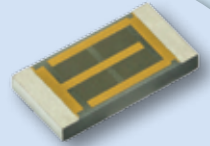


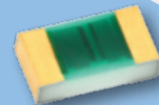


Vishay Intertechnology, Inc.

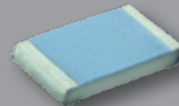
Thin Film Resistors



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



PATT
Automotive, Moisture-Resistant Chip Resistor, Temperature Up to 250 °C



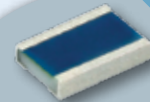
P
High-Precision, High-Stability Surface-Mount Resistors



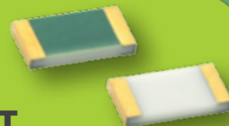
TNPV e3
High-Voltage Precision Thin Film Resistor Up to 1000 V



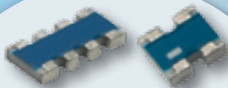
PRAHT
High-Temperature Surface-Mount Networks (Up to 230 °C)



MCW 0406 AT
Rated Dissipation P_{85} Up to 300 mW



PLTT
High-Temperature Precision Thin Film Resistor, Temperatures Up to 215 °C



ACAS 0606 AT
ACAS 0612 AT
TCR Tracking and Tolerance Matching of Two Different Resistor Values



THIN FILM RESISTORS

Focus Products

Thin Film Chip Resistors									
Series	Type	Sizes	Resistance Range	Power Rating	Maximum Voltage	Tolerance	TCR	Load-Life Stability	Operating Temp. Range
 CH	Wraparound / Flip Chip	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)								
 FC	Wraparound / Flip Chip	0402 to 1206	10 Ω to 1 kΩ	50 mW to 330 mW	30 V to 75 V	± 0.1 % to ± 5 %	± 25 ppm/°C to ± 100 ppm/°C	± 0.02 % (2000 h at P ₇₀)	-55 °C to +155 °C
	Precision high-frequency thin film chip resistor up to 20 GHz frequency performance								
 IGBR	Bare chip	0202 to 0808	1 Ω to 25 Ω	2 W to 4 W	75 V	± 5 % to ± 25 %	± 200 ppm/°C to ± 500 ppm/°C	± 1 % (1000 h at 200 °C film temperature)	-55 °C to +125 °C
	High-power wirebondable thin film resistor								
 MC Precision Professional	Wraparound	0402 to 1206	1 Ω to 2 MΩ	0.063 W to 0.4 W	50 V to 200 V	± 0.1 % to ± 1 %	± 10 ppm/K; ± 15 ppm/K; ± 25 ppm/K; ± 50 ppm/K	down to ≤ ± 0.1 % (1000 h at P ₇₀)	-55 °C to +155 °C
	Superior overall stability: class 0.1, 0.25, and 0.5; approved to EN 140401-801								
 MC AT Precision Professional	Wraparound	0402 to 1206	1 Ω to 1 MΩ	0.1 W to 0.4 W	50 V to 200 V	± 0.1 % to ± 1 %	± 10 ppm/K; ± 15 ppm/K; ± 25 ppm/K; ± 50 ppm/K	down to ≤ ± 0.1 % (1000 h at P ₇₀)	-55 °C to +175 °C
	Approved to EN 140401-801; AEC-Q200-qualified; sulfur-resistant								
 MCW AT Precision Professional	Wraparound	0406, 0612	1 Ω to 100 kΩ	0.25 W to 1 W	50 V to 75 V	± 0.1 % to ± 1 %	± 15 ppm/K; ± 25 ppm/K; ± 50 ppm/K	down to ≤ ± 0.1 % (1000 h at P ₇₀)	-55 °C to +175 °C
	Rated dissipation P ₇₀ up to 1 W; AEC-Q200 qualification pending for 0612 case size								
 P	Wraparound	0302 to 2512	10 Ω to 200 MΩ	40 mW to 2 W	25 V to 300 V	± 0.01 % to ± 5 %	± 5 ppm/°C to ± 100 ppm/°C	± 0.1 % typical (8000 h at P ₇₀)	-55 °C to +155 °C
	High precision								
 PAT	Wraparound	0402 to 2512	2.5 Ω to 3 MΩ	50 mW to 1 W	75 V to 200 V	± 0.1 % to ± 1 %	± 25 ppm/°C to ± 100 ppm/°C	± 0.05 % (2000 h at P ₇₀)	-55 °C to +155 °C
	AEC-Q200-qualified; precision moisture-resistant tantalum nitride thin film chip resistor								
 PATT	Wraparound	0402 to 1206	1 Ω to 1 MΩ	50 mW to 400 mW	75 V to 200 V	± 0.1 % to ± 1 %	± 25 ppm/°C to ± 200 ppm/°C	± 0.2 % (1000 h at P ₁₅₅)	-55 °C to +250 °C
	AEC-Q200-qualified; moisture-resistant tantalum nitride resistive film with operating temperature up to 250 °C								
 PCAN PCNM	Wraparound	0603 to 1206, 2512	2 Ω to 30.1 kΩ	0.5 W to 6 W	75 V to 200 V	± 0.1 % to ± 5 %	± 25 ppm/°C to ± 100 ppm/°C	± 1 % (1000 h at 70 °C)	-55 °C to +155 °C
	Power rating up to 6 W; aluminum nitride substrate for high thermal conductivity; PCNM is non-magnetic version								
 PEFR	Wraparound	0402 to 2010	100 Ω to 6 MΩ	50 mW to 500 mW	30 V to 200 V	± 0.05 % to ± 0.1 %	± 10 ppm/°C to ± 25 ppm/°C	± 0.05 % typical (8000 h at P ₇₀)	-55 °C to +155 °C
	ESCC-qualified Hi-Rel components								
 PHR	Wraparound	0402 to 2010	10 Ω to 6 MΩ	50 mW to 500 mW	30 V to 150 V	± 0.01 % to ± 0.1 %	± 5 ppm/°C to ± 25 ppm/°C	± 0.02 % typical (2000 h at P ₇₀)	-65 °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	± 0.01 % to ± 1 %	± 10 ppm/°C to ± 55 ppm/°C	± 0.35 % (2000 h at P ₂₂₀)	-55 °C to +215 °C
	High temperature								
 PLT	Wraparound	0603 to 1206	250 Ω to 775 kΩ	150 mW to 400 mW	75 V to 200 V	± 0.01 % to ± 0.1 %	± 5 ppm/°C	± 0.02 % (2000 h at P ₇₀)	-55 °C to +125 °C
	Precision low TCR of 5 ppm/°C with extremely tight tolerance of ± 0.01 %								
 PLTT	Wraparound	0603 to 2512	75 Ω to 3 MΩ	0.15 W to 1 W	75 V to 200 V	± 0.02 % to ± 2 %	± 5 ppm/°C	± 0.5 % typical (2000 h at 215 °C) 25 % of P ₇₀	-55 °C to +215 °C
	High-temperature precision thin film resistor								
 PNM	Wraparound	0402 to 2512	10 Ω to 3 MΩ	50 mW to 1 W	75 V to 200 V	± 0.1 % to ± 1 %	± 25 ppm/°C to ± 100 ppm/°C	± 0.03 % typical (1000 h at P ₇₀)	-55 °C to +155 °C
	Precision non-magnetic thin film chip resistor								
 PTN	Wraparound	0402 to 2512	1 Ω to 3 MΩ	50 mW to 2 W	75 V to 200 V	± 0.05 % to ± 1 %	± 10 ppm/°C to ± 100 ppm/°C	± 0.03 % (2000 h at P ₇₀)	-55 °C to +155 °C
	Precision moisture-resistant tantalum nitride chip resistor								



