EC200x&EC2x&EG2x-G &UC200T Series Compatible Design

UMTS/HSPA+/LTE Standard Module Series

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About the Document

Revision History

Version	Date	Author	Description
1.0	2020-07-10	Ward WANG/ Niko WU	Initial

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Quectel LTE Standard EC200x series module (EC200T series and EC200S-CN), EC2x series module (EC25 series, EC21 series, EC20 R2.1 and EC20-CN) and EG2x-G (EG21-G and EG25-G) module are compatible with UMTS/HSPA+ UC200T series module. This document briefly describes the compatible design among EC2x series, EG2x-G and UC200T series modules, which can help customers easily migrate from one to either of the others in their design and manufacturing.

2 General Descriptions

2.1. Product Description

The following tables show the general information and frequency bands of EC200x, EC2x, EG2x-G and UC200T series modules.

2.1.1. Module General Information

Table 1: Module General Information

Module Names	Pictures	Form Factors	Dimensions	Description
EC200T Series		80 LCC pads + 64 LGA pads	29 mm × 32 mm × 2.4 mm	LTE Standard module (EC200T-CN, EC200T-EU, EC200T-AU)
EC200S-CN		80 LCC pads + 64 LGA pads	29 mm × 32 mm × 2.4 mm	LTE Standard module

EC25 Series		80 LCC pads + 64 LGA pads	29 mm × 32 mm × 2.4 mm	LTE Standard module (EC25-E, EC25-EU, EC25-EUX, EC25-A, EC25-V, EC25-AF, EC25-AFX, EC25-AU, EC25-AUX, EC25-AUT, EC25-J, EC25-AUTL and EC25-MX)
EC21 Series		80 LCC pads + 64 LGA pads	29 mm × 32 mm × 2.4 mm	LTE Standard module (EC21-E, EC21-EU, EC21-EUX, EC21-A, EC21-V, EC21-AU, EC21-AUX, EC21-AUT, EC21-J and EC21-KL)
EC20 R2.1		80 LCC pads + 64 LGA pads	29 mm × 32 mm × 2.4 mm	LTE Standard module (EC20-CE R2.1)
EC20-CN		80 LCC pads + 64 LGA pads	29 mm × 32 mm × 2.4 mm	LTE Standard module
EG25-G		144 LGA pads	29 mm × 32 mm × 2.4 mm	LTE Standard module
EG21-G		144 LGA pads	29 mm × 32 mm × 2.4 mm	LTE Standard module

UC200T Series		80 LCC pads + 64 LGA pads	29 mm × 32 mm × 2.4 mm	UMTS/HSPA+ module (UC200T-EM, UC200T-GL)

2.1.2. Module Frequency Bands

Table 2: Module Frequency Bands

Module	LTE	UMTS	EVDO/CDMA	GSM	Rx-diversity [2]	GNSS
EC200T Series						
EC200T-CN	FDD: B1/B3/B5/B8 TDD: B34/B38/B39/B40/B41	WCDMA: B1/B5/B8	/	900/1800 MHz	Y[3]	/
EC200T-EU	FDD: B1/B3//B7/B8/B20/B28 TDD: B38/B40/B41	WCDMA: B1/B8	/	900/1800 MHz	Y[3]	/
EC200T-AU	FDD: B1/B2/B3/B4/B5/B7/B8/B28/B66 TDD: B40	WCDMA: B1/B2/B4/B5/B8	/	850/900/ 1800/1900 MHz	Y[3]	/
EC200S-CN						
EC200S-CN	FDD: B1/B3/B5/B8 TDD: B34/B38/B39/B40/B41	/	/	900/1800 MHz	/	/
EC25 Series						
EC25-E	FDD: B1/B3/B5/B7/B8/B20 TDD: B38/B40/B41	WCDMA: B1/B5/B8	/	900/1800 MHz	Y	GPS, GLONASS, BeiDou/Compass, Galileo, QZSS (Optional)
EC25-EU	FDD: B1/B3/B7/B8/B20/B28A TDD: B38/B40/B41	WCDMA: B1/B8	/	900/1800 MHz	Y	
EC25-EUX	FDD: B1/B3/B7/B8/B20/B28A TDD: B38/B40/B41	WCDMA: B1/B8	/	900/1800 MHz	Y	
EC25-A	FDD: B2/B4/B12	WCDMA: B2/B4/B5	/	/	Y	

EC25-V	FDD: B4/B13	/	/	/	Y	
EC25-AF	FDD: B2/B4/B5/B12/B13/B14/B66/B71	WCDMA: B2/B4/B5	/	/	Y	
EC25-AFX	FDD: B2/B4/B5/B12/B13/B14/B66/B71	WCDMA: B2/B4/B5	/	/	Y	
EC25-AU	FDD: B1/B2 [1]/B3/B4/B5/B7/B8/B28 TDD: B40	WCDMA: B1/B2/B5/B8	/	850/900/ 1800/1900 MHz	Y	
EC25-AUX	FDD: B1/B2 [1]/B3/B4/B5/B7/B8/B28 TDD: B40	WCDMA: B1/B2/B5/B8/B4	/	850/900/ 1800/1900 MHz	Y	
EC25-AUT	FDD: B1/B3/B5/B7/B28	WCDMA: B1/B5	/	/	Y	
EC25-J	FDD: B1/B3/B8/B18/B19/B26 TDD: B41	WCDMA: B1/B6/B8/B19	/	/	Y	
EC25-AUTL	FDD: B3/B7/B28	/	/	/	Y	/
EC25-MX	FDD: B2/B4/B5/B7/B28/B66	WCDMA: B2/B4/B5	/	/	Y	/
EC21 Series						
EC21-E	FDD: B1/B3/B5/B7/B8/B20	WCDMA: B1/B5/B8	/	900/1800 MHz	Y	GPS, GLONASS, BeiDou/Compass, Galileo, QZSS (Optional)
EC21-EU	FDD:B1/B3/B7/B8/B20/B28A	WCDMA: B1/B8	/	900/1800 MHz	Y	
EC21-EUX	FDD: B1/B3/B7/B8/B20/B28A	WCDMA: B1/B8	/	900/1800 MHz	Y	
EC21-A	FDD: B2/B4/B12	WCDMA: B2/B4/B5	/	/	Y	

EC21-V	FDD: B4/B13	/	/	/	Y	
EC21-AU	FDD: B1/B2 [1]/B3/B4/B5/B7/B8/B28 TDD: B40	WCDMA: B1/B2/B5/B8	/	850/900/ 1800/1900 MHz	Y	
EC21-AUX	FDD: B1/B2 [1]/B3/B4/B5/B7/B8/B28 TDD: B40	WCDMA: B1/B2/B5/B8/B4	/	850/900/ 1800/1900 MHz	Y	
EC21-AUT	FDD: B1/B3/B5/B7/B28	WCDMA: B1/B5	/	/	Y	
EC21-J	FDD: B1/B3/B8/B18/B19/B26	/	/	/	Y	/
EC21-KL	FDD: B1/B3/B5/B7/B8	/	/	/	Y	/
EC20 R2.1 & EC20-CN						
EC20-CE R2.1	FDD: B1/B3/B5/B8 TDD: B34/B38/B39/B40/B41	WCDMA: B1/B8 TD-SCDMA [2]: B34/B39	BC0	900/1800 MHz	Y	GPS, GLONASS, BeiDou/Compass, Galileo, QZSS (Optional)
EC20-CN	FDD: B1/B3/B5/B8 TDD: B34/B38/B39/B40/B41	WCDMA: B1/B8	/	900/1800 MHz	Y	/
EG25-G & EG21-G						
EG25-G	FDD: B1/B2/B3/B4/B5/B7/B8/B12/B13/ B18/B19/B20/B25/B26/B28 TDD: B38/B39/B40/B41	WCDMA: B1/B2/B4/B5/B6/ B8/B19	/	850/900/ 1800/1900 MHz	Y	GPS, GLONASS, BeiDou/Compass, Galileo, QZSS (Optional)
EG21-G	FDD: B1/B2/B3/B4/B5/B7/B8/B12/B13/ B18/B19/B20/B25/B26/B28 TDD: B38/B39/B40/B41	WCDMA: B1/B2/B4/B5/B6/ B8/B19	/	850/900/ 1800/1900 MHz	Y	

UC200T Series						
UC200T-EM	/	WCDMA: B1/B8	/	900/1800 MHz	/	/
UC200T-GL	/	WCDMA: B1/B2/B5/B6/B8	/	850/900/ 1800/1900 MHz	/	

NOTES

1. Y = supported (Rx-diversity is only supported by LTE & WCDMA and is not supported by TD-SCDMA).
2. [1] B2 band on EC21-AU/-AUX and EC25-AU/-AUX modules does not support Rx-diversity.
3. [2] means Rx-diversity is optional and is not supported by TD-SCDMA.
4. [3] means Rx-diversity is optional and is only supported by LTE.

2.2. Feature Overview

The following table compares the general features of EC200x, EC2x, EG2x-G and UC200T series modules.

Table 3: Feature Overview

Feature	EC200T Series	EC200S-CN	EC25 Series/EC21 Series/EC20 R2.1/EG25-G/EG21-G	EC20-CN	UC200T Series
Power Supply	3.4–4.5 V, Typ. = 3.8 V	3.4–4.5 V, Typ. = 3.8 V	3.3–4.3 V, Typ. = 3.8 V	3.3–4.3 V, Typ. = 3.8 V	3.4–4.5 V, Typ. = 3.8 V

Peak Current	VBAT_BB&RF: Max. 2.0 A	VBAT_BB&RF: Max. 2.0 A	VBAT_BB & RF: Max. 2.0 A	VBAT_BB & RF: Max. 2.0 A	VBAT_BB & RF: Max. 2.0 A
Sleep Current (USB Suspend)	2G: 2.11 mA @ DRX = 5 3G: 4.08 mA @ PF=64 4G: 3.52 mA LTE-TDD @ PF=64	2G: 1.03 mA @ DRX = 5 4G: 1.2 mA LTE-TDD @ PF=64	< 4 mA. For details, please refer to the Hardware Design document of these modules respectively.	< 4 mA. For details, please refer to the Hardware Design document of the module.	2G: 1.92 mA @ DRX = 5 3G: 4.38 mA @ PF = 64
LTE Features	Support up to LTE Cat 4. FDD: Max. 150 Mbps (DL), Max. 50 Mbps (UL) TDD: Max. 130 Mbps (DL), Max. 30 Mbps (UL)	Support up to LTE Cat 1. FDD: Max. 10 Mbps (DL), Max. 5 Mbps (UL) TDD: Max. 7.5 Mbps (DL), Max. 1 Mbps (UL)	**EC25 Series/EG25-G/ EC20 R2.1:** Support LTE Cat 4. FDD: Max. 150 Mbps (DL), Max. 50 Mbps (UL) TDD: Max. 130 Mbps (DL), Max. 30 Mbps (UL) **EC21 Series/EG21-G:** Support LTE Cat 1. FDD: Max. 10 Mbps (DL), Max. 5 Mbps (UL) TDD: Max. 7.5 Mbps (DL), Max. 1 Mbps (UL)	Support Cat 4. FDD: Max. 150 Mbps (DL) Max. 50 Mbps (UL) TDD: Max. 130 Mbps (DL) Max. 30 Mbps (UL)	/
Temperature Ranges	Operating temperature range: -35 to +75°C [1] Extended temperature range: -40 to +85°C [2] Storage temperature	Operating temperature range: -35 to +75°C [1] Extended temperature range: -40 to +85°C [2] Storage temperature	Operating temperature range: -35 to +75 °C [1] Extended temperature range: -40 to +85 °C [2] Storage temperature range: -40 to +90 °C	Operating temperature range: -35 to +75 °C [1] Extended temperature range: -40 to +85 °C [2] Storage temperature	Operating temperature range: -35 to +75 °C [1] Extended temperature range: -40 to +85 °C [2] Storage

