

NTC Thermistors, Naked Chips



FEATURES

- Accurate over a wide temperature range
- High stability (tolerance on B-value between $\pm 2.5\%$ and $\pm 0.75\%$) over a long life
- Excellent price/performance ratio
- For mechanical fixing in a housing or soldering directly to 'non-standard' leads

APPLICATIONS

- Temperature sensing and control.

DESCRIPTION

These thermistors have a negative temperature coefficient. The device consists of a silver metallized square chip.

PACKAGING

The naked chips are placed in sealed polythene bags and packed in cardboard boxes. The smallest packaging quantity is 5000 units.

MOUNTING

By reflow or wave soldering in any position or mechanical fixing.

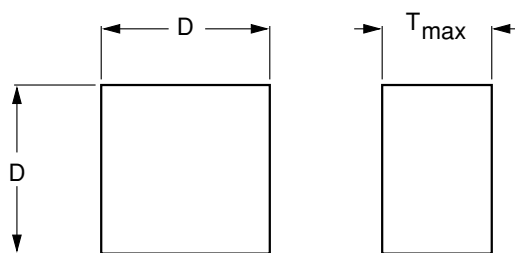
The use of ultrasonic soldering is **not** recommended.

QUICK REFERENCE DATA	
PARAMETER	VALUE
Resistance value at 25 °C (R_{25})	2.2 to 470 k Ω
Tolerance on R_{25} -value	$\pm 1\%$; $\pm 2\%$; $\pm 3\%$; $\pm 5\%$
$B_{25/85}$ -value	3740 to 4570 K
Tolerance on $B_{25/85}$ -value	$\pm 2.5\%$ to $\pm 0.75\%$
Climatic category	40/125/56
Operating temperature range: at zero dissipation (continuously) for short periods at maximum dissipation	-40 to +125 °C ≤ 150 °C 0 to +55 °C
Mass	see Electrical Data and Ordering Information table

ELECTRICAL DATA AND ORDERING INFORMATION							
R_{25} (Ω)	TC (%/K)	MASS (g)	D (mm)	T_{max} (mm)	$B_{25/85}$		CATALOG NUMBER 2322 640 ⁽¹⁾
					K	TOL. (%)	
2200	4.37	0.016	2.3 \pm 0.4	1.3	3977	± 0.75	0.222
2700	4.37	0.014	2.3 \pm 0.4		3977	± 0.75	0.272
3300	4.37	0.011	2.0 \pm 0.4		3977	± 0.75	0.332
4700	4.37	0.008	2.0 \pm 0.4		3977	± 0.75	0.472
5000	4.37	0.008	2.0 \pm 0.4		3977	± 0.75	0.502
6000	4.37	0.008	2.0 \pm 0.4		3977	± 0.75	0.602
6800	4.37	0.011	2.0 \pm 0.4		3977	± 0.75	0.682
8000	4.37	0.011	2.0 \pm 0.4		3977	± 0.75	0.802
10000	4.37	0.016	2.0 \pm 0.4		3977	± 0.75	0.103
12000	4.10	0.014	2.0 \pm 0.4		3740	± 2.0	0.123
15000	4.10	0.011	2.0 \pm 0.4		3740	± 2.0	0.153
22000	4.10	0.008	2.0 \pm 0.4		3740	± 2.0	0.223
33000	4.46	0.011	2.0 \pm 0.4		4090	± 1.5	0.333
47000	4.46	0.016	2.0 \pm 0.4		4090	± 1.5	0.473
68000	4.57	0.012	2.0 \pm 0.4		4190	± 1.5	0.683
100000	4.57	0.008	2.0 \pm 0.4		4190	± 1.5	0.104
150000	4.75	0.011	2.0 \pm 0.4		4370	± 2.5	0.154
220000	4.75	0.008	2.0 \pm 0.4		4370	± 2.5	0.224
330000	4.95	0.014	2.0 \pm 0.4		4570	± 1.5	0.334
470000	4.95	0.014	2.0 \pm 0.4		4570	± 1.5	0.474

Note

1. Replace dot in last 5 digits of catalog number, by a number according to the following list and depending on tolerance on required R_{25} -value:
 - a) 5 for a tolerance of $\pm 1\%$.
 - b) 4 for a tolerance of $\pm 2\%$.
 - c) 6 for a tolerance of $\pm 3\%$.
 - d) 3 for a tolerance of $\pm 5\%$.
2. R_{25} -values, TC, mass, dimensions and catalog numbers

DIMENSIONS in millimeters

Component outline.

