SM3501 HARDWARE DEVELOPMENT GUIDE

v1.0

CONTENTS

1、PRODUCT OVERVIEW

1.1 GENERAL DESCRIPTION

SM3501 M.2 is a 5G Sub-6 GHz M.2 module. Adopting the 3GPP Rel-17 RedCap technology, the module supports a theoretical peak data rate of 223 Mbps in the downlink and 123 Mbps in the uplink. The module supports LTE Cat 4 and 5G Sub-6 SA mode, and is backward compatible with Rel-15 and Rel-16 networks. The module can meet customers' different application demands for medium speed,large capacity, low latency, high reliability, etc., and is convenient for customersdesign.

1.2 Key Features

The following tables show entire radio band configuration of SM3501

	Supported LTE Frequency bands
LTE	B2/4/5/7/12/13/14/25/26/30/41/48/66/71
5G NR	n2/5/7/12/14/25/26/30/41/48/66/71/77/78

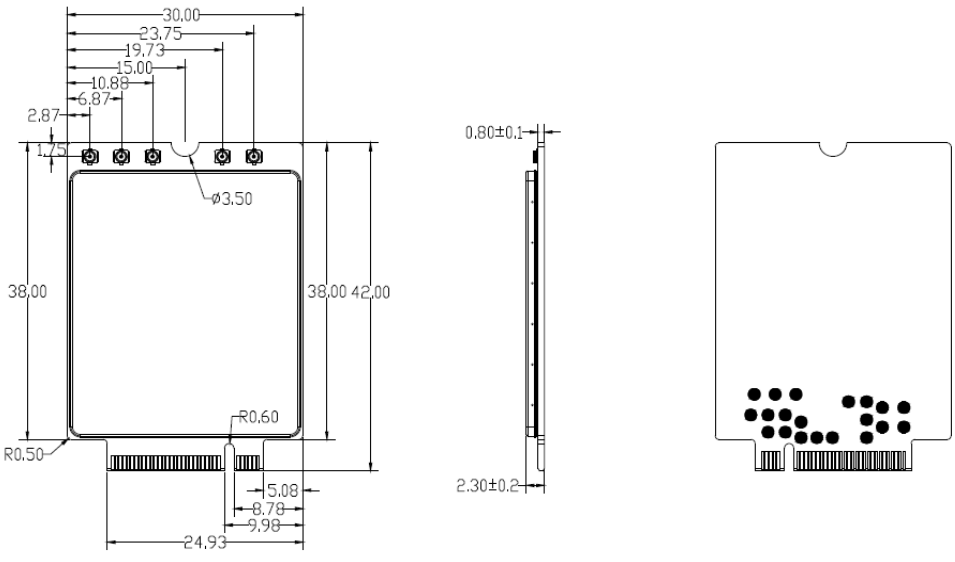
The following tables show the detailed features of the SM3501 module.

characteristics	description
Power Supply	3.5-4.3 V, Typical Value: 3.85 V
Data Speed	NR Max. 223Mbps (DL)/ Max. 123Mbps (UL) LTE Max. 200Mbps (DL)/ Max. 105Mbps (UL)
Temperature Range	Operating temperature range: -10 °C to +55 °C Extended temperature range: -40 °C to +85 °C Storage temperature range: -40 °C to +90°C
Transmiting Power	5G NR bands: Class 3 (23dBm±2dB) LTE bands: Class 3 (23dBm±2dB) LTE bands(B41): Class 2 (26dBm±2dB)
Dimensions	30 × 42 × 3.25 mm
Interfaces	USB 2.0 × 1 (with High Speed up to 480Mbps) UART/SIM/PCM/I2C USIM 1.8V/3.0V System Indicator Clock ADC
Antenna	LMHB TRX × 1 LMHB DRX × 1 UHB TRX × 1 UHB DRX × 1 GNSS × 1
(U)SIM Interfaces	Compliant with ISO/IEC 7816-3, ETSI and IMT-2000 Supported (U)SIM cards: Class B (3.0 V) and Class C (1.8 V)
eSIM	Support eSIM function
USB Interface	Compliant with USB 2.0 specification Maximum transmission rate: 480 Mbps Used for AT command communication,data transmission, firmwareupgrade, software debugging, GNSS NMEA sentence output and voice over USB
PCIe Interface	Compliant with PCIe Gen 2 PCIe x 1 lane, supporting up to 5 Gbps Used for AT command communication,data transmission, firmwareupgrade, software debugging, GNSS NMEA sentence

