PERFECT WIRELESS EXPERIENCE

FM350-GL-16

Hardware Guide PCIoT Draft

V1.0.3

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Contents

Applicable Model

No.	Applicable Model	Description
1	FM350-GL-16	NA

Change History

V1.0.3 (2023-8-1)	• Remove B46
V1.0.2 (2023-6-30)	• Add t_{on3} time value, 3.3.1.2 Start-up Timing Sequence & 3.3.3 Module Reset
V1.0.1 (2023-6-29)	• Updated PCIe Description, 2.2.2 Key Features • Updated PLDR&FLDR Timing, 3.3.3 Module Reset
V1.0 (2023-6-14)	• Initial Draft version

1 Foreword

1.1 Introduction

This document describes the electrical characteristics, RF performances, mechanical dimensions and application environments, etc. of FM350-GL-16 (hereinafter referred to as FM350). With the assistance of this document and other instructions, the developers can quickly understand the hardware functions of FM350 module and develop their own products.

1.2 Reference Standards

The design of the product complies with the following standards:

- 3GPP TS 34.121-1 V8.11.0: User Equipment (UE) conformance specification; Radio transmission and reception (FDD); Part 1: Conformance specification
- 3GPP TS 34.122 V11.13.0: Technical Specification Group Radio Access Network; Radio transmission and reception (TDD)
- 3GPP TS 36.521-1 V15.0.0: User Equipment (UE) conformance specification; Radio transmission and reception; Part 1: Conformance testing
- 3GPP TS 21.111 V10.0.0: USIM and IC card requirements
- 3GPP TS 51.011 V4.15.0: Specification of the Subscriber Identity Module -Mobile Equipment (SIM-ME) interface
- 3GPP TS 31.102 V10.11.0: Characteristics of the Universal Subscriber Identity Module (USIM) application
- 3GPP TS 31.111 V10.16.0: Universal Subscriber Identity Module (USIM) Application Toolkit (USAT)
- 3GPP TS 36.124 V13.2.0: Electro Magnetic Compatibility (EMC) requirements for mobile

terminals and ancillary equipment

- 3GPP TS 34.124 V8.4.0: Electro Magnetic Compatibility (EMC) requirements for mobile terminals and ancillary equipment
- 3GPP TS 27.007 V10.0.8: AT command set for User Equipment (UE)
- 3GPP TS 27.005 V10.0.1: Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE - DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)
- Specification for RF Front-End Control Interface Rev2.0
- PCI Express M.2 Specification Rev4.0
- UM10204 I2C-bus specification and user manual

1.3 Related Documents

- *FIBOCOM Design Guide_RF Antenna*
- *FIBOCOM FM350-GL Hardware Development Guide*
- *FIBOCOM FM350 AT Commands*
- *FIBOCOM_FM350_SAR_Design User Guide*
- PC IoT Product Modem – EC Protocol

2 Overview

2.1 Introduction

FM350 is a highly integrated 4G WWAN module which uses M.2 form factor interface. It supports GNSS and LTE/WCDMA systems which can be applied to most cellular networks of mobile carrier in the world. When the host is in above OS mode, the module works in MBB mode. When the host is in below OS mode, the module can work in IOT mode.

2.2 Specification

2.2.1 RF Characteristics

FM350 RF characteristic is shown in Table 1.

Table 1. RF characteristics

Operating Band	
FDD-LTE	B1/2/3/4/5/7/8/12/13/14/17/18/19/20/25/26/28/29/30/32/66/71
TDD-LTE	B34[1)]/38/39[1)]/40[2)]/41/42[2)]/43[2)]/48
UMTS/HSPA+	B1/2/4/5/8
GNSS	GPS/GLONASS/Galileo/BDS/QZSS
Data Throughput	
LTE Peak	DL 1.0Gbps (CAT16)/UL 211Mbps (CAT18)
UMTS/HSPA+ Peak	DL UMTS: 384 kbps/UL 384 kbps
	DL DC-HSPA+: 42 Mbps (CAT24)/UL 11.5 Mbps (CAT7)
Modulation Characteristic	

	3GPP Release 15
LTE Modulation	100MHz 5 DLCA, 256 QAM
	40MHz 2 ULCA, 256 QAM
UMTS Modulation	3GPP Release 8
RF Characteristic	
HPUE	Not Supported
MIMO	LTE DL 2x2 MIMO
Carrier Aggregation	
LTE	DL 5CA, UL 2CA

1) B34/39 is not supported in Japan
2) B40/42/43 is not supported in FCC
3) B40/42/43/48 is not supported in IC
4) NCC band: WCDMA B1,B8/LTE B1,B3,B7.B8.B28.B38.B41

2.2.2 Key Features

Table 2. Key features

Specification	
CPU	MTK T700, 7nm process, ARM Cortex-A55, up to 1.5 GHz
Memory	4Gb LPDDR4X+4Gb NAND Flash
Supported OS	Windows 11/Linux

Power Supply	DC 3.135V to 4.4V, typical 3.3V
Temperature	Normal operating temperature: –10°C to +55°C
	Extended operating temperature: –30°C to +75°C[1)]
	Storage temperature: –40°C to +85°C
Physical Characteristics	Interface: M.2 Key-B
	Dimension: 30 mm x 52 mm x 2.3 mm
	Weight: TBD
Interface	
Antenna Connector	WWAN Antenna x 2
	Support 2x2 MIMO
Function Interface	Dual SIM (one embedded eSIM), 1.8V/3V
	PCIe Gen3 x1[2)]
	USB 2.0 (For debug, suggest NC)
	USB 3.1 Gen1 (Reserved, suggest NC)
	W_Disable#
	SAR trigger
	LED
	MIPI/GPO for Tunable antenna
	I2C (Reserved)
Software	
Protocol Stack	IPV4/IPV6

AT Commands	3GPP TS 27.007
Firmware Update	Over PCIe
Other Feature	Multiple carrier
	Windows update

1) When temperature goes beyond normal operating temperature range of -10°C to +55°C, RF performance of module may be slightly off 3GPP specifications.
2) PCIe Gen1 speed is enough for 4G.

2.3 Antenna Configuration

FM350 module supports two antennas and the configuration is shown in Table 3:

Table 3. Antenna configuration

Antenna Connector	Function Description	Band Configuration (TX)	Band Configuration (RX)	Frequency Range (MHz)
ANT0 (M)	Main antenna port for TRX	WCDMA Band B1/2/4/5/8 LTE Band B1/2/3/4/5/7/8/12/13/14/17/18/19/20/25/26/28/30/66/71/34/38/39/40/41/42/43/48	WCDMA Band B1/2/4/5/8 LTE Band B1/2/3/4/5/7/8/12/13/14/17/18/19/20/25/26/28/29/30/32/66/71/34/38/39/40/41/42/43/48	617–3800

Antenna Connector	Function Description	Band Configuration (TX)	Band Configuration (RX)	Frequency Range (MHz)
ANT3 (D/G)	Diversity & GNSS ANT		WCDMA Band B1/2/4/5/8 LTE Band B1/2/3/4/5/7/8/12/13/14/17/18/19/20/25/26/28/29/30/32/66/71/34/38/39/40/41/42/43/48 GNSS	617–3800

For the bands which only support 2X2 DL MIMO.

3 Application Interface

3.1 M.2 Interface

The FM350 module applies standard M.2 Key-B interface, with a total of 75 gold edge finger pins.

3.1.1 Pin Map

74	+3.3V	CONFIG_2	75
72	+3.3V	VIO_CFG	73
70	+3.3V	GND	71
68	NC	CONFIG_1	69
66	SIM1_DETECT(1.8V)	RESET#(1.8V)	67
64	COEX_TXD(1.8V)	ANTCTL3(1.8V)	65
62	COEX_RXD(1.8V)	ANTCTL2(1.8V)	63
60	COEX3(1.8V)	ANTCTL1(1.8V)	61
58	RFFE_SDATA(1.8V)	ANTCTL0(1.8V)	59
56	RFFE_SCLK(1.8V)	GND	57
54	PEWAKE# (3.3/1.8V)	REFCLKP	55
52	CLKREQ# (3.3/1.8V)	REFCLKN	53
50	PERST# (3.3/1.8V)	GND	51
48	NC	PERp0	49
46	NC	PERn0	47
44	I2C_IRQ#(1.8V)	GND	45
42	I2C_SDA(1.8V I2C_Master)	PETp0	43
40	I2C_SCL(1.8V I2C_Master)	PETn0	41
38	NC	GND	39
36	UIM1_PWR	USB3.1_Rx+	37
34	UIM1_DATA	USB3.1_Rx-	35
32	UIM1_CLK	GND	33
30	UIM1_RESET	USB3.1_Tx+	31
28	DPR_2(mux for Hi-Z GPIO)	USB3.1_Tx-	29
26	W_DISABLE2#(3.3/1.8V)	GND	27
24	ANT_TUNER_1V8(mux for Hi-Z GPIO)	DPR(3.3/1.8V)	25
22	ANT_TUNER_CFG(mux for Hi-Z GPIO)	WOWWAN#(1.8V)	23
20	GPIO (Hi-Z)	CONFIG_0	21
	Notch	Notch	
	Notch	Notch	
	Notch	Notch	
	Notch	Notch	
10	LED1#(3.3V OD)	GND	11
8	W_DISABLE1#(3.3/1.8V)	USB D-	9
6	FULL_CARD_POWER_OFF#(3.3/1.8V)	USB D+	7
4	+3.3V	GND	5
2	+3.3V	GND	3
		CONFIG_3	1

Figure 1. Pin map

Pin "Notch" represents the gap of the gold fingers.

3.1.2 Pin Definition

The pin definition is listed out in Table 4.

Table 4. Pin Definition

Pin No.	Pin Name	I/O	Default state[1)]	Pin Description	DC Characteristics
1	CONFIG_3	DO	NC	FM350 M.2 module is configured as the WWAN – PCIe Gen3, USB3.1 Gen1 interface type	-
2	+3.3V	PI	-	Power input	Power Supply
3	GND	-	-	GND	Power Supply
4	+3.3V	PI	-	Power input	Power Supply
5	GND	-	-	GND	Power Supply
6	FULL_CARD_ POWER _OFF#	DI	PU	Power-on/off: Power-on: transition from Low to High Power-off: transition from High to Low	3.3/1.8V
7	USB D+	AIO	-	USB 2.0 data plus	0.3–3V
8	W_DISABLE1#	DI	PU	WWAN disable, active low	3.3/1.8V

Pin No.	Pin Name	I/O	Default state[1)]	Pin Description	DC Characteristics
9	USB D-	AIO	-	USB 2.0 data minus	0.3–3V
10	LED1#	OD	-	System status LED	3.3V
11	GND	-	-	GND	Power Supply
12	Notch			Notch	
13	Notch			Notch	
14	Notch			Notch	
15	Notch			Notch	
16	Notch			Notch	
17	Notch			Notch	
18	Notch			Notch	
19	Notch			Notch	
20	GPIO(Hi-Z)	DIO	Hi-Z	Hi-Z GPIO	1.8V
21	CONFIG_0	DO	NC	FM350 M.2 module is configured as the WWAN – PCIe Gen3, USB3.1 Gen1 interface type	-
22	ANT_TUNER_CFG	DI	PU	External interrupt for SAR and antenna environment detection be able to MUX as Hi-Z GPIO[1)]	1.8V
23	WOWWAN#	DO	PU	Asserted to Wake up external host, active low, reserved	1.8V

Pin No.	Pin Name	I/O	Default state[1)]	Pin Description	DC Characteristics
24	ANT_TUNER _1V8	PO	-	1.8V power output for antenna tuner, be able to MUX as Hi-Z GPIO[1)]	1.8V
25	DPR	DI	PU	External interrupt for 1st dynamic power reduction detection	3.3/1.8V
26	W_DISABLE2#	DI	PU	GNSS disable, active low, reserved	3.3/1.8V
27	GND	-	-	GND	Power Supply
28	DPR_2	DI	PU	Reserved MUX as Hi-Z GPIO	1.8V
29	USB3.1_TX-	AO	-	USB3.1 GEN1 transmit data minus, reserved	-
30	UIM1_ RESET	DO	-	SIM reset signal	1.8V/3V
31	USB3.1_TX+	AO	-	USB3.1 GEN1 transmit data plus, reserved	-
32	UIM1_CLK	DO	-	SIM clock signal	1.8V/3V
33	GND	-	-	GND	Power Supply
34	UIM1_DATA	DIO	-	SIM data input/output	1.8V/3V
35	USB3.1_RX-	AI	-	USB3.1 GEN1 receive data minus, reserved	-
36	UIM1_PWR	PO	-	SIM power supply	1.8V/3V

Pin No.	Pin Name	I/O	Default state[1)]	Pin Description	DC Characteristics
37	USB3.1_RX+	AI	-	USB3.1 GEN1 receive data plus, reserved	-
38	NC		-	NC	-
39	GND	-	-	GND	Power Supply
40	I2C_SCL	DO	PU	I2C master clock	1.8V
41	PETn0	AO	-	PCIe TX differential signals negative	-
42	I2C_SDA	DIO	PU	I2C master data	1.8V
43	PETp0	AO	-	PCIe TX differential signals positive	-
44	I2C_IRQ#	DI	PU	I2C interrupt, used for wake up I2C host	1.8V
45	GND	-	-	GND	Power Supply
46	NC	-	-	-	-
47	PERn0	AI	-	PCIe RX differential signals negative	-
48	NC	-	-	-	-
49	PERp0	AI	-	PCIe RX differential signals positive	-
50	PERST#	DI	PU	Asserted to reset module PCIe interface to default. If module	3.3/1.8V

Pin No.	Pin Name	I/O	Default state[1)]	Pin Description	DC Characteristics
				went into core dump, it would reset whole module, not only PCIe interface. Active low, pulled-up with a 10KΩ resistor	
51	GND	-	-	GND	Power Supply
52	CLKREQ#	DIO	OD	Asserted by module to request a PCIe reference clock to be available (active clock state) in order to transmit data. It is also used by L1 PM Sub states mechanism, asserted by either host or device to initiate an L1 exit. Active low	3.3/1.8V
53	REFCLKN	AI	-	PCIe reference clock signal Negative	-
54	PEWAKE#	DO	OD	Asserted to wake up system and reactivate PCIe link from L2 to L0, whether to support wake-up functionality depends on system. Active low	3.3/1.8V
55	REFCLKP	AI	-	PCIe reference clock signal Positive	-
56	RFFE_SCLK	DO	-	MIPI interface for ANT tuner,	1.8V

Pin No.	Pin Name	I/O	Default state[1)]	Pin Description	DC Characteristics
				RFFE clock	
57	GND			GND	Power Supply
58	RFFE_SDATA	DIO	-	MIPI interface for ANT tuner, RFFE data	1.8V
59	ANTCTL0	DO	PD	ANT tuner control bit_0	1.8V
60	COEX3	DIO	-	Wireless coexistence between WWAN and WiFi/BT modules, based on BT-SIG coexistence protocol. Reserved	1.8V
61	ANTCTL1	DO	PD	ANT tuner control bit_1	1.8V
62	COEX_RXD	DI	-	UART receive data input, used for Wireless coexistence between WWAN and WiFi/BT modules, based on BT-SIG coexistence protocol. Reserved	1.8V
63	ANTCTL2	DO	PD	ANT tuner control bit_2	1.8V
64	COEX_TXD	DO	-	UART transmit output, used for Wireless coexistence between WWAN and WiFi/BT modules, based on BT-SIG coexistence protocol. (WWAN module side), reserved	1.8V
65	ANTCTL3	DO	PD	ANT tuner control bit_3	1.8V

Pin No.	Pin Name	I/O	Default state[1)]	Pin Description	DC Characteristics
66	SIM1_ DETECT	DI	PU	SIM detect with a 390KΩ pull-up resistor, active high	1.8V
67	RESET#	DI	PU	WWAN reset input, active low	1.8V
68	NC	-	-	NC	-
69	CONFIG_1	DO	GND	FM350 M.2 module is configured as the WWAN – PCIe Gen3, USB3.1 Gen1 interface type	-
70	+3.3V	PI	-	Power input	Power Supply
71	GND	-	-	GND	Power Supply
72	+3.3V	PI	-	Power input	Power Supply
73	VIO_CFG	-	NC	Power domain indication for PCIe sideband signals. NC: support 1.8V/3.3V; GND: support 3.3V	-
74	+3.3V	PI	-	Power input	Power Supply
75	CONFIG_2	DO	NC	FM350 M.2 module is configured as the WWAN – PCIe Gen3, USB3.1 Gen1 interface type	-

1) Default state refers to the state when the pin-name function is enabled.

3.2 Electrical Specification

3.2.1 Power supply

The power supply pins and the power rating of FM350 module are shown in Table 5 and Table 6.

