

LBAD0XX1SC

**LTE CAT M1
Module**



Features

- **LTE CAT M1 – 23 dBm**
- **16 MB of flash**
- **Dimension: 11.1x11.4x1.4 mm (typ), 1.5mm(max)**
- **Package: LGA**
- **Antenna configurations: external**
- **SIM card: external**
- **3GPP Rel. 13 eDRX and PSM modes**
- **Power Consumption: enables up to 10 year battery life Hibernation current: 1.5 μ A (avg) eDRX current: <45 μ A (avg) @ 8 Hyperframes**
- **PSM current: dormant window configurable**
- **Operating temperature range: -40°C to 85°C**
- **OTA firmware upgrade**
- **Regulatory certificate:**
 - **FCC/IC: HSW-TY1SC**
 - **ETSI: EN 301 489-1 and EN 301 908-1**
 - **TELEC: 003-180242**
- **Carrier Certifications: PTCRB (5.38), GCF (3.73)**
- **3GPP release 13 compliant**
- **OMA Lightweight M2M (LWM2M)**
- **Control via AT commands according to 3GPP TS27.005, 27.007 and customized AT commands**
- **IPv4/IPv6 stack with TCP and UDP protocol**
- **SSL/TLS**

Applications

- **4G LTE technology capability**
- **Dedicated LTE half-duplex operation (HD-FDD) for CatM1**
- **Cellular transceiver designed to meet 3GPP Rel-13 specifications**
- **LTE universal modem supports (low-band and mid-band):**
- **Low-band B5/B8/B12/B13/B14/B17/B18/B19/B20/B26/B28**
- **Mid-band B1/B2/B3/B4/B25**
- **Optimized for Class 3 LTE output power (+23 dBm)**
- **Wearables**
- **Building automation/Security**
- **Medical/Healthcare**
- **Asset Tracking**

RoHS Compliance

This component is compliant with RoHS directive. This component was always RoHS compliant from the first date of manufacture.

Revision History

Revision	Date	Author	Change Description
0.1	04/03/2019	RF PD	Preliminary version
0.2	05/20/2019	RF PD	Updated feature summary; updated VBAT_FEM min voltage supply
0.3	07/23/2019	RF PD	Remove any reference to NB1, set several MCU pins to NC, Updated Block Diagram
1.0	11/14/2019	RF PD	Updated power specs
1.1	12/17/19	RF PD	Fixed Pin 46 description
1.2	04/22/20	RF PD	Fixed Dimensions of tape on page 18 and Storage period condition to 72 hours on page 21.

Table of Contents

FEATURES	1
APPLICATIONS	1
REVISION HISTORY	2
TABLE OF CONTENTS	3
1 INTRODUCTION	5
1.1 Block Diagram	5
1.2 Acronyms	5
1.3 References	5
2 MECHANICAL SPECIFICATION	6
2.1 Module Dimensions	6
2.2 Top and Side View	6
2.3 PCB Footprint Top View	7
2.4 Pin Configuration	8
3 RF SPECIFICATION	15
4 ENVIRONMENTAL SPECIFICATION	15
4.1 Absolute Maximum Rating	15
4.2 Recommended Operating Condition	15
5 APPLICATION INFORMATION	16
5.1 Recommended PCB Landing Pattern	16
6 ASSEMBLY INFORMATION	17
7 PACKAGING AND MARKING INFORMATION	18
7.1 Dimensions of Tape (Plastic tape)	18
7.2 Dimensions of Reel	18
7.3 Taping Diagrams	19
7.4 Module Marking Information	19
7.5 Moisture Sensitivity Level	19
8 REGULATORY INFORMATION	19
9 ROHS INFORMATION	20
10 ORDERING INFORMATION	20
11 NOTICE	21
11.1 Storage Conditions	21
11.2 Handling Conditions	21
11.3 Standard PCB Design (Land Pattern and Dimensions)	21
11.4 Notice for Chip Placer	21
11.5 Operational Environment Conditions	22
11.6 Input Power Capacity	22
12 PRECONDITIONS TO USE MURATA PRODUCTS	23

LIST OF FIGURES

Figure 1.1 Block Diagram	5
Figure 2.1 Module Top and Side View (Unit: mm)	6
Figure 2.2 Module Footprint Top View (Unit: mm)	7
Figure 2.3 Pinout Diagram Top View	8
Figure 6.1 Recommended PCB Landing Pattern	16
Figure 8.1 Reflow Profile	17
Figure 11.1 Tape Dimensions (Unit in mm).....	18
Figure 11.2 Reel Dimensions (Unit: mm)	18
Figure 11.3 Tape Diagram.....	19
Figure 11.7 Module Marking Diagram	19

LIST OF TABLES

Table 2.1: Module Dimensions	6
Table 2.2 Pinouts.....	9
Table 5.1 Absolute Maximum Rating	15
Table 5.2 Recommended Operating Condition	15

1 Introduction

1.1 Block Diagram

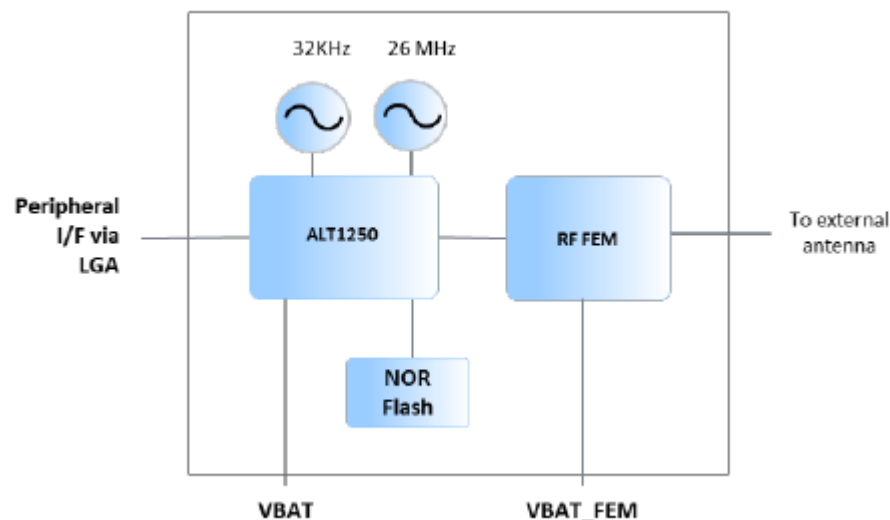


Figure 1.1 Block Diagram

1.2 Acronyms

- LTE Long Term Evolution
- UART Universal Asynchronous Receiver Transmitter
- eUICC Embedded SIM (Subscriber Identity Module)
- LGA Land Grid Array
- BB Baseband
- RFIC Radio Frequency Integrated Circuit
- GPS Global Positioning System
- LB Low Band (699 MHz to 915 MHz frequency range)
- MB Mid Band (1710 MHz to 2025 MHz frequency range)
- PSM Power Save Mode
- eDRX Extended Discontinuous Receive
- GPS Global Positioning System

1.3 References

- [1] Altair Semiconductor, AL1250 – Datasheet 1.18, Aug 2018

2 Mechanical Specification

2.1 Module Dimensions

Table 2.1: Module Dimensions

Parameter	Typical	Unit
Dimension (L x W x H)	11.1 ±0.2mm x 11.4 ±0.2mm x 1.50 (max)	mm
Weight	0.45 (typical)	g

