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QCA8334 Four-port Gigabit Ethernet Switch

Data Sheet

80-Y0619-1 Rev. A

October 15, 2012

Confidential and Proprietary – Qualcomm Atheros, Inc.

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Revision history

Revision	Date	Description
1.0	May 14, 2012	Initial release
A	October 15, 2012	System change from SharePoint to Agile based on MKG-17791

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1 General Description

The QCA8334 is a highly integrated four-port Gigabit Ethernet switch with non-blocking switch fabric, a high-performance lookup unit with 2048 MAC addresses, and a four-traffic class Quality of Service (QoS) engine. The QCA8334 switch has the flexibility to support various networking applications. The QCA8334 is designed for cost-sensitive switch applications in VoIP phone, PLC/EOC bridge and IPTV platform.

The QCA8334 integrates all the functions of a high-speed switch system, including packet buffer, PHY transceivers, media access controllers, address management, and a non-blocking switch fabric into a single 55 nm CMOS device. It complies with 10BASE-Te, and 1000BASE-T specifications, including MAC control, pause frame, and auto-negotiation subsections, providing compatibility with all industry standard Ethernet, Fast Ethernet and Gigabit Ethernet.

The QCA8334 device contains two full-duplex 10BASE-Te/100BASE-Tx/1000BASE-T transceivers and 10BASE-Te /100BASE-Tx can run at half-duplex, each of which performs all of the physical layer interface functions for 10BASE-Te Ethernet on category 5 unshielded twisted-pair (UTP) cable and Fast/Gigabit Ethernet on category 5 UTP cable.

The remaining two ports feature a standard GMII/RGMII/MII/SerDes interface to allow connection to host CPU in PON/xDSL/cable/Wi-Fi/fiber routers. The media access controllers on the QCA8334 also support jumbo frames which are typically used for high-performance connections to servers because they offer a smaller percentage of overhead on the link for more efficiency.

SPI or EEPROM interfaces provide easy programming of the on-chip 802.1p QoS and/or DiffServ/TOS. This allows switch traffic to be given different classes of priority or service — for example, voice traffic for IP phone applications, video traffic for multimedia applications, or data traffic for email applications.

Up to 4K virtual LANs (VLANs) can be set up via the SPI port for separation of different users or groups on the network. ACL feature can reduce CPU effort for VLAN/QoS/DSCP/forward mapping and remapping based on layer 1 to layer 4 information. PPPoE header add/removal can increase video quality and offload CPU loading. Hardware IGMP V1/V2/V3 is an innovation for IPTV service. Green ETHOS® power saving technologies can increase energy efficiency for no link or idle state.

The QCA8334 supports the following configuration:

- 2 *10/100/1000BASE-T + RGMII/MII/RMII + SerDes/SGMII

1.1 Features

- Support 9 KB jumbo frame;

- Support internal/external loopback;
- Support 100/1000 FX auto-sensing on SerDes port;
- ACL mask rule from L1 to L4;
- 96 ACL mask rule for pass/drop, VLAN/QoS/DSCP mapping/translation;
- Flow-based bandwidth control and monitor;
- User-defined ACL, up to 48 bytes depth in L4/L3/L2;
- QinQ function for S-VLAN & C-VLAN translation;
- Support VLAN translation and mapping with 64 translation entries;
- Port-based VLAN and 4 K IEEE802.1q VLAN group;
- Weighted Round Robin (WRR), Strict Priority (SP) queueing and combined WRR+SP;
- Independent VLAN learning (IVL) and Shared VLAN Learning (SVL);
- IGMP snooping V1/V2 /V3. IPv6 MLD V1/V2 forwarded to CPU;
- Support light hardware IGMP snooping V1/V2/V3, MLD V1/V2 and smart leave;
- Port mirror, 802.1X security, Rapid Spanning Tree;
- 2K MAC table, edit, search, add & delete;
- Hardware looping detection;
- IP packet/PPPoE bypass to reduce CPU loading on video packet;
- 16 PPPoE session support/PPP session header removal/addition;
- 41 MIBs counter/port and port status;
- 1 Mbit packet buffer;
- Scalable ingress/egress bandwidth control;
- Rule-based bandwidth control;
- Half power mode for cable length less than 30 m (for home installations);
- Support reduced AFE circuit;
- MAC limit by port/chip/VLAN;
- Trunking function;
- Support auto-failover;
- IEEE 802.3az power management support;
- Power saving on cable no link, short cable and 10BASE-Te idle;
- Programmable Wake-on-LAN (WoL);
- Built-in switching regulator for reduced BOM with single 3.3 V power only;
- Support power-on cable diagnostic LED display;

1.2 System block diagram

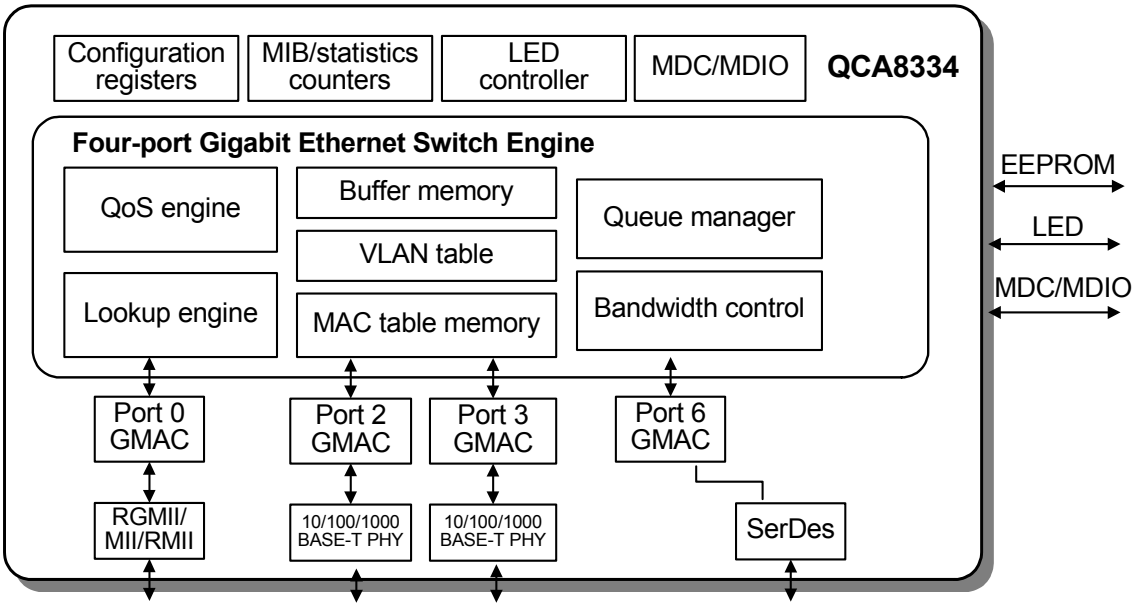

Figure 1-1 QCA8334 block diagram

2 Pin Description

This section includes package pinout and signal descriptions.

Nomenclatures for signal names

NC	No signal connection from this pin
_L	Signal name suffix indicating active low signals
_p	Signal name suffix indicating the positive side of a differential signal
_n	Signal name suffix indicating the negative side of a differential signal

Nomenclatures for signal types

D	Open drain for digital pads
IA	Analog input signal
I	Digital input signal
IH	Input signals with weak internal pull-up to prevent signals from floating when left open
IL	Input signals with weak internal pull-down to prevent signals from floating when left open
I/O	Digital bidirectional signal I/O pins include source end termination of 50 Ω impedance match and thus do not need external termination resistors. Leave unused pins float
OA	Analog output signal
O	Digital output signal Output pins include source end termination of 50 Ω impedance match and thus do not need external termination resistors. Leave unused pins float
P	Power or ground signal
PD	Internal weak pull-down
PU	Internal weak pull-up

2.1 Pinout diagram

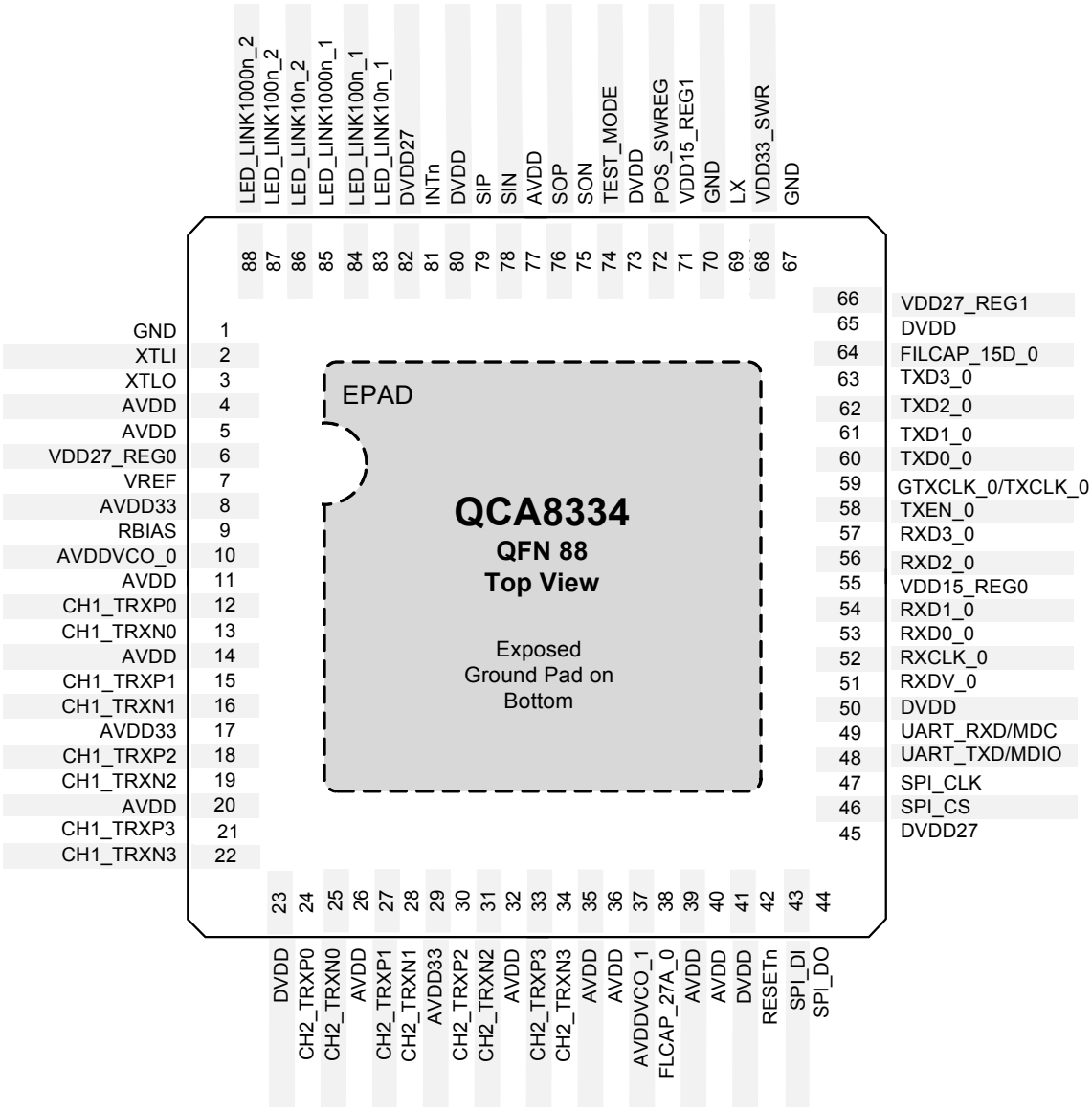

Figure 2-1 QCA8334 pinout diagram

2.2 Pin description

Table 2-1 Signal to pin descriptions (QFN)

Signal name	Pin	Type	Description
Media-dependent interface			
CH1_TRXN0	13	IA,OA	Media-dependent interface, MDI[3:0]: Transmitter output positive/negative Connect directly to transformer without any pull-down terminators, such as resistors or capacitors, required.
CH1_TRXP0	12	IA,OA	
CH1_TRXN1	16	IA,OA	
CH1_TRXP1	15	IA,OA	
CH1_TRXN2	19	IA,OA	
CH1_TRXP2	18	IA,OA	
CH1_TRXN3	22	IA,OA	
CH1_TRXP3	21	IA,OA	
CH2_TRXN0	25	IA,OA	Media-dependent interface, MDI[3:0]: Transmitter output positive/negative Connect directly to transformer without any pull-down terminators, such as resistors or capacitors, required.
CH2_TRXP0	24	IA,OA	
CH2_TRXN1	28	IA,OA	
CH2_TRXP1	27	IA,OA	
CH2_TRXN2	31	IA,OA	
CH2_TRXP2	30	IA,OA	
CH2_TRXN3	34	IA,OA	
CH2_TRXP3	33	IA,OA	
RGMII/MII/RMII interface 0			
GTXCLK_0/TXCLK_0	59	I/O	RGMII transmit clock, 125 MHz, 25 MHz or configurable. This is the reference clock for RGMII/MII mode. In RGMII/MII mode, when interface with 3.3 V source, insert a 200 ohm resister to this pin.
RXCLK_0	52	I/O	RGMII receive clock. This is the reference clock for RGMII/ MII/RMII mode. Reserve several resistors for EMI control.
RXDV_0	51	I/O,PU	RGMII/MII/RMII received data valid. This is output signal for MAC controller.
RXD0_0	53	I/O, PD	RGMII/MII/RMII receive data or configuration. The reference clock for these output signals is RXCLK_0 (pin 52). RXD[3:2]_0 are used as data output when operating in RGMII or MII mode. RXD[1:0]_0 are used as data output when operating in RMII mode.
RXD1_0	54	I/O, PD	
RXD2_0	56	I/O, PU	
RXD3_0	57	I/O, PD	
TXEN_0	58	I	RGMII/MII/RMII transmit enable. This is input signal for the MAC controller.
TXD0_0	60	I	RGMII/MII/RMII transmit data. These are input signals for MAC controller. The reference clock for these input signals is GTXCLK_ 0(pin59). TXD[3:2]_0 are used as data input when operating in RGMII or MII mode; TXD[1:0]_0 are used as data input when operating in RMII mode.
TXD1_0	61	I	
TXD2_0	62	I	
TXD3_0	63	I	

Table 2-1 Signal to pin descriptions (QFN) (cont.)

Signal name	Pin	Type	Description
LED			
LED_LINK10n_1	83	O,D	LED_LINK10n_[2:1] Parallel LED output for 10BASE-Te link/speed/activity, active low. The LED inactive state can be open-drain or driving high output, depending on the power-on strapping setup. The LED behaviour can be configurable, see the LED control registers (0x0050–0x005C). The register offset 0x0058 is for 10BASE-Te.
LED_LINK10n_2	86	O,D	
LED_LINK100n_1	84	O,D	LED_LINK100n_[2:1] Parallel LED output for 100BASE-Tx link/speed/activity, active low. The LED inactive state can be open-drain or driving high output, depending on the power-on strapping. The LED behaviour can be configured, see the LED control registers (0x0050–0x005C). The register offset 0x0054 is for 100BASE-Te.
LED_LINK100n_2	87	O,D	
LED_LINK1000n_1	85	O,D	LED_LINK1000n_[2:1] Parallel LED output for 1000BASE-T link/speed/activity, active low. The LED inactive state can be open-drain or driving high output, depending on the power-on strapping setup. The LED behaviour can be configured, see the LED control registers (0x0050–0x005C). The register offset 0x0050 is for 1000BASE-T.
LED_LINK1000n_2	88	O,D	
UART/MDIO and SPI EEPROM			
SPI_CLK	47	I/O, PD	SPI clock
SPI_CS	46	I/O, PD	SPI chip selection
SPI_DI	43	I, PD	SPI data input
SPI_DO	44	I/O, PU	SPI data output
UART_RXD/MDC	49	I, PD	Management data clock reference
UART_TXD/MDIO	48	I/O	Management data
SerDes interface			
SOP	76	OA	SerDes differential output pair
SON	75	OA	
SIP	79	IA	SerDes differential input pair
SIN	78	IA	
Miscellaneous			
RBIAS	9	OA	Connect 2.4 kΩ resistor to GND. The resistor value is adjustable, depending on PCB.
RESETn	42	IH	Chip reset, active low. The active low duration must be greater than 10 ms.
TEST_MODE	74	I	Test mode: 0 = Normal operation 1 = Test mode

Table 2-1 Signal to pin descriptions (QFN) (cont.)

Signal name	Pin	Type	Description
XTLI	2	IA	Crystal oscillator input, connect a 27 pF capacitor to GND. An external 25 MHz clock with swing from 0-1 V can be injected to this pin. When an external clock source is used, the 27 pF capacitor should be removed from this pin and the 27 pF capacitor at XTLO should be maintained.
XTLO	3	OA	Crystal oscillator output, connect a 27 pF capacitor to GND
INTn	81	O, PU	Interrupt, active low. See the global interrupt registers (0x0020–0x0024).
VREF	7	OA	Reference voltage, put a 1 nF cap to GND
POS_SWREG	72	I/O, PU	Control switch regulator output voltage
Power			
DVDD	23 41 50 65 73 80	P	1.2 V digital power input
AVDD	4 5 11 14 20 26 32 35 36 39 40 77	P	1 V analog power input
GND	1 67 70 EPAD	P	Ground
AVDD33	8 17 29	P	3.3 V analog power input
VDD33_SWR	68	P	3.3 V power for internal switching regulator
DVDD27	45 82	P	2.7 V power input for I/O PAD excluding RGMII interface.
LX	69	OA	Internal switching regulator output; connect to an inductor 4.7 µH, 1 A to generate 1.2 V power.
VDD27_REG0	6	P	2.7 V power output for analog; connect to an external capacitor 1 µF for power supply stabilization.

Table 2-1 Signal to pin descriptions (QFN) (cont.)

Signal name	Pin	Type	Description
VDD27_REG1	66	P	2.7 V power output for DVDD27; connect to an external capacitor 1 µF for power supply stabilization.
VDD15_REG0	55	P	RGMII interface 0 power source. It can be connected to external 2.7 V power or only connect an external capacitor 1 µF and using internal LDO for 1.8 V or 1.5 V interface power.
VDD15_REG1	71	P	RGMII interface 1 power source. It can be connected to external 2.7 V power or only connect an external capacitor 0.1 µF and using internal LDO for 1.8 V or 1.5 V interface power.
AVDDVCO_0	10	P	Analog 1.2 LDO output filter pin for VCO
AVDDVCO_1	37	P	
FILCAP_27A_0	38	P	Connect to an external capacitor 0.1 µF
FILCAP_15D_0	64	P	

3 Functional Description

The QCA8334 supports operating modes that can be configured using a low-cost serial EEPROM and/or the MDC/MDIO interface. The QCA8334 also supports a CPU header mode that appends two bytes to each frame.

The CPU can deheader frame with header to configure the switch register, the address lookup table, and VLAN and receive auto-cast MIB frames. The QCA8334 supports single PHY interface as a WAN port.

The first port (port0) supports a MAC interface that can be configured in RGMI/MII/RMII-PHY mode to connect to an external management CPU or an integrated CPU in a routing or xDSL engine.

The QCA8334 contains a 2K entry address lookup table that employs three entries per bucket to avoid hash collision and maintain non-blocking forwarding performance. The table also provides read/write accesses from the serial and CPU interfaces; each entry can be configured as a static entry. The QCA8334 supports 4K VLAN entries configurable as port-based VLANs or 802.1q tag-based VLANs.

To provide non-blocking switching performance in all traffic environments, the QCA8334 supports several types of QoS function with four-level priority queues based on port, IEEE 802.1p, IPv4 DSCP, IPv6 TC, 802.1q VID, or MAC address. Back pressure and IEEE 802.3x pause frame-based flow control schemes are included to support zero packet loss under temporary traffic congestion.

Meeting current service provider requirements, the QCA8334 switch uses the latest Qualcomm Atheros QoS switch architecture that supports ingress policing and egress rate limiting. The QCA8334 device supports IPv4 IGMP snooping and IPv6 MLD snooping to significantly improve the performance of streaming media and other bandwidth-intensive IP multicast applications.

A broadcast storm control mechanism prevents the packets from flooding into other parts of the network. The QCA8334 device has an intelligent switch engine to prevent head-of-line blocking problems on per-CoS basis for each port.

3.1 Basic switch function

The QCA8334 automatically learns the port number of an attached end station by looking at the source MAC address of all incoming packets at wire speed. If the source address is not found in the address table, the QCA8334 device adds it to the table. Once the MAC address/port number mapping is learned, all packets directed to that end station's MAC address are forwarded to the learned port number only.

When the QCA8334 device receives incoming packets from one of its ports, it searches in its address table for the destination MAC address, then forwards the packet to the appropriate port within the VLAN group. If the destination MAC address is not found (i.e. a new, unlearned MAC address), the QCA8334 handles the packet as a broadcast packet and transmits it to all ports within the VLAN group, except to the port where it comes in.

3.1.1 Lookup engine

The QCA8334 lookup engine or ARL (Address Resolution Logic) retrieves the DA and SA from each frame received from each port. The ARL performs all address searching, learning, and aging functions at wire speed. The ARL engine uses a hashing algorithm for fast storage and retrieval of address entries. To avoid hash collision, the QCA8334 uses a three-entry bin per hash location that stores up to three MAC addresses at each hash location. The address database is stored in the embedded SRAM and has a size of 2048 entries.

3.1.2 Automatic address learning

Up to 2048 MAC address/port number mappings can be stored in the address table. A three-way hash algorithm allows a maximum of three different addresses with the same hash key to be stored simultaneously. The QCA8334 searches for the SA of an incoming packet in the address table.

If the SA is not found, the address is hashed and stored in the first empty bin found at the hashed location. If all address bins are full, each entry's age time is examined to select the least recently used bin.

If the SA is found, the aging value of the corresponding entry is reset to 0x7. If the DA is dropped due to error or pause frame, the QCA8334 does not perform learning process for this frame.

3.1.3 Automatic address aging

Address aging supports network topology changes such as an end station disconnecting from the network or an address moving from one port to another. An address is removed (aged-out) from the address database after a specified amount of time since the last time it appears in an incoming frame source address. The QCA8334 has a default aging time of 5 minutes, and can be set in 7-second increments to a maximum of 10,000 minutes.

3.1.4 Flow control

The QCA8334 device supports IEEE 802.3x full-duplex flow control, force-mode full-duplex flow control, and half-duplex backpressure.

If the link partner supports auto-negotiation, the 802.3x full-duplex flow control is auto-negotiated between the remote node and the QCA8334. If the full-duplex flow control is enabled, when the buffer number used for specific port exceed the per port buffer threshold or total buffer used exceeds global based buffer threshold, the QCA8334 sends out an IEEE 802.3x compliant pause frame to stop the remote device from sending more frames.

Half-duplex flow control regulates the remote station to avoid dropping packets in network congestion. Backpressure is supported for half-duplex operations. When the free buffer space is almost empty, the QCA8334 device transmits a jam pattern on the port and forces a collision. If the half-duplex flow control mode is not set, the incoming packet is dropped if there is no buffer space available.

3.1.5 ARL table

The address database is stored in the embedded SRAM and has a size of 2048 entries with a default aging time of about 300 seconds or 5 minutes.

The ARL table supports:

- Search one address in the table
- Use Get Next to read out whole table
- Load and purge an entry in the ARL table
- Flush entries:
  - All entries
  - All non-static entries
  - One port's all entries
  - One port's all non-static entries

All registers and counters can be accessed (read and written) through the UART/MDIO interface and CPU port frames. Interrupts may be asserted upon access completion.

Table 3-1 ARL table

Bits	Name	Description
83:72	VID	The VID group indicates to which the MAC address belongs.
71	RESERVED	
70	COPY_TO_CPU	1 = Packets received with this address should be copied to the CPU port
69	REDIRECT_TO_CPU	1 = Packets received with this address should be redirected to the CPU port. If no CPU is connected to the switch, this frame should be discarded.
68	LEAKY_EN	1 = Use leaky VLAN enable for this MAC address. This bit can be used for unicast and multicast frame controlled by ARL_UNI_LEAKY_EN AND ARL_MULTI_LEAKY_EN.
67:64	STATUS	4'h0 = Empty entry 4'h1–4'h7 = Dynamic and valid entry 4'h8–4'hE = Reserved 4'F = Entry is static and is not aged out or changed by hardware.
63	RESERVED	
62	SA_DROP_EN	Drop packet enable when source address is in this entry. If this bit is set to 1, the packet with SA of this entry are dropped.

Table 3-1 ARL table (cont.)

Bits	Name	Description
61	MIRROR_EN	0 = Packets should only be sent to destination port 1 = Packets should be sent to mirror port and destination port.
60	PRI_EN	Priority override enable 1 = PRIORITY (ATU[58:56]) can override any other priority determined by the frame's data.
59	SVL_ENTRY	0 = IVL learned 1 = SVL learned
58:56	PRIORITY	The priority bits may be used as the frame's priority when PRI_ OVER_EN (bit[60]) is set to 1.
55	CROSS_PORT_STATE_EN	0 = Cross port state disable 1 = Cross port state enable
54:48	DES_PORT	Indicate which ports are associated with this MAC address when they are set to 1. E.g. bit[48] is assigned to port0, bit[50] to port2, etc. If all bits are set to 0 and the entry is static, the packet should be dropped. For multicast address and unicast for link aggregation, more than one bit is set to 1.
47:0	ADDRESS	48-bit MAC address

Table 3-2 Reserved ATU entry

Bit	Name	Description
64	STATUS	0 = Invalid 1 = Static and valid
63	COPY_TO_CPU	1 = Packets received with the address should be copied to the CPU port
62	REDIRECT_TO_CPU	1 = Packets received with this address should be redirected to the CPU port. If no CPU is connected to the switch, the packet is dropped.
61	LEAKY_EN	1 = Use leaky VLAN enable for this MAC address. This bit can be used for unicast and multicast frames, controlled by ARL_UNI_LEAKY_EN and ARL_MULTI_LEAKY_EN.
60	MIRROR_EN	0 = Packets should be sent only to the destination port 1 = Packets should be sent to the mirror port and the destination port
59	PRI_OVER_EN	Priority override enable 1 = PRIORITY (ATU[58:56]) can override any other priority determined by the frame's data
58:56	PRI	This priority bit may be used as a frame's priority when PRI_OVER_ EN is set to 1.
55	CROSS_PORT_STATE_EN	1 = Cross port state enabled
54:48	DES_PORT	These bits indicate which ports are associated with this MAC address when they are set to 1. E.g.bit[48] is assigned to port0, bit[50] to port2, etc.
47:0	ADDRESS	48-bit MAC address

3.1.6 Mirroring

Mirroring monitors traffic for information gathering or troubleshooting higher layer protocol operations. User can specify a desired mirrored port (sniffer port) to receive a copy of all traffic passing through a designated mirrored port.

The QCA8334 supports mirror frames that:

- Come from an ingress-specified port (ingress mirroring)
- Destined for egress-specified port (egress mirroring)
- Mirror all ingress and egress traffic to a designated port
- Mirror frames when configuring the ARL table with mirror enabled
- ACL mirror

3.2 QoS

3.2.1 Scheduling

For the QCA8334, ports MAC0, MAC5, and MAC6 support six queues and ports MAC1, MAC2, MAC3 and MAC4 support four queues. This egress queue scheduling mechanism can be configured to one of the following modes:

- Strict Priority (SP)
- Weighted Fair Queuing (WFQ)
- Mixed mode: The highest one or two queues use Strict Priority; other queues use wEighted Fair Queuing scheme.

The scheduling mode is configurable per port basis.

The QCA8334 recognizes the QoS information of ingress frames and maps to different egress priority levels. The QCA8334 determines the priority of the frames based on DA, TOS/TC, VLAN, and port. Each has an enable bit that can be applied. When more than one type of priority is selected, the order in which the frame priority should be applied can be determined. Priority enable bits and select order bits are set on a per port basis at the port's base address.

3.2.2 Ingress rate limit

In triple-play applications, the switch needs to limit the rate for all frames but continue to maintain QoS policy. The QCA8334 supports ingress and egress rate limiting requirements on a per port basis by configuring the port rate limit register.

Ingress rate limit can include or exclude the consideration of management frames and registered multicast frames. The QCA8334 can limit all frames and support rate limits from 32 Kbps to 1 Gbps, at 32 Kbps granularity.

Ingress rate limit supports one of the following mode on a per port basis.

- Two single rate mode
- Two rate three color mode: QCA8334 can support color aware or color blind mode

In color aware mode, QCA8334 can recognize the color with DEI bit if S-tagged frame or configured DEI bit in registers (register 0x0630–0x0650) for tagged priority or DSCP.

- When DEI is 0, the frame is declared Green. The long term average bit rate of Service Frames that are declared Green is bounded by CIR + EIR.
- While DEI is 1, the frame is declared Yellow. The long term average bit rate of Service Frames that are declared Yellow is bounded by EIR if Green is not using EIR bucket.

QCA8334 also supports Coupling Flag (CF). The choice of the value for CF has the effect of controlling the volume of the Service Frames that are declared Yellow.

- When CF is set to 0, the long term average bit rate of Service Frames that are declared Yellow is bounded by EIR.
- When CF is set to 1, the long term average bit rate of Service Frames that are declared Yellow is bounded by CIR + EIR, depending on the volume of offered Service Frames that are declared Green.

In color blind mode, the long term average bit rate of Service Frames is bounded by CIR + EIR, among which frames using CIR bucket is declared Green and frames using EIR bucket is declared Yellow.

3.2.3 Egress rate limit

The QCA8334 can also support per port or per queue based egress rate limiting. The QCA8334 can support egress rate limits from 32 Kbps to 1 Gbps, at 32 Kbps granularity.

3.2.4 Head-of-line blocking (HOL)

The QCA8334 supports ingress port buffer and egress port/queue buffer control to handle head-of-line blocking. The maximum queue depth for per port or per queue is configurable.

To avoid HOL, each port has dedicated buffer resource that can be configured per queue and/or per port basis for egress port. When the egress queue depth exceeds the configured number, the ingress frame destination to this queue is dropped if the flow control of source port is disabled; the pause frame is sent out to prohibit more frames from coming in if flow control of source port is enabled.

When queue limit reaches 3/4 of the HOL threshold, the ingress packets are dropped according to the RED algorithm. If color aware mode is configured, Yellow packets are dropped if the queue reaches 3/4 of the queue HOL threshold, while Green packets are dropped according to the RED algorithm.

3.2.5 Egress queue remap

The QCA8334 supports priority remap that can modify DSCP or 802.1Q priority tag in the egress frames. This feature is configured per egress queue. There are 16 entries of egress queue remap

table in total and the entry offset is 0x10 with base address 0x5AE00. Table 3-3 shows the entry format of egress queue remap.

Table 3-3 Egress queue remap

Bit	Field	Description
23	DSCP_REMARK_EN	Remapped DSCP enable
22	PRI_REMARK_EN	Remapped priority enable
21:16	DSCP_GREEN	Remapped DSCP for green
15:14	RESERVED	
13:8	DSCP_YELLOW	Remapped DSCP for yellow
7	RESERVED	
6:4	PRI_GREEN	Remapped priority for green
3	RESERVED	
2:0	PRI_YELLOW	Remapped priority for yellow

3.3 VLAN

The QCA8334 switch supports many VLAN options, including IEEE 802.1q and port-based VLANs. The QCA8334 supports 4096 IEEE 802.1q VLAN groups and 4K VLAN table entries. The QCA8334 device checks VLAN port membership from the translation VID.

Table 3-5 shows the QCA8334 supported 802.1q modes. The port-based VLAN is enabled according to the user-defined port VID value. The QCA8334 supports optional discard of tagged, untagged, and priority tagged frames. The QCA8334 supports untagging of the VLAN ID for packets going out on untagged ports on a per-port basis. The QCA8334 also supports double tagging frame which is S-Tag and C-Tag.

The QCA8334 can lookup the 4K VLAN table by S-Tag or C-Tag, depending on the configuration mode. There are also 64 entries in VLAN translation table to support the VLAN operation.

3.3.1 Port-based VLAN

The QCA8334 switch supports port-based VLAN functionality used for non-management frames when 802.1q is disabled on the ingress port. When FORCE_PORT_VLAN_EN is enabled, non-management frames conform to port-based configurations even if 802.1q is enabled on the ingress port. Each ingress port contains a register that restricts the output (or egress) ports to which it can send frames. This port-based VLAN register has a field PORT_VID_MEM that contains the port-based setting. If bit[0] of a port's PORT_VID_MEM is set to 1, the port is allowed to send frames to port 0, and so on. At reset, the PORT_VID_MEM for each port is set to all 1s, except for each port's own bit, which clears to 0. Note that the CPU port is port 0.

3.3.2 802.1q VLANs

The QCA8334 supports a maximum of 4096 entries in the VLAN table. The device supports 4096 VLAN ID, ranging from 0 to 4095. The QCA8334 supports both shared and independent VLAN learning (SVL and IVL). This means that forwarding decisions are based on the frame's destination MAC address, which should be unique among all VLANs.

3.3.3 VLAN security

The QCA8334 checks the ingress packets based on the VLAN operation mode and decide whether to forward or drop the packets. There are two sets of configuration: one is the ingress VLAN mode, see Table 3-4; another is 802.1q mode, see Table 3-5. The ingress VLAN mode is for checking whether the ingress frame is tagged or not. The 802.1q mode is for checking if the ingress VID is valid and if the ingress port belongs to the member.

Table 3-4 Ingress VLAN mode

ING_VLAN_MODE	Frame with tag	Frame with priority tag	Frame without tag
00	Forward	Forward	Forward
01	Forward	Drop	Drop
10	Drop	Forward	Forward
11	Forward	Forward	Forward

Table 3-5 802.q mode

802.1q	VID miss	VLAN member violation	No violation
Secure	Drop	Drop	Forward Use VLAN table result
Check	Drop	Forward Use VLAN table result	Forward Use VLAN table result
Fallback	Forward Use port-based VLAN	Forward Use VLAN table result	Forward Use VLAN table result
Disable	Forward Use port-based VLAN		

3.3.4 Port isolation

When FORCE_PORT_VLAN_EN is enabled on the ingress port, except for VLAN member check, non-management frames conform to port-based VLAN member check.

3.3.5 Leaky VLAN

The QCA8334 supports leaky VLAN to enable specific frames to be forwarded across VLAN boundary. Three types of frames can be leaked across VLAN boundary: unicast, multicast and ARP. Unicast and multicast are port or MAC address based, and ARP is port-based.

3.3.6 VLAN translation

The QCA8334 supports VLAN translation function. The QCA8334 lookups the VLAN translation table when packets arrive at the ingress port and packets transmit at the egress port.

The VLAN translation table allows user to modify the C-VID and/or S-VID, see Table 3-6.

Table 3-6 VLAN translation table

Bits	Name	Description
48	ONE_TO_ONE_MODE	0 = Disable 1:1 VLAN 1 = Enable 1:1 VLAN
47	C_VID_EN	1 = C-VID enable
46	S_VID_EN	1 = S-VID enable
45	O_VID_C	0 = Use S-VID 1 = Use C-VID
44:38	PORT_BIT_MAP	Source port when frame received; destination port when frame send out.
37:36	ENTRY_MODE	00 = Invalid entry 01 = Forward lookup enable (o -> s,c) 10 = Reverse lookup enable (s,c -> o) 11 = Forward & reverse lookup both enabled
35:24	C_VID	Custom VID
23:12	S_VID	Service VID
11:0	O_VID	Original VID

3.3.7 Egress mode

The QCA8334 supports per port egress VLAN mode:

- Tagged
- Untagged
- Unmodified
- Untouched

Frames sent out with tagged or untagged depend on the egress mode setting, see Table 3-7.

Table 3-7 VLAN egress mode — tagging

EG_VLAN_MODE	Egress VID = Untagged	Egress VID = Priority tagged	Egress VID = Tagged
Tagged	Egress port default VID	Egress port default VID	Egress VID
Unmodified	Untagged	Priority untagged	Egress VID
Untagged	Untagged	Untagged	Untagged
Untouched	Original packet's encapsulation		

The egress mode can be defined by the different operation modes, see Table 3-8.

Table 3-8 VLAN egress mode

802.1q disabled on egress port			Port-based egress VLAN mode
Edge port	S-Tag mode		Port-based egress VLAN mode
	C-Tag mode		VLAN-based egress VLAN mode
Core port	S-Tag mode	S-Tag	VLAN-based egress VLAN mode
		C-Tag	Keep translation result
	C-Tag mode	S-Tag	Keep translation result
		C-Tag	VLAN-based egress VLAN mode

3.3.8 VLAN table

The QCA8334 supports 4K VLAN membership table. It also supports the following commands to access the VLAN table.

- Read one entry
- Use Get Next to read out whole table
- Load and purge of an entry
- Flush all entries, flush all of one port's entries

Table 3-9 VLAN table format

Bits	Name	Description
20	VALID	0 = Entry is empty 1 = Entry is valid
19	IVL_EN	0 = VID is used to SVL; VID replaced by 0 when search MAC address. 1 = VID is used to IVL
18	LEARN_LOOKUP_DIS	0 = Normal operation about learn and final DP 1 = Not learn and not use ARL table DP to calculate final DP, but use UNI flood DP as ARL DP to calculate DP

Table 3-9 VLAN table format (cont.)

Bits	Name	Description
17:4	EG_VLAN_MODE	E.g. bits[5:4] for port0, …bits[17:16] for port6 00 = Unmodified 01 = Untagged 10 = Tagged 11 = Not member
3	PRI_OVER_EN	Priority overwrite enable 0 = Keep the original VLAN priority 1 = Overwrite the VLAN priority with bits[2:0] of this entry
2:0	PRI	Used as frame's VLAN priority when the PRI_OVER_EN (bit[3]) is set to 1.

3.4 ACL

The QCA8334 supports up to 96 ACL rule table entries. Each rule can support filtering or re-direction of the incoming packets based on the following field in the packet.

- Source MAC address
- Destination MAC address
- VID
- EtherType
- Source IP address
- Destination IP address
- Protocol
- Source TCP/UDP port number
- Destination TCP/UDP port number
- Physical port number
- User-defined window pattern

When the incoming packets match an entry in the rules table, the following action can be taken defined in the result field.

- Change C-Tag or S-Tag
- Drop or redirect the packet
- Configure rate limit based on flow
- Change priority

The QCA8334 can bind multiple keys and support up to 2 matches per packet to support different functions such as QoS, forwarding, routing, rate measuring/limiting, etc.

3.4.1 ACL rule

The ACL rule is constructed from a packet pattern, pattern mask and action. The pattern can be defined as MAC layer or layer 3 (IPv4 or IPv6) or user-defined window. The ACL pattern types supported by the QCA8334 are listed in Table 3-10.

Table 3-10 ACL patterns

Value	Description
1	MAC pattern
2	IPv4 pattern
3	IPv6 pattern 1
4	IPv6 pattern 2
5	IPv6 pattern 3
6	Window pattern
7	Enhanced MAC pattern
0	Invalid pattern

3.4.2 Action definition

The action is taken when the defined pattern is matched.

In the ACL rule matching, the QCA8334 supports two match consolidations. If the key of ingress frame is matched with two entries in the ACL, these two actions consolidate. The basic rule for consolidation is that the first action is the first priority if the related bit is active. If the related bit of the first entry is inactive, the second entry is used. But for ACL_MATCH_INT_EN, ACL_DP_ACT and MIRROR_EN field is the OR operation between two actions.

Table 3-11 Action definition

Bits	Name	Description
80	ACL_MATCH_INT_EN	Generate interrupt
79	ACL_EG_TRNAS_BYPASS	Bypass egress QinQ result
78	ACL_RATE_EN	0 = Not use ACL rate limit 1 = Use ACL rate limit
77:73	ACL_RATE_SEL	Select ACL rate limit (index)
72:70	ACL_DP_ACT	111 = Drop 011 = Redirect 001 = Copy to CPU 000 = Forward
69	MIRROR_EN	1 = Mirror packet to mirror port
68	DES_PORT_OVER_EN	1 = Use DES_PORT to determine packet destination port. It can cross VLAN.

Table 3-11 Action definition (cont.)

Bits	Name	Description
67:61	DES_PORT	If DES_PORT_EN is set to 1, these bits are used to determine destination port.
60	ENQUEUE_PRI_OVER_EN	1 = Use ENQUEUE_PRI to determine enqueue priority
59:57	ENQUEUE_PRI	Enqueue priority
56	ARP_WCMP	1 = Select hash
55:49	ARP_INDEX	Index of ARP table
48	ARP_INDEX_OVER_EN	Overwrite the router's result
47:46	FORCE_L3_MODE	00 = No force 01 = SNAT 10 = DNAT 11 = Reserved
45	LOOKUP_VID_CHANGE_EN	1 = Lookup use VID in S-Tag or C-Tag, determined by switch tag mode. For S-Tag mode, use S-Tag; for C-Tag mode, use C-Tag.
44	TRANS_CTAG_CHANGE_EN	Enqueue egress translation key change enable
43	TRANS_STAG_CHANGE_EN	Enqueue egress translation key change enable
42	CTAG_DEI_CHANGE_EN	1 = Frame should be send out by C-Tag; CFI changed to C-Tag[12]
41	CTAG_PRI_REMAP_EN	1 = Frame should be send out by C-Tag; priority changed to C-Tag[15:13]
40	STAG_DEI_CHANGE_EN	1 = Frame should be send out by S-Tag; CFI changed to S-Tag[12]
39	STAG_PRI_REMAP_EN	1 = Frame should be send out by S-Tag; priority changed to S-Tag[15:13]
38	DSCP_REMAP_EN	Modify the DSCP of packet 0 = Unmodified 1 = Modified
37:32	DSCP	DSCP value
31:16	CTAG	[15:13] C-Tag priority [12] CFI [11:0] C-Tag VID
15:0	STAG	[15:13] S-Tag priority [12] DEI [11:0] S-Tag VID

3.4.3 MAC pattern

The action is taken when the MAC pattern is matched.

Table 3-12 MAC pattern

Byte	Name	Description
16	[7] RULE RESULT INVERSE EN	0 = Apply action on the rule entry matches 1 = Apply action on the rule entry does not match
	[6:0] SOURCE PORT	Enable rule for physical source port
15:14	TYPE	EtherType field
13:12	VLAN[15:13] PRIORITY	VLAN priority bits
	[12] CFI	VLAN CFI bit
	[11:0] VID/VID LOW	This field can be VID or VID_LOW, depending on the VID_MASK_OPTION.
11:4	SA	Source address
3:0	DA	Destination address

Table 3-13 MAC pattern mask

Byte	Name	Description
16	[7:6] RULE VALID	00 = Start 01 = Continue 10 = End 11 = Start & end
	[5] FRAME WITH TAG MASK	0 = Ignore FRAME_WITH_TAG 1 = Consider FRAME_WITH_TAG
	[4] FRAME_WITH_TAG	0 = Untagged frame 1 = Tagged frame
	[3] VID MASK	0 = Range 1 = Mask
	[2:0] RULE TYPE	These three bits must be 001 to indicate the MAC rule.
15:14	TYPE MASK	Enable check mask for EtherType
13:12	VLAN [15:13] PRIORITY MASK	Enable check mask for VLAN priority
	[12] CFI MASK	Enable check mask for VLAN CFI
	[11:0] VID MASK/VID HIGH	Enable check mask for VID to define VID upper boundary
11:6	SA MASK	Enable check mask for SA
5:0	DA MASK	Enable check mask for DA

3.4.4 IPv4 pattern

The action is taken when the IPv4 rule is matched.

Table 3-14 IPv4 pattern

Byte	Name	Description
16	[7] RULE RESULT INVERSE EN	0 = Apply action on frames that match the rule 1 = Apply action on frames that do not match the rule
	[6:0] SOURCE PORT	Enable rule for physical source port
15	[7:6] RESERVED	
	[5:0] TCP FLAGS	TCP control bits
14	[7] RESERVED	
	[6] DHCPv4	DHCPv4 frame
	[5] RIPv1	RIPv1frame
	[4]SPORT_FIELD_TYPE	0 = TCP/UDP sport 1 = ICMP type/code
	[3:0] RESERVED	
13:12	TCP/UDP SOURCE PORT/ TCP/UDP SOURCE PORT LOW OR ICMP TYPE CODE	TCP/UDP source port number or low bound port number. See mask byte 14 bit[0].
11:10	TCP/UDP DESTINATION PORT/ TCP/UDP DESTINATION PORT LOW	TCP/UDP destination port number or low bound port number. See mask byte 14 bit[1].
9	DSCP	DSCP field
8	IP PROTOCOL	IP protocol
7:4	SIP	Source IP address
3:0	DIP	Destination IP address

Table 3-15 IPv4 mask

Byte	Name	Description
16	[7:6] RULE VALID	00 = Start 01 = Continue 10 = End 11 = Start & end
	[5:3] RESERVED	
	[2:0] RULE TYPE	These three bits must be 010 to indicate the IPv4 rule.
15	[7:6] RESERVED	
	[5:0] TCP FLAGS MASK	Enable check mask for TCP control bits

Table 3-15 IPv4 mask (cont.)

Byte	Name	Description
14	[7] RESERVED	
	[6] DHCPV4 MASK	Enable check for DHCPv4 frame
	[5] RIPv1 MASK	Enable check for RIPv4 frame
	[4:2] RESERVED	
	[1] TCP/UDP DESTINATION MASK	Indicates the definition of bytes 11 and 10. 0 = Range 1 = Mask
	[0] TCP/UDP SOURCE MASK	Indicates the definition of bytes 13 and 12. 0 = Range 1 = Mask
13:12	TCP/UDP SOURCE PORT MASK/ TCP/UDP SOURCE PORT HIGH OR ICMP TYPE CODE MASK	This can be mask or high definition. See byte 14, bit[0].
11:10	TCP/UDP DESTINATION PORT MASK/ TCP/UDP DESTINATION PORT HIGH	This can be mask or high definition. See byte 14, bit[1].
9	DSCP MASK	Enable check for DSCP bits
8	IP PROTOCOL MASK	Enable check for IP protocol bits
7:4	SIP MASK	Enable check for SIP
3:0	DIP MASK	Enable check for DIP

3.4.5 IPv6 pattern

Table 3-16 IPv6 pattern 1

Byte	Name	Description
16	[7] RULE RESULT INVERSE EN	0 = Apply action on the rule entry matches 1 = Apply action on the rule entry does not match
	[6:0] SOURCE PORT	Enable rule for physical source port
15:0	DIP	Destination IP address

Table 3-17 IPv6 pattern 2

Byte	Name	Description
16	[7] RULE RESULT INVERSE EN	0 = Apply action on the rule entry matches 1 = Apply action on the rule entry does not match
	[6:0] SOURCE PORT	Enable rule for physical source port
15:0	SIP	Source IP address.

Table 3-18 IPv6 pattern 3

Byte	Name	Description
16	[7] RULE RESULT INVERSE EN	0 = Apply action on the rule entry matches 1 = Apply action on the rule entry does not match
	[6:0] SOURCE PORT	Enable rule for physical source port
15	[7:6] RESERVED	
	[5:0] TCP FLAGS	TCP control bits
14	[7] RESERVED	
	[6] DHCPv6	DHCPv6 frame
	[5] RESERVED	
	[4]SPORT_FIELD_TYPE	0 = TCP/UDP SPORT 1 = ICMP TYPE/CODE
	[3:0] RESERVED	
13:12	TCP/UDP SOURCE PORT/ TCP/UDP SOURCE PORT LOW or ICMP TYPE CODE	TCP/UDP source port number or the low bound port number. See mask byte 14 bit[0]. ICMP type code, see byte 14 bit[4].
11:10	TCP/UDP DESTINATION PORT/ TCP/UDP DESTINATION PORT LOW	TCP/UDP destination port number or the low bound port number, see mask byte 14 bit[1].
9	RESERVED	
8:6	[23:20] RESERVED	
	[19:0] IPV6 FLOW LABEL	IPv6 flow label
5:2	RESERVED	
1	DSCP	DSCP field
0	IP PROTOCOL	IP protocol

Table 3-19 IPv6 mask 1

Byte	Name	Description
16	[7:6] RULE VALID	00 = Start 01 = Continue 10 = End 11 = Start & end
	[5:3] RESERVED	
	[2:0] RULE TYPE	These three bits must be 011 to indicate the IPv6 rule 1.
15:0	DIP MASK	Enable check for destination IP address

Table 3-20 IPv6 mask 2

Byte	Name	Description
16	[7:6] RULE VALID	00 = Start 01 = Continue 10 = End 11 = Start & end
	[5:3] RESERVED	
	[2:0] RULE TYPE	These three bits must be 100 to indicate the IPv6 rule 2
15:0	SIP MASK	Enable check for source IP address

Table 3-21 IPv6 mask 3

Byte	Name	Description
16	[7:6] RULE VALID	00 = Start 01 = Continue 10 = End 11 = Start & end
	[5:3] RESERVED	
	[2:0] RULE TYPE	These three bits must be 101 to indicate the IPv6 rule 3.
15	[7:6] RESERVED	
	[5:0] TCP FLAGS MASK	Enable check mask for TCP control bits
14	[7] FORWARD TYPE MASK	
	[6] DHCPV6 MASK	Enable check for DHCPv6 frame
	[5] RESERVED	
	[4:2] RESERVED	
	[1] TCP/UDP DESTINATION MASK	0 = Range 1 = Mask
	[0] TCP/UDP SOURCE MASK	0 = Range 1 = Mask
13:12	TCP/UDP SOURCE PORT/ TCP/UDP SOURCE PORT HIGH or ICMP TYPE CODE MASK	Enable check for TCP/IP source port or TCP/IDP source port upper bound; Enable check for ICMP type code.
11:10	TCP/UDP DESTINATION PORT/ TCP/UDP DESTINATION PORT HIGHMASK	Enable check for TCP/UDP destination port or TCP/UDP destination port upper bound.
9	RESERVED	
8:6	[23:20] RESERVED	
	[19:0] IPV6 FLOW LABEL MASK	Enable check for IPv6 flow label
5:2	RESERVED	

Table 3-21 IPv6 mask 3 (cont.)

Byte	Name	Description
1	DSCP MASK	Enable check for DSCP
0	IP PROTOCOL MASK	Enable check for IP protocol

3.4.6 Window pattern

Table 3-22 Window pattern

Byte	Name	Description
16	[7] RULE RESULT INVERSE EN	0 = Apply action on frames that match the rule 1 = Apply action on frames that do not match the rule
	[6:0] SOURCE PORT	Enable rule for physical source port
15:0	DATA	Data pattern

Table 3-23 Window pattern mask

Byte	Name	Description
16	[7:6] RULE VALID	00 = Start 01 = Continue 10 = End 11 = Start & end
	[2:0] RULE TYPE	These three bits must be 110 to indicate the window rule.
15:0	DATA MASK	Enable check for data pattern

3.4.7 Enhanced MAC pattern

Table 3-24 Enhanced MAC pattern

Byte	Name	Description
16	[7] RULE RESULT INVERSE EN	0 = Apply action on frames that match the rule 1 = Apply action on frames that do not match the rule
	[6:0] SOURCE PORT	Enable rule for physical source port

Table 3-24 Enhanced MAC pattern (cont.)

Byte	Name	Description
15	[7] FRAME WITH STAG MASK	0 = Ignore FRAME_WITH_STAG 1 = Consider FRAME_WITH_STAG
	[6] FRAME_WITH_STAG	0 = Frame without S-Tag 1 = Frame with S-Tag
	[5:2] RESERVED	
	[1] DA_SEL	0 = SA & DA[23:0] 1 = DA & SA[23:0]
	[0] SVID MASK	0 = Range 1 = Mask
14:13	TYPE	EtherType
12:11	CTAG	C-Tag
	[15:13] PRIORITY	Priority
	[12] CFI	CFI bit
	[11:0] VID/VID LOW	VID or VID low bound
10:9	STAG	S-Tag
	[15:13] PRIORITY	Priority
	[12] CFI	CFI bit
	[11:0] VID/VID LOW	VID or VID low bound
8:6	SA_LOW3/DA_LOW3	SA[23:0] or DA[23:0], see byte 15 bit[1].
5:0	DA/SA	Destination or source address, see byte 15 bit[1]

Table 3-25 Enhanced MAC pattern mask

Byte	Name	Description
16	[7:6] RULE VALID	00 = Start 01 = Continue 10 = End 11 = Start & end
	[5] FRAME WITH CTAG MASK	0 = Ignore FRAME_WITH_CTAG 1 = Consider FRAME_WITH_CTAG
	[4] FRAME_WITH_CTAG	0 = Frame without C-Tag 1 = Frame with C-Tag
	[3] CVID MASK	0 = Range 1 = Mask
	[2:0] RULE TYPE	These three bits must be 111 to indicate the enhanced MAC rule.
15	RESERVED	
14:13	TYPE MASK	Enable check for EtherType field

Table 3-25 Enhanced MAC pattern mask (cont.)

