

Type 3504 Series

Key Features

High thermal conductivity  
Aluminum-Nitride substrate.

High Power / Size ratio – 6W in 2512 size.

Thin film power resistors with TCR  $\pm 50\text{ppm}/^\circ\text{C}$  and tolerance  $\pm 1\%$ .



TE are pleased to introduce the new 3504 series. This is a high stability Thin Film Chip Power resistor range offering very high power / size ratio – 6W in 2512 size. The 3504 series offers TCR at  $\pm 50\text{ppm}/^\circ\text{C}$  and resistance tolerance at  $\pm 1\%$  as standard. Resistance values are within the IEC 63 E96 and E24 value grids. The 3504 resistors have accurate and uniform physical dimensions to facilitate automatic placement methods.

Applications

Power Supplies

Power Switching

Braking Systems

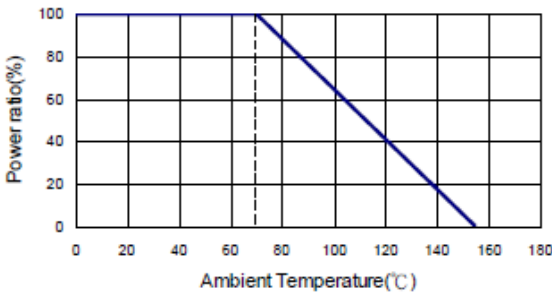
Automation Controls

Characteristics – Electrical

|                                       |                                            |
|---------------------------------------|--------------------------------------------|
| Power Rating @ $70^\circ\text{C}$     | 6.0W                                       |
| Resistance Range                      | $50\Omega \sim 30.1\text{K}\Omega$         |
| Temperature Coefficient of resistance | $\pm 50\text{PPM}/^\circ\text{C}$          |
| Max. Operating Voltage                | 100V                                       |
| Max Overload Voltage                  | 200V                                       |
| Operating Temperature Range           | $-55^\circ\text{C} \sim 155^\circ\text{C}$ |

Notes:  
Power rating dependant upon mounting by user  
Operating Voltage=  $\sqrt{P \cdot R}$  or Max. Operating voltage listed above, whichever is lower

Derating Curve



## Environmental Characteristics

| Item                                        | Requirement                                                | Test Method                                                                                                                                                                                             |
|---------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature Coefficient of Resistance (TCR) | As per TCRs specified in Electrical Characteristics tables | MIL-STD-202 Method 304<br>+25/-55/+25/+125/+25°C                                                                                                                                                        |
| Short Time Overload                         | $\Delta R \pm 0.5\%$                                       | Actual power handling capability is limited by the end user mounting process. As with any high power chip resistor the ability to remove the heat is critical to the overall performance of the device. |
| Insulation Resistance                       | >9999 MΩ                                                   | MIL-STD-202 Method 302<br>Apply 100VDC for 1 minute                                                                                                                                                     |
| Endurance                                   | $\Delta R \pm 1\%$                                         | MIL-STD-202 Method 108<br>70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"                                                                                                                 |
| Damp Heat with Load                         | $\Delta R \pm 0.4\%$                                       | MIL-STD-202 Method 103<br>40±2°C, 90~95% R.H. RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"                                                                                                     |
| Solderability                               | 95% min. coverage                                          | MIL-STD-202 Method 208<br>245±5°C for 3 seconds                                                                                                                                                         |
| Resistance to Soldering Heat                | $\Delta R \pm 0.2\%$                                       | MIL-STD-202 Method 210<br>260±5°C for 10 seconds                                                                                                                                                        |
| Low Temperature Operation                   | $\Delta R \pm 0.2\%$                                       | JIS-C-5201-1 4.36<br>1 hour, -65°C, followed by 45 minutes of RCWV                                                                                                                                      |
| High Temperature Exposure                   | $\Delta R \pm 0.2\%$                                       | MIL-STD-202 Method 108<br>At +155°C for 1000 hours                                                                                                                                                      |
| Thermal Shock                               | $\Delta R \pm 0.2\%$                                       | MIL-STD-202F Method 107<br>-55°C ~ 150°C, 100 cycles                                                                                                                                                    |

