



ProLight PBVS-7FQE-F2GR
7W Power LED
Technical Datasheet
Version: P1.3

ProLight Opto ProEngine Series

Features

- High flux density of lighting source
- Good color uniformity
- RoHS compliant
- More energy efficient than incandescent and most halogen lamps
- Long lifetime
- AEC-Q102 compliant
- SAE/ECE Compliant

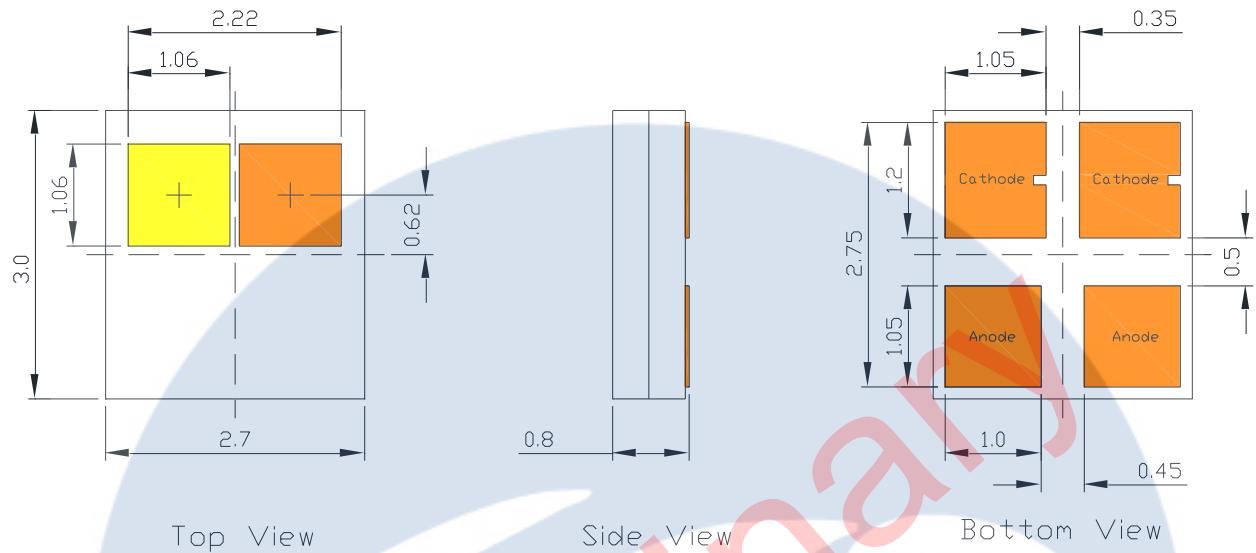
Main Applications

- Bicycle Lamps
- Exterior Automotive Lighting
- Floodlight
- Bending Light
- Daytime Running Light

Introduction

- The input power is 7 Watt, the multi-chip ultra high power ProEngine Serie delivers never before seen luminous flux output from a single emitter. The superficial illuminating nature of ProEngine makes them the preference bicycle lamps, typical applications include exterior automotive lighting Bending and Daytime Running Light.

Emitter Mechanical Dimensions

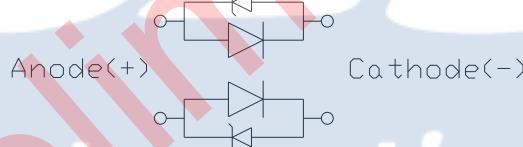


Top View

Side View

Bottom View

Circuit Diagram



Anode(+)

Cathode(-)

Notes:

1. Drawing not to scale.
2. All dimensions are in millimeters.
3. Unless otherwise indicated, tolerances are $\pm 0.1\text{mm}$.
4. Please do not solder the emitter by manual hand soldering, otherwise it will damage the emitter.
- 5. Please do not use a force of over 0.3kgf impact or pressure on the lens of the LED, otherwise it will cause a catastrophic failure.**

*The appearance and specifications of the product may be modified for improvement without notice.

Flux Characteristics, $T_J = 25^\circ\text{C}$

Radiation Pattern	Color	Part Number Emitter	Luminous Flux Φ_V (lm)			
			@1000mA		Refer @1200mA	
			Min.	Typ.	Min.	Typ.
Lambertian	White	PBVS-7FQE-F2GR	370	410	440	460
	PC Amber		240	255	275	290

- ProLight maintains a tolerance of $\pm 7\%$ on flux and power measurements.
- Please do not drive at rated current more than 1 second without proper heat sink.

Electrical Characteristics, $T_J = 25^\circ\text{C}$

Color	Forward Voltage V_F (V)			Refer @1200mA	Thermal Resistance Junction to Slug ($^\circ\text{C}/\text{W}$)
	@1000mA		Typ.		
	Min.	Typ.	Max.	Typ.	
White	3.0	3.2	3.4	3.3	4.7
	3.0	3.2	3.4	3.3	4.7

- ProLight maintains a tolerance of $\pm 0.1\text{V}$ for Voltage measurements.

Optical Characteristics at 1000mA, $T_J = 25^\circ\text{C}$

Radiation Pattern	Color	Dominant Wavelength λ_D , or Color Temperature CCT			Viewing Angle (degrees)
		Min.	Typ.	Max.	
					$2\theta_{1/2}$
Lambertian	White	5380 K	5620 K	5860 K	120
		5620 K	5880 K	6140 K	120
		5870 K	6150 K	6430 K	120
		6140 K	6450 K	6760 K	120
	PC Amber	587.5 nm	589.7 nm	592.5 nm	120

- ProLight maintains a tolerance of $\pm 5\%$ for CCT measurements.

Absolute Maximum Ratings

Parameter	White	PC Amber
Max DC Forward Current (mA)	1500	1200
Peak Pulsed Forward Current (mA)	1500 (less than 1/10 duty cycle@ 1KHz)	
LED Junction Temperature		150°C
Junction Temperature for short time applications*		175°C
Operating Temperature		-40°C - 125°C
Storage Temperature		-40°C - 125°C
Soldering Temperature		JEDEC 020c 260°C
Allowable Reflow Cycles		3
Reverse Voltage	Not designed to be driven in reverse bias	
ESD withstand voltage(kV)	up to 8	
acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 3B)		

Note: * The LED chip exhibits excellent performance but slight package discoloration occurs at highest temperatures. Exemplary median lifetime for $T_J = 175^\circ\text{C}$ is 100h.

Photometric Luminous Flux Bin Structure

Color	Bin Code	Minimum Photometric Flux (lm)	Maximum Photometric Flux (lm)	Available Color Bins
White	C	370	400	All
	D	400	430	All
	E	430	460	[1]
PC Amber	V	240	300	All
	W	300	360	[1]

- ProLight maintains a tolerance of $\pm 7\%$ on flux and power measurements.
- The flux bin of the product may be modified for improvement without notice.
- [1] The rest of color bins are not 100% ready for order currently. Please ask for quote and order Possibility.

