M2M Communication Module
LTM100 Series Specification Document

Sep,2016

Please make the compliance with the terms and conditions listed in this data.

Revision history

Revision	Date	Description
Rev20	Jul 2016	Initial release
Rev21	Sep 2016	Added FCC Warnings and Notices
Rev22	Sep 2016	Added Installation Guidelines for Antenna PAD & Antenna line Guidelines

- Table of contents -

■ **Appendix A (80pin BtoB connector Type: LTM100D)**

1. Introduction

LTM100 Series Specification(hereinafter, this Document)document is a guide for our customers to provide the design by applying the 3G/LTE communication modem LTM100.

·The information contained in this document are described in the design and the contents to prevent problems in advance.

·The information contained in this document are not guaranteed for operation of the system to the (customer center) from the customer device..

·I would like to design according hoping to comply with the information contained in thid document, there is no special reason.

1. 1 Terms and acronyms

This document requires a description for representation of the term there is a technical term is described below.

Table 1.1 Definitions of terms

Term	Definition
DCE	Data communication equipment(LTM100)
DTE	Data terminal equipment
External Equipment	Mounted with a module(LTM100) customer's equipment(DTE)
SIM	Subscriber identity module
UART	Universal asynchronous receiver transmitter
SPI	Serial peripheral interface
USB	Universal serial bus
ADC	Analog-to-digital converter
WCDMA	Wideband code division multiple access
LTE	Long term evolution
I2C	Inter-integrated circuit
I2S	Inter-IC sound
GNSS	Global navigation satellite system
GPIO	General-purpose input/output
HSIC	High-speed inter-chip
SMD	Surface Mount Devices
SMT	Surface Mounter Technology
Idle	Stanby status(LTM100)
RF	Radio Frequency
During communication	On communication status
3G/LTE Network	eNB,MME for 3 G or LTE Communication.
Network Regulation	3 G or LTE Network Communication Regulation (When a disaster occurs, If the telecommunications service provider telecommunications regulatory when communicating many users at the same time.

1. 2 Module Introduction

LTM100 Module is a wireless modem that supports Global 3G / LTE,
Data Speed in the case of LTE (Cat4) can be up to downlink 150Mbps uplink 50Mbps,
In case of 3G (HSPA +) up to downlink 42Mbps uplink 5.76Mbps.
LTM100 possible applications include security, power meter, remote control systems, billing systems,BIS, gateway, and so can the instruments and devices in a variety of industries and provides a SMD type and B2B connector type.

1. 2. 1 Air Interface

■ Support Band

- LTE : B1, B2, B4, B5, B7, B18, B19 (Note: LTE B7 does not work in US)
- WCDMA : B1, B2, B4, B5, B19
- GSM : 850, 900, 1800, 1900
- GNSS(Gen 8C) : GPS, GLONASS, BeiDou, Galileo and QZSS

■ Data Speed

- FDD LTE CAT4 (Down link: 150Mbps / Up link: 50Mbps)
- WCDMA HSPA+ (Down link: 42Mbps / Up link: 5.76Mbps)

※ Data throughput Depending on External communication environment.

■ RF Interface Type (SMD PAD)

- SMD Type
- 3 PADs : Main Antenna PAD, Sub Antenna PAD, GPS Antenna PAD

1. 2. 2 External Interface

■ DC Power Supply : 3.4V ~ 4.2V

■ External Interface

- UART : up to 4MHz support (2port)
- USB : USB 2.0 Support (1port)
- SDIO / SPI (UP TO 50MHz) Interface support

■ USIM Interface (2port)

- External UIM card support (Voltage 1.8V/2.95V)

■ Audio Interface (I2S)

- External Audion Codec Support

■ Control Interface

- Control pin : power on, reset, I2C, Status Indicator Output

■ Interface Type

- SMD PAD Type (101-PAD)

1. 2. 3 Certification Approval

Table 1.2 below is a list of Certification this module is approved.

Table 1.2 Certification Approval Band

	WCDMA					LTE							GSM			
	B1	B2	B4	B5	B19	B1	B2	B4	B5	B7	B18	B19	850	900	1800	1900
FCC		○	○	○			○	○	○				○			○
CE	○									○				○	○	
JATE/Telec	○				○	○					○	○				

note) LTE B7 does not work in US

2. Product Specification

2. 1 General Specifications

Table 2. 1 General Specifications

Classification		Specification	Remark
BAND	LTE	B1/B2/B4/B5/B7/B18/B19	B7 does not work in US
	WCDMA	B1/B2/B4/B5/B19	
	GSM	850/900/1800/1900	
GPS		GPS,Glonass,Beidou,Galileo, QZSS	
Memory (MCP)		4Gb NAND Flash / 2Gb LPDDR2 SDRAM	
101 PAD I/O		DC / UART(x2) / USB 2.0 / External USIM / I2C / SDIO / SPI / Power on key / Reset key / GPIO	
Antenna		MAIN(LTE P,WCDMA), SUB(LTE S), GPS Antenna PAD	LTE P:Primary LTE S:Secondary
Operating Voltage		+3.4 Vdc~ +4.2 Vdc (Typ 3.8Vdc)	
Dimensions		30 x 36.7 x 2.85 (mm)	
Weight		5.4g	
Temperature Range		-30°C to +85°C	

2. 2 Electrical specifications (Absolute maximum ratings)

It could affect the reliability of the module, please observe the following Absolute maximum ratings.

Table 2. 2 Absolute maximum ratings

Function	Description	Port	Min.	Max.	Unit
Supply voltages					
VBATT	Module Supply Voltage	Input	-0.3	4.6	V
USB	USB D+/D-	Input	-0.3	5.35	V
UIM	USIM Interface	Input	-0.3	2.1/3.2	V
UART	UART Interface	Input	-0.3	2.1	V
GPI	General Purpose Input	Input	-0.3	2.1	V
PWR_ON	Power on signal	Input	-0.3	2.1	V
RESET_N	RESET signal	Input	-0.15	2.1	V
Storage Temperature					
Temperature	Storage Temperature	-	-40	90	℃

The module is not protected against overvoltage and reverse voltage.

If you need more than the supply voltage specifications given in the Table above, use the appropriate protective circuit.

2. 3 Electrical specifications (Operating conditions)

Please observe the following design Operating conditions.

Table 2. 3 Operating conditions

Parameter		Min.	Typ.	Max.	Unit
Supply voltages					
VBATT	Module Supply Voltage	**note1)** 3.4	3.8	4.2	V
USB	USB D+/D-	-0.3	-	5.0	V
UIM	USIM Interface	1.76	1.8	1.83	V
		2.8	2.85	2.95	V
UART	UART Interface	-0.3	1.8	2.1	V
GPIO	General Purpose Input Output	-0.3	1.8	2.1	V
PWR_ON	Power on signal	-0.3	0	2.1	V
RESET_N	RESET signal	-0.15	1.8	2.1	V
Operating Temperature range					
Temperature	Operating Temperature range	-30		85	℃

note1) In case of GSM communication, The minimum supply voltage is +3.8Vdc.

Table 2. 4 Current consumption

Current consumption (VBATT = 3.7V)						
Mode	**Condition**	**Band**	**Min.**	**Typ.**	**Max.**	**Unit**
Power down mode	Module Power down (Avg.)	-		50uA		uA
LTE sleep mode	LTE sleep current (Avg.) USB & UART interface disconnected	All		-	2.0	mA
	LTE sleep current (Avg.) UART interface connected	All		-	33	mA
	LTE sleep current (Avg.) USB interface connected	All		-	42	mA
LTE Idle mode	LTE Idle current (Avg.), USB interface disconnected	All		TBD		mA
	LTE Idle current (Avg.), USB interface connected	All		TBD		mA
LTE connected mode	LTE connected current (Avg.), Tx power = 0dBm	Band1		260	270	mA
		Band2		TBD		mA
		Band4		TBD		mA
		Band5		TBD		mA
		Band7		TBD		mA
		Band18		TBD		mA

		Band19		TBD		mA
	LTE connected current (Avg.), Maximum Tx power (Typ. 22.5dBm)	Band1		650	680	mA
		Band2		TBD		mA
		Band4		TBD		mA
		Band5		TBD		mA
		Band7		TBD		mA
		Band18		TBD		mA
		Band19		TBD		mA
WCDMA sleep mode	WCDMA sleep current (Avg.)	All		TBD		mA
WCDMA Idle mode	WCDMA Idle current (Avg.), USB interface disconnected	All		TBD		mA
	WCDMA Idle current (Avg.), USB interface connected	All		TBD		mA
WCDMA connected mode	WCDMA connected current (Avg.), Tx power = 0dBm	Band1		TBD		mA
		Band2		TBD		mA
		Band4		TBD		mA
		Band5		TBD		mA
		Band19		TBD		mA
	WCDMA connected current (Avg.), Maximum Tx power (Typ. 22.5dBm)	Band1		TBD		mA
		Band2		TBD		mA
		Band4		TBD		mA
		Band5		TBD		mA
		Band19		TBD		mA
GSM sleep mode	GSM sleep current (Avg.)	All		TBD		mA
GSM Idle mode	GSM Idle current (Avg.), USB interface disconnected	All		TBD		mA
	GSM Idle current (Avg.), USB interface connected	All		TBD		mA
GSM connected mode	GSM connected current (Avg.), (4Tx+1Rx) Maximum Tx power (Typ. 27.5dBm)	DCS1800 PCS1900		TBD		mA
	GSM connected current (Avg.), (4Tx+1Rx) Maximum Tx power (Typ. 30.5dBm)	GSM850 EGSM900		TBD		mA

