THE DATASHEET OF

PT-39-R-C21-MPD

PT39 LEDs

Table of Contents

Features:

- Matched RGB Chipset with 3.9 mm^2 emitting area designed for LED projector applications
- Photonic lattice technology for very high surface brightness and uniform surface emission
- Wide color gamut: RED 623 nm, Red-Amber 615nm, GREEN 526 nm, Blue 460nm typical dominant wavelength
- Single emitting area per color allows for collection with single lens for simplified optics
- Aspect ratio optimized and compatible with micro-display diagonal sizes ranging from 0.45" to 0.55" with 4:3 aspect ratio.
- Thermally efficient Common Anode copper-core PCB package
- RoHS (EU-2002/95/EC Directive) and REACH compliant

Applications

- Specifically engineered for high brightness pocket-size, ultra portable front projectors, head-up projection displays and hybrid projectors
- Optimized for Micro-Display diagonal sizes ranging from 0.45" to 0.55".
- Suitable for DLP™ (0.45"WXGA, 0.55" SVGA), LCoS and HTPS /3LCD microdisplays

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Technology Overview

Luminus Big Chip LEDs™ benefit from a suite of innovations in the fields of chip technology, packaging and thermal management. These breakthroughs allow illumination engineers and system designers to achieve solutions that are high brightness and high efficiency.

Photonic Lattice Technology

Luminus' photonic lattice technology enables large area LED chips with uniform brightness over the entire LED chip surface. The optical power and brightness produced by these large monolithic chips enable solutions which replace arc and halogen lamps where arrays of traditional high power LEDs cannot.

For red, green and blue LEDs, the photonic lattice structures extract more light and create radiation patterns that are more collimated than traditional LEDs. (Having higher collimation from the source increases optical collection efficiencies and simplifies optical designs.)

Packaging Technology

Thermal management is critical in high power LED applications. With a thermal resistance from junction to case of 1.6° C/W, Luminus PT39 LEDs can be driven at higher current densities while maintaining a low junction temperature, thereby resulting in brighter solutions and longer lifetimes.

Reliability

For high power operation, Luminus Big Chip LEDs are one of the most reliable light sources in the world today. Big Chip LEDs have passed a rigorous suite of environmental and mechanical stress tests, including mechanical shock, vibration, temperature cycling and humidity, and have been fully qualified for use in extreme high power and high current applications. With very low failure rates and median lifetimes that typically exceed 60,000 hours, Luminus Big Chip LEDs are ready for even the most demanding applications. (Please refer to Luminus' Reliability application note for more information.)

Environmental Benefits

Luminus LEDs help reduce power consumption and the amount of hazardous waste entering the environment. All Big Chip LED products manufactured by Luminus are RoHS and REACH compliant and free of hazardous materials, including lead and mercury.

Understanding Big Chip LED Test Specifications

Every Luminus LED is extensively tested at full current to ensure that it meets the high quality standards expected from Luminus' products.

Testing of Big Chip LEDs

Luminus core board products are typically measured in such a way that the characteristics reported agree with how the devices will actually perform when incorporated into a system. This measurement is accomplished by mounting the devices on a 40°C heat sink and allowing the device to reach thermal equilibrium while fully powered. Only after the device reaches equilibrium are the measurements taken. This method of measurement ensures that Luminus Big Chip LEDs perform in the field just as they are specified.

Luminus surface mount LEDs are typically tested with a 20mSec input pulse and a junction temperature of 25°C. Expected flux values in real world operation can be extrapolated based on the information contained within this product data sheet.

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Ordering Information

Ordering Part Number [1]	Color	Min Flux or Power Bin [2]	Description
PT-39-R-C21-MPB	Red	2B1	Red LED, consisting of a 3.9 mm2 Red LED chip, thermistor and connector mounted on a copper-core PCB.
PT-39-R-C21-MPC		2B2	
PT-39-R-C21-MPD		2C	
PT-39-RA-C21-MPE	Red Amber	2D	Red-Amber LED, consisting of a 3.9 mm2 Red-Amber LED chip, thermistor and connector mounted on a copper-core PCB.
PT-39-RA-C21-MPF		2E	
PT-39-G-C21-MPC	Green	2C	Green LED, consisting of a 3.9 mm2 Green LED chip, thermistor and connector mounted on a copper-core PCB.
PT-39-G-C21-MPD		2D	
PT-39-G-C21-MPE		2E	
PT-39-G-C21-MPF		2F	
PT-39-B-C21-EPA	Blue	2D	Blue LED, consisting of a 3.9 mm2 Blue LED chip, thermistor and connector mounted on a copper-core PCB.
PT-39-B-C21-EPB		2E	
PT-39-B-C21-EPC		2F	

Note 1: Ordering part numbers represent bin kits (group of bins that are shippable for a given ordering part number)

Note 2: See Bin Kit and Flux / Power bin definitions on page 4

Ordering Part Number Nomenclature

XXX — 00 — XXXX — X00 — XXX

Product Family	Chip Area	Color	Package Configuration	Bin Kit [1]
PT: Metal Coreboard PCB	39: 3.9 mm^2	R= Red (623nm, typ) RA= Red -Amber (615nm, typ) G= Green B= Blue	C21: 26.5mm x 16.0 mm (standard) C22: 26.5mm x 16.0 mm (die rotated) See Mechanical Drawing section	See page 4 for bin kit definition

Note 1: A Bin Kit represents a group of individual flux or power bins that are shippable for a given ordering part number. Individual flux bins are not orderable.

