

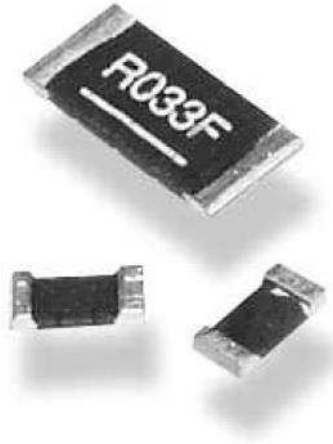
Key Features**Type TLR Series**

Up to 3 Watt
at 80°C

Supplied on
Tape

Ideal for
Current
Detection

12:06, 20:10
and 25:12
Packages
Available



TE Connectivity (TE) is pleased to offer this unique High Power, metal chip resistor for current sensing positions. It has a special metal resistive element and suitable barrier layers beneath the solder to prolong terminal life. Following the developments by semiconductor manufacturers in the production of a range of IC's for battery charge management and low voltage power supplies, the TLR Series satisfies the demand for a low ohmic shunt resistor to act as a current sensor. It has particular applications in the automotive industry for sensing in EMU's.

Characteristics – Electrical (Standard)

| Size | Power Rating @ 70°C | Resistance Range (mΩ) | | | TCR (PPM/°C) |
|------|------------------------|-----------------------|-----|-----|-----------------|
| | | ±1% | ±3% | ±5% | |
| 1206 | 1W | 0.5 | | | ±200 |
| 1206 | 1W | 0.75 ~ 10 | | | ±50 |
| 2512 | 1W | 0.5, 0.75, 1, 1.5, 2 | | | ±50 |
| 2512 | 1W | 6, 6.5, 7 | | | ±75 |
| 2512 | 1W | 4, 5, 10 | | | ±100 |
| 2512 | 1W | 2.5, 3 | | | ±150 |

Operating Temperature Range: -55 ~ 170°C

Operating Current = $\sqrt{P/R}$, Operating Voltage = $\sqrt{P \cdot R}$

Characteristics – Electrical (High Power)

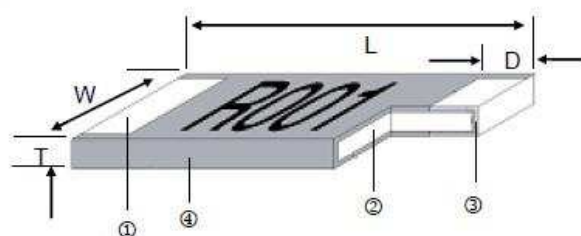
| Size | Power Rating @ 70°C | Resistance Range (mΩ) | | | TCR (PPM/°C) |
|------|---------------------|-----------------------|-----|-----|--------------|
| | | ±1% | ±3% | ±5% | |
| 2010 | 1.5W | 0.5 | | | ±100 |
| 2010 | 1.5W | 0.75 ~ 10 | | | ±50 |
| 2512 | 2W | 0.5, 0.75, 1, 1.5, 2 | | | ±50 |
| 2512 | 2W | 6, 6.5, 7 | | | ±75 |
| 2512 | 2W | 4, 5, 10 | | | ±100 |
| 2512 | 2W | 2.5, 3 | | | ±150 |
| 2512 | 3W | 0.5, 0.75, 1, 1.5, 2 | | | ±50 |

Operating Temperature Range: -55 ~ 170°C

Operating Current = $\sqrt{P/R}$, Operating Voltage = $\sqrt{P \cdot R}$

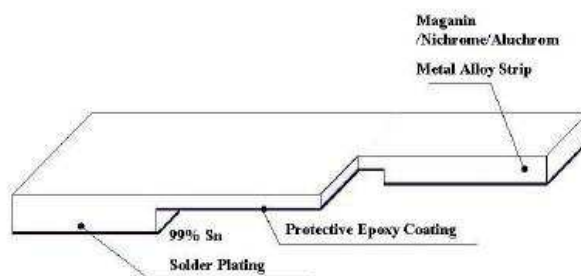
Construction and Dimensions

2512



| | | | |
|---|----------------|---|---------------|
| 1 | Solder Plating | 3 | Barrier Layer |
| 2 | Alloy plate | 4 | Overcoat |