Forward Voltage Bin Structure at 1000mA

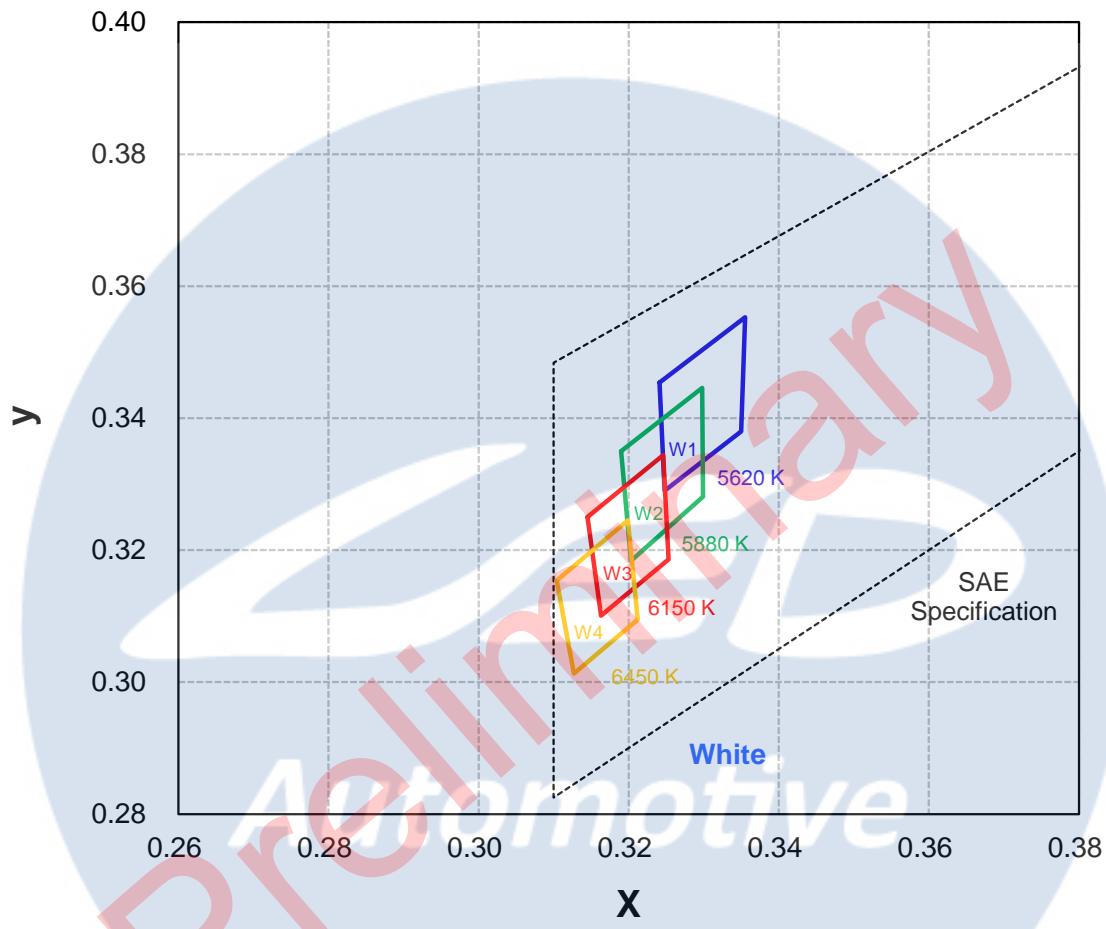
Color	Bin Code	Minimum Voltage (V)	Maximum Voltage (V)
White	B	3.0	3.2
	C	3.2	3.4
PC Amber	B	3.0	3.2
	C	3.2	3.4

- ProLight maintains a tolerance of $\pm 0.1\text{V}$ for Voltage measurements.

Note: Although several bins are outlined, product availability in a particular bin varies by production run and by product performance. Not all bins are available in all colors.

