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Bridgelux ES Array Series

Product Data Sheet

Introduction

The Bridgelux family of LED Array products delivers high performance, compact and cost-effective solid-state lighting solutions to serve the general lighting market. These products combine the higher efficacy, lifetime, and reliability benefits of LEDs with the light output levels of many conventional lighting sources. The Bridgelux ES Array Series has been specified to enable lamp and luminaire designs surpassing efficacy and quality of light requirements driven by regulatory standards with reasonable system design margins, enabling lighting product compliance to Energy Star, Title 24, Part L and other global standards.

The Bridgelux ES Array products provide a high performance alternative to conventional solid state solutions, delivering between 400 and 2000 lumens under application conditions in warm, neutral and cool white color temperatures. These compact high flux density light sources deliver uniform high quality illumination without pixilation or the multiple shadow effect caused by LED component based solutions. To simplify system design for appropriate light output, Bridgelux LED Arrays are specified to deliver performance under typical use conditions.

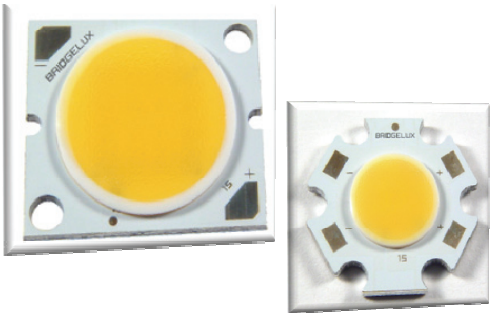
These integrated plug and play solutions reduce system complexity and enable miniaturized cost-effective lamp and luminaire designs. Lighting system designs incorporating these LED Arrays deliver comparable performance to that of 20-100 Watt incandescent and halogen, 7-42 Watt compact fluorescent, and 18-50 Watt HID based luminaires and feature increased system level efficacy and service life. Typical applications include replacement lamps, task, accent, spot, retail, track, down light, low bay, wide area, security, wall pack and street lighting.

Features

- Compact high flux density light source
- Uniform high quality illumination
- Streamlined thermal path
- Energy Star / ANSI compliant binning structure
- More energy efficient than incandescent, halogen and fluorescent lamps
- Low voltage DC operation
- Instant light with unlimited dimming
- Long operating life
- RoHS compliant and Pb free

Benefits

- Enhanced optical control
- Clean white light without pixilation
- Significantly reduced thermal resistance and increased operating temperatures
- Uniform consistent white light
- Lower operating costs
- Increased safety
- Easy to use with daylight and motion detectors to enable increased energy savings
- Reduced maintenance costs
- Environmentally friendly, no disposal issues



BRIDGELUX
The Magic of Light™

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Product Nomenclature

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

B X R A – A B C D E – R R R R R

Where:

B X R A – designates product family

A – designates color, C for Cool White, N for Neutral White and W for Warm White

B C – designates LED Array product flux, 04 for a 400 lumen array, 08 for a 800 lumen array, 12 for a 1200 lumen array, and 20 for a 2000 lumen array

D E – designates product family

R R R R R – used to designate product options, 00000 by default

The base product part number (BXRA-ABCDE) is indicated on each individual unit, printed on the bottom of the LED Array.

Average Lumen Maintenance Characteristics

Bridgelux projects that its family of LED Array products will deliver, on average, greater than 70% lumen maintenance after 50,000 hours of operation at the rated forward test current. This performance assumes constant current operation with case temperature maintained at or below 70°C. For use beyond these typical 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 LM80. 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. Bridgelux LED Arrays are compliant to the European Union directives on the restriction of hazardous substances in electronic equipment, namely the RoHS directive. Bridgelux will not intentionally add the following restricted materials to LED Array products: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).

UL Recognition

Bridgelux product became UL Recognized on 31 March, 2010. Please refer to the UL file E333389. Bridgelux uses UL Recognized materials with suitable flammability ratings in the LED Array to streamline the process for customers to secure UL listing of the final luminaire product. Bridgelux recommends that luminaires are designed with a Class 2 Driver to facilitate the UL listing process.

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.

Cautionary Statements

CAUTION: CONTACT WITH OPTICAL AREA

Contact with the resin area should be avoided. Applying stress to the resin area can result in damage to the product.

CAUTION: EYE SAFETY

Eye safety classification for the use of Bridgelux LED Arrays is contained in the CIE S 009/E2002 Photobiological Safety of Lamps and Lamp Systems specification. Bridgelux LED Arrays are classified under section 6 lamp classification as Risk Group 2 (Moderate Risk). Please use appropriate precautions. It is important that employees working with LEDs are trained to use them safely. Luminaire manufacturers should refer to CIE S 009/E2002 to establish the classification of their product.

CAUTION: RISK OF BURN

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

Case Temperature Measurement Point

A case temperature measurement point location is included on the top surface of the Bridgelux 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 closely linked 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. Measuring the top surface of the product can lead to inaccurate results due to the poor thermal conductivity of the top layers of the array such as the solder mask and other materials.

Bridgelux has provided the case temperature measurement location in a manner which closely ties it to the true case temperature of the LED Array under steady state operation. Deviations between thermal measurements taken at the point indicated and the back of the LED Array differ by less than 1°C, providing a robust method to testing thermal operation once the product is installed.

Flux Characteristics

Table 1: Flux Characteristics

Color	Base Part Number	Typical Luminous Flux ϕv (lm), T_{case}=60°C [3]	Minimum Luminous Flux ϕv (lm), T_j=25°C [1]	Typical Luminous Flux ϕv (lm), T_j=25°C	Test Current (mA) [2]
Warm White	BXRA-W0401	400	400	440	700
	BXRA-W0402	420	400	460	700
	BXRA-W0802	850	800	930	1050
	BXRA-W1202	1200	1200	1320	1200
	BXRA-W1203	1240	1200	1370	1050
Neutral White	BXRA-N0402	400	400	440	600
	BXRA-N0802	920	880	1020	1050
	BXRA-N1203	1380	1380	1530	1050
Cool White	BXRA-C0402	410	400	450	500
	BXRA-C0802	800	800	880	700
	BXRA-C1202	1200	1200	1320	1050
	BXRA-C2002	2000	2000	2200	1500

Notes for Table 1:

1. Bridgelux maintains a ± 7% tolerance of flux measurements.
2. Parts are tested in pulsed conditions, Tj = 25°C. Pulse width is 10 ms at rated test current.
3. Typical performance when driven with direct current using Bridgelux test set-up. Please contact a Bridgelux sales representative for additional details.

Optical Characteristics

Table 2: Optical Characteristics

Color	Base Part Number	Color Temperature (CCT) [1],[2],[3]			Typical Color Rendering Index [4]	Typical Viewing Angle (Degrees) 2 θ½ [6]	Typical Center Beam Candle Power (cd) [5]
		Min	Typ	Max			
Warm White	BXRA-W0401	2850 K	3000 K	3700 K	82	120	140
	BXRA-W0402					120	145
	BXRA-W0802					120	295
	BXRA-W1202					120	420
	BXRA-W1203					120	435
Neutral White	BXRA-N0402	3700K	4100 K	4750K	80	120	140
	BXRA-N0802					120	325
	BXRA-N1203					120	480
Cool White	BXRA-C0402	4750 K	5600 K	7000 K	65	120	145
	BXRA-C0802					120	280
	BXRA-C1202					120	420
	BXRA-C2002					120	700

Notes for Table 2:

1. Parts are tested in pulsed conditions, Tj = 25°C. Pulse width is 10 ms at rated test current.
2. Refer to Flux Characteristic Table for test current data.
3. Product is binned for color in x y coordinates.
4. Higher CRI options available upon request.
5. Center beam candle power is a calculated value based on lambertian radiation pattern at nominal test current.
6. Viewing angle is the off axis angle from the centerline where Iv is ½ of the peak value.

Electrical Characteristics

Table 3: Electrical Characteristics

Color	Base Part Number	Forward Voltage V_f (V) [1],[2]			Test Current (mA) [2]	Typical Temperature Coefficient of Forward Voltage (mV/°C) $\Delta V_f/\Delta T_j$	Typical Thermal Resistance Junction to Case (°C/W) $R\theta_{j-c}$
		Min	Typ	Max			
Warm White	BXRA-W0401	8.7	9.5	10.3	700	-3 to -9	1.0
	BXRA-W0402	8.3	9.0	9.7	700	-3 to -9	1.0
	BXRA-W0802	11.2	12.2	13.2	1050	-4 to -12	0.7
	BXRA-W1202	13.9	15.1	16.3	1200	-5 to -15	0.5
	BXRA-W1203	17.3	18.3	19.8	1050	-6 to -18	0.5
Neutral White	BXRA-N0402	8.4	8.9	9.7	600	-3 to -9	1.0
	BXRA-N0802	11.2	12.2	13.2	1050	-4 to -12	0.7
	BXRA-N1203	17.3	18.3	19.8	1050	-6 to -18	0.5
Cool White	BXRA-C0402	8.7	9.5	10.3	500	-3 to -9	1.4
	BXRA-C0802	11.7	12.7	13.7	700	-4 to -12	0.8
	BXRA-C1202	11.8	12.8	13.8	1050	-4 to -12	0.7
	BXRA-C2002	14.9	16.2	17.5	1500	-5 to -15	0.5

Notes for Table 3:

1. Parts are tested in pulsed conditions, Tj = 25°C. Pulse width is 10 ms at rated test current.
2. Bridgelux maintains a tester tolerance of ± 0.10 V on forward voltage measurements.

