

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.

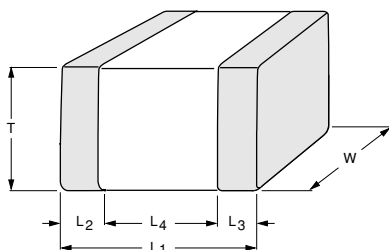
QUICK REFERENCE DATA

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

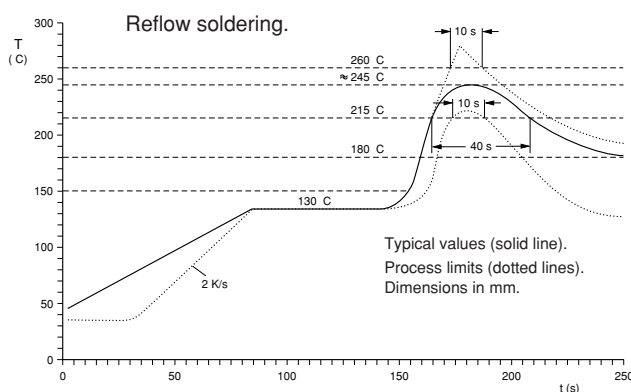
RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 470 K Ω

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

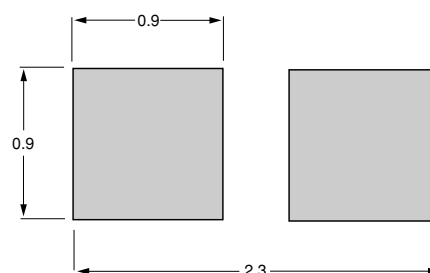
SOLDERING CONDITIONS

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.

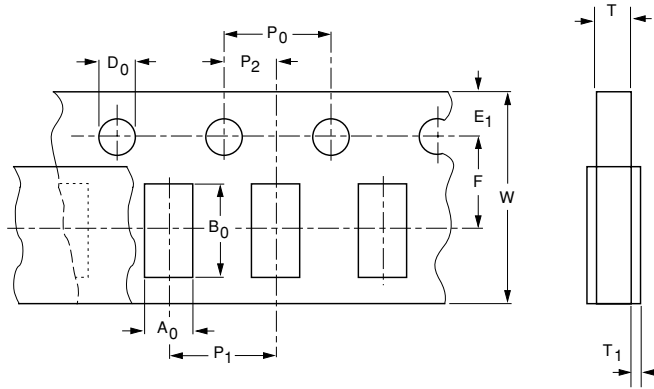


PACKAGING

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.

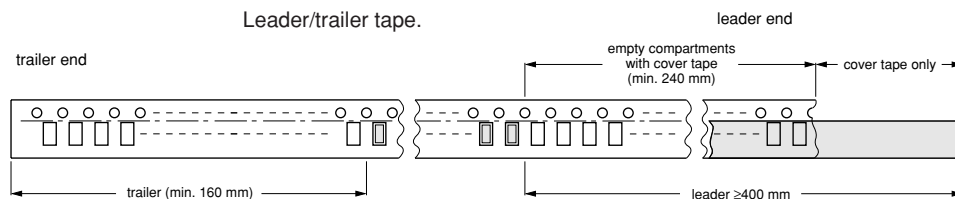
PAPER TAPE DIMENSIONS in millimeters

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	$\Delta R/R < 5\%$