Color Bin

White Binning Structure Graphical Representation



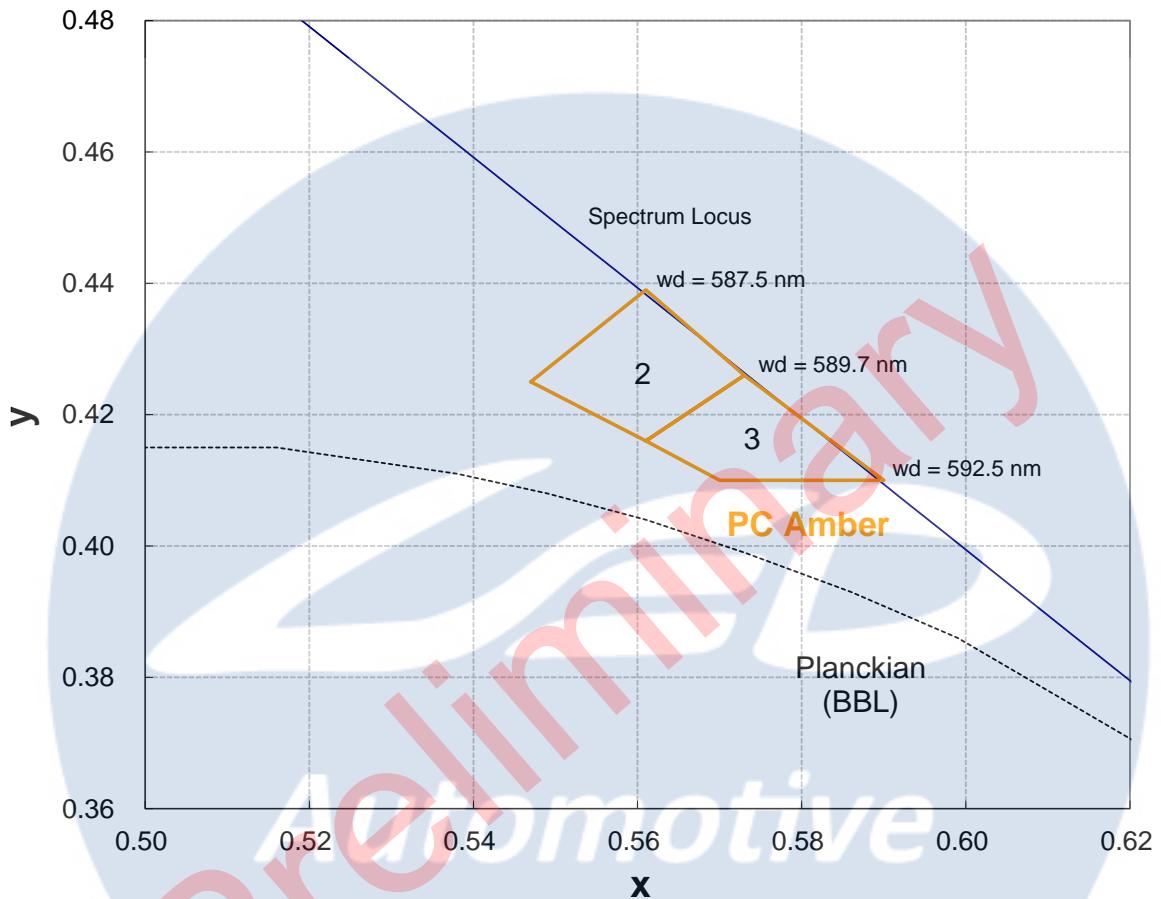
White Bin Structure

Bin Code	x	y	Typ. CCT (K)	Bin Code	x	y	Typ. CCT (K)
W1	0.3241	0.3454	5620	W3	0.3145	0.3250	6150
	0.3248	0.3290			0.3163	0.3101	
	0.3350	0.3380			0.3253	0.3186	
	0.3355	0.3553			0.3246	0.3344	
W2	0.3190	0.3350	5880	W4	0.3104	0.3154	6450
	0.3203	0.3184			0.3127	0.3013	
	0.3299	0.3281			0.3212	0.3095	
	0.3298	0.3446			0.3199	0.3245	

- Tolerance on each color bin (x, y) is ± 0.005

Color Bin

PC Amber Binning Structure Graphical Representation



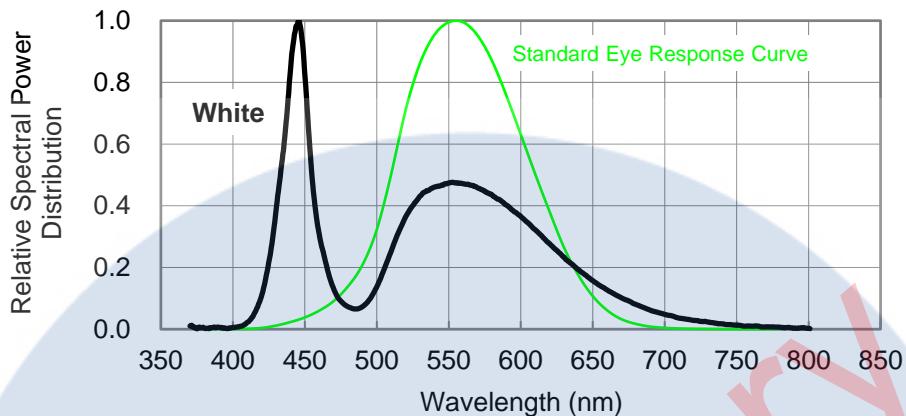
PC Amber Bin Structure

Bin Code	x	y	Bin Code	x	y
2	0.5470	0.4250	3	0.5610	0.4160
	0.5610	0.4160		0.5730	0.4260
	0.5730	0.4260		0.5900	0.4100
	0.5610	0.4390		0.5700	0.4100

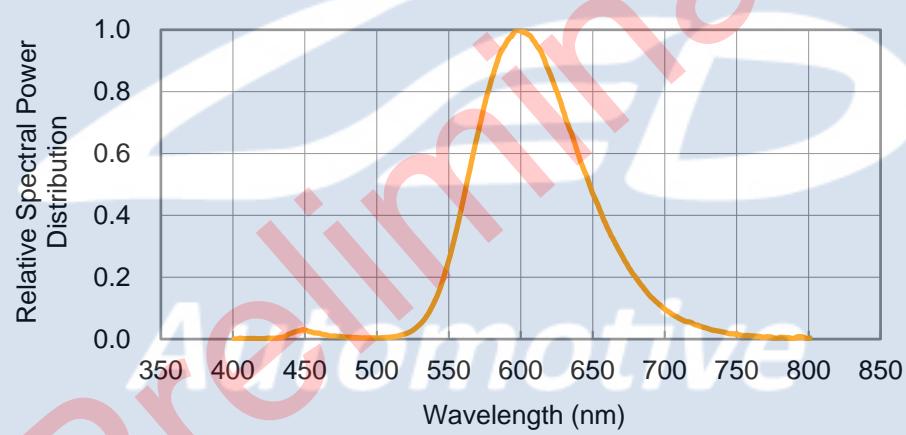
- Tolerance on each color bin (x , y) is ± 0.005

Color Spectrum, $T_J = 25^\circ\text{C}$

1. White



2. PC Amber



Junction Temperature Relative Characteristics

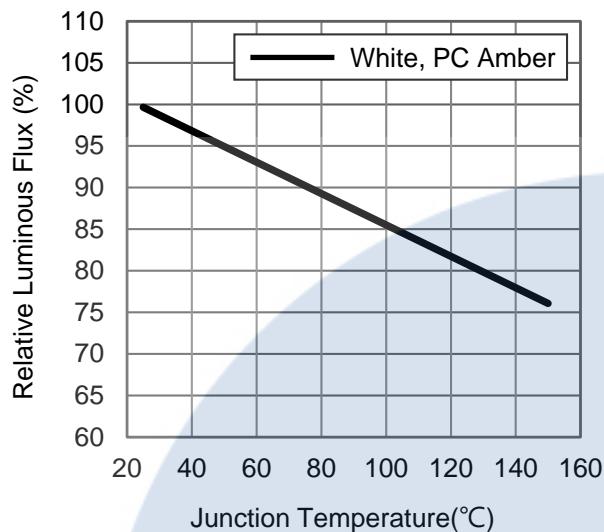


Fig 1. Junction Temperature vs.
Relative Luminous Flux at 1000mA.

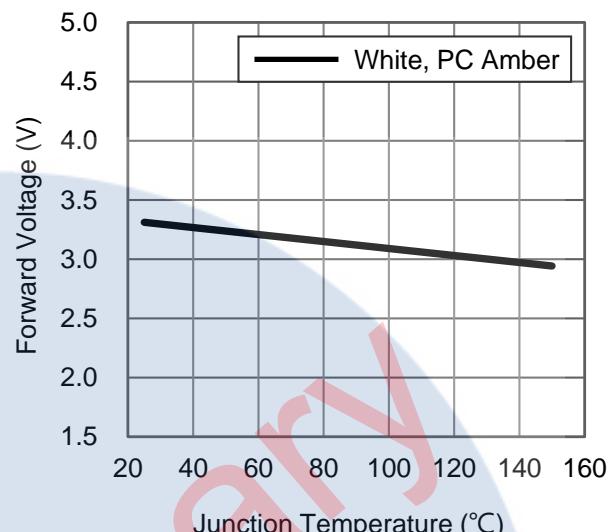


Fig 2. Junction Temperature vs.
Forward Voltage at 1000mA.

