Application Note

Difference for Migration

From KSZ8995MA/FQ to KSZ8895MQ/FMQ

Introduction

Micrel's new generation 5-port management switch KSZ8895 family has many new features and benefit with on-chip termination, lowest power consumption, power management, quality of service (QoS) four queues prioritization, programmable rate limit and priority ratio, RSTP, multiple packets filtering and so on. This application note describes the migration requirements from the KSZ8995 to KSZ8895.

There are two parts that can be migrated directly:

1. KSZ8995MA can be migrated to the KSZ8895MQ with all copper ports.
2. KSZ8995FQ can be migrated to the KSZ8895FMQ with fiber port to be used on port 3 and port 4, other are copper ports.

Pin to Pin Compatibility

The KSZ8995 device can be replaced by KS8895 on the PCB board directly since are compatible. Please see their pin diagrams below:

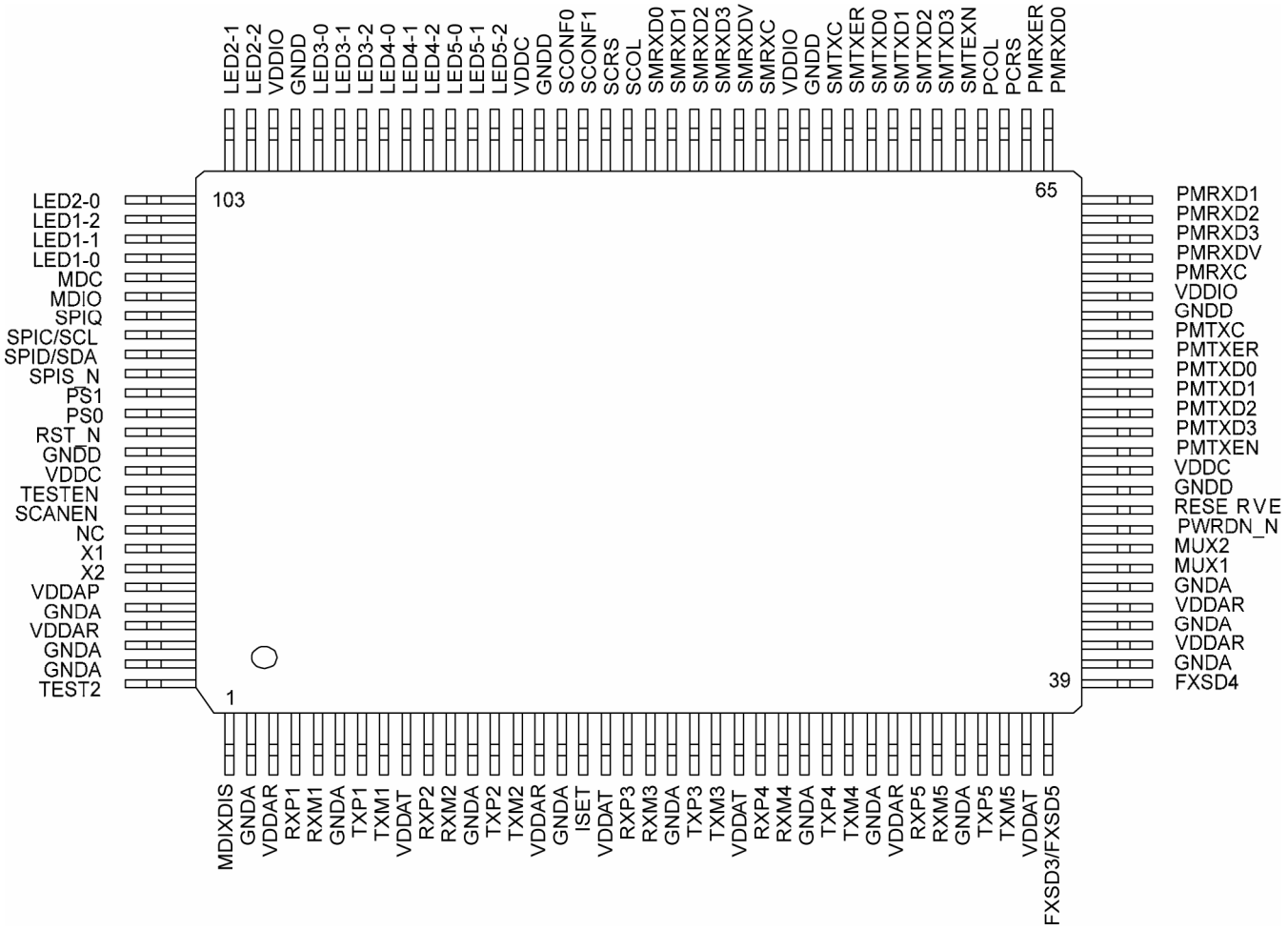


Figure 1: KSZ8995MA/FQ Pin Diagram

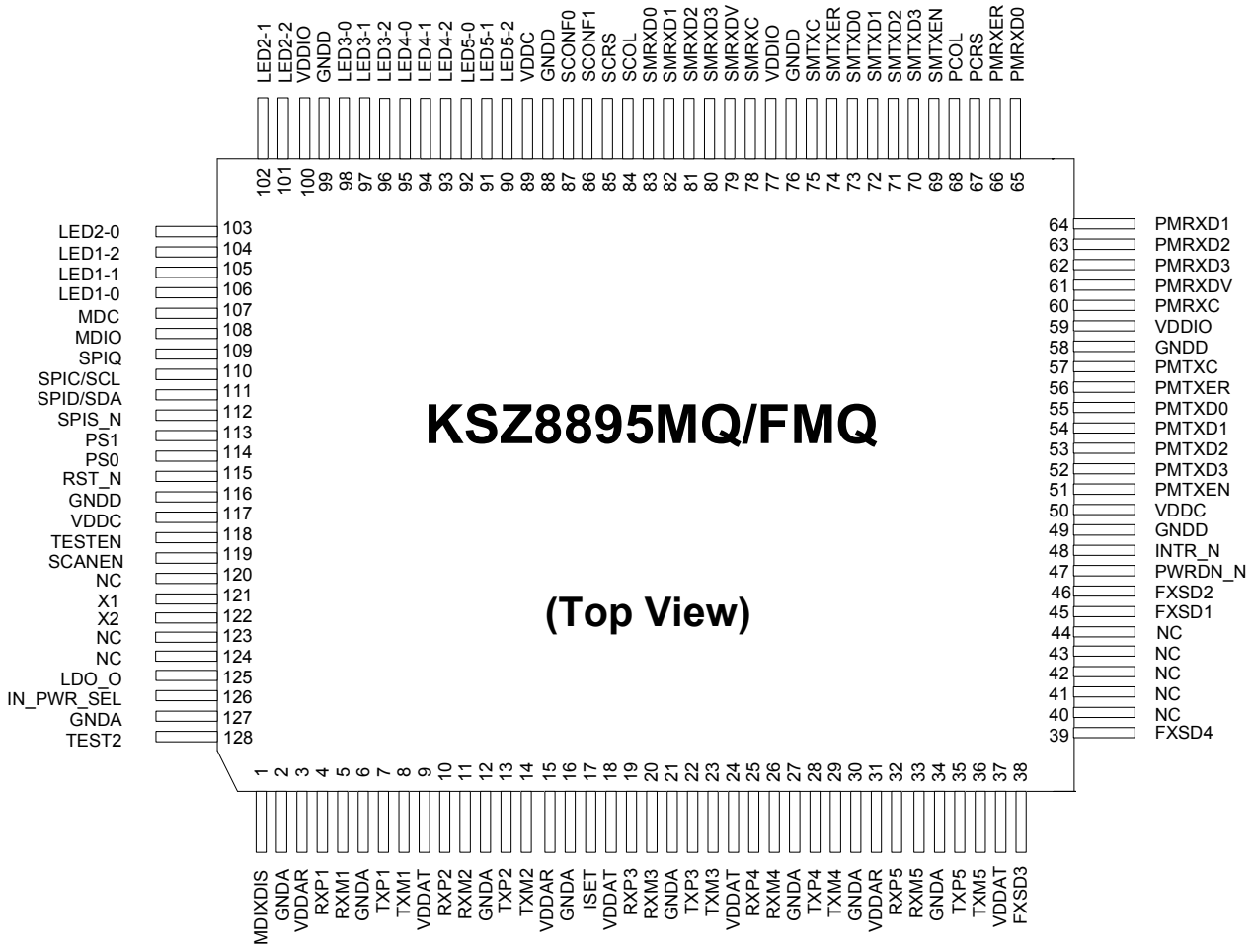


