

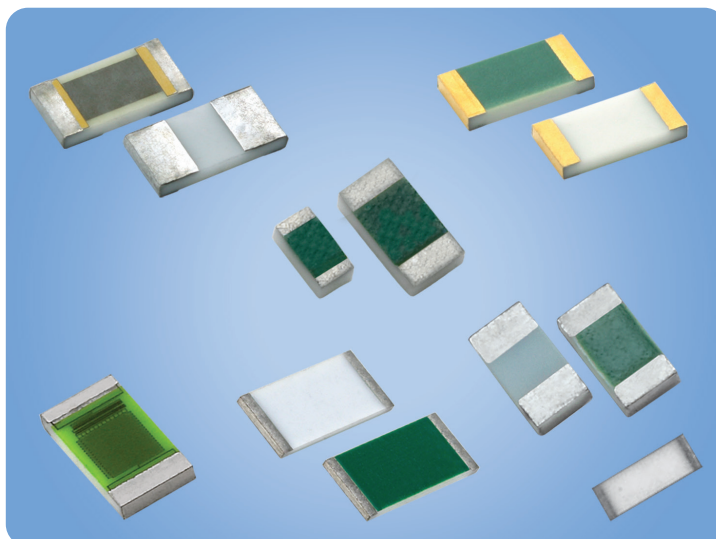


THIN / THICK FILM CHIP RESISTORS

Vishay Dale

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Resistive Solutions for a Wide Range of Industries



INTRODUCTION

Vishay Dale Thin Film chip resistors are manufactured in an ISO 9001 registered facility to ensure the highest quality products. In addition to state of the art manufacturing methods, Vishay employs additional processes to ensure the highest quality and reliability over competitive product offerings. Key features of our resistors include:

- Special Passivation Method (SPM) – The majority of our chip resistor series undergo an SPM coating process. SPM is Vishay’s proprietary coating blend to add an additional protective layer over the resistive film to prevent corrosion
- Moisture-Resistant Tantalum Nitride Film – Our versatile chip resistors are also available with tantalum nitride resistive film. Tantalum nitride is a self-passivating film with superior moisture resistance characteristics, even under extremely humid operating conditions
- Stable Thin Film Performance – Our chip resistors typically show established stable thin film performance over an extended period of time and generally outperform competitive products in reliability characteristics
- Custom Orders – In addition to the standard values, custom values are also available
- Quick Chip – Our Quick Chip program is another resource that can be utilized to expedite standard chip orders

RESOURCES

- For technical questions contact thinfilm@vishay.com
- Vishay Dale Thin Film Brands page: www.vishay.com/company/brands/daletinfilm/
- Vishay Dale Thin Film interactive sample board: www.vishay.com/landingpage/SMD_Board/index.html



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Performance Specifications

	E/H	FC	L-NS	M-	P-NS	PAT
Description	Precision QPL MIL-PRF-55342 Qualified Failure Rate: R, T, S	Precision High Frequency	Industrial Low Value	Industrial Thick Film Chip Resistor	Precision Industrial	Precision Automotive AEC-Q200 Qualified
Resistor Material	Tamelox Resistor Film (Passivated Nichrome)	Passivated Nichrome	Nickel Alloy	Ruthenium	Passivated Nichrome	Tantalum Nitride
Resistance Range	10 Ω to 6.19 MΩ	10 Ω to 1 kΩ	0.03 Ω to 10 Ω	10 Ω to 25 MΩ	10 Ω to 6.19 MΩ	2.5 Ω to 3 MΩ
TCR: Absolute (± ppm/°C)	25 to 300	25 to 100	300 to 500	100 to 300	10 to 100	25 to 100
Tolerance: Absolute (± %)	0.1 to 10	0.1 to 5	1 to 20	1 to 10	0.02 to 5	0.1 to 5
Power Rating (W)	0.05 to 1	0.05 to 0.33	0.125 to 2	0.1 to 2	0.05 to 1	0.05 to 1
Working Voltage Range (V)	40 to 200	30 to 75	$\sqrt{P \times R}$	25 to 200	75 to 200	75 to 200
Noise (dB)	< -25	< -35	< -35	< -35	< -35	< -30
Case Size	M55342/01-12 D55342/07 (07 size only)	0402, 0603, 0805, 1005, 1206	0505, 0603, 0705, 0805, 1005, 1010, 1206, 1505, 2208, 2010, 2512	0402, 0502, 0504, 0505, 0603, 0705, 0805, 1005, 1010, 1206, 1505, 2208, 2010, 2512	0402, 0502, 0505, 0603, 0705, 0805, 1005, 1010, 1206, 1505, 2208, 2010, 2512	0402, 0603, 0805, 1206, 1505, 2208, 2010, 2512
Operating Temperature Range (°C)	-55 to +125	-55 to +125	-55 to +125	-55 to +125	-55 to +125	-55 to +125
Storage Temperature (°C)	-55 to +150	-55 to +155	-55 to +155	-55 to +155	-55 to +155	-55 to +155
Lead (Pb) Term	X	X	X	X	X	
Lead (Pb)-Free Term		X	X	X	X	X
Gold Term		X	X		X	

