A S J

ASJ PTE LTD

LEAD FREE CHIP RESISTOR NETWORK SPECIFICATION

Reference No.	:	SYS-ENG-206
Revision No.	:	M

1.0	SCOPE	3
2.0	PART NUMBERING SYSTEM	3
3.0	RATING	3
3.1	Rating Power	3
3.2	Operating Temperature Range	4
3.3	Storage Temperature Range	4
3.4	Flammability Rating	4
3.5	Moisture Sensitivity Rating Level	4
3.6	RoHS compliance	4
3.7	Resistance Range, Resistance Tolerance and Temperature Coefficient of Resistance	4
3.8	Rated Voltage	4
4.0	MARKING ON PRODUCT	5
5.0	COMPONENT DIMENSION	6
5.1	Dimension	6
5.2	Schematic	6
6.0	ELECTRICAL CHARACTERISTICS AND TEST CONDITIONS	7 -13
6.1	Reflow Soldering	13
7.0	TAPING	14
7.1	Structure of Taping	14
7.2	Materials	14
7.3	Leader and Trailer Tape	15
7.4	Position of Taped Component	15
7.5	Tape Dimension	16
7.5.1	Paper Tape	16
7.6	Performance of Taping	16
7.6.1	Strength of carrier tape and top cover tape	16
7.6.2	Peel force of top cover tape	17
7.6.3	Minimum Bending Radius	17
7.7	Packaging	17
7.7.1	Standard Packaging Pan Size	17
7.7.2	Identification	18
7.7.3	Reel Dimension	19-20
8.0	APPLICABLE STANDARDS	20

1.0 SCOPE

This specification specified thick film chip resistor network used in high density SMD mounting for higher productivity with reduced assembling cost. In case there are discrepancies in specifications between this specification and the customer's specifications, the latter shall precede.

2.0 PART NUMBERING SYSTEM

Part Numbering is made in accordance with the following system:

YCN	XX	X -	XXXX -	X	X
Resistor Network	Type	No.of Resistor	Resistance Value Code	Tolerance	Packaging
YCN-Convex	01, 10, 16, 32	2, 4, 8	See clause 4.0	F - ±1% G - ±2% J - ±5% Z – Zero ohm	E - 4K L - 5K K - 10K

3.0 RATING

3.1 Rated Power

Table 1

(a) Zero Ohm Jumper Rated Power

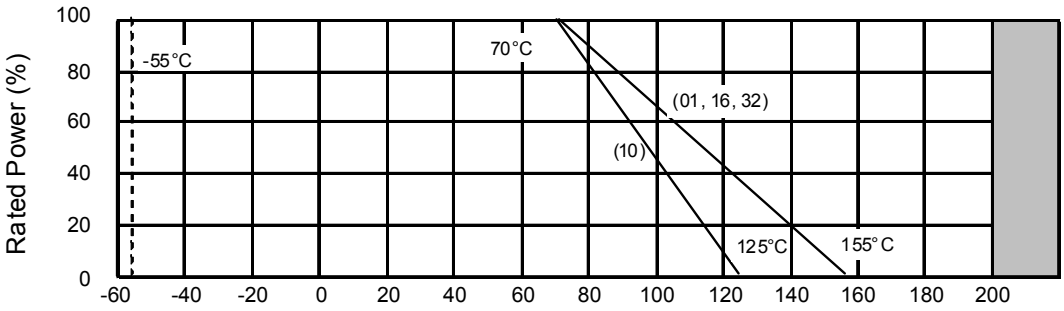
Type	Rated Current	Dielectric Withstanding Voltage	Resistance Tolerance
YCN01	0.5A	300V	≤ 50 mΩ
YCN10	1A	300V	< 50 mΩ
YCN16	1A	300V	< 50 mΩ
YCN32	1A	500V	< 50 mΩ

(b) Resistor Rated Power

Type	Rated Power	Max. Working Voltage	Max.Overload Voltage
YCN01	1/32W	12.5V	25V
YCN10	1/16W	25V	50V
YCN16	1/10W	50V	100V
YCN32	1/8W	200V	400V

Rated Power shall be the load power corresponding to nominal wattage suitable for continuous use at 70°C ambient temperature. In case the ambient temperature exceeds 70°C, reduce the load power in accordance with Derating curve in Fig. 1.

Fig.1 Power Derating Characteristics



3.2 Operating Temperature Range: -55°C ~+125°C (Type YCN 10)
-55°C ~+155°C (Type YCN 01, 16 & 32)

3.3 Storage Temperature Range: -5°C ~+40°C

3.4 Flammability Rating: Tested in accordance to UL94, V-0

3.5 Moisture Sensitivity Level Rating: Level 1

3.6 ASJ resistors are RoHS complaint in accordance to RoHS Directive 2002/95/EC.

3.7 Resistance Range, Resistance Tolerance and Temperature Coefficient of Resistance.

Table 2

Product	No. of Resistor	Resistance Range	Temperature Coefficient of Resistance	Resistance Tolerance
YCN 01	2	3Ω to 9.9Ω	±500ppm/°C	±2% & 5%
		10Ω to 999Ω	±300ppm/°C	
		1KΩ to 1MΩ	±200ppm/°C	
YCN 10	2, 4, 8	10Ω to 1MΩ	±250ppm/°C	±1% & ±2%
		10Ω to 1MΩ	±200ppm/°C	±5%
YCN 16	2, 4	1Ω to 1MΩ	±200ppm/°C	±1%, ±2% & 5%
YCN 32	4	1Ω to 1MΩ	±200ppm/°C	±1%, & ±5%
Zero Ohm Jumper		< 0.05Ω		

