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Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

SBM-160 LEDs

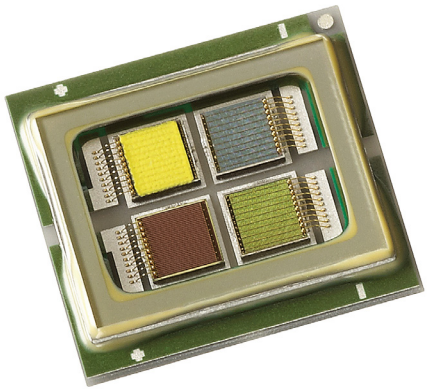

Table of Contents

Features:

- Extremely high optical output: up to 270 Red lumens
  up to 640 Green lumens
  up to 120 Blue lumens
  up to 550 White lumens
- High thermal conductivity package - junction to heat sink thermal resistance as low as 1.48 °C/W per die
- Photonic lattice technology for very high surface brightness and uniform emission
- Four big chips with emitting area of up to 4 mm^2 each
- Environmentally friendly: RoHS compliant
- Variable drive currents: less than 1 A through 4 A
- Available in RGBW combination

Applications

- Fiber-coupled Illumination
- Architectural and Entertainment Lighting
- Medical Lighting
- Machine Vision
- Spot Lighting
- Displays and Signage

PDS-001432Rev 04

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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 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 heat sink of 1.48° C/W per chip. Luminus SBM-160 LEDs have the lowest thermal resistance of any LED on the market. This allows the LED to be driven at higher current densities while maintaining a low junction temperature, thereby resulting in brighter solutions and longer lifetimes.

Reliability

Designed from the ground up, 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.

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 compliant and free of hazardous materials, including lead and mercury.

Understanding Big Chip 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 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.

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 less than 1A to 4A, and duty cycle from <1% to 100%), multiple drive conditions are listed.

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SBM-160 White Binning Structure

White die of SBM-160 LEDs is tested for luminous flux and chromaticity at a drive current of 4.0 A (1.0 A/mm^2) and placed into one of the following luminous flux (FF) and chromaticity (WW) bins:

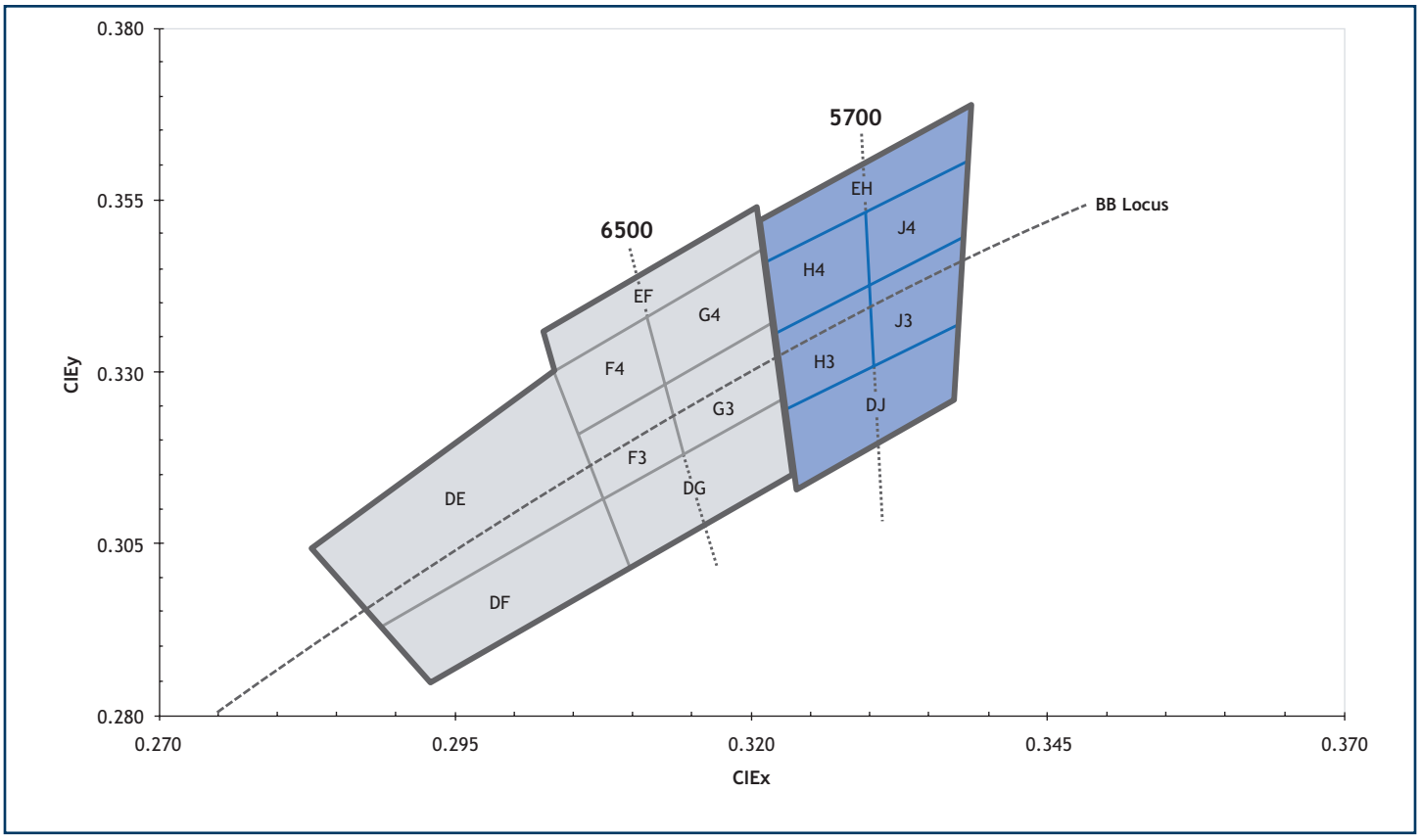
Flux Bins

Flux Bin Code (FF)	Composite Bin Code	Minumum Flux (lm) @ 4.0 A	Maximum Flux (lm) @ 4.0 A
D	DA, DB	440	510
E	EA, EB	510	590

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

Chromaticity Bins

Luminus' Standard Chromaticity Bins: 1931 CIE Curve



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The following tables describe the four chromaticity points that bound each chromaticity bin. Chromaticity bins are grouped together based on the color temperature.

