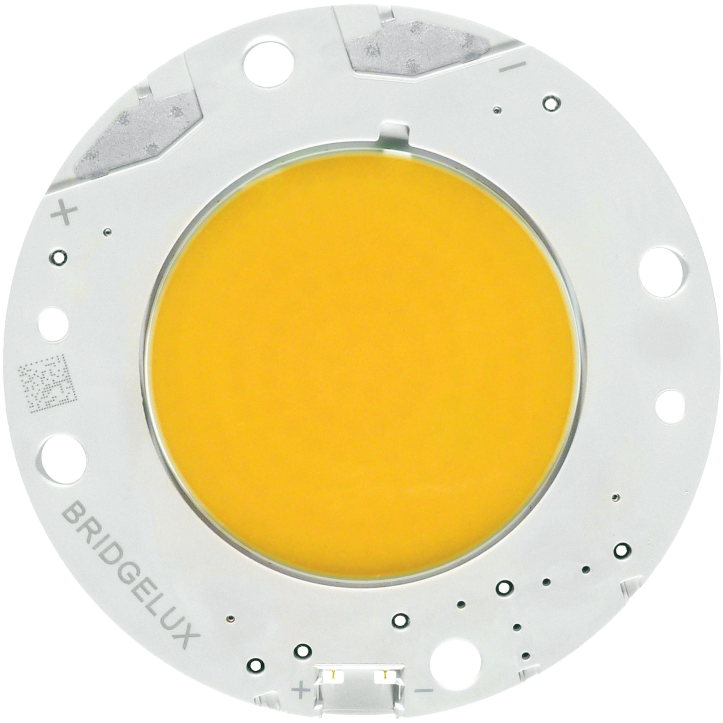


Bridgelux® Vero® 29 Array Series

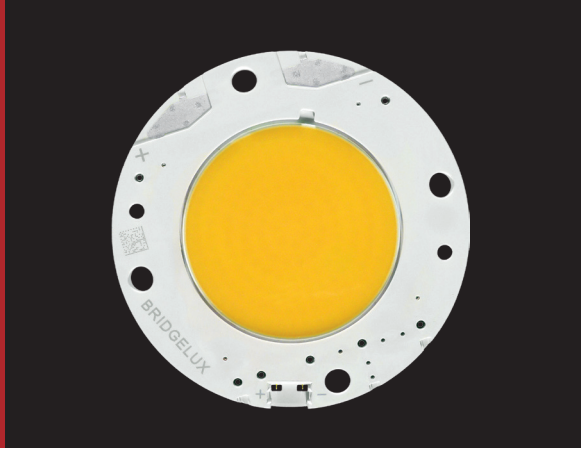
Product Data Sheet DS33

TEN YEAR Warranty™

BXRC-27x10K0 | 30x10K0 | 35x10K0 | 40x10K0 | 50x10K0

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 29 lumen output performance ranges from 2,200 to 19,400 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

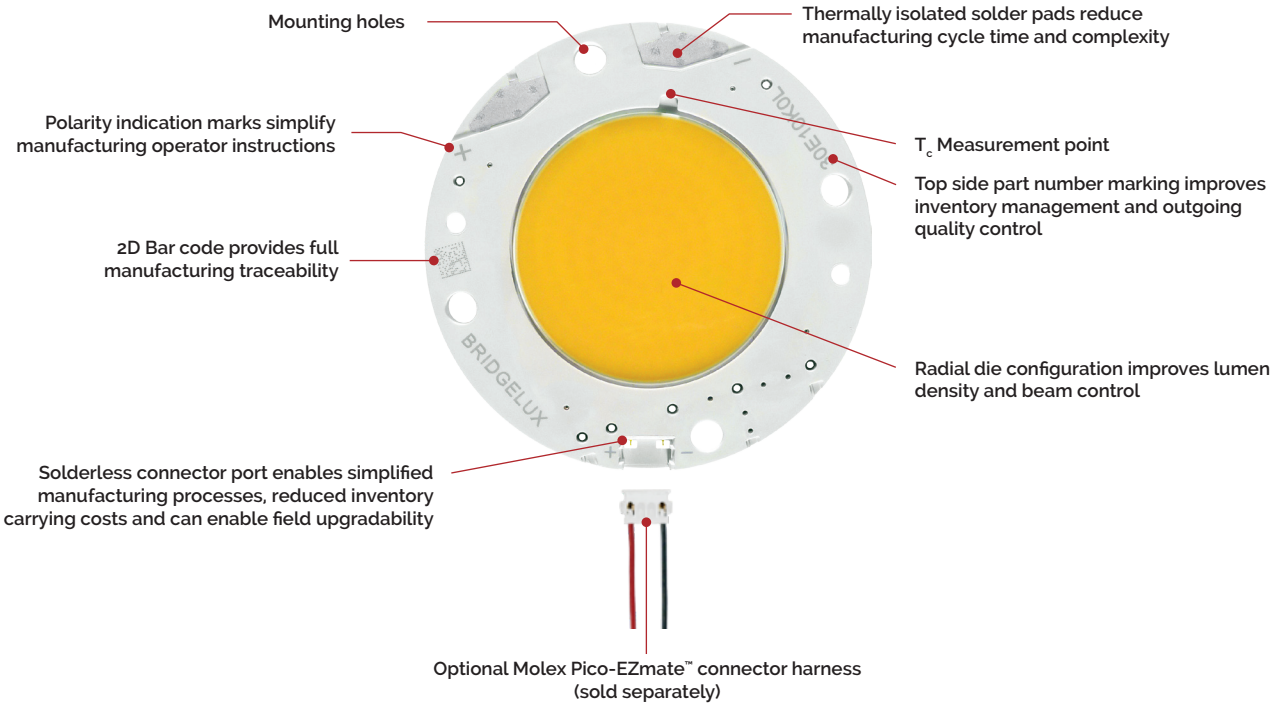
Benefits

- 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

Product Feature Map

Vero 29 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:

1 2 3 4 5 6 7 8 9 10 11 – 12 – 13 14

BXRC – 30 E 10K0 – L – 23

Product Family

Nominal CCT
27 = 2,700K
30 = 3,000K
35 = 3,500K
40 = 4,000K
50 = 5,000K

Minimum CRI
C = 70 CRI
E = 80 CRI
G = 90 CRI

Nominal Flux
10K0 = 10,000lm

Array Configuration

CCT Bin Options
22 = 2 SDCM
23 = 3 SDCM
24 = 4 SDCM

Product Selection Guide

The following product configurations are available:

Table 1: Selection Guide, Pulsed Measurement Data (T_j = T_c = 25˚C)

