0402 Series Wire-Wound Chip Inductor (Lead / Halogen Free)

1. Scope

This specification applies to 1.0mm x 0.5mm (0402) size, wire-wound chip inductor type.

2. Type Designation

DML 0510HS — ＊＊＊ — ＊ NH

(1) (2) (3) (4) (5)

Where (1) Product Type

DML : wire-wound chip inductor

(2) Size

0510 : 0.5 × 1.0mm

(3) Nominal inductance value : three digits of number, refer to Table 1.

The nominal inductance value shell is represented by two significant figures and a code “N” representing the unit.

For example:

2N2 = 2.2 nH

20N = 20 nH

121 = 120 nH

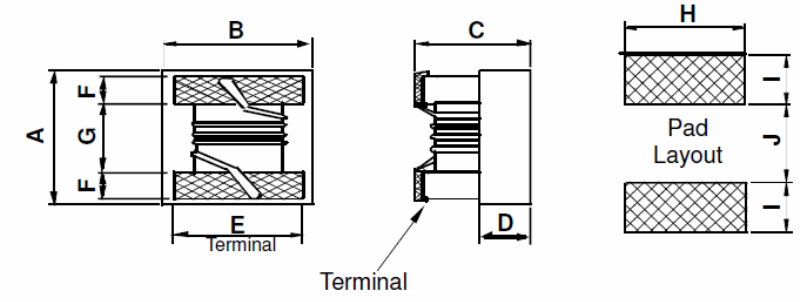
(4) Tolerance

B: ±0.1nH ; C: ±0.2nH ; D: ±0.5nH

G: ±2% ; H: ±3% ; J: ±5% ; K: ±10%

(5) NH = Sn plating (Lead free / Halogen free)

3. Construction and Physical Dimensions



A		B		C		D	E	F	G	H	I	J
Max.	Min	Max.	Min	Max.	Min							
1.27	0.90	0.76	0.45	0.61	0.45	0.15	0.51	0.23	0.56	0.65	0.35	0.50