3.8 Rated Voltage

The rated voltage is calculated from the rated power and nominal resistance by the following formula:

$$E = \sqrt{P.R.}$$

Where E : Rated Voltage (V)
P : Rated Power (W)
R : Nominal Resistance (Ω)

In case the value calculated by the formula exceeds the maximum working voltage given in Table 1, the maximum working voltage in Table 1 shall be regarded as the rated voltage.

4.0 MARKING ON PRODUCT

The nominal resistance shall be marked on the surface of each resistor.

Table 3 Marking on product

Part Number	Color	Marking
YCN01 YCN10 YCN16 YCN32	Light Brown	← Tolerance : ±1.0% (F) Marking by four numerals ↑ Tolerance: ±2.0% (G), ±5.0% (J) Marking by three numerals → Chip jumper resistor The marking used shall be 0

4.1 Numeric Numbering

4.1.1 2% & 5% Tolerance: *Three Numerals Marking Standard*
First 2 digits are significant figures, third digit is number of zeros. Letter R is decimal point.

Example:

Nominal Resistance	***Marking***	***Remarks***
1 Ω	1R0	1 X 10^0 = 1
10 Ω	100	10 X 10^0 = 1 0
100 Ω	101	10 X 10^1 = 1 00
4.7K Ω	472	47 X 10^2 = 47 00
47K Ω	473	47 X 10^3 = 47 000
470K Ω	474	47 X 10^4 = 47 0000
4.7M Ω	475	47 X 10^5 = 47 00000

4.1.2 0.5% & 1% Tolerance: *Four Numerals Marking Standard*
First 3 digits are significant figures; fourth digit is number of zeros.

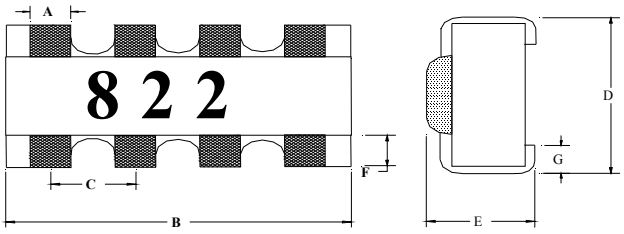
Example:

Nominal Resistance	***Marking***	***Remarks***
1 Ω	1R00	1 X 10^0 = 1
10 Ω	10R0	10 X 10^0 = 10
100 Ω	1000	100 X 10^0 = 100
4.7K Ω	4701	470 X 10^1 = 470 0
47K Ω	4702	470 X 10^2 = 470 00
470K Ω	4703	470 X 10^3 = 470 000
1M Ω	1004	100 X 10^4 = 100 0000

5.0 COMPONENT DIMENSION

5.1 Dimension

YCN TYPE (CONVEX)

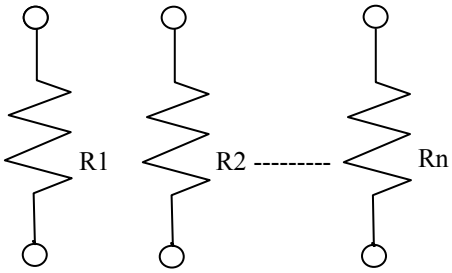


Type	Number of resistor	A	B	C	D	E	F	G
YCN01	2	0.35±0.10	0.80±0.10	(0.50)	0.60±0.10	0.30±0.05	0.15±0.10	0.15±0.05
YCN10	2	0.30±0.10	1.00±0.10	0.50±0.10	1.00±0.10	0.30±0.10	0.15±0.10	0.25±0.10
	4	0.33±0.10	2.00±0.10	0.50±0.10	1.00±0.10	0.40±0.10	0.20±0.10	0.25±0.10
	8	0.25±0.10	1.00±0.20	0.50±0.10	1.00±0.10	0.45±0.10	0.25±0.10	0.25±0.10
YCN16	2	0.50±0.15	1.60±0.20	0.80±0.05	1.60±0.20	0.50±0.10	0.30±0.15	0.30±0.15
	4	0.50±0.15	3.20±0.20	0.80±0.05	1.60±0.20	0.50±0.10	0.30±0.15	0.30±0.15
YCN32	4	1.10±0.15	5.08±0.20	1.27±0.05	3.20±0.20	0.60±0.10	0.50±0.20	0.50±0.15

