

# 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

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# 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

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

### Refer to below table

| code       | A               | B               | C               | D               | E               | F               | G               | H               | X                | Y                | Z                |
|------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
| Multiplier | 10 <sup>0</sup> | 10 <sup>1</sup> | 10 <sup>2</sup> | 10 <sup>3</sup> | 10 <sup>4</sup> | 10 <sup>5</sup> | 10 <sup>6</sup> | 10 <sup>7</sup> | 10 <sup>-1</sup> | 10 <sup>-2</sup> | 10 <sup>-3</sup> |
| 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 , X10<sup>2</sup> ohm , X10<sup>3</sup> ohm , X10<sup>4</sup> ohm , X10<sup>5</sup> 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)<br>10Ω≤R≤1MΩ<br>1% (E24/E96)<br>10Ω≤R≤1MΩ<br>Jumper≤50mΩ  | 10Ω≤R≤100Ω ±300ppm°C<br>100Ω<R≤1MΩ ±200ppm°C                        | Rated Current 0.5A<br>Maximum Current 1.0A |
| SC0100          | 1/32W | -55°C to 125°C              | 15V                     | 30V                      | 30V                             | 5% (E24)<br>1Ω≤R≤22MΩ<br>1% (E24/E96)<br>1Ω≤R≤10MΩ<br>0.5% (E24/E96)<br>10Ω≤R≤1MΩ<br>Jumper≤50mΩ                               | 1Ω≤R≤100Ω ±300ppm°C<br>100Ω<R≤22MΩ ±200ppm°C                        | Rated Current 0.5A<br>Maximum Current 1.0A |
| SC0201          | 1/20W | -55°C to 125°C              | 25V                     | 50V                      | 50V                             | 5% (E24)<br>1Ω≤R≤10MΩ<br>1% (E24/E96)<br>1Ω≤R≤10MΩ<br>0.5% (E24/E96)<br>1Ω≤R≤1MΩ<br>0.1% (E24/E96)<br>10Ω≤R≤1MΩ<br>Jumper≤50mΩ | 1Ω≤R≤10Ω ±300ppm°C<br>10Ω<R≤10MΩ ±200ppm°C                          | Rated Current 0.5A<br>Maximum Current 1.0A |
| SC0402          | 1/16W | -55°C to 155°C              | 50V                     | 100V                     | 100V                            | 5% (E24)<br>1Ω≤R≤22MΩ<br>1% (E24/E96)<br>1Ω≤R≤10MΩ<br>0.5% (E24/E96)<br>1Ω≤R≤1MΩ<br>0.1% (E24/E96)<br>10Ω≤R≤1MΩ<br>Jumper≤50mΩ | 1Ω≤R≤10Ω ±200ppm°C<br>10Ω<R≤10MΩ ±100ppm°C<br>10MΩ<R≤22MΩ ±200ppm°C | Rated Current 1.0A<br>Maximum Current 2.0A |
|                 | 1/8W  | -55°C to 155°C              | 50V                     | 100V                     | 100V                            | 5% (E24)<br>1Ω≤R≤1MΩ<br>1% (E24/E96)<br>1Ω≤R≤1MΩ   | 1Ω≤R≤1MΩ ±200ppm°C  |  |
| SC0603          | 1/10W | -55°C to 155°C              | 75V                     | 150V                     | 150V                            | 5% (E24)<br>1Ω≤R≤22MΩ<br>1% (E24/E96)<br>1Ω≤R≤10MΩ<br>0.5% (E24/E96)<br>1Ω≤R≤1MΩ<br>0.1% (E24/E96)<br>10Ω≤R≤1MΩ<br>Jumper≤50mΩ | 1Ω≤R≤10Ω ±200ppm°C<br>10Ω<R≤10MΩ ±100ppm°C<br>10MΩ<R≤22MΩ ±200ppm°C | Rated Current 1.0A<br>Maximum Current 2.0A |
