Towards Excellence in *Quality, Service & Innovation*

ASJ

DATA SHEET

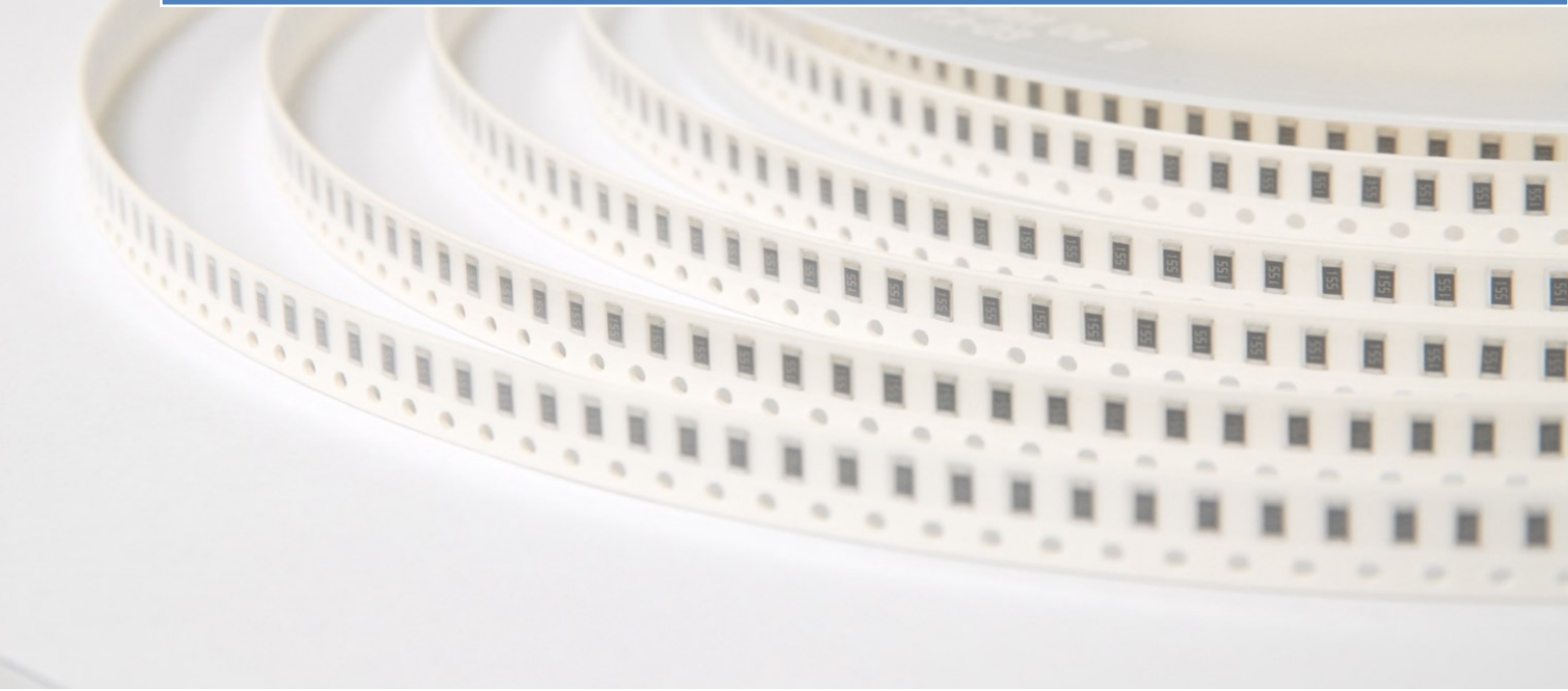
Fully Lead-Free Thick Film Chip Resistors

CRF Series

1% TO 5%, TCR -200 TO +600

SIZE: 01005

RoHs Compliant



Product Specification – June 24, 2020 V.3

1. SCOPE

1.1 This specification is applicable to fully lead-free and halogen free CRF series thick film chip resistors.

1.2 The fully lead-free products – No RoHS exemptions.

1.3 This product is for general purpose.

2. PART NUMBERING SYSTEM

Part Numbering is made in accordance with the following system:

CRF	03	-	100		-	J	Y
Type	Size (Inch/mm)		Nominal Resistance			Resistance Tolerance	Packaging
Fully Lead Free Thick Film Chip Resistors	03(01005)		5% (3-Digit)	EX. 10Ω=100 4.7Ω=4R7 Jumper=000		F=±1% J=±5% Z=Zero Ohm	Y=20,000 pcs Lead Free
			1% (4 Digit)	EX. 10.2Ω=10R2 10KΩ=1002 Jumper=0000			

3. RATING

3.1 Rated Power

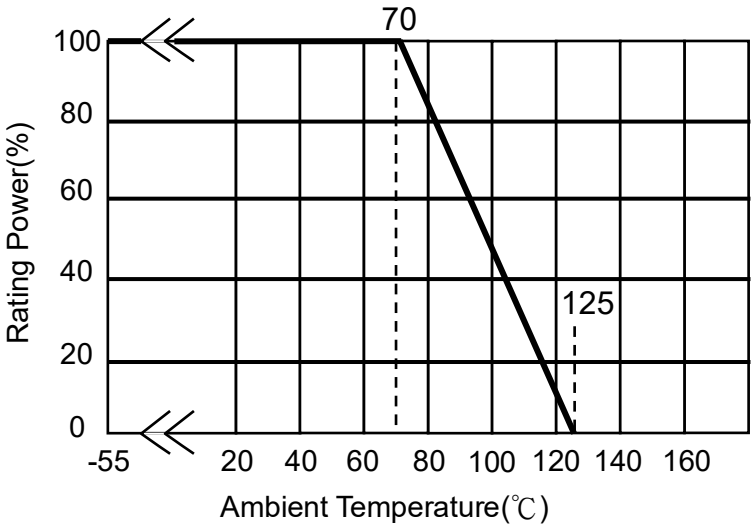
3.1.1. Resistor Range

Type	Rated Power at 70℃	Max. Working Voltage	Max. Overload Voltage
CRF03 (01005)	$\frac{1}{32}$W	15V	30V

3.2 Power Derating Curve

Operating Temperature Range： - 55～125 ℃

If the ambient temperature exceeds 70 degrees centigrade to 125 degrees centigrade, the power can be modified by the curve as below.



3.3 Standard Atmospheric Condition

Unless otherwise specified, the standard range of atmospheric conditions for making measurements and tests is as follows:

Ambient Temperature = + 5°C to +35°C

Relative Humidity = < 85% RH

Air Pressure = 86 kPa to 106kPa

If there may be any doubt about the results, measurement shall be made within the following limits:

Ambient Temperature = 20 ± 2°C

Relative Humidity = 60 to 70% RH

Air Pressure = 86 kPa to 106kPa

3.4 Operating Temperature Range -55°C to +125°C

3.5 Storage Temperature Range -5°C to + 40°C / < 85% RH

3.6 Flammability Rating Tested in accordance to UL-94, V-0

3.7 Moisture Sensitivity Level Rating: Level 1

3.8 Product Assurance ASJ resistor shall warranty 24 months from the date of shipment.

3.9 ASJ resistors are RoHS compliance in accordance to RoHS Directive.

3.10 Resistance, Resistance Tolerance and Temperature Coefficient of Resistance.

Type	Rated Power at 70℃	Max. Working Voltage	Max. Overload Voltage	T.C.R (ppm/℃)	Resistance Range		JUMPER (0Ω) Rated Current	JUMPER (0Ω) Resistance Value
					F(±1%) E-24、E-96	J(±5%) E-24		
CRF03 (01005)	$\frac{1}{32}$W	15V	30V	-200 +600	1Ω≦R<10Ω	1Ω≦R<10Ω	0.5A	50mΩ MAX
				±250	10Ω≦R≦1MΩ	10Ω≦R≦1MΩ		
Operating Temperature Range				-55℃ ~ +125℃				

3.11 Voltage Rating

Rated Voltage: DC voltage or AC voltage (rms) based on the rated power.

The voltage can be calculated by the following formula. If the calculated value exceeds the Max. voltage specified in the Table 3.1, the Max. voltage rating is set as the voltage rating.

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

E= Voltage rating (v)

P= Power rating (w)

R= Nominal resistance(Ω)

3.12 All product, product specifications and data are subject to change without notice to improve reliability, function or design or otherwise.

