GAINSTRONG

Oolite V8.2_SPEC_EN

AX1800 Router Module

Version 1.0.2

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Revision	Date	Contents of Revision Change	Remark
1.0.0	2023-08-23	First release	WSY
1.0.1	2023-10-26	Update specification parameters	WSY
1.0.2	2023-11-16	Update input voltage range	WSY

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1 INTRODUTION

The Oolite V8.2 module use the MT7621A as main chip, MT7975DN and MT7905DAN WiFi 6 WLAN chip Composition of dual frequency WiFi 6 module solution.

The MT7621A integrates a dual-core MIPS1004Kc (880MHz), HNAT/ HQoS/ Samba/ VPN accelerators, 5-port GbE switch, RGMII, USB3.0, USB2.0, 3xPCIe, SD-XC. The powerful CPU with rich portfolio is suitable for 802.11ac, LTE cat4/5, edge, hotspot, VPN, AC (Access Control). It can also connect to touch-panel, ZigBee/Z-Wave for Internet Service Router and Home Security Gateway.

The MT7975DN is an IEEE 802.11ax 2x2 A-band + 2x2 G-band MIMO and Wi-Fi/BT 2-in-1 chip which contains 2.4 GHz WI-Fi transceiver front-ends, 5 GHz Wi-Fi transceiver front-ends, and a Bluetooth transceiver front-end in a DRQFN package. Dedicated Dynamic Frequency Selection (DFS) and Spectrum Monitor (SM) receivers are included to support coexist with 5GHz radar or other 2.4G WIFI systems.

The MT7905DAN is a highly integrated Wi-Fi A/D chip which supports 573+1201 Mbps PHY rate. It fully complies with IEEE 802.11ax and backward compatible with IEEE 802.11 a/b/g/n/ac standards, offering feature-rich wireless connectivity at high standards, and delivering reliable, cost effective throughput from an extended distance.

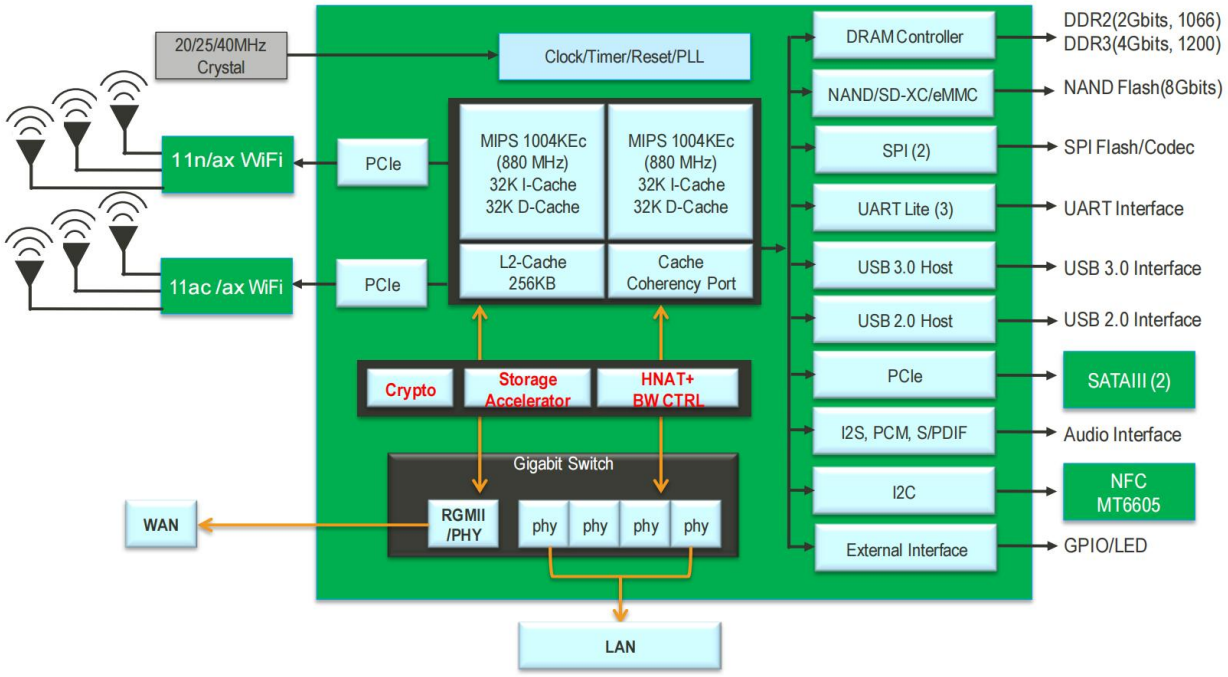
For the next generation router, MT7621AT provides several dedicated hardware engines to accelerate the NAT, QoS, Samba and VPN traffic. These accelerators relief the CPU for other upper layer applications.

