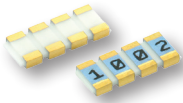




Vishay Intertechnology, Inc.

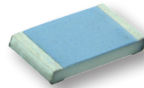
THIN FILM RESISTORS

PRAHT



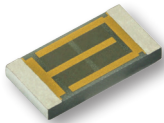
High-Temperature Surface-Mount Networks (up to 230 °C)

P



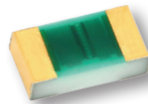
High-Precision, High-Stability Surface-Mount Resistors

PCAN



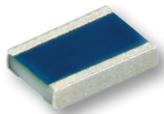
Precision High-Power Chip Resistor, up to 6 W, Aluminum Nitride Substrate

PATT



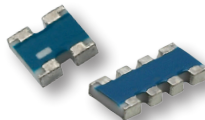
Automotive, Moisture Resistant Chip Resistor, Temperature up to 250 °C

MCW 0406 AT



Rated Dissipation P_{85} up to 300 mW

ACAS 0606 AT ACAS 0612 AT



TCR Tracking and Tolerance Matching of Two Different Resistor Values




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THIN FILM RESISTORS

Focus Products

Thin Film Resistors									
Model	Type	Sizes	Resistance Range	Power Rating at 70 °C	Maximum Voltage	Tolerance	Temp. Coefficient	Load Life Stability (1000 h at 70 °C at P_{70})	Operating Temp. Range
 MC AT Professional	Wraparound	0402 to 1206	1 Ω to 1 M Ω	0.1 W to 0.4 W	50 V up to 200 V	$\pm 0.5\%$; $\pm 1\%$	± 25 ppm/K; ± 50 ppm/K	$\Delta R/R$ max.: $\leq 0.15\%$	-55 °C to 175 °C
	Operating temperature up to 175 °C for 1000 h; AEC-Q200 qualified; approved to EN 140401-801								
 MCW 0406 AT Professional	Wraparound	0406	1 Ω to 100 k Ω	0.3 W	50 V	$\pm 0.5\%$; $\pm 1\%$	± 25 ppm/K; ± 50 ppm/K	$\Delta R/R$ max.: $\leq 0.15\%$	-55 °C to 175 °C
	Rated dissipation P_{85} up to 300 mW; AEC-Q200 qualified								
 MC Professional	Wraparound	0402 to 1206	1 Ω to 10 M Ω	0.1 W to 0.4 W	50 V up to 200 V	$\pm 0.5\%$; $\pm 1\%$	± 25 ppm/K; ± 50 ppm/K	$\Delta R/R$ max.: $\leq 0.25\%$	-55 °C to 155 °C
	Excellent overall stability: class 0.5; approved to EN 140401-801								

Networks									
Model	Type	Sizes	Resistance Range	Power Rating at 70 °C	Maximum Voltage	Absolute Tolerance	Tolerance Ratio	Load Life Stability (1000 h at 70 °C at P_{70})	Operating Temp. Range
 ACAS 0612 Professional	Wraparound	0612	47 Ω to 221 k Ω	0.3 W	75 V	$\pm 0.5\%$; $\pm 1\%$	± 25 ppm/K; ± 50 ppm/K	$\Delta R/R$ max.: $\leq 0.25\%$	-55 °C to 125 °C
	Two pairs of four equal resistor values								

