

PhlatLight™ PT121 Projection Chipset

PRELIMINARY DATA SHEET



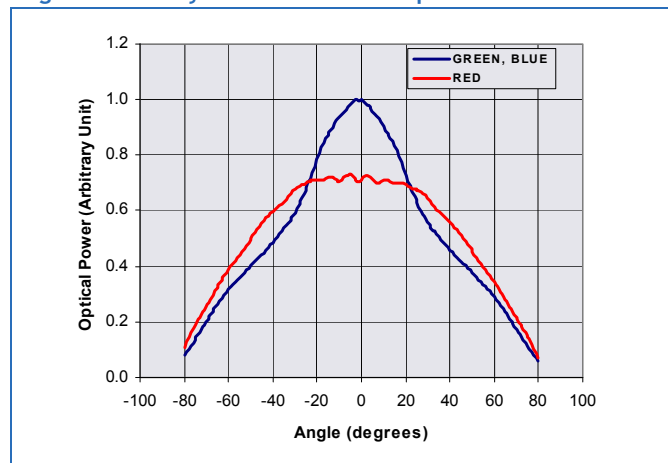
Technology Overview

Luminus Devices' Projection Technology (PT) is an innovative solid-state light source created to replace arc lamps in projection systems, enabling a new category of lamp-free projectors. Enabled by unique use of Photonic Lattice technology, PhlatLight chipsets represent a major breakthrough in brightness that delivers all the benefits of solid state light sources in projections applications:

- Wide color gamut for vivid colors, exceeds NTSC.
- Environmentally friendly technology - Mercury-free.
- Instant start and re-start - no more wait time.
- High reliability; no more lamp replacement.
- Electronic control of color points and light intensity on a frame by frame basis

PhlatLight products benefit from numerous innovations in the domain of packaging, thermal management and optical coupling that allow designers to achieve efficient light engine designs and deliver high screen brightness.

Angular Intensity Distribution- Example



PT121 Features

- Matched RGB Chipset with 12mm² emitting area per device designed for projection applications
- 4:3 aspect ratio matched with micro-display and screen aspect ratio
- Wide color gamut: RED 623 nm, GREEN 526 nm, BLUE 460nm typical dominant wavelength
- Photonic lattice technology for very high surface brightness
- 100% surface emission for high collection efficiency and low optical losses
- Single emitting area per color allows for collection with single lens for simplified optics
- Over 3575 emitted white lumens at 8000K color temperature from single chipset (Continuous Wave Operation)
- Over 2300 emitted white lumens at 8000K color temperature from single chipset under Pulsed Operation
- Uniform surface emission
- Thermally efficient Type CX Common Anode package
- RoHS (lead-free) compliant

Applications

- Data front projectors and professional Rear-Projection Displays with 4:3 aspect ratio
- Optimized for Micro-Display diagonal sizes ranging from 0.7" to 0.96" with 4:3 aspect ratio.
- Suitable for DLP™(0.7"XGA, 0.96SXGA), LCoS, HTPS and 3LCD microdisplays

