No. MLHKE06001

SPECIFICATIONS

MULTILAYER CHIP INDUCTOR
FOR HIGH FREQUENCY

HK1005 TYPE SERIES

TAIYO YUDEN CO., LTD.
TAIYO YUDEN (GUANG DONG) CO., LTD.

DATE : 3. Feb. 2006

1. Scope

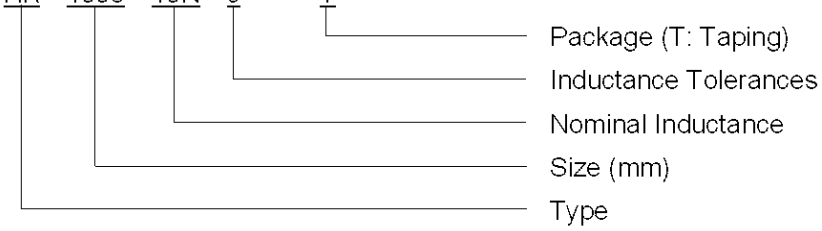
This specification applies to MULTILAYER CHIP INDUCTORS FOR HIGH FREQUENCY Taiyo Yuden Co., Ltd. delivers.

2. Ordering Codes and Product Name Format

2-1 The ordering codes of the products specified hereof shall be as shown in page 5.

2-2 Product Name Format

(Example) HK 1005 10N J – T



3. Appearance, Size, and Dimensions

3-1 Appearance : No defects for practical use.

3-2 Size and Dimensions : Conforms to Table 1 shown in page 2.

4. Electrical Characteristics

Conforms to page 5 to 6. The measuring conditions for the characteristics shall conform to pages 3 to 4.

5. Tests

Conforms to Item 5.1 to Item 5.9 of pages 7 to 8.

6. Packaging and Marking

The products shall be packaged to be free from water absorption and damages and the following information shall be marked on each of packages.

6-1 Ordering codes or names shall conform to page 5.

6-2 Control No.

6-3 Manufacturer Name

7. Packaging

Taping specification shall conform to pages 9 to 10.

8. Testing Conditions

Unless otherwise specified, the temperature shall be 5℃ to 35℃, the relative humidity shall be 45% to 85%, and the air pressure shall be 86kPa to 106kPa. If a question arises, the temperature shall be 20℃±2℃, the relative humidity shall be 60% to 70%, and the air pressure shall be 86kPa to 106kPa.

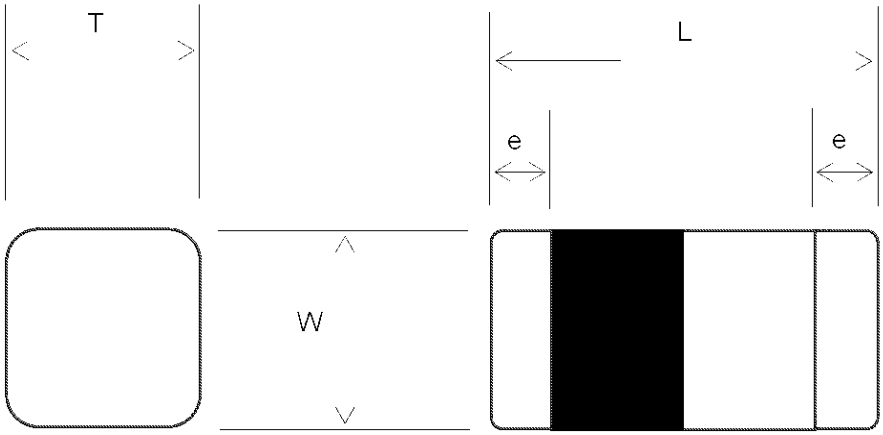
9. Cautions in Handling and in storage

Conforms to page 11.

※RoHS compliance

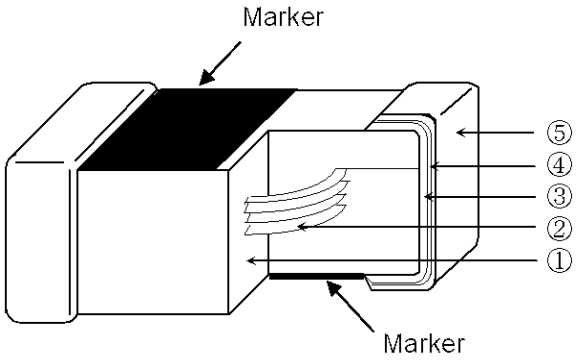
- This product conform to "RoHS compliance".
- "RoHS compliance" means that the product does not contain lead, cadmium, mercury, hexavalent chromium, PBB or PBDE referring to EU Directive 2002/95/EC, except other non-restricted substances or impurities which could not be technically removed at the refining process.

[1] Size, Dimensions and Materials



《Table 1》

Type	Dimensions and Tolerance (mm)			
	Length L	Width W	Thickness T	Electrode Width e
HK1005	1.0±0.05	0.5±0.05	0.5±0.05	0.25±0.1



《Table 2》

Name		Material
①	Ceramics	Dielectric glass ceramic
②	Internal Conductors	Ag
③	Terminal Electrodes (Base)	Ag
④	Terminal Electrodes (Plating)	Ni
⑤	Terminal Electrodes (Surface)	Sn

[2] Operating Temperature Range

page 5 to 6.

[3] Electrical Characteristics Measuring Method

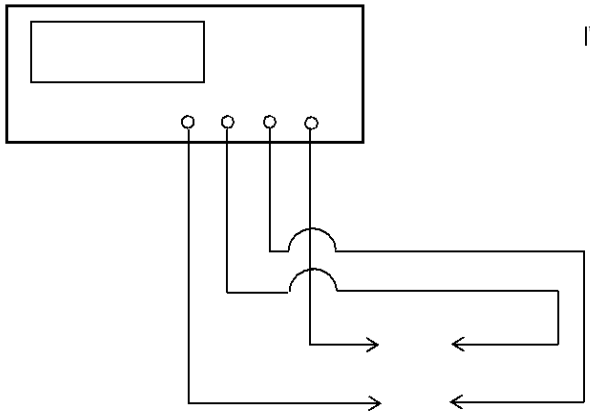
3-1 Inductance and Q values

Equipment to be used : HP4291A

Test fixtures : HP16193A

3-2 DC resistance

Circuits of equipment and instruments to be used.



Measuring method :

Test sample shall be set on 4-Terminals fixture.

The resistance value shall be read.

