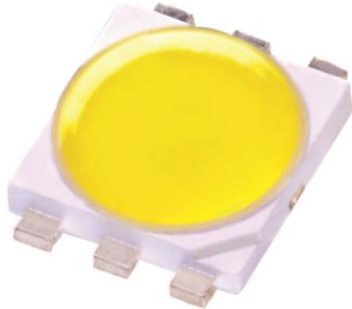




*ProLight Opto*  
Technology Corporation



**ProLight PP6N-2LxE-6SC**  
**2W Power LED**  
**Technical Datasheet**  
**Version: 1.5**

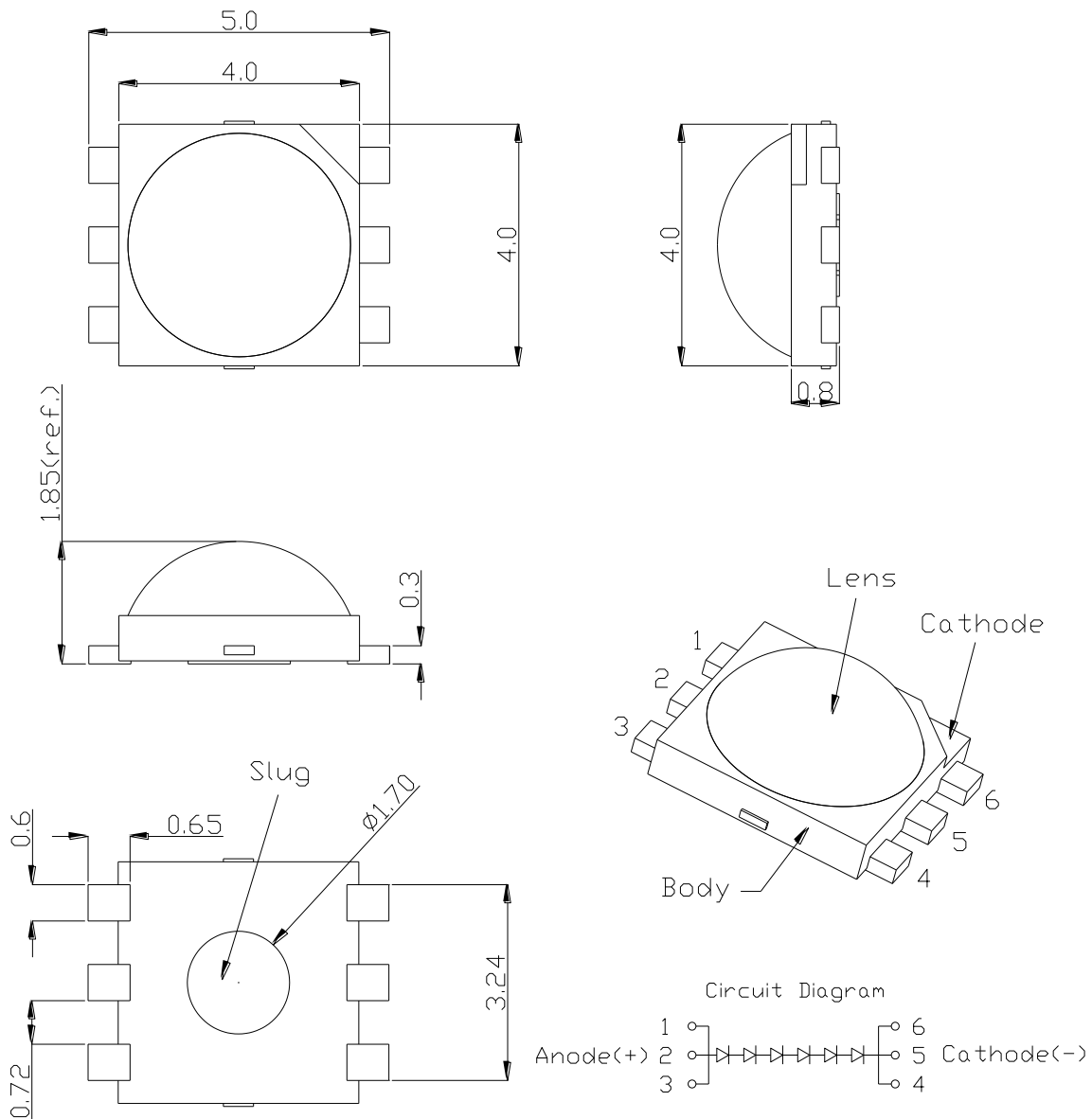
## Features

- Good color uniformity
- RoHS compliant
- Industry best moisture sensitivity level - JEDEC Level 1
- Lead free reflow soldering
- More energy efficient than incandescent and most halogen lamps
- Low Voltage DC operated
- Instant light (less than 100ns)
- No UV

## Typical Applications

- Entertainment Lighting
- Commercial Lighting
- Indoor Lighting
- Outdoor Lighting

# Emitter Mechanical Dimensions



## Notes:

1. The cathode side of the device is denoted by the chamfer on the part body.
2. Electrical insulation between the case and the board is required. Do not electrically connect either the anode or cathode to the slug.
3. Drawing not to scale.
4. All dimensions are in millimeters.
5. Unless otherwise indicated, tolerances are  $\pm 0.10$ mm
6. Please do not bend the leads of the LED, otherwise it will damage the LED.
7. **Please do not use a force of over 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 at 120mA, T<sub>J</sub> = 25°C

Radiation Pattern	Color	Part Number Emitter	Luminous Flux $\Phi_v$ (lm)		CRI Typical
			Minimum	Typical	
Lambertian	White	PP6N-2LWE-6SC	260	330	70
	Neutral White	PP6N-2LNE-6SC	245	320	70
	Warm White	PP6N-2LVE-6SC	225	280	73

- 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 at 120mA, T<sub>J</sub> = 25°C

Color	Forward Voltage V <sub>F</sub> (V)			Thermal Resistance Junction to Slug (°C/ W)
	Min.	Typ.	Max.	
White	16.2	18.6	21.0	10
Neutral White	16.2	18.6	21.0	10
Warm White	16.2	18.6	21.0	10

- ProLight maintains a tolerance of  $\pm 0.2V$  for Voltage measurements.

