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 0603 chip thermistors with a negative temperature coefficient. The device has no marking.

PACKAGING

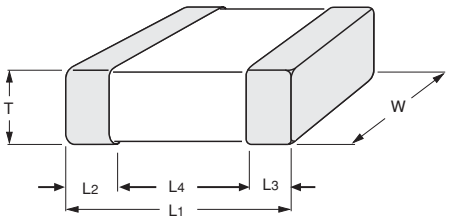
Available in 8 mm punched paper tape on reel package of 4000 units.

QUICK REFERENCE DATA	
PARAMETER	**VALUE**
Resistance value at 25 °C	2.2 kΩ to 100 kΩ
Tolerance on R25-value	±2%; ±3%; ±5%; ±10%
Tolerance on B25/85-value	see Table below
Maximum dissipation at 25 °C	125 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	≈0.0045 g

ELECTRICAL DATA AND ORDERING INFORMATION

R_{25} (kΩ)	$B_{25/85}$-VALUE (K)	TOLERANCE ON $B_{25/85}$ (%)	CATALOG NUMBER 2322 615 3....			
			±2% TOL. ON R_{25}	±3% TOL. ON R_{25}	±5% TOL. ON R_{25}	±10% TOL. ON R_{25}
2.2	3520	±1	34222	36222	33222	32222
2.7	3600	±1	34272	36272	33272	32272
4.7	3830	±1	34472	36472	33472	32472
10	3610	±1	34103	36103	33103	32103
15	3600	±1	34153	36153	33153	32153
22	3730	±1	34223	36223	33223	32223
33	3860	±1	34333	36333	33333	32333
47	3960	±1	34473	36473	33473	32473
68	3985	±1	34683	36683	33683	32683
100	4100	±1	34104	36104	33104	32104

DIMENSIONS in millimeters



L_1	W	T	L_2 and L_3 MIN.	L_4 MIN.
1.6 ±0.15	0.8 ±0.15	0.8 ±0.15	0.2	0.4

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 2.2 KΩ

T_{oper} (°C)	CATALOG NUMBER 2322 615 3.222		
	R_T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
–40	53502.61	–6.11	7.58
–35	39637.33	–5.89	6.83
–30	29679.76	–5.68	6.13
–25	22450.97	–5.48	5.45
–20	17148.62	–5.29	4.80
–15	13220.63	–5.11	4.18
–10	10283.06	–4.94	3.58
–5	8066.16	–4.77	3.01
0	6378.54	–4.62	2.46
5	5083.09	–4.47	1.93
10	4080.75	–4.32	1.42
15	3299.24	–4.18	0.93
20	2685.45	–4.05	0.46
25	2200.00	–3.93	0.00
30	1813.46	–3.80	0.22
35	1503.70	–3.69	0.43
40	1253.93	–3.58	0.64
45	1051.33	–3.47	0.84
50	886.05	–3.37	1.03
55	750.49	–3.27	1.22
60	638.72	–3.18	1.40
65	546.09	–3.09	1.58
70	468.95	–3.00	1.75
75	404.41	–2.92	1.92
80	350.18	–2.84	2.08
85	304.40	–2.76	2.23
90	265.61	–2.69	2.54
95	232.60	–2.62	2.85
100	204.39	–2.55	3.14
105	180.22	–2.49	3.43
110	159.41	–2.42	3.71
115	141.44	–2.36	3.98
120	125.88	–2.30	4.24
125	112.35	–2.25	4.50
130	100.55	–2.19	4.76
135	90.24	–2.14	5.00
140	81.19	–2.09	5.25
145	73.23	–2.04	5.48
150	66.22	–1.99	5.71