Features

- CPU MT7621A Embedded MIPS1004Kc (880 MHz)
- WLAN Chip MT7905DAN+MT7975DN (AX1800 WiFi6)

- RAM: 128MByte(256/512MByte optional)
- Flash:16MByte(32/64MByte optional)
- 5-port 10/100/1000Mbps SW/PHY
- Support 802.11b/g/n/ax 2T2R 2.4GHz 600Mbps, 802.11ac/ax 2T2R 5.8GHz 1200Mbps
- 1x RGMII/MII interface
- SPI, NAND Flash, SDXC, eMMC(4 bits)
- 1x USB 3.0, 1x USB 2.0, 1x PCIe host, I2C, SPI*2, UART lite*3, JTAG, MDC, MDIO, GPIO
- HW storage accelerator
- OpenWrt / Linux 5.15 SDK
- VoIP support (I2S, PCM) , Audio interface (SPDIF-Tx, I2S, PCM)
- Power supply voltage: 5V-12V
- Antenna: 2 x IPEX external Antenna(default combine) or 4 x IPEX external Antenna
- Size: 80.0mm x 70.0mm x 10.5mm

2 BLOCK DIAGRAM



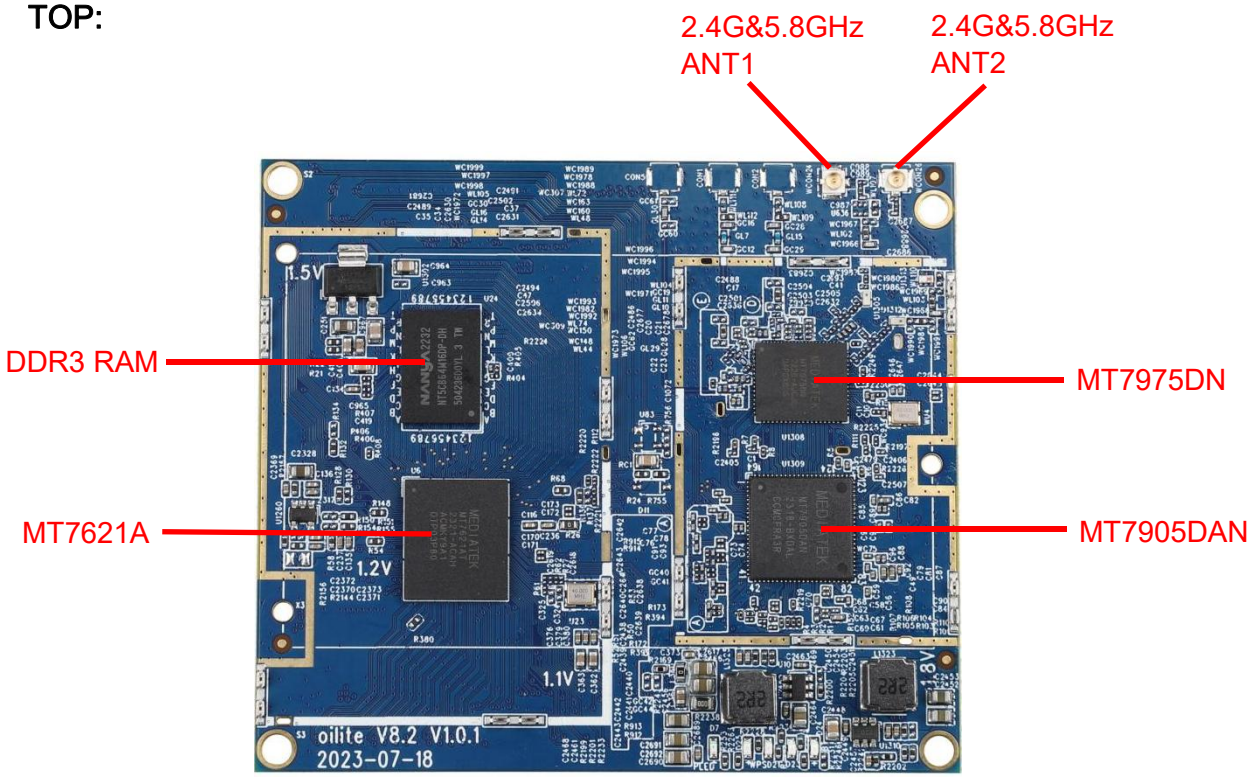
3 MAIN CHIP FEATURES

The following table covers the main features offered by the MT7621A. Overall, the MT7621A supports the requirements of an high-level AP/router, and a number of interfaces together with a large maximum RAM capacity.

