

## *Data Sheet*

Customer: \_\_\_\_\_

Product: Current Sensing Thick Film Resistors, High Power (Metal Paste) HPL Series

Size : 0402/0603/0805/1206/1210/2512

Issued Date: 19-Oct.-2017

Edition: Ver. 4

### Record of change

| Date         | Ver | Description                     | Page |
|--------------|-----|---------------------------------|------|
| 1-Apr.-2015  | 1   |                                 |      |
| 15-Sep.-2016 | 2   | Add 0402 size                   |      |
| 15-May-2017  | 3   | Part no. designation changed    |      |
| 19-Oct.-2017 | 4   | Change the title of this series |      |
|              |     |                                 |      |

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| Prepared by     | Checked by    | Approved by   | Accepted by (customer) |
|-----------------|---------------|---------------|------------------------|
| 1-Apr.-2015     | 1-Apr.-2015   | 1-Apr.-2015   |                        |
| <i>Andy Hsu</i> | <i>Hwa Wu</i> | <i>Hwa Wu</i> |                        |

# CURRENT SENSING THICK FILM RESISTORS HIGH POWER HPL Series (Metal Paste)

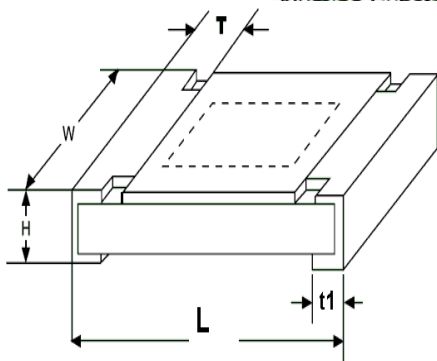
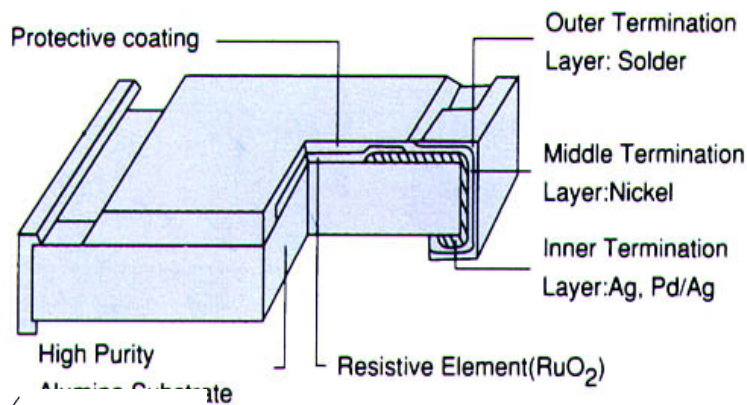
## ■ Features

- Low resistance and high precision (1%).
- Excellent reliability and suitable cost.
- Suitable for lead free soldering.
- RoHS compliant & Halogen Free.

## ■ Applications

- Consumer Electronics
- SMPS, M/B
- Portable Device
- Measurement instrument
- Electronic equipment

## ■ Configuration

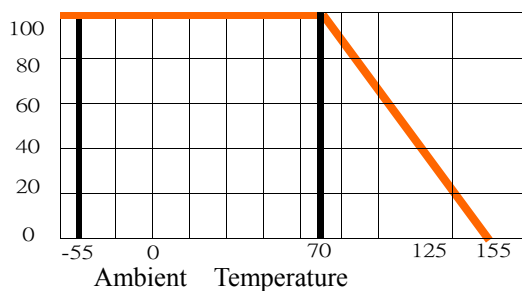


## ■ Dimensions

| Size | L         | W         | T         | t1        | H         |
|------|-----------|-----------|-----------|-----------|-----------|
| 0402 | 1.00±0.10 | 0.50±0.05 | 0.20±0.10 | 0.25±0.10 | 0.30±0.05 |
| 0603 | 1.60±0.10 | 0.80±0.10 | 0.25±0.15 | 0.25±0.15 | 0.45±0.15 |
| 0805 | 2.00±0.10 | 1.25±0.10 | 0.40±0.20 | 0.35±0.20 | 0.50±0.15 |
| 1206 | 3.10±0.10 | 1.60±0.10 | 0.50±0.25 | 0.40±0.20 | 0.60±0.15 |
| 1210 | 3.10±0.10 | 2.60±0.10 | 0.50±0.20 | 0.50±0.20 | 0.55±0.10 |
| 2010 | 5.00±0.20 | 2.50±0.20 | 0.60±0.25 | 0.50±0.20 | 0.55±0.10 |
| 2512 | 6.40±0.20 | 3.20±0.20 | 0.60±0.25 | 0.50±0.20 | 0.60±0.10 |

