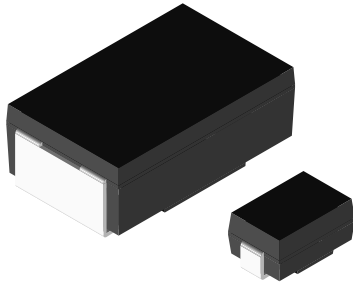




# Metal Film Resistors, High Precision, High Stability, Surface Mount



### FEATURES

- Extremely low temperature coefficient of resistance
- Molded encapsulation
- Wraparound compliant terminations eliminate the risk of solder fillet cracking
- Solderable terminations
- Excellent stability at different environmental conditions
- For axial-leaded product, see Vishay Dale's PTF datasheet ([www.vishay.com/doc?31019](http://www.vishay.com/doc?31019))
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



RoHS\* COMPLIANT

### Note

\* Lead (Pb)-containing terminations are not RoHS-compliant. Exemptions may apply.

### STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	SIZE INCH	POWER RATING $P_{85^{\circ}\text{C}}$ W	MAXIMUM WORKING VOLTAGE $V_{DC}$ <sup>(1)</sup>	TEMPERATURE COEFFICIENT $\pm$ ppm/ $^{\circ}\text{C}$	TOLERANCE $\pm$ %	RESISTANCE RANGE $\Omega$	ENCAPSULATION
PSF2012	2012	0.125	200	5, 10, 15, 25	0.01, 0.02, 0.05, 0.1, 0.25, 0.5, 1	15 to 100K	Epoxy
PSF4527	4527	0.25	300	5, 10, 15, 25	0.01, 0.02, 0.05, 0.1, 0.25, 0.5, 1	15 to 500K	Thermoplastic

### Notes

- Marking: Print-marked-model, value, tolerance, TC, date code.
- DSCC has created a drawing to support the need for a precision 2012-sized product. Vishay Dale is listed as a resource on this drawing as follows:.

DSCC DRAWING NUMBER	VISHAY DALE MODEL	POWER RATING $P_{85^{\circ}\text{C}}$ W	RESISTANCE RANGE $\Omega$	TOLERANCE $\pm$ %	TEMPERATURE COEFFICIENT $\pm$ ppm/ $^{\circ}\text{C}$	MAX. WORKING VOLTAGE $V_{DC}$ <sup>(1)</sup>
02001	PSF2012..1	0.125	15 to 100 K	0.01, 0.02, 0.05, 0.1, 0.25, 0.5, 1	5, 10	200

- This drawing can be reviewed at: [www.landandmaritime.dla.mil/Programs/MilSpec/ListDwgs.aspx?DocTYPE=DSCCdwg](http://www.landandmaritime.dla.mil/Programs/MilSpec/ListDwgs.aspx?DocTYPE=DSCCdwg).

<sup>(1)</sup> Continuous working voltage shall be  $\sqrt{P \times R}$  or maximum working voltage, whichever is less.

### TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	PSF2012	PSF4527
Rated dissipation at 85 $^{\circ}\text{C}$	W	0.125	0.25
Limiting element voltage	$V_{\Xi}$	200	300
Insulation voltage (1 min)	$V_{\text{eff}}$		> 500
Thermal resistance	K/W	< 1300	< 520
Insulation resistance	$\Omega$		$\geq 10^{11}$
Category temperature range	$^{\circ}\text{C}$		- 55 to + 150
Failure rate	$10^{-9}/\text{h}$		< 1
Weight/1000 pieces (typical)	g	90	760

### GLOBAL PART NUMBER INFORMATION

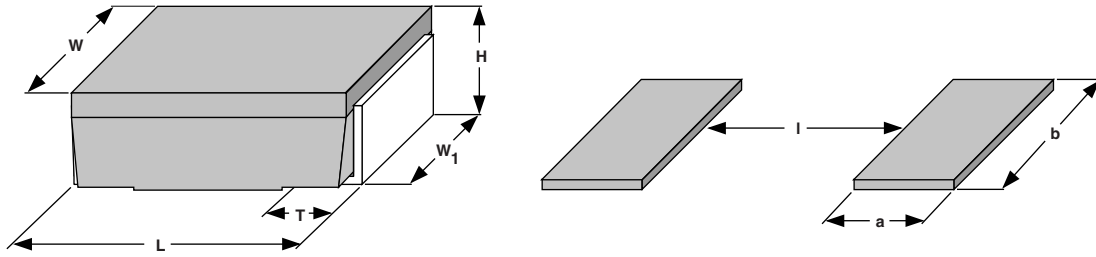
New Global Part Numbering: PSF201220K50BYTA (preferred part number format)



GLOBAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	TEMP. COEFFICIENT	PACKAGING	SPECIAL
PSF2012 PSF4527	R = $\Omega$ K = k $\Omega$ 15R00 = 15 $\Omega$ 1K000 = 1 k $\Omega$ 500K0 = 500 k $\Omega$	T = $\pm$ 0.01 % Q = $\pm$ 0.02 % A = $\pm$ 0.05 % B = $\pm$ 0.1 % C = $\pm$ 0.25 % D = $\pm$ 0.5 % F = $\pm$ 1 %	Z = $\pm$ 5 ppm/ $^{\circ}\text{C}$ Y = $\pm$ 10 ppm/ $^{\circ}\text{C}$ X = $\pm$ 15 ppm/ $^{\circ}\text{C}$ E = $\pm$ 25 ppm/ $^{\circ}\text{C}$ 0 = Special	EK = Lead (Pb)-free, bulk EA = Lead (Pb)-free, T/R BA = Tin/lead, bulk TA = Tin/lead, T/R (full)	Blank = Standard (Dash number) (Up to 2 digits) From 1 to 99 as applicable

### Note

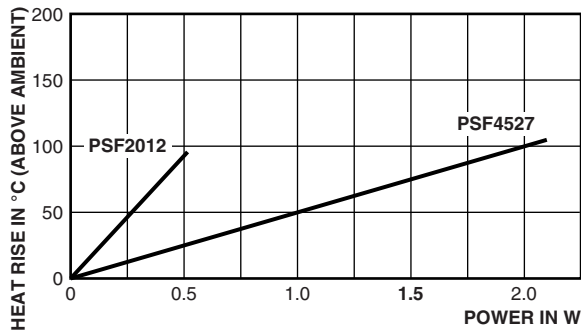
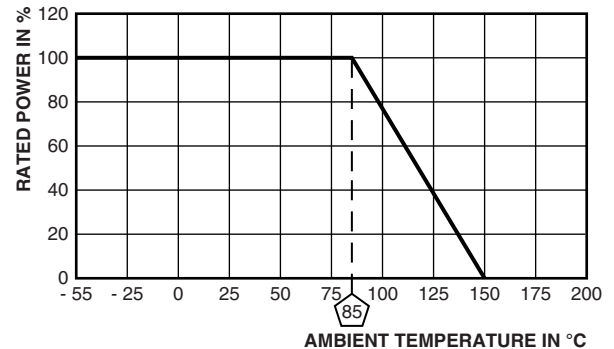
- For additional information on packaging, refer to the Surface Mount Resistor Packaging document ([www.vishay.com/doc?31543](http://www.vishay.com/doc?31543)).

**DIMENSIONS** in inches (millimeters)


MODEL	L	H	T	W	W <sub>1</sub>
PSF2012	0.200 ± 0.020 (5.08 ± 0.508)	0.096 ± 0.015 (2.44 ± 0.381)	0.040 ± 0.010 (1.02 ± 0.254)	0.125 ± 0.005 (3.18 ± 0.127)	0.050 ± 0.005 (1.27 ± 0.127)
PSF4527	0.455 ± 0.020 (11.56 ± 0.508)	0.167 ± 0.010 (4.24 ± 0.254)	0.100 ± 0.010 (2.54 ± 0.254)	0.275 ± 0.005 (6.98 ± 0.127)	0.215 ± 0.005 (5.46 ± 0.127)

**SOLDER PAD DIMENSIONS** in inches (millimeters)

MODEL	A	B	L
PSF2012	0.085 (2.16)	0.070 (1.78)	0.080 (2.03)
PSF4527	0.155 (3.94)	0.230 (5.94)	0.205 (5.21)

**THERMAL RESISTANCE**

**DERATING**

**MATERIAL SPECIFICATIONS**

<b>Element</b>	Precision deposited nickel chrome alloy with controlled annealing
<b>Encapsulation</b>	Molded epoxy on the 2012 and molded thermoplastic on the 4527
<b>Core</b>	Fire-cleaned high purity ceramic
<b>Termination</b>	Standard leadframe material is solder-coated copper on the 2012 and solder-coated bronze on the 4527

**PACKAGING**

MODEL	REEL				
	TAPE WIDTH	DIAMETER	PIECES/REEL	PACKAGING CODE	
				LEAD (Pb)-FREE	LEAD (Pb)-BEARING
PSF2012	12 mm/embossed plastic	330 mm/13"	2000	EA	TA
PSF4527	24 mm/embossed plastic	330 mm/13"	1200	EA	TA

**Note**

- Embossed carrier tape per EIA-481.