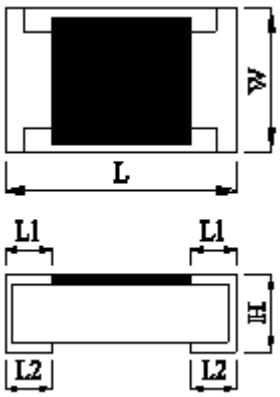
4. MARKING ON PRODUCT

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

Part Number	Color	Marking on Product
CRF03 (01005)	-	No marking

5. DIMENSIONS, CONSTRUCTIONS AND MATERIALS

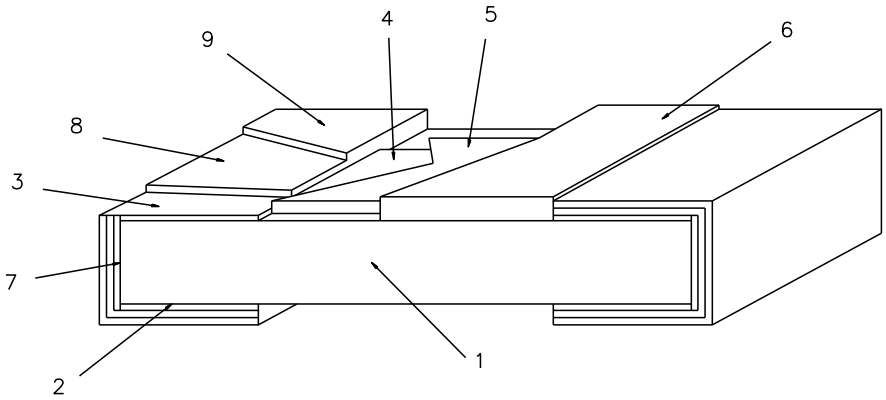
5.1 Dimensions



Unit:mm

Type \ Dimension / Size Code	L	W	H	L1	L2
CRF03	01005	0.40±0.02	0.20±0.02	0.13±0.02	0.10±0.03	0.10±0.03

5.2 Structure graph



1	Ceramic substrate	6	2nd Protective coating
2	Bottom inner electrode	7	Terminal inner electrode
3	Top inner electrode	8	Ni plating
4	Resistive layer	9	Sn plating
5	1st Protective coating		

5.3 Plating Thickness:

5.3.1 Ni:≧1μm

5.3.2 Sn(Tin):≧3μm

5.3.3 Sn(Tin):Matte Sn

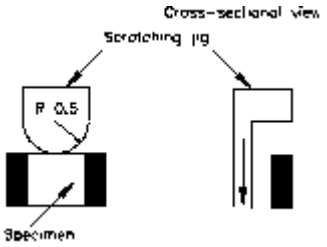
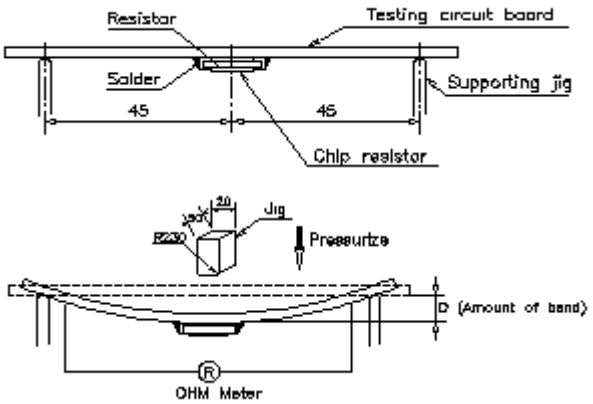
6. Reliability Test

6.1 Electrical Performance Test

Item	Conditions	Specifications	
		Resistors	Jumper
Temperature Coefficient of Resistance	$TCR(ppm/^{\circ}C) = \frac{(R2-R1)}{R1(T2-T1)} x10^6$ R1: Resistance at room temperature R2: Resistance at -55℃ or +125℃ T1: Room temperature T2: Temperature -55℃ or +125℃ Refer to JIS-C5201-1 4.8	Refer to item 3.10	NA
Short Time Overload	Applied 2.5 times rated voltage for 5 seconds and release the load for about 30 minutes, then measure its resistance variance rate. (Rated voltage refer to item 3.10 general specifications) Jumper : Applied Maximum overload current 1.25A. Refer to JIS-C5201-1 4.13	△R%=±2.0%	Refer to item 3.10
		No evidence of mechanical damage. No short or burned on the appearance.	
Dielectric Withstand Voltage	Put the resistor in the fixture, add 100VACin +,- terminal for. 1 minute. Refer to JIS-C5201-1 4.7	No short or burned on the appearance.	
Intermittent Overload	Put the tested resistor in chamber under temperature 25±2℃ and load 2.5 times rated DC voltage for 1 sec on, 25 sec off, 10000^{+400}_{-0} test cycles, then it be left at no-load for 1 hour , then measure its resistance variance rate. Jumper : Applied Maximum overload current:1.25A. Refer to JIS-C5201-1 4.13	△R%=±2.0%	Refer to item 3.10
		No evidence of mechanical damage. No short or burned on the appearance.	

