30 V to 60 V PTC Thermistors for Overload Protection

QUICK REFERENCE DATA		
PARAMETER	VALUE	UNIT
Maximum voltage (DC or AC)	30 to 60	V
Maximum holding current (I_{hd})	0.094 to 2	A
Resistance at 25 °C (R_{25})	0.3 to 50	Ω
Tolerance on R_{25} value	20	%
Maximum overload current I_{ol}	0.8 to 23	A
Switching temperature	135 to 145	°C
Operating temperature range at max. voltage	-40 to +85	°C
Storage temperature	-40 to +150	°C

QUALITY

UL approved PTCs are guaranteed to withstand severe test programs and have factory audited follow-up programs. Major UL qualification tests are long-life (6000 cycles) electrical cycle tests at trip-current, long-life stability storage tests (3000 h at 250 °C), damp heat and water immersion tests and over-voltage tests up to 200 % of rated voltage.

UL approved PTCs are guaranteed to withstand severe test programs

- Long-life cycle tests (over 5000 trip cycles)
- Long-life storage tests (3000 h at 250 °C)
- Electrical cycle tests at low ambient temperatures (-40 °C or 0 °C)
- Damp-heat and water immersion tests
- Overvoltage tests at up to 200 % of rated voltage

FEATURES

- Wide range of trip and non-trip currents: From 94 mA up to 2 A for the trip current
- Small ratio between trip and non-trip currents (I_t/I_{hd} = 1.5 at 25 °C)
- High maximum overload current (up to 23 A)
- Leaded parts withstand mechanical stresses and vibration
- UL file E148885 according to XGPU standard UL1434
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

APPLICATIONS

Overload (current, voltage, temperature) protection in:

- Industrial electronics
- Consumer electronics
- Electronic data processing

DESCRIPTION

These directly heated ceramic-based thermistors have a positive temperature coefficient and are primarily intended for overload protection. They consist of a ceramic pellet soldered between two tinned CCS wires and coated with a UL 94 V-0 high temperature hard silicone lacquer.

Bare metalized pellets are available on request.

MOUNTING

PTC thermistors can be mounted by wave, reflow, or hand-soldering. Current levels have been determined according IEC 60738 conditions. Different ways of mounting or connecting the thermistors can influence their thermal and electrical behavior. Standard operation is in air, any potting or encapsulation of PTC thermistors is not recommended and will change its operating characteristics.

Typical Soldering
235 °C; duration: 5 s (lead (Pb)-bearing)
245 °C, duration: 5 s (lead (Pb)-free)

Resistance to Soldering Heat
260 °C, duration: 10 s max.

MARKING

Only the gray lacquered thermistors with a diameter of 8.5 mm to 20.5 mm are marked with BC, R_{25} value (example 1R9) on one side and I_{hd}, $V_{max.}$ on the other side.