Byte	Name	Description
12:11	CTAG MASK	Enable check for C-Tag
	[15:13] PRIORITY MASK	Enable check for priority
	[12] CFI MASK	Enable check for CFI bit
	[11:0] VIDMASK/VID HIGH	Enable check for VID or VID upper bound
10:9	STAG MASK	Enable check for S-Tag
	[15:13] PRIORITY MASK	Enable check for priority
	[12] CFI MASK	Enable check for CFI bit
	[11:0] VID MASK/VID HIGH	Enable check for VID or VID upper bound
8:6	SA_LOW3/DA_LOW3 MASK	Enable check for SA[23:0] or DA[23:0]
5:0	DA/SA MASK	Enable check for destination or source address

3.5 IGMP/MLD snooping

The QCA8334 switch supports IPv4 IGMP snooping (v1/v2/v3 supported) and IPv6 MLD snooping. By setting the IGMP_MLD_EN bit in the FRAM_ACK_CTRL0/1 register, the QCA8334 can look inside IPv4 and IPv6 packets and redirect IGMP/MLD frames to the CPU for processing.

The QCA8334 also supports hardware IGMP join and fast leave functions. By setting IGMP_JOIN_EN and IGMP_LEAVE_EN bits in the port control register, the QCA8334 updates the ARL table automatically when the QCA8334 receives IGMP Join or Leave packets, and then forward them to the router port directly in case the CPU is not acting as a router or when enabling multicast VLAN_LEAKY to bypass multicast traffic directly from WAN to LAN.

The hardware join/fast leave supports the following packets:

- IGMPv1 join
- IGMPv2/MLDv1 join/leave
- IGMPv3/MLDv2 report excluding NONE or including NONE

3.5.1 IEEE 802.3 reserved group addresses filtering control

The QCA8334 supports the ability to drop, redirect, copy 802.1D specified reserved group MAC addresses 01-80-C2-00-00-04 to 01-80-C2-00-00-0F by adding the addresses to the ARL table.

3.5.2 802.1x

The QCA8334 supports identifying EAPOL frames by their reserved group addresses. Combined with port security feature, the QCA8334 can implement port-based or MAC-based access control.

3.5.3 Forwarding

The QCA8334 can be configured to prevent the forwarding of unicast frames and multicast frames with unregistered destination MAC address on a per-port basis. This can be done by setting UNI_FLOOD_DP and MULTI_FLOOD_DP where a bit represents a port of the QCA8334.

3.5.4 MAC limit

The QCA8334 supports MAC limit on a per-port basis or a global basis. When the number of learned MAC address limit is reached, the QCA8334 can be configured to forward a frame with a new source MAC address to the CPU or it can be dropped.

3.6 Atheros header

The QCA8334 support proprietary Qualcomm Atheros header that can indicate the packet information and allow CPU to control the packet forwarding. The header can be 2 bytes or 4 bytes with additional 2 bytes identifier. For 2 bytes header, each packet sent out or received must include header. For 4 bytes header, header can exist only in the management frame and there is no header in the normal frame. The Atheros header also supports read/write register through the CPU port.

Table 3-26 shows the type in the Atheros header.

Table 3-26 Type definition for Atheros header

Type	Packet type	Description
5'h0	NORMAL	Normal packet
5'h1	MIB	The packet includes MIB counter for the source port number in the header.
5'h2	READ_WRITE_REG_ACK	This packet indicates the register data for read register command or acknowledge for write register command. See “Atheros header receive” on page 55.
5'h3	802.1x	802.1x
5'h4	RESERVED MAC ADDR	Reserved ARL
5'h5	RIPv1	RIPv1
5'h6	DHCP	DHCP
5'h7	PPPoE DISCOVERY	PPPoE discovery
5'h8	ARP	ARP (If ARP not found, change this type to 5'h13)
5'h9	RESERVED	Reserved for RARP
5'hA	IGMP	IGMP packets
5'hB	MLD	MLD packets
5'hC	RESERVED	Reserved for neighbor discovery
5'hD	Redirect to CPU	ACL_REDIRECT_TO_CPU, ARL_REDIRECT_TO_CPU offload match redirect to CPU
5'hE	Normalization	The frame does not comply with normal TCP/IP flow.

Table 3-26 Type definition for Atheros header (cont.)

Type	Packet type	Description
5'hF	Learn limit	The MAC address reaches the learning limit.
5'h10	IPv4 NAT to CPU	Doing NAT and TCP special status; Doing NAT and frame is IP fragment.
5'h11	IP frame: SIP not found	The SIP in IP frame does not pass the source check.
5'h12	NAT not found	NAT not found
5'h13	ARP not found	The ARP frame does not pass the source check.
5'h14	IP frame: Routing not found	The frame DIP is not found in the routing table.
5'h15	TTL exceed	The router tries to forward one frame, but the TTL is 0 after decrease 1 and the destination is not CPU.
5'h16	MTU exceed	The frame length exceeds the MTU.
5'h17	Copy to CPU	ACL_COPY_TO_CPU, ARL_COPY_TO_CPU, Offload match copy to CPU
5'h18	Mirror to CPU	ACL_MIRROR_TO_CPU, ARL_MIRROR_TO_CPU, PORT_MIRROR_TO_CPU, Offload match mirror
5'h19	Flooding to CPU	Broadcast flooding to CPU, unknown unicast/multicast flooding to CPU
5'h1A	Forwarding to CPU	Bridging to CPU(ARL DP), routing to CPU (offload match), IGMP hardware join/leave forwarding to CPU, special DIP header/ACL assigned DP

3.6.1 Transmit

The QCA8334 sends out the frame with Atheros header when header is enabled. The header indicates the source port of the frame, frame type and priority. The detailed format of Atheros header is shown in Table 3-27.

Table 3-27 Atheros header transmit format

Bits	Name	Description
15:14	VERSION	The value is 10.
13:11	PRIORITY	Frame priority
10:6	TYPE	Frame type. See “Type definition for Atheros header” on page 53.
5:4	RESERVED	
3	FRAME_WITH_TAG	The ingress frame is tagged.
2:0	SOURCE_PORT_NUM	The ingress port number

3.6.2 Receive

The QCA8334 recognizes the Atheros header on receive when the header is enabled. The format is depicted in Table 3-28.

Table 3-28 Atheros header receive

Bit	Name	Description
15:14	VERSION	The version must be 10.
13:11	PRIORITY	Frame priority
10:8	CONTROL	0 = Normal 1 = Read/write register 2 = Disable learn 3 = Disable offload 4 = Disable learn & offload
7	FROM_CPU	The bit indicates the forwarding method. 0 = The forwarding is based on the lookup result. 1 = The forwarding is based on DP_BIT_MAP and bypass lookup.
6:0	DP_BIT_MAP	These bits indicate the forwarding port map. See the description in FROM_CPU.

3.6.3 Header for read/write register

The QCA8334 supports the read/write register through the Atheros header. Figure 3-1 shows the frame format of the read/write register command.

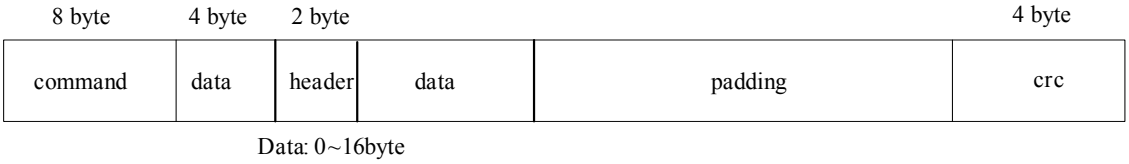

Figure 3-1 Read/write register command frame format

Table 3-29 Command format for read/write register using Atheros header

Bit	Name	Description
63:32	SEQ_NUM	The sequence number can be checked by CPU.
31:29	CHECK_CODE	Must be 101, otherwise the command would be ignored.
28	CMD	0 = Write 1 = Read
27:24	RESERVED	
23:20	LENGTH	The data length for read/write register. Maximum is 16 bytes.
18:0	ADDR	The starting register address for the read/write command. The address must be boundary of word address.

3.7 MIB/statistics counters

The statistics counter block maintains a set of forty MIB counters per port. These counters provide a set of Ethernet statistics for frames received on ingress and transmitted on egress. A register interface allows the CPU to capture, read, or clear the counter values.

The counters support:

- RMON MIB
- Ethernet-like MIB
- MIB II
- Bridge MIB
- RFC2819

The CPU interface supports:

- Autocast MIB counters after half-full
- Autocast MIB counters after timeout
- Autocast MIB counters when requested
- Clearing all MIB counters

Table 3-30 describes the statistics counter for each port.

Table 3-30 MIB counters

Counter	Width	Offset	Description
RxBroad	32-bit	0x00	The number of good broadcast frames received
RxPause	32-bit	0x04	The number of pause frames received
RxMulti	32-bit	0x08	The number of good multicast frames received
RxFcsErr	32-bit	0x0c	The total number of frames received with a valid length, but an invalid FCS and an integral number of octets
RxAllignErr	32-bit	0x10	The total number of frames received with a valid length that do not have an integral number of octets and an invalid FCS
RxUndersize	32-bit	0x14	The number of frames received that are less than 64 bytes long and have a good FCS
RxFragment	32-bit	0x18	The number of frames received that are less than 64 bytes long and have a bad FCS
Rx64Byte	32-bit	0x1C	The number of frames received that are exactly 64 bytes long, including those with errors
Rx128Byte	32-bit	0x20	The number of frames received whose length is between 65 and 127 bytes, including those with errors
Rx256Byte	32-bit	0x24	The number of The number of frames received whose length is between 128 and 255 bytes, including those with errors
Rx512Byte	32-bit	0x28	The number of frames received whose length is between 256 and 511 bytes, including those with errors

Table 3-30 MIB counters (cont.)

Counter	Width	Offset	Description
Rx1024Byte	32-bit	0x2C	The number of frames received whose length is between 512 and 1023 bytes, including those with errors
Rx1518Byte	32-bit	0x30	The number of frames received whose length is between 1024 and 1518 bytes, including those with errors
RxMaxByte	32-bit	0x34	The number of frames received whose length is between 1519 and max length, including those with errors (jumbo)
RxTooLong	32-bit	0x38	The number of frames received whose length exceeds max length, including those with FCS errors
RxGoodByte	64-bit	0x3C 0x40	Total data octets received in a frame with a valid FCS. All frame sizes are included.
RXBadByte	64-bit	0x44 0x48	Total data octets received in frame with and invalid FCS. All frame sizes are included. Pause frame is included with a valid FCS
RxOverFlow	32-bit	0x4C	Total valid frames received that are discarded due to lack of buffer space
Filtered	32-bit	0x50	Port disabled and unknown VID
TxBroad	32-bit	0x54	Total good frames transmitted with a broadcast destination address
TxPause	32-bit	0x58	Total good PAUSE frames transmitted
TxMulti	32-bit	0x5C	Total good frames transmitted with a multicast destination address
TxUnderRun	32-bit	0x60	Total valid frames discarded that were not transmitted due to transmit FIFO buffer underflow
Tx64Byte	32-bit	0x64	Total frames transmitted with a length of exactly 64 bytes, including errors
Tx128Byte	32-bit	0x68	Total frames transmitted with a length between 65 and 127 bytes, including those with errors
Tx256Byte	32-bit	0x6C	Total frames truncated with a length between 128 and 255 bytes, including those with errors
Tx512Byte	32-bit	0x70	Total frames truncated with a length between 256 and 511 bytes, including those with errors
Tx1024Byte	32-bit	0x74	Total frames truncated with a length between 512 and 1023 bytes, including those with errors
Tx1518Byte	32-bit	0x78	Total frames transmitted with length between 1024 and 1518, including those with errors (jumbo)
TxMaxByte	32-bit	0x7C	Total frames transmitted with length between 1519 and Maxlength, including those with errors (jumbo)
TxOverSize	32-bit	0x80	Total frames over Maxlength but transmitted truncated with bad FCS
TxByte	64-bit	0x84 0x88	Total data octets transmitted from counted, including those with a bad FCS
TxCollision	32-bit	0x8C	Total collisions experienced by a port during packet transmission
TxAbortCol	32-bit	0x90	Total number of frames not transmitted because the frame experienced 16 transmission attempts and is discarded
TxMultiCol	32-bit	0x94	Total number of successfully transmitted frames that experienced more than one collision
TxSingleCol	32-bit	0x98	Total number of successfully transmitted frames that experienced exactly one collision

Table 3-30 MIB counters (cont.)

Counter	Width	Offset	Description
TxExcDefer	32-bit	0x9C	The number of frames that deferred for an excessive period of time
TxDefer	32-bit	0xA0	Total frames whose transmission was delayed on its first attempt because the medium way is busy
TXLateCol	32-bit	0xA4	Total number of times a collision is detected later than 512 bit times into the transmission of a frame
RXUnicast	32-bit	0xA8	Total number of received good unicast frame
TXunicast	32-bit	0xAC	Total number of transmitted good unicast frame

3.8 LED control

There are totally six LED control rules. Three of them are used to control the LEDs of PHY 0 to PHY 3. The others are used to control the LEDs of PHY4. Each port has three LEDs. The default behaviors of the LEDs are 1000_LINK_ACTIVITY, 100_LINK_ACTIVITY and 10_LINK_ ACTIVITY.

The LED output is open-drain output, so two or three of them can be connected together to indicate OR operation of the original LEDs. To achieve this operation, another method is to modify the LED control register. These LEDs also can be individually configured On or Off by register.

Each LED can be controlled by the 16 bits shown in Table 3-31.

Table 3-31 LED control

Bits	Name	Description
15:14	PATTERN_EN	00 = LED always off 01 = LED blinking at 4 Hz 10 = LED always on 11 = LED controlled by the following bits
13	FULL_LIGHT_EN	1 = LED lights when link up in full-duplex
12	HALF_LIGHT_EN	1 = LED lights when link up in half-duplex
11	POWER_ON_LIGHT_EN	1 = Module should enter POWER_ON_RESET status after reset.
10	LINK_1000M_LIGHT_EN	1 = LED lights when link up at 1000 Mbps
9	LINK_100M_LIGHT_EN	1 = LED lights when link up at 100 Mbps
8	LINK_10M_LIGHT_EN	1 = LED lights when link up at 10 Mbps
7	COL_BLINK_EN	1 = LED blinks when collision is detected
6	RESERVED	Must be set to 0.
5	RX_BLINK_EN	1 = LED blinks when receiving frame
4	TX_BLINK_EN	1 = LED blinks when transmitting frame
3	RESERVED	Must be set to 0.

Table 3-31 LED control (cont.)

Bits	Name	Description
2	LINKUP_OVER_EN	0 = RX/TX blinking ignores the linkup speed. 1 = RX/TX blinking should check with linkup speed, Linkup LED is ON, allow blinking; otherwise, Off.
1:0	LED_BLINK_FREQ	LED blink frequency select: 00 = 2 Hz 01 = 4 Hz 10 = 8 Hz 11 = If link up at 1000Mbps, use 8 Hz. If link up at 100Mbps, use 4 Hz. If link up at 10 Mbps, use 2 Hz.

Table 3-32 LED rule default value

Bits	Name	LED_RULE_0/1	LED_RULE_2/3	LED_RULE_4/5
	Default Value	0xCC35	0xCA35	0xC935
15:14	PATTERN_EN	11	11	11
13	FULL_LIGHT_EN	0	0	0
12	HALF_LIGHT_EN	0	0	0
11	POWER_ON_LIGHT_EN	1	1	1
10	LINK_1000M_LIGHT_EN	1	0	0
9	LINK_100M_LIGHT_EN	0	1	0
8	LINK_10M_LIGHT_EN	0	0	1
7	COL_BLINK_EN	0	0	0
6	RESERVED	0	0	0
5	RX_BLINK_EN	1	1	1
4	TX_BLINK_EN	1	1	1
3	RESERVED	0	0	0
2	LINKUP_OVER_EN	1	1	1
1:0	LED_BLINK_RFREQ	01: 4 Hz	01: 4 Hz	01: 4 Hz

3.9 EEPROM programming format

Figure 3-2 shows the EEPROM programming format. Note that the last register should be at address 0, and the LOAD_EEPROM bit is written to 0 to stop loading EEPROM state machine.

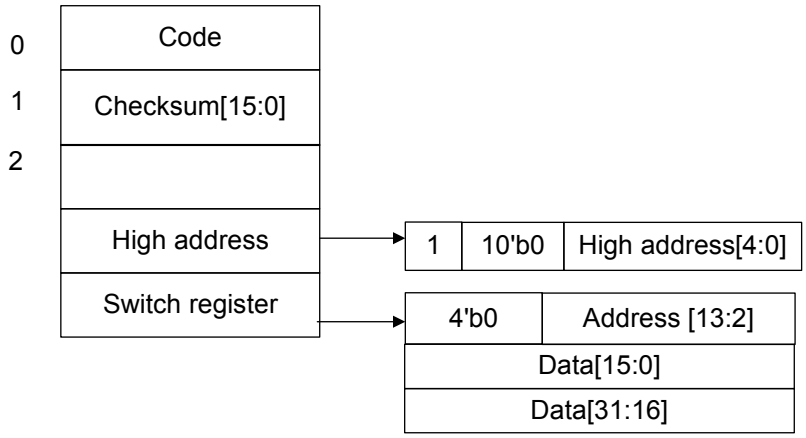

Figure 3-2 EEPROM programming format

3.10 MDC/MDIO access

Figure 3-3 shows the detail format and procedure to access the internal register by MDC/MDIO. Basically, there are two steps to access the register.

- Write the high address. This step can be omitted if the high address is unchanged.
- Read or write the register data. It is allowed to access 16-bit data once instead of twice if the upper or lower 16-bit data is unchanged. When the operation code is B10 for write operation and 01_B for read operation.

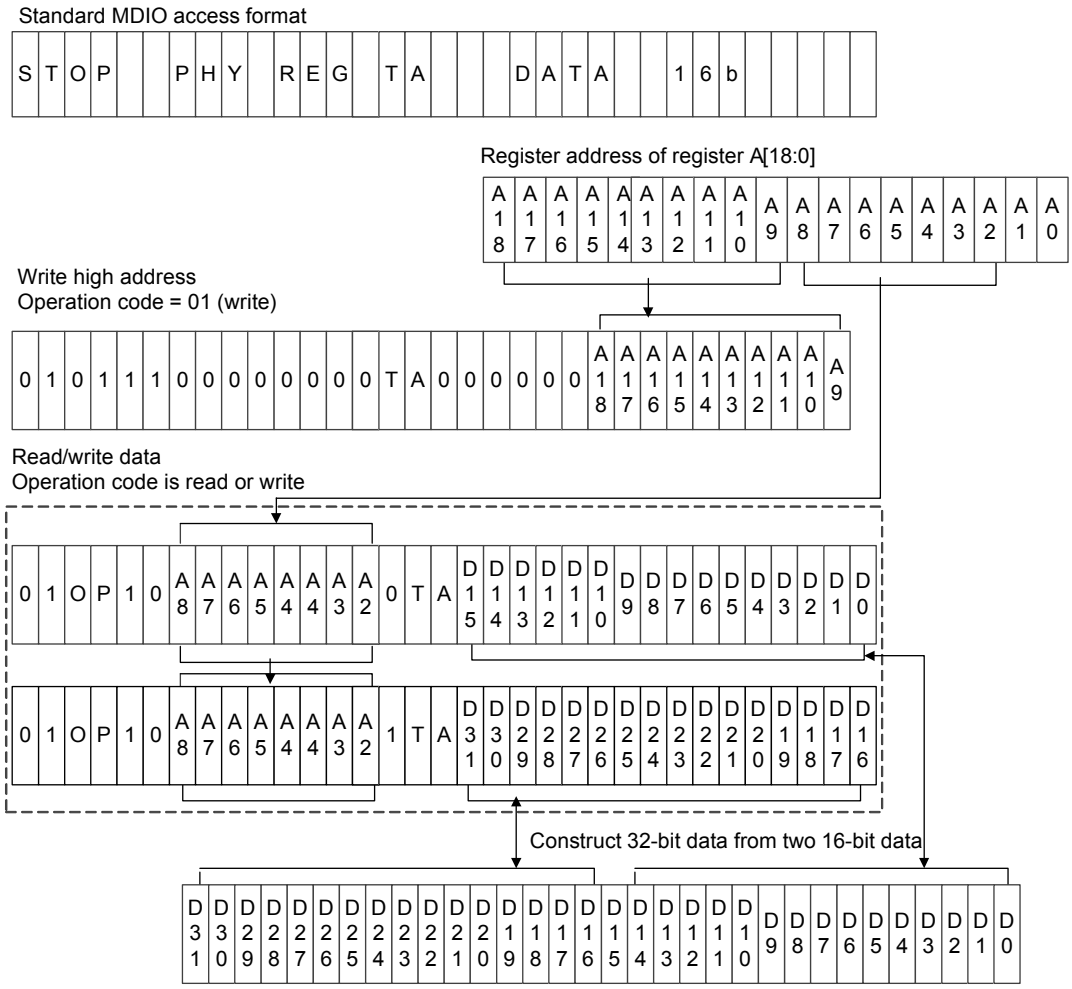

Figure 3-3 MDC/MDIO access format

3.11 IEEE 802.3az and energy efficient Ethernet

IEEE 802.3az provides a mechanism to greatly save the power consumption during data packets burst. The link partners enter low power idle state by sending short refresh signals to maintain the link.

There are two operating states: active state for normal data transfer, and low-power state during data packet bursts.

In the low-power state, the QCA8334 shuts off most of the analog and digital blocks to conserve energy. Due to the bursty traffic nature of Ethernet, system stays in low-power mode for most of the time, thus the power saving can be more than 90%.

At the link start up, both link partners exchange information via auto-negotiation to determine if both parties are capable of entering LPI mode.

Legacy Ethernet products are supported, and this is made transparent to the user.

3.11.1 IEEE 802.3az LPI mode

QCA8334 works in the following modes when 802.3az feature is turned on:

- Active: The regular mode to transfer data
- Sleep: Send special signal to inform remote link of entry into low-power state
- Quiet: No signal transmitted on media. Most of the analog and digital blocks are turned off to reduce energy.
- Refresh: Send periodically special training signal to maintain timing recovery and equalizer coefficients
- Wake: Send special wake-up signal to remote link to inform of the entry back into active.

The QCA8334 supports both 1000BASE-Tx EEE and 1000BASE-T EEE.

100BASE-Tx EEE requires asymmetrical operation, meaning each link partner to enter the LPI mode independent of the other partner.

1000BASE-T EEE requires symmetrical operation, meaning both link partners must enter the LPI mode simultaneously.

Figure 3-4 shows the 802.3az operating power modes—802.3az for the QCA8334.

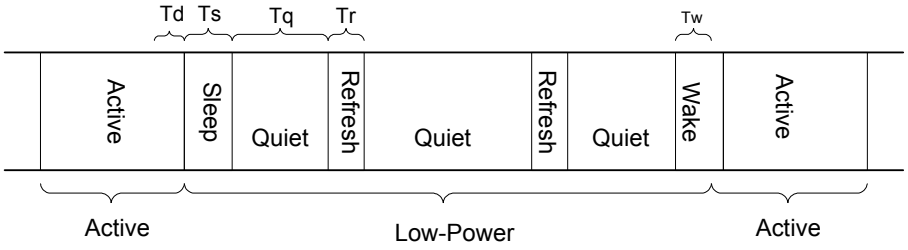

Figure 3-4 Operating power modes—802.3az LIP mode

3.12 Memory map

Table 3-33 Memory map

Offset range	Register sets
0x00000–0x000FF	Global register
0x00100–0x00AFF	EEE register
0x00200–0x003FF	Parser register
0x00400–0x005FF	ACL register
0x00600–0x007FF	Lookup register
0x00800–0x00BFF	QM register
0x00C00–0x00DFF	PKT edit register

Table 3-33 Memory map (cont.)

Offset range	Register sets
0x00E00–0x00FFF	Offload register
0x01000–0x010A7	Port 0 MIB counter
0x01200–0x012A7	Port 2 MIB counter
0x01300–0x013A7	Port 3 MIB counter
0x01600–0x016A7	Port 6 MIB counter
0x02000–0x0207F	Router MAC
0x02100–0x021FF	Public IP
0x02200–0x022FF	PPPoE session
0x1C000–0x1C0FF	ACL match counter
0x2A000–0x2A03F	Public IP
0x3C000–0x3C1FF	Reserved MAC address
0x58000–0x58FFF	ACL rule
0x59000–0x59FFF	ACL mask
0x5A000–0x5A7FF	ACL action
0x5AA00–0x5AAFF	Public IP
0x5A900–0x5A97F	Router MAC
0x5AC00–0x5ADFF	VLAN translation table
0x5AE00–0x5AEFF	Egress queue remap table
0x5F000–0x5F03F	PPPoE session

4 Electrical Characteristics

4.1 Absolute maximum ratings

Operation in conditions beyond the absolute maximum ratings can cause permanent damage or adversely affect the long-term reliability of the device; such conditions must be avoided.

Table 4-1 Absolute maximum ratings

Symbol	Parameter	Max.	Unit
DVDD	1.2 V digital power supply for core	1.6	V
AVDD	1.2 V analog power supply for core	1.6	V
DVDD27	2.7 V digital power supply for core	3.0	V
AVDD33	3.3 V analog power supply for core	4.0	V
T_{store}	Storage temperature[1]	–65 to 150	°C
HBM	ESD human body model	±2	kV
CDM	ESC charge device model	TBD	V
1. The storage temperature is the case surface temperature measured on the center top side of the chip.			

4.2 Recommended operating conditions

Table 4-2 lists the recommended operating conditions for the QCA8334.

Table 4-2 Recommended operating conditions

Symbol	Parameter	Min	Typ	Max	Unit
DVDD	1.2 V digital power supply for core	1.14	1.20	1.26	V
AVDD	1.2 V analog power supply for core	1.14	1.20	1.26	V
DVDD27	2.7 V digital power supply for core	2.57	2.70	2.83	V
AVDD33	3.3 V analog power supply for core	3.14	3.30	3.46	V
T_A	Ambient temperature (commercial)	–	25	–	°C
T_{J-OPER}	Junction temperature	0	–	120	°C
ψJT	Junction to top of package temperature	–	2.1	–	°C/W

4.3 Power consumption

This section provides power consumption at typical operation supply.

DVDD/AVDD = 1.2 V; AVDD33 = 3.3 V; T_A = 25 °C

Table 4-3 describes typical power drain on each of the on-chip power supply domains as a function of the QCA8334's operating mode.

Table 4-3 Total system power (1000BASE-T)

Link type	Link status	3.3 V (mA)	1.2 V (mA)	Power consumption (W)
No link		26	42	0.1362
1000M	Two ports active	126	264	0.7326
	One ports active	76	148	0.4284
100M	Two ports active	51	90	0.2763
	One ports active	38	66	0.2046
10M	Two ports active	60	50	0.258
	One ports active	24	44	0.132
1000MF	All ports 802.3az active	38	70	0.2094
100MF	All ports 802.3az active	33	60	0.1809

4.4 SerDes and SGMII characteristics

Table 4-4 shows the driver DC characteristics.

Table 4-4 Driver DC characteristics

Symbol	Parameter	Min	Typ	Max	Unit
Voh	Output voltage high	–	950	1050	mV
Vol	Output voltage low	500	650	–	mV
Vring	Output ringing	–	–	10	%
|Vod|	Output differential voltage	Programmable 300 (default)			mV
Vos	Output offset voltage	750	800	850	mV
Ro	Output impedance (single-ended) 50 Ohm termination	40	50	60	Ohm
	Output impedance (single-ended) 75 Ohm termination	60	75	90	Ohm
Delta Ro	Mismatch in a pair	–	–	10	%
Delta VOD	Change in V_{OD} between "0" and "1"	–	–	25	mV
Delta Vos	Change in V_{OS} between "0" and "1"	–	–	25	mV
Isa,Isb	Output current on short to GND	–	–	40	mA
Isab	Output current when a, b are shorted	–	–	12	mA

Table 4-4 Driver DC characteristics (cont.)

Symbol	Parameter	Min	Typ	Max	Unit
Ixa,Ixb	Power off leakage current	–	–	10	mA
Output differential voltage can be configured by SGMII_CTRL register 0x00e0 bits[12:10].					

Table 4-5 shows the receiver DC characteristics.

Table 4-5 Receiver DC characteristics

Symbol	Parameter	Min	Typ	Max	Unit
Vio	Internal offset voltage	730	825	930	mV
Vih	Input single voltage high	–	1050	1150	mV
Vil	Input single voltage low	500	600	–	mV
Vidth	Input differential threshold	-50	–	+50	mV
Vhyst	Input differential hysteresis	25	–	–	mV
Rin	Receiver differential input impedance 50 Ohm termination	80	100	120	Ohm
	Receiver differential input impedance 75 Ohm termination	120	150	180	Ohm

Table 4-6 shows the driver AC characteristics.

Table 4-6 Driver AC characteristics

Symbol	Parameter	Min	Max	Unit
tfall	Vod fall time (20%-80%)	100	200	ps
trise	Vod rise time (20%-80%)	100	200	ps
Tskew	Skew[1] between two members of a differential pair	–	20	ps
1. Skew measured at 50% of the transition.				

4.5 Power-on strapping

Table 4-7 lists the power-on strapping configurations.

Table 4-7 Power-on-strapping

Pin name	QFN	Power-on configuration	Description
RXD0_0	53	SPI_EN	0 = No EEPROM connected 1 = EEPROM connected
RXD1_0	54	SPI_SIZE	0 = 1K 1 = 4K or 2K
RXD2_0	56	LED_OPEN_EN	0 = Driver 1 = Open drain

Table 4-7 Power-on-strapping (cont.)

Pin name	QFN	Power-on configuration	Description
RXD3_0	57	CABLE_DIAG	0 = Disable power-on cable diagnostic 1 = Enable power-on cable diagnostic
SPI_DO	44	MDIO_EN	0 = UART interface 1 = MDC/MDIO interface
RXDV_0	51	CONTROL_DAC_HW0	11 = Follow DSP setting (default); the maximum power is high for cable > 110 m; 10 = Bypass half_amp; set real_half_amp =0; follow DSP half_bias setting. Lose half amplitude capability with short cable and the maximum power is high for cable > 100 m; 01 = Half amplitude follow DSP, bypass half_ bias; set real_half_bias = 1; Use half amplitude capability with short cable and the power = 100m or >110m cable; 00 = Everything is full no matter the cable length. This gives the worse power.
INTn	81	CONTROL_DAC_HW1	
POS_SWREG	72	SWR_SEL	0 = Use external 1.2 V regulator 1 = 1.2 V

4.6 DC electrical specifications

This section lists the general DC electrical characteristics under typical voltage input unless otherwise specified.

4.6.1 RGMII DC electrical specification

Table 4-8 describes RGMII DC electrical specification.

Table 4-8 2.5V digital I/O DC characteristics

Symbol	Parameter	Min	Max	Unit
V_{IH}	Input high level	1.7	3.6	V
V_{IL}	Input low level	–	0.7	V
V_{OH}	Output high level	2.2	–	V
V_{OL}	Output low level	–	0.4	V
I_{IH}	Input high current	–	–0.4	mA
I_{IL}	Input low current	0.4	–	mA

Table 4-9 RGMII DC characteristics under 1.8V/1.5V

Symbol	Parameter	Min	Max	Unit
V_{IH}	Input high level	0.75 * VDD[1]	–	V
V_{IL}	Input low level	–	0.25 * VDD	V
V_{OH}	Output high level	0.8 * VDD	–	V
V_{OL}	Output low level	–	0.2 * VDD	V
1. VDD is the I/O power 1.8V or 1.5V.				

4.6.2 Power-on-reset timing

Figure 4-1 shows the power-on-reset timing diagram.

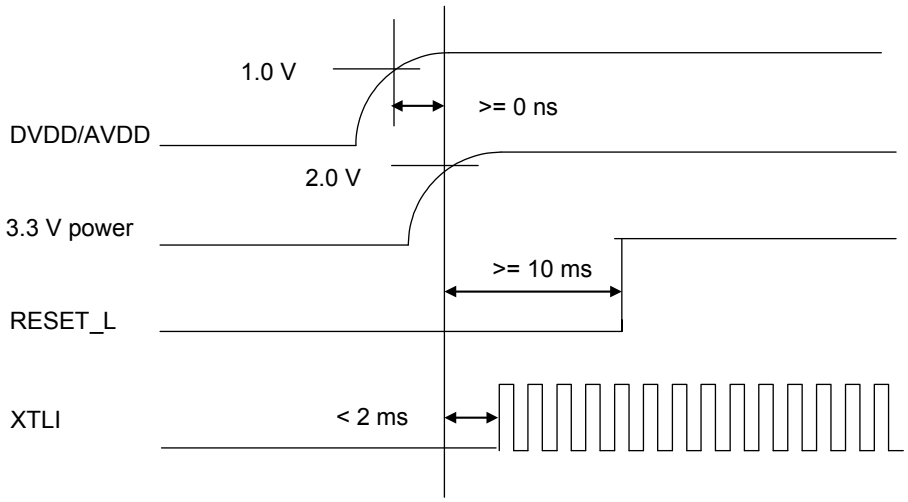

Figure 4-1 Power-on-reset timing diagram

4.7 AC electrical specifications

This section lists the AC electrical characteristics under typical voltage unless otherwise specified.

4.7.1 XTLI characteristics

Figure 4-2 shows the XTLI timing diagram when using external clock input.

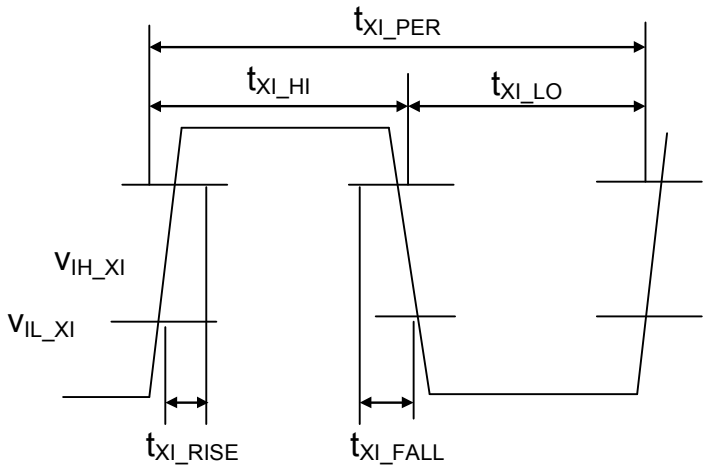

Figure 4-2 XTLI timing diagram

Table 4-10 External clock input characteristics

Symbol	Parameter	Min	Typ	Max	Unit
t_{XI_PER}	XI/OSCI clock period	40.0 - 50 ppm	40.0	40.0 + 50 ppm	ns
t_{XI_HI}	XI/OSCI clock high	14	20.0	–	ns
t_{XI_LO}	XI/OSCI clock low	14	20.0	–	ns
t_{XI_RISE}	XI/OSCI clock rise time, V_{IL} (max) to V_{IH} (min)	–	–	4	ns
t_{XI_FALL}	XI/OSCI clock fall time, V_{IL} (max) to V_{IH} (min)	–	–	4	ns
v_{IH_XI}	XTLI input high level voltage	0.8	–	1.4	V
v_{IL_XI}	XTLI input low level voltage	-0.3	–	0.15	V

Table 4-11 Recommended crystal parameters

Symbol	Parameter	Min	Typ	Max	Unit
Ff	Crystal fundamental frequency	–	25	–	MHz
Fs	Frequency stability over operating temperature at 0–70°C	-30 ppm	–	+30 ppm	MHz
Ft	Frequency tolerance at 25°C	-30 ppm	–	+30 ppm	MHz
Fo	Oscillation frequency	-50 ppm	–	+50 ppm	MHz
Cs	Shunt capacitance	–	7	–	pF
Cl	Load capacitance	–	15	–	pF
Vo	I/O voltage level (for driver level evaluation)	–	1.2	–	V
DL	Driver level	–	300	–	µW
ESR	Equivalent series resistance	–	30	50	Ω

4.7.2 MII timing

Figure 4-3 shows the MII timing diagram.

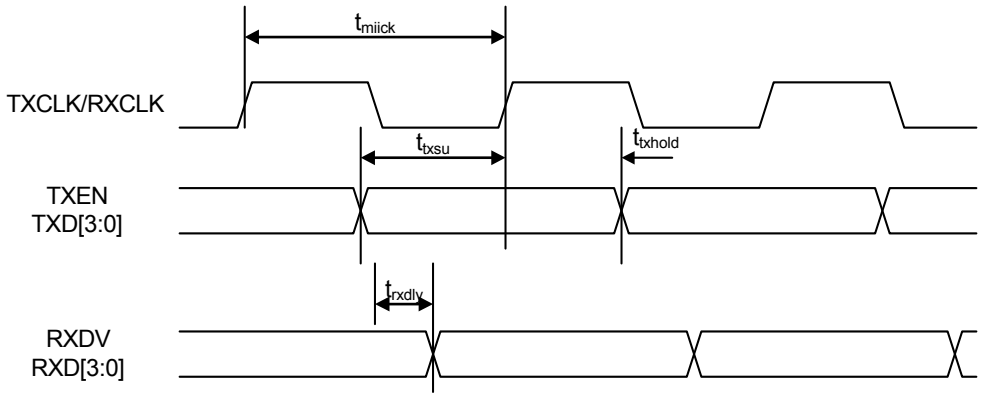

Figure 4-3 MII timing diagram

Table 4-12 MII timing parameter

Symbol	Parameter	Min	Typ	Max	Unit
t_{miick}	TXCLK/RXCLK period	–	40	–	ns
t_{txsu}	TXEN and TXD to TXCLK rising setup	10	–	–	ns
t_{txhold}	TXEN and TXD to TXCLK rising hold	10	–	–	ns
t_{rxdly}	RXCLK falling to RXDV, and RXD output delay	0	–	8	ns

4.7.3 RMII timing

Figure 4-4 shows the RMI timing diagram.

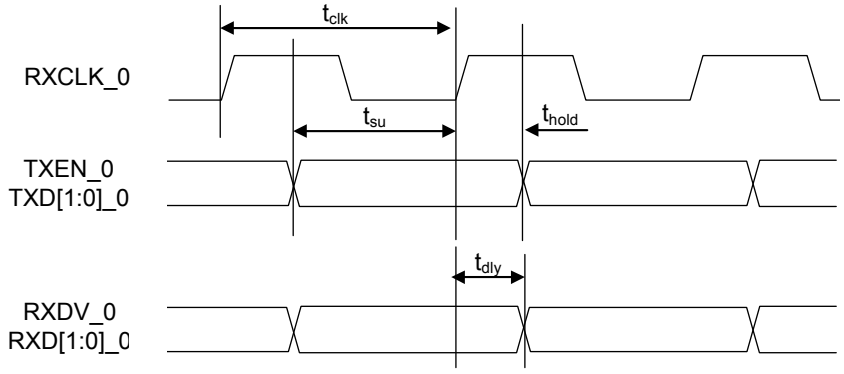

Figure 4-4 RMII timing

Table 4-13 RMII timing parameter

Symbol	Parameter	Min	Type	Max	Unit
t_{ck}	REFCLK period	–	20	–	ns
t_{su}	TXEN and TXD to RXCLK_0 rising setup time	4	–	–	ns
t_{hold}	TXEN and TXD to RXCLK_0 rising hold time	2	–	–	ns
t_{dly}	RXCLK_0 to RX_DV, and RXD output delay	3	–	14	ns

4.7.4 RGMII timing

Figure 4-5 shows the RGMII timing diagram.

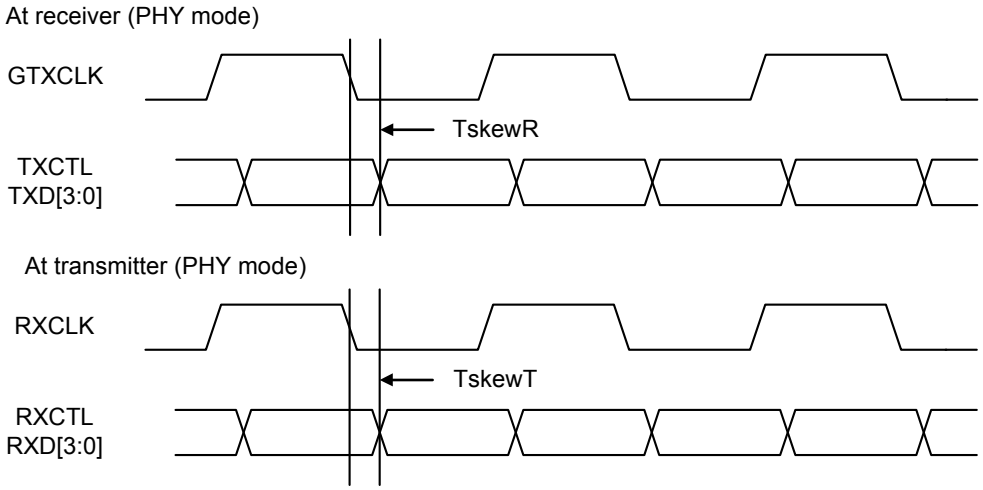

Figure 4-5 RGMII timing diagram

Table 4-14 RGMII timing parameter

Symbol	Parameter	Min	Typ	Max	Unit
TskewT	Data to clock output skew	-0.5	-	0.5	ns
TskewR	Data to clock input skew	1	-	2.6	ns

4.7.5 SPI timing

Figure 4-6 shows the SPI timing diagram.

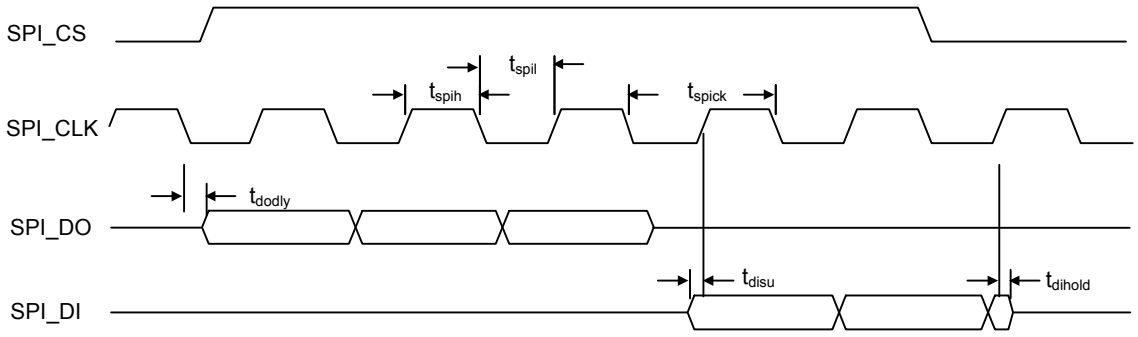

Figure 4-6 EEPROM interface timing diagram

Table 4-15 EEPROM interface timing

Symbol	Parameter	Min	Typ	Max	Unit
t_{spick}	SPI_CLK period	–	–	–	ns
t_{spil}	SPI_CLK low period	–	–	–	ns
t_{spih}	SPI_CLK high period	–	–	–	ns
t_{disu}	SPI_DI to SPI_CLK rising setup time	10	–	–	ns
t_{dihold}	SPI_DI to SPI_CLK rising hold time	10	–	–	ns
t_{dodly}	SPI_CLK falling to SPI_DO output delay time	–	–	20	ns

4.7.6 MDIO timing

Figure 4-7 shows the MDIO timing diagram.

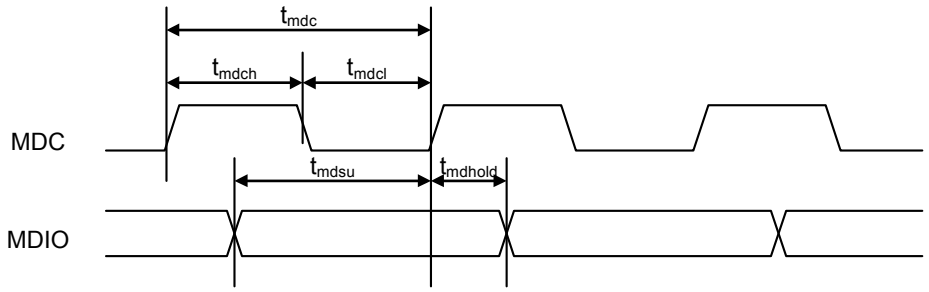

Figure 4-7 MDIO timing diagram

Table 4-16 MDIO timing

Symbol	Parameter	Min	Typ	Max	Unit
t_{mdc}	MDC period	100	–	–	ns
t_{mdcl}	MDC low period	40	–	–	ns
t_{mdch}	MDC high period	40	–	–	ns
t_{mdsu}	MDIO to MDC rising setup time	10	–	–	ns
t_{mdhold}	MDIO to MDC rising hold time	10	–	–	ns

5 Register Description

The register bit types include:

LH	Register field with latching high function. If status is high, then the register is set to a one and remains set until a read operation is performed through the management interface or a reset occurs.
LL	Register field with latching low function. If status is low, then the register is cleared to a zero and remains cleared until a read operation is performed through the management interface or a reset occurs.
Retain	Register value holds.
SC	Self-Clear. Writing a one to this register causes the desired function to be immediately executed, then the register field is cleared to zero when the function is complete.
Update	Value written to the register field does not take effect until a software reset is executed. The register bits can be read after write operation.
RO	Read only
R/W	Read/Write

5.1 Register address space (offset range: 0x0000–0x0E98)

Table 5-1 summarizes address space occupied by the registers.

Table 5-1 Register address space summary

Offset range	Name
0x0000–0x00E0	“Global control registers” on page 75
0x0100–0x0168	“EEE control registers” on page 100
0x0200–0x0270	“Parser control registers” on page 103
0x0400–0x0454	“ACL control registers” on page 113
0x0600–0x0718	“Lookup control registers” on page 122
0x0800–0x0B70	“QM control registers” on page 154
0x0C00–0x0C80	“PKT edit control registers” on page 235
0x00–0x1E	“PHY control registers” on page 242

5.2 Global control registers

Table 5-2 summarizes the global control registers.

Table 5-2 Global control registers summary

Offset range	Name
0x0000	Mask control register
0x0004	Port 0 pad mode control register
0x000C	Port 6 pad mode control register
0x0010	Power-on-strapping register
0x0020–0x0024	Global interrupt register
0x0028–0x002C	Global interrupt mask register
0x0030	Module enable control register
0x0034	MIB function register
0x0038	Interface high address register
0x003C	MDIO master control register
0x0040	BIST control register
0x0044	BIST recover register
0x0048	Service tag register
0x0050–0x005C	LED control register
0x0060–0x0064	Global MAC address
0x0078	Maximum frame size register
0x007C	Port0 status register
0x0084	Port2 status register
0x0088	Port3 status register
0x0094	Port6 status register
0x0098	Header control register
0x009C	Port0 header control register
0x00A4	Port2 header control register
0x00A8	Port3 header control register
0x00B4	Port6 header control register
0x00E0	SGMII control register

5.2.1 MASK_CTRL

Address offset: 0x0000

Table 5-3 summarizes the mask control register.

Table 5-3 MASK_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31	W/SC	0	SOFT_RET	1 = Software reset This bit is set by the software to initiate the hardware. It is self-cleared by the hardware after the initialization is done.
30:17	RO	0	RESERVED	
16	R/W	0	LOAD_EEPROM	Load EEPROM enable. This bit is set to automatically load registers from EEPROM. It is cleared after the loading is complete.
15:8	RO	0x13	DEVICE_ID	Device identifier
7:0	RO	0x01	REV_ID	Revision identifier

5.2.2 PORT0_PAD_CTRL

Address offset: 0x0004

Table 5-4 summarizes the port 0 pad mode control register.

Table 5-4 PORT0_PAD_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	0	MAC06_EXCHANGE_EN	Exchange MAC0 and MAC6
30	R/W	0	MAC0_M_RMII_EN	RMII master
29	R/W	0	MAC0_S_RMII_EN	RMII slave
28	R/W	0	MAC0_RMII_SEL	RMII clock inverse
27	R/W	0	MAC0_RMII_PIPE_RXCLK_SEL	RMII clock edge for rxpipe
26	R/W	0	MAC0_RGMII_EN	1 = MAC0 connected to CPU through RGMII interface
25	R/W	0	MAC0_RGMII_TXCLK_DELAY_EN	1 = RGMII interface TXCLK (input from CPU) is delayed. Delay value depends on bits[23:22].
24	R/W	0	Reserved	
23:22	R/W	0	MAC0_RGMII_TXCLK_DELAY_SEL	Control the delay value of RGMII interface TXCLK. 11 = maximum delay
21:20	R/W	0	MAC0_RGMII_RXCLK_DELAY_SEL	Control the delay value of RGMII interface RXCLK. 11 = maximum delay
19	R/W	0	SGMII_CLK125M_RX_SEL	Configure the receive clock phase for MAC interface and must be set when using SerDes or SGMII module. 0 = Rising edge 1 = Falling edge

Table 5-4 PORT0_PAD_CTRL bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
18	R/W	0	SGMII_CLK125M_TX_SEL	Configure the transmit clock phase for SerDes interface 0 = Rising edge 1 = Falling edge
17	R/W	0	FX100_EN	Enable 100BASE-FX interface
16	R/W	0	RESERVED	
15	R/W	0	RESERVED	
14	R/W	0	MAC0_PHY_GMII_EN	1 = MAC0 connected to CPU through GMII interface, PHY mode
13	R/W	0	MAC0_PHY_GMII_TXCLK_SEL	1 = Select invert clock input for port0 PHY mode, GMII interface TXCLK
12	R/W	0	MAC0_PHY_GMII_RXCLK_SEL	1 = Select invert clock output for port0 PHY mode, GMII interface RXCLK
11	R/W	0	MAC0_PHY_MII_PIPE_RXCLK_SEL	1 = Select clock edge for rxpipe; default is invert.
10	R/W	0	MAC0_PHY_MII_EN	1 = MAC0 connected to CPU through MII interface, PHY mode
9	R/W	0	MAC0_PHY_MII_TXCLK_SEL	1 = Select invert clock output for port0 PHY mode, MII interface TXCLK
8	R/W	0	MAC0_PHY_MII_RXCLK_SEL	1 = Select invert clock output for port0 PHY mode, MII interface RXCLK
7	R/W	0	MAC0_SGMII_EN	Enable SGMII interface
6	R/W	0	MAC0_MAC_GMII_EN	1 = MAC0 connected to CPU through GMII interface, MAC mode.
5	R/W	0	MAC0_MAC_GMII_TXCLK_SEL	1 = Select invert clock output for port0 MAC mode, GMII interface TXCLK
4	R/W	0	MAC0_MAC_GMII_RXCLK_SEL	1 = Select invert clock input for port0 MAC mode, GMII interface RXCLK
3	RO	0	RESERVED	
2	R/W	0	MAC0_MAC_MII_EN	1 = MAC0 connected to CPU through MII interface, MAC mode
1	R/W	0	MAC0_MAC_MII_TXCLK_SEL	1 = Select invert clock input for port0 MAC mode, MII interface TXCLK
0	R/W	0	MAC0_MAC_MII_RXCLK_SEL	1 = Select invert clock input for port0 MAC mode, MII interface RXCLK

5.2.3 PORT5_PAD_CTRL

Address offset: 0x0008

Table 5-5 summarizes the port 5 pad mode control register.

