ProLight Opto
Technology Corporation



ProLight PR2N-3LxE-SD
3W Power LED
Technical Datasheet
Version: 1.4

Prolight Opto ® Phenix Series

Features

- 100% foot print compatible with Philips-Lumileds Rebel.
- Patent free!!
- Best thermal material solution of the world!
- Best Moisture Sensitivity:JEDEC 1
- RoHS compliant

Main Applications

- Entertainment Lighting
- Commercial Lighting

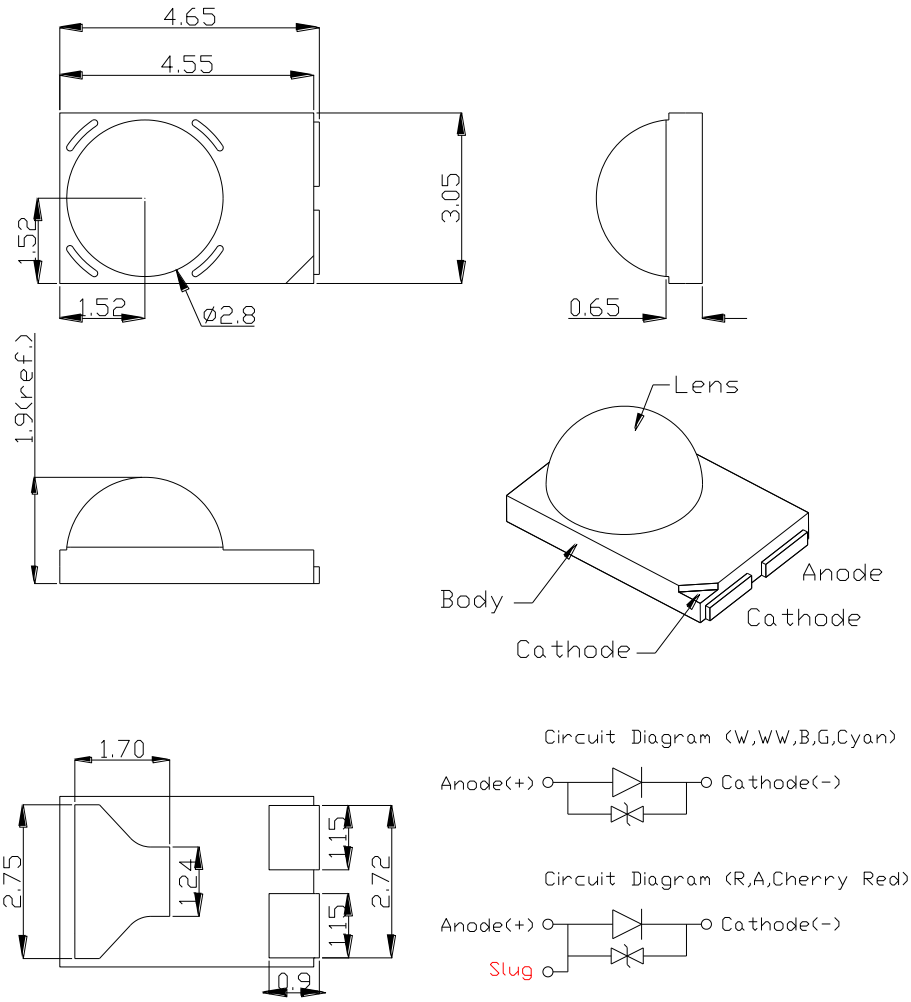
Introduction

- PROLIGHT Phenix, with the smallest high power LED footprint available by Prolight Opto, has offered extended solid-state lighting design possibilities. Prolight Phenix is designed with Prolight own Patents and using copper leadframe, the best thermal material of the world.
- Phenix qualifies as the JEDEC 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.

3F No.12, Kung-Yeh 10th Rd., Ping Chen Industrial Zone, Ping Chen, 324, Taoyuan Hsien, Taiwan, R.O.C.
Tel ：886-3-419-2099
Fax ：886-3-419-2377
www.prolightopto.com

2010/04

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 --- slug of device is not electrically neutral. Do not electrically connect either the anode or cathode to the slug.
3. Drawing not to scale.
4. All dimensions are in millimeters.
5. All dimensions without tolerances are for reference only.
6. Please do not solder the emitter by manual hand soldering, otherwise it will damage the emitter.
7. **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.

3F No.12, Kung-Yeh 10th Rd., Ping Chen Industrial Zone, Ping Chen, 324, Taoyuan Hsien, Taiwan, R.O.C.
Tel ：886-3-419-2099
Fax ：886-3-419-2377
www.prolightopto.com

Flux Characteristics, T_J = 25°C

Radiation Pattern	Color	Part Number Emitter	Lumious Flux or Power @ 350mA Minimum	Lumious Flux or Power @ 350mA Typical	Lumious Flux or Power Refer @700mA Typical
Lambertian	White	PR2N-3LWE-SD	80 lm	95 lm	162 lm
	Warm White	PR2N-3LVE-SD	80 lm	88 lm	150 lm
	Red	PR2N-3LRE-SD	30 lm	48 lm	86 lm
	Amber	PR2N-3LAE-SD	40 lm	50 lm	90 lm
	Green	PR2N-3LGE-SD	60 lm	72 lm	120 lm
	Cyan	PR2N-3LCE-SD	50 lm	57 lm	95 lm
	Blue	PR2N-3LBE-SD	13.9 lm	20 lm	35 lm
	Cherry Red	PR2N-3LEE-SD	115 mW	150 mW	250 mW

- ProLight maintains a tolerance of ± 10% on flux and power measurements.
- Please do not drive at rated current more than 1 second without proper heat sink.

Electrical Characteristics at, T_J = 25°C

Color	Forward Voltage V_F (V) @ 350mA Min.	Forward Voltage V_F (V) @ 350mA Typ.	Forward Voltage V_F (V) @ 350mA Max.	Forward Voltage V_F (V) Refer @700mA Typ.	Thermal Resistance Junction to Slug (°C/ W)
White	2.85	3.5	4.1	3.8	8
Warm White	2.85	3.5	4.1	3.8	8
Red	1.75	2.2	3.1	2.7	10
Amber	1.75	2.2	3.1	2.7	10
Green	2.85	3.5	4.1	3.8	8
Cyan	2.85	3.5	4.1	3.8	8
Blue	2.85	3.5	4.1	3.8	8
Cherry Red	1.75	2.1	3.1	2.6	10

3F No.12, Kung-Yeh 10th Rd., Ping Chen Industrial Zone, Ping Chen, 324, Taoyuan Hsien, Taiwan, R.O.C.
Tel ：886-3-419-2099
Fax ：886-3-419-2377
www.prolightopto.com

Optical Characteristics at 350mA, TJ = 25°C

Radiation Pattern	Color	Dominant Wavelength λ_D, Peak Wavelength [1] λ_P, or Color Temperature CCT Min.	Typ.	Max.	Total included Angle (degrees) $\theta_{0.90V}$	Viewing Angle (degrees) $2\theta_{1/2}$
Lambertian	White	4100 K	5500 K	10000 K	160	140
	Warm White	2700 K	3300 K	4100 K	160	140
	Red	613.5 nm	623 nm	631 nm	160	140
	Amber	587 nm	592 nm	597 nm	160	140
	Green	515 nm	525 nm	535 nm	160	140
	Cyan	495 nm	505 nm	515 nm	160	140
	Blue	455 nm	465 nm	475 nm	160	140
	Cherry Red [1]	720 nm	730 nm	740 nm	160	140

Notes:

- ProLight maintains a tolerance of ± 1nm for dominant wavelength measurements.
- ProLight maintains a tolerance of ± 5% for CCT measurements.
- [1] Cherry Red product is binned by radiometric power and peak wavelength rather than photometric lumens and dominant wavelength. ProLight Lumileds maintains a tolerance of ±2nm for peak wavelength measurements.