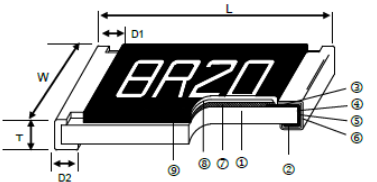
RCWV (Rated continuous working voltage)=  $\sqrt{P \cdot R}$  or Max. Operating voltage  
whichever is lower

Reference Standards: MIL-STD-202, JIS-C 5201

Storage Temperature: 25±3°C; Humidity < 80%RH

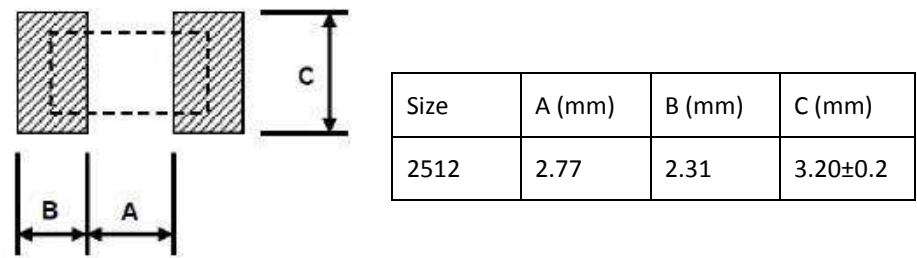
Shelf Life: 2 years from date of production

## Construction and Dimensions

|                                                                                     |   |                           |   |                    |   |                |
|-------------------------------------------------------------------------------------|---|---------------------------|---|--------------------|---|----------------|
|  | ① | Alumina Nitride Substrate | ④ | Edge Electrode     | ⑦ | Resistor Layer |
|                                                                                     | ② | Bottom Electrode          | ⑤ | Barrier Layer      | ⑧ | Overcoat       |
|                                                                                     | ③ | Top Electrode             | ⑥ | External Electrode | ⑨ | Marking        |

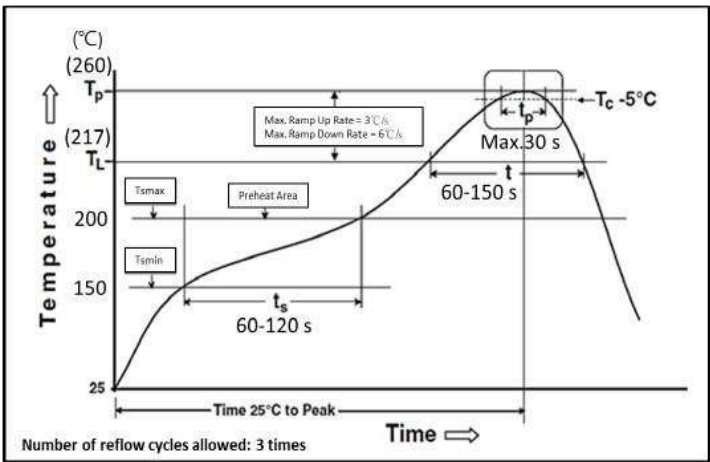
| Size | L (mm)    | W (mm)    | T (mm)    | D1 (mm)   | D2 (mm)   | Weight (g)<br>1000 Pcs |
|------|-----------|-----------|-----------|-----------|-----------|------------------------|
| 2512 | 6.30±0.20 | 3.10±0.20 | 0.43±0.15 | 0.70±0.25 | 1.60±0.25 | 42.32                  |

Recommended PCB Plan



NB. Use a PCB with a copper thickness of two ounces

Solder Profile (IPC/JEDEC J-STD-020)