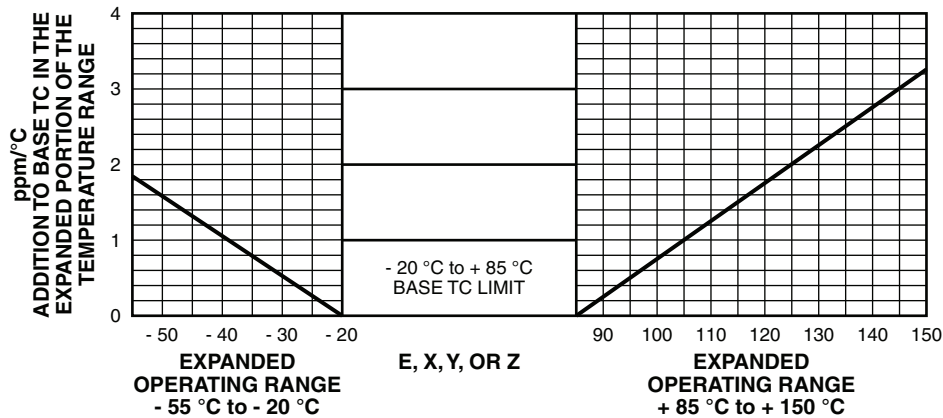
**TEMPERATURE COEFFICIENT OF RESISTANCE**

Temperature coefficient (TC) of resistance is normally stated as the maximum amount of resistance change from the original + 25 °C value as the ambient temperature increases or decreases. This is most commonly expressed in parts per million per degree centigrade (ppm/°C).

The resistance curve over the operating temperature range is usually a non-linear curve within predictable maximum limits. PSF resistors have a very uniform resistance temperature characteristic when measured over the operating range of - 20 °C to + 85 °C. The standard temperature coefficients available are

$$E = \pm 25 \text{ ppm/}^\circ\text{C}, X = \pm 15 \text{ ppm/}^\circ\text{C}, Y = \pm 10 \text{ ppm/}^\circ\text{C}, \text{ and } Z = \pm 5 \text{ ppm/}^\circ\text{C}.$$

Some applications of the PSF require operation beyond the specifications of - 20 °C to + 85 °C. The change in temperature coefficient of resistance is very small (less than  $\pm 0.05 \text{ ppm/}^\circ\text{C}$ ) over the expanded temperature range of - 55 °C to + 150 °C. Therefore, when operating outside the range of - 20 °C to + 85 °C, the designer can plan for a worst case addition of  $\pm 0.05 \text{ ppm/}^\circ\text{C}$  for each degree centigrade beyond either - 20 °C or + 85 °C as indicated in the graph. This applies to all four temperature coefficient codes.



**Example:**

Assume the operating characteristics demand a temperature range from - 55 °C to + 125 °C. This requires a  $\pm 35 \text{ }^\circ\text{C}$   $\Delta$  below - 20 °C and a  $\pm 40 \text{ }^\circ\text{C}$   $\Delta$  above + 85 °C. The extreme  $\Delta$  being  $\pm 40 \text{ }^\circ\text{C}$  means that the worst case addition to the specified TC limit of  $\pm 0.05 \text{ ppm/}^\circ\text{C}$  times  $\pm 40 \text{ }^\circ\text{C}$  or  $\pm 2 \text{ ppm/}^\circ\text{C}$ . Therefore, a Z which is characterized by a base TC limit of  $\pm 5 \text{ ppm/}^\circ\text{C}$  over the temperature range of - 20 °C to + 85 °C will exhibit a maximum temperature coefficient of  $\pm 7 \text{ ppm/}^\circ\text{C}$  over the expanded portion of the temperature range of - 55 °C to 125 °C.

**PERFORMANCE**

TEST	CONDITIONS OF TEST	TEST RESULTS (TYPICAL TEST LOTS)
Life	MIL-STD-202, method 108, 1000 h rated power at + 85 °C	$\leq \pm 0.04 \%$
Short time overload	MIL-PRF-55342, paragraph 4.8.6	$\leq \pm 0.01 \%$
Thermal shock	MIL-STD-202, method 107, - 65 °C to + 150 °C	$\leq \pm 0.02 \%$
Low temperature operation	MIL-PRF-55342, paragraph 4.8.5	$\leq \pm 0.02 \%$
Resistance to bonding exposure	MIL-STD-202, method 210	$\leq \pm 0.02 \%$
Moisture resistance	MIL-PRF-55342, paragraph 4.8.9	$\leq \pm 0.08 \%$
Solder mounting integrity	MIL-PRF-55342, paragraph 4.8.13, 3 kg for 30 s	No evidence of mechanical damage
Dielectric withstanding voltage	MIL-STD-202, methods 301 and 105	$\leq \pm 0.01 \%$
Solderability	MIL-STD-202, method 208	95 % coverage



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