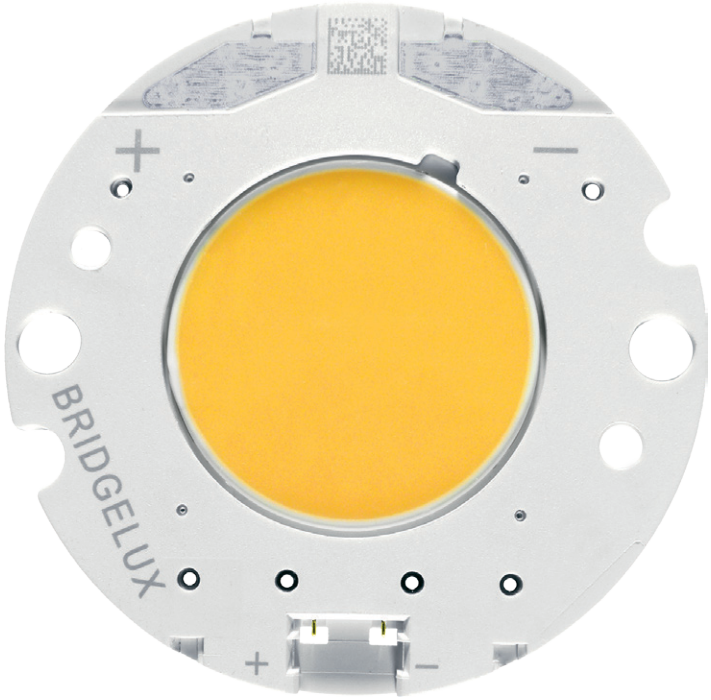


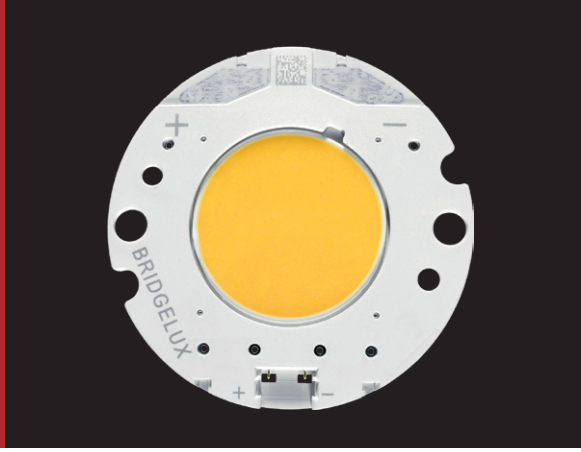
Bridgelux® Vero® 18 Array Series

Product Data Sheet DS32

BXRC-27x4000 | 30x4000 | 35x4000 | 40x4000 | 50x4000

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 18 lumen output performance ranges from 1600 to 7600 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

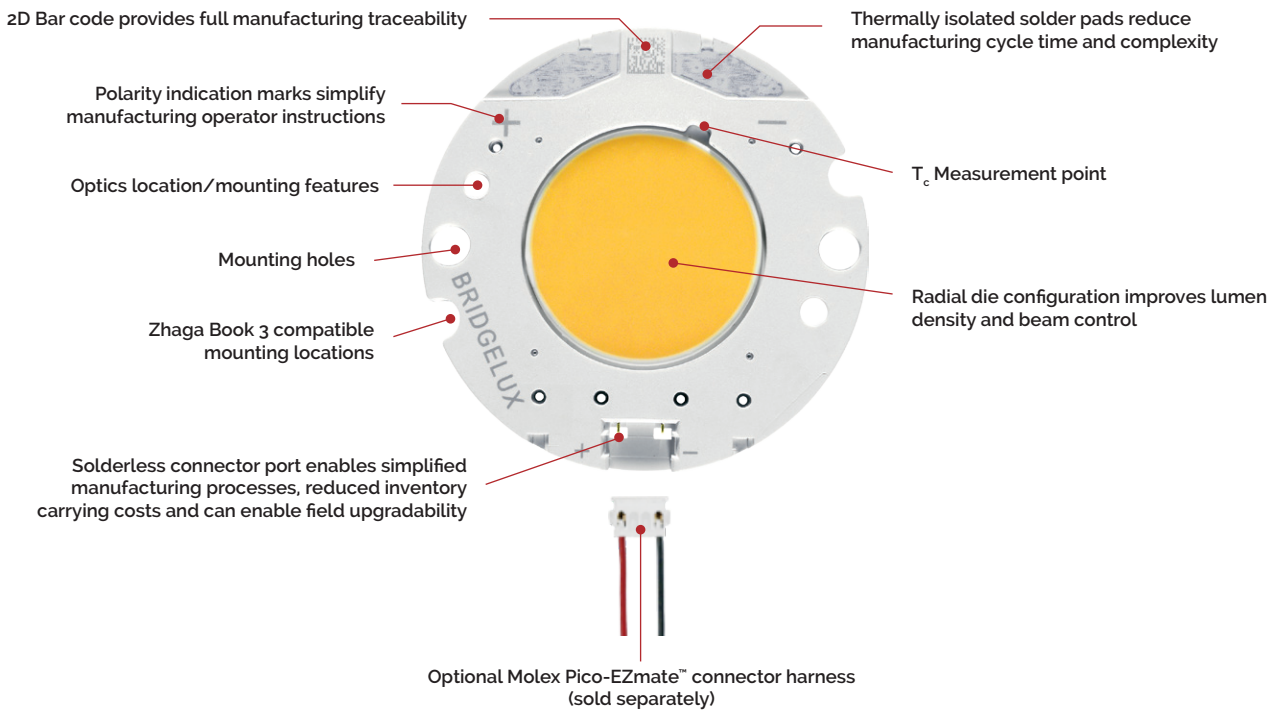
Benefits

- 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 18 is the second 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	4000	–	F	–	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
4000 = 4000lm

