

DATA SHEET

Anti Surge Thick Film Chip Resistor

CPS Series

1% TO 20%, TCR ± 200 TO ± 400

SIZE: 0805 & 1206

RoHs Compliant

ANTI SURGE THICK FILM CHIP RESISTOR

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DS-ENG-017

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1. SCOPE

- 1.1 This specification is applicable to lead and halogen free CPS series anti-surge thick film chip resistors.
- 1.2 Lead free products mean lead free termination meets RoHS requirement. Pb contained in glass material of resistor element is exempted by RoHS directive.

2. PART NUMBERING SYSTEM

Part Numbering is made in accordance with the following system:

CPS	21	-	XXXX	-	F	L
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Type	Size (Inch / mm)	Nominal Resistance		Resistance Tolerance	Packaging
Anti-Surge Thick Film Chip Resistors	21 (0805/2012)	Resistors	E24 Series	F = ±1%	L = 5,000 pcs Lead Free
	32 (1206/3216)		3-Digit	J = ±5%	
			4-Digit	K = ±10%	
			E96 Series	M = ±20%	
			10.2Ω=10R2		
			10KΩ=1002		

3. RATING

3.1 Rated Power

3.1.1 Resistor Rated Power

Product Type	Power Rating @ 70°C	T.C.R (ppm/°C) Max	Max Working Voltage	Max Overload Voltage
CPS21 (0805)	1/4W	±400	150V	200V
		±200		
CPS32 (1206)	1/3W	±400	200V	400V
		±200		



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3.2 Power Derating Characteristics

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

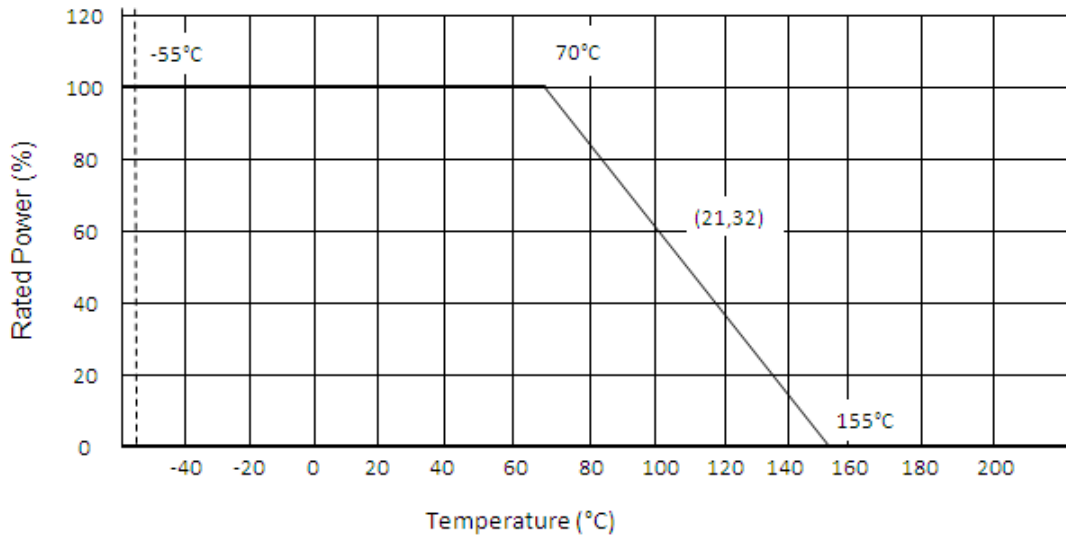


Fig.1 Power Derating Characteristics

3.3 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 = $20 \pm 2^\circ\text{C}$

Relative Humidity = 60 to 70% RH

Air Pressure = 86 kPa to 106kPa

3.4 Operating Temperature Range -55°C to +155°C

3.5 Storage Temperature Range -5°C to + 40°C

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

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- 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 2011/65/EU.
- 3.10 Resistance, Resistance Tolerance and Temperature Coefficient of Resistance.

