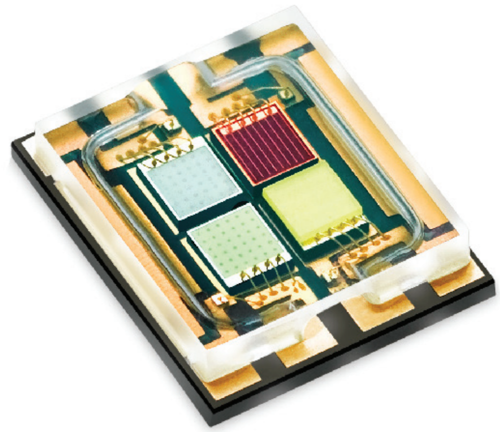
SBM-40-HC



Features:

- High optical output at 3A:
  - up to 280 Red lumens
  - up to 640 Green lumens
  - up to 4200 Blue mWatts
  - up to 900 White lumens
- High thermal conductivity package
- Four chips with emitting area of 1 mm^2 each
- Environmentally friendly: RoHS compliant
- Variable drive currents: 0.1A to 4A
- Available in RGBW combination

Table of Contents

Applications:

- Entertainment /Stage Lighting
- Architectural Ligthing
- Spot Lighting
- Pool and Fountain Lighting
- Medical Lighting
- Fiber-coupled Illumination
- Machine Vision

PDS-003034 Rev.1

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Technology Overview

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

Packaging Technology

Thermal management is critical in high power LED applications. With a thermal resistance from junction to case of 0.9 °C/W (electrical), Luminus SBM-40-HC LEDs have industry-leading thermal resistance. This allows the LED to be driven at higher current while maintaining a low junction temperature, thereby resulting in brighter solutions and longer lifetimes.

Reliability

Designed from the ground up, Luminus LEDs are one of the most reliable light sources in the world today. Luminus 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 LEDs are ready for even the most demanding applications.

Environmental Benefits

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

Understanding Luminus LED Test Specifications

Every Luminus LED is fully tested to ensure that it meets the high quality standards expected from Luminus' products.

Testing Temperature

Luminus surface mount LEDs are typically tested with a 20 ms 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.

This method of measurement ensures that Luminus LEDs perform in the field just as they are specified.

Multiple Operating Points

The tables on the following pages provide typical optical and electrical characteristics. Since the LEDs can be operated over a wide range of drive conditions (currents from 0.1 A to 4A (3A for red)), and duty cycle from <1% to 100%), multiple drive conditions are listed.

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SBM-40-HC Red, Green, Blue and White Binning Structure[1,2]

All SBM-40-HC LEDs are tested at 1 A for luminous flux, radiometric flux and dominant wavelength and placed into one of the following wavelength and flux bins. The binning structure is universally applied across each color of the SBM-40-HC product line.

Color	Min... Max Luminous Flux (lm) @ 1 A	Min...Max Radiometric Flux (mW) @ 1 A	Min... Max Luminous Flux (lm) @ 3 A	Min...Max Radiometric Flux (mW) @ 3 A
Red	110 ... 165		187 ... 280	
Green	220 ... 360		400 ... 640	
Blue		1100 ... 1800		2600 ... 4200
White	240 ... 400		540 ... 900	

Red, Green and Blue Dominant Wavelength Bins

Color	Wavelength Bin (FF)	Minumum Wavelength (nm) @ 1 A	Maximum Wavelength (nm) @ 1 A
Red	R1	621	627
Green	G1	519	525
	G2	525	531
Blue	B1	449	454
	B2	454	459

Note 1: Luminus maintains a +/- 6% tolerance on flux measurements.

Note 2: Only specific bins are available for large order, contact Luminus sales team for more information.

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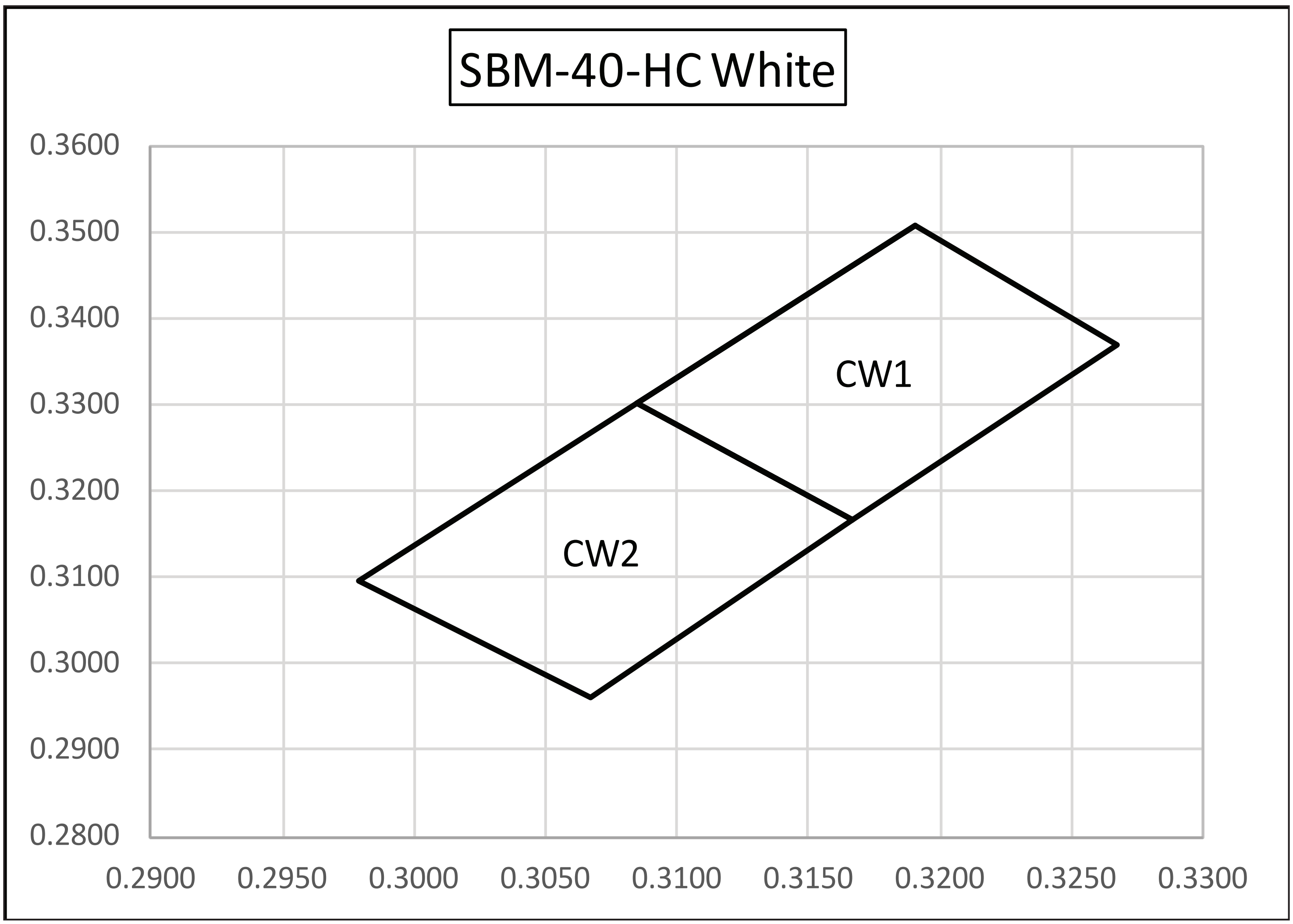
SBM-40-HC White Chromaticity Coordinates

Chromaticity Coordinates		
Bin Code (CW)	**CIEx**	**CIEy**
CW1	0.3190	0.3507
	0.3267	0.3370
	0.3167	0.3166
	0.3190	0.3507
CW2	0.3085	0.3302
	0.3167	0.2961
	0.2979	0.3096
	0.3085	0.3302



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Part Number Nomenclature

SBM	40	RGBW	HC41	<abnnn>
Product Family	**LED Emission Area**	**Color**	**Package Configuration**	**Bin kit**
SBM: Multi-Chip Surface mount device, Non-Encapsulated	40: 4 dies - each 1.0 mm^2	<Y>: Color R = Red G = Green B = Blue W = White	HC41: 10.0 mm x 11.0 mm - Surface mount, shipped in tape & reel	Flux and Chromaticity bin kit code - See available ordering codes below

SBM-40-HC Bin Kit Ordering Nomenclature and Ordering Part Number

All SBM-40-SC RGBW products are sold in sets of flux and chromaticity bins called bin kits. Each bin kit specifies a minimum flux bin and a specific selection of chromaticity bins. The ordering part number designation is as follows:

Bin Kit	RGB Flux	White Chromaticity	White Flux	Ordering Part Number
QE100	Full Distribution	CW1,CW2	Full Distribution	SBM-40-RGBW-HC41-QE100

For other bin kits, please contact a Luminus representative.

