SBM-40-SC

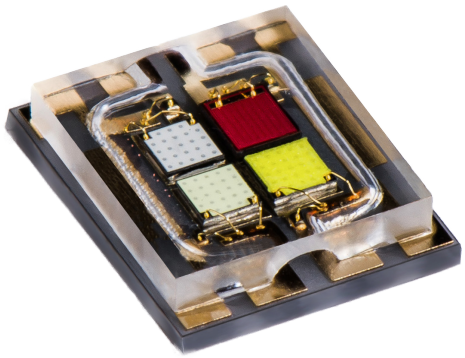

Table of Contents

Features:

- High optical output at 2 A:
  - up to 253 Red lumens
  - up to 404 Green lumens
  - up to 2265 Blue mWatts
  - up to 543 White lumens
- High thermal conductivity package
- Four chips with emitting area of 1 mm^2 each
- Environmentally friendly: RoHS compliant
- Variable drive currents: 0.1 A to 2.0 A
- Available in RGBW combination

Applications:

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

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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 0.8° C/W (electrical), Luminus SBM-40-SC 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 2.0 A, and duty cycle from <1% to 100%), multiple drive conditions are listed.

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SBM-40-SC Red, Green, Blue and White Binning Structure[1,2,3]

All SBM-40-SC LEDs are tested at 1 A at $T_{ambient}$=25ºC 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-SC product line.

Color	Min... Max Luminous Flux (lm) @ 1 A	Min...Max Radiometric Flux (mW) @ 1 A	Min... Max Luminous Flux (lm) @ 2 A (Correlated Values)	Min...Max Radiometric Flux (mW) @ 2 A (Correlated Values)
Red	90 ... 140		163 ... 253	
Green	210 ... 285		298 ... 404	
Blue		1000 ... 1400		1618 ... 2265
White	210 ... 345		330 ... 543	

Red, Green and Blue Dominant Wavelength Bins[3]

Color	Wavelength Bin (FF)	Minumum Wavelength (nm) @ 1 A	Maximum Wavelength (nm) @ 1 A
Red	RW	621	626
Green	GW	522	527
Blue	BW	451	456

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

Note 2: Contact Luminus sales team for specific bin requirements.

Note 3: Devices are binned at standard 1A, 20ms pulse , $T_{ambient}$=25ºC condition.

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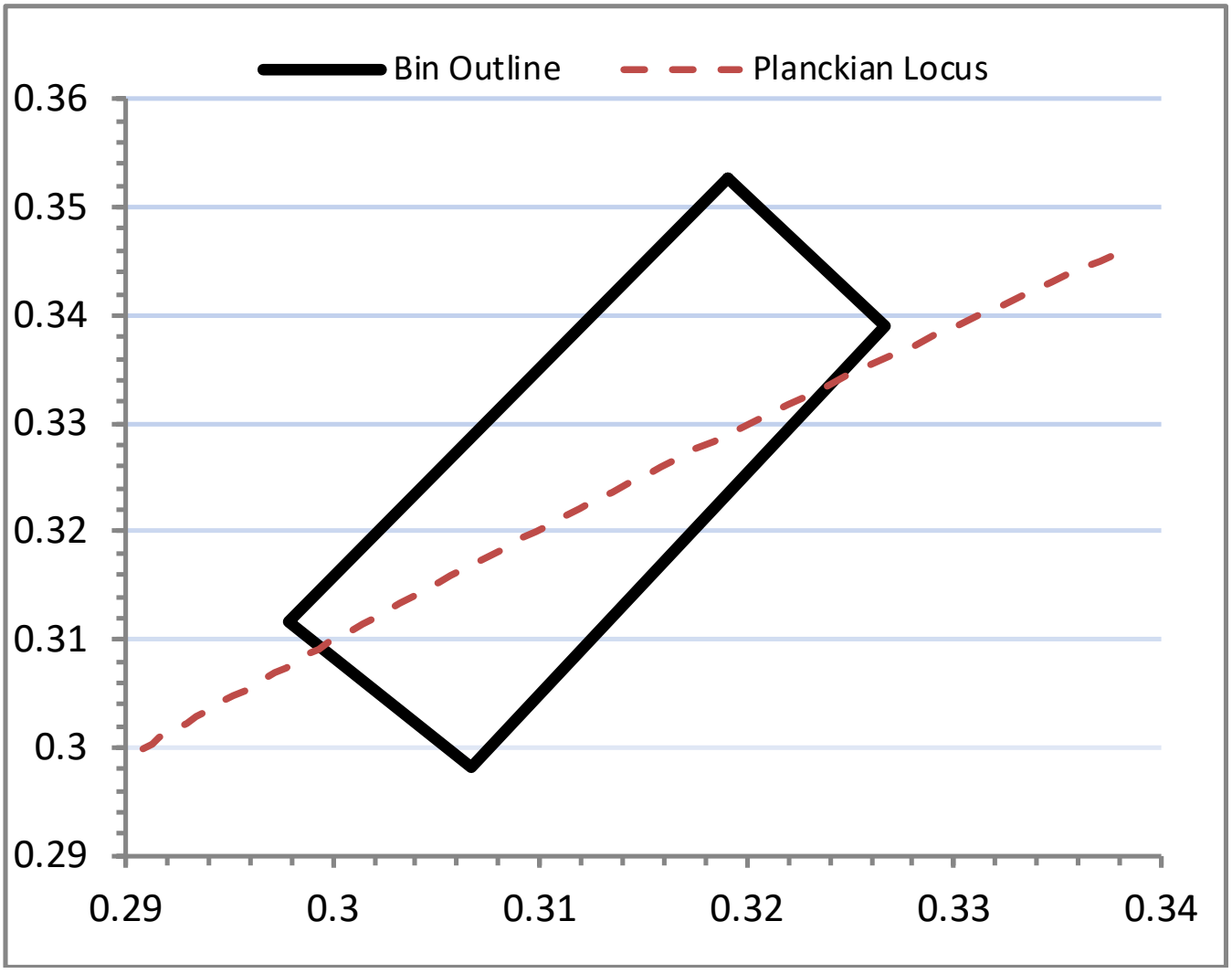
SBM-40-SC White Chromaticity Coordinates