3-3 SRF (Self-resonant Frequency)

Equipment to be used : HP8719C

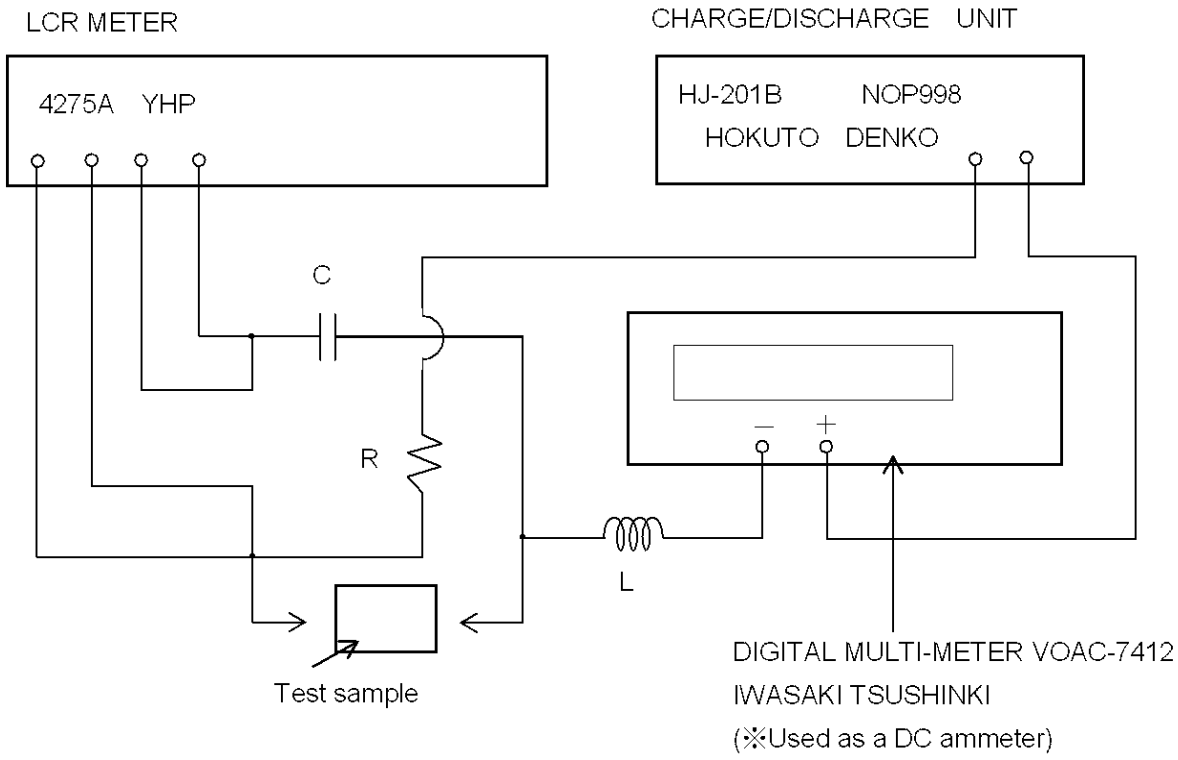
Measuring method :

S.R.F. shall be read from the impedance characteristics data measured by a network analyzer.

S.R.F. shall be the frequency indicated on this data where the difference between the inductive reactance and the capacitive reactance is zero.

3-4 IDC

Measuring circuit



Measuring method :

Measuring frequency 10MHz

The initial L value shall be measured under the above condition.

After the voltage of the DC power supply has been increased, the L (nH) value at respective currents at this time shall be "IDC".

Definition of IDC

The direct current is specified when the L (nH) value is reduced 5% in comparison to the initial L (nH) value or temperature rise of 20℃ by application of direct current, whichever comes first.

[4] Electrical Characteristics

Table 3

Operating Temperature Range: -55℃ to +125℃

Ordering Code	Inductance L (nH)	Tolerance	Q Min.	LQ Measuring Frequency (MHz)	Q (Typical) Frequency (MHz)					Self-resonant Frequency (MHz)		DC Resistance (Ω) max.	Rated current (mA) max.
					100	300	500	800	1000	min.	Typ.		-55～+125℃
HK1005 1N0S-T	1.0	S	8	100	11	25	34	43	52	10000	>13000	0.08	300
HK1005 1N2S-T	1.2	S	8	100	11	25	35	44	52	10000	>13000	0.09	300
HK1005 1N5S-T	1.5	S	8	100	11	24	33	44	48	6000	>13000	0.10	300
HK1005 1N8S-T	1.8	S	8	100	11	23	30	36	42	6000	11000	0.12	300
HK1005 2N0S-T	2.0	S	8	100	11	21	27	34	39	6000	10500	0.12	300
HK1005 2N2S-T	2.2	S	8	100	10	18	25	31	36	6000	10000	0.13	300
HK1005 2N4S-T	2.4	S	8	100	10	18	24	31	35	6000	9500	0.13	300
HK1005 2N7S-T	2.7	S	8	100	10	18	24	31	34	6000	9000	0.13	300
HK1005 3N0S-T	3.0	S	8	100	10	18	24	31	35	6000	8500	0.16	300
HK1005 3N3S-T	3.3	S	8	100	10	18	24	31	35	6000	8000	0.16	300
HK1005 3N6S-T	3.6	S	8	100	10	18	24	31	35	5000	7500	0.20	300
HK1005 3N9S-T	3.9	S	8	100	10	18	24	31	35	4000	7000	0.21	300
HK1005 4N3S-T	4.3	S	8	100	10	18	24	31	35	4000	6500	0.20	300
HK1005 4N7S-T	4.7	S	8	100	10	18	24	31	34	4000	6000	0.21	300
HK1005 5N1S-T	5.1	S	8	100	10	18	24	31	34	4000	5800	0.21	300
HK1005 5N6S-T	5.6	S	8	100	10	18	24	30	35	4000	5700	0.23	300
HK1005 6N2S-T	6.2	S	8	100	10	18	24	30	34	3900	5600	0.25	300
HK1005 6N8J-T	6.8	J	8	100	10	18	23	29	32	3900	5500	0.25	300
HK1005 7N5J-T	7.5	J	8	100	10	18	23	29	32	3700	5200	0.25	300
HK1005 8N2J-T	8.2	J	8	100	10	18	23	29	31	3600	4900	0.28	300
HK1005 9N1J-T	9.1	J	8	100	10	18	23	29	31	3400	4500	0.30	300
HK1005 10NJ-T	10.0	J	8	100	10	18	23	29	31	3200	4300	0.31	300
HK1005 12NJ-T	12.0	J	8	100	11	18	23	29	31	2700	3900	0.40	300
HK1005 15NJ-T	15.0	J	8	100	11	18	23	28	30	2300	3500	0.46	300
HK1005 18NJ-T	18.0	J	8	100	11	18	23	28	30	2100	3100	0.55	300
HK1005 22NJ-T	22.0	J	8	100	11	17	22	26	27	1900	2800	0.60	300
HK1005 27NJ-T	27.0	J	8	100	11	17	21	25	26	1600	2300	0.70	300
HK1005 33NJ-T	33.0	J	8	100	11	16	20	23	22	1300	1900	0.80	200
HK1005 39NJ-T	39.0	J	8	100	11	16	20	23	21	1200	1700	0.90	200
HK1005 47NJ-T	47.0	J	8	100	11	16	19	21	18	1000	1500	1.00	200
HK1005 56NJ-T	56.0	J	8	100	11	16	18	18	16	750	1300	1.00	200
HK1005 68NJ-T	68.0	J	8	100	11	15	17	18	11	750	1200	1.20	180
HK1005 82NJ-T	82.0	J	8	100	10	14	16	15	6	600	1100	1.30	150
HK1005 R10J-T	100.0	J	8	100	10	14	14	12	—	600	1000	1.50	150
HK1005 R12J-T	120.0	J	8	100	10	12	10	—	—	600	800	1.60	150
HK1005 R15J-T	150.0	J	8	100	12	17	17	—	—	550	920	3.20	140
HK1005 R18J-T	180.0	J	8	100	12	16	—	—	—	500	810	3.70	130
HK1005 R22J-T	220.0	J	8	100	12	16	—	—	—	450	700	4.20	120
HK1005 R27J-T	270.0	J	8	100	12	14	—	—	—	400	600	4.80	110

