Specification Number : JEBMM0-0058

Messrs. LITE-ON Technology Corp.

Approval Sheet for Product Specification

Issued Date : 15/Nov/2004

Product Description : BlueModule™

Customer Part Number :

Murata Part Number : LBMA477BK2-064

Date :
Company :
Dept. :
Approved by Signature :
Type :

The duplicate of this specification shall be returned to us with your authorised signiture. Unless it reaches us by 27/December/2004, it shall be mutually understood that this specification has been duly approved by you.

Prepared by

Keisuke Katabuchi (signature)
Keisuke Katabuchi (type)

Approved by

(signature)
Norio Nakajima (type)
Manager

Product Engineering Section I
Multilayer Products Department
Component Division III
Murata Manufacturing Co., Ltd.

1. Scope

This specification is applied to the Bluetooth HCI module (Blue Module™).

2. Part Number

Production Part Number	LBMA477BK2-064

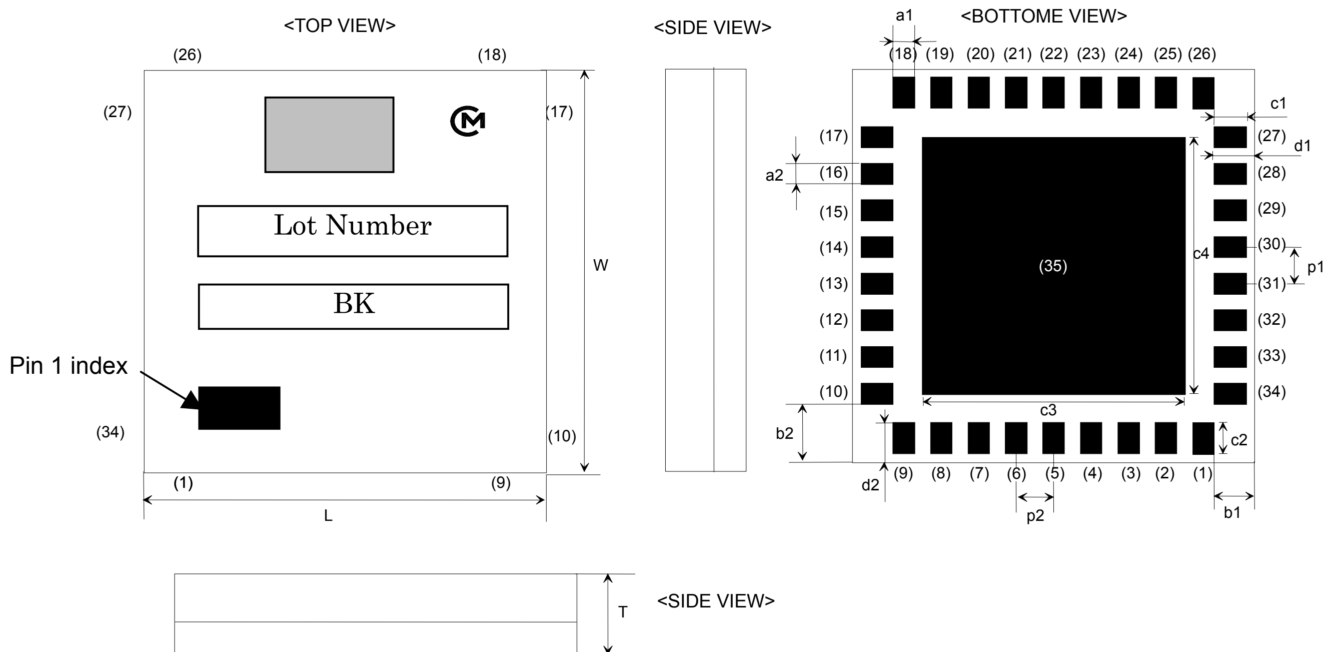
3. Rating

Ratings

		Min	Max	Unit
	Operating Temperature	-20	+70	deg.C
	Storage Temperature	-40	+85	deg.C
	Terminal Name	Min	Max	Unit
Supply Voltage	BTRF_REG		2.2	V
	BTL_REG		2.2	V
	V_I_O		4.1	V
	Input Terminal Voltage	Vss-0.3	VDD+0.3	V

4. Weight (Nominal)
0.3g

5. CONSTRUCTION, DIMENSIONS and Terminal Configurations



Mark	Dimension	Mark	Dimension	Mark	Dimension
L	7.5±0.2	W	7.5±0.2	T	1.4 max
a1	0.4±0.2	a2	0.4±0.2	b1	0.75±0.2
b2	1.1±0.2	c1	0.6±0.2	c2	0.6±0.2
c3	4.9±0.2	c4	4.9±0.2	d1	0.75±0.2
d2	0.75±0.2	p1	0.7±0.2	p2	0.7±0.2

(Unit: mm)

Terminal Configurations

Terminal No.	Terminal Name	Pin Type	Description
(1)	GROUND	I	-
(2)	NC	-	-
(3)	NC	-	-
(4)	NC	-	-
(5)	BLUE_TX	I	<UART_RXD> UART data input active high
(6)	REG_CTRL	I	Internal 1.8V regulator enable signal
(7)	EEPROM_CLK	O	Clock interface to an optional serial EEPROM
(8)	NC	-	
(9)	BLUE_HOST_WAKE	O	HOST_WAKE signal for power control
(10)	V_I_O	I	-
(11)	BLUE_WAKE	I	Active high or active low BT_WAKE signal for powe control
(12)	LPO_IN	I	32.768KHz digital clock input
(13)	BLUE_CLK_EN	O	-
(14)	GROUND	I	-
(15)	XTAL_OUT	O	Crystal Oscillator output
(16)	XTAL_IN	I	Crystal or frequency reference input
(17)	GROUND	I	-
(18)	TM0	I	Test Mode 0
(19)	TM1_2	I	Test mode 1 and 2
(20)	TM3	I	Test mode 3
(21)	BTRF_REG	I	-
(22)	RESET_N	I	Active LOW system reset
(23)	TX_PU_TDD_N	O	Complement of TX_PU_TDD
(24)	GROUND	I	-
(25)	ANTENNA_MATCH	I/O	<Ant> RF input/output
(26)	GROUND	I	-
(27)	ASAP_CLK	I/O	<PCM_CLK> Synchronous data clock
(28)	ASAP_FS	I/O	<PCM_SYNC> Synchronous data sync
(29)	BLUE_CTS	I	<UART_CTS> UART clear to send active low
(30)	ASAP_RX	O	<PCM_OUT> Synchronous data output
(31)	BLUE_RTS	O	<UART_RTS> UART request to send active low
(32)	ASAP_TX	I	<PCM_IN> Synchronous data input
(33)	BLUE_RX	O	<UART_TXD> UART data output active high
(34)	BTL_REG	I	-
(35)	GROUND	I	-

