SC262R Series

Hardware Design

Smart Module Series

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Safety Information

The following safety precautions must be observed during all phases of operation, such as usage, service or repair of any cellular terminal or mobile incorporating the module. Manufacturers of the cellular terminal should notify users and operating personnel of the following safety information by incorporating these guidelines into all manuals of the product. Otherwise, Quectel assumes no liability for customers' failure to comply with these precautions.

Full attention must be paid to driving at all times in order to reduce the risk of an accident. Using a mobile while driving (even with a handsfree kit) causes distraction and can lead to an accident. Please comply with laws and regulations restricting the use of wireless devices while driving.

Switch off the cellular terminal or mobile before boarding an aircraft. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communication systems. If there is an Airplane Mode, it should be enabled prior to boarding an aircraft. Please consult the airline staff for more restrictions on the use of wireless devices on an aircraft.

Wireless devices may cause interference on sensitive medical equipment, so please be aware of the restrictions on the use of wireless devices when in hospitals, clinics or other healthcare facilities.

Cellular terminals or mobiles operating over radio signal and cellular network cannot be guaranteed to connect in certain conditions, such as when the mobile bill is unpaid or the (U)SIM card is invalid. When emergency help is needed in such conditions, use emergency call if the device supports it. In order to make or receive a call, the cellular terminal or mobile must be switched on in a service area with adequate cellular signal strength. In an emergency, the device with emergency call function cannot be used as the only contact method considering network connection cannot be guaranteed under all circumstances.

The cellular terminal or mobile contains a transceiver. When it is ON, it receives and transmits radio frequency signals. RF interference can occur if it is used close to TV sets, radios, computers or other electric equipment.

In locations with explosive or potentially explosive atmospheres, obey all posted signs and turn off wireless devices such as mobile phone or other cellular terminals. Areas with explosive or potentially explosive atmospheres include fueling areas, below decks on boats, fuel or chemical transfer or storage facilities, and areas where the air contains chemicals or particles such as grain, dust or metal powders.

About the Document

Revision History

Version	Date	Author	Description
-	2022-07-11	Today JIN/ Xiaomeng GUO	Creation of the document
1.0.0	2022-07-11	Today JIN/ Xiaomeng GUO	Preliminary

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1 Introduction

This document defines SC262R series module and describes its air interface and hardware interfaces which are connected with your applications.

With this document, you can quickly understand module interface specifications, electrical and mechanical details, as well as other related information of the module. The document, coupled with application notes and user guides, makes it easy to design and set up mobile applications with the module.

This document is applicable to the following modules:

- SC262R-WF
- SC262R-EM
- SC262R-NA

SC262R-EM and SC262R-NA are temporarily under development.

2 Product Overview

2.1. Frequency Bands and Functions

SC262R is a series of 4G Smart LTE module based on Android operating system, and provides industrial grade performance. Its general features are listed below:

- Supports worldwide LTE-FDD, LTE-TDD, DC-HSPA+, HSPA+, HSDPA, HSUPA, WCDMA, EDGE and GPRS coverage.
- Supports short-range wireless communication via Wi-Fi 802.11a/b/g/n/ac and Bluetooth 4.2 LE.
- Integrates GPS/GLONASS/BDS or GPS/Galileo/BDS satellite positioning systems.
- Supports multiple audio and video codecs.
- Built-in high performance Adreno™ 308 graphics processing unit.
- Provides multiple audio and video input/output interfaces as well as abundant GPIO interfaces.

SC262R series module is available in three variants: SC262R-EM, SC262R-NA, SC262R-WF. The following tables show the supported frequency bands and network standards of SC262R series modules.

Table 1: SC262R-EM Frequency Bands

Mode	Frequency
LTE-FDD	B1/B2/B3/B4/B5/B7/B8/B20/B28
LTE-TDD	B38/B40/B41
WCDMA	B1/B2/B4/B5/B8
GSM	GSM850/EGSM900/DCS1800/PCS1900
Wi-Fi 802.11a/b/g/n/ac	2402–2482 MHz 5180–5825 MHz
Bluetooth 4.2 LE	2402–2480 MHz
GNSS	GPS: 1575.42 ±1.023 MHz GLONASS: 1597.5–1605.8 MHz BDS: 1561.098 ±2.046 MHz

	Galileo: 1575.42 ±1.023 MHz

Table 2: SC262R-NA Frequency Bands

Mode	Frequency
LTE-FDD	B2/B4/B5/B7/B12/B13/B14/B17/B25/B26/B66/B71
LTE-TDD	B41
WCDMA	B2/B4/B5
Wi-Fi 802.11a/b/g/n/ac	2402–2482 MHz 5180–5825 MHz
Bluetooth 4.2 LE	2402–2480 MHz
GNSS	GPS: 1575.42 ±1.023 MHz GLONASS: 1597.5–1605.8 MHz BDS: 1561.098 ±2.046 MHz Galileo: 1575.42 ±1.023 MHz

Table 3: SC262R-WF Frequency Bands

Mode	Frequency
Wi-Fi 802.11a/b/g/n/ac	2402–2482 MHz 5180–5825 MHz
Bluetooth 4.2 LE	2402–2480 MHz
GNSS	-

SC262R is a series of SMD type modules, which can be embedded into applications through its 274 pins, including 146 LCC pins and 128 LGA pins. With a compact profile of 40.5 mm × 40.5 mm × 2.8 mm, the module can meet almost all requirements for M2M applications such as edge device, edge computing, CPE, wireless POS, smart metering, router, data card, automotive, smart phone, digital signage, alarm panel, security and industry PDA, etc.

2.2. Key Features

The following table describes the detailed features of SC262R series module.

Table 4: Key Features

Feature	Details
Application Processor	● 64-bit quad-core ARM Cortex-A53 microprocessor, up to 1.3 GHz ● 512 KB L2 cache
Modem DSP	● Hexagon DSP v56 core, up to 691 MHz ● 768 KB L2 cache
GPU	Adreno™ 308 GPU with 64-bit addressing, up to 485 MHz
Memory	● 8 GB eMMC + 1 GB LPDDR3 (default) ● 16 GB eMMC + 2 GB LPDDR3 (optional)
Operating System	Android 10
Power Supply	● Supply voltage: 3.55–4.2 V ● Typical supply voltage: 3.8 V
Transmitting Power	● Class 4 (33 dBm ±2 dB) for GSM850 ● Class 4 (33 dBm ±2 dB) for EGSM900 ● Class 1 (30 dBm ±2 dB) for DCS1800 ● Class 1 (30 dBm ±2 dB) for PCS1900 ● Class E2 (27 dBm ±3 dB) for GSM850 8-PSK ● Class E2 (27 dBm ±3 dB) for EGSM900 8-PSK ● Class E2 (26 dBm ±3 dB) for DCS1800 8-PSK ● Class E2 (26 dBm ±3 dB) for PCS1900 8-PSK ● Class 3 (23 dBm ±2 dB) for WCDMA bands ● Class 3 (23 dBm ±2 dB) for LTE-FDD bands ● Class 3 (23 dBm ±2 dB) for LTE-TDD bands
LTE Features	Supports 3GPP R10 Cat 4 FDD and TDD Supports 1.4/3/5/10/15/20 MHz RF bandwidth ● FDD: Max. 150 Mbps (DL)/Max. 50 Mbps (UL) ● TDD: Max. 130 Mbps (DL)/Max. 30 Mbps (UL)
UMTS Features	Supports 3GPP R9 DC-HSDPA/DC-HSUPA/HSPA+/HSDPA/HSUPA/WCDMA Supports 16QAM, 64QAM and QPSK modulations ● DC-HSDPA: Max. 42 Mbps ● DC-HSUPA: Max. 11.2 Mbps ● WCDMA: Max. 384 kbps (DL)/Max. 384 kbps (UL)

GSM Features	**R99:** ● CSD: 9.6 kbps, 14.4 kbps **GPRS:** ● Supports GPRS multi-slot class 33 (33 by default) ● Coding scheme: CS 1–4 ● Max. 107 kbps (DL)/Max. 85.6 kbps (UL) **EDGE:** ● Supports EDGE multi-slot class 33 (33 by default) ● Supports GMSK and 8-PSK for different MCS ● Downlink coding schemes: MCS 1–9 ● Uplink coding schemes: MCS 1–9 ● Max. 296 kbps (DL)/Max. 236.8 kbps (UL)
WLAN Features	● Supports AP and STA mode ● 2.4 GHz, 5 GHz, 802.11a/b/g/n/ac, up to 433 Mbps
Bluetooth Feature	Bluetooth 4.2 LE
GNSS Features [1]	GPS/GLONASS/BDS or GPS/Galileo/BDS
SMS	● Text and PDU mode ● Point-to-point MO and MT ● SMS cell broadcast
LCM Interface	● Supports one 4-lane MIPI_DSI ● Supports HD+ (1440 × 720) @ 60 fps
Camera Interfaces	● Supports two 4-lane MIPI_CSI, up to 2.1 Gbps/lane ● Supports two cameras (4-lane + 4-lane) or three cameras (4-lane + 2-lane + 1-lane) ● Up to 13 MP
Video Codec	● Video encoding + decoding: 720P @ 30 fps + 1080P @ 30 fps ● Encoding: up to 1080P @ 30 fps; Decoding: up to 1080P @ 30 fps
Audio Interfaces	**Audio inputs:** ● Three single-ended microphone inputs **Audio outputs:** ● Class AB stereo headphone output ● Class AB earpiece differential output ● Class D speaker differential amplifier output
Audio Codec	● EVRC, EVRC-B, EVRC-WB; ● G.711, G.729A, and G.729AB; ● GSM-FR, GSM-EFR, GSM-HR; ● AMR-NB, AMR-WB, eAMR, BeAMR

[1] SC262R-WF does not support GNSS.

USB Interface	● Compliant with USB 2.0 specification ● Supports up to 480 Mbps ● Supports USB OTG ● Used for AT command communication, data transmission, software debugging and firmware upgrade
UART Interfaces	Three UART interfaces: UART5, UART2 (debug UART) and UART1, baud rate up to 4 Mbps ● UART5: 4-wire UART interface, and hardware flow control is supported ● UART2 (debug UART): 2-wire UART interface, used for debugging by default ● UART1: 2-wire UART interface
SD Card Interface	● Supports SD 3.0 ● Supports SD card hot-plug
(U)SIM Interfaces	● Two (U)SIM interfaces ● Supports USIM/SIM card: 1.8 V or 2.95 V ● Supports Dual SIM Dual Standby (supported by default)
I2C Interfaces	● Four I2C interfaces ● Used for peripherals such as camera, sensor, touch panel, etc.
ADC Interface	One generic ADC interface, up to 15-bit resolution
Real Time Clock	Supported
Antenna Interfaces	Main antenna, Rx-diversity antenna, GNSS antenna [1] and Wi-Fi/Bluetooth antenna
Physical Characteristics	● Size: (40.5 ±0.15) mm × (40.5 ±0.15) mm × (2.8 ±0.2) mm ● Package: LCC + LGA ● Weight: Approx. 10.2 g
Temperature Range	● Operating temperature range: -35 °C to +75 °C [2] ● Storage temperature range: -40 °C to +90 °C
Firmware Upgrade	Over USB interface or OTA
RoHS	All hardware components are fully compliant with EU RoHS directive.

[2] Within the operating temperature range, the module meets 3GPP specifications.

2.3. Functional Diagram

The following figure shows a block diagram of SC262R series module and illustrates the major functional parts.

- Power management
- Radio frequency
- Baseband
- LPDDR3 + eMMC flash
- Peripheral interfaces
  -- USB interface
  -- UART interfaces
  -- (U)SIM interfaces
  -- SD card interface
  -- GPIO interfaces
  -- I2C interfaces
  -- SPI interfaces
  -- ADC interface
  -- Vibration Motor Driver Interface
  -- LCM interface
  -- Touch panel interface
  -- Camera interfaces
  -- Audio interfaces

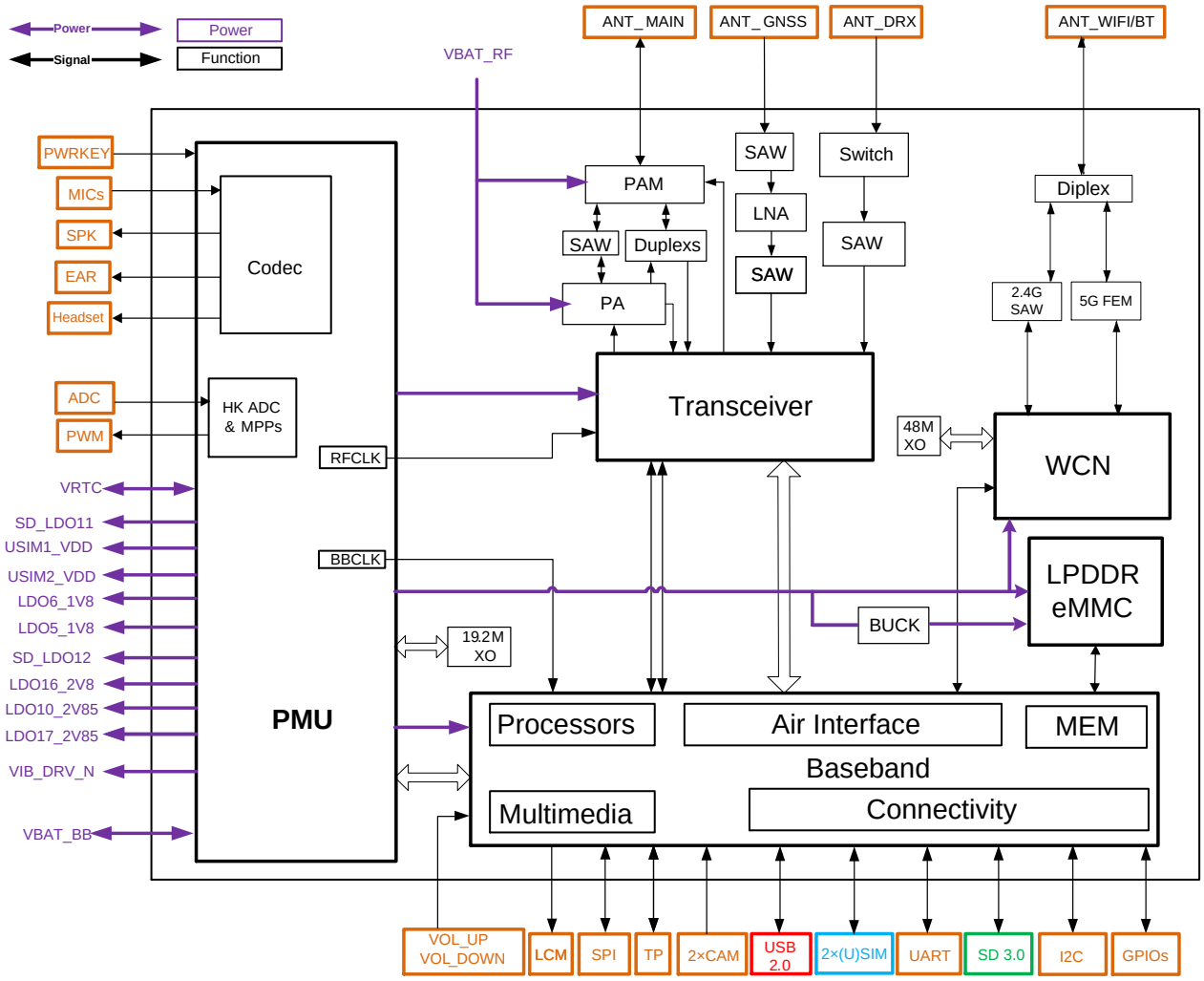


Figure 1: Functional Diagram

2.4. EVB Kit

To help you develop applications with the module, Quectel supplies an evaluation board (Smart EVB-G2) with accessories to control or test the module. For more details, see ***document [1]***.

3 Application Interfaces

3.1. General Description

SC262R is a series of SMD type modules with 146 LCC pins and 128 LGA pins. The following chapters provide the detailed description of pins/interfaces listed below.

- Power supply
- VRTC interface
- Power output
- Battery charging and management
- USB interface
- UART interfaces
- (U)SIM interfaces
- SD card interface
- GPIO interfaces
- I2C interfaces
- SPI interfaces
- ADC interface
- Vibration Motor Driver Interface
- LCM interface
- Touch panel interface
- Camera interfaces
- Sensor interfaces
- Audio interfaces
- USB_BOOT Control Interface

3.2. Pin Assignment

The following figure shows the pin assignment of SC262R series module.

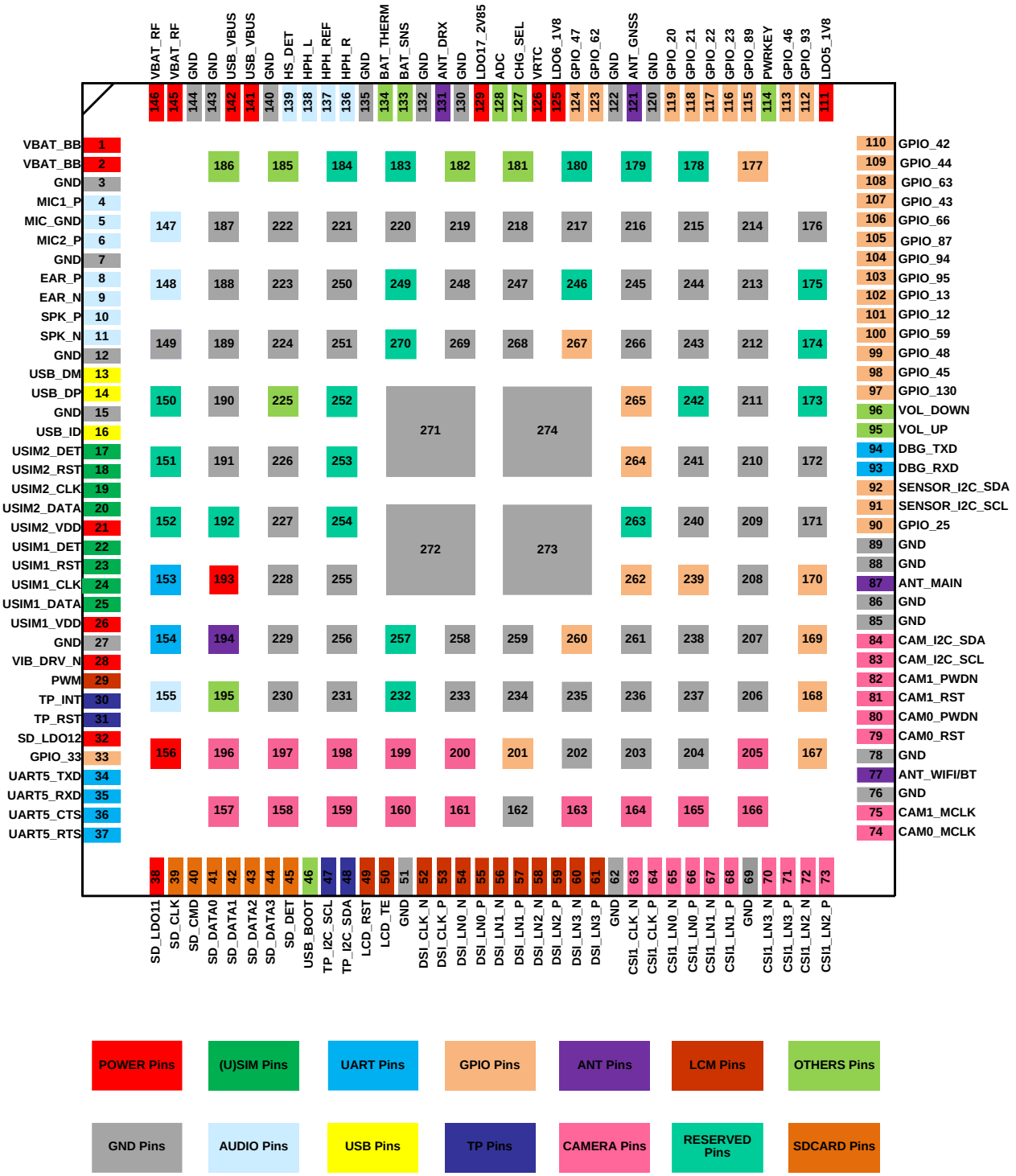


Figure 2: Pin Assignment (Top View)

3.3. Pin Description

Table 5: I/O Parameters Definition

Type	Description
AI	Analog input
AO	Analog output
AIO	Analog input/output
DI	Digital input
DO	Digital output
DIO	Digital input/output
OD	Open drain
PI	Power input
PO	Power output
PIO	Power input/output

The following table shows the pin definition and electrical characteristics of the module.

Table 6: Pin Description

Power Supply					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
VBAT_BB	1, 2	PIO	Power supply for the module's baseband part	Vmax = 4.2 V Vmin = 3.55 V Vnom = 3.8 V	You must provide them with sufficient current of up to 3 A. It is suggested to add a TVS for surge protection.
VBAT_RF	145, 146	PI	Power supply for the module's RF part	Vmax = 4.2 V Vmin = 3.55 V Vnom = 3.8 V	
VRTC	126	PIO	Power supply for RTC	$V_O$max = 3.2 V V_I = 2.0–3.25 V	If it is not used, keep this pin open.

LDO5_1V8	111	PO	1.8 V output	Vnom = 1.8 V $I_O$max = 20 mA	Power supply for external GPIO's pull-up and level shift circuits.
LDO6_1V8 [3]	125	PO	1.8 V output	Vnom = 1.8 V $I_O$max = 150 mA	Power supply for sensors, cameras, and I2C pull-up circuit. If it is used, connect an external 1.0–4.7 μF capacitor to this pin in parallel. If it is not used, keep it open.
LDO10_2V85	156	PO	2.85 V output	Vnom = 2.85 V $I_O$max = 150 mA	Reserved power supply. If it is used, add a 1.0–2.2 μF bypass capacitor. If it is not used, keep it open.
LDO17_2V85	129	PO	2.85 V output	Vnom = 2.85 V $I_O$max = 450 mA	Power supply for AVDD of LCM, TP, sensors and cameras. If it is used, connect an external 2.2–4.7 μF capacitor to this pin in parallel. If it is not used, keep it open.
LDO16_2V8	193	PO	2.8 V output	Vnom = 2.8 V $I_O$max = 55 mA	Reserved power supply. If it is used, add a 1.0–2.2 μF bypass capacitor. If it is not used, keep it open.

[3] When the module is in sleep mode, LDO6_1V8 wakes up periodically or randomly. Considering the actual requirement for power consumption during sleep mode, you can use either LDO6_1V8 or an external LDO for power supply. For lower power consumption, use an external LDO instead.