EXAMPLES:

PT-39-R-C21-MPD i s comprised of Red-Amber Flux Bins 2C, 2D, 2E, 2F, 2G.

PT-39-R-C22-MPD is comprised of Red Flux Bins 2C, 2D, 2E, 2F, 2G (Die rotated package configuration).

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PT39 Bin Kit[1] and Flux Bin[2,3,4] Definitions

Note: Please refer to ordering part number table on page 3 for Bin Kit availability

Red Flux Bins	Bin 2B1	Bin 2B2	Bin 2B3	Bin 2C	Bin 2D	Bin 2E	Bin 2F	Bin 2G	Bin 2H	
Red Bin Flux Range (lm)	455-475	475-490	490-530	530-580	580-635	635-690	690-745	745-800	800-860	
PT-39-R-C21-MPB	☑	☑	☑	☑	☑					
PT-39-R-C21-MPC		☑	☑	☑	☑	☑				
PT-39-R-C21-MPD				☑	☑	☑	☑	☑		
Red -Amber Flux Bins	**Bin 2D**	**Bin 2E**	**Bin 2F**	**Bin 2G**	**Bin 2H**	**Bin 2J**	**Bin 2K**	**Bin 2L**	**Bin 2M**	
Red -Amber Bin Flux Range (lm)	580-635	635-690	690-745	745-800	800-860	860-925	925-990	990-1055	1055 -1125	
PT-39-RA-C21-MPE	☑	☑	☑	☑	☑					
PT-39-RA-C21-MPF		☑	☑	☑	☑	☑				
Green Flux Bins	**Bin 2C**	**Bin 2D**	**Bin 2E**	**Bin 2F**	**Bin 2G**	**Bin 2H**	**Bin 2J**	**Bin 2K**	**Bin 2L**	**2M**
Green Bin Flux Range (lm)	1030 -1100	1100 1200	1200 -1250	1250 -1330	1330 -1450	1450 -1550	1550 -1660	1660 -1780	1780 -1900	1900 -2020
PT-39-G-C21-MPC	☑	☑	☑	☑	☑					
PT-39-G-C21-MPD		☑	☑	☑	☑	☑				
PT-39-G-C21-MPE			☑	☑	☑	☑	☑			
PT-39-G-C21-MPF				☑	☑	☑	☑	☑		
Blue Power Bins	**Bin 2D**	**Bin 2E**	**Bin 2F**	**Bin 2G**	**Bin 2H**	**Bin 2J**	**Bin 2K**	**Bin 2L**	**Bin 2M**	
Blue Bin Flux Range (lm)	190-215	215-235	235-255	255-280	280-300	300-320	320-345	345-370	370-400	
PT-39-B-C21-EPA	☑	☑	☑	☑	☑					
PT-39-B-C21-EPB		☑	☑	☑	☑	☑				
PT-39-B-C21-EPC			☑	☑	☑	☑	☑			

Note 1: Bin Kits are defined by a group of flux or power bins. Only one flux bin will be shipped in each individual pack. A shipment will contain packs of different allowed flux bins for a particular ordering part number. Individual Flux or Power bins are not ordereable.

Note 2: PT39 LEDs are tested for luminous flux at 9.8A at 25% duty cycle for Red, Red-Amber and Blue. and at 50% duty cycle for Green Devices. Devices are sorted and packed by flux bin. Not all flux bins are are currrently populated.

Note 3: Luminus maintains a test measurement accuracy for LED flux and power of +/- 6%.

Note 4: Blue Flux bin limits are defined at reference dominant wavelength of 462nm. See table on page 7 for Blue bin limits at other dominant wavelengths.

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Optical & Electrical Characteristics