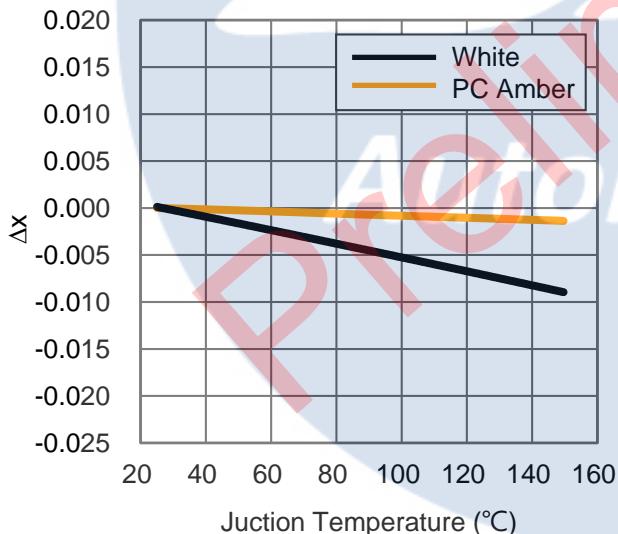


Fig 3. Junction Temperature vs.
Chromaticity Coordinate Δx at 1000mA.

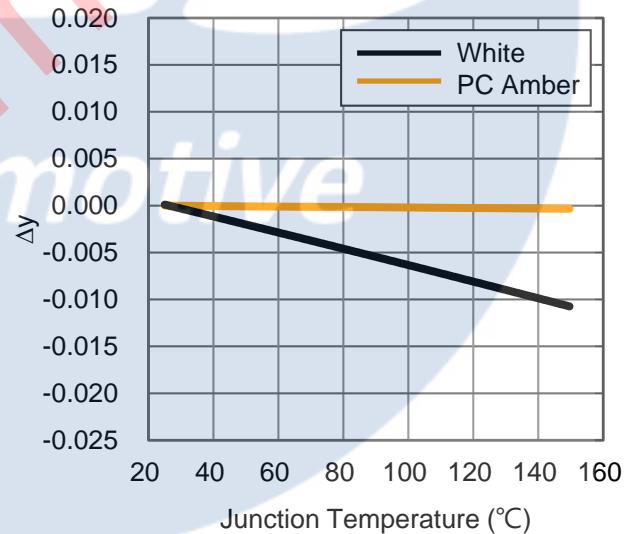


Fig 4. Junction Temperature vs.
Chromaticity Coordinate Δy at 1000mA.

Forward Current Relative Characteristics

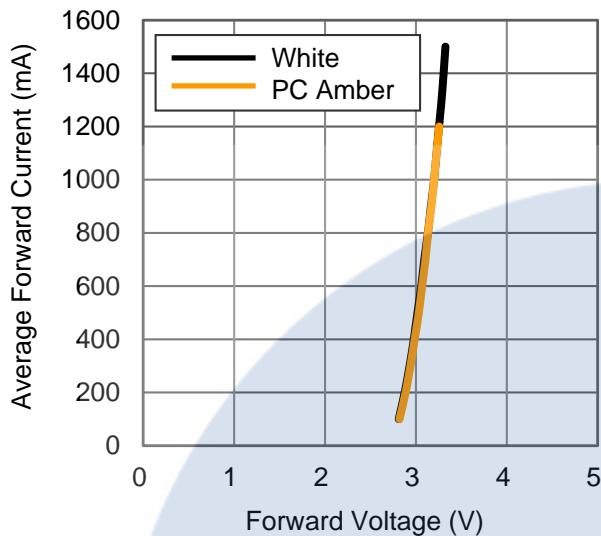


Fig 5. Forward Voltage vs.
Forward Current at $T_J=25^\circ\text{C}$.

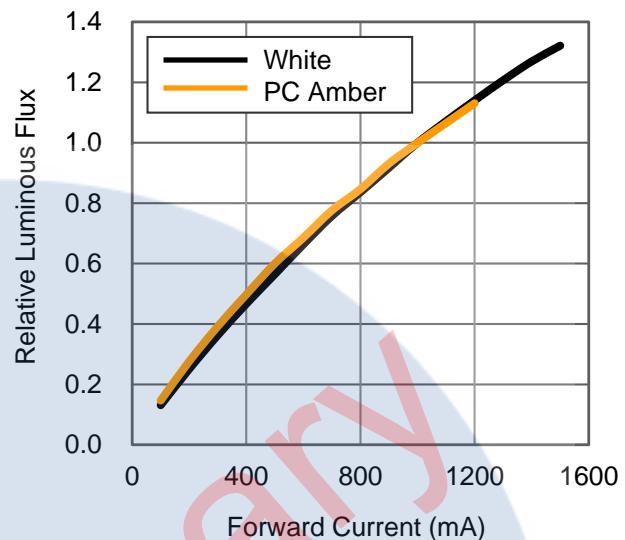


Fig 6. Forward Current vs.
Relative Luminous Flux at $T_J=25^\circ\text{C}$.

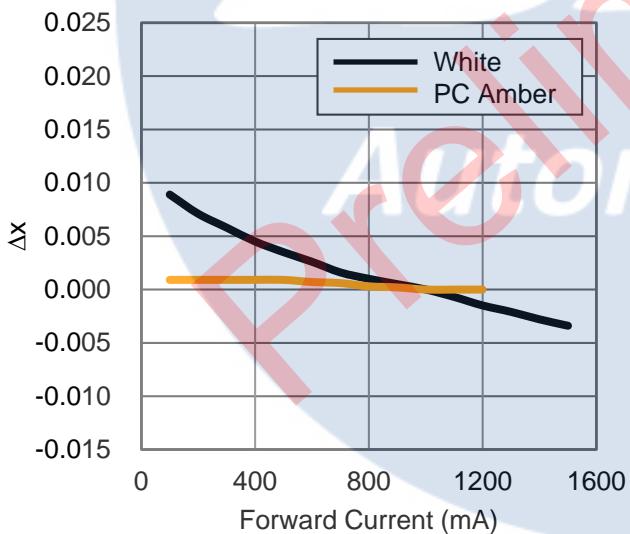


Fig 7. Forward Current vs.
Chromaticity Coordinate Δx at $T_J=25^\circ\text{C}$.