2.2 Top and Side View

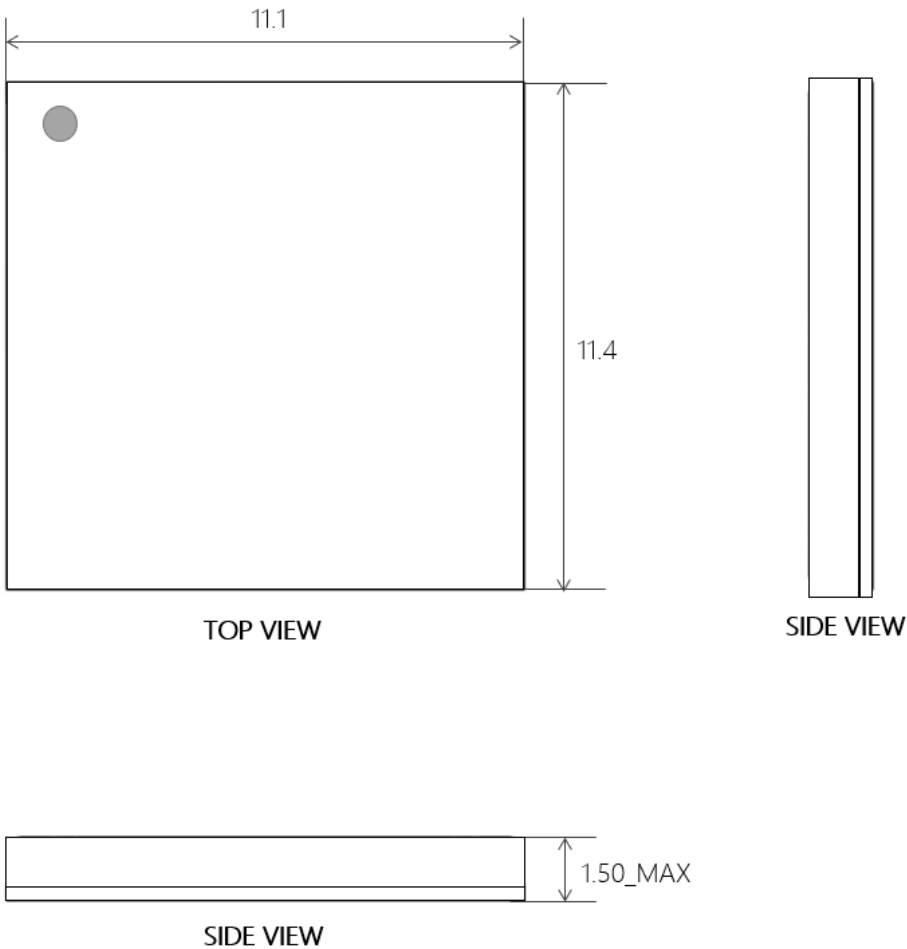


Figure 2.1 Module Top and Side View (Unit: mm)

2.3 PCB Footprint Top View

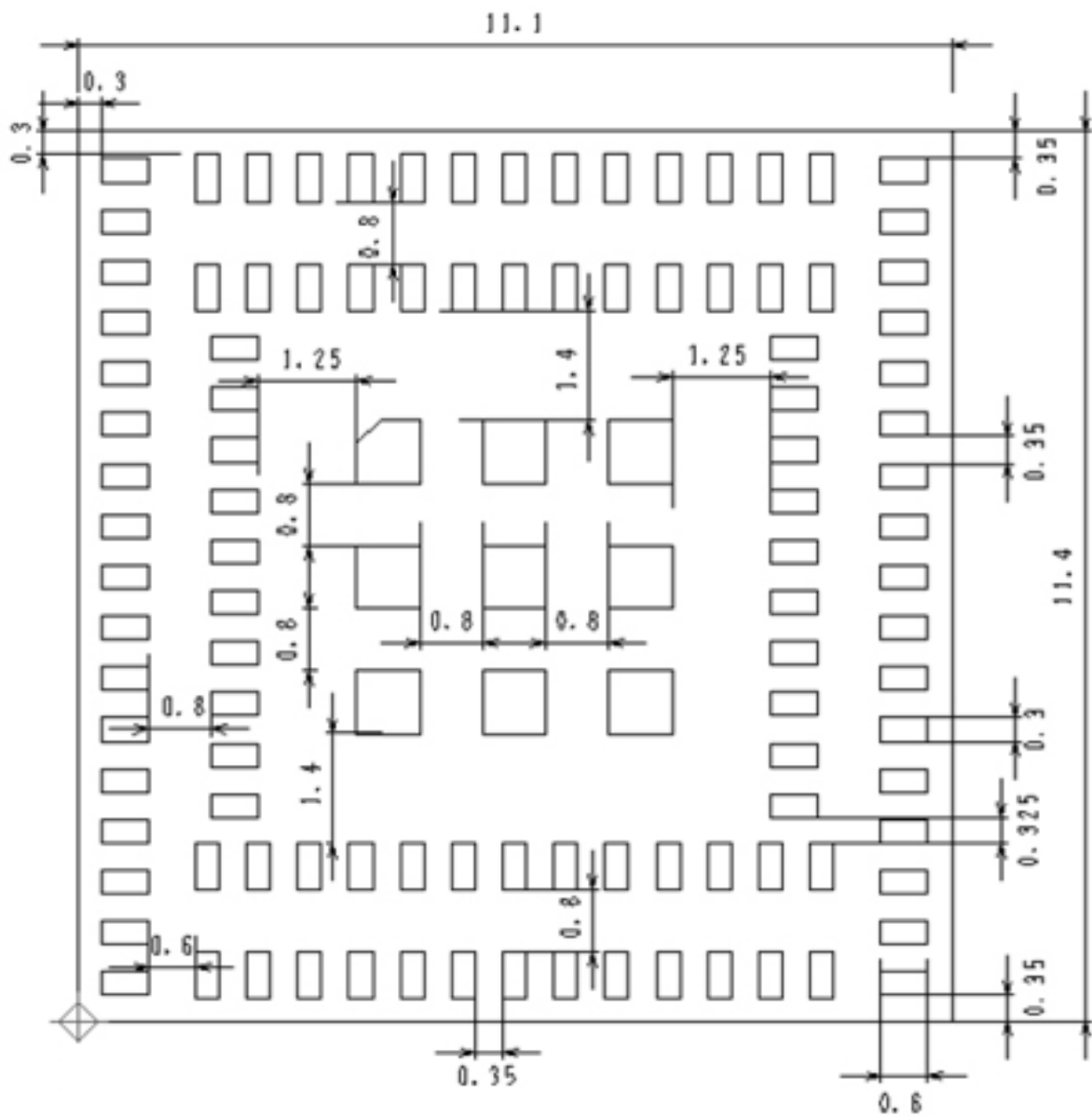


Figure 2.2 Module Footprint Top View (Unit: mm)

