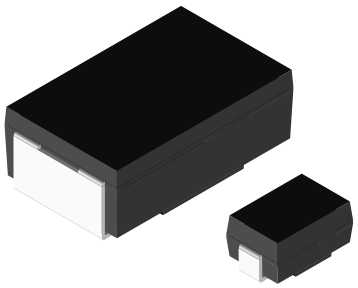
Metal Film Resistors, High Precision, High Stability, Surface Mount



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
- Compliant to RoHS directive 2002/95/EC

Pb-free Available

e3

RoHS* COMPLIANT

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	SIZE INCH	POWER RATING $P_{85\,°C}$ W	MAXIMUM WORKING VOLTAGE (1) V_{DC}	TEMPERATURE COEFFICIENT ± ppm/°C	TOLERANCE ± %	RESISTANCE RANGE Ω	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 $P_{85\,°C}$ W	RESISTANCE RANGE Ω	TOLERANCE ± %	TEMPERATURE COEFFICIENT ± ppm/°C	MAX. WORKING VOLTAGE (1) V_{DC}
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.dscc.dla.mil/Programs/MilSpec/listDwgs.asp?DocType=DSCCdwg.

(1) 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 °C	W	0.125	0.25
Limiting element voltage	V≅	200	300
Insulation voltage (1 min)	V_{eff}	> 500	
Thermal resistance	K/W	< 1300	< 520
Insulation resistance	Ω	≥ 10^{11}	
Category temperature range	°C	- 55 to + 150	
Failure rate	10^{-9}/h	< 1	
Weight/1000 pieces (typical)	g	90	760

GLOBAL PART NUMBER INFORMATION

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

P	S	F	2	0	1	2	2	0	K	5	0	B	Y	T	A		

GLOBAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	TEMP. COEFFICIENT	PACKAGING	SPECIAL
PSF2012 **PSF4527**	R = Ω K = kΩ **15R00** = 15 Ω **1K000** = 1 kΩ **500K0** = 500 kΩ	**T** = ± 0.01 % **Q** = ± 0.02 % **A** = ± 0.05 % **B** = ± 0.1 % **C** = ± 0.25 % **D** = ± 0.5 % **F** = ± 1 %	**Z** = ± 5 ppm/°C **Y** = ± 10 ppm/°C **X** = ± 15 ppm/°C **E** = ± 25 ppm/°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

* Pb containing terminations are not RoHS compliant, exemptions may apply

For technical questions, contact: ff2aresistors@vishay.com

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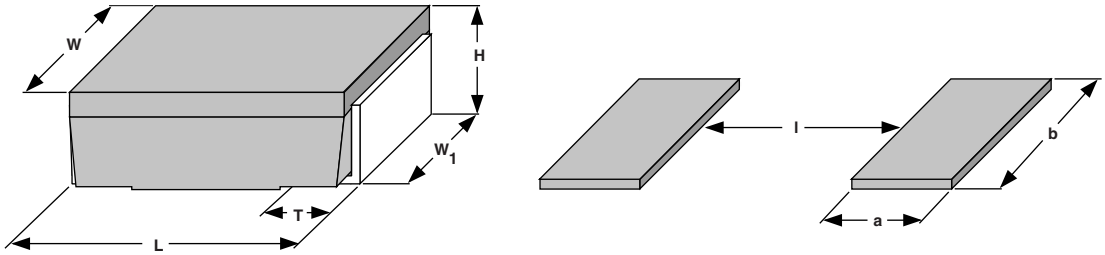
DIMENSIONS in inches (millimeters)

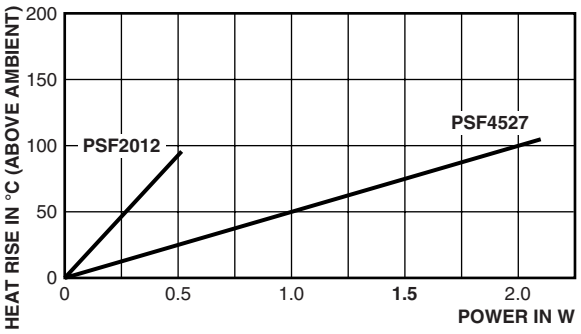


MODEL	L	H	T	W	W_1
PSF2012	0.200 ± 0.020 (5.08 ± 0.508)	0.096 ± 0.015 (2.44 ± 0.381)	0.040 ± 0.010 (1.02 ± 0.254)	0.125 ± 0.005 (3.18 ± 0.127)	0.050 ± 0.005 (1.27 ± 0.127)
PSF4527	0.455 ± 0.020 (11.56 ± 0.508)	0.167 ± 0.010 (4.24 ± 0.254)	0.100 ± 0.010 (2.54 ± 0.254)	0.275 ± 0.005 (6.98 ± 0.127)	0.215 ± 0.005 (5.46 ± 0.127)

