



ProLight PW2N-1FxE-N2SCR95A
1W Power LED
Technical Datasheet
Version: 1.1

ProLight Opto ® PW2N Series

Features

- High Color rendering index
- Good color uniformity
- Lead free reflow soldering
- RoHS compliant
- Instant light (less than 100ns)
- No UV

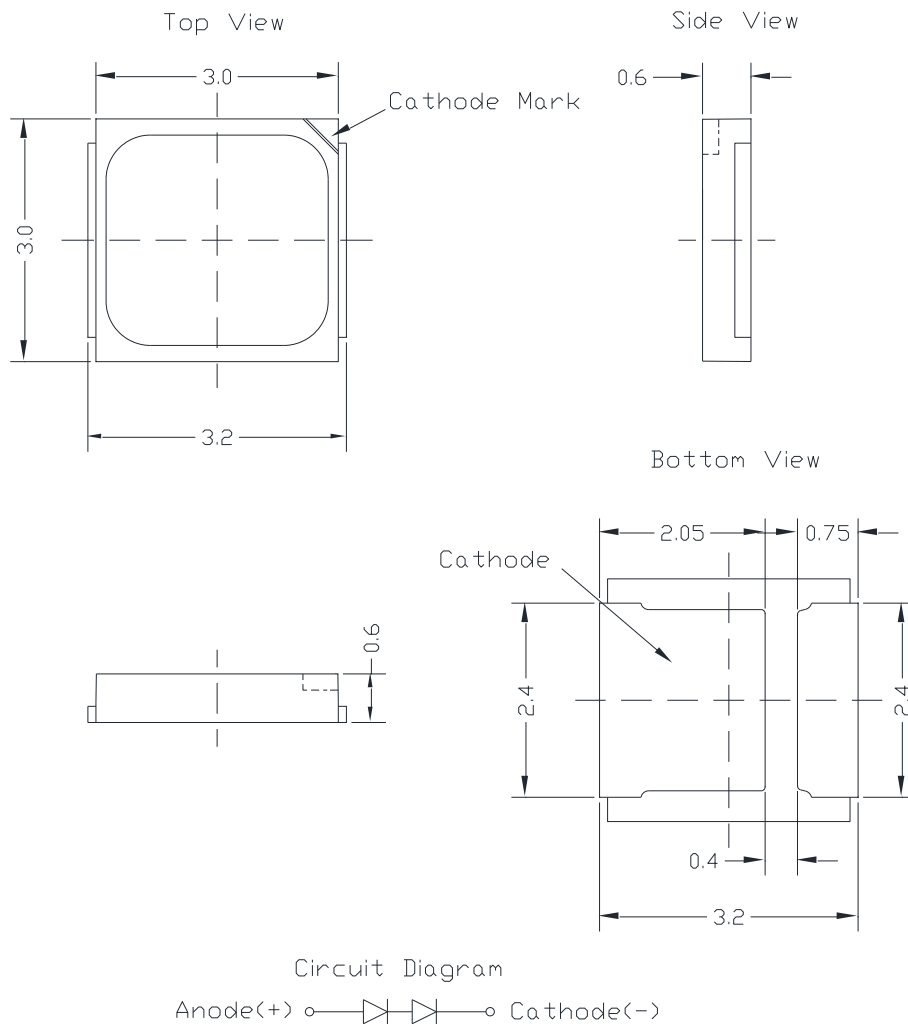
Main Applications

- T8/T5 tube
- LED bulb
- Indoor/Outdoor Commercial and Residential Architectural

Introduction

·PW2N 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



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 $\pm 0.10\text{mm}$.
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 150mA, T_j = 25°C

Radiation Pattern	Color	Part Number Emitter	Luminous Flux Φ_v (lm)		CRI Minimum
			Minimum	Typical	
Lambertian	White	PW2N-1FWE-N2SCR95A	110	120	95
	Neutral White	PW2N-1FNE-N2SCR95A	100	115	95
	Warm White	PW2N-1FVE-N2SCR95A	90	110	95

- ProLight maintains a tolerance of $\pm 7\%$ on flux and power measurements.
- ProLight maintains a tolerance of ± 2 on CRI measurements.
- Please do not drive at rated current more than 1 second without proper heat sink.

Electrical Characteristics at 150mA, T_j = 25°C

Color	Forward Voltage V _F (V)			Thermal Resistance Junction to Slug (°C/ W)
	Min.	Typ.	Max.	
White	5.8	6.0	6.4	10
Neutral White	5.8	6.0	6.4	10
Warm White	5.8	6.0	6.4	10

- ProLight maintains a tolerance of $\pm 0.1V$ for Voltage measurements.

Optical Characteristics at 150mA, T_j = 25°C

Radiation Pattern	Color	Color Temperature CCT			Total included Angle (degrees) $\theta_{0.90V}$	Viewing Angle (degrees) $2\theta_{1/2}$
		Min.	Typ.	Max.		
Lambertian	White	4750 K	5380 K	6010 K	160	120
	Neutral White	3250 K	3750 K	4250 K	160	120
	Warm White	2580 K	2900 K	3250 K	160	120

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

Electro-Optical Characteristics, $T_j = 25^{\circ}\text{C}$

I_F (mA)	V_F (V)	Power (W)	PW2N-1FWE-N2SCR95A		PW2N-1FNE-N2SCR95A		PW2N-1FVE-N2SCR95A	
			Flux (lm)	lm/W	Flux (lm)	lm/W	Flux (lm)	lm/W
50	5.46	0.27	42.6	156.2	40.7	149.2	39.0	142.8
75	5.61	0.42	63.1	150.0	60.4	143.5	57.8	137.4
100	5.75	0.57	82.8	144.1	79.2	137.8	75.8	131.9
125	5.88	0.73	101.6	138.3	97.4	132.6	93.5	127.2
150	6.00	0.90	120.0	133.3	115.0	127.8	110.0	122.2
175	6.12	1.07	137.4	128.3	131.8	123.1	126.6	118.2
200	6.23	1.25	154.6	124.0	148.2	118.9	141.8	113.8

● All values are reference only.