6. Electrical Characteristics

6-1 Operating Conditions

	Min	Typ	Max	Unit
Operating Temperature	-20	+25	+70	deg.C
Supply Voltage BTRF_REG, BTL_REG V_I_O	 1.71 1.71	 1.8 2.8	 1.98 3.63	 V V

6-2-1 Characteristics

+25degC,BTRF_REG/BTL_REG=1.8V, VIO=2.75V

Items	Contents			
Bluetooth specification	Ver 1.2			
Channel spacing	1MHz			
Number of RF channel	79			
Power class	2			
Operation mode(Rx/Tx)	Time division multiplex either transmit or receive Frequency hopping after one Rx/Tx cycle			
Items	Min	Typ	Max	Unit
1.Current Consumption RF Register x57=xC6				
1.1 BTRF_REG_IDC_max DH5; 100% slot utilization; 50% Rx/Tx slot duty cycle			75	mA
1.3 V_I_O_REG_IDC_max DH5; 100% slot utilization; 50% Rx/Tx slot duty cycle			10	mA
-TX characteristics-	Min	Typ	Max	Unit
2.Output Power	-4		4	dBm
3.Frequency range（Rx/Tx）	2400.5～2483.5MHz			
4.-20dB bandwidth			1	MHz
5.Adjacent Channel Power *1				
5.1 [M-N]＝2			-21	dBm
5.2 [M-N]≧3			-41	dBm
6.Modulation characteristics				
6.1 Modulation δf1avg	145		173	kHz
6.2 Modulation δf2max	125			kHz
6.3 Modulation δf2avg/δf1avg	0.85			
7.Initial Carrier Frequency Tolerance	-45		45	kHz
8.Carrier Frequency Drift				
8.1 1slot	-25		25	kHz
8.2 3slot	-40		40	kHz
8.3 5slot	-40		40	kHz
8.4 Maximum drift rate	-20		20	kHz/50μs
9.Out-of-Band Spurious Emissions				
9.1 30-1000MHz (Operation Mode)			-36	dBm
9.2 1000-12750MHz (Operation Mode)			-30	dBm
9.3 1800-1900MHz(Operation Mode)			-47	dBm
9.4 2110-2170MHz (Operation Mode)			-75	dBm
9.5 5150-5300MHz (Operation Mode)			-47	dBm

-RX characteristics-	min	typ	max	unit
10.Sensitivity (BER≦0.1%)				
10.1 2402MHz			-79	dBm
10.2 2441MHz			-79	dBm
10.3 2480MHz			-79	dBm
11.C/I Performance (BER≦0.1%) *2				
11.1 co-channel ratio (-60dBm input)			11	dBm
11.2 1MHz ratio (-60dBm input)			0	dBm
11.3 2MHz ratio (-60dBm input)			-30	dBm
11.4 3MHz ratio (-67dBm input)			-40	dBm
11.5 image ratio (-67dBm input)			-9	dBm
11.6 image +/- 1MHz ratio (-67dBm input)			-20	dBm
12.Blocking performance(BER≤0.1%) *3				
12.1 30MHz-2000MHz	-10			dBm
12.2 2000MHz-2400MHz	-27			dBm
12.3 2500MHz-3000MHz	-27			dBm
12.4 3000MHz-12750MHz	-10			dBm
13.Intermodulation performance (BER≦0.1%, -64dBm input)	-35			dBm
14.Maximum Input Level	-20			dBm

*1 Up to three sprious responses within Bluetooth limits are allowed.
*2 Up to five sprious responses within Bluetooth limits are allowed.
*3 Up to twenty-four sprious responses within Bluetooth limits are allowed.

6-2-2. Extreme condition : -20 to +70degC, BTRF_REG/BTL_REG=1.71-1.98V, VIO=1.71-3.63V