Absolute Maximum Ratings

Parameter	White/Warm White/Red/ Amber/Green/Cyan/Blue/Cherry Red
DC Forward Current (mA)	700
Peak Pulsed Forward Current (mA)	1000
Average Forward Current (mA)	700
ESD Sensitivity (HBM per MIL-STD-883E Method 3015.7)	±4000V (Class III)
LED Junction Temperature (°C)	120
Aluminum-core PCB Temperature (°C)	90
Storage & Operating Temperature (°C)	-40 to +90
Soldering Temperature(°C)	235°C

3F No.12, Kung-Yeh 10th Rd., Ping Chen Industrial Zone, Ping Chen, 324, Taoyuan Hsien, Taiwan, R.O.C.
Tel ：886-3-419-2099
Fax ：886-3-419-2377
www.prolightopto.com

ProLight Opto Technology Corporation

Radiometric Power Bin Structure at 350mA

Color	Bin Code	Minimum Radiometric Power (mW)	Maximum Radiometric Power (mW)	Available Color Bins
Cherry Red	J	115	145	All
	K	145	175	【1】

- ProLight maintains a tolerance of ± 10% 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.

Photometric Luminous Flux Bin Structure at 350mA

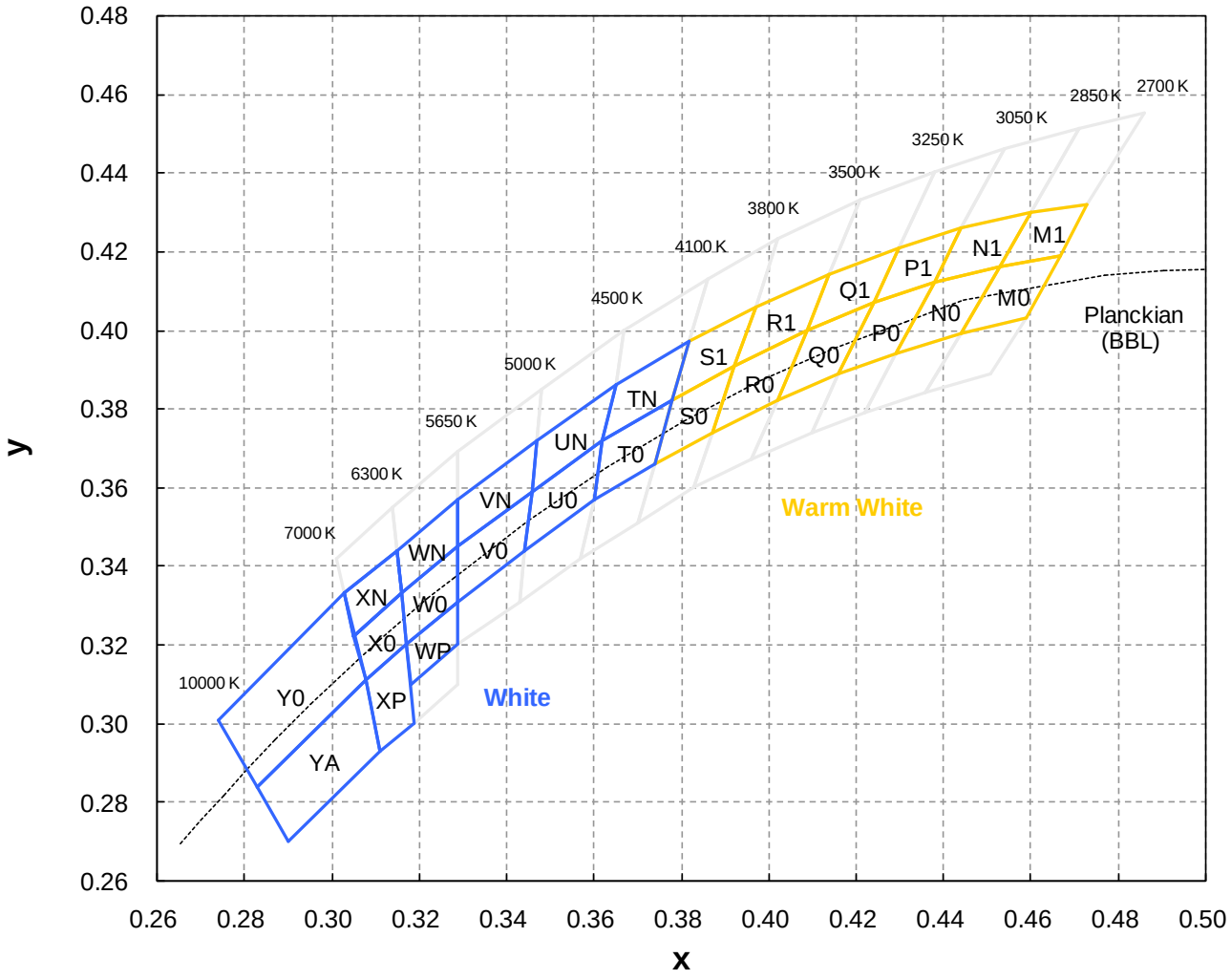
Color	Bin Code	Minimum Photometric Flux (lm)	Maximum Photometric Flux (lm)	Available Color Bins
White	T2	80	90	All
	U1	90	100	All
	U2	100	120	Xx, Wx 【1】
Warm White	T2	80	90	All
	U1	90	100	All
	U2	100	120	【1】
Red	Q	30	40	All
	R	40	50	All
	S1	50	60	All
Amber	R	40	50	All
	S1	50	60	All
Green	S2	60	70	All
	T1	70	80	All
	T2	80	90	【1】
Cyan	S1	50	60	All
	S2	60	70	【1】
Blue	M	13.9	18.1	A, 1, 2 【1】
	N	18.1	23.5	1, 2 【1】
	P	23.5	30.6	2 【1】

- ProLight maintains a tolerance of ± 10% 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.

3F No.12, Kung-Yeh 10th Rd., Ping Chen Industrial Zone, Ping Chen, 324, Taoyuan Hsien, Taiwan, R.O.C.
Tel ：886-3-419-2099
Fax ：886-3-419-2377
www.prolightopto.com

Color Bin

White and Warm White Binning Structure Graphical Representation



3F No.12, Kung-Yeh 10th Rd., Ping Chen Industrial Zone, Ping Chen, 324, Taoyuan Hsien, Taiwan, R.O.C.
Tel ：886-3-419-2099
Fax ：886-3-419-2377
www.prolightopto.com

Color Bins

White Bin Structure

Bin Code	x	y	Typ. CCT (K)	Bin Code	x	y	Typ. CCT (K)
T0	0.378	0.382	4300	WN	0.329	0.345	5970
	0.374	0.366			0.316	0.333	
	0.360	0.357			0.315	0.344	
	0.362	0.372			0.329	0.357	
TN	0.382	0.397	4300	WP	0.329	0.331	5970
	0.378	0.382			0.329	0.320	
	0.362	0.372			0.318	0.310	
	0.365	0.386			0.317	0.320	
U0	0.362	0.372	4750	X0	0.308	0.311	6650
	0.360	0.357			0.305	0.322	
	0.344	0.344			0.316	0.333	
	0.346	0.359			0.317	0.320	
UN	0.365	0.386	4750	XN	0.305	0.322	6650
	0.362	0.372			0.303	0.333	
	0.346	0.359			0.315	0.344	
	0.347	0.372			0.316	0.333	
V0	0.329	0.331	5320	XP	0.308	0.311	6650
	0.329	0.345			0.317	0.320	
	0.346	0.359			0.319	0.300	
	0.344	0.344			0.311	0.293	
VN	0.329	0.345	5320	Y0	0.308	0.311	8000
	0.329	0.357			0.283	0.284	
	0.347	0.372			0.274	0.301	
	0.346	0.359			0.303	0.333	
W0	0.329	0.345	5970	YA	0.308	0.311	8000
	0.329	0.331			0.311	0.293	
	0.317	0.320			0.290	0.270	
	0.316	0.333			0.283	0.284	

- Tolerance on each color bin (x , y) is ± 0.01

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.