Example:

The ordering part number SBM-40-RGBW-HC41-QE100 refers to bin kit which consists of a RGBW, SBM-40-HC emitter, with Red Flux > 110 lm and Red DWL range of 621nm-627 nm; Green flux > 220 lm and Green DWL range of 519 nm to 531 nm; Blue power > 1100 mW and Blue DWL range of 449 nm to 459 nm; White flux >240 lm.

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Product Shipping & Labeling Information

All SBM-40-HC products are packaged and labeled with their respective bin as outlined in the tables on pages 3 & 4. When shipped, each reel will only contain one bin. The part number designation is as follows:

SBM — 40 — RGBW — HC41 — QE<XXX>

Product Family	Chip Area	Color	Package Configuration	Bin Kit Identifier
Surface Mount (window)	4.0 mm^2	**R**: Red **G**: Green **B**: Blue **W**: White	Internal Code	QEXXX

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Optical & Electrical Characteristics [1,2]

Parameter	Symbol	Red	Green	Blue	White	Unit
Drive Condition[3]	I	1.0	1.0	1.0	1.0	A
Emitting Area	-	1.0	1.0	1.0	1.0	mm^2
Emitting Area Dimensions	-	1.0 x 1.0	1.0 x 1.0	1.0 x 1.0	1.0 x 1.0	mm x mm
Dominant Wavelength	$\lambda_{d\ min}$	621	519	449	-	nm
	$\lambda_{d\ typ}$	624	525	454	-	nm
	$\lambda_{d\ max}$	627	531	459	-	nm
FWHM (typ.)	$\Delta\lambda_{1/2}$	15.1	31.8	18.1	N/A	nm
Chromaticity Coordinates[4] (typ.)	x				0.31	-
	y				0.32	-
Forward Voltage	$V_{F\ min}$	2.3	3.0	2.7	2.7	V
	$V_{F\ typ}$	2.5	3.2	3.05	3.05	V
	$V_{F\ max}$	2.8	3.9	3.4	3.4	V
Minimum Current [5]	-	0.1	0.1	0.1	0.1	A
Maximum Current [5]	-	3.0	4.0	4.0	4.0	A
LED Junction Temperature [5]	$T_{j\ operating,max}$	115	150	150	150	ºC
Storage Temperature Range	-	-40/+100	-40/+100	-40/+100	-40/+100	ºC

Note 1: All ratings are based on test conditions of I_f = 1000 mA, T_c=25 ºC, 20 millisecond pulse. T_{case} is defined on Thermal Resistance section, page 16.

Note 2: Unless otherwise noted, values listed are typical. Devices are production tested and specified at 1 A/mm^2 for red, green, blue and white. Values provided at 3 A based on characterization and measurements at 2A/mm^2.

Note 3: SBM-40-HC RGBW devices can be driven at currents ranging from 0.1 A to 3 A depending on color and at duty cycles ranging from 1% to 100%. Drive current and duty cycle should be adjusted as necessary to maintain the junction temperature desired to meet application lifetime requirements.

Note 4: In CIE 1931 chromaticity diagram coordinates, normalized to x+y+z=1.

Note 5: SBM-40-HC RGBW devices are designed for continuous operation to a maximum current as specified above. Product lifetime data is specified at recommended forward drive currents. Sustained operation at or beyond 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 for further information.

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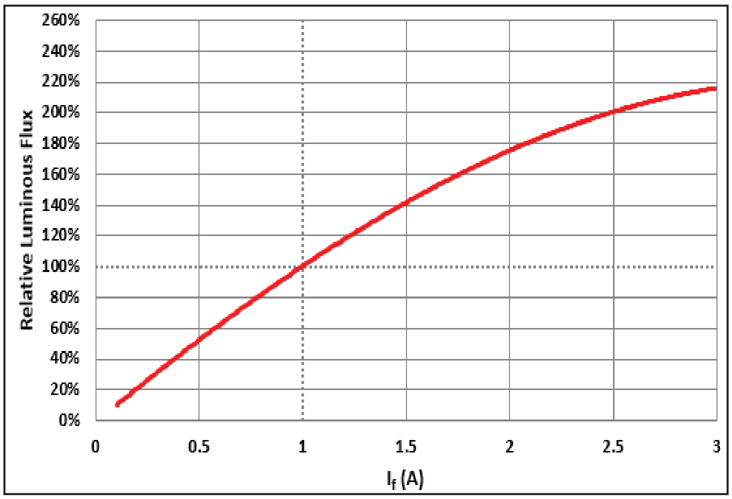
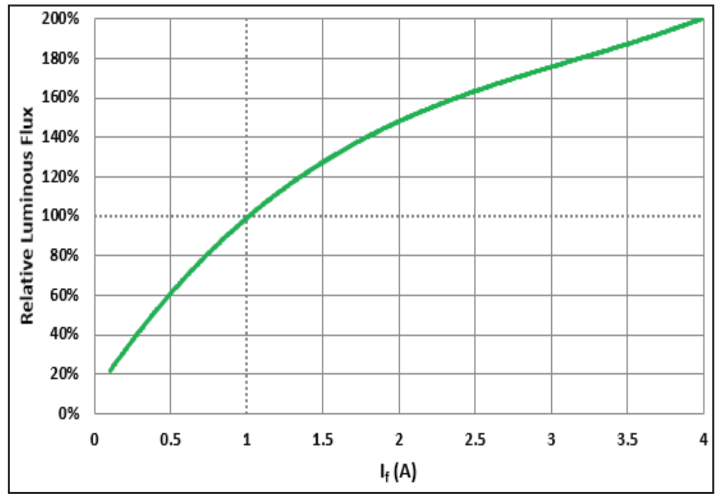
Optical & Electrical Characteristics[7]

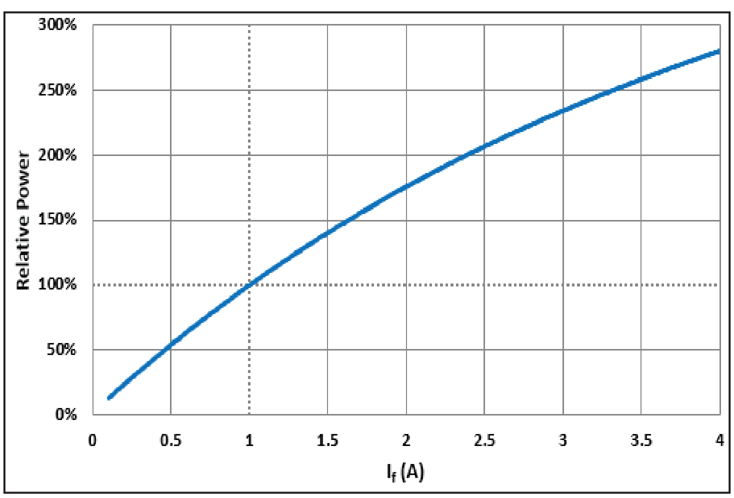
Relative Luminous Flux vs. If
φv/φv(1A) Single Pulse 20ms Tc = 25°;Red