※ Tolerance: J=±5%, S=±0.3nH

PACKING T (For taping)

※ S.R.F.(Typ) : 1N0～4N7 HP8719C, 5N1～R27 HP8719C or HP8753D

[4] Electrical Characteristics

Table 3

Operating Temperature Range: -55℃ to +85℃

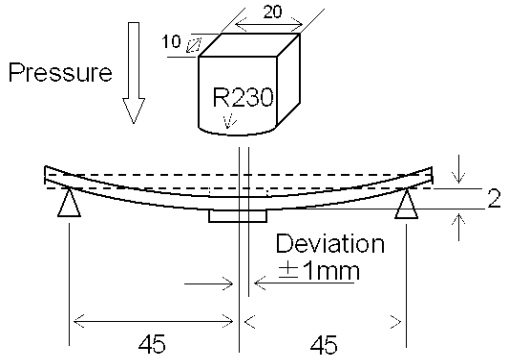
Ordering Code	Inductance L (nH)	Tolerance	Q Min.	LQ Measuring Frequency (MHz)	Q (Typical) Frequency (MHz)					Self-resonant Frequency (MHz)		DC Resistance (Ω) max.	Rated current (mA) max.
					100	300	500	800	1000	min.	Typ.		-55～+85℃
HK1005 1N0S-T	1.0	S	8	100	11	25	34	43	52	10000	>13000	0.08	900
HK1005 1N2S-T	1.2	S	8	100	11	25	35	44	52	10000	>13000	0.09	900
HK1005 1N5S-T	1.5	S	8	100	11	24	33	44	48	6000	>13000	0.10	850
HK1005 1N8S-T	1.8	S	8	100	11	23	30	36	42	6000	11000	0.12	700
HK1005 2N0S-T	2.0	S	8	100	11	21	27	34	39	6000	10500	0.12	700
HK1005 2N2S-T	2.2	S	8	100	10	18	25	31	36	6000	10000	0.13	700
HK1005 2N4S-T	2.4	S	8	100	10	18	24	31	35	6000	9500	0.13	650
HK1005 2N7S-T	2.7	S	8	100	10	18	24	31	34	6000	9000	0.13	650
HK1005 3N0S-T	3.0	S	8	100	10	18	24	31	35	6000	8500	0.16	600
HK1005 3N3S-T	3.3	S	8	100	10	18	24	31	35	6000	8000	0.16	550
HK1005 3N6S-T	3.6	S	8	100	10	18	24	31	35	5000	7500	0.20	500
HK1005 3N9S-T	3.9	S	8	100	10	18	24	31	35	4000	7000	0.21	500
HK1005 4N3S-T	4.3	S	8	100	10	18	24	31	35	4000	6500	0.20	500
HK1005 4N7S-T	4.7	S	8	100	10	18	24	31	34	4000	6000	0.21	500
HK1005 5N1S-T	5.1	S	8	100	10	18	24	31	34	4000	5800	0.21	450
HK1005 5N6S-T	5.6	S	8	100	10	18	24	30	35	4000	5700	0.23	430
HK1005 6N2S-T	6.2	S	8	100	10	18	24	30	34	3900	5600	0.25	430
HK1005 6N8J-T	6.8	J	8	100	10	18	23	29	32	3900	5500	0.25	430
HK1005 7N5J-T	7.5	J	8	100	10	18	23	29	32	3700	5200	0.25	400
HK1005 8N2J-T	8.2	J	8	100	10	18	23	29	31	3600	4900	0.28	380
HK1005 9N1J-T	9.1	J	8	100	10	18	23	29	31	3400	4500	0.30	360
HK1005 10NJ-T	10.0	J	8	100	10	18	23	29	31	3200	4300	0.31	340
HK1005 12NJ-T	12.0	J	8	100	11	18	23	29	31	2700	3900	0.40	330
HK1005 15NJ-T	15.0	J	8	100	11	18	23	28	30	2300	3500	0.46	320
HK1005 18NJ-T	18.0	J	8	100	11	18	23	28	30	2100	3100	0.55	310
HK1005 22NJ-T	22.0	J	8	100	11	17	22	26	27	1900	2800	0.60	300
HK1005 27NJ-T	27.0	J	8	100	11	17	21	25	26	1600	2300	0.70	300
HK1005 33NJ-T	33.0	J	8	100	11	16	20	23	22	1300	1900	0.80	250
HK1005 39NJ-T	39.0	J	8	100	11	16	20	23	21	1200	1700	0.90	250
HK1005 47NJ-T	47.0	J	8	100	11	16	19	21	18	1000	1500	1.00	230
HK1005 56NJ-T	56.0	J	8	100	11	16	18	18	16	750	1300	1.00	220
HK1005 68NJ-T	68.0	J	8	100	11	15	17	18	11	750	1200	1.20	200
HK1005 82NJ-T	82.0	J	8	100	10	14	16	15	6	600	1100	1.30	200
HK1005 R10J-T	100.0	J	8	100	10	14	14	12	—	600	1000	1.50	200
HK1005 R12J-T	120.0	J	8	100	10	12	10	—	—	600	800	1.60	200
HK1005 R15J-T	150.0	J	8	100	12	17	17	—	—	550	920	3.20	200
HK1005 R18J-T	180.0	J	8	100	12	16	—	—	—	500	810	3.70	200
HK1005 R22J-T	220.0	J	8	100	12	16	—	—	—	450	700	4.20	200
HK1005 R27J-T	270.0	J	8	100	12	14	—	—	—	400	600	4.80	200

※ Tolerance: J=±5%, S=±0.3nH

PACKING T (For taping)