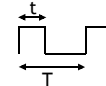
Optical and Electrical Characteristics

| | Symbol | Red | Green | EP-Blue | Unit |
|---|-----------------------|---------|---------|---------|-----------------|
| Emitting Area | | 12 | 12 | 12 | mm ² |
| Emitting Area Dimensions | | 4 x 3 | 4 x 3 | 4 x 3 | mmxmm |
| Characteristics at recommended Pulsed Drive Current $I_F^{1,2}$ | | | | | |
| Reference Duty Cycle ³ | | 25 | 50 | 25 | % |
| Recommended Peak Drive Current ⁴ | typ I_F | 30 | 30 | 30 | A |
| Peak Luminous Flux ⁵ | typ Φ_V | 1800 | 3500 | 750 | lm |
| Peak Radiometric Power | typ Φ_r | 10.4 | 7.3 | 16.3 | W |
| Dominant Wavelength | λ_{dmin} | 619 | 516 | 450 | nm |
| | typ λ_d | 623 | 525 | 460 | nm |
| | λ_{dmax} | 630 | 535 | 468 | nm |
| FWHM - Spectral bandwidth at 50% of Φ_V | typ $\Delta\lambda_d$ | 19 | 39 | 20 | nm |
| Color Saturation ^{6,7} | typ | 1.00 | 0.79 | 0.99 | |
| Chromaticity Coordinates ^{6,7} | typ x | 0.697 | 0.171 | 0.154 | |
| | typ y | 0.303 | 0.702 | 0.024 | |
| | min V_{Fmin} | 2.2 | 3.5 | 3.2 | V |
| Forward Voltage | typ V_F | 2.6 | 4.9 | 4.0 | V |
| | max V_{Fmax} | 3.4 | 5.9 | 5.2 | V |
| Dynamic Resistance | typ Ω_{dyn} | 0.02 | 0.03 | 0.02 | Ω |
| Device Thermal Characteristics and Lifetime | | | | | |
| Thermal Coefficient of Photometric Flux | typ | -1.1 | -0.2 | -0 | % / °C |
| Thermal Coefficient of Radiometric Flux | typ | -0.7 | -0.2 | -0.2 | % / °C |
| Forward Voltage Temperature Coefficient | typ | -3.0 | -3.0 | -3.0 | mV / °C |
| Median Lifetime ⁸ | | >60,000 | >60,000 | >60,000 | Hours |

Optical and Electrical Characteristics

| | | Symbol | Red | Green | EP-Blue | Unit |
|--|-----|-------------------|-------|-------|---------|----------|
| Characteristics at Reference Continuous Drive Current I_F (Continuous Waveform) ¹ | | | | | | |
| Reference Drive Current | typ | I_F | 18 | 18 | 18 | A |
| Luminous Flux | typ | Φ_V | 1010 | 2450 | 540 | lm |
| Radiometric Flux | typ | Φ_r | 5.8 | 4.7 | 10.8 | W |
| Dominant Wavelength | typ | λ_d | 624 | 528 | 462 | nm |
| Color Saturation ^{6,7} | typ | | 1.00 | 0.83 | 0.99 | |
| FWHM - Spectral bandwidth at 50% of Φ_V | typ | $\Delta\lambda_d$ | 18 | 38 | 21 | nm |
| | typ | x | 0.698 | 0.183 | 0.153 | |
| Chromaticity Coordinates ^{6,7} | typ | y | 0.301 | 0.703 | 0.025 | |
| | min | V_{Fmin} | 2.0 | 3.1 | 2.8 | V |
| Forward Voltage | typ | V_F | 2.3 | 4.4 | 3.6 | V |
| | max | V_{Fmax} | 3.0 | 5.3 | 4.6 | V |
| Dynamic Resistance | typ | Ω_{dyn} | 0.02 | 0.03 | 0.05 | Ω |

Note 1: All ratings are based on operation with a constant heat sink temperature $T_{hs} = 40^\circ\text{C}$. See Thermal Resistance section for T_{hs} definition.

Note 2: Parameters rated at typical duty cycle and Pulsed operation frequency $f > 240\text{Hz}$; $DC = \frac{t}{T}$ 

Note 3: Duty Cycle used to specify device ratings under Pulsed operation. PhlatLight devices can operate at duty cycles ranging from 1% to 100%. At higher duty cycles, drive current should be adjusted to maintain the junction temperature at desired levels to meet the application lifetime requirements.

Note 4: In pulsed operation, rise time from 10 to 90% of forward current should be larger than 0.5 microseconds.

Note 5: For EP-Blue devices, total flux from emitting area at reference dominant wavelength at recommended peak drive current conditions.