Chromaticity Coordinates		
Bin Code (WW)	CIEx	CIEy
1A	0.3191	0.3528
	0.3267	0.3391
	0.3067	0.2982
	0.2979	0.3117



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Part Number Nomenclature

SBM — 40 — RGBW — SC41 — <abnnn>

Product Family	LED Emission Area	Color	Package Configuration	Bin kit
SBM: Multi-Chip Surface mount device, Protective window	40: 4 dies - each 1.0 mm^2	<Y>: Color R = Red G = Green B = Blue W = White	SC41: Surface mount, shipped in tape & reel	Flux and Chromaticity bin kit code - See available ordering codes below

SBM-40-SC 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 Wavelength			RGB Flux	White Chro-maticity	White Flux	Ordering Part Number
	RW	GW	BW				
QD100	✓	✓	✓	Full Distribution	1A	Full Distribution	SBM-40-RGBW-SC41-QD100

For other bin kits, please contact a Luminus representative.

Example:

The ordering part number SBM-40-RGBW-SC41-QD100 refers to bin kit which consists of a RGBW, SBM-40-SC emitter, with Red Flux > 90 lm and Red DWL range of 621nm-626 nm; Green flux > 210 lm and Green DWL range of 522 nm to 527 nm; Blue power > 1000 mW and Blue DWL range of 451 nm to 456 nm; White flux >210 lm.

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Product Shipping & Labeling Information

All SBM-40-SC 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 — SC41 — QD<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	QDXXX

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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
Dominant Wavelength	$\lambda_{d\ min}$	621	522	451	-	nm
	$\lambda_{d\ typ}$	623	525	454	-	nm
	$\lambda_{d\ max}$	626	527	456	-	nm
FWHM (typ.)	$\Delta\lambda_{1/2}$	17	32	21	N/A	nm
Chromaticity Coordinates[4] (typ.)	x				0.31	-
	y				0.32	-
Forward Voltage	$V_{F\ min}$	2.3	3.0	3.0	3.0	V
	$V_{F\ typ}$					V
	$V_{F\ max}$	3.6	3.9	3.9	3.9	V
Minimum Current [5]	-	0.1	0.1	0.1	0.1	A
Maximum Current [5]	-	2.0	2.0	2.0	2.0	A
Maximum Operating Junction Temperature [5,6]	$T_{j\ operating,max}$	100	140	130	130	°C
Absolute Maximum Junction Temperature [5,6]	$T_{j\ absolute\ max}$	115	150	150	150	°C
Storage Temperature Range	-	-40/+100	-40/+100	-40/+100	-40/+100	°C

Note 1: All ratings are based on test conditions of I_f = 1000 mA, T_c=25 °C, 20 millisecond pulse. T_{case} is defined on Thermal Resistance section, page 12.

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

Note 3: SBM-40-SC RGBW devices can be driven at currents ranging from 0.1 A to 2 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-SC 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.

Note 6: Maximum Operating Junction Temperature and Absolute Maximum Junction Temperature assume that with all four (RGBW) LEDs operating simultaneously at 2A.

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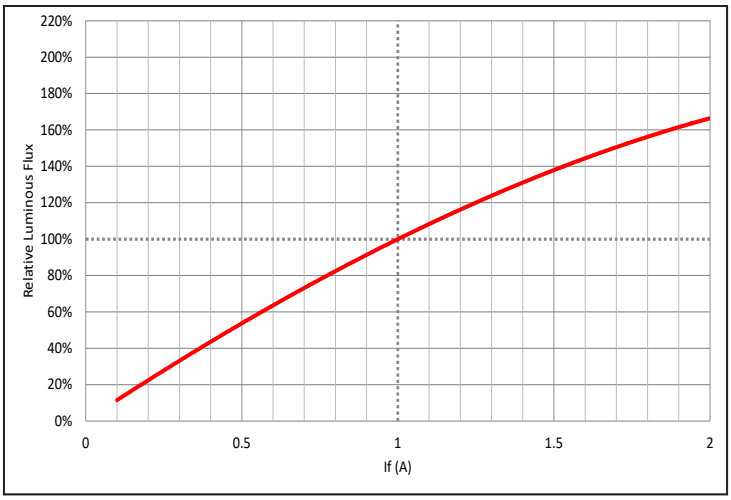
Optical & Electrical Characteristics[7]

