Achieving the best system cost in Mid/High Power

Mid-Power LED – 3030 Series

STW9C2SA (Neutral, Warm)

RoHS

Product Brief

Description

- This White Colored surface-mount LED comes in standard package dimension. Package Size : 3.0x3.0x0.65mm
- It has a substrate made up of a molded plastic reflector sitting on top of a lead frame.
- The die is attached within the reflector cavity and the cavity is encapsulated by silicone.
- The package design coupled with careful selection of component materials allow these products to perform with high reliability.

Features and Benefits

- Thermally Enhanced Package Design
- Mid Power to High Power up to 1W
- Max. Driving Current 200mA
- Compact Package Size
- High Color Quality with CRI Min. 90
- CRI R9 > 50
- Pb-free Reflow Soldering Application

Key Applications

- Interior lighting
- General lighting
- Indoor & Outdoor displays
- Architectural / Decorative lighting

Table 1. Product Selection Table

Part Number	CCT			
	Color	Min.	Typ.	Max.
STW9C2SA	Neutral White	3700K	4000K	4200K
STW9C2SA	Warm White	2600K	3000K	3700K

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Product Nomenclature

Table 2. Part Numbering System : $X_1X_2X_3\ X_4X_5\ X_6X_7$

Part Number Code	Description	Part Number	Value
X_1	Company	S	
X_2	Top View LED series	T	
X_3	Color Specification	W9	CRI 90
X_4	Package series	C	C series
X_5X_6	Characteristic code	2S	
X_7	Revision	A	

Table 3. Lot Numbering System :$Y_1Y_2Y_3Y_4Y_5Y_6Y_7Y_8Y_9Y_{10}$–$Y_{11}Y_{12}Y_{13}Y_{14}Y_{15}Y_{16}Y_{17}$

Lot Number Code	Description	Lot Number	Value
Y_1Y_2	Year		
Y_3	Month		
Y_4Y_5	Day		
Y_6	Top View LED series		
$Y_7Y_8Y_9Y_{10}$	Mass order		
$Y_{11}Y_{12}Y_{13}Y_{14}Y_{15}Y_{16}Y_{17}$	Internal Number		

Performance Characteristics

Table 4-1. Product Selection Guide, IF=100mA , T_A = 25ºC, RH30%

Part Number	CCT (K) [1]	RANK	Luminous Intensity [2] I_V (cd)		Luminous Flux [3] Φ_V (lm)		CRI R_a
	Typ.		Min	Max	Min	Max	Min.
STW9C2SA	4000	J17	17	19.5	51.4	59.6	90
		J19	19.5	21.5	59.0	65.7	90
		K21	21.5	24	65.1	73.4	90
	3500	J17	17	19.5	51.4	59.6	90
		J19	19.5	21.5	59.0	65.7	90
		K21	21.5	24	65.1	73.4	90
	3000	J17	17	19.5	51	59.2	90
		J19	19.5	21.5	58.5	65.4	90
		K21	21.5	24	64.5	73	90
	2700	J17	17	19.5	51	59.2	90
		J19	19.5	21.5	58.5	65.4	90
		K21	21.5	24	64.5	73	90

Notes :

1. Correlated Color Temperature is derived from the CIE 1931 Chromaticity diagram.
   Color coordinate : ±0.007
2. Seoul Semiconductor maintains a tolerance of ±7% on Intensity and power measurements.
   The luminous intensity Iv was measured at the peak of the spatial pattern which may not be aligned with the mechanical axis of the LED package.
3. Calculated performance values are for reference only.

Performance Characteristics

Table 5. Characteristics, IF=100mA , T_A = 25ºC, RH30%

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Forward Current	I_F	-	100	200	mA
Forward Voltage	V_F (100mA)	5.8	6.1	6.6	V
Reverse Voltage	V_r	-	0.9	1.4	V
Luminous Intensity (3,500 K)	I_v (100mA)	-	20 (60)	-	cd (lm)
	I_v (150mA)	-	28 (84)	-	
Color Rendering Index [1]	Ra	90	93	100	-
Viewing Angle [2]	$2\Theta_{1/2}$		120		
Power Dissipation	P_d	-	-	1.44	W
Junction Temperature	T_j	-	-	125	ºC
Operating Temperature	T_{opr}	- 40	-	+ 85	ºC
Storage Temperature	T_{stg}	- 40	-	+ 100	ºC
Thermal resistance (J to S) [[3]	$R\theta_{J-S}$	-	10	-	℃/W
ESD Sensitivity(HBM) [4]	-	-	-	5000	V

Notes :

1. Tolerance : VF :±0.1V, IV :±7%, Ra :±2, x,y :±0.007
2. $2\Theta_{1/2}$ is the off-axis where the luminous intensity is 1/2 of the peak intensity
3. Thermal resistance : Rth_{JS} (Junction / solder)
4. A zener diode is included for ESD Protection.

- LED's properties might be different from suggested values like above and below tables if operation condition will be exceeded our parameter range. Care is to be taken that power dissipation does not exceed the absolute maximum rating of the product.
- All measurements were made under the standardized environment of Seoul Semiconductor.

Relative Spectral Distribution

Fig 1. Color Spectrum, Ta = 25℃, RH30%

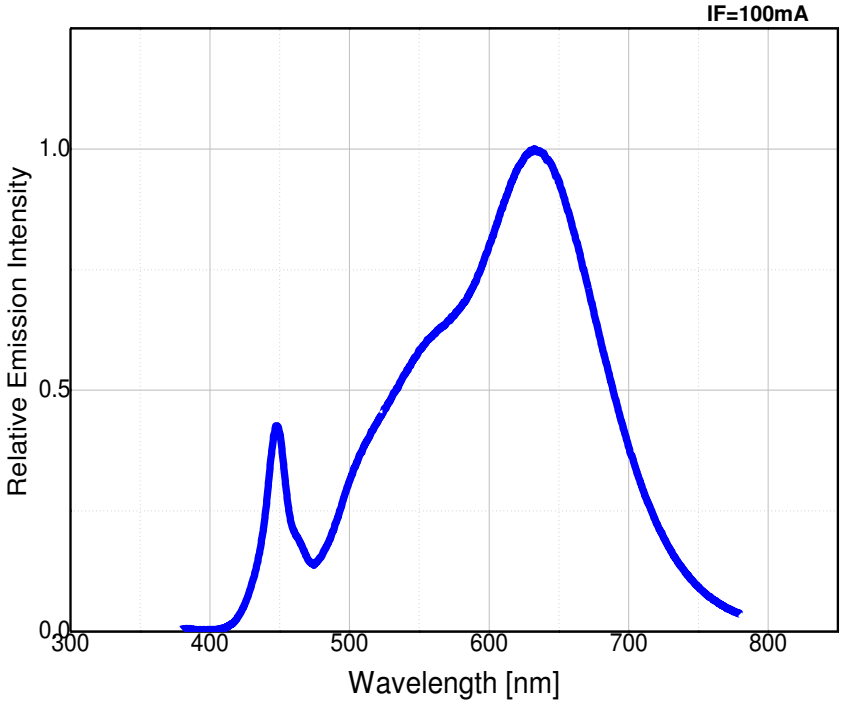
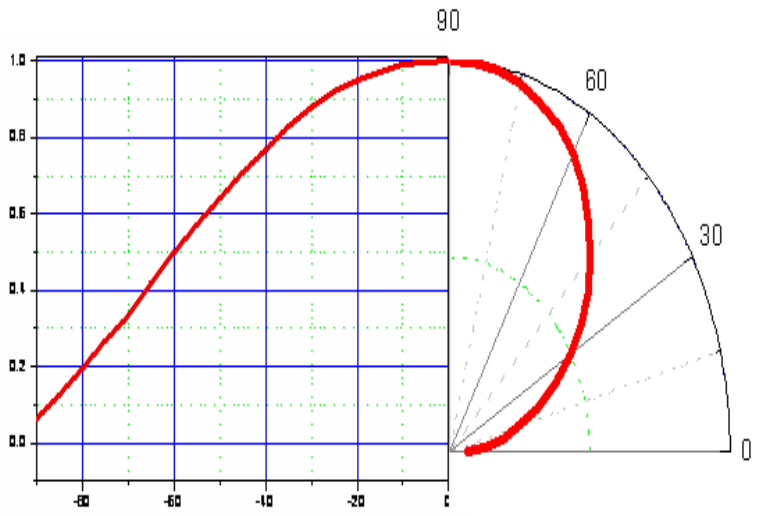