Table 5. Power supply pin

Pin No.	Pin Name	I/O	Pin Description	DC Parameter (V)		
				Minimum Value	Typical Value	Maximum Value
2, 4, 70, 72, 74	+3.3V	PI	Power supply input	3.135	3.3	4.4

Table 6. Power rating

Pin No.	Pin Name	I/O	Pin Description	Peak Current (mA)
2, 4, 70, 72, 74	+3.3V	PI	Power supply input	TBD

FM350 as PCI Express M.2 module utilizes a single power source (3.3 V generally) to power main circuitry on module. The voltage source (3.3 V) is expected to be available during the system's stand-by/suspend state to support wake event processing on the communications. there are five positive voltage pins to enable higher continuous current if required.

All the GND pins should be treated as normal power pins, though Some of them are used as interleaving GND pins for the higher frequency signals that require additional isolation from surrounding signals.

The regulated power rail of 3.3 V provided by the Platform should handle a max peak current of more than TBD as is indicated in Table 6. and a voltage less than the minimum value specified

in Table 5 may result in a trigger for the UVLO condition reset.

Refer to *FIBOCOM FM350-GL Hardware Development Guide* for power supply designs.

3.2.2 Logic Level

The FM350 module 1.8V logic level definition is shown in Table 7.

Table 7. Module 1.8V logic level definition

Parameter	Minimum	Typical	Maximum	Unit
V_{OH}	1.62	1.8	1.98	V
V_{OL}	-0.3	0	0.3	V
V_{IH}	1.3	1.8	1.89	V
V_{IL}@1mA	-0.3	0	0.3	V

The FM350 module 3.3V logic level definition is shown in Table 8:

Table 8. Module 3.3V logic level definition

Parameter	Minimum	Typical	Maximum	Unit
V_{IH}	2.3	3.3	3.465	V
V_{IL}@1mA	-0.3	0	0.3	V

3.2.3 Power Consumption

On the operating condition of a 3.3V power supply and the ambient temperature of 25°C, the FM350 power consumption is shown in the following table:

Table 9. Power consumption

Parameter	Mode	Condition	Typical Current (mA)	Note
I_{off}	Power off	Power supply enable, module power off	0.06	-
I_{Sleep}	WCDMA	DRX=8	5.1	-
	LTE FDD	Paging cycle #128 frames (1.28s DRx cycle)	5.5	-
	LTE TDD	Paging cycle #128 frames (1.28s DRx cycle)	5.5	-
	Radio Off	AT+CFUN=4, flight mode	3.9	-
$I_{WCDMA-RMS}$	WCDMA	Band1 (23.5dBm in call up status)	930	-
		Band2 (23.5dBm in call up status)	970	-
		Band4 (23.5dBm in call up status)	835	-
		Band5 (23.5dBm in call up status)	TBD	-
		Band8 (23.5dBm in call up status)	900	-
$I_{LTE-RMS}$	LTE FDD	Band1 (23dBm in call up status)	750	10MHz BW, 12 RB
		Band2	920	10MHz BW, 12

Parameter	Mode	Condition	Typical Current (mA)	Note
		(23dBm in call up status)		RB
		Band3 (23dBm in call up status)	795	10MHz BW, 12 RB
		Band4 (23dBm in call up status)	795	10MHz BW, 12 RB
		Band5 (23dBm in call up status)	TBD	10MHz BW, 12 RB
		Band7 (23dBm in call up status)	895	10MHz BW, 12 RB
		Band8 (23dBm in call up status)	TBD	10MHz BW, 12 RB
		Band12 (23dBm in call up status)	740	10MHz BW, 12 RB
		Band13 (23dBm in call up status)	790	10MHz BW, 12 RB
		Band14 (23dBm in call up status)	760	10MHz BW, 12 RB
		Band17 (23dBm in call up status)	680	10MHz BW, 12 RB
		Band18 (23dBm in call up status)	705	10MHz BW, 12 RB
		Band19	700	10MHz BW, 12

Parameter	Mode	Condition	Typical Current (mA)	Note
		(23dBm in call up status)		RB
		Band20 (23dBm in call up status)	775	10MHz BW, 12 RB
		Band25 (23dBm in call up status)	930	10MHz BW, 12 RB
		Band26 (23dBm in call up status)	TBD	10MHz BW, 12 RB
		Band28 (23dBm in call up status)	770	10MHz BW, 12 RB
		Band30 (22dBm in call up status)	895	10MHz BW, 12 RB
		Band66 (23dBm in call up status)	890	10MHz BW, 12 RB
		Band71 (23dBm in call up status)	TBD	10MHz BW, 12 RB
	LTE TDD[1)]	Band34 (23dBm in call up status)	445	10MHz BW, 12 RB
		Band38 (23dBm in call up status)	495	10MHz BW, 12 RB
		Band39 (23dBm in call up status)	445	10MHz BW, 12 RB
		Band40	480	10MHz BW, 12

Parameter	Mode	Condition	Typical Current (mA)	Note
		(23dBm in call up status)		RB
		Band41 (23dBm in call up status)	550	10MHz BW, 12 RB
		Band42 (23dBm in call up status)	TBD	10MHz BW, 12 RB
		Band43 (23dBm in call up status)	TBD	10MHz BW, 12 RB
		Band48 (21dBm in call up status)	TBD	10MHz BW, 12 RB

1) LTE TDD band current is tested with slot configuration DL: UL:S=4: 4: 2

2) The above data is the average value obtained by testing the sample for high/medium/low channels in room temperature (ambient temperature 25°C)

In IoT mode, eSIM and ThingsMatrix servers keep the connection, Total power consumption=Sleep power consumption + Report power consumption + Heartbeat power consumption[1)] + GNSS. To connect to a real network, use the following typical settings as an example: Report Interval: 300s, Heartbeat Interval: 300s,GNSS Interval: 900s.

Parameter	Mode	Condition	Typical Current (mA)	Note
$I_{WCDMA-RMS}$	WCDMA	(0dBm in call up status)	TBD	-
$I_{LTE-RMS}$	LTE FDD	(0dBm in call up status)	TBD	10MHz BW, 12 RB

Parameter	Mode	Condition	Typical Current (mA)	Note
	LTE TDD	(0dBm in call up status)	TBD	10MHz BW, 12 RB

1) Heartbeat is the communication between EC and Module, similar to the role of watchdog, and its power consumption is too low to be ignore

3.3 Control Signal

The FM350 module provides the control signals for power on/off and reset operations. The pins are defined in the following table:

Table 10. Control signal

Pin No.	Pin Name	I/O	Default state	Function	DC Characteristics
6	FULL_CARD_ POWER_OFF#	DI	PU	Module power on/off control, Power on: a transition from Low to High Power off: a transition from High to Low	3.3/1.8V
67	RESET#	DI	PU	WWAN reset input, active low,	1.8V
50	PERST#	DI	PU	Asserted to reset module PCIe interface to default. If module went into core dump, it would reset whole module, not only PCIe interface. Active low,	3.3/1.8V

Pin No.	Pin Name	I/O	Default state	Function	DC Characteristics
				pulled-up with a 10KΩ resistor	

RESET# and PERST# need to be controlled by independent GPIO without sharing with other devices on the host. RESET# and PERST# are sensitive signals, so they should be kept away from RF interference and be protected by GND. It should be routing neither near PCB edge nor on surface layer to avoid module abnormal reset caused by ESD

3.3.1 Module Start-Up

3.3.1.1 Start-up Circuit

The FCPO# (FULL_CARD_POWER_OFF#) pin needs a voltage transition from a logic low state to a logic high state for booting up. EC (Embedded Chipset) controls the module start-up. The recommended design is using a default PD port to control FCPO#. It is advised to reserve a 100K (NC) pull-down resistor on EC side. The circuit design is shown in Figure 4:

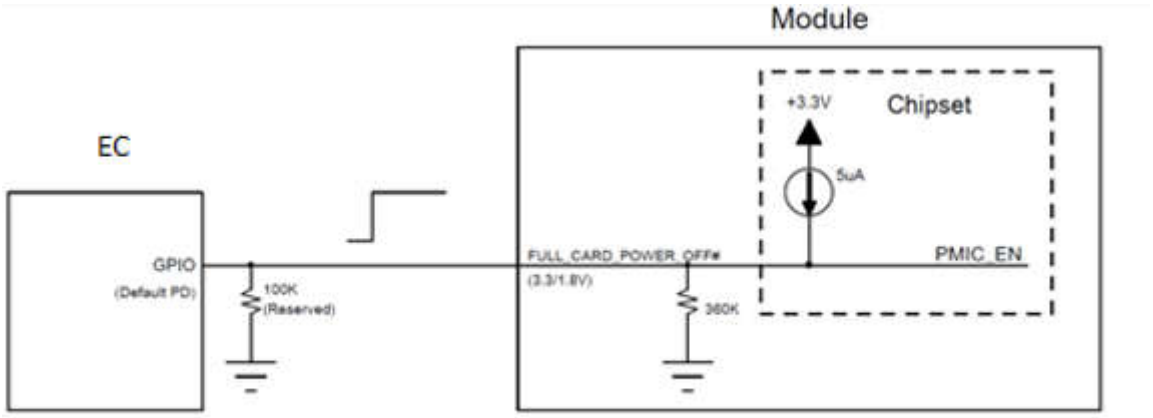


Figure 2. Circuit for module start-up controlled by EC

3.3.1.2 Start-up Timing Sequence

When the +3.3V power supply is stable, the module will power on and start initialization process as soon as FCPO# is pulled high. Module will complete its initialization process in about 15s. The start-up timing is shown in Figure 5:

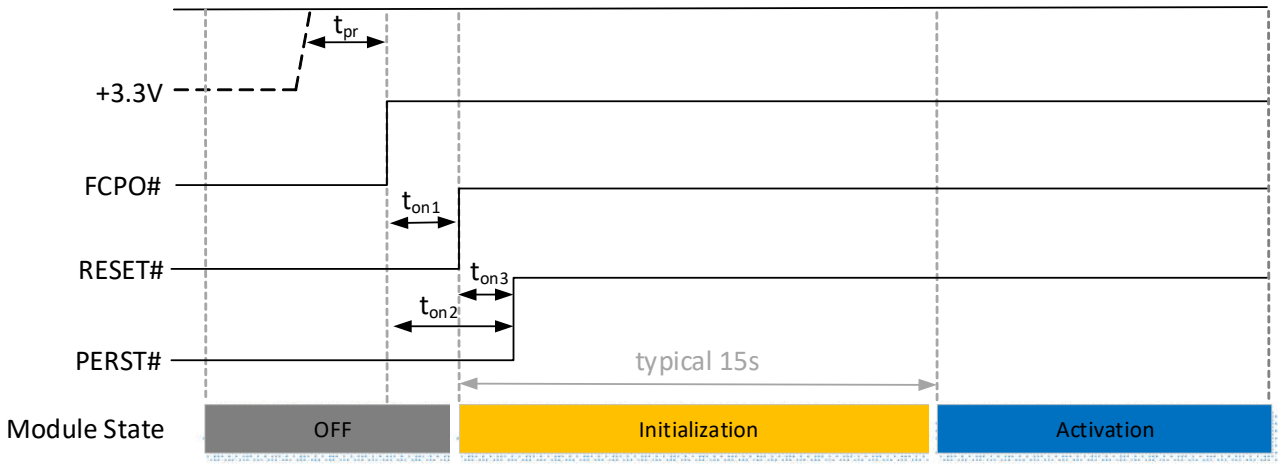


Figure 3. Timing control for Start-up

Table 11. Timing parameters for startup

Index	Min. (ms)	Recommended (ms)	Max. (ms)	Comment
t_{pr}	0	-	-	The delay from +3.3V POWER achieving 3.135V to FCPO# pulled-high.
t_{on1}	20	20	-	The delay from FCPO# pulled-high to RESET# de-asserted
t_{on2}	50	100	-	The delay from FCPO# pulled-high to PERST# de-asserted, PERST# must always be the last to be

				de-asserted
t_{on3}	30	80	-	PERST# should be de-asserted after RESET# pull high.

The minimum detection time of PCIe link is about 23ms after PERST# de-asserted

3.3.2 Module Shutdown

The module can be shut down by the following controls in Table 12.

Table 12. Shutdown controls

Shutdown Control	Action	Condition
Software (Recommend)	Sending AT+CPWROFF command, and then pull-down RESET# and FCPO# pin	Normal operation status.
Hardware	Pull down RESET# and FCPO# pin	No response after sent the AT+CPWROFF

The module can be shut down by sending AT+CPWROFF command. When the module receives the software shutdown command, the module will start the finalization process (the reverse process of initialization), and it will be completed after t_{sd} time (t_{sd} is the AP waiting time from the time when AP sends 'AT+CPWROFF' command to the time when AP receives 'OK', the max t_{sd} is 5s). The control timing is shown in Figure 6:

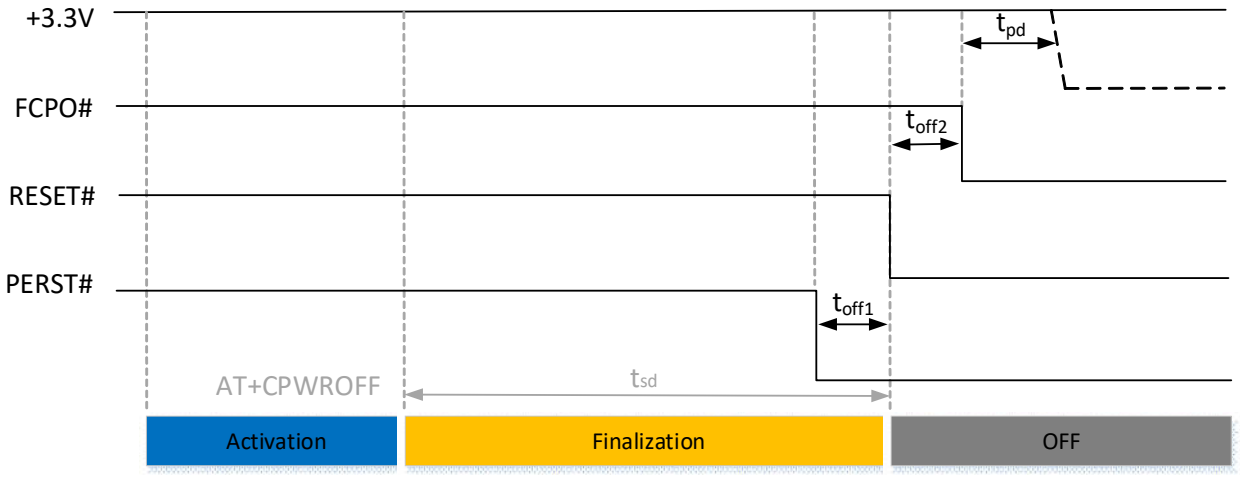


Figure 4. Shutdown timing control

Table 13. Timing parameters for shutdown control

Index	Min. (ms)	Recommended (ms)	Max. (ms)	Comment
t_{off1}	16	20	-	The delay from PERST# pulled-low to RESET# asserted.
t_{off2}	2	10	-	The delay from RESET# pulled-low to FCPO# pulled-high.
t_{pd}	10	100	-	The delay from FCPO# pulled-down to +3.3V turned-off. In order to saving more power, it is advisable to turn off the +3.3V power.
t_{sd}	-	-	5000	maximum finalization time

3.3.3 Module Reset

The FM350 module can be reset to its initial status by pulling-down RESET# for more than 2ms (10ms is recommended), and module will restart after RESET# signal is released. Care should be

taken not to activate the RESET# pin unless there is a critical failure. The reference circuit design is shown in the Figure 7:

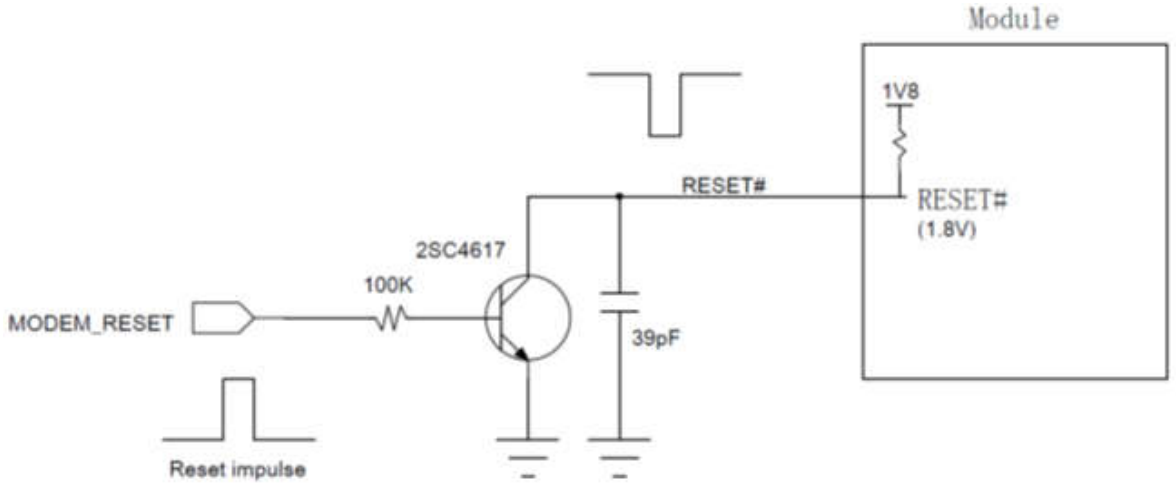


Figure 5. Reference design for reset circuit

There are two types reset control timings, referred as function level device reset (FLDR) in Figure 8-1

and platform level device reset (PLDR) in Figure 8-2.