Table 5-5 PORT5_PAD_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31:27	RO	0	RESERVED	
26	R/W	0	MAC5_RGMII_EN	1 = MAC5 connected to CPU through RGMII interface
25	R/W	0	MAC5_RGMII_TXCLK_DELAY_EN	1 = CPU RGMII interface TXCLK (input from CPU) is delayed. Delay value depends on bits[23:22].
24	R/W	0	MAC_RGMII_RXCLK_DELAY_EN	This bit controls all RGMII interface (MAC0, MAC5 and MAC6) 1 = RGMII interface RXCLK is delayed. 1000M = Delay 2 ns output to CPU 10M/100M: Delay value depends on bits[21:20].
23:22	R/W	0	MAC5_RGMII_TXCLK_DELAY_SEL	Control the delay value of RGMII interface TXCLK. 11 = maximum delay
21:20	R/W	0	MAC5_RGMII_RXCLK_DELAY_SEL	Control the delay value of RGMII interface RXCLK. 11 = maximum delay
19:12	RO	0	RESERVED	
11	R/W	0	MAC5_PHY_MII_PIPE_RXCLK_SEL	1 = Select clock edge for rxpipe. Default is invert.
10	R/W	0	MAC5_PHY_MII_EN	1 = MAC5 connected to CPU through MII interface, PHY mode
9	R/W	0	MAC5_PHY_MII_TXCLK_SEL	1 = Select invert clock output for port5 PHY mode, MII interface TXCLK
8	R/W	0	MAC5_PHY_MII_RXCLK_SEL	1 = Select invert clock output for port5 PHY mode, MII interface RXCLK
7:3	R/W	0	RESERVED	
2	R/W	0	MAC5_MAC_MII_EN	1 = MAC5 connected to CPU through MII interface, MAC mode
1	R/W	0	MAC5_MAC_MII_TXCLK_SEL	1 = Select invert clock input for port5 MAC mode, MII interface TXCLK
0	R/W	0	MAC5_MAC_MII_RXCLK_SEL	1 = Select invert clock input for port5 MAC mode, MII interface RXCLK

5.2.4 PORT6_PAD_CTRL

Address offset: 0x000C

Table 5-6 summarizes the port 6 pad mode control register.

Table 5-6 PORT6_PAD_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31:27	RO	0	RESERVED	
26	R/W	0	MAC6_RGMII_EN	1 = MAC6 connected to CPU through RGMII interface
25	R/W	0	MAC6_RGMII_TXCLK_DELAY_EN	1 = RGMII interface TXCLK (input from CPU) is delayed. Delay value depends on bits[23:22].
24	R/W	0	Reserved	
23:22	R/W	0	MAC6_RGMII_TXCLK_DELAY_SEL	Control the delay value of RGMII interface TXCLK. 11 = maximum delay
21:20	R/W	0	MAC6_RGMII_RXCLK_DELAY_SEL	Control the delay value of RGMII interface RXCLK. 11 = maximum delay
19:18	RO	0	RESERVED	
17	R/W	0	PHY4_RGMII_EN	1 = PHY4 connected to CPU through RGMII interface.
16:12	RO	0	RESRVED	
11	R/W	0	MAC6_PHY_MII_PIPE_RXCLK_SEL	1 = Select clock edge for rxpipe. Default is invert.
10	R/W	0	MAC6_PHY_MII_EN	1 = MAC6 connected to CPU through MII interface, PHY mode.
9	R/W	0	MAC6_PHY_MII_TXCLK_SEL	1 = Select invert clock output for port6 PHY mode, MII interface TXCLK.
8	R/W	0	MAC6_PHY_MII_RXCLK_SEL	1 = Select invert clock output for port6 PHY mode, MII interface RXCLK.
7	R/W	0	MAC6_SGMII_EN	
6:3	RO	0	RESERVED	
2	R/W	0	MAC6_MAC_MII_EN	1 = MAC6 connected to CPU through MII interface, MAC mode.
1	R/W	0	MAC6_MAC_MII_TXCLK_SEL	1 = Select invert clock input for port6 MAC mode, MII interface TXCLK.
0	R/W	0	MAC6_MAC_MII_RXCLK_SEL	1 = Select invert clock input for port6 MAC mode, MII interface RXCLK.

5.2.5 PWS_REG

Address offset: 0x0010

Table 5-7 summarizes the power-on-strapping register.

Table 5-7 PWS_REG bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	0	POWER_ON_SEL	Power-on-strapping select
30:29	RO	0	RESERVED	
28	R/W	0	PACKAGEMIN_EN	1 = Select 88-pin package pinout
27	R/W	0	INPUT_MODE	1 = GMII interface digital PAD work at input mode
26	R/W	0	RESERVED	
25	R/W	0	SPI_EN_CSR	1 = EEPROM is connected to the switch
24	R/W	0	LED_OPEN_EN_CSR	0 = LED pad is in driver mode 1 = LED pad is in open drain mode
23:22	R/W	0	RESERVED	
21	R/W	1	RESERVED	
20:19	R/W	0	RESERVED	
18:17	R/W	3	RESERVED	
16:13	R/W	0	RESERVED	
12	R/W	1	RESERVED	
11:10	R/W	0	RESERVED	
9:8	R/W	3	RESERVED	
7	R/W	0	SERDES_AEN	SerDes auto-negotiation: 0 = Enable auto-negotiation 1 = Disable auto-negotiation
6	R/W	0	RESERVED	
5	R/W	1	RESERVED	
4:0	R/W	0	RESERVED	

5.2.6 GLOBAL_INT0

Address offset: 0x0020

Table 5-8 summarizes the global interrupt 0 register.

Table 5-8 GLOBAL_INT0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:30	RO	0	RESERVED	
29	R/W1C	0	ACL_INI_INT	Interrupt when ACL memory initial done.
28	R/W1C	0	LOOKUP_INI_INT	Interrupt when address table initial done (including ARL, reserved ARL, VLAN).
27	R/W1C	0	QM_INI_INT	Interrupt when QM memory initial done.
26	R/W1C	0	MIB_INI_INT	Interrupt when MIB memory initial done.

Table 5-8 GLOBAL_INT0 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
25	R/W1C	0	OFFLOAD_INI_INT	Interrupt when offload memory initial done.
24	R/W1C	0	HARDWARE_INI_DONE	Interrupt when hardware memory initial done.
23	R/W1C	0	ACL_MATCH_INT	Interrupt when ACL match (and ACL_ MATCH_INT_EN in ACL result is 1).
22	R/W1C	0	ARL_DONE_INT	Interrupt when address table access is done by CPU.
21	R/W1C	0	ARL_CPU_FULL_INT	Interrupt when CPU loads a new address in address table, but the address's two entries are all valid.
20	R/W1C	0	VT_DONE_INT	VLAN table access is done by CPU.
19	R/W1C	0	MIB_DONE_INT	MIB access done by CPU.
18	R/W1C	0	ACL_DONE_INT	Interrupt when ACL access done by CPU
17	R/W1C	0	OFFLOAD_DONE_INT	Interrupt when offload table access done by CPU
16	R/W1C	0	OFFLOAD_CPU_FULL_ DONE_INT	Interrupt when CPU load a new entry in HNAT table, but the offload's entries are all valid.
15:12	RO	0	RESERVED	
11	R/W1C	0	ARL_LEARN_CREATE_INT	Create new entry. ARL learn a new address: auto learn, add a new address to ARL. IGMP/MLD join a new entry: add new IGMP/MLD multicast entry to ARL
10	R/W1C	0	ARL_LEARN_CHANGE_INT	Change an existing entry. ARL learn: auto learn, address exists. Change to new port IGMP/MLD join new port: add source port to IGMP/MLD multicast entry IGMP/MLD leave port: one port remove from the IGMP/MLD entry
9	R/W1C	0	ARL_DELETE_INT	Delete an existing entry Age: Age one entry from ARL (including UNI/MUL/IGMP…) IGMP/MLD leave port: one IGMP/MLD entry is removed from ARL
8	R/W1C	0	ARL_LEARN_FULL_INT	Interrupt when learn a new address in address table, but the address's two entries are all valid.
7	RO	0	RESERVED	
6	R/W1C	0	NAPT_AGE_DELETE_INT	NAPT age interrupt
5	R/W1C	0	ARP_LEARN_CREATE_INT	Create new entry ARP learn a new address: auto learn, add a new address to ARP table

Table 5-8 GLOBAL_INT0 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
4	R/W1C	0	ARP_LEARN_CHANGE_INT	Change an existed entry ARP learn: auto learn, address exists. Change to new port
3	R/W1C	0	ARP_AGE_DELETE_INT	Interrupt when entry removed by hardware age
2	R/W1C	0	ARP_LEARN_FULL_INT	Interrupt when learning a new address in ARP table, but table is full.
1	R/W1C	0	VT_MISS_VIO_INT	Interrupt when the VID is not in VLAN table.
0	R/W1C	0	VT_MEM_VIO_INT	Interrupt when the VID is in VLAN table, but source port is not the member of the VID.

5.2.7 GLOBAL_INT1

Address offset: 0x0024

Table 5-9 summarizes the global interrupt 1 register.

Table 5-9 GLOBAL_INT1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23:20	RO	0	RESERVED	
19	R/W1C	0	THERM_INT	Thermal meter input
18	R/W1C	0	EEPROM_ERR_INT	Interrupt when error occurs during load EEPROM
17	R/W1C	0	EEPROM_INT	Interrupt when EEPROM load done
16	R/W1C	0	MDIO_DONE_INT	MDIO access switch register done interrupt
15	R/W1C	0	PHY_INT	Physical layer interrupt
14	R/W1C	0	QM_ERR_INT	Interrupt when QM detect error
13	R/W1C	0	LOOKUP_ERR_INT	Interrupt when lookup detect error
12	R/W1C	0	LOOP_CHECK_INT	Interrupt when loop checked by hardware
11:8	RO	0	RESERVED	
7:1	R/W1C	0	LINK_CHG_INT_EN	Link status change interrupt enable
0	R/W	0	BIST_DONE_INT	Interrupt when BIST done

5.2.8 GLOBAL_INT0_MASK

Address offset: 0x0028

Table 5-10 summarizes the global interrupt 0 mask register.

Table 5-10 GLOBAL_INT0_MASK bit description

Bits	R/W	Initial value	Mnemonic	Description
31:30	RO	0	RESERVED	
29	R/W	0	ACL_INI_INT_EN	Enable interrupt when ACL memory initial done
28	R/W	0	LOOKUP_INI_INT_EN	Enable interrupt when address table initial done (including ARL, reserved ARL, VLAN).
27	R/W	0	QM_INI_INT_EN	Enable interrupt when QM memory initial done
26	R/W	0	MIB_INI_INT_EN	Enable interrupt when MIB memory initial done
25	R/W	0	OFFLOAD_INI_INT_EN	Enable interrupt when offload memory initial done
24	R/W	0	HARDWARE_INI_DONE_ EN	Enable interrupt when hardware memory initial done
23	R/W	0	ACL_MATCH_INT_EN	Enable interrupt when ACL match
22	R/W	0	ARL_DONE_INT_EN	Enable interrupt when address table access is done by CPU
21	R/W	0	ARL_CPU_FULL_INT_EN	Enable interrupt for ARL_CPU_FULL_INT
20	R/W	0	VT_DONE_INT_EN	Enable interrupt for VT_DONE_INT
19	R/W	0	MIB_DONE_INT_EN	Enable interrupt for MIB_DONE_INT
18	R/W	0	ACL_DONE_INT_EN	Enable interrupt for ACL_DONE_INT
17	R/W	0	OFFLOAD_DONE_INT_EN	Enable interrupt for OFFLOAD_DONE_INT
16	R/W	0	OFFLOAD_CPU_FULL_ DONE_INT_EN	Enable interrupt for OFFLOAD_CPU_FULL_ DONE_INT
15:12	R/W	0	RESERVED	
11	R/W	0	ARL_LEARN_CREATE_ INT_EN	Enable interrupt for ARL_LEARN_CREATE_INT
10	R/W	0	ARL_LEARN_CHANGE_ INT_EN	Enable interrupt for ARL_LEARN_CHANGE_INT
9	R/W	0	ARL_DELETE_INT_EN	Enable interrupt for ARL_DELETE_INT
8	R/W	0	ARL_LEARN_FULL_INT_ EN	Enable interrupt for ARL_LEARN_FULL_INT
7	R/W	0	RESERVED	
6	R/W	0	NAPT_AGE_DELETE_INT_ EN	Enable interrupt for NAPT_AGE_DELETE_INT
5	R/W	0	ARP_LEARN_CREATE_ INT_EN	Enable interrupt for ARP_LEARN_CREATE_INT
4	R/W	0	ARP_LEARN_CHANGE_ INT_EN	Enable interrupt for ARP_LEARN_CHANGE_INT
3	R/W	0	ARP_AGE_DELETE_INT_ EN	Enable interrupt for ARP_AGE_DELETE_INT
2	R/W	0	ARP_LEARN_FULL_INT_ EN	Enable interrupt for ARP_LEARN_FULL_INT

Table 5-10 GLOBAL_INT0_MASK bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
1	R/W	0	VT_MISS_VIO_INT_EN	Enable interrupt for VT_MISS_VIO_INT
0	R/W	0	VT_MEM_VIO_INT_EN	Enable interrupt for VT_MEM_VIO_INT

5.2.9 GLOBAL_INT1_MASK

Address offset: 0x002C

Table 5-11 summarizes the global interrupt 1 mask register.

Table 5-11 GLOBAL_INT1_MASK bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23:20	RO	0	RESERVED	
19	R/W	0	THERM_INT_EN	Thermal meter interrupt enable
18	R/W	0	EEPROM_ERR_INT_EN	Enable interrupt for EEPROM_ERR_INT
17	R/W	0	EEPROM_INT_EN	Enable interrupt for EEPROM_INT
16	R/W	0	MDIO_DONE_INT_EN	Enable interrupt for MDIO_DONE_INT
15	R/W	0	PHY_INT_EN	Enable interrupt for PHY_INT
14	R/W	0	QM_ERR_INT_EN	Enable interrupt for QM_ERR_INT
13	R/W	0	LOOKUP_ERR_INT_EN	Enable interrupt for LOOKUP_ERR_INT
12	R/W	0	LOOP_CHECK_INT_EN	Enable interrupt for LOOP_CHECK_INT
11:1	RO	0	RESERVED	
0	R/W	0	BIST_DONE_INT_EN	Enable interrupt for BIST_DONE_INT

5.2.10 MODULE_EN

Address offset: 0x0030

Table 5-12 summarizes the module enable register.

Table 5-12 MODULE_EN bit description

Bits	R/W	Initial value	Mnemonic	Description
31:11	RO	0	RESERVED	
10	R/W	1	SPECIAL_DIP_EN	Enable special DIP (224.0.0.x or ff02::1) broadcast 0 = Use multicast DP 1 = Use broadcast DP
9	R/W	1	RESERVED	

Table 5-12 MODULE_EN bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
8	R/W	1	RESERVED	
7:3	R/W	0	RESERVED	
2	R/W	0	L3_EN	1 = Layer 3 offload enable
1	R/W	0	ACL_EN	1 = ACL module enable
0	R/W	0	MIB_EN	0 = MIB count disable 1 = MIB count enable

5.2.11 MIB

Address offset: 0x0034

Table 5-13 summarizes the MIB function register.

Table 5-13 MIB bit description

Bits	R/W	Initial value	Mnemonic	Description
31:27	RO	0	RESERVED	
26:24	R/W	0	MIB_FUNC	000 = No operation 001 = Flush all counters for all ports 010 = Flush all MIB counters of appointed port 011 = Capture all counters for all ports and auto-cast to CPU port 1xx = Reserved
23:21	R/W	0	MIB_FLUSH_PORT	Flush all MIB counters of this port
20	R/W	0	MIB_CPU_KEEP	0 = Clear MIB counter to 0 after read 1 = Do not clear MIB counter after it has been read.
19:18	RO	0	RESERVED	
17	R/W SC	0	MIB_BUSY	0 = MIB module is empty, and can access new command. 1 = MIB module is busy, and can not access another new command.
16	R/W	0	MIB_AT_HALF_EN	MIB auto-cast enable due to half flow. 1 = MIB is auto-cast when any counter's highest bit count to 1.
15:0	R/W	15'h0	MIB_TIMER	MIB auto-cast timer. 0 = MIB does not auto-cast due to timer times out. The time is times of 8.4 ms; recommended value is 'h100.

5.2.12 INTERFACE_HIGH_ADDR

Address offset: 0x0038

Table 5-14 summarizes the interface high address register.

Table 5-14 INTERFACE_HIGH_ADDR bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	SPI_SPEED	0 = Normal operation mode 1 = Fast speed for test
30:28	R/W	0	RESERVED	
27:24	R/W	0Xf	RELOAD_TIMER	Reload EEPROM timer If the EEPROM can not be read out, EEPROM is reloaded when the timer done. It's times 8 ms. 0 = No need to reload EEPROM
23:20	R/W	0	RESERVED	
19	R/W	0	SGMII_CLK125M_RX_SEL	SGMII interface Rx clock selection 1 = Inverse clock
18	R/W	0	SGMII_CLK125M_TX_SEL	SGMII interface Tx clock selection 1 = Inverse clock
17:10	R/W	0	RESERVED	
9:0	R/W	0	RESERVED	

5.2.13 MDIO master control

Address offset: 0x003C

Table 5-15 summarizes the MDIO master control register.

Table 5-15 MDIO master control bit description

Bits	R/W	Initialvalue	Mnemonic	Description
31	R/W	0	MDIO_BUSY	1 = Internal MDIO interface is busy. This bit is set to 1 when CPU read or write PHY register through internal MDIO interface, and is cleared after hardware finish the command.
30	RO	0	MDIO_MASTER_EN	1 = Use MDIO master to configure PHY register. MDC is changed to internal MDC to PHY.
29:28	R/W	0	RESERVED	
27	RO	0	MDIO_CMD	0 = Write 1 = Read
26	R/W	0	MDIO_SUP_PRE	0 = With 32 bits preamble 1 = Suppress preamble enable
25:21	RO	0	PHY_ADDR	PHY address

Table 5-15 MDIO master control bit description (cont.)

Bits	R/W	Initialvalue	Mnemonic	Description
20:16	R/W	0	REG_ADDR	PHY register address
15:0	R/W	0	MDIO_DATA	When write, these bits are data written to PHY register. When read, these bits are data read out from PHY register.

5.2.14 BIST_CTRL

Address offset: 0x0040

Table 5-16 summarizes the BIST control register.

Table 5-16 BIST_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	0	BIST_BUSY	This bit is written to 1 to begin BIST test and is cleared to 0 by hardware after test done. 0 = BIST done or idle 1 = BIST test
30	RO	0	BIST_WITH_ONE_ERR	1 = BIST test one error in data memory and can be recovered.
29	RO	0	BIST_PASS	All memory is OK, or only one error in data memory.
28:24	RO	0	RESERVED	
23	R/W	0	BIST_CRITICAL	Enable critical pattern for BIST test
22	R/W	1	BIST_PTN_EN_2	1 = Enable pattern 2 for BIST test
21	R/W	1	BIST_PTN_EN_1	1 = Enable pattern 1 for BIST test
20	R/W	1	BIST_PTN_EN_0	1 = Enable pattern 0 for BIST test
19:0	RO	0	RESERVED	

5.2.15 BIST_RECOVER

Address offset: 0x0044

Table 5-17 summarizes the BIST recover register.

Table 5-17 BIST_RECOVER bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	0	BIST_RECOVER_EN	1 = Enable hardware recover data memory MBIST error.
30:13	RO	0	RESERVED	
12:0	R/W	0	BIST_RECOVER_ADDR	BIST test error address of memory.

5.2.16 SERVICE_TAG

Address offset: 0x0048

Table 5-18 summarizes the service tag register.

Table 5-18 SERVICE_TAG bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	R/W	0	RESERVED	
17	R/W	0	SWITCH_S-TAG_ MODE	Select switch work VLAN mode. 0 = C-Tag mode 1 = S-Tag mode
16	RO	0	RESERVED	
15:0	R/W	0x88A8	SERVICE_TAG	Identify the service tagged frame when core port is enabled.

5.2.17 LED_CTRL0

Address offset: 0x0050

Table 5-19 summarizes the LED control 0 register.

Table 5-19 LED_CTRL 0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:16	R/W	0xCC35	LED_CTRL_RULE_1	PHY4 LED0 control rule
15:0	R/W	0xCC35	LED_CTRL_RULE_0	PHY0–PHY3 LED0 control rule

5.2.18 LED_CTRL1

Address offset: 0x0054

Table 5-20 summarizes the LED control 1 register.

Table 5-20 LED_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:16	R/W	0xCA35	LED_CTRL_RULE_3	PHY4 LED1 control rule
15:0	R/W	0xCA35	LED_CTRL_RULE_2	PHY0–PHY3 LED1 control rule

5.2.19 LED_CTRL2

Address offset: 0x0058

Table 5-21 summarizes the LED control 2 register.

Table 5-21 LED_CTRL2 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:16	R/W	16'hC935	LED_CTRL_RULE_5	PHY4 LED2 control rule
15:0	R/W	16'hC935	LED_CTRL_RULE_4	PHY0–PHY3 LED2 control rule

5.2.20 LED_CTRL3

Address offset: 0x005C

Table 5-22 summarizes the LED control 3 register.

Table 5-22 LED_CTRL3 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:26	R/W	0	RESERVED	
25:24	R/W	11	LED_PATTERN_EN_32	Pattern enable for port3 LED2
23:22	R/W	11	LED_PATTERN_EN_31	Pattern enable for port3 LED1
21:20	R/W	11	LED_PATTERN_EN_30	Pattern enable for port3 LED0
19:18	R/W	11	LED_PATTERN_EN_22	Pattern enable for port2 LED2
17:16	R/W	11	LED_PATTERN_EN_21	Pattern enable for port2 LED1
15:14	R/W	11	LED_PATTERN_EN_20	Pattern enable for port2 LED0
13:12	RO	0	RESERVED	
11:10	RO	0	RESERVED	
9:8	RO	0	RESERVED	
7:2	RO	0	RESERVED	
1:0	R/W	0	BLINK_HIGH_TIME	When LED blinking, these bits determine LED light time. 00 = 50% of blinking period. 250 ms for 2 Hz, 125 ms for 4 Hz, 62.5 ms for 8 Hz. 01 = 12.5% of blinking period 10 = 25% of blinking period 11 = 75% of blinking period

5.2.21 GOL_MAC_ADDR0

Address offset: 0x0060

Table 5-23 summarizes the global MAC address 0 register.

Table 5-23 GOL_MAC_ADDR0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:16	R/W	0	RESERVED	
15:8	R/W	0	MAC_ADDR_BYTE4	Station address of switch, used as source address in pause frame or other management frames.
7:0	R/W	0x01	MAC_ADDR_BYTE5	Station MAC address

5.2.22 GOL_MAC_ADDR1

Address offset: 0x0064

Table 5-24 summarizes the global MAC address 1 register.

Table 5-24 GLOL_MAC_ADDR1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:0	R/W	0	MAC_ADDR_BYTE0	Station MAC address

5.2.23 MAX_FRAME_SIZE

Address offset: 0x0078

Table 5-25 summarizes the maximum frame size register.

Table 5-25 MAX_FRAME__SIZE bit description

Bits	R/W	Initial value	Mnemonic	Description
31:21	RO	0	RESERVED	
20	R/W	0	TEST_PAUSE	Test for MAC send out pause frames. MAC sends out pause on frame on positive edge of this signal and pause off frame on negative edge.
19	R/W	0	IPG_DEC_EN	0 = Normal IPG 96 bit time 1 = MAC decreases two bytes of IPG when send out frame and receive check.
18	RO	0	RESERVED	
17	RO	0	RESERVED	
16	R/W	0	MAC_CRC_RESERVE_EN	0 = MAC removes 4 byte CRC when received frame, and add CRC when transmit out frame; 1 = MAC does not remove 4 byte CRC when received frame, and does not add CRC when transmit out frame.

Table 5-25 MAX_FRAME__SIZE bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
15:14	RO	0	RESERVED	
13:0	R/W	'H5EE	MAX_FRAME_SIZE	Maximum frame size can be received and transmitted by MAC. If a packet's size is larger than MAX_FRAME_SIZE, it is dropped by MAC. The value is for normal packet, it is added 4 by MAC if support VLAN, added 8 for double VLAN, and added 2 for Atheros header.

5.2.24 PORT0_STATUS

Address offset: 0x007C

Table 5-26 summarizes the port 0 status register.

Table 5-26 PORT0_STATUS bit description

Bits	R/W	Initial value	Mnemonic	Description
31:13	RO	0	RESERVED	
12	R/W	1	FLOW_LINK_EN_0	PHY link mode enable 0 = MAC can be configured by software. 1 = Enable MAC flow control configure auto-negotiation with PHY
11	RO	0	AUTO_RX_FLOW_EN_0	Transmit flow control enable after auto-negotiation.
10	RO	0	AUTO_TX_FLOW_EN_0	Transmit flow control enable after auto-negotiation.
9	R/W	0	LINK_EN_0	PHY link mode enable 0 = MAC can be configured by software 1 = Enable MAC auto-negotiation with PHY
8	RO	0	LINK_0	Link status: 0 = PHY link down 1 = PHY link up
7	R/W	1	TX_HALF_FLOW_EN_0	1 = Transmit flow control enable in half-duplex mode.
6	R/W	0	DUPLEX_MODE_0	Duplex mode: 0 = Half-duplex mode 1 = Full-duplex mode
5	R/W	0	RX_FLOW_EN_0	Rx MAC flow control enable
4	R/W	0	TX_FLOW_EN_0	Tx MAC flow control enable
3	RO	0	RXMAC_EN_0	Rx MAC enable

Table 5-26 PORT0_STATUS bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
2	R/W	0	TXMAC_EN_0	Tx MAC enable
1:0	R/W	0	SPEED_0	Speed mode: 00 = 10M 01 = 100M 10 = 1000M 11 = Error speed mode

5.2.25 PORT2_STATUS

Address offset: 0x0084

Table 5-27 summarizes the port 2 status register.

Table 5-27 PORT2_STATUS bit description

Bits	R/W	Initial value	Mnemonic	Description
31:13	RO	0	RESERVED	
12	R/W	1	FLOW_LINK_EN_2	PHY link mode enable 0 = MAC can be configured by software. 1 = Enable MAC flow control configure auto-negotiation with PHY
11	RO	0	AUTO_RX_FLOW_EN_2	Transmit flow control enable after auto-negotiation.
10	RO	0	AUTO_TX_FLOW_EN_2	Transmit flow control enable after auto-negotiation.
9	R/W	0	LINK_EN_2	PHY link mode enable. 0 = MAC can be configured by software. 1 = Enable MAC auto-negotiation with PHY
8	RO	0	LINK_2	Link status: 0 = PHY link down 1 = PHY link up
7	R/W	1	TX_HALF_FLOW_EN_2	1 = Transmit flow control enable in half-duplex mode.
6	R/W	0	DUPLEX_MODE_4	Duplex mode 0 = Half-duplex mode 1 = Full-duplex mode
5	R/W	0	RX_FLOW_EN_2	Rx MAC flow control enable
4	R/W	0	TX_FLOW_EN_2	Tx MAC flow control enable
3	RO	0	RXMAC_EN_2	Rx MAC enable

Table 5-27 PORT2_STATUS bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
2	R/W	0	TXMAC_EN_2	Tx MAC enable
1:0	R/W	0	SPEED_2	Speed mode: 00 = 10M 01 = 100M 10 = 1000M 11 = Error speed mode

5.2.26 PORT3_STATUS

Address offset: 0x0088

Table 5-28 summarizes the port 3 status register.

Table 5-28 PORT 3_STATUS bit description

Bits	R/W	Initial value	Mnemonic	Description
31:13	RO	0	RESERVED	
12	R/W	1	FLOW_LINK_EN_3	PHY link mode enable 0 = MAC can be configured by software. 1 = Enable MAC flow control configure auto-negotiation with PHY
11	RO	0	AUTO_RX_FLOW_EN_3	RX flow control enable after auto-negotiation.
10	RO	0	AUTO_TX_FLOW_EN_3	TX low control enable after auto-negotiation.
9	R/W	0	LINK_EN_3	PHY link mode enable 0 = MAC can be configure by software. 1 = Enable MAC auto-negotiation with PHY
8	RO	0	LINK_3	Link status: 1 = PHY link up 0 = PHY link down
7	R/W	1	TX_HALF_FLOW_EN_3	1 = Transmit flow control enable in half-duplex mode.
6	R/W	0	DUPLEX_MODE_3	Duplex mode: 0 = Half-duplex mode 1 = Full-duplex mode
5	R/W	0	RX_FLOW_EN_3	Rx MAC flow control enable
4	R/W	0	TX_FLOW_EN_3	Tx MAC flow control enable
3	RO	0	RXMAC_EN_3	Rx MAC enable

Table 5-28 PORT 3_STATUS bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
2	R/W	0	TXMAC_EN_3	Tx MAC enable
1:0	R/W	0	SPEED_3	Speed mode: 00 = 10M 01 = 100M 10 = 1000M 11 = Error speed mode

5.2.27 PORT6_STATUS

Address offset: 0x0094

Table 5-29 summarizes the port 6 status register.

Table 5-29 PORT 6_STATUS bit description

Bits	R/W	Initial value	Mnemonic	Description
31:13	RO	0	RESERVED	
12	R/W	1	FLOW_LINK_EN_6	PHY link mode enable 0 = MAC can be configured by software. 1 = Enable MAC flow control configure auto-negotiation with PHY
11	RO	0	AUTO_RX_FLOW_EN_6	Rx flow control enable after auto-negotiation.
10	RO	0	AUTO_TX_FLOW_EN_6	Tx flow control enable after auto-negotiation.
9	R/W	0	LINK_EN_6	PHY link mode enable 0 = MAC can be configure by software. 1 = Enable MAC auto-negotiation with PHY
8	RO	0	LINK_6	Link status: 0 = PHY link down 1 = PHY link up
7	R/W	1	TX_HALF_FLOW_EN_6	1 = Transmit flow control enable in half-duplex mode.
6	R/W	0	DUPLEX_MODE_6	Duplex mode: 0 = Half-duplex mode 1 = Full-duplex mode
5	R/W	0	RX_FLOW_EN_6	Rx MAC flow control enable
4	R/W	0	TX_FLOW_EN_6	Tx MAC flow control enable
3	RO	0	RXMAC_EN_6	Rx MAC enable.

Table 5-29 PORT 6_STATUS bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
2	R/W	0	TXMAC_EN_6	Tx MAC enable
1:0	R/W	0	SPEED_6	Speed mode: 00 = 10M 01 = 100M 10 = 1000M 11 = Error speed mode

5.2.28 HEADER_CTRL

Address offset: 0x0098

Table 5-30 summarizes the header control register.

Table 5-30 HEADER_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31:17	RO	0	RESERVED	
16	R/W	0	HEADER_LENGTH_SEL	0 = 2-byte header 1 = 4-byte header
15:0	R/W	0	HEADER_TYPE_VALUE	2-byte header type added between SA & header field

5.2.29 PORT0_HEADER_CTRL

Address offset: 0x009C

Table 5-31 summarizes the port 0 header control register.

Table 5-31 PORT0_HEADER_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31:6	RO	0	RESERVED	
5	R/W	0	IPG_DEC_EN_0	0 = Normal IPG 96 bit time 1 = MAC decreases two bytes of IPG when send out frame and receive check.
4	R/W	0	MAC_LOOP_BACK_0	1 = Enable MAC loop back at GMII/MII interface

Table 5-31 PORT0_HEADER_CTRL bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
3:2	R/W	0	RX_HEADER_MODE_0	0x0 = No header; 0x1 = Only management with header, must be under 4 bytes header mode. 0x2 = All frame with header; 0x3 = Reserved
1:0	R/W	0	TX_HEADER_MODE_0	0x0 = No header; 0x1 = Only management with header; must be under 4 bytes header mode. 0x2 =All frame with header; 0x3 = Reserved

5.2.30 PORT2_HEADER_CTRL

Address offset: 0x00A4

Table 5-32 summarizes the port 2 header control register.

Table 5-32 PORT 2_HEADER_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31:6	RO	0	RESERVED	
5	R/W	0	IPG_DEC_EN_2	0 = Normal IPG 96 bit time 1 = MAC decreases two bytes of IPG when send out frame and receive check.
4	R/W	0	MAC_LOOP_BACK_2	1 = Enable MAC loop back at GMII/MII interface
3:2	R/W	0	RX_HEADER_MODE_2	0x0 = No header; 0x1 = Only management with header, must be under 4 bytes header mode. 0x2 = All frame with header; 0x3 = Reserved
1:0	R/W	0	TX_HEADER_MODE_2	0x0 = No header; 0x1 = Only management with header; must be under 4 bytes header mode. 0x2 = All frame with header; 0x3 = Reserved

5.2.31 PORT3_HEADER_CTRL

Address offset: 0x00A8

Table 5-33 summarizes the port 3 header control register.

Table 5-33 PORT3_HEADER_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31:6	RO	0	RESERVED	
5	R/W	0	IPG_DEC_EN_3	0 = Normal IPG 96 bit time 1 = MAC decreases two bytes of IPG when send out frame and receive check.
4	R/W	0	MAC_LOOP_BACK_3	1 = Enable MAC loop back at GMII/MII interface
3:2	R/W	0	RX_HEADER_MODE_3	0x0 = No header; 0x1 = Only management with header, must be under 4 bytes header mode. 0x2 = All frame with header; 0x3 = Reserved
1:0	R/W	0	TX_HEADER_MODE_3	0x0 = No header; 0x1 = Only management with header; must be under 4 bytes header mode. 0x2 = All frame with header; 0x3 = Reserved

5.2.32 PORT6_HEADER_CTRL

Address offset: 0x00B4

Table 5-34 summarizes the port 6 header control register.

Table 5-34 PORT6_HEADER_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31:6	RO	0	RESERVED	
5	R/W	0	IPG_DEC_EN_6	0 = Normal IPG 96 bit time 1 = MAC decreases two bytes of IPG when send out frame and receive check.
4	R/W	0	MAC_LOOP_BACK_6	1 = Enable MAC loop back at GMII/MII interface
3:2	R/W	0	RX_HEADER_MODE_6	0x0 = No header; 0x1 = Only management with header, must be under 4 bytes header mode. 0x2 = All frame with header; 0x3 = Reserved
1:0	R/W	0	TX_HEADER_MODE_6	0x0 = No header; 0x1 = Only management with header; must be under 4 bytes header mode. 0x2 = All frame with header; 0x3 = Reserved

5.2.33 SGMII debug 1 register

Address offset: 0x00bc

Table 5-35 summarizes the SGMII debug 1 register.

Table 5-35 SGMII debug 1 register bit description

Bits	R/W	Initial value	Mnemonic	Description
31:10	R/O	0	RESERVED	
9	R/W	0	SERDES_SYNC_STATUS	SerDes interface synchronization status: 1 = Synchronization works fine 0 = No synchronization
8:7	R/O	0	RESERVED	
6	R/W	0	SERDES_AN_COMPLETE	SerDes interface autonegotiation: 1 = Autonegotiation completed 0 = Autonegotiation is not completed
5:0	R/O	0	RESERVED	

5.2.34 SGMII_CTRL

Address offset: 0x00E0

Table 5-36 summarizes the SGMII control register.

Table 5-36 SGMII_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	1	FULL_DUPLEX_25M	Full-duplex in the base-page of base-x for auto-negotiation.
30	R/W	1	HALF_DUPLEX_25M	Half-duplex in the base-page of base-x for auto-negotiation.
29:28	R/W	00	REMOTE_FAULT_25M	REMOTE_FAULT[1:0] in the base-page of base-x for auto-negotiation. Generated by the remote_fault logic internal MAC.
27	R/W	0	NEXT_PAGE_25M	NEXT_PAGE index in the base-page of base-x and SGMII PHY/MAC for auto-negotiation.
26	R/W	1	PAUSE_25M	Pause in the base-page of base-x and SGMII-PHY/MAC for auto-negotiation. This part is not included in the standard for SGMII.
25	R/W	1	ASYM_PAUSE_25M	ASYM_PAUSE in the base-page of base-x and SGMII-PHY/MAC for auto-negotiation. This part is not included in the standard for SGMII.
24	R/W	1	PAUSE_SG_TX_EN_25M	Enable transmitting pause in the base-page of base-x and SGMII-PHY/MAC for auto-negotiation.

Table 5-36 SGMII_CTRL bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
23:22	R/W	0	MODE_CTRL_25M	MODE_CTRL signal for mode selection among BASE-X (2'h0), SGMII-PHY (2'h1), and SGMII-MAC (2'h2).
21	R/W	0	MR_LOOPBACK, FORCE_SPEED	Indicate loopback from MII register of cooper PHY and force speed control signal.
20	R/W	0	MR_REG4_CH_25M	Indicate register 4 has changed.
19	R/W	0	AUTO_LPI_25M	When RX_LPI_ACTIVE active for once, the register latches this to indicate that the link-partner.
18	R/W	0	PRBS_EN	Enable SerDes PRBS test function
17	R/W	0	SGMII_TH_LOS[1]	Combined with bit[15], Signal detection threshold setting control 00 = Default 01 = -2dB 10 = +2dB 11 = +2dB
16	R/W	1	DIS_AUTO_LPI_25M	Disable the auto-detect link-partner's az ability.
15	R/W	0	SGMII_TH_LOS[0]	Same as bit[17]
14:13	R/W	11	SGMII_CDR_BW	CDR digital accumulator length control 00 = 0 01 = ±2 10 = ±4 11 = ±8
12:10	R/W	001	SGMII_TXDR_CTRL	Default value is 001. 000 = Driver output Vdiff,pp=500 mV 001 = 600 mV 010 = 700 mV 011 = 800 mV 100 = 900 mV 101 = 1 V 110 = 1.1V 111 = 1.2 V
9:8	R/W	0	SGMII_FIBER_MODE	00 = Not in fiber mode 01 = 100BASE-FX mode 10 = Reserved 11 = 1000BASE-FX mode
7	R/W	1	SGMII_SEL_CLK125M	0 = sgmii_clk125m_rx_delay is not delayed 1 = sgmii_clk125m_rx_delay is delayed by 2 ns
6	R/W	1	SGMII_PLL_BW	0 = SGMII PLL bandwidth is low 1 = SGMII PLL bandwidth is high (default)
5	R/W	0	SGMII_HALFTX	0 = TX driver amplitude is normal (default) 1 = TX driver amplitude is half

Table 5-36 SGMII_CTRL bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
4	R/W	0	SGMII_EN_SD	0 = Signal detection disabled and SGMII_FB_SDO = 0 1 = Signal detection enabled
3	R/W	0	SGMII_EN_TX	0 = TX driver is in idle and kept in 900 mV 1 = TX driver enabled
2	R/W	0	SGMII_EN_RX	0 = RX chain disabled, CLK125M_RX and DOUT_RX could be any logic of 1 or 0 1 = RX chain enabled
1	R/W	0	SGMII_EN_PLL	0 = SGMII PLL disabled 1 = DSGMII PLL enabled
0	R/W	0	SGMII_EN_LCKDT	0 = Disabled (default) 1 = SGMII VCO control voltage detector and lock detector enabled

5.2.35 MAC_PWR_SEL

Address offset: 0x0e4

Table 5-37 summarizes the MAC_PWR_SEL register.

Table 5-37 MAC_PWR_SEL bit description

Bits	R/W	Initial value	Mnemonic	Description
31:20	R/O	0	RESERVED	
19	R/W	0	PWR_RGMII_0	For MAC0 RGMII interface power source selection when using internal regulator: 0 = 1.5 V 1 = 1.8 V
18	R/W	0	PWR_RGMII_1	For MAC5/6 RGMII interface power source selection when using internal regulator: 0 = 1.5 V 1 = 1.8 V
17:0	R/W	00x2a545	RESERVED	

5.3 EEE control registers

Table 5-38 summarizes the EEE control registers.

Table 5-38 EEE control register summary

Offset range	Name
0x0100	EEE control register
0x0130–0x0018	Port2 EEE variable register
0x0140–0x0148	Port3 EEE variable register

5.3.1 EEE_CTRL

Address offset: 0x0100

Table 5-39 summarizes the EEE control register.

Table 5-39 EEE_CTRL bit description

Bits	R/W	Initialvalue	Mnemonic	Description
31:14	RO	0	RESERVED	
13	R/W	0	RESERVED	
12	RO	1	RESERVED	
11	R/W	0	RESERVED	
10	RO	1	RESERVED	
9	R/W	0	RESERVED	
8	R/W	1	LPI_EN_3	LPI enable for port3
7	R/W	0	RESERVED	
6	R/W	1	LPI_EN_2	LPI enable for port2
5	R/W	0	RESERVED	
4	RO	0	RESERVED	
3	R/W	0	EEE_CPU_CHANGE_EN	1 = CPU can set the resolved value
2	R/W	0	EEE_LLDP_TO_CPU_EN	0 = EEE LLDP packet to deheader 1 = EEE LLDP packet to CPU
1	R/W	0	EEE_EN	1 = Support LLDP auto-negotiation PHY wake-up time
0	RO	0	RESERVED	

5.3.2 EEE_LOC_VALUE_2

Address offset: 0x0130

Table 5-40 summarizes the port 2 EEE variable register 0.

Table 5-40 EEE_LOC_VALUE_2 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:16	R/W	0x11	LOC_RX_VALUE_2	LocRxSystemValue
15:0	R/W	0x11	LOC_TX_VALUE_2	LocTxSystemValue

5.3.3 EEE_REM_VALUE_2

Address offset: 0x0134

Table 5-41 summarizes the port 2 EEE variable register 1.

Table 5-41 EEE_REM_VALUE_2 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:16	R/W	0	ECHO_RX_VALUE_2	LocRxSystemValueEcho
15:0	R/W	0	ECHO_TX_VALUE_2	LocTxSystemValueEcho

5.3.4 EEE_RES_VALUE_2

Address offset: 0x0138

Table 5-42 summarizes the port 2 EEE variable register 2.

Table 5-42 EEE_RES_VALUE_2 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:16	RO	0x24	LOC_RESOLVED_RX_VALUE_2	LocResolvedRxSystemValueEcho
15:0	RO	0x24	LOC_RESOLVED_TX_VALUE_2	LocResolvedTxSystemValueEcho

5.3.5 EEE_LOC_VALUE_3

Address offset: 0x0140

Table 5-43 summarizes the port 3 EEE variable register 0.

Table 5-43 EEE_LOC_VALUE_3 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:16	R/W	0x11	LOC_RX_VALUE_3	LocRxSystemValue
15:0	R/W	0x11	LOC_TX_VALUE_3	LocTxSystemValue

5.3.6 EEE_REM_VALUE_3

Address offset: 0x0144

Table 5-44 summarizes the port 3 EEE variable register 1.

Table 5-44 EEE_REM_VALUE_3 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:16	R/W	0	ECHO_RX_VALUE_3	LocRxSystemValueEcho
15:0	R/W	0	ECHO_TX_VALUE_3	LocTxSystemValueEcho

5.3.7 EEE_RES_VALUE_3

Address offset: 0x0148

Table 5-45 summarizes the port 3 EEE variable register 2.

Table 5-45 EEE_RES_VALUE_3 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:16	RO	0x24	LOC_RESOLVED_RX_VALUE_3	LocResolvedRxSystemValueEcho
15:0	RO	0x24	LOC_RESOLVED_TX_VALUE_3	LocResolvedTxSystemValueEcho

5.4 Parser control registers

Table 5-46 summarizes the parser registers.

Table 5-46 Parser register summary

Offset range	Name
0x0200–0x0204	Normalize control register
0x0208	Normalize length control register
0x0210–0x0214	Frame acknowledge control register
0x0218–0x024C	Window rule control register
0x0270	Trunk hash enable register

5.4.1 NORMALIZE_CTRL0

Address offset: 0x0200

Table 5-47 summarizes the normalize control 0 register.

Table 5-47 NORMALIZE_CTRL0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:30	RO	0	RESERVED	
29	R/W0	0	TCP_PSH1_ACK0_DROP_EN	1 = Frame with PUSH=1 & ACK=0 is dropped.
28	R/W0	0	TCP_FIN1_ACK0_DROP_EN	1 = Frame with FIN=1 & ACK=0 is dropped.
27	R/W0	0	TCP_RST1_WITH_DATA_ DROP_EN	1 = Frame with RST=1 and IP_LEN - IP_ HDR_LEN - TCP_OFFSET > 0 is dropped.
26	R/W	0	TCP_SYN1_WITH_DATA_ DROP_EN	1 = Frame with SYN=1 and IP_LEN - IP_ HDR_LEN - TCP_OFFSET > 0 is dropped.
25	R/W	0	TCP_RST1_DROP_EN	1 = Frame with RST=1 is dropped.
24	R/W	0	TCP_SYN0_ACK0_RST0_ DROP_EN	1 = Frame with SYN=0 & ACK=0 & RST=0 is dropped.
23	R/W	0	TCP_SYN1_FIN1_DROP_EN	1 = Frame with SYN=1 & FIN=1 is dropped.
22	R/W	0	TCP_SYN1_RST1_DROP_EN	1 = Frame with SYN=1 & RST=1 is dropped.
21	R/W	0	TCP_NULLSCAN_DROP_EN	1 = Frame with Seq_Num=0 and all TCP FLAG zero is dropped.
20	R/W	0	TCP_XMASSCAN_DROP_EN	1 = Frame with Seq_Num=0, FIN=1, URG=1, and PSH=1 is dropped
19	RO	0	TCP_SYN1_ACK1_PSH1_ DROP_EN	1 = Frame with SYN=1 & ACK=1 & PSH=1 is dropped.
18	RO	0	TCP_SYN1_PSH1_DROP_EN	1 = Frame with SYN=1 & PSH=1 is dropped.
17	RO	0	TCP_SYN1_URG1_DROP_EN	1 = Frame with SYN=1 & URG=1 is dropped.
16	RO	0	TCP_SYN_ERR_DROP_EN	1 = Frame with SYN=1 & ACK=0 & SP<1024 is dropped
15	RO	0	TCP_HDR_MIN_DROP_EN	1 = If frame with TCP header length less than TCP_HDR_MIN_SIZE, but not first of fragment, is dropped
14	R/W	0	TCP_SAME_PORT_DROP_EN	1 = TCP frame with SP equal to DP is dropped.
13	R/W	0	IPV4_CHECKSUM_DROP_EN	1 = Frame with IPv4 checksum error is dropped.
12	R/W	0	IPV4_DIP_ERR_DROP_EN	1 = Frame is dropped if with DIP all zero, or DIP[31:24] is 0x7F.
11	R/W	0	IPV4_SIP_ERR_DROP_EN	1 = Frame is dropped if with SIP[31:24] more than 0xE0 and less than 0xF0, or equal to 0x7F, or SIP[31:0] is 0x32'hFFFFFFFF.

Table 5-47 NORMALIZE_CTRL0 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
10	R/W	0	IPV4_FRAG_LEN_DROP_EN	1 = Frame with IPv4 fragment length check error is dropped.
9	R/W	0	IPV4_FRAG_MAX_DROP_EN	
8	R/W	0	IPV4_FRAG_MIN_DROP_EN	1 = Frame with offset length less than minimum is dropped
7	R/W	0	IPV4_DF_DROP_EN	1 = Frame with DF=1 and offset or MF not zero, is dropped
6	R/W	0	IP_LEN_DROP_EN	1 = Frame with IP length field error is dropped, IPv4 and IPv6 included.
5	R/W	0	IPV4_HDR_LEN_CHECK_EN	1 = Check the IP options. If frame is with options, drop or send to CPU
4	R/W	0	IPV4_HDR_LEN_DROP_EN	Forward or drop frame when IPv4 header length check fails.
3	RO	0	IPV4_HDR_LEN_MIN_DROP_EN	0 = Frame is dropped if the leangth of IPv4 header check fails.
2	R/W	0	IP_SAME_PORT_DROP_EN	1 = Frame is dropped if SIP equals to DIP.
1	R/W	0	IP_VER_DROP_EN	1 = Frame is dropped if the version field is not equal to 0x4 or 0x6 in IP header.
0	R/W	1	VID_4095_DROP_EN	1 = Frame is dropped if VID equals to 4095.

5.4.2 NORMALIZE_CTRL1

Address offset: 0x0204

Table 5-48 summarizes the normalize control 1 register.

Table 5-48 NORMALIZE_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	R/W	0	IPV4_FRAG_MIN	Define the minimum length of IPv4 frame with fragment
23:21	R/O	0	RESERVED	
20	R/W	0	INVALID_MAC_SRC_ADDR_DROP_EN	SA is broadcast or multicast address. The frame is dropped by the switch.
19	R/W	0	IPV4_MIN_PKT_LEN_DROP_EN	If the frame length is less than the minimum IPv4 frame size.
18	R/W	0	IPV6_MIN_PKT_LEN_DROP_EN	If the frame length is less than the minimum IPv6 frame size
17	R/W	0	INVALID_SIP6_DROP_EN	Drop Invalid Source IP for IPv6 IP is ::1 or ff00::/8

Table 5-48 NORMALIZE_CTRL1 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
16	R/W	0	INVALID_DIP6_DROP_EN	Drop Invalid Destination IP for IPv6 \ IP is ::1 or ::/128
15:12	R/W	0x5	TCP_HDR_MIN_SIZE	Defined the minimum size of TCP header
11	R/W	0	ICMP_CHECKSUM_DROP_EN	Drop the ICMP checksum error
10	R/W	0	ICMPV6_FRAG_DROP_EN	1 = Frame with fragment ICMPv6 is dropped.
9	R/W	0	ICMPV4_FRAG_DROP_EN	1 = Frame with fragment ICMPv4 is dropped.
8	R/W	0	ICMPV6_MAX_LEN_DROP_EN	1 = Frame with un-fragment ICMPv6 length larger than ICMPV6_MAX_LEN is dropped.
7	R/W	0	ICMPV4_MAX_LEN_DROP_EN	1 = Frame with un-fragment ICMPv4 length larger than ICMPV4_MAX_LEN is dropped.
6	R/W	0	UDP_CHECKSUM_DROP_EN	1 = Frame with UDP checksum error is dropped.
5	R/W	0	UDP_LEN_DROP_EN	1 = Frame with UDP length check error is dropped.
4	R/W	0	UDP_SAME_PORT_DROP_EN	1 = UDP frame with SP equal to DP is dropped.
3	R/W	0	TCP_OPTION_DROP_EN	1 = Frame with SYN=0 and IP header larger than 20 byte, is dropped.
2	R/W	0	TCP_URG0_PTR_ERR_DROP_EN	1 = Frame with URG=0 but pointer not zero is dropped.
1	R/W	0	TCP_CHECKSUM_DROP_EN	1 = Frame with TCP checksum error is dropped.
0	R/W	0	TCP_URG1_ACK0_DROP_EN	1 = Frame with URG=1 & ACK=0 is dropped.

5.4.3 NORMALIZE_LEN_CTRL

Address offset: 0x0208

Table 5-49 summarizes the normalize length control register.

Table 5-49 NORMALIZE_LEN_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31:30	RO	0	RESERVED	
29:16	R/W	0x40	ICMPV6_MAX_LEN	Defined the maximum IP payload length of ICMPv6 frame
15:14	RO	0	RESERVED	
13:0	R/W	0x40	ICMPV4_MAX_LEN	Defined the maximum IP payload length of ICMPv4 frame

5.4.4 FRAM_ACK_CTRL0

Address offset: 0x00210

Table 5-50 summarizes the frame ACK control 0 register.

Table 5-50 FRAM_ACK_CTRL0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30	R/W	0	ARP_REQ_EN_3	See bit[6]
29	R/W	0	ARP_ACK_EN_3	See bit[5]
28	R/W	0	DHCP_EN_3	See bit[4]
27	R/W	0	EAPOL_EN_3	See bit[3]
26	R/W	0	IGMP_LEAVE_EN_3	See bit[2]
25	R/W	0	IGMP_JOIN_EN_3	See bit[1]
24	R/W	0	IGMP_MLD_EN_3	See bit[0]
23	RO	0	RESERVED	
22	R/W	0	ARP_REQ_EN_2	See bit[6]
21	R/W	0	ARP_ACK_EN_2	See bit[5]
20	R/W	0	DHCP_EN_2	See bit[4]
19	R/W	0	EAPOL_EN_2	See bit[3]
18	R/W	0	IGMP_LEAVE_EN_2	See bit[2]
17	R/W	0	IGMP_JOIN_EN_2	See bit[1]
16	R/W	0	IGMP_MLD_EN_2	See bit[0]
15	RO	0	RESERVED	
14	R/W	0	ARP_REQ_EN_1	See bit[6]
13	R/W	0	ARP_ACK_EN_1	See bit[5]
12	R/W	0	DHCP_EN_1	See bit[4]
11	R/W	0	EAPOL_EN_1	See bit[3]
10	R/W	0	IGMP_LEAVE_EN_1	See bit[2]
9	R/W	0	IGMP_JOIN_EN_1	See bit[1]
8	R/W	0	IGMP_MLD_EN_1	See bit[0]
7	RO	0	RESERVED	
6	R/W	0	ARP_REQ_EN_0	ARP request frame acknowledge enable
5	R/W	0	ARP_ACK_EN_0	ARP response frame acknowledge enable
4	R/W	0	DHCP_EN_0	0 = Acknowledge DHCP frame disable 1 = Acknowledge DHCP frame enable

Table 5-50 FRAM_ACK_CTRL0 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
3	R/W	0	EAPOL_EN_0	1 = Hardware acknowledge 802.1x frame, and send frame copy or redirect to CPU controlled by EAPAL_REDIRECT_EN
2	R/W	0	IGMP_LEAVE_EN_0	1 = Enable IGMP/MLD hardware fast leave
1	R/W	0	IGMP_JOIN_EN_0	1 = Enable IGMP/MLD hardware join
0	R/W	0	IGMP_MLD_EN_0	IGMP/MLD snooping enable. If this bit is set to 1, the port examines all received frames and copy or redirect to CPU port controlled by IGMP_COPY_EN.