	range: -40 to +90°C	range: -40 to +90°C		range: -40 to +90 °C	temperature range: -40 to +90 °C
UART Interface	Baud rate: reach up to 1 Mbps Flow control: RTS/CTS	Baud rate: reach up to 921600 bps Flow control: RTS/CTS	Baud rate: reach up to 921600 bps Flow control: RTS/CTS	Baud rate: reach up to 921600 bps Flow control: RTS/CTS	Baud rate: reach up to 1 Mbps Flow control: RTS/CTS
USB Interface	USB 2.0 HS (Slave only)	USB 2.0 HS (Slave only)	USB 2.0 (HS) (Slave only)	USB 2.0 (HS) (Slave only)	USB 2.0 (HS) (Slave only)
Digital Audio	PCM interface	PCM interface	PCM interface	PCM interface	PCM interface
I2C Interface	Supported	Supported	Supported	Supported	Supported
SD Interface	Support SD 3.0 protocol	Support SD 3.0 protocol *	Support SD 3.0 protocol	Support SD 3.0 protocol	Support SD 3.0 protocol*
WLAN/BT Interface	Support SDIO 3.0 interface for WLAN* (BT function is not supported)	Support SDIO 3.0 interface for WLAN* (BT function is not supported)	Supported (Optional)	Support SDIO 3.0 interface for WLAN (BT function is not supported)	/
SGMII Interface	/	/	Support 10 Mbps/100 Mbps/1000 Mbps Ethernet working modes (Optional)	Support 10 Mbps/100 Mbps/1000 Mbps Ethernet work modes	/
(U)SIM Card Detection	YES	YES	Supported	Supported	Supported
GNSS	/	/	GPS, GLONASS, BeiDou/Compass,	/	/

			Galileo, QZSS (Optional)		
Firmware Upgrade	USB interface and FOTA	USB interface and DFOTA	Via USB interface or DFOTA	Via USB interface or DFOTA	Via USB interface or FOTA

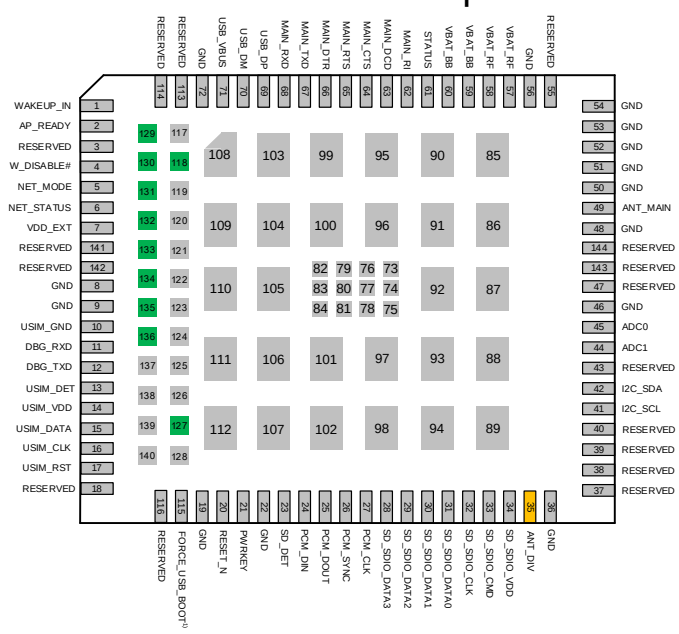
NOTES

1. [1)] Within operating temperature range, the module is 3GPP compliant.
2. [2)] Within extended temperature range, the module remains the ability to establish and maintain a voice, SMS, data transmission, etc. There is no unrecoverable malfunction. There are also no effects on radio spectrum and no harm to radio network. Only one or more parameters like P_{out} might reduce in their value and exceed the specified tolerances. When the temperature returns to normal operating temperature levels, the module will meet 3GPP specifications again.
3. "*" means under development.

2.3. Pin Assignment

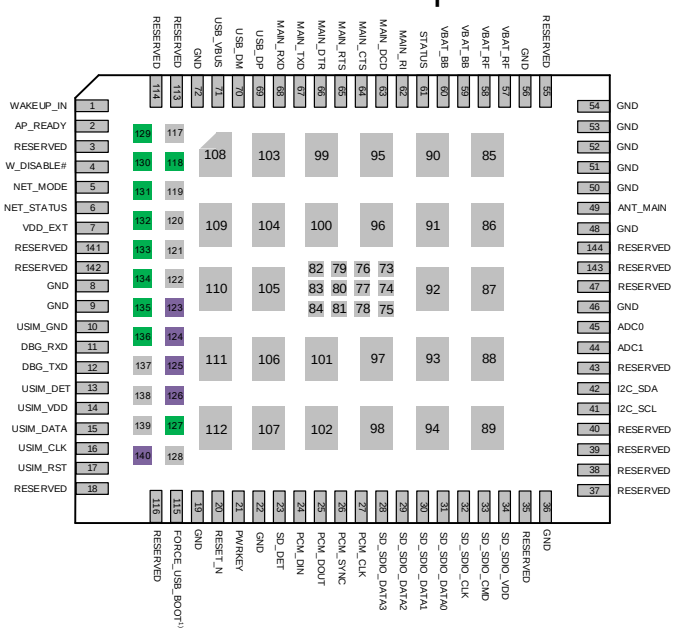
The following figures show the pin assignment of EC200x, EC2x, EG2x-G and UC200T series modules.

EC200T Series Top View

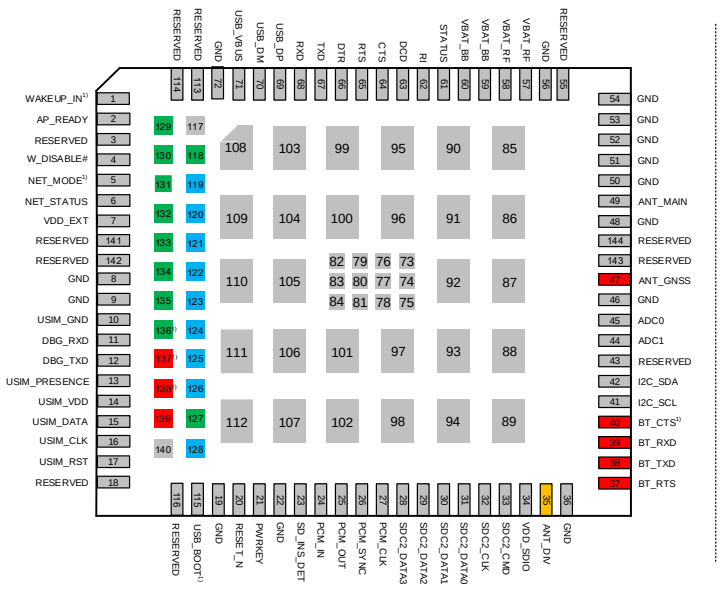


EC25 Series/EC21 Series/
EC20 R2.1/EG25-G/EG21-G
Top View

EC200S-CN Top View



EC20-CN Top View



UC200T Series Top View

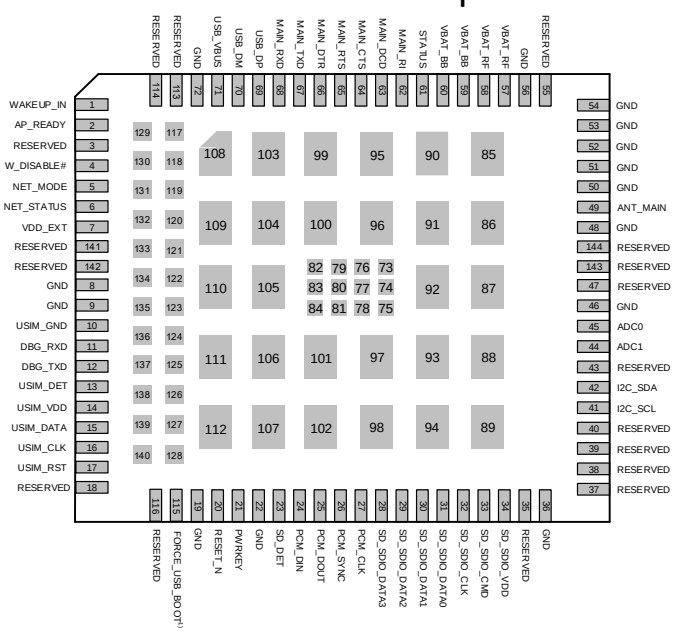


Figure 1: EC200x&EC2x&EG2x-G&&UC200T Series Pin Assignment

NOTES

1. The pins in red are the additional ones of EC25 series/EC21 series/EC20 R2.1/EG25-G/EG21-G modules as compared with EC20-CN.
2. The pins in red and blue are the additional ones of EC25 series/EC21 series/EC20 R2.1/EG25-G/EG21-G modules as compared with EC200T series modules.
3. The pins in red, green, orange, and blue are the additional ones of EC25 series/EC21 series/EC20 R2.1/EG25-G/EG21-G modules as compared with UC200T series modules.
4. The pins in purple are the exclusive functions of EC200S-CN module as compared with EC25 series/EC21 series/EC20 R2.1/EG25-G/EG21-G/UC200T series modules. For more detail, please refer to ***document [16]*** and ***document [17]***.

3 Pin Description

This chapter describes the pin definition of EC200x, EC2x, EG2x-G and UC200T series modules.

Table 4: I/O Parameters Definition

Symbol	Description
AI	Analog Input
AO	Analog Output
DI	Digital Input
DO	Digital Output
IO	Bidirectional
OD	Open Drain
PI	Power Input
PO	Power Output

3.1. Pin Description

The following tables show the pin definition of EC200x, EC2x, EG2x-G and UC200T series modules.

