SPECIFICATIONS FOR SMALITE

TOP 3528 series

Customer	**Approved**	**Checked**	**Prepared**

Descriptions

Our 3528 products, use silica gel solid crystal and silica gel packages, effectively improve the heat dissipation performance. Reliability is better than companies in general, its a complete white combination with high brightness, low-light decay characteristics.。

Features

●Size（mm）3.5*2.8*1.9

●Viewing angle：120°

●RoHS compliant lead-free soldering compatible

●Cool white （WZ3528）

>CCT:4700-15000K, Typical 5500k

●Warm white （IZ3528）

>CCT：2400K-4700K, Typical 3200k

Applications

●Channel letter

●Portable lighting

●Decorative lighting

●OA equipment

●Backlighting of full color LCD

●Bulbs and fluorescent lamps

Absolute maximum ratings(Ta=25℃)

Parameter	Symbol	Value	Unit
Power dissipation	Pd	140	mW
Forward current	If	40	mA
Reverse voltage	Vr	5	V
Operating temperature range	Top	-40 ~+100	℃
Storage temperature range	Tstg	-40~+100	℃
Pulse Forward Current	Ifp	100	mA
Electrostatic Discharge	ESD	2000(HBM)	V
Junction temperature	Tj	85	℃

Electro-optical characteristics(Ta=25℃)

Parameter	Test Condition	Symbol	Value			Unit
			MIN.	TYP.	MAX	
Forward voltage	If=20 mA	Vf	2.8		3.5	V
Luminous intensity	If=20 mA	Iv	1000		2500	Mcd
Viewing angle at 50% Iv	If=20 mA	2 θ 1/2		120		Deg
Reverse current	Vr=5V	Ir			10	μA

NOTES：

Tolerance: Iv ±10%, λd±2nm, Vf±0.05V, X, Y ±0.01)

IFP Conditions: Pulse Width≦10msec and Duty≦1/10.

Intensity bin limit(If=20mA)

Bin	Min.(mcd)	Max.(mcd)
L	1000	1200
	1200	1400
M	1400	1600
	1600	1800
H	1800	2100
	2100	2500

Vf bin limit(If=20mA)

