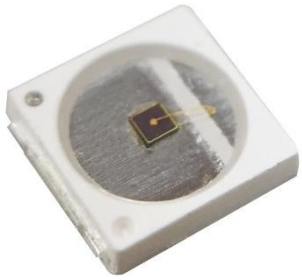
ProLight Opto
Technology Corporation



ProLight PJ2R-FFxE
0.5W Power LED
Technical Datasheet
Version: 1.4

ProLight Opto ® PJ2R Series

Features

·Good color uniformity
·Lead free reflow soldering
·RoHS compliant
·Instant light (less than 100ns)
·No UV

Main Applications

·Backlighting
·Signaling
·Exterior Automotive Lighting
·Automotive Interior Lighting

Introduction

·PJ2R 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.

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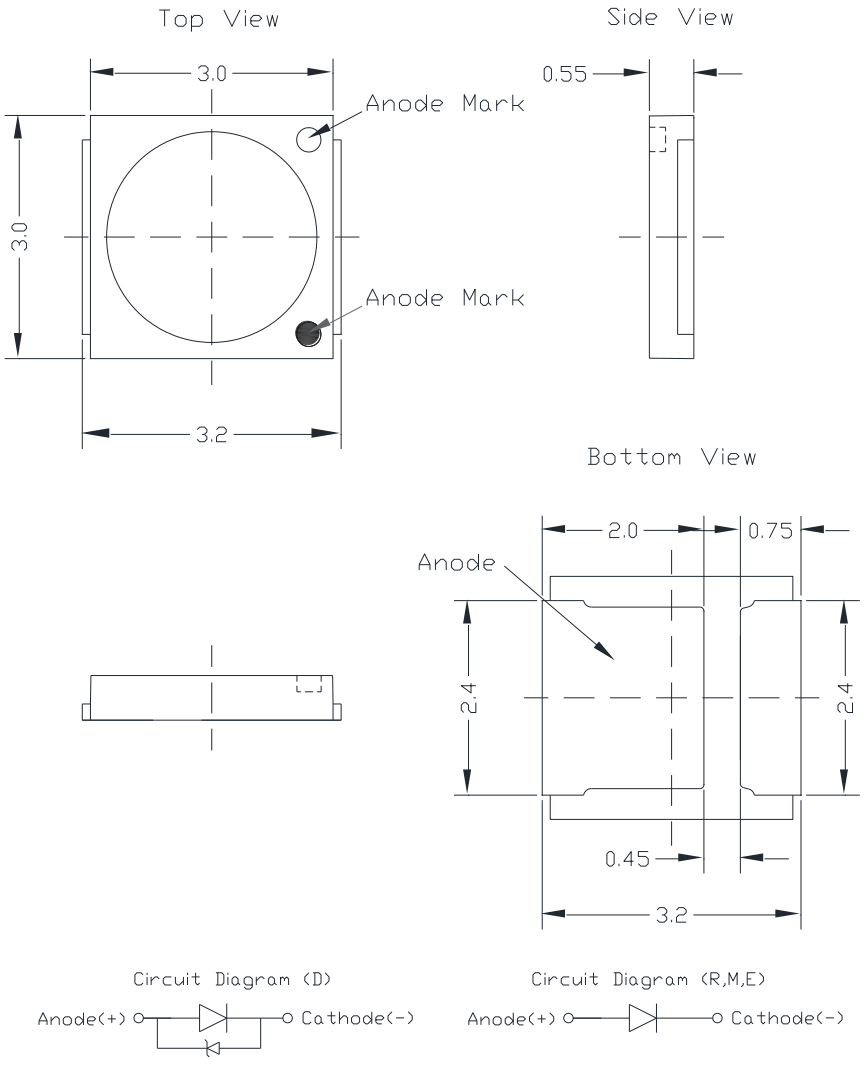
2018/02
DS-0843

Emitter Mechanical Dimensions



Notes:
1. The anode 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 ± 0.10mm.
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.