	output Supports endpoint (EP) mode and root complex (RC) mode
5G NR Features	Supports 3GPP Rel-17 Redcap. 5G NR sub-6 Supported modulations: -Uplink: QPSK,16QAM, 64QAM and256QAM -Downlink:QPSK,16QAM. 64QAM and 256QAM Supports SCs 15 kHz and 30 kHz. Supports SA on all the 5G bands Supports Option 2
LTE Features	Supports 3GPP Rel-16 LTE Category: DL Cat 4/UL Cat 4 Supported modulations: -Uplink:QPSK, 16QAM, 64QAM and 256QAM -Downlink:QPSK,16QAM, 64QAM and 256QAM Supports 1.4/3/5/10/15/20 MHz RF bandwidth Max.transmission data rates : 195 Mbps (DL), 105 Mbps (UL)

2、PIN DESCRIPTION

2.1 GENERAL DESCRIPTION



Pin NO.	Pin Name	I/O	Discription	Voltage
1	CLK_WCN	DO	38.4 MHz RF XO clock buffer output	
2	VCC	PI	Power supply for the module-	3.5-4.3 V, Typical Value: 3.85 V
3	GND		Ground	
4	VCC	PI	Power supply for the module	3.5-4.3 V, Typical Value: 3.85 V
5	GND		Ground	
6	FULL_CARD_POWER_OFF#	DI	Turn on/off the module-	
7	USB_DP	AIO	USB 2.0 differential data(+)	
8	SPI_MISO	DI	SPI Master input, Slave output	
9	USB_DM	AIO	USB 2.0 differential data(-)	
10	SPI_MOSI	DO	SPI Master output, Slave input	
11	GND		Ground	
12	Notch		Notch	
13	Notch		Notch	
14	Notch		Notch	
15	Notch		Notch	
16	Notch		Notch	
17	Notch		Notch	
18	Notch		Notch	
19	Notch		Notch	
20	SPI_CS	DO	SPI chip select	
21	VCC_0V825	PO	For wlan	
22	SPI_CLK	DO	SPI clock	
23	VCC_1V224	PO	For wlan	
24	GPIO_1	DIO	General-purpose input/output 1	
25	VCC_1V8	PO	For wlan	
26	GPIO_2	DIO	General-purpose input/output 2	
27	GND		Ground	
28	GPIO_3	DIO	General-purpose input/output 3	
29	NC		NC	

30	USIM_RST	DO	(U)SIM1 card reset	
31	NC		NC	
32	USIM_CLK	DO	(U)SIM1 card clock	
33	GND		Ground	
34	USIM_DATA	DIO	(U)SIM1 card data	
35	NC		NC	
36	USIM_VDD	PO	(U)SIM1 card power supply	
37	NC		NC	
38	VBUS_DET	DI	USB VBUS detect	
39	GND		Ground	
40	NC		NC	
41	PCIE_TX_M	AO	PCIe transmit (-)	
42	NC		NC	
43	PCIE_TX_P	AO	PCIe transmit (+)	
44	I2C_SDA	DIO	I2C serial data	
45	GND		Ground	
46	I2C_CLK	DO	I2C serial clock	
47	PCIE_RX_M	AI	PCIe receive (-)	
48	SLEEK_CLK_WCN	DO	Sleep clock output for WLAN	
49	PCIE_RX_P	AI	PCIe receive (+)	
50	PCIE_RST_N	DI	PCIe reset	
51	GND		Ground	
52	PCIE_CLK_REQ_N	OD	PCIe clock request	
53	PCIE_CLK_M	AIO	PCIe reference clock(-)	
54	PCIE_WAKE_N	OD	PCIe wake up	
55	PCIE_CLK_P	AIO	PCIe reference clock(+)	
56	GRFC1	DO	GPIOs configured for General RF controls	
57	GND		Ground -	
58	GRFC2	DO	GPIOs configured for General RF controls	
59	PCM_SYNC	DIO	PCM data frame sync	
60	WLAN_EN	DO	Wlan enable	
61	PCM_DIN	DI	PCM data input-	
62	GPIO_4	DIO	General-purpose input/output 4	
63	PCM_OUT	DO	PCM data output--	
64	GPIO_5	DIO	General-purpose input/output 5	
65	PCM_CLK	DIO	PCM clk-	

