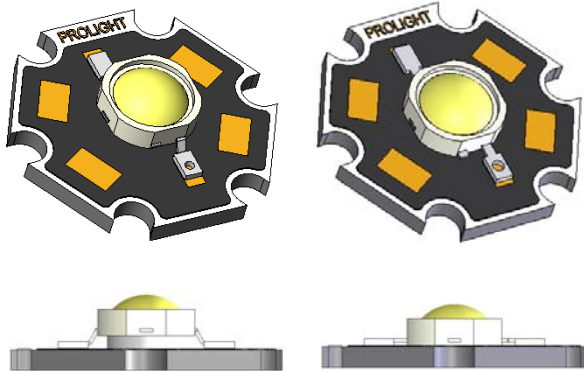




ProLight Opto
Technology Corporation



**ProLight PG1X-5LXS
5W Power LED
Technical Datasheet
Version: 2.8**

Features

- High flux per LED
- Very long operating life(up to 100k hours)
- Various colors
- Good color uniformity
- More energy efficient than incandescent and most halogen lamps
- Low Voltage DC operated
- Instant light (less than 100ns)
- No UV
- Superior ESD protection

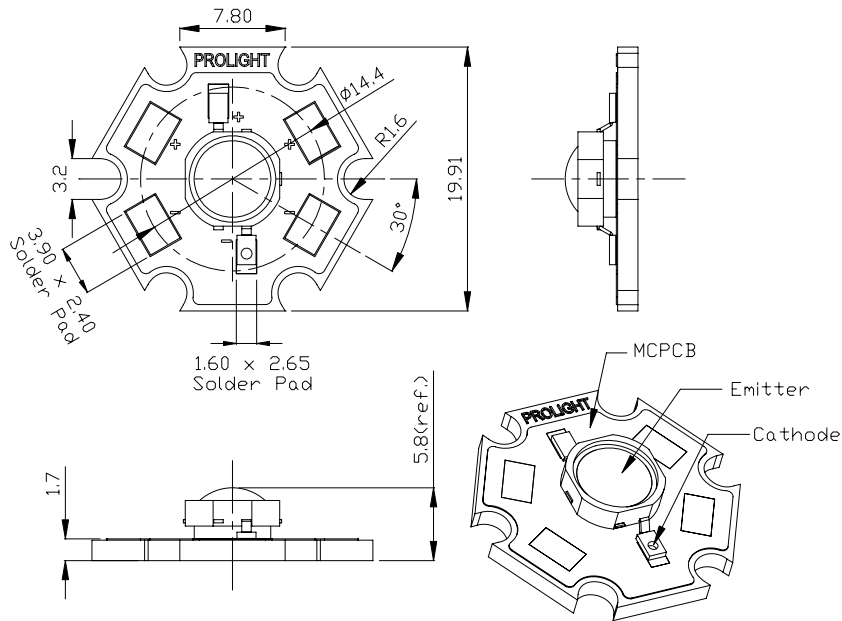
Typical Applications

- Reading lights (car, bus, aircraft)
- Portable (flashlight, bicycle)
- Uplighters/Downlighters
- Decorative/Entertainment
- Bollards/Security/Garden
- Cove/Undershelf/Task
- Indoor/Outdoor Commercial and Residential Architectural
- Automotive Ext (Stop-Tail-Turn, CHMSL, Mirror Side Repeat)
- LCD backlights

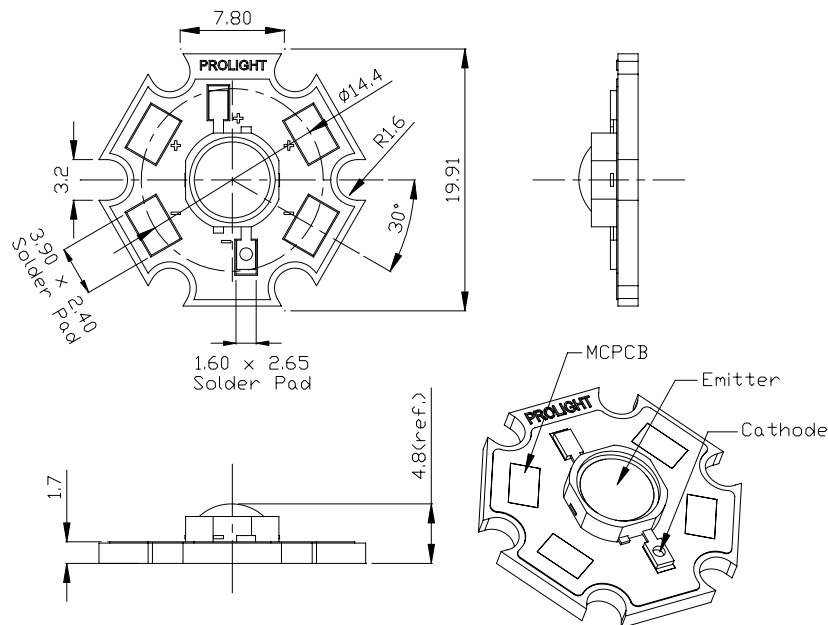
ProLight

Star Mechanical Dimensions

Lambertian - Standard Star



Lambertian - Low Profile Star



Notes:

1. Slots in aluminum-core PCB for M3 or #4 mounting screw.
2. Electrical interconnection pads labeled on the aluminum-core PCB with "+" and "-" to denote positive and negative, respectively. All positive pads are interconnected, as are all negative pads, allowing for flexibility in array interconnection.
3. Drawing not to scale.
4. All dimensions are in millimeters.
5. All dimensions without tolerances are for reference only.
6. Please do not use a force of over 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.