Min.(V)	Max.(V)
2.7	2.9
2.9	3.1
3.1	3.3
3.3	3.5
3.5	3.7
3.7	3.9

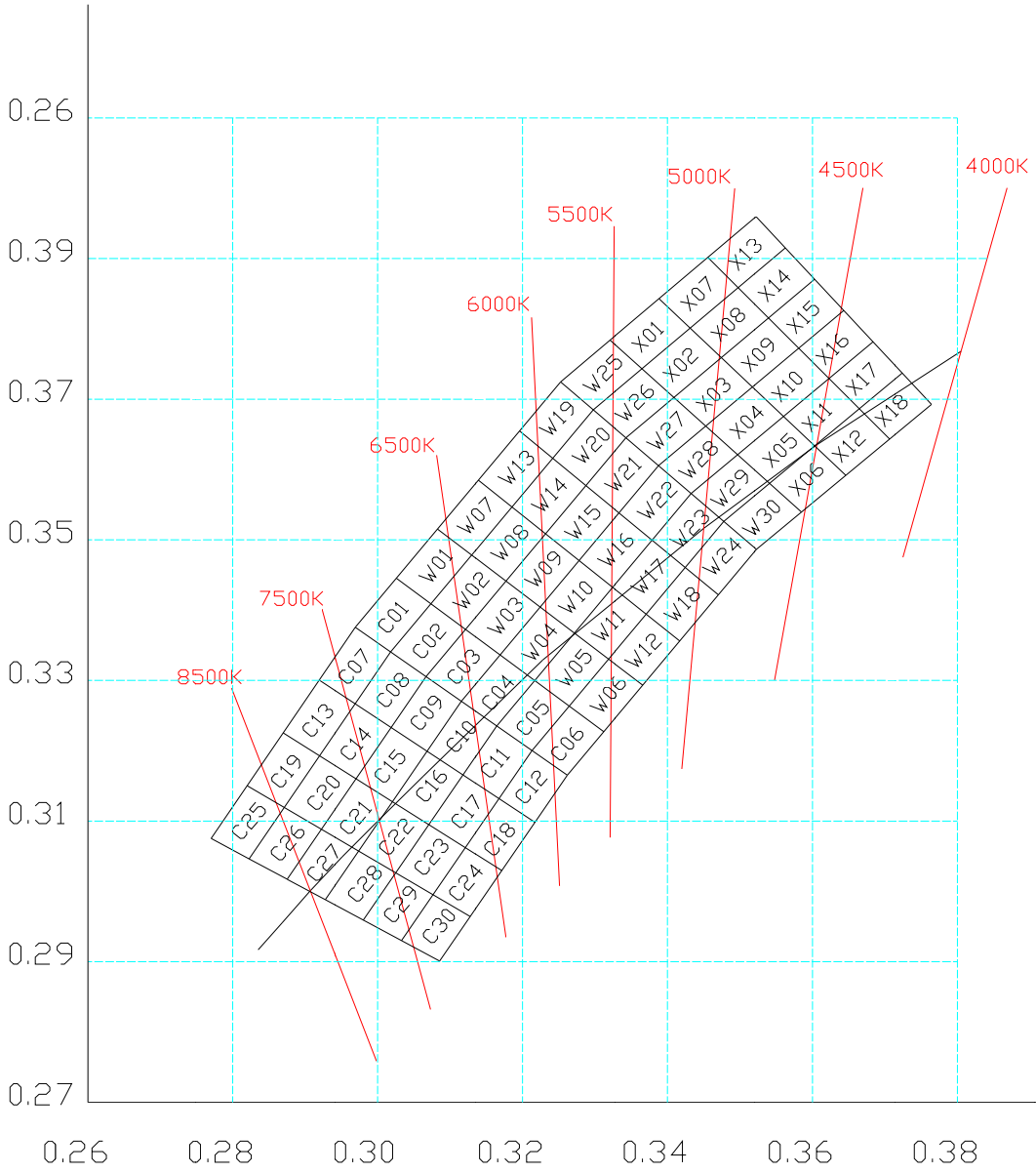
Color bin limit(If=20mA)—◎white

Bin	X	Y	Bin	X	Y	Bin	X	Y	Bin	X	Y
C01	0.2969	0.3376	C09	0.3019	0.3233	C17	0.3071	0.3095	C25	0.2770	0.3075
	0.3018	0.3340		0.3068	0.3199		0.3121	0.3062		0.2823	0.3046
	0.3071	0.3411		0.3115	0.3270		0.3167	0.3132		0.2871	0.3119
	0.3026	0.3445		0.3067	0.3305		0.3118	0.3166		0.282	0.315
C02	0.3018	0.3340	C10	0.3068	0.3199	C18	0.3121	0.3062	C26	0.2823	0.3046
	0.3067	0.3305		0.3118	0.3166		0.3171	0.3029		0.2875	0.3017
	0.3121	0.3373		0.3164	0.3235		0.3217	0.3098		0.2922	0.3088
	0.3071	0.3411		0.3115	0.3270		0.3167	0.3132		0.2871	0.3119
C03	0.3067	0.3305	C11	0.3118	0.3166	C19	0.282	0.315	C27	0.2875	0.3017
	0.3115	0.3270		0.3167	0.3132		0.2871	0.3119		0.2928	0.2988
	0.3169	0.3336		0.3213	0.3200		0.2920	0.3193		0.2974	0.3057
	0.3121	0.3373		0.3164	0.3235		0.2870	0.3225		0.2922	0.3088
C04	0.3115	0.3270	C12	0.3167	0.3132	C20	0.2871	0.3119	C28	0.2928	0.2988
	0.3164	0.3235		0.3217	0.3098		0.2922	0.3088		0.2980	0.2959
	0.3217	0.3300		0.3262	0.3165		0.2970	0.3160		0.3025	0.3026
	0.3169	0.3336		0.3213	0.3200		0.2920	0.3193		0.2974	0.3057
C05	0.3164	0.3235	C13	0.2870	0.3225	C21	0.2922	0.3088	C29	0.2980	0.2959
	0.3213	0.3200		0.2920	0.3193		0.2974	0.3057		0.3033	0.2930
	0.3264	0.3263		0.2969	0.3267		0.3020	0.3127		0.3076	0.2995
	0.3217	0.3300		0.2919	0.3300		0.2970	0.3160		0.3025	0.3026
C06	0.3213	0.3200	C14	0.2920	0.3193	C22	0.2974	0.3057	C30	0.3033	0.2930
	0.3262	0.3165		0.2970	0.3160		0.3025	0.3026		0.3086	0.2901
	0.3312	0.3227		0.3019	0.3233		0.3071	0.3095		0.3128	0.2964
	0.3264	0.3263		0.2969	0.3267		0.3020	0.3127		0.3076	0.2995
C07	0.2919	0.3300	C15	0.2970	0.3160	C23	0.3025	0.3026	W01	0.3026	0.3445
	0.2969	0.3267		0.3020	0.3127		0.3076	0.2995		0.3071	0.3411
	0.3018	0.3340		0.3068	0.3199		0.3121	0.3062		0.3130	0.3478
	0.2969	0.3376		0.3019	0.3233		0.3071	0.3095		0.3082	0.3515
C08	0.2969	0.3267	C16	0.3020	0.3127	C24	0.3076	0.2995	W02	0.3071	0.3411
	0.3019	0.3233		0.3071	0.3095		0.3128	0.2964		0.3121	0.3373
	0.3067	0.3305		0.3118	0.3166		0.3171	0.3029		0.3177	0.3441
	0.3018	0.3340		0.3068	0.3199		0.3121	0.3062		0.3130	0.3478