Fig 2. Viewing Angle Distribution **IF=100mA**



Forward Current Characteristics

Fig 3. Forward Voltage vs. Forward Current , Ta=25℃

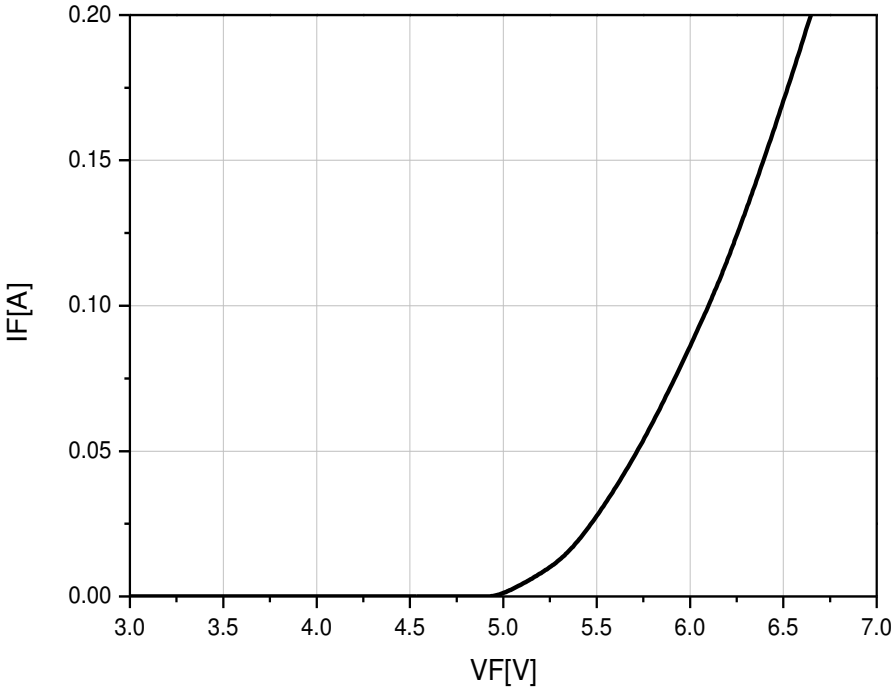
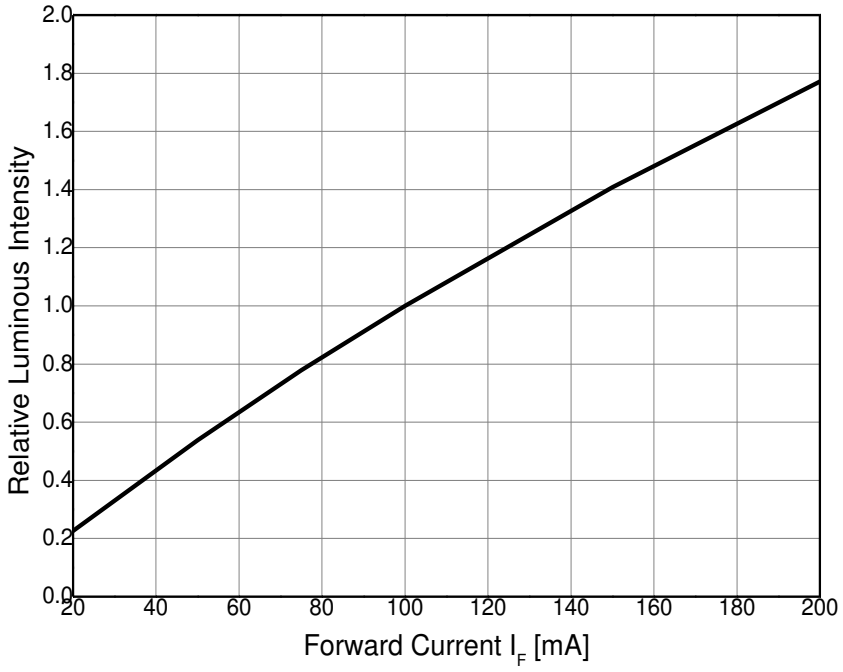
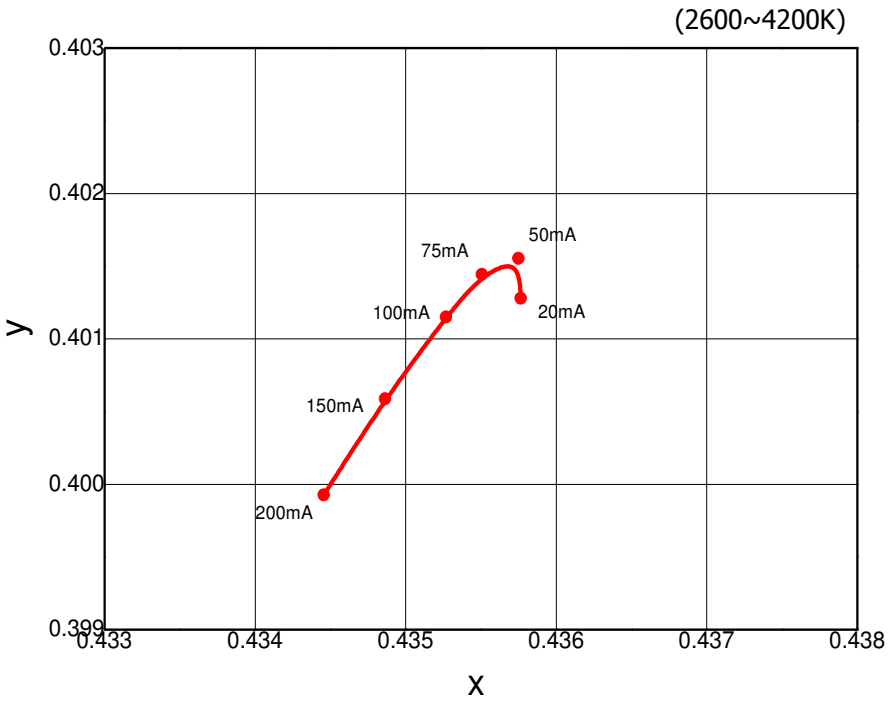


