ProLight PV2N-4LxE-xWFC
4W Power LED
Technical Datasheet
Version: 1.5

ProLight Opto PV2N Series

Features

- Best Moisture Sensitivity: JEDEC Level 1
- RoHS compliant
- Very wide Viewing Angle

Main Applications

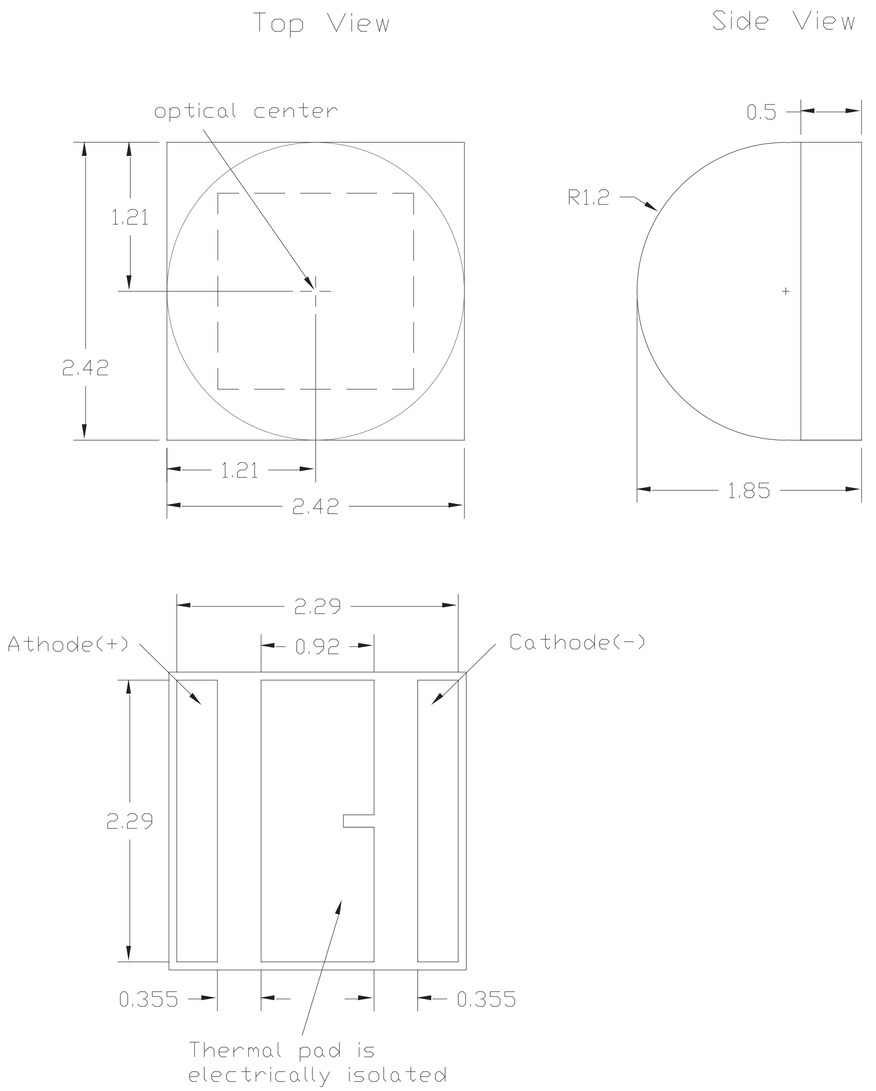
- Commercial Lighting
- Indoor Lighting
- Outdoor Lighting
- Warning Lighting
- Architectural
- Horticulture
- Consumer Portable
- High-End Portable

Introduction

·ProLight 2424, is one of the smallest high power LED footprint available by ProLight Opto, has offered extended solid-state lighting design possibilities. The 2424's combination of consistent design across all configurations and its small size permit improved color mixing and optical control, compared to the larger 3535 LED. ProLight 2424 is designed with ProLight unique packaging technology which providing high stability reliability.

·2424 qualifies as the JEDEC Level 1 MSL sensitivity level and suitable for SMD process, Pb free reflow soldering capability, and full compliance with EU education of Hazardous Substances (RoHS) legislation.

Emitter Mechanical Dimensions



Notes:
1. Drawing not to scale.
2. All dimensions are in millimeters.
3. Unless otherwise indicated, tolerances are ± 0.1mm.
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.

Flux Characteristics, T_J = 25°C

Color	Part Number Emitter	Luminous Flux Φ_V (lm) @350mA Min.	@350mA Typ.	Refer @700mA Typ.	Refer @1000mA Typ.	Refer @1500mA Typ.	CRI Typ.
White	PV2N-4LWE-WFC	155	170	315	425	585	70
Warm White	PV2N-4LVE-WFC	130	145	270	365	500	70
PC Amber	PV2N-4LPE-AWFC	90	110	200	270	-	-

- 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) Min.	@350mA Typ.	Max.	Refer @700mA Typ.	Refer @1000mA Typ.	Refer @1500mA Typ.	Thermal Resistance Junction to Slug (°C/ W)
White	2.60	2.80	3.40	2.92	3.00	3.15	3
Warm White	2.60	2.80	3.40	2.92	3.00	3.15	3
PC Amber	2.60	2.80	3.40	2.92	3.00	-	3

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

Optical Characteristics at 350mA, T_J = 25°C

Radiation Pattern	Color	Dominant Wavelength λ_D, or Color Temperature CCT Min.	Typ.	Max.	Viewing Angle (degrees) $2\ \theta_{1/2}$
Lambertian	White	4800 K	5600 K	6450 K	130
	Warm White	2580 K	2900 K	3250 K	130
	PC Amber	587.5 nm	589.7 nm	592.5 nm	130

- ProLight maintains a tolerance of ± 1nm for dominant wavelength measurements.
- ProLight maintains a tolerance of ± 5% for CCT measurements.