Bin	X	Y	Bin	X	Y	Bin	X	Y	Bin	X	Y
W03	0.3121	0.3373	W13	0.3139	0.3585	W23	0.3379	0.3499	X03	0.3409	0.3702
	0.3169	0.3336		0.3185	0.3547		0.3425	0.3461		0.3453	0.3662
	0.3224	0.3404		0.3241	0.3616		0.3478	0.3526		0.3517	0.3717
	0.3177	0.3441		0.3196	0.3655		0.3433	0.3566		0.3474	0.3759
W04	0.3169	0.3336	W14	0.3185	0.3547	W24	0.3425	0.3461	X04	0.3453	0.3662
	0.3217	0.3300		0.3232	0.3509		0.3470	0.3422		0.3497	0.3621
	0.3271	0.3367		0.3287	0.3577		0.3523	0.3486		0.3560	0.3675
	0.3224	0.3404		0.3241	0.3616		0.3478	0.3526		0.3517	0.3717
W05	0.3217	0.3300	W15	0.3232	0.3509	W25	0.3252	0.3724	X05	0.3497	0.3621
	0.3264	0.3263		0.3278	0.3470		0.3297	0.3685		0.3541	0.3580
	0.3319	0.3330		0.3333	0.3538		0.3365	0.3743		0.3603	0.3633
	0.3271	0.3367		0.3287	0.3577		0.3321	0.3784		0.3560	0.3675
W06	0.3264	0.3263	W16	0.3278	0.3470	W26	0.3297	0.3685	X06	0.3541	0.3580
	0.3312	0.3227		0.3324	0.3432		0.3343	0.3645		0.3585	0.3539
	0.3366	0.3293		0.3379	0.3499		0.3409	0.3702		0.3646	0.3592
	0.3319	0.3330		0.3333	0.3538		0.3365	0.3743		0.3603	0.3633
W07	0.3082	0.3515	W17	0.3324	0.3432	W27	0.3343	0.3645	X07	0.3387	0.3842
	0.3130	0.3478		0.3371	0.3394		0.3388	0.3605		0.3431	0.3801
	0.3185	0.3547		0.3425	0.3461		0.3453	0.3662		0.3497	0.3859
	0.3139	0.3585		0.3379	0.3499		0.3409	0.3702		0.3456	0.3902
W08	0.3130	0.3478	W18	0.3371	0.3394	W28	0.3388	0.3605	X08	0.3431	0.3801
	0.3177	0.3441		0.3417	0.3356		0.3433	0.3566		0.3474	0.3759
	0.3232	0.3509		0.3470	0.3422		0.3497	0.3621		0.3539	0.3815
	0.3185	0.3547		0.3425	0.3461		0.3453	0.3662		0.3497	0.3859
W09	0.3177	0.3441	W19	0.3196	0.3655	W29	0.3433	0.3566	X09	0.3474	0.3759
	0.3224	0.3404		0.3241	0.3616		0.3478	0.3526		0.3517	0.3717
	0.3278	0.3470		0.3297	0.3685		0.3541	0.3580		0.3581	0.3772
	0.3232	0.3509		0.3252	0.3724		0.3497	0.3621		0.3539	0.3815
W10	0.3224	0.3404	W20	0.3241	0.3616	W30	0.3478	0.3526	X10	0.3517	0.3717
	0.3271	0.3367		0.3287	0.3577		0.3523	0.3486		0.3560	0.3675
	0.3324	0.3432		0.3343	0.3645		0.3585	0.3539		0.3623	0.3729
	0.3278	0.3470		0.3297	0.3685		0.3541	0.3580		0.3581	0.3772
W11	0.3271	0.3367	W21	0.3287	0.3577	X01	0.3321	0.3784	X11	0.3560	0.3675
	0.3319	0.3330		0.3333	0.3538		0.3365	0.3743		0.3603	0.3633
	0.3371	0.3394		0.3388	0.3605		0.3431	0.3801		0.3665	0.3686
	0.3324	0.3432		0.3343	0.3645		0.3387	0.3842		0.3623	0.3729
W12	0.3319	0.3330	W22	0.3333	0.3538	X02	0.3365	0.3743	X12	0.3603	0.3633
	0.3366	0.3293		0.3379	0.3499		0.3409	0.3702		0.3646	0.3592
	0.3417	0.3356		0.3433	0.3566		0.3474	0.3759		0.3707	0.3643
	0.3371	0.3394		0.3388	0.3605		0.3431	0.3801		0.3665	0.3686

Bin	X	Y	Bin	X	Y	Bin	X	Y	Bin	X	Y
X13	0.3456	0.3902	X14	0.3497	0.3859	X15	0.3539	0.3815	X16	0.3581	0.3772
	0.3497	0.3859		0.3539	0.3815		0.3581	0.3772		0.3623	0.3729
	0.3563	0.3915		0.3603	0.3871		0.3643	0.3826		0.3684	0.3782
	0.3522	0.3959		0.3563	0.3915		0.3603	0.3871		0.3643	0.3826
X17	0.3623	0.3729	X18	0.3665	0.3686						
	0.3665	0.3686		0.3707	0.3643						
	0.3724	0.3737		0.3764	0.3693						
	0.3684	0.3782		0.3724	0.3737						