General Characteristics		Symbol	Red	Red -Amber Preliminary	Green	Blue	Unit
Emitting Area		x	3.9	3.9	3.9	3.9	mm^2
Emitting Area Dimensions		x	2.09 x 1.87	2.09 x 1.87	2.09 x 1.87	2.09 x 1.87	mmxmm
Characteristics at Recommended Test Drive Current , I_f [1, 2]							
Reference Duty Cycle [3]			25	25	50	25	%
Test Peak Drive Current [1,2,4]	typ	I_F	9.8	9.8	9.8	9.8	A
Peak Luminuous Flux [1,2,5]	typ	Φ_v	575	750	1400	235	lm
Peak Radiometric Flux [1,2]	typ	Φ_r	3.2	3.1	2.9	5.0	W
Dominant Wavelength	min	λ_{dmin}	619	611	516	450	nm
	typ	λ_d	623	615	525	460	nm
	max	λ_{dmax}	630	622	535	468	nm
FWHM- Spectral bandwidth at 50% of Φv	typ		19	19	34	20	nm
Chromaticity Coordinates [6,7]	typ	x	0.698	0.680	0.167	0.147	
	typ	y	0.302	0.320	0.704	0.033	
Forward Voltage	min	$V_{F\,min}$	2.2	2.2	3.5	3.2	V
	typ	V_F	2.6	2.6	4.9	3.9	V
	max	$V_{F\,max}$	3.2	3.2	5.9	5.2	V
Dynamic Resistance	typ		0.05	0.05	0.08	0.05	Ω
Device Thermal Characteristics							
Thermal Coefficient of Photometric Flux	typ		-1.0	tbd	-0.2	~0	% / °C
Thermal Coefficient of Radiometric Flux	typ		-0.6	tbd	-0.2	-0.2	% / °C
Forward Voltage Temperature Coefficient	typ		-1.5	tbd	-1.0	-3	mV/ °C
Characteristics at Reference Continuous Drive Current I_F (continuous wave)[1]							
Reference Drive Current	typ	I_F	5.9	5.9	5.9	5.9	A
Luminous Flux	typ	Φ_v	320	420	1000	175	lm
Radiometric Flux	typ	Φ_r	1.8	1.7	1.9	3.3	W
Dominant Wavelength	typ	λ_d	624	616	528	462	nm
FWHM -Spectral bandwidth at 50% of Φv	typ		18	18	36	21	nm
Chromaticity Coordinates [6,7]	typ	x	0.700	0.682	0.171	0.145	nm
	typ	y	0.300	0.318	0.702	0.036	nm
Forward Voltage	typ	V_F	2.3	2.3	4.4	3.4	V

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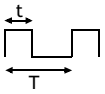
Optical & Electrical Characteristics

Note 1: All ratings are based on testing conditions with a constant heat sink temperature T_{hs} = 40°C. See Thermal Resistance section for T_{hs} definition.

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



Note 3: Duty Cycle used to specify device ratings under Pulsed operation. Big Chip LED 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 Blue devices, total flux from emitting area at typical dominant wavelength. Refer to page 7 for brightness specifications at other wavelength

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

Note 7: For Reference only

Absolute Maximum Ratings

	Symbol	Red	Red -Amber	Green	Blue	Unit
Minimum Current (CW or Pulsed)[1]		200	200	200	200	mA
Maximum Current (CW) [2]		9.8	9.8	9.8	9.8	A
Maximum Current (Pulsed) [1,2] (t<=2.5ms, frequency > 240Hz, duty cycle <60%)		12	12	12	12	A
Absolute Maximum Junction Temperature [2]	T_{jmax}	110	110	170	170	°C
Storage Temperature Range		-40 / +100	-40 / +100	-40 / +100	-40 / +100	°C

Note 1: Luminus Big Chip 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 termperature (see note 2 below). Refer to lifetime derating curves for further information.

Note 2: Sustained operation at or above Maximum Operating Junction Temperature (T_{jmax}) will result in reduced device life time.

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Blue Bin Flux Ranges by Dominant Wavelength [1,2]

	Bin 2D		Bin 2E		Bin 2F		Bin 2G		Bin2H		Bin 2J		Bin 2K		Bin 2L	
DWL (nm)	Min (lm)	Max (lm)	Min (lm)	Max (lm)	Min (lm)	Max (lm)	Min (lm)	Max (lm)	Min (lm)	Max (lm)	Min (lm)	Max (lm)	Min (lm)	Max (lm)	Min (lm)	Max (lm)
450	93	105	105	115	115	125	125	137	137	147	147	156	156	169	169	181
451	101	114	114	125	125	136	136	149	149	159	159	170	170	183	183	197
452	109	123	123	135	135	146	146	161	161	172	172	184	184	198	198	212
453	117	133	133	145	145	157	157	173	173	185	185	197	197	213	213	228
439	125	142	142	155	155	168	168	185	185	198	198	211	211	227	227	244
455	133	151	151	165	165	179	179	197	197	211	211	225	225	242	242	260
456	141	160	160	175	175	190	190	208	208	223	223	238	238	257	257	275
457	150	169	169	185	185	201	201	220	220	236	236	252	252	272	272	291
458	158	178	178	195	195	212	212	232	232	249	249	265	265	286	286	307
459	166	188	188	205	205	222	222	244	244	262	262	279	279	301	301	323
460	174	197	197	215	215	233	233	256	256	274	274	293	293	316	316	338
461	182	206	206	225	225	244	244	268	268	287	287	306	306	330	330	354
462	190	215	215	235	235	255	255	280	280	300	300	320	320	345	345	370
463	198	224	224	245	245	266	266	292	292	313	313	334	334	360	360	386
464	206	233	233	255	255	277	277	304	304	326	326	347	347	374	374	402
465	214	242	242	265	265	288	288	316	316	338	338	361	361	389	389	417
466	222	252	252	275	275	298	298	328	328	351	351	375	375	404	404	433
467	230	261	261	285	285	309	309	340	340	364	364	388	388	418	418	449
468	239	270	270	295	295	320	320	352	352	377	377	402	402	433	433	465

Note 1: Flux Min, Max values are continuous as function of dominant wavelength values. For illustration purposes, flux Min and Max values are provided at discrete dominant wavelength values.