Note 6: In CIE 1931 chromaticity diagram coordinates, normalized to $X+Y+Z=1$

Note 7: For Reference only

Note 8: Assuming $T_j < 80^\circ\text{C}$ for Red devices, $T_j < 115^\circ\text{C}$ for Blue devices and $T_j < 125^\circ\text{C}$ for Green devices.

Absolute Maximum Ratings

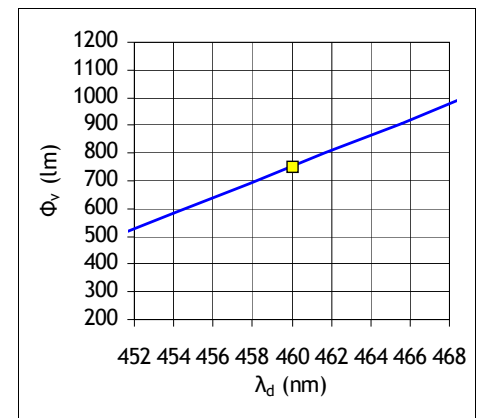
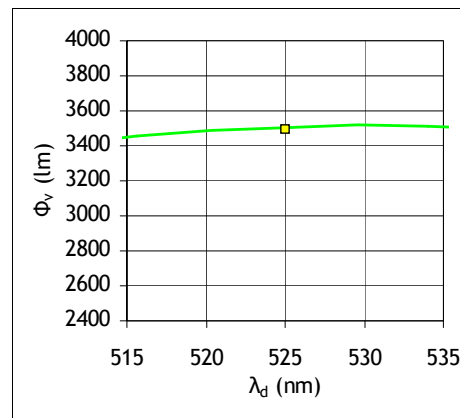
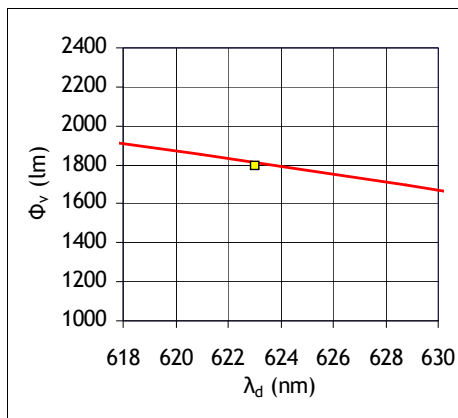
| | Symbol | Red | Green | EP-Blue | Unit |
|---|----------------|----------|----------|----------|------|
| Maximum Current ^{1,2} | Max | 36 | 36 | 36 | A |
| Maximum Operating Junction Temperature ³ | Max T_{jmax} | 110 | 170 | 170 | °C |
| Storage Temperature Range | | -40/+100 | -40/+100 | -40/+100 | °C |

Note 1: Luminus PhlatLight LEDs are designed for operation to an absolute maximum forward drive current density of $2.5A/mm^2$ cw, and $3A/mm^2$ pulsed ($f > 240Hz$, duty cycle $< 60%$). Please refer to absolute maximum rating table above for specific absolute maximum currents for the products covered in this datasheet. Product lifetime data is specified at recommended forward drive currents. Sustained operation at absolute maximum currents will result in a reduction of device lifetime compared to recommended forward drive currents. Actual device lifetimes will also depend on junction temperature. Refer to the lifetime derating curves (available from Luminus) for further information.

Note 2: In pulsed operation, rise time from 10 to 90% of forward current should be larger than 0.5 microseconds.

