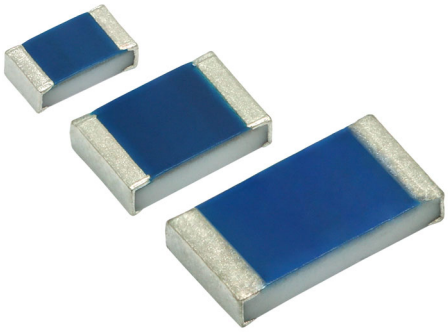
Temperature Dependent Platinum Thin Film Chip Resistor (RTD)



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

Pb-free

e3

RoHS COMPLIANT

HALOGEN FREE

LINKS TO ADDITIONAL RESOURCES

Design Tools

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.

APPLICATIONS

Temperature measurement and control in

- Aviation electronics
- Industrial electronics
- Medical electronics

TECHNICAL SPECIFICATIONS

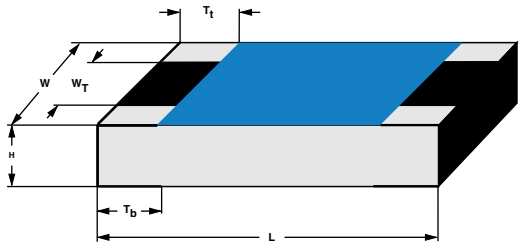
DESCRIPTION		PTS 0603	PTS 0805	PTS 1206
Resistance values R_0 at 0 °C		100 Ω	100 Ω, 500 Ω	100 Ω, 500 Ω, 1000 Ω
Temperature coefficient (0 °C to +100 °C), IEC 60751		+3850 ppm/K		
Tolerance classes		F0.3, F0.6		
Operating temperature range		-55 °C to +155 °C		
Long term stability $\Delta R_0/R_0$; R_0 change after 1000 h at +155 °C		< ± 0.04 %		
Insulation resistance		> 10 MΩ		
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
Failure rate: $FIT_{observed}$		≤ 0.1 x 10^{-9}/h		

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

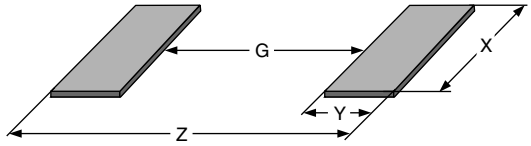
(2) Indicated measurement currents can be applied continuously with self-heating effect of less then 0.1 °C

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 (Al_2O_3) 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:

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

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:

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

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

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

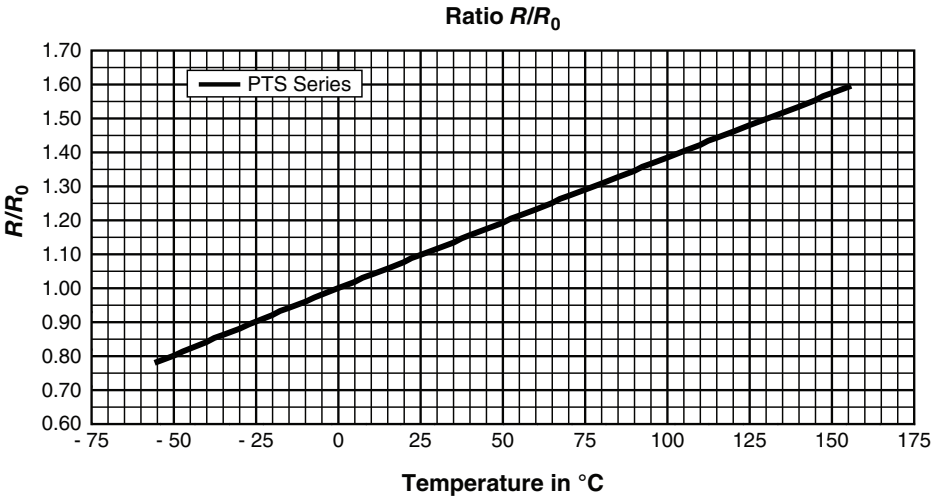
The tolerances values of the PTS series are classified by the following equations as specified by IEC 60751:

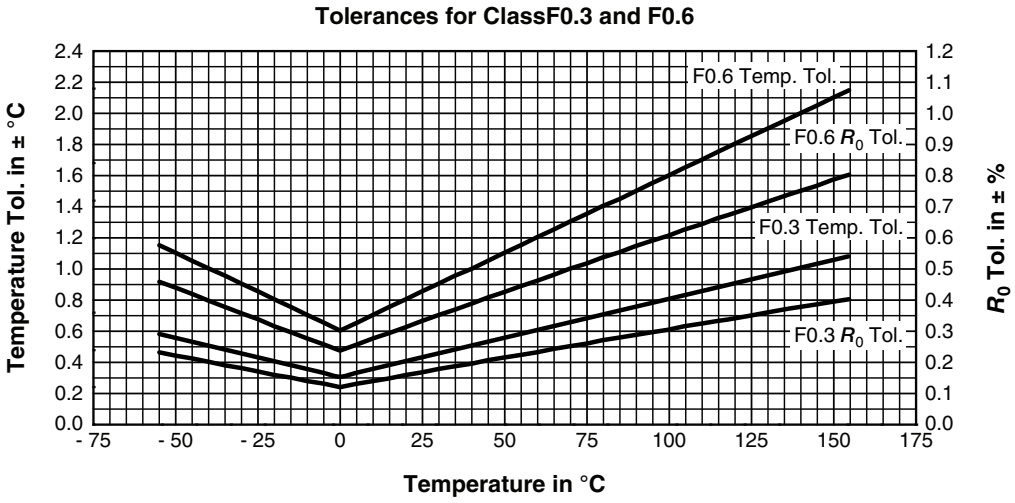
Class F0.3: $\Delta T_{F0.3} = \pm (0.30 + 0.005 \times |T|)$

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

NOMINAL RESISTANCE VALUES AND TEMPERATURE TOLERANCE

TEMPERATURE	R_T/R_0 RATIO	NOMINAL RESISTANCE VALUES			CLASS F0.3	CLASS F0.6
		R_0 100 Ω	R_0 500 Ω	R_0 1000 Ω	$T_{Tol.}$	$T_{Tol.}$
(°C)		(Ω)	(Ω)	(Ω)	(°C)	(°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





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