5.4.5 FRAM_ACK_CTRL1

Address offset: 0x00214

Table 5-51 summarizes the frame ACK control 1 register.

Table 5-51 FRAM_ACK_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:26	RO	0	RESERVED	
25	R/W	0	PPPOE_EN	0 = PPPoE package acknowledge disable 1 = PPPoE package acknowledge enable
24	R/W	0	IGMP_V3_EN	0 = IGMPv3 or MLDv2 acknowledge disable 1 = IGMPv3 or MLDv2 acknowledge enable
23	RO	0	RESERVED	
22	R/W	0	ARP_REQ_EN_6	See bit[6]
21	R/W	0	ARP_ACK_EN_6	See bit[5]
20	R/W	0	DHCP_EN_6	See bit[4]
19	R/W	0	EAPOL_EN_6	See bit[3]
18	R/W	0	IGMP_LEAVE_EN_6	See bit[2]
17	R/W	0	IGMP_JOIN_EN_6	See bit[1]
16	R/W	0	IGMP_MLD_EN_6	See bit[0]
15	RO	0	RESERVED	
14	R/W	0	ARP_REQ_EN_5	See bit[6]
13	R/W	0	ARP_ACK_EN_5	See bit[5]
12	R/W	0	DHCP_EN_5	See bit[4]
11	R/W	0	EAPOL_EN_5	See bit[3]
10	R/W	0	IGMP_LEAVE_EN_5	See bit[2]
9	R/W	0	IGMP_JOIN_EN_5	See bit[1]
8	R/W	0	IGMP_MLD_EN_5	See bit[0]

Table 5-51 FRAM_ACK_CTRL1 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
7	RO	0	RESERVED	
6	R/W	0	ARP_REQ_EN_4	ARP request frame acknowledge enable
5	R/W	0	ARP_ACK_EN_4	ARP response frame acknowledge enable
4	R/W	0	DHCP_EN_4	0 = Acknowledge DHCP frame disable 1 = Acknowledge DHCP frame enable
3	R/W	0	EAPOL_EN_4	1 = Hardware acknowledge 802.1x frame, and send frame copy or redirect to CPU controlled by EAPAL_ REDIRECT_EN.
2	R/W	0	IGMP_LEAVE_EN_4	1 = Enable IGMP/MLD hardware fast leave
1	R/W	0	IGMP_JOIN_EN_4	1 = Enable IGMP/MLD hardware join
0	R/W	0	IGMP_MLD_EN_4	IGMP/MLD snooping enable. If this bit is set to 1, the port examines all received frames and copies or redirects to CPU port controlled by IGMP_COPY_EN.

5.4.6 WIN_RULE_CTRL0

Address offset: 0x0218

Table 5-52 summarizes the window rule control 0 register.

Table 5-52 WIN_RULE_CTRL0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:28	RO	0	RESERVED	
27:24	R/W	0	L4_LENGTH_0	These bits indicate that window rule in port0 to select length of L4, from L4_OFFSET_0.
23:20	R/W	0	L3_LENGTH_0	These bits indicate that window rule in port0 to select length of L3, from L3_OFFSET_0.
19:16	R/W	0	L2_LENGTH_0	These bits indicate that window rule in port0 to select length of L2, from L2_OFFSET_0.
15	RO	0	RESERVED	
14:10	R/W	0	L4_OFFSET_0	These bits indicate that window rule in port0 to select offset of L3, from TCP/UDP header.
9:5	R/W	0	L3_OFFSET_0	These bits indicate that window rule in port0 to select offset of L3, from IP header.
4:0	R/W	0	L2_OFFSET_0	These bits indicate that window rule in port0 to select offset of L2, from MAC DA.

5.4.7 WIN_RULE_CTRL2

Address offset: 0x0220

Table 5-53 summarizes the window rule control 2 register.

Table 5-53 WIN_RULE_CTRL2 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:28	RO	0	RESERVED	
27:24	R/W	0	L4_LENGTH_2	These bits indicate that window rule in port2 to select length of L4, from L4_OFFSET_2.
23:20	R/W	0	L3_LENGTH_2	These bits indicate that window rule in port2 to select length of L3, from L3_OFFSET_2.
19:16	R/W	0	L2_LENGTH_2	These bits indicate that window rule in port2 to select length of L2, from L2_OFFSET_2.
15	R/W	0	RESERVED	
14:10	R/W	0	L4_OFFSET_2	These bits indicate that window rule in port2 to select offset of L3, from TCP/UDP header.
9:5	R/W	0	L3_OFFSET_2	These bits indicate that window rule in port2 to select offset of L3, from IP header.
4:0	R/W	0	L2_OFFSET_2	These bits indicate that window rule in port2 to select offset of L2, from MAC DA.

5.4.8 WIN_RULE_CTRL3

Address offset: 0x0224

Table 5-54 summarizes the window rule control 3 register.

Table 5-54 WIN_RULE_CTRL3 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:28	RO	0	RESERVED	
27:24	R/W	0	L4_LENGTH_3	These bits indicate that window rule in port3 to select length of L4, from L4_OFFSET_3.
23:20	R/W	0	L3_LENGTH_3	These bits indicate that window rule in port3 to select length of L3, from L3_OFFSET_3.
19:16	R/W	0	L2_LENGTH_3	These bits indicate that window rule in port3 to select length of L2, from L2_OFFSET_3.
15	R/W	0	RESERVED	
14:10	R/W	0	L4_OFFSET_3	These bits indicate that window rule in port3 to select offset of L3, from TCP/UDP header.
9:5	R/W	0	L3_OFFSET_3	These bits indicate that window rule in port3 to select offset of L3, from IP header.
4:0	R/W	0	L2_OFFSET_3	These bits indicate that window rule in port3 to select offset of L2, from MAC DA.

5.4.9 WIN_RULE_CTRL6

Address offset: 0x0230

Table 5-55 summarizes the window rule control 6 register.

Table 5-55 WIN_RULE_CTRL6 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:28	RO	0	RESERVED	
27:24	R/W	0	L4_LENGTH_6	These bits indicate that window rule in port6 to select length of L4, from L4_OFFSET_6.
23:20	R/W	0	L3_LENGTH_6	These bits indicate that window rule in port6 to select length of L3, from L3_OFFSET_6.
19:16	R/W	0	L2_LENGTH_6	These bits indicate that window rule in port6 to select length of L2, from L2_OFFSET_6.
15	R/W	0	RESERVED	
14:10	R/W	0	L4_OFFSET_6	These bits indicate that window rule in port6 to select offset of L3, from TCP/UDP header.
9:5	R/W	0	L3_OFFSET_6	These bits indicate that window rule in port6 to select offset of L3, from IP header.
4:0	R/W	0	L2_OFFSET_6	These bits indicate that window rule in port6 to select offset of L2, from MAC DA.

5.4.10 WIN_RULE_CTRL7

Address offset: 0x0234

Table 5-56 summarizes the window rule control 7 register.

Table 5-56 WIN_RULE_CTRL7 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23:20	R/W	0	L3_LENGTH1_0	These bits indicate that window rule in port0 to select length of L3, from L3_OFFSET1_0.
19:16	R/W	0	L2_LENGTH1_0	These bits indicate that window rule in port0 to select length of L2, from L2_OFFSET1_0.
15:10	R/W	0	RESERVED	
9:5	R/W	0	L3_OFFSET1_0	These bits indicate that window rule in port0 to select offset of L3, from IP header.
4:0	R/W	0	L2_OFFSET1_0	These bits indicate that window rule in port0 to select offset of L2, from the end of snap.

5.4.11 WIN_RULE_CTRL9

Address offset: 0x023C

Table 5-57 summarizes the window rule control 9 register.

Table 5-57 WIN_RULE_CTRL9 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23:20	R/W	0	L3_LENGTH1_2	These bits indicate that window rule in port2 to select length of L3, from L3_OFFSET1_0.
19:16	R/W	0	L2_LENGTH1_2	These bits indicate that window rule in port2 to select length of L2, from L2_OFFSET1_0.
15:10	RO	0	RESERVED	
9:5	R/W	0	L3_OFFSET1_2	These bits indicate that window rule in port2 to select offset of L3, from IP header.
4:0	R/W	0	L2_OFFSET1_2	These bits indicate that window rule in port2 to select offset of L2, from the end of snap.

5.4.12 WIN_RULE_CTRL10

Address offset: 0x0240

Table 5-58 summarizes the window rule control 10 register.

Table 5-58 WIN_RULE_CTRL10 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23:20	R/W	0	L3_LENGTH1_3	These bits indicate that window rule in port3 to select length of L3, from L3_OFFSET1_0.
19:16	R/W	0	L2_LENGTH1_3	These bits indicate that window rule in port3 to select length of L2, from L2_OFFSET1_0.
15:10	R/W	0	RESERVED	
9:5	R/W	0	L3_OFFSET1_3	These bits indicate that window rule in port3 to select offset of L3, from IP header.
4:0	R/W	0	L2_OFFSET1_3	These bits indicate that window rule in port3 to select offset of L2, from the end of snap.

5.4.13 WIN_RULE_CTRL13

Address offset: 0x024C

Table 5-59 summarizes the window rule control 13 register.

Table 5-59 WIN_RULE_CTRL13 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23:20	R/W	0	L3_LENGTH1_6	These bits indicate that window rule in port6 to select length of L3, from L3_OFFSET1_0.
19:16	R/W	0	L2_LENGTH1_6	These bits indicate that window rule in port6 to select length of L2, from L2_OFFSET1_0.
15:10	R/W	0	RESERVED	
9:5	R/W	0	L3_OFFSET1_6	These bits indicate that window rule in port6 to select offset of L3, from IP header.
4:0	R/W	0	L2_OFFSET1_6	These bits indicate that window rule in port6 to select offset of L2, from the end of snap.

5.4.14 TRUNK_HASH_EN

Address offset: 0x0270

Table 5-60 summarizes the trunk hash enable register.

Table 5-60 TRUNK_HASH_EN bit description

Bits	R/W	Initial value	Mnemonic	Description
31:4	RO	0	RESERVED	
3	R/W	1	TRUNK_HASH_SIP_EN	SIP join the trunk hash
2	R/W	1	TRUNK_HASH_DIP_EN	DIP join the trunk hash
1	R/W	1	TRUNK_HASH_SA_EN	SA join the trunk hash
0	R/W	1	TRUNK_HASH_DA_EN	DA join the trunk hash

5.5 ACL control registers

Table 5-61 summarizes the ACL registers.

Table 5-61 ACL register summary

Offset range	Name
0x0400–0x0414	ACL function register
0x0418	VLAN translation test register
0x0420–0x0424	Port0 VLAN control register
0x0430–0x0434	Port2 VLAN control register
0x0438–0x043C	Port3 VLAN control register
0x0450–0x0454	Port6 VLAN control register

5.5.1 ACL_FUNC0

Address offset: 0x0400

Table 5-62 summarizes the ACL function 0 register.

Table 5-62 ACL_FUNC0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	0	ACL_BUSY	Depend: ACL_DONE_INT, ACL table busy. This bit must be set to 1 to start a ACL operation and cleared to 0 after operation done. If this bit is set to 1, CPU can not request another operation.
30:11	RO	0	RESERVED	
10	R/W	0	ACL_FUNC	0 = Write 1 = Read
9:8	R/W	0	ACL_RULE_SEL	ACL rule selection: 00 = Rule 01 = Mask 10 = Result 11 = Reserved
7	RO	0	RESERVED	
6:0	R/W	0	ACL_FUNC_INDEX	ACL rule index

5.5.2 ACL_FUNC1

Address offset: 0x0404

Table 5-63 summarizes the ACL function 1 register.

Table 5-63 ACL_FUNC1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:0	R/WW	0	ACL_RULE_DATA_0	ACL rule: byte[3:0]

5.5.3 ACL_FUNC2

Address offset: 0x0408

Table 5-64 summarizes the ACL function 2 register.

Table 5-64 ACL_FUNC2 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:0	R/WW	0	ACL_RULE_DATA_1	ACL rule: byte[7:4]

5.5.4 ACL_FUNC3

Address offset: 0x040C

Table 5-65 summarizes the ACL function 3 register.

Table 5-65 ACL_FUNC3 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:0	R/WW	0	ACL_RULE_DATA_2	ACL rule: byte[11:8]

5.5.5 ACL_FUNC4

Address offset: 0x0410

Table 5-66 summarizes the ACL function 4 register.

Table 5-66 ACL_FUNC4 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:0	R/W\W	0	ACL_RULE_DATA_3	ACL rule: byte[15:12]

5.5.6 ACL_FUNC5

Address offset: 0x0414

Table 5-67 summarizes the ACL function 5 register.

Table 5-67 ACL_FUNC5 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:8	R/W	0	RESERVED	
7:0	R/WW	0	ACL_RULE_DATA_4	ACL rule: byte[16]

5.5.7 VLAN_TRANS_TEST

Address offset: 0x0418

Table 5-68 summarizes the VLAN translation test register.

Table 5-68 VLAN_TRANS_TEST bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	0	VLAN_TRANS_TEST_EN	
30:2	RO	0	RESERVED	

Table 5-68 VLAN_TRANS_TEST bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
1	R/W	0	EG_TRANS_FLTR_BYPASS_EN	Translation filter bypass enable Only valid for not 1:1 entry when doing second QinQ lookup. If it's valid, the forwarding member is set to 0x7f.
0	R/W	0	NET_ISOLATE_EN	1 = Isolate private net and public net. The packet is dropped at layer forwarding when DIP is private IP but SIP is not private IP.

5.5.8 PORT0_VLAN_CTRL0

Address offset: 0x0420

Table 5-69 summarizes the port 0 VLAN control 0 register.

Table 5-69 PORT0_VLAN_CTRL0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:29	R/W	0	ING_PORT_CPRI_0	Port default CVLAN priority for received frames.
28	RO	0	RESERVED	
27:16	R/W	0x1	PORT_DEFAULT_CVID_0	Port default VID. This field is used as tagged VID added to untagged frames when transmitted from this port.
15:13	R/W	0	ING_PORT_SPRI_0	Port default SVLAN priority for received frames.
12	RO	0	RESERVED	
11:0	R/W	0x1	PORT_DEFAULT_SVID_0	Port default VID. This field is used as tagged VID added to untagged frames when transmitted from this port.

5.5.9 PORT0_VLAN_CTRL1

Address offset: 0x0424

Table 5-70 summarizes the port 0 VLAN control 1 register.

Table 5-70 PORT0_VLAN_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:15	RO	0	RESERVED	
14	R/W	0	EG_VLAN_TYPE_0	0 = All frames can be sent out. 1 = Only tagged frames can be sent out.

Table 5-70 PORT0_VLAN_CTRL1 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
13:12	R/W	11	EG_VLAN_MODE_0	Egress VLAN mode 00 = Egress transmits frames unmodified 01 = Egress transmits frames without VLAN 10 = Egress transmits frames with VLAN 11 = Untouched
11	RO	0	RESERVED	
10	RO	0	SPCHECK_EN_0	1 = L3 source port check enable
9	R/W	0	CORE_PORT_EN_0	0 = Edge port 1 = Core port
8	R/W	0	FORCE_DEFAULT_VID_EN_0	0 = Use frame tag only. 1 = Force to use port default VID and priority for received frame, when 802.1q mode is not disable.
7	R/W	0	PORT_TLS_MODE_0	0 = Port work at NON-TLS mode 1 = Port work at TLS mode
6	R/W	1	PORT_VLAN_PROP_EN_0	1 = Enable part-based VLAN propagate function.
5	R/W	0	PORT_CLONE_EN_0	0 = Enable port replace 1 = Enable port clone
4	R/W	0	VLAN_PRI_PRO_EN_0	1 = VLAN priority propagation enable
3:2	R/W	0	ING_VLAN_MODE_0	00 = All frame can be received by this port, including untagged and tagged frames. 01 = Only frame with tag can be received by this port. 10 = Only frame untagged can be received by this port, including no VLAN and priority VLAN. 11 = Reserved
1:0	RO	0	RESERVED	

5.5.10 PORT2_VLAN_CTRL0

Address offset: 0x0430

Table 5-71 summarizes the port 2 VLAN control 0 register.

Table 5-71 PORT2_VLAN_CTRL0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:29	R/W	0	ING_PORT_CPRI_2	Port default CVLAN priority for received frames.
28	RO	0	RESERVED	
27:16	R/W	0X1	PORT_DEFAULT_CVID_2	Port default VID. This field is used as tagged VID added to untagged frames when transmitted from this port.

Table 5-71 PORT2_VLAN_CTRL0 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
15:13	R/W	0	ING_PORT_SPRI_2	Port default SVLAN priority for received frames.
12	RO	0	RESERVED	
11:0	R/W	0X1	PORT_DEFAULT_SVID_2	Port default VID. This field is used as tagged VID added to untagged frames when transmitted from this port.

5.5.11 PORT2_VLAN_CTRL1

Address offset: 0x0434

Table 5-72 summarizes the port 2 VLAN control 1 register.

Table 5-72 PORT2_VLAN_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:15	RO	0	RESERVED	
14	R/W	0	EG_VLAN_TYPE_2	0 = All frames can be sent out. 1 = Only tagged frames can be sent out.
13:12	R/W	3	EG_VLAN_MODE_2	Egress VLAN mode. 00 = Egress transmits frames unmodified 01 = Egress transmits frames without VLAN 10 = Egress transmits frames with VLAN 11 =Untouched
11	RO	0	RESERVED	
10	R/W	0	SPCHECK_EN_2	1 = L3 source port check enable
9	R/W	0	CORE_PORT_EN_2	0 = Edge port 1 = Core port
8	R/W	0	FORCE_DEFAULT_VID_EN_2	0 = Use frame tag only. 1 = Force to use port default VID and priority for received frame, when 802.1q mode is not disable.
7	R/W	0	PORT_TLS_MODE_2	0 = Port work at NON-TLS mode 1 = Port work at TLS mode
6	R/W	1	PORT_VLAN_PROP_EN_2	1 = Enable part-based VLAN propagate function.
5	R/W	0	PORT_CLONE_EN_2	0 = Enable port replace 1 = Enable port clone
4	R/W	0	VLAN_PRI_PRO_EN_2	1 = VLAN priority propagation enable

Table 5-72 PORT2_VLAN_CTRL1 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
3:2	R/W	0	ING_VLAN_MODE_2	00 = All frame can be received by this port, including untagged and tagged frames. 01 = Only frame with tag can be received by this port. 10 = Only frame untagged can be received by this port, including no VLAN and priority VLAN. 11 = Reserved
0	RO	0	RESERVED	

5.5.12 PORT3_VLAN_CTRL0

Address offset: 0x0438

Table 5-73 summarizes the port 3 VLAN control 0 register.

Table 5-73 PORT3_VLAN_CTRL0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:29	R/W	0	ING_PORT_CPRI_3	Port default CVLAN priority for received frames.
28	RO	0	RESERVED	
27:16	R/W	0X1	PORT_DEFAULT_CVID_3	Port default VID. This field is used as tagged VID added to untagged frames when transmitted from this port.
15:13	R/W	0	ING_PORT_SPRI_3	Port default SVLAN priority for received frames.
12	RO	0	RESERVED	
11:0	R/W	0X1	PORT_DEFAULT_SVID_3	Port default VID. This field is used as tagged VID added to untagged frames when transmitted from this port.

5.5.13 PORT3_VLAN_CTRL1

Address offset: 0x043C

Table 5-74 summarizes the port 3 VLAN control 1 register.

Table 5-74 PORT3_VLAN_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:15	RO	0	RESERVED	
14	R/W	0	EG_VLAN_TYPE_3	0 = All frames can be sent out. 1 = Only tagged frames can be sent out.

Table 5-74 PORT3_VLAN_CTRL1 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
13:12	R/W	3	EG_VLAN_MODE_3	Egress VLAN mode. 00 = Egress transmits frames unmodified 01 = Egress transmits frames without VLAN 10 = Egress transmits frames with VLAN 11 = Untouched
11	RO	0	RESERVED	
10	R/W	0	SPCHECK_EN_3	1 = L3 Source port check enable
9	R/W	0	CORE_PORT_EN_3	0 = Edge port 1 = Core port
8	R/W	0	FORCE_DEFAULT_VID_EN_3	0 = Use frame tag only. 1 = Force to use port default VID and priority for received frame, when 802.1q mode is not disable.
7	R/W	0	PORT_TLS_MODE_3	0 = Port work at NON-TLS mode 1 = Port work at TLS mode
6	R/W	1	PORT_VLAN_PROP_EN_3	1 = Enable part-based VLAN propagate function.
5	R/W	0	PORT_CLONE_EN_3	0 = Enable port replace 1 = Enable port clone
4	R/W	0	VLAN_PRI_PRO_EN_3	1 = VLAN priority propagation enable
3:2	R/W	0	ING_VLAN_MODE_3	00 = All Frame can be received by this port, including untagged and tagged frames. 01 = Only frame with tag can be received by this port. 10 = Only frame untagged can be received by this port, including no VLAN and priority VLAN. 11 = Reserved
0	RO	0	RESERVED	

5.5.14 PORT6_VLAN_CTRL0

Address offset: 0x0450

Table 5-75 summarizes the port 6 VLAN control 0 register.

Table 5-75 PORT6_VLAN_CTRL0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:29	R/W	0	ING_PORT_CPRI_6	Port default CVLAN priority for received frames.
28	RO	0	RESERVED	
27:16	R/W	0X1	PORT_DEFAULT_CVID_6	Port default VID. This field is used as tagged VID added to untagged frames when transmitted from this port.

Table 5-75 PORT6_VLAN_CTRL0 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
15:13	R/W	0	ING_PORT_SPRI_6	Port default SVLAN priority for received frames.
12	RO	0	RESERVED	
11:0	R/W	0X1	PORT_DEFAULT_SVID_6	Port default VID. This field is used as tagged VID added to untagged frames when transmitted from this port.

5.5.15 PORT6_VLAN_CTRL1

Address offset: 0x0454

Table 5-76 summarizes the port 6 VLAN control 1 register.

Table 5-76 PORT6_VLAN_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:15	RO	0	RESERVED	
14	R/W	0	EG_VLAN_TYPE_6	0 = All Frames can be sent out. 1 = Only tagged frames can be sent out.
13:12	R/W	3	EG_VLAN_MODE_6	Egress VLAN mode. 00 = Egress transmits frames unmodified 01 = Egress transmits frames without VLAN 10 = Egress transmits frames with VLAN 11 = Untouched
11	RO	0	RESERVED	
10	R/W	0	SPCHECK_EN_6	1 = L3 source port check enable
9	R/W	0	CORE_PORT_EN_6	0 = Edge port 1 = Core port
8	R/W	0	FORCE_DEFAULT_VID_EN_6	0 = Use frame tag only. 1 = Force to use port default VID and priority for received frame, when 802.1q mode is not disable.
7	R/W	0	PORT_TLS_MODE_6	0 = Port work at NON-TLS mode 1 = Port work at TLS mode
6	R/W	1	PORT_VLAN_PROP_EN_6	1 = Enable part-based VLAN propagate function.
5	R/W	0	PORT_CLONE_EN_6	0 = Enable port replace 1 = Enable port clone
4	R/W	0	VLAN_PRI_PRO_EN_6	1 = VLAN priority propagation enable

Table 5-76 PORT6_VLAN_CTRL1 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
3:2	R/W	0	ING_VLAN_MODE_6	00 = All frame can be received by this port, including untagged and tagged frames. 01 = Only frame with tag can be received by this port. 10 = Only frame untagged can be received by this port, including no VLAN and priority VLAN. 11 = Reserved
0	RO	0	RESERVED	

5.5.16 IPV4_PRI_BASE_ADDR

Address offset: 0x0470

Table 5-77 summarizes the IPv4 private base address register.

Table 5-77 IPV4_PRI_BASE_ADDR bit description

Bits	R/W	Initial value	Mnemonic	Description
31:0	R/W	32'hC0A80000	IPV4_PRI_BASE_ADDR	Private IPv4 base address

5.5.17 IPV4_PRI_BASE_ADDR_MASK

Address offset: 0x0474

Table 5-78 summarizes the IPv4 private base address mask register.

Table 5-78 IPV4_PRI_BASE_ADDR_MASK bit description

Bits	R/W	Initial value	Mnemonic	Description
31:0	R/W	32'hFFFF0000	IPV4_PRI_BASE_ADDR_MASK	Private IPv4 subnet mask

5.6 Lookup control registers

Table 5-79 summarizes the lookup registers.

Table 5-79 Lookup register summary

Offset range	Name
0x0600–0x0608	ATU data register
0x060C	ATU function register
0x0610–0x0614	VTU function register

Table 5-79 Lookup register summary (cont.)

Offset range	Name
0x0618	ARL control register
0x0620–0x0624	Global forward control register
0x0628	Global learn limit control
0x0630–0x064C	TOS priority mapping register
0x0650	VLAN priority to priority map register
0x0654	Loop check result
0x0660	Port0 lookup control register
0x0664	Port0 priority control register
0x0668	Port0 learn limit control register
0x0678	Port2 lookup control register
0x067C	Port2 priority control register
0x0680	Port2 learn limit control register
0x0684	Port3 lookup control register
0x0688	Port3 priority control register
0x068C	Port3 learn limit control register
0x06A8	Port6 lookup control register
0x06AC	Port6 priority control register
0x06B0	Port6 learn limit control register
Trunk control registers	
0x0700	Trunk control0 register
0x0704	Trunk control1 register
0x0708	Trunk control2 register
ACL registers	
0x0710	ACL forward source filter register 0
0x0714	ACL forward source filter register 1
0x0718	ACL forward source filter register 2

5.6.1 ATU_DATA0

Address offset: 0x0600

Table 5-80 summarizes the ATU data 0 register.

Table 5-80 ATU_DATA0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:0	R/WW	0	ATU_MAC_ADDR0	MAC address bits[31:0]

5.6.2 ATU_DATA1

Address offset: 0x0604

Table 5-81 summarizes the ATU data 1 register.

Table 5-81 ATU_DATA1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/WW	0	ATU_HASH_HIGH_ ADDR	MAC hash address maximum bit use for Get Next
30	R/WW	0	ATU_SA_DROP_EN	Drop packet enable when source address is in this entry. If this bit is set to 1, the packet with SA of this entry is dropped.
29	R/WW	0	ATU_MIRROR_EN	0 = Packets is send to destination port only. 1 = Packets is send to mirror and destination port.
28	R/WW	0	ATU_PRI_OVER_EN	Priority override enable 1 = ATU_PRI can override any other priority determined by the frame's data.
27	R/WW	0	ATU_SVL_ENTRY	0 = IVL learned 1 = SVL learned
26:24	R/WW	0	ATU_PRI	This priority bits may be used as frame's priority when PRI_OVER_EN is set to one.
23	R/WW	0	ATU_CROSS_ PORT_STATE_EN	1 = ATU_CROSS_PORT_STATE enable
22:16	R/WW	0	ATU_DES_PORT	These bits indicate which ports are associated with this MAC address when they are set to 1.
15:0	R/WW	0	ATU_MAC_ADDR1	MAC address bits[47:32]

5.6.3 ATU_DATA2

Address offset: 0x0608

Table 5-82 summarizes the ATU data 2 register.

Table 5-82 TU_DATA2 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:21	R/W	0	RESERVED	
20	R/W	0	WHITE_LIST_EN	If the ARL entry is white list (ATU_STATUS = 4'hf and WHITE_LIST_EN is 1'b1), this entry can be updated when this source MAC address coming from other port.
19:8	R/W	0	ATU_VID	This MAC address is the member of ATU_VID group.
7	R/W	0	ATU_SHORT_LOOP	If learn engine find source port mismatch then set to 1, loop check engine clear it.

Table 5-82 TU_DATA2 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
6	R/W	0	ATU_COPY_TO_CPU	1 = Packet received with this address is copied to CPU port.
5	R/W	0	ATU_REDIRECT_TO_CPU	1 = Packet received with this address is redirected to CPU port. If no CPU connected to switch, this frame is discarded.
4	R/W	0	ATU_LEAKY_EN	1 = Use leaky VLAN enable for this MAC address This bit can be used for unicast and multicast frame, control by ARL_UNI_LEAKY_EN and ARL_MULTI_LEAKY_EN.
3:0	R/W	0	ATU_STATUS	4'h0: Entry is empty 4'h1–4'h7: Entry is dynamic and valid. 4'h8–4'hE: Entry is dynamic and valid, can be age but can not be changed by any other address. 4'hF: Entry is static and is not aged or changed by hardware.

5.6.4 ATU_FUNC_REG

Address offset: 0x060C

Table 5-83 summarizes the ATU function register.

Table 5-83 ATU_FUNC_REG bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/WSC	0	AT_BUSY	Depend: AT_DONE, address table busy. This bit must be set to 1 to start an AT operation and cleared to 0 by hardware after the operation is done. If this bit is 1 on read, CPU can not request another operation.
30:25	RO	0	RESERVED	
24:22	R/W	0	TRUNK_PORT_NUM	Trunk port number. When CPU function is change trunk port, the AT_PORT_NUM in ARL bitmap is changed to TRUNK_PORT_NUM.
21	RO	0	RESERVED	
20:16	R/W	0	ATU_INDEX	If ATU_TYPE is reserved ATU entry, this index is the address of reserved ATU entry.
15	R/W	0	AT_VID_EN	1 = When CPU function is Get Next, the VID in the valid ARL entry must be equal to the VID set.
14	R/W	0	AT_PORT_EN	1 = When CPU function is Get Next, the AT_PORT_NUM must be in the destination port in the valid ARL entry.
13	R/W	0	AT_MULTI_EN	0 = All entries. 1 = When CPU function is Get Next, the high bytes of MAC address in the valid ARL entry must be 0x01005E or 0x3333.

Table 5-83 ATU_FUNC_REG bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
12	R/W	0	AT_FULL_VIO	ARL table full violation. This bit is set to 1 if the ARL table is full when CPU want to add a new entry to ARL table, and also be set to 1 if the ARL table is empty when CPU want to purge an entry to ARL table.
11:8	R/W	0	AT_PORT_NUM	Port number to be flushed. If AT_FUNC is set to 0101, lookup module must flush all unicast entries for the port. (or flush the port from ARL table)
7:6	RO	0	RESERVED	
5	R/W	0	ATU_TYPE	0 = Normal ATU entry 1 = Reserved ATU entry
4	R/W	0	FLUSH_STATIC_EN	1 = When AT_FUNC set to 101, static entry in ARL table can be flushed. 0 = When AT_FUNC set to 101, only flush dynamic entry in ARL table.
3:0	R/W	0	AT_FUNC	Address table operate function: 0000 = No operation. 0001 = Flush all entries. 0010 = Load an entry. If these bits are set to 010, CPU want to load an entry into ARL table. 0011 = Purge an entry. If these bits are set to 011, CPU want to purge an entry from ARL table. 0100 = Flush all unlocked entries in ARL. 0101 = Flush one port from ARL table 0110 =Get next valid or static entry in ARL table. If address and AT_STATUS and VID are all zero, hardware searches the first valid entry from entry0. If address is set to zero and AT_STATUS is not zero, hardware searches next valid entry from entry which address is 48'h0. If hardware return back with address and AT_ STATUS and VID all zero, there's no other next valid entry in ARL table. 0111 = Search MAC address 1000 = Change trunk port

5.6.5 VTU_FUNC_REG0

Address offset: 0x0610

Table 5-84 summarizes the VTU function register 0.

Table 5-84 VTU_FUNC_REG0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:21	RO	0	RESERVED	
20	R/WW	0	VTU_VALID	0 = Entry is empty 1 = Entry is valid
19	R/WW	0	VTU_IVL_EN	0 = VID is used to SVL, VID replaced by 0 when search MAC address. 1 = VID is used to IVL
18	R/WW	0	VTU_LEARN_LOOKUP_DIS	0 = Normal operation about learn and final DP 1 = Not learn and not use ARL table DP to calculate final DP, but use UNI flood DP as ARL DP to calculate DP
17:4	R/WW	0	VTU_EG_VLAN_MODE	E.g. bits[5:4] for port0, …bits[17:16] for port6 00 = Unmodified 01 = Untagged 10 = Tagged 11 = Not member
3	R/WW	0	VTU_PRI_OVER_EN	VLAN priority override enable
2:0	R/WW	0	VTU_PRI	This priority bits may be used as frame's priority when VTU_PRI_OVER_EN set to 1.

5.6.6 VTU_FUNC_REG1

Address offset: 0x0614

Table 5-85 summarizes the VTU function register 1.

Table 5-85 VTU_FUNC_REG1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/WSC	0	VT_BUSY	Depend: VT_DONE, VLAN table busy. This bit must be set to 1 to start a VT operation and cleared to zero after operation done. If this bit is set to 1, CPU can not request another operation.
30:28	RO	0	RESERVED	
27:16	R/WW	0	VID	Depend: VT_DONE,VT_CSR_VID[11:0], value of VLAN ID to be added or purged.
15:12	RO	0	RESERVED	
11:8	R/W	0	VT_PORT_NUM	Port number
7:5	RO	0	RESERVED	
4	R/OC	0	VT_FULL_VIO	VLAN table full violation. This bit is set to 1 if the VLAN table is full when CPU want to add a new VID to VLAN table.

Table 5-85 VTU_FUNC_REG1 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
3	RO	0	RESERVED	
2:0	R/W	0	VT_FUNC	VLAN table operate function. 000 = No operation. 001 = Flush all entries. 010 = Load an entry. If these bits are set to 3'b010, CPU loads an entry into VLAN table. 011 = Purge an entry. If these bits are set to 3'b011, CPU purges an entry from VLAN table. 100 = Remove an port from VLAN table. The port number which needs to be removed is indicated in VT_PORT_ NUM. 101 = Get next If VID is 12'b0 and VT_BUSY is set by software, hardware searches the first valid entry in VLAN table. If VID is 12'b0 and VT_BUSY is reset by hardware, there's no valid entry from VID set by software. 110 = Read one entry

5.6.7 ARL_CTRL

Address offset: 0x0618

Table 5-86 summarizes the ARL control register.

Table 5-86 ARL_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	1	INVALID_VLAN_IVL_SVL	0 = SVL mode 1 = IVL mode The ARL searching mode when VLAN entry lookup is invalid.
30	R/W	1	LEARN_CHANGE_EN	0 = If hash violation occur when learning, no new address be learned to ARL. 1 = Enable new MAC address change old one if hash violation occur when learning
29	R/W	0	IGMP_JOIN_LEAKY_EN	IGMP join address leaky VLAN enable 0 = IGMP join address needn't be set to LEAKY_ EN in ARL table, bit[68] in ATU entry is set to 0. 1 = IGMP join address is set to LEAKY_EN in ARL table, bit[68] in ATU entry is set to 1.
28	R/W	1	IGMP_JOIN_NEW_EN	1 = Enable hardware add new address to ARL table when received IGMP/MLD join frame, and remove address from ARL when received IGMP/MLD leave frame.
27	R/W	0	IGMP_JOIN_PRI_ REMAP_EN	Use for IGMP packet learn in ARL table, define DA priority remap enable (ATU[60])

Table 5-86 ARL_CTRL bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
26:24	R/W	3'b0	IGMP_JOIN_PRI	Use for IGMP packet learn in ARL table, define DA priority (ATU[59:57])
23:20	R/W	4'hE	IGMP_JOIN_STATUS	Use for IGMP packet learn in ARL table, define the status (ATU[67:64])
19	R/W	1	AGE_EN	Enable age operation 1 = Lookup module can age the address in the address table.
18:16	R/W	0	LOOP_CHECK_TIMER	3'h0 = Disable loop back check 3'h1 = 1 ms 3'h2 = 10 ms 3'h3 = 100 ms 3'h4 = 500 ms 3'h5–3'h7 = Reserved
15:0	R/W	'h2B	AGE_TIME	Address table age timer. These bits determine the time that each entry remains valid in the address table, since last accessed. For the time is times 7s, maximum age time is about 10,000 minutes. The default value is 'h2B for five minutes. If AGE_EN is set to 1, these bits shouldn't be set to zero.

5.6.8 GLOBAL_FW_CTRL0

Address offset: 0x0620

Table 5-87 summarizes the global forward control 0 register.

Table 5-87 GLOBAL_FW_CTRL0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:28	RO	0	RESERVED	
27:26	R/W	0	ARP_FORWARD_ACT	0 = Redirect to CPU 1 = Copy to CPU 2 = Forward
25:24	R/W	0	SP_NOT_FOUND_ACT	For IP packet 0 = Forward 1 = Drop 2 = To CPU
23:22	R/W	0	ARP_SP_NOT_FOUND_ACT	For ARP packet 0 = Forward 1 = Drop 2 = To CPU
21	RO	0	RESERVED	

Table 5-87 GLOBAL_FW_CTRL0 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
20	R/W	1	HASH_MODE	Hash mode for MAC address 0 = crc_16 1 = crc_10
19	R/W	0	ARP_REQ_UNI	The destination port of ARP request is only ROUTER_DP in ARP table.
18	RO	0	RESERVED	
17	R/W	0	NAT_NOT_FOUND_DROP_EN	0 = To CPU 1 = Drop
16	RO	0	RESERVED	
15	RO	0	RESERVED	
14	R/W	0	IGMP_LEAVE_DROP_EN	IGMP/MLD leave packet. After updated the port map of ARL (IGMP/MLD group address). If port map in ARL is not empty, 0 = Forward to IGMP_JOIN_LEAVE_DP 1 = Drop this packet
13	R/W	0	ARL_UNI_LEAKY_EN	0 = Ignore LEAKY_EN bit in ARL table to control unicast frame leaky VLAN. Only use port-based UNI_LEAKY_EN to control unicast frame leaky VLAN. 1 = Use LEAKY_EN bit in ARL table to control unicast frame leaky VLAN, and ignore UNI_ LEAKY_EN.
12	R/W	0	ARL_MULTI_LEAKY_EN	0 = Ignore LEAKY_EN bit in ARL table to control multicast frame leaky VLAN. Only use port-based MULTI_LEAKY_EN to control multicast frame leaky VLAN. 1 = Use LEAKY_EN bit in ARL table to control multicast frame leaky VLAN, and ignore MULTI_LEAKY_EN.
11	R/W	0	MANAGE_VID_VIO_DROP_EN	0 = Management frame transmit out if VLAN violation occurs. 1 = Management frame is drop if VLAN violation occurs.
10	R/W	0	CPU_PORT_EN	0 = No CPU connect to switch 1 = CPU is connected to port0 If this bit is set to 1, HEAD_EN of MAC0 is set to 1.
9	RO	0	RESERVED	
8	R/W	0	PPPOE_REDIRECT_EN	PPPoE discovery frame redirect to CPU enable. 1 = PPPoE discovery frame is redirected to CPU port. 0 = PPPoE discovery frame is transmitted as normal frame.

Table 5-87 GLOBAL_FW_CTRL0 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
7:4	R/W	0xF	MIRROR_PORT_NUM	Port number which packet is mirrored to. 4'h0 is port0, etc. If value is more than 6, no mirror port connected to switch.
3	R/W	0	IGMP_COPY_EN	0 = QM redirects IGMP/MLD frame to CPU port. 1 = QM copies IGMP/MLD frame to CPU port. This IGMP does not include the IGMP join/leave packet
2	R/W	0	RIP_COPY_EN	0 = Do not copy RIPv1 frame to CPU 1 = Copy RIPv1 frame to CPU
1	R/W	0	RESERVED	
0	R/W	0	EAPOL_REDIRECT_EN	0 = 802.1x frame copy to CPU 1 = 802.1x frame redirect to CPU

5.6.9 GLOBAL_FW_CTRL1

Address offset: 0x0624

Table 5-89 summarizes the global forward control 1 register.

Table 5-88 GLOBAL_FW_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
32:24	R/W	7'b0	IGMP_JOIN_LEAVE_DP	If MAC receive IGMP/MLD, fast join or leave frame is sent due to these bits map destination port. Notes: CPU port can cross VLAN if port bit map set to 1.
23	RO	0	RESERVED	
22:16	R/W	7'h7E	BROAD_DP	If MAC receives broadcast frame, use these bits to determine destination port.
15	RO	0	RESERVED	
14:8	R/W	7'h7E	MULTI_FLOOD_DP	If MAC receives unknown multicast frame whose DA is not contained in ARL table, use these bits to determine destination port.
7	RO	0	RESERVED	
6:0	R/W	7'h7E	UNI_FLOOD_DP	If MAC receives unknown unicast frame whose DA is not contained in ARL table, use these bits to determine destination port.

5.6.10 GOL_LEARN_LIMIT

Address offset: 0x0628

Table 5-89 summarizes the global learn limit control register.

Table 5-89 GLOBAL_FW_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:14	RO	0	RESERVED	
13	R/W	0	GOL_SA_LEARN_LIMIT_DROP_EN	1 = If SA is not in ARL table, packet is dropped when global learned MAC address counter is equal to GOL_SA_LEARN_CNT; 0 = If SA is not in ARL table or SA in ARL but port member is not the source port, packet is redirected to CPU when learned MAC address counter is equal to GOL_SA_LEARN_CNT.
12	R/W	0	GOL_SA_LEARN_LIMIT_EN	1 = Global SA learn limit enable
11:0	R/W	0	GOL_SA_LEARN_CNT	Global MAC address can be learned to ARL. When learn new MAC address + 1, age - 1.

5.6.11 TOS_PRI_MAP_REG0

Address offset: 0x0630

Table 5-90 summarizes the TOS/TC priority mapping register 0.

Table 5-90 TOS_PRI_MAP_REG0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:28	R/W	0	TOS_MAP_0X1C	See bits[3:0]
27:24	R/W	0	TOS_MAP_0X18	
23:20	R/W	0	TOS_MAP_0X14	
19:16	R/W	0	TOS_MAP_0X10	
15:12	R/W	0	TOS_MAP_0X0C	
11:8	R/W	0	TOS_MAP_0X08	
7:4	R/W	0	TOS_MAP_0X04	
3:0	R/W	0	TOS_MAP_0X00	Bit[3]: DEI Bits[2:0] Priority

5.6.12 TOS_PRI_MAP_REG1

Address offset: 0x0634

Table 5-91 summarizes the TOS/TC priority mapping register 1.

Table 5-91 TOS_PRI_MAP_REG1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:28	R/W	0x1	TOS_MAP_0X3C	See bits[3:0] of TOS_PRI_MAP_REG0
27:24	R/W	0x1	TOS_MAP_0X38	
23:20	R/W	0x1	TOS_MAP_0X34	
19:16	R/W	0x1	TOS_MAP_0X30	
15:12	R/W	0x1	TOS_MAP_0X2C	
11:8	R/W	0x1	TOS_MAP_0X28	
7:4	R/W	0x1	TOS_MAP_0X24	
3:0	R/W	0x1	TOS_MAP_0X20	

5.6.13 TOS_PRI_MAP_REG2

Address offset: 0x0638

Table 5-92 summarizes the TOS/TC priority mapping register 2.

Table 5-92 TOS_PRI_MAP_REG2 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:28	R/W	0x2	TOS_MAP_0X5C	See bits[3:0] of TOS_PRI_MAP_REG0
27:24	R/W	0x2	TOS_MAP_0X58	
23:20	R/W	0x2	TOS_MAP_0X54	
19:16	R/W	0x2	TOS_MAP_0X50	
15:12	R/W	0x2	TOS_MAP_0X4C	
11:8	R/W	0x2	TOS_MAP_0X48	
7:4	R/W	0x2	TOS_MAP_0X44	
3:0	R/W	0x2	TOS_MAP_0X40	

5.6.14 TOS_PRI_MAP_REG3

Address offset: 0x063C

Table 5-93 summarizes the TOS/TC priority mapping register 3.

Table 5-93 TOS_PRI_MAP_REG3 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:28	R/W	0x3	TOS_MAP_0X7C	See bits[3:0] of TOS_PRI_MAP_REG0
27:24	R/W	0x3	TOS_MAP_0X78	
23:20	R/W	0x3	TOS_MAP_0X74	
19:16	R/W	0x3	TOS_MAP_0X70	
15:12	R/W	0x3	TOS_MAP_0X6C	
11:8	R/W	0x3	TOS_MAP_0X68	
7:4	R/W	0x3	TOS_MAP_0X64	
3:0	R/W	0x3	TOS_MAP_0X60	

5.6.15 TOS_PRI_MAP_REG4

Address offset: 0x0640

Table 5-94 summarizes the TOS/TC priority mapping register 4.

Table 5-94 TOS_PRI_MAP_REG4 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:28	R/W	0x4	TOS_MAP_0X9C	See bits[3:0] of TOS_PRI_MAP_REG0
27:24	R/W	0x4	TOS_MAP_0X98	
23:20	R/W	0x4	TOS_MAP_0X94	
19:16	R/W	0x4	TOS_MAP_0X90	
15:12	R/W	0x4	TOS_MAP_0X8C	
11:8	R/W	0x4	TOS_MAP_0X88	
7:4	R/W	0x4	TOS_MAP_0X84	
3:0	R/W	0x4	TOS_MAP_0X80	

5.6.16 TOS_PRI_MAP_REG5

Address offset: 0x0644

Table 5-95 summarizes the TOS/TC priority mapping register 5.

Table 5-95 TOS_PRI_MAP_REG5 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:28	R/W	0x5	TOS_MAP_0XBC	See bits[3:0] of TOS_PRI_MAP_REG0
27:24	R/W	0x5	TOS_MAP_0XB8	
23:20	R/W	0x5	TOS_MAP_0XB4	
19:16	R/W	0x5	TOS_MAP_0XB0	
15:12	R/W	0x5	TOS_MAP_0XAC	
11:8	R/W	0x5	TOS_MAP_0XA8	
7:4	R/W	0x5	TOS_MAP_0XA4	
3:0	R/W	0x5	TOS_MAP_0XA0	

5.6.17 TOS_PRI_MAP_REG6

Address offset: 0x0648

Table 5-96 summarizes the TOS/TC priority mapping register 6.

Table 5-96 TOS_PRI_MAP_REG6 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:28	R/W	0x6	TOS_MAP_0XDC	See bits[3:0] of TOS_PRI_MAP_REG0
27:24	R/W	0x6	TOS_MAP_0XD8	
23:20	R/W	0x6	TOS_MAP_0XD4	
19:16	R/W	0x6	TOS_MAP_0XD0	
15:12	R/W	0x6	TOS_MAP_0XCC	
11:8	R/W	0x6	TOS_MAP_0XC8	
7:4	R/W	0x6	TOS_MAP_0XC4	
3:0	R/W	0x6	TOS_MAP_0XC0	

5.6.18 TOS_PRI_MAP_REG7

Address offset: 0x064C

Table 5-97 summarizes the TOS/TC priority mapping register 7.

Table 5-97 TOS_PRI_MAP_REG7 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:28	R/W	0x7	TOS_MAP_0XFC	See bits[3:0] of TOS_PRI_MAP_REG0
27:24	R/W	0x7	TOS_MAP_0XF8	
23:20	R/W	0x7	TOS_MAP_0XF4	
19:16	R/W	0x7	TOS_MAP_0XF0	
15:12	R/W	0x7	TOS_MAP_0XEC	
11:8	R/W	0x7	TOS_MAP_0XE8	
7:4	R/W	0x7	TOS_MAP_0XE4	
3:0	R/W	0x7	TOS_MAP_0XE0	

5.6.19 VLAN_PRI_MAP_REG0

Address offset: 0x0650

Table 5-98 summarizes the VLAN priority to priority mapping register 0.

Table 5-98 VLAN_PRI_MAP_REG0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:28	R/W	7	VLAN_MAP_0X7	See bits[3:0] of VLAN_PRI_MAP_REG0
27:24	R/W	6	VLAN_MAP_0X6	
23:20	R/W	5	VLAN_MAP_0X5	
19:16	R/W	4	VLAN_MAP_0X4	
15:12	R/W	3	VLAN_MAP_0X3	
11:8	R/W	2	VLAN_MAP_0X2	
7:4	R/W	1	VLAN_MAP_0X1	
3:0	R/W	0	VLAN_MAP_0X0	

5.6.20 LOOP_CHECK_RESULT

Address offset: 0x0654

Table 5-99 summarizes the loop check result register.

Table 5-99 LOOP_CHECK_RESULT bit description

Bits	R/W	Initial value	Mnemonic	Description
31:8	RO	0	RESERVED	

Table 5-99 LOOP_CHECK_RESULT bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
7:4	RO	0	PORT_NUM_NEW	When hardware checked loop occur, these bits indicate MAC address new port number.
3:0	RO	0	PORT_NUM_OLD	When hardware checked loop occur, these bits indicate MAC address old port number.

5.6.21 PORT0_LOOKUP_CTRL

Address offset: 0x0660

Table 5-100 summarizes the port 0 lookup control register.

Table 5-100 PORT0_LOOKUP_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	0	MULTICAST_DROP_EN_0	1 = Drop the multicast packet from this port. Do not drop IGMP/MLD join/leave and special DIP packet.
30:29	RO	0	RESERVED	
28	R/W	0	UNI_LEAKY_EN_0	Unicast frame leaky VLAN enable. Use ARL_UNI_LEAKY_EN and LEAKY_EN bit in ARL table to control unicast leaky VLAN. When ARL_UNI_LEAKY_EN is set to zero, only UNI_LEAKE_EN control unicast frame leaky VLAN. If ARL_UNI_LEAKY_EN is set to 1, only frame with DA in ARL table and LEAKY_EN bit is set to 1 can be forward as leaky VLAN, ignore UNI_LEAKY_EN. If MAC receives unicast frame from this port which forwards as leaky VLAN, the frame could be switched to destination port defined in ARL table and cross all VLAN (include part-based and 802.1q).
27	R/W	0	MULTI_LEAKY_EN_0	Use ARL_MULTI_LEAKY_EN and LEAKY_EN bit in ARL table to control unicast leaky VLAN. When ARL_MULTI_LEAKY_EN is set to zero, only MULTI_LEAKY_EN control multicast frame leaky VLAN. If ARL_MULTI_LEAKY_EN is set to 1, only frame with DA in ARL table and LEAKY_EN bit is set to 1 can be forward as leaky VLAN, ignore MULTI_LEAKY_EN. If MAC receives multicast frame from this port which forwards as leaky VLAN, the frame could be switched to destination port defined in ARL table and cross all VLAN (include part-based VLAN and 802.1q).
26	R/W	0	ARP_LEAKY_EN_0	0 = ARP frame can not cross VLAN ingress port mirror. If this bit is set to 1, all packets received from this port are copied to mirror port. 1 = If MAC receive ARP frame from this port, it can cross all VLAN (include part-based VLAN and 802.1q).
25	R/W	0	NG_MIRROR_EN_0	Ingress port mirror. If this bit is set to 1, all packets received from this port is copied to mirror port.

Table 5-100 PORT0_LOOKUP_CTRL bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
24	RO	0	RESERVED	
23	RO	0	RESERVED	
22	RO	0	RESERVED	
21	R/W	0	PORT_LOOPBACK_EN_0	0 = Normal forwarding 1 = Loop back. Packet sent in from this port is sent out from the same port. This packet is not sent to other ports.
20	R/W	1	LEARN_EN_0	Enable learn operation 0 = Do not learn new MAC address to ARL table 1 = Enable hardware learn new MAC address into ARL table.
19	RO	0	RESERVED	
18:16	R/W	3'h4	PORT_STATE_0	Port state.These bits are used to manage the port to determine what kind of frames are allowed to enter or leave the port for simple bridge loop detection or 803.1D Spanning Tree. 000 = Disable mode. The port is completely disabled, and can not receive or transmit any frames. 001 = Blocking mode. In this state, the port forwards received management frames to the designed port only. Any other frames can not be transmitted or received by the port, and without learning any SA address. 010 = Listening mode. In this state, the port receives and transmits only management frames, but without learning any SA address. Any other frames can not be transmitted or received by the port. 011 = Learning mode. In this state, the port learns all SA, and discards all frames except management frames, and only management frames allowed to be transmitted out. 100 = Forward mode. In this state, the port learns all SA, transmits and receives all frames like normal.
15	RO	0	RESERVED	
14:12	RO	0	RESERVED	
11	RO	0	RESERVED	
10	R/W	0	FORCE_PORT_VLAN_EN_0	1 = Force to use port-based VLAN enable. If this bit is set to 1, use port-based VLAN & VLAN table result to determine destination port.