1206 & 2010



| Value | Material |
|--------------|---------------------------|
| 0.5mΩ ~ 3mΩ | Manganese, Copper |
| 3.5mΩ ~ 10mΩ | Aluminium, Iron, Chromium |

NB. 1206 and 2010 size – No Coating / Marking

Dimensions:

| Part number | Resistance mΩ | L | W | T | D | Weight (g) 1000 pcs |
|--------------------|----------------------------|----------------|----------------|---------------|---------------|---------------------------|
| TLR2B10FR0005*TDG | 0.5 | 3.20 ±0.25 | 1.60 ±0.10 | 0.60 ±0.20 | 1.35 ±0.25 | 22.6 |
| TLR2B10DR00075*TDG | 0.75 | 3.20 ±0.25 | 1.60 ±0.10 | 0.60 ±0.20 | 1.23 ±0.25 | 22.6 |
| TLR2B10D**TDG | 1.0, 3.5, 4.0, 5.0, 6.0 | 3.20 ±0.25 | 1.60 ±0.10 | 0.60 ±0.20 | 1.10 ±0.25 | 22.6 |
| TLR2B10D**TDG | 2.0, 3.0, 10 | 3.20 ±0.25 | 1.60 ±0.10 | 0.60 ±0.20 | 0.60 ±0.25 | 22.6 |
| TLR2B10D**TDG | 1.2, 1.5, 7.0, 8.0, 9.0 | 3.20 ±0.25 | 1.60 ±0.10 | 0.60 ±0.20 | 0.90 ±0.25 | 22.6 |
| TLR2H15ER0005*TDG | 0.5 | 5.08 ±0.25 | 2.54 ±0.15 | 0.60 ±0.20 | 2.17 ±0.25 | 42.3 |
| TLR2H15DR00075*TDG | 0.75 | 5.08 ±0.25 | 2.54 ±0.15 | 0.60 ±0.20 | 2.04 ±0.25 | 42.3 |
| TLR2H15D**TDG | 1.0, 1.5 | 5.08 ±0.25 | 2.54 ±0.15 | 0.60 ±0.20 | 1.84 ±0.25 | 42.3 |
| TLR2H15D**TDG | 2.0, 6.0, 7.0, 8.0 | 5.08 ±0.25 | 2.54 ±0.15 | 0.60 ±0.20 | 1.54 ±0.25 | 42.3 |
| TLR2H15D**TDG | 3.0, 3.5 | 5.08 ±0.25 | 2.54 ±0.15 | 0.60 ±0.20 | 1.04 ±0.25 | 42.3 |
| TLR2H15D**TDG | 4.0, 5.0, 5.5 | 5.08 ±0.25 | 2.54 ±0.15 | 0.60 ±0.20 | 1.84 ±0.25 | 42.3 |
| TLR2H15D**TDG | 9.0, 10 | 5.08 ±0.25 | 2.54 ±0.15 | 0.60 ±0.20 | 1.29 ±0.25 | 42.3 |
| TLR3A**DR0005TDG | 0.5 | 6.35 ±0.254 | 3.18 ±0.254 | 1.25 ±0.20 | 1.30 ±0.38 | 184.11 |
| TLR3A**DR00075TDG | 0.75 | 6.35 ±0.254 | 3.18 ±0.254 | 0.75 ±0.20 | 1.30 ±0.38 | 131.11 |
| TLR3A**DR001TDG | 1.0 | 6.35 ±0.254 | 3.18 ±0.254 | 0.65 ±0.20 | 1.30 ±0.38 | 110.85 |
| TLR3A**DR0015TDG | 1.5 | 6.35 ±0.254 | 3.18 ±0.254 | 0.45 ±0.20 | 1.30 ±0.38 | 67.16 |
| TLR3A**DR002TDG | 2.0 | 6.35 ±0.254 | 3.18 ±0.254 | 0.35 ±0.20 | 1.30 ±0.38 | 49.30 |
| TLR3A**KR0025TDG | 2.5 | 6.35 ±0.254 | 3.18 ±0.254 | 0.65 ±0.20 | 1.30 ±0.38 | 97.95 |
| TLR3A**KR003TDG | 3.0 | 6.35 ±0.254 | 3.18 ±0.254 | 0.55 ±0.20 | 1.30 ±0.38 | 83.49 |
| TLR3A**ER004TDG | 4.0 | 6.35 ±0.254 | 3.18 ±0.254 | 0.45 ±0.20 | 1.30 ±0.38 | 62.59 |
| TLR3A**ER005TDG | 5.0 | 6.35 ±0.254 | 3.18 ±0.254 | 0.35 ±0.20 | 1.30 ±0.38 | 49.84 |
| TLR3A**WR006TDG | 6.0 | 6.35 ±0.254 | 3.18 ±0.254 | 0.32 ±0.20 | 1.30 ±0.38 | 41.76 |
| TLR3A**WR0065TDG | 6.5 | 6.35 ±0.254 | 3.18 ±0.254 | 0.30 ±0.20 | 1.30 ±0.38 | 35.85 |
| TLR3A**WR007TDG | 7.0 | 6.35 ±0.254 | 3.18 ±0.254 | 0.27 ±0.20 | 1.30 ±0.38 | 34.01 |
| TLR3A**ER010TDG | 10 | 6.35 ±0.254 | 3.18 ±0.254 | 0.25 ±0.20 | 1.30 ±0.38 | 25.97 |

