

## 30 V to 60 V PTC Thermistors For Overload Protection



### 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  
( $I_t/I_{nt} = 1.5$  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
- 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
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC


**RoHS**  
COMPLIANT

### APPLICATIONS

Over-temperature/over-load protection:

- Telecommunications
- Automotive systems
- Industrial electronics
- Consumer electronics
- Electronic data processing

### DESCRIPTION

These directly heated thermistors have a positive temperature coefficient and are primarily intended for overload protection. They consist of a naked disk with two tinned brass or copper clad steel leads and are coated with a high temperature silicone UL 94 V-0 coating. Leadless disks and leaded disks without coating are available on request.

### MOUNTING

The PTC Thermistors are suitable for processing on automatic insertion equipment.

#### Typical soldering

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

#### Resistance to soldering heat

260 °C, duration: 10 s max.

### MARKING

Only the grey 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  $I_{nt}$ ,  $V_{max}$ . on the other side.

QUICK REFERENCE DATA		
PARAMETER	VALUE	UNIT
Maximum voltage (DC or AC)	30 to 60	V
Holding current	0.094 to 2	A
Resistance at 25 °C ( $R_{25}$ )	0.3 to 50	$\Omega$
$I_{max}$ .	0.8 to 23	A
Switch temperature	140	°C
Operating temperature range at max. voltage	- 40 to + 85	°C
Climatic category	40/125/56	

ELECTRICAL DATA AND ORDERING INFORMATION for 2381 66. 5...1; max. voltage = 30 V to 60 V (AC or DC) <sup>(1)</sup>									
I <sub>nt</sub> MAX. at 25 °C (mA)	I <sub>t</sub> MIN. at 25 °C (mA)	R <sub>25</sub> ± 20 % (Ω)	V MAX. (V)	I MAX. <sup>(2)</sup> at 25 °C (mA)	I <sub>res</sub> MAX. at V <sub>max.</sub> and 25 °C (mA)	DISSIP. FACTOR (mW/K)	Ø D MAX. (mm)	CATALOG NUMBERS	
								BULK	TAPE ON REEL
94	145	50	60	800	22	6.9	5	2381 660 59491	2381 660 69491
130	195	25	60	1200	25	6.9	5	2381 660 51311	2381 660 61311
180	270	13	30	1700	45	6.9	5	2381 660 51811	2381 660 61811
270	405	6	30	2500	60	6.9	5	2381 660 52711	2381 660 62711
320	480	5	30	3500	62	7.8	7	2381 661 53211	2381 661 63211
410	615	3	30	4500	65	7.8	7	2381 661 54111	2381 661 64111
470	705	2.5	30	5000	70	8.8	8.5	2381 661 54711	2322 661 64711
540	810	1.9	30	6000	75	8.8	8.5	2381 661 55411	2381 661 65411
610	915	1.7	30	7000	80	9.9	10.5	2381 662 56111	2381 662 66111
700	1050	1.3	30	8000	90	9.9	10.5	2381 662 57011	2381 662 67011
830	1245	1.1	30	10 000	100	11.5	12.5	2381 662 58311	2381 662 68311
920	1380	0.9	30	11 000	105	11.5	12.5	2381 662 59211	2381 662 69211
1170	1755	0.7	30	13 500	140	14.5	16.5	2381 663 51121	-
1390	2085	0.5	30	16 000	170	14.5	16.5	2381 663 51321	-
1770	2655	0.4	30	20 000	200	18.7	20.5	2381 664 51721	-
2050	3075	0.3	30	23 000	220	18.7	20.5	2381 664 52021	-

**Notes**

<sup>(1)</sup> The thermistors are clamped at the seating plane.

<sup>(2)</sup> I<sub>max.</sub> is the maximum overload current that may flow through the PTC when it passes from the low ohmic to the high ohmic state.

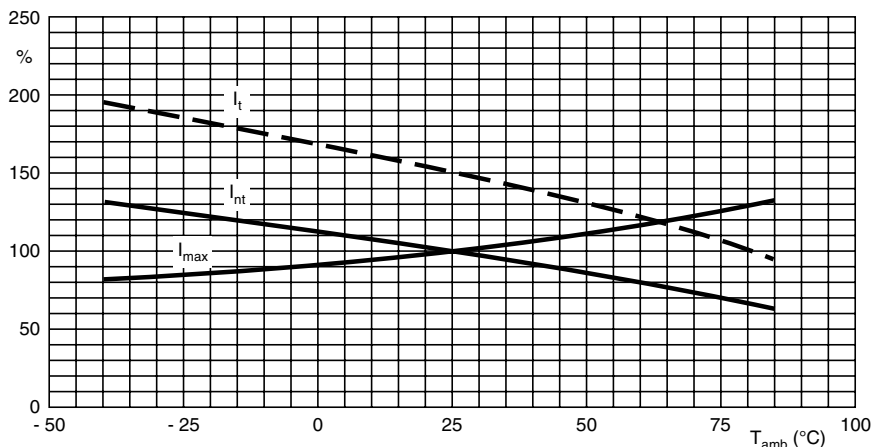
UL approval: I<sub>max.</sub> x 0.85

SAP AND 12NC PART NUMBERS			
12NC	SAP CODING	12NC	SAP CODING
2381 660 x9491	PTCCL05H940EyE	2381 662 x6111	PTCCL11H6111DyE
2381 660 x1311	PTCCL05H1311EyE	2381 662 x7011	PTCCL11H7011DyE
2381 660 x1811	PTCCL05H1811DyE	2381 662 x8311	PTCCL13H8311DyE
2381 660 x2711	PTCCL05H2711DyE	2381 662 x9211	PTCCL13H9211DyE
2381 661 x3211	PTCCL07H3211DyE	2381 663 51121	PTCCL17H112DBE
2381 661 x4111	PTCCL07H4111DyE	2381 663 51321	PTCCL17H132DBE
2381 661 x4711	PTCCL09H4711DyE	2381 664 51721	PTCCL21H172DBE
2381 661 x5411	PTCCL09H5411DyE	2381 664 52021	PTCCL21H202DBE