ELECTRICAL DATA AND ORDERING INFORMATION

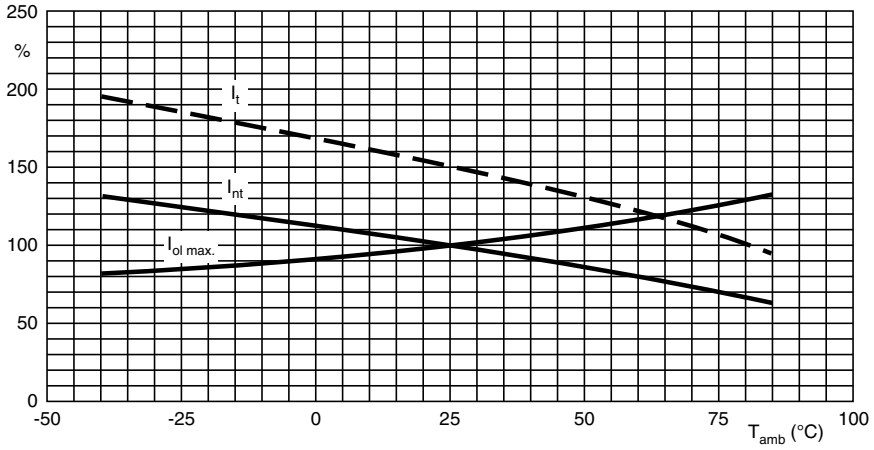
I_{nt} MAX. at 25 °C (mA) (1)	I_t MIN. at 25 °C (mA) (1)	R_{25} ± 20 % (Ω)	V MAX. (V)	I_{ol} MAX. at 25 °C (mA) (2)	I_{res} MAX. at $V_{max.}$ and 25 °C (mA) (1)	DISSIP. FACTOR (mW/K) (1)	Ø D MAX. (mm)	ORDERING PART NUMBERS	
								BULK	TAPE ON REEL
94	145	50	60	800	22	6.9	5	PTCCL05H940EBE	PTCCL05H940ETE
130	195	25	60	1200	25	6.9	5	PTCCL05H131EBE	PTCCL05H131ETE
180	270	13	30	1700	45	6.9	5	PTCCL05H181DBE	PTCCL05H181DTE
270	405	6	30	2500	60	6.9	5	PTCCL05H271DBE	PTCCL05H271DTE
320	480	5	30	3500	62	7.8	7	PTCCL07H321DBE	PTCCL07H321DTE
410	615	3	30	4500	65	7.8	7	PTCCL07H411DBE	PTCCL07H411DTE
470	705	2.5	30	5000	70	8.8	8.5	PTCCL09H471DBE	PTCCL09H471DTE
540	810	1.9	30	6000	75	8.8	8.5	PTCCL09H541DBE	PTCCL09H541DTE
610	915	1.7	30	7000	80	9.9	10.5	PTCCL11H611DBE	PTCCL11H611DTE
700	1050	1.3	30	8000	90	9.9	10.5	PTCCL11H701DBE	PTCCL11H701DTE
830	1245	1.1	30	10 000	100	11.5	12.5	PTCCL13H831DBE	PTCCL13H831DTE
920	1380	0.9	30	11 000	105	11.5	12.5	PTCCL13H921DBE	PTCCL13H921DTE
1170	1755	0.7	30	13 500	140	14.5	16.5	PTCCL17H112DBE	-
1390	2085	0.5	30	16 000	170	14.5	16.5	PTCCL17H132DBE	-
1770	2655	0.4	30	20 000	200	18.7	20.5	PTCCL21H172DBE	-
2050	3075	0.3	30	23 000	220	18.7	20.5	PTCCL21H202DBE	-

Notes

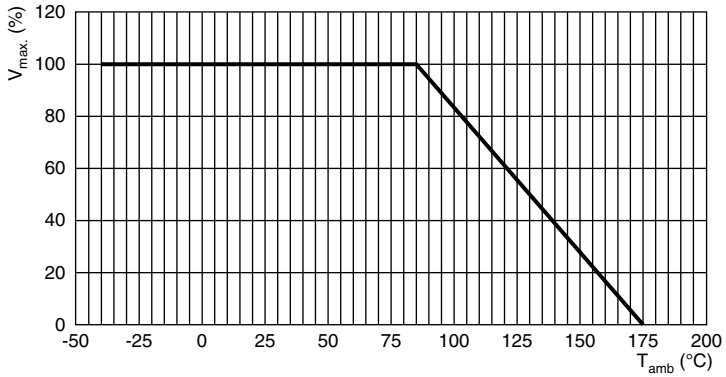
(1) The indicated current levels are guaranteed according IEC 60738 mounting conditions. For different mounting conditions the indicated current levels can change and should be evaluated in the application.

(2) $I_{ol\ max.}$ is the maximum overload current that may flow through the PTC when it passes from the low ohmic to the high ohmic state. UL approval: $I_{ol\ max.}$ x 0.85

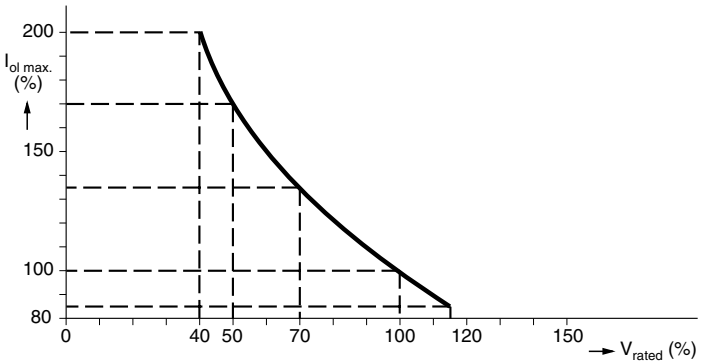
CURRENT DEVIATION AS A FUNCTION OF THE AMBIENT TEMPERATURE



