

Temperature Dependent Platinum Thin Film Chip Resistor (RTD)



DESIGN SUPPORT TOOLS

[click logo to get started](#)


PTS SMD flat chip temperature dependent resistors are the perfect choice for temperature control of electronics operating under varying environmental conditions. The highly controlled platinum thin film manufacturing process guarantees an outstanding stability of temperature characteristics which ensures reliable operation even under harsh conditions.

FEATURES

- Standardized characteristics according to IEC 60751
- Advanced thin film technology
- Short reaction times down to $t_{0.9} \leq 2$ s (in air)
- Outstanding stability of temperature characteristic
- Supports lead (Pb)-free soldering
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

Temperature measurement and control in

- Aviation electronics
- Industrial electronics
- Medical electronics

TECHNICAL SPECIFICATIONS

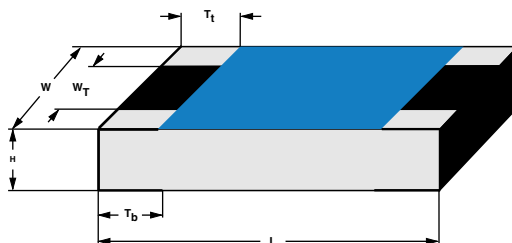
DESCRIPTION		PTS 0603	PTS 0805	PTS 1206
Resistance values R_0 at 0 °C		100 Ω	100 Ω , 500 Ω	100 Ω , 500 Ω , 1000 Ω
Temperature coefficient (0 °C to +100 °C), IEC60751		+3850 ppm/K		
Tolerance classes		F0.3, F0.6		
Operating temperature range		-55 °C to +155 °C		
Long term stability $\Delta R_0/R_0$; R_0 change after 1000 h at +155 °C		< ± 0.04 %		
Insulation resistance		> 10 M Ω		
Measurement current $I_{meas.}$ (DC) ⁽²⁾	100 Ω	0.1 mA to 0.50 mA	0.1 mA to 1.0 mA	0.1 mA to 1.0 mA
	500 Ω	-	0.1 mA to 0.40 mA	0.1 mA to 0.40 mA
	1000 Ω	-	-	0.1 mA to 0.25 mA
Self-heating ⁽¹⁾	Still air ($v = 0$ m/s)	≤ 0.9 K/mW	≤ 0.8 K/mW	≤ 0.7 K/mW
Thermal response time (1)	Flowing water ($v = 0.4$ m/s)	$t_{0.5} \leq 0.1$ s	$t_{0.5} \leq 0.2$ s	$t_{0.5} \leq 0.3$ s
		$t_{0.9} \leq 0.2$ s	$t_{0.9} \leq 0.3$ s	$t_{0.9} \leq 0.4$ s
	Flowing air ($v = 3.0$ m/s)	$t_{0.5} \leq 1.0$ s	$t_{0.5} \leq 1.5$ s	$t_{0.5} \leq 2.0$ s
		$t_{0.9} \leq 2.0$ s	$t_{0.9} \leq 3.0$ s	$t_{0.9} \leq 5.0$ s

Notes

⁽¹⁾ Valid for sensor element only, in low dissipative mode. Response time and self-heating are influenced by mounting materials as substrate, solder lands, tracks and solders used

⁽²⁾ Indicated measurement currents can be applied continuously with self-heating effect of less than 0.1 °C

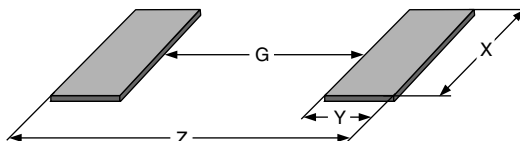
DIMENSIONS in millimeters



DIMENSIONS - PTS sensor types, mass and relevant physical dimensions

TYPE	H	L	W	W _T	T _t	T _b	MASS (mg)
PTS 0603	0.45 + 0.1/- 0.05	1.55 +0.05 / -0.1	0.85 ± 0.1	> 75 % of W	0.3 + 0.15/- 0.2	0.3 + 0.15/- 0.2	1.9
PTS 0805	0.45 + 0.1/- 0.05	2.0 ± 0.1	1.25 ± 0.15	> 75 % of W	0.4 ± 0.2	0.4 ± 0.2	4.6
PTS 1206	0.55 ± 0.1	3.1 + 0.1/- 0.2	1.6 ± 0.15	> 75 % of W	0.5 ± 0.25	0.5 ± 0.25	9.2