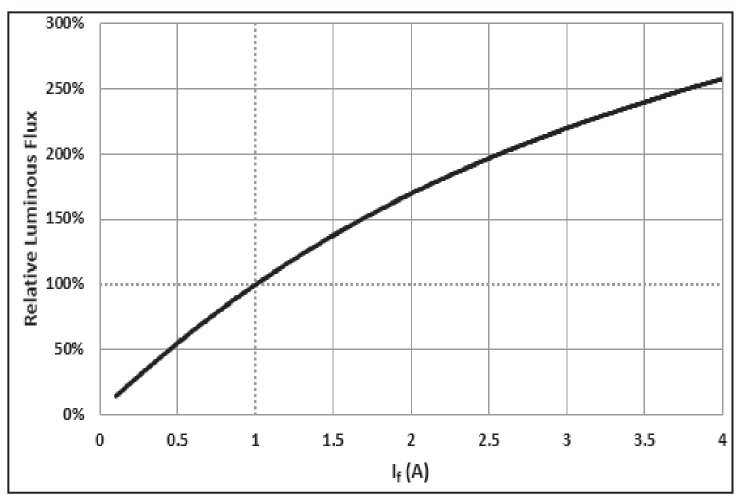
Relative Luminous Flux vs. If
φv/φv(1A) Single Pulse 20ms Tc = 25°;Green



Relative Luminous Flux vs. If
φv/φv(1A) Single Pulse 20ms Tc = 25°;Blue



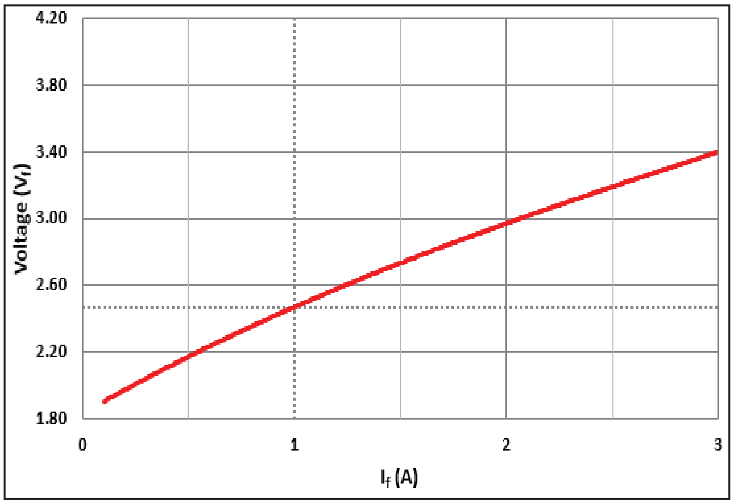
Relative Luminous Flux vs. If
φv/φv(1A) Single Pulse 20ms Tc = 25°;White



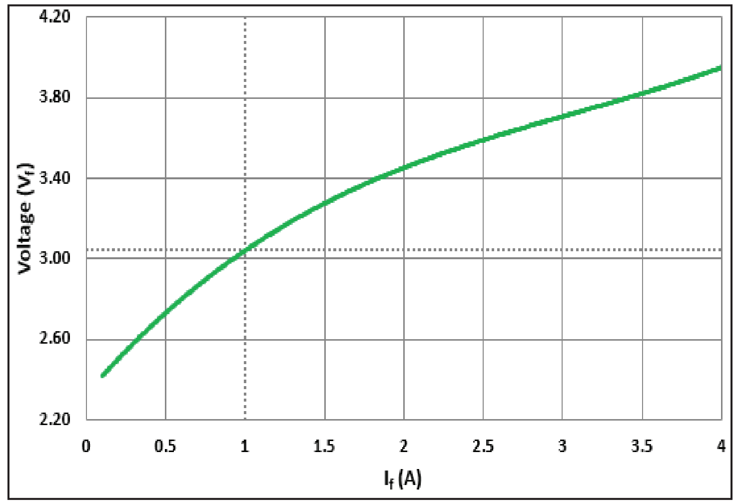
Note 7: Flux and power values are measured using a current pulse of typical 20 ms. Luminus maintains a test measurement accuracy for LED flux and power of ±6%.

Optical & Electrical Characteristics

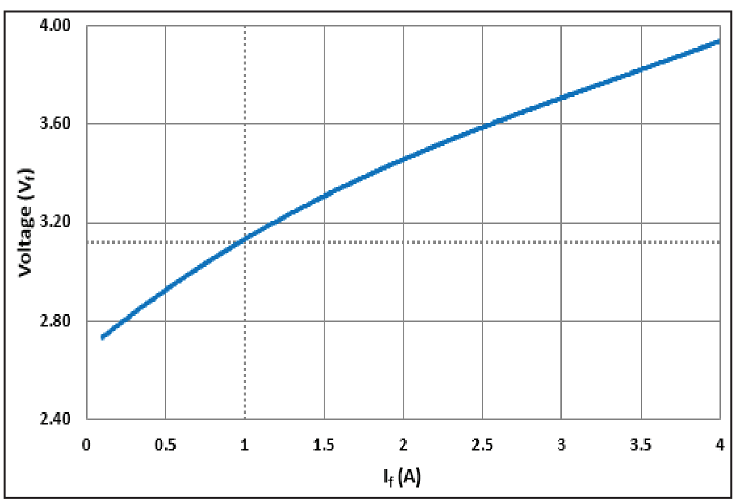
Vf vs. If
Vf(If) Single Pulse 20ms Tc = 25°;Red



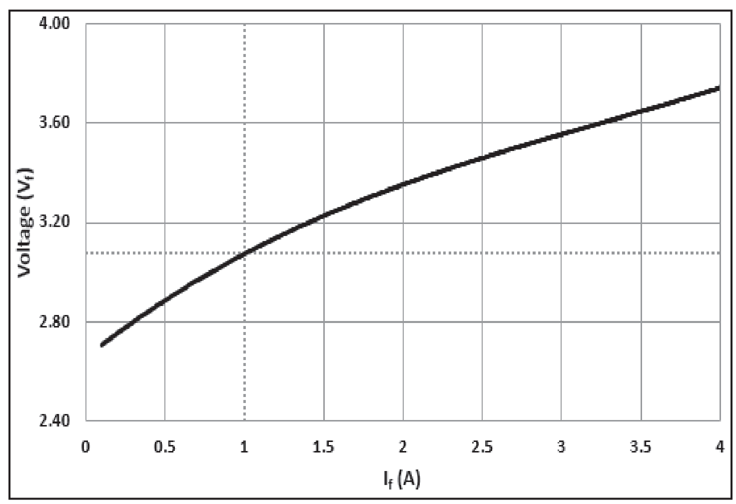
Vf vs. If
Vf(If) Single Pulse 20ms Tc = 25°;Green