(unit:mm)

## ■ Power Derating Curve



(Maximum dissipation in percentage of rated power as a function of the ambient temperature)

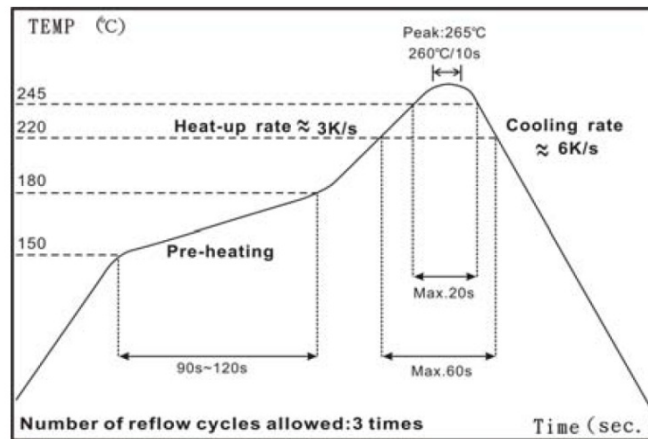
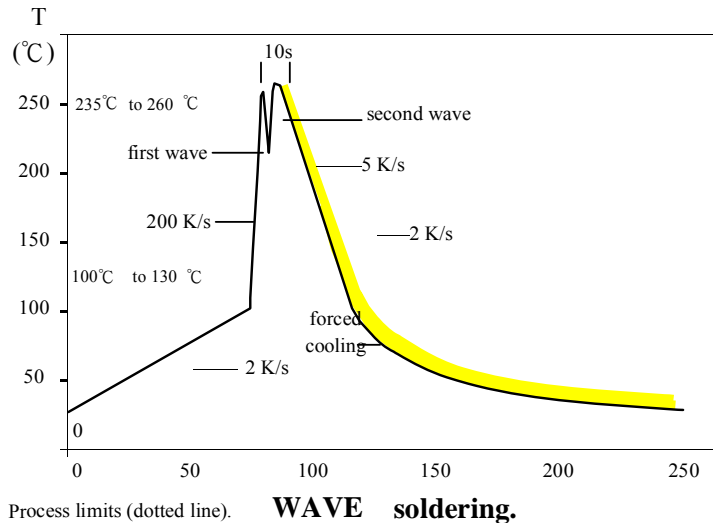
# CURRENT SENSING THICK FILM RESISTORS HIGH POWER HPL Series (Metal Paste)

## Rating

| Size    | Power Rating at 70°C | Tolerance (%)    | T.C.R. ppm/°C        | Resistance Range      |                       | Standard Resistance Values       |
|---------|----------------------|------------------|----------------------|-----------------------|-----------------------|----------------------------------|
|         |                      |                  |                      | Min.                  | Max.                  |                                  |
| HPL0402 | 1/8W                 | ±1%(F)<br>±5%(J) | 0~+200<br>0~+300     | 470mΩ<br>100mΩ        | 976mΩ<br>430mΩ        | E-24<br><br>E-96<br>(on request) |
| HPL0603 | 1/4W                 |                  | ±100<br>±200<br>±400 | 100mΩ<br>20mΩ<br>10mΩ | 976mΩ<br>99mΩ<br>19mΩ |                                  |
| HPL0805 | 1/2W                 |                  | ±100<br>±200         | 47mΩ<br>10mΩ          | 976mΩ<br>46mΩ         |                                  |
| HPL1206 | 3/4W                 |                  | ±100<br>±200         | 47mΩ<br>10mΩ          | 976mΩ<br>47mΩ         |                                  |
| HPL1210 | 3/4W                 |                  | ±100<br>±200         | 47mΩ<br>10mΩ          | 976mΩ<br>47mΩ         |                                  |
| HPL2010 | 1W                   |                  | ±100<br>±200         | 47mΩ<br>10mΩ          | 976mΩ<br>47mΩ         |                                  |
| HPL2512 | 2W                   |                  | ±100<br>±200         | 47mΩ<br>10mΩ          | 976mΩ<br>47mΩ         |                                  |