GND					
Pin Name	**Pin No.**				
GND	3, 7, 12, 15, 27, 51, 62, 69, 76, 78, 85, 86, 88, 89, 120, 122, 130, 132, 135, 140, 143, 144, 149, 162, 171, 172, 176, 187–191, 202–204, 206–224, 226–231, 233–238, 240, 241, 243–245, 247, 248, 250, 251, 255, 256, 258, 259, 261, 266, 268, 269, 271–274				
Audio Interfaces					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
MIC1_P	4	AI	Microphone input for channel 1 (+)		
MIC_GND	5	AI	Microphone reference ground		If it is not used, connect it to the ground.
MIC2_P	6	AI	Microphone input for headset (+)		
EAR_P	8	AO	Earpiece output (+)		
EAR_N	9	AO	Earpiece output (-)		
SPK_P	10	AO	Speaker output (+)		
SPK_N	11	AO	Speaker output (-)		
HPH_R	136	AO	Headphone right channel output		
HPH_REF	137	AO	Headphone reference ground		
HPH_L	138	AO	Headphone left channel output		
HS_DET	139	AI	Headset hot-plug detect		High level by default.
MIC_BIAS1	147	AO	Bias voltage output for microphone 1	V_O = 1.6–2.85 V	
MIC3_P	148	AI	Microphone input for channel 2 (+)		
MIC_BIAS2	155	AO	Bias voltage output for microphone 2	V_O = 1.6–2.85 V	
USB Interface					

Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment
USB_VBUS	141, 142	PI	Charging power input. USB 5 V power input. USB/adaptor insertion detection.	Vmax = 6.2 V Vmin = 4.35 V Vnom = 5.0 V	
USB_DM	13	AIO	USB 2.0 differential data (-)		USB 2.0 standard compliant. 90 Ω differential impedance.
USB_DP	14	AIO	USB 2.0 differential data (+)		
USB_ID	16	DI	USB ID detect		High level by default.
(U)SIM Interfaces					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
USIM2_DET	17	DI	(U)SIM2 card hot-plug detect	V_{IL}max = 0.63 V V_{IH}min = 1.17 V	Active low. Externally pull it up to 1.8 V. If it is not used, keep it open. This function is disabled by default via software. Cannot be multiplexed into a generic GPIO.
USIM2_RST	18	DO	(U)SIM2 card reset	V_{OL}max = 0.4 V V_{OH}min = 0.8 × USIM2_VDD	Cannot be multiplexed into generic GPIOs.
USIM2_CLK	19	DO	(U)SIM2 card clock		
USIM2_DATA	20	DIO	(U)SIM2 card data	V_{IL}max = 0.2 × USIM2_VDD V_{IH}min = 0.7 × USIM2_VDD V_{OL}max = 0.4 V V_{OH}min = 0.8 × USIM2_VDD	

				$I_O$max = 55 mA **For 1.8 V (U)SIM:** Vmax = 1.85 V Vmin = 1.75 V **For 2.95 V (U)SIM:** Vmax = 3.1 V Vmin = 2.8 V	
USIM2_VDD	21	PO	(U)SIM2 card power supply		Either 1.8 V or 2.95 V (U)SIM card is supported and can be identified automatically by the module.
USIM1_DET	22	DI	(U)SIM1 card hot-plug detect	V_{IL}max = 0.63 V V_{IH}min = 1.17 V	Active low. Externally pull it up to 1.8 V. If it is not used, keep it open. This function is disabled by default via software. Cannot be multiplexed into a generic GPIO.
USIM1_RST	23	DO	(U)SIM1 card reset	V_{OL}max = 0.4 V V_{OH}min = 0.8 × USIM1_VDD	Cannot be multiplexed into generic GPIOs.
USIM1_CLK	24	DO	(U)SIM1 card clock		
USIM1_DATA	25	DIO	(U)SIM1 card data	V_{IL}max = 0.2 × USIM1_VDD V_{IH}min = 0.7 × USIM1_VDD V_{OL}max = 0.4 V V_{OH}min = 0.8 × USIM1_VDD	
USIM1_VDD	26	PO	(U)SIM1 card power supply	$I_O$max = 55 mA **For 1.8 V (U)SIM:** Vmax = 1.85 V Vmin = 1.75 V **For 2.95 V (U)SIM:** Vmax = 3.1 V Vmin = 2.8 V	Either 1.8 V or 2.95 V (U)SIM card is supported and can be identified automatically by the module.
UART Interfaces					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**

UART5_TXD	34	DO	UART5 transmit	V_{OL}max = 0.45 V V_{OH}min = 1.35 V	1.8 V power domain. If not used, keep these pins open.
UART5_RXD	35	DI	UART5 receive	V_{IL}max = 0.63 V V_{IH}min = 1.17 V	
UART5_CTS	36	DI	DCE clear to send	V_{IL}max = 0.63 V V_{IH}min = 1.17 V	
UART5_RTS	37	DO	DCE request to send	V_{OL}max = 0.45 V V_{OH}min = 1.35 V	
DBG_RXD	93	DI	UART2 receive (debug UART by default)	V_{IL}max = 0.63 V V_{IH}min = 1.17 V	
DBG_TXD	94	DO	UART2 transmit (debug UART by default)	V_{OL}max = 0.45 V V_{OH}min = 1.35 V	
UART1_RXD	153	DI	UART1 receive	V_{IL}max = 0.63 V V_{IH}min = 1.17 V	
UART1_TXD	154	DO	UART1 transmit	V_{OL}max = 0.45 V V_{OH}min = 1.35 V	
SD Card Interface					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
SD_LDO11	38	PO	SD card power supply	Vnom = 2.95 V $I_O$max = 800 mA	
SD_LDO12	32	PO	1.8/2.95 V output power supply for SD card pull-up circuits.	Vnom = 1.8/2.95 V $I_O$max = 50 mA	
SD_CLK	39	DO	SD card clock	**1.8 V SD card:** V_{OL}max = 0.45 V V_{OH}min = 1.4 V **2.95 V SD card:** V_{OL}max = 0.37 V V_{OH}min = 2.2 V	50 Ω characteristic impedance.
SD_CMD	40	DIO	SD card command	**1.8 V SD card:** V_{IL}max = 0.58 V V_{IH}min = 1.27 V V_{OL}max = 0.45 V V_{OH}min = 1.4 V	
SD_DATA0	41	DIO	SDIO data bit 0		
SD_DATA1	42	DIO	SDIO data bit 1		
SD_DATA2	43	DIO	SDIO data bit 2		

SD_DATA3	44	DIO	SDIO data bit 3	**2.95 V SD card:** V_{IL}max = 0.73 V V_{IH}min = 1.84 V V_{OL}max = 0.37 V V_{OH}min = 2.2 V	
SD_DET	45	DI	SD card hot-plug detect	V_{IL}max = 0.63 V V_{IH}min = 1.17 V	Active low.
Touch Panel Interface					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
TP_INT	30	DI	TP interrupt	V_{IL}max = 0.63 V V_{IH}min = 1.17 V	1.8 V power domain.
TP_RST	31	DO	TP reset	V_{OL}max = 0.45 V V_{OH}min = 1.35 V	1.8 V power domain. Active low.
TP_I2C_SCL	47	OD	TP I2C clock		Externally pull them up to 1.8 V. Can be used for other I2C devices.
TP_I2C_SDA	48	OD	TP I2C data		
LCM Interface					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
PWM	29	DO	PWM output	V_{OL}max = 0.45 V V_{OH}max = VBAT_BB	Adjusts backlight brightness.
LCD_RST	49	DO	LCD reset	V_{OL}max = 0.45 V V_{OH}min = 1.35 V	1.8 V power domain.
LCD_TE	50	DI	LCD tearing effect	V_{IL}max = 0.63 V V_{IH}min = 1.17 V	
DSI_CLK_N	52	AO	LCD MIPI clock (-)		
DSI_CLK_P	53	AO	LCD MIPI clock (+)		
DSI_LN0_N	54	AO	LCD MIPI data 0 (-)		
DSI_LN0_P	55	AO	LCD MIPI data 0 (+)		
DSI_LN1_N	56	AO	LCD MIPI data 1 (-)		
DSI_LN1_P	57	AO	LCD MIPI data 1 (+)		
DSI_LN2_N	58	AO	LCD MIPI data 2 (-)		

DSI_LN2_P	59	AO	LCD MIPI data 2 (+)		
DSI_LN3_N	60	AO	LCD MIPI data 3 (-)		
DSI_LN3_P	61	AO	LCD MIPI data 3 (+)		
Camera Interfaces					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
CSI1_CLK_N	63	AI	MIPI CSI1 clock (-)		
CSI1_CLK_P	64	AI	MIPI CSI1 clock (+)		
CSI1_LN0_N	65	AI	MIPI CSI1 lane 0 data (-)		
CSI1_LN0_P	66	AI	MIPI CSI1 lane 0 data (+)		
CSI1_LN1_N	67	AI	MIPI CSI1 lane 1 data (-)		
CSI1_LN1_P	68	AI	MIPI CSI1 lane 1 data (+)		
CSI1_LN3_N	70	AI	MIPI CSI1 lane 3 data (-)		
CSI1_LN3_P	71	AI	MIPI CSI1 lane 3 data (+)		
CSI1_LN2_N	72	AI	MIPI CSI1 lane 2 data (-)		
CSI1_LN2_P	73	AI	MIPI CSI1 lane 2 data (+)		
CSI0_CLK_N	157	AI	MIPI CSI0 clock (-)		
CSI0_CLK_P	196	AI	MIPI CSI0 clock (+)		
CSI0_LN0_N	158	AI	MIPI CSI0 lane 0 data (-)		
CSI0_LN0_P	197	AI	MIPI CSI0 lane 0 data (+)		
CSI0_LN1_N	159	AI	MIPI CSI0 lane 1 data (-)		
CSI0_LN1_P	198	AI	MIPI CSI0 lane 1 data (+)		

CSI0_LN2_N	160	AI	MIPI CSI0 lane 2 data (-)		
CSI0_LN2_P	199	AI	MIPI CSI0 lane 2 data (+)		
CSI0_LN3_N	161	AI	MIPI CSI0 lane 3 data (-)		
CSI0_LN3_P	200	AI	MIPI CSI0 lane 3 data (+)		
CAM0_MCLK	74	DO	Master clock of camera0		
CAM1_MCLK	75	DO	Master clock of camera1		
CAM0_RST	79	DO	Reset of camera0	V_{OL}max = 0.45 V V_{OH}min = 1.35 V	1.8 V power domain.
CAM0_PWDN	80	DO	Power down of camera0		
CAM1_RST	81	DO	Reset of camera1		
CAM1_PWDN	82	DO	Power down of camera1		
CAM_I2C_SCL	83	OD	I2C clock of front and rear cameras		Externally pull them up to 1.8 V.
CAM_I2C_SDA	84	OD	I2C data of front and rear cameras		
CAM2_MCLK	165	DO	Master clock of camera2		
CAM2_RST	164	DO	Reset of camera2	V_{OL}max = 0.45 V V_{OH}min = 1.35 V	1.8 V power domain.
CAM2_PWDN	163	DO	Power down of camera2		
DCAM_I2C_SCL	166	OD	I2C clock of depth camera		Externally pull them up to 1.8 V.
DCAM_I2C_SDA	205	OD	I2C data of depth camera		
Keypad Interfaces					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
PWRKEY	114	DI	Turn on/off the module	V_{IL}max = 0.63 V V_{IH}min = 1.17 V	Pulled up to 1.8 V internally. Active low.

RESET_N	225	DI	Reset the module		Disabled by default and can be enabled via software configuration.
VOL_UP	95	DI	Volume up	V_{IL}max = 0.63 V V_{IH}min = 1.17 V	If it is not used, keep it open. Cannot be externally pulled up. 1.8 V power domain.
VOL_DOWN	96	DI	Volume down	V_{IL}max = 0.63 V V_{IH}min = 1.17 V	If it is not used, keep it open. Cannot be externally pulled up. 1.8 V power domain.
Sensor I2C Interface					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
SENSOR_I2C_SCL	91	OD	I2C clock for external sensor		Dedicated for external sensors. Cannot be used for touch panel, NFC, I2C keyboard, etc. Externally pull them up to 1.8 V.
SENSOR_I2C_SDA	92	OD	I2C data for external sensor		
Charging Interface					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
BAT_SNS	133	AI	Sensed battery voltage for charger circuits		The maximum input voltage is 4.2 V.
BAT_THERM	134	AI	Battery temperature detect		Internally pulled up. Supports 47 kΩ NTC thermistor by default - externally connect it to the 47 kΩ NTC thermistor. If it is not used, connect it to GND with a 47 kΩ resistor.

BAT_ID	185	AI	Battery type detect	V_I = 0.1–1.7 V	Internally pulled down with a 100 kΩ resistor. If it is not used, keep it open.
CHG_SEL	127	DI	Charging select		If you use an internal charging chip, keep this pin open. If you use an external charging chip, connect it to GND.
ADC Interface					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
ADC	128	AI	General-purpose ADC interface		The maximum input voltage is 1.7 V.
Antenna Interfaces					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
ANT_MAIN	87	AIO	Main antenna interface		50 Ω impedance.
ANT_DRX	131	AI	Rx-diversity antenna interface		
ANT_GNSS [4]	121	AI	GNSS antenna interface		
ANT_WIFI/BT	77	AIO	Wi-Fi/Bluetooth antenna interface		
GPIO Interfaces					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
GPIO_33	33	DIO	General-purpose input/output	V_{IL}max = 0.63 V V_{IH}min = 1.17 V V_{OL}max = 0.45 V V_{OH}min = 1.4 V	1.8 V power domain.
GPIO_25	90	DIO	General-purpose input/output		
GPIO_130	97	DIO	General-purpose input/output		
GPIO_45	98	DIO	General-purpose input/output		

[4] SC262R-WF does not support GNSS.

GPIO_48	99	DIO	General-purpose input/output
GPIO_59	100	DIO	General-purpose input/output
GPIO_12	101	DIO	General-purpose input/output
GPIO_13	102	DIO	General-purpose input/output
GPIO_95	103	DIO	General-purpose input/output
GPIO_94	104	DIO	General-purpose input/output
GPIO_87	105	DIO	General-purpose input/output
GPIO_66	106	DIO	General-purpose input/output
GPIO_43	107	DIO	General-purpose input/output
GPIO_63	108	DIO	General-purpose input/output
GPIO_44	109	DIO	General-purpose input/output
GPIO_42	110	DIO	General-purpose input/output
GPIO_93	112	DIO	General-purpose input/output
GPIO_46	113	DIO	General-purpose input/output
GPIO_89	115	DIO	General-purpose input/output
GPIO_23	116	DIO	General-purpose input/output
GPIO_22	117	DIO	General-purpose input/output
GPIO_21	118	DIO	General-purpose input/output
GPIO_20	119	DIO	General-purpose input/output
GPIO_62	123	DIO	General-purpose input/output
GPIO_47	124	DIO	General-purpose input/output

GPIO_6	167	DIO	General-purpose input/output		
GPIO_7	168	DIO	General-purpose input/output		
GPIO_127	169	DIO	General-purpose input/output		
GPIO_34	170	DIO	General-purpose input/output		
GPIO_90	177	DIO	General-purpose input/output		
GPIO_39	201	DIO	General-purpose input/output		
GPIO_86	239	DIO	General-purpose input/output		
GPIO_88	264	DIO	General-purpose input/output		Cannot be pulled up during power-on. 1.8 V power domain.
GPIO_85	265	DIO	General-purpose input/output		1.8 V power domain.
GPIO_61	267	DIO	General-purpose input/output		
GNSS LNA Enable Interface					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
GNSS_LNA_EN	194	DIO	GNSS LNA enable control		Cannot be multiplexed into a generic GPIO.
Antenna Tuner Control Interface					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
RFFE3_CLK	260	DIO	Used for external MIPI IC Control		Cannot be multiplexed into generic GPIOs.
RFFE3_DATA	262	DIO	Used for external MIPI IC Control		
USB_BOOT Control Interface					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**

USB_BOOT	46	DI	Force the module into emergency download mode		You can force the module to enter emergency download mode by pulling this pin up to LDO5_1V8 during power-on.
Vibration Motor Driver Interface					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
VIB_DRV_N	28	PO	Vibration motor driver output control	V_O = 1.2–3.1 V $I_O$max = 175 mA	Connect it to the negative pole of the motor.
Indication Interface					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
CHG_LED	195	AO	Indicates the module's charging status	$I_O$max = 5 mA	
Other Interfaces					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
NFC_CLK	181	DO	NFC clock		
NFC_CLK_REQ	182	DI	NFC clock request		
CBL_PWR_N	186	DI	Cable power-on; initiates power on when grounded		The module cannot be turned off when this pin is pulled down. If it is not used, keep it open.
Reserved Pins					
Pin Name	**Pin No.**				**Comment**
RESERVED	150–152, 173–175, 178–180, 183, 184, 192, 232, 242, 246, 249, 252–254, 257, 263, 270				Keep these pins open.

3.4. Power Supply

3.4.1. Power Supply Pins

SC262R series module provides two VBAT_RF pins and two VBAT_BB pins for connection with the external power supply. The VBAT_RF pins are used for the RF part of the module and the VBAT_BB pins are used for the baseband part of the module.

3.4.2. Voltage Stability Requirements

The power supply range of the module is 3.55–4.2 V, and the recommended value is 3.8 V. The power supply performance, such as load capacity, voltage ripple, etc. directly influences the module's performance and stability. Under ultimate conditions, the transient peak current of the module may surge up to 3 A. If the power supply capacity is not sufficient, there will be the risk that the voltage drops below 3.1 V and as a result the module powers off automatically. Therefore, make sure the input voltage never drops below 3.1 V.

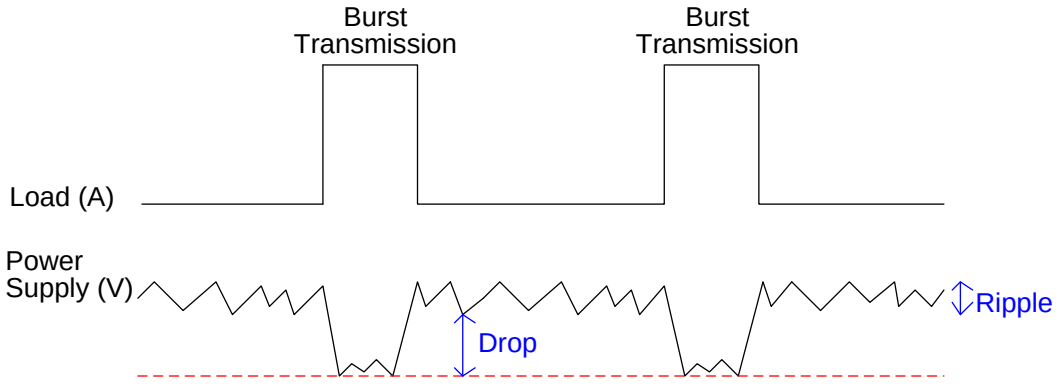


Figure 3: Power Supply Limits during Burst Transmission

To decrease voltage drop, use a bypass capacitor of about 100 µF with low ESR (ESR = 0.7 Ω), and reserve a multi-layer ceramic chip capacitor (MLCC) array due to its ultra-low ESR. It is recommended to use three ceramic capacitors (100 nF, 33 pF, 10 pF) to compose the MLCC array and place these capacitors close to VBAT_BB/VBAT_RF pins. Additionally, add a 4.7 µF capacitor in parallel. The main power supply from an external application has to be a single voltage source and can be expanded to two sub paths with star structure. The width of VBAT trace should be no less than 3 mm. In principle, the longer the VBAT trace is, the wider it should be.

In addition, in order to get a stable power source, it is suggested to use a TVS and place it as close to the VBAT_BB/VBAT_RF pins as possible to enhance surge protection. The following figure shows the star structure of the power supply.

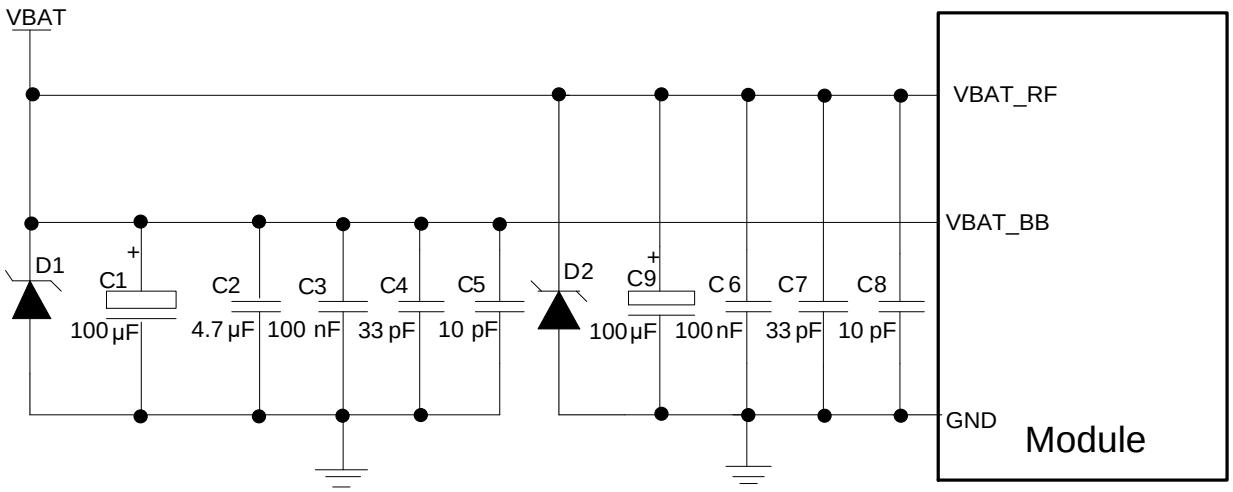


Figure 4: Star Structure of the Power Supply

3.4.3. Reference Design for Power Supply

The power design for the module is very important, as the performance of the module largely depends on the power source. The power supply of SC262R series module should be able to provide sufficient current of at least 3 A. If the voltage drop between the input and output is not too high, it is suggested to use an LDO to supply power for the module. If there is a big voltage difference between the input source and the desired output (VBAT), a buck converter is recommended.

The following figure shows a reference design for +5 V input power source. The typical output voltage is 3.8 V and the maximum load current is 5.0 A.

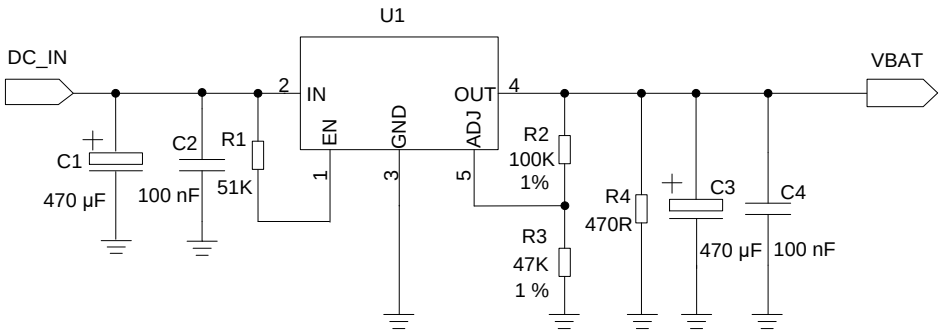


Figure 5: Reference Circuit of Power Supply

NOTE

1. It is recommended to switch off the power supply when the module is in abnormal state, and then switch on the power to restart the module.

2. The module supports battery charging by default. If the above power supply design is adopted, make sure the charging function is disabled by software, or connect VBAT to a Schottky diode in series to avoid the reverse current to the power supply chip.

3.5. Turn On and Off

3.5.1. Turn On with PWRKEY

The module can be turned on by driving the PWRKEY pin low for at least 1.6 s. The PWRKEY pin is pulled up to 1.8 V internally. It is recommended to use an open drain/collector driver to control PWRKEY. A simple reference circuit is illustrated in the following figure.

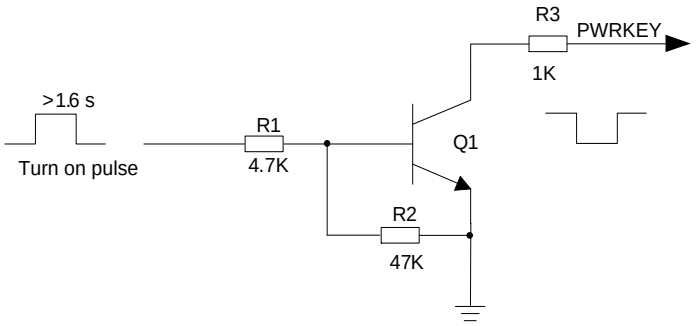


Figure 6: Turn On the Module Using Driving Circuit

The other way to control PWRKEY is using a button directly. You must place a TVS component nearby the button for ESD protection. A reference circuit is shown in the following figure.

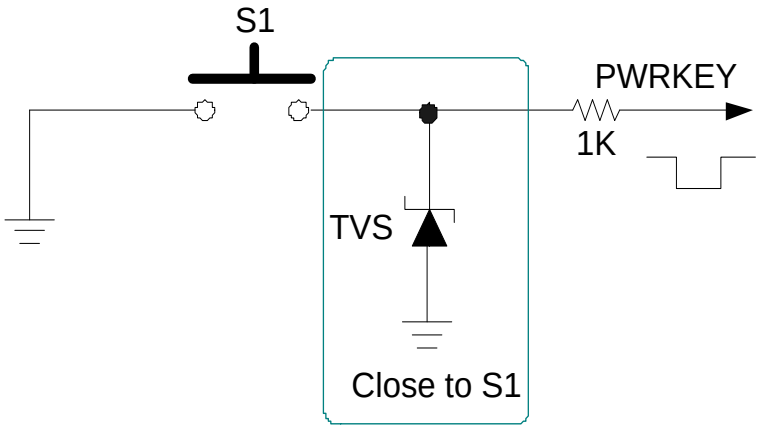


Figure 7: Turn On the Module Using Button

The turning-on scenario is illustrated in the following figure.

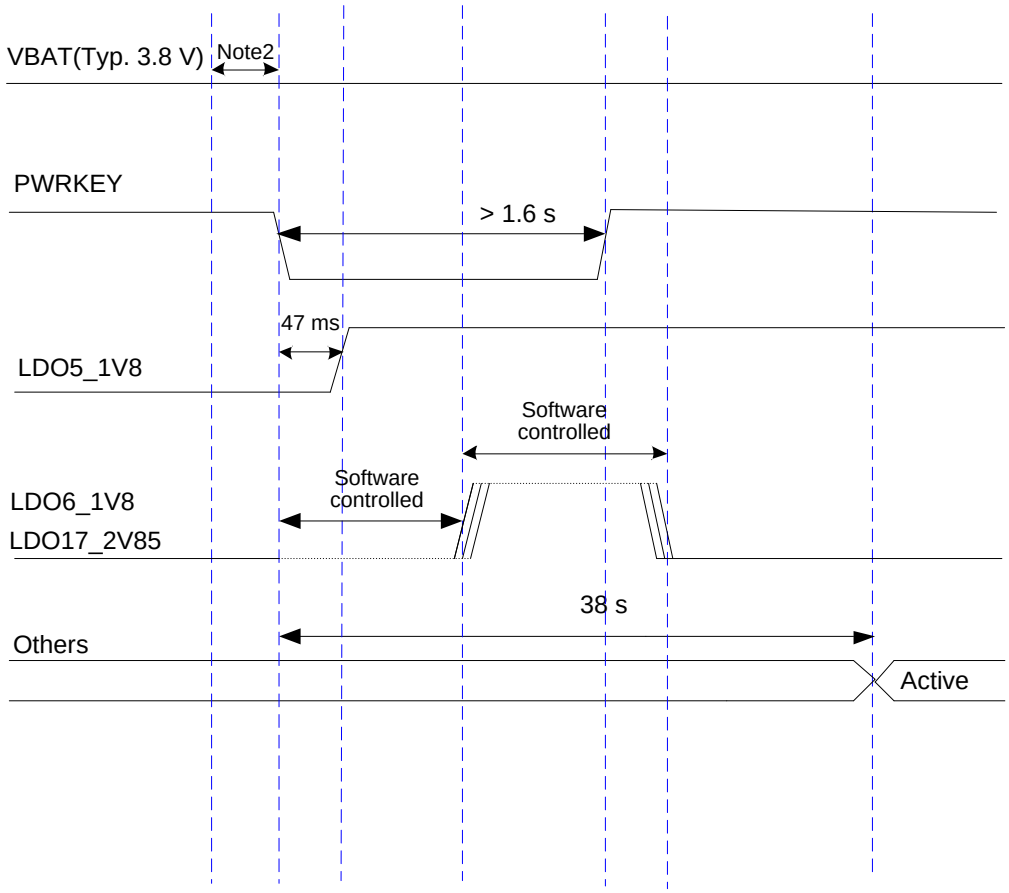


Figure 8: Timing of Turning On the Module

NOTE

1. When the module is powered on for the first time, its timing of turning on may be different from that shown above.
2. Make sure that VBAT is stable before pulling down PWRKEY. It is recommended to wait until VBAT to be stable at 3.8 V for at least 30 ms before pulling down PWRKEY. Additionally, PWRKEY cannot be kept pulling down all the time.