2. 4 Drawing modem

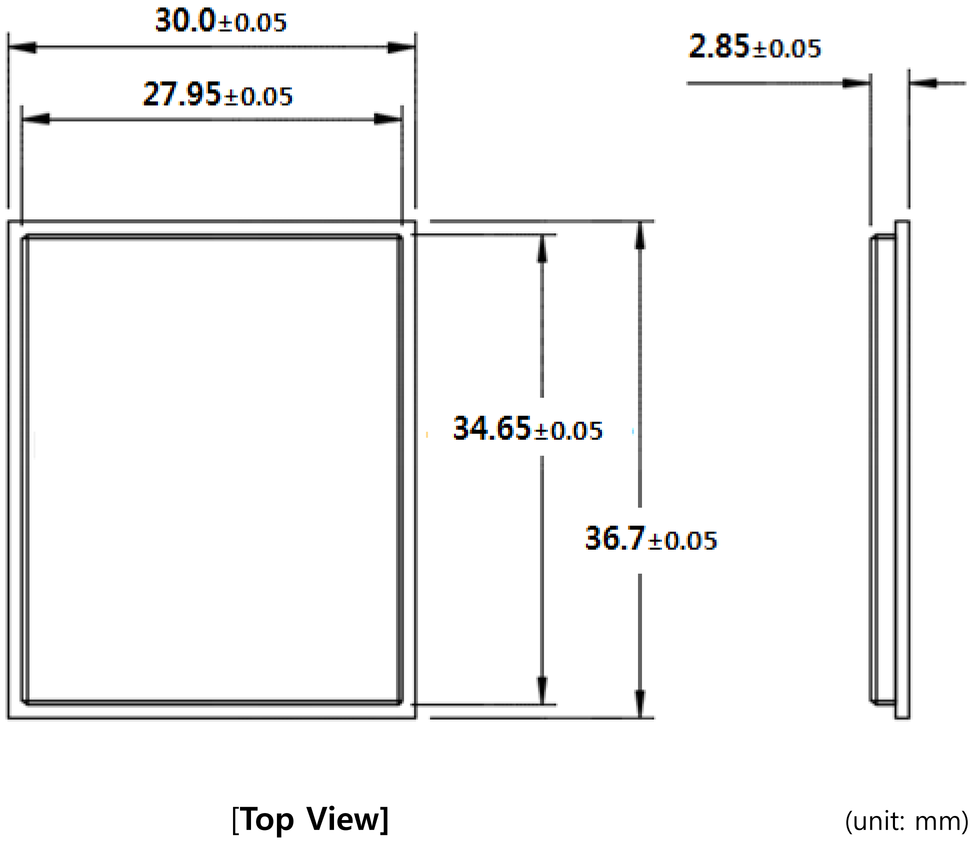


Figure 2. 1 LTM100 Outline drawing

2. 5 Real Picture

Figure 2. 2 LTM100 Real Picture

2. 6 Interface PAD (SMD Type)

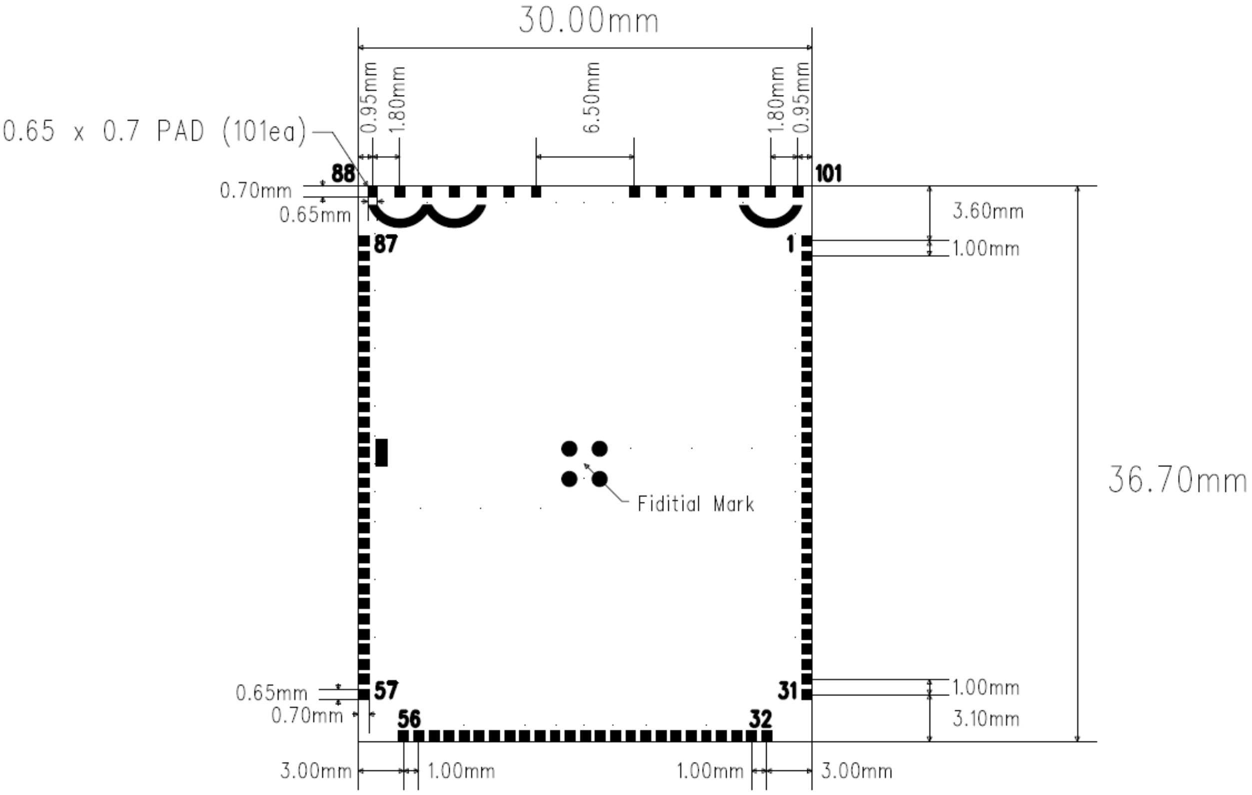
This module offers the Interface of 101 PAD Bottom side so that you can send and receive control data and control by connecting with external devices.

Please design with reference to the description of each of the PAD.

2. 6. 1 101 PAD Detail Outline

Module Bottom PAD(101 ea) are formed as SMD Type as the following drawings

SMT(Surface Mounting Technology) with the customer's device, it can Module, control and communications



[Bottom View]

Figure 2. 3 LTM100 Bottom Drawing

2. 6. 2 101 PAD Description

Descriptions of Bottom side 101PAD refer to Table 2.5 below.

Table 2. 5 101 PAD description

PAD No.	PAD name	Input / Output		Remark
		Voltage	Type	
1	GND	GND	-	Ground
2	GND	GND	-	Ground
3	EMERGENCY DOWNLOAD	-	-	For EMERGENCY DOWNLOAD/ internal pull up (Low enable)
4	GPO_01	1.8V	Out	GPIO output port 01
5	DSR	1.8V	Out	UART1 Data Set Ready
6	RI	1.8V	Out	UART1 Ring Indicator
7	SPI_MOSI	1.8V	Out	SPI Master-out Slave-in
8	SPI_MISO	1.8V	In	SPI Master-in Slave-out
9	SPI_CLK	1.8V	Out	Clock for SPI data communication
10	SPI_CS	1.8V	Out	Chip Selectfor SPI data communication
11	RESOUT_N	1.8V	Out	RESOUT signal output (Low active)
12	UIM2 Power	1.8/2.95V	Out	UIM2 Power
13	UIM2_CLK	1.8/2.95V	-	UIM2 Clock
14	UIM2_DATA	1.8/2.95V	-	UIM2 Data
15	UIM2_RESET	1.8/2.95V	-	UIM2 Reset
16	UIM2_DET	1.8V	In	UIM2 Detect signal
17	Reserved	-	-	Reserved
18	Reserved	-	-	Reserved
19	Reserved	-	-	Reserved
20	Reserved	-	-	Reserved
21	GND	GND	-	Ground
22	USB (-)	-	-	USB (-) signal
23	USB (+)	-	-	USB (+) signal
24	HSIC_STB	-	-	HSIC Strobe
25	HSIC_DATA	-	-	HSIC Data
26	SDC1_CLK	1.8V	-	SDC1 Clock
27	SDC1_CMD	1.8V	-	SDC1 Commend
28	SDC1_DATA_3	1.8V	-	SDC1 DATA bit 3
29	SDC1_DATA_0	1.8V	-	SDC1 DATA bit 0
30	SDC1_DATA_1	1.8V	-	SDC1 DATA bit 1
31	SDC1_DATA_2	1.8V	-	SDC1 DATA bit 2
32	Codec_I2C_SDA	1.8V	Bath	I2C Data (for Codec)
33	Codec_I2C_SCL	1.8V	Out	I2C Clock (for Codec)
34	Reserved	-	-	Reserved
35	Codec_I2S_DATA0	1.8V	-	I2S DATA bit 0 (for Codec)
36	Codec_I2S_DATA1	1.8V	-	I2S DATA bit 1 (for Codec)
37	Codec_I2S_SCK	1.8V	-	I2S Data Clock (for Codec)
38	Codec_I2S_WS	1.8V	-	I2S Word Select (for Codec)
39	Reserved	1.8V	-	Reserved
40	I2S_MCLK	-	Out	I2S Master Clock (for Codec)

