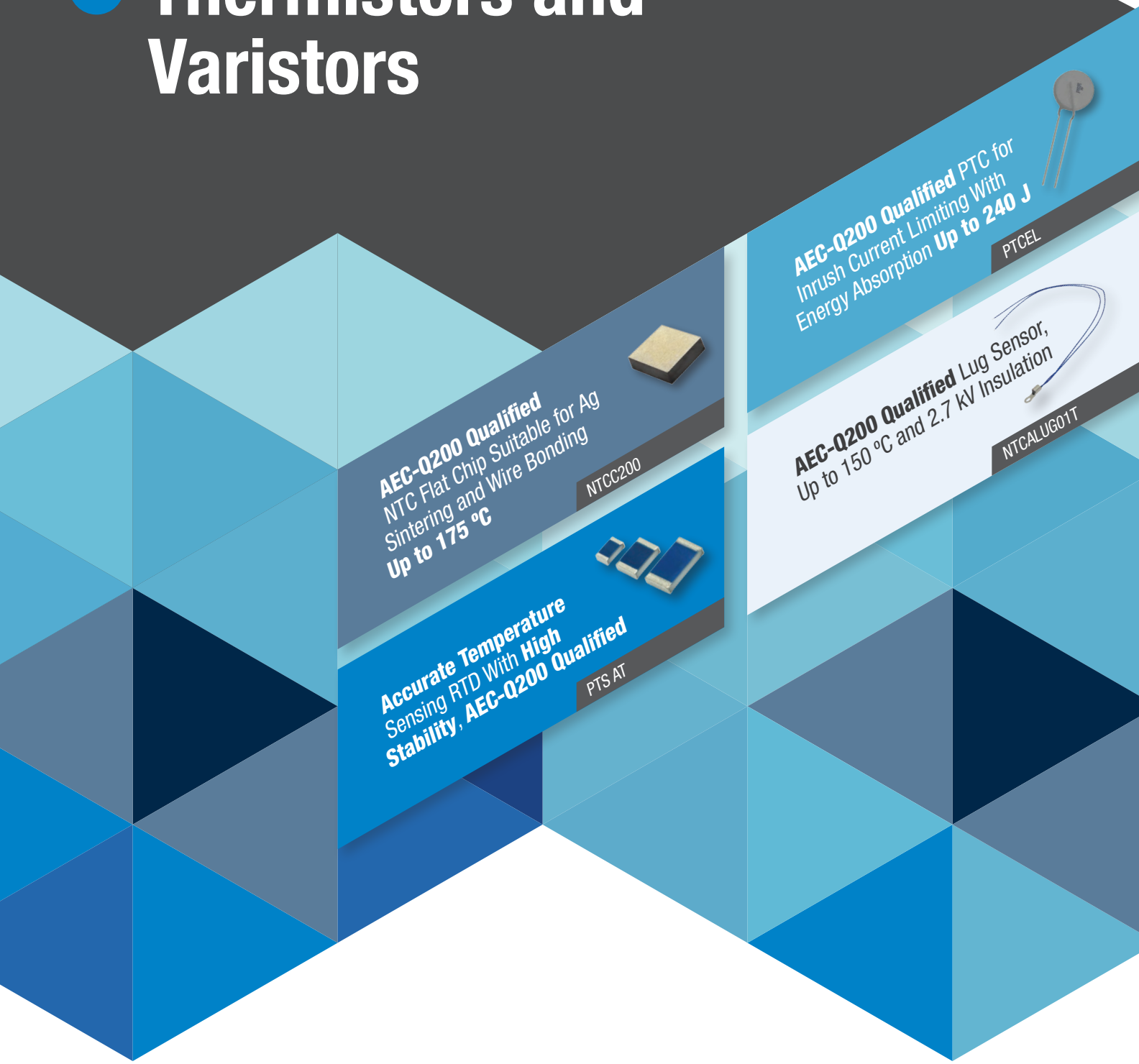
Vishay Intertechnology, Inc.

