

Chip High Voltage Thick Film Resistors

Token (HVR) Thick-Film Chip Resistors operate at high voltages Introduction

▶ Preview

New (HVR) High-voltage chip resistors deliver ratings up to 4 KV. Token electronics has introduced a thick-film chip resistor series with wide resistance range from 10Ω to 100MΩ. The (HVR) series of surface mount resistors feature high-voltage operation in standard 0402, 0603, 0805, 1206, 2010 and 2512 package sizes, making them well ideal for automatic handling methods.

The (HVR) resistors offer high voltage, extended surge ratings. This pulse-withstanding chip resistors combine extended surge values with high-voltage ratings for high-power applications. The (HVR) series are designed for use in high-voltage power supplies, circuit protection devices, medical equipment (defibrillators), military equipment (night vision cameras, x-ray equipment), automotive industry, and High Pulse Equipments.

Token's (HVR) series features high grade alumina substrate wrap-around terminations with an electroplated nickel barrier (Ni) with Edge Electrode (NiCr), and either tin/lead or RoHS-compliant matte tin finish. In addition, the overall robust construction allows the chip resistor to operate in harsh, high-voltage environments.

The (HVR) series feature tolerances of ±1%, and ±5%. Continuous voltage ratings are rated up to 3 KV, with maximum overload voltage to 4 KV. Power ratings for the HVR02(0402), HVR03(0603), HVR05(0805), HVR06(1206), HVR0A(2010) and HVR12(2512) resistors are 1/16W, 1/10W, 1/8W, 1/4W, 1/2W and 1W, respectively, with an operating temperature range of -55°C to +155°C. Custom specifications are available.

The (HVR) series are available in taping packaging and RoHS compliant. For non-standard technical requirements and special applications, please contact us with your specific needs.



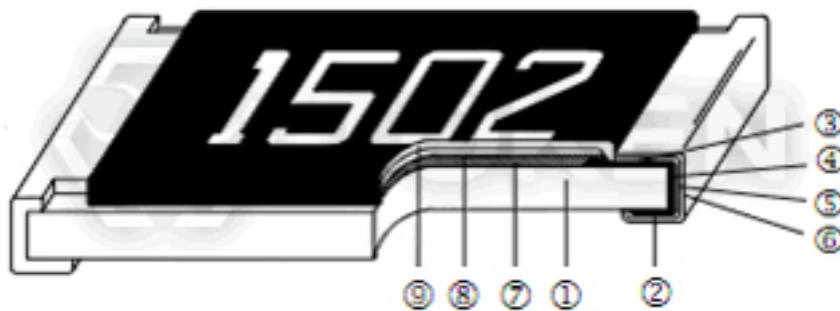
► **Features**

- Reduced size of final equipment
- Miniature size HVR02(0402) available
- Excellent performance at high voltage
- Higher component and equipment reliability
- Pb-free terminations meet RoHS requirements
- Thick film chips with highly reliable multilayer electrode construction

► **Applications**

- Inverter, Converters
- Automatic Equipment Controller
- High-Voltage Power Supplies, Circuit --Protection Devices
- Medical Equipment (Defibrillators, High Pulse Equipment)
- Printer Equipment, Consumer Product, Outdoor Equipments
- Military Equipment (Night Vision Cameras, X-ray Equipment)

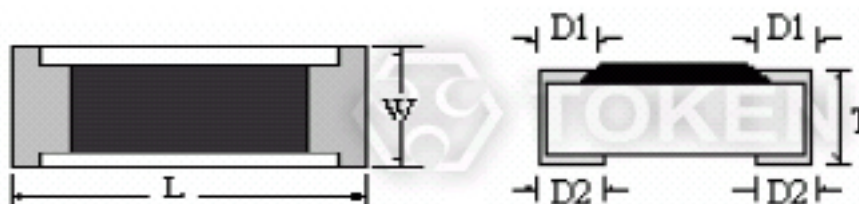
► **Construction (HVR)**



Thick Film High Voltage Chip (HVR) Construction

① ↓	② ↓	③ ↓	④ ↓	⑤ ↓
Alumina Substrate	Bottom Electrode (Ag)	Top Electrode (Ag-Pd)	Edge Electrode (NiCr)	Barrier Layer (Ni)
⑥ ↓	⑦ ↓	⑧ ↓	⑨ ↓	
External Electrode (Sn)	Resistor Layer (RuO ₂ /Ag)	Primary Overcoat (Glass)	Secondary Overcoat (Epoxy)	