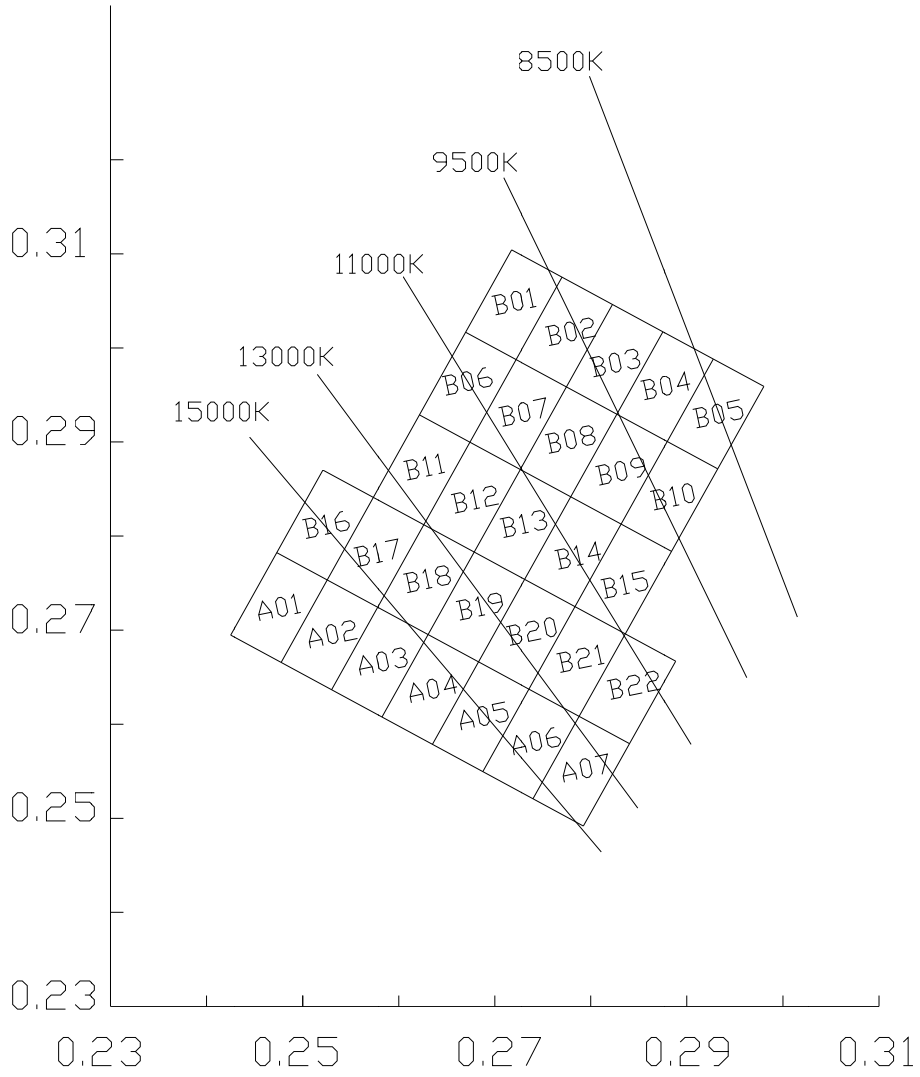
White CIE Chromaticity Diagram



◎ Cool white

Bin	X	Y	Bin	X	Y	Bin	X	Y	Bin	X	Y
B01	0.2670	0.3017	B09	0.2779	0.2842	B17	0.2526	0.2753	A03	0.2530	0.2637
	0.2722	0.2988		0.2832	0.2813		0.2578	0.2724		0.2583	0.2608
	0.2770	0.3075		0.2880	0.2900		0.2626	0.2812		0.2631	0.2695
	0.2718	0.3104		0.2827	0.2929		0.2574	0.2841		0.2578	0.2724
B02	0.2722	0.2988	B10	0.2832	0.2813	B18	0.2578	0.2724	A04	0.2583	0.2608
	0.2775	0.2958		0.2884	0.2784		0.2631	0.2695		0.2635	0.2579
	0.2823	0.3046		0.2932	0.2871		0.2679	0.2783		0.2683	0.2666
	0.2770	0.3075		0.2880	0.2900		0.2626	0.2812		0.2631	0.2695
B03	0.2775	0.2958	B11	0.2574	0.2841	B19	0.2631	0.2695	A05	0.2635	0.2579
	0.2827	0.2929		0.2626	0.2812		0.2683	0.2666		0.2688	0.2550
	0.2875	0.3017		0.2674	0.2900		0.2731	0.2754		0.2736	0.2637
	0.2823	0.3046		0.2622	0.2929		0.2679	0.2783		0.2683	0.2666
B04	0.2827	0.2929	B12	0.2626	0.2812	B20	0.2683	0.2666	A06	0.2688	0.2550
	0.2880	0.2900		0.2679	0.2783		0.2736	0.2637		0.2740	0.2521
	0.2928	0.2988		0.2727	0.2871		0.2784	0.2725		0.2788	0.2608
	0.2875	0.3017		0.2674	0.2900		0.2731	0.2754		0.2736	0.2637
B05	0.2880	0.2900	B13	0.2679	0.2783	B21	0.2736	0.2637	A07	0.2740	0.2521
	0.2932	0.2871		0.2731	0.2754		0.2788	0.2608		0.2792	0.2492
	0.2980	0.2959		0.2779	0.2842		0.2836	0.2696		0.2840	0.2579
	0.2928	0.2988		0.2727	0.2871		0.2784	0.2725		0.2788	0.2608
B06	0.2622	0.2929	B14	0.2731	0.2754	B22	0.2788	0.2608	A08		
	0.2674	0.2900		0.2784	0.2725		0.2840	0.2579			
	0.2722	0.2988		0.2832	0.2813		0.2888	0.2667			
	0.2670	0.3017		0.2779	0.2842		0.2836	0.2696			
B07	0.2674	0.2900	B15	0.2784	0.2725	A01	0.2425	0.2695	A09		
	0.2727	0.2871		0.2836	0.2696		0.2478	0.2666			
	0.2775	0.2958		0.2884	0.2784		0.2526	0.2753			
	0.2722	0.2988		0.2832	0.2813		0.2473	0.2782			
B08	0.2727	0.2871	B16	0.2473	0.2782	A02	0.2478	0.2666	A10		
	0.2779	0.2842		0.2526	0.2753		0.2530	0.2637			
	0.2827	0.2929		0.2574	0.2841		0.2578	0.2724			
	0.2775	0.2958		0.2521	0.2870		0.2526	0.2753			