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-27E4000-F-2x	2700	80	1050	3850	3605	29.5	31.0	124
BXRC-27G4000-F-2x	2700	90	1050	3100	2832	29.5	31.0	100
BXRC-30E4000-F-2x	3000	80	1050	4050	3691	29.5	31.0	131
BXRC-30G4000-F-2x	3000	90	1050	3230	2929	29.5	31.0	104
BXRC-35E4000-F-2x	3500	80	1050	4150	3760	29.5	31.0	134
BXRC-40E4000-F-2x	4000	80	1050	4200	3884	29.5	31.0	135
BXRC-40G4000-F-2x	4000	90	1050	3670	3300	29.5	31.0	118
BXRC-50C4000-F-24	5000	70	1050	4430	4000	29.5	31.0	143
BXRC-50E4000-F-24	5000	80	1050	4200	3783	29.5	31.0	136
BXRC-50G4000-F-24	5000	90	1050	3885	3560	29.5	31.0	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-27E4000-F-2x	2700	80	1050	3492	3269	28.6	30.0	116
BXRC-27G4000-F-2x	2700	90	1050	2728	2492	28.6	30.0	91
BXRC-30E4000-F-2x	3000	80	1050	3662	3337	28.6	30.0	122
BXRC-30G4000-F-2x	3000	90	1050	2842	2578	28.6	30.0	95
BXRC-35E4000-F-2x	3500	80	1050	3770	3416	28.6	30.0	125
BXRC-40E4000-F-2x	4000	80	1050	3793	3508	28.6	30.0	126
BXRC-40G4000-F-2x	4000	90	1050	3230	2904	28.6	30.0	108
BXRC-50C4000-F-24	5000	70	1050	3898	3520	28.6	30.0	130
BXRC-50E4000-F-24	5000	80	1050	3696	3329	28.6	30.0	123
BXRC-50G4000-F-24	5000	90	1050	3419	3133	28.6	30.0	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 rated 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 rated 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 1 and the flux vs. current characteristics shown in Figure 2. The performance at commonly used drive currents is summarized in Table 3.

Table 3: Performance at Commonly Used Drive Currents

Part Number	CRI	Drive Current[1] (mA)	Typical V_f T_c = 25°C (V)	Typical Power T_c = 25°C (W)	Typical Flux[2] T_c = 25°C (lm)	Typical DC Flux[3] T_c = 85°C (lm)	Typical Efficacy T_c = 25°C (lm/W)
BXRC-27E4000-F-2x	80	500	28.1	14.1	1985	1794	141
		700	28.7	20.1	2701	2443	134
		1050	**29.5**	**31.0**	**3850**	**3492**	**124**
		1400	30.2	42.3	4891	4447	116
		2100	31.6	66.4	6587	6037	99
BXRC-27G4000-F-2x	90	500	28.1	14.1	1598	1402	114
		700	28.7	20.1	2175	1909	108
		1050	**29.5**	**31.0**	**3100**	**2728**	**100**
		1400	30.2	42.3	3938	3475	93
		2100	31.6	66.4	5304	4717	80
BXRC-30E4000-F-2x	80	500	28.1	14.1	2088	1882	149
		700	28.7	20.1	2841	2562	141
		1050	**29.5**	**31.0**	**4050**	**3662**	**131**
		1400	30.2	42.3	5145	4664	122
		2100	31.6	66.4	6929	6331	104
BXRC-30G4000-F-2x	90	500	28.1	14.1	1665	1460	119
		700	28.7	20.1	2266	1989	113
		1050	**29.5**	**31.0**	**3230**	**2842**	**104**
		1400	30.2	42.3	4103	3620	97
		2100	31.6	66.4	5526	4914	83
BXRC-35E4000-F-2x	80	500	28.1	14.1	2139	1937	152
		700	28.7	20.1	2912	2638	145
		1050	**29.5**	**31.0**	**4150**	**3770**	**134**
		1400	30.2	42.3	5272	4802	125
		2100	31.6	66.4	7100	6518	107

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.

Performance at Commonly Used Drive Currents

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

Part Number	CRI	Drive Current[1] (mA)	Typical V_f T_c = 25°C (V)	Typical Power T_c = 25°C (W)	Typical Flux[2] T_c = 25°C (lm)	Typical DC Flux[3] T_c = 85°C (lm)	Typical Efficacy T_c = 25°C (lm/W)
BXRC-40E4000-F-2x	80	500	28.1	14.1	2165	1949	153
		700	28.7	20.1	2947	2654	146
		1050	**29.5**	**31.0**	**4200**	**3793**	**135**
		1400	30.2	42.3	5336	4831	125
		2100	31.6	66.4	7186	6558	107
BXRC-40G4000-F-2x	90	500	28.1	14.1	1892	1659	135
		700	28.7	20.1	2575	2260	128
		1050	**29.5**	**31.0**	**3670**	**3230**	**118**
		1400	30.2	42.3	4662	4113	110
		2100	31.6	66.4	6279	5584	95
BXRC-50C4000-F-24	70	500	28.1	14.1	2283	2003	163
		700	28.7	20.1	3108	2727	155
		1050	**29.5**	**31.0**	**4430**	**3898**	**143**
		1400	30.2	42.3	5628	4965	133
		2100	31.6	66.4	7579	6740	114
BXRC-50E4000-F-24	80	500	28.1	14.1	2165	1899	154
		700	28.7	20.1	2947	2586	147
		1050	**29.5**	**31.0**	**4200**	**3696**	**136**
		1400	30.2	42.3	5336	4707	126
		2100	31.6	66.4	7186	6390	108
BXRC-50G4000-F-24	90	500	28.1	14.1	2003	1757	143
		700	28.7	20.1	2726	2392	136
		1050	**29.5**	**31.0**	**3885**	**3419**	**125**
		1400	30.2	42.3	4936	4354	117
		2100	31.6	66.4	6647	5911	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] $\Delta V_f / \Delta T$ (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-xxx4000-F-2x	1050	27.3	29.5	31.7	-15	0.13	26.1	32.7
	2100	29.2	31.6	34.2	-15	0.17	28.0	35.2

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.
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[3,4,5]	2100mA
Maximum Peak Pulsed Drive Current[6]	3000mA
Maximum Reverse Voltage[7]	-55V

Notes for Table 5:

1. For IEC 62717 requirement, please consult your Bridgelux sales representative.
2. Refer to Bridgelux Application Note AN31: Assembly Considerations for Bridgelux Vero LED Arrays.
3. DC Forward Current for LM-80 is the maximum drive current for which LM-80 data is currently available.
4. 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 arrays. Contact your Bridgelux sales representatives for LM-80 report.
5. Arrays may be driven at higher currents however lumen maintenance may be reduced.
6. Bridgelux recommends a maximum duty cycle of 10% and pulse width of 20 ms when operating LED Arrays at maximum peak pulsed current specified. Maximum peak pulsed currents indicate values where LED Arrays can be driven without catastrophic failures.
7. 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

Figure 1: Drive Current vs. Voltage ($T_j = T_c = 25°C$)

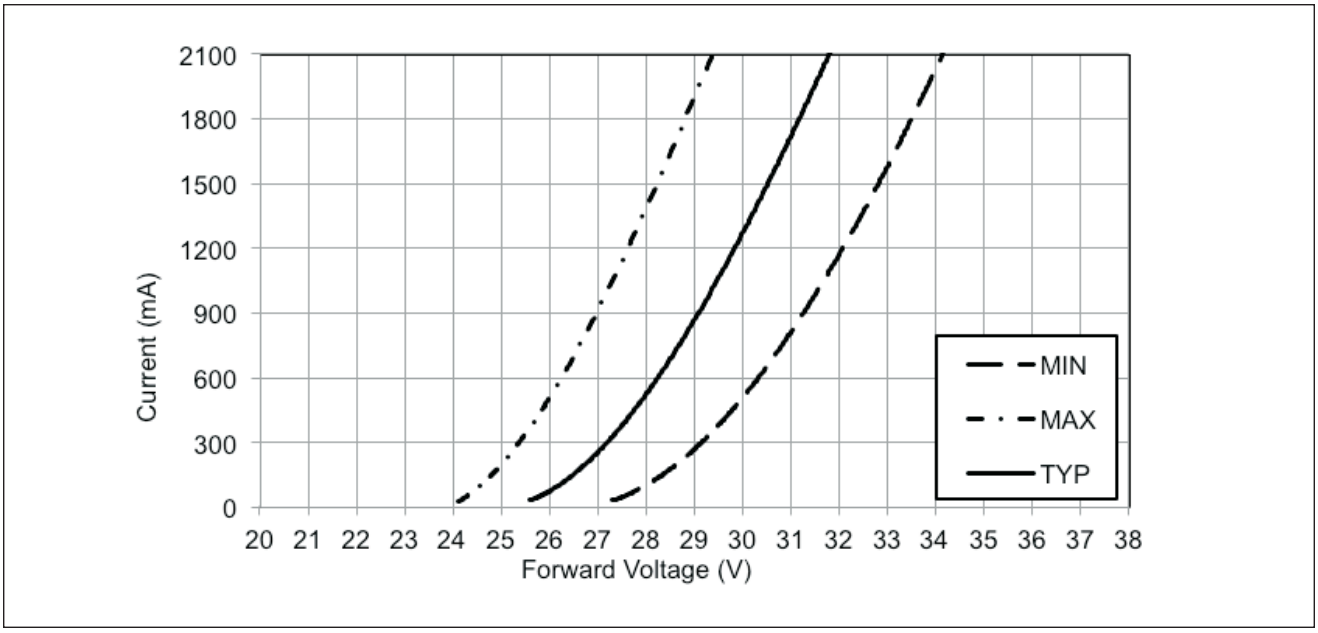
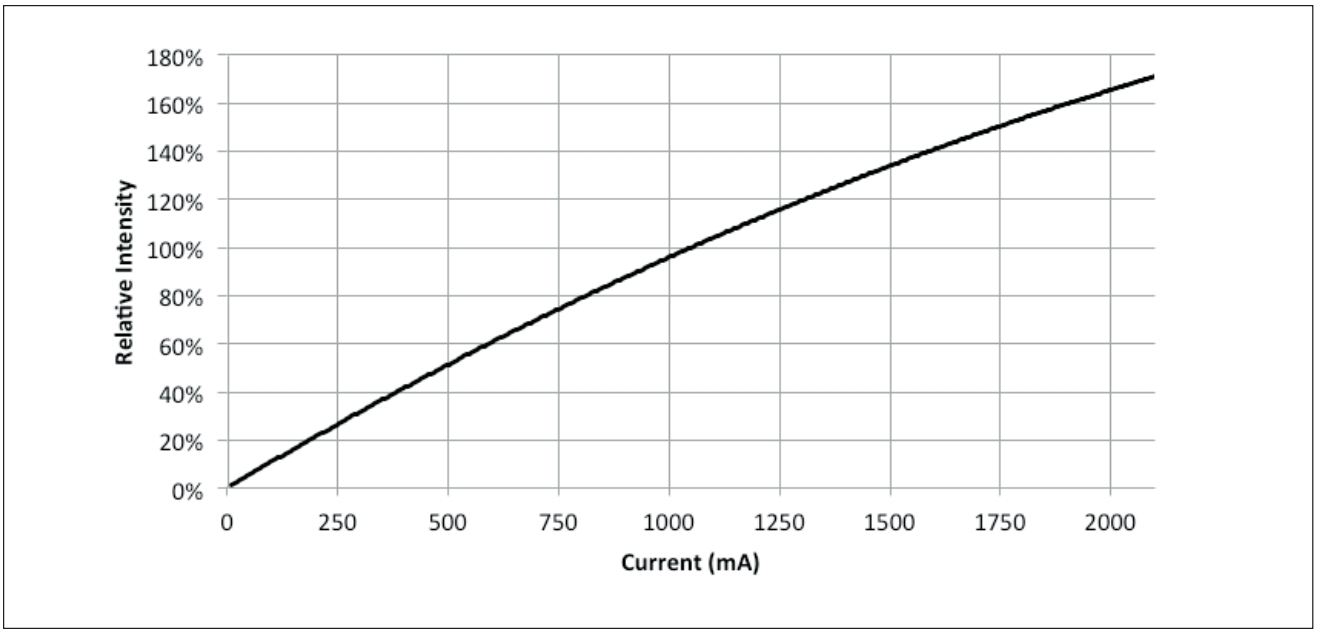


Figure 2: Typical Relative Luminous Flux vs. Drive Current ($T_j = T_c = 25°C$)



Note for Figure 2:

1. Bridgelux does not recommend driving high power LEDs at low currents. Doing so may produce unpredictable results. Pulse width modulation (PWM) is recommended for dimming effects.