Precision Thin Film Resistor Networks									
Series	Type	Schematic	Resistance Range	Power Rating	Maximum Voltage	Tolerance	TCR	Load Life	Operating Temp.
 MPM	SOT-23	Divider	250 Ω to 100 k Ω (per resistor)	200 mW (package)	100 V	Abs. 0.1 %, ratio 0.01 %	Abs. 25 ppm/°C / trac. 2 ppm/°C	0.015 % ratio, 2000 h at 70 °C	-55 °C to +125 °C
	SOT-23 resistor divider network								
 ORN	8 pin SOIC	Isolated / divider / custom	33 Ω to 500 k Ω (per resistor)	400 mW (package)	100 V	Abs. 0.1 %, ratio 0.01 %	Abs. 25 ppm/°C / trac. 5 ppm/°C	0.015 % ratio, 2000 h at 70 °C	-55 °C to +125 °C
	8 pin 50 mil pitch SOIC resistor network								
 NOMC	14,16 pin SOIC	Isolated / bussed / custom	1 k Ω to 100 k Ω (per resistor)	500 mW (package)	100 V	Abs. 0.1 %, ratio 0.05 %	Abs. 25 ppm/°C / trac. 5 ppm/°C	0.015 % ratio, 2000 h at 70 °C	-55 °C to +125 °C
	14 & 16 pin 50 mil pitch SOIC resistor network								
 DFN	8 pin DFN	Isolated / divider / custom	100 Ω to 100 k Ω (per resistor)	400 mW (package)	100 V	Abs. 0.1 %, ratio 0.05 %	Abs. 25 ppm/°C / trac. 3 ppm/°C	0.015 % ratio, 2000 h at 70 °C	-55 °C to +125 °C
	Compact 8 pin DFN style resistor network								
 ACAS 0606 AT	Wraparound	0606	47 Ω to 150 k Ω	0.2 W	75 V	Abs. $\pm 0.1\%$, ratio $\pm 0.05\%$	($\pm 25 / \pm 15 / \pm 10$) ppm/K (abs.) ($\pm 15 / \pm 10 / \pm 5$) ppm/K (trac.)	$\Delta R/R$ max.: $\leq 0.1\%$ (abs.) $\Delta R/R$ max.: $\leq 0.05\%$ (ratio) (1000 h at 70 °C at P_{70})	-55 °C to 155 °C
	TCR tracking and tolerance matching of two different resistor values								
 ACAS 0612 AT	Wraparound	0612	47 Ω to 150 k Ω	0.4 W	75 V	Abs. $\pm 0.1\%$, ratio $\pm 0.05\%$	($\pm 25 / \pm 15 / \pm 10$) ppm/K (abs.) ($\pm 15 / \pm 10 / \pm 5$) ppm/K (trac.)	$\Delta R/R$ max.: $\leq 0.1\%$ (abs.) $\Delta R/R$ max.: $\leq 0.05\%$ (ratio) (1000 h at 70 °C at P_{70})	-55 °C to 155 °C
	TCR tracking and tolerance matching up to four different resistor values								
 PRA	Wraparound network	072, 074, 100, 135, 182	2 Ω to 2 M Ω	30 mW to 200 mW (per resistor) at 70 °C	20 V to 150 V	Abs. 0.1 % to 0.5 %, ratio 0.01 %	Abs. 10 ppm/°C / trac. 2 ppm/°C	$\Delta R/R$ max.: $< 0.1\%$ $\Delta R/R$ max.: $< 0.02\%$ (matched)	-55 °C to +155 °C
	Two to eight resistors, unequal values available								
 PRA HT	Wraparound	100, 135, 182	2 Ω to 2 M Ω	100 mW to 200 mW at 70 °C (per resistor)	150 V	Abs. 0.1 % to 1 %, ratio 0.05 %	Abs. 15 ppm/°C / trac. 2 ppm/°C	$\Delta R/R$ max.: $< 0.5\%$ $\Delta R/R$ max.: $< 0.25\%$ (matched)	-55 °C to +215 °C
	Ratio stability								

