

SUNWAY R CHIP DATASHEET



Thick Film General Purpose SC Series

Tolerance : $\pm 0.1\%$ / $\pm 0.5\%$ / $\pm 1\%$ / $\pm 5\%$

Sizes : 0075 / 01005 / 0201 / 0402 / 0603 / 0805 / 1206 / 1210 / 2010 / 2512

RoHS compliant & Halogen free



CATALOGUE

| | |
|--|----|
| 1. ORDERING INFORMATION..... | 1 |
| 2. MARKING..... | 2 |
| 3. CONSTRUCTION AND DIMENSION..... | 4 |
| 4. ELECTRICAL CHARACTERISTICS..... | 5 |
| 5. FUNCTIONAL DESCRIPTION..... | 7 |
| 6. FOOTPRINT AND SOLDERING PROFILES..... | 8 |
| 7. PACKING STYLE AND PACKAGING QUANTITY..... | 12 |
| 8. TESTS AND REQUIREMENTS..... | 17 |
| 9. REVISION HISTORY..... | 19 |
| 10. SUNWAY CONTACT..... | 20 |

1. ORDERING INFORMATION

SCOPE

This specification describes SC series chip resistors with lead free terminations made by thick film process

APPLICATIONS

All general purpose application

FEATURES

- Halogen Free Epoxy
- RoHS compliant
- Products with lead free terminations meet RoHS requirements
- Pb-glass contained in electrodes, resistors element and glass are exempted by RoHS
- Reducing environmentally hazardous wastes
- High component and equipment reliability Saving of PCB space
- None forbidden-materials used in products/production

NOTE

All our RSMD products meet RoHS compliant and Halogen Free

ORDERING EXAMPLE

The ordering code for a SC0402 0.0625W chip resistor value 100KΩ with ±5% tolerance ,supplied in 7-inch paper tape reel of 10,000 unit per reel is : SC0402J1003F2ANRH

ORDERING INFORMATION-GLOBAL PART NUMBER

Global part numbers are identified by the series, sizes, tolerance ,packing type, temperature coefficient, taping reel and resistance value.

GLOBAL PART NUMBER

| | | | | | | | |
|-----------|-------------|----------|-------------|----------|-----------|----------|-----------|
| SC | XXXX | X | XXXX | X | XX | X | XH |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |

(1) SIZE

0075/0100/0201/0402/0603/0805/1206/1210/2010/2512

(2) TOLERANCE

B=±0.1% D=±0.5%
F=±1.0% J=±5.0%

(3) RESISTANCE

There are 2-4digits indicated the resistance value.
Letter R/K/M is decimal point
Example:
9R76 = 9.76 Ω
9761 = 9760 Ω
1004 = 1,000,000 Ω

(4) TEMPERATURE COEFFICIENT OF RESISTANCE

| | | |
|-----------|-----------|-----------|
| A=±5ppm | B=±10ppm | C=±15ppm |
| D=±25ppm | E=±50ppm | M=±75ppm |
| F=±100ppm | L=±150ppm | G=±200ppm |
| H=±225ppm | I=±300ppm | N=±175ppm |
| O=±300ppm | J=±350ppm | K=±400ppm |
| Q=±700ppm | | |

(5) POWER

1A=1/32W ,1B=1/20W , 1C=1/2W,1D=3/4W,1E=1/50W,
1W=1W,2A=1/16W,2B=1/10W,4A=1/8W,4B=1/5W,8A=1/4W

(6) CONTROL CODE

N:Lead Free, P:Total Lead Free

(7) PACKATING TYPE & PRODUCT CODE

| | |
|-------------------------------|-------------------------------|
| R = 7" Paper tape | P = 10" Paper tape |
| H = 13" Paper tape | K = 07" Embossed plastic tape |
| T = 10" Embossed plastic tape | G = 13" Embossed plastic tape |
| E = ESD safe reel | H = Default code |

2. MARKING

| Size | Tolerance 1%, 0.5% | Description | Tolerance 5% | Description |
|------------------------------------|-----------------------|--|-----------------|--|
| SC0075/0100/ 0201/0402 | | NO marking | | NO marking |
| SC0603 | | 1%, 0.5%, E24 exception values 10/11/13/15/20/75 of E24 series 240=24×10 ⁰ =24 | | 5%, E24 series: 3 digits First two digits for significant figure and 3rd digit for number of zeros 223=22×10 ³ =22K |
| | | 1%, 0.5%, E96 refer to EIA-96 marking method ,including values 10/11/13/15/20/75 of E24 series * 29B=196×10=1.96K | | |
| SC0805/1206/ 1210/2010/ 2512 | | 1%, 0.5%, E96 refer to EIA-96 marking method ,including values 10/11/13/15/20/75 of E24 series First three digits for significant figure and 4th digit for number of zeros. 2203=220×10 ³ =220K | | 5%, E24 series: 3 digits First two digits for significant figure and 3rd digit for number of zeros 223=22×10 ³ =22K |