Absolute Maximum Ratings

Parameter	White/Warm White
DC Forward Current (mA)	1500
Peak Pulsed Forward Current (mA)	1800 (less than 1/10 duty cycle@1KHz)
ESD Sensitivity (HBM per MIL-STD-883E Method 3015.7)	2KV
LED Junction Temperature	150°C
Operating Temperature	-40°C - 120°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

Parameter	PC Amber
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	150°C
Operating Temperature	-40°C - 120°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 350mA

Color	Bin Code	Minimum Photometric Flux (lm)	Maximum Photometric Flux (lm)	Available Color Bins
White	X1	155	170	All
	X2	170	185	[1]
	Y1	185	200	[1]
Warm White	W1	130	140	All
	W2	140	155	[1]
	X1	155	170	[1]
PC Amber	U1	90	100	3
	U2	100	110	2,3
	V1	110	120	2
	V2	120	130	[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.

Forward Voltage Bin Structure at 350mA

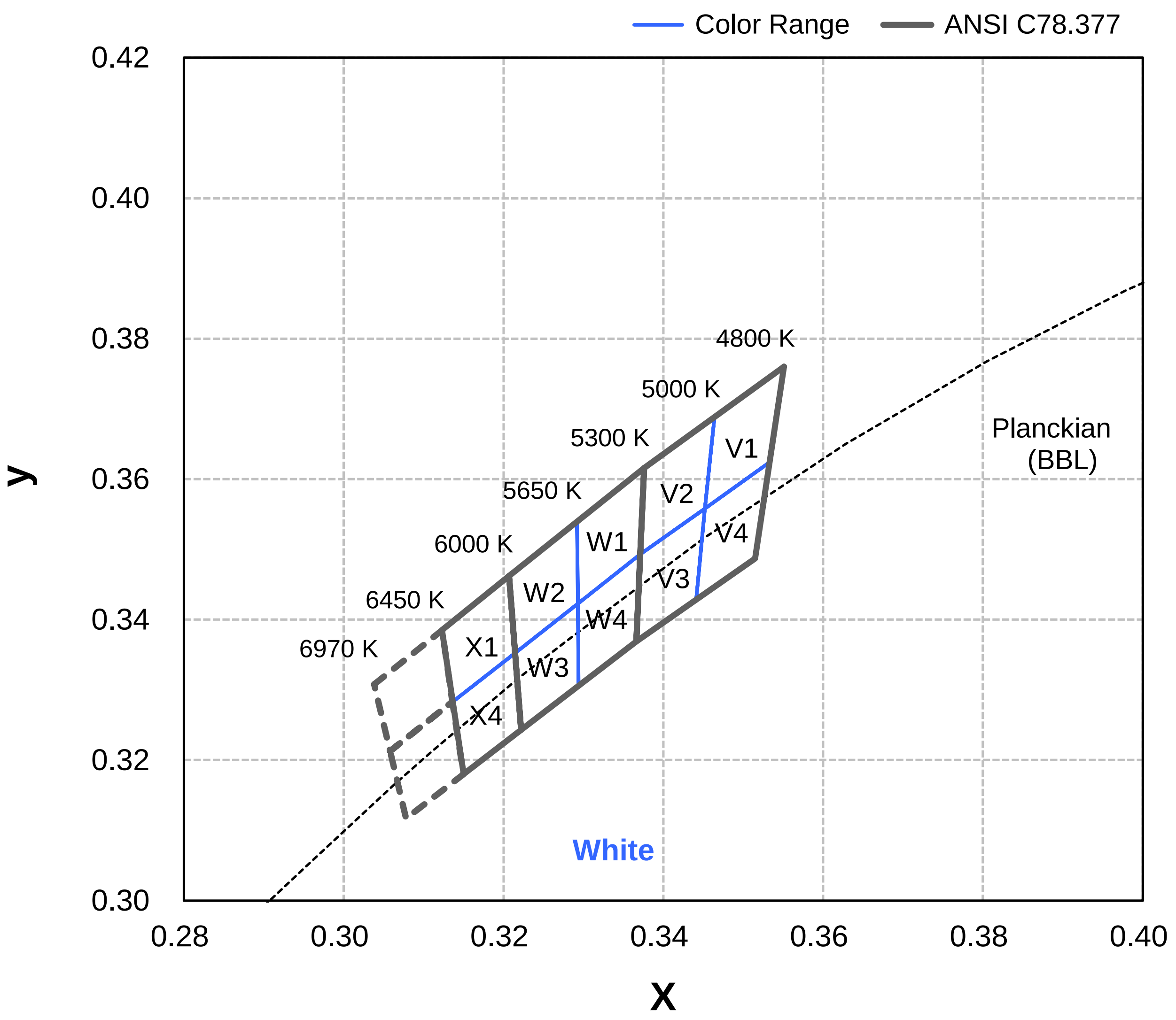
Color	Bin Code	Minimum Voltage (V)	Maximum Voltage (V)
White	a	2.6	2.8
	A	2.8	3.0
	B	3.0	3.2
	D	3.2	3.4
Warm White	a	2.6	2.8
	A	2.8	3.0
	B	3.0	3.2
	D	3.2	3.4
PC Amber	a	2.6	2.8
	A	2.8	3.0
	B	3.0	3.2
	D	3.2	3.4

- ProLight maintains a tolerance of ± 0.1V 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