Figure 2: KS8895MQ/FMQ Pin Diagram

Describe the pin to pin compatibility to replace KSZ8995 with KSZ8895 on existing board:

1. Pin 1 to pin 37 are the same between KSZ8995 and KSZ8895.

2. Pin 38 is NC (No Connection) in KS8895MQ/TMQ, pin 38 is FXSD3 in KSZ8895FMQ which is same with KSZ8995FQ. Pin 39 is NC (No Connection) on the KS8895MQ/TMQ, pin 39 is FXSD4 on KSZ8895FMQ which is the same with KSZ8995FQ. Pin 38 and pin 39 have internal pull-down for copper mode of the KSZ8895MQ/TMQ. Pin 38 and pin 39 are signal detect pins for fiber mode of port 3 and port 4 on the KSZ8895FMQ.

3. Pin 40 to pin 46 are NC (No Connection) in the KSZ8895, Due to using new process technology with less power and ground pins for KS8895. These pins can be NC or are connected to power/ ground with internal no connection for product with the KSZ8995 device to be replaced by the KSZ8895 device. Pin 45 and pin 46 MUX pins on the KSZ8995 are for factory test, NC them are for normal operation.

4. Pin 47 PWRDN_N is the same as hardware power-down pin between KSZ8995 and KSZ8895.

5. Pin 48 is NC on the KSZ8995, pin 48 is INTR_N interrupt pin for the link change in the KSZ8895. It is ok to leave this pin floating if the interrupt pin is unused.

6. Pin 49 to pin 122 are the same between the KSZ8995 and KSZ8895.

7. Pin 123 and pin 124 are NC with internal No Connection in KS8895, pin 123 and pin 124 are the power VDDAP and ground on the KSZ8995, So it doesn't matter when KSZ8895 instead of KSZ8995 is used the pin 123 and pin 124.

8. Pin 125 and pin 126 are power and ground pins in the KSZ8995. Pin 125 and pin 126 are LDO_O (1.2V LDO controller output) and IN_PWR_SEL (internal 1.2V LDO controller select) pins on the KS8895. When pin 126 IN_PWR_SEL pin is ground '0', then the internal 1.2V LDO controller is disabled and the pin 125 LDO_O is tri-stated, so the two pins will not be affected when the KSZ8895 is used instead of the KSZ8995 because pin 126 is ground '0' with internal 1.2V LDO controller disabled and pin 125 is tri-stated with a power.