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 2.7 KΩ

T_{oper} (°C)	CATALOG NUMBER 2322 615 3.272		
	R_T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
–40	70762.57	–6.26	7.58
–35	52048.04	–6.03	6.83
–30	38704.41	–5.82	6.13
–25	29084.12	–5.61	5.45
–20	22074.19	–5.42	4.80
–15	16914.12	–5.23	4.18
–10	13078.64	–5.06	3.58
–5	10201.06	–4.89	3.01
0	8022.83	–4.72	2.46
5	6359.87	–4.57	1.93
10	5079.88	–4.42	1.42
15	4086.95	–4.28	0.93
20	3310.90	–4.14	0.46
25	2700.00	–4.02	0.00
30	2215.79	–3.89	0.22
35	1829.45	–3.77	0.43
40	1519.26	–3.66	0.64
45	1268.68	–3.55	0.84
50	1065.09	–3.45	1.03
55	898.74	–3.35	1.22
60	762.09	–3.25	1.40
65	649.26	–3.16	1.58
70	555.63	–3.07	1.75
75	477.56	–2.99	1.92
80	412.18	–2.90	2.08
85	357.17	–2.83	2.23
90	310.69	–2.75	2.54
95	271.26	–2.68	2.85
100	237.68	–2.61	3.14
105	208.97	–2.54	3.43
110	184.33	–2.48	3.71
115	163.12	–2.41	3.98
120	144.79	–2.35	4.24
125	128.90	–2.30	4.50
130	115.08	–2.24	4.76
135	103.02	–2.19	5.00
140	92.47	–2.13	5.25
145	83.22	–2.08	5.48
150	75.07	–2.04	5.71

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 4.7 KΩ

T_{oper} (°C)	CATALOG NUMBER 2322 615 3.472		
	R_T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
–40	152831.92	–6.66	7.58
–35	110192.48	–6.43	6.83
–30	80369.15	–6.20	6.13
–25	59267.29	–5.98	5.45
–20	44169.70	–5.78	4.80
–15	33252.16	–5.58	4.18
–10	25276.18	–5.39	3.58
–5	19391.74	–5.21	3.01
0	15009.33	–5.04	2.46

T_{oper} (°C)	CATALOG NUMBER 2322 615 3.472		
	R_T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
5	11715.98	–4.87	1.93
10	9219.53	–4.71	1.42
15	7311.41	–4.56	0.93
20	5841.30	–4.42	0.46
25	4700.00	–4.28	0.00
30	3807.45	–4.15	0.22
35	3104.52	–4.02	0.43
40	2547.18	–3.90	0.64
45	2102.41	–3.78	0.84
50	1745.26	–3.67	1.03
55	1456.75	–3.56	1.22
60	1222.36	–3.46	1.40
65	1030.87	–3.36	1.58
70	873.61	–3.26	1.75
75	743.79	–3.17	1.92
80	636.11	–3.08	2.08
85	546.36	–3.00	2.23
90	471.22	–2.92	2.54
95	408.03	–2.84	2.85
100	354.67	–2.77	3.14
105	309.43	–2.69	3.43
110	270.91	–2.62	3.71
115	238.01	–2.56	3.98
120	209.79	–2.49	4.24
125	185.50	–2.43	4.50
130	164.53	–2.37	4.76
135	146.36	–2.31	5.00
140	130.57	–2.26	5.25
145	116.80	–2.20	5.48
150	104.76	–2.15	5.71

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 10 KΩ

T_{oper} (°C)	CATALOG NUMBER 2322 615 3.103		
	R_T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
–40	243448.30	–6.06	7.58
–35	180771.94	–5.85	6.83
–30	135622.82	–5.65	6.13
–25	102751.48	–5.46	5.45
–20	78575.54	–5.28	4.80
–15	60622.56	–5.10	4.18
–10	47167.68	–4.94	3.58
–5	36995.19	–4.78	3.01
0	29239.78	–4.63	2.46
5	23279.76	–4.49	1.93
10	18664.43	–4.35	1.42
15	15064.25	–4.22	0.93
20	12236.28	–4.10	0.46
25	10000.00	–3.98	0.00
30	8220.27	–3.86	0.22
35	6795.17	–3.75	0.43
40	5647.32	–3.65	0.64
45	4717.53	–3.55	0.84
50	3960.30	–3.45	1.03