Table 5: Pin Definition

EC200T Series				EC200S-CN				EC25 Series/EC21 Series/EC20 R2.1/ EG25-G/EG21-G				EC20-CN				UC200T Series			
Pin No.	Pin Name	I/O	Power Domain	Pin No.	Pin Name	I/O	Power Domain	Pin No.	Pin Name	I/O	Power Domain	Pin No.	Pin Name	I/O	Power Domain	Pin No.	Pin Name	I/O	Power Domain
1	WAKEUP_IN	DI	1.8 V	1	WAKEUP_IN	DI	1.8 V	1	WAKEUP_IN	DI	1.8 V	1	WAKEUP_IN	DI	1.8 V	1	WAKEUP_IN	DI	1.8 V
2	AP_READY	DI	1.8 V	2	AP_READY	DI	1.8 V	2	AP_READY	DI	1.8 V	2	AP_READY	DI	1.8 V	2	AP_READY	DI	1.8 V
4	W_DISABLE#	DI	1.8 V	4	W_DISABLE#	DI	1.8 V	4	W_DISABLE#	DI	1.8 V	4	W_DISABLE#	DI	1.8 V	4	W_DISABLE#	DI	1.8 V
5	NET_MODE	DO	1.8 V	5	NET_MODE	DO	1.8 V	5	NET_MODE	DO	1.8 V	5	NET_MODE	DO	1.8 V	5	NET_MODE	DO	1.8 V
6	NET_STATUS	DO	1.8 V	6	NET_STATUS	DO	1.8 V	6	NET_STATUS	DO	1.8 V	6	NET_STATUS	DO	1.8 V	6	NET_STATUS	DO	1.8 V
7	VDD_EXT	PO	1.8 V	7	VDD_EXT	PO	1.8 V	7	VDD_EXT	PO	1.8 V	7	VDD_EXT	PO	1.8 V	7	VDD_EXT	PO	1.8 V
8	GND	/	GND	8	GND	/	GND	8	GND	/	GND	8	GND	/	GND	8	GND	/	GND
9	GND	/	GND	9	GND	/	GND	9	GND	/	GND	9	GND	/	GND	9	GND	/	GND
10	USIM_GND	/	GND	10	USIM_GND	/	GND	10	USIM_GND	/	GND	10	USIM_GND	/	GND	10	USIM_GND	/	GND
11	DBG_RXD	DI	1.8 V	11	DBG_RXD	DI	1.8 V	11	DBG_RXD	DI	1.8 V	11	DBG_RXD	DI	1.8 V	11	DBG_RXD	DI	1.8 V
12	DBG_TXD	DO	1.8 V	12	DBG_TXD	DO	1.8 V	12	DBG_TXD	DO	1.8 V	12	DBG_TXD	DO	1.8 V	12	DBG_TXD	DO	1.8 V
13	USIM_DET	DI	1.8 V	13	USIM_DET	DI	1.8 V	13	USIM_ PRESENCE	DI	1.8 V	13	USIM_ PRESENCE	DI	1.8 V	13	USIM_DET	DI	1.8 V
14	USIM_VDD	PO	1.8/3.0 V	14	USIM_VDD	PO	1.8/3.0 V	14	USIM_VDD	PO	1.8/3.0 V	14	USIM_VDD	PO	1.8/3.0 V	14	USIM_VDD	PO	1.8/3.0 V
15	USIM_DATA	IO	1.8/3.0 V	15	USIM_DATA	IO	1.8/3.0 V	15	USIM_DATA	IO	1.8/3.0 V	15	USIM_DATA	IO	1.8/3.0 V	15	USIM_DATA	IO	1.8/3.0 V
16	USIM_CLK	DO	1.8/3.0 V	16	USIM_CLK	DO	1.8/3.0 V	16	USIM_CLK	DO	1.8/3.0 V	16	USIM_CLK	DO	1.8/3.0 V	16	USIM_CLK	DO	1.8/3.0 V
17	USIM_RST	DO	1.8/3.0 V	17	USIM_RST	DO	1.8/3.0 V	17	USIM_RST	DO	1.8/3.0 V	17	USIM_RST	DO	1.8/3.0 V	17	USIM_RST	DO	1.8/3.0 V
19	GND	/	GND	19	GND	/	GND	19	GND	/	GND	19	GND	/	GND	19	GND	/	GND
20	RESET_N	DI	1.8 V	20	RESET_N	DI	1.8 V	20	RESET_N	DI	1.8 V	20	RESET_N	DI	1.8 V	20	RESET_N	DI	1.8 V
21	PWRKEY	DI	VBAT	21	PWRKEY	DI	VBAT	21	PWRKEY	DI	The output voltage is	21	PWRKEY	DI	The output voltage is	21	PWRKEY	DI	VBAT

										0.8 V when the module is powered on.				0.8 V when the module is powered on.				
22	GND	/	GND	22	GND	/	GND	22	GND	/	GND	22	GND	/	GND	22	GND	/	GND
23	SD_DET	DI	1.8/2.8V	23	SD_DET	DI	1.8/2.8V	23	SD_INS_DET	DI	1.8 V	23	SD_INS_DET	DI	1.8 V	23	SD_DET	DI	1.8/2.8V
24	PCM_DIN	DI	1.8 V	24	PCM_DIN	DI	1.8 V	24	PCM_IN	DI	1.8 V	24	PCM_IN	DI	1.8 V	24	PCM_DIN	DI	1.8V
25	PCM_DOUT	DO	1.8 V	25	PCM_DOUT	DO	1.8 V	25	PCM_OUT	DO	1.8 V	25	PCM_OUT	DO	1.8 V	25	PCM_DOUT	DO	1.8V
26	PCM_SYNC	IO	1.8 V	26	PCM_SYNC	IO	1.8 V	26	PCM_SYNC	IO	1.8 V	26	PCM_SYNC	IO	1.8 V	26	PCM_SYNC	IO	1.8V
27	PCM_CLK	IO	1.8 V	27	PCM_CLK	IO	1.8 V	27	PCM_CLK	IO	1.8 V	27	PCM_CLK	IO	1.8 V	27	PCM_CLK	IO	1.8V
28	SD_SDIO_DATA3	IO	1.8/2.8 V	28	SD_SDIO_DATA3	IO	1.8/2.8 V	28	SDC2_DATA3	IO	1.8/2.85 V	28	SDC2_DATA3	IO	1.8/2.85 V	28	SD_SDIO_DATA3	IO	1.8/2.8 V
29	SD_SDIO_DATA2	IO	1.8/2.8 V	29	SD_SDIO_DATA2	IO	1.8/2.8 V	29	SDC2_DATA2	IO	1.8/2.85 V	29	SDC2_DATA2	IO	1.8/2.85 V	29	SD_SDIO_DATA2	IO	1.8/2.8 V
30	SD_SDIO_DATA1	IO	1.8/2.8 V	30	SD_SDIO_DATA1	IO	1.8/2.8 V	30	SDC2_DATA1	IO	1.8/2.85 V	30	SDC2_DATA1	IO	1.8/2.85 V	30	SD_SDIO_DATA1	IO	1.8/2.8 V
31	SD_SDIO_DATA0	IO	1.8/2.8 V	31	SD_SDIO_DATA0	IO	1.8/2.8 V	31	SDC2_DATA0	IO	1.8/2.85 V	31	SDC2_DATA0	IO	1.8/2.85 V	31	SD_SDIO_DATA0	IO	1.8/2.8 V
32	SD_SDIO_CLK	DO	1.8/2.8 V	32	SD_SDIO_CLK	DO	1.8/2.8 V	32	SDC2_CLK	DO	1.8/2.85 V	32	SDC2_CLK	DO	1.8/2.85 V	32	SD_SDIO_CLK	DO	1.8/2.8 V
33	SD_SDIO_CMD	IO	1.8/2.8 V	33	SD_SDIO_CMD	IO	1.8/2.8 V	33	SDC2_CMD	IO	1.8/2.85 V	33	SDC2_CMD	IO	1.8/2.85 V	33	SD_SDIO_CMD	IO	1.8/2.8 V
34	SD_SDIO_VDD	PO	1.8/2.8 V	34	SD_SDIO_VDD	PO	1.8/2.8 V	34	VDD_SDIO	PO	1.8/2.85 V	34	VDD_SDIO	PO	1.8/2.85 V	34	SD_SDIO_VDD	PO	1.8/2.8 V
35	ANT_DIV	AI	/	35	RESERVED	/	-	35	ANT_DIV	AI	/	35	ANT_DIV	AI	/	35	RESERVED	/	/
36	GND	/	GND	36	GND	/	GND	36	GND	/	GND	36	GND	/	GND	36	GND	/	GND
37	RESERVED	/	/	37	RESERVED	/	/	37	BT_RTS	DI	1.8 V	37	RESERVED	/	/	37	RESERVED	/	/
38	RESERVED	/	/	38	RESERVED	/	/	38	BT_TXD	DO	1.8 V	38	RESERVED	/	/	38	RESERVED	/	/
39	RESERVED	/	/	39	RESERVED	/	/	39	BT_RXD	DI	1.8 V	39	RESERVED	/	/	39	RESERVED	/	/
40	RESERVED	/	/	40	RESERVED	/	/	40	BT_CTS	DO	1.8 V	40	RESERVED	/	/	40	RESERVED	/	/
41	I2C_SCL	OD	An external 1.8 V pull-up resistor is required.	41	I2C_SCL	OD	An external 1.8 V pull-up resistor is required.	41	I2C_SCL	OD	An external 1.8 V pull-up resistor is required.	41	I2C_SCL	OD	An external 1.8 V pull-up resistor is required.	41	I2C_SCL	OD	An external 1.8 V pull-up resistor is required.

42	I2C_SDA	OD	An external 1.8 V pull-up resistor is required.	42	I2C_SDA	OD	An external 1.8 V pull-up resistor is required.	42	I2C_SDA	OD	An external 1.8 V pull-up resistor is required.	42	I2C_SDA	OD	An external 1.8 V pull-up resistor is required.	42	I2C_SDA	OD	An external 1.8 V pull-up resistor is required.
44	ADC1	AI	0–VBAT_BB	44	ADC1	AI	0–VBAT_BB	44	ADC1	AI	0.3–VBAT_BB	44	ADC1	AI	0.3–VBAT_BB	44	ADC1	AI	0–VBAT_BB
45	ADC0	AI	0–VBAT_BB	45	ADC0	AI	0–VBAT_BB	45	ADC0	AI	0.3–VBAT_BB	45	ADC0	AI	0.3–VBAT_BB	45	ADC0	AI	0–VBAT_BB
46	GND	/	GND	46	GND	/	GND	46	GND	/	GND	46	GND	/	GND	46	GND	/	GND
47	RESERVED	/	/	47	RESERVED	/	/	47	ANT_GNSS	AI	/	47	RESERVED	/	/	47	RESERVED	/	/
48	GND	/	GND	48	GND	/	GND	48	GND	/	GND	48	GND	/	GND	48	GND	/	GND
49	ANT_MAIN	IO	/	49	ANT_MAIN	IO	/	49	ANT_MAIN	IO	/	49	ANT_MAIN	IO	/	49	ANT_MAIN	IO	/
50–54	GND	/	GND	50–54	GND	/	GND	50–54	GND	/	GND	50–54	GND	/	GND	50–54	GND	/	GND
56	GND	/	GND	56	GND	/	GND	56	GND	/	GND	56	GND	/	GND	56	GND	/	GND
57	VBAT_RF	PI	3.4–4.5 V	57	VBAT_RF	PI	3.4–4.5 V	57	VBAT_RF	PI	3.3–4.3 V	57	VBAT_RF	PI	3.3–4.3 V	57	VBAT_RF	PI	3.4–4.5 V
58	VBAT_RF	PI	3.4–4.5 V	58	VBAT_RF	PI	3.4–4.5 V	58	VBAT_RF	PI	3.3–4.3 V	58	VBAT_RF	PI	3.3–4.3 V	58	VBAT_RF	PI	3.4–4.5 V
59	VBAT_BB	PI	3.4–4.5 V	59	VBAT_BB	PI	3.4–4.5 V	59	VBAT_BB	PI	3.3–4.3 V	59	VBAT_BB	PI	3.3–4.3 V	59	VBAT_BB	PI	3.4–4.5 V
60	VBAT_BB	PI	3.4–4.5 V	60	VBAT_BB	PI	3.4–4.5 V	60	VBAT_BB	PI	3.3–4.3 V	60	VBAT_BB	PI	3.3–4.3 V	60	VBAT_BB	PI	3.4–4.5 V
61	STATUS	OD	/	61	STATUS	OD	/	61	STATUS	OD	/	61	STATUS	OD	/	61	STATUS	OD	/
62	MAIN_RI	DO	1.8 V	62	MAIN_RI	DO	1.8 V	62	RI	DO	1.8 V	62	RI	DO	1.8 V	62	MAIN_RI	DO	1.8 V
63	MAIN_DCD	DO	1.8 V	63	MAIN_DCD	DO	1.8 V	63	DCD	DO	1.8 V	63	DCD	DO	1.8 V	63	MAIN_DCD	DO	1.8 V
64	MAIN_CTS	DO	1.8 V	64	MAIN_CTS	DO	1.8 V	64	CTS	DO	1.8 V	64	CTS	DO	1.8 V	64	MAIN_CTS	DO	1.8 V
65	MAIN_RTS	DI	1.8 V	65	MAIN_RTS	DI	1.8 V	65	RTS	DI	1.8 V	65	RTS	DI	1.8 V	65	MAIN_RTS	DI	1.8 V
66	MAIN_DTR	DI	1.8 V	66	MAIN_DTR	DI	1.8 V	66	DTR	DI	1.8 V	66	DTR	DI	1.8 V	66	MAIN_DTR	DI	1.8 V
67	MAIN_TXD	DO	1.8 V	67	MAIN_TXD	DO	1.8 V	67	TXD	DO	1.8 V	67	TXD	DO	1.8 V	67	MAIN_TXD	DO	1.8 V
68	MAIN_RXD	DI	1.8 V	68	MAIN_RXD	DI	1.8 V	68	RXD	DI	1.8 V	68	RXD	DI	1.8 V	68	MAIN_RXD	DI	1.8 V
69	USB_DP	IO	/	69	USB_DP	IO	/	69	USB_DP	IO	/	69	USB_DP	IO	/	69	USB_DP	IO	/

