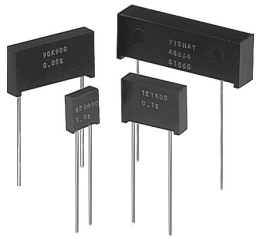
Ultra High-Precision Z Foil Through-Hole Resistor

with TCR of ±0.2 ppm/°C, Tolerance of ±0.005% (50 ppm), Load Life Stability of ±0.005%

FEATURES



- **Temperature coefficient of resistance (TCR):** ±0.2 ppm/°C typical (–55°C to +125°C, +25°C ref.)
- Rated power: to 1 W at +125°C
- Resistance tolerance: to ±0.005% (50 ppm)
- Load life stability: ±0.005% at 70°C, 2000 h or ±0.015% at 70°C, 10000 h
- Resistance range: 5 Ω to 600 kΩ
- Bulk Metal® Foil resistors are not restricted to standard values; specific “as required” values can be supplied (e.g. 1K2345 vs. 1K)
- Electrostatic Discharge (ESD): Up to 25 kV

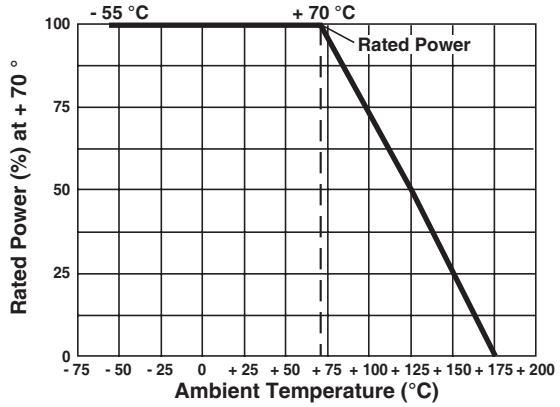
Pb-free Available

RoHS* COMPLIANT

TYPICAL TCR AND MAX. SPREAD
(–55°C to +125°C, +25°C ref.)

VALUE	STANDARD TOLERANCE	TYPICAL TCR AND MAX. SPREAD (ppm/°C)
100 Ω to 600 kΩ	±0.005%	±0.2 ±0.6
80 Ω to <100 Ω	±0.005%	±0.2 ±0.8
50 Ω to <80 Ω	±0.01%	±0.2 ±1.0
25 Ω to <50 Ω	±0.01%	±0.2 ±1.3
10 Ω to <25 Ω	±0.02%	±0.2 ±1.6
5 Ω to <10 Ω	±0.05%	±0.2 ±2.3