Absolute Minimum and Maximum Ratings

Table 4: Minimum and Maximum Current and Reverse Voltage Ratings

Part Number	Maximum DC Forward Current (mA)	Minimum DC Forward Current (mA) [2]	Maximum Peak Pulsed Current (mA) [3]	Maximum Reverse Voltage (Vr)[1]
BXRA-W0401	1500	450	2100	-15 Volts
BXRA-W0402	1500	450	2100	-15 Volts
BXRA-W0802	2000	600	2800	-20 Volts
BXRA-W1202	2500	750	3500	-25 Volts
BXRA-W1203	2000	600	2800	-30 Volts
BXRA-N0402	1500	450	2100	-15 Volts
BXRA-N0802	2000	600	2800	-20 Volts
BXRA-N1203	2000	600	2800	-30 Volts
BXRA-C0402	1000	300	1400	-15 Volts
BXRA-C0802	1500	450	2100	-20 Volts
BXRA-C1202	2000	600	2800	-20 Volts
BXRA-C2002	2500	750	3500	-25 Volts

Notes for Table 4:

1. Light emitting diodes are not designed to be driven in reverse voltage.
2. Driving these high current devices at low currents can result in variations in performance. For low current operation pulse width modulation is recommended.
3. Bridgelux recommends a maximum duty cycle of 10% when operating LED Arrays at the maximum peak pulsed current specified.

Table 5: Maximum Ratings

Parameter	Maximum Rating
LED Junction Temperature	150°C
Storage Temperature	-40°C to +105°C
Operating Case Temperature	105°C
Soldering Temperature	3.5 seconds, 350°C or lower

Typical Performance at Alternative Drive Currents

The Bridgelux LED Arrays are tested and binned against the specifications shown in Tables 1, 2 and 3. Customers also have options to drive the LED Arrays at alternative drive currents dependent on the specific application. The typical performance at any drive current can be derived from the flux vs. current characteristics shown in Figures 8-11 and from the current vs. voltage characteristics shown in Figures 15-24. The typical performance at common drive currents is also summarized in Table 6 for warm white products, Table 7 for neutral white products and Table 8 for cool white products.

Table 6: Typical Product Performance at Alternative Drive Currents – Warm White

Color	Part Number	Typical Luminous Flux ϕv (lm), T_{case}=60°C	Typical Luminous Flux ϕv (lm), T_j=25°C	Typical Forward Voltage V_f (V)	Forward Current (mA) [2]
Warm White	BXRA-W0401	290	325	9.2	500
		400	**440**	**9.5**	**700** [1]
		560	620	9.9	1050
	BXRA-W0402	315	350	8.8	500
		420	**460**	**9.0**	**700** [1]
		600	660	9.5	1050
	BXRA-W0802	430	480	11.4	500
		580	640	11.7	700
		850	**930**	**12.2**	**1050** [1]
		1050	1170	12.6	1400
	BXRA-W1202	740	820	14.4	700
		1060	1180	14.9	1050
		1200	**1320**	**15.1**	**1200** [1]
		1360	1510	15.4	1400
		1640	1820	15.8	1750
	BXRA-W1203	630	700	17.1	500
		860	960	17.6	700
		1230	**1370**	**18.3**	**1050** [1]
		1570	1750	18.9	1400

Notes for Table 6:

1. Product is tested and binned at the specified drive current.
2. Operating these LED Arrays at or below the drive currents listed in Table 6, with a case temperature maintained at or below 70°C, will enable the average lumen maintenance projection outlined earlier in this Product Data Sheet.

Typical Performance at Alternative Drive Currents (continued)

Table 7: Typical Product Performance at Alternative Drive Currents – Neutral White

Color	Part Number	Typical Luminous Flux ϕv (lm), T_{case}=60°C	Typical Luminous Flux ϕv (lm), T_j=25°C	Typical Forward Voltage V_f (V)	Forward Current (mA) [2]
Neutral White	BXRA-N0402	330	370	8.8	500
		400	**440**	**8.9**	**600** [1]
		450	500	9.0	700
	BXRA-N0802	470	525	11.4	500
		640	710	11.7	700
		920	**1020**	**12.2**	**1050** [1]
		1170	1300	12.6	1400
	BXRA-N1203	710	790	17.1	500
		960	1070	17.6	700
		1380	**1530**	**18.3**	**1050** [1]
		1750	1950	18.9	1400

Notes for Table 7:

1. Product is tested and binned at the specified drive current.
2. Operating these LED Arrays at or below the drive currents listed in Table 7, with a case temperature maintained at or below 70°C, will enable the average lumen maintenance projection outlined earlier in this Product Data Sheet.

Typical Performance at Alternative Drive Currents (continued)

Table 8: Typical Product Performance at Alternative Drive Currents – Cool White

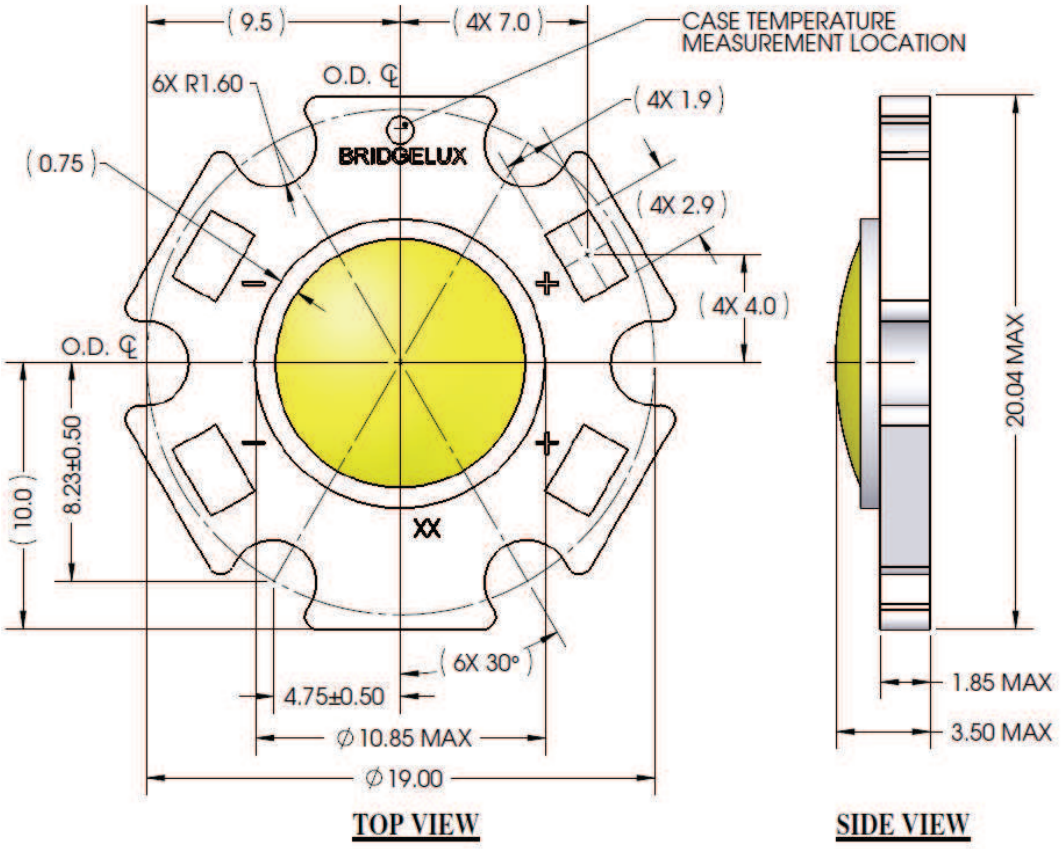
Color	Part Number	Typical Luminous Flux ϕv (lm), T_{case}=60°C	Typical Luminous Flux ϕv (lm), T_j=25°C	Typical Forward Voltage V_f (V)	Forward Current (mA) [2]
Cool White	BXRA-C0402	315	340	9.2	350
		410	**450**	**9.5**	**500** [1]
		560	620	9.9	700
	BXRA-C0802	590	650	12.2	500
		800	**880**	**12.7**	**700** [1]
		1120	1240	13.2	1050
	BXRA-C1202	830	920	12.3	700
		1200	**1320**	**12.8**	**1050** [1]
		1510	1680	13.2	1400
	BXRA-C2002	1020	1130	15.1	700
		1460	1620	15.6	1050
		1850	2050	16.1	1400
		2000	**2200**	**16.2**	**1500** [1]
		2270	2520	16.5	1750

Notes for Table 8:

1. Product is tested and binned at the specified drive current.
2. Operating these LED Arrays at or below the drive currents listed in Table 8, with a case temperature maintained at or below 70°C, will enable the average lumen maintenance projection outlined earlier in this Product Data Sheet.