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Flux Characteristics at 150mA, T_j = 25°C

Radiation Pattern	Color	Part Number Emitter	Luminous Flux or Power Minimum	Luminous Flux or Power Typical	PPF (μmol/s) Typical
Lambertian	Red	PJ2R-FFRE	18.1 lm	20 lm	0.46
	Royal Blue	PJ2R-FFDE	175 mW	220 mW	0.81
	Crimson	PJ2R-FFME	85 mW	105 mW	0.54
	Cherry Red	PJ2R-FFEE	65 mW	85 mW	-

- 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 150mA, T_j = 25°C

Color	Forward Voltage V_F (V) Min.	Typ.	Max.	Thermal Resistance Junction to Slug (°C/ W)
Red	1.8	2.2	2.6	20
Royal Blue	2.8	3.1	3.4	20
Crimson	1.8	2.1	2.6	20
Cherry Red	1.8	2.0	2.6	20

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

Optical Characteristics at 150mA, T_j = 25°C

Radiation Pattern	Color	Dominant Wavelength λ_D, Peak Wavelength [1] λ_P Min.	Typ.	Max.	Total included Angle (degrees) $\theta_{0.90V}$	Viewing Angle (degrees) $2\theta_{1/2}$
Lambertian	Red	613.5 nm	623 nm	631 nm	160	120
	Royal Blue	450 nm	455 nm	460 nm	160	120
	Crimson [1] [2]	650 nm	660 nm	670 nm	160	120
	Cherry Red [1]	720 nm	730 nm	740 nm	160	120

- ProLight maintains a tolerance of ± 1nm for dominant wavelength measurements.
- [1] Crimson, Cherry Red product is binned by peak wavelength rather than dominant wavelength.
- [2] The peak wavelength of 660nm should contain the dominant wavelength of around 640nm.

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Absolute Maximum Ratings

Parameter	Red/Royal Blue/ Crimson/Cherry Red
DC Forward Current (mA)	150
Peak Pulsed Forward Current (mA)	220 (less than 1/10 duty cycle@1KHz)
ESD Sensitivity (HBM per MIL-STD-883E Method 3015.7)	±4000V (Class III)
LED Junction Temperature	120°C
Operating Board Temperature at Maximum DC Forward Current	-40°C - 90°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

Radiometric Power Bin Structure

Color	Bin Code	Radiometric Power (mW) Min.	Radiometric Power (mW) Max.	PPF (µmol/s) Min.	PPF (µmol/s) Max.	PPF (µmol/J) Typ.	Available Color Bins
Royal Blue	L	175	225	0.65	0.83	1.59	All【1】
	M	225	275	0.83	1.02	1.99	
Crimson	H	85	115	0.44	0.59	1.63	All【1】
	J	115	145	0.59	0.75	2.13	
Cherry Red	G	65	85	-	-	-	All【1】
	H	85	115	-	-	-	

- 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.

Photometric Luminous Flux Bin Structure

Color	Bin Code	Photometric Flux (lm) Min.	Photometric Flux (lm) Max.	PPF (µmol/s) Min.	PPF (µmol/s) Max.	PPF (µmol/J) Typ.	Available Color Bins
Red	N	18.1	23.5	-		1.44	All【1】
	P	23.5	30.6	--	-	-	

- 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.

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Peak Wavelength Bin Structure

Color	Bin Code	Minimum Peak Wavelength (nm)	Maximum Peak Wavelength (nm)
Crimson	1	650	655
	2	655	660
	3	660	665
	4	665	670
Cherry Red	1	720	740

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

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
Royal Blue	5	450	455
	6	455	460

- 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.

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Forward Voltage Bin Structure

Color	Bin Code	Minimum Voltage (V)	Maximum Voltage (V)
Red	A	1.8	2.0
	B	2.0	2.2
	D	2.2	2.4
	E	2.4	2.6
Royal Blue	A	2.8	3.0
	B	3.0	3.2
	D	3.2	3.4
Crimson	A	1.8	2.0
	B	2.0	2.2
	D	2.2	2.4
	E	2.4	2.6
Cherry Red	A	1.8	2.0
	B	2.0	2.2
	D	2.2	2.4
	E	2.4	2.6

- 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.