Part Number	Nominal CCT[1] (K)	CRI[2]	Nominal Drive Current[3] (mA)	Typical Pulsed Flux[4,5,6] T_c = 25°C (lm)	Minimum Pulsed Flux[6,7] T_c = 25°C (lm)	Typical V_f (V)	Typical Power (W)	Typical Efficacy (lm/W)
BXRC-27E10K0-L-2x	2700	80	2100	9780	9119	38.0	79.8	123
BXRC-27G10K0-L-2x	2700	90	2100	8010	7324	38.0	79.8	100
BXRC-30E10K0-L-2x	3000	80	2100	10475	9570	38.0	79.8	131
BXRC-30G10K0-L-2x	3000	90	2100	8540	7797	38.0	79.8	107
BXRC-35E10K0-L-2x	3500	80	2100	10600	9758	38.0	79.8	133
BXRC-35G10K0-L-2x	3500	90	2100	9221	8237	38.0	79.8	116
BXRC-40E10K0-L-2x	4000	80	2100	10875	9736	38.0	79.8	136
BXRC-40G10K0-L-2x	4000	90	2100	9415	8300	38.0	79.8	118
BXRC-50C10K0-L-24	5000	70	2100	11400	10380	38.0	79.8	143
BXRC-50E10K0-L-24	5000	80	2100	10875	9858	38.0	79.8	136
BXRC-50G10K0-L-24	5000	90	2100	10010	9021	38.0	79.8	125

Table 2: Selection Guide, Stabilized DC Performance (T_c = 85˚C) [8,9]

Part Number	Nominal CCT[1] (K)	CRI[2]	Nominal Drive Current[3] (mA)	Typical DC Flux T_c = 85°C (lm)	Minimum DC Flux[10] T_c = 85°C (lm)	Typical V_f (V)	Typical Power (W)	Typical Efficacy (lm/W)
BXRC-27E10K0-L-2x	2700	80	2100	8855	8256	36.8	77.3	115
BXRC-27G10K0-L-2x	2700	90	2100	7049	6445	36.8	77.3	91
BXRC-30E10K0-L-2x	3000	80	2100	9509	8687	36.8	77.3	123
BXRC-30G10K0-L-2x	3000	90	2100	7515	6861	36.8	77.3	97
BXRC-35E10K0-L-2x	3500	80	2100	9514	8758	36.8	77.3	123
BXRC-35G10K0-L-2x	3500	90	2100	8114	7249	36.8	77.3	105
BXRC-40E10K0-L-2x	4000	80	2100	9768	8745	36.8	77.3	126
BXRC-40G10K0-L-2x	4000	90	2100	8285	7304	36.8	77.3	107
BXRC-50C10K0-L-24	5000	70	2100	10032	9134	36.8	77.3	130
BXRC-50E10K0-L-24	5000	80	2100	9570	8675	36.8	77.3	124
BXRC-50G10K0-L-24	5000	90	2100	8809	7938	36.8	77.3	114

Notes for Tables 1 & 2:

1. Nominal CCT as defined by ANSI C78.377-2011.
2. CRI Values are minimums. Minimum R9 value for 80 CRI products is 0, the minimum R9 values for 90 CRI products is 50.
3. Drive current is referred to as nominal drive current.
4. Products tested under pulsed condition (10ms pulse width) at nominal test current where T_j (junction temperature) = T_c (case temperature) = 25˚C.
5. Typical performance values are provided as a reference only and are not a guarantee of performance.
6. Bridgelux maintains a ±7% tolerance on flux measurements.
7. Minimum flux values at the nominal test current are guaranteed by 100% test.
8. Typical stabilized DC performance values are provided as reference only and are not a guarantee of performance.
9. 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˚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.
10. 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[1] (mA)	Typical V_f T_c = 25°C (V)	Typical Watt T_j = 25°C (W)	Typical Flux[2] T_c = 25°C (lm)	Typical DC Flux[3] T_c = 85°C (lm)	Typical Efficacy T_j = 25°C (lm/W)
BXRC-27E10K0-L-2x	80	500	35.1	17.6	2663	2380	152
		700	35.6	24.9	3666	3273	147
		1050	36.4	38.2	5353	4778	140
		2100	**38.0**	**79.8**	**9780**	**8855**	**123**
		2800	39.0	109.2	12498	11203	114
		3150	39.5	124.4	13668	12268	110
		4200	40.4	169.7	16660	15021	98
BXRC-27G10K0-L-2x	90	500	35.1	17.6	2181	1894	124
		700	35.6	24.9	3002	2605	120
		1050	36.4	38.2	4385	3803	115
		2100	**38.0**	**79.8**	**8010**	**7049**	**100**
		2800	39.0	109.2	10236	8918	94
		3150	39.5	124.4	11194	9766	90
		4200	40.4	169.7	13645	11957	80
BXRC-30E10K0-L-2x	80	500	35.1	17.6	2852	2555	163
		700	35.6	24.9	3926	3514	158
		1050	36.4	38.2	5734	5131	150
		2100	**38.0**	**79.8**	**10475**	**9509**	**131**
		2800	39.0	109.2	13386	12030	123
		3150	39.5	124.4	14639	13173	118
		4200	40.4	169.7	17844	16130	105
BXRC-30G10K0-L-2x	90	500	35.1	17.6	2325	2020	132
		700	35.6	24.9	3201	2778	128
		1050	36.4	38.2	4675	4055	122
		2100	**38.0**	**79.8**	**8540**	**7515**	**107**
		2800	39.0	109.2	10913	9508	100
		3150	39.5	124.4	11935	10412	96
		4200	40.4	169.7	14548	12749	86
BXRC-35E10K0-L-2x	80	500	35.1	17.6	2886	2557	164
		700	35.6	24.9	3973	3516	159
		1050	36.4	38.2	5802	5133	152
		2100	**38.0**	**79.8**	**10600**	**9514**	**133**
		2800	39.0	109.2	13546	12036	124
		3150	39.5	124.4	14814	13180	119
		4200	40.4	169.7	18057	16139	106
BXRC-35G10K0-L-2x	90	500	35.1	17.6	2510	2181	143
		700	35.6	24.9	3456	2999	139
		1050	36.4	38.2	5047	4379	132
		2100	**38.0**	**79.8**	**9221**	**8114**	**116**
		2800	39.0	109.2	11783	10266	108
		3150	39.5	124.4	12887	11242	104
		4200	40.4	169.7	15708	13765	93

Notes for Table 3 can be found on page 5.