PAD No.	**PAD name**	**Input / Output**		**Remark**
		Voltage	**Type**	
41	CODEC_RESET_N	1.8V	Out	RESET signal output (for Codec)
42	Reserved	-	-	Reserved
43	Reserved	-	-	Reserved
44	TXD	1.8V	In	UART1 Data Input
45	CTS	1.8V	Out	UART1 Clear To Send
46	RXD	1.8V	Out	UART1 Data Output
47	RTS	1.8V	In	UART1 Ready To Send
48	Reserved	-	-	Reserved
49	GPI_01	1.8V	In	GPIO input port 01
50	GPI_02	1.8V	In	GPIO input port 02
51	GPI_03	1.8V	In	GPIO input port 03
52	UIM1 Power	1.8/2.95V	Out	UIM1 Power
53	ADC	1.8V	In	Analog-to-digital converter
54	Not used	-	-	Not used
55	USB_VBUS	5.0V	In	USB Power
56	GND	GND	-	Ground
57	VBATT	3.8V	In	Power
58	VBATT	3.8V	In	Power
59	VBATT	3.8V	In	Power
60	GPI_04	1.8V	In	GPIO input port 04
61	GPO_02	1.8V	Out	GPIO output port 02
62	RESET_N	1.8V	In	Hardware Reset (low active)
63	Power_on_key	1.8V	In	Power on/off (Low enable)
64	In_Service_IND	1.8V	Out	In Service(3G/LTE) Indicate
65	Development key Dump mode	1.8V	In	Dump mode for Software/ internal pull down (High enable)
66	GPO_03	1.8V	Out	GPIO output port 03
67	GPO_04	1.8V	Out	GPIO output port 04
68	DTR	1.8V	In	UART1 Data Terminal Ready
69	DCD	1.8V	Out	UART1 Data Carrier Detect
70	Not used	-	-	Not used
71	Not used	-	-	Not used
72	Not used	-	-	Not used
73	Not used	-	-	Not used
74	Not used	-	-	Not used
75	Not used	-	-	Not used
76	UIM1_CLK	1.8/2.95V	-	UIM1 Clock
77	UIM1_RESET	1.8/2.95V	-	UIM1 Reset
78	UIM1_DATA	1.8/2.95V	-	UIM1 Data
79	UIM1_DET	1.8V	In	UIM1 Detect signal
80	LTE_Service	1.8V	Out	LTE Service Indicate
81	UART2_TXD	1.8V	In	UART2 Data Input
82	I2C_SCL	1.8V	Out	I2C Clock
83	UART2_RXD	1.8V	Out	UART2 Data Output
84	I2C_SDA	1.8V	Both	I2C Data
85	GPO_05	1.8V	Out	GPIO output port 05

PAD No.	PAD name	Input / Output		Remark
		Voltage	Type	
86	3G_Service	1.8V	Out	3G Service Indicate
87	GND	GND	-	Ground
88	GND	GND	-	Ground
89	GPS_ANT	-	-	GPS Antenna connection PAD
90	GND	GND	-	Ground
91	SUB_ANT	-	-	2nd Antenna connection PAD
92	GND	GND	-	Ground
93	GND	GND	-	Ground
94	GND	GND	-	Ground
95	GND	GND	-	Ground
96	GND	GND	-	Ground
97	GND	GND	-	Ground
98	GND	GND	-	Ground
99	GND	GND	-	Ground
100	MAIN_ANT	-	-	1st Antenna connection PAD
101	GND	GND	-	Ground

note1) In/Out indication of the "Type is based on the module.

note2) Reserved, Not Used pin should not be there, please open a connection with your device. Module is can be damage and can cause malfunctions muse be urged compliance.

2. 6. 3 Module DC Power Input PADs

The Power supply of the modules are designed to supply hope in the Table below of the Power and Ground PAD 101 PADs.

Table 2. 6 DC Power Input PADs

PAD No.	PAD name	Input / Output		Remark
		Voltage	Type	
57	VBATT	3.8V	In	Power input
58	VBATT	3.8V	In	Power input
59	VBATT	3.8V	In	Power input
1,2	GND	GND	-	Ground
21,56	GND	GND	-	Ground
87,88	GND	GND	-	Ground
90,92	GND	GND	-	Ground
93,94	GND	GND	-	Ground
95,96	GND	GND	-	Ground
97,98	GND	GND	-	Ground
99,101	GND	GND	-	Ground

note) Please supply VBATT pins have a DC power on 3.4V ~ 4.2V (Typ. 3.8V) range.

2. 6. 4 Module Power on/off and Reset control PADs

Power on / off control of the Module is in a 101 PAD "Power_on_key signal" of PAD number 63, "Hardware Power Reset" of Module is controlled by the RESET_N signal of the PAD number 62.

Table 2. 7 Power on/off 및 Reset control **PADs**

PAD No.	PAD name	Input / Output		Remark
		Voltage	Type	
62	RESET_N	1.8V	In	Modem Hardware Power Reset control (Active Low)
63	Power_on_key	1.8V	In	Modem Power on/off control (Active Low)

When power on as "Figure 2-4" below 1.5s (1,500ms) to over, power off when there 2.0s (2,000ms) is applied to at least give it high signal on / off operation.

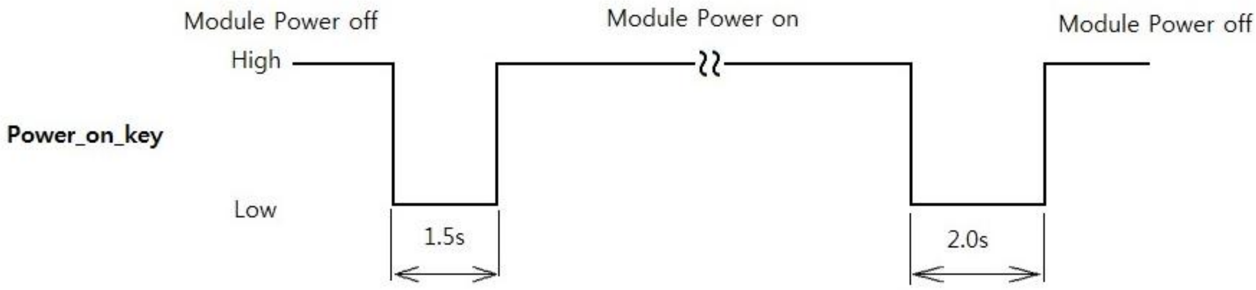


Figure 2. 4 Power On/Off control

Module power on If the condition remains, the pin 36 is High (approximately 1.6V) by the internal pull-up, to give Module Reset maintain a "Low" signal as shown below 500ms or more if required by the Low Module It will be Reset.

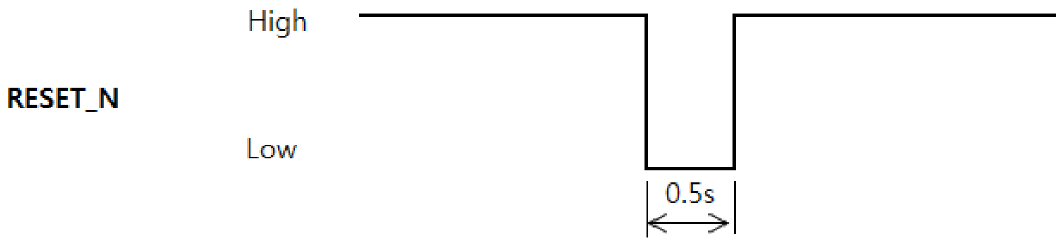


Figure 2. 5 RESET control

2. 6. 5 UART Interface PADs

As Interface for "Data terminal equipment"(DTE) and UART data communications, and supports UART1 and UART2, you can send and receive data by RS-232 data communication requirements.

Table 2. 8 UART Interface PADs

PAD No.	PAD name	Input / Output		Remark
		Voltage	Type	
5	DSR	1.8V	Out	UART1 Data Set Ready
6	RI	1.8V	Out	UART1 Ring Indicator
44	TXD	1.8V	In	UART1 Data Input
45	CTS	1.8V	Out	UART1 Clear To Send
46	RXD	1.8V	Out	UART1 Data Output
47	RTS	1.8V	In	UART1 Ready To Send
68	DTR	1.8V	In	UART1 Data Terminal Ready
69	DCD	1.8V	Out	UART1 Data Carrier Detect
81	UART2_TXD	1.8V	In	UART2 Data Input
83	UART2_RXD	1.8V	Out	UART2 Data Output

2. 6. 6 USB Interface PADs

As Interface for "Data terminal equipment"(DTE) and USB data communication, in addition to data communication it can also be used as a Source Download Software and debugging purposes.

Table 2. 9 USB Interface PADs

PAD No.	PAD name	Input / Output		Remark
		Voltage	Type	
55	USB_VBUS	5.0V	In	USB Powet input
22	USB (-)	-	Both	USB (-) signal
23	USB (+)	-	Both	USB (+) signal
24	HSIC_STB	-		HSIC Strobe
25	HSIC_DATA	-		HSIC Data

2. 6. 7 External USIM Interface PADs

This model is used to select an internal e-SIM, or support the Interface to enable External USIM outside.