unit: mm

4. Specifications

Table 1 Electric Specification Characteristics

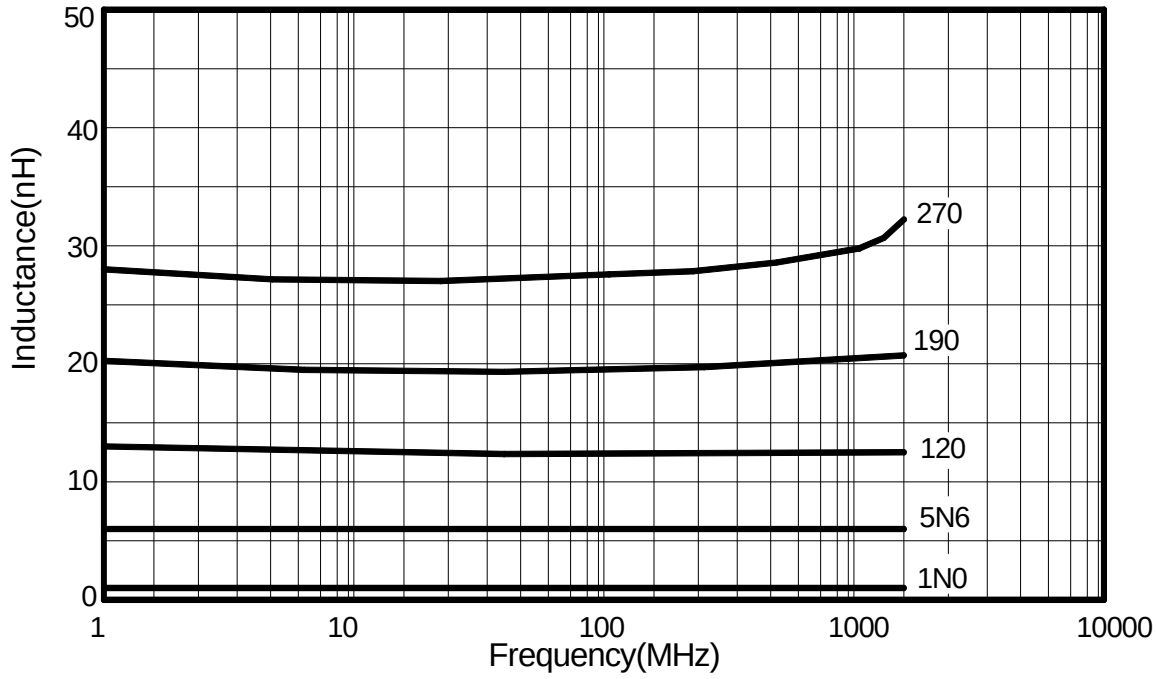
Part Number	Inductance	Tolerance	Q	LQ Meas. Freq.	SRF (GHz)	RDC (Ω)	IDC (mA)	900MHz		1.7GHz	
	(nH)	(%)	min.	(MHz)	min.	max.	max.	L Typ	Q Typ	L Typ	Q Typ
DML0510HS-1N0- xxx	1.0	±0.1nH ±0.2nH ±0.5nH ±5% ±10%	16	250	12.7	0.045	1360	1.02	77	1.02	69
DML0510HS -1N5- xxx	1.5		14		10.0	0.100	300	--	--	--	--
DML0510HS -1N9- xxx	1.9	±0.2nH ±0.5nH ±5% ±10%	16	250	11.3	0.070	1040	1.72	68	1.74	82
DML0510HS -2N0- xxx	2.0		16		11.1	0.070	1040	1.93	54	1.93	75
DML0510HS -2N2- xxx	2.2		19		10.8	0.070	960	2.19	59	2.23	100
DML0510HS -2N4- xxx	2.4		15		10.5	0.070	790	2.24	51	2.27	68
DML0510HS -2N7- xxx	2.7		16		10.4	0.120	640	2.23	42	2.25	61
DML0510HS -3N3- xxx	3.3		19		7.00	0.066	840	3.10	65	3.12	87
DML0510HS -3N6- xxx	3.6		19		6.80	0.066	840	3.56	45	3.62	71
DML0510HS -3N9- xxx	3.9		19		5.80	0.066	840	3.89	50	4.00	75
DML0510HS -4N3- xxx	4.3		18		6.00	0.091	700	4.19	47	4.30	71
DML0510HS -4N7- xxx	4.7		18		4.70	0.130	640	4.55	48	4.68	68
DML0510HS -5N1- xxx	5.1		20		4.80	0.083	800	5.15	56	5.25	82
DML0510HS -5N6- xxx	5.6		20		4.80	0.083	760	5.16	54	5.28	81
DML0510HS -6N2- xxx	6.2		20		4.80	0.083	760	6.16	52	6.37	76
DML0510HS -6N8- xxx	6.8	±0.2nH ±0.5nH ±2% ±5% ±10%	20	250	4.80	0.083	680	6.56	63	6.93	78
DML0510HS -7N5- xxx	7.5		22		4.80	0.104	680	7.91	60	8.22	88
DML0510HS -8N2- xxx	8.2		22		4.40	0.104	680	8.50	57	8.85	84
DML0510HS -8N7- xxx	8.7		18		4.10	0.200	480	8.78	54	9.21	73
DML0510HS -9N0- xxx	9.0	±2% ±5% ±10%	22	250	4.16	0.104	680	9.07	62	9.53	78
DML0510HS -9N5- xxx	9.5		18		4.00	0.200	480	9.42	54	9.98	69
DML0510HS -10N- xxx	10		21		3.90	0.195	480	9.8	50	10.1	67
DML0510HS -11N- xxx	11		24		3.68	0.120	640	10.7	52	11.2	78
DML0510HS -12N- xxx	12		24		3.60	0.120	640	11.9	53	12.7	71
DML0510HS -13N- xxx	13		24		3.45	0.210	440	13.4	51	14.6	57
DML0510HS -15N- xxx	15		24		3.28	0.172	560	14.6	55	15.5	77