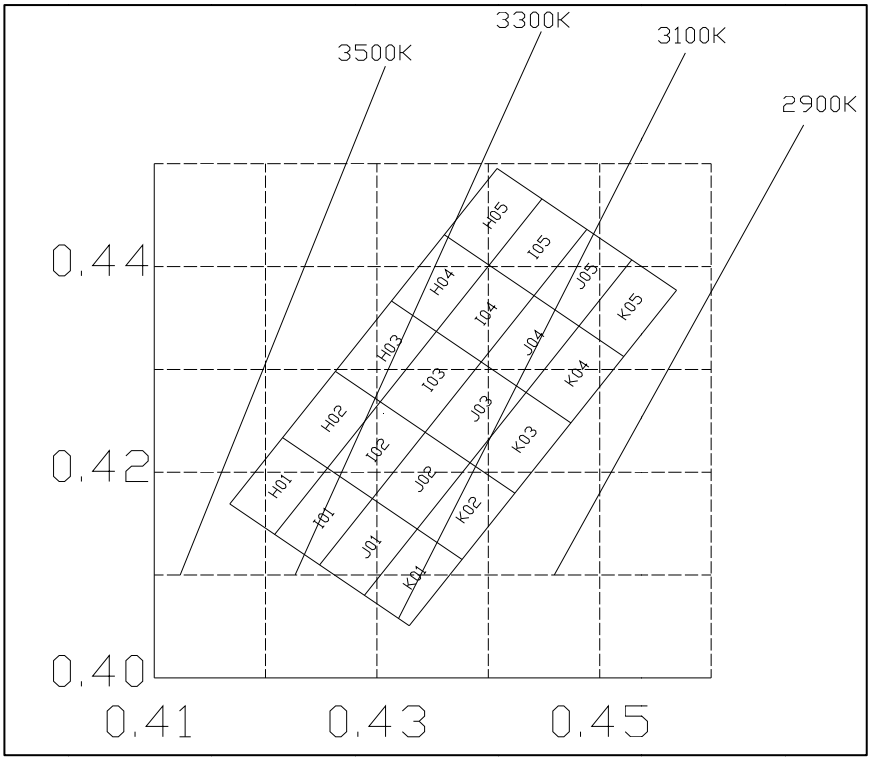
Cool white CIE Chromaticity Diagram



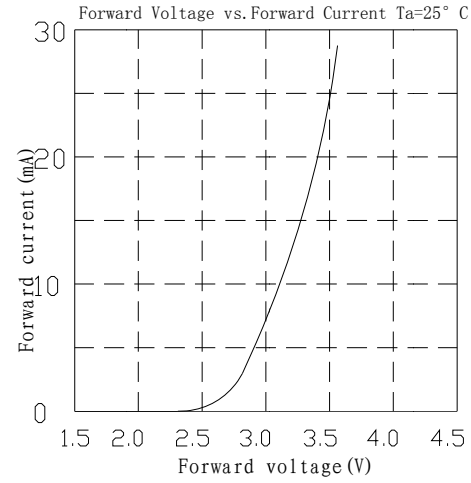
◎ Warm white

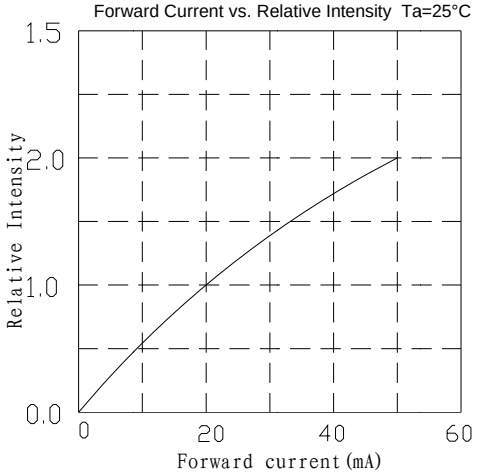
色区	X	Y	色区	X	Y	色区	X	Y	色区	X	Y
H01	0.4168	0.4169	I01	0.4208	0.4139	J01	0.4248	0.4110	K01	0.4289	0.4080
	0.4208	0.4139		0.4248	0.4110		0.4289	0.4080		0.4329	0.4051
	0.4256	0.4204		0.4296	0.4174		0.4336	0.4145		0.4376	0.4115
	0.4215	0.4234		0.4256	0.4204		0.4296	0.4174		0.4336	0.4145
H02	0.4215	0.4234	I02	0.4256	0.4204	J02	0.4296	0.4174	K02	0.4336	0.4145
	0.4256	0.4204		0.4296	0.4174		0.4336	0.4145		0.4376	0.4115
	0.4303	0.4268		0.4343	0.4239		0.4384	0.4209		0.4424	0.4180
	0.4263	0.4298		0.4303	0.4268		0.4343	0.4239		0.4384	0.4209
H03	0.4263	0.4298	I03	0.4303	0.4268	J03	0.4343	0.4239	K03	0.4384	0.4209
	0.4303	0.4268		0.4343	0.4239		0.4384	0.4209		0.4424	0.4180
	0.4353	0.4337		0.4394	0.4307		0.4434	0.4278		0.4474	0.4248
	0.4313	0.4366		0.4353	0.4337		0.4394	0.4307		0.4434	0.4278
H04	0.4313	0.4366	I04	0.4353	0.4337	J04	0.4394	0.4307	K04	0.4434	0.4278
	0.4353	0.4337		0.4394	0.4307		0.4434	0.4278		0.4474	0.4248
	0.4401	0.4401		0.4441	0.4372		0.4481	0.4342		0.4522	0.4312
	0.4360	0.4431		0.4401	0.4401		0.4441	0.4372		0.4481	0.4342
H05	0.4360	0.4431	I05	0.4401	0.4401	J05	0.4441	0.4372	K05	0.4481	0.4342
	0.4401	0.4401		0.4441	0.4372		0.4481	0.4342		0.4522	0.4312
	0.4448	0.4466		0.4488	0.4436		0.4529	0.4407		0.4569	0.4377
	0.4408	0.4495		0.4448	0.4466		0.4488	0.4436		0.4529	0.4407