Performance at Commonly Used Drive Currents

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

Part Number	CRI	Drive Current[1] (mA)	Typical V_f T_c = 25°C (V)	Typical Watt T_j = 25°C (W)	Typical Flux[2] T_c = 25°C (lm)	Typical DC Flux[3] T_c = 85°C (lm)	Typical Efficacy T_j = 25°C (lm/W)
BXRC-40E10K0-L-2x	80	500	35.1	17.6	2961	2625	169
		700	35.6	24.9	4076	3610	164
		1050	36.4	38.2	5953	5271	156
		2100	**38.0**	**79.8**	**10875**	**9768**	**136**
		2800	39.0	109.2	13897	12358	127
		3150	39.5	124.4	15198	13532	122
		4200	40.4	169.7	18525	16570	109
BXRC-40G10K0-L-2x	90	500	35.1	17.6	2563	2226	146
		700	35.6	24.9	3529	3062	142
		1050	36.4	38.2	5154	4471	135
		2100	**38.0**	**79.8**	**9415**	**8285**	**118**
		2800	39.0	109.2	12031	10482	110
		3150	39.5	124.4	13158	11479	106
		4200	40.4	169.7	16038	14055	95
BXRC-50C10K0-L-24	70	500	35.1	17.6	3104	2696	177
		700	35.6	24.9	4273	3708	171
		1050	36.4	38.2	6240	5413	163
		2100	**38.0**	**79.8**	**11400**	**10032**	**143**
		2800	39.0	109.2	14568	12692	133
		3150	39.5	124.4	15932	13899	128
		4200	40.4	169.7	19420	17018	114
BXRC-50E10K0-L-24	80	500	35.1	17.6	2961	2572	169
		700	35.6	24.9	4076	3537	164
		1050	36.4	38.2	5953	5164	156
		2100	**38.0**	**79.8**	**10875**	**9570**	**136**
		2800	39.0	109.2	13897	12108	127
		3150	39.5	124.4	15198	13259	122
		4200	40.4	169.7	18525	16234	109
BXRC-50G10K0-L-24	90	500	35.1	17.6	2725	2367	155
		700	35.6	24.9	3752	3256	151
		1050	36.4	38.2	5479	4753	143
		2100	**38.0**	**79.8**	**10010**	**8809**	**125**
		2800	39.0	109.2	12792	11145	117
		3150	39.5	124.4	13989	12204	112
		4200	40.4	169.7	17052	14943	100

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 ± 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°C (V) [1, 2, 3]			Typical Coefficient of Forward Voltage[4] $\Delta V_f/\Delta T_c$ (mV/°C)	Typical Thermal Resistance Junction to Case[5,6] R_{j-c} (°C/W)	Driver Selection Voltages[7] (V)	
		Minimum	Typical	Maximum			V_f Min. Hot T_c = 105°C (V)	V_f Max. Cold T_c = -40°C (V)
BXRC-xxx10K0-L-2x	2100	35.2	38.0	40.9	-20	0.06	33.6	42.2
	4200	37.3	40.4	44.0	-20	0.07	35.7	45.3

Notes for Table 4:

1. Parts are tested in pulsed conditions, T_c = 25°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 ± 0.10V on forward voltage measurements.
4. Typical coefficient of forward voltage tolerance is ± 0.1mV 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[1] (T_c)	105˚C
Soldering Temperature[2]	350˚C or lower for a maximum of 10 seconds
Maximum Drive Current[3]	4200mA
Maximum Peak Pulsed Drive Current[4]	6000mA
Maximum Reverse Voltage[5]	-65V

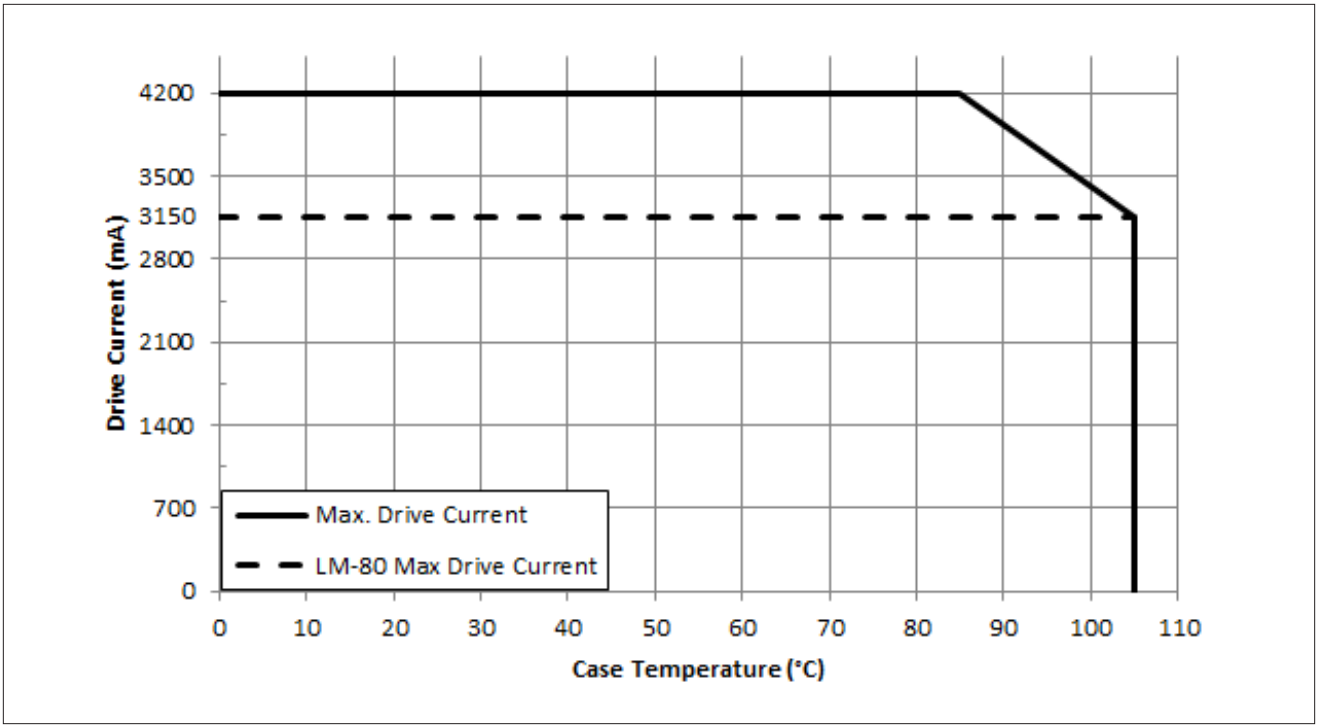
Notes for Table 5:

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 29 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 29 Drive Current Derating Curve**



Notes for Figure 1:

1. LM-80 Max Drive Current must not be exceeded 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.

Performance Curves

Figure 2: Drive Current vs. Forward Voltage ($T_j = T_c = 25°C$)