Thermistors and Varistors



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THERMISTORS AND VARISTORS

Focus Products

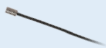
Surface-Mount NTC Thermistors

Series	Size and Encapsulant	Lead Wire or Termination Characteristics	R_{25} Range	Tolerance	$B_{25/85}$	$B_{25/85}$ Tolerance	Temperature Range
NTCS0402 / NTCS0603 / NTCS0805 	0402, 0603, 0805	Ni barrier and tinned on T&R glass protected	4.7 kΩ to 680 kΩ	± 1 % to ± 5 %	3420 K to 4125 K	± 1 % to ± 3 %	-40 °C to +150 °C
Standard series; AEC-Q200 qualified, cUL recognized; glass protected							
NTCS...SMT 	0402 to 0805	Ni barrier and tinned on T&R glass protected	100 kΩ to 210 kΩ	± 1 %	3590 K	± 1 %	-40 °C to +125 °C
Enhanced stability of < 0.2 % typical; 10 000 h lifetime at highest operating temperature							
NTHS 	0402 to 1208	Ni barrier and tinned on T&R glass protected	4.7 kΩ to 350 kΩ	± 1 % to ± 10 %	3486 K to 4261 K	± 3 %	-40 °C to +125 °C
Standard series; glass-protected							
NTCC200 / NTCC300 	2 mm x 2 mm x 0.7 mm	Ag/Au metallized bondable die	4.7 kΩ to 20 kΩ	± 1 % to ± 5 %	3435 K to 3865 K	± 1 %	-55 °C to +175 °C
Leadless NTC for wirebonding applications; high thermal shock resistant; 10 000 h lifetime at highest operating temperature							
NTCSMELF 	DO35 glass	Tinned dumet on T&R	10 kΩ to 100 kΩ	± 5 %	3977 K	± 1.3 %	-40 °C to +150 °C
Glass-sealed							

Through-Hole NTC Thermistors

Series	Size and Encapsulant	Lead Wire or Termination Characteristics	R_{25} Range	Tolerance	$B_{25/85}$	$B_{25/85}$ Tolerance	Temperature Range
NTCLE100 	3.8 mm to 5.0 mm epoxy	Tinned Cu 0.6 mm	3.3 Ω to 470 kΩ	± 2 % to ± 5 %	2880 K to 4570 K	± 0.5 % to ± 1.5 %	-40 °C to +125 °C
Standard classics series; color band coded; cUL recognized							
NTCLE203 	3.6 mm epoxy	Tinned Ni 0.4 mm	2 kΩ to 470 kΩ	± 1 % to ± 5 %	3528 K to 4570 K	± 0.5 % to ± 2 %	-40 °C to +125 °C
Accuracy line; tolerance down to ± 1 %							
NTCLE203...SB0 	4.2 mm epoxy	Tinned Ni 0.5 mm	2.06 kΩ to 30 kΩ	± 1.93 % to ± 2.2 %	3528 K to 4090 K	± 0.5 % to ± 0.75 %	-55 °C to +150 °C
AEC-Q200 qualified; thermal cycling resistant; suitable for potting							
NTCLE213 	4.2 mm epoxy	Tinned Ni 0.5 mm	2.06 kΩ to 100 kΩ	± 1 % to ± 5 %	3435 K to 4190 K	± 0.5 % to ± 1.5 %	-55 °C to +150 °C
Mini sensor epoxy coated 2.5 mm; thermal cycling resistant; suitable for potting; AEC-Q200 qualified							
NTCLE301 	2.5 mm epoxy	Insulated silvered Ni 0.25 mm	2795 Ω	± 2.93 %	3977 K	± 0.75 %	-40 °C to +125 °C
Classic insulated leads series							
NTCLE305 	1.60 mm epoxy	Insulated silvered Ni 0.20 mm	2.06 kΩ to 10 kΩ	± 0.5 K	3511 K to 3984 K	± 0.5 % to ± 0.75 %	-40 °C to +125 °C
Miniature insulated leads; AEC-Q200 qualified; two point sensor ± 0.5 °C							
NTCLG...E2 	SOD27 glass	Tinned CCSW 0.56 mm bulk / T&R	10 kΩ to 100 kΩ	± 5 %	3797 K to 3977 K	± 1.3 % to ± 3 %	-40 °C to +200 °C
Glass-encapsulated; high temperature resistant for harsh environments							
NTCLE413, NTCLE428 	3 mm epoxy	(UL-2651) PVC lead wire AWG30	4.7 kΩ to 100 kΩ	± 1 % to ± 5 %	3435 K to 4190 K	± 0.5 % to ± 1.5 %	-40 °C to +105 °C
Mini PVC insulated leads series; accurate down to ± 0.3 °C							

