# APPROVAL SHEET

## TTU12, TTU25

## ±1%

## Ultra Low TCR / High Power Current Sensor

Size: 1206, 2512



RoHS COMPLIANT

Pb Pb-Free

*Contents in this sheet are subject to change without prior notice.

## FEATURES

1. High Power rating in Small package size 2512 with Low TCR down to 50 ppm/℃
2. Extra low Resistance down to 0.5mΩ with High Power Rating 3W
3. 170℃ Operating Temperature Certainly.
4. Suitable for Lead Free Soldering.

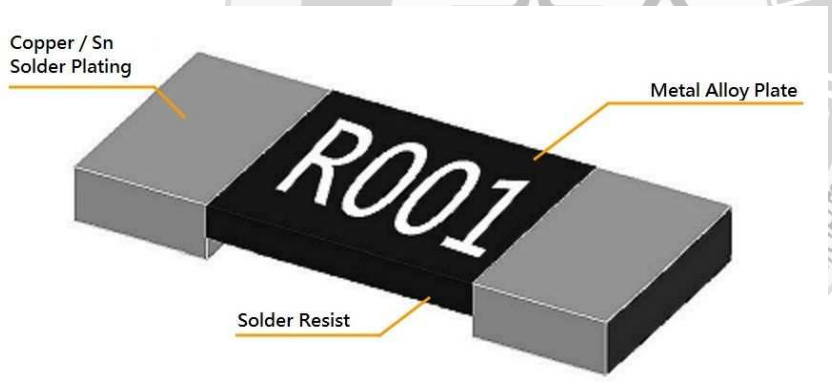
## APPLICATIONS

- Current sensor
- Medical equipment
- Measuring instrument
- Communication device
- Power supply
- Computer
- White Good

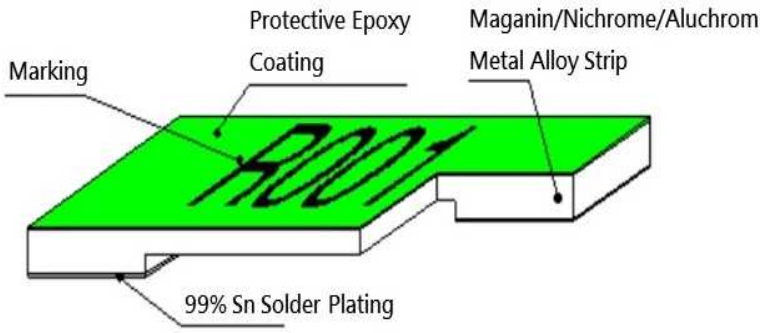
## DESCRIPTION

This specification describes TTU series current sensor – High power and Ultra low TCR/High power with lead-free terminations made by metal alloy plate.

### ■ High power (TTU12 and TTU25,100PPM )




### ■ Ultra Low TCR /High Power ( TTU25, 50ppm )



## Quick Reference Data

### ■ High Power

| Series | Size Code | Operating Temperature | Functional code | | | Resistance Range ( mΩ) | Resistance Tolerance |
|---|---|---|---|---|---|---|---|
| | | | Power | | TCR | | |
| | | | Q | S | P | | |
| TTU | 1206 (3216) | -55℃ to +155℃ | 2W | | 100ppm/℃ | 1 | ±1% |
| | 2512 (6342) | | | 3W | | | |

### ■ Ultra Low TCR /High Power

| Series | Size Code | Operating Temperature | Functional code | | | | | Resistance Range ( mΩ) | Resistance Tolerance |
|---|---|---|---|---|---|---|---|---|---|
| | | | Power | | | TCR | | | |
| | | | Q | R | S | P | N | | |
| TTU | 2512 (6342) | -55℃ to +170℃ | | | 3W | 100ppm/℃ | | 0.5 | ±1% |
| | | | | | 3W | | 50 ppm/℃ | 1.0~3.5 | |
| | | | | 2.5W | | | | 4~6 | |
| | | | 2W | | | | | 7~10 | |