POWER DERATING CURVE



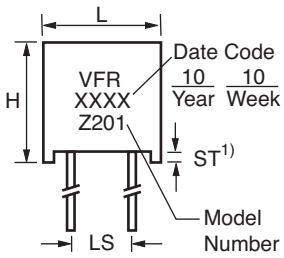
MODEL SELECTION

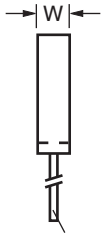
MODEL NUMBER	RESISTANCE RANGE [2]	MAXIMUM WORKING VOLTAGE	AMBIENT POWER RATING		AVERAGE WEIGHT	DIMENSIONS	
			at +70°C	at +125°C		INCHES	mm
Z201 (Z201L) [1]	5 Ω to 100 kΩ	300 V	0.6 W	0.3 W	0.5 g	W: 0.105 ±0.010 L: 0.300 ±0.010 H: 0.326 ±0.010 ST: 0.010 min. SW: 0.040 ±0.005 LL: 1.000 ±0.125 LS: 0.150 ±0.005 [1]	2.67 ±0.25 7.62 ±0.25 8.28 ±0.25 0.254 min. 1.02 ±0.13 25.4 ±3.18 3.81 ±0.13
Z204	5 Ω to 200 kΩ	350 V	1.0 W	0.5 W	1.25 g	W: 0.160 max. L: 0.575 max. H: 0.413 max. ST: 0.035 ±0.005 SW: 0.050 ±0.005 LL: 1.000 ±0.125 LS: 0.400 ±0.020	4.06 max. 14.61 max. 10.49 max. 0.889 ±0.13 1.27 ±0.13 25.4 ±3.18 10.16 ±0.51
Z205	5 Ω to 300 kΩ	350 V	1.5 W	0.75 W	1.75 g	W: 0.160 max. L: 0.820 max. H: 0.413 max. ST: 0.035 ±0.005 SW: 0.050 ±0.005 LL: 1.000 ±0.125 LS: 0.650 ±0.020	4.06 max. 20.83 max. 10.49 max. 0.889 ±0.13 1.27 ±0.13 25.4 ±3.18 16.51 ±0.51
Z206	5 Ω to 600 kΩ	500 V	2.0 W	1.0 W	3.7 g	W: 0.260 max. L: 1.200 max. H: 0.413 max. ST: 0.035 ±0.005 SW: 0.050 ±0.005 LL: 1.000 ±0.125 LS: 0.900 ±0.020	6.60 max. 30.48 max. 10.49 max. 0.889 ±0.13 1.27 ±0.13 25.4 ±3.18 22.86 ±0.51
			up to 400K				
			1.0 W	0.5 W			
			over 400K				

Note
[1] 0.200 in (5.08 mm) lead spacing available – specify Z201L instead of Z201.
[2] For non standard values please contact Application Engineering at foil@vpgsensors.com

STANDARD IMPRINTING AND DIMENSIONS

Front View

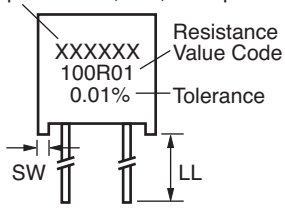




Lead Material
#22 AWG Round
Solder Coated Copper

Rear View

Optional Customer Part Number
Print Specification, etc., if Required



Note
1. The standoffs shall be so located as to give a lead clearance of 0.010 in minimum between the resistor body and the printed circuit board when the standoffs are seated on the printed circuit board. This is to allow for proper cleaning of flux and other contaminants from the unit after all soldering processes.

ENVIRONMENTAL PERFORMANCE COMPARISON			
	MIL-PRF-55182 CHAR J	Z SERIES TYPICAL ΔR	Z SERIES MAXIMUM ΔR (1)
Test Group I Thermal shock, 5× (–65°C to +150°C) Short time overload, 6.25× rated power	 ±0.2% ±0.2%	 ±0.002% (20 ppm) ±0.003% (30 ppm)	 ±0.01% (100 ppm) ±0.01% (100 ppm)
Test Group II Resistance temperature characteristics Low temperature storage (24 h at –65°C) Low temperature operation (45 min, rated power at –65°C) Terminal strength	 ±25 ppm/°C ±0.15% ±0.15% ±0.20%	 ±0.2 ppm/°C ±0.002% (20 ppm) ±0.002% (20 ppm) ±0.002% (20 ppm)	 see table 1 ±0.01% (100 ppm) ±0.01% (100 ppm) ±0.01% (100 ppm)
Test Group III DWV Insulation resistance Resistance to solder heat Moisture resistance	 ±0.15% ≥10^4 MΩ ±0.10% ±0.40%	 ±0.002% (20 ppm) ±0.005% (50 ppm) ±0.010% (100 ppm)	 ±0.01% (100 ppm) ≥10^4 MΩ ±0.01% (100 ppm) ±0.02% (200 ppm)
Test Group IV Shock Vibration	 ±0.2% ±0.2%	 ±0.002% (20 ppm) ±0.002% (20 ppm)	 ±0.01% (100 ppm) ±0.01% (100 ppm)
Test Group V Life test at rated power/+125°C 2 000 h 10 000 h	 ±0.5% ±2.0%	 ±0.005% (50 ppm) ±0.015% (150 ppm)	 ±0.015% (150 ppm) ±0.050% (500 ppm)
Test Group Va Life test at 2× rated power/+70°C, 2 000 h	 ±0.5%	 ±0.005% (50 ppm)	 ±0.015% (150 ppm)
Test Group VI High temperature exposure (2 000 h at +175°C)	 ±2.0%	 ±0.02% (200 ppm)	 ±0.05% (500 ppm)
Test Group VII Voltage coefficient	 5 ppm/V		 3 ppm/V