Marking – 2512 only

Resistance (3 digit)

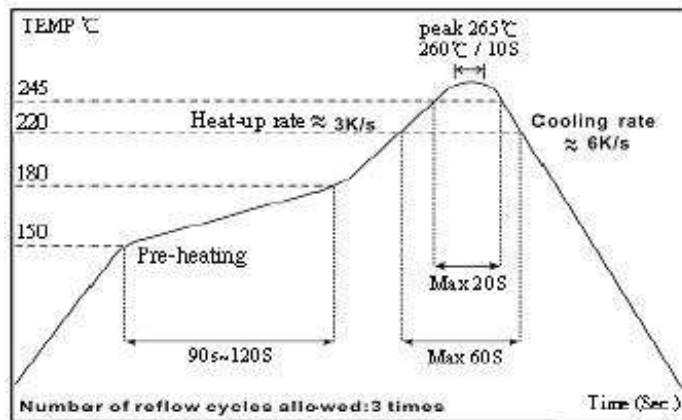
| | | |
|------------|-------|--------|
| Resistance | 0.5mΩ | 0.75mΩ |
| Codes | M50 | M75 |

Resistance (4 Digit)

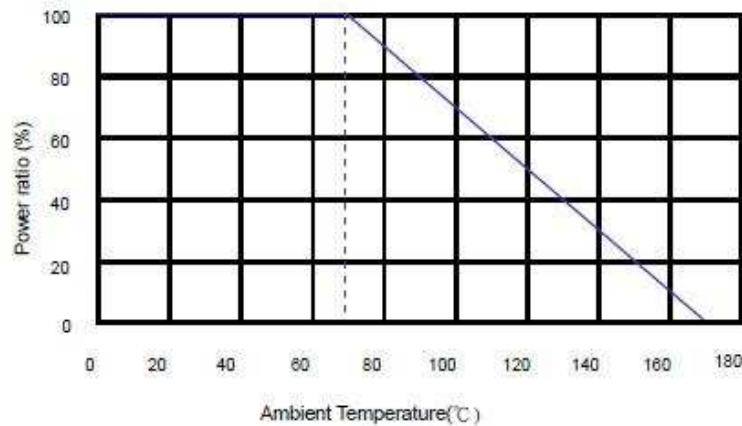
| | | | | |
|------------|------|------|------|------|
| Resistance | 1mΩ | 2mΩ | 7mΩ | 10mΩ |
| Codes | R001 | R002 | R007 | R010 |