Note 2: Luminus maintains a test measurement accuracy for LED flux and power of +/- 6%.

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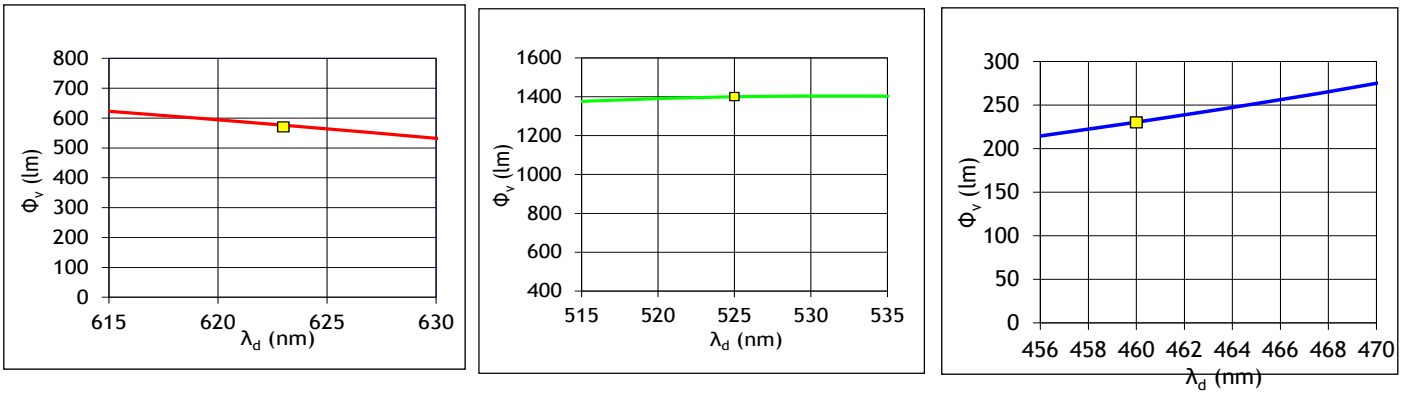
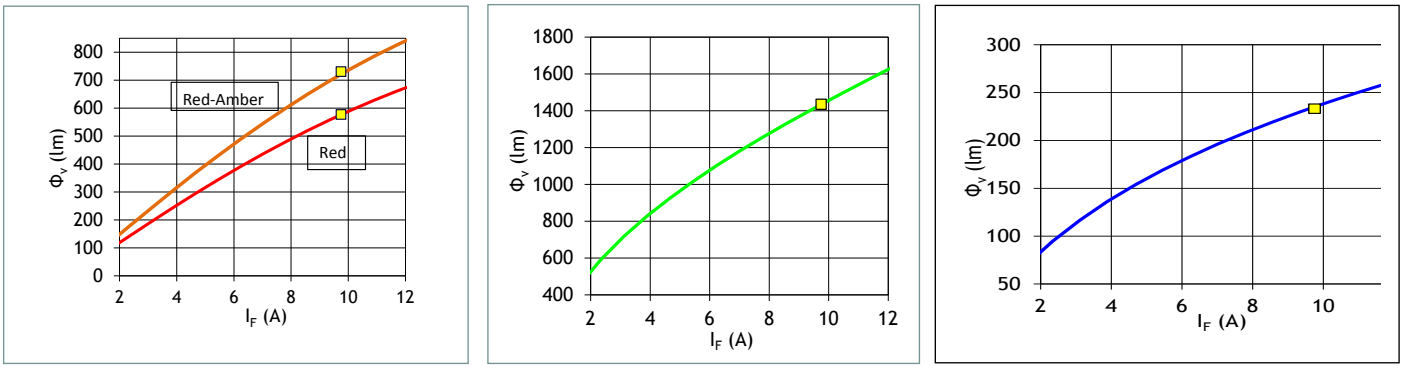
Luminous Flux variation with Wavelength: $\Phi_v = f(\lambda_d)$ at Test Drive Current $I_F = 9.8$ A



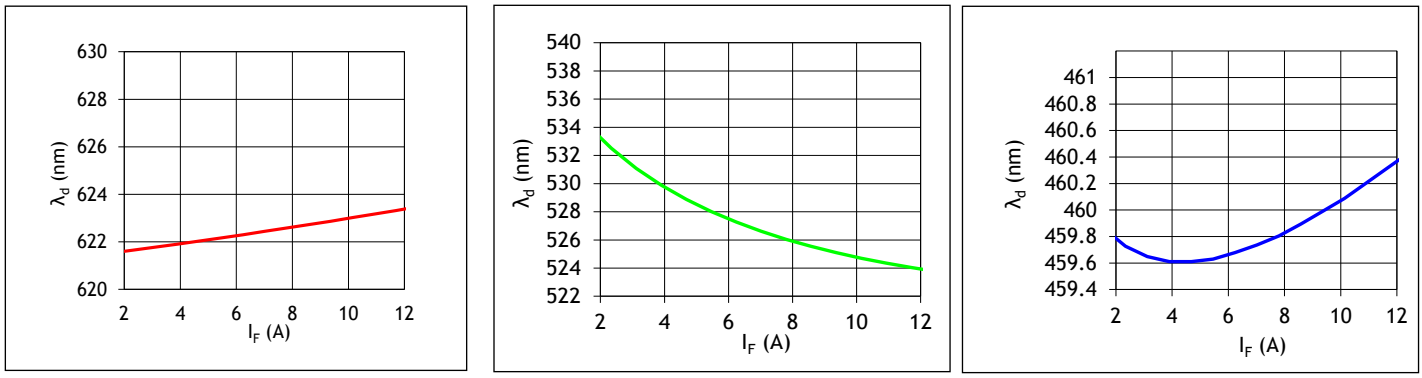
See notes 1,2, 3 on page 9. See note 4 on page 9 regarding Red-Amber.