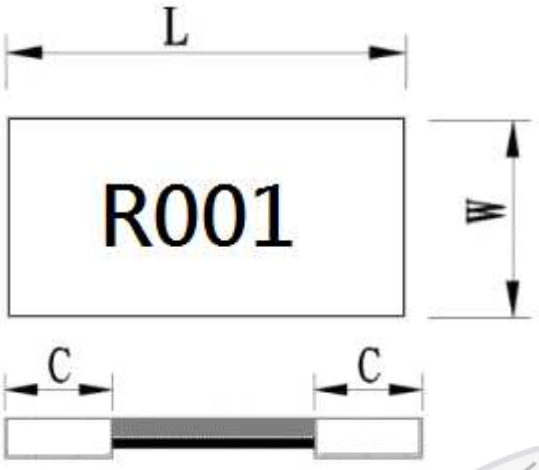
Note:

1. This is the maximum voltage that may be continuously supplied to the resistor element, see “IEC publication 60115-8”
2. Max. Operation Voltage : So called RCWV (Rated Continuous Working Voltage) is determined by

$$RCWV = \sqrt{RatedPower \times ResistanceValue}$$

## DIMENSIONS: (unit:mm)

### 1206/2512




■ **High Power :**

| Type | Resistance Range (mΩ) | L(mm) | W(mm) | C(mm) |
|---|---|---|---|---|
| TTU1206 | 1 | 3.20±0.20 | 1.50±0.20 | 0.8±0.25 |
| TTU2512 | 1 | 6.40±0.25 | 3.20±0.25 | 2.65±0.25 |

■ **Ultra Low TCR /High Power :**

| Type | Resistance Range (mΩ) | L(mm) | W(mm) | C(mm) |
|---|---|---|---|---|
| TTU2512 | 0.5 | 6.35±0.25 | 3.0±0.2 | 2.68±0.25 |
| TTU2512 | 1 | 6.35±0.25 | 3.0±0.2 | 1.93±0.25 |
| TTU2512 | 1.5 | 6.35±0.25 | 3.0±0.2 | 1.43±0.25 |
| TTU2512 | 2~3.5 | 6.35±0.25 | 3.0±0.2 | 1.18±0.25 |
| TTU2512 | 4~4.5 | 6.35±0.25 | 3.0±0.2 | 2.18±0.25 |
| TTU2512 | 5~6 | 6.35±0.25 | 3.0±0.2 | 1.93±0.25 |
| TTU2512 | 6.5~7.5 | 6.35±0.25 | 3.0±0.2 | 1.43±0.25 |
| TTU2512 | 8~10 | 6.35±0.25 | 3.0±0.2 | 1.18±0.25 |