Table 2. 10 External USIM Interface PADs

PAD No.	PAD name	Input / Output		Remark
		Voltage	Type	
12	UIM2 Power	1.8/2.95V	Out	UIM2 Power Supply
13	UIM2_CLK	1.8/2.95V	-	UIM2 Clock
14	UIM2_DATA	1.8/2.95V	-	UIM2 Data
15	UIM2_RESET	1.8/2.95V	-	UIM2 Reset
16	UIM2_DET	1.8V	In	UIM2 Detect signal
52	UIM1 Power	1.8/2.95V	Out	UIM1 Power Supply
76	UIM1_CLK	1.8/2.95V	-	UIM1 Clock
77	UIM1_RESET	1.8/2.95V	-	UIM1 Reset
78	UIM1_DATA	1.8/2.95V	-	UIM1 Data
79	UIM1_DET	1.8V	In	UIM1 Detect signal

2. 6. 8 Audio and I2C Interface PADs

This Module with I2C Interface is able to control communication with the outside Device, Interface, which offers support for external Codec.

Table 2. 11 I2C and Audio Interface PADs

PAD No.	PAD name	Input / Output		Remark
		Voltage	Type	
32	Codec_I2C_SDA	1.8V	Both	**Note1)** I2C Data (for Codec)
33	Codec_I2C_SCL	1.8V	Out	**Note1)** I2C Clock (for Codec)
35	Codec_I2S_DATA0	1.8V	-	I2S DATA bit 0 (for Codec)
36	Codec_I2S_DATA1	1.8V	-	I2S DATA bit 1 (for Codec)
37	Codec_I2S_SCK	1.8V	-	I2S Data Clock (for Codec)
38	Codec_I2S_WS	1.8V	-	I2S Word Select (for Codec)
40	I2S_MCLK	-	Out	I2S Master Clock (for Codec)
41	CODEC_RESET_N	1.8V	Out	RESET signal output (for Codec)
53	ADC	1.8V	In	Analog-to-digital converter
82	I2C_SCL	1.8V	Out	**Note2)** I2C Clock (for external device)
84	I2C_SDA	1.8V	Both	**Note2)** I2C Data (for external device)

note1) These signals are set high by internal pull-up resistor.

note2) These signals require external pull-up resistor.

2. 6. 9 SPI and SDIO Interface PADs

This module also supports SPI and SDIO Interface for additional data communication with external devices.

Table 2. 12 SPI and SDIO Interface PADs

PAD No.	PAD name	Input / Output		Remark
		Voltage	Type	
7	SPI_MOSI	1.8V	Out	SPI Master-out Slave-in
8	SPI_MISO	1.8V	In	SPI Master-in Slave-out
9	SPI_CLK	1.8V	Out	Clock for SPI data communication
10	SPI_CS	1.8V	Out	Chip Selectfor SPI data communication
26	SDC1_CLK	1.8V	-	SDIO Clock
27	SDC1_CMD	1.8V	-	SDIO Commend
28	SDC1_DATA_3	1.8V	-	SDIO DATA bit 3
29	SDC1_DATA_0	1.8V	-	SDIO DATA bit 0
30	SDC1_DATA_1	1.8V	-	SDIO DATA bit 1
31	SDC1_DATA_2	1.8V	-	SDIO DATA bit 2

2. 6. 10 GPIO Interface PADs

Indicating the status of this Module is a GPO and the GPI are available to suit customers' applications , As shown below are assigned as the general Input / Output PADs.

Table 2. 13 GPIO Interface PADs

PAD No.	PAD name	Input / Output		Remark
		Voltage	Type	
3	EMERGENCY DOWNLOAD	-	-	For EMERGENCY DOWNLOAD (Low enable)
4	GPO_01	1.8V	Out	GPIO output port 01
11	RESOUT_N	1.8V	Out	RESOUT signal output (Low active)
49	GPI_01	1.8V	In	GPIO input port 01
50	GPI_02	1.8V	In	GPIO input port 02
51	GPI_03	1.8V	In	GPIO input port 03
60	GPI_04	1.8V	In	GPIO input port 04
61	GPO_02	1.8V	Out	GPIO output port 02
64	In_Service_IND	1.8V	Out	In Service(3G/LTE) Indicate
65	Development key	1.8V	In	Dump mode for Software (High enable)
66	GPO_03	1.8V	Out	GPIO output port 03
67	GPO_04	1.8V	Out	GPIO output port 04
80	LTE_Service	1.8V	Out	LTE Service Indicate
85	GPO_05	1.8V	Out	GPIO output port 05
86	3G_Service	1.8V	Out	3G Service Indicate

2. 6. 11 RF signal PADs

So please RF signal is assigned to the following PADs see Table 2.14 below when connected to the Antenna.

Table 2. 14 RF signal PADs

PAD No.	PAD name	Input / Output		Remark
		Voltage	Type	
89	GPS_ANT	-	RF	GPS RF connection PAD
91	SUB_ANT	-	RF	2nd RF connection PAD (LTE 2nd RF signal PAD)
100	MAIN_ANT	-	RF	1st RF connection PAD (WCDMA Main RF signal PAD LTE 1st RF signal PAD)

2. 6. 12 Reserved and Not Used PADs

Assigned to the pin to the inside of the other uses of this Module,don't need to connect customer's device, please to open

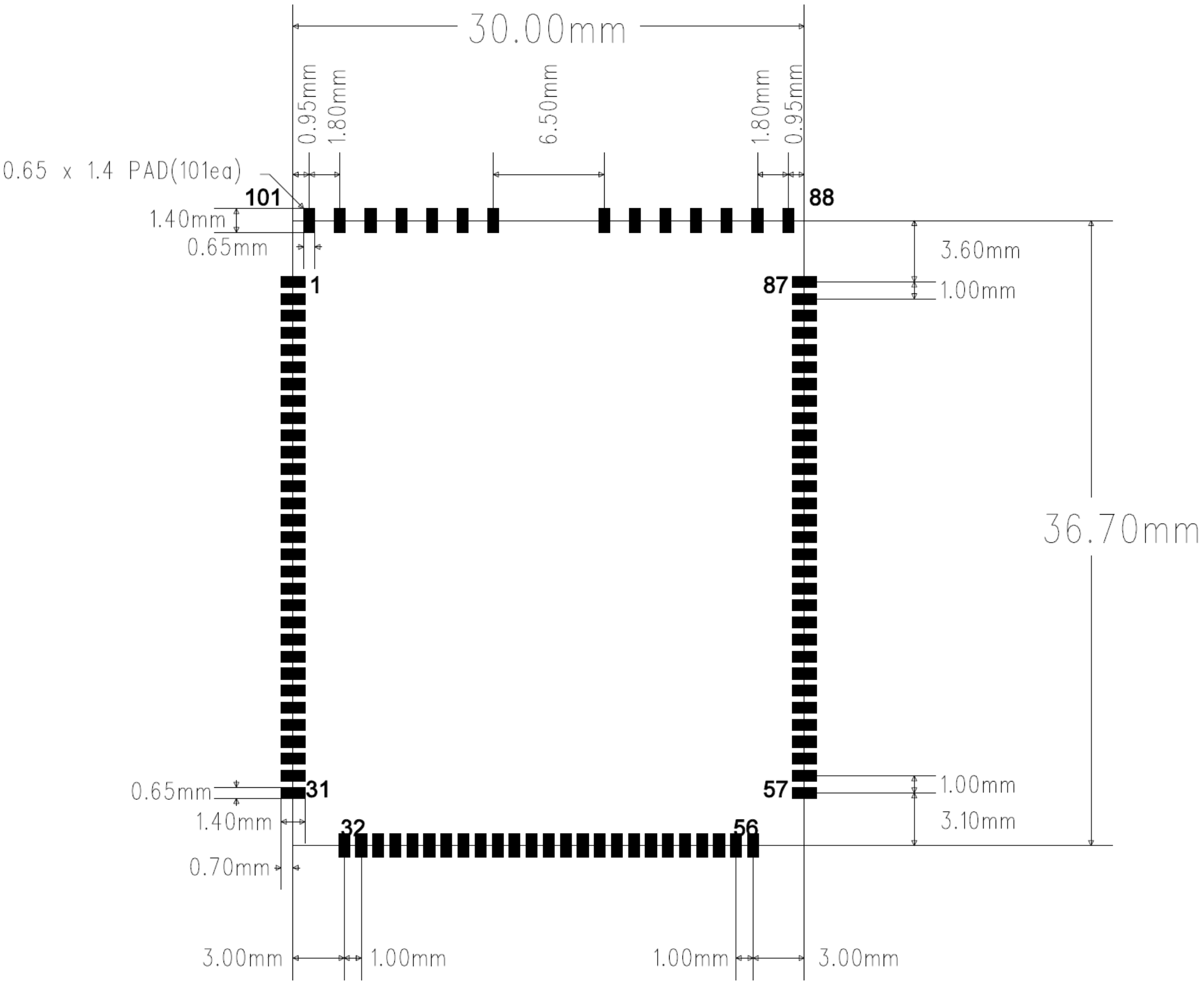
Table 2. 15 Reserved & Not Used PADs

PAD No.	PAD name	Input / Output		Remark
		Voltage	Type	
17,18,19,20,34,39,42,43,48	Reserved	-	-	
54,70,71,72,73,74,75	Not Used	-	-	

3. Customer PCB Design Guide

3. 1 Customer PCB PAD Design Guide

With reference to the following Figure 3. 1 Design Guide, please design the customer's PCB.



