

# Bridgelux® Vero® 10 Array Series

Product Data Sheet DS30

BXRC-27x1000

30x1000

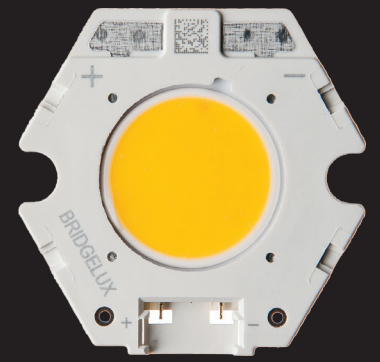
35x1000

40x1000

50x1000

# Introduction

Vero



Vero represents a revolutionary advancement in chip on board (COB) light source technology and innovation. Vero LED light sources simplify luminaire design and manufacturing processes, improve light quality, and define a platform for future functionality integration.

Vero is available in four different light emitting surface (LES) configurations and has been engineered to reliably operate over a broad current range, enabling new degrees of flexibility in luminaire design optimization. Vero arrays deliver increased lumen density to enable improved beam control and precision lighting with 2 and 3 SDCM color control standard for clean and consistent uniform lighting.

Vero includes an on board connector port to enable solder free electrical interconnect and simple easy to use mounting features to enable plug-and-play installation.

## Features

- Market leading efficacy of 130 lm/W typical
- Vero 10 lumen output performance ranges from 480 to 2,425 lumens
- Broad range of CCT options from 2700K to 5000K
- CRI options include minimum 70, 80, and 90
- 2 and 3 SDCM color control for 2700K-4000K CCT
- Reliable operation at up to 2X nominal drive current
- Radial die pattern and improved lumen density
- Thermally isolated solder pads
- Onboard connector port
- Top side part number markings

## Benefits

- Broad application coverage for interior and exterior lighting
- Flexibility for application driven lighting design requirements
- High quality true color reproduction
- Uniform consistent white light
- Flexibility in design optimization
- Improved optical control
- Enhanced ease of use and manufacturability
- Solderless connectivity enables plug & play installation and field upgradability
- Improved inventory management and quality control

# Contents

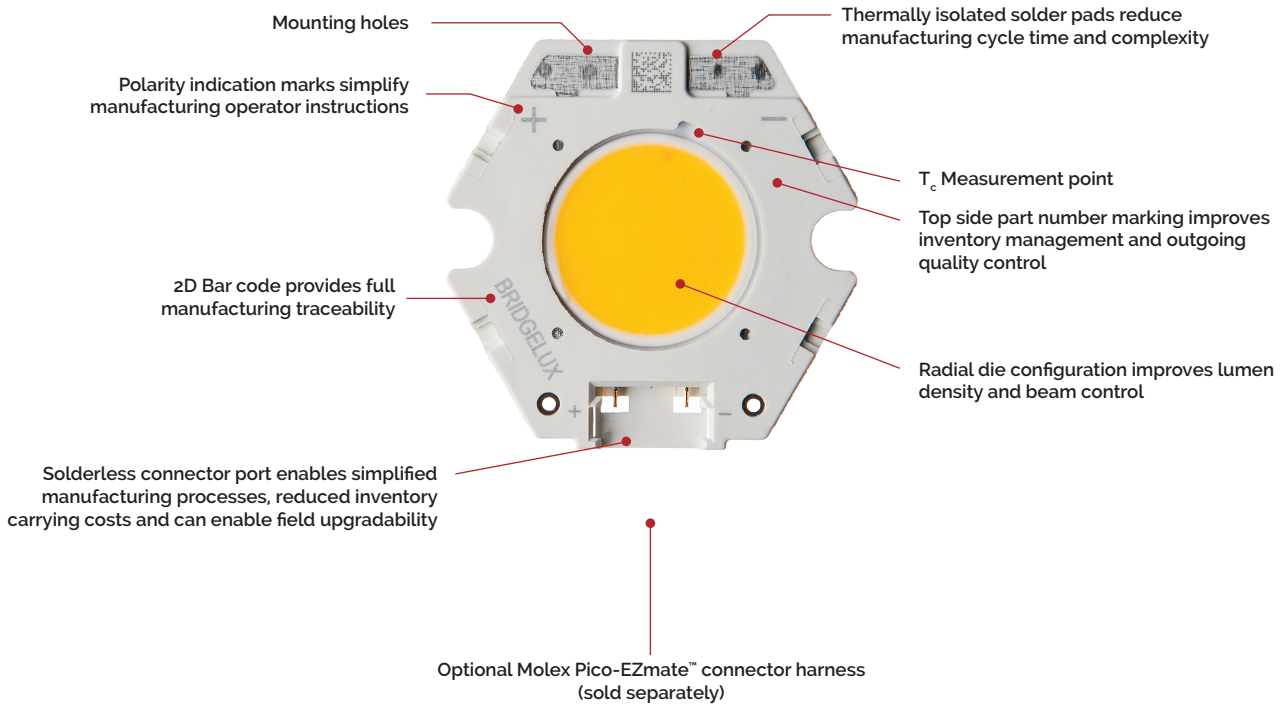
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# Product Feature Map

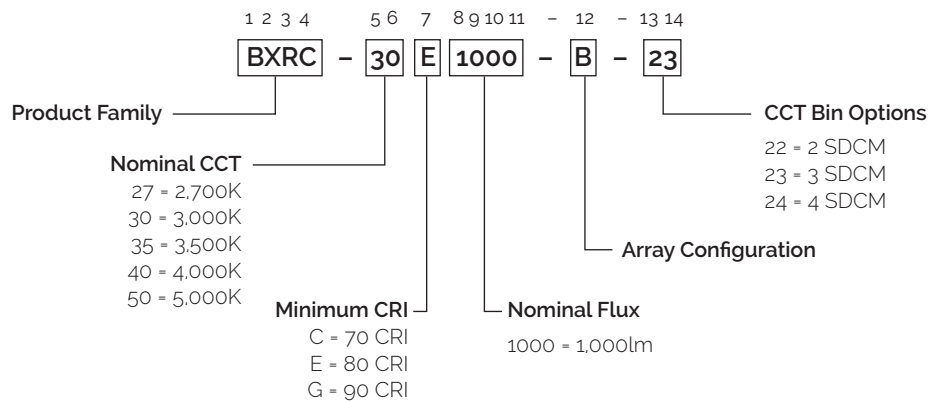
Vero 10 is the largest form factor in the Vero family of next generation solid state light sources. In addition to delivering the performance and light quality required for many lighting applications, Vero incorporates several

features to simplify the design integration and manufacturing process, accelerate time to market and reduce system costs. Please consult the Bridgelux Vero Array Series Product Brief for more information on the Vero family of products.



## Product Nomenclature

The part number designation for Bridgelux Vero LED arrays is explained as follows:



# Product Selection Guide

The following product configurations are available:

**Table 1:** Selection Guide, Pulsed Measurement Data ( $T_j = T_c = 25^\circ\text{C}$ )

Part Number	Nominal CCT <sup>1</sup> (K)	CRI <sup>2</sup>	Nominal Drive Current <sup>3</sup> (mA)	Typical Pulsed Flux <sup>4,5,6</sup> $T_c = 25^\circ\text{C}$ (lm)	Minimum Pulsed Flux <sup>6,7</sup> $T_c = 25^\circ\text{C}$ (lm)	Typical $V_f$ (V)	Typical Power (W)	Typical Efficacy (lm/W)
BXRC-27E1000-B-2x	2700	80	350	1150	1070	26.5	9.3	124
BXRC-27G1000-B-2x	2700	90	350	910	579	26.5	9.3	98
BXRC-30E1000-B-2x	3000	80	350	1207	1098	26.5	9.3	130
BXRC-30G1000-B-2x	3000	90	350	950	866	26.5	9.3	102
BXRC-35E1000-B-2x	3500	80	350	1208	1105	26.5	9.3	130
BXRC-40E1000-B-2x	4000	80	350	1274	1147	26.5	9.3	137
BXRC-40G1000-B-2x	4000	90	350	1070	989	26.5	9.3	115
BXRC-50C1000-B-24	5000	70	350	1358	1248	26.5	9.3	146
BXRC-50E1000-B-24	5000	80	350	1274	1159	26.5	9.3	137
BXRC-50G1000-B-24	5000	90	350	1106	1010	26.5	9.3	119