(1) Measurement error allowed for ΔR limits: 0.01 Ω

"Z" SERIES SPECIFICATIONS		
Stability (1) Load life at 2 000 h Load life at 10 000 h	 ±0.015% (150 ppm) ±0.005% (50 ppm) ±0.050% (500 ppm) ±0.015% (100 ppm)	 Maximum ΔR at 0.3 W/+125°C Maximum ΔR at 0.1 W/+70°C Maximum ΔR at 0.3 W/+125°C Maximum ΔR at 0.1 W/+70°C
Current Noise	0.010 μV_{RMS}/V of applied voltage (<–40 dB)	
High Frequency Operation Rise time Inductance (L) (2) Capacitance (C)	 1.0 ns at 1 kΩ 0.1 µH maximum; 0.08 µH typical 1.0 pF maximum; 0.5 pF typical	
Voltage Coefficient	<3 ppm/V (3)	
Thermal EMF (4)	0.05 µV/°C typical 1 µV/W (Model Z201)	

Notes
(1) Load life ΔR maximum can be reduced by 80%, please contact applications engineering.
(2) Inductance (L) due mainly to the leads.
(3) The resolution limit of existing test equipment (within the measurement capability of the equipment.)
(4) µV/°C relates to EMF due to lead temperature difference and µV/watt due to power applied to the resistor.

GLOBAL PART NUMBER INFORMATION [1]

NEW GLOBAL PART NUMBER: Y145380K5000V9L (preferred part number format)

DENOTES PRECISION	VALUE	CHARACTERISTICS
Y	**R** = Ω **K** = kΩ **M** = MΩ	**0** = tin/lead **9** = lead (Pb)-free **1 to 999** = custom

Y	1	4	5	3	8	0	K	5	0	0	0	V	9	L

PRODUCT CODE	RESISTANCE TOLERANCE	PACKAGING
1453 = Z201 **1454** = Z201L **1441** = Z204 **1443** = Z205 **1447** = Z206	**V** = ± 0.005% **T** = ± 0.01% **Q** = ± 0.02% **A** = ± 0.05% **B** = ± 0.1% **C** = ± 0.25% **D** = ± 0.5% **F** = ± 1.0%	**L** = bulk pack

FOR EXAMPLE: ABOVE GLOBAL ORDER Y1453 80K5000 V 9 L:

TYPE: Z201
VALUE: 80.5 kΩ
ABSOLUTE TOLERANCE: ± 0.005%
TERMINATION: lead (Pb)-free
PACKAGING: bulk pack

HISTORICAL PART NUMBER: Z201 T 80K500 V B (will continue to be used)

Z201	T	80K500	V	B
MODEL	TERMINATION	RESISTANCE VALUE	TOLERANCE	PACKAGING
Z201 **Z201L** **Z204** **Z205** **Z206**	**T** = lead (Pb)-free None = tin/lead alloy	**250R00** = 250.00 Ω **5K2310** = 5.231 kΩ **1M000** = 1 MΩ	**V** = ± 0.005% **T** = ± 0.01% **Q** = ± 0.02% **A** = ± 0.05% **B** = ± 0.1% **C** = ± 0.25% **D** = ± 0.5% **F** = ± 1.0%	**B** = bulk pack

Note
[1] For non-standard requests, please contact application engineering.