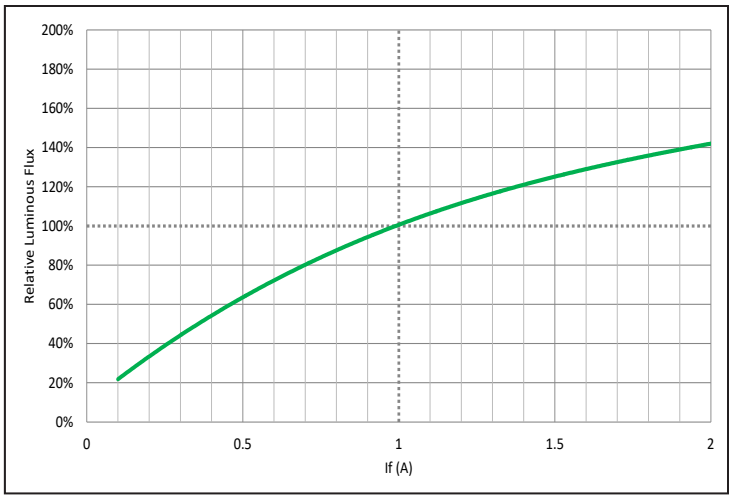
Relative Luminous Flux - Red

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



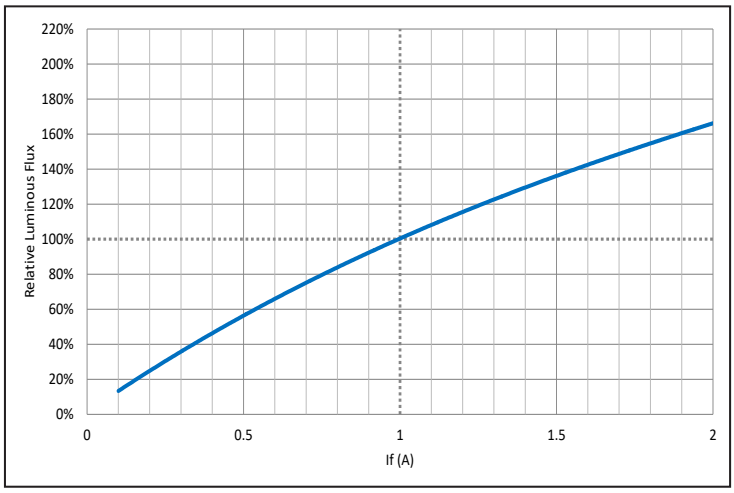
Relative Luminous Flux - Green

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



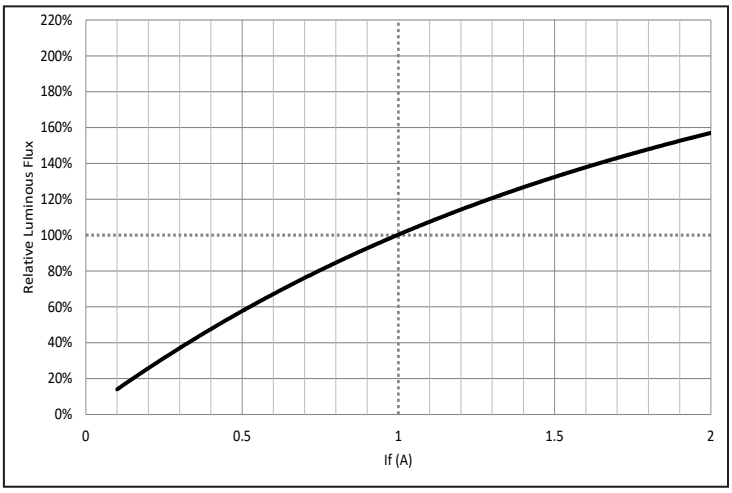
Relative Luminous Flux - Blue

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



Relative Luminous Flux - White

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



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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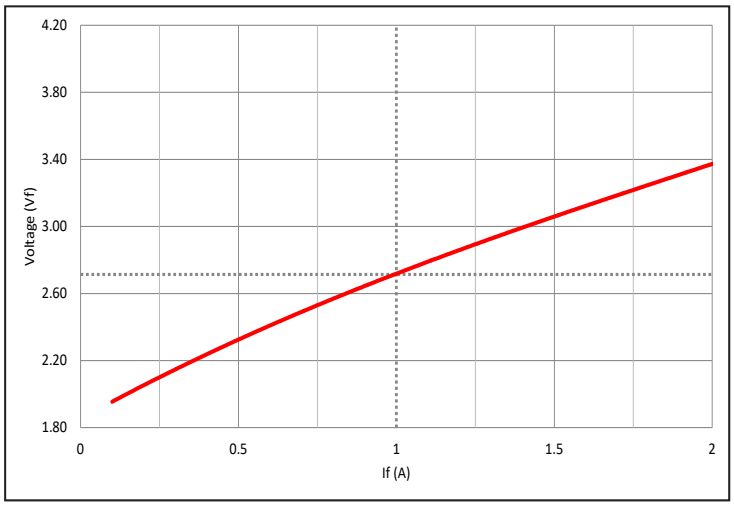
Optical & Electrical Characteristics

