

SMD POWER RESISTORS - AEC-Q200 QUALIFIED

TYPE 3522 SERIES

INTRODUCTION

TE Connectivity (TE)'s 3522 Series AEC-Q200 Qualified SMD Power Resistors provide a reliable, space-efficient solution for automotive, industrial, and power management applications. With a 3W power rating, compact surface-mount design, and excellent thermal and electrical performance, the series enables designers to achieve higher power density without compromising reliability. Standard tape-and-reel packaging ensures seamless integration into automated manufacturing environments. Engineered to support demanding operating conditions, the 3522 Series combines robust construction with stable performance across a wide temperature range. Its excellent power-to-size ratio helps optimize PCB space while maintaining superior power handling capability. The resistor is well suited for applications such as battery management systems, motor drives, power supplies, automotive electronics, and AEC-Q200 qualification further demonstrates the product's capability to meet stringent automotive quality and reliability requirements, providing designers with confidence in mission-critical applications.



FEATURES

- 3 Watts at 70°C
- Small size to power ratio
- Supplied on tape
- Value marked on resistor
- Available via distribution
- 500 volt maximum overload
- 250 volt working voltage
- Terminal finish matte Sn over Ni
- AEC-Q200 Qualified

APPLICATIONS

- High-power load resistors
- Motor control and drive circuits
- LED driver circuits and lighting systems
- General-purpose high-frequency electronic circuits due to short lead structure
- Current sensing and current limiting circuits
- DC-DC converters and power supplies

Note: SMD (Surface mount devices) resistors and inductors should be kept in their original packaging to protect them from ESD (Electrostatic Discharge). The full reels can be broken into smaller quantities, without exposing them to ESD, as long as the components are still in the plastic or paper tape. These resistors and inductors should not be removed from the plastic or paper tape unless they are in an ESD protected environment.

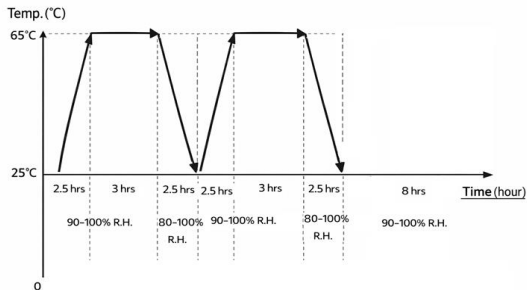
ELECTRICAL CHARACTERISTICS

Type	3522
Power rating at 70°C	3W
Rated current (Jumper)	2.5A
Max. overload current (Jumper)	10A
Max working voltage	250V
Max overload voltage	500V
Dielectric withstand voltage	500V
Temperature range	-55°C~+155°C
Ambient temperature	70°C

CATEGORY INDEX

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ENVIRONMENTAL CHARACTERISTICS