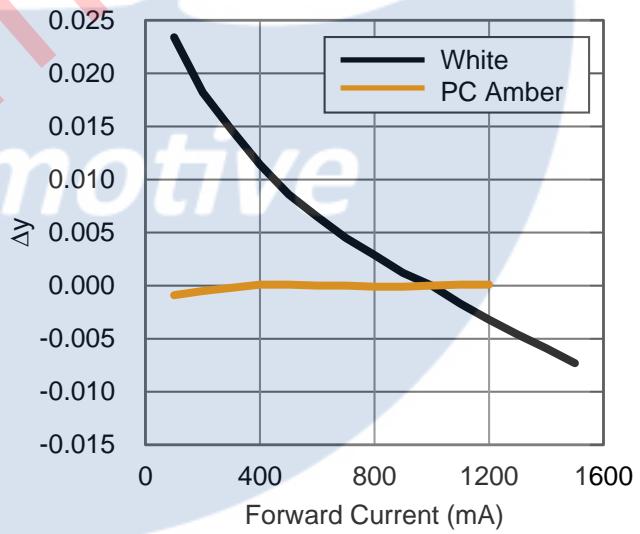


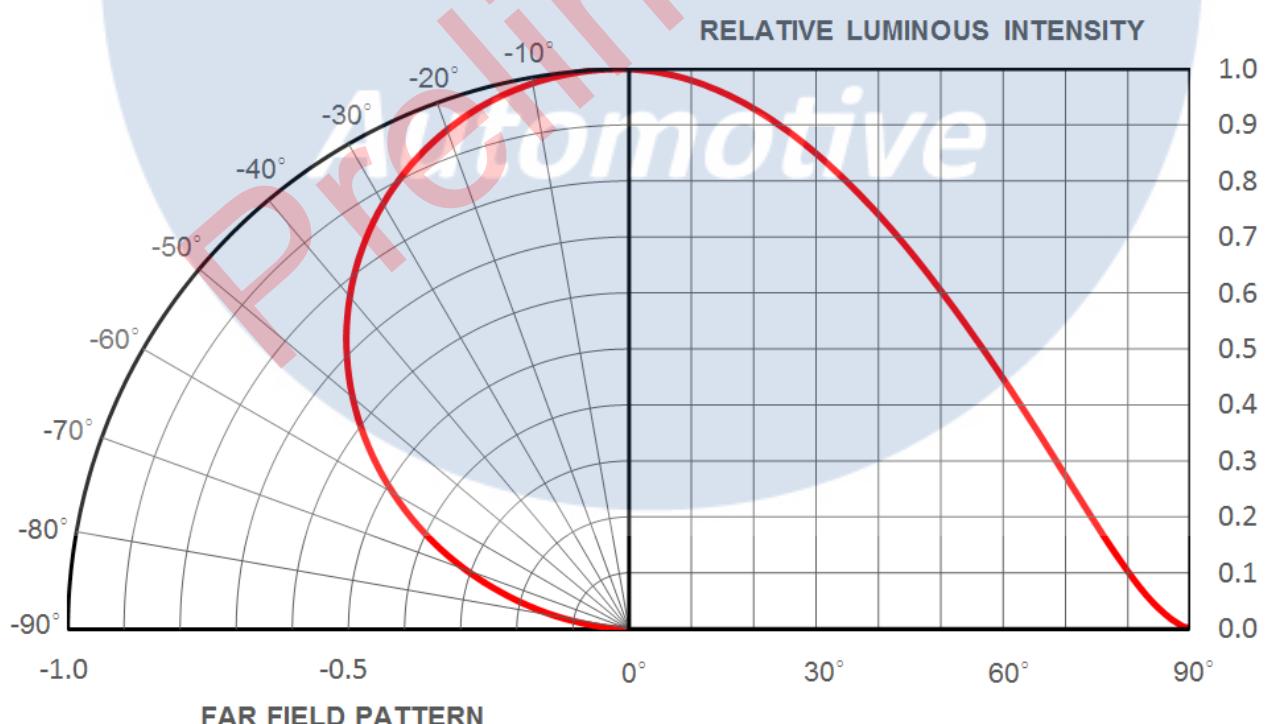
Fig 8. Forward Current vs.
Chromaticity Coordinate Δy at $T_J=25^\circ\text{C}$.

Board Temperature vs. Maximum Forward Current

Maximum Forward Current



Typical Representative Spatial Radiation Pattern



Moisture Sensitivity Level – JEDEC Level 1

Level	Floor Life		Soak Requirements			
			Standard		Accelerated Environment	
	Time	Conditions	Time (hours)	Conditions	Time (hours)	Conditions
1	Unlimited	≤30°C / 85% RH	168 +5/-0	85°C / 85% RH	NA	NA

- The standard soak time includes a default value of 24 hours for semiconductor manufacturer's exposure time (MET) between bake and bag and includes the maximum time allowed out of the bag at the distributor's facility.
- Table below presents the moisture sensitivity level definitions per IPC/JEDEC's J-STD-020C.

Level	Floor Life		Soak Requirements			
			Standard		Accelerated Environment	
	Time	Conditions	Time (hours)	Conditions	Time (hours)	Conditions
1	Unlimited	≤30°C / 85% RH	168 +5/-0	85°C / 85% RH	NA	NA
2	1 year	≤30°C / 60% RH	168 +5/-0	85°C / 60% RH	NA	NA
2a	4 weeks	≤30°C / 60% RH	696 +5/-0	30°C / 60% RH	120 +1/-0	60°C / 60% RH
3	168 hours	≤30°C / 60% RH	192 +5/-0	30°C / 60% RH	40 +1/-0	60°C / 60% RH
4	72 hours	≤30°C / 60% RH	96 +2/-0	30°C / 60% RH	20 +0.5/-0	60°C / 60% RH
5	48 hours	≤30°C / 60% RH	72 +2/-0	30°C / 60% RH	15 +0.5/-0	60°C / 60% RH
5a	24 hours	≤30°C / 60% RH	48 +2/-0	30°C / 60% RH	10 +0.5/-0	60°C / 60% RH
6	Time on Label (TOL)	≤30°C / 60% RH	Time on Label (TOL)	30°C / 60% RH	NA	NA

Reliability testing in accordance with AEC-Q102

The development of this product included extensive operational life-time testing and environmental testing. Table 1 summarizes the tests applied and cumulative test results obtained from testing performed in accordance with AEC-Q102.

Table 1. Operating life, mechanical and environmental tests performed on it's package in accordance with AEC-Q102.

#	STRESS	ABV	Conditions	Duration	Failure Criteria	Rejects
1	Pre- and Post-Stress Electrical Test	TEST	Test is performed as specified in the applicable stress reference at room temperature.	N/A	See notes [2]	0
A1	Pre-conditioning	PC	Soak Tamb = 85 °C, RH = 85% Reflow soldering	N/A	See notes [2]	0
A2a	Wet High Temperature Operating Life	WHTOL 1	Tambient = 85 °C / 85% RH IF = max. DC [1]	1000 hours	See notes [2]	0
A3a	Power Temperature Cycling	PTC	-40°C to 125°C, 10 minutes dwell, 20 minutes transfer (1 hour cycle), 2 minutes ON/2 minutes OFF, IF = max. DC [1]	1000 hours	See notes [2]	0
A4	Temperature Cycling	TC	-40°C to 125°C, 15 minutes dwell	1000 cycles	See notes [2]	0
B1a	High Temperature Operating Life	HTOL1	Tsolder = 85°C, IF = max. DC [1]	1000 hours	See notes [2]	0
B1b	High Temperature Operating Life	HTOL2	Maximum specified Tsolder, IF = max. DC [1]	1000 hours	See notes [2]	0
C9	Thermal Resistance	TR	All qualification parts submitted for testing	N/A	See notes [2]	0
C10	Solderability	SD	245 °C ± 5 °C	3s	See notes [3]	0
C12	Hydrogen Sulphide	H2S	Corrosion class A: (preferred) Duration 336 h at 40 °C and 90% RH. H2S concentration: 15ppm	336 hours	See notes [2]	0
E3	Electrostatic Discharge Human Body Model	HBM	ANSI/ESDA/JEDEC JS-001	N/A	See notes [3]	0
G2	Vibration Variable Frequency	VVF	10-2000-10 Hz, log or linear sweep rate, 20 G about 1 min., 1.5 mm, 3X/axis	N/A	See notes [3]	0
G3	Mechanical Shock	MS	1500 G, 0.5 msec. pulse, 5 shocks each 6 axis	N/A	See notes [3]	0