|                 | 1/5W  | -55°C to 155°C              | 75V                     | 150V                     | 150V                            | 5% (E24)<br>1Ω≤R≤1MΩ<br>1% (E24/E96)<br>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)<br>1Ω≤R≤100MΩ<br>1% (E24/E96)<br>1Ω≤R≤10MΩ<br>0.5% (E24/E96)<br>1Ω≤R≤1MΩ<br>0.1% (E24/E96)<br>10Ω≤R≤1MΩ<br>10%, 20%<br>24MΩ≤R≤100MΩ<br>Jumper≤50mΩ | 1Ω≤R≤10Ω<br>±200ppm°C<br>10Ω<R≤10MΩ<br>±100ppm°C<br>10MΩ<R≤22MΩ<br>±200ppm°C<br>24MΩ≤R≤100MΩ<br>±300ppm°C | Rated Current<br>2.0A<br>Maximum<br>Current<br>5.0A  |
|                 | 1/4W  | -55°C to 155°C              | 150V                    | 300V                     | 300V                            | 5% (E24)<br>1Ω≤R≤1MΩ<br>1% (E24/E96)<br>1Ω≤R≤1MΩ  | 1Ω≤R≤1MΩ<br>±200ppm°C   |  |
| SC1206          | 1/4W  | -55°C to 155°C              | 200V                    | 400V                     | 500V                            | 5% (E24)<br>1Ω≤R≤100MΩ<br>1% (E24/E96)<br>1Ω≤R≤10MΩ<br>0.5% (E24/E96)<br>1Ω≤R≤1MΩ<br>0.1% (E24/E96)<br>10Ω≤R≤1MΩ<br>10%, 20%<br>24MΩ≤R≤100MΩ<br>Jumper≤50mΩ | 1Ω≤R≤10Ω<br>±200ppm°C<br>10Ω<R≤10MΩ<br>±100ppm°C<br>10MΩ<R≤22MΩ<br>±200ppm°C<br>24MΩ≤R≤100MΩ<br>±300ppm°C | Rated Current<br>2.0A<br>Maximum<br>Current<br>10.0A |
|                 | 1/2W  | -55°C to 155°C              | 200V                    | 400V                     | 500V                            | 5% (E24)<br>1Ω≤R≤1MΩ<br>1% (E24/E96)<br>1Ω≤R≤1MΩ  | 1Ω≤R≤1MΩ<br>±200ppm°C   |  |
| SC1210          | 1/2W  | -55°C to 155°C              | 200V                    | 500V                     | 500V                            | 5% (E24)<br>1Ω≤R≤22MΩ<br>1% (E24/E96)<br>1Ω≤R≤10MΩ<br>0.1%,0.5%<br>(E24/E96)<br>10Ω≤R≤1MΩ<br>Jumper≤50mΩ  | 1Ω≤R≤10Ω<br>±200ppm°C<br>10Ω<R≤10MΩ<br>±100ppm°C<br>10MΩ<R≤22MΩ<br>±200ppm°C                              | Rated Current<br>2.0A<br>Maximum<br>Current<br>10.0A |
| SC2010          | 3/4W  | -55°C to 155°C              | 200V                    | 500V                     | 500V                            | 5% (E24)<br>1Ω≤R≤22MΩ<br>1% (E24/E96)<br>1Ω≤R≤10MΩ<br>0.1%,0.5%<br>(E24/E96)<br>10Ω≤R≤1MΩ<br>Jumper≤50mΩ  | 1Ω≤R≤10Ω<br>±200ppm°C<br>10Ω<R≤10MΩ<br>±100ppm°C<br>10MΩ<R≤22MΩ<br>±200ppm°C                              | Rated Current<br>2.0A<br>Maximum<br>Current<br>10.0A |
| SC2512          | 1W    | -55°C to 155°C              | 200V                    | 500V                     | 500V                            | 5% (E24)<br>1Ω≤R≤22MΩ<br>1% (E24/E96)<br>1Ω≤R≤10MΩ<br>0.1%,0.5%<br>(E24/E96)<br>10Ω≤R≤1MΩ<br>Jumper≤50mΩ  | 1Ω≤R≤10Ω<br>±200ppm°C<br>10Ω<R≤10MΩ<br>±100ppm°C<br>10MΩ<R≤22MΩ<br>±200ppm°C                              | Rated Current<br>2.0A<br>Maximum<br>Current<br>10.0A |
|                 | 2W    | -55°C to 155°C              | 200V                    | 400V                     | 500V                            | 5% (E24)<br>1Ω≤R≤1MΩ<br>1% (E24/E96)<br>1Ω≤R≤1MΩ  | 1Ω≤R≤1MΩ<br>±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:

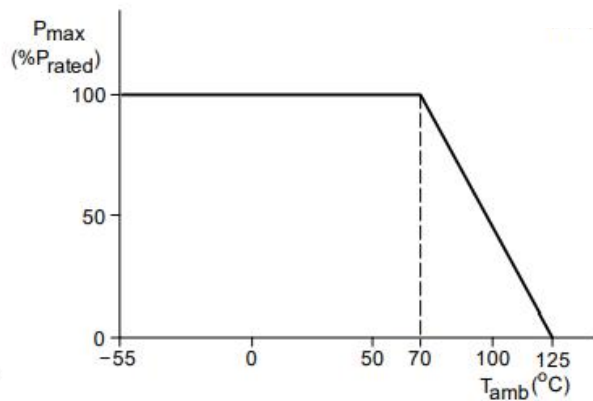


Fig3: Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature

## 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<sub>amb</sub> = 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 mm<sup>2</sup> (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<br>TAPING REEL |            |            |           |           |
| ESD SAFE REEL(S)<br>4MM WIDTH,1MM<br>PITCH PLASTIC<br>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

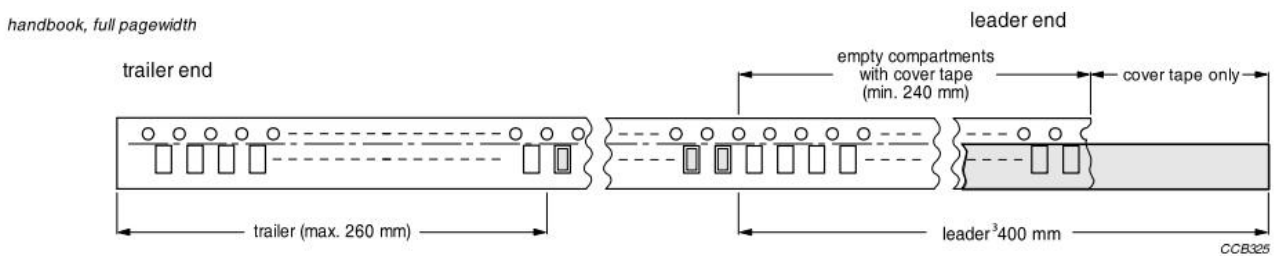


Fig11: Leader/trailer tape



## 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  $300 \pm 10$  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  $165^\circ$  and  $180^\circ$ .



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)    | 180 +0/-3 | 60 +1/-0  | 13.0 ± 0.2 | ---        | 13.6 ± 0.5 | 16.5 ± 0.5 |
| SC2512         | 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<br>Formula:<br>$T.C.R = \frac{R2 - R1}{R1 \times (t2 - t1)} \times 10^6 \text{ (ppm/C)}$<br>Where<br>t1=+25 °C or specified room temperature<br>t2=-55 °C or +125 °C test temperature<br>R1=resistance at reference temperature in ohms<br>R2=resistance at test temperature in ohms | Refer to table 2  |
| Life/ Endurance                                | MIL-STD-202 Method 108A<br>IEC 60115-1 4.25.1 | At 70± 2°C for 1,000 hours;<br>RCWV applied for 1.5 hours on and 0.5 hour off, s<br>till air required  | 0075: ± (5%+100mΩ)<br><100mΩ for jumper<br>0100: ±(3% +50mΩ)<br><100mΩf or jumper<br>Others:<br>± (1%+50mΩ) for B/D/F tol<br>± (3%+50mΩ) for J tol<br><100mR for jumper     |
| High Temperature Exposure                      | MIL-STD-202 Method 108A<br>IEC 60068-2-2      | 1,000 hours at maximum operating temperature<br>depending on specification, unpowered.   | 0075: ± (5%+100mΩ)<br><100mΩ for jumper<br>0100: ±(1% +50mΩ)<br>< 50mΩf or jumper<br>Others:<br>± (1%+50mΩ) for B/D/F tol<br>± (2%+50mΩ) for J tol<br><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<br>Parts mounted on test-boards, without condensation on parts   | 0075: ± (2%+100mΩ)<br><100mΩ for jumper<br>0100: ±(2% +50mΩ)<br>< 100mΩf or jumper<br>Others:<br>± (0.5%+50mΩ) for B/ D/F tol<br>± (2%+50mΩ) for J tol<br><100mR for jumper |
| Humidity                                       | IEC 60115-1 4.24.2                            | Steady state for 1000 hours at 40°C / 95% R.H.<br>RCWV applied for 1.5 hours on and 0.5 hour off   | 0075: ± (5%+100mΩ)<br>no visible damage<br>0100: ±(3% +50mΩ)<br>< 100mΩf or jumper<br>Others:<br>± (1%+50mΩ) for B/D/F tol<br>± (2%+50mΩ) for J tol<br><100mR for jumper    |
| Thermal Shock                                  | MIL-STD-202 Method 107G                       | -55/+125°C<br>Note Number of cycles required is 300.<br>Devices mounted<br>Maximum transfer time is 20 seconds.<br>Dwell time is 15 minutes. Air - Air   | 0075/0100: ± (1% +50mΩ)<br>< 50mΩf or jumper<br>Others:<br>± (0.5%+50mΩ) for B/D/F tol<br>± (1%+50mΩ) for J tol<br>< 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: $\pm (2\% + 50m\Omega)$<br>< 50m $\Omega$ f or jumper<br>Others:<br>$\pm (1\% + 50m\Omega)$ for B/D/F tol<br>$\pm (2\% + 50m\Omega)$ for J tol<br><50mR for jumper<br>No visible damage   |
| Board Flex/Bending            | IEC 60115-1 4.33                            | Device mounted or as described only<br>1 board bending required<br>bending time: 60 $\pm$ 5 seconds<br>0075/0100/0201/0402:5mm;<br>0603/0805:3mm;<br>1206 and above:2mm  | 0075/0100: $\pm (1\% + 50m\Omega)$<br>< 50m $\Omega$ f or jumper<br>Others:<br>$\pm (1\% + 50m\Omega)$ for B/D/F/J tol<br><50mR for jumper<br>No visible damage  |
| Solderability - Wetting       | J-STD-002 test B                            | Electrical Test not required Magnification 50X<br>SMD conditions:<br>1st step: method B, aging 4 hours at 155°C dry heat<br>2nd step: leadfree solder bath at 245 $\pm$ 3°C<br>Dipping time: 3 $\pm$ 0.5 seconds | Well tinned<br>(>95% covered)<br>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<br>IEC 60115-1 4.18 | Condition B, no pre-heat of samples<br>Leadfree solder, 260°C $\pm$ 5°C, 10 $\pm$ 1 seconds immersion time<br>Procedure 2 for SMD: devices fluxed And cleaned with isopropanol                                   | 0075: $\pm (3\% + 50m\Omega)$<br><50m $\Omega$ for jumper<br>0100: $\pm (1\% + 50m\Omega)$<br>< 50m $\Omega$ f or jumper<br>Others:<br>$\pm (0.5\% + 50m\Omega)$ for B/D/F tol.<br>$\pm (1\% + 50m\Omega)$ for J tol.<br><50mR for jumper<br>No visible damage |