Color Bin

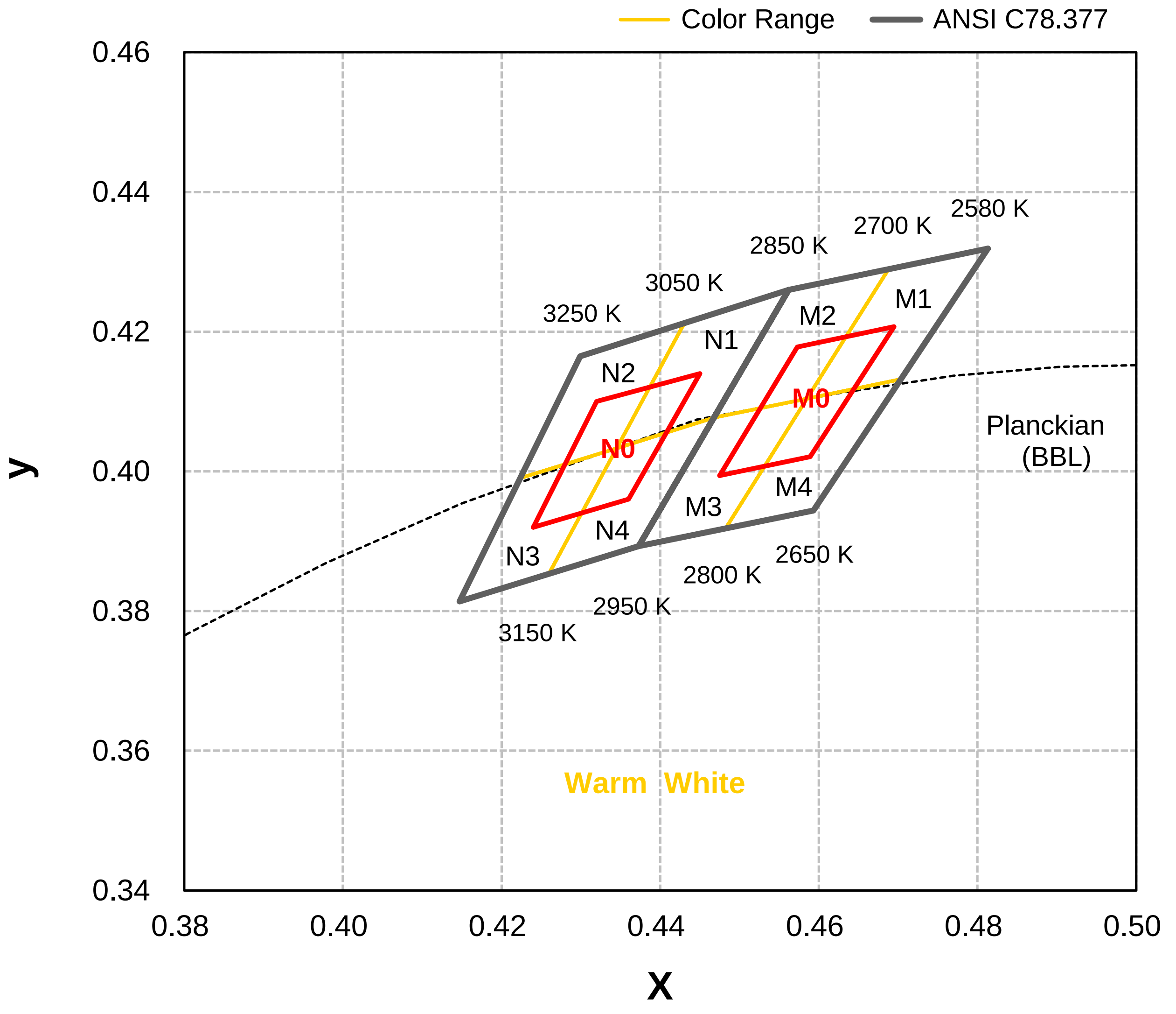
White Bin Structure

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

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

Color Bin

Warm White Binning Structure Graphical Representation



Color Bin

Warm White Bin Structure

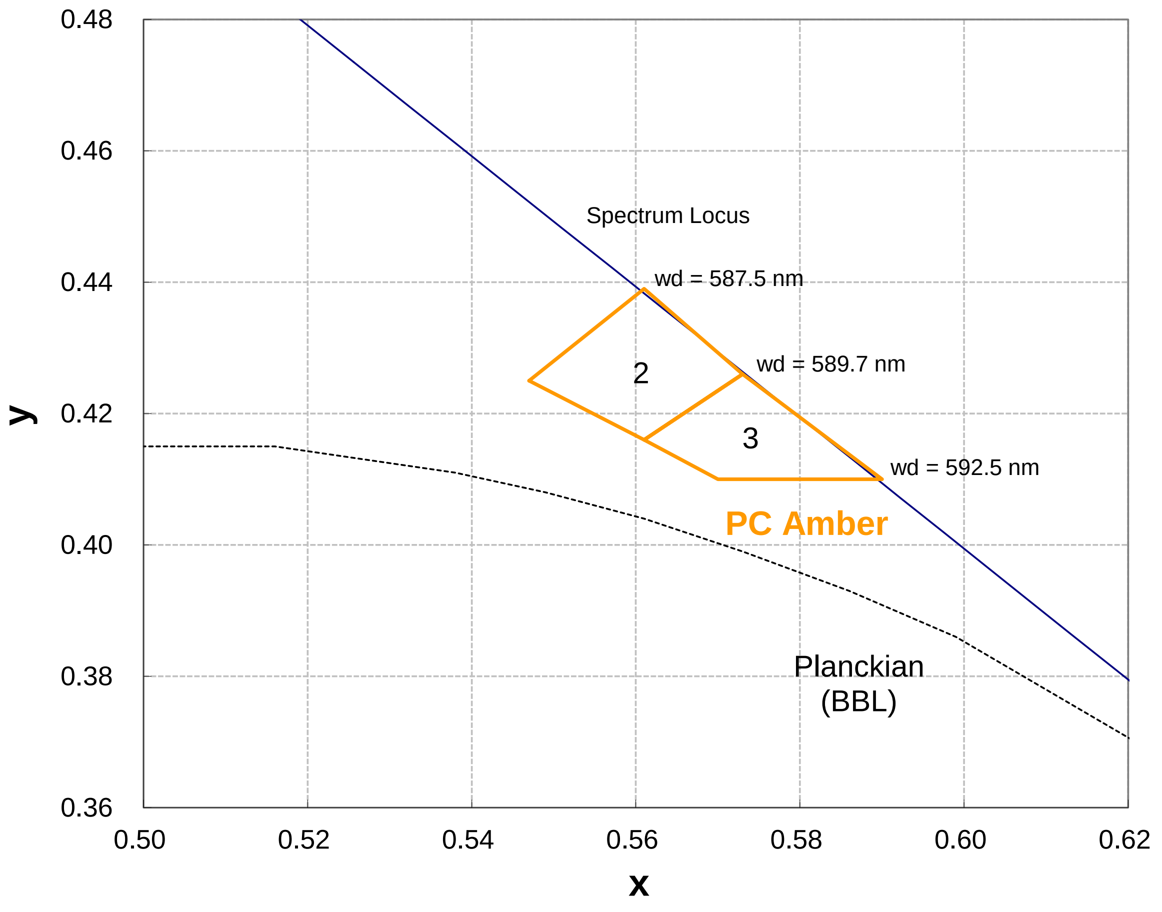
Bin Code	x	y	Typ. CCT (K)	Bin Code	x	y	Typ. CCT (K)
M1	0.481 0.469 0.459 0.470	0.432 0.429 0.410 0.413	2650	N1	0.443 0.456 0.447 0.435	0.421 0.426 0.408 0.403	2950
M4	0.470 0.459 0.448 0.459	0.413 0.410 0.392 0.394	2650	N4	0.435 0.447 0.437 0.426	0.403 0.408 0.389 0.385	2950
M0	0.448 0.457 0.470 0.459	0.399 0.418 0.421 0.402	2700	N0	0.424 0.432 0.445 0.436	0.392 0.410 0.414 0.396	3050
M2	0.469 0.456 0.447 0.459	0.429 0.426 0.408 0.410	2800	N2	0.430 0.443 0.435 0.422	0.417 0.421 0.403 0.399	3150
M3	0.459 0.447 0.437 0.448	0.410 0.408 0.389 0.392	2800	N3	0.422 0.435 0.426 0.415	0.399 0.403 0.385 0.381	3150