Assembly NTC Thermistors

Series	Size and Encapsulant	Lead Wire or Termination Characteristics	R_{25} Range	Tolerance	$B_{25/85}$	$B_{25/85}$ Tolerance	Temperature Range
NTCLP450 	Pipe 3.2 mm	UL-2651 PVC lead wire AWG30	100 kΩ	± 3 %	4190 K	± 1.5 %	-40 °C to +105 °C
Miniature pipe sensor							
NTCALUG01A 	Stud screw M3	PTFE AWG24 TP Cu	4.7 kΩ to 100 kΩ	± 1 % to ± 5 %	3435 K to 4190 K	± 0.5 % to ± 1.5 %	-40 °C to +150 °C
Robust surface temperature sensor; AEC-Q200 qualified; UL-recognized							
NTCALUG02A 	Stud screw M3	PEEK AWG30 SP Ni	4.7 kΩ to 100 kΩ	± 1 % to ± 3 %	3435 K to 4190 K	± 0.5 % to ± 1.5 %	-55 °C to +125 °C
Low thermal gradient surface temperature sensor; high insulation voltage of 1500 V_{AC}							
NTCALUG01T 	Stud screw M3	ETFE AWG26 SP Cu	10 kΩ to 100 kΩ	± 1 % to ± 2 %	3435 K to 4190 K	± 0.5 % to ± 1.5 %	-55 °C to +150 °C
High temperature (150 °C) lug sensor with long life time; high insulation voltage of 2700 V_{AC}; AEC-Q200 qualified; UL-recognized							
NTCALUG03/39 	Stud screw M2/M3	ETFE AWG32 SP Ni	10 kΩ 4.7 kΩ	± 2 % to ± 3 %	3740 K to 3984 K	± 0.5 % to ± 1.5 %	-40 °C to +125 °C
Miniature surface temperature sensor; low thermal gradient; best in class							
NTCASCW 	Passivated M4 aluminum screw	Tinned Cu 0.6 mm Tinned Ni 0.5 mm	1 kΩ to 470 kΩ	± 1 % to ± 5 %	3528 K to 4570 K	± 0.5 % to ± 2.5 %	-40 °C to +100 °C
Screw threaded sensor; 1500 V insulation voltage							
NTCAIMME3 	Stainless steel 2.5 mm to 3.9 mm (brass collar)	UL-2651 PVC lead wire AWG30	10 kΩ	± 3 %	3984 K	± 0.5 %	-25 °C to +105 °C
Miniature fluid immersion sensor; fast response time < 3 s							
NTCACAP 	ABS cap diameter 7 mm to 9 mm	Tinned, AWG22, single or double insulated	2.7 kΩ to 10 kΩ	± 1 %, ± 2 %	3984 K	± 0.5 %	-55 °C to +60 °C
Refrigerator sensor; double insulated							

THERMISTORS AND VARISTORS

Focus Products

Thin Film Linear Temperature Sensors (RTD)

Series	Size and Encapsulant	Lead Wire or Termination Characteristics	R at $T_{ref.}$	T_n	Tolerance	TCR	Temperature Range
PTS 	0603 to 1206	Ni barrier and tinned glass sealed with protective coating	100 Ω, 500 Ω, 1 kΩ	0 °C	F0.3, F0.6	+3850 ppm/K	-55 °C to +155 °C
Accurate and highly stable RTD sensor up to +155 °C							
PTS AT 	0603 to 1206	Ni barrier and tinned glass sealed with protective coating	100 Ω, 500 Ω, 1 kΩ	0 °C	F0.3, F0.6	+3850 ppm/K	-55 °C to +175 °C
Accurate and highly stable RTD sensor up to +175 °C; AEC-Q200 qualified							
TFPT 	0603 / 0805 / 1206	Ni barrier and tinned	100 Ω to 10 kΩ	25 °C	± 0.5 % to ± 5 %	+4110 ppm/K	-55 °C to +150 °C
Nickel thin film sensor for compensation; high stability; 0.5 % R-tolerance; cUL-recognized; AEC-Q200 qualified							
TFPTL10/15 	3.6 mm / 4.0 mm epoxy	Tinned CCSW 0.5 mm	100 Ω to 5 kΩ	25 °C	± 1 % to ± 5 %	+4110 ppm/K	-55 °C to +150 °C
Nickel thin film sensor for compensation; cUL-recognized							

PTC Sensing Thermistors

Series	Size and Encapsulant	Lead Wire or Termination Characteristics	R at $T_{ref.}$	T_n	$U_{max.}$	$U_{meas.}$	Temperature Range
PTCSL03 	4.0 mm silicone	Tinned Ni 0.5 mm bulk, 2.5 mm pitch	20 Ω to 120 Ω	80 °C to 150 °C	30 V	≤ 5 V	-20 °C to T_n +15 °C
Cost-effective thermistor for over-temperature protection							