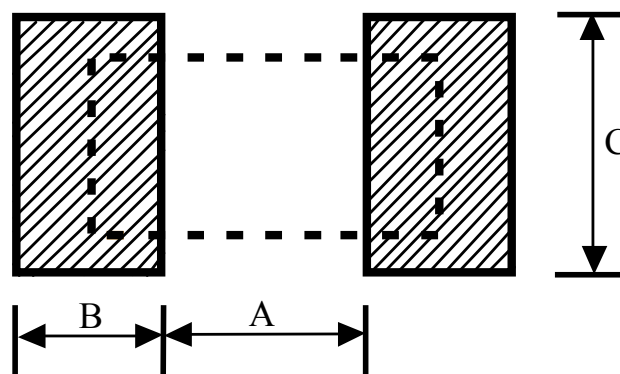
Construction (HVR)



High voltage surface Mount Chip (HVR) Dimensions

Codes	L (Unit: mm)	W (Unit: mm)	T (Unit: mm)	D1 (Unit: mm)	D2 (Unit: mm)
HVR02 (0402)	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.20±0.10
HVR03 (0603)	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20
HVR05 (0805)	2.00±0.10	1.25±0.10	0.55±0.10	0.35±0.20	0.40±0.20
HVR06 (1206)	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20
HVR0A (2010)	5.00±0.20	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20
HVR12 (2512)	6.35±0.20	3.20±0.15	0.55±0.10	0.60±0.25	0.50±0.20

Recommend Land Pattern (Unit: mm) (HVR)



Recommend Land Pattern (HVR)

Codes	A	B	C
HVR02 (0402)	0.50	0.45	0.60±0.2
HVR03 (0603)	0.90	0.60	0.90±0.2
HVR05 (0805)	1.20	0.70	1.30±0.2
HVR06 (1206)	2.00	0.90	1.60±0.2
HVR0A (2010)	3.80	0.90	2.80±0.2
HVR12 (2512)	3.80	1.60	3.50±0.2

▶ Standard Electrical Specifications (HVR)