Fig 4. Forward Current vs. Relative Luminous Flux, Ta=25℃



Forward Current Characteristics

Fig 5. Forward Current vs. CIE X, Y Shift , Ta=25℃



Junction Temperature Characteristics

Fig 6. Relative Light Output vs. Junction Temperature

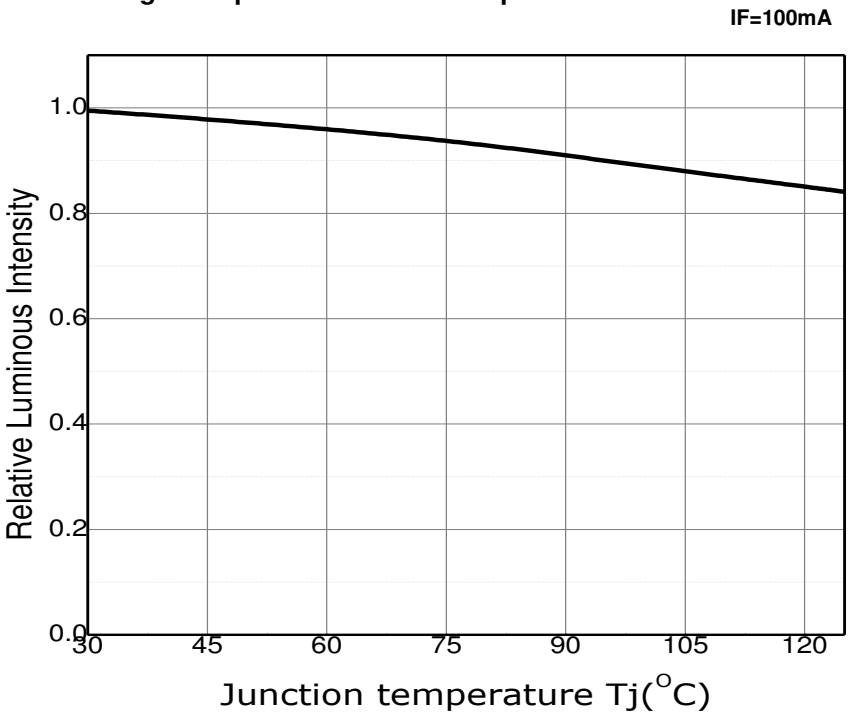
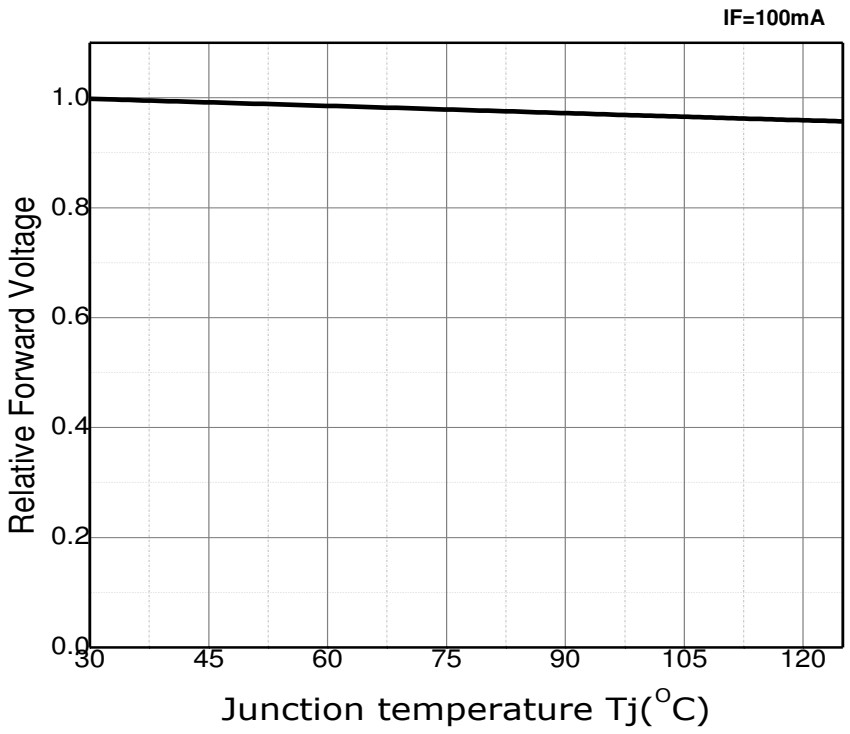
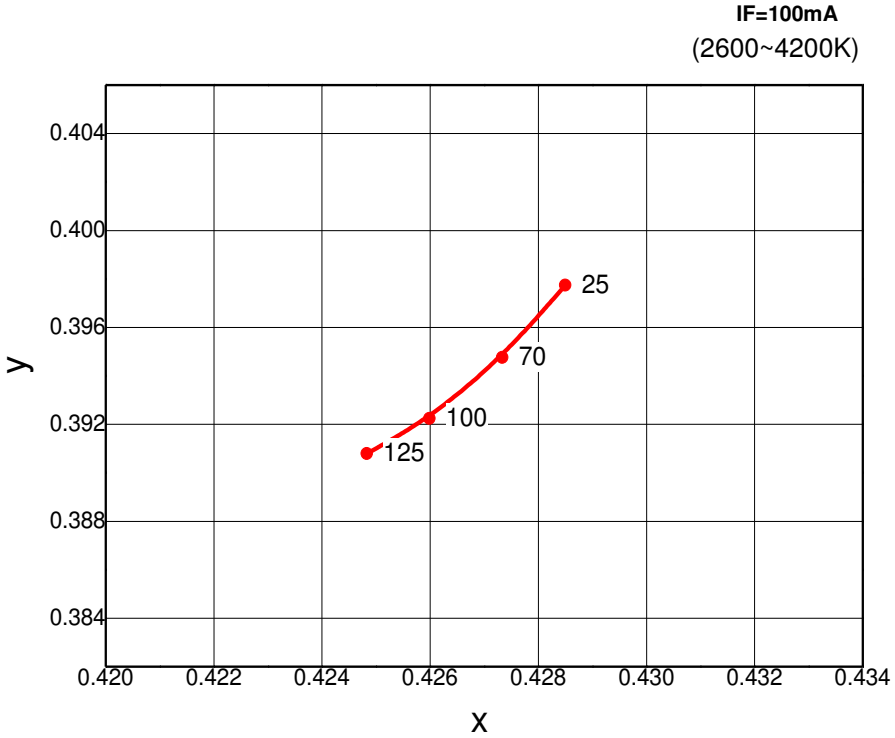