### Marking

### 2512/1206

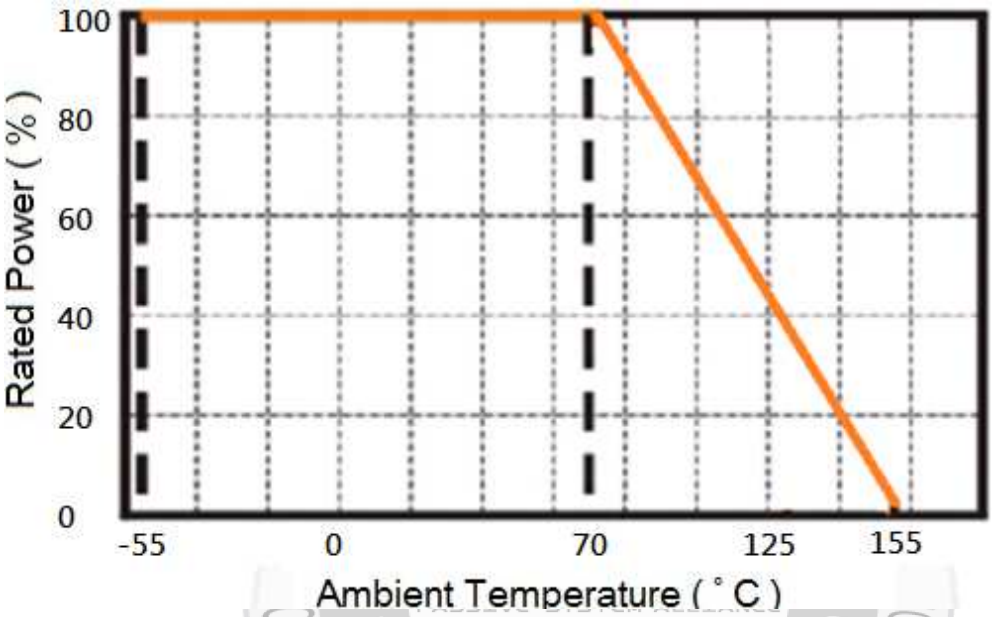

**R001=1mR**

## FUNCTIONAL DESCRIPTION

### DERATING

The power that the resistor can dissipate depends on the operating temperature; see Fig1

■ **High Power :**




■ **Ultra Low TCR /High Power :**

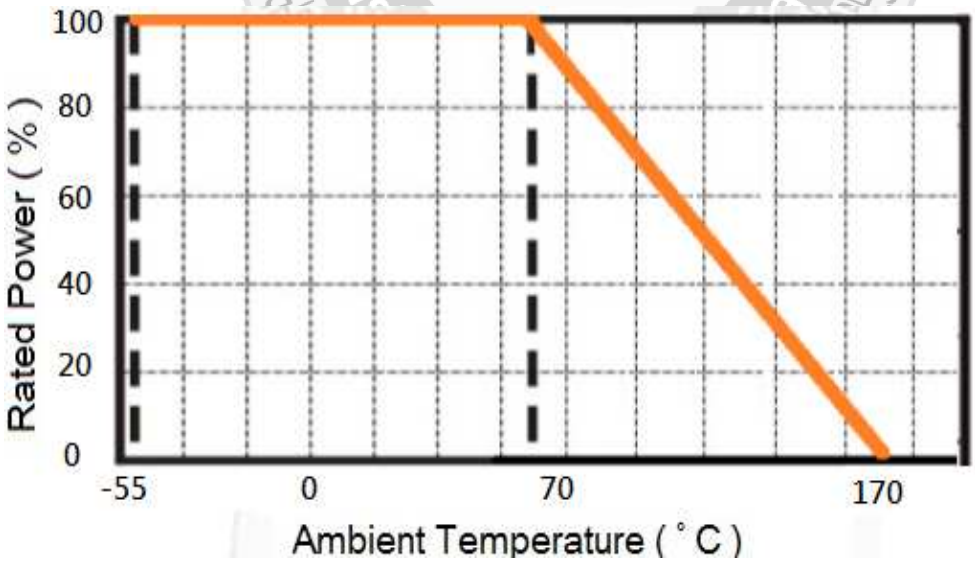



Fig.1 Maximum dissipation in percentage of rated power
As a function of the ambient temperature

## MOUNTING

Due to their rectangular shapes and small tolerances, Surface Mountable 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 individual soldering condition.

The end terminations guarantee a reliable contact.

## SOLDERING CONDITION

1The 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 solderability at 235°C during 2 seconds within lead-free solder bath. The test condition for no leaching is 260°C for 30 seconds. Typical examples of soldering profile and condition that provide reliable joints without any damage are given in Fig 3. and Table 1.