70	USB_DM	IO	/	70	USB_DM	IO	/	70	USB_DM	IO	/	70	USB_DM	IO	/	70	USB_DM	IO	/
71	USB_VBUS	AI	3.0–5.25 V	71	USB_VBUS	AI	3.0–5.25 V	71	USB_VBUS	AI	3.0–5.25 V	71	USB_VBUS	AI	3.0–5.25 V	71	USB_VBUS	AI	3.0–5.25 V
72	GND	/	GND	72	GND	/	GND	72	GND	/	GND	72	GND	/	GND	72	GND	/	GND
85–112	GND	/	GND	85–112	GND	/	GND	85–112	GND	/	GND	85–112	GND	/	GND	85–112	GND	/	GND
115	FORCE_USB_BOOT	DI	1.8 V	115	FORCE_USB_BOOT	DI	1.8 V	115	USB_BOOT	DI	1.8 V	115	USB_BOOT	DI	1.8 V	115	FORCE_USB_BOOT	DI	1.8 V
118	WLAN_SLP_CLK	DO	1.8 V	118	WLAN_SLP_CLK	DO	1.8 V	118	WLAN_SLP_CLK	DO	1.8 V	118	WLAN_SLP_CLK	DO	1.8 V	118	RESERVED	/	/
119	RESERVED	/	/	119	RESERVED	/	/	119	EPHY_RST_N	DO	1.8/2.85 V	119	EPHY_RST_N	DO	1.8/2.85 V	119	RESERVED	/	/
120	RESERVED	/	/	120	RESERVED	/	/	120	EPHY_INT_N	DI	1.8 V	120	EPHY_INT_N	DI	1.8 V	120	RESERVED	/	/
121	RESERVED	/	/	121	RESERVED	/	/	121	SGMII_MDATA	IO	1.8/2.85 V	121	SGMII_MDATA	IO	1.8/2.85 V	121	RESERVED	/	/
122	RESERVED	/	/	122	RESERVED	/	/	122	SGMII_MCLK	DO	1.8/2.85 V	122	SGMII_MCLK	DO	1.8/2.85 V	122	RESERVED	/	/
123	RESERVED	/	/	123	SPK_N	AO	/	123	SGMII_TX_M	AO	/	123	SGMII_TX_M	AO	/	123	RESERVED	/	/
124	RESERVED	/	/	124	SPK_P	AO	/	124	SGMII_TX_P	AO	/	124	SGMII_TX_P	AO	/	124	RESERVED	/	/
125	RESERVED	/	/	125	MIC_P	AI	/	125	SGMII_RX_P	AI	/	125	SGMII_RX_P	AI	/	125	RESERVED	/	/
126	RESERVED	/	/	126	MIC_N	AI	/	126	SGMII_RX_M	AI	/	126	SGMII_RX_M	AI	/	126	RESERVED	/	/
127	WLAN_PWR_EN	DO	1.8 V	127	WLAN_PWR_EN	DO	1.8 V	127	PM_ENABLE	DO	1.8 V	127	PM_ENABLE	DO	1.8 V	127	RESERVED	/	/
128	RESERVED	/	/	128	RESERVED	/	/	128	USIM2_VDD	PO	1.8/2.85 V	128	USIM2_VDD	PO	1.8/2.85 V	128	RESERVED	/	/
129	WLAN_SDIO_DATA3	IO	1.8 V	129	WLAN_SDIO_DATA3	IO	1.8 V	129	SDC1_DATA3	IO	1.8 V	129	SDC1_DATA3	IO	1.8 V	129	RESERVED	/	/
130	WLAN_SDIO_DATA2	IO	1.8 V	130	WLAN_SDIO_DATA2	IO	1.8 V	130	SDC1_DATA2	IO	1.8 V	130	SDC1_DATA2	IO	1.8 V	130	RESERVED	/	/
131	WLAN_SDIO_DATA1	IO	1.8 V	131	WLAN_SDIO_DATA1	IO	1.8 V	131	SDC1_DATA1	IO	1.8 V	131	SDC1_DATA1	IO	1.8 V	131	RESERVED	/	/
132	WLAN_SDIO_DATA0	IO	1.8 V	132	WLAN_SDIO_DATA0	IO	1.8 V	132	SDC1_DATA0	IO	1.8 V	132	SDC1_DATA0	IO	1.8 V	132	RESERVED	/	/
133	WLAN_SDIO_CLK	DO	1.8 V	133	WLAN_SDIO_CLK	DO	1.8 V	133	SDC1_CLK	DO	1.8 V	133	SDC1_CLK	DO	1.8 V	133	RESERVED	/	/
134	WLAN_SDIO_CMD	DO	1.8 V	134	WLAN_SDIO_CMD	DO	1.8 V	134	SDC1_CMD	DO	1.8 V	134	SDC1_CMD	DO	1.8 V	134	RESERVED	/	/
135	WLAN_WAKE	DI	1.8 V	135	WLAN_WAKE	DI	1.8 V	135	WAKE_ON_WIRELESS	DI	1.8 V	135	WAKE_ON_WIRELESS	DI	1.8 V	135	RESERVED	/	/

136	WLAN_EN	DO	1.8 V	136	WLAN_EN	DO	1.8 V	136	WLAN_EN	DO	1.8 V	136	WLAN_EN	DO	1.8 V	136	RESERVED	/	/
137	RESERVED	/	/	137	RESERVED	/	/	137	COEX_UART_RX	DI	1.8 V	137	RESERVED	/	/	137	RESERVED	/	/
138	RESERVED	/	/	138	RESERVED	/	/	138	COEX_UART_TX	DO	1.8 V	138	RESERVED	/	/	138	RESERVED	/	/
139	RESERVED	/	/	139	RESERVED	/	/	139	BT_EN	DO	1.8 V	139	RESERVED	/	/	139	RESERVED	/	/
140	RESERVED	/	/	140	MICBIAS	PO	/	140	RESERVED	/	/	140	RESERVED	/	/	140	RESERVED	/	/
3, 18, 43, 55, 73–84, 113, 114, 116, 117, 141–144	RESERVED	/	/	3, 18, 43, 55, 73–84, 113, 114, 116, 117, 141–144	RESERVED	/	/	3, 18, 43, 55, 73–84, 113, 114, 116, 117, 141–144	RESERVED	/	/	3, 18, 43, 55, 73–84, 113, 114, 116, 117, 141–144	RESERVED	/	/	3, 18, 43, 55, 73–84, 113, 114, 116, 117, 141–144	RESERVED	/	/

NOTES

1. Keep all reserved and unused pins unconnected.
2. All GND pins should be connected to ground.
3. For comprehensive and detailed definition of pin 117–140 for Wi-Fi and SGMII functions, please refer to ***document [6]***.
4. The pins in red indicate that the footprint is compatible but the functions or voltage domain are different between these modules.

4 Hardware Reference Design

The following chapters describe the compatible design among EC200x, EC2x, EG25-G and UC200T series modules on main functionalities.

4.1. Power Supply

Power design for a module is very crucial, as the performance of the module largely depends on the power source. The power supply for EC200x, EC2x, EG2x-G and UC200T series should be able to provide sufficient current up to 2.0 A.

The following figure shows a reference design for +5.0 V input power source. The typical output of the power supply is about 3.8 V and the maximum load current is 3.0 A.

In addition, in order to avoid the damage caused by electric surge and ESD, it is suggested that a TVS diode with low reverse stand-off voltage V_{RWM}, low clamping voltage V_C and high reverse peak pulse current I_{PP} should be used. The following figures show a reference design for +5.0 V input power source and the star structure of the power supply.

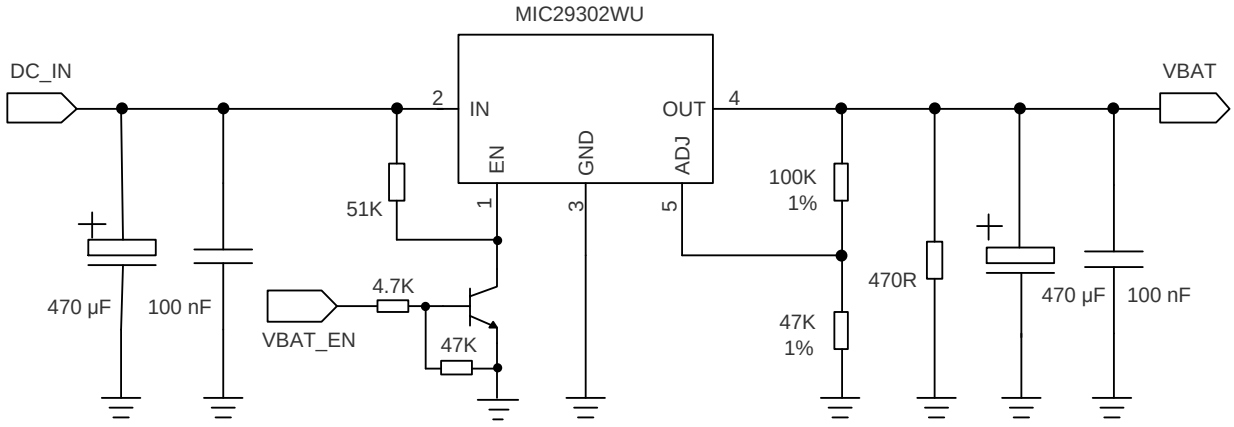


Figure 2: Reference Circuit of Power Supply

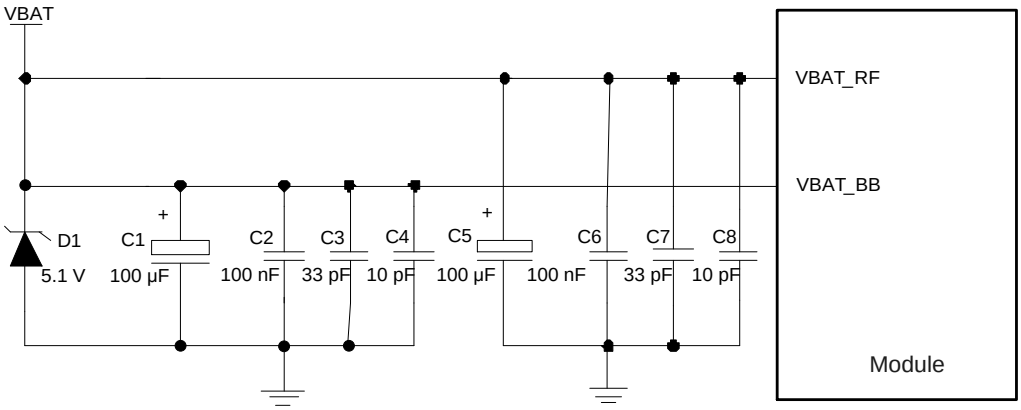


Figure 3: Star Structure of the Power Supply

4.2. Power-on and off Circuits

The following is a reference design of the power-on and off circuits for EC200x, EC2x, EG2x-G and UC200T series modules.