Solder Profile

Reflow



Derating Curve

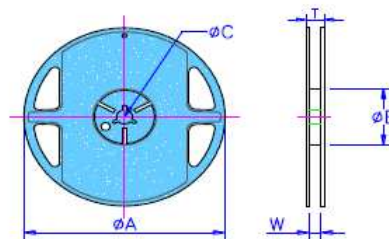


Environmental Characteristics

| Item | Requirement | Test Method |
|--|----------------------|--|
| Temperature Coefficient of Resistance (T.C.R.) | As Spec. | MIL-STD-202 Method 304 +25°C ~125°C, 25°C is the reference temperature |
| Short Term Overload | ±0.5% | JIS-C-5201-1 5.5 5*rated power for 5 seconds |
| Endurance | ±1% | MIL-STD-202 Method 108A 70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF" |
| Dry Heat | ±1% | JIS-C-5201-1 7.2 at +170°C for 1000 hrs |
| Solderability | 95% Minimum Coverage | MIL-STD-202 Method 208H 245±5°C for 3 seconds |
| Resistance to Soldering Heat | ±0.5% | MIL-STD-202 Method 210E 260±5°C for 10 seconds |
| Thermal Shock | ±0.5% | MIL-STD-202 Method 107G -55°C ~ 150°C, 100 cycles |

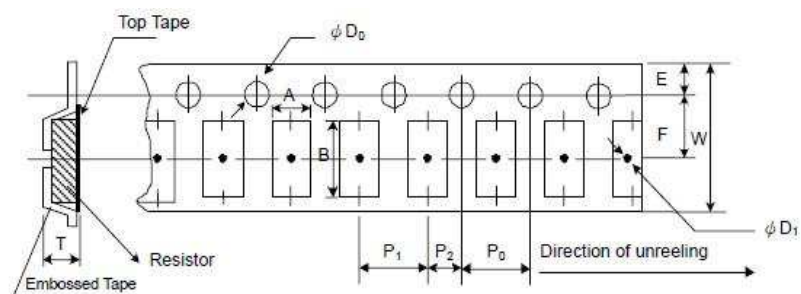
Packaging

Reel Dimensions (mm)



| Tape Width | Reel Diameter | ØA | ØB | ØC | W | T |
|------------|---------------|-----------|--------------------|----------|----------|----------|
| 8mm | 7 Inch | 178.5±1.5 | 60 ⁺¹⁻⁰ | 13.0±0.2 | 9.0±0.5 | 12.5±0.5 |
| 12mm | | | 60±1.0 | | 13.0±1.0 | 15.5±0.5 |

Embossed Plastic Tape specification



| Size | Res mΩ | A ±0.1 | B ±0.1 | W ±0.2 | E ±0.1 | F ±0.5 | P ₀ ±0.1 | P ₁ ±0.1 | P ₂ ±0.05 | ∅D ₀ ±0.05 | ∅D ₁ min | T ±0.2 | Qty |
|------|-----------|-----------|-----------|-----------|-----------|-----------|------------------------|------------------------|-------------------------|--------------------------|------------------------|-----------|------|
| 2B | All | 1.90 | 3.60 | 8.0 | 1.75 | 3.5 | 4.0 | 4.0 | 2.0 | 1.55 | 1.0 | 0.87 | 2000 |
| 2H | All | 2.85 | 5.55 | 12.0 | 1.75 | 5.5 | 4.0 | 4.0 | 2.0 | 1.55 | 1.4 | 0.85 | 2000 |
| 3A | ≤0.75 | 3.40 | 6.75 | 12.0 | 1.75 | 5.5 | 4.0 | 4.0 | 2.0 | 1.55 | 1.4 | 1.45 | 2000 |
| | 1-10 | | | | | | | | | | | 0.81 | |

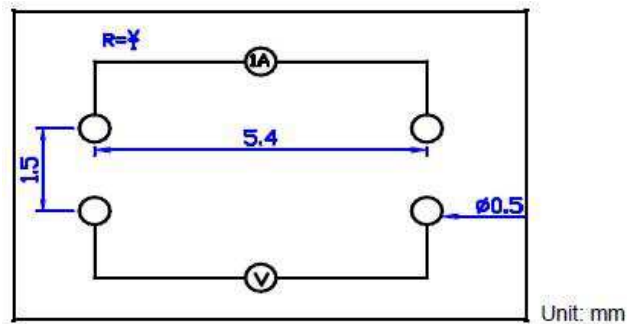
1. The cumulative tolerance of 10 sprockets hole pitch is ±0.2mm.
2. Carrier camber shall be not more than 1mm per 100mm through a length of 250mm.
3. A & B measured 0.3mm from the bottom of the packet
4. T measured at a point on the inside bottom of the packet to the top surface of the carrier.
5. Pocket position relative to sprocket hole is measured as the true position of the pocket and not the pocket hole.