※ S.R.F.(Typ) : 1N0～4N7 HP8719C, 5N1～R27 HP8719C or HP8753D

[5] Chip Inductor Reliability Test

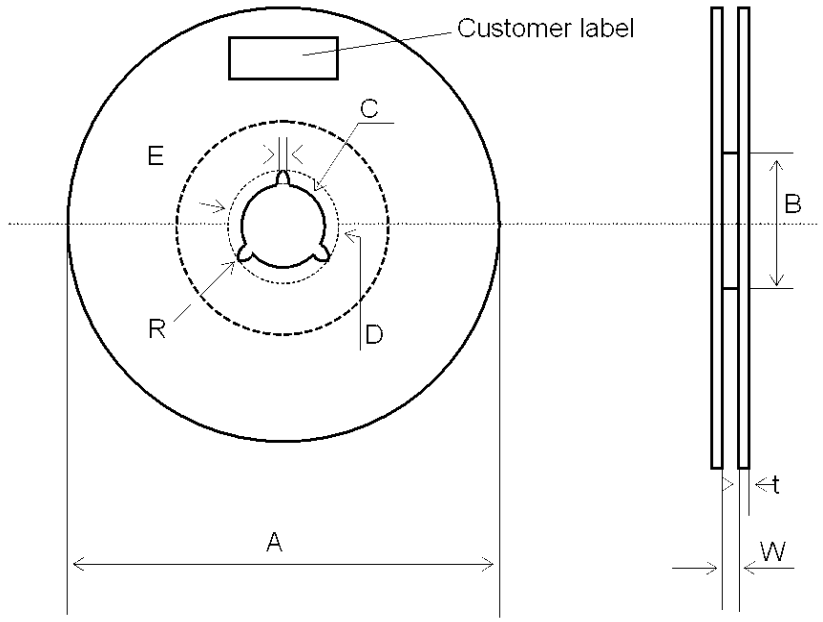
No.	Item	Specified Value	Testing Method
5.1	Bending Strength	No mechanical damage.	Test sample shall be soldered to the printed circuit board shown in attached drawing 1 and a load is applied in the arrow direction until amount of deflection reaches to 2mm.  Unit【mm】
5.2	Resistance to Humidity	No mechanical damage. Inductance change rate : Within±10% Q change rate : Within±20%	Test sample shall be kept in an atmosphere with temperature of 60℃±2℃ and relative humidity of 90% to 95% for 500±12 hours. After the test, test sample shall be kept at normal temperature with normal humidity for 2 to 3 hours. Then measurement shall be conducted.
5.3	Heat Resistance Test	No mechanical damage. Inductance change rate : Within±10% Q change rate : Within±20%	Test sample shall be kept in an atmosphere with temperature of 125℃±2℃ for 500 ± 12hours. After the test, test sample shall be kept at normal temperature with normal humidity for 2 to 3hours. Then measurement shall be conducted.
5.4	Humidity Resistance Load Life Test	No mechanical damage. Inductance change rate : Within±10% Q change rate : Within±20%	Test sample shall be soldered to the printed circuit board shown in attached drawing 2 and kept in atmosphere with temperature of 60℃± 2℃ with a relative humidity of 90% to 95% for 500 ± 12hours while supplying the rated current. After the test, test sample shall be kept at normal temperature with normal humidity for 2 to 3hours. Then measurement shall be conducted.

[5] Chip Inductor Reliability Test

<table>
<tr><th>No.</th><th>Item</th><th>Specified Value</th><th>Testing Method</th></tr>
<tr><td>5.5</td><td>High Temperature Load Life Test</td><td>No mechanical damage.
Inductance change rate :
Within ±10%
Q change rate :
Within ±20%</td><td>Test sample shall be soldered to the printed circuit board shown in attached drawing 2 and kept in atmosphere with temperature of highest operating temperature for 500±12hours while supplying the rated current.
After the test, test sample shall be kept at normal temperature with normal humidity for 2 to 3hours. Then measurement shall be conducted.</td></tr>
<tr><td>5.6</td><td>Thermal Shock</td><td>No mechanical damage.
Inductance change rate :
Within ±10%
Q change rate :
Within ±20%</td><td>Test sample shall be soldered to the printed circuit board shown in attached drawing 2 and 5 cycles of test shall be conducted under the conditions shown below.
After the test, test sample shall be kept at normal temperature with normal humidity for 2 to 3 hours. Then measurement shall be conducted.
<table>
<tr><th>Step</th><th>Temperature</th><th>Time</th></tr>
<tr><td>1</td><td>-55℃± $^{0}_{3}$ ℃</td><td>30min.±3min.</td></tr>
<tr><td>2</td><td>Normal temp</td><td>2min.~3min.</td></tr>
<tr><td>3</td><td>Highest Operating temperature</td><td>30min.±3min.</td></tr>
<tr><td>4</td><td>Normal temp</td><td>2min.~3min.</td></tr>
</table></td></tr>
<tr><td>5.7</td><td>Resistance to Soldering Heat</td><td>No mechanical damage.
Remaining terminal electrode : 70% min.
Inductance change rate :
Within±5%</td><td>Test sample shall be immersed in a methanol (JIS K1501) solution containing rosin (JIS K5902) (weight ratio 25%), preheated at 150℃ to 180℃ for 2 to 3minutes and immersed into a solder hot melt (H60A or H63A specified in JIS Z3282) of 260℃±5℃ for 10±0.5seconds.</td></tr>
<tr><td>5.8</td><td>Solderability</td><td>More than 75% of terminal electrode shall be covered with fresh solder.</td><td>Flux: Methanol solution containing rosin (JIS K5902) (weight ratio 25%)
Preheating: 150 to 180℃, 2 to 3 minutes
[Eutectic solder] (JIS Z 3282 H60A or H63A)
230℃±5℃, 4±1 seconds
[Pb-free solder] (Sn/3.0Ag/0.5Cu)
245℃±3℃, 4±1 seconds.</td></tr>
<tr><td>5.9</td><td>Temperature Characteristic</td><td>Inductance change rate :
Within±10%</td><td>Measurement were taken in a temperature range of -30℃ to +85℃ and the value at +20℃ was the reference value.</td></tr>
</table>