6500K Chromaticity Bins		
Bin Code (WW)	CIEx	CIEy
DG	0.307	0.311
	0.322	0.326
	0.323	0.316
	0.309	0.302
F3*	0.305	0.321
	0.313	0.329
	0.315	0.319
	0.307	0.311
F4*	0.303	0.330
	0.312	0.339
	0.313	0.329
	0.305	0.321
G3*	0.313	0.329
	0.321	0.337
	0.322	0.326
	0.315	0.319
G4*	0.312	0.339
	0.321	0.348
	0.321	0.337
	0.313	0.329
EF	0.302	0.335
	0.320	0.354
	0.321	0.348
	0.303	0.330
DE	0.283	0.304
	0.303	0.330
	0.307	0.311
	0.289	0.293
DF	0.289	0.293
	0.307	0.311
	0.309	0.302
	0.293	0.285

5700K Chromaticity Bins		
Bin Code (WW)	CIEx	CIEy
DJ	0.322	0.324
	0.337	0.337
	0.336	0.326
	0.323	0.314
H3*	0.321	0.335
	0.329	0.342
	0.329	0.331
	0.322	0.324
H4*	0.321	0.346
	0.329	0.354
	0.329	0.342
	0.321	0.335
J3*	0.329	0.342
	0.337	0.349
	0.337	0.337
	0.330	0.331
J4*	0.329	0.354
	0.338	0.362
	0.337	0.349
	0.329	0.342
EH	0.320	0.352
	0.338	0.368
	0.338	0.362
	0.321	0.346

*Sub-bins within ANSI defined quadrangles per ANSI C78.377-2008

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Product Shipping & Labeling Information

All SBM-160 products are packaged and labeled with their respective bin as outlined in the tables on pages 3 & 4. When shipped, each package will only contain one bin. The part number designation is as follows:

SBM — 160 — RGBW — H41 — FF — WW

Product Family	Chip Area	Color	Package Configuration	Flux Bin	Chromaticity Bin
Surface Mount (window)	16.0 mm^2	**R**: Red **G**: Green **B**: Blue **W**: White	Internal Code	See page 3 for bins	See page 4 for bins

Note : Some flux and chromaticity bins may have limited availability. Application specific bin kits, consisting of multiple bins, may be available. For ordering information, please refer to page 14 and reference PDS-001792: SBM-160 Binning & Labeling document.

Example:

The part number SBM-160-RGBW-H41-EA-G4 refers to a RGBW, SBM-160 emitter, with a flux range of 510-550 lumens and a chromaticity value within the box defined by the four points (0.313, 0.338), (0.321, 0.348), (0.322, 0.336), (0.312, 0.328).

Optical & Electrical Characteristics

Parameter	Symbol	Red	Green	Blue	White	Unit
Drive Condition[2]	I	4.0	4.0	4.0	4.0	A
Current Density	j	1.00	1.00	1.00	1.00	A/mm^2
Forward Voltage	$V_{F\,min}$	1.90	3.00	2.50	2.50	V
	$V_{F\,typ}$	2.50	4.60	3.80	3.80	V
	$V_{F\,typ}$	2.60	5.10	4.80	5.50	V
Typical Luminous Flux[4]	$\Phi_{v\,typ}$	215	550	90	510	lm
Minimum Luminous Flux	$\Phi_{V\,min}$	160	400	65	440	lm
Wavelength min-max	λ_d	619-624	520-530	450-460	N/A	nm
FWHM	$\Delta\lambda_{1/2}$	18	38	24	N/A	nm
Chromaticity Coordinates[5, 6]	x	0.700	0.204	0.142	0.312	-
	y	0.300	0.716	0.043	0.328	-
Radiometric Efficiency	η_{rad}	21	6	15	13	%

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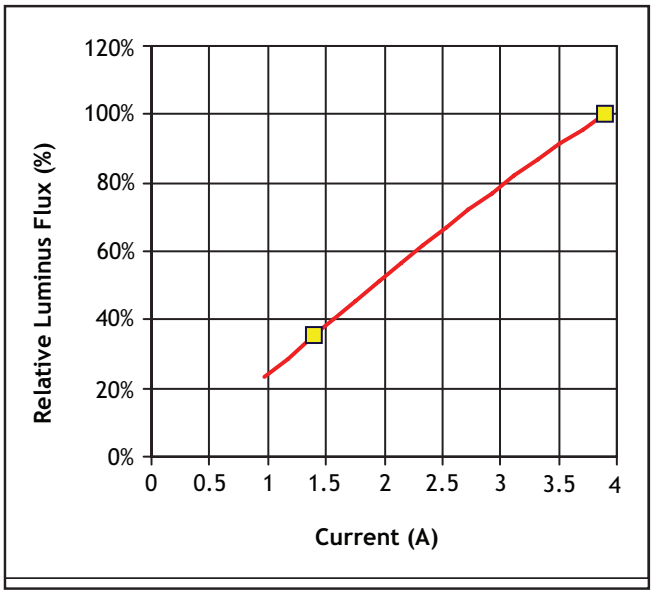
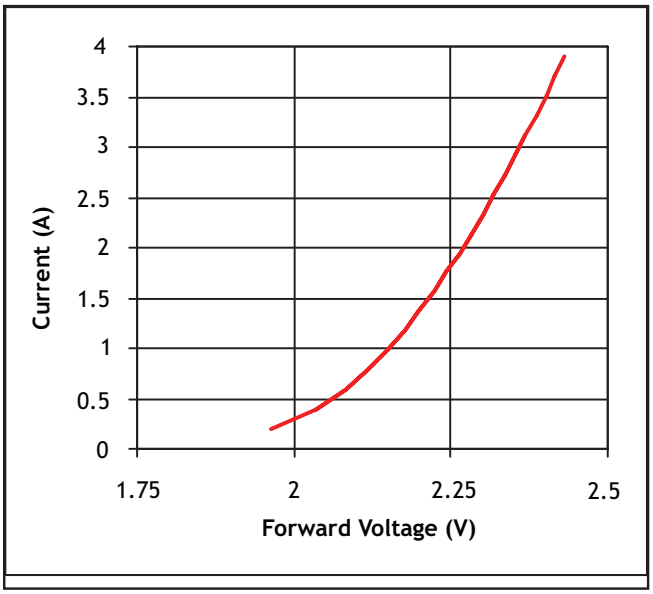
Optical & Electrical Characteristics