Mechanical Dimensions

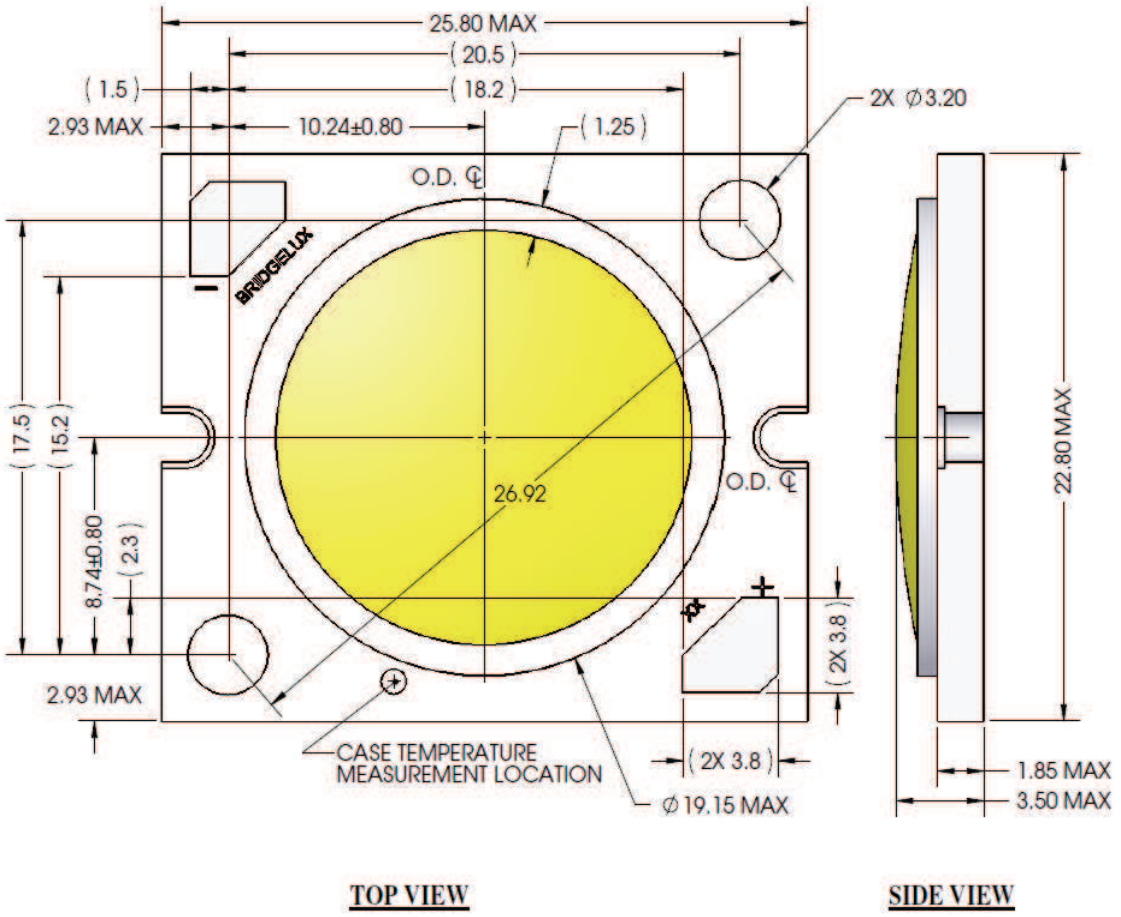
Figure 1: Drawing for 400 lumen product options (part numbers BXRA-C0402, BXRA-N0402, BXRA-W0401, and BXRA-W0402).



Notes for Figure 1:

1. Slots are for M2.5 or #4 screws.
2. Solder pads are labeled “+” and “-“ to denote positive and negative, respectively.
3. Drawings are not to scale.
4. Drawing dimensions are in millimeters.
5. Bridgelux recommends two tapped holes for mounting screws with 19.20 ± 0.05mm center-to-center spacing.
6. Unless otherwise specified, tolerances are ± 0.10mm.
7. Dimensions with parentheses “( )” are for reference only.
8. Refer to product Application Notes AN10 and AN11 for product handling, mounting and heat sink recommendations.
9. The optical center of the LED Array is defined by the mechanical center of the array.

Figure 2: Drawing for 800, 1200, and 2000 lumen product options (part numbers BXRA-C0802, BXRA-W0802, BXRA-C1202, BXRA-W1202, BXRA-W1203, BXRA-N0802, BXRA-N1203 and BXRA-C2002).



Notes for Figure 2:

1. Mounting holes are for M2.5 or #4 screws.
2. Solder pads are labeled “+” and “-“ to denote positive and negative, respectively.
3. Drawings are not to scale.
4. Drawing dimensions are in millimeters.
5. Bridgelux recommends two tapped holes for mounting screws with 26.92 ± 0.10mm center-to-center spacing.
6. Unless otherwise specified, tolerances are ± 0.10mm.
7. Dimensions with parentheses “( )” are for reference only.
8. Refer to product Application Notes AN10 and AN11 for product handling, mounting and heat sink recommendations.
9. The optical center of the LED Array is defined by the mechanical center of the array.

Typical Radiation Pattern

Figure 3: Typical Spatial Radiation Pattern

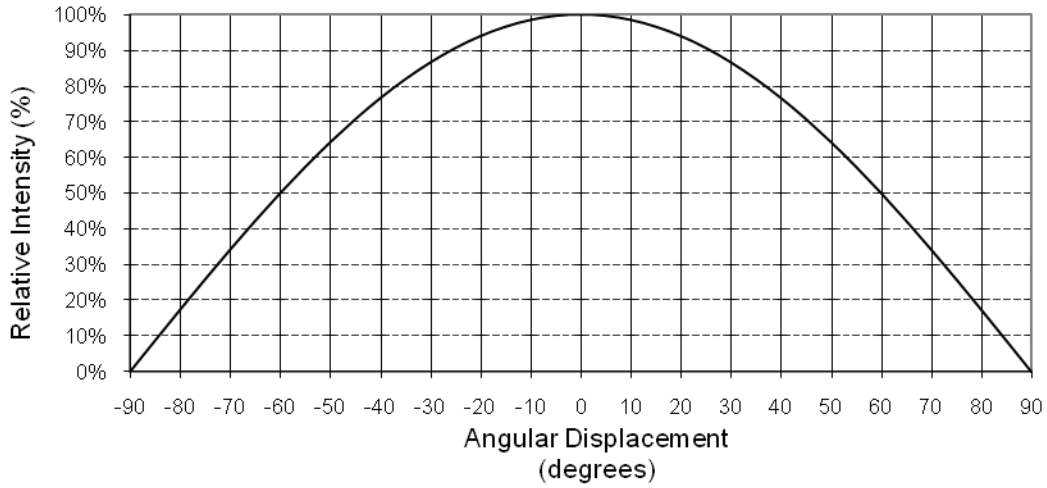
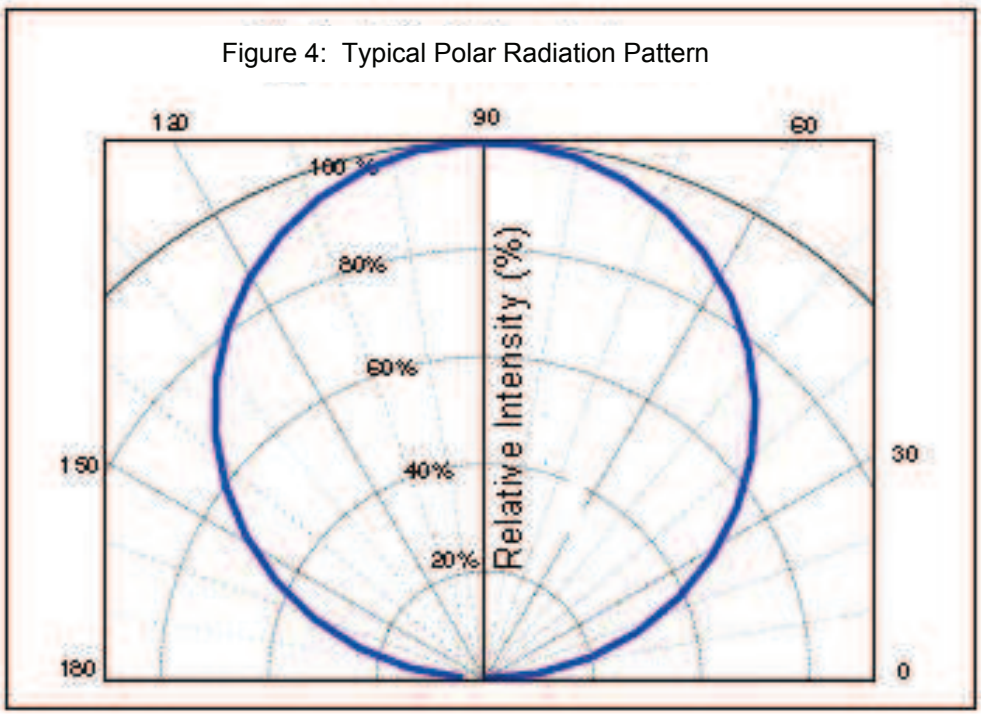


