PT-39 LEDs

Thermally Enhanced

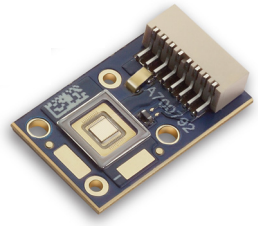

Table of Contents

Features:

- Matched RGB Chipset with 3.9 mm^2 emitting area designed for LED projector applications
- Enhanced thermal performance allows for operation up to 13.7 A (3 A/mm^2)
- Ultra low thermal resistance, common anode copper-core-board package
- Wide color gamut: Blue 460 nm typical dominant wavelength
- Single emitting area per color allows for collection with single lens for simplified optics
- LED mounted on MCPCB for easier thermal and optical integration
- Aspect ratio optimized and compatible with micro-display diagonal sizes ranging from 0.45" to 0.55"
- 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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Ordering Information

Ordering Part Number [1]	Color	Min Power Bin [2]	Description
PT-39-B-L21-EPD	Blue	2G	Blue LED, consisting of a 3.9 mm² Blue LED chip, thermistor and connector mounted on a copper-core PCB.
PT-39-B-L21-EPE		2H	

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 Power bin definitions on page 4

Ordering Part Number Nomenclature

PT – 39 – XX – LXX – XXX

Product Family	Chip Area	Color	Package Configuration	Bin Kit [1]
PT: Metal Coreboard PCB	39: 3.9 mm²	B: Blue	L21: 26.5 mm x 16.0 mm (standard) L22: 26.5 mm x 16.0 mm (die-rotated configuration) 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.

EXAMPLE: PT-39-B-L21-EPE is comprised of Blue Flux Bins 2H, 2J, 2K, 2L, 2M and 2N.

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PT-39 Bin Kit[1] and Flux Bin[2,3,4] Definitions

Note: Please refer to ordering part number table on page 2 for Bin Kit availability

Flux Bins	Bin 2G	Bin 2H	Bin 2J	Bin 2K	Bin 2L	Bin 2M	Bin 2N
Power Range (lm)	255-280	280-300	300-320	320-345	345-370	370-400	400-430
PT-39-B-L21-EPD	☑	☑	☑	☑	☑	☑	☑
PT-39-B-L21-EPE		☑	☑	☑	☑	☑	☑

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 orderable.

Note 2: PT-39 LEDs are tested for luminous flux at 9.8 A at 25% duty cycle for Blue. Devices are sorted and packed by flux bin. Not all flux bins are currently 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 462 nm. See table on page 6 for Blue bin limits at other dominant wavelengths.

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Optical & Electrical Characteristics

General Characteristics		Symbol	Blue	Unit
Emitting Area			3.9	mm^2
Emitting Area Dimensions			2.09 x 1.87	mm x mm
Characteristics at Recommended Test Drive Current , I_f [1, 2]				
Reference Duty Cycle [3]			25	%
Test Peak Drive Current [1,2,4]	typ	I_F	9.8	A
Peak Luminous Flux [1,2,5]	typ	Φ_v	300	lm
Peak Radiometric Flux [1,2]	typ	Φ_r	6.2	W
Dominant Wavelength	min	λ_{dmin}	450	nm
	typ	λ_d	460	nm
	max	λ_{dmax}	468	nm
FWHM- Spectral bandwidth at 50% of Φ_r	typ		20	nm
Chromaticity Coordinates [6,7]	typ	x	0.147	
	typ	y	0.033	
Forward Voltage	min	$V_{F\,min}$	2.7	V
	typ	V_F	3.2	V
	max	$V_{F\,max}$	4.7	V
Dynamic Resistance	typ		0.09	Ω
Device Thermal Characteristics				
Thermal Coefficient of Photometric Flux	typ		~0	% / °C
Thermal Coefficient of Radiometric Flux	typ		-0.2	% / °C
Forward Voltage Temperature Coefficient	typ		-3	mV/ °C
Characteristics at Reference Continuous Drive Current I_F (continuous wave)[1]				
Reference Drive Current	typ	I_F	5.9	A
Luminous Flux	typ	Φ_v	210	lm
Radiometric Flux	typ	Φ_r	4.3	W
Dominant Wavelength	typ	λ_d	461	nm
FWHM -Spectral bandwidth at 50% of Φ_r	typ		21	nm
Chromaticity Coordinates [6,7]	typ	x	0.144	nm
	typ	y	0.034	nm
Forward Voltage	typ	V_F	3.4	V

See notes on page 5.

