EICUT

E7628 Module Manual

Read Manual

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Revision History

Date	Version	Description	Author
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1. Product Overview

The E7628 module is a compact embedded networking platform based on the MediaTek MT7628DAN system-on-chip (SoC). It is designed to provide integrated Wi-Fi connectivity, Ethernet networking, and multiple hardware interfaces in a single module, making it suitable for embedded networking and IoT applications.

The module integrates the main processor, wireless communication circuitry, and peripheral interfaces on a single board. This integration simplifies hardware design and allows developers to quickly build devices that require reliable network connectivity.

The E7628 supports 2.4 GHz Wi-Fi communication, enabling devices to connect to wireless networks or operate as an access point. In addition to wireless connectivity, the module includes several Ethernet interfaces, allowing it to function in wired networking applications such as routers, gateways, and network controllers.

To support communication with external components, the module exposes multiple hardware interfaces, including UART, SPI, I2S, USB, and PCIe. These interfaces allow the module to interact with microcontrollers, sensors, storage devices, audio components, and other peripheral hardware.

The module operates with a 3.3 V power supply and includes several control and reset pins such as PERST_N and CPURST_N, which manage system initialization and boot behavior. Boot configuration is determined through dedicated bootstrap pins that define the device's startup mode during power-up.

Because of its integrated networking capabilities and flexible interfaces, the E7628 module is widely used in applications such as wireless routers, IoT gateways, smart home devices, industrial controllers, and embedded communication systems.

In summary, the E7628 module provides a compact and efficient solution for adding network processing, Wi-Fi connectivity, and multiple peripheral interfaces to embedded systems.

1.1. Product Pictures

The following figures show 3D views of the top and bottom sides of the E7628 module.