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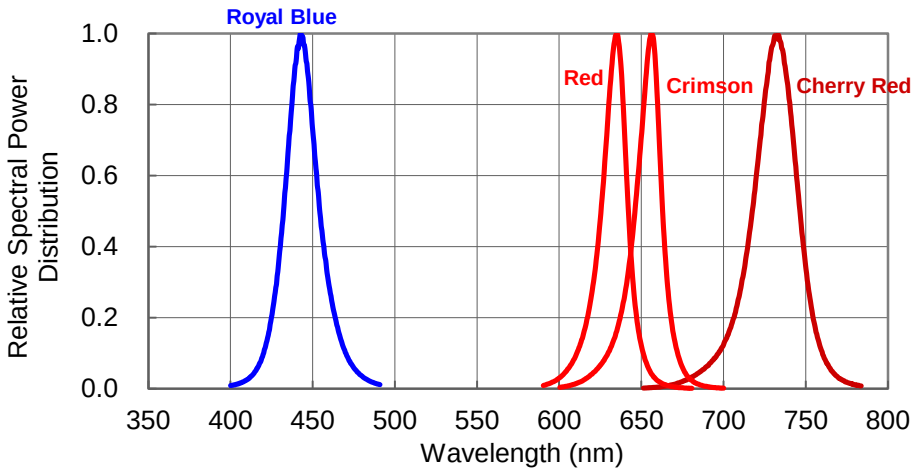
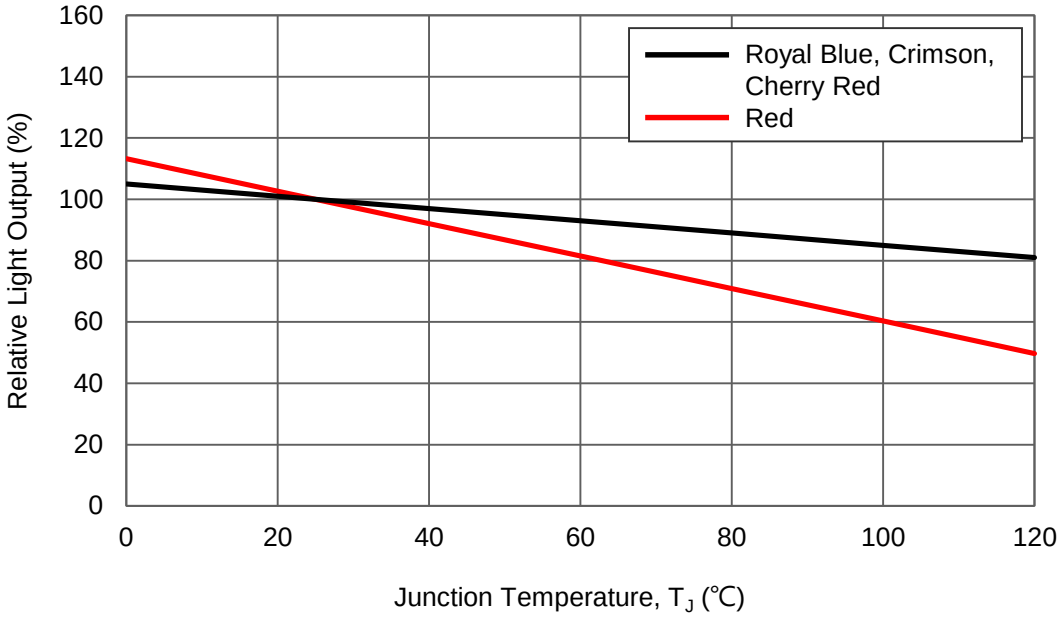
Color Spectrum, T_J = 25°C