Absolute Maximum Ratings

Parameter	White/Neutral White/Warm White
DC Forward Current (mA)	200
Peak Pulsed Forward Current (mA)	250 (less than 1/10 duty cycle@1KHz)
ESD Sensitivity (HBM per MIL-STD-883E Method 3015.7)	$\pm 2000\text{V}$ (Class III)
LED Junction Temperature	120°C
Operating Board Temperature at Maximum DC Forward Current	$-40^{\circ}\text{C} - 90^{\circ}\text{C}$
Storage Temperature	$-40^{\circ}\text{C} - 120^{\circ}\text{C}$
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

Color	Bin Code	Minimum Photometric Flux (lm)	Maximum Photometric Flux (lm)	Available Color Bins
White	V1	110	120	All
	V2	120	130	[1]
	W1	130	140	[1]
Neutral White	U2	100	110	Qx [1]
	V1	110	120	Sx [1]
	V2	120	130	[1]
Warm White	U1	90	100	Mx [1]
	U2	100	110	Nx [1]
	V1	110	120	[1]

- ProLight maintains a tolerance of $\pm 7\%$ 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

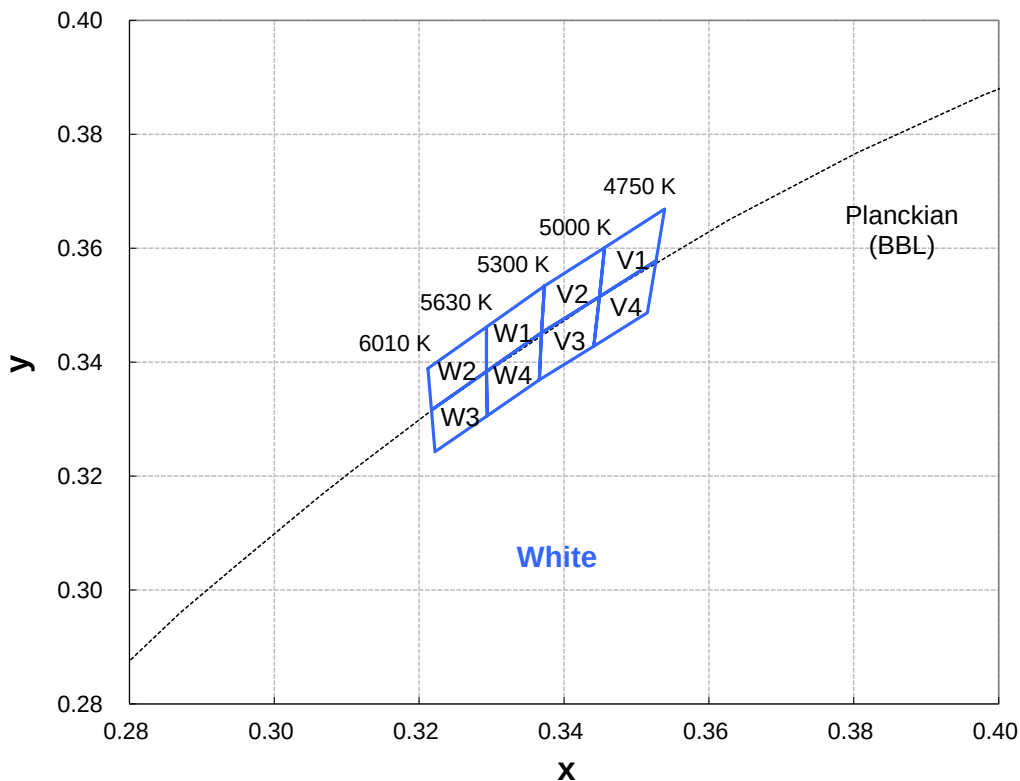
Color	Bin Code	Minimum Voltage (V)	Maximum Voltage (V)
White	B	5.8	6.0
	D	6.0	6.2
	E	6.2	6.4
Neutral White	B	5.8	6.0
	D	6.0	6.2
	E	6.2	6.4
Warm White	B	5.8	6.0
	D	6.0	6.2
	E	6.2	6.4

- ProLight maintains a tolerance of $\pm 0.1V$ 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