THIN FILM RESISTORS

Focus Products

Precision Thin Film Chip Resistors									
Series	Type	Sizes	Resistance Range	Power Rating	Maximum Voltage	Tolerance	TCR	Load Life	Operating Temp.
PCAN	Wraparound	1206 / 2512	30 Ω to 175 Ω	2 W to 6 W	200 V	0.1 % to 5 %	25 ppm/°C to 100 ppm/°C	1 % at 1000 h, 70 °C	-55 °C to 155 °C
	Power rating up to 6 W; aluminum nitride substrate for high thermal conductivity								
PATT	Wraparound	0402 / 0603 / 0805 / 1206	1 Ω to 1 MΩ	50 mW to 400 mW	200 V	0.1 % to 1 %	25 ppm/°C to 200 ppm/°C	0.2 % at 1000 h, 155 °C	-55 °C to 250 °C
	AEC-Q200 qualified, moisture resistant tantalum nitride resistive film with operating temperature up to 250 °C								
PLT	Wraparound	0603 / 0805 / 1206	250 Ω to 775 kΩ	150 mW to 400 mW	200 V	0.01 % to 0.1 %	5 ppm/°C	0.01 % at 2000 h, 70 °C	-55 °C to 125 °C
	Precision low TCR of 5 ppm/°C with extreme tight tolerance of ± 0.01 %								
PAT	Wraparound	0402 to 2512	10 Ω to 3 MΩ	50 mW to 1 W	200 V	0.1 % to 1 %	25 ppm/°C to 100 ppm/°C	0.05 % at 2000 h, 70 °C	-55 °C to 155 °C
	AEC-Q200 qualified, precision moisture resistant tantalum nitride thin film chip resistor								
FC	Wraparound / flip chip	0402 to 1206	10 Ω to 1 kΩ	50 mW to 330 mW	75 V	0.1 % to 5 %	25 ppm/°C to 100 ppm/°C	0.02 % at 2000 h, 70 °C	-55 °C to 155 °C
	Precision high frequency thin film chip resistor up to 20 GHz frequency performance								
PNM	Wraparound	0402 to 2512	10 Ω to 3 MΩ	50 mW to 1 W	200 V	0.1 % to 1 %	25 ppm/°C to 100 ppm/°C	0.03 % at 2000 h, 70 °C	-55 °C to 155 °C
	Precision non-magnetic thin film chip resistor								
PTN	Wraparound	0402 to 2512	10 Ω to 3 MΩ	50 mW to 2 W	200 V	0.05 % to 1 %	10 ppm/°C to 100 ppm/°C	0.05 % at 2000 h, 70 °C	-55 °C to 155 °C
	Precision moisture resistant tantalum nitride chip resistor								
TNPW e3	Wraparound	0402 to 1210	10 Ω to 3.01 MΩ	0.063 W to 0.33 W	50 V up to 200 V	± 0.1 %	± 10 ppm/K; ± 15 ppm/K; ± 25 ppm/K	ΔR/R max.: ≤ 0.05 % (1000 h at 70 °C at P ₇₀)	-55 °C to 125 °C
	Excellent stability ≤ 0.05 % (1000 h rated power at 70 °C); AEC-Q200 qualified (sizes 0402 to 1206); sulfur resistant								
TNPU	Wraparound	0603 to 1206	100 Ω to 511 kΩ	0.1 W to 0.25 W	75 V up to 200 V	± 0.02 %; ± 0.05 %; ± 0.1 %	± 5 ppm/K; ± 10 ppm/K	ΔR/R max.: ≤ 0.05 % (1000 h at 70 °C at P ₇₀)	-55 °C to 125 °C
	Low temperature coefficient and tight tolerances (± 0.02 %; ± 5 ppm/K); AEC-Q200 qualified; sulfur resistant								
MC AT Precision	Wraparound	0402 to 1206	47 Ω to 1 MΩ	0.1 W to 0.4 W	50 V up to 200 V	± 0.1 %	± 10 ppm/K; ± 15 ppm/K; ± 25 ppm/K	ΔR/R max.: ≤ 0.1 % (1000 h at 70 °C at P ₇₀)	-55 °C to 155 °C
	Approved to EN 140401-801; AEC-Q200 qualified; sulfur resistant								
MCW 0406 AT Precision	Wraparound	0406	1 Ω to 100 kΩ	0.25 W	50 V	± 0.1 %	± 15 ppm/K; ± 25 ppm/K	ΔR/R max.: ≤ 0.1 % (1000 h at 70 °C at P ₇₀)	-55 °C to 155 °C
	Rated dissipation P ₇₀ up to 250 mW; AEC-Q200 qualified (pending)								
MC Precision	Wraparound	0402 to 1206	100 Ω to 2 MΩ	0.063 W to 0.25 W	50 V up to 200 V	± 0.1 %; ± 0.25 %	± 10 ppm/K; ± 15 ppm/K; ± 25 ppm/K	ΔR/R max.: ≤ 0.1 % (1000 h at 70 °C at P ₇₀)	-55 °C to 125 °C
	Superior overall stability: class 0.1 and 0.25; approved to EN 140401-801								
Model	Type	Sizes	Resistance Range	Power Rating at 70 °C	Maximum Voltage	Tolerance	Temp. Coefficient	Load Life Stability (2000 h at 70 °C at Pn)	Operating Temp. Range
RMKHT	Bare chip	20 mm x 20 mm to 213 mm x 102 mm	10 Ω to 7.5 MΩ	5 mW to 200 mW	n/a	0.05 % to 1 %	25 ppm/°C	0.35 % (at 215 °C)	-55 °C to +215 °C
	High temperature backside metallized option								
CH	Wraparound	02016 / 0402 / 0603	10 Ω to 500 Ω	30 mW to 125 mW	30 V to 50 V	1 % to 10 %	100 ppm/°C	n/a	-55 °C to +155 °C
	Frequency up to 50 GHz (design kits available)								
P	Wraparound	0302 to 2512	10 Ω to 200 MΩ	40 mW to 2 W	25 V to 300 V	0.01 % to 2 %	5 ppm/°C to 100 ppm/°C	0.05 % typical	-55 °C to +155 °C
	High precision								
PFRR	Wraparound	0402 to 2010	100 Ω to 3.01 MΩ	50 mW to 500 mW	50 V to 300 V	0.05 % to 0.1 %	10 ppm/°C and 25 ppm/°C	0.05 % typical	-55 °C to +155 °C
	Hi-Rel components								
PHR	Wraparound	0402 to 2010	50 Ω to 3 MΩ	100 mW to 500 mW	35 V to 150 V	0.01 % to 0.1 %	5 ppm/°C to 25 ppm/°C	0.02 % typical	-55 °C to +155 °C
	ESCC qualified Hi-Rel / high precision components								
PHT	Wraparound	0402 to 2010	10 Ω to 7.5 MΩ	18.9 mW to 200 mW	50 V to 300 V	0.05 % to 1 %	10 ppm/°C to 50 ppm/°C	0.5 % at 215 °C 2000 h at Pn	-55 °C to +215 °C
	High temperature								
PVHT	Wraparound	0402 to 2010	10 Ω to 3 MΩ	31 mW to 200 mW	50 V to 300 V	0.05 % to 1 %	10 ppm/°C to 50 ppm/°C	0.8 % typical after 2000 h at 250 °C / Pn	-55 °C to +250 °C
	Very high temperature								