ProLight

Flux Characteristics at 700mA, T_J = 25°C

| Radiation Pattern | Color | Part Number | | Lumious Flux Φ _v (lm) | |
|-------------------|------------|---------------|------------------|----------------------------------|---------|
| | | Standard Star | Low Profile Star | Minimum | Typical |
| Lambertian | White | PG1A-5LWS | PG1N-5LWS | 129.5 | 200 |
| | Warm White | PG1A-5LVS | PG1N-5LVS | 129.5 | 180 |
| | Green | PG1A-5LGS | PG1N-5LGS | 147.7 | 210 |
| | Blue | PG1A-5LBS | PG1N-5LBS | 30.6 | 50 |
| | Amber | PG1A-5LAS | PG1N-5LAS | 99.6 | 160 |
| | Red | PG1A-5LRS | PG1N-5LRS | 99.6 | 155 |

- 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 700mA, T_J = 25°C

| Color | Forward Voltage V _F (V) | | | Dynamic Resistance (Ω) | Temperature Coefficient of V _F (mV/ °C) ΔV _F / ΔT _J | Thermal Resistance Junction to Board (°C/ W) |
|------------|------------------------------------|------|------|------------------------|---|--|
| | Min. | Typ. | Max. | | | |
| White | 5.6 | 7.0 | 8.6 | 1.0 | -4.0 | 6 |
| Warm White | 5.6 | 7.0 | 8.6 | 1.0 | -4.0 | 6 |
| Green | 5.6 | 7.0 | 8.6 | 1.0 | -4.0 | 6 |
| Blue | 5.6 | 7.0 | 8.6 | 1.0 | -4.0 | 6 |
| Amber | 3.8 | 4.4 | 6.2 | 2.4 | -4.0 | 6 |
| Red | 3.8 | 4.4 | 6.2 | 2.4 | -4.0 | 6 |

Optical Characteristics at 700mA, T_J = 25°C

| Radiation Pattern | Color | Dominant Wavelength λ _D , or Color Temperature CCT | | | Spectral Half-width (nm) Δλ _{1/2} | Temperature Coefficient of Dominant Wavelength (nm/ °C) Δλ _D / ΔT _J | Total included Angle (degrees) θ _{0.90V} | Viewing Angle (degrees) 2 θ _{1/2} |
|-------------------|------------|---|--------|---------|---|--|--|---|
| | | Min. | Typ. | Max. | | | | |
| Lambertian | White | 4100 K | 5500 K | 10000 K | --- | --- | 160 | 140 |
| | Warm White | 2700 K | 3300 K | 4100 K | --- | --- | 160 | 140 |
| | Green | 515 nm | 525 nm | 535 nm | 35 | 0.04 | 160 | 140 |
| | Blue | 455 nm | 465 nm | 475 nm | 25 | 0.04 | 160 | 140 |
| | Amber | 587 nm | 592 nm | 597 nm | 20 | 0.05 | 160 | 140 |
| | Red | 613.5 nm | 623 nm | 631 nm | 20 | 0.05 | 160 | 140 |

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

ProLight

Absolute Maximum Ratings

| Parameter | White/Warm White/ Green/Blue | Amber/Red |
|--------------------------------------|---------------------------------|-------------|
| DC Forward Current (mA) | 700 | 700 |
| Peak Pulsed Forward Current (mA) | 1000 | 1000 |
| Average Forward Current (mA) | 700 | 700 |
| ESD Sensitivity | ±16000V HBM | |
| LED Junction Temperature (°C) | 135 | 120 |
| Aluminum-core PCB Temperature (°C) | 105 | 105 |
| Storage & Operating Temperature (°C) | -40 to +105 | -40 to +105 |
| Soldering Temperature(°C) | 260 for 5 seconds Max. | |

