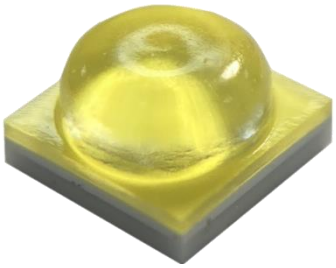


ProLight PB2H-4BxE-HWFC
4W Power LED
Technical Datasheet
Version: 1.0

ProLight Opto PB2H Series

Features

- Corrosion robustness
- SMD 3535 ceramic package
- Maximum drive current: 1200 mA
- Wide viewing angle: 125° (Batwing optical lens)
- Best JEDEC Moisture Sensitivity Level 1

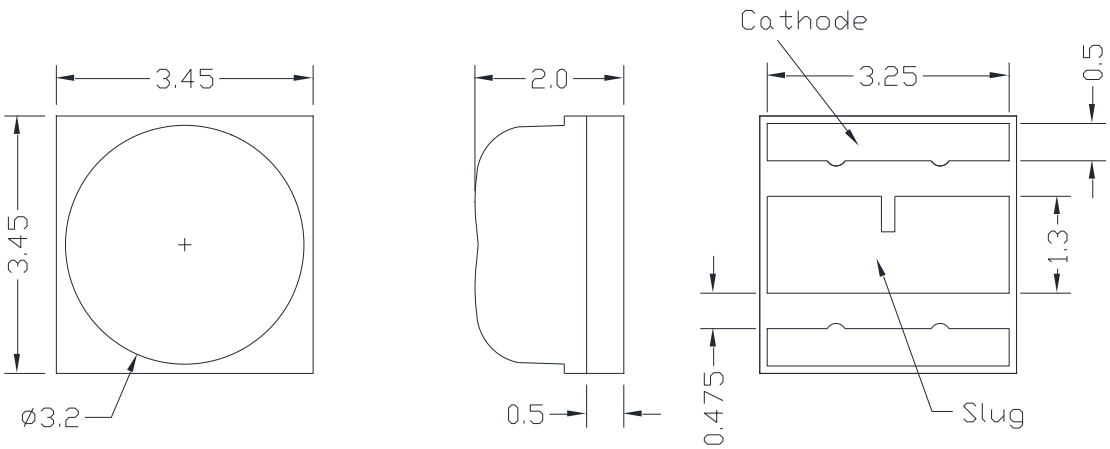
Main Applications

- Horticultural Lighting
- Accent and effect lighting

Introduction

·Phenix 3535 qualifies as the JEDEC Level 1 MSL sensitivity level and suitable for SMD process, Pb_free reflow soldering capability, and full compliance with EU Reduction of Hazardous Substances (RoHS) legislation.

Emitter Mechanical Dimensions



Top View　　Side View　　Bottom View

Circuit Diagram

Notes:

1. Electrical insulation between the case and the board is required. Do not electrically connect either the anode or cathode to the slug.
2. Drawing not to scale.
3. All dimensions are in millimeters.
4. Unless otherwise indicated, tolerances are ± 0.1mm.
5. Please do not solder the emitter by manual hand soldering, otherwise it will damage the emitter.
6. **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˚C

Part Number Emitter	Luminous Flux Φ_V (lm) @700mA Min.	@700mA Typ.	Refer @350mA Typ.	Refer @1000mA Typ.	PPF (µmol/s) @700mA Min.	@700mA Typ.	Refer @350mA Typ.	Refer @1000mA Typ.
PB2H-4BWE-HWFC	340	365	194	498	4.66	5.00	2.66	6.82
PB2H-4BNE-HWFC	340	355	189	484	4.49	4.69	2.49	6.39

- ProLight maintains a tolerance of ± 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˚C

Color	Forward Voltage V_F (V) @700mA Min.	@700mA Typ.	@700mA Max.	Refer @350mA Typ.	Refer @1000mA Typ.	Thermal Resistance Junction to Slug (˚C/ W)
White	2.8	2.9	3.2	2.8	3.0	4.9
Neutral White	2.8	2.9	3.2	2.8	3.0	4.9

- ProLight maintains a tolerance of ± 0.1V for Voltage measurements.

Optical Characteristics at 700mA, T_J = 25˚C

Radiation Pattern	Color	Color Temperature CCT Min.	Typ.	Max.	Total included Angle (degrees) $\theta_{0.90V}$	Viewing Angle (degrees) $2\theta_{1/2}$
Batwing	White	4800 K	5600 K	6450 K	160	125
	Neutral White	3710 K	4255 K	4800 K	160	125

- ProLight maintains a tolerance of ± 5% for CCT measurements.

Absolute Maximum Ratings

Parameter	White/Neutral White
DC Forward Current (mA)	1200
Peak Pulsed Forward Current (mA)	1500 (less than 1/10 duty cycle@1KHz)
ESD Sensitivity (HBM per MIL-STD-883E Method 3015.7)	2KV
LED Junction Temperature	120°C
Operating Board Temperature at Maximum DC Forward Current	-40°C - 105°C
Storage Temperature	-40°C - 120°C
Soldering Temperature	JEDEC 020c 260°C
Allowable Reflow Cycles	3
Reverse Voltage	Not designed to be driven in reverse bias