**Table 2:** Selection Guide, Stabilized DC Performance ( $T_c = 85^\circ\text{C}$ )<sup>8,9</sup>

Part Number	Nominal CCT <sup>1</sup> (K)	CRI <sup>2</sup>	Nominal Drive Current <sup>3</sup> (mA)	Typical DC Flux $T_c = 85^\circ\text{C}$ (lm)	Minimum DC Flux <sup>10</sup> $T_c = 85^\circ\text{C}$ (lm)	Typical $V_f$ (V)	Typical Power (W)	Typical Efficacy (lm/W)
BXRC-27E1000-B-2x	2700	80	350	1022	951	25.7	9.0	114
BXRC-27G1000-B-2x	2700	90	350	809	515	25.7	9.0	90
BXRC-30E1000-B-2x	3000	80	350	1073	976	25.7	9.0	120
BXRC-30G1000-B-2x	3000	90	350	845	770	25.7	9.0	94
BXRC-35E1000-B-2x	3500	80	350	1074	983	25.7	9.0	120
BXRC-40E1000-B-2x	4000	80	350	1128	1016	25.7	9.0	126
BXRC-40G1000-B-2x	4000	90	350	948	876	25.7	9.0	106
BXRC-50C1000-B-24	5000	70	350	1194	1097	25.7	9.0	133
BXRC-50E1000-B-24	5000	80	350	1120	1019	25.7	9.0	125
BXRC-50G1000-B-24	5000	90	350	972	888	25.7	9.0	108

Notes for Tables 1 & 2:

- Nominal CCT as defined by ANSI C78.377-2011.
- CRI Values are minimums. Minimum Rg value for 80 CRI products is 0, the minimum Rg values for 90 CRI products is 50.
- Drive current is referred to as nominal drive current.
- Products tested under pulsed condition (10ms pulse width) at rated test current where  $T_j$  (junction temperature) =  $T_c$  (case temperature) =  $25^\circ\text{C}$ .
- Typical performance values are provided as a reference only and are not a guarantee of performance.
- Bridgelux maintains a  $\pm 7\%$  tolerance on flux measurements.
- Minimum flux values at the rated test current are guaranteed by 100% test.
- Typical stabilized DC performance values are provided as reference only and are not a guarantee of performance.
- Typical performance is estimated based on operation under DC (direct current) with LED array mounted onto a heat sink with thermal interface material and the case temperature maintained at  $85^\circ\text{C}$ . Based on Bridgelux test setup, values may vary depending on the thermal design of the luminaire and/or the exposed environment to which the product is subjected.
- Minimum flux values at elevated temperatures are provided for reference only and are not guaranteed by 100% production testing. Based on Bridgelux test setup, values may vary depending on the thermal design of the luminaire and/or the exposed environment to which the product is subjected.

# Performance at Commonly Used Drive Currents

Vero LED arrays are tested to the specifications shown using the nominal drive currents in Table 1. Vero may also be driven at other drive currents dependent on specific application design requirements. The performance at any drive current can be derived from the current vs. voltage characteristics shown in Figure 2 and the flux vs. current characteristics shown in Figure 3. The performance at commonly used drive currents is summarized in Table 3.

**Table 3:** Product Performance at Commonly Used Drive Currents

Part Number	CRI	Drive Current <sup>1</sup> (mA)	Typical $V_f$ $T_c = 25^\circ\text{C}$ (V)	Typical Power $T_j = 25^\circ\text{C}$ (W)	Typical Flux <sup>2</sup> $T_c = 25^\circ\text{C}$ (lm)	Typical DC Flux <sup>3</sup> $T_c = 85^\circ\text{C}$ (lm)	Typical Efficacy $T_j = 25^\circ\text{C}$ (lm/W)
BXRC-27E1000-B-2x	80	175	24.9	4.4	609	541	140
		<b>350</b>	<b>26.5</b>	<b>9.3</b>	<b>1150</b>	<b>1022</b>	<b>124</b>
		500	27.6	13.8	1571	1397	114
		700	29.0	20.3	2055	1827	101
BXRC-27G1000-B-2x	90	175	24.9	4.4	482	428	111
		<b>350</b>	<b>26.5</b>	<b>13.3</b>	<b>910</b>	<b>809</b>	<b>69</b>
		500	27.6	19.3	1244	1105	64
		700	29.0	30.5	1626	1445	53
BXRC-30E1000-B-2x	80	175	24.9	4.4	639	568	147
		<b>350</b>	<b>26.5</b>	<b>13.3</b>	<b>1207</b>	<b>1073</b>	<b>91</b>
		500	27.6	19.3	1649	1467	85
		700	29.0	30.5	2157	1918	71
BXRC-30G1000-B-2x	90	175	24.9	4.4	503	447	115
		<b>350</b>	<b>26.5</b>	<b>13.3</b>	<b>950</b>	<b>845</b>	<b>72</b>
		500	27.6	19.3	1298	1154	67
		700	29.0	30.5	1697	1510	56
BXRC-35E1000-B-2x	80	175	24.9	4.4	640	569	147
		<b>350</b>	<b>26.5</b>	<b>13.3</b>	<b>1208</b>	<b>1074</b>	<b>91</b>
		500	27.6	19.3	1651	1468	85
		700	29.0	30.5	2158	1920	71

Notes for Table 3:

1. Alternate drive currents in Table 3 are provided for reference only and are not a guarantee of performance.
2. Bridgelux maintains a  $\pm 7\%$  tolerance on flux measurements.
3. Typical stabilized DC performance values are provided as reference only and are not a guarantee of performance.

# Performance at Commonly Used Drive Currents

**Table 3:** Product Performance at Commonly Used Drive Currents (Continued)

Part Number	CRI	Drive Current <sup>1</sup> (mA)	Typical $V_f$ $T_c = 25^\circ\text{C}$ (V)	Typical Power $T_j = 25^\circ\text{C}$ (W)	Typical Flux <sup>2</sup> $T_c = 25^\circ\text{C}$ (lm)	Typical DC Flux <sup>3</sup> $T_c = 85^\circ\text{C}$ (lm)	Typical Efficacy $T_j = 25^\circ\text{C}$ (lm/W)
BXRC-40E1000-B-2x	80	175	24.9	4.4	675	598	155
		<b>350</b>	<b>26.5</b>	<b>13.3</b>	<b>1274</b>	<b>1128</b>	<b>96</b>
		500	27.6	19.3	1741	1542	90
		700	29.0	30.5	2276	2016	75
BXRC-40G1000-B-2x	90	175	24.9	4.4	567	502	130
		<b>350</b>	<b>26.5</b>	<b>13.3</b>	<b>1070</b>	<b>948</b>	<b>81</b>
		500	27.6	19.3	1462	1295	76
		700	29.0	30.5	1912	1693	63
BXRC-50C1000-B-24	70	175	24.9	4.4	719	632	165
		<b>350</b>	<b>26.5</b>	<b>13.3</b>	<b>1358</b>	<b>1194</b>	<b>102</b>
		500	27.6	19.3	1856	1631	96
		700	29.0	30.5	2426	2133	80
BXRC-50E1000-B-24	80	175	24.9	4.4	675	593	155
		<b>350</b>	<b>26.5</b>	<b>13.3</b>	<b>1274</b>	<b>1120</b>	<b>96</b>
		500	27.6	19.3	1741	1531	90
		700	29.0	30.5	2276	2001	75
BXRC-50G1000-B-24	90	175	24.9	4.4	586	515	134
		<b>350</b>	<b>26.5</b>	<b>13.3</b>	<b>1106</b>	<b>972</b>	<b>83</b>
		500	27.6	19.3	1511	1329	78
		700	29.0	30.5	1976	1737	65

Notes for Table 3:

1. Alternate drive currents in Table 3 are provided for reference only and are not a guarantee of performance.
2. Bridgelux maintains a  $\pm 7\%$  tolerance on flux measurements.
3. Typical stabilized DC performance values are provided as reference only and are not a guarantee of performance.

