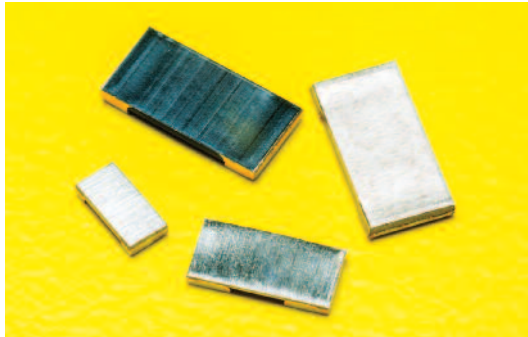
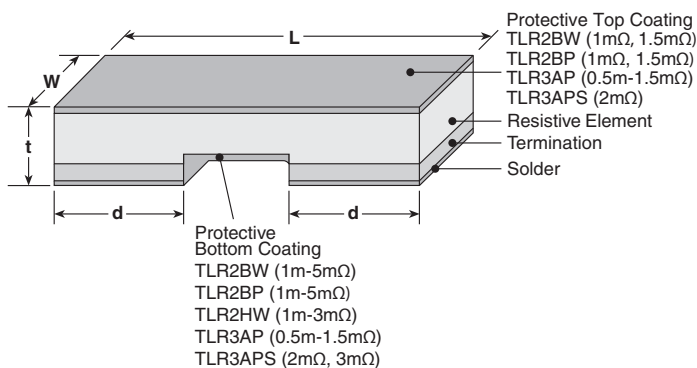




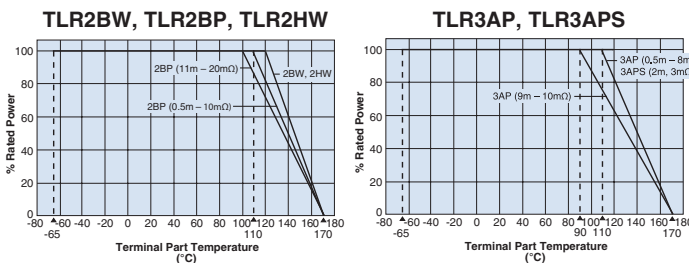
### features

- Ultra-low TCR (+50ppm/°C) available
- Metal alloy: superior corrosion and heat resistance
- Applications include current sensing, voltage division and pulse applications
- Ultra low resistance (0.5mΩ - 20mΩ)
- Suitable for reflow soldering (Not suitable for flow soldering)
- Products with lead-free terminations meet EU RoHS and China RoHS requirements
- AEC-Q200 Qualified

### dimensions and construction



### Derating Curve



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based in the terminal part temperature" in the beginning of our catalog before use.

| Size Code | Resistance             | L                        | W                        | d                        | t                        |
|-----------|------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| TLR2BW    | New 0.5mΩ              |                          |                          | .049±.008<br>(1.25±0.20) | .028±.008<br>(0.70±0.20) |
|           | 1mΩ                    | .126±.008<br>(3.20±0.20) | .063±.008<br>(1.60±0.20) | .043±.008<br>(1.10±0.20) | .024±.008<br>(0.60±0.20) |
|           | New 1.5mΩ              |                          |                          | .020±.008<br>(0.50±0.20) |                          |
| TLR2BP    | 2mΩ - 20mΩ             |                          |                          |                          |                          |
|           | New 0.5mΩ              |                          |                          | .049±.008<br>(1.25±0.20) | .028±.008<br>(0.70±0.20) |
|           | 1mΩ, 1.5mΩ             | .126±.008<br>(3.20±0.20) | .063±.008<br>(1.60±0.20) | .043±.008<br>(1.10±0.20) | .024±.008<br>(0.60±0.20) |
| TLR2HW    | 2mΩ - 20mΩ             |                          |                          | .020±.008<br>(0.50±0.20) |                          |
|           | New 0.5mΩ              |                          |                          | .075±.008<br>(1.90±0.20) | .028±.008<br>(0.70±0.20) |
|           | 1mΩ                    | .200±.008<br>(5.00±0.20) | .100±.008<br>(2.50±0.20) | .071±.008<br>(1.80±0.20) | .026±.008<br>(0.65±0.20) |
| TLR3AP    | 2mΩ - 6mΩ              |                          |                          | .060±.008<br>(1.50±0.20) | .024±.008<br>(0.60±0.20) |
|           | 7mΩ - 10mΩ             |                          |                          | .020±.008<br>(0.50±0.20) |                          |
|           | 0.5mΩ                  |                          |                          | .107±.01<br>(2.725±0.25) |                          |
| TLR3APS   | 0.68mΩ, 0.75mΩ, 0.82mΩ |                          |                          | .105±.01<br>(2.675±0.25) |                          |
|           | 1mΩ, 1.5mΩ, 3mΩ, 4mΩ   | .25±.01<br>(6.35±0.25)   | .125±.01<br>(3.18±0.25)  | .087±.01<br>(2.20±0.25)  | .024±.01<br>(0.62±0.25)  |
|           | 2mΩ                    |                          |                          | .098±.01<br>(2.50±0.25)  |                          |
| TLR3APS   | 5mΩ, 6mΩ, 7mΩ, 8mΩ     |                          |                          | .047±.01<br>(1.20±0.25)  |                          |
|           | 9mΩ, 10mΩ              |                          |                          | .030±.01<br>(0.77±0.25)  |                          |
|           | 2mΩ, 3mΩ               | .25±.01<br>(6.35±0.25)   | .125±.01<br>(3.18±0.25)  | .047±.01<br>(1.20±0.25)  | .024±.01<br>(0.60±0.25)  |

