

TEMPORARY SPECIFICATION

POWER INDUCTOR

NRS6010 Series

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Taiyo Yuden reserves the right to make change to the Temporary Specification at any time without notice.

TENTATIVE

	Specifications	No. _____
	NRS6010 TYPE	(1 / 1 2)

1. Range of application

This specifications are applied to Power Inductor, NRS6010 type.

2. Ordering code

Example : NRS 6010 I 100 M _____
 (1) (2) (3) (4) (5) (6)

- (1) Type
- (2) External dimensions
- (3) Packing style (T: Tape & Reel)
- (4) Inductance
- (5) Inductance tolerance
- (6) Internal Code

3. Standard measuring method

Inductance	: LCR meter	(HP 4285A or equivalent, 100KHz, 1V)
Self-resonant frequency	: Impedance/Material Analyzer	(HP 4291A or equivalent)
DC resistance	: DC Ohmmeter	(HIOKI 3227 or equivalent)

Standard test conditions for electrical characteristics

Unless otherwise specified, temperature is at 20 ± 15 and humidity is at 65 ± 20 %.

Should any doubt arise about the test results, further test shall be conducted at a temperature 20 ± 2 and humidity 65 ± 5 %.

For inductance, our measured values shall be standard.

4. Operating temperature range

-25 to +120 (Including self-heating)

5. Storage temperature range

-40 to +85 (For products in unopened tape package, -5 to 40)

6. Electrical characteristics

Refer to table 1.

7. External dimensions and structural drawing

Refer to Table 2.

8. Mechanical performance

Refer to Table 3.

9. Environment test performance specifications

Refer to Table 3.

10. Tape and Reel packaging dimensions

Refer to Table 4.

11. Packing form

Refer to Table 5.

12. Reflow profile chart

Refer to Table 6.

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	Table 1	No. _____
	ELECTRICAL CHARACTERISTICS	(2 / 1 2)

Ordering Code	Nominal Inductance [μH]	Inductance Tolerance [%]	D.C. Resistance ±20% [Ω]	Rated Current [mA]		Self-resonant Frequency Min [MHz]
				Saturation Current Idc1	Temperature Rise current Idc2	
NRS6010T 1R5MMGF	1.5	±20	0.090	2400	1900	77
NRS6010T 2R2MMGF	2.2	±20	0.110	1900	1700	56
NRS6010T 3R3MMGF	3.3	±20	0.135	1600	1500	42
NRS6010T 4R7MMGF	4.7	±20	0.165	1300	1400	36
NRS6010T 6R8MMGF	6.8	±20	0.220	1200	1200	30
NRS6010T 100MMGF	10	±20	0.270	1000	1100	25
NRS6010T 220MMGF	22	±20	0.580	650	700	12

*) The saturation current value (Idc1) is the DC current value having inductance decrease down to 30%.
(at 20)

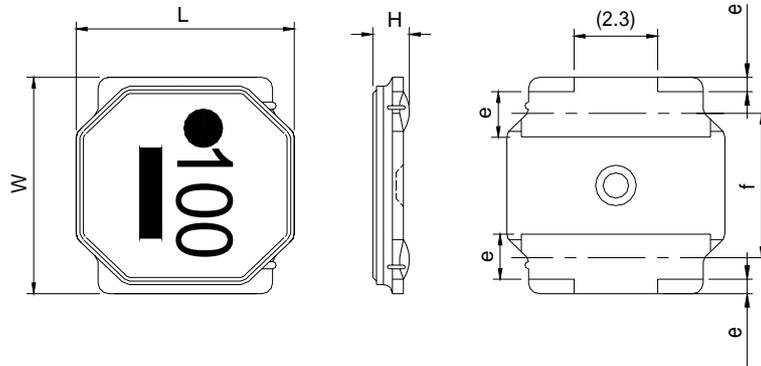
*) The temperature rise current value (Idc2) is the DC current value having temperature increase up to 40 .
(at 20)

*) The rated current is the DC current value that satisfies both of current saturation current value and temperature rise current value.