Features	MT7621A
CPU	MIPS1004Kc (880 MHz, Durl Core)
I-Cache, D-Cache	32 KB, 32 KB
L2 Cache	256KB
HNAT/HQoS	HQoS 16 queues HNAT 2 Gbps forwarding (IPv4, IPv6 routing, DS-Lite, 6RD, 6to4)
Memory	
DRAM Controller	16-bit
DDR2	800 Mbps (max 256 MByte)
DDR3	1200 Mbps (max 512 MByte)
NAND	Small page 512-Byte (max 512 Mbit) Large page 2k-Byte (max 8 Gbit)
SPI Flash	3B addr mode (max 128 Mbit) 4B addr mode (max 512 Mbit)
SD eMMC	SD-XC class 10 (max 128 GByte) 4-bit eMMC (max 8 GByte)
PCIe	3
USB	USB3 x 1+ USB2 x 1 or USB2 x 2
Ethernet	5-port GSW + RGMII(1)
I2S	1
PCM	1
I2C	1
SPDIF-Tx	1
UART Lite	3
JTAG	1
Package	LFBGA 11.7 mm x 13.6 mm

4 PICTURES

TOP:



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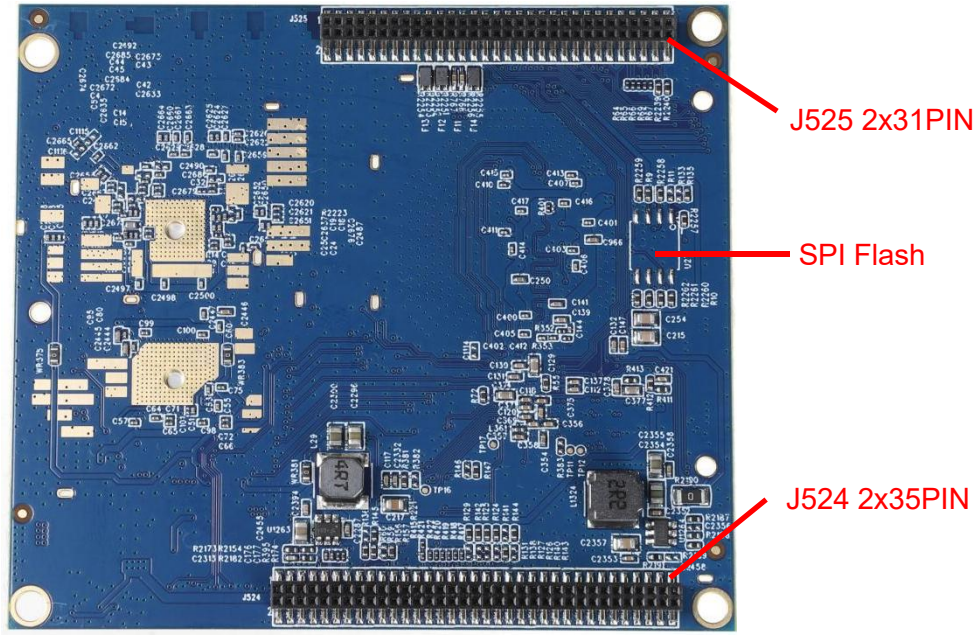

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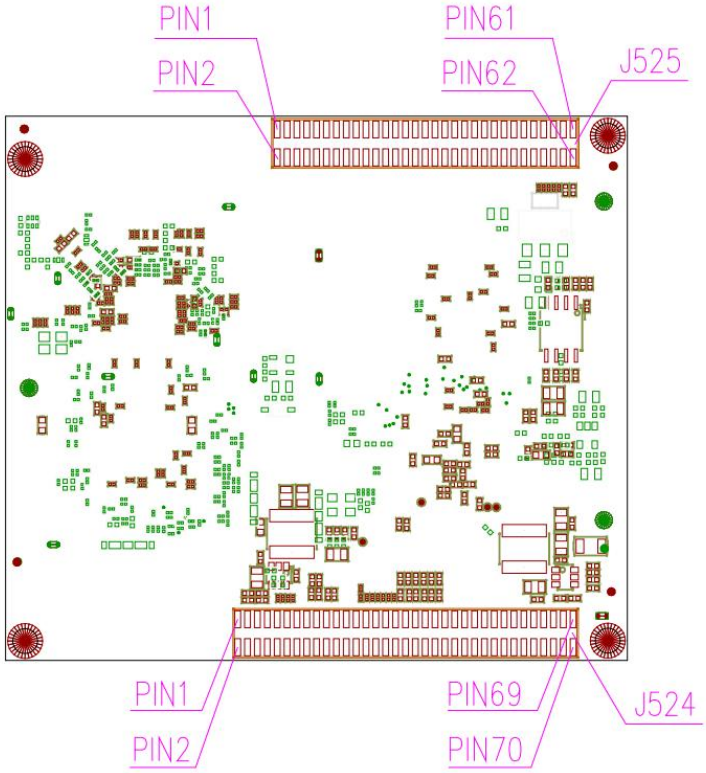
5 PINS DESCRIPTION



