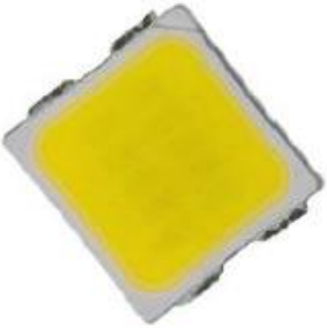
RoHS Pb Free



ProLight PF2E-6FxE-7xxN24V2
6W Power LED
Technical Datasheet
Version: 1.0

ProLight Opto PF2E Series

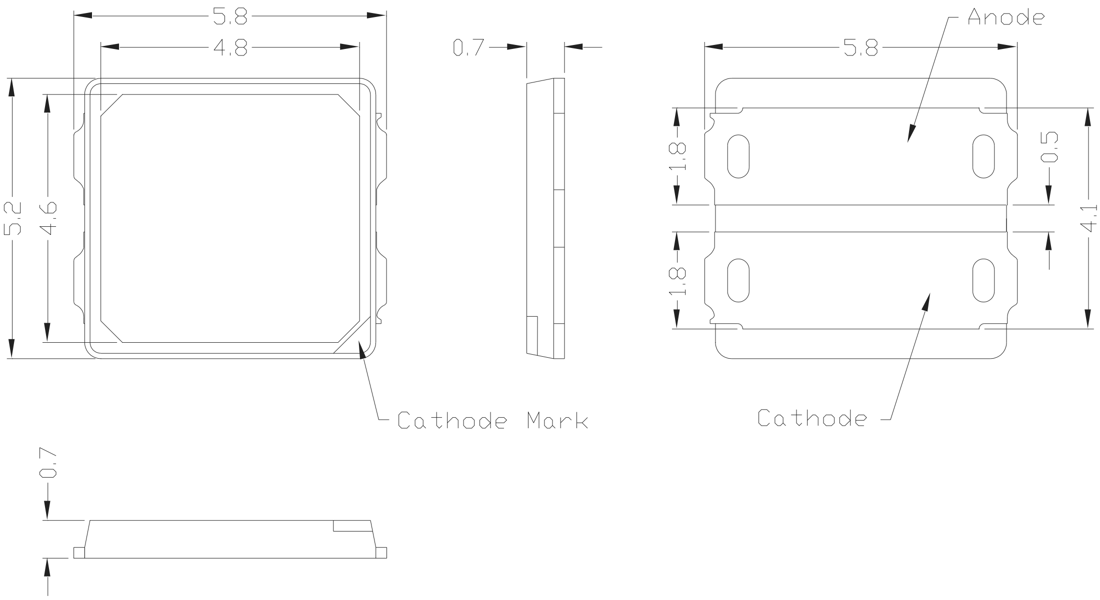
Features

- Industry-compatible size : 5.2 x 5.8 x 0.7 mm
- 6-V configuration
- RoHS compliant

Main Applications

- Warning Light
- Indoor lighting
- Outdoor lighting
- Architectural

Mechanical Dimensions



Notes:
1. The cathode side of the device is denoted by the chamfer on the part body.
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 at 640mA, T_J = 25°C

Radiation Pattern	Color	Part Number	Luminous Flux Φ_V (lm) Min.	Typ.	CRI Min.
Lambertian	Warm White	PF2E-6FVE-730N24V2	640	670	70
	Neutral White	PF2E-6FNE-740N24V2	700	740	70
	White	PF2E-6FWE-750N24V2	700	740	70
	White	PF2E-6FWE-765N24V2	700	730	70

- 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 at 640mA, T_J = 25°C

Forward Voltage V_F (V) Min.	Typ.	Max.	Thermal Resistance Junction to Solder Pad (℃/W) Typ.
5.6	6.0	6.4	2

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

Optical Characteristics at 640mA, T_J = 25°C

Part Number	Color Temperature CCT Min.	Typ.	Max.	Viewing Angle (FWHM, degrees) Typ.
PF2E-6FVE-730N24V2	2880 K	3000 K	3210 K	120
PF2E-6FNE-740N24V2	3755 K	4000 K	4260 K	120
PF2E-6FWE-750N24V2	4735 K	5000 K	5370 K	120
PF2E-6FWE-765N24V2	6080 K	6500 K	7065 K	120

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

Absolute Maximum Ratings

Parameter	Warm White/Neutral White/White
Max DC Forward Current (mA)	1000
Peak Pulsed Forward Current (mA)	1200 (less than 1/10 duty cycle@1KHz)
ESD Sensitivity (HBM per MIL-STD-883E Method 3015.7)	±2000V
LED Junction Temperature	125°C
Operating Temperature	-40°C - 100°C
Storage Temperature	-40°C - 100°C
Reverse Voltage	Not designed to be driven in reverse bias
Moisture Sensitivity Rating	MSL 3

Photometric Luminous Flux Bin Structure

Part Number	Bin Code	Minimum Photometric Flux (lm)	Maximum Photometric Flux (lm)	Available Color Bins
PF2E-6FVE-730N24V2	WC	640	660	All
	WD	660	680	[1]
	WE	680	700	[1]
	WF	700	720	[1]
PF2E-6FNE-740N24V2	WF	700	720	All
	WG	720	740	[1]
	WH	740	760	[1]
	WI	760	780	[1]
PF2E-6FWE-750N24V2 PF2E-6FWE-765N24V2	WF	700	720	All
	WG	720	740	[1]
	WH	740	760	[1]
	WI	760	780	[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.

