DOMINANT™
Opto Technologies
Innovating Illumination

RELIABILITY REPORT
DomiLED
InGaN : DDZB-HKG

Title: DomiLED InGaN DDZB-HKG Product Qualification

Sample History: All parts were built and tested in DOMINANT Opto Technologies Sdn. Bhd.

Qualification Plan: All units are to be pre-conditioned before proceeding to the respective test

	Conditions
• Pre-conditioning as per JEDEC Level 2 requirement (JESD22-A113) • IR re-flow soldering on FR4 board	• Bake @ 125°C, 24 hrs • Storage @ 85°C/60% RH, 168 hrs • 3xIR re-flow soldering at 260°C/10 sec. min. (JEDEC)

Failure Criteria:

• Electrical Failures	• Vf shift >= 20% • Ir > 2x standard limits
• Light Output Degradation	• % Iv shift <= ±50%
• Visual Failures	• Broken or damaged package or lead • Solderability < 95% wetting • Dimension out of tolerance
• Corrosion Test	• Visible black spots on metallic surface

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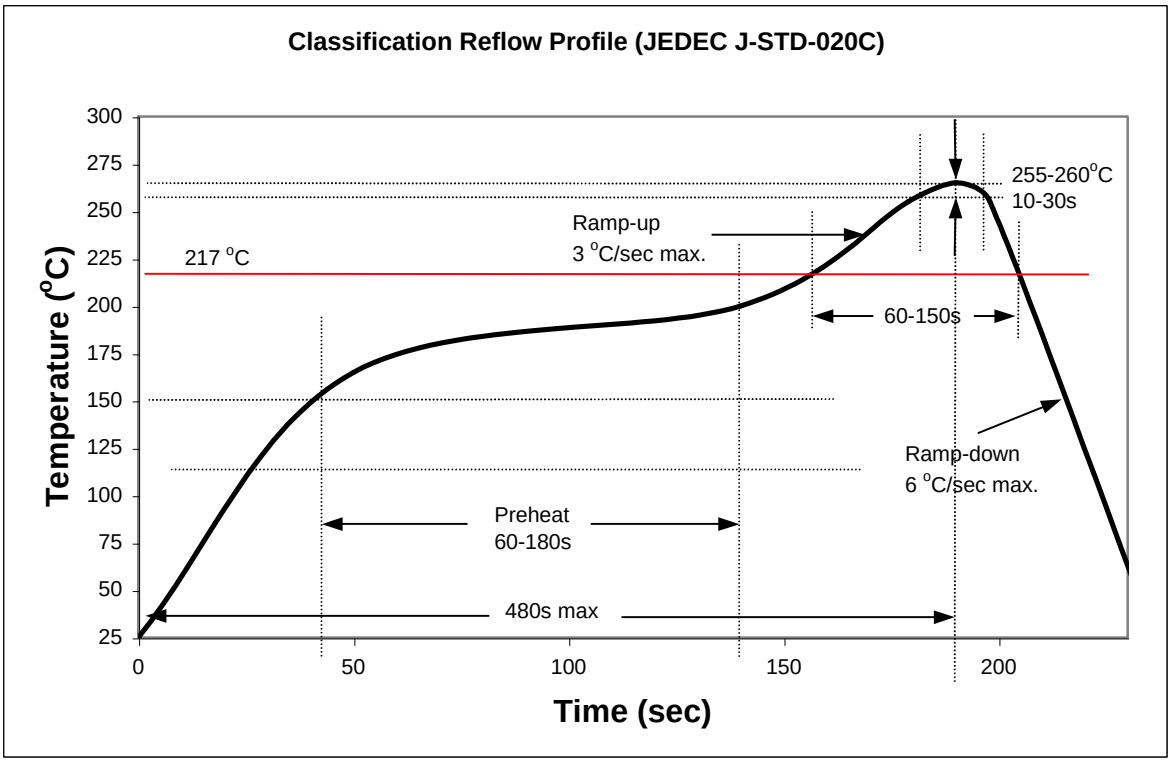
Recommended Pb Free IR-Reflow Soldering Profile



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References Device: DDZB-HKG

Reliability Test Matrix:

Pre-conditioning @ 85°C/60% RH for 168 hours

IR/Convection Re-Flow Process at Peak Temperature 260°C for 10 seconds

Device: DDZB-HKG

Result: No. of failure(s)

No	Test Type	Stress Condition	S/S	Test Point	Vf	Iv
1a	High Temperature Operating Life Test (HTOL 1) JESD22-A108	a) IR re-flow soldering • Ts = 115°C • If = 20mA	26	0 hrs 168 hrs 504 hrs 1000 hrs	0/26 0/26 0/26 0/26	0/26 0/26 0/26 0/26
1b	High Temperature Operating Life Test (HTOL 2) JESD22-A108	a) IR re-flow soldering • Ts = 100°C • If = 50mA	26	0 hrs 168 hrs 504 hrs 1000 hrs	0/26 0/26 0/26 0/26	0/26 0/26 0/26 0/26
2a	Wet High Temperature Operating Life Test (WHTOL 1) JESD22-A101	a) Pre-conditioning b) IR re-flow soldering • Ts = 85°C/85% RH • If = 50mA	26	0 hrs 168 hrs 504 hrs 1000 hrs	0/26 0/26 0/26 0/26	0/26 0/26 0/26 0/26
2b	Wet High Temperature Operating Life Test (WHTOL 2) JESD22-A101	a) Pre-conditioning b) IR re-flow soldering • Ts = 85°C/85% RH • If = 3mA	26	0 hrs 168 hrs 504 hrs 1000 hrs	0/26 0/26 0/26 0/26	0/26 0/26 0/26 0/26
3	Thermal Shock Test (TSK) JESD22-A106	a) Pre-conditioning b) IR re-flow soldering • -40°C to 125°C, 15 min dwell, < 10 sec transfer	26	0 X 100 X 500 X 1000 X	0/26 0/26 0/26 0/26	0/26 0/26 0/26 0/26
4	Power Temperature Cycling Test (PTC) JESD22-A105	a) Pre-conditioning b) IR re-flow soldering • Ts = -40°C to 105°C • If = 40mA	26	0 X 100 X 500 X 1000 X	0/26 0/26 0/26 0/26	0/26 0/26 0/26 0/26
5	Electrostatic Discharge (ESD) – HBM ANSI/ESDA/JEDEC JS-001-2010	a) 1500Ω 100pF, ±1000V b) 1500Ω 100pF, ±2000V	10 10	-	Pass	Pass

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References Device: DDZB-HKG

Result: No. of failure(s)

No	Test Type	Stress Condition	S/S	Test Point	Vf	Iv
6	Electrostatic Discharge (ESD) – CDM AECQ101-005	a) ±1000V	10	-	Pass	Pass
7	Electrostatic Discharge (ESD) – MM JESD 22-A115C	a) 0Ω 200pF, ±100V b) 0Ω 200pF, ±200V	10 10	-	Pass	Pass
8	Destructive Physical Analysis (DPA) Appendix 6	Perform for PTC, WHTOL, H2S & FMG	2	-	-	-
9	Terminal Strength Test* MIL-STD-750 Method 2036	Force: 10N for 10 seconds	10	0X 1X	0/10 0/10	0/10 0/10
10	Resistance to Solder Heat Test (RSH -reflow) AEC-Q005 J-STD-020	Reflow soldering 3 times at peak reflow temperature 260°C	30	0X 3X	0/30 0/30	0/30 0/30
11	Pulsed Operating Life (PLT) JESD22-A108	• Ts = 55˚C • If = 125mA • tp = 100µs, D = 0.03, • T = 0.003s (1 cycle)	26	0 hrs 168 hrs 504 hrs 1000 hrs	0/26 0/26 0/26 0/26	0/26 0/26 0/26 0/26
12	DEW Test JESD22-A100	• Ta = 30˚C to 65˚C • If = 3mA • Tdwell @ 65°C = 4-8hrs. Ttransfer=2-4hr. RH = 90-98%	26	0 hrs 504 hrs 1008 hrs	0/26 0/26 0/26	0/26 0/26 0/26
13	Hydrogen Sulphide Test (H2S)* IEC 60068-2-43	a) IR re-flow soldering • H_2S 15PPM, 40°C/90%RH	26	0 hrs 168 hrs 336 hrs	0/26 0/26 0/26	0/26 0/26 0/26
14	Flowing Mixed Gas Test (FMG)* IEC 60068-2-60	a) IR re-flow soldering • Method 4 • 25°C, 75% RH	26	0 hrs 168 hrs 336 hrs 504 hrs	0/26 0/26 0/26 0/26	0/26 0/26 0/26 0/26

*Generic data

Conclusions: All qualified test are according to AEC-Q102 standard.

All qualification samples passed.

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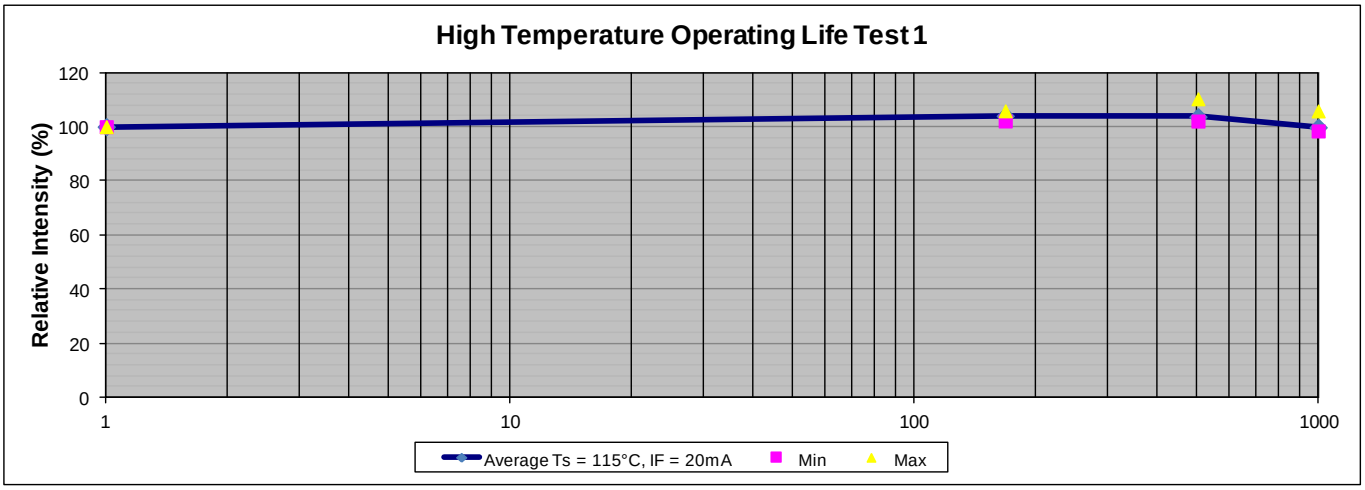
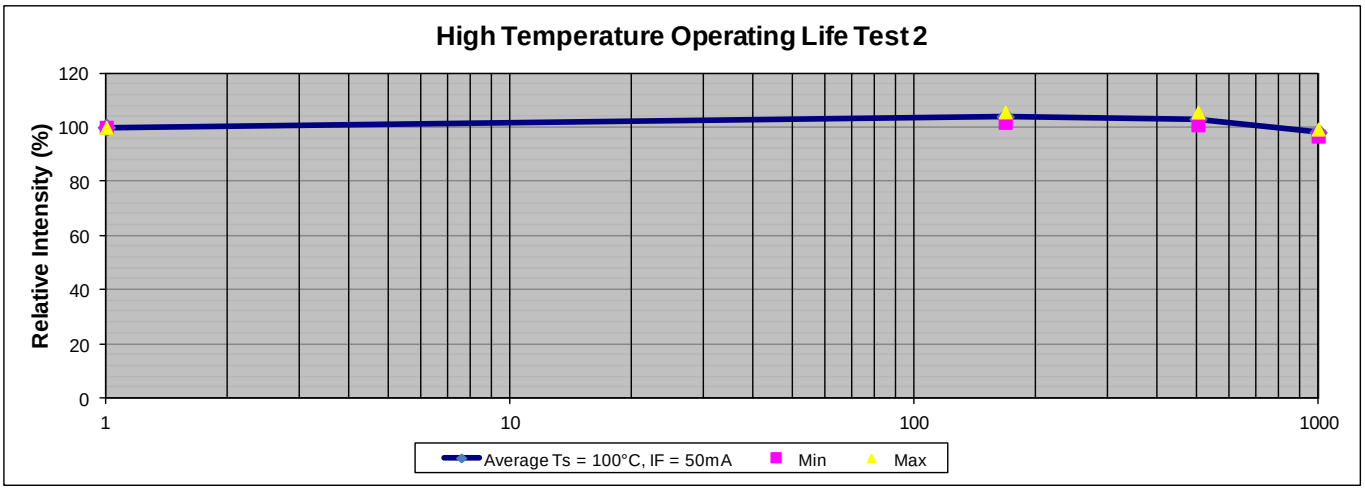
Iv Degradation Data





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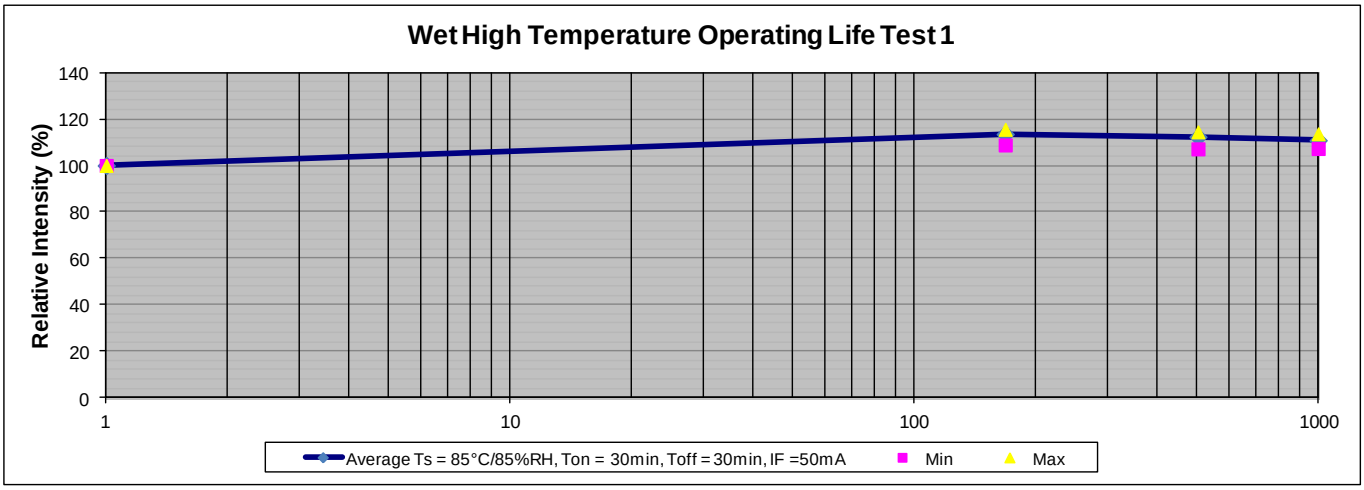

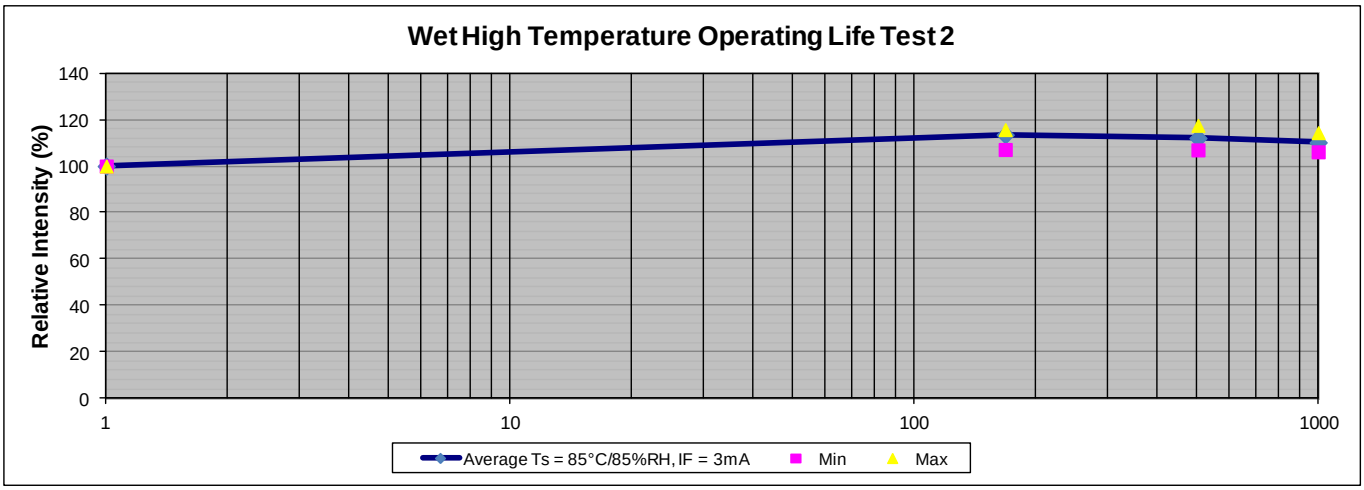

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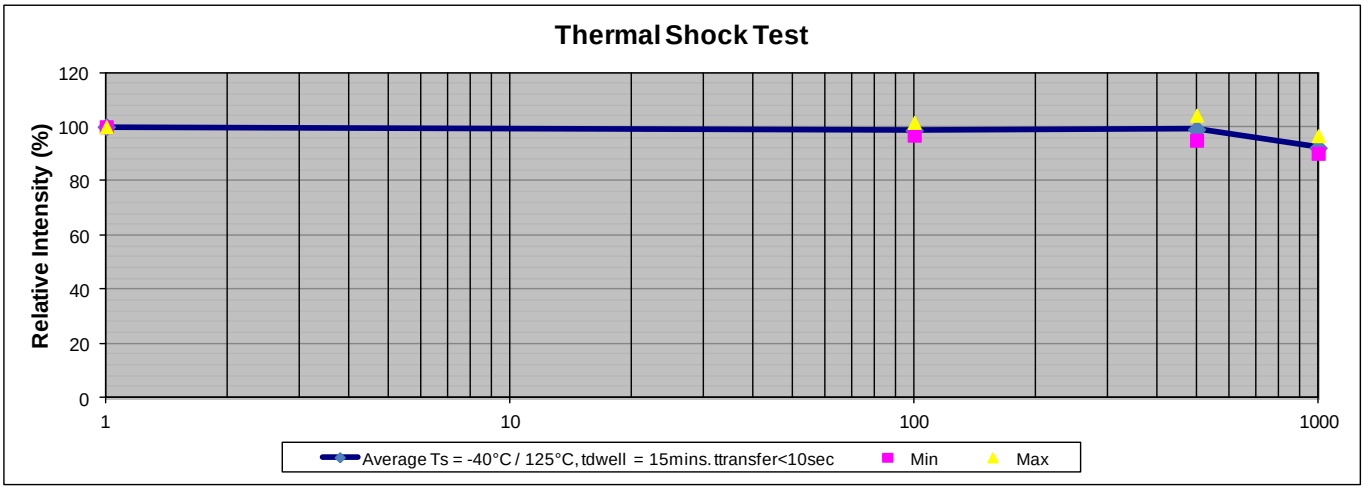