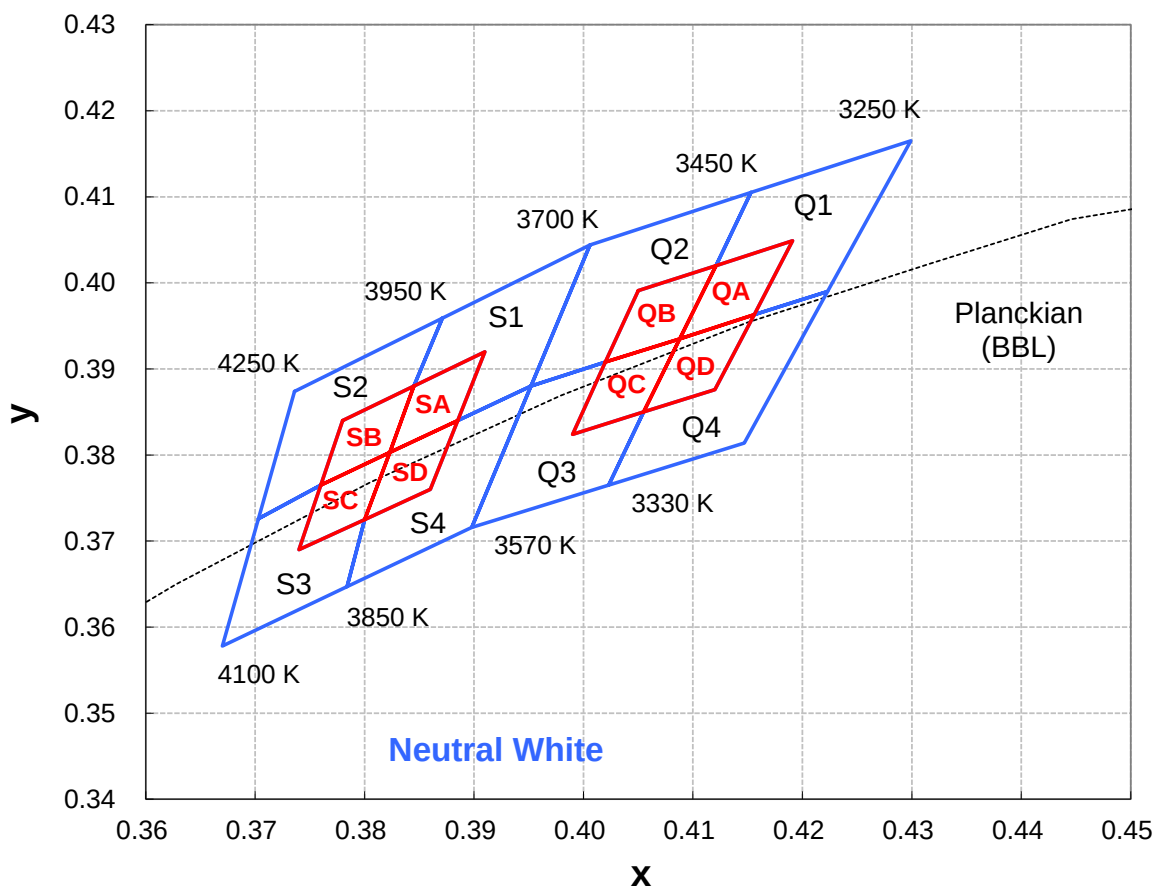
White Bin Structure

Bin Code	x	y	Typ. CCT (K)	Bin Code	x	y	Typ. CCT (K)
V1	0.3456	0.3601	4875	W1	0.3373	0.3534	5465
	0.3539	0.3669			0.3369	0.3452	
	0.3527	0.3578			0.3293	0.3384	
	0.3449	0.3515			0.3293	0.3462	
V4	0.3449	0.3515	4875	W4	0.3293	0.3384	5465
	0.3527	0.3578			0.3369	0.3452	
	0.3515	0.3487			0.3366	0.3369	
	0.3441	0.3428			0.3294	0.3306	
V2	0.3373	0.3534	5150	W2	0.3212	0.3389	5820
	0.3456	0.3601			0.3293	0.3462	
	0.3449	0.3515			0.3293	0.3384	
	0.3369	0.3452			0.3217	0.3316	
V3	0.3369	0.3452	5150	W3	0.3217	0.3316	5820
	0.3449	0.3515			0.3293	0.3384	
	0.3441	0.3428			0.3294	0.3306	
	0.3366	0.3369			0.3222	0.3243	