Refer to below table

| code | A | B | C | D | E | F | G | H | X | Y | Z |
|------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
| Multiplier | 10 ⁰ | 10 ¹ | 10 ² | 10 ³ | 10 ⁴ | 10 ⁵ | 10 ⁶ | 10 ⁷ | 10 ⁻¹ | 10 ⁻² | 10 ⁻³ |
| Value | Code | Value | Code | Value | Code | Value | Code | Value | Code | Value | Code |
| 100 | 01 | 147 | 17 | 215 | 33 | 316 | 49 | 464 | 65 | 681 | 81 |
| 102 | 02 | 150 | 18 | 221 | 34 | 324 | 50 | 475 | 66 | 698 | 82 |
| 105 | 03 | 154 | 19 | 226 | 35 | 332 | 51 | 487 | 67 | 715 | 83 |
| 107 | 04 | 158 | 20 | 232 | 36 | 340 | 52 | 499 | 68 | 732 | 84 |
| 110 | 05 | 162 | 21 | 237 | 37 | 348 | 53 | 511 | 69 | 750 | 85 |
| 113 | 06 | 165 | 22 | 243 | 38 | 357 | 54 | 523 | 70 | 768 | 86 |
| 115 | 07 | 169 | 23 | 249 | 39 | 365 | 55 | 536 | 71 | 787 | 87 |
| 118 | 08 | 174 | 24 | 255 | 40 | 374 | 56 | 549 | 72 | 806 | 88 |
| 121 | 09 | 178 | 25 | 261 | 41 | 383 | 57 | 562 | 73 | 825 | 89 |
| 124 | 10 | 182 | 26 | 267 | 42 | 392 | 58 | 576 | 74 | 845 | 90 |
| 127 | 11 | 187 | 27 | 274 | 43 | 402 | 59 | 590 | 75 | 866 | 91 |
| 130 | 12 | 191 | 28 | 280 | 44 | 412 | 60 | 604 | 76 | 887 | 92 |
| 133 | 13 | 196 | 29 | 287 | 45 | 422 | 61 | 619 | 77 | 909 | 93 |
| 137 | 14 | 200 | 30 | 294 | 46 | 432 | 62 | 634 | 78 | 931 | 94 |
| 140 | 15 | 205 | 31 | 301 | 47 | 442 | 63 | 649 | 79 | 953 | 95 |
| 143 | 16 | 210 | 32 | 309 | 48 | 453 | 64 | 665 | 80 | 976 | 96 |

Values of E3,E6,E12,E24 ,E48& E96

To simplify resistor manufacture, handling, purchase & electronic circuit design, resistor values are arranged into standard resistor values conforming to the E series. The different sets of standard resistor values are known by their E-series numbers: E3 has three resistors in each decade, E6 has six, E12 has twelve, and so forth.

VALUES SERIES

| | | | | | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| E3 | 1.0 | 2.2 | 4.7 | | | | | | | | | | | | |
| E6 | 1.0 | 1.5 | 2.2 | 3.3 | 4.7 | 6.8 | | | | | | | | | |
| E12 | 1.0 | 1.2 | 1.5 | 1.8 | 2.2 | 2.7 | 3.3 | 3.9 | 4.7 | 5.6 | 6.8 | 8.2 | | | |
| E-24 | 1.0 | 1.1 | 1.2 | 1.3 | 1.5 | 1.6 | 1.8 | 2.0 | 2.2 | 2.4 | 2.7 | 3.0 | 3.3 | 3.6 | 3.9 |
| | 4.3 | 4.7 | 5.1 | 5.6 | 6.2 | 6.8 | 7.5 | 8.2 | 9.1 | | | | | | |
| E-48 | 1.00 | 1.05 | 1.10 | 1.15 | 1.21 | 1.27 | 1.33 | 1.40 | 1.47 | 1.54 | 1.62 | 1.69 | 1.78 | 1.87 | 1.96 |
| | 2.05 | 2.15 | 2.26 | 2.37 | 2.49 | 2.61 | 2.74 | 2.87 | 3.01 | 3.16 | 3.32 | 3.48 | 3.65 | 3.83 | 4.02 |
| | 4.22 | 4.42 | 4.64 | 4.87 | 5.11 | 5.36 | 5.62 | 5.90 | 6.19 | 6.49 | 6.81 | 7.15 | 7.50 | 7.87 | 8.25 |
| | 8.66 | 9.09 | 9.53 | | | | | | | | | | | | |
| E-96 | 1.00 | 1.02 | 1.05 | 1.07 | 1.10 | 1.13 | 1.15 | 1.18 | 1.21 | 1.24 | 1.27 | 1.30 | 1.33 | 1.37 | 1.40 |
| | 1.43 | 1.47 | 1.50 | 1.54 | 1.58 | 1.62 | 1.65 | 1.69 | 1.74 | 1.78 | 1.82 | 1.87 | 1.91 | 1.96 | 2.00 |
| | 2.05 | 2.10 | 2.15 | 2.21 | 2.26 | 2.32 | 2.37 | 2.43 | 2.49 | 2.55 | 2.61 | 2.67 | 2.74 | 2.80 | 2.87 |
| | 2.94 | 3.01 | 3.09 | 3.16 | 3.24 | 3.32 | 3.40 | 3.48 | 3.57 | 3.65 | 3.74 | 3.83 | 3.92 | 4.02 | 4.12 |
| | 4.22 | 4.32 | 4.42 | 4.53 | 4.64 | 4.75 | 4.87 | 4.99 | 5.11 | 5.23 | 5.36 | 5.49 | 5.62 | 5.76 | 5.90 |
| | 6.04 | 6.19 | 6.34 | 6.49 | 6.65 | 6.81 | 6.98 | 7.15 | 7.32 | 7.50 | 7.68 | 7.87 | 8.06 | 8.25 | 8.45 |
| | 8.66 | 8.87 | 9.09 | 9.31 | 9.53 | 9.76 | | | | | | | | | |

Preferred value of resistance shall be composed by significant figures shown in the above table and multipliers including: "X10 ohm , X10² ohm , X10³ ohm , X10⁴ ohm , X10⁵ ohm ."