3.5.2. Turn Off the Module

Drive the PWRKEY pin low for at least 1 s, and then choose to turn off the module when the prompt window comes up.

You can also force the module to power off by driving PWRKEY low for at least 8 s. The forced power-down scenario is illustrated in the following figure.

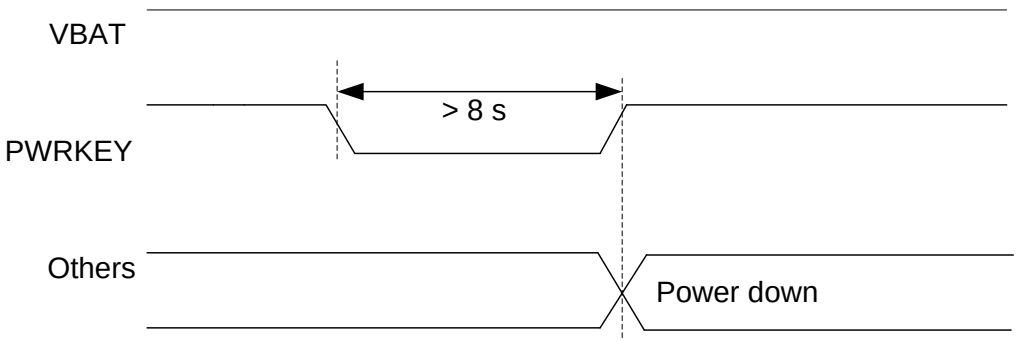


Figure 9: Timing of Turning Off the Module

3.6. VRTC Interface

The RTC (Real Time Clock) can be powered by an external power source through VRTC when the module is powered down and there is no power supply for VBAT. The external power source can be a rechargeable battery (such as a coin cell) according to application demands. A reference circuit design is shown below.

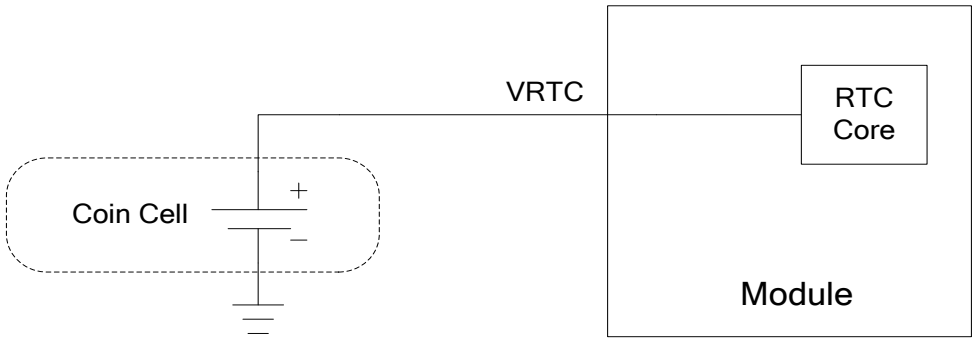


Figure 10: RTC Powered by Coin Cell

If RTC is ineffective, it can be synchronized through the network after the module is powered on. The recommended input voltage range for VRTC is 2.0–3.25 V and the recommended typical value is 3.0 V.

3.7. Power Output

SC262R series module supports output of regulated voltages for peripheral circuits. During application, it is recommended to connect a 33 pF and a 10 pF capacitor in parallel in the circuit to suppress high-frequency noise.

Table 7: Power Description

Pin Name	Default Voltage (V)	Driving Current (mA)	@ Idle State
LDO5_1V8	1.8	20	Keeps ON
LDO6_1V8 [5]	1.8	150	-
LDO10_2V85	2.85	150	-
LDO17_2V85	2.85	450	-
LDO16_2V8	2.8	55	-
SD_LDO12	1.8/2.95	50	-
SD_LDO11	2.95	800	-
USIM1_VDD	1.8/2.95	55	-
USIM2_VDD	1.8/2.95	55	-

3.8. Battery Charging and Management

SC262R series module supports battery charging. The battery charger IC in the module supports trickle charging, constant current charging and constant voltage charging modes, which optimize the charging procedure for Li-ion batteries.

- **Trickle charging:** There are two steps in this mode. When the battery voltage is below 2.8 V, a 90 mA trickle charging current is applied to the battery. When the battery voltage is charged up and is between 2.8 V and 3.2 V, the charging current can be set to 450 mA maximally.
- **Constant current mode (CC mode):** When the battery is increased to 3.2–4.2 V, the system will switch to CC mode. The maximum charging current is 1.44 A when an adapter is used for battery charging, and the maximum charging current is 450 mA for USB charging.
- **Constant voltage mode (CV mode):** When the battery voltage reaches the final value 4.2 V, the system will switch to CV mode and the charging current will decrease gradually. When the battery level reaches 100 %, charging is completed.

[5] When the module is in sleep mode, LDO6_1V8 wakes up periodically or randomly. Considering the actual requirement for power consumption during sleep mode, you can use either LDO6_1V8 or an external LDO for power supply. If you require lower power consumption during sleep mode, use an external LDO for power supply.

Table 8: Pin Definition of Charging Interface

Pin Name	Pin No.	I/O	Description	Comment
BAT_SNS	133	AI	Sensed battery voltage for charger circuits	The maximum input voltage is 4.2 V.
BAT_THERM	134	AI	Battery temperature detect	Internally pulled up. Supports 47 kΩ NTC thermistor by default - externally connect it to the 47 kΩ NTC thermistor. If it is not used, connect it to GND with a 47 kΩ resistor.
BAT_ID	185	AI	Battery type detect	Internally pulled down with a 100 kΩ resistor. If it is not used, keep it open.
CHG_SEL	127	DI	Charging select	If you use an internal charging chip, keep this pin open. If you use an external charging chip, connect it to GND.

SC262R series module supports battery temperature detection in the condition that the battery integrates a thermistor (47 kΩ 1 % NTC thermistor with a B-constant of 4050 K by default) and the thermistor is connected to BAT_THERM pin. If the BAT_THERM pin is not connected, there will be malfunctions such as battery charging failure, battery level display error, etc. The default battery temperature range is -3.0 °C to 48.5 °C.

A reference design for the battery charging circuit is shown below.

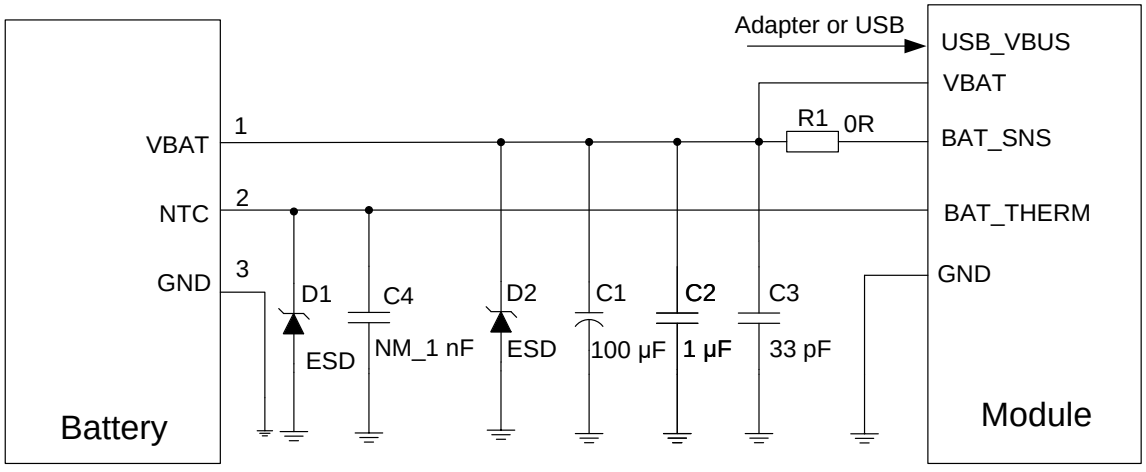


Figure 11: Reference Design for Battery Charging Circuit

Mobile devices such as mobile phones or handheld POS systems are powered by batteries. For different

batteries, you should modify the charging and discharging curve correspondingly to achieve the best performance.

If the thermistor is not available in the battery, or an adapter is utilized to power the module, you must connect BAT_THERM to GND via a 47 kΩ resistor. Otherwise, the system may mistakenly judge that the battery temperature is abnormal, and therefore cause battery charging failure.

BAT_SNS must be connected. Otherwise, the module will have abnormalities in voltage detection, as well as associated problems with power-on/off and battery charging/discharging.

3.9. USB Interface

SC262R series module provides one integrated Universal Serial Bus (USB) interface which complies with USB 2.0 specification and supports high-speed (480 Mbps) and full-speed (12 Mbps) modes. The USB interface supports USB OTG and is used for AT command communication, data transmission, software debugging and firmware upgrade.

The following table shows the pin definition of USB interface.

Table 9: Pin Definition of USB Interface

Pin Name	Pin No.	I/O	Description	Comment
USB_VBUS	141, 142	PI	Charging power input. USB 5 V power input. USB/adaptor insertion detection.	Vmax = 6.2 V Vmin = 4.35 V Vnom = 5.0 V
USB_DM	13	AIO	USB 2.0 differential data (-)	USB 2.0 standard compliant. 90 Ω differential impedance.
USB_DP	14	AIO	USB 2.0 differential data (+)	
USB_ID	16	DI	USB ID detect	High level by default.

For the design of USB 2.0 interface, it is recommended to connect USB_ID directly to the USB_ID pin of the external USB port for USB ID detection. When you insert a device into the external USB port, the USB_ID pin of the module will be pulled down to make the module enter host mode.

You can choose either to support USB OTG or not. The following figures show the reference designs.

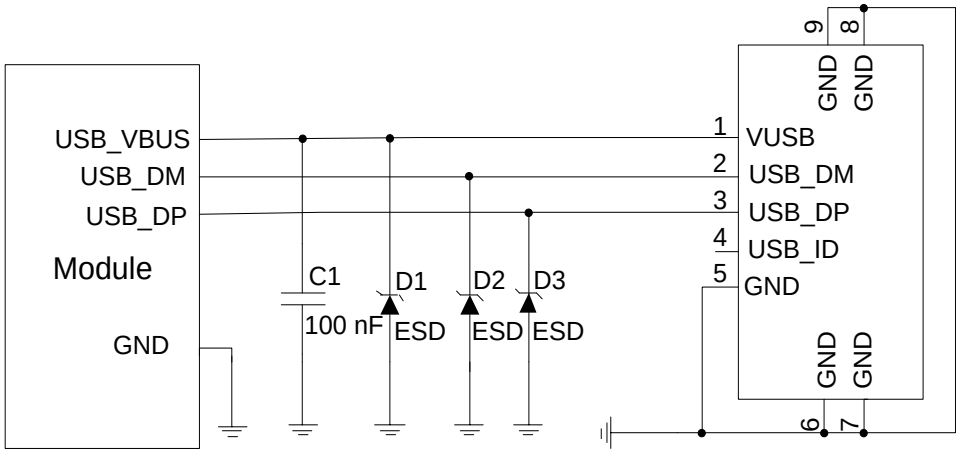


Figure 12: USB Interface Reference Design (OTG Not Supported)

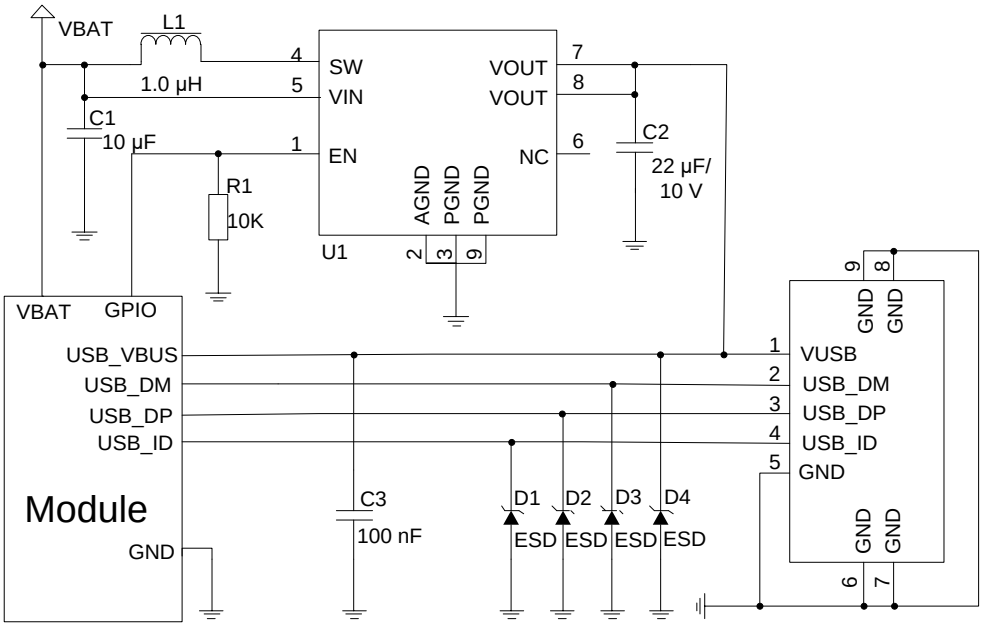


Figure 13: USB Interface Reference Design (OTG Supported)

In order to ensure USB performance, comply with the following principles when designing the USB interface.

- Route the USB signal traces as a differential pair with total grounding. The impedance of USB differential trace should be controlled to 90 Ω.
- Keep the ESD protection devices as close as possible to the USB connector. Pay attention to the influence of junction capacitance of ESD protection devices on USB data lines. Typically, the capacitance value should be less than 2 pF.
- Do not route signal traces under crystals, oscillators, magnetic devices or RF signal traces. Route the USB differential traces in inner-layer of the PCB, and surround the traces with ground on that layer

and with ground planes above and below.

- Make sure the trace length difference between USB 2.0 differential data signals is less than 0.7 mm.

Table 10: USB Trace Length Inside the Module

Pin No.	Signal	Length (mm)	Length Difference (DP - DM)
13	USB_DM	32.25	-0.10
14	USB_DP	32.15	

3.10. UART Interfaces

SC262R series module provides three UART interfaces and supports up to 4 Mbps:

- **UART5:** 4-wire UART interface, and hardware flow control is supported
- **UART2 (debug UART):** 2-wire UART interface, used for debugging by default
- **UART1:** 2-wire UART interface

Table 11: Pin Definition of UART Interfaces

Pin Name	Pin No.	I/O	Description	Comment
UART5_TXD	34	DO	UART5 transmit	1.8 V power domain. If not used, keep these pins open.
UART5_RXD	35	DI	UART5 receive	
UART5_CTS	36	DI	DCE clear to send	
UART5_RTS	37	DO	DCE request to send	
DBG_RXD	93	DI	UART2 receive (debug UART by default)	
DBG_TXD	94	DO	UART2 transmit (debug UART by default)	
UART1_RXD	153	DI	UART1 receive	
UART1_TXD	154	DO	UART1 transmit	

UART5 is a 4-wire UART interface with 1.8 V power domain. You should use a voltage level translator if your application is equipped with a 3.3 V UART interface. The following figure shows the reference

design.

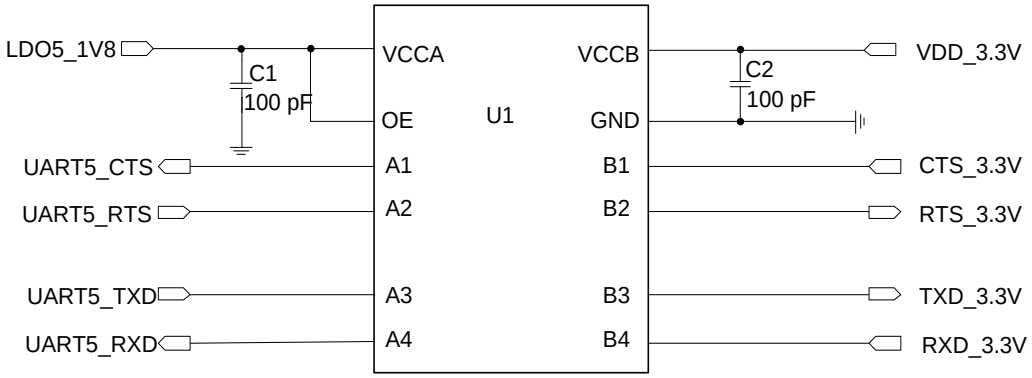


Figure 14: Reference Circuit with Voltage Level Translator Chip (for UART5)

The following figure is an example of connection between the module and PC. It is recommended to add a level translator and an RS-232 level translator chip between the module and PC. The following figure shows the reference design.

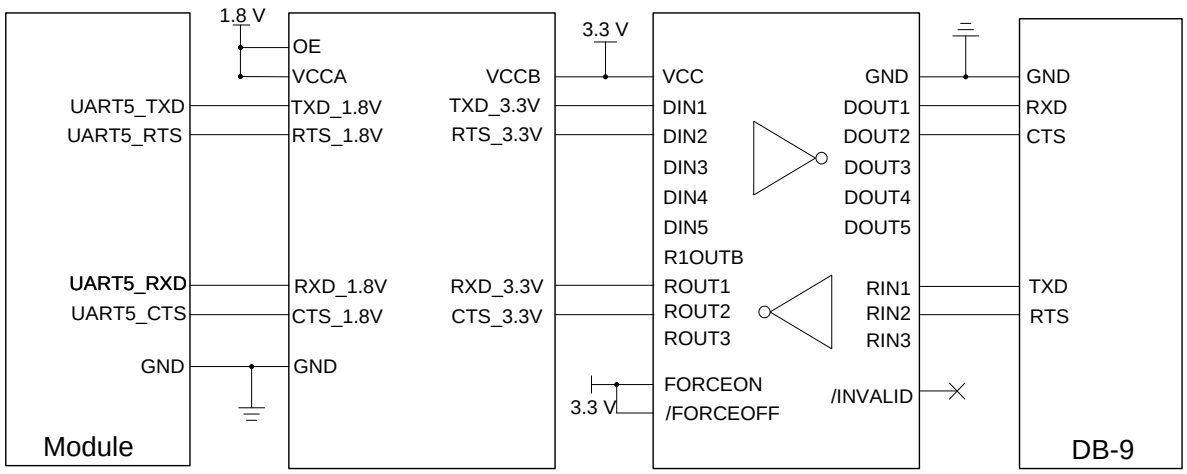


Figure 15: RS-232 Level Match Circuit (for UART5)

NOTE

UART2 and UART1 are similar to UART5. For the reference design, refer to that of UART5.

3.11. (U)SIM Interfaces

SC262R series module provides two (U)SIM interfaces that meet ETSI and IMT-2000 requirements. Dual SIM Dual Standby is supported by default. Either 1.8 V or 2.95 V (U)SIM card is supported, and the (U)SIM card is powered by the internal power supply of the module.

Table 12: Pin Definition of (U)SIM Interfaces

Pin Name	Pin No.	I/O	Description	Comment
USIM2_DET	17	DI	(U)SIM2 card hot-plug detect	Active low. Externally pull it up to 1.8 V. If it is not used, keep it open. This function is disabled by default via software. Cannot be multiplexed into a generic GPIO.
USIM2_RST	18	DO	(U)SIM2 card reset	Cannot be multiplexed into generic GPIOs.
USIM2_CLK	19	DO	(U)SIM2 card clock	
USIM2_DATA	20	DIO	(U)SIM2 card data	
USIM2_VDD	21	PO	(U)SIM2 card power supply	Either 1.8 V or 2.95 V (U)SIM card is supported and can be identified automatically by the module.
USIM1_DET	22	DI	(U)SIM1 card hot-plug detect	Active low. Externally pull it up to 1.8 V. If it is not used, keep it open. This function is disabled by default via software. Cannot be multiplexed into a generic GPIO.
USIM1_RST	23	DO	(U)SIM1 card reset	Cannot be multiplexed into generic GPIOs.
USIM1_CLK	24	DO	(U)SIM1 card clock	
USIM1_DATA	25	DIO	(U)SIM1 card data	
USIM1_VDD	26	PO	(U)SIM1 card power supply	Either 1.8 V or 2.95 V (U)SIM card is supported and can be identified automatically by the module.

SC262R series module supports (U)SIM card hot-plug via the USIM_DET pin. (This function is disabled by default via software. To enable it, contact Quectel Technical Supports to change the software configuration.)

A reference circuit for (U)SIM interface with an 8-pin (U)SIM card connector is shown below.

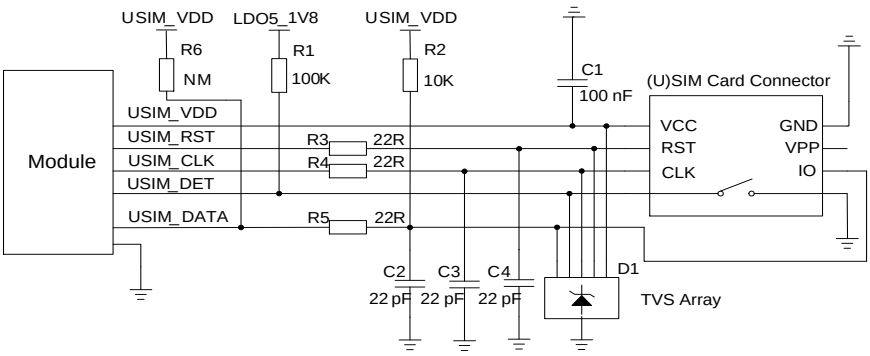


Figure 16: Reference Circuit for (U)SIM Interface with an 8-pin (U)SIM Card Connector

If you do not need to use USIM_DET, keep this pin open. The following is a reference circuit for (U)SIM interface with a 6-pin (U)SIM card connector.

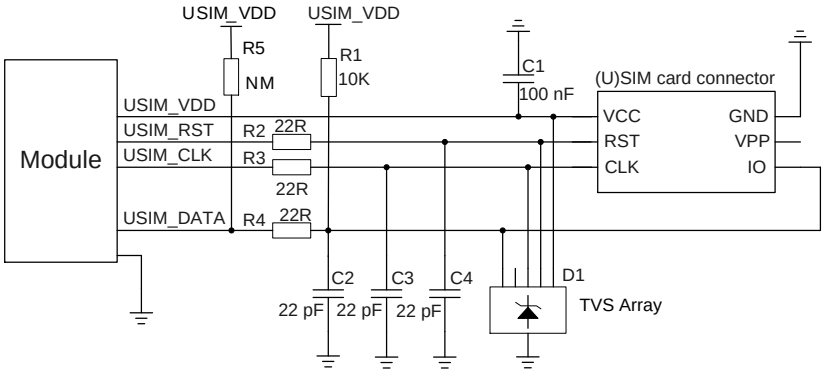


Figure 17: Reference Circuit for (U)SIM Interface with a 6-pin (U)SIM Card Connector

In order to ensure good performance and avoid damage of (U)SIM cards, follow the criteria listed below during (U)SIM circuit design:

- Place the (U)SIM card connector as close to the module as possible. Keep the trace length as short as possible, at most 200 mm.
- Keep (U)SIM card signals away from RF and VBAT traces.
- Reserve a filter capacitor for USIM_VDD, and its maximum capacitance should not exceed 1 μF. Additionally, place the capacitor near the (U)SIM card connector.
- To avoid cross-talk between USIM_DATA and USIM_CLK, keep them away from each other and shield them with ground. USIM_RST also needs ground protection.

- In order to ensure good ESD protection, it is recommended to add a TVS array with parasitic capacitance not exceeding 50 pF. Add 22 Ω resistors in series between the module and (U)SIM card to suppress EMI spurious transmission and enhance ESD protection. Please note that the (U)SIM peripheral circuit should be close to the (U)SIM card connector.
- Add 22 pF capacitors in parallel on USIM_DATA, USIM_CLK and USIM_RST signal lines to filter RF interference, and place them as close to the (U)SIM card connector as possible.
- Place the reserved pull-up resistors R6 and R5 in ***Figure 16***: Reference Circuit for (U)SIM Interface with an 8-pin (U)SIM Card Connector and ***Figure 17***: Reference Circuit for (U)SIM Interface with a 6-pin (U)SIM Card Connector close to the module.

3.12. SD Card Interface

SD Card interface of SC262R series module supports SD 3.0 protocol. The pin definition of SD card interface is shown below.

Table 13: Pin Definition of SD Card Interface

Pin Name	Pin No.	I/O	Description	Comment
SD_CLK	39	DO	SD card clock	50 Ω characteristic impedance.
SD_CMD	40	DIO	SD card command	
SD_DATA0	41	DIO	SDIO data bit 0	
SD_DATA1	42	DIO	SDIO data bit 1	
SD_DATA2	43	DIO	SDIO data bit 2	
SD_DATA3	44	DIO	SDIO data bit 3	
SD_DET	45	DI	SD card hot-plug detect	Active low.
SD_LDO11	38	PO	SD card power supply	Vnom = 2.95 V $I_O$max = 800 mA
SD_LDO12	32	PO	1.8/2.95 V output power supply for SD card pull-up circuits.	Vnom = 1.8/2.95 V $I_O$max = 50 mA

A reference circuit for the SD card interface is shown below.