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	Table 2	No. _____
	EXTERNAL DIMENSIONS AND STRUCTURAL DRAWING	(3 / 1 2)

1 . External dimensions

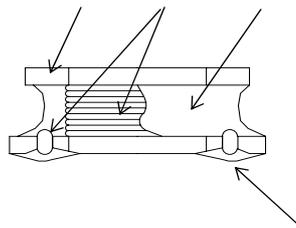


() : Reference value

Description	Mark	Dimensions
Length	L	6.0 ± 0.2
Width	W	6.0 ± 0.2
Height	H	1.0Max.
Pitch	e	1.35 ± 0.2
	e	0.3 ± 0.2
Width of Electrode	f	4.0 ± 0.2

(Unit: mm)

2 . Structural drawing



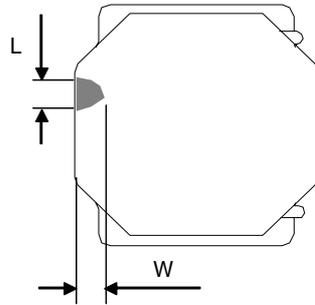
Ferrite core	Ni - Zn ferrite	
Winding wire	Polyurethane-copper wire	
Over-coating resin	Epoxy resin, containing	
Electrode	External electrode (substrate)	Ag
	External electrode (base plating)	Ni - Sn
	External electrode (top surface solder coating)	Sn - Ag - Cu

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	Table 2	No. _____
	EXTERNAL DIMENSIONS AND STRUCTURAL DRAWING	(4 / 1 2)

3 . Core chipping

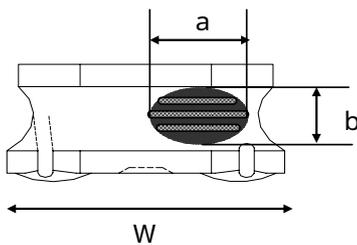
The appearance standard of the chipping size in top side, of bottom side ferrite core is following dimension.



L	W
1.5mm Max.	1.5mmMax.

4 . Void appearance tolerance limit

Size of voids occurring to coating resin is specified below.



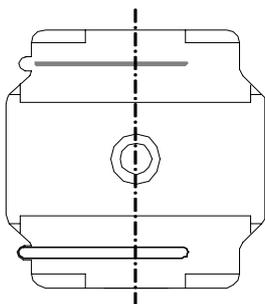
Width direction (dimension a) : Acceptable when $a \leq w/2$
Nonconforming when $a > w/2$

Length direction (dimension b) : Dimension b is not specified.
When total area of voids (including one exposing coil) occurring to each sides is not greater than 50% of coating resin area, that is acceptable.

5 . Electrode appearance criterion for exposed wire

<Cross section of wire joint part>

<Appearance judgment>



Upper part of wire is exposed.

Good



Solder is shed by wire.

Less than 1/2 of joint side length.

It is not covered more than the half of the diameter with solder.

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	Table 3	No. _____
	MECHANICAL PERFORMANCE / ENVIRONMENTAL TEST PERFORMANCE SPECIFICATIONS	(6 / 1 2)

