

# Bridgelux Vero Décor Array Series

## Product Data Sheet DS34

BXRC-xxH1000-B-xx, BXRC-xxH2000-C-xx, BXRC-xxH4000-F-xx, BXRC-17E4000-F-04,  
BXRC-25E4000-F-04, BXRC-56G4000-F-04, BXRC-56G10K0-L-04



### Introduction

The **Bridgelux Décor™** line of products produce unmatched quality of light with brilliant color rendering options designed specifically for high end, niche applications. The Bridgelux Décor line of specialty LED products is available on the Bridgelux Vero Series of chip on board products.

**Décor Ultra** products provide a high CRI of 97, befitting of the most luxurious retail shops and world renowned museums.

**Décor Food** products offer color points developed to address the unique requirements of the food, grocery, and restaurant industries. Highlighting the distinctive colors and nuanced patterns found in meats and breads, the Décor Culinary products are a must have for any butcher counter or bakery.

**Décor Specialty** products provide color points developed specifically for the healthcare and entertainment industries. The 5600K color point combined with a CRI of 90 provides the bright white required by these industries.

The Vero platform represents a revolutionary advancement in chip on board (COB) light source technology and innovation. Vero simplifies luminaire design and manufacturing processes, improves light quality, and defines a platform for future functionality integration.

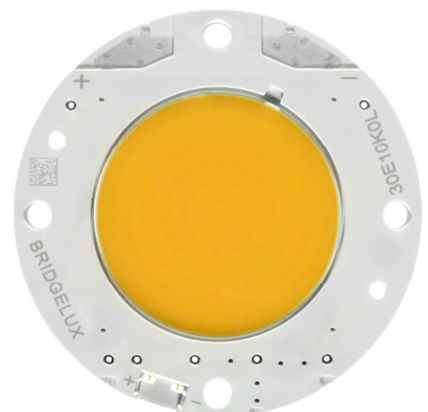
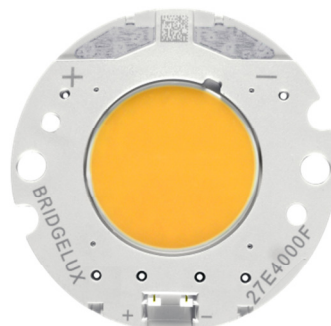
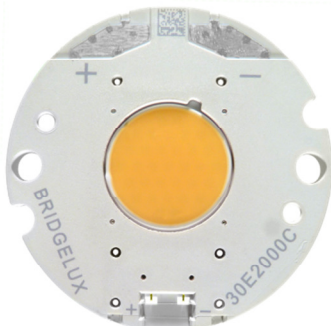
The Vero Series products are available in four different LES (light emitting surface) configurations and have been engineered to reliably operate over a broad current range, enabling new degrees of flexibility in luminaire design optimization. These industry leading arrays deliver increased lumen density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

- Typical 97 CRI with a 95 CRI minimum (Décor Ultra)
- Application specific color points
- Typical R9 value of 98 for brilliant rendering of red colors and skin tones (Décor Ultra)
- 2 and 3 SDCM color control
- 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

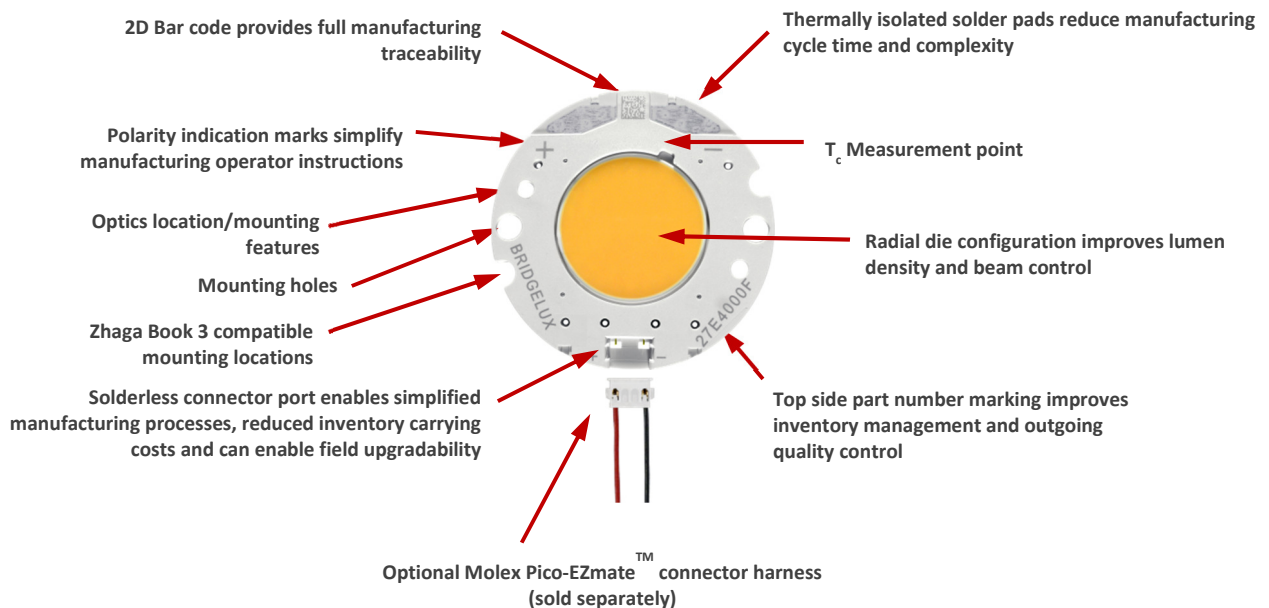
- Broad application coverage for interior lighting requiring state of the art color rendering
- Flexibility for application driven lighting design requirements
- High quality true color reproduction
- Uniform consistent white light
- Flexibility in design optimization
- Improved optical control
- Enhanced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



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## Product Feature Map

The Bridgelux Vero platform offers numerous advanced product features. In addition to delivering industry leading performance and light quality, Vero incorporates several features to simplify the design integration and manufacturing process, accelerating time to market and reducing 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:

BXRC – AB C DEFG – H – IJ

Where:

BXRC – Designates product family

AB – Designates the nominal color temperature; 27 = 2700K; 30 = 3000K, etc.

C – Designates minimum CRI; H = 97 typical

DEFG – Designates nominal flux; 2000 = 2,000 lm, 4000 = 4,000 lm, 10K0 = 10,000 lm, etc.

H – Designates array configuration

IJ – Designates CCT Bin options

02 = 2 SDCM

03 = 3 SDCM

### Top Side Part Number Markings

Vero includes a top side part number marking to help simplify inventory management and increase opportunities for production quality control. Any Vero product can be quickly identified to determine the product configuration, color or CRI by simply looking at its top side markings. Unlike previous product generations where markings were included only on the back side of the array, no longer is it necessary to handle (turnover), uninstall the array in an infield application or guess which product it is by the color of the phosphor area. The Vero line of LED array products also has a 2D bar code which provides additional information and full product traceability for quality control purposes.

### Enhanced Connectivity Options

Vero's thermally isolated solder pads have been designed to make soldering fast and secure. For those who prefer an even faster solderless installation, Vero has a connector port that can be used to further simplify your manufacturing process, reduce inventory cost and allow for field upgradability. The connector port mates to the Molex Pico-EZmate connector harness, sold separately by Molex and through their distribution network. The Molex connector harnesses come in a variety of wire lengths and wire gauge options and can also be custom engineered to meet your specific design requirements. Please consult your local Molex sales representative or visit [www.molex.com](http://www.molex.com) for more information.

### Lumen Maintenance Characteristics

Bridgelux projects that the Vero Décor family of LED array products will deliver, on average, greater than 70% lumen maintenance after 50,000 hours of operation at two times the nominal drive current (except for Vero 29 which is limited to 1.5 times the nominal drive current for lumen maintenance) in Table 1. This performance assumes constant current operation at up to 2 times the nominal drive current (except for Vero 29 which is limited to 1.5 times the nominal drive current for lumen maintenance) with case temperature maintained at or below 85°C. For use beyond these operating conditions please consult your Bridgelux sales representative for further assistance.

These projections are based on a combination of package test data, semiconductor chip reliability data, a fundamental understanding of package related degradation mechanisms, and performance observed from products installed in the field using Bridgelux die technology. Bridgelux conducts lumen maintenance tests per LM-80. Observation of design limits is required in order to achieve this projected lumen maintenance.

### Environmental Compliance

Bridgelux is committed to providing environmentally friendly products to the solid-state lighting market. Vero LED Arrays comply with the European Union directives on the restriction of hazardous substances in electronic equipment, namely the RoHS directive. Bridgelux does not intentionally add the following restricted materials to any LED array products: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).

### UL Recognition

Bridgelux secures UL Recognition for all of its LED array products. Please refer to the UL file E357031 for the latest list of UL Recognized Bridgelux Vero LED arrays. Bridgelux uses UL Recognized materials with suitable flammability ratings in the Vero LED array products to streamline the process for customers to secure UL listing of the final luminaire product.

## **CE Recognition**

In accordance with the relevant European Union Directives, the BXRC series LED array products conform to the applicable requirements of the IEC/EN 62031:2008 (LED Modules for General Lighting Safety Specifications) and IEC 62471:2006 (Photobiological Safety of Lamps and Lamp Systems). Bridgelux maintains a CE Declaration of Conformity statement on its website and displays the CE mark on product packing labels.

## **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.

## **Case Temperature Measurement Point**

A case temperature measurement point location is included on the top surface of the Vero LED arrays. The location of this measurement point is indicated in the mechanical dimensions section of this data sheet.