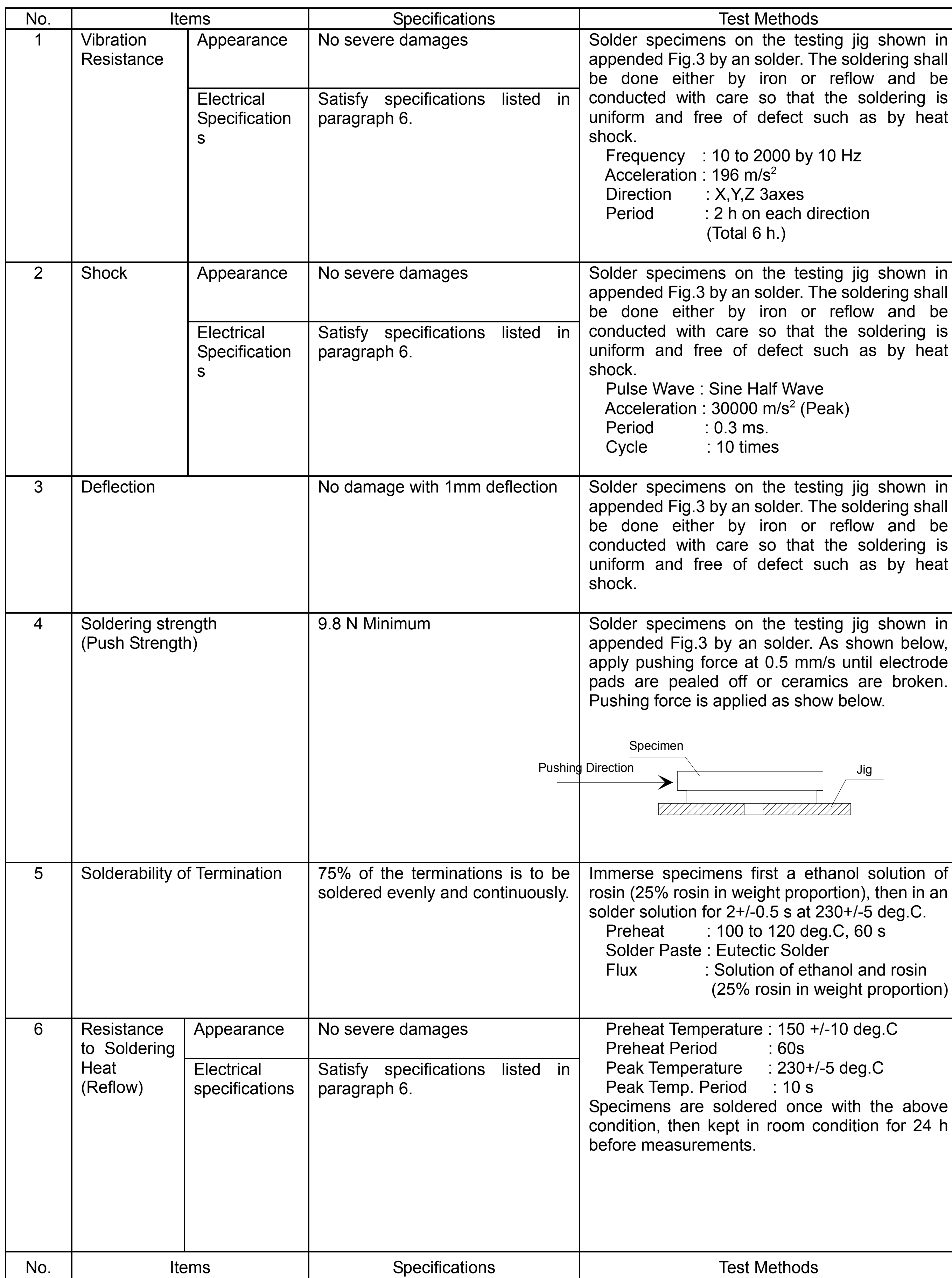
Items	Min	Typ	Max	Unit
1.Current Consumption RF Register x57=xC6				
1.1 BTRF_REG_IDC_max DH5; 100% slot utilization; 50% Rx/Tx slot duty cycle			80	mA
1.3 V_I_O_REG_IDC_max DH5; 100% slot utilization; 50% Rx/Tx slot duty cycle			12	mA
-TX characteristics-	Min	Typ	Max	Unit
2.Output Power	-6		+6	dBm
3.Frequency range（Rx/Tx）	2400.5～2483.5MHz			
4.-20dB bandwidth			1	MHz
5.Adjacent Channel Power *1				
5.1 [M-N]＝2			-20	dBm
5.2 [M-N]≧3			-40	dBm
6.Modulation characteristics				
6.1 Modulation δf1avg	145		175	kHz
6.2 Modulation δf2max	115			kHz
6.3 Modulation δf2avg/δf1avg	0.8			
7.Initial Carrier Frequency Tolerance	-75		75	kHz
8.Carrier Frequency Drift				
8.1 1slot	-25		25	kHz
8.2 3slot	-40		40	kHz
8.3 5slot	-40		40	kHz
8.4 Maximum drift rate	-20		20	kHz/50μs
9.Out-of-Band Spurious Emissions				
9.1 30-1000MHz (Operation Mode)	-36			dBm
9.2 1000-12750MHz (Operation Mode)	-30			dBm
9.3 1800-1900MHz(Operation Mode)	-47			dBm
9.4 2110-2170MHz (Operation Mode)	-65			dBm
9.5 5150-5300MHz (Operation Mode)	-47			dBm

-RX characteristics-	min	typ	max	unit
10.Sensitivity (BER≦0.1%)				
10.1 2402MHz			-77	dBm
10.2 2441MHz			-77	dBm
10.3 2480MHz			-77	dBm

*1 Up to three spurious responses within Bluetooth limits are allowed.

Note
The above mentioned values have been obtained according to our own measuring methods (testing jig Fig.1) and may very depend on the circuit, in which the component is actually incorporated. Therefore, you are kindly requested to test the performance of the component actually in your set.

7. Other Specification and Methods



No.	Items		Specifications	Test Methods
1	Vibration Resistance	Appearance	No severe damages	Solder specimens on the testing jig shown in appended Fig.3 by an solder. The soldering shall be done either by iron or reflow and be conducted with care so that the soldering is uniform and free of defect such as by heat shock. Frequency : 10 to 2000 by 10 Hz Acceleration : 196 m/s^2 Direction : X,Y,Z 3axes Period : 2 h on each direction (Total 6 h.)
		Electrical Specifications	Satisfy specifications listed in paragraph 6.	
2	Shock	Appearance	No severe damages	Solder specimens on the testing jig shown in appended Fig.3 by an solder. The soldering shall be done either by iron or reflow and be conducted with care so that the soldering is uniform and free of defect such as by heat shock. Pulse Wave : Sine Half Wave Acceleration : 30000 m/s^2 (Peak) Period : 0.3 ms. Cycle : 10 times
		Electrical Specifications	Satisfy specifications listed in paragraph 6.	
3	Deflection		No damage with 1mm deflection	Solder specimens on the testing jig shown in appended Fig.3 by an solder. The soldering shall be done either by iron or reflow and be conducted with care so that the soldering is uniform and free of defect such as by heat shock.
4	Soldering strength (Push Strength)		9.8 N Minimum	Solder specimens on the testing jig shown in appended Fig.3 by an solder. As shown below, apply pushing force at 0.5 mm/s until electrode pads are pealed off or ceramics are broken. Pushing force is applied as show below.
5	Solderability of Termination		75% of the terminations is to be soldered evenly and continuously.	Immerse specimens first a ethanol solution of rosin (25% rosin in weight proportion), then in an solder solution for 2+/-0.5 s at 230+/-5 deg.C. Preheat : 100 to 120 deg.C, 60 s Solder Paste : Eutectic Solder Flux : Solution of ethanol and rosin (25% rosin in weight proportion)
6	Resistance to Soldering Heat (Reflow)	Appearance	No severe damages	Preheat Temperature : 150 +/-10 deg.C Preheat Period : 60s Peak Temperature : 230+/-5 deg.C Peak Temp. Period : 10 s Specimens are soldered once with the above condition, then kept in room condition for 24 h before measurements.
		Electrical specifications	Satisfy specifications listed in paragraph 6.	
No.	Items		Specifications	Test Methods