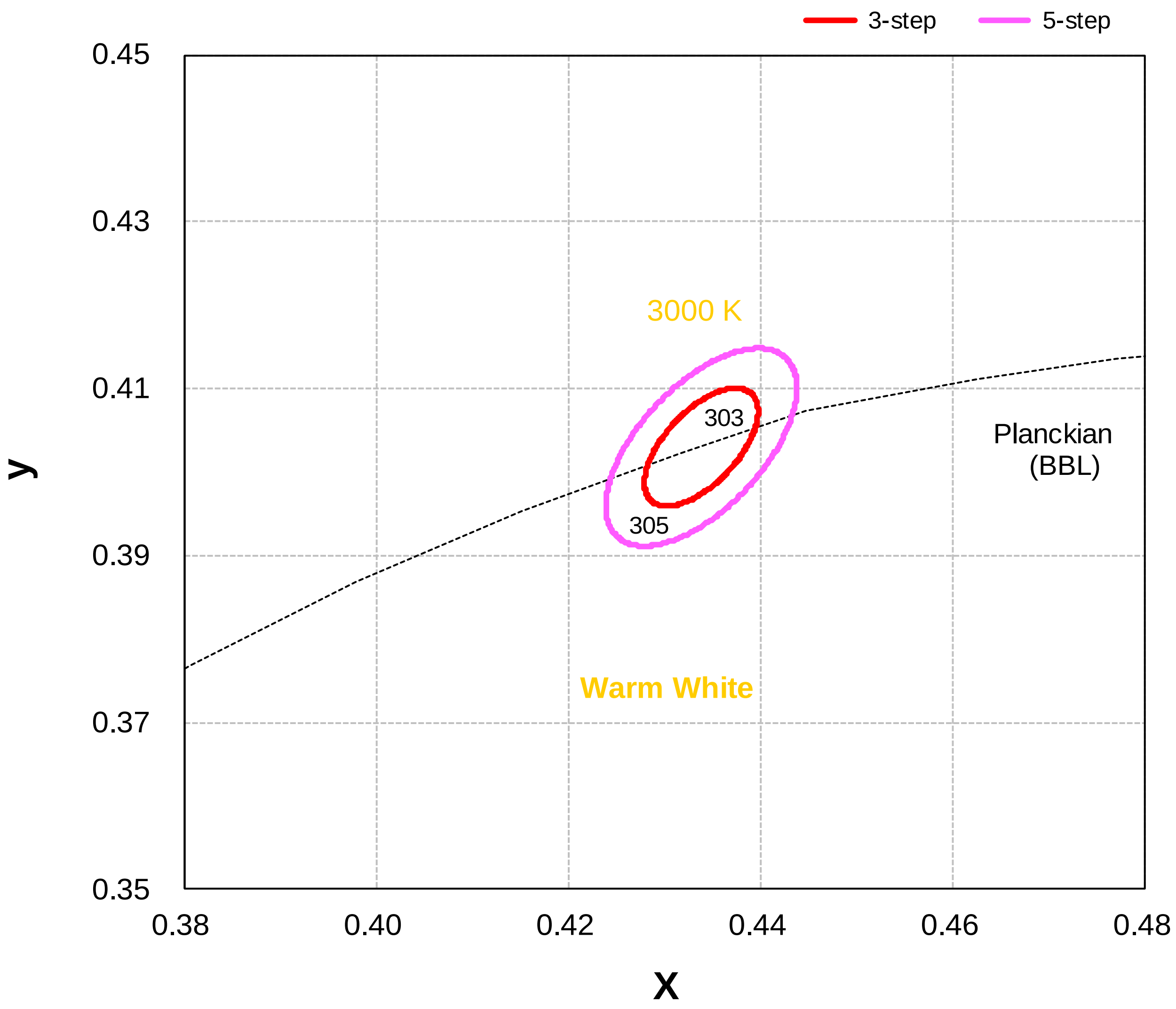
Forward Voltage Bin Structure

Bin Code	Minimum Voltage (V)	Maximum Voltage (V)
Y	5.6	5.8
Z	5.8	6.0
A	6.0	6.2
B	6.2	6.4