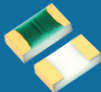
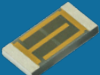
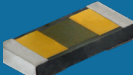
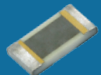
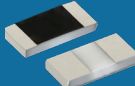


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Performance Specifications

	PATT	PCAN	PCNM	PHP	PHPA
					
Description	Precision High Temperature Automotive AEC-Q200 Qualified Thin Film Chip Resistor	Precision High Power, Aluminum Nitride Substrate (Up to 6 W)	High Power Precision Non-Magnetic	Precision High Power	Precision High Power Automotive AEC-Q200 Qualified
Resistor Material	Tantalum Nitride	Passivated Nichrome	Nichrome	Passivated Nichrome	Tantalum Nitride
Resistance Range	1 Ω to 1 M	2 Ω to 30.1 k Ω	2 Ω to 30.1 k Ω	10 Ω to 30.1 k Ω	10 Ω to 30.1 k Ω
TCR: Absolute (\pm ppm/$^{\circ}$C)	25 to 100	25 to 100	25 to 100	25 to 100	25 to 100
Tolerance: Absolute (\pm %)	0.1 to 5	0.1 to 5	0.1 to 5.0	0.1 to 5	0.1 to 5.0
Power Rating (W)	0.15	0.5 to 6	2.6	0.375 to 2.5	1 to 2.5
Working Voltage Range (V)	75	75 to 200	100	75 to 200	200
Noise (dB)	< -30	< -30 dB	< -30	< -30	< -30
Case Size	0603, 0402, 0805, 1206	0603, 0805, 1206, 2512	1206, 2512	1206, 2512, 0603, 0805	1206, 2512
Operating Temperature Range ($^{\circ}$C)	-55 to +250	-55 to +155	-55 to +155	-55 to +125	-55 to +155
Storage Temperature ($^{\circ}$C)	-55 to +250	-55 to +155	-55 to +155	-55 to +155	-55 to +155
Lead (Pb) Term		X	X	X	
Lead (Pb)-Free Term	X	X	X	X	X
Gold Term	X	X	X		



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Performance Specifications

	PLT	PLTT	PLTU	PNM	PTN
Description	Precision Low TCR	Precision High Temperature, Low TCR Automotive AEC-Q200 Qualified	Ultra Precision Low TCR	Precision Non-Magnetic	Precision Moisture-Resistant
Resistor Material	Passivated Nichrome	Passivated Nichrome	Passivated Nichrome	Tantalum Nitride	Tantalum Nitride
Resistance Range	250 Ω to 775 kΩ	250 Ω to 3 MΩ	100 Ω to 3 MΩ	10 Ω to 3 MΩ	1 Ω to 3 MΩ
TCR: Absolute (± ppm/°C)	5	5	2	25 to 100	10 to 100
Tolerance: Absolute (± %)	0.01 to 0.1	0.02 to 0.1	0.01 to 0.1	0.1 to 5	0.05 to 5
Power Rating (W)	0.15 to 0.4	0.25 to 0.40	0.15 to 1	0.05 to 1	0.05 to 2
Working Voltage Range (V)	75 to 200	75 to 200	75 to 200	75 to 200	75 to 200
Noise (dB)	< -35	< -35	< -35	< -30	< -30
Case Size	0603, 0705, 0805, 1206	0603, 0805, 1206, 2010, 2512	0603, 0805, 1206, 2010, 2512	0402, 0502, 0505, 0603, 0705, 0805, 1005, 1010, 1206, 1505, 2208, 2010, 2512	0402, 0502, 0505, 0603, 0705, 0805, 1005, 1010, 1206, 1505, 2208, 2010, 2512
Operating Temperature Range (°C)	-55 to +125	-55 to +215	-55 to +125	-55 to +125	-55 to +125
Storage Temperature (°C)	-55 to +155	-55 to +230	-55 to +155	-55 to +155	-55 to +155
Lead (Pb) Term	X		X	X	X
Lead (Pb)-Free Term	X		X	X	X
Gold Term		X			X



