bridgelux®

Bridgelux® Gen 7 V13 Thrive™ Array

Product Data Sheet DS321

FIVE YEAR Warranty™

BXRE-27S | 30S | 35S | 40S | 50S | 57S | 65S

Introduction

V13 Thrive

Bridgelux Thrive™ combines unique chip, phosphor and packaging technology to closely match the spectra of natural light over the visible wavelength range. Thrive can be used in constant color point luminaires to bring full spectrum natural light indoors or in tunable white luminaires to incorporate circadian elements that may impact human well-being. The high fidelity spectral output of Thrive creates stunning environments with excellent color rendering and outstanding TM30 metrics. Thrive is available in both SMD components and LED arrays to enable a broad range of lighting applications including retail, hospitality, office, education, architectural, museums, healthcare and residential lighting.

Features

- Engineered spectrum to closely match natural light
- CRI >95, R1-R15 >90, high Rf and Rg values
- High efficacy full spectrum solution
- No violet chip augmentation
- Hot color targeted
- Form factor consistent with existing Bridgelux COB arrays
- Broad product platform availability (SMDs and COBs)

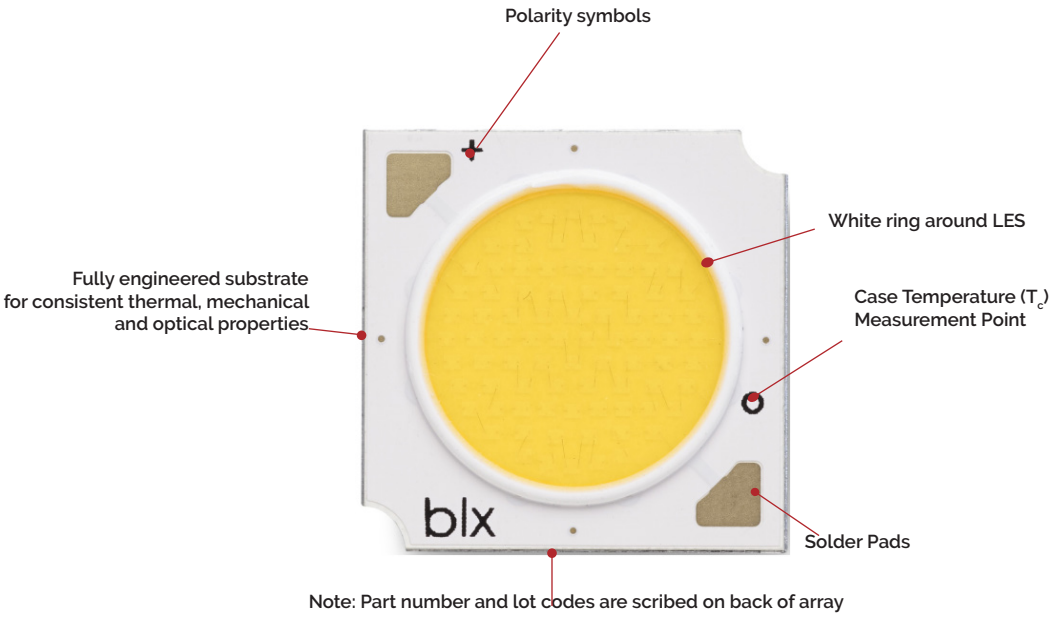
Benefits

- Full consistent spectrum with fewer spectral spikes
- Natural and vivid color rendering
- Greater energy savings, lower utility costs
- Economical, high efficiency solution
- Uniform and consistent white light at application conditions
- Ease of design and rapid go-to-market
- Enables greater design flexibility and platform color consistency

Contents

Product Feature Map

Bridgelux arrays are fully engineered devices that provide consistent thermal and optical performance on an engineered mechanical platform. The V Series arrays are the most compact chip-on-board devices across all of Bridgelux's LED Array products. The arrays incorporate several features to simplify design integration and assembly. Please visit www.bridgelux.com for more information on the V Series family of products.



Product Nomenclature

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

1 2 3 4 – 5 6 7 8 9 10 11 – 12 – 13 14

BXRE – 30 S 2001 – C – 7 3

Product Family

Nominal CCT
27 = 2,700K
30 = 3,000K
35 = 3,500K
40 = 4,000K
50 = 5,000K
57 = 5,700K
65 = 6,500K

Minimum CRI
S = Thrive

Flux Indicator
2001 = 2000 lm

Array Configuration

Gen 7

CCT Bin Options
2 = 2 SDCM
3 = 3 SDCM
4 = 4 SDCM

Product Selection Guide

The following product configurations are available:

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

Part Number[1,6]	Nominal CCT[1] (K)	CRI[2]	Nominal Drive Current[3] (mA)	Typical V_f (V)	Typical Pulsed Flux[4,5,6,7] T_c = 25°C (lm)	Minimum Pulsed Flux[6,7,8] T_c = 25°C (lm)	Typical Power (W)	Typical Efficacy (lm/W)	Typical Photosynthetic Photon Flux (PPF)	Typical Photon Efficiency (µmol/J)
BXRE-27S2001-C-73	2700	95	630	34.4	2330	2050	21.7	108	40.66	2.06
BXRE-30S2001-C-73	3000	95	630	34.4	2520	2218	21.7	116	43.05	2.16
BXRE-35S2001-C-73	3500	95	630	34.4	2612	2299	21.7	121	43.23	2.15
BXRE-40S2001-C-73	4000	95	630	34.4	2661	2342	21.7	123	43.31	2.14
BXRE-50S2001-C-74	5000	95	630	34.4	2774	2441	21.7	128	45.47	2.22
BXRE-57S2001-C-74	5700	95	630	34.4	2810	2473	21.7	130	46.20	2.24
BXRE-65S2001-C-74	6500	95	630	34.4	2782	2448	21.7	128	45.74	2.22

Table 2: Selection Guide, Stabilized DC Test Performance (T_c = 85˚C)[4,5,6]

Part Number[1,6]	Nominal CCT[1] (K)	CRI[2]	Nominal Drive Current[3] (mA)	Typical V_f (V)	Typical DC Flux[4,5,6,7] T_c = 85°C (lm)	Minimum DC Flux[6,7,8,9] T_c = 85°C (lm)	Typical Power (W)	Typical Efficacy (lm/W)	Typical Photosynthetic Photon Flux (PPF)	Typical Photon Efficiency (µmol/J)
BXRE-27S2001-C-73	2700	95	630	33.7	2120	1866	21.2	100	36.99	1.91
BXRE-30S2001-C-73	3000	95	630	33.7	2293	2018	21.2	108	39.18	2.01
BXRE-35S2001-C-73	3500	95	630	33.7	2377	2092	21.2	112	39.34	2.00
BXRE-40S2001-C-73	4000	95	630	33.7	2421	2131	21.2	114	39.40	1.99
BXRE-50S2001-C-74	5000	95	630	33.7	2524	2221	21.2	119	41.67	2.08
BXRE-57S2001-C-74	5700	95	630	33.7	2557	2250	21.2	120	42.04	2.09
BXRE-65S2001-C-74	6500	95	630	33.7	2532	2228	21.2	119	41.63	2.06

Notes for Table 1 & 2:
1. Product CCT is hot targeted at T_c = 85˚C. Nominal CCT as defined by ANSI C78.377-2011.
2. All CRI values are measured at T_j = T_c = 25˚C. CRI values are minimums. Bridgelux maintains a ± 3 tolerance on CRI values.
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. Typical stabilized DC performance values are provided as reference only and are not a guarantee of performance.
5. Typical performance values are provided as a reference only and are not a guarantee of performance.
6. 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.
7. Bridgelux maintains a ±7% tolerance on flux measurements.
8. Minimum flux values at the nominal test current are guaranteed by 100% test.
9. 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

V Series Thrive LED arrays are tested to the specifications shown using the nominal drive currents in Table 1. V Series Thrive LED Arrays 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 10 and the flux vs. current characteristics shown in Figure 11. 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 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)
BXRE-27S2001-C-73	95	315	32.2	10.1	1202	1117	119
		420	33.6	14.1	1600	1464	113
		630	**34.4**	**21.7**	**2330**	**2120**	**108**
		945	35.2	33.3	3329	3017	100
		1260	35.7	45.0	4332	3815	96
BXRE-30S2001-C-73	95	315	32.2	10.1	1301	1208	128
		420	33.6	14.1	1730	1583	123
		630	**34.4**	**21.7**	**2520**	**2293**	**116**
		945	35.2	33.3	3601	3263	108
		1260	35.7	45.0	4685	4126	104
BXRE-35S2001-C-73	95	315	32.2	10.1	1348	1252	133
		420	33.6	14.1	1793	1641	127
		630	**34.4**	**21.7**	**2612**	**2377**	**121**
		945	35.2	33.3	3732	3382	112
		1260	35.7	45.0	4857	4276	108
BXRE-40S2001-C-73	95	315	32.2	10.1	1373	1275	135
		420	33.6	14.1	1827	1672	129
		630	**34.4**	**21.7**	**2661**	**2421**	**123**
		945	35.2	33.3	3802	3446	114
		1260	35.7	45.0	4947	4356	110
BXRE-50S2001-C-73	95	315	32.2	10.1	1432	1329	141
		420	33.6	14.1	1905	1743	135
		630	**34.4**	**21.7**	**2774**	**2524**	**128**
		945	35.2	33.3	3964	3592	119
		1260	35.7	45.0	5158	4542	115
BXRE-57S2001-C-73	95	315	32.2	10.1	1450	1347	143
		420	33.6	14.1	1929	1765	137
		630	**34.4**	**21.7**	**2810**	**2557**	**130**
		945	35.2	33.3	4015	3639	121
		1260	35.7	45.0	5224	4600	116
BXRE-65S2001-C-73	95	315	32.2	10.1	1436	1333	142
		420	33.6	14.1	1910	1748	135
		630	**34.4**	**21.7**	**2782**	**2532**	**128**
		945	35.2	33.3	3975	3603	120
		1260	35.7	45.0	5173	4555	115

Notes for Table 3:

1. Alternate drive currents 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.

Spectrum Characteristics

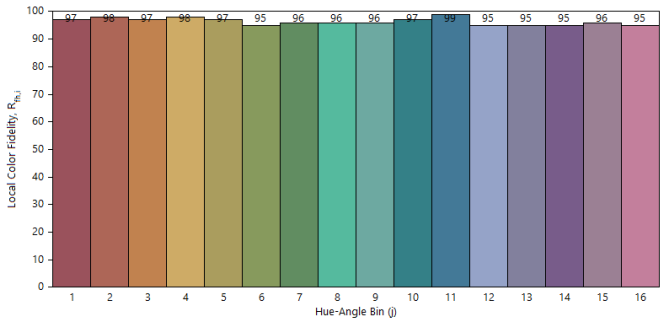
Table 4: Typical Color Rendering Index and TM-30 Values at, T_c=85˚C

Nominal CCT[1]	R_f	R_g	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
2700K	95	103	97	99	94	94	97	98	97	98	99	97	91	98	98	95	98
3000K	95	104	98	99	93	94	97	98	96	96	97	96	92	95	98	95	97
3500K	95	98	98	98	97	98	98	98	98	97	93	97	97	95	98	97	98
4000K	97	100	99	99	97	99	99	99	99	98	94	97	99	96	99	98	98
5000K	97	100	98	99	98	98	98	98	99	98	95	98	98	98	98	98	97
5700K	94	98	98	98	97	95	98	97	96	95	92	97	96	96	98	98	97
6500K	95	98	98	98	97	96	98	98	96	96	93	97	96	97	98	98	97

Note for Table 4:

1. Bridgelux maintains a tolerance of ± 3 on Color Rendering Index R1-R15 measurements and TM-30 measurements.

Figure 1: 2700K Thrive TM-30 Graphs



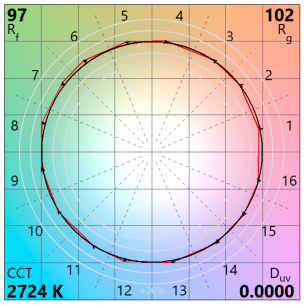
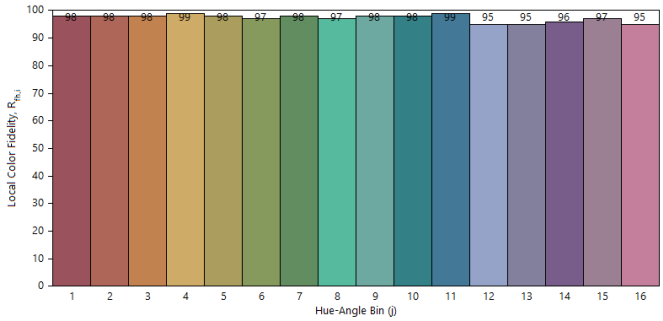


Figure 2: 3000K Thrive TM-30 Graphs



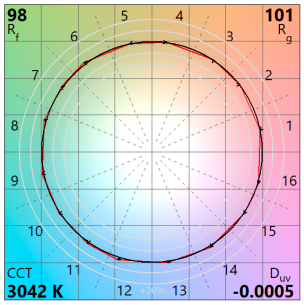
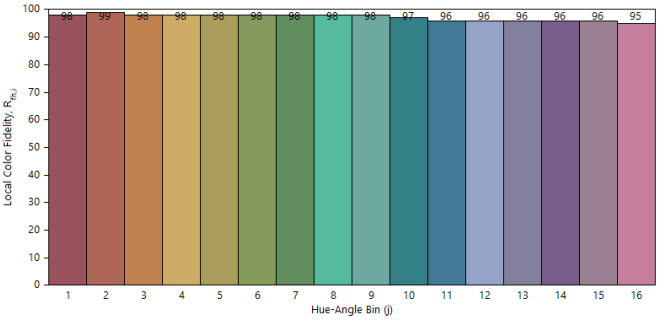
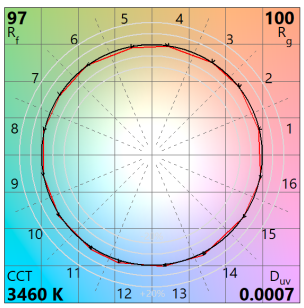