Vf vs. If
Vf(If) Single Pulse 20ms Tc = 25°;Blue



Vf vs. If
Vf(If) Single Pulse 20ms Tc = 25°;White



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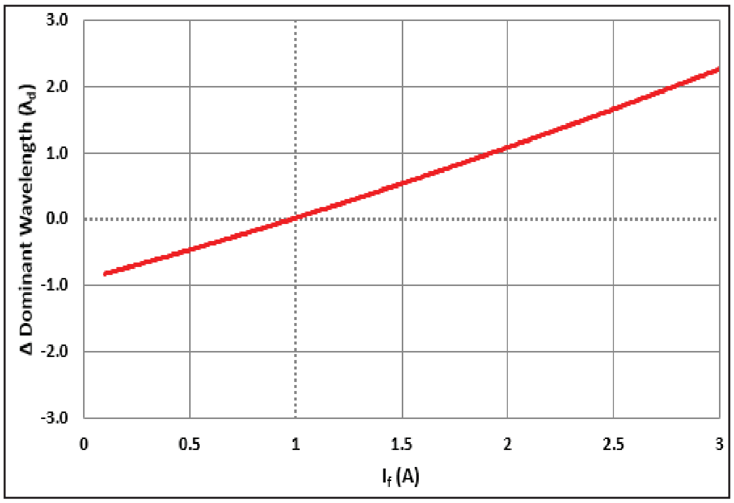
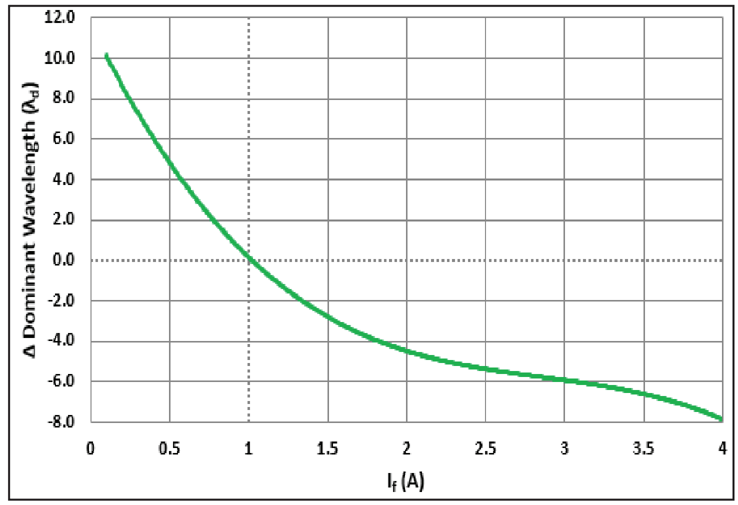
Optical & Electrical Characteristics

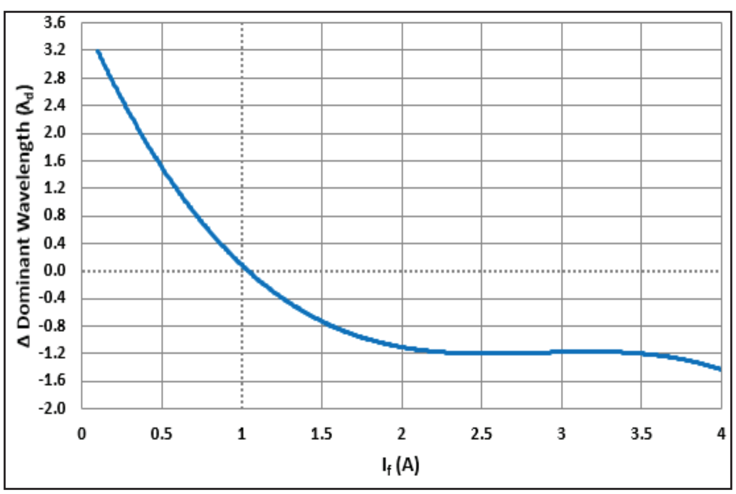
Δ Dominant Wavelength (λd)
Red Tc=25°;Red



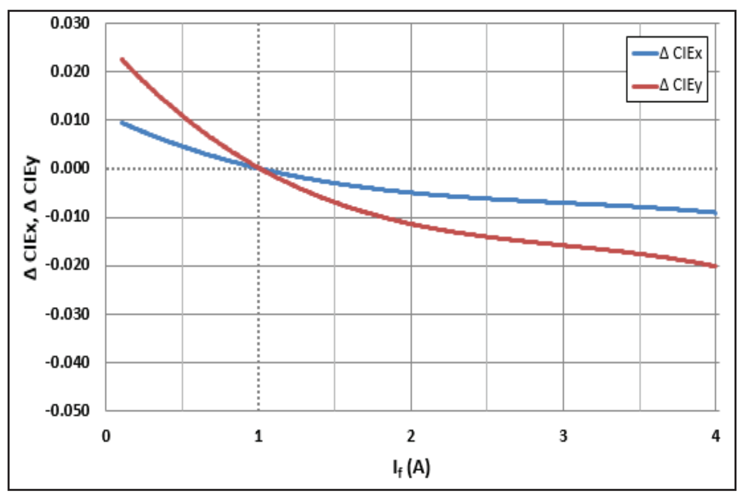
Δ Dominant Wavelength (λd)
Green Tc=25°;Green



Δ Dominant Wavelength (λd)
Blue Tc=25°,Blue



Chromaticity Shift vs. If
ΔCIEx,y = CIEx,y(If) - CIEx,y (1A), Single Pulse 20ms Tc = 25°C,White



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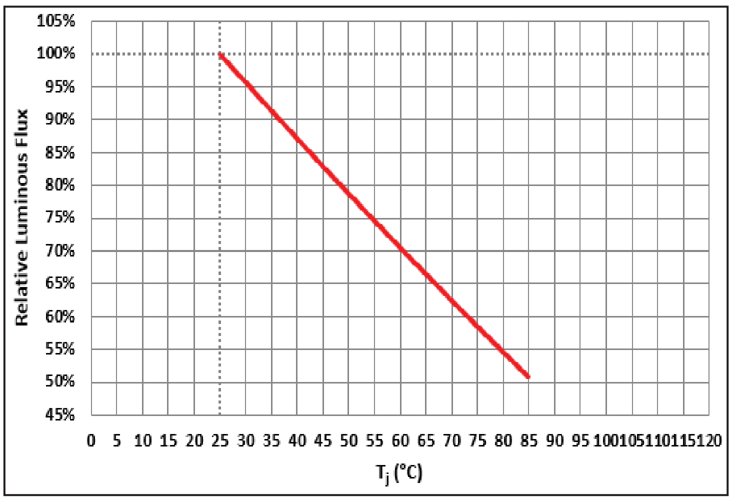
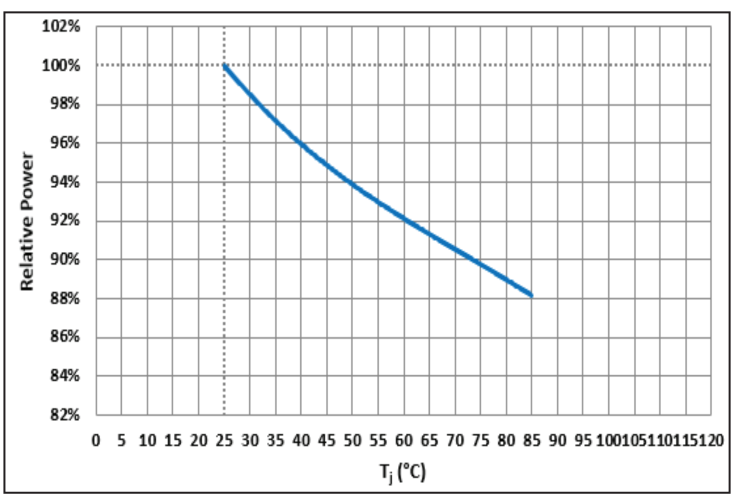
Optical & Electrical Characteristics[7]

Relative Luminous Flux vs. Tj
φv/φv(85°C) Single Pulse 20ms If = 1A;Red

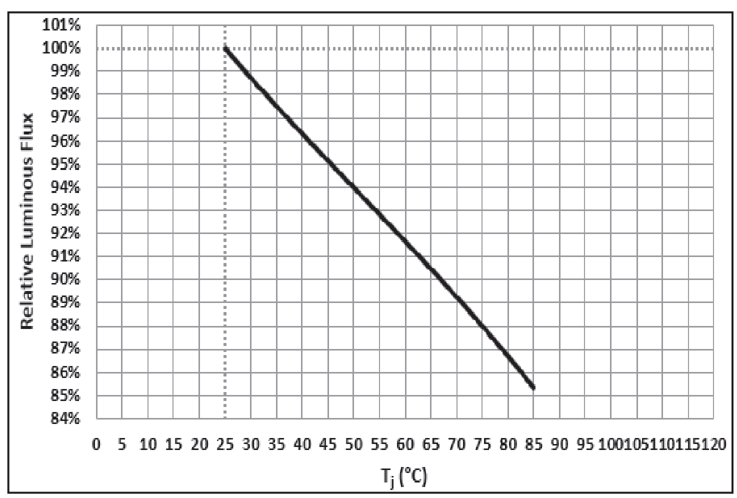


Relative Luminous Flux vs. Tj
φv/φv(85°C) Single Pulse 20ms If = 1A;Green

Relative Power vs. Tj
φv/φv(85°C) Single Pulse 20ms If = 1A;Blue



Relative Luminous Flux vs. Tj
φv/φv(85°C) Single Pulse 20ms If = 1A;White



Note 7: Flux and power values are measured using a current pulse of typical 20 ms. Luminus maintains a test measurement accuracy for LED flux and power of ±6%.