The purpose of this measurement point is to allow the user access to a measurement point which correlates to the true case temperature on the back surface of the LED array. Once the LED array is installed, it is challenging to measure the back surface of the array, or true case temperature.

Consistent and repeatable temperature measurements can be correlated to the data sheet performance specifications and to published LM-80 reliability data. The use of the case temperature measurements point is fully explained in AN30.

## **CAUTION: CONTACT WITH LIGHT EMITTING SURFACE (LES)**

Avoid any contact with the LES. Do not touch the LES of the Vero 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. 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.

## **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 62471: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 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.

## Product Selection Guide

The following product configurations are available:

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

Product	Part Number <sup>[1]</sup>	Nominal CCT (K)	CRI	Nominal Drive Current <sup>[2]</sup> (mA)	Typical Pulsed Flux <sup>[3]</sup> $T_c = 25^\circ\text{C}$ (lm)	Typical $V_f$ (V)	Typical Power (W)	Typical Efficacy (lm/W)
Décor Ultra Vero 10	BXRC-27H1000-B-xx	2700	97	350	700	26.5	9.3	75
Décor Ultra Vero 10	BXRC-30H1000-B-xx	3000	97	350	755	26.5	9.3	81
Décor Ultra Vero 13	BXRC-27H2000-C-xx	2700	97	500	1210	32.3	16.2	75
Décor Ultra Vero 13	BXRC-30H2000-C-xx	3000	97	500	1330	32.3	16.2	82
Décor Ultra Vero 18	BXRC-27H4000-F-xx	2700	97	1050	2340	29.5	31.0	76
Décor Ultra Vero 18	BXRC-30H4000-F-xx	3000	97	1050	2580	29.5	31.0	83
Décor Food Vero 18	BXRC-17E4000-F-04	1750	80	1050	2150	29.5	31.0	69
Décor Food Vero 18	BXRC-25E4000-F-04	2500	80	1050	3300	29.5	31.0	107
Décor Specialty Vero 18	BXRC-56G4000-F-04	5600	90	1050	3550	29.5	31.0	115
Décor Specialty Vero 29	BXRC-56G10K0-L-04	5600	90	2100	9680	38.0	79.8	121

**Table 2: Selection Guide, Stabilized DC Performance ( $T_c = 85^\circ\text{C}$ )<sup>[4][5]</sup>**

Product	Part Number <sup>[1]</sup>	Nominal CCT (K)	CRI	Nominal Drive Current <sup>[2]</sup> (mA)	Typical DC Flux $T_c = 85^\circ\text{C}$ (lm)	Typical $V_f$ (V)	Typical Power (W)	Typical Efficacy (lm/W)
Décor Ultra Vero 10	BXRC-27H1000-B-xx	2700	97	350	574	25.8	9.0	64
Décor Ultra Vero 10	BXRC-30H1000-B-xx	3000	97	350	619	25.8	9.0	69
Décor Ultra Vero 13	BXRC-27H2000-C-xx	2700	97	500	992	31.5	15.8	63
Décor Ultra Vero 13	BXRC-30H2000-C-xx	3000	97	500	1091	31.5	15.8	69
Décor Ultra Vero 18	BXRC-27H4000-F-xx	2700	97	1050	1919	28.8	30.2	63
Décor Ultra Vero 18	BXRC-30H4000-F-xx	3000	97	1050	2116	28.8	30.2	70
Décor Food Vero 18	BXRC-17E4000-F-04	1750	80	1050	1892	28.8	30.2	63
Décor Food Vero 18	BXRC-25E4000-F-04	2500	80	1050	2904	28.8	30.2	96
Décor Specialty Vero 18	BXRC-56G4000-F-04	5600	90	1050	3053	28.8	30.2	101
Décor Specialty Vero 29	BXRC-56G10K0-L-04	5600	90	2100	8325	37.0	77.8	107

Notes for Tables 1 & 2:

1. The “-xx” suffix refers to color control, “-02” for 2SDCM, “-03” for 3SDCM or “-04” for 4SDCM.
2. Drive current is referred to as nominal drive current.
3. Bridgelux maintains a  $\pm 7\%$  tolerance on flux measurements.
4. Typical stabilized DC performance values are provided as reference only and are not a guarantee of performance.
5. 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.

## Performance at Commonly Used Drive Currents

Vero LED Arrays are tested at the drive currents in bold text and highlighted in grey. 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 Figures 2, 3, 4, and 5 and the flux vs. current characteristics shown in Figures 6, 7, 8, and 9. 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 (mA) <sup>[1]</sup>	Typical V <sub>f</sub> T <sub>c</sub> = 25°C (V)	Typical Watt T <sub>c</sub> = 25°C (W)	Typical Flux T <sub>c</sub> = 25°C (lm) <sup>[2]</sup>	Typical DC Flux T <sub>c</sub> = 85°C (lm) <sup>[2][3]</sup>	Typical Efficacy T <sub>c</sub> = 25°C (lm/W)
BXRC-27H1000-B-xx	97	175	25.3	4.4	372	313	84
		<b>350</b>	<b>26.5</b>	<b>9.3</b>	<b>700</b>	<b>574</b>	<b>75</b>
		500	27.4	13.7	956	762	70
		700	28.4	19.9	1260	962	63
BXRC-30H1000-B-xx	97	175	25.3	4.4	401	337	91
		<b>350</b>	<b>26.5</b>	<b>9.3</b>	<b>755</b>	<b>619</b>	<b>81</b>
		500	27.4	13.7	1031	822	75
		700	28.4	19.9	1359	1037	68
BXRC-27H2000-C-xx	97	175	30.2	5.3	461	387	87
		350	31.4	11.0	875	726	80
		<b>500</b>	<b>32.3</b>	<b>16.2</b>	<b>1210</b>	<b>992</b>	<b>75</b>
		700	33.4	23.4	1619	1308	69
		1050	35.1	36.9	2251	1760	61
BXRC-30H2000-C-xx	97	175	30.2	5.3	506	425	96
		350	31.4	11.0	962	798	87
		<b>500</b>	<b>32.3</b>	<b>16.2</b>	<b>1330</b>	<b>1091</b>	<b>82</b>
		700	33.4	23.4	1780	1438	76
		1050	35.1	36.9	2474	1935	67
BXRC-27H4000-F-xx	97	500	28.1	14.1	1184	989	84
		700	28.7	20.1	1617	1343	80
		<b>1050</b>	<b>29.5</b>	<b>31.0</b>	<b>2340</b>	<b>1919</b>	<b>76</b>
		1400	30.2	42.3	3001	2433	71
		2100	31.6	66.4	4183	3294	63
BXRC-30H4000-F-xx	97	500	28.1	14.1	1306	1091	93
		700	28.7	20.1	1782	1481	89
		<b>1050</b>	<b>29.5</b>	<b>31.0</b>	<b>2580</b>	<b>2116</b>	<b>83</b>
		1400	30.2	42.3	3308	2683	78
		2100	31.6	66.4	4612	3631	69
BXRC-17E4000-F-04	80	500	28.1	14.1	1088	975	77
		700	28.7	20.1	1485	1324	74
		<b>1050</b>	<b>29.5</b>	<b>31.0</b>	<b>2150</b>	<b>1892</b>	<b>69</b>
		1400	30.2	42.3	2757	2399	65
		2100	31.6	66.4	3843	3248	58
BXRC-25E4000-F-04	80	500	28.1	14.1	1670	1497	119
		700	28.7	20.1	2280	2032	113
		<b>1050</b>	<b>29.5</b>	<b>31.0</b>	<b>3300</b>	<b>2904</b>	<b>107</b>
		1400	30.2	42.3	4231	3682	100
		2100	31.6	66.4	5899	4985	89
BXRC-56G4000-F-04	90	500	28.1	14.1	1797	1574	128
		700	28.7	20.1	2453	2137	122
		<b>1050</b>	<b>29.5</b>	<b>31.0</b>	<b>3550</b>	<b>3053</b>	<b>115</b>
		1400	30.2	42.3	4552	3871	108
		2100	31.6	66.4	6346	5240	96
BXRC-56G10K0-L-04	90	500	35.1	17.6	2597	2285	148
		700	35.6	24.9	3549	3123	142
		1050	36.4	38.2	5170	4550	135
		<b>2100</b>	<b>38.0</b>	<b>79.8</b>	<b>9680</b>	<b>8325</b>	<b>121</b>
		2800	39.0	109.2	12419	10929	114
		3150	39.5	124.4	13698	12054	110
		4200	40.4	169.7	17192	15129	101

Notes for Table 3:

1. Values in bold correspond to performance at nominal drive current listed in Table 1. Alternate drive currents in Table 3 are provided for reference only and are not a guarantee of performance.
2. Bridgelux maintains a ± 7% tolerance on flux measurements.
3. Typical stabilized DC performance values are provided as reference only and are not a guarantee of performance.