J524 Header					
Descriptions	**Name**	**PINs**		**Name**	**Descriptions**
Power input,Supports 5V-12V input	5V	1	2	5V	Power input,Supports 5V-12V input
Power input,Supports 5V-12V input	5V	3	4	5V	Power input,Supports 5V-12V input
Groun	GND	5	6	GND	Groun
PCIe2 differential receive RX -	PCIE_RXN2	7	8	PCIE_RXP2	PCIe2 differential receive RX +
PCIe2 differential transmit TX -	PCIE_TX2_N	9	10	PCIE_TX2_P	PCIe2 differential transmit TX+
PCIe2 reference clock (negative)	PCIE_CK2_N	11	12	PCIE_CK2_P	PCIe2 reference clock (positive)
Groun	GND	13	14	GND	Groun
Default debug uart transmit /GPIO#2/System configuration pins, use with caution	UART0_TXD	15	16	UART0_RXD	Default debug uart receive /GPIO#1
I2C Clock/GPIO#4	I2C_SCLK	17	18	I2C_SD	I2C Data/GPIO#3
System configuration pins, use with caution/GPO0 (output only)	GPIO0	19	20	GE_RXCLK	RGMII2 Rx Clock/GPIO#33

RGMII2 Rx Data bit #1/GPIO#29	GE_RXD1	21	22	GE_RXD0	RGMII2 Rx Data bit #0/GPIO#28
RGMII2 Rx Data Valid/GPIO#32	GE_RXDV	23	24	GE_RXD3	RGMII2 Rx Data bit #3/GPIO#31
RGMII2 Rx Data bit #2/GPIO 30	GE_RXD2	25	26	GE_MDIO	PHY Management Data. Note: While RGMII/MII connects to external PHY, this pin is MDIO. Else, it should be NC.
System configuration pins, use with caution/PHY Management Clock. Note: While RGMII/MII connects to external PHY, this pin is MDC. Else, it should be NC.	GE_MDC	27	28	GE_TXEN	RGMII2 Tx Data Valid/GPIO#26
RGMII2 Tx Clock/GPIO#27	GE_TXCLK	29	30	GE_TXD0	RGMII2 Tx Data bit #0/GPIO#22
RGMII2 Tx Data bit #1/GPIO#23	GE_TXD1	31	32	GE_TXD2	RGMII2 Tx Data bit #2/GPIO#24
RGMII2 Tx Data bit #3/GPIO#25	GE_TXD3	33	34	ESW_P0_LED_0	Port #0 PHY LED indicators
Digital test Without a network cable plugged in, the default output is 1. When a network cable is detected, the output is 0 at this time.	ESW_P0_LED_1	35	36	ESW_P1_LED_0	Port #1 PHY LED indicators Without a network cable plugged in, the default output is 1. When a network cable is detected, the output is 0 at this time.
Port #2 PHY LED indicators Without a network cable plugged in, the default output is 1. When a network cable is detected, the output is 0 at this time.	ESW_P2_LED_0	37	38	ESW_P3_LED_0	Port #3 PHY LED indicators Without a network cable plugged in, the default output is 0. When a network cable is detected, the output is 1
Port #4 PHY LED indicators Without a network cable plugged in, the default output is 1. When a network cable is detected, the output is 0 at this time.	ESW_P4_LED_0	39	40	PERST_N	System configuration pins, use with caution/PICe reset/GPIO#19/REFCLK0_OUT
Groun	GND	41	42	GND	Groun
Port #4 MDI Transceivers	ESW_TXVN_D_P4	43	44	ESW_TXVP_D_P4	Port #4 MDI Transceivers
Port #4 MDI Transceivers	ESW_TXVN_C_P4	45	46	ESW_TXVP_C_P4	Port #4 MDI Transceivers
Port #4 MDI Transceivers	ESW_TXVN_B_P4	47	48	ESW_TXVP_B_P4	Port #4 MDI Transceivers
Port #4 MDI Transceivers	ESW_TXVN_A_P4	49	50	ESW_TXVP_A_P4	Port #4 MDI Transceivers
Groun	GND	51	52	GND	Groun
Port #3 MDI Transceivers	ESW_TXVN_D_P3	53	54	ESW_TXVP_D_P3	Port #3 MDI Transceivers
Port #3 MDI Transceivers	ESW_TXVN_C_P3	55	56	ESW_TXVP_C_P3	Port #3 MDI Transceivers
Port #3 MDI Transceivers	ESW_TXVN_B_P3	57	58	ESW_TXVP_B_P3	Port #3 MDI Transceivers
Port #3 MDI Transceivers	ESW_TXVN_A_P3	59	60	ESW_TXVP_A_P3	Port #3 MDI Transceivers
Groun	GND	61	62	GND	Groun