T_{oper} (°C)	CATALOG NUMBER 2322 615 3.103		
	R_T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
55	3340.37	–3.36	1.22
60	2830.32	–3.27	1.40
65	2408.64	–3.18	1.58
70	2058.41	–3.10	1.75
75	1766.22	–3.02	1.92
80	1521.40	–2.95	2.08
85	1315.43	–2.87	2.23
90	1141.44	–2.80	2.54
95	993.91	–2.73	2.85
100	868.35	–2.67	3.14
105	761.11	–2.61	3.43
110	669.19	–2.54	3.71
115	590.14	–2.48	3.98
120	521.94	–2.43	4.24
125	462.92	–2.37	4.50
130	411.68	–2.32	4.76
135	367.08	–2.27	5.00
140	328.14	–2.22	5.25
145	294.05	–2.17	5.48
150	264.12	–2.12	5.71

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 15 KΩ

T_{oper} (°C)	CATALOG NUMBER 2322 615 3.153		
	R_T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
–40	362484.49	–6.07	7.58
–35	269088.54	–5.85	6.83
–30	201887.78	–5.64	6.13
–25	152996.55	–5.45	5.45
–20	117051.45	–5.26	4.80
–15	90360.69	–5.09	4.18
–10	70354.10	–4.92	3.58
–5	55223.01	–4.76	3.01
0	43681.57	–4.61	2.46
5	34806.62	–4.47	1.93
10	27929.29	–4.33	1.42
15	22560.62	–4.20	0.93
20	18340.15	–4.08	0.46
25	15000.00	–3.96	0.00
30	12339.55	–3.85	0.22
35	10207.46	–3.74	0.43
40	8488.74	–3.64	0.64
45	7095.43	–3.54	0.84
50	5959.80	–3.44	1.03
55	5029.40	–3.35	1.22
60	4263.35	–3.26	1.40
65	3629.59	–3.18	1.58
70	3102.87	–3.10	1.75
75	2663.17	–3.02	1.92
80	2294.55	–2.94	2.08
85	1984.26	–2.87	2.23
90	1722.03	–2.80	2.54
95	1499.58	–2.73	2.85
100	1310.17	–2.67	3.14

T_{oper} (°C)	CATALOG NUMBER 2322 615 3.153		
	R_T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
105	1148.34	–2.61	3.43
110	1009.58	–2.55	3.71
115	890.23	–2.49	3.98
120	787.23	–2.43	4.24
125	698.07	–2.38	4.50
130	620.67	–2.32	4.76
135	553.27	–2.27	5.00
140	494.43	–2.22	5.25
145	442.91	–2.18	5.48
150	397.69	–2.13	5.71

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 22 KΩ

T_{oper} (°C)	CATALOG NUMBER 2322 615 3.223		
	R_T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
–40	603211.80	–6.28	7.58
–35	443042.83	–6.06	6.83
–30	328857.73	–5.86	6.13
–25	246572.40	–5.66	5.45
–20	186660.99	–5.47	4.80
–15	142608.21	–5.29	4.18
–10	109909.84	–5.12	3.58
–5	85419.80	–4.96	3.01
0	66918.84	–4.80	2.46
5	52826.61	–4.66	1.93
10	42007.45	–4.51	1.42
15	33638.10	–4.38	0.93
20	27116.78	–4.25	0.46
25	22000.00	–4.12	0.00
30	17958.43	–4.00	0.22
35	14745.66	–3.89	0.43
40	12176.02	–3.77	0.64
45	10108.62	–3.67	0.84
50	8435.86	–3.57	1.03
55	7075.02	–3.47	1.22
60	5962.13	–3.38	1.40
65	5047.43	–3.29	1.58
70	4291.97	–3.20	1.75
75	3665.11	–3.12	1.92
80	3142.63	–3.04	2.08
85	2705.24	–2.96	2.23
90	2337.57	–2.88	2.54
95	2027.26	–2.81	2.85
100	1764.33	–2.74	3.14
105	1540.72	–2.68	3.43
110	1349.86	–2.61	3.71
115	1186.38	–2.55	3.98
120	1045.88	–2.49	4.24
125	924.73	–2.43	4.50
130	819.95	–2.38	4.76
135	729.04	–2.32	5.00
140	649.93	–2.27	5.25
145	580.89	–2.22	5.48
150	520.48	–2.17	5.71