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

Color Bin

Neutral White Binning Structure Graphical Representation



Color Bin

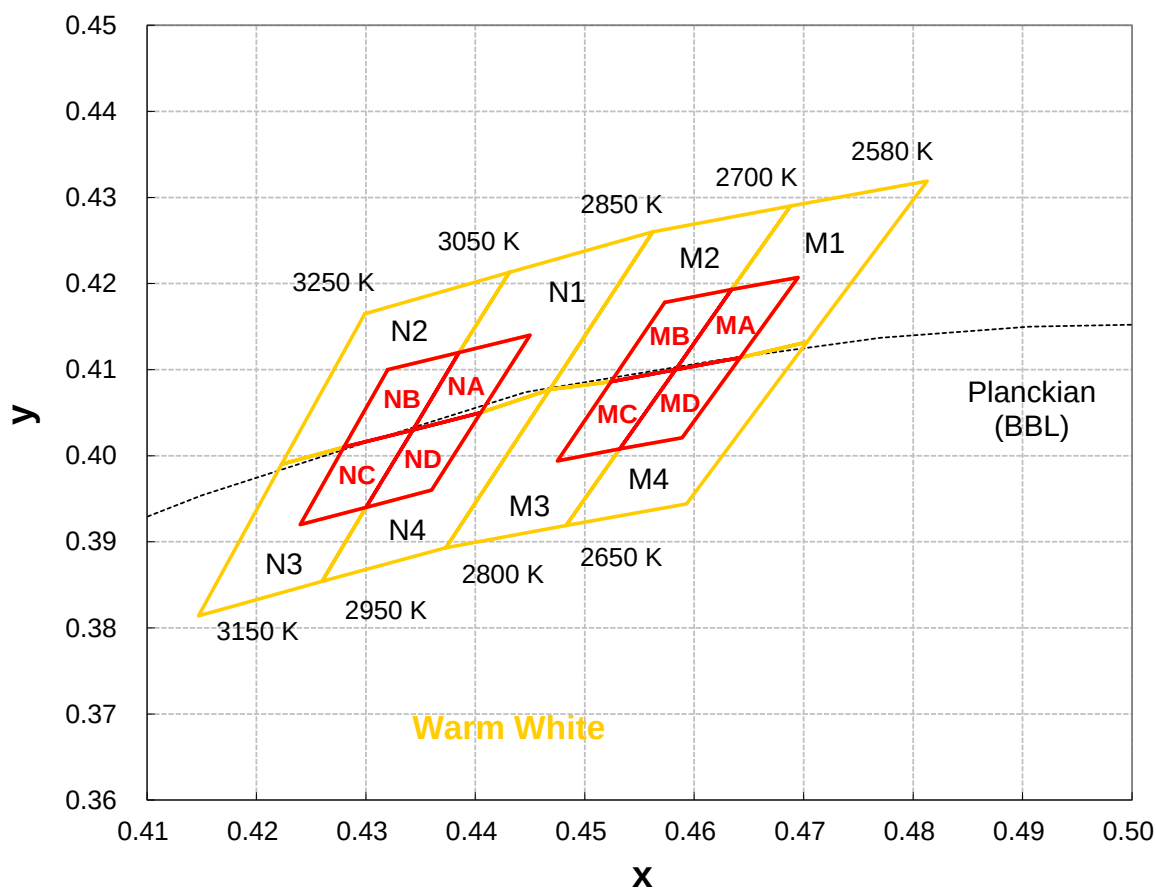
Neutral White Bin Structure

Bin Code	x	y	Typ. CCT (K)	Bin Code	x	y	Typ. CCT (K)
Q1	0.4153	0.4105	3335	Q2	0.4006	0.4044	3575
	0.4299	0.4165			0.4153	0.4105	
	0.4223	0.3990			0.4121	0.4020	
	0.4156	0.3963			0.4050	0.3991	
	0.4191	0.4049			0.4020	0.3908	
Q4	0.4121	0.4020	3335	Q3	0.3952	0.3880	3575
	0.4156	0.3963			0.3952	0.3880	
	0.4223	0.3990			0.4020	0.3908	
	0.4147	0.3814			0.3990	0.3824	
	0.4023	0.3765			0.4055	0.3850	
QA	0.4055	0.3850	3450	QB	0.4023	0.3765	3450
	0.4120	0.3876			0.3898	0.3716	
	0.4121	0.4020			0.4050	0.3991	
	0.4191	0.4049			0.4121	0.4020	
	0.4156	0.3963			0.4088	0.3935	
QD	0.4088	0.3935	3450	QC	0.4020	0.3908	3450
	0.4088	0.3935			0.4020	0.3908	
	0.4156	0.3963			0.4088	0.3935	
	0.4120	0.3876			0.4055	0.3850	
	0.4055	0.3850			0.3990	0.3824	
S1	0.3871	0.3959	3825	S2	0.3736	0.3874	4100
	0.4006	0.4044			0.3871	0.3959	
	0.3952	0.3880			0.3845	0.3880	
	0.3885	0.3840			0.3780	0.3840	
	0.3910	0.3920			0.3760	0.3765	
S4	0.3845	0.3880	3825	S3	0.3703	0.3726	4100
	0.3885	0.3840			0.3703	0.3726	
	0.3952	0.3880			0.3760	0.3765	
	0.3898	0.3716			0.3740	0.3690	
	0.3784	0.3647			0.3800	0.3725	
SA	0.3800	0.3725	3975	SB	0.3784	0.3647	3975
	0.3860	0.3760			0.3670	0.3578	
	0.3845	0.3880			0.3780	0.3840	
	0.3910	0.3920			0.3845	0.3880	
	0.3885	0.3840			0.3823	0.3803	
SD	0.3823	0.3803	3975	SC	0.3760	0.3765	3975
	0.3885	0.3840			0.3823	0.3803	
	0.3860	0.3760			0.3800	0.3725	
	0.3800	0.3725			0.3740	0.3690	

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

Color Bin

Warm White Binning Structure Graphical Representation



Color Bin

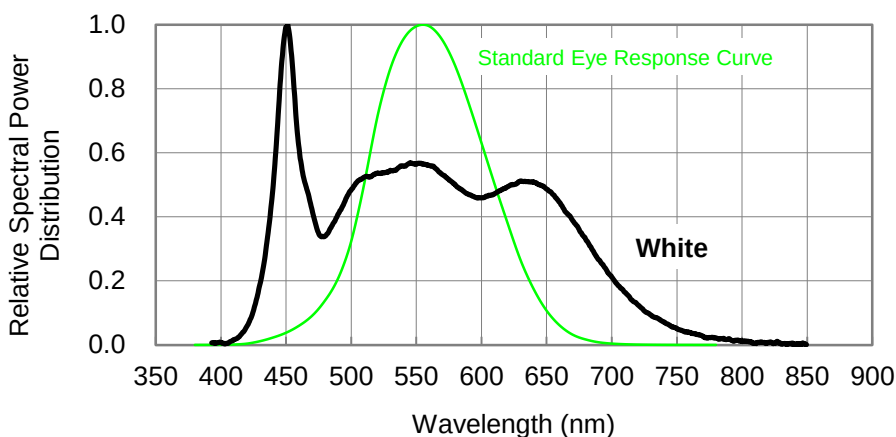
Warm White Bin Structure

Bin Code	x	y	Typ. CCT (K)	Bin Code	x	y	Typ. CCT (K)
M1	0.4688	0.4290	2650	M2	0.4562	0.4260	2800
	0.4813	0.4319			0.4688	0.4290	
	0.4703	0.4132			0.4634	0.4193	
	0.4642	0.4114			0.4573	0.4178	
	0.4695	0.4207			0.4524	0.4086	
	0.4634	0.4193			0.4468	0.4077	
M4	0.4642	0.4114	2650	M3	0.4468	0.4077	2800
	0.4703	0.4132			0.4524	0.4086	
	0.4593	0.3944			0.4475	0.3994	
	0.4483	0.3919			0.4532	0.4008	
	0.4532	0.4008			0.4483	0.3919	
	0.4589	0.4021			0.4373	0.3893	
MA	0.4634	0.4193	2700	MB	0.4573	0.4178	2700
	0.4695	0.4207			0.4634	0.4193	
	0.4642	0.4114			0.4583	0.4100	
	0.4583	0.4100			0.4524	0.4086	
MD	0.4583	0.4100	2700	MC	0.4524	0.4086	2700
	0.4642	0.4114			0.4583	0.4100	
	0.4589	0.4021			0.4532	0.4008	
	0.4532	0.4008			0.4475	0.3994	
N1	0.4431	0.4213	2950	N2	0.4299	0.4165	3150
	0.4562	0.4260			0.4431	0.4213	
	0.4468	0.4077			0.4385	0.4120	
	0.4405	0.4050			0.4320	0.4100	
	0.4450	0.4140			0.4280	0.4010	
	0.4385	0.4120			0.4223	0.3990	
N4	0.4405	0.4050	2950	N3	0.4223	0.3990	3150
	0.4468	0.4077			0.4280	0.4010	
	0.4373	0.3893			0.4240	0.3920	
	0.4260	0.3854			0.4300	0.3940	
	0.4300	0.3940			0.4260	0.3854	
	0.4360	0.3960			0.4147	0.3814	
NA	0.4385	0.4120	3050	NB	0.4320	0.4100	3050
	0.4450	0.4140			0.4385	0.4120	
	0.4405	0.4050			0.4343	0.4030	
	0.4343	0.4030			0.4280	0.4010	
ND	0.4343	0.4030	3050	NC	0.4280	0.4010	3050
	0.4405	0.4050			0.4343	0.4030	
	0.4360	0.3960			0.4300	0.3940	
	0.4300	0.3940			0.4240	0.3920	

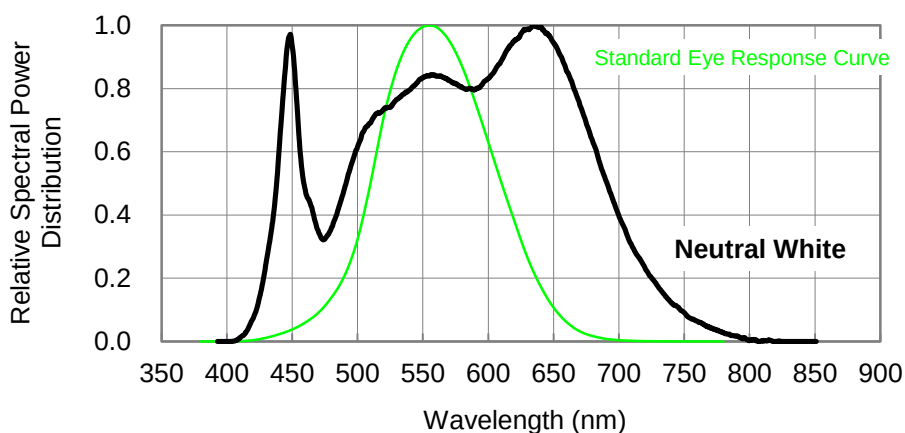
- Tolerance on each color bin (x , y) is ± 0.005