Characteristics	Limits	Test Methods
Operational life	$\pm(1\%+0.1\Omega)\max$	125, at 35% of operating power, 1000H(1.5 hours "ON", 0.5 hour "OFF"). (MIL-STD-202)
	$<100\text{m}\Omega$	Apply rated current for 0 Ω
Temperature Coefficient of Resistance	$1\Omega \leq R \leq 10\Omega \leq \pm 400\text{PPM}/^\circ\text{C}$ $10\Omega < R \leq 100\Omega \leq \pm 200\text{PPM}/^\circ\text{C}$ $100\Omega < R \leq 10\text{M}\Omega \leq \pm 100\text{PPM}/^\circ\text{C}$	Parametrically test per lot and sample size requirements, summary to show Min, Max, Mean and Standard deviation at room as well as min. and max. operating temperatures. (User Spec)
External Visual	No Mechanical Damage	Electrical test not required. Inspect device construction, marking and workmanship (MIL-STD-883 Method 2009)
Physical dimension	Reference 2.0 Dimension standards	Verify physical dimensions to the applicable device detail specification Note: User and Supplier specifications Electrical test not required. (JESD22 MH Method JB-100)
Resistance to solvent	Marking Unsmeared	Note: Add Aqueous wash chemical OKEM Clean or equivalent. Do not use banned solvents. (MIL-STD-202 Method 215)
Terminal Strength	Not broken	Force of 1.8kg for 60 seconds. (JIS-C-6429)
High Temperature Exposure (storage)	$\pm(1\%+0.1\Omega)\max$	1000hrs. @T=155°C.Unpowered Measurement at 24 $\pm$ 2 hours after test conclusion. (MIL-STD-202 Method 108)
	$<50\text{m}\Omega$	Apply rated current for 0 Ω
Moisture Resistance	Resistance change rate is $\pm(0.5\%+0.1\Omega)\max$	 T=24 hours /cycle. Unpowered. Measurement at 24$\pm$2 hours after test conclusion. (MIL-STD-202 Method 106)
Temperature cycling	Resistance change rate is $\pm(0.5\%+0.1\Omega)\max$	1000 Cycles (-55°C to +155°C). Measurement at 24 $\pm$ 2 hours after test conclusion (JESD22 Method JA-104)
	$<50\text{m}\Omega$	Apply to rated current for 0 Ω
Biased Humidity	Resistance change rate is $\pm(1\%+0.1\Omega)\max$	10% rated power, 85°C/85% RH, 1000H, Measurement at 24 hours after test conclusion (MIL-STD-202 Method 103)
	$<100\text{m}\Omega$	Apply rated current for 0 Ω



ENVIRONMENTAL CHARACTERISTICS (CONTINUATION)

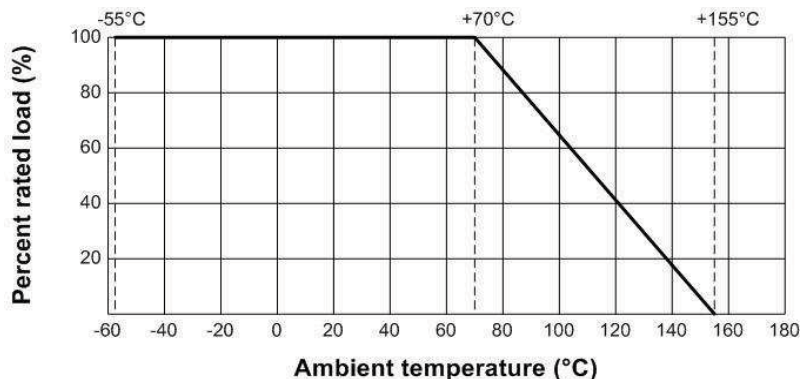
Characteristics	Limits	Test Methods												
Mechanical Shock	±(1%+0.1Ω) max	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6. (MIL-STD-202 Method 213)												
Vibration	±(1%+0.1Ω) max	5g's for 20 min., 12 cycle each of 3 orientations Note: Use 8"*5"PCB 0.031" thick 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2' from any secure point. Test from 10-2000Hz. (MIL-STD-202 Method 204)												
Thermal Shock	±(1%+0.1Ω) max	-55°C/+155°C, Maximum transfer time -20 seconds, Dwell time -15 minutes. Air-Air. (MIL-STD-202 Method 107) Note: Number of cycles required - 300,												
	<50mΩ	Apply rated current for 0 Ω												
ESD	±(10%+0.1Ω)max	With the electrometer in direct contact with the discharge tip, verify the voltage setting at levels of ±500V, ±1KV, ±2KV, ±4KV, ±8KV, The electrometer reading shall be within ±10% for voltages from 500V to ≤800V. (AEC-Q200-002)												
Solderability	95% coverage Min.	For both leaded & SMD. Electrical test not required. Magnification 50X. Conditions:												
		<table><tr><th>Method</th><th>Temperature</th><th>Time</th></tr><tr><td>B</td><td>155°C dry heat, the dip in bath with 245°C</td><td>4 Hrs</td></tr><tr><td>B</td><td>215°C</td><td>5 Sec</td></tr><tr><td>D</td><td>260°C</td><td>60 Sec</td></tr></table>	Method	Temperature	Time	B	155°C dry heat, the dip in bath with 245°C	4 Hrs	B	215°C	5 Sec	D	260°C	60 Sec
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		B	155°C dry heat, the dip in bath with 245°C	4 Hrs										
		B	215°C	5 Sec										
D	260°C	60 Sec												
(J-STD-002)														
Flammability	No ignition of the tissue paper or scorching of the pinewood board	V-0 or V-1 are acceptable. Electrical test not required. (UL-94)												
Board Flex	±(1%+0.05Ω)max	2mm (Min) (JIS-C-6429)												
	<50mΩ	Apply rated current for 0Ω												
Flame Retardance	No flame	Temperature sensing at 500°C, Voltage power subjected to 32VDC current clamped up to 500ADC and decreased in 1.0VDC/hour. (AEC-Q200-001)												
Resistance to Soldering Heat	±(1%+0.05Ω) max.	Condition B No pre-heat of samples. Note: Single Wave Solder - Procedure 2 for SMD and Procedure 1 for Leaded with solder within 1.5mm of device body. (MIL-STD-202 Method 210)												
	<50mΩ	Apply rated current for 0W												