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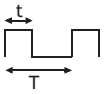
Optical & Electrical Characteristics

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>240 Hz; $DC = \frac{t}{T}$



Note 3: Duty Cycle used to specify device ratings under Pulsed operation. 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 6 for brightness specifications at other wavelengths

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

Note 7: For Reference only

Absolute Maximum Ratings

	Symbol	Blue	Unit
Absolute Minimum Current (CW or Pulsed)[1]		200	mA
Absolute Maximum Current (CW) [2]		9.8	A
Absolute Maximum Current (Pulsed) [2,3] (Frequency > 240Hz, duty cycle <50%)		13.7	A
Absolute Maximum Junction Temperature [4]	T_{jmax}	170	°C
Storage Temperature Range		-40 / +100	°C

Note 1: Product performance and lifetime data is specified at recommended forward drive currents. Sustained operation at or near absolute minimum currents may result in a reduction of device performance and device lifetime compared to recommended forward drive currents.

Note 2: Luminus LEDs' absolute maximum forward drive current density is 2.5 A/mm^2 CW, and 3.5 A/mm^2 pulsed (f>240 Hz, duty cycle <50%). 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. (See Reliability Application Note, APN-001444.) Sustained operation at or above 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. Please refer to lifetime derating curves (available from Luminus) for further information.

Note 3: In pulsed operation, rise time from 10 to 90% of forward current should be larger than 0.5 microseconds.

Note 4: 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 2G		Bin 2H		Bin 2J		Bin 2K		Bin 2L		Bin 2M		Bin 2N	
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)
450	125	137	137	147	147	156	156	169	169	181	181	196	196	211
451	136	149	149	159	159	170	170	183	183	197	197	213	213	229
452	146	161	161	172	172	184	184	198	198	212	212	230	230	247
453	157	173	173	185	185	197	197	213	213	228	228	247	247	266
454	168	185	185	198	198	211	211	227	227	244	244	264	264	284
455	179	197	197	211	211	225	225	242	242	260	260	281	281	302
456	190	208	208	223	223	238	238	257	257	275	275	298	298	321
457	201	220	220	236	236	252	252	272	272	291	291	315	315	339
458	212	232	232	249	249	265	265	286	286	307	307	332	332	357
459	222	244	244	262	262	279	279	301	301	323	323	349	349	376
460	233	256	256	274	274	293	293	316	316	338	338	366	366	394
461	244	268	268	287	287	306	306	330	330	354	354	383	383	412
462	255	280	280	300	300	320	320	345	345	370	370	400	400	430
463	266	292	292	313	313	334	334	360	360	386	386	417	417	449
464	277	304	304	326	326	347	347	374	374	402	402	434	434	467
465	288	316	316	338	338	361	361	389	389	417	417	451	451	485
466	298	328	328	351	351	375	375	404	404	433	433	468	468	504
467	309	340	340	364	364	388	388	418	418	449	449	485	485	522
468	320	352	352	377	377	402	402	433	433	465	465	502	502	540