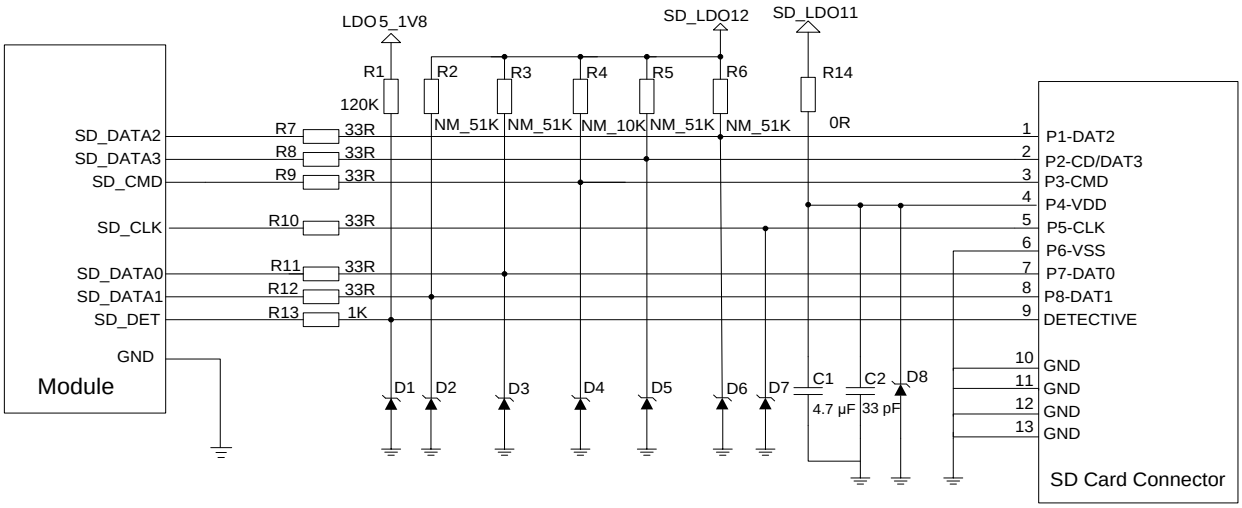


Figure 18: Reference Circuit for SD Card Interface

SD_LDO11 is the power supply for the SD card and can provide up to 800 mA output current. Due to the high output current, it is recommended that the trace width should be at least 0.8 mm. In order to ensure stability of output current, add a 4.7 µF and a 33 pF capacitor in parallel near the SD card connector.

SD_CMD, SD_CLK, SD_DATA0, SD_DATA1, SD_DATA2, and SD_DATA3 are all high-speed signal lines. In PCB design, control the characteristic impedance of them to 50 Ω, and do not cross them with other traces. It is recommended to route the traces on the inner layer of PCB and keep them of the same length. Additionally, SD_CLK needs ground shielding separately.

Layout guidelines:

- Control the impedance to 50 Ω ±10 % and add ground shielding.
- The trace length difference between SD_CLK and other signal traces like SD_CMD and SD_DATA should not exceed 1 mm.

Table 14: SD Card Trace Length Inside the Module

Pin No.	Signal	Length (mm)
39	SD_CLK	21.50
40	SD_CMD	21.40
41	SD_DATA0	21.45
42	SD_DATA1	21.60
43	SD_DATA2	21.40

44	SD_DATA3	21.35

3.13. GPIO Interfaces

SC262R series module has abundant GPIO interfaces with a power domain of 1.8 V. The pin definition is listed below.

Table 15: Pin Definition of GPIO Interfaces

Pin Name	Pin No.	GPIO No.	Default State	Comment
GPIO_6	167	GPIO_6	B-PD:nppukp [6]	
GPIO_7	168	GPIO_7	B-PD:nppukp	
GPIO_12	101	GPIO_12	B-PD:nppukp	Wakeup [7]
GPIO_13	102	GPIO_13	B-PD:nppukp	Wakeup
GPIO_20	119	GPIO_20	B-PD:nppukp	
GPIO_21	118	GPIO_21	B-PD:nppukp	Wakeup
GPIO_22	117	GPIO_22	B-PD:nppukp	
GPIO_23	116	GPIO_23	B-PD:nppukp	
GPIO_25	90	GPIO_25	B-PD:nppukp	Wakeup
GPIO_33	33	GPIO_33	B-PD:nppukp	
GPIO_34	170	GPIO_34	B-PD:nppukp	Wakeup
GPIO_39	201	GPIO_39	B-PD:nppukp	
GPIO_42	110	GPIO_42	B-PD:nppukp	Wakeup
GPIO_43	107	GPIO_43	B-PD:nppukp	Wakeup
GPIO_44	109	GPIO_44	B-PD:nppukp	Wakeup

[6] B: Bidirectional digital with CMOS input; PD:nppukp = default pull-down with programmable options following the colon (:).

[7] Wakeup: Interrupt pins that can wake up the system.

GPIO_45	98	GPIO_45	B-PD:nppukp	Wakeup
GPIO_46	113	GPIO_46	B-PD:nppukp	Wakeup
GPIO_47	124	GPIO_47	B-PD:nppukp	
GPIO_48	99	GPIO_48	B-PD:nppukp	Wakeup
GPIO_59	100	GPIO_59	B-PD:nppukp	Wakeup
GPIO_61	267	GPIO_61	B-PD:nppukp	Wakeup
GPIO_62	123	GPIO_62	B-PD:nppukp	Wakeup
GPIO_63	108	GPIO_63	B-PD:nppukp	Wakeup
GPIO_66	106	GPIO_66	B-PD:nppukp	
GPIO_85	265	GPIO_85	B-PD:nppukp	
GPIO_86	239	GPIO_86	B-PD:nppukp	Wakeup
GPIO_87	105	GPIO_87	B-PD:nppukp	
GPIO_88	264	GPIO_88	B-PD:nppukp	
GPIO_89	115	GPIO_89	B-PD:nppukp	
GPIO_90	177	GPIO_90	B-PD:nppukp	Wakeup
GPIO_93	112	GPIO_93	B-PD:nppukp	Wakeup
GPIO_94	104	GPIO_94	B-PD:nppukp	
GPIO_95	103	GPIO_95	B-PD:nppukp	
GPIO_127	169	GPIO_127	B-PD:nppukp	Wakeup
GPIO_130	97	GPIO_130	B-PD:nppukp	Wakeup
SD_DET	45	GPIO_67	B-PD:nppukp	Wakeup
TP_INT	30	GPIO_65	B-PD:nppukp	Wakeup
TP_RST	31	GPIO_64	B-PD:nppukp	
TP_I2C_SCL	47	GPIO_11	B-PD:nppukp	
TP_I2C_SDA	48	GPIO_10	B-PD:nppukp	

LCD_RST	49	GPIO_60	B-PD:nppukp	
LCD_TE	50	GPIO_24	B-PD:nppukp	
CAM0_MCLK	74	GPIO_26	B-PD:nppukp	
CAM1_MCLK	75	GPIO_28	B-PD:nppukp	Wakeup
CAM0_RST	79	GPIO_128	B-PD:nppukp	Wakeup
CAM0_PWDN	80	GPIO_126	B-PD:nppukp	Wakeup
CAM1_RST	81	GPIO_129	B-PD:nppukp	
CAM1_PWDN	82	GPIO_125	B-PD:nppukp	
CAM2_MCLK	165	GPIO_27	B-PD:nppukp	
CAM2_RST	164	GPIO_38	B-PD:nppukp	Wakeup
CAM2_PWDN	163	GPIO_41	B-PD:nppukp	Wakeup
VOL_UP	95	GPIO_91	B-PD:nppukp	Wakeup
VOL_DOWN	96	GPIO_50	B-PD:nppukp	Wakeup
UART5_TXD	34	GPIO_16	B-PD:nppukp	
UART5_RXD	35	GPIO_17	B-PD:nppukp	Wakeup
UART5_CTS	36	GPIO_18	B-PD:nppukp	
UART5_RTS	37	GPIO_19	B-PD:nppukp	
UART1_TXD	154	GPIO_0	B-PD:nppukp	
UART1_RXD	153	GPIO_1	B-PD:nppukp	Wakeup

NOTE

For more details about GPIO configuration, see ***document [2]***.

3.14. I2C Interfaces

SC262R series module provides four I2C interfaces. All I2C interfaces are open drain signals and

therefore you must pull them up externally. The reference power domain is 1.8 V. The SENSOR_I2C interface only supports sensors of ADSP architecture. CAM_I2C and DCAM_I2C signals are controlled by Linux Kernel code and support connection with devices related to video output.

Table 16: Pin Definition of I2C Interfaces

Pin Name	Pin No.	I/O	Description	Comment
TP_I2C_SCL	47	OD	TP I2C clock	Used for touch panel
TP_I2C_SDA	48	OD	TP I2C data	
CAM_I2C_SCL	83	OD	I2C clock of front and rear cameras	Used for camera
CAM_I2C_SDA	84	OD	I2C data of front and rear cameras	
DCAM_I2C_SCL	166	OD	I2C clock of depth camera	Used for camera
DCAM_I2C_SDA	205	OD	I2C data of depth camera	
SENSOR_I2C_SCL	91	OD	I2C clock for external sensor	Used for external sensor
SENSOR_I2C_SDA	92	OD	I2C data for external sensor	

3.15. SPI Interfaces

SC262R series module provides three SPI interfaces, which are multiplexed from UART and GPIO interfaces. These interfaces can only support master mode and can be used for fingerprint recognition.

Table 17: Pin Definition of SPI Interfaces

Pin Name	Pin No.	I/O	Description	Comment
UART5_RXD	35	DI	SPI5 data input	Can be multiplexed into SPI5_MISO
UART5_TXD	34	DO	SPI5 data output	Can be multiplexed into SPI5_MOSI
UART5_RTS	37	DO	SPI5 clock	Can be multiplexed into SPI5_CLK
UART5_CTS	36	DO	SPI5 chip select	Can be multiplexed into SPI5_CS
GPIO_22	117	DO	SPI6 chip select	Can be multiplexed into SPI6_CS

GPIO_23	116	DO	SPI6 clock	Can be multiplexed into SPI6_CLK
GPIO_20	119	DO	SPI6 data output	Can be multiplexed into SPI6_MOSI
GPIO_21	118	DI	SPI6 data input	Can be multiplexed into SPI6_MISO
GPIO_87	105	DO	SPI7 chip select	Can be multiplexed into SPI7_CS
GPIO_85	265	DO	SPI7 data output	Can be multiplexed into SPI7_MOSI
GPIO_88	264	DO	SPI7 clock	Can be multiplexed into SPI7_CLK
GPIO_86	239	DI	SPI7 data input	Can be multiplexed into SPI7_MISO

3.16. ADC Interface

SC262R series module supports one Analog-to-Digital Converter (ADC) interface. The ADC interface supports resolution of up to 15 bits. The pin definition is shown below.

Table 18: Pin Definition of ADC Interface

Pin Name	Pin No.	I/O	Description	Comment
ADC	128	AI	General-purpose ADC interface	The maximum input voltage is 1.7 V.

3.17. Vibration Motor Driver Interface

The pin definition of the Vibration Motor Driver Interface is listed below.

Table 19: Pin Definition of Vibration Motor Driver Interface

Pin Name	Pin No.	I/O	Description	Comment
VIB_DRV_N	28	PO	Vibration motor driver output control	Connect it to the negative pole of the motor.

The motor is driven by an exclusive circuit, and the reference circuit is shown below.

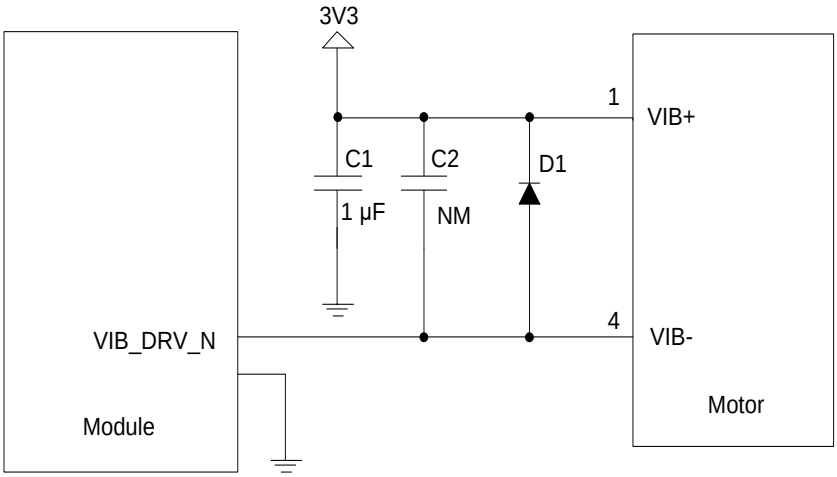


Figure 19: Reference Circuit for Motor Connection

When the motor stops working and the VIB_DRV_N is disconnected, the redundant electricity on the motor can be discharged from the circuit loop formed by diodes, thus avoiding damage to components.

3.18. LCM Interface

SC262R series module provides one LCM interface, which is MIPI_DSI standard compliant. The interface supports high-speed differential data transmission and supports HD+ display (1440 × 720 @ 60 fps). The pin definition of the LCM interface is shown below.

Table 20: Pin Definition of LCM Interface

Pin Name	Pin No.	I/O	Description	Comment
LDO17_2V85	129	PO	2.85 V output power supply for LCM VCC	Vnom = 2.85 V $I_O$max = 450 mA
PWM	29	DO	PWM output	Adjusts backlight brightness
LCD_RST	49	DO	LCD reset	1.8 V power domain
LCD_TE	50	DI	LCD tearing effect	
DSI_CLK_N	52	AO	LCD MIPI clock (-)	
DSI_CLK_P	53	AO	LCD MIPI clock (+)	
DSI_LN0_N	54	AO	LCD MIPI data 0 (-)	

DSI_LN0_P	55	AO	LCD MIPI data 0 (+)
DSI_LN1_N	56	AO	LCD MIPI data 1 (-)
DSI_LN1_P	57	AO	LCD MIPI data 1 (+)
DSI_LN2_N	58	AO	LCD MIPI data 2 (-)
DSI_LN2_P	59	AO	LCD MIPI data 2 (+)
DSI_LN3_N	60	AO	LCD MIPI data 3 (-)
DSI_LN3_P	61	AO	LCD MIPI data 3 (+)

A reference circuit for the LCM interface is shown below.

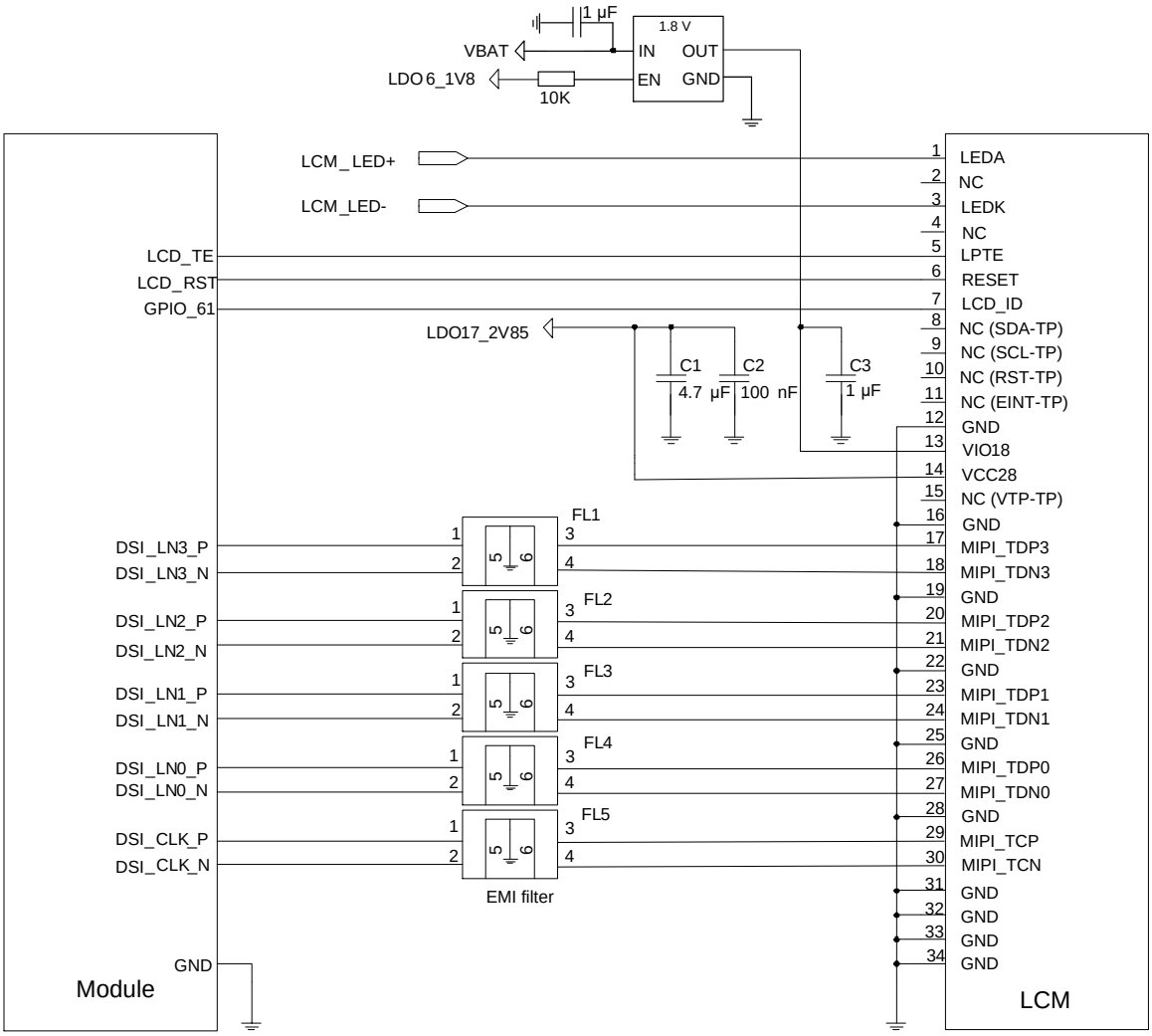


Figure 20: Reference Circuit Design for LCM Interface

MIPI are high-speed signal lines. It is recommended to add common-mode filters in series near the LCM connector, to improve protection against electromagnetic radiation interference.

It is recommended to read the LCM ID register through MIPI when compatible design with other displays is required. If several LCMs share the same IC, it is recommended that the LCM factory should burn an OTP register to distinguish different screens. You can also connect the LCD_ID pin of LCM to the ADC pin of the module, but you need to make sure that the output voltage of LCD_ID should not exceed the voltage range of the ADC pin.

You can design the external backlight driving circuit for LCM according to actual requirements. A reference circuit design is shown in the following figure, in which the PWM pin is used to adjust the backlight brightness.

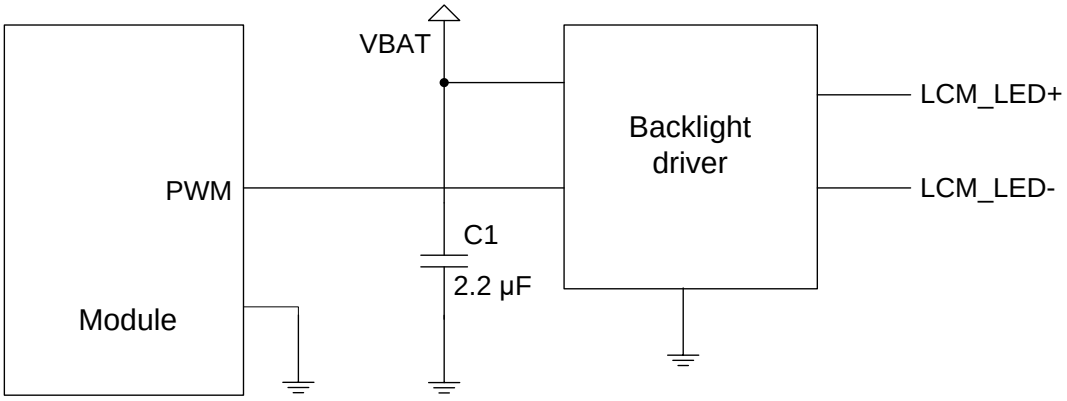


Figure 21: Reference Design for External Backlight Driving Circuit

3.19. Touch Panel Interface

SC262R series module provides one I2C interface for connection with Touch Panel (TP), and also provides the corresponding power supply and interrupt pins. The definitions of TP interface pins are illustrated below.

Table 21: Pin Definition of Touch Panel Interface

Pin Name	Pin No.	I/O	Description	Comment
LDO17_2V85	129	PO	2.85 V output power supply for TP VDD	Vnom = 2.85 V $I_O$max = 450 mA
LDO6_1V8	125	PO	1.8 V output power supply for TP I/O power domain and I2C pull-up circuit	Vnom = 1.8 V $I_O$max = 150 mA
TP_INT	30	DI	TP interrupt	1.8 V voltage domain.
TP_RST	31	DO	TP reset	1.8 V voltage domain. Active low.
TP_I2C_SCL	47	OD	TP I2C clock	Externally pull them up to 1.8 V. Can be used for other I2C devices.
TP_I2C_SDA	48	OD	TP I2C data	

A reference circuit for the TP interface is shown below.

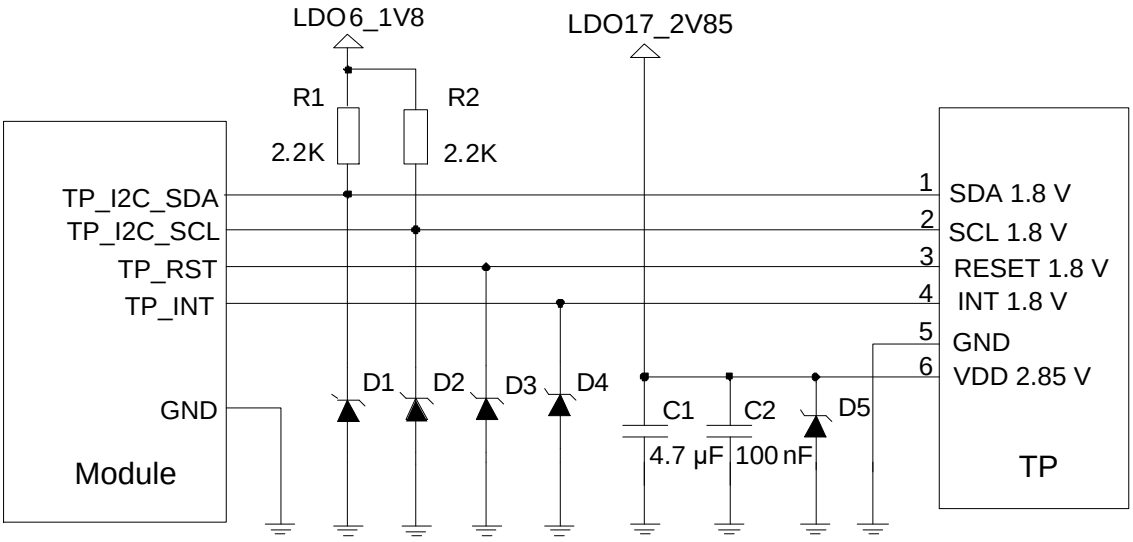


Figure 22: Reference Circuit Design for TP Interface

3.20. Camera Interfaces

Based on MIPI_CSI standard, SC262R series module supports two cameras (4-lane + 4-lane) or three cameras (4-lane + 2-lane + 1-lane), and the maximum pixel of the camera can be up to 13 MP. The video and photo quality is determined by various factors such as the camera sensor, camera lens quality, etc.

Table 22: Pin Definition of Camera Interface

Pin Name	Pin No.	I/O	Description	Comment
LDO6_1V8	125	PO	1.8 V output power supply for DOVDD of camera	Vnom = 1.8 V $I_O$max = 150 mA
LDO17_2V85	129	PO	2.85 V output power supply for AVDD of camera	Vnom = 2.85 V $I_O$max = 450 mA
CSI1_CLK_N	63	AI	MIPI CSI1 clock (-)	
CSI1_CLK_P	64	AI	MIPI CSI1 clock (+)	
CSI1_LN0_N	65	AI	MIPI CSI1 lane 0 data (-)	
CSI1_LN0_P	66	AI	MIPI CSI1 lane 0 data (+)	
CSI1_LN1_N	67	AI	MIPI CSI1 lane 1 data (-)	
CSI1_LN1_P	68	AI	MIPI CSI1 lane 1 data (+)	

CSI1_LN3_N	70	AI	MIPI CSI1 lane 3 data (-)	
CSI1_LN3_P	71	AI	MIPI CSI1 lane 3 data (+)	
CSI1_LN2_N	72	AI	MIPI CSI1 lane 2 data (-)	
CSI1_LN2_P	73	AI	MIPI CSI1 lane 2 data (+)	
CSI0_CLK_N	157	AI	MIPI CSI0 clock (-)	
CSI0_CLK_P	196	AI	MIPI CSI0 clock (+)	
CSI0_LN0_N	158	AI	MIPI CSI0 lane 0 data (-)	
CSI0_LN0_P	197	AI	MIPI CSI0 lane 0 data (+)	
CSI0_LN1_N	159	AI	MIPI CSI0 lane 1 data (-)	
CSI0_LN1_P	198	AI	MIPI CSI0 lane 1 data (+)	
CSI0_LN2_N	160	AI	MIPI CSI0 lane 2 data (-)	
CSI0_LN2_P	199	AI	MIPI CSI0 lane 2 data (+)	
CSI0_LN3_N	161	AI	MIPI CSI0 lane 3 data (-)	
CSI0_LN3_P	200	AI	MIPI CSI0 lane 3 data (+)	
CAM0_MCLK	74	DO	Master clock of camera0	1.8 V power domain.
CAM1_MCLK	75	DO	Master clock of camera1	
CAM0_RST	79	DO	Reset of camera0	
CAM0_PWDN	80	DO	Power down of camera0	
CAM1_RST	81	DO	Reset of camera1	
CAM1_PWDN	82	DO	Power down of camera1	
CAM_I2C_SCL	83	OD	I2C clock of front and rear cameras	Externally pull them up to 1.8 V.
CAM_I2C_SDA	84	OD	I2C data of front and rear cameras	
CAM2_MCLK	165	DO	Master clock of camera2	1.8 V power domain.
CAM2_RST	164	DO	Reset of camera2	
CAM2_PWDN	163	DO	Power down of camera2	

DCAM_I2C_SDA	205	OD	I2C data of depth camera	Externally pull them up to 1.8 V.
DCAM_I2C_SCL	166	OD	I2C clock of depth camera	

The following is a reference circuit design for 3-camera applications.