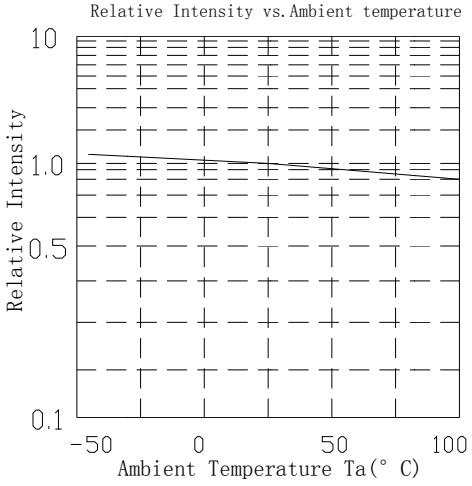
Warm white CIE Chromaticity Diagram

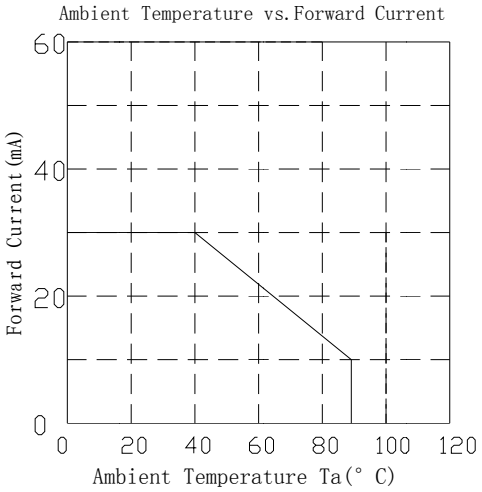


Typical optical characteristics curves

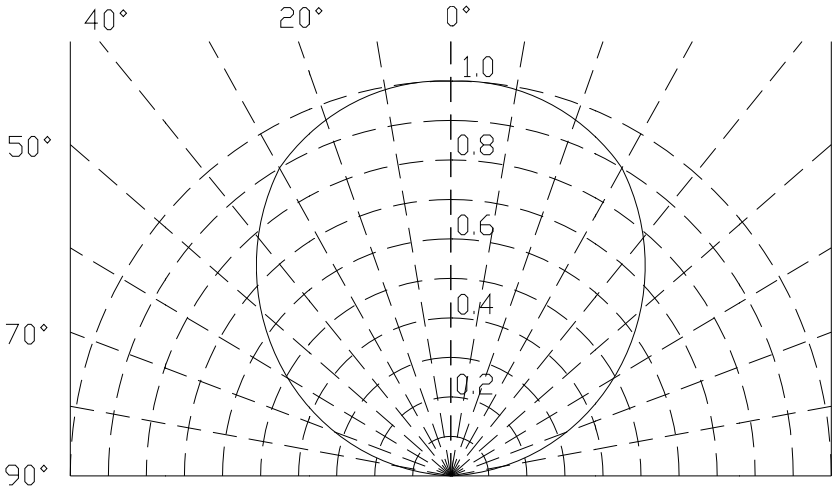






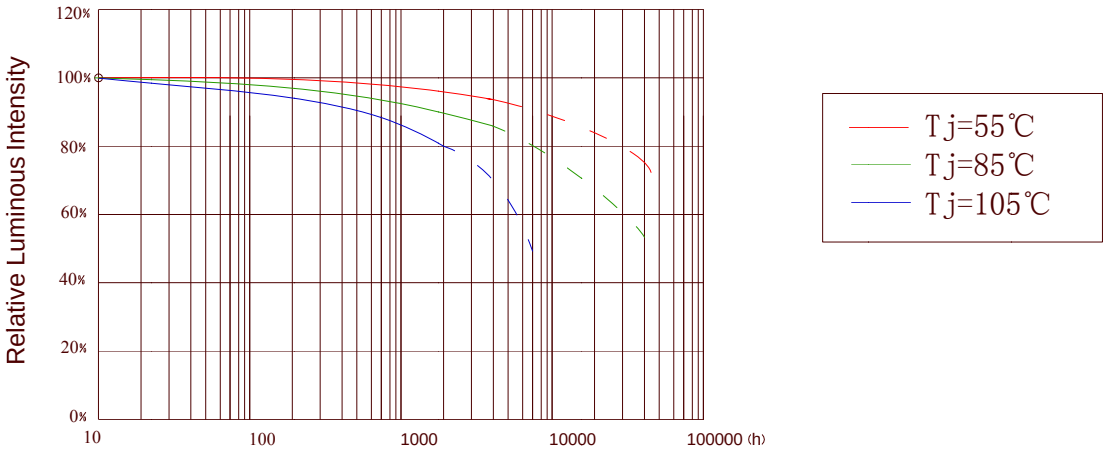


Curves of beam angle and relative brightness

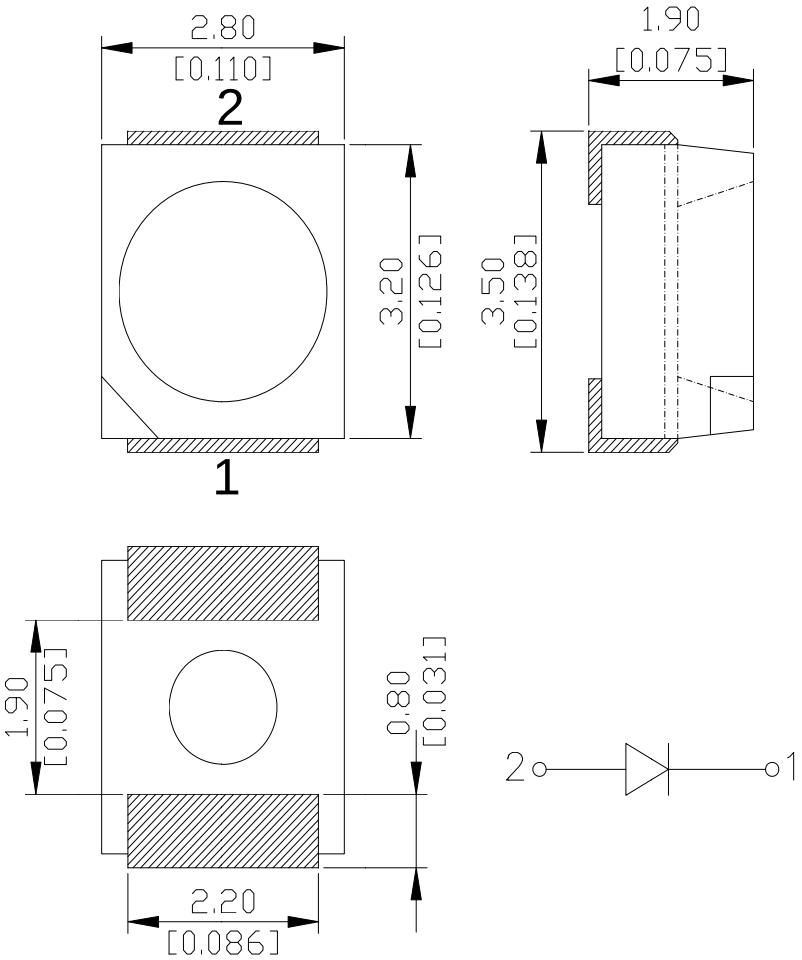


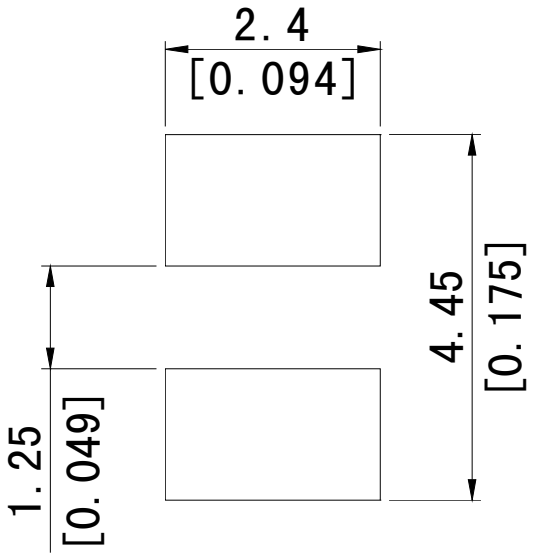
Life Test