- Both FLDR and PLDR could be used for module abnormal recovery and FW upgrade.
- PLDR is recommended to use for system warm boot and FW upgrade.

The main difference between FLDR and PLDR is that the internal PMU of the module will be off temporarily during the PLDR timing.

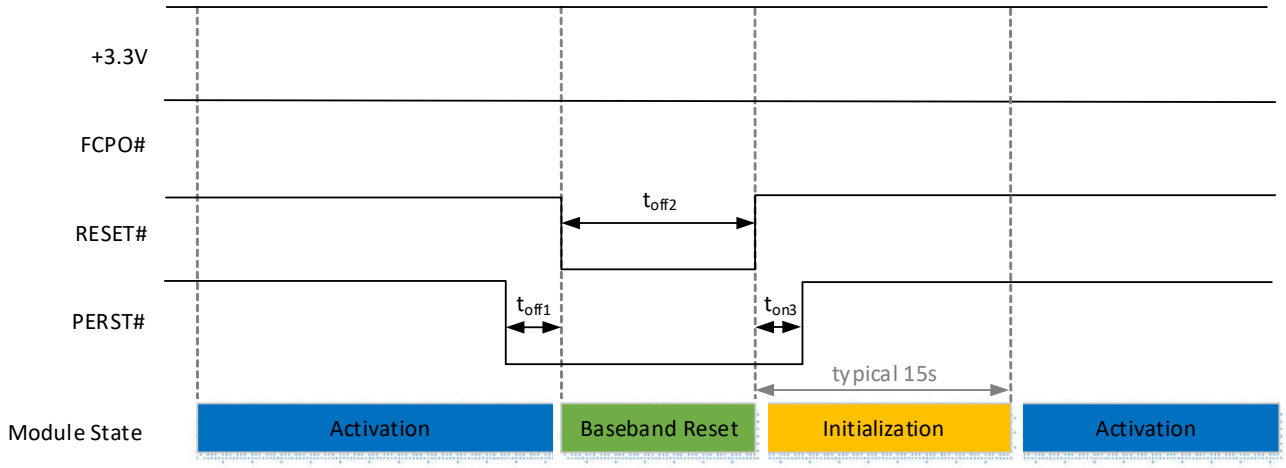


Figure 6-1. FLDR control timing

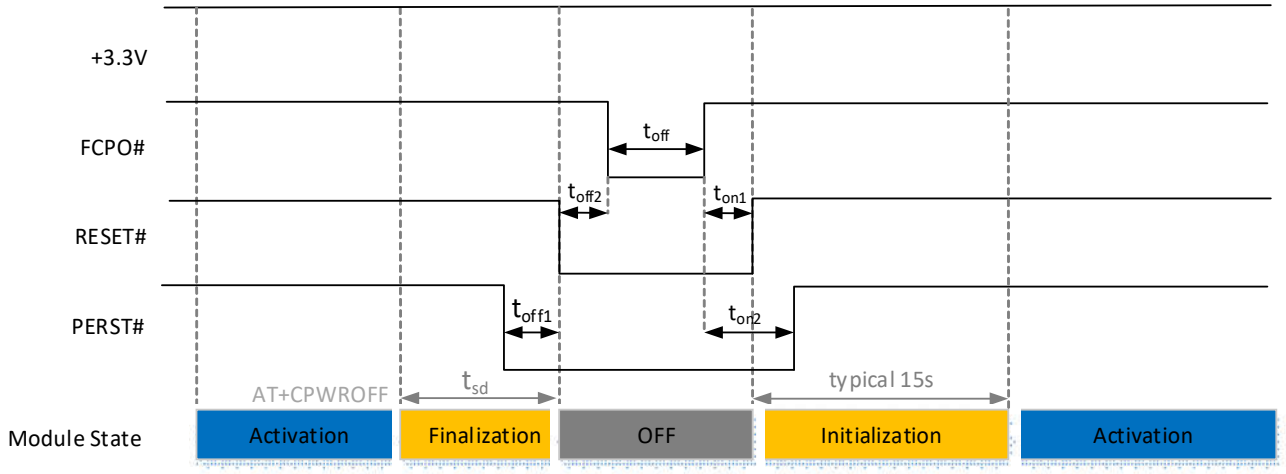


Figure 8-2. PLDR control timing

Table 14. Timing parameters for module reset

Index	Min. (ms)	Recommended (ms)	Max. (ms)	Comment
t_{off1}	16	20	-	The delay from the time when PERST# is pulled down to the time when RESET# should be asserted refer section 3.3.2
t_{off2}	2	10	-	The delay from RESET# pulled-down to FCPO# pulled-high refer section 3.3.2
t_{off}	500	500	-	Time duration needed by FM350 to discharge all its residual voltages before FCPO# can be driven high again. This is required for both Pre-OS and Runtime flow.
t_{on1}	20	20	-	RESET# should be de-asserted after FCPO# is pulled high. refer section 3.3.1.2
t_{on2}	50	100	-	The delay of PERST# de-asserted after FCPO# pulled high. PERST# must always be the last to get de-asserted. refer section 3.3.1.2
t_{on3}	30	80	-	PERST# should be de-asserted after RESET# pull high. refer to section 3.3.1.2
t_{sd}	-	-	5000	refer section 3.3.2

3.3.4 PCIe Link State

Modem has the lowest power consumption in D0 L1.2 PCIe link state, $D3_{cold}$ L2 will increase the power consumption by 0.5mA due to the internal pull-up of PERST# in asserted state. CLKREQ# can be asserted or de-asserted in $D3_{cold}$ L2 state, but the state of CLKREQ# should not be changed again during $D3_{cold}$ L2 state. If CLKREQ# is in asserted state during $D3_{cold}$ L2, an additional current of 0.3mA will be consumed.

Table 15. PCIe link states vs power consumption

PCIe Link State	PERST#	CLKREQ#	Power Consumption (mA)	Description
D0 L1.2	H	H	I_{sleep}	Refer section 3.2.3
$D3_{cold}$ L2	L	H	I_{sleep}+0.5	The extra 0.5mA is consumed on PERST# pulled-down
	L	L	I_{sleep}+0.8	The extra 0.3mA is consumed on CLKREQ# pulled-down

3.3.4.1 D0 L1.2

Module supports the low power PCIe link state of D0 L1.2 for power consumption reduction. The D0 L0@S0/S0ix→D0 L1.2@S0/S0ix→D0 L0@S0/S0ix timing is shown in Figure 9:

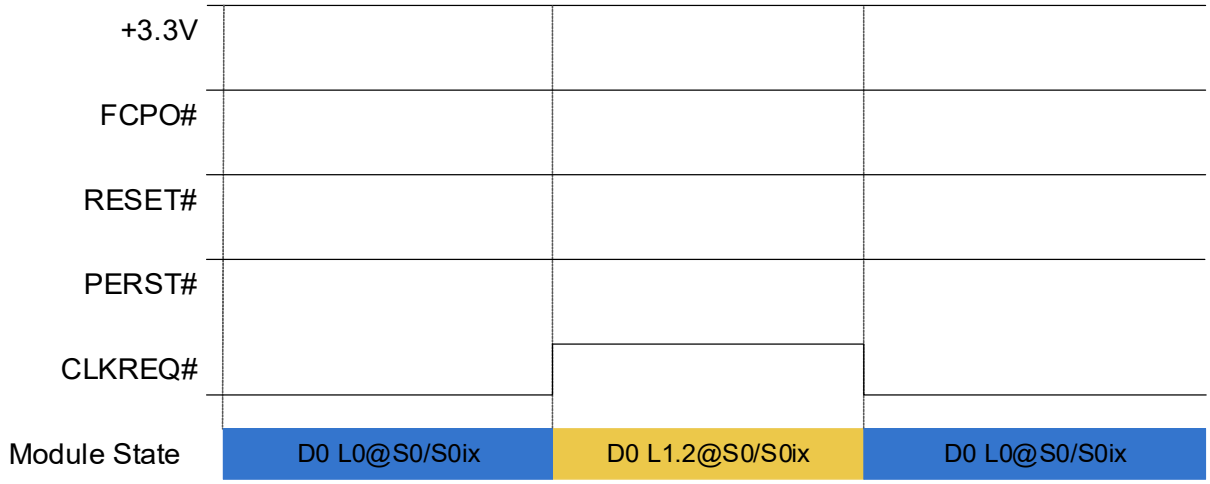


Figure 7. D0 L1.2 timing

3.3.4.2 $D3_{cold}$ L2

Module also supports the low power PCIe link state of $D3_{cold}$ L2. In $D3_{cold}$ L2 state, PCIe link can be waked up by either modem or host. The D0 L0@S0/S0ix→$D3_{cold}$ L2@S0/S0ix→D0 L0@S0/S0ix timing is shown in Figure 10 and Figure 11:

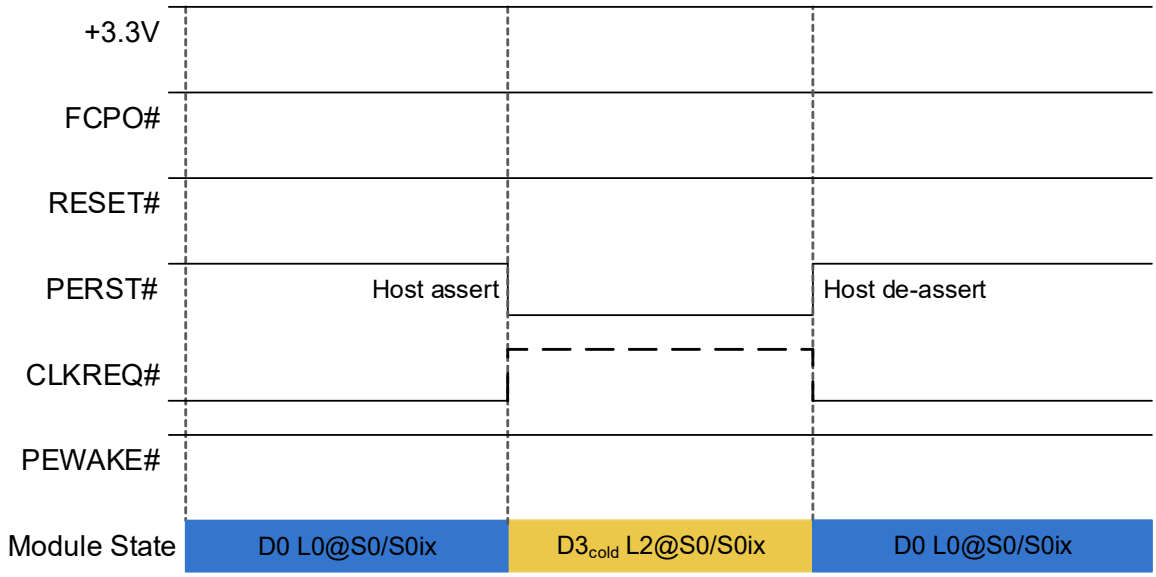


Figure 8. $D3_{cold}$ L2 timing (host wakeup)

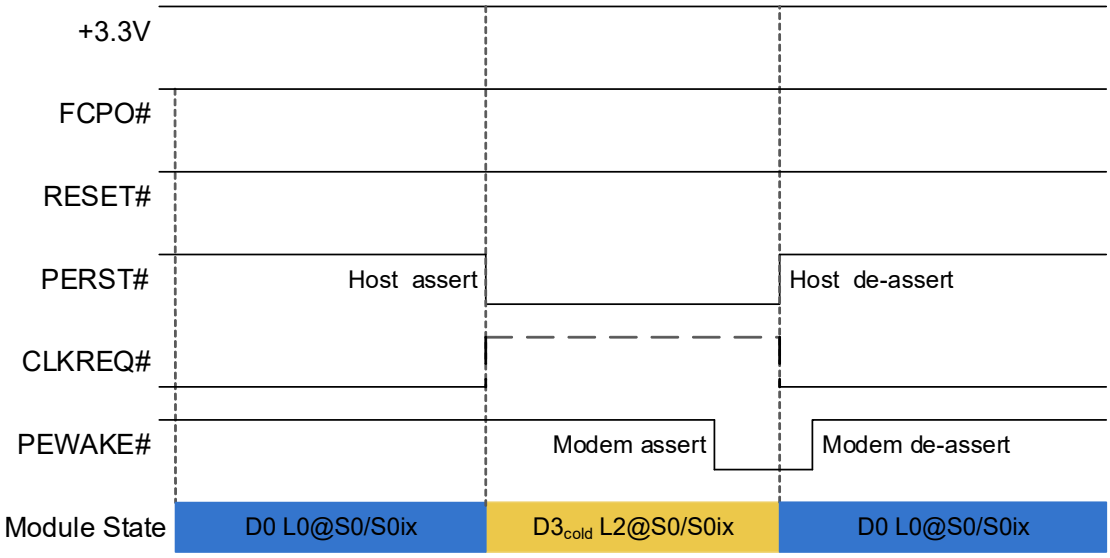


Figure 9. $D3_{cold}$ L2 timing (modem wakeup)

3.3.5 Timing Application

The recommended timing application in Windows 11 OS is as in Table 16:

Table 16. Timing applications

System Status		Timing Application
S0ix (Modem standby)	D0 L1.2	Refer to section 3.3.4.1 Figure 9 D0 L1.2 Timing
	$D3_{cold}$ L2	Refer to section 3.3.4.2 Figure 10/11 $D3_{cold}$ L2 timing
S3, S4, S5	Power on (back to S0)	Refer to section 3.3.1.2 Figure 5 Timing control for start-up
	Power off (out of S0)	Refer to section 3.3.2 Figure 6 Shutdown timing control

System Status		Timing Application
G3 boot	Power on	Refer to section 3.3.1.2 Figure 5 Timing control for start-up
Warm boot		Refer to section 3.3.3 Figure 8-2 Module reset timing
Modem FW upgrade / Modem recovery		Refer to section 3.3.3 Figure 8-1 /Figure 8-2 Module reset timing

3.4 PCIoT Mode Timing

When the host is in above OS mode, the module works in MBB mode. When the host is in below OS mode, the module can work in IoT mode. For example, from S0 MBB mode to S4/S5 IoT mode transition, Or from S4/S5 IoT mode to S0 MBB mode transition, the Control timing is shown in Figure 15 and Figure 16:

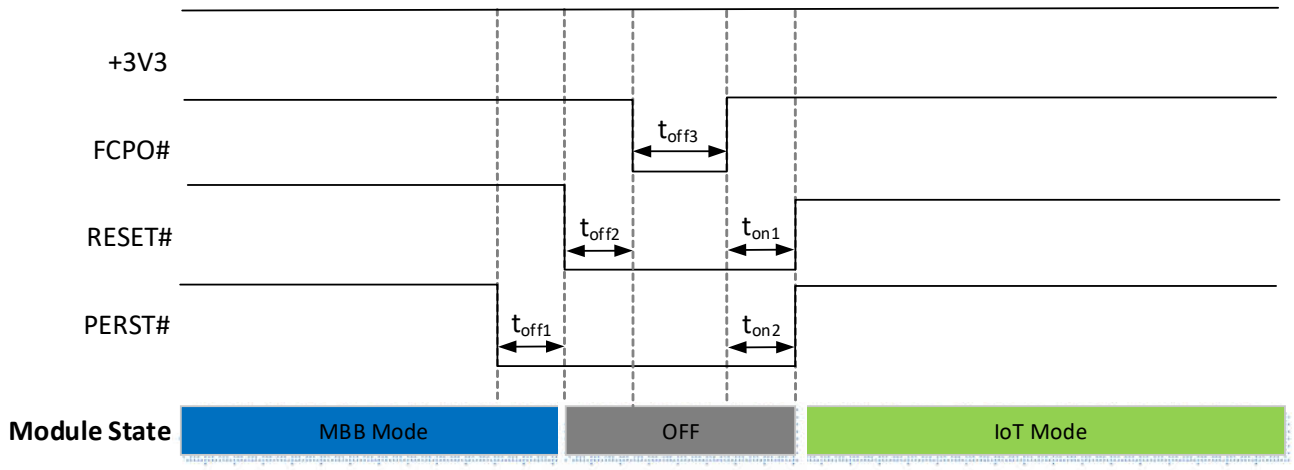


Figure 15. S0 to S4/S5 transition timing

Index	Min.	Recommended	Max.	Comment
t_{off1}	16ms	20ms	-	RESET# should be asserted after PERST#
t_{off2}	2ms	10ms	-	FCPO# should be asserted after RESET#