Performance Curves

Figure 3: Typical DC Flux vs. Case Temperature

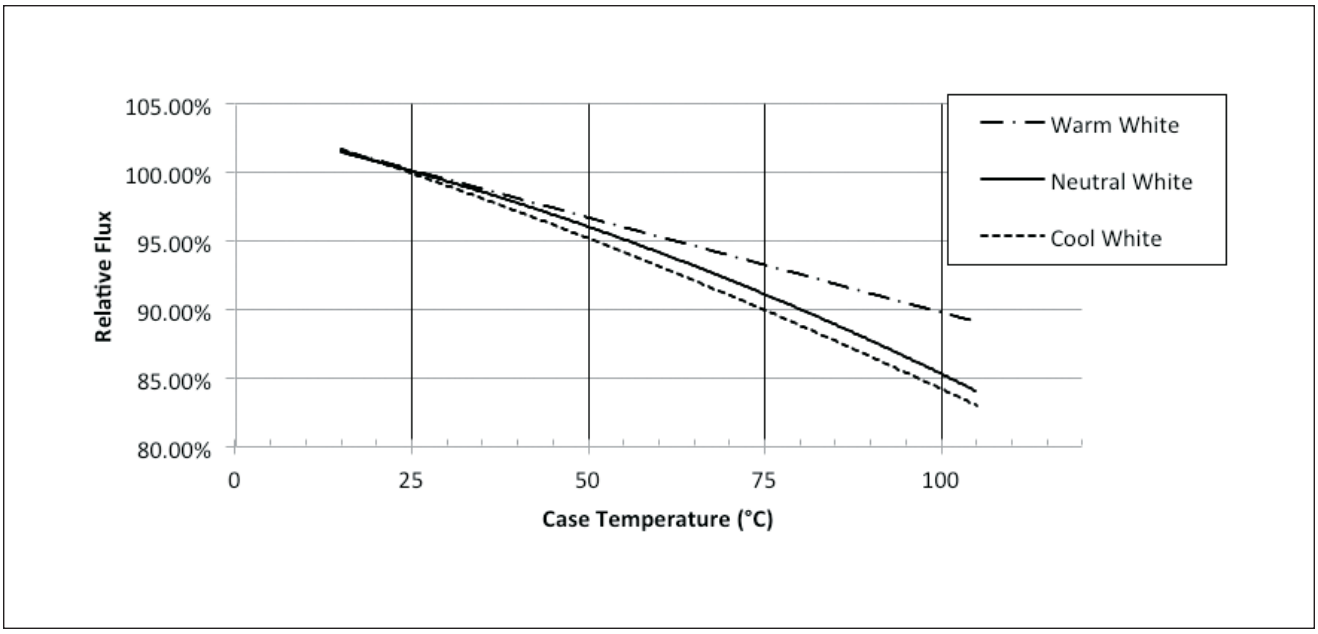
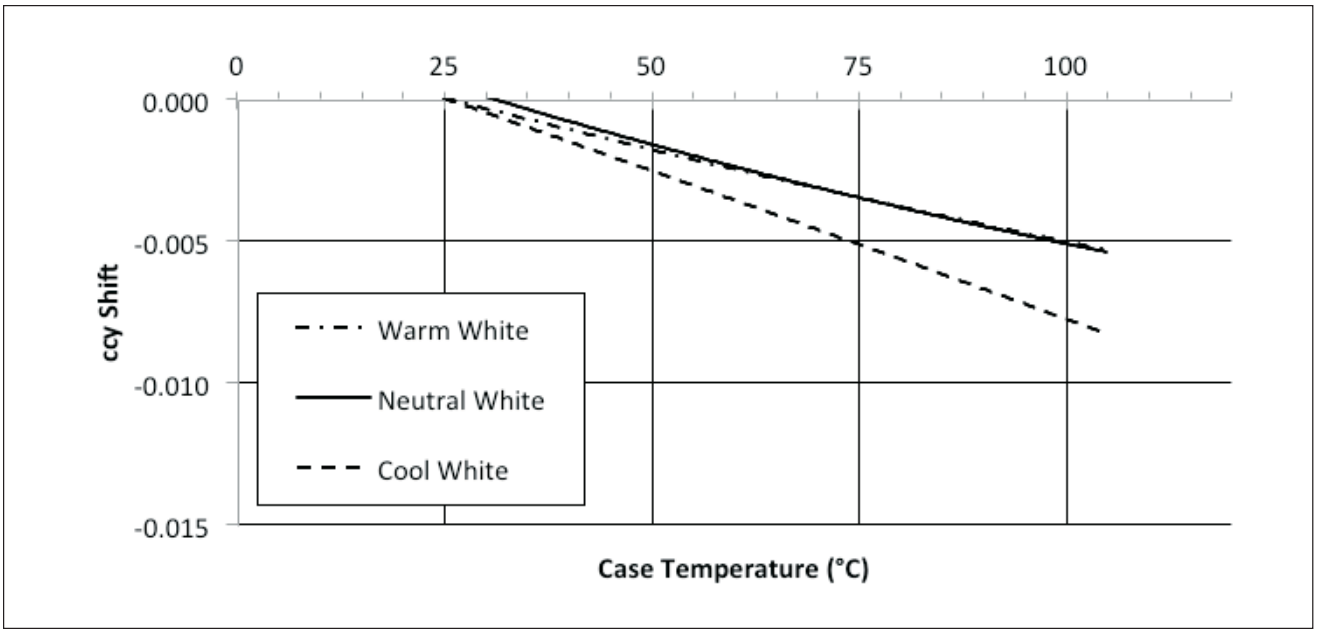