Affect of Tj on Luminous Maintenance
(If=20mA)
(Dot line: Expected Life)



Mechanical Dimensions



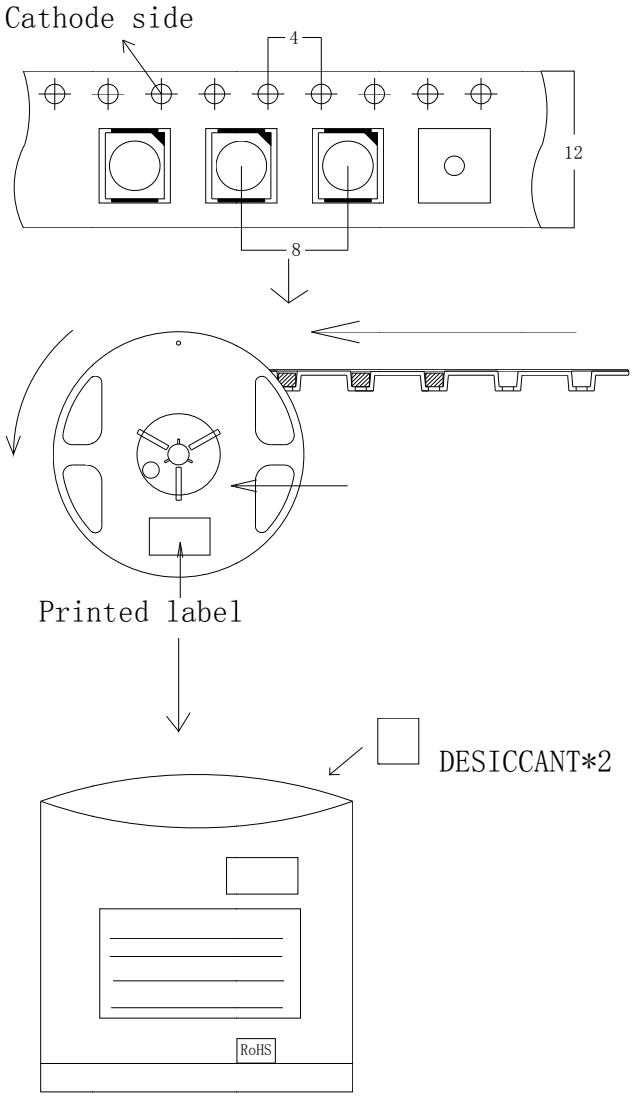


For reflow soldering

Kit number system

SL	-□	□	□□□□	-□	□
Smalite	R: Red G: Green B: Blue W: White I: Warm Y: Yellow O: Orange L: Kelly C: Color A: Amber P: Pink H: High Ra	Z: P-N F: N-P M: More chip	3528: TOP3528	A:20mA B:30mA C:60mA	L:1000-1400 M:1400-1800 H:1800-2500