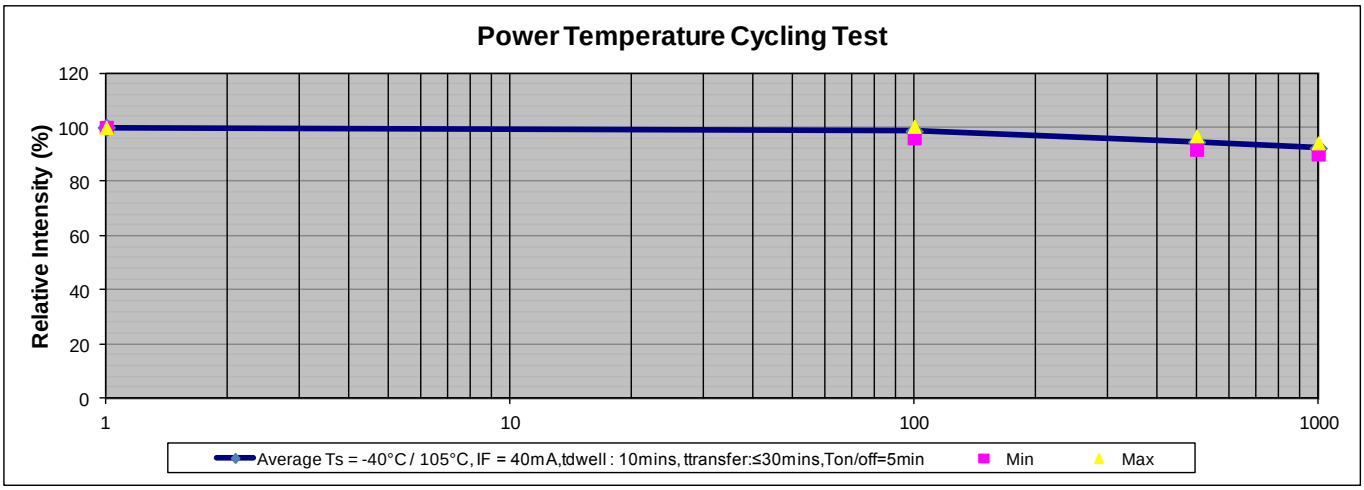

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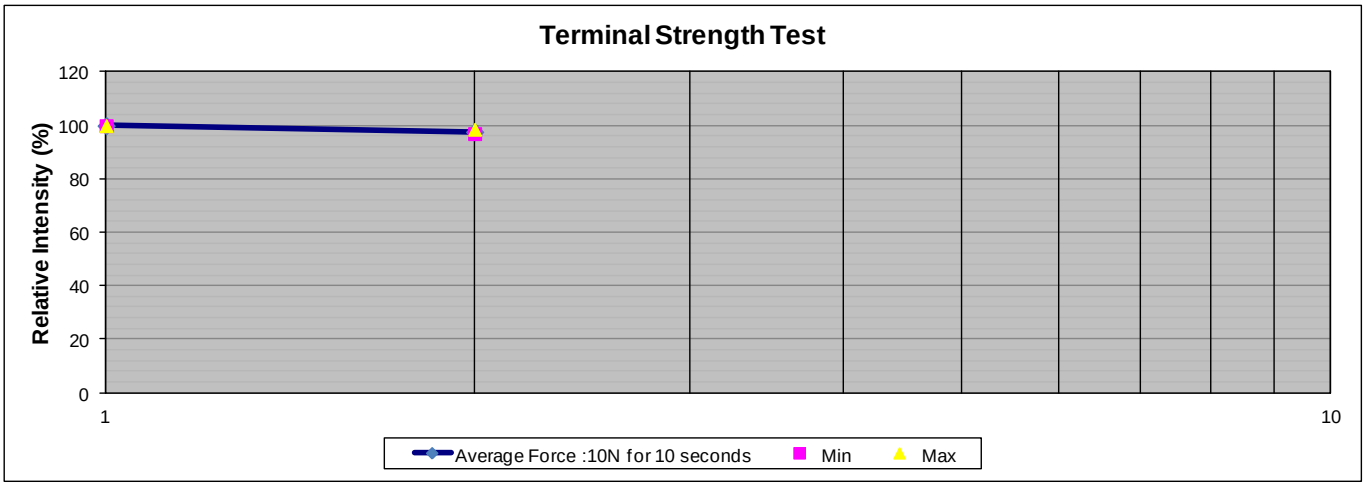

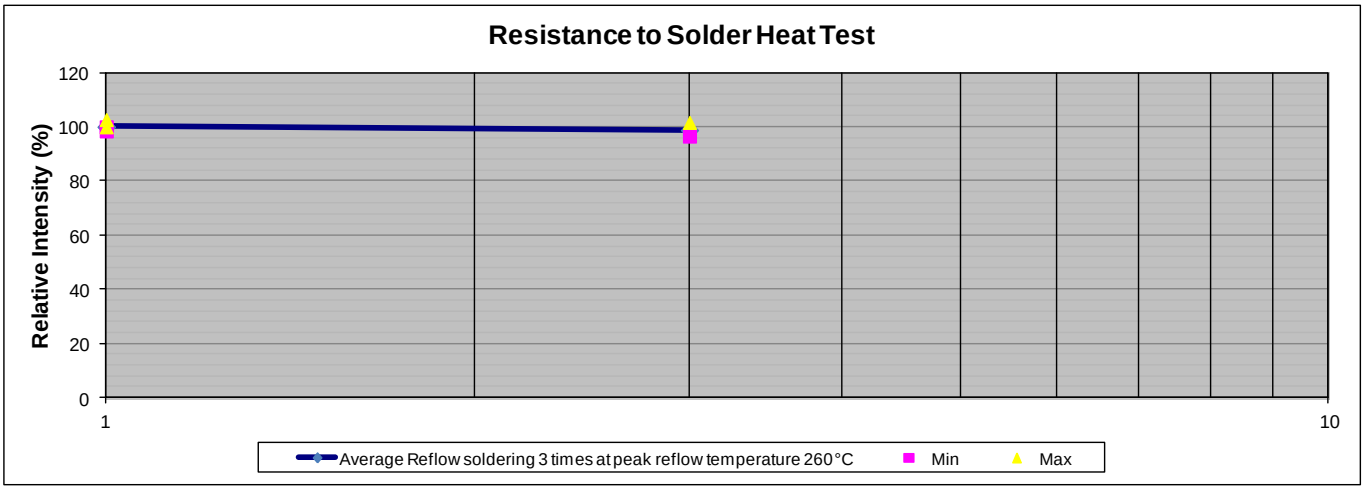

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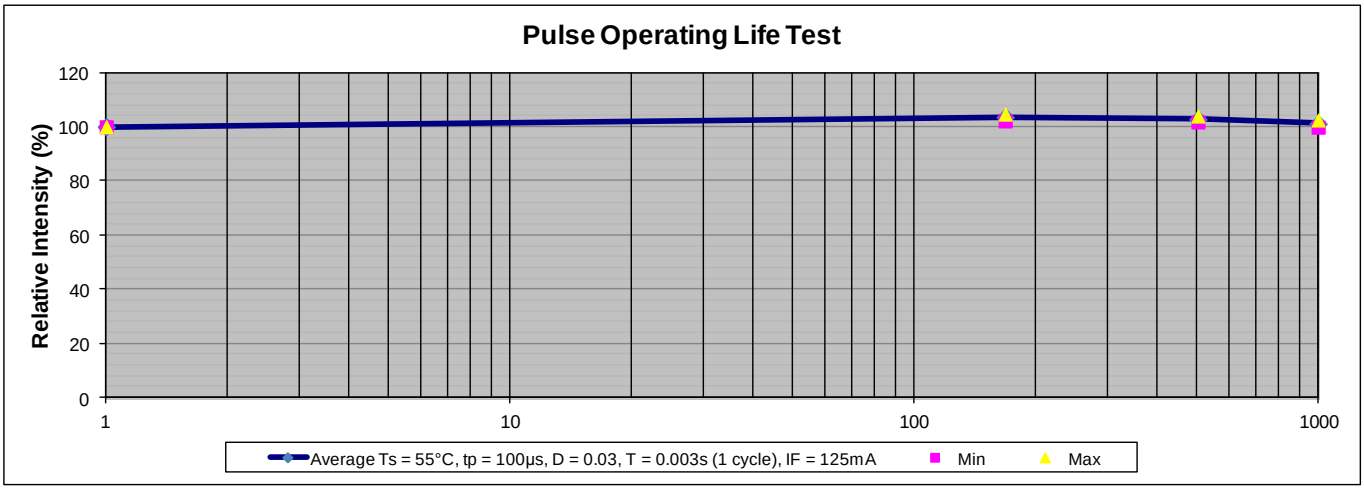

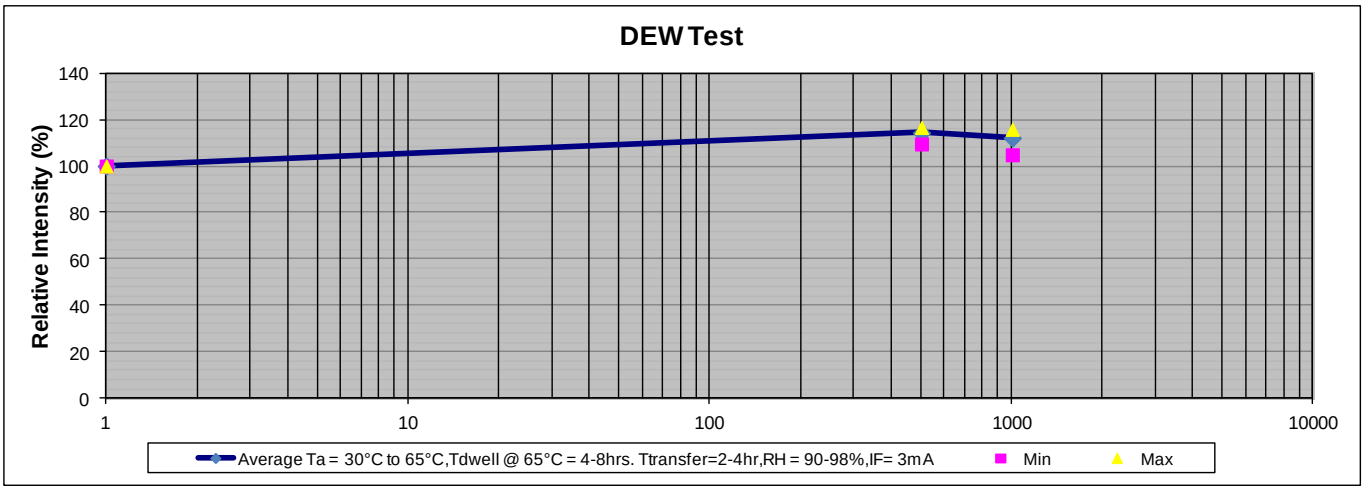

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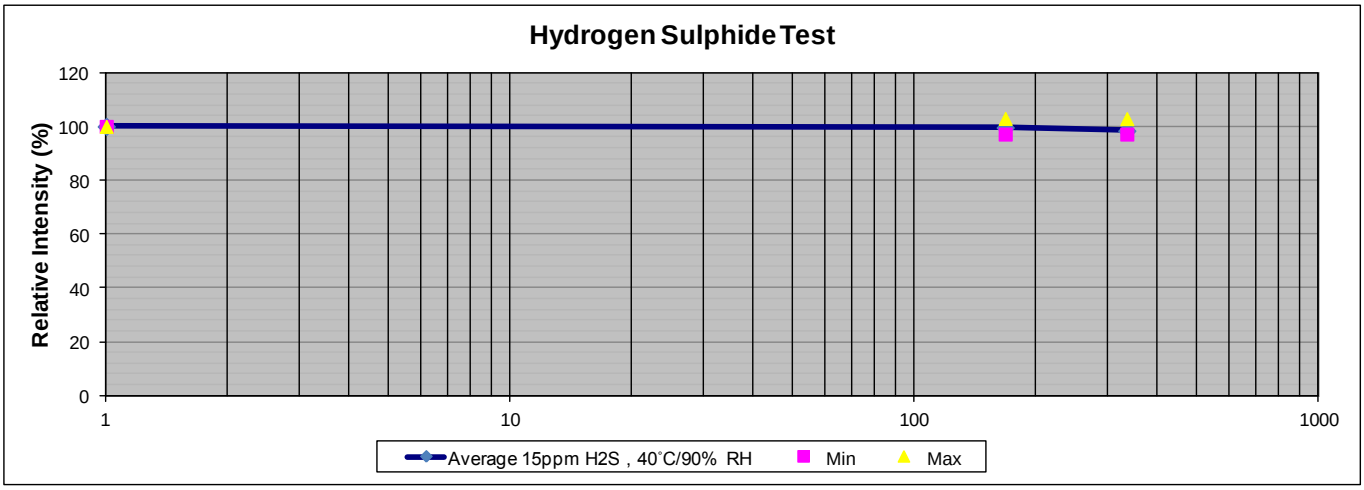

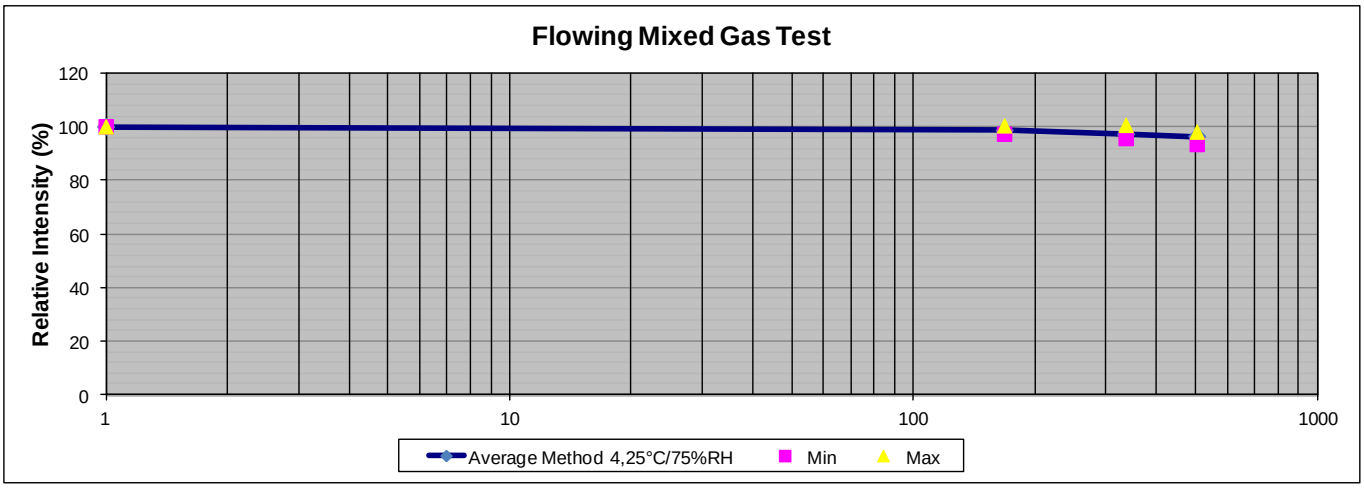

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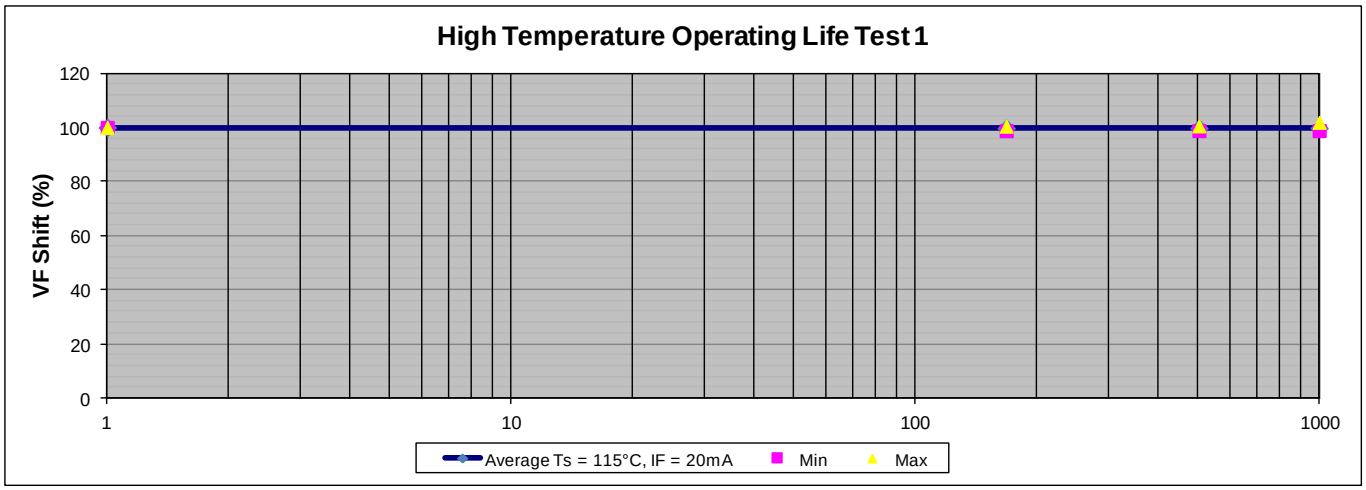
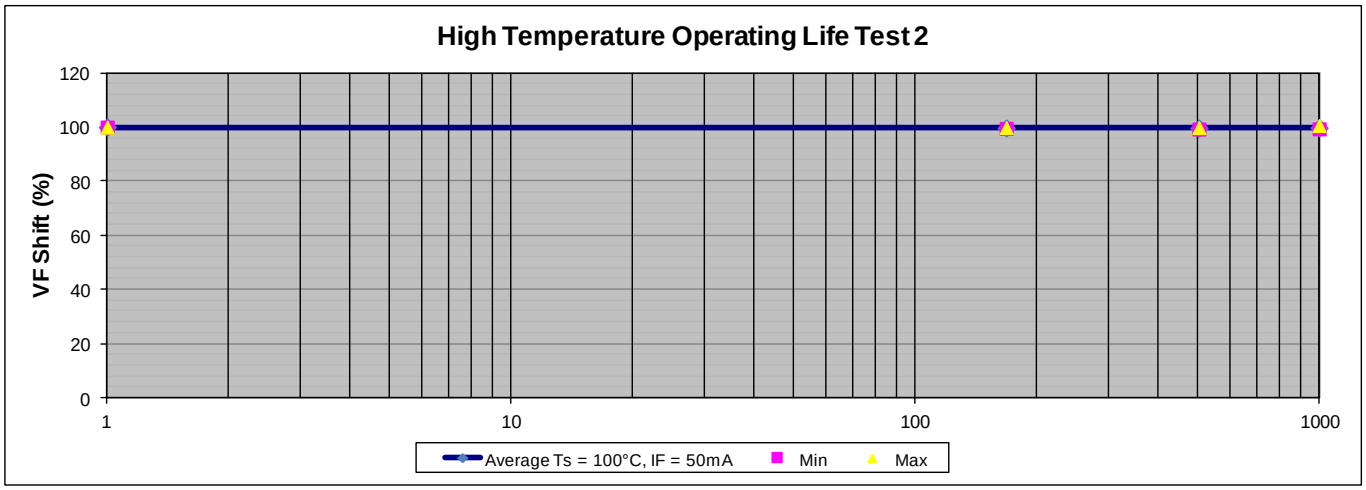
Vf Shift data