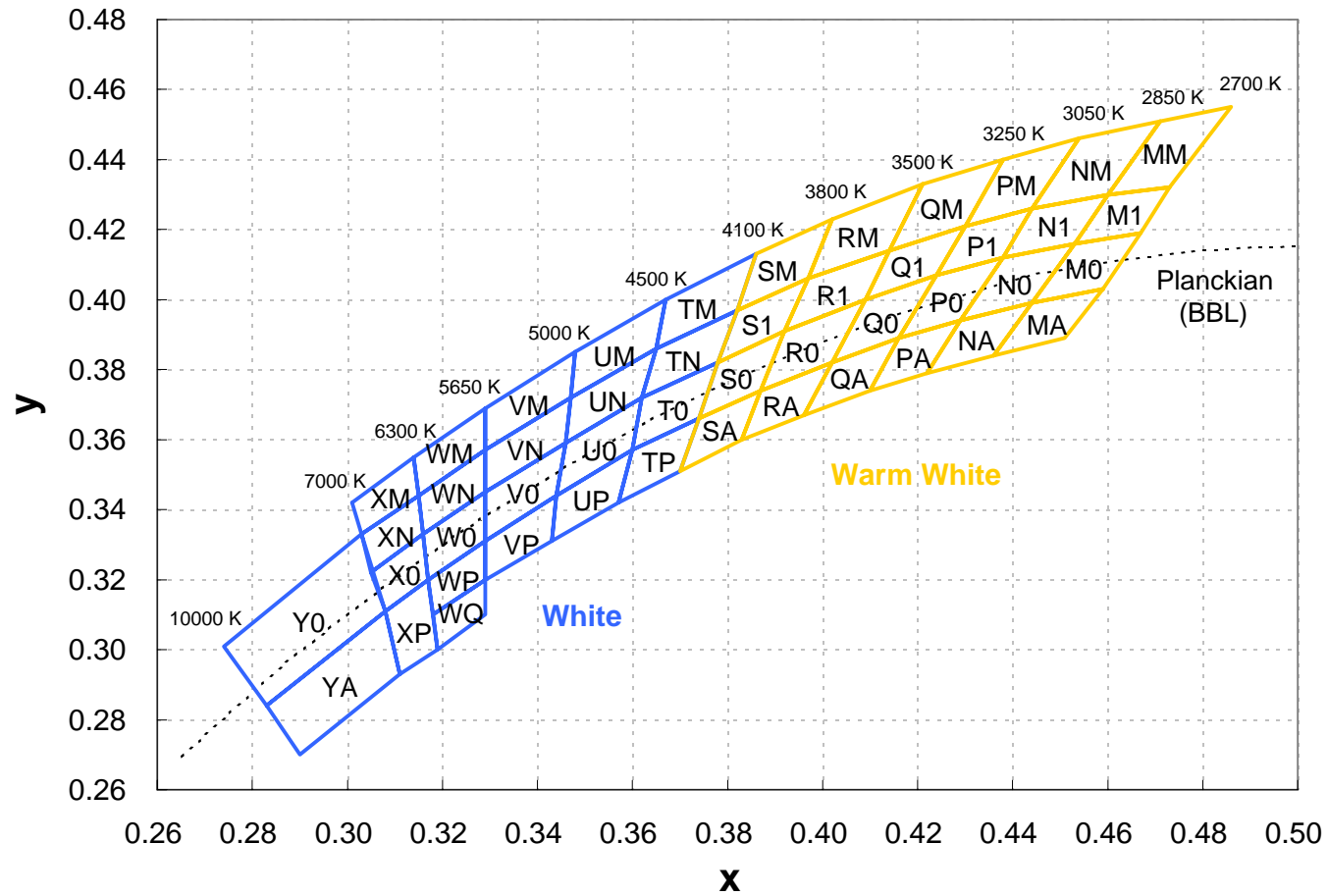
Photometric Luminous Flux Bin Structure

| Color | Bin Code | Minimum Photometric Flux (lm) | Maximum Photometric Flux (lm) |
|------------|----------|-------------------------------|-------------------------------|
| White | V2 | 129.5 | 147.7 |
| | W1 | 147.7 | 168.4 |
| | W2 | 168.4 | 192.0 |
| | X1 | 192.0 | 218.9 |
| Warm White | V2 | 129.5 | 147.7 |
| | W1 | 147.7 | 168.4 |
| | W2 | 168.4 | 192.0 |
| | X1 | 192.0 | 218.9 |
| Green | W1 | 147.7 | 168.4 |
| | W2 | 168.4 | 192.0 |
| | X1 | 192.0 | 218.9 |
| | X2 | 218.9 | 249.6 |
| Blue | Q | 30.6 | 39.8 |
| | R | 39.8 | 51.7 |
| | S1 | 51.7 | 58.9 |
| Amber | U2 | 99.6 | 113.6 |
| | V1 | 113.6 | 129.5 |
| | V2 | 129.5 | 147.7 |
| | W1 | 147.7 | 168.4 |
| Red | U2 | 99.6 | 113.6 |
| | V1 | 113.6 | 129.5 |
| | V2 | 129.5 | 147.7 |
| | W1 | 147.7 | 168.4 |

- ProLight maintains a tolerance of ± 10% on flux and power measurements.