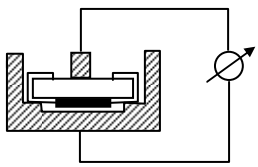
Unit of Measurement: mm

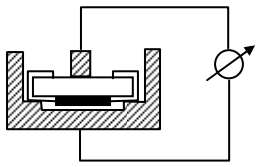
5.2 Schematic

n = 2, 4, 8



6.0 ELECTRICAL CHARACTERISTICS AND TEST CONDITIONS

CHARACTERISTICS		SPECIFICATIONS		TESTING CONDITIONS
		Zero Ohm	**Resistance**	
1	Resistance Value	≤ 50 mΩ	Resistance accuracy being fully rely with respect to tolerance of resistor.	***JIS C 5202 5.1*** Application time to be within 5 secs . Applied Voltage for resistance measurement : <10Ω 0.1V 10~99Ω 0.3V 100~999 1.0V 1K~ 9.9K 3.0 V 10K~ 99.9K 10.0 V 100K~999K 30.0 V 1M & Over 50.0 V
2	Resistance Temperature Coefficient	NA	Refer Section 3.4 Table 2	***JIS C 5202 5.2*** Measure R at t_o=25^{0}C and after 45 minutes measure R at t=125^{0}C. *Calculation :* $TCR(ppm/^0C)=\frac{R-R_0}{R_0} * \frac{1}{t-t_0} * 10^6$
3	Short Time Overload	≤ 50 mΩ	±(1%+0.05Ω) YCN01: 0.5%, 1%: ±(1.0% + 0.05Ω) 2%, 5% : ± (2.0% + 0.10Ω)	***JIS C 5202 5.5*** Apply at 2.5 times rated voltage for 5 seconds. Applied voltage shall not exceed maximum overload voltage or current.
4	Insulation Resistance	> 10G Ω		***JIS C 5202 5.6*** Apply 100V ± 15VDC for 1 minutes 

5	Dielectric Withstanding Voltage	No failure of resistor such as short-circuit, burning, breakdown.			***JIS C 5202 5.7*** Apply 300VAC for 1 minutes ± 10secs. 
		≤ 50 mΩ	±(1%+0.05Ω)		
6	Noise	NA	1~9Ω	<-10dB (0.32μv/v)	***JIS C 5202 5.9*** Vn(dB) = T –f(T-S) – D
			10~99Ω	<-5dB (0.52μv/v)	
			100~999Ω	<0dB (1.0μv/v)	
			1K~9.9KΩ	<10dB (3.2μv/v)	
			10K~99.9KΩ	<18dB (5.6μv/v)	
			100K~999.9KΩ	<20dB (10μv/v)	
			>1MΩ	<30dB (32μv/v)	
7	Terminal Strength - Bend Test	≤ 50mΩ	Tolerance resistor. With no evidence of mechanical damage after releasing the pressure. ±(1%+0.05Ω)		***JIS C 5202 6.1.4(1) Method 2*** Apply force till 3mm bend and hold for 30±1sec. Measure resistance while applying pressure.
8	Resistance to soldering heat	≤ 50mΩ	±(1%+0.05Ω)		***JIS C 5202 6.10*** A) Solder bath method Preheat: 120±10 °C for 40 secs. Resistor dipped entirely in solder bath of 260±5°C for 10±1sec. B) Reflow soldering method Peak : 250^{+5}_{-0} °C 230±5°C for 30 - 40secs. C) Soldering Iron method Bit temp.: 350±10°C Application time of soldering iron is 3 ±1 sec. After which the sample shall be left at ambient temperature for 1~ 2 hrs before measurement.

9	Solderability	≥ 95% Coverage		Precondition by baking 4 hours at 155°C. ***IEC 60068-2-58*** Solder bath method : Solder : Sn-3Ag-0.5Cu Flux : 25% Colophony, 75% 2-Propanol by weight. 245±5°C for 2^{+1}_{-0} sec
10	Resistance to Solvent	≤ 50mΩ	±(1%+0.05Ω) Marking shall be legible without mechanical damage in appearance.	***JIS C 5202 6.9*** Immerse in 20°C~25°C Isoproyl Alcohol solvent for 60±10secs.
11	Low Temperature	≤ 50mΩ	±(1%+0.05Ω)	***JIS C 5202 7.1*** -55±5°C for 1000 $\pm^{48}_{0}$ hours Sample shall be left at ambient temperature for 1~ 2 hrs after test before measuring final resistance.
12	Low Temperature with Load	≤ 50mΩ	±(1%+0.05Ω)	***JIS C 5202 7.1*** -55±5°C for 90 minutes, 0.1 rated continuous working voltage as per 3.5 shall be applied for 45 $\pm^{5}_{0}$ minutes. Voltage Sample shall be left at ambient temperature for ≈ 8 hrs after the removal of the voltage for 15 $\pm^{5}_{0}$ before measuring final resistance.
13	High Temperature	≤ 100mΩ	±(1%+0.05Ω)	***JIS C 5202 7.2*** 125±5°C for 1000 $\pm^{48}_{0}$ hours Sample shall be left at ambient temperature for 1~ 2 hrs after test before measuring final resistance.