1. Royal Blue、Red、Crimson 、Cherry Red



Light Output Characteristics

Relative Light Output vs. Junction Temperature at 150mA



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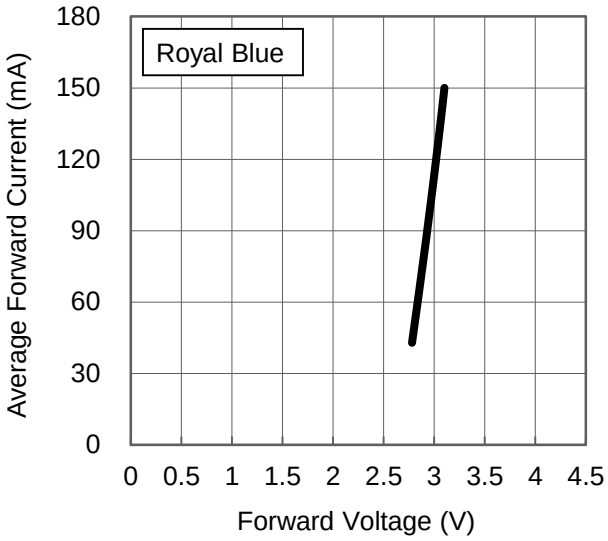
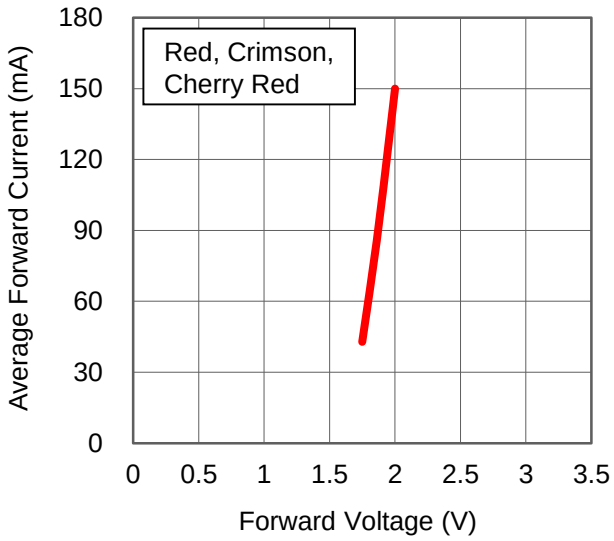
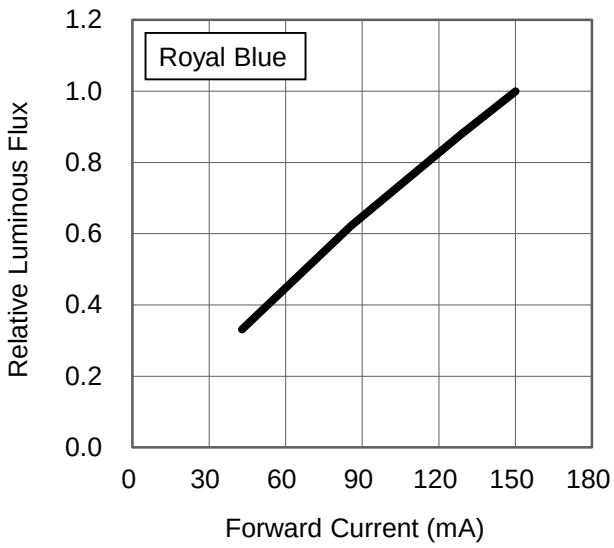
Forward Current Characteristics, T_j = 25°C