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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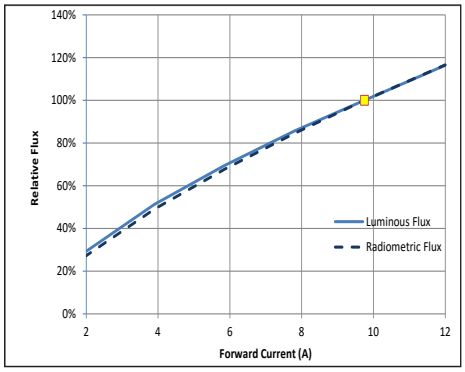
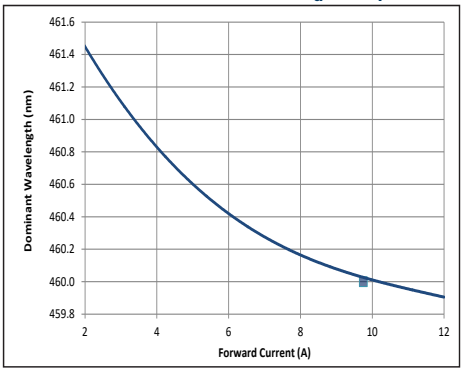
Characterization Curves

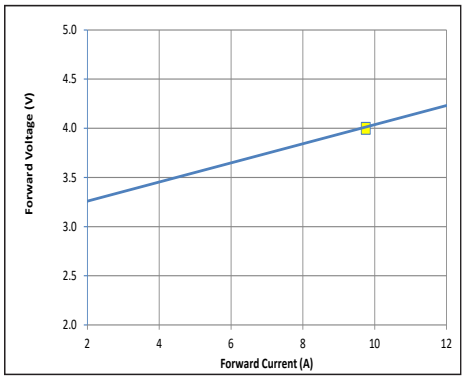
Normalized Luminous Flux variation with Forward Current: $\Phi_v / \Phi_F = f(I_F)$ [1,2]



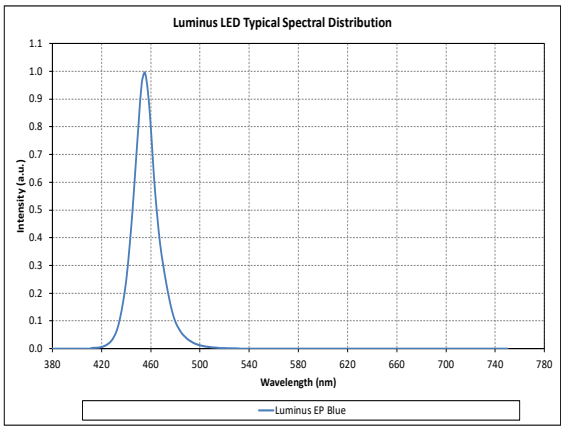
Dominant Wavelength variation with Forward Current - $\lambda_d = f(I_F)$ - Typical[1,2]



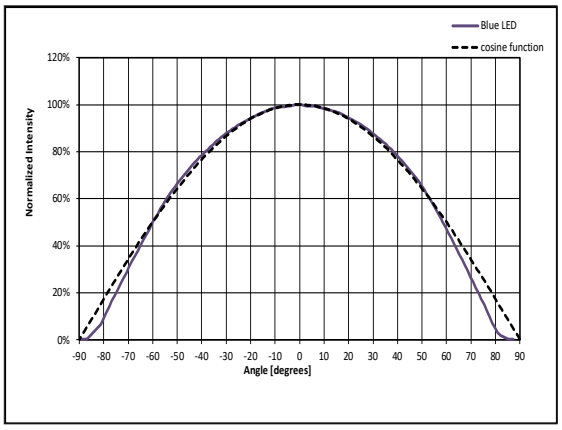
Forward Voltage variation with Drive current - $V_F = f(I_F)$ - Typical[1,2]



Optical Spectrum (Typical)[1,3]



Angular Intensity Distribution (Typical)[4]



Note 1: For Pulsed operation, the reference duty cycles used are 25%, 50% and 25% respectively (T_{hs}=40°C; Frequency =720 Hz).

Note 2: Square on curves indicate device operating current point (9.8 A) under reference conditions listed in the Optical and Electrical Characteristics table.

Note 3: Typical spectrum at recommended peak drive current. Please contact Luminus to obtain data in Excel format.

Note 4: Curves (solid) represent the angular radiation pattern of a typical device. Discontinuous line represents cosine function. For any specific device, slight variations may be expected.