DML0510HS -16N- xxx	**16**		**24**		**3.10**	**0.220**	**560**	**16.6**	**46**	**18.8**	**47**
DML0510HS -18N- xxx	**18**		**25**		**3.10**	**0.230**	**420**	**18.3**	**57**	**20.3**	**62**
DML0510HS -19N- xxx	**19**		**24**		**3.04**	**0.202**	**480**	**19.1**	**50**	**21.1**	**67**
DML0510HS -20N- xxx	**20**		**25**		**3.00**	**0.250**	**420**	**20.7**	**52**	**23.7**	**53**
DML0510HS -22N- xxx	**22**		**25**		**2.80**	**0.300**	**400**	**23.2**	**53**	**26.8**	**53**
DML0510HS -23N- xxx	**23**		**24**		**2.72**	**0.300**	**400**	**23.8**	**49**	**26.9**	**64**
DML0510HS -24N- xxx	**24**		**25**		**2.70**	**0.300**	**400**	**25.1**	**51**	**29.5**	**50**
DML0510HS -27N- xxx	**27**		**24**		**2.48**	**0.300**	**400**	**28.7**	**49**	**33.5**	**63**
DML0510HS -30N- xxx	**30**		**25**		**2.35**	**0.350**	**400**	**31.1**	**46**	**38.5**	**39**
DML0510HS -33N- xxx	**33**		**24**		**2.35**	**0.350**	**400**	**34.9**	**31**	**41.7**	**32**
DML0510HS -36N- xxx	**36**		**24**		**2.32**	**0.440**	**320**	**39.5**	**44**	**48.4**	**53**
DML0510HS -39N- xxx	**39**		**25**		**2.10**	**0.550**	**200**	**41.7**	**47**	**50.2**	**45**
DML0510HS -40N- xxx	**40**		**24**		**2.24**	**0.500**	**320**	**39.0**	**44**	**47.4**	**33**
DML0510HS -43N- xxx	**43**		**25**		**2.03**	**0.810**	**100**	**45.8**	**46**	**61.6**	**34**
DML0510HS -47N- xxx	**47**		**25**		**2.10**	**0.830**	**150**	**50.0**	**38**	**55.8**	**37**
DML0510HS -51N- xxx	**51**		**25**		**1.75**	**0.820**	**100**	**50.4**	**47**	**59.4**	**37**
DML0510HS -56N- xxx	**56**		**25**		**1.76**	**0.970**	**100**	**57.4**	**49**	**72.4**	**40**
DML0510HS -68N- xxx	**68**		**22**		**1.62**	**1.120**	**100**	**69.6**	**45**	**83.4**	**38**
DML0510HS -82N- xxx	**82**		**22**		**1.26**	**1.550**	**50**	**--**	**--**	**--**	**--**
DML0510HS -101- xxx	**100**		**22**		**1.16**	**2.000**	**30**	**--**	**--**	**--**	**--**
DML0510HS -121- xxx	**120**		**20**		**>1.80**	**2.660**	**50**	**--**	**--**	**--**	**--**