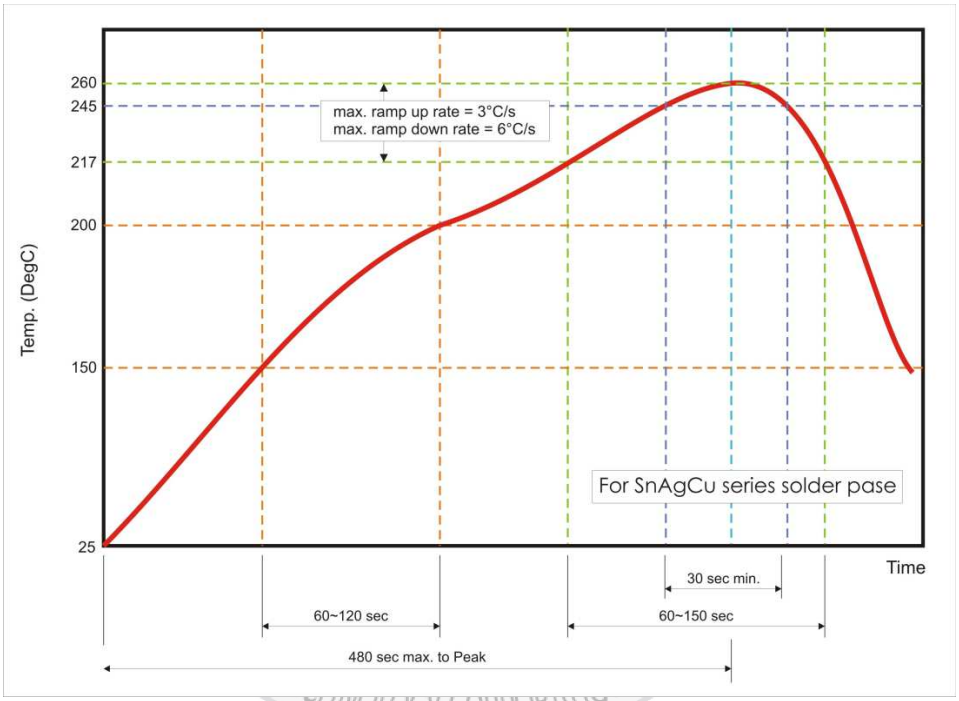



**Fig. 3 Infrared soldering profile for Chip Resistors**

**Table 1. Infrared soldering condition for Chip Resistors**

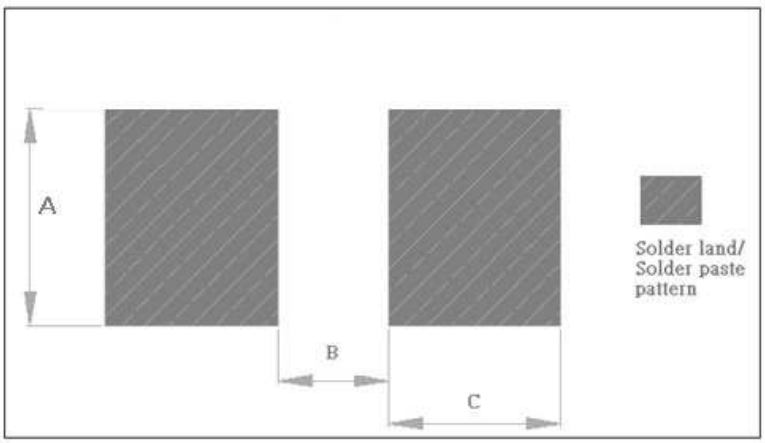
| Temperature Condition | Exposure Time |
|---|---|
| Average ramp-up rate (217℃ to 260℃) | Less than 3℃/second |
| Between 150 and 200℃ | Between 60-120 seconds |
| > 217℃ | Between 60-150 seconds |
| Peak Temperature | 260ºC +0/-5℃ |
| Time within 245℃ | Min. 30 seconds |
| Ramp-down rate (Peak to 217℃) | Less than 6℃/second |
| Time from 25℃ to Peak | No greater than 480 seconds |