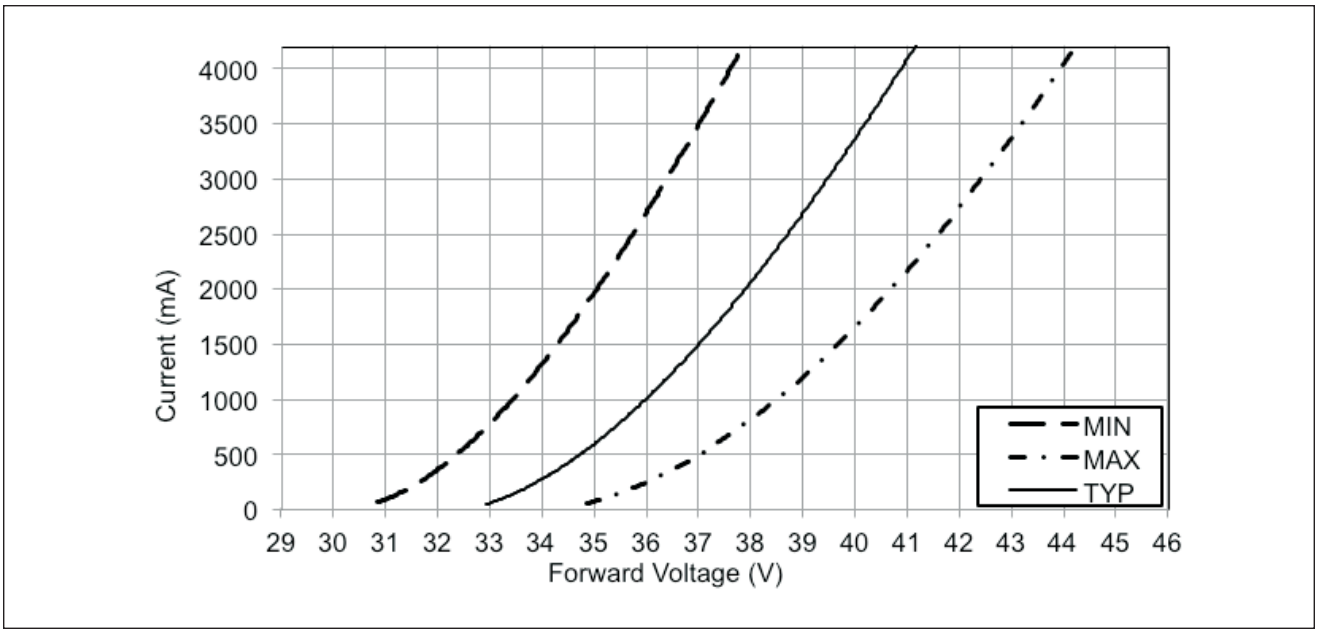
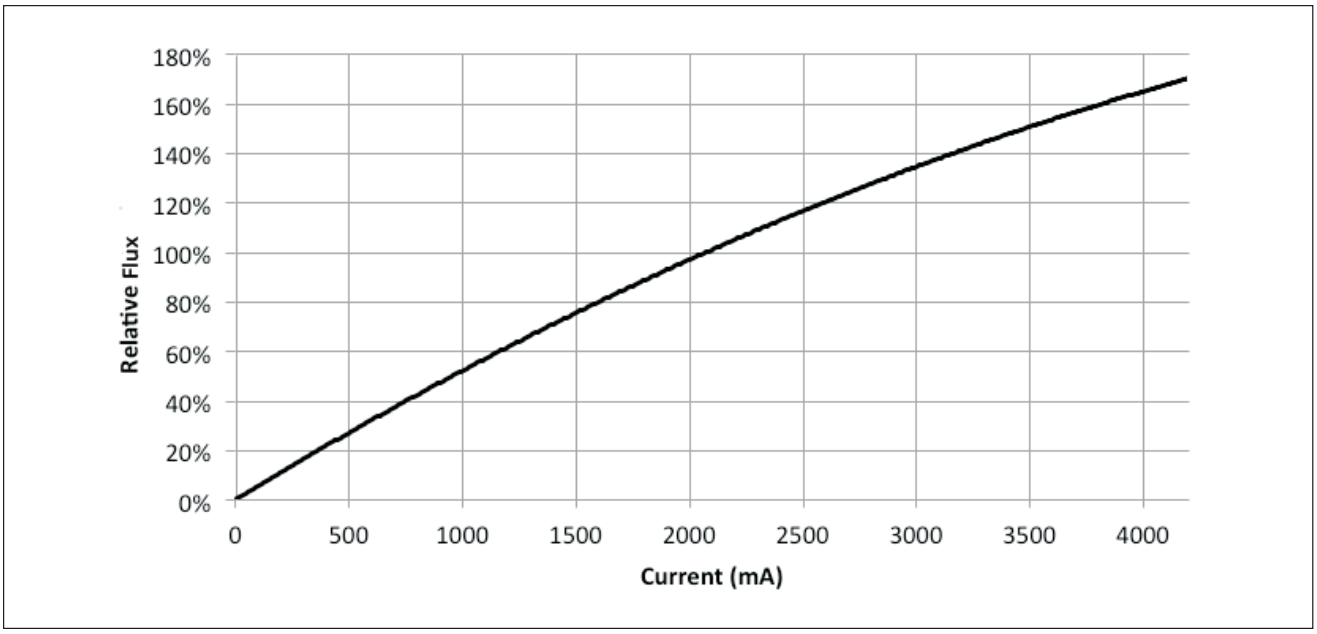


Figure 3: Typical Relative Luminous Flux vs. Drive Current ($T_j = T_c = 25°C$)