Product Type	Power Rating @ 70°C	T.C.R (ppm/°C) Max	Resistance Range				Max Working Voltage	Max Overload Voltage	Operating Temperature Range
			F(±1%)	J(±5%)	K(±10%)	M(±20%)			
			E-96	E-24	E-24	E-24			
CPS21 (0805)	1/4W	±400	1Ω ≤ R < 10Ω				150V	200V	-55°C to +155°C
		±200	10Ω ≤ R ≤ 100KΩ						
CPS32 (1206)	1/3W	±400	1Ω ≤ R < 10Ω				200V	400V	
		±200	10Ω ≤ R ≤ 100KΩ						

3.11 Rated Voltage

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

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

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 Section 3.1.2, the maximum working voltage in Section 3.1.2 shall be regarded as the rated voltage.

3.12 Document review period: every 3 months

4. MARKING ON PRODUCT

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

Part Number	Color	Marking on Product
CPS21 (0805)	Light Yellow	1) Tolerance : +/-1.0% (F) ° Four Numerals Marking (E96 Series) ° 0603 Three Characters Marking based on E-96 marking standard.
CPS32 (1206)	Light Yellow	2) Tolerance; ± 2.0% (G), ±5.0% (J), ±10%(K), ±20% (M) Three Numerals Marking

4.1 Numeric Numbering

4.1.1 1% Tolerance : **Four Numerals Marking**

First 3 digits are significant figures; fourth digit is number of zeros.

Examples:

<i>Nominal Resistance</i>	<i>Marking</i>	<i>Remarks</i>
1 Ω	1R00	$1 \times 10^0 = 1$
10 Ω	10R0	$10 \times 10^0 = 10$
100 Ω	1000	$100 \times 10^0 = 100$
4.7K Ω	4701	$470 \times 10^1 = 4700$
47K Ω	4702	$470 \times 10^2 = 47000$
470K Ω	4703	$470 \times 10^3 = 470000$
1M Ω	1004	$100 \times 10^4 = 1000000$

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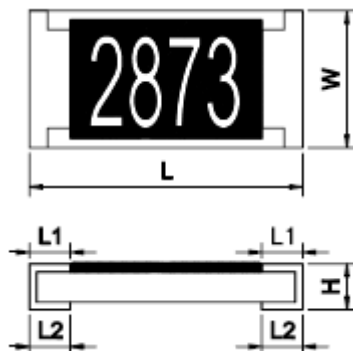
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5. DIMENSIONS, CONSTRUCTIONS AND MATERIALS

5.1 Dimensions



Unit: Inches (Millimeters)

Type	L	W	H	l ₁	l ₂
CPS21 (0805)	0.079±0.004 (2.00± 0.10)	0.05±0.004 (1.25± 0.10)	0.020±0.004 (0.50± 0.10)	0.014±0.008 (0.35± 0.20)	0.014±0.006 (0.35± 0.15)
CPS32 (1206)	0.120±0.004 (3.05± 0.10)	0.061±0.004 (1.55± 0.10)	0.020 +0.004/-0.002 (0.50 +0.10/-0.05)	0.018±0.008 (0.45± 0.20)	0.014±0.006 (0.35± 0.15)

