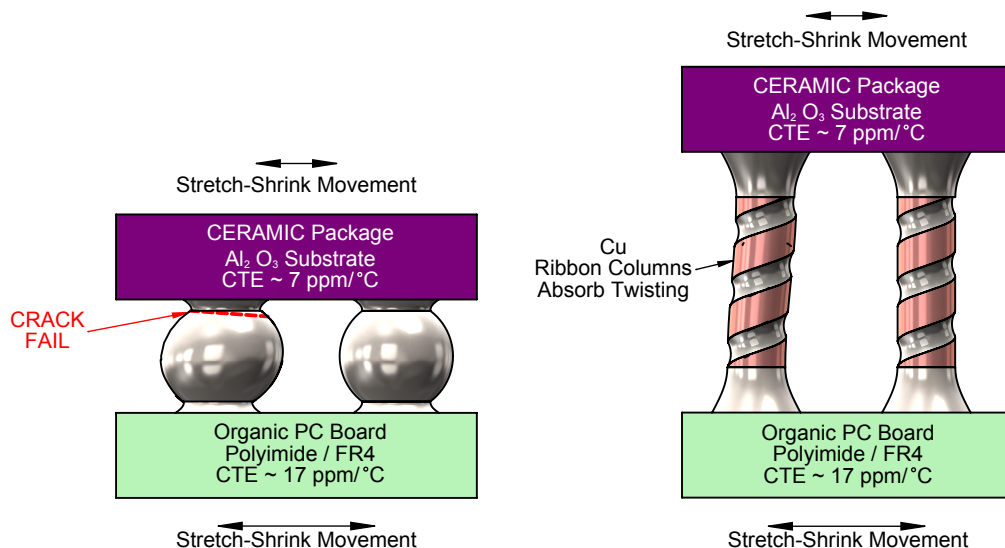



Substrate Size	XY Size (mm)	Distance Corner to Corner (mm)	CTE Mismatch ppm/°C	±Change In Temperature								
				Δ0°C	Δ25°C	Δ50°C	Δ75°C	Δ100°C	Δ125°C	Δ150°C	Δ160°C	Δ175°C
				Solder Ball Deformation (um - microns)								
5x5mm	5	7.07	10.0	0.00	1.77	3.54	5.30	7.07	8.84	10.61	11.31	12.37
10x10mm	10	14.14	10.0	0.00	3.54	7.07	10.61	14.14	17.68	21.21	22.63	24.75
12x12mm	12	16.97	10.0	0.00	4.24	8.49	12.73	16.97	21.21	25.46	27.15	29.70
15x15mm	15	21.21	10.0	0.00	5.30	10.61	15.91	21.21	26.52	31.82	33.94	37.12
21x21mm	21	29.70	10.0	0.00	7.42	14.85	22.27	29.70	37.12	44.55	47.52	51.97
23x23mm	23	32.53	10.0	0.00	8.13	16.26	24.40	32.53	40.66	48.79	52.04	56.92
25x25mm	25	35.36	10.0	0.00	8.84	17.68	26.52	35.36	44.19	53.03	56.57	61.87
27x27mm	27	38.18	10.0	0.00	9.55	19.09	28.64	38.18	47.73	57.28	61.09	66.82
31x31mm	31	43.84	10.0	0.00	10.96	21.92	32.88	43.84	54.80	65.76	70.14	76.72
32.5x32.5mm	32.5	45.96	10.0	0.00	11.49	22.98	34.47	45.96	57.45	68.94	73.54	80.43
35x35mm	35	49.50	10.0	0.00	12.37	24.75	37.12	49.50	61.87	74.25	79.20	86.62
37.5x37.5mm	37.5	53.03	10.0	0.00	13.26	26.52	39.77	53.03	66.29	79.55	84.85	92.81
40x40mm	40	56.57	10.0	0.00	14.14	28.28	42.43	56.57	70.71	84.85	90.51	98.99
42.5x42.5mm	42.5	60.10	10.0	0.00	15.03	30.05	45.08	60.10	75.13	90.16	96.17	105.18
45x45mm	45	63.64	10.0	0.00	15.91	31.82	47.73	63.64	79.55	95.46	101.82	111.37
52.5x52.5mm	52.5	74.25	10.0	0.00	18.56	37.12	55.68	74.25	92.81	111.37	118.79	129.93

COLOR CODE:	BGA SOLDER BALL PACKAGE	CCGA COLUMN PACKAGE
GREEN	ACCEPTABLE PERFORMANCE	MINIMAL PERFORMANCE IMPROVEMENT
YELLOW	SHORTER LIFE CYCLE.	LONGER OPERATING LIFE
ORANGE	NOT RECOMMENDED	FULL BENEFITS