SOLDER PAD DIMENSIONS in millimeters



RECOMMENDED SOLDERPAD DIMENSIONS

TYPE	WAVE SOLDERING				REFLOW SOLDERING			
	G	Y	X	Z	G	Y	X	Z
PTS 0603	0.55	1.1	1.1	2.75	0.65	0.7	0.95	2.05
PTS 0805	0.8	1.25	1.50	3.2	0.9	0.9	1.4	2.7
PTS 1206	1.4	1.5	1.9	4.4	1.5	1.15	1.75	3.8

DESCRIPTION

A homogeneous film of platinum is deposited on a high grade (Al₂O₃) ceramic substrate and conditioned to achieve the correct temperature coefficient and stability. The sensor-elements are covered by a protective coating designed for electrical, mechanical and climatic protection. The terminations receive a final pure matte tin on nickel plating, the immunity against tin whisker growth has been proven under extensive testing.

QUALITY

The result of the determined production is verified by an extensive testing procedure performed on 100 % of the individual sensors. Only accepted products are laid directly into the paper tape in accordance with **IEC 60286-3**.

STORAGE

Solderability is specified for 2 years after production or re-qualification. The permitted storage time is 2 years.

ASSEMBLY

The PTS are suitable for processing on automatic SMD assembly systems. They are suitable for automatic soldering using wave, reflow or vapour phase. The encapsulation is resistant to all cleaning solvents commonly used in the electronics industry, including

alcohols, esters and aqueous solutions. The suitability of conformal coatings, if applied, shall be qualified by appropriate means to ensure the long-term stability of the whole system. The use of potting resins in close contact with the coating or terminations is not allowed. For frequent high temperature usage, thermal compatible substrates and solder alloys should be used, to minimize any thermal mismatch with the component.

All products comply with the CEFIC-EECA-EICTA list of legal restrictions on hazardous substances.

This includes full compatibility with the following directives:

- 2000/53/EC End of Vehicle life Directive (ELV)
- 2000/53/EC Annex II to End of Vehicle Life Directive (ELV II)
- 2011/65/EU Restriction of the use of Hazardous Substances Directive (RoHS)
- 2002/96/EC Waste Electrical and Electronic Equipment Directive (WEEE)

APPROVALS

The PTS are tested in accordance with

- IEC 60751
- IEC 60068 series

PART NUMBER AND PRODUCT DESCRIPTION ⁽¹⁾

PART NUMBER ⁽²⁾: PTS060301B100RP100

P	T	S	0	6	0	3	0	1	B	1	0	0	R	P	1	0	0
TYPE			SIZE CODE			SPECIAL CHARACTER		TOLERANCE CLASS		RESISTANCE VALUE			PACKAGING ⁽³⁾		SPECIAL		
3 digits			4 digits			1 digit		2 digits		4 digits			2 digits		2 digits		
PTS = platinum temperature sensor SMD			0603 0805 1206			0 = neutral		1B = class F0.3 2B = class F0.6		100R = 100 Ω 500R = 500 Ω 1K00 = 1000 Ω			PU P1 P5		00 = standard		

PRODUCT DESCRIPTION ⁽⁴⁾: PTS 0603-B P1 100R

PTS	0603	-B	P1	100R
TYPE	SIZE CODE	TOLERANCE CLASS	PACKAGING ⁽³⁾	RESISTANCE VALUE
PTS = platinum temperature sensor SMD	0603 0805 1206	B = class F0.3 2B = class F0.6	PU P1 P5	100R = 100 Ω 500R = 500 Ω 1K = 1000 Ω

Notes

- (1) Products can be ordered using either the PART NUMBER or the PRODUCT DESCRIPTION
 (2) The part number is shown to facilitate the introduction of a unified part numbering system
 (3) Please refer to table PACKAGING
 (4) We recommend that the Production Description is used to minimize the possibility of errors in order handling