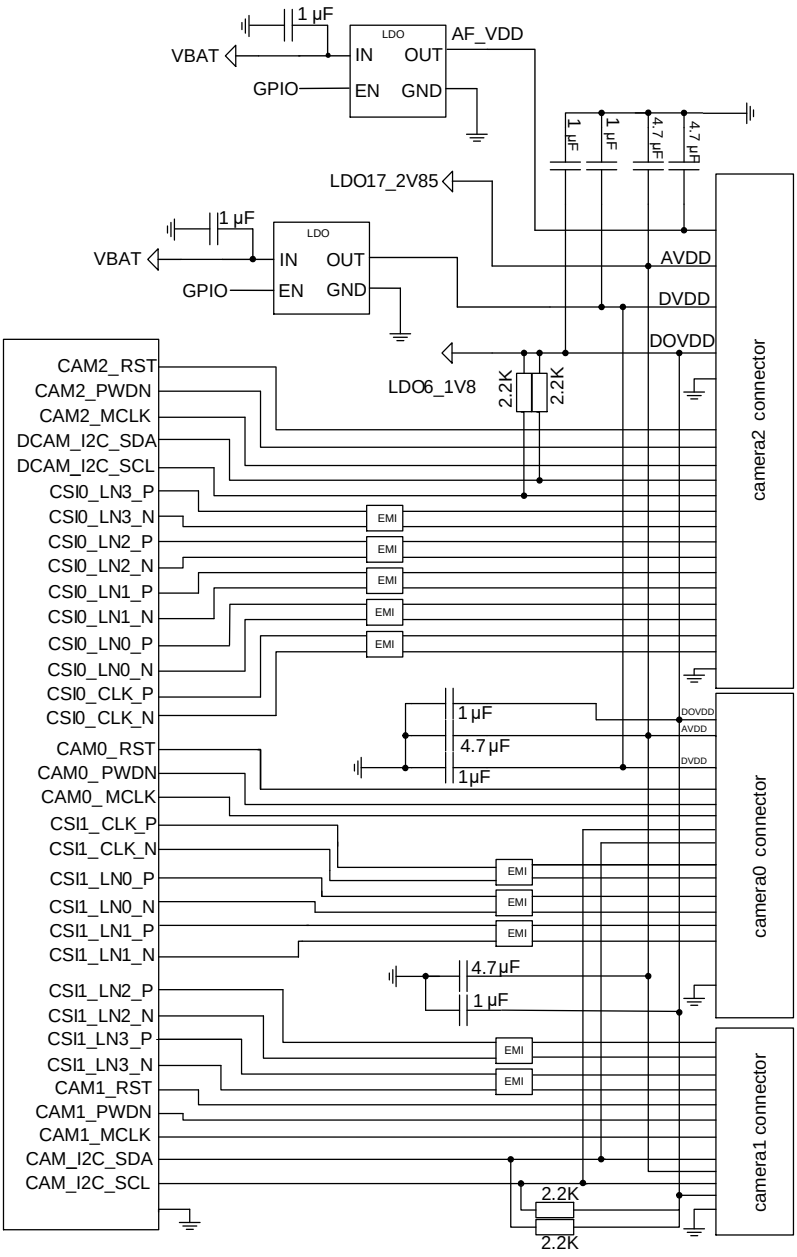


Figure 23: Reference Circuit Design for 3-Camera Applications

NOTE

In 3-camera applications, CSI1_LN3_P and CSI1_LN3_N are used as CLK_P and CLK_N of camera1, and CSI1_LN2_P and CSI1_LN2_N are used as the LN_P and LN_N of camera1.

3.20.1. Design Considerations

- Special attention should be paid to the pin definition of LCM/camera connectors. Make sure the module and the connectors are correctly connected.
- MIPI are high speed signal lines, supporting maximum data rate of up to 2.1 Gbps. The differential impedance should be controlled to 100 Ω. Additionally, it is recommended to route the trace on the inner layer of PCB, and do not cross it with other traces. For the same group of DSI or CSI signals, keep all the MIPI traces of the same length. In order to avoid crosstalk, keep a distance of 1.5 times the trace width among MIPI signal lines. During impedance matching, do not connect GND on different planes to ensure impedance consistency.
- It is recommended to select a low-capacitance TVS for ESD protection and the recommended parasitic capacitance should be below 1 pF.
- Route MIPI traces according to the following rules:
  a) The total trace length should not exceed 305 mm;
  b) Control the differential impedance to 100 Ω ±10 %;
  c) Control intra-lane length difference within 0.67 mm;
  d) Control inter-lane length difference within 1.3 mm.

Table 23: MIPI Trace Length Inside the Module

Pin Name	Pin No.	Length (mm)	Length Difference (P - N)
52	DSI_CLK_N	12.40	0.00
53	DSI_CLK_P	12.40	
54	DSI_LN0_N	11.75	-0.10
55	DSI_LN0_P	11.65	
56	DSI_LN1_N	9.40	-0.10
57	DSI_LN1_P	9.30	
58	DSI_LN2_N	9.60	0.00
59	DSI_LN2_P	9.60	
60	DSI_LN3_N	12.35	0.00
61	DSI_LN3_P	12.35	
63	CSI1_CLK_N	18.10	-0.05
64	CSI1_CLK_P	18.05	

65	CSI1_LN0_N	18.05	0.05
66	CSI1_LN0_P	18.10	
67	CSI1_LN1_N	18.15	0.05
68	CSI1_LN1_P	18.20	
70	CSI1_LN3_N	18.10	0.10
71	CSI1_LN3_P	18.20	
72	CSI1_LN2_N	18.05	0.05
73	CSI1_LN2_P	18.10	
157	CSI0_CLK_N	22.60	-0.05
196	CSI0_CLK_P	22.55	
158	CSI0_LN0_N	22.55	-0.05
197	CSI0_LN0_P	22.50	
159	CSI0_LN1_N	20.25	0.05
198	CSI0_LN1_P	20.30	
160	CSI0_LN2_N	20.50	0.00
199	CSI0_LN2_P	20.50	
161	CSI0_LN3_N	12.95	0.00
200	CSI0_LN3_P	12.95	

3.21. Sensor Interfaces

SC262R series module supports communication with sensors via I2C interfaces, and it supports ALS/PS sensor, compass, accelerometer sensor, gyroscopic sensor, etc.

Table 24: Pin Definition of Sensor Interfaces

Pin Name	Pin No.	I/O	Description	Comment
SENSOR_I2C_SCL	91	OD	I2C clock of external sensor	Dedicated for external sensors. Cannot be used for touch panel, NFC, I2C keyboard, etc. Externally pull them up to 1.8 V.
SENSOR_I2C_SDA	92	OD	I2C data of external sensor	
GPIO_43	107	DI	Light sensor interrupt	
GPIO_44	109	DI	Direction sensor interrupt	
GPIO_42	110	DI	Accelerometer sensor interrupt	
GPIO_63	108	DI	Gyroscopic sensor interrupt	

3.22. Audio Interfaces

SC262R series module provides three analog input channels and three analog output channels. The following table shows the pin definition.

Table 25: Pin Definition of Audio Interfaces

Pin Name	Pin No.	I/O	Description	Comment
MIC1_P	4	AI	Microphone input for channel 1 (+)	
MIC_GND	5	AI	Microphone reference ground	If it is not used, connect it to the ground.
MIC2_P	6	AI	Microphone input for headset (+)	

MIC_BIAS2	155	AO	Bias voltage output for microphone 2	V_O = 1.6–2.85 V
MIC3_P	148	AI	Microphone input for channel 2 (+)	
MIC_BIAS1	147	AO	Bias voltage output for microphone 1	V_O = 1.6–2.85 V
EAR_P	8	AO	Earpiece output (+)	
EAR_N	9	AO	Earpiece output (-)	
SPK_P	10	AO	Speaker output (+)	
SPK_N	11	AO	Speaker output (-)	
HPH_R	136	AO	Headphone right channel output	
HPH_REF	137	AO	Headphone reference ground	
HPH_L	138	AO	Headphone left channel output	
HS_DET	139	AI	Headset hot-plug detect	High level by default.

- The module offers three audio input channels, including three single-ended channels.
- The output voltage range of the two MIC_BIAS is programmable between 1.6 V and 2.85 V, and the maximum output current is 3 mA.
- The earpiece interface uses differential output.
- The loudspeaker interface uses differential output as well. The output channel is available with a Class-D amplifier whose output power is 1362 mW when the load is 8 Ω.
- The headphone interface features stereo left and right channel output, and supports headphone insertion detect.

3.22.1. Reference Circuit Design for Microphone Interfaces

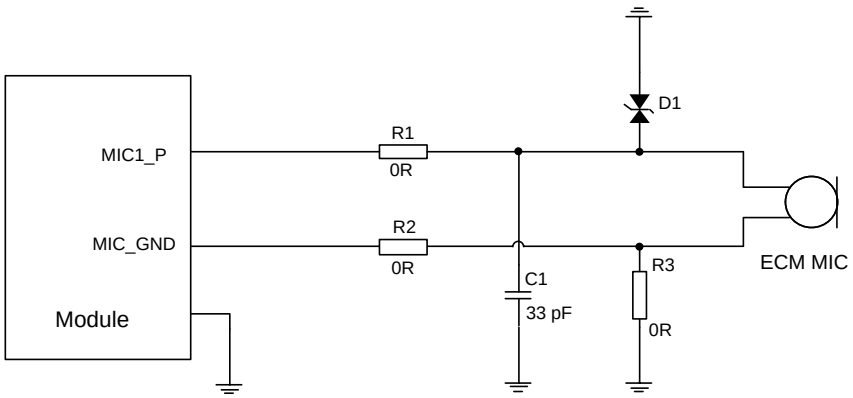


Figure 24: Reference Circuit Design for ECM Microphone Interface

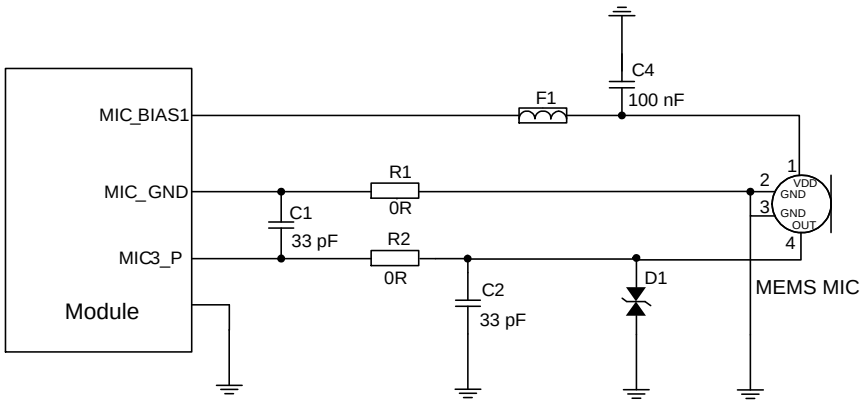


Figure 25: Reference Circuit Design for MEMS Microphone Interface

3.22.2. Reference Circuit Design for Earpiece Interface

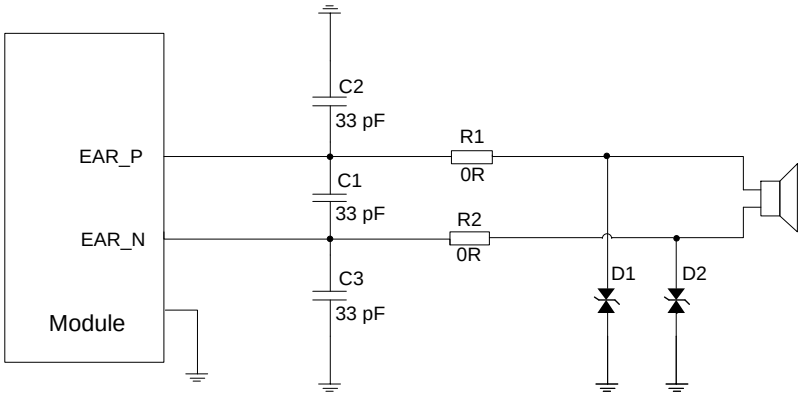


Figure 26: Reference Circuit Design for Earpiece Interface

3.22.3. Reference Circuit Design for Headset Interface

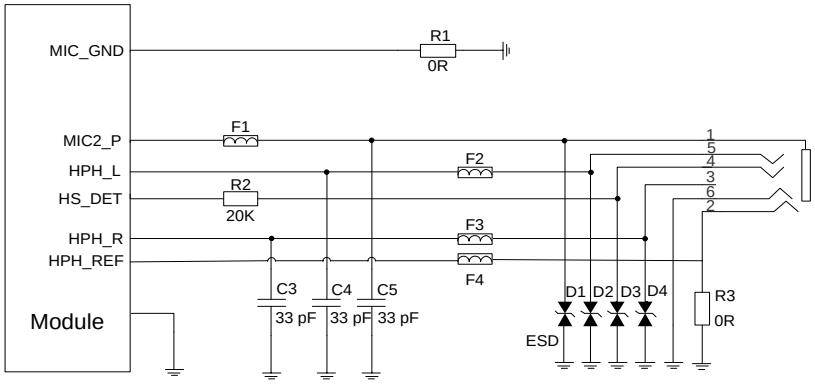


Figure 27: Reference Circuit Design for Headset Interface

3.22.4. Reference Circuit Design for Loudspeaker Interface

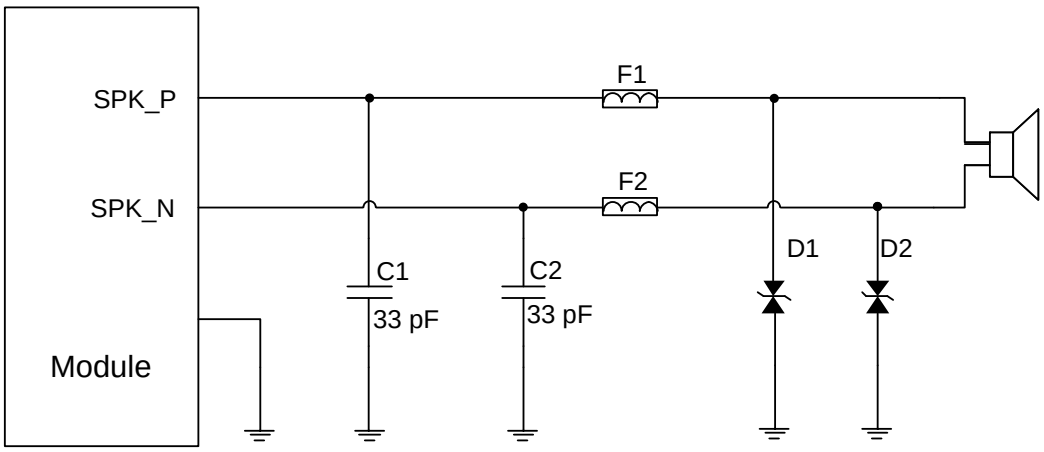


Figure 28: Reference Circuit Design for Loudspeaker Interface

3.22.5. Design Considerations for Audio Interfaces

It is recommended to use the electret microphone with dual built-in capacitors (e.g. 10 pF and 33 pF) to filter out RF interference, thus reducing TDD noise. The 33 pF capacitor is applied to filter out RF interference when the module is transmitting at EGSM900. Without this capacitor, TDD noise could be heard during voice calls. The 10 pF capacitor is used to filter out RF interference at DCS1800. Please note that the resonant frequency point of a capacitor largely depends on its material and manufacturing technique. Therefore, you should consult the capacitor vendors to choose the most suitable capacitor to filter out the high-frequency noises.

The severity of RF interference in the voice channel during GSM transmitting largely depends on the application design. In some cases, EGSM900 TDD noise is more severe; while in other cases, DCS1800 TDD noise is more obvious. Therefore, you should select a suitable capacitor according to the test results. Sometimes, even no RF filtering capacitor is required.

In order to decrease radio or other signal interference, place RF antennas away from audio interfaces and audio traces. Additionally, keep power traces far away from the audio traces and do not route them in parallel.

Route the differential audio traces according to the differential signal layout rule.

3.23. USB_BOOT Control Interface

USB_BOOT is an emergency download interface. You can force the module to enter emergency download mode by pulling it up to LDO5_1V8 during power-on. This is an emergency option when failures

such as abnormal start-up or running occur. For firmware upgrade and debugging in the future, reserve the following reference design.

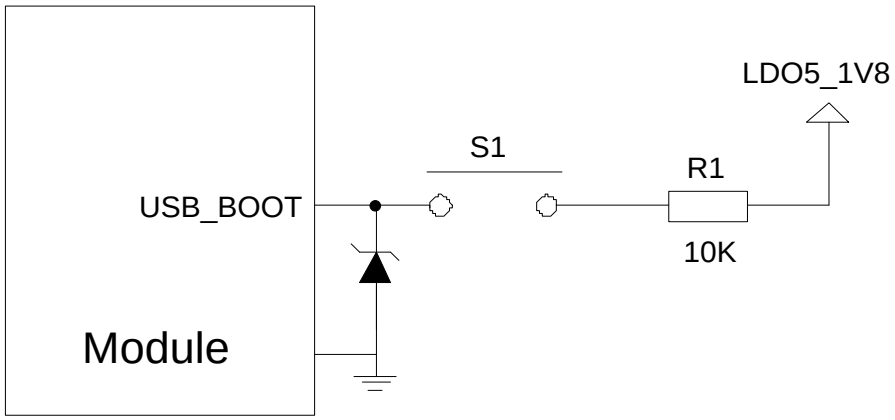


Figure 29: Reference Circuit Design for USB_BOOT Control Interface

4 Wi-Fi and Bluetooth

SC262R series module provides a shared antenna interface ANT_WIFI/BT for Wi-Fi and Bluetooth functions. The interface impedance should be controlled to 50 Ω. You can connect external antennas such as PCB antenna, sucker antenna, and ceramic antenna to the module via the interface to achieve Wi-Fi and Bluetooth functions.

4.1. Wi-Fi

SC262R series module supports 2.4 GHz and 5 GHz dual-band WLAN based on IEEE 802.11a/b/g/n/ac standard protocols. The maximum data rate is up to 433 Mbps. The features are as below:

- Supports Wake-on-WLAN (WoWLAN)
- Supports ad hoc mode
- Supports WAPI SMS4 hardware encryption
- Supports AP mode
- Supports Wi-Fi Direct
- Supports MCS 0–9 for VHT20, VHT40 and VHT80

4.1.1. Wi-Fi Performance

The following table lists the Wi-Fi transmitting and receiving performance of the module.

Table 26: Wi-Fi Transmitting Performance

	Standard	Rate	Output Power
2.4 GHz	802.11b	1 Mbps	16 dBm ±2.5 dB
	802.11b	11 Mbps	16 dBm ±2.5 dB
	802.11g	6 Mbps	16 dBm ±2.5 dB
	802.11g	54 Mbps	14 dBm ±2.5 dB
	802.11n HT20	MCS0	15 dBm ±2.5 dB

	802.11n HT20	MCS7	13 dBm ±2.5 dB
	802.11n HT40	MCS0	14 dBm ±2.5 dB
	802.11n HT40	MCS7	13 dBm ±2.5 dB
5 GHz	802.11a	6 Mbps	15 dBm ±2.5 dB
	802.11a	54 Mbps	13 dBm ±2.5 dB
	802.11n HT20	MCS0	14 dBm ±2.5 dB
	802.11n HT20	MCS7	13 dBm ±2.5 dB
	802.11n HT40	MCS0	14 dBm ±2.5 dB
	802.11n HT40	MCS7	13 dBm ±2.5 dB
	802.11ac VHT20	MCS0	14 dBm ±2.5 dB
	802.11ac VHT20	MCS8	13 dBm ±2.5 dB
	802.11ac VHT40	MCS0	14 dBm ±2.5 dB
	802.11ac VHT40	MCS9	12 dBm ±2.5 dB
	802.11ac VHT80	MCS0	14 dBm ±2.5 dB
	802.11ac VHT80	MCS9	12 dBm ±2.5 dB

Table 27: Wi-Fi Receiving Performance

	Standard	Rate	Sensitivity
2.4 GHz	802.11b	1 Mbps	-97 dBm
	802.11b	11 Mbps	-89 dBm
	802.11g	6 Mbps	-91 dBm
	802.11g	54 Mbps	-74 dBm
	802.11n HT20	MCS0	-90 dBm
	802.11n HT20	MCS7	-71 dBm
	802.11n HT40	MCS0	-88 dBm

	802.11n HT40	MCS7	-69 dBm
5 GHz	802.11a	6 Mbps	-91 dBm
	802.11a	54 Mbps	-75 dBm
	802.11n HT20	MCS0	-90 dBm
	802.11n HT20	MCS7	-72 dBm
	802.11n HT40	MCS0	-88 dBm
	802.11n HT40	MCS7	-69 dBm
	802.11ac VHT20	MCS0	-85 dBm
	802.11ac VHT20	MCS8	-61 dBm
	802.11ac VHT40	MCS0	-88 dBm
	802.11ac VHT40	MCS9	-64 dBm
	802.11ac VHT80	MCS0	1-91 dBm
	802.11ac VHT80	MCS9	-69 dBm

Reference specifications are listed below:

- IEEE 802.11n WLAN MAC and PHY, October 2009 + IEEE 802.11-2007 WLAN MAC and PHY, June 2007
- IEEE Std 802.11a, IEEE Std 802.11b, IEEE Std 802.11g: IEEE 802.11-2007 WLAN MAC and PHY, June 2007

4.2. Bluetooth

SC262R series module supports Bluetooth 4.2 (BR/EDR + BLE) specification, as well as GFSK, 8-DPSK, π/4-DQPSK modulation modes.

- Maximally supports up to 7 wireless connections.
- Maximally supports up to 3.5 piconets at the same time.
- Support one SCO or eSCO connection.

The BR/EDR channel bandwidth is 1 MHz, and can accommodate 79 channels. The BLE channel bandwidth is 2 MHz, and can accommodate 40 channels.

Table 28: Bluetooth Data Rate and Version

Version	Data Rate	Maximum Application Throughput
1.2	1 Mbit/s	> 80 kbit/s
2.0 + EDR	3 Mbit/s	> 80 kbit/s
3.0 + HS	24 Mbit/s	Reference 3.0 + HS
4.2	24 Mbit/s	Reference 4.2 LE

Reference specifications are listed below:

- Bluetooth Radio Frequency TSS and TP Specification 1.2/2.0/2.0 + EDR/2.1/2.1 + EDR/3.0/3.0 + HS, August 6, 2009
- Bluetooth Low Energy RF PHY Test Specification, RF-PHY.TS/4.0.0, December 15, 2009

4.2.1. Bluetooth Performance

The following table lists the Bluetooth transmitting and receiving performance of SC262R series module.

Table 29: Bluetooth Transmitting and Receiving Performance

Transmitter Performance			
Packet Types	DH5	2-DH5	3-DH5
Transmitting Power	8.5 dBm	-0.5 dBm	-0.54 dBm
Receiver Performance			
Packet Types	DH5	2-DH5	3-DH5
Receiving Sensitivity	-92 dBm	-93 dBm	-88 dBm

5 GNSS

SC262R series module integrates a IZat™ GNSS engine (GEN 8C) which supports multiple positioning and navigation systems including GPS, GLONASS, Galileo and BDS. With an embedded LNA, the module provides greatly improved positioning accuracy.

5.1. GNSS Performance

The following table lists the GNSS performance of the module in conduction mode.

Table 30: GNSS Performance

Parameter	Description	Conditions	Typ.	Unit
Sensitivity	Acquisition	Autonomous	-146	dBm
	Reacquisition	Autonomous	-158	dBm
	Tracking	Autonomous	-158	dBm
TTFF	Cold start @ open sky	Autonomous	30.8	s
	Warm start @ open sky	Autonomous	21	s
	Hot start @ open sky	Autonomous	3.3	s
Accuracy	CEP-50	Autonomous @ open sky	2.5	m

NOTE

1. Tracking sensitivity: the minimum GNSS signal power at which the module can maintain lock (keep positioning for at least 3 minutes continuously).
2. Reacquisition sensitivity: the minimum GNSS signal power required for the module to maintain lock within 3 minutes after loss of lock.
3. Acquisition sensitivity: the minimum GNSS signal power at which the module can fix position

successfully within 3 minutes after executing cold start command.
4. SC262R-WF does not support GNSS.

5.2. Reference Design

Bad design of antenna and layout may cause reduced GNSS receiving sensitivity, longer GNSS positioning time, or reduced positioning accuracy. In order to avoid this, follow the reference design rules as below:

- Maximize the distance between the GNSS RF part and the GPRS RF part (including trace routing and antenna layout) to avoid mutual interference.
- In user systems, place GNSS RF signal lines and RF components far away from high-speed circuits, switch-mode power supplies, power inductors, the clock circuit of single-chip microcomputers, etc.
- For applications with harsh electromagnetic environment or high ESD-protection requirements, it is recommended to add ESD protective diodes for the antenna interface. The junction capacitance of the diodes should be less than 0.5 pF. Otherwise, it will influence the impedance characteristic of RF circuit loop, or cause attenuation of bypass RF signals.
- Control the impedance of feeder lines and PCB traces to 50 Ω, and keep the trace as short as possible.
- See ***Chapter 6.3*** for reference circuit designs of GNSS antenna.

6 Antenna Interfaces

SC262R series module provides four antenna interfaces for the main antenna, Rx-diversity antenna, Wi-Fi/Bluetooth antenna and GNSS antenna respectively. The impedance of the antenna ports should be controlled to 50 Ω.