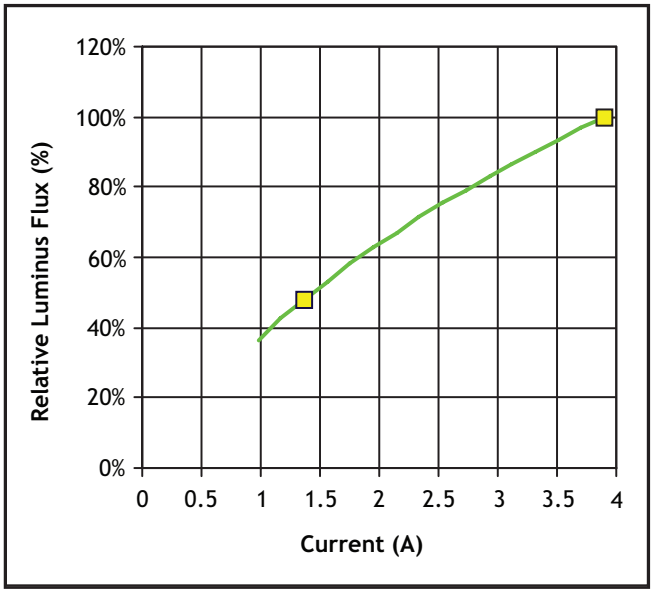
Characteristics Curves for Red

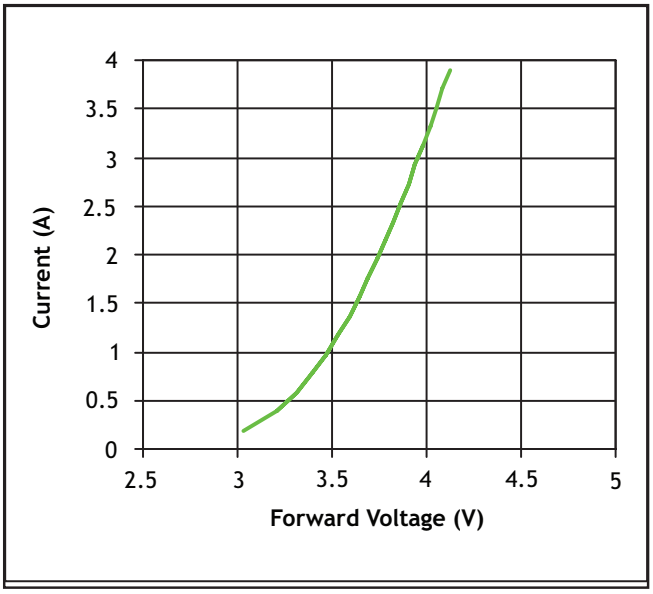




Note 1: Yellow squares indicate reference drive conditions

Characteristics Curves for Green





Note 1: Yellow squares indicate reference drive conditions

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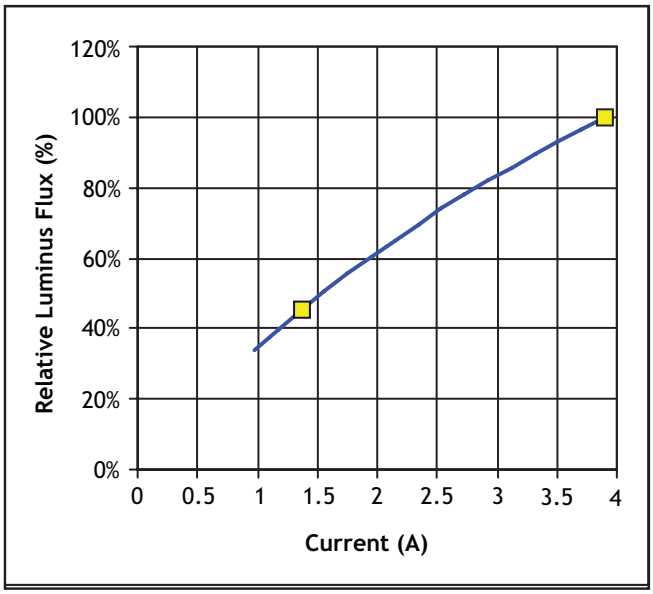
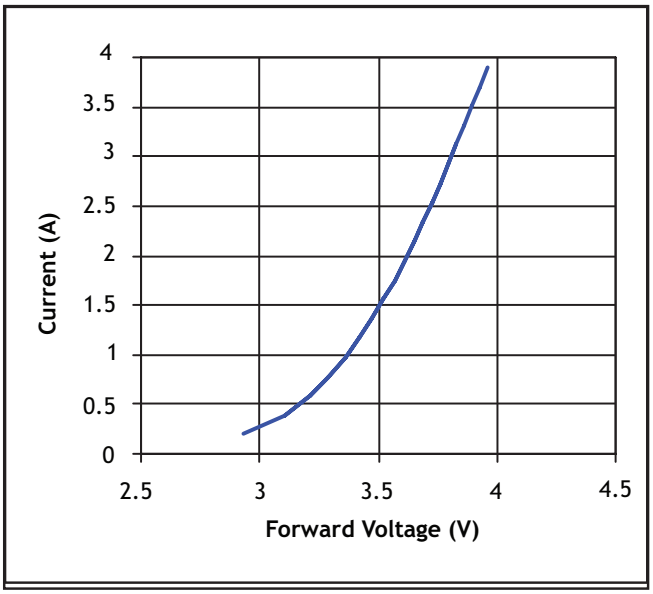
Optical & Electrical Characteristics