3F No.12, Kung-Yeh 10th Rd., Ping Chen Industrial Zone, Ping Chen, 324, Taoyuan Hsien, Taiwan, R.O.C.
Tel ：886-3-419-2099
Fax ：886-3-419-2377
www.prolightopto.com

Color Bins

Warm White Bin Structure

Bin Code	x	y	Typ. CCT (K)	Bin Code	x	y	Typ. CCT (K)
M0	0.453	0.416	2770	Q0	0.409	0.400	3370
	0.444	0.399			0.402	0.382	
	0.459	0.403			0.416	0.389	
	0.467	0.419			0.424	0.407	
M1	0.460	0.430	2770	Q1	0.414	0.414	3370
	0.453	0.416			0.409	0.400	
	0.467	0.419			0.424	0.407	
	0.473	0.432			0.430	0.421	
N0	0.438	0.412	2950	R0	0.392	0.391	3650
	0.429	0.394			0.387	0.374	
	0.444	0.399			0.402	0.382	
	0.453	0.416			0.409	0.400	
N1	0.444	0.426	2950	R1	0.414	0.414	3650
	0.438	0.412			0.409	0.400	
	0.453	0.416			0.392	0.391	
	0.460	0.430			0.397	0.406	
P0	0.424	0.407	3150	S0	0.392	0.391	3950
	0.416	0.389			0.387	0.374	
	0.429	0.394			0.374	0.366	
	0.438	0.412			0.378	0.382	
P1	0.430	0.421	3150	S1	0.397	0.406	3950
	0.424	0.407			0.392	0.391	
	0.438	0.412			0.378	0.382	
	0.444	0.426			0.382	0.397	

- Tolerance on each color bin (x , y) is ± 0.01

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.

3F No.12, Kung-Yeh 10th Rd., Ping Chen Industrial Zone, Ping Chen, 324, Taoyuan Hsien, Taiwan, R.O.C.
Tel ：886-3-419-2099
Fax ：886-3-419-2377
www.prolightopto.com

ProLight Opto Technology Corporation

Peak Wavelength Bin Structure

Color	Bin Code	Minimum Peak Wavelength (nm)	Maximum Peak Wavelength (nm)
Cherry Red	1	720	740

- ProLight maintains a tolerance of ± 1nm for peak wavelength measurements.

Dominant Wavelength Bin Structure

Color	Bin Code	Minimum Dominant Wavelength (nm)	Maximum Dominant Wavelength (nm)
Red	2	613.5	620.5
	4	620.5	631.0
Amber	2	587.0	589.5
	4	589.5	592.0
	6	592.0	594.5
	7	594.5	597.0
Green	A	515	520
	1	520	525
	2	525	530
	3	530	535
Cyan	A	495	500
	1	500	505
	2	505	510
	3	510	515
Blue	A	455	460
	1	460	465
	2	465	470
	3	470	475

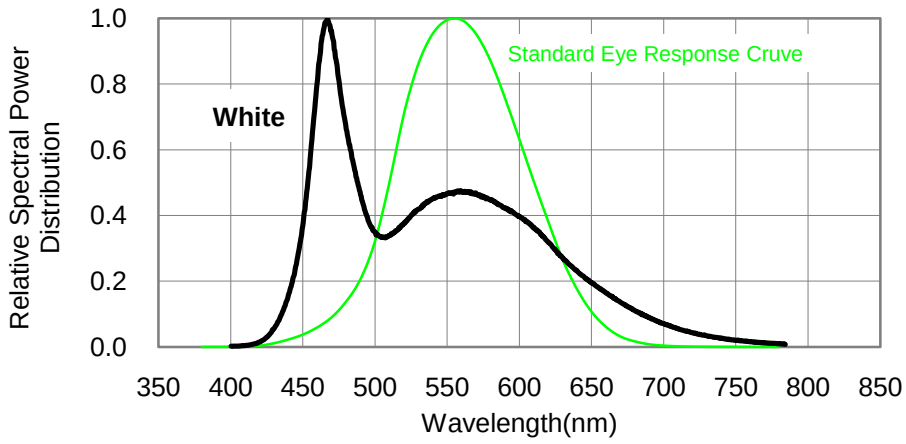
- ProLight maintains a tolerance of ± 1nm for dominant wavelength measurements.

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.

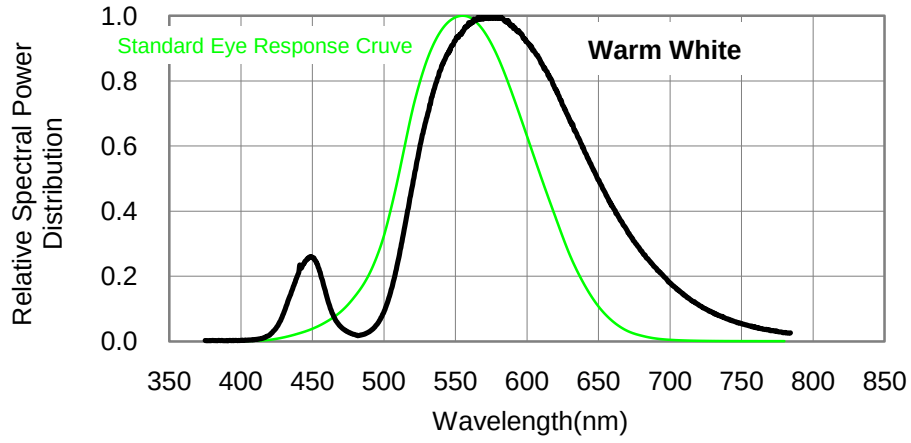
3F No.12, Kung-Yeh 10th Rd., Ping Chen Industrial Zone, Ping Chen, 324, Taoyuan Hsien, Taiwan, R.O.C.
Tel ：886-3-419-2099
Fax ：886-3-419-2377
www.prolightopto.com