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Product Highlights

Series Type	Key Features	Applications
E/H MIL-PRF-55342	Established reliability “R”, “S”, and “T” failure rate levels	Military
	Military QPL listed	Aerospace
	Wide resistance range available: 10 Ω to 6.19 M Ω	Radar and satellite systems
FC	Small size (20 mm x 40 mm min.)	Low noise amplifiers
	Frequency response up to 20 GHz	High speed routers
	Tolerances down to 0.1 %	Attenuation circuitry
	Termination solder (lead or lead (Pb)-free), ribbon- or wire-bondable	High frequency line termination
L-NS	Moisture-resistant nickel alloy film	Current sense circuits
	Small case size	Current limit circuits
	Stable film performance of 0.4 % ΔR at 2000 h at 70 °C	Measurement systems
M-	High power rating per case size	Military
	Wide resistance range available: 10 Ω to 25 M Ω	Aerospace
	Stable film performance characteristics: 0.15 % ΔR at 2000 h, 70 °C	Industrial
P-NS	Wide selection of case sizes	Precision reference
	Wide resistance range available: 10 Ω to 6.19 M Ω	Low noise instrumentation
	Stable film performance characteristics: 0.05 % ΔR at 10 000 h, +70 °C	Automated test equipment
PAT	AEC-Q200 compliant	Automotive equipment
	AEC-Q200 ESD-rated Class 1C (2 kV), power rating up to 1 W	Telecommunications
	Moisture-resistant tantalum nitride resistor film on high purity alumina substrate	Industrial equipment
	Stable film and performance characteristics: < 0.05 % at 2000 h at 70 °C	Test and measurement equipment
PATT	Intrinsic moisture-protected resistor element (tantalum nitride)	Automotive
	Wide resistance range covering low values from 2.75 Ω to 120 k Ω	Oil and gas exploration
	Load life stability of 0.2 % at 1000 h at 155 °C and 100 % rated power	Military and aerospace
PCAN	Aluminum nitride substrate for high thermal conductivity and power rating up to 6 W	Power supplies
	Low TCR down to 25 ppm/°C and tight tolerance down to \pm 0.1 %	Power switching
	Load life stability of 1 % at 1000 h at 70 °C	Military and aerospace
PCNM	High thermal conductivity aluminum nitride substrate	Braking systems
	Precision non-magnetic	Medical imaging
	High power ratings up to 6 W	Power supply
	Tolerances down to 0.1 %	Power switching
PHP	High power ratings from 1.0 W to 2.5 W	High precision medical imaging
	Stable film and performance characteristics of 0.1 % ΔR at +70 °C for 2000 h	Power supply
	Available in the 1206 and 2512 case sizes	Power measurement
	Wide wraparound terminations to enhance heat dissipation	Test and measurement equipment