Figure 4: Typical Polar Radiation Pattern



Wavelength Characteristics at Rated Test Current, Tj=25°C

Figure 5: Typical Warm White Color Spectrum

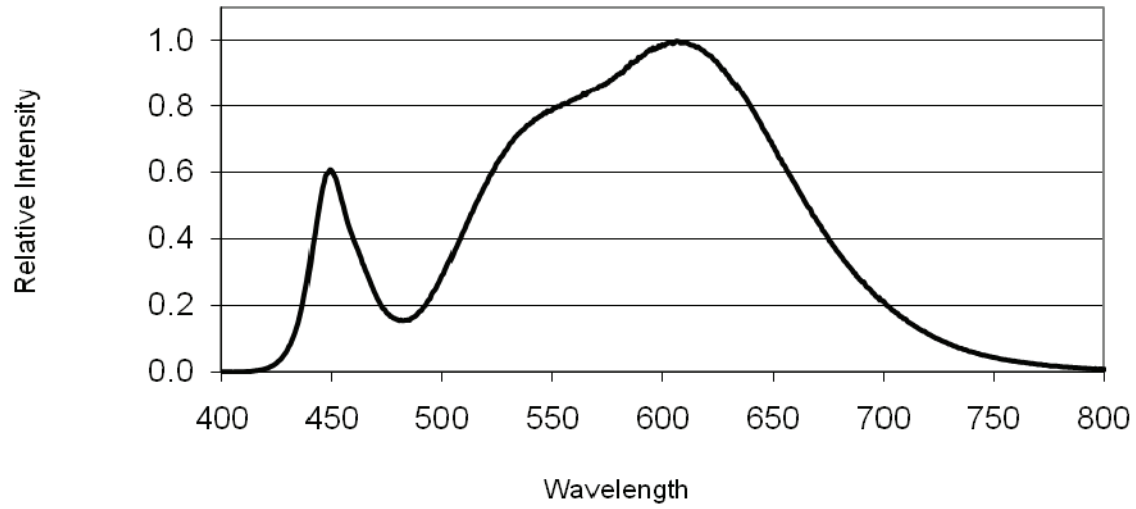
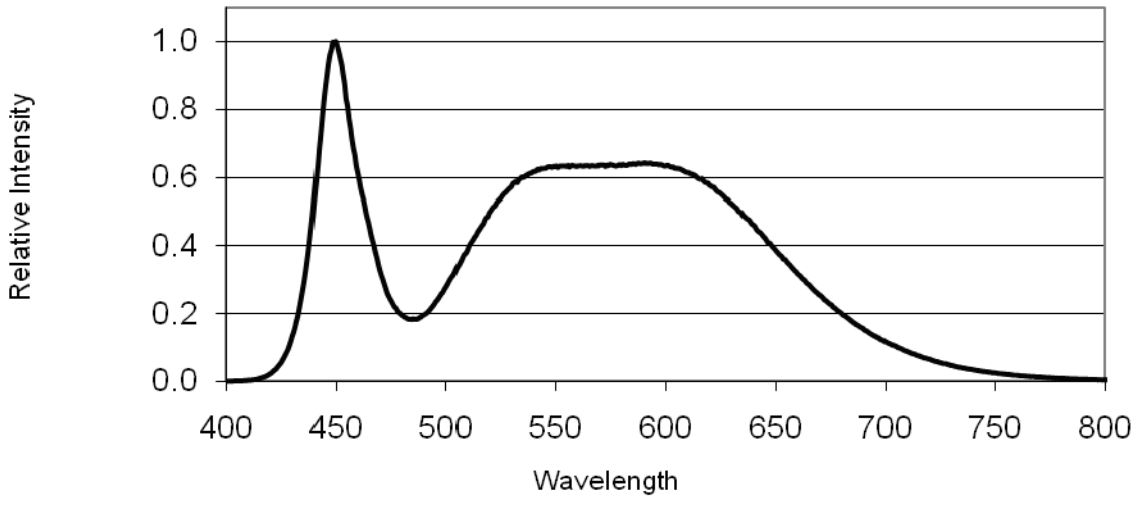
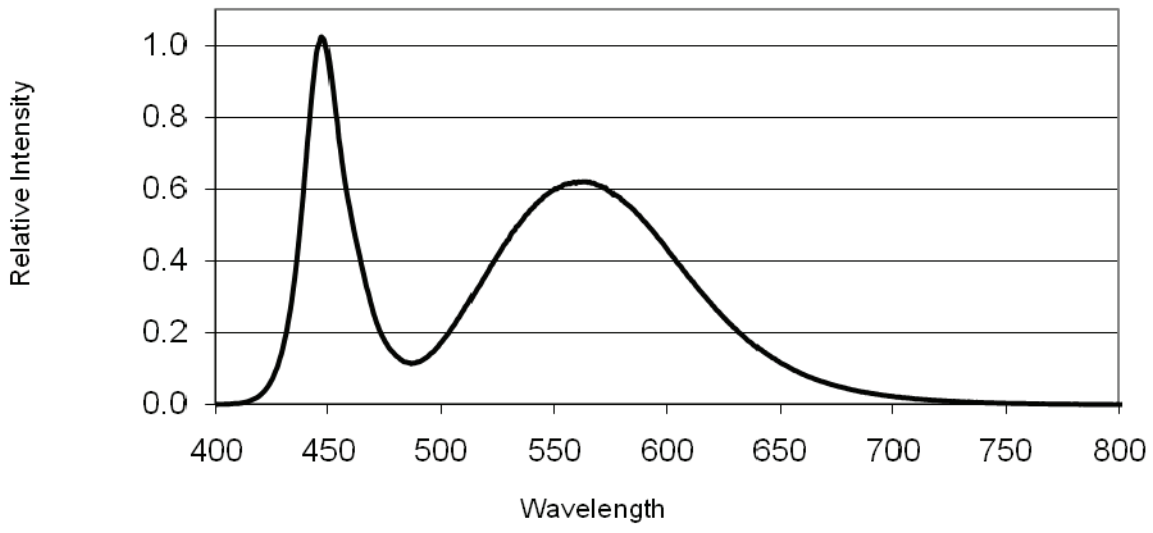


Figure 6: Typical Neutral White Color Spectrum



Wavelength Characteristics at Rated Test Current, T_j=25°C (continued)

Figure 7: Typical Cool White Color Spectrum



Typical Relative Luminous Flux vs. Current, Tj=25° C

Figure 8: Typical Flux vs. Current (400lm arrays)