## Flux & Electrical Characteristics

**Table 4: Flux Characteristics**

CCT (K)	Part Number	CRI	Nominal Drive Current (mA) <sup>[1]</sup>	Typical Pulsed Flux $T_c = 25^\circ\text{C}$ (lm) <sup>[1][2][6]</sup>	Minimum Pulsed Flux $T_c = 25^\circ\text{C}$ (lm) <sup>[1][2]</sup>	Typical DC Flux $T_c = 85^\circ\text{C}$ (lm) <sup>[3][4][6]</sup>	Minimum DC Flux $T_c = 85^\circ\text{C}$ (lm) <sup>[5]</sup>
2700	BXRC-27H1000-B-xx	97	350	700	635	574	521
3000	BXRC-30H1000-B-xx	97	350	755	695	619	570
2700	BXRC-27H2000-C-xx	97	500	1210	1110	992	910
3000	BXRC-30H2000-C-xx	97	500	1330	1210	1091	992
2700	BXRC-27H4000-F-xx	97	1050	2340	2130	1919	1747
3000	BXRC-30H4000-F-xx	97	1050	2580	2310	2116	1894
1750	BXRC-17E4000-F-04	80	1050	2150	2050	1892	1804
2500	BXRC-25E4000-F-04	80	1050	3300	2680	2904	2358
5600	BXRC-56G4000-F-04	90	1050	3550	3200	3053	2752
5600	BXRC-56G10K0-L-04	90	2100	9680	8715	8325	7495

Notes for Table 4:

- Parts are tested in pulsed conditions,  $T_c = 25^\circ\text{C}$ . Pulse width is 10 milliseconds at nominal drive current.
- Bridgelux maintains a  $\pm 7\%$  tolerance on flux measurements.
- 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 the 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 DC Flux values are provided for reference only and are not a parameter 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.
- Refer to Table 3 for typical performance at other drive currents.

**Table 5: Electrical Characteristics and Driver Selection Voltages**

Part Number	Drive Current (mA) <sup>[1]</sup>	Forward Voltage Pulsed, $T_c = 25^\circ\text{C}$ (V) <sup>[1][2][3]</sup>			Typical Coefficient of Forward Voltage $\Delta V_f / \Delta T_c$ (mV/ $^\circ\text{C}$ )	Typical Thermal Resistance Junction to Case $R\theta_{j-c}$ (C/W) <sup>[4]</sup>	Driver Selection Voltages (V) <sup>[5]</sup>	
		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-xx	350	24.5	<b>26.5</b>	28.5	-11	1.6	23.6	29.2
	700	26.2	28.4	30.7	-11	2.1	25.3	31.4
BXRC-xxx2000-C-xx	500	29.9	<b>32.3</b>	34.7	-14	0.78	28.8	35.6
	1050	32.0	35.1	37.9	-14	0.93	30.9	38.8
BXRC-xxx4000-F-xx	1050	27.3	<b>29.5</b>	31.7	-12	0.29	26.3	32.5
	2100	29.2	31.6	34.2	-12	0.38	28.2	35.0
BXRC-xxx10K0-L-xx	2100	35.2	<b>38.0</b>	40.9	-16	0.13	33.9	41.9
	4200	37.3	40.4	44.0	-16	0.17	36.0	45.0

Notes for Table 5:

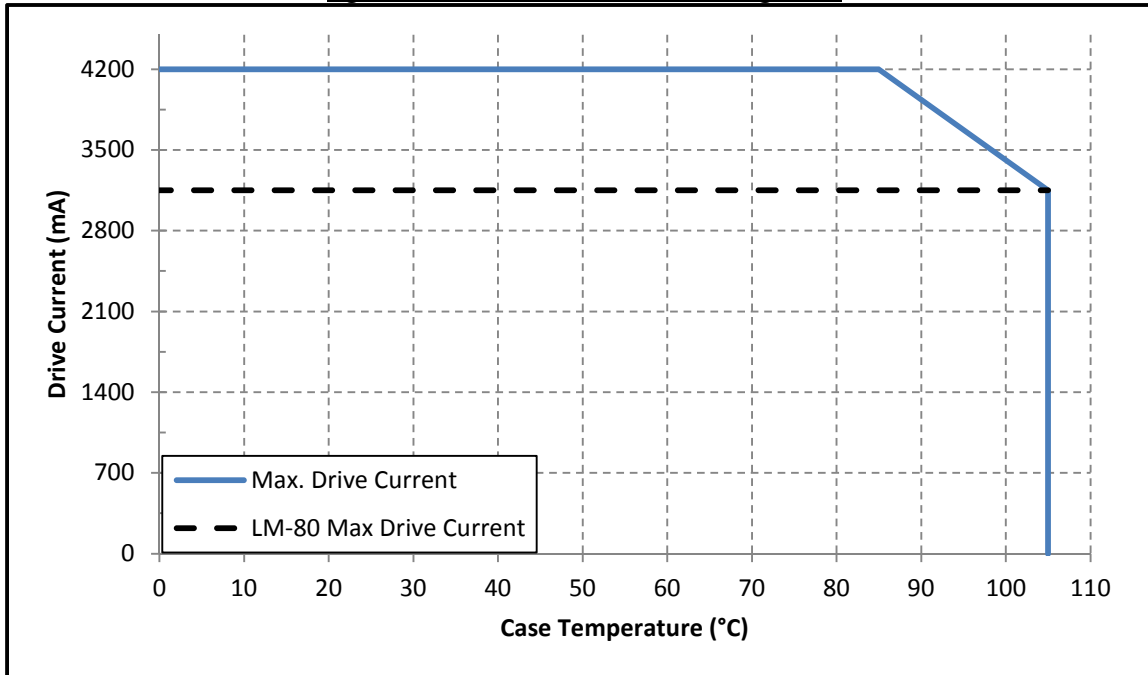
- Parts are tested in pulsed conditions at the nominal drive current (indicated in bold font),  $T_c = 25^\circ\text{C}$ . Pulse width is 10 ms.
- Bridgelux maintains a tester tolerance of  $\pm 0.10$  V on forward voltage measurements.
- Forward voltage minimum and maximum values at the nominal drive current (indicated in bold font) are guaranteed by 100% test. Values provided at other drive currents are provided for reference only and are not guaranteed by test.
- Thermal resistance values are based on testing data from a 3000K 80 CRI product.
- $V_f$  Min hot and  $V_f$  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.



### Drive Current Derating Curve

The maximum allowable drive current for the Vero 29 family of products is dependent on the operating case temperature. Please refer to Figure 17 for the location of the  $T_c$  Point.

**Figure 1: Vero 29 Drive Current Derating Curve**



Notes for Figure 1:

1. LM-80 Max Drive Current must not be violated in order to meet LM-80 lifetime projections.
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.

## Absolute Maximum Ratings

**Table 6: Maximum Drive Current and Reverse Voltage Ratings**

Part Number	Maximum Drive Current (mA) <sup>[3]</sup>	Maximum Peak Pulsed Drive Current (mA) <sup>[1]</sup>	Maximum Reverse Voltage (V <sub>r</sub> ) <sup>[2]</sup>
BXRC-xxx1000-B-xx	700	1500	-45
BXRC-xxx2000-C-xx	1050	1500	-55
BXRC-xxx4000-F-xx	2100	3000	-50
BXRC-xxx10K0-L-xx <sup>[4]</sup>	4200	6000	-65

Notes for Table 6:

1. Bridgelux recommends a maximum duty cycle of 10% 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.
2. 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.
3. 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.
4. Please refer to Figure 1 for drive current derating curve.

**Table 7: Maximum Ratings**

Parameter	Maximum Rating
LED Junction Temperature	150°C
Storage Temperature	-40°C to +105°C
Operating Case Temperature	105°C <sup>[2]</sup>
Soldering Temperature <sup>[1]</sup>	350°C for a maximum of 10 seconds
ESD Withstand Voltage per JESD22-A114D (HBM)	8,000 volts

Notes for Table 7:

1. See Bridgelux Application Note AN31, Assembly Considerations for Vero LED arrays, for more information.
2. For IEC 62717 requirement, please contact Bridgelux Sales Support.

Drive Current vs. Forward Voltage Characteristics

Figure 2: Drive Current vs. Forward Voltage ( $T_j = T_c = 25^{\circ}\text{C}$ ) – BXRC-xxx1000-B-xx