Color Bin

White and Warm White Binning Structure Graphical Representation



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 | W0 | 0.329 | 0.345 | 5970 |
| | 0.374 | 0.366 | | | 0.329 | 0.331 | |
| | 0.360 | 0.357 | | | 0.317 | 0.320 | |
| | 0.362 | 0.372 | | | 0.316 | 0.333 | |
| TN | 0.382 | 0.397 | 4300 | WN | 0.329 | 0.345 | 5970 |
| | 0.378 | 0.382 | | | 0.316 | 0.333 | |
| | 0.362 | 0.372 | | | 0.315 | 0.344 | |
| | 0.365 | 0.386 | | | 0.329 | 0.357 | |
| TP | 0.374 | 0.366 | 4300 | WP | 0.329 | 0.331 | 5970 |
| | 0.370 | 0.351 | | | 0.329 | 0.320 | |
| | 0.357 | 0.342 | | | 0.318 | 0.310 | |
| | 0.360 | 0.357 | | | 0.317 | 0.320 | |
| TM | 0.386 | 0.413 | 4300 | WQ | 0.329 | 0.320 | 5970 |
| | 0.382 | 0.397 | | | 0.329 | 0.310 | |
| | 0.365 | 0.386 | | | 0.319 | 0.300 | |
| | 0.367 | 0.400 | | | 0.318 | 0.310 | |
| U0 | 0.362 | 0.372 | 4750 | WM | 0.329 | 0.369 | 5970 |
| | 0.360 | 0.357 | | | 0.329 | 0.357 | |
| | 0.344 | 0.344 | | | 0.315 | 0.344 | |
| | 0.346 | 0.359 | | | 0.314 | 0.355 | |
| UN | 0.365 | 0.386 | 4750 | X0 | 0.308 | 0.311 | 6650 |
| | 0.362 | 0.372 | | | 0.305 | 0.322 | |
| | 0.346 | 0.359 | | | 0.316 | 0.333 | |
| | 0.347 | 0.372 | | | 0.317 | 0.320 | |
| UP | 0.360 | 0.357 | 4750 | XN | 0.305 | 0.322 | 6650 |
| | 0.357 | 0.342 | | | 0.303 | 0.333 | |
| | 0.343 | 0.331 | | | 0.315 | 0.344 | |
| | 0.344 | 0.344 | | | 0.316 | 0.333 | |
| UM | 0.365 | 0.386 | 4750 | XP | 0.308 | 0.311 | 6650 |
| | 0.367 | 0.400 | | | 0.317 | 0.320 | |
| | 0.348 | 0.385 | | | 0.319 | 0.300 | |
| | 0.347 | 0.372 | | | 0.311 | 0.293 | |
| V0 | 0.329 | 0.331 | 5320 | XM | 0.301 | 0.342 | 6650 |
| | 0.329 | 0.345 | | | 0.314 | 0.355 | |
| | 0.346 | 0.359 | | | 0.315 | 0.344 | |
| | 0.344 | 0.344 | | | 0.303 | 0.333 | |
| 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 | |
| VP | 0.329 | 0.331 | 5320 | YA | 0.308 | 0.311 | 8000 |
| | 0.344 | 0.344 | | | 0.311 | 0.293 | |
| | 0.343 | 0.331 | | | 0.290 | 0.270 | |
| | 0.329 | 0.320 | | | 0.283 | 0.284 | |
| VM | 0.329 | 0.357 | 5320 | | | | |
| | 0.329 | 0.369 | | | | | |
| | 0.348 | 0.385 | | | | | |
| | 0.347 | 0.372 | | | | | |

- 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.

ProLight

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 | |
| MA | 0.459 | 0.403 | 2770 | QA | 0.416 | 0.389 | 3370 |
| | 0.444 | 0.399 | | | 0.402 | 0.382 | |
| | 0.436 | 0.384 | | | 0.396 | 0.367 | |
| | 0.451 | 0.389 | | | 0.410 | 0.374 | |
| MM | 0.471 | 0.451 | 2770 | QM | 0.421 | 0.433 | 3370 |
| | 0.460 | 0.430 | | | 0.414 | 0.414 | |
| | 0.473 | 0.432 | | | 0.430 | 0.421 | |
| | 0.486 | 0.455 | | | 0.438 | 0.440 | |
| 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 | |
| NA | 0.444 | 0.399 | 2950 | RA | 0.387 | 0.374 | 3650 |
| | 0.429 | 0.394 | | | 0.383 | 0.360 | |
| | 0.422 | 0.379 | | | 0.396 | 0.367 | |
| | 0.436 | 0.384 | | | 0.402 | 0.382 | |
| NM | 0.454 | 0.446 | 2950 | RM | 0.421 | 0.433 | 3650 |
| | 0.444 | 0.426 | | | 0.414 | 0.414 | |
| | 0.460 | 0.430 | | | 0.397 | 0.406 | |
| | 0.471 | 0.451 | | | 0.402 | 0.423 | |
| 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 | |
| PA | 0.429 | 0.394 | 3150 | SA | 0.387 | 0.374 | 3950 |
| | 0.416 | 0.389 | | | 0.383 | 0.360 | |
| | 0.410 | 0.374 | | | 0.370 | 0.351 | |
| | 0.422 | 0.379 | | | 0.374 | 0.366 | |
| PM | 0.438 | 0.440 | 3150 | SM | 0.402 | 0.423 | 3950 |
| | 0.430 | 0.421 | | | 0.397 | 0.406 | |
| | 0.444 | 0.426 | | | 0.382 | 0.397 | |
| | 0.454 | 0.446 | | | 0.386 | 0.413 | |

- 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.