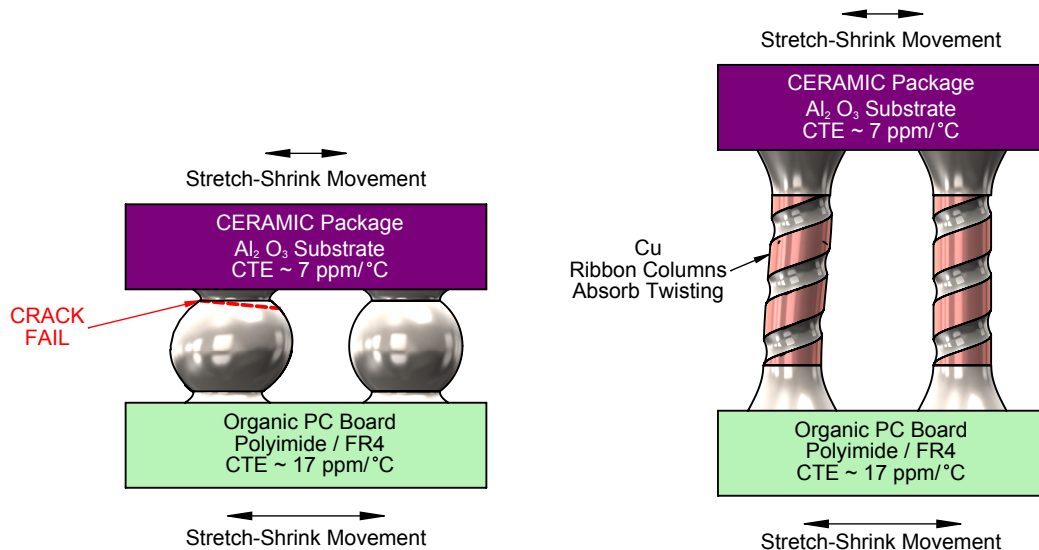


CTE MISMATCH CERAMIC BGA DEFORMATION METRIC

APPROVALS	DATE				
DRAWN T.Au	12/30/14				
ENG M. Hart	12/30/14	TITLE TEMPERATURE CYCLE PROFILE -55°C to +105°C			
MFG		SCALE NONE	SIZE A	DRAWING NO. 155110	REV A
QA		DO NOT SCALE DRAWING			SHEET 1 OF 3
CUST					
REVISED					

Substrate Size	X/Y Size (Inch)	Distance Corner to Corner (Inch)	CTE Mismatch ppm/°C	±Change in Temperature								
				Δ0°C	Δ25°C	Δ50°C	Δ75°C	Δ100°C	Δ125°C	Δ150°C	Δ160°C	Δ175°C
				Solder Ball Deformation (Mils)								
5x5mm	0.20	0.28	10.0	0.00	0.07	0.14	0.21	0.28	0.35	0.42	0.45	0.49
10x10mm	0.39	0.56	10.0	0.00	0.14	0.28	0.42	0.56	0.70	0.84	0.89	0.97
12x12mm	0.47	0.67	10.0	0.00	0.17	0.33	0.50	0.67	0.84	1.00	1.07	1.17
15x15mm	0.59	0.84	10.0	0.00	0.21	0.42	0.63	0.84	1.04	1.25	1.34	1.46
21x21mm	0.83	1.17	10.0	0.00	0.29	0.58	0.88	1.17	1.46	1.75	1.87	2.05
23x23mm	0.91	1.28	10.0	0.00	0.32	0.64	0.96	1.28	1.60	1.92	2.05	2.24
25x25mm	0.98	1.39	10.0	0.00	0.35	0.70	1.04	1.39	1.74	2.09	2.23	2.44
27x27mm	1.06	1.50	10.0	0.00	0.38	0.75	1.13	1.50	1.88	2.25	2.41	2.63
31x31mm	1.22	1.73	10.0	0.00	0.43	0.86	1.29	1.73	2.16	2.59	2.76	3.02
32.5x32.5mm	1.28	1.81	10.0	0.00	0.45	0.90	1.36	1.81	2.26	2.71	2.90	3.17
35x35mm	1.38	1.95	10.0	0.00	0.49	0.97	1.46	1.95	2.44	2.92	3.12	3.41
37.5x37.5mm	1.48	2.09	10.0	0.00	0.52	1.04	1.57	2.09	2.61	3.13	3.34	3.65
40x40mm	1.57	2.23	10.0	0.00	0.56	1.11	1.67	2.23	2.78	3.34	3.56	3.90
42.5x42.5mm	1.67	2.37	10.0	0.00	0.59	1.18	1.77	2.37	2.96	3.55	3.79	4.14
45x45mm	1.77	2.51	10.0	0.00	0.63	1.25	1.88	2.51	3.13	3.76	4.01	4.38
52.5x52.5mm	2.07	2.92	10.0	0.00	0.73	1.46	2.19	2.92	3.65	4.38	4.68	5.11