Index	Min.	Recommended	Max.	Comment
t_{off3}	500ms	500ms	-	Time to allow the WWAN module to fully discharge any residual voltages before the pin could be de-asserted again. This is required for both Pre-OS as well as Runtime flow
t_{on1}	0ms	20ms	-	If in IoT mode, host has no control, follow the behavior inside the module
t_{on2}	0ms	50ms	-	If in IoT mode, host has no control, follow the behavior inside the module

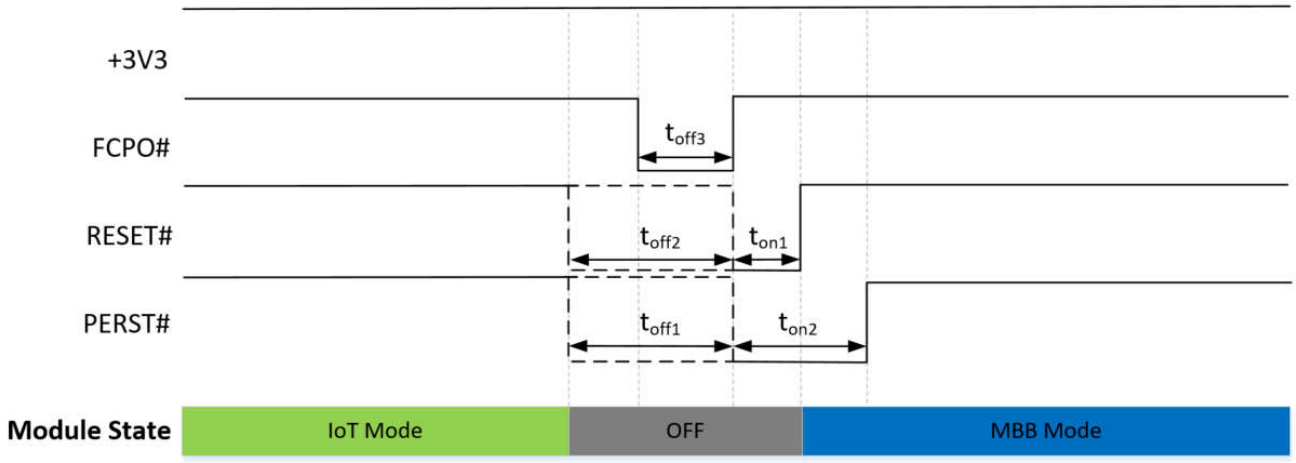


Figure 16. S4/S5 to S0 transition timing

Index	Min.	Recommended	Max.	Comment
t_{off1}	> 0ms	500ms	-	If in IoT mode, host has no control, follow the behavior inside the module
t_{off2}	> 0ms	500ms	-	If in IoT mode, host has no control, follow the behavior inside the module

Index	Min.	Recommended	Max.	Comment
t_{off3}	500ms	500ms	-	Time to allow the WWAN module to fully discharge any residual voltages before the pin could be de-asserted again. This is required for both Pre-OS as well as Runtime flow
t_{on1}	20ms	20ms	-	RESET# should be de-asserted after FCPO# pull high
t_{on2}	50ms	50ms	-	The time delay of PERST# de-asserted after FCPO#, PERST# must always be the last to get de-asserted

In IoT mode, when EC detect modem heartbeat abnormal need reset, EC will control FCPO# output low-level pulse to recovery modem.

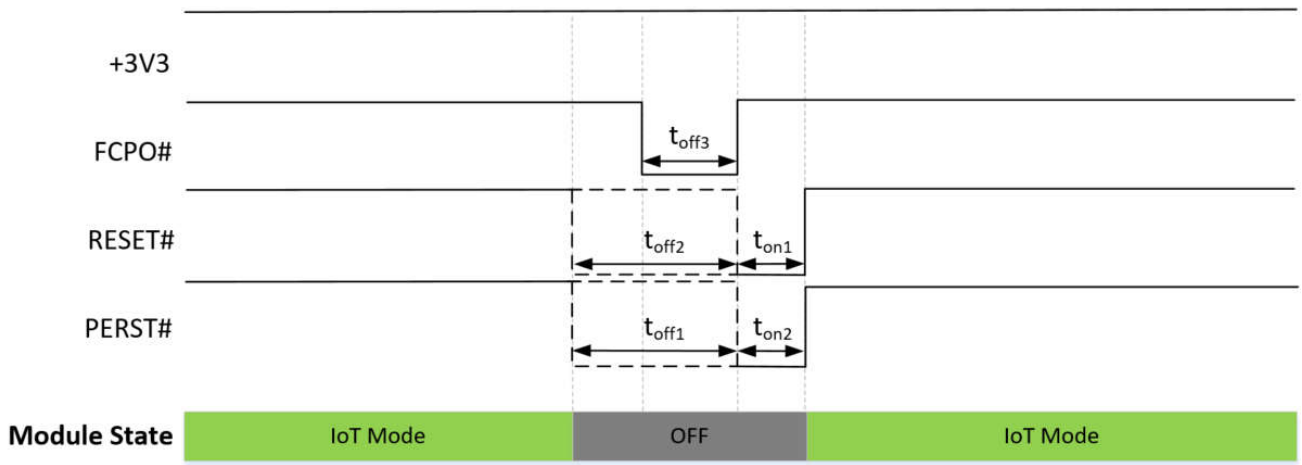


Figure 17. Heartbeat failure recovery timing

Index	Min.	Recommended	Max.	Comment
t_{off1}	>0ms	500ms	-	If in IoT mode, host has no control, follow the behavior inside the module
t_{off2}	>0ms	500ms	-	If in IoT mode, host has no control, follow the

Index	Min.	Recommended	Max.	Comment
				behavior inside the module
t_{off3}	500ms	500ms	-	Time to allow the WWAN module to fully discharge any residual voltages before the pin could be de-asserted again. This is required for both Pre-OS as well as Runtime flow
t_{on1}	0ms	20ms	-	If in IoT mode, host has no control, follow the behavior inside the module
t_{on2}	0ms	50ms	-	If in IoT mode, host has no control, follow the behavior inside the module

3.5 PCIe Interface

FM350 module supports PCIe as IPC interface for data transfer. The PCIe supports Gen3 X1 for data transmission channel, it is also compatible with PCIe Gen2 and Gen1. BIOS configuration must follow X86 platform BKC (Best Know Configuration) reference design.

PCIe interface will be initialized by host driver, then mapped with MBIM & GNSS port in Win11 OS and with RMNET & AT port in Chrome/Linux OS. The MBIM and RMNET interfaces are used for data transfer, and GNSS port is used for receiving GNSS data, and AT port is used for AT command.

PCIe interface pins and the connections with AP are provided in Table 17 and Figure 12.

Refer to *FIBOCOM FM350-GL Hardware Development Guide* for schematic and layout designs.

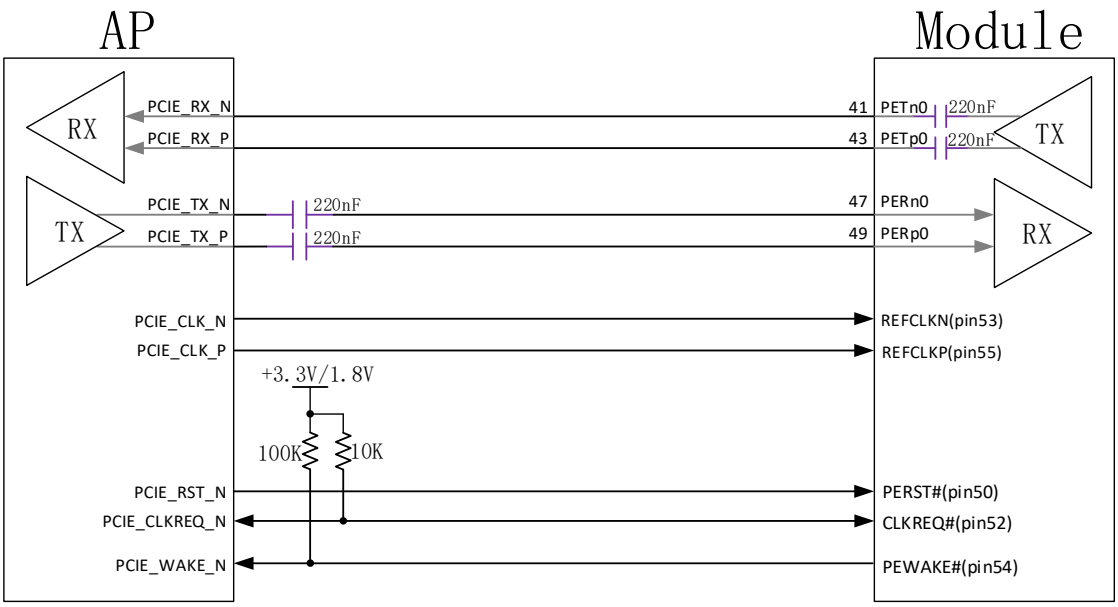


Figure 10. PCIe interface Connection with AP

Table 17. PCIe pin Definition

Pin No.	Pin Name	I/O	Default state	Description	DC Characteristics
41	PETn0	AO	-	PCIe TX Differential signals, negative	-
43	PETP0	AO	-	PCIe TX Differential signals, positive	-
47	PERn0	AI	-	PCIe RX Differential signals, negative	-
49	PERP0	AI	-	PCIe RX Differential signals, positive	-
53	REFCLKN	AI	-	PCIe Reference Clock signal Negative	-
55	REFCLKP	AI	-	PCIe Reference Clock signal Positive	-

Pin No.	Pin Name	I/O	Default state	Description	DC Characteristics
50	PERST#	DI	PU	Asserted to reset module PCIe interface to default. If module went into core dump, it would reset whole module, not only PCIe interface. Active low, pulled-up with a 10KΩ resistor	3.3/1.8V
52	CLKREQ#	DIO	OD	Asserted by module to request a PCIe reference clock to be available (active clock state) in order to transmit data. It is also used by L1 PM Sub states mechanism, asserted by either host or device to initiate an L1 exit. Active low, requiring an external pull-up resistor on platform	3.3/1.8V
54	PEWAKE#	DO	OD	Asserted to wake up system and reactivate PCIe link from L2 to L0, whether to support wake-up functionality depends on system. Active low, requiring an external pull-up resistor on platform	3.3/1.8V

3.6 USB Interface

The USB interface is a reserved interface, and recommended to be NC.

3.7 USIM Interface

The FM350 module supports dual SIM interface, one is for an embedded-SIM IC and the other is for a pluggable SIM card. Both of the SIM interfaces electrically supports 1.8V and 3.0V SIM cards.

3.7.1 USIM Pins

The USIM1 pins description is shown in Table 18:

Table 18. USIM Pin description

Pin No.	Pin Name	I/O	Default state	Description	DC Characteristics
36	UIM1_PWR	PO	-	USIM power supply	1.8V/3V
30	UIM1_RESET	DO	-	USIM reset	1.8V/3V
32	UIM1_CLK	DO	-	USIM clock	1.8V/3V
34	UIM1_DATA	DIO	-	USIM data, internal pull up (4.7KΩ)	1.8V/3V
66	SIM1_DETECT	DI	PU	USIM card insertion detection, internal pull-up (390K). High level indicates that the SIM card is inserted; and low level indicates that the SIM card is removed	1.8V

3.7.2 USIM Hot-Plug

The FM350 module supports the SIM card hot-plug function, which determines whether the

SIM card is inserted or not by detecting the SIM_DETECT pin state.

The SIM card hot-plug function can be configured by "AT+MSMPD" command, and the description for AT command is shown in Table 19:

Refer to the *FIBOCOM FM350-GL Hardware Development Guide* for schematic and layout designs.

Table 19. AT Command for hot-plug

AT Command	Hot-plug Detection	Function Description
AT+MSMPD=1	Enable	By default, the SIM card hot-plug detection function is enabled. The module can detect whether the SIM card is inserted or not through the SIM_DETECT pin state.
AT+MSMPD=0	Disable	The SIM card hot-plug detection function is disabled. The module reads the SIM card when starting up, and the SIM_DETECT status will not be detected any more.

SIM_DETECT is active high. It can be swapped to active low by AT CMD.

3.8 Status Indicator

The FM350 module provides two signals to indicate the operating status of the module, and the status indicator pins are shown in Table 20:

Table 20. Status indicator pin description

Pin No.	Pin Name	I/O	Default sate	Pin Description	DC Characteristics

Pin No.	Pin Name	I/O	Default sate	Pin Description	DC Characteristics
10	LED1#	DO	-	System status LED	3.3V
23	WOWWAN#	DO	PU	To Wake up host, Reserved	1.8V

3.8.1 LED#1 Signal

The LED#1 signal is used to indicate the operating status of the module, and the detailed description is shown in the following table:

Table 21. LED# status

Module Status	LED1# Signal Status
RF function ON	Low level (LED On)
RF function OFF	High level (LED Off)

The reference LED driving circuit is shown in Figure 13:

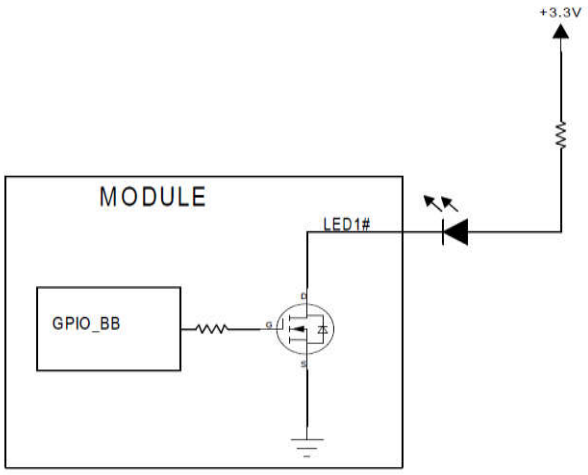


Figure 11. LED driving circuit

The resistance of LED current-limiting resistor is selected according to the driving voltage and the driving current.

3.8.2 WOWWAN#

The WOWWAN# signal is used to wake the Host (AP) when there comes the data request. The definition of WOWWAN# signal is as follows:

Table 22. WOWWAN# signaling

Operating Mode	WOWWAN# Signal
SMS or data requests	pull low for 1s then drive high (pulse signal).
Idle/Sleep	High level

The WOWWAN# timing is shown in Figure 14.

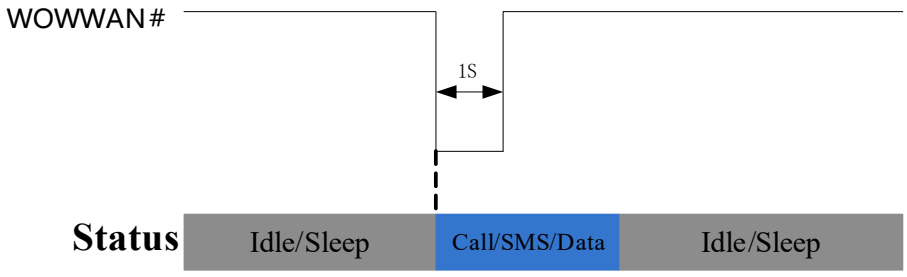


Figure 12. WOWWAN# timing

WOWWAN# is disabled by default, it can be enabled by AT CMD: AT+GTWAKE=1 and restart module.

3.9 Interrupt Control

The FM350 module provides five interrupt signals, and the pin definition is as the following

table:

Table 23. Interrupt pins description

Pin No.	Pin Name	I/O	Default state	Pin Description	DC Characteristics
8	W_DISABLE1#	DI	PU	Enable/Disable RF network, active low	3.3/1.8V
22	ANT_TUNER_ CFG	DI	PU	External interrupt for SAR and antenna environment detection	1.8V
25	DPR	DI	PU	External interrupt for 1st dynamic power reduction detection	3.3/1.8V
26	W_DISABLE2#	DI	PU	Enable/Disable GNSS signal, active low. Reserved	3.3/1.8V

3.9.1 W_DISABLE1#

The module provides a hardware pin to enable/disable WWAN RF function, and the function can also be controlled by the AT command. The module enters the flight mode after the RF function is disabled. The definition of W_DISABLE1# signaling is as in Table 24:

Table 24. W_DISABLE1# function status

W_DISABLE1# signal Status	Function
High/Floating	WWAN function is enabled, the module exits the flight mode.
Low	WWAN function is disabled, the module enters flight mode.