Dominant Wavelength Bin Structure

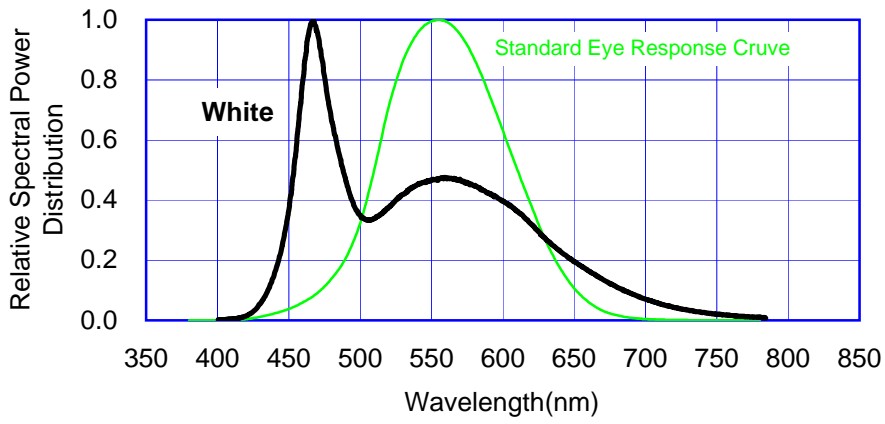
| Color | Bin Code | Minimum Dominant Wavelength (nm) | Maximum Dominant Wavelength (nm) |
|-------|----------|----------------------------------|----------------------------------|
| Green | A | 515 | 520 |
| | 1 | 520 | 525 |
| | 2 | 525 | 530 |
| | 3 | 530 | 535 |
| Blue | A | 455 | 460 |
| | 1 |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

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

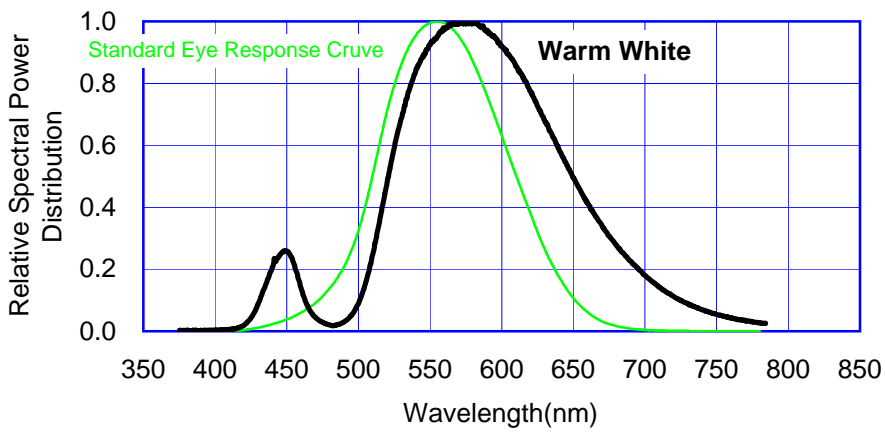
Note: Although several bins are outlined, product availability in a particular bin varies by production run and by product performance. Not all bins are available in all colors.