[6] Taping Specification

6-1 Marking and Dimensions of Reel



Customer label description

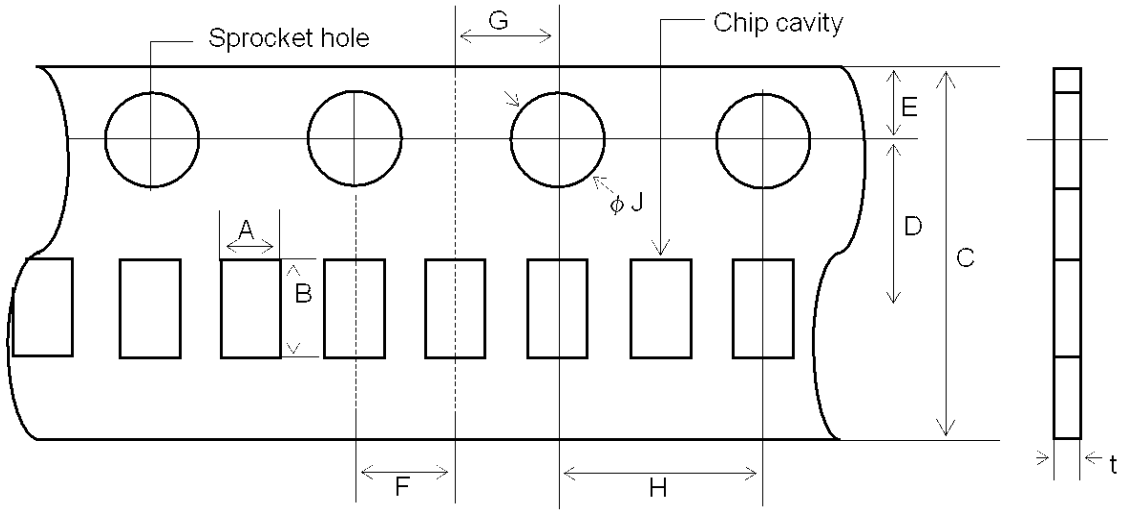
1. Manufacturer Name
2. Customer Parts No.
3. Our parts No.
4. Quantity
5. Control No.
   (Shipping Lot No.)
6. Manufacturing site
   (MADE IN ○○○)

Code	ϕA	ϕB	ϕC	ϕD
Dimension	178±2.0	50 min	13±0.2	21±0.8

Code	E	W	T	R
Dimension	2.0±0.5	10±1.5	2.5 max	1.0

Unit【mm】

6-2 External Dimension of Paper Tape



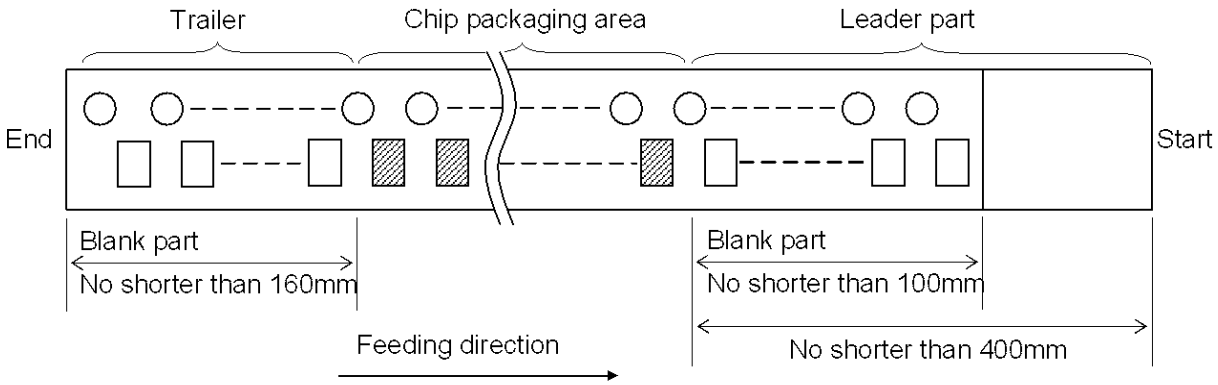
Code	A	B	C	D	E
Dimension	0.65±0.1	1.15±0.1	8.0±0.3	3.5±0.05	1.75±0.1

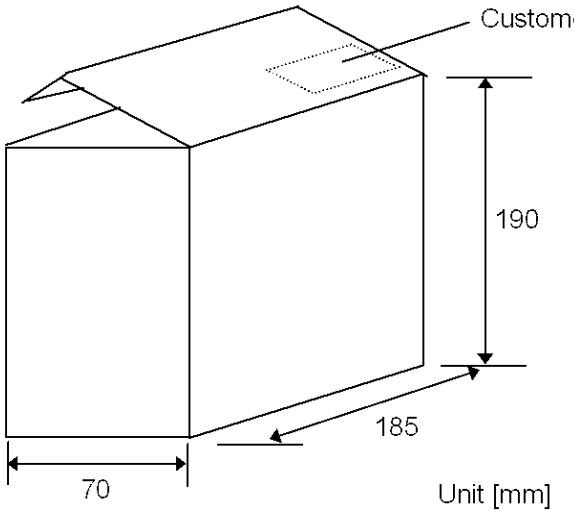
Code	F	G	H	ϕJ	t
Dimension	2.0±0.05	2.0±0.05	4.0±0.1	$1.5^{+0.1}_{-0}$	0.8 max

※A, B, t：Sufficient clearance.

Unit【mm】

6-3 Packaging





Customer label description

1. Manufacturer Name
2. Customer Parts No.
3. Our parts No.
4. Quantity
5. Control No.
   ※ (Shipping Lot No.)
6. Manufacturing site
   (MADE IN ○○○)

Unit [mm]
(The size is only for reference.)

・To attach labels means that all products are passed.

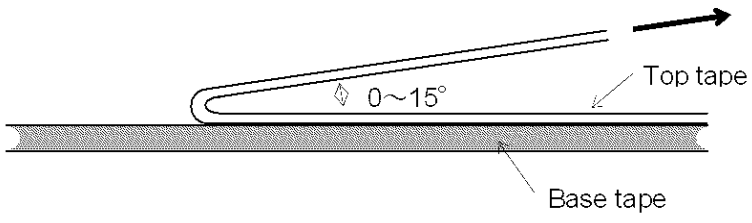
※Control No.
We control our products by control number and shipping lot number is not marked on customer label.
Shipping lot number is marked on our control label.
Shipping lot number is traceable from our Control number marked on customer label.

6-4 Quantity of taping package

TYPE	Thickness T	1reel	1carton box
HK1005	0.50 mm	10,000 / reel	50,000 / 5 reels

6-5 The tensile strength of the tape is 5N or over.

6-6 Top tape strength
Top tape requires peeling strength of 0.1N～0.7N in the arrow direction as shown below.



[7] Cautions in Handling for Mounting

Before soldering, preheating shall be conducted.

When installing a printed circuit board on the set after inductors are mounted, these inductors shall be free from a residual stress due to overall deflection of the printed circuit board or partial deflection resulting from tightening of screws.

At soldering, please take care the solder is not excessively put on the electrode of the inductor.

In case solder is too much put on the electrode, excessive stress is applied to the inductor and it may damage the inductor.

Rosin-type flux shall be used and highly acidic flux (any containing a minimum of 0.2wt% chlorine) shall not be used.

[8] Cautions in Handling

- Sets of tweezers made of non-magnetic material such as titanium shall be used.
- Soldering irons and measuring equipments shall be grounded.
- The electrodes of inductors or the conductive parts which conduct to these electrodes shall be protected from direct touch of bare hands or ambient metallic items (steel desk or the like).
- The inductors shall be kept away from the objects such as speakers, coils, etc. which generate a magnetic field.
- Note that the inductor should not be exposed to static electricity.

[9] Cautions for storage

To maintain the solderability of terminal electrodes and to keep the packaging material in good condition, care must be taken to control temperature and humidity in the storage area.

Humidity should especially be kept as low as possible.