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

Color Bin for PF2E-6FVE-730N24V2

Warm White Binning Structure Graphical Representation



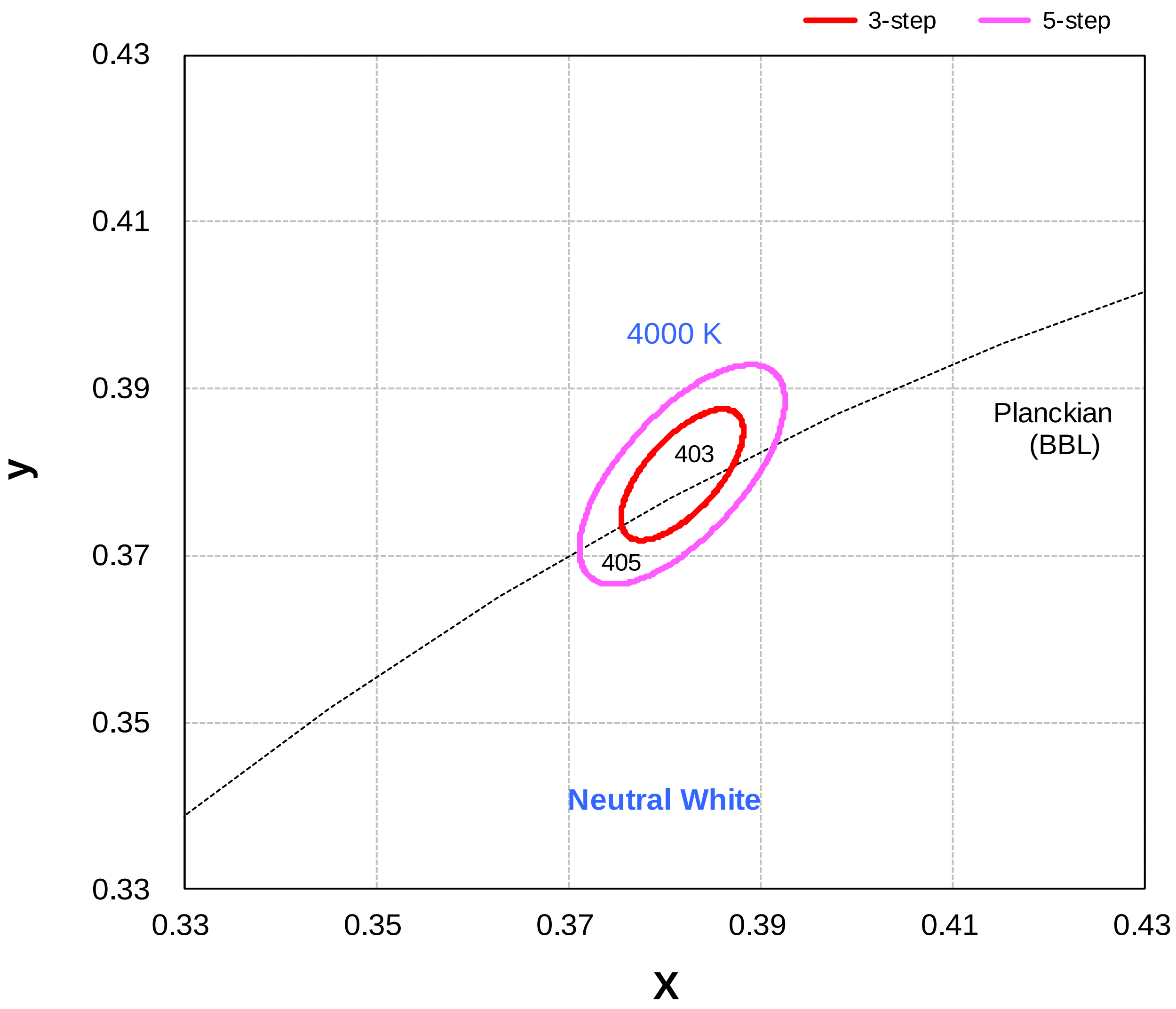
Warm White Bin Structure

CCT (K)	MacAdam Ellipse	Bin Code	Center Point x	Center Point y	Major Axis a	Minor Axis b	Rotation Angle (°)
3000	3-step	303	0.4338	0.4030	0.00830	0.00400	53.20
	5-step	303, 305	0.4338	0.4030	0.01390	0.00680	53.20

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

Color Bin for PF2E-6FNE-740N24V2

Neutral White Binning Structure Graphical Representation



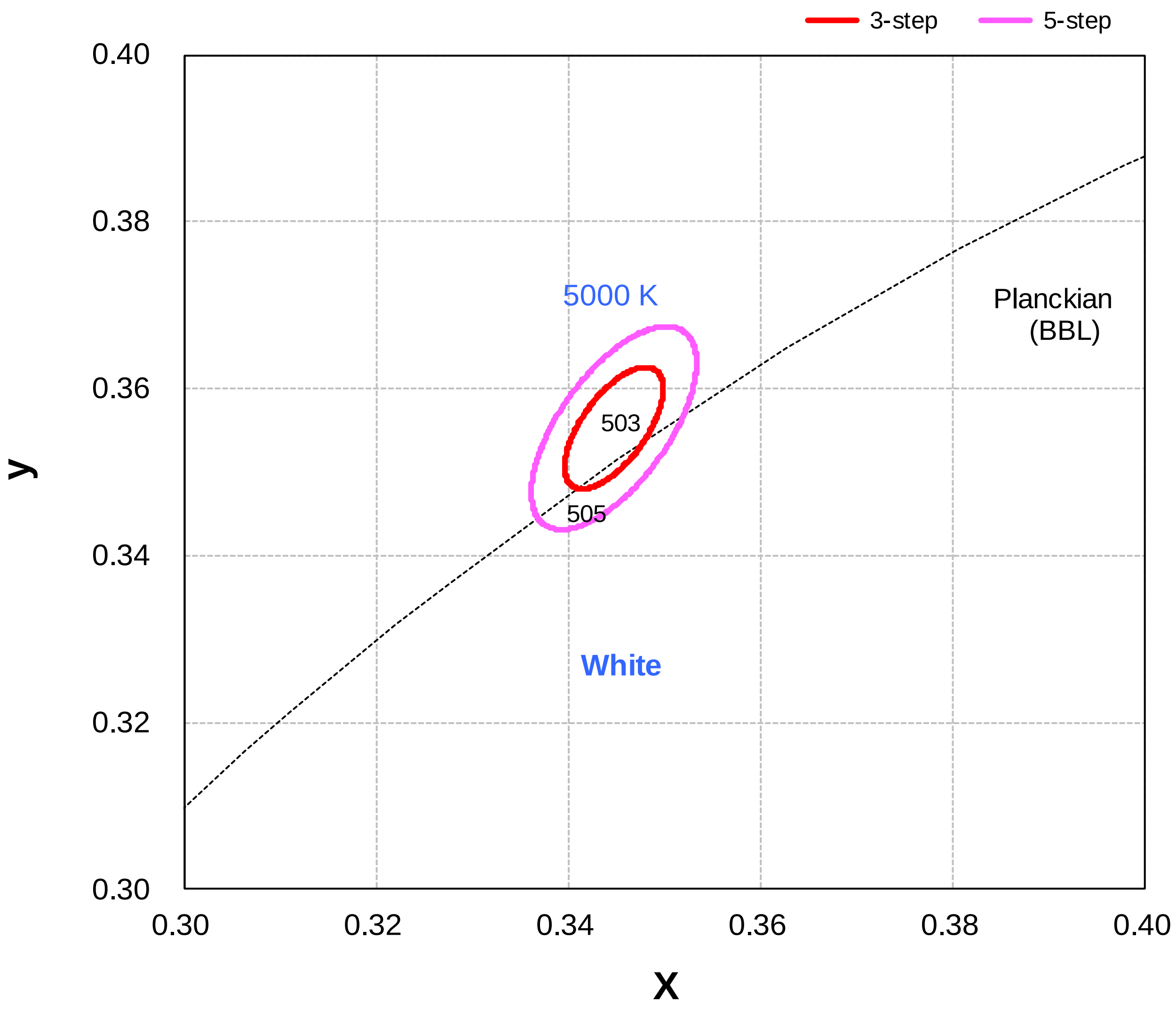
Neutral White Bin Structure

CCT (K)	MacAdam Ellipse	Bin Code	Center Point x	Center Point y	Major Axis a	Minor Axis b	Rotation Angle (°)
4000	3-step	403	0.3818	0.3797	0.00930	0.00400	53.70
	5-step	403, 405	0.3818	0.3797	0.01560	0.00670	53.70