## CATALOGUE NUMBERS

| TTU | 08 | S | N | XXXX | F | T | L |
|---|---|---|---|---|---|---|---|
| **Type code**<br><br>High Power & Ultra Low TCR /High Power Current Sensor | **Size code**<br><br>12: 1206<br>25: 2512 | **Power Rating**<br>S: 3W<br>R: 2.5W<br>Q: 2W | **TCR**<br><br>P: 100ppm<br>N: 50ppm | **Resistance**<br><br>e.g. :<br>R001=1mΩ<br>R0L5=0.5mΩ<br>R3L5=3.5 mΩ<br>R010=10 mΩ | **Tolerance**<br><br>F: 1.0% | **Packaging code**<br><br>T: 7" Taped & Reeled<br>. | **Termination Code**<br><br>L: Sn base (lead free) |

## Recommend Solder Pad Dimensions

## 2- wire pad layout






### ■ High Power :

| Type | Resistance Range (mΩ) | A(mm) | B(mm) | C(mm) |
|---|---|---|---|---|
| TTU1206 | 1 | 1.5 | 1.4 | 0.9 |
| TTU2512 | 1 | 3.1 | 2.4 | 1.9 |

### ■ Ultra Low TCR /High Power :

| Type | Resistance Range (mΩ) | A(mm) | B(mm) | C(mm) |
|---|---|---|---|---|
| TTU2512 | 0.5 | 3.4 | 0.52 | 3.13 |
| TTU2512 | 1 | 3.4 | 2.04 | 2.38 |
| TTU2512 | 1.5 | 3.4 | 3.04 | 1.88 |
| TTU2512 | 2~3.5 | 3.4 | 3.54 | 1.63 |
| TTU2512 | 4~4.5 | 3.4 | 1.54 | 2.63 |
| TTU2512 | 5~6 | 3.4 | 2.04 | 2.38 |
| TTU2512 | 6.5~7.5 | 3.4 | 3.04 | 1.88 |
| TTU2512 | 8~10 | 3.4 | 3.54 | 1.63 |

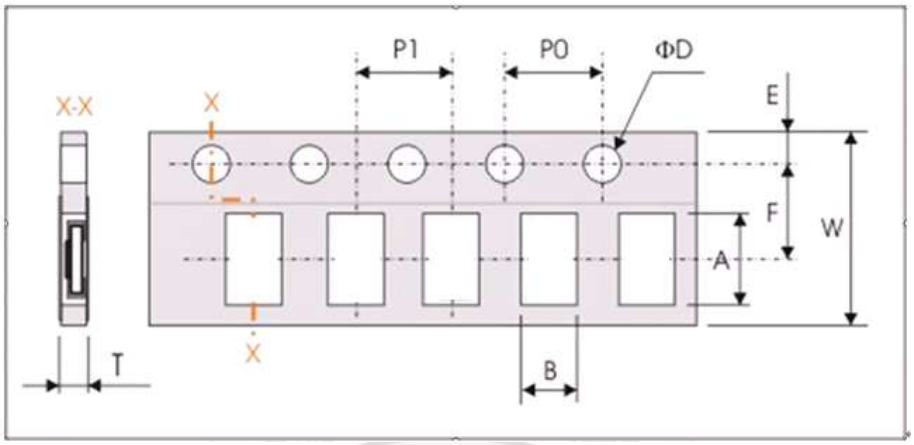
## TEST AND REQUIREMENTS(JIS C 5201-1 : 1998)