## Optical Characteristics at 120mA, T<sub>J</sub> = 25°C

Color	Color Temperature CCT			Total included Angle (degrees) $\theta_{0.90V}$	Viewing Angle (degrees) $2 \theta_{1/2}$
	Min.	Typ.	Max.		
White	5000 K	5740 K	6480 K	160	140
Neutral White	3710 K	4370 K	5030 K	160	140
Warm White	2580 K	3000 K	3220 K	160	140

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

## Absolute Maximum Ratings

Parameter	White/Neutral White/Warm White
DC Forward Current (mA)	120
Peak Pulsed Forward Current (mA)	150 (less than 1/10 duty cycle@1KHz)
ESD Sensitivity (HBM per MIL-STD-883E Method 3015.7)	> ±500V
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

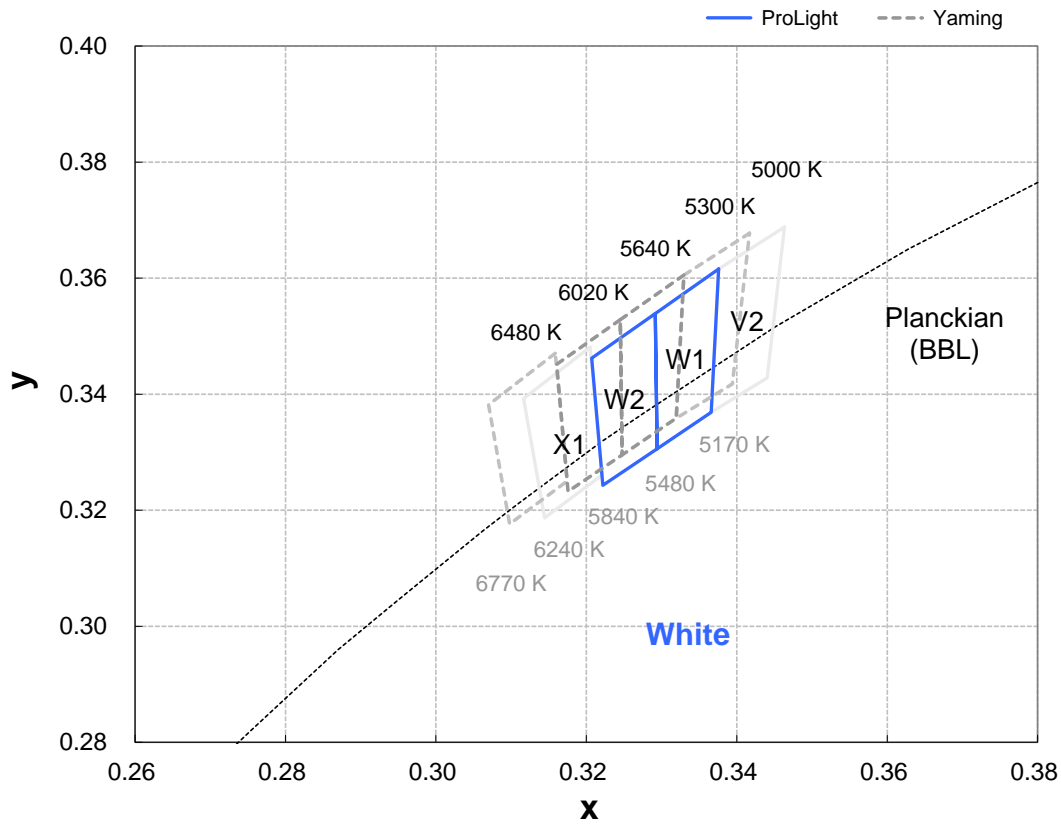
## Photometric Luminous Efficiency Bin Structure at 120mA, T<sub>J</sub> = 25°C

Color	Bin Code	Minimum Efficiency (lm/W)	Maximum Efficiency (lm/W)	Available Color Bins
White	W1	125	130	All
	W2	130	135	[1]
	X1	135	140	[1]
	X2	140	145	[1]
	Y1	145	150	[1]
Neutral White	W1	125	130	All
	W2	130	135	[1]
	X1	135	140	[1]
	X2	140	145	[1]
Warm White	V1	115	120	All
	V2	120	125	[1]
	W1	125	130	[1]
	W2	130	135	[1]
	X1	135	140	[1]
	X2	140	145	[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.
- <sup>[1]</sup> The rest of color bins are not 100% ready for order currently. Please ask for quote and order possibility.