Recommended conditions

Ambient temperature	Below 40℃
Humidity	Below 70%RH

The ambient temperature must be kept below 30℃. Even under ideal storage conditions inductor electrode solderability decreases as time passes, so inductors should be used within 6 months from the time of delivery.

If exceeding the above period, please check solderability before using the inductors.

The packaging material should be kept where no chlorine or sulfur exists in the air.

[10] Cautions on cleaning

Freon, Clorosen, Triclen, Alcohol, etc. are used as solvent of cleaning process.

However, some of them are restricted due to negative influence to human body and/or destruction of the environment.

Solvent shall be selected with care. Effect to the other parts shall be considered at cleaning.

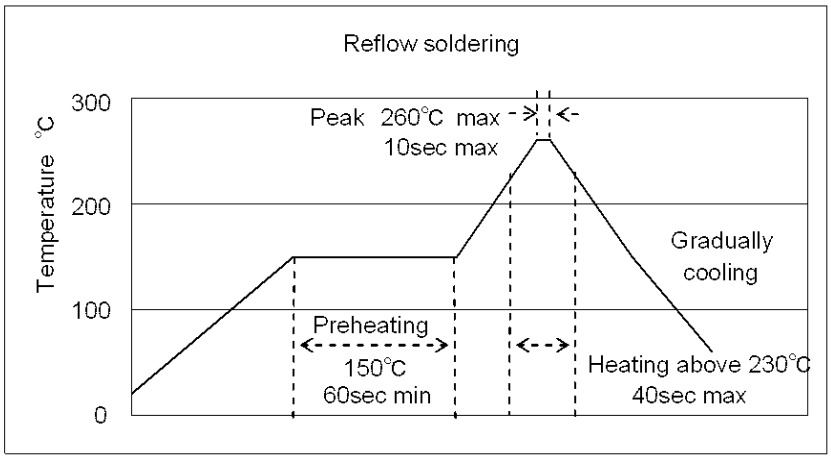
[11] Manufacturing factory

TAIYO YUDEN CO., LTD. ／ JAPAN

TAIYO YUDEN (GUANG DONG) CO., LTD. ／ CHINA

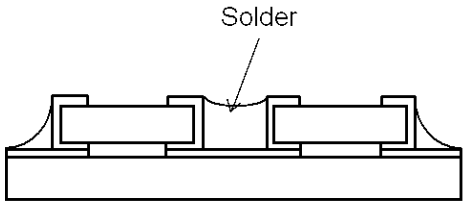
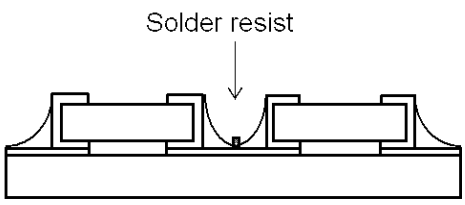
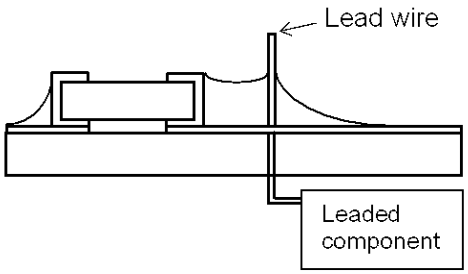
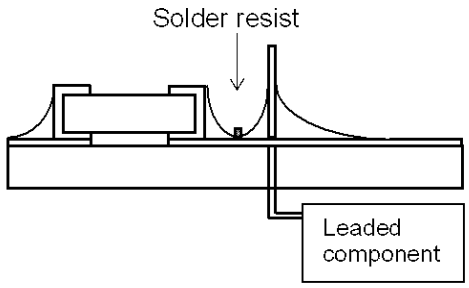
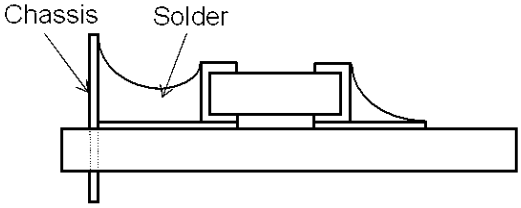
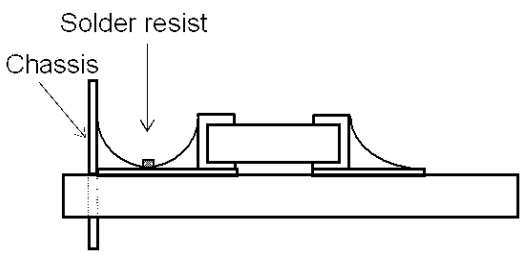
[12] Recommended Soldering Condition

Recommended Soldering Profiles for Lead-free Solder Paste



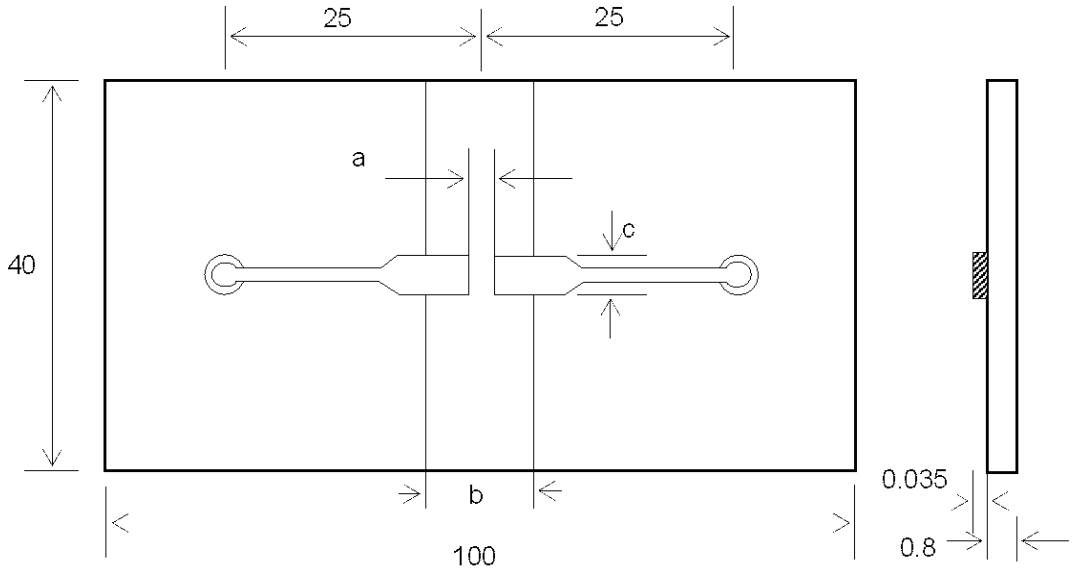
※Components should be preheated to within 100 to 130℃ from soldering temperature.
※Assured to be reflow soldering for 2 times.

Note: The above profiles are the maximum allowable soldering condition, therefore these profiles are not always recommended.