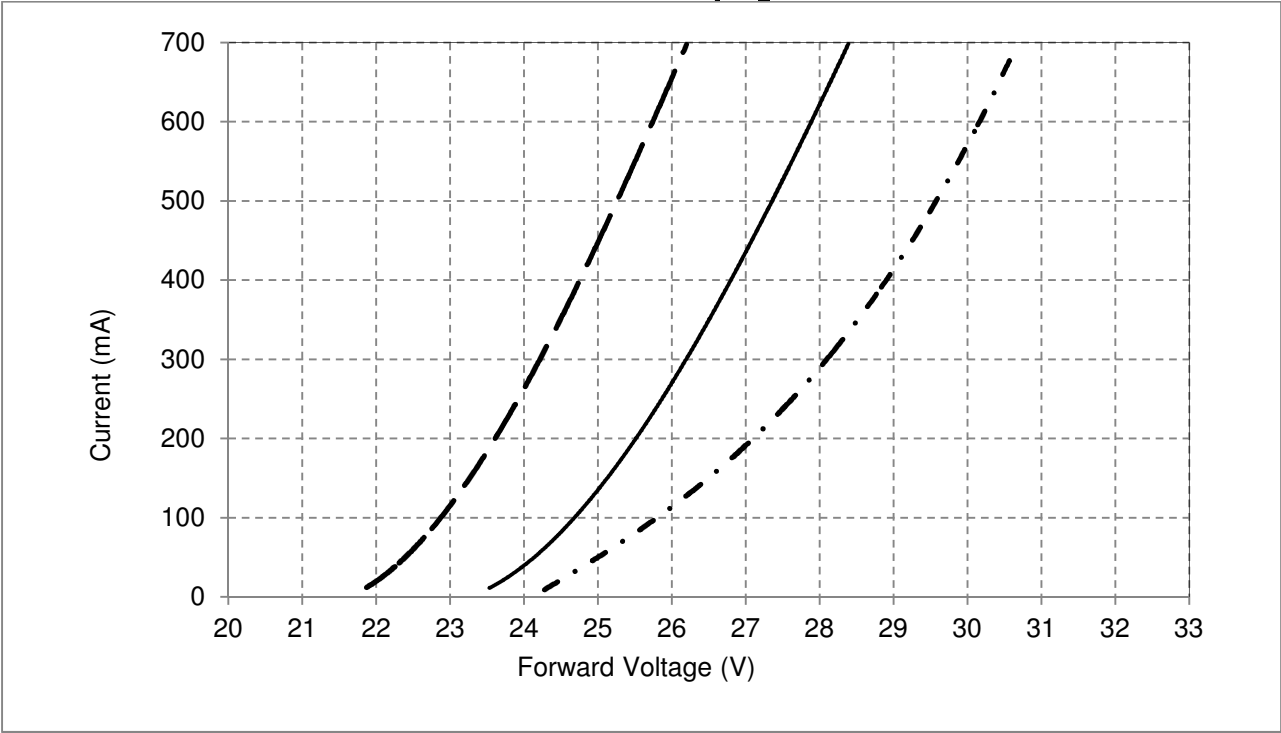
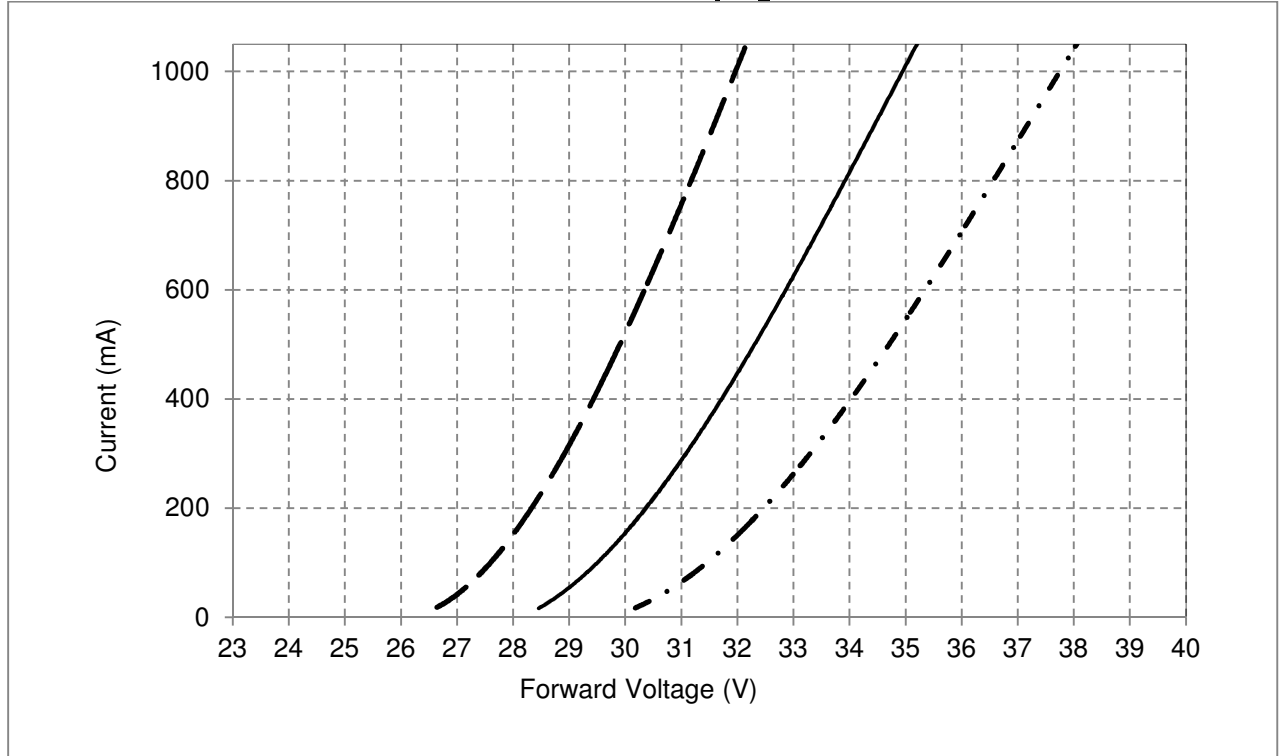


Figure 3: Drive Current vs. Forward Voltage ( $T_j = T_c = 25^{\circ}\text{C}$ ) – BXRC-xxx2000-C-xx



Drive Current vs. Forward Voltage Characteristics Continued

Figure 4: Drive Current vs. Forward Voltage ( $T_i = T_c = 25^{\circ}\text{C}$ ) – BXRC-xxx4000-F-xx

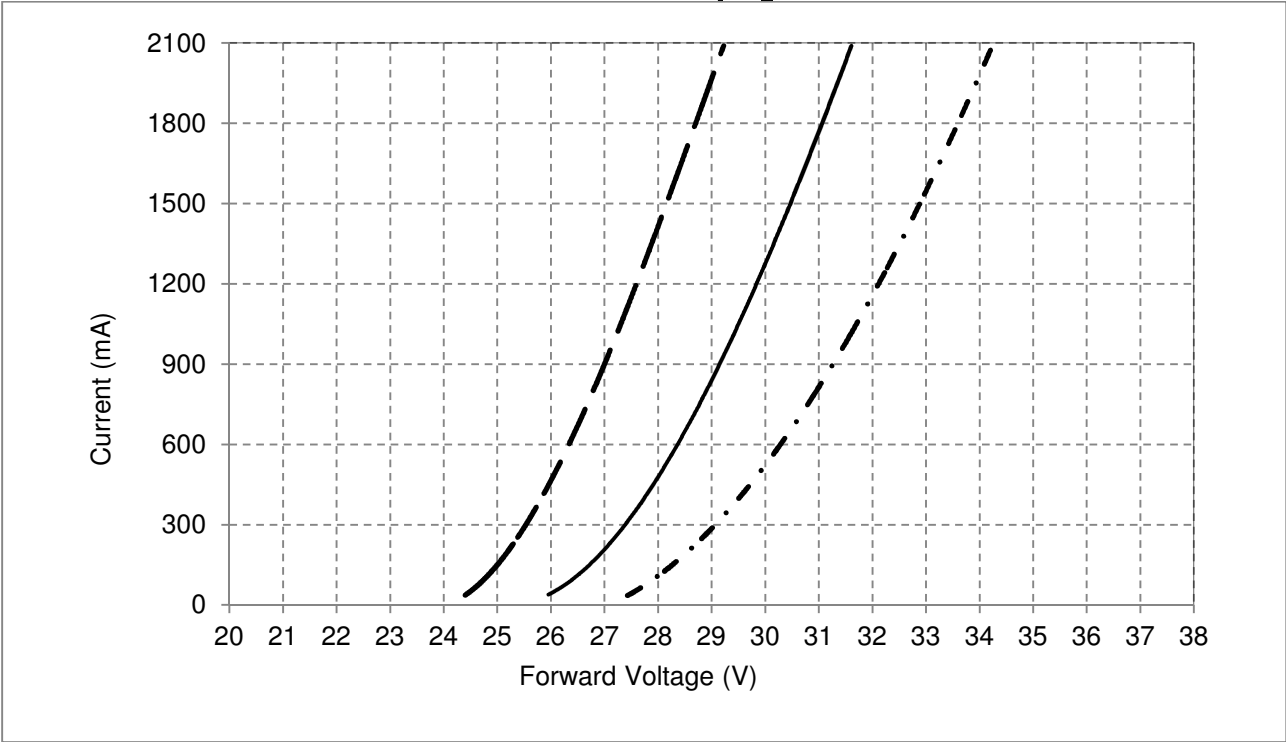
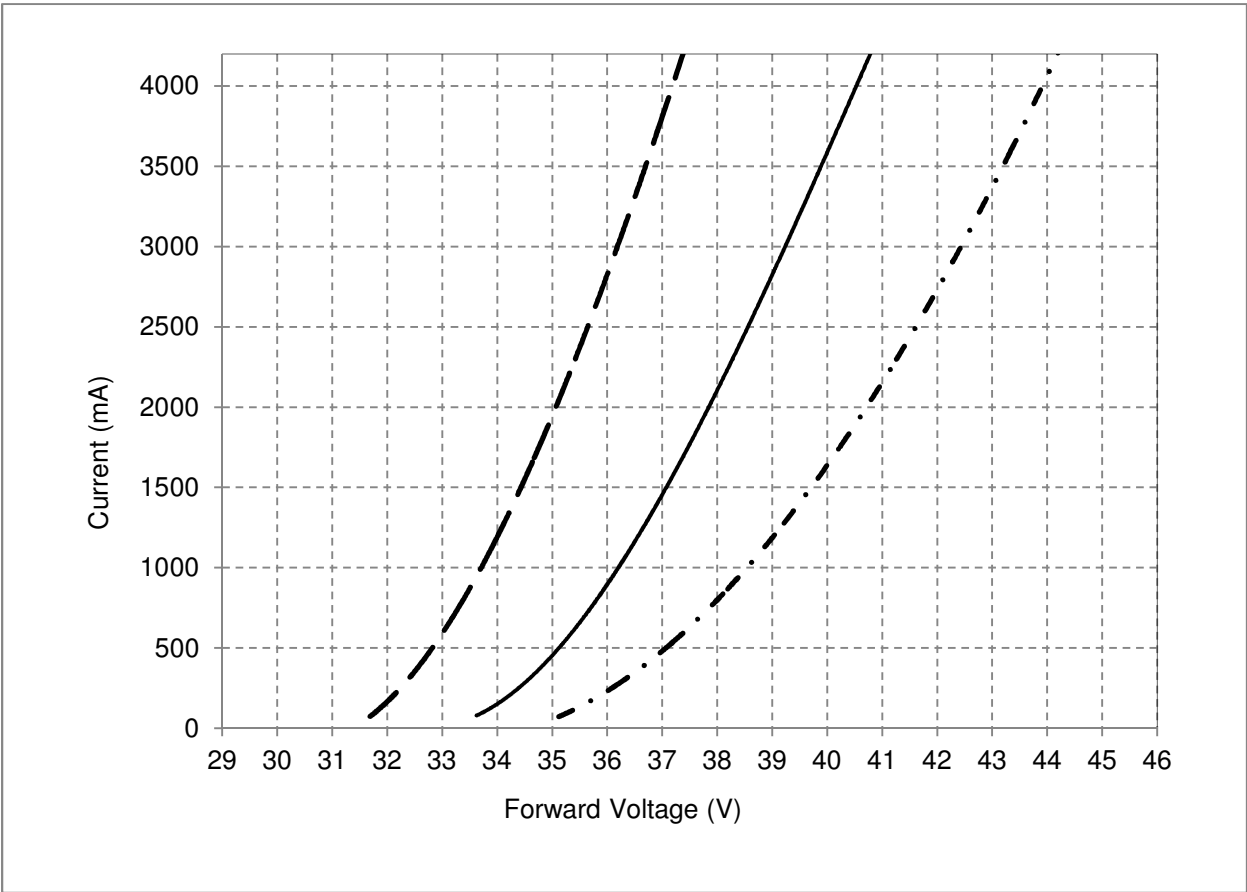