THIN FILM RESISTORS

Focus Products

Thin Film Chip Resistors									
Series	Type	Sizes	Resistance Range	Power Rating	Maximum Voltage	Tolerance	TCR	Load-Life Stability	Operating Temp. Range
PVHT	Wraparound	0402 to 2010	35 Ω to 2.5 MΩ	31 mW to 200 mW	50 V to 300 V	± 0.05 % to ± 1 %	± 5 ppm/°C to ± 55 ppm/°C	± 0.8 % (2000 h at P ₇₀)	-55 °C to +250 °C
	Very high temperature								
BMKHT	Bare chip	20 mm x 20 mm to 213 mm x 102 mm	10 Ω to 7.5 MΩ	5 mW to 200 mW at 215 °C	up to 300 V	± 0.05 % to ± 1 %	± 15 ppm/K; ± 30 ppm/K	± 0.35 % (2000 h at P ₂₂₀)	-55 °C to +230 °C
	High-temperature wirebondable chip resistor								
SEM	Bare chip	0202	1 Ω to 1 MΩ	0.25 W	100 V	± 0.1 % to ± 5 %	± 25 ppm/°C to ± 250 ppm/°C	± 0.25 % (1000 h at P ₇₀)	-55 °C to +150 °C
	Precision wirebondable thin film resistor								
TNPU e3	Wraparound	0603 to 1206	100 Ω to 511 kΩ	0.1 W to 0.25 W	75 V to 200 V	± 0.02 %; ± 0.05 %; ± 0.1 %	± 5 ppm/K; ± 10 ppm/K	ΔR/Rl max.: ≤ 0.05 % (1000 h at P ₇₀)	-55 °C to +125 °C
	Low temperature coefficient and tight tolerances (± 0.02 %; ± 5 ppm/K); AEC-Q200-qualified; sulfur-resistant								
TNPV e3	Wraparound	1206, 1210	121 kΩ to 3.01 MΩ	0.25 W to 0.33 W	700 V, 1000 V	± 0.1 % to ± 1 %	± 10 ppm/K to ± 50 ppm/K	ΔR/Rl max.: ≤ 0.05 % (1000 h at P ₇₀)	-55 °C to +155 °C
	High-temperature precision thin film resistor								
TNPW e3	Wraparound	0402 to 1210	4.7 Ω to 3.01 MΩ	0.1 W to 0.5 W	50 V to 200 V	± 0.1 %	± 10 ppm/K; ± 15 ppm/K; ± 25 ppm/K	ΔR/Rl max.: ≤ 0.05 % (1000 h at P ₇₀)	-55 °C to +155 °C
	Excellent stability ≤ 0.05 % (1000 h rated power at 70 °C); AEC-Q200-qualified (sizes 0402 to 1206); sulfur-resistant								