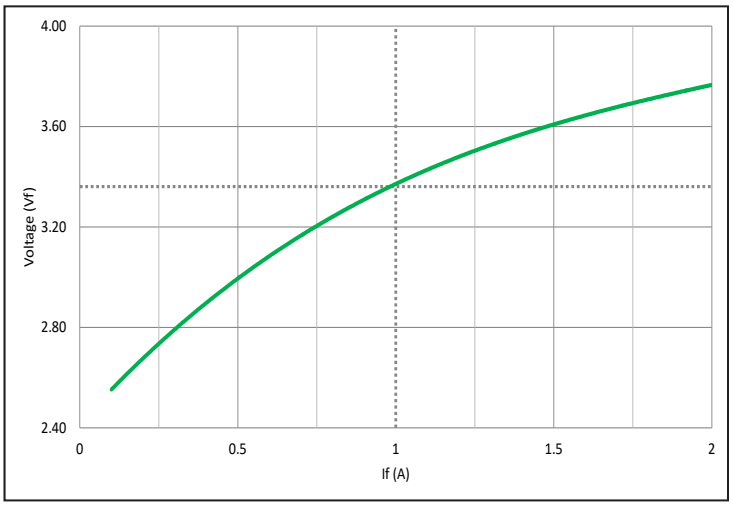
Voltage as function of Forward Current - Red

Vf vs. If
Vf(If) Single Pulse 20ms Tj = 25°



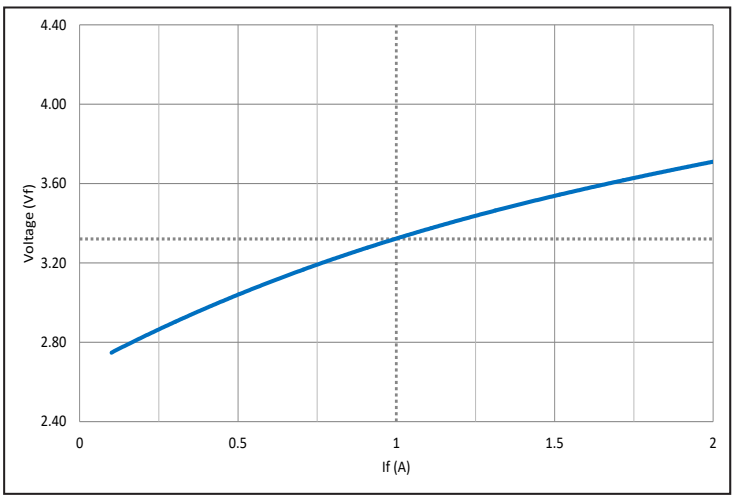
Voltage as function of Forward Current - Green

Vf vs. If
Vf(If) Single Pulse 20ms Tj = 25°



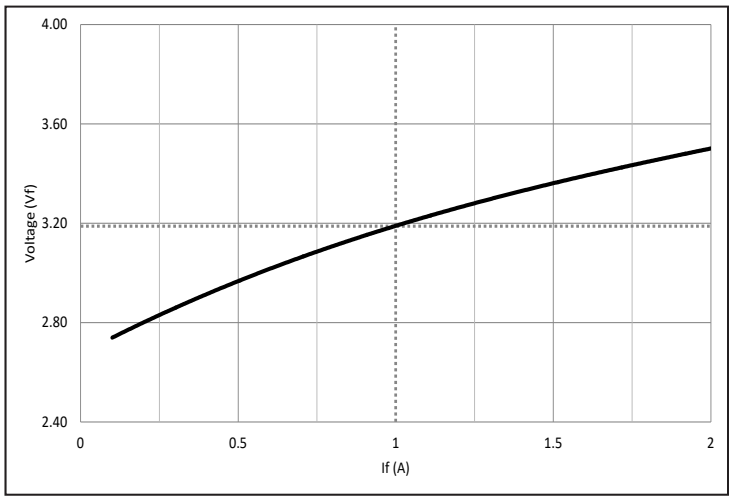
Voltage as function of Forward Current - Blue

Vf vs. If
Vf(If) Single Pulse 20ms Tj = 25°



Voltage as function of Forward Current - White

Vf vs. If
Vf(If) Single Pulse 20ms Tj = 25°



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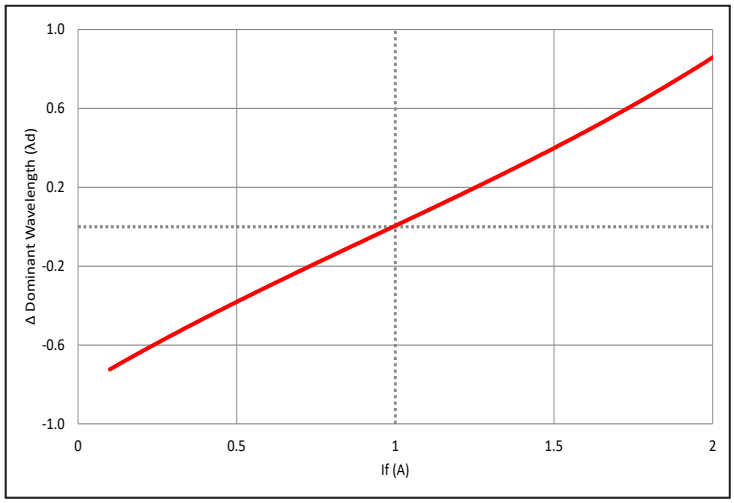
Optical & Electrical Characteristics