# Color Bins at 120mA, T<sub>J</sub> = 25°C

## White Binning Structure Graphical Representation



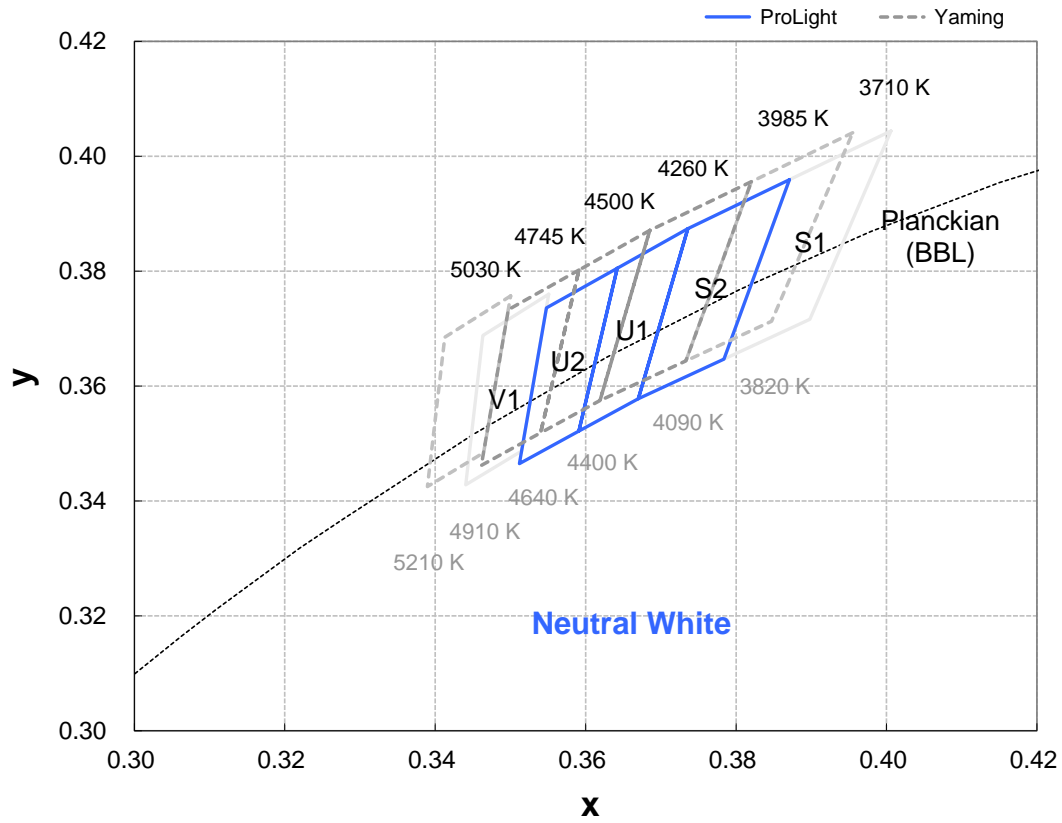
### ProLight White Bin Structure

Bin Code	x	y	Typ. CCT (K)	Bin Code	x	y	Typ. CCT (K)
V2	0.3464	0.3688	5150	W2	0.3292	0.3539	5830
	0.3376	0.3616			0.3207	0.3462	
	0.3366	0.3369			0.3222	0.3243	
	0.3441	0.3428			0.3294	0.3306	
W1	0.3376	0.3616	5470	X1	0.3205	0.3481	6250
	0.3292	0.3539			0.3117	0.3393	
	0.3294	0.3306			0.3145	0.3187	
	0.3366	0.3369			0.3221	0.3261	

- Tolerance on each color bin (x , y) is ± 0.005
- ProLight vs Yaming color shift (x, y) is (0.0046, 0.0010)

# Color Bins at 120mA, T<sub>J</sub> = 25°C

## Neutral White Binning Structure Graphical Representation



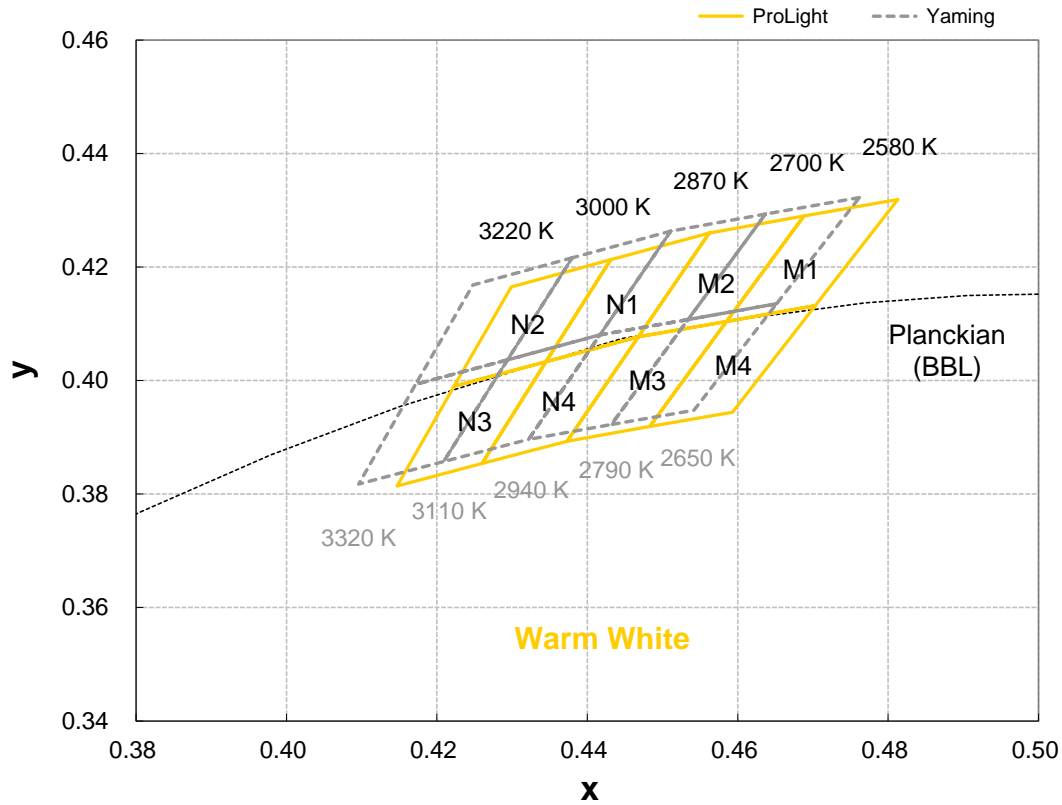
### ProLight Neutral White Bin Structure