PACKAGING

TYPE	CODE	QUANTITY	CARRIER TAPE	WIDTH	PITCH	BOX/REEL	BOX/REEL DIAMETER
PTS 0603 PTS 0805 PTS 1206	PU	100	Paper tape acc. IEC 60286-3	8 mm	4 mm	Box	114 mm
	P1	1000				Reel	180 mm/7"
	P5	5000					

FUNCTIONAL PERFORMANCE

The temperature resistance relationships of the PTS series follow different equations:

For the temperature range of -55 °C up to 0 °C:

$$R_T = R_0 \times (1 + A \times T + B \times T^2 + C \times (T - 100 \text{ °C}) \times T^3)$$

And for the temperature range of 0 °C up to +155 °C:

$$R_T = R_0 \times (1 + A \times T + B \times T^2)$$

R_T : Resistance as a function of temperature

R_0 : Nominal resistance value at 0 °C

T : Temperature in °C

Coefficients according to IEC 60751:

$$A = 3.9083 \times 10^{-3} \text{ °C}^{-1}$$

$$B = -5.775 \times 10^{-7} \text{ °C}^{-2}$$

$$C = -4.183 \times 10^{-12} \text{ °C}^{-4}$$

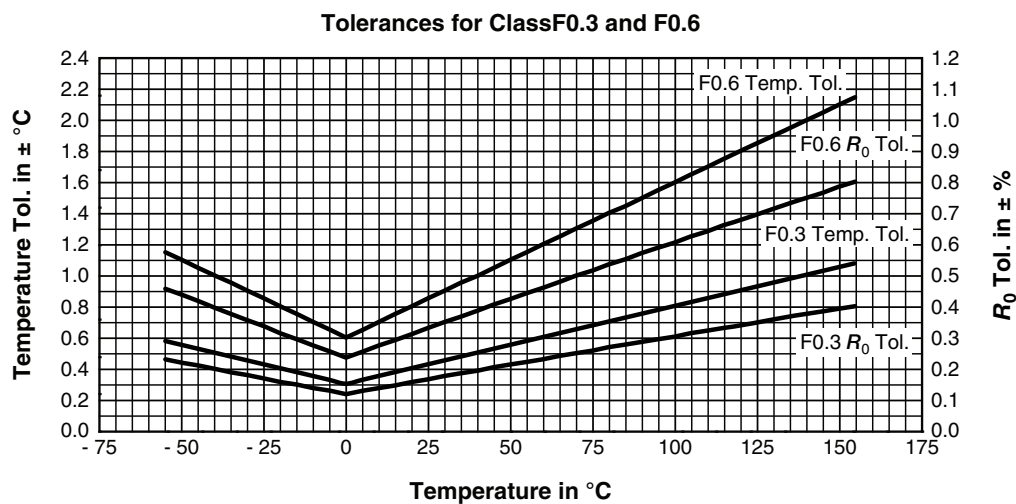
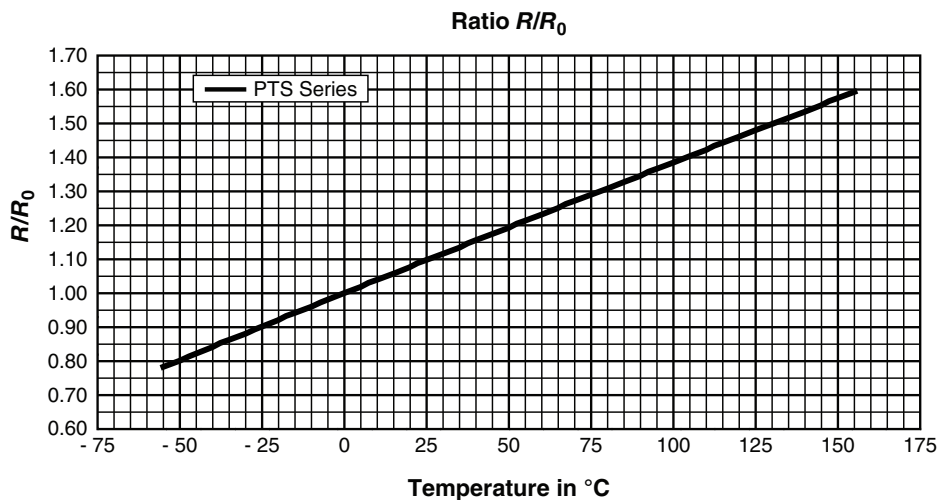
The tolerances values of the PTS series are classified by the following equations as specified by IEC 60751:

Class F0.3: $\Delta T_{F0.3} = \pm (0.30 + 0.005 \times |T|)$

Class F0.6: $\Delta T_{F0.6} = \pm (0.60 + 0.010 \times |T|)$

**NOMINAL RESISTANCE VALUES AND TEMPERATURE TOLERANCE**

TEMPERATURE (°C)	R_T/R_0 RATIO	NOMINAL RESISTANCE VALUES			CLASS F0.3	CLASS F0.6
		R_0 100 Ω (Ω)	R_0 500 Ω (Ω)	R_0 1000 Ω (Ω)	$T_{Tot.}$ (°C)	$T_{Tot.}$ (°C)
-55	0.78319	78.32	391.59	783.19	± 0.58	± 1.15
-50	0.80306	80.31	401.53	803.06	± 0.55	± 1.10
-45	0.82290	82.29	411.45	822.90	± 0.53	± 1.05
-40	0.84271	84.27	421.35	842.71	± 0.50	± 1.00
-35	0.86248	86.25	431.24	862.48	± 0.48	± 0.95
-30	0.88222	88.22	441.11	882.22	± 0.45	± 0.90
-25	0.90192	90.19	450.96	901.92	± 0.43	± 0.85
-20	0.92160	92.16	460.80	921.60	± 0.40	± 0.80
-15	0.94124	94.12	470.62	941.24	± 0.38	± 0.75
-10	0.96086	96.09	480.43	960.86	± 0.35	± 0.70
-5	0.98044	98.04	490.22	980.44	± 0.33	± 0.65
0	1.00000	100.00	500.00	1000.00	± 0.30	± 0.60
5	1.01953	101.95	509.76	1019.53	± 0.33	± 0.65
10	1.03903	103.90	519.51	1039.03	± 0.35	± 0.70
15	1.05849	105.85	529.25	1058.49	± 0.38	± 0.75
20	1.07794	107.79	538.97	1077.94	± 0.40	± 0.80
25	1.09735	109.73	548.67	1097.35	± 0.43	± 0.85
30	1.11673	111.67	558.36	1116.73	± 0.45	± 0.90
35	1.13608	113.61	568.04	1136.08	± 0.48	± 0.95
40	1.15541	115.54	577.70	1155.41	± 0.50	± 1.00
45	1.17470	117.47	587.35	1174.70	± 0.53	± 1.05
50	1.19397	119.40	596.99	1193.97	± 0.55	± 1.10
55	1.21321	121.32	606.60	1213.21	± 0.58	± 1.15
60	1.23242	123.24	616.21	1232.42	± 0.60	± 1.20
65	1.25160	125.16	625.80	1251.60	± 0.63	± 1.25
70	1.27075	127.08	635.38	1270.75	± 0.65	± 1.30
75	1.28987	128.99	644.94	1289.87	± 0.68	± 1.35
80	1.30897	130.90	654.48	1308.97	± 0.70	± 1.40
85	1.32803	132.80	664.02	1328.03	± 0.73	± 1.45
90	1.34707	134.71	673.53	1347.07	± 0.75	± 1.50
95	1.36608	136.61	683.04	1366.08	± 0.78	± 1.55
100	1.38506	138.51	692.53	1385.06	± 0.80	± 1.60
105	1.40400	140.40	702.00	1404.00	± 0.83	± 1.65
110	1.42293	142.29	711.46	1422.93	± 0.85	± 1.70
115	1.44182	144.18	720.91	1441.82	± 0.88	± 1.75
120	1.46068	146.07	730.34	1460.68	± 0.90	± 1.80
125	1.47951	147.95	739.76	1479.51	± 0.93	± 1.85
130	1.49832	149.83	749.16	1498.32	± 0.95	± 1.90
135	1.51710	151.71	758.55	1517.10	± 0.98	± 1.95
140	1.53584	153.58	767.92	1535.84	± 1.00	± 2.00
145	1.55456	155.46	777.28	1554.56	± 1.03	± 2.05
150	1.57325	157.33	786.63	1573.25	± 1.05	± 2.10
155	1.59191	159.19	795.96	1591.91	± 1.08	± 2.15





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.