Figure 5: Drive Current vs. Forward Voltage ( $T_i = T_c = 25^{\circ}\text{C}$ ) – BXRC-xxx10K0-L-xx



Typical Relative Luminous Flux vs. Drive Current,  $T_c=25^{\circ}\text{C}$

Figure 6: Typical Flux vs. Drive Current,  $T_c = 25^{\circ}\text{C}$  – BXRC-xxx1000-B-xx

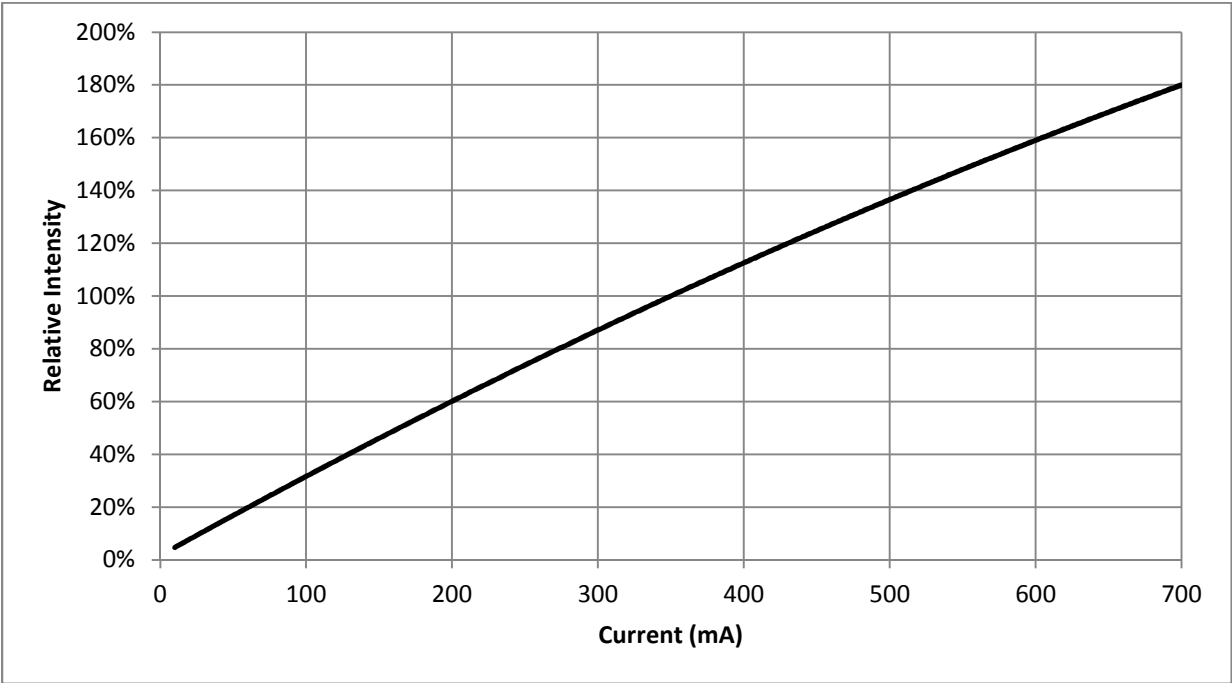
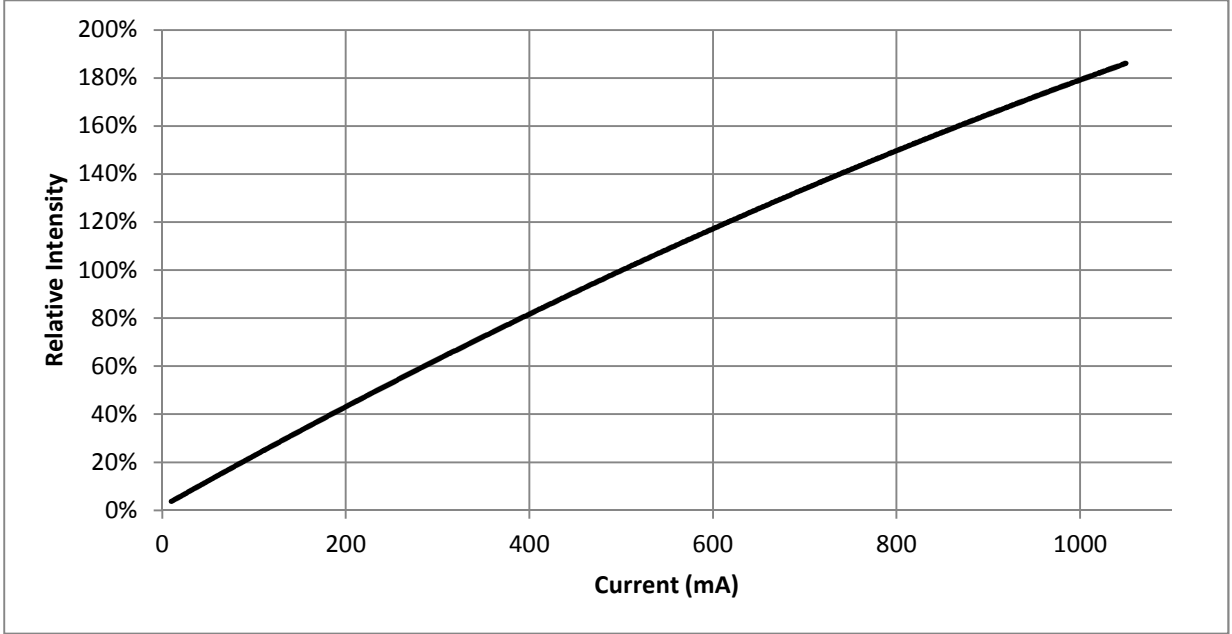
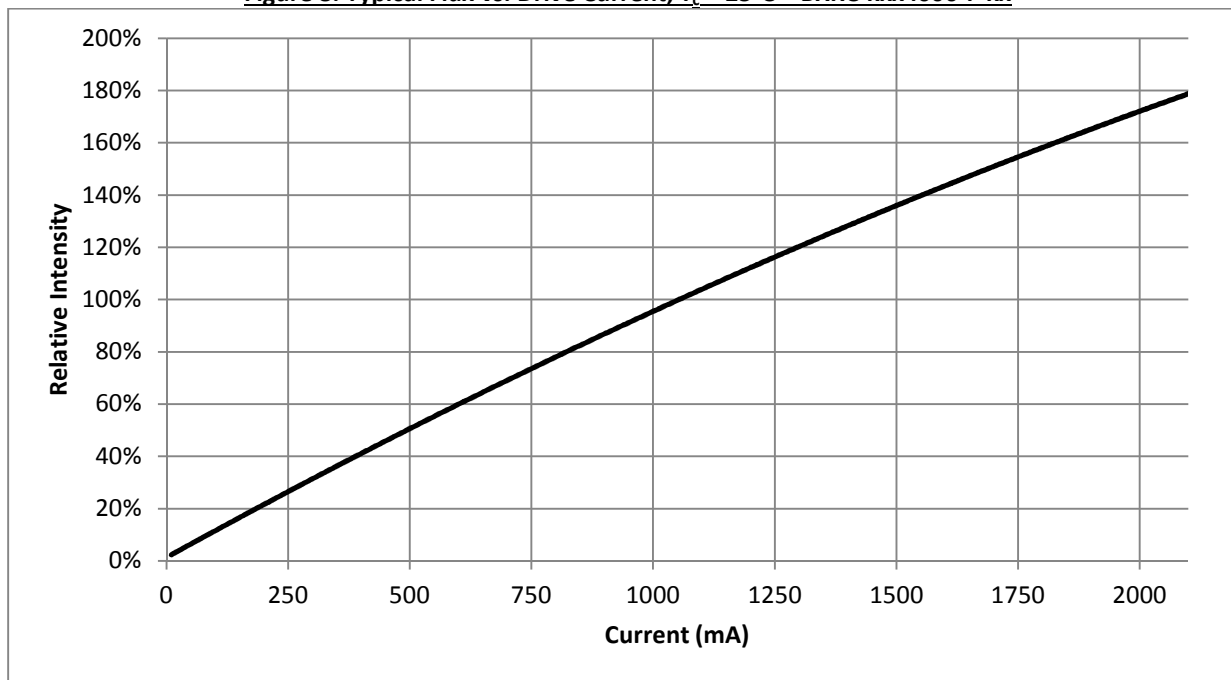