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Product Highlights

Series Type	Key Features	Applications
<u>PHPA</u>	AEC-Q200 compliant	Automotive equipment
	Moisture-resistant tantalum nitride resistor film on high purity alumina substrate	Automotive / industrial equipment
	High power ratings from 1.0 W to 2.5 W	Power supply
	Available in the 1206 and 2512 case sizes	Power measurement
	Wide wraparound terminations to enhance heat dissipation	Test and measurement equipment
<u>PLT</u>	Extremely tight tolerance to 0.01 %	Medical
	Low TCR of 5 ppm/°C	Military
	Stable film: 0.02 % ΔR at 2000 h at 70 °C	Industrial
<u>PLTT</u>	Stable film and performance characteristics: < 0.05 % at 2000 h at 215 °C at 25 % rated power	Oil / gas precision applications
	Extremely low TCR of ± 5 ppm/°C over a wide temperature range	Down-hole exploration
	Highly suitable for high temperature industrial applications	Automotive under the hood applications
	Tight tolerance to 0.02 %	Aircraft controls
<u>PLTU</u>	Ultra precision TCR of ± 2 ppm/°C	Military / industrial control systems
	Tolerances to ± 0.01 %	Test and measurement equipment
	Anti-corrosion resistant film with special passivation method (SPM)	Industrial and test equipment
	Very low noise and voltage coefficient (< -35 dB, 0.1 ppm/V)	Calibration systems
	Stable film and performance characteristics ($\Delta R \pm 0.04$ % at 70 °C, 1000 h)	Medical equipment
<u>PNM</u>	All non-magnetic materials	Medical imaging
	Stable film and performance characteristics: 0.03 % ΔR at 70 °C, 10 000 h	High end audio equipment
	Tolerances down to 0.1 %	Measurement sensing
<u>PTN</u>	Moisture-resistant tantalum nitride film	Military and aerospace
	High power rating per case size over traditional chip resistors	Industrial / test and measurement equipment
	Wide resistance range available: 1 Ω to 3 M Ω	Telecommunications



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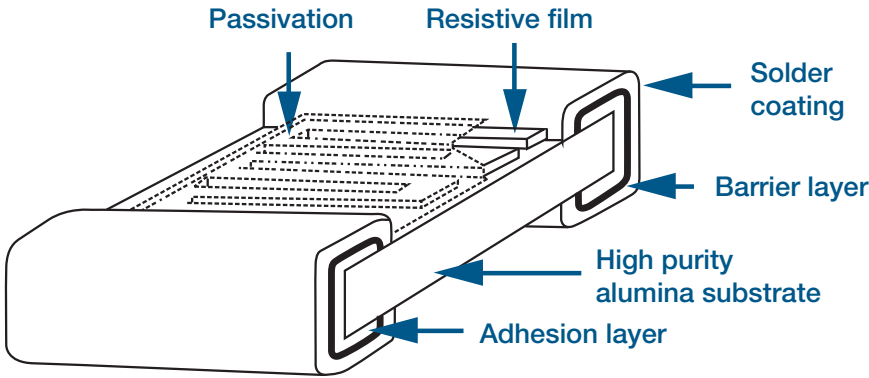
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Mechanical Specifications

Layers	E/H	FC	L-NS	M-	P-NS	PAT	PATT	PCAN
Substrate	High Purity Alumina	High Purity Alumina	High Purity Alumina	High Purity Alumina	High Purity Alumina	High Purity Alumina	High Purity Alumina	Aluminum Nitride
Resistive Film	Tamelox Resistor Film (Passivated Nichrome)	Passivated Nichrome	Nickel Alloy	Ruthenium	Passivated Nichrome	Tantalum Nitride	Tantalum Nitride	Passivated Nichrome
Passivation	SPM	SPM	Epoxy	Glass	SPM	Silicon Nitride and Epoxy	Silicon Nitride and SPM	SPM
Barrier	Nickel	Nickel	Nickel	Nickel	Nickel	Nickel	Nickel	Nickel
Adhesion Layer	Nichrome	Nichrome	X	X	Nichrome	Titanium Tungsten	Titanium Tungsten	Titanium Tungsten
PAD Layer	Gold	X	X	Ag Pd	Gold	Gold	Gold	Gold

Layers	PCNM	PHP	PHPA	PLT	PLTU	PNM	PTN
Substrate	High Purity Alumina	High Purity Alumina	High Purity Alumina	High Purity Alumina	High Purity Alumina	High Purity Alumina	High Purity Alumina
Resistive Film	Passivated Nichrome	Passivated Nichrome	Tantalum Nitride	Passivated Nichrome	Passivated Nichrome	Tantalum Nitride	Tantalum Nitride
Passivation	Epoxy	SPM	Epoxy	Silicon Nitride and SPM	SPM	Epoxy	Epoxy
Barrier	Electroless Nickel	Nickel	Nickel	Nickel	Nickel	Electroless Nickel	Nickel
Adhesion Layer	Titanium Tungsten	Titanium Tungsten	Titanium Tungsten	Titanium Tungsten	Titanium Tungsten	Titanium Tungsten	Titanium Tungsten
PAD Layer	Gold	Gold	Gold	Gold	Gold	Gold	Gold