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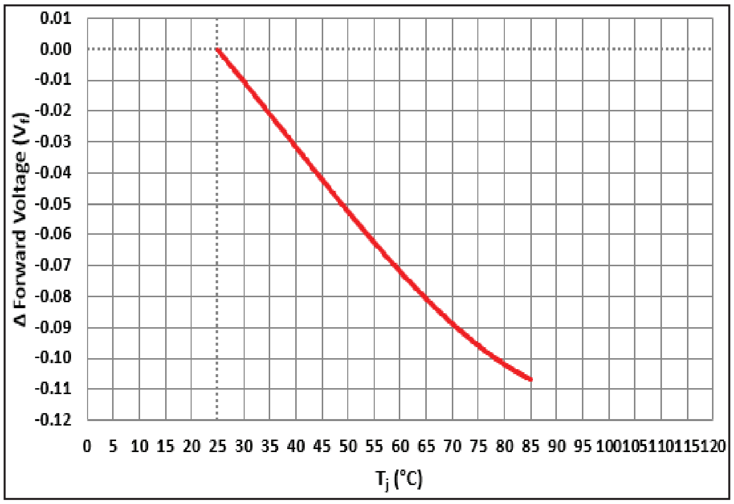
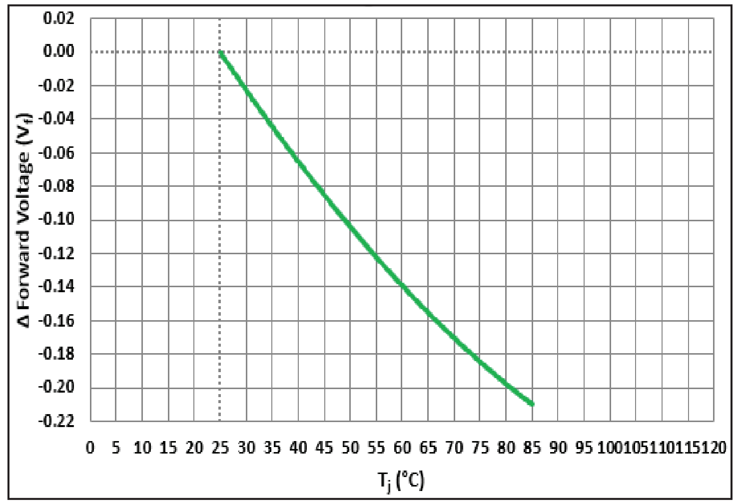
Optical & Electrical Characteristics

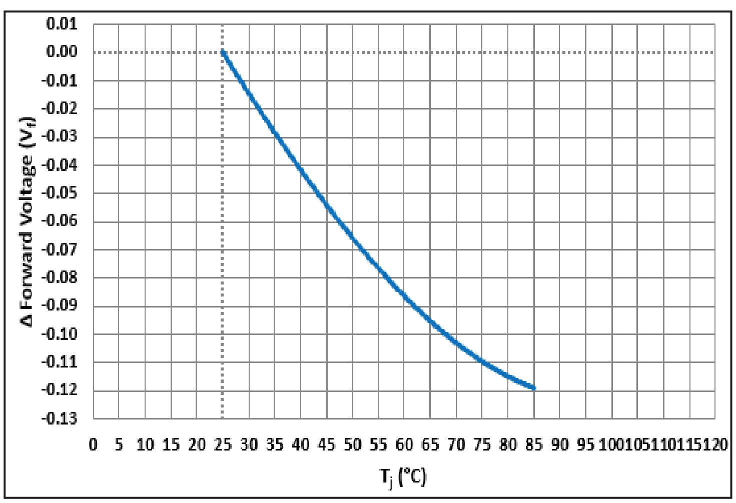
Vf vs. Tj
ΔVf = V(Tj) - V(85°C) Single Pulse 20ms If = 1A;Red



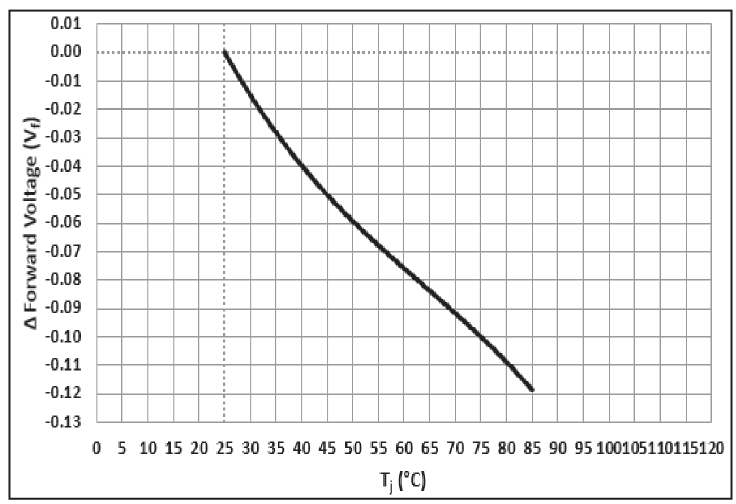
Vf vs. Tj
ΔVf = V(Tj) - V(85°C) Single Pulse 20ms If = 1A;Green



Vf vs. Tj
ΔVf = V(Tj) - V(85°C) Single Pulse 20ms If = 1A;Blue



Vf vs. Tj
ΔVf = V(Tj) - V(85°C) Single Pulse 20ms If = 1A;White



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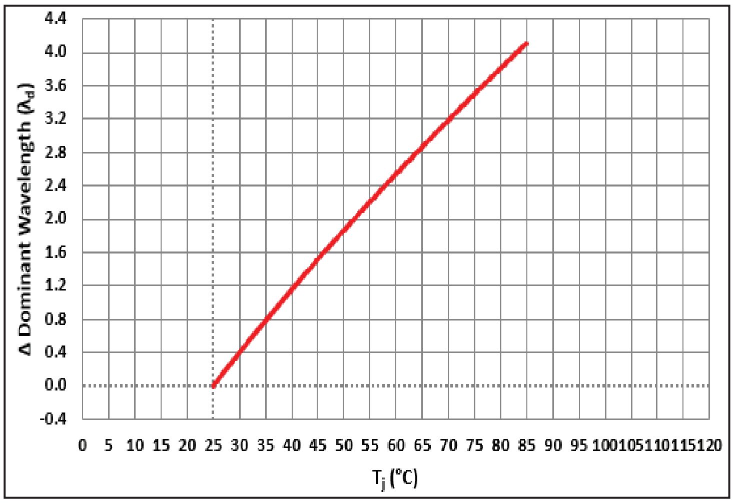
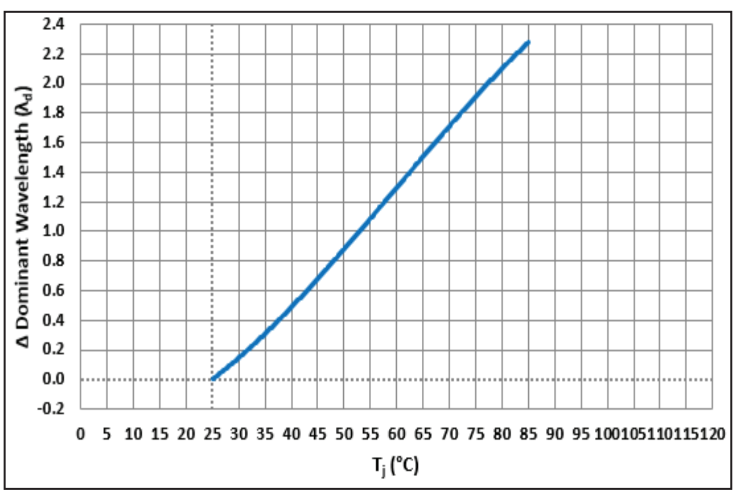
Optical & Electrical Characteristics