Measurements

1. TLR3A 4-wire precision measurement

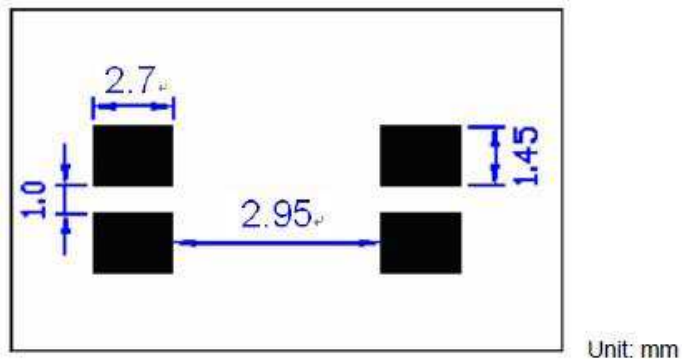
Equipment: ADEX AX-1152D DC Low Ohm Meter

Excitation Current: 3A (0.5mΩ~1.5 mΩ) 1A (2mΩ~10mΩ)



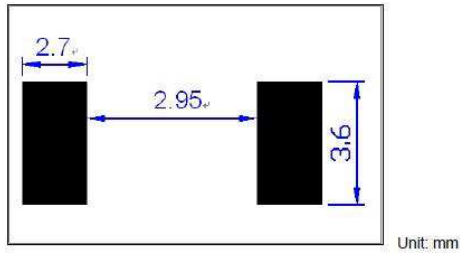
2. TLR3A 4-wire pad layout (recommended for precision current sensing)

■Note: No circuits between pads to avoid short circuit



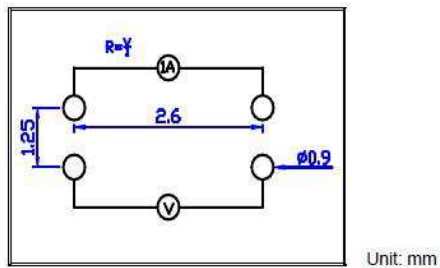
3. TLR3A 2-wire pad layout

- Note: No circuits between pads to avoid short circuit



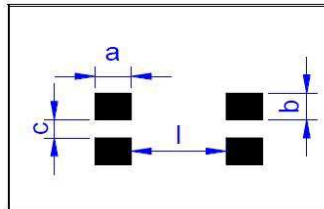
4. TLR 2B 4-wire precision measurement

- Equipment: ADEX AX-1152D DC Low Ohm Meter
- Excitation Current: 1A (0.5mΩ~10mΩ)



5. TLR2B 4-wire pad layout (recommended for precision current sensing)

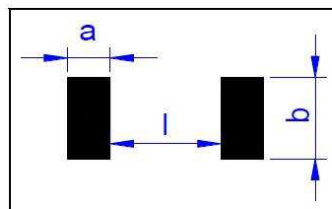
- Note: No circuits between pads to avoid short circuit



| Type | Item | a m/m | b m/m | c m/m | l m/m |
|------|-----------|----------|----------|----------|----------|
| | 0M50 | 1.80 | 0.7 | 0.5 | 0.55 |
| | 0M75 | 1.68 | 0.7 | 0.5 | 0.55 |
| | R001 | 1.55 | 0.7 | 0.5 | 0.55 |
| | 1M2 | 1.35 | 0.7 | 0.5 | 0.95 |
| | 1M5 | 1.35 | 0.7 | 0.5 | 1.55 |
| | R002~R003 | 1.05 | 0.7 | 0.5 | 1.55 |
| | 3M5~R006 | 1.55 | 0.7 | 0.5 | 0.55 |
| | R007~R009 | 1.35 | 0.7 | 0.5 | 0.95 |
| | R010 | 1.05 | 0.7 | 0.5 | 1.55 |