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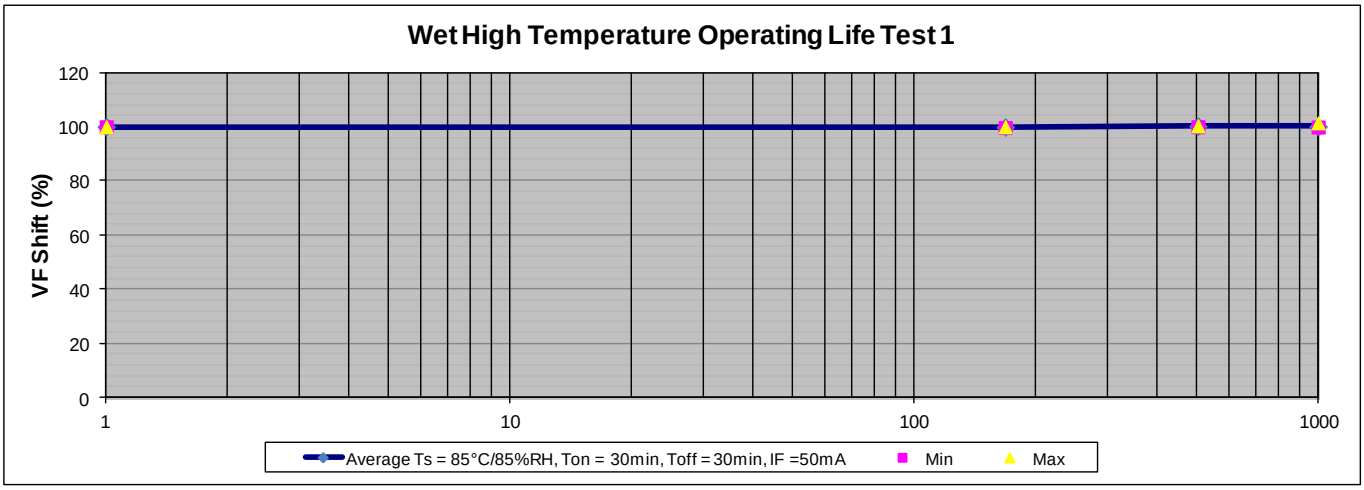

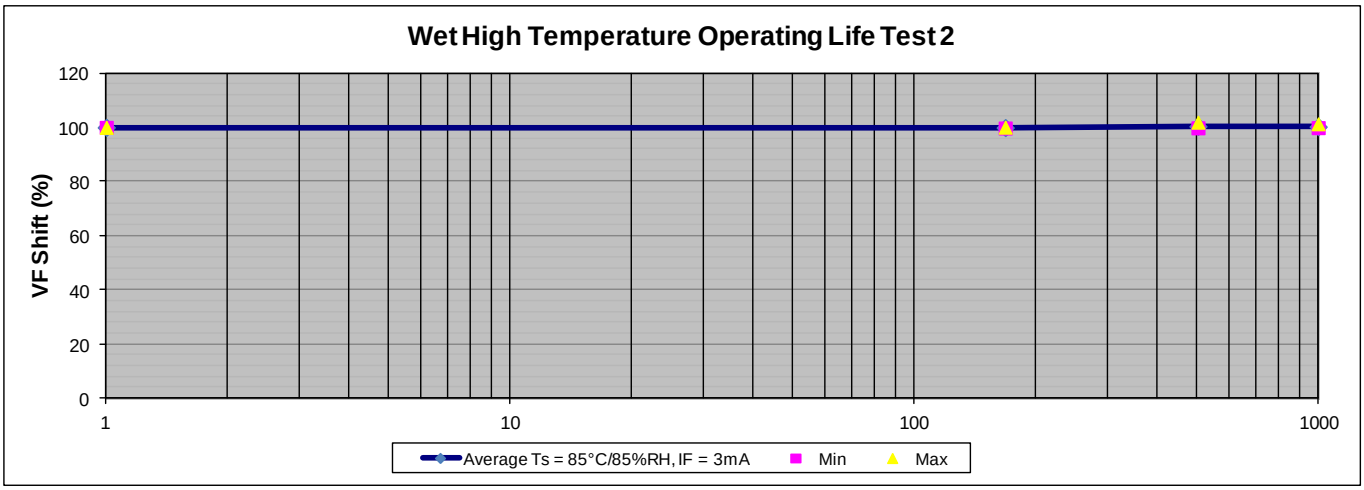

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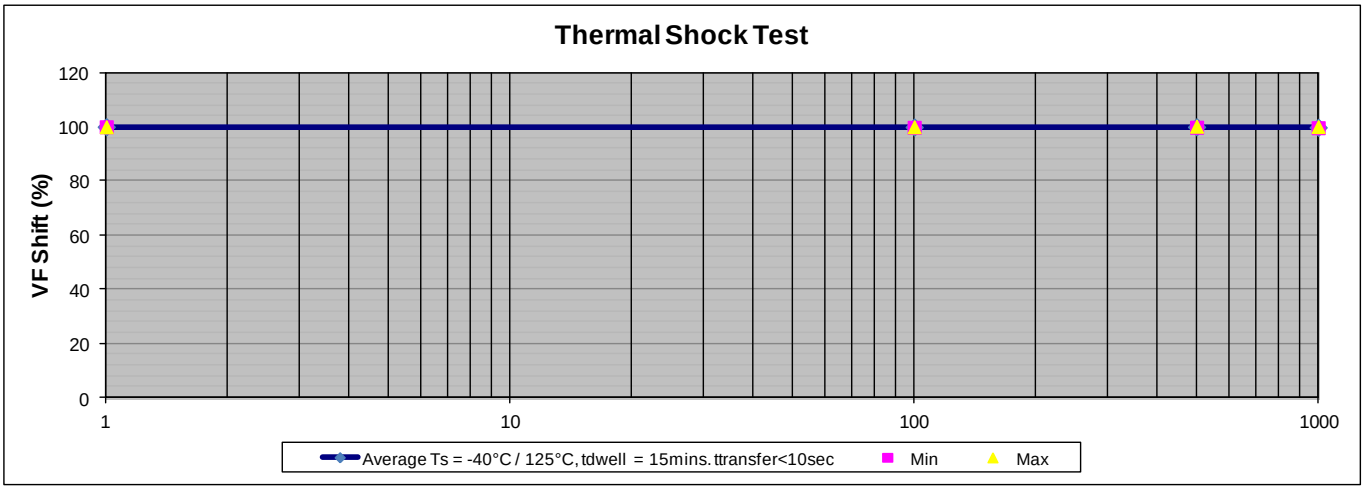

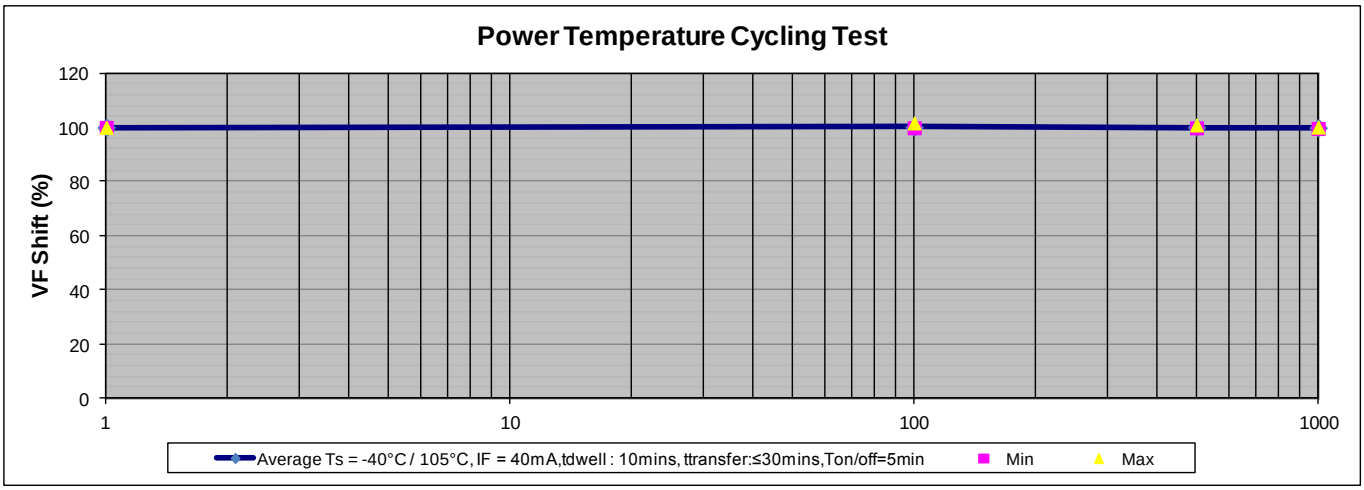

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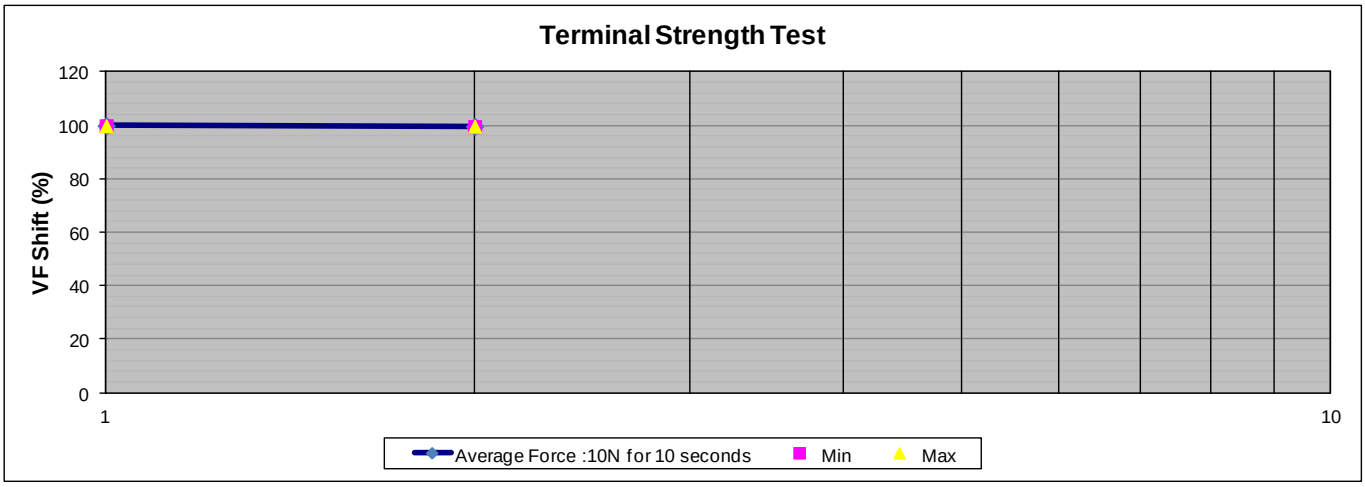

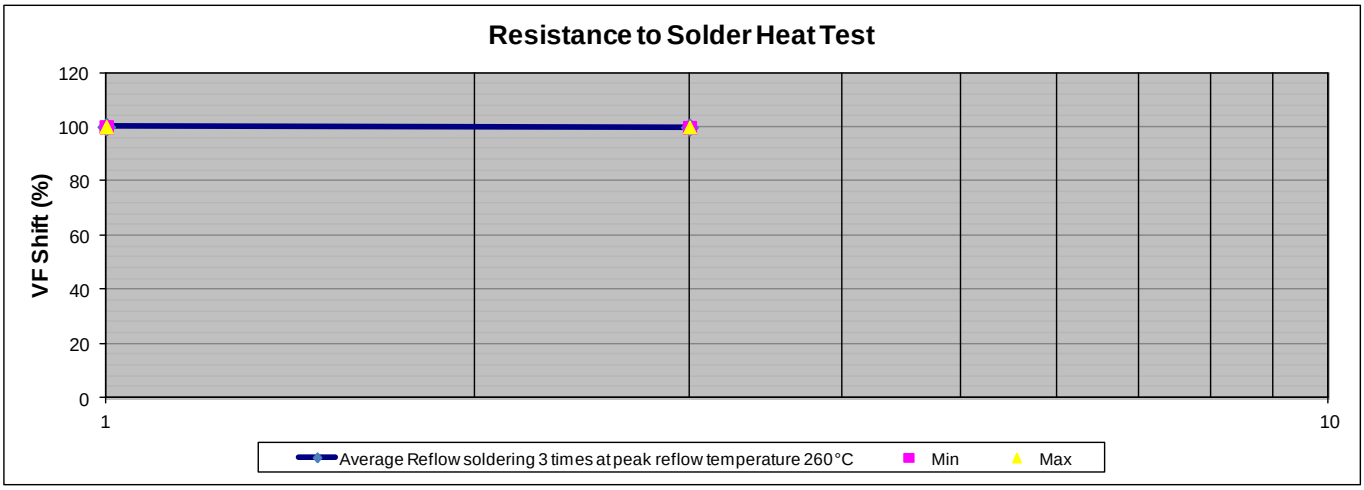

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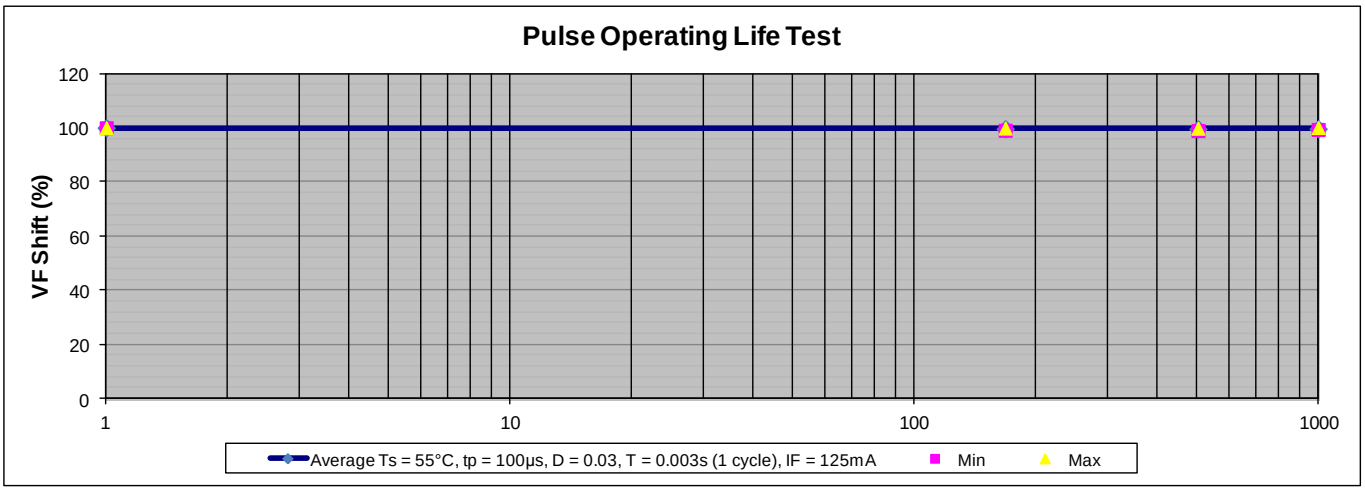

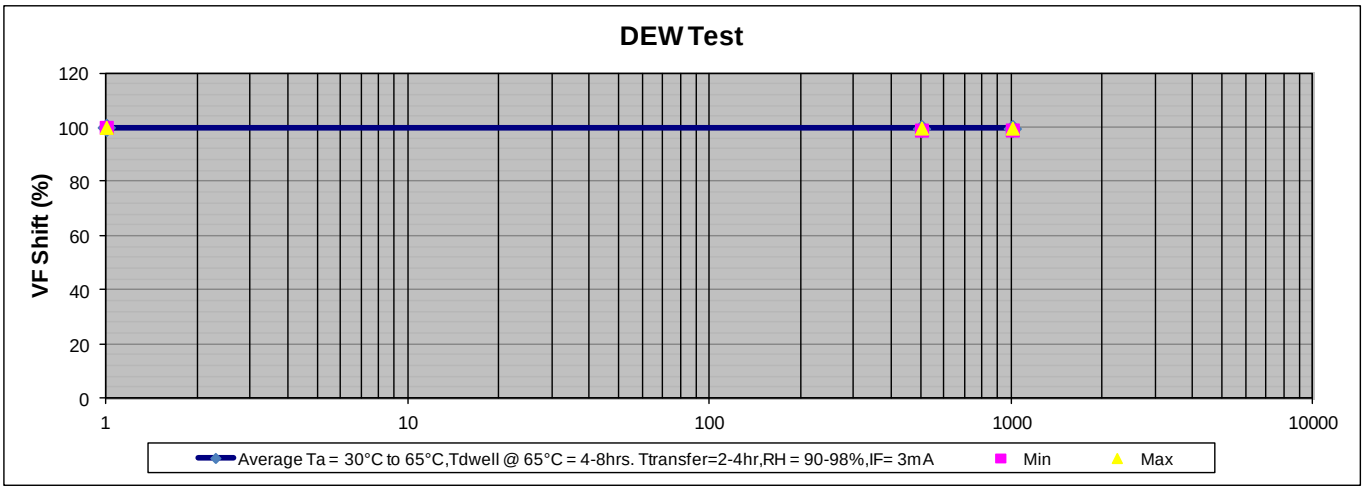

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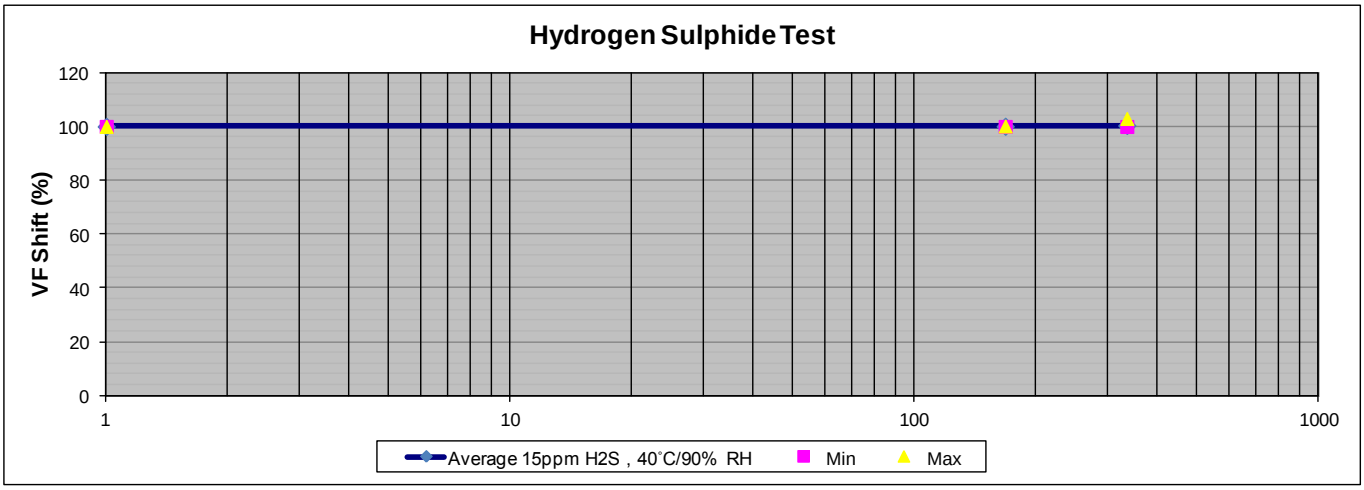