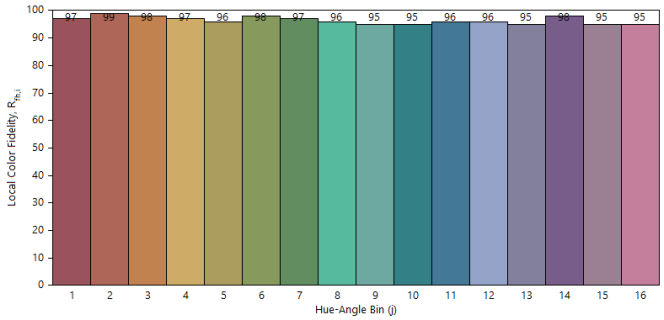
Figure 3: 3500K Thrive TM-30 Graphs





Spectrum Characteristics

Figure 4: 4000K Thrive TM-30 Graphs



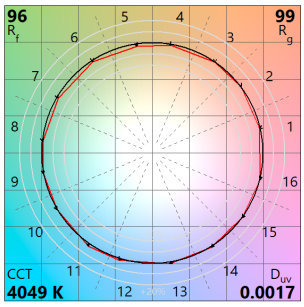
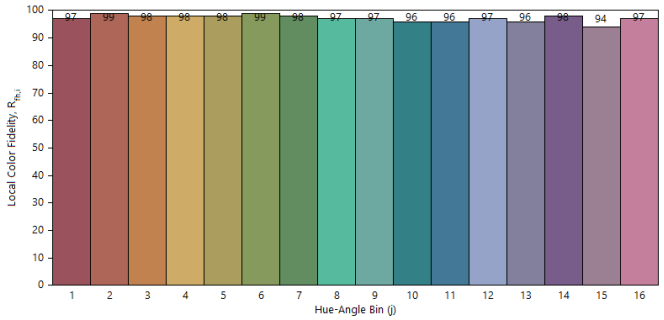


Figure 5: 5000K Thrive TM-30 Graphs



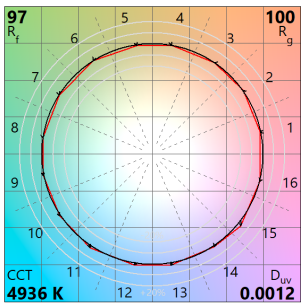
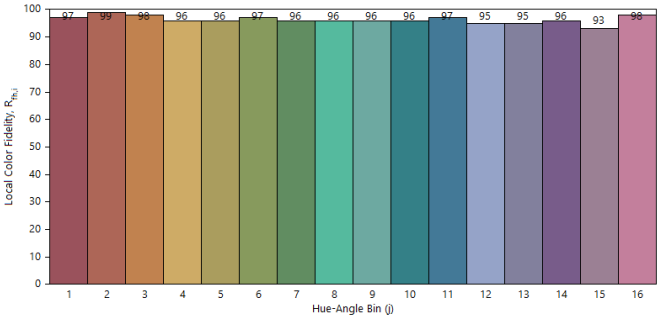


Figure 6: 5700K Thrive TM30 Graphs



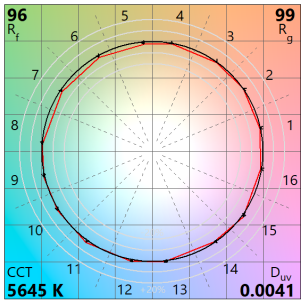
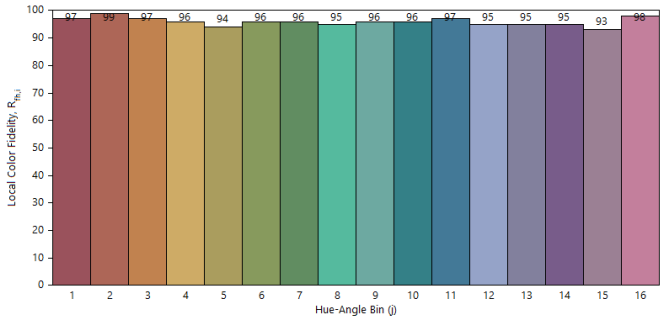
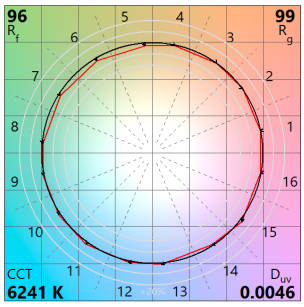