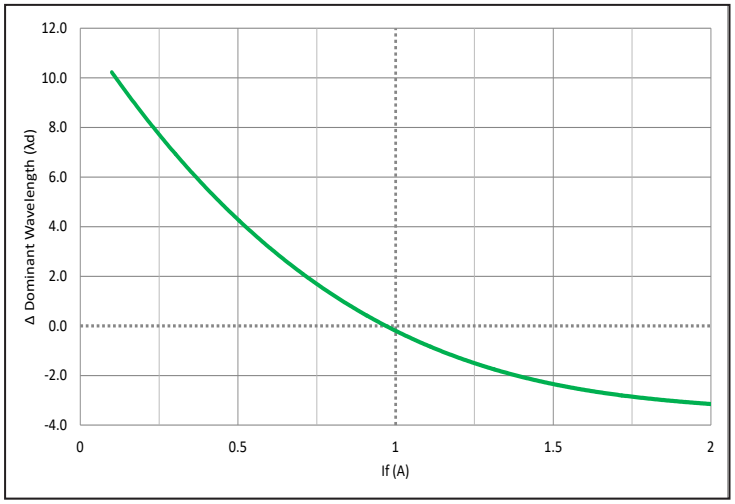
Wavelength change as function of Current - Red

Δ Dominant Wavelength (λd)
Red Tj=25°



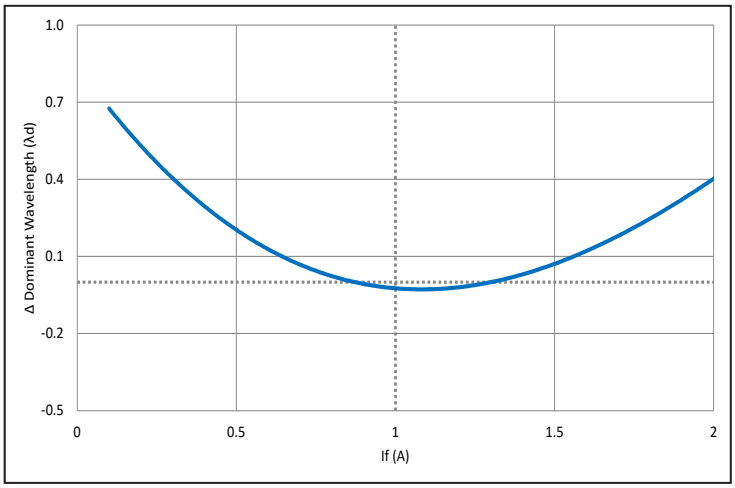
Wavelength change as function of Current - Green

Δ Dominant Wavelength (λd)
Green Tj=25°



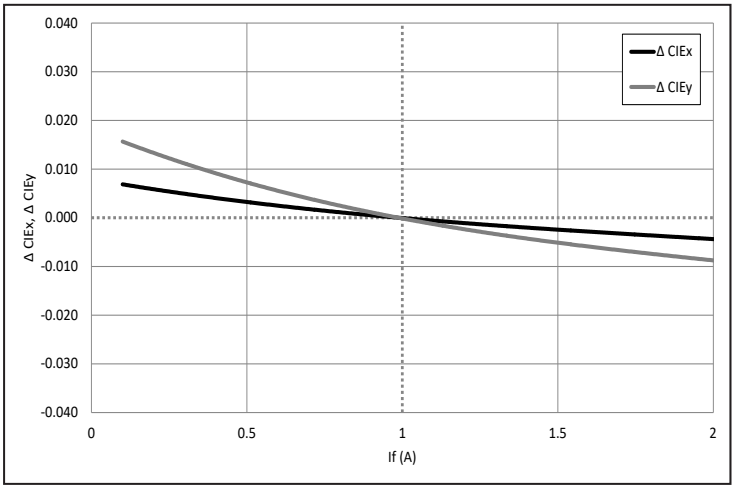
Wavelength change as function of Current - Blue