Table 5-100 PORT0_LOOKUP_CTRL bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
9:8	R/W	00	VLAN_MODE_0	802.1q mode for this port. 00 = 802.1q disable. Use port-based VLAN only. 01 = Fallback. Enable 802.1q for all received frames. Do not discard ingress membership violation and use the port-based VLAN if the frame's VID is not contained in VLAN table. 10 = Check. Enable 802.1q for all received frames. Do not discard ingress membership violation but discard frames which VID is not contained in VLAN table. 11 = Secure. Enable 802.1q for all received frames. Discard frames with ingress membership violation or whose VID is not contained in the VLAN table.
7	RO	0	RESERVED	
6:0	R/W	'h7E	PORT_VID_MEM_0	Port-based VLAN member. Each bit restricts which port can send frames to. To send frames to port0, bit[16] must be set to 1, etc. These bits are set to 1 after reset except the port's bit. This prevents frames going out the port they received in.

5.6.22 PORT0_PRI_CTRL

Address offset: 0x0664

Table 5-101 summarizes the port 0 priority control register.

Table 5-101 PORT0_PRI_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31:21	RO	0	RESERVED	
20	R/W	0	EG_MAC_BASE_ VLAN_EN_0	Enable egress MAC-based VLAN
19	RO	0	RESERVED	
18	R/W	0	DA_PRI_EN_0	1 = DA priority can be used for QoS.
17	R/W	0	VLAN_PRI_EN_0	1= VLAN priority can be used for QoS.
16	R/W	0	IP_PRI_EN_0	1 = TOS/TC can be used for QoS.
15:8	RO	0	RESERVED	
7:6	R/W	0	DA_PRI_SEL_0	DA priority selected level for QoS. There are five levels of priority for QoS. The highest is priority in packet header. The others are selected by these bits. If these bits are set to zero, DA priority is selected after header. If these bits are set to n, DA priority is selected after the priority set to n-1.
5:4	R/W	1	VLAN_PRI_SEL_0	VLAN priority selected level for QoS.

Table 5-101 PORT0_PRI_CTRL bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
3:2	R/W	2	IP_PRI_SEL_0	IP priority selected level for QoS.
1:0	RO	0	RESERVED	

5.6.23 PORT0_LEARN_LIMIT

Address offset: 0x0668

Table 5-102 summarizes the port 0 learn limit control register.

Table 5-102 PORT0_LEARN_LIMIT bit description

Bits	R/W	Initial value	Mnemonic	Description
31:30	RO	0	RESERVED	
29	R/W	0	IGMP_LEARN_LIMIT_ DROP_EN_0	Drop or redirect the ingress frame to CPU when new group address coming but learned group address already reach the limitation
28	R/W	0	SA_LEARN_LIMIT_DROP_ EN_0	Drop or redirect the ingress frame to CPU when new SA coming but learned SA already reach the limitation
27	R/W	0	IGMP_LEARN_LIMIT_EN_0	1 = IGMP Learn Limit enable.
26:16	R/W	0	IGMP_JOIN_CNT_0	Hardware join IGMP. When join new entry or new port to IGMP + 1, leave or age - 1.
15:12	R/W	7	SA_LEARN_STATUS_0	If less than 0x7, dynamic can be fresh to setting value and age.
11	R/W	0	SA_LEARN_LIMIT_EN_0	1 = SA learn limit enable
10:0	R/W	0	SA_LEARN_CNT_0	The MAC address can be learned and written to the ARL table — only dynamic entry is counted 0: Indicate the MAC limit number is 0 1: Indicate the MAC limit number is 1 2: Indicate the MAC limit number is 2 ... and so on... until: 1024: Indicate the MAC limit is 1024

5.6.24 PORT2_LOOKUP_CTRL

Address offset: 0x0678

Table 5-103 summarizes the port 2 lookup control register.

Table 5-103 PORT2_LOOKUP_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	0	MULTICAST_ DROP_EN_2	1 = Drop the multicast packet from this port. Do not drop IGMP/MLD join/leave and special DIP packet.
30:29	RO	0	RESERVED	
28	R/W	0	UNI_LEAKY_EN_2	Unicast frame leaky VLAN enable. Also use ARL_UNI_LEAKY_EN and LEAKY_EN bit in ARL table to control unicast leaky VLAN. When ARL_UNI_LEAKY_EN is set to zero, only UNI_ LEAKE_EN control unicast frame leaky VLAN. If ARL_UNI_LEAKY_EN is set to 1, only frame with DA in ARL table and LEAKY_EN bit is set to 1 can be forward as leaky VLAN, ignore UNI_LEAKY_EN. If MAC receive unicast frame from this port which forwards as leaky VLAN, the frame could be switched to destination port defined in ARL table and cross all VLAN (include part-based and 802.1q).
27	R/W	0	MULTI_LEAKY_ EN_2	Multicast frame leaky VLAN enable. Also use ARL_MULTI_LEAKY_EN and LEAKY_EN bit in ARL table to control unicast leaky VLAN. When ARL_MULTI_LEAKY_EN is set to zero, only MULTI_LEAKY_EN control multicast frame leaky VLAN. If ARL_MULTI_LEAKY_EN is set to 1, only frame with DA in ARL table and LEAKY_EN bit is set to 1 can be forward as leaky VLAN, ignore MULTI_LEAKY_EN. If MAC receive multicast frame from this port which forwards as leaky VLAN, the frame could be switched to destination port defined in ARL table and cross all VLAN (include part-based VLAN and 802.1q).
26	R/W	0	ARP_LEAKY_EN_ 2	0 = ARP frame can not cross VLAN 1 = If MAC receive ARP frame from this port, it can cross all VLAN (include part-based VLAN and 802.1q).
25	R/W	0	ING_MIRROR_ EN_2	Ingress port mirror. If this bit is set to 1, all packets received from this port is copied to mirror port.
24:22	RO	0	RESERVED	
21	R/W	0	PORT_ LOOPBACK_EN_2	0 = Normal forwarding 1 = Loop back. Packet sent in from this port is sent out from the same port. This packet is not sent to other ports
20	R/W	1	LEARN_EN_2	Enable learn operation 0 = Not learn new MAC address to ARL table 1 = Enable hardware learn new MAC address into ARL table.
19	RO	0	RESERVED	

Table 5-103 PORT2_LOOKUP_CTRL bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
18:16	R/W	3'h4	PORT_STATE_2	Port state. These bits are used to manage the port to determine what kind of frames are allowed to enter or leave the port for simple bridge loop detection or 803.1D spanning tree. 3'b000 = Disable mode. The port is completely disable, and cannot receive or transmit any frames. 3'b001 = Blocking mode. In this state, the port forwards received management frames to the designed port only. Any other frames cannot be transmitted or received by the port, and without learning any SA address. 3'b010 = Listening mode. In this state, the port receives and transmits only management frames, but without learning any SA address. Any other frames cannot be transmitted or received by the port. 3'b011 = Learning mode. In this state, the port learns all SA, and discards all frames except management frames, and only management frames are allowed to be transmitted out. 3'b100 = Forward mode. In this state, the port learns all SA, transmits and receives all frames like normal.
15	RO	0	RESERVED	
14:12	RO	0	RESERVED	
11	RO	0	RESERVED	
10	R/W	0	FORCE_PORT_ VLAN_EN_2	1 = Force to use port-based VLAN enable. If this bit is set to 1, use port-based VLAN and VLAN table result to determine destination port.
9:8	R/W	00	VLAN_MODE_2	802.1q mode for this port. 00 = 802.1q disable. Use part-based VLAN only. 01 = Fallback. Enable 802.1q for all received frames. Do not discard ingress membership violation and use the part-based VLAN if the frame's VID is not contained in VLAN table. 10 = Check. Enable 802.1q for all received frames. Do not discard ingress membership violation but discard frames which VID is not contained in VLAN table. 11 = Secure. Enable 802.1q for all received frames. Discard frames with ingress membership violation or whose VID is not contained in the VLAN table.
7	R/W	0'	RESERVED	
6:0	R/W	h7B	PORT_VID_MEM_ 2	Port-based VLAN member. Each bit restricts which port can send frames to.To send frames to port0, bit[16] must be set to 1, etc. These bits are set to one after reset except the port's bit. This prevents frames going out the port they received in.

5.6.25 PORT2_PRI_CTRL

Address offset: 0x067C

Table 5-104 summarizes the port 2 priority control register.

Table 5-104 PORT2_PRI_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31:21	RO	0	RESERVED	
20	R/W	0	EG_MAC_BASE_ VLAN_EN_2	Enable egress MAC-based VLAN
19	RO	0	RESERVED	
18	R/W	0	DA_PRI_EN_2	1 = DA priority can be used for QoS.
17	R/W	0	VLAN_PRI_EN_2	1 = VLAN priority can be used for QoS.
16	R/W	0	IP_PRI_EN_2	1 = TOS/TC can be used for QoS.
15:8	RO	0	RESERVED	
7:6	R/W	0	DA_PRI_SEL_2	DA priority selected level for QoS. There are five levels of priority for QoS.The highest is priority in packet header. The others are selected by these bits. If these bits are set to zero, DA priority is selected after header. If these bits are set to n, DA priority is selected after the priority set to n-1.
5:4	R/W	1	VLAN_PRI_SEL_2	VLAN priority selected level for QoS.
3:2	R/W	2	IP_PRI_SEL_2	IP priority selected level for QoS.
1:0	RO	0	RESERVED	

5.6.26 PORT2_LEARN_LIMIT

Address offset: 0x0680

Table 5-105 summarizes the port 2 learn limit control register.

Table 5-105 PORT2_LEARN_LIMIT bit description

Bits	R/W	Initial value	Mnemonic	Description
31:30	RO	0	RESERVED	
29	R/W	0	IGMP_LEARN_LIMIT_DROP_EN_ 2	Drop or redirect the ingress frame to CPU when new group address coming but learned group address already reach the limitation
28	R/W	0	SA_LEARN_LIMIT_DROP_EN_2	Drop or redirect the ingress frame to CPU when new SA coming but learned SA already reach the limitation
27	R/W	0	IGMP_LEARN_LIMIT_EN_2	1 = IGMP learn limit enable.
26:16	R/W	0	IGMP_JOIN_CNT_2	Hardware join IGMP. When join new entry or new port to IGMP + 1, leave or age - 1.
15:12	R/W	7	SA_LEARN_STATUS_2	If less than 0x7, dynamic can be fresh to setting value and age.

Table 5-105 PORT2_LEARN_LIMIT bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
11	R/W	0	SA_LEARN_LIMIT_EN_2	1 = SA Learn Limit enable.
10:0	R/W	0	SA_LEARN_CNT_2	The MAC address can be learned and written to the ARL table — only dynamic entry is counted 0: Indicate the MAC limit number is 0 1: Indicate the MAC limit number is 1 2: Indicate the MAC limit number is 2 ... and so on... until: 1024: Indicate the MAC limit is 1024

5.6.27 PORT3_LOOKUP_CTRL

Address offset: 0x0684

Table 5-106 summarizes the port 3 lookup control register.

Table 5-106 PORT3_LOOKUP_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	0	MULTICAST_DROP_EN_3	1 = Drop the multicast packet from this port. Do not drop IGMP/MLD join/leave and Special DIP packet.
30:29	RO	0	RESERVED	
28	R/W	0	UNI_LEAKY_EN_3	Unicast frame leaky VLAN enable. Also use ARL_UNI_LEAKY_EN and LEAKY_EN bit in ARL table to control unicast leaky VLAN. When ARL_UNI_LEAKY_EN is set to zero, only UNI_LEAKE_EN control unicast frame leaky VLAN. If ARL_UNI_LEAKY_EN is set to 1, only frame with DA in ARL table and LEAKY_EN bit is set to 1 can be forward as leaky VLAN, ignore UNI_LEAKY_EN. If MAC receive unicast frame from this port which forwards as leaky VLAN, the frame could be switched to destination port defined in ARL table and cross all VLAN (include part-based and 802.1q).
27	R/W	0	MULTI_LEAKY_EN_3	Multicast frame leaky VLAN enable. Also use ARL_MULTI_LEAKY_EN and LEAKY_EN bit in ARL table to control unicast leaky VLAN. When ARL_MULTI_LEAKY_EN is set to zero, only MULTI_LEAKY_EN control multicast frame leaky VLAN. If ARL_MULTI_LEAKY_EN is set to 1, only frame with DA in ARL table and LEAKY_EN bit is set to 1 can be forward as leaky VLAN, ignore MULTI_LEAKY_EN. If MAC receive multicast frame from this port which forwards as leaky VLAN, the frame could be switched to destination port defined in ARL table and cross all VLAN (include part-based VLAN and 802.1q).

Table 5-106 PORT3_LOOKUP_CTRL bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
26	R/W	0	ARP_LEAKY_EN_3	0 = ARP frame can not cross VLAN 1 = If MAC receive ARP frame from this port, it can cross all VLAN (include part-based VLAN and 802.1q).
25	R/W	0	ING_MIRROR_EN_3	Ingress port mirror. If this bit is set to 1, all packets received from this port is copied to mirror port.
24	RO	0	RESERVED	
23	RO	0	RESERVED	
22	RO	0	RESERVED	
21	R/W	0	PORT_LOOPBACK_EN_3	0 = Normal forwarding 1 = Loop back. Packet sent in from this port is sent out from the same port. This packet is not sent to other ports.
20	R/W	1	LEARN_EN_3	Enable learn operation 0 = Do not learn new MAC address to ARL table 1 = Enable hardware learn new MAC address into ARL table.
19	RO	0	RESERVED	
18:16	R/W	3'h4	PORT_STATE_3	Port state. These bits are used to manage the port to determine what kind of frames are allowed to enter or leave the port for simple bridge loop detection or 803.1D Spanning Tree. 000 = Disable mode. The port is completely disabled, and can not receive or transmit any frames. 001 = Blocking mode. In this state, the port forwards received management frames to the designed port only. Any other frames can not be transmitted or received by the port, and without learning any SA address. 010 = Listening mode. In this state, the port receives and transmits only management frames, but without learning any SA address. Any other frames can not be transmitted or received by the port. 011 = Learning mode. In this state, the port learns all SA, and discards all frames except management frames, and only management frames allowed to be transmitted out. 100 = Forward mode. In this state, the port learns all SA, transmits and receives all frames like normal.
15	RO	0	RESERVED	
14:12	RO	0	RESERVED	
11	RO	0	RESERVED	
10	R/W	0	FORCE_PORT_VLAN_EN_3	1 = Force to use part-based VLAN enable. If this bit is set to 1, use part-based VLAN & VLAN table result to determine destination port.

Table 5-106 PORT3_LOOKUP_CTRL bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
9:8	R/W	00	VLAN_MODE_3	802.1q mode for this port. 00 = 802.1q disable. Use part-based VLAN only. 01 = Fallback. Enable 802.1q for all received frames. Do not discard ingress membership violation and use the part-based VLAN if the frame's VID is not contained in VLAN table. 10 = Check. Enable 802.1q for all received frames. Do not discard ingress membership violation but discard frames which VID is not contained in VLAN table. 11 = Secure. Enable 802.1q for all received frames. Discard frames with ingress membership violation or whose VID is not contained in the VLAN table.
7	R/W	0	RESERVED	
6:0	R/W	0x77	PORT_VID_MEM_3	Port-based VLAN member. Each bit restricts which port can send frames to. To send frames to port0, bit[16] must be set to 1, etc.These bits are set to one after reset except the port's bit. This prevents frames going out the port they received in.

5.6.28 PORT3_PRI_CTRL

Address offset: 0x0688

Table 5-107 summarizes the port 3 priority control register.

Table 5-107 PORT3_PRI_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31:21	RO	0	RESERVED	
20	R/W	0	EG_MAC_BASE_ VLAN_EN_3	Enable egress MAC-based VLAN
19	RO	0	RESERVED	
18	R/W	0	DA_PRI_EN_3	1 = DA priority can be used for QoS.
17	R/W	0	VLAN_PRI_EN_3	1 = VLAN priority can be used for QoS.
16	R/W	0	IP_PRI_EN_3	1 = TOS/TC can be used for QoS.
15:8	RO	0	RESERVED	
7:6	R/W	0	DA_PRI_SEL_3	DA priority selected level for QoS. There are five levels of priority for QoS.The highest is priority in packet header. The others are selected by these bits. If these bits are set to zero, DA priority is selected after header. If these bits are set to n, DA priority is selected after the priority set to n-1.
5:4	R/W	1	VLAN_PRI_SEL_3	VLAN priority selected level for QoS.

Table 5-107 PORT3_PRI_CTRL bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
3:2	R/W	2	IP_PRI_SEL_3	IP priority selected level for QoS.
1:0	RO	0	RESERVED	

5.6.29 PORT3_LEARN_LIMIT

Address offset: 0x068C

Table 5-108 summarizes the port 3 learn limit control register.

Table 5-108 PORT3_LEARN_LIMIT bit description

Bits	R/W	Initial value	Mnemonic	Description
31:30	RO	0	RESERVED	
29	R/W	0	IGMP_LEARN_LIMIT_ DROP_EN_3	Drop or redirect the ingress frame to CPU when new group address coming but learned group address already reach the limitation
28	R/W	0	SA_LEARN_LIMIT_DROP_ EN_3	Drop or redirect the ingress frame to CPU when new SA coming but learned SA already reach the limitation
27	R/W	0	IGMP_LEARN_LIMIT_EN_3	1 = IGMP learn limit enable.
26:16	R/W	0	IGMP_JOIN_CNT_3	Hardware join IGMP. When join new entry or new port to IGMP + 1, leave or age - 1.
15:12	R/W	7	SA_LEARN_STATUS_3	If less than 0x7, dynamic can be fresh to setting value and age.
11	R/W	0	SA_LEARN_LIMIT_EN_3	1 = SA learn limit enable.
10:0	R/W	0	SA_LEARN_CNT_3	The MAC address can be learned and written to the ARL table — only dynamic entry is counted 0: Indicate the MAC limit number is 0 1: Indicate the MAC limit number is 1 2: Indicate the MAC limit number is 2 ... and so on... until: 1024: Indicate the MAC limit is 1024

5.6.30 PORT6_LOOKUP_CTRL

Address offset: 0x06A8

Table 5-109 summarizes the port 6 lookup control register.

Table 5-109 PORT6_LOOKUP_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	0	MULTICAST_ DROP_EN_6	1 = Drop the multicast packet from this port. Do not drop IGMP/MLD join/leave and Special DIP packet.
30:29	RO	0	RESERVED	
28	R/W	0	UNI_LEAKY_EN_6	Unicast frame leaky VLAN enable. Also use ARL_UNI_LEAKY_EN and LEAKY_EN bit in ARL table to control unicast leaky VLAN. When ARL_UNI_LEAKY_EN is set to zero, only UNI_ LEAKE_EN control unicast frame leaky VLAN. If ARL_UNI_LEAKY_EN is set to 1, only frame with DA in ARL table and LEAKY_EN bit is set to 1 can be forward as leaky VLAN, ignore UNI_LEAKY_EN. If MAC receive unicast frame from this port which forwards as leaky VLAN, the frame could be switched to destination port defined in ARL table and cross all VLAN (include part-based and 802.1q).
27	R/W	0	MULTI_LEAKY_ EN_6	Multicast frame leaky VLAN enable. Also use ARL_MULTI_LEAKY_EN and LEAKY_EN bit in ARL table to control unicast leaky VLAN. When ARL_MULTI_LEAKY_EN is set to zero, only MULTI_LEAKY_EN control multicast frame leaky VLAN. If ARL_MULTI_LEAKY_EN is set to 1, only frame with DA in ARL table and LEAKY_EN bit is set to 1 can be forward as leaky VLAN, ignore MULTI_LEAKY_EN. If MAC receive multicast frame from this port which forwards as leaky VLAN, the frame could be switched to destination port defined in ARL table and cross all VLAN (include part-based VLAN and 802.1q).
26	R/W	0	ARP_LEAKY_EN_6	0 = ARP frame can not cross VLAN 1 = If MAC receive ARP frame from this port, it can cross all VLAN (include part-based VLAN and 802.1q).
25	R/W	0	ING_MIRROR_EN_ 6	Ingress port mirror. If this bit is set to 1, all packets received from this port is copied to mirror port.
24	RO	0	RESERVED	
23	RO	0	RESERVED	
22	RO	0	RESERVED	
21	R/W	0	PORT_ LOOPBACK_EN_6	0 = Normal forwarding 1 = Loop back. Packet sent in from this port is sent out from the same port. This packet is not sent to other ports.
20	R/W	1	LEARN_EN_6	Enable learn operation 0 = Do not learn new MAC address to ARL table 1 = Enable hardware learn new MAC address into ARL table
19	RO	0	RESERVED	

Table 5-109 PORT6_LOOKUP_CTRL bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
18:16	RO	3'h4	PORT_STATE_6	Port state. These bits are used to manage the port to determine what kind of frames are allowed to enter or leave the port for simple bridge loop detection or 803.1d Spanning Tree. 000 = Disable mode. The port is completely disable, and can not receive or transmit any frames. 001 = Blocking mode. In this state, the port forwards received management frames to the designed port only. Any other frames can not be transmitted or received by the port, and without learning any SA address. 010 = Listening mode. In this state, the port receives and transmits only management frames, but without learning any SA address. Any other frames can not be transmitted or received by the port. 011 = Learning mode. In this state, the port learns all SA, and discards all frames except management frames, and only management frames allowed to be transmitted out. 100 = Forward mode. In this state, the port learns all SA, transmits and receives all frames like normal.
15	RO	0	RESERVED	
14:12	RO	0	RESERVED	
11	R/W	0	RESERVED	
10	R/W	0	FORCE_PORT_ VLAN_EN_6	1 = Force to use part-based VLAN enable. If this bit is set to 1, use part-based VLAN & VLAN table result to determine destination port.
9:8	R/W	2'0	VLAN_MODE_6	802.1q mode for this port. 00 = 802.1q disable. Use part-based VLAN only. 01 = Fallback. Enable 802.1q for all received frames. Do not discard ingress membership violation and use the part-based VLAN if the frame's VID is not contained in VLAN table. 10 = Check. Enable 802.1q for all received frames. Do not discard ingress membership violation but discard frames which VID is not contained in VLAN table. 11 = Secure. Enable 802.1q for all received frames. Discard frames with ingress membership violation or whose VID is not contained in the VLAN table.
7	RO	'h6F	RESERVED	
6:0	R/W	0x3f	PORT_VID_MEM_ 6	Port -based VLAN member. Each bit restricts which port can send frames to. To send frames to port0, bit[16] must be set to 1, etc. These bits are set to 1 after reset except the port's bit. This prevents frames going out the port they received in.

5.6.31 PORT6_PRI_CTRL

Address offset: 0x06AC

Table 5-110 summarizes the port 6 priority control register.

Table 5-110 PORT6_PRI_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31:21	RO	0	RESERVED	
20	R/W	0	EG_MAC_BASE_ VLAN_EN_6	Enable egress MAC-based VLAN
19	RO	0	RESERVED	
18	R/W	0	DA_PRI_EN_6	DA priority selected level for QoS. There are five levels of priority for QoS. The highest is priority in packet header. The others are selected by these bits. If these bits are set to zero, DA priority is selected after header. If these bits are set to n, DA priority is selected after the priority set to n-1.
17	R/W	0	VLAN_PRI_EN_6	VLAN priority selected level for QoS.
16	R/W	0	IP_PRI_EN_6	IP priority selected level for QoS.
15:8	RO	0	RESERVED	
7:6	R/W	0	DA_PRI_SEL_6	DA priority selected level for QoS. There are five levels of priority for QoS. The highest is priority in packet header. The others are selected by these bits. If these bits are set to zero, DA priority is selected after header. If these bits are set to n, DA priority is selected after the priority set to n-1.
5:4	R/W	1	VLAN_PRI_SEL_6	DA priority selected level for QoS.
3:2	R/W	2	IP_PRI_SEL_6	IP priority selected level for QoS.
1:0	RO	0	RESERVED	

5.6.32 PORT6_LEARN_LIMIT

Address offset: 0x06B0

Table 5-111 summarizes the port 6 learn limit control register.

Table 5-111 PORT6_LEARN_LIMIT bit description

Bits	R/W	Initial value	Mnemonic	Description
31:30	RO	0	RESERVED	
29	R/W	0	IGMP_LEARN_LIMIT_ DROP_EN_6	Drop or redirect the ingress frame to CPU when new group address coming but learned group address already reach the limitation
28	R/W	0	SA_LEARN_LIMIT_DROP_ EN_6	Drop or redirect the ingress frame to CPU when new SA coming but learned SA already reach the limitation
27	R/W	0	IGMP_LEARN_LIMIT_EN_ 6	1 = IGMP learn limit enable.

Table 5-111 PORT6_LEARN_LIMIT bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
26:16	R/W	0	IGMP_JOIN_CNT_6	Hardware join IGMP. When join new entry or new port to IGMP + 1, leave or age - 1.
15:12	R/W	7	SA_LEARN_STATUS_6	If less than 0x7, dynamic can be fresh to setting value and age.
11	R/W	0	SA_LEARN_LIMIT_EN_6	1 = SA learn limit enable.
10:0	R/W	0	SA_LEARN_CNT_6	The MAC address can be learned and written to the ARL table — only dynamic entry is counted 0: Indicate the MAC limit number is 0 1: Indicate the MAC limit number is 1 2: Indicate the MAC limit number is 2 ... and so on... until: 1024: Indicate the MAC limit is 1024

5.6.33 GOL_TRUNK_CTRL0

Address offset: 0x0700

Table 5-112 summarizes the global trunk control 0 register.

Table 5-112 GOL_TRUNK_CTRL0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	0	TRUNK3_EN	Trunk 3 enable
30:24	R/W	0	TRUNK3_MEM	Trunk 3 member bitmap
23	R/W	0	TRUNK2_EN	Trunk 2 enable
22:16	R/W	0	TRUNK2_MEM	Trunk 2 member bitmap
15	R/W	0	TRUNK1_EN	Trunk 1 enable
14:8	R/W	0	TRUNK1_MEM	Trunk 1 member bitmap
7	R/W	0	TRUNK0_EN	Trunk 0 enable
6:0	R/W	0	TRUNK0_MEM	Trunk 0 member bitmap

5.6.34 GOL_TRUNK_CTRL1

Address offset: 0x0704

Table 5-113 summarizes the global trunk control 1 register.

Table 5-113 GOL_TRUNK_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	0	TRUNK1_MEM3_EN	Trunk 1 member 3 enable
30:28	R/W	0	TRUNK1_MEM3_NUM	Trunk 1 member 3 port number
27	R/W	0	TRUNK1_MEM2_EN	Trunk 1 member 2 enable
26:24	R/W	0	TRUNK1_MEM2_NUM	Trunk 1 member 2 port number
23	R/W	0	TRUNK1_MEM1_EN	Trunk 1 member 1 enable
22:20	R/W	0	TRUNK1_MEM1_NUM	Trunk 1 member 1 port number
19	R/W	0	TRUNK1_MEM0_EN	Trunk 1 member 0 enable
18:16	R/W	0	TRUNK1_MEM0_NUM	Trunk 1 member 0 port number
15	R/W	0	TRUNK0_MEM3_EN	Trunk 0 member 3 enable
14:12	R/W	0	TRUNK0_MEM3_NUM	Trunk 0 member 3 port number
11	R/W	0	TRUNK0_MEM2_EN	Trunk 0 member 2 enable
10:8	R/W	0	TRUNK0_MEM2_NUM	Trunk 0 member 2 port number
7	R/W	0	TRUNK0_MEM1_EN	Trunk 0 member 1 enable
6:4	R/W	0	TRUNK0_MEM1_NUM	Trunk 0 member 1 port number
3	R/W	0	TRUNK0_MEM0_EN	Trunk 0 member 0 enable
2:0	R/W	0	TRUNK0_MEM0_NUM	Trunk 0 member 0 port number

5.6.35 GOL_TRUNK_CTRL2

Address offset: 0x0708

Table 5-114 summarizes the global trunk control 2 register.

Table 5-114 GOL_TRUNK_CTRL2 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	0	TRUNK3_MEM3_EN	Trunk 3 member 3 enable
30:28	R/W	0	TRUNK3_MEM3_NUM	Trunk 3 member 3 port number
27	R/W	0	TRUNK3_MEM2_EN	Trunk 3 member 2 enable
26:24	R/W	0	TRUNK3_MEM2_NUM	Trunk 3 member 2 port number
23	R/W	0	TRUNK3_MEM1_EN	Trunk 3 member 1 enable
22:20	R/W	0	TRUNK3_MEM1_NUM	Trunk 3 member 1 port number
19	R/W	0	TRUNK3_MEM0_EN	Trunk 3 member 0 enable
18:16	R/W	0	TRUNK3_MEM0_NUM	Trunk 3 member 0 port number
15	R/W	0	TRUNK2_MEM3_EN	Trunk 2 member 3 enable
14:12	R/W	0	TRUNK2_MEM3_NUM	Trunk 2 member 3 port number
11	R/W	0	TRUNK2_MEM2_EN	Trunk 2 member 2 enable

Table 5-114 GOL_TRUNK_CTRL2 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
10:8	R/W	0	TRUNK2_MEM2_NUM	Trunk 2 member 2 port number
7	R/W	0	TRUNK2_MEM1_EN	Trunk 2 member 1 enable
6:4	R/W	0	TRUNK2_MEM1_NUM	Trunk 2 member 1 port number
3	R/W	0	TRUNK2_MEM0_EN	Trunk 2 member 0 enable
2:0	R/W	0	TRUNK2_MEM0_NUM	Trunk 2 member 0 port number

5.6.36 ACL_FWD_SRC_FLTR_CTRL0

Address offset: 0x0710

Table 5-115 summarizes the ACL forward source filter 0 register.

Table 5-115 ACL_FWD_SRC_FLTR_CTRL0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:0	R/W	32'hFFFFFFFF	ACL_FWD_SRC_FLTR_ CTRL0	For ACL rule [31:0] source filter control bit 0 = Disable source filter 1 = Enable source filter

5.6.37 ACL_FWD_SRC_FLTR_CTRL1

Address offset: 0x0714

Table 5-116 summarizes the ACL forward source filter 1 register.

Table 5-116 ACL_FWD_SRC_FLTR_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:0	R/W	32'hFFFFFFFF	ACL_FWD_SRC_FLTR_ CTRL1	For ACL rule [63:32] source filter control bit 0 = Disable source filter 1 = Enable source filter

5.6.38 ACL_FWD_SRC_FLTR_CTRL2

Address offset: 0x0718

Table 5-116 summarizes the ACL forward source filter 2 register.

Table 5-117 ACL_FWD_SRC_FLTR_CTRL2 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:0	R/W	32'hFFFFFFFF	ACL_FWD_SRC_FLTR_CTRL2	For ACL rule [95:64] source filter control bit 0 = Disable source filter 1 = Enable source filter

5.7 QM control registers

Table 5-118 summarizes the QM registers.

Table 5-118 QM register summary

Offset range	Name
0x0800	Global flow control threshold register
0x0808	QM control register
0x0810	WAN priority to queue mapping register
0x0814	LAN priority to queue mapping register
0x0830	Port0 WRR control register
0x0838	Port2 WRR control register
0x083C	Port3 WRR control register
0x0848	Port6 WRR control register
0x0890–0x08AC	Port0 egress rate limit control register
0x08D0–0x08EC	Port2 egress rate limit control register
0x08F0–0x090C	Port3 egress rate limit control register
0x0950–0x096C	Port6 egress rate limit control register
0x0970–0x0974	Port0 HOL control register
0x0980–0x0984	Port2 HOL control register
0x0988–0x098C	Port3 HOL control register
0x09A0–0x09A4	Port6 HOL control register
0x09B0	Port0 flow control threshold register
0x09B8	Port2 flow control threshold register
0x09BC	Port3 flow control threshold register
0x09C8	Port6 flow control threshold register
0x09F0	ACL policy mode register
0x09F4	ACL counter mode register
0x09F8	ACL policy counter reset register
0x0A00–0x0A04	ACL0 rate limit control register
0x0A08–0x0A0C	ACL1 rate limit control register

Table 5-118 QM register summary (cont.)

Offset range	Name
0x0A10–0x0A14	ACL2 rate limit control register
0x0A18–0x0A1C	ACL3 rate limit control register
0x0A20–0x0A24	ACL4 rate limit control register
0x0A28–0x0A2C	ACL5 rate limit control register
0x0A30–0x0A34	ACL6 rate limit control register
0x0A38–0x0A3C	ACL7 rate limit control register
0x0A40–0x0A44	ACL8 rate limit control register
0x0A48–0x0A4C	ACL9 rate limit control register
0x0A50–0x0A54	ACL10 rate limit control register
0x0A58–0x0A5C	ACL11 rate limit control register
0x0A60–0x0A64	ACL12 rate limit control register
0x0A68–0x0A6C	ACL13 rate limit control register
0x0A70–0x0A74	ACL14 rate limit control register
0x0A78–0x0A7C	ACL15 rate limit control register
0x0A80–0x0A84	ACL16 rate limit control register
0x0A88–0x0A8C	ACL17 rate limit control register
0x0A90–0x0A94	ACL18 rate limit control register
0x0A98–0x0A9C	ACL19 rate limit control register
0x0AA0–0x0AA4	ACL20 rate limit control register
0x0AA8–0x0AAC	ACL21 rate limit control register
0x0AB0–0x0AB4	ACL22 rate limit control register
0x0AB8–0x0ABC	ACL23 rate limit control register
0x0AC0–0x0AC4	ACL24 rate limit control register
0x0AC8–0x0ACC	ACL25 rate limit control register
0x0AD0–0x0AD4	ACL26 rate limit control register
0x0AD8–0x0ADC	ACL27 Rate limit control register
0x0AE0–0x0AE4	ACL28 rate limit control register
0x0AE8–0x0AEC	ACL29 rate limit control register
0x0AF0–0x0AF4	ACL30 rate limit control register
0x0AF8–0x0AFC	ACL31 rate limit control register
0x0B00–0x0B08	Port0 ingress rate limit control register
0x0B20–0x0B28	Port2 ingress rate limit control register
0x0B30–0x0B38	Port3 ingress rate limit control register
0x0B60–0x0B68	Port6 ingress rate limit control register
0x0B70	To CPU frame remap priority control register

5.7.1 GLOBAL_FLOW_THD

Address offset: 0x0800

Table 5-119 summarizes the global flow control register.

Table 5-119 GLOBAL_FLOW_THD bit description

Bits	R/W	Initial value	Mnemonic	Description
31:25	RO	0	RESERVED	
24:16	R/W	'h120	GOL_XON_THRES	Global base transmit on threshold. When block memory used by all ports less than this value, MAC sends out pause off frame, and link partner starts transmitting frame out.
15:9	RO	0	RESERVED	
8:0	R/W	'h188	GOL_XOFF_THRES	Global base transmit off threshold. When block memory used by all ports more than this value, MAC sends out pause on frame, and link partner stops transmitting frame out.

5.7.2 QM_CTRL_REG

Address offset: 0x0808

Table 5-120 summarizes the QM control register.

Table 5-120 QM_CTRL_REG bit description

Bits	R/W	Initial value	Mnemonic	Description
31:30	RO	0	RESERVED	
29:28	RO	0	RESERVED	
27:26	RO	0	RESERVED	
25:23	RO	0	RESERVED	
22:16	R/W	7'h7F	GOL_FLOW_EN	Global flow control enable when global threshold is reached. E.g. bit[16] for port0; .
15:11	RO	0	RESERVED	
10	R/W	0	QM_FUNC_TEST	1 = Function test, QM drops all packets from port2,3
9	R/W	0	MS_FC_EN	Multicast server flow control enable
8	RO	0	RESERVED	
7	R/W	0	RATE_DROP_EN	Drop packet enable due to rate limit. 0 = Switch uses flow control to the source port due to rate limit; if the port does not stop, switch drops frame from that port. 1 = Switch drops frames due to rate limit.

Table 5-120 QM_CTRL_REG bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
6	R/W	0	FLOW_DROP_EN	0 = Switch does not drop packets due to flow control. 1 = Packet could be dropped due to flow control except the highest priority packet.
5:0	R/W	'hE	FLOW_DROP_CNT	Maximum free queue could be use after the port has been flow control. Then packets is drop except the highest priority. Default value 'hE is set to normal packets which length is no more than 1518 bytes. For jumbo frame, 'd33 is commanded.

5.7.3 WAN_QUEUE_MAP_REG

Address offset: 0x0810

Table 5-121 summarizes the WAN port priority to queue mapping register.

Table 5-121 WAN_QUEUE_MAP_REG bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:28	R/W	5	WAN_PRI_QUEUE_0X7	The destination queue for priority value 0x7 in port 0, and 6
27	RO	0	RESERVED	
26:24	R/W	4	WAN_PRI_QUEUE_0X6	The destination queue for priority value 0x6 in port 0, and 6
23	RO	0	RESERVED	
22:20	R/W	3	WAN_PRI_QUEUE_0X5	The destination queue for priority value 0x5 in port 0, and 6
19	RO	0	RESERVED	
18:16	R/W	3	WAN_PRI_QUEUE_0X4	The destination queue for priority value 0x4 in port 0, and 6
15	RO	0	RESERVED	
14:12	R/W	2	WAN_PRI_QUEUE_0X3	The destination queue for priority value 0x3 in port 0, and 6
11	RO	0	RESERVED	
10:8	R/W	2	WAN_PRI_QUEUE_0X2	The destination queue for priority value 0x2 in port 0, and 6
7	RO	0	RESERVED	
6:4	R/W	0	WAN_PRI_QUEUE_0X1	The destination queue for priority value 0x1 in port 0, and 6
3	RO	0	RESERVED	
2:0	R/W	1	WAN_PRI_QUEUE_0X0	The destination queue for priority value 0x0 in port 0, and 6

5.7.4 LAN_QUEUE_MAP_REG

Address offset: 0x0814

Table 5-122 summarizes the LAN port priority to queue mapping register.

Table 5-122 LAN_QUEUE_MAP_REG bit description

Bits	R/W	Initial value	Mnemonic	Description
31:30	RO	0	RESERVED	
29:28	R/W	3	LAN_PRI_QUEUE_0X7	The destination queue for priority value 0x7 in port 2, 3
27:26	RO	0	RESERVED	
25:24	R/W	3	LAN_PRI_QUEUE_0X6	The destination queue for priority value 0x6 in port2, 3
23:22	RO	0	RESERVED	
21:20	R/W	2	LAN_PRI_QUEUE_0X5	The destination queue for priority value 0x5 in port 2, 3
19:18	RO	0	RESERVED	
17:16	R/W	2	LAN_PRI_QUEUE_0X4	The destination queue for priority value 0x4 in port2, 3
15:14	RO	0	RESERVED	
13:12	R/W	1	LAN_PRI_QUEUE_0X3	The destination queue for priority value 0x3 in port 2, 3
11:10	RO	0	RESERVED	
9:8	R/W	1	LAN_PRI_QUEUE_0X2	The destination queue for priority value 0x2 in port 2, 3
7:6	RO	0	RESERVED	
5:4	R/W	0	LAN_PRI_QUEUE_0X1	The destination queue for priority value 0x1 in port 2, 3
3:2	RO	0	RESERVED	
1:0	R/W	0	LAN_PRI_QUEUE_0X0	The destination queue for priority value 0x0 in port 2, 3

5.7.5 PORT0_WRR_CTRL

Address offset: 0x0830

Table 5-123 summarizes the port 0 WRR control register.

Table 5-123 PORT0_WRR_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31:30	R/W	00	WEIGHT_PRI_ CTRL_0	00 = Strict priority 01 = Only highest queue use strict priority; others use weighted fair queuing scheme 10 = The highest two queues use strict priority; other two queues use weighted fair queuing scheme. 11 = All queues use weighted fair queuing scheme which defined in WRR_PRI3/2/1/0.
29:25	RO	8	WRR_PRI5_1	WRR setting for priority 5
24:20	RO	8	WRR_PRI4_1	WRR setting for priority 4
19:15	R/W	8	WRR_PRI3_0	WRR setting for priority 3
14:10	R/W	4	WRR_PRI2_0	WRR setting for priority 2
9:5	R/W	2	WRR_PRI1_0	WRR setting for priority 1
4:0	R/W	1	WRR_PRI0_0	WRR setting for priority 0

5.7.6 PORT2_WRR_CTRL

Address offset: 0x0838

Table 5-124 summarizes the port 2 WRR control register.

Table 5-124 PORT2_WRR_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31:30	R/W	00	WEIGHT_PRI_ CTRL_2	00 = Strict priority 01 = Only highest queue use strict priority; others use weighted fair queuing scheme 10 = The highest two queues use strict priority; other two queues use weighted fair queuing scheme. 11 = All Queues use weighted fair queuing scheme which defined in WRR_PRI3/2/1/0.
29:25	RO	0	RESERVED	
24:20	RO	0	RESERVED	
19:15	R/W	8	WRR_PRI3_2	WRR setting for priority 3
14:10	R/W	4	WRR_PRI2_2	WRR setting for priority 2
9:5	R/W	2	WRR_PRI1_2	WRR setting for priority 1
4:0	R/W	1	WRR_PRI0_2	WRR setting for priority 0

5.7.7 PORT3_WRR_CTRL

Address offset: 0x083C

Table 5-125 summarizes the port 3 WRR control register.

Table 5-125 PORT3_WRR_CTR bit description

Bits	R/W	Initial value	Mnemonic	Description
31:30	R/W	00	WEIGHT_PRI_CTRL_3	00 = Strict priority 01 = Only highest queue use strict priority; others use weighted fair queuing scheme 10 = The highest two queues use strict priority, other two queues use weighted fair queuing scheme. 11 = All queues use weighted fair queuing scheme which defined in WRR_PRI3/2/1/0.
29:25	R/W	0	RESERVED	
24:20	R/W	0	RESERVED	
19:15	R/W	8	WRR_PRI3_3	WRR setting for priority 3
14:10	R/W	4	WRR_PRI2_3	WRR setting for priority 2
9:5	R/W	2	WRR_PRI1_3	WRR setting for priority 1
4:0	R/W	1	WRR_PRI0_3	WRR setting for priority 0

5.7.8 PORT6_WRR_CTRL

Address offset: 0x0848

Table 5-126 summarizes the port 6 WRR control register.

Table 5-126 PORT6_WRR_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31:30	R/W	00	WEIGHT_PRI_CTRL_6	00 = Strict priority 01 = Only highest queue use strict priority; others use weighted fair queuing scheme 10 = The highest two queues use strict priority, other two queues use weighted fair queuing scheme. 11 = All Queues use weighted fair queuing scheme which defined in WRR_PRI3/2/1/0.
29:25	R/W	8	WRR_PRI5_6	WRR setting for priority 5
24:20	R/W	8	WRR_PRI4_6	WRR setting for priority 4
19:15	R/W	8	WRR_PRI3_6	WRR setting for priority 3
14:10	R/W	4	WRR_PRI2_6	WRR setting for priority 2
9:5	R/W	2	WRR_PRI1_6	WRR setting for priority 1
4:0	R/W	1	WRR_PRI0_6	WRR setting for priority 0

5.7.9 PORT0_EG_RATE_CTRL0

Address offset: 0x0890

Table 5-127 summarizes the port 0 rate limit control 0 register.

Table 5-127 PORT0_EG_RATE_CTRL0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:16	R/W	0x7FFF	EG_PRI1_CIR_0	Egress rate limit for priority 1. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 1. If these bits are set to 15'h0, no priority 1 frame is send out from port 0.
15	RO	0	RESERVED	
14:0	R/W	0x7FFF	EG_PRI0_CIR_0	Egress rate limit for priority 0. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 0. If these bits are set to 15'h0, no priority 0 frame is send out from port 0.

5.7.10 PORT0_EG_RATE_CTRL1

Address offset: 0x0894

Table 5-128 summarizes the port 0 rate limit control 1 register.

Table 5-128 PORT0_EG_RATE_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:16	R/W	0x7FFF	EG_PRI3_CIR_0	Egress rate limit for priority 3. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 3. If these bits are set to 15'h0, no priority 3 frame is send out from port 0.
15	RO	0	RESERVED	
14:0	R/W	0x7FFF	EG_PRI2_CIR_0	Egress rate limit for priority 2. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 2. If these bits are set to 15'h0, no priority 2 frame is send out from port 0.

5.7.11 PORT0_EG_RATE_CTRL2

Address offset: 0x0898

Table 5-129 summarizes the port 0 rate limit control 2 register.

Table 5-129 PORT0_EG_RATE_CTRL2 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:16	R/W	0x7FFF	EG_PRI5_CIR_0	Egress rate limit for priority 5. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 5. If these bits are set to 15'h0, no priority 5 frame is send out from port 0.
15	RO	0	RESERVED	
14:0	R/W	0x7FFF	EG_PRI4_CIR_0	Egress rate limit for priority 4. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 4. If these bits are set to 15'h0, no priority 4 frame is send out from port 0.

5.7.12 PORT0_EG_RATE_CTRL3

Address offset: 0x089C

Table 5-130 summarizes the port 0 rate limit control 3 register.

Table 5-130 PORT0_EG_RATE_CTRL3 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:16	R/W	0x7FFF	EG_PRI1_EIR_0	Egress rate limit for priority 1. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 1. If these bits are set to 15'h0, no priority 1 frame is send out from this port.
15	RO	0	RESERVED	
14:0	R/W	0x7FFF	EG_PRI0_EIR_0	Egress rate limit for priority 0. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 0. If these bits are set to 15'h0, no priority 0 frame is send out from this port.

5.7.13 PORT0_EG_RATE_CTRL4

Address offset: 0x08A0

Table 5-131 summarizes the port 0 rate limit control 4 register.

Table 5-131 PORT0_EG_RATE_CTRL4 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:16	R/W	0x7FFF	EG_PRI3_EIR_0	Egress rate limit for priority 3. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 3. If these bits are set to 15'h0, no priority 3 frame is send out from this port.
15	RO	0	RESERVED	
14:0	R/W	0x7FFF	EG_PRI2_EIR_0	Egress rate limit for priority 2. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 2. If these bits are set to 15'h0, no priority 2 frame is send out from this port.

5.7.14 PORT0_EG_RATE_CTRL5

Address offset: 0x08A4

Table 5-132 summarizes the port 0 rate limit control 5 register.

Table 5-132 PORT0_EG_RATE_CTRL5 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:16	R/W	0x7FFF	EG_PRI5_EIR_0	Egress rate limit for priority 5. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 5. If these bits are set to 15'h0, no priority 5 frame is send out from this port.
15	RO	0	RESERVED	
14:0	R/W	0x7FFF	EG_PRI4_EIR_0	Egress rate limit for priority 4. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 4. If these bits are set to 15'h0, no priority 4 frame is send out from this port.

5.7.15 PORT0_EG_RATE_CTRL6

Address offset: 0x08A8

Table 5-133 summarizes the port 0 rate limit control 6 register.

Table 5-133 PORT0_EG_RATE_CTRL6 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:28	R/W	0	EG_PRI3_CBS_0	Committed burst size for priority 3 Commit burst size: 0: 0k bytes 1: 2k bytes 2: 4k bytes 3: 8k bytes 4: 16k bytes 5: 32k bytes 6: 128k bytes 7: 512k bytes For packet mode: 0: 0k packets 1: 2k packets 2: 4k packets 3: 16k packets 4: 64k packets 5: 256k packets 6: 512k packets 7: 1024k packets
27	RO	0	RESERVED	
26:24	R/W	0	EG_PRI3_EBS_0	Excess burst size for priority 3 Excess burst size: 0: 0k bytes 1: 2k bytes 2: 4k bytes 3: 8k bytes 4: 16k bytes 5: 32k bytes 6: 128k bytes 7: 512k bytes For packet mode: 0: 0k packets 1: 2k packets 2: 4k packets 3: 16k packets 4: 64k packets 5: 256k packets 6: 512k packets 7: 1024k packets
23	RO	0	RESERVED	

Table 5-133 PORT0_EG_RATE_CTRL6 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
22:20	R/W	0	EG_PRI2_CBS_0	Committed burst size for priority 2 Commit burst size: 0: 0k bytes 1: 2k bytes 2: 4k bytes 3: 8k bytes 4: 16k bytes 5: 32k bytes 6: 128k bytes 7: 512k bytes For packet mode: 0: 0k packets 1: 2k packets 2: 4k packets 3: 16k packets 4: 64k packets 5: 256k packets 6: 512k packets 7: 1024k packets
19	RO	0	RESERVED	
18:16	R/W	0	EG_PRI2_EBS_0	Excess burst size for priority 2 Excess burst size: 0: 0k bytes 1: 2k bytes 2: 4k bytes 3: 8k bytes 4: 16k bytes 5: 32k bytes 6: 128k bytes 7: 512k bytes For packet mode: 0: 0k packets 1: 2k packets 2: 4k packets 3: 16k packets 4: 64k packets 5: 256k packets 6: 512k packets 7: 1024k packets
15	RO	0	RESERVED	

Table 5-133 PORT0_EG_RATE_CTRL6 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
14:12	R/W	0	EG_PRI1_CBS_0	Committed burst size for priority 1 Commit burst size: 0: 0k bytes 1: 2k bytes 2: 4k bytes 3: 8k bytes 4: 16k bytes 5: 32k bytes 6: 128k bytes 7: 512k bytes For packet mode: 0: 0k packets 1: 2k packets 2: 4k packets 3: 16k packets 4: 64k packets 5: 256k packets 6: 512k packets 7: 1024k packets
11	RO	0	RESERVED	
10:8	R/W	0	EG_PRI1_EBS_0	Excess burst size for priority 1 Excess burst size: 0: 0k bytes 1: 2k bytes 2: 4k bytes 3: 8k bytes 4: 16k bytes 5: 32k bytes 6: 128k bytes 7: 512k bytes For packet mode: 0: 0k packets 1: 2k packets 2: 4k packets 3: 16k packets 4: 64k packets 5: 256k packets 6: 512k packets 7: 1024k packets
7	RO	0	RESERVED	

Table 5-133 PORT0_EG_RATE_CTRL6 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
6:4	R/W	0	EG_PRI0_CBS_0	Committed burst size for priority 0 Commit burst size: 0: 0k bytes 1: 2k bytes 2: 4k bytes 3: 8k bytes 4: 16k bytes 5: 32k bytes 6: 128k bytes 7: 512k bytes For packet mode: 0: 0k packets 1: 2k packets 2: 4k packets 3: 16k packets 4: 64k packets 5: 256k packets 6: 512k packets 7: 1024k packets
3	RO	0	RESERVED	
2:0	R/W	0	EG_PRI0_EBS_0	Excess burst size for priority 0 Excess burst size: 0: 0k bytes 1: 2k bytes 2: 4k bytes 3: 8k bytes 4: 16k bytes 5: 32k bytes 6: 128k bytes 7: 512k bytes For packet mode: 0: 0k packets 1: 2k packets 2: 4k packets 3: 16k packets 4: 64k packets 5: 256k packets 6: 512k packets 7: 1024k packets

5.7.16 PORT0_EG_RATE_CTRL7

Address offset: 0x08AC

Table 5-134 summarizes the port0 rate limit control 7 register.