For dimensions see Electrical Data and Ordering Information Table.

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES							
T_{oper} (°C)	R_T/R_{25}	ΔR DUE TO B-TOLERANCE (%)	TC (%/K)	R_{25} (k Ω)			
				2322 640 (see Electrical Data and Ordering Information table, note 1)			
				0.222	0.272	0.332	0.472
-40	33.21	2.66	6.57	73.06	89.67	109.6	156.1
-35	23.99	2.41	6.36	52.78	64.77	79.17	112.8
-30	17.52	2.17	6.15	38.55	47.31	57.82	82.35
-25	12.93	1.94	5.95	28.44	34.91	42.67	60.77
-20	9.636	1.71	5.76	21.20	26.02	31.80	45.30
-15	7.250	1.50	5.58	15.95	19.58	23.93	34.08
-10	5.505	1.29	5.40	12.11	14.86	18.16	25.87
-5	4.216	1.08	5.24	9.275	11.38	13.91	19.81
0	3.255	0.89	5.08	7.162	8.790	10.74	15.30
5	2.534	0.70	4.92	5.575	6.842	8.362	11.91
10	1.987	0.52	4.78	4.372	5.366	6.558	9.340
15	1.570	0.34	4.64	3.454	4.239	5.181	7.378
20	1.249	0.17	4.50	2.747	3.372	4.121	5.869
25	1.000	0.00	4.37	2.200	2.700	3.300	4.700
30	0.8059	0.16	4.25	1.773	2.176	2.660	3.788
35	0.6535	0.32	4.13	1.438	1.764	2.156	3.072
40	0.5330	0.47	4.02	1.173	1.439	1.759	2.505
45	0.4372	0.62	3.91	0.9618	1.180	1.443	2.055
50	0.3605	0.77	3.80	0.7932	0.973	1.190	1.694
55	0.2989	0.91	3.70	0.6575	0.807	0.9863	1.405
60	0.2490	1.05	3.60	0.5478	0.672	0.8217	1.170
65	0.2084	1.18	3.51	0.4586	0.562	0.6879	0.9797
70	0.1753	1.31	3.42	0.3857	0.473	0.5785	0.8239
75	0.1481	1.44	3.33	0.3258	0.399	0.4887	0.6960
80	0.1256	1.57	3.25	0.2764	0.339	0.4146	0.5905
85	0.1070	1.69	3.16	0.2355	0.289	0.3532	0.5031
90	0.09154	1.81	3.09	0.2014	0.247	0.3021	0.4303
95	0.07860	1.93	3.01	0.1729	0.212	0.2594	0.3694
100	0.06773	2.04	2.94	0.1490	0.182	0.2235	0.3183
105	0.05858	2.15	2.87	0.1289	0.158	0.1933	0.2753
110	0.05083	2.26	2.80	0.1118	0.137	0.1677	0.2389
115	0.04426	2.37	2.73	0.0974	0.1195	0.1461	0.2080
120	0.03866	2.47	2.67	0.0851	0.1044	0.1276	0.1817
125	0.03387	2.57	2.61	0.0745	0.0915	0.1118	0.1592
130	0.02977	2.67	2.55	0.0655	0.0804	0.0982	0.1399
135	0.02624	2.77	2.49	0.0577	0.0709	0.0866	0.1233
140	0.02319	2.86	2.43	0.0510	0.0626	0.0765	0.1090
145	0.02055	2.96	2.38	0.0452	0.0555	0.0678	0.0966
150	0.01826	3.05	2.33	0.0402	0.0493	0.0603	0.0858



RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES								
T _{oper} (°C)	R _T /R ₂₅	ΔR DUE TO B-TOLERANCE (%)	TC (%/K)	R ₂₅ (kΩ)				
				2322 640 (see Electrical Data and Ordering Information table, note 1)				
				0.502	0.602	0.682	0.802	0.103
-40	33.21	2.66	6.57	166.1	199.3	225.8	265.7	332.1
-35	23.99	2.41	6.36	120.0	143.9	163.1	191.9	240.0
-30	17.52	2.17	6.15	87.60	105.1	119.1	140.2	175.2
-25	12.93	1.94	5.95	64.65	77.57	87.92	103.4	129.3
-20	9.636	1.71	5.76	48.18	57.82	65.53	77.09	96.36
-15	7.250	1.50	5.58	36.25	43.50	49.30	58.00	72.50
-10	5.505	1.29	5.40	27.52	33.03	37.43	44.04	55.05
-5	4.216	1.08	5.24	21.08	25.30	28.67	33.73	42.16
0	3.255	0.89	5.08	16.28	19.53	22.14	26.04	32.56
5	2.534	0.70	4.92	12.67	15.20	17.23	20.27	25.34
10	1.987	0.52	4.78	9.936	11.92	13.51	15.90	19.87
15	1.570	0.34	4.64	7.849	9.419	10.67	12.56	15.70
20	1.249	0.17	4.50	6.244	7.493	8.492	9.990	12.49
25	1.000	0.00	4.37	5.000	6.000	6.800	8.000	10.00
30	0.8059	0.16	4.25	4.030	4.836	5.480	6.447	8.059
35	0.6535	0.32	4.13	3.267	3.921	4.444	5.228	6.535
40	0.5330	0.47	4.02	2.665	3.198	3.624	4.264	5.330
45	0.4372	0.62	3.91	2.186	2.623	2.972	3.497	4.372
50	0.3605	0.77	3.80	1.803	2.163	2.451	2.884	3.606
55	0.2989	0.91	3.70	1.494	1.793	2.032	2.391	2.989
60	0.2490	1.05	3.60	1.245	1.494	1.693	1.992	2.490
65	0.2084	1.18	3.51	1.042	1.251	1.417	1.668	2.084
70	0.1753	1.31	3.42	0.8765	1.052	1.192	1.402	1.753
75	0.1481	1.44	3.33	0.7405	0.8886	1.007	1.185	1.481
80	0.1256	1.57	3.25	0.6282	0.7538	0.8544	1.005	1.256
85	0.1070	1.69	3.16	0.5352	0.6422	0.7278	0.8563	1.070
90	0.09154	1.81	3.09	0.4577	0.5493	0.6225	0.7324	0.9154
95	0.07860	1.93	3.01	0.3930	0.4716	0.5345	0.6288	0.7860
100	0.06773	2.04	2.94	0.3387	0.4064	0.4607	0.5419	0.6773
105	0.05858	2.15	2.87	0.2929	0.3515	0.3983	0.4686	0.5858
110	0.05083	2.26	2.80	0.2542	0.3050	0.3457	0.4067	0.5083
115	0.04426	2.37	2.73	0.2213	0.2656	0.3010	0.3541	0.4426
120	0.03866	2.47	2.67	0.1933	0.2320	0.2629	0.3093	0.3866
125	0.03387	2.57	2.61	0.1694	0.2032	0.2303	0.2710	0.3387
130	0.02977	2.67	2.55	0.1488	0.1786	0.2024	0.2382	0.2977
135	0.02624	2.77	2.49	0.1312	0.1574	0.1784	0.2099	0.2624
140	0.02319	2.86	2.43	0.1160	0.1391	0.1577	0.1855	0.2319
145	0.02055	2.96	2.38	0.1028	0.1233	0.1398	0.1644	0.2055
150	0.01826	3.05	2.33	0.0913	0.1096	0.1242	0.1461	0.1826