Luminous Flux variation with Forward Current: $\Phi_v = f(I_F)$



See notes 1,2, 3 on page 9.

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



See notes 1,2, 3 on page 9. See note 4 on page 9 regarding Red-Amber.

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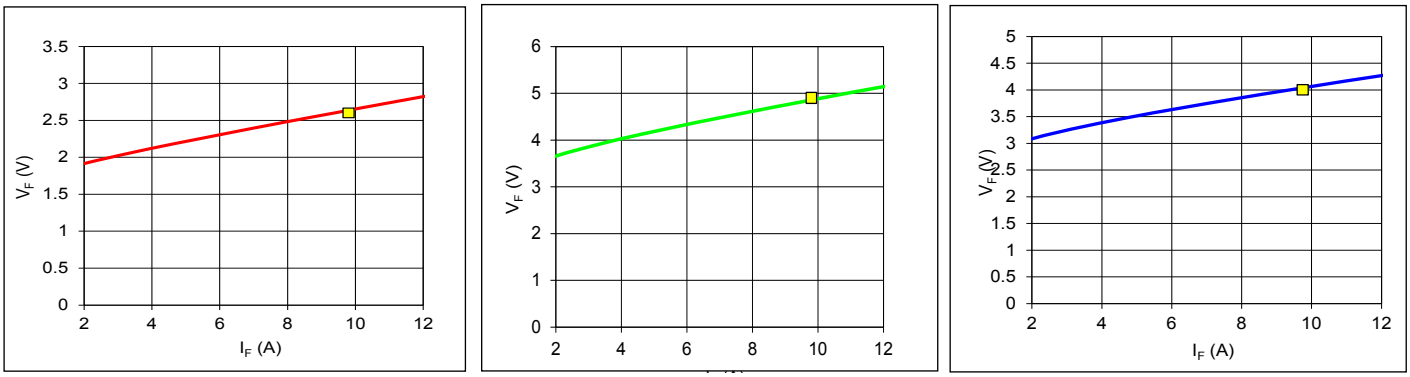
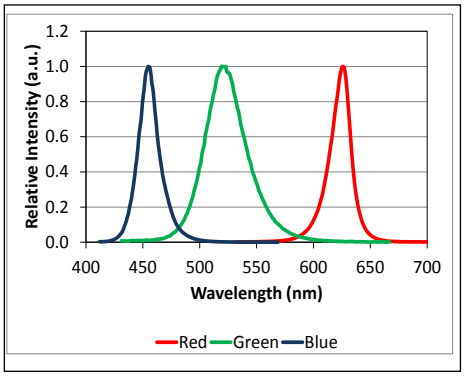
Forward Voltage variation with Drive current - $V_F = f(I_F)$ - Typical



See notes 1,2, 3 on page 9

Optical Spectrum (Typical)



See notes 1,2, 4 on page 9

Note 1: For Pulsed operation, the reference RGB duty cycles used are 25%, 50% and 25% respectively (T_{hs}=40°C).

Note 2: Yellow square indicate device operating point under reference conditions listed in the Optical and Electrical Characteristics table.

Note 3: Parametric graphs for Red-Amber are TBD. These will be added as they become available.

Note 4: Typical spectrum at recommended peak drive current .

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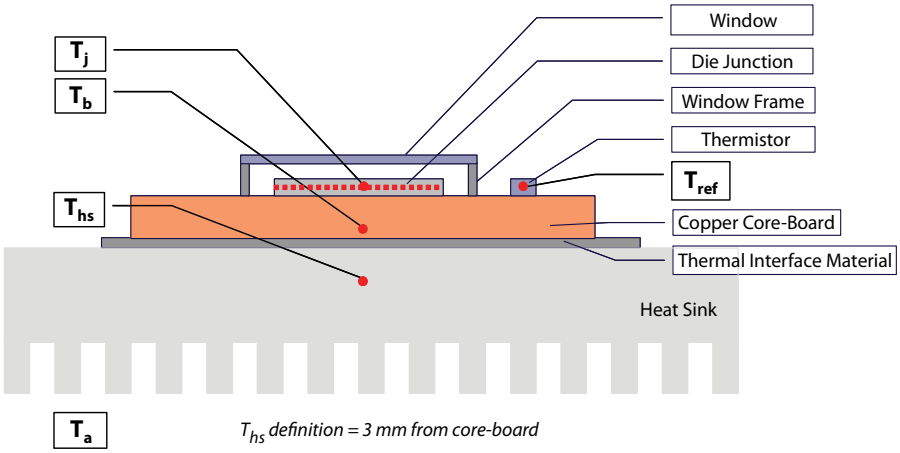
Thermal Resistance



Typical Thermal Resistance

$R_{\theta j\text{-}b}$ [1]	1.6 °C/W
$R_{\theta b\text{-}hs}$ [2]	0.2 °C/W
$R_{\theta j\text{-}hs}$ [1,2]	1.8 °C/W
$R_{\theta j\text{-}ref}$ [2]	1.6 °C/W

Note 1: Thermal resistance values are based on FEA model results correlated to measured $R_{\theta j\text{-}hs}$ data.

