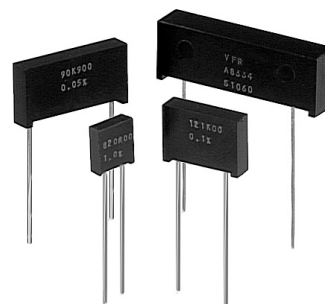


## High Precision Foil Resistor

with Zero TCR, no Humidity Effect and 0.005% Tolerance within a Unique Construction, Minimizing the Effects of Stress Factors

### FEATURES

- Temperature coefficient of resistance (TCR):
  - 55°C to +125°C, 25°C ref.
  - S10XC/D series:  $\pm 2$  ppm/°C typical
  - S10XK series:  $\pm 1$  ppm/°C typical
- Power rating: to 1 W at +125°C
- Resistance tolerance: to  $\pm 0.005\%$  (50 ppm)
- Load life stability:  $\pm 0.005\%$  at 70°C, 2000 h at rated power
- Resistance range: 0.5  $\Omega$  to 1 M $\Omega$
- VFR resistors are not restricted to standard values; specific "as required" values can be supplied (e.g., 1K2345 vs. 1K)
- Electrostatic discharge (ESD) to 25 kV



Available

RoHS\*  
COMPLIANT

### Resistance Versus TCR (-55°C to +125°C, +25°C ref.)

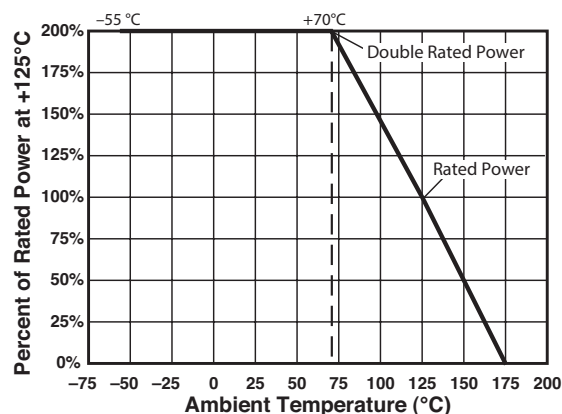
RESISTOR <sup>(1) (2)</sup>	RESISTANCE VALUE ( $\Omega$ )	TYPICAL TCR AND MAX SPREAD (ppm/°C)
S10X(C)/(D)	80 to <1M	$\pm 2 \pm 2.5$
S10X(K)	80 to <600K	$\pm 1 \pm 2.5$
S10X(C)/(D)	50 to <80	$\pm 2 \pm 3.5$
S10X(K)		$\pm 1 \pm 3.5$
S10X(C)/(D)	0.5 to <50	$\pm 2 \pm 4.5$
S10X(K)		$\pm 1 \pm 4.5$

#### Note

<sup>(1)</sup> X refers to S Series model number

<sup>(2)</sup> (C) and (D) refer to C Foil Alloy Types; (K) refers to the K Foil Alloy type

### Power Derating Curve



#### Note

\* This datasheet provides information about parts that are RoHS-compliant and/or parts that are non-RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS compliant. Please see the information/tables in this datasheet for details.