Fig 7. Junction Temperature vs. Relative Forward Voltage



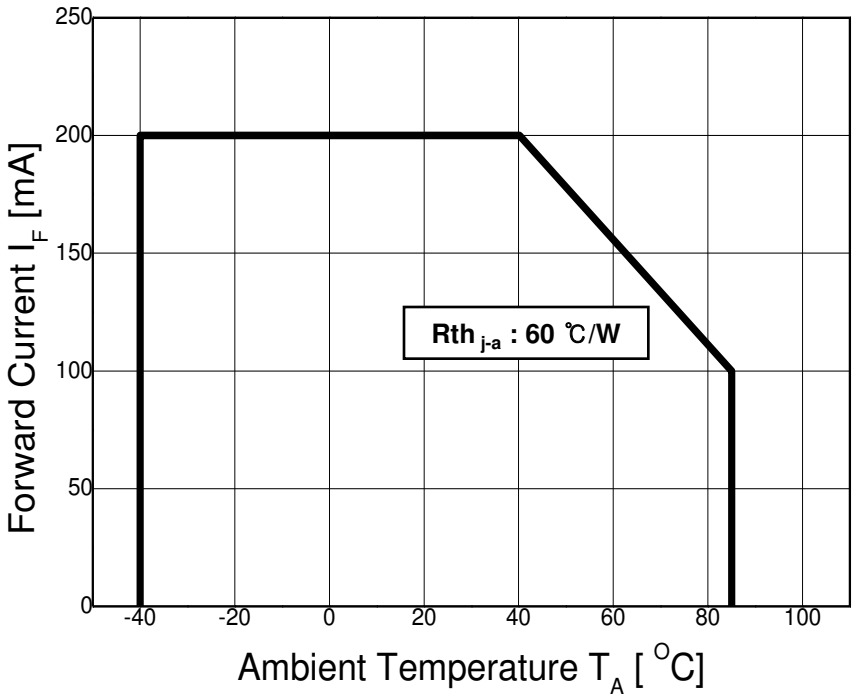
Junction Temperature Characteristics

Fig 8. Chromaticity Coordinate vs. Junction Temperature



Ambient Temperature Characteristics

Fig 9. Maximum Forward Current vs. Ambient Temperature



Color Bin Structure

Table 6. Bin Code description

Part Number	Luminous Intensity (cd) @ I_F = 100mA			Color Chromaticity Coordinate @ I_F = 100mA	Typical Forward Voltage (V_f)		
	Bin Code	Min.	Max.		Bin Code	Min.	Max.
STW9C2SA	J17	17	19.5	Refer to page.14	Z58	5.8	6.0
	J19	19.5	21.5		Z60	6.0	6.2
	K21	21.5	24		Z62	6.2	6.4
					Z64	6.4	6.6

Table 7. Intensity rank distribution

CCT	CIE	IV Rank		
3200- 4200K	E , F	J17	J19	K21
2600 - 3200K	G, H	J17	J19	K21

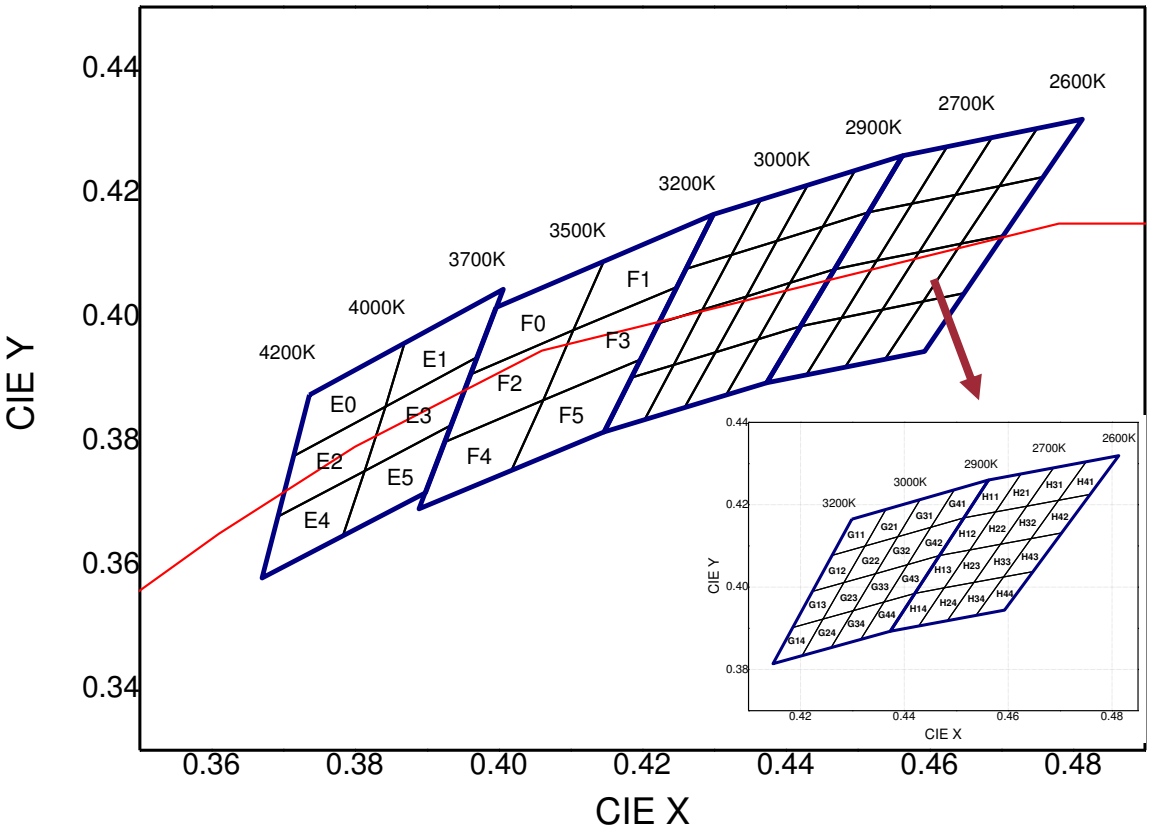
Currently available
Not yet available

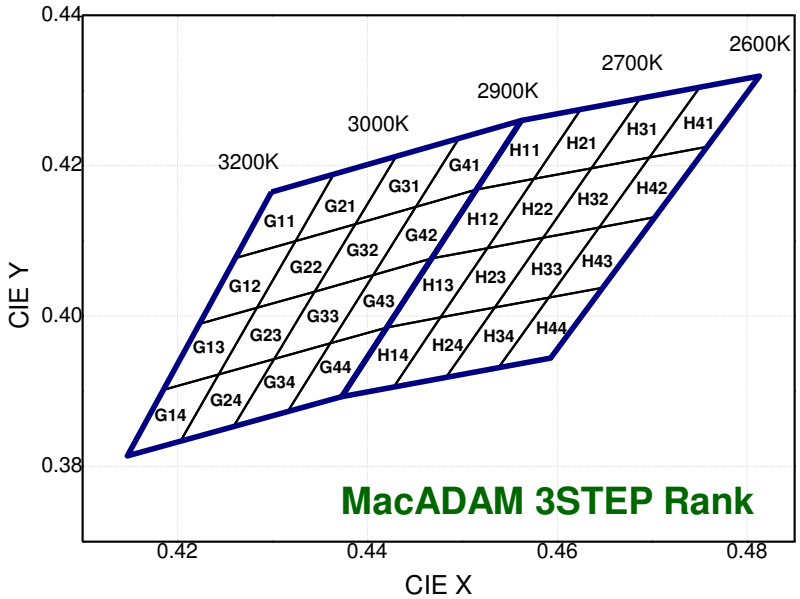
Notes

- All measurements were made under the standardized environment of Seoul Semiconductor.
- Seoul Semiconductor sorts the LED package according to the luminous intensity IV.
- The lumen table is only for reference.

