

Surface Mount, NTC Thermistors



FEATURES

- High sensitivity
- High accuracy over a wide temperature range
- Suitable for wave or reflow soldering
- NiSn terminations
- Fully glass coated

APPLICATIONS

- Temperature compensation, sensing and protection in, for example:
 - Battery chargers
 - Consumer equipment
 - Office equipment

DESCRIPTION

Size 0805 chip thermistors with a negative temperature coefficient. The device has no marking.

PACKAGING

Available in 8 mm punched paper tape on reel package of 4000 units.

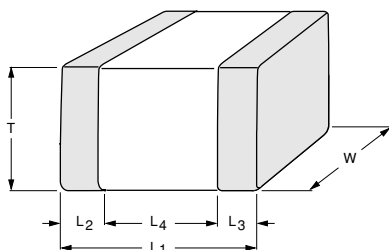
QUICK REFERENCE DATA

PARAMETER	VALUE
Resistance value at 25 °C	2.2 kΩ to 470 kΩ
Tolerance on R ₂₅ -value	±2%; ±3%; ±5%; ±10%
Tolerance on B _{25/85} -value	see table below
Maximum dissipation at 25 °C	210 mW
Thermal time constant τ	≈8 s
Operating temperature range	–40 to +150 °C
R/T values	see tables
Climatic category	40/125/56
Mass	≈0.0095 g

ELECTRICAL DATA AND ORDERING INFORMATION

R ₂₅ (kΩ)	B _{25/85} -VALUE (K)	TOLERANCE ON B _{25/85} (%)	CATALOG NUMBER 2322 615 5....			
			±2% TOL. ON R ₂₅	±3% TOL. ON R ₂₅	±5% TOL. ON R ₂₅	±10% TOL. ON R ₂₅
2.2	3600	±1	4222	6222	3222	2222
4.7	3500	±1	4472	6472	3472	2472
10	3570	±3	4103	6103	3103	2103
15	3700	±1	4153	6153	3153	2153
22	3800	±1	4223	6223	3223	2223
33	3920	±1	4333	6333	3333	2333
47	3960	±1	4473	6473	3473	2473
68	4100	±1	4683	6683	3683	2683
100	4100	±1	4104	6104	3104	2104
330	3930	±1	4334	6334	3334	2334
470	4025	±1	4474	6474	3474	2474

Note: R₂₅ - values, B_{25/85} - values and catalog numbers. See Resistance Values Tables.

DIMENSIONS in millimeters

L ₁	W	T	L ₂ and L ₃ MIN.	L ₄ MIN.
2.0 ±0.2	1.25 ±0.15	0.8 ±0.15	0.2	0.55

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R₂₅ AT 2.2 KΩ

T _{oper} (°C)	CATALOG NUMBER 2322 615 5.222		
	R _T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
-40	57658	-6.26	7.58
-35	42410	-6.03	6.83
-30	31537	-5.82	6.13
-25	23698	-5.61	5.45
-20	17986	-5.42	4.80
-15	13782	-5.23	4.18
-10	10657	-5.06	3.58
-5	8312	-4.89	3.01
0	6537	-4.72	2.46
5	5182	-4.57	1.93
10	4139	-4.42	1.42
15	3330	-4.28	0.93
20	2698	-4.14	0.46
25	2200	-4.02	0.00
30	1805	-3.89	0.22
35	1491	-3.77	0.43
40	1238	-3.66	0.64
45	1034	-3.55	0.84
50	868	-3.45	1.03
55	732	-3.35	1.22
60	621.0	-3.25	1.40
65	529.0	-3.16	1.58
70	452.7	-3.07	1.75
75	389.1	-2.99	1.92
80	335.8	-2.90	2.08
85	291.0	-2.83	2.23
90	253.2	-2.75	2.54
95	221.0	-2.68	2.85
100	193.7	-2.61	3.14
105	170.3	-2.54	3.43
110	150.2	-2.48	3.71
115	132.9	-2.41	3.98
120	118.0	-2.35	4.24
125	105.0	-2.20	4.50
130	93.80	-2.24	4.76
135	83.94	-2.19	5.00
140	75.35	-2.13	5.25
145	67.81	-2.08	5.48
150	61.17	-2.04	5.71

**RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 4.7 K Ω**

T_{oper} (°C)	CATALOG NUMBER 2322 615 5.472		
	R_T (Ω)	TC (%/K)	$\Delta R/R$ DUE TO B-TOLERANCE (%)
-40	101275	-5.75	7.58
-35	76325	-5.57	6.83
-30	58034	-5.39	6.13
-25	44505	-5.22	5.45
-20	434413	-5.06	4.80
-15	26821	-4.91	4.18
-10	21065	-7.76	3.58
-5	16667	-4.61	3.01
0	13280	-4.47	2.46
5	10654	-4.34	1.93
10	8603	-4.21	1.42
15	6991	-4.09	0.93
20	5716	-3.97	0.46
25	4700	-3.86	0.00
30	3887	-3.75	0.22
35	3231	-3.64	0.43
40	2700	-3.54	0.64
45	2268	-3.44	0.84
50	1914	-3.35	1.03
55	1623	-3.26	1.22
60	1381.7	-3.17	1.40
65	1181.7	-3.09	1.58
70	1014.7	-3.01	1.75
75	874.8	-2.93	1.92
80	757.1	-2.85	2.08
85	657.7	-2.78	2.23
90	573.3	-2.71	2.54
95	501.5	-2.64	2.85
100	440.1	-2.58	3.14
105	387.5	-2.52	3.43
110	342.2	-2.46	3.71
115	303.1	-2.40	3.98
120	269.2	-2.34	4.24
125	239.8	-2.29	4.50
130	214.2	-2.23	4.76
135	191.82	-2.18	5.00
140	172.20	-2.13	5.25
145	154.96	-2.09	5.48
150	139.78	-2.04	5.71

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 10 K Ω

T_{oper} (°C)	CATALOG NUMBER 2322 615 5.103		
	R_T (Ω)	TC (%/K)	$\Delta R/R$ DUE TO B-TOLERANCE (%)
-40	232634	-5.92	11.22
-35	173538	-5.71	10.14
-30	130769	-5.51	9.10
-25	99489	-5.33	8.11
-20	76385	-5.15	7.15
-15	59157	-4.98	6.24
-10	46194	-4.82	5.35
-5	36356	-4.67	4.50
0	28829	-4.52	3.68

T _{oper} (°C)	CATALOG NUMBER 2322 615 5.103		
	R _T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
5	23025	-4.38	2.89
10	18515	-4.25	2.13
15	14986	-4.12	1.40
20	12205	-4.00	0.69
25	10000	-3.88	0.00
30	8240	-3.77	0.66
35	6827	-3.66	1.31
40	5687	-3.56	1.93
45	4760	-3.46	2.53
50	4004.16	-3.37	3.11
55	3383.77	-3.28	3.68
60	2872.26	-3.19	4.23
65	2448.52	-3.11	4.76
70	2095.90	-3.03	5.28
75	1801.17	-2.95	5.78
80	1553.80	-2.88	6.27
85	1345.33	-2.81	6.74
90	1168.95	-2.74	7.20
95	1019.16	-2.67	7.65
100	891.48	-2.61	8.09
105	782.28	-2.54	8.51
110	688.56	-2.48	8.93
115	607.85	-2.43	9.33
120	538.14	-2.37	9.73
125	477.73	-2.32	10.11
130	425.24	-2.26	10.48
135	379.49	-2.21	10.85
140	339.51	-2.17	11.20
145	304.47	-2.12	11.55
150	273.69	-2.07	11.89

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R ₂₅ AT 15 KΩ			
T _{oper} (°C)	CATALOG NUMBER 2322 615 5.153		
	R _T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
-40	391251	-6.14	11.22
-35	289245	-5.94	10.14
-30	215960	-5.75	9.10
-25	162779	-5.56	8.11
-20	123815	-5.38	7.15
-15	95001	-5.21	6.24
-10	73505	-5.05	5.35
-5	57329	-4.89	4.50
0	45058	-4.74	3.68
5	35674	-4.60	2.89
10	28445	-4.46	2.13
15	22834	-4.33	1.40
20	18450	-4.20	0.69
25	15000	-4.08	0.00
30	12268	-3.96	0.66
35	10092	-3.85	1.31
40	8347	-3.74	1.93
45	6941	-3.64	2.53
50	5801.08	-3.54	3.11