7	Temperature Cycle	Appearance	No severe damages	Set the specimens to the supporting jig in the same manner and under the same condition as Fig.1 and conduct the 100 cycles according to the temperatures and time shown in the following table.
		Electrical specifications	Satisfy specifications listed in paragraph 6.	

Step	1	2
Temp.(deg.C)	Min operating Temp. +0/-3	Max operating Temp. +3/-0
Time (min)	30+/-3	30+/-3

8	Humidity Load Life	Appearance	No severe damages	Temperature : 85+/-2 deg.C Humidity : 80 to 85%RH Period : 500+24/-0 h Room Condition : 2 to 24 h Supply Voltage : 3.63V D.C. to V_I_O, 1.93V D.C to BTRF_REG and BTL_REG
		Electrical specifications	Satisfy specifications listed in paragraph 6.	
9	High Temp. Load Life	Appearance	No severe damages	Temperature : 85+/-2 deg.C Period : 500+24/-0 h Room Condition : 2 to 24 h Supply Voltage : 3.63V D.C. to V_I_O 1.93V D.C to BTRF_REG and BTL_REG
		Electrical specifications	Satisfy specifications listed in paragraph 6.	

Excessive mechanical force or thermal stress may damage the products. Appropriate handling is required.

8. Interface

UART

9. IC/Firmware

BROADCOM's BCM2035 B3 Version

10. Production Site

FUKUI MURATA MFG.CO.,LTD.

Fig.1 Measurement Board

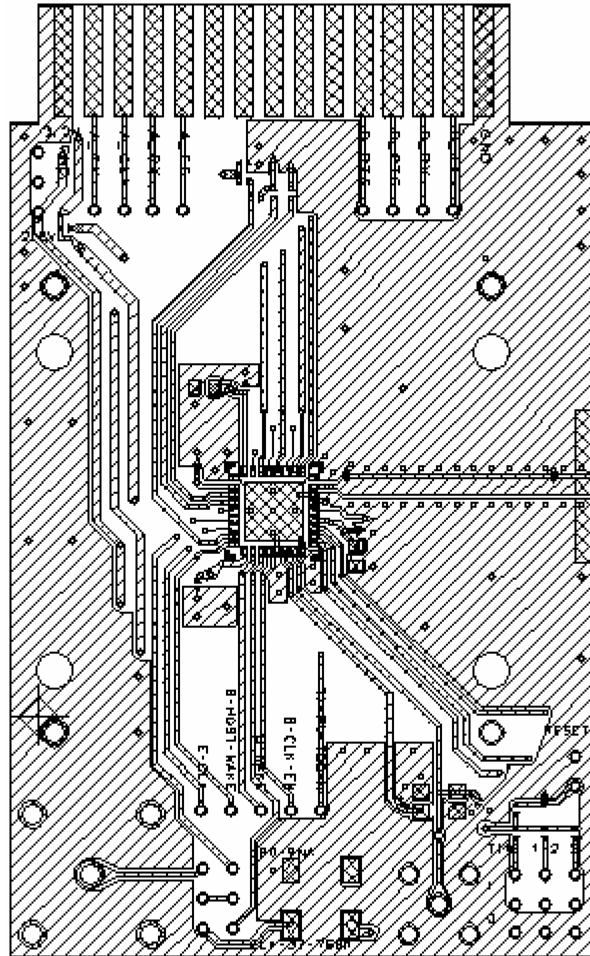
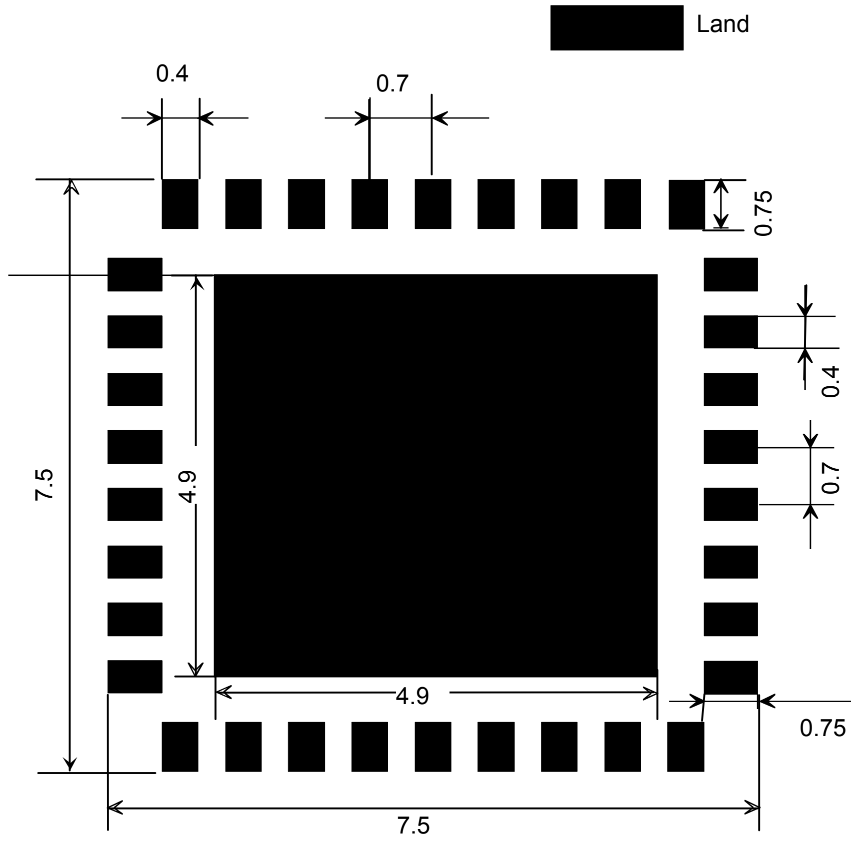
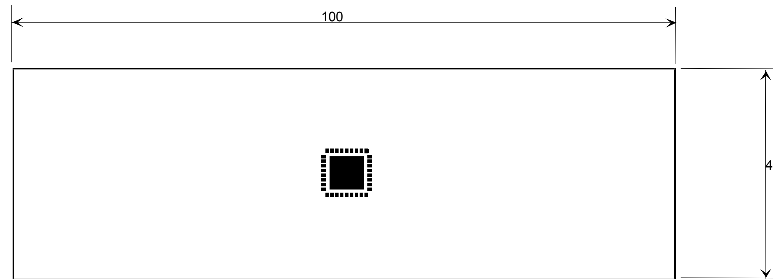


