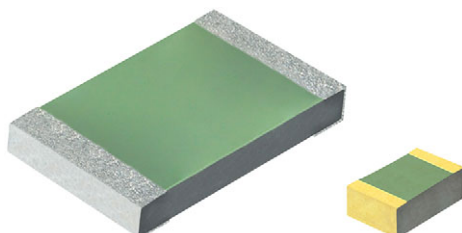


High Power and High Precision Wraparound Thin Film Chip Resistor



LINKS TO ADDITIONAL RESOURCES



FEATURES

- Power rating up to 2 W on standard FR4 for 1206 size
- Wide resistance range: 39 Ω to 600 k Ω
- Tolerance down to ± 0.05 %
- Load life stability: typical 0.03 %
- TCR down to 5 ppm/ $^{\circ}\text{C}$
- Material categorization:
for definitions of compliance please see www.vishay.com/doc?99912


RoHS*
Available

HALOGEN FREE
Available

GREEN
(5-2008)
Available

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

PAL series chip resistors are designed for high power applications with increased dissipation thanks to aluminum nitride substrate. Combined with a resistive thin film layer which can withstand an established temperature as high as 200 $^{\circ}\text{C}$. The restrictions are mainly due to the robustness of terminations and solder joints. PAL series is recommended for customers who need to switch to lower devices, with the same power limits.

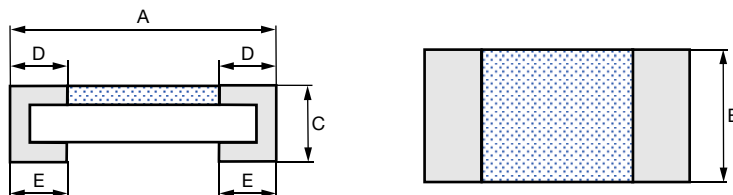
STANDARD ELECTRICAL SPECIFICATIONS						
MODEL	SIZE	RESISTANCE RANGE Ω	RATED POWER $P_R^{(1)}$ W	LIMITING ELEMENT VOLTAGE V	TOLERANCE $\pm$ %	TEMPERATURE COEFFICIENT $\pm$ ppm/ $^{\circ}\text{C}$
PAL0402	0402	39 to < 80	0.5	50	0.1, 0.5, 1	25, 50
		80 to 50K	0.5	50	0.05, 0.1, 0.5, 1	5, 10, 25, 50
PAL0603	0603	39 to < 60	0.7	75	0.1, 0.5, 1	25, 50
		60 to 108K	0.7	75	0.05, 0.1, 0.5, 1	5, 10, 25, 50
PAL0805	0805	39 to < 60	1.0	150	0.1, 0.5, 1	25, 50
		60 to 240K	1.0	150	0.05, 0.1, 0.5, 1	5, 10, 25, 50
PAL1206	1206	39 to < 60	2.0	200	0.1, 0.5, 1	25, 50
		60 to 600K	2.0	200	0.05, 0.1, 0.5, 1	5, 10, 25, 50

Note

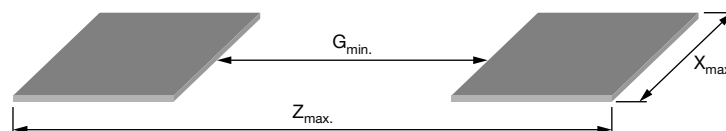
(1) FR4 PCB at ambient +70 $^{\circ}\text{C}$, one sided copper 70 μm thick

MECHANICAL SPECIFICATIONS	
Substrate	Aluminum nitride
Technology	Thin film
Film	Nickel chromium-based alloy with mineral passivation
Protection	Epoxy + silicone
Terminations	N type: tin silver over nickel barrier G type: gold over nickel barrier

CLIMATIC SPECIFICATIONS	
Operating temperature range	-55 $^{\circ}\text{C}$ to +155 $^{\circ}\text{C}$

DIMENSIONS in millimeters (inches)