Performance Curves

Figure 4: Typical DC Flux vs. Case Temperature

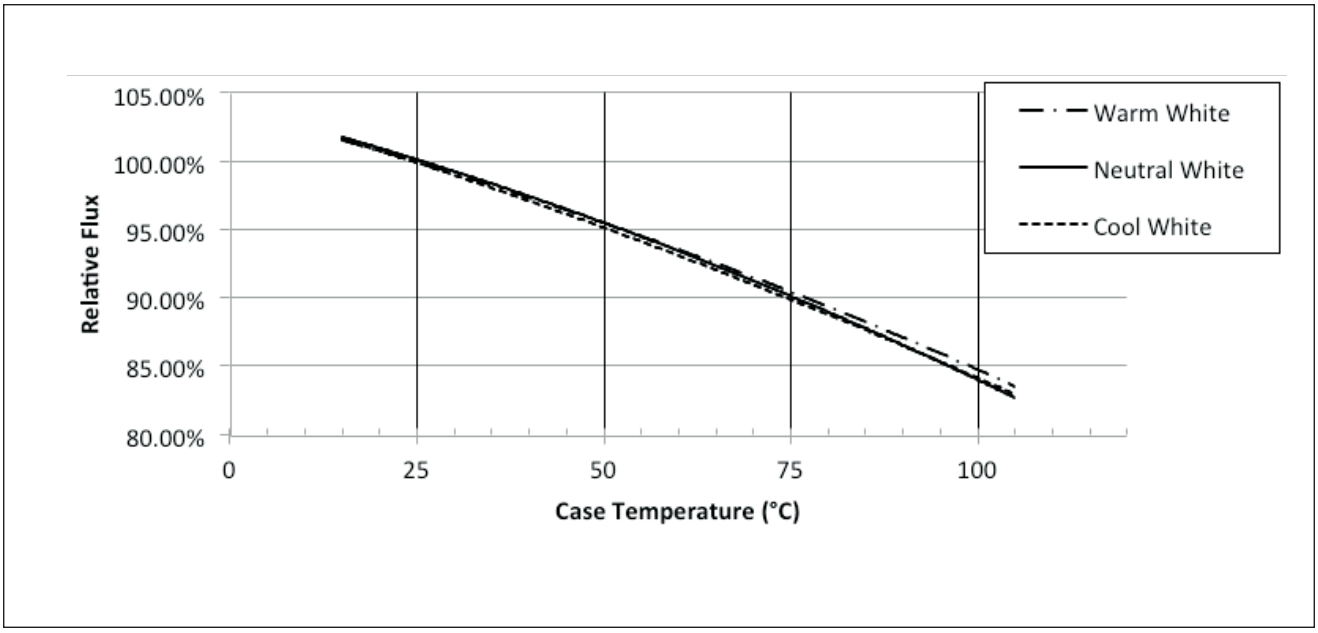
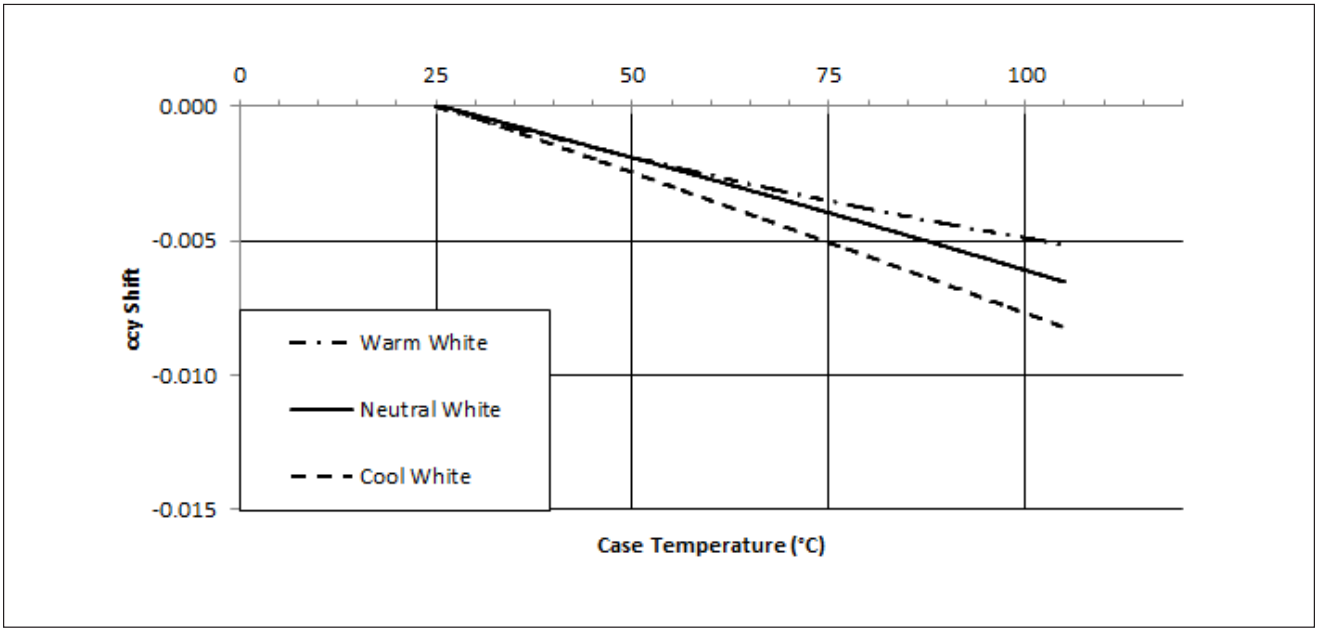


Figure 5: Typical DC ccy Shift vs. Case Temperature

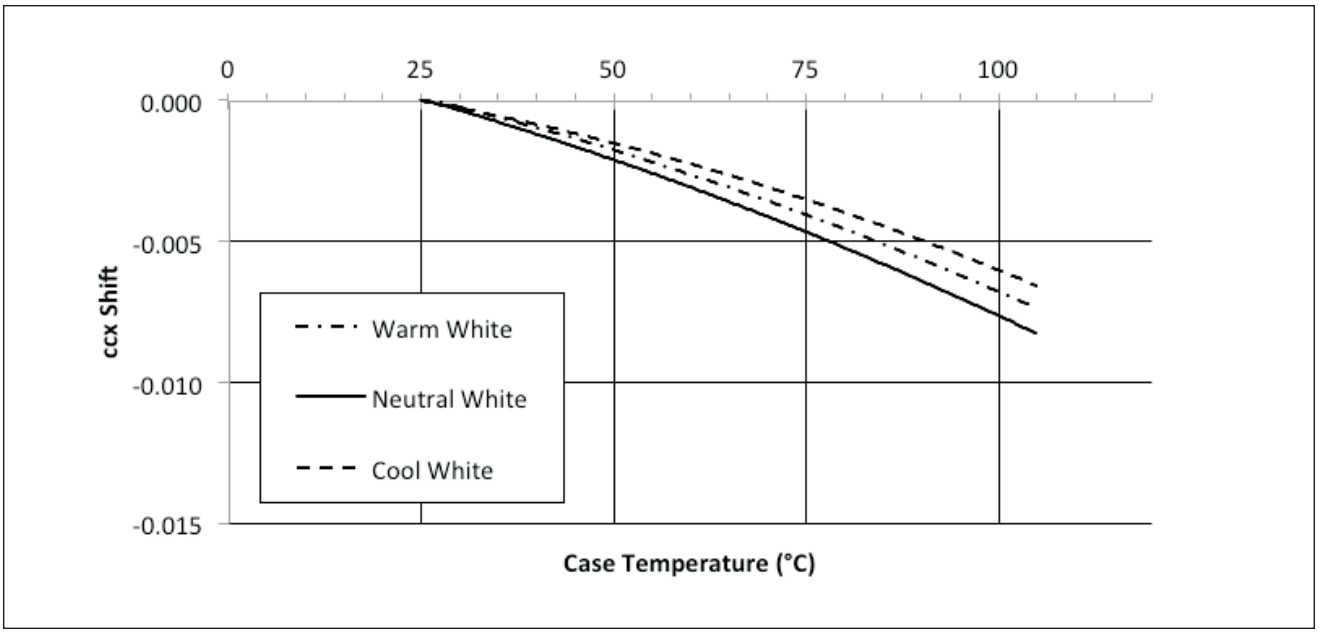


Notes for Figures 4-5:

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

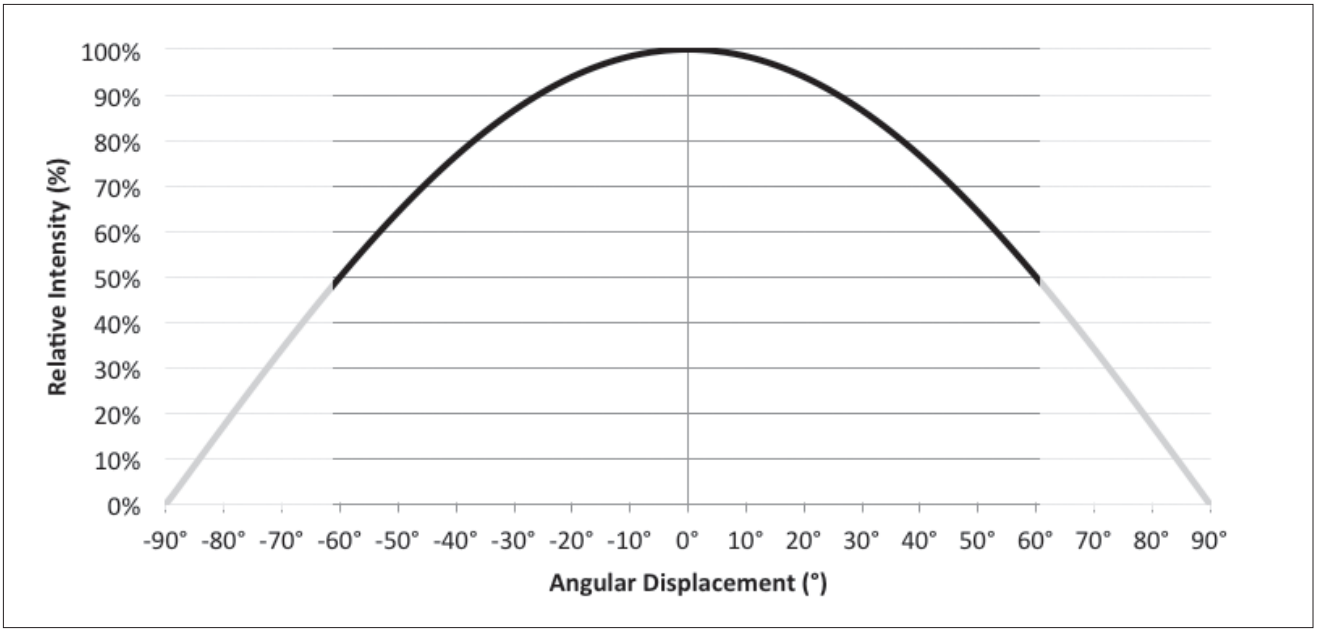


Notes for Figure 6:

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

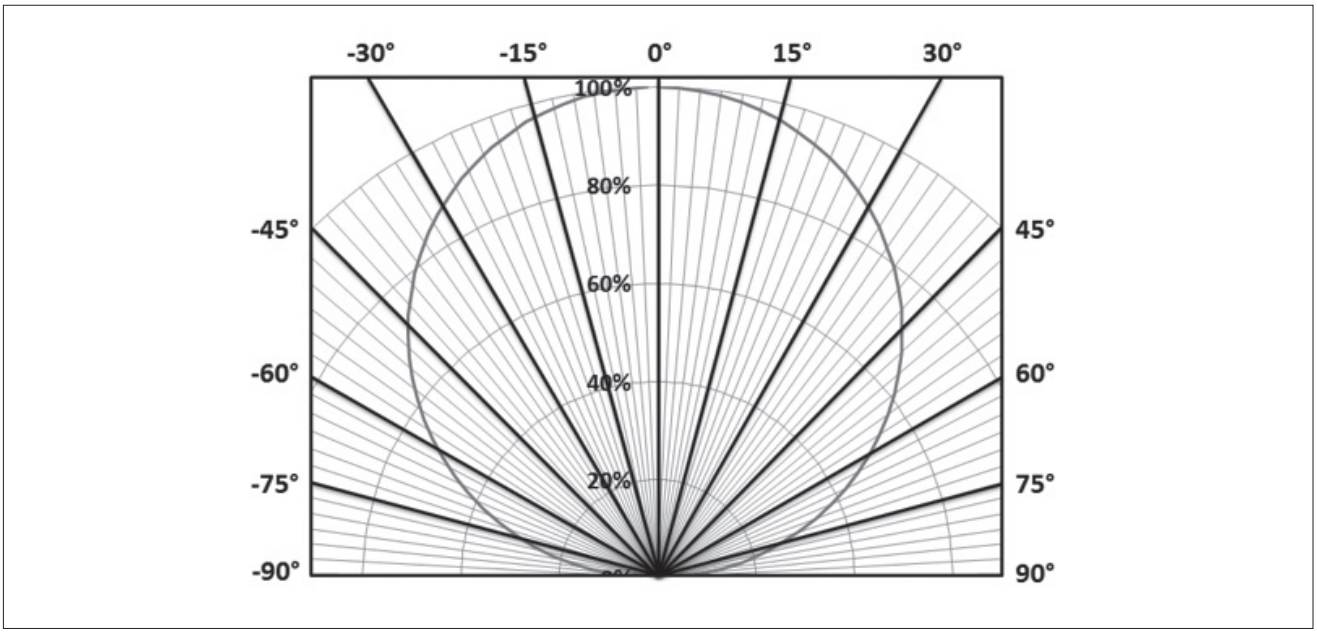
Figure 7: Typical Spatial Radiation Pattern



Notes for Figure 7:

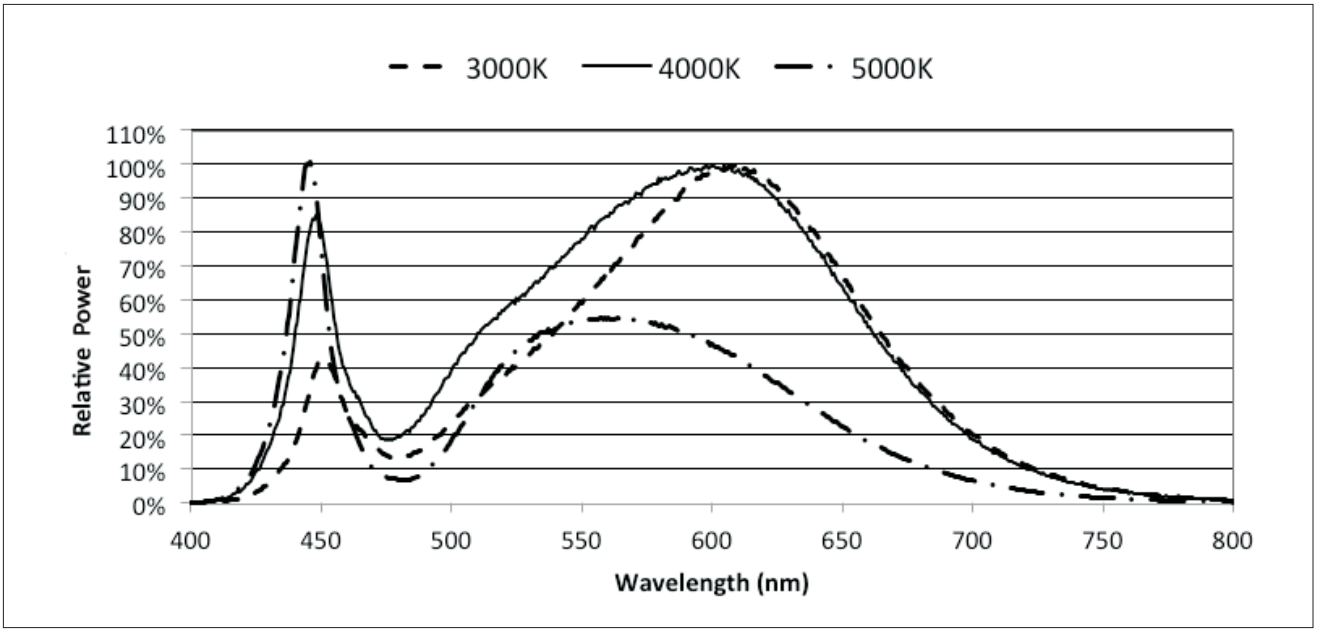
1. Typical viewing angle is 120°.
2. The viewing angle is defined as the off axis angle from the centerline where Iv is ½ of the peak value.