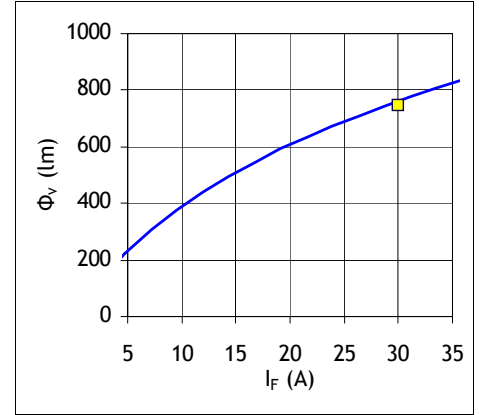
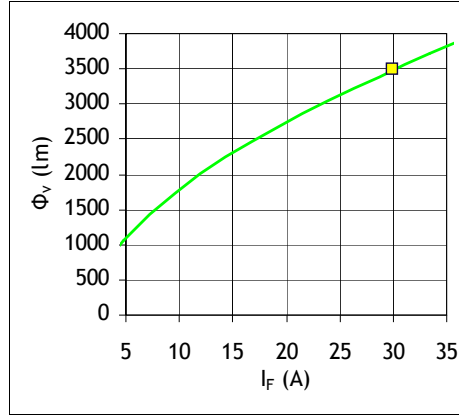
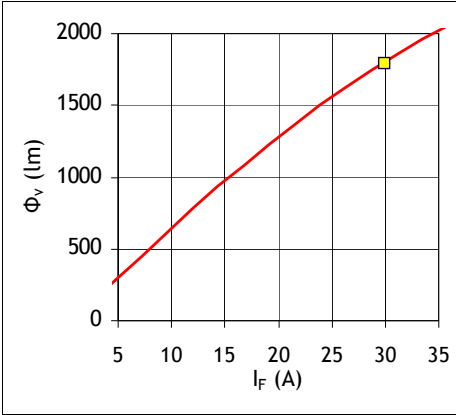
Note 3: Sustained operation at Maximum Operating Junction Temperature (T_{jmax}) will result in reduced device life time.

Luminous Flux variation with Wavelength: $\Phi_v = f(\lambda_d)$ at Recommended Operating Current I_F



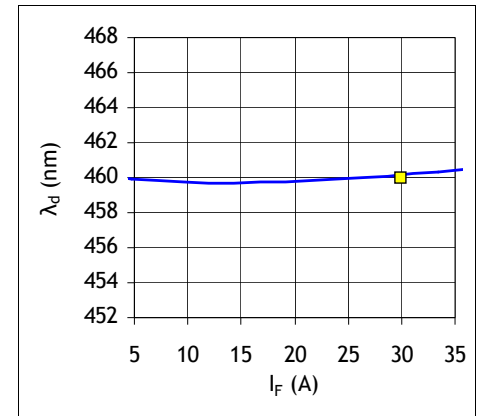
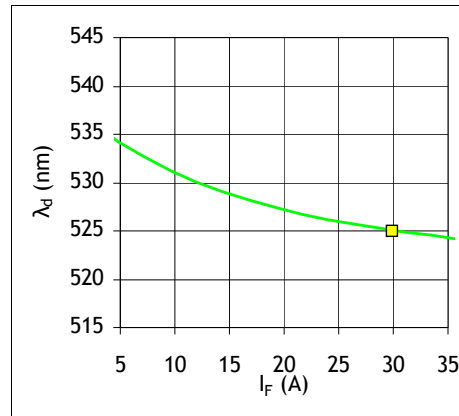
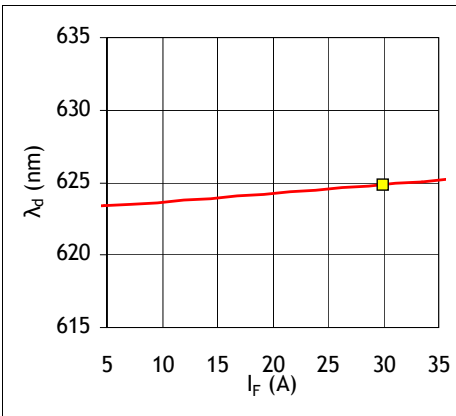
See note 1 on page 7.