The function of W_DISABLE1# is disabled in default, it can be enabled by AT CMD: AT+GTFMODE=1 and restart module.

3.9.2 SAR and Antenna Environment Detection

The related position of devices with FM350 installed in different placement states and the end user's body has effect on parameter configurations of Radio-Frequency-related functions such as SAR and tunable antenna.

ANT_TUNER_CFG on Pin 22 is the detection signal for the related position mentioned above referred as SAR and antenna environment. It will assist in the implementation of SAR and tunable antenna. FM350 will assign different parameters for SAR and tunable antenna functions based on the logic Low/High states of ANT_TUNER_CFG.

3.9.3 SAR Trigger

FM350 module supports Body SAR and TA SAR function by detecting the DPR pins. The voltage level of DPR is high in default, and when the SAR sensor detects the closing human body, the DPR signal will be pulled down. As the result, the module then lowers down its emission power to its default threshold value, thus reducing the RF radiation on the human body. The threshold of emission power can be set by the AT Commands.

Refer to *FIBOCOM_FM350_SAR_Design User Guide* for more details.

The definition of DPR signal is shown in Table 25:

Table 25. DPR function signaling

DPR Signal Status	Function
High/Floating	The module keeps the default emission power
Low	Lower the maximum emission power to the threshold value of the

module.

3.10 ANT Tunable Interface

The module supports two ANT Tunable interfaces, the MIPI RFFE interface and the 4bit-GPO interface.

With cooperation between an external antenna tuner and the tunable ANT, ANT tunable interfaces can flexibly configure the bands of LTE antenna to improve the antenna's working efficiency and save space for the antenna. The pin definition is shown in Table 26:

Table 26. ANT tunable interface pin description

Pin No.	Pin Name	I/O	Default state	Pin Description	DC Characteristics
24	ANT_TUNER_1V8	PO	-	1.8V power output for antenna tuner, max output current of 200mA	1.8V
56	RFFE_SCLK	DO	-	MIPI interface for ANT tuner, RFFE clock	1.8V
58	RFFE_SDATA	DIO	-	MIPI interface for ANT tuner, RFFE data	1.8V
59	ANTCTL0	DO	PD	ANT tuner control bit_0	1.8V
61	ANTCTL1	DO	PD	ANT tuner control bit_1	1.8V
63	ANTCTL2	DO	PD	ANT tuner control bit_2	1.8V
65	ANTCTL3	DO	PD	ANT tuner control bit_3	1.8V

When the ANT_TUNER_1V8 power provided by the module is used as the VIO of MIPI RFFE

Interface, it is following the timing as is shown in Figure 15. Do not overload it or use it for other purpose.

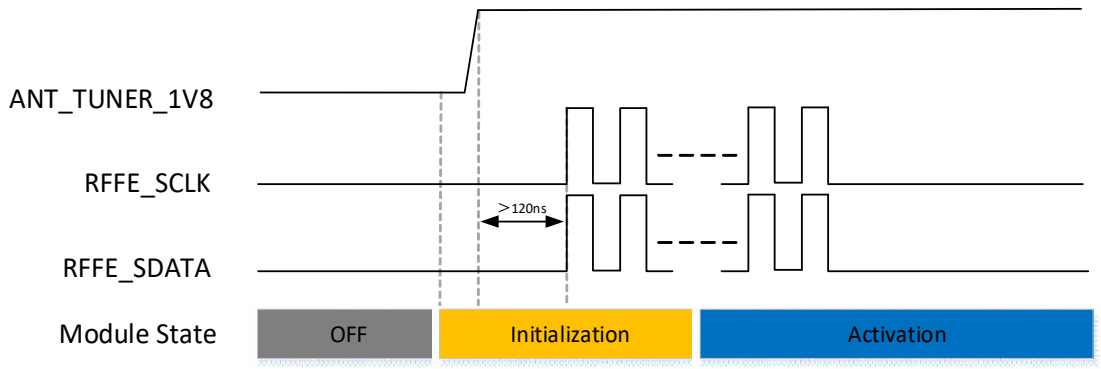


Figure 13. MIPI RFFE power-up timing

Refer to *FIBOCOM FM350-GL Hardware Development Guide* for schematic and layout design.

3.11 Configuration Interface

The FM350 module provides four pins for the configuration as the WWAN-PCIe type M.2 module as is listed in Table 27.

Table 27. Configuration interface pin description

Pin No.	Pin Name	I/O	Default state	Pin Description	DC Characteristics
1	CONFIG_3	O	NC	FM350 M.2 module is configured as the WWAN – PCIe Gen3, USB3.1 Gen1 interface type	-
21	CONFIG_0	O	NC	FM350 M.2 module is configured as the WWAN – PCIe Gen3, USB3.1 Gen1 interface type	-
69	CONFIG_1	O	GND	FM350 M.2 module is configured as	-

Pin No.	Pin Name	I/O	Default state	Pin Description	DC Characteristics
				the WWAN – PCIe Gen3, USB3.1 Gen1 interface type	
75	CONFIG_2	O	NC	FM350 M.2 module is configured as the WWAN – PCIe Gen3, USB3.1 Gen1 interface type	-

The M.2 module configuration of FM350 is as shown in Table 28:

Table 28. FM350 M.2 configuration state

Config_0 (pin21)	Config_1 (pin69)	Config_2 (pin75)	Config_3 (pin1)	Module Type and Main Host Interface	Port Configuration
NC	GND	NC	NC	WWAN–PCIe Gen3, USB3.1 Gen1	Vendor defined

Please refer to *PCI Express M.2 Specification Rev4.0* for more details.

3.12 I2C Interface

As shown in Table 29, FM350 module supports one I2C interface in I2C compliant master mode operation for external PC IOT application. The cloud information is sent to the host through the I2C of the module to manage and control the PC remotely.

Refer to *UM10204 I2C-bus specification and user manual* which is an in-fact world standard for details about I2C, and refer to the *FIBOCOM FM350-GL Hardware Development Guide* for schematic designs.

Table 29. I2C pins description

Pin No.	Pin Name	I/O	Default state	Description	DC Characteristics
40	I2C_SCL	DO	PU	I2C clock, master mode	1.8V
42	I2C_SDA	DIO	PU	I2C date, master mode	1.8V
44	I2C_IRQ#	DI	PU	interrupt signal to wake up I2C host of FM350 module	1.8V

The FM350 communicates with the EC through the I2C interface. In default mode, the FM350 I2C is configured as the master mode and operating speed in Fast-mode with a bit rate up to 400 kbit/s.

The signal on I2C_SCL is the synchronous clock signal between the master device and slave device. It is always controlled by FM350. I2C_SDA is the data input and output between the master device and slave device. It can be controlled by FM350, and it also can be controlled by EC according to the specific time sequence.

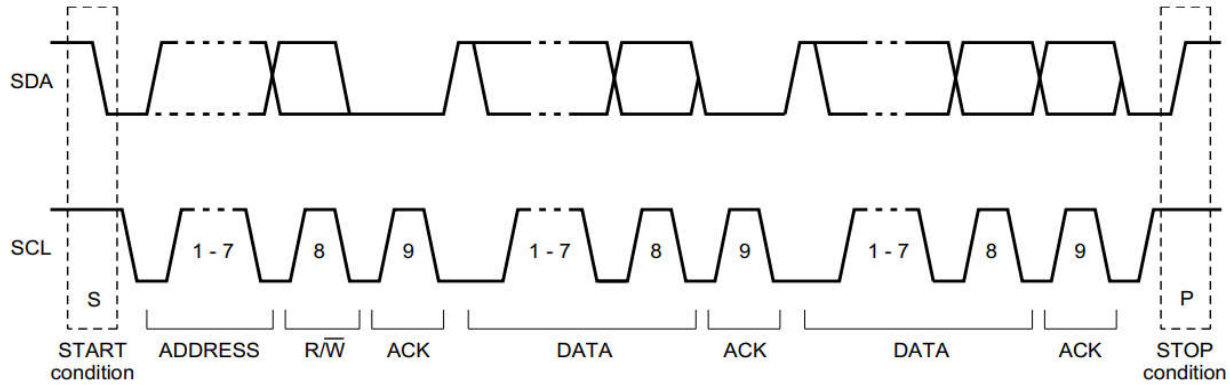


Figure 25. Complete data transfer

I2C_IRQ# I2C interrupt request. Low level active. Is used for EC to notify FM350 that there are some data need to be transmitted. On I2C bus, the data transmission is always started and controlled by FM350. If there are some data need to be transmitted to FM350 from EC while

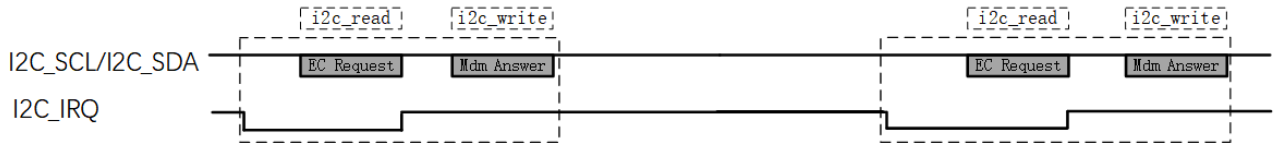
there is no communication on I2C bus, the EC needs to trigger the I2C_IRQ# to notify the FM350, and then the FM350 starts the data transmission.

Modem requests communication:

- When FM350 sends the request to EC through I2C write (I2C Start + 7bit Address + 1bit W + DATA_STREAM + I2C Stop).
- EC processes the request, prepares the response, and then triggers I2C_IRQ#.
- FM350 gets the EC response through I2C read (I2C Start +7bit Address + 1bit R + DATA_STREAM + I2C Stop).

EC requests communication:

- EC Triggers I2C_IRQ when I2C is idle.
- FM350 gets the request from EC through I2C read (I2C Start + 7bit Address + 1bit R + DATA_STREAM + I2C Stop).
- FM350 sends the response to EC through I2C write (I2C Start +7bit Address + 1bit W + DATA_STREAM + I2C Stop).



1) For the request of modem, EC should respond in 1 second.

2) For the request of EC, modem should respond in 1 second.

3) When EC triggers the IRQ, the I2C_IRQ signal should be kept low for 20ms at least for de-bounce purpose.

4) The I2C_IRQ signal should be kept low level not more than 50ms, and it should be pull up even though there is no I2C START signal in 50ms.

4 Radio Frequency

4.1 RF Interface

4.1.1 RF Interface Functionality

The FM350 module supports four RF connectors used for external antenna connection. As Figure 16 shows, "M" is for Main antenna, used to receive and transmit RF signals, "D/G" is for Diversity and GNSS antenna, used to receive the diversity and GNSS RF signals.

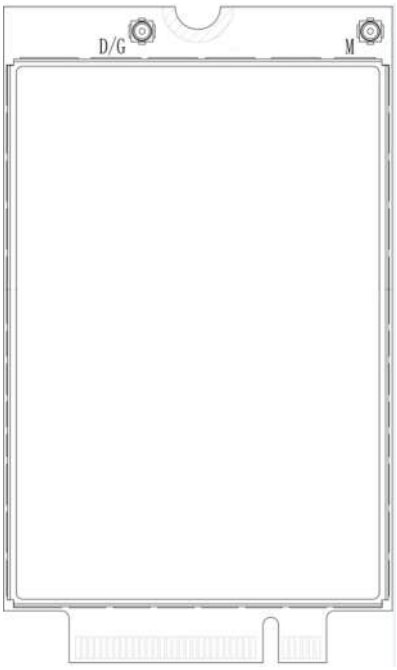


Figure 14. RF connectors

4.1.2 RF Connector Characteristic

Rated Condition		Environment Condition
Frequency Range	DC–6GHz	Temperature Range: –40°C-+85°C

Characteristic Impedance	50Ω

4.1.3 RF Connector Dimensions

FM350 module uses standard M.2 RF connectors, supporting the USS Ⅳ generation. The RF connector part number is 818004607 manufactured by ECT Corporation, and the connector size is 2 x 2 x 0.6mm. The connector dimensions are shown as the following figures:

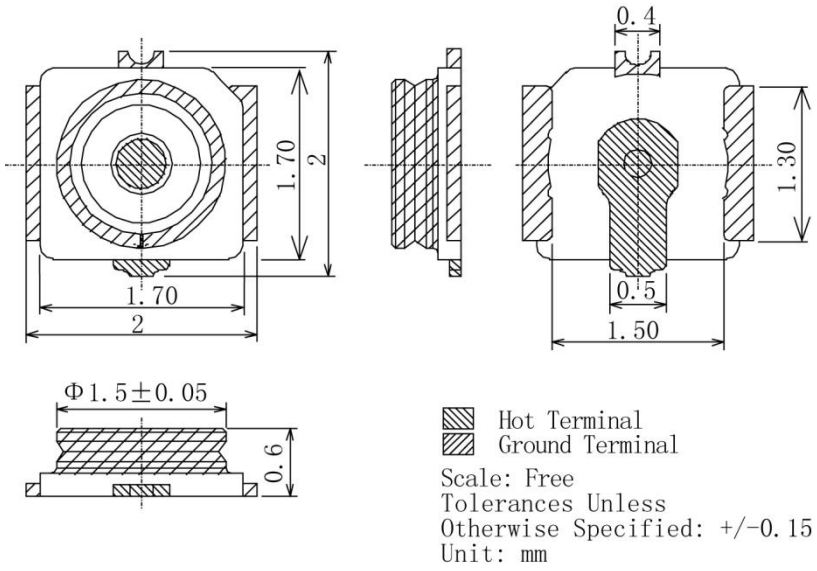


Figure 15. RF connector dimensions

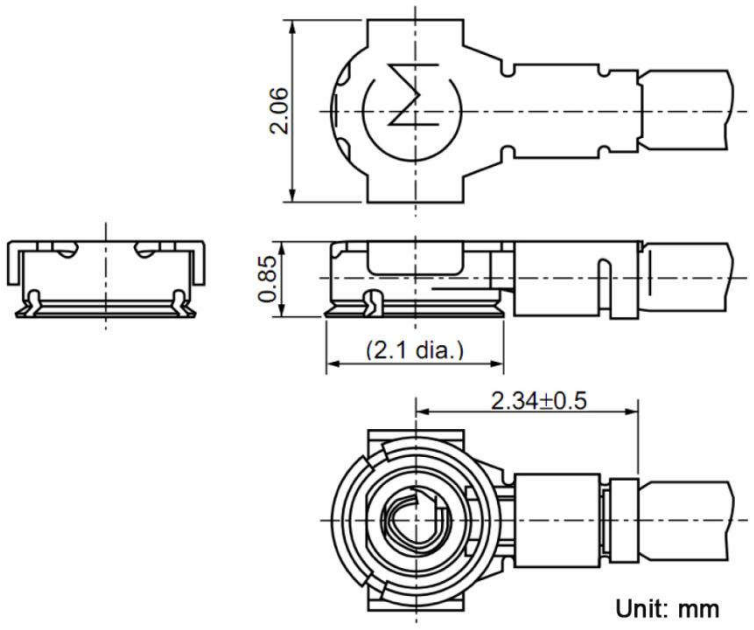


Figure 16. 0.81mm coaxial antenna dimensions

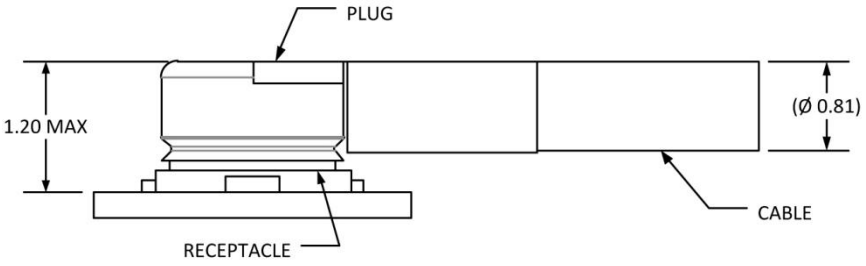


Figure 17. Schematic diagram of 0.81mm coaxial antenna connected to the RF connector

Mate RF connector parallel refer Figure 20, do not slant mate with strong force.