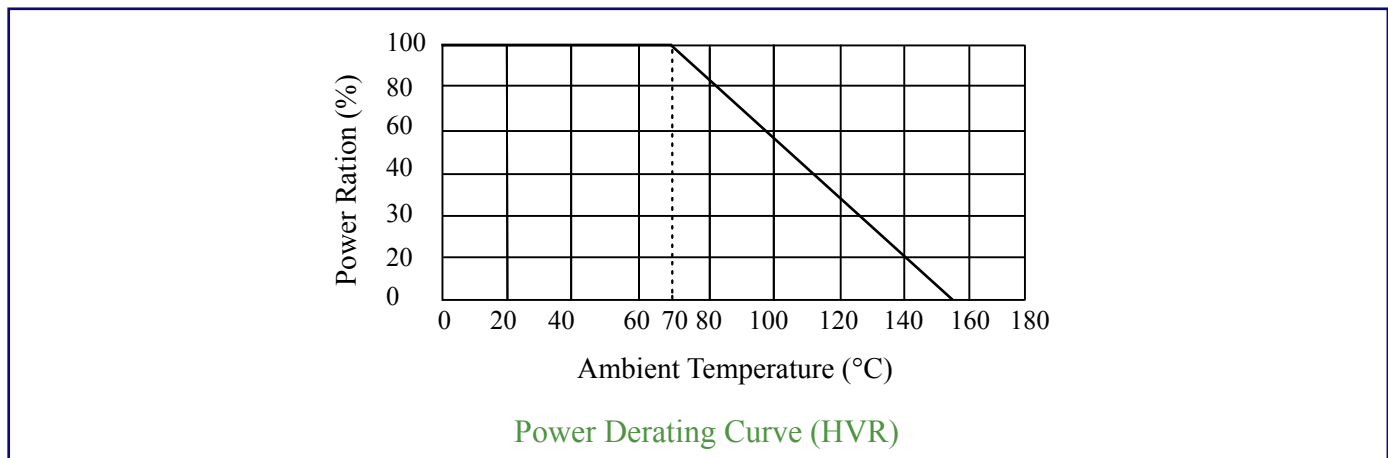
Type	Power Rating at 70°C	Operating Temp. Range	Max Operating Voltage	Max Overloading Voltage	Resistance Tolerance	Resistance Range	TCR
HVR02 (0402)	1/16W	-55 ~ +155°C	100V	200V	±1.0%, ±5.0%	10Ω~1MΩ	±100PPM/°C
					±1.0%	1.02MΩ~10MΩ	±200PPM/°C
					±5.0%	1.1MΩ~20MΩ	±200PPM/°C
					±5.0%	22MΩ~100MΩ	±400PPM/°C
HVR03 (0603)	1/10W	-55 ~ +155°C	200V	400V	±1.0%, ±5.0%	10Ω~1MΩ	±100PPM/°C
					±1.0%	1.02MΩ~10MΩ	±200PPM/°C
					±5.0%	1.1MΩ~20MΩ	±200PPM/°C
					±5.0%	22MΩ~100MΩ	±400PPM/°C
HVR05 (0805)	1/8W	-55 ~ +155°C	400V	800V	±1.0%, ±5.0%	10Ω~1MΩ	±100PPM/°C
					±1.0%	1.02MΩ~10MΩ	±200PPM/°C
					±5.0%	1.1MΩ~20MΩ	±200PPM/°C
					±5.0%	22MΩ~100MΩ	±400PPM/°C
HVR06 (1206)	1/4W	-55 ~ +155°C	500V	1000V	±1.0%, ±5.0%	10Ω~1MΩ	±100PPM/°C
					±1.0%	1.02MΩ~10MΩ	±200PPM/°C
					±5.0%	1.1MΩ~20MΩ	±200PPM/°C
					±5.0%	22MΩ~100MΩ	±400PPM/°C
HVR0A (2010)	1/2W	-55 ~ +155°C	2000V	3000V	±1.0%, ±5.0%	10Ω~1MΩ	±100PPM/°C
					±1.0%	1.02MΩ~10MΩ	±200PPM/°C
					±5.0%	1.1MΩ~20MΩ	±200PPM/°C
					±5.0%	22MΩ~100MΩ	±400PPM/°C
HVR12 (2512)	1W	-55 ~ +155°C	3000V	4000V	±1.0%, ±5.0%	10Ω~1MΩ	±100PPM/°C
					±1.0%	1.02MΩ~10MΩ	±200PPM/°C
					±5.0%	1.1MΩ~20MΩ	±200PPM/°C
					±5.0%	22MΩ~100MΩ	±400PPM/°C

Note:

Operating Voltage=(P×R)^{1/2} or Max. operating voltage listed above, whichever is lower.

Overload Voltage=2.5×(P×R)^{1/2} or Max. overloading voltage listed above, whichever is lower.

▶ Standard Electrical Specifications (HVR)