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

Note:
1. 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.
2. ProLight **SmartBin** is working to make the color bin smarter, by selecting that intelligence is infused into major **M0 , N0** bin with minor M1-M4 , N1-N4 bins and processes that make assembly easily

Color Bin

PC Amber Binning Structure Graphical Representation



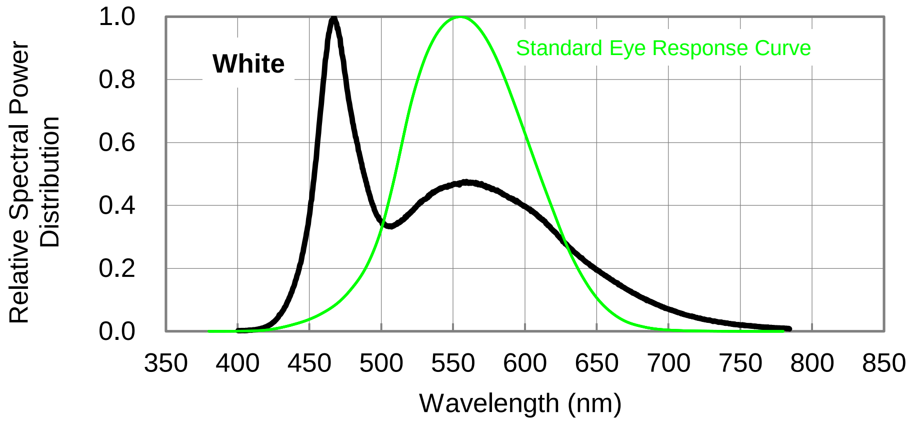
PC Amber Bin Structure

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

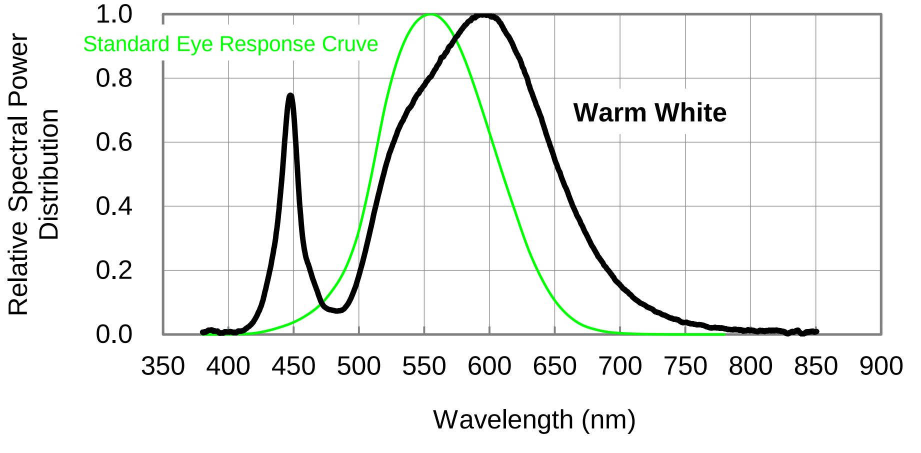
- Tolerance on each color bin (x , y) is ± 0.005