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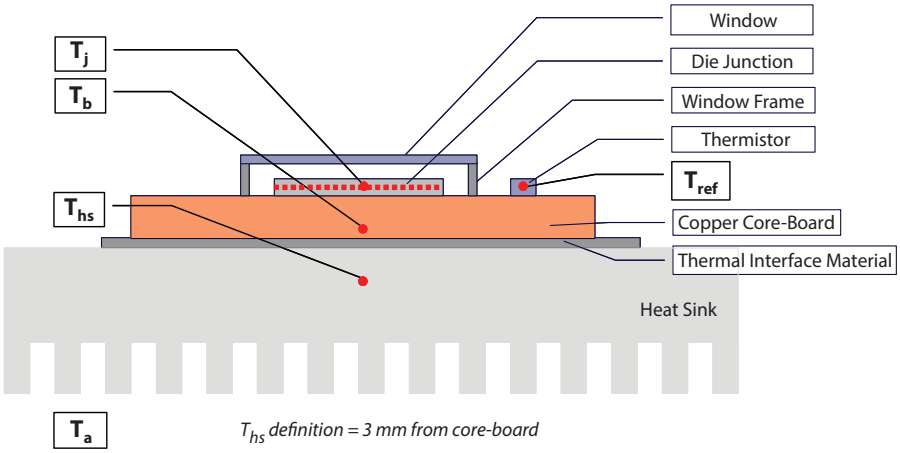
Thermal Resistance



Typical Thermal Resistance

$R_{\theta j\text{-}b}$ [1]	1.0°C/W
$R_{\theta b\text{-}hs}$ [2]	0.2°C/W
$R_{\theta j\text{-}hs}$ [1,2]	1.2°C/W
$R_{\theta j\text{-}ref}$ [2]	1.0°C/W

Note 1: Thermal resistance values are based on modeled results correlated to measured $R_{\theta j\text{-}hs}$ data using the wavelength shift method.

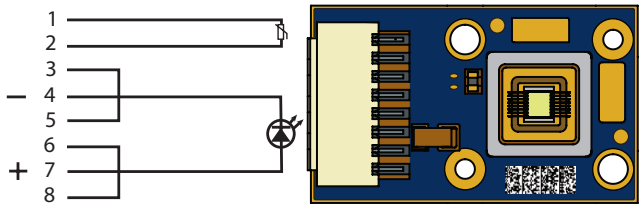
Note 2: Thermal Resistance is based on eGraf 1205 Thermal interface.

Thermistor Information

The thermistor used in PT-39 devices are mounted on coreboards is from Murata Manufacturing Co. The global part number is NCP15XH103J03RC.

Please contact Luminus for information on use of the thermistor and for data in Excel format for temperature vs. resistance plot below.