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6. ELECTRICAL CHARACTERISTICS AND TEST CONDITIONS

CHARACTERISTICS		SPECIFICATIONS	TESTING CONDITIONS
		Resistance	
1	Resistance Temperature Coefficient	Refer to Clause 3.10	<p>JIS-C5201-1 4.8 At +25/-55⁰C and +25/+125⁰C. Formula: $TCR = \frac{R_2 - R_1}{R_1 (t_2 - t_1)} \times 10^6 \text{ (ppm/}^0\text{C)}$ Where t₁ = +25⁰C or specified room temperature t₂ = -55⁰C or +125⁰C test temperature R₁ = resistance at reference temperature in ohms R₂ = resistance at test temperature in ohms</p>
2	Short Time Overload	±(0.5%+0.05Ω)	<p>JIS-C5201-1 4.13 Applied 2.5 times rated voltage for 5 seconds and ± (0.5% + 0.05Ω) release the load for about 30 minutes , then measure its resistance variance rate. (Rated voltage refer to item 3. general specifications)</p>
3	Insulation Resistance	≥10 GΩ	<p>JIS-C5201-1 4.6 Put the resistor in the fixture, add 100 VDC in +, - terminal for 60 sec then measured the insulation resistance between electrodes and insulating enclosure or between electrodes and base material.</p>
4	Dielectric Withstand Voltage	No short or burned on the appearance.	<p>JIS-C5201-1 4.7 Put the resistor in the fixture, add VAC (see SPEC below) in +, - terminal for. CPS21, CPS32 apply 500 VAC 1 minute.</p>
5	Intermittent Overload	±(1.0%+0.05Ω)	<p>JIS-C5201-1 4.13 Put the tested resistor in chamber under temperature 25± 2⁰C and load the 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.</p>



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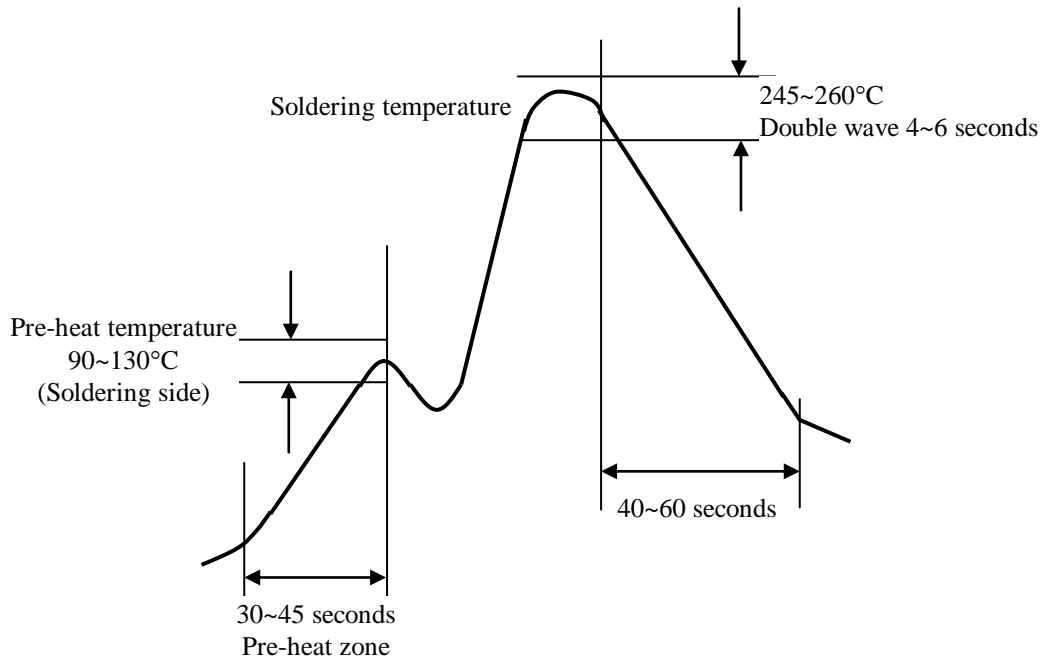