Notes:

1. Depending on the maximum derating curve.
2. Criteria for judging failure

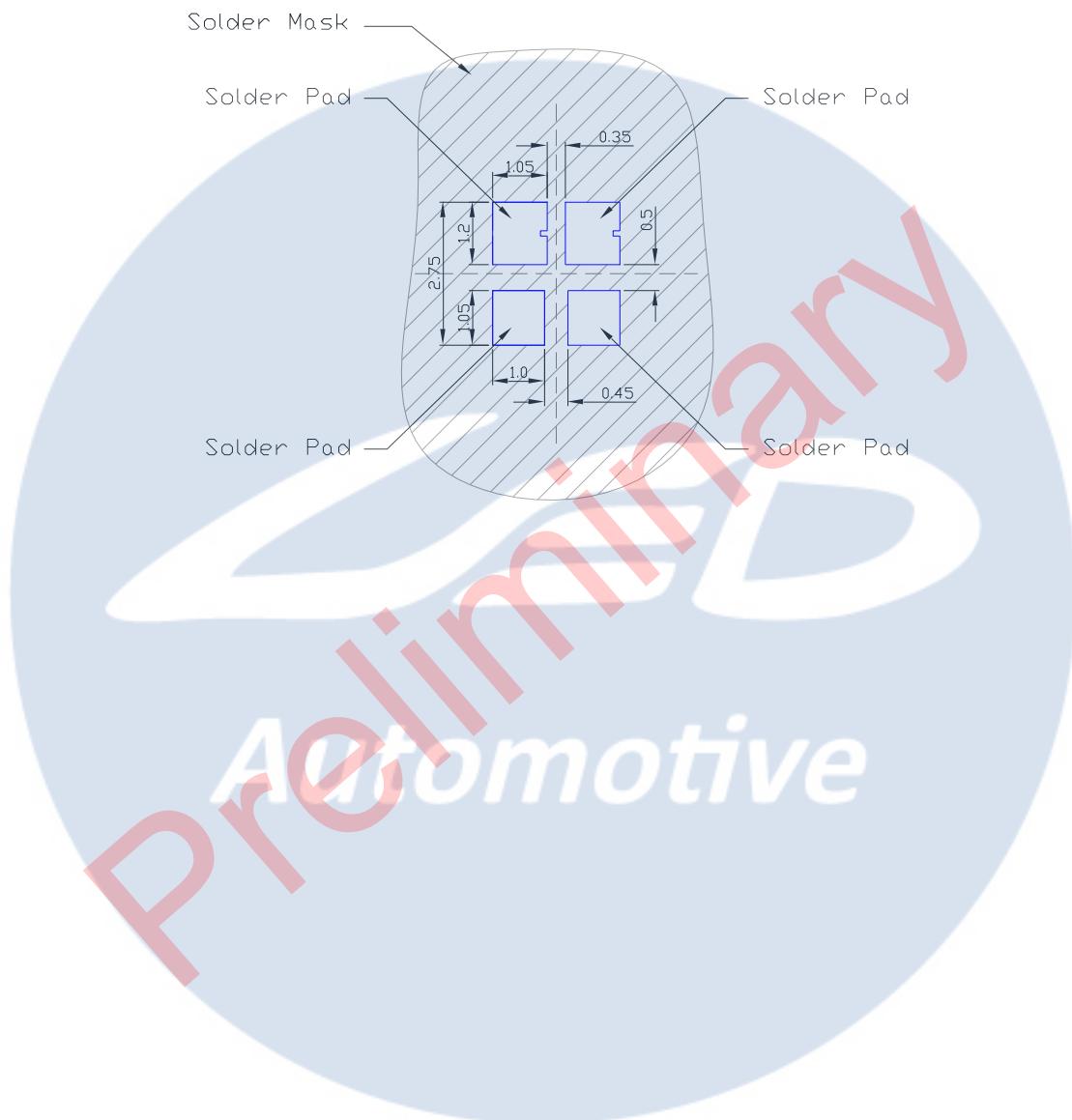
Item	Test Condition	Criteria for Judgement	
		Min.	Max.
Forward Voltage (V _F)	I _F = max DC	--	Initial Level x 1.1
Luminous Flux or Radiometric Power (Φ _V)	I _F = max DC	Initial Level x 0.8	--
Reverse Current (I _R)	V _R = 5V	--	50 µA

* The test is performed after the LED is cooled down to the room temperature.

3. A failure is an LED that is open or shorted.

Recommended Solder Pad Design

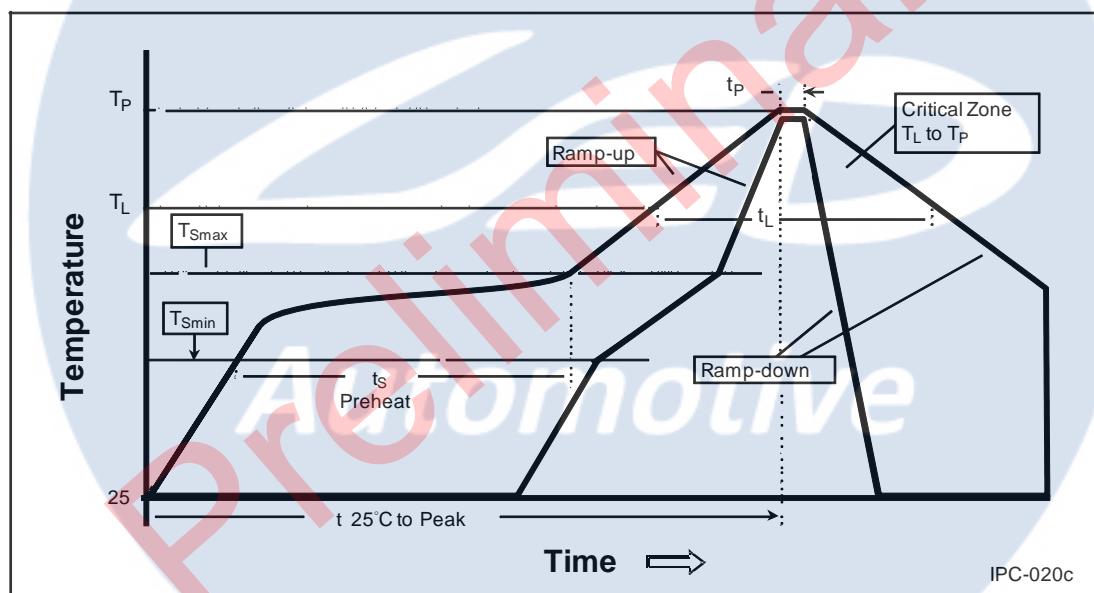
Standard Emitter



- All dimensions are in millimeters.