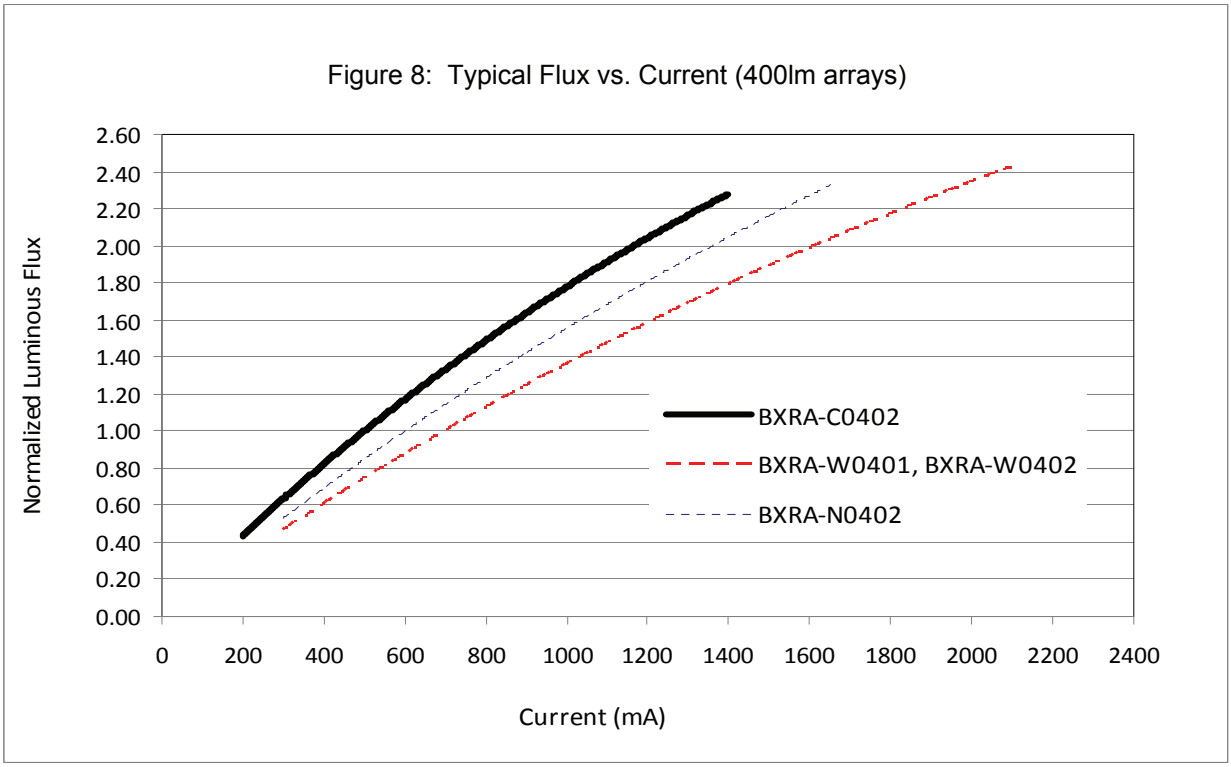
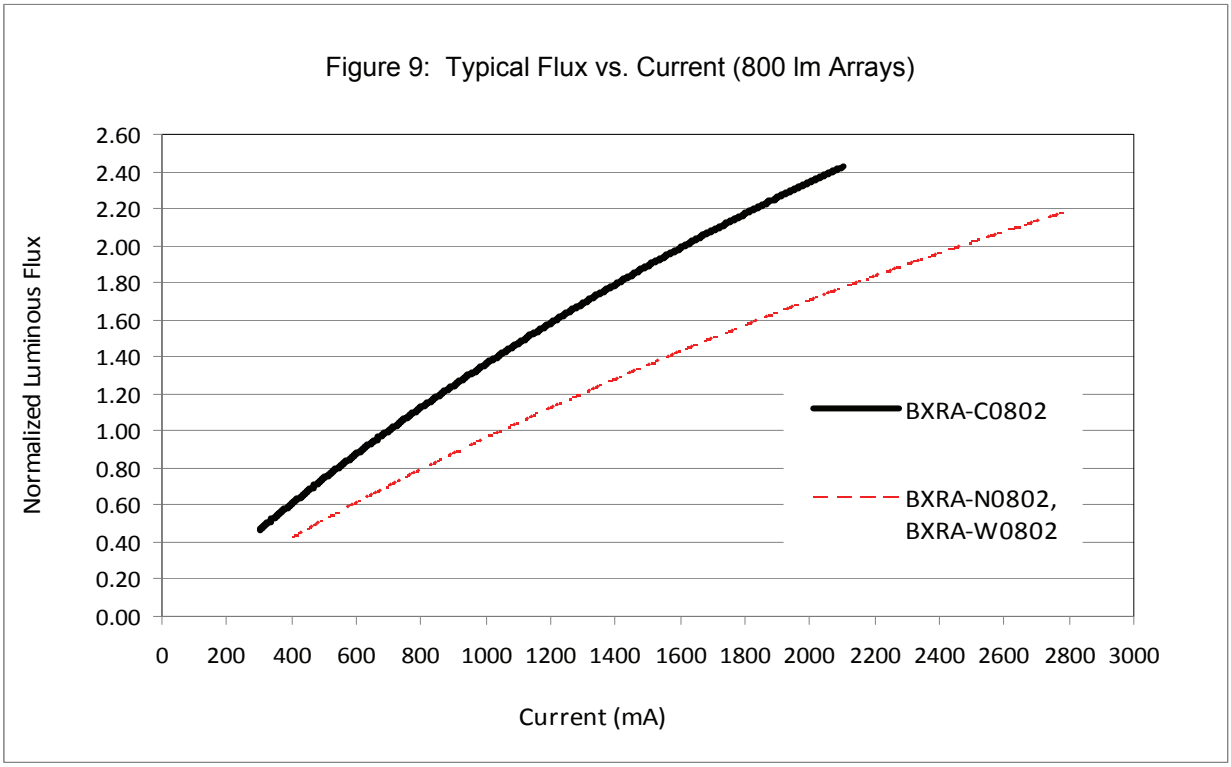


Figure 9: Typical Flux vs. Current (800 lm Arrays)



Typical Relative Luminous Flux vs. Current, T_j=25° C (continued)

Figure 10: Typical Flux vs. Current (1200 lm Arrays)

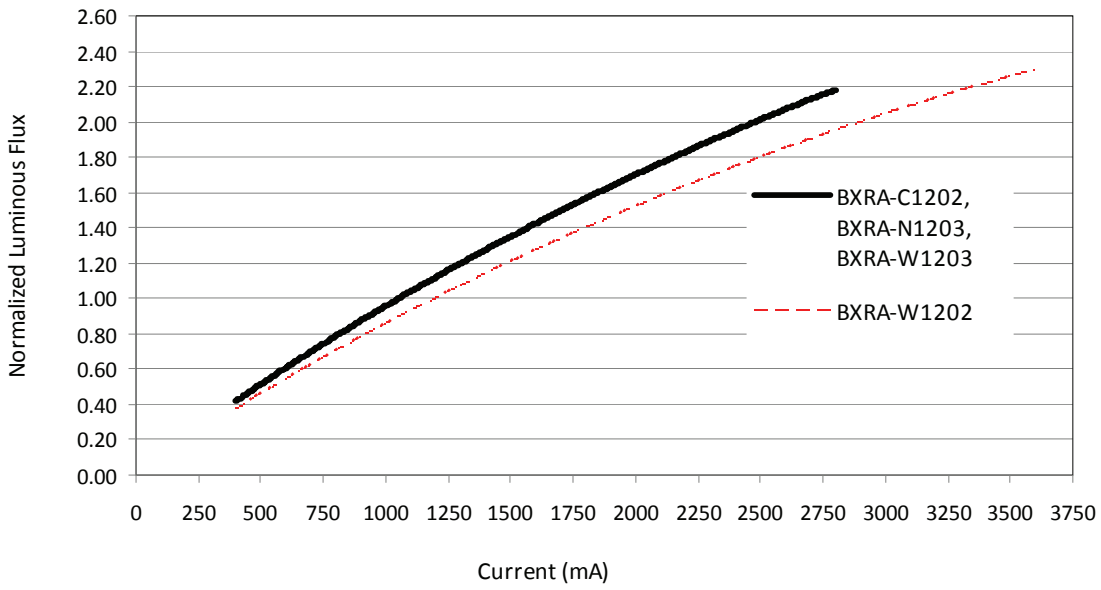
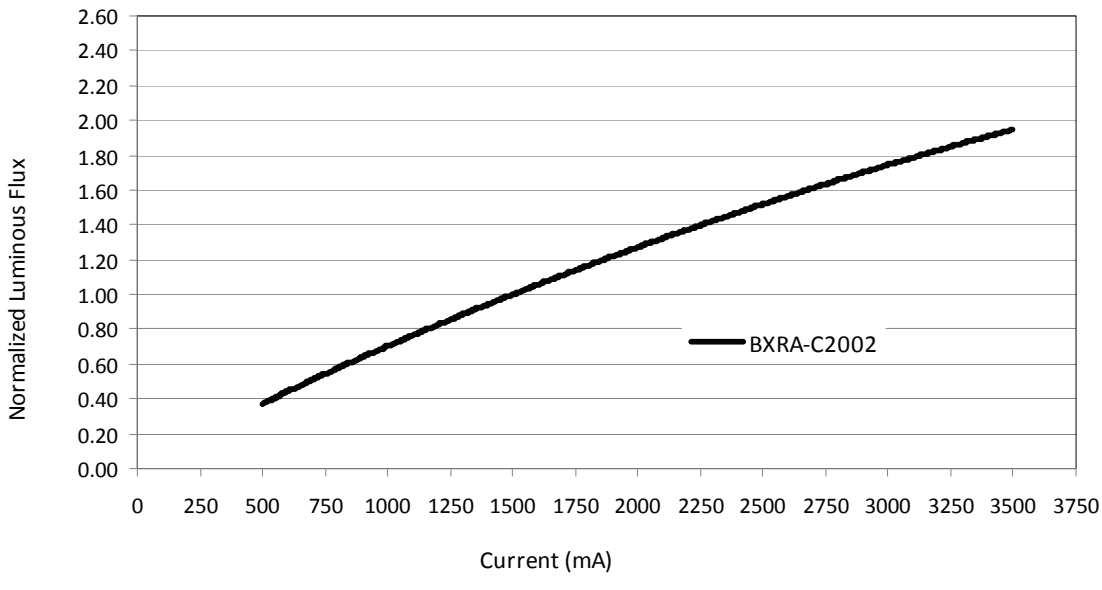