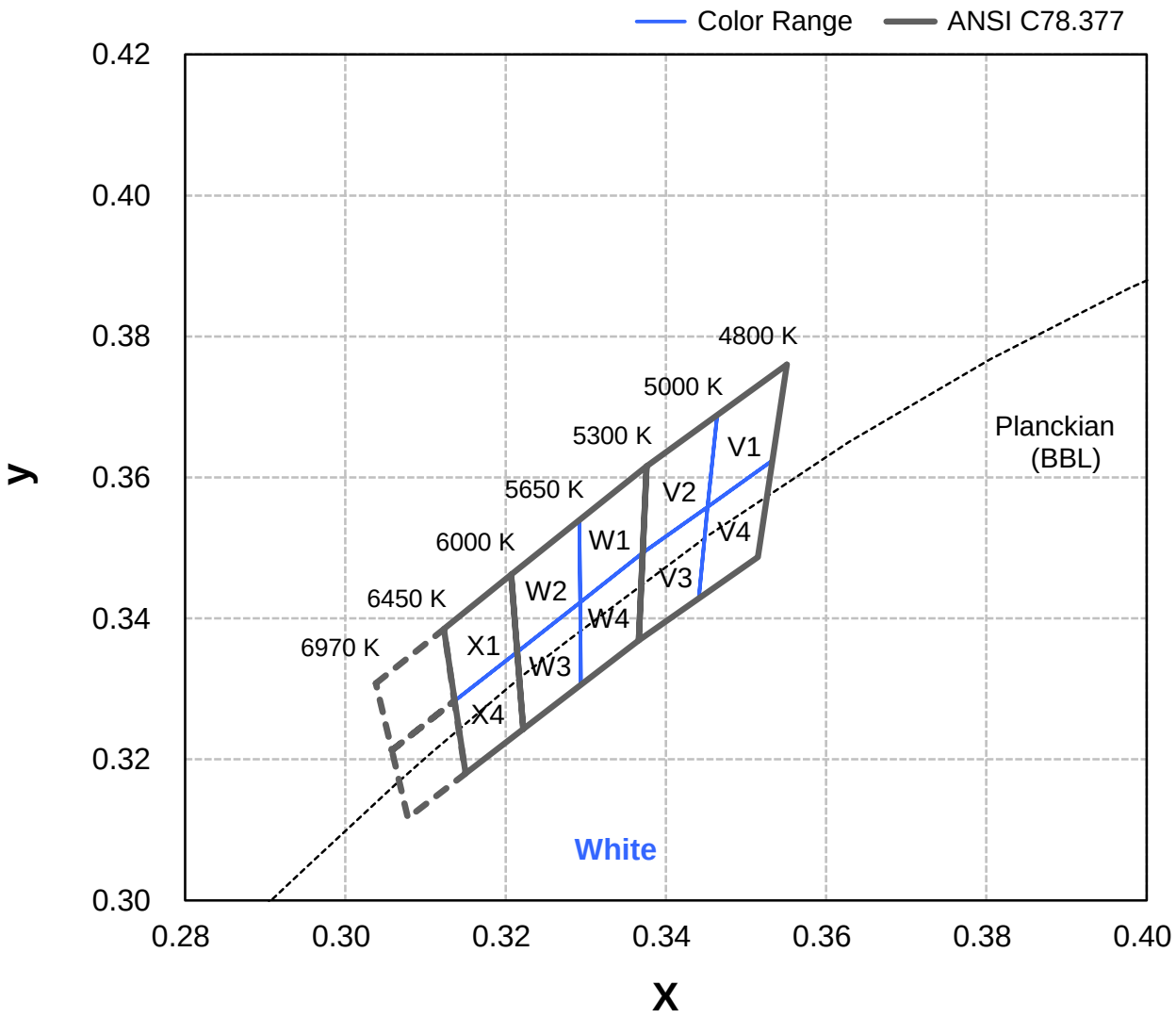
Photometric Luminous Flux Bin Structure at 700mA

Color	Bin Code	Photometric Flux (lm) Min.	Photometric Flux (lm) Max.	PPF (μmol/s) Min.	PPF (μmol/s) Max.	PPF/W (μmol/J) Typ.	Available Color Bins
White	B	340	370	4.66	5.07	2.40	All
	C	370	400	5.07	5.48	2.60	【1】
	D	400	440	5.48	6.03	-	【1】
Neutral White	B	340	370	4.49	4.88	2.31	All
	C	370	400	4.88	5.28	2.50	【1】
	D	400	440	5.28	5.81	-	【1】

- ProLight maintains a tolerance of ± 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.