Not recommended soldering condition	Recommended soldering condition
	
	
	

Attached Drawing 1

Printed circuit board for Bending Strength Test



Unit【mm】

Specification

Glass cloth-based epoxy resin

Type GE 4 specified in JIS C6484

Thickness：0.8mm

Chip Size	a	b	c
1.0×0.5	0.6	2.0	0.7

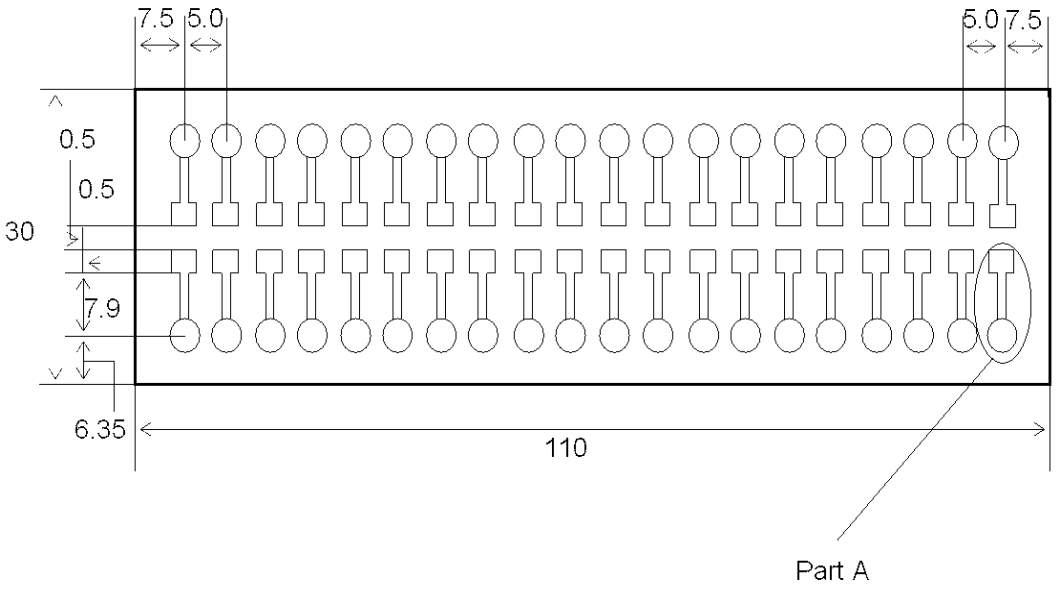
Unit【mm】

Attached Drawing 2

Printed circuit board for reliability test

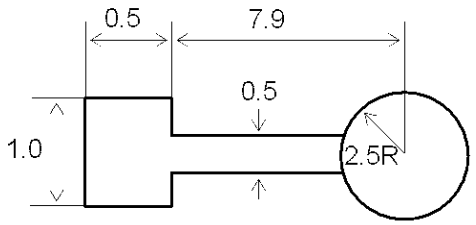
Material：Glass epoxy

Thickness：1.6mm



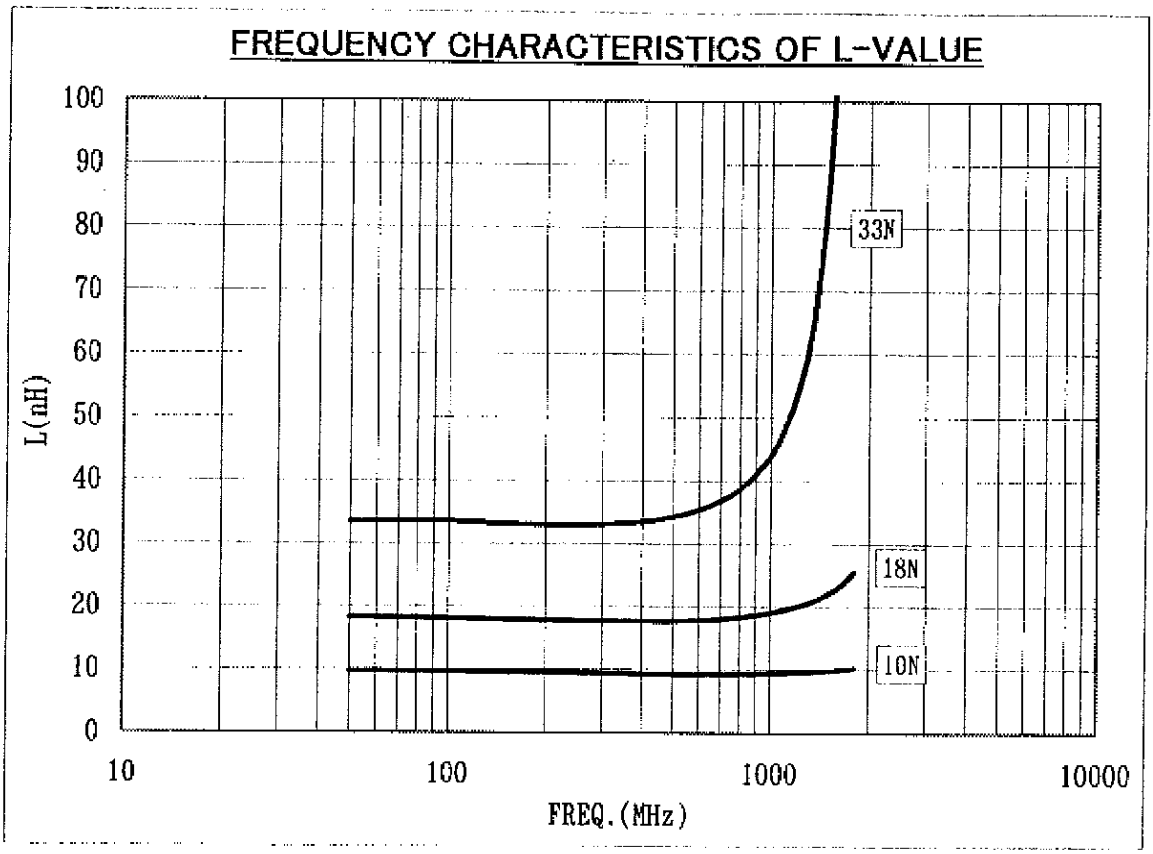
Unit【mm】

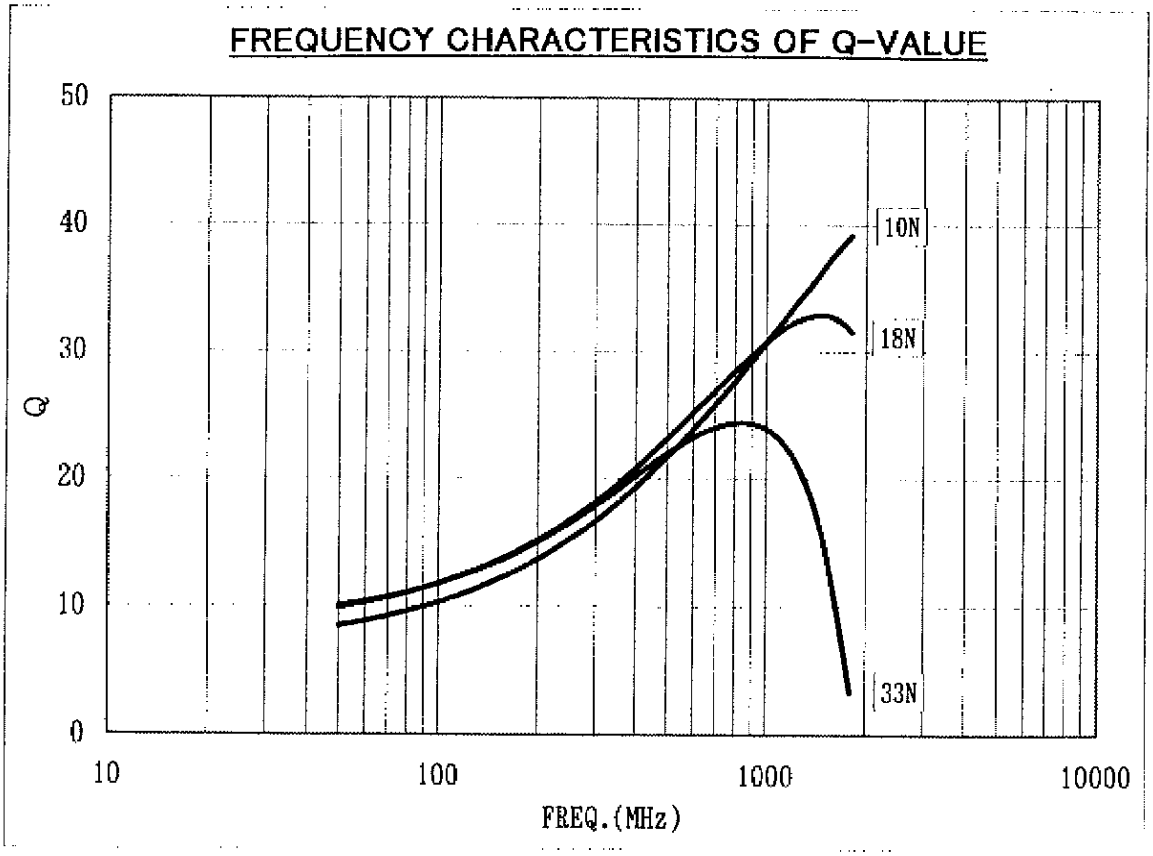
Part A



Unit【mm】

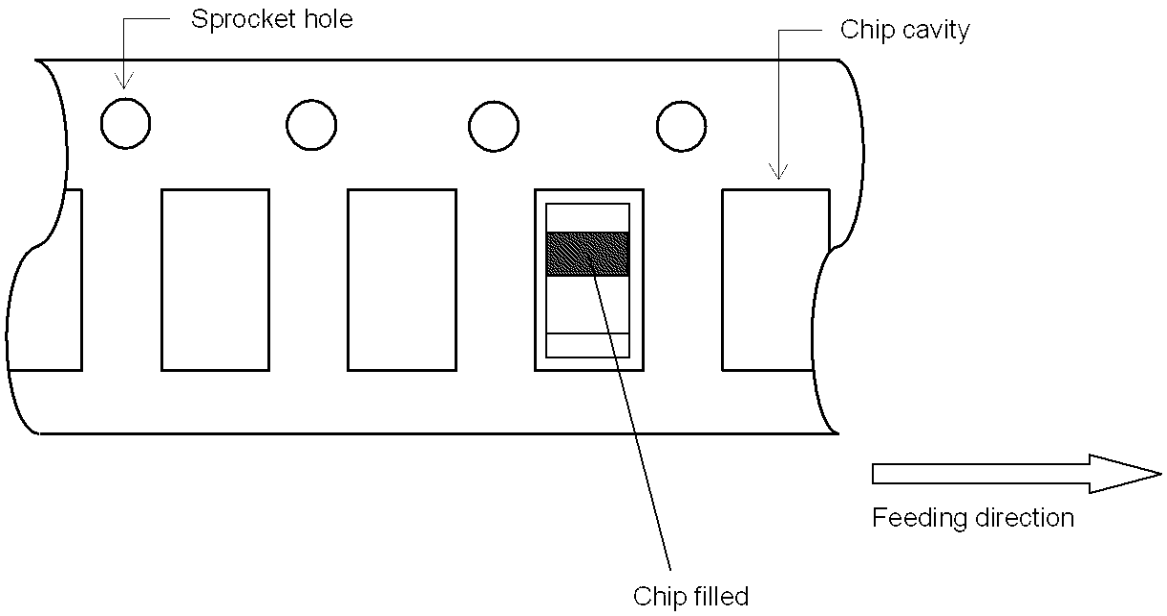
HK1005 FREQUENCY CHARACTERISTICS (Typ.)



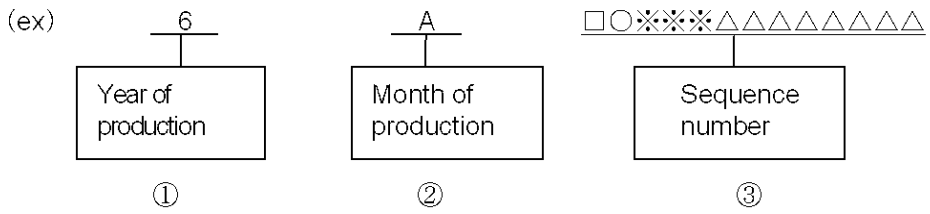


HK1005 Series Marking position of component in tape

All markings are in the side of sprocket holes



Composition of the shipping lot number



①Year of production (The last numeral of the Christian era. 2006year → 6)

②Month of production (It is due to the table below.)

③Sequence number is alphanumeric including space.

month	1	2	3	4	5	6	7	8	9	10	11	12
symbol	A	B	C	D	E	F	G	H	J	K	L	M

Operating conditions for guarantee of this product are as shown in the specification.
Please note that Taiyo Yuden Co., Ltd. shall not be responsible for a failure and/or abnormality which are caused by use under the conditions other than the aforesaid operating conditions.

This product is developed, designed and intended for use in general electronics equipments. (for AV, household, office supply, information service, telecommunications, etc.). Before incorporating the components into any equipments in the field such as aerospace, aviation, nuclear control, submarine, transportation, (automotive driving and control, passenger protection, train control, ship control), transportation signal, disaster prevention, medical, public information network etc.
where higher safety and reliability are especially required, please contact Taiyo Yuden Co., Ltd. for more detail in advance.
And before incorporating the components or devices into the equipments not mentioned in the above, if there is possibility of direct damage or injury to human body, please contact Taiyo Yuden Co., Ltd. for more detail in advance.