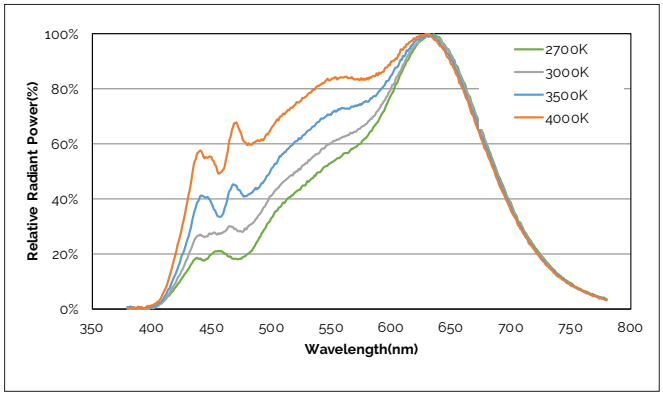
Figure 7: 6500K Thrive TM-30 Graphs

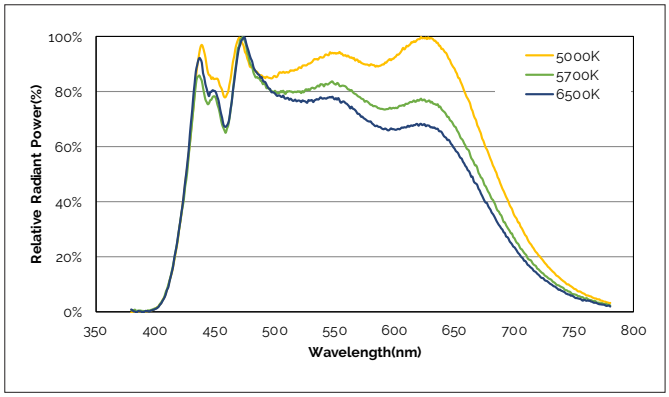




Spectrum Characteristics

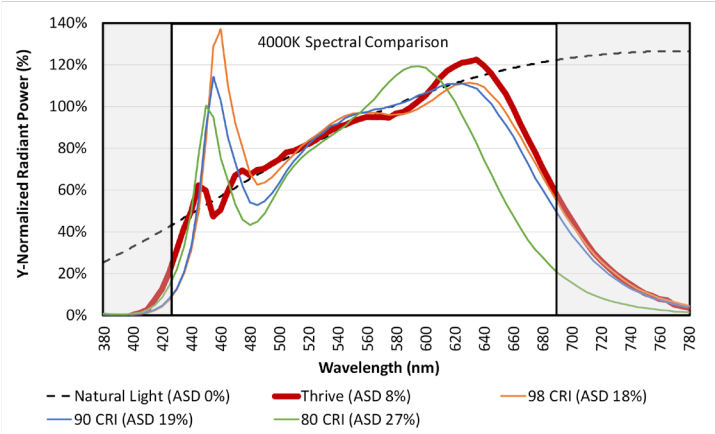
Figure 8: Typical Color Spectrum





Note for Figure 8:

1. Color spectra measured at nominal current for T_j = 85°C.



Spectral Matching to Natural Light

The lighting market is in the early stages of adoption of human-centric lighting (HCL). HCL encompasses the effects of lighting on the physical and emotional health and well-being of people. Throughout evolution, the human visual system has evolved under the natural light of sun and fire. These light sources have standardized industry spectral power definitions that describe the state of natural light. However, conventional metrics such as CCT, CRI, and TM-30 fail to adequately quantify the naturalness, or closeness of these light sources to the standardized natural spectra. Due to a lack of an industry standard metric to quantitatively measure the naturalness of a light source, Bridgelux has pioneered a new metric that takes the guesswork out of comparing LED light sources to natural light.

Average Spectral Difference, or ASD, is calculated by measuring the absolute difference between two spectra at discrete wavelengths. These values are averaged across a wavelength range derived from the photopic response curve, or V(); a luminous efficiency function describing the average spectral sensitivity of human perception of brightness. The range of 425nm to 690nm was selected to remove the tails of the V() gaussian distribution below 1% of the peak value at 555nm, covering 99.9% of the area under the photopic response curve. Natural light is defined following the approach of IES TM-30; black body curves for light sources of ≤4000K and the CIE standard illuminant D for light sources of ≥ 5000K.

Natural light has an ASD of 0%; lower ASD values indicate a closer match to natural light. Thrive is engineered to provide the closest match to natural light available using proprietary chip, phosphor and packaging technology, resulting in an ASD between 8% to 10% for all CCTs. By comparison, standard 80, 90, and 98 CRI light sources have ASD values that are 100% to 300% larger than Thrive. To learn more about the ASD metric, please contact your Bridgelux sales representative. Bridgelux will publish a white paper to further educate the market about the benefits of the ASD metric in Q2 2020.

Electrical Characteristics

Table 5: Electrical Characteristics

Part Number	Drive Current (mA)	Forward Voltage Pulsed, T_c = 25°C (V) [1, 2, 3, 8]			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)
BXRE-xxx2001-C-7x	630	32.2	34.4	37.4	-14.1	0.20	31.0	38.3
	1260	33.4	35.7	38.8	-14.1	0.24	33.4	41.0

Notes for Table 5:

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.
8. This product has been designed and manufactured per IEC 62031:2014. This product has passed dielectric withstand voltage testing at 1160 V. The working voltage designated for the insulation is 80V d.c. The maximum allowable voltage across the array must be determined in the end product application.

Absolute Maximum Ratings

Table 6: 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]	300˚C or lower for a maximum of 6 seconds
Maximum Drive Current[3]	1260mA
Maximum Peak Pulsed Drive Current[4]	1800mA
Maximum Reverse Voltage[5]	-60V

Notes for Table 6:

1. For IEC 62717 requirement, please consult your Bridgelux sales representative.
2. Refer to Bridgelux Application Note AN101: Handling and Assembly of Bridgelux V Series LED Arrays.
3. Arrays may be driven at higher currents however lumen maintenance may be reduced.
4. 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.
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.

Eye Safety

Table 7: Eye Safety Risk Group (RG) Classifications

Part Number	Drive Current [5] (mA)	CCT[1,5]			
		2700K/3000K	4000K[2]	5000K[3]	6500K[4]
BXRE-xxx200x-C-7x	630	RG1	RG1	RG1	RG1
	945	RG1	RG1	RG2	RG2
	1260	RG1	RG2	RG2	RG2

Notes for Table 7:

1. Eye safety classification for the use of Bridgelux V Series LED arrays is in accordance with specification IEC/TR 62778: Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires.
2. For products classified as RG2 at 4000K, E_{thr}= 1847.5 lx.
3. For products classified as RG2 at 5000K E_{thr}= 1315.8 lx.
4. For products classified as RG2 at 6500K, E_{thr}= 1124.5 lx.
5. Please contact your Bridgelux sales representative for E_{thr} values at specific drive currents and CCTs not listed.