Color Bin

White Binning Structure Graphical Representation



Color Bin

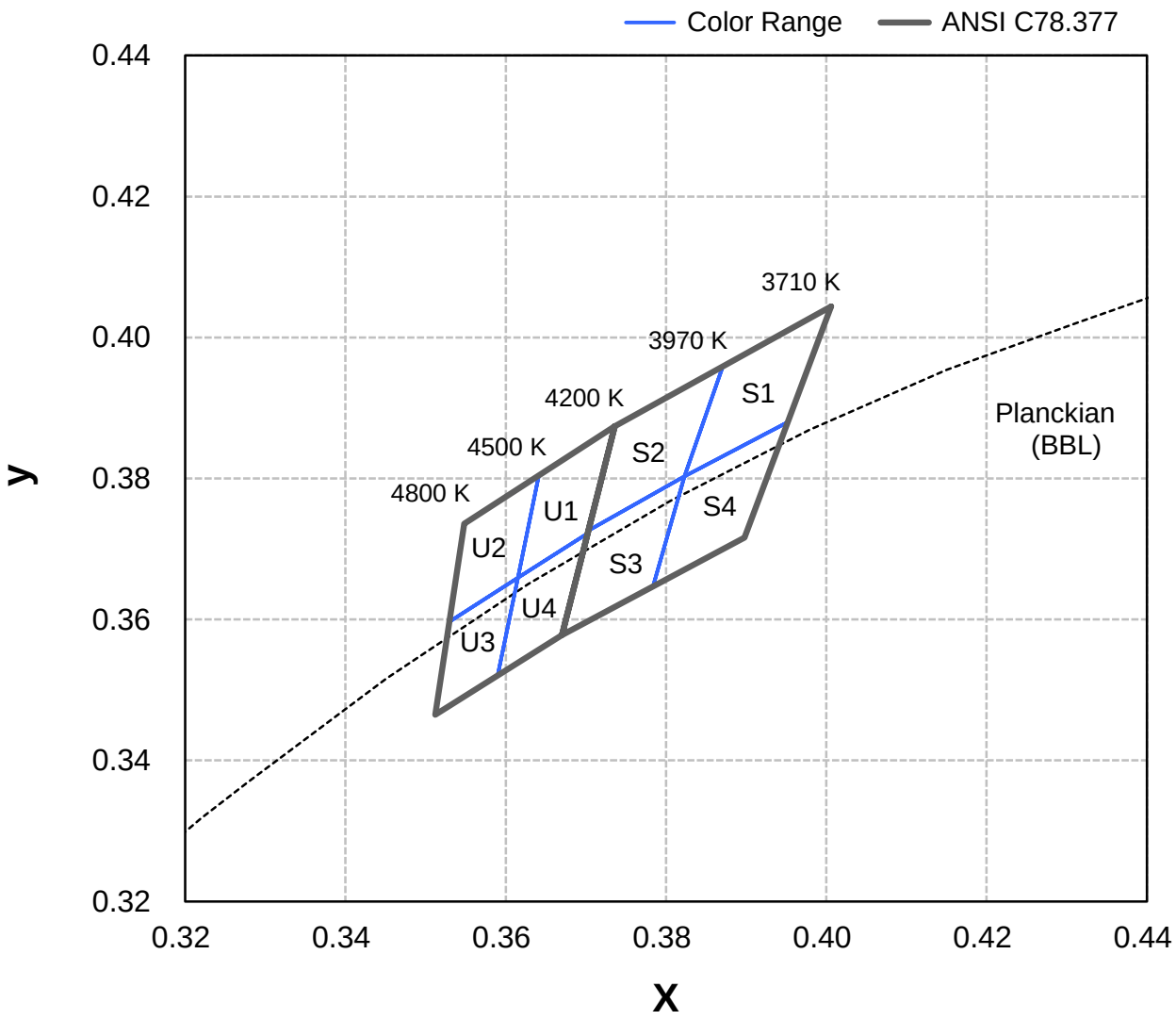
White Bin Structure

Bin Code	x	y	Typ. CCT (K)	Bin Code	x	y	Typ. CCT (K)
V1	0.3464	0.3688	4870	W4	0.3293	0.3423	5475
	0.3551	0.3760			0.3371	0.3493	
	0.3533	0.3624			0.3366	0.3369	
	0.3452	0.3558			0.3294	0.3306	
V4	0.3452	0.3558	4870	W2	0.3207	0.3462	5830
	0.3533	0.3624			0.3292	0.3539	
	0.3515	0.3487			0.3293	0.3423	
	0.3441	0.3428			0.3215	0.3353	
V2	0.3376	0.3616	5155	W3	0.3215	0.3353	5830
	0.3464	0.3688			0.3293	0.3423	
	0.3452	0.3558			0.3294	0.3306	
	0.3371	0.3493			0.3222	0.3243	
V3	0.3371	0.3493	5155	X1	0.3123	0.3385	6240
	0.3452	0.3558			0.3207	0.3462	
	0.3441	0.3428			0.3215	0.3353	
	0.3366	0.3369			0.3136	0.3283	
W1	0.3292	0.3539	5475	X4	0.3136	0.3283	6240
	0.3376	0.3616			0.3215	0.3353	
	0.3371	0.3493			0.3222	0.3243	
	0.3293	0.3423			0.3150	0.3180	

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

Color Bin

Neutral White Binning Structure Graphical Representation



Color Bin

Neutral White Bin Structure

Bin Code	x	y	Typ. CCT (K)	Bin Code	x	y	Typ. CCT (K)
S1	0.3871	0.3959	3480	U1	0.3641	0.3804	4350
	0.4006	0.4044			0.3736	0.3874	
	0.3952	0.3880			0.3702	0.3722	
	0.3823	0.3803			0.3615	0.3659	
S4	0.3823	0.3803	3480	U4	0.3615	0.3659	4350
	0.3952	0.3880			0.3702	0.3722	
	0.3898	0.3716			0.3670	0.3578	
	0.3784	0.3647			0.3590	0.3521	
S2	0.3736	0.3874	4085	U2	0.3548	0.3736	4650
	0.3871	0.3959			0.3641	0.3804	
	0.3823	0.3803			0.3615	0.3659	
	0.3703	0.3726			0.353	0.3597	
S3	0.3703	0.3726	4085	U3	0.3530	0.3597	4650
	0.3823	0.3803			0.3615	0.3659	
	0.3784	0.3647			0.3590	0.3521	
	0.3670	0.3578			0.3512	0.3465	

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

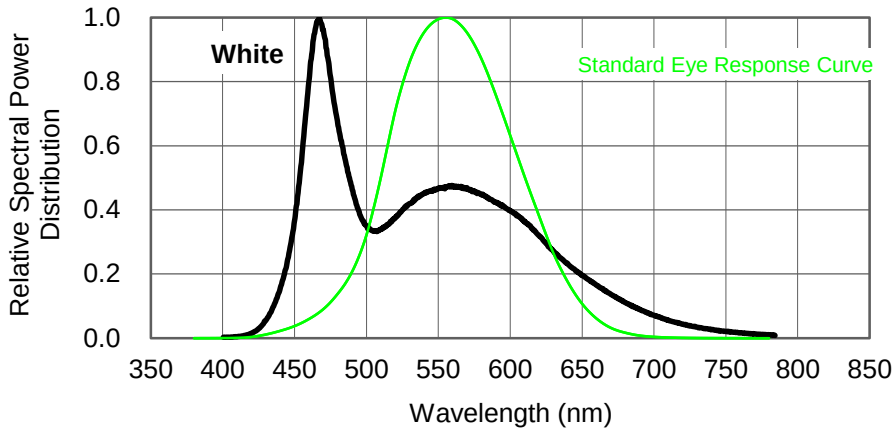
Forward Voltage Bin Structure at 700mA

Color	Bin Code	Minimum Voltage (V)	Maximum Voltage (V)
White	A	2.8	2.9
	B	2.9	3.0
	D	3.0	3.1
	E	3.1	3.2
Neutral White	A	2.8	2.9
	B	2.9	3.0
	D	3.0	3.1
	E	3.1	3.2