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

Color Bin for PF2E-6FWE-750N24V2

White Binning Structure Graphical Representation



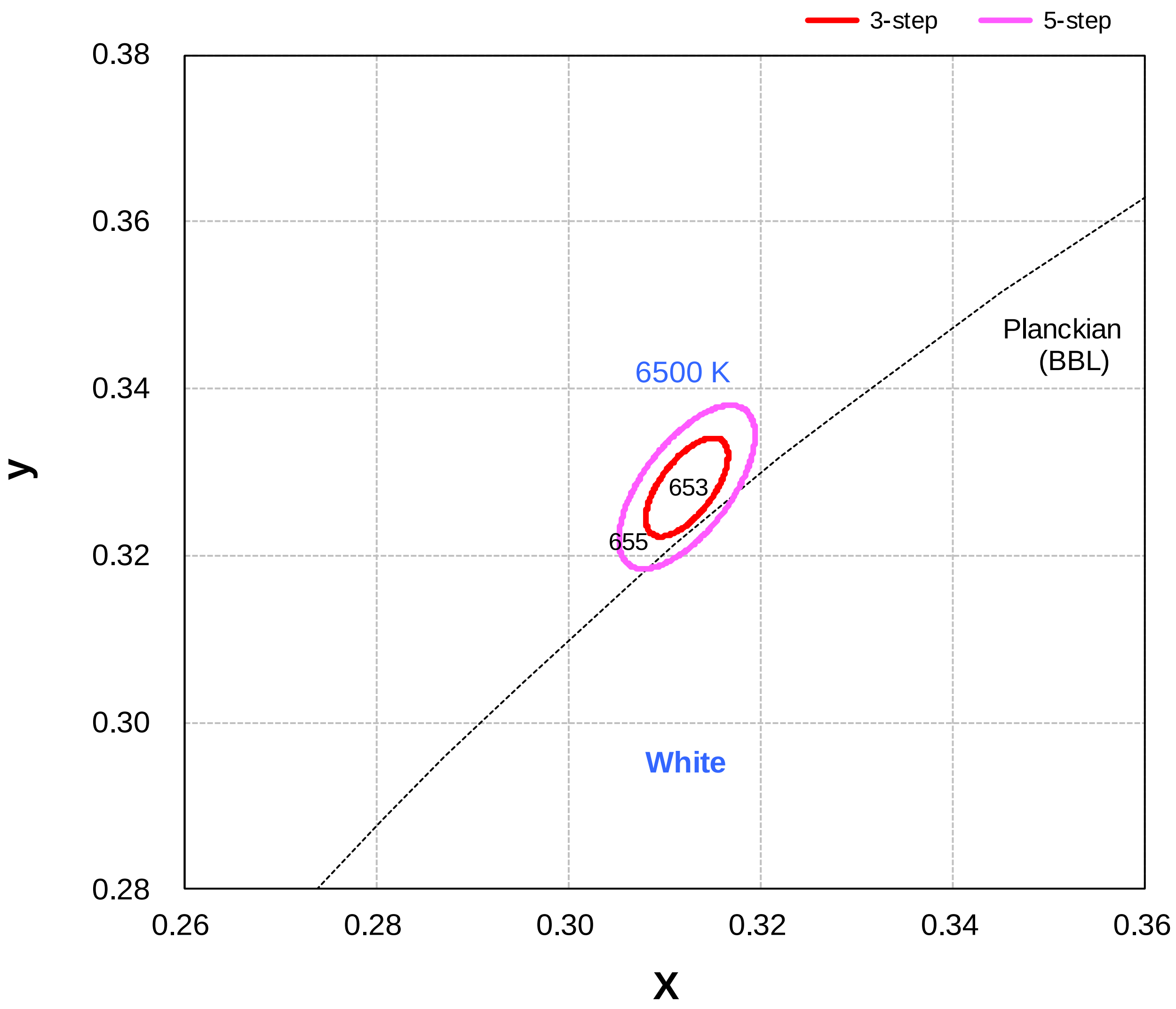
White Bin Structure

CCT (K)	MacAdam Ellipse	Bin Code	Center Point x	Center Point y	Major Axis a	Minor Axis b	Rotation Angle (°)
5000	3-step	503	0.3447	0.3553	0.00820	0.00350	59.60
	5-step	503, 505	0.3447	0.3553	0.01370	0.00590	59.60

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

Color Bin for PF2E-6FWE-765N24V2

White Binning Structure Graphical Representation



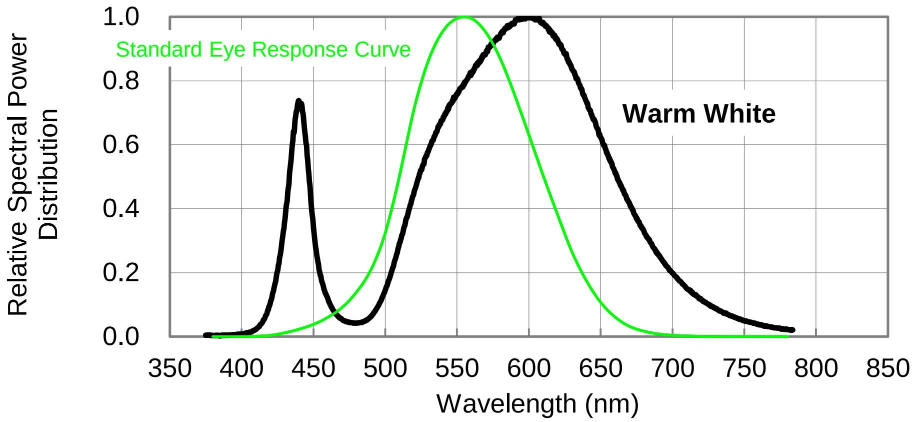
White Bin Structure

CCT (K)	MacAdam Ellipse	Bin Code	Center Point x	Center Point y	Major Axis a	Minor Axis b	Rotation Angle (°)
6500	3-step	653	0.3123	0.3282	0.00670	0.00290	58.60
	5-step	653, 655	0.3123	0.3282	0.01110	0.00480	58.60