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES						
T _{oper} (°C)	R _T /R ₂₅	ΔR DUE TO B-TOLERANCE (%)	TC (%/K)	R ₂₅ (kΩ)		
				2322 640 (see Electrical Data and Ordering Information table, note 1)		
				0.123	0.153	0.223
-40	25.78	6.81	6.09	309.4	386.8	567.2
-35	19.13	6.16	5.89	229.5	286.9	420.8
-30	14.32	5.53	5.70	171.8	214.8	315.0
-25	10.82	4.93	5.52	129.8	162.3	238.0
-20	8.245	4.35	5.35	98.93	123.7	181.4
-15	6.335	3.80	5.19	76.02	95.03	139.4
-10	4.907	3.26	5.03	58.88	73.60	107.9
-5	3.830	2.74	4.88	45.95	57.44	84.25
0	3.011	2.24	4.73	36.13	45.16	66.24



T _{oper} (°C)	R _T /R ₂₅	ΔR DUE TO B-TOLERANCE (%)	TC (%/K)	R ₂₅ (kΩ)		
				2322 640 (see Electrical Data and Ordering Information table, note 1)		
				0.123	0.153	0.223
5	2.384	1.76	4.60	28.60	35.76	52.45
10	1.900	1.30	4.46	22.80	28.50	41.81
15	1.525	0.85	4.34	18.30	22.87	33.55
20	1.231	0.42	4.21	14.77	18.47	27.09
25	1.000	0.00	4.10	12.00	15.00	22.00
30	0.8170	0.41	3.98	9.804	12.26	17.97
35	0.6712	0.80	3.88	8.054	10.07	14.77
40	0.5543	1.19	3.77	6.652	8.315	12.20
45	0.4602	1.57	3.67	5.522	6.903	10.12
50	0.3839	1.94	3.57	4.607	5.759	8.447
55	0.3219	2.30	3.48	3.862	4.828	7.081
60	0.2710	2.65	3.39	3.252	4.067	5.963
65	0.2293	2.99	3.30	2.751	3.439	5.044
70	0.1947	3.33	3.22	2.337	2.921	4.284
75	0.1661	3.66	3.14	1.993	2.492	3.654
80	0.1422	3.98	3.06	1.707	2.134	3.129
85	0.1223	4.29	2.99	1.467	1.834	2.690
90	0.1055	4.60	2.92	1.266	1.583	2.321
95	0.09135	4.90	2.85	1.096	1.370	2.010
100	0.07937	5.19	2.78	0.9524	1.190	1.746
105	0.06919	5.48	2.71	0.8302	1.038	1.522
110	0.06050	5.76	2.65	0.7260	0.9075	1.331
115	0.05307	6.04	2.59	0.6369	0.7961	1.168
120	0.04670	6.31	2.53	0.5604	0.7005	1.027
125	0.04121	6.57	2.47	0.4945	0.6181	0.9065

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES

T _{oper} (°C)	R _T /R ₂₅	ΔR DUE TO B-TOLERANCE (%)	TC (%/K)	R ₂₅ (kΩ)	
				2322 640 (see Electrical Data and Ordering Information table, note 1)	
				0.333	0.473
-40	33.81	5.55	6.55	1116	1589
-35	24.50	5.02	6.34	808.6	1151
-30	17.93	4.52	6.15	591.7	842.8
-25	13.25	4.03	5.96	437.1	622.6
-20	9.875	3.56	5.78	325.9	464.1
-15	7.425	3.10	5.61	245.0	349.0
-10	5.630	2.67	5.45	185.8	264.6
-5	4.304	2.24	5.29	142.0	202.3
0	3.315	1.84	5.14	109.4	155.8
5	2.573	1.44	4.99	84.91	120.9
10	2.011	1.07	4.85	66.37	94.53
15	1.583	0.70	4.72	52.24	74.40
20	1.254	0.34	4.59	41.39	58.95
25	1.000	0.00	4.46	33.00	47.00
30	0.8024	0.33	4.34	26.47	37.71
35	0.6474	0.66	4.23	21.37	30.43
40	0.5255	0.98	4.12	17.34	24.70
45	0.4288	1.28	4.01	14.15	20.15
50	0.3518	1.59	3.91	11.61	16.53
55	0.2901	1.88	3.81	9.572	13.63
60	0.2403	2.17	3.71	7.931	11.30
65	0.2001	2.45	3.62	6.603	9.404
70	0.1674	2.72	3.53	5.522	7.865
75	0.1406	2.99	3.44	4.639	6.607
80	0.1186	3.25	3.36	3.913	5.573