14	Thermal Shock (Temperature Cycling)	≤ 50mΩ	±(0.5%+0.05Ω) for 1% tolerance resistor ±(1%+0.05Ω) for 2%, 5% tolerance resistor	***JIS C 5202 7.4*** Step Temp. (°C) Time (Minute) 1 -55±5 30 mins 2 25±5 5 mins max 3 155±5 30 mins 4 25±5 5 mins max Repeat step 1 to 4 for 5 cycles
15	Resistance to damp Heat (Humidity)	≤ 100mΩ	±(0.5%+0.05Ω) for 1% tolerance resistor ±(2.0%+0.05Ω) for 2%, 5% tolerance resistor	***JIS C 5202 7.5*** 40±5°C and 90~95%RH for $1000\pm_{0}^{48}$hours Sample shall be left at ambient temperature for 1~ 2 hrs after test before measuring final resistance.
16	Loadlife	≤ 100mΩ	±(1.0%+0.05Ω) for 1% tolerance resistor ±(3.0%+0.1Ω) for 2%, 5% tolerance resistor	***JIS C 5202 7.10*** At 70±5°C Apply DC rated voltage at 90minutes On, 30minutes Off for $1000\pm_{0}^{48}$hours Sample shall be left at ambient temperature for 1~ 2 hrs after test before measuring final resistance.
17	Intermittent Overload (YCN01)	50mΩ Lower	±(5.0% + 0.10Ω)	***JIS C5201-1 4.13*** Put the tested resistor in chamber under temperature 25±2°C and load 2.5 times rated DC voltage for 1sec on, 25sec off, $10000\ {}_{0}^{+400}$ test cycles, then it be left at no-load for 1 hour, then measure its resistance variance rate.

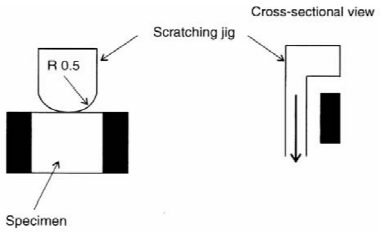
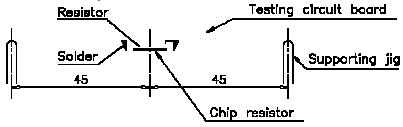
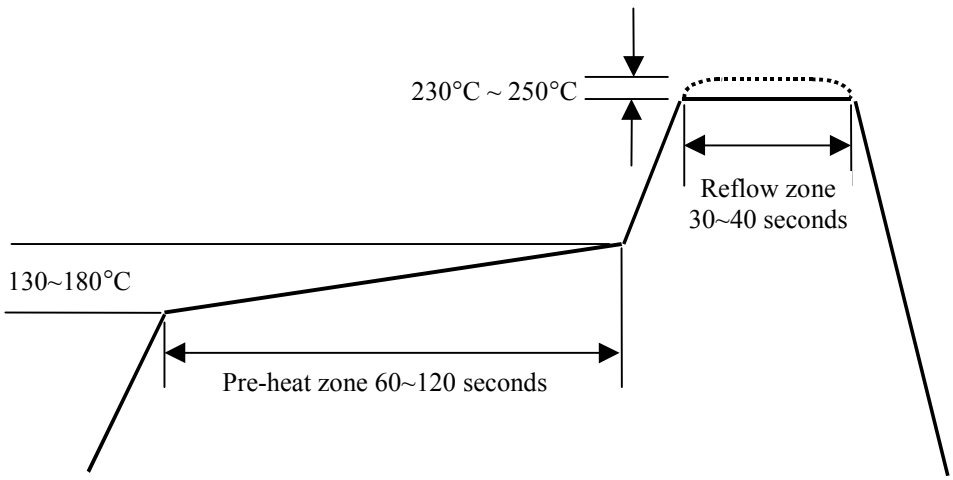
18	Joint strength of solder (YCN01)	50mΩ Lower	Test item 1: 1.△ R%=± (1.0%+0.05Ω) 2. No evidence of mechanical damage. No terminal peel off. Test item 2: 1.△ R%=± (1.0%+0.05Ω) 2. No evidence of mechanical. No terminal peel off and core body cracked. Test item 3: 1. Adhesion After application of temperature cycle, adhesion should be 50% or more of initial strength. 2. Bending strength: After application of temperature cycle, bending load should be 50% or more of initial strength.	***JIS-C5201-1 4.32 & 4.33*** Put the tested resistor in the apparatus of PCT, at a temperature of 105oC, humidity of 100% RH, and pressure of 1.22 x 105 Pa for duration of 4hours. Then after left the tested resistor in room temperature for 2 hours or more. Test method: (A) Test item 1 (Adhesion): A static load using a R0.5 scratch tool shall be applied on the core of the component and in the direction of the arrow and held for 10sec and under load measure its resistance variance rate: 1. YCN 01 = 5N load  (B) Test item 2 (Bending Strength) Solder tested resistor on the PC board, add force in the middle down, and under load measure its resistance variance rate. YCN01, D = 3mm  (C)Test item 3(Endurance measurement): Put the tested resistor in the chamber under the temperature cycle which shown in Table 1 shall be repeated 1000± 4 times consecutively. Then separate follow test item 1 and test item 2 50% condition to test, measured its resistance variance rate.