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 33 KΩ

T_{oper} (°C)	CATALOG NUMBER 2322 615 3.333		
	R_T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
–40	1061183.25	–6.70	7.58
–35	764124.83	–6.44	6.83
–30	557157.76	–6.20	6.13
–25	411057.96	–5.97	5.45
–20	306646.44	–5.75	4.80
–15	231156.78	–5.55	4.18
–10	175976.71	–5.36	3.58
–5	135222.68	–5.18	3.01
0	104827.07	–5.01	2.46
5	81945.82	–4.84	1.93
10	64568.99	–4.69	1.42
15	51261.67	–4.54	0.93
20	40989.49	–4.40	0.46
25	33000.00	–4.27	0.00
30	26740.98	–4.14	0.22
35	21803.80	–4.02	0.43
40	17883.65	–3.91	0.64
45	14751.46	–3.80	0.84
50	12233.79	–3.69	1.03
55	10198.43	–3.59	1.22
60	8543.91	–3.49	1.40
65	7191.86	–3.40	1.58
70	6081.39	–3.31	1.75
75	5164.90	–3.22	1.92
80	4404.97	–3.14	2.08
85	3772.02	–3.06	2.23
90	3242.57	–2.99	2.54
95	2797.84	–2.91	2.85
100	2422.78	–2.84	3.14
105	2105.27	–2.78	3.43
110	1835.47	–2.71	3.71
115	1605.39	–2.65	3.98
120	1408.51	–2.59	4.24
125	1239.47	–2.53	4.50
130	1093.87	–2.47	4.76
135	968.07	–2.42	5.00
140	859.04	–2.36	5.25
145	764.28	–2.31	5.48
150	681.69	–2.26	5.71

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 47 KΩ

T_{oper} (°C)	CATALOG NUMBER 2322 615 3.473		
	R_T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
–40	1643692.75	–6.85	7.58
–35	1174859.36	–6.59	6.83
–30	850461.50	–6.34	6.13
–25	623018.26	–6.11	5.45
–20	461556.69	–5.89	4.80
–15	345583.02	–5.69	4.18
–10	261354.11	–5.49	3.58
–5	199536.23	–5.31	3.01
0	153713.87	–5.13	2.46
5	119426.97	–4.97	1.93
10	93541.28	–4.81	1.42

T_{oper} (°C)	CATALOG NUMBER 2322 615 3.473		
	R_T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
15	73831.58	–4.66	0.93
20	58702.60	–4.52	0.46
25	47000.00	–4.38	0.00
30	37881.11	–4.25	0.22
35	30725.55	–4.13	0.43
40	25072.93	–4.01	0.64
45	20578.93	–3.89	0.84
50	16984.15	–3.79	1.03
55	14091.76	–3.68	1.22
60	11751.42	–3.58	1.40
65	9847.55	–3.49	1.58
70	8290.73	–3.40	1.75
75	7011.37	–3.31	1.92
80	5954.99	–3.22	2.08
85	5078.74	–3.14	2.23
90	4348.67	–3.07	2.54
95	3737.83	–2.99	2.85
100	3224.64	–2.92	3.14
105	2791.80	–2.85	3.43
110	2425.34	–2.87	3.71
115	2113.94	–2.72	3.98
120	1848.39	–2.65	4.24
125	1621.16	–2.59	4.50
130	1426.09	–2.54	4.76
135	1258.09	–2.48	5.00
140	1112.95	–2.42	5.25
145	987.19	–2.37	5.48
150	877.91	–2.32	5.71