2.4 Pin Configuration

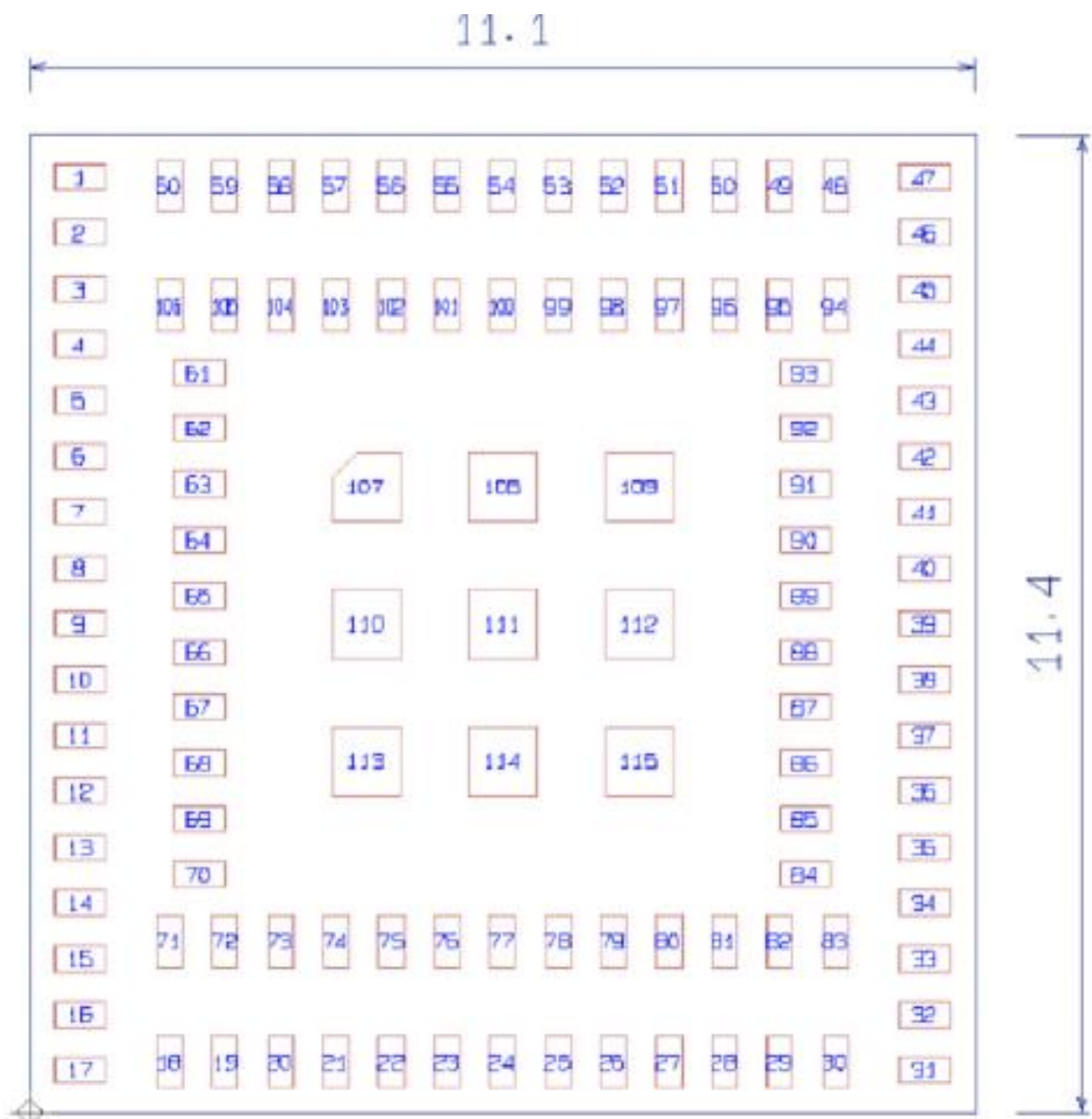


Figure 2.3 Pinout Diagram Top View

Table 2.2 Pinouts

1SC Pin#	Module Pin Name	ALT1250 Pin No	ALT1250 IC Symbol Pin Name	Type	Direction	Reset Value	IO Domain / Supply	Description
1	DEBUG_RSTN	P4	DEBUG_RSTN	Digital	I/O	PU	VDDIO	Reserved (No Connection)
2	DEBUG_SEL	M4	DEBUG_SEL/GPIO31	Digital	I/O	PD	VDDIO	Reserved (No Connection)
3	EJ_TDO	N5	EJ_TDO/GPIO22	Digital	I/O	PU	VDDIO	Reserved (No Connection)
4	EJ_TRST	J5	EJ_TRST/GPIO20	Digital	I/O	PD	VDDIO	JTAG Test Reset - require external pull down
5	PMU_AT_IN	R3	PMU_AT_IN	Analog	I		VRTC	Anti-tamper input; short to GND if not used
6	PMU_WAKEUP	P2	PMU_WAKEUP	Analog	I		VRTC	Wakeup active high; Device Wake-Up (HI)
7	VDD_RF	L1	PMU_VO_RF	Power	O			MIPI RFFE IO (antenna tuning)
8	VSIM	R1	PMU_VO_SIM	Power	O			SIM LDO output
9	VDD_AUX	T2	PMU_VO_AUX_LDO	Power	O			SC2 LDO output
10	VDD_XO	N1	PMU_VO_XO	Power	O			Reserved (No Connection)
11	SIMIO	M10	SC_IO/GPIO14	Digital	I/O	PD	VDDIO	SIM Data 1.8V
12	I2C1_SDA	H2	I2C1_SDA/SPIS_MRDY/ PWM3/MCU_I2C1_SDA/ MCU_FLASH1_SCK/ UART0_RI/MCU_S PIM1_CLK_A/ MCU_PWM3/GPIO44	Digital	I/O	PU	VDDIO	Reserved (No Connection)
13	I2C1_SCL	H4	I2C1_SCL/SPIS_CLK/ LED3/MCU_I2C1_SCL/ MCU_FLASH1_CS_N/ UART0_DTR/MCU_SPI M1_EN0_A/MCU_LED3/ GPIO45	Digital	I/O	PU	VDDIO	Reserved (No Connection)
14	I2C0_SCL	L7	I2C0_SCL/SPIS_MISO/ KEYPAD9/FEM19/ MCU_I2C0_SCL/ UART0_DSR/GPIO43	Digital	I/O	PU	VDDIO	Reserved (No Connection)
15	I2C0_SDA	J7	I2C0_SDA/SPIS_MOSI/ CLKOUT/KEYPAD7/ MCU_I2C0_SDA/ UART0_DCD/ MCU_CLKOUT/GPIO42	Digital	I/O	PU	VDDIO	Reserved (No Connection)
16	VBAT_FEM			Power	I			Input from battery to FEM
17	VBAT_FEM			Power	I			Input from battery to FEM
18	VBAT_FEM			Power	I			Input from battery to FEM
19	GND							
20	UART2_RX	H14	UART2_RX/ SPIS_MOSI_A/PWM2/ EJ1_TDI_B/UART1_RX/ MCU_UART1_RX/ MCU_SPI_M1_MISO_A/ MCU_SPIM0_MISO_A/ UART3_RX_B/ MCU_PWM2/GPIO27	Digital	I/O	PU	VDDIO	• Default is UART1 Receive Data • Dedicated for Altair debug interface
21	UART2_CTS	G15	UART2_CTS/ SPIS_MRDY_A/E J1_TRST_B/ UART1_CTS/ MCU_UART1_CTS/ MCU_SPIM1_CLK_A/ MCU_SPIM0_CLK_A/U	Digital	I/O	PD	VDDIO	• Default is UART1 Clear to Send • Dedicated for Altair debug interface