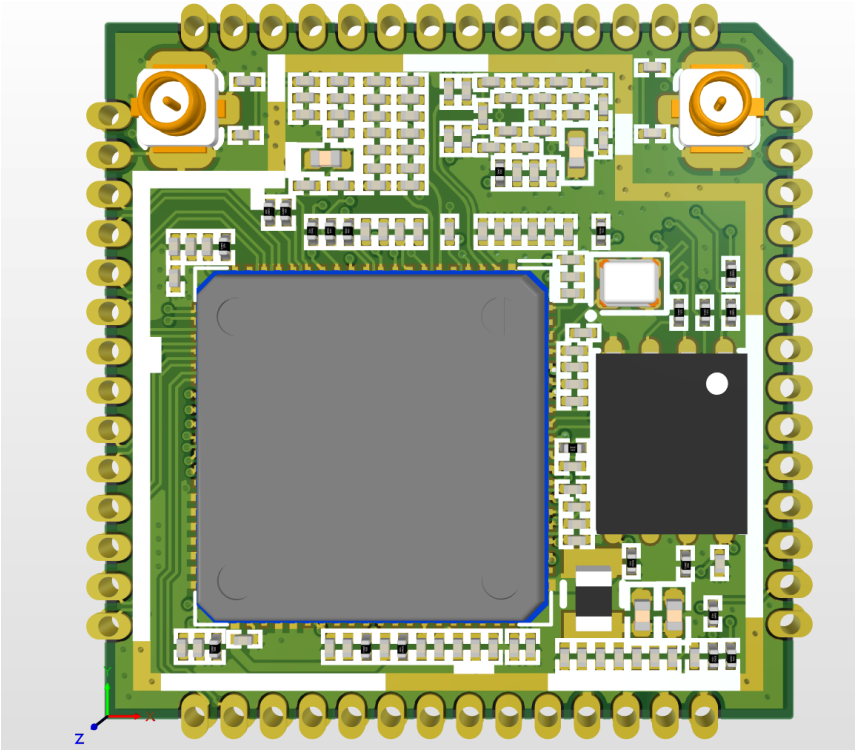


Figure 1-3D Top View of module

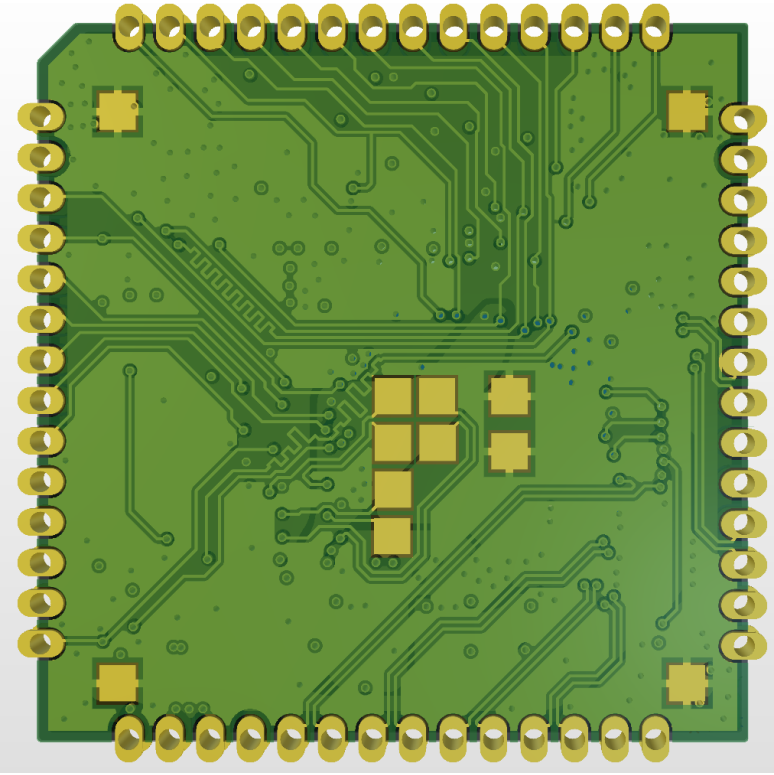


Figure 2-3D Bottom View of module

1.2. Key Features

The E7628 module is built around the MediaTek **MT7628DAN** router-on-a-chip, which integrates an 802.11n MAC and baseband, a 2.4 GHz radio and FEM, a 575/580 MHz MIPS® 24K™ CPU core and a 5-port 10/100 Fast Ethernet switch. The MT7628DAN includes everything needed to build an AP router from a single chip; its embedded CPU handles demanding applications such as routing, security and VoIP. Alongside the SoC, the module carries a **128 Mbit SPI Flash** as non-volatile storage.

Processor and Memory

- Embedded MIPS24KEc (575/580 MHz) with 64 KB I-Cache and 32 KB D-Cache
- 64 MB DDR2 KGD in MCM package (integrated in the SoC)
- **128 Mbit (16 MB) SPI Flash** on the module

Wireless (2.4 GHz)

- 2T2R 2.4 GHz with 300 Mbps PHY data rate
- Legacy 802.11b/g and HT 802.11n modes
- 20/40 MHz channel bandwidth
- Reverse Data Grant (RDG)
- Maximal Ratio Combining (MRC)
- Space Time Block Coding (STBC)
- 16 Multiple BSSID
- WEP64/128, TKIP, AES, WPA, WPA2, WAPI
- QoS: WMM, WMM-PS
- WPS: PBC, PIN
- Voice Enterprise: 802.11k+r
- Operating modes: AP, STA and AP/STA hybrid

Ethernet

- 5-port 10/100 FE PHY
- Default configuration: 1× WAN + 4× LAN

Peripheral Interfaces

- x1 USB 2.0 Host, x1 PCIe Root Complex
- SPI/SD-XC/eMMC
- I2C, I2S, SPI, PCM, UART, JTAG, PWM, GPIO

Power Management

- An optimized PMU

- Green AP:
  - Intelligent Clock Scaling (exclusive)
  - DDRII: ODT off, Self-refresh mode

Software

- AP Firmware: Linux 2.6 SDK, eCOS with IPv6
- Internet of Things (IoT)

Applications

- Routers
- NAS devices
- Dual band concurrent routers

Note: The feature list above describes the capabilities of the MT7628DAN SoC. The interfaces actually available on the module pins are listed in Table 3-Module Pinout.

1.3. Block Diagram

Figure 3 shows the block diagram of the module, and Figure 4 shows the internal functional block diagram of the MT7628DAN SoC.