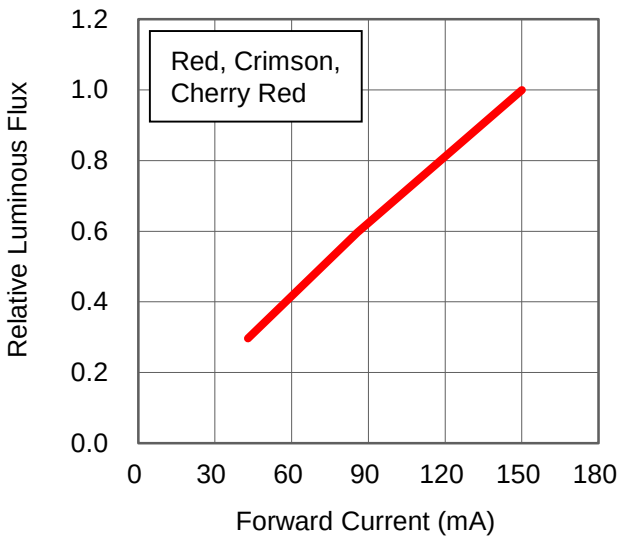
1. Forward Voltage vs. Forward Current





2. Forward Current vs. Normalized Relative Luminous Flux





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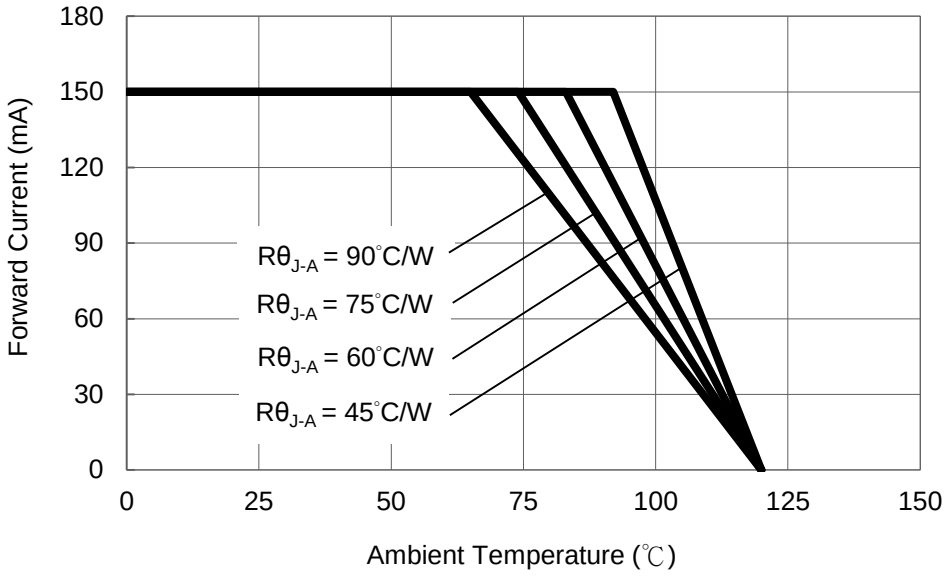
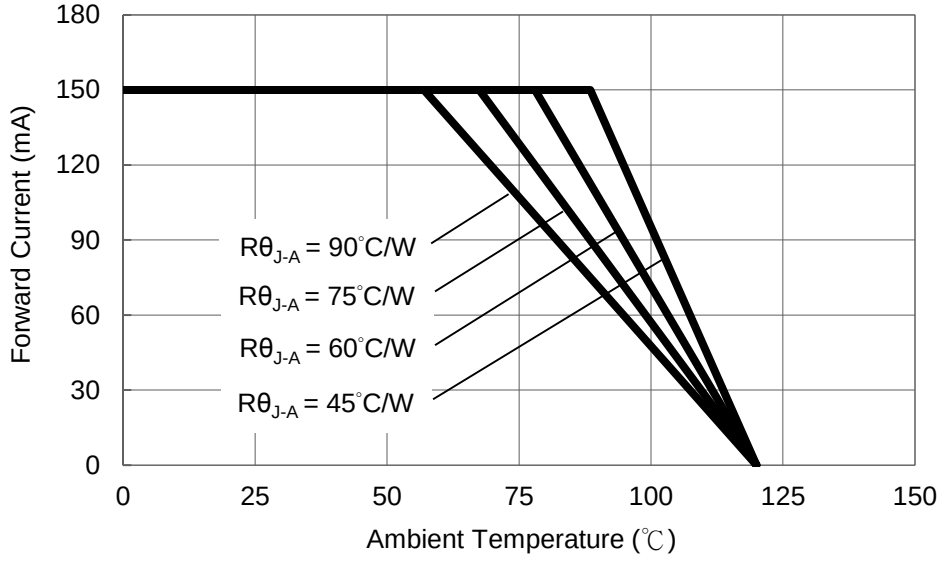
Ambient Temperature vs. Maximum Forward Current

1. Royal Blue (T_{JMAX} = 120°C)



2. Red, Crimson, Cherry Red (T_{JMAX} = 120°C)



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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

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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	--

* 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.