				Table 1 Temperature cycle test condition Lowest temperature: Testing condition: -35 ± 5 °C Highest temperature: 105 ± 5 °C Temperature – retaining time: 15 minutes each
19	Leaching test (YCN01)	1. Solder coverage over 95%. 2. The underlying material (such as ceramic) shall not be visible at the crest corner area of electrode.		The tested resistor is immersed into molten solder of 260 ± 5°C for 30 seconds. Then the resistor is left as placed under microscope to observe its solder area.
20	Resistance to dry heat (YCN01)	50mΩ Lower	±(1.0%+0.05Ω) for 0.5%, 1% tolerance resistor ±(2.0%+0.1Ω) for 2%, 5% tolerance resistor No evidence of mechanical damage.	***JIS-C5201-1 4.25*** Put tested resistors in chamber under temperature 155 ± 5°C for 96 ± 4 hours. Then leaving in room temperature for 60 minutes, and measure its resistance variance rate
21	Loading Life in Moisture (YCN01)	50mΩ Lower	±(2.0%+0.10Ω) for 0.5%, 1% tolerance resistor ±(3.0%+0.10Ω) for 2%, 5% tolerance resistor No evidence of mechanical damage.	***JIS-C5201-1 4.24*** Put the tested resistor in the chamber under temperature 40±2°C, relative humidity 90~95% and load the rated voltage 90minutes on, 30minutes off, total 1000 hours. Then leaving the tested resistor in room temperature for 60minutes, and measure its resistance variance rate.
22	Whisker test (YCN 01)	Max 50μm		(A) Test item 1(Thermal Shock test): Min storage temp.: -40 ± 2°C Max storage temp.: 85 ± 2°C Temp.- retaining time: 7 mins No. of temp. cycles: 1,500

			(B) Test item 2 (Constant temperature/ humidity test) Temperature: 85°C Humidity: 85% Testing duration: 500 ± 4 hours (C) Inspection: Inspect for whisker formation on specimens that underwent the acceleration test specified in sub clause 4.2, with a magnifier (stereomicroscope) of about 40 or higher magnification. If judgment is hard in this method, use a scanning electron microscope (SEM) of about 1,000 higher magnifications.

6.1 Soldering Profile

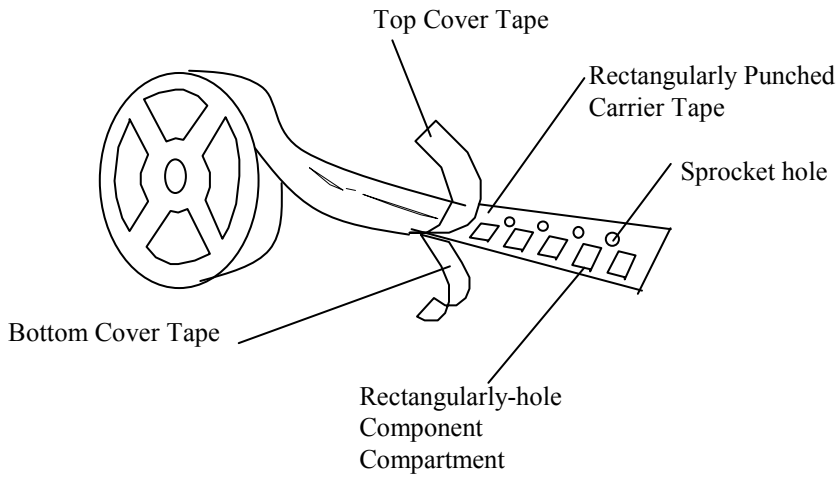
6.1.1 Reflow Soldering



7.0 TAPING

7.1 Structure of Taping

Taping of Rectangularly Punched Carrier System



7.2 Materials

(1) Every taping shall consist of materials as shown in Table 4.

(2) Every taping shall not adversely affect the mechanical, electrical and solderability performances.

(3) Materials of taping shall generate no statics.

(4) The taped products are stored at a temperature -5 to +40°C and a relative humidity 40 to 60% without exposing to direct sunlight and, after such conditioning, the tape shall show no deterioration in performances such as change in adhesion force or peel forces.

Table 4 Materials of Taping

Type	Carrier Tape	Top Cover Tape	Bottom Cover Tape
Taping of Rectangularly Punched Carrier System	Paper	Thermal adhesion polyester	Thermal adhesion paper

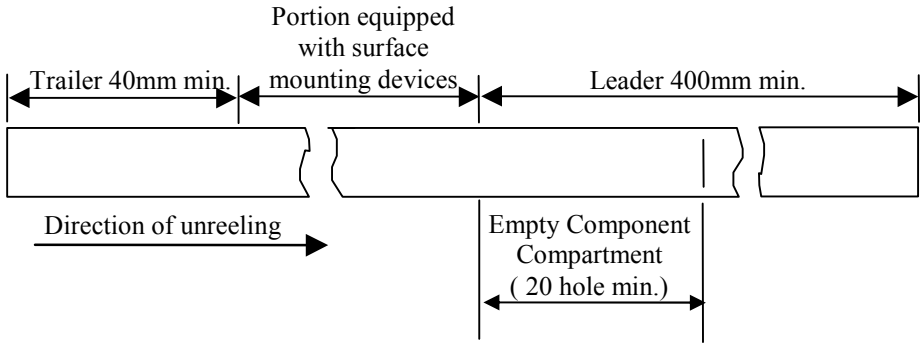
7.3 Leader and Trailer Tape

1) Leader Tape The length of leader tape shall be at least 400 mm including 20 or more of rectangular holes (component compartments) in which no component is placed. The 20 or more empty component compartments shall be sealed with the top cover tape (see Fig. 2).