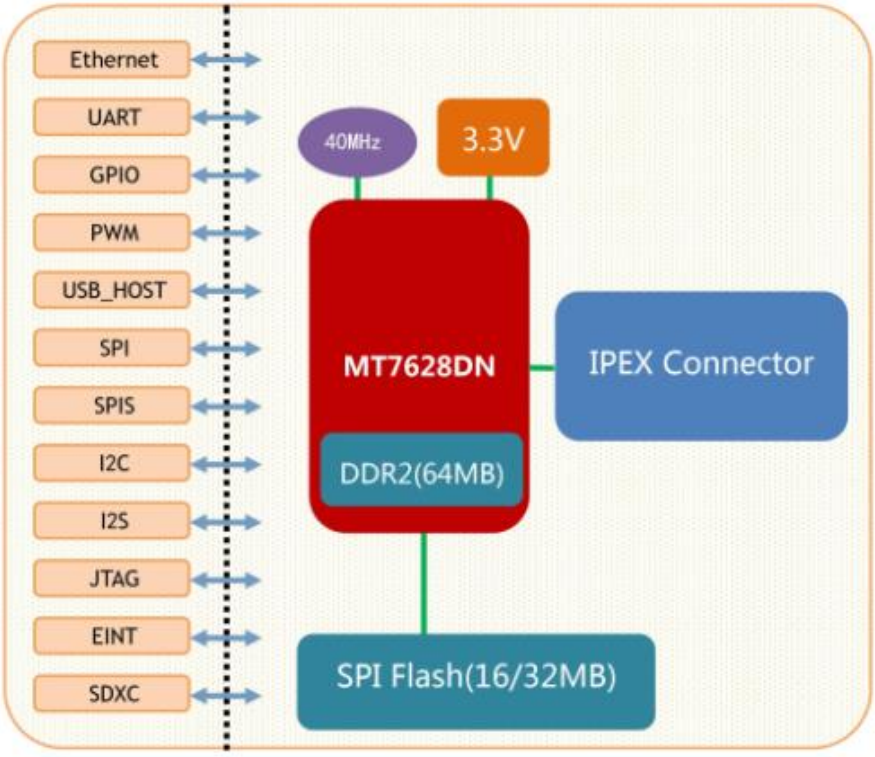


Figure 3-Module Block Diagram

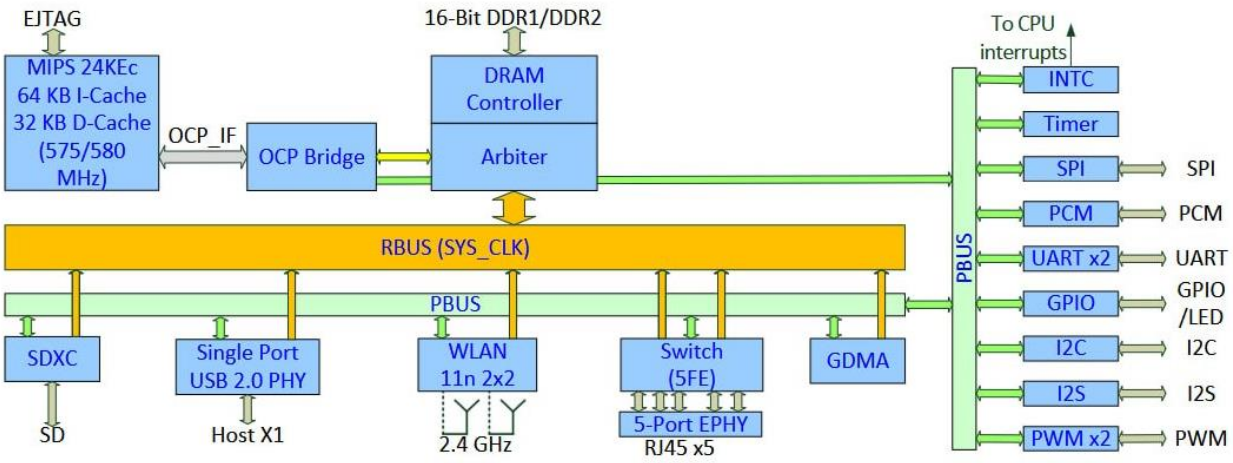


Figure 4-MT7628DAN SoC Functional Block Diagram

1.4. Module Parameters

The table below summarizes the main hardware parameters of the module.

Table 1-Module Parameters

Item	Parameter	Remark
Module model	E7628	
Main chip	MediaTek MT7628DAN	
CPU core	MIPS24KEc	
CPU frequency	Up to 580 MHz	
RAM	64 MB DDR2	Integrated in the SoC
Flash	16 MB (128 Mbit) SPI Flash	
Operating humidity	10% ~ 95%	Non-condensing
Storage humidity	5% ~ 95%	Non-condensing

1.5. Interfaces

The table below lists the interfaces supported by the module and their status in the factory default firmware.

Table 2-Interfaces

Interface	Available on Module	Factory Default Firmware
Wi-Fi	IEEE 802.11b/g/n	Enabled
Ethernet	5 × 10/100 Mbps ports	1× WAN, 4× LAN
UART	3 channels	2 channels (UART0, UART1)
SDIO	1 channel	N/A
SPI	1 channel	N/A

I2C	1 channel	N/A
I2S	1 channel	N/A
PWM	1 channel	N/A
GPIO	More than 8 channels	Partly occupied by firmware

Note: The factory default firmware is based on Linux and supports transparent data transmission over Ethernet, Wi-Fi, UART0 and UART1.