Port #2 MDI Transceivers	ESW_TXVN_D_P2	63	64	ESW_TXVP_D_P2	Port #2 MDI Transceivers
Port #2 MDI Transceivers	ESW_TXVN_C_P2	65	66	ESW_TXVP_C_P2	Port #2 MDI Transceivers
Port #2 MDI Transceivers	ESW_TXVN_B_P2	67	68	ESW_TXVP_B_P2	Port #2 MDI Transceivers
Port #2 MDI Transceivers	ESW_TXVN_A_P2	69	70	ESW_TXVP_A_P2	Port #2 MDI Transceivers

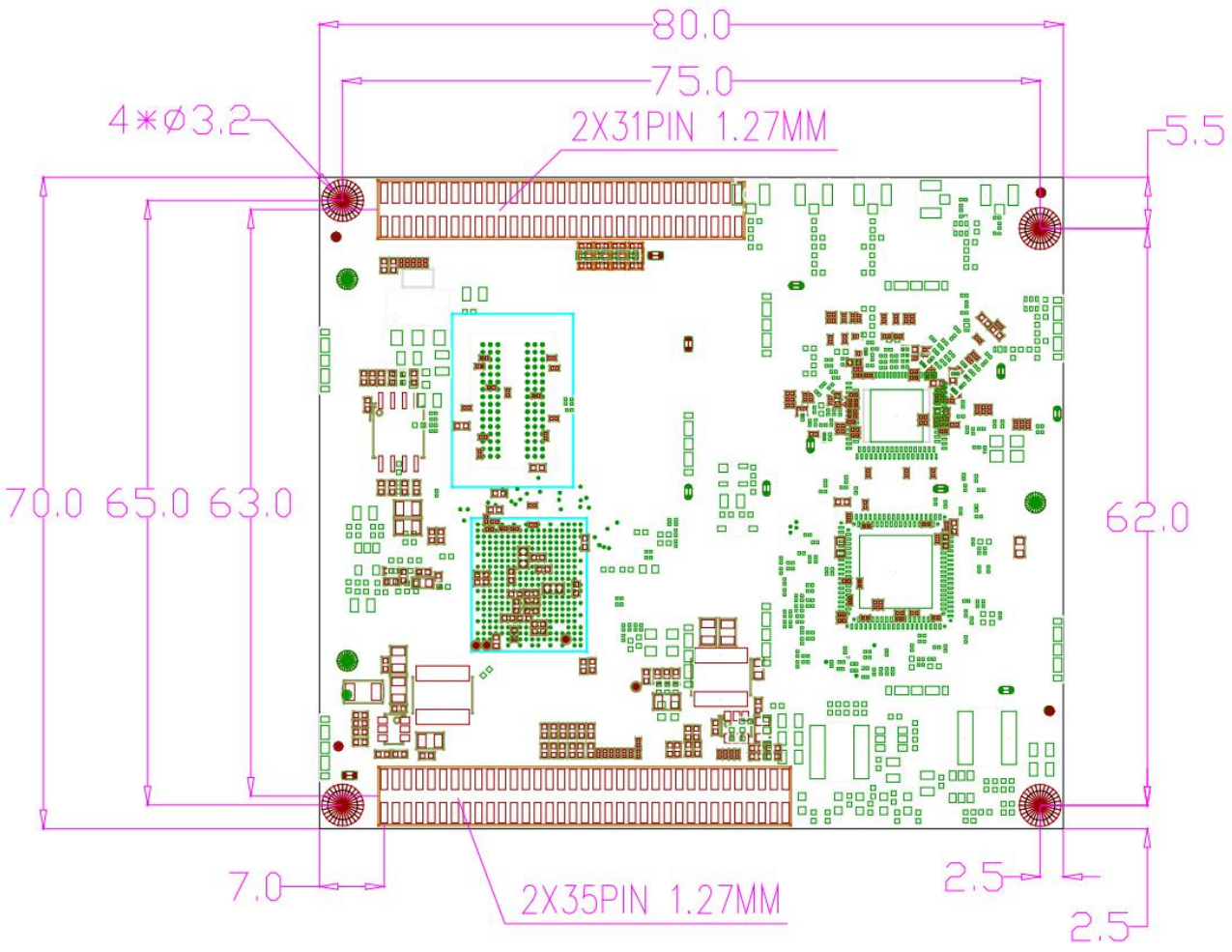
J525 Header

Descriptions	Name	PINs		Name	Descriptions
Port #1 MDI Transceivers	ESW_TXVN_D_P1	1	2	ESW_TXVP_D_P1	Port #1 MDI Transceivers
Port #1 MDI Transceivers	ESW_TXVN_C_P1	3	4	ESW_TXVP_C_P1	Port #1 MDI Transceivers
Port #1 MDI Transceivers	ESW_TXVN_B_P1	5	6	ESW_TXVP_B_P1	Port #1 MDI Transceivers
Port #1 MDI Transceivers	ESW_TXVN_A_P1	7	8	ESW_TXVP_A_P1	Port #1 MDI Transceivers
Port #0 MDI Transceivers	ESW_TXVN_D_P0	9	10	ESW_TXVP_D_P0	Port #0 MDI Transceivers
Port #0 MDI Transceivers	ESW_TXVN_C_P0	11	12	ESW_TXVP_C_P0	Port #0 MDI Transceivers
Port #0 MDI Transceivers	ESW_TXVN_B_P0	13	14	ESW_TXVP_B_P0	Port #0 MDI Transceivers
Port #0 MDI Transceivers	ESW_TXVN_A_P0	15	16	ESW_TXVP_A_P0	Port #0 MDI Transceivers
Groun	GND	17	18	GND	Groun
USB Port0 HS/FS/LS data pin Data+ (USB3.0)	USB_DP	19	20	USB_DM	USB Port0 HS/FS/LS data pin Data- (USB3.0)
USB Port0 SS data pin RX+ (USB3.0)	SSUSB_RXP	21	22	SSUSB_RXN	USB Port0 SS data pin RX- (USB3.0)
USB Port0 SS data pin TX- (USB3.0)	SSUSB_TXN	23	24	SSUSB_TXP	USB Port0 SS data pin TX+ (USB3.0)
Groun	GND	25	26	GND	Groun
USB Port1 data pin Data+ (USB2.0)	USB_DP_1P	27	28	USB_DM_1P	USB Port1 data pin Data- (USB2.0)
Groun	GND	29	30	GND	Groun
System configuration pins, use with caution/UART Request To Send/GPIO#9 /PCM_DTX	RTS2_N	31	32	RXD3	UART RX Data/GPIO#8/I2S_SDI