Appropriate antenna type and design should be used with matched antenna parameters according to specific application. It is required to perform a comprehensive functional test for the RF design before mass production of terminal products. The entire content of this chapter is provided for illustration only. Analysis, evaluation and determination are still necessary when designing target products.

6.1. Main/Rx-diversity Antenna Interfaces

The pin definition of main/Rx-diversity antenna interfaces is shown below.

Table 31: Pin Definition of Main/Rx-diversity Antenna Interfaces

Pin Name	Pin No.	I/O	Description	Comment
ANT_MAIN	87	AIO	Main antenna interface	50 Ω impedance
ANT_DRX	131	AI	Rx-diversity antenna interface	

The operating frequencies of SC262R series modules are listed in the following tables.

6.1.1. Operating Frequencies

Table 32: SC262R-EM Operating Frequencies

3GPP Band	Receive	Transmit	Unit
GSM850	869–894	824–849	MHz
EGSM900	925–960	880–915	MHz

DCS1800	1805–1880	1710–1785	MHz
PCS1900	1930–1990	1850–1910	MHz
WCDMA B1	2110–2170	1920–1980	MHz
WCDMA B2	1930–1990	1850–1910	MHz
WCDMA B4	2110–2155	1710–1755	MHz
WCDMA B5	869–894	824–849	MHz
WCDMA B8	925–960	880–915	MHz
LTE-FDD B1	2110–2170	1920–1980	MHz
LTE-FDD B2	1930–1990	1850–1910	MHz
LTE-FDD B3	1805–1880	1710–1785	MHz
LTE-FDD B4	2110–2155	1710–1755	MHz
LTE-FDD B5	869–894	824–849	MHz
LTE-FDD B7	2620–2690	2500–2570	MHz
LTE-FDD B8	925–960	880–915	MHz
LTE-FDD B20	791–821	832–862	MHz
LTE-FDD B28 (A + B)	758–803	703–748	MHz
LTE-TDD B38	2570–2620	2570–2620	MHz
LTE-TDD B40	2300–2400	2300–2400	MHz
LTE-TDD B41	2496–2690	2496–2690	MHz

Table 33: SC262R-NA Operating Frequencies

3GPP Band	Receive	Transmit	Unit
WCDMA B2	1930–1990	1850–1910	MHz
WCDMA B4	2110–2155	1710–1755	MHz
WCDMA B5	869–894	824–849	MHz

LTE-FDD B2	1930–1990	1850–1910	MHz
LTE-FDD B4	2110–2155	1710–1755	MHz
LTE-FDD B5	869–894	824–849	MHz
LTE-FDD B7	2620–2690	2500–2570	MHz
LTE-FDD B12	729–746	699–716	MHz
LTE-FDD B13	746–756	777–787	MHz
LTE-FDD B14	758–768	788–798	MHz
LTE-FDD B17	734–746	704–716	MHz
LTE-FDD B25	1930–1995	1850–1915	MHz
LTE-FDD B26	859–894	814–849	MHz
LTE-FDD B66	2100–2200	1710–1780	MHz
LTE-FDD B71	663–698	617–652	MHz
LTE-TDD B41	2496–2690	2496–2690	MHz

6.1.2. Reference Design for Main and Rx-diversity Antenna Interfaces

A reference circuit design for main and Rx-diversity antenna interfaces is shown below. Reserve a π-type matching circuit for each antenna to achieve better RF performance, and place the π-type matching components (R1/C1/C2, R2/C3/C4) as close to the antennas as possible. The capacitors are not mounted by default and the resistors are 0 Ω.

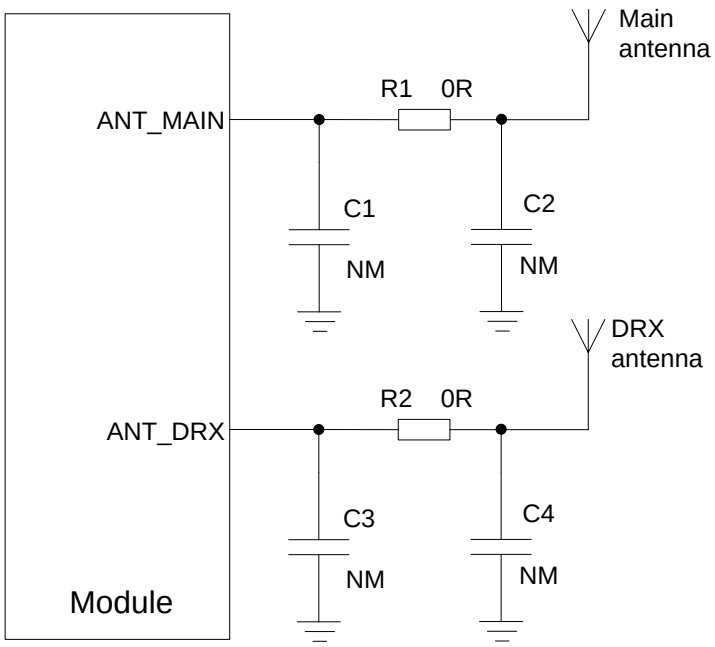


Figure 30: Reference Circuit Design for Main and Rx-diversity Antenna Interfaces

6.2. Wi-Fi and Bluetooth Antenna Interface

The following tables show the pin definition and frequency specification of the Wi-Fi/Bluetooth antenna interface.

Table 34: Pin Definition of Wi-Fi/Bluetooth Antenna Interface

Pin Name	Pin No.	I/O	Description	Comment
ANT_WIFI/BT	77	AIO	Wi-Fi/Bluetooth antenna interface	50 Ω impedance

Table 35: Wi-Fi/Bluetooth Frequency

Type	Frequency	Unit
Wi-Fi (2.4 GHz)	2402–2482	MHz
Wi-Fi (5 GHz)	5180–5825	MHz
Bluetooth 4.2 LE	2402–2480	MHz

A reference circuit design for Wi-Fi/Bluetooth antenna interface is shown as below. C1 and C2 are not mounted by default and the resistor is 0 Ω.

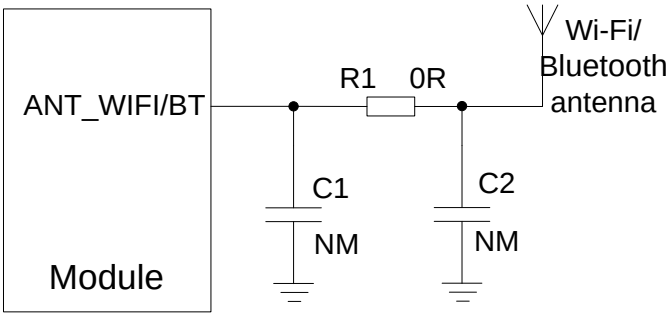


Figure 31: Reference Circuit Design for Wi-Fi/Bluetooth Antenna

6.3. GNSS Antenna Interface & Frequency Bands

The following tables show the pin definition and frequency specification of GNSS antenna interface.

Table 36: Pin Definition of GNSS Antenna Interface

Pin Name	Pin No.	I/O	Description	Comment
ANT_GNSS	121	AI	GNSS antenna interface	50 Ω impedance

Table 37: GNSS Frequency

Type	Frequency	Unit
GPS	1575.42 ±1.023	MHz
GLONASS	1597.5–1605.8	MHz
BDS	1561.098 ±2.046	MHz
Galileo	1575.42 ±1.023	MHz

NOTE

SC262R-WF does not support GNSS.

6.3.1. Passive Antenna Reference Design

GNSS antenna interface supports passive ceramic antennas and other types of passive antennas. A reference circuit design is given below.

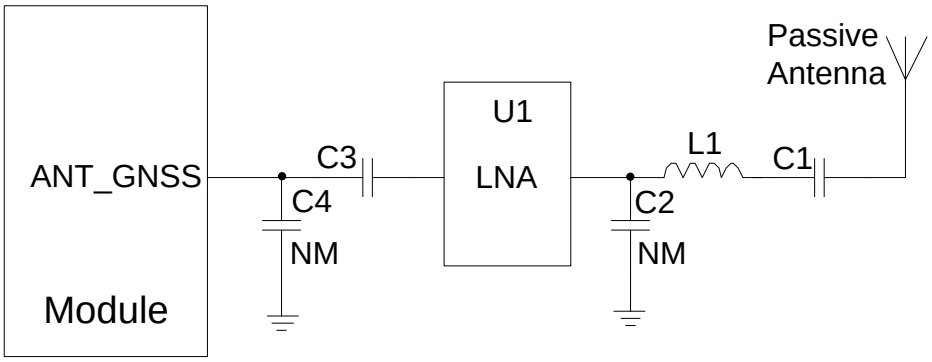


Figure 32: Reference Circuit Design for GNSS Passive Antenna

NOTE

When the passive antenna is placed far away from the module (that is, the antenna trace is long) and the external loss is more than 2 dB, it is recommended to add an external LNA circuit for better GNSS receiving performance, and place the LNA close to the antenna.

6.3.2. Active Antenna Reference Design

In any case, it is recommended to use a passive antenna. If active antenna is indeed needed in your application, it is recommended to reserve a π-type attenuation circuit provision and use high-performance LDO as the power supply. The active antenna is powered by a 56 nH inductor through the antenna's signal path. The common power supply voltage ranges from 3.3 V to 5.0 V. Despite its low power consumption, the active antenna still requires stable and clean power supplies. Therefore, it is recommended to use high-performance LDO as the power supply. A reference design for GNSS active antenna is shown below.

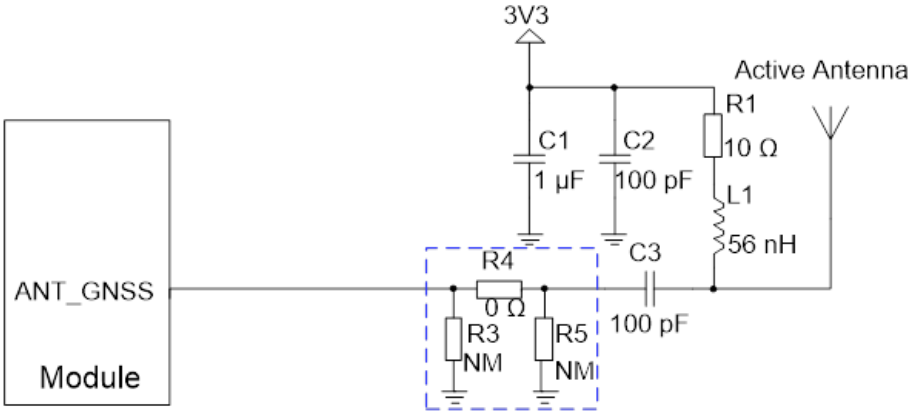


Figure 33: Reference Circuit Design for GNSS Active Antenna

NOTE

It is recommended to use a passive GNSS antenna when LTE B13 or B14 is supported, as the use of active antenna may generate harmonics which will affect the GNSS performance.

6.4. RF Routing Guidelines

For user's PCB, the characteristic impedance of all RF traces should be controlled to 50 Ω. The impedance of the RF traces is usually determined by the trace width (W), the materials' dielectric constant, the height from the reference ground to the signal layer (H), and the spacing between RF traces and grounds (S). Microstrip or coplanar waveguide is typically used in RF layout to control characteristic impedance. The following are reference designs of microstrip or coplanar waveguide with different PCB structures.

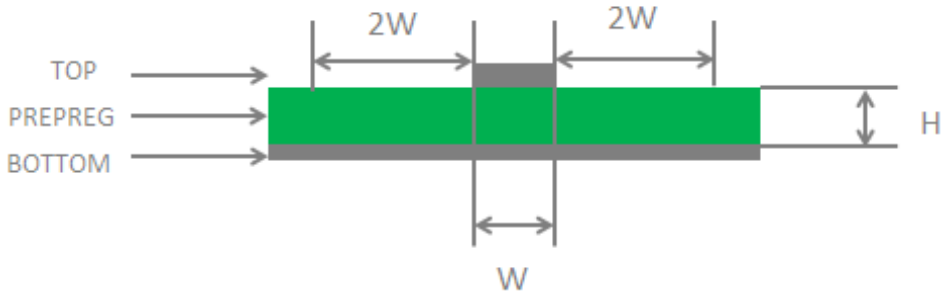


Figure 34: Microstrip Design on a 2-layer PCB

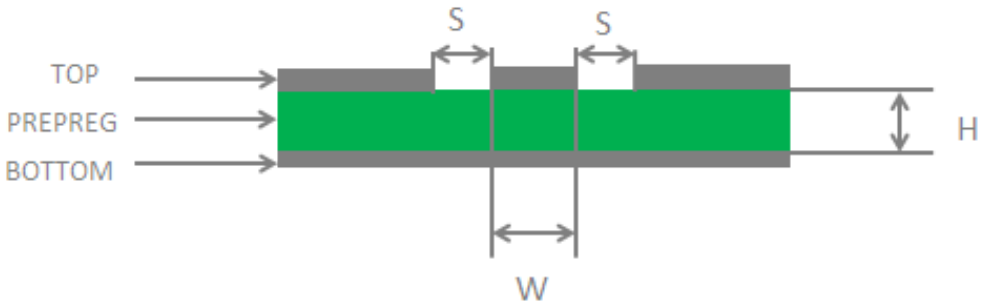


Figure 35: Coplanar Waveguide Design on a 2-layer PCB

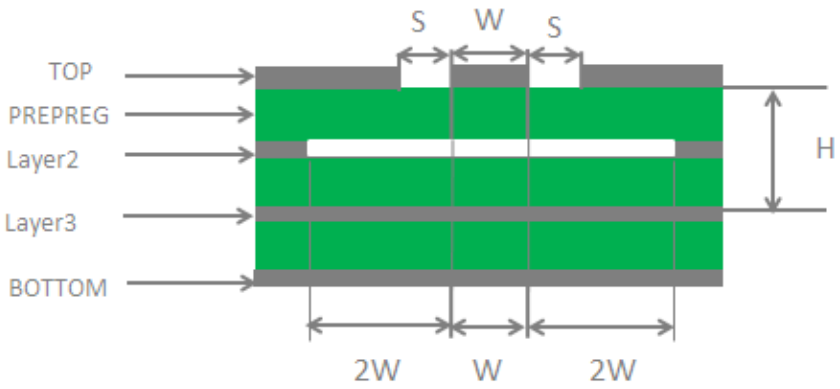


Figure 36: Coplanar Waveguide Design on a 4-layer PCB (Layer 3 as Reference Ground)

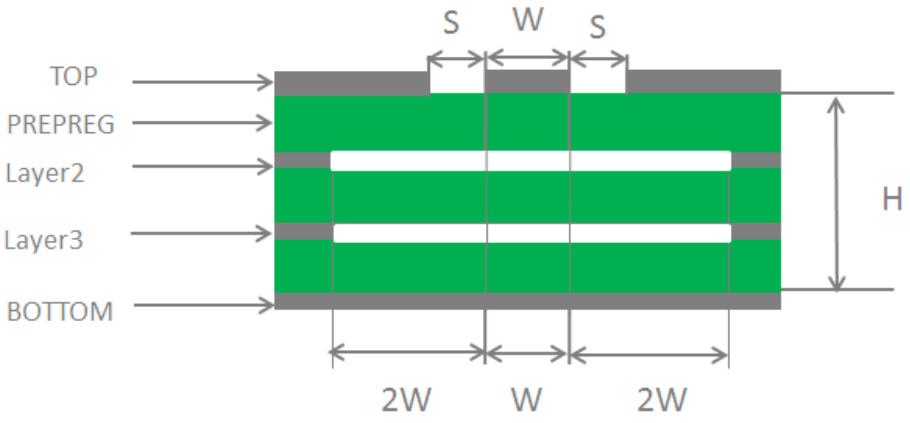


Figure 37: Coplanar Waveguide Design on a 4-layer PCB (Layer 4 as Reference Ground)

To ensure RF performance and reliability, follow the principles below in RF layout design:

- Use an impedance simulation tool to accurately control the characteristic impedance of RF traces to 50 Ω.
- The GND pins adjacent to RF pins should not be designed as thermal relief pads, and should be fully connected to ground.
- The distance between the RF pins and the RF connector should be as short as possible and all the right-angle traces should be changed to curved ones. The recommended trace angle is 135°.
- There should be clearance under the signal pin of the antenna connector or solder joint.
- The reference ground of RF traces should be complete. Meanwhile, adding some ground vias around RF traces and the reference ground could help to improve RF performance. The distance between the ground vias and RF traces should be not less than twice the width of RF signal traces (2 × W).
- Keep RF traces away from interference sources, and avoid intersection and paralleling between traces on adjacent layers.

For more details about RF layout, see ***document [3]***.

6.5. Antenna Installation

6.5.1. Antenna Design Requirements

The following table shows the requirement on the main antenna, Rx-diversity antenna, Wi-Fi/Bluetooth antenna and GNSS antenna.

Table 38: Antenna Design Requirements

Type	Requirements
GSM/WCDMA/LTE	VSWR: ≤ 2 Gain: 1 dBi Max Input Power: 50 W Input Impedance: 50 Ω Polarization Type: Vertical Cable insertion loss: **< 1 dB:** LB (<1 GHz) **< 1.5 dB:** MB (1–2.3 GHz) **< 2 dB:** HB (> 2.3 GHz)
Wi-Fi/Bluetooth	VSWR: ≤ 2 Gain: 1 dBi Max Input Power: 50 W Input Impedance: 50 Ω Polarization Type: Vertical Cable Insertion Loss: < 1 dB

GNSS	Frequency range: 1559–1609 MHz Polarization: RHCP or linear VSWR: < 2 (Typ.)
	For passive antenna usage: Passive Antenna Gain: > 0 dBi
	For active antenna usage: Passive Antenna Gain: > 0 dBi Active Antenna Gain: > -2 dBi Active Antenna Noise Figure: < 1.5 dB (Typ.) Active Antenna Embedded LNA Gain: < 17 dB (Typ.)

6.5.2. RF Connector Recommendation

If you use an RF connector for antenna connection, it is recommended to use the U.FL-R-SMT connector provided by HIROSE.

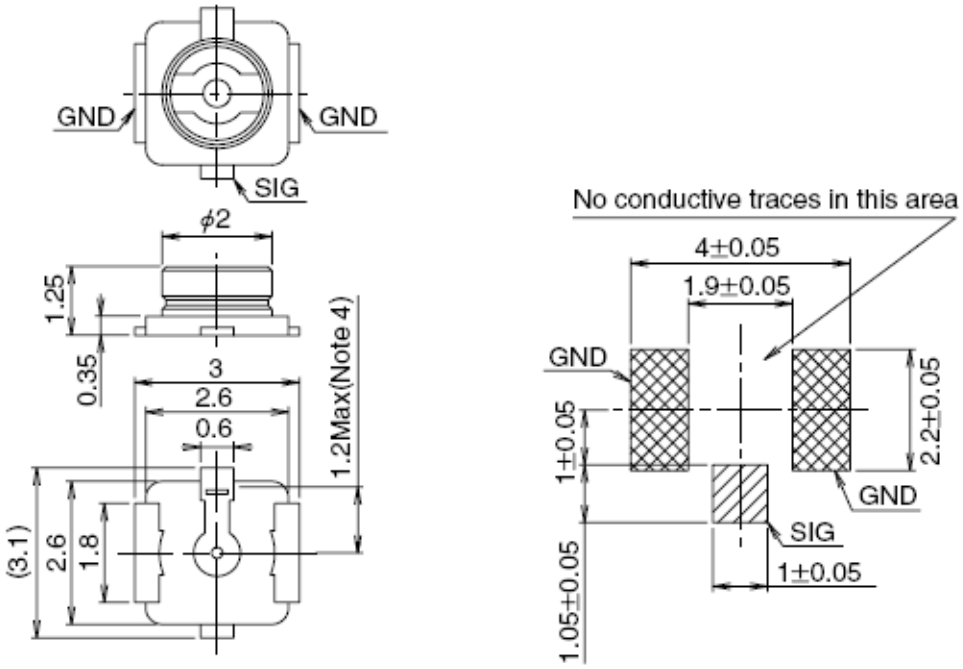


Figure 38: Dimensions of the Receptacle (Unit: mm)

U.FL-LP series mated plugs listed in the following figure can be used to match the U.FL-R-SMT.

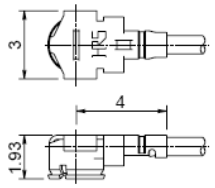
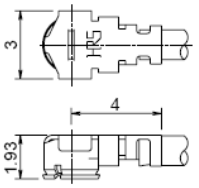
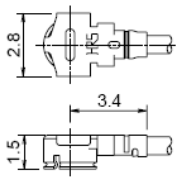
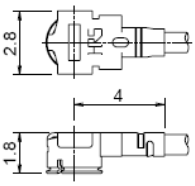
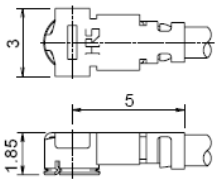
Part No.	U.FL-LP-040	U.FL-LP-066	U.FL-LP(V)-040	U.FL-LP-062	U.FL-LP-088
					
Mated Height	2.5mm Max. (2.4mm Nom.)	2.5mm Max. (2.4mm Nom.)	2.0mm Max. (1.9mm Nom.)	2.4mm Max. (2.3mm Nom.)	2.4mm Max. (2.3mm Nom.)
Applicable cable	Dia. 0.81mm Coaxial cable	Dia. 1.13mm and Dia. 1.32mm Coaxial cable	Dia. 0.81mm Coaxial cable	Dia. 1mm Coaxial cable	Dia. 1.37mm Coaxial cable
Weight (mg)	53.7	59.1	34.8	45.5	71.7
RoHS	YES				

Figure 39: Specifications of Mated Plugs

The following figure describes the space factor of mated connectors.

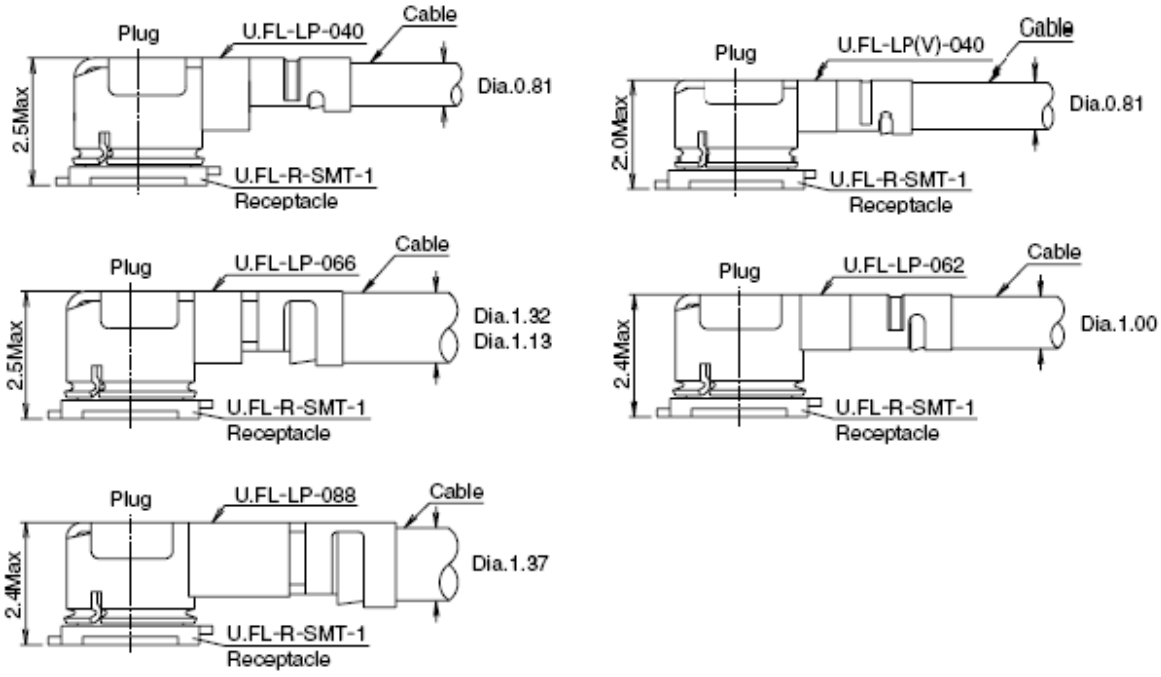


Figure 40: Space Factor of Mated Connectors (Unit: mm)

For more details, visit http://www.hirose.com.

7 Electrical Characteristics and Reliability

7.1. Absolute Maximum Ratings

Absolute maximum ratings for power supply and voltage on digital and analog pins of the module are listed in the following table.

Table 39: Absolute Maximum Ratings

Parameter	Min.	Max.	Unit
VBAT	-0.5	6	V
USB_VBUS	-0.5	16	V
Peak Current of VBAT	-	3	A
Voltage on Digital Pins	-0.3	2.16	V

7.2. Power Supply Ratings

Table 40: Power Supply Ratings

Parameter	Description	Conditions	Min.	Typ.	Max.	Unit
VBAT	VBAT	The actual input voltages must be kept between the minimum and maximum values	3.55	3.8	4.2	V
	Voltage drop during transmitting burst	Maximum power control level at EGSM900	-	-	400	mV

I_{VBAT}	Peak supply current (during transmission slot)	Maximum power control level at EGSM900	-	1.8	3.0	A
USB_VBUS	USB power supply		4.35	5.0	6.2	V
VRTC	Power supply voltage of the backup battery		2.0	3.0	3.25	V

7.3. Operating and Storage Temperatures

The operating and storage temperatures are listed in the following table.

Table 41: Operating and Storage Temperatures

Parameter	Min.	Typ.	Max.	Unit
Operating temperature range	-35	+25	+75	ºC
Storage temperature range	-40	-	+90	ºC

7.4. Power Consumption

The values of current consumption are shown below.