Color Spectrum, T_j = 25°C

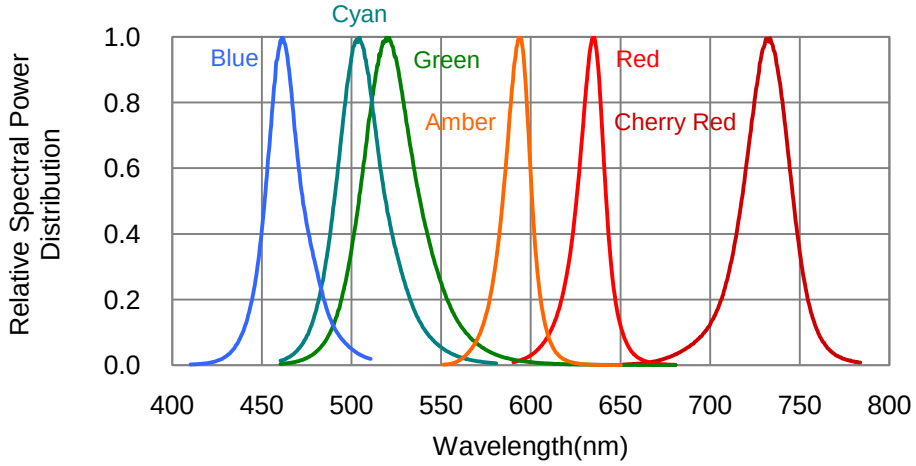
1. White



2. Warm White



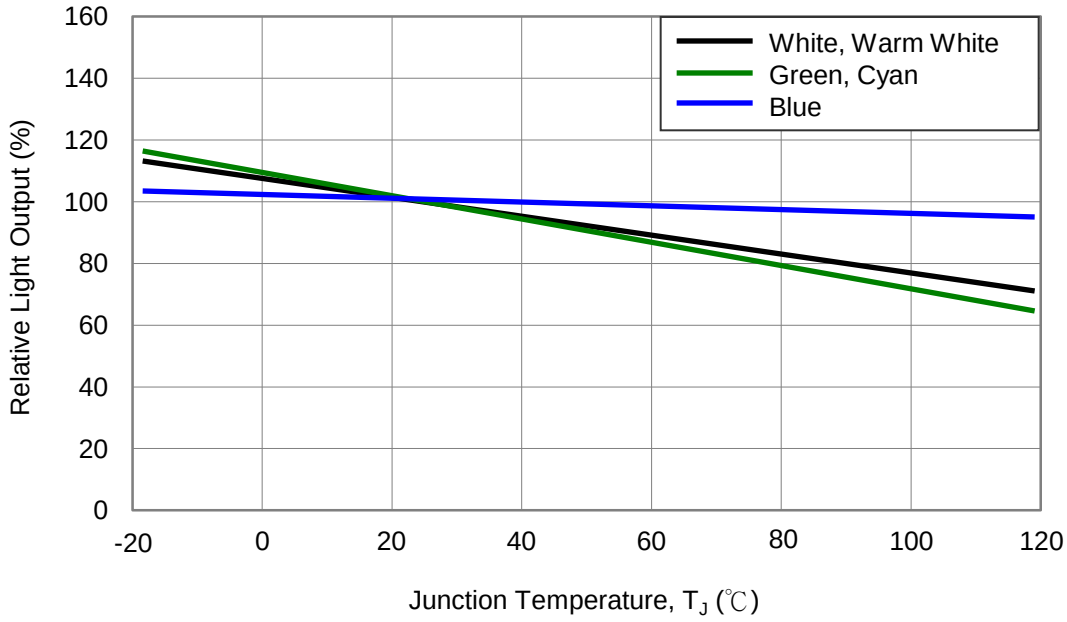
3. Blue、Cyan 、 Green、Amber、Red 、Cherry Red

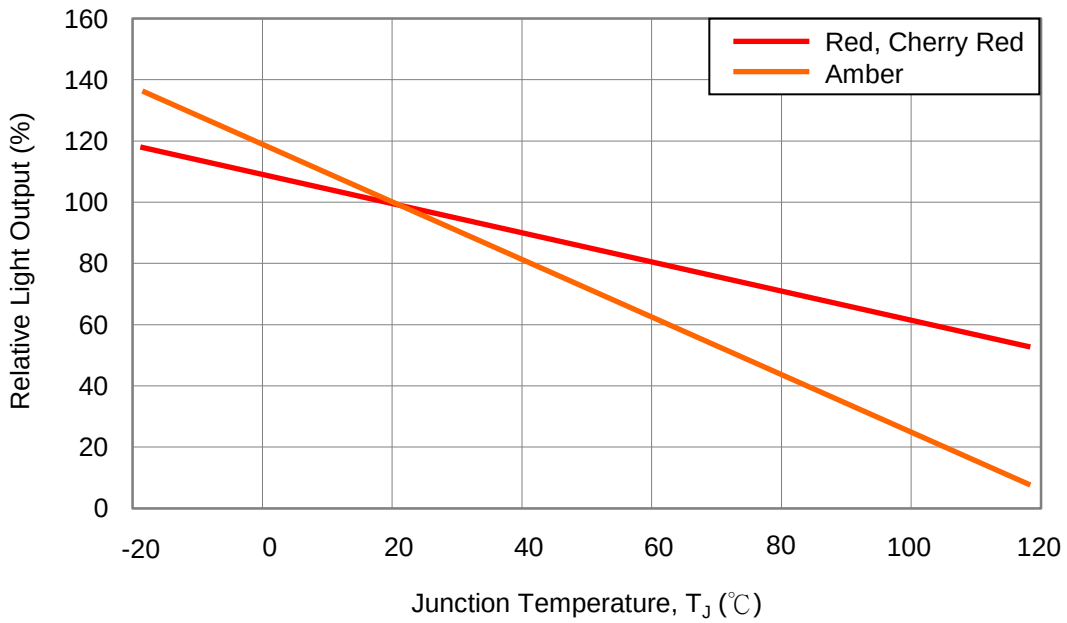


3F No.12, Kung-Yeh 10th Rd., Ping Chen Industrial Zone, Ping Chen, 324, Taoyuan Hsien, Taiwan, R.O.C.
Tel ：886-3-419-2099
Fax ：886-3-419-2377
www.prolightopto.com

Light Output Characteristics

Relative Light Output vs. Junction Temperature at 700mA

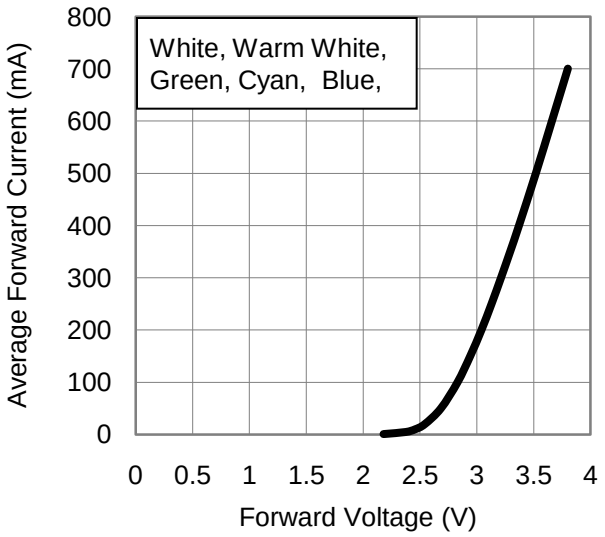


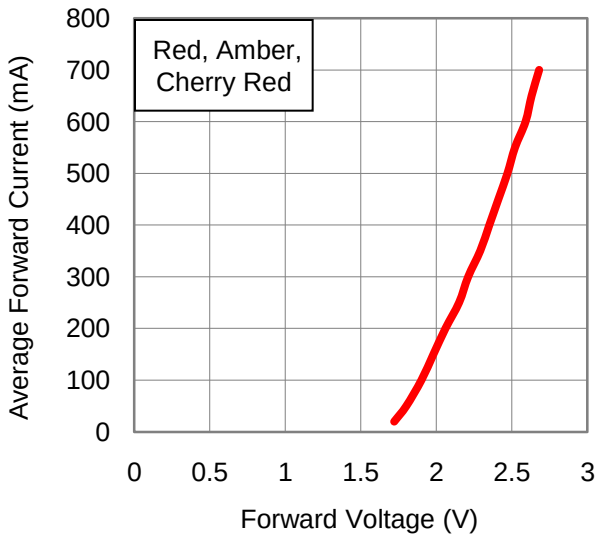


3F No.12, Kung-Yeh 10th Rd., Ping Chen Industrial Zone, Ping Chen, 324, Taoyuan Hsien, Taiwan, R.O.C.
Tel ：886-3-419-2099
Fax ：886-3-419-2377
www.prolightopto.com