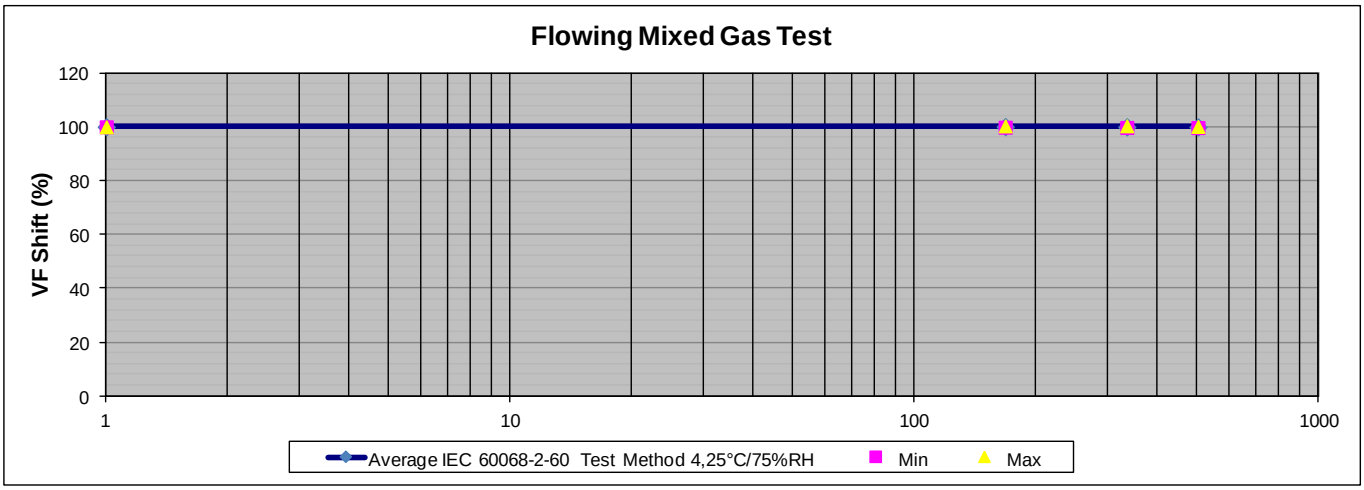

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Reliability Test Data:

High Temperature Operating Life Test 1

Ts=115°C, IF=20mA

Unit no.	0 hrs	0 hrs	168 hrs	Delta VF	168 hrs	Delta IV	504 hrs	Delta VF	504 hrs	Delta IV	1000 hrs	Delta VF	1000 hrs	Delta IV
	VF (V)	IV (mcd)	VF (V)	%	IV (mcd)	%	VF (V)	%	IV (mcd)	%	VF (V)	%	IV (mcd)	%
1	2.91	2101.77	2.899	-0.38	2186.45	4.03	2.887	-0.79	2160.29	2.78	2.888	-0.76	2084.14	-0.84
2	2.897	2138.26	2.889	-0.28	2219.4	3.79	2.888	-0.31	2198.86	2.83	2.889	-0.28	2112.55	-1.20
3	2.854	2137.1	2.848	-0.21	2214.54	3.62	2.849	-0.18	2184.91	2.24	2.85	-0.14	2103.6	-1.57
4	2.895	2168.07	2.885	-0.35	2260.36	4.26	2.885	-0.35	2242.81	3.45	2.884	-0.38	2168.26	0.01
5	2.883	2207.02	2.878	-0.17	2292.17	3.86	2.879	-0.14	2271.44	2.92	2.879	-0.14	2195.89	-0.50
6	2.897	2170.66	2.89	-0.24	2268.15	4.49	2.891	-0.21	2267.58	4.47	2.888	-0.31	2165.25	-0.25
7	2.898	2130.71	2.888	-0.35	2219.18	4.15	2.888	-0.35	2208.58	3.65	2.884	-0.48	2118.87	-0.56
8	2.898	2183.91	2.888	-0.35	2265.56	3.74	2.889	-0.31	2248.34	2.95	2.886	-0.41	2157.39	-1.21
9	2.887	2171.35	2.883	-0.14	2260.03	4.08	2.885	-0.07	2239.53	3.14	2.884	-0.10	2146.98	-1.12
10	2.896	2101.67	2.889	-0.24	2179.65	3.71	2.889	-0.24	2165.07	3.02	2.95	1.86	2081.38	-0.97
11	2.889	2110.41	2.88	-0.31	2206.97	4.58	2.878	-0.38	2187.51	3.65	2.876	-0.45	2101.94	-0.40
12	2.874	2138.86	2.867	-0.24	2219.22	3.76	2.868	-0.21	2204.7	3.08	2.866	-0.28	2137.05	-0.08
13	2.895	2079.61	2.887	-0.28	2157.52	3.75	2.884	-0.38	2153.18	3.54	2.882	-0.45	2078.89	-0.03
14	2.893	2174.77	2.885	-0.28	2253.22	3.61	2.882	-0.38	2230.83	2.58	2.88	-0.45	2158.54	-0.75
15	2.889	2134.45	2.884	-0.17	2206.75	3.39	2.885	-0.14	2181.89	2.22	2.883	-0.21	2111.28	-1.09
16	2.865	2180.27	2.859	-0.21	2297.16	5.36	2.855	-0.35	2257.81	3.56	2.857	-0.28	2163.65	-0.76
17	2.896	2162.17	2.889	-0.24	2255.92	4.34	2.889	-0.24	2261.67	4.60	2.888	-0.28	2158.3	-0.18
18	2.873	2140.24	2.866	-0.24	2222.08	3.82	2.867	-0.21	2217.56	3.61	2.866	-0.24	2122.86	-0.81
19	2.881	2185.36	2.874	-0.24	2257.93	3.32	2.872	-0.31	2235.39	2.29	2.873	-0.28	2166.43	-0.87
20	2.893	2206.43	2.884	-0.31	2284.23	3.53	2.881	-0.41	2252.41	2.08	2.882	-0.38	2177.58	-1.31
21	2.892	2189.11	2.882	-0.35	2300.12	5.07	2.889	-0.10	2278.09	4.06	2.888	-0.14	2183.94	-0.24
22	2.894	2135.77	2.885	-0.31	2208.15	3.39	2.882	-0.41	2303.03	7.83	2.881	-0.45	2206.28	3.30
23	2.871	2139.67	2.864	-0.24	2227.45	4.10	2.887	0.56	2248.13	5.07	2.884	0.45	2171.97	1.51
24	2.897	2189.55	2.88	-0.59	2288.23	4.51	2.88	-0.59	2266.73	3.52	2.882	-0.52	2178.59	-0.50
25	2.897	2168.78	2.862	-1.21	2214.74	2.12	2.863	-1.17	2215.15	2.14	2.863	-1.17	2146.25	-1.04
26	2.867	2109.77	2.88	0.45	2233.63	5.87	2.883	0.56	2327.37	10.31	2.882	0.52	2232.65	5.82
Average				-0.287		4.009		-0.274		3.677		-0.220		-0.217
Min				-1.208		2.119		-1.174		2.084		-1.174		-1.568
Max				0.453		5.871		0.558		10.314		1.865		5.824

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High Temperature Operating Life Test 2

Ts=100°C, IF=50mA

Unit no.	0 hrs	0 hrs	168 hrs	Delta VF	168 hrs	Delta IV	504 hrs	Delta VF	504 hrs	Delta IV	1000 hrs	Delta VF	1000 hrs	Delta IV
	VF (V)	IV (mcd)	VF (V)	%	IV (mcd)	%	VF (V)	%	IV (mcd)	%	VF (V)	%	IV (mcd)	%
1	2.901	2208.23	2.889	-0.41	2294.7	3.92	2.88	-0.72	2269.94	2.79	2.882	-0.65	2175.32	-1.49
2	2.871	2198	2.864	-0.24	2274.66	3.49	2.865	-0.21	2261.46	2.89	2.866	-0.17	2147.9	-2.28
3	2.871	2137.66	2.863	-0.28	2231.74	4.40	2.863	-0.28	2207.05	3.25	2.865	-0.21	2109.39	-1.32
4	2.865	2148.19	2.857	-0.28	2228.76	3.75	2.857	-0.28	2211.29	2.94	2.86	-0.17	2099.71	-2.26
5	2.889	2202.86	2.877	-0.42	2274.84	3.27	2.874	-0.52	2254.51	2.34	2.878	-0.38	2164.38	-1.75
6	2.896	2100.72	2.883	-0.45	2193.09	4.40	2.883	-0.45	2157.05	2.68	2.884	-0.41	2068.38	-1.54
7	2.898	2238.4	2.887	-0.38	2318.42	3.57	2.89	-0.28	2259.12	0.93	2.887	-0.38	2165.73	-3.25
8	2.86	2117.59	2.854	-0.21	2208.64	4.30	2.852	-0.28	2192.36	3.53	2.855	-0.17	2084.75	-1.55
9	2.894	2201.06	2.88	-0.48	2287.8	3.94	2.879	-0.52	2266.23	2.96	2.881	-0.45	2161.31	-1.81
10	2.884	2109.29	2.873	-0.38	2182.47	3.47	2.874	-0.35	2150.78	1.97	2.876	-0.28	2045.27	-3.04
11	2.875	2172.44	2.868	-0.24	2296.24	5.70	2.87	-0.17	2294.89	5.64	2.869	-0.21	2139.22	-1.53
12	2.896	2131.45	2.885	-0.38	2211.98	3.78	2.883	-0.45	2199.78	3.21	2.884	-0.41	2096.69	-1.63
13	2.867	2171.78	2.862	-0.17	2267.6	4.41	2.86	-0.24	2253.03	3.74	2.864	-0.10	2157.63	-0.65
14	2.881	2213.13	2.871	-0.35	2291.59	3.55	2.87	-0.38	2272.65	2.69	2.872	-0.31	2173.54	-1.79
15	2.882	2095.86	2.873	-0.31	2183.38	4.18	2.875	-0.24	2172.41	3.65	2.874	-0.28	2074.6	-1.01
16	2.877	2123.89	2.867	-0.35	2210.82	4.09	2.867	-0.35	2205.11	3.82	2.868	-0.31	2087.13	-1.73
17	2.89	2141.14	2.878	-0.42	2228.86	4.10	2.875	-0.52	2189.28	2.25	2.878	-0.42	2098.71	-1.98
18	2.891	2143.17	2.879	-0.42	2242.03	4.61	2.877	-0.48	2234.03	4.24	2.884	-0.24	2094.23	-2.28
19	2.89	2135.46	2.884	-0.21	2174.44	1.83	2.884	-0.21	2161.44	1.22	2.885	-0.17	2106.83	-1.34
20	2.877	2124.65	2.87	-0.24	2216.47	4.32	2.868	-0.31	2187.42	2.95	2.872	-0.17	2087.74	-1.74
21	2.895	2198.85	2.881	-0.48	2273.26	3.38	2.88	-0.52	2262.36	2.89	2.883	-0.41	2135.86	-2.86
22	2.876	2156.36	2.869	-0.24	2242.94	4.02	2.868	-0.28	2227.17	3.28	2.874	-0.07	2097.5	-2.73
23	2.891	2044.76	2.883	-0.28	2138.5	4.58	2.883	-0.28	2123.87	3.87	2.891	0.00	2010.86	-1.66
24	2.866	2127.53	2.859	-0.24	2218.4	4.27	2.859	-0.24	2203.25	3.56	2.883	0.59	2098.47	-1.37
25	2.896	2129.15	2.89	-0.21	2210.37	3.81	2.891	-0.17	2199.66	3.31	2.893	-0.10	2095.16	-1.60
26	2.89	2249.9	2.879	-0.38	2338.7	3.95	2.876	-0.48	2326.79	3.42	2.879	-0.38	2210.06	-1.77
Average				-0.325		3.965		-0.355		3.077		-0.242		-1.844
Min				-0.484		1.825		-0.724		0.926		-0.655		-3.247
Max				-0.174		5.699		-0.173		5.637		0.593		-0.652

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Wet High Temperature Operating Life Test 1

Ts = 85°C/85% RH, IF = 50mA

Unit no.	0 hrs	0 hrs	168 hrs	Delta VF	168 hrs	Delta IV	504 hrs	Delta VF	504 hrs	Delta IV	1000 hrs	Delta VF	1000 hrs	Delta IV
	VF (V)	IV (mcd)	VF (V)	%	IV (mcd)	%	VF (V)	%	IV (mcd)	%	VF (V)	%	IV (mcd)	%
1	2.867	2120.74	2.867	0.00	2373.42	11.91	2.87	0.10	2350.57	10.84	2.865	-0.07	2331.91	9.96
2	2.875	2106.86	2.867	-0.28	2366.44	12.32	2.882	0.24	2317.68	10.01	2.872	-0.10	2337.28	10.94
3	2.851	2136.32	2.848	-0.11	2324.97	8.83	2.858	0.25	2289.05	7.15	2.852	0.04	2323.08	8.74
4	2.888	2068.94	2.883	-0.17	2323.44	12.30	2.894	0.21	2268.65	9.65	2.886	-0.07	2307.6	11.54
5	2.874	2141	2.87	-0.14	2454.8	14.66	2.879	0.17	2450.94	14.48	2.874	0.00	2424.98	13.26
6	2.886	2203.4	2.88	-0.21	2448.62	11.13	2.891	0.17	2427.46	10.17	2.887	0.03	2364.47	7.31
7	2.857	2058.7	2.852	-0.18	2346.4	13.97	2.864	0.25	2339.68	13.65	2.856	-0.04	2322.91	12.83
8	2.888	2100.29	2.885	-0.10	2337.26	11.28	2.898	0.35	2310.19	9.99	2.89	0.07	2342.22	11.52
9	2.883	2140.56	2.879	-0.14	2437.81	13.89	2.888	0.17	2421.8	13.14	2.882	-0.03	2362.54	10.37
10	2.885	2119.06	2.88	-0.17	2410.73	13.76	2.892	0.24	2380.7	12.35	2.887	0.07	2316.94	9.34
11	2.863	2118.5	2.862	-0.03	2398.35	13.21	2.872	0.31	2386.62	12.66	2.865	0.07	2351.01	10.98
12	2.878	2113.47	2.873	-0.17	2394.74	13.31	2.888	0.35	2380.25	12.62	2.882	0.14	2342.86	10.85
13	2.864	2042.87	2.862	-0.07	2347.78	14.93	2.872	0.28	2317.53	13.44	2.866	0.07	2303.09	12.74
14	2.881	2161.77	2.877	-0.14	2446.13	13.15	2.885	0.14	2425.19	12.19	2.878	-0.10	2408.68	11.42
15	2.86	2151.25	2.858	-0.07	2470.94	14.86	2.866	0.21	2415.69	12.29	2.86	0.00	2337.34	8.65
16	2.887	2130.3	2.885	-0.07	2454.27	15.21	2.897	0.35	2434.56	14.28	2.894	0.24	2383.48	11.88
17	2.886	2150.88	2.883	-0.10	2462.62	14.49	2.891	0.17	2446.67	13.75	2.928	1.46	2407.97	11.95
18	2.886	2173.73	2.882	-0.14	2459.27	13.14	2.894	0.28	2433.35	11.94	2.888	0.07	2349.88	8.10
19	2.854	2103.98	2.851	-0.11	2381.27	13.18	2.861	0.25	2366.94	12.50	2.857	0.11	2290.21	8.85
20	2.874	2022.51	2.871	-0.10	2335.32	15.47	2.878	0.14	2303.66	13.90	2.88	0.21	2298.3	13.64
21	2.875	2115.7	2.871	-0.14	2445.14	15.57	2.876	0.03	2415.75	14.18	2.873	-0.07	2312.49	9.30
22	2.888	2140.75	2.882	-0.21	2445.14	14.22	2.892	0.14	2418.82	12.99	2.888	0.00	2381.93	11.27
23	2.881	2145.02	2.877	-0.14	2429.3	13.25	2.887	0.21	2409.98	12.35	2.88	-0.03	2405.93	12.16
24	2.864	2046.37	2.861	-0.10	2330.4	13.88	2.873	0.31	2309.13	12.84	2.868	0.14	2277.75	11.31
25	2.889	2069.24	2.884	-0.17	2366.06	14.34	2.894	0.17	2351.26	13.63	2.893	0.14	2320.91	12.16
26	2.883	2045.04	2.88	-0.10	2349.49	14.89	2.889	0.21	2332.2	14.04	2.882	-0.03	2273.43	11.17
Average				-0.130		13.506		0.219		12.347		0.088		10.855
Min				-0.278		8.831		0.035		7.149		-0.104		7.310
Max				0.000		15.571		0.347		14.476		1.455		13.636