Figure 7: Typical Flux vs. Drive Current,  $T_c = 25^{\circ}\text{C}$  – BXRC-xxx2000-C-xx

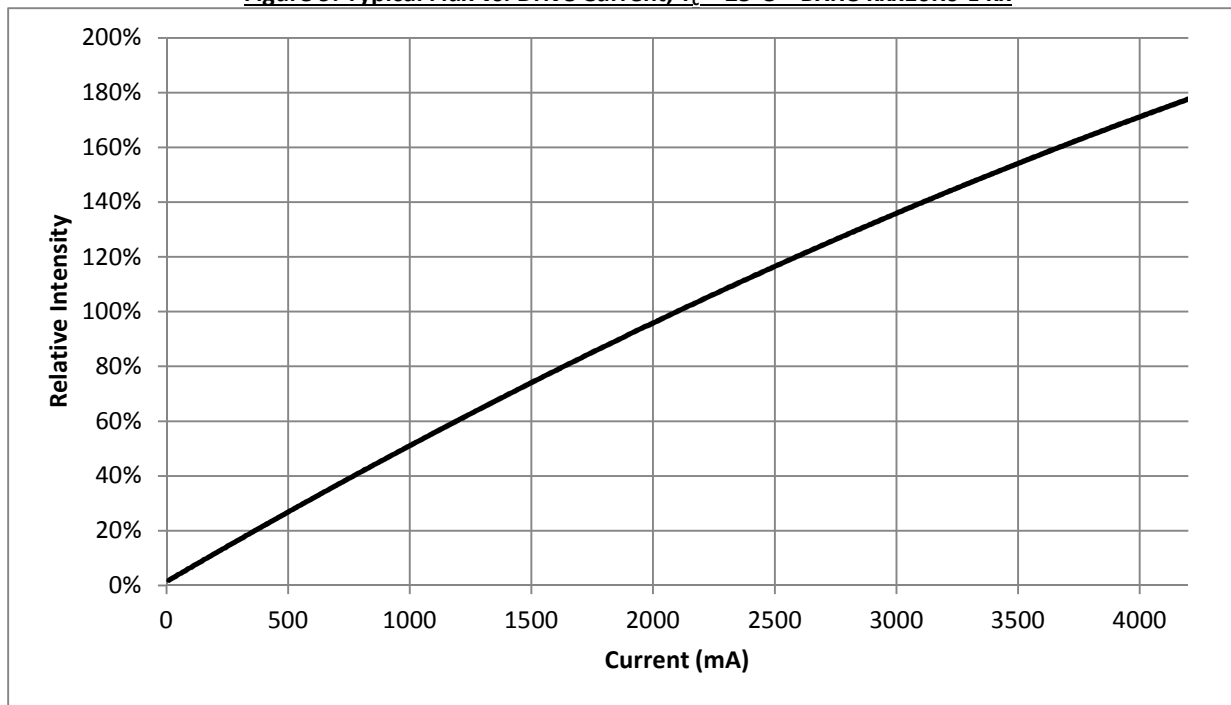


## Typical Relative Luminous Flux vs. Drive Current, $T_c=25^\circ\text{C}$ Continued

**Figure 8: Typical Flux vs. Drive Current,  $T_c = 25^\circ\text{C}$  – BXRC-xxx4000-F-xx**

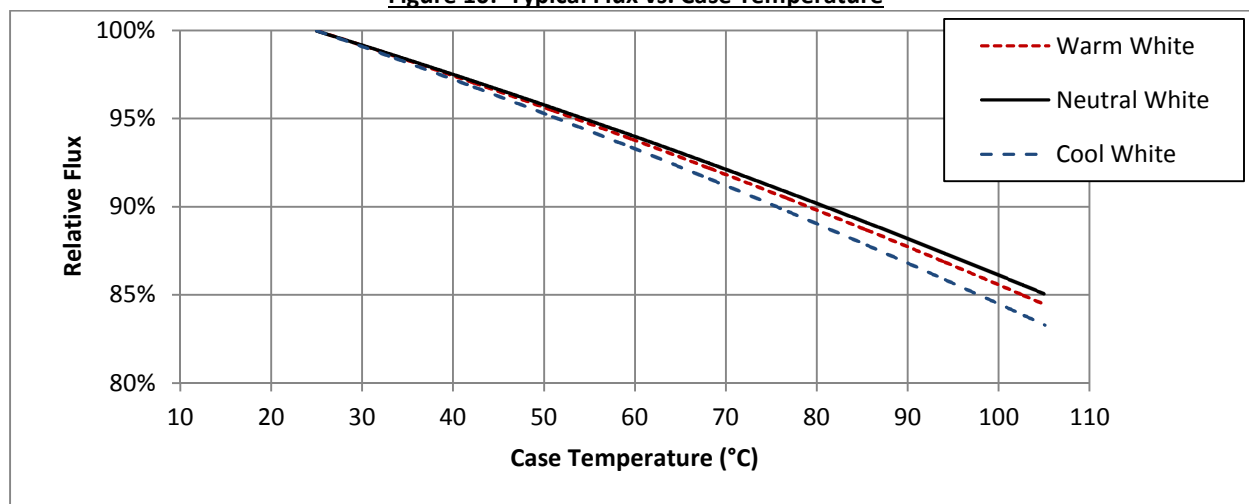


**Figure 9: Typical Flux vs. Drive Current,  $T_c = 25^\circ\text{C}$  – BXRC-xxx10K0-L-xx**



## Typical Light Output Characteristics vs. Temperature

**Figure 10: Typical Flux vs. Case Temperature**

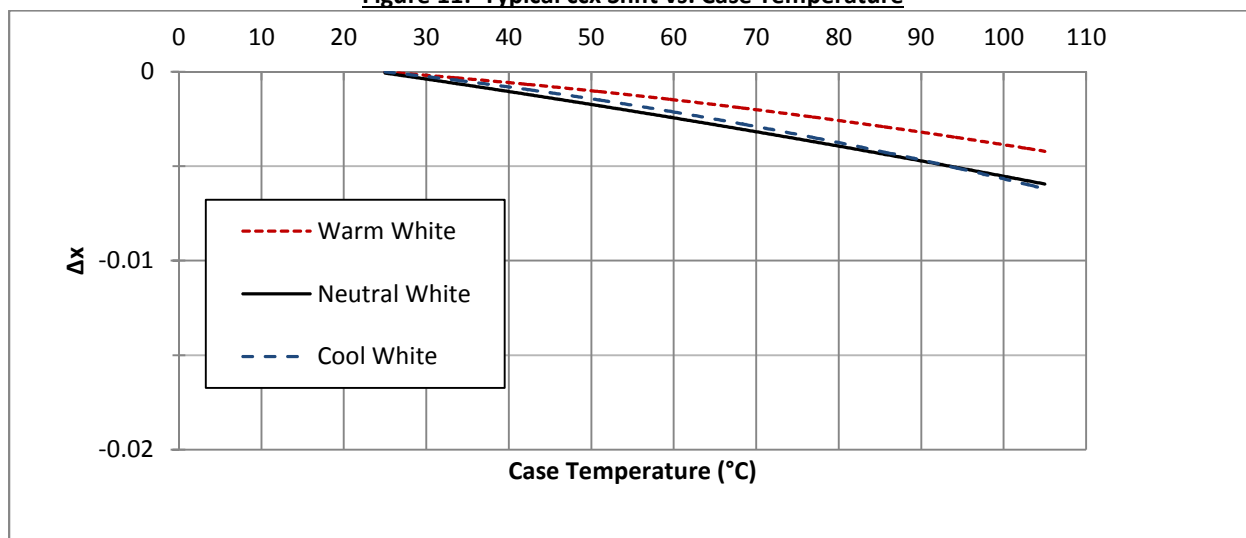


**Notes for Figure 10:**

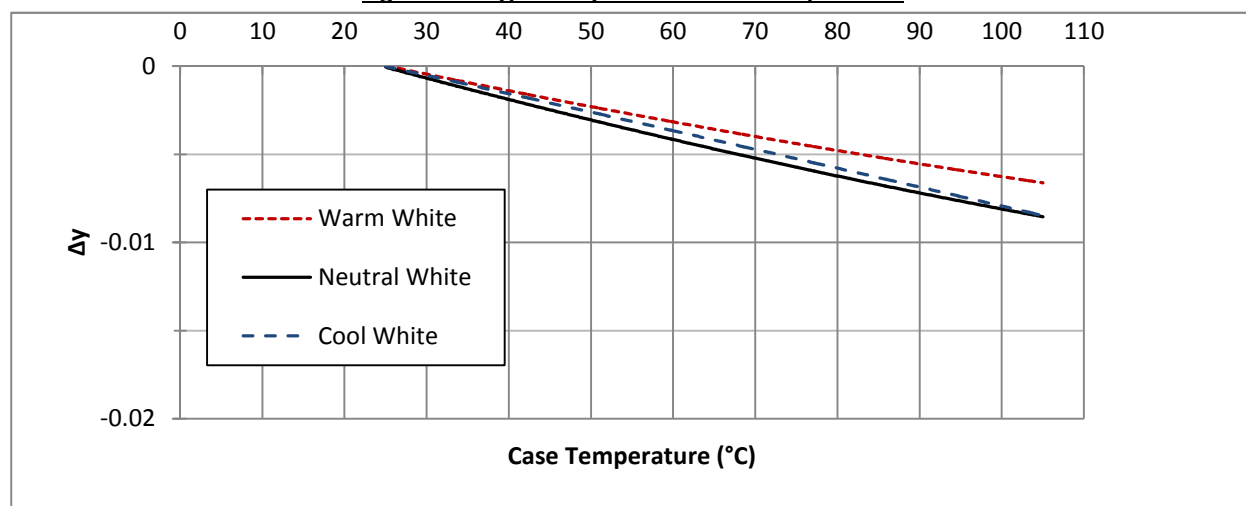
1. Characteristics shown for warm white reflect 3000K 80 CRI.
2. Characteristics shown for neutral white reflect 4000K 80 CRI.
3. Characteristics shown for cool white reflect 5000K 70 CRI.
4. For other color SKUs the shift in color will vary, please contact your Bridgelux sales representative for more information.

