



OCTA LIGHT BULGARIA PLO



BULLSTAR SERIES

HIGH POWER LED

TEST RELIABILITY AND SENSITIVITY CLASSIFICATION

VARIABLE VIBRATION TEST

INTRODUCTION

This document contains information about the reliability classification level of Octa Light BullStar series, that are sensitive to moisture-induced stress. Once identified they can be properly packaged, stored and handled to avoid thermal and mechanical damage during assembly and/or repair operations. Passing the criteria in these tests shows that LEDs are sufficient by itself to provide assurance of long term reliability. Most of them are considered and recommended by JEDEC and ASSIST.

BACKGROUND

Octa Light LEDs exhibit very long operational life characteristics, typically 50,000 hours or longer. Like all light sources, LEDs slowly decrease in light output over time. Because they rarely fail, situations can occur where LEDs are emitting less light than intended by the specifier, yet still appear to be operating. LEDs can also undergo gradual shifts in color that result in an unacceptable appearance.



TESTING PROCEDURE:

The variable frequency vibration test is performed to determine the effect of vibration, within a specified frequency range, on the internal structural elements. This method is intended to evaluate component(s) for use in electrical equipment. It is intended to determine the ability of the component(s) to withstand moderate to severe vibration as a result of motion produced by transportation or field operation. Vibration of this type may disturb operating characteristics, particularly if the repetitive stress causes fatigue. This is a destructive test intended for component qualification. It is normally applicable to cavity-type packages.

USED APPARATUS:

Dynamic mechanical analyzer – capable of providing the required variable frequency vibration at the specified levels

Optical and electrical equipment for post-test measurements

CONDITIONS:

Service condition	Peak Acceleration (G)	Displacement pk-pk (in / mm)	Cross-over frequency (Hz)	Min./ Max. Frequency (Hz)
1	20 (+/-2%)	0.060/1.5	1500	20/2000

Vibration will be applied to the component outer surface casing or leads in a manner to simulate expected vibration during processing and packaged shipment. The devices shall be vibrated with simple harmonic motion corresponding to the test levels described in the table above. Each test level will include simple harmonic motion of continuously swept frequency with the indicated peak-peak displacement below the crossover frequency, and indicated peak acceleration above the crossover frequency. A tolerance level of +/- 10% on the test being performed, either displacement or acceleration, is allowed. The test frequency range is from the indicated minimum frequency to the indicated maximum test frequency. A complete sweep of the test frequency range, from the minimum to maximum and return to the minimum frequency, shall be traversed in a logarithmic manner, in 4 minutes.



The sweep rate is 1 decade/minute. This complete sweep shall be performed 4 times in each of the orientations X, Y, and Z (total of 12 times). If there are no significant stress sensitivities of the component under test in a particular frequency range (for examples, in the lower frequency ranges, or in a region of an uncontrollable fixture resonance), then that portion of the frequency sweep may be deleted from the stress application with full documentation of the reasons for the test exception and extent of the portion(s) of the sweep test deleted.

FAILURE CRITERIA:

A component shall be defined as a failure if hermeticity requirements cannot be demonstrated, if parametric limits are exceeded or if functionality cannot be demonstrated under the conditions specified in the applicable procurement document. Mechanical damage, such as cracking, chipping or breaking of the package will also be considered a failure provided such damage was not caused by fixturing or handling and the damage is critical to component performance in the specific application.