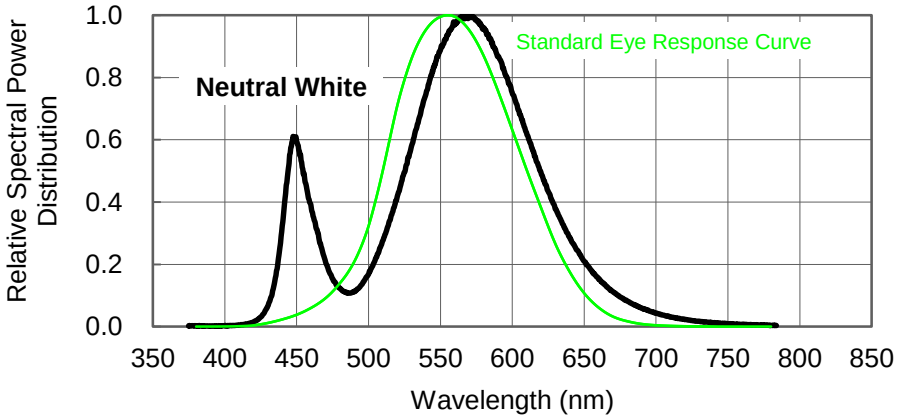
- ProLight maintains a tolerance of ± 0.1V for Voltage measurements.