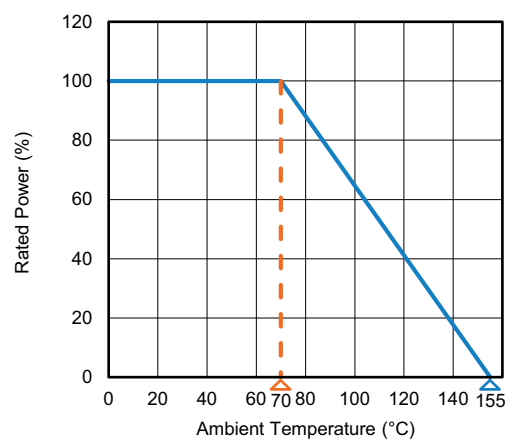
CASE SIZE	A	B	C	D		E	
	TOL. $\pm 0.150 (\pm 0.006)$	TOL. $\pm 0.130 (\pm 0.005)$	TOL. $\pm 0.130 (\pm 0.005)$	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
	NOMINAL	NOMINAL	NOMINAL				
0402	1.000 (0.039)	0.600 (0.024)	0.500 (0.020)	0.100 (0.004)	0.350 (0.014)	0.150 (0.006)	0.350 (0.014)
0603	1.520 (0.060)	0.850 (0.033)		0.250 (0.010)	0.510 (0.020)	0.250 (0.010)	0.510 (0.020)
0805	1.910 (0.075)	1.270 (0.050)		0.250 (0.010)	0.510 (0.020)	0.250 (0.010)	0.510 (0.020)
1206	3.060 (0.120)	1.600 (0.063)		0.270 (0.011)	0.530 (0.021)	0.270 (0.011)	0.530 (0.021)

SUGGESTED LAND PATTERN (to IPC-7351A)


CHIP SIZE	DIMENSIONS in millimeter (inches)		
	Z _{max.}	G _{min.}	X _{max.}
0402	1.55 (0.061)	0.15 (0.006)	0.73 (0.029)
0603	2.37 (0.093)	0.35 (0.014)	0.98 (0.039)
0805	2.76 (0.109)	0.74 (0.029)	1.40 (0.055)
1206	3.91 (0.154)	1.85 (0.073)	1.73 (0.068)

TEMPERATURE COEFFICIENT

TCR (ppm/°C)	CODE (TEMPERATURE RANGE)
± 5	Z (0 °C to +70 °C)
± 10	Y (-55 °C to +155 °C)
± 25	E (-55 °C to +155 °C)
± 50	H (-55 °C to +155 °C)

POWER DERATING CURVES

Note

- FR4 PCB with one side 70 μ m thick copper, width 0.52 cm for 0402, 0.60 cm for 0603, 0.95 cm for 0805, and 1.50 cm for 1206 SnAgCu solder paste

**POPULAR OPTIONS**

For any option it is recommended to consult Vishay Sfernice for availability first.

Option: MarkingOption to order 0013:

Marking of ohmic value and tolerance:

0805 size: 3 digits marking (according to EIA-96)

1206 size: 4 digits marking (same codification than in the ordering procedure)

Tolerance indicated by a color dot.

No standard marking available for smaller sizes.

A price adder will apply to the unit price of the parts for options 0013 and 0014.

Option to order 0014:

Marking of ohmic value:

0805 size: 3 digits marking (according to EIA-96)

1206 size: 4 digits marking (same codification than in the ordering procedure)