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

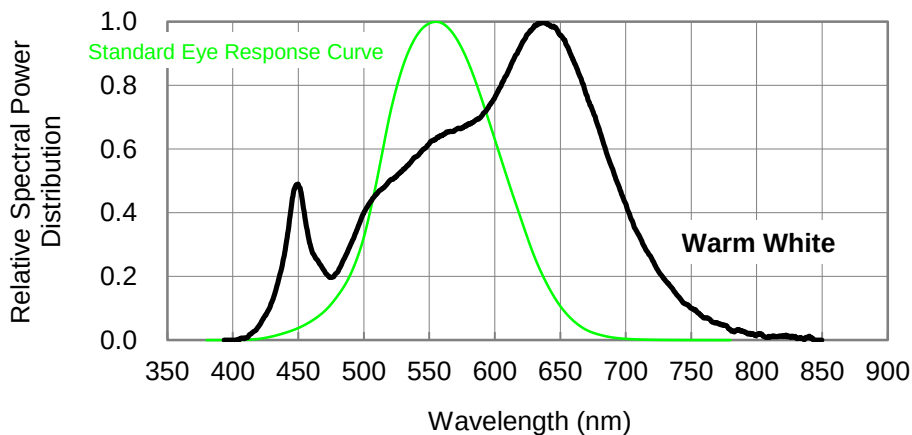
1. White



2. Neutral White

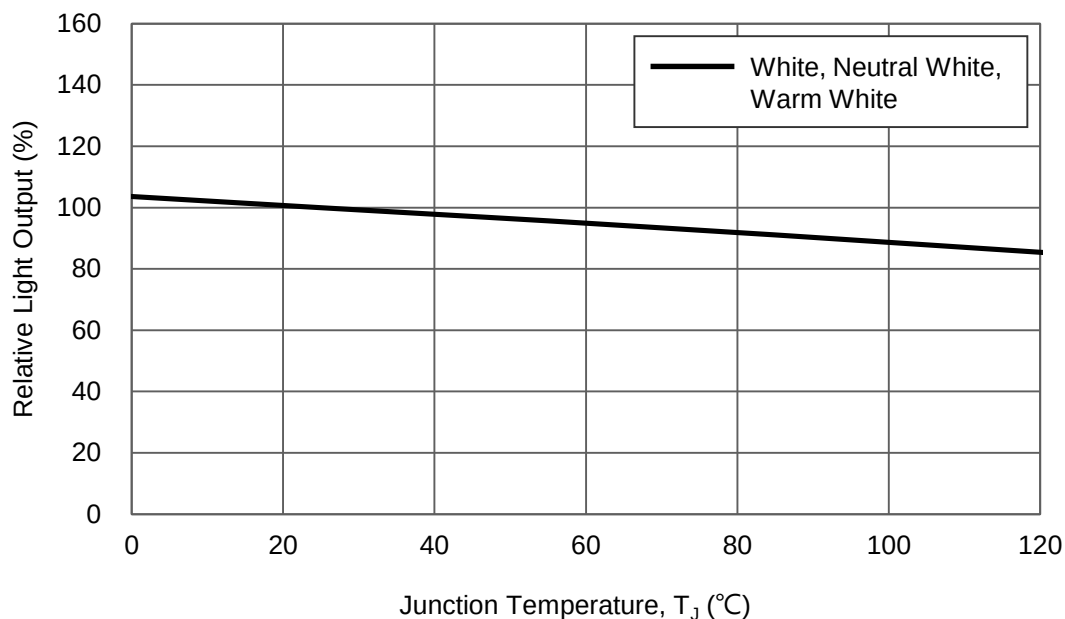


3. Warm White

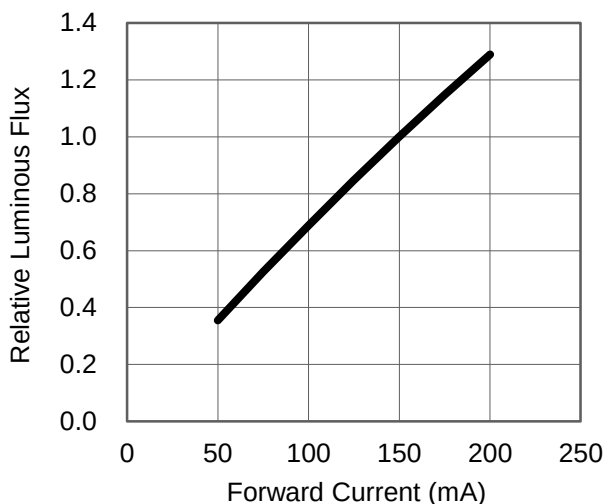
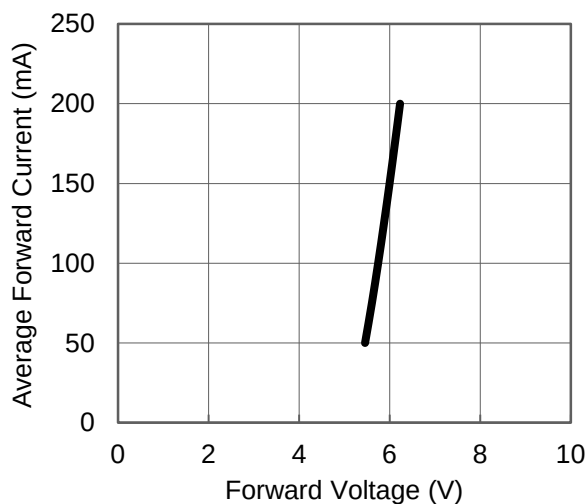