# Electrical Characteristics

**Table 4:** Electrical Characteristics

Part Number	Drive Current (mA)	Forward Voltage Pulsed, $T_c = 25^\circ\text{C}$ (V) <sup>1, 2, 3</sup>			Typical Coefficient of Forward Voltage <sup>4</sup> $\Delta V_f / \Delta T_c$ (mV/ $^\circ\text{C}$ )	Typical Thermal Resistance Junction to Case <sup>5, 6</sup> $R_{j-c}$ ( $^\circ\text{C}/\text{W}$ )	Driver Selection Voltages <sup>7</sup> (V)	
		Minimum	Typical	Maximum			$V_f$ Min. Hot $T_c = 105^\circ\text{C}$ (V)	$V_f$ Max. Cold $T_c = -40^\circ\text{C}$ (V)
BXRC-xxx1000-B-2x	350	24.5	26.5	28.5	-14	0.47	23.4	29.4
	700	26.5	29.0	31.2	-14	0.59	25.4	32.1

Notes for Table 4:

1. Parts are tested in pulsed conditions,  $T_c = 25^\circ\text{C}$ . Pulse width is 10ms.
2. Voltage minimum and maximum are provided for reference only and are not a guarantee of performance.
3. Bridgelux maintains a tester tolerance of  $\pm 0.10\text{V}$  on forward voltage measurements.
4. Typical coefficient of forward voltage tolerance is  $\pm 0.1\text{mV}$  for nominal current.
5. Thermal resistance values are based from test data of a 3000K 80 CRI product.
6. Thermal resistance value was calculated using total electrical input power; optical power was not subtracted from input power. The thermal interface material used during testing is not included in the thermal resistance value.
7.  $V_f$  min hot and max cold values are provided as reference only and are not guaranteed by test. These values are provided to aid in driver design and selection over the operating range of the product.



# Absolute Maximum Ratings

**Table 5:** Maximum Ratings

Parameter	Maximum Rating
LED Junction Temperature ( $T_j$ )	150°C
Storage Temperature	-40°C to +105°C
Operating Case Temperature <sup>1</sup> ( $T_c$ )	105°C
Soldering Temperature <sup>2</sup>	350°C or lower for a maximum of 10 seconds
Maximum Drive Current <sup>3</sup>	700mA
Maximum Peak Pulsed Drive Current <sup>4</sup>	1500mA
Maximum Reverse Voltage <sup>5</sup>	-45V

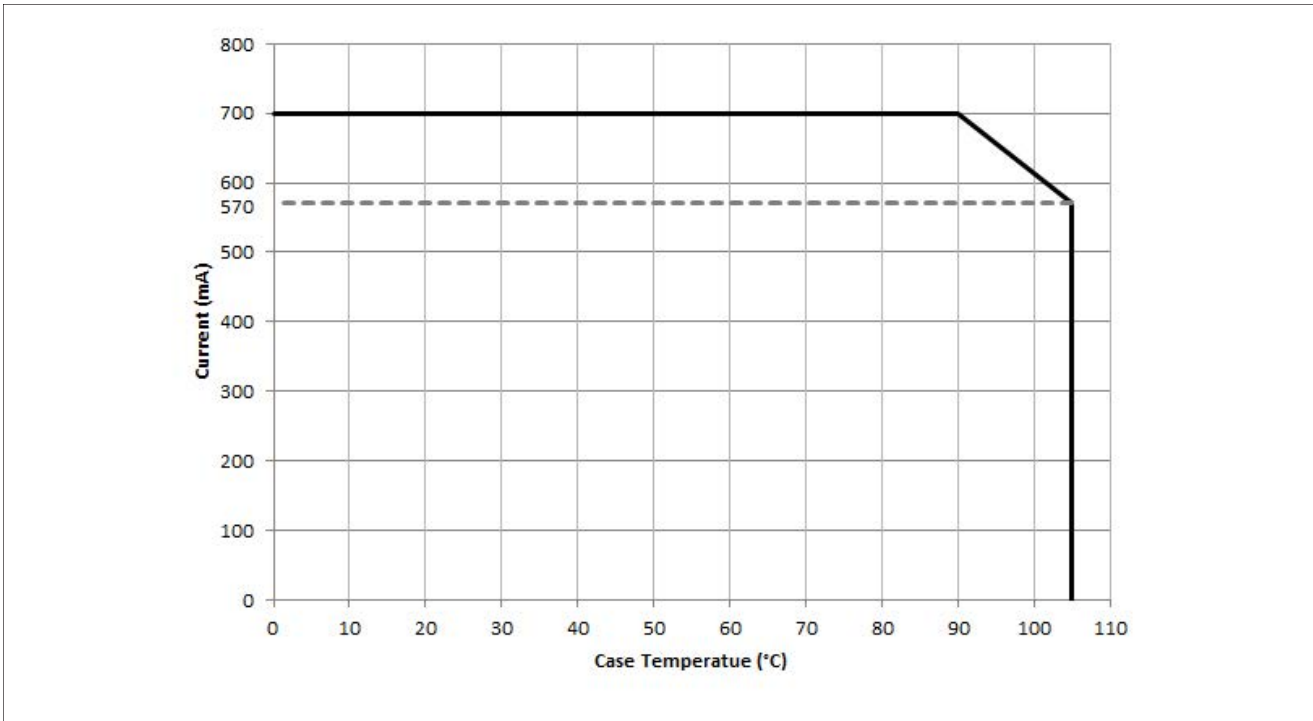
Notes for Table 5:

1. Please refer to Figure 1 for drive current derating. For IEC 62717 requirement, please contact Bridgelux Sales Support.
2. See Bridgelux Application Note AN31, Assembly Considerations for Vero LED arrays, for more information.
3. Please refer to Figure 1 for drive current derating curve.
4. Bridgelux recommends a maximum duty cycle of 10% and pulse width of 20ms when operating LED Arrays at the maximum peak pulsed current specified. Maximum peak pulsed currents indicate values where the LED array can be driven without catastrophic failures.
5. Light emitting diodes are not designed to be driven in reverse voltage and will not produce light under this condition. Maximum rating provided for reference only.

# Performance Curves

The maximum allowable drive current for the Vero 10 family of products is dependent on the operating case temperature. Please refer to the Product Feature Map (page 2) for the location of the  $T_c$  Point.

**Figure 1: Vero 10 Drive Current Derating Curve**



Notes for Figure 1:

1. In order to meet LM-80 lifetime projections Vero 10 may be driven up to 700mA at case temperatures up to 90°C. Operating conditions above case temperatures of 90°C driving conditions must follow the Vero 10 Drive Current Derating Curve.
2. Lumen maintenance (L70) and lifetime predictions are valid for drive current and case temperature conditions used for LM-80 testing as included in the applicable LM-80 test report for these products. Contact your Bridgelux sales representative for LM-80 report.