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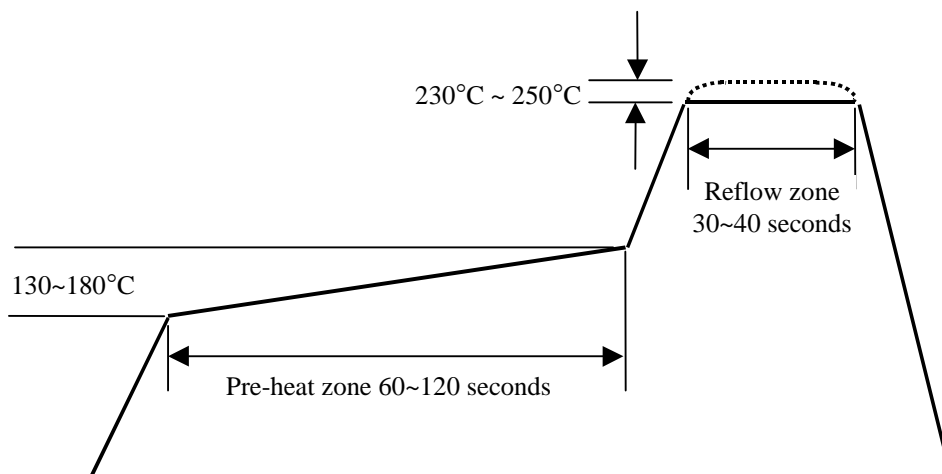
7	Terminal strength	Test1: No evidence of mechanical damage. Test2: $\geq 5N$	JIS-C5201-1 4.16 Test1: The resistor mounted on the board applied 5N pushing force on the sample rear for 10 sec. Test2: The resistor mounted on the board slowly, add force on the sample rear until the sample termination is breakdown.
8	Core Body Strength	$\pm(1.0\%+0.05\Omega)$ No visible damage	JIS-C5201-1 4.15 Applied R0.5 test probe at its central part then pushing 10N { 1.02 Kgf } force on the sample for 10 sec. CPS21, CPS32 : probe R0.5
9	Low Temperature Operation	$\pm(0.5\%+0.05\Omega)$ No visible damage	MIL-R-55342D 4.7.4 Put the tested resistor in the chamber at room temperature 25°C. Decreasing the temperature to -55°C and keep the temperature at -55°C 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.
10	Lightening Surge	$\pm (1.0\% + 0.05\Omega)$	IEC 60 115-1 4.27 Test 1: 5 pulses of 1.2/50µs with a period of not less than 12 s. Test 2: 10 pulses of 10/700µs with a period of not less than 1 min.
11	Loadlife	$\pm (1.0\%+0.05\Omega)$	JIS-C5201-1 4.25 Put the tested resistor in chamber under temperature 70± 2°C 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.
12	Solderability	Solder coverage over 95%	JIS-C5201-1 4.17 Put the 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 tested resistor in room temperature for 2 hours or more. Test method: The resistor be immersed into solder pot in temperature 235± 5°C for 2 sec, then the resistor is left as placed under microscope to observed its solder area.