T _{oper} (°C)	CATALOG NUMBER 2322 615 5.153		
	R _T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
55	4872.07	-3.44	3.68
60	4111.09	-3.35	4.23
65	3484.70	-3.26	4.76
70	2966.62	-3.18	5.28
75	2536.16	-3.09	5.78
80	2176.92	-3.02	6.27
85	1875.84	-2.94	6.74
90	1622.46	-2.87	7.20
95	1408.39	-2.79	7.65
100	1226.82	-2.73	8.09
105	1072.25	-2.66	8.51
110	940.20	-2.60	8.93
115	827.00	-2.54	9.33
120	729.62	-2.48	9.73
125	645.60	-2.42	10.11
130	572.86	-2.36	10.48
135	509.71	-2.31	10.85
140	454.71	-2.26	11.20
145	406.69	-2.21	11.55
150	364.64	-2.16	11.89

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R₂₅ AT 22 KΩ

T _{oper} (°C)	CATALOG NUMBER 2322 615 5.223		
	R _T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
-40	—	—	11.22
-35	—	—	10.14
-30	—	—	9.10
-25	—	—	8.11
-20	—	—	7.15
-15	—	—	6.24
-10	—	—	5.35
-5	—	—	4.50
0	—	—	3.68
5	—	—	2.89
10	—	—	2.13
15	—	—	1.40
20	—	—	0.69
25	—	—	0.00
30	—	—	0.66
35	—	—	1.31
40	—	—	1.93
45	—	—	2.53
50	—	—	3.11
55	—	—	3.68
60	—	—	4.23
65	—	—	4.76
70	—	—	5.28
75	—	—	5.78
80	—	—	6.27
85	—	—	6.74
90	—	—	7.20
95	—	—	7.65
100	—	—	8.09



T_{oper} (°C)	CATALOG NUMBER 2322 615 5.223		
	R_T (Ω)	TC (%/K)	$\Delta R/R$ DUE TO B-TOLERANCE (%)
105	—	—	8.51
110	—	—	8.93
115	—	—	9.33
120	—	—	9.73
125	—	—	10.11
130	—	—	10.48
135	—	—	10.85
140	—	—	11.20
145	—	—	11.55
150	—	—	11.89

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 33 K Ω			
T_{oper} (°C)	CATALOG NUMBER 2322 615 5.333		
	R_T (Ω)	TC (%/K)	$\Delta R/R$ DUE TO B-TOLERANCE (%)
−40	1116205	−6.79	7.58
−35	800263	−6.53	6.83
−30	581009	−6.28	6.13
−25	426845	−6.05	5.45
−20	317101	−5.84	4.80
−15	238064	−5.63	4.18
−10	180512	−5.44	3.58
−5	138166	−5.26	3.01
0	106700	−5.08	2.46
5	83100	−4.92	1.93
10	65241	−4.76	1.42
15	51612	−4.61	0.93
20	41127	−4.47	0.46
25	33000	−4.34	0.00
30	26654	−4.21	0.22
35	21664	−4.08	0.43
40	17714	−3.97	0.64
45	14568	−3.86	0.84
50	12046	−3.75	1.03
55	10014	−3.65	1.22
60	8365.9	−3.55	1.40
65	7023.2	−3.45	1.58
70	5923.3	−3.36	1.75
75	5018.0	−3.27	1.92
80	4269.1	−3.19	2.08
85	3647.0	−3.11	2.23
90	3127.8	−3.03	2.54
95	2692.7	−2.96	2.85
100	2326.6	−2.89	3.14
105	2017.4	−2.82	3.43
110	1755.2	−2.75	3.71
115	1532.1	−2.69	3.98
120	1341.6	−2.63	4.24
125	1178.3	−2.57	4.50
130	1038.0	−2.51	4.76
135	916.94	−2.45	5.00
140	812.24	−2.40	5.25
145	721.40	−2.35	5.48
150	642.37	−2.30	5.71

**RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R₂₅ AT 47 K Ω**

T _{oper} (°C)	CATALOG NUMBER 2322 615 5.473		
	R _T (Ω)	TC (%/K)	$\Delta R/R$ DUE TO B-TOLERANCE (%)
-40	1521799	-6.60	7.58
-35	1100680	-6.37	6.83
-30	805081	-6.15	6.13
-25	595168	-5.94	5.45
-20	444453	-5.74	4.80
-15	335105	-5.56	4.18
-10	254976	-5.38	3.58
-5	195699	-5.21	3.01
0	151452	-5.05	2.46
5	118137	-4.89	1.93
10	92847	-4.74	1.42
15	73497	-4.60	0.93
20	58581	-4.47	0.46
25	47000	-4.34	0.00
30	37946	-4.22	0.22
35	30822	-4.10	0.43
40	25180	-3.99	0.64
45	20684	-3.88	0.84
50	17082	-3.78	1.03
55	14179	-3.68	1.22
60	11827.4	-3.58	1.40
65	9912.2	-3.49	1.58
70	8344.7	-3.40	1.75
75	7055.8	-3.31	1.92
80	5990.9	-3.23	2.08
85	5107.4	-3.15	2.23
90	4371.0	-3.08	2.54
95	3754.9	-3.00	2.85
100	3237.3	-2.93	3.14
105	2800.8	-2.86	3.43
110	2431.3	-2.80	3.71
115	2117.4	-2.73	3.98
120	1849.8	-2.67	4.24
125	1620.9	-2.61	4.50
130	1424.6	-2.55	4.76
135	1255.53	-2.50	5.00
140	1109.60	-2.44	5.25
145	983.22	-2.39	5.48
150	873.49	-2.34	5.71

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R₂₅ AT 68 K Ω

T _{oper} (°C)	CATALOG NUMBER 2322 615 5.683		
	R _T (Ω)	TC (%/K)	$\Delta R/R$ DUE TO B-TOLERANCE (%)
-40	2596437	-6.92	7.58
-35	1848208	-6.68	6.83
-30	1331164	-6.45	6.13
-25	969559	-6.23	5.45
-20	713753	-6.02	4.80
-15	530805	-5.82	4.18
-10	398593	-5.64	3.58
-5	302091	-5.45	3.01
0	230981	-5.28	2.46
5	178104	-5.12	1.93
10	138441	-4.96	1.42
15	108442	-4.81	0.93

T _{oper} (°C)	CATALOG NUMBER 2322 615 5.683		
	R _T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
20	85571	-4.67	0.46
25	68000	-4.53	0.00
30	54403	-4.40	0.22
35	43806	-4.27	0.43
40	35493	-4.15	0.64
45	28928	-4.03	0.84
50	23712.10	-3.92	1.03
55	19543.12	-3.81	1.22
60	16191.85	-3.71	1.40
65	13483.03	-3.61	1.58
70	11281.91	-3.52	1.75
75	9484.20	-3.43	1.92
80	8008.76	-3.34	2.08
85	6792.08	-3.25	2.23
90	5784.22	-3.17	2.54
95	4945.65	-3.09	2.85
100	4244.99	-3.02	3.14
105	3657.17	-2.94	3.43
110	3162.06	-2.87	3.71
115	2743.45	-2.81	3.98
120	2388.22	-2.74	4.24
125	2085.71	-2.68	4.50
130	1827.19	-2.62	4.76
135	1605.54	-2.56	5.00
140	1414.89	-2.50	5.25
145	1250.39	-2.44	5.48
150	1108.03	-2.39	5.71

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R₂₅ AT 100 KΩ

T _{oper} (°C)	CATALOG NUMBER 2322 615 5.104		
	R _T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
-40	3833689	-6.96	7.58
-35	2724206	-6.71	6.83
-30	1959612	-6.47	6.13
-25	1426014	-6.25	5.45
-20	1049150	-6.03	4.80
-15	779950	-5.83	4.18
-10	585575	-5.64	3.58
-5	443786	-5.45	3.01
0	339343	-5.28	2.46
5	261695	-5.11	1.93
10	203455	-4.96	1.42
15	159402	-4.81	0.93
20	125811	-4.66	0.46
25	100000	-4.52	0.00
30	80021	-4.39	0.22
35	64447	-4.27	0.43
40	52224	-4.15	0.64
45	42570	-4.03	0.84
50	34897	-3.92	1.03
55	28763	-3.81	1.22
60	23830	-3.71	1.40
65	19842.4	-3.61	1.58
70	16601.3	-3.52	1.75
75	13953.8	-3.43	1.92
80	11780.6	-3.34	2.08