Color Spectrum, T_J = 25˚C

1. White

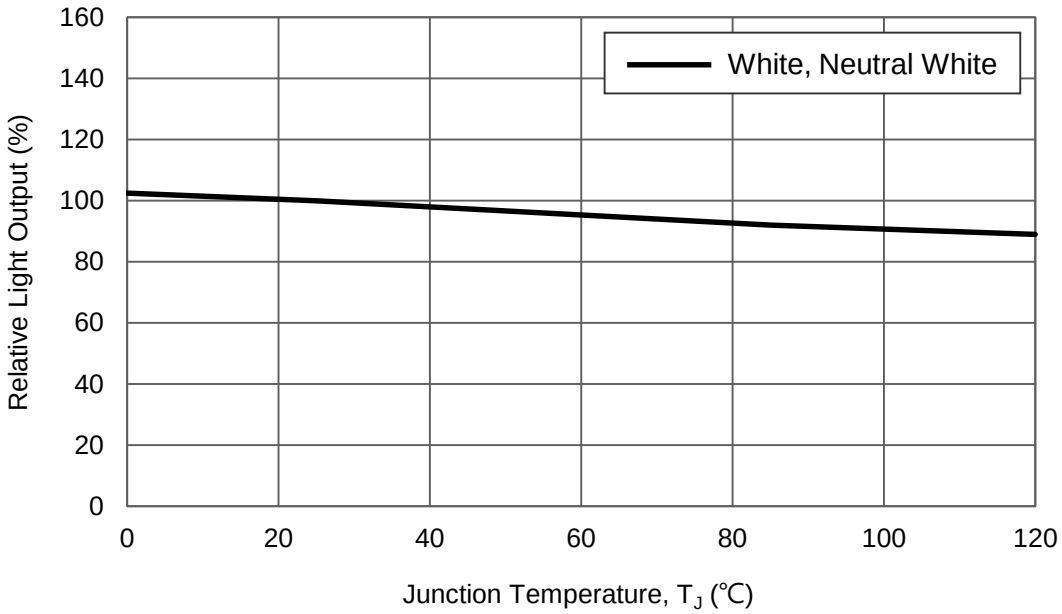


2. Neutral White

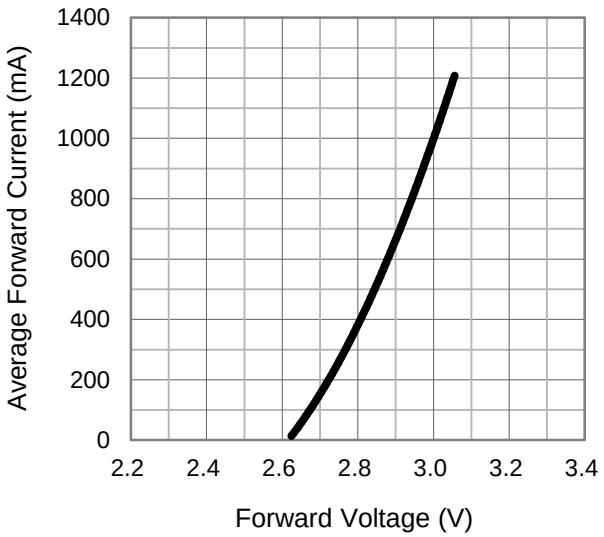


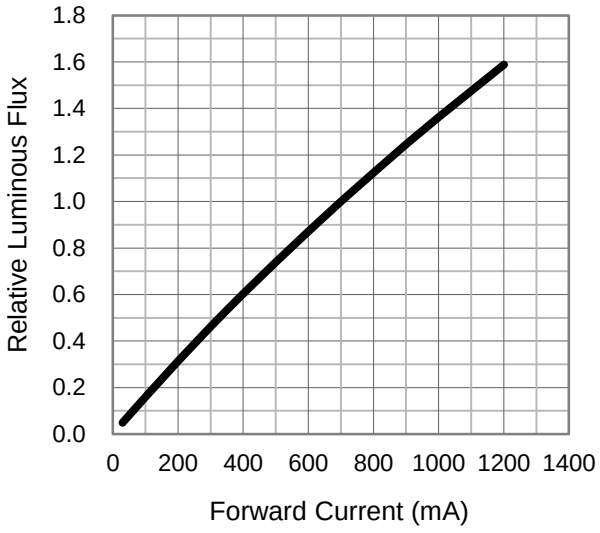
Light Output Characteristics

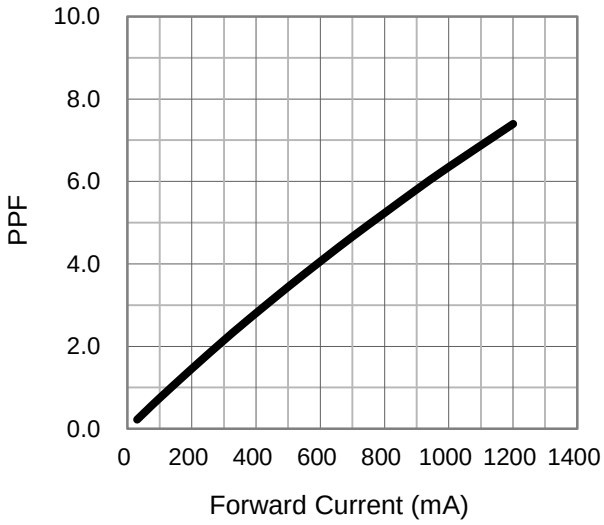
Relative Light Output vs. Junction Temperature at 700mA