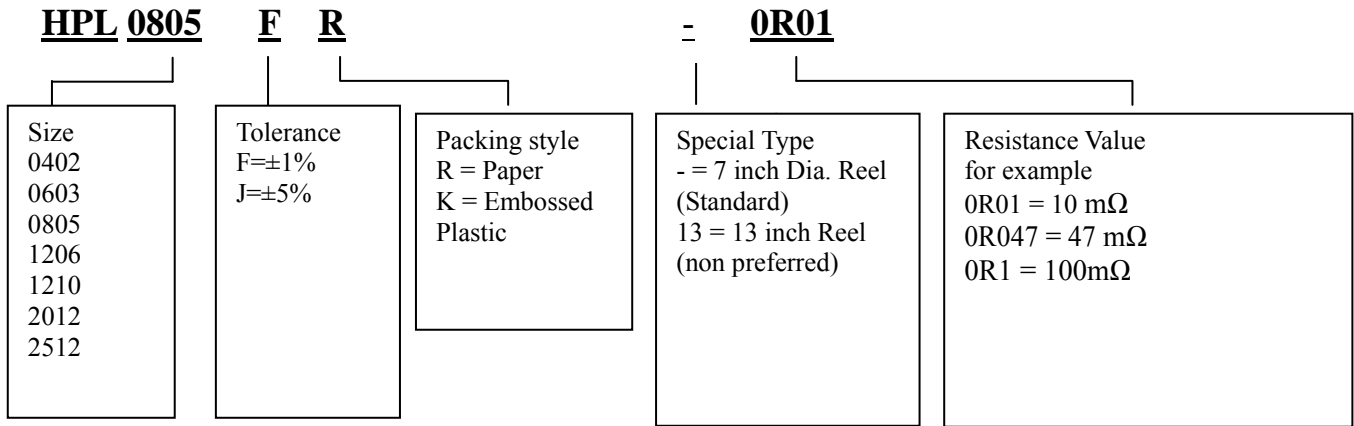
Note : RCWV(Rated Continuous Working Voltage) =  $\sqrt{P(\text{rated power}) \times R(\text{Resistance value})}$   
 RCWV: Working Voltage(V). P: Rated Power (W), R: Resistance Value(Ω)

## Soldering Temperature Curve



# CURRENT SENSING THICK FILM RESISTORS HIGH POWER HPL Series (Metal Paste)

## ■ Part Numbering



## GENERAL SPECIFICATION

### ■ Resistance Marking

#### E - 24 SERIES



4 digits marking for ±1%, ±5%  
E24 (10mΩ~976mΩ)  
Examples: R100 = 100mΩ  
R047 = 47mΩ



3 digits marking for 0603 ±1%, ±5%  
E24 (100mΩ~976mΩ)  
Examples: R10 = 100mΩ  
R50 = 50mΩ

3 digit marking with underline for 0603 ±1%  
E-96 (10mΩ~976mΩ)  
Examples: 499 = 499 mΩ