Packaging



NOTES：

1. Empty component pockets are sealed with top cover tape;
2. The maximum number of missing lamps is two;
3. The cathode is oriented towards the tape sprocket hole in accordance with ANSI/EIA RS-481 specifications.
4. 2,000 pcs / Reel.

Reliability

(1)TEST ITEMS AND RESULTS

Type	Test Item	Ref. Standard	Test Conditions	Note	Number of Damaged
Environmental Sequence	Resistance to Soldering Heat(Reflow Soldering)	JESD22-B106	Tsld=260℃,10sec	2 times	0/22
	Temperature Cycle	JESD22-A104	-40℃ 30min ↑↓5min 100℃ 30min	1000 cycle	0/100
	Thermal Shock	JESD22-A106	-40℃ 15min ↑↓ 100℃ 15min	1000 cycle	0/100
	High Temperature Storage	JESD22-A103	T_a=100℃	1000 hrs	0/100
	Low Temperature	JESD22-A119	T_a=-40℃	1000 hrs	0/100
	Power temperature Cycling	JESD22-A105	On 5min -40℃>15min ↑↓ ↑↓<15min Off5min 100℃>15min	100 cycle	0/100
Operation Sequence	Life Test	JESD22-A108	T_a=25℃ I_F=40mA	1000 hrs	0/100
	High Humidity Heat Life Test	JESD22-A101	60℃ RH=90% I_F=30mA	1000 hrs	0/100

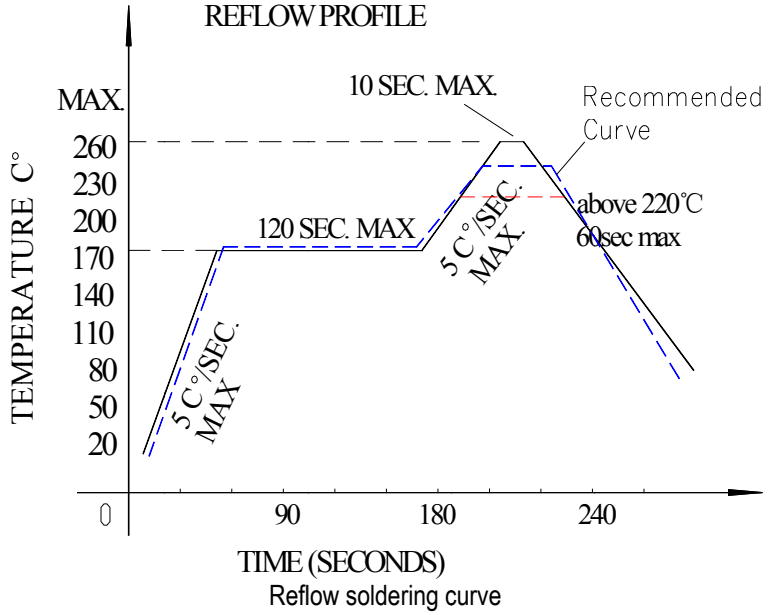
(2)CRITERIA FOR JUDGING THE DAMAGE

Item	Symbol	Test Conditions	Criteria for Judgement	
			Min.	Max.
Forward Voltage	VF	IF=15mA	_	U.S.L*)×1.1
Reverse Current	IR	VR=5V	_	U.S.L*)×2.0
Luminous Intensity	IV	IF=15mA.	L.S.L**)×0.7	_

U.S.L.: Upper Standard Level L.S.L.: Lower Standard Level

Specifications

一、 Requirements for application and reflow soldering：



Reflow soldering curve

■Notes for reflow soldering:

1. No more than twice for reflow soldering.
2. To ensure the quality of our LEDs, we encapsulate them with silica gels. So please do not put pressure on the LEDs.
3. Please choose the right nozzle to avoid the damage to products due to the pressure.
4. Please put on the antistatic hand loop during the use. The worktable should be with antistatic finish. The equipments must be contacted with ground.

■ Handwork soldering: Handwork soldering:

1. During the soldering, the electronic soldering iron must be kept under the temperature of 300℃ and the soldering time must not be beyond 3 seconds. No touch between the electronic soldering iron and colloid.
2. Handwork soldering is only allowed once. We won't take responsibility for more than that.
3. Avoid using sharp objects to compress products Colloidal Part directly.

二、Storage conditions:

Before opening the package

The LEDs can be preserved for 1 year in condition of temperature no more than 30℃ and humidity no more than 70%RH. Recommended for moisture-proof foil bag with desiccant packaging methods, stored in the constant temperature and humidity box.

Stored for more than 7 days, next time must be dehumidification, the dehumidification conditions is 70 ℃ with 20hours.

After opening the package

The SMD LEDs should be run out with 24hours in condition of temperature no more than 30℃ and humidity no more than 70%RH. The rest products should be pressurized in vacuum condition with desiccants. Stored for more than 7 days, next time also must be dehumidification, the dehumidification conditions is 70 ℃ with 20hours.