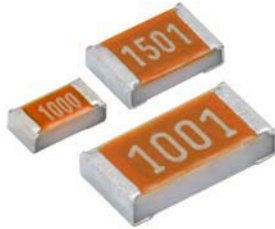


## SMD PTC - Nickel Thin Film Linear Thermistors



### FEATURES

- Alumina substrate base with nickel based PTC thin film element
- 0603, 0805 and 1206 sizes available
- Available in tape and reel packaging
- Standard  $R_{25}$  tolerances:  $\pm 0.5\%$ ,  $\pm 1\%$ ,  $\pm 5\%$
- Operation range - 55 °C to + 150 °C
- High stability over the entire temperature range
- cUL recognized component: File E148885
- Compliant to RoHS Directive 2002/95/EC
- Halogen-free according to IEC 61249-2-21 definition



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

### QUICK REFERENCE DATA

PARAMETER DESCRIPTION	VALUE			UNIT
	TFPT0603	TFPT0805	TFPT1206	
Resistance value at 25 °C <sup>(2)</sup>	100 to 1K	100 to 5K	100 to 10K	$\Omega$
Tolerance on $R_{25}$ -value <sup>(2)</sup>	$\pm 0.5; \pm 1; \pm 5$			%
TCR at 25 °C	4110			ppm/K
Tolerance on TCR at 25 °C <sup>(1)</sup>	$\pm 400$			
Operating temperature range: at rated power at zero dissipation <sup>(4)</sup>	- 55 to + 70 - 55 to + 150			°C
Dissipation factor $\delta$ (for information only)	1.8	2.3	4	mW/K
Maximum rated power at 70 °C ( $P_{70}$ )	75	100	125	mW
Maximum working voltage RCWV <sup>(3)</sup>	30	40	50	V
Climatic category (LCT/UCT/days)	55/150/56			-
Weight	2	5.5	10	mg

#### Notes

- (1) Contact Vishay if closer TCR lot tolerance is desired
- (2) Other  $R_{25}$ -values and tolerances are available upon request
- (3) Rated continuous working voltage is maximum working voltage or  $\sqrt{P_{70} \times R}$ , whichever is less
- (4) Zero power or zero dissipation is considered as measuring power max. 1 % of rated power  $P_{70}$

### STANDARD RESISTANCE VALUES at 25 °C in $\Omega$

100	180	330	560	1.0K	1.8K	3.3K	5.0K	8.2K
120	220	390	680	1.2K	2.2K	3.9K	5.6K	10.0K
150	270	470	820	1.5K	2.7K	4.7K	6.8K	

#### Note

- Rated continuous working voltage is maximum working voltage or  $\sqrt{P_{70} \times R}$ , whichever is less

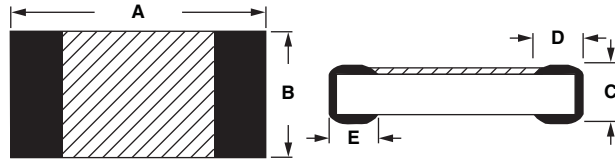
### GLOBAL PART NUMBER INFORMATION

Global Part Numbering: TFPT1206L1002FM (preferred part number format)

T F P T 1 2 0 6 L 1 0 0 2 F M

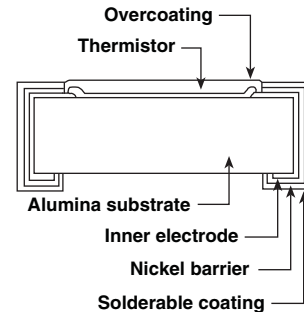
GLOBAL MODEL	CHARACTERISTIC	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING
TFPT0603 TFPT0805 TFPT1206	L = Linear	1002 = 10K	D = $\pm 0.5\%$ F = $\pm 1\%$ J = $\pm 5\%$	M = Lead (Pb)-free, T/R (5000 pieces) V = Lead (Pb)-free, T/R (1000 pieces) Z = Tin/lead, T/R (5000 pieces) Y = Tin/lead, T/R (1000 pieces)