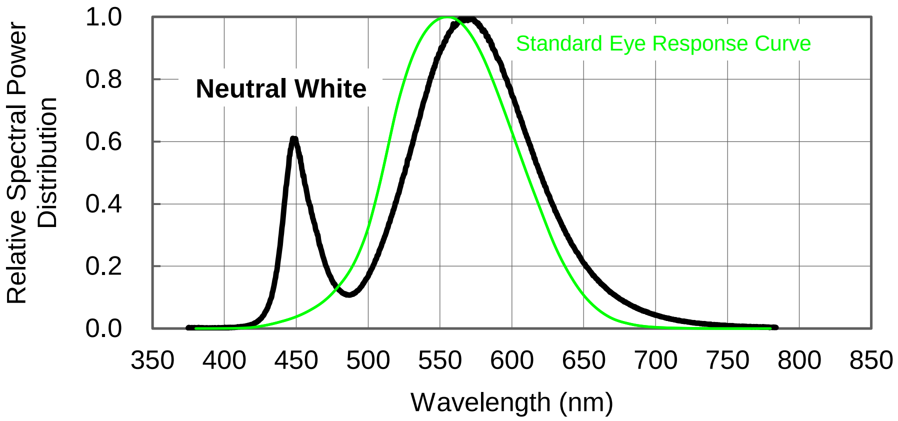
- Tolerance on each color bin (x , y) is ± 0.005