Figure 4: Typical DC ccy Shift vs. Case Temperature

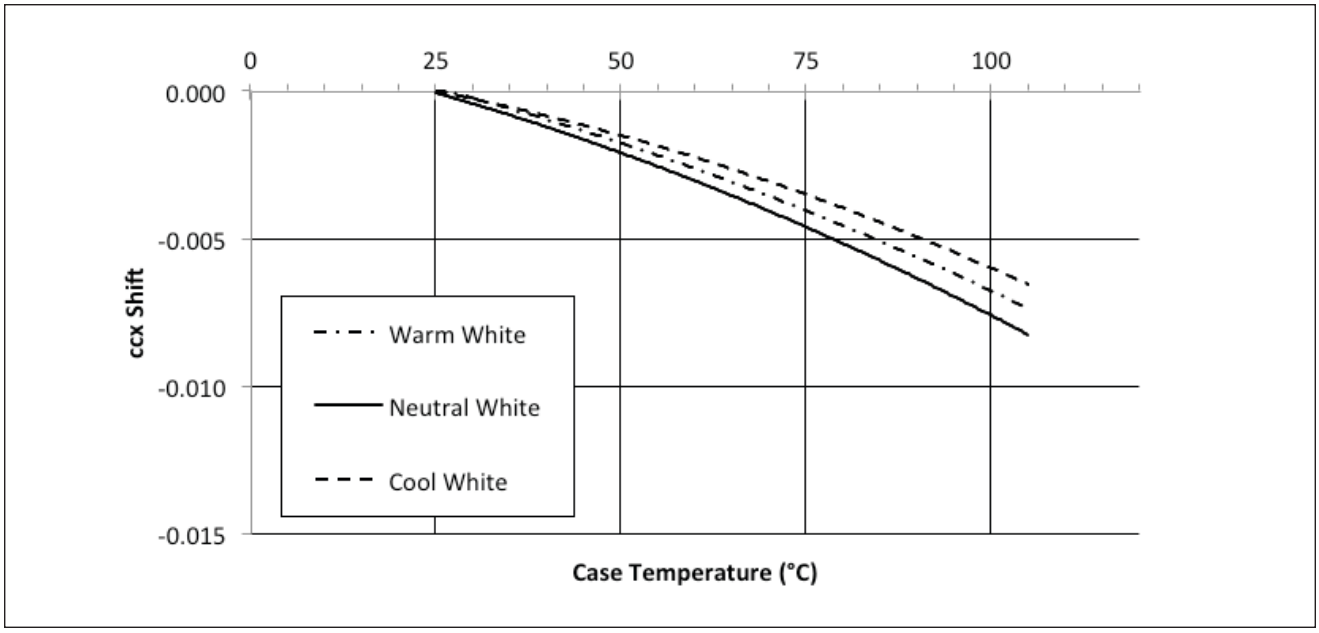


Notes for Figures 3-4:

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 5: Typical ccx Shift vs. Case Temperature

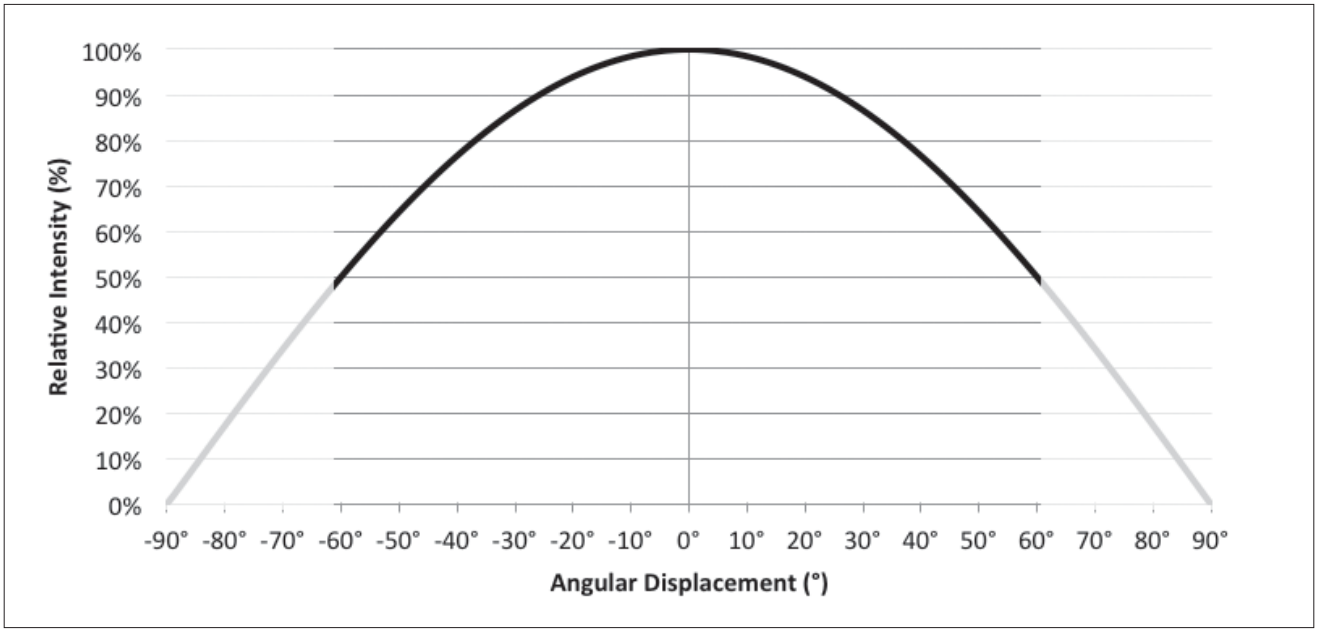


Notes for Figure 5:

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.