**DIMENSIONS** in millimeters

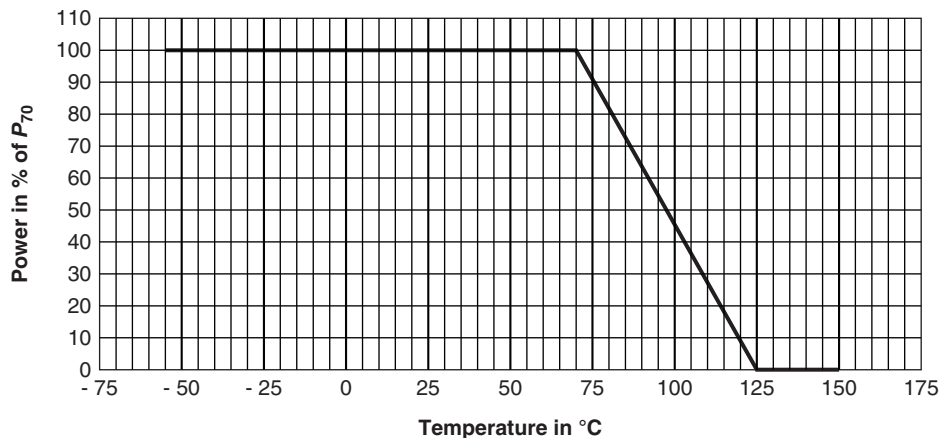


PART NUMBER	A	B	C	D	E
TFPT 0603	1.60 ± 0.10	0.85 ± 0.10	0.45 ± 0.10	0.30 ± 0.20	0.30 ± 0.20
TFPT 0805	2.00 ± 0.15	1.25 ± 0.15	0.45 ± 0.10	0.40 ± 0.20	0.40 ± 0.20
TFPT 1206	3.20 ± 0.15	1.60 ± 0.15	0.55 ± 0.10	0.50 ± 0.25	0.50 ± 0.25

**CONSTRUCTION**



**Power Derating**



**Note**

- Zero power is considered as measuring power max. 1 % of rated power  $P_{70}$

<b>PERFORMANCE (1)</b>	
TEST	MAXIMUM $\Delta R/R_{25}$ (2)
High temperature exposure (100 h at 125 °C)	0.25 %
Effects of bonding (10 s solder dip at 260 °C)	0.25 %
Thermal shock (30 min at - 55 °C, 30 min at 125 °C, 5 cycles)	0.25 %
Low temperature operation (maximum rated power for 2 h at - 55 °C)	0.25 %
Short time overload (2.5 x RCWV for 5 s)	0.25 %
Load life (1000 h 70 °C, maximum rated power 1.5 h "ON", 0.5 h "OFF")	0.25 %
Solderability (95 % coverage P/F)	P
Leaching (physical damage P/F)	P

**Notes**

- (1) Environmental performance specifications use test procedures as outlined in MIL-R-23648D and MIL-STD-202
- (2) TFPTs are ESD sensitive



AVERAGE RATIO $R/R_{25}$ TFPT ALL SIZES AND VALUES									
TEMP.	$R/R_{25}$	TEMP.	$R/R_{25}$	TEMP.	$R/R_{25}$	TEMP.	$R/R_{25}$	TEMP.	$R/R_{25}$
		- 20	0.825	20	0.980	60	1.150	100	1.337
		- 19	0.828	21	0.984	61	1.155	101	1.342
		- 18	0.832	22	0.988	62	1.159	102	1.347
		- 17	0.836	23	0.992	63	1.164	103	1.352
		- 16	0.839	24	0.996	64	1.168	104	1.357
- 55	0.702	- 15	0.843	<b>25</b>	<b>1.000</b>	65	1.173	105	1.362
- 54	0.705	- 14	0.847	26	1.004	66	1.177	106	1.367
- 53	0.708	- 13	0.851	27	1.008	67	1.182	107	1.372
- 52	0.712	- 12	0.854	28	1.012	68	1.186	108	1.377
- 51	0.715	- 11	0.858	29	1.017	69	1.191	109	1.382
- 50	0.719	- 10	0.862	30	1.021	70	1.196	110	1.387
- 49	0.722	- 9	0.866	31	1.025	71	1.200	111	1.392
- 48	0.725	- 8	0.869	32	1.029	72	1.205	112	1.397
- 47	0.729	- 7	0.873	33	1.033	73	1.209	113	1.402
- 46	0.732	- 6	0.877	34	1.037	74	1.214	114	1.407
- 45	0.736	- 5	0.881	35	1.042	75	1.219	115	1.412
- 44	0.739	- 4	0.885	36	1.046	76	1.223	116	1.417
- 43	0.743	- 3	0.889	37	1.050	77	1.228	117	1.422
- 42	0.746	- 2	0.892	38	1.054	78	1.232	118	1.427
- 41	0.749	- 1	0.896	39	1.059	79	1.237	119	1.432
- 40	0.753	0	0.900	40	1.063	80	1.242	120	1.437
- 39	0.756	1	0.904	41	1.067	81	1.246	121	1.442
- 38	0.760	2	0.908	42	1.071	82	1.251	122	1.448
- 37	0.763	3	0.912	43	1.076	83	1.256	123	1.453
- 36	0.767	4	0.916	44	1.080	84	1.261	124	1.458
- 35	0.771	5	0.920	45	1.084	85	1.265	125	1.463
- 34	0.774	6	0.924	46	1.089	86	1.270	126	1.468
- 33	0.778	7	0.927	47	1.093	87	1.275	127	1.473
- 32	0.781	8	0.931	48	1.097	88	1.280	128	1.478
- 31	0.785	9	0.935	49	1.102	89	1.284	129	1.484
- 30	0.788	10	0.939	50	1.106	90	1.289	130	1.489
- 29	0.792	11	0.943	51	1.110	91	1.294	131	1.494
- 28	0.796	12	0.947	52	1.115	92	1.299	132	1.499
- 27	0.799	13	0.951	53	1.119	93	1.303	133	1.505
- 26	0.803	14	0.955	54	1.124	94	1.308	134	1.510
- 25	0.806	15	0.959	55	1.128	95	1.313	135	1.515
- 24	0.810	16	0.963	56	1.133	96	1.318	136	1.520
- 23	0.814	17	0.967	57	1.137	97	1.323	137	1.526
- 22	0.817	18	0.971	58	1.141	98	1.328	138	1.531
- 21	0.821	19	0.975	59	1.146	99	1.333	139	1.536