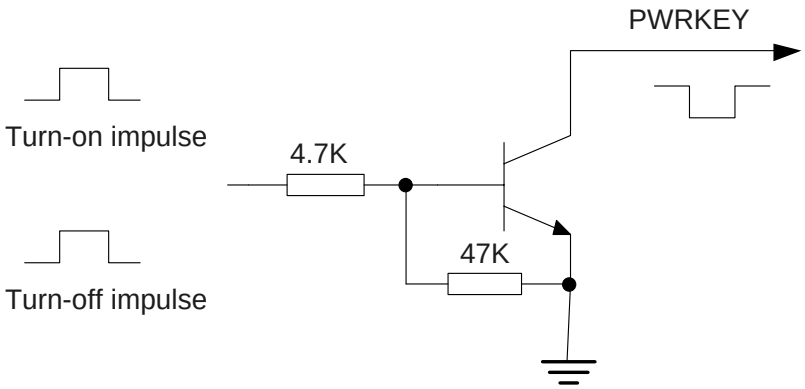


Figure 4: Turn on and off the Module Using Driving Circuit

The power-on scenarios of EC200x, EC2x, EG2x-G and UC200T series modules are illustrated in the figure below.

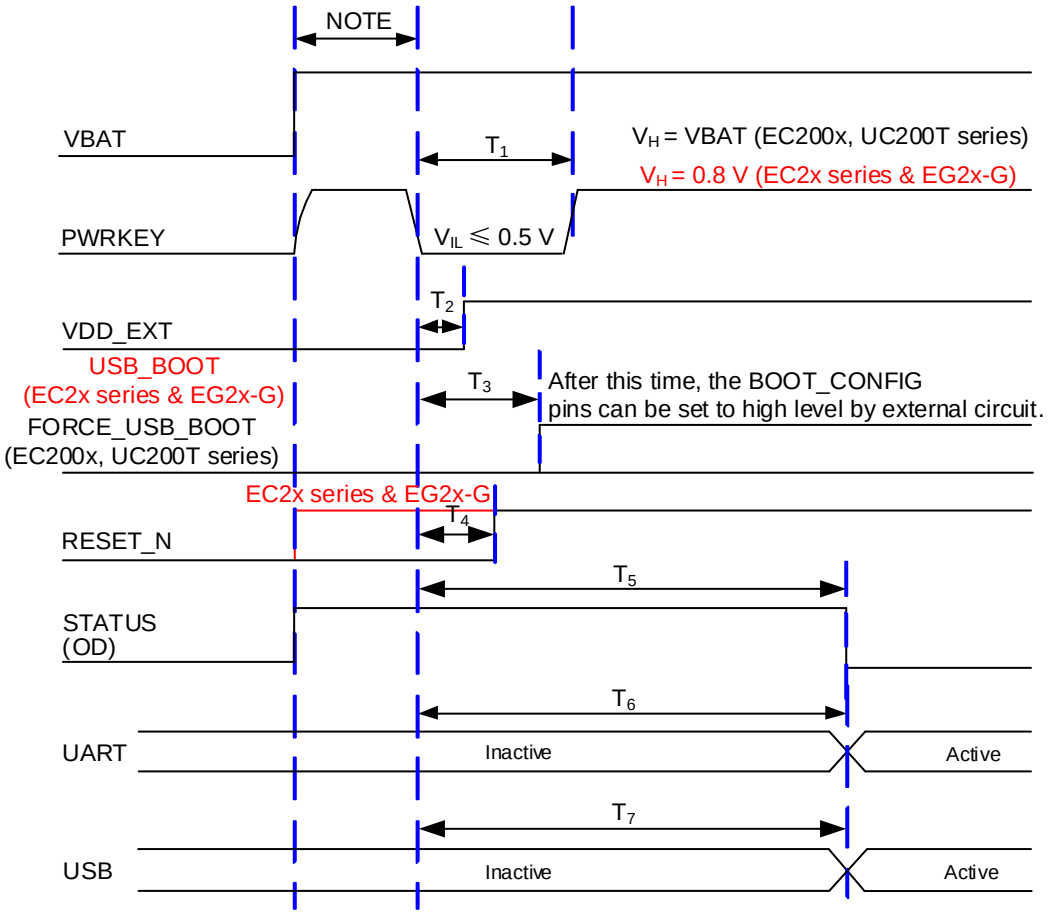


Figure 5: Power-on Scenarios of Modules

The power-on timing of EC200x, EC2x, EG2x-G and UC200T series modules are illustrated in the table below.

Table 6: Power-on Timing of EC200x, EC2x, EG2x-G and UC200T Series

Module	T_1	T_2	T_3	T_4	T_5	T_6	T_7
EC200T Series	≥ 500 ms	5 ms (Typ.)	≥ 100 ms	22 ms (Typ.)	≥ 10 s	≥ 10 s	≥ 10 s
EC200S-CN	≥ 500 ms	5 ms (Typ.)	≥ 100 ms	22 ms (Typ.)	≥ 10 s	≥ 10 s	≥ 10 s
EC25 Series/ EC21 Series/ EC20 R2.1 EG2x-G EC20-CN	≥ 500 ms	100 ms (Typ.)	≥ 200 ms	/	≥ 2.5 s	≥ 12 s	≥ 13 s

UC200T Series	≥ 500 ms	5 ms (Typ.)	≥ 100 ms	22 ms (Typ.)	≥ 10 s	≥ 10 s	≥ 10 s

NOTE

Please make sure that VBAT is stable before pulling down PWRKEY pin. It is recommended that the time between powering up VBAT and pulling down PWRKEY pin is no less than 30 ms.

It is also a safe way to use **AT+QPOWD** command to turn off the module, which is similar to turning off the module via PWRKEY pin.

Please refer to ***document [18]*** for details about **AT+QPOWD** command.

The power-off scenarios of EC200x, EC2x, EG2x-G and UC200T series modules are illustrated in the figure below.

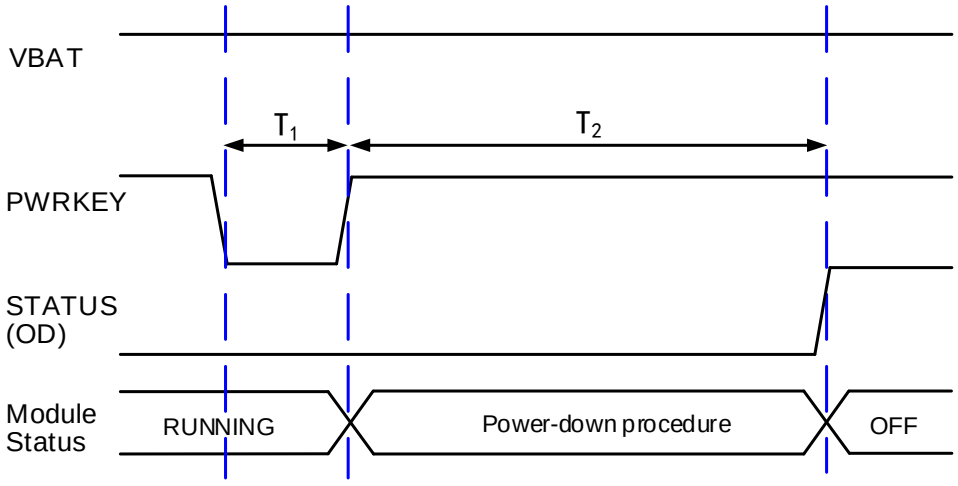


Figure 6: Power-off Scenarios of Modules

The power-off timing by PWRKEY of EC200x, EC2x, EG2x-G and UC200T series modules is illustrated in the table below.

Table 7: Power-off Timing by PWRKEY of EC200x, EC2x, EG2x-G and UC200T Series

Module	T_1	T_2
EC200T Series	≥ 650 ms	≥ 2 s
EC200S-CN	≥ 650 ms	≥ 2 s
EC25 Series/ EC21 Series/	≥ 650 ms	≥ 29.5 s

EC20 R2.1/ EC20-CN EG2x-G		
UC200T series	≥ 650 ms	≥ 2 s

4.3. Reset Circuit

When it is failed to turn off the module by both command **AT+QPOWD** and PWRKEY pin, the RESET_N can be used to reset the module. The following is a reference design for EC200x, EC2x, EG2x-G and UC200T's reset circuit.

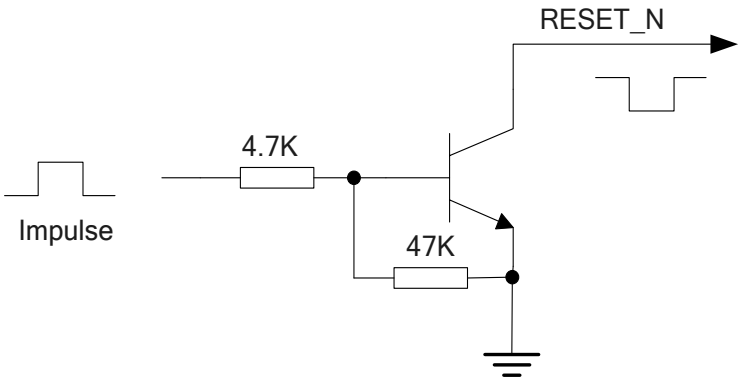


Figure 7: Reset the Module Using Driving Circuit

The reset scenarios of EC200x, EC2x, EG2x-G and UC200T series modules are illustrated in the figure below.

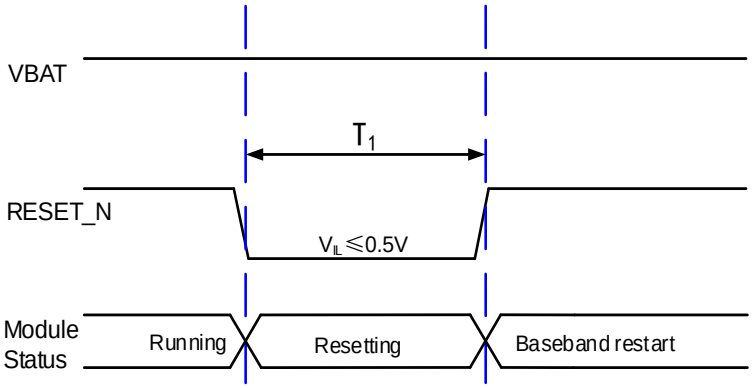


Figure 8: Reset Scenarios of Modules

The reset timing of EC200x, EC2x, EG2x-G and UC200T series modules is illustrated in the table below.