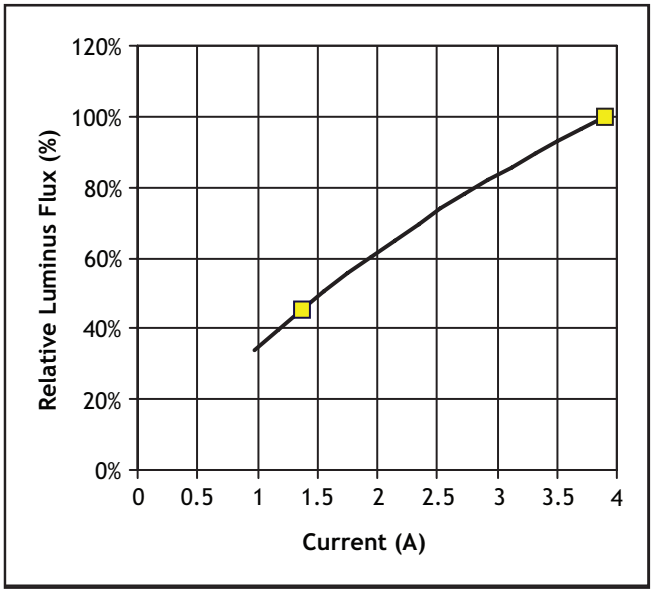
Characteristics Curves for Blue

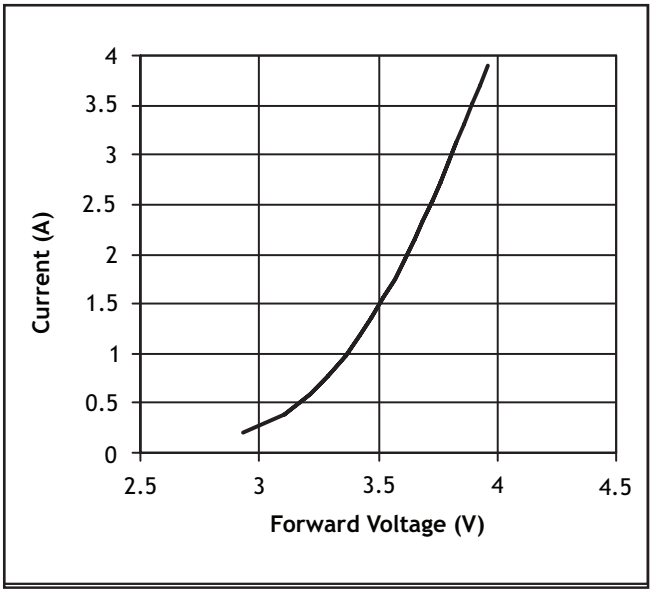




Note 1: Yellow squares indicate reference drive conditions

Characteristics Curves for White





Note 1: Yellow squares indicate reference drive conditions

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Optical & Electrical Characteristics

($T_{heat\ sink}$ = 40°C)[1]

Common Characteristics						
Parameter	**Symbol**	**Red**	**Green**	**Blue**	**White**	**Unit**
Emitting Area		4.0	4.0	4.0	4.0	mm^2
Emitting Area Dimensions		2.09 x 1.87	2.09 x 1.87	2.09 x 1.87	2.09 x 1.87	V
Dynamic Resistance	Ω_{dyn}	0.05	0.07	0.08	0.08	Ω
Thermal Coefficient of Photometric Flux		-1.14	-0.17	-0.008	-0.20	%/°C
Thermal Coefficient of Radiometric Flux		-0.69	-0.18	-0.13	-0.18	%/°C
Thermal Coefficient of Junction Voltage		-2.1	-3.9	-5.1	-4.5	mV/°C

Absolute Maximum Ratings						
Parameter	**Symbol**	**Red**	**Green**	**Blue**	**White**	**Unit**
Maximum Current[7]		4	4	4	4	A
Maximum Junction Temperature[8]	T_{jmax}	110	150	150	150	°C
Storage Temperature Range		-40/+100	-40/+100	-40/+100	-40/+100	°C
Maximum Total Current (RMS)[9,10]				32		A

Note 1: All ratings are based on test conditions of T_j=25°C, 20 millisecond pulse. See Thermal Resistance section for T_{hs} definition.

Note 2: Listed drive conditions are typical for common applications. SBM-160 RGBW devices can be driven at currents ranging from <1 A to 4 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 3: Unless otherwise noted, values listed are typical. Devices are production tested and specified at 1.0A/mm^2 for red, green, blue and white.

Note 4: Total flux from emitting area at listed dominant wavelength. Reported performance is included to show trends for a selected power level. For specific minimum and maximum values, use bin tables. For product roadmap and future performance of devices, contact Luminus.

Note 5: In CIE 1931 chromaticity diagram coordinates, normalized to X+Y+Z=1.

Note 6: For reference only. CIE measurement uncertainty for white is estimated to be +/- 0.01.

Note 7: SBM-160 RGBW devices are designed for operation to an absolute maximum current as specified above. Product lifetime data is specified at recommended forward drive currents. Sustained operation at or beyond 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 for further information. In pulsed operation, rise time from 10-90% of forward current should be larger than 0.5 microseconds.