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References Device: DDZB-HKG

Wet High Temperature Operating Life Test 2

Ts = 85°C/85% RH, IF = 3mA

Unit no.	0 hrs	0 hrs	168 hrs	Delta VF	168 hrs	Delta IV	504 hrs	Delta VF	504 hrs	Delta IV	1000 hrs	Delta VF	1000 hrs	Delta IV
	VF (V)	IV (mcd)	VF (V)	%	IV (mcd)	%	VF (V)	%	IV (mcd)	%	VF (V)	%	IV (mcd)	%
1	2.877	2198.24	2.87	-0.24	2543.6	15.71	2.872	-0.17	2400.69	9.21	2.875	-0.07	2333.13	6.14
2	2.86	2091.08	2.858	-0.07	2395.64	14.56	2.869	0.31	2363.21	13.01	2.861	0.03	2358.63	12.79
3	2.886	2109.75	2.884	-0.07	2382.18	12.91	2.894	0.28	2256.94	6.98	2.918	1.11	2343.86	11.10
4	2.877	2121.75	2.875	-0.07	2399.85	13.11	2.886	0.31	2306.1	8.69	2.877	0.00	2316.6	9.18
5	2.889	2189.22	2.884	-0.17	2531.54	15.64	2.9	0.38	2434.8	11.22	2.889	0.00	2363.83	7.98
6	2.868	2169.6	2.866	-0.07	2391.44	10.22	2.895	0.94	2359.82	8.77	2.869	0.03	2354.56	8.53
7	2.884	2204.96	2.882	-0.07	2426.85	10.06	2.894	0.35	2476.06	12.30	2.882	-0.07	2443.06	10.80
8	2.884	2128.76	2.88	-0.14	2415.46	13.47	2.894	0.35	2398.29	12.66	2.893	0.31	2364.38	11.07
9	2.881	2157.38	2.877	-0.14	2448.56	13.50	2.89	0.31	2377.85	10.22	2.919	1.32	2386.07	10.60
10	2.882	2174.83	2.879	-0.10	2461.61	13.19	2.896	0.49	2420.73	11.31	2.886	0.14	2322.12	6.77
11	2.884	2074.06	2.884	0.00	2385.43	15.01	2.898	0.49	2336.95	12.68	2.888	0.14	2319.1	11.81
12	2.88	2013.5	2.88	0.00	2293.48	13.91	2.89	0.35	2366.88	17.55	2.878	-0.07	2303.24	14.39
13	2.876	2120.69	2.878	0.07	2271.99	7.13	2.891	0.52	2276.2	7.33	2.881	0.17	2289.68	7.97
14	2.849	2048.64	2.846	-0.11	2339.73	14.21	2.857	0.28	2323.15	13.40	2.883	1.19	2310.23	12.77
15	2.886	2126.37	2.882	-0.14	2454.07	15.41	2.895	0.31	2452.41	15.33	2.897	0.38	2424.55	14.02
16	2.887	2159.84	2.885	-0.07	2461.72	13.98	2.898	0.38	2355.47	9.06	2.893	0.21	2309.29	6.92
17	2.882	2139.89	2.88	-0.07	2386.1	11.51	2.937	1.91	2352.84	9.95	2.893	0.38	2300.48	7.50
18	2.863	2132.72	2.861	-0.07	2442.72	14.54	2.872	0.31	2415.31	13.25	2.862	-0.03	2326.63	9.09
19	2.864	2118.25	2.862	-0.07	2442.46	15.31	2.873	0.31	2407.94	13.68	2.864	0.00	2356.46	11.25
20	2.871	2131.63	2.871	0.00	2460.9	15.45	2.881	0.35	2454.2	15.13	2.874	0.10	2411.8	13.14
21	2.884	2132.65	2.886	0.07	2424.2	13.67	2.897	0.45	2399.8	12.53	2.896	0.42	2298.58	7.78
22	2.876	2104.26	2.873	-0.10	2358.21	12.07	2.879	0.10	2386.57	13.42	2.874	-0.07	2303.53	9.47
23	2.889	2138.34	2.885	-0.14	2469.32	15.48	2.895	0.21	2446.8	14.43	2.916	0.93	2380.3	11.32
24	2.871	2084	2.87	-0.03	2397.31	15.03	2.881	0.35	2433.37	16.76	2.874	0.10	2375.67	14.00
25	2.875	2118.92	2.868	-0.24	2440.55	15.18	2.88	0.17	2431.38	14.75	2.872	-0.10	2375.51	12.11
26	2.876	2199.45	2.873	-0.10	2431.37	10.54	2.882	0.21	2432.38	10.59	2.875	-0.03	2340.7	6.42
Average				-0.083		13.492		0.394		12.084		0.251		10.189
Min				-0.243		7.134		-0.174		6.977		-0.104		6.136
Max				0.070		15.711		1.908		17.551		1.319		14.390

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Thermal Shock Test

-40/125°C, 15mins dwell, <10sec transfer

Unit no.	0 X	0 X	100 X	Delta VF	100 X	Delta IV	500 X	Delta VF	500 X	Delta IV	1000 X	Delta VF	1000 X	Delta IV
	VF (V)	IV (mcd)	VF (V)	%	IV (mcd)	%	VF (V)	%	IV (mcd)	%	VF (V)	%	IV (mcd)	%
1	2.888	2102.08	2.882	-0.21	2084.9	-0.82	2.886	-0.07	2086.41	-0.75	2.878	-0.35	1896.75	-9.77
2	2.869	2130.23	2.865	-0.14	2121.73	-0.40	2.868	-0.03	2189.05	2.76	2.862	-0.24	2002.22	-6.01
3	2.893	2257.18	2.89	-0.10	2204.04	-2.35	2.89	-0.10	2184.64	-3.21	2.885	-0.28	2084.01	-7.67
4	2.882	2068.49	2.876	-0.21	2004.31	-3.10	2.879	-0.10	1973.58	-4.59	2.873	-0.31	1948.03	-5.82
5	2.863	2051.79	2.859	-0.14	2018.39	-1.63	2.859	-0.14	2036.63	-0.74	2.853	-0.35	1881.12	-8.32
6	2.869	2195.3	2.867	-0.07	2155.62	-1.81	2.869	0.00	2161.54	-1.54	2.862	-0.24	2033.12	-7.39
7	2.883	2125.85	2.881	-0.07	2075	-2.39	2.882	-0.03	2050.76	-3.53	2.885	0.07	1932.45	-9.10
8	2.882	2011.52	2.881	-0.03	2008.32	-0.16	2.881	-0.03	2024.96	0.67	2.876	-0.21	1925.79	-4.26
9	2.874	2178.43	2.872	-0.07	2131.53	-2.15	2.874	0.00	2099.91	-3.60	2.87	-0.14	1993.86	-8.47
10	2.881	2108.82	2.881	0.00	2103.52	-0.25	2.887	0.21	2119.95	0.53	2.88	-0.03	1942.53	-7.89
11	2.881	2115.3	2.879	-0.07	2108.04	-0.34	2.884	0.10	2164.63	2.33	2.878	-0.10	1976.75	-6.55
12	2.882	2039.02	2.881	-0.03	2071.64	1.60	2.884	0.07	2085.58	2.28	2.877	-0.17	1972.09	-3.28
13	2.851	2079.3	2.851	0.00	2038.33	-1.97	2.852	0.04	2041.35	-1.83	2.846	-0.18	1895.56	-8.84
14	2.885	2152.1	2.881	-0.14	2118.88	-1.54	2.887	0.07	2091.14	-2.83	2.881	-0.14	1954.92	-9.16
15	2.877	2095.46	2.875	-0.07	2066.17	-1.40	2.876	-0.03	2080.01	-0.74	2.872	-0.17	1970.09	-5.98
16	2.882	2122.3	2.881	-0.03	2086.72	-1.68	2.88	-0.07	2027.02	-4.49	2.877	-0.17	1927.99	-9.16
17	2.874	2164.08	2.873	-0.03	2134.53	-1.37	2.874	0.00	2157.28	-0.31	2.866	-0.28	1960.89	-9.39
18	2.886	2133	2.883	-0.10	2111.84	-0.99	2.888	0.07	2179.17	2.16	2.879	-0.24	1973.99	-7.45
19	2.877	2174.56	2.873	-0.14	2147.19	-1.26	2.876	-0.03	2066.32	-4.98	2.874	-0.10	1980.03	-8.95
20	2.886	2149.19	2.882	-0.14	2085.69	-2.95	2.883	-0.10	2130.45	-0.87	2.88	-0.21	1947.06	-9.40
21	2.875	2154.95	2.873	-0.07	2115.29	-1.84	2.873	-0.07	2049.29	-4.90	2.868	-0.24	1955.68	-9.25
22	2.878	2182	2.874	-0.14	2127.44	-2.50	2.873	-0.17	2170.54	-0.53	2.869	-0.31	1968.37	-9.79
23	2.883	2161.31	2.88	-0.10	2137.08	-1.12	2.88	-0.10	2108.63	-2.44	2.876	-0.24	1955	-9.55
24	2.877	2032.35	2.874	-0.10	2035.46	0.15	2.874	-0.10	2118.77	4.25	2.867	-0.35	1936.02	-4.74
25	2.887	2051.64	2.884	-0.10	2043.4	-0.40	2.882	-0.17	2057.01	0.26	2.88	-0.24	1916.09	-6.61
26	2.884	2147.28	2.881	-0.10	2128.28	-0.88	2.879	-0.17	2192.88	2.12	2.876	-0.28	1957.51	-8.84
Average				-0.093		-1.291		-0.039		-0.942		-0.212		-7.755
Min				-0.208		-3.103		-0.174		-4.978		-0.349		-9.791
Max				0.000		1.600		0.208		4.252		0.069		-3.282

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Power Temperature Cycling Test

Ts = -40°C/105°C, IF= 40mA

Unit no.	0 X	0 X	100 X	Delta VF	100 X	Delta IV	500 X	Delta VF	500 X	Delta IV	1000 X	Delta VF	1000 X	Delta IV
	VF (V)	IV (mcd)	VF (V)	%	IV (mcd)	%	VF (V)	%	IV (mcd)	%	VF (V)	%	IV (mcd)	%
1	2.88	2109.66	2.878	-0.07	2050.93	-2.78	2.878	-0.07	1952.53	-7.45	2.868	-0.42	1943.28	-7.89
2	2.849	2079.1	2.845	-0.14	1998.74	-3.87	2.846	-0.11	1910.73	-8.10	2.843	-0.21	1886.63	-9.26
3	2.858	1971.71	2.855	-0.10	1957.65	-0.71	2.855	-0.10	1878.88	-4.71	2.85	-0.28	1847.82	-6.28
4	2.884	2180.38	2.92	1.25	2166.13	-0.65	2.892	0.28	2071.84	-4.98	2.877	-0.24	2001.32	-8.21
5	2.876	2113.62	2.874	-0.07	2078.44	-1.66	2.875	-0.03	1981.81	-6.24	2.869	-0.24	1964.07	-7.08
6	2.878	2117.31	2.877	-0.03	2083.06	-1.62	2.876	-0.07	2013.41	-4.91	2.875	-0.10	1938.22	-8.46
7	2.883	1985.97	2.882	-0.03	1967.37	-0.94	2.88	-0.10	1898.87	-4.39	2.878	-0.17	1852.67	-6.71
8	2.851	2053.68	2.85	-0.04	2046.62	-0.34	2.849	-0.07	1952.32	-4.94	2.846	-0.18	1930.84	-5.98
9	2.876	2165.15	2.923	1.63	2156.67	-0.39	2.876	0.00	2081.07	-3.88	2.872	-0.14	2034.98	-6.01
10	2.843	2054.75	2.843	0.00	2029.58	-1.22	2.842	-0.04	1961.35	-4.55	2.842	-0.04	1906.34	-7.22
11	2.853	2136.16	2.853	0.00	2098.29	-1.77	2.852	-0.04	2045.22	-4.26	2.856	0.11	2004.63	-6.16
12	2.885	2116.78	2.883	-0.07	2096.6	-0.95	2.911	0.90	2015.7	-4.78	2.885	0.00	1957.58	-7.52
13	2.854	2029.44	2.852	-0.07	2005.16	-1.20	2.852	-0.07	1944.32	-4.19	2.849	-0.18	1893.48	-6.70
14	2.874	2099.35	2.873	-0.03	2058.59	-1.94	2.876	0.07	1964	-6.45	2.871	-0.10	1898.27	-9.58
15	2.883	2062.79	2.884	0.03	2015.69	-2.28	2.887	0.14	1939.64	-5.97	2.882	-0.03	1859.97	-9.83
16	2.847	2101.21	2.846	-0.04	2085.84	-0.73	2.844	-0.11	1989.16	-5.33	2.845	-0.07	1918.38	-8.70
17	2.876	2027.17	2.876	0.00	2012.04	-0.75	2.871	-0.17	1928.31	-4.88	2.871	-0.17	1881.27	-7.20
18	2.882	2045.44	2.882	0.00	2014.63	-1.51	2.88	-0.07	1922.97	-5.99	2.883	0.03	1847.05	-9.70
19	2.866	2055.17	2.872	0.21	2025.43	-1.45	2.865	-0.03	1937.68	-5.72	2.865	-0.03	1870.19	-9.00
20	2.865	2066.26	2.865	0.00	2032.03	-1.66	2.861	-0.14	1950.18	-5.62	2.861	-0.14	1902.7	-7.92
21	2.85	2083.72	2.849	-0.04	2060.37	-1.12	2.847	-0.11	1978.24	-5.06	2.846	-0.14	1964.63	-5.72
22	2.882	2148.94	2.88	-0.07	2111.22	-1.76	2.879	-0.10	2033.07	-5.39	2.877	-0.17	2006.61	-6.62
23	2.869	2164.23	2.869	0.00	2118.06	-2.13	2.865	-0.14	2008.11	-7.21	2.863	-0.21	1995.54	-7.79
24	2.848	2105.62	2.848	0.00	2075.38	-1.44	2.846	-0.07	1981.37	-5.90	2.843	-0.18	1937.32	-7.99
25	2.871	2151.99	2.871	0.00	2114.55	-1.74	2.869	-0.07	2014.24	-6.40	2.866	-0.17	1988.85	-7.58
26	2.872	2111.57	2.874	0.07	2119.51	0.38	2.871	-0.03	2045.77	-3.12	2.86	-0.42	1936.38	-8.30
Average				0.092		-1.394		-0.014		-5.400		-0.150		-7.670
Min				-0.140		-3.865		-0.174		-8.098		-0.418		-9.832
Max				1.634		0.376		0.901		-3.116		0.105		-5.715

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Terminal Strength Test

Force 10N for 10s

Unit no.	0 X	0 X	1 X	1 X	1 X	Delta IV
	VF (V)	IV(lm)	VF (V)	%	IV(lm)	%
1	1.949	1.87	1.942	-0.344	1.82	-2.52
2	1.935	1.83	1.931	-0.202	1.79	-2.63
3	1.916	1.90	1.912	-0.245	1.87	-1.49
4	1.906	1.95	1.902	-0.241	1.89	-2.94
5	1.939	1.85	1.933	-0.325	1.81	-2.14
6	1.945	1.81	1.940	-0.262	1.77	-2.32
7	1.924	1.80	1.919	-0.249	1.75	-2.69
8	1.943	1.84	1.937	-0.268	1.81	-1.58
9	1.930	1.92	1.925	-0.259	1.87	-2.54
10	1.927	1.89	1.923	-0.228	1.85	-2.31
Average				-0.262		-2.317
Min				-0.344		-2.941
Max				-0.202		-1.495

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Resistance To Solder Heat Test

Reflow soldering 3 times at peak reflow temperature 260°C

Unit no.	0 X	0 X	1 X	Delta VF	1 X	Delta IV	3 X	Delta VF	3 X	Delta IV
	VF (V)	IV (mcd)	VF (V)	%	IV (mcd)	%	VF (V)	%	IV (mcd)	%
1	2.868	1904.38	2.869	0.03	1934.44	1.58	2.865	-0.10	1919.57	0.80
2	2.885	1658.97	2.885	0.00	1663.94	0.30	2.881	-0.14	1642.43	-1.00
3	2.876	1659.05	2.877	0.03	1646.84	-0.74	2.874	-0.07	1620.41	-2.33
4	2.881	1575.43	2.884	0.10	1586.53	0.70	2.88	-0.03	1555.82	-1.24
5	2.86	1664.02	2.862	0.07	1668.36	0.26	2.857	-0.10	1635.76	-1.70
6	2.877	1618.19	2.876	-0.03	1634.77	1.02	2.873	-0.14	1643.12	1.54
7	2.88	1644.94	2.881	0.03	1651.96	0.43	2.877	-0.10	1631.65	-0.81
8	2.933	1640.51	2.935	0.07	1630.47	-0.61	2.931	-0.07	1610.87	-1.81
9	2.872	1677.41	2.874	0.07	1689.45	0.72	2.868	-0.14	1666.05	-0.68
10	2.877	1641.61	2.879	0.07	1672.35	1.87	2.872	-0.17	1635.06	-0.40
11	2.877	1650.04	2.878	0.03	1651.99	0.12	2.874	-0.10	1628.97	-1.28
12	2.873	1635.73	2.873	0.00	1647.39	0.71	2.869	-0.14	1631.49	-0.26
13	2.869	1681.26	2.871	0.07	1679.08	-0.13	2.866	-0.10	1654.24	-1.61
14	2.879	1652.99	2.881	0.07	1638.05	-0.90	2.876	-0.10	1615.07	-2.29
15	2.925	1674.53	2.927	0.07	1674.31	-0.01	2.919	-0.21	1668.24	-0.38
16	2.867	1655.59	2.866	-0.03	1631.35	-1.46	2.863	-0.14	1612.67	-2.59
17	2.872	1657.79	2.872	0.00	1661.81	0.24	2.869	-0.10	1645.6	-0.74
18	2.868	1635.39	2.87	0.07	1610.71	-1.51	2.865	-0.10	1589.68	-2.80
19	2.878	1610.69	2.88	0.07	1612.23	0.10	2.874	-0.14	1594.73	-0.99
20	2.912	1669.55	2.913	0.03	1649.67	-1.19	2.906	-0.21	1627.25	-2.53
21	2.881	1653.28	2.881	0.00	1697.5	2.67	2.878	-0.10	1680.19	1.63
22	2.906	1678.49	2.907	0.03	1665.83	-0.75	2.902	-0.14	1657.3	-1.26
23	2.909	1626.51	2.91	0.03	1605.9	-1.27	2.905	-0.14	1570.96	-3.42
24	2.871	1638.15	2.872	0.03	1633.43	-0.29	2.867	-0.14	1612.32	-1.58
25	2.901	1594.33	2.903	0.07	1606.23	0.75	2.897	-0.14	1586.54	-0.49
26	2.883	1593.32	2.884	0.03	1586.05	-0.46	2.879	-0.14	1563	-1.90
27	2.871	1679.01	2.872	0.03	1681.26	0.13	2.867	-0.14	1662.75	-0.97
28	2.877	1605.32	2.879	0.07	1603.41	-0.12	2.874	-0.10	1575.92	-1.83
29	2.887	1664.31	2.889	0.07	1664.24	0.00	2.884	-0.10	1651.73	-0.76
30	2.887	1685.28	2.888	0.03	1673.85	-0.68	2.881	-0.21	1645.86	-2.34
Average				0.042		0.049		-0.126		-1.200
Min				-0.035		-1.509		-0.208		-3.415
Max				0.104		2.675		-0.035		1.628