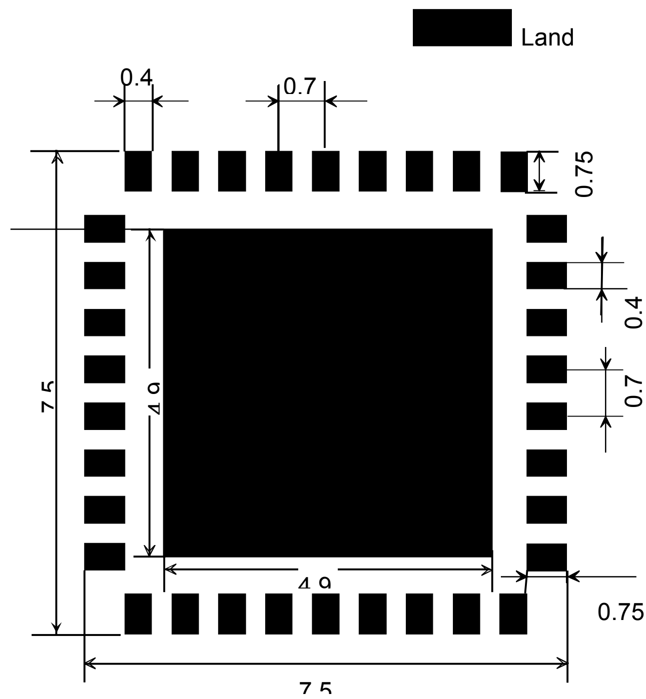
Fig.2 Land Patterns



(Unit:mm)

Fig.2 Testing Board

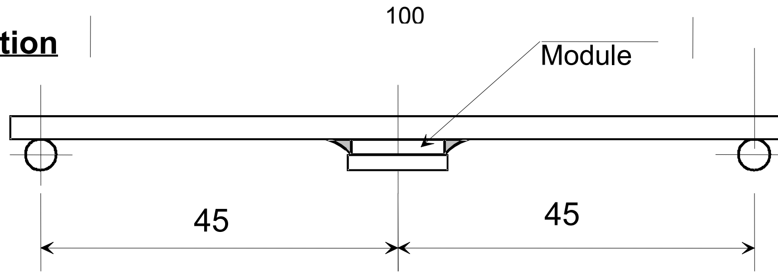




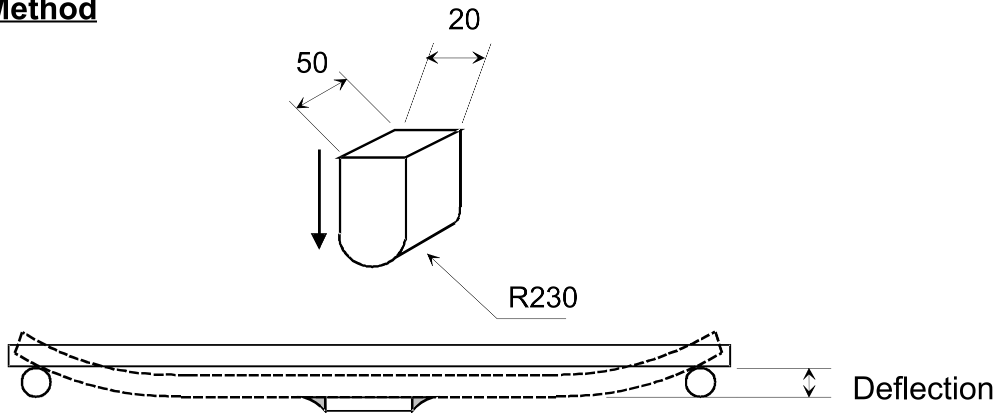
Unit:mm

Glass epoxy board t=0.8mm
Copper thickness 35um min

Mounted Situation



Testing Method



11.Tape and Reel Packing

(1) Dimensions of Tape (Plastic tape)

1.Cumulative tolerance of max. ± 0.3 every 10 pitches

2.Reference value

4.0 ± 0.1
1.5+0.1
2.0 ± 0.1
1.6 ± 0.1
Max=0.6
Pad 1
7.5 ± 0.1
16.0± 0.3
7.8 ± 0.1
Min=14.25
Min= 1.5
12.0 ± 0.1
Feeding Direction
Max 5.0°
7.8 ± 0.1

(2) Dimensions of Reel

17.0±0.6
2.0±0.5
(ϕ 100)
(ϕ 330)
ϕ 13±0.2
20.4 max

(Unit :mm)