[Top View]

Figure 3. 1 Cusomer PCB Layout Guide

3. 2 Installation Guidelines for Antenna PAD

The proper connection between the antenna pad and the application PCB
must be implementing the following installation guidelines for the layout of the application PCB.

a) The whole layer stack below the antenna connection pad should be free of digital lines.

b) Increase GND keep-out (i.e. clearance) around the antenna pad, on the top layer of the application PCB, to at least 150 μm up to adjacent pads metal definition on the area below the module, to reduce parasitic capacitance to ground.

c) Add GND clearance on the buried metal layer below the antenna pad, to reduce parasitic capacitance to ground.

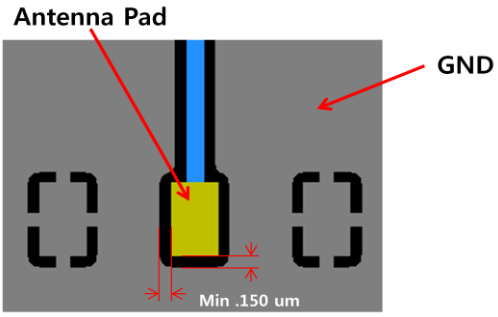


Figure 3. 2 GND clearance on top layer around antenna pad

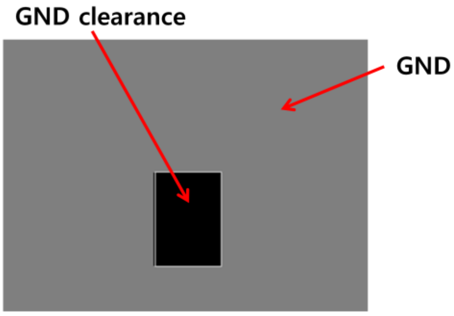


Figure 3. 3 On the 2nd buried layer below antenna pad

When you intend to install this module(LTM100) with RF connector type,
please refer to the trace guideline figure below. (trace loss: max. 0.3dB)

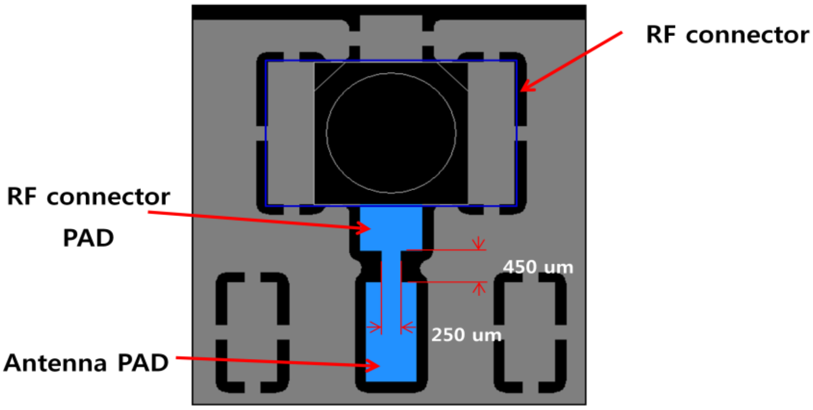


Figure 3. 4 Trace guideline from the antenna pad to the RF connector pad

3. 3 Antenna line Guidelines

a) Make sure that the impedance of the microstrip line is 50ohm.

b) Reduce the return loss(or V.S.W.R.) as possible with the help of antenna designers.

c) Avoid having other signal tracks and crossing any un-shielded transmission line footprint with other signal tracks on different layers.

d) The ground surrounding the antenna line should be directly connected to the main ground plane on the PCB by means of via holes.

e) Place EM noisy devices far away from the antenna line as possible.

f) Keep the antenna line far away from the power supply lines.

4. FCC Warnings and Notices

4. 1 FCC Warnings

The FCC requires the user to be notified that any changes or modifications made to this module that are not expressly approved by WISOL CO., LTD could void the user's authority to operate the equipment.

4. 2 Notices

a) If not installed and used in accordance with the instructions on the manual, this module may cause a malfunction.
In designing this module, please follow the instructions in this manual.

b) Final Installers should be require to satisfy RF exposure compliance for installations and final host devices.
Compliance of this device in all final host configurations is the responsibility of the guarantee.
The maximum permitted antenna gain including cable loss of the final host device is as follows.

Table 4. 1 The Maximum Permitted Antenna Gain

Band	Max. Permitted Antenna Gain
WCDMA B2	3.196dBi
WCDMA B4	3.964dBi
WCDMA B5	2.151dBi
LTE B2	3.196dBi
LTE B4	3.964dBi
LTE B5	2.151dBi
GSM850	2.151dBi
GSM1900	3.196dBi

The user manual which is provided by OEM integrators for end users must include the following information in a prominent location.

“To comply with FCC RF exposure compliance requirements, the antenna used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

c) If the FCC ID is not visible when this module(LTM100) is installed inside final host device, then a label must be affixed to the outside of the final host device with a statement similar to the following:

"Contains FCC ID: 2ABA2LTM100" or “This device contains FCC ID: 2ABA2LTM100”

■ Appendix A

(80pin BtoB connector Type: LTM100D)

■ Appendix A (80pin BtoB connector Type)

A. 1 Air Interface

■ Support Band

- LTE : B1, B4, B5, B7, B11, B18, B19 (Note: LTE B7 does not work in US)
- WCDMA : B1, B2, B4, B5(B6,B19)
- GSM : 850, 900, 1800, 1900
- GNSS(Gen 8C) : GPS, GLONASS, BeiDou, Galileo and QZSS

■ Data Speed

- FDD LTE CAT4 (Down link: 150Mbps / Up link: 50Mbps)
- WCDMA HSPA+ (Down link: 42Mbps / Up link: 5.76Mbps)

※ Data throughput Depending on External communication environment.

■ Air Interface Type (Coaxial Connector 3port)

- U.FL-R-SMT (HIROSE社)
- 3port : 1st / 2nd Antenna 2port, GPS Antenna 1port

A. 2 External Interface

■ DC Power supply : 3.4V ~ 4.2V

■ Communication Interface

- UART : up to 4Mbps Support (2port)
- USB : USB 2.0 Support (1port)

■ USIM Interface

- External UIM card Support (Voltage 1.8V/2.95V)

■ Audio Interface

- Audio : Analog output (2pin)

■ Control Interface

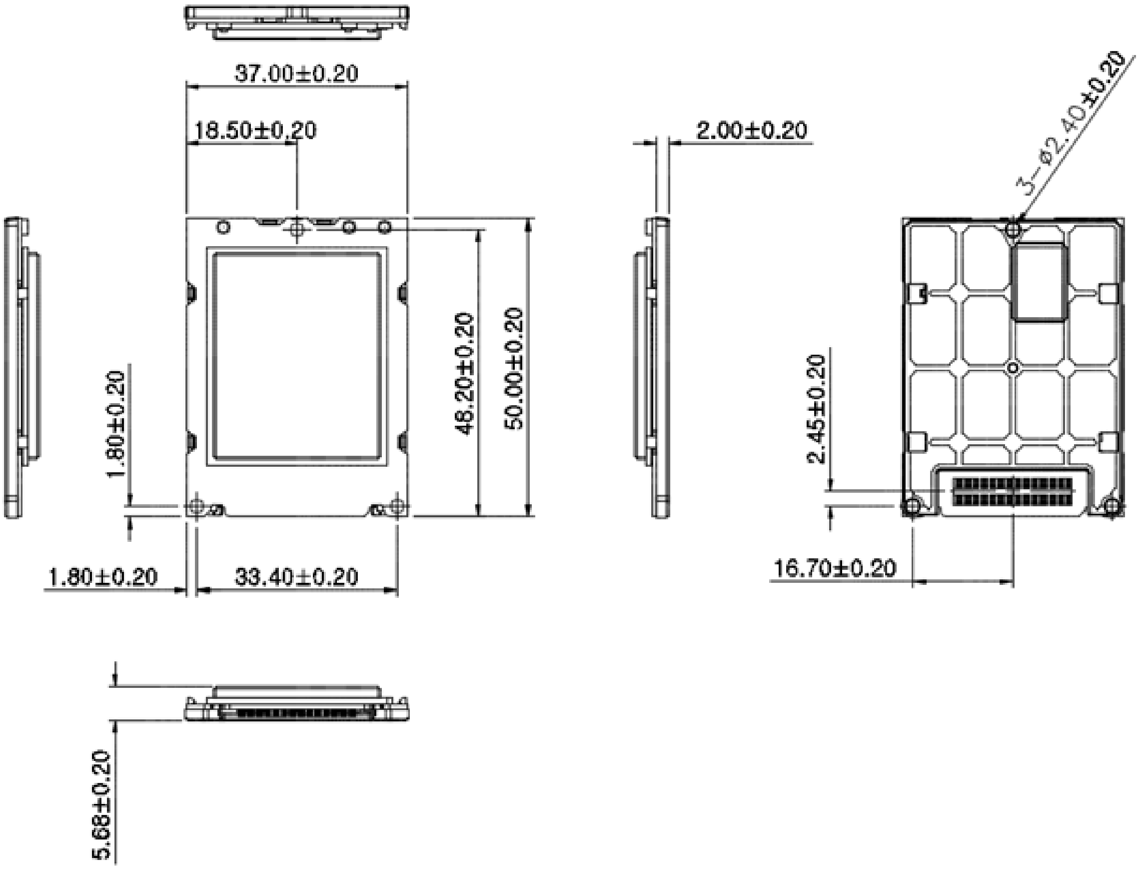
- Control pin : power on, reset, I2C,Status Indicator Output

■ Interface Type (80pin B2B Connector)

- AXK6F80347YG (Panasonic社)

A. 3 Module Drawing

Please refer to the following module design drawings.