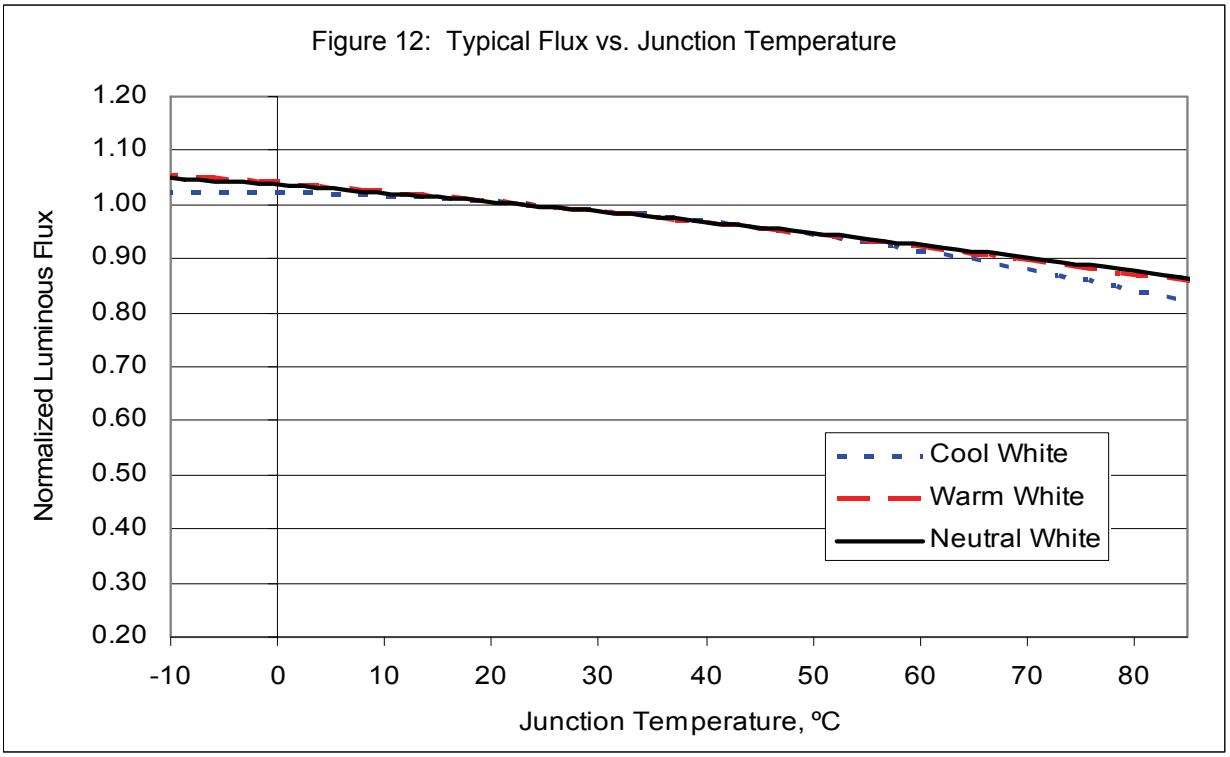
Figure 11: Typical Flux vs. Current (2000 lm Arrays)



Note for Figures 8 through 11: Bridgelux does not recommend driving high power LED Arrays at low currents. Doing so may produce unpredictable results. Pulse width modulation (PWM) is recommended for dimming effects.

Typical Light Output Characteristics vs. Temperature

Figure 12: Typical Flux vs. Junction Temperature



Typical Chromaticity Characteristics vs. Temperature

Figure 13: Typical x Shift vs. Junction Temperature

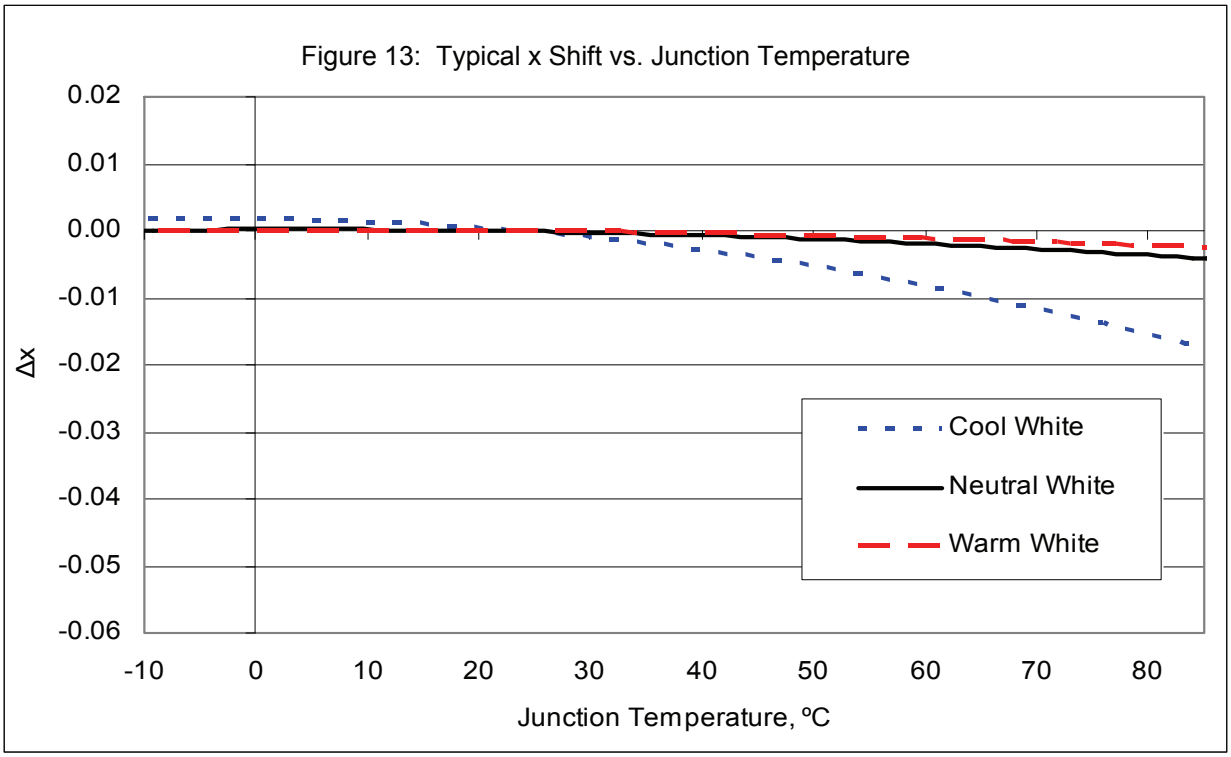
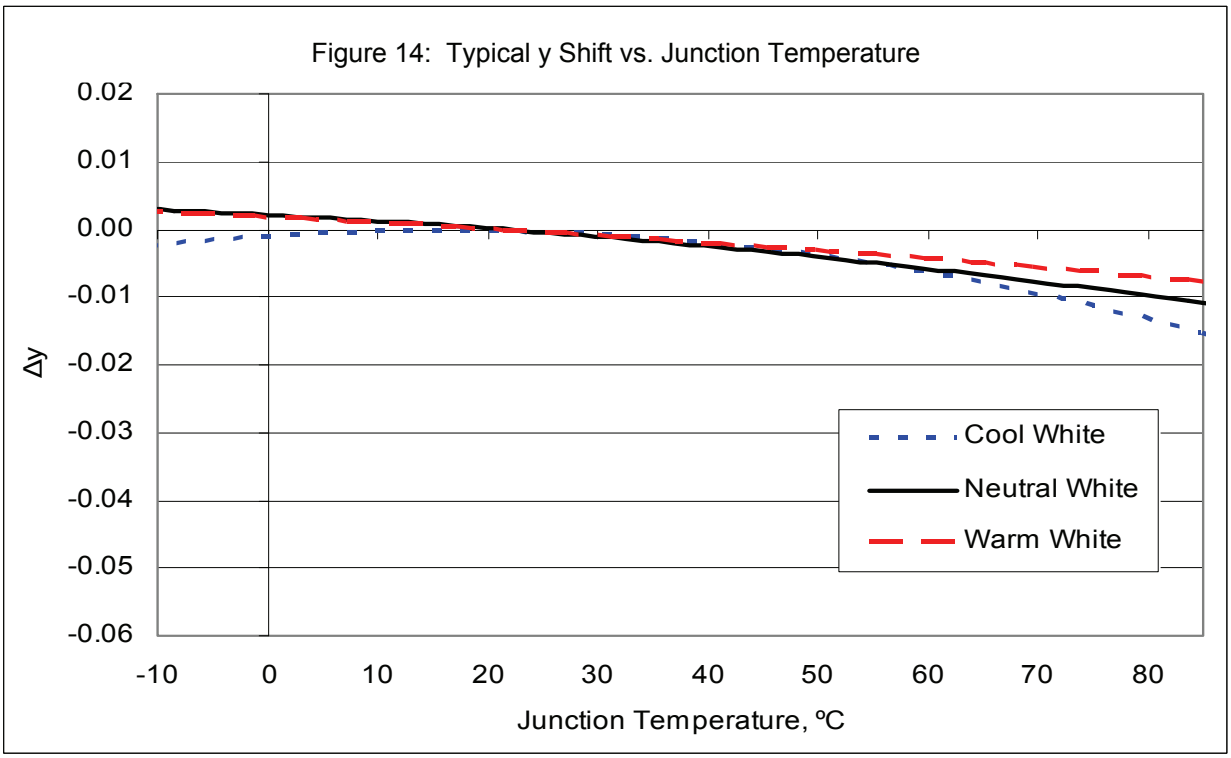