Color Spectrum, T_C = 25°C

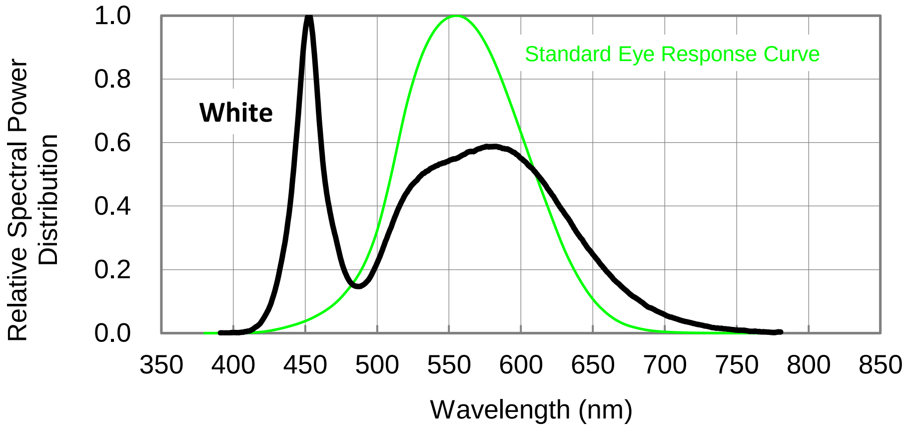
1. PF2E-6FVE-730N24V2



2. PF2E-6FNE-740N24V2

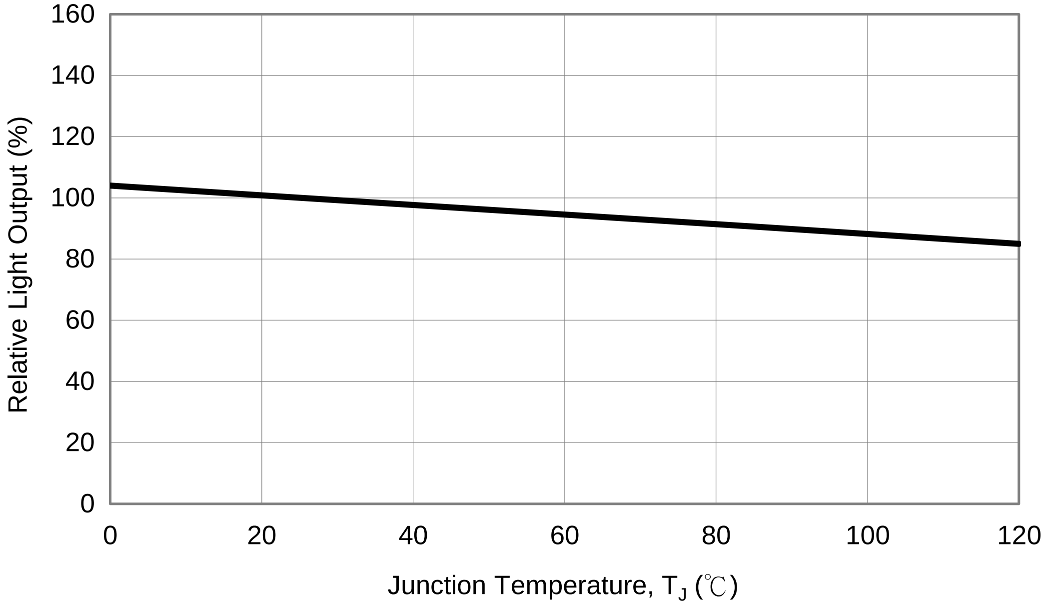


3. PF2E-6FWE-750N24V2、PF2E-6FWE-765N24V2

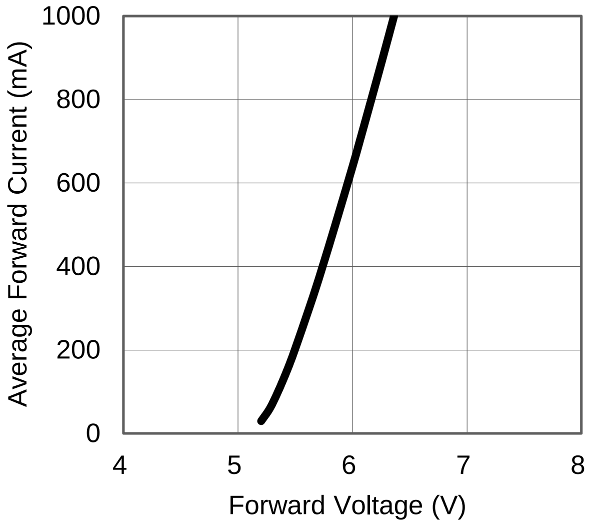


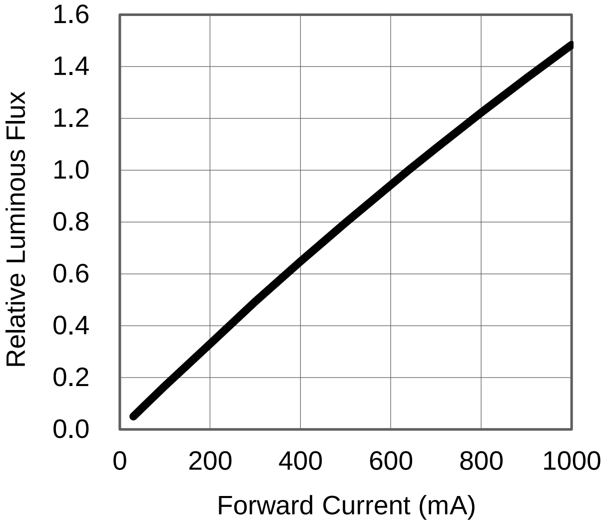
Light Output Characteristics

Relative Light Output vs. Junction Temperature at 640mA

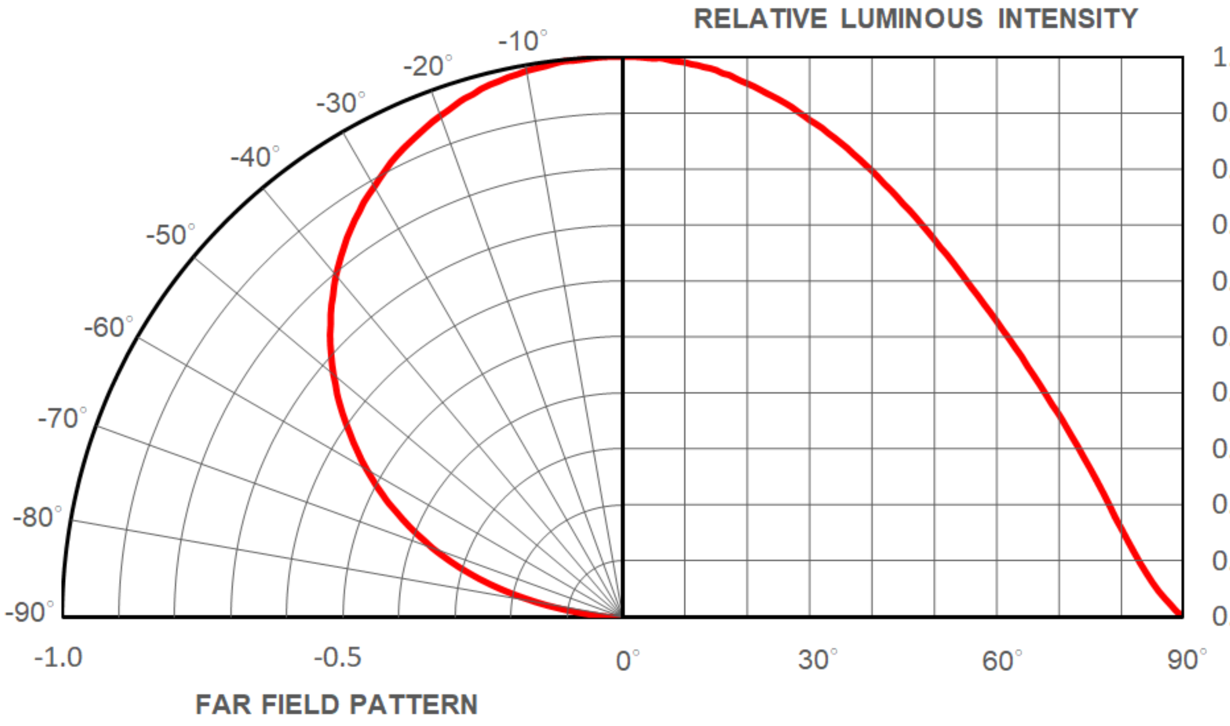


Forward Current Characteristics, T_J = 25˚C





Typical Representative Spatial Radiation Pattern



Moisture Sensitivity Level - JEDEC Level 3

Level	Floor Life		Soak Requirements			
			Standard		Accelerated Environment	
	Time	Conditions	Time (hours)	Conditions	Time (hours)	Conditions
3	168 hours	≤30˚C / 60% RH	192 +5/-0	30˚C / 60% RH	40 +1/-0	60˚C / 60% RH

- 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)	60°C/90%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)	105°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 100°C, 20 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	--