ENVIRONMENT TESTS	Test Item	Standard	Test method														
	Resistance to vibration	L/L within $\pm 10\%$ No abnormality observed in appearance.	The test samples shall be soldered to the test board by the reflow soldering conditions shown in Table 6. Then it shall be submitted to below test conditions. <table border="1" style="margin-left: 20px;"> <tr> <td>Frequency range</td> <td>10Hz ~ 55 Hz</td> </tr> <tr> <td>Total Amplitude</td> <td>1.5 mm (May not exceed acceleration 196 m/S^2)</td> </tr> <tr> <td>Sweeping Method</td> <td>10Hz to 55Hz to 10 Hz for 1 min.</td> </tr> <tr> <td>Time</td> <td>For 2 hours on each X, Y, and Z axis.</td> </tr> </table>	Frequency range	10Hz ~ 55 Hz	Total Amplitude	1.5 mm (May not exceed acceleration 196 m/S^2)	Sweeping Method	10Hz to 55Hz to 10 Hz for 1 min.	Time	For 2 hours on each X, Y, and Z axis.						
	Frequency range	10Hz ~ 55 Hz															
	Total Amplitude	1.5 mm (May not exceed acceleration 196 m/S^2)															
	Sweeping Method	10Hz to 55Hz to 10 Hz for 1 min.															
	Time	For 2 hours on each X, Y, and Z axis.															
	Resistance to soldering heat (Reflow)	L/L within $\pm 10\%$ No abnormality observed in appearance.	The test sample shall be exposed to reflow oven at 230 ± 5 for 40 seconds, with peak temperature at 260 ± 5 for 5 seconds, 2 times. Test board thickness: 1.0 mm Test board material: glass epoxy-resin														
Solderability	At least 90 % of surface of terminal electrode is covered by new solder.	The test samples shall be dipped in flux, and then immersed in molten solder as shown in below table. Flux: Methanol solution containing rosin 25 %. <table border="1" style="margin-left: 20px;"> <tr> <td>Solder Temperature</td> <td>245 ± 5</td> </tr> <tr> <td>Time</td> <td>$5 \pm 1.0 \text{ s.}$</td> </tr> <tr> <td>Immersing Speed</td> <td>25 mm/s</td> </tr> </table>	Solder Temperature	245 ± 5	Time	$5 \pm 1.0 \text{ s.}$	Immersing Speed	25 mm/s									
Solder Temperature	245 ± 5																
Time	$5 \pm 1.0 \text{ s.}$																
Immersing Speed	25 mm/s																
Temperature characteristics	L/L within $\pm 20\%$ No abnormality observed in appearance.	Measurement of inductance shall be taken at temperature range within - 25 to + 85 . With reference to inductance value at + 20 , change rate shall be calculated.															
Thermal shock	L/L within $\pm 10\%$ No abnormality observed in appearance.	The test samples shall be soldered to the test board by the reflow soldering conditions shown in Table 6. The test samples shall be placed at specified temperature for specified time by step 1 to step 4 as shown in below table in sequence. The temperature cycle shall be repeated 100 cycles. Conditions of steps for 1 cycle <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Step</th> <th>Temperature</th> <th>Time (min)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-40 ± 3</td> <td>30 ± 3</td> </tr> <tr> <td>2</td> <td>Room Temp.</td> <td>3 maximum</td> </tr> <tr> <td>3</td> <td>85 ± 2</td> <td>30 ± 3</td> </tr> <tr> <td>4</td> <td>Room Temp</td> <td>3 maximum</td> </tr> </tbody> </table>	Step	Temperature	Time (min)	1	-40 ± 3	30 ± 3	2	Room Temp.	3 maximum	3	85 ± 2	30 ± 3	4	Room Temp	3 maximum
Step	Temperature	Time (min)															
1	-40 ± 3	30 ± 3															
2	Room Temp.	3 maximum															
3	85 ± 2	30 ± 3															
4	Room Temp	3 maximum															
Low temperature life test	L/L within $\pm 10\%$ No abnormality observed in appearance.	The test samples shall be soldered to the test board by the reflow soldering conditions shown in Table 6. After that, the test samples shall be placed at test conditions as shown in below table. <table border="1" style="margin-left: 20px;"> <tr> <td>Temperature</td> <td>-40 ± 2</td> </tr> <tr> <td>Time</td> <td>$500 + 24 \text{ h}$</td> </tr> </table>	Temperature	-40 ± 2	Time	$500 + 24 \text{ h}$											
Temperature	-40 ± 2																
Time	$500 + 24 \text{ h}$																