System configuration pins, use with caution/UART TX Data/GPIO#11 /PCM_CLK/SPDIF_TX	TXD2	33	34	TXD3	UART TX Data/GPIO#7/I2S_WS
UART RX Data/GPIO#12/PCM_FS	RXD2	35	36	RTS3_N	System configuration pins, use with caution/UART Request To Send/GPIO#5 /I2S_SDO/SPDIF_TX
UART Clear To Send/GPIO#10/PCM_DRX	CTS2_N	37	38	CTS3_N	UART Clear To Send/GPIO#6/I2S_CLK
NAND Flash ALE Latch Enable/SD_CMD/GPIO#44	ND_ALE	39	40	ND_WP	NAND Flash Write Protect/SD_WP/GPIO#41
NAND Flash Command Latch Enable/SD_CD/GPIO#43	ND_CLE	41	42	ND_WE_N	System configuration pins, use with caution/NAND Flash Write Enable/SPI_CS1/GPIO#35
Default module's own NOR flash usage, external usage with caution/NAND Flash Read Enable/SPI_CLK/GPIO#36	ND_RE_N	43	44	ND_CS_N	Default module's own NOR flash usage, external usage with caution/NAND Flash Chip Select/SPI_CS0/GPIO#34
NAND Flash Ready_Busy/SD_CLK/GPIO#42	ND_RB_N	45	46	ND_D0	NAND Flash Data0/SD DATA0/GPIO#45
NAND Flash Data2/SD_DATA2/GPIO#47	ND_D2	47	48	ND_D1	NAND Flash Data1/SD_DATA1/GPIO#46
Default module's own NOR flash usage, external usage with caution/NAND Flash Data4/SPI_MISO/GPIO#37	ND_D4	49	50	ND_D3	NAND Flash Data3/SD_DATA3/GPIO#48
Default module's own NOR flash usage, external usage with caution/NAND Flash Data6/SPI_WP/GPIO#39	ND_D6	51	52	ND_D5	Default module's own NOR flash usage, external usage with caution/NAND Flash Data5/SPI_MOSI/GPIO#38
JTAG Clock/GPIO#16	JTCLK	53	54	ND_D7	Default module's own NOR flash usage, external usage with caution/NAND Flash Data7/SPI_HOLD/GPIO#40
JTAG Data Output/GPIO#13	EJTAG-TDO	55	56	JTMS	JTAG Mode Select/GPIO#15
JTAG Target Reset/GPIO#17	JTRST_N	57	58	JTDI	JTAG Data Input/GPIO#14
Watchdog reset/GPIO#18/REFCLK0_OUT	WPS	59	60	LED_WLAN_2G	WIFI_LED(MT7915DAN Out)
Bluetooth_LED(MT7915DAN Out)	LED_BT	61	62	LED_WLAN_5G	WIFI_LED(MT7915DAN Out)