6.2 Mechanical Performance Test

Item	Conditions	Specifications	
		Resistors	Jumper
Solderability	Preconditioning Put the tested resistor in the apparatus of PCT, at a temperature of 105℃, humidity of 100% RH, and pressure of 1.22×10^5 Pa for a duration of 4 hours. Then after left the tested resistor in room temperature for 2 hours or more. Test method: The resistor be immersed into solder pot in temperature 235±5℃ for 2 sec, then the resistor is left as placed under microscope to observed its solder area. Refer to JIS-C5201-1 4.17	Solder coverage over 95%	
Resistance to Soldering Heat	◎Test method 1 (Solder pot test): The tested resistor be immersed into molten solder of 260^{+5}_{-0} ℃ for 10 seconds. Then the resistor is left in the room for 1 hour. ◎Test method 2 (Solder pot test): The tested resistor be immersed into molten solder of 260^{+5}_{-0} ℃ for 30 seconds. Then the resistor is left as placed under microscope to observe its solder area. ◎Test method 3 (Electric iron test): Preheating temperature : 350±10℃ Electric iron preheating time : 3^{+1}_{-0} sec Preheating the electric iron on electrode termination, as after that step placed the iron over 60 min. and measured its resistance variance rate. Refer to JIS-C5201-1 4.18	Test item 1: (1).Variance rate on resistance: △R%=±2.0% (2).No evidence of electrode damage. No side conductive peeling off. Test item 2: (1).Solder coverage over 95%. (2).The underlying material (such as ceramic) shall not be visible at the crest corner area of the electrode. Test item 3: (1).Variance rate on resistance: △R%=±2.0% (2).No evidence of electrode damage. No side conductive peeling off.	Refer to item 3.10

Item	Conditions	Specifications	
		Resistors	Jumper
Joint Strength of Solder	Preconditioning Put tested resistor in the apparatus of PCT, at a temperature of 105°C, humidity of 100% RH, and pressure of 1.22×10^5 Pa for a duration of 4 hours. Then after left the specimen in a temperature for 2 hours or more. ◎Test item 1 (Adhesion): A static load using a R0.1 scratch tool shall be applied on the core of the component and in the direction of the arrow and held for 10 seconds and under load measured its resistance variance rate. Load:5N  Refer to JIS-C5201-1 4.32 ◎Test item 2 (Bending Strength): Solder tested resistor on to PC board add force in the middle down, and under load measured its resistance variance rate. D:3mm  Refer to JIS-C5201-1 4.33	Test item 1: (1).Variance rate on resistance △R%=±1.0% (2).No evidence of mechanical damage. No terminal peeling off. Test item 2: (1).Variance rate on resistance: △R%=±1.0% (2).No evidence of mechanical damage. No terminal peeling off and core body cracked.	Refer to item 3.10

6.3 Environmental Test

<table>
<tr><th rowspan="2">Item</th><th rowspan="2">Conditions</th><th colspan="2">Specifications</th></tr>
<tr><th>Resistors</th><th>Jumper</th></tr>
<tr><td rowspan="2">Resistance to Dry Heat</td><td rowspan="2">Put tested resistor in chamber under temperature 125±3℃ for 1000^{+48}_{-0} hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate.