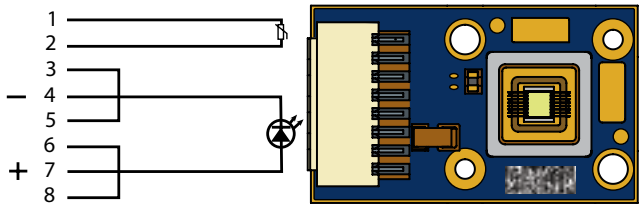
Note 2: Thermal Resistance is based on eGraf 1205 Thermal interface.

Thermistor Information

The thermistor used in PT39 devices are mounted on coreboards is from Murata Manufacturing Co. The global part number is NCP15XH103J03RC. Please see http://www.murata.com/ for details on calculating thermistor temperature.

For more information on use of the thermistor, please contact Luminus directly.

Electrical Pinout



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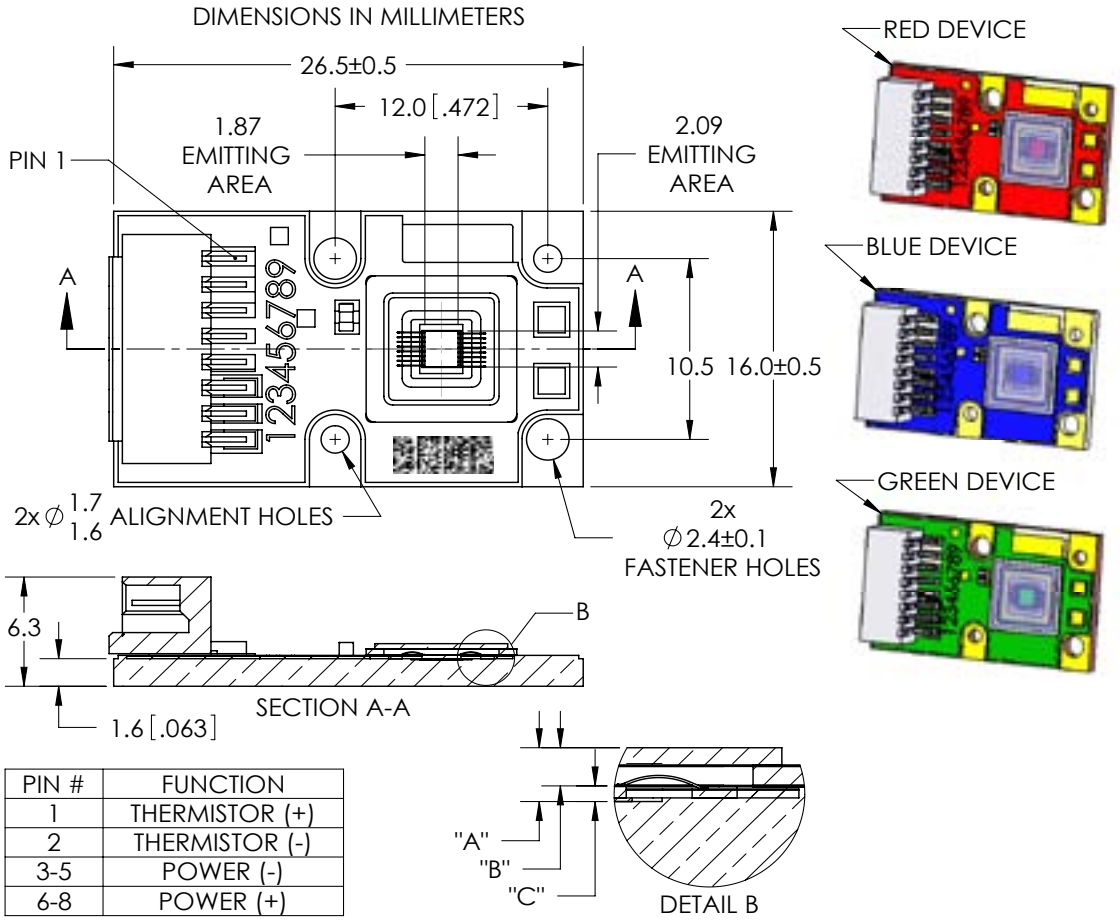
Mechanical Dimensions -Standard Die Configuration



PIN #	FUNCTION
1	THERMISTOR (+)
2	THERMISTOR (-)
3-5	POWER (-)
6-8	POWER (+)