*** For additional information you can see IPC/JEDEC JESD22-B103B**



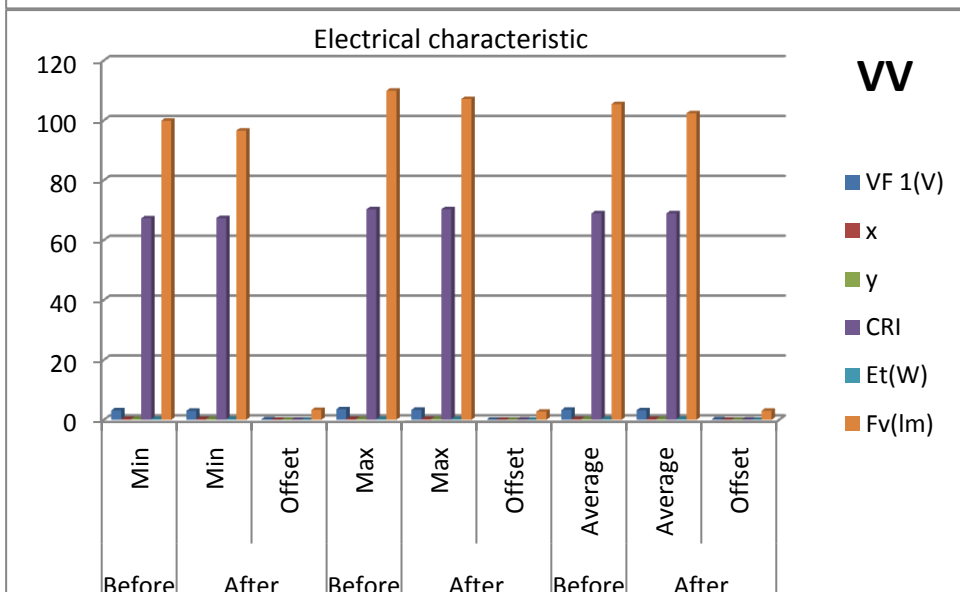
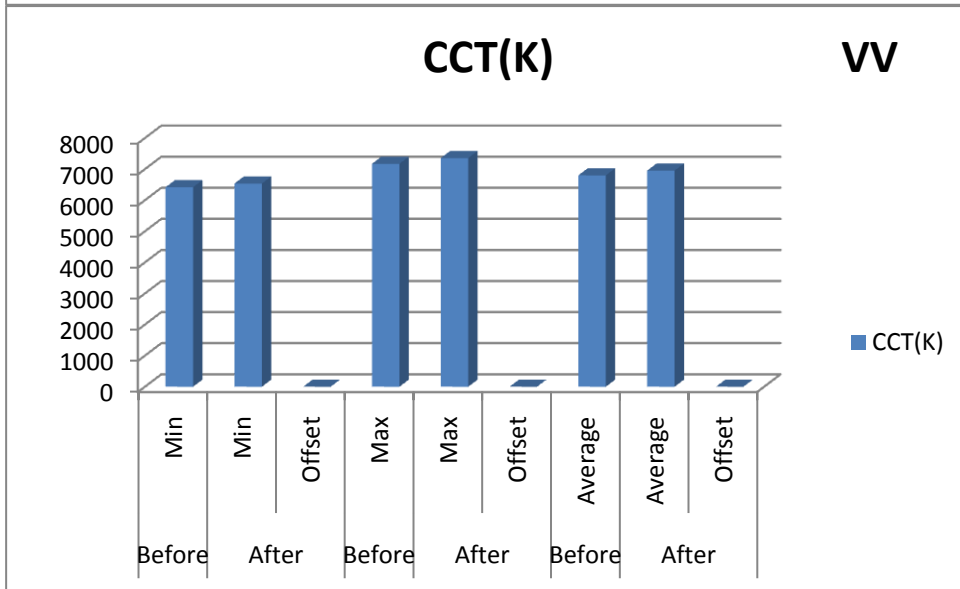
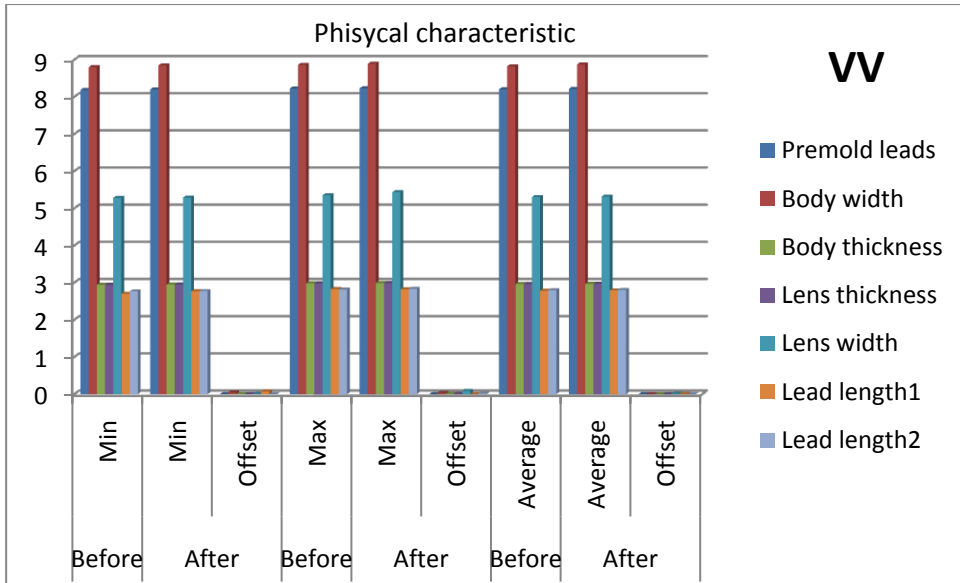
Variable Vibration Test - Data Before test