* Sulfuration test: H2S 3-5PPM 50 ±2 91%~93%RH 1000H



DERATING CURVE

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with this curve.



VOLTAGE RATING

Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform corresponding to the power rating, as determined from the following formula:

$$RCWV = \sqrt{P \times R}$$

Note:

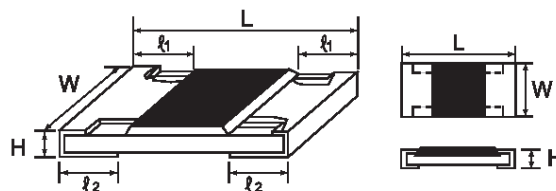
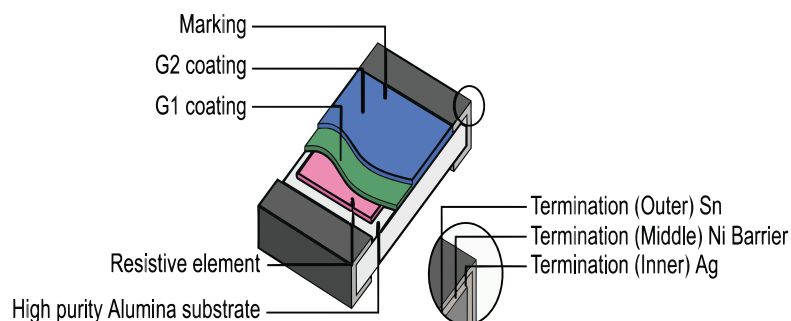
1. Maximum working voltage or $\sqrt{P \times R}$, whichever is lower
2. Maximum overload voltage or $2.5\sqrt{P \times R}$, whichever is lower.

Where: RCWV = Rated DC or RMS AC continuous working voltage at commercial-line frequency and waveform (volt) and

P = Power Rating (watt)

R = Nominal Resistance (ohm)

CONSTRUCTION AND DIMENSIONS

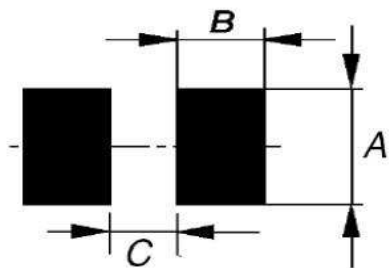


Dimensions	L ± 0.10	W ± 0.15	H ± 0.10	l1 ± 0.25	l2 ± 0.20
3522	6.35	3.20	1.10	0.60	1.80

Power rating @70°C	Tolerance %	Resistance Range	Standard series
3W	Jumper	<50 mΩ	-
	± 1%	1Ω - 10MΩ	E96
	± 5%	1Ω - 10MΩ	E24



RECOMMENDED LAND PATTERN (Unit: mm)



Dimension	A	B	C
3522	3.70	3.30	2.70

4 LAYERS PCB SPECIFICATION

1. Outside 2 layers (Top and Bottom) with copper foil thickness at 2oz.
2. Inside 2 layers (Middle layers) with copper foil thickness at 4oz.