(Unit: mm)

Figure A-1 Outline Drawing

A. 4 Real Picture

[Top] [Bottom]

Figure A-2 Real Picture

A. 5 80pin BtoB connector Specification

Connecting Components with external devices is recommended for parts described below.

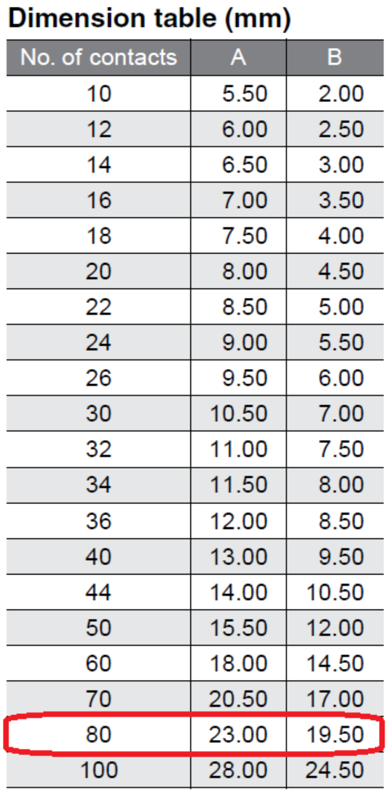
(80pin Board to Board connector, hereinafter, 80pin BtoB connector)

Table A-1 80pin BtoB connector Specification

Item	Connector P/N	Manufacture	Header/Socket
80pin connector	AXK6F80347YG	Panasonic	Header

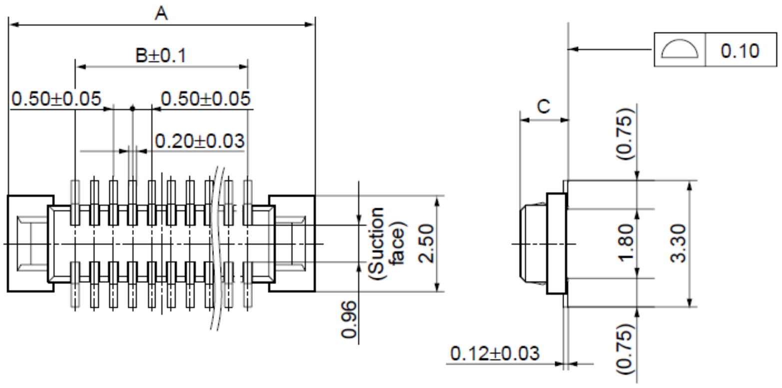
※ Customer connector Spec: AXK5F80547YG (Socket Type / **Mated height 2.0mm** / Panasonic社)

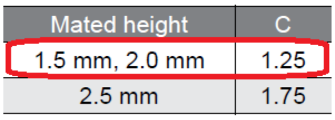
Mounted on this Module 80pin BtoB connector Spec(Header)	
Pin Numbers	80
Manufacturer	Panasonic
Part number(Mounted on this Module)	AXK6F80347YG (Header)



Dimension table (mm)

No. of contacts	A	B
10	5.50	2.00
12	6.00	2.50
14	6.50	3.00
16	7.00	3.50
18	7.50	4.00
20	8.00	4.50
22	8.50	5.00
24	9.00	5.50
26	9.50	6.00
30	10.50	7.00
32	11.00	7.50
34	11.50	8.00
36	12.00	8.50
40	13.00	9.50
44	14.00	10.50
50	15.50	12.00
60	18.00	14.50
70	20.50	17.00
80	23.00	19.50
100	28.00	24.50



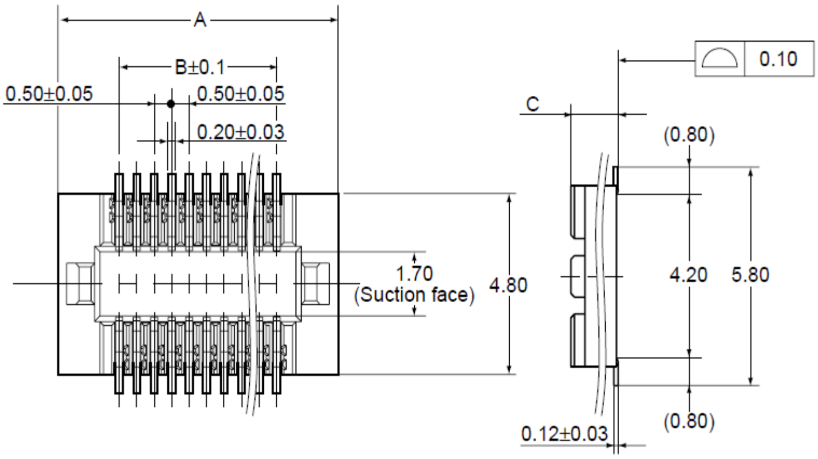


Mated height	C
1.5 mm, 2.0 mm	1.25
2.5 mm	1.75

Customer connector Spec	
Pin numbers	80
Manufacturer	Panasonic
Customer connector Spec	AXK5F80547YG (Socket)

Dimension table (mm)

No. of contacts	A	B
10	5.50	2.00
12	6.00	2.50
14	6.50	3.00
16	7.00	3.50
18	7.50	4.00
20	8.00	4.50
22	8.50	5.00
24	9.00	5.50
26	9.50	6.00
30	10.50	7.00
32	11.00	7.50
34	11.50	8.00
36	12.00	8.50
40	13.00	9.50
44	14.00	10.50
50	15.50	12.00
60	18.00	14.50
70	20.50	17.00
80	23.00	19.50
100	28.00	24.50



Mated height	C
1.5 mm	1.35
2.0 mm, 2.5 mm	1.85

A. 6 80pin BtoB connector pin Map

Refer to below Table A-2 pin description about 80pin BtoB connector.

Table A-2 80pin BtoB connector pin description

Pin No.	Pin name	Input / Output		Remark
		Voltage	Type	
1	GND	GND	-	Ground
2	Reserved	-	-	**note2)** reserved
3	Reserved	-	-	**note2)** reserved
4	GND	GND	-	Ground
5	AD	Analog	In	ADC Input
6	DA	Analog	Out	DAC(PDM) Output
7	Reserved	-	-	**note2)** reserved
8	VUIM2	1.8/2.95V	Out	External UIM Power
9	Reserved	-	-	**note2)** reserved
10	UIM2_RESET/	1.8/2.95V	Out	External UIM Reset
11	Reserved	-	-	**note2)** reserved
12	UIM2_DATA	1.8/2.95V	Both	External UIM Data
13	Reserved	-	-	**note2)** reserved
14	UIM2_CLK	1.8/2.95V	Out	External UIM Clock
15	Reserved	-	-	**note2)** reserved
16	Reserved	-	-	**note2)** reserved
17	Not USED	-	-	**note2)** Not used
18	GPO1	3.0V	Out	General Output signal 01
19	UART_INIT	3.0V	In	Reset of the UART data rate
20	AREA_IND	3.0V	Out	Communication service area indicator
21	PS_HOLD	3.0V	Out	Modem Power On status indicator
22	RESET_CHK	3.0V	Out	Module status indicator
23	RI	3.0V	Out	SMS Receive notification signal
24	DSR	3.0V	Out	UART1 Data Set Ready
25	DCD	3.0V	Out	UART1 Data Carrier Detect
26	RTS	3.0V	In	UART1 Ready To Send
27	CTS	3.0V	Out	UART1 Clear To Send
28	DTR	3.0V	In	UART1 Data Terminal Ready
29	RXD	3.0V	Out	**note1)** UART1 receiving signal data/DCE(modem) → DTE(customer)
30	TXD	3.0V	In	**note1)** UART1 transmitting signal data/DCE(modem) ← DTE(customer)
31	VBATT	3.8V	In	Power input
32	GND	GND	-	Ground
33	VBATT	3.8V	In	Power input
34	Reserved	-	-	**note2)** reserved
35	PWR_ON	2.8V	In	Power on/off input signal
36	RESET_N	1.8V	In	External Reset input signal
37	Reserved	-	-	**note2)** reserved
38	VBATT	3.8V	In	Power input
39	C_STATUS/GPO2	3.0V	Out	General Output signal 02
40	VBATT	3.8V	In	Power input