Color Spectrum, T_J = 25˚C

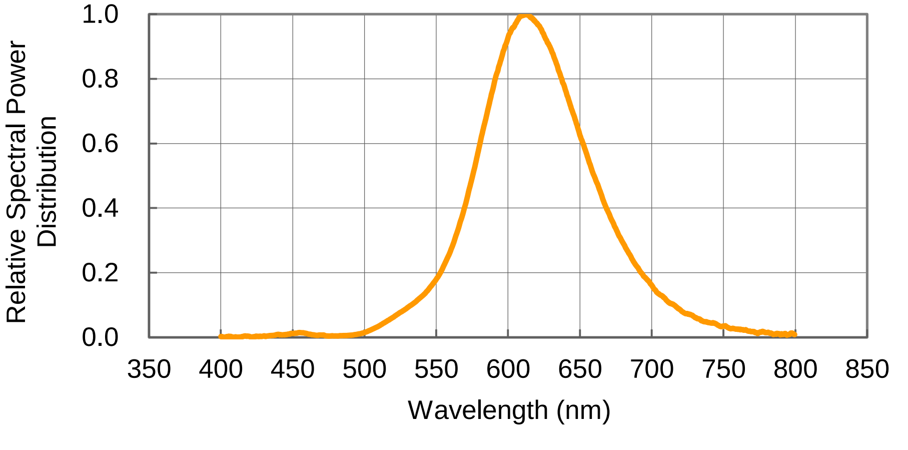
1. White



2. Warm White

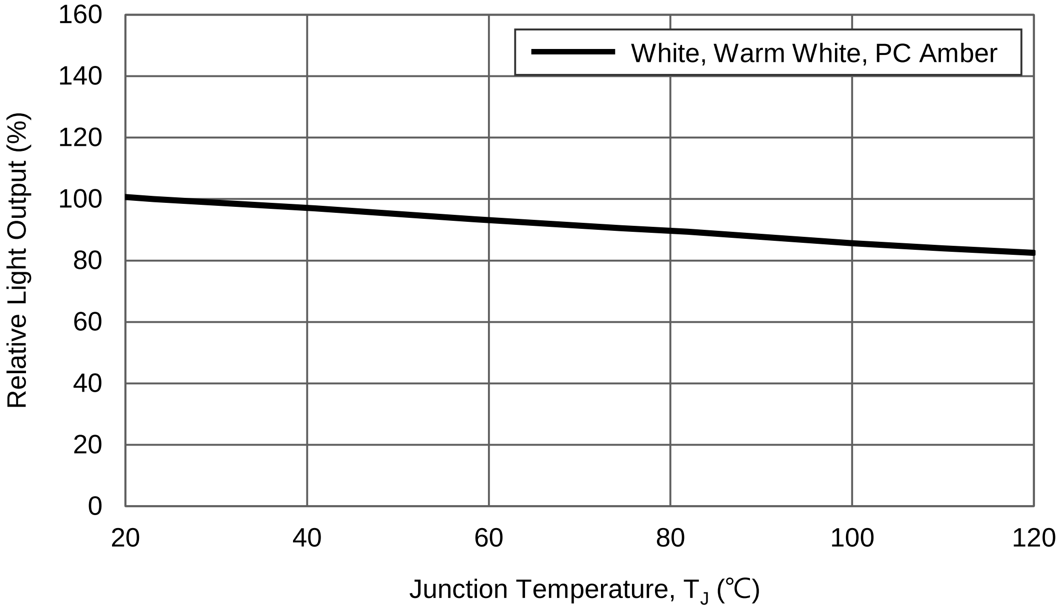


3. PC Amber



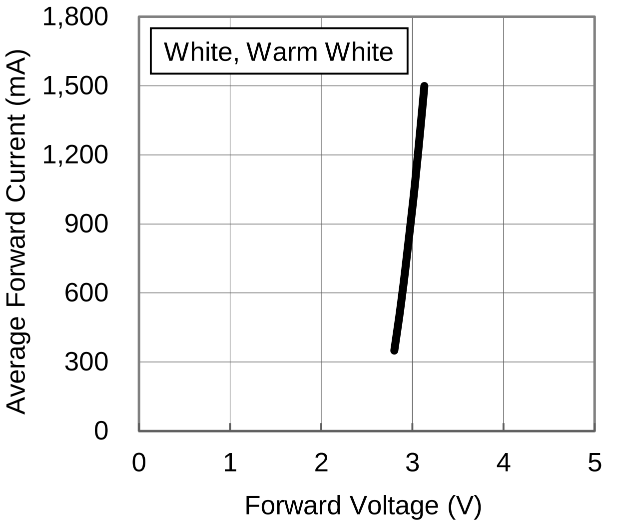
Light Output Characteristics

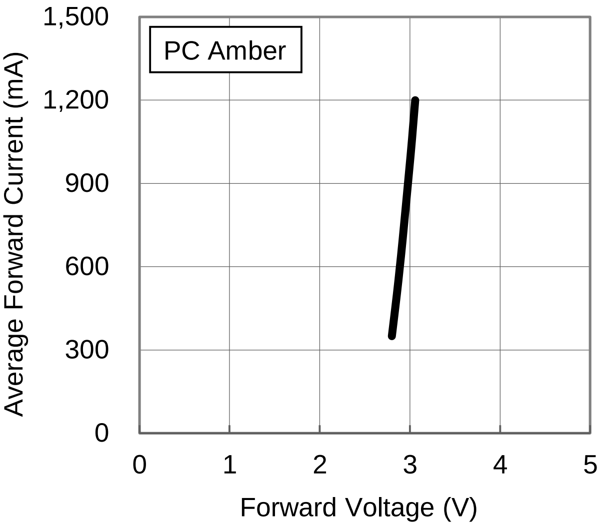
Relative Light Output vs. Junction Temperature at 350mA



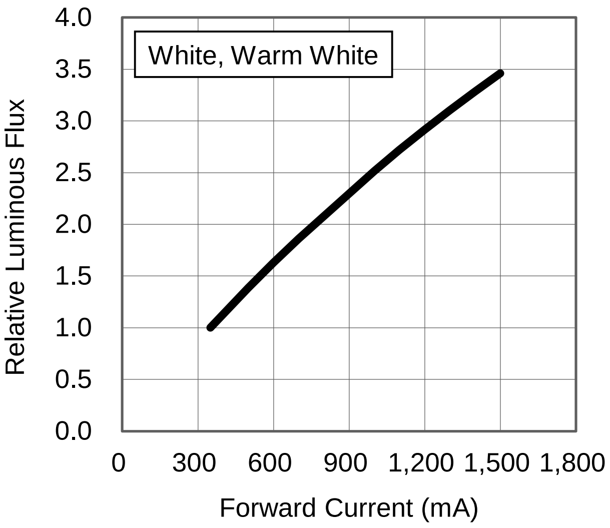
Forward Current Characteristics, $T_J = 25^{\circ}C$