DIMENSION NAME	DESCRIPTION	NOMINAL DIMENSION	TOLERANCE
"A"	TOP OF METAL SUBSTRATE TO TOP OF GLASS	0.94	±0.13
"B"	EMITTING AREA TO TOP OF GLASS	0.67	± 0.16
"C"	TOP OF METAL SUBSTRATE TO EMITTING AREA	0.27	± 0.05

DWG-001703

Notes:
1) Red, Green and Blue PT39 Big Chip LEDs are individually assembled into a common anode copper core- board with a footprint of 26.5 mm x 16 mm.
2) Dimensions above are for information only. Please refer to the latest revision of the DWG- 001703 package outline mechanical specifications. (For legacy coreboard with interconnect clip, please see DWG-001263)
3) Connector- MOLEX Part Number: 874380843 or Global Part Number: WTB16-081SF. Please refer to DWG-001703 for pin-out information

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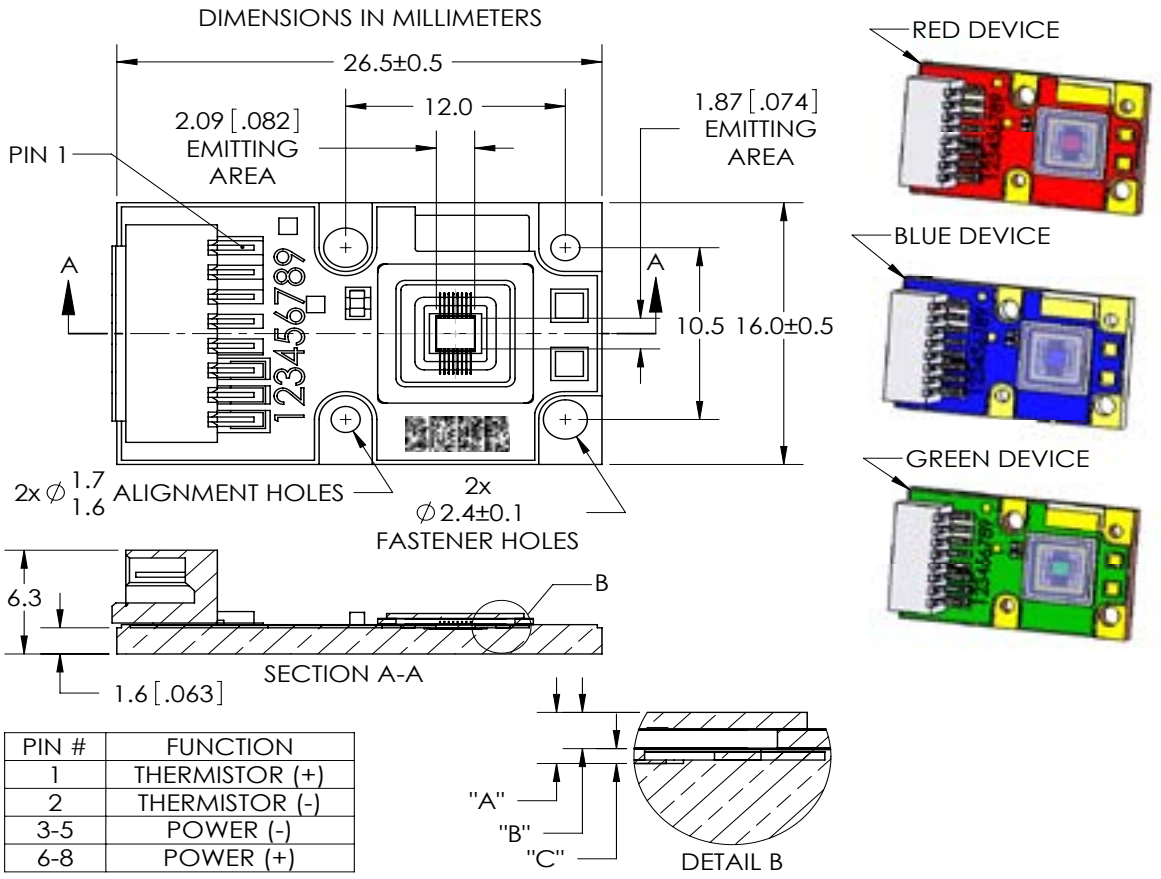
Mechanical Dimensions –Rotated Die Configuration



PIN #	FUNCTION
1	THERMISTOR (+)
2	THERMISTOR (-)
3-5	POWER (-)
6-8	POWER (+)

DIMENSION NAME	DESCRIPTION	NOMINAL DIMENSION	TOLERANCE
"A"	TOP OF METAL SUBSTRATE TO TOP OF GLASS	0.94	±0.13
"B"	EMITTING AREA TO TOP OF GLASS	0.67	± 0.16
"C"	TOP OF METAL SUBSTRATE TO EMITTING AREA	0.27	± 0.05