T _{oper} (°C)	R _T /R ₂₅	ΔR DUE TO B-TOLERANCE (%)	TC (%/K)	R ₂₅ (kΩ)	
				2322 640 (see Electrical Data and Ordering Information table, note 1)	
				0.333	0.473
85	0.1004	3.51	3.28	3.315	4.721
90	0.08542	3.76	3.20	2.819	4.015
95	0.07292	4.00	3.13	2.406	3.427
100	0.06248	4.24	3.06	2.062	2.936
105	0.05372	4.47	2.98	1.773	2.525
110	0.04635	4.70	2.92	1.530	2.179
115	0.04013	4.93	2.85	1.342	1.886
120	0.03485	5.15	2.79	1.150	1.638
125	0.03037	5.36	2.73	1.002	1.427
130	0.02654	5.57	2.67	0.8757	1.247
135	0.02326	5.78	2.61	0.7675	1.093
140	0.02044	5.98	2.55	0.6746	0.9608
145	0.01802	6.18	2.50	0.5945	0.8468
150	0.01592	6.37	2.44	0.5254	0.7483

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES

T _{oper} (°C)	R _T /R ₂₅	ΔR DUE TO B-TOLERANCE (%)	TC (%/K)	R ₂₅ (kΩ)	
				2322 640 (see Electrical Data and Ordering Information table, note 1)	
				0.683	0.104
-40	36.66	5.69	6.70	2493	3666
-35	26.38	5.15	6.49	1794	2638
-30	19.17	4.63	6.29	1303	1917
-25	14.06	4.13	6.10	956.2	1406
-20	10.41	3.65	5.92	708.0	1041
-15	7.779	3.18	5.74	528.9	777.9
-10	5.861	2.73	5.57	398.5	586.1
-5	4.453	2.30	5.41	302.8	445.3
0	3.409	1.88	5.26	231.8	340.9
5	2.631	1.48	5.11	178.9	263.1
10	2.044	1.09	4.97	139.0	204.4
15	1.600	0.72	4.83	108.8	160.0
20	1.261	0.35	4.70	85.74	126.1
25	1.000	0.00	4.57	68.00	100.0
30	0.7981	0.34	4.45	54.27	79.81
35	0.6408	0.67	4.35	43.57	64.08
40	0.5175	1.00	4.22	35.19	51.74
45	0.4202	1.32	4.11	28.57	42.02
50	0.3431	1.63	4.00	23.33	34.31
55	0.2816	1.93	3.90	19.15	28.16
60	0.2322	2.22	3.80	15.79	23.22
65	0.1925	2.51	3.71	13.09	19.25
70	0.1602	2.79	3.62	10.90	16.03
75	0.1340	3.06	3.53	9.114	13.40
80	0.1126	3.33	3.45	7.655	11.26
85	0.09496	3.59	3.36	6.457	9.496
90	0.08042	3.85	3.28	5.469	8.042
95	0.06837	4.10	3.21	4.649	6.837
100	0.05835	4.35	3.13	3.968	5.835
105	0.04998	4.59	3.06	3.399	4.998
110	0.04296	4.82	2.99	2.921	4.296
115	0.03705	5.05	2.92	2.519	3.705
120	0.03206	5.28	2.86	2.180	3.206
125	0.02783	5.50	2.80	1.892	2.783



RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES					
T_{oper} (°C)	R_T/R_{25}	ΔR DUE TO B-TOLERANCE (%)	TC (%/K)	R_{25} (k Ω)	
				2322 640 (see Electrical Data and Ordering Information table, note 1)	
				0.154	0.224
-40	41.02	10.10	6.89	6153	9024
-35	29.29	9.12	6.68	4394	6444
-30	21.12	8.18	6.48	3168	4646
-25	15.37	7.28	6.29	2305	3381
-20	11.28	6.42	6.11	1693	2483
-15	8.358	5.59	5.93	1254	1839
-10	6.242	4.80	5.76	936.4	1373
-5	4.700	4.03	5.60	705.0	1034
0	3.567	3.30	5.44	535.0	784.7
5	2.727	2.59	5.29	409.1	600.0
10	2.101	1.90	5.15	315.1	462.1
15	1.629	1.25	5.01	244.4	358.4
20	1.272	0.61	4.88	190.8	279.9
25	1.000	0.00	4.75	150.0	220.0
30	0.7910	0.59	4.62	118.6	174.0
35	0.6295	1.18	4.51	94.42	138.5
40	0.5039	1.74	4.39	75.58	110.9
45	0.4056	2.30	4.28	60.85	89.24
50	0.3283	2.84	4.17	49.25	72.24
55	0.2672	3.37	4.07	40.08	58.78
60	0.2185	3.89	3.97	32.78	48.08
65	0.1796	4.40	3.87	26.94	39.51
70	0.1483	4.90	3.78	22.25	32.63
75	0.1231	5.39	3.69	18.46	27.07
80	0.1025	5.86	3.60	15.38	22.56
85	0.08582	6.33	3.52	12.87	18.88
90	0.07213	6.79	3.44	10.82	15.87
95	0.06086	7.24	3.36	9.129	13.39
100	0.05155	7.68	3.28	7.732	11.34
105	0.04383	8.11	3.21	6.574	9.642
110	0.03740	8.53	3.14	5.610	8.228
115	0.03203	8.94	3.07	4.804	7.046
120	0.02752	9.35	3.00	4.128	6.054
125	0.02372	9.75	2.94	3.559	5.219

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES					
T_{oper} (°C)	R_T/R_{25}	ΔR DUE TO B-TOLERANCE (%)	TC (%/K)	R_{25} (k Ω)	
				2322 640 (see Electrical Data and Ordering Information table, note 1)	
				0.334	0.474
-40	48.62	6.22	7.13	16044	22850
-35	34.19	5.63	6.91	11282	16068
-30	24.28	5.06	6.71	8013	11413
-25	17.42	4.51	6.52	5747	8185
-20	12.61	3.98	6.33	4161	5926
-15	9.211	3.47	6.15	3040	4329
-10	6.788	2.98	5.98	2240	3190
-5	5.045	2.51	5.82	1665	2371
0	3.781	2.06	5.66	1248	1776
5	2.855	1.62	5.50	942.3	1342
10	2.173	1.19	5.36	717.1	1021
15	1.666	0.78	5.22	549.8	783.0



T _{oper} (°C)	R _T /R ₂₅	ΔR DUE TO B-TOLERANCE (%)	TC (%/K)	R ₂₅ (kΩ)	
				2322 640 (see Electrical Data and Ordering Information table, note 1)	
				0.334	0.474
20	1.286	0.38	5.08	424.5	604.6
25	1.000	0.00	4.95	330.0	470.0
30	0.7825	0.37	4.82	258.2	367.8
35	0.6163	0.74	4.70	203.4	289.6
40	0.4883	1.09	4.59	161.1	229.5
45	0.3892	1.44	4.47	128.4	182.9
50	0.3120	1.77	4.36	103.0	146.7
55	0.2515	2.10	4.26	83.00	118.2
60	0.2038	2.43	4.15	67.26	95.80
65	0.1660	2.74	4.06	54.79	78.03
70	0.1359	3.05	3.96	44.86	63.88
75	0.1118	3.35	3.87	36.90	52.55
80	0.09240	3.64	3.78	30.49	43.43
85	0.07670	3.93	3.69	25.31	36.05
90	0.06395	4.21	3.61	21.10	30.06
95	0.05354	4.48	3.53	17.67	25.16
100	0.04501	4.75	3.45	14.85	21.15
105	0.03798	5.01	3.37	12.53	17.85
110	0.03218	5.27	3.30	10.70	15.12
115	0.02736	5.52	3.23	9.029	12.86
120	0.02335	5.77	3.16	7.704	10.97
125	0.01999	6.01	3.09	6.597	9.396