3. CONSTRUCTION AND DIMENSION

CONSTRUCTION

The resistor is constructed on top of a high-grade ceramic body .Internal metal electrodes are added on each end to make the contacts to the thick film resistive element .The composition of the resistive element is a noble metal imbedded into a glass and covered by a second glass to prevent environmental influences .The resistor is laser trimmed to the rated resistance value .The resistor is covered with a protective epoxy coat, finally the two external termination (matte tin on Ni -barrier) are added , as shown in Fig 1 .



Fig1: Chip resistor outlines

DIMENSION

Table 1

| TYPE | L(mm) | W(mm) | H(mm) | l1(mm) | l2(mm) |
|--------|-----------|-----------|-----------|-----------|-----------|
| SC0075 | 0.30±0.01 | 0.15±0.01 | 0.13±0.01 | 0.08±0.03 | 0.08±0.03 |
| SC0100 | 0.40±0.02 | 0.20±0.02 | 0.13±0.02 | 0.10±0.03 | 0.10±0.03 |
| SC0201 | 0.60±0.03 | 0.30±0.03 | 0.23±0.03 | 0.10±0.05 | 0.15±0.05 |
| SC0402 | 1.00±0.05 | 0.50±0.05 | 0.35±0.05 | 0.20±0.10 | 0.25±0.10 |
| SC0603 | 1.60±0.10 | 0.80±0.10 | 0.45±0.10 | 0.25±0.15 | 0.25±0.15 |
| SC0805 | 2.00±0.10 | 1.25±0.10 | 0.50±0.10 | 0.35±0.20 | 0.35±0.20 |
| SC1206 | 3.10±0.10 | 1.60±0.10 | 0.55±0.10 | 0.45±0.20 | 0.40±0.20 |
| SC1210 | 3.10±0.10 | 2.60±0.15 | 0.55±0.10 | 0.45±0.15 | 0.50±0.20 |
| SC2010 | 5.00±0.10 | 2.50±0.15 | 0.55±0.10 | 0.60±0.20 | 0.50±0.20 |
| SC2512 | 6.35±0.10 | 3.10±0.15 | 0.55±0.10 | 0.60±0.20 | 0.50±0.20 |

4. ELECTRICAL CHARACTERISTICS

ELECTRICAL CHARACTERISTICS

Table 1

| CHARACTERISTICS | POWER | OPERATING TEMPERATURE RANGE | MAXIMUM WORKING VOLTAGE | MAXIMUM OVERLOAD VOLTAGE | DIELECTRIC WITHSTANDING VOLTAGE | RESISTANCE RANGE | TEMPERATURE COEFFICIENT | JUMPER CRITERIA |
|-----------------|-------|-----------------------------|-------------------------|--------------------------|---------------------------------|--|---|--|
| SC0075 | 1/50W | -55°C to 125°C | 10V | 25V | 25V | 5% (E24) 10Ω≤R≤1MΩ 1% (E24/E96) 10Ω≤R≤1MΩ Jumper≤50mΩ | 10Ω≤R≤100Ω ±300ppm°C 100Ω<R≤1MΩ ±200ppm°C | Rated Current 0.5A Maximum Current 1.0A |
| SC0100 | 1/32W | -55°C to 125°C | 15V | 30V | 30V | 5% (E24) 1Ω≤R≤22MΩ 1% (E24/E96) 1Ω≤R≤10MΩ 0.5% (E24/E96) 10Ω≤R≤1MΩ Jumper≤50mΩ | 1Ω≤R≤100Ω ±300ppm°C 100Ω<R≤22MΩ ±200ppm°C | Rated Current 0.5A Maximum Current 1.0A |
| SC0201 | 1/20W | -55°C to 125°C | 25V | 50V | 50V | 5% (E24) 1Ω≤R≤10MΩ 1% (E24/E96) 1Ω≤R≤10MΩ 0.5% (E24/E96) 1Ω≤R≤1MΩ 0.1% (E24/E96) 10Ω≤R≤1MΩ Jumper≤50mΩ | 1Ω≤R≤10Ω ±300ppm°C 10Ω<R≤10MΩ ±200ppm°C | Rated Current 0.5A Maximum Current 1.0A |
| SC0402 | 1/16W | -55°C to 155°C | 50V | 100V | 100V | 5% (E24) 1Ω≤R≤22MΩ 1% (E24/E96) 1Ω≤R≤10MΩ 0.5% (E24/E96) 1Ω≤R≤1MΩ 0.1% (E24/E96) 10Ω≤R≤1MΩ Jumper≤50mΩ | 1Ω≤R≤10Ω ±200ppm°C 10Ω<R≤10MΩ ±100ppm°C 10MΩ<R≤22MΩ ±200ppm°C | Rated Current 1.0A Maximum Current 2.0A |
| | 1/8W | -55°C to 155°C | 50V | 100V | 100V | 5% (E24) 1Ω≤R≤1MΩ 1% (E24/E96) 1Ω≤R≤1MΩ | 1Ω≤R≤1MΩ ±200ppm°C | |
| SC0603 | 1/10W | -55°C to 155°C | 75V | 150V | 150V | 5% (E24) 1Ω≤R≤22MΩ 1% (E24/E96) 1Ω≤R≤10MΩ 0.5% (E24/E96) 1Ω≤R≤1MΩ 0.1% (E24/E96) 10Ω≤R≤1MΩ Jumper≤50mΩ | 1Ω≤R≤10Ω ±200ppm°C 10Ω<R≤10MΩ ±100ppm°C 10MΩ<R≤22MΩ ±200ppm°C | Rated Current 1.0A Maximum Current 2.0A |
| | 1/5W | -55°C to 155°C | 75V | 150V | 150V | 5% (E24) 1Ω≤R≤1MΩ 1% (E24/E96) 1Ω≤R≤1MΩ | 1Ω≤R≤1MΩ ±200ppm°C | |