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 68 KΩ

T_{oper} (°C)	CATALOG NUMBER 2322 615 3.683		
	R_T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
–40	2324375.76	–6.77	7.58
–35	1667529.37	–6.52	6.83
–30	1211147.53	–6.28	6.13
–25	889916.80	–6.05	5.45
–20	661046.51	–5.84	4.80
–15	496103.17	–5.64	4.18
–10	375940.63	–5.45	3.58
–5	287504.04	–5.28	3.01
0	221786.10	–5.11	2.46
5	172502.28	–4.95	1.93
10	135221.13	–4.79	1.42
15	106786.33	–4.65	0.93
20	84928.25	–4.51	0.46
25	68000.00	–4.38	0.00
30	54796.21	–4.26	0.22
35	44427.35	–4.14	0.43
40	36231.83	–4.02	0.64
45	29713.87	–3.91	0.84
50	24499.27	–3.81	1.03
55	20303.65	–3.71	1.22

T_{oper} (°C)	CATALOG NUMBER 2322 615 3.683		
	R_T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
60	16909.48	–3.61	1.40
65	14149.29	–3.52	1.58
70	11893.39	–3.43	1.75
75	10040.74	–3.34	1.92
80	8512.21	–3.26	2.08
85	7245.46	–3.18	2.23
90	6191.15	–3.11	2.54
95	5310.02	–3.03	2.85
100	4570.69	–2.96	3.14
105	3947.95	–2.90	3.43
110	3421.48	–2.83	3.71
115	2974.79	–2.77	3.98
120	2594.49	–2.71	4.24
125	2269.63	–2.65	4.50
130	1991.22	–2.59	4.76
135	1751.89	–2.53	5.00
140	1545.52	–2.48	5.25
145	1367.06	–2.43	5.48
150	1212.28	–2.38	5.71

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 100 KΩ

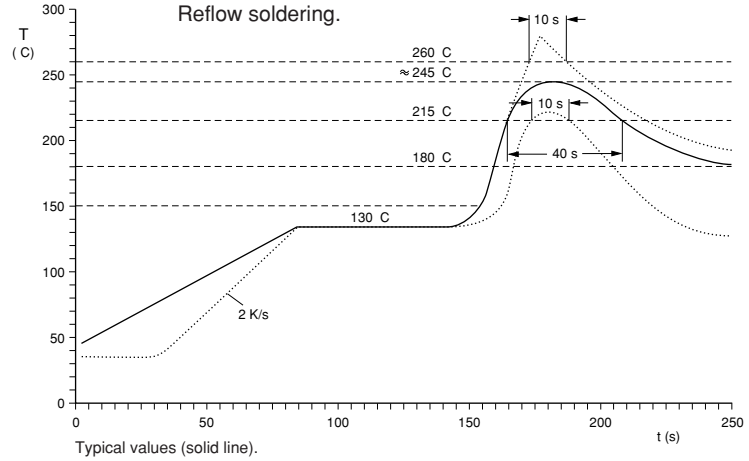
T_{oper} (°C)	CATALOG NUMBER 2322 615 3.104		
	R_T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
–40	3921252.41	–7.03	7.58
–35	2774564.66	–6.77	6.83
–30	1988706.07	–6.52	6.13
–25	1442860.78	–6.28	5.45
–20	1058901.24	–6.06	4.80
–15	785573.28	–5.85	4.18
–10	588792.99	–5.65	3.58
–5	445601.87	–5.47	3.01
0	340346.26	–5.29	2.46
5	262229.45	–5.12	1.93
10	203722.79	–4.96	1.42
15	159521.65	–4.80	0.93
20	125851.24	–4.66	0.46
25	100000.00	–4.52	0.00
30	80002.55	–4.39	0.22
35	64422.07	–4.26	0.43
40	52199.54	–4.14	0.64
45	42548.23	–4.02	0.84
50	34879.32	–3.91	1.03
55	28748.92	–3.80	1.22
60	23820.09	–3.70	1.40
65	19835.37	–3.60	1.58
70	16596.82	–3.51	1.75
75	13951.27	–3.42	1.92
80	11779.54	–3.33	2.08
85	9988.36	–3.25	2.23
90	8504.34	–3.17	2.54
95	7269.45	–3.09	2.85
100	6237.53	–3.02	3.14
105	5371.72	–2.95	3.43
110	4642.45	–2.88	3.71