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Pulse Operating Life Test

Ts= 55˚C, IF= 125mA

Unit no.	0 hrs	0 hrs	168 hrs	Delta VF	168 hrs	Delta IV	504 hrs	Delta VF	504 hrs	Delta IV	1000 hrs	Delta VF	1000 hrs	Delta IV
	VF (V)	IV (mcd)	VF (V)	%	IV (mcd)	%	VF (V)	%	IV (mcd)	%	VF (V)	%	IV (mcd)	%
1	2.9	2124.66	2.873	-0.93	2207.8	3.91	2.87	-1.03	2180.23	2.62	2.882	-0.62	2177.5	2.49
2	2.894	2180.2	2.882	-0.41	2244.57	2.95	2.882	-0.41	2232.43	2.40	2.882	-0.41	2199.85	0.90
3	2.896	2107.64	2.882	-0.48	2163.22	2.64	2.881	-0.52	2153.71	2.19	2.88	-0.55	2111.9	0.20
4	2.896	2186.41	2.884	-0.41	2233.32	2.15	2.882	-0.48	2225.22	1.78	2.88	-0.55	2182.88	-0.16
5	2.897	2105.1	2.886	-0.38	2160.32	2.62	2.884	-0.45	2147.89	2.03	2.885	-0.41	2114.07	0.43
6	2.897	2122.98	2.886	-0.38	2197.19	3.50	2.885	-0.41	2175.51	2.47	2.886	-0.38	2149.37	1.24
7	2.89	2156.79	2.877	-0.45	2218.3	2.85	2.876	-0.48	2198.5	1.93	2.874	-0.55	2167.84	0.51
8	2.889	2150.04	2.878	-0.38	2219.22	3.22	2.876	-0.45	2189.21	1.82	2.873	-0.55	2162.63	0.59
9	2.898	2121.62	2.883	-0.52	2215.03	4.40	2.882	-0.55	2182.37	2.86	2.88	-0.62	2150.37	1.36
10	2.894	2142.89	2.881	-0.45	2213.95	3.32	2.877	-0.59	2188.73	2.14	2.877	-0.59	2162.24	0.90
11	2.893	2179.72	2.884	-0.31	2273.99	4.32	2.883	-0.35	2265.75	3.95	2.884	-0.31	2214.84	1.61
12	2.891	2137.42	2.882	-0.31	2219.77	3.85	2.88	-0.38	2200.19	2.94	2.879	-0.42	2167.66	1.41
13	2.879	2131.87	2.871	-0.28	2211.87	3.75	2.87	-0.31	2210.58	3.69	2.867	-0.42	2160.56	1.35
14	2.895	2178.3	2.886	-0.31	2256.92	3.61	2.885	-0.35	2242.22	2.93	2.885	-0.35	2199.25	0.96
15	2.876	2135.14	2.869	-0.24	2217.68	3.87	2.867	-0.31	2201.75	3.12	2.868	-0.28	2157.38	1.04
16	2.863	2142.45	2.852	-0.38	2225.54	3.88	2.853	-0.35	2219.66	3.60	2.855	-0.28	2185.32	2.00
17	2.892	2144.38	2.878	-0.48	2203.05	2.74	2.878	-0.48	2188.52	2.06	2.879	-0.45	2163.35	0.88
18	2.884	2150.43	2.873	-0.38	2221.73	3.32	2.872	-0.42	2212.45	2.88	2.869	-0.52	2185.71	1.64
19	2.885	2162.92	2.878	-0.24	2240.17	3.57	2.875	-0.35	2217.12	2.51	2.877	-0.28	2180.36	0.81
20	2.892	2277.27	2.881	-0.38	2366.08	3.90	2.877	-0.52	2327.77	2.22	2.879	-0.45	2299.18	0.96
21	2.887	2097.03	2.877	-0.35	2176.55	3.79	2.876	-0.38	2167.12	3.34	2.876	-0.38	2124.33	1.30
22	2.839	2182.66	2.834	-0.18	2262.75	3.67	2.834	-0.18	2250.41	3.10	2.837	-0.07	2213.99	1.44
23	2.889	2174.04	2.881	-0.28	2250.74	3.53	2.878	-0.38	2245.44	3.28	2.879	-0.35	2197.77	1.09
24	2.859	2192.43	2.854	-0.17	2285.41	4.24	2.851	-0.28	2270.98	3.58	2.854	-0.17	2220.78	1.29
25	2.877	2170.92	2.874	-0.10	2251.03	3.69	2.87	-0.24	2219.4	2.23	2.878	0.03	2183.61	0.58
26	2.885	2096.47	2.872	-0.45	2194.23	4.66	2.868	-0.59	2173.32	3.67	2.888	0.10	2136.58	1.91
Average				-0.371		3.536		-0.433		2.744		-0.378		1.106
Min				-0.931		2.146		-1.034		1.775		-0.621		-0.161
Max				-0.104		4.663		-0.176		3.947		0.104		2.487

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DEW Test

Ta = 30°C to 65°C, IF= 3mA

Unit no.	0 hrs	0 hrs	504 hrs	Delta VF	504 hrs	Delta IV	1008 hrs	Delta VF	1008 hrs	Delta IV
	VF (V)	IV (mcd)	VF (V)	%	IV (mcd)	%	VF (V)	%	IV (mcd)	%
1	2.887	2115.71	2.868	-0.66	2421.71	14.46	2.867	-0.69	2395.69	13.23
2	2.891	2146.29	2.878	-0.45	2420.19	12.76	2.878	-0.45	2418.38	12.68
3	2.875	2162.51	2.863	-0.42	2487.44	15.03	2.864	-0.38	2472.4	14.33
4	2.886	2181.58	2.873	-0.45	2478.27	13.60	2.876	-0.35	2404.08	10.20
5	2.887	2148.29	2.875	-0.42	2481.59	15.51	2.876	-0.38	2377.83	10.68
6	2.885	2188.06	2.871	-0.49	2450.43	11.99	2.869	-0.55	2433.11	11.20
7	2.889	2174.21	2.876	-0.45	2465.99	13.42	2.878	-0.38	2450.78	12.72
8	2.839	2062.8	2.829	-0.35	2397.33	16.22	2.829	-0.35	2372.64	15.02
9	2.892	2165.91	2.88	-0.41	2481.21	14.56	2.88	-0.41	2408.97	11.22
10	2.883	2215.92	2.871	-0.42	2426.75	9.51	2.872	-0.38	2323.65	4.86
11	2.895	2102.17	2.881	-0.48	2451.3	16.61	2.882	-0.45	2434.65	15.82
12	2.88	2147.05	2.866	-0.49	2473.6	15.21	2.868	-0.42	2455.07	14.35
13	2.894	2179.74	2.88	-0.48	2447.17	12.27	2.883	-0.38	2400.04	10.11
14	2.889	2211.57	2.86	-1.00	2506.5	13.34	2.861	-0.97	2449.1	10.74
15	2.892	2156.87	2.878	-0.48	2480.08	14.99	2.881	-0.38	2418.65	12.14
16	2.858	2164.51	2.851	-0.24	2476.79	14.43	2.85	-0.28	2472.47	14.23
17	2.895	2178.23	2.88	-0.52	2515.24	15.47	2.882	-0.45	2500.71	14.80
18	2.891	2193.23	2.878	-0.45	2470.85	12.66	2.879	-0.42	2425.79	10.60
19	2.892	2160.3	2.879	-0.45	2471.1	14.39	2.882	-0.35	2444.82	13.17
20	2.873	2085.97	2.861	-0.42	2381.45	14.17	2.863	-0.35	2302.04	10.36
21	2.895	2036.59	2.877	-0.62	2360	15.88	2.882	-0.45	2345.94	15.19
22	2.898	2057.21	2.883	-0.52	2383.58	15.86	2.887	-0.38	2269.16	10.30
23	2.882	2212.26	2.87	-0.42	2516.91	13.77	2.874	-0.28	2473.93	11.83
24	2.894	2152.08	2.882	-0.41	2469.31	14.74	2.884	-0.35	2417.23	12.32
25	2.892	2086.82	2.877	-0.52	2403.53	15.18	2.879	-0.45	2338.28	12.05
26	2.891	2099.95	2.877	-0.48	2428.09	15.63	2.88	-0.38	2334.17	11.15
Average				-0.481		14.294		-0.425		12.127
Min				-1.004		9.514		-0.969		4.862
Max				-0.245		16.608		-0.278		15.816

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Hydrogen Sulphide Test

15ppm H2S , 40˚C/90% RH

Unit no.	0hrs	0hrs	168hrs	Delta VF	168hrs	Delta IV	336hrs	Delta VF	336hrs	Delta IV
	VF(V)	IV(lm)	VF(V)	%	IV(lm)	%	VF(V)	%	IV(lm)	%
1	2.892	6.99	2.895	0.093	6.93	-0.84	2.899	0.22	6.84	-2.08
2	2.881	7.04	2.882	0.052	7.04	0.00	2.886	0.18	6.87	-2.45
3	2.878	6.94	2.879	0.059	7.09	2.12	2.884	0.21	6.93	-0.07
4	2.885	6.92	2.889	0.146	7.06	2.12	2.891	0.21	6.76	-2.29
5	2.882	6.84	2.886	0.111	6.65	-2.71	2.889	0.22	6.66	-2.53
6	2.877	7.00	2.878	0.035	6.91	-1.28	2.881	0.14	6.81	-2.62
7	2.895	7.39	2.896	0.031	7.30	-1.26	2.901	0.21	7.22	-2.28
8	2.888	7.00	2.890	0.045	7.00	0.12	2.893	0.17	6.91	-1.29
9	2.878	7.15	2.879	0.066	7.17	0.23	2.883	0.18	6.99	-2.18
10	2.883	6.84	2.884	0.042	6.71	-2.00	2.894	0.37	6.65	-2.81
11	2.882	7.29	2.884	0.052	7.19	-1.40	2.889	0.23	7.10	-2.53
12	2.891	7.25	2.894	0.104	7.15	-1.41	2.911	0.72	7.10	-2.00
13	2.915	6.93	2.914	-0.014	6.73	-2.84	2.914	-0.03	6.75	-2.51
14	2.901	6.81	2.902	0.031	6.63	-2.63	2.902	0.02	6.63	-2.73
15	2.905	7.03	2.906	0.055	6.86	-2.42	2.929	0.82	6.86	-2.42
16	2.910	6.85	2.910	-0.003	6.69	-2.34	2.909	-0.02	6.70	-2.22
17	2.912	6.77	2.915	0.124	6.88	1.73	2.998	2.95	6.76	-0.04
18	2.948	6.80	2.951	0.102	6.90	1.59	3.000	1.74	6.99	2.91
19	2.951	6.79	2.952	0.020	6.87	1.27	2.953	0.04	6.89	1.53
20	2.912	6.95	2.912	0.003	7.06	1.57	2.923	0.40	6.95	-0.02
21	2.916	6.95	2.918	0.051	7.15	2.96	2.920	0.14	6.77	-2.53
22	2.932	6.96	2.932	0.003	6.90	-0.96	2.936	0.15	6.78	-2.69
23	2.932	6.98	2.935	0.133	6.80	-2.61	2.934	0.10	6.78	-2.84
24	2.909	6.68	2.911	0.069	6.80	1.71	2.915	0.20	6.74	0.79
25	2.906	7.03	2.906	0.014	6.96	-1.01	2.908	0.07	6.89	-1.98
26	2.934	6.86	2.934	0.014	6.84	-0.21	2.933	-0.02	6.72	-2.04
Average				0.055		-0.404		0.370		-1.613
Min				-0.014		-2.841		-0.027		-2.840
Max				0.146		2.963		2.947		2.913

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Flowing Mixed Gas

Method 4,25°C/75%RH

Unit no.	0 hrs	0 hrs	168 hrs	Delta VF	168 hrs	Delta IV	336 hrs	Delta VF	336 hrs	Delta IV	504 hrs	Delta VF	504 hrs	Delta IV
	VF(V)	IV(mcd)	VF(V)	%	IV(mcd)	%	VF(V)	%	IV(mcd)	%	VF(V)	%	IV(mcd)	%
1	2.893	3335.75	2.89	-0.10	3261.26	-2.23	2.886	-0.24	3208.58	-3.81	2.885	-0.28	3230.48	-3.16
2	2.881	3209.13	2.883	0.07	3143.52	-2.04	2.877	-0.14	3080.65	-4.00	2.878	-0.10	3109.51	-3.10
3	2.876	3167.73	2.879	0.10	3096.62	-2.24	2.872	-0.14	3031.83	-4.29	2.875	-0.03	3058.71	-3.44
4	2.882	3147.11	2.884	0.07	3083.4	-2.02	2.877	-0.17	3010.13	-4.35	2.88	-0.07	3034.62	-3.57
5	2.881	3146.06	2.884	0.10	3091.31	-1.74	2.877	-0.14	3008.19	-4.38	2.88	-0.03	3029.33	-3.71
6	2.885	3245.46	2.881	-0.14	3190.23	-1.70	2.878	-0.24	3123.08	-3.77	2.886	0.03	3169.88	-2.33
7	2.895	3181.84	2.891	-0.14	3144.69	-1.17	2.888	-0.24	3075.44	-3.34	2.894	-0.03	3113.74	-2.14
8	2.882	3076.86	2.88	-0.07	3056.04	-0.68	2.875	-0.24	2968.79	-3.51	2.88	-0.07	3004.6	-2.35
9	2.881	3138.26	2.881	0.00	3124.19	-0.45	2.875	-0.21	3020.08	-3.77	2.878	-0.10	3046.57	-2.92
10	2.893	3205.89	2.892	-0.03	3185.91	-0.62	2.887	-0.21	3079.24	-3.95	2.89	-0.10	3102.99	-3.21
11	2.89	3254.47	2.887	-0.10	3189.68	-1.99	2.888	-0.07	3121.28	-4.09	2.889	-0.03	3150.02	-3.21
12	2.884	3190.2	2.88	-0.14	3161.66	-0.89	2.882	-0.07	3101.03	-2.80	2.883	-0.03	3122.8	-2.11
13	2.883	3212.84	2.883	0.00	3188.61	-0.75	2.882	-0.03	3109.92	-3.20	2.884	0.03	3122.92	-2.80
14	2.88	3151.29	2.881	0.03	3136.29	-0.48	2.876	-0.14	3034.77	-3.70	2.882	0.07	3062.71	-2.81
15	2.89	3186.43	2.891	0.03	3169.6	-0.53	2.883	-0.24	3058	-4.03	2.891	0.03	3104.26	-2.58
16	2.943	2500.54	2.944	0.03	2458.26	-1.69	2.946	0.10	2427.41	-2.92	2.936	-0.24	2335.23	-6.61
17	2.913	2512.65	2.914	0.03	2464.21	-1.93	2.915	0.07	2509.51	-0.12	2.908	-0.17	2454.85	-2.30
18	2.919	2581.54	2.921	0.07	2530.51	-1.98	2.921	0.07	2535.56	-1.78	2.914	-0.17	2465.36	-4.50
19	2.904	2508.44	2.906	0.07	2472.81	-1.42	2.906	0.07	2489.32	-0.76	2.9	-0.14	2395.99	-4.48
20	2.922	2536.81	2.932	0.34	2515.43	-0.84	2.933	0.38	2483.5	-2.10	2.926	0.14	2390.53	-5.77
21	2.9	2552.33	2.905	0.17	2482.76	-2.73	2.906	0.21	2461.38	-3.56	2.898	-0.07	2383.54	-6.61
22	2.902	2480.16	2.905	0.10	2438.89	-1.66	2.906	0.14	2454	-1.05	2.9	-0.07	2370.93	-4.40
23	2.934	2547.11	2.943	0.31	2505.39	-1.64	2.943	0.31	2481.83	-2.56	2.936	0.07	2387.31	-6.27
24	2.911	2542.9	2.918	0.24	2517.1	-1.01	2.919	0.27	2546.99	0.16	2.911	0.00	2488.39	-2.14
25	2.897	2510.31	2.905	0.28	2474.94	-1.41	2.907	0.35	2439.7	-2.81	2.899	0.07	2377.79	-5.28
26	2.941	2485.53	2.948	0.24	2494.23	0.35	2.948	0.24	2499.04	0.54	2.941	0.00	2436.41	-1.98
Average				0.061		-1.366		-0.013		-2.846		-0.050		-3.608
Min				-0.139		-2.726		-0.243		-4.382		-0.277		-6.613
Max				0.342		0.350		0.376		0.544		0.137		-1.976

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Electrostatic Discharge (ESD) Testing Report

Human Body Model (HBM)

Sample	± 1000V	± 2000V
#01	PASS	PASS
#02	PASS	PASS
#03	PASS	PASS
#04	PASS	PASS
#05	PASS	PASS
#06	PASS	PASS
#07	PASS	PASS
#08	PASS	PASS
#09	PASS	PASS
#10	PASS	PASS

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Electrostatic Discharge (ESD) Testing Report

Charge Device Model (CDM)

Sample	± 250V	± 500V	± 1000V
#01	PASS	PASS	PASS
#02	PASS	PASS	PASS
#03	PASS	PASS	PASS
#04	PASS	PASS	PASS
#05	PASS	PASS	PASS
#06	PASS	PASS	PASS
#07	PASS	PASS	PASS
#08	PASS	PASS	PASS
#09	PASS	PASS	PASS
#10	PASS	PASS	PASS

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Electrostatic Discharge (ESD) Testing Report

Machine Model (MM)

Sample	± 100V	± 200V
#01	PASS	PASS
#02	PASS	PASS
#03	PASS	PASS
#04	PASS	PASS
#05	PASS	PASS
#06	PASS	PASS
#07	PASS	PASS
#08	PASS	PASS
#09	PASS	PASS
#10	PASS	PASS

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Destructive Physical Analysis (DPA) Report

PTC

1.0 DPA DETAILS

Ref. #	DPA191636
Package	DomiLED
Part Number	DDZB-HKG
Reliability Test	PTC

2.0 ANALYSIS RESULT

Optical Inspection

2.1 Units were proceed for optical inspection. Results were shown in fig below.

Fig 1a: Unit #1: Top view

Fig 1b: Unit #2: Top view

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X-ray Analysis

2.2 Both units were then proceed for X-ray analysis & results were shown in fig below.

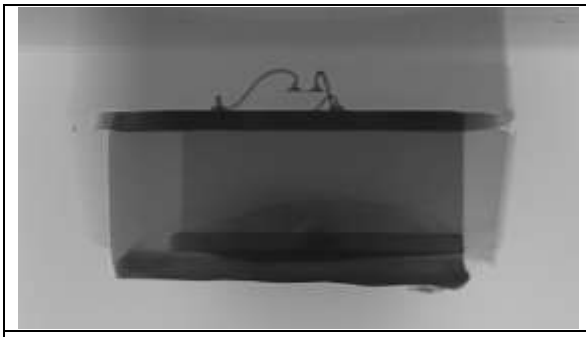

Fig 2a:Unit#1: Side view #1

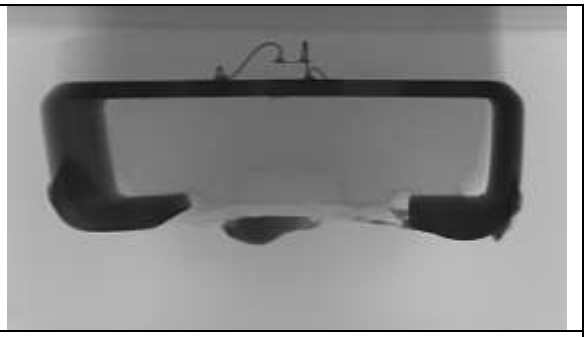

Fig 2b:Unit #1: Side view #2

Fig 2c:Unit#2: Side view #1

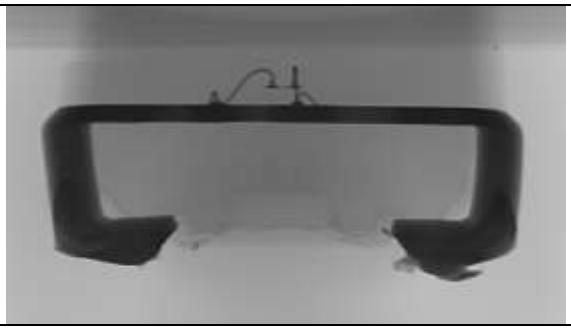

Fig 2d:Unit #2: Side view #2

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Chemical Decapsulation

2.3 Units were then proceed for internal visual after chemical decapsulation using high power scope. Results were shown in fig below.