PTC Power Thermistors

Series	Size and Encapsulant	Lead Wire or Termination Characteristics	R_{25} Range	Tolerance	Max. Voltage	Max. Holding Current I_{nt} Max. Overload Current I_{OL} Max. Energy E_m	Temperature Range
PTCCL... 30 V / 60 V 	5 mm to 20.5 mm, silicone	Tinned CCSW 0.6 mm / 0.5 mm 5 mm pitch	0.3 Ω to 50 Ω	± 20 %	30 V_{RMS} to 60 V_{RMS}	I_{nt} 0.09 to 2.0 A_{RMS} I_{OL} 0.8 to 23.0 A_{RMS}	-40 °C to +85 °C
Low voltage overload PTC thermistor; best current / size ratio; UL-recognized							
PTCCL... 145 V 	5 mm to 20.5 mm, silicone	Tinned CCSW 0.6 mm / 0.5 mm 5 mm pitch	1.3 Ω to 240 Ω	± 20 %	145 V_{RMS}	I_{nt} 0.05 to 1.0 A_{RMS} I_{OL} 0.2 to 13.0 A_{RMS}	0 °C to +70 °C
Medium voltage overload PTC thermistor; best current / size ratio; UL-recognized							
PTCCL... 265 V 	5 mm to 20.5 mm, silicone	Tinned CCSW 0.6 mm / 0.5 mm 5 mm pitch	2.1 Ω to 3 kΩ	± 20 %	265 V_{RMS}	I_{nt} 0.005 to 0.8 A_{RMS} I_{OL} 0.08 to 5.5 A_{RMS}	-20 °C to +70 °C
High voltage overload PTC thermistor; best current / size ratio; UL-recognized							
PTCCL... 600 V / 1000 V 	5 mm to 10 mm, silicone	Tinned CCSW 0.6 mm / 0.5 mm 5 mm pitch	400 Ω to 1.6 kΩ	± 20 % to ± 30 %	600 V_{RMS} to 1000 V_{RMS}	I_{nt} 0.01 to 0.03 A_{RMS} I_{OL} 0.1 to 0.5 A_{RMS}	-20 °C to +85 °C
High voltage overload and inrush current limiting PTC thermistor; best current / size ratio; UL-recognized (selected types)							
PTCEL 	13 mm to 17 mm, silicone	Tinned CCSW 0.8 mm / 0.6 mm 5 mm / 7.5 mm pitch	60 Ω to 500 Ω	± 30 %	350 V_{RMS} to 700 V_{RMS}	I_{nt} 0.042 to 0.120 A_{RMS} E_m 150 to 240 J	-40 °C to +105 °C
High energy inrush current limiting PTC thermistor; energy levels up to 240 J							

Varistors

Series	Size and Encapsulant	Lead Wire or Termination Characteristics	Voltage Range RMS	$V_{clamp\ DC}$ (at 1 mA)	Max. $I_{surge\ pack}$ 8/20 µs	Max. Energy (10/1000 µs)	Temperature Range
VDRS..... 	5 mm to 14 mm H/F epoxy coated	Tinned CCSW 0.6 mm, 0.8 mm; Cu 1.0 mm in straight, kinked leads	14 V to 680 V	22 V to 1100 V ± 10 %	100 A to 6500 A	0.5 J to 496 J	-40 °C to +85 °C
Standard over-voltage surge protector; UL-recognized							
VDRH.... 	5 mm to 20 mm H/F epoxy coated	Tinned CCSW 0.6 mm, 0.8 mm; Cu 1.0 mm in straight, kinked leads	11 V to 680 V	18 V to 1100 V ± 10 %	250 A to 10 000 A	0.7 J to 620 J	-40 °C to +125 °C
High surge over-voltage protector; extended operating temperature to 125 °C; UL-recognized up to 105 °C (selected types)							
VDRUS... 	7 mm to 20 mm Silicone HT coated	Tinned CCSW 0.6 mm, 0.8 mm; Cu 1.0 mm in straight, kinked leads	115 V to 680 V	18 V to 1100 V ± 10 %	1800 A to 13 000 A	19 J to 720 J	-40 °C to +125 °C
Ultra surge over-voltage protector; high temperature silicone coating; UL-recognized up to 125 °C							
MLV0402 / MLV0603 / MLV0805 / MLV1206 / MLV1210 / MLV1812 / MLV2220 	0402 to 2220	Ni Barrier + tinned	4 V to 60 V	7 V to 110 V ± 10 %	20 A to 1200 A	0.05 J to 12 J	-55 °C to +85 °C
Surface-mount; multilayer varistor							

Thermistors and **RTDs** for **Fast, Accurate**, and **Stable** Temperature Sensing

Advantages of Vishay Thermistors

- Superior performance in high stability applications
- Fast-reacting sensors by miniaturization
- Custom-made solutions

For the Following **Applications**

- Battery management systems
- Engine management
- Power inverters and motor drives
- Industrial process controls

Increase battery lifetime with Vishay's NTCALUGs in your BMS applications

Useful **Links**

- NTC Curve Calculator Tool
  www.vishay.com/thermistors/ntc-curve-list/
- Non-Linear Resistors Selector Guide
  www.vishay.com/doc?49050
- Non-Linear Resistors 3D Models
  www.vishay.com/doc?29106
- Non-Linear Resistors SPICE Models
  www.vishay.com/thermistors/tab/designtools/

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