Luminous Flux variation with Drive Current - $\Phi_v = f(I_F)$ - Typical



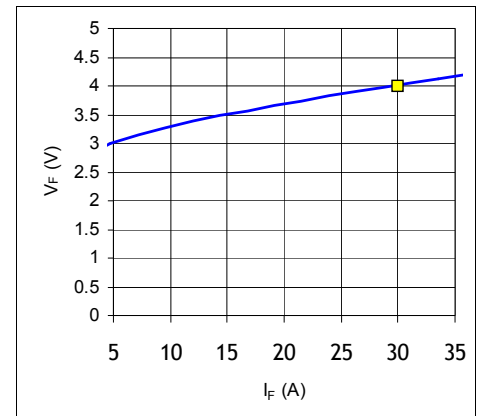
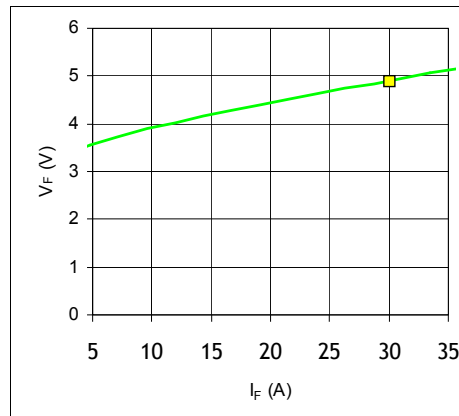
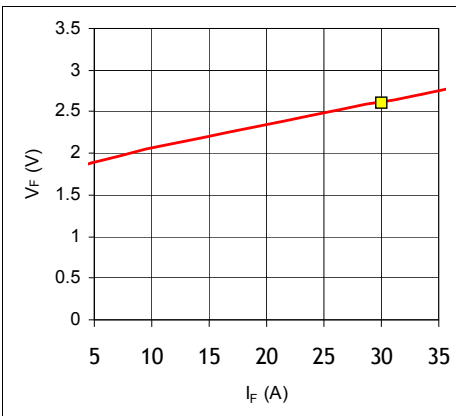
See notes 1,2 on page 6.

Dominant Wavelength variation with Forward Current - $\lambda_d = f(I_F)$ - Typical



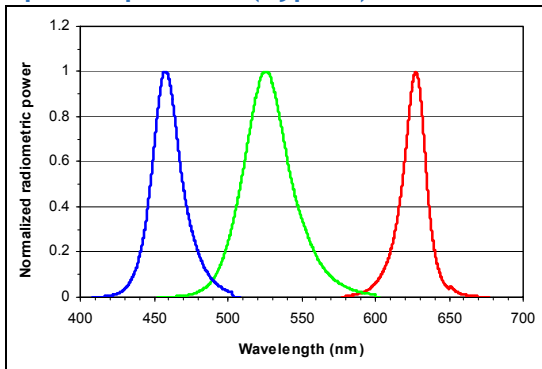
See notes 1,2 on page 6.

Forward Voltage variation with Drive current - $V_F = f(I_F)$ - Typical



See notes 1,2 on page 6.

Optical Spectrum (Typical)