THIN FILM RESISTORS PROVIDE THE ULTIMATE PERFORMANCE FOR YOUR REQUIREMENTS

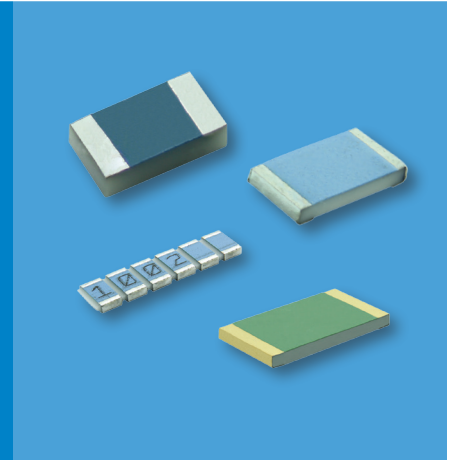


Advantages of Vishay Thin Film Resistors

- Very high temperature products up to 270 °C
- High stability $|\Delta R/R|$ max.: $\leq 0.05\%$
- High precision and low noise
- Sulfur resistant

For the Following Applications

- Exploration - down hole drilling
- Automotive - engine, gear box, brake, battery management
- Smart power - inverter, e-meter, grid control
- Industrial - control and measurement systems
- Avionics - flight control computers



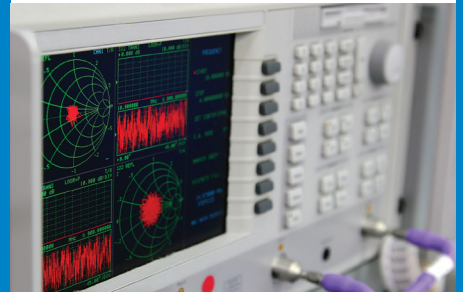
High-temperature resistors and arrays provide high stability in harsh environment such as down hole drilling.



Vishay thin film resistors offer outstanding longtime performance for analog signal conditioning circuits for automotive, industrial, and smart grid power applications.



Precision thin film resistors and networks provide long term stability and enhance accuracy of test and measurement equipment.



Useful Links

- Resistors for down hole applications www.vishay.com/doc?49025
- Vishay Dale thin film overview: Solutions for a wide range of industries www.vishay.com/doc?49188
- SMD resistor selector guide www.vishay.com/doc?49252

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