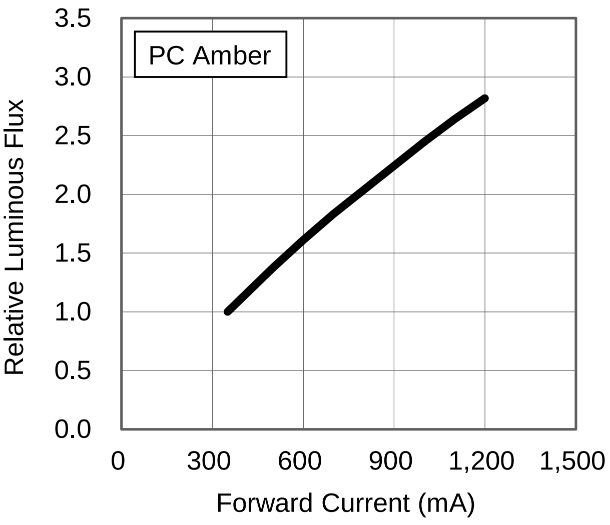
1. Forward Voltage vs. Forward Current





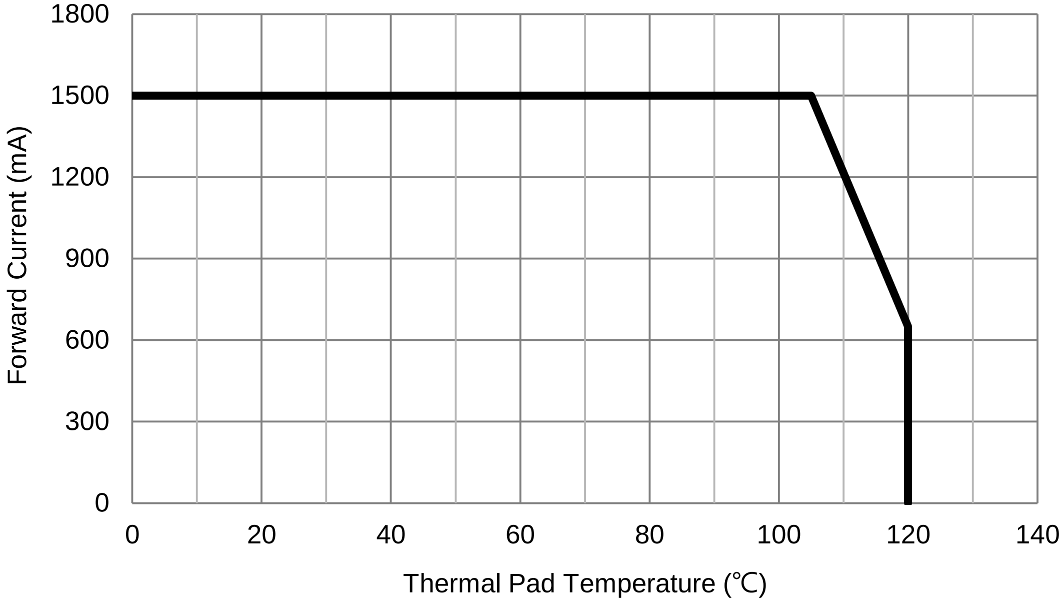
2. Forward Current vs. Normalized Relative Luminous Flux