Figure 14: Typical y Shift vs. Junction Temperature



Typical Forward Current Characteristics at Tj = 25°C

Figure 15: Typical Current vs. Voltage, BXRA-C0402

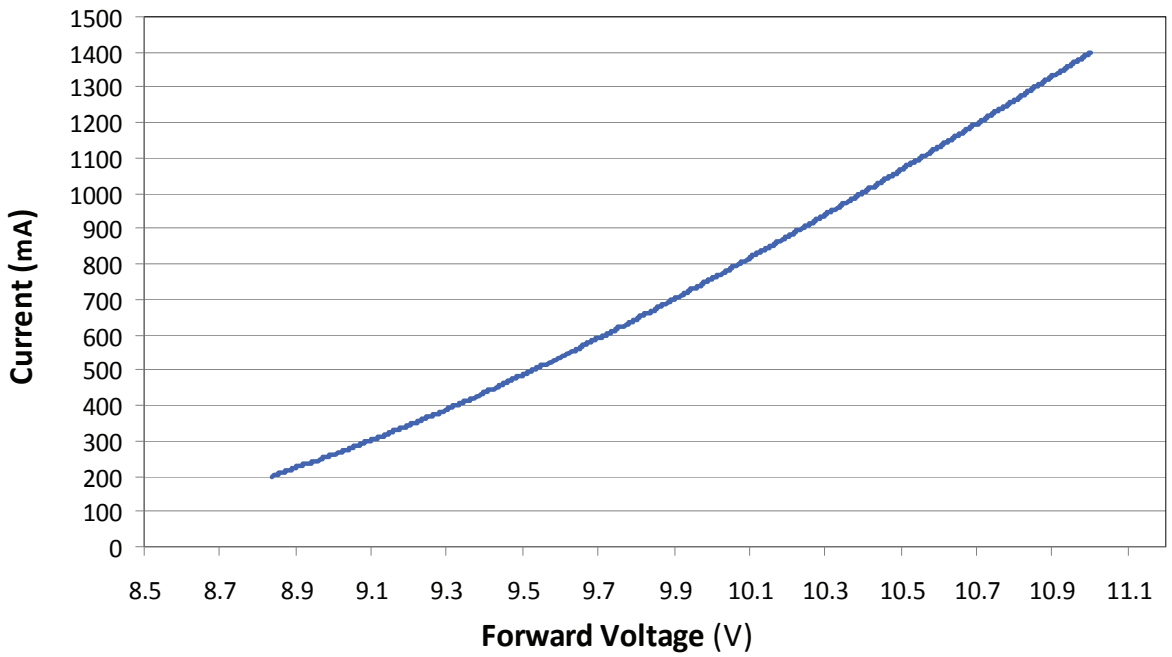
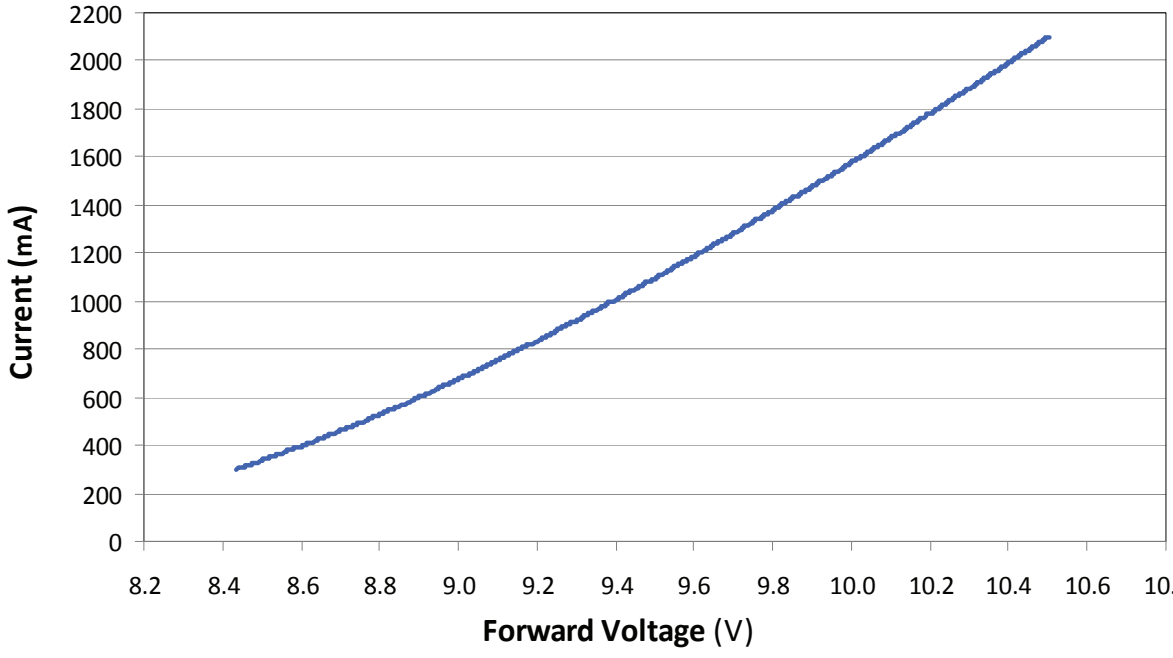


Figure 16: Typical Current vs. Voltage, BXRA-N0402



Typical Forward Current Characteristics at T_j = 25°C (continued)

Figure 17: Typical Current vs. Voltage, BXRA-W0401

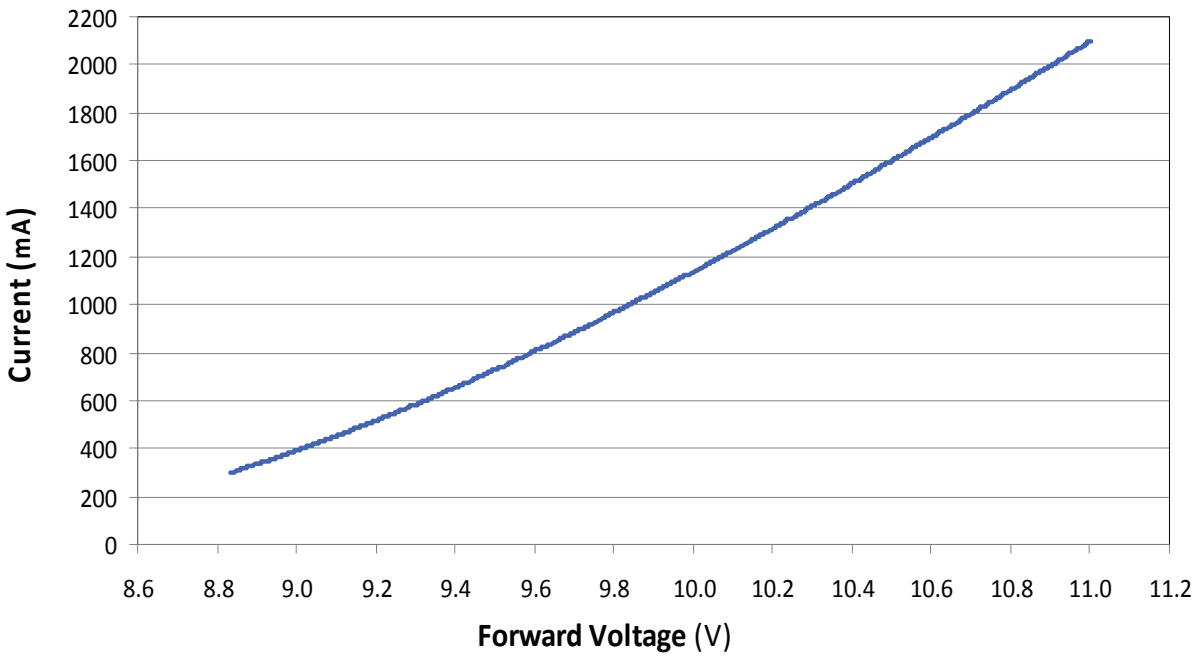
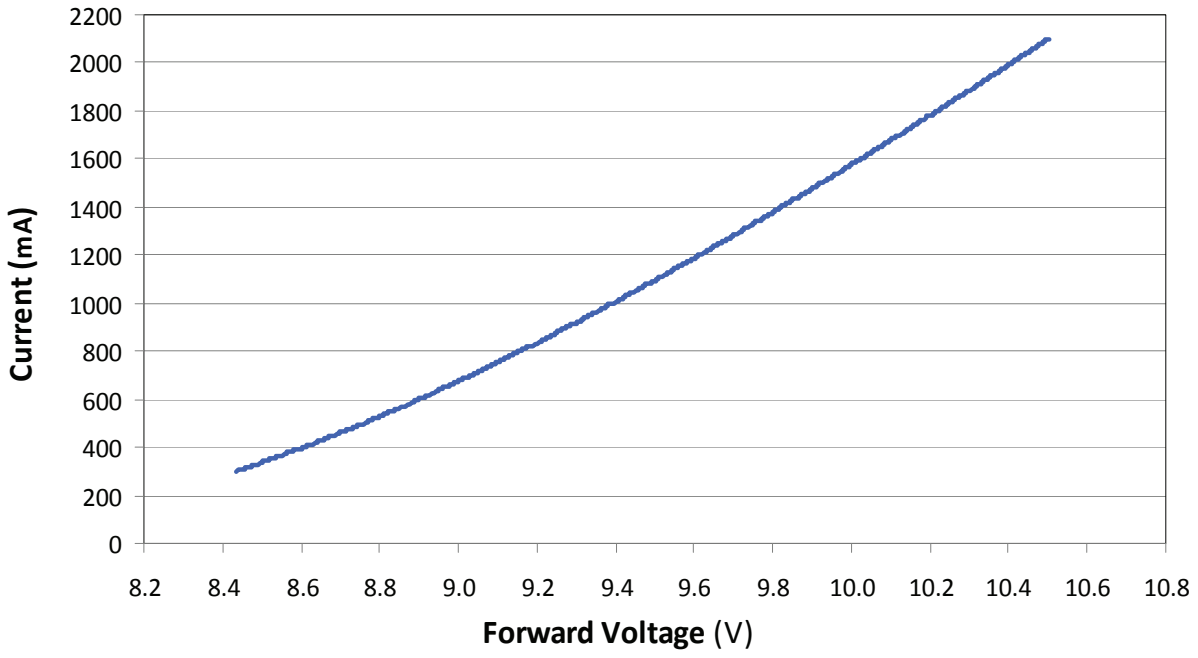