MARKING

Marking for E-96 series in 2512 size: 4 digit marking

First three digits are significant figures of resistance and the fourth digit represents the number of following zeros. N.B. For values below 100Ω the letter R denotes decimal point e.g. 1R80 = 1.8Ω

Ex.		1003		100KΩ
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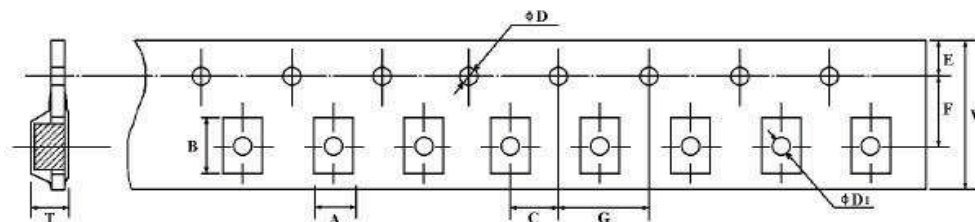
Marking for E-24 series in 2512 size: 3 digit marking

First two digits are significant figures, and the third digit represents the number of zeros

Ex.		102		1KΩ
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PACKAGING SPECIFICATION

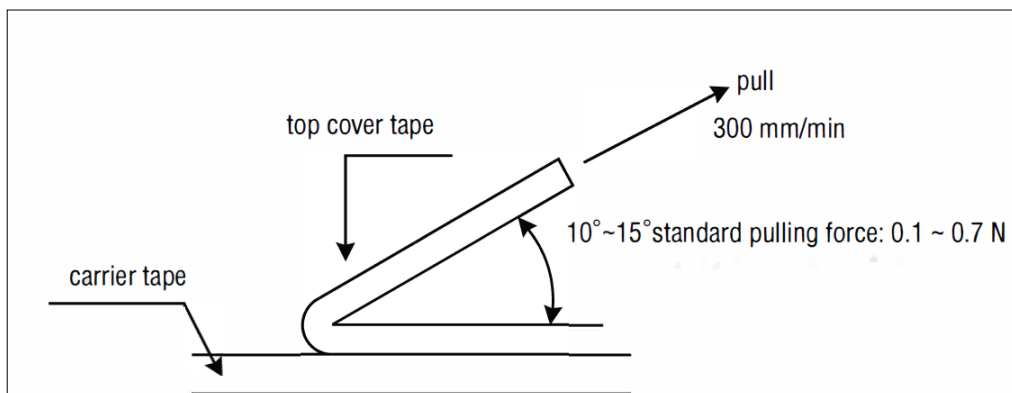
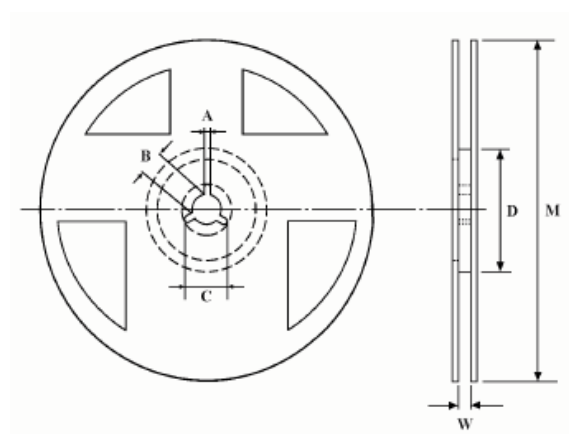
TAPING DIMENSIONS (Unit: mm)