VOLTAGE DERATING AS A FUNCTION OF AMBIENT TEMPERATURE



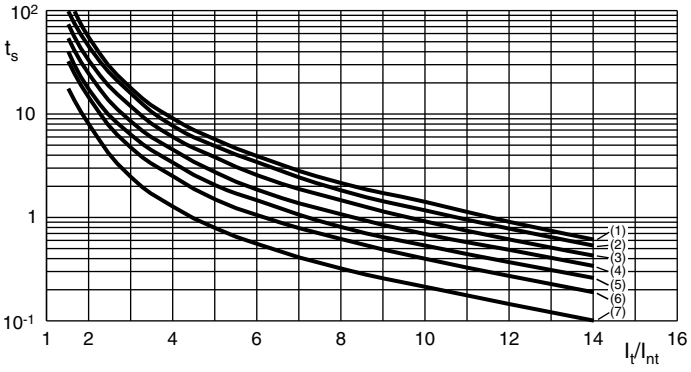
MAXIMUM OVERLOAD CURRENT $I_{ol\ max.}$ DERATING AS A FUNCTION OF VOLTAGE



$I_{max.}$ as stated in the electrical data and ordering information tables, is the maximum overload current that may flow through the PTC when passing from the low ohmic to high ohmic state at rated voltage.

When other PTC voltages are present after tripping, the $I_{max.}$ value can be derived from the above $I_{max.}$ as a function of voltage graph. Voltages below V_{rated} will allow higher overload currents to pass the PTC.

TYPICAL TRIP-TIME AS A FUNCTION OF TRIP CURRENT RATIO



Curve 1: Ø $D_{max.}$ = 20.5 mm
Curve 2: Ø $D_{max.}$ = 16.5 mm
Curve 3: Ø $D_{max.}$ = 12.5 mm
Curve 4: Ø $D_{max.}$ = 10.5 mm
Curve 5: Ø $D_{max.}$ = 8.5 mm
Curve 6: Ø $D_{max.}$ = 7.0 mm
Curve 7: Ø $D_{max.}$ = 5.0 mm

Measured in accordance with *"IEC 60738"*.

Trip-Time or Switching Time (t_s)

To check the trip-time for a specific PTC, refer to the Electrical Data and Ordering Information tables for the value Int. Divide the overload or trip current by this I_{nt} and you realize the factor I_t/I_{nt}. This rule is valid for any ambient temperature between 0 °C and 85 °C. Adapt the correct non-trip current with the appropriate curve in the Current Deviation as a Function of the Ambient Temperature graph. The relationship between the I_t/I_{nt} factor and the switching time is a function of the PTC diameter; see the above graphs.

Example

What will be the trip-time at I_{ol} = 3 A and T_{amb} = 0 °C of a thermistor type PTCCL09H471DBE; 2.5 Ω; Ø $D_{max.}$ = 8.5 mm:

I_{nt} from the table: 470 mA at 25 °C
I_{nt}: 470 x 1.12 = 526 mA (at 0 °C)

Overload current = 3 A; factor I_t/I_{nt}: $^3/_{0.526}$ = 5.70. In the Typical trip-time as a function of trip current ratio graph, at the 8.5 mm line and I_t/I_{nt} = 5.70, the typical trip-time is 1.7 s.

COMPONENTS PACKING INFORMATION			
SAP ORDERING PART NUMBER		SPQ	PACKING OUTLINE
PTCCL05H....BE		500	Bulk
PTCCL05H....TE		1500	Tape and reel
PTCCL07H....BE	PTCCL09H....BE	250	Bulk
PTCCL07H....TE	PTCCL09H....TE	1500	Tape and reel
PTCCL11H....BE	PTCCL13H....BE	250	Bulk
PTCCL11H....TE		1500	Tape and reel
PTCCL13H....TE		750	Tape and reel
PTCCL17H....BE		200	Bulk
PTCCL21H....BE		100	Bulk

PTC THERMISTORS IN BULK

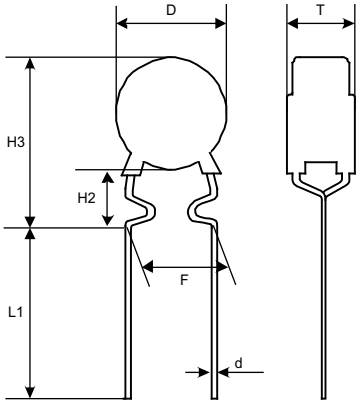


Fig. 1

DIMENSIONS OF BULK TYPE PTCs (in mm)	
D	See table
d	0.6 ± 0.05
T	4.0 max.
H2	4.0 ± 1.0
H3	D + 5 max.
L1	20 min.
F	5.0