T _{oper} (°C)	CATALOG NUMBER 2322 615 5.104		
	R _T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
85	9988.4	-3.26	2.23
90	8503.6	-3.18	2.54
95	7268.2	-3.10	2.85
100	6236.0	-3.03	3.14
105	5370.1	-2.95	3.43
110	4640.8	-2.88	3.71
115	4024.3	-2.82	3.98
120	3501.2	-2.75	4.24
125	3055.8	-2.69	4.50
130	2675.3	-2.63	4.76
135	2349.16	-2.57	5.00
140	2068.70	-2.51	5.25
145	1826.80	-2.46	5.48
150	1617.53	-2.41	5.71

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R₂₅ AT 330 KΩ

T _{oper} (°C)	CATALOG NUMBER 2322 615 5.334		
	R _T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
-40	10487886	-6.53	7.58
-35	7608431	-6.31	6.83
-30	5579063	-6.10	6.13
-25	4133083	-5.90	5.45
-20	3091952	-5.71	4.80
-15	2334781	-5.53	4.18
-10	1778826	-5.35	3.58
-5	1366860	-5.19	3.01
0	1058900	-5.03	2.46
5	826748	-4.87	1.93
10	650328	-4.73	1.42
15	515223	-4.59	0.93
20	410989	-4.45	0.46
25	330000	-4.33	0.00
30	266642	-4.20	0.22
35	216752	-4.08	0.43
40	177219	-3.97	0.64
45	145704	-3.86	0.84
50	120433.64	-3.76	1.03
55	100058.09	-3.66	1.22
60	83540.50	-3.56	1.40
65	70081.02	-3.47	1.58
70	59058.74	-3.38	1.75
75	49988.97	-3.29	1.92
80	42491.26	-3.21	2.08
85	36265.45	-3.13	2.23
90	31073.52	-3.05	2.54
95	26725.79	-2.98	2.85
100	23070.38	-2.91	3.14
105	19985.16	-2.84	3.43
110	17371.44	-2.77	3.71
115	15149.15	-2.71	3.98
120	13253.08	-2.64	4.24
125	11629.86	-2.58	4.50
130	10235.70	-2.52	4.76
135	9034.48	-2.47	5.00
140	7996.32	-2.41	5.25
145	7096.44	-2.36	5.48
150	6314.17	-2.31	5.71

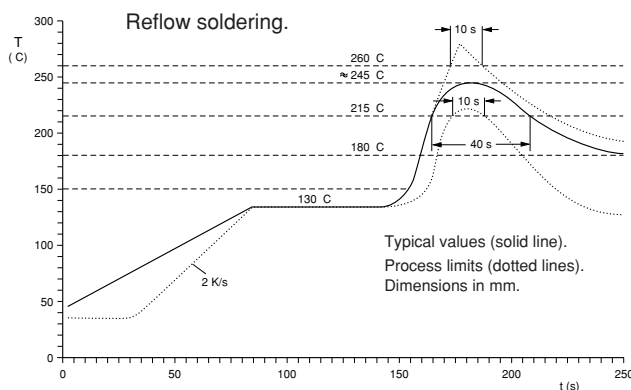
RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 470 K Ω

T_{oper} (°C)	CATALOG NUMBER 2322 615 5.474		
	R_T (Ω)	TC (%/K)	$\Delta R/R$ DUE TO B-TOLERANCE (%)
-40	16324913	-6.70	7.58
-35	11742019	-6.48	6.83
-30	8539774	-6.26	6.13
-25	6276830	-6.05	5.45
-20	4660312	-5.86	4.80
-15	3493589	-5.67	4.18
-10	2643155	-5.49	3.58
-5	2017389	-5.32	3.01
0	1552759	-5.15	2.46
5	1204778	-5.00	1.93
10	941992	-4.85	1.42
15	741961	-4.70	0.93
20	588538	-4.56	0.46
25	470000	-4.43	0.00
30	377772	-4.31	0.22
35	305531	-4.18	0.43
40	248579	-4.07	0.64
45	203402	-3.96	0.84
50	167350.17	-3.85	1.03
55	138415.65	-3.75	1.22
60	115064.97	-3.65	1.40
65	96120.34	-3.55	1.58
70	80671.71	-3.46	1.75
75	68011.83	-3.37	1.92
80	57588.01	-3.29	2.08
85	48965.99	-3.20	2.23
90	41802.84	-3.12	2.54
95	35826.37	-3.05	2.85
100	30819.49	-2.97	3.14
105	26608.25	-2.90	3.43
110	23052.64	-2.83	3.71
115	20039.47	-2.77	3.98
120	17476.84	-2.70	4.24
125	15289.84	-2.64	4.50
130	13417.16	-2.58	4.76
135	11808.44	-2.53	5.00
140	10422.13	-2.47	5.25
145	9223.86	-2.42	5.48
150	8185.07	-2.36	5.71