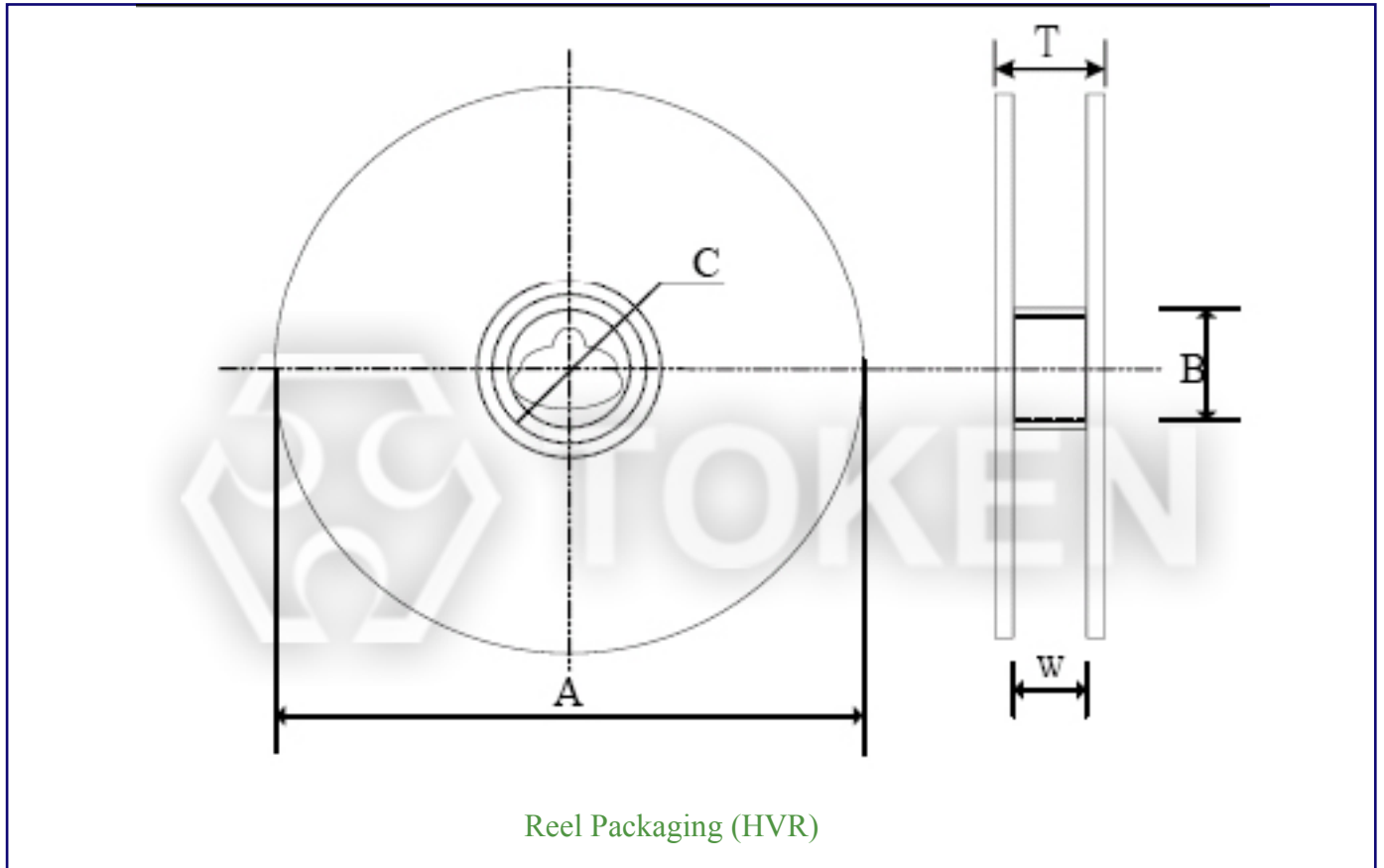
Item	Specification		Test Method
	Tol. 1%	Tol. 5%	
Dry Heat	$\pm(1\%+0.05\Omega)$	$\pm(1.5\%+0.10\Omega)$	At +155°C for 1000 hrs.
Endurance	$\pm(2\%+0.10\Omega)$	$\pm(3\%+0.10\Omega)$	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs “ON” and 0.5 hrs “OFF”.
Bending Strength	$\pm(1\%+0.05\Omega)$	$\pm(1\%+0.05\Omega)$	Bending once for 5 seconds, 2010, 2512 sizes: 2mm, other sizes:3mm.
Short Time Overload	$\pm(1\%+0.05\Omega)$	$\pm(2\%+0.05\Omega)$	RCWV*2.5 or Max Overloading Voltage , 5 seconds.
Damp Heat with Load	$\pm(2\%+0.10\Omega)$	$\pm(3\%+0.10\Omega)$	40±2°C, 90~95% R.H. Max. working voltage for 1000 hrs with 1.5 hrs “ON” and 0.5 hrs “OFF”.
Resistance to Soldering Heat	$\pm(0.5\%+0.05\Omega)$	$\pm(1\%+0.05\Omega)$	260±5°C for 10 seconds.
Rapld Change of Temperature	$\pm(0.5\%+0.05\Omega)$	$\pm(1\%+0.05\Omega)$	-55°C to +155°C, 5 cycles.
Temperature Coefficient of Resistance	AS Spec		-55°C ~ +125°C, 25°C is the reference temperature.
Insulation Resistance	≥100 GΩ		Max. overload voltage for 1 minute.
Solderability	95% Min. coverage		245±5°C for 3 seconds.
Voltage Proof	No breakdown or flashover		1.42 times RCWV(RMS) for 1 minute.
Leaching	Individual leaching area ≤5% total leaching area ≤10%		260±5°C for 30 seconds.

Remark:

Reference Standards: IEC60115-1, 60068-2-58; JIS-C 5201-1.