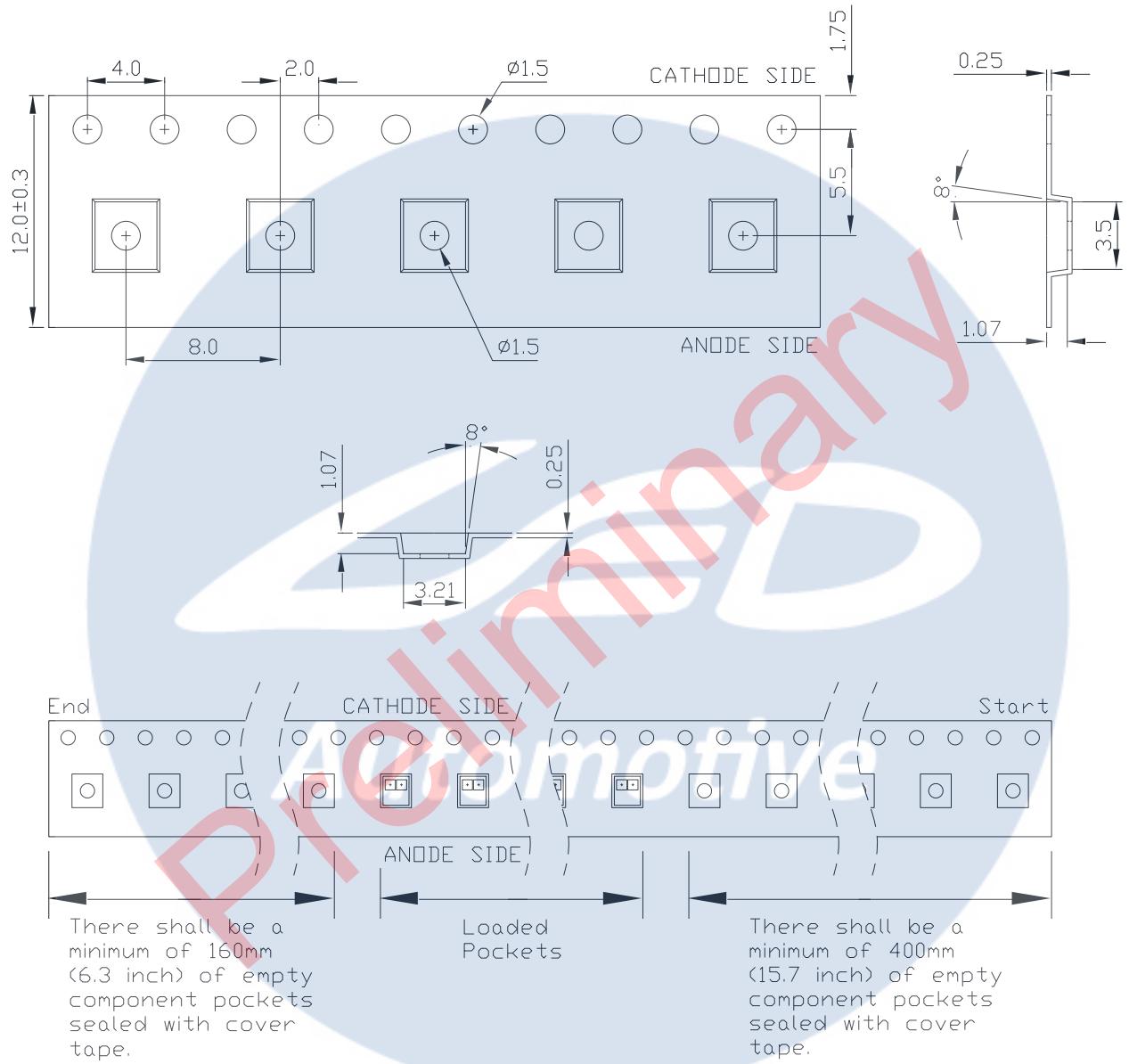
Reflow Soldering Condition

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average Ramp-Up Rate (T_{Smax} to T_p)	3°C / second max.	3°C / second max.
Preheat		
– Temperature Min (T_{Smin})	100°C	150°C
– Temperature Max (T_{Smax})	150°C	200°C
– Time (t_{Smin} to t_{Smax})	60-120 seconds	60-180 seconds
Time maintained above:		
– Temperature (T_L)	183°C	217°C
– Time (t_L)	60-150 seconds	60-150 seconds
Peak/Classification Temperature (T_p)	240°C	260°C
Time Within 5°C of Actual Peak Temperature (t_p)	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.



- We recommend using the M705-S101-S4 solder paste from SMIC (Senju Metal Industry Co., Ltd.) for lead-free soldering.
- Do not use solder pastes with post reflow flux residue >47%. (58Bi-42Sn eutectic alloy, etc) This kind of solder pastes may cause a reliability problem to LED.
- All temperatures refer to topside of the package, measured on the package body surface.
- Repairing should not be done after the LEDs have been soldered. When repairing is unavoidable, a double-head soldering iron should be used. It should be confirmed beforehand whether the characteristics of the LEDs will or will not be damaged by repairing.
- Reflow soldering should not be done more than three times.
- When soldering, do not put stress on the LEDs during heating.
- After soldering, do not warp the circuit board.