2) Trailer Tape The trailer tape at the hub of reel shall be least 40 mm in length including carrier tape with empty component compartments. The empty component compartments shall be sealed with the top cover tape.

The last portion of the carrier tape shall release from the reel hub.

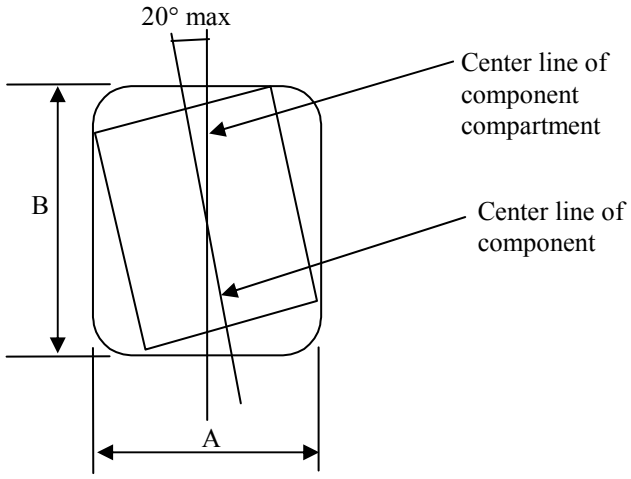
Fig. 2 Explanation of Leader and Trailer Tape



7.4 Position of Taped Component

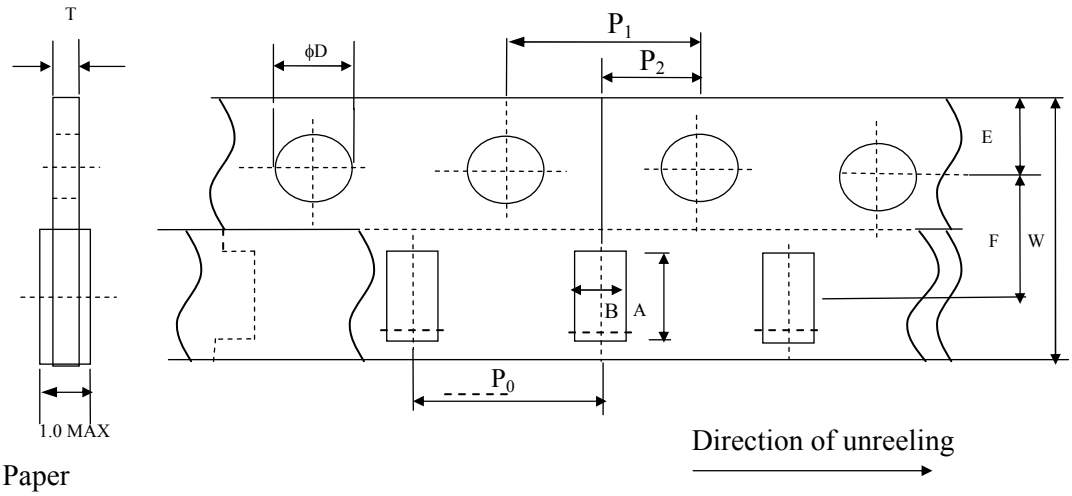
Position of Taped component The angle made by the center line of taped component and the center line of component compartment shall not exceed 20 degrees (see Fig. 3).

Fig. 3 Angle between Center Line of Component and Center Line of Component compartment



7.5 Tape Dimension

7.5.1 Paper Tape



Paper
[Punched]

Remark: Pitch tolerance over any 10 pitches of Po is ± 0.20 mm

Type	No of resistor	A	B	W	E	F	T	Po,P1	P2	ϕD
YCN01	2	0.90±0.10	0.70±0.10	8.00±0.20	1.75±0.10	3.50±0.05	0.43±0.10	2.00±0.10 , 4.00±0.05	2.00±0.05	1.50±0.10
YCN10	2	1.20±0.10	1.20±0.10	8.00±0.20	1.75±0.10	3.50±0.05	0.45±0.10	4.00±0.10	2.00±0.05	1.50±0.10
	4	2.20±0.10	2.00±0.20	8.00±0.20	1.75±0.10	3.50±0.05	0.45±0.10	4.00±0.10	2.00±0.05	1.50±0.10
	8	4.30±0.20	1.90±0.20	12.0+0.20	1.75±0.10	5.5±0.05	0.60±0.10	4.00±0.10	2.00±0.05	1.50±0.10
YCN16	2	1.90±0.10	1.90±0.20	8.00±0.20	1.75±0.10	3.50±0.05	0.75±0.10	4.00±0.10	2.00±01.05	1.50±0.10
	4	3.50±0.10	2.00±0.20	8.00±0.20	1.75±0.10	3.50±0.05	0.75±0.10	4.00±0.10	2.00±01.05	1.50±0.10
YCN32	4	5.60±0.20	3.50±0.20	12.00±0.30	1.75±0.10	5.50±0.05	0.75±0.10	4.00±0.10	2.00±0.05	1.50±0.10

Unit of Measurement: mm

7.6 Performance of Taping

7.6.1 Strength of carrier tape and top cover tape
When a tensile force of 10N (1.02 kgf) is applied in the direction of unreeling the tape, the carrier tape and top cover tape shall withstand this force.