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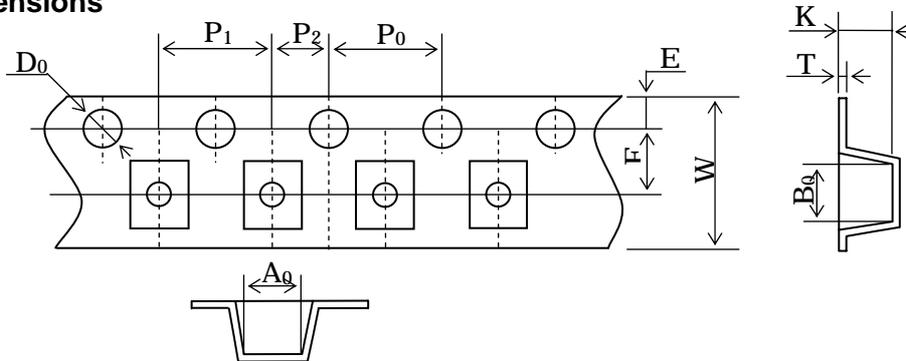
	Table 3	No. _____
	MECHANICAL PERFORMANCE / ENVIRONMENTAL TEST PERFORMANCE SPECIFICATIONS	(7 / 1 2)

	Test Item	Standard	Test method							
ENVIRONMENT TESTS	Loading at high temperature life test	L/L within $\pm 10\%$ No abnormality observed in appearance.	<p>The test samples shall be soldered to the test board by the reflow soldering conditions shown in Table 6. The test samples shall be placed in thermostatic oven set at specified temperature and applied the rated current continuously as shown in below table.</p> <table border="1"> <tr> <td>Temperature</td> <td>85 \pm 2</td> </tr> <tr> <td>Applied current</td> <td>Rated current (Refer to Table 1)</td> </tr> <tr> <td>Time</td> <td>500 + 24 h</td> </tr> </table>	Temperature	85 \pm 2	Applied current	Rated current (Refer to Table 1)	Time	500 + 24 h	
	Temperature	85 \pm 2								
	Applied current	Rated current (Refer to Table 1)								
Time	500 + 24 h									
Damp heat life test	L/L within $\pm 10\%$ No abnormality observed in appearance.	<p>The test samples shall be soldered to the test board by the reflow soldering conditions shown in Table 6. The test samples shall be placed in thermostatic oven set at specified temperature and humidity as shown in below table.</p> <table border="1"> <tr> <td>Temperature</td> <td>60 \pm 2</td> </tr> <tr> <td>Humidity</td> <td>90 ~ 95 %RH</td> </tr> <tr> <td>Time</td> <td>500 + 24 h</td> </tr> </table>	Temperature	60 \pm 2	Humidity	90 ~ 95 %RH	Time	500 + 24 h		
Temperature	60 \pm 2									
Humidity	90 ~ 95 %RH									
Time	500 + 24 h									
Loading under damp heat life test	L/L within $\pm 10\%$ No abnormality observed in appearance.	<p>The test samples shall be soldered to the test board by the reflow soldering conditions shown in Table 6. The test samples shall be placed in thermostatic oven set at specified temperature and humidity and applied the rated current continuously as shown in below table.</p> <table border="1"> <tr> <td>Temperature</td> <td>60 \pm 2</td> </tr> <tr> <td>Humidity</td> <td>90 ~ 95 %RH</td> </tr> <tr> <td>Applied current</td> <td>Rated current (Refer to Table 1)</td> </tr> <tr> <td>Time</td> <td>500 + 24 h</td> </tr> </table>	Temperature	60 \pm 2	Humidity	90 ~ 95 %RH	Applied current	Rated current (Refer to Table 1)	Time	500 + 24 h
Temperature	60 \pm 2									
Humidity	90 ~ 95 %RH									
Applied current	Rated current (Refer to Table 1)									
Time	500 + 24 h									

Standard measuring condition	Unless otherwise specified, the test samples are placed at room temperature and humidity and measured within 48 hours after exposure to test conditions.
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	Table 4	No. _____
	TAPE & REEL PACKAGING DIMENSIONS	(8 / 1 2)