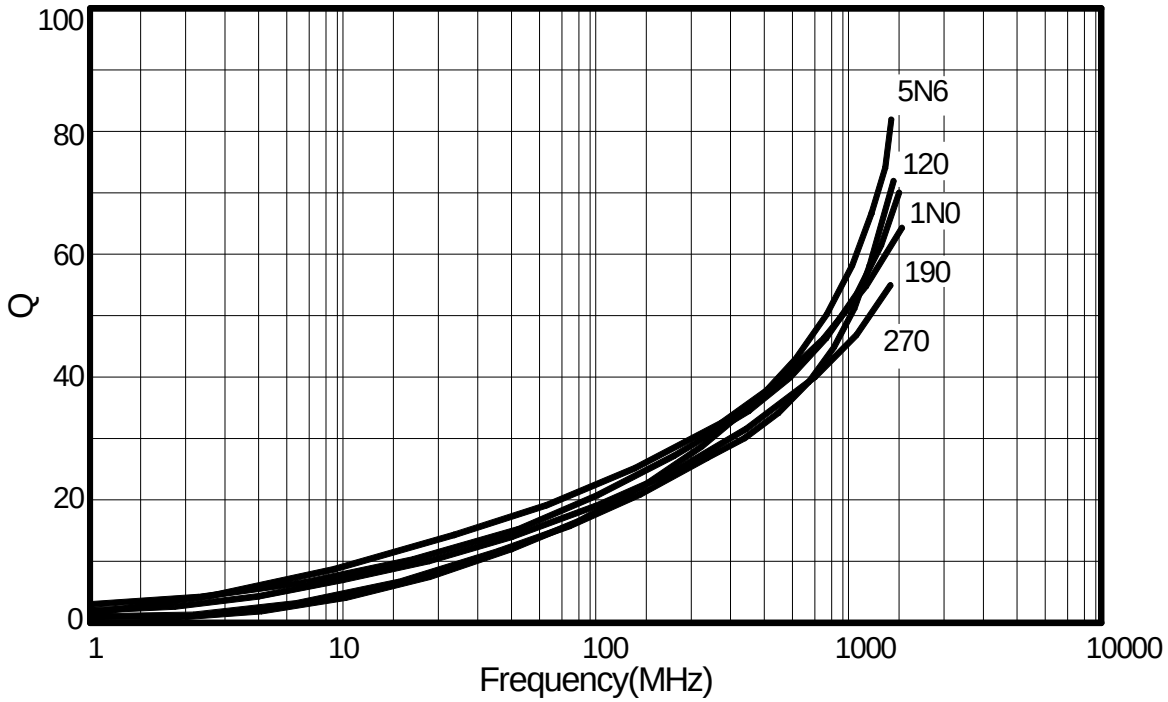
** Please contact local sales for other tolerance requirement if needed.

- L, Q vs Frequency Typical Characteristics Chart

TYPICAL L vs FREQUENCY



TYPICAL Q vs FREQUENCY



5. Characteristics

Unless otherwise specified, the standard range of atmospheric conditions for marking measurements tests is as follows;

Temperature	24 ± 5℃
Relative humidity	45 to 85%RH
Air pressure	86 to 106kPa

If there is any doubt about results, measurements shall be made within the following limits;

Temperature	20 ± 2℃
Relative humidity	60 to 70%RH
Air pressure	86 to 106kPa

5-1 Electrical

Item	Conditions	Specifications
Inductance	Measurement shall be performed by HP4291	Refer to Table 1.
Q value	Measurement shall be performed by HP4291	Refer to Table 1.
Self Resonance Frequency	Measurement shall be performed by HP8753D.	Refer to Table 1.
DC Resistance(RDC)	Measurement shall be performed by Micro-Ohmmeter (GOM-801G)	Refer to Table 1.
Rated Current(IDC)	Applied the current to coils, the inductance change should be less than 10% to initial value	Refer to Table 1.