### ordering information

| TLR  | 2BW                                                              | D                    | TD                                                            | 10L0                                                                                                        | F         | 75                           |
|------|------------------------------------------------------------------|----------------------|---------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-----------|------------------------------|
| Type | Power Rating                                                     | Termination Material | Packaging                                                     | Nominal Resistance                                                                                          | Tolerance | T.C.R.                       |
|      | 2BW: 1W<br>2BP: 1.5W<br>2HW: 2W<br>3AP: 3W, 5W (New)<br>3APS: 3W | D: SnAgCu            | TD: 7" 4mm pitch punched paper<br>TE: 7" 4mm embossed plastic | ±1%: 4 digits<br>All values less than 0.1Ω (100m) are expressed in mW with "L" as decimal<br>Ex: 2mΩ = 2L00 | F: ±1%    | 50: 50ppm/°C<br>75: 75ppm/°C |

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

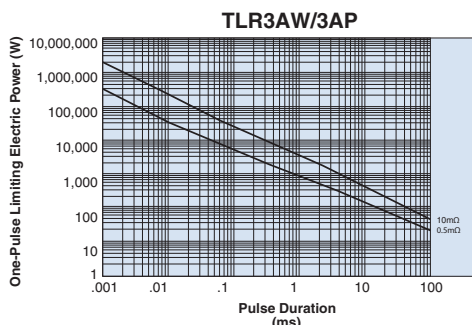
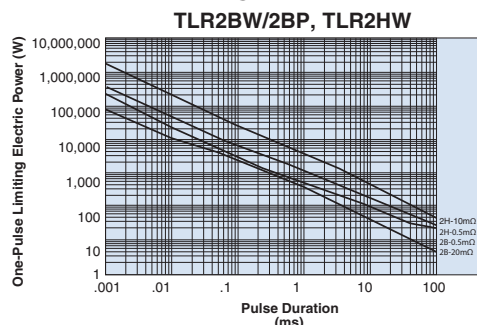
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### applications and ratings

| Part Designation | Power Rating | T.C.R. (ppm/°C) Max.** | Standard Resistance (Ω)                                              | Resistance Tolerance | Rated Terminal Part Temperature | Operating Temperature Range |
|------------------|--------------|------------------------|----------------------------------------------------------------------|----------------------|---------------------------------|-----------------------------|
| TLR2BW           | 1W           | ±50                    | 2m,3m,4m,5m,6m,7m,8m,9m,10m,11m,12m,13m,15m,16m,18m,20m              | F: ±1%               | +120°C and less                 | -65°C to +170°C             |
|                  |              | ±75                    | 0.5m,1m,1.5m,2m,3m,4m,5m,6m,7m,8m,9m,10m,11m,12m,13m,15m,16m,18m,20m |                      |                                 |                             |
| TLR2BP           | 1.5W         | ±50                    | 2m,3m,4m,5m,6m,7m,8m,9m,10m,11m,12m,13m,15m,16m,18m,20m              | F: ±1%               | +110°C and less                 | -65°C to +170°C             |
|                  |              | ±75                    | 11m,12m,13m,15m,16m,18m,20m                                          |                      | +100°C and less                 |                             |
|                  |              |                        | 0.5m,1m,1.5m,2m,3m,4m,5m,6m,7m,8m,9m,10m                             |                      | +110°C and less                 |                             |
|                  |              |                        | 11m,12m,13m,15m,16m,18m,20m                                          |                      | +100°C and less                 |                             |
| TLR2HW           | 2W           | ±50                    | 0.5m,1m,2m,2.5m,3m,4m,5m,6m,7m,8m,9m,10m                             | F: ±1%               | +120°C and less                 | -65°C to +170°C             |
|                  |              | ±75                    |                                                                      |                      |                                 |                             |
| TLR3AP           | 3W           | ±50                    | 2m,3m,4m,5m,6m,7m,8m,9m,10m                                          | F: ±1%               | 0.5m ~ 8m: +110°C and less      | -65°C to +170°C             |
|                  |              | ±75                    | 0.5m,0.68m,0.75m,0.82m,1m,1.5m,2m,3m,4m,5m,6m,7m,8m,9m,10m           |                      | 9m, 10m: +90°C and less         |                             |
|                  | 5W (New)     | ±50                    | 2m,3m,4m                                                             | F: ±1%               | +110°C and less                 | -65°C to +170°C             |
|                  |              | ±75                    | 1m,2m,3m,4m                                                          |                      |                                 |                             |
| TLR3APS          | 3W           | ±50, ±75               | 2m,3m                                                                | F: ±1%               | +110°C and less                 | -65°C to +170°C             |