Typical Radiation Pattern

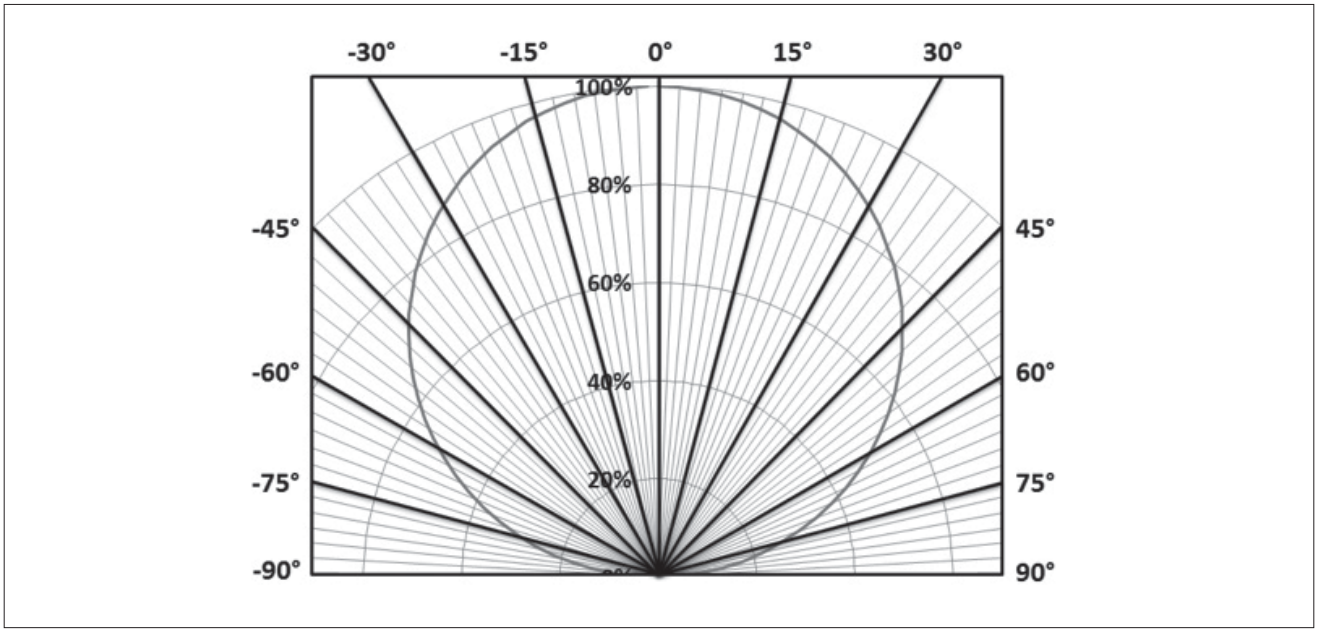
Figure 6: Typical Spatial Radiation Pattern



Note for Figure 6:

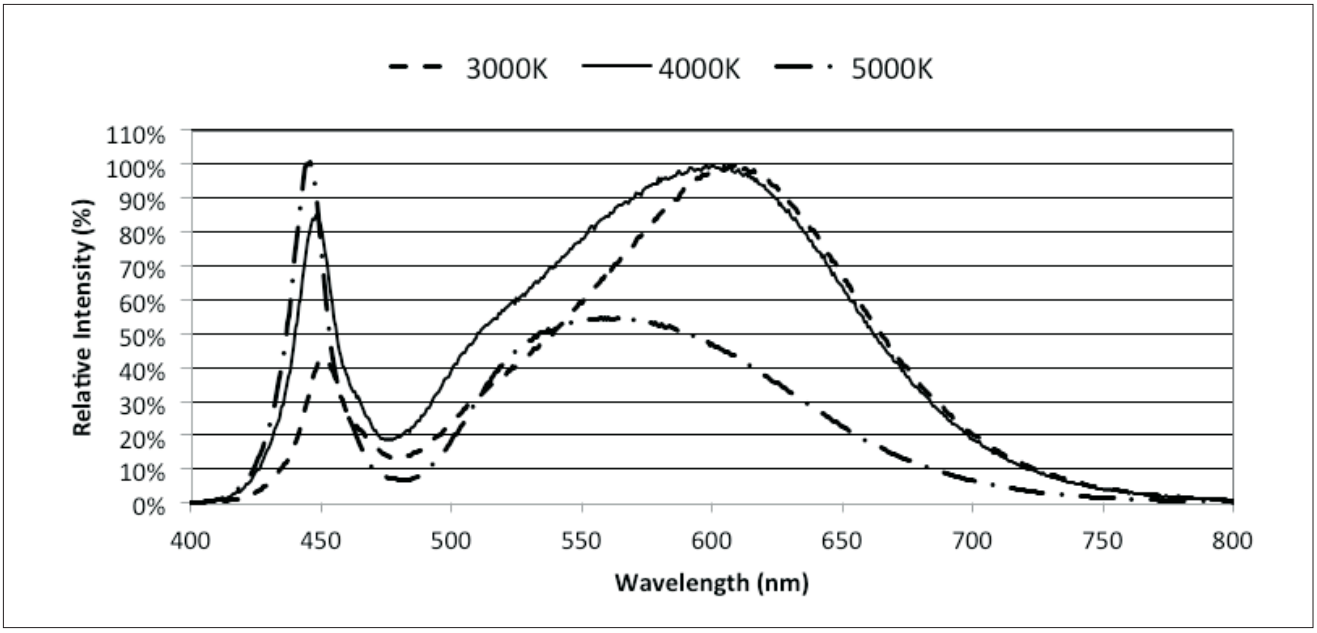
1. Typical viewing angle is 120°.
2. The viewing angle is defined as the off axis angle from the centerline where Iv is ½ of the peak value.