## Typical Chromaticity Characteristics vs. Temperature

**Figure 11: Typical ccx Shift vs. Case Temperature**



**Figure 12: Typical ccy Shift vs. Case Temperature**



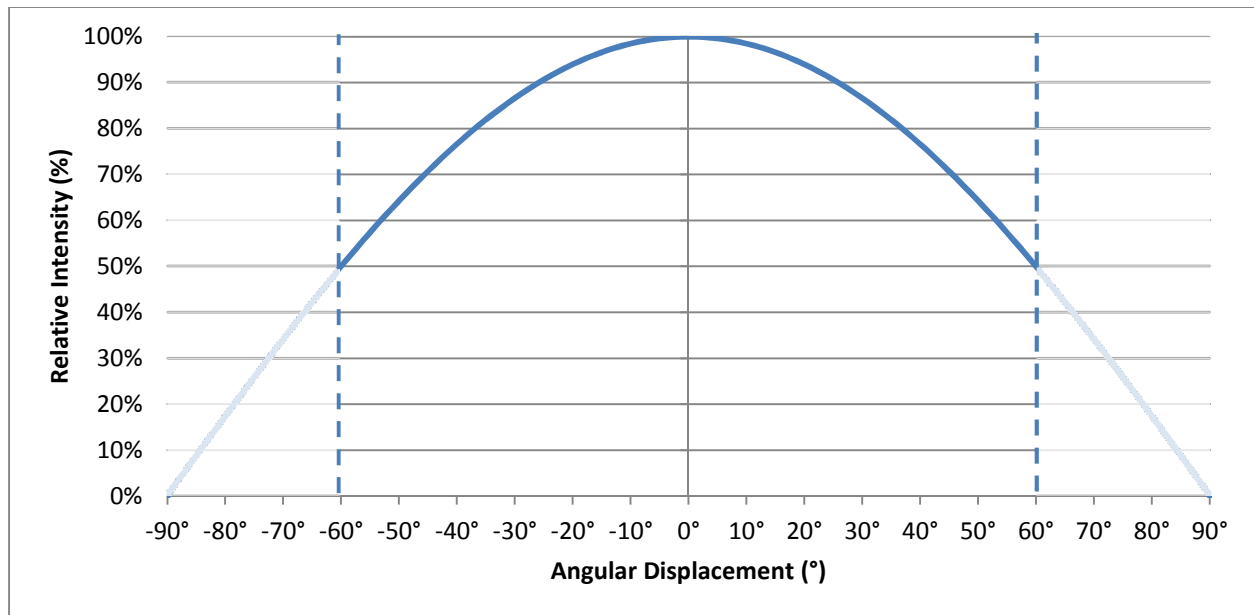
Notes for Figure 11 and 12:

1. Characteristics shown for warm white reflect 3000K 80 CRI.
2. Characteristics shown for neutral white reflect 4000K 80 CRI.
3. Characteristics shown for cool white reflect 5000K 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

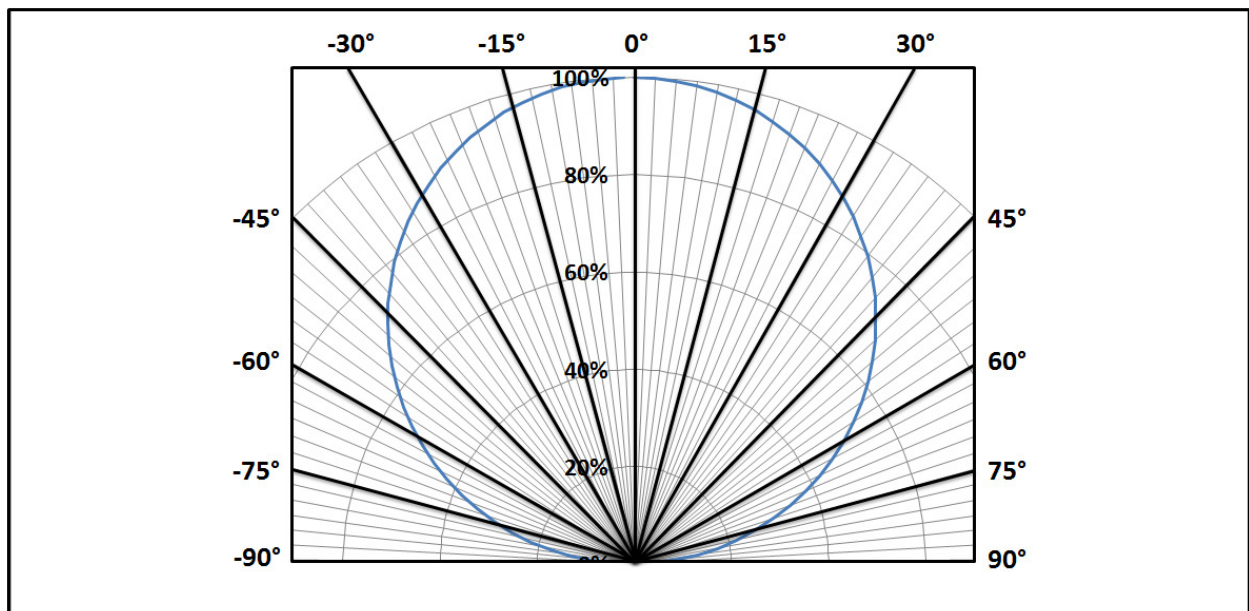
**Figure 13: Typical Spatial Radiation Pattern**



Notes for figure 13:

1. Typical viewing angle is 120°.
2. The viewing angle is defined as the off axis angle from the centerline where Iv is ½ of the peak value.

**Figure 14: Typical Polar Radiation Pattern**



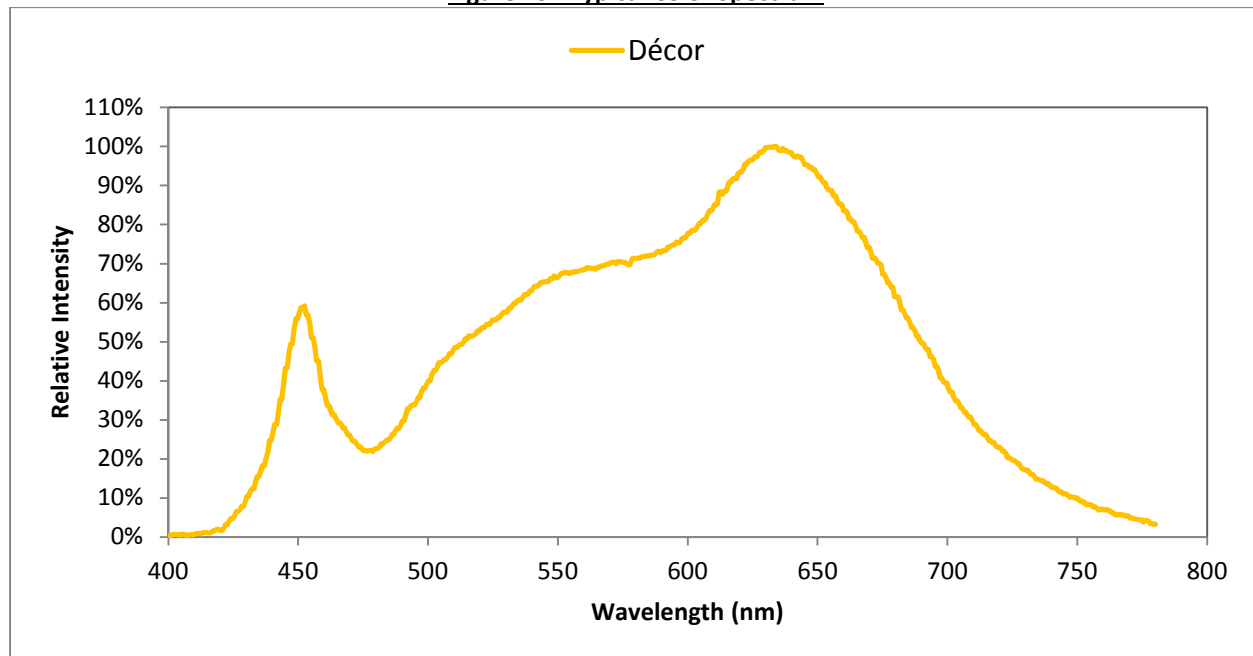
### 97 CRI- Wavelength & CRI Characteristics at Drive Current, Tc=25°C

The high CRI light delivered by the Bridgelux Vero Décor products reproduces colors faithfully compared with natural light. Figure 15 displays the spectral curve of Décor.

Table 8 compares CRI R values of Décor to other light sources. The typical overall CRI (Ra) of 97 results in excellent color representation - especially for colors which the human eye is particularly sensitive.