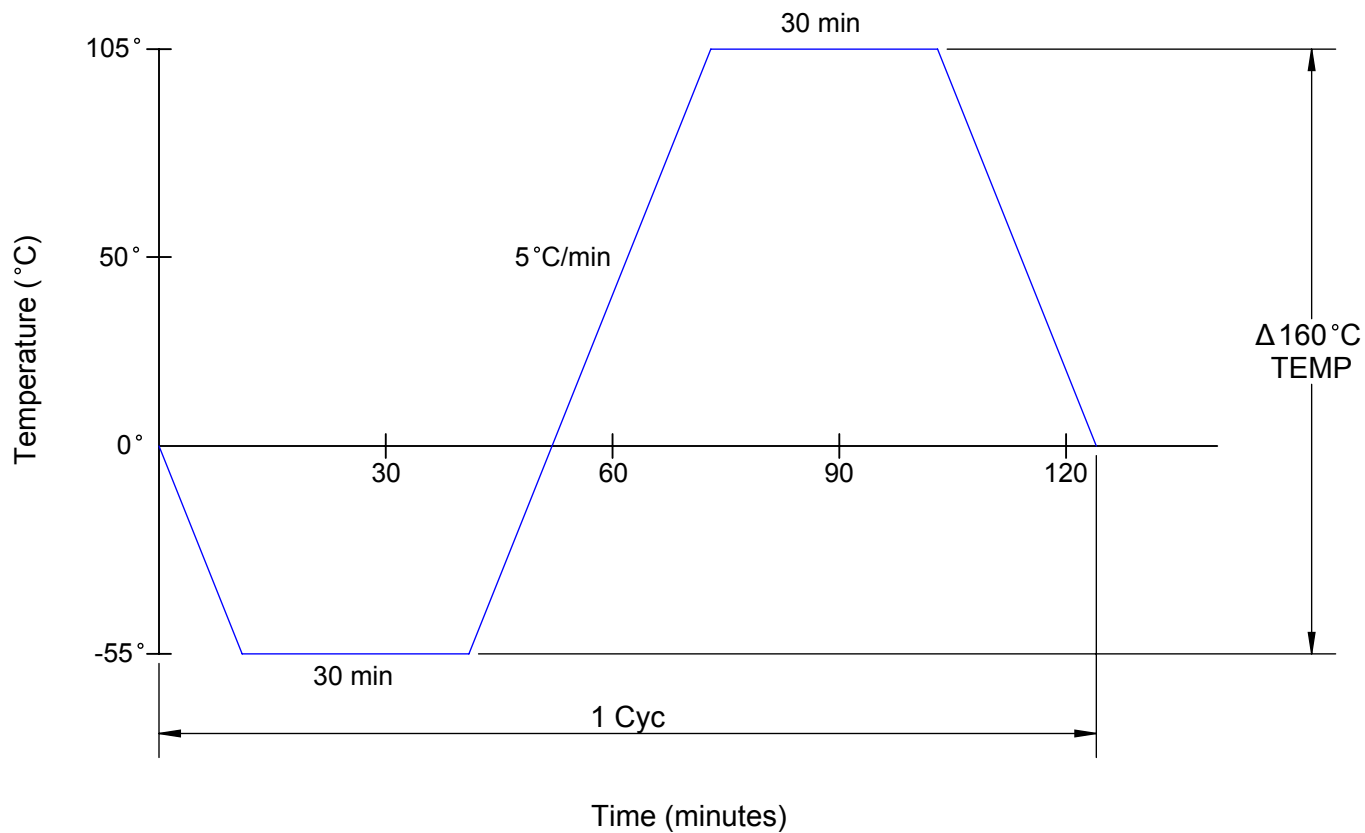
COLOR CODE:	BGA SOLDER BALL PACKAGE	CCGA COLUMN PACKAGE
GREEN	ACCEPTABLE	MINIMAL PERFORMANCE IMPROVEMENT
YELLOW	SHORTER LIFE CYCLE.	LONGER OPERATING LIFE
ORANGE	NOT RECOMMENDED	FULL BENEFITS



CTE MISMATCH CERAMIC BGA DEFORMATION Inch - Mil

APPROVALS	DATE				
DRAWN T.Au	12/30/14				
ENG M. Hart	12/30/14	TITLE TEMPERATURE CYCLE PROFILE -55°C to +105°C			
MFG		SCALE NONE	SIZE A	DRAWING NO. 155110	REV A
QA		DO NOT SCALE DRAWING			SHEET 2 OF 3
CUST					
REVISED					

TEMPERATURE CYCLING PROFILE
-55 °C TO +105 °C
Δ 160 °C SWING



APPROVALS	DATE	TopLine®			
DRAWN T. Au	12/30/14				
ENG M. Hart	12/30/14	TITLE TEMPERATURE CYCLE PROFILE -55°C to +105°C			
MFG		SCALE	SIZE	DRAWING NO.	REV
QA		NONE	A	155110	A
CUST		DO NOT SCALE DRAWING			SHEET 3 OF 3
REVISED					