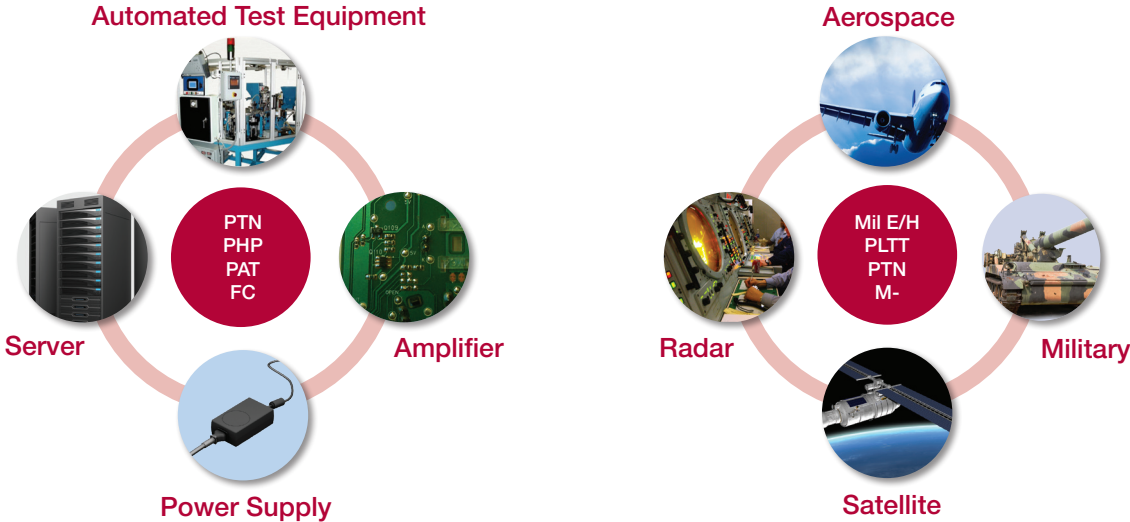




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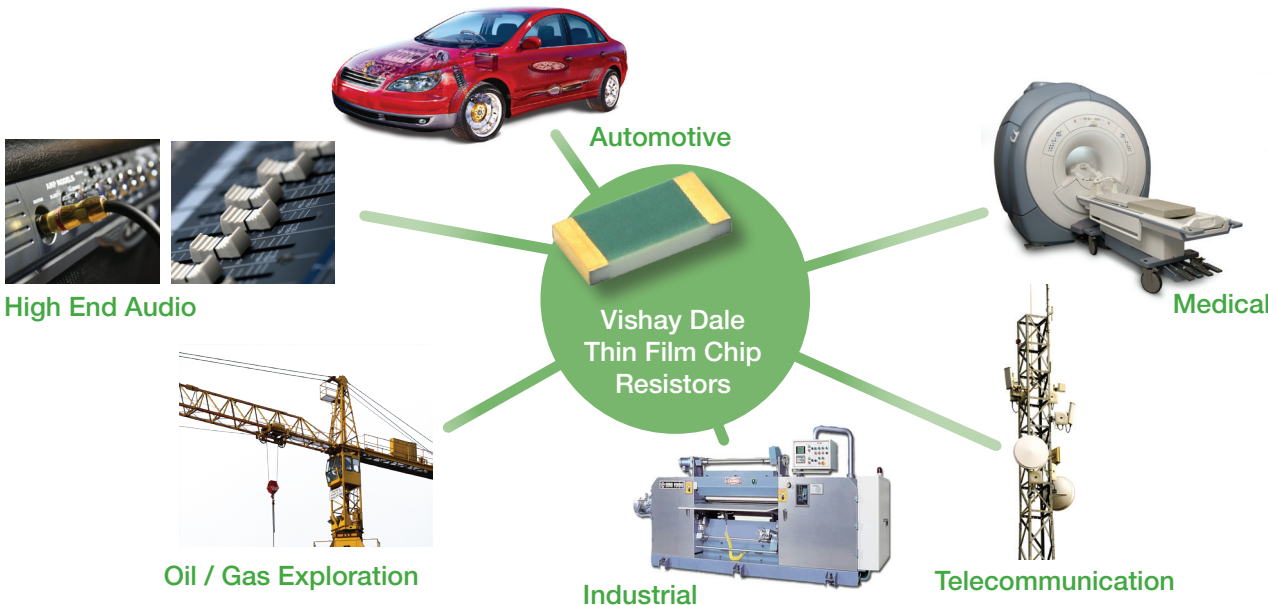
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Target Applications