Note 8: Lifetime dependent on LED junction temperature. Input power and thermal system must be properly managed to ensure lifetime. See charts on pg 9 for further information.

Note 9: Maximum current dependent on board temperature and operating condition. Specified value assumes continuous operation and T_{board}=60°C. See maximum current application note for PWM equivalent maximum currents and derating curve for board temperature.

Note 10: Special design considerations must be observed for operation under 1 A. Please contact Luminus for further information.

Note 11: Caution must be taken not to stare at the light emitted from these LEDs. Under special circumstances, the high intensity could damage the eye.

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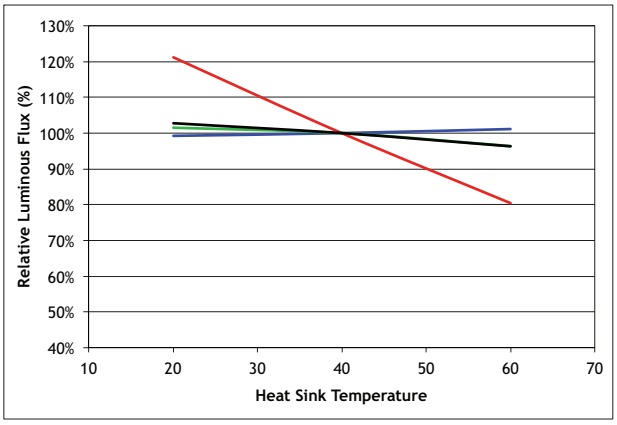
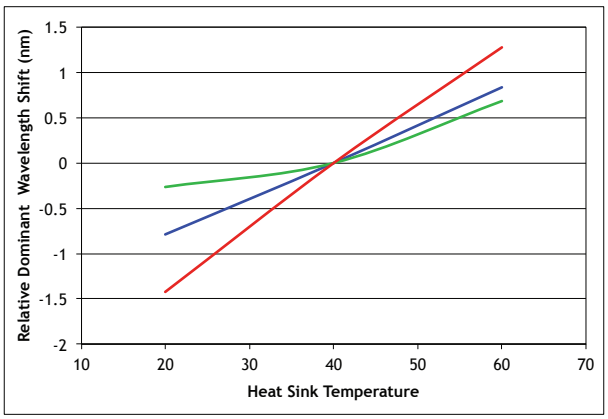
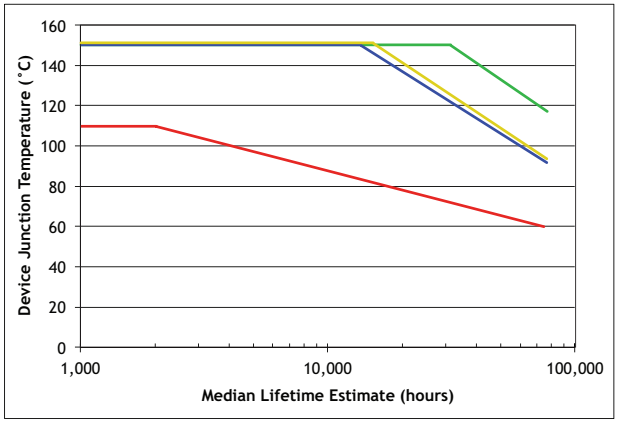
Light Output and Spectral Characteristics Over Heat Sink Temperature

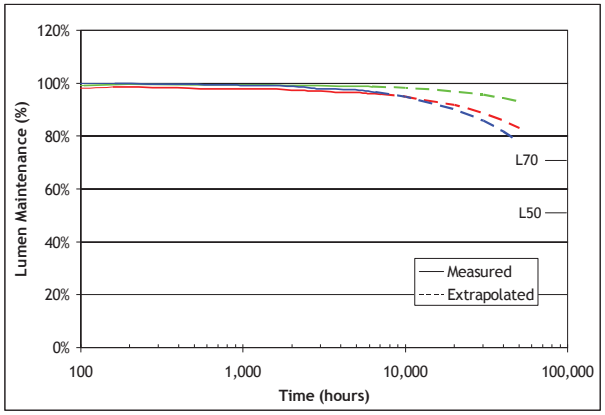




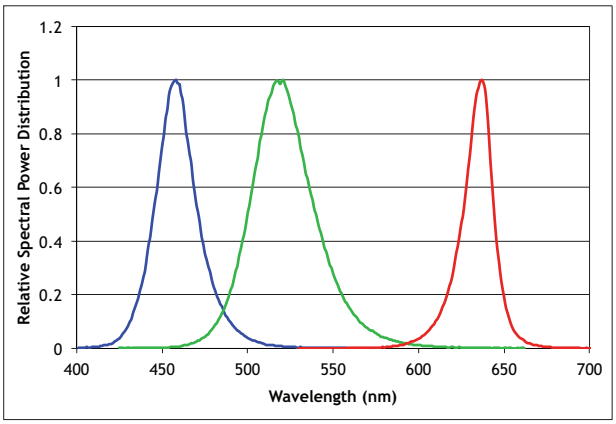
Median Lifetime Estimate vs. Tj[13]

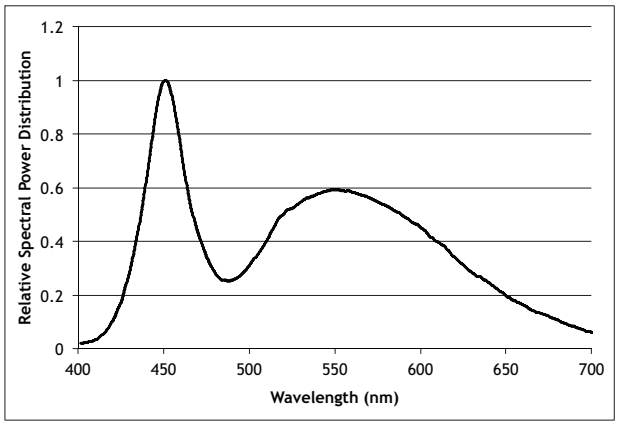


Lumen Maintenance[14]



Typical Spectrum[15]





Note 13: Median lifetime estimate as a function of junction temperature at 1.0A/mm^2 in continuous operation. Lifetime defined as time to 70% of initial intensity. Based on preliminary lifetime test data from single-chip modules. Data can be used to model failure rate over typical product lifetime.