Bin Code	x	y	Typ. CCT (K)	Bin Code	x	y	Typ. CCT (K)
S1	0.4006	0.4044	3850	U2	0.3642	0.3805	4620
	0.3871	0.3959			0.3548	0.3736	
	0.3784	0.3647			0.3512	0.3465	
	0.3898	0.3716			0.3591	0.3522	
S2	0.3871	0.3959	4130	V1	0.3551	0.3760	4890
	0.3736	0.3874			0.3464	0.3688	
	0.3670	0.3578			0.3441	0.3428	
	0.3784	0.3647			0.3515	0.3487	
U1	0.3736	0.3874	4380				
	0.3642	0.3805					
	0.3591	0.3522					
	0.3670	0.3578					

- Tolerance on each color bin (x , y) is ± 0.005
- ProLight vs Yaming color shift (x, y) is (0.0050, 0.0003)

# Color Bins at 120mA, T<sub>J</sub> = 25°C

## Warm White Binning Structure Graphical Representation



### ProLight Warm White Bin Structure

Bin Code	x	y	Typ. CCT (K)	Bin Code	x	y	Typ. CCT (K)
N1	0.4562	0.4260	2950	M1	0.4813	0.4319	2650
	0.4431	0.4213			0.4688	0.4290	
	0.4345	0.4033			0.4585	0.4104	
	0.4468	0.4077			0.4703	0.4132	
N4	0.4468	0.4077	2950	M4	0.4703	0.4132	2650
	0.4345	0.4033			0.4585	0.4104	
	0.4260	0.3854			0.4483	0.3919	
	0.4373	0.3893			0.4593	0.3944	
N2	0.4431	0.4213	3100	M2	0.4688	0.4290	2800
	0.4299	0.4165			0.4562	0.4260	
	0.4223	0.3990			0.4468	0.4077	
	0.4345	0.4033			0.4585	0.4104	
N3	0.4345	0.4033	3100	M3	0.4585	0.4104	2800
	0.4223	0.3990			0.4468	0.4077	
	0.4147	0.3814			0.4373	0.3893	
	0.4260	0.3854			0.4483	0.3919	

- Tolerance on each color bin (x , y) is ± 0.005
- ProLight vs Yaming color shift (x, y) is (0.0051, -0.0003)

## Forward Voltage Bin Structure at 120mA, T<sub>J</sub> = 25°C

Color	Bin Code	Minimum Voltage (V)	Maximum Voltage (V)
White	A	16.2	16.8
	B	16.8	17.4
	D	18.0	18.6
	E	18.6	19.2
	F	19.2	19.8
	G	19.8	20.4
	H	20.4	21.0
	Neutral White	A	16.2
B		16.8	17.4
D		18.0	18.6
E		18.6	19.2
F		19.2	19.8
G		19.8	20.4
H		20.4	21.0
Warm White		A	16.2
	B	16.8	17.4
	D	18.0	18.6
	E	18.6	19.2
	F	19.2	19.8
	G	19.8	20.4
	H	20.4	21.0

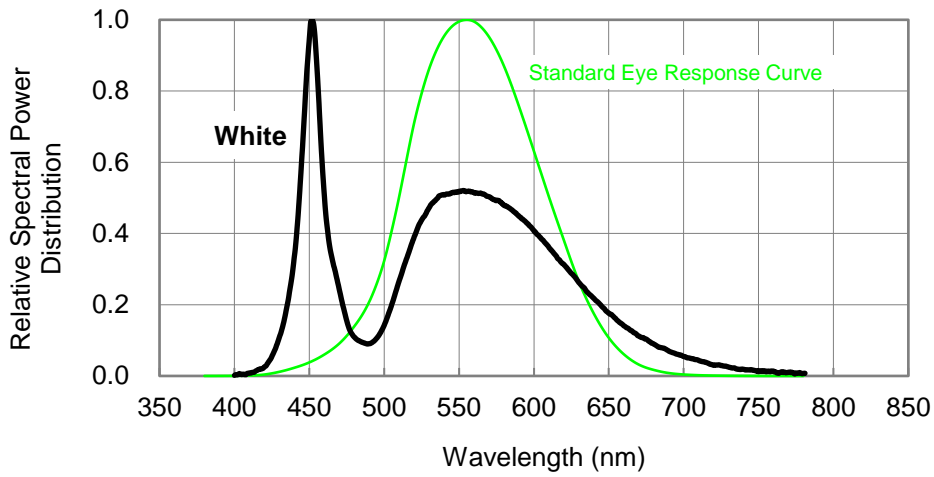
- ProLight maintains a tolerance of  $\pm 0.2V$  for Voltage measurements.

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.