Vishay Dale Thin Film chip resistors have a track record of providing solutions to a wide range of industries, including military, aerospace, medical, automotive, industrial, and telecommunications. Our broad chip resistor portfolio covers a wide resistance range from 0.03 Ω to 25 MΩ, with exceptionally low TCR and tolerance offerings down to ± 5 ppm/°C and ± 0.01 %, respectively.





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SEMICONDUCTORS

MOSFETs Segment

MOSFETs

- Low Voltage TrenchFET® Power MOSFETs
- Medium Voltage Power MOSFETs
- High Voltage Planar MOSFETs
- High Voltage Superjunction MOSFETs
- Automotive Grade MOSFETs

ICs

- VRPower® DrMOS Integrated Power Stages
- Power Management and Power Control ICs
- Smart Load Switches
- Analog Switches and Multiplexers

Diodes Segment

Rectifiers

- Schottky Rectifiers
- Ultra Fast Recovery Rectifiers
- Standard and Fast Recovery Rectifiers
- High Power Rectifiers/Diodes
- Bridge Rectifiers

Small Signal Diodes

- Schottky and Switching Diodes
- Zener Diodes
- RF PIN Diodes

Protection Diodes

- TVS Diodes or TRANSZORB® (unidirectional, bidirectional)
- ESD Protection Diodes (including arrays)

Thyristors / SCRs

- Phase-Control Thyristors
- Fast Thyristors

IGBTs

- Field Stop Trench
- Punch-Through Trench

Power Modules

- Input Modules (diodes and thyristors)
- Output and Switching Modules (contain MOSFETs, IGBTs, and diodes)
- Custom Modules

Optoelectronic Components Segment

Infrared Emitters and Detectors

Optical Sensors

- Proximity
- Ambient light
- Light Index (RGBW, UV, IR)
- Humidity
- Quadrant Sensors
- Transmissive
- Reflective

Infrared Remote Control Receivers

Optocouplers

- Phototransistor, Photodarlington
- Linear
- Phototriac
- High Speed
- IGBT and MOSFET Driver

Solid-State Relays

LEDs and 7-Segment Displays

Infrared Data Transceiver Modules

Custom Products

PASSIVE COMPONENTS

Resistors and Inductors Segment

Film Resistors

- Metal Film Resistors
- Thin Film Resistors
- Thick Film Resistors
- Power Thick Film Resistors
- Metal Oxide Film Resistors
- Carbon Film Resistors

Wirewound Resistors

- Vitreous, Cemented, and Housed Resistors
- Braking and Neutral Grounding Resistors
- Custom Load Banks

Power Metal Strip® Resistors

Battery Management Shunts

Crowbar and Steel Blade Resistors

Thermo Fuses

Chip Fuses

Pyrotechnic Initiators / Igniters

Variable Resistors

- Cermet Variable Resistors
- Wirewound Variable Resistors
- Conductive Plastic Variable Resistors
- Contactless Potentiometers
- Hall Effect Position Sensors
- Precision Magnetic Encoders

Networks / Arrays

Non-Linear Resistors

- NTC Thermistors
- PTC Thermistors
- Thin Film RTDs
- Varistors

Magnetics

- Inductors
- Wireless Charging Coils
- Planar Devices
- Transformers
- Custom Magnetics

Connectors

Capacitors Segment

Tantalum Capacitors

- Molded Chip Tantalum Capacitors
- Molded Chip Polymer Tantalum Capacitors
- Coated Chip Tantalum Capacitors
- Solid Through-Hole Tantalum Capacitors
- Wet Tantalum Capacitors

Ceramic Capacitors

- Multilayer Chip Capacitors
- Disc Capacitors
- Multilayer Chip RF Capacitors
- Chip Antennas
- Thin Film Capacitors

Film Capacitors

Power Capacitors

Heavy Current Capacitors

Aluminum Electrolytic Capacitors

ENYCAP™ Energy Storage Capacitors