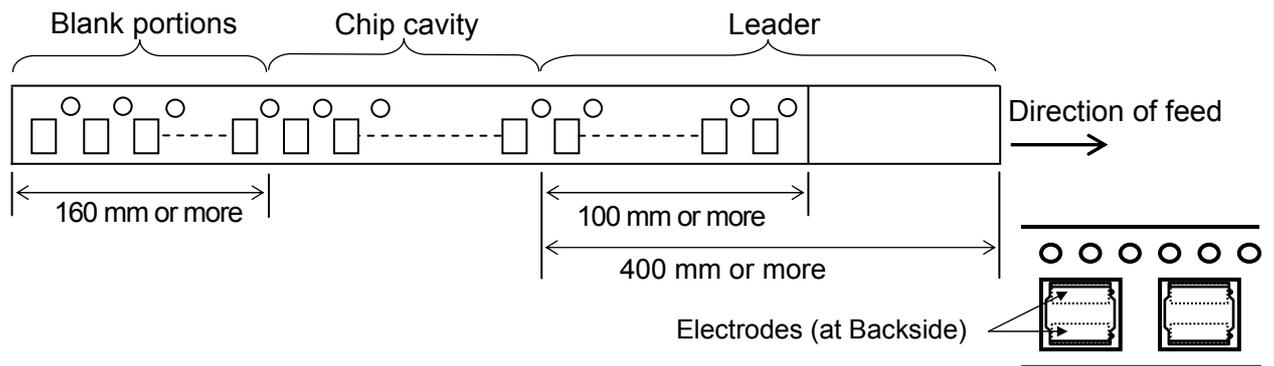
1 . Dimensions



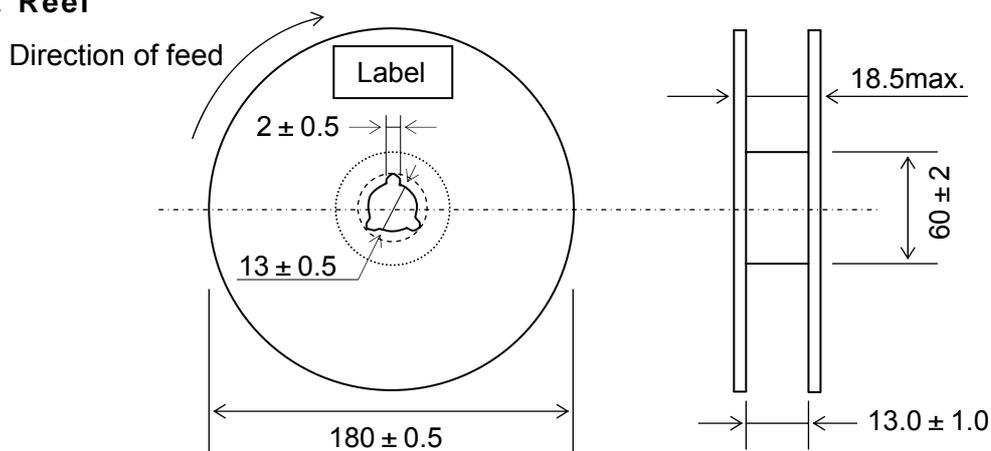
Unit: mm

A ₀	B ₀	W	F	E	P ₁	P ₂	P ₀	D ₀	T	K
6.3 ±0.1	6.3 ±0.1	12.0 ±0.3	5.5 ±0.1	1.75 ±0.1	8.0 ±0.1	2.0 ±0.1	4.0 ±0.1	1.5 +0.1 -0	0.4 ±0.1	1.4 ±0.1

2 . Direction of rolling



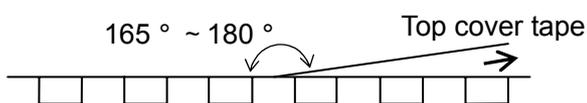
3 . Reel



Unit: mm

Label position: On the opposite side of sprocket holes side of reel

4 . Top tape strength



Peel-off strength : 0.1 N ~ 1.3 N
 Peel-off angle : 165 ° ~ 180 °
 Peel-off speed : 300 mm/min

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	Table 5	No. _____
	PACKING FORM	(9 / 1 2)

1 . The number of components

A tape & reel package contains 1000 inductors.