Product Bin Definitions

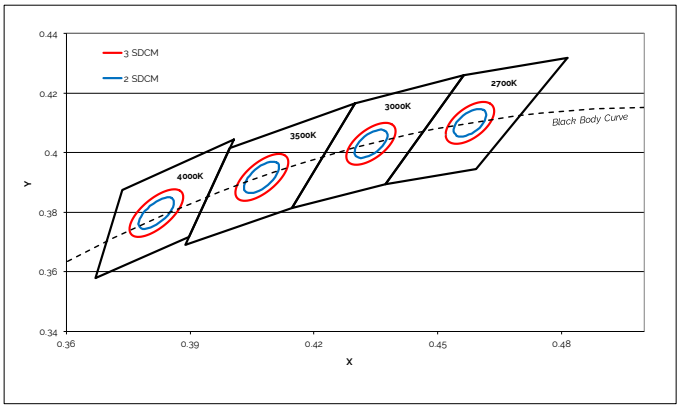
Table 8: 2-, 3- and 4-step MacAdam Ellipse Color Bin Definitions

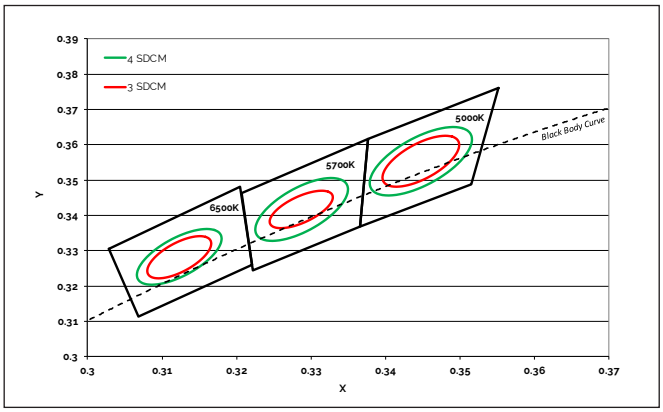
CCT	Center Point		Degree	2-step		3-step		4-step	
	x	y	(°)	a	b	a	b	a	b
2700K	0.4578	0.4101	53.700	0.00540	0.00280	0.0081	0.0042	N/A	N/A
3000K	0.4338	0.403	53.217	0.00556	0.00272	0.0083	0.0041	N/A	N/A
4000K	0.3818	0.3797	53.717	0.00626	0.00268	0.0094	0.0040	N/A	N/A
5000K	0.3447	0.3553	59.617	N/A	N/A	0.0082	0.0035	0.0110	0.0047
5700K	0.3287	0.3417	59.060	N/A	N/A	0.0074	0.0032	0.0099	0.0042
6500K	0.3123	0.3282	58.567	N/A	N/A	0.0066	0.0028	0.0090	0.0038

Notes for Table 8:

1. Color binning at T_c=85°C
2. Bridgelux maintains a tolerance of ± 0.007 on x and y color coordinates in the CIE 1931 color space.

Figure 9: C.I.E. 1931 Chromaticity Diagram (Color targeted at T_c=85°C)





Performance Curves

Figure 10: V13C Drive Current vs. Voltage (T_c=25°C)

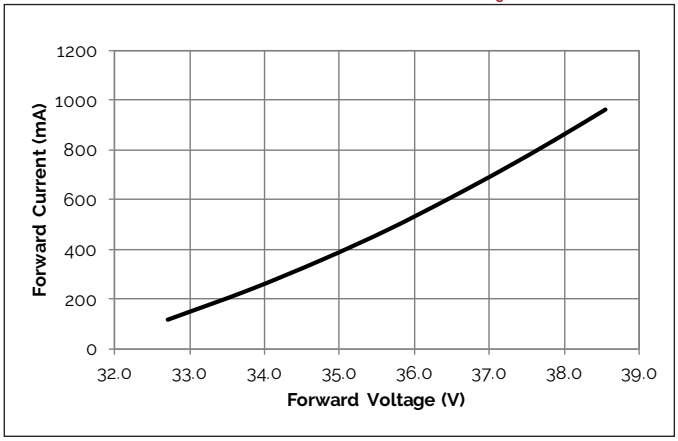


Figure 11: V13C Typical Relative Flux vs. Current (T_c=25°C)