# Performance Curves

Figure 2: Drive Current vs. Forward Voltage ( $T_j = T_c = 25^\circ\text{C}$ )

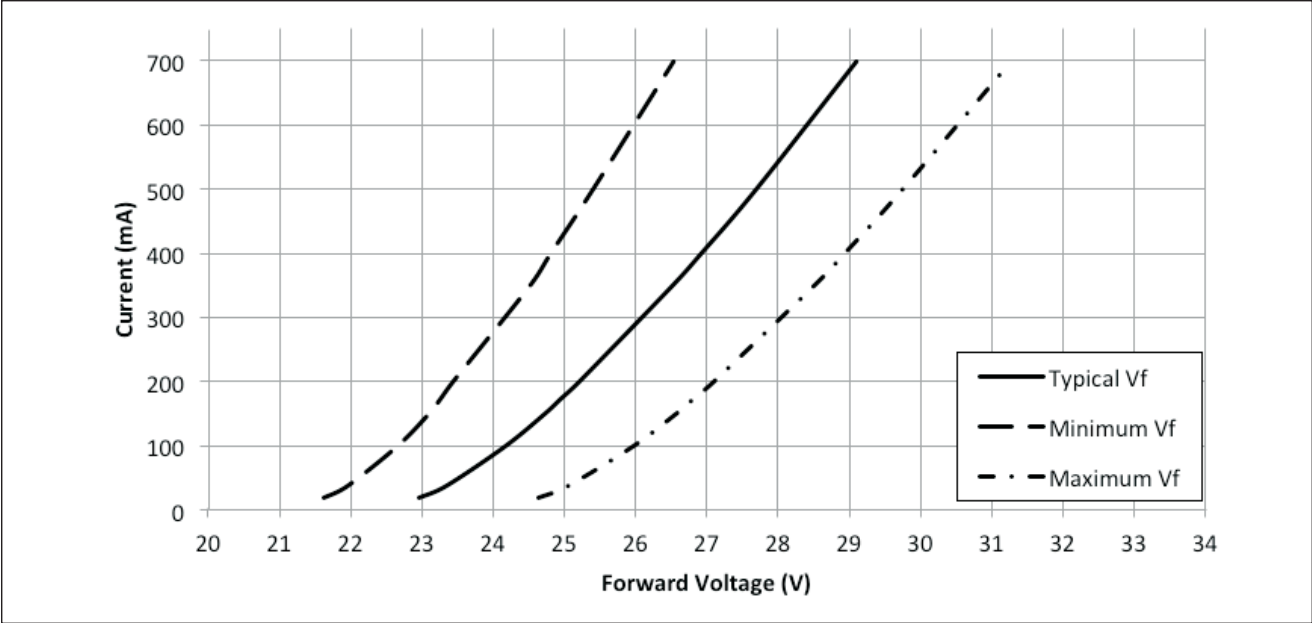
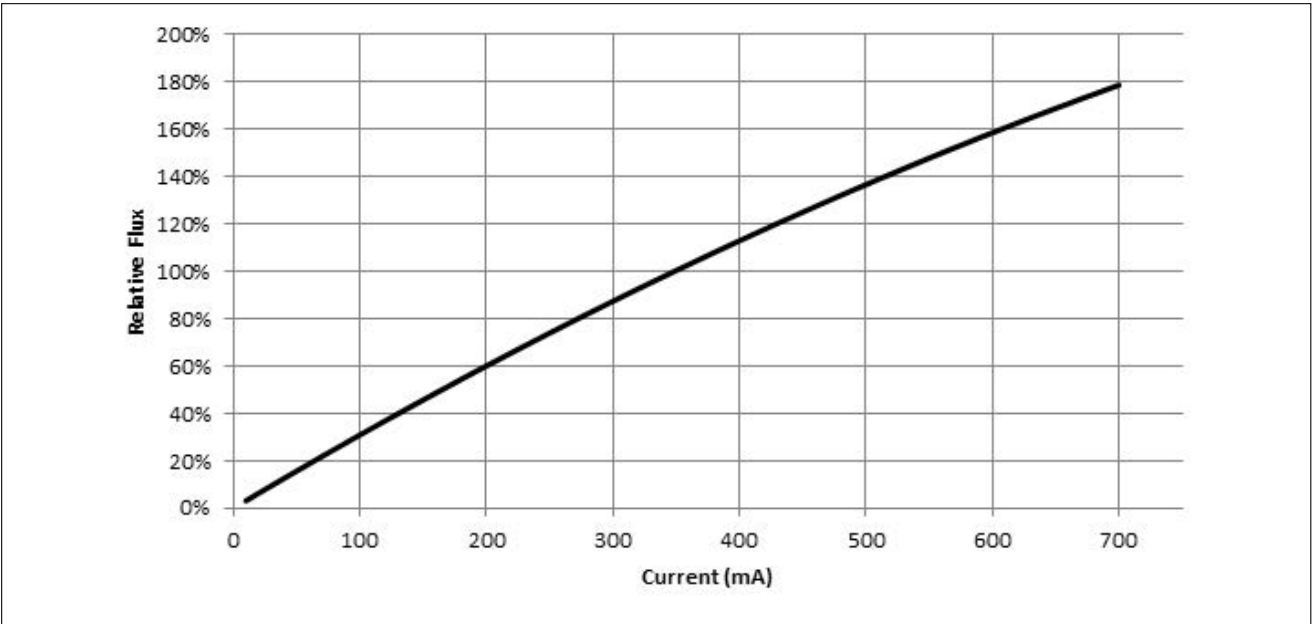
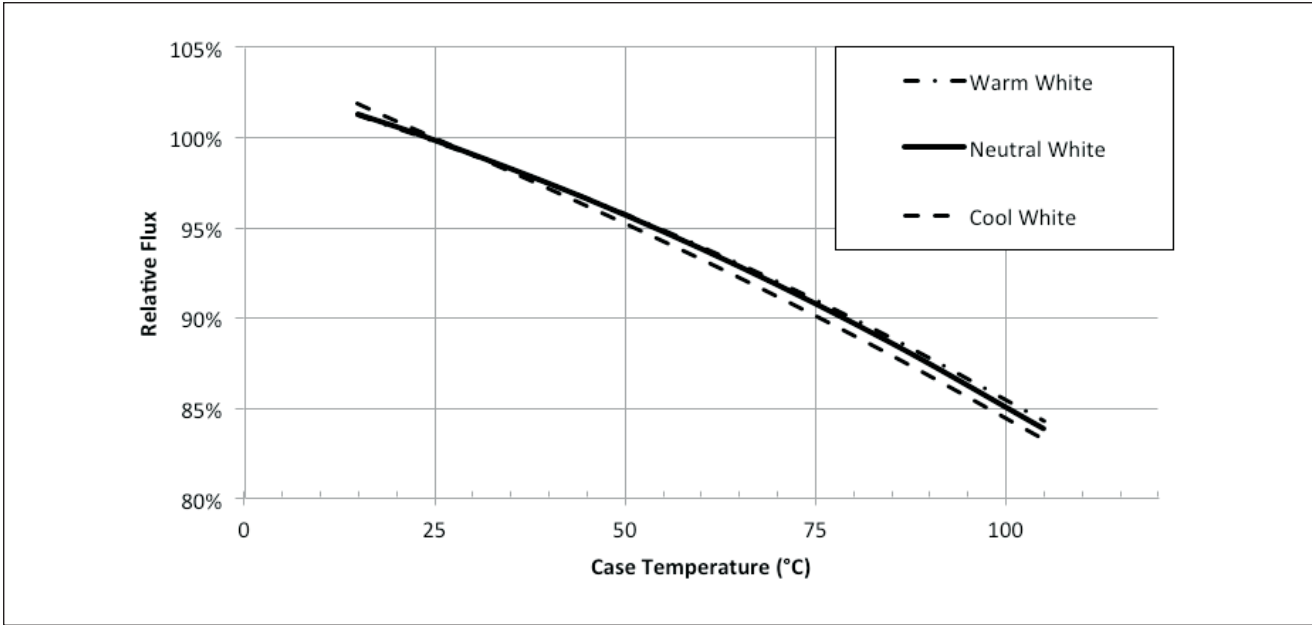


Figure 3: Typical Relative Luminous Flux vs. Drive Current ( $T_j = T_c = 25^\circ\text{C}$ )