5-2 Mechanical Performance

Item	Conditions	Specifications
Vibration Test (Low Frequency)	1. Amplitude: 1.5m/m 2. Frequency: 10-55-10 Hz(1min) 3. Direction: X, Y, Z 4. Duration: 2 HRS/X, Y, Z	1.Inductors should have no evidence of electrical and mechanical damage 2.Inductance should not change more than ±10% 3.Q should not change more than ±20%
Resistance to Soldering Test	Inductors should be reflow to a P.C. board. Using SnAgCu solder paste. Solder process should be 270℃ for 10±2 seconds.	1. Inductors should have no evidence of electrical and mechanical damage 2. Inductance should not change more than ±5% 3.Q should not change more than ±10%
Component Adhesion (Push Test)	The device should be reflow soldered (260℃±5℃ for 10 seconds) to a tinned copper substrate. A dynometer force gauge should be applied to the side of the component. The device must withstand a minimum force of 2 or 4 pounds without a failure of the termination attached to component.	1 lbs. for 0402 4 lbs. for the rest
Drop Test	Drop 1 time for each face and 1 time for each corner..Total drop 10 times. Drop height :100 cm Drop weight :125 g (The inductor should solder into P.C. board with SnAgCu)	After test ,the chip inductor don't fell or broke on the P.C. board.
Solderability Test	After fluxing(alpha 100 or equiv), inductor shall be dipped in a melted solder bath(SnCuNi) at 250 ±5℃ for 3 seconds.	The terminal should at least be 90% covered with solder.
Resistance to Solvent Test	MIL-STD202F, Method 215D	There shall be no case of deformation change in appearance or obliteration of marking.

5-3 Environment Performance

<table>
<tr><th>Item</th><th colspan="3">Conditions</th><th>Specifications</th></tr>
<tr><td>Temperature Characteristic</td><td colspan="3">-40℃ ~ +125℃</td><td rowspan="6">1.Inductorsshal have no evidence of electrical and mechanical damage
2.Inductance shall not change more than ±10%
3. Shall not change more than ±20%</td></tr>
<tr><td>Humidity Test</td><td colspan="3">1. Temp.：40 ± 2℃
2. R.H.：90 – 95%
3. Time：96 ±2 Hours</td></tr>
<tr><td>Low Temperature Storage Test</td><td colspan="3">1. Temp.：-40 ±2℃
2. Time：96 ±2 Hours
3. Inductors are to be tested after 1hour at room temperature.</td></tr>
<tr><td rowspan="3">Thermal Shock Test</td><td colspan="3">The specimen shall be subjected to 5 continuous cycles, each as shown in the figure below.</td></tr>
<tr><td></td><td>Temperature</td><td>Time</td></tr>
<tr><td>1
2
3
4</td><td>－25 ± 2℃
Room temperature
＋125 ± 2℃
Room temperature</td><td>30 minutes
15 minutes
30 minutes
15 minutes</td></tr>
<tr><td colspan="4">(The inductor should solder into P.C. board with SnAgCu)</td></tr>
<tr><td>High Temperature Storage Test</td><td colspan="3">1. Temp.：125± 2℃
2. Time：96 ± 2 Hours
3. Inductors are to be tested after 1 hour at room temperature.</td></tr>
<tr><td>High Temperature Load Life Test</td><td colspan="3">1. Temp.：85 ± 2℃
2. Time：1000 ± 12 Hours
3. Load：Allowed DC current
(The inductor should solder into P.C. board with SnAgCu)</td><td rowspan="2">There should be no evidence of short or open circuit</td></tr>
<tr><td>Humidity Load Life</td><td colspan="3">1. Temp.：40 ± 2℃
2. R.H.：90 – 95%
3. Time：1000 ± 12 Hours
4. Load：Allowed DC current
(The inductor should solder into P.C. board with SnAgCu)</td></tr>
</table>