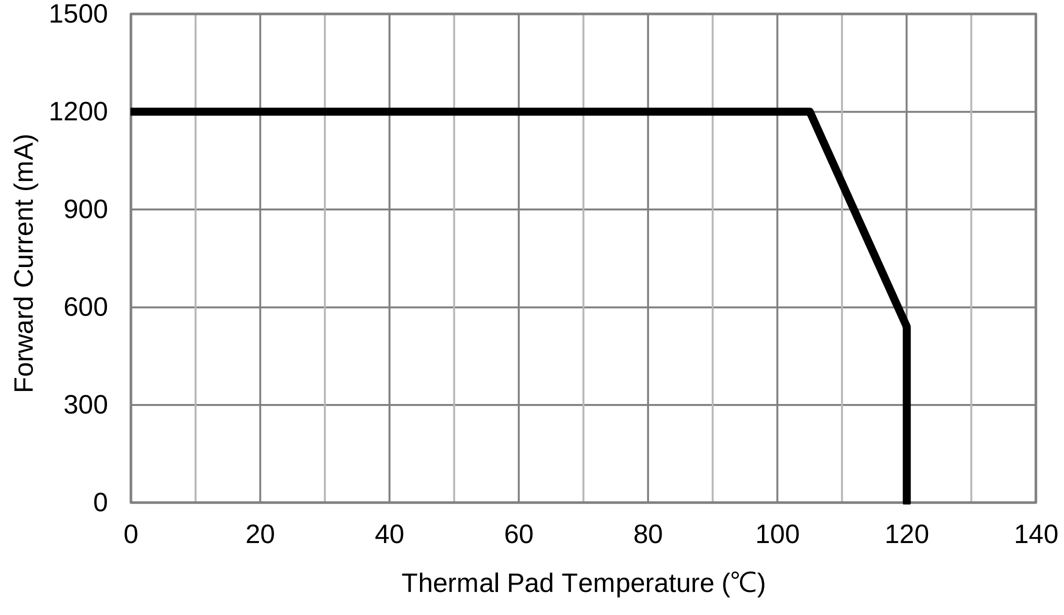


Thermal Pad Temperature vs. Maximum Forward Current

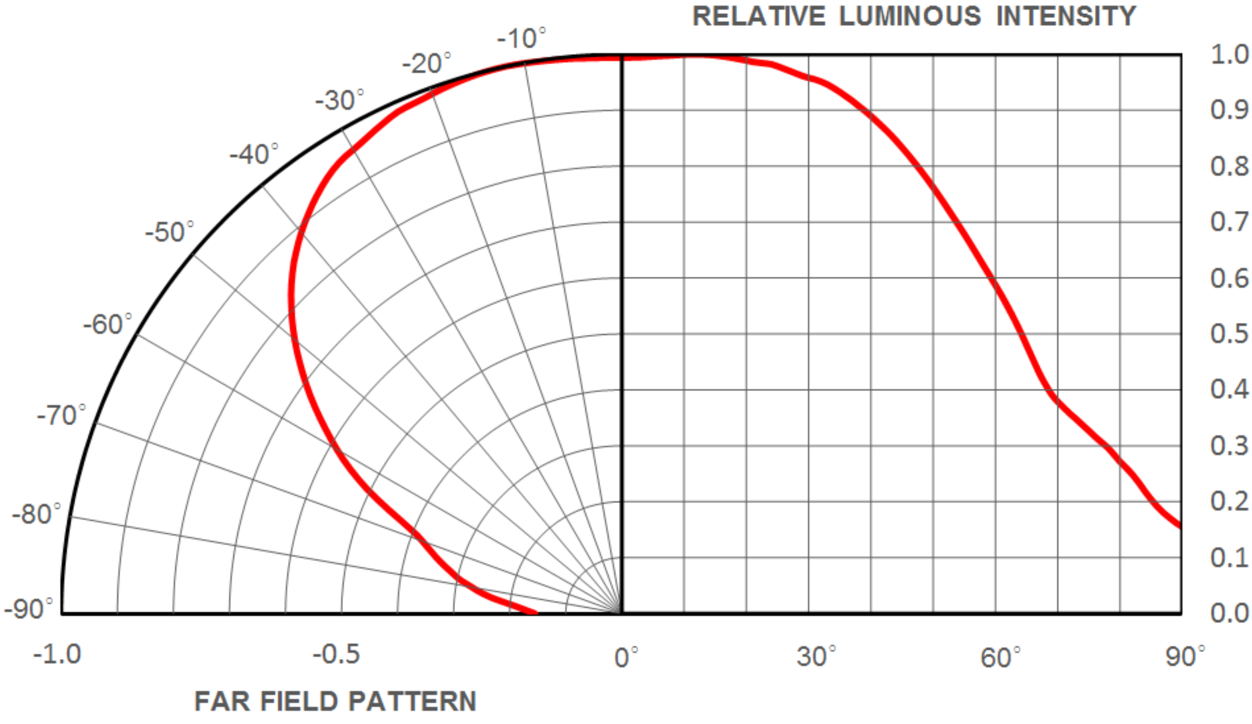
1. White, Warm White



2. PC Amber



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

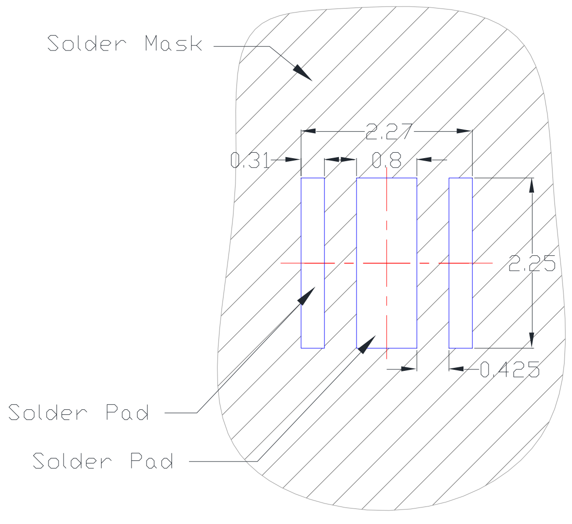
Item	Test Condition	Criteria for Judgement	
		Min.	Max.
Forward Voltage (V_F)	I_F = max DC	--	Initial Level x 1.1
Luminous Flux or Radiometric Power (Φ_V)	I_F = max DC	Initial Level x 0.7	--
Reverse Current (I_R)	V_R = 5V	--	50 µA

* 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

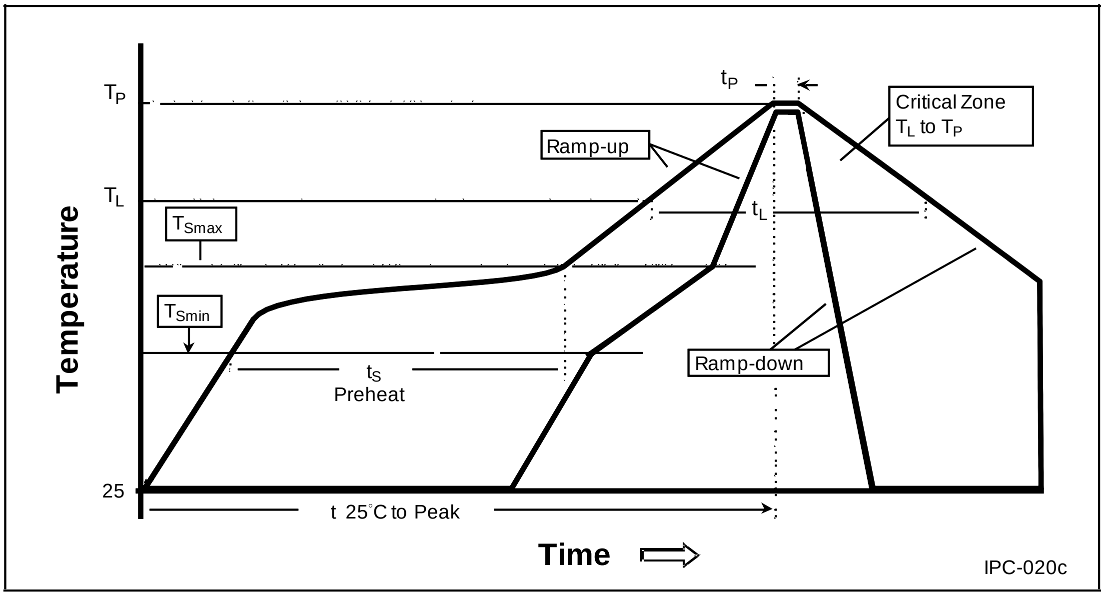
Standard Emitter



- All dimensions are in millimeters.

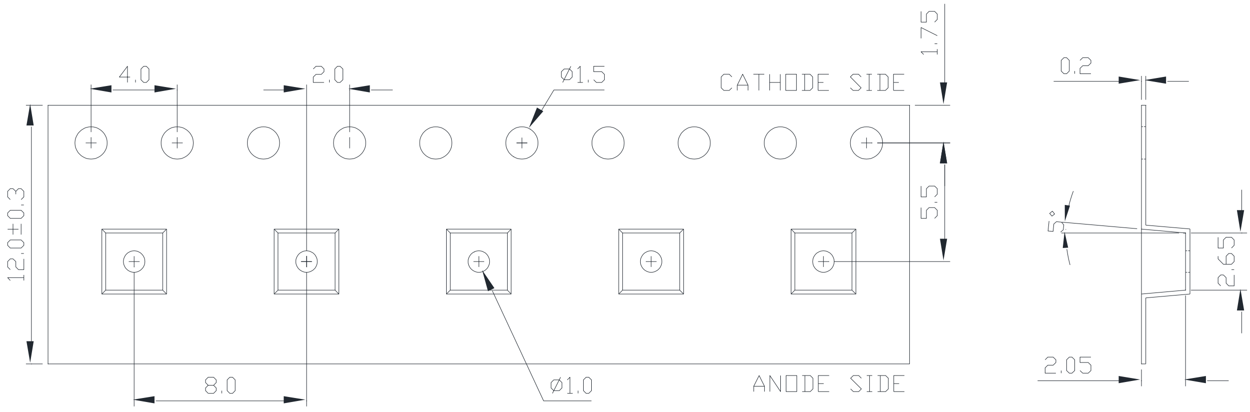
Reflow Soldering Condition

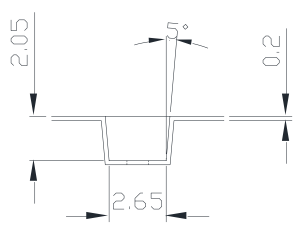
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average Ramp-Up Rate (T_{Smax} to T_P)	3°C / second max.	3°C / second max.
Preheat – Temperature Min (T_{Smin}) – Temperature Max (T_{Smax}) – Time (t_{Smin} to t_{Smax})	 100°C 150°C 60-120 seconds	 150°C 200°C 60-180 seconds
Time maintained above: – 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.