Unit#1

Fig 3a: Top view

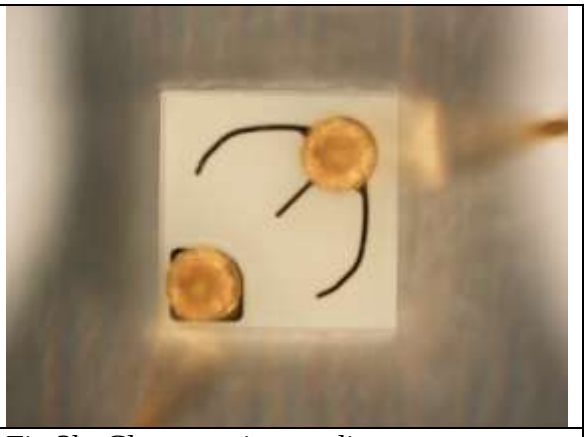

Fig 3b: Close up view to die

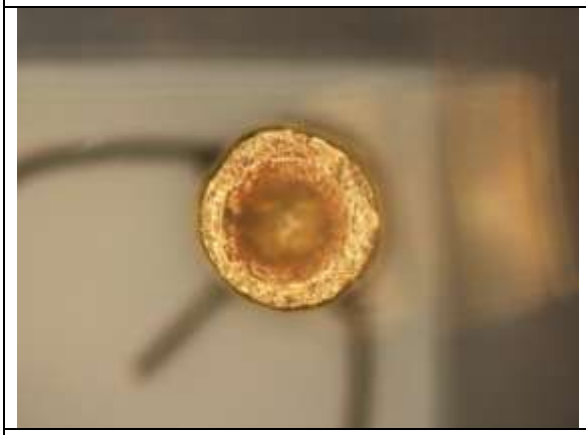

Fig 3c: Close up view to ball bonding on P-Pad

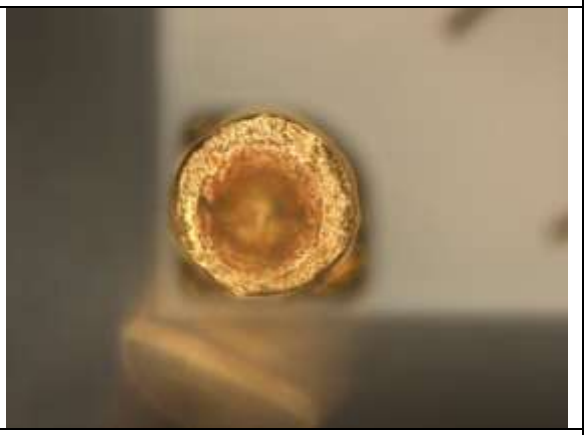

Fig 3d: Close up view to ball bonding on N-Pad

Fig 3e: Close up view to stitch bonding on anode lead frame pad

Fig 3f: Close up view to stitch bonding on cathode lead frame pad

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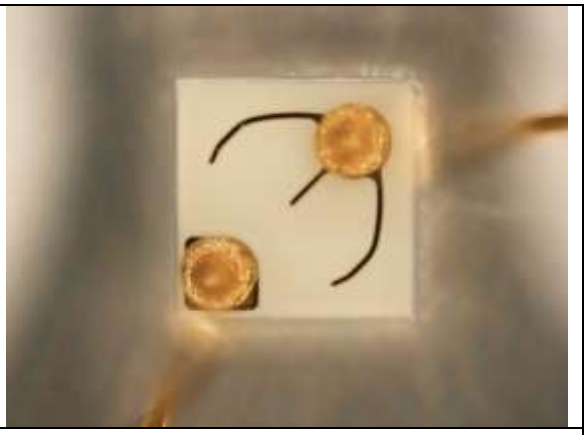
Unit#2

	
Fig 4a: Top view	Fig 4b: Close up view to die

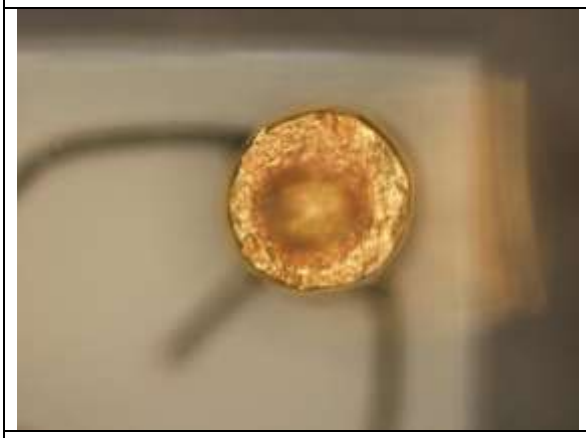
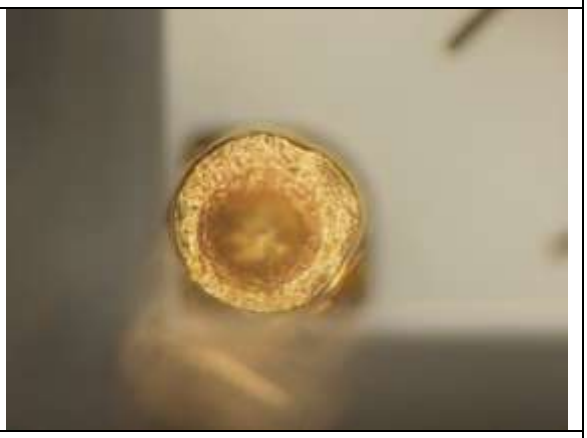

	

Fig 4c: Close up view to ball bonding on P-Pad	Fig 4d: Close up view to ball bonding on N-Pad
Fig 4e: Close up view to stitch bonding on anode lead frame pad	Fig4f: Close up view to stitch bonding on cathode lead frame pad

3.0 OBSERVATION & CONCLUSION

3.1 No abnormality was observed during initial optical inspection and after chemical decapsulation.

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WHTOL 1

1.0 DPA DETAILS

Ref. #	DPA191668
Package	DomiLED
Part Number	DDZB-HKG
Reliability Test	WHTOL1

2.0 ANALYSIS RESULT

Optical Inspection

2.1 Units were proceed for optical inspection. Results were shown in fig below.

Fig 1a: Unit #1: Top view

Fig 1b: Unit #2: Top view

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X-ray Analysis

2.2 Both units were then proceed for X-ray analysis & results were shown in fig below.

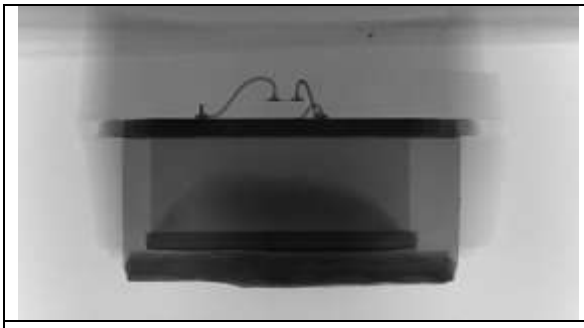	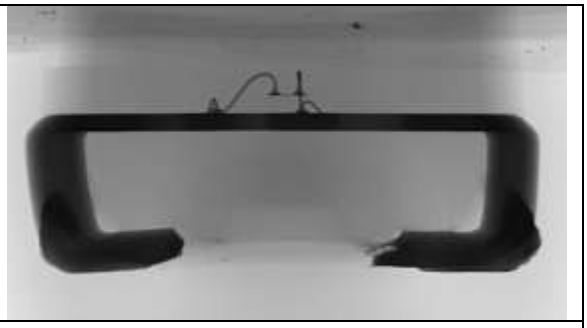
Fig 2a:Unit#1: Side view #1	Fig 2b:Unit #1: Side view #2
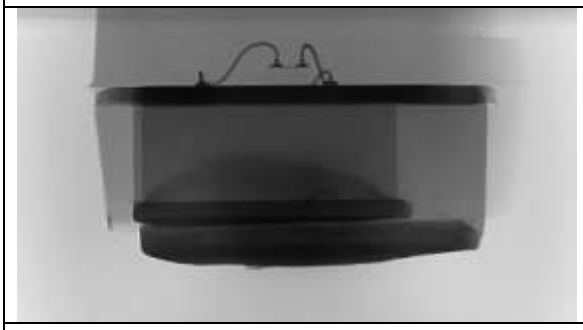	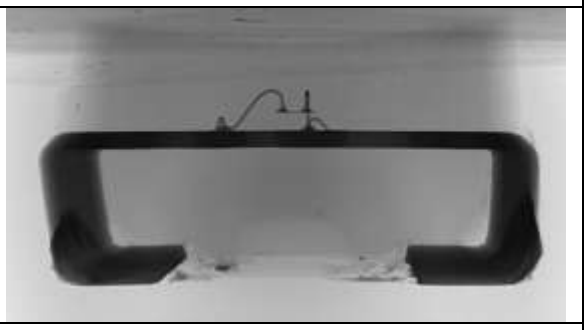
Fig 2c:Unit#2: Side view #1	Fig 2d:Unit #2: Side view #2

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Chemical Decapsulation

2.4 Units were then proceed for internal visual after chemical decapsulation using high power scope. Results were shown in fig below.

Unit #1

Fig 3a: Top view

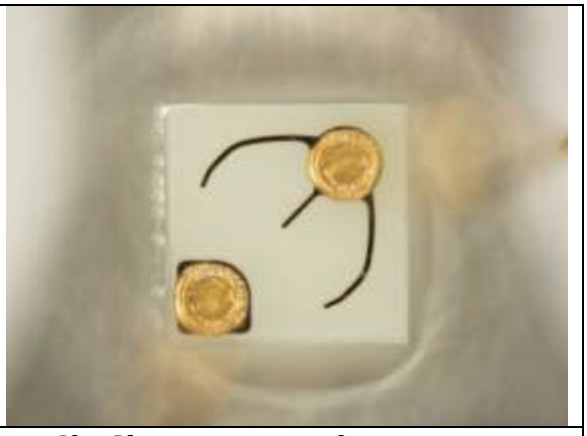

Fig 3b: Close up view to die

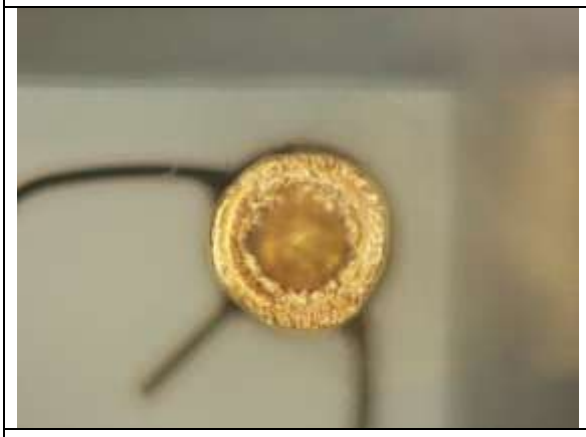

Fig 3c: Close up view to ball bonding on P-Pad

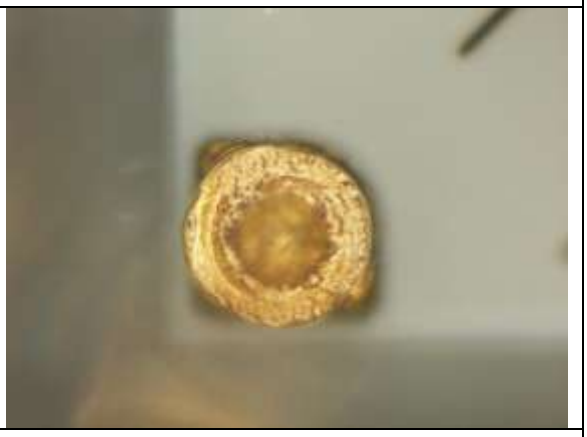

Fig 3d: Close up view to ball bonding on N-Pad

Fig 3e: Close up view to stitch bonding on anode lead frame pad

Fig 3f: Close up view to stitch bonding on cathode lead frame pad

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Unit #2

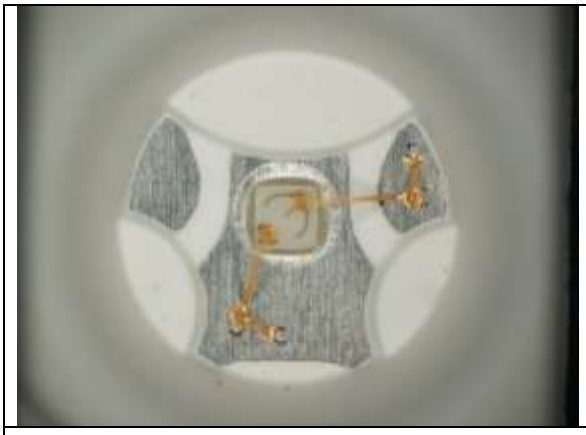

Fig 4a: Top view

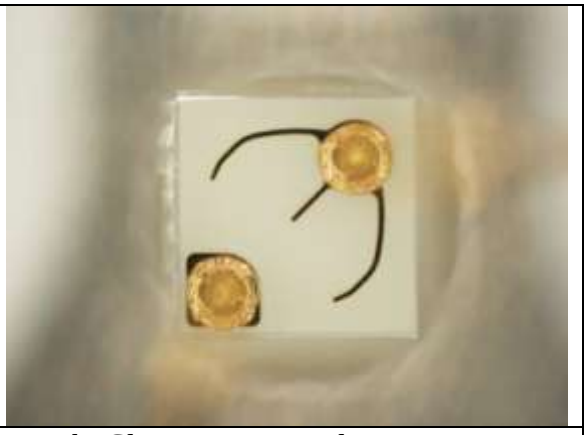

Fig 4b: Close up view to die

Fig 4c: Close up view to ball bonding on P-Pad

Fig 4d: Close up view to ball bonding on N-Pad

Fig 4e: Close up view to stitch bonding on anode lead frame pad

Fig4f: Close up view to stitch bonding on cathode lead frame pad

3.0 OBSERVATION & CONCLUSION

3.1 No abnormality was observed during initial optical inspection and after chemical decapsulation.

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References Device: DDZB-HKG

WHTOL 2

1.0 DPA DETAILS

Ref. #	DPA200010
Package	DomiLED
Part Number	DDZB-HKG
Reliability Test	WHTOL2

2.0 ANALYSIS RESULT

Optical Inspection

2.1 Units were proceed for optical inspection. Results were shown in fig below.

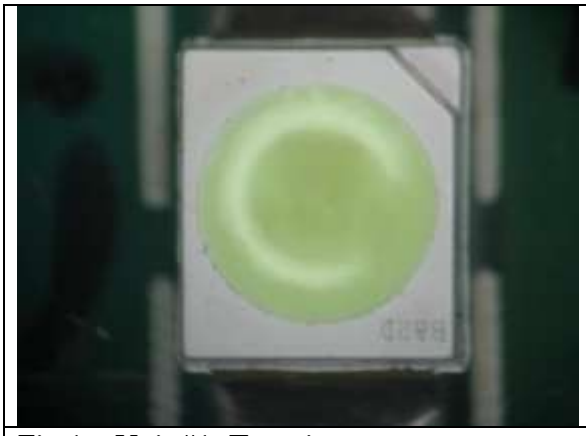

Fig 1a: Unit #1: Top view

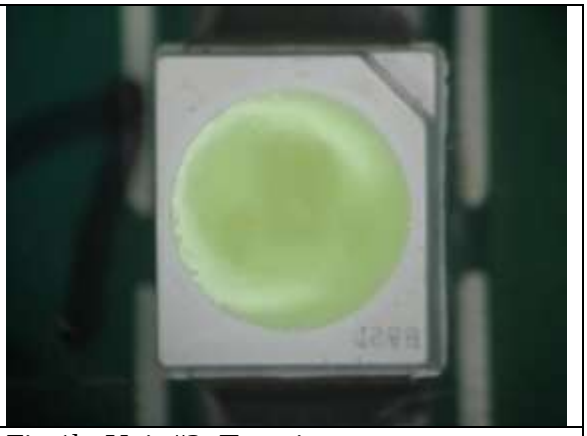

Fig 1b: Unit #2: Top view

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X-ray Analysis

2.2 Both units were then proceed for X-ray analysis & results were shown in fig below.

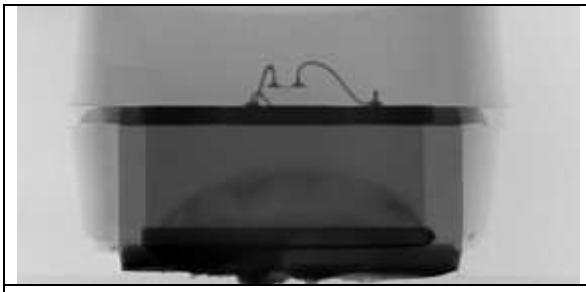

Fig 2a:Unit#1: Side view #1

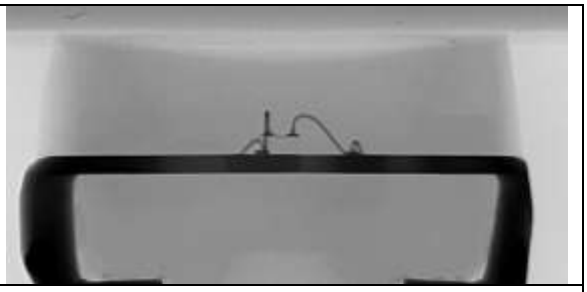

Fig 2b:Unit #1: Side view #2

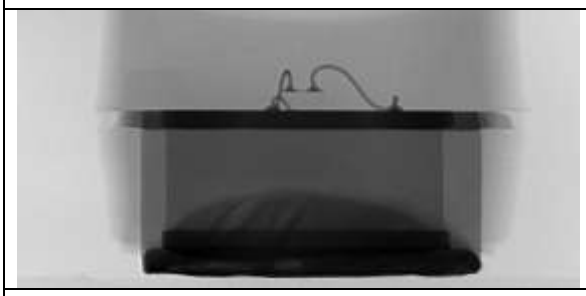

Fig 2c:Unit#2: Side view #1

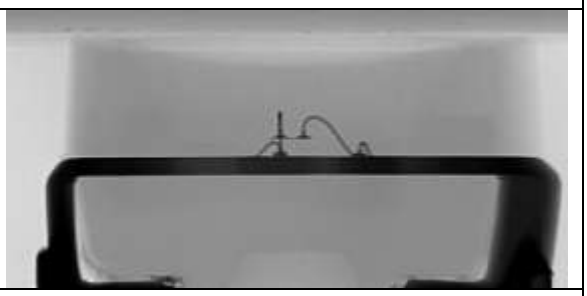

Fig 2d:Unit #2: Side view #2

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Chemical Decapsulation

2.5 Units were then proceed for internal visual after chemical decapsulation using high power scope. Results were shown in fig below.