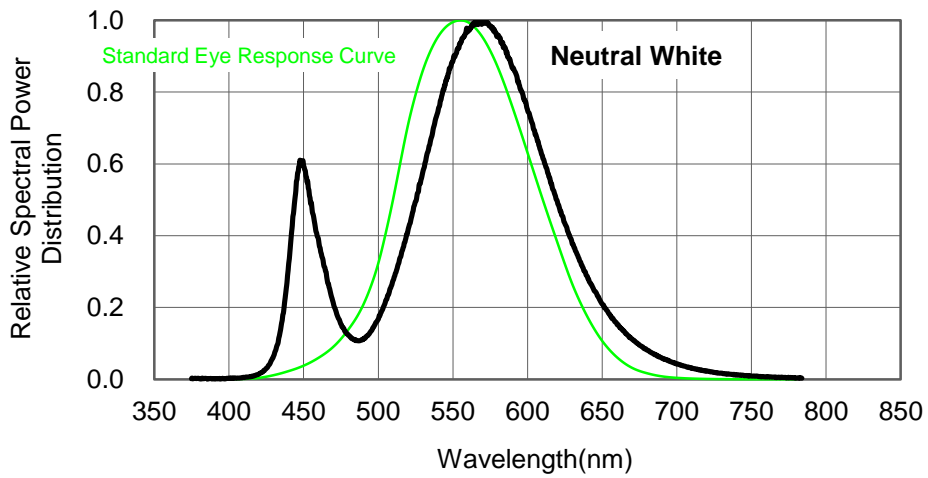


# Color Spectrum, $T_J = 25^\circ\text{C}$

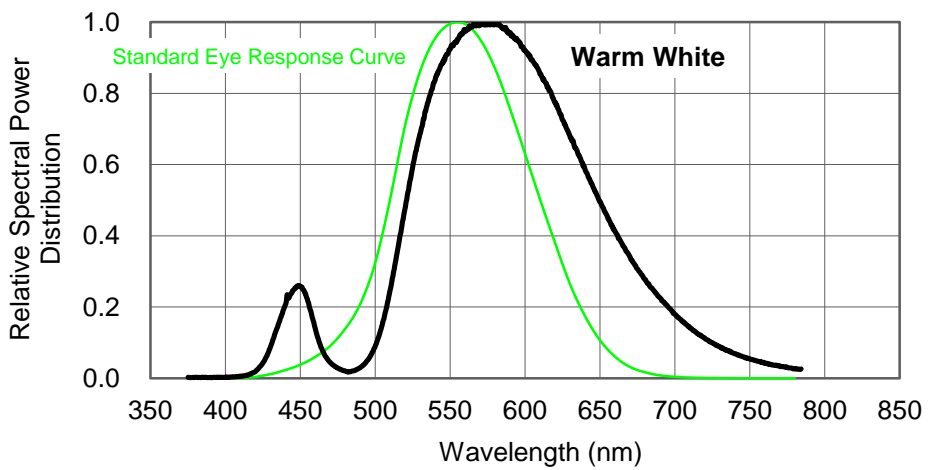
## 1. White



## 2. Neutral White

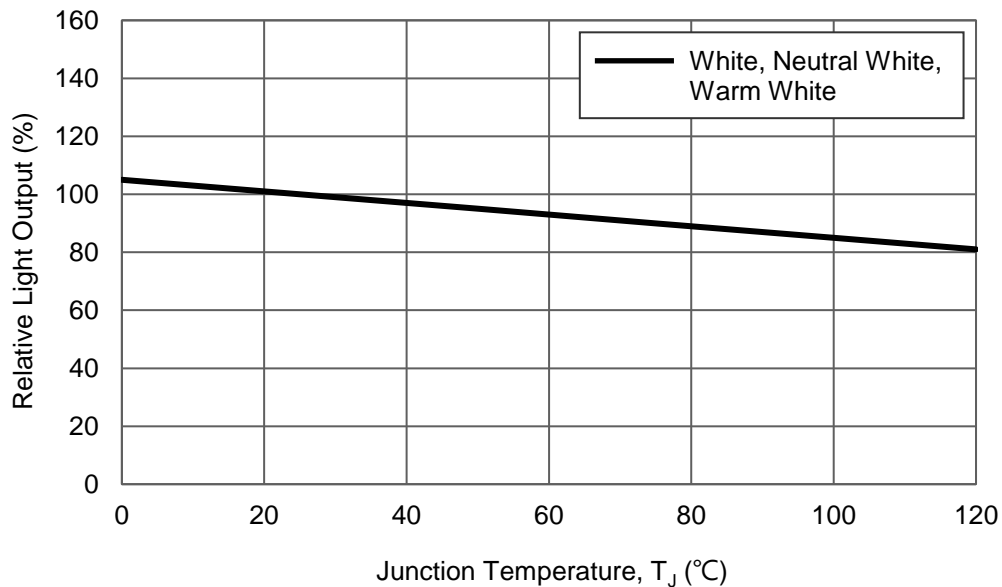


## 3. Warm White



# Light Output Characteristics

## Relative Light Output vs. Junction Temperature at 120mA



## Forward Current Characteristics, $T_j = 25^\circ\text{C}$

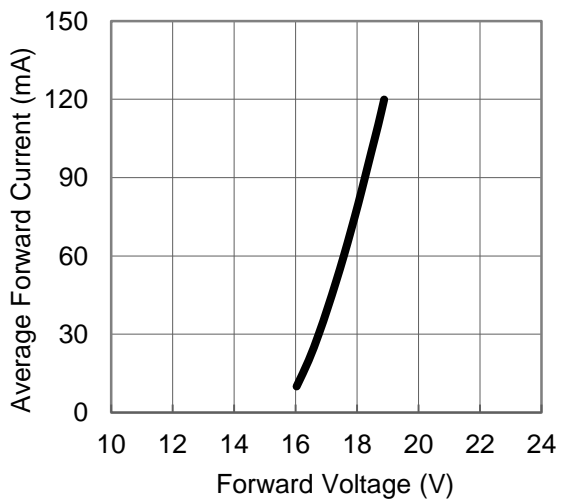


Fig 1. Forward Current vs. Forward Voltage for White, Neutral White, Warm White.