## 9. REVISION HISTORY

### REVISION HISTORY

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

# 10. SUNWAY CONTACT

## Asia

### **HQ Shenzhen China**

No. 1013, Xihuan Road, Shajing Town,  
Bao'an District, Shenzhen, China  
Tel:+86-755-81773388  
E-mail:Sales-south@sz-sunway.com

### **Shenzhen China**

North third floor, block A, Tefa  
information port, No. 2 Kefeng Road,  
Science Park, Nanshan District,  
Shenzhen,China  
E-mail:Sales-south@sz-sunway.com

### **Beijing china**

No.14, Jinxiu Street, Business  
Development Area, Beijing, China  
E-mail:Sales-east@sz-sunway.com

### **Shanghai China**

Floor 1, Building 1, No. 2653 Hunan  
Road, Pudong New Area, Shanghai,  
China  
E-mail:Sales-east@sz-sunway.com

### **Changzhou China**

No.369 Jinlong Road, Jintan District,  
Changzhou, China  
E-mail:Sales-east@sz-sunway.com

### **Yiyang China**

Yiyang High-tech Zone East Industrial  
Park Standardized Plant, Yiyang,China  
E-mail:Sales-east@sz-sunway.com

### **Mianyang china**

No.268 Binhe North Road West Section,  
High-tech Zone, Mianyang, China

### **Taiwan China**

Floor 2, NO 637 Ruiguang Road, Neihu  
District, Taipei City 114, Taiwan

### **Shin-Yokohama Japan**

3rd floor-A, INTELLEX-Shin-Yokohama  
building 1-17-12, Shin-yokohama,  
Kohoku-ku, Yokohama-shi, Kanagawa,  
Janpan

### **Suwon South Korea**

101-801, Digital Empire 2,#88  
Sinwon-road,Yeongtong-gu,Suwon-Si,  
Gyeonggi-do, Korea

### **Vinh Phuc Vietnam**

CNO8-2, Binh Xuyen 2 IP, Ba Hien, Binh  
Xuyen,Vinh Phuc,Vietnam

## Northern America

### **Cupertino USA**

20040 Stevens Creek Blvd, Suite 100,  
Cupertino, CA95014,USA

### **San Diego USA**

10180Telesis Ct Suite165/220,San  
Diego, CA 92121,USA

## Europe

### **Stockholm Sweden**

Kistagangen 20BS-164 40 Kista, Sweden  
Email:europe@sz-sunway.com

### **Bettlach Switzerland**

Bischmattstrasse 7 CH-2544 Bettlach,  
Switzerland  
Email:europe@sz-sunway.com

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