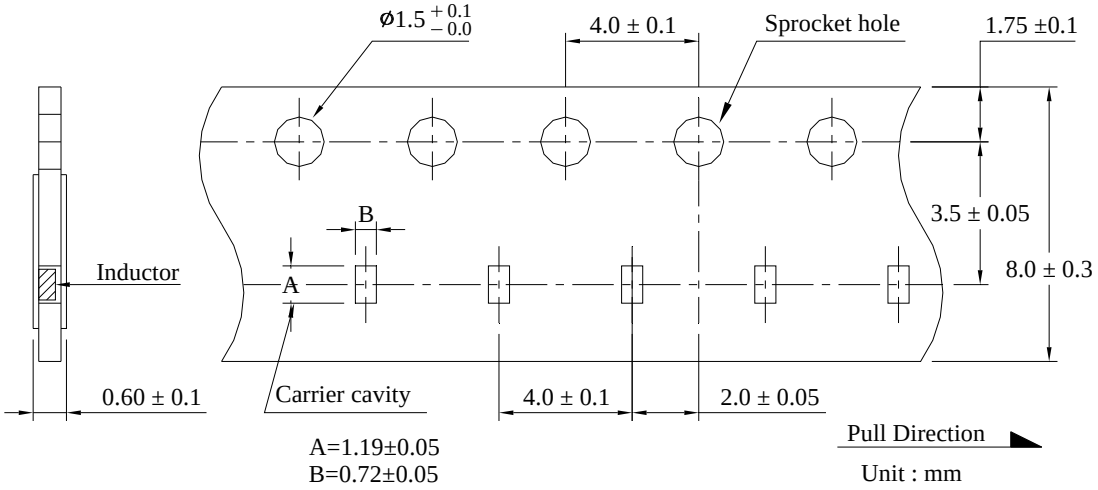
NOTE：

Unless otherwise specified, allow the specimen to stand at room temperature for 1 hour or more but not more than 2 hours, measure the electrical and mechanical performances.