Δ Dominant Wavelength (λd)
Blue Tj=25°



CIEx, y change as function of Current - White

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



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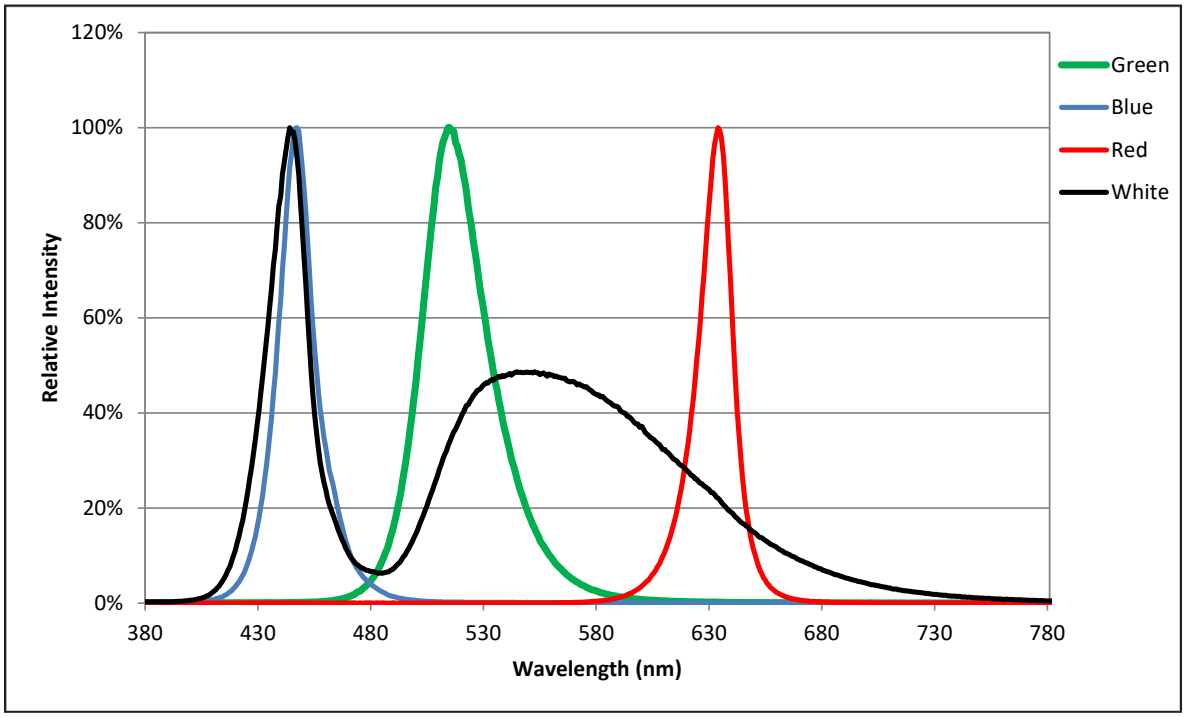
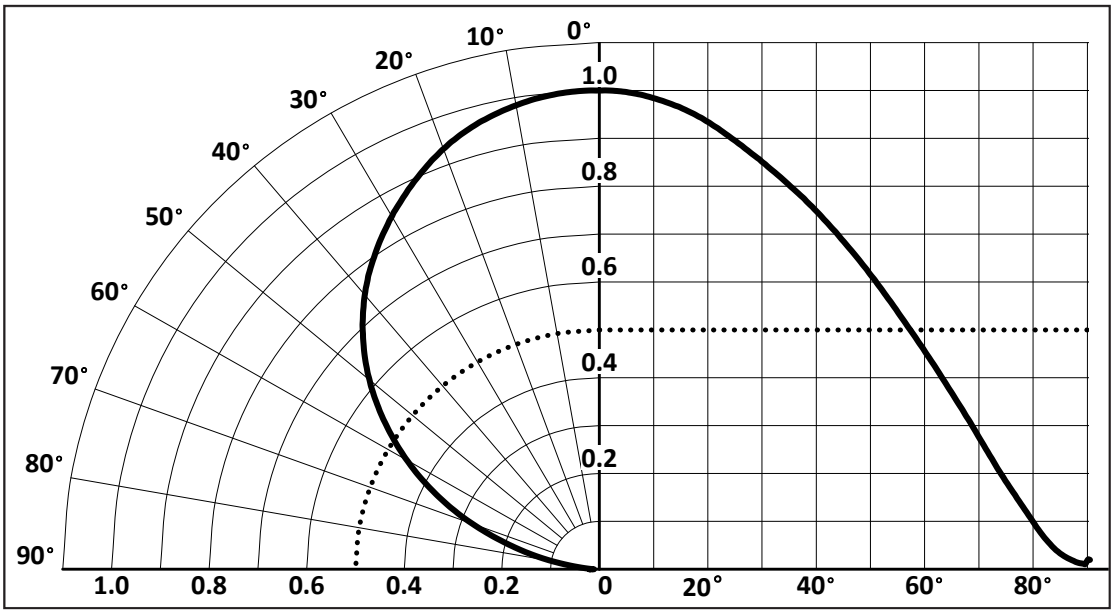
Optical & Electrical Characteristics

SBM-40-SC -RGBW Spectrum[8]



SBM-40-SC -RGBW 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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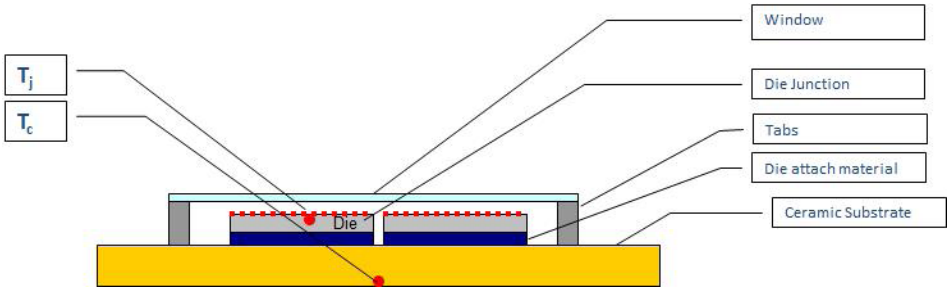
SBM-40-SC Thermal Resistance



Thermal resistance junction to case, $R_{th(j-c)\_real}$ = 1.0 °C/W (typ.),(All chips operated simultaneously)
Thermal resistance junction to case, $R_{th(j-c)\_electrical}$ = 0.8 °C/W (typ.) (All chips operated simultaneously)