6. TLR2B 2-wire pad layout

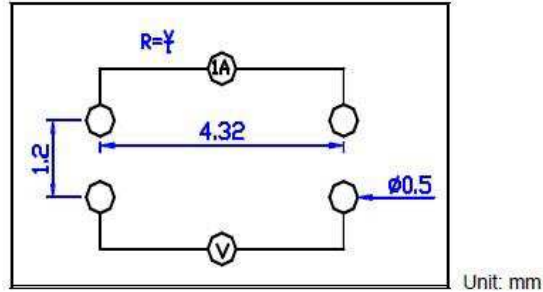
- Note: No circuits between pads to avoid short circuit



| Type | Item | a m/m | b m/m | l m/m |
|------|-----------|----------|----------|----------|
| | 0M50 | 1.80 | 1.90 | 0.55 |
| | 0M75 | 1.68 | 1.90 | 0.55 |
| | R001 | 1.55 | 1.89 | 0.55 |
| | 1M2 | 1.35 | 1.90 | 0.95 |
| | 1M5 | 1.35 | 1.89 | 1.55 |
| | R002~R003 | 1.05 | 1.89 | 1.55 |
| | 3M5~R006 | 1.55 | 1.89 | 0.55 |
| | R007~R009 | 1.35 | 1.89 | 0.95 |
| | R010 | 1.05 | 1.89 | 1.55 |

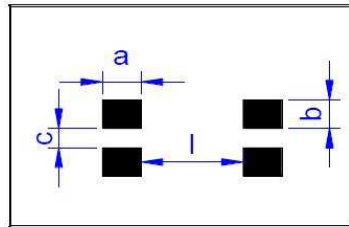
7. TLR2H 4-wire precision measurement

- Equipment: ADEX AX-1152D DC Low Ohm Meter
- Excitation Current: 1A (0.5mΩ~10mΩ)



8. TLR2H 4-wire pad layout (recommended for precision current sensing)

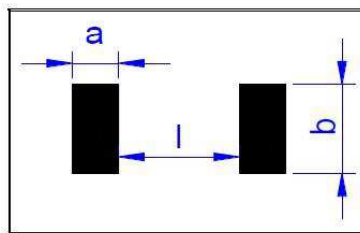
- Note: No circuits between pads to avoid short circuit



| Type | Item | a m/m | b m/m | c m/m | l m/m |
|-----------|------|----------|----------|----------|----------|
| OM50 | | 2.61 | 1.045 | 0.8 | 0.60 |
| OM75 | | 2.49 | 1.045 | 0.8 | 0.80 |
| R001~1M5 | | 2.29 | 1.045 | 0.8 | 0.95 |
| R002 | | 1.99 | 1.045 | 0.8 | 1.55 |
| R003~3M5 | | 1.49 | 1.045 | 0.8 | 2.55 |
| R004~5M5 | | 2.29 | 1.045 | 0.8 | 0.95 |
| R006~R008 | | 1.99 | 1.045 | 0.8 | 1.55 |
| R009~R010 | | 1.74 | 1.045 | 0.8 | 2.05 |

9. TLR2H 2-wire pad layout

- Note: No circuits between pads to avoid short circuit



| Type | Item | a m/m | b m/m | l m/m |
|-----------|------|----------|----------|----------|
| OM50 | | 2.61 | 2.89 | 0.60 |
| OM75 | | 2.49 | 2.89 | 0.80 |
| R001~1M5 | | 2.29 | 2.89 | 0.95 |
| R002 | | 1.99 | 2.89 | 1.55 |
| R003~3M5 | | 1.49 | 2.89 | 2.55 |
| R004~5M5 | | 2.29 | 2.89 | 0.95 |
| R006~R008 | | 1.99 | 2.89 | 1.55 |
| R009~R010 | | 1.74 | 2.89 | 2.05 |

How To Order

| TLR | 2B | 10 | D | R005 | F | TDG |
|--|-------------------------------------|--|--|--|-------------------------------|-------------------|
| Common Part | Size | *Power Rating | **TCR (PPM/°C) | Resistance Code | Tolerance | Packaging |
| TLR – Ultra Low Ohm Metal Strip Resistor | 2B – 1206 2H – 2010 3A – 2512 | 1.0 = 10 1.5 = 15 2.0 = 20 3.0 = 30 | D = ±50 W = ±75 E = ±100 K = ±150 | R0005 - 0.5mΩ R0015 – 1.5mΩ R002 – 2mΩ | J = ±5% H = ±3% F = ±1% | TDG = 2000 / Reel |

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