Note 14: Lumen maintenance vs. time at 1.0A/mm^2 in continuous operation, Red junction temperature of 70ºC, Green junction temperatures of 120ºC, Blue and White junction temperatures of 100ºC.

Note 15: Typical spectrum at current density of 1.0 A/mm^2 in continuous operation.

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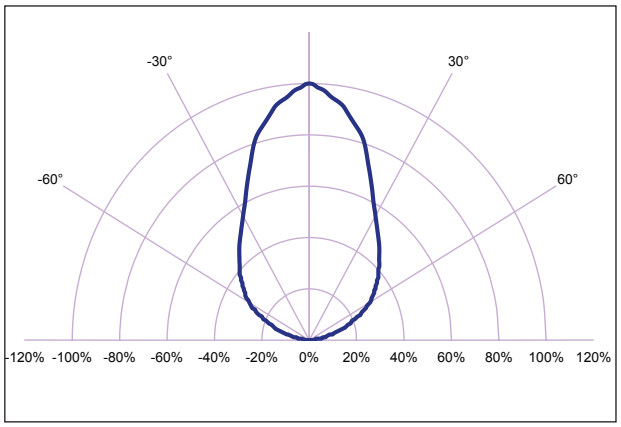
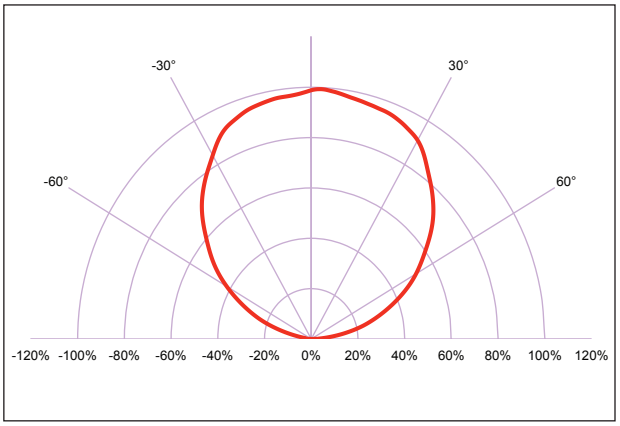
Typical Radiation Patterns

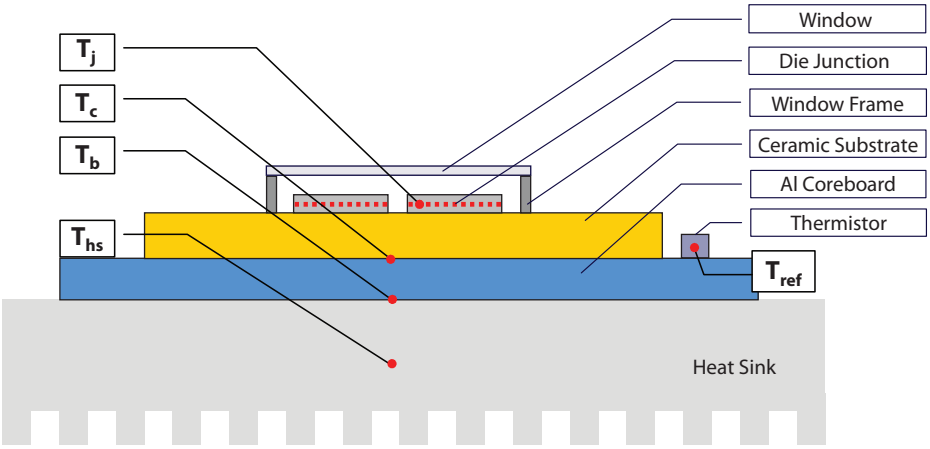
Typical Polar Radiation Pattern for Blue and Green



Typical Polar Radiation Pattern for Red and White



Thermal Resistance



Typical Thermal Resistance

Chip	R/G/B/W
$R_{\theta C\text{-}ref}$ [1]	0.62 °C/W

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

Thermistor Information

The thermistor used in SBM-160 RGBW devices is from Murata Manufacturing Co. The global part number is NCP15XH103J03RC. Please see http://www.murata.com/ for details on calculating thermistor temperature.