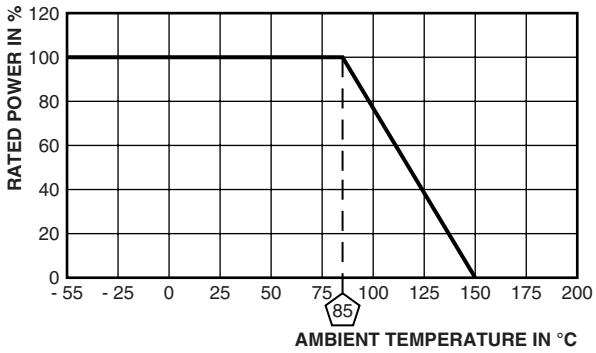
SOLDER PAD DIMENSIONS in inches (millimeters)

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

Element	Precision deposited nickel chrome alloy with controlled annealing
Encapsulation	Molded epoxy on the 2012 and molded thermoplastic on the 4527
Core	Fire-cleaned high purity ceramic
Termination	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.

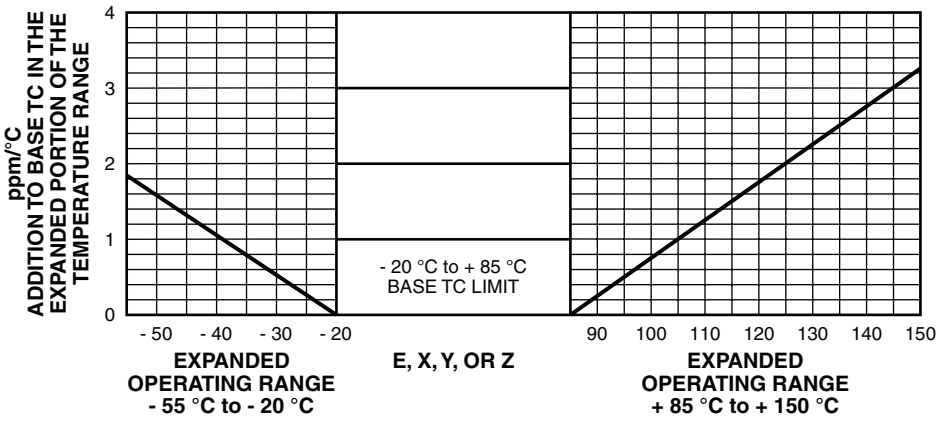
TEMPERATURE COEFFICIENT OF RESISTANCE

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 = ± 25 ppm/°C, X = ± 15 ppm/°C, Y = ± 10 ppm/°C, and Z = ± 5 ppm/°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 ± 0.05 ppm/°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 ± 0.05 ppm/°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 ± 35 °C Δ below - 20 °C and a ± 40 °C Δ above + 85 °C. The extreme Δ being ± 40 °C means that the worst case addition to the specified TC limit of ± 0.05 ppm/°C times ± 40 °C or ± 2 ppm/°C. Therefore, a Z which is characterized by a base TC limit of ± 5 ppm/°C over the temperature range of - 20 °C to + 85 °C will exhibit a maximum temperature coefficient of ± 7 ppm/°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	≤ ± 0.04 %
Short time overload	MIL-PRF-55342, paragraph 4.8.6	≤ ± 0.01 %
Thermal shock	MIL-STD-202, method 107, - 65 °C to + 150 °C	≤ ± 0.02 %
Low temperature operation	MIL-PRF-55342, paragraph 4.8.5	≤ ± 0.02 %
Resistance to bonding exposure	MIL-STD-202, method 210	≤ ± 0.02 %
Moisture resistance	MIL-PRF-55342, paragraph 4.8.9	≤ ± 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	≤ ± 0.01 %
Solderability	MIL-STD-202, method 208	95 % coverage

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