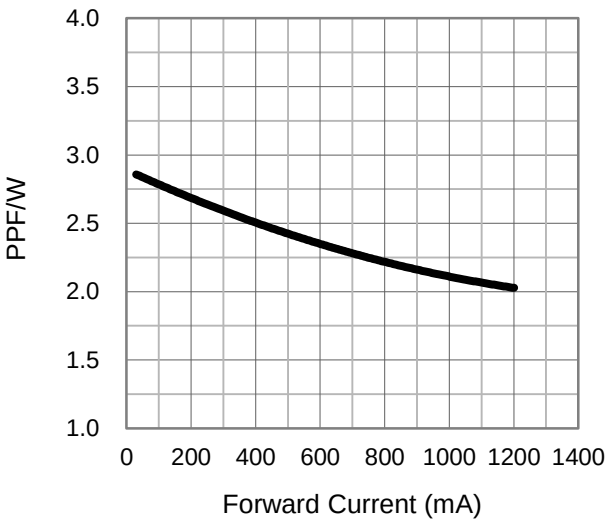


Forward Current Characteristics, T_J = 25˚C



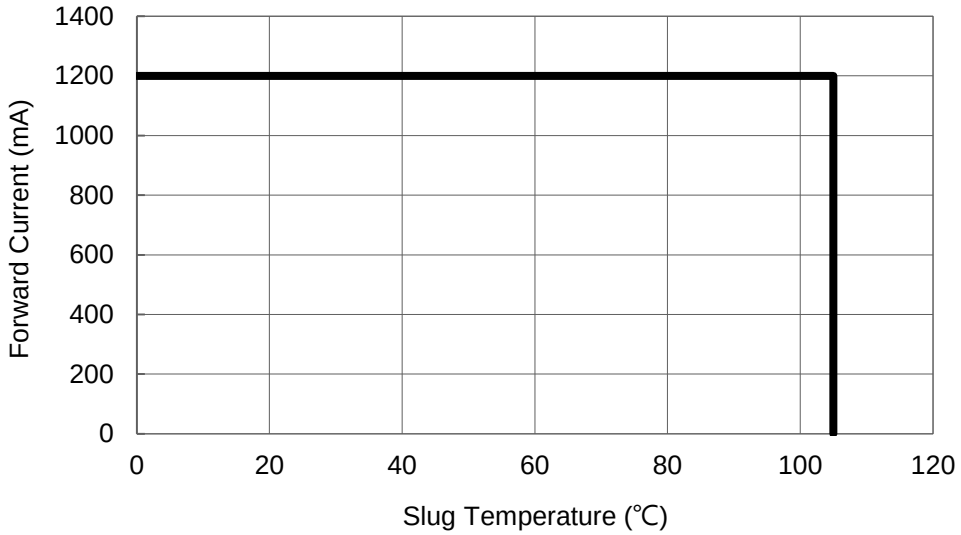




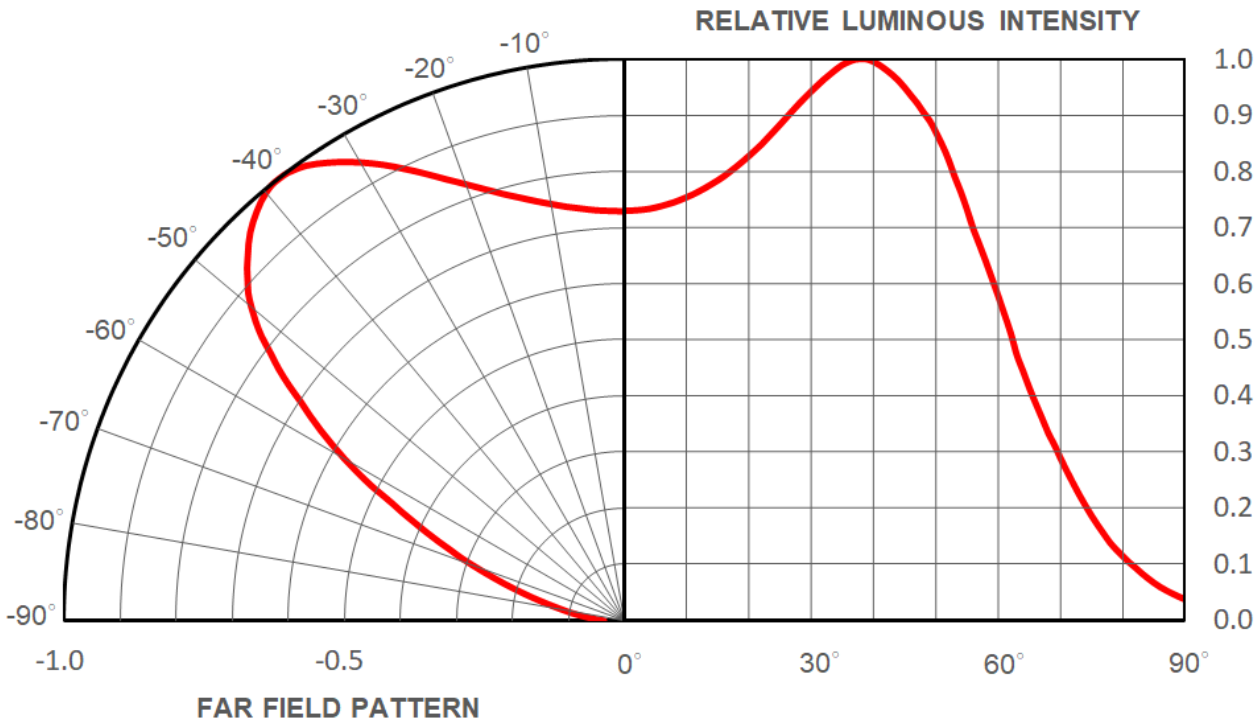


Slug Temperature vs. Maximum Forward Current

1. White、Neutral White



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 manufature'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

Qualification Reliability Testing

Stress Test	Stress Conditions	Stress Duration	Failure Criteria
Room Temperature Operating Life (RTOL)	25°C, I_F = max DC (Note 1)	1000 hours	Note 2
Wet High Temperature Operating Life (WHTOL)	85°C/60%RH, I_F = max DC (Note 1)	1000 hours	Note 2
Wet High Temperature Storage Life (WHTSL)	85°C/85%RH, non-operating	1000 hours	Note 2
High Temperature Storage Life (HTSL)	110°C, non-operating	1000 hours	Note 2
Low Temperature Storage Life (LTSL)	-40°C, non-operating	1000 hours	Note 2
Non-operating Temperature Cycle (TMCL)	-40°C to 120°C, 30 min. dwell, <5 min. transfer	200 cycles	Note 2
Mechanical Shock	1500 G, 0.5 msec. pulse, 5 shocks each 6 axis		Note 3
Natural Drop	On concrete from 1.2 m, 3X		Note 3
Variable Vibration Frequency	10-2000-10 Hz, log or linear sweep rate, 20 G about 1 min., 1.5 mm, 3X/axis		Note 3
Solder Heat Resistance (SHR)	260°C ± 5°C, 10 sec.		Note 3
Solderability	Steam age for 16 hrs., then solder dip at 260°C for 5 sec.		Solder coverage on lead

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

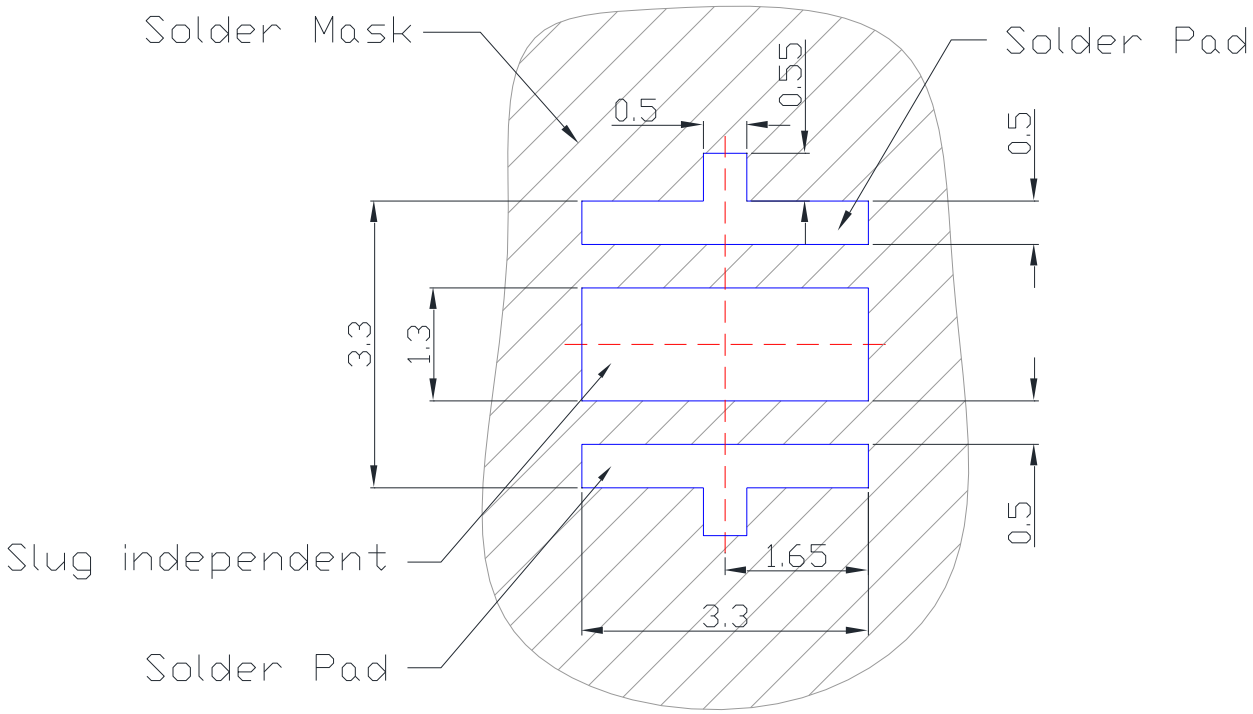
Item	Test Condition	Criteria for Judgement	
		Min.	Max.
Forward Voltage (V_F)	I_F = max DC	--	Initial Level x 1.1
Luminous Flux or Radiometric Power (Φ_V)	I_F = max DC	Initial Level x 0.7	--
Reverse Current (I_R)	V_R = 5V	--	50 μA