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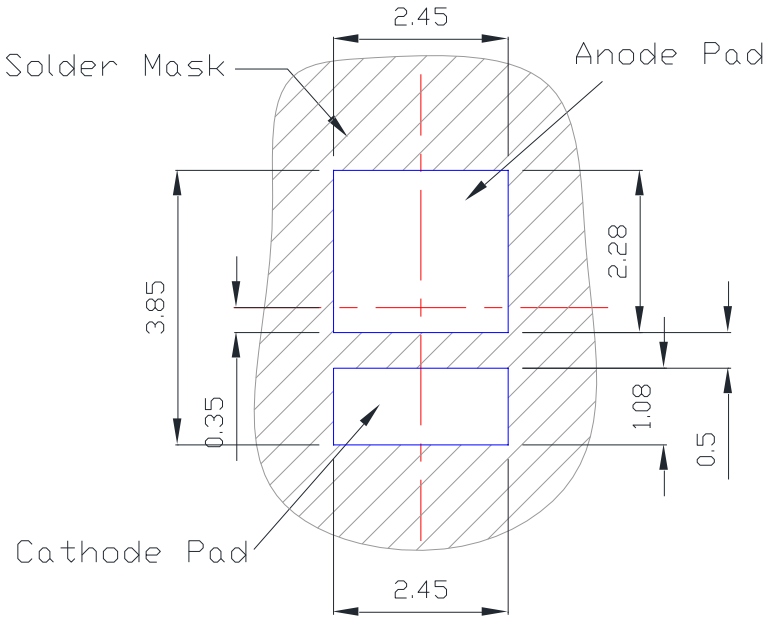
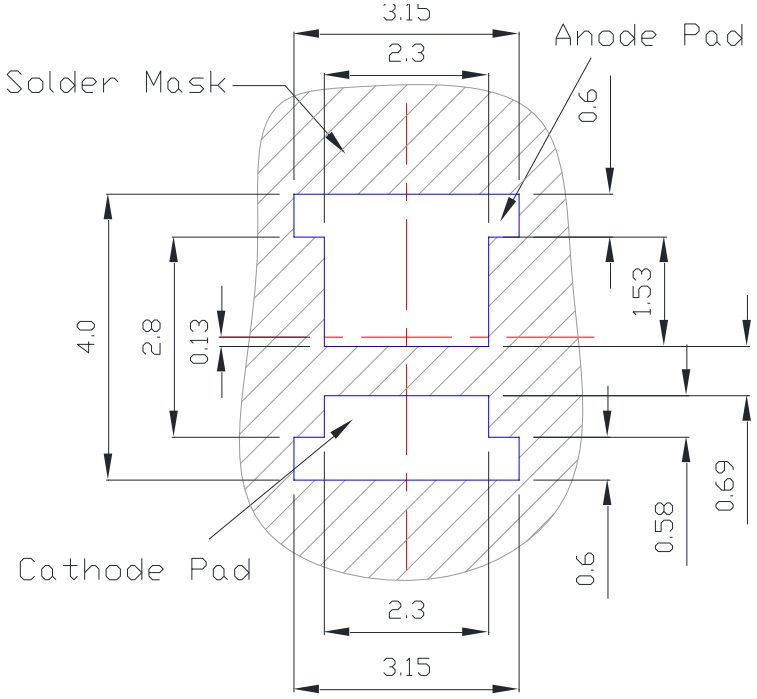
Recommended Solder Pad Design

Standard Emitter

TYPE A.



TYPE B.



- All dimensions are in millimeters.

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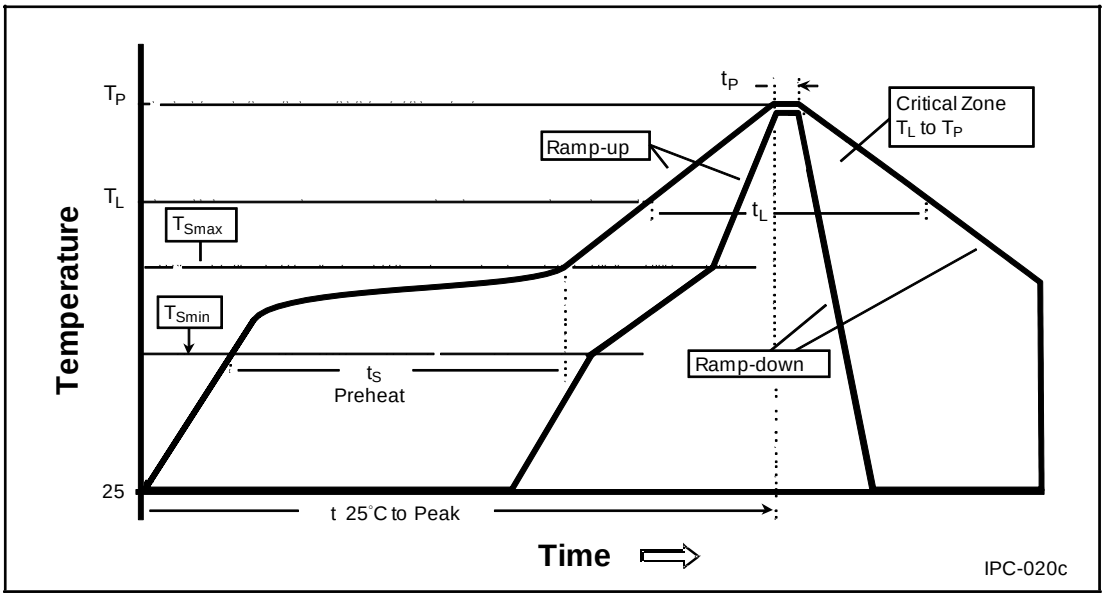
Reflow Soldering Condition

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.