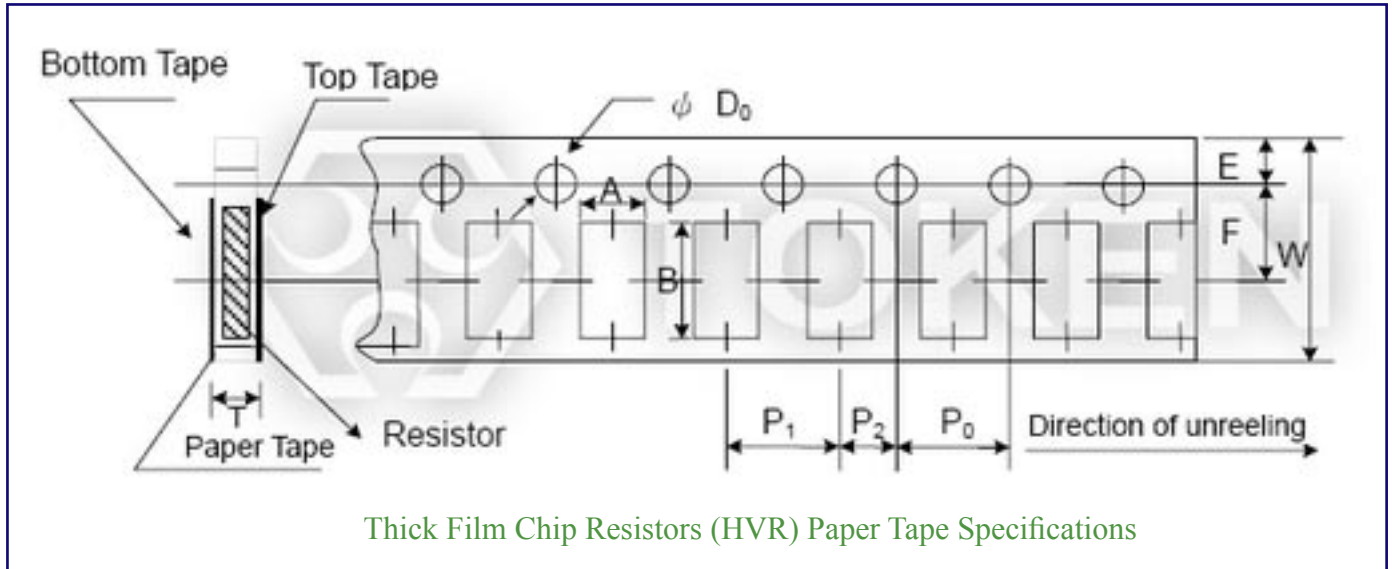
Storage Temperature: 25±3°C; Humidity < 80%RH.

► Packaging Quantity & Reel Specifications (Unit: mm) (HVR)



Type	Tape Width	Packaging Quantity	Reel Diameter	ΦA	ΦB	ΦC	W	T	
HVR02	8mm	Paper	10Kpcs	7 inch	178.5±1.5	60+1/-0	13.0±0.2	9.0±0.5	12.5±0.2
			20Kpcs						
			40Kpcs	10 inch	254±1.0	100±0.5	13.0±0.2	9.0±0.5	13.5±0.5
HVR03	8mm	Paper	5Kpcs	13 inch	330±1.0	100±0.5	13.0±0.2	9.0±0.5	13.5±0.5
HVR05			10Kpcs						
HVR06			20Kpcs						
HVR0A	12mm	Embossed	4Kpcs	7 inch	178.5±1.5	60+1/-0	13.0±0.5	13.0±0.5	15.5±0.5
HVR12			8Kpcs	10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5