9. Pin 127 to pin 128 are same between KSZ8995 and KSZ8895.

Pin to pin comparison

Pin Number	Pin Name	Type	KSZ8995MA/FQ Function	KSZ8895MQ/FMQ Function(1)
1-37			MDI-XDIS, RX/TX pairs and ground/power	Same with KSZ8995
38	FXSD3/5	Ipd	FQ: Fiber signal detect pin for port 3 MA/XA: Fiber signal detect pin for port 5 No connection for copper	FMQ: Fiber signal detect pin for port 3 MQ/TMQ/RQ: no connection for copper
39	FXSD4	Ipd	FQ/MA/XA: Fiber signal detect pin for port 4 No connection for copper	FMQ: Fiber signal detect pin for port 4 MQ/TMQ/RQ: no connection for copper
40			GNDA	NC (Internal no connection) Note: due to use 0.13um technology, KSZ8895 can reduce some ground and power pins.
41			VDDAR	NC (Internal no connection)
42			GNDA	NC (Internal no connection)
43			VDDAR	NC (Internal no connection)
44			GNDA	NC (Internal no connection)
45		NC	MUX1	NC (Internal no connection)
46		NC	MUX2	NC (Internal no connection)
47	PWRDN_N	Ipu	Full-chip power down. Active low.	Full-chip power down. Active low.
48			RESERVED with NC	Interrupt pin, if doesn't use this pin, NC is ok
49	GNDD	Gnd	Digital ground.	Digital ground.
50	VDDC	P	1.8V digital core V_{DD}.	1.2V digital core V_{DD}.
51-57			Port 5 PHY5 P5-MII TX Signals	Port 5 PHY5 P5-MII TX Signals
58	GNDD	Gnd	Digital ground.	Digital ground.
59	VDDIO	P	3.3V digital V_{DD} for digital I/O circuitry.	3.3V, 2.5V or 1.8V digital V_{DD} for digital I/O circuitry.
60-68			Port 5 PHY5 P5-MII RX Signals	Port 5 PHY5 P5-MII RX Signals Strap pin same with KSZ8995
69-75			Port 5 MAC5 SW5-MII TX Signals	Port 5 MAC5 SW5-MII TX Signals
76	GNDD	Gnd	Digital ground.	Digital ground.
77	VDDIO	P	3.3V digital V_{DD} for digital I/O circuitry.	3.3V, 2.5V or 1.8V digital V_{DD} for digital I/O circuitry.
78-85			Port 5 MAC5 SW5-MII RX Signals	Port 5 MAC5 SW5-MII RX Signals
86-87	SCONF[1:0]	Ipd	Configuration pins for MII	Same with KSZ8995
88	GNDD	Gnd	Digital ground.	Digital ground.

Pin Number	Pin Name	Type	KSZ8995MA/FQ Function	KSZ8895MQ/FMQ Function[1]
89	VDDC	P	1.8V digital core V_{DD}.	1.2V digital core V_{DD}.
90-92	LED5[2:0]	Ipu/O	Port 5 LED indicators	Same with KSZ8995
93-95	LED4[2:0]	Ipu/O	Port 4 LED indicators	Same with KSZ8995 except LED4-0 strap option: PU (default) = Normal mode. PD = Energy Detection mode (EDPD mode)
96-98	LED3[2:0]	Ipu/O	Port 3 LED indicators	Same with KSZ8995 except LED3-0 strap option: PU = Select I/O drive current (8mA) PD = Select I/O drive strength (12mA).
99	GNDD	Gnd	Digital ground.	Digital ground.
100	VDDIO	P	3.3V digital V_{DD} for digital I/O circuitry.	3.3V, 2.5V or 1.8V digital V_{DD} for digital I/O circuitry.
101-103	LED2[2:0]	Ipu/O	Port 2 LED indicators	Same with KSZ8995 except LED2-1 strap option: It is for port 3 only. PU (default) = Enable auto-negotiation. PD = Disable auto-negotiation. Strap to register60 bit [7].
104	LED1-2	Ipu/O	Port 1 LED indicator 2	Port 1 LED indicator 2
105	LED1-1	Ipu/O	Port 1 LED indicator 1	Port 1 LED indicator 1 Strap option: for port 3 only. PU (default) = no force flow control, normal operation. PD = force flow control.
106	LED1-0	Ipu/O	Port 1 LED indicator 0	Port 1 LED indicator 0 Strap option for port 3 only. PU (default) = force half-duplex if auto-negotiation is disabled or fails. PD = force full-duplex if auto negotiation is disabled or fails.
107-112			MDC/MDIO and SPI interfaces	Same with KSZ8995
113-114	PS[1:0]	Ipd	Serial bus configuration pin.	Same with KSZ8995
115-122	RST_N	Ipu	Reset pin	Same with KSZ8995
116	GNDD	Gnd	Digital ground.	Digital ground.
117	VDDC	P	1.8V digital core V_{DD}.	1.2V digital core V_{DD}.
118-122			TEST/SCANEN, NC and X1/X2 pins	Same with KSZ8995.
123			VDDAP	NC (Internal no connection)
124			GNDA	NC (Internal no connection)
125			VDDAR	LDO_O When pin126 is pull-up, the Internal 1.2V LDO controller is enabled and creates 1.2V output with using an external FET. When pin126 is pull-down (default), the pin 125 is tri-stated.
126			GNDA	IN_PWR_SEL (internal pull-down) Pull-up to enable LDO_O of pin 125. Pull down to GNDA to disable LDO_0.
127	GNDA	Gnd	Analog ground	Analog ground.
128	TEST2	NC	NC for normal operation	Same with KSZ8995

Note1: For other change, see below for details.