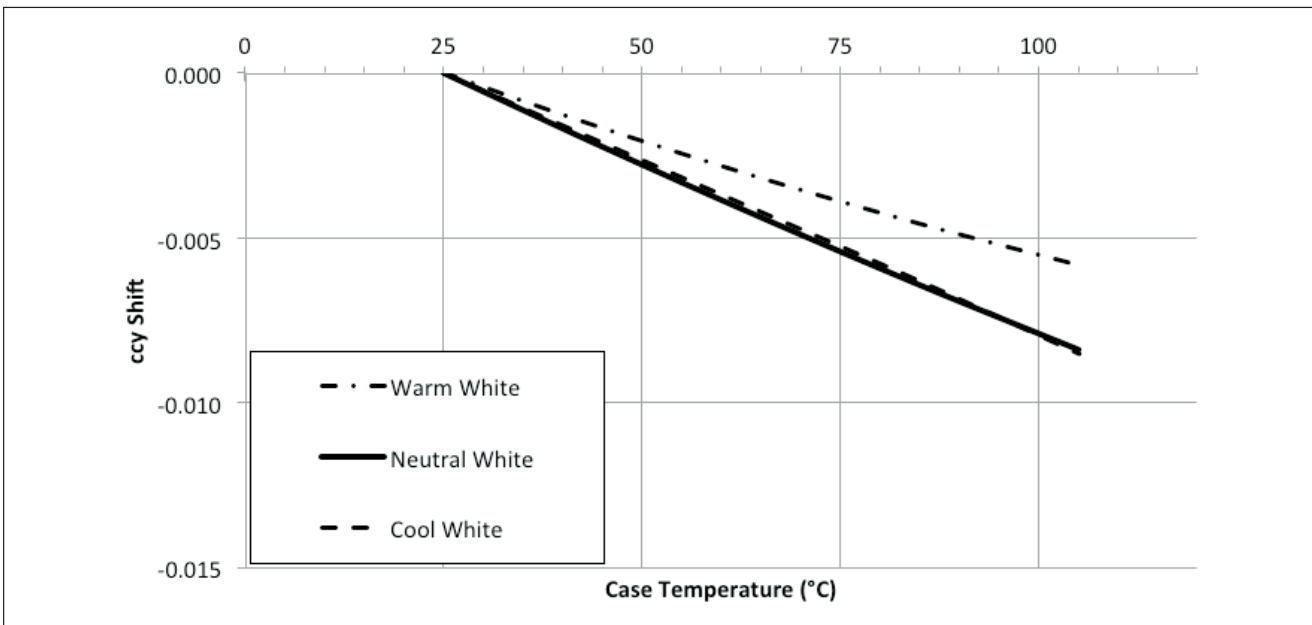


# Performance Curves

**Figure 4: Typical DC Flux vs. Case Temperature**



**Figure 5: Typical DC ccy Shift vs. Case Temperature**

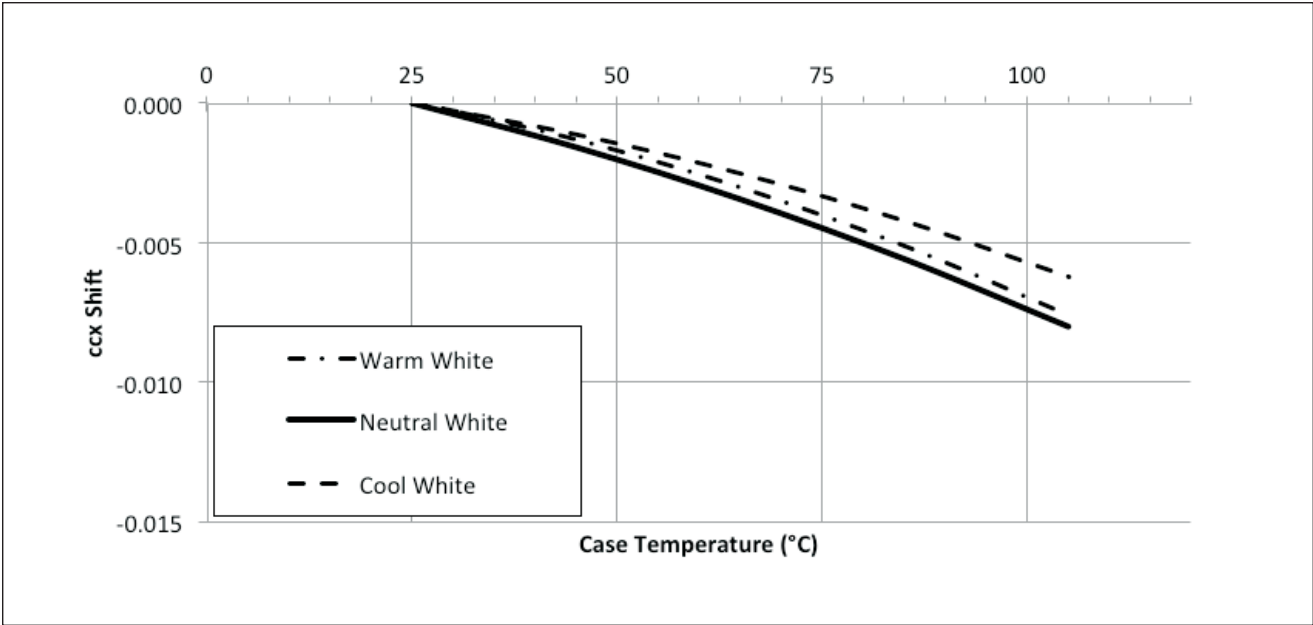


Notes for Figures 4-5:

1. Characteristics shown for warm white based on 3000K and 80 CRI.
2. Characteristics shown for neutral white based on 4000K and 80 CRI.
3. Characteristics shown for cool white based on 5000K and 70 CRI.
4. For other color SKUs, the shift in color will vary. Please contact your Bridgelux Sales Representative for more information.

# Performance Curves

Figure 6: Typical DC ccx Shift vs. Case Temperature

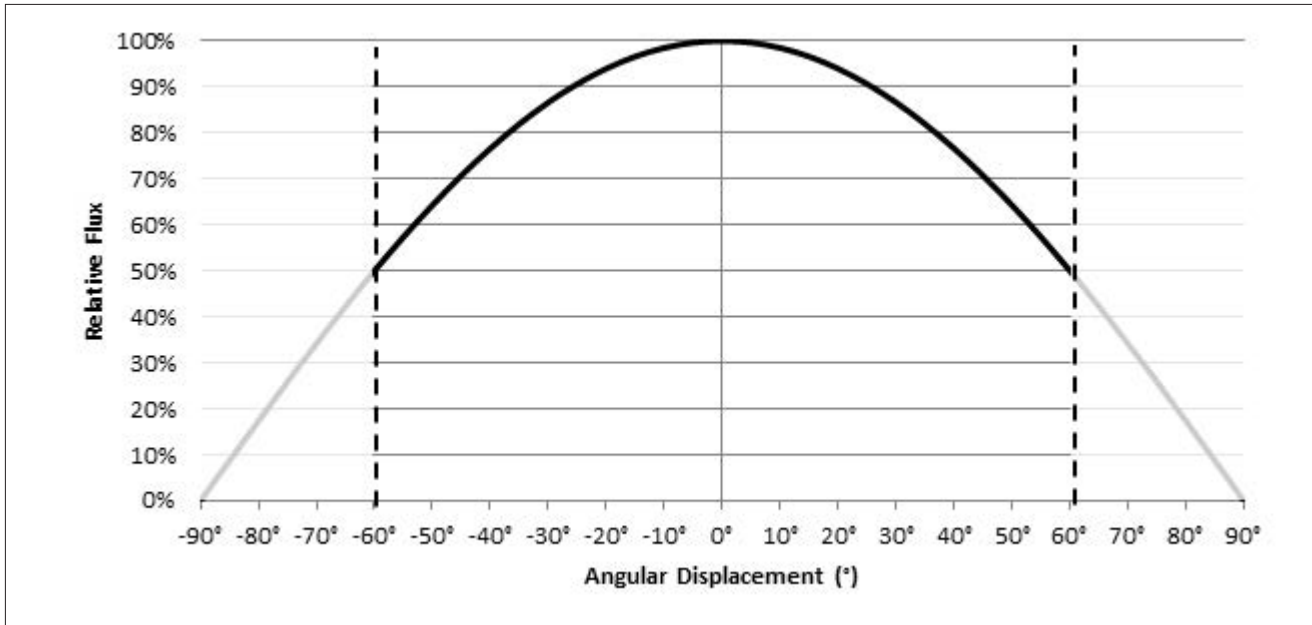


Notes for Figure 6:

- 1. Characteristics shown for warm white based on 3000K and 80 CRI.
- 2. Characteristics shown for neutral white based on 4000K and 80 CRI.
- 3. Characteristics shown for cool white based on 5000K and 70 CRI.
- 4. For other color SKUs, the shift in color will vary. Please contact your Bridgelux Sales Representative for more information.