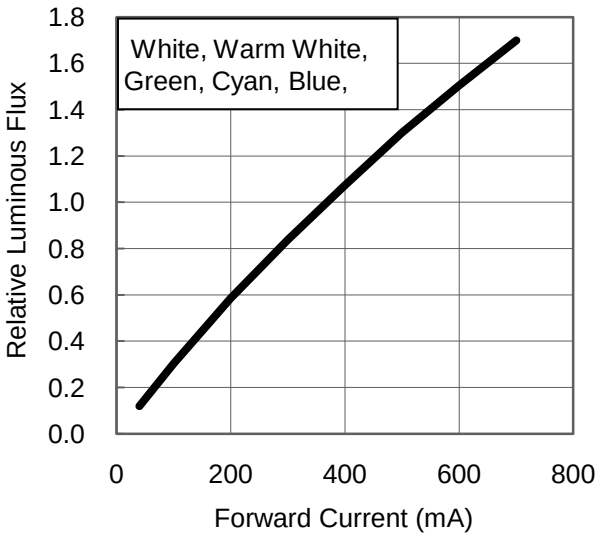
Forward Current Characteristics, T_j = 25°C

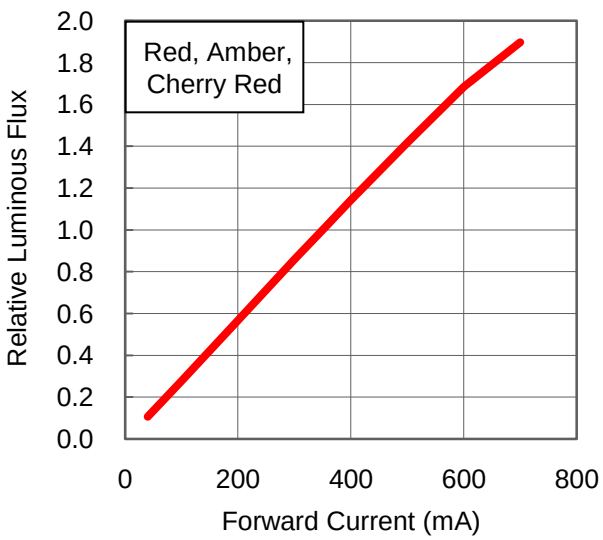
1. Forward Voltage vs. Forward Current





2. Forward Current vs. Normalized Relative Luminous Flux

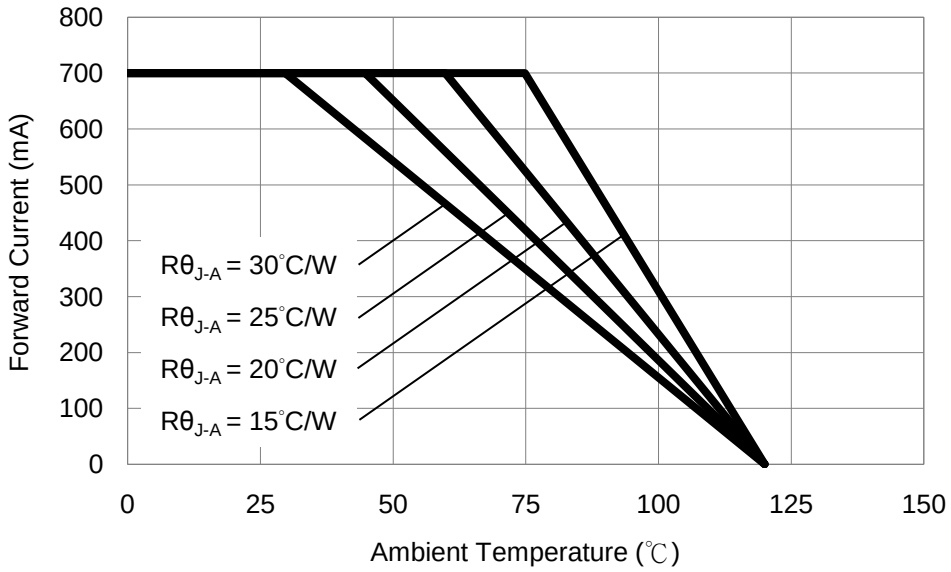




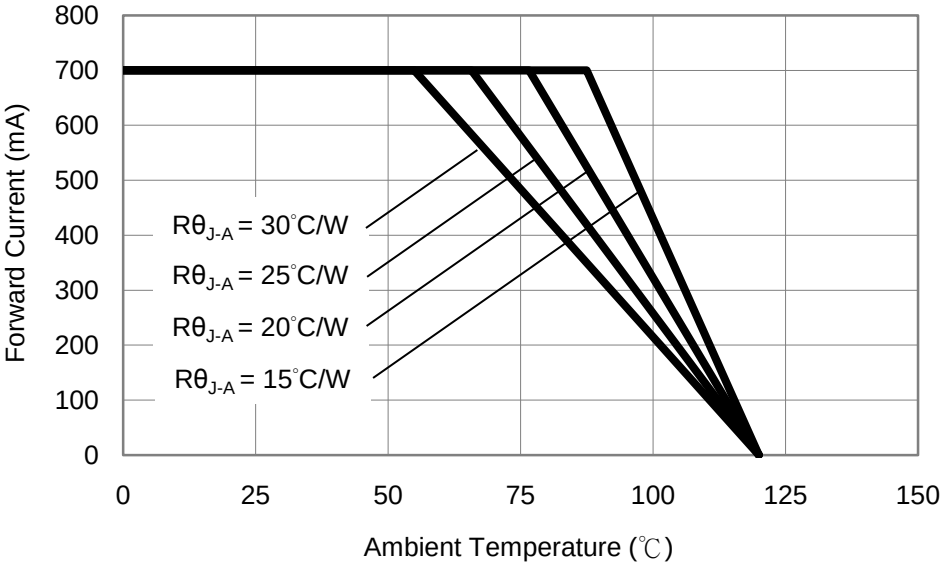
3F No.12, Kung-Yeh 10th Rd., Ping Chen Industrial Zone, Ping Chen, 324, Taoyuan Hsien, Taiwan, R.O.C.
Tel ：886-3-419-2099
Fax ：886-3-419-2377
www.prolightopto.com