Sample - UNIT	Premold leads	Body width	Body thickness	Lens thickness	Lens width	Lead length 1	Lead length 2	VF (V)	x	y	CCT(K)	CRI	Et(W)	Fv(lm)
Sample-1	8,2078	8,8493	2,9716	2,9716	5,3024	2,7675	2,7923	3,3087	0,3138	0,3374	6417,4535	67,9578	0,2899	108,8773
Sample-2	8,2067	8,8577	2,9639	2,9639	5,2881	2,7004	2,7964	3,2884	0,3119	0,3324	6556,3659	68,0007	0,2892	107,3747
Sample-3	8,1979	8,8567	2,9694	2,9694	5,2870	2,7625	2,8015	3,3303	0,3098	0,3299	6694,3540	69,1376	0,2818	103,9006
Sample-4	8,1892	8,8322	2,9661	2,9661	5,2958	2,7893	2,8035	3,3313	0,3114	0,3321	6585,4168	68,3026	0,2953	109,4970
Sample-5	8,1979	8,8242	2,9803	2,9803	5,3034	2,8177	2,7794	3,3935	0,3099	0,3264	6724,5117	67,3028	0,2981	108,8557
Sample-6	8,2187	8,8254	2,9705	2,9705	5,3002	2,8191	2,7844	3,3318	0,3128	0,3336	6496,8716	67,4663	0,2850	106,1160
Sample-7	8,2088	8,8177	2,9650	2,9650	5,2925	2,8217	2,7844	3,3765	0,3111	0,3297	6621,9218	67,9084	0,2855	105,5229
Sample-8	8,2001	8,8275	2,9661	2,9661	5,3133	2,7655	2,7964	3,3857	0,3110	0,3305	6622,1830	67,9804	0,2933	108,4060
Sample-9	8,1903	8,8114	2,9792	2,9792	5,2859	2,7494	2,7924	3,3346	0,3122	0,3328	6535,9756	67,8187	0,2893	107,6016
Sample-10	8,1925	8,8172	2,9551	2,9551	5,3045	2,7565	2,7944	3,2964	0,3092	0,3258	6769,3519	67,8780	0,2901	106,0253
Sample-11	8,2208	8,8113	2,9650	2,9650	5,2947	2,8146	2,7903	3,3400	0,3047	0,3178	7149,7649	69,4024	0,2921	104,8634
Sample-12	8,2067	8,8225	2,9551	2,9551	5,2892	2,7514	2,8005	3,3393	0,3081	0,3254	6838,0298	68,8818	0,2905	106,2537
Sample-13	8,2165	8,8225	2,9639	2,9639	5,3024	2,7572	2,8033	3,3259	0,3082	0,3271	6813,4931	69,5818	0,2926	107,4714
Sample-14	8,2143	8,8134	2,9639	2,9639	5,2892	2,7353	2,8035	3,2526	0,3065	0,3235	6959,4188	69,7322	0,2954	107,6524
Sample-15	8,2197	8,8211	2,9683	2,9683	5,2980	2,7933	2,7954	3,2787	0,3091	0,3285	6749,4154	69,4081	0,2876	106,0353
Sample-16	8,2219	8,8166	2,9551	2,9551	5,2881	2,7414	2,7995	3,2858	0,3081	0,3269	6820,5971	69,6341	0,2882	105,9625
Sample-17	8,2197	8,8178	2,9672	2,9672	5,2936	2,8104	2,7924	3,3100	0,3097	0,3302	6693,9322	69,1559	0,2899	107,2685