**RATIO FORMULA**

$$R_T = R_{25} \times (9.0014 \times 10^{-1} + 3.87235 \times 10^{-3} (\text{°C})^{-1} \times T + 4.86825 \times 10^{-6} (\text{°C})^{-2} \times T^2 + 1.37559 \times 10^{-9} (\text{°C})^{-3} \times T^3)$$

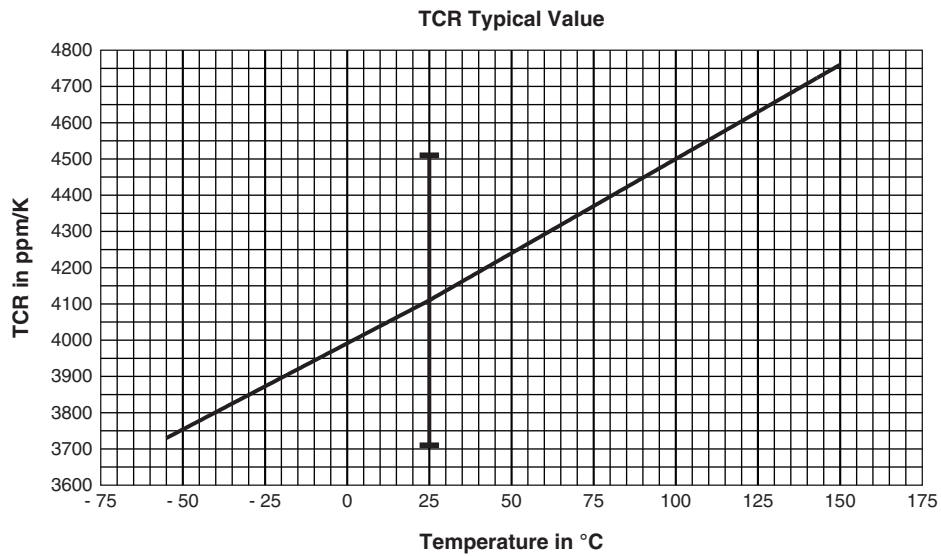
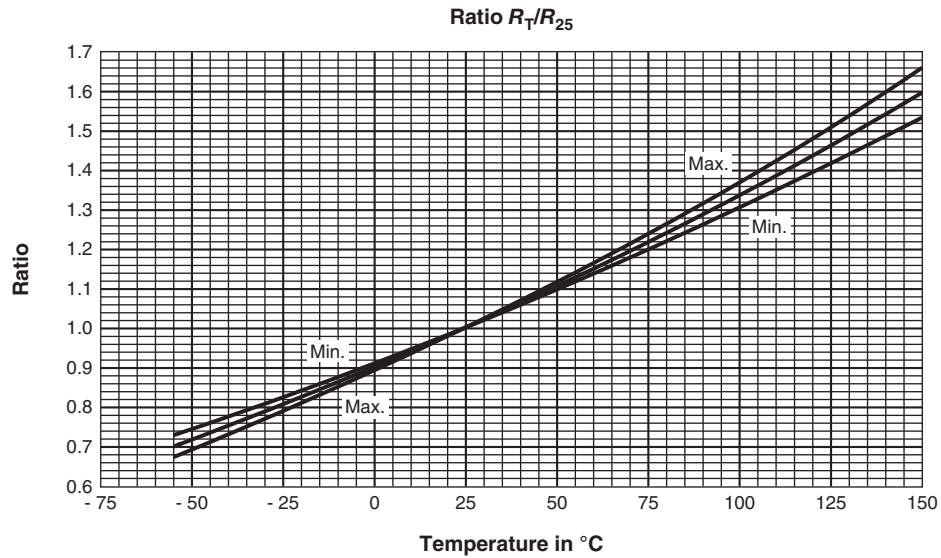
$$T(\text{°C}) = 28.54 \times (R_T/R_{25})^3 - 158.5 \times (R_T/R_{25})^2 + 474.8 \times (R_T/R_{25}) - 319.85$$

RATIO TOLERANCES		
LOW TEMP.	HIGH TEMP.	TOL.
- 55 °C	+ 150 °C	± 4 %
- 40 °C	+ 125 °C	± 3 %
- 20 °C	+ 85 °C	± 2 %
0 °C	+ 55 °C	± 1 %
+ 12 °C	+ 40 °C	± 0.5 %

**Ratio Tolerance Examples:**

At 40 °C, ratio = 1.063 ± 0.5 % (0.005)  
so, ratio = 1.058 to 1.068

At 125 °C, ratio = 1.460 ± 3 % (0.044)  
so, ratio = 1.416 to 1.504





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