Refer to JIS-C5201-1 4.25</td><td>△R%=±2.0%</td><td>Refer to item 3.10</td></tr>
<tr><td colspan="2">No evidence of mechanical damage.
No short or burned on the appearance.</td></tr>
<tr><td rowspan="2">Thermal Shock</td><td rowspan="2">Put the tested resistor in the chamber under the Thermal Shock which shown in the following table shall be repeated 300 times consecutively. Then leaving the tested resistor in the room temperature for 1 hours, and measure its resistance variance rate.
<table>
<tr><th colspan="2">Testing Condition</th></tr>
<tr><td>Lowest Temperature</td><td>-55±5℃</td></tr>
<tr><td>Highest Temperature</td><td>125±5℃</td></tr>
<tr><td>Temperature-retaining time</td><td>15 minutes each</td></tr>
</table>
Refer to MIL-STD 202 Method 107</td><td>△R%=±2.0%</td><td>Refer to item 3.10</td></tr>
<tr><td colspan="2">No evidence of mechanical damage.
No short or burned on the appearance.</td></tr>
<tr><td rowspan="2">Loading Life in Moisture</td><td rowspan="2">Put the tested resistor in the chamber under temperature 40±2℃, relative humidity 90~95% and load the rated voltage for 90 minutes on, 30 minutes off, total 1000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate.

Refer to JIS-C5201-1 4.24</td><td>△R%=±5.0%</td><td>Refer to item 3.10</td></tr>
<tr><td colspan="2">No evidence of mechanical damage.
No short or burned on the appearance.</td></tr>
<tr><td rowspan="2">Load Life</td><td rowspan="2">Put the tested resistor in chamber under temperature 70±2℃ and load the rated voltage for 90 minutes on, 30 minutes off, total 1000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate.

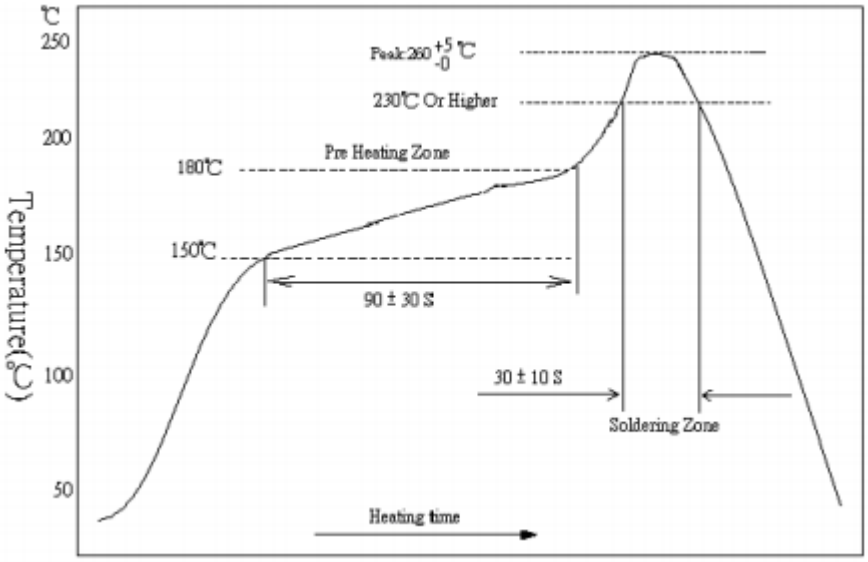
Refer to JIS-C5201-1 4.25</td><td>△R%=±5.0%</td><td>Refer to item 3.10</td></tr>
<tr><td colspan="2">No evidence of mechanical damage.
No short or burned on the appearance.</td></tr>
<tr><td rowspan="2">Low Temperature Operation</td><td rowspan="2">Put the tested resistor in the chamber at room temperature 25℃.Decreasing the temperature to -55℃ and keep the temperature at -55℃ for 1 hour. Then load the rated voltage for 45 minutes on, and 15 minutes off. Then leaving the tested resistor in room temperature for 8±1 hours, and measure its resistance variance rate.

Refer to MIL-R-55342D 4.7.4</td><td>△R%=±2.0%</td><td>Refer to item 3.10</td></tr>
<tr><td colspan="2">No evidence of mechanical damage.
No short or burned on the appearance.</td></tr>
</table>

6.4 Technical application notes: This is for recommendation, customer are please to perform adjustment according to actual application)