1SC Pin#	Module Pin Name	ALT1250 Pin No	ALT1250 IC Symbol Pin Name	Type	Direction	Reset Value	IO Domain / Supply	Description
22	UART2_TX	G13	ART3_CTS_B/GPIO29 "UART2_TX/ SPIS_MISO_A/FE M22/ EJ1_TMS_B/UART1_TX/ MCU_UART1_TX/ MCU_SPIM1_MOSI_A/ MCU_SPIM0_MOSI_A/ UART3_TX_B/GPIO 28	Digital	I/O	PU	VDDIO	•Default is UART1 Transmit Data •Dedicated for Altair debug interface
23	GND							
24	RF_GNSS_COMMON_ANT			RF	O			GNSS receiver output
25	RF_GNSS_ANT			RF	I			GNSS receiver input
26	GND							
27	RF_AUX_OUT1			RF			I	
28	GND							
29	RF_RXTX			RF			I/O	CAT-M1 RF in/out signal
30	GND							
31	PWM3	N13	PWM3/I2C1_SDA/ SC_SWP/F EM29/ MCU_CC_OUT3/ MCU_CC_IN3/ MCU_LED3/MCU_P WM3/GPIO53	Digital	I/O	PU	VDDIO	TX Indicator
32	PWM0	P10	PWM0/CLKOUT/ MCU_CC_O UT0/ MCU_CC_IN0/MCU_CLK OUT/FEM28/ MCU_PWM0/G PIO50	Digital	I/O	PD	VDDIO	Device Reset Status (HI)
33	AUX_ADC4	H12	AUX_ADC4/FEM7/ PCM_OUT/MCU_LED0/ MCU_CC_OUT1/GPIO5	Digital	I/O	PD	VDDIO	External DCDC Control
34	AUX_ADC3	J13	AUX_ADC3/FEM6/ PCM_IN/K EYPAD4/ MCU_SPIM1_CLK_B/ MCU_I2C1_SCL/ SWDAT/MCU_CC_IN3/ GPIO4	Digital	I/O	PU	VDDIO	Reserved (No Connection)
35	AUX_ADC2	K14	AUX_ADC2/FEM5/ PCM_FS/K EYPAD7/ MCU_SPIM1_EN0_B/ MCU_I2C1_SDA/ SWCLK/MCU_CC_IN2/ GPIO3	Digital	I/O	PU	VDDIO	Reserved (No Connection)
36	AUX_ADC0	L13	AUX_ADC0/I2C1_SCL/ MCU_CC_IN0/ KEYPAD9/MCU_LED 4/ PWM2/MCU_PWM2/ GPIO 1	Digital	I/O	PU	VDDIO	Reserved (No Connection)
37	AUX_ADC1	M14	AUX_ADC1/FEM4/ PCM_CLK/ KEYPAD6/ CLKOUT/MCU_LED 1/ MCU_CLKOUT/ MCU_CC_I N1/GPIO2	Digital	I/O	PD	VDDIO	GNSS coexistence indicator
38	GND							
39	SF_SO/IO1	"Y14	FLASH0_IO1/GPIO71	Digital	I/O	PD	V_FLASH	Reserved (No Connection)
40	SF_SI/IO0	"AA15	FLASH0_IO0/GPIO70	Digital	I/O	PU	V_FLASH	Reserved (No Connection)
41	SF_nHOLD/IO3	"Y12	FLASH0_IO3/GPIO73	Digital	I/O	PU	V_FLASH	Reserved (No Connection)
42	SF_nWP/IO2	"AA13	FLASH0_IO2/GPIO72	Digital	I/O	PD	V_FLASH	Reserved (No Connection)
43	SPIM0_EN0	P12	SPIM0_EN0/ UART1_RTS/MC U_PCM_OUT_A/ UART0_DSR/	Digital	I/O	PU	VDDIO	Port C: UART RTS

1SC Pin#	Module Pin Name	ALT1250 Pin No	ALT1250 IC Symbol Pin Name	Type	Direction	Reset Value	IO Domain / Supply	Description
			MCU_SPIS_CLK_B/ SWDAT/ MCU_SPIM0_EN0_A/ GPIO35					
44	SPIM0_EN1	R13	SPIM0_EN1/ SPIS_SRDY_ABC/ KEYPAD4/FEM18/ MCU_SPIS_SRDY_AB/ MCU_CC_IN2/MC U_FLASH1_CS_N1/ MCU_CC_OUT2/ GPIO36	Digital	I/O	PU	VDDIO	External LNA GNSS
45	SPIM0_MISO	T12	SPIM0_MISO/ UART1_RX/MC U_PCM_FS_A/ UART0_DTR/ MCU_SPIS_MOSI_B/ MCU_UART1_RX/ MCU_SPIM0_MISO_AB/ GPIO34	Digital	I/O	PU	VDDIO	Port C: UART RX
46	SPIM0_MOSI	U13	SPIM0_MOSI/ UART1_TX/MC U_PCM_IN_A/ UART0_DCD/ MCU_SPIS_MISO_B/ SWCLK/ MCU_SPIM0_MOSI_AB/ GPIO33	Digital	I/O	PU	VDDIO	Port C: UART TX
47	NC							Reserved (No Connection)
48	VFLASH	R15 AA5	PMU_VDDIO_FLASH0_ R15PMU_VO_FLASH	Power	O			Reserved (No Connection)
49	VDDIO	AA7 Y6	PMU_VDDIO PMU_VO_IO	Power	O			IO Reference
50	VDD_RET	"W9 V8	PMU_VDD_RET PMU_VO_RET	Power	O			Debug monitoring only
51	FLASH0_CS_N1	V14	FLASH0_CS_N1/FEM24/ GPIO 66	Digital	I/O	PU	V_FLASH	GNSS SFN indication
52	FLASH1_CS_N	M6	MCU_FLASH1_CS_N/ PWM0/KEYPAD5/LED0/ MCU_LED0/ FLASH1_CS_N1/ MCU_PWM0/GPIO54	Digital	I/O	PU	VDDIO	Reserved (No Connection)
53	FLASH1_IO1	R7	MCU_FLASH1_IO1/ I2C0_SCL/UART0_TX/ KEYPAD1/MCU_ I2C0_SCL/ MCU_CC_OUT1/M CU_UART1_TX/GPIO57	Digital	I/O	PU	VDDIO	Reserved (No Connection)
54	FLASH0_CS_N2	W11	FLASH0_CS_N2/FEM27/ LED5/MCU_LED5/ GPIO78	Digital	I/O	PU	V_FLASH	Reserved (No Connection)
55	FLASH1_SCK	U7	MCU_FLASH1_SCK/ PWM1/KEYPAD8/LED1/ MCU_LED1/M CU_PWM1/GPIO55	Digital	I/O	PD	VDDIO	Reserved (No Connection)
56	PMU_VBACKUP	W7	PMU_VBACKUP	Power	I			Input from backup battery or NC if not used
57	PMU_VRTC	W5	PMU_VRTC	Power	O			Use for PMU_SHUTDOWN and PMU_POWERBUTTON pull source
58	VBAT	U3	PMU_VBAT_LDO	Power	I			Voltage from Battery
59		V2	PMU_VBAT_DCDC_V2	Power	I			
60		W1	PMU_VBAT_DCDC_W1	Power	I			