## Model Selection

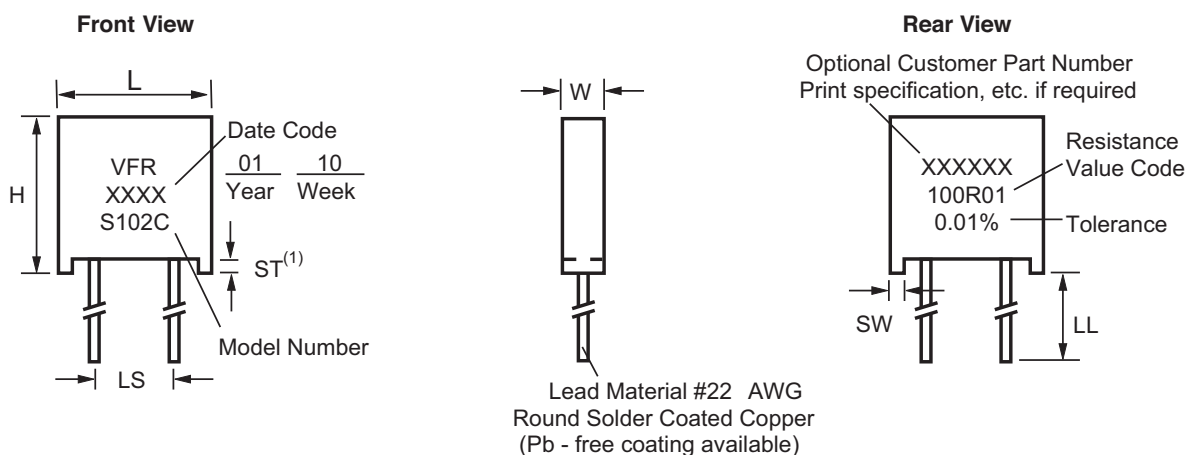
MODEL NUMBER	RESISTANCE RANGE (Ω)	MAXIMUM WORKING VOLTAGE	AMBIENT POWER RATING		AVERAGE WEIGHT IN GRAMS	DIMENSIONS			TIGHTEST TOLERANCE VS. LOWEST RESISTANCE VALUE
			at +70°C	at +125°C		INCHES	MM	F <sup>(1)</sup> (INCHES)	
S102C (S102J) <sup>(2)</sup>	1 to 150K	300	0.6 W	0.3 W up to 100K	0.6	W: 0.105±0.010 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	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	0.005%/50 Ω 0.01%/25 Ω 0.02%/12 Ω 0.05%/5 Ω 0.1%/2 Ω 0.50%/1 Ω 1%/0.5 Ω	
S102K (S102L) <sup>(2)</sup>	1 to 100K		0.4 W	0.2 W over 100K		LS: 0.150±0.005	3.81±0.13		
S104D (S104F) <sup>(1)</sup>	1 to 500K	350	1.0 W	0.5 W up to 200K	1.4	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		(0.138) (0.565) (0.413)
S104K	1 to 300K		0.6 W	0.3 W over 200K		LS: 0.400±0.020	10.16±0.51		
S105D (S105F) <sup>(1)</sup>	1 to 750K	350	1.5 W	0.75 W up to 300K	1.9	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		(0.138) (0.890) (0.413) (0.7±0.05)
S105K	1 to 500K		0.8 W	0.4 W over 300K		LS: 0.650±0.020	16.51±0.51		
S106D	0.5 to 1M	500	2.0 W	1.0 W up to 400K	4.0	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		
S106K	0.5 to 600K		1.0 W	0.5 W over 400K		LS: 0.900±0.020	22.86±0.51		

## Note

<sup>(1)</sup> S104F and S105F have different package dimensions (see the third column of dimensions). All other specifications are the same.

<sup>(2)</sup> 0.200 in (5.08 mm) lead spacing available – specify S102J for S102C, and S102L for S102K.

## Standard Imprinting and Dimensions



## Note

<sup>(1)</sup> Standoffs provided to allow proper flushing of flux, debris, and contaminants from under resistor after all solder operations.

<sup>(2)</sup> The standoffs shall be so located as to give a lead clearance of 0.010" minimum between the resistor body and the printed circuit board when the standoffs are seated on the printed circuit board.

Environmental Performance Comparison			
	MIL-PRF-55182 CHAR J	S-SERIES MAXIMUM $\Delta R$	S-SERIES TYPICAL $\Delta R$
<b>Test Group I</b> Thermal shock, 5 x (–65°C to +150°C) Short time overload, 6.25 x rated power	±0.2% ±0.2%	±0.01% (100 ppm) ±0.01% (100 ppm)	±0.002% (20 ppm) ±0.003% (30 ppm)
<b>Test Group II</b> 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% ±0.2%	±6.5 ppm/°C ±0.01% (100 ppm) ±0.01% (100 ppm) ±0.01% (100 ppm)	±2.0 ppm/°C ±0.002% (20 ppm) ±0.002% (20 ppm) ±0.002% (20 ppm)
<b>Test Group III</b> Dielectric Withstanding Voltage (DWV) Resistance to solder heat Moisture resistance	±0.15% ±0.1% ±0.4%	±0.01% (100 ppm) ±0.01% (100 ppm) ±0.05% (500 ppm)	±0.002% (20 ppm) ±0.005% (50 ppm) ±0.01% (100 ppm)
<b>Test Group IV</b> Shock Vibration	±0.2% ±0.2%	±0.01% (100 ppm) ±0.01% (100 ppm)	±0.002% (20 ppm) ±0.002% (20 ppm)
<b>Test Group V</b> Life test at 0.3 W/+125°C 2000 h 10 000 h	±0.5% ±2.0%	±0.015% (150 ppm) ±0.05% (500 ppm)	±0.01% (100 ppm) ±0.03% (300 ppm)

Environmental Performance Comparison			
<b>Test Group Va</b> Life test at 0.6 W (2 x rated power)/+70°C, 2000 h	±0.5%	±0.015% (150 ppm)	±0.01% (100 ppm)
<b>Test Group VI</b> High temperature exposure (2000 h at +175°C)	±2.0%	±0.1% (1000 ppm)	±0.05% (500 ppm)
<b>Test Group VII</b> Voltage coefficient	5 ppm/V	<0.1 ppm/V	<0.1 ppm/V