1.6. E7628 Module Pinout

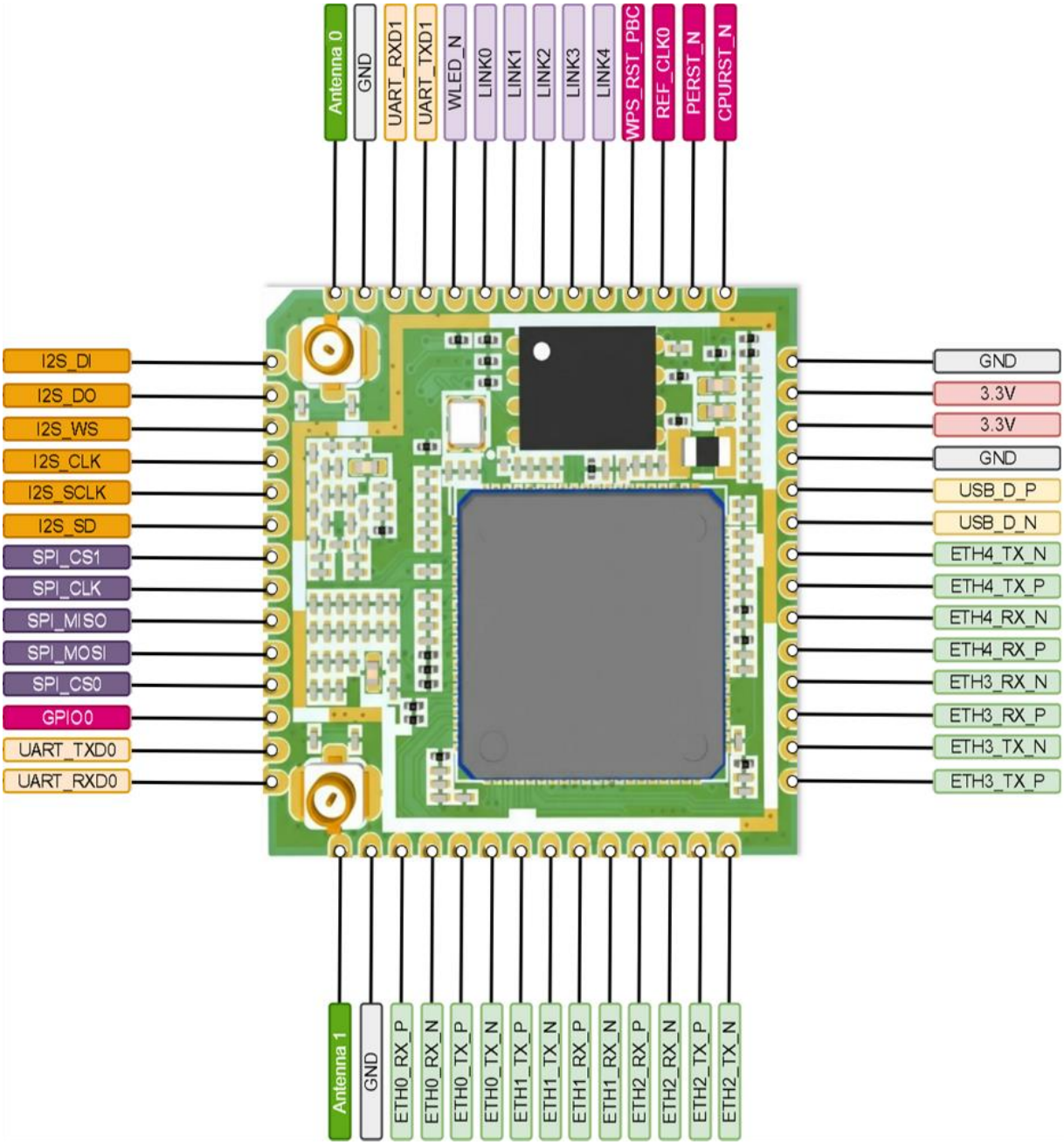


Figure 5-Pinout Top View of module

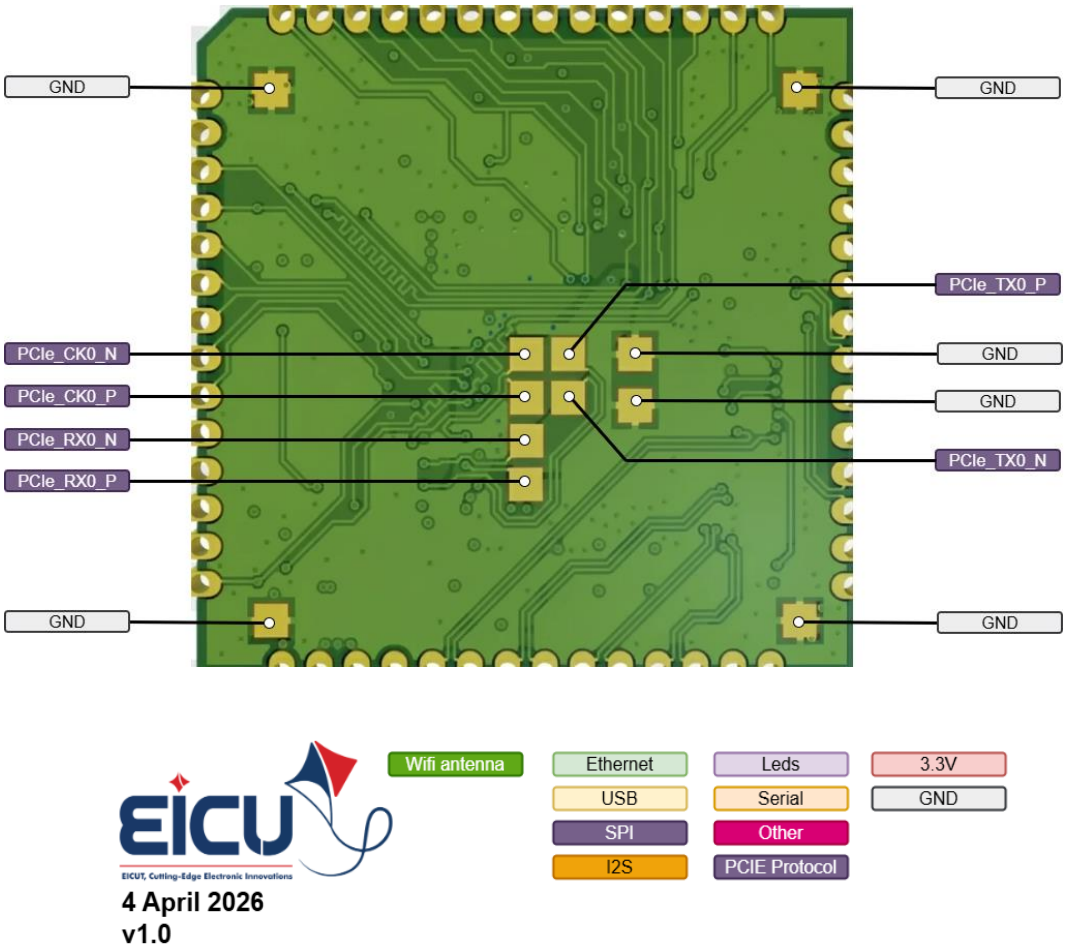


Figure 6-Pinout Bottom View of module

Table 3-Module Pinout

#	Pin name	Type	Drive	Description
1	I2S_DI	O	4mA	I2S data input
2	I2S_DO	I/O,IPD	4mA	I2S data output
3	I2S_WS	O	4mA	I2S word select (0: left, 1: right)
4	I2S_CLK	I/O	4mA	I2S clock
5	I2C_SCLK		4mA	I2C clock
6	I2C_SD		4mA	I2C data
7	SPI_CS1	O,IPD	4mA	SPI chip select 1
8	SPI_CLK	O	4mA	SPI clock
9	SPI_MISO	I/O	4mA	SPI Master input/Slave output
10	SPI_MOSI	I/O,IPD	4mA	SPI Master output/Slave input
11	SPI_CS0	O	4mA	SPI chip select 0
12	GPIO0	I/O,IPD	4mA	General Purpose I/O