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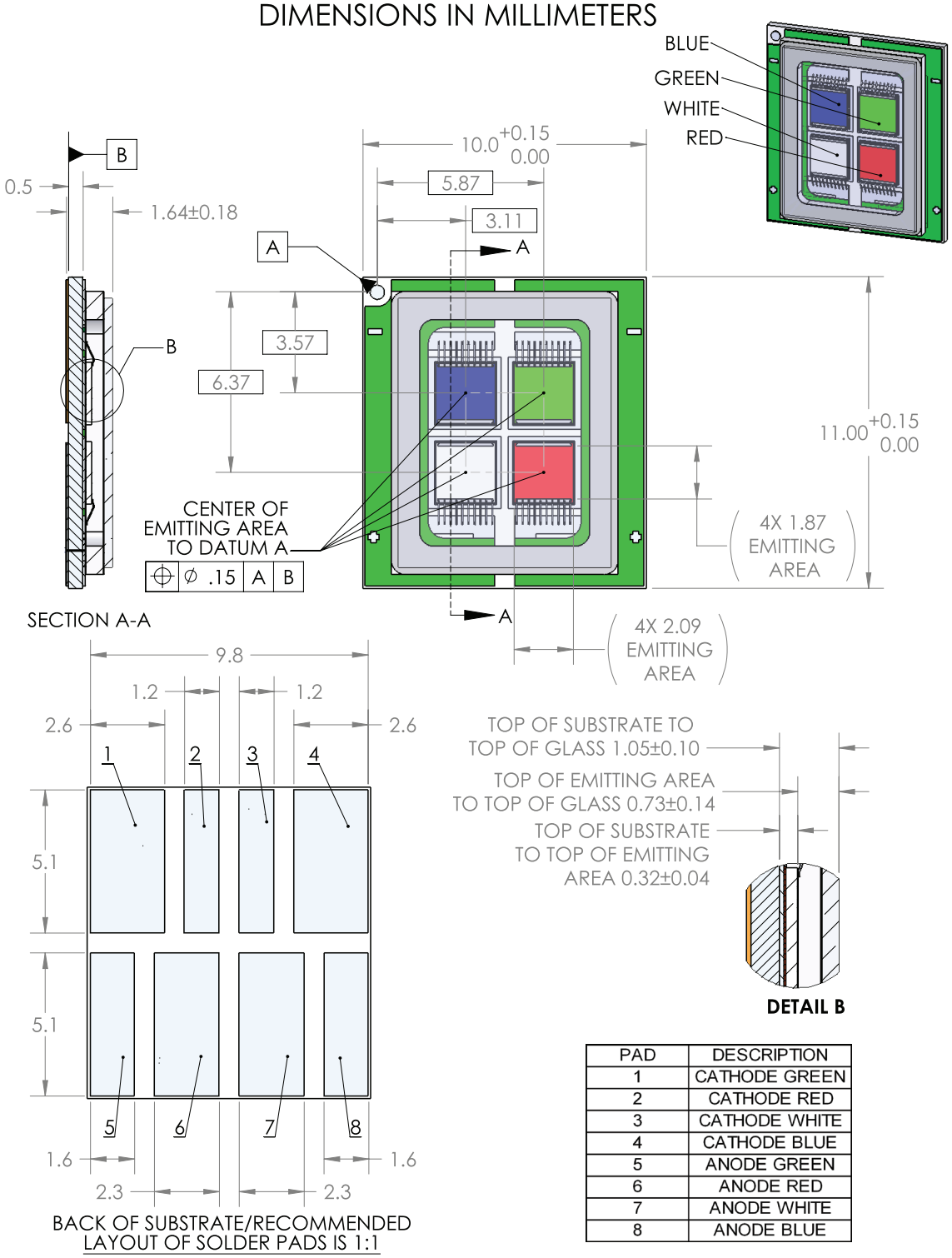
Mechanical Dimensions – SBM-160 Emitter

DIMENSIONS IN MILLIMETERS



PAD	DESCRIPTION
1	CATHODE GREEN
2	CATHODE RED
3	CATHODE WHITE
4	CATHODE BLUE
5	ANODE GREEN
6	ANODE RED
7	ANODE WHITE
8	ANODE BLUE

For a detailed drawing, please refer drawing number: DWG: 001374

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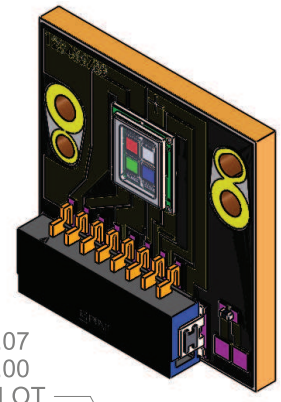
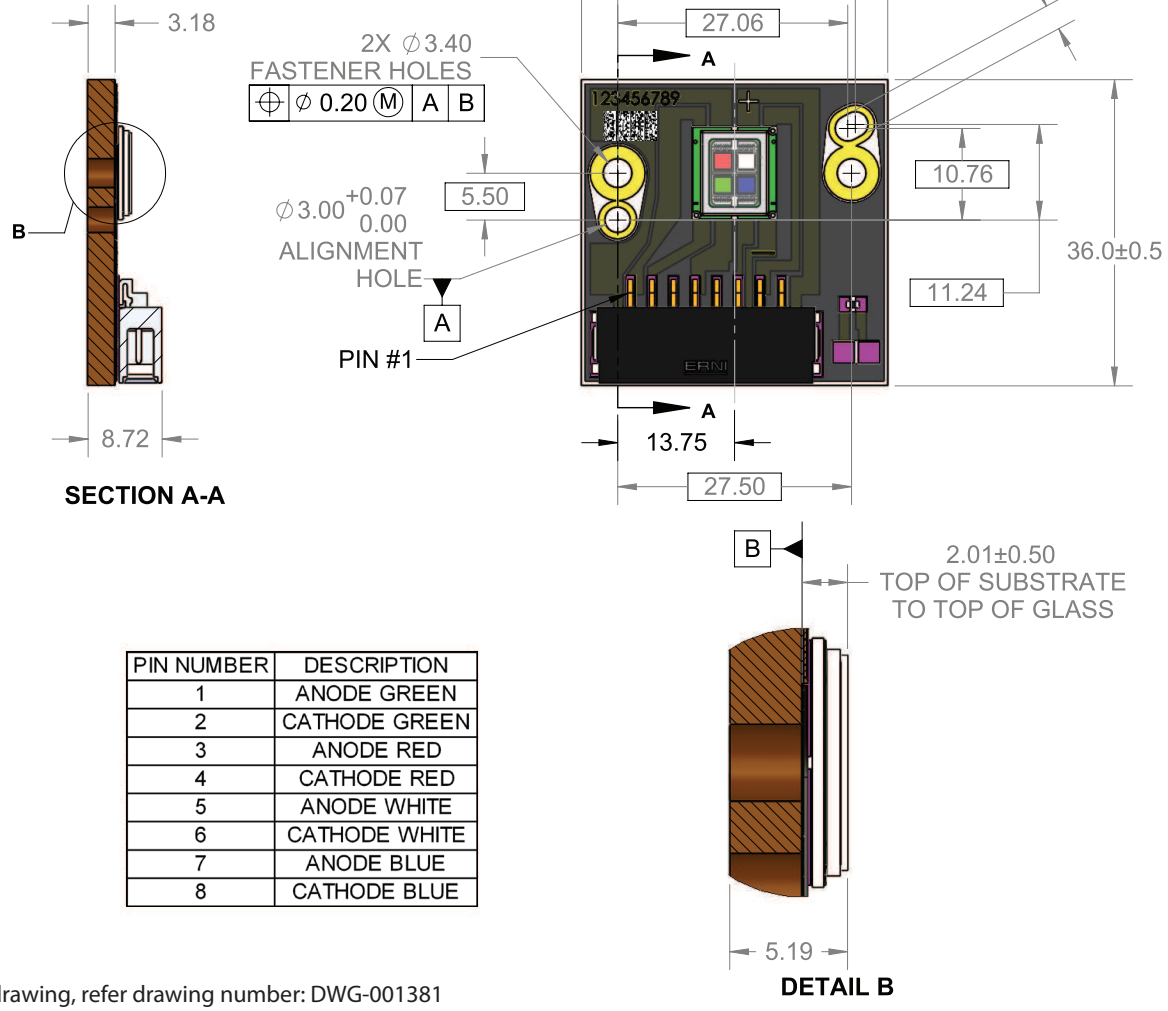
Mechanical Dimensions – SBR-160 Development Board