T_{oper} (°C)	CATALOG NUMBER 2322 615 3.104		
	R_T (Ω)	TC (%/K)	ΔR/R DUE TO B-TOLERANCE (%)
115	4025.87	–2.81	3.98
120	3502.66	–2.75	4.24
125	3057.12	–2.68	4.50
130	2676.44	–2.62	4.76
135	2350.10	–2.57	5.00
140	2069.46	–2.51	5.25
145	1827.38	–2.46	5.48
150	1617.93	–2.40	5.71

SOLDERING CONDITIONS

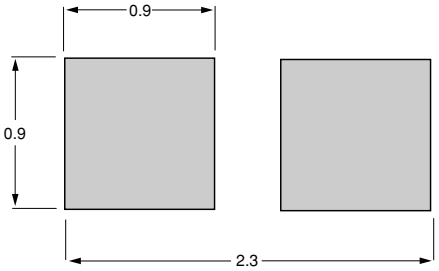
This SMD thermistor is only suitable for wave or reflow soldering, in accordance with *"CECC 00802"*. The maximum temperature of 260 °C during 10 s should not be exceeded.

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



Typical values (solid line).
Process limits (dotted lines).
Dimensions in mm.

Dimensions of the solder lands.

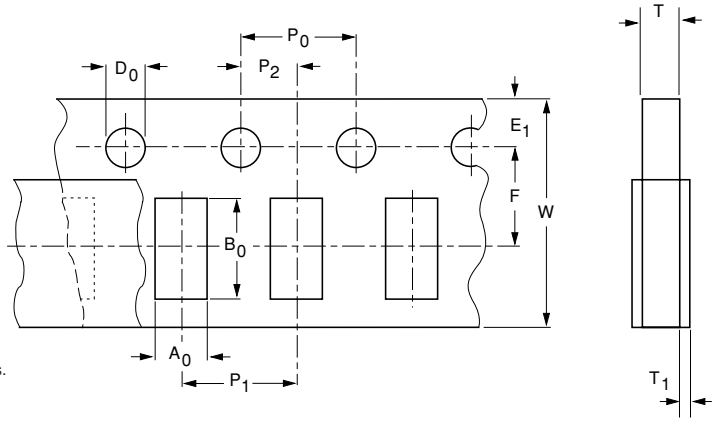


PACKAGING

TAPE SPECIFICATIONS

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

PAPER TAPE



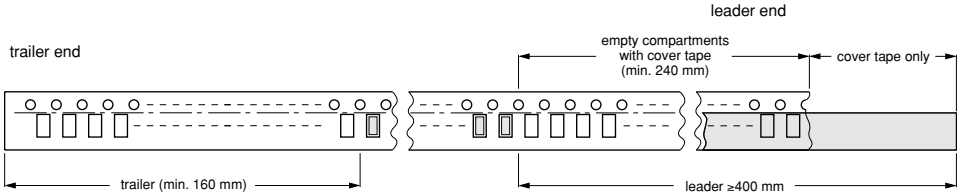
Cumulative pitch error: 0.2 mm over 10 pitches.
Cumulative tolerance over 10 holes: ±0.2 mm.

DIMENSIONS OF PAPER TAPE in millimeters		
PARAMETER	**DIMENSION**	**TOLERANCE**
A_0; note 1	1.15	±0.1
B_0; note 1	1.9	±0.1
K_0	4.1	±0.1
W	8.0	±0.2
E1	1.75	±0.1
F	3.5	±0.05
D_0	1.55	±0.05
D_1	1.5	+0.1/−0.0
P_0; note 2	4.0	±0.1
P_1	12	±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



Leader/trailer tape.

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	Tc	solderability	2 s at 235 °C	min. 95% of surface wetted
		resistance to soldering heat	10 s at 260 °C	$\Delta R/R < 5\%$