Ambient Temperature vs. Maximum Forward Current

1. White, Warm White, Green, Cyan, Blue (T_{JMAX} = 120˚C)



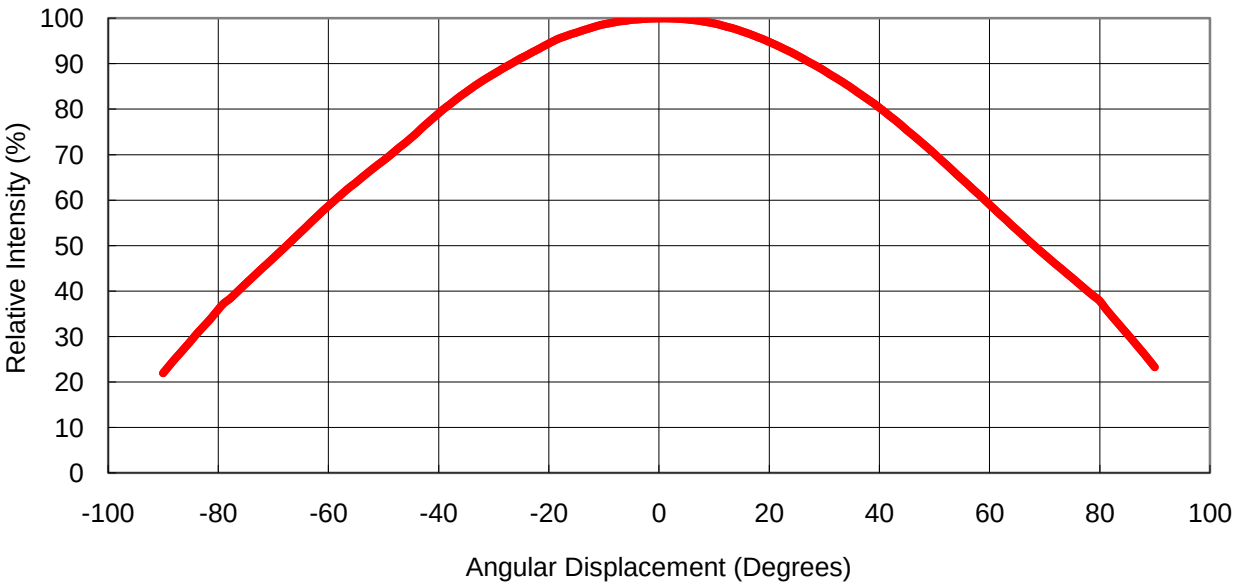
2. Red, Amber, Cherry Red (T_{JMAX} = 120˚C)



3F No.12, Kung-Yeh 10th Rd., Ping Chen Industrial Zone, Ping Chen, 324, Taoyuan Hsien, Taiwan, R.O.C.
Tel ：886-3-419-2099
Fax ：886-3-419-2377
www.prolightopto.com

Typical Representative Spatial Radiation Pattern

Lambertian Radiation Pattern



3F No.12, Kung-Yeh 10th Rd., Ping Chen Industrial Zone, Ping Chen, 324, Taoyuan Hsien, Taiwan, R.O.C.
Tel ：886-3-419-2099
Fax ：886-3-419-2377
www.prolightopto.com

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
Non-operating Thermal Shock (TMSK)	-40°C to 120°C, 20 min. dwell, <20 sec. 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.

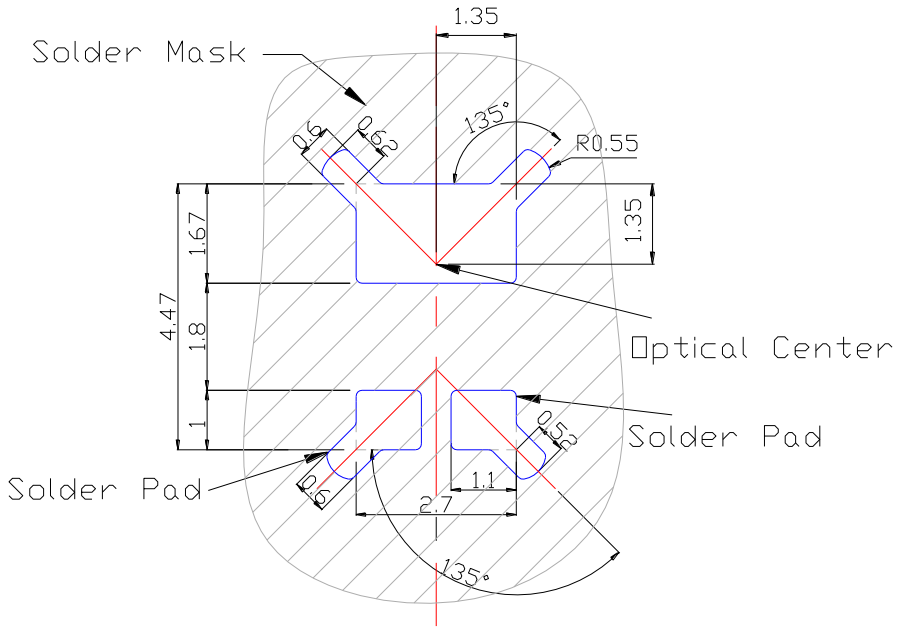
3. A failure is an LED that is open or shorted.

3F No.12, Kung-Yeh 10th Rd., Ping Chen Industrial Zone, Ping Chen, 324, Taoyuan Hsien, Taiwan, R.O.C.
Tel ：886-3-419-2099
Fax ：886-3-419-2377
www.prolightopto.com

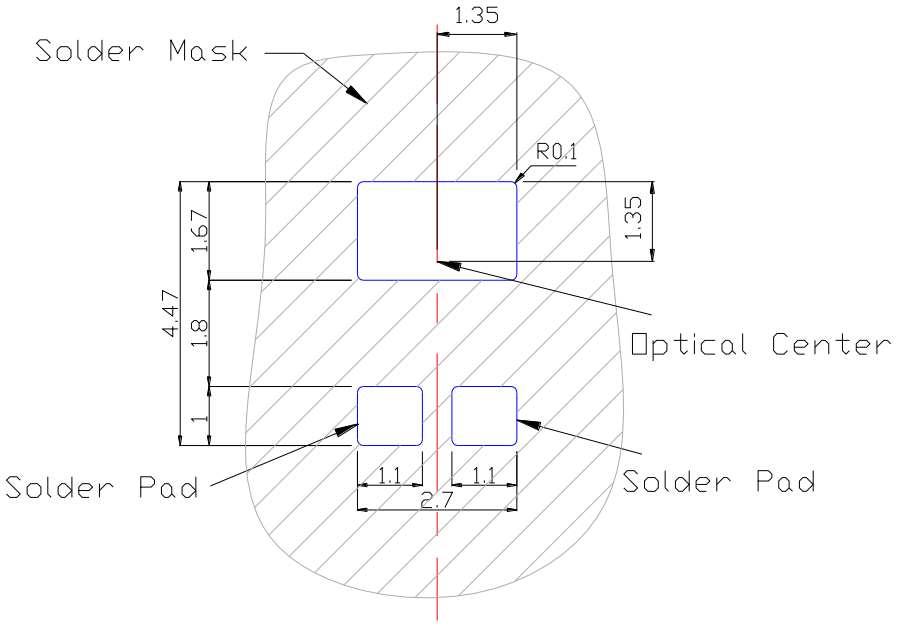
Recommended Solder Pad Design

Standard Emitter

TYPE A.



TYPE B.