1SC Pin#	Module Pin Name	ALT1250 Pin No	ALT1250 IC Symbol Pin Name	Type	Direction	Reset Value	IO Domain / Supply	Description
61	EJ_TDI	L5	EJ_TDI/GPIO21	Digital	I/O	PD	VDDIO	Reserved (No Connection)
62	EJ_TMS	K4	EJ_TMS/SWDAT/GPIO19	Digital	I/O	PD	VDDIO	Reserved (No Connection)
63	PMU_AT_OUT	N3	PMU_AT_OUT	Analog	O		VRTC	Anti-tamper output; connect to PMU_AT_IN or NC if not used
64	PMU_SHUTDOWN	M2	PMU_SHUTDOWN	Analog	I	PU	VRTC	"Shutdown active low , Modem reset (HI)
65	PMU_EXT_ALARM	L3	PMU_EXT_ALARM/ALARM/3 2KHZ_CLK_OUT/GPO0	Analog	O		VDDIO	Debug monitoring only
66	PMU_POWER_BUTTON ON	K2	PMU_POWER_BUTTON	Analog	I	PU	VRTC	Power button active low
67	PMU_ATB	J3	PMU_ATB	Test	I/O		VBAT	Reserved (No Connection)
68	SIMRST	M8	SC_RST/GPIO13	Digital	I/O	PD	VDDIO	SIM Reset 1.8V
69	SIMCLK	L9	SC_CLK/GPIO15	Digital	I/O	PD	VDDIO	SIM Clock 1.8V
70	SIM_DETECT	J11	SC_DET/PWM0/FEM12/MCU_PWM0/GPIO16	Digital	I/O	PD	VDDIO	SIM Detection 1.8V
71	SC_SWP	J9	SC_SWP/CLKOUT/FEM13/P WM3/MCU_PM3/EJ1_TO_AB/CLK32KHZ_EXT/MCU_CLKOUT/MCU_CC_OUT3/GPI O17	Digital	I/O	PD	VDDIO	Host Wake-Up (HI)
72	UART0_RTS	K8	UART0_RTS/SPIM0_EN0_A/I 2C0_SDA/UART2_RTS/MCU_UART0_RTS/EJ1_TCK_A/MC U_I2C0_SDA/MCU_SPIM0_E N0_B/UART3_RTS_A/GPIO26	Digital	I/O	PU	VDDIO	•Default is UART0 Request to Send •Data host interface; UART RTS (HI)
73	UART0_TX	K10	UART0_TX/SPIM0_MOSI_A/F EM15/UART2_TX/MCU_UA RT0_TX/EJ1_TMS_A/UART3_T X_A/GPIO24	Digital	I/O	PU	VDDIO	•Default is UART0 Transmit Data •Data host interface; UART TX (HI)
74	UART2_RTS	K6	UART2_RTS/SPIS_CLK_A/FE M23/EJ1_TCK_B/UART1_RTS/MCU_UART1_RTS/MCU_SPI M1_EN_A/MCU_SPIM0_EN0_A/UART3_RTS_B/GPIO30	Digital	I/O	PU	VDDIO	•Default is UART1 Request to Send •Dedicated for Altair debug interface
75	UART0_RX	G11	UART0_RX/SPIM0_MISO_A/ FEM14/UART2_RX/MCU_UA RT0_RX/EJ1_TDI_A/UART3_RX_A/GPIO23	Digital	I/O	PU	VDDIO	•Default is UART0 Clear to Send •Data host interface; UART RX (HI)
76	UART0_CTS	G9	UART0_CTS/SPIM0_CLK_A/I2 C0_SCL/UART2_CTS/MCU_UA RT0_CTS/EJ1_TRST_A/MCU_I2C0_SCL/MCU_SPIM0_CLK_B/UART3_CTS_A/GPIO25	Digital	I/O	PU	VDDIO	•Default is UART0 Clear to Send •Data host interface; UART CTS (HI)
77	RFFE_SCLK	H6	RFFE_SCLK/FEM10/GPIO11	Digital	I/O	PD	VDDIO	MIPI RFFE Clock (antenna tuning)
78	RFFE_SDATA	H8	RFFE_SDATA/FEM11/GPIO12	Digital	I/O	PD	VDDIO	MIPI RFFE data (antenna tuning)
79	GND							Ground

1SC Pin#	Module Pin Name	ALT1250 Pin No	ALT1250 IC Symbol Pin Name	Type	Direction	Reset Value	IO Domain / Supply	Description
80	GND							Ground
81	GND							Ground
82	PWM1	L11	PWM1/I2C0_SDA/ MCU_SPI M1_MISO_AB/ KEYPAD5/MC U_CC_OUT1/ MCU_CC_IN1/ MCU_PWM1/GPIO51	Digital	I/O	PU	VDDIO	Reserved (No Connection)
83	PWM2	M12	PWM2/I2C0_SCL/ MCU_SPIM1_MOSI_AB/ FEM16/MCU_C C_OUT2/MCU_CC_IN2/ MCU_PWM2/GPIO52	Digital	I/O	PU	VDDIO	Reserved (No Connection)
84	SPIM1_MISO	N9	MCU_SPIM1_MISO/ SPIS_MOSI_A/ KEYPAD6/PWM1/MC U_SPIS_MOSI_A/SC_IO/ MCU_PCM_FS_B/ MCU_PWM1/GPIO39	Digital	I/O	PD	VDDIO	Reserved (No Connection)
85	SPIM1_EN	P8	MCU_SPIM1_EN/ SPIS_CLK_A/KEYPAD8/ PWM3/ MCU_SPIS_CLK_A/ SC_DET/MCU_PCM_ IN_B/MCU_PWM3/ GPIO40	Digital	I/O	PU	VDDIO	Reserved (No Connection)
86	SPIM1_MOSI	T8	MCU_SPIM1_MOSI/ SPIS_MISO_A/PWM2/ MCU_PWM2/ MCU_SPIS_MISO_A/ SC_CLK/ MCU_PCM_OUT_B/ GPIO38	Digital	I/O	PD	VDDIO	Reserved (No Connection)
87	SPIM1_CLK	R9	MCU_SPIM1_CLK/ SPIS_MRDY_A/PWM0/ MCU_CC_OUT0/ MCU_SPIS_MRDY_A/ SC_RST/ MCU_PCM_CLK_B/ GPIO41	Digital	I/O	PD	VDDIO	Reserved (No Connection)
88	SF_CLK	W15	FLASH0_SCK/GPIO67	Digital	I/O	PD	V_FLASH	Reserved (No Connection)
89	GND							
90	USB_DN	J15	USB_DN/GPI64_3V3	Digital	I		VDDIO	Reserved (No Connection)
91	USB_DP	L15	USB_DP/GPI63_3V3	Digital	I/O		VDDIO	Reserved (No Connection)
92	GND							
93	USB3V3	N15	USB_V3P3	Digital	I/O		VDDIO	Reserved (No Connection)
94	SPIM0_CLK	V12	SPIM0_CLK/ UART1_CTS/MC U_PCM_CLK_A/ UART0_RI/M CU_SPIS_MRDY_B/ MCU_UART1_TX/ MCU_SPIM0_CLK_A/ GPIO37	Digital	I/O	PU	VDDIO	Port C: UART CTS
95	PCM_FS	R11	PCM_FS/UART1_RTS/ KEYPAD1/FEM21/ MCU_FLASH1_IO1/ MCU_LED5/ MCU_UART1_RTS/ MCU_PCM_FS/GPIO47	Digital	I/O	PU	VDDIO	Reserved (No Connection)
96	PCM_IN	N11	PCM_IN/UART1_RX/ KEYPAD2/LED4/	Digital	I/O	PU	VDDIO	Reserved (No Connection)