Unit #1

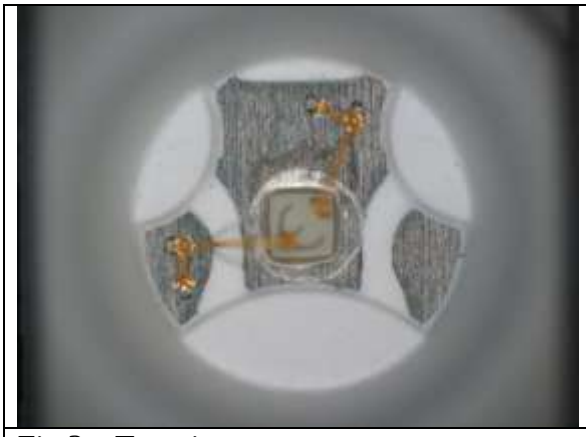

Fig 3a: Top view

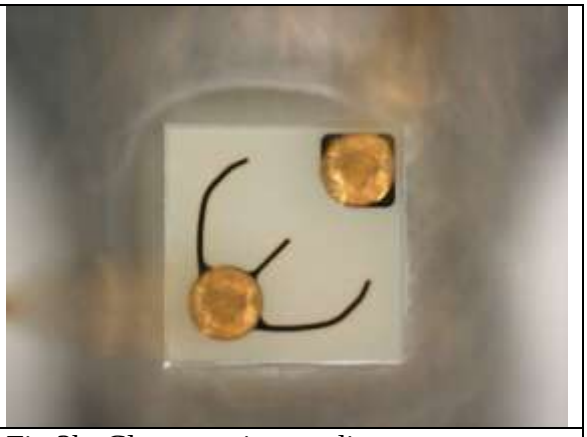

Fig 3b: Close up view to die

Fig 3c: Close up view to ball bonding on P-Pad

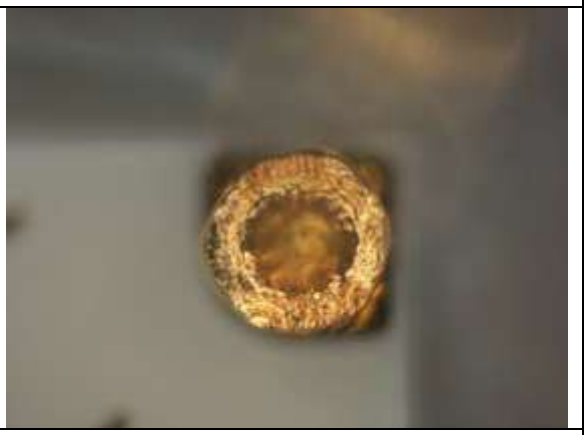

Fig 3d: Close up view to ball bonding on N-Pad

Fig 3e: Close up view to stitch bonding on anode lead frame pad

Fig 3f: Close up view to stitch bonding on cathode lead frame pad

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Unit #2

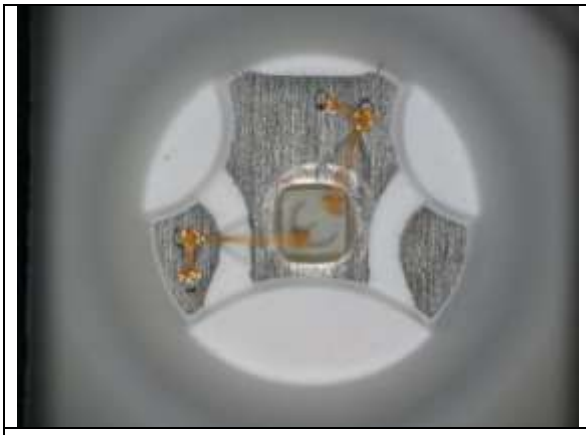
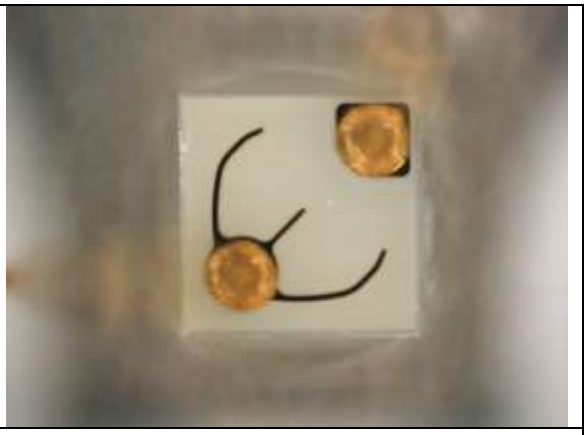
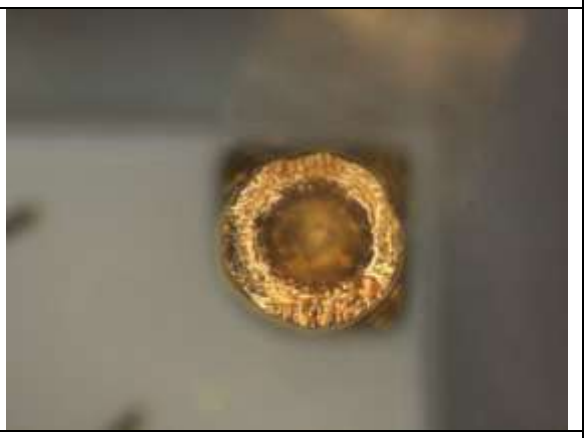
	

Fig 4a: Top view	Fig 4b: Close up view to die
	
Fig 4c: Close up view to ball bonding on P-Pad	Fig 4d: Close up view to ball bonding on N-Pad
Fig 4e: Close up view to stitch bonding on anode lead frame pad	Fig4f: Close up view to stitch bonding on cathode lead frame pad

3.0 OBSERVATION & CONCLUSION

3.1 No abnormality was observed during initial optical inspection and after chemical decapsulation.

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H2S

1.0 DPA DETAILS

Ref. #	DPA180440
Package	DomiLED
Part Number	DDW-HZKG
Reliability Test	H2S

2.0 ANALYSIS RESULT

Optical Inspection

2.1 Units were proceed for optical inspection. Results were shown in fig below.

Fig 1a: Unit #1: Top view

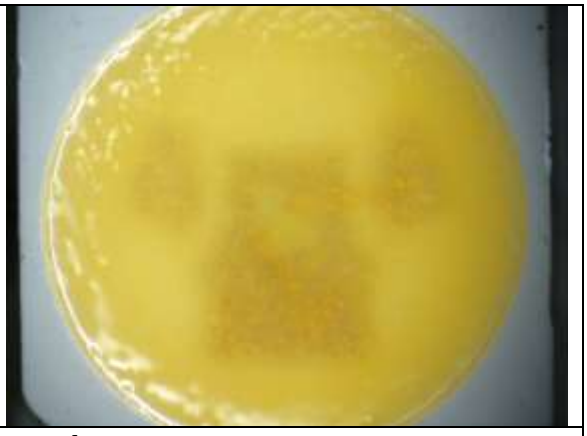

Fig 1b: Unit #2: Top view

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Chemical Decapsulation

2.2 Both units were then proceed for chemical decapsulation & results were shown in fig below.

Unit #1

Fig 2a: Top view

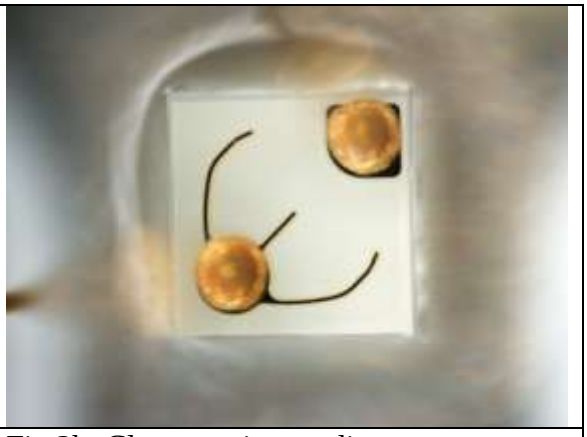

Fig 2b: Close up view to die

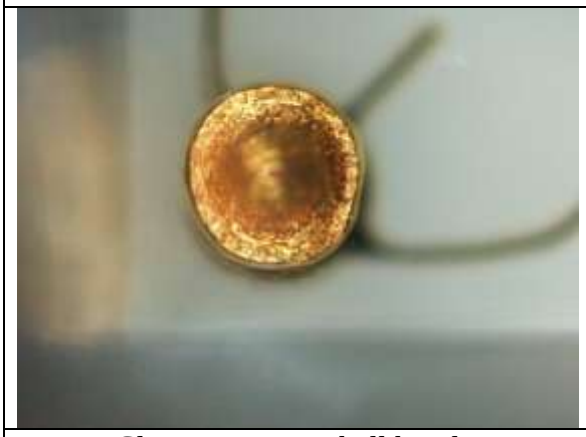

Fig 2c: Close up view to ball bonding at P-pad

Fig 2d: Close up view to ball bonding at N-pad

Fig 2e: Close up view to stitch bonding at anode lead frame pad

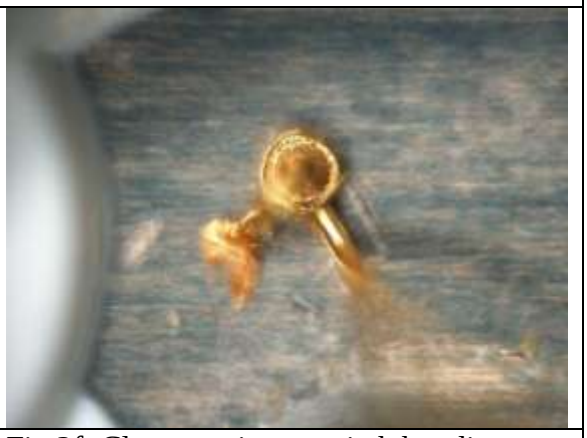

Fig 2f: Close up view to stitch bonding at cathode lead frame pad

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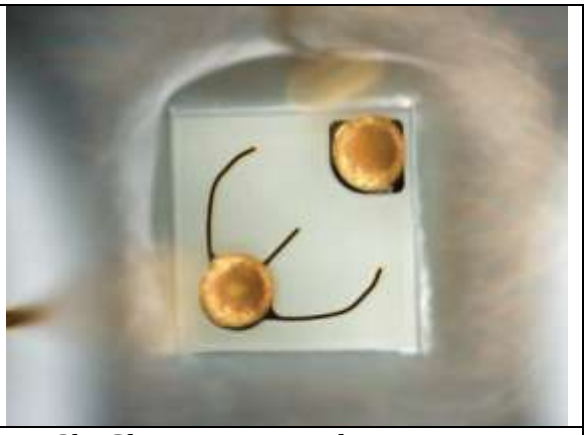
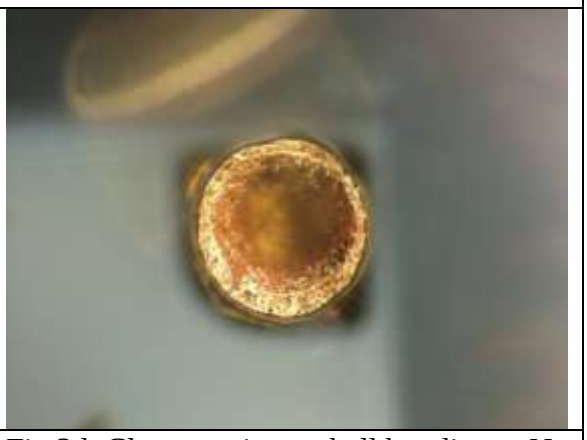
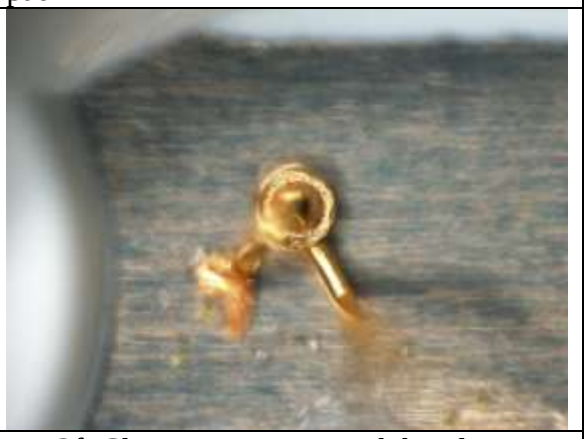
Unit #2

	
Fig 3a: Top view	Fig 3b: Close up view to die
	
Fig 3c: Close up view to ball bonding at P-pad	Fig 3d: Close up view to ball bonding at N-pad
	
Fig 3e: Close up view to stitch bonding at anode lead frame pad	Fig 3f: Close up view to stitch bonding at cathode lead frame pad

3.0 OBSERVATION & CONCLUSION

3.1 No abnormality was observed during initial optical inspection & after chemical decapsulation.

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FMG

1.0 DPA DETAILS

Ref. #	DPA180555
Package	DomiLED
Part Number	DDW-HZKG
Reliability Test	FMG

2.0 ANALYSIS RESULT

Optical Inspection

2.1 Units were proceed for optical inspection. Results were shown in fig below.

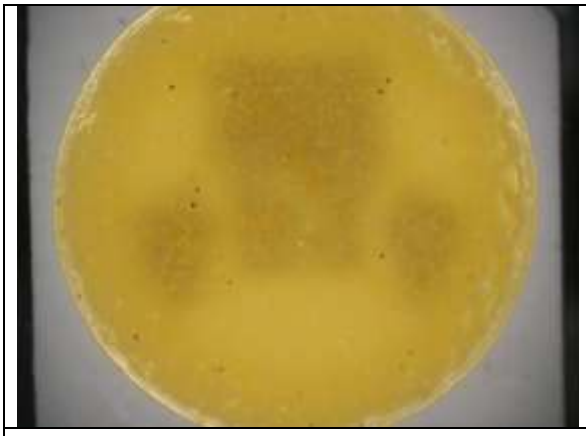

Fig 1a: Unit #1: Top view

Fig 1b: Unit #2: Top view

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Chemical Decapsulation

2.2 Both units were then proceed for chemical decapsulation & results were shown in fig below.

Unit #1

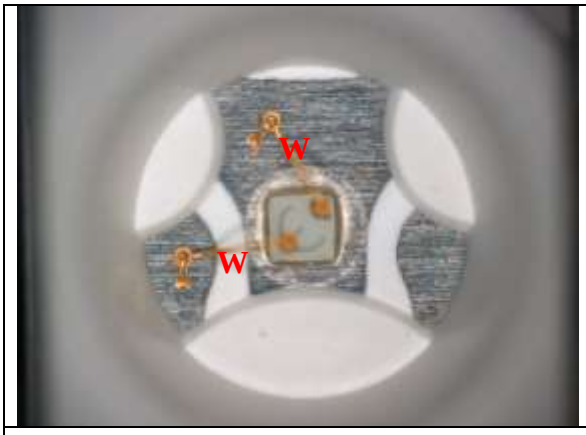

Fig 2a: Top view

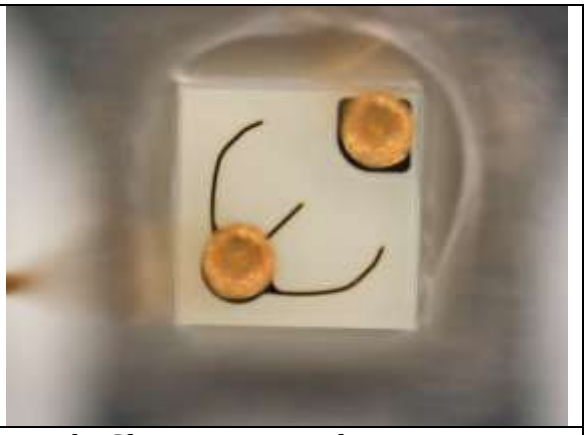

Fig 2b: Close up view to die

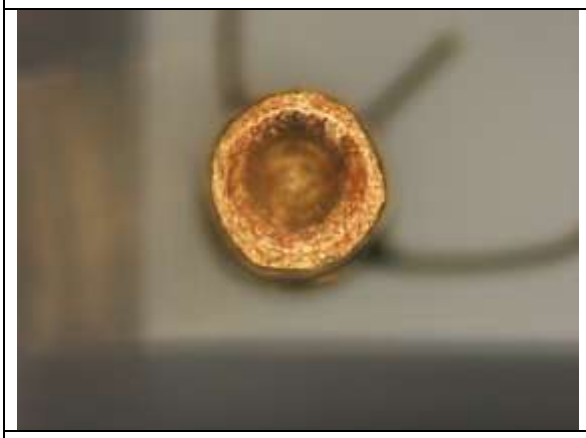

Fig 2c: Close up view to ball bonding at P-pad

Fig 2d: Close up view to ball bonding at N-pad

Fig 2e: Close up view to stitch bonding at anode leadframe pad

Fig 2f: Close up view to stitch bonding at cathode leadframe pad

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Unit #2

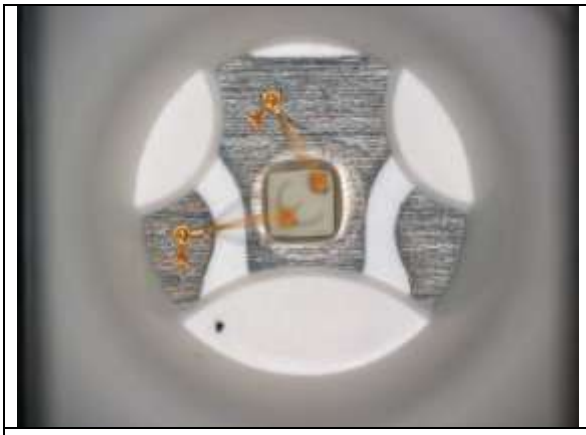	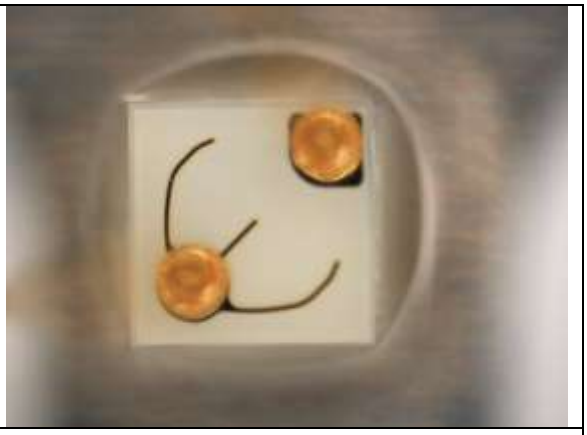
Fig 3a: Top view	Fig 3b: Close up view to die
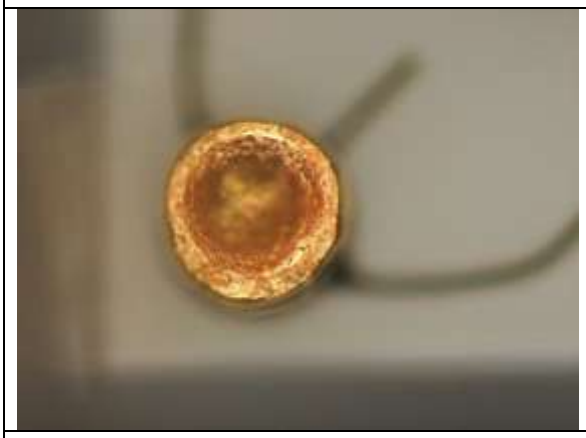	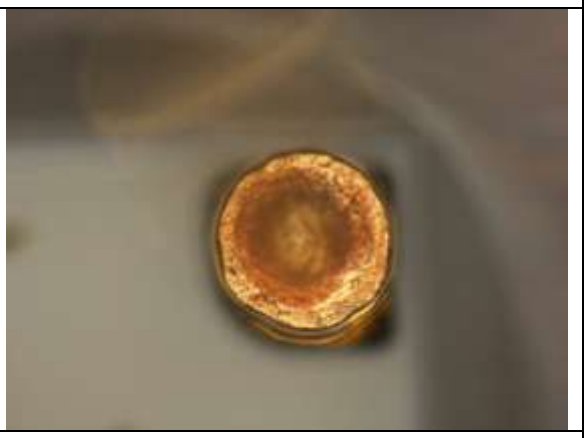
Fig 3c: Close up view to ball bonding at P-pad	Fig 3d: Close up view to ball bonding at N-pad
Fig 3e: Close up view to stitch bonding at anode leadframe pad	Fig 3f: Close up view to stitch bonding at cathode leadframe pad

3.0 OBSERVATION & CONCLUSION

3.1 No abnormality was observed during initial optical inspection & after chemical decapsulation.

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