Table 8: Reset Timing of EC200x, EC2x, EG2x-G and UC200T Series

Module	T_1
EC200T Series	≥ 300 ms
EC200S-CN	≥ 300 ms
EC25 Series/ EC21 Series/ EC20 R2.1/ EC20-CN EG2x-G	150 ms ≤ T_1 ≤ 460 ms
UC200T Series	≥ 300 ms

4.4. (U)SIM Interface

The (U)SIM interface of EC200x, EC2x, EG2x-G and UC200T series modules circuitry meets ETSI and IMT-2000 requirements. Both 1.8V and 3.0V (U)SIM cards are supported. The following figure shows a reference design for (U)SIM interface with an 8-pin (U)SIM card connector

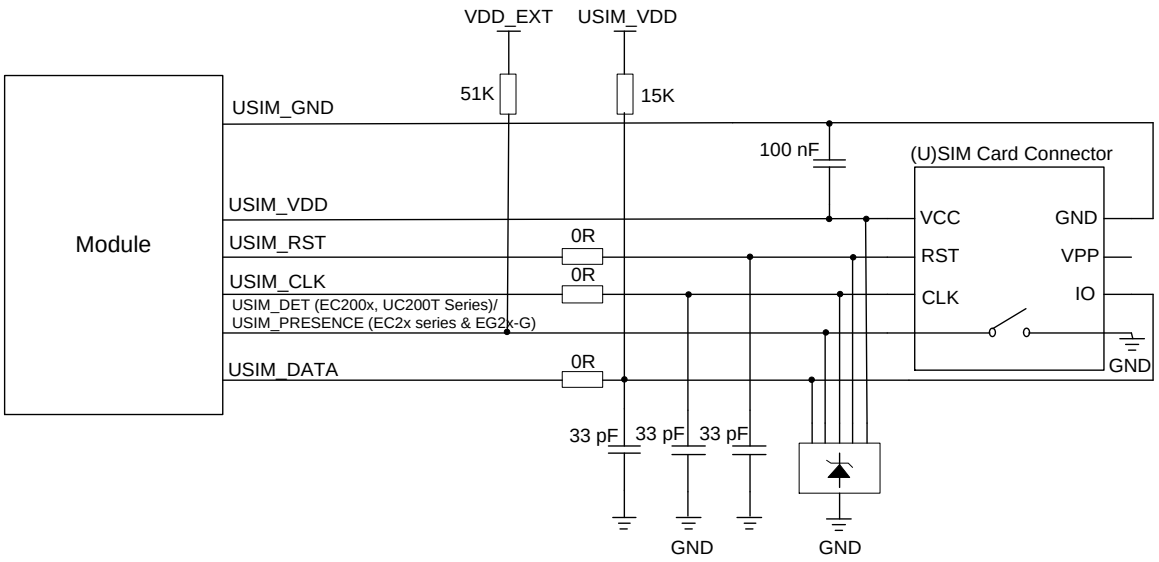


Figure 9: Reference Circuit of (U)SIM Interface with an 8-Pin (U)SIM Card Connector

If (U)SIM card detection function is not needed, please keep USIM_DET/USIM_PRESENCE unconnected. A reference circuit for (U)SIM interface with a 6-pin (U)SIM card connector is illustrated in the following figure.

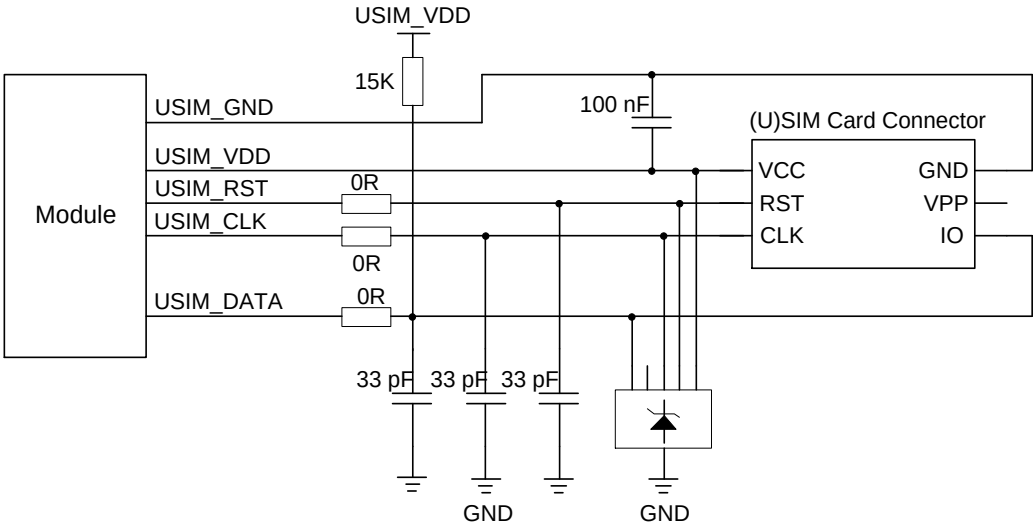


Figure 10: Reference Circuit of (U)SIM Interface with a 6-Pin (U)SIM Card Connector

4.5. USB Interface

EC200x, EC2x, EG2x-G and UC200T series modules contain one integrated Universal Serial Bus (USB) interface which complies with USB 2.0 specification, supports high-speed (480 Mbps) and full-speed (12 Mbps) modes. The USB interface of these modules can only serves as a slave device and is used for AT command communication, data transmission, GNSS NMEA sentence output [1)], software debugging and firmware upgrade.

The USB interface is recommended to be reserved for firmware upgrade in customers' design. The following figure shows the reference circuit of USB interface.

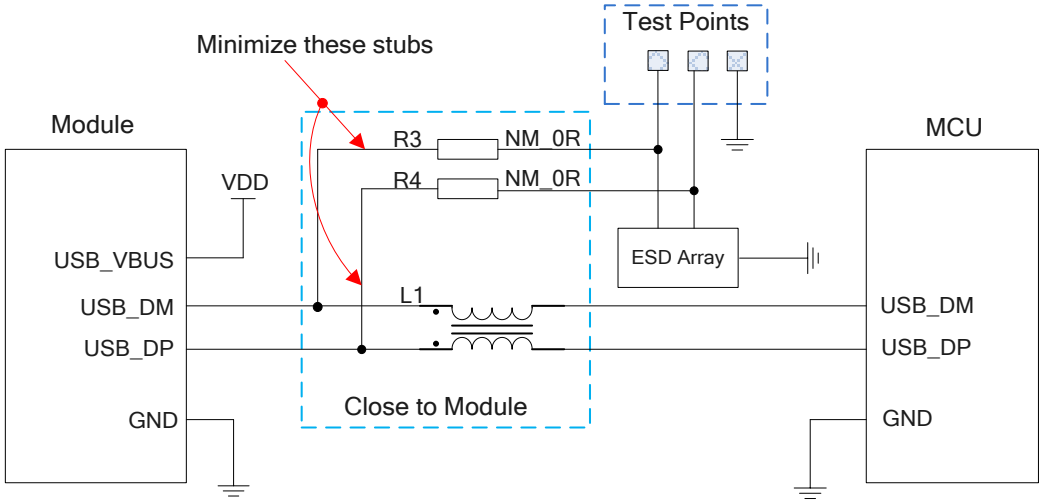


Figure 11: Reference Circuit of USB Application

A common mode choke L1 is recommended to be added in series between the module and customer's MCU in order to suppress EMI spurious transmission. Meanwhile, the 0Ω resistors (R3 and R4) should be added in series between the module and the test points so as to facilitate debugging, and the resistors are not mounted by default. In order to ensure the integrity of USB data line signal, L1/R3/R4 components must be placed close to the module, and also these resistors should be placed close to each other. The extra stubs of trace must be as short as possible.

NOTE

[1)] The USB interface cannot be used for GNSS NMEA sentence output for EC20-CN, EC200x, UC200T series modules.

4.6. PCM and I2C Interfaces

EC200x, EC2x, EG2x-G and UC200T series modules support one PCM interface used for audio applications and one I2C interface. The following figure shows a reference design of PCM and I2C interfaces with external codec IC.

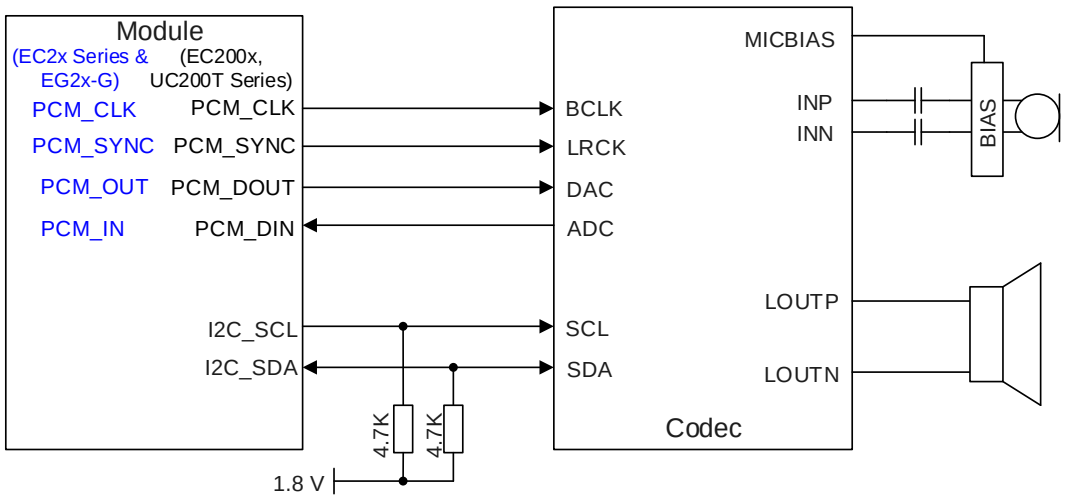


Figure 12: Reference Circuit of PCM and I2C Application with Audio Codec

NOTES

1. It is recommended to reserve an RC (R = 22 Ω, C = 22 pF) circuits on the PCM lines, especially for PCM_CLK.
2. EC200x, EC2x, EG2x-G and UC200T series modules work as a master device pertaining to I2C interface.

4.7. UART Interfaces

EC200x, EC2x, EG2x-G and UC200T series modules support one main UART and one debug UART interface. The main UART interface can be used for data transmission and AT command communication. For EC2x series and EG2x-G modules, the debug UART interface can also be used for GNSS NMEA sentences output [1)].

EC200x, EC2x, EG2x-G and UC200T series modules provide 1.8 V UART interface. A level translator should be used if customers' application is equipped with a 3.3 V UART interface. Level translator TXS0108EPWR provided by *Texas Instrument* is recommended. The following figure shows a reference design.

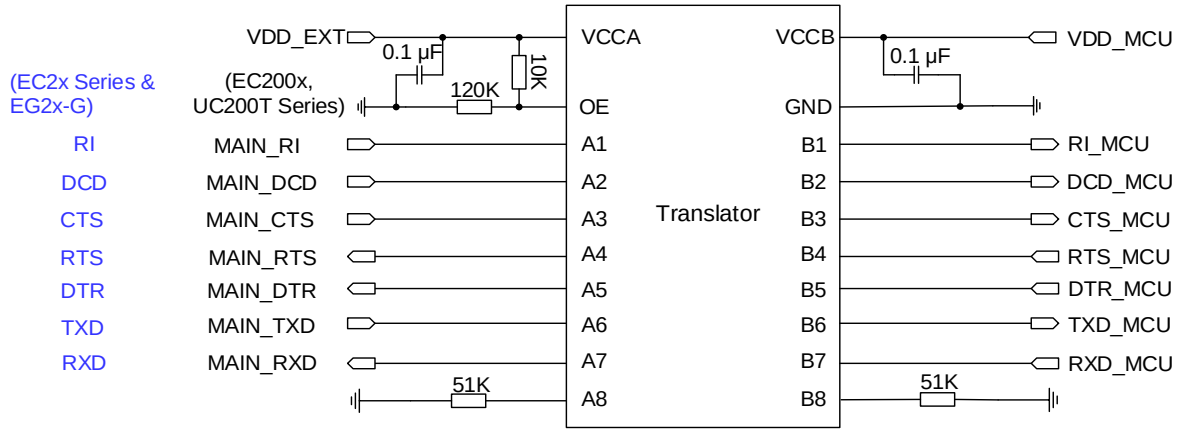


Figure 13: Reference Circuit with Level Translator Chip

Please visit http://www.ti.com for more information.