ELECTRICAL CHARACTERISTICS

Table 2

| CHARACTERISTICS | POWER | OPERATING TEMPERATURE RANGE | MAXIMUM WORKING VOLTAGE | MAXIMUM OVERLOAD VOLTAGE | DIELECTRIC WITHSTANDING VOLTAGE | RESISTANCE RANGE | TEMPERATURE COEFFICIENT | JUMPER CRITERIA |
|-----------------|-------|-----------------------------|-------------------------|--------------------------|---------------------------------|---|---|--|
| SC0805 | 1/8W | -55°C to 155°C | 150V | 300V | 300V | 5% (E24) 1Ω≤R≤100MΩ 1% (E24/E96) 1Ω≤R≤10MΩ 0.5% (E24/E96) 1Ω≤R≤1MΩ 0.1% (E24/E96) 10Ω≤R≤1MΩ 10%, 20% 24MΩ≤R≤100MΩ Jumper≤50mΩ | 1Ω≤R≤10Ω ±200ppm°C 10Ω<R≤10MΩ ±100ppm°C 10MΩ<R≤22MΩ ±200ppm°C 24MΩ≤R≤100MΩ ±300ppm°C | Rated Current 2.0A Maximum Current 5.0A |
| | 1/4W | -55°C to 155°C | 150V | 300V | 300V | 5% (E24) 1Ω≤R≤1MΩ 1% (E24/E96) 1Ω≤R≤1MΩ | 1Ω≤R≤1MΩ ±200ppm°C | |
| SC1206 | 1/4W | -55°C to 155°C | 200V | 400V | 500V | 5% (E24) 1Ω≤R≤100MΩ 1% (E24/E96) 1Ω≤R≤10MΩ 0.5% (E24/E96) 1Ω≤R≤1MΩ 0.1% (E24/E96) 10Ω≤R≤1MΩ 10%, 20% 24MΩ≤R≤100MΩ Jumper≤50mΩ | 1Ω≤R≤10Ω ±200ppm°C 10Ω<R≤10MΩ ±100ppm°C 10MΩ<R≤22MΩ ±200ppm°C 24MΩ≤R≤100MΩ ±300ppm°C | Rated Current 2.0A Maximum Current 10.0A |
| | 1/2W | -55°C to 155°C | 200V | 400V | 500V | 5% (E24) 1Ω≤R≤1MΩ 1% (E24/E96) 1Ω≤R≤1MΩ | 1Ω≤R≤1MΩ ±200ppm°C | |
| SC1210 | 1/2W | -55°C to 155°C | 200V | 500V | 500V | 5% (E24) 1Ω≤R≤22MΩ 1% (E24/E96) 1Ω≤R≤10MΩ 0.1%,0.5% (E24/E96) 10Ω≤R≤1MΩ Jumper≤50mΩ | 1Ω≤R≤10Ω ±200ppm°C 10Ω<R≤10MΩ ±100ppm°C 10MΩ<R≤22MΩ ±200ppm°C | Rated Current 2.0A Maximum Current 10.0A |
| SC2010 | 3/4W | -55°C to 155°C | 200V | 500V | 500V | 5% (E24) 1Ω≤R≤22MΩ 1% (E24/E96) 1Ω≤R≤10MΩ 0.1%,0.5% (E24/E96) 10Ω≤R≤1MΩ Jumper≤50mΩ | 1Ω≤R≤10Ω ±200ppm°C 10Ω<R≤10MΩ ±100ppm°C 10MΩ<R≤22MΩ ±200ppm°C | Rated Current 2.0A Maximum Current 10.0A |
| SC2512 | 1W | -55°C to 155°C | 200V | 500V | 500V | 5% (E24) 1Ω≤R≤22MΩ 1% (E24/E96) 1Ω≤R≤10MΩ 0.1%,0.5% (E24/E96) 10Ω≤R≤1MΩ Jumper≤50mΩ | 1Ω≤R≤10Ω ±200ppm°C 10Ω<R≤10MΩ ±100ppm°C 10MΩ<R≤22MΩ ±200ppm°C | Rated Current 2.0A Maximum Current 10.0A |
| | 2W | -55°C to 155°C | 200V | 400V | 500V | 5% (E24) 1Ω≤R≤1MΩ 1% (E24/E96) 1Ω≤R≤1MΩ | 1Ω≤R≤1MΩ ±200ppm°C | |

5. FUNCTIONAL DESCRIPTION

FUNCTIONAL DESCRIPTION

OPERATING TEMPERATURE RANGE

SC0402 to SC2512 Range:-55°C to +155°C

(Fig.2)

SC0075 to SC0201 Range:-55°C to +125°C

(Fig.3)



Fig2: Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature

FUNCTIONAL DESCRIPTION

Each type rated power at 70 ±2°C:



Fig3: Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature

RATED VOLTAGE

The DC or AC (rms) continuous working voltage corresponding to the rated power is determined by the following formula:

$$V = (P \cdot R)^{1/2}$$

or max. working voltage whichever is less

Where

V=Continuous rated DC or AC

(rms)working voltage (V)