6 MECHANICAL

Dimensions (mm)	Length	Width	Height
	80.0 (Tolerance:±0.2mm)	70.0 (Tolerance:±0.2mm)	10.5 (Tolerance:±0.2mm)



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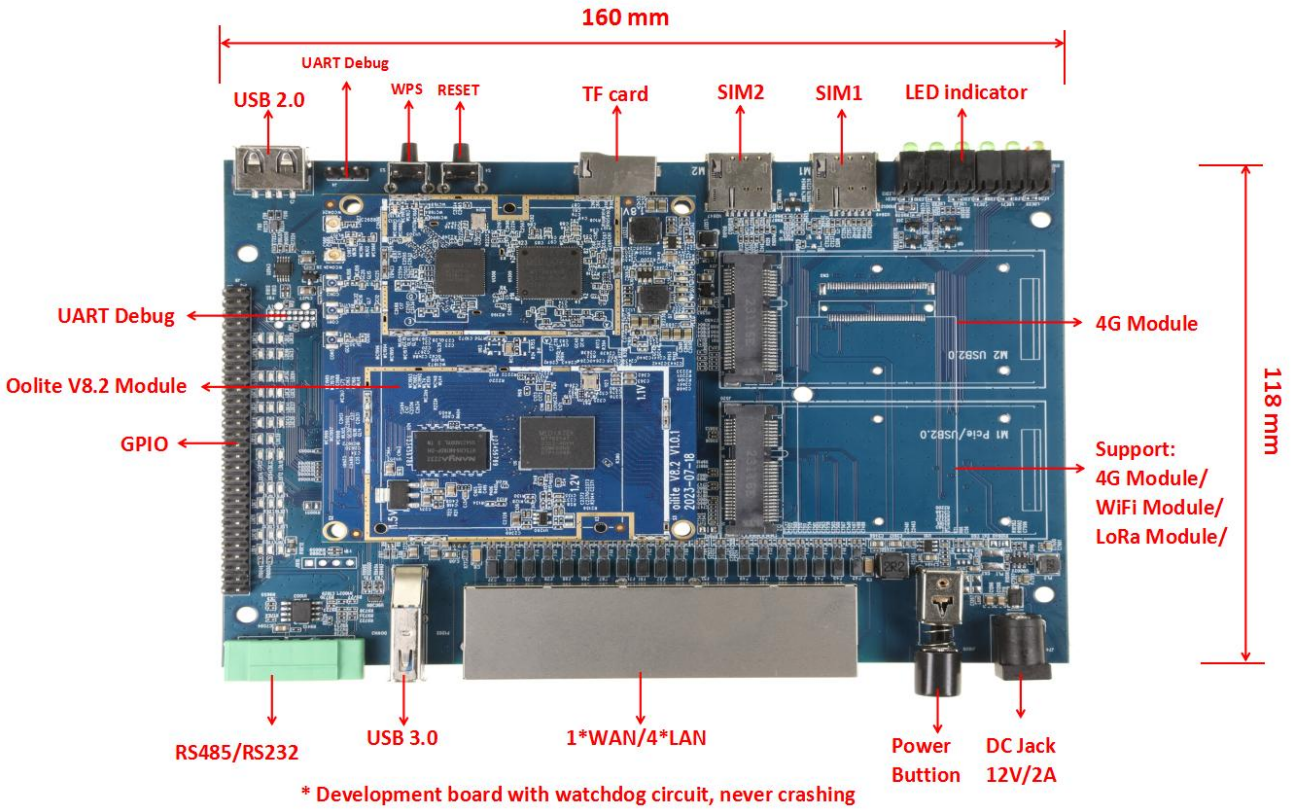
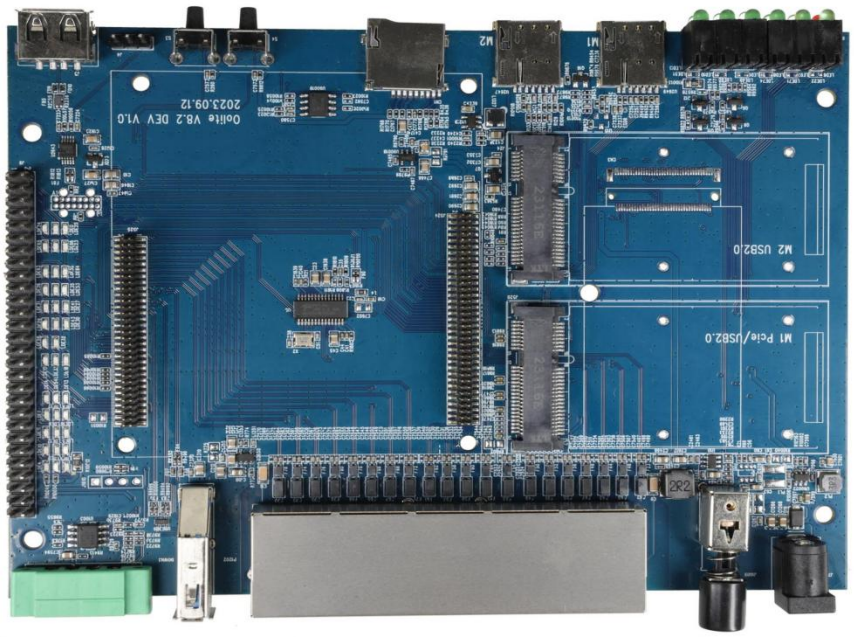
7 DEV INTERFACE DIAGRAM