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

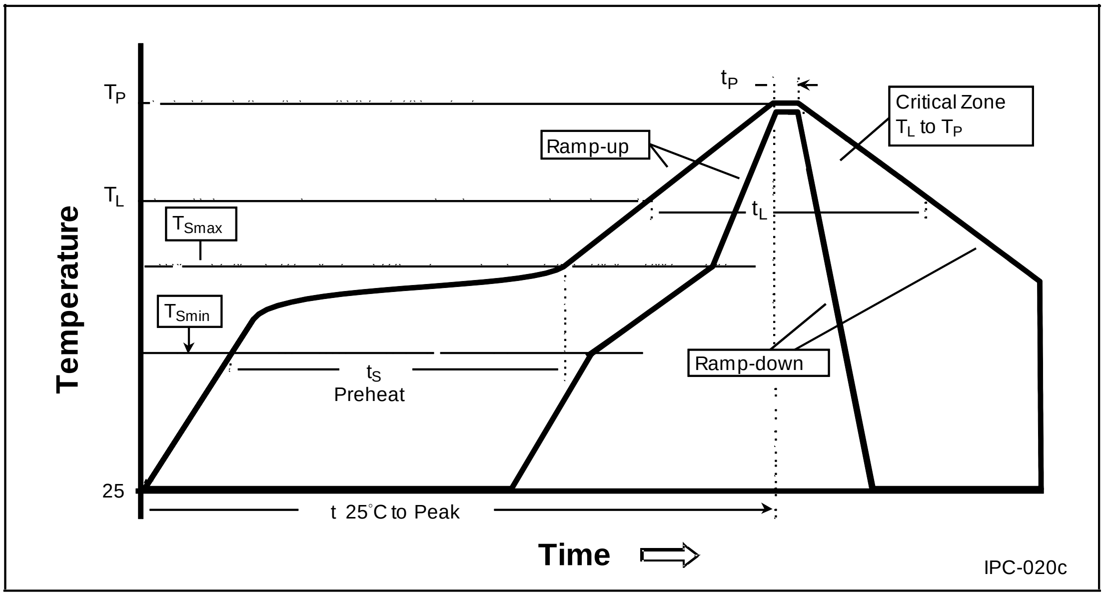
3. A failure is an LED that is open or shorted.

Recommended Solder Pad Design

- All dimensions are in millimeters.

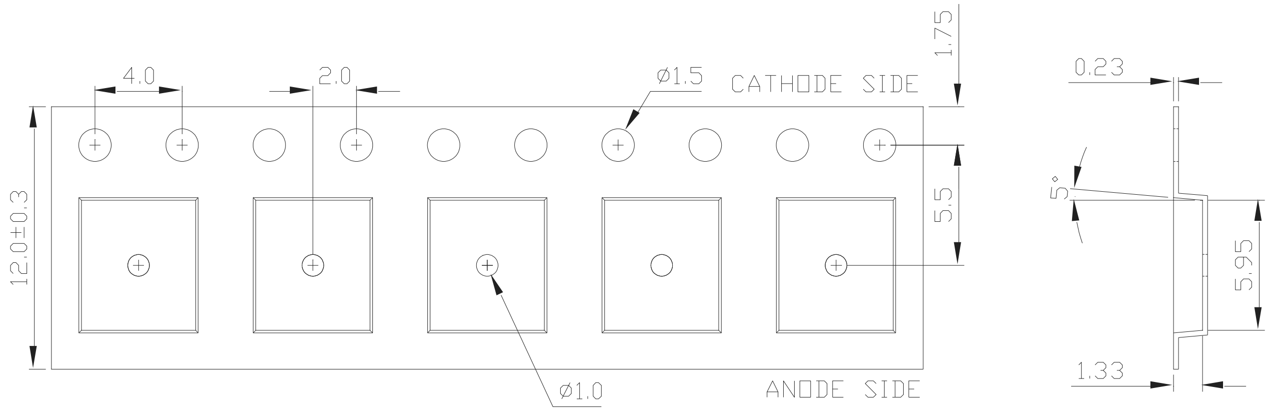
Reflow Soldering Condition

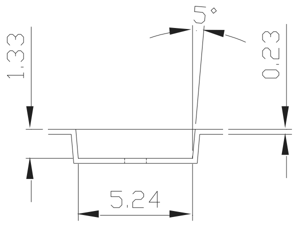
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average Ramp-Up Rate (T_{Smax} to T_P)	3°C / second max.	3°C / second max.
Preheat – Temperature Min (T_{Smin}) – Temperature Max (T_{Smax}) – Time (t_{Smin} to t_{Smax})	 100°C 150°C 60-120 seconds	 150°C 200°C 60-180 seconds
Time maintained above: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

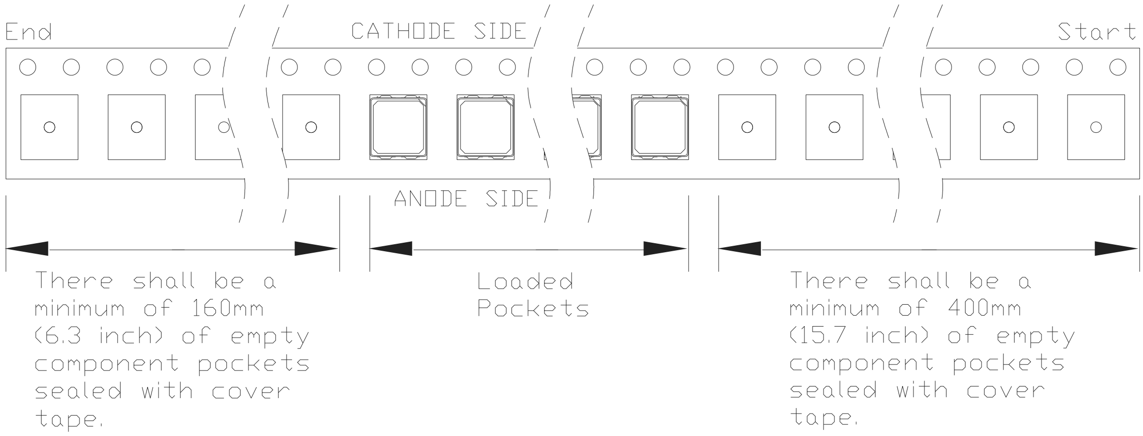


- **We recommend using the M705-S101-S4 solder paste from SMIC (Senju Metal Industry Co., Ltd.) for lead-free soldering.**
- **Do not use solder pastes with post reflow flux residue>47%. (58Bi-42Sn eutectic alloy, etc) This kind of solder pastes may cause a reliability problem to LED.**
- All temperatures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