Another example with transistor translation circuit is shown as below. For the design of circuits in dotted lines, please refer to that of circuits in solid lines, but please pay attention to the direction of connection.

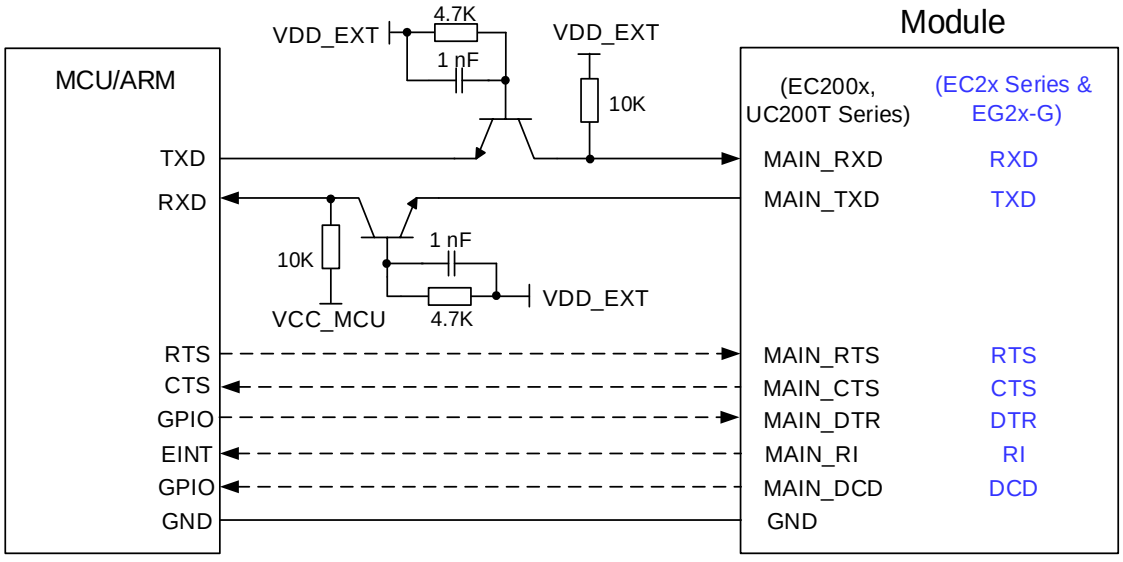


Figure 14: Reference Circuit with Transistor Circuit

NOTES

1. Transistor circuit solution is not suitable for applications with high baud rate exceeding 460 kbps.
2. [1)] The USB interface cannot be used for GNSS NMEA sentence output for EC200x, UC200T series modules.

4.8. Antenna Interfaces

ANT_MAIN of EC200x, EC2x, EG2x-G and UC200T series modules are compatible with each other. The RF antenna interface has an impedance of 50 Ω. A reference circuit for the interface is shown below. In order to achieve better RF performance, a π-type matching circuit should be reserved, and the π-type matching components (R1&C1&C2) should be placed as close the antenna as possible. By default, the resistance of R1 is 0 Ω and capacitors C1 and C2 are not mounted.

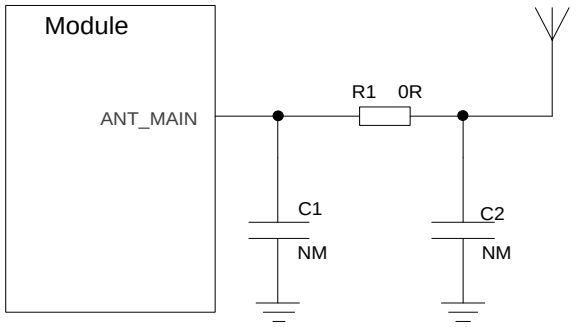


Figure 15: Reference Circuit of ANT_MAIN Interface

EC200x, UC200T series and EC20-CN modules do not support GNSS function. EC25 series/EC21 series/EC20 R2.1 and EG2x-G modules support GNSS function, with ANT_GNSS interface included. A reference design for ANT_GNSS antenna interface of EC25 series/EC21 series/EC20 R2.1 and EG2x-G is shown as below.

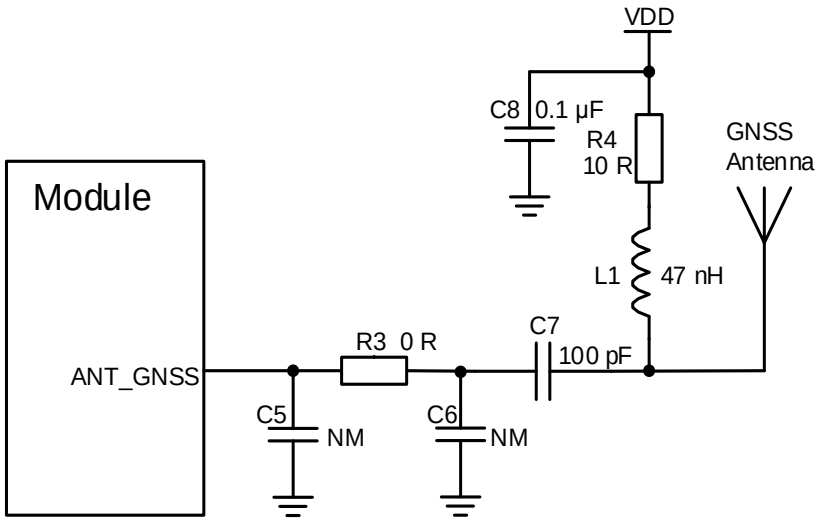


Figure 16: Reference Circuit of ANT_GNSS Interface (EC2x&EG2x-G Series)

NOTES

1. An external LDO can be selected to supply power according to the active antenna requirement.
2. If the module is designed with a passive antenna, then the VDD circuit is not needed.

EC200T series, EC2x series and EG2x-G modules support Rx-diversity function, with ANT_DIV interface included. A reference design for ANT_DIV antenna interface of EC200T series, EC2x series and EG2x-G modules is shown as below.

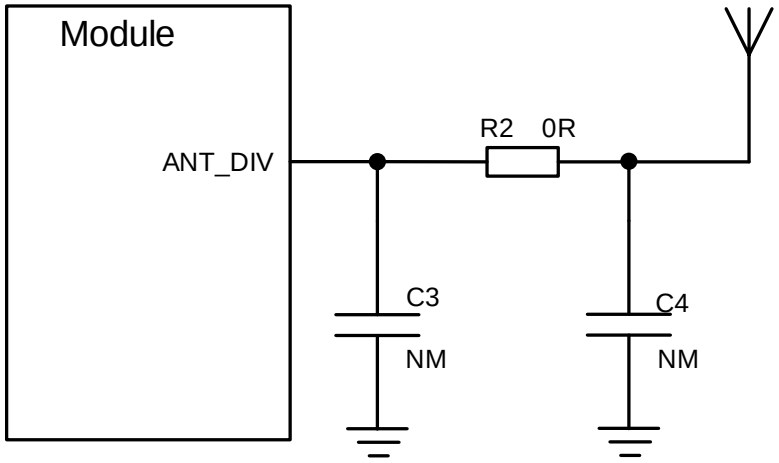


Figure 17: Reference Circuit of ANT_DIV Interface (EC200T&EC2x&EG2x-G Series)

5 Recommended Footprints

The following figure shows the recommended compatible footprint of EC200x, EC2x, EG2x-G and UC200T series modules. All dimensions are measured in mm, and the dimensional tolerances are ±0.05 mm unless otherwise specified.

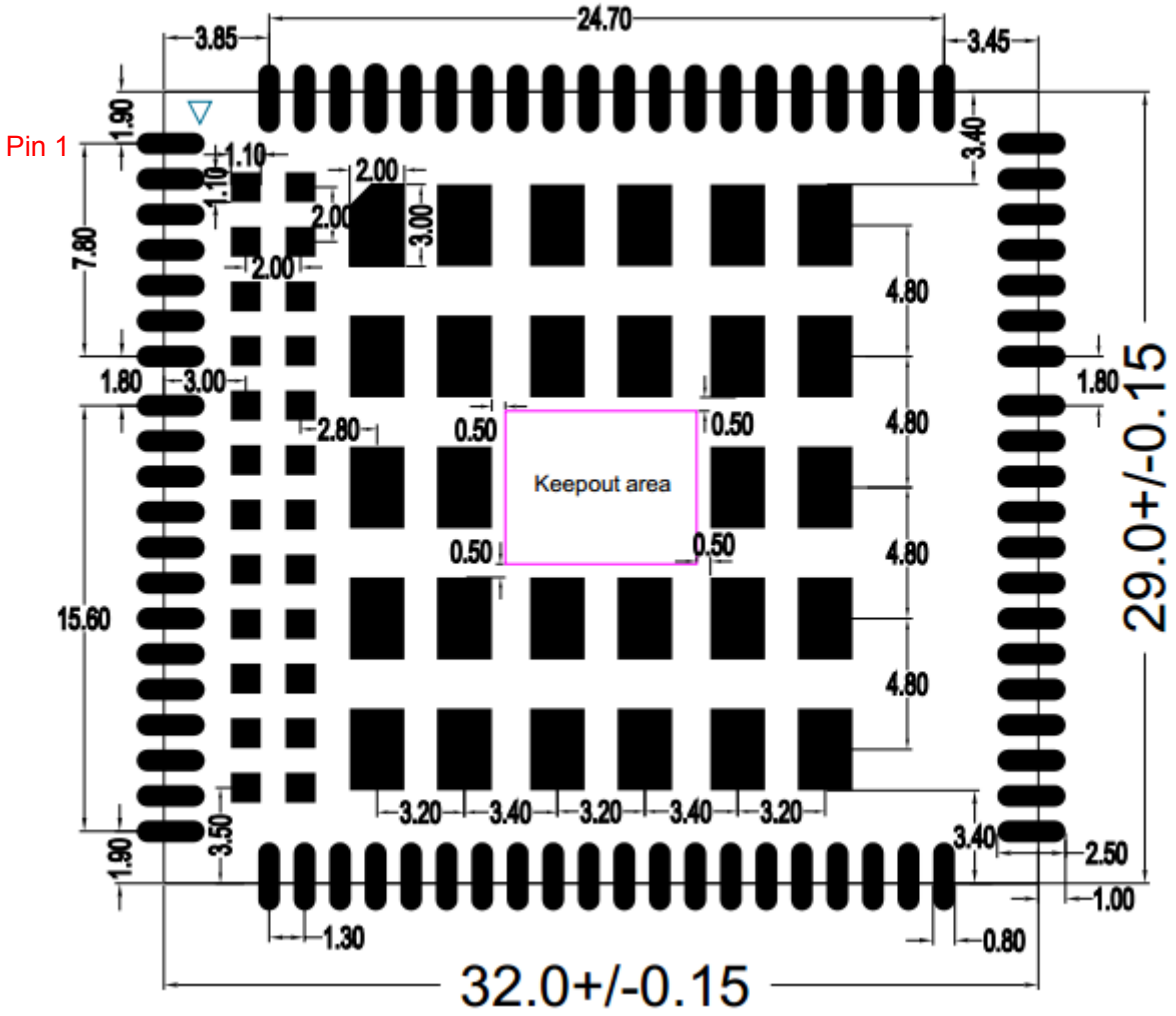


Figure 18: Recommended Compatible Footprint

If SGMII or Wi-Fi function (supported by EC2x/EG25-G) is not needed, it is recommended to keep out the area for pins 117–140 in the compatible design. The following figure shows the recommended compatible footprint without SGMII or Wi-Fi function.