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

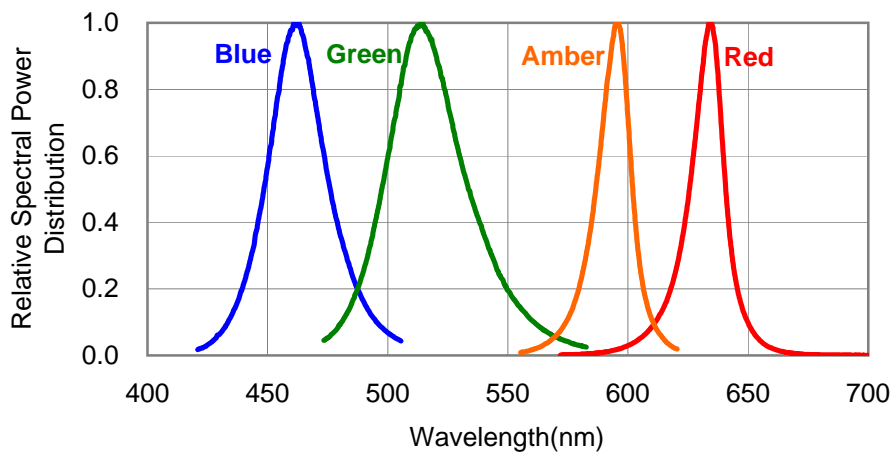
1. White



2. Warm White

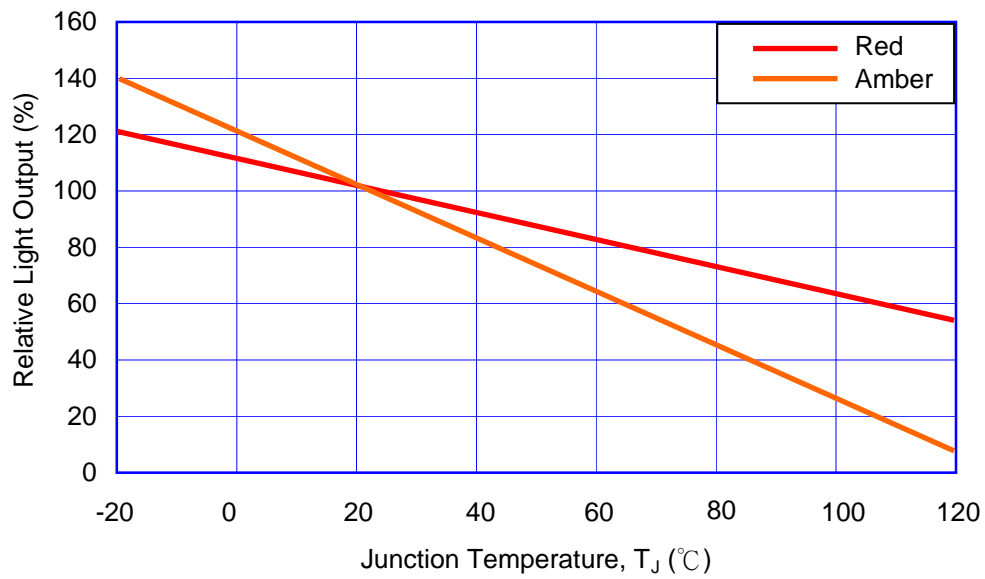
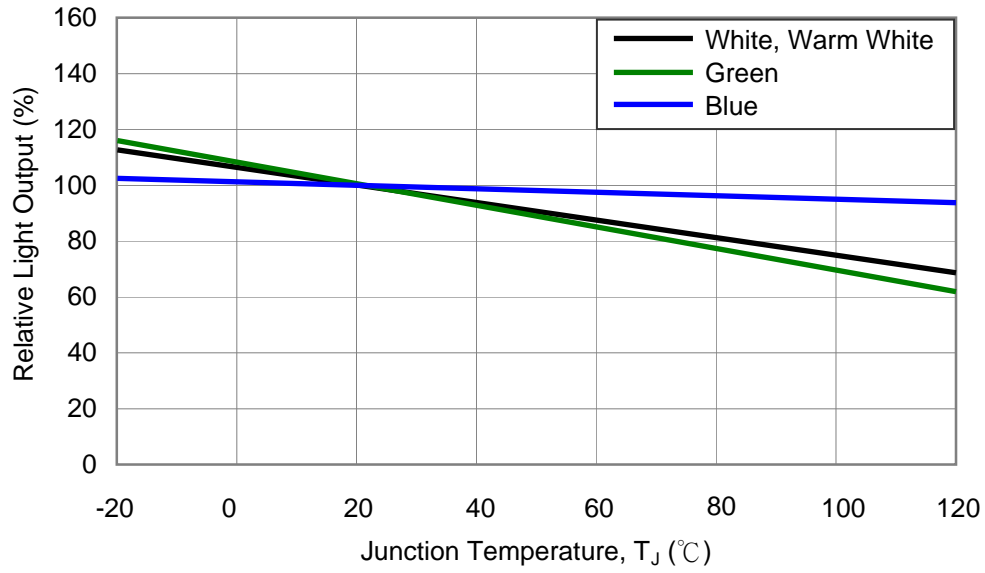


3. Blue 、 Green 、 Amber 、 Red



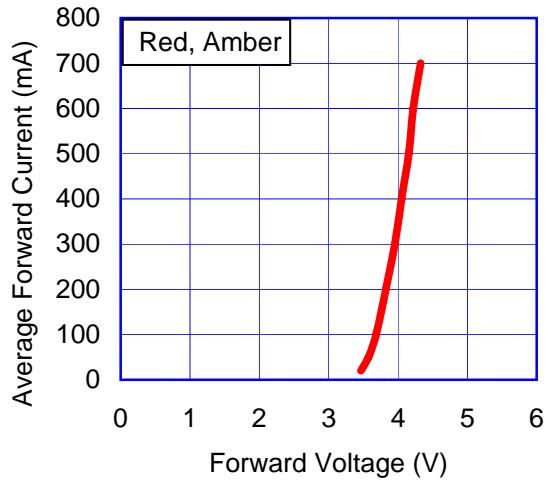
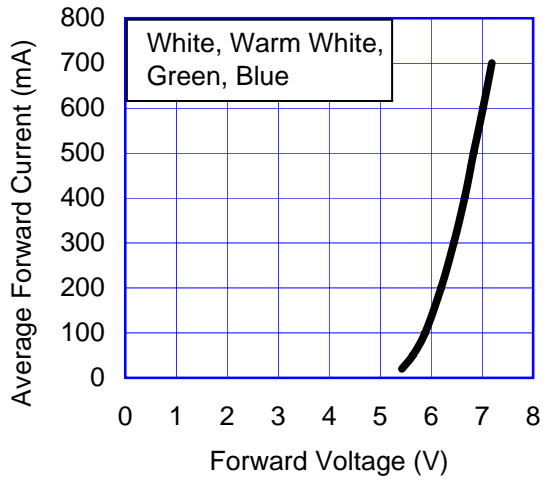
Light Output Characteristics