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

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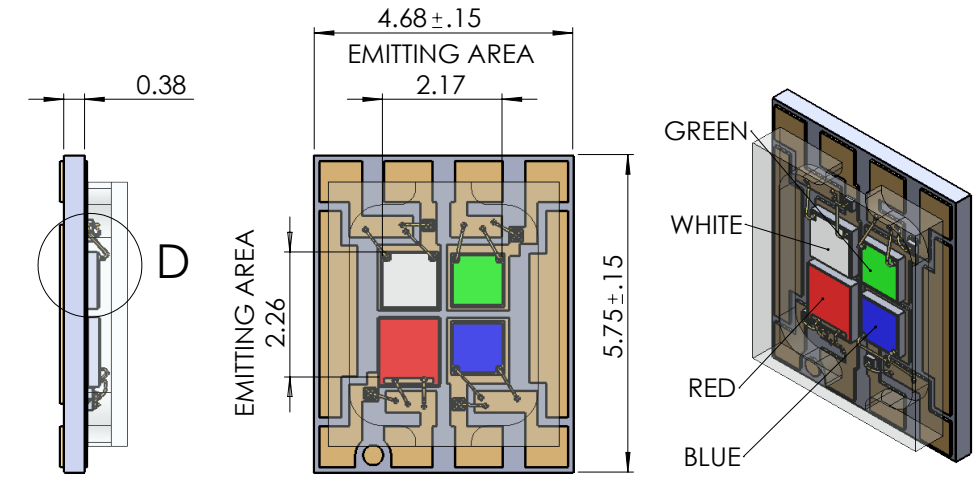
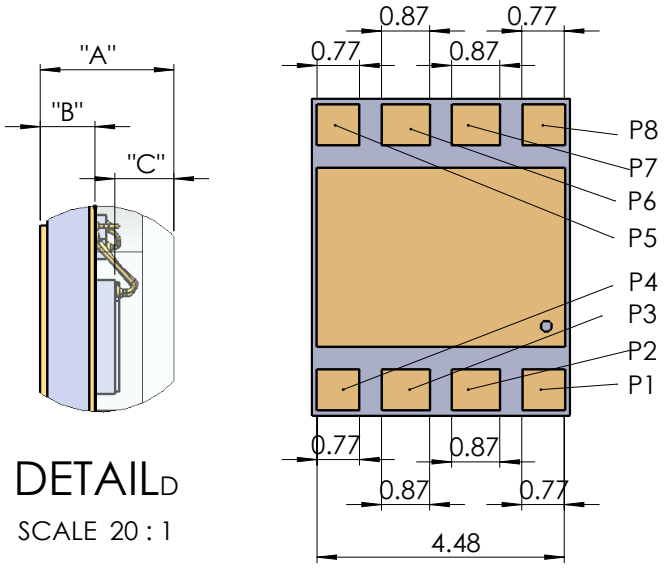
Mechanical Dimensions – SBM-40-SC Emitter





DETAIL D
SCALE 20 : 1

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	0.52	±.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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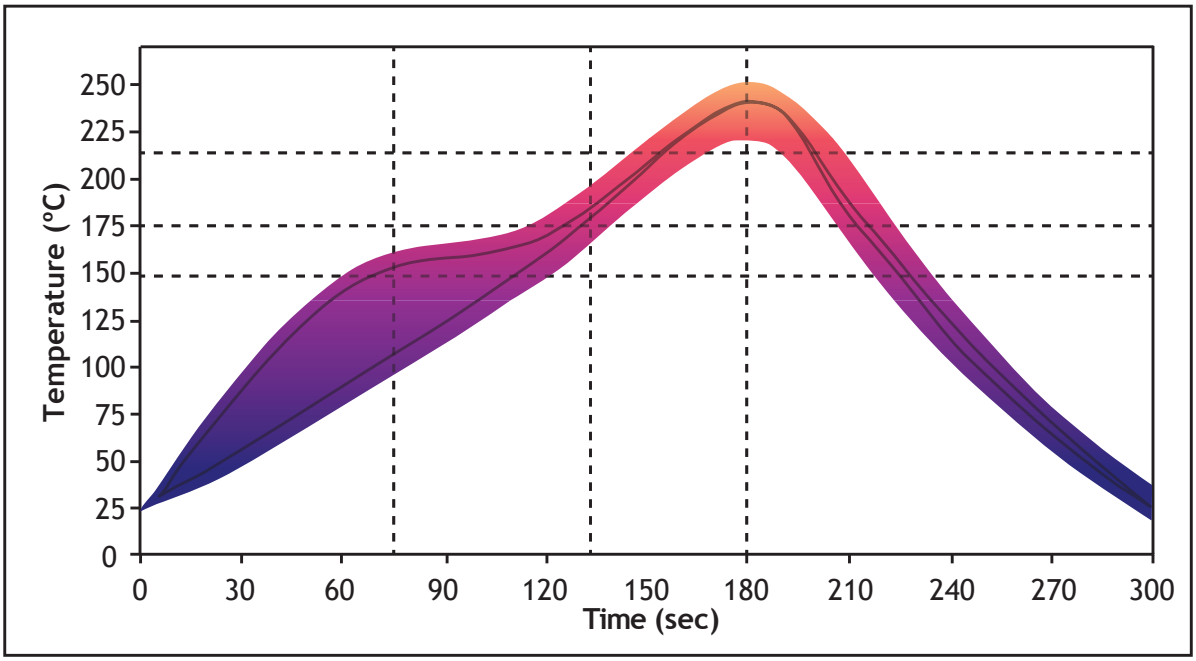
Solder Profile