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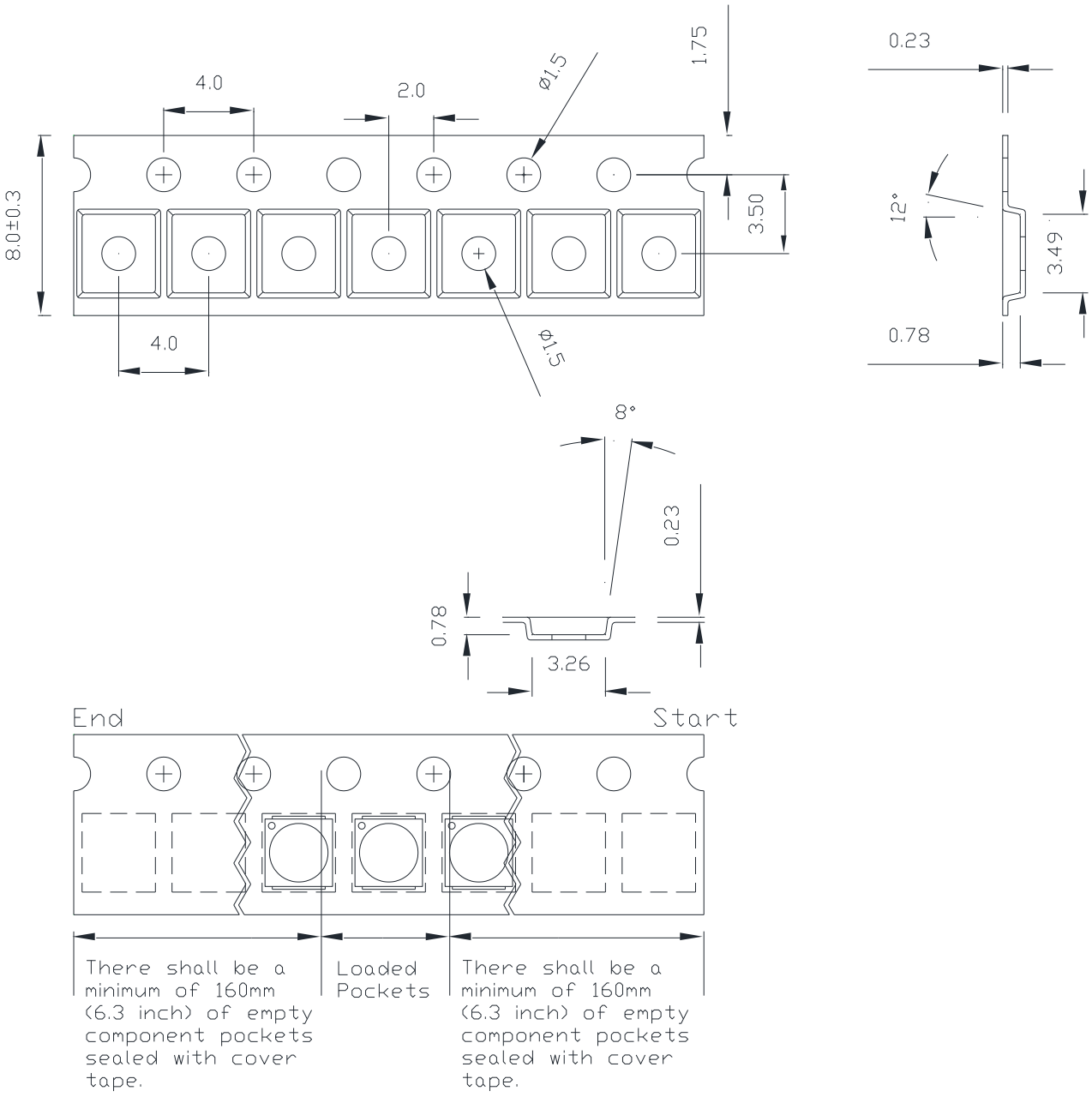
Emitter Reel Packaging