13	UART_TXD0	O,IPD	4mA	UART0 TXD
14	UART_RXD0	I	4mA	UART0 RXD
15	ANT1	RF		Antenna 1 RF port
16	GND	G		Ground pin
17	ETH0_RX_P	A		10/100 PHY Port #0 RXP
18	ETH0_RX_N	A		10/100 PHY Port #0 RXN
19	ETH0_TX_P	A		10/100 PHY Port #0 TXP
20	ETH0_TX_N	A		10/100 PHY Port #0 TXN
21	ETH1_TX_P	A		10/100 PHY Port #1 TXP
22	ETH1_TX_N	A		10/100 PHY Port #1 TXN
23	ETH1_RX_P	A		10/100 PHY Port #1 RXP
24	ETH1_RX_N	A		10/100 PHY Port #1 RXN
25	ETH2_RX_P	A		10/100 PHY Port #2 RXP
26	ETH2_RX_N	A		10/100 PHY Port #2 RXN
27	ETH2_TX_P	A		10/100 PHY Port #2 TXP
28	ETH2_TX_N	A		10/100 PHY Port #2 TXN
29	ETH3_TX_P	A		10/100 PHY Port #3 TXP
30	ETH3_TX_N	A		10/100 PHY Port #3 TXN
31	ETH3_RX_P	A		10/100 PHY Port #3 RXP
32	ETH3_RX_N	A		10/100 PHY Port #3 RXN
33	ETH4_RX_P	A		10/100 PHY Port #4 RXP
34	ETH4_RX_N	A		10/100 PHY Port #4 RXN
35	ETH4_TX_P	A		10/100 PHY Port #4 TXP
36	ETH4_TX_N	A		10/100 PHY Port #4 TXN
37	USB_D_N	I/O		USB Port 0 data pin Data -
38	USB_D_P	I/O		USB Port 0 data pin Data +
39	GND	G		Ground pin
40	3.3V	P		3.3 V power supply
41	3.3V	P		3.3 V power supply
42	GND	G		Ground pin
43	CPURST_N	I,IPU	4mA	Power-on reset (active low)
44	PERST_N	I,IPU	4mA	PCIe device reset
45	REF_CLK0	O,IPD	4mA	Reference Clock Output
46	WPS_RST_PBC	O	4mA	Watchdog time out reset
47	LINK4	I/O	4mA	10/100 PHY Port #4 activity LED (active low), JTAG_TRST_N

48	LINK3	I/O	4mA	10/100 PHY Port #3 activity LED (active low), JTAG_CLK
49	LINK2	I/O	4mA	10/100 PHY Port #2 activity LED (active low), JTAG_TMS
50	LINK1	I/O	4mA	10/100 PHY Port #1 activity LED (active low), JTAG_TDI
51	LINK0	I/O	4mA	10/100 PHY Port #0 activity LED (active low), JTAG_TDO
52	WLED_N	O	4mA	WLAN activity LED (active low)
53	UART_TXD1	O,IPD	4mA	UART1 Lite TXD
54	UART_RXD1	I	4mA	UART1 Lite RXD
55	GND	G		Ground pin
56	ANT0	RF		Antenna 0 RF port
57	GND	G		Ground pin
58	GND	G		Ground pin
59	GND	G		Ground pin
60	GND	G		Ground pin
61	PCIE_CK0_N	I/O		External reference clock output (negative)
62	PCIE_CK0_P	I/O		External reference clock output (positive)
63	PCIE_RX0_N	I/O		PCIe 0 differential Receiver RX
64	PCIE_RX0_P	I/O		PCIe 0 differential Receiver RX
65	PCIE_TX0_P	I/O		PCIe 0 differential transmit TX
66	PCIE_TX0_N	I/O		PCIe 0 differential transmit TX

Note

IPD : Internal pull-down

IPU : Internal pull-up

I : Input

O : Output

IO : Bi-directional

P : Power

G : Ground

RF : RF port

A : Analog

NC : Not connected

Pin usage notes:

- Unused signal pins can be left floating.
- LINK0–LINK4 and WLED_N are active-low LED outputs.
- By default, the RF signals are routed to the on-board IPEX antenna connectors and the ANT0/ANT1 pads are not connected. To use the pads, remove the antenna connector and fit a 0 Ω resistor.
- PERST_N, UART_TXD1, I2S_DO, SPI_CS1, SPI_CLK, SPI_MOSI and UART_TXD0 are bootstrap pins sampled at power-up. Do not drive these pins or add external pull-up/pull-down resistors during power-up (see Bootstrap Configuration).
- The 3.3V pins require a supply that can deliver at least 800 mA.