1SC Pin#	Module Pin Name	ALT1250 Pin No	ALT1250 IC Symbol Pin Name	Type	Direction	Reset Value	IO Domain / Supply	Description
			MCU_FLASH1_IO2/ MCU_LED4/ MCU_UART1_RX/ MCU_PCM_IN/GPIO48					
97	PCM_OUT	T10	PCM_OUT/UART1_TX/ KEYPA D3/PWM2/ MCU_FLASH1_IO 3/ MCU_PWM2/ MCU_UART1_TX/ MCU_PCM_OUT/GPIO4 9	Digital	I/O	PU	VDDIO	Reserved (No Connection)
98	PCM_CLK	V10	PCM_CLK/UART1_CTS/ KEYP AD0/FEM20/ MCU_FLASH1_I O0/ MCU_LED2/ MCU_UART1_CTS/ MCU_PCM_CLK/GPIO4 6	Digital	I/O	PD	VDDIO	Reserved (No Connection)
99	GND							
100	CLKOUT	U9	CLKOUT/ 32KHZ_CLK_OUT/ PWM0/FLASH1_CS_N1/ LED2/MCU_CLKOUT/ MCU_CC_OUT1/ MCU_PWM0/GPIO60	Digital	O	PD	VDDIO	Reserved (No Connection)
101	GND							
102	PMU_VCAP	V6	PMU_VCAP	Analog	O		VBAT	Connecting external capacitor as backup for VBAT or NC if not used
103	FLASH1_IO3	N7	MCU_FLASH1_IO3/ I2C1_SCL/UART0_RTS/ KEYPAD3/ MCU_I2C1_SCL/ MCU_CC_OUT3/ MCU_UART1_RTS/ GPIO59	Digital	I/O	PU	VDDIO	Reserved (No Connection)
104	FLASH1_IO2	P6	MCU_FLASH1_IO2/ I2C1_SDA/UART0_CTS/ KEYPAD2/ MCU_I2C1_SDA/ MCU_CC_OUT2/ MCU_UART1_CTS/ GPIO58	Digital	I/O	PD	VDDIO	Reserved (No Connection)
105	FLASH1_IO0	T6	MCU_FLASH1_IO0/ I2C0_SDA/UART0_RX/ KEYPAD0/MCU_I2C0_SDA/ MCU_CC_OUT0/ MCU_UART1_RX/ GPIO56	Digital	I/O	PU	VDDIO	Reserved (No Connection)
106	EJ_TCK	R5	EJ_TCK/SWCLK/GPIO18	Digital	I/O	PD	VDDIO	Reserved (No Connection)
107-115	GND_PAD							

3 RF Specification

The module is compliant to the 3GPP spec for release 13 and rated at a Class 3 device (23 dBm)

4 Environmental Specification

4.1 Absolute Maximum Rating

Table 4.1 Absolute Maximum Rating

Parameters		Min	Typ	Max	Unit
Storage Temperature		-40		+85	degC
Supply Voltage	VBAT	-0.3	-	4.35	V
	PMU_VBACKUP	-0.3	-	4.35	V
	PMU_VCAP	-0.3	-	4.35	V
	VBAT_FEM	-0.5	-	5.2	V

4.2 Recommended Operating Condition

Table 4.2 Recommended Operating Condition

Parameters		Min	Typ	Max	Unit
Operating Temperature		-40	25	+85	degC
Supply Voltage	VBAT	2.2		4.35	V
	PMU_VBACKUP	2.2		4.35	V
	PMU_VCAP	2.2		4.35	V
	VBAT_FEM	2.85		4.5	V
Interface Voltage	V_IO	1.7	1.8	1.9	V

For VDDIO, the total current from all IOs combined, and supplied by PMU_VDDIO, should not exceed 50mA.

5 Application Information

5.1 Recommended PCB Landing Pattern

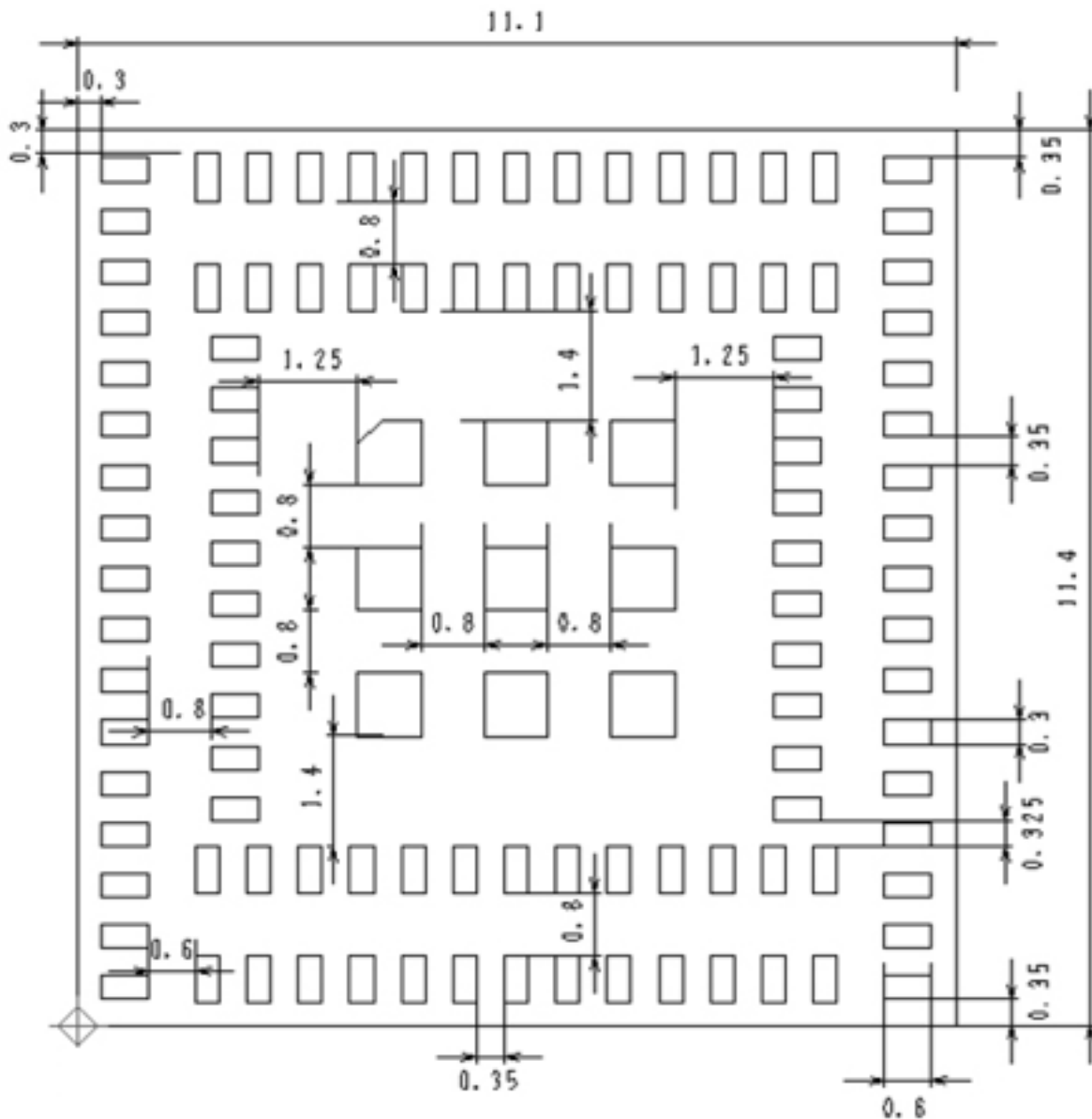


Figure 5.1 Recommended PCB Landing Pattern

6 Assembly Information

Refer to Figure6.1 for recommended soldering conditions.