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

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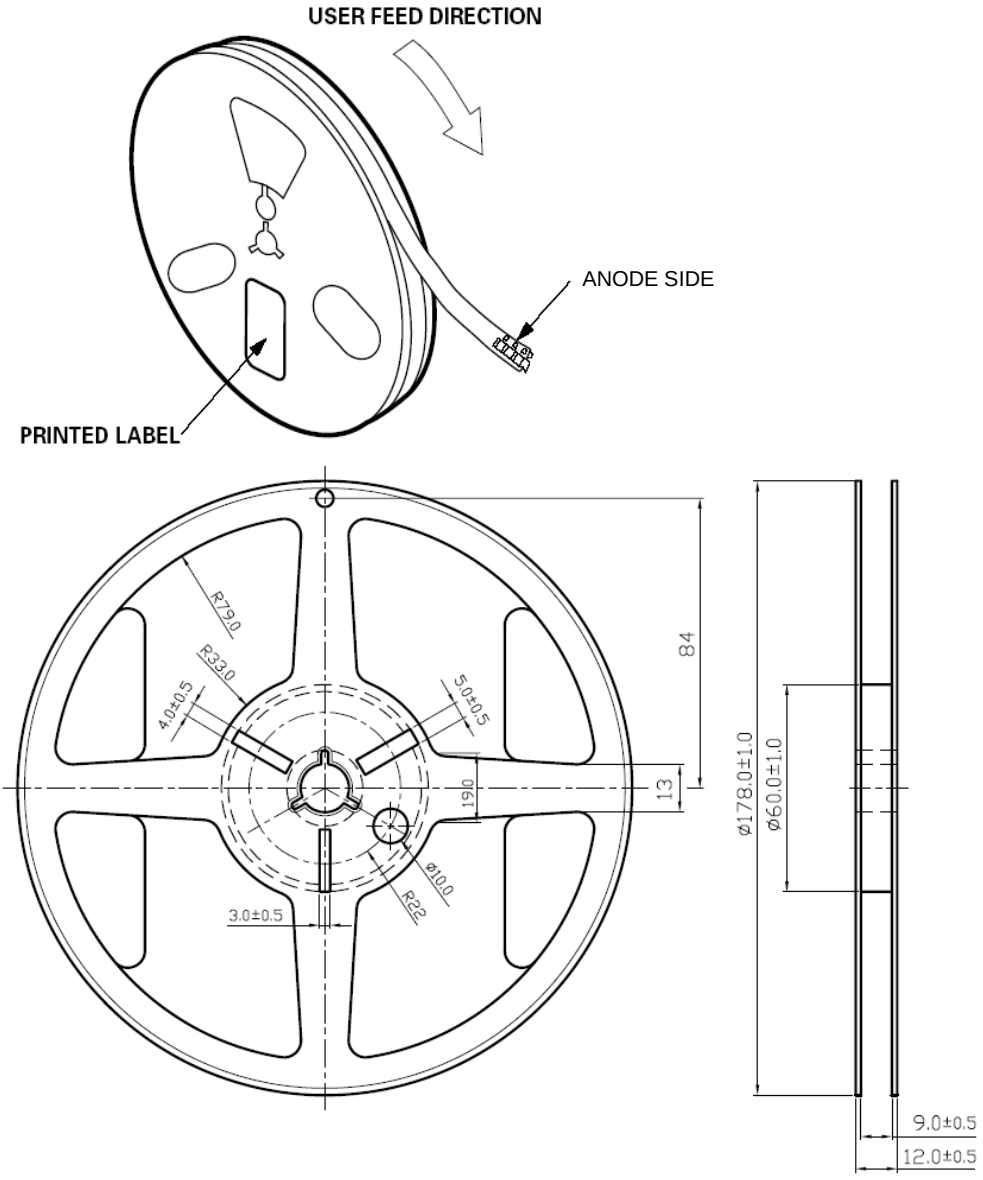
Emitter Reel Packaging



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.

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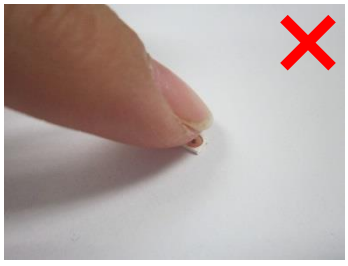
Precaution for Use

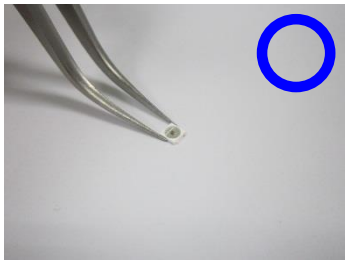
- Storage
  Please do not open the moisture barrier bag (MBB) more than one week. This may cause the leads of LED discoloration. We recommend storing ProLight's LEDs in a dry box after opening the MBB. The recommended storage conditions are temperature 5 to 30°C and humidity less than 40% RH. It is also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