Figure 8: Typical Polar Radiation Pattern



Typical Color Spectrum

Figure 9: Typical Color Spectrum

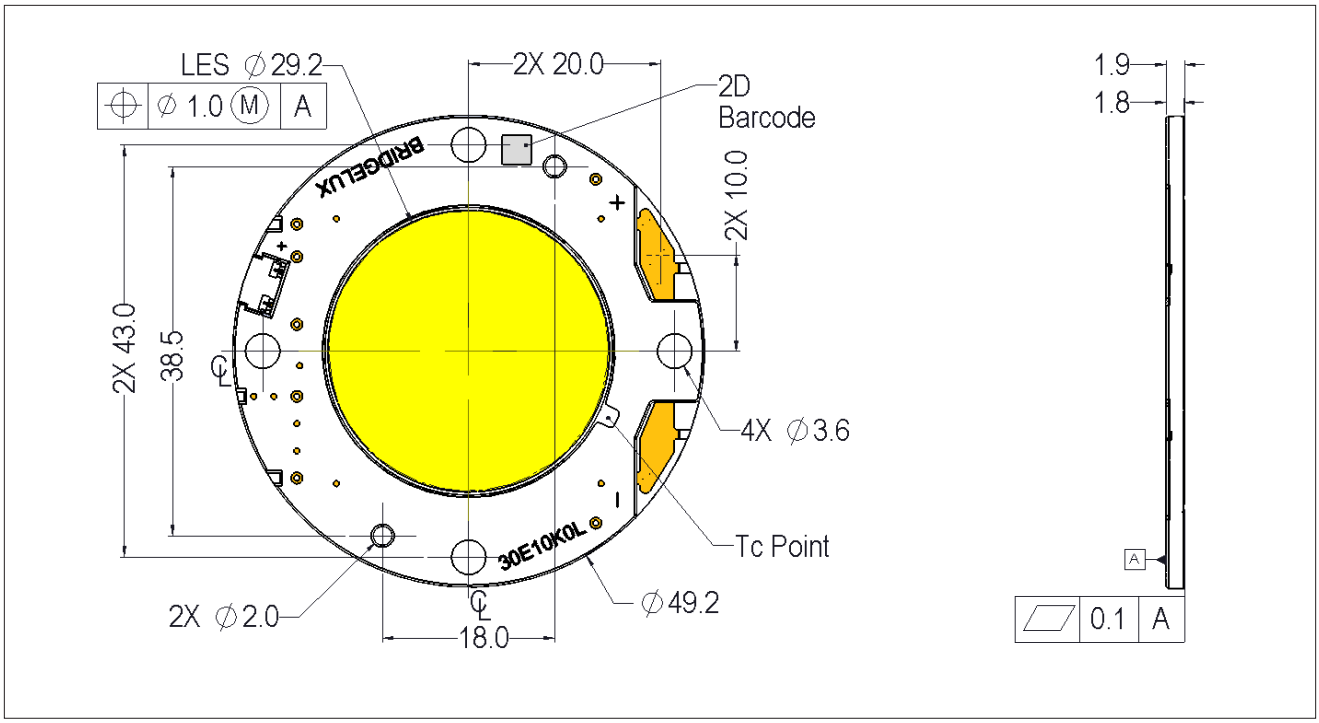


Notes for Figure 9:

1. Color spectra measured at nominal current for T_j = T_c = 25°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 29 LED Array

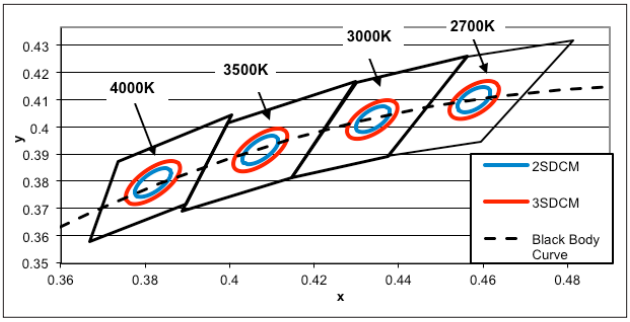


Notes for Figure 10:

1. Drawings are not to scale.
2. Drawing dimensions are in millimeters.
3. Unless otherwise specified, tolerances are ± 0.10mm.
4. Mounting holes (4X) are for M3 screws.
5. Bridgelux recommends four tapped holes for mounting screws with 43.0 ± 0.10mm 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 ± 0.2mm.
11. Bridgelux maintains a flatness of 0.10mm across the mounting surface of the array.

Color Binning Information

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

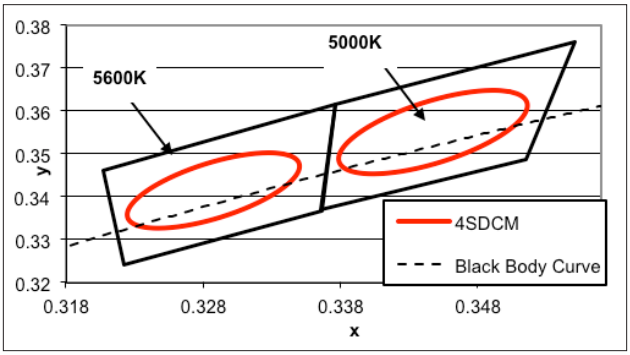


Note: Pulsed Test Conditions, T_c = 25°C

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)
23 (3SDCM)	(2651K - 2794K)	(2968K - 3136K)	(3369K - 3586K)	(3851K - 4130K)
22 (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