Electrical Pinout



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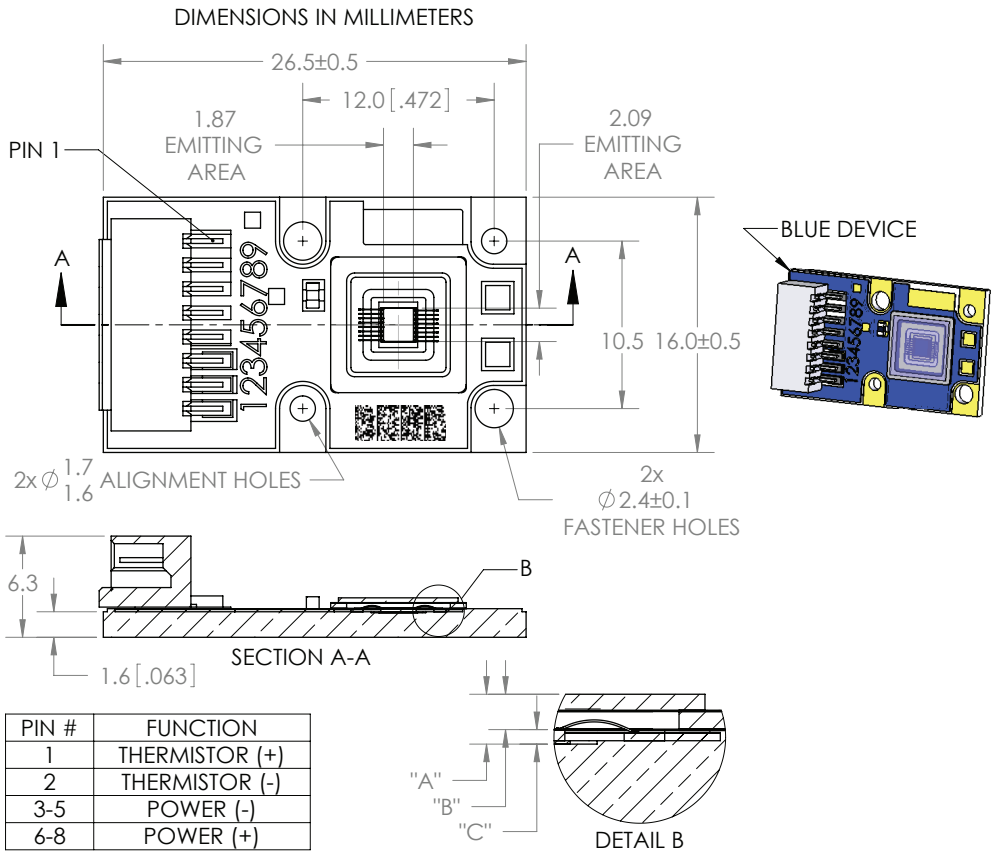
Mechanical Dimensions -Standard Die Configuration



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	0.90	±0.13
"B"	EMITTING AREA TO TOP OF GLASS	0.67	± 0.16
"C"	TOP OF METAL SUBSTRATE TO EMITTING AREA	0.23	± 0.05

DWG-001989

Note 1: PT-39 LEDs are individually assembled into a common anode copper core- board with a footprint of 26.5 mm x 16 mm.
Note 2: Dimensions above are for information only. Please refer to the latest revision of the DWG-001989 package outline mechanical specifications.
Note 3: Connector-MOLEX Part Number: 874380843 or Global Part Number: WTB16-081SF.

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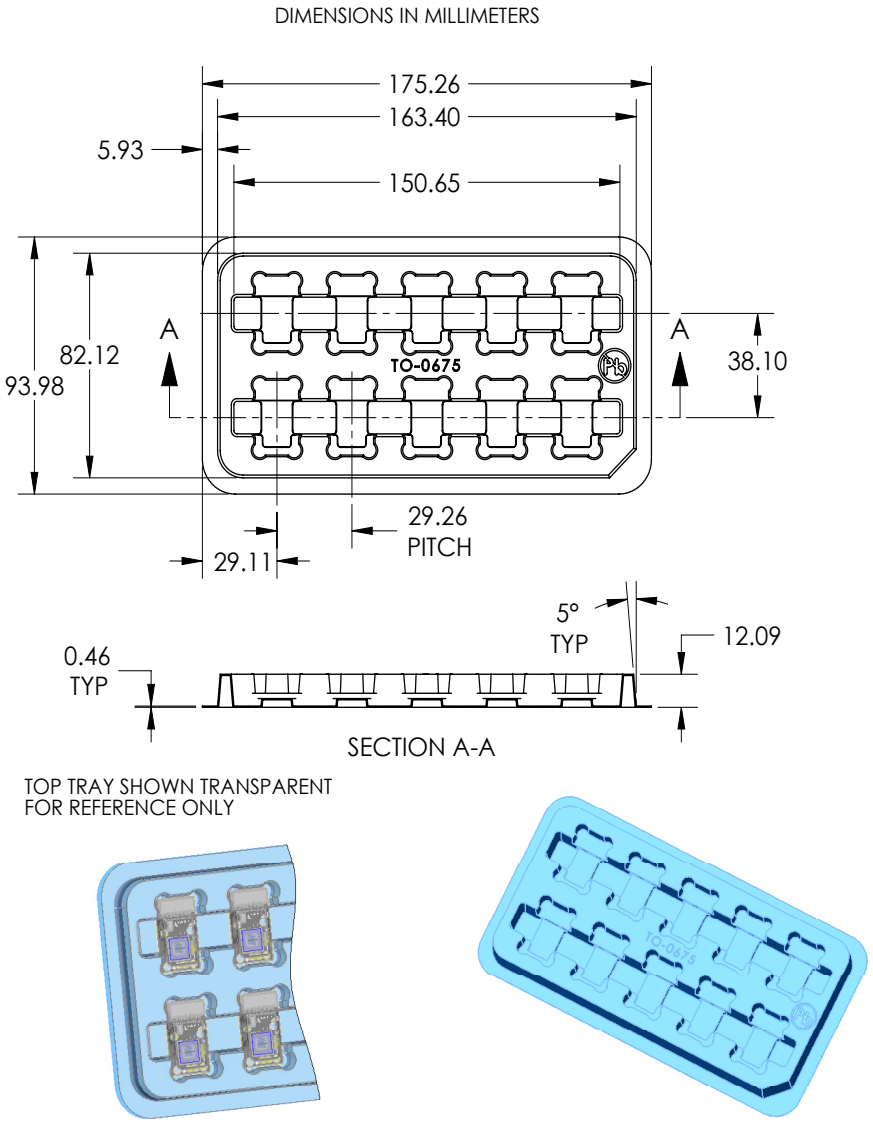
Shipping Tray Outline