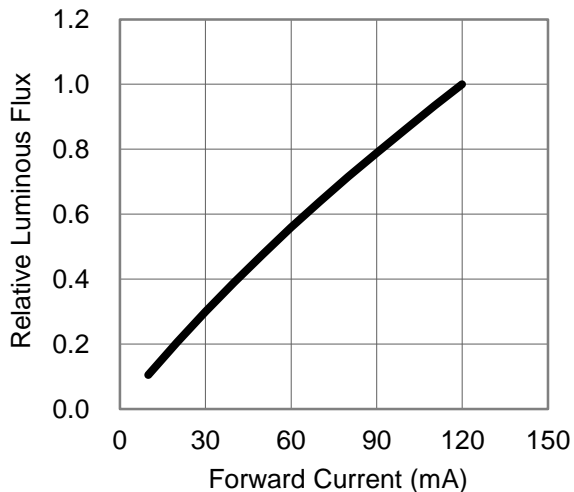
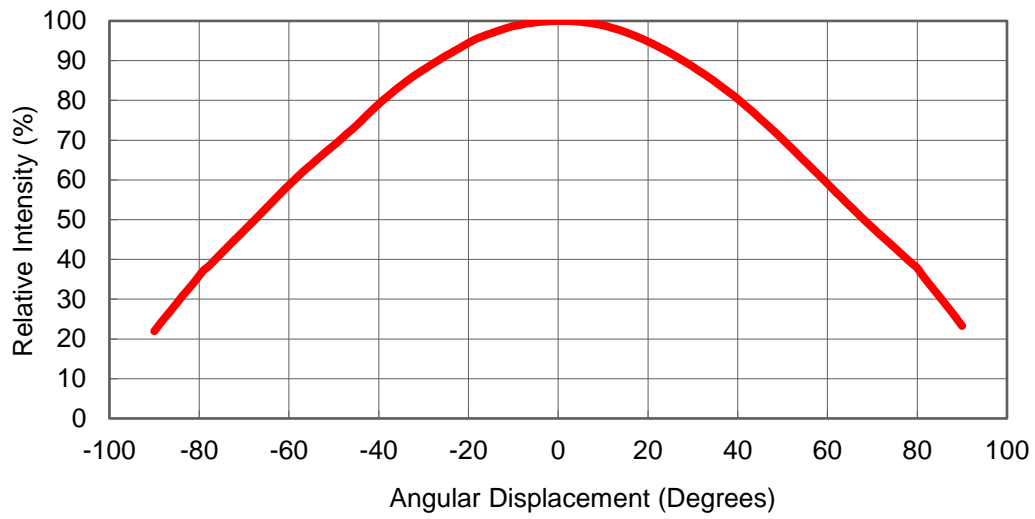


Fig 2. Relative Luminous Flux vs. Forward Current for White, Neutral White, Warm White at  $T_j=25^\circ\text{C}$  maintained.

# Typical Representative Spatial Radiation Pattern

## Lambertian 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 manufacture'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, $I_F = \text{max DC}$ (Note 1)	1000 hours	Note 2
Wet High Temperature Operating Life (WHTOL)	85°C/60%RH, $I_F = \text{max DC}$ (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 $\pm$ 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:

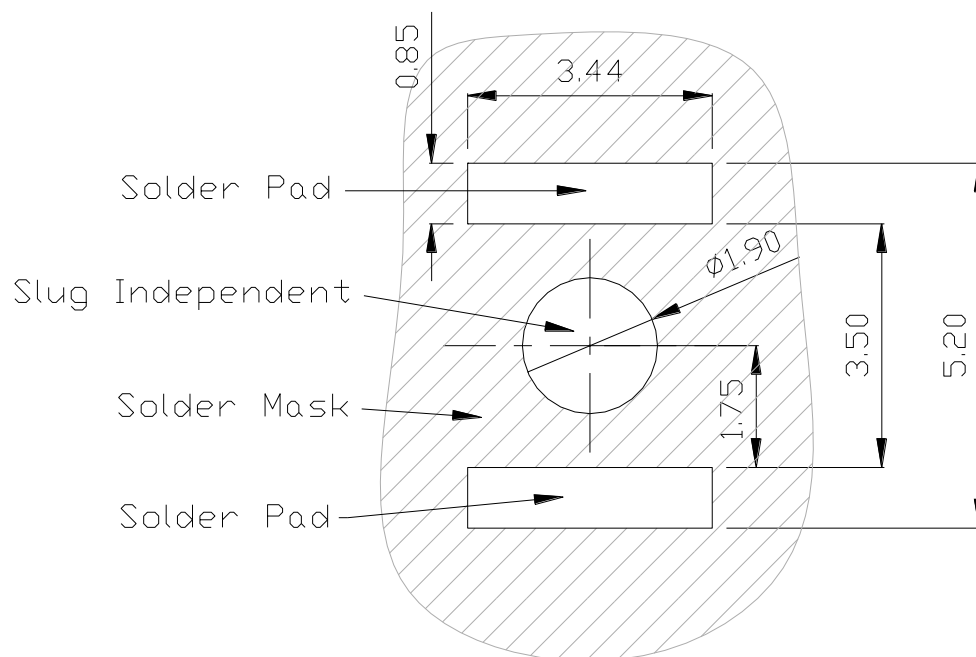
1. Depending on the maximum derating curve.
2. Criteria for judging failure

Item	Test Condition	Criteria for Judgement	
		Min.	Max.
Forward Voltage ( $V_F$ )	$I_F = \text{max DC}$	-	Initial Level x 1.1
Luminous Flux or Radiometric Power ( $\Phi_V$ )	$I_F = \text{max DC}$	Initial Level x 0.7	-
Reverse Current ( $I_R$ )	$V_R = 5V$	-	50 $\mu A$

\* 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.