Table 42: SC262R-EM Power Consumption

Description	Conditions	Typ.	Unit
OFF state	Power down	20	μA
GSM/GPRS supply current	Sleep (USB disconnected) @ DRX = 2	3.9	mA
	Sleep (USB disconnected) @ DRX = 5	2.9	mA
	Sleep (USB disconnected) @ DRX = 9	2.6	mA
WCDMA	Sleep (USB disconnected) @ DRX = 6	4.1	mA

supply current	Sleep (USB disconnected) @ DRX = 8	3.1	mA
	Sleep (USB disconnected) @ DRX = 9	2.8	mA
LTE-FDD supply current	Sleep (USB disconnected) @ DRX = 6	4.6	mA
	Sleep (USB disconnected) @ DRX = 8	3.5	mA
	Sleep (USB disconnected) @ DRX = 9	3.0	mA
LTE-TDD supply current	Sleep (USB disconnected) @ DRX = 6	4.7	mA
	Sleep (USB disconnected) @ DRX = 8	3.6	mA
	Sleep (USB disconnected) @ DRX = 9	3.0	mA
GSM voice call	GSM850 @ PCL 5	282.9	mA
	GSM850 @ PCL 12	116.4	mA
	GSM850 @ PCL 19	96.7	mA
	EGSM900 @ PCL 5	268.6	mA
	EGSM900 @ PCL 12	155.9	mA
	EGSM900 @ PCL 19	94.6	mA
	DCS1800 @ PCL 0	201.7	mA
	DCS1800 @ PCL 7	155.4	mA
	DCS1800 @ PCL 15	150.3	mA
	PCS1900 @ PCL 0	200.3	mA
	PCS1900 @ PCL 7	155.4	mA
	PCS1900 @ PCL 15	151.1	mA
WCDMA voice call	B1 @ max. power	559.4	mA
	B2 @ max. power	583	mA
	B4 @ max. power	587.6	mA
	B5 @ max. power	511.9	mA
	B8 @ max. power	558.7	mA

GPRS data transfer	GSM850 (1UL/4DL) @ PCL 5	278.8	mA
	GSM850 (2UL/3DL) @ PCL 5	414.2	mA
	GSM850 (3UL/2DL) @ PCL 5	495.3	mA
	GSM850 (4UL/1DL) @ PCL 5	598.1	mA
	EGSM900 (1UL/4DL) @ PCL 5	262.4	mA
	EGSM900 (2UL/3DL) @ PCL 5	397	mA
	EGSM900 (3UL/2DL) @ PCL 5	469.3	mA
	EGSM900 (4UL/1DL) @ PCL 5	566	mA
	DCS1800 (1UL/4DL) @ PCL 0	195.5	mA
	DCS1800 (2UL/3DL) @ PCL 0	289	mA
	DCS1800 (3UL/2DL) @ PCL0	366.5	mA
	DCS1800 (4UL/1DL) @ PCL 0	456.7	mA
	PCS1900 (1UL/4DL) @ PCL 0	186.8	mA
	PCS1900 (2UL/3DL) @ PCL 0	279.2	mA
	PCS1900 (3UL/2DL) @ PCL0	361.2	mA
	PCS1900 (4UL/1DL) @ PCL 0	453.3	mA
EDGE data transfer	GSM850 (1UL/4DL) @ PCL 8	210.64	mA
	GSM850 (2UL/3DL) @ PCL 8	337.6	mA
	GSM850 (3UL/2DL) @ PCL 8	454.4	mA
	GSM850 (4UL/1DL) @ PCL 8	579.1	mA
	EGSM900 (1UL/4DL) @ PCL 8	209.1	mA
	EGSM900 (2UL/3DL) @ PCL 8	333.5	mA
	EGSM900 (3UL/2DL) @ PCL 8	454.2	mA
	EGSM900 (4UL/1DL) @ PCL 8	578.9	mA
	DCS1800 (1UL/4DL) @ PCL 2	197.3	mA

	DCS1800 (2UL/3DL) @ PCL 2	304.5	mA
	DCS1800 (3UL/2DL) @ PCL 2	393.4	mA
	DCS1800 (4UL/1DL) @ PCL 2	495.1	mA
	PCS1900 (1UL/4DL) @ PCL 2	184.7	mA
	PCS1900 (2UL/3DL) @ PCL 2	292.2	mA
	PCS1900 (3UL/2DL) @ PCL 2	393.4	mA
	PCS1900 (4UL/1DL) @ PCL 2	496.2	mA
WCDMA data transfer	B1 (HSDPA) @ max. power	511.3	mA
	B2 (HSDPA) @ max. power	511.1	mA
	B4 (HSDPA) @ max. power	550.2	mA
	B5 (HSDPA) @ max. power	458.4	mA
	B8 (HSDPA) @ max. power	484.5	mA
	B1 (HSUPA) @ max. power	524.9	mA
	B2 (HSUPA) @ max. power	566.8	mA
	B4 (HSUPA) @ max. power	566.2	mA
	B5 (HSUPA) @ max. power	493.1	mA
	B8 (HSUPA) @ max. power	522.3	mA
LTE data transfer	LTE-FDD B1 @ max. power	728.1	mA
	LTE-FDD B2 @ max. power	723	mA
	LTE-FDD B3 @ max. power	732.4	mA
	LTE-FDD B4 @ max. power	758.7	mA
	LTE-FDD B5 @ max. power	615.5	mA
	LTE-FDD B7 @ max. power	826.9	mA
	LTE-FDD B8 @ max. power	642.7	mA
	LTE-FDD B20 @ max. power	677.9	mA

	LTE-FDD B28 @ max. power	764.5	mA
	LTE-TDD B38 @ max. power	448.4	mA
	LTE-TDD B40 @ max. power	432.7	mA
	LTE-TDD B41 @ max. power	444.2	mA

Table 43: SC262R-NA Power Consumption

Description	Conditions	Typ.	Unit
OFF state	Power down	8	μA
WCDMA supply current	Sleep (USB disconnected) @ DRX = 6	3.698	mA
	Sleep (USB disconnected) @ DRX = 8	2.711	mA
	Sleep (USB disconnected) @ DRX = 9	2.566	mA
LTE-FDD supply current	Sleep (USB disconnected) @ DRX = 6	6.698	mA
	Sleep (USB disconnected) @ DRX = 8	3.509	mA
	Sleep (USB disconnected) @ DRX = 9	3.011	mA
LTE-TDD supply current	Sleep (USB disconnected) @ DRX = 6	6.954	mA
	Sleep (USB disconnected) @ DRX = 8	3.611	mA
	Sleep (USB disconnected) @ DRX = 9	2.897	mA
WCDMA voice call	B2 @ max. power	603.0	mA
	B4 @ max. power	659.3	mA
	B5 @ max. power	586.1	mA
WCDMA data transfer	B2 (HSDPA) @ max. power	617.1	mA
	B4 (HSDPA) @ max. power	608.5	mA
	B5 (HSDPA) @ max. power	541.7	mA
	B2 (HSUPA) @ max. power	631.8	mA
	B4 (HSUPA) @ max. power	608.8	mA

	B5 (HSUPA) @ max. power	553.3	mA
LTE data transfer	LTE-FDD B2 @ max. power	729.9	mA
	LTE-FDD B4 @ max. power	727.8	mA
	LTE-FDD B5 @ max. power	581.1	mA
	LTE-FDD B7 @ max. power	850.7	mA
	LTE-FDD B12 @ max. power	734.9	mA
	LTE-FDD B13 @ max. power	721.7	mA
	LTE-FDD B14 @ max. power	700	mA
	LTE-FDD B17@ max. power	763.5	mA
	LTE-FDD B25 @ max. power	771.9	mA
	LTE-FDD B26 @ max. power	659.5	mA
	LTE-FDD B66 @ max. power	718.6	mA
	LTE-FDD B71 @ max. power	688.1	mA
	LTE-TDD B41 @ max. power	469.1	mA

7.5. Tx Power

The following tables show the RF output power of SC262R series module.

Table 44: SC262R-EM RF Output Power

Frequency Bands	Max. RF Output Power	Min. RF Output Power
GSM850	33 dBm ±2 dB	5 dBm ±5 dB
EGSM900	33 dBm ±2 dB	5 dBm ±5 dB
DCS1800	30 dBm ±2 dB	0 dBm ±5 dB
PCS1900	30 dBm ±2 dB	0 dBm ±5 dB
WCDMA B1	24 dBm +1/-3 dB	< -49 dBm

WCDMA B2	24 dBm +1/-3 dB	< -49 dBm
WCDMA B4	24 dBm +1/-3 dB	< -49 dBm
WCDMA B5	24 dBm +1/-3 dB	< -49 dBm
WCDMA B8	24 dBm +1/-3 dB	< -49 dBm
LTE-FDD B1	23 dBm ±2 dB	< -39 dBm
LTE-FDD B2	23 dBm ±2 dB	< -39 dBm
LTE-FDD B3	23 dBm ±2 dB	< -39 dBm
LTE-FDD B4	23 dBm ±2 dB	< -39 dBm
LTE-FDD B5	23 dBm ±2 dB	< -39 dBm
LTE-FDD B7	23 dBm ±2 dB	< -39 dBm
LTE-FDD B8	23 dBm ±2 dB	< -39 dBm
LTE-FDD B20	23 dBm ±2 dB	< -39 dBm
LTE-FDD B28	23 dBm ±2 dB	< -39 dBm
LTE-TDD B38	23 dBm ±2 dB	< -39 dBm
LTE-TDD B40	23 dBm ±2 dB	< -39 dBm
LTE-TDD B41	23 dBm ±2 dB	< -39 dBm

Table 45: SC262R-NA RF Output Power

Frequency Bands	Max. RF Output Power	Min. RF Output Power
WCDMA B2	24 dBm +1/-3 dB	< -49 dBm
WCDMA B4	24 dBm +1/-3 dB	< -49 dBm
WCDMA B5	24 dBm +1/-3 dB	< -49 dBm
LTE-FDD B2	23 dBm ±2 dB	< -39 dBm
LTE-FDD B4	23 dBm ±2 dB	< -39 dBm
LTE-FDD B5	23 dBm ±2 dB	< -39 dBm

LTE-FDD B7	23 dBm ±2 dB	< -39 dBm
LTE-FDD B12	23 dBm ±2 dB	< -39 dBm
LTE-FDD B13	23 dBm ±2 dB	< -39 dBm
LTE-FDD B14	23 dBm ±2 dB	< -39 dBm
LTE-FDD B17	23 dBm ±2 dB	< -39 dBm
LTE-FDD B25	23 dBm ±2 dB	< -39 dBm
LTE-FDD B26	23 dBm ±2 dB	< -39 dBm
LTE-FDD B66	23 dBm ±2 dB	< -39 dBm
LTE-FDD B71	23 dBm ±2 dB	< -39 dBm
LTE-TDD B41	23 dBm ±2 dB	< -39 dBm

NOTE

In GPRS 4-slot Tx mode, the maximum output power is reduced by 3 dB. This design conforms to the GSM specification as described in ***Chapter 13.16*** of *3GPP TS 51.010-1*.

7.6. Rx Sensitivity

The following table shows the RF receiving sensitivity of SC262R series module.

Table 46: SC262R-EM RF Receiving Sensitivity

Frequency Bands	Receiving Sensitivity (Typ.)			3GPP (SIMO)
	Primary	Diversity	SIMO	
GSM850	-110.6	-	-	-102.4 dBm
EGSM900	-110.2	-	-	-102.4 dBm
DCS1800	-108.9	-	-	-102.4 dBm
PCS1900	-109	-	-	-102.4 dBm

WCDMA B1	-109.5	-111	TBD	-106.7 dBm
WCDMA B2	-110	109.5	TBD	-104.7 dBm
WCDMA B4	-110	-109.5	TBD	-106.7 dBm
WCDMA B5	-111.5	-111	TBD	-104.7 dBm
WCDMA B8	-111	-111.5	TBD	-103.7 dBm
LTE-FDD B1 (10 MHz)	-98.2	-99.5	-100.5	-96.3 dBm
LTE-FDD B2 (10 MHz)	-98.2	-98.2	-100.5	-94.3 dBm
LTE-FDD B3 (10 MHz)	-97.8	-97.8	-100	-93.3 dBm
LTE-FDD B4 (10 MHz)	-98.2	-99.5	-101.5	-96.3 dBm
LTE-FDD B5 (10 MHz)	-100	-100.5	-101.5	-94.3 dBm
LTE-FDD B7 (10 MHz)	-97.3	-97.5	-100	-94.3 dBm
LTE-FDD B8 (10 MHz)	-99.5	-100	-102.5	-93.3 dBm
LTE-FDD B20 (10 MHz)	-99.5	-100.2	-102.5	-93.3 dBm
LTE-FDD B28 (10 MHz)	-98.3	-99.5	-101.5	-94.8 dBm
LTE-TDD B38 (10 MHz)	-98	-98	-100.5	-96.3 dBm
LTE-TDD B40 (10 MHz)	-99	-99	-101.5	-96.3 dBm
LTE-TDD B41 (10 MHz)	-97.3	-97.2	-99.5	-94.3 dBm

Table 47: SC262R-NA RF Receiving Sensitivity

Frequency Bands	Receiving Sensitivity (Typ.)			3GPP (SIMO)
	Primary	Diversity	SIMO	
WCDMA B2	-109.5	-110	TBD	-104.7 dBm
WCDMA B4	-110	-110	TBD	-106.7 dBm
WCDMA B5	-111	-111.5	TBD	-104.7 dBm
LTE-FDD B2 (10 MHz)	-98.6	-99.3	-99	-94.3 dBm

LTE-FDD B4 (10 MHz)	-98.4	-98.9	-101.4	-96.3 dBm
LTE-FDD B5 (10 MHz)	-99.8	-100.9	-103.8	-94.3 dBm
LTE-FDD B7 (10 MHz)	-97.6	-98.9	-101.3	-93.3 dBm
LTE-FDD B12 (10 MHz)	-98.8	-98.8	-102.2	-93.3 dBm
LTE-FDD B13 (10 MHz)	-99.8	-99.3	-102.6	-93.3 dBm
LTE-FDD B14 (10 MHz)	-98.9	-98.8	-101.9	-93.3 dBm
LTE-FDD B17 (10 MHz)	-97.6	-99	-101.7	-93.3 dBm
LTE-FDD B25 (10 MHz)	-98.4	-99.3	-101.6	-92.8 dBm
LTE-FDD B26 (10 MHz)	-99.8	-100.8	-103.6	-93.8 dBm
LTE-FDD B66 (10 MHz)	-98.5	-99	-101.5	-96.3 dBm
LTE-FDD B71 (10 MHz)	-97.8	-97.6	-100.8	-93.5 dBm
LTE-TDD B41 (10 MHz)	-98.1	-97.8	-100.8	-94.3 dBm

7.7. ESD Protection

Static electricity occurs naturally and it may damage the module. Therefore, applying proper ESD countermeasures and handling methods is imperative. For example, wear anti-static gloves during the development, production, assembly and testing of the module; add ESD protection components to the ESD sensitive interfaces and points in the product design.

The following table shows the electrostatic discharge characteristics of SC262R series module.

Table 48: ESD Characteristics (Temperature: 25 ºC, Humidity: 45 %)

Tested Points	Contact Discharge	Air Discharge	Unit
VBAT, GND	±5	±10	kV
All Antenna Interfaces	±5	±10	kV
Other Interfaces	±0.5	±1	kV

8 Mechanical Information

This chapter describes the mechanical dimensions of the module. All dimensions are measured in millimeter (mm), and the dimensional tolerances are ±0.2 mm unless otherwise specified.

8.1. Mechanical Dimensions

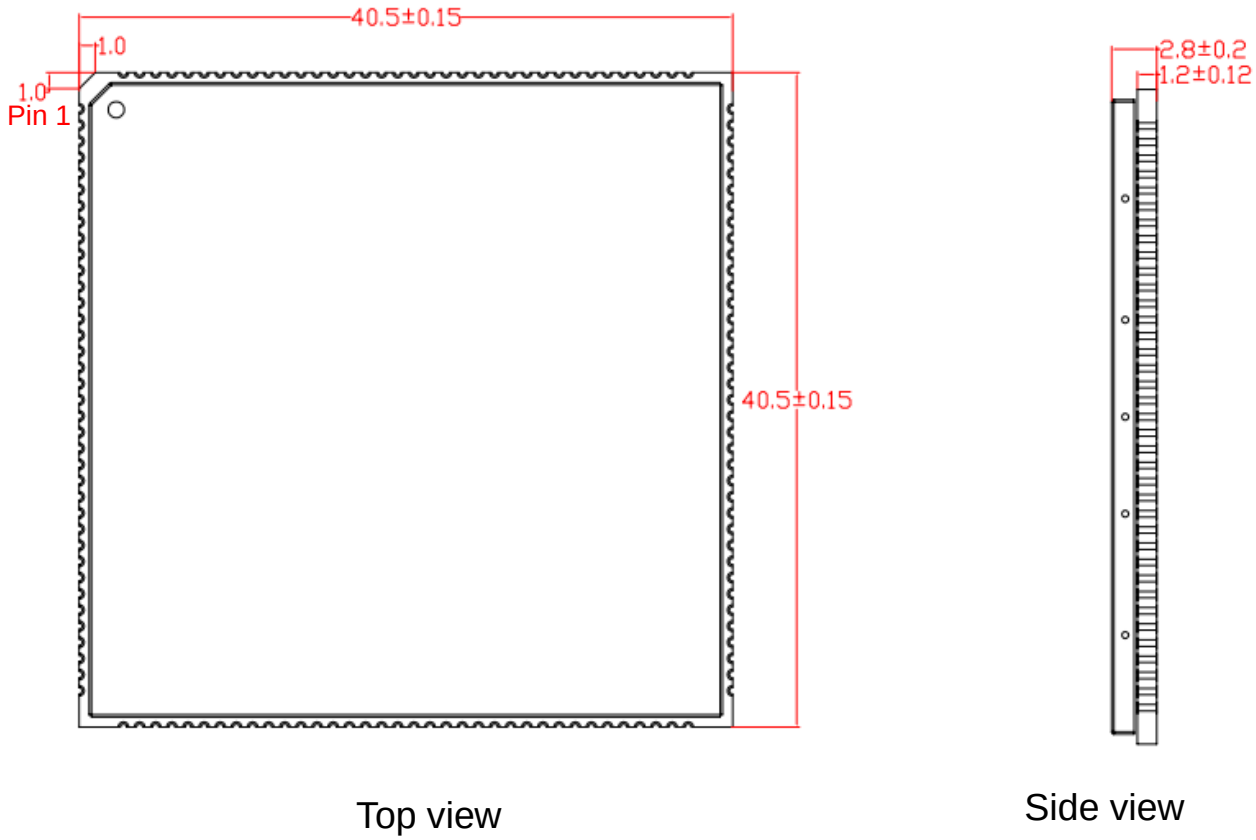


Figure 41: Top and Side Dimensions

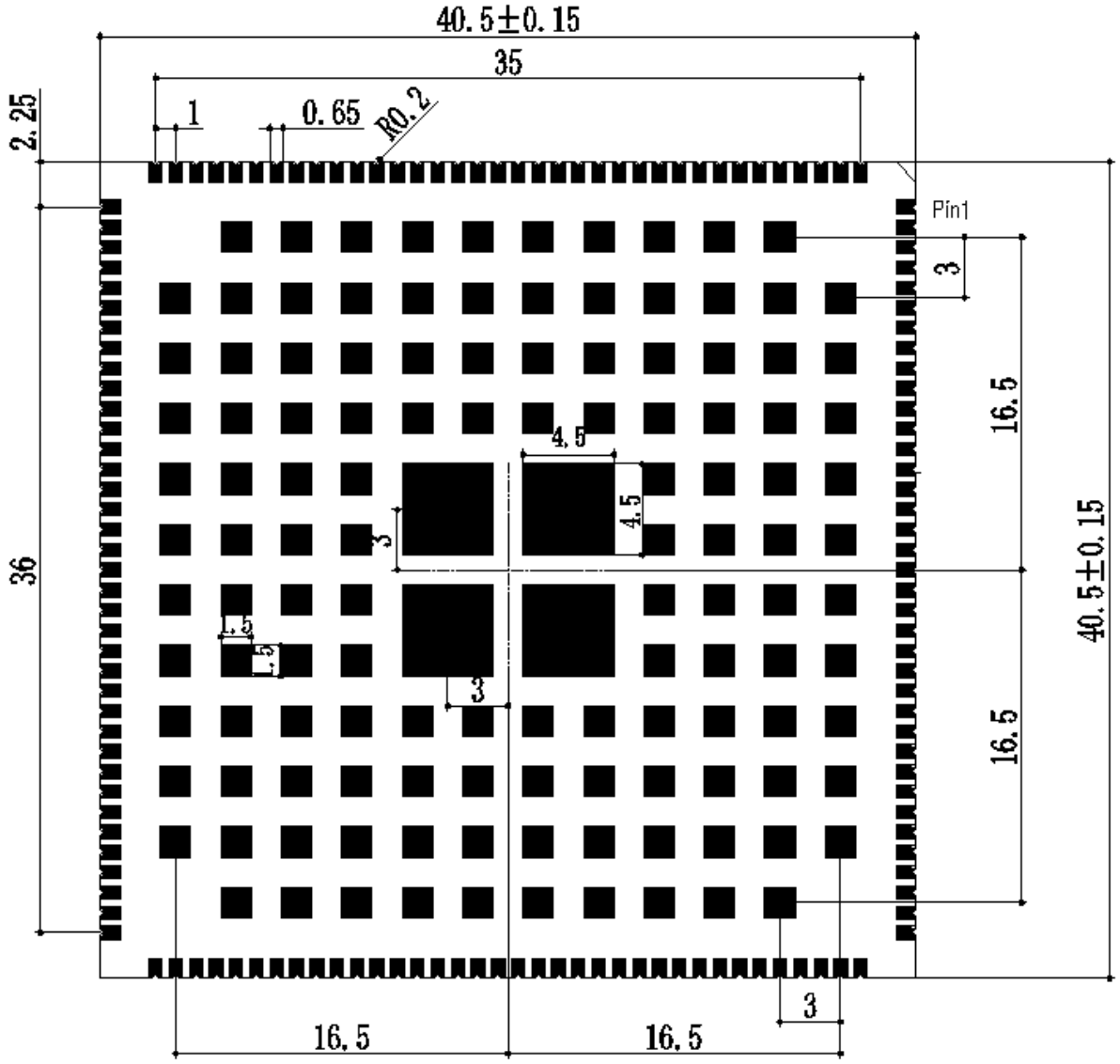


Figure 42: Bottom Dimension (Bottom View)

NOTE

The package warpage level of the module conforms to *JEITA ED-7306* standard.

8.2. Recommended Footprint

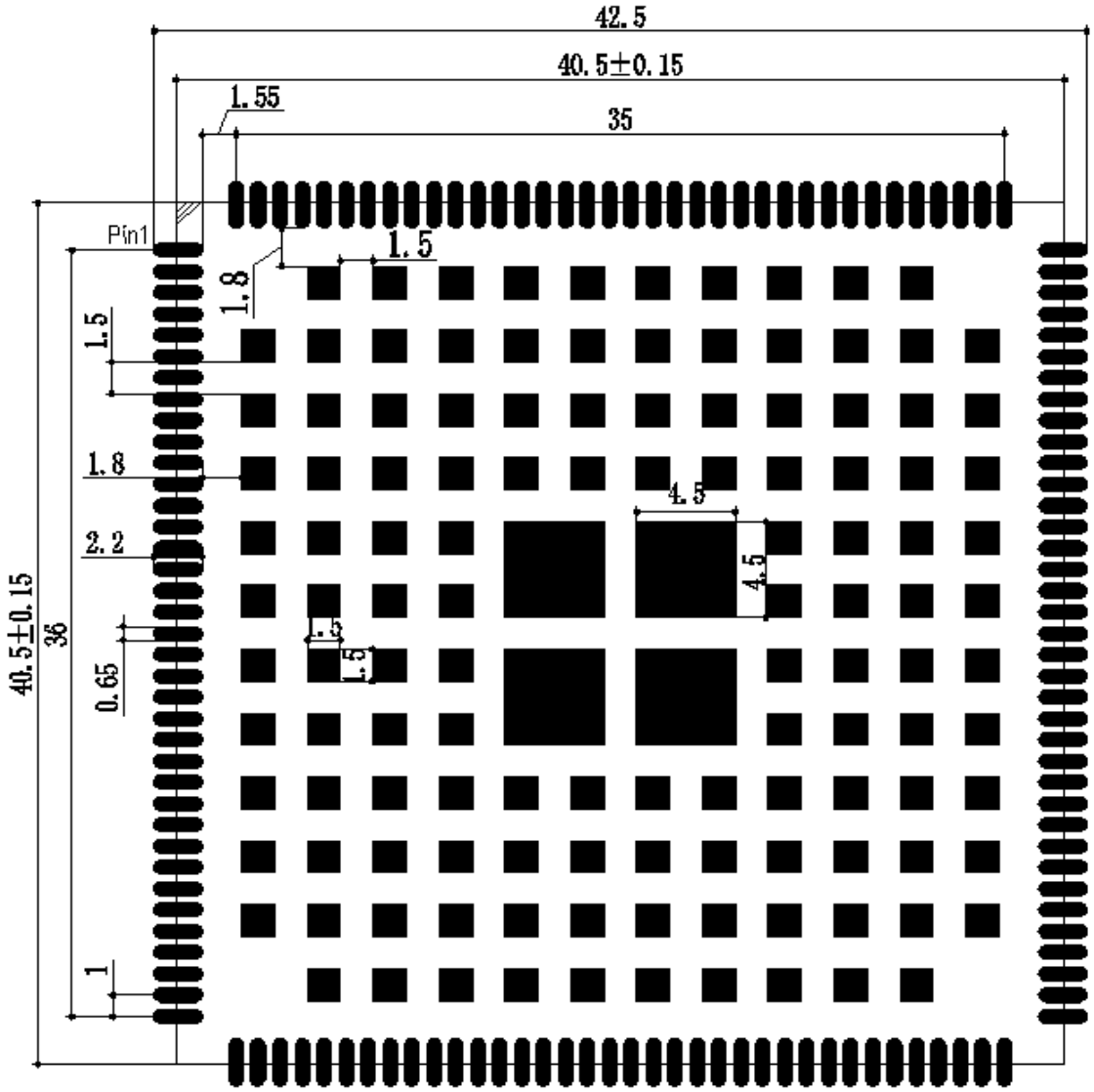


Figure 43: Recommended Footprint (Top View)

NOTE

1. Keep at least 3 mm between the module and other components on the motherboard to improve soldering quality and maintenance convenience.
2. All RESERVED pins should be kept open and MUST NOT be connected to ground.