Sample-18	8,2056	8,8096	2,9760	2,9760	5,3133	2,8016	2,8025	3,3259	0,3090	0,3285	6753,3914	69,1944	0,2900	106,9101
Sample-19	8,2154	8,8226	2,9749	2,9749	5,3232	2,8094	2,7813	3,3752	0,3070	0,3225	6941,4432	68,9769	0,2928	106,3955
Sample-20	8,1968	8,8093	2,9716	2,9716	5,3122	2,7735	2,7924	3,2886	0,3089	0,3278	6764,7055	69,2217	0,2900	106,7126
Sample-21	8,2088	8,8184	2,9628	2,9628	5,2903	2,8116	2,7843	3,2935	0,3099	0,3289	6695,5926	68,3023	0,2984	109,8974
Sample-22	8,2165	8,8110	2,9595	2,9595	5,3111	2,7373	2,7963	3,2577	0,3086	0,3264	6798,7667	68,9165	0,2791	102,9193
Sample-23	8,2012	8,8149	2,9639	2,9639	5,2947	2,7815	2,8075	3,2478	0,3075	0,3232	6897,7712	68,6310	0,2842	103,9051
Sample-24	8,2023	8,8120	2,9705	2,9705	5,3505	2,7354	2,8015	3,1929	0,3071	0,3224	6934,3705	68,7225	0,2819	102,8975
Sample-25	8,1947	8,8482	2,9716	2,9716	5,3002	2,8016	2,7903	3,2802	0,3095	0,3289	6722,4060	68,9785	0,2804	103,8926
Sample-26	8,2056	8,8496	2,9650	2,9650	5,2980	2,7966	2,7894	3,2009	0,3086	0,3272	6789,7280	69,2937	0,2782	102,7732
Sample-27	8,1925	8,8532	2,9683	2,9683	5,2958	2,8004	2,7847	3,2079	0,3077	0,3236	6881,8229	68,5683	0,2795	102,2882
Sample-28	8,2078	8,7987	2,9573	2,9573	5,2881	2,8257	2,7746	3,2160	0,3096	0,3291	6715,8533	69,0900	0,2775	102,8612
Sample-29	8,1827	8,8224	2,9453	2,9453	5,2804	2,8254	2,7663	3,3834	0,3102	0,3296	6673,5371	68,7933	0,2764	102,6322
Sample-30	8,2023	8,8291	2,9573	2,9573	5,2903	2,7959	2,7776	3,1554	0,3109	0,3322	6612,1325	69,1732	0,2779	103,7596
Sample-31	8,2208	8,8115	2,9639	2,9639	5,3045	2,8104	2,7993	3,2879	0,3102	0,3275	6696,8036	67,8266	0,2778	102,7031
Sample-32	8,2121	8,8110	2,9705	2,9705	5,2991	2,8180	2,7967	3,3393	0,3085	0,3259	6811,6609	69,2140	0,2801	103,3918
Sample-33	8,2110	8,8095	2,9562	2,9562	5,3034	2,8056	2,7995	3,2938	0,3060	0,3196	7037,9047	68,9258	0,2816	102,4267
Sample-34	8,1936	8,8153	2,9705	2,9705	5,3341	2,7374	2,7993	3,3003	0,3072	0,3247	6900,8405	69,7699	0,2843	104,5330
Sample-35	8,2165	8,8179	2,9562	2,9562	5,3472	2,7989	2,8148	3,3663	0,3090	0,3279	6758,0498	69,2374	0,2817	104,3613