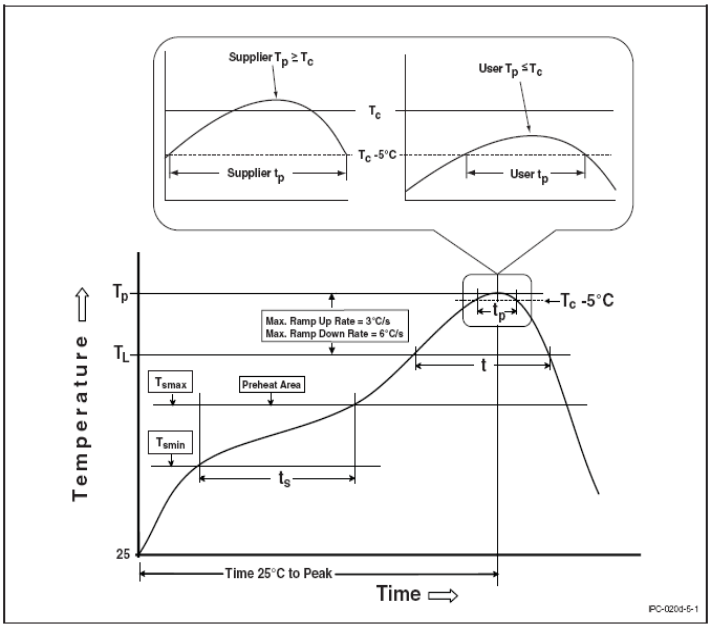
- All dimensions are in millimeters.
- Electrical isolation is required between Slug and Solder Pad.

3F No.12, Kung-Yeh 10th Rd., Ping Chen Industrial Zone, Ping Chen, 324, Taoyuan Hsien, Taiwan, R.O.C.
Tel ：886-3-419-2099
Fax ：886-3-419-2377
www.prolightopto.com

Reflow Soldering Condition

ProLight Opto Technology Corporation

Profile Feature	Sn-Pb Eutectic Assembly	Low-Temp. & Pb-Free Assembly (58Bi-42Sn Eutectic Alloy)
Preheat & Soak Temperature min (T_{smin}) Temperature max (T_{smax}) Time (T_{smin} to T_{smax})	 100 °C 150 °C 60-120 seconds	 90 °C 120 °C 60-120 seconds
Average Ramp-Up Rate (T_{smax} to T_P)	3 °C / second max.	2 °C / second max.
Liquidous temperature (T_L)	183°C	138°C
Time at liquidous (t_L)	60-150 seconds	20-50 seconds
Peak package body temperature (T_P)	235°C	185°C
Time (t_P) within 5°C of the specified classification temperature (T_C)	20 seconds	20 seconds
Average ramp-down rate (T_P to T_{smax})	6 °C/second max.	3 °C/second max.
Time 25°C to Peak Temperature	6 minutes max.	4 minutes max.

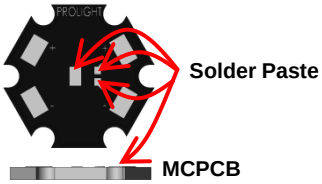


- All temperatures refer to topside of the package, measured on the package body surface.
- Repairing should not be done after the LEDs have been soldered. When repairing is unavoidable, a heat plate should be used. It should be confirmed beforehand whether the characteristics of LEDs will or will not be damaged by repairing.
- Reflow soldering should not be done more than two times.
- When soldering, do not put stress on the LEDs during heating.
- After soldering, do not warp the circuit board.

3F No.12, Kung-Yeh 10th Rd., Ping Chen Industrial Zone, Ping Chen, 324, Taoyuan Hsien, Taiwan, R.O.C.
Tel ：886-3-419-2099
Fax ：886-3-419-2377
www.prolightopto.com

Heat Plate Soldering Condition

(1) Soldering Process for Solder Paste



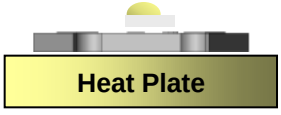
Use Solder Mask to print Solder Paste on MCPCB.

⇩



Place Emitter on MCPCB.

⇩



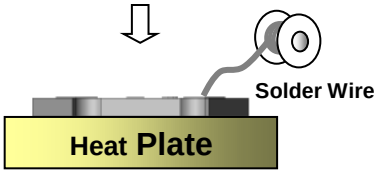
Put MCPCB on Heat Plate until Solder Paste melt.
The Solder Paste sould be melted within 10 seconds.
Take out MCPCB out from Heat Plate within 15 seconds.

(2) Soldering Process for Solder Wire



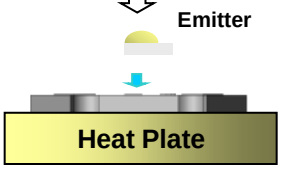
Put MCPCB on Heat Plate.

⇩



Place Solder Wire to the solder pad of MCPCB.

⇩

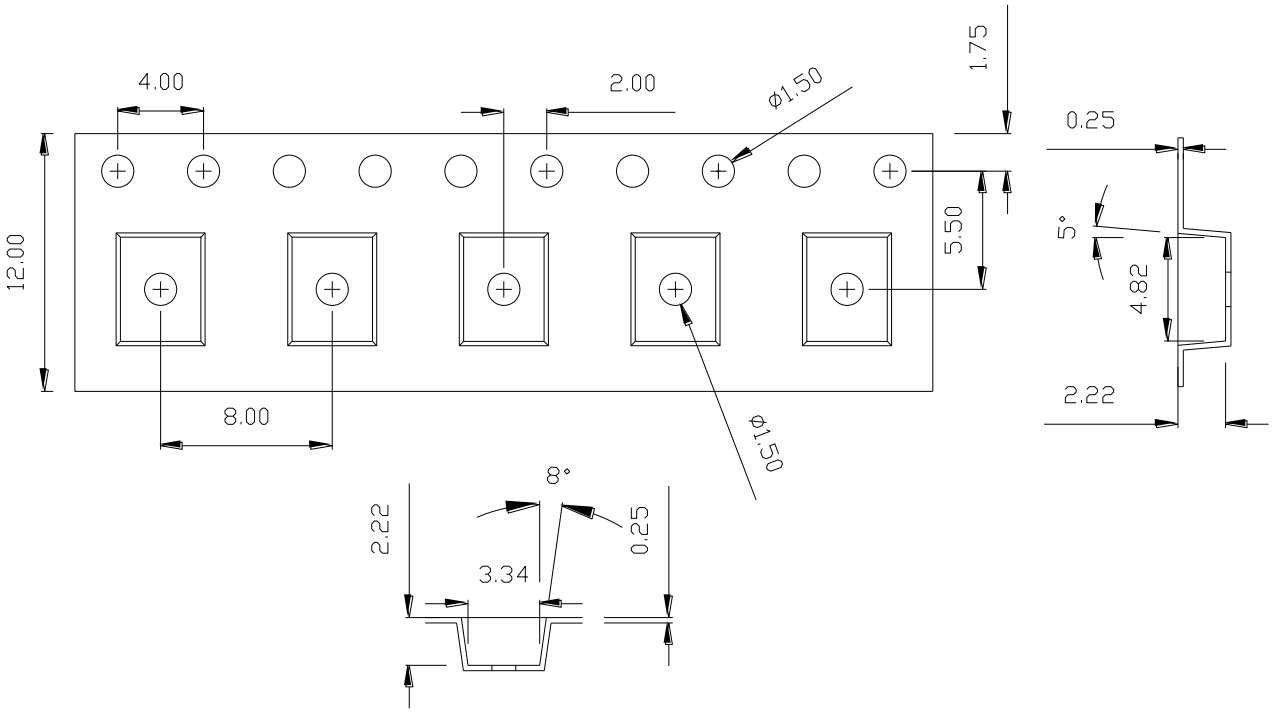


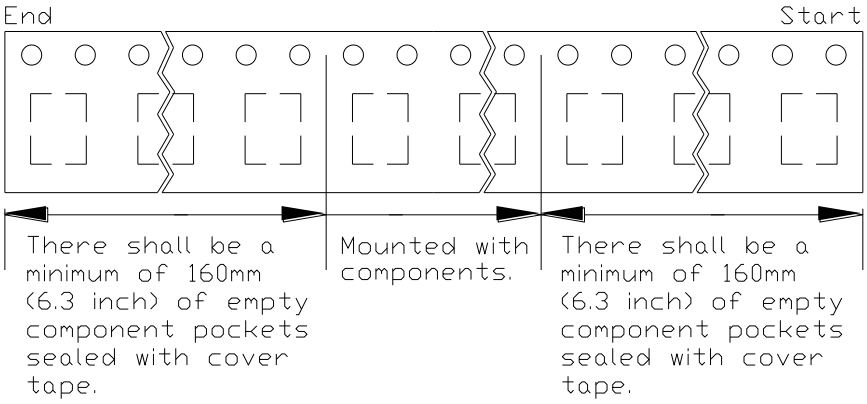
Put Emitter on MCPCB. Take the MCPCB out
From Heat Plate within 10 seconds.