# Typical Radiation Pattern

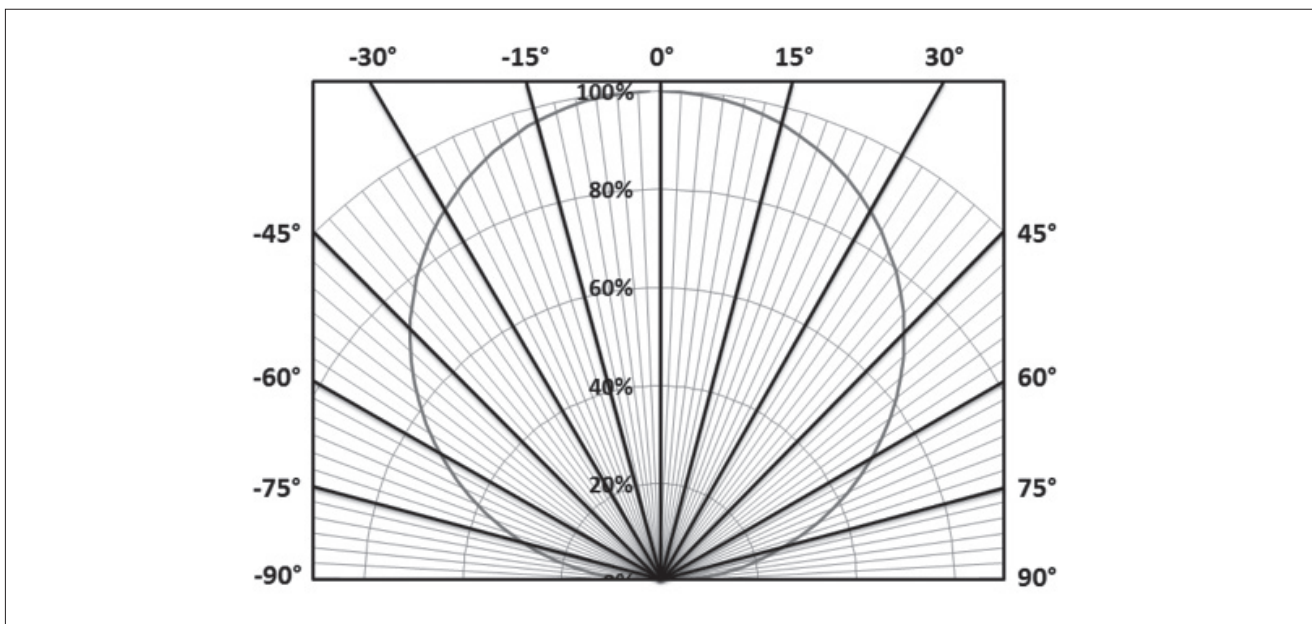
Figure 7: Typical Spatial Radiation Pattern



Notes for Figure 7:

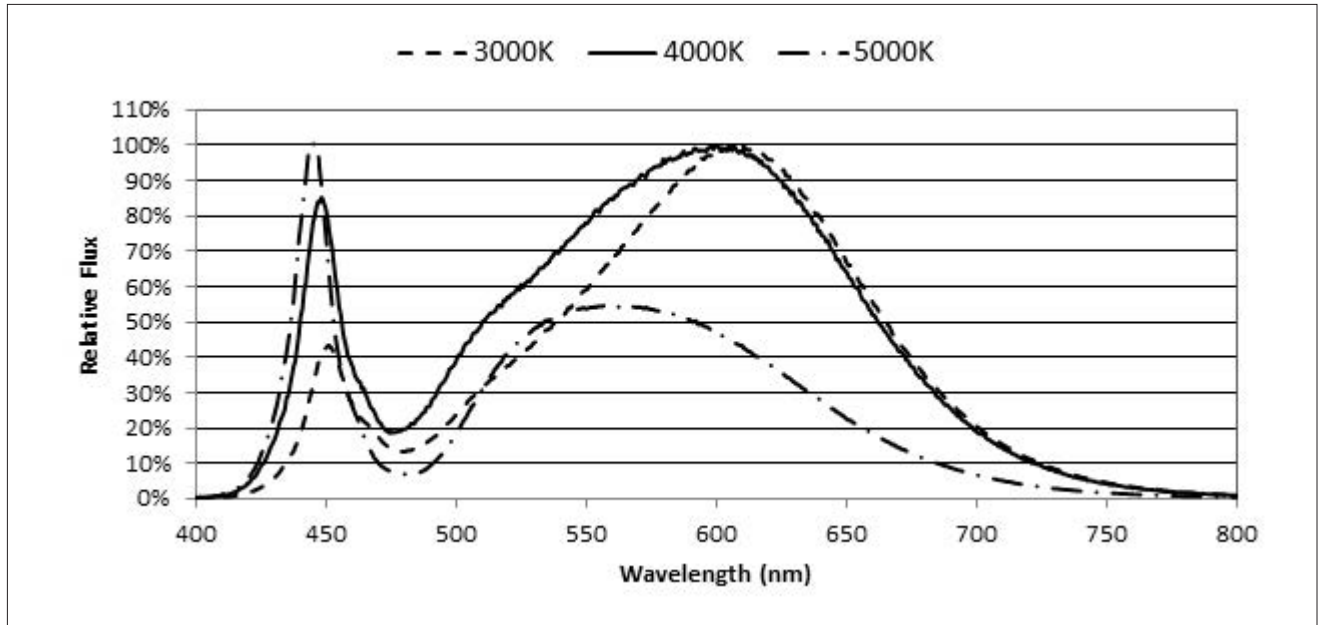
1. Typical viewing angle is  $120^\circ$ .
2. The viewing angle is defined as the off axis angle from the centerline where  $I_v$  is  $\frac{1}{2}$  of the peak value.