Table 5-134 PORT0_EG_RATE_CTRL7 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:28	R/W	0	EG_PRI5_CBS_0	Committed burst size for priority 5 Commit burst size: 0: 0k bytes 1: 2k bytes 2: 4k bytes 3: 8k bytes 4: 16k bytes 5: 32k bytes 6: 128k bytes 7: 512k bytes For packet mode: 0: 0k packets 1: 2k packets 2: 4k packets 3: 16k packets 4: 64k packets 5: 256k packets 6: 512k packets 7: 1024k packets
27	RO	0	RESERVED	
26:24	R/W	0	EG_PRI5_EBS_0	Excess burst size for priority 5 Excess burst size: 0: 0k bytes 1: 2k bytes 2: 4k bytes 3: 8k bytes 4: 16k bytes 5: 32k bytes 6: 128k bytes 7: 512k bytes For packet mode: 0: 0k packets 1: 2k packets 2: 4k packets 3: 16k packets 4: 64k packets 5: 256k packets 6: 512k packets 7: 1024k packets
23	RO	0	RESERVED	

Table 5-134 PORT0_EG_RATE_CTRL7 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
22:20	R/W	0	EG_PRI4_CBS_0	Committed burst size for priority 4 Commit burst size: 0: 0k bytes 1: 2k bytes 2: 4k bytes 3: 8k bytes 4: 16k bytes 5: 32k bytes 6: 128k bytes 7: 512k bytes For packet mode: 0: 0k packets 1: 2k packets 2: 4k packets 3: 16k packets 4: 64k packets 5: 256k packets 6: 512k packets 7: 1024k packets
19	RO	0	RESERVED	
18:16	R/W	0	EG_PRI4_EBS_0	Excess burst size for priority 4 Excess burst size: 0: 0k bytes 1: 2k bytes 2: 4k bytes 3: 8k bytes 4: 16k bytes 5: 32k bytes 6: 128k bytes 7: 512k bytes For packet mode: 0: 0k packets 1: 2k packets 2: 4k packets 3: 16k packets 4: 64k packets 5: 256k packets 6: 512k packets 7: 1024k packets
15:14	RO	0	RESERVED	
13	R/W	0	EG_PRI5_RATE_ UNIT_0	Rate limit unit for queue 5: 0 = Bytes 1 = Packets

Table 5-134 PORT0_EG_RATE_CTRL7 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
12	R/W	0	EG_PRI4_RATE_ UNIT_0	Rate limit unit for queue 4: 0 = Bytes 1 = Packets
11	R/W	0	EG_PRI3_RATE_ UNIT_0	Rate limit unit for queue 3: 0 = Bytes 1 = Packets
10	R/W	0	EG_PRI2_RATE_ UNIT_0	Rate limit unit for queue 2: 0 = Bytes 1 = Packets
9	R/W	0	EG_PRI1_RATE_ UNIT_0	Rate limit unit for queue 1: 0 = Bytes 1 = Packets
8	R/W	0	EG_PRI0_RATE_ UNIT_0	Rate limit unit for queue 0: 0 = Bytes 1 = Packets
7:5	RO	0	RESERVED	
4	R/W	0	EGRESS_MANAGE_ RATE_EN_0	Enable management frame to be calculate to egress rate limit.
3	R/W	0	EGRESS_RATE_EN_0	Enable part-based rate limit. Rate is set at EG_PRIO_ CIR Enable port-based maximum burst size. Max burst size is set at EG_PRIO_CBS
2:0	R/W	3’h2	EG_TIME_SLOT_0	Egress rate limit time slot control register. 3'h0: 1/128 ms 3'h1: 1/64 ms 3'h2: 1/32 ms 3'h3: 1/16 ms 3'h4: 1/4 ms 3'h5: 1 ms 3'h6: 10 ms 3'h7: 100 ms

5.7.17 PORT2_EG_RATE_CTRL0

Address offset: 0x08D0

Table 5-135 summarizes the port 2 rate limit control 0 register.

Table 5-135 PORT2_EG_RATE_CTRL0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:16	R/W	0x7FFF	EG_PRI1_CIR_2	Egress rate limit for priority 1. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 1. If these bits are set to 15'h0, no priority 1 frame is send out from this port.
15	RO	0	RESERVED	
14:0	R/W	0x7FFF	EG_PRI0_CIR_2	Egress rate limit for priority 0. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 0. If these bits are set to 15'h0, no priority 0 frame is send out from this port.

5.7.18 PORT2_EG_RATE_CTRL1

Address offset: 0x08D4

Table 5-136 summarizes the port 2 rate limit control 1 register.

Table 5-136 PORT2_EG_RATE_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:16	R/W	0x7FFF	EG_PRI3_CIR_2	Egress rate limit for priority 3. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 3. If these bits are set to 15'h0, no priority 3 frame is send out from this port.
15	RO	0	RESERVED	
14:0	R/W	0x7FFF	EG_PRI2_CIR_2	Egress rate limit for priority 2. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 2. If these bits are set to 15'h0, no priority 2 frame is send out from this port.

5.7.19 PORT2_EG_RATE_CTRL2

Address offset: 0x08DC

Table 5-137 summarizes the port 2 rate limit control 2 register.

Table 5-137 PORT2_EG_RATE_CTRL2 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:16	R/W	0x7FFF	EG_PRI1_EIR_2	Egress rate limit for priority 1. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 1. If these bits are set to 15'h0, no priority 1 frame is send out from this port.
15	RO	0	RESERVED	
14:0	R/W	0x7FFF	EG_PRI0_EIR_2	Egress rate limit for priority 0. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 0. If these bits are set to 15'h0, no priority 0 frame is send out from this port.

5.7.20 PORT2_EG_RATE_CTRL3

Address offset: 0x08E0

Table 5-138 summarizes the port 2 rate limit control 3 register.

Table 5-138 PORT2_EG_RATE_CTRL3 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:16	R/W	0x7FFF	EG_PRI3_EIR_2	egress rate limit for priority 3. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 3. If these bits are set to 15'h0, no priority 3 frame is send out from this port.
15	RO	0	RESERVED	
14:0	R/W	0x7FFF	EG_PRI2_EIR_2	Egress rate limit for priority 2. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 2. If these bits are set to 15'h0, no priority 2 frame is send out from this port.

5.7.21 PORT2_EG_RATE_CTRL4

Address offset: 0x08E8

Table 5-139 summarizes the port 2 rate limit control 4 register.

Table 5-139 PORT2_EG_RATE_CTRL4 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:28	R/W	0	EG_PRI3_CBS_2	Committed burst size for priority 3
27	RO	0	RESERVED	
26:24	R/W	0	EG_PRI3_EBS_2	Excess burst size for priority 3
23	RO	0	RESERVED	
22:20	R/W	0	EG_PRI2_CBS_2	Committed burst size for priority 2
19	RO	0	RESERVED	
18:16	R/W	0	EG_PRI2_EBS_2	Excess burst size for priority 2
15	RO	0	RESERVED	
14:12	R/W	0	EG_PRI1_CBS_2	Committed burst size for priority 1
11	RO	0	RESERVED	
10:8	R/W	0	EG_PRI1_EBS_2	Excess burst size for priority 1
7	RO	0	RESERVED	
6:4	R/W	0	EG_PRI0_CBS_2	Committed burst size for priority 0
3	RO	0	RESERVED	
2:0	R/W	0	EG_PRI0_EBS_2	Excess burst size for priority 0

5.7.22 PORT2_EG_RATE_CTRL5

Address offset: 0x08EC

Table 5-140 summarizes the port 2 rate limit control 5 register.

Table 5-140 PORT2_EG_RATE_CTRL5 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:12	RO	0	RESERVED	
11	R/W	0	EG_PRI3_RATE_UNIT_2	Rate limit unit for queue 3: 0 = Bytes 1 = Packets
10	R/W	0	EG_PRI2_RATE_UNIT_2	Rate limit unit for queue 2: 0 = Bytes 1 = Packets
9	R/W	0	EG_PRI1_RATE_UNIT_2	Rate limit unit for queue 1: 0 = Bytes 1 = Packets

Table 5-140 PORT2_EG_RATE_CTRL5 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
8	R/W	0	EG_PRI0_RATE_UNIT_2	Rate limit unit for queue 0: 0 = Bytes 1 = Packets
7:5	RO	0	RESERVED	
4	R/W	0	EGRESS_MANAGE_ RATE_EN_2	Enable management frame to be calculate to egress rate limit.
3	R/W	0	EGRESS_RATE_EN_2	Enable port-based rate limit. Rate is set at EG_ PRIO_CIR Maximum burst size is also set at EG_PRIO_CBS
2:0	R/W	3'h2	EG_TIME_SLOT_2	Egress rate limit time slot control register. 3'h0: 1/128 ms 3'h1: 1/64 ms 3'h2: 1/32 ms 3'h3: 1/16 ms 3'h4: 1/4 ms 3'h5: 1 ms 3'h6: 10 ms 3'h7: 100 ms

5.7.23 PORT3_EG_RATE_CTRL0

Address offset: 0x08F0

Table 5-141 summarizes the port 3 rate limit control 0 register.

Table 5-141 PORT3_EG_RATE_CTRL0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:16	R/W	0x7FFF	EG_PRI1_CIR_3	Egress rate limit for priority 1. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 1. If these bits are set to 15'h0, no priority 1 frame is send out from this port.
15	RO	0	RESERVED	
14:0	R/W	0x7FFF	EG_PRI0_CIR_3	Egress rate limit for priority 0. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 0. If these bits are set to 15'h0, no priority 0 frame is send out from this port.

5.7.24 PORT3_EG_RATE_CTRL1

Address offset: 0x08F4

Table 5-142 summarizes the port 3 rate limit control 1 register.

Table 5-142 PORT3_EG_RATE_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:16	R/W	0x7FFF	EG_PRI3_CIR_3	Egress rate limit for priority 3. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 3. If these bits are set to 15'h0, no priority 3 frame is send out from this port.
15	RO	0	RESERVED	
14:0	R/W	0x7FFF	EG_PRI2_CIR_3	Egress rate limit for priority 2. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 2. If these bits are set to 15'h0, no priority 2 frame is send out from this port.

5.7.25 PORT3_EG_RATE_CTRL2

Address offset: 0x08FC

Table 5-143 summarizes the port 3 rate limit control 2 register.

Table 5-143 PORT3_EG_RATE_CTRL2 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:16	R/W	0x7FFF	EG_PRI1_EIR_3	Egress rate limit for priority 1. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 1. If these bits are set to 15'h0, no priority 1 frame is send out from this port.
15	RO	0	RESERVED	
14:0	R/W	0x7FFF	EG_PRI0_EIR_3	Egress rate limit for priority 0. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 0. If these bits are set to 15'h0, no priority 0 frame is send out from this port.

5.7.26 PORT3_EG_RATE_CTRL3

Address offset: 0x0900

Table 5-144 summarizes the port 3 rate limit control 3 register.

Table 5-144 PORT3_EG_RATE_CTRL3 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:16	R/W	0x7FFF	EG_PRI3_EIR_3	Egress rate limit for priority 3. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 3. If these bits are set to 15'h0, no priority 3 frame is send out from this port.
15	RO	0	RESERVED	
14:0	R/W	0x7FFF	EG_PRI2_EIR_3	Egress rate limit for priority 2. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 2. If these bits are set to 15'h0, no priority 2 frame is send out from this port.

5.7.27 PORT3_EG_RATE_CTRL4

Address offset: 0x0908

Table 5-145 summarizes the port 3 rate limit control 4 register.

Table 5-145 PORT3_EG_RATE_CTRL4 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:28	R/W	0	EG_PRI3_CBS_3	Committed burst size for priority 3
27	RO	0	RESERVED	
26:24	R/W	0	EG_PRI3_EBS_3	Excess burst size for priority 3
23	RO	0	RESERVED	
22:20	R/W	0	EG_PRI2_CBS_3	Committed burst size for priority 2
19	RO	0	RESERVED	
18:16	R/W	0	EG_PRI2_EBS_3	Excess burst size for priority 2
15	RO	0	RESERVED	
14:12	R/W	0	EG_PRI1_CBS_3	Committed burst size for priority 1
11	RO	0	RESERVED	
10:8	R/W	0	EG_PRI1_EBS_3	Excess burst size for priority 1
7	RO	0	RESERVED	
6:4	R/W	0	EG_PRI0_CBS_3	Committed burst size for priority 0
3	RO	0	RESERVED	
2:0	R/W	0	EG_PRI0_EBS_3	Excess burst size for priority 0

5.7.28 PORT3_EG_RATE_CTRL5

Address offset: 0x090C

Table 5-146 summarizes the port 3 rate limit control 5 register.

Table 5-146 PORT3_EG_RATE_CTRL5 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:12	RO	0	RESERVED	
11	R/W	0	EG_PRI3_RATE_UNIT_3	Rate limit unit for queue 3: 0 = Bytes 1 = Packets
10	R/W	0	EG_PRI2_RATE_UNIT_3	Rate limit unit for queue 2: 0 = Bytes 1 = Packets
9	R/W	0	EG_PRI1_RATE_UNIT_3	Rate limit unit for queue 1: 0 = Bytes 1 = Packets
8	R/W	0	EG_PRI0_RATE_UNIT_3	Rate limit unit for queue 0: 0 = Bytes 1 = Packets
7:5	RO	0	RESERVED	
4	R/W	0	EGRESS_MANAGE_RATE_EN_3	Enable management frame to be calculate to egress rate limit.
3	R/W	0	EGRESS_RATE_EN_3	Enable port-based rate limit. Rate is set at EG_PRIO_CIR Enable Max burst size also. Max burst size is set at EG_PRIO_CBS
2:0	R/W	3'h2	EG_TIME_SLOT_3	Egress rate limit time slot control register. 3'h0: 1/128 ms 3'h1: 1/64 ms 3'h2: 1/32 ms 3'h3: 1/16 ms 3'h4: 1/4 ms 3'h5: 1 ms 3'h6: 10 ms 3'h7: 100 ms

5.7.29 PORT6_EG_RATE_CTRL0

Address offset: 0x0950

Table 5-147 summarizes the port 6 rate limit control 0 register.

Table 5-147 PORT6_EG_RATE_CTRL0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:16	R/W	0x7FFF	EG_PRI1_CIR_6	Egress rate limit for priority 1. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 1. If these bits are set to 15'h0, no priority 1 frame is send out from this port.
15	RO	0	RESERVED	
14:0	R/W	0x7FFF	EG_PRI0_CIR_6	Egress rate limit for priority 0. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 0. If these bits are set to 15'h0, no priority 0 frame is send out from this port.

5.7.30 PORT6_EG_RATE_CTRL1

Address offset: 0x0954

Table 5-148 summarizes the port 6 rate limit control 1 register.

Table 5-148 PORT6_EG_RATE_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERV6ED	
30:16	R/W	0x7FFF	EG_PRI3_CIR_6	Egress rate limit for priority 3. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 3. If these bits are set to 15'h0, no priority 3 frame is send out from this port.
15	RO	0	RESERVED	
14:0	R/W	0x7FFF	EG_PRI2_CIR_6	Egress rate limit for priority 2. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 2. If these bits are set to 15'h0, no priority 2 frame is send out from this port.

5.7.31 PORT6_EG_RATE_CTRL2

Address offset: 0x0958

Table 5-149 summarizes the port 6 rate limit control 2 register.

Table 5-149 PORT6_EG_RATE_CTRL2 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:16	R/W	0x7FFF	EG_PRI5_CIR_6	Egress rate limit for priority 5. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 5. If these bits are set to 15'h0, no priority 5 frame is send out from this port.
15	RO	0	RESERVED	
14:0	R/W	0x7FFF	EG_PRI4_CIR_6	Egress rate limit for priority 4. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 4. If these bits are set to 15'h0, no priority 4 frame is send out from this port.

5.7.32 PORT6_EG_RATE_CTRL3

Address offset: 0x095C

Table 5-150 summarizes the port 6 rate limit control 3 register.

Table 5-150 PORT6_EG_RATE_CTRL3 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:16	R/W	0x7FFF	EG_PRI1_EIR_6	Egress rate limit for priority 1. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 1. If these bits are set to 15'h0, no priority 1 frame is send out from this port.
15	RO	0	RESERVED	
14:0	R/W	0x7FFF	EG_PRI0_EIR_6	Egress rate limit for priority 0. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 0. If these bits are set to 15'h0, no priority 0 frame is send out from this port.

5.7.33 PORT6_EG_RATE_CTRL4

Address offset: 0x0960

Table 5-151 summarizes the port 6 rate limit control 4 register.

Table 5-151 PORT6_EG_RATE_CTRL4 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:16	R/W	0x7FFF	EG_PRI3_EIR_6	Egress rate limit for priority 3. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 3. If these bits are set to 15'h0, no priority 3 frame is send out from this port.
15	RO	0	RESERVED	
14:0	R/W	0x7FFF	EG_PRI2_EIR_6	Egress rate limit for priority 2. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 2. If these bits are set to 15'h0, no priority 2 frame is send out from this port.

5.7.34 PORT6_EG_RATE_CTRL5

Address offset: 0x0964

Table 5-152 summarizes the port 6 rate limit control 5 register.

Table 5-152 PORT6_EG_RATE_CTRL5 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:16	R/W	0x7FFF	EG_PRI5_EIR_6	Egress rate limit for priority 5. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 5. If these bits are set to 15'h0, no priority 5 frame is send out from this port.
15	RO	0	RESERVED	
14:0	R/W	0x7FFF	EG_PRI4_EIR_6	Egress rate limit for priority 4. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 4. If these bits are set to 15'h0, no priority 4 frame is send out from this port.

5.7.35 PORT6_EG_RATE_CTRL6

Address offset: 0x0968

Table 5-153 summarizes the port 6 rate limit control 6 register.

Table 5-153 PORT6_EG_RATE_CTRL6 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:28	R/W	0	EG_PRI3_CBS_6	Committed burst size for priority 3
27	RO	0	RESERVED	
26:24	R/W	0	EG_PRI3_EBS_6	Excess burst size for priority 3
23	RO	0	RESERVED	
22:20	R/W	0	EG_PRI2_CBS_6	Committed burst size for priority 2
19	RO	0	RESERVED	
18:16	R/W	0	EG_PRI2_EBS_6	Excess burst size for priority 2
15	RO	0	RESERVED	
14:12	R/W	0	EG_PRI1_CBS_6	Committed burst size for priority 1
11	RO	0	RESERVED	
10:8	R/W	0	EG_PRI1_EBS_6	Excess burst size for priority 1
7	RO	0	RESERVED	
6:4	R/W	0	EG_PRI0_CBS_6	Committed burst size for priority 0
3	RO	0	RESERVED	
2:0	R/W	0	EG_PRI0_EBS_6	Excess burst size for priority 0

5.7.36 PORT6_EG_RATE_CTRL7

Address offset: 0x096C

Table 5-154 summarizes the port 6 rate limit control 7 register.

Table 5-154 PORT6_EG_RATE_CTRL7 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	RO	0	RESERVED	
30:28	R/W	0	EG_PRI5_CBS_6	Committed burst size for priority 5
27	RO	0	RESERVED	
26:24	R/W	0	EG_PRI5_EBS_6	Excess burst size for priority 5
23	RO	0	RESERVED	
22:20	R/W	0	EG_PRI4_CBS_6	Committed burst size for priority 4
19	RO	0	RESERVED	
18:16	R/W	0	EG_PRI4_EBS_6	Excess burst size for priority 4
15:14	RO	0	RESERVED	

Table 5-154 PORT6_EG_RATE_CTRL7 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
13	R/W	0	EG_PRI5_RATE_UNIT_6	Rate limit unit for queue 5: 0 = Bytes 1 = Packets
12	R/W	0	EG_PRI4_RATE_UNIT_6	Rate limit unit for queue 4: 0 = Bytes 1 = Packets
11	RO	0	EG_PRI3_RATE_UNIT_6	Rate limit unit for queue 3: 0 = Bytes 1 = Packets
10	R/W	0	EG_PRI2_RATE_UNIT_6	Rate limit unit for queue 2: 0 = Bytes 1 = Packets
9	R/W	0	EG_PRI1_RATE_UNIT_6	Rate limit unit for queue 1: 0 = Bytes 1 = Packets
8	R/W	0	EG_PRI0_RATE_UNIT_6	Rate limit unit for queue 0: 0 = Bytes 1 = Packets
7:5	RO	0	RESERVED	
4	R/W	0	EGRESS_MANAGE_RATE_EN_6	Enable management frame to be calculate to egress rate limit.
3	RO	0	EGRESS_RATE_EN_6	Enable Port-based rate limit. Rate is set at EG_PRIO_CIR Enable Port-based Max burst size also. Max burst size is set at EG_PRIO_CBS
2:0	R/W	3’h2	EG_TIME_SLOT_6	Egress rate limit time slot control register. 3'h0: 1/128 ms 3'h1: 1/64 ms 3'h2: 1/32 ms 3'h3: 1/16 ms 3'h4:1/4 ms 3'h5: 1 ms 3'h6: 10 ms 3'h7: 100 ms

5.7.37 PORT0_HOL_CTRL0

Address offset: 0x0970

Table 5-155 summarizes the port 0 HOL control 0 register.

Table 5-155 PORT0_HOL_CTRL0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:30	RO	0	RESERVED	
29:24	R/W	0x28	EG_PORT_QUEUE_NUM_0	Most buffer can be used for this port. Buffer number is times of 8. 6'h0: 0 6'h1: No more than 8 6'h2: No more than 16 …… 6'h3F: No more than 504
23:20	R/W	0	EG_PRI5_QUEUE_NUM_0	See bits[3:0]. This is for priority queue 5.
19:16	R/W	0	EG_PRI4_QUEUE_NUM_0	See bits[3:0]. This is for priority queue 4.
15:12	R/W	0	EG_PRI3_QUEUE_NUM_0	See bits[3:0]. This is for priority queue 3.
11:8	R/W	0	EG_PRI2_QUEUE_NUM_0	See bits[3:0]. This is for priority queue 2.
7:4	R/W	0	EG_PRI1_QUEUE_NUM_0	See bits[3:0]. This is for priority queue 1.
3:0	R/W	0	EG_PRI0_QUEUE_NUM_0	Most buffer can be used for priority 0 queue. Buffer number is times of 8. 4'h0: 0 4'h1: No more than 8 4'h2: No more than 16 …… 4'hF: No more than 240

5.7.38 PORT0_HOL_CTRL1

Address offset: 0x0974

Table 5-156 summarizes the port 0 HOL control 1 register.

Table 5-156 PORT0_HOL_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:17	RO	0	RESERVED	
16	R/W	0	EG_MIRROR_EN_0	Egress port mirror. If this bit is set to 1, all packets send out through this port is copied to mirror port.
15:9	RO	0	RESERVED	
8	R/W	1	PORT_RED_EN_0	WRED enable
7	R/W	0x1	EG_PORT_QUEUE_CTRL_EN_0	1 = Enable use PORT_QUEUE_NUM to control queue depth in this port.
6	R/W	0x1	EG_PRI_QUEUE_CTRL_EN_0	1 = Enable use PRI*_QUEUE_NUM to control queue depth in this port.

Table 5-156 PORT0_HOL_CTRL1 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
5:4	RO	0	RESERVED	
3:0	R/W	0x0	ING_BUF_NUM_0	Buffer number is times of 8. 4'h0: 0 4'h1: No more than 8 4'h2: No more than 16 …… 4'hF: No more than 240

5.7.39 PORT2_HOL_CTRL0

Address offset: 0x0980

Table 5-157 summarizes the port 2 HOL control 0 register.

Table 5-157 PORT2_HOL_CTRL0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:30	RO	0	RESERVED	
29:24	R/W	0x28	EG_PORT_QUEUE_NUM_2	Most buffer can be used for this port. Buffer number is times of 8. 6'h0: 0 6'h1: No more than 8 6'h2: No more than 16 …… 6'h3F: No more than 504
23:20	R/W	0	RESERVED	
19:16	R/W	0	RESERVED	
15:12	R/W	0	EG_PRI3_QUEUE_NUM_2	See bits[3:0]. This is for priority queue 3.
11:8	R/W	0	EG_PRI2_QUEUE_NUM_2	See bits[3:0]. This is for priority queue 2.
7:4	R/W	0	EG_PRI1_QUEUE_NUM_2	See bits[3:0]. This is for priority queue 1.
3:0	R/W	0	EG_PRI0_QUEUE_NUM_2	Most buffer can be used for priority 0 queue. Buffer number is times of 8. 4'h0: 0 4'h1: No more than 8 4'h2: No more than 16 …… 4'hF: No more than 240

5.7.40 PORT2_HOL_CTRL1

Address offset: 0x0984

Table 5-158 summarizes the port 2 HOL control 1 register.

Table 5-158 PORT2_HOL_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:17	RO	0	RESERVED	
16	R/W	0	EG_MIRROR_EN_2	Egress port mirror. If this bit is set to 1, all packets send out through this port are copied to mirror port.
15:9	RO	0	RESERVED	
8	R/W	1	PORT_RED_EN_1	WRED enable
7	R/W	0x1	EG_PORT_QUEUE_CTRL_EN_2	1 = Enable use PORT_QUEUE_NUM to control queue depth in this port.
6	R/W	0x1	EG_PRI_QUEUE_CTRL_EN_2	1 = Enable use PRI*_QUEUE_NUM to control queue depth in this port.
5:4	RO	0	RESERVED	
3:0	R/W	0x2	ING_BUF_NUM_2	Buffer number is times of 8. 4'h0: 0 4'h1: No more than 8 4'h2: No more than 16 …… 4'hF: No more than 240

5.7.41 PORT3_HOL_CTRL0

Address offset: 0x0988

Table 5-159 summarizes the port 3 HOL control 0 register.

Table 5-159 PORT3_HOL_CTRL0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:30	RO	0	RESERVED	
29:24	R/W	0x28	EG_PORT_QUEUE_NUM_3	Most buffer can be used for this port. Buffer number is times of 8. 6'h0: 0 6'h1: No more than 8 6'h2: No more than 16 …… 6'h1F: No more than 504
23:20	R/W	0	RESERVED	
19:16	R/W	0	RESERVED	
15:12	R/W	0	EG_PRI3_QUEUE_NUM_3	See bits[3:0]. This is for priority queue 3.
11:8	R/W	0	EG_PRI2_QUEUE_NUM_3	See bits[3:0]. This is for priority queue 2.

Table 5-159 PORT3_HOL_CTRL0 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
7:4	R/W	0	EG_PRI1_QUEUE_NUM_3	See bits[3:0]. This is for priority queue 1.
3:0	R/W	0	EG_PRI0_QUEUE_NUM_3	Most buffer can be used for priority 0 queue. Buffer number is times of 8. 4'h0: 0 4'h1: No more than 8 4'h2: No more than 16 …… 4'hF: No more than 240

5.7.42 PORT3_HOL_CTRL1

Address offset: 0x098c

Table 5-160 summarizes the port 3 HOL control 1 register.

Table 5-160 PORT3_HOL_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:17	RO	0	RESERVED	
16	R/W	0	EG_MIRROR_EN_3	Egress port mirror. If this bit is set to 1, all packets send out through this port are copied to mirror port.
15:9	RO	0	RESERVED	
8	R/W	1	PORT_RED_EN_1	WRED enable
7	R/W	0x1	EG_PORT_QUEUE_CTRL_EN_3	1 = Enable use PORT_QUEUE_NUM to control queue depth in this port.
6	R/W	0x1	EG_PRI_QUEUE_CTRL_EN_3	1 = Enable use PRI*_QUEUE_NUM to control queue depth in this port.
5:4	RO	0	RESERVED	
3:0	R/W	0x2	ING_BUF_NUM_3	Buffer number is times of 8. 4'h0: 0 4'h1: No more than 8 4'h2: No more than 16 …… 4'hF: No more than 240

5.7.43 PORT6_HOL_CTRL0

Address offset: 0x09A0

Table 5-161 summarizes the port 6 HOL control 0 register.

Table 5-161 PORT6_HOL_CTRL0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:30	RO	0	RESERVED	
29:24	R/W	0x28	EG_PORT_QUEUE_NUM_6	Most buffer can be used for this port. Buffer number is times of 8. 6'h0: 0 6'h1: No more than 8 6'h2: No more than 16 …… 6'h3F: No more than 504
23:20	R/W	0	EG_PRI5_QUEUE_NUM_6	See bits[3:0]. This is for priority queue 5.
19:16	R/W	0	EG_PRI4_QUEUE_NUM_6	See bits[3:0]. This is for priority queue 4.
15:12	R/W	0	EG_PRI3_QUEUE_NUM_6	See bits[3:0]. This is for priority queue 3.
11:8	R/W	0	EG_PRI2_QUEUE_NUM_6	See bits[3:0]. This is for priority queue 2.
7:4	R/W	0	EG_PRI1_QUEUE_NUM_6	See bits[3:0]. This is for priority queue 1.
3:0	R/W	0	EG_PRI0_QUEUE_NUM_6	Most buffer can be used for priority 0 queue. Buffer number is times of 8. 4'h0: 0 4'h1: No more than 8 4'h2: No more than 16 …… 4'hF: No more than 240

5.7.44 PORT6_HOL_CTRL1

Address offset: 0x09A4

Table 5-162 summarizes the port 6 HOL control 1 register.

Table 5-162 PORT6_HOL_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:17	RO	0	RESERVED	
16	R/W	0	EG_MIRROR_EN_6	Egress port mirror. If this bit is set to 1, all packets send out through this port are copied to mirror port.
15:9	RO	0	RESERVED	
8	R/W	1	PORT_RED_EN_1	WRED enable
7	R/W	0x1	EG_PORT_QUEUE_CTRL_EN_6	1 = Enable use PORT_QUEUE_NUM to control queue depth in this port.
6	R/W	0x1	EG_PRI_QUEUE_CTRL_EN_6	1 = Enable use PRI*_QUEUE_NUM to control queue depth in this port.

Table 5-162 PORT6_HOL_CTRL1 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
5:4	RO	0	RESERVED	
3:0	R/W	0x0	ING_BUF_NUM_6	Buffer number is times of 8. 4'h0: 0 4'h1: No more than 8 4'h2: No more than 16 …… 4'hF: No more than 240

5.7.45 PORT0_FLOW_THD

Address offset: 0x09B0

Table 5-163 summarizes the port 0 flow control threshold control register.

Table 5-163 PORT0_FLOW_THD bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23:16	R/W	'h3A	PORT_XON_THRES_0	Port-based transmit on threshold. When block memory used by one port is less than this value, MAC sends out pause off frame, and link partner starts transmitting frame out.
15:8	RO	0	RESERVED	
7:0	R/W	'h4A	PORT_XOFF_THRES_0	Port-based transmit off threshold. When block memory used by one port is more than this value, MAC sends out pause on frame, and link partner stops transmitting frame out.

5.7.46 PORT2_FLOW_THD

Address offset: 0x09B8

Table 5-164 summarizes the port 2 flow control threshold register.

Table 5-164 PORT2_FLOW_THD bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23:16	R/W	'h3A	PORT_XON_THRES_2	Port-based transmit on threshold. When block memory used by one port is less than this value, MAC sends out pause off frame, and link partner starts transmitting frame out.

Table 5-164 PORT2_FLOW_THD bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
15:8	RO	0	RESERVED	
7:0	R/W	'h4B	PORT_XOFF_THRES_2	Port-based transmit off threshold. When block memory used by one port is more than this value, MAC sends out pause on frame, and link partner stops transmitting frame out.

5.7.47 PORT3_FLOW_THD

Address offset: 0x09BC

Table 5-165 summarizes the port 3 flow control threshold control register.

Table 5-165 PORT3_FLOW_THD bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23:16	R/W	'h3A	PORT_XON_THRES_3	Port-based transmit on threshold. When block memory used by one port is less than this value, MAC sends out pause off frame, and link partner starts transmitting frame out.
15:8	RO	0	RESERVED	
7:0	R/W	'h4A	PORT_XOFF_THRES_3	Port-based transmit off threshold. When block memory used by one port is more than this value, MAC sends out pause on frame, and link partner stops transmitting frame out.

5.7.48 PORT6_FLOW_THD

Address offset: 0x09C8

Table 5-166 summarizes the port 6 flow control threshold control register.

Table 5-166 PORT6_FLOW_THD bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23:16	R/W	'h3A	PORT_XON_THRES_6	Port-based transmit on threshold. When block memory used by one port is less than this value, MAC sends out pause off frame, and link partner starts transmitting frame out.
15:8	RO	0	RESERVED	
7:0	R/W	'h4A	PORT_XOFF_THRES_6	Port-based transmit off threshold. When block memory used by one port is more than this value, MAC sends out pause on frame, and link partner stops transmitting frame out.

5.7.49 ACL_POLICY_MODE

Address offset: 0x09F0

Table 5-167 summarizes the ACL policy register.

Table 5-167 ACL_POLICY_MODE bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	0	ACL_SEL_31	See bit[0]
30	R/W	0	ACL_SEL_30	See bit[0]
29	R/W	0	ACL_SEL_29	See bit[0]
28	R/W	0	ACL_SEL_28	See bit[0]
27	R/W	0	ACL_SEL_27	See bit[0]
26	R/W	0	ACL_SEL_26	See bit[0]
25	R/W	0	ACL_SEL_25	See bit[0]
24	R/W	0	ACL_SEL_24	See bit[0]
23	R/W	0	ACL_SEL_23	See bit[0]
22	R/W	0	ACL_SEL_22	See bit[0]
21	R/W	0	ACL_SEL_21	See bit[0]
20	R/W	0	ACL_SEL_20	See bit[0]
19	R/W	0	ACL_SEL_19	See bit[0]
18	R/W	0	ACL_SEL_18	See bit[0]
17	R/W	0	ACL_SEL_17	See bit[0]
16	R/W	0	ACL_SEL_16	See bit[0]
15	R/W	0	ACL_SEL_15	See bit[0]
14	R/W	0	ACL_SEL_14	See bit[0]
13	R/W	0	ACL_SEL_13	See bit[0]
12	R/W	0	ACL_SEL_12	See bit[0]
11	R/W	0	ACL_SEL_11	See bit[0]
10	R/W	0	ACL_SEL_10	See bit[0]
9	R/W	0	ACL_SEL_9	See bit[0]
8	R/W	0	ACL_SEL_8	See bit[0]
7	R/W	0	ACL_SEL_7	See bit[0]
6	R/W	0	ACL_SEL_6	See bit[0]
5	R/W	0	ACL_SEL_5	See bit[0]
4	R/W	0	ACL_SEL_4	See bit[0]
3	R/W	0	ACL_SEL_3	See bit[0]
2	R/W	0	ACL_SEL_2	See bit[0]

Table 5-167 ACL_POLICY_MODE bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
1	R/W	0	ACL_SEL_1	See bit[0]
0	R/W	0	ACL_SEL_0	0 = ACL rate limit 1 = ACL counter

5.7.50 ACL_COUNTER_MODE

Address offset: 0x09F4

Table 5-168 summarizes the ACL counter mode register.

Table 5-168 ACL_COUNTER_MODE bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	0	ACL_CNT_MODE_31	See bit[0]
30	R/W	0	ACL_CNT_MODE_30	See bit[0]
29	R/W	0	ACL_CNT_MODE_29	See bit[0]
28	R/W	0	ACL_CNT_MODE_28	See bit[0]
27	R/W	0	ACL_CNT_MODE_27	See bit[0]
26	R/W	0	ACL_CNT_MODE_26	See bit[0]
25	R/W	0	ACL_CNT_MODE_25	See bit[0]
24	R/W	0	ACL_CNT_MODE_24	See bit[0]
23	R/W	0	ACL_CNT_MODE_23	See bit[0]
22	R/W	0	ACL_CNT_MODE_22	See bit[0]
21	R/W	0	ACL_CNT_MODE_21	See bit[0]
20	R/W	0	ACL_CNT_MODE_20	See bit[0]
19	R/W	0	ACL_CNT_MODE_19	See bit[0]
18	R/W	0	ACL_CNT_MODE_18	See bit[0]
17	R/W	0	ACL_CNT_MODE_17	See bit[0]
16	R/W	0	ACL_CNT_MODE_16	See bit[0]
15	R/W	0	ACL_CNT_MODE_15	See bit[0]
14	R/W	0	ACL_CNT_MODE_14	See bit[0]
13	R/W	0	ACL_CNT_MODE_13	See bit[0]
12	R/W	0	ACL_CNT_MODE_12	See bit[0]
11	R/W	0	ACL_CNT_MODE_11	See bit[0]
10	R/W	0	ACL_CNT_MODE_10	See bit[0]
9	R/W	0	ACL_CNT_MODE_9	See bit[0]
8	R/W	0	ACL_CNT_MODE_8	See bit[0]
7	R/W	0	ACL_CNT_MODE_7	See bit[0]

Table 5-168 ACL_COUNTER_MODE bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
6	R/W	0	ACL_CNT_MODE_6	See bit[0]
5	R/W	0	ACL_CNT_MODE_5	See bit[0]
4	R/W	0	ACL_CNT_MODE_4	See bit[0]
3	R/W	0	ACL_CNT_MODE_3	See bit[0]
2	R/W	0	ACL_CNT_MODE_2	See bit[0]
1	R/W	0	ACL_CNT_MODE_1	See bit[0]
0	R/W	0	ACL_CNT_MODE_0	0 = Frame counter 1 = Byte counter

5.7.51 ACL_CNT_RESET

Address offset: 0x09F8

Table 5-169 summarizes the ACL counter reset register.

Table 5-169 ACL_CNT_RESET bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	0	ACL_CNT_RST_31	See bit[0]
30	R/W	0	ACL_CNT_RST_30	See bit[0]
29	R/W	0	ACL_CNT_RST_29	See bit[0]
28	R/W	0	ACL_CNT_RST_28	See bit[0]
27	R/W	0	ACL_CNT_RST_27	See bit[0]
26	R/W	0	ACL_CNT_RST_26	See bit[0]
25	R/W	0	ACL_CNT_RST_25	See bit[0]
24	R/W	0	ACL_CNT_RST_24	See bit[0]
23	R/W	0	ACL_CNT_RST_23	See bit[0]
22	R/W	0	ACL_CNT_RST_22	See bit[0]
21	R/W	0	ACL_CNT_RST_21	See bit[0]
20	R/W	0	ACL_CNT_RST_20	See bit[0]
19	R/W	0	ACL_CNT_RST_19	See bit[0]
18	R/W	0	ACL_CNT_RST_18	See bit[0]
17	R/W	0	ACL_CNT_RST_17	See bit[0]
16	R/W	0	ACL_CNT_RST_16	See bit[0]
15	R/W	0	ACL_CNT_RST_15	See bit[0]
14	R/W	0	ACL_CNT_RST_14	See bit[0]
13	R/W	0	ACL_CNT_RST_13	See bit[0]
12	R/W	0	ACL_CNT_RST_12	See bit[0]

Table 5-169 ACL_CNT_RESET bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
11	R/W	0	ACL_CNT_RST_11	See bit[0]
10	R/W	0	ACL_CNT_RST_10	See bit[0]
9	R/W	0	ACL_CNT_RST_9	See bit[0]
8	R/W	0	ACL_CNT_RST_8	See bit[0]
7	R/W	0	ACL_CNT_RST_7	See bit[0]
6	R/W	0	ACL_CNT_RST_6	See bit[0]
5	R/W	0	ACL_CNT_RST_5	See bit[0]
4	R/W	0	ACL_CNT_RST_4	See bit[0]
3	R/W	0	ACL_CNT_RST_3	See bit[0]
2	R/W	0	ACL_CNT_RST_2	See bit[0]
1	R/W	0	ACL_CNT_RST_1	See bit[0]
0	R/W	0	ACL_CNT_RST_0	1 = Clear counter

5.7.52 ACL_RATE_CTRL0_0

Address offset: 0x0A00

Table 5-170 summarizes the ACL 0 rate control 0 register.

Table 5-170 ACL_RATE_CTRL0_0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_0	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_0	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.53 ACL_RATE_CTRL1_0

Address offset: 0x0A04

Table 5-171 summarizes the ACL0 rate control 1 register.

Table 5-171 ACL_RATE_CTRL1_0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_0	Borrow enable

Table 5-171 ACL_RATE_CTRL1_0 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
22	R/W	0	ACL_RATE_UNIT_0	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_0	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_0	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_SLOT_0	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot.
17:15	R/W	0	ACL_EBS_0	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_0	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.54 ACL_RATE_CTRL0_1

Address offset: 0x0A08

Table 5-172 summarizes the ACL 1 rate control 0 register.

Table 5-172 ACL_RATE_CTRL0_1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_1	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_1	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.55 ACL_RATE_CTRL1_1

Address offset: 0x0A0C

Table 5-173 summarizes the ACL 1 rate control 1 register.

Table 5-173 ACL_RATE_CTRL1_1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_1	Borrow enable
22	R/W	0	ACL_RATE_UNIT_1	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_1	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_1	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_SLOT_1	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_1	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_1	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.56 ACL_RATE_CTRL0_2

Address offset: 0x0A10

Table 5-174 summarizes the ACL 2 rate control 0 register.

Table 5-174 ACL_RATE_CTRL0_2 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_2	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_2	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.57 ACL_RATE_CTRL1_2

Address offset: 0x0A14

Table 5-175 summarizes the ACL 2 rate control 1 register.

Table 5-175 ACL_RATE_CTRL1_2 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_2	Borrow enable
22	R/W	0	ACL_RATE_UNIT_2	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_2	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_2	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_2	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_2	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_2	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.58 ACL_RATE_CTRL0_3

Address offset: 0x0A18

Table 5-176 summarizes the ACL 3 rate control 0 register.

Table 5-176 ACL_RATE_CTRL0_3 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_3	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_3	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.59 ACL_RATE_CTRL1_3

Address offset: 0x0A1C

Table 5-177 summarizes the ACL 3 rate control 1 register.

Table 5-177 ACL_RATE_CTRL1_3 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_3	Borrow enable
22	R/W	0	ACL_RATE_UNIT_3	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_3	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_3	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_SLOT_3	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_3	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_3	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.60 ACL_RATE_CTRL0_4

Address offset: 0x0A20

Table 5-178 summarizes the ACL 4 rate control 0 register.

Table 5-178 ACL_RATE_CTRL0_4 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_4	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_4	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.61 ACL_RATE_CTRL1_4

Address offset: 0x0A24

Table 5-179 summarizes the ACL 4 rate control 1 register.

Table 5-179 ACL_RATE_CTRL1_4 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_4	Borrow enable
22	R/W	0	ACL_RATE_UNIT_4	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_4	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_4	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_4	ACL ingress rate limit control timer slot. 00 = 100 µs 01 =1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot.
17:15	R/W	0	ACL_EBS_4	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_4	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.62 ACL_RATE_CTRL0_5

Address offset: 0x0A28

Table 5-180 summarizes the ACL 5 rate control 0 register.

Table 5-180 ACL_RATE_CTRL0_5 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_5	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_5	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.63 ACL_RATE_CTRL1_5

Address offset: 0x0A2C

Table 5-181 summarizes the ACL 5 rate control 1 register.

Table 5-181 ACL_RATE_CTRL1_5 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_5	Borrow enable
22	R/W	0	ACL_RATE_UNIT_5	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_5	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_5	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_5	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot.
17:15	R/W	0	ACL_EBS_5	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_5	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.64 ACL_RATE_CTRL0_6

Address offset: 0x0A30

Table 5-182 summarizes the ACL 6 rate control 0 register.

Table 5-182 ACL_RATE_CTRL0_6 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_6	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_6	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.65 ACL_RATE_CTRL1_6

Address offset: 0x0A34

Table 5-183 summarizes the ACL 6 rate control 1 register.

Table 5-183 ACL_RATE_CTRL1_6 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_6	Borrow enable
22	R/W	0	ACL_RATE_UNIT_6	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_6	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_6	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_6	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96kbps, do not select 100us as time slot
17:15	R/W	0	ACL_EBS_6	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_6	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.66 ACL_RATE_CTRL0_7

Address offset: 0x0A38

Table 5-184 summarizes the ACL 7 rate limit control 0 register.

Table 5-184 ACL_RATE_CTRL0_7 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_7	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_7	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.67 ACL_RATE_CTRL1_7

Address offset: 0x0A3C

Table 5-185 summarizes the ACL 7 rate control 1 register.

Table 5-185 ACL_RATE_CTRL1_7 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_7	Borrow enable
22	R/W	0	ACL_RATE_UNIT_7	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_7	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_7	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_SLOT_7	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_7	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_7	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.68 ACL_RATE_CTRL0_8

Address offset: 0x0A40

Table 5-186 summarizes the ACL 8 rate control 0 register.

Table 5-186 ACL_RATE_CTRL0_8 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_8	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_8	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.69 ACL_RATE_CTRL1_8

Address offset: 0x0A44

Table 5-187 summarizes the ACL8 rate control 1 register.

Table 5-187 ACL_RATE_CTRL1_8 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_8	Borrow enable
22	R/W	0	ACL_RATE_UNIT_8	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_8	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_8	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_SLOT_8	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_8	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_8	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.70 ACL_RATE_CTRL0_9

Address offset: 0x0A48

Table 5-188 summarizes the ACL 9 rate control 0 register.

Table 5-188 ACL_RATE_CTRL0_9 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_9	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_9	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.71 ACL_RATE_CTRL1_9

Address offset: 0x0A4C

Table 5-189 summarizes the ACL 9 rate control 1 register.

Table 5-189 ACL_RATE_CTRL1_9 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_9	Borrow enable
22	R/W	0	ACL_RATE_UNIT_9	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_9	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_9	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_SLOT_9	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_9	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_9	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.72 ACL_RATE_CTRL0_10

Address 0x0A50

Table 5-190 summarizes the ACL 10 rate control 0 register.

Table 5-190 ACL_RATE_CTRL0_10 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_10	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_10	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.73 ACL_RATE_CTRL1_10

Address offset: 0x0A54

Table 5-191 summarizes the ACL 10 rate control 1 register.

Table 5-191 ACL_RATE_CTRL1_10 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_10	Borrow enable
22	R/W	0	ACL_RATE_UNIT_10	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_10	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_10	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_10	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_10	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_10	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.74 ACL_RATE_CTRL0_11

Address offset: 0x0A58

Table 5-192 summarizes the ACL 11 rate control 0 register.

Table 5-192 ACL_RATE_CTRL0_11 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_11	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_11	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.75 ACL_RATE_CTRL1_11

Address offset: 0x0A5C

Table 5-193 summarizes the ACL 11 rate control 1 register.

Table 5-193 ACL_RATE_CTRL1_11 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_11	Borrow enable
22	R/W	0	ACL_RATE_UNIT_11	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_11	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_11	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_11	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_11	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_11	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.76 ACL_RATE_CTRL0_12

Address offset: 0x0A60

Table 5-194 summarizes the ACL 12 rate control 0 register.

Table 5-194 ACL_RATE_CTRL0_12 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_12	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_12	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.77 ACL_RATE_CTRL1_12

Address offset: 0x0A64

Table 5-195 summarizes the ACL 12 rate control 1 register.

Table 5-195 ACL_RATE_CTRL1_12 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_12	Borrow enable
22	R/W	0	ACL_RATE_UNIT_12	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_12	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_12	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_12	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot.
17:15	R/W	0	ACL_EBS_12	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_12	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.78 ACL_RATE_CTRL0_13

Address offset: 0x0A68

Table 5-196 summarizes the ACL 13 rate control 0 register.

Table 5-196 ACL_RATE_CTRL0_13 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_13	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_13	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.79 ACL_RATE_CTRL1_13

Address offset: 0x0A6C

Table 5-197 summarizes the ACL 13 rate control 1 register.

Table 5-197 ACL_RATE_CTRL1_13 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_13	Borrow enable
22	R/W	0	ACL_RATE_UNIT_13	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_13	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_13	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_13	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_13	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_13	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.80 ACL_RATE_CTRL0_14

Address offset: 0x0A70

Table 5-198 summarizes the ACL 14 rate control 0 register.

Table 5-198 ACL_RATE_CTRL0_14 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_14	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_14	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.81 ACL_RATE_CTRL1_14

Address offset: 0x0A74

Table 5-199 summarizes the ACL 14 rate control 1 register.

Table 5-199 ACL_RATE_CTRL1_14 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_14	Borrow enable
22	R/W	0	ACL_RATE_UNIT_14	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_14	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_14	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_14	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot.
17:15	R/W	0	ACL_EBS_14	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_14	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.82 ACL_RATE_CTRL0_15

Address offset: 0x0A78

Table 5-200 summarizes the ACL 15 rate limit control 0 register.

Table 5-200 ACL_RATE_CTRL0_15 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_15	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_15	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.83 ACL_RATE_CTRL1_15

Address offset: 0x0A7C

Table 5-201 summarizes the ACL 15 rate limit control 1 register.

Table 5-201 ACL_RATE_CTRL1_15 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_15	Borrow enable
22	R/W	0	ACL_RATE_UNIT_15	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_15	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_15	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_15	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_15	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_15	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.84 ACL_RATE_CTRL0_16

Address offset: 0x0A80

Table 5-202 summarizes the ACL 16 rate limit control 0 register.

Table 5-202 ACL_RATE_CTRL0_16 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_16	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_16	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.85 ACL_RATE_CTRL1_16

Address offset: 0x0A84

Table 5-203 summarizes the ACL 16 rate limit control 1 register.

Table 5-203 ACL_RATE_CTRL1_16 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_16	Borrow enable
22	R/W	0	ACL_RATE_UNIT_16	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_16	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_16	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_16	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_16	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_16	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.86 ACL_RATE_CTRL0_17

Address offset: 0x0A88

Table 5-204 summarizes the ACL 17 rate limit control 0 register.

Table 5-204 ACL_RATE_CTRL1_17 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_17	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_17	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.87 ACL_RATE_CTRL1_17

Address offset: 0x0A8C

Table 5-205 summarizes the ACL 17 rate limit control 1 register.

Table 5-205 ACL_RATE_CTRL1_17 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_17	Borrow enable
22	R/W	0	ACL_RATE_UNIT_17	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_17	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_17	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_SLOT_17	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_17	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_17	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.88 ACL_RATE_CTRL0_18

Address offset: 0x0A90

Table 5-206 summarizes the ACL 18 rate limit control 0 register.

Table 5-206 ACL_RATE_CTRL0_18 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_18	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_18	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.89 ACL_RATE_CTRL1_18

Address offset: 0x0A94

Table 5-207 summarizes the ACL 18 rate limit control 1 register.

Table 5-207 ACL_RATE_CTRL1_18 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_18	Borrow enable
22	R/W	0	ACL_RATE_UNIT_18	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_18	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_18	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_18	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot.
17:15	R/W	0	ACL_EBS_18	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_18	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.90 ACL_RATE_CTRL0_19

Address offset: 0x0A98

Table 5-208 summarizes the ACL 19 rate limit control 0 register.

Table 5-208 ACL_RATE_CTRL0_19 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_19	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_19	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.91 ACL_RATE_CTRL1_19

Address offset: 0x0A9C

Table 5-209 summarizes the ACL 19 rate limit control 1 register.

Table 5-209 ACL_RATE_CTRL1_19 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_19	Borrow enable
22	R/W	0	ACL_RATE_UNIT_19	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_19	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_19	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_19	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_19	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_19	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.92 ACL_RATE_CTRL0_20

Address offset: 0x0AA0

Table 5-210 summarizes the ACL 20 rate limit control 0 register.

Table 5-210 ACL_RATE_CTRL0_20 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_20	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_20	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.93 ACL_RATE_CTRL1_20

Address offset: 0x0AA4

Table 5-211 summarizes the ACL 20 rate limit control 1 register.

Table 5-211 ACL_RATE_CTRL1_20 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_20	Borrow enable
22	R/W	0	ACL_RATE_UNIT_20	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_20	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_20	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_20	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot.
17:15	R/W	0	ACL_EBS_20	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_20	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.94 ACL_RATE_CTRL0_21

Address offset: 0x0AA8

Table 5-212 summarizes the ACL 21 rate limit control 0 register.

Table 5-212 ACL_RATE_CTRL0_21 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_21	Committed burst size for ingress rate limit
14:0	R/W	0	ACL_CIR_21	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.95 ACL_RATE_CTRL1_21

Address offset: 0x0AAC

Table 5-213 summarizes the ACL 21 rate limit control 1 register.

Table 5-213 ACL_RATE_CTRL1_21 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_21	Borrow enable
22	R/W	0	ACL_RATE_UNIT_21	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_21	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_21	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_21	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_21	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_21	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.96 ACL_RATE_CTRL0_22

Address offset: 0x0AB0

Table 5-214 summarizes the ACL 22 rate limit control 0 register.

Table 5-214 ACL_RATE_CTRL0_22 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_22	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_22	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.97 ACL_RATE_CTRL1_22

Address offset: 0x0AB4

Table 5-215 summarizes the ACL 22 rate limit control 1 register.

Table 5-215 ACL_RATE_CTRL1_22 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_22	Borrow enable
22	R/W	0	ACL_RATE_UNIT_22	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_22	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_22	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_22	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_22	Excess burst size for ingress rate limit
14:0	R/W	0X7FFF	ACL_EIR_22	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.98 ACL_RATE_CTRL0_23

Address offset: 0x0AB8

Table 5-216 summarizes the ACL 23 rate limit control 0 register.

Table 5-216 ACL_RATE_CTRL0_23 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_23	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_23	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.99 ACL_RATE_CTRL1_23

Address offset: 0x0ABC

Table 5-217 summarizes the ACL 23 rate limit control 1 register.