8.3. Top and Bottom Views

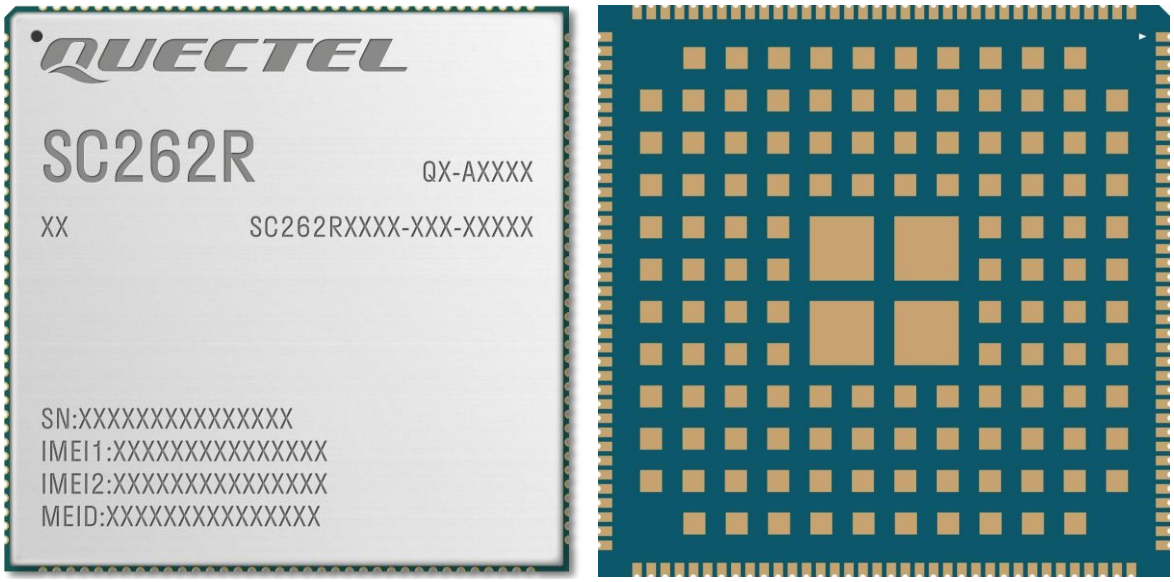


Figure 44: Top and Bottom Views of the Module

NOTE

Images above are for illustration purpose only and may differ from the actual module. For authentic appearance and label, please refer to the module received from Quectel.

9 Storage, Manufacturing and Packaging

9.1. Storage Conditions

The module is provided with vacuum-sealed packaging. MSL of the module is rated as 3. The storage requirements are shown below.

1. Recommended Storage Condition: the temperature should be 23 ±5 °C and the relative humidity should be 35–60 %.

2. Shelf life (in a vacuum-sealed packaging): 12 months in Recommended Storage Condition.

3. Floor life: 168 hours [8] in a factory where the temperature is 23 ±5 °C and relative humidity is below 60 %. After the vacuum-sealed packaging is removed, the module must be processed in reflow soldering or other high-temperature operations within 168 hours. Otherwise, the module should be stored in an environment where the relative humidity is less than 10 % (e.g., a dry cabinet).

4. The module should be pre-baked to avoid blistering, cracks and inner-layer separation in PCB under the following circumstances:

   - The module is not stored in Recommended Storage Condition;
   - Violation of the third requirement mentioned above;
   - Vacuum-sealed packaging is broken, or the packaging has been removed for over 24 hours;
   - Before module repairing.

5. If needed, the pre-baking should follow the requirements below:

   - The module should be baked for 8 hours at 120 ±5 °C;
   - The module must be soldered to PCB within 24 hours after the baking, otherwise it should be put in a dry environment such as in a dry cabinet.

[8] This floor life is only applicable when the environment conforms to *IPC/JEDEC J-STD-033*. It is recommended to start the solder reflow process within 24 hours after the package is removed if the temperature and moisture do not conform to, or are not sure to conform to *IPC/JEDEC J-STD-033*. And do not remove the packages of tremendous modules if they are not ready for soldering.

NOTE

1. To avoid blistering, layer separation and other soldering issues, extended exposure of the module to the air is forbidden.
2. Take out the module from the package and put it on high-temperature-resistant fixtures before baking. If shorter baking time is desired, see *IPC/JEDEC J-STD-033* for the baking procedure.
3. Pay attention to ESD protection, such as wearing anti-static gloves, when touching the modules.

9.2. Manufacturing and Soldering

Push the squeegee to apply the solder paste on the surface of stencil, thus making the paste fill the stencil openings and then penetrate to the PCB. Apply proper force on the squeegee to produce a clean stencil surface on a single pass. To guarantee module soldering quality, the thickness of stencil for the module is recommended to be 0.18–0.20 mm. For more details, see ***document [4]***.

The peak reflow temperature should be 235–246 ºC, with 246 ºC as the absolute maximum reflow temperature. To avoid damage to the module caused by repeated heating, it is strongly recommended that the module should be mounted only after reflow soldering for the other side of PCB has been completed. The recommended reflow soldering thermal profile (lead-free reflow soldering) and related parameters are shown below.

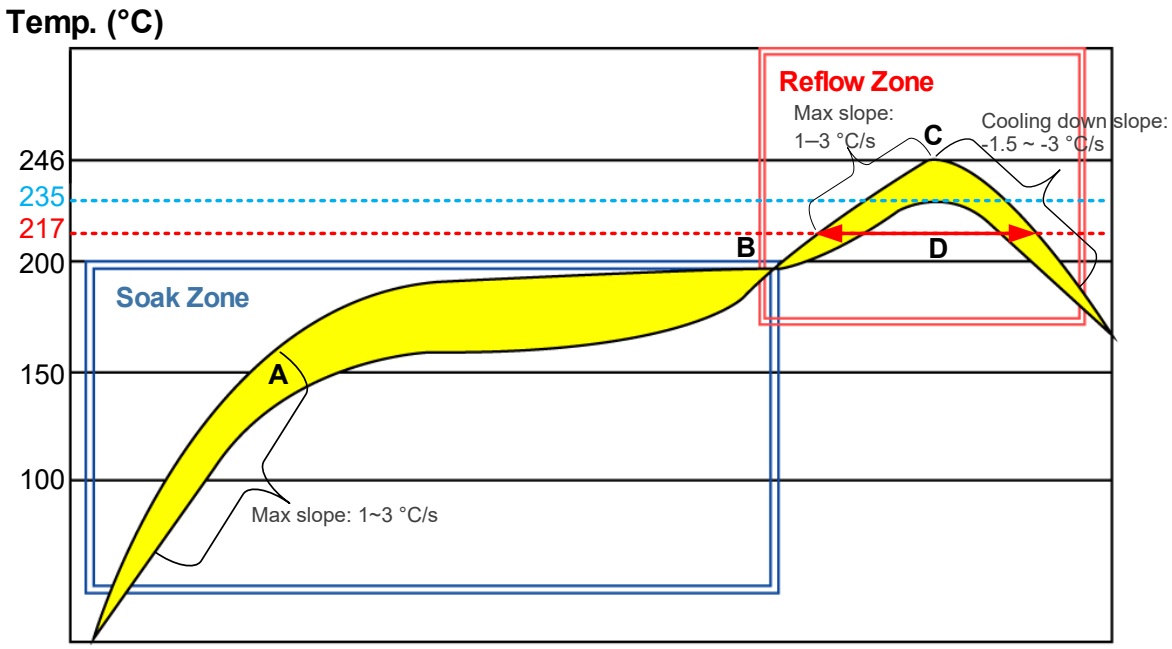


Figure 45: Recommended Reflow Soldering Thermal Profile

Table 49: Recommended Thermal Profile Parameters

Factor	Recommendation
Soak Zone	
Max slope	1–3 °C/s
Soak time (between A and B: 150 °C and 200 °C)	70–120 s
Reflow Zone	
Max slope	1–3 °C/s
Reflow time (D: over 217 °C)	40–70 s
Max temperature	235 °C to 246 °C
Cooling down slope	-1.5 to -3 °C/s
Reflow Cycle	
Max reflow cycle	1

NOTE

1. If a conformal coating is necessary for the module, do NOT use any coating material that may chemically react with the PCB or shielding cover, and prevent the coating material from flowing into the module.
2. Due to the complexity of the SMT process, please contact Quectel Technical Support in advance for any situation that you are not sure about, or any process (e.g. selective soldering, ultrasonic soldering) that is not mentioned in ***document [4]***.

9.3. Packaging Specification

This chapter describes only the key parameters and process of packaging. All figures below are for reference only. The appearance and structure of the packaging materials are subject to the actual delivery.

The module adopts carrier tape packaging and details are as follow:

9.3.1. Carrier Tape

Dimension details are as follow:

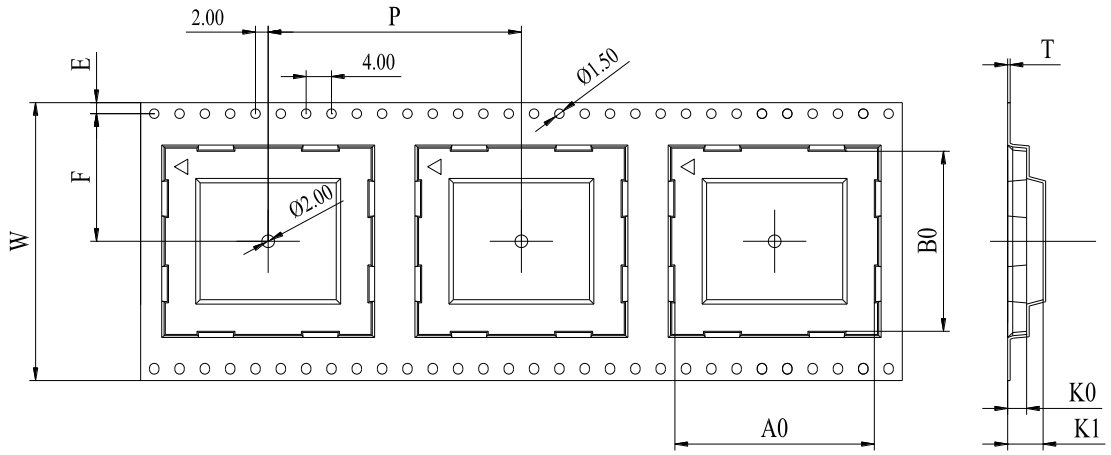


Figure 46: Carrier Tape Dimension Drawing

Table 50: Carrier Tape Dimension Table (Unit: mm)

W	P	T	A0	B0	K0	K1	F	E
72	56	0.4	41.2	41.2	4	4.6	34.2	1.75

9.3.2. Plastic Reel

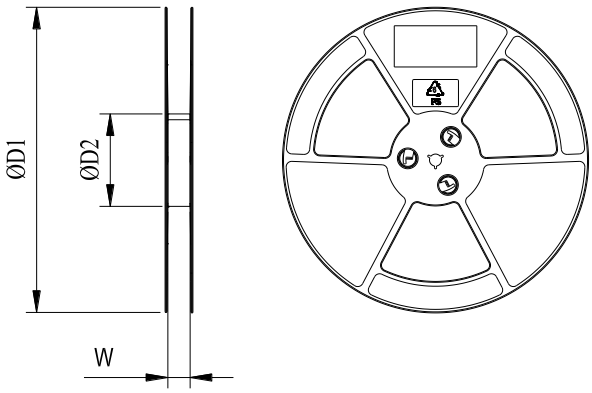
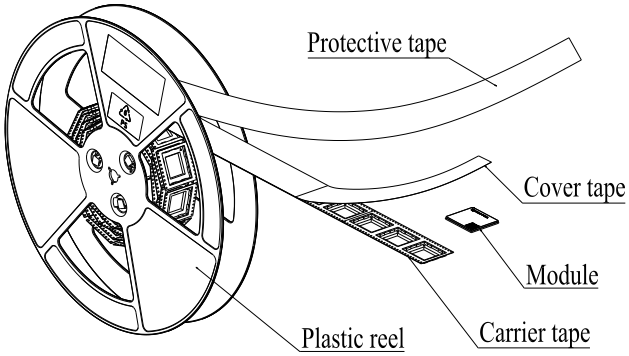


Figure 47: Plastic Reel Dimension Drawing

Table 51: Plastic Reel Dimension Table (Unit: mm)

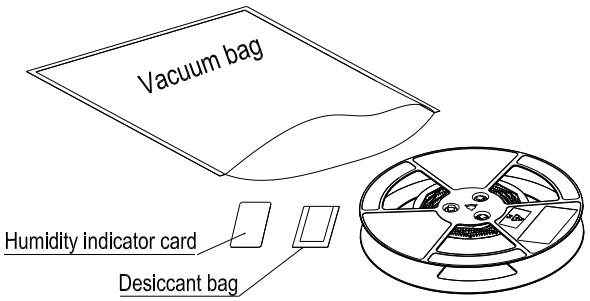
øD1	øD2	W
380	180	72.5

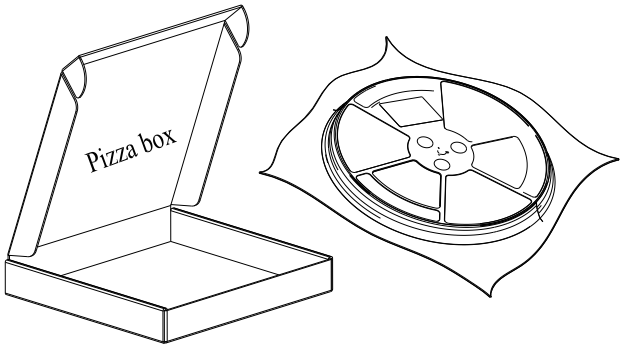
9.3.3. Packaging Process



Place the module into the carrier tape and use the cover tape to cover it; then wind the heat-sealed carrier tape to the plastic reel and use the protective tape for protection. 1 plastic reel can load 200 modules.

Place the packaged plastic reel, 1 humidity indicator card and 1 desiccant bag into a vacuum bag, vacuumize it.





Place the vacuum-packed plastic reel into the pizza box.

Put 4 packaged pizza boxes into 1 cartoon box and seal it. 1 carton box can pack 800 modules.

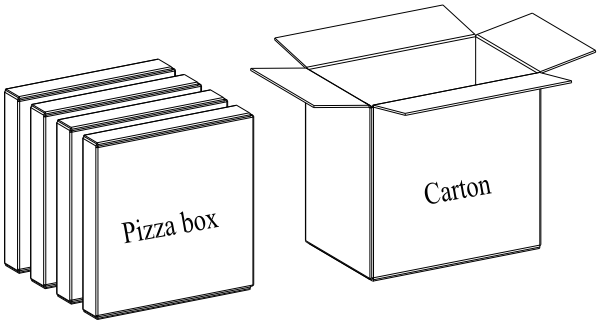


Figure 48: Packaging Process

10 Appendix References

Table 52: Related Documents

Document Name
[1] Quectel_Smart_EVB_G2_User_Guide
[2] Quectel_SC262R_Series_Pin_Description_and_GPIO_Configuration
[3] Quectel_RF_Layout_Application_Note
[4] Quectel_Module_Secondary_SMT_Application_Note
[5] Quectel_SC262R_Series_Reference_Design

Table 53: Terms and Abbreviations

Abbreviation	Description
ADC	Analog-to-Digital Converter
ADSP	Audio Digital Signal Processor
ALS	Ambient Light Sensor
AMR	Adaptive Multi-rate
AP	Access Point
ARM	Advanced RISC Machine
BB	Baseband
BLE	Bluetooth Low Energy
bps	Bits per Second
BR	Basic Rate

CDMA	Code Division Multiple Access
CEP	Circular Error Probable
CMOS	Complementary Metal-Oxide-Semiconductor
CPE	Customer-Premise Equipment
CS	Coding Scheme
CSD	Circuit Switched Data
CSI	Camera Serial Interface
CTS	Clear to Send
DC	Dual Carrier
DCS	Digital Cellular System
DL	Downlink
DPSK	Differential Phase Shift Keying
DQPSK	Differential Quadrature Reference Phase Shift Keying
DRX	Discontinuous Reception
DSI	Display Serial Interface
DSP	Digital Signal Processor
ECM	Electret Condenser Microphone
EDGE	Enhanced Data Rate for GSM Evolution
EDR	Enhanced Data Rate
EFR	Enhanced Full Rate
EGSM	Extended GSM
eMMC	Embedded Multimedia Card
eSCO	Extended Synchronous Connection Oriented
ESD	Electrostatic Discharge
ESR	Equivalent Series Resistance

ETSI	European Telecommunications Standards Institute
EVB	Evaluation Board
EV-DO/EVDO	Evolution-Data Optimized
EVRC	Enhanced Variable Rate Codec
FDD	Frequency Division Duplex
FEM	Front End Module
fps	Frame per Second
FR	Full Rate
GFSK	Gaussian Frequency Shift Keying
GLONASS	Global Navigation Satellite System (Russia)
GMSK	Gaussian Minimum Shift Keying
GNSS	Global Navigation Satellite System
GPIO	General Purpose Input/Output
GPRS	General Packet Radio Service
GPS	Global Positioning System
GPU	Graphics Processing Unit
GRFC	Generic RF control
GSM	Global System for Mobile Communications
G.W.	Gross Weight
HD+	High Definition Plus
HR	Half Rate
HS	High Speed
HSDPA	High Speed Downlink Packet Access
HSPA	High Speed Packet Access
HSPA+	High-Speed Packet Access+

HSUPA	High Speed Uplink Packet Access
HT	High Throughput
IC	Integrated Circuit
IEEE	Institute of Electrical and Electronics Engineers
I/O	Input/Output
I2C	Inter-Integrated Circuit
IMT-2000	International Mobile Telecommunications for the year 2000
$I_O$max	Maximum Output Load Current
LCC	Leadless Chip Carrier
LCD	Liquid Crystal Display
LCM	LCD Module
LDO	Low Dropout Regulator
LE	Low Energy
LED	Light Emitting Diode
LGA	Land Grid Array
LNA	Low Noise Amplifier
LPDDR	Low-Power Double Data Rate
LTE	Long-Term Evolution
M2M	Machine to Machine
MAC	Media Access Control
MCS	Modulation and Coding Scheme
MEMS	Micro-Electro-Mechanical System
MIPI	Mobile Industry Processor Interface
MOQ	Minimum Order Quantity
MP	Megapixel

MPP	Multi Purpose Pin
MSL	Moisture Sensitivity Levels
N.W.	Net Weight
NFC	Near Field Communication
NTC	Negative Temperature Coefficient
OTA	Over-the-Air Upgrade
OTG	On-The-Go
OTP	One Time Programable
PA	Power Amplifier
PC	Personal Computer
PCB	Printed Circuit Board
PCL	Power Control Level
PCS	Personal Communication Service
PDA	Personal Digital Assistant
PDU	Protocol Data Unit
PHY	Physical Layer
PMU	Power Management Unit
POS	Point of Sale
PS	Proximity Sensor
PWM	Pulse Width Modulation
PSK	Phase Shift Keying
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RF	Radio Frequency
RFFE	RF Front End

RoHS	Restriction of Hazardous Substances
RTC	Real Time Clock
RTS	Request to Send
SAW	Surface Acoustic Wave
SCO	Synchronous Connection Oriented
SD	Secure Digital
SIMO	Single Input Multiple Output
SMD	Surface Mounting Device
SMS	Short Message Service
SMT	Surface Mount Technology
SPI	Serial Peripheral Interface
STA	Station
TDD	Time-Division Duplex
TP	Touch Panel
TTFF	Time to First Fix
TVS	Transient Voltage Suppressor
UART	Universal Asynchronous Receiver & Transmitter
UL	Uplink
UMTS	Universal Mobile Telecommunications System
USB	Universal Serial Bus
(U)SIM	(Universal) Subscriber Identity Module
VBAT	Voltage at Battery (Pin)
Vmax	Maximum Voltage
Vmin	Minimum Voltage
Vnom	Nominal Voltage

V_I	Voltage Input
V_{IH}min	Minimum High-level Input Voltage
V_{IL}max	Maximum Low-level Input Voltage
V_O	Voltage Output
$V_O$max	Maximum Output Voltage
V_{OH}max	Maximum High-level Output Voltage
V_{OH}min	Minimum High-level Output Voltage
V_{OL}max	Maximum Low-level Output Voltage
WAPI	WLAN Authentication and Privacy Infrastructure
WCDMA	Wideband Code Division Multiple Access
WLAN	Wireless Local Area Network
XO	Crystal Oscillator

FCC Certification Requirements.

According to the definition of mobile and fixed device is described in Part 2.1091(b), this device is a mobile device.

And the following conditions must be met:

1. This Modular Approval is limited to OEM installation for mobile and fixed applications only. The antenna installation and operating configurations of this transmitter, including any applicable source-based timeaveraging duty factor, antenna gain, and cable loss must satisfy MPE categorical Exclusion Requirements of 2.1091.
2. The EUT is a mobile device; maintain at least a 20 cm separation between the EUT and the user's body and must not transmit simultaneously with any other antenna or transmitter.
3. A label with the following statements must be attached to the host end product: This device contains FCC ID: XMR2022SC262RNA
4. This module must not transmit simultaneously with any other antenna or transmitter
5. The host end product must include a user manual that clearly defines operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.

For portable devices, in addition to the conditions 3 through 6 described above, a separate approval is required to satisfy the SAR requirements of FCC Part 2.1093

If the device is used for other equipment that separate approval is required for all other operating configurations, including portable configurations with respect to 2.1093 and different antenna configurations.

For this device, OEM integrators must be provided with labeling instructions of finished products.

Please refer to KDB784748 D01 v07, section 8. Page 6/7 last two paragraphs:
A certified modular has the option to use a permanently affixed label, or an electronic label. For a permanently affixed label, the module must be labeled with an FCC ID - Section 2.926 (see 2.2 Certification (labeling requirements) above). The OEM manual must provide clear instructions explaining to the OEM the labeling requirements, options and OEM user manual instructions that are required (see next paragraph).
For a host using a certified modular with a standard fixed label, if (1) the module's FCC ID is not visible when installed in the host, or (2) if the host is marketed so that end users do not have straightforward commonly used methods for access to remove the module so that the FCC ID of the module is visible; then an additional permanent label referring to the enclosed module: "Contains Transmitter Module FCC ID: XMR2022SC262RNA" or "Contains FCC ID: XMR2022SC262RNA" must be used. The host OEM user manual must also contain clear instructions on how end users can find and/or access the module and the FCC ID.
The final host / module combination may also need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.
The user's manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes, or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.
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.
Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.
To ensure compliance with all non-transmitter functions the host manufacturer is responsible for ensuring compliance with the module(s) installed and fully operational. For example, if a host was previously authorized as an unintentional radiator under the Supplier's Declaration of Conformity procedure without a transmitter certified module and a module is added, the host manufacturer is responsible for ensuring that the after the module is installed and operational the host continues to be compliant with the Part 15B unintentional radiator requirements.

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

IC Statement

IRSS-GEN
"This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions: (1) This device may not cause interference; and (2) This device must accept any interference, including interference that may cause undesired operation of the device." or "Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1) l’appareil ne doit pas produire de brouillage; 2) l’utilisateur de l’appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d’en compromettre le fonctionnement."
Déclaration sur l'exposition aux rayonnements RF
L'autre utilisé pour l'émetteur doit être installé pour fournir une distance de séparation d'au moins 20 cm de toutes les personnes et ne doit pas être colocalisé ou fonctionner conjointement avec une autre antenne ou un autre émetteur.
The host product shall be properly labeled to identify the modules within the host product.
The Innovation, Science and Economic Development Canada certification label of a module shall be clearly visible at all times when installed in the host product; otherwise, the host product must be labeled to display the Innovation, Science and Economic Development Canada certification number for the module, preceded by the word “Contains” or similar wording expressing the same meaning, as follows:
“Contains IC: 10224A-22SC262RNA” or “where: 10224A-22SC262RNA is the module’s certification number”.
Le produit hôte doit être correctement étiqueté pour identifier les modules dans le produit hôte.
L'étiquette de certification d'Innovation, Sciences et Développement économique Canada d'un module doit être clairement visible en tout temps lorsqu'il est installédans le produit hôte; sinon, le produit hôte doit porter une étiquette indiquant le numéro de certification d'Innovation, Sciences et Développement économique Canada pour le module, précédé du mot «Contient» ou d'un libellé semblable exprimant la même signification, comme suit:
"Contient IC: 10224A-22SC262RNA " ou "où: 10224A-22SC262RNA estle numéro de certification du module".

i. the device for operation in the band 5150–5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;

ii. for devices with detachable antenna(s), the maximum antenna gain permitted for devices in the bands 5250-5350 MHz and 5470-5725 MHz shall be such that the equipment still complies with the e.i.r.p. limit;

iii. for devices with detachable antenna(s), the maximum antenna gain permitted for devices in the band 5725-5850 MHz shall be such that the equipment still complies with the e.i.r.p. limits as appropriate;

iv. Omnidirectional antenna is recommended