### environmental applications

#### One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage.

Please ask us about the resistance characteristic of continuous applied pulse.

The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

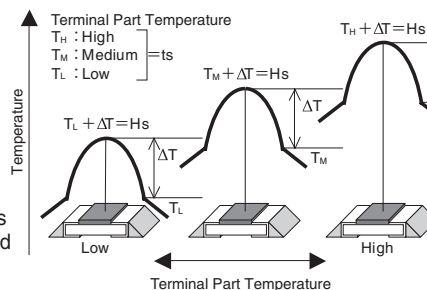
#### Thermal Resistance

| Type | Size | Resistance (Ω) | Rth (°C/W) |
|------|------|----------------|------------|
| TLR  | 2BW  | 0.5m           | 7.2        |
|      |      | 20m            | 116        |
|      | 2HW  | 0.5m           | 9          |
|      |      | 10m            | 61.1       |
|      | 3AP  | 0.5m           | 6          |
|      |      | 10m            | 62         |

$$R_{th} = (H_s - t_s) / \text{Power}$$

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.

#### Performance Characteristics



The temperature of the resistor will increase the same  $\Delta T$  from the standard terminal part temperature regardless of the ambient temperature when the same power is applied. This is because there is hardly any heat dissipation from the resistor surface to the ambient air.

| Parameter                                    | Requirement $\Delta R \pm\%$ |         | Test Method                                                                                                                                                                                                         |
|----------------------------------------------|------------------------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                              | Limit                        | Typical |                                                                                                                                                                                                                     |
| Resistance                                   | Within regulated tolerance   | —       | 25°C                                                                                                                                                                                                                |
| T.C.R.                                       | Within specified T.C.R.      | —       | +25°C/+125°C                                                                                                                                                                                                        |
| Resistance to Solder Heat                    | ±0.5%                        | ±0.3%   | 260°C ± 5°C, 10 ± 2 seconds                                                                                                                                                                                         |
| Rapid Change of Temperature                  | ±0.5%                        | ±0.3%   | -55°C (15 minutes), +150°C (15 minutes), 1000 cycles                                                                                                                                                                |
| Moisture Resistance                          | ±0.5%                        | ±0.1%   | MIL-STD-202-106, 0% power, 7a and 7b not required                                                                                                                                                                   |
| Biased Humidity                              | ±0.5%                        | ±0.1%   | 85°C ± 2°C, 85% RH, 1000 hours, 10% bias                                                                                                                                                                            |
| Endurance of Rated Terminal Part Temperature | ±1.0%                        | ±0.3%   | 120°C ± 2°C (2BW, 2HW), 110°C ± 2°C (3AP 0.5mΩ~8mΩ)<br>90°C ± 2°C (3AP 9mΩ~10mΩ), 110°C ± 2°C (2BP 1mΩ~10mΩ)<br>100°C ± 2°C (2BP 11mΩ~20mΩ), 110°C ± 2°C (3APS 2mΩ, 3mΩ)<br>1000 hours, 1.5 hr ON, 0.5 hr OFF cycle |
| High Temperature Exposure                    | ±1.0%                        | ±0.6%   | ±155°C, 1000 hours                                                                                                                                                                                                  |
|                                              | ±2.0%                        | ±0.8%   | ±170°C, 1000 hours                                                                                                                                                                                                  |

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