Relative Light Output vs. Junction Temperature at 700mA

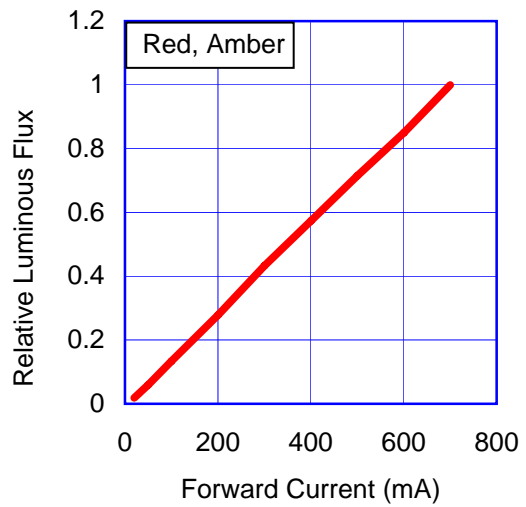
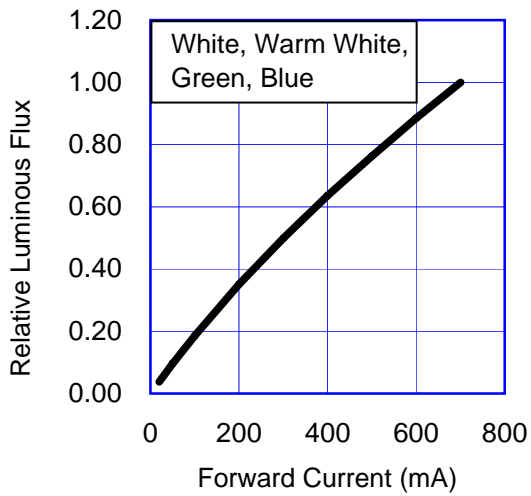