Δ Dominant Wavelength (λd)
If = 1A;Red

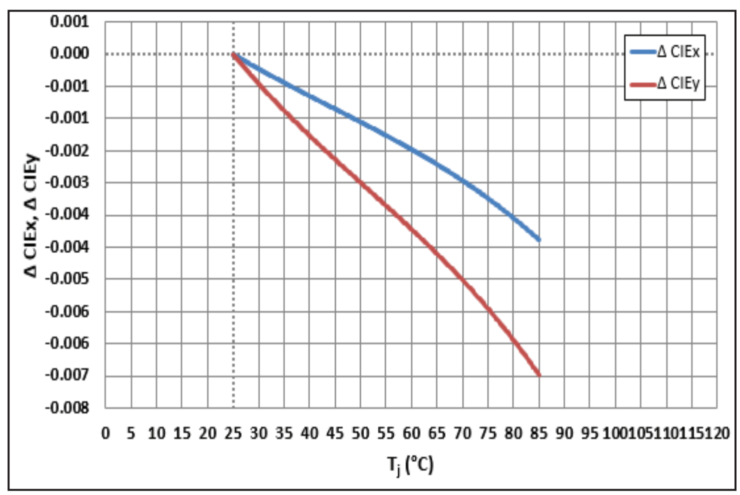


Δ Dominant Wavelength (λd)
If = 1A;Green

Δ Dominant Wavelength (λd)
If = 1A,Blue



Chromaticity Shift vs. Tj
ΔCIEx,y = CIEx,y(If) - CIEx,y , Single Pulse 20ms If = 1A,White



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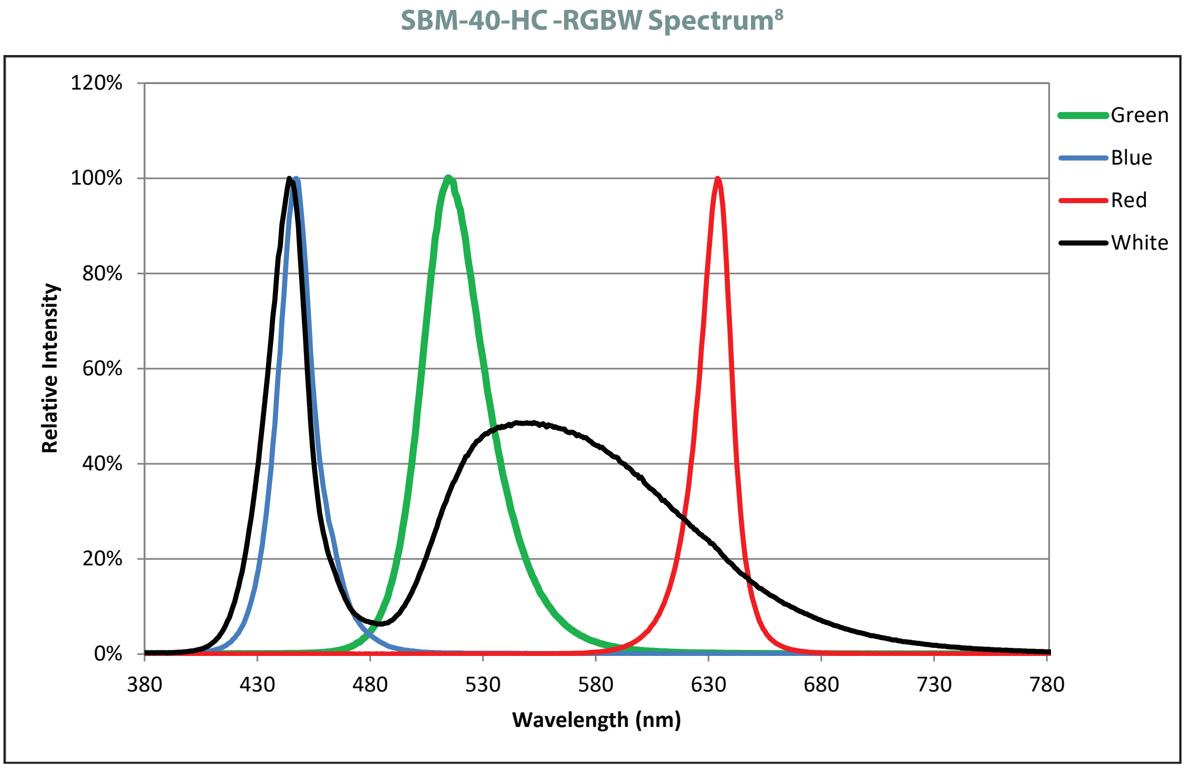
Optical & Electrical Characteristics



Note 8: Typical spectrum from Red, Green, Blue and White LEDs at reference current of 1 A, CW. Please contact Luminus to obtain data in Excel format.

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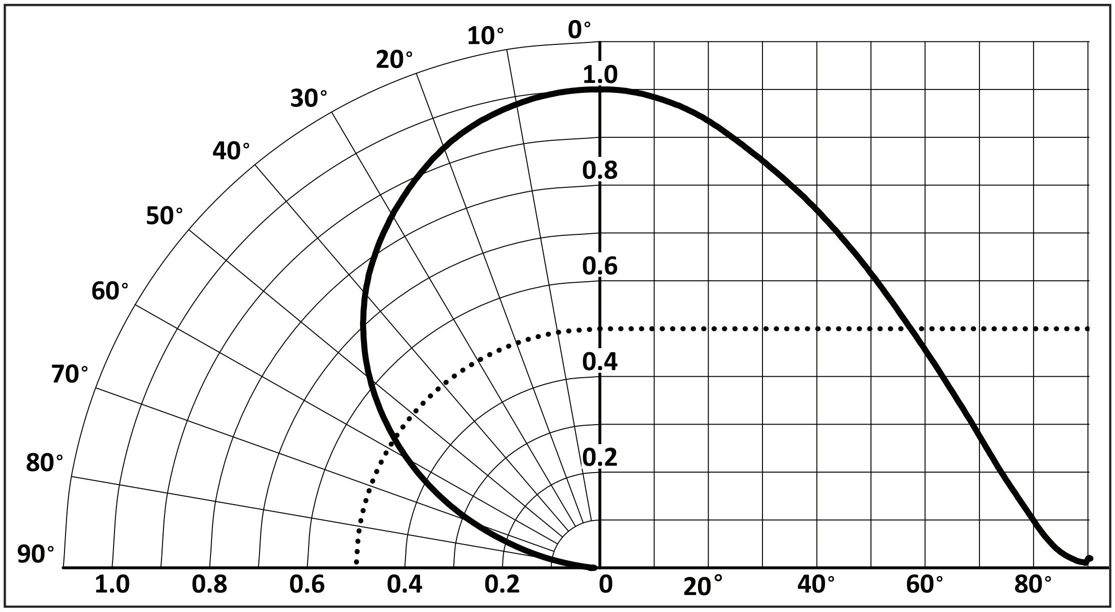
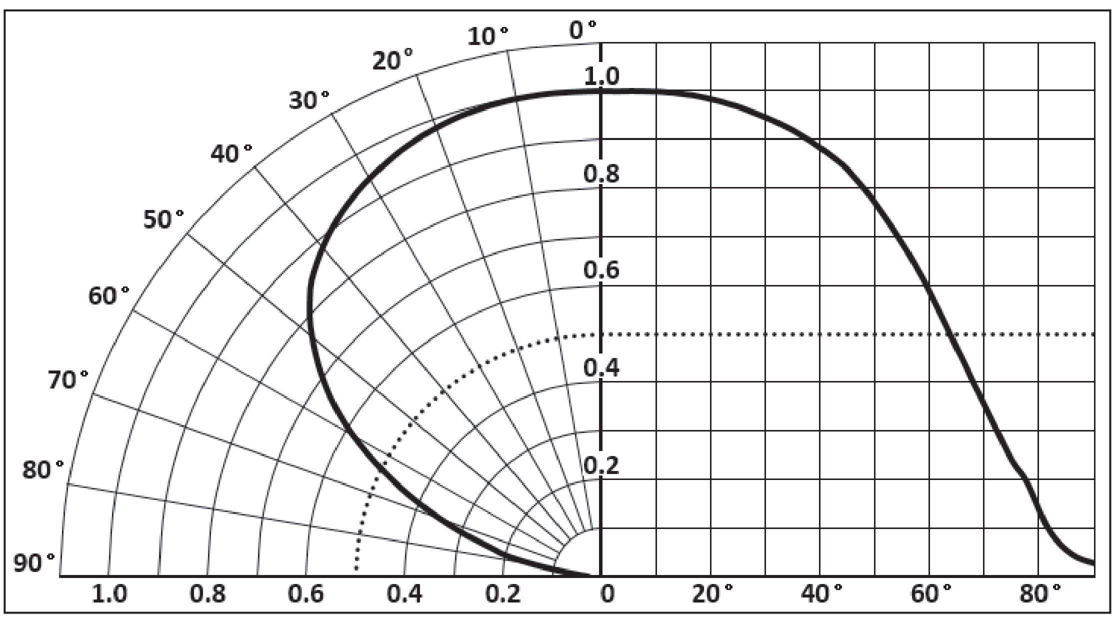
Optical & Electrical Characteristics