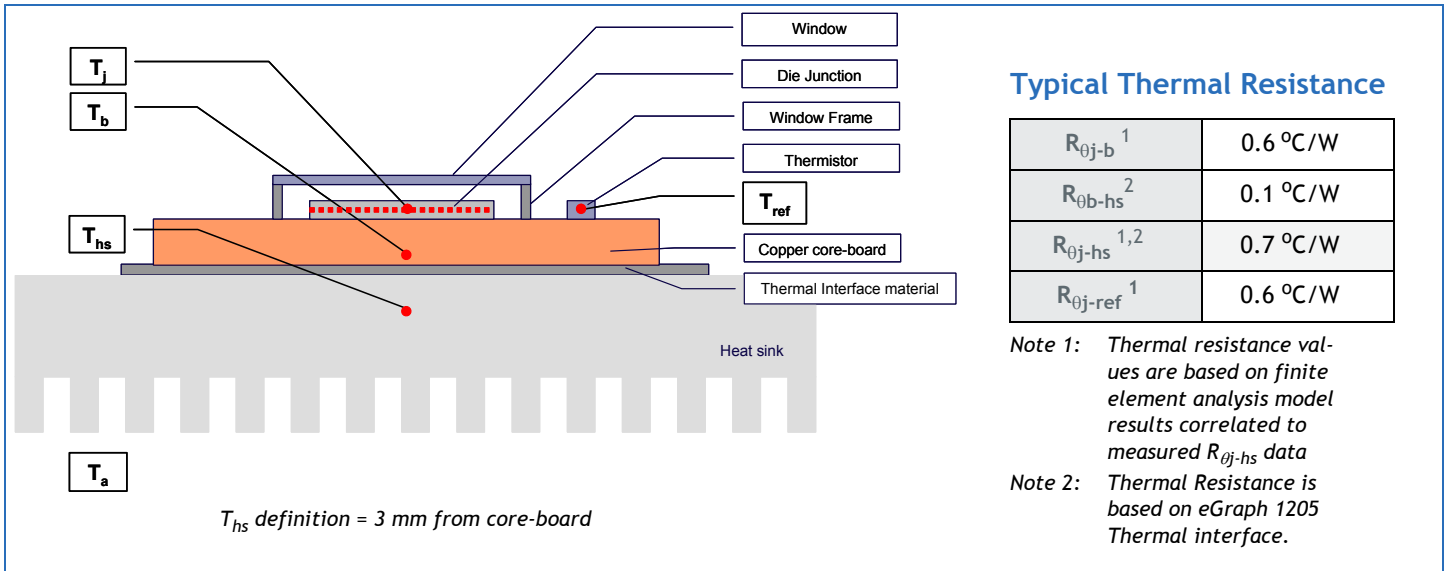


See note 3 on page 6.

Chart Notes

- Note 1:** For Pulsed operation, typical RGB duty cycles used are 25%, 50% and 25% respectively for pulsed operation ($T_{hs} = 40^{\circ}\text{C}$).
- Note 2:** Yellow square indicate device operating point under recommended conditions listed in the Optical and Electrical Characteristics table.
- Note 3:** Typical Spectrum at recommended peak drive current.