Color Bin Structure

CIE Chromaticity Diagram Ta=25℃, IF=100mA





- Energy Star binning applied to all 2600~4200K.
- MACADAM 3 Step binning for 2600~3200K.
- Measurement Uncertainty of the Color Coordinates : ± 0.007

Color Bin Structure

<IF=100mA, Ta=25℃>

E0		E1		E2	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3736	0.3874	0.3869	0.3958	0.3714	0.3775
0.3714	0.3775	0.3842	0.3855	0.3692	0.3677
0.3842	0.3855	0.397	0.3935	0.3813	0.3751
0.3869	0.3958	0.4006	0.4044	0.3842	0.3855
E3		**E4**		**E5**	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3842	0.3855	0.3692	0.3677	0.3813	0.3751
0.3813	0.3751	0.367	0.3578	0.3783	0.3646
0.3934	0.3825	0.3783	0.3646	0.3898	0.3716
0.397	0.3935	0.3813	0.3751	0.3934	0.3825
F0		**F1**		**F2**	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3996	0.4015	0.4146	0.4089	0.396	0.3907
0.396	0.3907	0.4104	0.3978	0.3925	0.3798
0.4104	0.3978	0.4248	0.4048	0.4062	0.3865
0.4146	0.4089	0.4299	0.4165	0.4104	0.3978
F3		**F4**		**F5**	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.4104	0.3978	0.3925	0.3798	0.4062	0.3865
0.4062	0.3865	0.3889	0.369	0.4017	0.3751
0.4198	0.3931	0.4017	0.3751	0.4147	0.3814
0.4248	0.4048	0.4062	0.3865	0.4198	0.3931

Color Bin Structure

<IF=100mA, Ta=25℃>

G11		G21		G31		G41	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.4365	0.4189	0.4430	0.4212	0.4496	0.4236	0.4562	0.4260
0.4324	0.4100	0.4387	0.4122	0.4451	0.4145	0.4515	0.4168
0.4261	0.4077	0.4324	0.4100	0.4387	0.4122	0.4451	0.4145
0.4299	0.4165	0.4365	0.4189	0.4430	0.4212	0.4496	0.4236
G12		**G22**		**G32**		**G42**	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.4324	0.4100	0.4387	0.4122	0.4451	0.4145	0.4515	0.4168
0.4284	0.4011	0.4345	0.4033	0.4406	0.4055	0.4468	0.4077
0.4223	0.3990	0.4284	0.4011	0.4345	0.4033	0.4406	0.4055
0.4261	0.4077	0.4324	0.4100	0.4387	0.4122	0.4451	0.4145
G13		**G23**		**G33**		**G43**	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.4284	0.4011	0.4345	0.4033	0.4406	0.4055	0.4468	0.4077
0.4243	0.3922	0.4302	0.3943	0.4361	0.3964	0.4420	0.3985
0.4185	0.3902	0.4243	0.3922	0.4302	0.3943	0.4361	0.3964
0.4223	0.3990	0.4284	0.4011	0.4345	0.4033	0.4406	0.4055
G14		**G24**		**G34**		**G44**	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.4243	0.3922	0.4302	0.3943	0.4361	0.3964	0.4316	0.3873
0.4203	0.3834	0.4259	0.3853	0.4259	0.3853	0.4302	0.3943
0.4147	0.3814	0.4203	0.3834	0.4420	0.3985	0.4373	0.3893
0.4185	0.3902	0.4243	0.3922	0.4316	0.3873	0.4361	0.3964

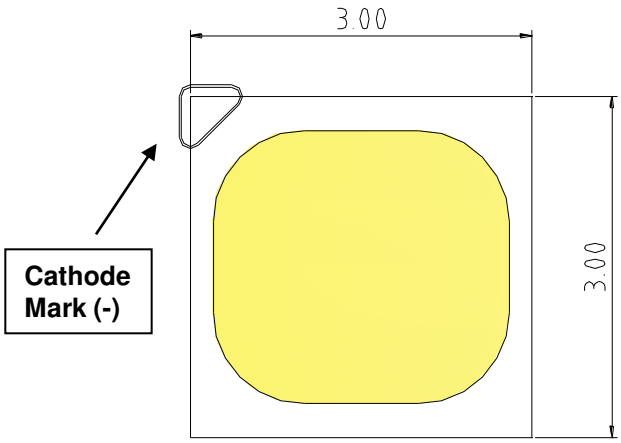
Color Bin Structure

<IF=100mA, Ta=25℃>

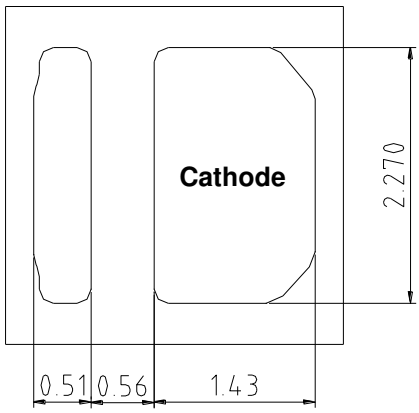
H11		H21		H31		H41	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.4325	0.4275	0.4687	0.4289	0.4750	0.4304	0.4810	0.4319
0.4575	0.4182	0.4636	0.4197	0.4697	0.4211	0.4758	0.4225
0.4515	0.4168	0.4575	0.4182	0.4636	0.4197	0.4697	0.4211
0.4562	0.4260	0.4625	0.4275	0.4687	0.4289	0.4750	0.4304
H12		**H22**		**H32**		**H42**	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.4575	0.4182	0.4636	0.4197	0.4697	0.4211	0.4758	0.4225
0.4526	0.4090	0.4585	0.4104	0.4644	0.4118	0.4703	0.4132
0.4468	0.4077	0.4526	0.4090	0.4585	0.4104	0.4644	0.4118
0.4515	0.4168	0.4575	0.4182	0.4636	0.4197	0.4697	0.4211
H13		**H23**		**H33**		**H43**	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.4526	0.4090	0.4585	0.4104	0.4644	0.4118	0.4703	0.4132
0.4477	0.3998	0.4534	0.4012	0.4591	0.4025	0.4648	0.4038
0.4420	0.3985	0.4477	0.3998	0.4534	0.4012	0.4591	0.4025
0.4468	0.4077	0.4526	0.4090	0.4585	0.4104	0.4644	0.4118
H14		**H24**		**H34**		**H44**	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.4477	0.3998	0.4534	0.4012	0.4591	0.4025	0.4648	0.4038
0.4428	0.3906	0.4483	0.3919	0.4538	0.3932	0.4593	0.3944
0.4373	0.3893	0.4428	0.3906	0.4483	0.3919	0.4538	0.3932
0.4420	0.3985	0.4477	0.3998	0.4534	0.4012	0.4591	0.4025