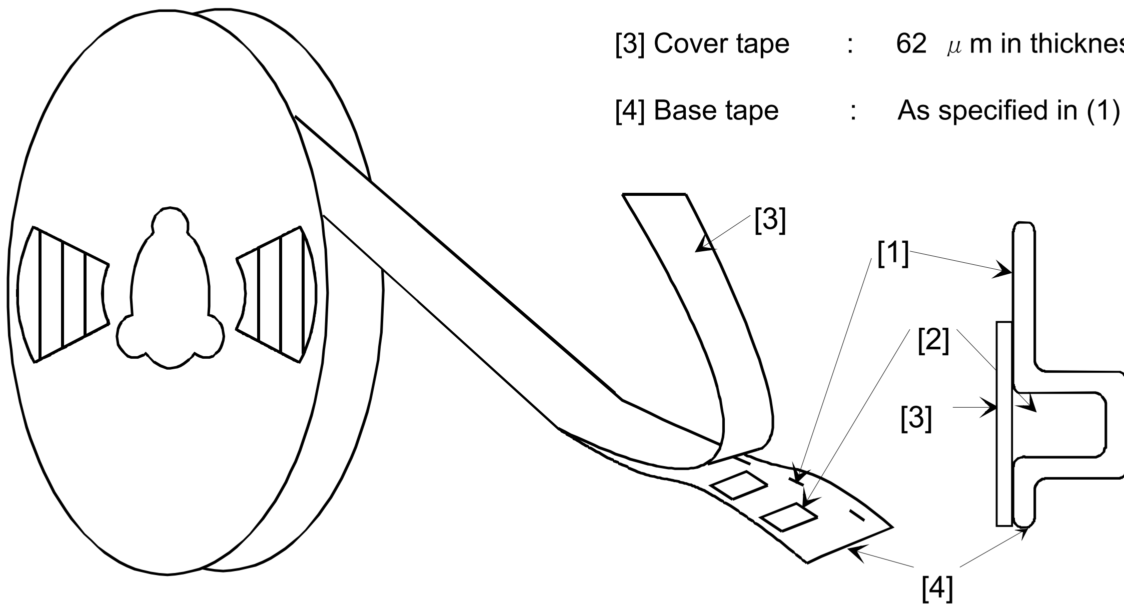
(3) Taping Diagrams

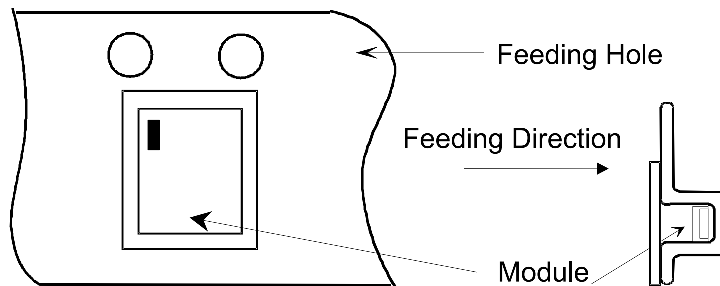
[1] Feeding Hole : As specified in (1)

[2] Hole for chip : As specified in (1)

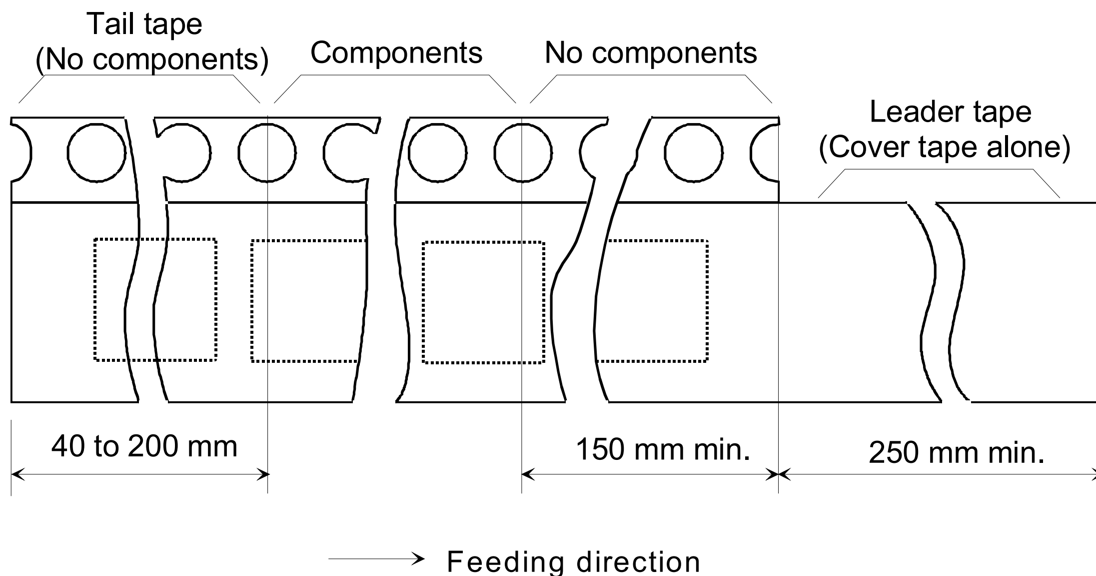
[3] Cover tape : 62 μm in thickness

[4] Base tape : As specified in (1)





(4) Leader and Tail tape



(5) The tape for chips are wound clockwise, the feeding holes to the right side as the ta pe is pulled toward the user.