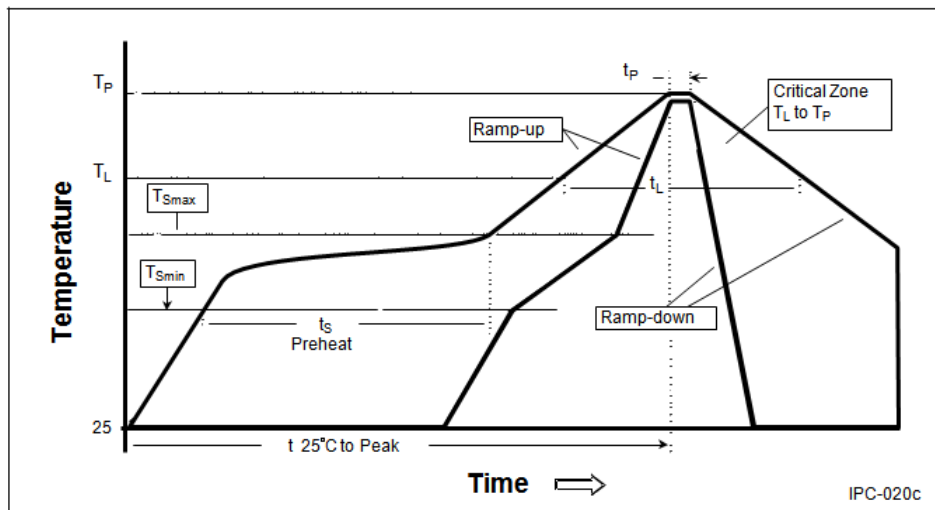
## Recommended Solder Pad Design



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

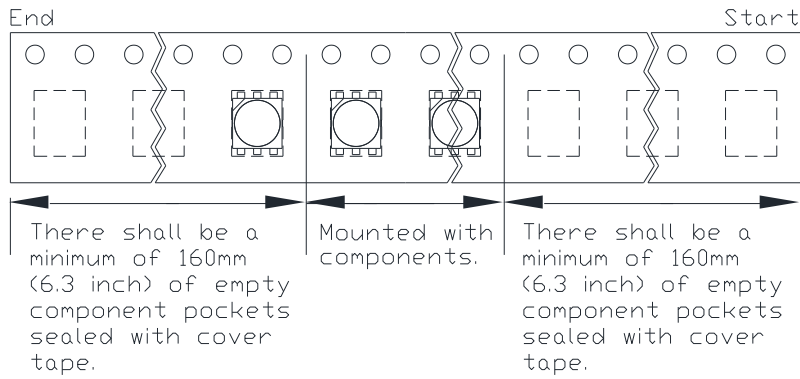
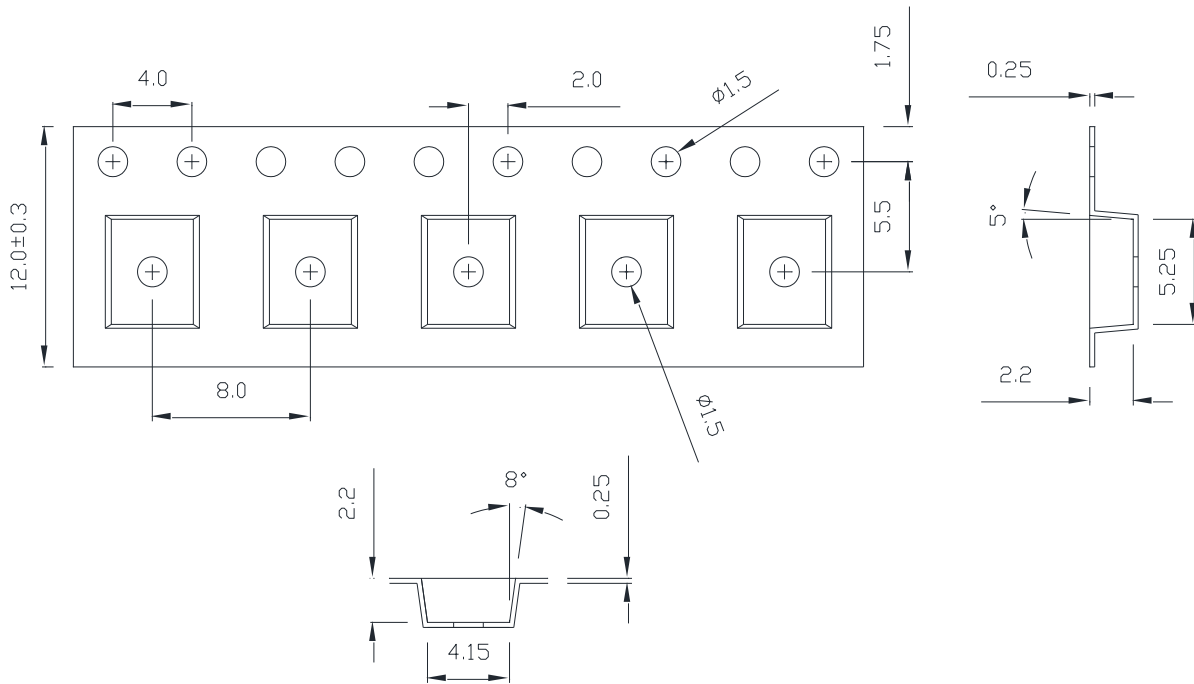
## Reflow Soldering Condition

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 <ul style="list-style-type: none"> <li>- Temperature Min (<math>T_{Smin}</math>)</li> <li>- Temperature Max (<math>T_{Smax}</math>)</li> <li>- Time (<math>t_{Smin}</math> to <math>t_{Smax}</math>)</li> </ul>	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
Time maintained above: <ul style="list-style-type: none"> <li>- Temperature (<math>T_L</math>)</li> <li>- Time (<math>t_L</math>)</li> </ul>	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