P= Rated power (W)

R = Resistance value (Ω)

6. FOOTPRINT AND SOLDERING PROFILES

FOOTPRINT DIMENSIONS



Fig4: Single resistor chips recommended dimensions of footprints

Table 3 Reflow soldering footprint dimensions for relevant chip resistors size ,see Fig 4.

| Unit: mm | | | | | |
|-------------------|----------------------|------|------|-----------|--------------------|
| PRODUCT SIZE CODE | FOOTPRINT DIMENSIONS | | | | Placement accuracy |
| | A | B | C | D | |
| SC0075 | 0.34 | 0.14 | 0.10 | 0.15 | N/A |
| SC0100 | 0.48 | 0.12 | 0.18 | 0.18~0.23 | N/A |
| SC0201 | 1.00 | 0.30 | 0.35 | 0.40 | N/A |
| SC0402 | 1.50 | 0.50 | 0.50 | 0.60 | ±0.15 |
| SC0603 | 2.60 | 0.80 | 0.90 | 0.80 | ±0.25 |
| SC0805 | 3.00 | 1.20 | 0.90 | 1.20 | ±0.25 |
| SC1206 | 4.20 | 2.20 | 1.00 | 1.50 | ±0.25 |
| SC1210 | 4.20 | 2.20 | 1.00 | 2.40 | ±0.25 |
| SC2010 | 6.10 | 3.30 | 1.40 | 2.40 | ±0.25 |
| SC2512 | 8.00 | 4.40 | 1.80 | 4.00 | ±0.25 |

Table 4 Wave soldering footprint dimensions for relevant chip resistors size ,see Fig 4.

| Unit: mm | | | | | |
|-------------------|----------------------|------|------|------|--------------------|
| PRODUCT SIZE CODE | FOOTPRINT DIMENSIONS | | | | Placement accuracy |
| | A | B | C | D | |
| SC0603 | 2.70 | 0.90 | 0.90 | 0.80 | ±0.25 |
| SC0805 | 3.30 | 1.30 | 1.00 | 1.30 | ±0.25 |
| SC1206 | 4.70 | 2.50 | 1.10 | 1.70 | ±0.25 |
| SC1210 | 4.70 | 2.50 | 1.10 | 2.50 | ±0.25 |
| SC2010 | 6.40 | 4.20 | 1.10 | 2.50 | ±0.25 |
| SC2512 | 8.20 | 5.50 | 1.35 | 3.20 | ±0.25 |

MOUNTING

Due to their rectangular shape and small dimensional tolerances, Surface Mounted Resistors are suitable for handling by automatic placement systems. Chip placement can be on ceramic substrates and printed-circuit boards (PCBs). Electrical connection to the circuit is by wave, vapour phase or infrared soldering. The end terminations guarantee a reliable contact and the protective coating enables 'face down' mounting.

The laws of heat conduction, convection and radiation determine the temperature rise in a resistor owing to power dissipation. The maximum body temperature usually occurs in the middle of the resistor and is called the hot-spot temperature. The hot-spot temperature depends on the ambient temperature and the dissipated power. This is described in the data sheet under the chapter heading "Functional description".

The hot-spot temperature is important for mounting because the connections to the chip resistors will reach a temperature close to the hot-spot temperature. Heat conducted by the connections must not reach the melting point of the solder at the

joints. Therefore a maximum solder joint temperature of 110°C is advised.

The ambient temperature on large or very dense printed-circuit boards (PCBs) is influenced by the dissipated power. The ambient temperature will again influence the hot-spot temperature. Therefore, the packing density that is allowed on the PCB is influenced by the dissipated power.

EXAMPLE OF MOUNTING EFFECTS

Assume that the maximum temperature of a PCB is 95°C and the ambient temperature is 50°C. In this case the maximum temperature rise that may be allowed is 45°C.

In the graph (see Fig.5), this point is found by drawing the line from point A (PCB = 95°C) to point B (T_{amb} = 50°C) and from here to the left axis.

To find the maximum packing density, this horizontal line is extended until it intersects with the curve 0.125 W (point C). The maximum packing density, 19 units/50 × 50 mm² (point D), is found on the horizontal axis.



Fig5: PCB temperature as a function of applied power, mounting density ambient temperature

SOLDERING CONDITIONS

The lead free Surface Mount Resistors are able to stand the reflow soldering conditions as below:

- Temperature: above 220 °C
- Endurance: 95 to 120 seconds
- Cycles: 3 times The test of "soldering heat resistance" is carried out in

accordance with the schedule of "MIL-STD-202G-method 210F", "The robust construction of chip resistors allows them to be completely immersed in a solder bath of 260 °C for 10 seconds". Therefore, it is possible to mount Surface Mount Resistors on one side of a PCB and other discrete components on the reverse (mixed PCBs).

Surface Mount Resistors are tested for solder ability at 245 °C during 2 seconds. The test condition for no leaching is 260 °C for 30 seconds. Typical examples of soldering processes that provide reliable joints without any damage, the recommended soldering profiles referring to "IEC 61760-1" are given in Figs 6, 7 and 8.