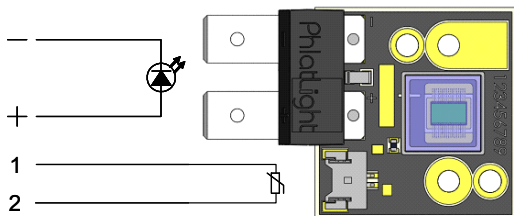
Thermal Resistance



Thermistor Information

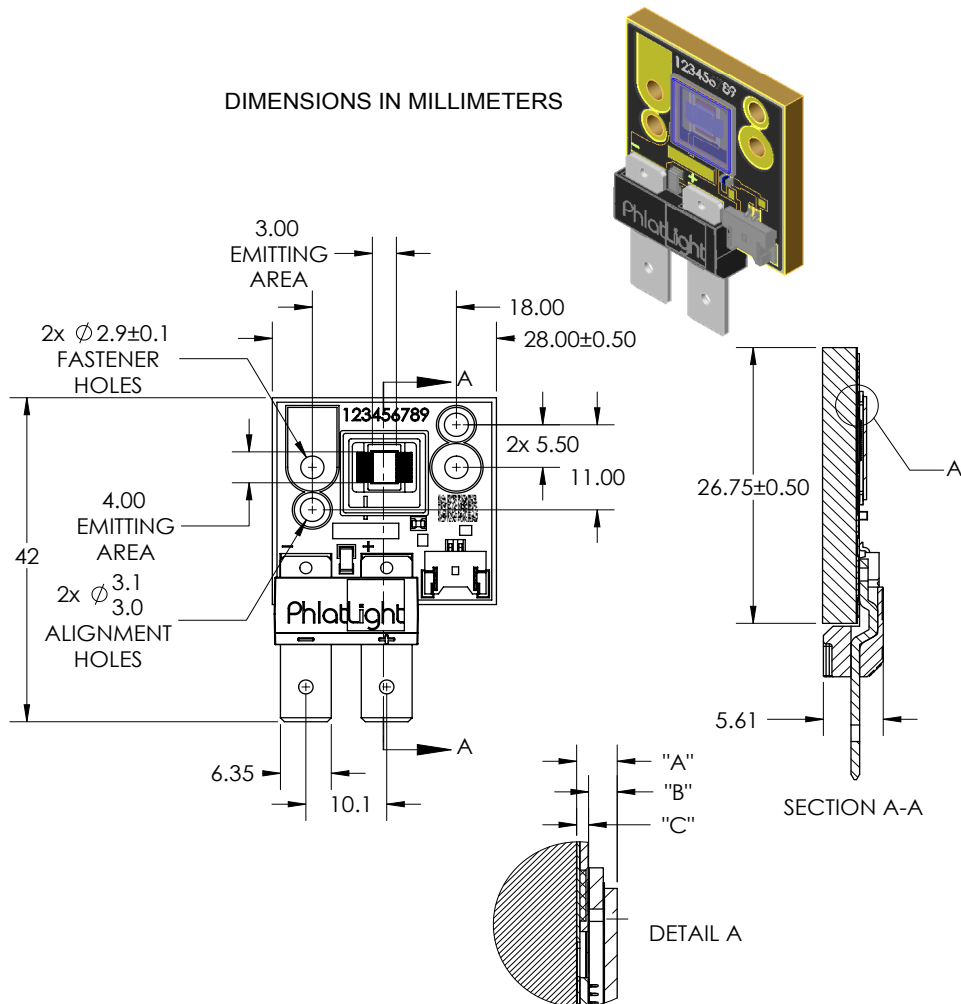
The thermistor used in PhlatLight™ devices mounted on core-boards is from Murata Manufacturing Co. The global part number is NCP15XH103J03RC. Please see <http://www.murata.com/> or <http://www.murata.co.jp> for details on calculating thermistor temperature.

Electrical Pinout



Mechanical Dimensions

Package: Type CX



| DIMENSION NAME | DESCRIPTION | NOMINAL DIMENSION | TOLERANCE |
|----------------|---|-------------------|-----------|
| "A" | TOP OF METAL SUBSTRATE TO TOP OF GLASS | 0.95 | ±0.13 |
| "B" | EMITTING AREA TO TOP OF GLASS | 0.67 | ±0.16 |
| "C" | TOP OF METAL SUBSTRATE TO EMITTING AREA | 0.28 | ±0.05 |

Recommended connector for Anode and Cathode: Panduit Disco Lok™ Series P/N: DNG14-250FL-C or equivalent
 Thermistor Connector: MOLEX P/N 53780-0270. Recommended Female: MOLEX P/N 51146-0200 or equivalent
 For detailed drawing of the PT121 Type CX package, please refer to the DWG-001268document

Ordering Information

| Device Part Number | Color | Description |
|--------------------|-------|---|
| PT-121-R-C11-MPB | Red | Red PhlatLight PT121 device consisting of a 12mm ² LED (4:3 aspect ratio), thermistor and connector mounted on a type CX copper-core PCB |
| PT-121-G-C11-MPB | Green | Green PhlatLight PT121 device consisting of a 12mm ² LED (4:3 aspect ratio), thermistor and connector mounted on a type CX copper-core PCB |
| PT-121-B-C11-EPA | Blue | Blue PhlatLight PT121 device consisting of a 12mm ² LED (4:3 aspect ratio), thermistor and connector mounted on a type CX copper-core PCB |

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