Pin No.	Pin name	Input / Output		Remark
		Voltage	Type	
41	GPI1	3.0V	In	General Input signal 01
42	Not USED	-	-	**note2)** Not used
43	I2C_SCL	3.0V	Out	I2C clock signal
44	I2C_SDA	3.0V	Both	I2C data signal
45	GPI2	3.0V	In	General Input signal 02
46	GPI3	3.0V	In	General Input signal 03
47	RXD2	3.0V	Out	**note1)** UART2 receiving signal data/DCE(modem) → DTE(customer)
48	TXD2	3.0V	In	**note1)** UART2 transmitting signal data/DCE(modem) ← DTE(customer)
49	FUPSTS_OUT/EMG_RI	3.0V	Out	Emergency ring indicator
50	ANTINF_0	3.0V	Out	Antenna Information about receiver sensitivity (bit"0")
51	MODE1	3.0V	In	-
52	ANTINF_1	3.0V	Out	Antenna Information about receiver sensitivity (bit"1")
53	MODE2	3.0V	In	-
54	MOS_IND	3.0V	Out	MRMS Reservation status indicator
55	GND	GND	-	Ground
56	Reserved	-	-	**note2)** reserved
57	GND	GND	-	Ground
58	Reserved	-	-	**note2)** reserved
59	Reserved	-	-	**note2)** reserved
60	Audio_In_P	Analog	Out	**note1)** Module Audio Positive Output signal
61	Reserved	-	-	**note2)** reserved
62	Audio_In_N	Analog	Out	**note1)** Module Audio Negative Output signal
63	GND	GND	-	Ground
64	Reserved	-	-	**note2)** reserved
65	GND	GND	-	Ground
66	Reserved	-	-	**note2)** reserved
67	Reserved	-	-	**note2)** reserved
68	Reserved	-	-	**note2)** reserved
69	Reserved	-	-	**note2)** reserved
70	Reserved	-	-	**note2)** reserved
71	GPI4	3.0V	In	General Input signal 04
72	VBUS	5.0V	In	USB Power
73	GPI5/APL_MODE	3.0V	In	General Input signal 05
74	D-	USB	Both	USB (-) signal
75	RF_CONT	3.0V	In	airplane mode
76	D+	USB	Both	USB (+) signal
77	GND	GND	-	Ground
78	GND	GND	-	Ground
79	GND	GND	-	Ground
80	GND	GND	-	Ground

note1) Pin name of the UART1, UART2, Audio are in your products view.
In practice, Please transmit / receive of the signal, see In / Out of the Type.

note2) Reserved, Not Used pin should not be there, please open a connection with your device.

A. 6. 1 Module DC Power Input pins

The power supply in this module, Please use the following Power and Ground pin of the "80pin Interface connector pin".

Table A-3 DC Power input pins

Pin No.	Pin name	Input / Output		Remark
		Voltage	Type	
31	VBATT	3.8V	In	Power input
33	VBATT	3.8V	In	Power input
38	VBATT	3.8V	In	Power input
40	VBATT	3.8V	In	Power input
1	GND	GND	-	Ground
4	GND	GND	-	Ground
32	GND	GND	-	Ground
55	GND	GND	-	Ground
57	GND	GND	-	Ground
63	GND	GND	-	Ground
65	GND	GND	-	Ground
77	GND	GND	-	Ground
78	GND	GND	-	Ground
79	GND	GND	-	Ground
80	GND	GND	-	Ground

note)Please supply VBATT pins have a DC power on 3.4V ~ 4.2V (Typ. 3.8V) range.

A. 6. 2 Module Power on/off and Reset control pins

Module is controlled by the Power on / off the 80 pin connector "PWR_ON signal" of the PAD number 35, Module Hardware Reset power is controlled by the "RESET_N signal" of the PAD number 36.

Table A-4 Power on/off and Reset control **pins**

Pin No.	Pin name	Input / Output		Remark
		Voltage	Type	
35	PWR_ON	2.8V	In	Power on/off input signal (Range: 2.2V ~ 3.0V)
36	RESET_N	1.8V	In	External Reset input signal (Active Low)

When power on as "Figure A-4" below 1.5s (1,500ms) to over, power off when there 2.0s (2,000ms) is applied to at least give it high signal on / off operation.

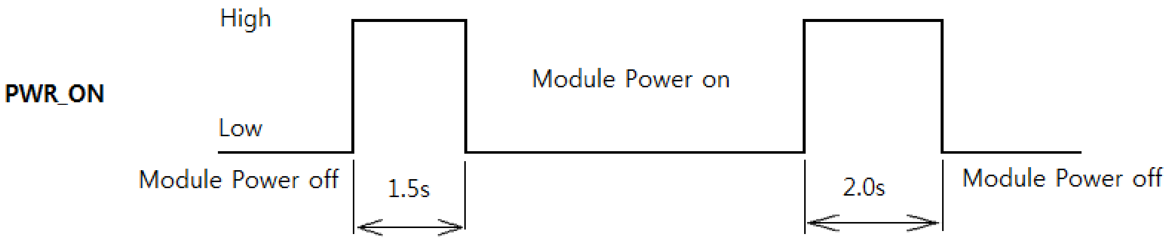


Figure A-3 PWR_ON control

Module power on If the condition remains, the pin 36 is High (approximately 1.6V) by the internal pull-up, to give Module Reset maintain a "Low" signal as shown below 500ms or more if required by the Low Module It will be Reset.

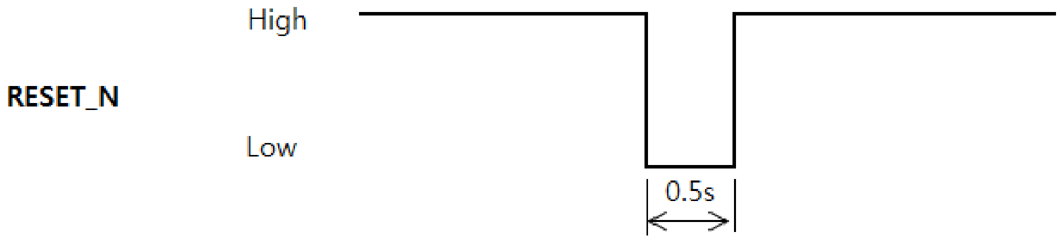


Figure A-4 RESET_N control

A. 6. 3 UART Interface pins

As Interface for "Data terminal equipment"(DTE) and UART data communications, and supports UART1 and UART2, you can send and receive data by RS-232 data communication requirements.

Table A-5 UART Interface **pins**

Pin No.	Pin name	Input / Output		Remark
		Voltage	Type	
19	UART_INIT	3.0V	In	Reset of the UART data rate
24	DSR	3.0V	Out	UART1 Data Set Ready
25	DCD	3.0V	Out	UART1 Data Carrier Detect
26	RTS	3.0V	In	UART1 Ready To Send
27	CTS	3.0V	Out	UART1 Clear To Send
28	DTR	3.0V	In	UART1 Data Terminal Ready
29	RXD	3.0V	Out	UART1 receiving signal data/DCE(modem) → DTE(customer)
30	TXD	3.0V	In	UART1 transmitting signal data/DCE(modem) ← DTE(customer)
47	RXD2	3.0V	Out	UART2 receiving signal data/DCE(modem) → DTE(customer)
48	TXD2	3.0V	In	UART2 transmitting signal data/DCE(modem) ← DTE(customer)

A. 6. 4 USB Interface pins

As Interface for data terminal equipment (DTE) and USB data communication, in addition to data communication it can also be used as a Source Download Software and debugging purposes.

Table A-6 USB Interface **pins**

Pin No.	**Pin name**	**Input / Output**		**Remark**
		Voltage	**Type**	
72	VBUS	5.0V	In	USB Power
74	D-	USB	Both	USB (-) signal
76	D+	USB	Both	USB (+) signal

A. 6. 5 External USIM Interface pins

This model is used to select an internal e-SIM, or support the Interface to enable External USIM outside.

Table A-7 External USIM Interface **pins**

Pin No.	**Pin name**	**Input / Output**		**Remark**
		Voltage	**Type**	
8	VUIM2	2.85V	Out	External UIM Power
10	UIM2_RESET/	2.85V	Out	External UIM Reset
12	UIM2_DATA	2.85V	Both	External UIM Data
14	UIM2_CLK	2.85V	Out	External UIM Clock

A. 6. 6 I2C and Analog Interface pins

This Module has to do with I2C Interface External Device communication and control, and support Audio output.

Table A-8 I2C and Analog Interface **pins**

Pin No.	**Pin name**	**Input / Output**		**Remark**
		Voltage	**Type**	
43	I2C_SCL	3.0V	Out	I2C clock signal
44	I2C_SDA	3.0V	Both	I2C data signal
60	Audio_In_P	Analog	Out	Module Audio Positive Output signal
62	Audio_In_N	Analog	Out	Module Audio Negative Output signal

A. 6. 7 GPIO Interface pins

Indicating the status of this Module is a GPO and the GPI are available to suit customers' applications , As shown below are assigned as the general Input / Output PADs.

Table A-9 GPIO Interface **pins**

Pin No.	**Pin name**	**Input / Output**		**Remark**
		Voltage	**Type**	
18	GPO1	3.0V	Out	General Output signal 01
20	AREA_IND	3.0V	Out	Communication service area indicator
21	PS_HOLD	3.0V	Out	Modem Power On status indicator
22	RESET_CHK	3.0V	Out	Module status indicator
23	RI	3.0V	Out	SMS Receive notification signal
39	C_STATUS/GPO2	3.0V	Out	General Output signal 02
49	FUPSTS_OUT/EMG_RI	3.0V	Out	Emergency ring indicator
50	ANTINF_0	3.0V	Out	Antenna Information about receiver sensitivity (bit"0")
52	ANTINF_1	3.0V	Out	Antenna Information about receiver sensitivity (bit"1")
54	MOS_IND	3.0V	Out	MRMS Reservation status indicator
41	GPI1	3.0V	In	General Input signal 01
45	GPI2	3.0V	In	General Input signal 02
46	GPI3	3.0V	In	General Input signal 03
51	MODE1	3.0V	In	-
53	MODE2	3.0V	In	-
71	GPI4	3.0V	In	General Input signal 04
73	GPI5/APL_MODE	3.0V	In	General Input signal 05
75	RF_CONT	3.0V	In	airplane mode
5	AD	Analog	In	ADC Input
6	DA	Analog	Out	DAC(PDM) Output

A. 6. 8 Reserved and Not USED pins

Assigned to the pin to the inside of the other uses of this Module,don't need to connect customer's device, please to open

Table A-10 Reserved & Not USED **pins**

Pin No.	**Pin name**	**Input / Output**		**Remark**
		Voltage	**Type**	
2,3,7,9,11,13,15,16, 34,37,56,58,59,61, 64,66,67,68,69,70	Reserved	-	-	
17,42	Not USED	-	-	

A. 7 Antenna Connector Specification description

This module had three of the external antenna port.