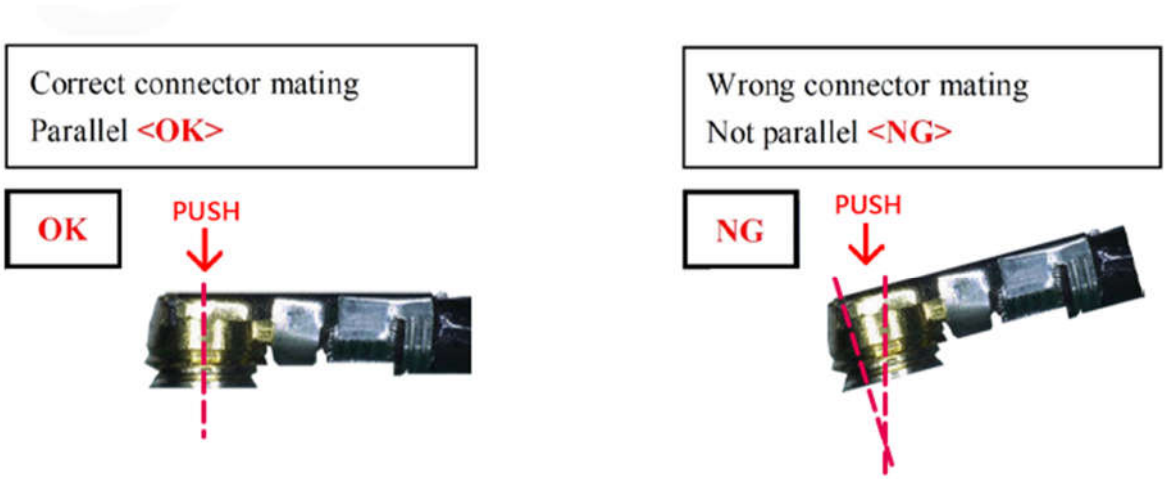


Figure 18. Mate RF connector

In order to avoid damage when that RF connector is un-mating, it is recommended using pulling JIG as Figure 21, and the pulling JIG must be lifted up vertically to PCB surface (see Figure 22 and 23).

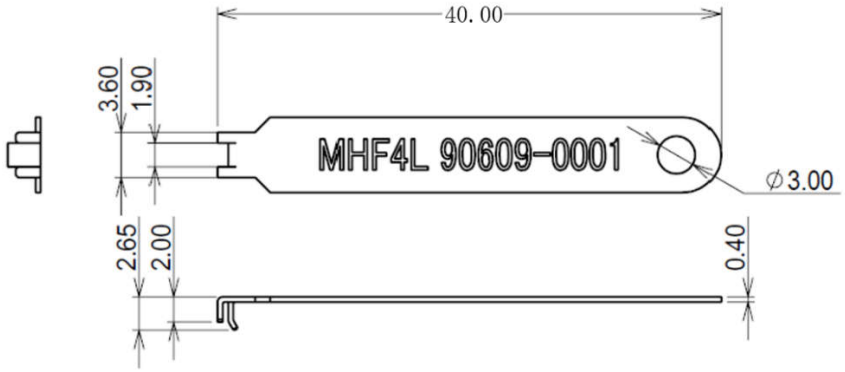


Figure 19. Pulling JIG

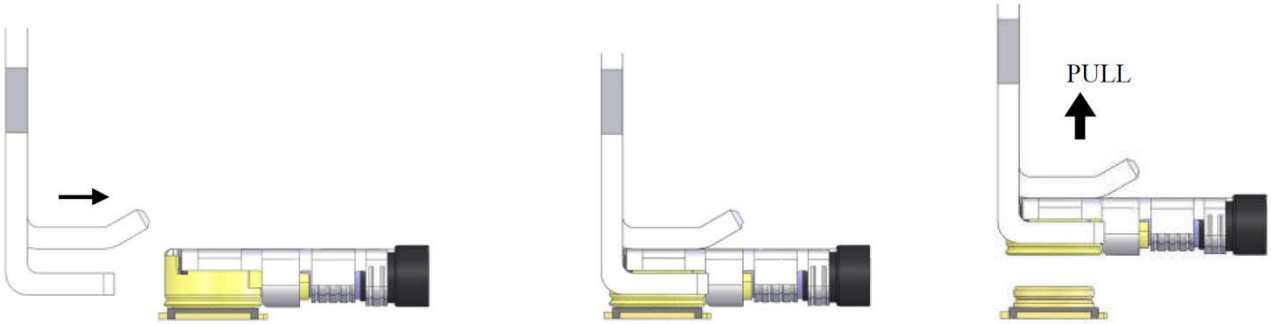


Figure 20. Lift up pulling JIG

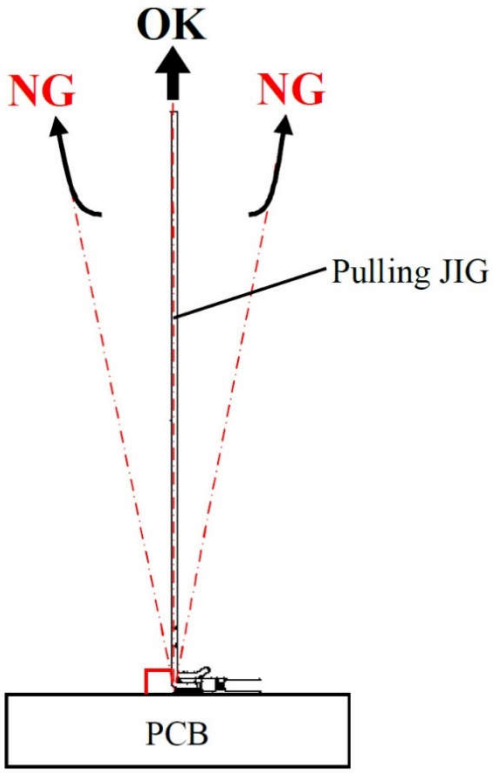


Figure 21. Pulling direction

4.2 Operating Band

The FM350 module operating bands of the antennas are shown in the following table:

Operating Band	Description	RAT	TX (MHz)	RX (MHz)
Band 1	2100MHz	LTE FDD/WCDMA	1920 - 1980	2110 - 2170
Band 2	1900MHz	LTE FDD/WCDMA	1850 - 1910	1930 - 1990
Band 3	1800MHz	LTE FDD	1710 - 1785	1805 - 1880
Band 4	1700MHz	LTE FDD/WCDMA	1710 - 1755	2110 - 2155

Operating Band	Description	RAT	TX (MHz)	RX (MHz)
Band 5	850MHz	LTE FDD/WCDMA	824 - 849	869 - 894
Band 7	2600MHz	LTE FDD	2500 - 2570	2620 - 2690
Band 8	900MHz	LTE FDD/WCDMA	880 - 915	925 - 960
Band 12	700MHz	LTE FDD	699 - 716	729 - 746
Band 13	700MHz	LTE FDD	777 - 787	746 - 756
Band 14	700MHz	LTE FDD	788 - 798	758 - 768
Band 17	700MHz	LTE FDD	704 - 716	734 - 746
Band 18	800MHz	LTE FDD	815 - 830	860 - 875
Band 19	800MHz	LTE FDD	830 - 845	875 - 890
Band 20	800MHz	LTE FDD	832 - 862	791 - 821
Band 25	1900MHz	LTE FDD	1850 - 1915	1930 - 1995
Band 26	850MHz	LTE FDD	814 - 849	859 - 894
Band 28	700MHz	LTE FDD	703 - 748	758 - 803
Band 29	700MHz	LTE FDD	-	717 - 728
Band 30	2300MHz	LTE FDD	2305 - 2315	2350 - 2360
Band 32	1500MHz	LTE FDD	-	1452 - 1496
Band 34	2000MHz	LTE TDD	2010 -2025	2010 -2025
Band 38	2600MHz	LTE TDD	2570 - 2620	2570 - 2620
Band 39	1900MHZ	LTE TDD	1880 - 1920	1880 - 1920
Band 40	2300MHz	LTE TDD	2300 - 2400	2300 - 2400

Operating Band	Description	RAT	TX (MHz)	RX (MHz)
Band 41	2500MHz	LTE TDD	2496 - 2690	2496 - 2690
Band 42	3500MHZ	LTE TDD	3400 - 3600	3400 - 3600
Band 43	3700MHz	LTE TDD	3600 - 3800	3600 - 3800
Band 48	3600MHz	LTE TDD	3550 – 3700	3550 – 3700
Band 66	1700MHz	LTE FDD	1710 - 1780	2110 - 2200
Band 71	600MHz	LTE FDD	663 -698	617 - 652
GPS L1	-	-	-	1575.42±1.023
GLONASS G1	-	-	-	1602.5625±4
Galileo E1	-	-	-	1575.42±2.046
BDS B1	-	-	-	1561.098±2.046

4.3 Transmitting Power

The transmitting power for each band of the FM350 module is shown in the following table:

RAT	Band	3GPP Requirement (dBm)	Tx Power (dBm)	Note
WCDMA	Band 1	24+1.7/-3.7	23.5±1	-
	Band 2	24+1.7/-3.7	23.5±1	-
	Band 4	24+1.7/-3.7	23.5±1	-
	Band 5	24+1.7/-3.7	23.5±1	-
	Band 8	24+1.7/-3.7	23.5±1	-

RAT	Band	3GPP Requirement (dBm)	Tx Power (dBm)	Note
LTE	Band 1	23±2.7	23±1	10MHz BW, 12 RB
	Band 2	23±2.7	23±1	10MHz BW, 12 RB
	Band 3	23±2.7	23±1	10MHz BW, 12 RB
	Band 4	23±2.7	23±1	10MHz BW, 12 RB
	Band 5	23±2.7	23+2/-1	10MHz BW, 12 RB
	Band 7	23±2.7	23±1	10MHz BW, 12 RB
	Band 8	23±2.7	23+2/-1	10MHz BW, 12 RB
	Band 12	23±2.7	23+2/-1	10MHz BW, 12 RB
	Band 13	23±2.7	23+2/-1	10MHz BW, 12 RB
	Band 14	23±2.7	23+2/-1	10MHz BW, 12 RB
	Band 17	23±2.7	23+2/-1	10MHz BW, 12 RB
	Band 18	23±2.7	23+2/-1	10MHz BW, 12 RB
	Band 19	23±2.7	23+2/-1	10MHz BW, 12 RB
	Band 20	23±2.7	23+2/-1	10MHz BW, 12 RB
	Band 25	23±2.7	23±1	10MHz BW, 12 RB
	Band 26	23±2.7	23+2/-1	10MHz BW, 12 RB
	Band 28	23+2.7/-3.2	23+2/-1	10MHz BW, 12 RB
	Band 30	23±2.7	22±1	10MHz BW, 12 RB
	Band 34	23±2.7	23±1	10MHz BW, 12 RB
	Band 38	23±2.7	23±1	10MHz BW, 12 RB

RAT	Band	3GPP Requirement (dBm)	Tx Power (dBm)	Note
	Band 39	23±2.7	23±1	10MHz BW, 12 RB
	Band 40	23±2.7	23±1	10MHz BW, 12 RB
	Band 41	23±2.7	23±1	10MHz BW, 12 RB
	Band 42	23+3/-4	23±1	10MHz BW, 12 RB
	Band 43	23+3/-4	23±1	10MHz BW, 12 RB
	Band 48	23+3/-4	21±1	10MHz BW, 12 RB
	Band 66	23±2.7	23±1	10MHz BW, 12 RB
	Band 71	23+2.7/-3.2	23+2/-1	10MHz BW, 12 RB

The max TX power is in primary RF path at ambient temperature 25°C.

4.4 Receiver Sensitivity

4.4.1 Dual Antenna Receiver Sensitivity

All bands support dual antenna, the receiver sensitivity for each band of FM350 module is shown in the following table:

RAT	Band	3GPP Requirement (dBm)	RX Sensitivity[1)] Typical (dBm)	Note
WCDMA	Band 1	-106.7	-113	-
	Band 2	-104.7	-112.5	-
	Band 4	-106.7	-112.9	-

RAT	Band	3GPP Requirement (dBm)	RX Sensitivity[1)] Typical (dBm)	Note
	Band 5	-104.7	-114.5	-
	Band 8	-103.7	-114.2	-
LTE FDD	Band 1	-96.3	-101.9	10MHz BW
	Band 2	-94.3	-101.3	10MHz BW
	Band 3	-93.3	-101.6	10MHz BW
	Band 4	-96.3	-101.8	10MHz BW
	Band 5	-94.3	-103.4	10MHz BW
	Band 7	-94.3	-101.2	10MHz BW
	Band 8	-93.3	-102.7	10MHz BW
	Band 12	-93.3	-103.5	10MHz BW
	Band 13	-93.3	-103.8	10MHz BW
	Band 14	-93.3	-103.3	10MHz BW
	Band 17	-93.3	-103.3	10MHz BW
	Band 18	-96.3	-103.2	10MHz BW
	Band 19	-96.3	-103	10MHz BW
	Band 20	-93.3	-103.5	10MHz BW
	Band 25	-92.8	-100.6	10MHz BW
	Band 26	-93.8	-103	10MHz BW
	Band 28	-94.8	-103.5	10MHz BW
	Band 29	-93.3	-104.2	10MHz BW

RAT	Band	3GPP Requirement (dBm)	RX Sensitivity[1)] Typical (dBm)	Note
LTE TDD	Band 30	-95.3	-101.0	10MHz BW
	Band 32	-96.3	-100.5	10MHz BW
	Band 66	-95.8	-101.1	10MHz BW
	Band 71	-93.5	-103	10MHz BW
	Band 34	-96.3	-101.5	10MHz BW
	Band 38	-96.3	-100.2	10MHz BW
	Band 39	-96.3	-102.3	10MHz BW
	Band 40	-96.3	-100.5	10MHz BW
	Band 41	-94.3	-100.5	10MHz BW
	Band 42	-95	-101.8	10MHz BW
	Band 43	-95	-101.8	10MHz BW
	Band 48	-95	-102	10MHz BW

1) The RX sensitivity values are measured in dual antennas condition (Main + Diversity). For single main antenna (without Diversity), the sensitivity will drop around 3dBm for each band.

2) B29 dual antenna receiver sensitivity is tested in DL CA: CA_2A-29A

3) B32 dual antenna receiver sensitivity is tested in DL CA: CA_20A-32A

4)[i] The above data is based on ambient temperature 25°C.

4.5 GNSS

FM350 module supports GNSS with D/G antenna, the GNSS includes GPS/GLONASS/ Galileo/BDS/QZSS. GNSS feature and performance are as in the table below.

Description	Positioning system	Condition	Test Result
			Typical
Current	GPS	Fixing	40mA @ -130dBm
		Tracking	40mA @ -130dBm
		Sleep	5.4mA
	GPS+ BDS+ GLONASS+ Galileo+ QZSS	Fixing	40mA @ -130dBm
		Tracking	40mA @ -130dBm
		Sleep	5.4mA
TTFF	GPS	Cold start	35s @ -130dBm
		Warm start	32s @ -130dBm
		Hot Start	1s @ -130dBm
	GPS+ BDS+ GLONASS+ Galileo+ QZSS	Cold start	36s @ -130dBm
		Warm start	34s @ -130dBm
		Hot Start	1s @ -130dBm
Sensitivity	GPS	Tracking	-162dBm
		Acquisition	-146dBm
	GPS+ BDS+ GLONASS+ Galileo+ QZSS	Tracking	-158dBm
		Acquisition	-146dBm

GNSS current is tested in flight mode at ambient temperature 25℃.

4.6 Antenna Design

The FM350 module provides two antenna ports, and the antenna design requirements are shown in the following table:

FM350 Module Main Antenna Requirement	
Item	Requirement
WCDMA	WCDMA band 1 (2100): 250MHz WCDMA band 2 (1900): 140MHz WCDMA band 4 (1700): 445MHz WCDMA band 5 (850): 70MHz WCDMA band 8 (900): 80MHz
LTE	LTE band 1 (2100): 250MHz LTE band 2 (1900): 140MHz LTE Band 3 (1800): 170MHz LTE band 4 (1700): 445MHz LTE band 5 (850): 70MHz LTE band 7 (2600): 190MHz LTE Band 8 (900): 80MHz LTE band 12 (700): 47MHz LTE band 13 (700): 41MHz

FM350 Module Main Antenna Requirement	
	LTE band 14 (700): 40MHz LTE band 17 (700): 42MHz LTE band 18 (800): 60MHz LTE band 19 (800): 60MHz LTE band 20 (800): 71MHz LTE band 25 (1900): 145MHz LTE band 26 (850): 80MHz LTE band 28 (700): 100MHz LTE band 29 (700): 11MHz LTE band 30 (2300): 55MHz LTE band 32 (1500): 44MHz LTE band 34 (2000): 15MHz LTE band 38 (2600): 50MHz LTE band 39 (1900): 40MHz LTE band 40 (2300): 100MHz LTE band 41 (2500): 194MHz LTE band 42 (3500): 200MHz LTE band 43 (3700): 200MHz LTE band 48 (3600): 150MHz LTE band 66 (1700): 490MHz LTE band 71 (600): 81MHz
GNSS	GPS: 2MHz GLONASS: 8MHz

FM350 Module Main Antenna Requirement	
	Galileo: 8MHz BDS: 4MHz
Impedance	50Ω
Input power	> 28dBm average power WCDMA & LTE
Recommended standing-wave ratio (SWR)	⩽ 2:1

5 ESD Characteristics

The module is generally not protected against Electrostatic Discharge (ESD). ESD handling precautions that apply to ESD sensitive components should be strictly followed. Proper ESD handling procedures must be applied throughout the processing, handling, assembly and operation of any application with module. The ESD characteristics are shown in the following table (Temperature: 25°C, Relative Humidity: 40%).