“S” Series Specifications		
<b>Stability<sup>(1)</sup></b> Load life at 2 000 h Load life at 10 000 h	±0.015% (150 ppm) ±0.005% (50 ppm) ±0.050% (500 ppm) ±0.010% (100 ppm)	Maximum $\Delta R$ at 0.3 W/+125°C Maximum $\Delta R$ at 0.1 W/+70°C Maximum $\Delta R$ at 0.3 W/+125°C Maximum $\Delta R$ at 0.05 W/+125°C
<b>Current Noise</b>	0.010 $\mu V_{RMS}/V$ of applied voltage (–40 dB)	
<b>High Frequency Operation</b> Rise time Inductance (L) <sup>(2)</sup> Capacitance (C)	1.0 ns at 1 k $\Omega$ 0.1 $\mu H$ maximum; 0.08 $\mu H$ typical 1.0 pF maximum; 0.5 pF typical	
<b>Voltage Coefficient</b>	<0.1 ppm/V <sup>(3)</sup>	
<b>Thermal Electromotive Force (EMF)<sup>(4)</sup></b>	0.1 $\mu V/^{\circ}C$ maximum; 0.05 $\mu V/^{\circ}C$ typical 1 $\mu V/W$ (Model S102C)	

**Note**

<sup>(1)</sup> Load life  $\Delta R$  maximum can be reduced by 80%, please contact applications engineering department.

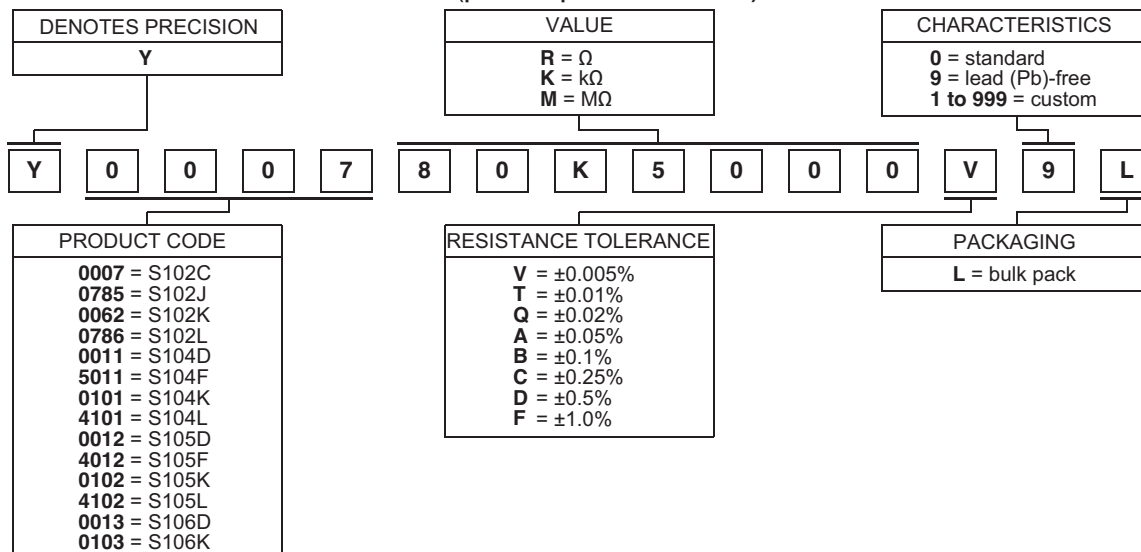
<sup>(2)</sup> Inductance (L) due mainly to the leads.

<sup>(3)</sup> The resolution limit of existing test equipment (within the measurement capability of the equipment, or “essentially zero”).

<sup>(4)</sup>  $\mu V/^{\circ}C$  relates to EMF due to lead temperature difference and  $\mu V/watt$  due to power applied to the resistor.

Global Part Number Information<sup>(1)</sup>

NEW GLOBAL PART NUMBER: Y000780K5000V9L (preferred part number format)



FOR EXAMPLE: ABOVE GLOBAL ORDER Y0007 80K5000 V 9 L:

TYPE: S102C

VALUE: 80.5 kΩ

ABSOLUTE TOLERANCE: ±0.005%

TERMINATION: lead (Pb)-free

PACKAGING: bulk pack

HISTORICAL PART NUMBER: S102C T 80K500 V B (will continue to be used)

S102C	T	80K500	V	B
MODEL	TERMINATION	RESISTANCE VALUE	TOLERANCE	PACKAGING
S102C S102J S102K S102L S104D S104F S104K S104L S105D S105F S105K S105L S106D S106K	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

<sup>(1)</sup> For non-standard requests, please contact application engineering.