SBM-40-HC -RGB Angular Distribution



SBM-40-HC -W Angular Distribution



Note 8: Typical spectrum from Red, Green, Blue and White LEDs at reference current of 1 A, CW. Please contact Luminus to obtain data in Excel format.

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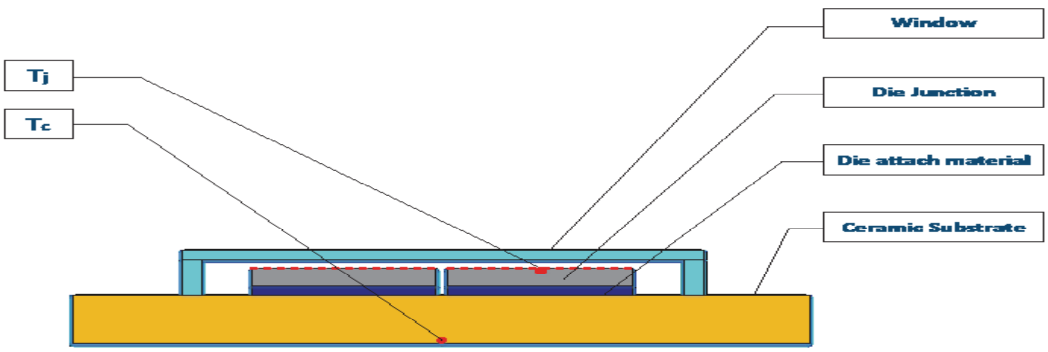
SBM-40-HC Thermal Resistance



Thermal resistance junction to case, $R_{th(j\text{-}c)\_real}$ = 1.2 °C/W (typ.),(All chips operated simultaneously)
Thermal resistance junction to case, $R_{th(j\text{-}c)\_electrical}$ = 0.9 °C/W (typ.) (All chips operated simultaneously)

Case Temperature (T_c) = Temperature at bottom of ceramic substrate.

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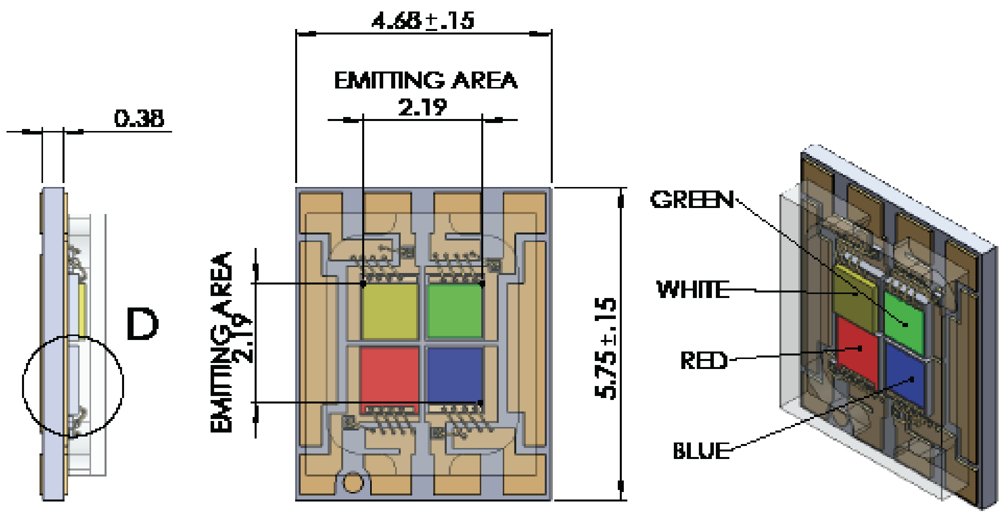
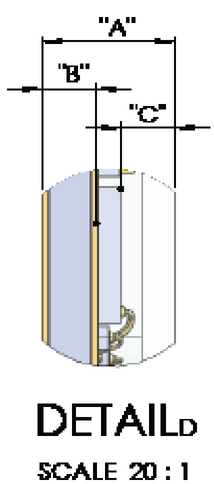
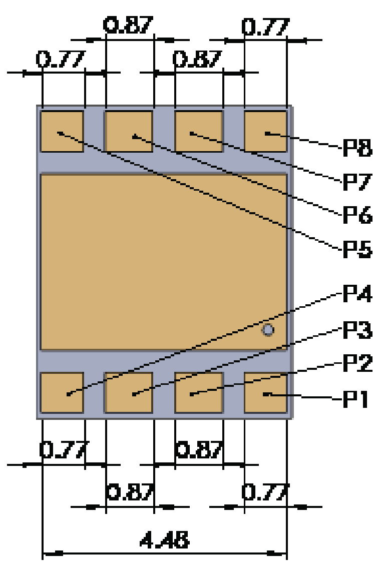
Mechanical Dimensions – SBM-40-HC Emitter







PAD	ASSIGNMENT
P1	CATHODE, RED
P2	ANODE, RED
P3	CATHODE, BLUE
P4	ANODE, BLUE
P5	CATHODE, GREEN
P6	ANODE, GREEN
P7	CATHODE, WHITE
P8	ANODE, WHITE

DIMENSION NAME	DESCRIPTION	NOMINAL DIMENSION	TOLERANCE
"A"	BOTTOM OF SUBSTRATE TO TOP OF WINDOW	1.21	±.10
"B"	BOTTOM OF SUBSTRATE TO TOP OF COPPER TRACE	0.51	±.05
"C"	TOP OF DIE EMITTING AREA TO TOP OF WINDOW	0.48	±.07

For prototyping purposes, please see Bergquist thermal clad boards, part #803807 (square board) or part # 803808 (star board). Available from Digi-Key or Mouser.