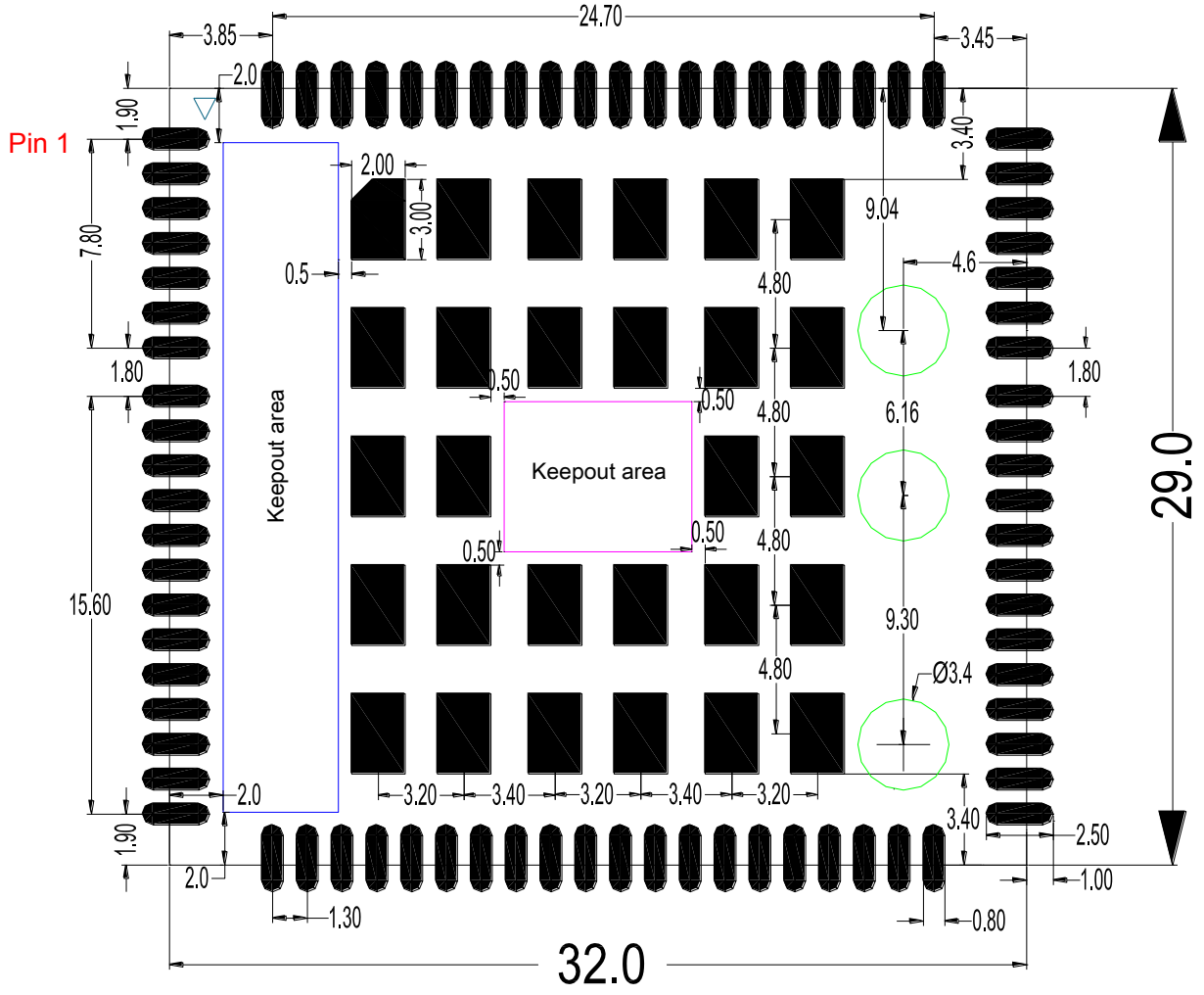


Figure 19: Recommended Compatible Footprint Without SGMII or Wi-Fi Function

NOTES

1. Do not design the keepout area marked in purple. Also, it is recommended to keep out the area marked in blue for pins 117–140 if SGMII or Wi-Fi function is not needed.
2. When it concerns to the compatible design with UC200T series module, the three round areas in green should be designed as keepout area.
3. For convenient maintenance of the module, keep about 3mm between the module and other components in the motherboard.
4. EG2x-G shares the same recommended compatible footprint with EC2x and UC200T series modules but different recommended stencil. For more detail, please refer to ***document [10]*** and ***document [12]***.

The following figure shows the sketch map of installation among EC200x, EC2x, EG2x-G and UC200T series modules.

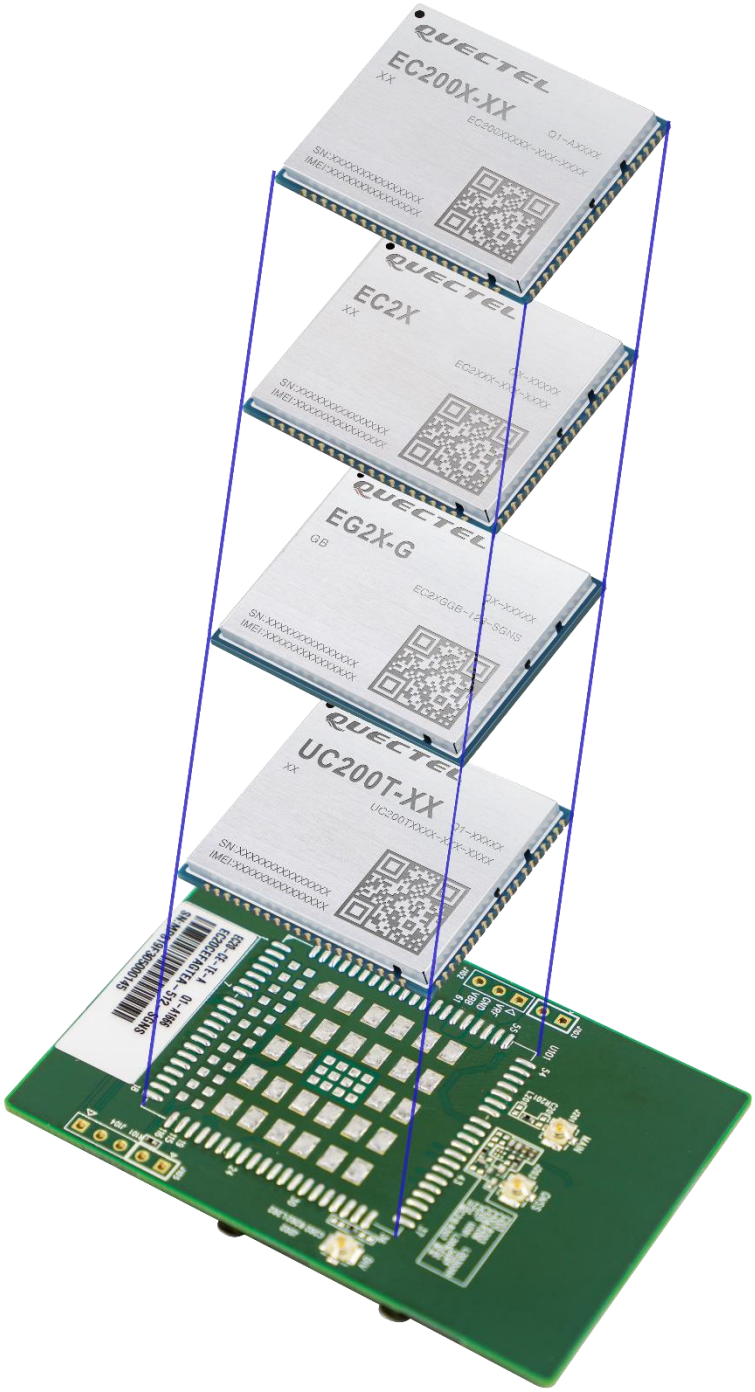


Figure 20: Installation Sketch Map of EC200x, EC2x, EG2x-G and UC200T Series Modules

6 Appendix References

Table 9: Related Documents

SN	Document Name	Remark
[1]	Quectel_UC200T_Hardware_Design	UC200T Hardware Design
[2]	Quectel_EC21_Hardware_Design	EC21 Hardware Design
[3]	Quectel_EC21_Reference_Design	EC21 Reference Design
[4]	Quectel_EC25_Hardware_Design	EC25 Hardware Design
[5]	Quectel_EC25_Reference_Design	EC25 Reference Design
[6]	Quectel_EC20_R2.1_Hardware_Design	EC20 R2.1 Hardware Design
[7]	Quectel_EC20_R2.1_Reference_Design	EC20 R2.1 Reference Design
[8]	Quectel_EC20-CN_Hardware_Design	EC20-CN Hardware Design
[9]	Quectel_EC20-CN_Reference_Design	EC20-CN Reference Design
[10]	Quectel_EG21-G_Hardware_Design	EG21-G Hardware Design
[11]	Quectel_EG21-G_Reference_Design	EG21-G Reference Design
[12]	Quectel_EG25-G_Hardware_Design	EG25-G Hardware Design
[13]	Quectel_EG25-G_Reference_Design	EG25-G Reference Design
[14]	Quectel_EC200T_Series_Hardware_Design	EC200T Series Hardware Design
[15]	Quectel_EC200T_Series_Reference_Design	EC200T Series Reference Design
[16]	Quectel_EC200S-CN_Hardware_Design	EC200S-CN Hardware Design
[17]	Quectel_EC200S-CN_Reference_Design	EC200S-CN Reference Design
[18]	Quectel_EC25&EC21_AT_Commands_Manual	EC25&EC21 AT Commands Manual
[19]	Quectel_Module_Secondary_SMT_User_Guide	Module Secondary SMT User Guide

Table 10: Terms and Abbreviations

Abbreviation	Description
AMR	Adaptive Multi-rate
bps	Bits Per Second
CTS	Clear To Send
DFOTA	Delta Firmware Upgrade Over-The-Air
DL	Downlink
DTR	Data Terminal Ready
DTX	Discontinuous Transmission
ESD	Electrostatic Discharge
FDD	Frequency Division Duplex
GLONASS	GLObalnaya NAvigatsionnaya Sputnikovaya Sistema, the Russian Global Navigation Satellite System
GMSK	Gaussian Minimum Shift Keying
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GSM	Global System for Mobile Communications
HSPA	High Speed Packet Access
I/O	Input/Output
LTE	Long Term Evolution
PCB	Printed Circuit Board
PF	Paging Frame
RF	Radio Frequency
Rx	Receive
SGMII	Serial Gigabit Media Independent Interface
SMS	Short Message Service

TDD	Time Division Duplexing
TD-SCDMA	Time Division-Synchronous Code Division Multiple Access
TX	Transmitting Direction
UL	Uplink
UMTS	Universal Mobile Telecommunications System
(U)SIM	(Universal) Subscriber Identity Module
WCDMA	Wideband Code Division Multiple Access
Wi-Fi	Wireless Fidelity
WLAN	Wireless Local Area Network