When products are immersed in solvent after mounting, ensure the temperature difference is within 100°C. Soldering must be done by this method to prevent products from damage. Set up the highest temperature of reflow within 260 °C. If considering other soldering conditions, you must contact Murata before proceeding.

Reflow soldering standard conditions

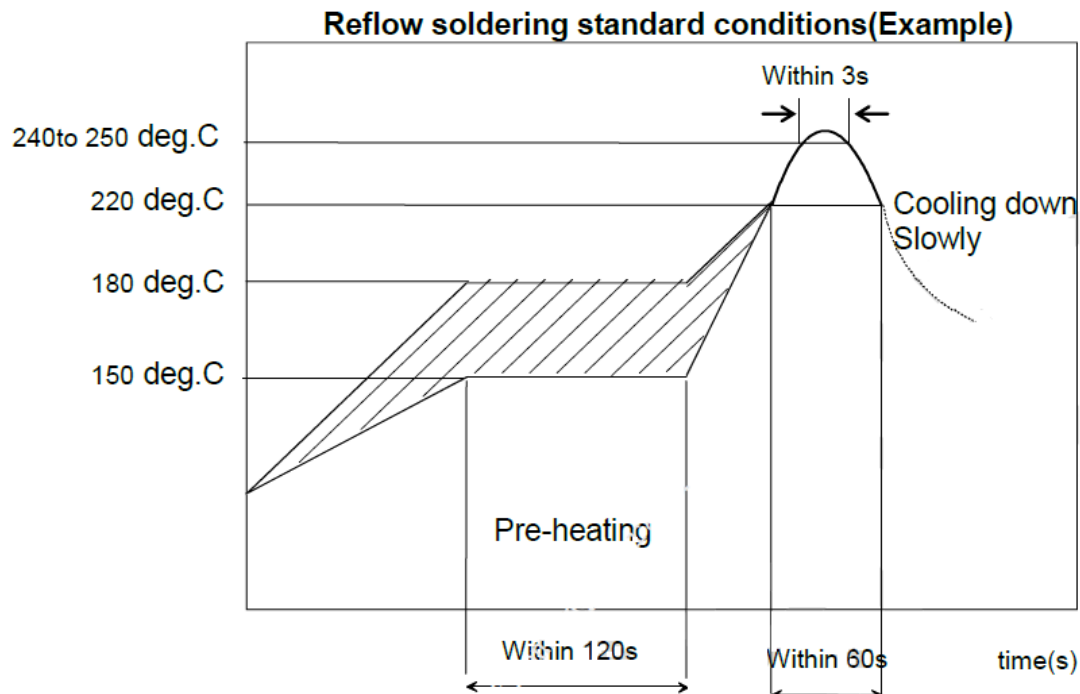


Figure6.1 Reflow Profile

Please don't use the reflow method more than twice.

Use rosin type flux or a weakly active flux with a chlorine content of 0.2 wt % or less.

Since this Product is Moisture Sensitive, any cleaning with liquid is NOT permitted.

7.3 Taping Diagrams

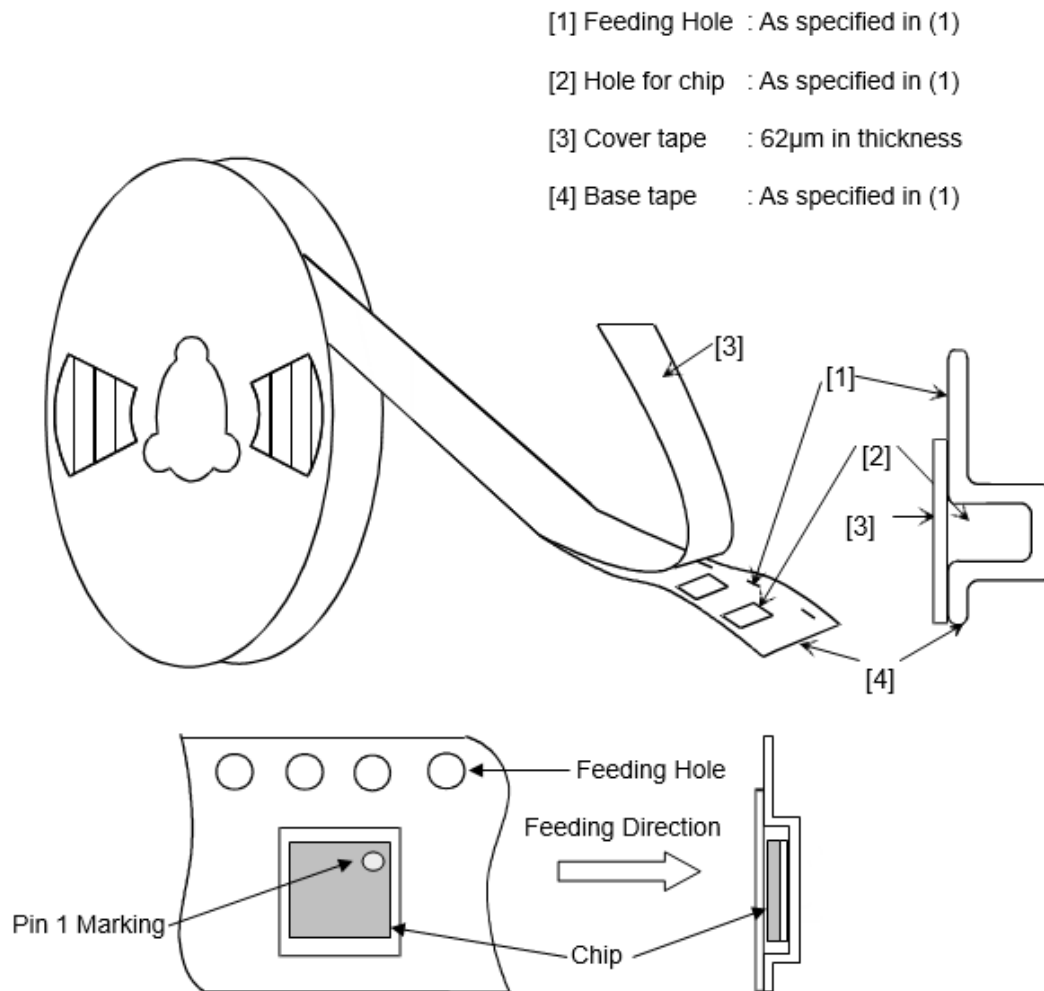


Figure 7.3 Taping Diagram

7.4 Module Marking Information

Figure 7.4 shows the module marking. Dimensions are nominal, not absolute.