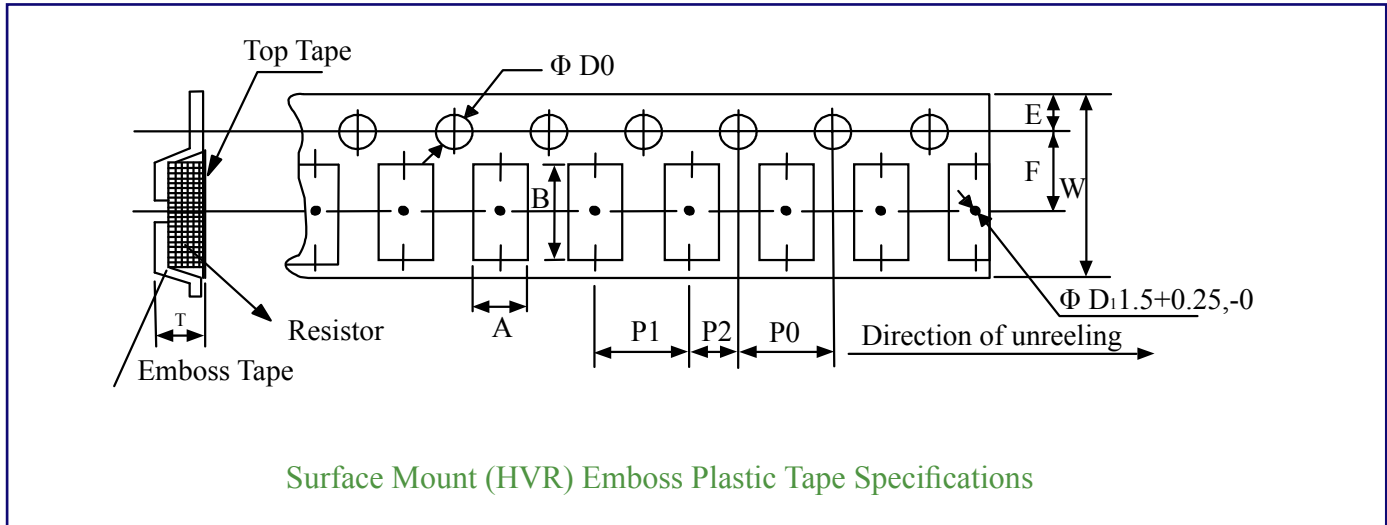
▶ Paper Tape Specifications (Unit: mm) (HVR)



Codes	A	B	W	E	F
HVR02	0.65±0.10	1.15±0.10	8.0±0.20	1.75±0.10	3.50±0.05
HVR03	1.10±0.10	1.90±0.10	8.0±0.20	1.75±0.10	3.50±0.05
HVR05	1.60±0.10	2.40±0.20	8.0±0.20	1.75±0.10	3.50±0.05
HVR06	1.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05

Codes	P ₀	P ₁	P ₂	ΦD ₀	T
HVR02	4.00±0.10	2.00±0.05	2.00±0.05	1.55+0.1/-0	0.45±0.10
HVR03	4.00±0.10	4.00±0.05	2.00±0.05	1.55+0.1/-0	0.70±0.10
HVR05	4.00±0.10	4.00±0.05	2.00±0.05	1.55+0.1/-0	0.85±0.10
HVR06	4.00±0.10	4.00±0.05	2.00±0.05	1.55+0.1/-0	0.85±0.10

▶ Emboss Plastic Tape Specifications (Unit: mm) (HVR)



Codes	A	B	W	E	F
HVR0A	2.8±0.20	5.5±0.20	12.0±0.30	1.75±0.10	5.5±0.05
HVR12	3.5±0.20	6.7±0.20	12.0±0.30	1.75±0.10	5.5±0.05

Codes	P ₀	P ₁	P ₂	ΦD ₀	T
HVR0A	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1/-0	1.2
HVR12	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1/-0	1.2

▶ Order Codes (HVR)



❶ Part Number

❷ Dimensions(L×W) (mm)

Code	Dimensions (L×W)	EIA
02	1.00×0.50 mm	EIA0402
03	1.60×0.80 mm	EIA0603
05	2.00×1.25 mm	EIA0805
06	3.00×1.50 mm	EIA1206
0A	4.90×2.40 mm	EIA2010
12	6.30×3.10 mm	EIA2512

❸ ResistanceTolerance (%)

Code	Resistance Tolerance
F	±1%
J	±5%

❹ Package (TR/P)

Code	Package
TR	Taping Reel
P	Bulk

❺ TCR (ppm/°C)

Code	TCR
E	±100ppm/°C
F	±200ppm/°C
H	±400ppm/°C

❻ Power Rating (W)

Code	Power Rating
T	1W
U	1/2W
V	1/4W
W	1/8W
X	1/10W
Y	1/16W

❼ Resistance (Ω)

Code	Resistance
4R70	4.7Ω
1000	100Ω
4700	470Ω
4992	49900Ω
1003	100000Ω

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