Core Power from 1.8V to 1.2V

The KSZ8895 can use 1.2V low core power for the low power consumption. Due to ground the pin 126 after the KSZ8995 is replaced by using KSZ8895, the internal 1.2V LDO controller is disabled, an external 1.2V LDO is still needed. Just change the external 1.8V LDO to a 1.2V LDO, the 1.2V power rail will meet the core power request of the KSZ8895 device.

For new designs, there is one more option to use the internal 1.2V LDO controller with a cheap MOSFET to support 1.2V core power by pull-up on pin 126 IN_PWR_SEL, please see the reference schematics in the hardware design package of the design kit.

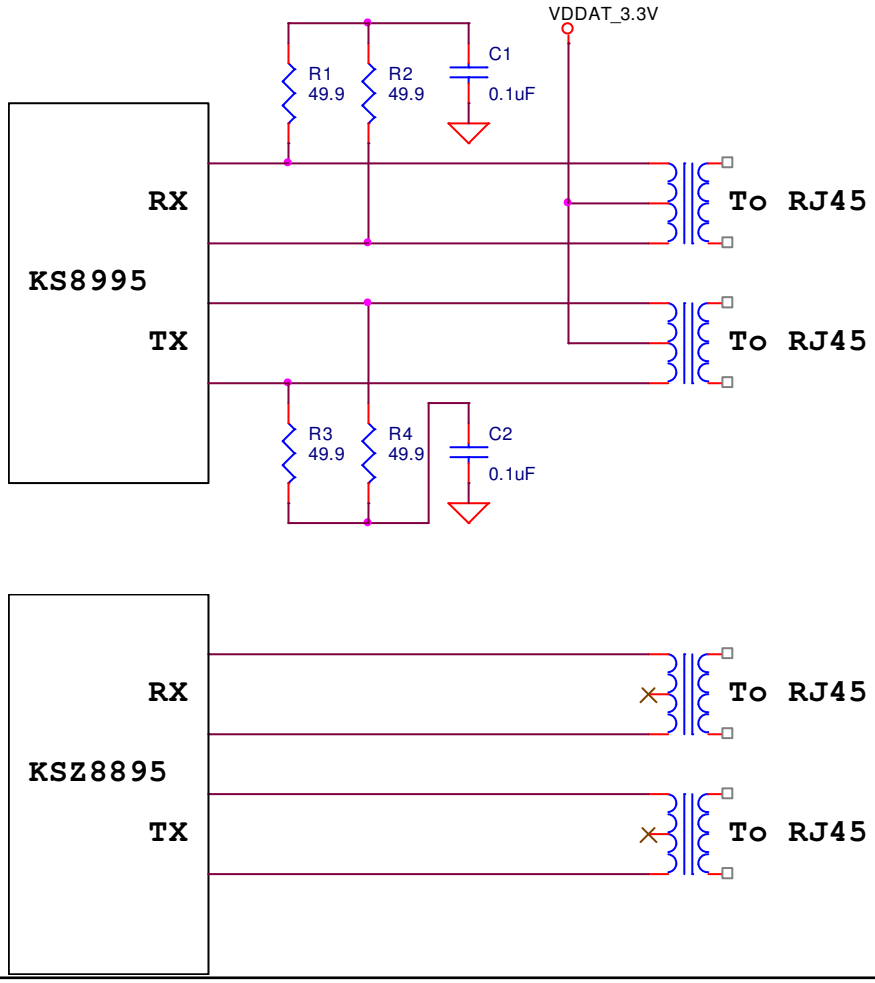
Transceiver Power 3.3V only

For the VDDAT power, KSZ8995 supports 2.5V or 3.3V, KSZ8895 supports 3.3V only. If the old product uses 2.5V as VDDAT power, then the migration should use 3.3V as VDDAT for the KSZ8895 device.