Light Output Characteristics

Relative Light Output vs. Junction Temperature at 150mA

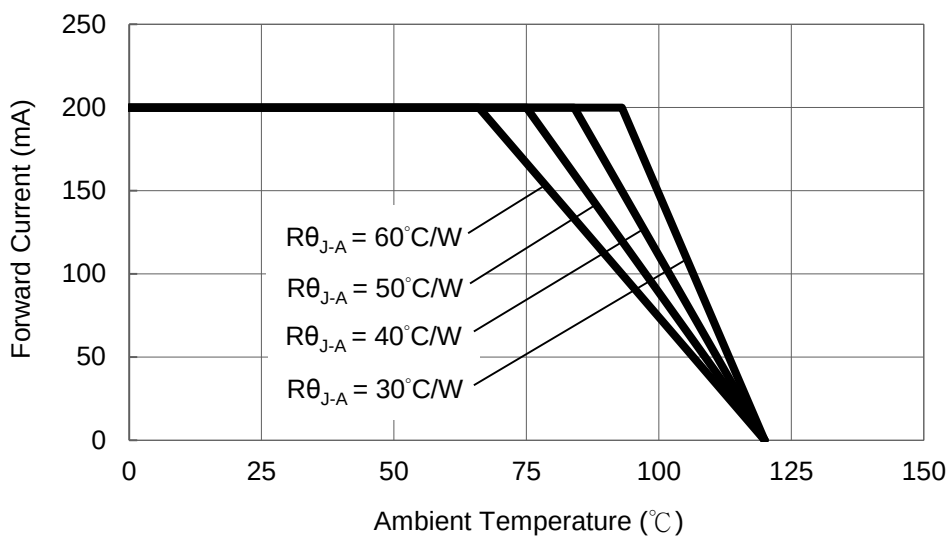


Forward Current Characteristics, $T_j = 25^\circ\text{C}$



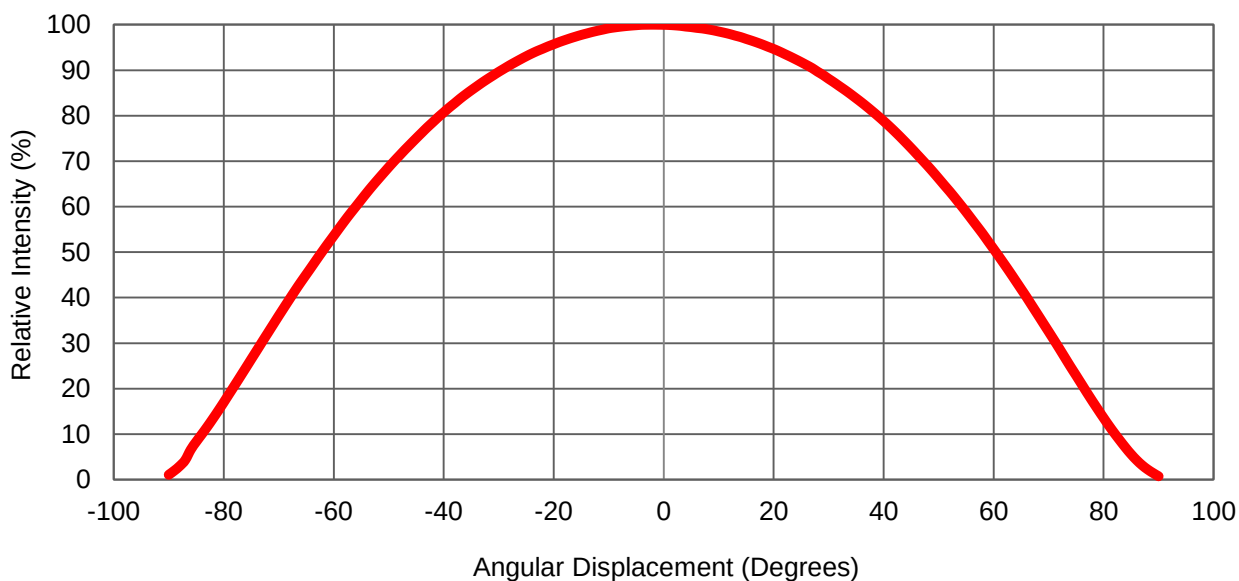
Ambient Temperature vs. Maximum Forward Current

1. White, Neutral White, Warm White ($T_{JMAX} = 120^{\circ}\text{C}$)



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	$\leq 30^{\circ}\text{C}$ / 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	$\leq 30^{\circ}\text{C}$ / 85% RH	168 +5/-0	85°C / 85% RH	NA	NA
2	1 year	$\leq 30^{\circ}\text{C}$ / 60% RH	168 +5/-0	85°C / 60% RH	NA	NA
2a	4 weeks	$\leq 30^{\circ}\text{C}$ / 60% RH	696 +5/-0	30°C / 60% RH	120 +1/-0	60°C / 60% RH
3	168 hours	$\leq 30^{\circ}\text{C}$ / 60% RH	192 +5/-0	30°C / 60% RH	40 +1/-0	60°C / 60% RH
4	72 hours	$\leq 30^{\circ}\text{C}$ / 60% RH	96 +2/-0	30°C / 60% RH	20 +0.5/-0	60°C / 60% RH
5	48 hours	$\leq 30^{\circ}\text{C}$ / 60% RH	72 +2/-0	30°C / 60% RH	15 +0.5/-0	60°C / 60% RH
5a	24 hours	$\leq 30^{\circ}\text{C}$ / 60% RH	48 +2/-0	30°C / 60% RH	10 +0.5/-0	60°C / 60% RH
6	Time on Label (TOL)	$\leq 30^{\circ}\text{C}$ / 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 (Φ_V)	$I_F = \text{max DC}$	Initial Level x 0.7	--

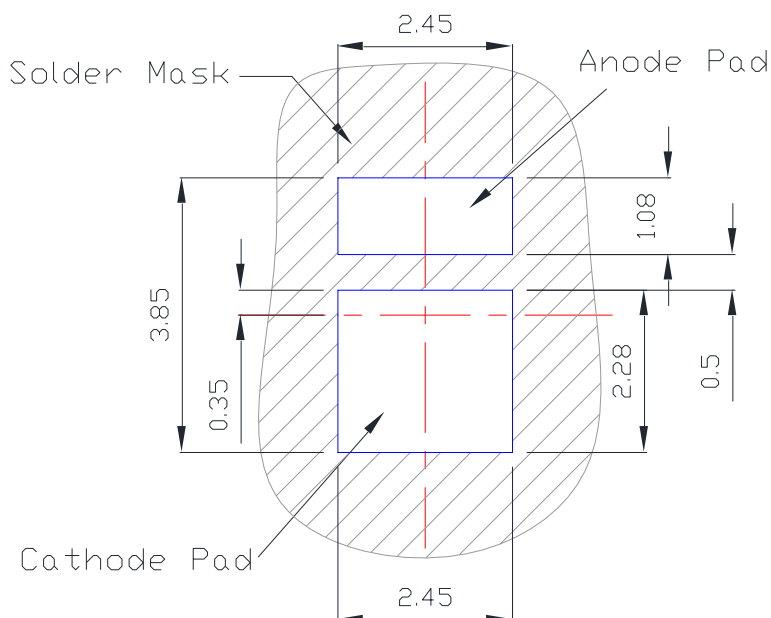
* The test is performed after the LED is cooled down to the room temperature.