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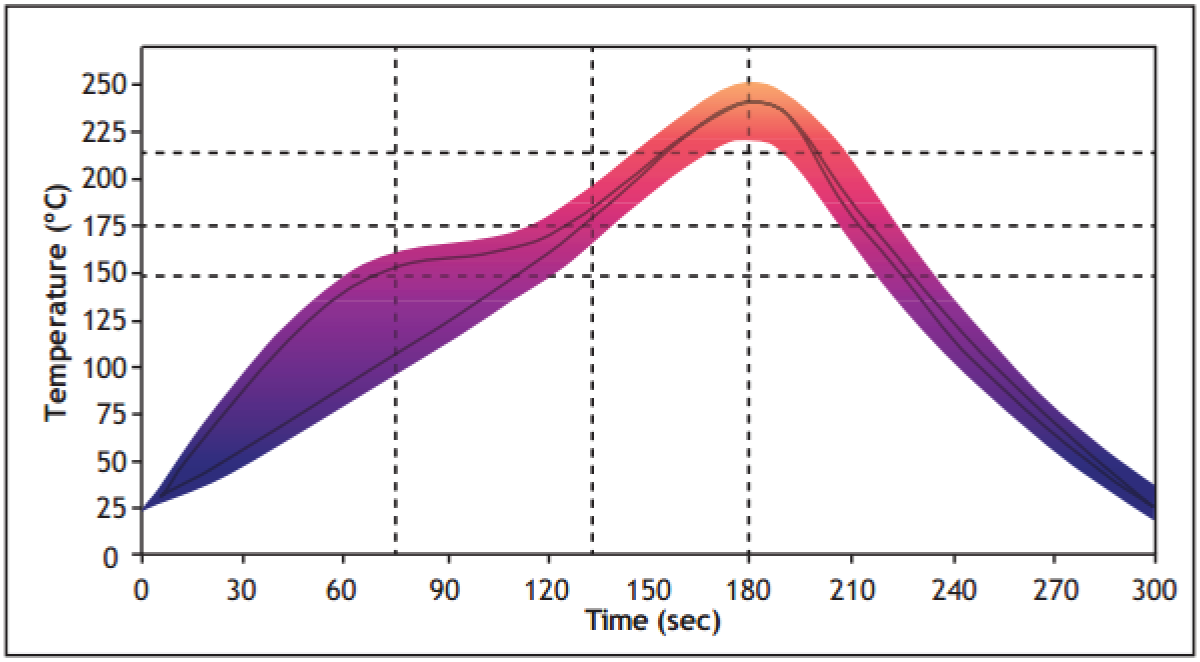
Solder Profile

SAC 305 Reflow Profile Window For Low Density Boards



Solder Profile Stage	Lead-Free Solder	Lead-based Solder
Rate of Rise	2 ºC/sec max	2 ºC/sec max
Preheat Min Temp ($T_{i,min}$)	100 ºC	120 ºC
Preheat Max Temp ($T_{i,max}$)	175 ºC	130 ºC
Preheat Time ($T_{i,min}$ to $T_{i,max}$)	90 seconds	120 seconds
Liquidus Min Temp (T_L)	185 ºC	160 ºC
Liquidus to Liquidus Time (T_L to T_{L2})	30-60 seconds	30 seconds
Liquidus Peak Temp (T_p)	240 ºC max	220ºC max
Cooldown	≤ 4 ºC/sec	≤ 6 ºC/sec
Profile Length (Ambient to Peak)	4 min	3.5 - 4 min

Note 9: Temperatures are taken and monitored at the component copper layer.

Note 10: Optimum profile may differ due to oven type, circuit board or assembly layout.

Note 11: Recommended lead free, no-clean solder: AIM NC254-SAC305.

Note 12: Refer to soldering and handling application note (APN-001473) for additional solder profiles and details.

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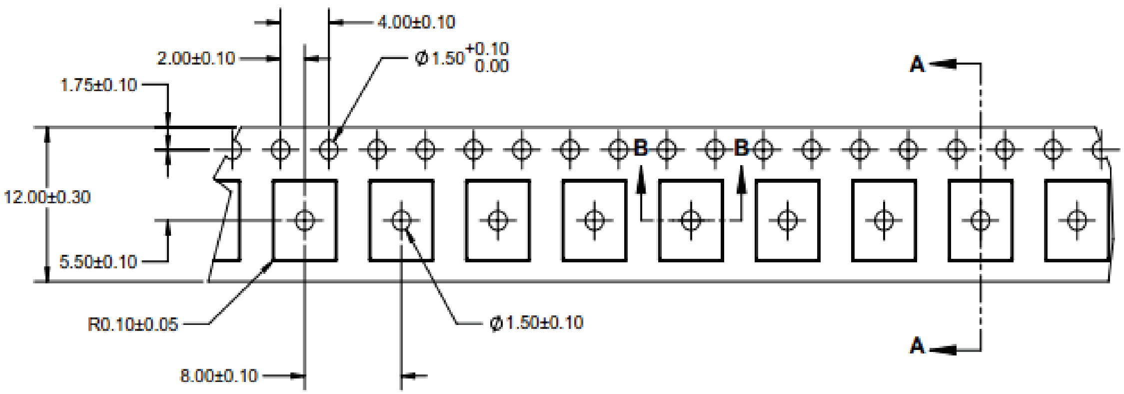
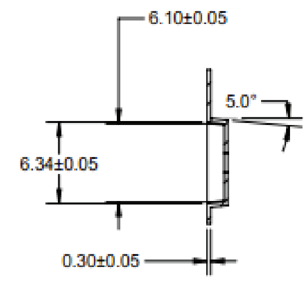
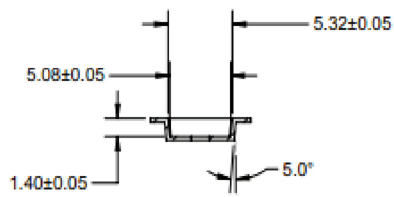
Packaging Specification

Packing Unit = 500 pcs per reel

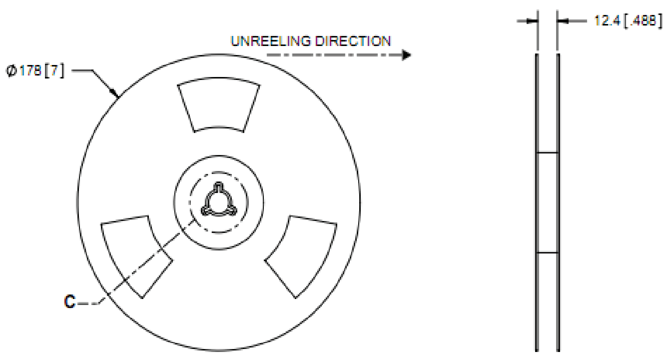


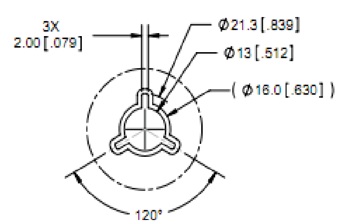


SECTION A-A

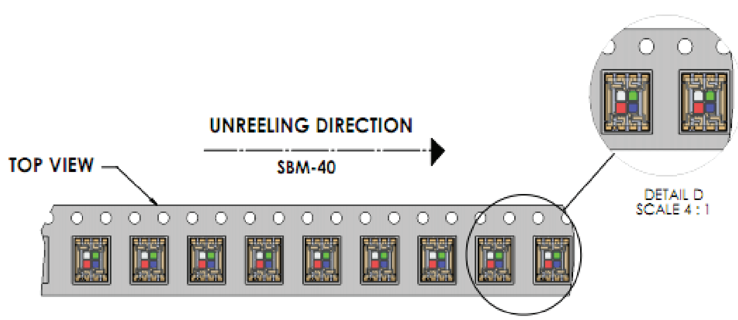


SECTION B-B





DETAIL C



Note 13: For detailed drawing, please refer to drawing number: TO-1156.

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Revision History

Revision	Date	Description
1	11/08/2020	Datasheet release

This product is protected by U.S. Patents 6,831,302; 7,074,631; 7,083,993; 7,084,434; 7,098,589; 7,105,861; 7,138,666; 7,166,870; 7,166,871; 7,170,100; 7,196,354; 7,211,831; 7,262,550; 7,274,043; 7,301,271; 7,341,880; 7,344,903; 7,345,416; 7,348,603; 7,388,233; 7,391,059 Patents Pending in the U.S. and other countries.

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