Mechanical Dimensions

Top View

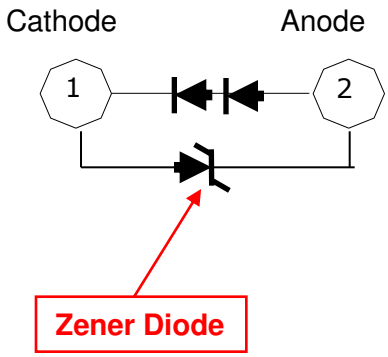


Bottom View



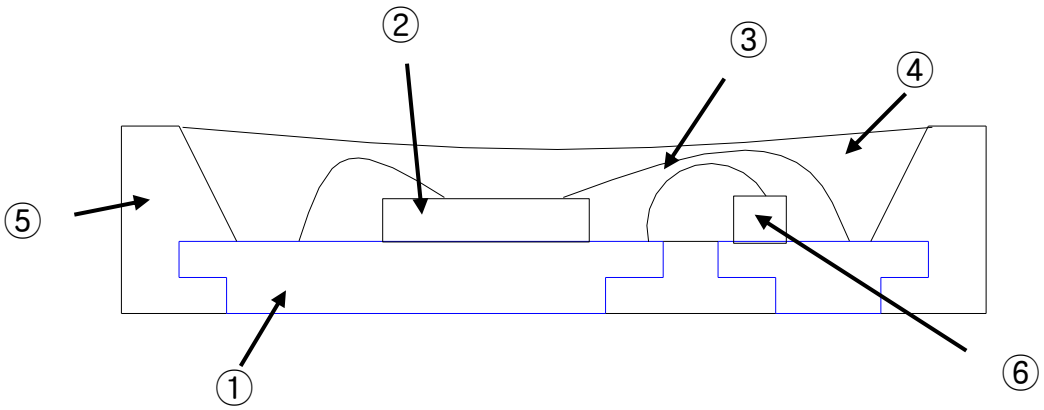
Side View

Circuit



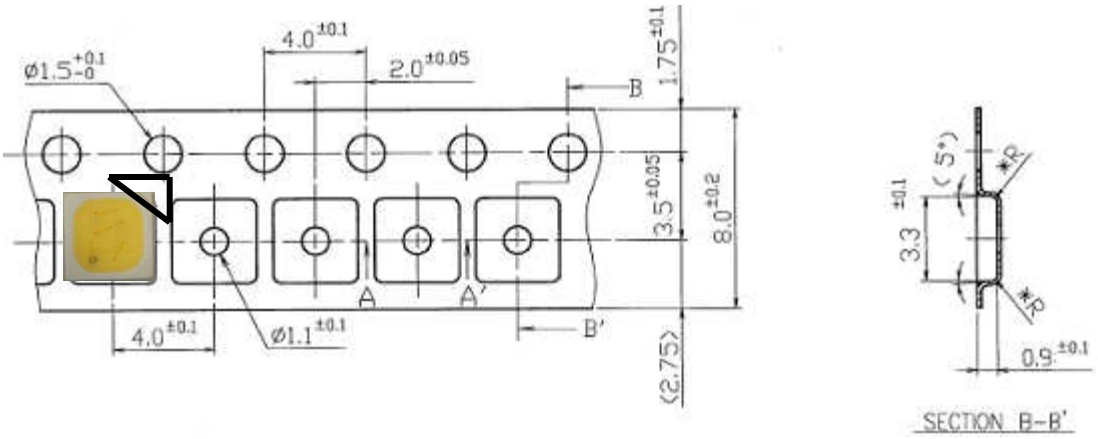
1. All dimensions are in millimeters.
2. Scale : none
3. Undefined tolerance is ±0.2mm

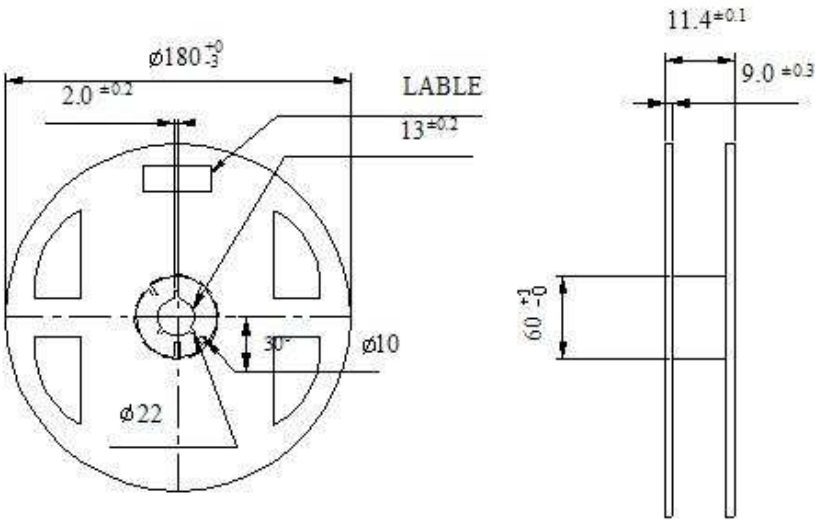
Mechanical Dimensions



Parts No.	Name	Description	Materials
①	LEAD FRAME	Metal	Copper Alloy (Silver Plated)
②	Chip Source	Blue LED	GaN on Sapphire
③	Wire	Metal	Gold Wire
④	Encapsulation	Silicone	+Phosphor
⑤	Body	Thermo Plastic	Heat-resistant Polymer
⑥	Zener Diode	Si	-