Precision Thin Film Resistor Networks									
Series	Type	Schematic	Resistance Range	Power Rating	Maximum Voltage	Tolerance	TCR	Load-Life Stability	Operating Temp. Range
ACAS 0606 AT	Wraparound Network	0606	47 Ω to 150 kΩ	0.2 W	75 V	Abs. ± 0.1 %, ratio ± 0.05 %	(± 25 / ± 15 / ± 10) ppm/K (abs.) (± 15 / ± 10 / ± 5) ppm/K (trac.)	ΔR/Rl max.: ≤ 0.05 % (ratio) (1000 h at P ₇₀)	-55 °C to +155 °C
	TCR tracking and tolerance matching of two different resistor values								
ACAS 0612 AT	Wraparound Network	0612	47 Ω to 150 kΩ	0.4 W	75 V	Abs. ± 0.1 %, ratio ± 0.05 %	(± 25 / ± 15 / ± 10) ppm/K (abs.) (± 15 / ± 10 / ± 5) ppm/K (trac.)	ΔR/Rl max.: ≤ 0.05 % (ratio) (1000 h at P ₇₀)	-55 °C to +155 °C
	TCR tracking and tolerance matching up to four different resistor values								
DFN	8-pin DFN	Isolated / divider / custom	100 Ω to 100 kΩ (per resistor)	400 mW (package)	100 V	Abs. ± 0.05 %, ratio ± 0.015 %	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								
MORN	QSOP	Isolated / divider / custom	400 Ω to 100 kΩ (per resistor)	200 mW (package)	50 V	Abs. ± 0.05 %, ratio ± 0.01 %	Abs. ± 25 ppm/°C / trac. ± 1 ppm/°C	± 0.015 % ratio, 2000 h at 70 °C	-55 °C to +125 °C
	Compact 8-pin 25 mil pitch QSOP resistor network								
MPM	SOT-23	Divider	250 Ω to 100 kΩ (per resistor)	200 mW (package)	100 V	Abs. ± 0.05 %, 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								
NOMC	14-16-pin SOIC	Isolated / bussed / custom	1 kΩ to 100 kΩ (per resistor)	500 mW (package)	100 V	Abs. ± 0.1 %, ratio ± 0.025 %	Abs. ± 25 ppm/°C / trac. ± 5 ppm/°C	± 0.015 % ratio, 2000 h at 70 °C	-55 °C to +125 °C
	14- and 16-pin 50 mil pitch SOIC resistor network								
QRN	8-pin SOIC	Isolated / divider / custom	33 Ω to 500 kΩ (per resistor)	400 mW (package)	100 V	Abs. ± 0.05 %, 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								
PBA	Wraparound Network	072, 074, 100, 135, 182	10 Ω to 2 MΩ	30 mW to 200 mW (per resistor) at 70 °C	20 V to 150 V	Abs. ± 0.1 %, ratio ± 0.01 %	Abs. ± 10 ppm/°C / trac. ± 2 ppm/°C	ΔR/Rl max.: ≤ 0.1 % (abs.) ΔR/Rl max.: ≤ 0.02 % (ratio)	-55 °C to +155 °C
	Two to eight resistors; unequal values available								
PBA HT	Wraparound Network	100, 135, 182	10 Ω to 2 MΩ	10 mW to 20 mW at 215 °C (per resistor)	50 V to 150 V	Abs. ± 0.1 %, ratio ± 0.05 %	Abs. ± 10 ppm/°C / trac. ± 2 ppm/°C	ΔR/Rl max.: ≤ 0.5 % (abs.) ΔR/Rl max.: ≤ 0.25 % (ratio) 1000 h at 215 °C	-55 °C to +215 °C
	TCR tracking and ratio stability for high-temperature applications up to 215 °C								

THIN FILM RESISTORS PROVIDE THE ULTIMATE PERFORMANCE FOR YOUR REQUIREMENTS

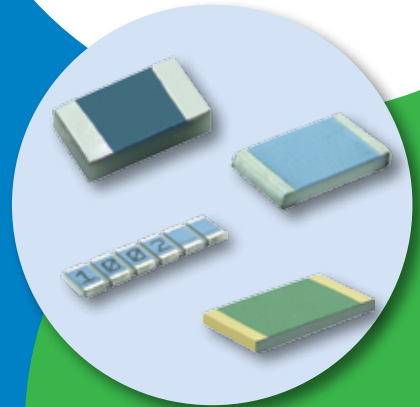


Advantages of Vishay Thin Film Resistors

- Very high temperature products up to 270 °C
- High stability $|\Delta R/R|$ max.: ≤ 0.02 %
- 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

EN9100
certified
manufacturing line

GREEN
(5-2008)

**HALOGEN
FREE**

**Sulfur
resistant**
(per ASTM B809-95
humid vapor test)
(according to
ASTM B 809)

**AEC-Q200
QUALIFIED**

Approved to
EN 140401-801



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