2. Bootstrap Configuration

The bootstrapping pins of the MT7628DAN are configured using pull-up and pull-down resistors to define the default operating mode during power-up. As shown in the schematic, 4.7 kΩ resistors are used to set the logic level of each bootstrap pin.

In this configuration, UART_TXD0, I2S_DO, SPI_MOSI, and SPI_CS1 are pulled down to GND, while PERST_N, UART_TXD1, and SPI_CLK are pulled up to 3.3V. These default states determine the chip boot mode, enable normal operating mode, and select the appropriate clock and interface settings when the device starts.

This resistor network ensures that the MT7628DAN enters the intended boot configuration reliably at power-up.

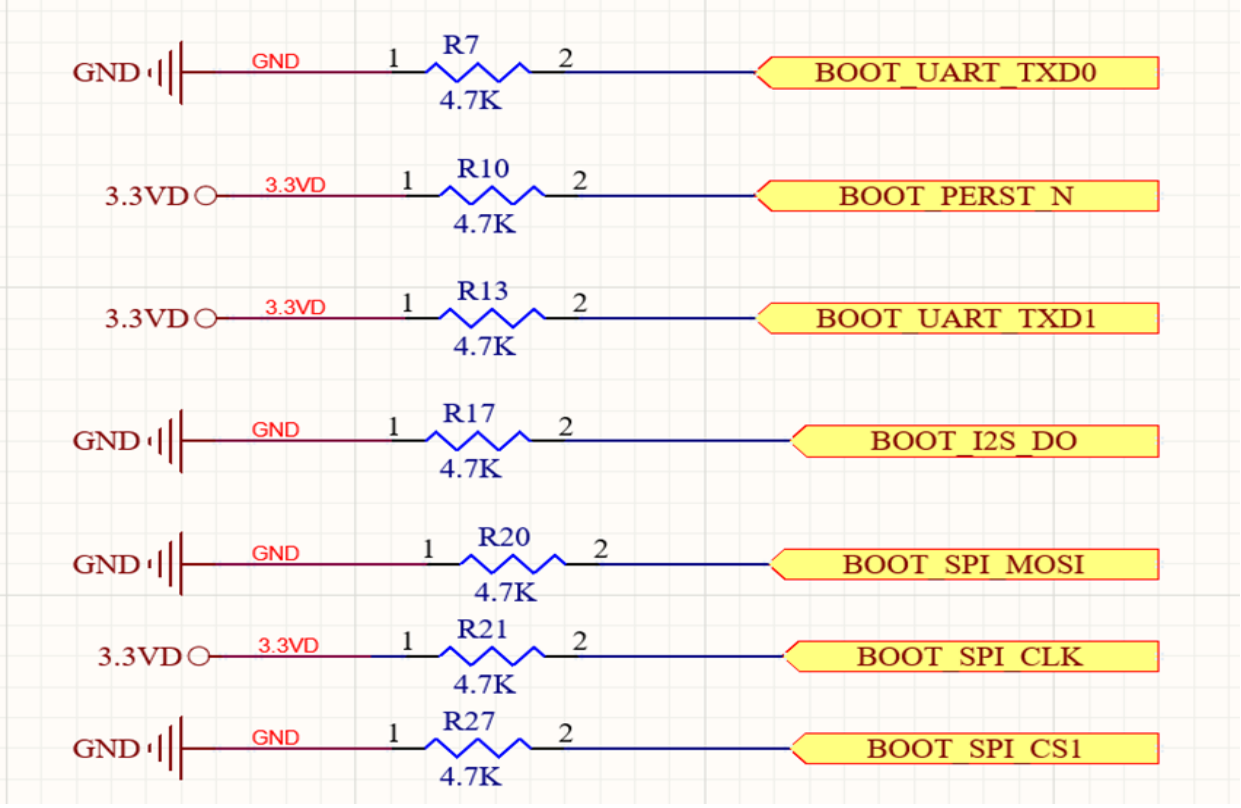


Figure 7-Bootstrap Configuration

2.1. Bootstrapping Pins Description

Table 4-Bootstrapping Pins Description

Pin Name	Boot Strapping Signal Name	Description
UART_TXD1	DBG_JTAG_MODE	0: JTAG_MODE 1: EPHY_LED (default)
PERST_N	XTAL_FREQ_SEL	0: 25 MHz DIP 1: 40 MHz SMD
I2S_SDO	DRAM_TYPE	**1: DDR1 0: DDR2** [note] This pin is valid for MT7628AN only. It needs to be pull-low for 7628KN which only supports DDR1.
{SPI_MOSI SPI_CLK, SPI_CS1}	CHIP_MODE[2:0]	A vector to set chip function/test/debug modes. **000**: Boot from PLL (boot from SPI 3-Byte Addr) **001**: Boot from PLL (boot from SPI 4-Byte Addr) **010**: Boot from XTAL (boot from SPI 3-Byte Addr) **011**: Boot from XTAL (boot from SPI 4-Byte Addr)
UART_TXD0	EXT_BGCK	1: Test Mode 0: Normal (default)

3. Maximum Ratings and Operating Conditions

Table 5-Absolute Maximum Ratings

Parameter	Rating
I/O supply voltage	**3.63 V**
Input, Output, or I/O Voltage	**GND -0.3 V to Vcc +0.3 V**

Table 6-Maximum Temperatures

Parameter	Rating
Maximum Junction Temperature (Plastic Package)	**125 °C**
Maximum Lead Temperature (Soldering 10 s)	**260 °C**

Table 7-Operating Conditions

Parameter	Rating
I/O supply voltage	**3.3 V ± 10%**
DDR1 supply voltage	**2.5 V ± 5%**
DDR2 supply voltage	**1.8 V ± 5%**
Core supply voltage	**1.2 V ± 10%**
Ambient Temperature Range	**-20 to 55 °C**

3.1. Thermal Characteristics

Thermal characteristics without an external heat sink in still air conditions.