6.1 Soldering Profile

6.1.1 IR Reflow



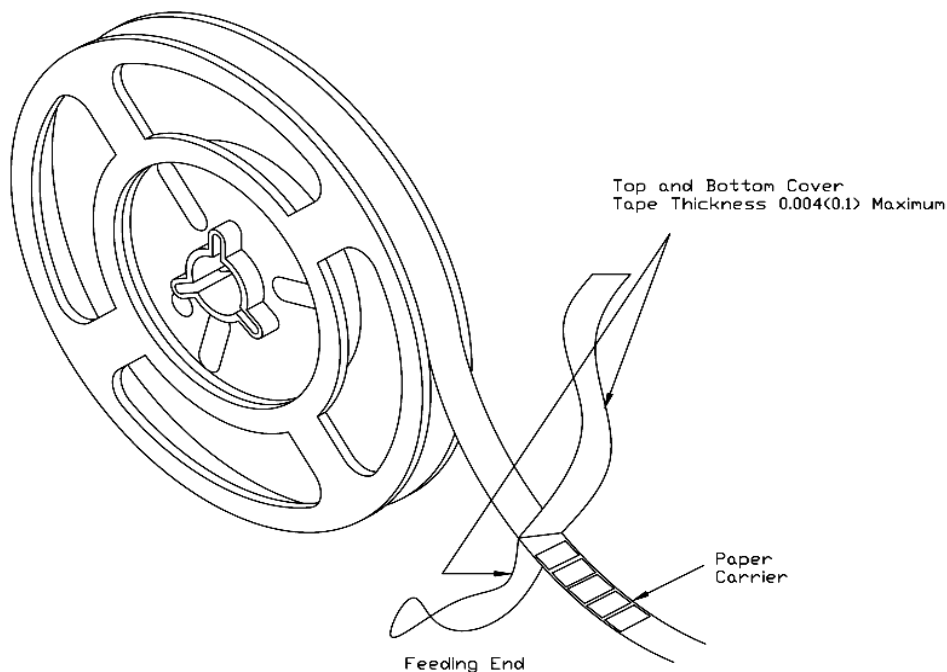
6.1.2 Wave Soldering



7. TAPING

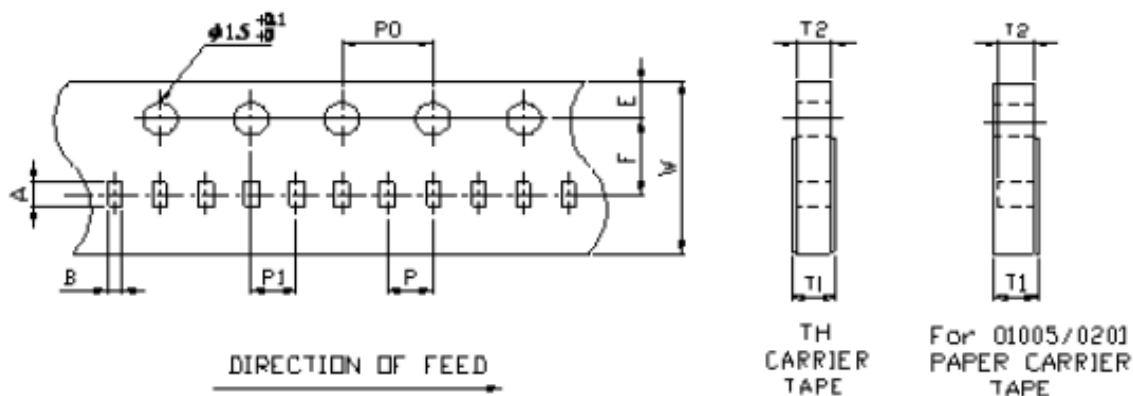
7.1 Structure of Taping

Paper Carrier



7.2 Dimension

7.5.1 Dimension of Punched Paper Tape Carrier System



Remark : Pitch tolerance over any 10 pitches of P_0 is ± 0.2 mm

Dimension of Punched Paper Tape Carrier System

(unit: mm)

Code	A	B	W	E	F	P1	Do	T2
CPS21	2.4 ± 0.1	1.65 ± 0.1	8.0 ±	1.75 ±	3.5 ±	4.0 ± 0.1	1.5 ± ₀ ^{0.1}	0.75 ± 0.1
CPS32	3.5 ± 0.1	1.9 ± 0.1	0.2	0.1	0.05			0.75 ± 0.1