Décor delivers high typical values of R9 (98) and R15 (98). These are important attributes for the perception of realistic colors. R9 enhances red colors and R15 enables realistic rendering of human skin tones.

**Figure 15: Typical Color Spectrum**

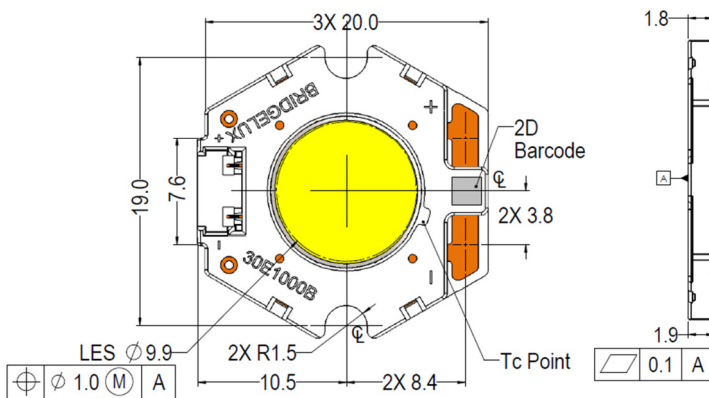


**Table 8: CRI Spectra for Décor Ultra Products vs Alternative Light Sources**

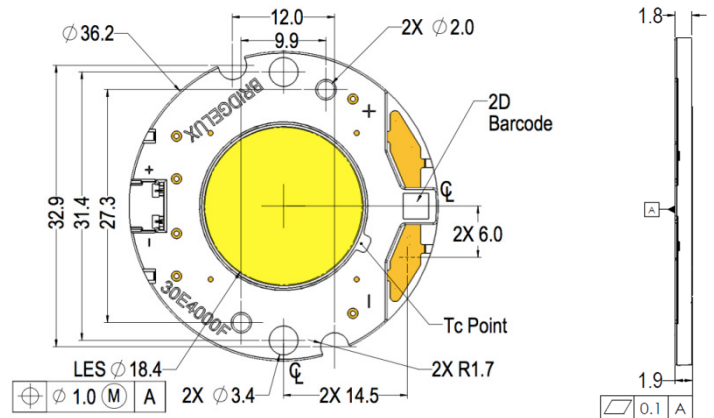
Light Source	Ra	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
Bridgelux Décor	97	97	100	96	96	98	98	99	98	98	99	92	87	98	97	98
Typical Halogen	98	98	99	99	99	98	98	99	97	92	97	98	97	98	99	97
Typical Metal Halide	82	90	94	69	82	81	81	87	71	27	59	62	55	93	78	88
Typical Compact Fluorescent	87	91	93	86	91	89	90	88	70	17	76	91	81	93	92	81

## Mechanical Dimensions

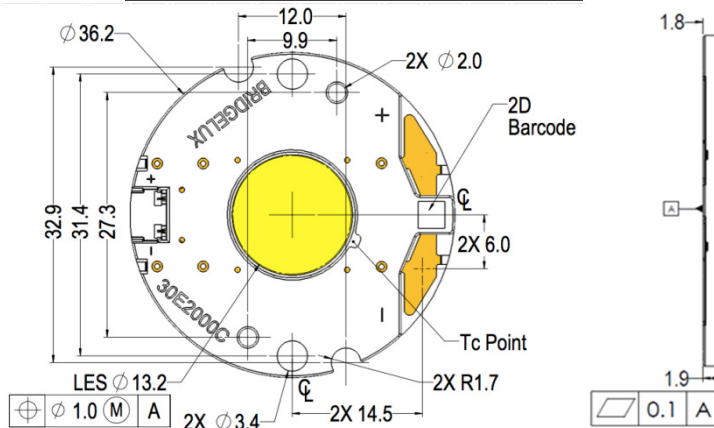
**Figure 16: Drawing for Vero 10 LED Array**



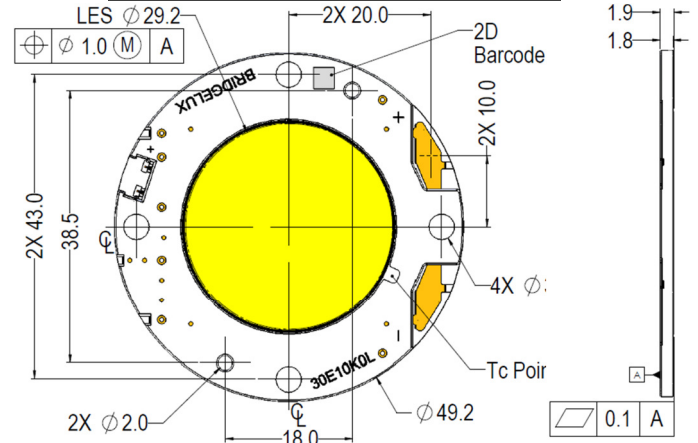
**Figure 17: Drawing for Vero 18 LED Array**



**Figure 18: Drawing for Vero 13 LED Array**



**Figure 19: Drawing for Vero 29 LED Array**

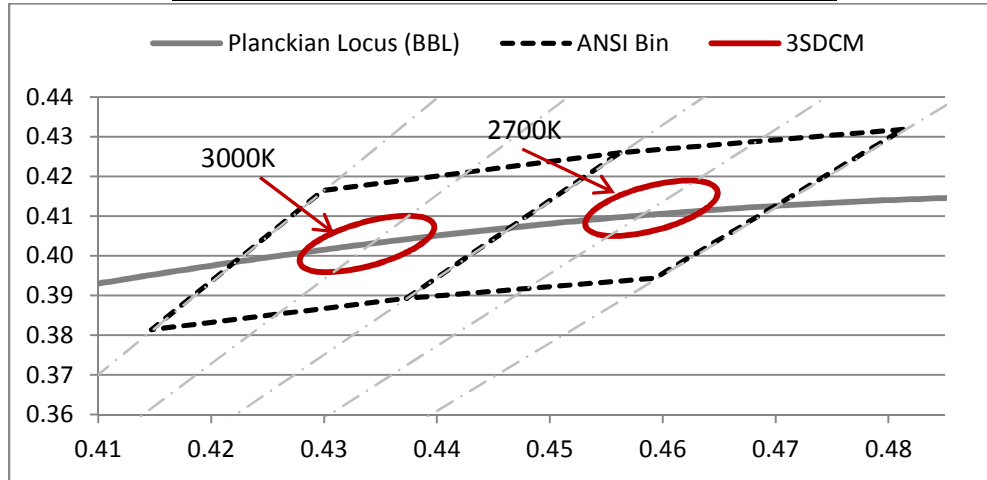


Notes for Figures 16, 17, 18, 19:

1. Mounting holes (2X) are for M2.5 screws.
2. For the Vero 13 & Vero 18, Bridgelux recommends two tapped holes for mounting screws with  $31.4 \pm 0.10$ mm center-to-center spacing.
3. For the Vero 10, Bridgelux recommends two tapped holes for mounting screws with  $19.0 \pm 0.10$ mm center-to-center spacing.
4. Screws with flat shoulders (pan, dome, button, round, truss, mushroom) provide optimal torque control. Do NOT use flat, countersink, or raised head screws.
5. Solder pads and connector port are labeled "+" and "-" to denote positive and negative, respectively.
6. 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.
7. Drawings are not to scale.
8. Drawing dimensions are in millimeters.
9. Unless otherwise specified, tolerances are  $\pm 0.10$ mm.
10. Refer to Application Notes AN30 and AN31 for product handling, mounting and heat sink recommendations.
11. The optical center of the LED Array is nominally defined by the mechanical center of the array to a tolerance of  $\pm 0.2$ mm.
12. Bridgelux maintains a flatness of 0.10mm across the mounting surface of the array.
13. Bridgelux Vero 13 and Vero 18 LED arrays are packaged in trays of 20 units with a maximum planar dimension of 215.0mm x 279.4 mm (8.5 x 11 inches) per tray.
14. Bridgelux Vero 10 LED arrays are packaged in trays of 40 units with a maximum planar dimension of 215.0 mm x 279.4 mm (8.5 x 11 inches) per tray.

## 97 CRI- Color Binning Information

**Figure 20: Graph of Warm White Test Bins in xy Color Space**



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

**Table 9: Warm White xy Bin Coordinates and Associated Typical CCT**

Bin Code	2700K	3000K
ANSI Bin (for reference only)	(2580K - 2870K)	(2870K - 3220K)
03 (3SDCM)	(2651K - 2794K)	(2968K - 3136K)
02 (2SDCM)	(2674K - 2769K)	(2995K - 3107K)
Center Point (x,y)	(0.4578, 0.4101)	(0.4338, 0.403)

## Design Resources

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. Included below is a list of resources under development which will be downloaded from the Bridgelux web site under the Design Resources section.

### Application Notes

- AN30: Effective Thermal Management of Bridgelux Vero LED Arrays
- AN31: Assembly Considerations for Bridgelux Vero LED Arrays
- AN32: Electrical Drive Considerations for Bridgelux Vero LED Arrays
- AN34: Reliability Data Sheet for Bridgelux Vero LED Arrays
- AN36: Optical Considerations for Bridgelux Vero LED Arrays

### Optical Source Models

Optical source models and ray set files are available for all Bridgelux Vero LED array products. The list below contains the formats currently available. If you require a specific format not included in this list, please contact your Bridgelux sales representative for assistance.

- Zemax
- ASAP
- IESNA
- LightTools
- LucidShape
- OPTIS SPEOS
- PHOTOPA
- TracePro
- Radiant Imaging Source Model

### 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.

## 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, please visit [www.bridgelux.com](http://www.bridgelux.com).

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