Fig6: Infrared soldering forced air convection reflow soldering-temperature/time profile for SnPb solders

SOLDERING CONDITION

Typical values (solid line)
Process limits (dotted lines)



Fig7: Infrared soldering forced air convection reflow soldering-temperature/time profile for **SnAgCu** solders

Typical values (solid line)
Process limits (dotted lines)

The resistors may be soldered twice in accordance with this method if desired



Fig8: Double wave soldering for SnPb and leadfree SnAgCu solder-temperature/time profile (terminal temperature)

7. PACKING STYLE & PACKAGING QUANTITY

PACKING STYLE AND PACKAGING QUANTITY

Table 3 Packing style and packaging quantity

| PACKING STYLE | PAPER TAPING REEL(R) | | | | |
|---|-----------------------|------------|------------|-----------|-----------|
| | EMBOSSSED TAPING REEL | | | | |
| ESD SAFE REEL(S) 4MM WIDTH,1MM PITCH PLASTIC EMBOSSSED | | | | | |
| REEL DIMENSION | 7"(178mm) | 10"(254mm) | 13"(330mm) | 7"(178mm) | 7"(178mm) |
| SC0075 | --- | --- | --- | 20000 | --- |
| SC0100 | 20000 | --- | 80000 | 40000 | --- |
| SC0201 | 10000 | 20000 | 50000 | --- | --- |
| SC0402 | 10000 | 20000 | 50000 | --- | --- |
| SC0603 | 5000 | 10000 | 20000 | --- | --- |
| SC0805 | 5000 | 10000 | 20000 | --- | --- |
| SC1206 | 5000 | 10000 | 20000 | --- | --- |
| SC1210 | 5000 | 10000 | 20000 | --- | --- |
| SC2010 | --- | --- | --- | --- | 4000 |
| SC2512 | --- | --- | --- | --- | 4000 |

NOTE

For tape and reel specification / dimensions ,please refer to data sheet "Chip resistors packing" .



Fig9: Paper/PE tape

Table 5 Dimensions of paper/PE tape for relevant chip resistors size; see Fig.9

| PRODUCT SIZE | SYMBOL | | | | | | | | | | Unit: mm |
|--------------|------------|------------|-----------|------------|------------|-----------|-----------|-----------|------------|------------|----------|
| CODE | A0 | B0 | W | E | F | P0 | P1 | P2 | Ø D0 | T | |
| SC0075 | 0.18± 0.03 | 0.33± 0.03 | 4.0± 0.05 | 0.90± 0.03 | 1.88± 0.02 | 2.0± 0.04 | 1.0± 0.02 | 1.0± 0.02 | 0.8± 0.04 | 0.20± 0.03 | |
| SC0100 | 0.25± 0.05 | 0.45± 0.05 | 8.0± 0.02 | 1.75± 0.10 | 3.50± 0.05 | 4.0± 0.10 | 2.0± 0.05 | 2.0± 0.05 | 1.5+0.1/-0 | 0.31± 0.03 | |
| SC0201 | 0.40± 0.05 | 0.70± 0.05 | 8.0± 0.02 | 1.75± 0.10 | 3.50± 0.05 | 4.0± 0.10 | 2.0± 0.05 | 2.0± 0.05 | 1.5+0.1/-0 | 0.42± 0.03 | |
| SC0402 | 0.67± 0.03 | 1.17± 0.03 | 8.0± 0.10 | 1.75± 0.10 | 3.50± 0.05 | 4.0± 0.10 | 2.0± 0.05 | 2.0± 0.05 | 1.5+0.1/-0 | 0.42± 0.05 | |
| SC0603 | 1.09± 0.05 | 1.86± 0.05 | 8.0± 0.10 | 1.75± 0.10 | 3.50± 0.05 | 4.0± 0.10 | 4.0± 0.05 | 2.0± 0.05 | 1.5+0.1/-0 | 0.60± 0.03 | |
| SC0805 | 1.64± 0.05 | 2.37± 0.05 | 8.0± 0.10 | 1.75± 0.10 | 3.50± 0.05 | 4.0± 0.10 | 4.0± 0.05 | 2.0± 0.05 | 1.5+0.1/-0 | 0.75± 0.05 | |
| SC1206 | 1.89± 0.05 | 3.37± 0.05 | 8.0± 0.10 | 1.75± 0.10 | 3.50± 0.05 | 4.0± 0.10 | 4.0± 0.05 | 2.0± 0.05 | 1.5+0.1/-0 | 0.75± 0.05 | |
| SC1210 | 2.85± 0.10 | 3.50± 0.05 | 8.0± 0.10 | 1.75± 0.10 | 3.50± 0.05 | 4.0± 0.10 | 4.0± 0.05 | 2.0± 0.05 | 1.5+0.1/-0 | 0.75± 0.05 | |

NOTE

1. For size 0201, the typical value of thickness (excluding cover tape) is 0.42 mm for paper tape and 0.33 mm for PE tape.
2. M is reversed type.
3. For size 1206, the typical value of thickness (excluding cover tape) is 0.75±0.1.

TESTS AND REQUIREMENTS

ENVIRONMENTAL CONSIDERATIONS

- Cover tape, carrier tape and reel do not contain environmentally harmful PVC materials.
- Cover tape and reel are antistatic.
- Because the carrier tape is made of polycarbonate, a homogeneous material (mono-plastic), it is ideally suited for recycling
- Compared to other PVC-free materials polycarbonate shows excellent stiffness and very little deformation with temperature.