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

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Packing and Shipping Specifications

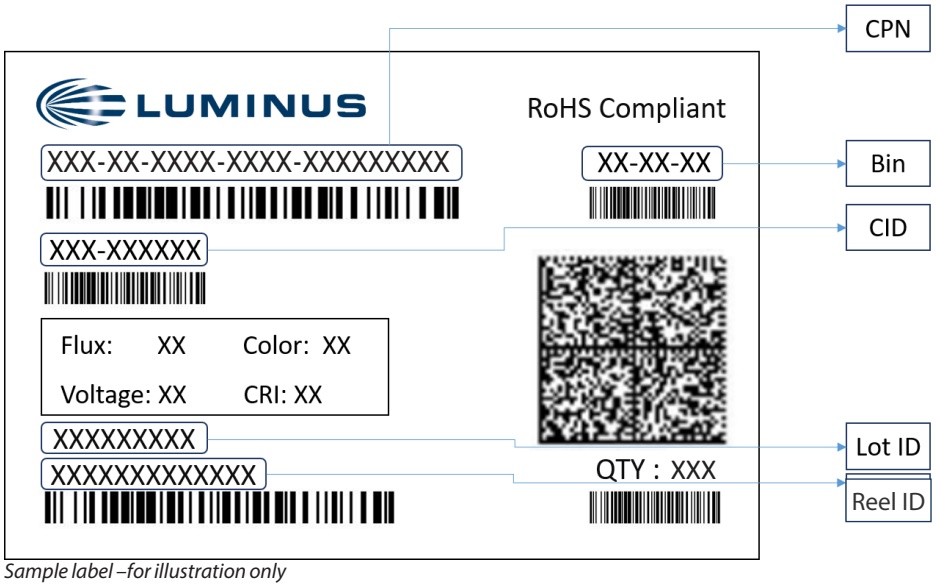
Packing Specification

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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Notes

Static Electricity

This product is sensitive to static electricity, and care should be taken when handling them. Static electricity or surge voltage will damage the LEDs. It is recommended to wear an anti-electrostatic wristband or anti-electrostatic gloves when handling the LEDs. All devices, equipment and machinery must be properly grounded. It is recommended that measures be taken to isolate LED processing equipment from potential sources of voltage surges.

Reference: APN-002815 Electrical Stress Damage to LEDs and How to Prevent It

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History of Changes

Rev	Date	Description of Change
01	05/15/12	Preliminary Specification
02	08/28/12	Added product characterization curves
03	02/17/15	Updated address and year, remove preliminary marks
04	10/31/23	Updated flux bin Updated Voltage spec, Flux bin and Shipping label Red Amber and Green parts have been discontinued since 2020- Consider PT-39-G-L51

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