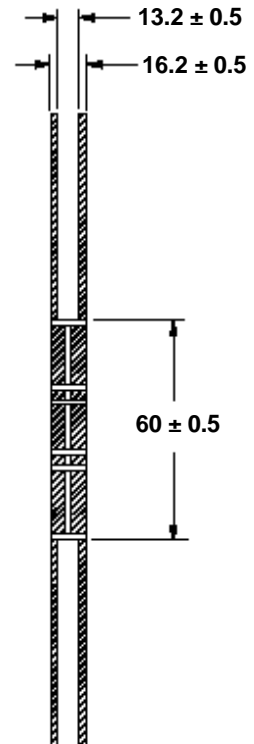
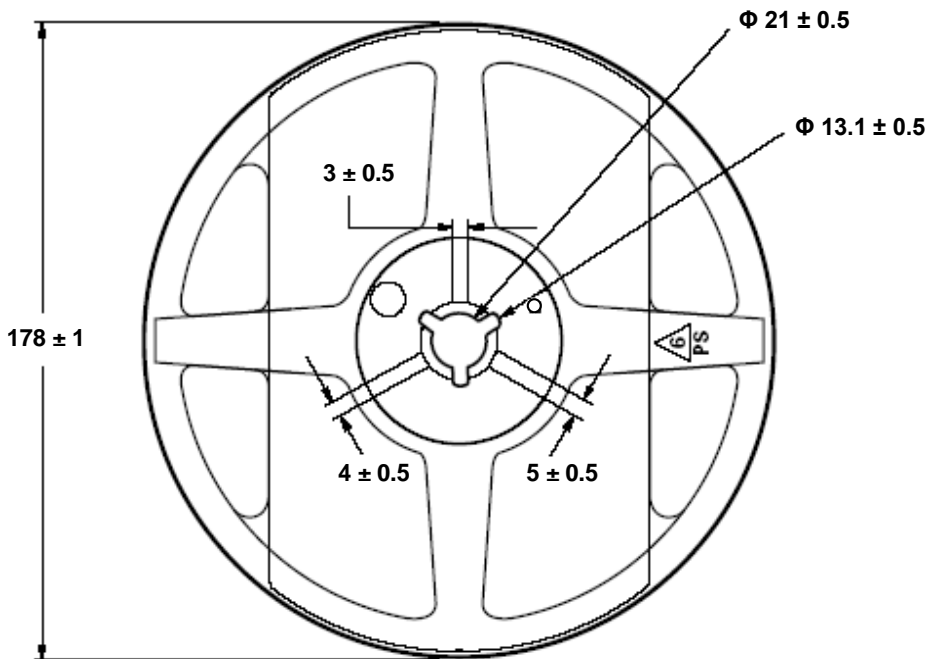
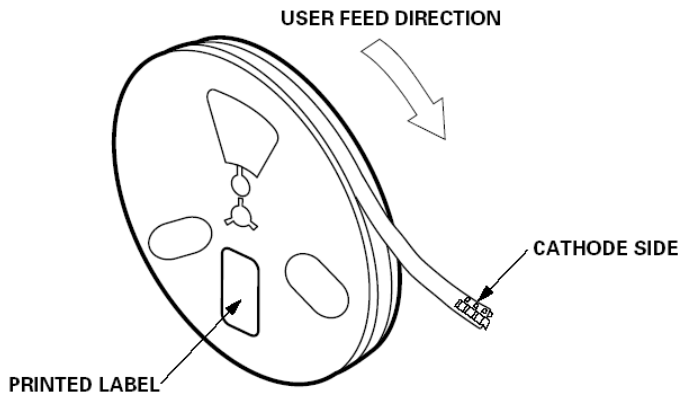


## Notes:

1. Drawing not to scale.
2. All dimensions are in millimeters.
3. Unless otherwise indicated, tolerances are  $\pm 0.10$ mm.



# Emitter Reel Packaging



Notes:

1. Empty component pockets sealed with top cover tape.
2. 250, 500 and 1000 pieces per reel.
3. Drawing not to scale.
4. All dimensions are in millimeters.

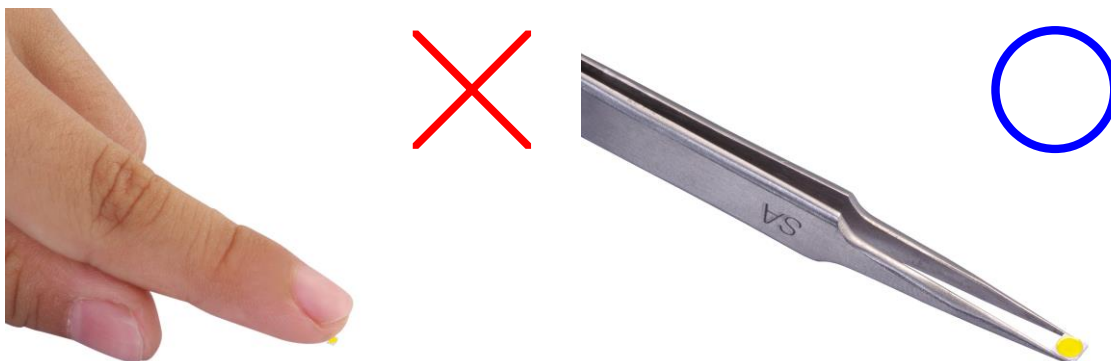
## Precaution for Use

- 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 not electrically neutral. Therefore, we recommend to isolate the heat sink.
- The LEDs are sensitive to electrostatic discharge. Appropriate ESD protection measures must be taken when working with the LEDs. Non-compliance with ESD protection measures may lead to damage or destruction of the LEDs.
- **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 Silicone Lens LEDs

Notes for handling of silicone lens LEDs

- Please do not use a force of over 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)



ProLight