- Heat plate temperature: 260˚C max for Lead Solder and 260˚C max for Lead-Free Solder.
- When soldering, do not put stress on the LEDs during heating.
- After soldering, do not warp the circuit board.

3F No.12, Kung-Yeh 10th Rd., Ping Chen Industrial Zone, Ping Chen, 324, Taoyuan Hsien, Taiwan, R.O.C.
Tel ：886-3-419-2099
Fax ：886-3-419-2377
www.prolightopto.com

Emitter Reel Packaging

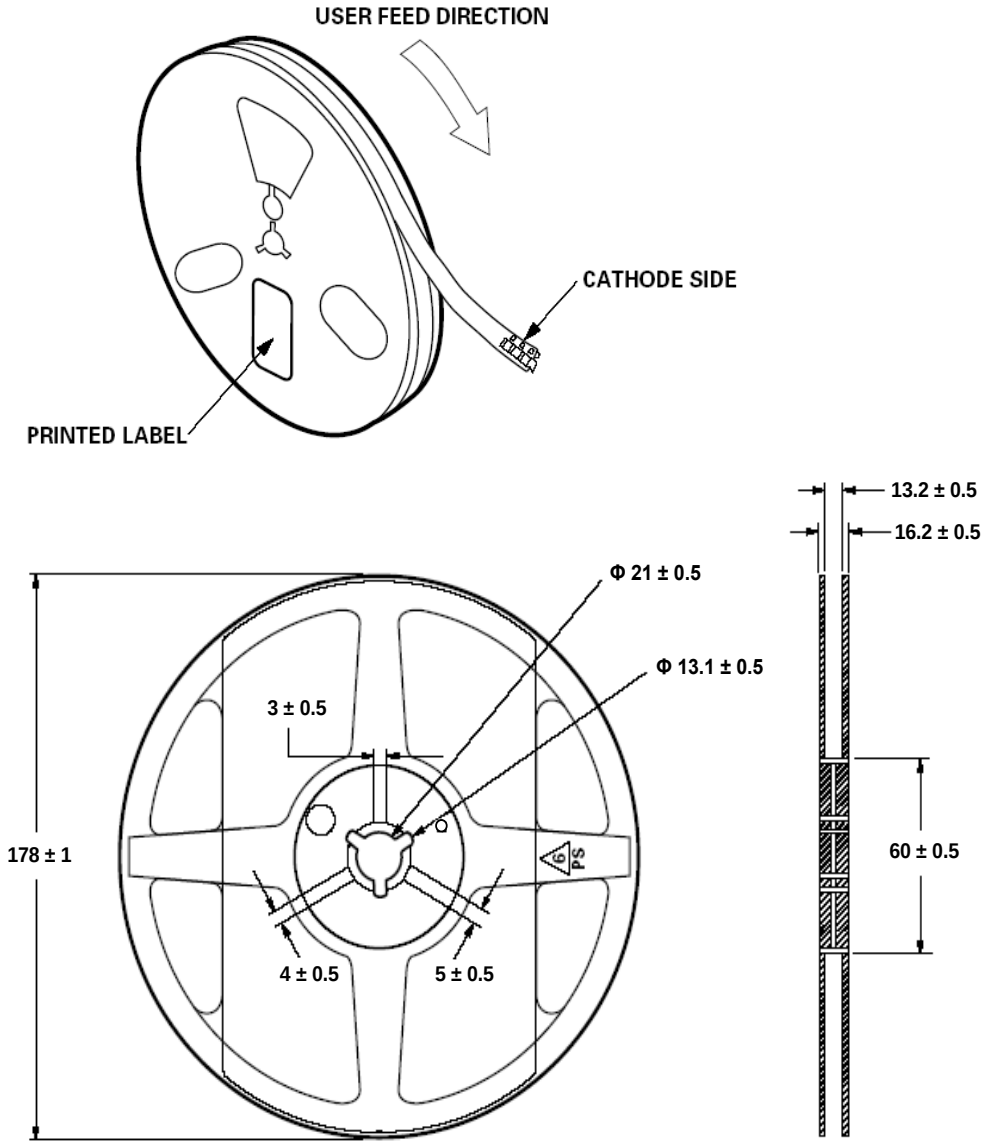




Notes:
1. Drawing not to scale.
2. All dimensions are in millimeters.
3. General tolerance is ± 0.10 mm.

3F No.12, Kung-Yeh 10th Rd., Ping Chen Industrial Zone, Ping Chen, 324, Taoyuan Hsien, Taiwan, R.O.C.
Tel ：886-3-419-2099
Fax ：886-3-419-2377
www.prolightopto.com

Emitter Reel Packaging



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

3F No.12, Kung-Yeh 10th Rd., Ping Chen Industrial Zone, Ping Chen, 324, Taoyuan Hsien, Taiwan, R.O.C.
Tel ：886-3-419-2099
Fax ：886-3-419-2377
www.prolightopto.com

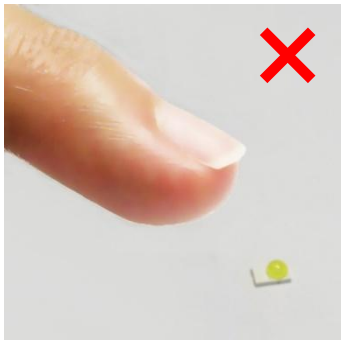
Precaution for Use

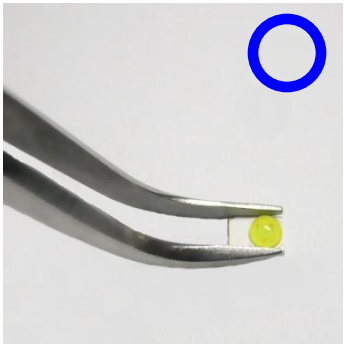
- Storage
  Please do not open the moisture barrier bag (MBB) more than one week. This may cause the leads of LED discoloration. We recommend storing ProLight's LEDs in a dry box after opening the MBB. The recommended storage conditions are temperature 5 to 30°C and humidity less than 40% RH. It is also 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.
- The slug is to be soldered. If not, please use the heat conductive adhesive.
- 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 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)





3F No.12, Kung-Yeh 10th Rd., Ping Chen Industrial Zone, Ping Chen, 324, Taoyuan Hsien, Taiwan, R.O.C.
Tel ：886-3-419-2099
Fax ：886-3-419-2377
www.prolightopto.com