Interface	Contact Discharge	Air Discharge
GND	±8 kV	±15 kV
Antenna Interface	±8 kV	NA
Golden Finger	±2 kV	NA

ESD performance is based on EVB-M2 development board

6 Structure Specification

6.1 Product Appearance

The product appearance for FM350 module is shown in Figure 24:

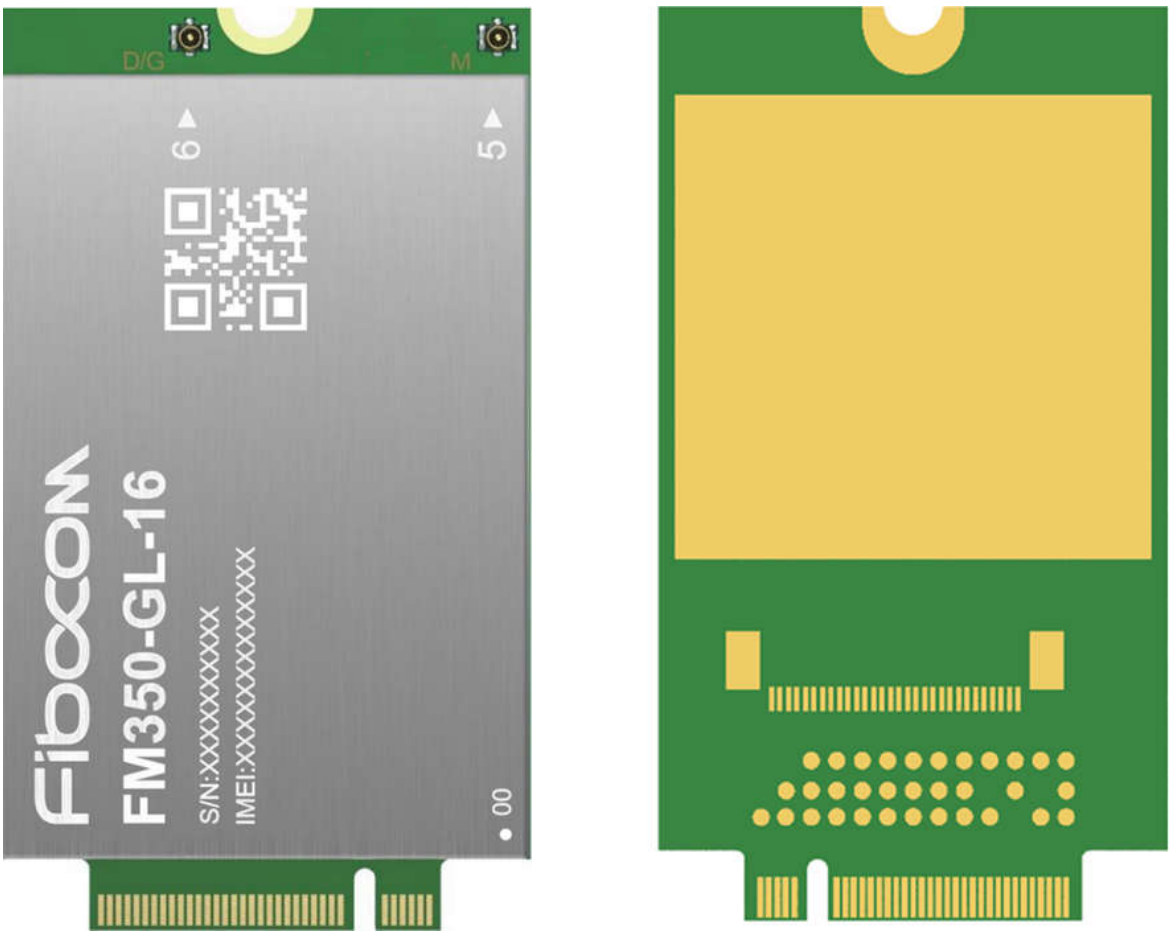
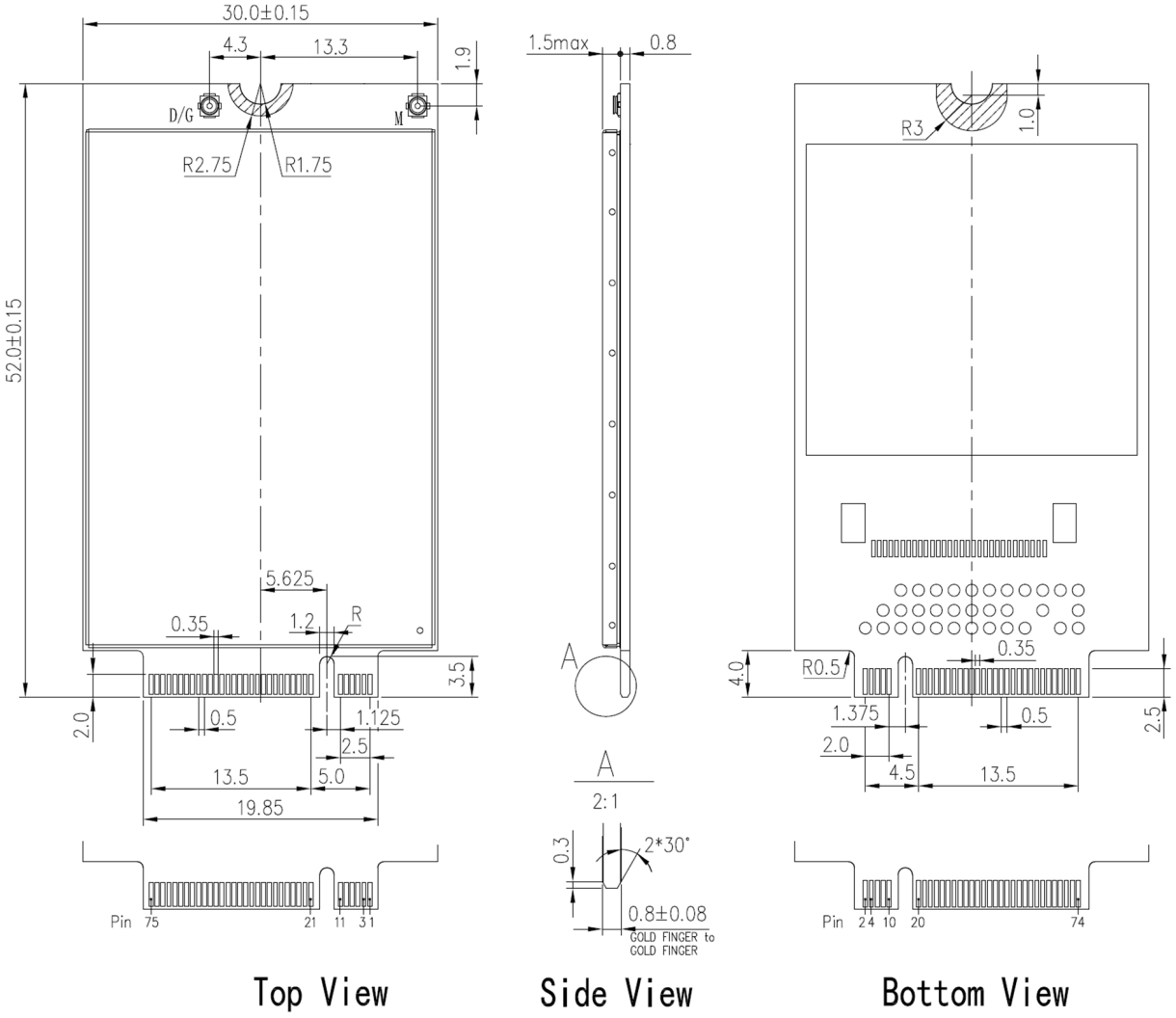


Figure 22. Module appearance

6.2 Dimensions of Structure

The structural dimensions of the FM350 module is shown in Figure 25:

Figure 23. Dimensions of structure



6.3 M.2 Interface Model

The FM350 M.2 module adopts 75-pin gold finger as external interface, where 67 pins are signal pins and 8 pins are notch pins as shown in Figure 3. For module dimension, please refer to Figure 25. Based on the nomenclature shown in Figure 26 for the M.2 module definition, FM350 module adopts Type 3052-S3-B interface (30x52mm, the component maximum height on t top layer is 1.5mm, PCB thickness is 0.8mm, and KEY ID is B).

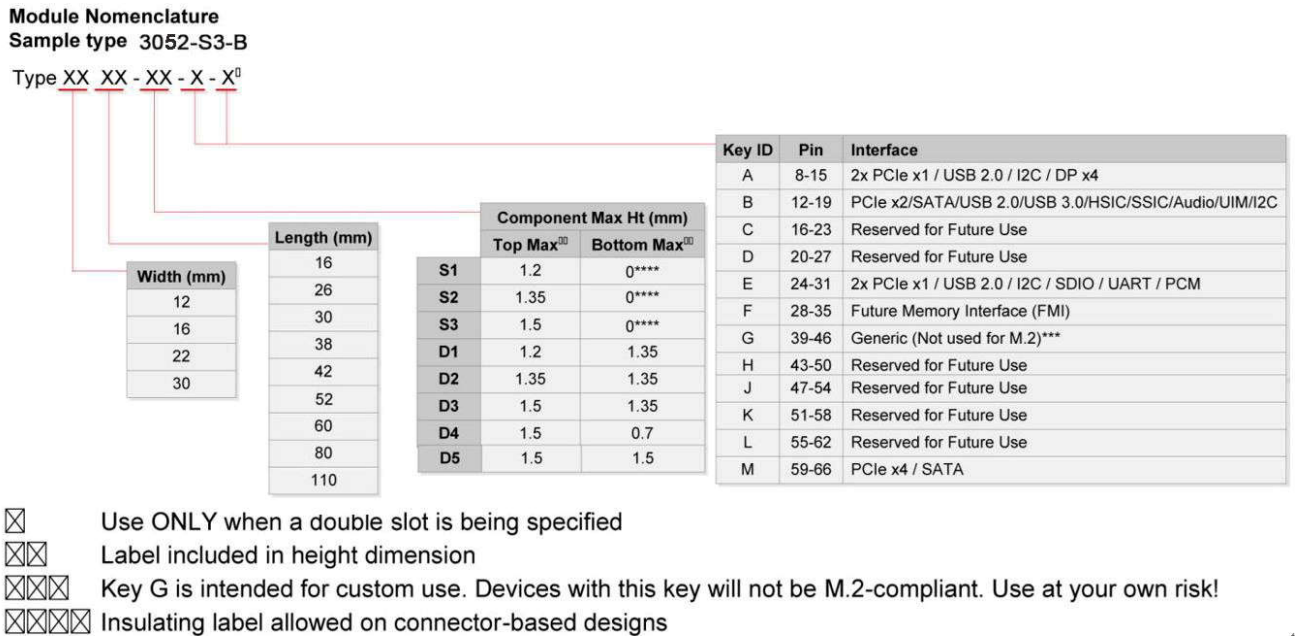


Figure 24. M.2 interface model nomenclature

6.4 M.2 Connector

FM350 module connects with host by M.2 connector which is built in host. The recommended part number is APCI0026-P001A manufactured by LOTES Corporation, and the dimensions are shown in Figure 27. For stack-up top-mount single-sided module, the recommended part number is APCI0144-P001A, manufactured by LOTES Corporation, and the dimension is shown in Figure 28. The package of connector, please refer to the specification.

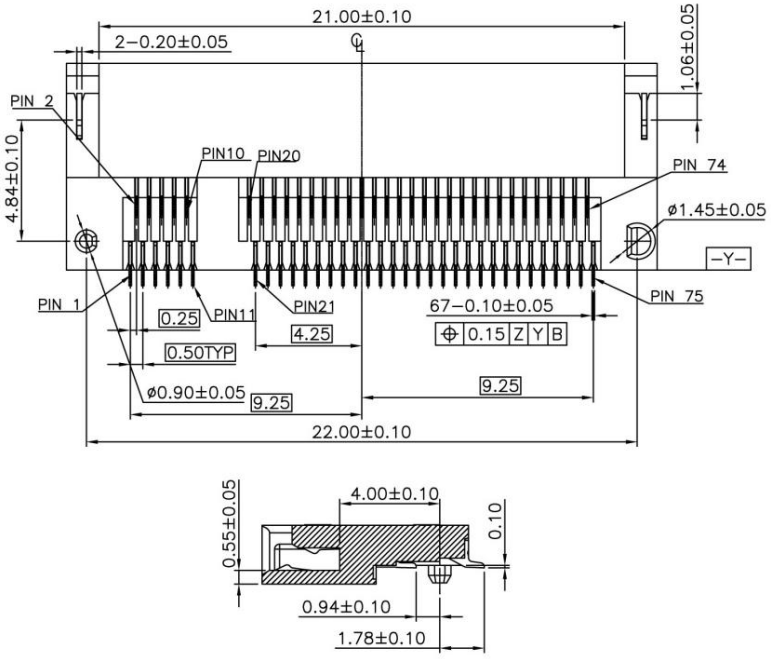


Figure 25. M.2 Dimensions of structure for stack-up Mid-mount single-sided module

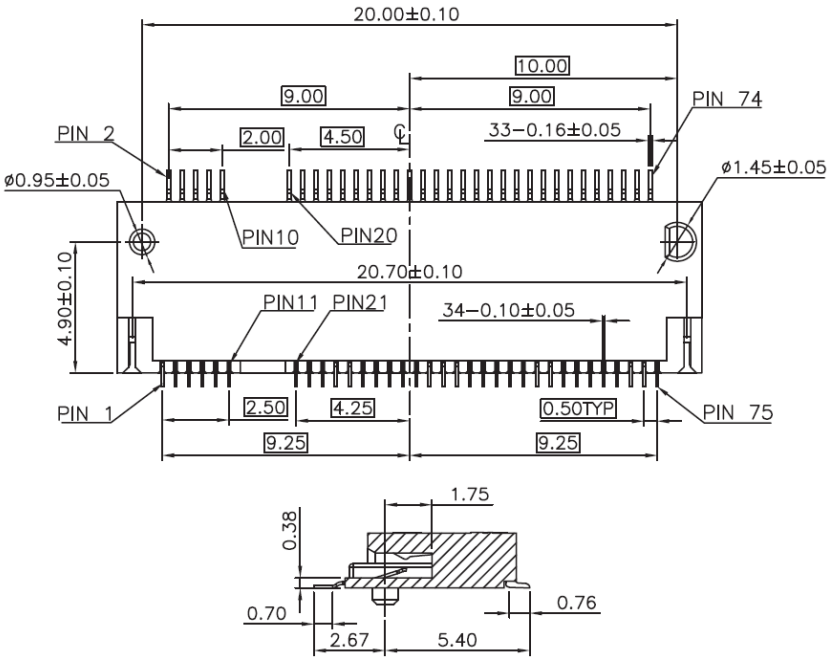


Figure 26. M.2 dimensions of structure for stack-up top-mount single-sided module

6.5 M.2 Card Assembly

6.5.1 Card Insertion

Angled insertion is allowable and preferred; intent is to minimize the insertion and extraction force. The minimum angle of insertion is 5°. For APCI0144-P001A, the maximum angle of insertion is 5°. For APCI0026-P001A, the maximum angle of insertion is 20°. Refer to Figure 29 and Figure 30 to insert and extract the module.