Soldering Profile

6.4.1 Lead Free IR Reflow Soldering Profile



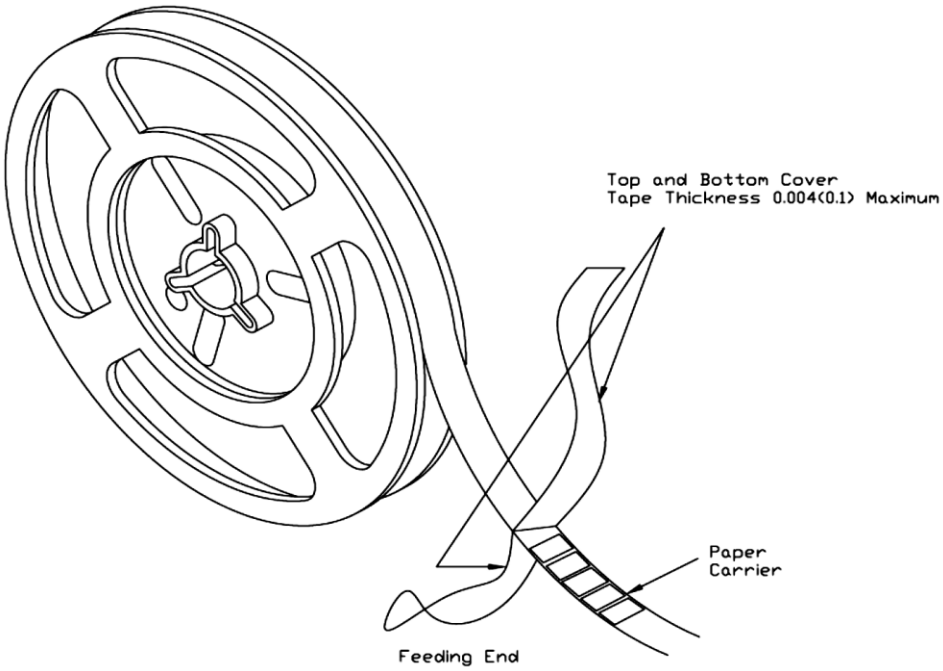
Remark: The peak temperature of soldering heat is 260^{+5}_{-0} ˚C

6.4.2 Soldering Iron: Temperature 350˚C±10˚C, dwell time shall be less than 3 sec.

7. TAPING

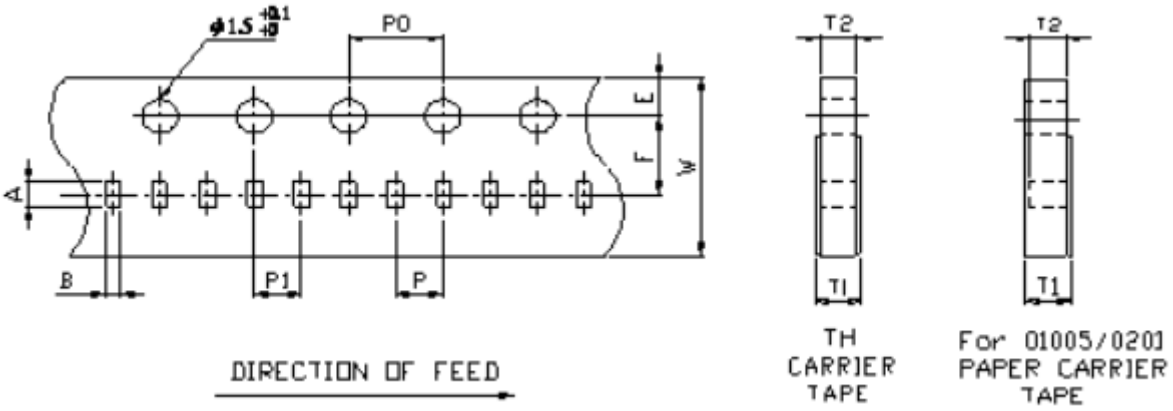
7.1 Structure of Taping

Paper Carrier



7.2 Dimension

7.2.1 Dimension of Punched Paper Tape Carrier System (CRF03)



Remark: Pitch tolerance over any 10 pitches of Po is ± 0.2 mm

Dimension of Punched Paper Tape Carrier System (CRF03)

(unit : mm)

Code	A	B	W	E	F	T1
CRF03	0.43±0.03	0.23±0.03	8.00±0.30	1.75±0.10	3.50±0.05	0.31±0.03