Dimension	A	B	C	ØD	E	F	G	W	ØD ₁	T
	±0.10	±0.10	±0.15	+0.1 -0	±0.10	±0.15	±0.1	±0.30	±0.1	±0.1
3522	3.5	6.7	2.0	1.5	1.75	5.5	4.0	12	1.5	1.35

**PEELING STRENGTH OF TOP COVER TAPE (Unit: mm)**

Test condition 0.1 to 0.7 N at a peel-off speed of 300mm / min

**REEL DIMENSION (Unit: mm)**

Qty/Reel	A ±0.5	B ±0.5	C ±0.15	D ±1	M ±2	W ±1
2000	2	13	21	60	178	13.5

ENVIRONMENT RELATED SUBSTANCE

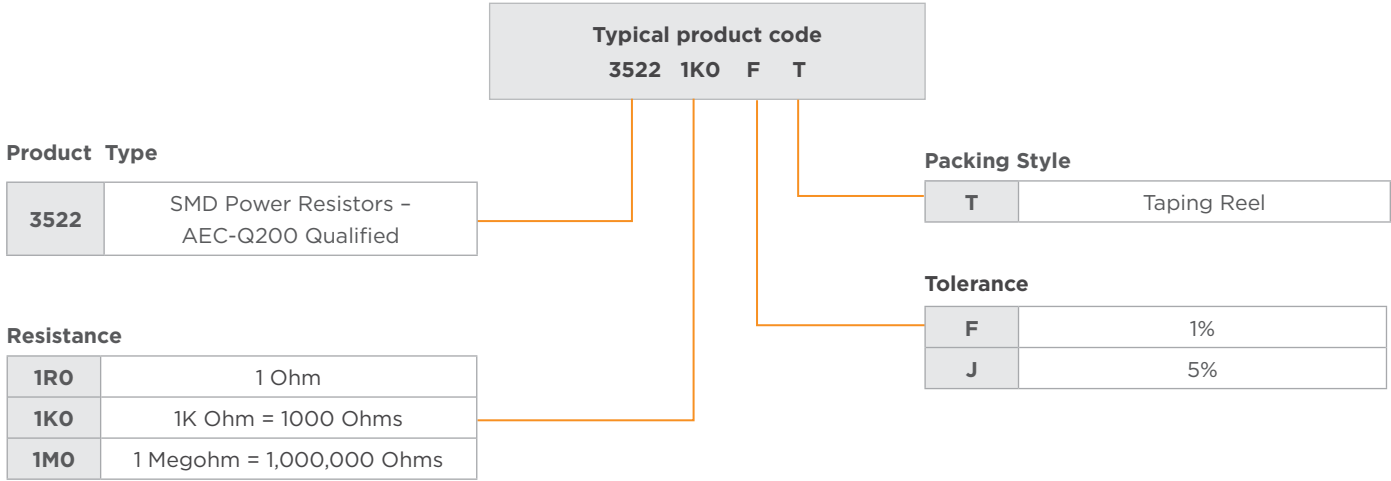
This product complies with the applicable requirements of the EU RoHS Directive, EU PAHs requirements, EU PFOS requirements, and halogen-free material expectations. Ozone-depleting substances are not used in the manufacturing process for this product. This product is not manufactured using chlorofluorocarbons (CFCs), Hydrochlorofluorocarbons (HCFCs), hydrobromofluorocarbons (HBFCs), or other ozone-depleting substances at any stage of manufacture.

STORAGE CONDITION (MSL1)

The performance of these products, including solderability, is guaranteed for a year from the date of arrival at the customer location, provided the products remain in the original delivered packaging and are stored at a temperature of 25°C ± 10°C and a relative humidity of 60%RH ± 10%RH. Even within this period, the products should not be stored under conditions that may adversely affect electrical performance, solderability, or packaging integrity.

1. In salty air or in atmospheres containing corrosive gases such as Cl₂, H₂S, NH₃, SO₂, or NO₂.
2. In direct sunlight

ORDERING INFORMATION



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