Sample-36	8,2132	8,8146	2,9792	2,9792	5,3144	2,7863	2,7983	3,3220	0,3087	0,3281	6775,0495	69,9943	0,2840	105,1493
Sample-37	8,1914	8,8142	2,9595	2,9595	5,3013	2,7783	2,8053	3,3635	0,3087	0,3279	6775,5196	69,8736	0,2770	102,7241
Sample-38	8,1947	8,8209	2,9639	2,9639	5,2980	2,7795	2,8063	3,2944	0,3087	0,3272	6782,7362	69,5674	0,2764	102,3844
Sample-39	8,2088	8,8121	2,9770	2,9770	5,3243	2,8227	2,7903	3,4095	0,3104	0,3290	6666,7852	68,7605	0,2687	100,0689
Sample-40	8,2001	8,8093	2,9738	2,9738	5,3210	2,7705	2,8143	3,1679	0,3114	0,3305	6595,9893	67,8804	0,2675	99,8865
Sample-41	8,1990	8,8169	2,9650	2,9650	5,2991	2,7655	2,7943	3,3192	0,3075	0,3226	6905,2398	68,2654	0,2839	103,3064
Sample-42	8,2078	8,8043	2,9727	2,9727	5,3166	2,8191	2,7987	3,3559	0,3080	0,3242	6860,0905	68,6473	0,2820	103,0186
Sample-43	8,2056	8,8232	2,9650	2,9650	5,3034	2,7336	2,7944	3,4207	0,3044	0,3177	7170,7193	69,6898	0,2992	107,6312
Sample-44	8,1881	8,8246	2,9573	2,9573	5,2991	2,7859	2,8003	3,2569	0,3048	0,3185	7132,1960	69,7050	0,2970	107,0547
Sample-45	8,2143	8,8173	2,9573	2,9573	5,2870	2,8096	2,7993	3,3450	0,3087	0,3282	6775,3266	69,7317	0,2970	109,3998
Sample-46	8,2143	8,8225	2,9661	2,9661	5,3045	2,7504	2,7993	3,2985	0,3057	0,3209	7044,8602	69,7589	0,3018	109,2449
Sample-47	8,1958	8,8064	2,9486	2,9486	5,2848	2,7873	2,7997	3,3210	0,3054	0,3214	7053,7212	70,2968	0,3008	109,0651
Sample-48	8,2154	8,8237	2,9530	2,9530	5,2936	2,7849	2,8005	3,3561	0,3051	0,3202	7086,8836	70,0845	0,3018	109,0798
Sample-49	8,1925	8,8080	2,9770	2,9770	5,3078	2,8120	2,8155	3,3698	0,3060	0,3209	7024,8305	69,2735	0,2806	101,9178
Sample-50	8,1936	8,8197	2,9617	2,9617	5,3002	2,8046	2,7964	3,5485	0,3072	0,3233	6915,1746	69,1281	0,2974	108,2663
Min	8,1827	8,7987	2,9453	2,9453	5,2804	2,7004	2,7663	3,1554	0,3044	0,3177	6417,4535	67,3028	0,2675	99,8865
Max	8,2219	8,8577	2,9803	2,9803	5,3505	2,8257	2,8155	3,5485	0,3138	0,3374	7170,7193	70,2968	0,3018	109,8974
Average	8,2050	8,8209	2,9653	2,9653	5,3024	2,7842	2,7956	3,3134	0,3087	0,3265	6800,0192	68,9409	0,2868	105,4229