| TEST | PROCEDURE | REQUIREMENT |
|---|---|---|
| | | Resistor |
| DC resistance<br>**IEC 60115-1 / JIS C 5201-1 , Clause 4.5** | F: ±1% | Within the specified tolerance |
| Temperature Coefficient of Resistance(T.C.R)<br>**IEC 60115-1 4.8.4.1** | Natural resistance change per change in degree centigrade.<br>$\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6$ (ppm/ C)<br>$R_1$ : Resistance at reference temperature<br>$R_2$ : Resistance at test temperature<br>$t_1$ : 20°C+5°C-1°C<br>t2 : 125°C+5°C-1°C | Refer to<br>" QUICK REFERENCE DATA " |
| Short time Overload (S.T.O.L)<br>**IEC60115-1 4.13** | ■ High Power series<br>2.5 times of rated power for 5 seconds at room temperature | No visible damage<br><±(0.5%) |
| | ■ Ultra Low TCR/High Power Series<br>5 times the rated power is applied to the resistor for 5 seconds and the change in resistance is measured after 30mins | <±(1.0%) |
| Resistance to soldering heat(R.S.H)<br>**MIL-STD-202G-method 210F**<br>**IEC 60115-1 4.18** | The resistor is immersed in solder bath at 260 °C, 10 seconds and the resistance is measured 1hr after the test. | <±(1.0%) |
| Solderability<br>**IPC/JEDEC J-STD-002B test B** | The resistor is immersed in solder bath at 245± 3 °C for 3± 0.5 seconds. | good tinning (>95% covered)<br>no visible damage |
| Thermal Shock<br>**MIL-STD-202G-method 107** | -55/+155 °C<br>Note: Number of cycles required is 300. Devices mounted.<br>Maximum transfer time is 20 seconds. Dwell time is 15 minutes and the change in resistance is measured after 2hrs. | <±(1.0%) |
| Endurance<br>**MIL-STD-202G-method 108**<br>**IEC 60115-1 4.25.1** | 70±2°C, 1000 hours, loaded with RCWV,1.5 hours on and 0.5 hours off | <±(1.0%) |
| Bending Strength<br>**IEC60115-1 4.33** | Device mounted on PCB test board as described, only 1 board bending required<br>Bending : 2mm<br>Holding time: minimum 60±1secs | <±(1.0%) |

| | | |
|---|---|---|
| High Temperature Exposure<br>**MIL-STD-202G-method 108**<br>**IEC 60115-1 4.25.3** | ■ High Power series<br>155±5℃, 1000hrs, unpowered | <±(1.0%) |
| | ■ Ultra Low TCR/High Power Series :<br>The resistor is placed in a constant temperature-humidity chamber at 170±2℃ for 1000hrs and the resistance is measured 60mins after the end of the cycle. | |
| Insulation Resistance<br>**Clause 4.6** | 100V DC for 1 minute. | >100 MΩ |

## PACKAGING

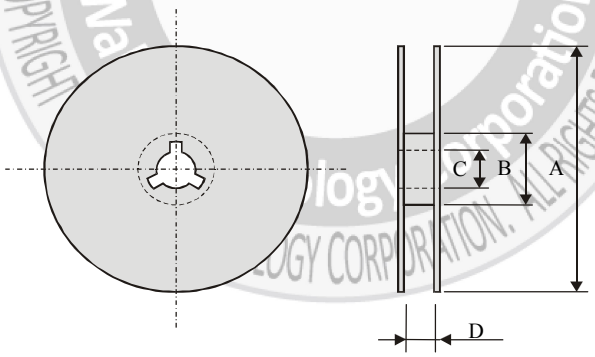
### Paper Tape specifications (unit :mm)




| Series No. | A | B | W | F | E |
|---|---|---|---|---|---|
| TTU 2512 Series | 6.70±0.20 | 3.50±0.20 | 12.00±0.30 | 5.50±0.05 | 1.75±0.10 |
| TTU 1206 Series | 3.40±0.10 | 1.77±0.10 | 8.00±0.10 | 3.50±0.05 | 1.75±0.10 |

| Series No. | P1 | P0 | ΦD | T |
|---|---|---|---|---|
| TTU 2512 Series | 4.00±0.10 | 4.00±0.10 | 1.55±0.05 | Max 1.10 |
| TTU 1206 Series | 4.00±0.10 | 4.00±0.10 | 1.55±0.10 | 0.22±0.05 |

### Reel dimensions




| Symbol | A | B | C | D |
|---|---|---|---|---|
| (unit : mm) | 180.0±1.5 | 60.0±0.2 | 13.5±0.5 | Max 13.00 |

### Taping quantity :

- 4,000 pcs per reel with embossed Tape: TTU12, TTU25 /High Power
- 2,000 pcs per reel with embossed Tape: TTU25 /Ultra Low TCR /High Power