Table 8-MT7628KN Thermal characteristics

Parameter	Rating
Thermal Resistance θ_{JA} (°C/W) for JEDEC 2L system PCB	**26.1°C/W**
Thermal Resistance θ_{JA} (°C/W) for JEDEC 4L system PCB	**17.72°C/W**
Thermal Resistance θ_{JC} (°C/W) for JEDEC	**6.5°C/W**
Thermal Resistance ψ_{JT} (°C/W) for JEDEC 2L system PCB	**1.81°C/W**

Thermal Resistance ψ_{JT} (°C/W) for JEDEC 4L system PCB	**1.18°C/W**

Table 9-MT7628NN Thermal characteristics

Parameter	Rating
Thermal Resistance θ_{JA} (°C/W) for JEDEC 2L system PCB	**27.01°C/W**
Thermal Resistance θ_{JA} (°C/W) for JEDEC 4L system PCB	**18.15°C/W**
Thermal Resistance θ_{JC} (°C/W) for JEDEC	**6.9°C/W**
Thermal Resistance ψ_{JT} (°C/W) for JEDEC 2L system PCB	**2.41°C/W**
Thermal Resistance ψ_{JT} (°C/W) for JEDEC 4L system PCB	**1.51°C/W**

3.2. DC Electrical Characteristics

Table 10-DC Electrical Characteristics

Parameter	Sym	Conditions	Min	Typ	Max	Unit
3.3 V supply voltage (IO)	Vddc33	-	2.97	3.3	3.63	V
2.5 V supply voltage (DDR1)	Vdd25	-	2.375	2.5	2.625	V
1.8 V supply voltage (DDR2)	Vdd18	-	1.71	1.8	1.89	V
1.2 V supply voltage	Vdd12	-	1.08	1.2	1.32	V
3.3 V current consumption	Icc33	-	-	-	-	mA
1.5 V current consumption	Icc15	-	-	-	-	mA
1.2 V current consumption	Icc12	-	-	-	-	mA
DDR2 Current	Icc18	-	-	-	-	mA

3.3. Power Supply Requirements

Table 11-Power Supply Requirements

Parameter	Value
Input supply voltage	3.3 V ± 0.2 V DC
No-load current	170 ± 50 mA
Required supply current	≥ 800 mA

4. Dimensions

The following figures show the dimensions of the E7628 module.

Main dimensions:

- Module size: 23.5 mm × 23.5 mm
- Number of edge pads: 56, pad width 0.90 mm
- Pad pitch: 1.35 mm
- The center pads on the bottom side act as a heat shield and can be connected to GND.