EMBOSSED/BLISTER TAPE



Fig10: Embossed/blister tape

| PRODUCT SIZE | SYMBOL | | | | | | | | | | Unit: mm |
|--------------|------------|------------|------------|------------|------------|-----------|-----------|-----------|------------|------------|----------|
| CODE | A0 | B0 | W | E | F | P0 | P1 | P2 | Ø D0 | T | |
| SC2010 | 2.77± 0.10 | 5.45± 0.10 | 12.0± 0.20 | 1.75± 0.10 | 5.50± 0.05 | 4.0± 0.10 | 4.0± 0.10 | 2.0± 0.05 | 1.5+0.1/-0 | 1.10± 0.10 | |
| SC2512 | 3.40± 0.10 | 6.37± 0.10 | 12.0± 0.20 | 1.75± 0.10 | 5.50± 0.05 | 4.0± 0.10 | 4.0± 0.10 | 2.0± 0.05 | 1.5+0.1/-0 | 1.10± 0.10 | |

LEADER/TRAILER TAPE SPECIFICATION



Fig11: Leader/trailer tape

TAPING REQUIREMENTS

- Resistance side faces up.
- Component is free and not sticking to top and/or bottom tape.
- Component should be easy to remove from carrier tape and the chip cavity should have no mechanical damage

PEEL-OFF FORCE

- Peel-off forces of both paper/PE and embossed/blister tapes are in accordance with "IEC 60286-3" ; that is, at a peel-off speed of 300 ± 10 mm/minute, 0.1 N to 1.0 N for 8 mm tape and 0.1 N to 1.3 N for tape larger than 8 mm. The peel-off angle should be between 165° and 180° .



handbook, full pagewidth



Fig12: Peel-off force

REEL SPECIFICATION



Fig13: Reel

| PRODUCT SIZE | QUANTITY | REEL SIZE | | Unit: mm | | | | | |
|----------------|----------|-----------------|------------------|-----------|-----------|------------|------------|------------|------------|
| | | 8 mm tape width | 12 mm tape width | A | N | C | D | W1 | W2max. |
| SC0075 | 20,000 | --- | --- | --- | --- | --- | --- | --- | --- |
| | 20,000 | 7" (Ø 178 mm) | --- | 180 +0/-3 | 60 +1/-0 | 13.0 ± 0.2 | --- | 9.0 ± 0.2 | 12.0 ± 0.2 |
| SC0100 | 40,000 | --- | --- | --- | --- | --- | --- | --- | --- |
| | 80,000 | 13" (Ø 330 mm) | --- | 330 +0/-3 | 100 ± 0.5 | 13.5 ± 0.5 | --- | 10.0 ± 0.5 | 14.0 ± 0.5 |
| | 10,000 | --- | --- | --- | --- | --- | --- | --- | --- |
| SC0201 | 15,000 | 7" (Ø 178 mm) | --- | 180 +0/-3 | 60 +1/-0 | 13.0 ± 0.2 | --- | 9.0 ± 0.2 | 12.0 ± 0.2 |
| | 20,000 | --- | --- | --- | --- | --- | --- | --- | --- |
| | 50,000 | 13" (Ø 330 mm) | --- | 330 +0/-3 | 100 ± 0.5 | 13.5 ± 0.5 | --- | 10.0 ± 0.5 | 14.0 ± 0.5 |
| | 10,000 | --- | --- | --- | --- | --- | --- | --- | --- |
| SC0402 | 20,000 | 7" (Ø 178 mm) | --- | 180 +0/-3 | 60 +1/-0 | 13.0 ± 0.2 | 21.0 ± 0.8 | 9.0 ± 0.2 | 12.0 ± 0.2 |
| | 20,000 | 10" (Ø 254 mm) | --- | 254 +0/-3 | 100 ± 0.5 | 13.0 ± 0.2 | --- | 9.8 ± 0.5 | 13.0 ± 0.5 |
| | 50,000 | 13" (Ø 330 mm) | --- | 330 +0/-3 | 100 ± 0.5 | 13.5 ± 0.5 | --- | 10.0 ± 0.5 | 14.0 ± 0.5 |
| SC0603/SC0805/ | 5,000 | 7" (Ø 178 mm) | --- | 180 +0/-3 | 60 +1/-0 | 13.0 ± 0.2 | --- | 9.0 ± 0.2 | 12.0 ± 0.2 |
| | 10,000 | 10" (Ø 254 mm) | --- | 254 +0/-3 | 100 ± 0.5 | 13.0 ± 0.2 | --- | 9.8 ± 0.5 | 13.0 ± 0.5 |
| SC1206 | 20,000 | 13" (Ø 330 mm) | --- | 330 +0/-3 | 100 ± 0.5 | 13.5 ± 0.5 | --- | 10.0 ± 0.5 | 14.0 ± 0.5 |
| | 5,000 | 7" (Ø 178 mm) | --- | 180 +0/-3 | 60 +1/-0 | 13.0 ± 0.2 | --- | 9.0 ± 0.2 | 12.0 ± 0.2 |
| SC1210 | 20,000 | 13" (Ø 330 mm) | --- | 330 +0/-3 | 100 ± 0.5 | 13.5 ± 0.5 | --- | 10.0 ± 0.5 | 14.0 ± 0.5 |
| SC2010 | 4,000 | --- | 7" (Ø 178 mm) | --- | --- | --- | --- | --- | --- |
| | 4,000 | --- | 7" (Ø 178 mm) | 180 +0/-3 | 60 +1/-0 | 13.0 ± 0.2 | --- | 13.6 ± 0.5 | 16.5 ± 0.5 |

TAPE AND REEL SPECIFICATIONS

All tape and reel specifications are in accordance with "IEC 60286-3". Basic dimensions are given in Figs 1, 2 and 5, and Tables 1, 2 and 3.