Code	T2	P	P0	10xP0	P1
CRF03	0.17±0.03	2.00±0.05	4.00±0.05	40.0±0.20	2.00±0.05

7.3 Packaging

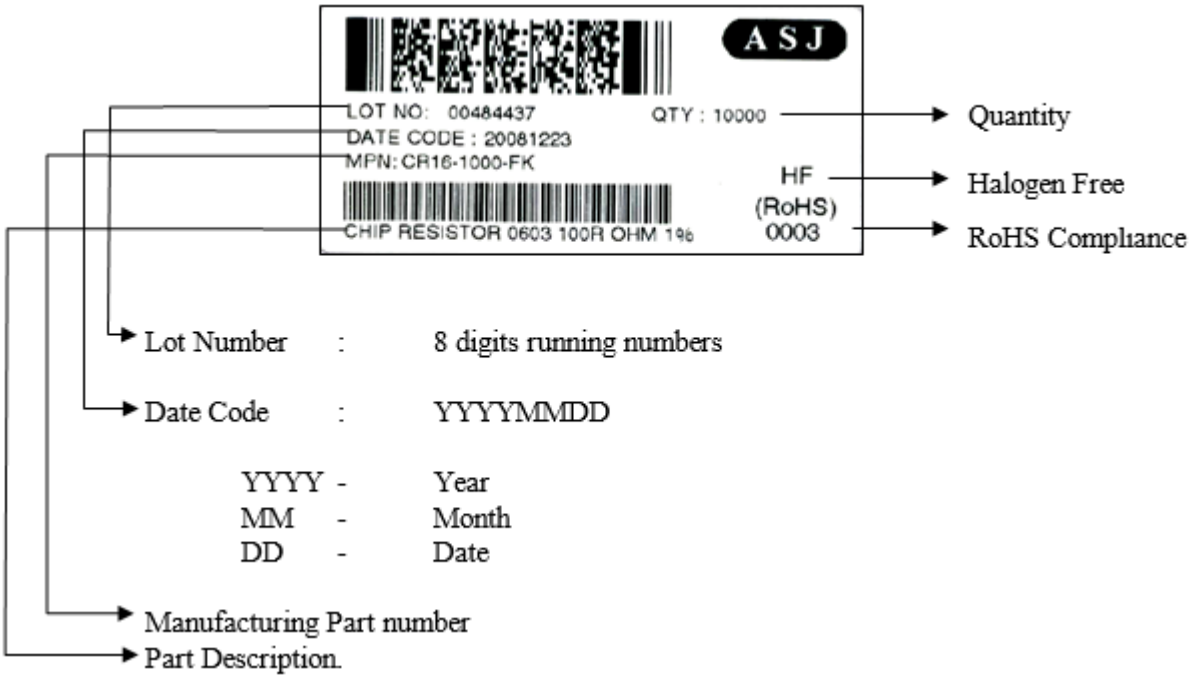
7.3.1 Taping

7.3.2 Quantity – Tape and Reels

Packaging Quantity(pcs/reel)				
Punch Paper Carrier Tape				
Code	2mm Pitch	4mm Pitch	Model	Remark
CRF03	20,000 pcs	-----	7" Reel	-----