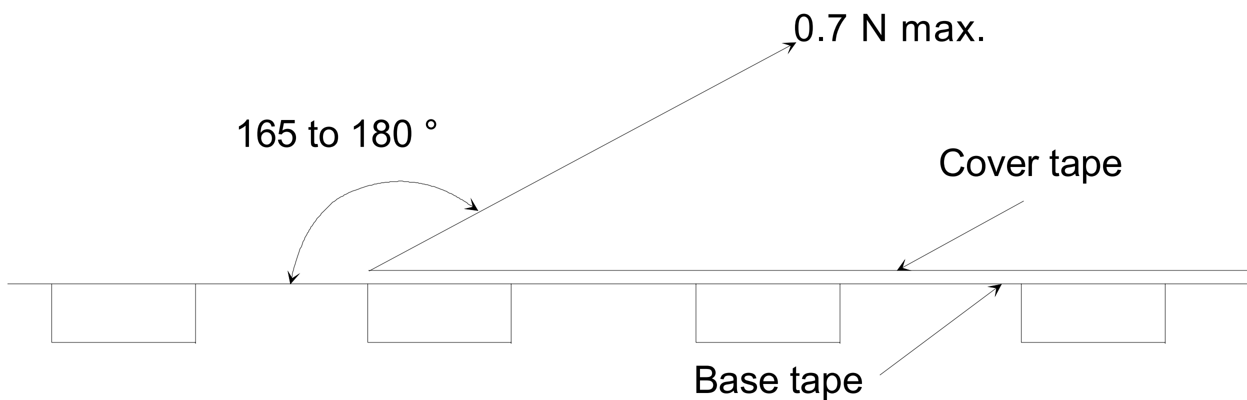
(6) The cover tape and base tape are not adhered at no components area for 250 mm min.

(7) Tear off strength against pulling of cover tape : 5 N min.

(8) Packaging unit : 1000 pcs./ reel

(9) material : Base tape : Plastic
Reel : Plastic
Cover tape , cavity tape and reel are made the anti-static processing.

(10) Peeling of force : 0.7 N max. in the direction of peeling as shown below.



NOTICE

1. Storage Conditions:

The product shall be stored under the following conditions in order not to damage the solderbility of the external electrodes.
- The product shall be stored without opening the packing and at the ambient temperature between 5 and 30 deg.C and humidity between 20 and 70 %RH. And the product shall be used within 6 months after reception. (Packing materials, in particular, may be deformed at the temperature over 45 deg.C.)
- After opening the packing, the product shall be stored at 5 to 30 deg.C / ≦ 60 %RH and the product shall be used within 48 hours. If the product is not used within 48 hours after opening the packing, the product shall be baked under the following conditions.
  Baking condition : 125 +/-5 deg.C, 24 hours, 1 time
  The products shall be baked on the heat-resistant tray because the material (Base Tape, Reel Tape and Cover Tape) are not heat-resistant.
- The product shall be stored in non corrosive gas (Cl_2, NH_3, SO_2, No_x, etc.).
- Solderbility shall be confirmed before use if the product is stored for more than 3 months.
- When the indicator in the packing has changed its color, the product shall be baked before soldering.
- Any excess mechanical shock including, but not limited to, sticking the packing materials by sharp object and dropping the product, shall not be applied in order not to damage the packing materials.

2. Handling Conditions:

- Be careful in handling or transporting products because excessive stress or mechanical shock may break products due to the nature of ceramics structure.
- Handle with care because the characteristics of products may change if products may have cracks or damages on their terminals. Do not touch products with bear hands that may result in poor solderability.

3. Standard PCB Design (Land Patterns and Dimensions) :

- All the ground terminals should be connected to the ground patterns. Please refer to Fig.2 for the standard land dimensions.
- The recommended land patterns and dimensions are as 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. When using non-standard lands, contact Murata beforehand.

4. Notice for Chip Placer :

- When placing products on the PCB, products may be stressed and broken by uneven forces from a worn-out chucking locating claw or a suction nozzle. To prevent products from damages, be sure to follow the specifications for the maintenance of the chip placer being used. For the positioning of products on the PCB, be aware that mechanical chucking may damage products.

5. Soldering Conditions :

- Carefully perform preheating so that the temperature difference (delta T) between the solder and products surface should be in the following range. When products are immersed in solvent after mounting, pay special attention to maintain the temperature difference within 100 deg.C. Soldering must be carried out by the above mentioned conditions to prevent products from damage. Contact Murata before use if concerning other soldering conditions.

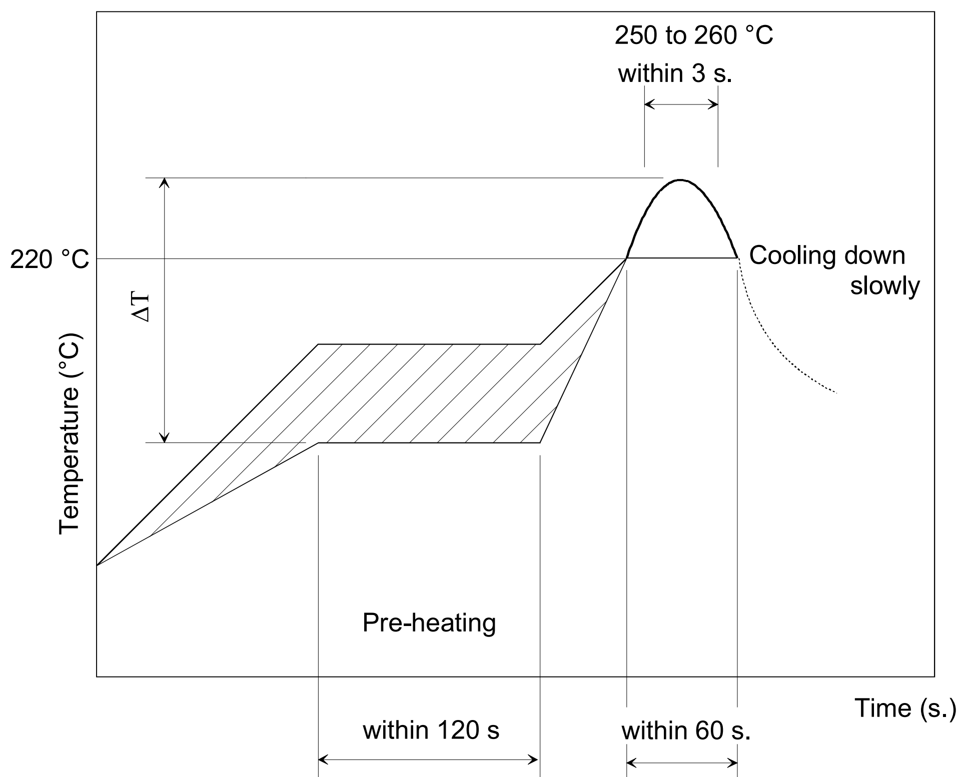
Soldering methods	Temperature
Soldering iron method	delta T ≦ 130 deg.C
Reflow method	

- Soldering iron method conditions are indicated below.