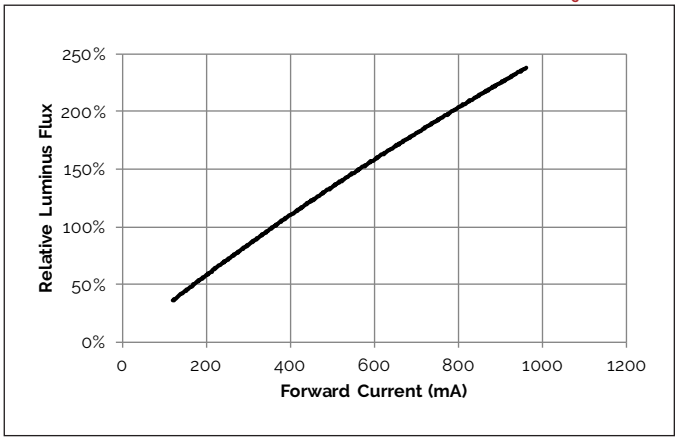


Figure 12: Typical DC Flux vs. Case Temperature

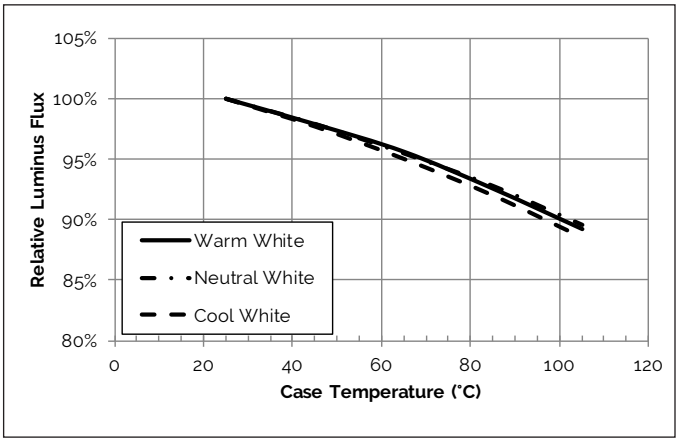


Figure 13: Typical ccx Shift vs. Case Temperature

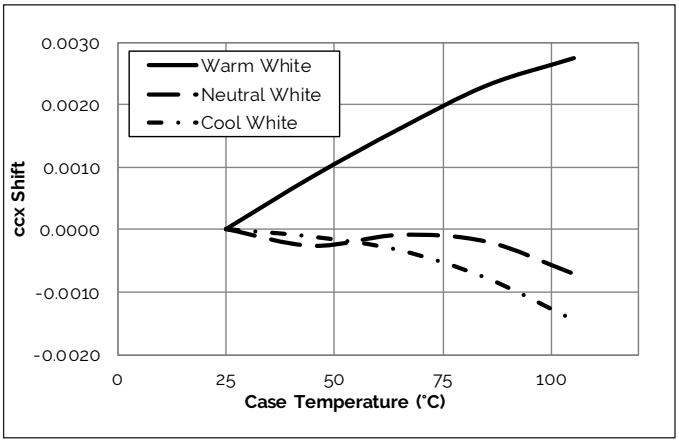
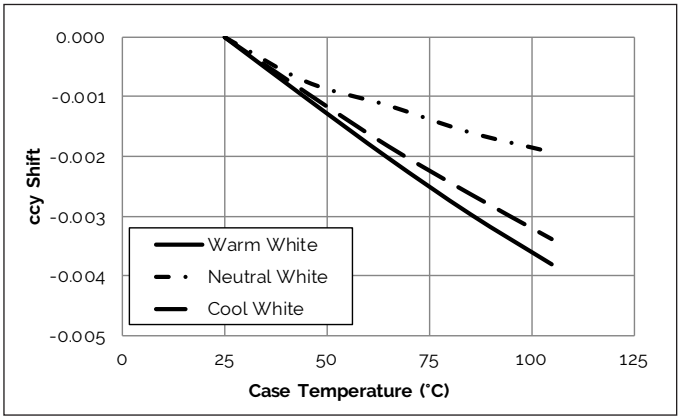


Figure 14: Typical ccy Shift vs. Case Temperature

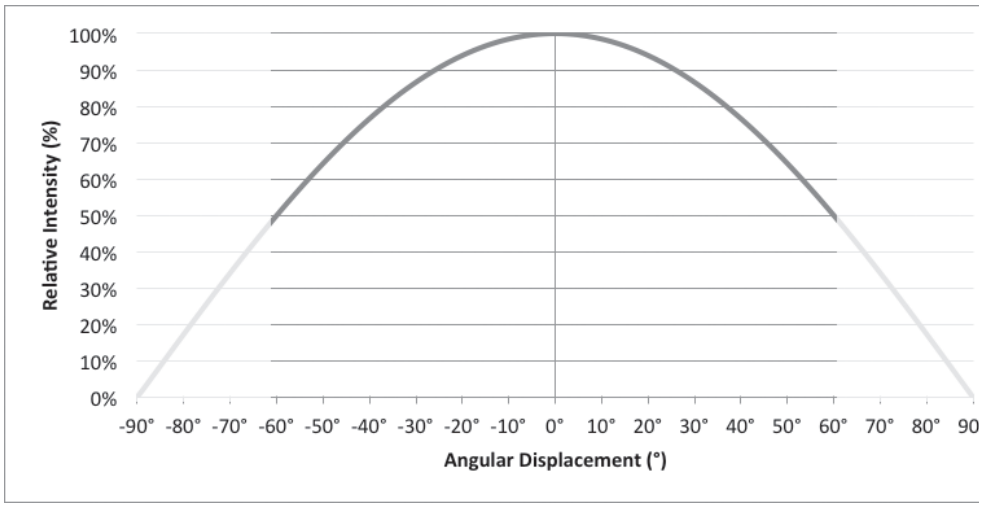


Notes for Figures 12-14:

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.
2. Characteristics shown for warm white based on 3000K Thrive
3. Characteristics shown for neutral white based on 4000K Thrive
4. Characteristics shown for cool white based on 5700K Thrive
5. For other color SKUs, the shift in color will vary. Please contact your Bridgelux Sales Representative for more information.