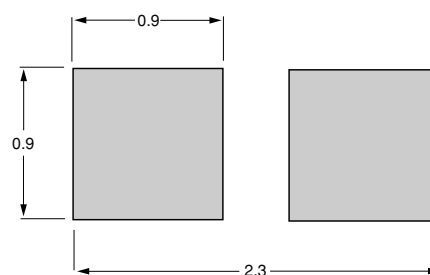
SOLDERING CONDITIONS

This SMD thermistor is only suitable for wave or reflow soldering, in accordance with "CECC 00802". The maximum temperature of 260°C during 10 s should not be exceeded.

Typical examples of a soldering processes that will provide reliable joints without damage, are shown below.



Dimensions of the solder lands.

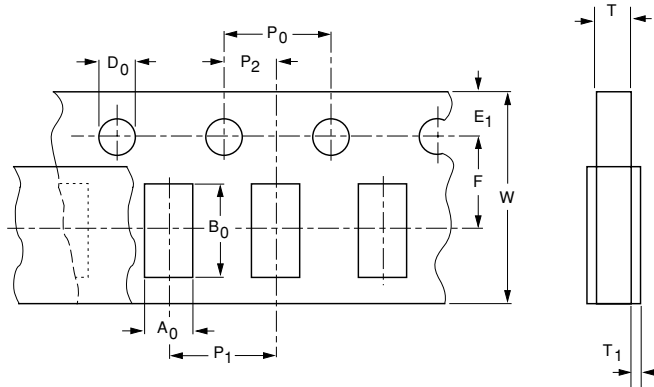


PACKAGING

TAPE SPECIFICATIONS

All tape specifications are in accordance with "IEC 60286-3". Basic dimensions are given below. Carrier tape material is paper.

PAPER TAPE



Cumulative pitch error: 0.2 mm over 10 pitches.
Cumulative tolerance over 10 holes: ± 0.2 mm.

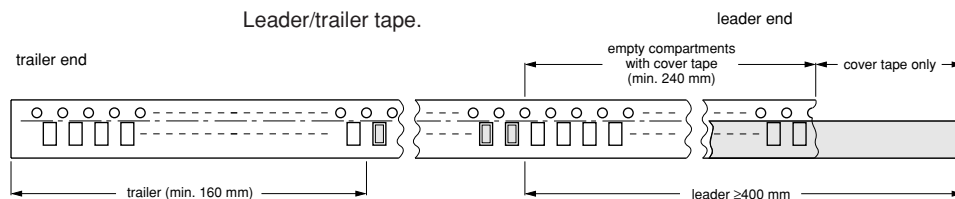
PAPER TAPE DIMENSIONS in millimeters

PARAMETER	DIMENSION	TOLERANCE
A ₀ ; note 1	1.7	± 0.2
B ₀ ; note 1	2.35	± 0.1
W	8.0	± 0.2
E1	1.75	± 0.1
F	3.5	± 0.05
D ₀	1.55	± 0.05
P ₀ ; note 2	4.0	± 0.1
P ₁	4.0	± 0.1
P ₂	2.0	± 0.05
T tape thickness	1.1	max
T ₁ cover tape	<0.1	—

Notes

1. Measured 0.3 mm above base pocket.
2. P₀ pitch tolerance over any 10 pitches is ± 0.2 mm.

LEADER/TRAILER TAPE SPECIFICATION



TAPING PACKAGE REQUIREMENTS

Component is free and not sticking to top and/or bottom tape.

Component should be easy to remove from carrier tape.

TESTS AND REQUIREMENTS

SOLDERABILITY AND RESISTANCE TO SOLDERING HEAT

IEC 60068-2-58	TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
6	T _c	solderability	2 s at 235 °C	min. 95% of surface wetted
		resistance to soldering heat	10 s at 260 °C	$\Delta R/R < 5\%$