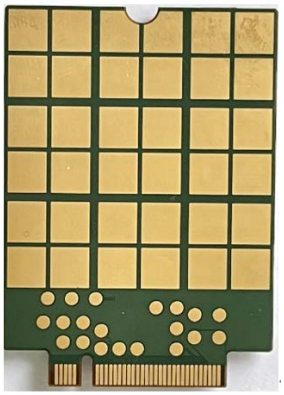
66	USIM_DET	DI	USIM detect	
67	NC		NC	
68	GPIO_6	DIO	General-purpose input/output 6	
69	GPIO_7	DIO	General-purpose input/output 7	
70	VCC	PI	Power supply for the module	3.135-4.4 V, Typical Value: 3.7 V
71	GND		- \Ground	
72	VCC	PI	Power supply for the module	3.135-4.4 V, Typical Value: 3.7 V
73	VDD_1V8	PI	I/O Supply	
74	VCC	PI	Power supply for the module	3.135-4.4 V, Typical Value: 3.7 V
75	GPIO_8	DIO	General-purpose input/output 8	

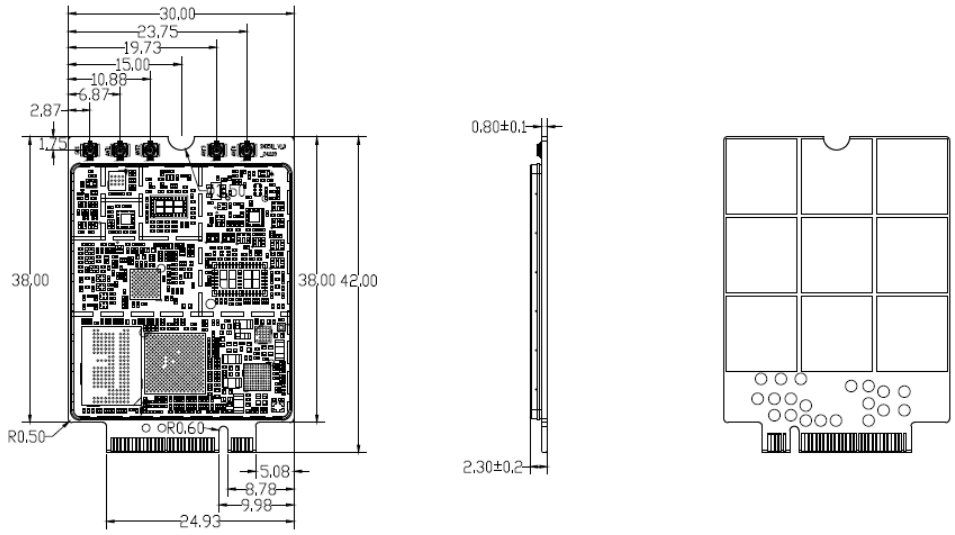
Table 2-1 Definitions of pins

NOTE:**P** indicates power pins; **I** indicates pins for digital signal input; **O** indicates pins for digital signal output,**G** indicates ground.