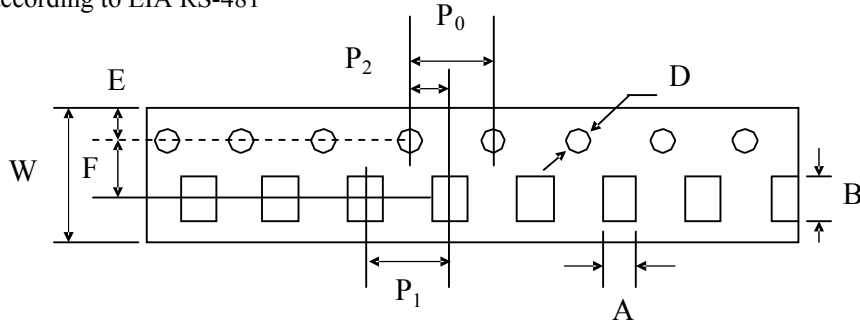
No marking for 0402 size

# CURRENT SENSING THICK FILM RESISTORS HIGH POWER HPL Series (Metal Paste)

## GENERAL SPECIFICATION

### ■ Tape And Reel Package

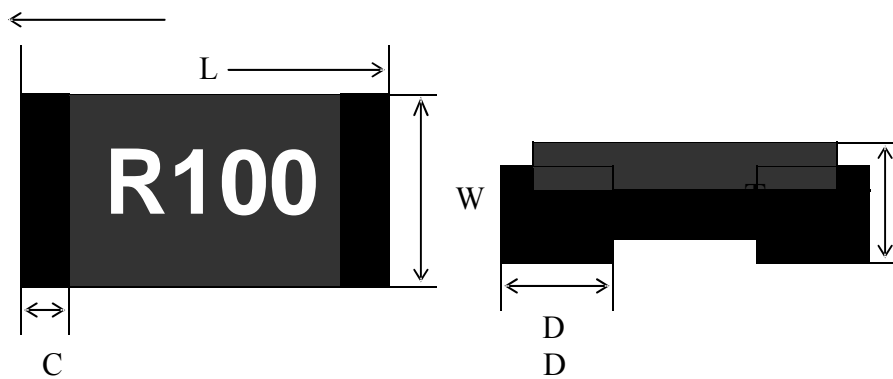
• Taping specs are according to EIA RS-481



Accumulated dimensional tolerance  $40 \pm 0.2 \text{ mm}$

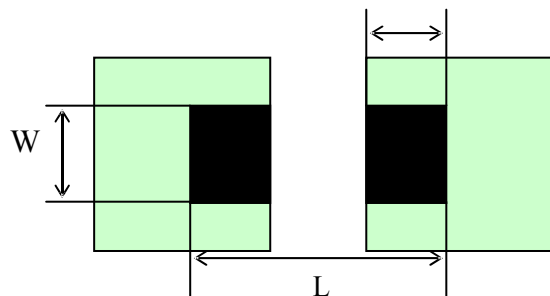
| Size | A               | B               | W                | F               | E               | P1              | P2              | P0              | D                  |
|------|-----------------|-----------------|------------------|-----------------|-----------------|-----------------|-----------------|-----------------|--------------------|
| 0402 | $0.65 \pm 0.1$  | $1.15 \pm 0.1$  | $8.00 \pm 0.30$  | $3.50 \pm 0.05$ | $1.75 \pm 0.10$ | $4.00 \pm 0.10$ | $2.00 \pm 0.05$ | $4.00 \pm 0.10$ | $1.50 + 0.10 / -0$ |
| 0603 | $1.10 \pm 0.20$ | $1.90 \pm 0.20$ | $8.00 \pm 0.30$  | $3.50 \pm 0.05$ | $1.75 \pm 0.10$ | $4.00 \pm 0.10$ | $2.00 \pm 0.05$ | $4.00 \pm 0.10$ | $1.50 + 0.10 / -0$ |
| 0805 | $1.65 \pm 0.20$ | $2.40 \pm 0.20$ | $8.00 \pm 0.30$  | $3.50 \pm 0.05$ | $1.75 \pm 0.10$ | $4.00 \pm 0.10$ | $2.00 \pm 0.05$ | $4.00 \pm 0.10$ | $1.50 + 0.10 / -0$ |
| 1206 | $2.00 \pm 0.20$ | $3.60 \pm 0.20$ | $8.00 \pm 0.30$  | $3.50 \pm 0.05$ | $1.75 \pm 0.10$ | $4.00 \pm 0.10$ | $2.00 \pm 0.05$ | $4.00 \pm 0.10$ | $1.50 + 0.10 / -0$ |
| 1210 | $3.00 \pm 0.20$ | $3.60 \pm 0.20$ | $8.00 \pm 0.30$  | $3.50 \pm 0.05$ | $1.75 \pm 0.10$ | $4.00 \pm 0.10$ | $2.00 \pm 0.05$ | $4.00 \pm 0.10$ | $1.50 + 0.10 / -0$ |
| 2010 | $2.80 \pm 0.20$ | $5.50 \pm 0.20$ | $12.00 \pm 0.30$ | $5.50 \pm 0.05$ | $1.75 \pm 0.10$ | $4.00 \pm 0.10$ | $2.00 \pm 0.05$ | $4.00 \pm 0.10$ | $1.50 + 0.10 / -0$ |
| 2512 | $3.50 \pm 0.20$ | $6.70 \pm 0.20$ | $12.00 \pm 0.30$ | $5.50 \pm 0.05$ | $1.75 \pm 0.10$ | $4.00 \pm 0.10$ | $2.00 \pm 0.05$ | $4.00 \pm 0.10$ | $1.50 + 0.10 / -0$ |