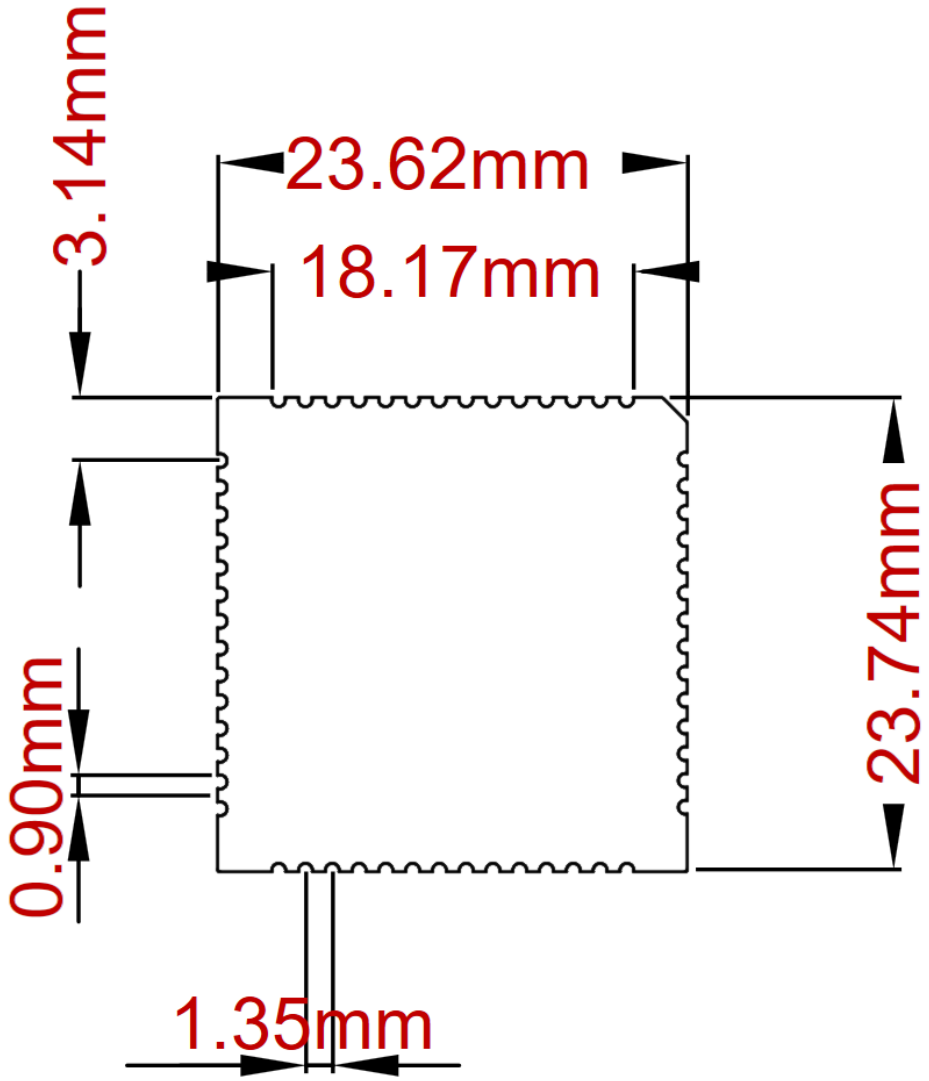


Figure 8-Dimensions Top View

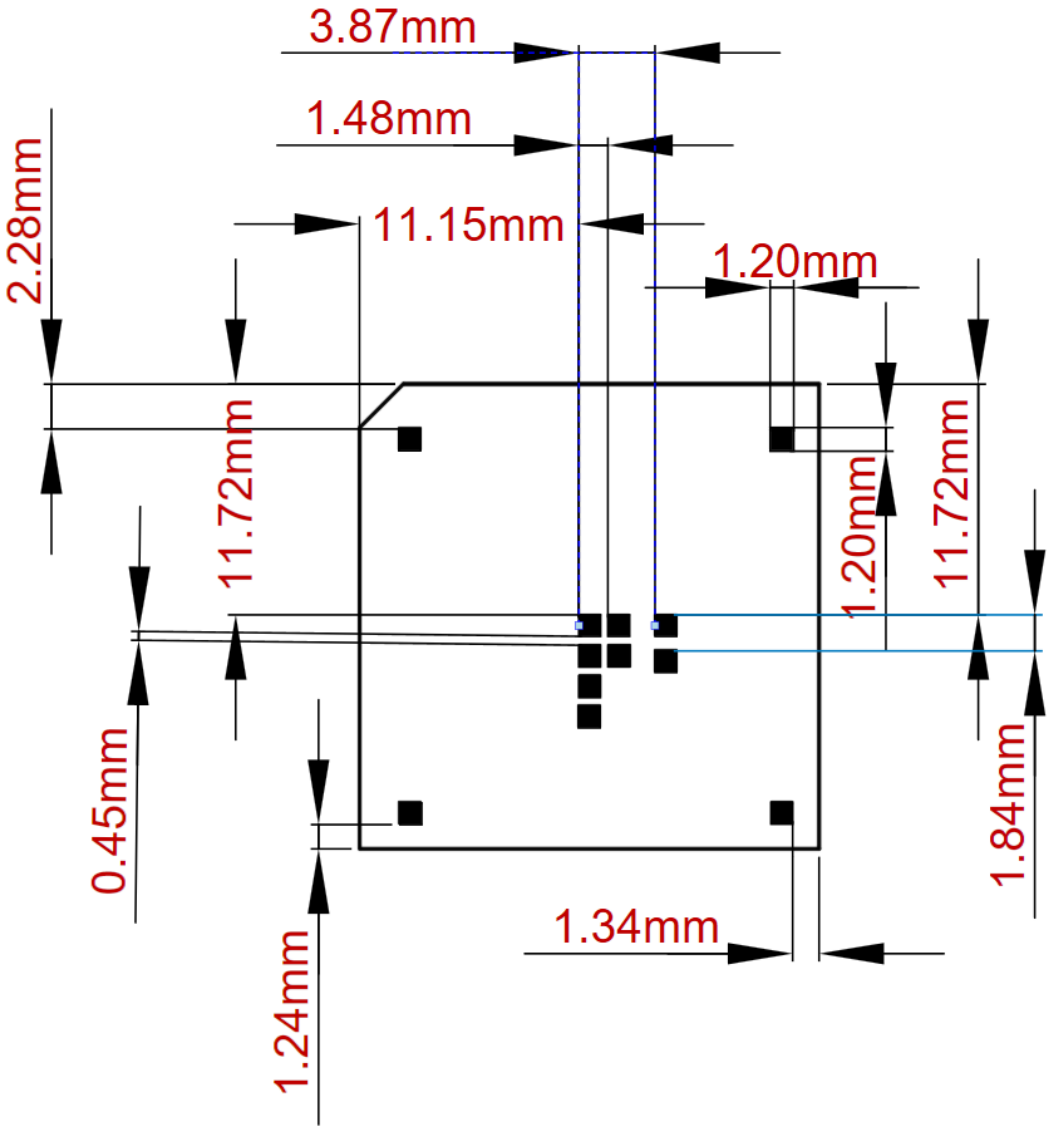


Figure 9-Dimensions Bottom View