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

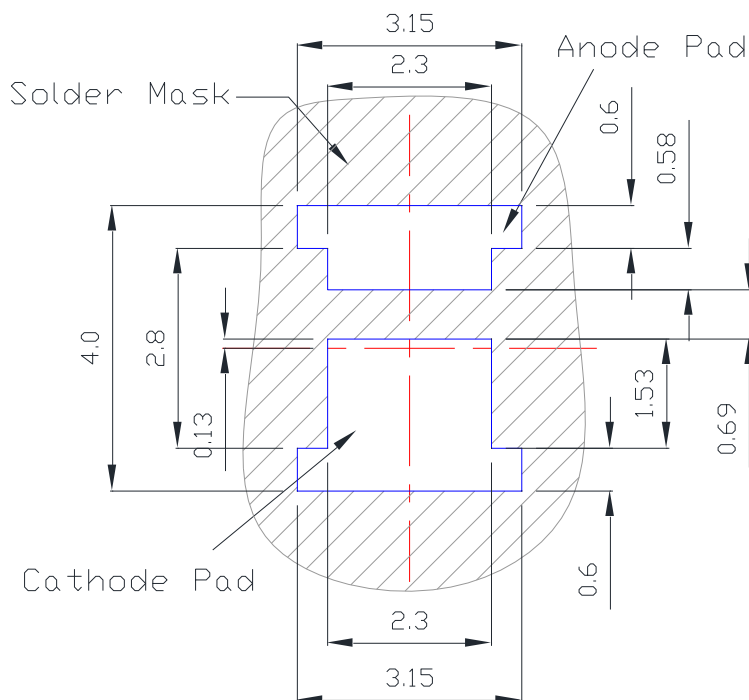
Recommended Solder Pad Design

Standard Emitter

TYPE A.



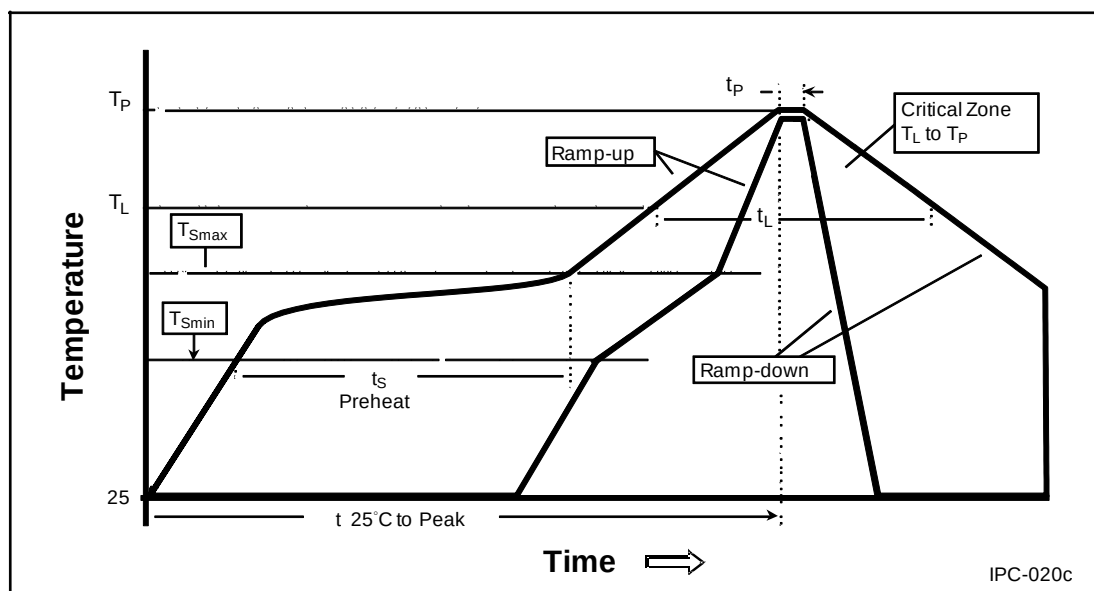
TYPE B.



- All dimensions are in millimeters.