DWG-001705

Notes:
1) Red, Green and Blue PT39 Big Chip LEDs are individually assembled into a common anode copper core- board with a footprint of 26.5 mm x 16 mm.
2) Dimensions above are for information only. Refer to the latest revision of the DWG- 001705, package outline mechanical specifications (For legacy coreboard with interconnect clip, please see DWG-001471)
3) Connector- MOLEX Part Number: 874380843 or Global Part Number: WTB16-081SF. Please refer to DWG-001705 for pin-out information

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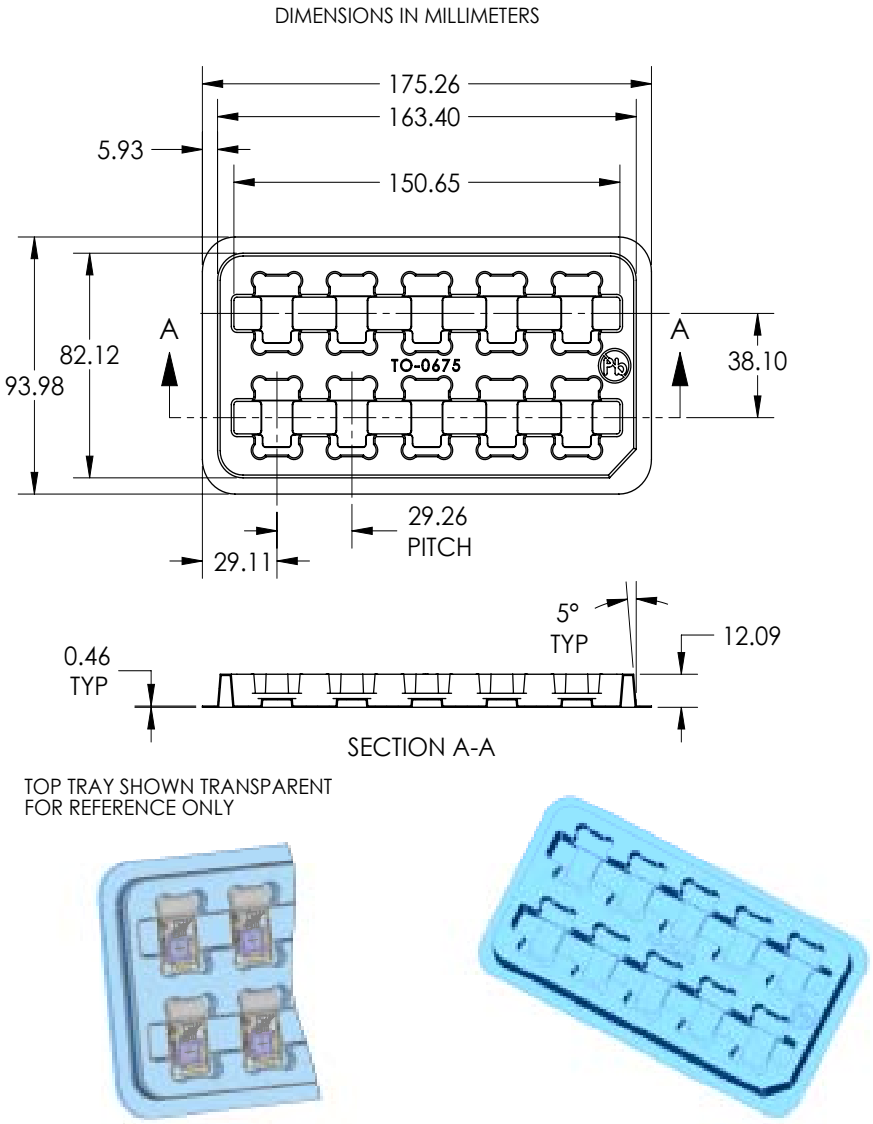
Shipping Tray Outline



For detailed drawing of shipping trays, please refer to document TO-0675 , available upon request.

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Packing and Shipping Specifications

Packing Specification

Packing Configuration	Qty /Pack	Reel Dimensions (diameter x W, mm)	Gross Weight (kg)
Stack of 5 trays with 10 devices per tray Each pack is enclosed in ESD bag	50	95 x 176 x 50	0.45

Product Label Specification

Label Fields:

- 6-8 digit Box number (for Luminus internal use)
- Luminus ordering part number
- Quantity of devices in pack
- Part number revision (for Luminus internal use)
- Customer's part number (optional)
- Flux Bin
- 2D Bar code

Sample label –for illustration only

Shipping Box

Shipping Box	Quantity	Material	Dimensions (L x W x H, mm)
Carton Box	1 -20 packs	S4651	560 x 560 x 200

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History of Changes

Rev	Date	Description of Change
01	01/05/09	Preliminary Specifications
02	07/28/09	Add die rotated configuration ordering part numbers and supporting information
03	09/09/09	Update thermal coefficients and dynamic resistance values
04	03/01/10	Add EP-Blue specifications and ordering part numbers
05	08/03/10	Add MPC-Green specifications and ordering part numbers
06	01/11/11	Add bin definitions for Red, Green, Blue Bin Kits
07	04/12/11	Updated luminuous flux and optical power specifications per test calibration update
08	01/27/12	Update mechanical drawings with shunt-less coreboard configurations; Add Red -Amber (615nm) preliminary product specifications; Implement new logo/datasheet template;

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