TBD

Figure 7.4 Module Marking Diagram

7.5 Moisture Sensitivity Level

The module is rated to MSL 4 (72 hours). Please observe this rating with the utmost importance.

8 Regulatory Information

The module is FCC/IC certified (HSW-TY1SC and 4492A-TY1SC) and RED ETSI EN 301908-13, EN301908-1, EN301489-1, EN301489-19, EN301489-52 compliant. Please contact support if you need the DoC for the module. The module is also certified for use in Japan (TELEC 003-180242).

The module is certified to GCF 3.70.2 and PTCRB 5.36. The module is fully compliant to CAT M1 3GPP release 13.

9 RoHS Information

The Type 1SC module conforms to RoHS requirements.

10 Ordering Information

Product	Model Name	Murata Ordering Part Number	Standard Order Increment
Module Sample	Type 1SC	LBAD0XX1SC-TEMP	*** pcs
Development Kit	Type 1SC DK	LBAD0XX1SC-EVK-TEMP	1 pcs

11 Notice

11.1 Storage Conditions

Please use this product within 6 months after receipt.

- The product shall be stored in original under with an ambient temperature from 5 to 35°C, and humidity from 20% to 70%RH.

(Packing materials, in particular, may become deformed if the temperature exceeds 40°C.)

- If the product is not used for more than 6months after receipt, confirm the solderability before use.
- Store the product in non-corrosive gas (Cl₂, NH₃, SO₂, Nox, etc.).
- Avoid mechanical shock, such as dropping or puncturing the product, to preserve integrity of the packing materials.
- After the package is opened, store it at <30°C / <60%RH and use the product within 72 hours.
- If the color of the indicator in the packing changes, bake the product before soldering.

Baking condition: 125±5/-0°C, 24hours, 1 time

Baked the product on a heat-resistant tray because other materials (Base Tape, Reel Tape and Cover Tape) are not heat-resistant.

11.2 Handling Conditions

Be careful in handling or transporting products because excessive stress or mechanical shock may break products.

Handle products with care to avoid cracks or damages on the terminals, causing unwarranted changes in the product characteristics. Do not touch products with bare hands to avoid degrading solder ability or damage caused by static electrical charge.

11.3 Standard PCB Design (Land Pattern and Dimensions)

All the ground terminals should be connected to the ground patterns. Furthermore, the ground pattern should be provided between IN and OUT terminals. Please refer to the specifications for the standard land dimensions.

The recommended land pattern and dimensions is in accordance with Murata's standard. The characteristics of products may vary depending on the pattern drawing method, grounding method, land dimensions, land forming method of the NC terminals and the PCB material and thickness. Therefore, be sure to verify the characteristics in the actual set. If using non-standard lands, contact Murata beforehand.

11.4 Notice for Chip Placer

When positioning products on the PCB, be aware that mechanical chucking may damage products. When placing products on the PCB, a worn-out chucking locating claw or a suction nozzle can cause undue stress and uneven force, resulting in damaged products. To prevent products from damage, be sure to follow the specifications for the maintenance of the chip placer in use.

11.5 Operational Environment Conditions

Products are designed to work under normal environmental conditions (ambient temperature, humidity and pressure) as stated above. However, if products are used under the following circumstances, they may be damaged, resulting in leakage of electricity and abnormal temperatures.

- In an atmosphere containing corrosive gas (Cl₂, NH₃, SO_x, NO_x, etc.).
- In an atmosphere containing combustible and volatile gases.
- Dusty environment.
- Direct sunlight.
- Excessive moisture.
- Excessive humidity where water condenses.
- Extreme cold, such as in freezing temperatures.

If products could be exposed to those conditions described above, consult with Murata before actual use.

Static electricity may degrade or destroy products. Avoid static electricity or excessive voltage while assembling and measuring.

11.6 Input Power Capacity

Avoid exceeding the input power capacity as specified in this document.

If operating conditions may exceed parameters as stated in this document, inform Murata before use.

12 PRECONDITIONS TO USE MURATA PRODUCTS

PLEASE READ THIS NOTICE BEFORE USING OUR PRODUCTS.

Please make sure that your product has been evaluated and confirmed from the aspect of the fitness for the specifications of our product when our product is mounted to your product.

All the items and parameters in this product specification/datasheet/catalog have been prescribed on the premise that our product is used for the purpose, under the condition and in the environment specified in this specification. You are requested not to use our product deviating from the condition and the environment specified in this specification.

Please note that the only warranty that we provide regarding the products is its conformance to the specifications provided herein. Accordingly, we shall not be responsible for any defects in products or equipment incorporating such products, which are caused under the conditions other than those specified in this specification.

WE HEREBY DISCLAIMS ALL OTHER WARRANTIES REGARDING THE PRODUCTS, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, THAT THEY ARE DEFECT-FREE, OR AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS.

The product shall not be used in any application listed below which requires especially high reliability for the prevention of such defect as may directly cause damage to the third party's life, body or property. You acknowledge and agree that, if you use our products in such applications, we will not be responsible for any failure to meet such requirements. Furthermore, YOU AGREE TO INDEMNIFY AND DEFEND US AND OUR AFFILIATES AGAINST ALL CLAIMS, DAMAGES, COSTS, AND EXPENSES THAT MAY BE INCURRED, INCLUDING WITHOUT LIMITATION, ATTORNEY FEES AND COSTS, DUE TO THE USE OF OUR PRODUCTS IN SUCH APPLICATIONS.

- Aircraft equipment.
- Aerospace equipment
- Undersea equipment.
- Power plant control equipment
- Medical equipment.
- Transportation equipment (vehicles, trains, ships, elevator, etc.).
- Traffic signal equipment.
- Disaster prevention / crime prevention equipment.
- Burning / explosion control equipment
- Application of similar complexity and/ or reliability requirements to the applications listed in the above.

We expressly prohibit you from analyzing, breaking, reverse-engineering, remodeling altering, and reproducing our product. Our product cannot be used for the product which is prohibited from being manufactured, used, and sold by the regulations and laws in the world.

We do not warrant or represent that any license, either express or implied, is granted under any our patent right, copyright, mask work right, or our other intellectual property right relating to any combination, machine, or process in which our products or services are used. Information provided by us regarding third-party products or services does not constitute a license from us to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from us under our patents or other intellectual property.

Please do not use our products, our technical information and other data provided by us for the purpose of developing of mass-destruction weapons and the purpose of military use.

Moreover, you must comply with "foreign exchange and foreign trade law", the "U.S. export administration regulations", etc. Please note that we may discontinue the manufacture of our products, due to reasons such as end of supply of materials and/or components from our suppliers.

By signing on specification sheet or approval sheet, you acknowledge that you are the legal representative for your company and that you understand and accept the validity of the contents herein. When you are not able to return the signed version of specification sheet or approval sheet within 30 days from receiving date of specification sheet or approval sheet, it shall be deemed to be your consent on the content of specification sheet or approval sheet. Customer acknowledges that engineering samples may deviate from specifications and may contain defects due to their development status. We reject any liability or product warranty for engineering samples. In particular we disclaim liability for damages caused by

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- deviation or lapse in function of engineering sample,
- improper use of engineering samples.

We disclaim any liability for consequential and incidental damages.

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