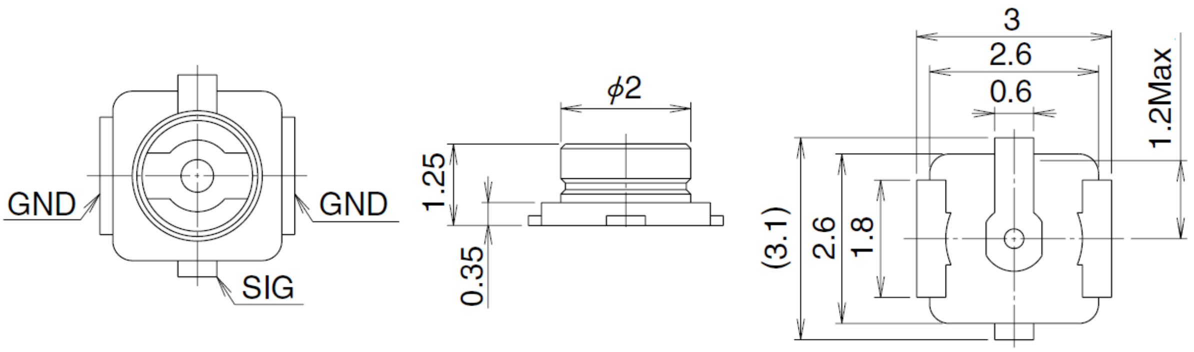
LTE Primary or WCDMA(3G) Antenna 1 port , LTE Secondary Antenna 1 port,
GPS Antenna 1 port.

The antenna port may be connected to the customer's device antenna.

A. 7. 1 Antenna Connector Specification

Table A-11 Antenna **connector Specification**

구 분	Connector P/N	Manufacturer	notes
Antenna connection connector	U.FL-R-SMT	Hirose	3 port (LTE 2port, GPS 1port)

Antenna connector Specification	
Manufacturer	Hirose
Part number(Mounted on this Module)	U.FL-R-SMT
	

A. 7. 2 Antenna Connector Description

For Antenna connector locations, see the Figure A-6 below.

Figure A-5 Antenna Connector

A. 8 Module Assembly Guide

A. 8. 1 Module Assembly Instruction

When this Module mounted on the Board(PCB) assembled by the customer,

please refer to Figure A-7.

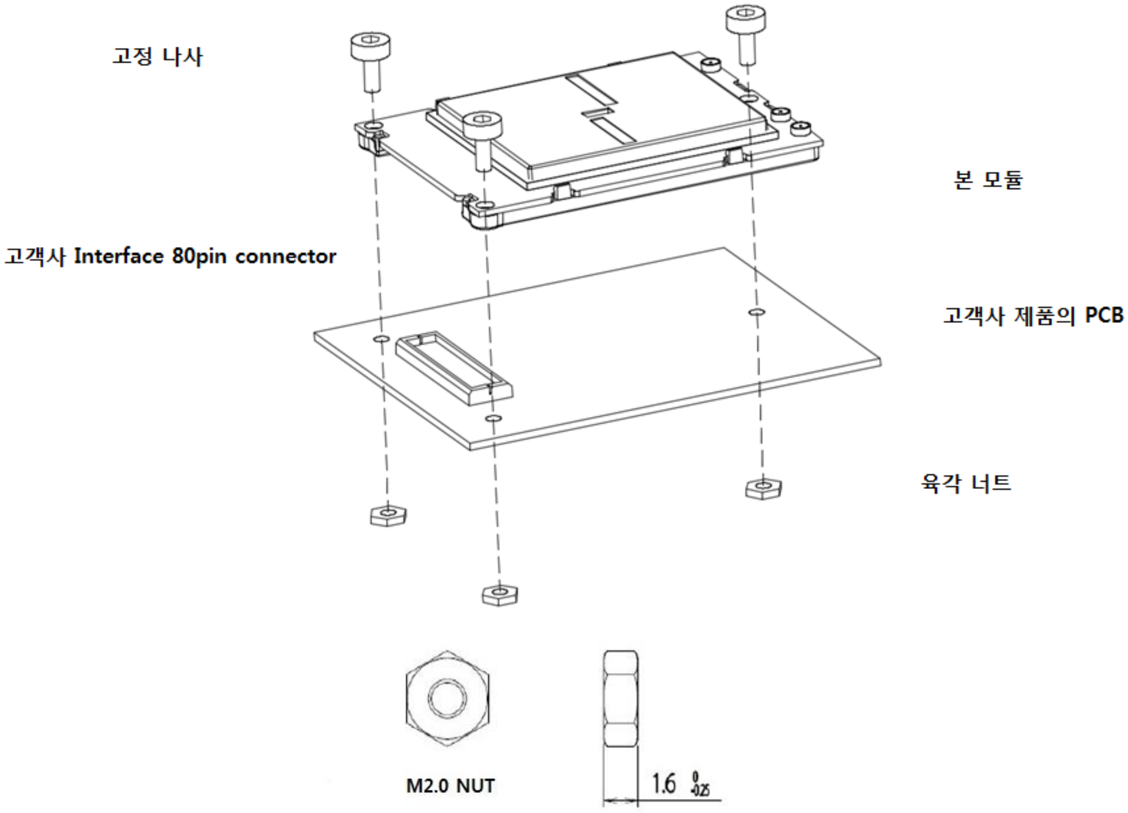
Please fix the Module each three screws and nuts.

When the assembly while power is on customer during assembly in customers' Board,

Damage given in this Module, please note that it may be a problem such as a power failure and malfunction occurred.

fixed screw: M2.0 X d mm

d = 2.8 + t + 3.0 ± 0.2mm (t : Customer device PCB thickness)



Notice) fixed screw tighten torque: 1.2 ± 0.2kgfcm **(Don't tighten the screw to more than 1.5kgfcm)**

Figure A-6 Module Assembly Instruction

A. 9 Customer PCB Board Layout Guide

Board Layout of customers design, please refer to the drawing below

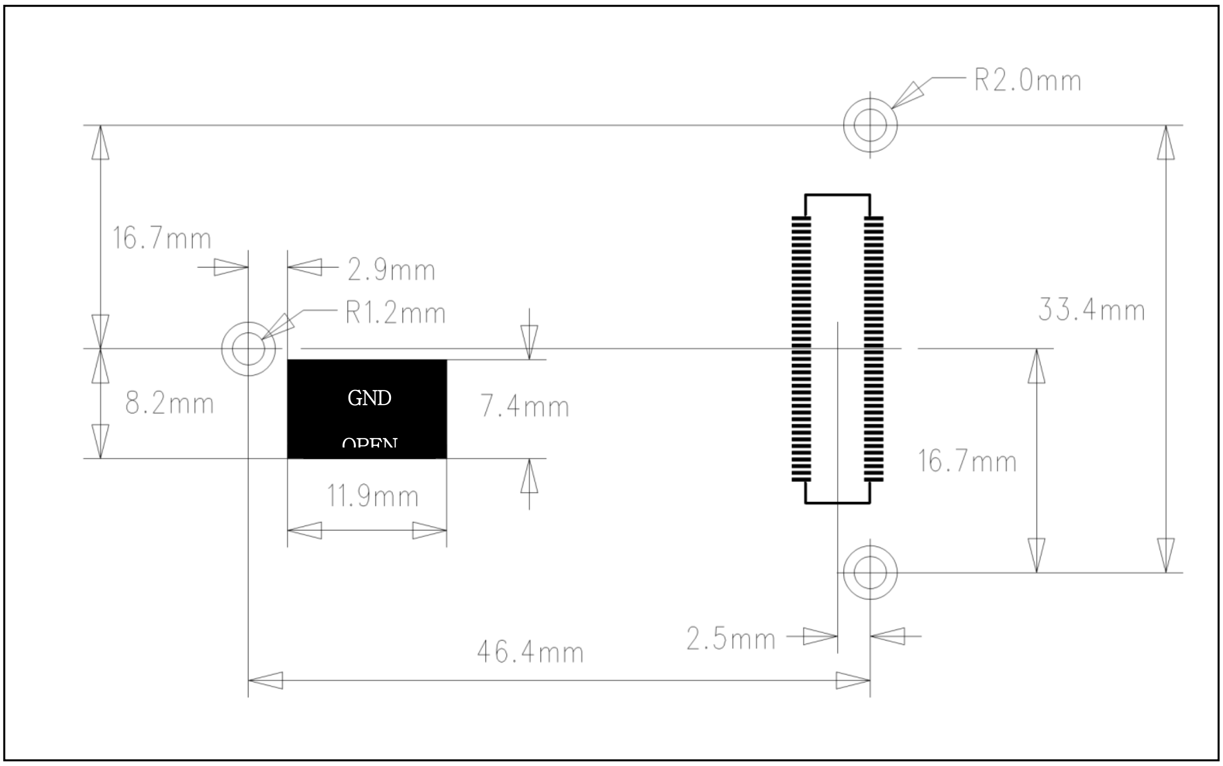


Figure A-7 Customer PCB Layout Guide