7.3.3 Identification

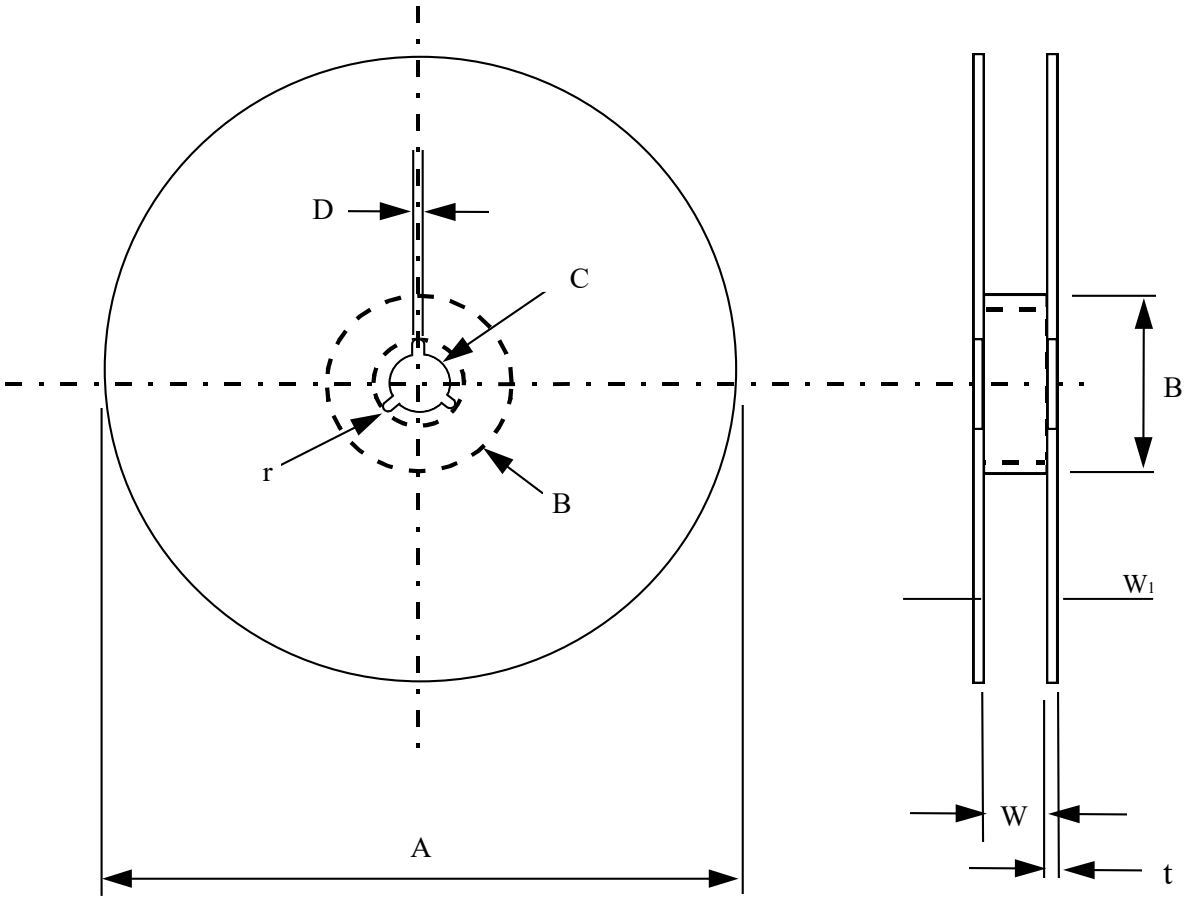
Production label that indicates the 8 digits lot number, product type, resistance value and tolerance shall be pasted on the surface of each reel.



7.3.4 Packaging Reel Box

Dimension	Reel Box	Number of Reels
185 × 60 × 186 mm	25K Box	5
185 × 120 × 186 mm	50K Box	10

7.3.5 Reel Dimensions

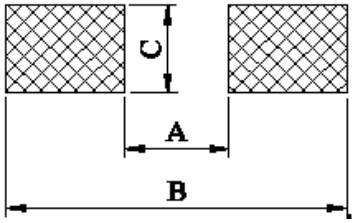


Model	A	B	C	D	W	W_1	t	r
7"Reel (5K) (except 0201 & 0402 10K)	ϕ178±2.0	ϕ60min	13± 0.2	ϕ2.0± 0.5	11± 0.1	14.4 max	1.0± 0.1	1.0
7"Reel (4K)	ϕ178±2.0	ϕ60min	13± 0.2	ϕ2.0± 0.5	13±1.0	14.4 max	1.2± 0.1	1.0
10"Reel (10K)	ϕ254±2.0	ϕ60min	13± 0.2	ϕ2.0± 0.5	11± 1.0	14.4 max	1.5± 0.1	1.0
13"Reel (20K, 50K)	ϕ330±2.0	ϕ60min	13± 0.2	ϕ2.0± 0.5	11± 1.0	14.4 max	2.1± 0.1	-
13"Reel (20K,50K)	ϕ330±1.0	ϕ100±1	13.5±0.5	2~3±0.5	10±0.5	-	-	-

8. SURFACE MOUNT LAND PATTERNS Design (For Reflow Soldering)

When a component is soldered, the resistance after soldering changes slightly depending on the size of the soldering area and the amount of soldering. When designing a circuit, it is necessary to consider the effect of a decrease or increase in its resistance

Unit: mm



TYPE \ DIM	A	B	C
CRF03	0.20	0.50	0.20

9. REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version.1	20.03.2019		Initial Release
Version.2	31.12.2019		Typo error in clause 8
Version.3	24.06.2020		Revise clause 2 part numbering system Revise clause 3.5