Figure 7: Typical Polar Radiation Pattern



Typical Color Spectrum

Figure 8: Typical Color Spectrum

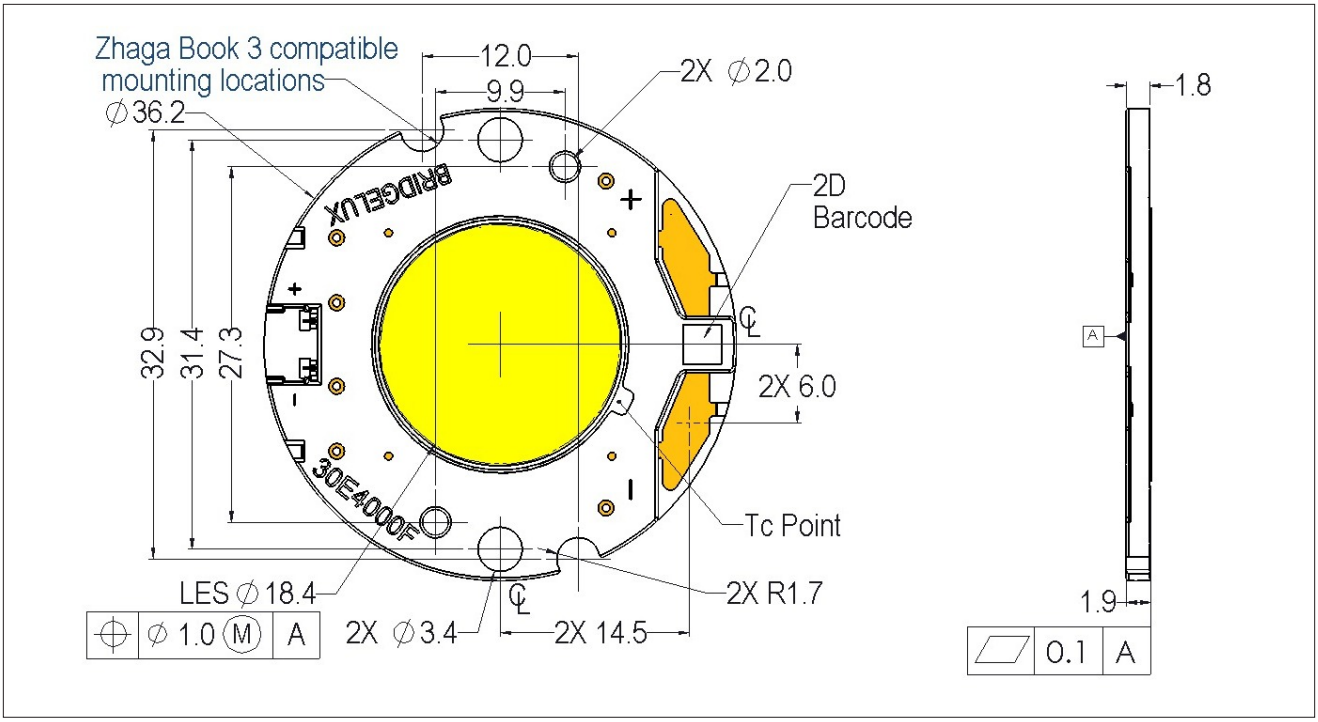


Notes for Figure 8:

1. Color spectra measured at rated 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 9: **Drawing for Vero 18 LED Array**

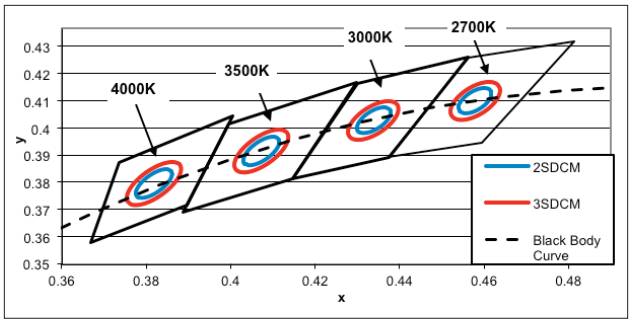


Notes for Figure 9:

1. Drawings are not to scale.
2. Drawing dimensions are in millimeters.
3. Unless otherwise specified, tolerances are ±0.01mm.
4. Mounting holes (2X) are for M2.5 screws.
5. Bridgelux recommends two tapped holes for mounting screws with 31.4 ± 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 10: Graph of Warm and Neutral White Test Bins in xy Color Space

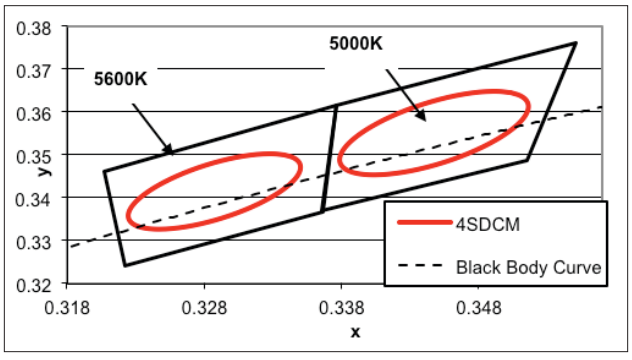


Note: Pulsed Test Conditions, T_c = 25°C

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)
03 (3SDCM)	(2651K - 2794K)	(2968K - 3136K)	(3369K - 3586K)	(3851K - 4130K)
02 (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 11: Graph of Cool White Test Bins in xy Color Space