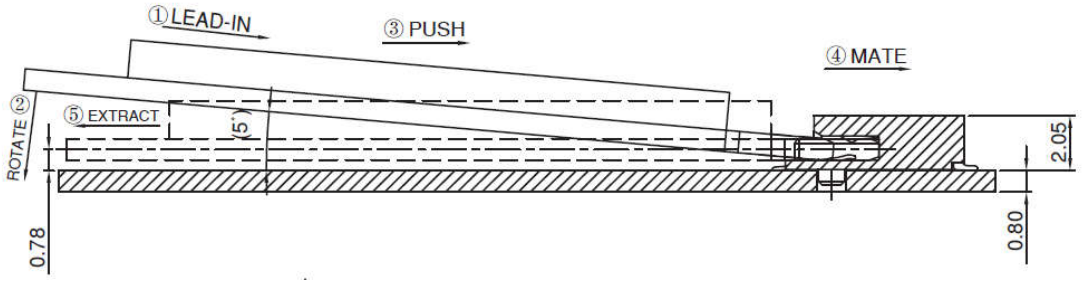


Figure 27. Angle of insertion for APCI0144-P001A

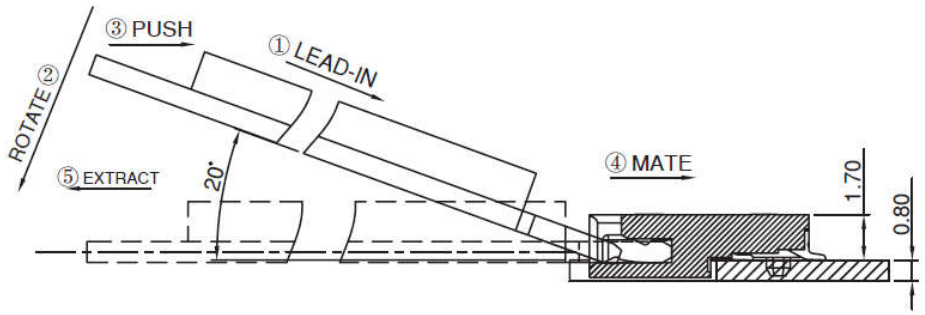


Figure 28. Angle of insertion for APCI0026-P001A

6.5.2 Mid-mount Connection with Single-Sided Module

Stack-up Mid-mount (In-line) single-sided module is shown in Figure 31. The maximum height of components is 1.5mm.

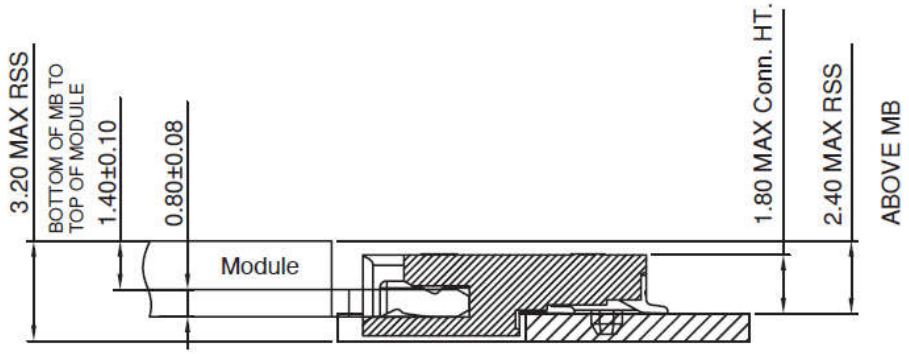


Figure 29. Stack-up mid-mount single-sided module

2.4 mm maximum above mother board

Suggest to cut the area of mother board under M.2 module

6.5.3 Top-mount Connection with Single-Sided Module

Stack-up top-mount single-sided module is shown in Figure 32. The maximum height of components is 1.5mm.

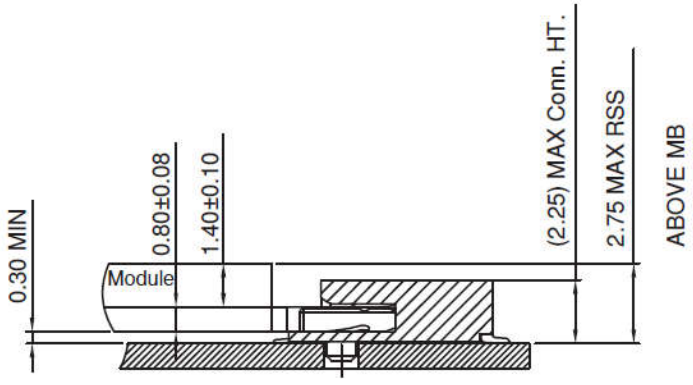


Figure 30. Stack-up top-mount single-sided module

1) 2.75mm maximum above mother board

2) Full keep out area 30×52mm below module, which means don't place any

components and routings below M.2 module.

3) Add thermal pad between M.2 module and mother board for thermal dissipation.

6.6 Storage

6.6.1 Storage Life

Storage Conditions (recommended): Temperature is 23 ± 5℃, relative humidity is less than RH 60%.

Storage period: Under the recommended storage conditions, the storage life is 12 months.

6.7 Packaging

The FM350 module uses the tray sealed packing, combined with the outer packing method using the hard cartoon box, so that the storage, transportation and the usage of modules can be protected to the greatest extent.

The module is a precision electronic product, and may suffer permanent damage if no correct electrostatic protection measures are taken.

6.7.1 Tray Package

The FM350 module uses tray package, 20 pcs are packed in each tray, with 5 trays including one empty tray on top in each box and 5 boxes in each case. Tray packaging process is shown

in Figure 33:

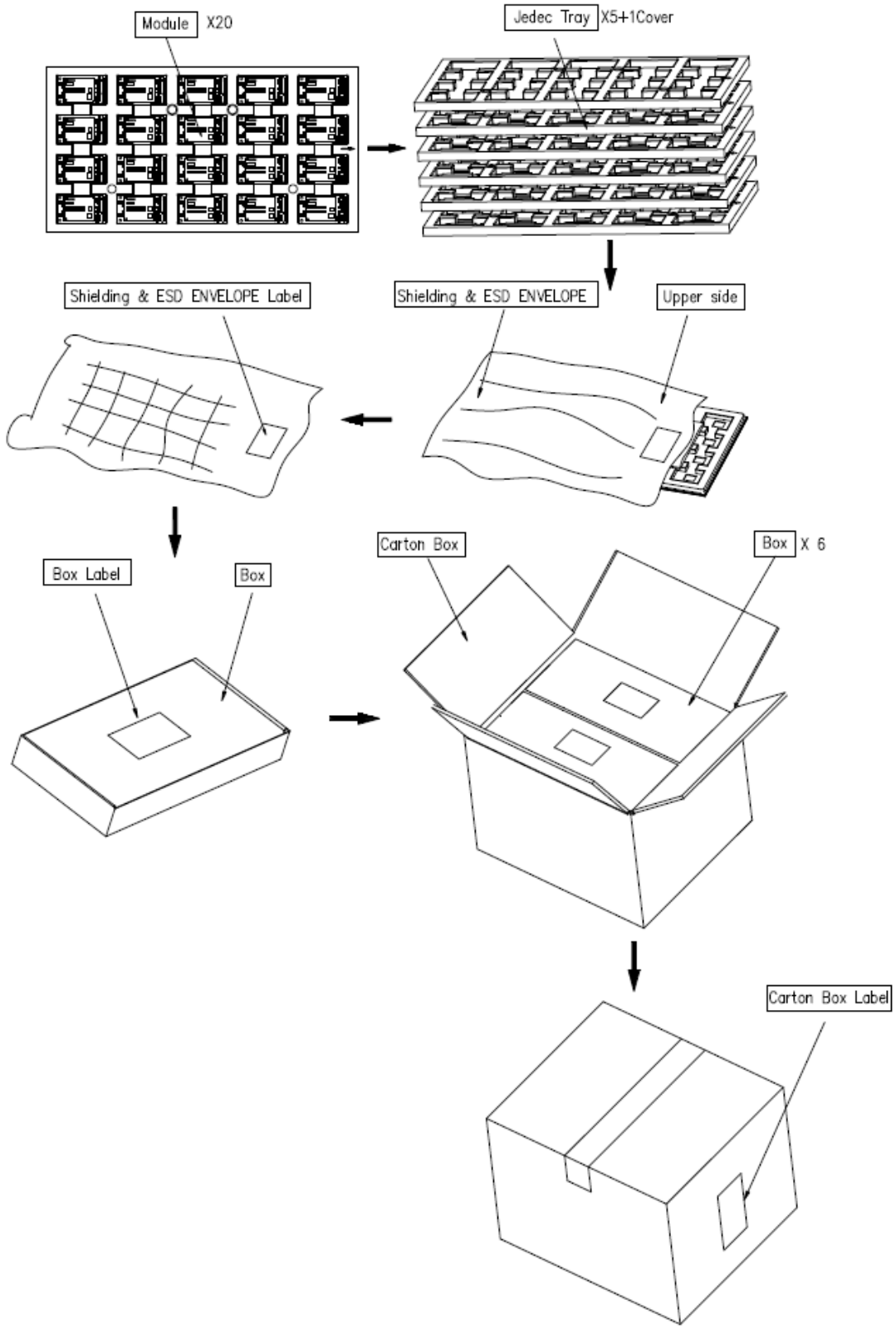

Module
X20
Jedec Tray
X5+1Cover
Shielding & ESD ENVELOPE Label
Shielding & ESD ENVELOPE
Upper side
Box Label
Box
Carton Box
Box
X 6
Carton Box Label

Figure 31. Tray packaging process

6.7.2 Tray Size

The pallet size is 330 mm×175 mm×6.5 mm, and is shown in Figure 34:

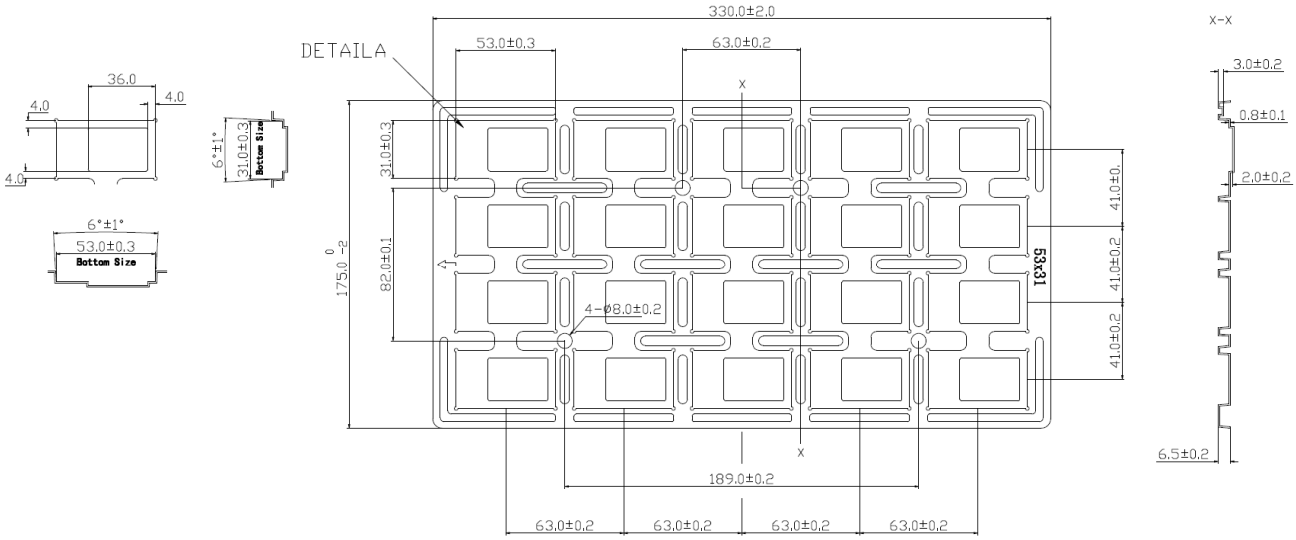


Figure 32. Tray size (unit: mm)

7 Appendix

7.1 Acronyms and Abbreviations

Abbreviation	Description
PI	Power Input
PO	Power Output
DI	Digital Input
DO	Digital Output
DIO	Digital Input /Output
AI	Analog Input
AO	Analog Output
AIO	Analog Input /Output
OD	Open Drain
T	Tristate
PU	Internal pull up
PD	Internal pull down
Hi-Z	High impedance
NC	Not connected
V_{OH}	Output high level effective voltage
V_{OL}	Output low level effective voltage
V_{IH}	Input high level effective voltage
V_{IL}	Input low level effective voltage

Abbreviation	Description
GPIO	General Purpose Digital Input/Output
GPO	General Purpose Digital Output
GPI	General Purpose Digital Input
SAR	Specific Absorption Rate
IPC	Inter-Process Communication
UVLO	Under voltage lock out
RFFE	RF frond end
PLDR	Platform-level Device Reset

8.NCC 警语

1. 減少電磁波影響，請妥適使用

2. 電波功率密度 MPE 標準值為：____ mW/cm^2，送測產品實測值為：____ mW/cm^2，建議使用時設備天線至少距離人體____ 公分。

9. CE Conformance information

CE Conformance information The device could be used with a separation distance of 20cm to the human body.

Hereby, [Fibocom Wireless Inc.] declares that the radio equipment type [FM350-GL-16] is in compliance with Directive 2014/53/EU.

The full DoC can be found at https://www.fibocom.com/en/downloadcenter/index.html.

10. FCC Conformance information

Important Notice to OEM integrators 1. This module is limited to OEM installation ONLY. 2. This module is limited to installation in mobile applications, according to Part 2.1091(b). 3. The separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and different antenna configurations 4. For FCC Part 15.31 (h) and (k): The host manufacturer is responsible for additional testing to verify compliance as a composite system. When testing the host device for compliance with Part 15 Subpart B, the host manufacturer is required to show compliance with Part 15 Subpart B while the transmitter module(s) are installed and operating. The modules should be transmitting and the evaluation should confirm that the module's intentional emissions are compliant (i.e. fundamental and out of band emissions). The host manufacturer must verify that there are no additional unintentional emissions other than what is permitted in Part 15 Subpart B or emissions are complaint with the transmitter(s) rule(s). The Grantee will provide guidance to the host manufacturer for Part 15 B requirements if needed.

Important Note

notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify to Fibocom Wireless Inc. that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the USI, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

End Product Labeling

When the module is installed in the host device, the FCC/IC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily re-moved. If not, a second label must be placed on the outside of the final device that contains the following text: “Contains FCC ID:ZMOFM350GL16” “Contains IC: 21374-FM350GL16 “ The FCC ID/IC ID can be used only when all FCC/IC compliance requirements are met.

Antenna Installation

(1) The antenna must be installed such that 20 cm is maintained between the antenna and users,

(2) The transmitter module may not be co-located with any other transmitter or antenna.

(3) Only antennas of the same type and with equal or less gains as shown below may be used with this module. Other types of antennas and/or higher gain antennas may require additional authorization for operation.

Antenna Type	Bands	Peak Gain
PIFA or Monopole	WCDMA B2	4
	WCDMA B4	3
	WCDMA B5	3
	LTE B2	4
	LTE B4	3
	LTE B5	3
	LTE B7	4
	LTE B12	3
	LTE B13	3
	LTE B14	3
	LTE B17	3
	LTE B25	4
	LTE B26	3
	LTE B30	1
	LTE B38	4

Antenna Type	Bands	Peak Gain
PIFA or Monopole	LTE B41	4
	LTE B48	1
	LTE B66	3
	LTE B71	3

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC/IC authorization is no longer considered valid and the FCC ID/IC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC/IC authorization.

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.

Federal Communication Commission Interference Statement

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. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

List of applicable FCC rules

This module has been tested and found to comply with part 22, part 24, part 27, part 90,part 96, part 15B requirements for Modular Approval. The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuity), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

This device is intended only for OEM integrators under the following conditions: (For module device use)

1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and

2) The transmitter module may not be co-located with any other transmitter or antenna. As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

11. ISED Conformance information

Industry Canada Statement 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.

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, et

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement."

Radiation Exposure Statement

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

Déclaration d'exposition aux radiations:

Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

This device is intended only for OEM integrators under the following conditions: (For module device use)

1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and

2) The transmitter module may not be co-located with any other transmitter or antenna. As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes: (Pour utilisation de dispositif module)

1) L'antenne doit être installée de telle sorte qu'une distance de 20 cm est respectée entre l'antenne et les utilisateurs, et

2) Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

Tant que les 2 conditions ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur

son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

IMPORTANT NOTE:

In the event that these conditions can not be met (for example certain laptop configurations or colocation with another transmitter), then the Canada authorization is no longer considered valid and the IC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for reevaluating the end product (including the transmitter) and obtaining a separate Canada authorization.

NOTE IMPORTANTE:

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considéré comme valide et l'ID IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: “Contains IC:21374-FM350GL16”.

Plaque signalétique du produit final

Ce module émetteur est autorisé uniquement pour une utilisation dans un dispositif où l'antenne peut être installée de telle sorte qu'une distance de 20cm peut être maintenue entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: 21374-FM350GL16".

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.

Manuel d'information à l'utilisateur final

L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module. Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.