SBM-160 devices are available premounted on a copper-clad MCPCB for prototyping purposes. Please see page 14 for ordering information.

DIMENSIONS IN MILLIMETERS





PIN NUMBER	DESCRIPTION
1	ANODE GREEN
2	CATHODE GREEN
3	ANODE RED
4	CATHODE RED
5	ANODE WHITE
6	CATHODE WHITE
7	ANODE BLUE
8	CATHODE BLUE

For a detailed drawing, refer drawing number: DWG-001381

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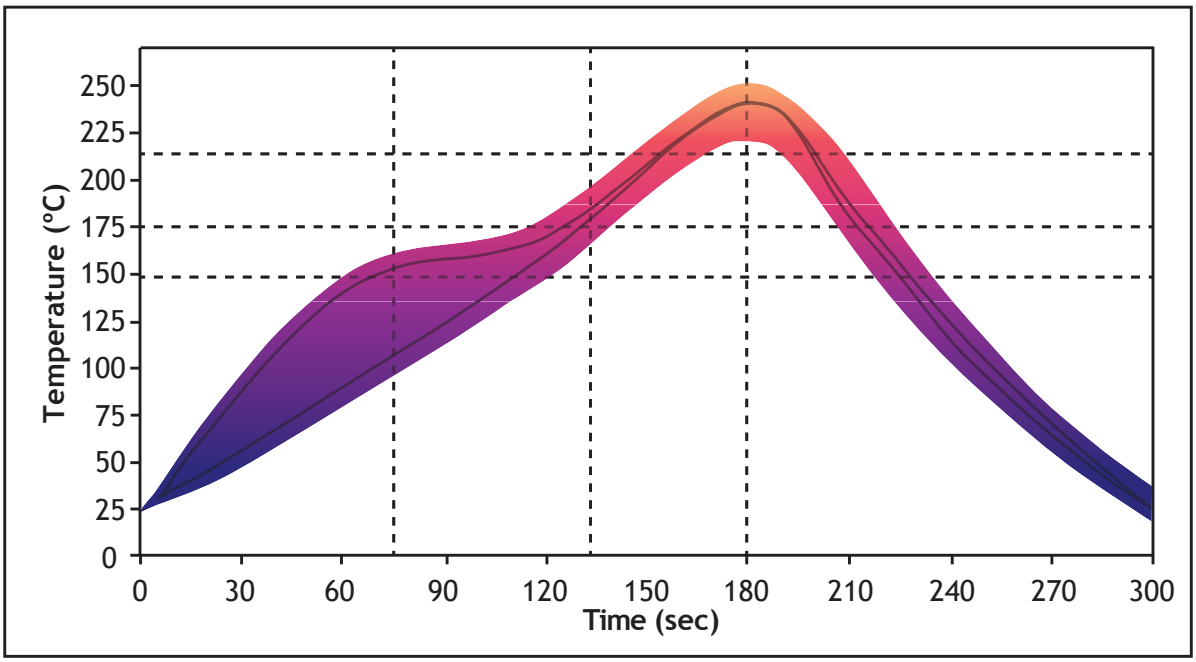
Solder Profile

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

Note 2: Optimum profile may differ due to oven type, circuit board or assembly layout.

Note 3: Recommended lead free, no-clean solder: AIM NC254-SAC305.

Note 4: Refer to soldering and handling application note for additional solder profiles and details.

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Ordering Information

Ordering Part Number [1,2]	Color	Description
SBM-160-RGBW-H41-RE102	RGBW	SBM-160 RGBW Big Chip LED™ surface mount LED consisting of a red 4 mm^2 LED, a green 4 mm^2 LED, a blue 4 mm^2 LED, a white 4 mm^2 LED , tray pack
SBR-160-RGBW-R41-RE102	RGBW	SBR-160 evaluation module consisting of a SBM-160 RGBW surface mount LED mounted on a development board

Note 1: SBM-160-RGBW-H41-RE102 denotes a bin kit comprising of all flux bins as listed on page 3 and chromaticity bins listed on page 3 and 4.

Note 1: For ordering information on all available bin kits, please see PDS-001792: SBM-160 Binning & Labeling document.

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