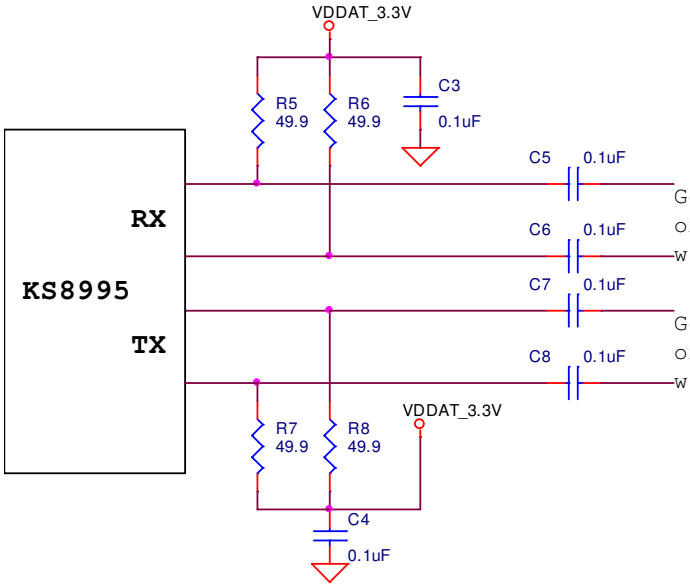
On-chip Termination and Internal Biasing

KSZ8895 supports the on-chip termination and internal biasing, so all external 49.9ohm termination resistors on the RX pair and TX pair can be removed. There is no need to pull up to VDDAT for the center tap of the transformer, Just leave the center taps open or go through two capacitors to ground separately for RX and TX paths. The transformer will not consume power and reduce the system power consumption. Please see the figures below.

Connection Comparison for Copper Port

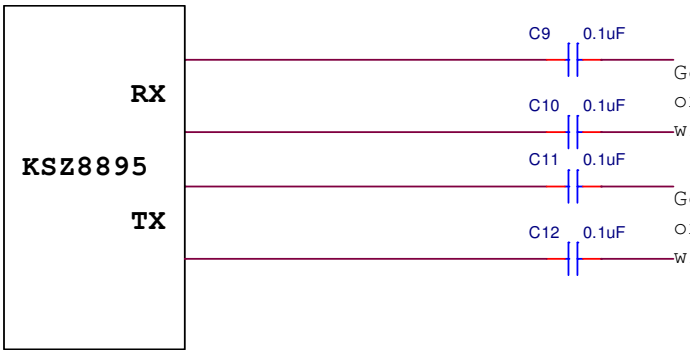


Connection Comparison for Fiber Module or Cap AC Coupling with Two Copper Ports



Go to fiber module TX pair with terminations
or go to another device copper port TX
with termination resistors of external biasing

Go to fiber module RX pair with terminations
or go to another device copper port RX
with termination resistors of external biasing



Go to fiber module TX pair with terminations
or go to another device copper port TX
with termination resistors of external biasing

Go to fiber module RX pair with terminations
or go to another device copper port RX
with termination resistors of external biasing

If the old product with the KSZ8995 device to be replaced by the KSZ8895 uses a quad transformer, the quad transformer should be changed to part number of the H1664NL in which the internal center taps of the RX and TX is disconnected with no connection. Use Pulse H1664NL or other similar quad transformer.

ISET Resistor Value

Due to use enhanced mix signal design with DSP technology for the transceiver in the KSZ8895 device, the ISET resistor value will be changed also from 3.01K of the KSZ8995 to 12.4K of the KSZ8895.

Conclusion

By the above describes the difference and migration path from the KSZ8995 to the KSZ8895, the migration is simple and easy. They are pin to pin compatible, the core power voltage changes to 1.2V, change the ISET resistor value to 12.4K and refer to the connection diagram for new features of on-chip termination and internal biasing. As shown in this paper, Micrel's Ethernet product KSZ8895 family of switches provides an easy way to migrate from the KSZ8995 to the KSZ8895 to upgrade and supports your Ethernet applications.

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