7.7 Packaging

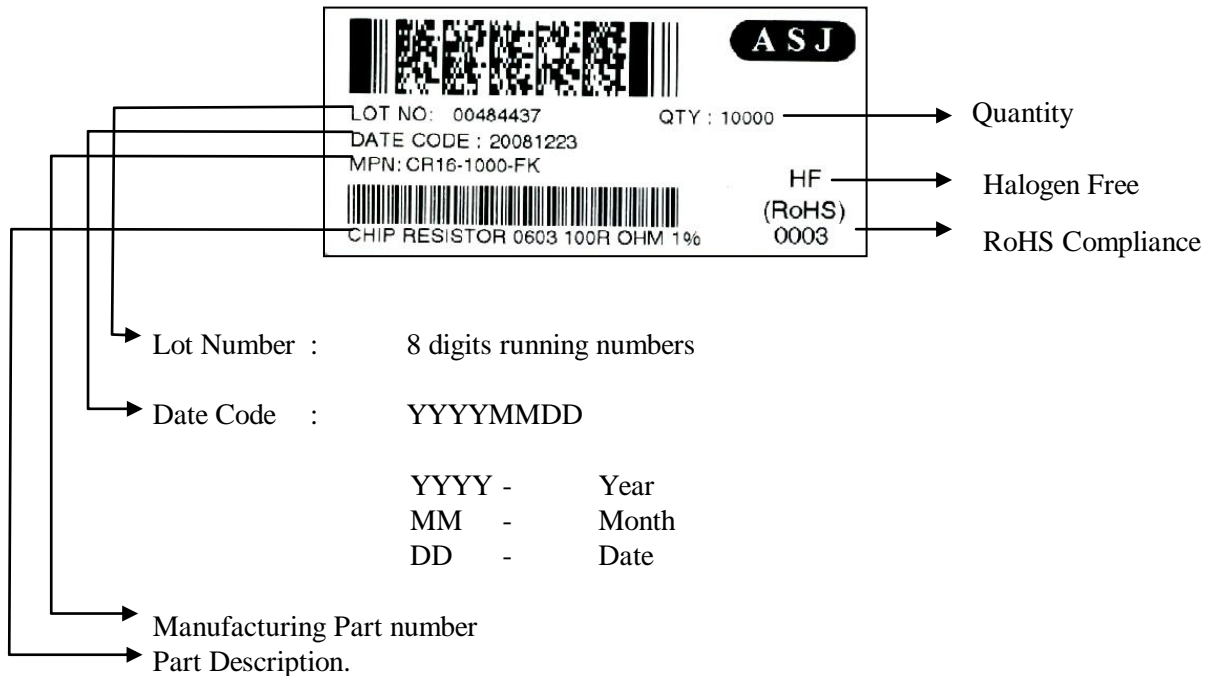
7.7.1 Taping

7.7.1.1 Quantity – Tape and Reels

Code	Quantity	Model	Remarks
CPS21	5000 pcs	7" Reel	10 000 or 20 000 pcs on request
CPS32			

7.7.2 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.