Table 5-217 ACL_RATE_CTRL1_23 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_23	Borrow enable
22	R/W	0	ACL_RATE_UNIT_23	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_23	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_23	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_23	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_23	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_23	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.100 ACL_RATE_CTRL0_24

Address offset: 0x0AC0

Table 5-218 summarizes the ACL 24 rate limit control 0 register.

Table 5-218 ACL_RATE_CTRL0_24 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_24	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_24	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.101 ACL_RATE_CTRL1_24

Address offset: 0x0AC4

Table 5-219 summarizes the ACL 24 rate limit control 1 register.

Table 5-219 ACL_RATE_CTRL1_24 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_24	Borrow enable
22	R/W	0	ACL_RATE_UNIT_24	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_24	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_24	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_24	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_24	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_24	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.102 ACL_RATE_CTRL0_25

Address offset: 0x0AC8

Table 5-220 summarizes the ACL 25 rate limit control register 0.

Table 5-220 ACL_RATE_CTRL0_25 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_25	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_25	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.103 ACL_RATE_CTRL1_25

Address offset: 0x0ACC

Table 5-221 summarizes the ACL 25 rate limit control 1 register.

Table 5-221 ACL_RATE_CTRL1_25 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_25	Borrow enable
22	R/W	0	ACL_RATE_UNIT_25	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_25	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_25	Color mode for ingress rate limit
19:18	RO	01	ACL_RATE_TIME_ SLOT_25	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_25	Excess burst size for ingress rate limit
14:0	RO	0x7FFF	ACL_EIR_25	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.104 ACL_RATE_CTRL0_26

Address offset: 0x0AD0

Table 5-222 summarizes the ACL 26 rate limit control 0 register.

Table 5-222 ACL_RATE_CTRL0_26 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_26	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_26	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.105 ACL_RATE_CTRL1_26

Address offset: 0x0AD4

Table 5-223 summarizes the ACL 26 rate limit control 1 register.

Table 5-223 ACL_RATE_CTRL1_26 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_26	Borrow enable
22	R/W	0	ACL_RATE_UNIT_26	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_26	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_26	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_26	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_26	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_26	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.106 ACL_RATE_CTRL0_27

Address offset: 0x0AD8

Table 5-224 summarizes the ACL 27 rate limit control 0 register.

Table 5-224 ACL_RATE_CTRL0_27 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_27	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_27	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.107 ACL_RATE_CTRL1_27

Address offset: 0x0ADC

Table 5-225 summarizes the ACL 27 rate limit control 1 register.

Table 5-225 ACL_RATE_CTRL1_27 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_27	Borrow enable
22	R/W	0	ACL_RATE_UNIT_27	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_27	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_27	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_27	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_27	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_27	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.108 ACL_RATE_CTRL0_28

Address offset: 0x0AE0

Table 5-226 summarizes the ACL 28 rate limit control 0 register.

Table 5-226 ACL_RATE_CTRL0_28 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_28	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_28	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.109 ACL_RATE_CTRL1_28

Address offset: 0x0AE4

Table 5-227 summarizes the ACL 28 rate limit control 1 register.

Table 5-227 ACL_RATE_CTRL1_28 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_28	Borrow enable
22	R/W	0	ACL_RATE_UNIT_28	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_28	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_28	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_28	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_28	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_28	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.110 ACL_RATE_CTRL0_29

Address offset: 0x0AE8

Table 5-228 summarizes the ACL 29 rate limit control 0 register.

Table 5-228 ACL_RATE_CTRL0_29 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_29	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_29	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.111 ACL_RATE_CTRL1_29

Address offset: 0x0AEC

Table 5-229 summarizes the ACL 29 rate limit control 1 register.

Table 5-229 ACL_RATE_CTRL1_29 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_29	Borrow enable
22	R/W	0	ACL_RATE_UNIT_29	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_29	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_29	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_29	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_29	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_29	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.112 ACL_RATE_CTRL0_30

Address offset: 0x0AF0

Table 5-230 summarizes the ACL 30 rate limit control 0 register.

Table 5-230 ACL_RATE_CTRL0_30 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_30	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_30	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.113 ACL_RATE_CTRL1_30

Address offset: 0x0AF4

Table 5-231 summarizes the ACL 30 rate limit control 1 register.

Table 5-231 ACL_RATE_CTRL1_30 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_30	Borrow enable
22	R/W	0	ACL_RATE_UNIT_30	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_30	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_30	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_30	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot
17:15	R/W	0	ACL_EBS_30	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_30	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.114 ACL_RATE_CTRL0_31

Address offset: 0x0AF8

Table 5-232 summarizes the ACL 31 rate limit control 0 register.

Table 5-232 ACL_RATE_CTRL0_31 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:18	RO	0	RESERVED	
17:15	R/W	0	ACL_CBS_31	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_CIR_31	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.115 ACL_RATE_CTRL1_31

Address offset: 0x0AFC

Table 5-233 summarizes the ACL 31 rate limit control 1 register.

Table 5-233 ACL_RATE_CTRL1_31 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ACL_BORROW_EN_31	Borrow enable
22	R/W	0	ACL_RATE_UNIT_31	0 = Bytes 1 = Packets
21	R/W	0	ACL_CF_31	Coupling flag for ingress rate limit
20	R/W	0	ACL_CM_31	Color mode for ingress rate limit
19:18	R/W	01	ACL_RATE_TIME_ SLOT_31	ACL ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot.
17:15	R/W	0	ACL_EBS_31	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ACL_EIR_31	Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.116 PORT0_ING_RATE_CTRL0

Address offset: 0x0B00

Table 5-234 summarizes the port 0 ingress rate limit control 0 register.

Table 5-234 PORT0_ING_RATE_CTRL0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	R/W	‘h18	ADD_RATE_BYTE_0	Byte number is added to frame when calculate rate limit. Default is 24 bytes for IPG, preamble, CRC and SFD.
23:22	R/W	01	ING_RATE_C_ TIME_SLOT_0	Committed Ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot.
21	RO	0	RESERVED	
20	R/W	0	ING_RATE_MODE_0	0 = Two single rate 1 = One two-rate three-color

Table 5-234 PORT0_ING_RATE_CTRL0 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
19:18	RO	0	RESERVED	
17:15	/W	0	ING_CBS_0	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ING_CIR_0	Committed Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.117 PORT0_ING_RATE_CTRL1

Address offset: 0x0B04

Table 5-235 summarizes the port 0 ingress rate limit control 1 register.

Table 5-235 PORT0_ING_RATE_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ING_BORROW_EN_0	Borrow enable
22	R/W	0	ING_RATE_UNIT_0	0 = Bytes 1 = Packets
21	R/W	0	ING_CF_0	Coupling flag for ingress rate limit
20	R/W	0	ING_CM_0	Color mode for ingress rate limit
19:18	R/W	01	ING_RATE_E_TIME_SLOT_0	Excess Ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot.
17:15	R/W	0	ING_EBS_0	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ING_EIR_0	Excess Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.118 PORT0_ING_RATE_CTRL2

Address offset: 0x0B08

Table 5-236 summarizes the port 0 ingress rate limit control 2 register.

Table 5-236 PORT0_ING_RATE_CTRL2 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:16	RO	0	RESERVED	
15	R/W	0	ING_C_MULTI_RATE_EN_0	Ingress committed rate limit enable to count the multicast frames
14	R/W	0	ING_C_UNI_RATE_EN_0	Ingress committed rate limit enable to count the unicast frames
13	R/W	0	ING_C_UNK_MULTI_RATE_EN_0	Ingress committed rate limit enable to count the unknown multicast frames
12	R/W	0	ING_C_UNK_UNI_RATE_EN_0	Ingress committed rate limit enable to count the unknown unicast frames
11	R/W	0	ING_C_BROAD_RATE_EN_0	Ingress committed rate limit enable to count the broadcast frames
10	R/W	0	ING_C_MANAGE_RATE_EN_0	Ingress committed rate limit enable to count the management frames
9	R/W	0	ING_C_TCP_CTRL_RATE_EN_0	Ingress committed rate limit enable to count the TCP control frames
8	R/W	0	ING_C_ING_MIRROR_RATE_EN_0	Ingress committed rate limit enable to count the ingress mirror frames
7	R/W	0	ING_E_MULTI_RATE_EN_0	Ingress excess rate limit enable to count the multicast frames
6	R/W	0	ING_E_UNI_RATE_EN_0	Ingress excess rate limit enable to count the unicast frames
5	R/W	0	ING_E_UNK_MULTI_RATE_EN_0	Ingress excess rate limit enable to count the unknown multicast frames
4	R/W	0	ING_E_UNK_UNI_RATE_EN_0	Ingress excess rate limit enable to count the unknown unicast frames
3	R/W	0	ING_E_BROAD_RATE_EN_0	Ingress excess rate limit enable to count the broadcast frames
2	R/W	0	ING_E_MANAGE_RATE_EN_0	Ingress excess rate limit enable to count the management frames
1	R/W	0	ING_E_TCP_CTRL_RATE_EN_0	Ingress excess rate limit enable to count the TCP control frames
0	R/W	0	ING_E_ING_MIRROR_RATE_EN_0	Ingress excess rate limit enable to count the ingress mirror frames

5.7.119 PORT2_ING_RATE_CTRL0

Address offset: 0x0B20

Table 5-237 summarizes the port 2 ingress rate limit control 0 register.

Table 5-237 PORT2_ING_RATE_CTRL0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	R/W	'h18	ADD_RATE_BYTE_2	Byte number is added to frame when calculate rate limit. Default is 24 bytes for IPG, preamble, CRC and SFD.
23:22	R/W	01	ING_RATE_C_TIME_SLOT_2	Committed Ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot.
21	RO	0	RESERVED	
20	R/W	0	ING_RATE_MODE_2	0 = Two single rate 1 = One two-rate three-color
19:18	RO	0	RESERVED	
17:15	R/W	0	ING_CBS_2	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ING_CIR_2	Committed Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 2. If these bits are set to 15'h0, no frame is received in from this port.

5.7.120 PORT2_ING_RATE_CTRL1

Address offset: 0x0B24

Table 5-238 summarizes the port 2 ingress rate limit control 1 register.

Table 5-238 PORT2_ING_RATE_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ING_BORROW_EN_2	Borrow enable
22	R/W	0	ING_RATE_UNIT_2	0 = Bytes 1 = Packets
21	R/W	0	ING_CF_2	Coupling flag for ingress rate limit
20	R/W	0	ING_CM_2	Color mode for ingress rate limit

Table 5-238 PORT2_ING_RATE_CTRL1 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
19:18	R/W	01	ING_RATE_E_TIME_ SLOT_2	Excess Ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot.
17:15	R/W	0	ING_EBS_2	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ING_EIR_2	Excess Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.121 PORT2_ING_RATE_CTRL2

Address offset: 0x0B28

Table 5-239 summarizes the port 2 ingress rate limit control 2 register.

Table 5-239 PORT2_ING_RATE_CTRL2 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:16	RO	0	RESERVED	
15	R/W	0	ING_C_MULTI_RATE_EN_2	Ingress committed rate limit enable to count the multicast frames
14	R/W	0	ING_C_UNI_RATE_EN_2	Ingress committed rate limit enable to count the unicast frames
13	R/W	0	ING_C_UNK_MULTI_RATE_EN_2	Ingress committed rate limit enable to count the unknown multicast frames
12	R/W	0	ING_C_UNK_UNI_RATE_EN_2	Ingress committed rate limit enable to count the unknown unicast frames
11	R/W	0	ING_C_BROAD_RATE_EN_2	Ingress committed rate limit enable to count the broadcast frames
10	R/W	0	ING_C_MANAGE_RATE_EN_2	Ingress committed rate limit enable to count the management frames
9	R/W	0	ING_C_TCP_CTRL_RATE_EN_2	Ingress committed rate limit enable to count the TCP control frames
8	R/W	0	ING_C_ING_MIRROR_RATE_EN_2	Ingress committed rate limit enable to count the ingress mirror frames
7	R/W	0	ING_E_MULTI_RATE_EN_2	Ingress excess rate limit enable to count the multicast frames
6	R/W	0	ING_E_UNI_RATE_EN_2	Ingress excess rate limit enable to count the unicast frames

Table 5-239 PORT2_ING_RATE_CTRL2 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
5	R/W	0	ING_E_UNK_MULTI_RATE_EN_2	Ingress excess rate limit enable to count the unknown multicast frames
4	R/W	0	ING_E_UNK_UNI_RATE_EN_2	Ingress excess rate limit enable to count the unknown unicast frames
3	R/W	0	ING_E_BROAD_RATE_EN_2	Ingress excess rate limit enable to count the broadcast frames
2	R/W	0	ING_E_MANAGE_RATE_EN_2	Ingress excess rate limit enable to count the management frames
1	R/W	0	ING_E_TCP_CTRL_RATE_EN_2	Ingress excess rate limit enable to count the TCP control frames
0	R/W	0	ING_E_ING_MIRROR_RATE_EN_2	Ingress excess rate limit enable to count the ingress mirror frames

5.7.122 PORT3_ING_RATE_CTRL0

Address offset: 0x0B30

Table 5-240 summarizes the port 3 ingress rate limit control 0 register.

Table 5-240 PORT3_ING_RATE_CTRL0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	R/W	‘h18	ADD_RATE_ BYTE_3	Byte number is added to frame when calculate rate limit. Default is 24 bytes for IPG, preamble, CRC and SFD.
23:22	R/W	01	ING_RATE_C_ TIME_SLOT_3	Committed Ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot.
21	RO	0	RESERVED	
20	R/W	0	ING_RATE_ MODE_3	0 = Two single rate 1 = One two-rate three-color
19:18	RO	0	RESERVED	
17:15	R/W	0	ING_CBS_3	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ING_CIR_3	Committed Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 2. If these bits are set to 15'h0, no frame is received in from this port.

5.7.123 PORT3_ING_RATE_CTRL1

Address offset: 0x0B34

Table 5-241 summarizes the port 3 ingress rate limit control 1 register.

Table 5-241 PORT3_ING_RATE_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	0	RESERVED	
23	R/W	0	ING_BORROW_EN_3	Borrow enable
22	R/W	0	ING_RATE_UNIT_3	0 = Bytes 1 = Packets
21	R/W	0	ING_CF_3	Coupling flag for ingress rate limit
20	R/W	0	ING_CM_3	Color mode for ingress rate limit
19:18	R/W	01	ING_RATE_E_TIME_ SLOT_3	Excess Ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot.
17:15	R/W	0	ING_EBS_3	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ING_EIR_3	Excess Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.124 PORT3_ING_RATE_CTRL2

Address offset: 0x0B38

Table 5-242 summarizes the port 3 ingress rate limit control 2 register.

Table 5-242 PORT3_ING_RATE_CTRL2 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:16	RO	0	RESERVED	
15	R/W	0	ING_C_MULTI_RATE_EN_3	Ingress committed rate limit enable to count the multicast frames
14	R/W	0	ING_C_UNI_RATE_EN_3	Ingress committed rate limit enable to count the unicast frames
13	R/W	0	ING_C_UNK_MULTI_RATE_EN_3	Ingress committed rate limit enable to count the unknown multicast frames

Table 5-242 PORT3_ING_RATE_CTRL2 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
12	R/W	0	ING_C_UNK_UNI_RATE_EN_3	Ingress committed rate limit enable to count the unknown unicast frames
11	R/W	0	ING_C_BROAD_RATE_EN_3	Ingress committed rate limit enable to count the broadcast frames
10	R/W	0	ING_C_MANAGE_RATE_EN_3	Ingress committed rate limit enable to count the management frames
9	R/W	0	ING_C_TCP_CTRL_RATE_EN_3	Ingress committed rate limit enable to count the TCP control frames
8	R/W	0	ING_C_ING_MIRROR_RATE_EN_3	Ingress committed rate limit enable to count the ingress mirror frames
7	R/W	0	ING_E_MULTI_RATE_EN_3	Ingress excess rate limit enable to count the multicast frames
6	R/W	0	ING_E_UNI_RATE_EN_3	Ingress excess rate limit enable to count the unicast frames
5	R/W	0	ING_E_UNK_MULTI_RATE_EN_3	Ingress excess rate limit enable to count the unknown multicast frames
4	R/W	0	ING_E_UNK_UNI_RATE_EN_3	Ingress excess rate limit enable to count the unknown unicast frames
3	R/W	0	ING_E_BROAD_RATE_EN_3	Ingress excess rate limit enable to count the broadcast frames
2	R/W	0	ING_E_MANAGE_RATE_EN_3	Ingress excess rate limit enable to count the management frames
1	R/W	0	ING_E_TCP_CTRL_RATE_EN_3	Ingress excess rate limit enable to count the TCP control frames
0	R/W	0	ING_E_ING_MIRROR_RATE_EN_3	Ingress excess rate limit enable to count the ingress mirror frames

5.7.125 PORT6_ING_RATE_CTRL0

Address offset: 0x0B60

Table 5-243 summarizes the port 6 ingress rate limit control 0 register.

Table 5-243 PORT6_ING_RATE_CTRL0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	R/W	'h18	ADD_RATE_BYTE_6	Byte number is added to frame when calculate rate limit. Default is 24 bytes for IPG, preamble, CRC and SFD.
23:22	R/W	01	ING_RATE_C_TIME_SLOT_6	Committed Ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot.
21	RO	0	RESERVED	
20	R/W	0	ING_RATE_MODE_6	0 = Two single rate 1 = One two-rate three-color
19:18	RO	0	RESERVED	
17:15	R/W	0	ING_CBS_6	Committed burst size for ingress rate limit
14:0	R/W	0x7FFF	ING_CIR_6	Committed Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for egress priority 2. If these bits are set to 15'h0, no frame is received in from this port.

5.7.126 PORT6_ING_RATE_CTRL1

Address offset: 0x0B64

Table 5-244 summarizes the port 6 ingress rate limit control 1 register.

Table 5-244 PORT6_ING_RATE_CTRL1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:24	RO	'h18	RESERVED	
23	R/W	0	ING_BORROW_EN_6	Borrow enable
22	R/W	0	ING_RATE_UNIT_6	0 = Bytes 1 = Packets
21	R/W	0	ING_CF_6	Coupling flag for ingress rate limit
20	R/W	0	ING_CM_6	Color mode for ingress rate limit

Table 5-244 PORT6_ING_RATE_CTRL1 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
19:18	R/W	01	ING_RATE_E_TIME_ SLOT_6	Excess Ingress rate limit control timer slot. 00 = 100 µs 01 = 1 ms 10 = 10 ms 11 = 100 ms Note: If port rate limit set to less than 96 kbps, do not select 100 µs as time slot.
17:15	R/W	0	ING_EBS_6	Excess burst size for ingress rate limit
14:0	R/W	0x7FFF	ING_EIR_6	Excess Ingress rate limit for all priority. Rate is limited to times of 32 kbps. Default 15'h7FFF is for disable rate limit for ingress. If these bits are set to 15'h0, no frame is received in from this port.

5.7.127 PORT6_ING_RATE_CTRL2

Address offset: 0x0B68

Table 5-245 summarizes the port 6 ingress rate limit control 2 register.

Table 5-245 PORT6_ING_RATE_CTRL2 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:16	RO	0	RESERVED	
15	R/W	0	ING_C_MULTI_RATE_EN_6	Ingress committed rate limit enable to count the multicast frames
14	R/W	0	ING_C_UNI_RATE_EN_6	Ingress committed rate limit enable to count the unicast frames
13	R/W	0	ING_C_UNK_MULTI_RATE_EN_6	Ingress committed rate limit enable to count the unknown multicast frames
12	R/W	0	ING_C_UNK_UNI_RATE_EN_6	Ingress committed rate limit enable to count the unknown unicast frames
11	R/W	0	ING_C_BROAD_RATE_EN_6	Ingress committed rate limit enable to count the broadcast frames
10	R/W	0	ING_C_MANAGE_RATE_EN_6	Ingress committed rate limit enable to count the management frames
9	R/W	0	ING_C_TCP_CTRL_RATE_EN_6	Ingress committed rate limit enable to count the TCP control frames
8	R/W	0	ING_C_ING_MIRROR_RATE_EN_6	Ingress committed rate limit enable to count the ingress mirror frames
7	R/W	0	ING_E_MULTI_RATE_EN_6	Ingress excess rate limit enable to count the multicast frames
6	R/W	0	ING_E_UNI_RATE_EN_6	Ingress excess rate limit enable to count the unicast frames

Table 5-245 PORT6_ING_RATE_CTRL2 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
5	R/W	0	ING_E_UNK_MULTI_RATE_EN_6	Ingress excess rate limit enable to count the unknown multicast frames
4	R/W	0	ING_E_UNK_UNI_RATE_EN_6	Ingress excess rate limit enable to count the unknown unicast frames
3	R/W	0	ING_E_BROAD_RATE_EN_6	Ingress excess rate limit enable to count the broadcast frames
2	R/W	0	ING_E_MANAGE_RATE_EN_6	Ingress excess rate limit enable to count the management frames
1	R/W	0	ING_E_TCP_CTRL_RATE_EN_6	Ingress excess rate limit enable to count the TCP control frames
0	R/W	0	ING_E_ING_MIRROR_RATE_EN_6	Ingress excess rate limit enable to count the ingress mirror frames

5.7.128 CPU_GROUP_CTRL

Address offset: 0x0B70

Table 5-246 summarizes the CPU packet remap priority control register.

Table 5-246 CPU_GROUP_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	0	CPU_GROUP_REMAP_EN	Remap the packet (to CPU) priority
30:23	RO	0	RESERVED	
22:20	R/W	0	CPU_GROUP5_PRI	Header type 5'h19–5'h1A
19	RO	0	RESERVED	
18:16	R/W	1	CPU_GROUP4_PRI	Header type 5'h17–5'h18
15	RO	0	RESERVED	
14:12	R/W	2	CPU_GROUP3_PRI	Header type 5'hE–5'h16
11	RO	0	RESERVED	
10:8	R/W	3	CPU_GROUP2_PRI	Header type 5'h5–5'hD
7	RO	0	RESERVED	
6:4	R/W	4	CPU_GROUP1_PRI	Header type 5'h3,5'h4
3	RO	0	RESERVED	
2:0	R/W	5	CPU_GROUP0_PRI	Header type 5'h1,5'h2. 5'h1C

5.8 PKT edit control registers

Table 5-247 summarizes the packet editor registers.

Table 5-247 Packet editor register summary

Offset range	Name
0x0C00	PKT edit control register
0x0C40–0x0C44	Port0 queue remap register
0x0C4C	Port2 queue remap register
0x0C50	Port3 queue remap register
0x0C60–0x0C64	Port6 queue remap register
0x0C70-0x0C7C	Router default VID register
0x0C80	Router egress VLAN mode register

5.8.1 PKT_EDIT_CTRL

Address offset: 0x0C00

Table 5-248 summarizes the PKT edit control register.

Table 5-248 PKT_EDIT_CTRL bit description

Bits	R/W	Initial value	Mnemonic	Description
31:27	RO	0	RESERVED	
26	R/W	0	VLAN_PRI_REMAP_EN_6	1 = Frame sent out from port6; remap priority based on frame priority.
25	RO	0	RESERVED	
24	RO	0	RESERVED	
23	R/W	0	VLAN_PRI_REMAP_EN_3	1 = Frame sent out from port3; remap priority based on frame priority.
22	R/W	0	VLAN_PRI_REMAP_EN_2	1 = Frame sent out from port2; remap priority based on frame priority.
21	RO	0	RESERVED	
20	R/W	0	VLAN_PRI_REMAP_EN_0	1 = Frame sent out from port0; remap priority based on frame priority.
19:12	R/W	0	IP_TTL	
11	R/W	0	IP_TTL_CHANGE_EN	1 = Frame TTL change to IP_TTL.
10	R/W	0	IPV4_ID_RANDOM_EN	1 = Frame sent out with random ID.
9	R/W	0	IPV4_DF_CLEAR_EN	1 = IPv4 DF field cleared to zero.
8	RO	0	RESERVED	
7	RO	0	RESERVED	
6:2	RO	0	RESERVED	

Table 5-248 PKT_EDIT_CTRL bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
1	R/W	0	TO_CPU_VID_CHG_EN	The VID option for the TO CPU frames. 0 = Keep original VID 1 = Change to internal VID
0	R/W	0	RM_RTD_PPPOE_EN	When packet is routed, and the PPPOE_CMD in ARP table is zero. 0 = Do nothing. 1 = Remove PPPoE header if the packet has PPPoE header.

5.8.2 PORT0_QUEUE_REMAP_REG0

Address offset: 0x0C40

Table 5-249 summarizes the port 0 queue remap register 0.

Table 5-249 PORT0_QUEUE_REMAP_REG0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	0	PORT0_QUEUE3_EN	Enable queue 3 remap
30:28	RO	0	RESERVED	
27:24	R/W	0	PORT0_QUEUE3_IDX	Queue 3 remap table index
23	R/W	0	PORT0_QUEUE2_EN	Enable queue 2 remap
22:20	RO	0	RESERVED	
19:16	R/W	0	PORT0_QUEUE2_IDX	Queue 2 remap table index
15	R/W	0	PORT0_QUEUE1_EN	Enable queue 1 remap
14:12	RO	0	RESERVED	
11:8	R/W	0	PORT0_QUEUE1_IDX	Queue 1 remap table index
7	R/W	0	PORT0_QUEUE0_EN	Enable queue 0 remap
6:4	RO	0	RESERVED	
3:0	R/W	0	PORT0_QUEUE0_IDX	Queue 0 remap table index

5.8.3 PORT0_QUEUE_REMAP_REG1

Address offset: 0x0C44

Table 5-250 summarizes the port 0 queue remap register 1.

Table 5-250 PORT0_QUEUE_REMAP_REG0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:16	RO	0	RESERVED	
15	R/W	0	PORT0_QUEUE5_EN	Enable queue 5 remap
14:12	RO	0	RESERVED	
11:8	R/W	0	PORT0_QUEUE5_IDX	Queue 5 remap table index
7	R/W	0	PORT0_QUEUE4_EN	Enable queue 4 remap
6:4	RO	0	RESERVED	
3:0	R/W	0	PORT0_QUEUE4_IDX	Queue 4 remap table index

5.8.4 PORT2_QUEUE_REMAP_REG0

Address offset: 0x0C4C

Table 5-251 summarizes the port 2 queue remap register 0.

Table 5-251 PORT2_QUEUE_REMAP_REG0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	0	PORT2_QUEUE3_EN	Enable queue 3 remap
30:28	RO	0	RESERVED	
27:24	R/W	0	PORT2_QUEUE3_IDX	Queue 3 remap table index
23	R/W	0	PORT2_QUEUE2_EN	Enable queue 2 remap
22:20	RO	0	RESERVED	
19:16	R/W	0	PORT2_QUEUE2_IDX	Queue 2 remap table index
15	R/W	0	PORT2_QUEUE1_EN	Enable queue 1 remap
14:12	RO	0	RESERVED	
11:8	R/W	0	PORT2_QUEUE1_IDX	Queue 1 remap table index
7	R/W	0	PORT2_QUEUE0_EN	Enable queue 0 remap
6:4	RO	0	RESERVED	
3:0	R/W	0	PORT2_QUEUE0_IDX	Queue 0 remap table index

5.8.5 PORT3_QUEUE_REMAP_REG0

Address offset: 0x0C50

Table 5-252 summarizes the port 3 queue remap register 0.

Table 5-252 PORT3_QUEUE_REMAP_REG0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	0	PORT3_QUEUE3_EN	Enable queue 3 remap
30:28	RO	0	RESERVED	
27:24	R/W	0	PORT3_QUEUE3_IDX	Queue 3 remap table index
23	R/W	0	PORT3_QUEUE2_EN	Enable queue 2 remap
22:20	RO	0	RESERVED	
19:16	R/W	0	PORT3_QUEUE2_IDX	Queue 2 remap table index
15	R/W	0	PORT3_QUEUE1_EN	Enable queue 1 remap
14:12	RO	0	RESERVED	
11:8	R/W	0	PORT3_QUEUE1_IDX	Queue 1 remap table index
7	R/W	0	PORT3_QUEUE0_EN	Enable queue 0 remap
6:4	RO	0	RESERVED	
3:0	R/W	0	PORT3_QUEUE0_IDX	Queue 0 remap table index

5.8.6 PORT6_QUEUE_REMAP_REG0

Address offset: 0x0C60

Table 5-253 summarizes the port 6 queue remap register 0.

Table 5-253 PORT6_QUEUE_REMAP_REG0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31	R/W	0	PORT6_QUEUE3_EN	Enable queue 3 remap
30:28	RO	0	RESERVED	
27:24	R/W	0	PORT6_QUEUE3_IDX	Queue 3 remap table index
23	R/W	0	PORT6_QUEUE2_EN	Enable queue 2 remap
22:20	RO	0	RESERVED	
19:16	R/W	0	PORT6_QUEUE2_IDX	Queue 2 remap table index
15	R/W	0	PORT6_QUEUE1_EN	Enable queue 1 remap
14:12	RO	0	RESERVED	
11:8	R/W	0	PORT6_QUEUE1_IDX	Queue 1 remap table index Enable queue 0 remap Queue 0 remap table index
7	R/W	0	PORT6_QUEUE0_EN	Enable queue 0 remap
6:4	RO	0	RESERVED	
3:0	R/W	0	PORT6_QUEUE0_IDX	Queue 0 remap table index

5.8.7 PORT6_QUEUE_REMAP_REG1

Address offset: 0x0C64

Table 5-254 summarizes the port 6 queue remap register 1.

Table 5-254 PORT6_QUEUE_REMAP_REG1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:16	RO	0	RESERVED	
15	R/W	0	PORT6_QUEUE5_EN	Enable queue 5 remap
14:12	RO	0	RESERVED	
11:8	R/W	0	PORT6_QUEUE5_IDX	Queue 5 remap table index
7	RO	0	PORT6_QUEUE4_EN	Enable queue 4 remap
6:4	RO	0	RESERVED	
3:0	R/W	0	PORT6_QUEUE4_IDX	Queue 4 remap table index

5.8.8 Router default VID register 0

Address offset: 0x0C70

Table 5-255 summarizes the router default VID register 0.

Table 5-255 Router default VID register 0 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:28	RO	0	RESERVED	
27:16	RO	1	RESERVED	
15:12	RO	0	RESERVED	
11:0	R/W	1	ROUTER_DEFAULT_VID0	Port 0 default VID for router

5.8.9 Router default VID register 1

Address offset: 0x0C74

Table 5-256 summarizes the router default VID register 1.

Table 5-256 Router default VID register 1 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:28	RO	0	Reserved	
27:16	R/W	1	ROUTER_DEFAULT_VID3	Port 3 default VID for router

Table 5-256 Router default VID register 1 bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
15:12	RO	0	Reserved	
11:0	R/W	1	ROUTER_DEFAULT_VID2	Port 2 default VID for router

5.8.10 Router default VID register 3

Address offset: 0x0C7C

Table 5-257 summarizes the router default VID register 3.

Table 5-257 Router default VID register 3 bit description

Bits	R/W	Initial value	Mnemonic	Description
31:12	RO	0	Reserved	
11:0	R/W	1	ROUTER_DEFAULT_VID6	Port 6 default VID for router

5.8.11 Router egress VLAN mode

Address offset: 0x0C80

Table 5-258 summarizes the router default VID register 3.

Table 5-258 Router egress VLAN mode bit description

Bits	R/W	Initial value	Mnemonic	Description
31:26	RO	0	RESERVED	
25:24	R/W	0	ROUTER_EG_VLAN_MODE6	Router egress VLAN mode of port 6
23:22	RO	0	RESERVED	
21:20	RO	0	RESERVED	
19:18	RO	0	RESERVED	
17:16	RO	0	RESERVED	
15:14	RO	0	RESERVED	
13:12	R/W	0	ROUTER_EG_VLAN_MODE3	Router egress VLAN mode of port 3
11:10	RO	0	RESERVED	
9:8	R/W	0	ROUTER_EG_VLAN_MODE2	Router egress VLAN mode of port 2
7:6	RO	0	RESERVED	
5:4	RO	0	RESERVED	

Table 5-258 Router egress VLAN mode bit description (cont.)

Bits	R/W	Initial value	Mnemonic	Description
3:2	RO	0	RESERVED	
1:0	R/W	0	ROUTER_EG_VLAN_MODE0	Router egress VLAN mode of port 0 00 = Egress transmits frames unmodified 01 = Egress transmits frames without VLAN 10 = Egress transmits frames with VLAN 11 = Untouched

5.9 PHY control registers

Table 5-259 summarizes the PHY control registers.

Table 5-259 PHY control register summary

Offset (Hex)	Description
0	Control register
1	Status register
2	PHY identifier
3	PHY identifier 2
4	Auto-negotiation advertisement register
5	Link partner ability register
6	Auto-negotiation expansion register
7	Next page transmit register
8	Link partner next page register
9	1000BASE-T control register
A	1000BASE-T status register
B	Reserved
C	Reserved
D	Reserved
E	Reserved
F	Extended status register
10	PHY-specific control register
11	PHY-specific status register
12	Interrupt enable register
13	Interrupt status register
14	Extended PHY-specific register
15	Receive error counter register
16	Virtual cable tester control register

Table 5-259 PHY control register summary (cont.)

Offset (Hex)	Description
17	Reserved
18	Reserved
19	Reserved
1A	Reserved
1B	Reserved
1D	Debug port 1 (address offset)
1E	Debug port 2 (data port)
1F	Reserved

Table 5-260 summarizes the registers in MMD3 (MDIO manageable device address 3 for PCS).

Table 5-260 PHY control register summary — MMD3

Offset (Hex)	Description
0	PCS control register
1	PCS status register
E	EEE capability
16	EEE wake error counter

Table 5-261 summarizes the registers in MMD7 (MDIO manageable device address 7 for PCS).

Table 5-261 PHY control register summary — MMD7

Offset	Description
0	AN control
1	AN status
5	AN package register
2	AN XNP transmit
17	AN XNP transmit1
18	AN XNP transmit2
19	ANXNP ability
1A	ANXNP ability1
1B	ANXNP ability2
3C	EEE advertisement
3D	EEE LP advertisement
8000	EEE ability auto-negotiation result

5.9.1 Control register

Address offset: 0x00

Table 5-262 summarizes the control registers.

Table 5-262 Control register bit description

Bits	Symbol	Type		Description
15	RESET	Mode	R/W	PHY Software Reset. Writing a 1 to this bit causes the PHY the reset operation is done, this bit is cleared to 0 automatically. The reset occurs immediately. 0 = Normal operation 1 = PHY reset
		HW Rst	0	
		SW Rst	SC	
14	LOOPBACK	Mode	R/W	When loopback is activated, the transmitter data presented on TXD is looped back to RXD internally. Link is broken when loopback is enabled. 0 = Disable loopback 1 = Enable loopback
		HW Rst	0	
		SW Rst	0	
13	SPEED SELECTION	Mode	R/W	11 = Reserved 10 = 1000 Mb/s 01 = 100 Mb/s 00 = 10 Mb/s
		HW Rst	0	
		SW Rst	Retain	
12	AUTO-NEGOTIATION	Mode	R/W	0 = Disable auto-negotiation process 1 = Enable auto-negotiation process
		HW Rst	1	
		SW Rst	Retain	
11	POWER DOWN	Mode	R/W	When the port is switched from power down to normal operation, software reset and restart auto-negotiation are performed even when bits reset (bit[15]) and restart auto-negotiation (bit[9]) are not set by the user. 0 = Normal operation 1 = Power down
		HW Rst	0	
		SW Rst	0	
10	ISOLATE	Mode	R/W	The GMII/MII output pins are tristated when this bit is set to 1. The GMII/MII inputs are ignored. 0 = Normal operation 1 = Isolate
		HW Rst	0	
		SW Rst	0	
9	RESTART AUTO-NEGOTIATION	Mode	R/W, SC	Auto-negotiation automatically restarts after hardware or software reset regardless of whether or not the restart bit (bit[9]) is set. 0 = Normal operation 1 = Restart auto-negotiation process
		HW Rst	0	
		SW Rst	SC	
8	DUPLEX MODE	Mode	R/W, SC	0 = Half-duplex 1 = Full-duplex
		HW Rst	1	
		SW Rst	Retain	

Table 5-262 Control register bit description (cont.)

Bits	Symbol	Type		Description
7	COLLISION TEST	Mode	R/W	Setting this bit to 1 causes the COL pin to assert whenever the TX_EN pin is asserted. 0 = Disable COL signal test 1 = Enable COL signal test
		HW Rst	0	
		SW Rst	0	
6	SPEED SELECTION (MSB)	Mode	R/W	See bit[13]
		HW Rst	See Desc.	
		SW Rst		
5:0	RESERVED	Mode	RO	Always be 00000.
		HW Rst	000000	
		SW Rst	00000	

5.9.2 Status Register

Address offset: 0x01, or 0d01

Table 5-263 summarizes the status registers.

Table 5-263 Status registers bit description

Bits	Symbol	Type		Description
15	100BASE-T4	Mode	RO	100BASE-T4 This protocol is not available. 0 = PHY not able to perform 100BASE-T4
		HW Rst	Always 0	
		SW Rst	Always 0	
14	100BASE-X FULL	Mode	RO	Capable of 100BASE-Tx full-duplex operation
		HW Rst	Always 1	
		SW Rst	Always 1	
13	100BASE-X HALF	Mode	RO	Capable of 100BASE-Tx half-duplex operation
		HW Rst	Always 1	
		SW Rst	Always 1	
12	10 MBPS FULL-DUPLEX	Mode	RO	Capable of 10BASE-Te full duplex operation
		HW Rst	Always 1	
		SW Rst	Always 1	
11	10 MBPS HALF-DUPLEX	Mode	RO	Capable of 10 Mbps half duplex operation
		HW Rst	Always 1	
		SW Rst	Always 1	
10	100BASE-T2 FULL-DUPLEX	Mode	RO	Not able to perform 100BASE-T2
		HW Rst	Always 0	
		SW Rst	Always 0	

Table 5-263 Status registers bit description (cont.)

Bits	Symbol	Type		Description
9	100BASE-T2 HALF-DUPLEX	Mode	RO	Not able to perform 100BASE-T2
		HW Rst	Always 0	
		SW Rst	Always 0	
8	EXTENDED STATUS	Mode	RO	Extended status information in the extended status register
		HW Rst	Always 0	
		SW Rst	Always 0	
7	RESERVED	Mode	RO	Always be 0.
		HW Rst	Always 0	
		SW Rst	Always 0	
6	MF PREAMBLE SUPPRESSION	Mode	RO	PHY accepts management frames with preamble suppressed
		HW Rst	Always 1	
		SW Rst	Always 1	
5	AUTO-NEGOTIATION COMPLETE	Mode	RO	0 = Auto-negotiation process incomplete 1 = Auto-negotiation process complete
		HW Rst	0	
		SW Rst	0	
4	REMOTE FAULT	Mode	RO, LH	0 = Remote fault condition not detected 1 = Remote fault condition detected
		HW Rst	0	
		SW Rst	0	
3	AUTO-NEGOTIATION ABILITY	Mode	RO	1 = PHY able to perform auto-negotiation
		HW Rst	Always 1	
		SW Rst	Always 1	
2	LINK STATUS	Mode	RO, LL	This register bit indicates whether the link was lost since the last read. For the current link status, read bit[10] of PHY-specific status register. 0 = Link is down 1 = Link is up
		HW Rst	0	
		SW Rst	0	
1	JABBER DETECT	Mode	RO, LH	0 = Jabber condition not detected 1 = Jabber condition detected
		HW Rst	0	
		SW Rst	0	
0	EXTENDED CAPABILITY	Mode	RO	1 = Extended register capabilities
		HW Rst	Always 1	
		SW Rst	Always 1	

5.9.3 PHY identifier

Address offset: 0x02 or 0d02

Table 5-264 summarizes the PHY identifier.

Table 5-264 PHY Identifier bit description

Bits	Symbol	Type		Description
15:0	ONI[18:3]	Mode	RO	Organizationally unique identifier bits[18:3]
		HW Rst	Always 16'h004d	
		SW Rst	Always 16'h004d	

5.9.4 PHY Identifier 2

Address offset: 0x3

Table 5-265 summarizes the PHY identifiers 2.

Table 5-265 PHY Identifier 2 bit description

Bits	Symbol	Type		Description
15:10	ONI[24:19]	Mode	RO	Organizationally unique identifier bits[24:19]
		HW Rst	Always 16'hd035	
		SW Rst	Always 16'hd035	
9:4	MODEL NUMBER	Mode	RO	Model Number
3:0	REVISION NUMBER	Mode	RO	Revision Number

5.9.5 Auto-negotiation advertisement register

Address offset: 0x04, or 0d04

Table 5-266 summarizes the auto-negotiation advertisement register.

Table 5-266 Auto-negotiation advertisement register bit description

Bits	Symbol	Type		Description
15	NEXT PAGE	Mode	R/W	The value of this bit is updated immediately after writing this register, but the value written to this bit does not takes effect until any one of the following occurs: ■ Software reset is asserted (control register bit[15]) ■ Restart auto-negotiation is asserted (control register bit[9]) ■ Power down (control register bit[11]) transitions from power down to normal operation ■ Link goes down If 1000BASE-T is advertised then the required next pages are automatically transmitted. Register is set to 0 if no additional next pages are needed. 0 = Not advertised 1 = Advertise
		HW Rst	0	
		SW Rst	Update	
14	ACK	Mode	RO	Must be 0
		HW Rst	Always 0	
		SW Rst	Always 0	
13	REMOTE FAULT	Mode	R/W	0 = Do not set remote fault bit 1 = Set remote fault bit
		HW Rst	Always 0	
		SW Rst	Always 0	
12	RESERVED	Mode	RO	Always 0
		HW Rst	Always 0	
		SW Rst	Always 0	
11	ASYMMETRIC PAUSE	Mode	R/W	The value of this bit is updated immediately after writing this register. But the value written to this bit does not takes effect until any one of the following occurs: ■ Software reset is asserted (control register bit[15]) ■ Restart auto-negotiation is asserted (control register bit[9]) ■ Power down (control register bit[11]) transitions from power down to normal operation ■ Link goes down 0 = No asymmetric pause 1 = Asymmetric pause Note: This bit has added the pad control and can be set from the F001 top. Its default value is one.
		HW Rst	1	
		SW Rst	Update	

Table 5-266 Auto-negotiation advertisement register bit description (cont.)

Bits	Symbol	Type		Description
10	PAUSE	Mode	R/W	The value of this bit is updated immediately after writing this register. But the value written to this bit does not takes effect until any one of the following occurs: ■ Software reset is asserted (control register bit[15]) ■ Restart auto-negotiation is asserted (control register bit[9]) ■ Power down (control register bit[11]) transitions from power down to normal operation ■ Link goes down 0 = MAC PAUSE not implemented 1 = MAC PAUSE implemented Note: This bit has added the pad control and can be set from the F001 top, its default value is one.
		HW Rst	1	
		SW Rst	Update	
9	100BASE-T4	Mode	RO	Not able to perform 100BASE-T4
		HW Rst	Always 0	
		SW Rst	Always 0	
8	100BASE -TX	Mode	R/W	The value of this bit is updated immediately after writing this register. But the value written to this bit does not takes effect until any one of the following occurs: ■ Software reset is asserted (control register bit[15]) ■ Restart auto-negotiation is asserted (control register bit[9]) ■ Power down (control register bit[11]) transitions from power down to normal operation ■ Link goes down 0 = Not advertised 1 = Advertise
		HW Rst	1	
		SW Rst	Update	
7	100BASE-TX HALF DUPLEX	Mode	R/W	The value of this bit is updated immediately after writing this register. But the value written to this bit does not takes effect until any one of the following occurs: ■ Software reset is asserted (control register bit[15]) ■ Restart auto-negotiation is asserted (control register bit[9]) ■ Power down (control register bit[11]) transitions from power down to normal operation ■ Link goes down 0 = Not advertised 1 = Advertise
		HW Rst	1	
		SW Rst	Update	

Table 5-266 Auto-negotiation advertisement register bit description (cont.)

Bits	Symbol	Type		Description
6	10BASE-TE FULL DUPLEX	Mode	R/W	The value of this bit is updated immediately after writing this register. But the value written to this bit does not takes effect until any one of the following occurs: ■ Software reset is asserted (control register bit[15]) ■ Restart auto-negotiation is asserted (control register bit[9]) ■ Power down (control register bit[11]) transitions from power down to normal operation ■ Link goes down 0 = Not advertised 1 = Advertise
		HW Rst	1	
		SW Rst	Update	
5	10BASE-TE HALF DUPLEX	Mode	R/W	The value of this bit is updated immediately after writing this register. But the value written to this bit does not takes effect until any one of the following occurs: ■ Software reset is asserted (control register bit[15]) ■ Restart auto-negotiation is asserted (control register bit[9]) ■ Power down (control register bit[11]) transitions from power down to normal operation ■ Link goes down 0 = Not advertised 1 = Advertise
		HW Rst	1	
		SW Rst	Update	
4:0	SELECTOR FIELD	Mode	RO	Selector field mode 00001 = 802.3
		HW Rst	Always 00001	
		SW Rst	Always 00001	

5.9.6 Link partner ability register

Address offset: 0x05, or 0d05

Table 5-267 summarizes the link partner ability register.

Table 5-267 Link partner ability bit description

Bits	Symbol	Type		Description
15	NEXT PAGE	Mode	RO	Received code word bit[15] 0 = Link partner not capable of next page 1 = Link partner capable of next page
		HW Rst	0	
		SW Rst	0	
14	ACK	Mode	RO	Acknowledge Received code word bit[14] 0 = Link partner does not have next page ability 1 = Link partner received link code word
		HW Rst	0	
		SW Rst	0	

Table 5-267 Link partner ability bit description (cont.)

Bits	Symbol	Type		Description
13	REMOTE FAULT	Mode	RO	Remote fault Received code word bit[13] 0 = Link partner has not detected remote fault 1 = Link partner detected remote fault
		HW Rst	0	
		SW Rst	0	
12	RESERVED	Mode	RO	Technology ability field Received code word bit[12]
		HW Rst	0	
		SW Rst	0	
11	ASYMMETRIC PAUSE	Mode	RO	Technology ability field Received code word bit[11] 0 = Link partner does not request asymmetric pause 1 = Link partner requests asymmetric pause
		HW Rst	0	
		SW Rst	0	
10	PAUSE	Mode	RO	Technology ability field Received code word bit[0] 0 = Link partner is not capable of pause operation 1 = Link partner is capable of pause operation
		HW Rst	0	
		SW Rst	0	
9	100BASE-T4	Mode	RO	Technology ability field Received code word bit[9] 0 = Link partner is not 100BASE-T4 capable 1 = Link partner is 100BASE-T4 capable
		HW Rst	0	
		SW Rst	0	
8	100BASE-TX FULL DUPLEX	Mode	RO	Technology ability field Received code word bit[8] 0 = Link partner is not 100BASE-Tx full-duplex capable 1 = Link partner is 100BASE-Tx full-duplex capable
		HW Rst	0	
		SW Rst	0	
7	100BASE-TX HALF DUPLEX	Mode	RO	Technology ability field Received code word bit[7] 0 = Link partner is not 100BAse-TX half-duplex capable 1 = Link partner is 100BASE-Tx half-duplex capable
		HW Rst	0	
		SW Rst	0	
6	10BASE-TE FULL DUPLEX	Mode	RO	Technology ability field Received code word bit[6] 0 = Link partner is not 10BASE-Te full-duplex capable 1 = Link partner is 10BASE-Te full-duplex capable
		HW Rst	0	
		SW Rst	0	
5	10BASE-TE HALF DUPLEX	Mode	RO	Technology ability field Received code word bit[5] 0 = Link partner is not 10BASE-Te half-duplex capable 1 = Link partner is 10BASE-Te half-duplex capable
		HW Rst	0	
		SW Rst	0	
4:0	SELECTOR FIELD	Mode	RO	Selector field Received code word bits[4:0]
		HW Rst	00000	
		SW Rst	00000	

5.9.7 Auto-negotiation expansion register

Address offset: 0x06, or 0d06

Table 5-268 summarizes the auto-negotiation expansion register.

Table 5-268 Auto-negotiation expansion bit description

Bits	Symbol	Type		Description
15:5	RESERVED	Mode	RO	Reserved. Must be 0
		HW Rst	Always 0x000	
		SW Rst	Always 0x000	
4	PARALLEL DETECTION FAULT	Mode	RO, LH	0 = No fault has been detected 1 = A fault has been detect
		HW Rst	0	
		SW Rst	0	
3	LINK PARTNER NEXT PAGE ABLE	Mode	RO	0 = Link partner is not next page able 1 = Link partner is Next page able
		HW Rst	0	
		SW Rst	0	
2	LOCAL NEXT PAGE ABLE	Mode	R/W	1 = Local device is next page able
		HW Rst	1	
		SW Rst	1	
1	PAGE RECEIVED	Mode	RO, LH	0 = No new page has been received 1 = A new page has been received
		HW Rst	0	
		SW Rst	0	
0	LINK PARTNER AUTO-NEGOTIATION ABLE	Mode	RO	0 = Link partner is not auto-negotiation enable 1 = Link partner is auto-negotiation enable
		HW Rst	0	
		SW Rst	0	

5.9.8 Next page transmit register

Address offset: 0x07, or 0d07

Table 5-269 summarizes the next page transmit register.

Table 5-269 Next page transmit register bit description

Bits	Symbol	Type		Description
15	NEXT PAGE	Mode	R/W	Transmit code word bit[15]
		HW Rst	0	
		SW Rst	0	

Table 5-269 Next page transmit register bit description (cont.)

Bits	Symbol	Type		Description
14	RESERVED	Mode	R/W	Transmit code word bit[14]
		HW Rst	0	
		SW Rst	0	
13	MESSAGE PAGE MODE	Mode	R/W	Transmit code word bit[13]
		HW Rst	0	
		SW Rst	0	
12	ACK	Mode	R/W	Transmit code word bit[12]
		HW Rst	0	
		SW Rst	0	
11	TOGGLE	Mode	RO	Transmit code word bit[11]
		HW Rst	0	
		SW Rst	0	
10:0	MESSAGE/UNFORMATTED FIELD	Mode	R/W	Transmit code word bits[10:0]
		HW Rst	0x001	
		SW Rst	0x001	

5.9.9 Link partner next page register

Address offset: 0x08, or 0d08

Table 5-270 summarizes the link partner next page register.

Table 5-270 link partner next page bit description

Bits	Symbol	Type		Description
15	NEXT PAGE	Mode	RO	Transmit code word bit[15]
		HW Rst	0	
		SW Rst	0	
14	RESERVED	Mode	RO	Transmit code word bit[14]
		HW Rst	0	
		SW Rst	0	
13	MESSAGE PAGE MODE	Mode	RO	Transmit code word bit[13]
		HW Rst	0	
		SW Rst	0	
12	ACK2	Mode	RO	Transmit code word bit[12]
		HW Rst	0	
		SW Rst	0	

Table 5-270 link partner next page bit description (cont.)

Bits	Symbol	Type		Description
11	TOGGLE	Mode	RO	Transmit code word bit[11]
		HW Rst	0	
		SW Rst	0	
10:0	MESSAGE/UNFORMATTED FIELD	Mode	R/W	Transmit code word bits[10:0]
		HW Rst	0x000	
		SW Rst	0x000	

5.9.10 1000BASE-T control register

Address offset: 0x09, or 0d09

Table 5-271 summarizes the 1000BASE-T control register.

Table 5-271 1000BASE-T control bit description

Bits	Symbol	Type		Description
15:13	TEST MODE	Mode	R/W	TX_TCLK comes from the RX_CLK pin for jitter testing in test modes 2 and 3. After exiting the test mode, hardware reset or software reset (control register bit[15]) is issued to ensure normal operation. 000 = Normal mode 001 = Test mode 1 — Transmit waveform test 010 = Test mode 2 — Transmit jitter test (master mode) 011 = Test mode 3 —Transmit jitter test (slave mode) 100 = Test mode 4 — Transmit distortion test 101, 110, 111 = Reserved
		HW Rst	000	
		SW Rst	Retain	
12	MASTER/SLAVE MANUAL CONFIGURATION ENABLE	Mode	R/W	The value of this bit is updated immediately after writing this register, but the value written to this bit does not takes effect until any one of the following occurs: ■ Software reset is asserted (control register bit[15]) ■ Restart auto-negotiation is asserted (control register bit[9]) ■ Power down (control register bit[11]) transitions from power down to normal operation ■ Link goes down 0 = Automatic master/slave configuration 1 = Manual master/slave configuration
		HW Rst	0	
		SW Rst	Update	

Table 5-271 1000BASE-T control bit description (cont.)