3、Dimensions

3.1 Module Picture





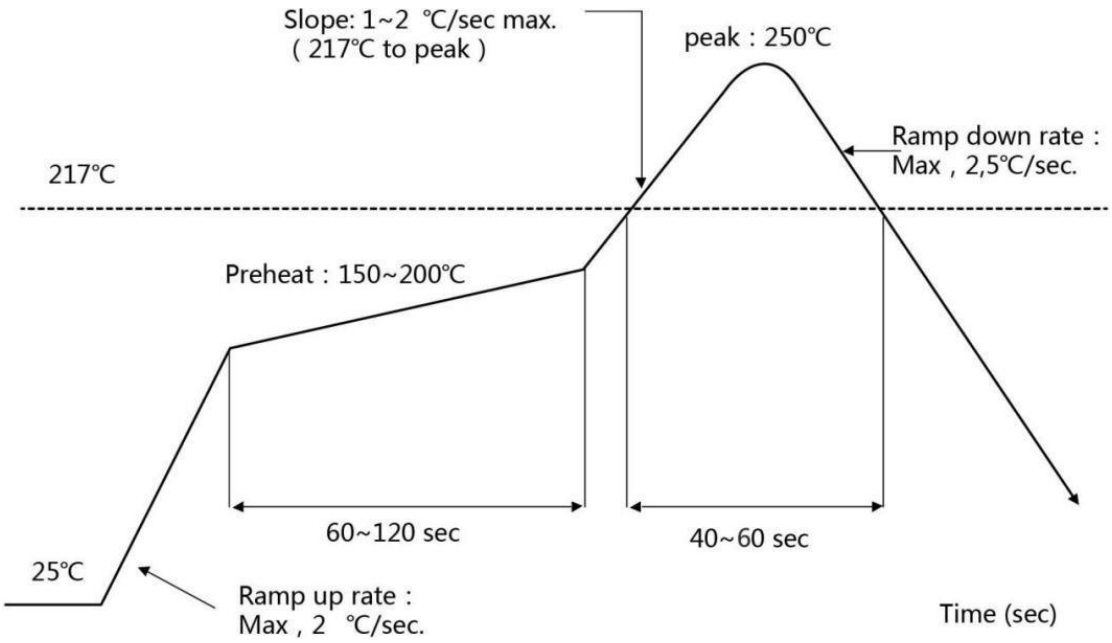
4、 Environmental Requirements

4.1 Recommended Reflow Profile.

Referred to IPC/JEDEC standard.

Peak Temperature : <250°C

Number of Times : ≤2 times



Note:Take and use the module, please insure the electrostatic protective

measures.
1. Reflow soldering temperature should be according to the customer the main size of the products, such as the temperature set at 250 + 5 ℃ for the MID motherboard. About the module packaging, storage and use of matters needing attention are as follows:

2. The module of the reel and storage life of vacuum packing: 1). Shelf life: 8 months, storage environment conditions: temperature in: < 40 ℃, relative humidity: < 90% r.h.

3. The module vacuum packing once opened, time limit of the assembly:
Card:
1) check the humidity display value should be less than 30% (in blue), such as: 30% ~ 40% (pink), or greater than 40% (red) the module have been moisture absorption.
2.) factory environmental temperature humidity control: ≦ -30 ℃, ≦ 60% r.h..
3). Once opened, the workshop the preservation of life for 168 hours.

4. Once opened, such as when not used up within 168 hours:
1). The module must be again to remove the module moisture absorption.
2). The baking temperature: 125 ℃, 8 hours.
3). After baking, put the right amount of desiccant to seal packages.

FCC Statements:

RF Exposure Information: To maintain compliance with FCC RF exposure requirements, use the product that maintain a 20cm separation distance between the user's body and the host.

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:
(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications or changes to this equipment. Such modifications or changes could void the user’s authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio
communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
-Reorient or relocate the receiving antenna.
-Increase the separation between the equipment and receiver.
-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-Consult the dealer or an experienced radio/TV technician for help.

This device is intended only for OEM integrators under the following conditions:

1. The antenna must be installed such that 20 cm is maintained between the antenna and users.
2. The transmitter module may not be co-located with any other transmitter or antenna. As long as the two conditions above are met, additional transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required for the installed module.

Important Note:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the Federal Communications Commission of the U.S. Government (FCC) authorizations are no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator shall be responsible for re-evaluating the end-product (including the transmitter) and obtaining a separate FCC authorization in the U.S..

OEM Integrators - End Product Labeling Considerations:

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: “Contains, FCC ID: 2AUOUM3501”. The grantee's FCC ID can be used only when all FCC compliance requirements are met.

OEM Integrators - End Product Manual Provided to the End User:

The OEM integrator shall not provide information to the end user regarding how to install or remove this RF module in end product user manual. The end user manual must include all required regulatory information and warnings as outlined in this document.