Items \ Kind of iron	Ceramic heater
Soldering iron wattage	≦ 18 W
Temperature of iron-tip	≦350 °C
Iron contact time	within 3 s

- Diameter of iron-tip : ϕ 3.0 mm max.
- Do not touch the module itself directly by the iron-tip.

Reflow soldering standard conditions(Example)

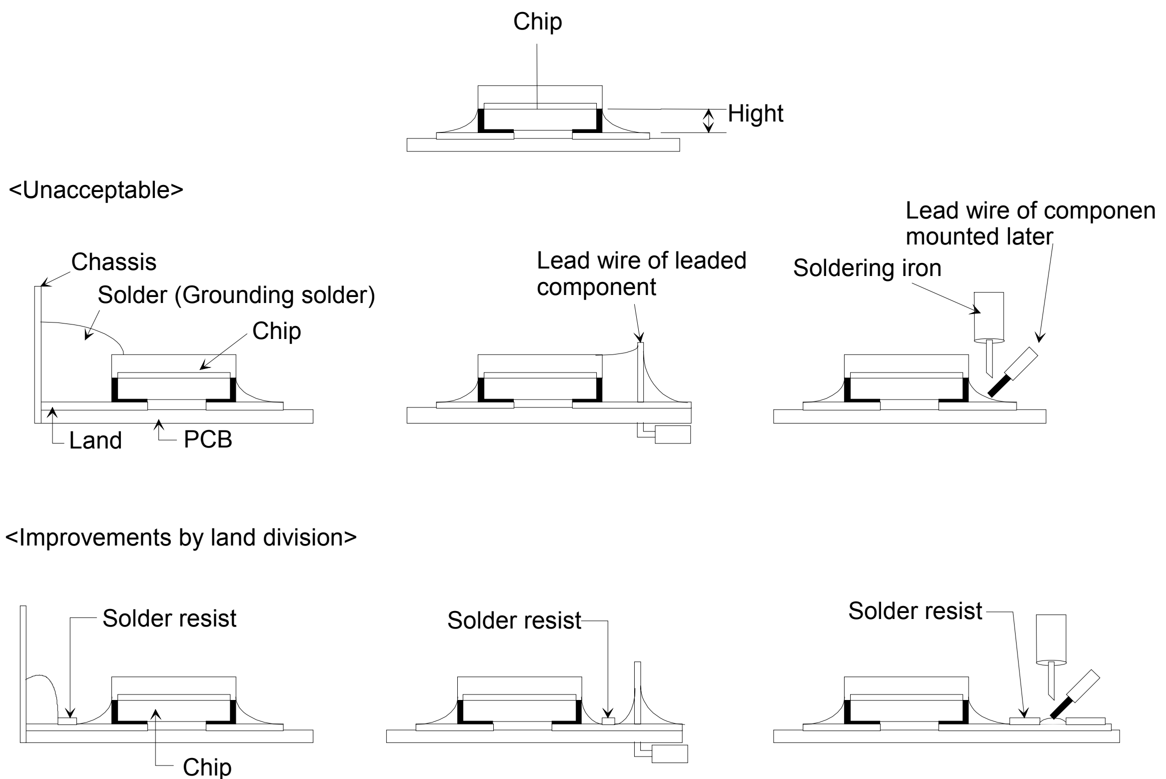


- Use rosin type flux or weakly active flux with a chlorine content of 0.2 wt% or less. Be careful so as not to remain the flux residue around products. Because there are possibilities to become worse the characteristics.

- Amount of Solder Paste:

Ensure that solder is applied smoothly to a minimum height of 0.2 to 0.5 mm at the end surface of the external electrodes. If too much or little solder is applied, there is high possibility that the mechanical strength will be insufficient, creating the variation of characteristics.

Amount of solder paste



6. Operational Environment Conditions :

- Products are designed to work for electronic products under normal environmental conditions (ambient temperature, humidity and pressure). Therefore, products have no problems to be used under the similar conditions to the above-mentioned. However, if products are used under the following circumstances, it may damage products and electric shock and abnormal temperature may occur.
  - In an atmosphere containing corrosive gas (CL_2, NH_3, SO_x, NO_x, etc.).
  - In an atmosphere containing combustible and volatile gases.
  - Dusty place.
  - Direct sunlight place.
  - Water splashing place.
  - Humid place where water condenses.
  - Freezing place.
- If there are possibilities for products to be used under the preceding clause, consult with Murata before actual use.
- As it might be a cause of degradation or destruction to apply static electricity to products, do not apply static electricity or excessive voltage while assembling and measuring.

7. Limitation of Applications :

Please contact Murata before using products for the applications listed below which require especially high reliability for the prevention of defects which might directly cause damage to the third party's life, body or property.

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

Note :

- Please make sure that your product has been evaluated and confirmed against your specifications when our product is mounted to your product.

- All the items and parameters in this product specification have been prescribed on the premise that our product is used for the purpose, under the condition and in the environment agreed upon between you and us. You are requested not to use our product deviating from such agreement.

- We consider it not appropriate to include other terms and conditions for transaction warranty in product specifications, drawings or other technical documents. Therefore, even if your original part of this product specification includes such terms and conditions as warranty clause, product liability clause, or intellectual property infringement liability clause, we are not able to accept such terms and conditions in this product specification unless they are based on the governmental regulation or what we have agreed otherwise in a separate contact. We would like to suggest that you propose to discuss them under negotiation of contract.