2 . Tape and Reel

Emboss carrier tape: 12mm-width and 8 mm-pitch
 Reel: 180 mm-diameter

3 . The allowable number of empty chip cavities

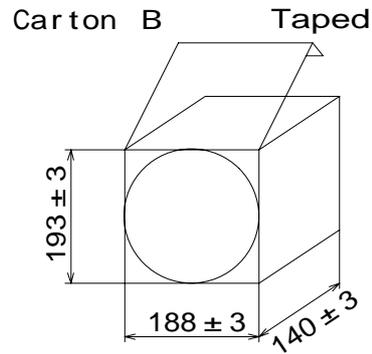
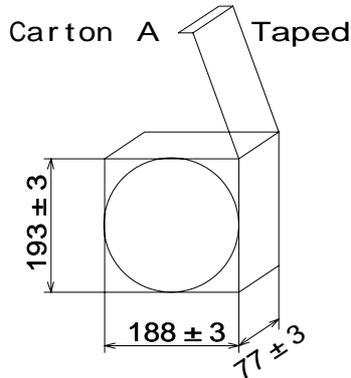
Maximum two (2) chip cavities missing product may exist in a reel but they may not be consecutive two cavities.

4 . Marking

The following items shall be marked legibly on per tape & reel package.

- (1) Part number of Taiyo Yuden Co., Ltd.
- (2) Supplier name (Taiyo Yuden Co., Ltd.)
- (3) Lot number
- (4) Date (stamp)
- (5) The number of components packed in a reel

5 . Dimensions of packing box (for Tape & Reel package)

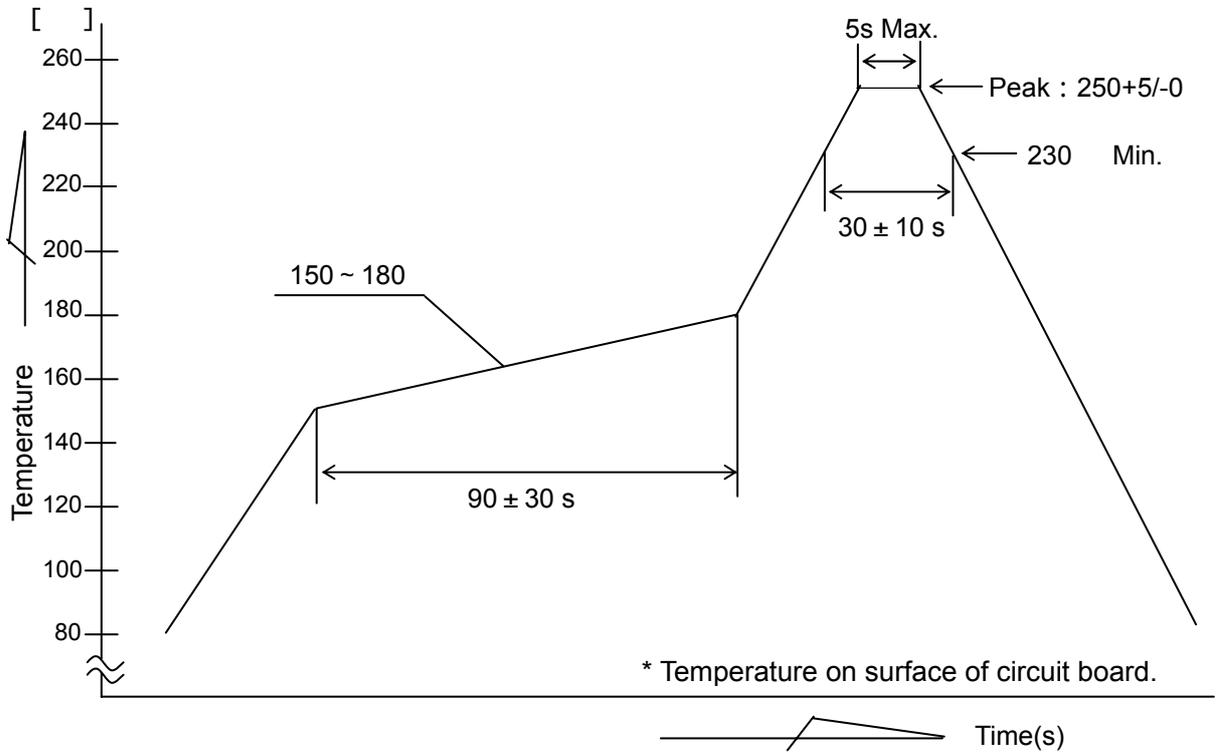


(Unit: mm)