Bits	Symbol	Type		Description
11	MASTER/SLAVE CONFIGURATION	Mode	R/W	The value of this bit is updated immediately after writing this register, but the value written to this bit does not takes effect until any one of the following occurs: ■ Software reset is asserted (control register bit[15]) ■ Restart auto-negotiation is asserted (control register bit[9]) ■ Power down (control register bit[11]) transitions from power down to normal operation ■ Link goes down Bit[11] is ignored if bit[12] is equal to 0. 0 = Manual configure as slave 1 = Manual configure as master
		HW Rst	0	
		SW Rst	Update	
10	PORT TYPE	Mode	R/W	The value of this bit is updated immediately after writing this register, but the value written to this bit does not takes effect until any one of the following occurs: ■ Software reset is asserted (control register bit[15]) ■ Restart auto-negotiation is asserted (control register bit[9]) ■ Power down (control register bit[11]) transitions from power down to normal operation ■ Link goes down Bit[10] is ignored if bit[12] is equal to 1. 0 = Prefer single port device (slave) 1 = Prefer multi-port device (master)
		HW Rst	0	
		SW Rst	Update	
9	1000BASE-T FULL DUPLEX	Mode	R/W	The value of this bit is updated immediately after writing this register, but the value written to this bit does not takes effect until any one of the following occurs: ■ Software reset is asserted (control register bit[15]) ■ Restart auto-negotiation is asserted (control register bit[9]) ■ Power down (control register bit[11]) transitions from power down to normal operation ■ Link goes down 0 = Not advertised 1 = Advertised
		HW Rst	1	
		SW Rst	Update	
8	1000BASE-T HALF-DUPLEX	Mode	R/W	The value of this bit is updated immediately after writing this register, but the value written to this bit does not takes effect until any one of the following occurs: ■ Software reset is asserted (control register bit[15]) ■ Restart auto-negotiation is asserted (control register bit[9]) ■ Power down (control register bit[11]) transitions from power down to normal operation ■ Link goes down 0 = Not advertised 1 = Advertised Note: The default setting is no 1000 base/half duplex advertised.
		HW Rst	0	
		SW Rst	Update	

Table 5-271 1000BASE-T control bit description (cont.)

Bits	Symbol	Type		Description
7:0	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	0	

5.9.11 1000BASE-T status register

Address offset: 0x0A, or 0d10

Table 5-272 summarizes the 1000BASE-T status register.

Table 5-272 1000BASE-T status bit description

Bits	Symbol	Type		Description
15	MASTER/SLAVE CONFIGURATION FAULT	Mode	RO, LH	This register bit is cleared on read 0 = No fault detected 1 = Master/slave configuration fault detected
		HW Rst	0	
		SW Rst	0	
14	MASTER/SLAVE CONFIGURATION RESOLUTION	Mode	RO	This register bit is not valid until bit[1] of the auto-negotiation expansion register is 1. 0 = Local PHY configuration resolved to slave 1 = Local PHY configuration resolved to master
		HW Rst	0	
		SW Rst	0	
13	LOCAL RECEIVER STATUS	Mode	RO	0 = Local receiver is not ok 1 = Local receiver is ok
		HW Rst	0	
		SW Rst	0	
12	REMOTE RECEIVER STATUS	Mode	RO	0 = Remote receiver is not ok 1 = Remote receiver is ok
		HW Rst	0	
		SW Rst	0	
11	LINK PARTNER 1000BASE-T FULL DUPLEX CAPABILITY	Mode	RO	This register bit is not valid until bit[0] of the auto-negotiation expansion register is 1. 0 = Link Partner is not capable of 1000BASE-T half duplex 1 = Link Partner is capable of 1000BASE-T half duplex
		HW Rst	0	
		SW Rst	0	
10	LINK PARTNER 1000BASE-T HALF DUPLEX CAPABILITY	Mode	RO	This register bit is not valid until bit[0] of the auto-negotiation expansion register is 1. 0 = Link Partner is not capable of 1000BASE-T full duplex 1 = Link Partner is capable of 1000BASE-T full duplex
		HW Rst	0	
		SW Rst	0	
9:8	RESERVED	Mode	RO	
		HW Rst	Always 0	
		SW Rst	Always 0	

Table 5-272 1000BASE-T status bit description (cont.)

Bits	Symbol	Type		Description
7:0	IDLE ERROR COUNT	Mode	RO, SC	MSB of idle error counter These register bits report the idle error count since the last time this register was read. The counter pegs at 11111111 and does not roll over.
		HW Rst	0	
		SW Rst	0	

5.9.12 MMD access control register

Address offset: 0x0D, or 0d13

Table 5-273 summarizes the MMD access control register.

Table 5-273 MMD access control bit description

Bits	Symbol	Type		Description
15:14	FUNCTION	Mode	R/W	00 = Address 01 = Data, no post increment 10 = Data, post increment on reads and writes 11 = Data, post increment on writes only
		HW Rst.	00	
		SW Rst.	Retain	
13:5	RESERVED	Mode	RO	
		HW Rst.	0	
		SW Rst.	0	
4:0	DEVAD	Mode	R/W	Device address
		HW Rst.	0	
		SW Rst.	Update	

5.9.13 MMD access address data register

Address offset: 0x0E, or 0d14

Table 5-274 summarizes the MMD access address data register.

Table 5-274 MMD access address data register bit description

Bits	Symbol	Type		Description
15:0	ADDRESS DATA	Mode	R/W	If bits[15:14] of the MMD access control register is 00, MMD DEVAD's address register. Otherwise, MMD DEVAD's data register as indicated by the contents of its address register.
		HW Rst.	00	
		SW Rst.	Retain	

5.9.14 Extended status register

Address offset: 0x0F, or 0d15

Table 5-275 summarizes the extended status register.

Table 5-275 Extended status register bit description

Bits	Symbol	Type		Description
15	1000BASE-X FULL DUPLEX	Mode	RO	PHY not able to perform 1000BASE-X full duplex
		HW Rst	Always 0	
		SW Rst	Always 0	
14	1000BASE-X HALF DUPLEX	Mode	RO	PHY not able to perform 1000BASE-X half duplex
		HW Rst	Always 0	
		SW Rst	Always 0	
13	1000BASE-T FULL-DUPLEX	Mode	RO	PHY able to perform 1000BASE-T full duplex
		HW Rst	Always 1	
		SW Rst	Always 1	
12	1000BASE-T HALF-DUPLEX	Mode	RO	PHY not able to perform 1000BASE-T half duplex
		HW Rst	Always 0	
		SW Rst	Always 0	
11:0	RESERVED	Mode	RO	
		HW Rst	Always 0	
		SW Rst	Always 0	

5.9.15 Function control register

Address offset: 0x10, or 0d16

Table 5-276 summarizes the function control register.

Table 5-276 Function control register bit description

Bits	Symbol	Type		Description
15:12	RESERVED	Mode	RO	Always 0
		HW Rst	0	
		SW Rst	0	
11	ASSERT CRS ON TRANSMIT	Mode	R/W	This bit has effect only in 10BASE-Te half-duplex mode: 0 = Assert on receiving. Do not assert on transmitting 1 = Assert on transmitting or receiving
		HW Rst	0	
		SW Rst	Retain	

Table 5-276 Function control register bit description (cont.)

Bits	Symbol	Type		Description
10	RESERVED	Mode	RO	Always 0
		HW Rst	0	
		SW Rst	0	
9:8	RESERVED	Mode	RO	Always 0
		HW Rst	0	
		SW Rst	0	
6:5	MDI CROSSOVER MODE	Mode	R/W	Changes to these bits are disruptive to the normal operation; therefore, any changes to these registers must be followed by a software reset to take effect. 00 = Manual MDI configuration 01 = Manual MDIX configuration 10 = Reserved 11 = Enable automatic crossover for all modes
		HW Rst	11	
		SW Rst	Update	
4:3	RESERVED	Mode	RO	Always 0
		HW Rst	0	
		SW Rst	0	
2	SQE TEST	Mode	R/W	SQE test is automatically disabled in full-duplex mode. 0 = SQE test disabled 1 = SQE test enabled
		HW Rst	0	
		SW Rst	Retain	
1	POLARITY REVERSAL	Mode	R/W	If polarity is disabled, then the polarity is forced to be normal in 10BASE-Te. 0 = Polarity reversal enabled 1 = Polarity reversal disabled
		HW Rst	0	
		SW Rst	Retain	
0	DISABLE JABBER	Mode	R/W	Jabber has effect only in 10BASE-Te half-duplex mode. 0 = Enable jabber function 1 = Disable jabber function
		HW Rst	0	
		SW Rst	Retain	

5.9.16 PHY-specific status register

Address offset: 0x11, or 0d17

Table 5-277 summarizes the PHY-specific status register.

Table 5-277 PHY-specific status register bit description

Bits	Symbol	Type		Description
15:14	SPEED	Mode	RO	These status bits are valid when auto-negotiation is completed or auto-negotiation is disabled. 11 = Reserved 10 = 1000 Mbps 01 = 100 Mbps 00 = 10 Mbps
		HW Rst	00	
		SW Rst	Retain	
13	DUPLEX	Mode	RO	This status bit is valid only when auto-negotiation is complete or disabled. 0 = Half-duplex 1 = Full-duplex
		HW Rst	0	
		SW Rst	Retain	
12	PAGE RECEIVED (REAL TIME)	Mode	RO	0 = Page not received 1 = Page received
		HW Rst	0	
		SW Rst	Retain	
11	SPEED AND DUPLEX RESOLVED	Mode	RO	When auto-negotiation is not enabled for force speed mode. 0 = Not resolved 1 = Resolved
		HW Rst	0	
		SW Rst	0	
10	LINK (REAL TIME)	Mode	RO	0 = Link down 1 = Link up
		HW Rst	0	
		SW Rst	0	
9:7	RESERVED	Mode	RO	Always 0
		HW Rst	0	
		SW Rst	0	
6	MDI CROSSOVER STATUS	Mode	RO	This status bit is valid only when auto-negotiation is completed or auto-negotiation is disabled. 0 = MDI 1 = MDIX
		HW Rst	0	
		SW Rst	Retain	
5	WIRESPEED DOWNGRADE	Mode	RO	0 = Not downgrade 1 = Downgrade
		HW Rst	0	
		SW Rst	0	
4	RESERVED	Mode	RO	Always 0
		HW Rst	0	
		SW Rst	0	
3	TRANSMIT PAUSE ENABLED	Mode	RO	This is a reflection of the MAC pause resolution. This bit is for information purposes and is not used by the device. This status bit is valid only when auto-negotiation is completed or auto-negotiation is disabled. 0 = Transmit pause disabled 1 = Transmit pause enabled
		HW Rst	0	
		SW Rst	0	

Table 5-277 PHY-specific status register bit description (cont.)

Bits	Symbol	Type		Description
2	RECEIVE PAUSE ENABLED	Mode	RO	This is a reflection of the MAC pause resolution. This bit is for information purposes and is not used by the device. This status bit is valid only when auto-negotiation is completed or auto-negotiation is disabled. 0 = Receive pause disabled 1 = Receive pause enabled
		HW Rst	0	
		SW Rst	Retain	
1	POLARITY (REAL TIME)	Mode	RO	0 = Normal 1 = Reversed
		HW Rst	0	
		SW Rst	0	
0	JABBER (REAL TIME)	Mode	RO	0 = No jabber 1 = Jabber
		HW Rst	0	
		SW Rst	Retain	

5.9.17 Interrupt enable register

Address offset: 0x12, or 0d18

Table 5-278 summarizes the interrupt enable register.

Table 5-278 Interrupt enable register bit description

Bits	Symbol	Type		Description
15	AUTO-NEGOTIATION ERROR INTERRUPT ENABLE	Mode	R/W	0 = Interrupt disable 1 = Interrupt enable
		HW Rst	0	
		SW Rst	Retain	
14	SPEED CHANGED INTERRUPT ENABLE	Mode	R/W	0 = Interrupt disable 1 = Interrupt enable
		HW Rst	0	
		SW Rst	Retain	
13	DUPLEX CHANGED INTERRUPT ENABLE	Mode	R/W	0 = Interrupt disable 1 = Interrupt enable
		HW Rst	0	
		SW Rst	Retain	
12	PAGE RECEIVED INTERRUPT ENABLE	Mode	R/W	0 = Interrupt disable 1 = Interrupt enable
		HW Rst	0	
		SW Rst	Retain	
11	LINK FAIL INTERRUPT	Mode	R/W	0 = Interrupt disable 1 = Interrupt enable
		HW Rst	0	
		SW Rst	Retain	

Table 5-278 Interrupt enable register bit description (cont.)

Bits	Symbol	Type		Description
10	LINK SUCCESS INTERRUPT	Mode	R/W	0 = Interrupt disable 1 = Interrupt enable
		HW Rst	0	
		SW Rst	Retain	
9	FLD_INT_BIT1	Mode	R/W	0 = Interrupt disable 1 = Interrupt enable
		HW Rst	0	
		SW Rst	Retain	
8	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	Retain	
7	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	Retain	
6	FLD_INT_BIT0	Mode	R/W	0 = Interrupt disable 1 = Interrupt enable
		HW Rst	0	
		SW Rst	Retain	
5	WIRESPEED-DOWNGRADE INTERRUPT	Mode	R/W	0 = Interrupt disable 1 = Interrupt enable
		HW Rst	0	
		SW Rst	Retain	
4:2	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	Retain	
1	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	Retain	
0	JABBER INTERRUPT	Mode	R/W	0 = Interrupt disable 1 = Interrupt enable
		HW Rst	0	
		SW Rst	Retain	

5.9.18 Interrupt status register

Address offset: 0x13, or 0d19

Table 5-279 summarizes the interrupt status register.

Table 5-279 Interrupt status register bit description

Bits	Symbol	Type		Description
15	AUTO-NEGOTIATION ERROR	Mode	RO, LH	An error occurs if master/slave does not resolve, parallel detect fault, no common HCD, or link does not come up after negotiation is completed. 0 = No auto-negotiation error 1 = Auto-negotiation error
		HW Rst	0	
		SW Rst	Retain	
14	SPEED CHANGED	Mode	RO, LH	0 = Speed not changed 1 = Speed changed
		HW Rst	0	
		SW Rst	Retain	
13	RESERVED	Mode	RO, LH	
		HW Rst	0	
		SW Rst	Retain	
12	PAGE RECEIVED	Mode	RO	0 = Page not received 1 = Page received
		HW Rst	0	
		SW Rst	Retain	
11	LINK FAIL INTERRUPT	Mode	RO	0 = Link down 1 = No link down
		HW Rst	0	
		SW Rst	Retain	
10	LINK SUCCESS INTERRUPT	Mode	RO, LH	0 = Link up 1 = No link up
		HW Rst	0	
		SW Rst	Retain	
9	FLD_INT_BIT1	Mode	RO, LH	Fast link down interrupt 1 {fld_int_bit1,fld_int_bit0} 00 = no fast link down 01 = 10BT fast link down occur 10 = 100BT fast link down occur 11 = 1000BT fast link down occur
		HW Rst	0	
		SW Rst	0	
8	RESERVED	Mode	RO, LH	
		HW Rst	0	
		SW Rst	Retain	
7	RESERVED	Mode	RO, LH	
		HW Rst	0	
		SW Rst	Retain	
6	FLD_INT_BIT0	Mode	RO, LH	Fast link down interrupt 0
		HW Rst	0	
		SW Rst	Retain	

Table 5-279 Interrupt status register bit description (cont.)

Bits	Symbol	Type		Description
5	WIRESPEED-DOWNGRADE INTERRUPT	Mode	RO, LH	0 = No wirespeed-downgrade 1 = Wirespeed-downgrade
		HW Rst	0	
		SW Rst	Retain	
4:2	RESERVED	Mode	RO, LH	
		HW Rst	0	
		SW Rst	Retain	
1	RESERVED	Mode	RO, LH	
		HW Rst	0	
		SW Rst	Retain	
0	JABBER INTERRUPT	Mode	RO, LH	0 = No jabber 1 = Jabber
		HW Rst	0	
		SW Rst	Retain	

5.9.19 Smart speed register

Address offset: 0x14, or 0d20

Table 5-280 summarizes the smart speed register.

Table 5-280 Smart speed register bit description

Bits	Symbol	Type		Description
15:11	RESERVED	Mode	RO	Reserved. Must be 00000000.
		HW Rst	0	
		SW Rst	0	
10	ANEG_NOW_QUAL	Mode	R/W	A rise of input pin ANEG_NOW sets this bit to 2, and cause PHY to restart auto-negotiation. Self-cleared.
		HW Rst	0	
		SW Rst	Retain	
9	REV_ANEG_QUAL	Mode	R/W	Make PHY to auto-negotiate in reversed mode. This bit takes its value from the input pin REV_ANEG upon following: 1. HW reset (fall of RST_DSP_I); 2. PHY SW reset; 3. Rise of ANEG_NOW.
		HW Rst	0	
		SW Rst	Update	
8	GIGA_DIS_QUAL	Mode	R/W	Make PHY to disable Gigabit mode. This bit takes its value from the input pin GIGA_DIS upon following: 1. Hardware reset (fall of RST_DSP_I); 2. PHY software reset; 3. Rise of ANEG_NOW.
		HW Rst	0	
		SW Rst	Update	

Table 5-280 Smart speed register bit description (cont.)

Bits	Symbol	Type		Description
7	CFG_PAD_EN	Mode	RO, LH	The default value is zero; if this bit is set to one, then the auto-negotiation arbitration FSM bypasses the LINK_STATUS_CHECK state when the 10 base/100 base ready signal is asserted.
		HW Rst	0	
		SW Rst	Retain	
6	MR_LTDIS	Mode	R/W	The default value is zero; if this bit is set to one, then the NLP receive link integrity test FSM stays at the NLP_TEST_PASS state.
		HW Rst	0	
		SW Rst	Update	
5	SMARTSPEED_EN	Mode	R/W	The default value is one; if this bit is set to one and cable inhibits completion of the training phase, then after a few failed attempts, the DSP PHY automatically downgrades the highest ability to the next lower speed: from 1000 to 100 to 10.
		HW Rst	1	
		SW Rst	Update	
4:2	SMARTSPEED_RETRY_LIMIT	Mode	R/W	The default value is three. If these bits are set to three, then the DSP PHY attempts five times before downgrading. The number of attempts can be changed through setting these bits.
		HW Rst	011	
		SW Rst	Update	
1	BYPASS_SMARTSPEED_TIMER	Mode	R/W	The default value is zero. If this bit is set to one, the Smartspeed FSM bypasses the timer used for stability.
		HW Rst	0	
		SW Rst	Update	
0	RESERVED	Mode	RO	Reserved. Must be set to 0.
		HW Rst	0	
		SW Rst	0	

5.9.20 Receive error counter register

Address offset: 0x15, or 0d21

Table 5-281 summarizes the status register.

Table 5-281 Status register bit description

Bits	Symbol	Type		Description
15:0	RECEIVE ERROR COUNT	Mode	RO	Counter pegs at 0xFFFF and does not roll over. (When RX_DV is valid, count RX_ER numbers) (In this version, only for 100BASE-Tx and 1000BASE-T)
		HW Rst	0x0000	
		SW Rst	Retain	

5.9.21 Virtual cable tester control register

Address offset: 0x16, or 0d22

Table 5-282 summarizes the virtual cable tester control register.

Table 5-282 Virtual cable tester control register bit description

Bits	Symbol	Type		Description
15	RUN CDT	Mode	RW	When set, hardware automatically disables this bit when VCT is done. 0 = Disable VCT Test 1 = Enable VCT Test
		HW Rst	0	
		SW Rst	Retain	
14	BP_VCT_EN_PON	Mode	RW	0 = Enable VCT Test when power on 1 = Disable VCT Test when power on
		HW Rst	0	
		SW Rst	Retain	
13	DISABLE INTER-PAIR SHORT CHECK	Mode	RW	0 = Enable inter-pair short check 1 = Disable inter-pair short check
		HW Rst	0	
		SW Rst	0	
12	RESERVED	Mode	RO	Always 0
		HW Rst	0	
		SW Rst	0	
11	CABLE DIAGNOSTICS STATUS	Mode	RO	0 = Complete 1 = In progress
		HW Rst	0	
		SW Rst	0	
10	CABLE LENGTH UNIT	Mode	RW	This bit must be set to 1 for meter unit.
		HW Rst	0	
		SW Rst	0	
9:0	MDI PAIR SELECT	Mode	RO	Always 0
		HW Rst	0	
		SW Rst	0	

5.9.22 Debug port

Address offset: 0x1D, or 0d29

Table 5-283 summarizes the debug port (address offset 0x1d, or 0d29).

Table 5-283 Debug port (address offset 0x1d, or 0d29) bit description

Bits	Symbol	Type		Description
15:6	RESERVED	Mode	RO	
		HW Rst	0	
		SW Rst	0	

Table 5-283 Debug port (address offset 0x1d, or 0d29) bit description (cont.)

Bits	Symbol	Type		Description
5:0	ADDRESS OFFSET	Mode	R/W	The address index of the register is written or read.
		HW Rst	0	
		SW Rst	0	

5.9.23 Debug port 2 (R/W port)

Address offset: 0x1E, or 0d30

Table 5-284 summarizes the debug port 2 — R/W port.

Table 5-284 Debug port 2 (R/W port) bit description

Bits	Symbol	Type		Description
15:0	DEBUG DATA PORT	Mode	R/W	The data port of debug register. Before access this register, must set the address offset first.
		HW Rst	0	
		SW Rst	0	

5.10 Debug register

5.10.1 Analog test control

Address offset: 0x00, or 0d00

Table 5-285 summarizes the debug register — analog test control.

Table 5-285 Analog test control bit description

Bits	Symbol	Type		Description
15	SEL_CLK125M_DSP	Mode	R/W	Control bit for RGMII interface Rx clock delay: 0 = RGMII Rx clock delay disable 1 = RGMII Rx clock delay enable
		HW Rst	1	
		SW Rst	0	
14:12	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	Retain	
11	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	0	

Table 5-285 Analog test control bit description (cont.)

Bits	Symbol	Type		Description
10	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	Retain	
9	RESERVED	Mode	R/W	
		HW Rst	1	
		SW Rst	Retain	
8	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	Retain	
7:5	RESERVED	Mode	R/W	
		HW Rst	1	
		SW Rst	Retain	
4	RESERVED	Mode	R/W	
		HW Rst	1’b1	
		SW Rst	Retain	
3:2	MANU_SWITCH_ON	Mode	R/W	Control SWR 1000BT output voltage: 00 = 2.0 V 10 = 1.8 V 01 = 1.9 V 11 = 1.7 V
		HW Rst	2’h3	
		SW Rst	Retain	
1	RESERVED	Mode	R/W	
		HW Rst	1	
		SW Rst	Retain	
0	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	Retain	

5.10.2 System mode control

Address offset: 0x03

Table 5-286 summarizes the debug register — system mode control.

Table 5-286 System mode control bit description

Bits	Symbol	Type		Description
15	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	0	
14	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	Retain	
13:9	RESERVED	Mode	R/W	
		HW Rst	1	
		SW Rst	0	
8	OUT_MDIO_SW	Mode	R/W	Control the MDIO signal when POWER_DOWN mode is high. 0 = MDIO is valid, driven by inner state 1 = MDIO is 1
		HW Rst	1	
		SW Rst	Retain	
7:4	RESERVED	Mode	R/W	
		HW Rst	4’b1111	
		SW Rst	Retain	
3:0	RESERVED	Mode	R/W	
		HW Rst	4’b1111	
		SW Rst	Retain	
7:5	RESERVED	Mode	R/W	
		HW Rst	1	
		SW Rst	Retain	
4:3	RESERVED	Mode	R/W	
		HW Rst	2’h1	
		SW Rst	Retain	
2	RESERVED	Mode	R/W	
		HW Rst	1’b0	
		SW Rst	Retain	
1	RESERVED	Mode	R/W	
		HW Rst	1	
		SW Rst	Retain	
0	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	Retain	

5.10.3 System control mode

Address offset: 0x05, or 0d05

Table 5-287 summarizes the debug register — system control mode.

Table 5-287 System control mode bit description

Bits	Symbol	Type		Description
15	RESERVED	Mode	RO	
		HW Rst	0	
		SW Rst	0	
14	RESERVED	Mode	RO	
		HW Rst	0	
		SW Rst	0	
13	RESERVED	Mode	R/W	
		HW Rst	1	
		SW Rst	Retain	
12	RESERVED	Mode	R/W	
		HW Rst	1	
		SW Rst	Retain	
11	RESERVED	Mode	R/W	
		HW Rst	1	
		SW Rst	Retain	
10	RESERVED	Mode	R/W	
		HW Rst	1	
		SW Rst	Retain	
9	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	Retain	
8	GTXCLK_DELAY	Mode	R/W	RGMII Tx clock delay control bit: 0 = RGMII Tx clock delay disable 1 = RGMII Tx clock delay enable
		HW Rst	0	
		SW Rst	Retain	
7	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	Retain	
6	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	Retain	

Table 5-287 System control mode bit description (cont.)

Bits	Symbol	Type		Description
5:4	RESERVED	Mode	R/W	
		HW Rst	00	
		SW Rst	Retain	
3	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	Retain	
2	RESERVED	Mode	R/W	
		HW Rst	1	
		SW Rst	Retain	
1	100_CLASSA	Mode	R/W	This bit is 100BASE-Tx Class A and Class AB mode select bit. 0 = 100BASE-Tx Class AB 1 = 100BASE-Tx Class A
		HW Rst	1	
		SW Rst	Retain	
0	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	Retain	

5.10.4 HIB control and auto-negotiation test register

Address offset: 0x0B

Table 5-288 summarizes the HIB control and auto-negotiation test register.

Table 5-288 HIB control and auto-negotiation test register bit description

Bits	Symbol	Type		Description
15	PS_HIB_EN	Mode	R/W	Power hibernation control bit 0 = Hibernation disable 1 = Hibernation enable
		HW Rst	1	
		SW Rst	Retain	
14	WAKE_MODE	Mode	R/W	0 = PHY wakes up only by energy detect 1 = PHY wakes up by energy detect or wake-up pin
		HW Rst	0	
		SW Rst	Retain	
13	EN_ANY_CHANGE	Mode	R/W	0 = Turn on/off analog end step by step 1 = Turn on/off analog end at the same time
		HW Rst	1	
		SW Rst	Retain	
12	HIB_PULSE_SW	Mode	R/W	0 = PHY does not send NLP pulse but detects signal from cables at hibernation state 1 = PHY sends NLP pulse and detects signal from cables at hibernation state
		HW Rst	1	
		SW Rst	Retain	

Table 5-288 HIB control and auto-negotiation test register bit description (cont.)

Bits	Symbol	Type		Description
11	GATE_25M_EN_SW	Mode	R/W	Always 1 0 = The 25 MHz clock of auto-negotiation is not controlled by hibernation 1 = Shut down the 25 MHz clock of auto-negotiation at hibernation state
		HW Rst	1	
		SW Rst	1	
10	SEL_RST_80U	Mode	R/W	Duration of the reset triggered by speed mode change 0 = 240 µs 1 = 80/120/160/240 µs (see bits[9:8] of this register)
		HW Rst	1	
		SW Rst	Retain	
9:8	SEL_RST_TIMER	Mode	R/W	Duration configuration for reset timer 00 = 80 µs 01 = 120 µs 10 = 160 µs 11 = 240 µs
		HW Rst	00	
		SW Rst	Retain	
7	RESERVED	Mode	RO	Always 0
		HW Rst	0	
		SW Rst	0	
6:5	GTX_DLY_VAL	Mode	R/W	GTX clock delay select
		HW Rst	10	
		SW Rst	Retain	
4	BYPASS_BREAK_LINK_TIMER	Mode	R/W	0 = Auto-negotiation state stays at TRANSMIT_DISABLE for about 1.2 second when auto-negotiation is restarted 1 = BREAL_LINK timer is bypassed when auto-negotiation is restarted, thus auto-negotiation state stays at TRANSMIT_DISABLE for one cycle (40 ns)
		HW Rst	0	
		SW Rst	Retain	
3	DBG_LINK_OK_100T	Mode	R/W	For link management use. The forced LINK_OK_100BT
		HW Rst	0	
		SW Rst	0	
2	DBG_LINK_OK_1000T	Mode	R/W	For link management use. The forced LINK_OK_1000BT
		HW Rst	0	
		SW Rst	0	
1	DBG_LINK_RDY_100T	Mode	R/W	For link management use. The forced LINK_RDY_100BT
		HW Rst	0	
		SW Rst	0	
0	DBG_EN_EN	Mode	R/W	For link management use. When this bit is set, the test bits in this register take effect.
		HW Rst	0	
		SW Rst	0	

5.10.5 RGMII mode selection

Address offset: 0x012, or 0d18

Table 5-289 summarizes the debug register — RGMII mode selection.

Table 5-289 RGMII mode selection bit description

Bits	Symbol	Type		Description
15:14	RESERVED	Mode	R/W	
		HW Rst	01	
		SW Rst	Retain	
13:12	RESERVED	Mode	R/W	
		HW Rst	00	
		SW Rst	Retain	
11	RESERVED	Mode	R/W	
		HW Rst	1	
		SW Rst	Retain	
10	RESERVED	Mode	R/W	
		HW Rst	1	
		SW Rst	Retain	
9:6	RESERVED	Mode	RO	
		HW Rst	0	
		SW Rst	0	
5	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	0	
4	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	Retain	
3	RGMII_MODE	Mode	R/W	0 = Select GMII/MII interface with MAC 1 = Select RGMII interface with MAC
		HW Rst	0	
		SW Rst	Retain	
2	RESERVED	Mode	R/W	
		HW Rst	1	
		SW Rst	1	
1:0	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	0	

5.10.6 Green feature configure register

Address offset: 0x3D

Table 5-290 summarizes the debug register — green feature configure register.

Table 5-290 Green feature configure register bit description

Bits	Symbol	Type		Description
15	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	Retain	
14	RESERVED	Mode	RO	
13:8	RESERVED	Mode	R/W	
		HW Rst	6'h28	
		SW Rst	Retain	
7	RESERVED	Mode	R/W	
		HW Rst	1	
		SW Rst	Retain	
6	GATE_CLK_IN1000	Mode	R/W	0 = When in 1000BASE-T mode, gate dig100/dig10/vct clk 1 = When in 1000BASE-T mode, do not gate dig100/dig10/vct clk
		HW Rst	1	
		SW Rst	Retain	
5:0	RESERVED	Mode	R/W	
		HW Rst	6'h20	
		SW Rst	Retain	

5.11 MMD3 — PCS register

5.11.1 PCS control1

Address offset: 0x00 or 0d00

Device address: 3

Table 5-291 summarizes the PCS control 1 register.

Table 5-291 PCS control1 bit description

Bits	Symbol	Type		Description
15	PCS_RST	Mode	R/W	Reset bit, self-cleared. When write this bit to 1, reset the registers (not vender specific) in MMD3/MMD7 and cause software reset in MII register0 bit[15].
		HW Rst	0	
		SW Rst	0	
14:11	RESERVED	Mode	RO	Always 0
		HW Rst	0	
		SW Rst	0	
10	CLOCK_STOPPABLE	Mode	R/W	Not implemented
		HW Rst	1	
		SW Rst	Retain	
9:0	RESERVED	Mode	R/W	Always 0
		HW Rst	1	
		SW Rst	Retain	

5.11.2 PCS status1

Address offset: 0x01 or 0d01

Device address: 3

Table 5-292 summarizes the PCS status 1register.

Table 5-292 PCS status1 bit description

Bits	Symbol	Type		Description
15:12	RESERVED	Mode	R/W	Always 0
		HW Rst	0	
		SW Rst	0	
11	TX LP IDLE RECEIVED	Mode	RO	When read as 1, it indicates that the transmit PCS has received low power idle signaling one or more times since the register was last read. Latch high.
		HW Rst	0	
		SW Rst	0	
10	RX LP IDLE RECEIVED	Mode	R/W	When read as 1, it indicates that the receive PCS has received low power idle signaling one or more times since the register was last read. Latch high.
		HW Rst	0	
		SW Rst	0	
9	TX LP IDLE INDICATION	Mode	R/W	When read as 1, it indicates that the transmit PCS is currently receiving low power idle signals.
		HW Rst	0	
		SW Rst	0	

Table 5-292 PCS status1 bit description (cont.)

Bits	Symbol	Type		Description
8	RX LP IDLE INDICATION	Mode	R/W	When read as 1, it indicates that the receive PCS is currently receiving low power idle signals.
		HW Rst	0	
		SW Rst	0	
7:0	RESERVED	Mode	RO	Always 0
		HW Rst	0	
		SW Rst	0	

5.11.3 EEE capability register

Address offset: 0x014 or 0d020

Device address: 3

Table 5-293 summarizes the EEE capacity register.

Table 5-293 EEE capability register bit description

Bits	Symbol	Type		Description
15:3	RESERVED	Mode	RO	Always 0
		HW Rst	0	
		SW Rst	0	
2	1000BT EEE	Mode	RO	EEE is supported for 1000BASE-T.
		HW Rst	1	
		SW Rst	1	
1	100BT EEE	Mode	RO	EEE is supported for 100BASE-Tx.
		HW Rst	1	
		SW Rst	1	
0	RESERVED	Mode	R/W	Always 0
		HW Rst	0	
		SW Rst	0	

5.11.4 EEE wake error counter

Address offset: 0x016 or 0d022

Device address: 3

Table 5-294 summarizes the EEE wake error register.

Table 5-294 EEE wake error counter bit description

Bits	Symbol	Type		Description
15:0	EEE WAKE ERROR COUNTER	Mode	RO	Count wake time faults where the PHY fails to complete its normal wake sequence within the time required for the specific PHY type. This counter is clear after read, and hold at all ones in the case of overflow.
		HW Rst	0	
		SW Rst	0	

5.11.5 AZ control

Address offset: 0x8008 (Hex)

Device address: 3

Table 5-295 summarizes the AZ control register.

Table 5-295 AZ control bit description

Bits	Symbol	Type		Description
15:8	SHORT_AZ_ THRESHOLD	Mode	R/W	Used for short cable AZ control This bit controls a threshold to stop the timing adjusting during the AZ wake up training
		HW Rst	8'd16	
		SW Rst	Retain	
7:0	LONG_AZ_ THRESHOLD	Mode	R/W	Used for long cable AZ control This bit controls a threshold to stop the timing adjusting during the AZ wake up training
		HW Rst	8'd29	
		SW Rst	Retain	

5.11.6 AZ debug

Address offset: 0x800D (Hex)

Device address: 3

Table 5-296 summarizes the AZ debug register.

Table 5-296 AZ debug bit description

Bits	Symbol	Type		Description
15	RESERVED	Mode	R/W	
		HW Rst	0	
		SW Rst	Retain	
14	AZ_FULL_AMP_ WAKE	Mode	R/W	1 = In AZ_WAKE state, PHY sends out signal with the same amplitude as non-AZ link. 0 = In AZ_WAKE state, PHY sends out signal always with full amplitude.
		HW Rst	0	
		SW Rst	Retain	

Table 5-296 AZ debug bit description (cont.)

Bits	Symbol	Type		Description
13:0	RESERVED	Mode	R/W	
		HW Rst	0xb3f	
		SW Rst	Retain	

5.11.7 PHY cable diagnostics code

Address offset: 0x8064

Device address: 3

Table 5-297 summarizes the PHY cable diagnostics code register.

Table 5-297 PHY cable diagnostics bit description

Bits	Symbol	Type		Description
15:12	VCT_PAIR_A_CODE	Mode	RO	Pair A cable diagnostics code 0x0 = Invalid; cable diagnostics routine is not completed successfully; 0x1 = Pair OK, no fault detected 0x2 = Pair open 0x3 = Intra pair short 0x4 = Inter pair short 0x9 = Pair busy
		HW Rst	0	
		SW Rst	0	
11:8	VCT_PAIR_B_CODE	Mode	RO	Pair B cable diagnostics code
		HW Rst	0	
		SW Rst	0	
7:4	VCT_PAIR_C_CODE	Mode	RO	Pair C cable diagnostics code
		HW Rst	0	
		SW Rst	0	
3:0	VCT_PAIR_D_CODE	Mode	RO	Pair D cable diagnostics code
		HW Rst	0	
		SW Rst	0	

5.11.8 PHY cable diagnostics pair A length

Address offset: 0x8065

Device address: 3

Table 5-298 summarizes the PHY cable diagnostics pair A length register.

Table 5-298 PHY cable diagnostics pair A length bit description

Bits	Symbol	Type		Description
15:0	PAIR_A_ LENGTH	Mode	RO	Cable length for pair A If bit[10] of MII register 0x16 = 1, then cable length unit is meter; else, cable length unit is centimeter
		HW Rst	0	
		SW Rst	0	

5.11.9 PHY cable diagnostics pair B length

Address offset: 0x8066

Device address: 3

Table 5-299 summarizes the PHY cable diagnostics pair B length register.

Table 5-299 PHY cable diagnostics pair B length bit description

Bits	Symbol	Type		Description
15:0	PAIR_B_ LENGTH	Mode	RO	Cable length for pair B If bit[10] 0f MII register 0x16 = 1, then cable length unit is meter; else, cable length unit is centimeter
		HW Rst	0	
		SW Rst	0	

5.11.10 PHY cable diagnostics pair C length

Address offset: 0x8067

Device address: 3

Table 5-300 summarizes the PHY cable diagnostics pair C length register.

Table 5-300 PHY cable diagnostics pair C length bit description

Bits	Symbol	Type		Description
15:0	PAIR_C_ LENGTH	Mode	RO	Cable length for pair C If bit[10] 0f MII register 0x16 = 1, then cable length unit is meter; else, cable length unit is centimeter
		HW Rst	0	
		SW Rst	0	

5.11.11 PHY cable diagnostics pair D length

Address offset: 0x8068

Device address: 3

Table 5-301 summarizes the PHY cable diagnostics pair D length register.

Table 5-301 PHY cable diagnostics pair D length bit description

Bits	Symbol	Type		Description
15:0	PAIR_D_ LENGTH	Mode	RO	Cable length for pair D If bit[10] 0f MII register 0x16 = 1, then cable length unit is meter; else, cable length unit is centimeter
		HW Rst	0	
		SW Rst	0	

5.11.12 CLD16

Address offset: 0x806E (Hex)

Device address: 3

Table 5-295 summarizes the AZ control register.

Table 5-302 AZ control bit description

Bits	Symbol	Type		Description
15	BP_AUTO_VCT	Mode	R/W	1 = Disable detecting cable length via sending pulses and receiving reflections on channel 2/3. 0 = Enable detecting cable length via sending pulses and receiving reflections on channel 2/3.
		HW Rst	1'b1	
		SW Rst	Retain	
14:0	RESERVED	Mode	R/W	
		HW Rst	0x88b	
		SW Rst	Retain	

5.12 MMD7 — auto-negotiation register

5.12.1 AN control

Address offset: 0x0 or 0d0

Device address: 7

Table 5-303 summarizes the AN control 1 register.

Table 5-303 AN control 1 bit description

Bits	Symbol	Type		Description
15	AN_RST	Mode	RO	Reset bit, self-clear. When write this bit 1: 1. Reset the registers (not vender-specific) in MMD3/MMD7. 2. Cause software reset in MII register0 bit[15].
		HW Rst	0	
		SW Rst	0	

Table 5-303 AN control 1 bit description (cont.)

Bits	Symbol	Type		Description
14	RESERVED	Mode	RO	Always 0
		HW Rst	1	
		SW Rst	1	
13	XNP_CTRL	Mode	RO	If MII register 4 bit[12] is set to 0, setting of this bit shall have no effect. 0 = Local device does not intend to enable the exchange of extended next page. 1 = Local device intends to enable the exchange of extended next page.
		HW Rst	1	
		SW Rst	1	
12:0	RESERVED	Mode	R/W	Always 0
		HW Rst	0	
		SW Rst	0	

5.12.2 AN package

Address offset: 0x05 or 0d05

Device address: 7

Table 5-304 summarizes the AN package.

Table 5-304 AN package bit description

Bits	Symbol	Type		Description
15:8	RESERVED	Mode	RO	Always 0
		HW Rst	0	
		SW Rst	0	
7	AUTO_NEG_PRESENT	Mode	RO	Always 1
		HW Rst	1	
		SW Rst	1	
6:4	RESERVED	Mode	RO	Always 0
		HW Rst	0	
		SW Rst	0	
3	PCS PRESENT	Mode	RO	Always 1
		HW Rst	1	
		SW Rst	1	
2:1	RESERVED	Mode	R/W	Always 0
		HW Rst	0	
		SW Rst	0	

Table 5-304 AN package bit description (cont.)

Bits	Symbol	Type		Description
0	MII_REG_PRESENT	Mode	R/W	Always 1
		HW Rst	1	
		SW Rst	1	

5.12.3 AN status

Address offset: 0x01 or 0d1

Device address: 7

Table 5-305 summarizes the AN status.

Table 5-305 AN status bit description

Bits	Symbol	Type		Description
15:8	RESERVED	Mode	RO	
		HW Rst	0	
		SW Rst	0	
7	XNP_STATUS	Mode	RO	0 = Extended next page shall not be used. 1 = Both local device and link partner have indicated support for extended next page.
		HW Rst	0	
		SW Rst	0	
6:0	RESERVED	Mode	RO	
		HW Rst	0	
		SW Rst	0	

5.12.4 AN XNP transmit

Address offset: 0x016 or 0d22

Device address: 7

Table 5-306 summarizes the AN XNP transmit register.

.

Table 5-306 AN XNP transmit bit description

Bits	Symbol	Type		Description
15:0	XNP_22	Mode	RO	Bits[15:0] of extended next page transmits
		HW Rst	0	
		SW Rst	0	

5.12.5 AN XNP transmit1

Address offset: 0x017 or 0d23

Device address: 7

Table 5-307 summarizes the AN XNP transmit 1 register.

Table 5-307 AN XNP transmit1 bit description

Bits	Symbol	Type		Description
15:0	XNP_23	Mode	RO	Bits[31:16] of extended next page transmits
		HW Rst	0	
		SW Rst	0	

5.12.6 AN XNP transmit 2

Address offset: 0x018 or 0d24

Device address: 7

Table 5-308 summarizes the AN XNP transmit 2 register.

Table 5-308 AN XNP transmit2 bit description

Bits	Symbol	Type		Description
15:0	XNP_23	Mode	RO	Bits[47:32] of extended next page transmits
		HW Rst	0	
		SW Rst	0	

5.12.7 AN LP XNP ability

Address offset: 0x019 or 0d25

Device address: 7

Table 5-309 summarizes the AN LP XNP ability register.

Table 5-309 AN LP XNP ability bit description

Bits	Symbol	Type		Description
15:0	LP_XNP_1	Mode	RO	Bits[15:0] of received extended next page from link partner
		HW Rst	15'h0	
		SW Rst	15'h0	

5.12.8 AN LP XNP ability1

Address offset: 0x01A or 0d26

Device address: 7

Table 5-310 summarizes the AN LP XNP ability 1 register.

Table 5-310 AN LP XNP ability1 bit description

Bits	Symbol	Type		Description
15:0	LP_XNP_2	Mode	RO	Latched when LP_XNP_1 is read Bits[31:16] of received extended next page from link partner
		HW Rst	15'h0	
		SW Rst	15'h0	

5.12.9 AN LP XNP ability2

Address offset: 0x01B or 0d27

Device address: 7

Table 5-311 summarizes the AN LP XNP ability2 register.

Table 5-311 AN LP XNP ability2 bit description

Bits	Symbol	Type		Description
15:0	LP_XNP_3	Mode	RO	Latched when LP_XNP_1 is read Bits[47:32] of received extended next page from link partner
		HW Rst	15'h0	
		SW Rst	15'h0	

5.12.10 EEE advertisement

Address offset: 0x3C (Hex)

Device address: 7

Table 5-312 summarizes the EEE advertisement register.

Table 5-312 EEE advertisement bit description

Bits	Symbol	Type		Description
15:3	RESERVED	Mode	RO	Always 0
		HW Rst	0	
		SW Rst	0	

Table 5-312 EEE advertisement bit description (cont.)

Bits	Symbol	Type		Description
2	EEE_1000BT	Mode	R/W	If local device supports EEE operation for 1000BASE_T, and EEE operation is desired, this bit shall be set to 1.
		HW Rst	1	
		SW Rst	Retain	
1	EEE_100BT	Mode	R/W	If local device supports EEE operation for 100BASE-Tx, and EEE operation is desired, this bit shall be set to 1.
		HW Rst	1	
		SW Rst	Retain	
0	RESERVED	Mode	RO	Always 0
		HW Rst	0	
		SW Rst	0	

5.12.11 EEE LP advertisement

Address offset: 0x3D (Hex)

Device address: 7

Table 5-313 summarizes the EEE LP advertisement register.

Table 5-313 EEE LP advertisement bit description

Bits	Symbol	Type		Description
15:3	RESERVED	Mode	RO	Always 0
		HW Rst	0	
		SW Rst	0	
2	EEE_1000BT	Mode	RO	If local device supports EEE operation for 1000BASE-T, and EEE operation is desired, this bit shall be set to 1.
		HW Rst	0	
		SW Rst	0	
1	EEE_100BT	Mode	RO	If local device supports EEE operation for 100BASE-Tx, and EEE operation is desired, this bit shall be set to 1.
		HW Rst	0	
		SW Rst	0	
0	RESERVED	Mode	RO	Always 0
		HW Rst	0	
		SW Rst	0	

5.12.12 EEE ability auto-negotiation result

Address offset: 0x8000 (Hex)

Device address: 7

Table 5-314 summarizes the EEE ability auto-negotiation result register.

Table 5-314 EEE ability auto-negotiation result bit description

Bits	Symbol	Type		Description
15:3	RESERVED	Mode	RO	Always 0
		HW Rst	0	
		SW Rst	0	
2	EEE_1000BT_EN	Mode	RO	0 = 1000BASE-T az disable; either side does not support EEE operation for 1000BT, or EEE operation is not desired. 1 = 1000BASE-T az enable; both sides support EEE operation for 1000BT, and EEE operation is desired.
		HW Rst	0	
		SW Rst	0	
1	EEE_100BT_EN	Mode	RO	0 = 100BASE-Tx az disable; either side does not support EEE operation for 100BASE-Tx, or EEE operation is not desired. 1 = 100BASE-Tx az enable; both sides support EEE operation for 100BASE-Tx, and EEE operation is desired.
		HW Rst	0	
		SW Rst	0	
0	RESERVED	Mode	RO	Always 0
		HW Rst	0	
		SW Rst	0	

6 Package Dimensions

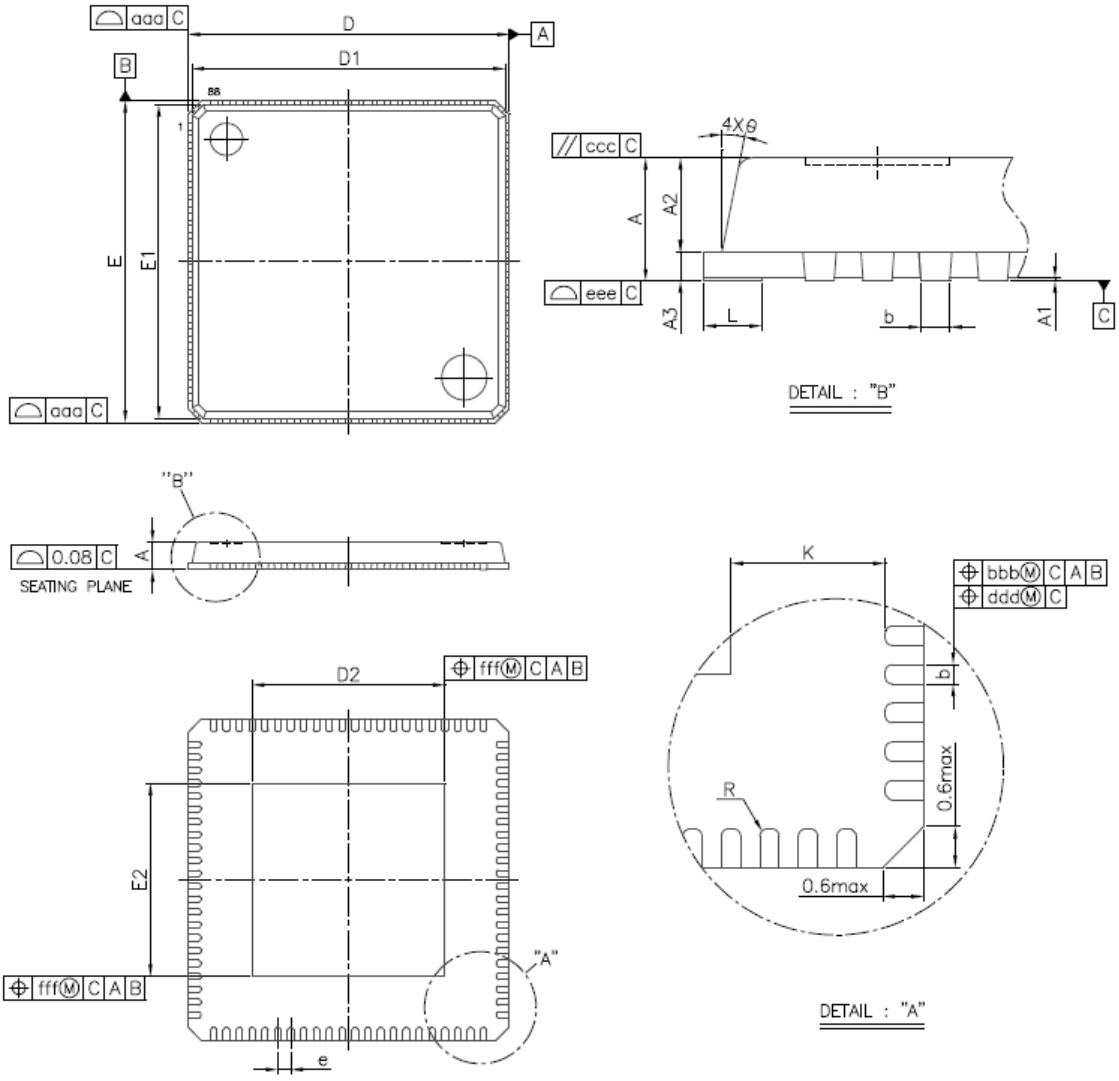

Figure 6-1 88-pin QFN package drawing

Table 6-1 Package dimensions (QFN)

Symbol	Min.	Nom.	Max.	Unit
A	0.80	0.85	0.90	mm
A1	0.00	0.02	0.05	mm
A2	0.60	0.65	0.70	mm
A3		0.20 REF		mm
b	0.15	0.20	0.25	mm
D/E		10.00 BSC		mm
D1/E1		9.75 BSC		mm
D2/E2	5.85	6.00	6.15	mm
e		0.40 BSC		mm
L	0.30	0.40	0.50	mm
θ	0	–	14	°
R	0.075	–	–	mm
K	0.20	–	–	mm
aaa		0.10		mm
bbb		0.07		mm
ccc		0.10		mm
ddd		0.05		mm
eee		0.08		mm
fff		0.10		mm
Reference document: JEDEC MO-220				

7 Ordering Information

The order information is listed in Table 7-1.

Table 7-1 Ordering information

Ordering number	Package	Ambient temperature	Default ordering unit
QCA8334-AL3C	QFN 88-pin (10 mm x 10 mm)	Commercial (0–70 °C)	Tray

8 Top-Side Marking

The top-side marking is listed in Figure 8-1.

Table 8-1 Top-side marking

Ordering number	Marking
QCA8334-AL3C	QCA8334-AL3C

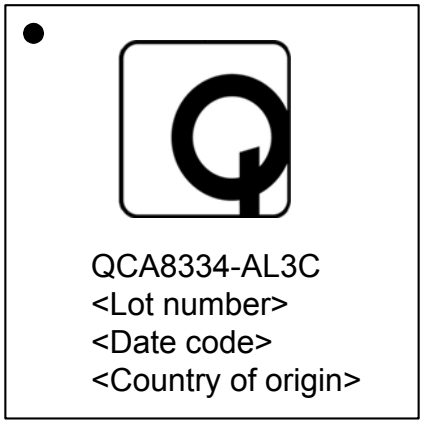

Figure 8-1 QCA8334 top-side marking