PAPER/PE TAPE

ADVANTAGE - PE TAP

- Better anti-moisture
- Less fiber
- Meet "ISO 14000" environmental regulation

MATERIAL CHARACTERISTIC - PE TAPE

- PE is a polymer material commonly used for food containers, plastic bags and toys, so is safe for human beings. In addition, it is recyclable.
- Conform to "ISO14000" environmental packing and American F.D.A restraint regulations

8. TESTS AND REQUIREMENTS

TESTS AND REQUIREMENTS

| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS |
|--|---|--|---|
| Temperature Coefficient of Resistance (T.C.R.) | MIL-STD-202 Method 304 | At +25/-55°C and +25/+125°C Formula: $T.C.R = \frac{R2 - R1}{R1 \times (t2 - t1)} \times 10^6 \text{ (ppm/C)}$ Where t1=+25 °C or specified room temperature t2=-55 °C or +125 °C test temperature R1=resistance at reference temperature in ohms R2=resistance at test temperature in ohms | Refer to table 2 |
| Life/ Endurance | MIL-STD-202 Method 108A IEC 60115-1 4.25.1 | At 70± 2°C for 1,000 hours; RCWV applied for 1.5 hours on and 0.5 hour off, s till air required | 0075: ± (5%+100mΩ) <100mΩ for jumper 0100: ±(3% +50mΩ) <100mΩf or jumper Others: ± (1%+50mΩ) for B/D/F tol ± (3%+50mΩ) for J tol <100mR for jumper |
| High Temperature Exposure | MIL-STD-202 Method 108A IEC 60068-2-2 | 1,000 hours at maximum operating temperature depending on specification, unpowered. | 0075: ± (5%+100mΩ) <100mΩ for jumper 0100: ±(1% +50mΩ) < 50mΩf or jumper Others: ± (1%+50mΩ) for B/D/F tol ± (2%+50mΩ) for J tol <50mR for jumper |
| Moisture Resistance | MIL-STD-202 Method 106G | Each temperature / humidity cycle is defined at 8 hours (method 106F), 3 cycles / 24 hours for 10d with 25°C / 65°C 95% R.H, without steps 7a&7b, unpowered Parts mounted on test-boards, without condensa tion on parts | 0075: ± (2%+100mΩ) <100mΩ for jumper 0100: ±(2% +50mΩ) < 100mΩf or jumper Others: ± (0.5%+50mΩ) for B/ D/F tol ± (2%+50mΩ) for J tol <100mR for jumper |
| Humidity | IEC 60115-1 4.24.2 | Steady state for 1000 hours at 40°C / 95% R.H. RCWV applied for 1.5 hours on and 0.5 hour off | 0075: ± (5%+100mΩ) no visible damage 0100: ±(3% +50mΩ) < 100mΩf or jumper Others: ± (1%+50mΩ) for B/D/F tol ± (2%+50mΩ) for J tol <100mR for jumper |
| Thermal Shock | MIL-STD-202 Method 107G | -55/+125°C Note Number of cycles required is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air - Air | 0075/0100: ± (1% +50mΩ) < 50mΩf or jumper Others: ± (0.5%+50mΩ) for B/D/F tol ± (1%+50mΩ) for J tol < 50mR for jumper |

TESTS AND REQUIREMENTS

| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS |
|-------------------------------|---|--|--|
| Short Time Overload | IEC 60115-1 4.13 | 2.5 times RCWV or maximum overload voltage which is less for 5 seconds at room temperature | 0075/0100: $\pm (2\% + 50m\Omega)$ < 50m Ω f or jumper Others: $\pm (1\% + 50m\Omega)$ for B/D/F tol $\pm (2\% + 50m\Omega)$ for J tol <50mR for jumper No visible damage |
| Board Flex/Bending | IEC 60115-1 4.33 | Device mounted or as described only 1 board bending required bending time: 60 \pm 5 seconds 0075/0100/0201/0402:5mm; 0603/0805:3mm; 1206 and above:2mm | 0075/0100: $\pm (1\% + 50m\Omega)$ < 50m Ω f or jumper Others: $\pm (1\% + 50m\Omega)$ for B/D/F/J tol <50mR for jumper No visible damage |
| Solderability - Wetting | J-STD-002 test B | Electrical Test not required Magnification 50X SMD conditions: 1st step: method B, aging 4 hours at 155°C dry heat 2nd step: leadfree solder bath at 245 \pm 3°C Dipping time: 3 \pm 0.5 seconds | Well tinned (>95% covered) No visible damage |
| -Leaching | J-STD-002 test D | Leadfree solder ,260°C, 30 seconds immersion time | No visible damage |
| -Resistance to Soldering Heat | MIL-STD-202 Method 210F IEC 60115-1 4.18 | Condition B, no pre-heat of samples Leadfree solder, 260°C \pm 5°C, 10 \pm 1 seconds immersion time Procedure 2 for SMD: devices fluxed And cleaned with isopropanol | 0075: $\pm (3\% + 50m\Omega)$ <50m Ω for jumper 0100: $\pm (1\% + 50m\Omega)$ < 50m Ω f or jumper Others: $\pm (0.5\% + 50m\Omega)$ for B/D/F tol. $\pm (1\% + 50m\Omega)$ for J tol. <50mR for jumper No visible damage |

9. REVISION HISTORY

REVISION HISTORY

| REVISION | DATE | CHANGE NOTIFICATION | DESCRIPTIONN |
|-----------|------------|---------------------|------------------------------------|
| Version 1 | 24-03-2022 | - | -First issue of this specification |

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