Figure 8: Typical Polar Radiation Pattern



# Typical Color Spectrum

Figure 9: Typical Color Spectrum

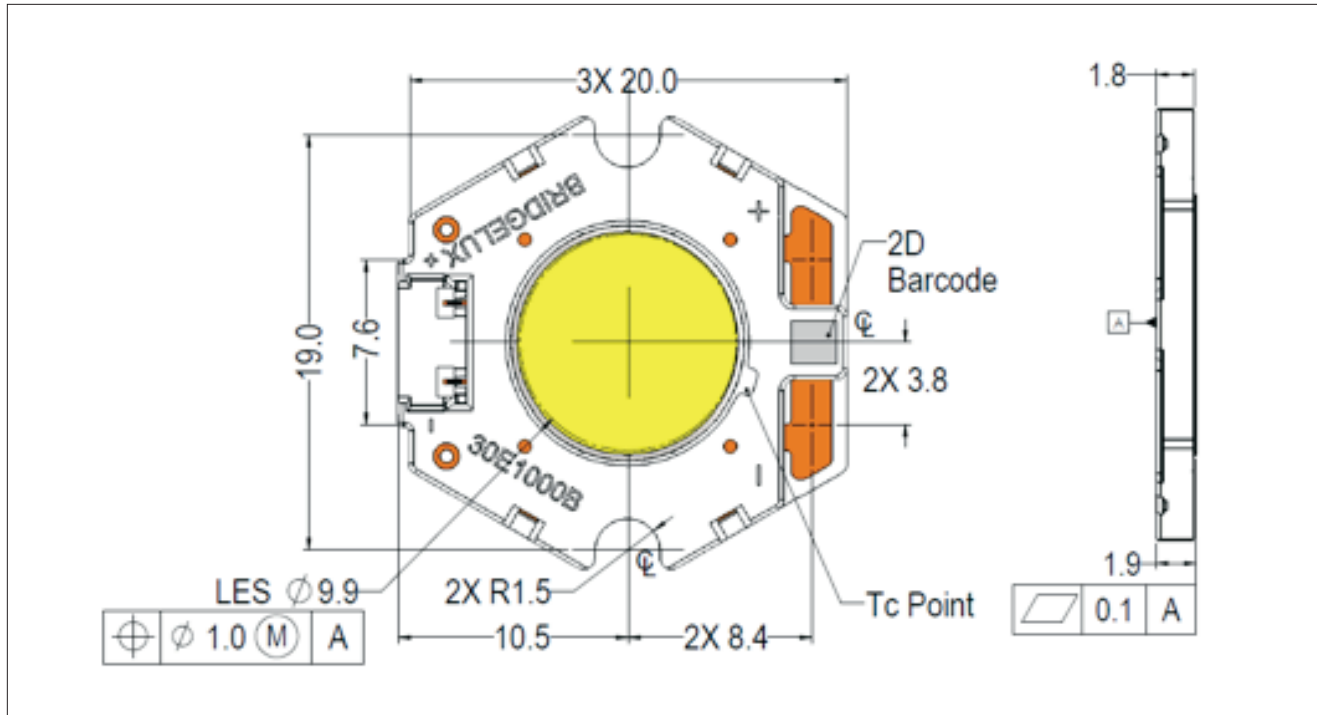


Notes for Figure 9:

1. Color spectra measured at rated current for  $T_j = T_c = 25^\circ\text{C}$ .
2. Color spectra shown for warm white is 3000K and 80 CRI.
3. Color spectra shown for neutral white is 4000K and 80 CRI.
4. Color spectra shown for cool white is 5000K and 70 CRI.

# Mechanical Dimensions

**Figure 10: Drawing for Vero 10 LED Array**



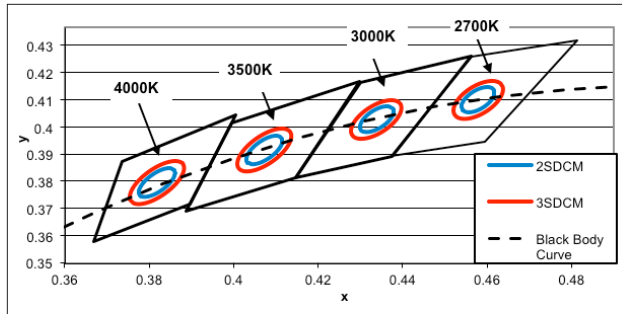
Notes for Figure 10:

1. Drawings are not to scale.
2. Dimensions are in mm.
3. Unless otherwise specified, tolerances are  $\pm 0.10\text{mm}$ .
4. Mounting slots (2X) are for M2.5 screws.
5. Bridgelux recommends two tapped holes for mounting screws with  $19.0 \pm 0.10\text{mm}$  center-to-center spacing.
6. Screws with flat shoulders (pan, dome, button, round, truss, mushroom) provide optimal torque control. Do NOT use flat, countersink, or raised head screws.
7. Solder pads and connector port are labeled "+" and "-" to denote positive and negative, respectively.
8. It is not necessary to provide electrical connections to both the solder pads and the connector port. Either set may be used depending on application specific design requirements.
9. Refer to Application Notes AN30 and AN31 for product handling, mounting and heat sink recommendations.
10. The optical center of the LED Array is nominally defined by the mechanical center of the array to a tolerance of  $\pm 0.2\text{mm}$ .
11. Bridgelux maintains a flatness of  $0.10\text{mm}$  across the mounting surface of the array.



# Color Binning Information

**Figure 11: Graph of Warm and Neutral White Test Bins in xy Color Space**

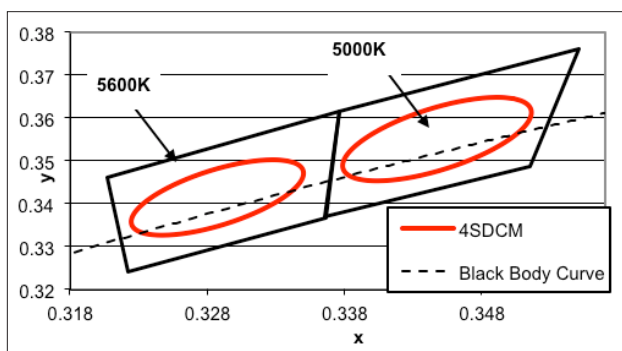


Note: Pulsed Test Conditions,  $T_c = 25^\circ\text{C}$

**Table 6: Warm and Neutral White xy Bin Coordinates and Associated Typical CCT**

Bin Code	2700K	3000K	3500K	4000K
ANSI Bin (for reference only)	(2580K - 2870K)	(2870K - 3220K)	(3220K - 3710K)	(3710K - 4260K)
o3 (3SDCM)	(2651K - 2794K)	(2968K - 3136K)	(3369K - 3586K)	(3851K - 4130K)
o2 (2SDCM)	(2674K - 2769K)	(2995K - 3107K)	(3404K - 3548K)	(3895K - 4081K)
Center Point (x,y)	(0.4578, 0.4101)	(0.4338, 0.403)	(0.4073, 0.3917)	(0.3818, 0.3797)

**Figure 12: Graph of Cool White Test Bins in xy Color Space**



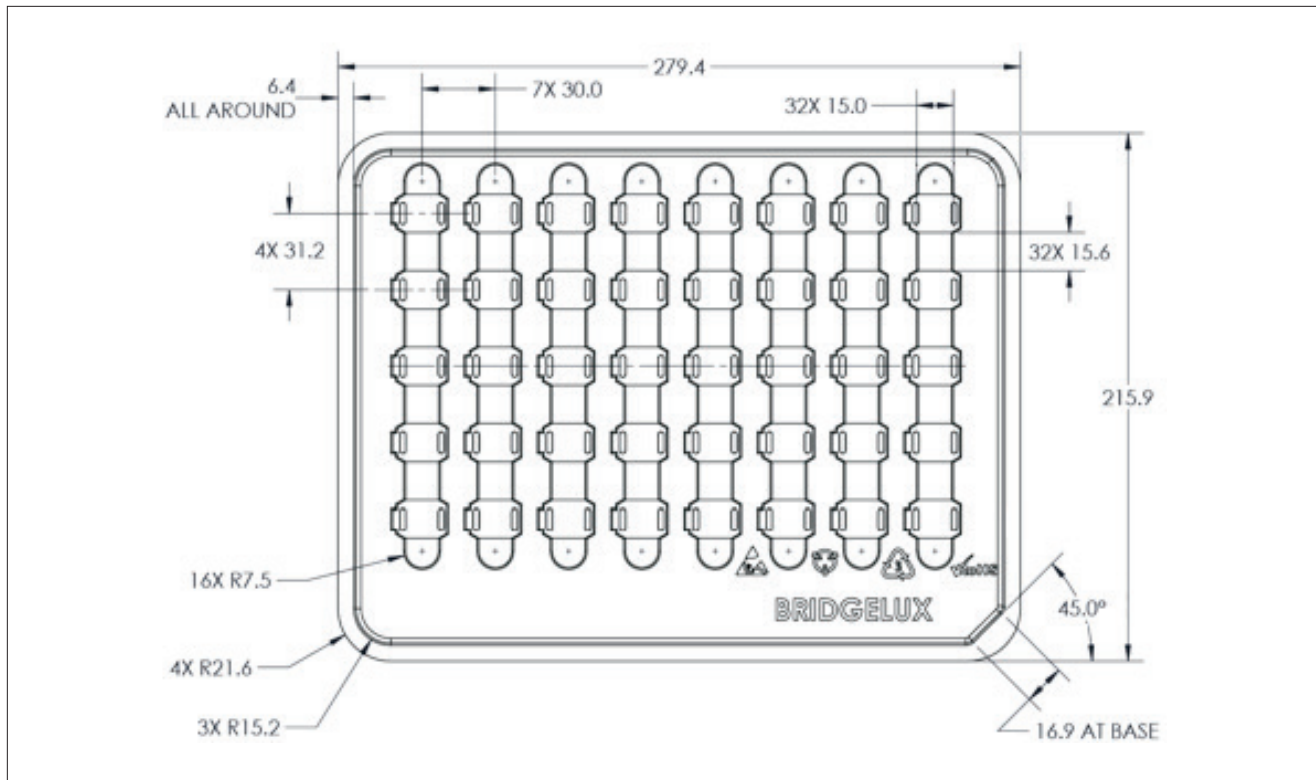
Note: Pulsed Test Conditions,  $T_c = 25^\circ\text{C}$