* 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

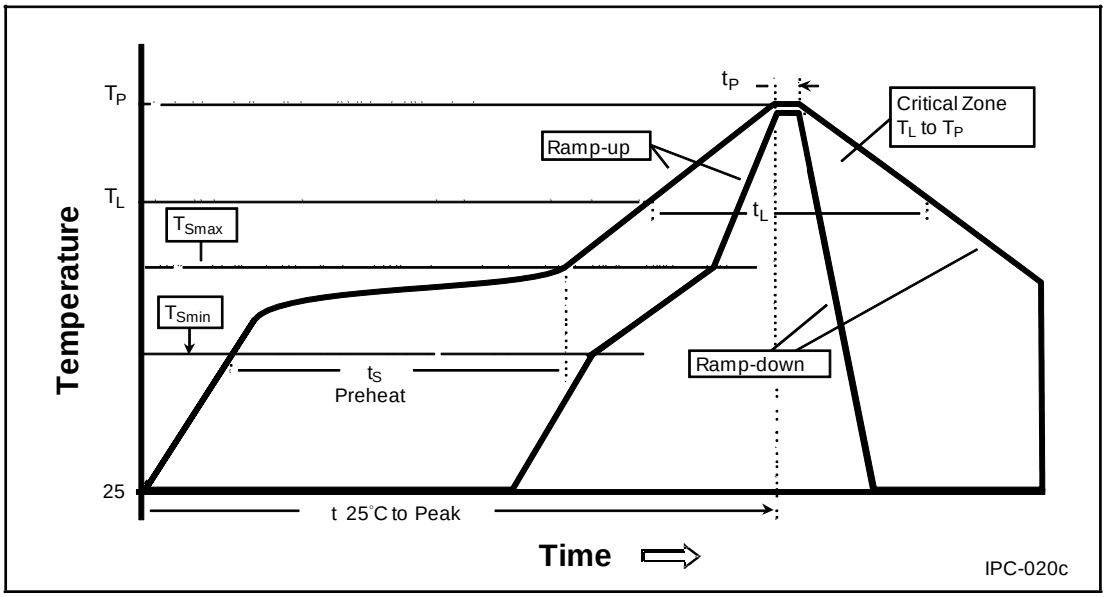
Standard Emitter



- All dimensions are in millimeters.
- Electrical isolation is required between Slug and Solder Pad.

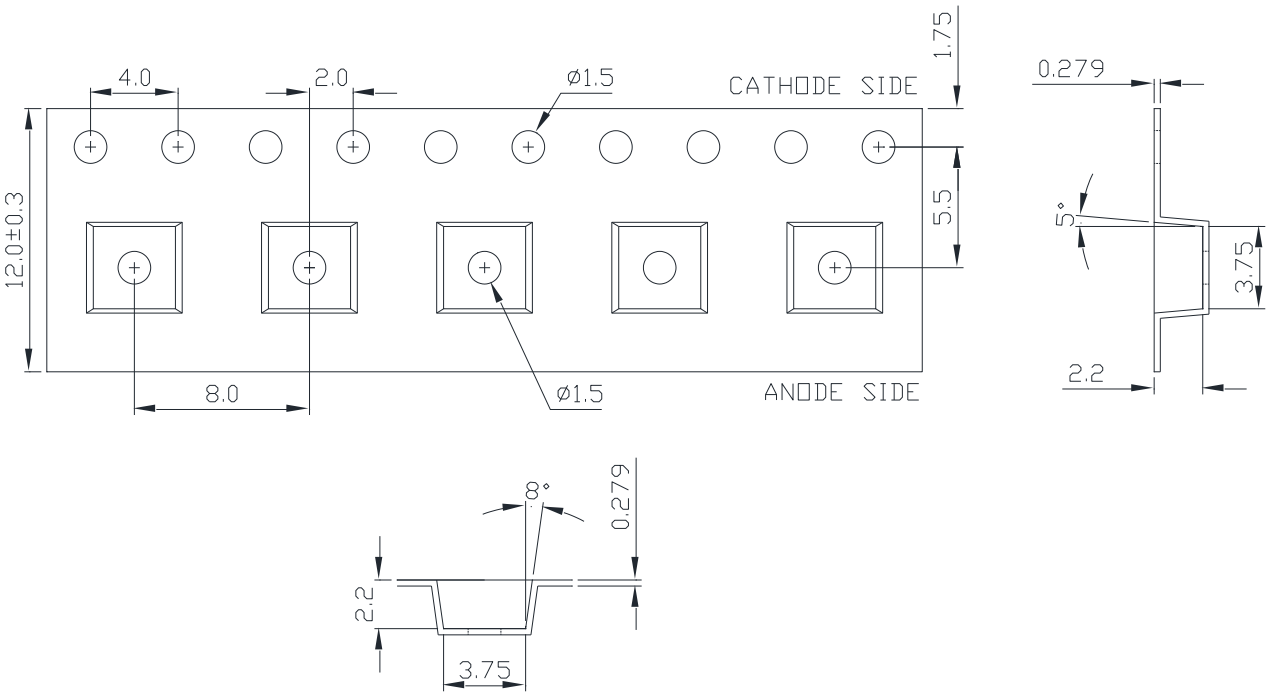
Reflow Soldering Condition

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}) – Temperature Max (T_{Smax}) – Time (t_{Smin} to t_{Smax})	 100°C 150°C 60-120 seconds	 150°C 200°C 60-180 seconds
Time maintained above: – Temperature (T_L) – Time (t_L)	 183°C 60-150 seconds	 217°C 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.