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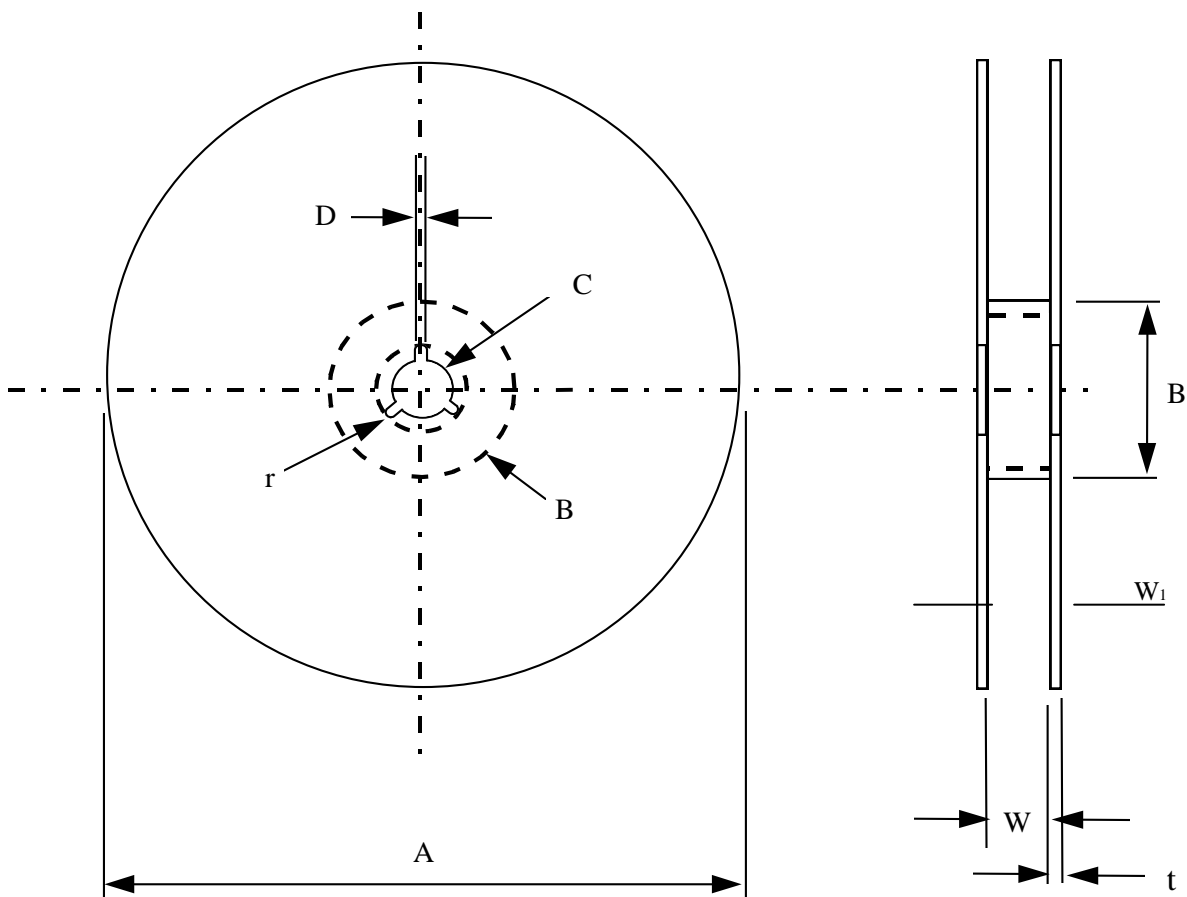
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7.7.3 Packaging Reel Box

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

7.7.4 Reel Dimensions



Model	A	B	C	D	W	W ₁	t	r
7" Reel (5K) (except 0402 10K)	$\phi 178 \pm 2.0$	$\phi 60 \text{min}$	13 ± 0.2	$\phi 2.0 \pm 0.5$	11 ± 0.1	14.4 max	1.0 ± 0.1	1.0
7" Reel (4K)	$\phi 178 \pm 2.0$	$\phi 60 \text{min}$	13 ± 0.2	$\phi 2.0 \pm 0.5$	13 ± 1.0	14.4 max	1.2 ± 0.1	1.0
10" Reel (10K)	$\phi 254 \pm 2.0$	$\phi 60 \text{min}$	13 ± 0.2	$\phi 2.0 \pm 0.5$	11 ± 1.0	14.4 max	1.5 ± 0.1	1.0
13" Reel (20K, 50K)	$\phi 330 \pm 2.0$	$\phi 60 \text{min}$	13 ± 0.2	$\phi 2.0 \pm 0.5$	11 ± 1.0	14.4 max	2.1 ± 0.1	-



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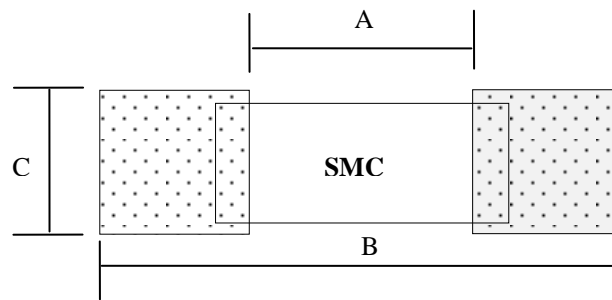
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8. SURFACE MOUNT LAND PATTERNS



Product (Type)	Land Dimension		
	A	B	C
CPS21 (0805)	0.047 [1.2]	0.118 [3.0]	0.051 [1.3]
CPS32 (1206)	0.087 [2.2]	0.165 [4.2]	0.063 [1.6]

9. REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version. 1	February 13,2015		Initial Release