7.6.2 Peel force of top cover tape

The peel force of top cover tape shall be 0.1N to 0.7N (10 to 70 gf) when the top cover tape is pulled at a speed of 200mm/min with the angle between the tape during peel and the direction of unreeling maintained at 165 to 180 degree as illustrated in Fig 4.

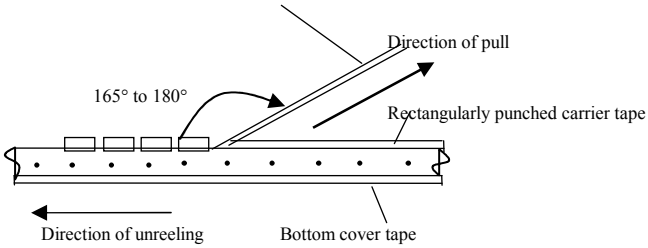


Fig. 4 Peeling Test

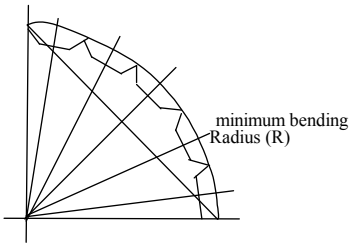
7.6.3 Minimum Bending Radius

When the tape is bent with the minimum bending radius specified in Fig 5 and Table 5, components shall maintain their position and shall be free from abnormalities such as damage.

Table 5

Type	Minimum Bending Radius
YCN32	25.0 mm
YCN16	30.0 mm
YCN10	40.0 mm

Fig. 5 Explanation of Minimum Bending Radius



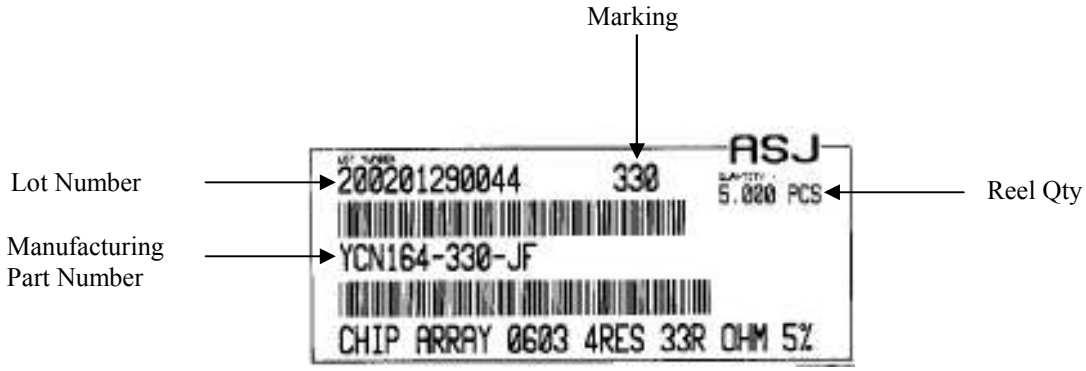
7.7 Packaging

7.7.1 Standard Packaging Pan Size

Packaging	No. of Resistor	2	4	8
Tape	YCN01	10000	-	-
	YCN10	10000	10000	5000, 10000
	YCN16	5000	5000	-
	YCN32	-	4000	-

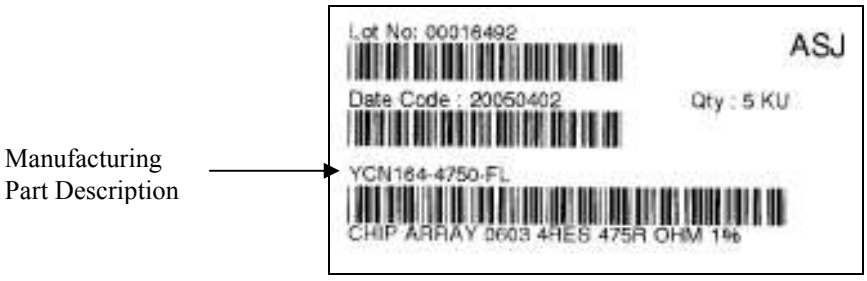
7.7.2 Identification

A label indicating product type, resistance value and tolerance shall be pasted on the surface of each reel.



How to read lot Number:

XXXX	XX	XX	XXXX
Year	Mth	Day	Serialize Number



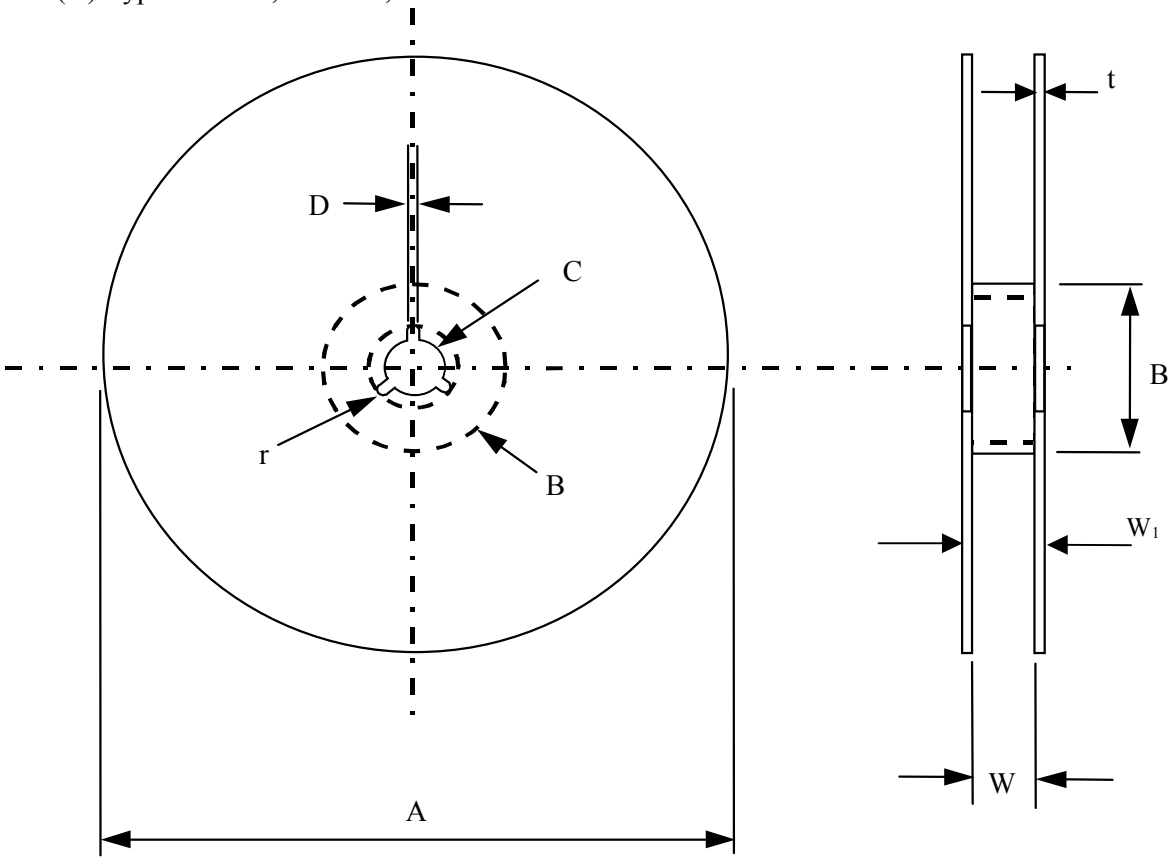
Lot Number : 8 digits running numbers

Date Code : YYYYMMDD

YYYY - Year
MM - Month
DD - Date

7.7.3 Reel Dimension

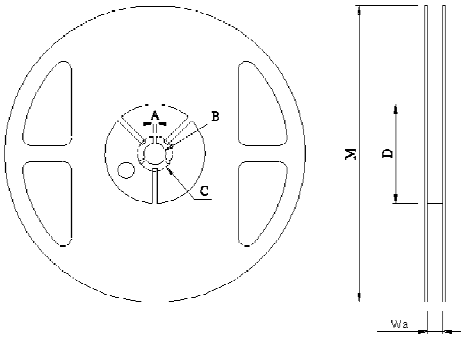
(A) Type YCN 10, YCN 16, YCN 32



TYPE	NO OF RESISTOR	A	B	C	D	W	W_1	t	r
YCN10	2	ϕ178±2.0	$\phi 60^{+1}_{0}$	13± 0.2	2.0± 0.5	11±1.0	14.4 max	1.0± 0.1	1.0
	4	ϕ178±2.0	$\phi 60^{+1}_{0}$	13± 0.2	2.0± 0.5	11±1.0	14.4 max	1.0± 0.1	1.0
	8	ϕ178±2.0	$\phi 80^{+1}_{0}$	13± 0.2	2.0± 0.5	16.5±1.5	20.0 max	1.0± 0.1	1.0
YCN16	2	ϕ178±2.0	$\phi 60^{+1}_{0}$	13± 0.2	2.0± 0.5	11±1.0	14.4 max	1.0± 0.1	1.0
	4	ϕ178±2.0	$\phi 60^{+1}_{0}$	13± 0.2	2.0± 0.5	11±1.0	14.4 max	1.0± 0.1	1.0
YCN32	4	ϕ178±2.0	$\phi 60^{+1}_{0}$	13± 0.2	2.0± 0.5	11±1.0	14.4 max	1.0± 0.1	1.0

Unit of Measurement : mm

(B) Type YCN 01



Reel Type / Tape	Wa	M	A	B	C	D
7'' reel for 8mm tape	9.0 ± 0.5	178 ± 2.0	2.0 ± 0.5	13.5 ± 0.5	21.0 ± 0.5	60.0 ± 1.0

Unit of Measurement : mm

8.0 APPLICABLE STANDARDS

JIS C 5202	Test Methods of Fixed Resistors for Electronic Equipment.
JIS C 0806	Packaging of Electronic Components on continuous tapes (surface mount devices).
MIL-STD-202	Test Methods for Electronic and Electrical Parts.
IPC/JEDEC J STD 020B	Moisture / Reflow sensitivity classification for non hermetic solid state surface mount devices.
2002/95/EC	RoHS Directive
IEC 60068-2-58	Solderability