PTC THERMISTORS ON TAPE AND REEL

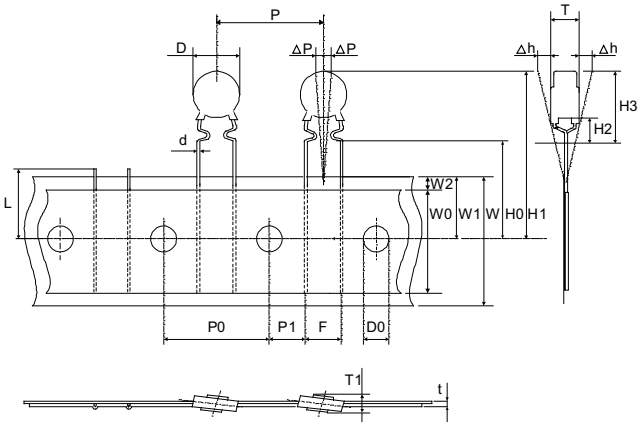
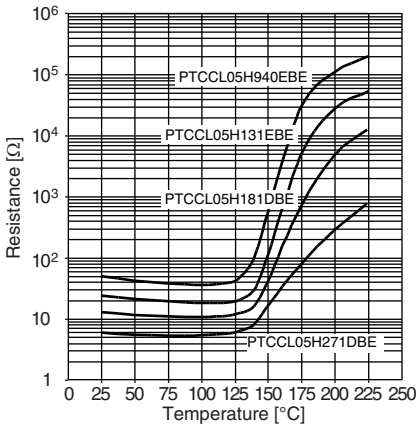


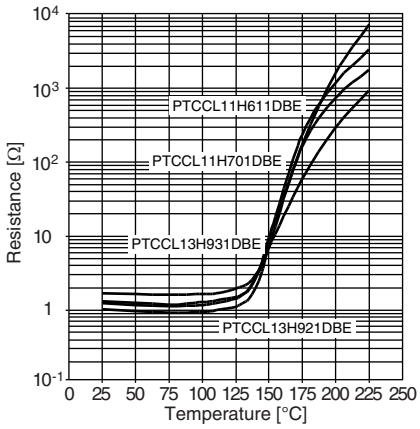
Fig. 2

TAPE AND REEL ACCORDING TO IEC 60286-2 (in mm)			
SYMBOL	PARAMETER	DIMENSIONS	TOLERANCE
D	Body diameter	See table	max.
d	Lead diameter	0.6	± 0.05
P	Pitch of components Diameter < 12 mm Diameter ≥ 12 mm	 12.7 25.4	 ± 1.0 ± 2.0
P_0	Feedhole pitch	12.720.385 mm	± 0.3
F	Leadcenter to leadcenter distance (between component and tape)	5.0	+ 0.5 / - 0.2
H0	Lead wire clinch height	16.0	± 0.5
H2	Component bottom to seating plane	4.0	± 1.0
H3	Component top to seating plane	D + 5	max.
T	Total thinkness	4.0	max.

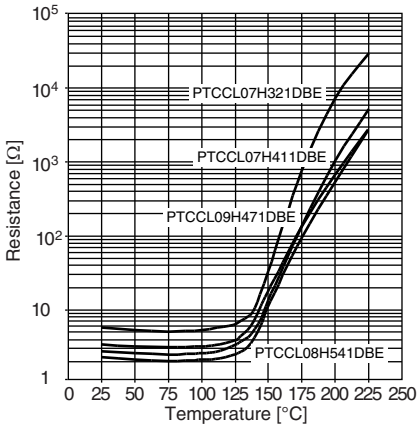
TYPICAL RESISTANCE / TEMPERATURE CHARACTERISTIC



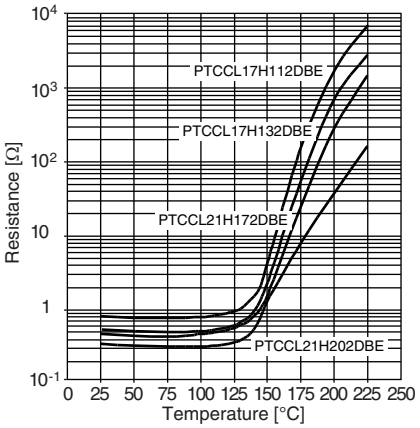
TYPICAL RESISTANCE / TEMPERATURE CHARACTERISTIC



TYPICAL RESISTANCE / TEMPERATURE CHARACTERISTIC



TYPICAL RESISTANCE / TEMPERATURE CHARACTERISTIC



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.