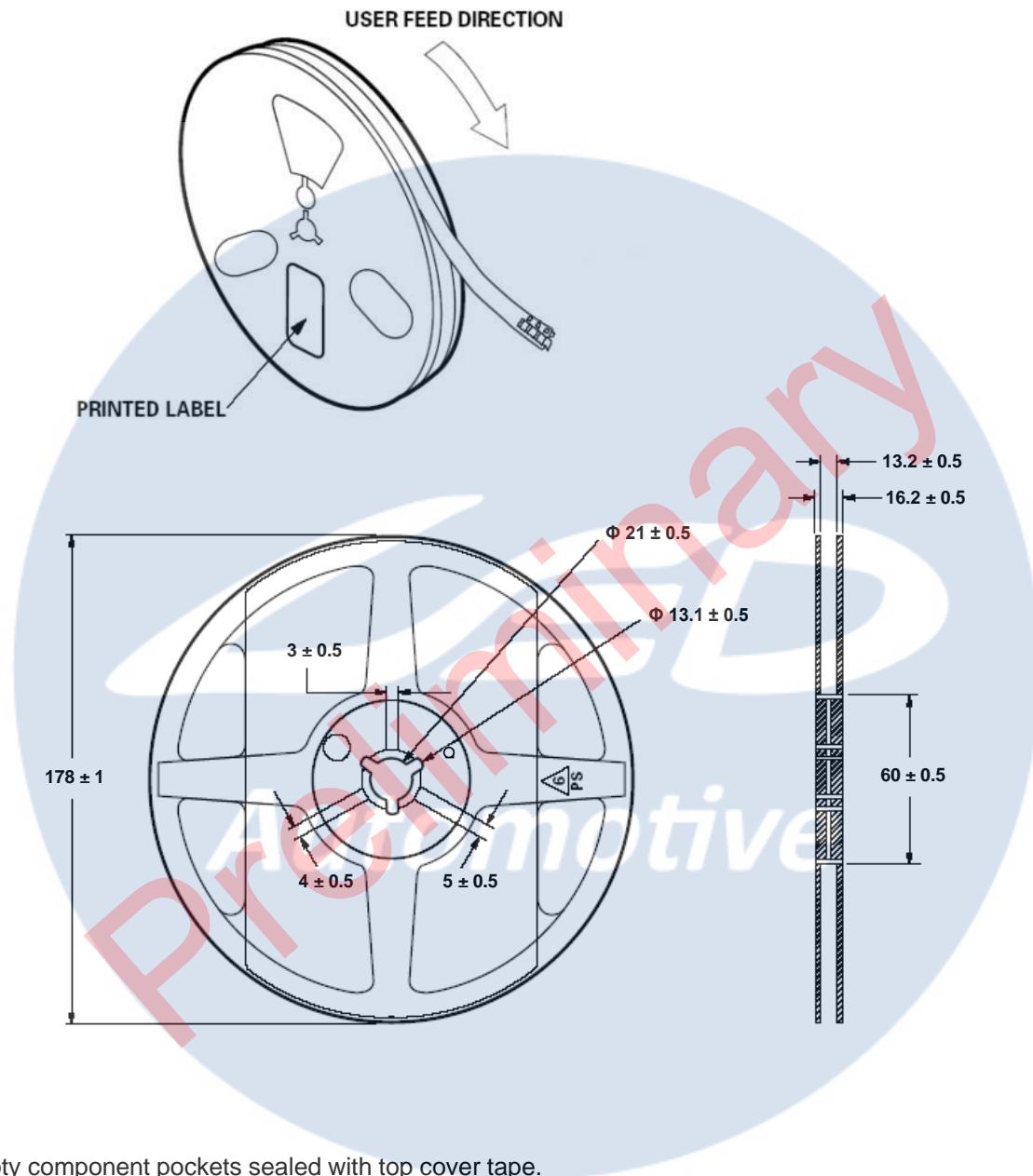
Emitter Reel Packaging



Notes:

1. Drawing not to scale.
2. All dimensions are in millimeters.
3. Unless otherwise indicated, tolerances are $\pm 0.1\text{mm}$.

Emitter Reel Packaging



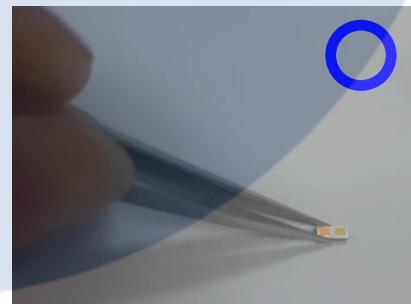
Precaution for Use

- We recommend using the M705-S101-S4 solder paste from SMIC (Senju Metal Industry Co., Ltd.) for lead-free soldering.
- Do not use solder pastes with post reflow flux residue >47%. (58Bi-42Sn eutectic alloy, etc) This kind of solder pastes may cause a reliability problem to LED.
- Any mechanical force or any excess vibration shall not be accepted to apply during cooling process to normal temperature after soldering.
- Please avoid rapid cooling after soldering.
- Components should not be mounted on warped direction of PCB.
- Repairing should not be done after the LEDs have been soldered. When repairing is unavoidable, a heat plate should be used. It should be confirmed beforehand whether the characteristics of the LEDs will or will not be damaged by repairing.
- This device should not be used in any type of fluid such as water, oil, organic solvent and etc. When cleaning is required, isopropyl alcohol should be used.
- When the LEDs are illuminating, operating current should be decided after considering the package maximum temperature.
- The appearance, specifications and flux bin of the product may be modified for improvement without notice. Please refer to the below website for the latest datasheets.
<http://www.prolightopto.com/>

Handling of Lens LEDs

Notes for handling of lens LEDs

- Please do not use a force of over 1kgf impact or pressure on the lens, otherwise it will cause a catastrophic failure.
- The LEDs should only be picked up by making contact with the sides of the LED body.
- Avoid touching the lens especially by sharp tools such as Tweezers.
- Avoid leaving fingerprints on the lens.
- Please store the LEDs away from dusty areas or seal the product against dust.
- Please do not mold over the lens with another resin. (epoxy, urethane, etc)



Disclaimers

ProLightopto Technology has made every reasonable effort to ensure the accuracy of the information in this datasheet. However, it should be understood that this information is for guidance only and does not constitute any offer or part of a contract.

ProLightopto Technology does not guarantee or accept any legal liability for the accuracy, completeness, or usefulness of any information, product, technology, or process disclosed in this datasheet.

The company reserves the right to make changes or improvements to this datasheet at its discretion.

Unless this datasheet is incorporated into a formal contract, customers should not rely on the information as a binding commitment to any specifications or product parameters by ProLightopto Technology. Customers are advised to verify that the information is current and complete before entering into any contract or acknowledging any purchase order. Therefore, all products described herein are subject to ProLightopto Technology's terms and conditions at the time of order acknowledgment.

Unless agreed upon by contractual agreement, not all parameters of each product are necessarily tested. ProLightopto Technology does not warrant or grant any license, either expressed or implied, under its patent rights or the rights of others.

Reproduction of the information contained herein is permitted only if done without any modifications or alterations. Altering this information and reproducing it is considered an unfair and deceptive business practice. ProLightopto Technology is not responsible or liable for any such altered documentation.

Reselling ProLightopto Technology's products with statements that differ from or exceed the parameters specified by ProLightopto Technology voids all express or implied warranties for the associated product or service and is considered an unfair and deceptive business practice. ProLightopto Technology is not responsible or liable for any such statements.

ProLightopto Technology's products are not authorized for use as critical components in life support devices or systems without explicit written approval from ProLightopto Technology.

For the purposes of this disclaimer :

1. Life support devices or systems are defined as those intended for surgical implant into the body or those that support or sustain life. Their failure, when used according to instructions for use provided in the labeling, can reasonably be expected to result in significant injury to the user.
2. A critical component is any component of a life support device or system whose failure can reasonably be expected to cause the failure of the device or system, or to affect its safety or effectiveness.