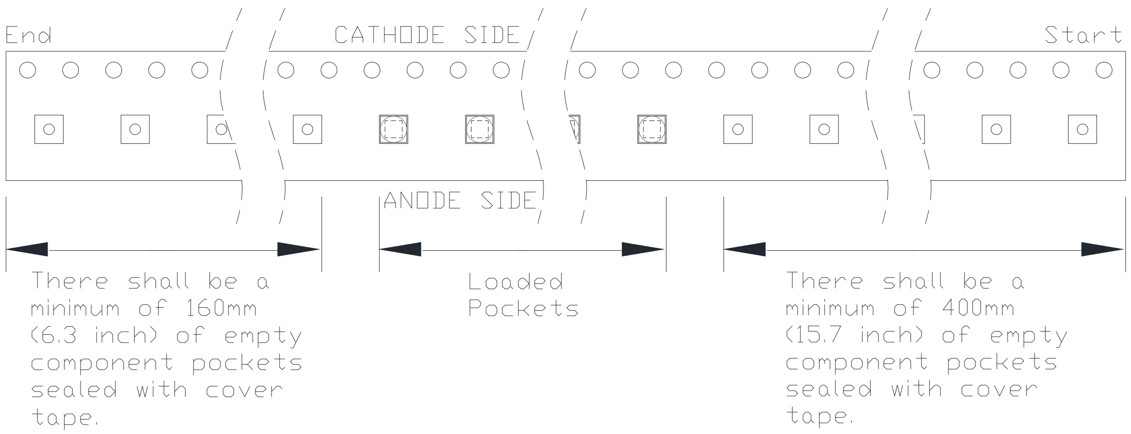


- **We recommend using the M705-S101-S4 solder paste from SMIC (Senju Metal Industry Co., Ltd.) for lead-free soldering.**
- **Do not use solder pastes with post reflow flux residue>47%. (58Bi-42Sn eutectic alloy, etc) This kind of solder pastes may cause a reliability problem to LED.**
- All temperatures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

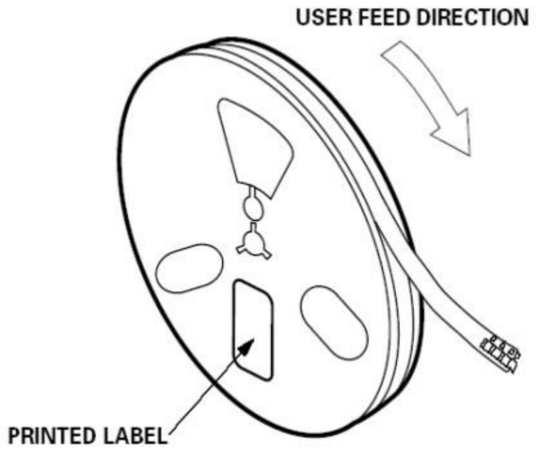


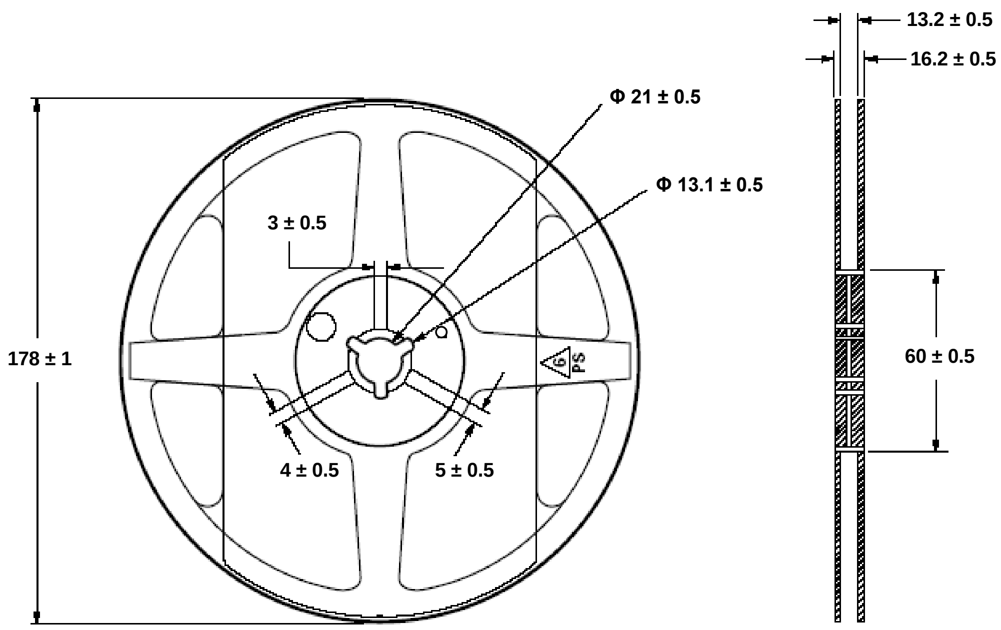




Notes:
1. Drawing not to scale.
2. All dimensions are in millimeters.
3. Unless otherwise indicated, tolerances are ± 0.1mm.

Emitter Reel Packaging





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

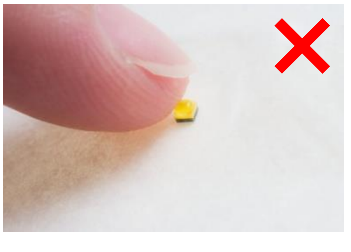
Precaution for Use

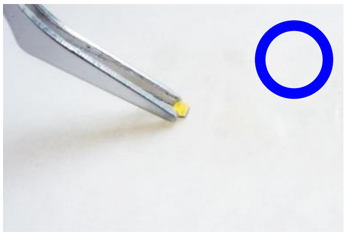
- Storage
  Please do not open the moisture barrier bag (MBB) more than one week. This may cause the leads of LED discoloration. We recommend storing ProLight's LEDs in a dry box after opening the MBB. The recommended storage conditions are temperature 5 to 30˚C and humidity less than 40% RH. It is also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