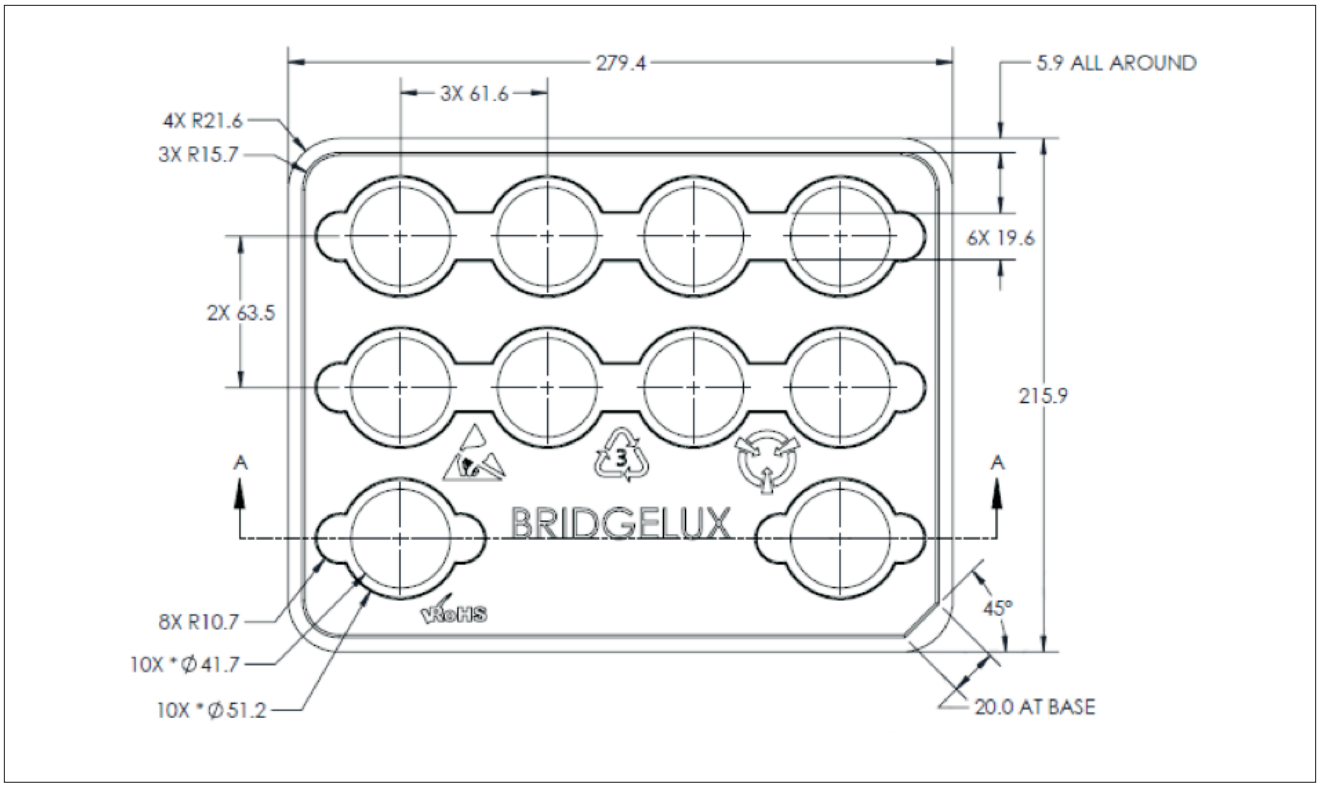
Note: Pulsed Test Conditions, T_c = 25°C

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

Bin Code	5000K	5600K
ANSI Bin (for reference only)	(4745K - 5311K)	(5310K - 6020K)
24 (4SDCM)	(4801K - 5282K)	(5475K - 5830K)
Center Point (x,y)	(0.3447, 0.3553)	(0.3293, 0.3423)

Packaging and Labeling

Figure 13: Drawing for Vero 29 Packaging Tray

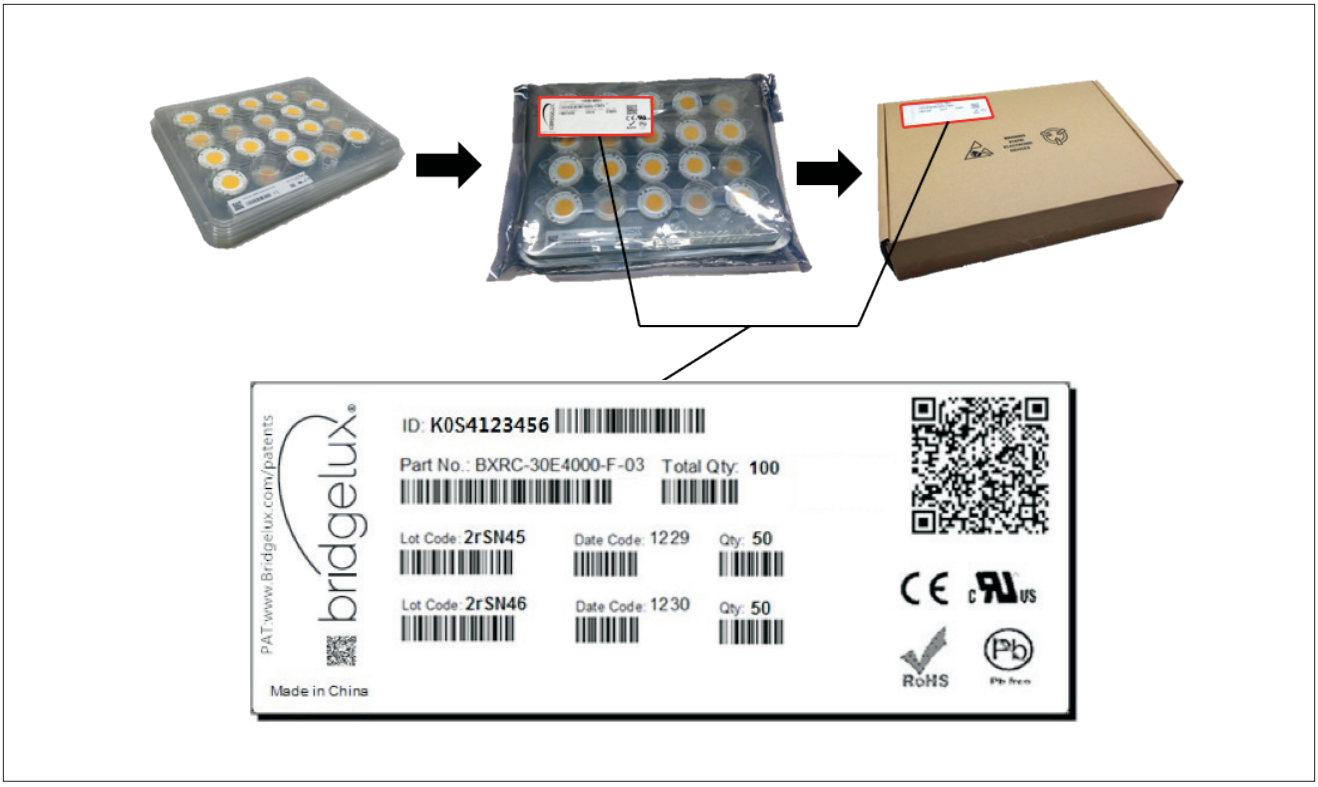


Notes for Figure 13:

1. Dimensions are in millimeters
2. Tolerances: X.X = ± 0.1, X.XX = ± 0.05, Angles = ±1˚
3. Trays are stackable without interference and will not stick together during unstacking operation

Packaging and Labeling

Figure 14: Vero Series Packaging and Labeling



Notes for Figure 14:

1. Each tray holds 10 COBs, 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.

Figure 15: Product Labeling

Bridgelux COB arrays have laser markings on the back side of the substrate to help with product identification. In addition to the product identification markings, Bridgelux COB arrays also contain markings for internal Bridgelux manufacturing use only. The image below shows which markings are for customer use and which ones are for Bridgelux internal use only. The Bridgelux internal manufacturing markings are subject to change without notice, however these will not impact the form, function or performance of the COB array.

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 of resources under development, visit 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.

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, please visit bridgelux.com.

bridgelux®

101 Portola Avenue
Livermore, CA 94551
Tel (925) 583-8400
Fax (925) 583-8410
www.bridgelux.com