PERFORMANCES			
TESTS	CONDITIONS	GLOBAL PERFORMANCES	TYPICAL VISHAY PERFORMANCES
Short-term overload	IEC 60115-1 / IEC 6115-8 $2.5 U_R / 2 \text{ s}$ limited to $2 U_{\max}$	$\pm (0.5 \% R + 0.05 \Omega)$	$\pm (0.05 \% R + 0.05 \Omega)$
Load life	IEC 60115-1 / IEC 60115-8 2000 h, 90 / 30 P_R at 70 °C	$\pm (0.5 \% R + 0.05 \Omega)$	$\pm (0.03 \% R + 0.05 \Omega)$
High temperature exposure	IEC 60115-1 / IEC 60115-8 1000 h, +155 °C, unpowered	$\pm (0.5 \% R + 0.05 \Omega)$	$\pm (0.03 \% R + 0.05 \Omega)$
Rapid change of temperature	IEC 60115-1 / IEC 60115-8 -55 °C / +155 °C 100 cycles, 30 min LCT, 30 min UCT	$\pm (0.5 \% R + 0.05 \Omega)$	$\pm (0.05 \% R + 0.05 \Omega)$
Damp heat, steady state	IEC 60115-1 / IEC 60115-8 (40 ± 2) °C; 56 days; (93 ± 3) % RH	$\pm (0.1 \% R + 0.05 \Omega)$	$\pm (0.04 \% R + 0.05 \Omega)$
Shear test (adhesion)	IEC 60115-1 / IEC 60115-8 0402 to 0603 ≥ 3 N to 5 N 0805 to 1206 ≥ 9 N to 25 N	No visible damage	No visible damage

ASSEMBLY SPECIFICATION			
For the assembly on board, we recommend the lead (Pb)-free thermal profile as per J-STD-020C			
TESTS	CONDITIONS	GLOBAL PERFORMANCES	TYPICAL VISHAY PERFORMANCES
Resistance to soldering heat	IEC 60115-1 / IEC 60068-2-58 solder bath method: 260 °C / 10 s	$\pm (0.1 \% R + 0.05 \Omega)$	$\pm (0.01 \% R + 0.05 \Omega)$
Board flex (substrate bending)	IEC 60115-1 / IEC 60115-8 depth: 2 mm, 3 times	$\pm (0.1 \% R + 0.05 \Omega)$	$\pm (0.003 \% R + 0.05 \Omega)$

GLOBAL PART NUMBER INFORMATION

Global Part Numbering: PAL1206Y1003BGTB99

P	A	L	1	2	0	6	Y	1	0	0	3	B	G	T	D	9	9
GLOBAL MODEL	SIZE	TCR	VALUE	TOLERANCE	TERMINATION	PACKAGING	OPTION										
PAL	0402 0603 0805 1206	Z = ± 5 ppm (0 °C; +70 °C) Y = ± 10 ppm/°C E = ± 25 ppm/°C H = ± 50 ppm/°C	The first three digits are significant figures and the last digit specifies the number of zeros to follow, R designates decimal point Examples: 1000 = 100 Ω 3901 = 3900 Ω 1004 = 1 M Ω	W = ± 0.05 % B = ± 0.1 % D = ± 0.5 % F = ± 1 %	N = tin silver over nickel barrier G = gold over nickel barrier	For more information see "Codification of Packaging" table.	For more information see "Codification of options on two digits" table. Leave blank if no option.										

Note

- Examples with options:
PAL1206Y1003BGTB13
PAL1206Y1003BGTB14

Several options are already available.

However, for any specific requirements, please consult Vishay Sfernice for feasibility

CODIFICATION OF OPTIONS ON TWO DIGITS

OPTION	OPTION 2 DIGITS
..	..
0099	99
0100	0A
0101	0B
0102	0C
0103	0D
0104	0E
0105	0F

CODIFICATION OF PACKAGING

WAFFLE PACK	
W	100 min., 1 mult.
PLASTIC TAPE	
T	100 min., 100 mult., up to full tape
TD	1000 min., 1000 mult., delivered in reels of 1000 pcs
TF	Full tape (depending on size of chip: 5000 pcs 0402 / 0603; 4000 pcs 0805 / 1206)

PACKAGING

SIZE	MOQ	NUMBER OF PIECES PER PACKAGE			TAPE WIDTH	TAPE PITCH	PACKAGING DIMENSIONS
		WAFFLE PACK 2" × 2"	TAPE AND REEL				
			MIN.	MAX.			
0402	100	340	100	5000	8 mm	4 mm	Ø 180 mm / 7"
0603		100					
0805							
1206							



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