Reel Packaging



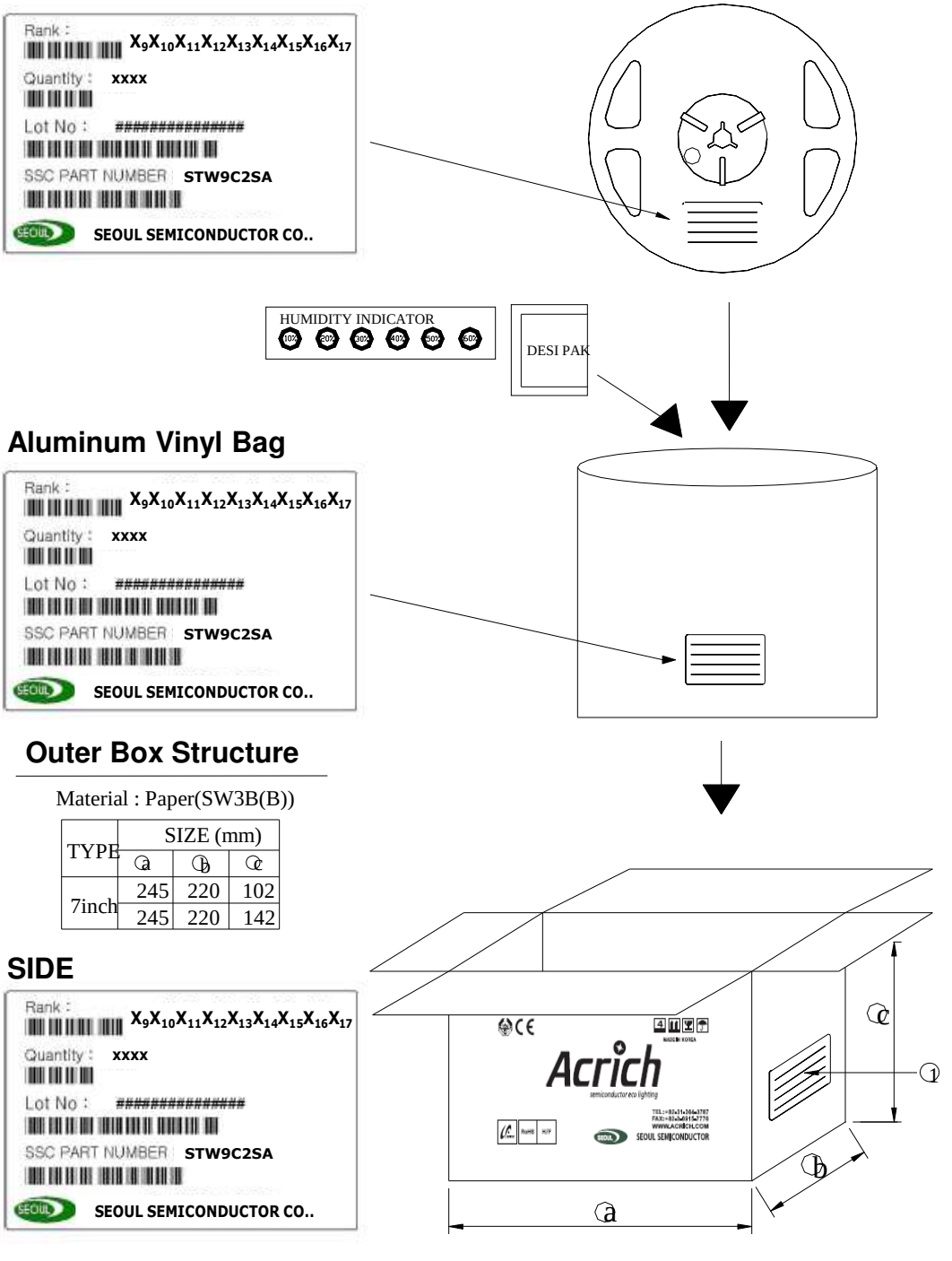


(Tolerance: ±0.2, Unit: mm)

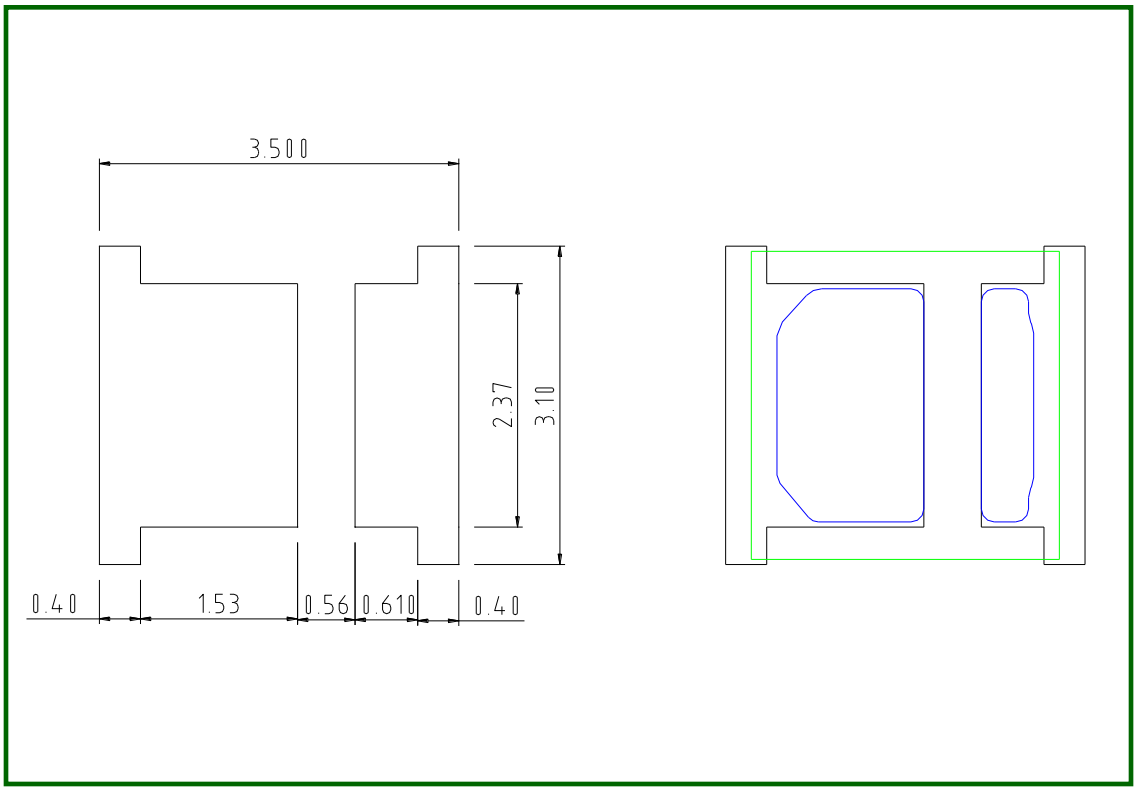
1) Quantity : Max 4,500pcs/Reel
2) Cumulative Tolerance : Cumulative Tolerance/10 pitches to be ±0.2mm
3) Adhesion Strength of Cover Tape
   Adhesion strength to be 0.1-0.7N when the cover tape is turned off from the carrier tape at the angle of 10˚ to the carrier tape.
4) Package : P/N, Manufacturing data Code No. and Quantity to be indicated on a damp proof Package.

Reel Packaging

Reel



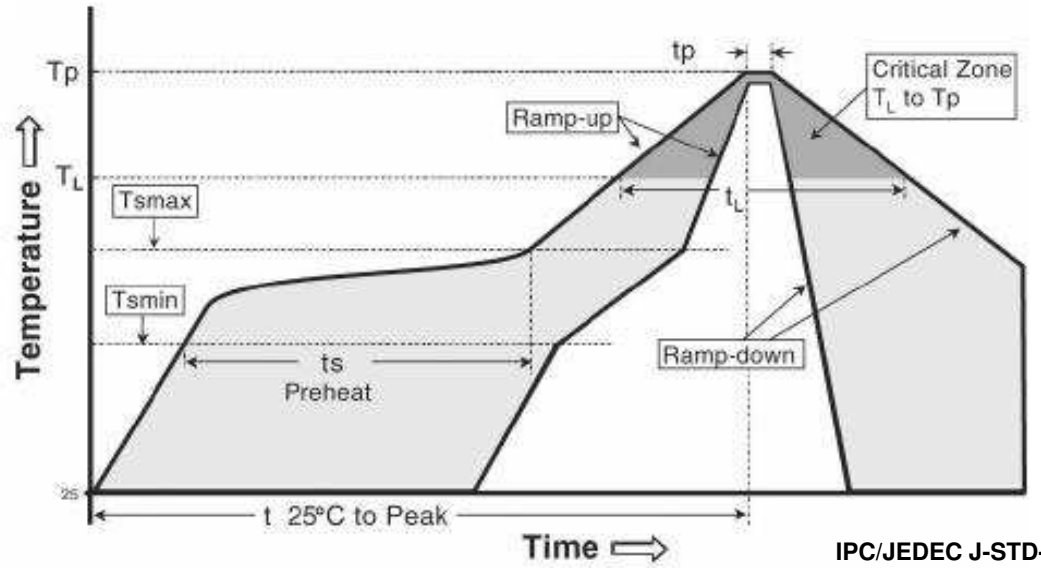
Recommended Solder Pad



Notes :

1. All dimensions are in millimeters.
2. Scale : none
3. This drawing without tolerances are for reference only
4. Undefined tolerance is ±0.1mm

Reflow Soldering Characteristics



IPC/JEDEC J-STD-020

Table 7.