Forward Current Characteristics, $T_J = 25^\circ\text{C}$

1. Forward Voltage vs. Forward Current

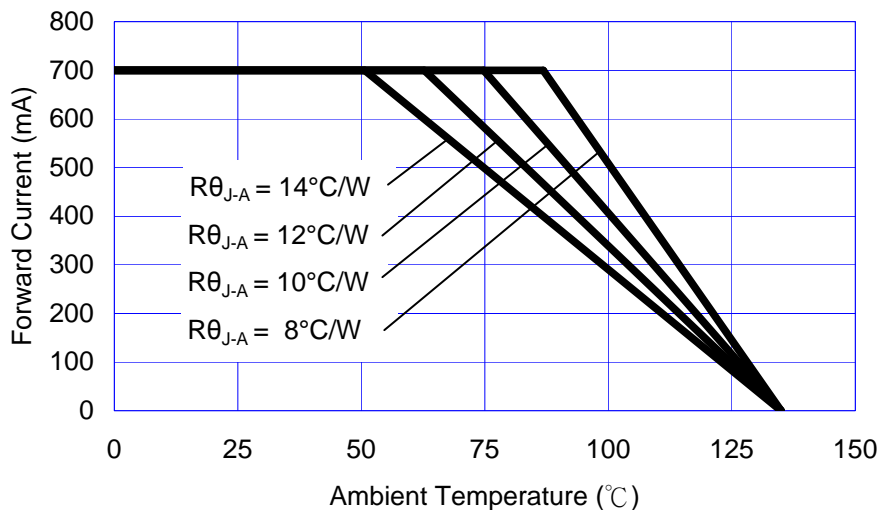


2. Forward Current vs. Normalized Relative Luminous Flux

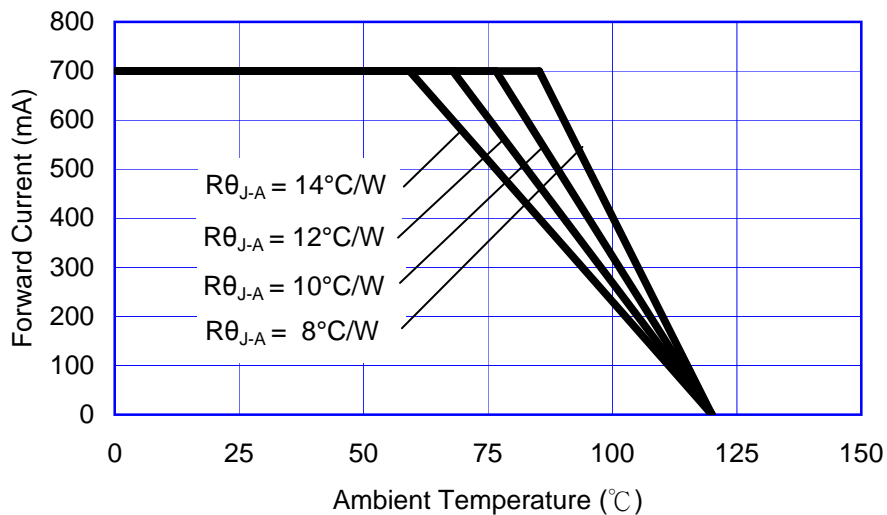


Ambient Temperature vs. Maximum Forward Current

1. White, Warm White, Green, Blue ($T_{JMAX} = 135^{\circ}C$)

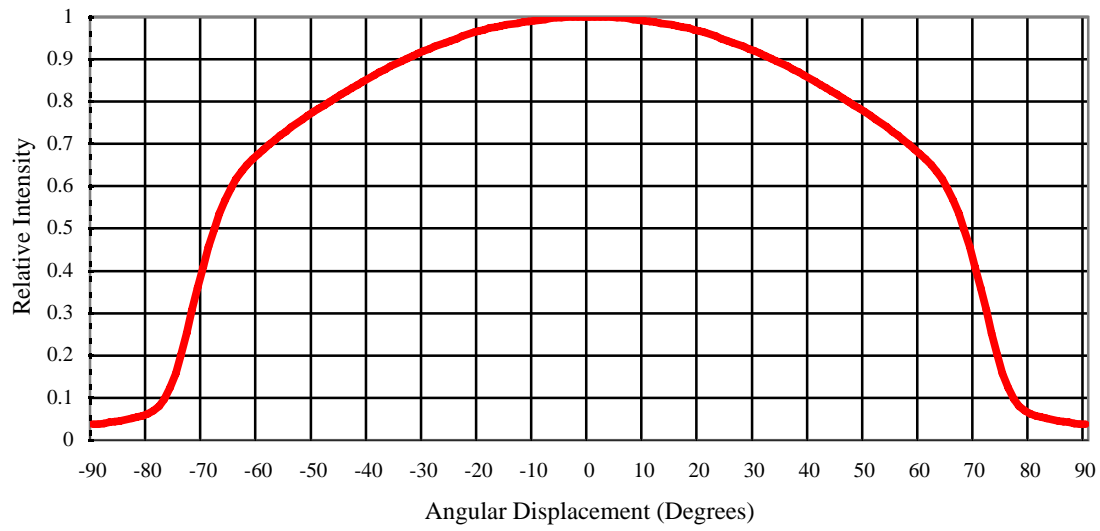


2. Red, Amber ($T_{JMAX} = 120^{\circ}C$)



Typical Representative Spatial Radiation Pattern

Lambertian Radiation Pattern



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 |
| 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:

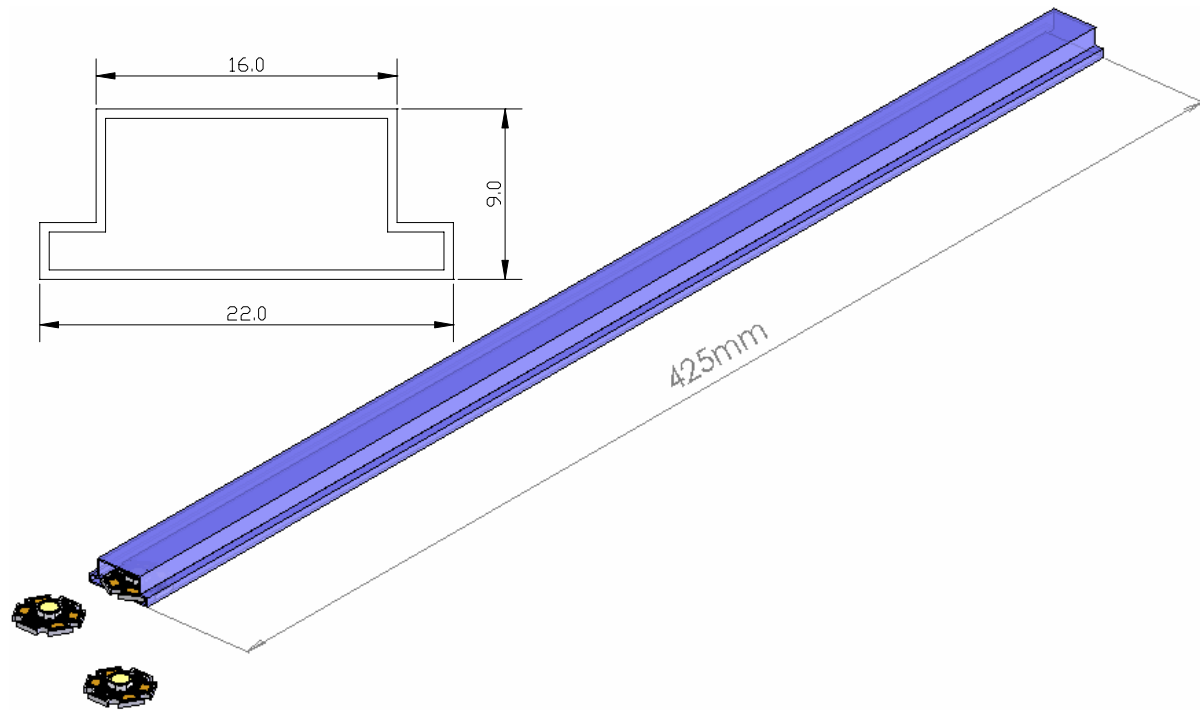
1. Depending on the maximum derating curve.
2. Criteria for judging failure

| Item | Test Condition | Criteria for Judgement | |
|---|-----------------------|------------------------|---------------------|
| | | Min. | Max. |
| Forward Voltage (V_F) | $I_F = \text{max DC}$ | - | Initial Level x 1.1 |
| Luminous Flux or Radiometric Power (Φ_V) | $I_F = \text{max DC}$ | Initial Level x 0.7 | - |
| 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.

Star Tube Packaging



Notes:

1. 20 pieces per tube.
2. Drawing not to scale.
3. All dimensions are in millimeters.
4. All dimensions without tolerances are for reference only.

**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.

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 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 decided after considering the package maximum temperature.
- The appearance and specifications of the product may be modified for improvement without notice.