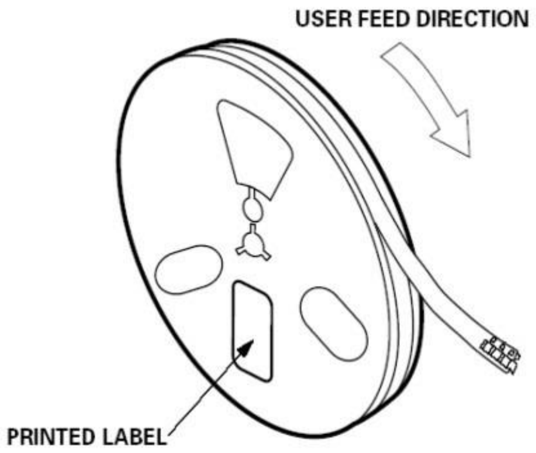


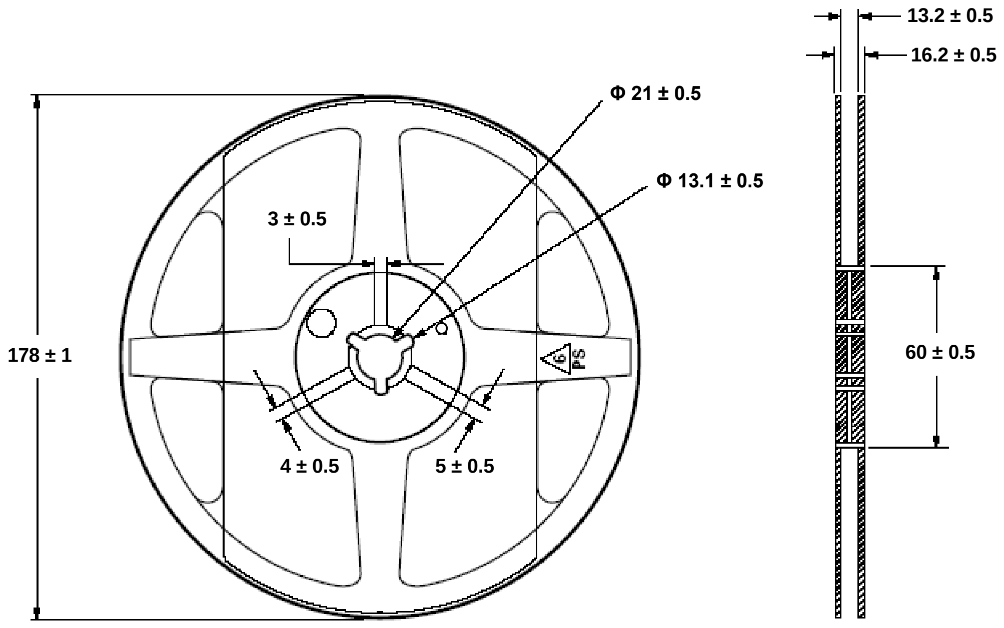




Note:
1. Tolerance unless mentioned is ± 0.1mm；unit = mm.

Emitter Reel Packaging





Notes:
1. Empty component pockets sealed with top cover tape.
2. 1500 pieces per reel.
3. Drawing not to scale.
4. All dimensions are in millimeters.

Moisture Sensitivity

We recommends keeping LEDs in the provided, resealable moisture-barrier packaging (MBP) until immediately prior to soldering. Unopened MBP that contains LEDs do not need special storage for moisture sensitivity.

Once the MBP is opened, LEDs should be handled and stored as MSL 3 per JEDEC J-STD-033, meaning they have limited exposure time before damage to the LED may occur during the soldering operation. The table on the right specifies the maximum exposure time in days depending on temperature and humidity conditions. LEDs with exposure time longer than the specified maximums must be baked according to the baking conditions listed below.

Moisture Sensitivity Level	Temp.	Maximum Percent Relative Humidity				
		50%	60%	70%	80%	90%
Level 3	35 ℃	8	5	1	0.5	0.5
Level 3	30 ℃	11	7	1	1	1
Level 3	25 ℃	14	10	2	1	1
Level 3	20 ℃	20	13	2	1	1

Baking Conditions

It is not necessary to bake all LEDs. Only the LEDs that meet all of the following criteria must be baked:

1.LEDs that have been removed from the original MBP.
2.LEDs that have been exposed to a humid environment longer than listed in the Moisture Sensitivity section above.
3.LEDs that have not been soldered.

LEDs should be baked at 60 ºC for 24 hours. LEDs may be baked in the original reels. Remove LEDs from the MBP before baking. Do not bake parts at temperatures higher than 60 ºC. This baking operation resets the exposure time as defined in the Moisture Sensitivity section above.

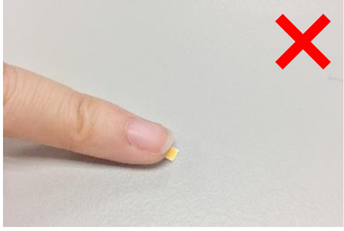
Precaution for Use

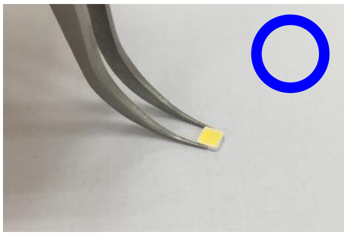
- Storage
  Please do not open the moisture barrier bag (MBB) more than one week. This may cause the leads of LED discoloration. We recommend storing ProLight's LEDs in a dry box after opening the MBB. The recommended storage conditions are temperature 5 to 30˚C and humidity less than 40% RH. It is also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

Notes for handling of silicone LEDs

- Please do not use a force of over 0.3kgf impact or pressure on the silicone , 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 especially by sharp tools such as Tweezers.
- Avoid leaving fingerprints on the silicone.
- 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.