6. Packaging

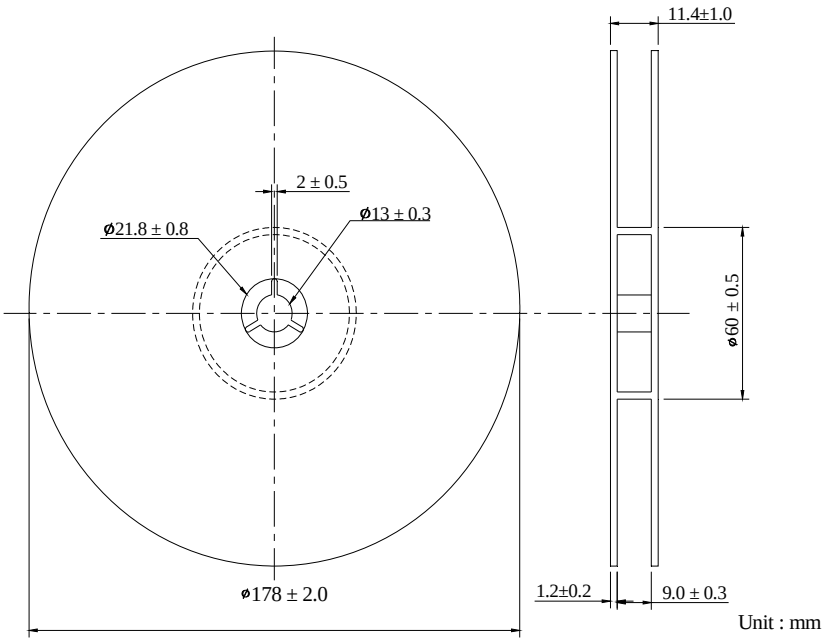
6-1 Dimensions

6-1-1 Tape Packaging Dimensions



Material : Paper

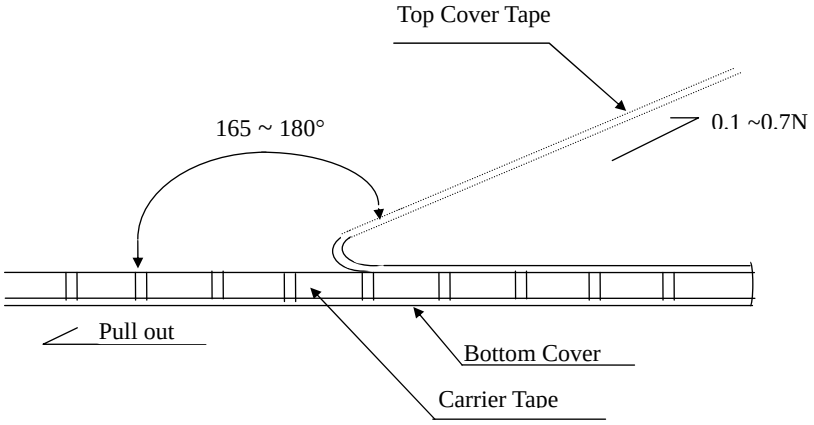
6-1-2 Reel Dimensions



6-2 Peel Strength of Top Cover Tape

The peel speed shall be about 300 mm/minute

The peel strength of top cover tape shall be between 0.1 to 0.7N.



6-3 Quantity per Reel

4,000 pieces / reel

6-4 Marking

The following items shall be marked on the reel.

(1) Manufactures parts number
(2) Quantity
(3) Manufacturing date code
(4) Manufacturer’s name
(5) The country of origin

7. Precautions

7-1 Storage

(1) The product shall be stored in a room where temperature and humidity must be controlled. (temperature: 5-35℃, humidity : 45-85% RH).
However, humidity keeps it low, as it is possible.

(2) The product shall be stored as direct sunshine doesn't hit on it.

(3) The product shall be stored with on moisture, dust, a material that will make solderability inferior, and a harmful gas (hydrogen chloride, sulfurous acid gas, and hydrogen sulfide).

(4) The product shall be stored as tape packaging condition.

7-2 Term for use

(1) The term for use is within one year from the shipping day of the product.

(2) If the product has been left unused for more than one year after delivered, check solderability before use.

7-3 Chip mounting

(1) When chip are mounted on PC board, protective coat of the product must not be scratched. If it will be scratched, it will make characteristic inferior.

(2) In case that product will be soldered by soldering iron, heating shall be done on the land, and soldering iron must not hit on the product itself.

(3) In case that resin coating or resin seal will be made for a PC board after chip mounting, do washing and drying it enough before coating or sealing. If ion bear or moisture will be sealed in resin coating, it will make characteristic inferior.

(4) For resinous use, it is necessary to set up enough the curing conditions. As it gets improper for the condition, changes of a resistance value are large and are a case.

(5) According to shape, material, and pressure of clamping in chip mounting machine, there is the case that crack will be appeared on the product.
Control a shock energy for clamping the product under 7×10^{-4} J .
With a shock energy around clamping that says here, it is suited to a potential energy, in case that iron block of 25 g is dropped naturally to the product placed on iron plate for the height of 2.8mm.

(6) The glue to fix the product on the PC board around chip mounting, it is needed high insulation resistance and great performance or moisture. And it is needed that these characteristics are not inferno in using temperature range and a hot spot temperature to be acting.

7-4 Using and Handling

(1) It is necessary to investigate the performance and reliability enough when using under harsh environment.

(2) It is necessary to protect the and protective coat of the product from mechanical stress.

(3) Handle with care when PC board is divided or fixed on support body, because bending of PC board after chip mounting will make mechanical stress for the product.

(4) The product shall be used within rated range shown in specification.
Especially, if current more than specified value will be loaded to the product, there is a case it will make damage for machine because of temperature rise depending on generation of heat, and characteristic inferior.

(5) In case that product is loaded a rated current, it is necessary to confirm temperature of the product and to reduce a load current according to load reduction curve, because a temperature rise of the product depends on influence of heat from mounting density and neighboring element.

(6) If there is a possibility that a large voltage (pulse voltage, shock voltage) charge to the product, It is necessary that operating condition shall be set up before use, because performance of the product is affected by a large shock voltage.

(7) The items listed listed in the specifications assure the product quality as the product alone. Evaluation and confirmation of the product quality after mounting, in accordance with the operation condition, is required for actual use.