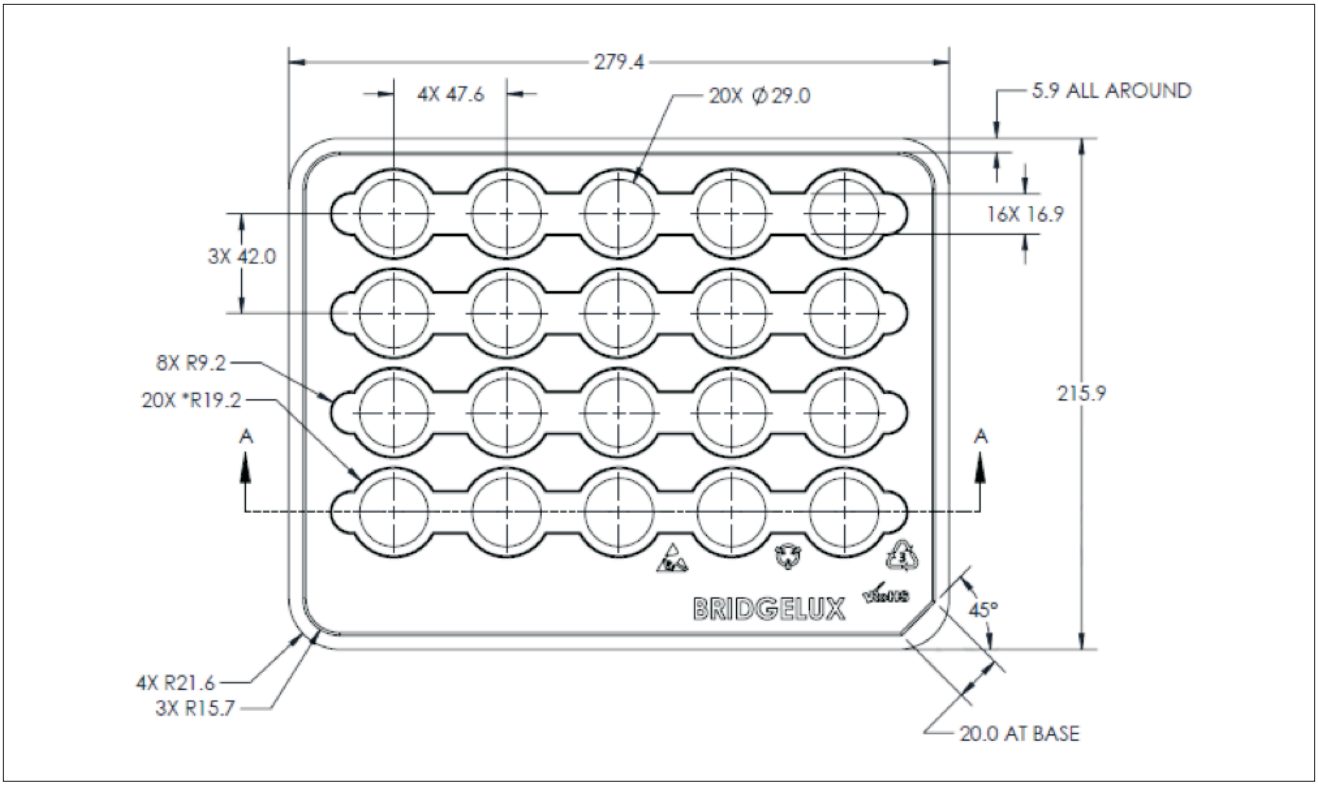
Note: Pulsed Test Conditions, T_c = 25°C

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

Bin Code	5000K	5600K
ANSI Bin (for reference only)	(4745K - 5311K)	(5310K - 6020K)
04 (4SDCM)	(4801K - 5282K)	(5475K - 5830K)
Center Point (x,y)	(0.3447, 0.3553)	(0.3293, 0.3423)

Packaging

Figure 12: Drawing for Vero 18 Packaging Tray

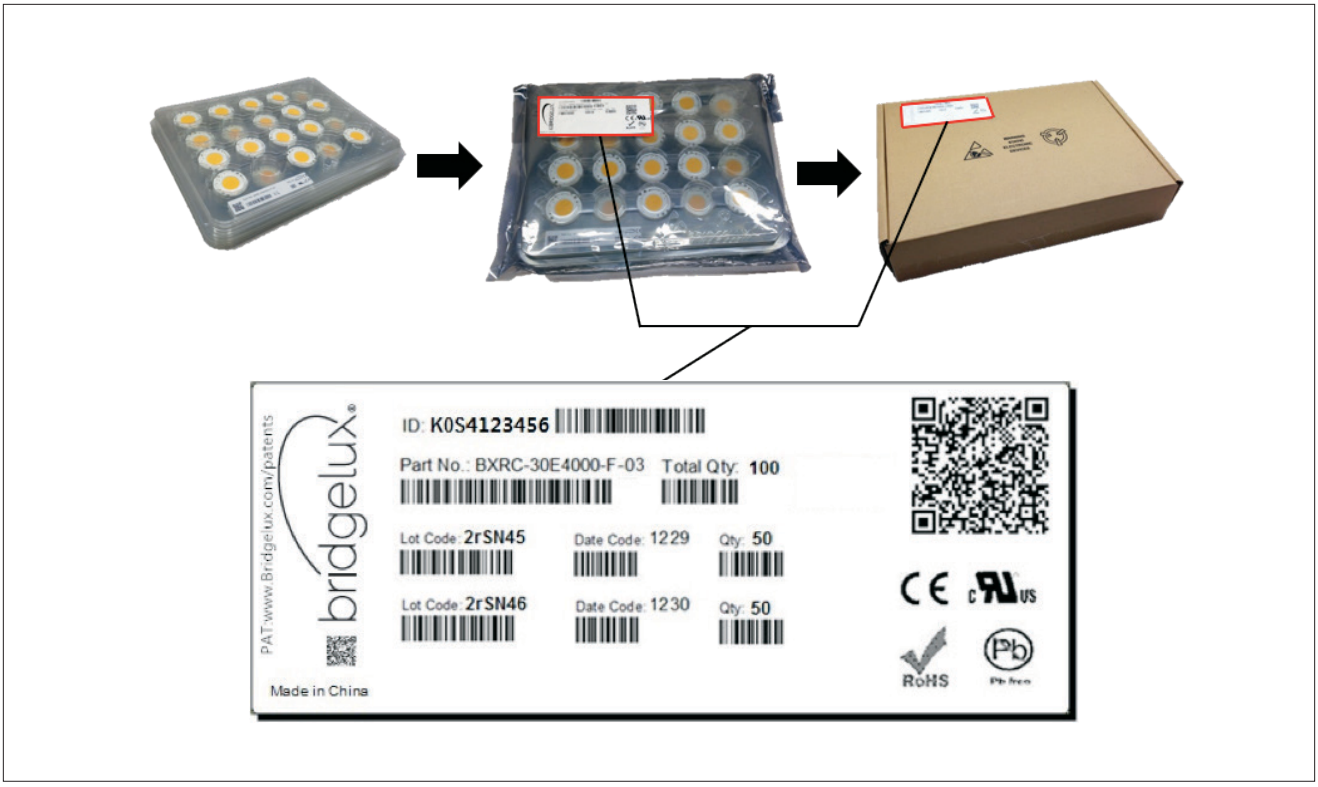


Notes for Figure 12:

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

Figure 13: Vero Series Packaging and Labeling



Notes for Figure 13:

1. Each tray holds 20 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 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.

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