8 SCHEMATIC DESIGN NOTES

This part contains the schematic and PCB design notes for the customer who use the Core module for their own production. You can see our reference design and the MT7621A Spec. for more detail design information.

7.1 ANTENNA CONNECTER

By default, the RF antenna is an external 2* IPEX antenna, The dual band WiFi antenna is combined into two external IPEX antennas through a combiner. If you need four separate antennas, you can meet your requirements through optional configuration.

7.2 PCIe

MT7621AT can support three PCIe interfaces. It has occupied two interfaces by MT7905DAN . In fact, only one PCIe interface is available.

7.3 NETPORT LED INDICATORS

Port #3 PHY LED indicators, Without network cable plugged in, the default output is low level. When network cable is detected, the output is high level

Port #1-#2,Port #4-#5 PHY LED indicators, Without network cable plugged in, the default output is high level. When network cable is detected, the output is low level

7.4 POWER

There is only one external power 5 VDC-12VDC for the Core Moudle. Other powers as 1.8VDC, 1.5VDC and 1.2VDC are all generated from the Core Moudle internally.

Power consumption:

For the 5 VDC,the main board should supply at least 2A current for the module, for security use ,the Margin should be 30% at least.

Power Ripple:

Small ripple is necessary for better performance, especially for the RF property.

The 5VDC ripple should be ≤50mV at idle state and ≤100mV at full load.

8 MODULE OPERATING ENVIRONMENT

Operating Temperature	0℃ ~45℃
Storage Temperature	-40℃ ~ 80℃
Operating Humidity	10%~90% non-condensing
Storage Humidity	5%~90% non-condensing

9 RF PARAMETERS

Item	Specifications
Operating Frequencies	802.11ac/n/a : 5150GHz-5.850GHz 802.11b/g/n : 2.4GHz-2.483GHz
Modulation	OFDM: BPSK@6/9Mbps, QPSK@12/18Mbps, 16-QAM@24Mbps, 64- QAM@48/54Mbps DSSS: DBPSK@1Mbps, DQPSK@2Mbps, CCK@5.5/11Mbps MIMO-OFDM(11n): MCS 0-31 MIMO-OFDM (11ac): MCS 0-9
Modulation Mode	802.11a/g/n: BPSK, QPSK, 16QAM, 64QAM 802.11b: CCK(11 & 5.5 Mbps), DQPSK (2Mbps), DBPSK (1Mbps) 802.11n: PSK/CCK,DBPSK, DQPSK, OFDM 802.11ac: BPSK、QPSK、16-QAM、64-QAM、256-QAM
Maximum Radio Power	2.4GHz: 22dBm 5GHz: 20dBm (Transmit power is multi-chain combined power, no antenna gain isincluded. The actual transmit power depends on local laws and regulations)