**Table 7: Cool White xy Bin Coordinates and Associated Typical CCT**

Bin Code	5000K	5600K
ANSI Bin (for reference only)	(4745K - 5311K)	(5310K - 6020K)
o4 (4SDCM)	(4801K - 5282K)	(5475K - 5830K)
Center Point (x,y)	(0.3447, 0.3553)	(0.3293, 0.3423)

# Packaging

Figure 13: Drawing for Vero 10 Packaging Tray

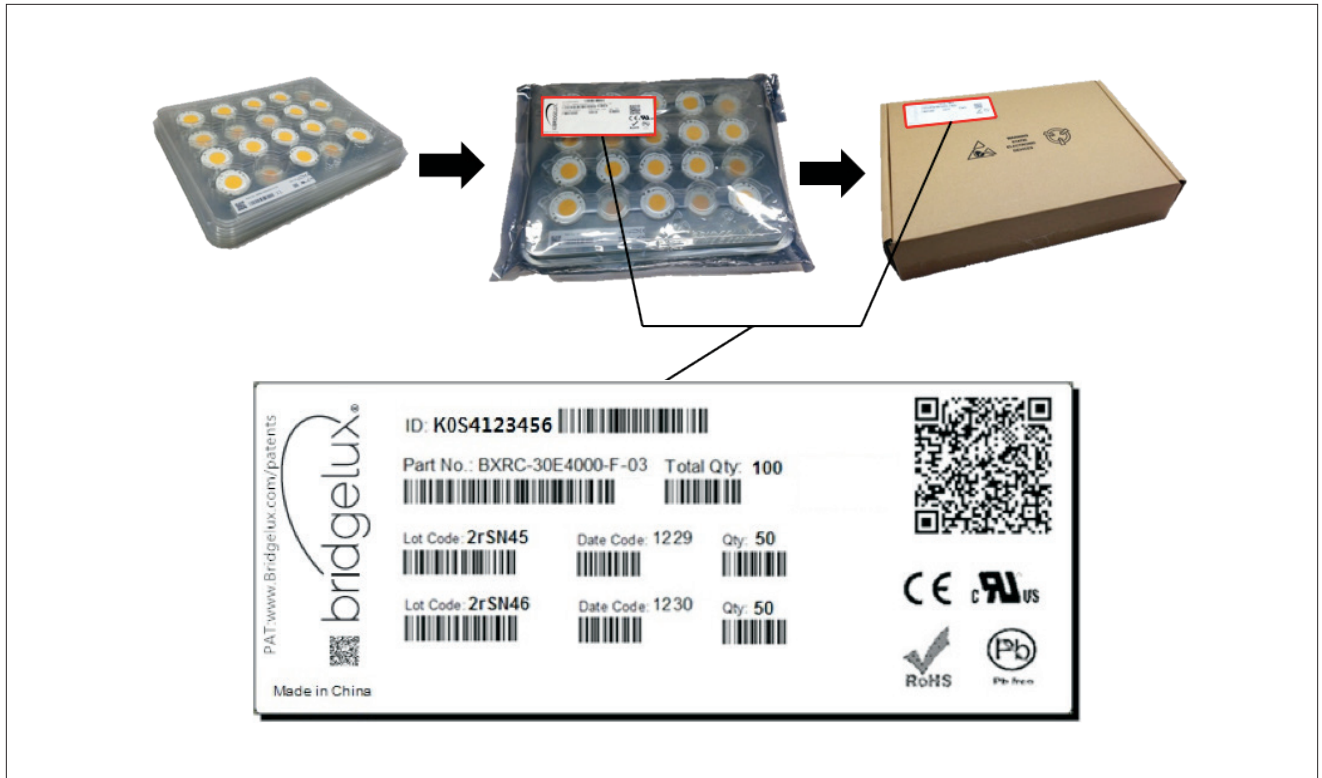


Notes for Figure 13:

1. Dimensions are in millimeters
2. Tolerances: XX -  $\pm 0.1$ , XXX -  $\pm 0.05$ , Angles -  $\pm 1^\circ$
3. Trays are stackable without interference and will not stick together during unstacking operation

# Packaging

**Figure 14: Vero Series Packaging and Labeling**



Notes for Figure 14:

1. Each tray holds 40 LEDs. 5 trays are stacked and one empty tray placed on top to cover the top tray.
2. Stacked trays are to contain only 1 part number and be vacuum sealed in an anti-static bag and placed in own box.
3. Each bag and box is to be labeled as shown above.

# Design Resources

## Application Notes

Bridgelux has developed a comprehensive set of application notes and design resources to assist customers in successfully designing with the Vero product family of LED array products. For a list of resources under development, visit [www.bridgelux.com](http://www.bridgelux.com).

## Optical Source Models

Optical source models and ray set files are available for all Bridgelux products. For a list of available formats, visit [www.bridgelux.com](http://www.bridgelux.com).

## 3D CAD Models

Three dimensional CAD models depicting the product outline of all Bridgelux Vero LED arrays are available in both SAT and STEP formats. Please contact your Bridgelux sales representative for assistance.

# Precautions

## CAUTION: CHEMICAL EXPOSURE HAZARD

Exposure to some chemicals commonly used in luminaire manufacturing and assembly can cause damage to the LED array. Please consult Bridgelux Application Note AN31 for additional information.

## CAUTION: EYE SAFETY

Eye safety classification for the use of Bridgelux Vero LED arrays is in accordance with IEC specification EN62471: Photobiological Safety of Lamps and Lamp Systems. Vero LED arrays are classified as Risk Group 1 (Low Risk) when operated at or below the maximum drive current. Please use appropriate precautions. It is important that employees working with LEDs are trained to use them safely.

## CAUTION: RISK OF BURN

Do not touch the Vero LED array or yellow resin area during operation. Allow the array to cool for a sufficient period of time before handling. The Vero LED array may reach elevated temperatures such that could burn skin when touched.

## CAUTION

### CONTACT WITH LIGHT EMITTING SURFACE (LES)

Avoid any contact with the LES. Do not touch the LES of the LED array or apply stress to the LES (yellow phosphor resin area). Contact may cause damage to the LED array.

Optics and reflectors must not be mounted in contact with the LES (yellow phosphor resin area). Optical devices may be mounted on the top surface of the plastic housing of the Vero LED array. Use the mechanical features of the LED array housing, edges and/or mounting holes to locate and secure optical devices as needed.

# Disclaimers

## MINOR PRODUCT CHANGE POLICY

The rigorous qualification testing on products offered by Bridgelux provides performance assurance. Slight cosmetic changes that do not affect form, fit, or function may occur as Bridgelux continues product optimization.

## STANDARD TEST CONDITIONS

Unless otherwise stated, array testing is performed at the nominal drive current.

# About Bridgelux

Bridgelux is a leading developer and manufacturer of technologies and solutions transforming the \$40 billion global lighting industry into a \$100 billion market opportunity. Based in Livermore, California, Bridgelux is a pioneer in solid state lighting (SSL), expanding the market for light emitting diode (LED) technologies by driving down the cost of LED lighting systems. Bridgelux's patented light source technology replaces traditional technologies (such as incandescent, halogen, fluorescent and high intensity discharge lighting) with integrated, solid state lighting solutions that enable lamp and luminaire manufacturers to provide high performance and energy efficient white light for the rapidly growing interior and exterior lighting markets, including street lights, commercial lighting and consumer applications.

**For more information about the company,  
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