Number of products 1reel	Maximum number in a carton	
	Carton A	Carton B
1000 pcs/1 reel	4000 pcs/4 reel	8000 pcs/8 reel

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	Table 6	No. _____
	REFLOW PROFILE CHART (REFERENCE)	(1 0 / 1 2)

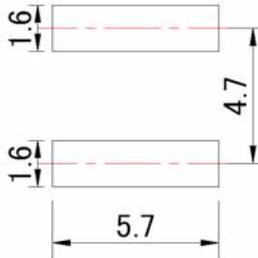


The products may be exposed to reflow soldering process of above profile up to two times.

	Precautions	No. _____ (1 1 / 1 2)
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1 . Surface Mounting

- Mounting and soldering conditions should be checked beforehand.
- Applicable soldering process to this products is reflow soldering only.
- Recommended Land-Pattern :



(Unit: mm)

2 . Handling

- Keep the products away from all magnets and magnetic objects.
- Be careful not to subject the products to excessive mechanical shocks.
- Please avoid applying impact to the products after mounted on pc board.
- Avoid ultrasonic cleaning.

3 . Storage

To prevent deterioration of the solderability of terminal electrodes and/or the packing materials of the products, please store the products under following storage conditions.

Ambient temperature range 0 to 40

Humidity 70 % RH maximum

Even under the ideal storage conditions, solderability of inductor's electrode deteriorates as time passes, so inductors should be used within 6 months after the delivery time.

4 . Regarding Regulations

- Any Class - or Class - ozone-depleting substance (ODS) listed in the Clean Air Act in US for regulation is not included in the products or applied to the products at any stage of whose manufacturing processes.
- Certain brominated flame retardants (PBBs, PBDEs) are not used at all.
- The products of this specifications are not subject to the Export Trade Control Order in Japan or the Export Administration Regulations in US.

5 . RoHS compliance

This product conforms to "RoHS compliance".

6 . Production Sites and country of origin

TAIYO YUDEN (PHILIPPINES) INC.

	Precautions	No. _____ (1 2 / 1 2)
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7 . Guarantee

The guaranteed operating conditions of the products are in accordance with the conditions specified in this specifications.

Please note that Taiyo Yuden Co., Ltd. takes no responsibility for any failure and/or abnormality which is caused by use under other than the aforesaid operating conditions.

SPECIAL NOTICE

Please note that Taiyo Yuden Co., Ltd. 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.

Please conduct validation and verification of products in actual condition of mounting and operating environment before commercial shipment of the equipment.

All electronic components in this specification are developed, designed and intended for use in general electronics equipment. (for AV, office automation, household, office supply, information service, telecommunication, (such as mobile phone or PC) etc.)

Before incorporating the components or devices into any equipment in the field such as transportation, (automotive control, train control, ship control), transportation signal, disaster prevention, medical, public information network (telephone exchange, base station) etc. which may have direct influence to harm or injure a human body, please contact Taiyo Yuden Co., Ltd. for more detail in advance.

Do not incorporate the products into any equipment in fields such as aerospace, aviation, nuclear control, submarine system, military, etc. where higher safety and reliability are especially required.

In addition, even electronic components or functional modules that are used for the general electronic equipment, if evaluation check for safety shall be performed before commercial shipment and moreover, due consideration to install a protective circuit is strongly recommended at customer's design stage.

The contents of this specification are applicable to the products which are purchased from our sales offices or distributors (so called "TAIYO YUDEN's official sales channel").

It is only applicable to the products purchased from any of TAIYO YUDEN's official sales channel.

Please note that Taiyo Yuden Co., Ltd. shall have no responsibility for any controversies or disputes that may occur in connection with a third party's intellectual property rights and other related rights arising from your usage of products in this specification. Taiyo Yuden Co., Ltd. grants no license for such rights.