Marking

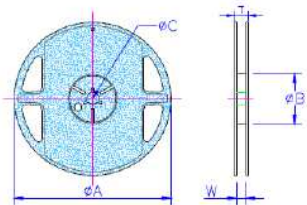
4 digit marking – 3 significant figures plus multiplier

|            |      |       |      |        |
|------------|------|-------|------|--------|
| Resistance | 500Ω | 2.2KΩ | 10KΩ | 12.5KΩ |
| Marking    | 5000 | 2201  | 1002 | 1252   |

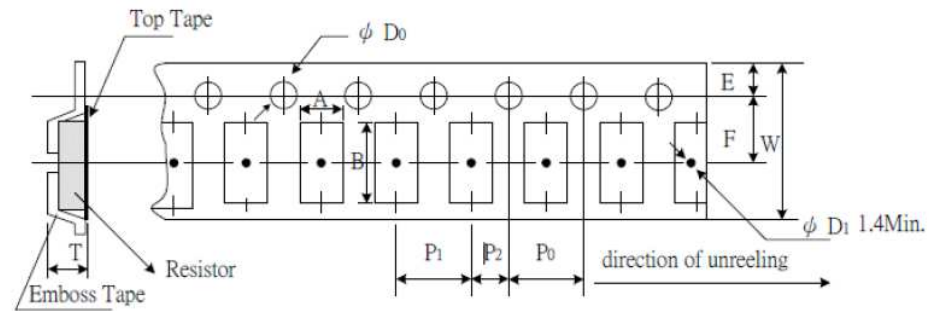
Packaging

Reel Specification

| ∅A    | ∅B   | ∅C   | W    | T    | Qty  |
|-------|------|------|------|------|------|
| 178.0 | 60.0 | 13.5 | 13.5 | 15.5 | 1000 |
| ±1.0  | ±1.0 | ±0.7 | ±1.0 | ±1.0 | 4000 |

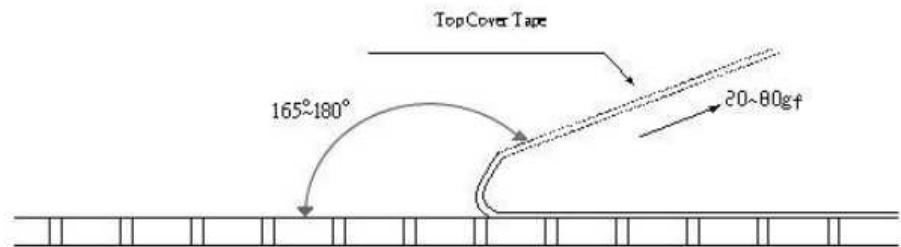


### Emboss Plastic Tape Specification



|              |              |              |              |              |                |                |                |                     |              |
|--------------|--------------|--------------|--------------|--------------|----------------|----------------|----------------|---------------------|--------------|
| $A \pm 0.10$ | $B \pm 0.10$ | $W \pm 0.10$ | $E \pm 0.10$ | $F \pm 0.05$ | $P_0 \pm 0.10$ | $P_1 \pm 0.10$ | $P_2 \pm 0.05$ | $\phi D_0 \pm 0.10$ | $T \pm 0.20$ |
| 3.40         | 6.65         | 12.00        | 1.75         | 5.50         | 4.00           | 4.00           | 2.00           | 1.50                | 1.00         |

- Peel force of top cover tape
- The peel speed shall be about 300mm/min $\pm 5\%$
- The peel force of top cover tape shall be between 20gf to 80gf



### How to Order

| 3504                                      | G         | 3A        | 10K                                                                 | F         | TDF                       |
|-------------------------------------------|-----------|-----------|---------------------------------------------------------------------|-----------|---------------------------|
| Common Part                               | TCR       | Size      | Resistance value                                                    | Tolerance | Packaging                 |
| 3504 – High Power Thin Film Chip Resistor | G – 50ppm | 3A - 2512 | 100R - 100 $\Omega$<br>1K0 - 1000 $\Omega$<br>10K - 10,000 $\Omega$ | F – 1%    | TDF – 1K RL<br>TD – 5K RL |

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