(unit: mm)



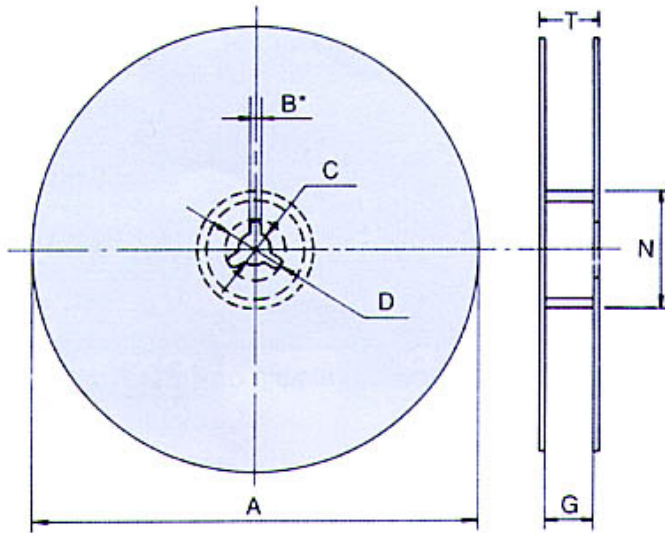
\* 2W loading with total solder-pad and trace size of  $300 \text{ mm}^2$

| Type    | W     | D      | L     |
|---------|-------|--------|-------|
| HPL2512 | 3.7mm | 2.45mm | 7.6mm |



# CURRENT SENSING THICK FILM RESISTORS HIGH POWER HPL Series (Metal Paste)

■ • Reel Package



| Size        | Packaging Q'ty | A         | N         | C        | D     | B       | G        | T         |
|-------------|----------------|-----------|-----------|----------|-------|---------|----------|-----------|
| <b>0402</b> | 10Kpcs / Reel  | 178.0±2.0 | 60.0±0.5  | 13.0±0.5 | 20min | 2.0±0.5 | 10.0±1.5 | 14.9 max. |
| <b>0603</b> | 5Kpcs / Reel   | 178.0±2.0 | 60.0±0.5  | 13.0±0.5 | 20min | 2.0±0.5 | 10.0±1.5 | 14.9 max. |
| <b>0805</b> | 20Kpcs / Reel  | 330.0±2.0 | 100.0±1.0 | 13.5±0.5 | 20min | 2.0±0.5 | 10.0±1.5 | 14.9 max. |
| <b>1206</b> |                |           |           |          |       |         |          |           |
| <b>1210</b> |                |           |           |          |       |         |          |           |
| <b>2010</b> | 4Kpcs / Reel   | 178.0±2.0 | 60.0±0.5  | 13.0±0.5 | 20min | 2.0±0.5 | 13.8±1.5 | 16.7 max. |
| <b>2512</b> | 16Kpcs / Reel  | 330.0±2.0 | 100.0±1.0 | 13.5±0.5 | 20min | 2.0±0.5 | 13.8±1.5 | 20.0 max. |

(unit: mm)