Variable Vibration Test - Data After test

Sample - UNIT	Premold leads	Body width	Body thickness	Lens thickness	Lens width	Lead length 1	Lead length 2	VF (V)	x	y	CCT(K)	CRI	Et(W)	Fv(lm)
Sample-1	8,2165	8,8713	2,9694	2,9694	5,3199	2,7839	2,7934	3,2287	0,3112	0,335	6535,0313	68,1029	0,2913	105,5111
Sample-2	8,2012	8,8673	2,9672	2,9672	5,2903	2,7705	2,7974	3,1881	0,3092	0,3301	6686,7059	68,0177	0,2917	104,3265
Sample-3	8,2132	8,8736	2,9792	2,9792	5,2969	2,7765	2,7944	3,3098	0,307	0,3272	6839,8702	69,2937	0,2849	100,6392
Sample-4	8,2187	8,8573	2,9639	2,9639	5,3024	2,7916	2,8065	3,2274	0,3087	0,3298	6713,7174	68,3493	0,2978	106,5635
Sample-5	8,2285	8,8625	2,9792	2,9792	5,3111	2,7976	2,7863	3,3372	0,3071	0,3241	6862,2409	67,3531	0,3008	105,8857
Sample-6	8,2197	8,8746	2,9858	2,9858	5,31	2,7946	2,7773	3,2904	0,3101	0,3314	6622,6328	67,4683	0,2879	103,1112
Sample-7	8,2154	8,8706	2,9705	2,9705	5,3024	2,7875	2,7933	3,208	0,3083	0,3272	6761,0318	67,8993	0,2889	102,5441
Sample-8	8,2154	8,8701	2,9738	2,9738	5,321	2,7805	2,7924	3,2481	0,3082	0,328	6760,5446	68,0181	0,2962	105,498
Sample-9	8,211	8,8894	2,9902	2,9902	5,3045	2,7695	2,7933	3,2392	0,3095	0,3305	6664,408	67,9415	0,2926	104,757
Sample-10	8,2056	8,8692	2,9584	2,9584	5,3056	2,7813	2,8013	3,2049	0,3064	0,3236	6910,0351	67,8564	0,293	103,0807
Sample-11	8,2099	8,8642	2,9606	2,9606	5,3144	2,7976	2,8133	3,073	0,3073	0,3253	6841,1577	67,8	0,2797	99,1518
Sample-12	8,2067	8,8729	2,977	2,977	5,3056	2,7933	2,7993	3,0836	0,3054	0,3236	6971,843	69,2011	0,2836	100,3094
Sample-13	8,2023	8,8675	2,9639	2,9639	5,3089	2,7885	2,8095	3,0541	0,303	0,3172	7207,1382	68,9387	0,2847	99,1433
Sample-14	8,211	8,8683	2,9727	2,9727	5,3374	2,7823	2,8172	3,0831	0,3044	0,3221	7052,8122	69,8666	0,2868	101,1493
Sample-15	8,2132	8,865	2,953	2,953	5,3659	2,7835	2,8195	3,088	0,3056	0,3244	6948,1074	69,3319	0,2859	101,3874
Sample-16	8,2023	8,8768	2,9814	2,9814	5,3188	2,7785	2,8082	3,0831	0,3061	0,3263	6898,3735	69,9177	0,286	101,9314
Sample-17	8,2088	8,8649	2,9573	2,9573	5,3122	2,7873	2,8163	3,1184	0,3053	0,3244	6969,8951	70,0553	0,2807	99,4869
Sample-18	8,2056	8,8798	2,9705	2,9705	5,3078	2,7775	2,8135	3,1228	0,3056	0,3247	6943,3562	69,5938	0,2799	99,3431
Sample-19	8,2274	8,866	2,9781	2,9781	5,3341	2,8114	2,7995	3,1396	0,3077	0,3271	6799,9688	68,6986	0,2716	96,7574
Sample-20	8,2056	8,8678	2,9716	2,9716	5,3199	2,7785	2,8343	3,1291	0,3086	0,3281	6735,9284	67,9347	0,2709	96,5826
Sample-21	8,2034	8,8565	2,9617	2,9617	5,2991	2,8207	2,7957	3,1696	0,307	0,3262	6847,2638	68,3051	0,3016	107,1537
Sample-22	8,2219	8,8461	2,9628	2,9628	5,3188	2,7853	2,8053	3,0003	0,3057	0,3241	6948,3532	68,9609	0,2817	99,5373
Sample-23	8,2078	8,8759	2,9694	2,9694	5,3013	2,7785	2,8025	3,0311	0,3045	0,3207	7061,3721	68,6916	0,2871	100,686
Sample-24	8,2132	8,8734	2,9749	2,9749	5,3549	2,7695	2,8095	3,0408	0,3041	0,32	7093,8298	68,7102	0,2843	99,4705
Sample-25	8,2088	8,8673	2,9749	2,9749	5,3111	2,7986	2,7883	3,0303	0,3067	0,3265	6862,0235	68,9748	0,2836	100,8163
Sample-26	8,2056	8,8652	2,9694	2,9694	5,4338	2,7976	2,7953	3,0165	0,3057	0,3248	6938,3364	69,3356	0,2816	99,6822