Typical Radiation Pattern

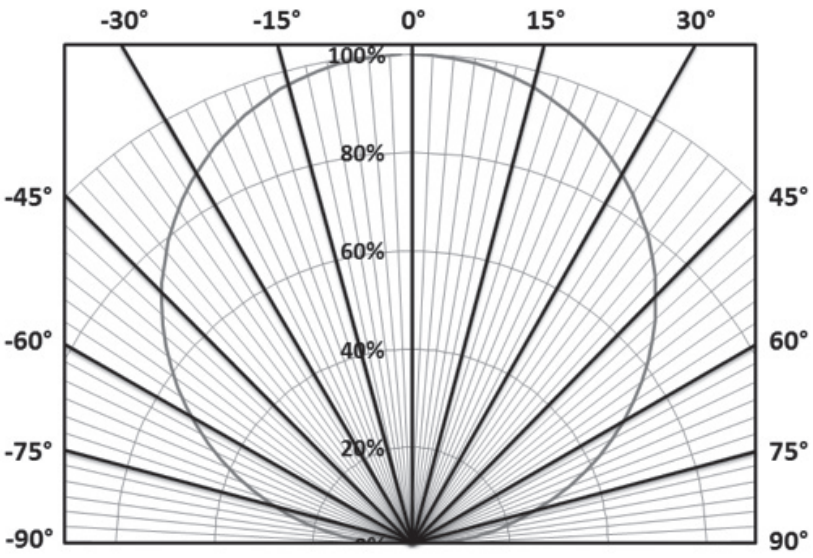
Figure 15: Typical Spatial Radiation Pattern



Notes for Figure 15:

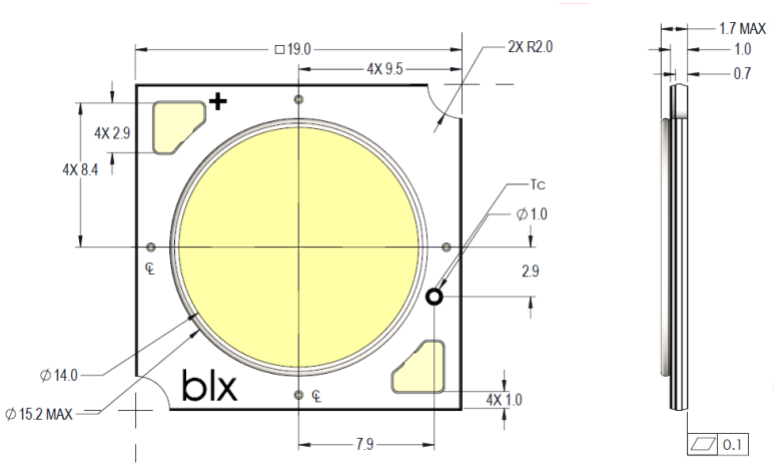
1. Typical viewing angle is 120°.
2. The viewing angle is defined as the off axis angle from the centerline where intensity is ½ of the peak value.

Figure 16: Typical Polar Radiation Pattern



Mechanical Dimensions

Figure 17: V13 LED Array



Notes for Figure 17:

1. Drawings are not to scale.
2. Drawing dimensions are in millimeters.
3. Unless otherwise specified, tolerances are ±0.1mm.
4. Mounting locations (2X) are for M2.5 screws.
5. Screws with flat shoulders (pan, dome, button, round, truss, mushroom) provide optimal torque control. Do NOT use flat, countersink, or raised head screws.
6. The optical center of the LED Array is nominally defined by the mechanical center of the array to a tolerance of ± 0.2mm.
7. Bridgelux maintains a flatness of 0.10mm across the mounting surface of the array.

Packaging and Labeling

Figure 18: V13 Packaging

Notes for Figure 18:

1. Each tube holds 30 V13 COB arrays.
2. One tube is sealed in an anti-static bag. Four bags are placed in a shipping box. Depending on quantities ordered, a bigger shipping box, containing four boxes may be used to ship products.
3. Each bag and box is to be labeled as shown above.
4. Dimensions for each tube are 8.3 (W) x 15.4 (H) x 430 (L). Dimensions for the anti-static bag are 75 (W) x 615 (L) x 3.1 (T) mm. Dimensions for the shipping box are 58.7 x 13.3 x 7.9 cm

Packaging and Labeling

Figure 19: **Gen. 7 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 V Series product family of LED array products. For all available application notes 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 V Series LED arrays are available in both IGS and STEP formats. Please contact your Bridgelux sales representative for assistance.

LM80

LM80 testing has been completed and the LM80 report is now available. Please contact your Bridgelux sales representative for LM-80 report.

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 AN101 for additional information.

CAUTION: RISK OF BURN

Do not touch the V Series LED array during operation. Allow the array to cool for a sufficient period of time before handling. The V Series 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).

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: Bridging Light and Life™

At Bridgelux, we help companies, industries and people experience the power and possibility of light. Since 2002, we've designed LED solutions that are high performing, energy efficient, cost effective and easy to integrate. Our focus is on light's impact on human behavior, delivering products that create better environments, experiences and returns—both experiential and financial. And our patented technology drives new platforms for commercial and industrial luminaires.

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