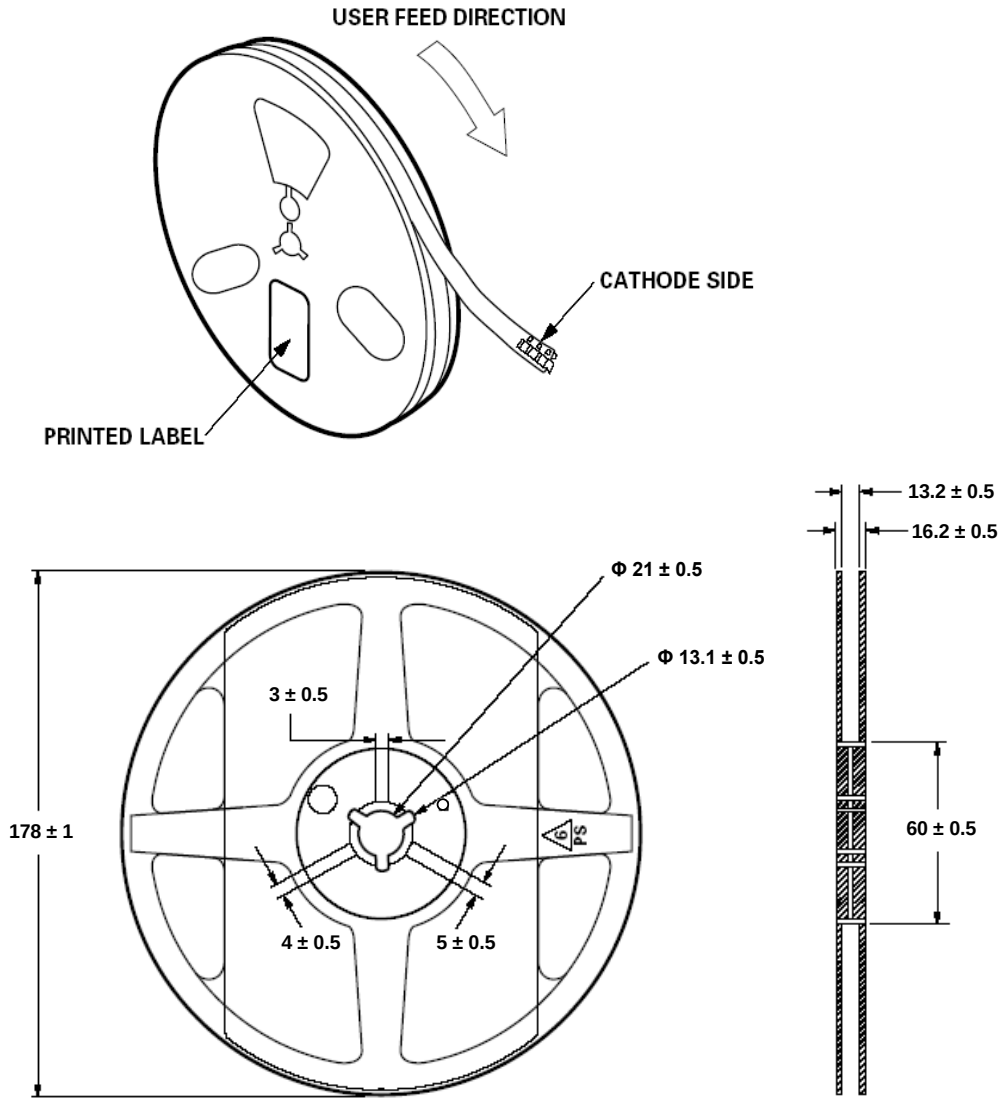
- **We recommend using the M705-S101-S4 solder paste from SMIC (Senju Metal Industry Co., Ltd.) for lead-free soldering.**
- **Do not use solder pastes with post reflow flux residue>47%. (58Bi-42Sn eutectic alloy, etc) This kind of solder pastes may cause a reliability problem to LED.**
- All temperatures 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 ± 0.1mm.

Emitter Reel Packaging



Notes:
1. Empty component pockets sealed with top cover tape.
2. 1,000 pieces per reel.
3. Drawing not to scale.
4. All dimensions are in millimeters.

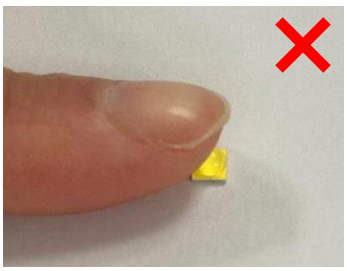
Precaution for Use

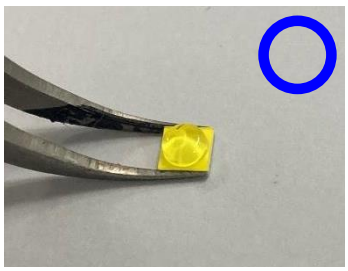
- Storage
  Please do not open the moisture barrier bag (MBB) more than one week. This may cause the leads of LED discoloration. We recommend storing ProLight's LEDs in a dry box after opening the MBB. The recommended storage conditions are temperature 5 to 30°C and humidity less than 40% RH. It is also recommended to return the LEDs to the MBB and to reseal the MBB.
- The slug is is not electrically neutral. Therefore, we recommend to isolate the heat sink.
- **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 decide 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 Silicone Lens LEDs

Notes for handling of silicone lens LEDs

- Please do not use a force of over 0.3kgf impact or pressure on the silicone 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 silicone lens especially by sharp tools such as Tweezers.
- Avoid leaving fingerprints on the silicone lens.
- Please store the LEDs away from dusty areas or seal the product against dust.
- 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 silicone lens must be prevented.
- Please do not mold over the silicone lens with another resin. (epoxy, urethane, etc)





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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.