Reflow Soldering Condition

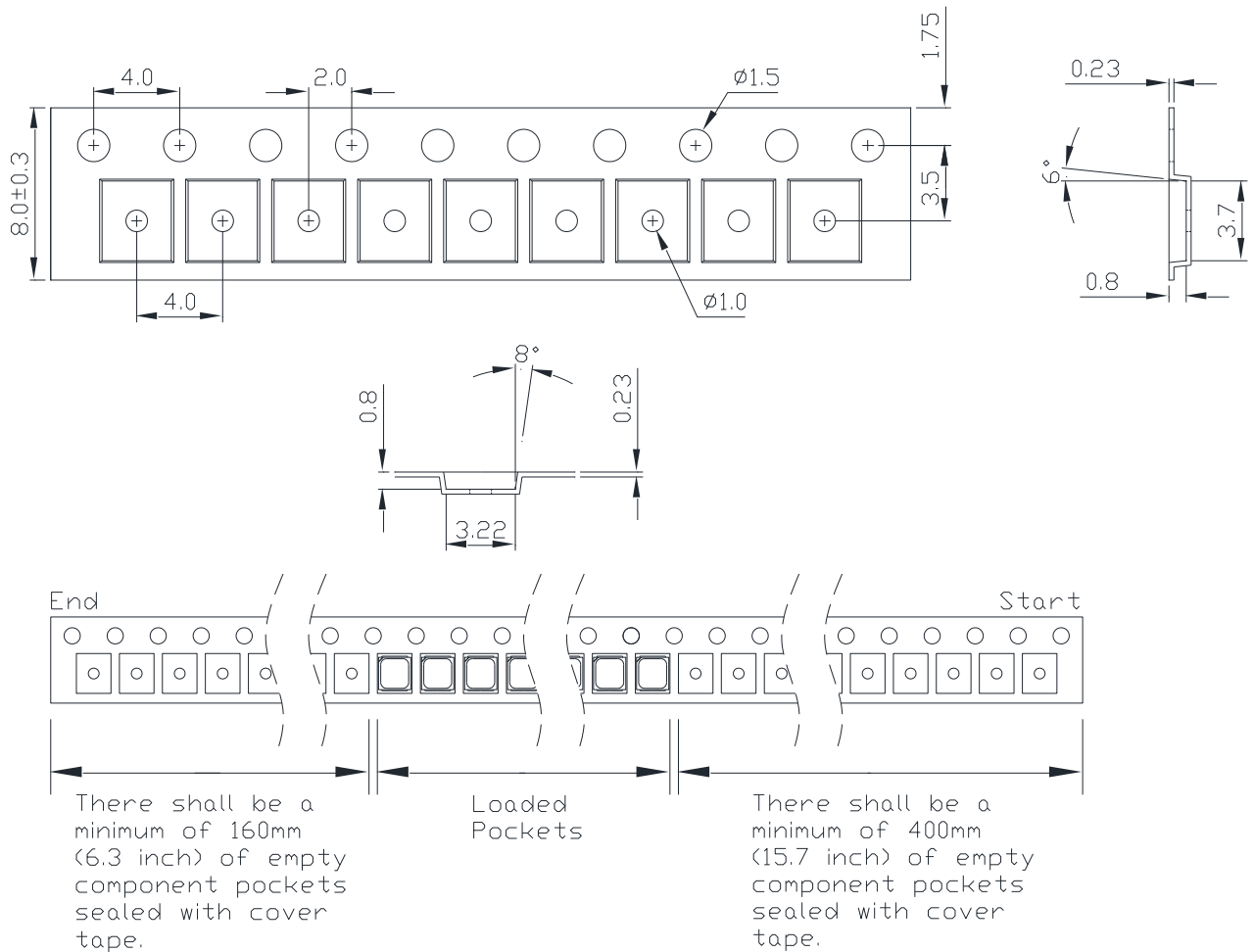
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average Ramp-Up Rate (T_{Smax} to T_p)	3°C / second max.	3°C / second max.
Preheat – Temperature Min (T_{Smin}) – Temperature Max (T_{Smax}) – Time (t_{Smin} to t_{Smax})	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
Time maintained above: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

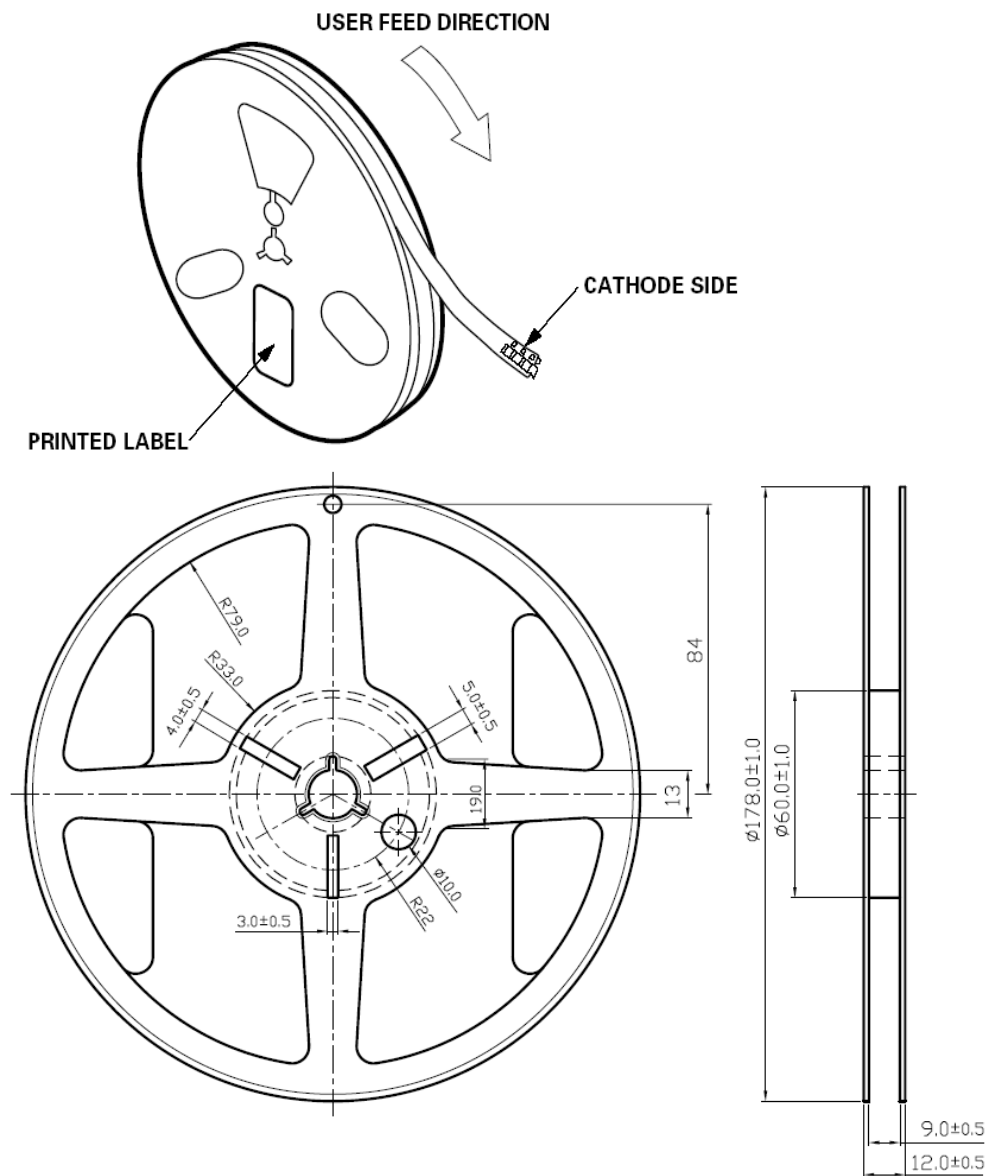


Emitter Reel Packaging



Notes:

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



Notes:

1. Empty component pockets sealed with top cover tape.
2. 3000 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 reseat the MBB.
- The slug 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 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 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)