# CURRENT SENSING THICK FILM RESISTORS

## HIGH POWER HPL Series (Metal Paste)

### ■ HPL < 1Ω Specification And Test Methods

| ITEM                          | SPECIFICATION  | TEST METHOD  |
|-------------------------------|--|--|
| DC Resistance                 | J: $\pm 5\%$ , F: $\pm 1\%$  | <b>IEC 60115-1 / JIS C 5201-1 , Clause 4.5</b><br>Measure the resistance value.  |
| Short time Overload           | J: $\Delta R \leq \pm (2\% + 0.5m\Omega)$<br>F: $\Delta R \leq \pm (1\% + 0.5m\Omega)$                           | <b>IEC 60115-1 / JIS C 5201-1 , Clause 4.13</b><br>2.5×Rated voltage or Max. Overload Voltage for 5 sec. measure resistance after 30 minutes   |
| Solderability                 | Over 95% of termination must be covered with solder  | <b>IEC 60115-1 / JIS C 5201-1 , Clause 4.17</b><br>After immersing flux, dip in the $235\pm 2^{\circ}\text{C}$ molten solder bath for $2\pm 0.5$ sec.  |
| Resistance to Solder Heat     | J: $\Delta R \leq \pm (1\% + 0.5m\Omega)$<br>F: $\Delta R \leq \pm (0.5\% + 0.5m\Omega)$<br>No mechanical damage | <b>IEC 60115-1 / JIS C 5201-1 , Clause 4.18</b><br>With $260\pm 5^{\circ}\text{C}$ for $10\pm 1$ sec.  |
| Temperature Coefficient (TCR) | As Spec.   | <b>IEC 60115-1 / JIS C 5201-1 , Clause 4.8</b><br>$-55^{\circ}\text{C} \sim +125^{\circ}\text{C}$ , $25^{\circ}\text{C}$ is the reference temperature  |
| Load Life Humidity            | J: $\Delta R \leq \pm (3\% + 0.5m\Omega)$<br>F: $\Delta R \leq \pm (1\% + 0.5m\Omega)$                           | <b>IEC 60115-1 / JIS C 5201-1 , Clause 4.24</b><br>Maintain the temperature of the resistor at $40\pm 2^{\circ}\text{C}$ and 90 ~ 95% R.H. with the rated voltage applied. Cycle ON for 1.5 hours and OFF for 0.5 hour for 1000+48/-0 hours. After 1~4 hour, measure   |
| Load Life                     | J: $\Delta R \leq \pm (3\% + 0.5m\Omega)$<br>F: $\Delta R \leq \pm (1\% + 0.5m\Omega)$                           | <b>IEC 60115-1 / JIS C 5201-1 , Clause 4.25</b><br>Permanent resistance change after 1000+48/-0 hours (1.5 hours ON , 0.5 hour OFF) at RCWV or Max. Keep the resistor at $70\pm 2^{\circ}\text{C}$ ambient   |
| Temperature Cycle             | J: $\Delta R \leq \pm (1\% + 1m\Omega)$<br>F: $\Delta R \leq \pm (0.5\% + 1m\Omega)$<br>No mechanical damage     | <b>IEC 60115-1 / JIS C 5201-1 , Clause 4.19</b><br>Repeat 5 cycles as follows<br>$-55^{\circ}\text{C}$ (30 min.) + $25^{\circ}\text{C}$ (2~3 min.)<br>$+125^{\circ}\text{C}$ (30 min.) + $25^{\circ}\text{C}$ (2~3 min.) for 0201<br>$55^{\circ}\text{C}$ (30 min.) + $25^{\circ}\text{C}$ (2~3 min.)<br>$+155^{\circ}\text{C}$ (30 min.) + $25^{\circ}\text{C}$ (2~3 min.) for others |
| Insulation Resistance         | Between termination and coating must be over $1000M\Omega$   | <b>IEC 60115-1 / JIS C 5201-1 , Clause 4.6</b><br>Test voltage: $100\pm 15\text{V}$  |
| Bending Strength              | J: $\Delta R \leq \pm (1\% + 1m\Omega)$<br>F: $\Delta R \leq \pm (0.5\% + 1m\Omega)$<br>No mechanical damage     | <b>IEC 60115-1 / JIS C 5201-1 , Clause 4.33</b><br>Resistance change after bended on the 90mm PCB<br>Bend: 3mm for 0603、0805<br>2mm for 1206、1210、2010、2512  |