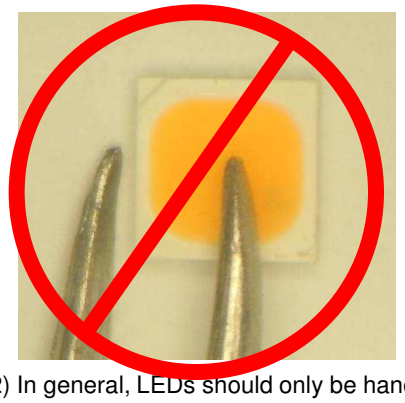
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (Tsmax to Tp)	3° C/second max.	3° C/second max.
Preheat - Temperature Min (Tsmin) - Temperature Max (Tsmax) - Time (Tsmin to Tsmax) (ts)	 100 °C 150 °C 60-120 seconds	 150 °C 200 °C 60-180 seconds
Time maintained above: - Temperature (TL) - Time (tL)	 183 °C 60-150 seconds	 217 °C 60-150 seconds
Peak Temperature (Tp)	215℃	260℃
Time within 5°C of actual Peak Temperature (tp)2	10-30 seconds	20-40 seconds
Ramp-down Rate	6 °C/second max.	6 °C/second max.
Time 25°C to Peak Temperature	6 minutes max.	8 minutes max.

Caution

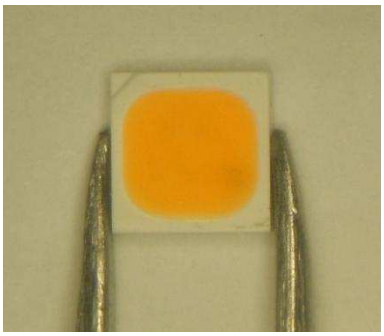
1. Reflow soldering is recommended not to be done more than two times. In the case of more than 24 hours passed soldering after first, LEDs will be damaged.
2. Repairs should not be done after the LEDs have been soldered. When repair is unavoidable, suitable tools must be used.
3. Die slug is to be soldered.
4. When soldering, do not put stress on the LEDs during heating.
5. After soldering, do not warp the circuit board.

Handling 3030 Series LEDs

(1) During processing, mechanical stress on the surface should be minimized as much as possible. Sharp objects of all types should not be used to pierce the sealing compound.



(2) In general, LEDs should only be handled from the side. By the way, this also applies to LEDs without a silicone sealant, since the surface can also become scratched.



(3) When populating boards in SMT production, there are basically no restrictions regarding the form of the pick and place nozzle, except that mechanical pressure on the surface of the resin must be prevented. This is assured by choosing a pick and place nozzle which is larger than the LED's reflector area.

(4) Silicone differs from materials conventionally used for the manufacturing of LEDs. These conditions must be considered during the handling of such devices. Compared to standard encapsulants, silicone is generally softer, and the surface is more likely to attract dust.

As mentioned previously, the increased sensitivity to dust requires special care during processing. In cases where a minimal level of dirt and dust particles cannot be guaranteed, a suitable cleaning solution must be applied to the surface after the soldering of components.

(5) SSC suggests using isopropyl alcohol for cleaning. In case other solvents are used, it must be assured that these solvents do not dissolve the package or resin.
Ultrasonic cleaning is not recommended. Ultrasonic cleaning may cause damage to the LED.

(6) Please do not mold this product into another resin (epoxy, urethane, etc) and do not handle this. product with acid or sulfur material in sealed space.

Precaution for Use

(1) Storage

To avoid the moisture penetration, we recommend store in a dry box with a desiccant .

The recommended storage temperature range is 5℃ to 30℃ and a maximum humidity of RH50%.

(2) Use Precaution after Opening the Packaging

Use proper SMT techniques when the LED is to be soldered dipped as separation of the lens may affect the light output efficiency.

Pay attention to the following:

a. Recommend conditions after opening the package

- Sealing

- Temperature : 5 ~ 40℃ Humidity : less than RH30%

b. If the package has been opened more than 4 week(MSL_2a) or the color of the desiccant changes, components should be dried for 10-12hr at 60±5℃

(3) Do not apply mechanical force or excess vibration during the cooling process to normal temperature after soldering.

(4) Do not rapidly cool device after soldering.

(5) Components should not be mounted on warped (non coplanar) portion of PCB.

(6) Radioactive exposure is not considered for the products listed here in.

(7) Gallium arsenide is used in some of the products listed in this publication.

These products are dangerous if they are burned or shredded in the process of disposal.

It is also dangerous to drink the liquid or inhale the gas generated by such products when chemically disposed of.

(8) This device should not be used in any type of fluid such as water, oil, organic solvent and etc. When washing is required, IPA (Isopropyl Alcohol) should be used.

(9) When the LEDs are in operation the maximum current should be decided after measuring the package temperature.

(10) LEDs must be stored properly to maintain the device. If the LEDs are stored for 3 months or more after being shipped from SSC, a sealed container with a nitrogen atmosphere should be used for storage.

(11) The appearance and specifications of the product may be modified for improvement without notice.

(12) Long time exposure of sunlight or occasional UV exposure will cause lens discoloration.

(13) VOCs (Volatile organic compounds) emitted from materials used in the construction of fixtures can penetrate silicone encapsulants of LEDs and discolor when exposed to heat and photonic energy.

The result can be a significant loss of light output from the fixture.

Knowledge of the properties of the materials selected to be used in the construction of fixtures can help prevent these issues.

(14) Attaching LEDs, do not use adhesives that outgas organic vapor.

(15) The driving circuit must be designed to allow forward voltage only when it is ON or OFF.

If the reverse voltage is applied to LED, migration can be generated resulting in LED damage.

Company Information

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Seoul Semiconductor (SeoulSemicon.com) manufacturers and packages a wide selection of light emitting diodes (LEDs) for the automotive, general illumination/lighting, appliance, signage and back lighting markets. The company is the world's fifth largest LED supplier, holding more than 10,000 patents globally, while offering a wide range of LED technology and production capacity in areas such as "nPola", deep UV LEDs, "Acrich", the world's first commercially produced AC LED, and "Acrich MJT - Multi-Junction Technology" a proprietary family of high-voltage LEDs. The company's broad product portfolio includes a wide array of package and device choices such as Acrich, high-brightness LEDs, mid-power LEDs, side-view LEDs, through-hole type LED lamps, custom displays, and sensors. The company is vertically integrated from epitaxial growth and chip manufacture in it's fully owned subsidiary, Seoul Viosys, through packaged LEDs and LED modules in three Seoul Semiconductor manufacturing facilities. Seoul Viosys also manufactures a wide range of unique deep-UV wavelength devices.

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