Sample-27	8,223	8,8784	2,9694	2,9694	5,3089	2,7986	2,7844	3,0303	0,3048	0,3211	7038,4653	68,5595	0,2822	98,9232
Sample-28	8,2078	8,8642	2,9573	2,9573	5,2991	2,8157	2,7724	3,0585	0,3067	0,3265	6863,2012	69,188	0,2805	99,6633
Sample-29	8,2143	8,8687	2,9486	2,9486	5,2881	2,8154	2,7803	3,0541	0,3072	0,3271	6824,5532	68,8503	0,2794	99,3586
Sample-30	8,2143	8,8711	2,9584	2,9584	5,2958	2,8056	2,7843	3,0492	0,3081	0,3298	6749,8617	69,1848	0,2809	100,6396
Sample-31	8,2154	8,8673	2,9683	2,9683	5,3078	2,7936	2,7993	3,2596	0,3018	0,3157	7305,7192	69,391	0,2953	101,8352
Sample-32	8,2088	8,8858	2,9562	2,9562	5,4075	2,7813	2,8013	3,1864	0,3053	0,323	6986,9436	68,8215	0,2944	103,5486
Sample-33	8,2176	8,8767	2,9595	2,9595	5,3056	2,7833	2,8123	3,2067	0,3051	0,3245	6977,1061	69,5484	0,2959	104,6977
Sample-34	8,2219	8,8715	2,9705	2,9705	5,2991	2,7783	2,8073	3,185	0,3034	0,3207	7128,6387	69,7563	0,2997	105,0715
Sample-35	8,2121	8,8835	2,965	2,965	5,3089	2,7936	2,8085	3,1978	0,3062	0,3262	6893,0301	69,3857	0,2911	103,2935
Sample-36	8,2143	8,8715	2,9595	2,9595	5,3078	2,7883	2,8043	3,2	0,3051	0,3244	6977,0624	69,6676	0,2923	103,292
Sample-37	8,2121	8,8718	2,9661	2,9661	5,31	2,7913	2,8072	3,2049	0,307	0,3278	6829,6646	69,2375	0,2933	104,4841
Sample-38	8,2187	8,8683	2,9814	2,9814	5,3286	2,7875	2,8045	3,1939	0,306	0,326	6904,6085	69,211	0,2942	104,3316
Sample-39	8,2099	8,8748	2,9749	2,9749	5,3253	2,8064	2,7904	3,2128	0,3039	0,3199	7111,3866	68,9775	0,2968	103,6499
Sample-40	8,2045	8,8702	2,976	2,976	5,3253	2,7996	2,8013	3,2305	0,3061	0,3257	6907,5271	69,1366	0,2933	103,9543
Sample-41	8,2154	8,873	2,9716	2,9716	5,3056	2,7986	2,8033	3,2282	0,3047	0,3202	7057,8064	68,2197	0,2871	100,1309
Sample-42	8,2187	8,8598	2,977	2,977	5,3133	2,8144	2,8015	3,2454	0,305	0,3216	7022,4143	68,6357	0,2853	99,9188
Sample-43	8,2197	8,8711	2,9672	2,9672	5,3067	2,7956	2,8065	3,2344	0,3012	0,3152	7356,2802	69,6964	0,303	104,8628
Sample-44	8,2099	8,8794	2,9573	2,9573	5,3056	2,7818	2,8093	3,241	0,3018	0,316	7302,6114	69,721	0,3008	104,3152
Sample-45	8,2001	8,8588	2,9573	2,9573	5,2969	2,8116	2,8135	3,2512	0,3059	0,326	6916,1493	69,7138	0,2996	106,501
Sample-46	8,2099	8,8722	2,9606	2,9606	5,3067	2,7949	2,8103	3,2564	0,3026	0,3182	7217,5895	69,7902	0,3054	106,5665
Sample-47	8,2208	8,8692	2,9519	2,9519	5,2925	2,7959	2,8085	3,2397	0,3025	0,3191	7209,7586	70,3188	0,3037	106,2403
Sample-48	8,2078	8,8869	2,9628	2,9628	5,3034	2,7865	2,8103	3,3006	0,3021	0,3181	7247,3024	70,0663	0,3058	106,7302
Sample-49	8,2143	8,8523	2,9639	2,9639	5,31	2,8046	2,8325	3,2644	0,303	0,3183	7192,324	69,3828	0,2839	98,6212
Sample-50	8,2099	8,8647	2,9519	2,9519	5,31	2,8116	2,8138	3,234	0,3041	0,3202	7095,4884	69,0825	0,2974	104,0427
Min	8,2001	8,8461	2,9486	2,9486	5,2881	2,7695	2,7724	3,0003	0,3012	0,3152	6535,0313	67,3531	0,2709	96,5826
Max	8,2285	8,8894	2,9902	2,9902	5,4338	2,8207	2,8343	3,3372	0,3112	0,335	7356,2802	70,3188	0,3058	107,1537
Average	8,212398	8,86989	2,96738	2,96738	5,315532	2,79192	2,80260	3,170204	0,30576	0,3240	6951,8294	68,963196	0,28992	102,3835