**Notes**

- For bulk parts replace x by "5" and y by "B"
- For taped on reel parts replace x by "6" and y by "T"

**CURRENT DEVIATION AS A FUNCTION OF THE AMBIENT TEMPERATURE**

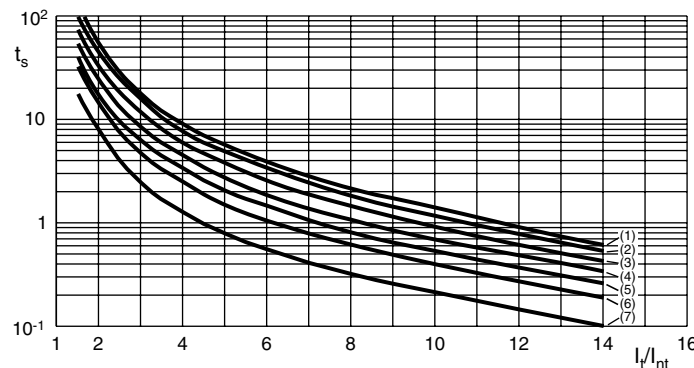


**VOLTAGE DERATING AS A FUNCTION OF AMBIENT TEMPERATURE**

**ELECTRICAL CHARACTERISTICS I<sub>max</sub>. 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 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:  $\varnothing D_{max} = 20.5$  mm
  - Curve 2:  $\varnothing D_{max} = 16.5$  mm
  - Curve 3:  $\varnothing D_{max} = 12.5$  mm
  - Curve 4:  $\varnothing D_{max} = 10.5$  mm
  - Curve 5:  $\varnothing D_{max} = 8.5$  mm
  - Curve 6:  $\varnothing D_{max} = 7.0$  mm
  - Curve 7:  $\varnothing D_{max} = 5.0$  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  $I_{nt}$ . 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 70 °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 2381 661 54711; 2.5  $\Omega$ ;  $\varnothing D_{max} = 8.5$  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 OUTLINE			
CODE NUMBER 2381		SPQ	OUTLINE
660	5...1	500	Fig. 1a
	6...1	1500	Fig. 1b
661	5...1	250	Fig. 1a
	6...1	1500	Fig. 1b
662	5...1	250	Fig. 1a
	66111 to 67011	1500	Fig. 1b
	68311 to 69211	750	Fig. 1b
663	5...1	200	Fig. 1a
664	5...1	100	Fig. 1a

**PTC THERMISTORS IN BULK**

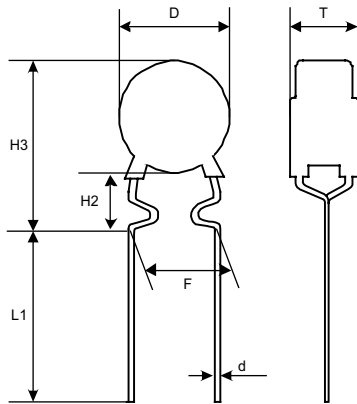


Fig. 1a

DIMENSIONS OF BULK TYPE PTC'S (in mm)	
D	See table
d	0.6 ± 10 %
T	4.0 max.
H2	4.0 ± 1.0
H3	D + 5 max.
L1	20 min.
F	5.0

**PTC THERMISTORS ON TAPE ON REEL**

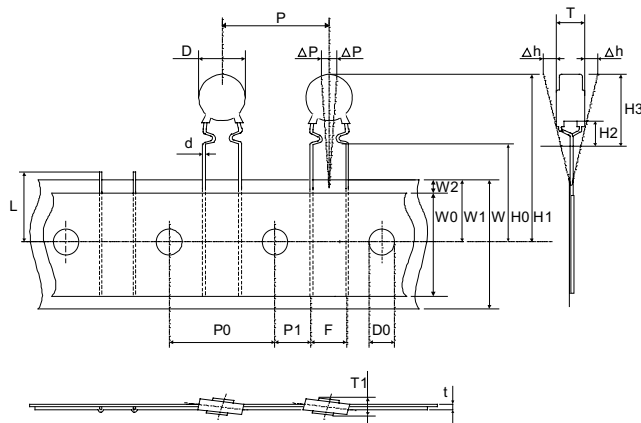


Fig. 1b

TAPE AND REEL ACCORDING TO IEC 60286-2 dimensions in millimeters			
SYMBOL	PARAMETER	DIMENSIONS	TOLERANCE
D	Body diameter	See table	max.
d	Lead diameter	0.6	± 10 %
P	Pitch of components	Diameter < 12 mm	± 1.0
		Diameter ≥ 12 mm	± 2.0
P <sub>0</sub>	Feedhole pitch	12.7	± 0.3
F	Leadcenter to leadcenter distance (between component and tape)	5.0	+ 0.6 - 0.1
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 thickness	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.

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.

## Material Category Policy

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.