SAC 305 Reflow Profile Window For Low Density Boards



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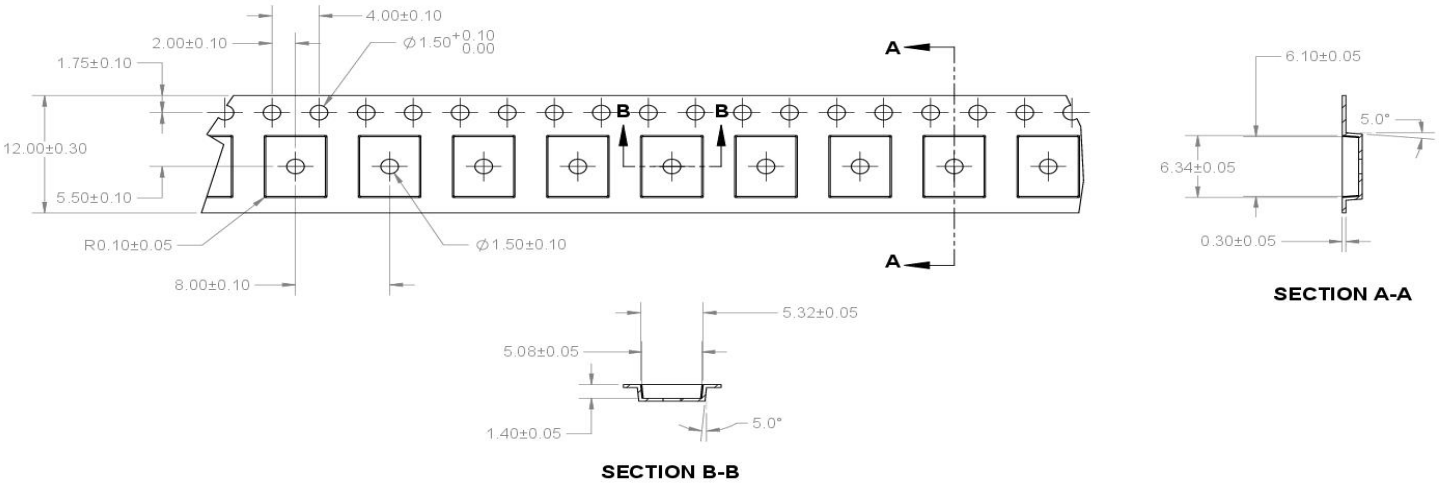
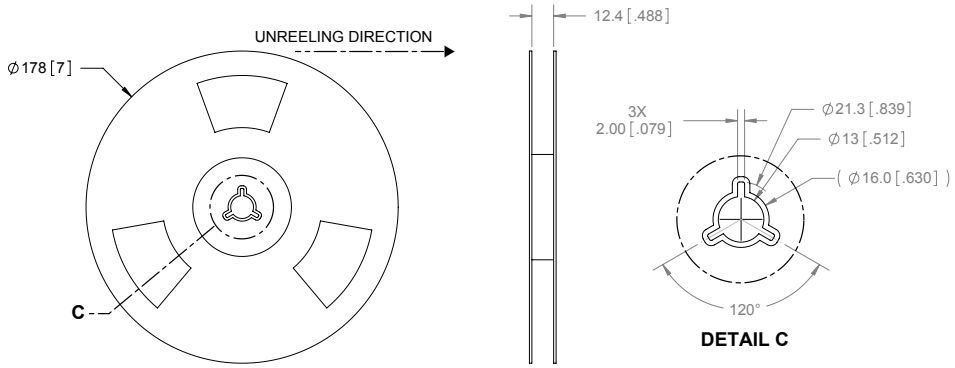
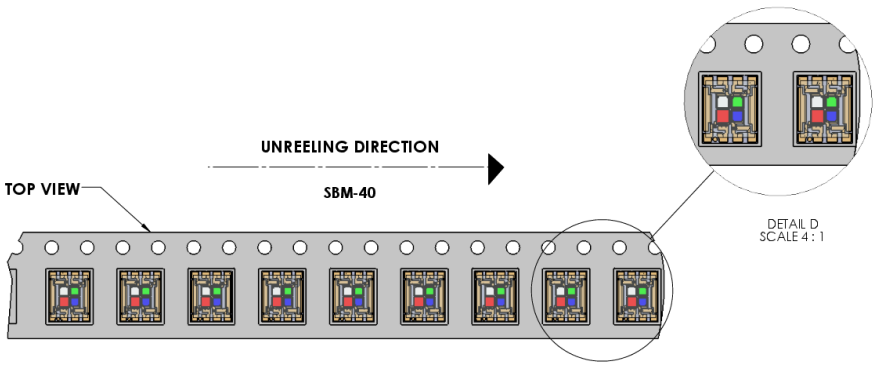
Packaging Specification

Packing Unit = 500 pcs per reel







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

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Revision History

Revision	Date	Description
Rev 01	05/27/2018	Preliminary Datasheet release
Rev 02	08/15/2018	Initial Release with updated white chromaticity bins and editorial changes.

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