TEST SUMMARY AND CONCLUSIONS

With this document we are providing prove that the product can withstand alternate exposures at high mechanical extremes. The test satisfies all failure criteria. It is considered to a Jedec standards classification.



COMPANY INFORMATION

Octa Light Bulgaria Plc is the first Bulgarian Manufacturer of High Power Light Emitting Diodes for general lighting applications. The long year company experience in artificial lighting on LED basis has made possible the creation of the first European LED specially designed for reaching best performance in light output, optical efficacy and thermal management. Octa Light Products help reduce CO₂ emissions and reduce the need for power plant expansion.

Thanks to its advanced optical properties, the BullStar series enable never before possible applications in outdoor, indoor, industrial, architectural and general lighting when pure white light is necessary. The sophisticated optical properties allow strong package light concentration suitable for most general lighting applications without the need of any secondary optics.

Octa Light is a fully integrated supplier, offering core Light emitting devices in all three base colors - Red, Green, Blue and white, as well as exotic colors as Pink, Cyan, Yellow, Purple and other on basis of client requirements. Octa Light Bulgaria PLC is entirely based within Europe, with R&D and manufacturing center in Bulgaria. Founded in 2010, Octa Light commits to continuously rise the lumen efficiency of its products and to bring its light emitting diodes closer to mass usage within next years.

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