Figure 18: Typical Current vs. Voltage, BXRA-W0402



Typical Forward Current Characteristics at T_j = 25°C (continued)

Figure 19: Typical Current vs. Voltage, BXRA-C0802

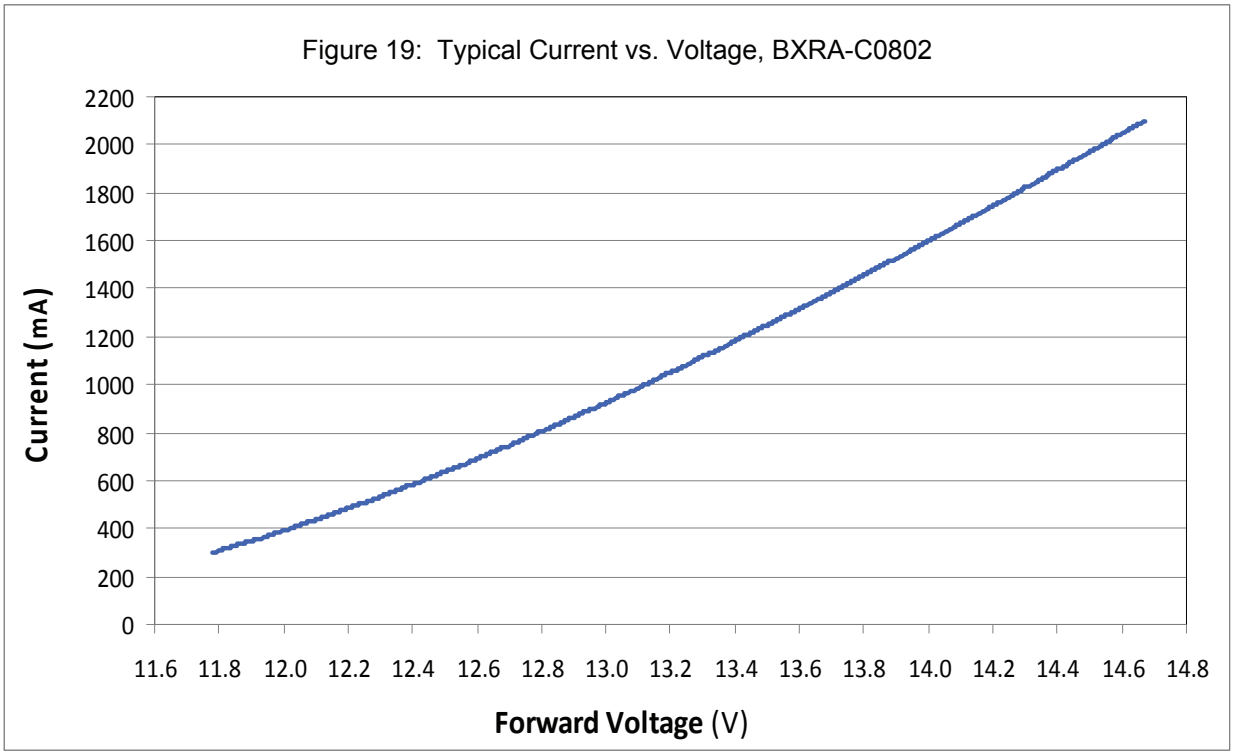
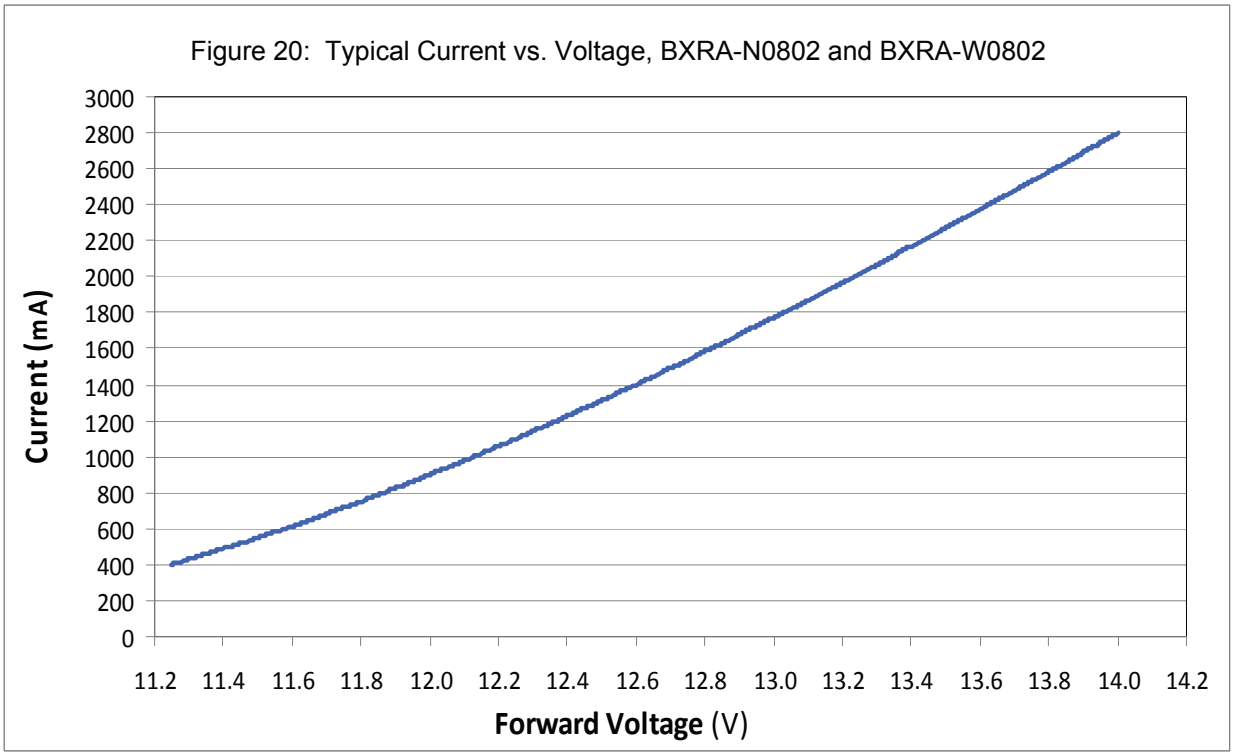


Figure 20: Typical Current vs. Voltage, BXRA-N0802 and BXRA-W0802



Typical Forward Current Characteristics at T_j = 25°C (continued)

Figure 21: Typical Current vs. Voltage, BXRA-C1202

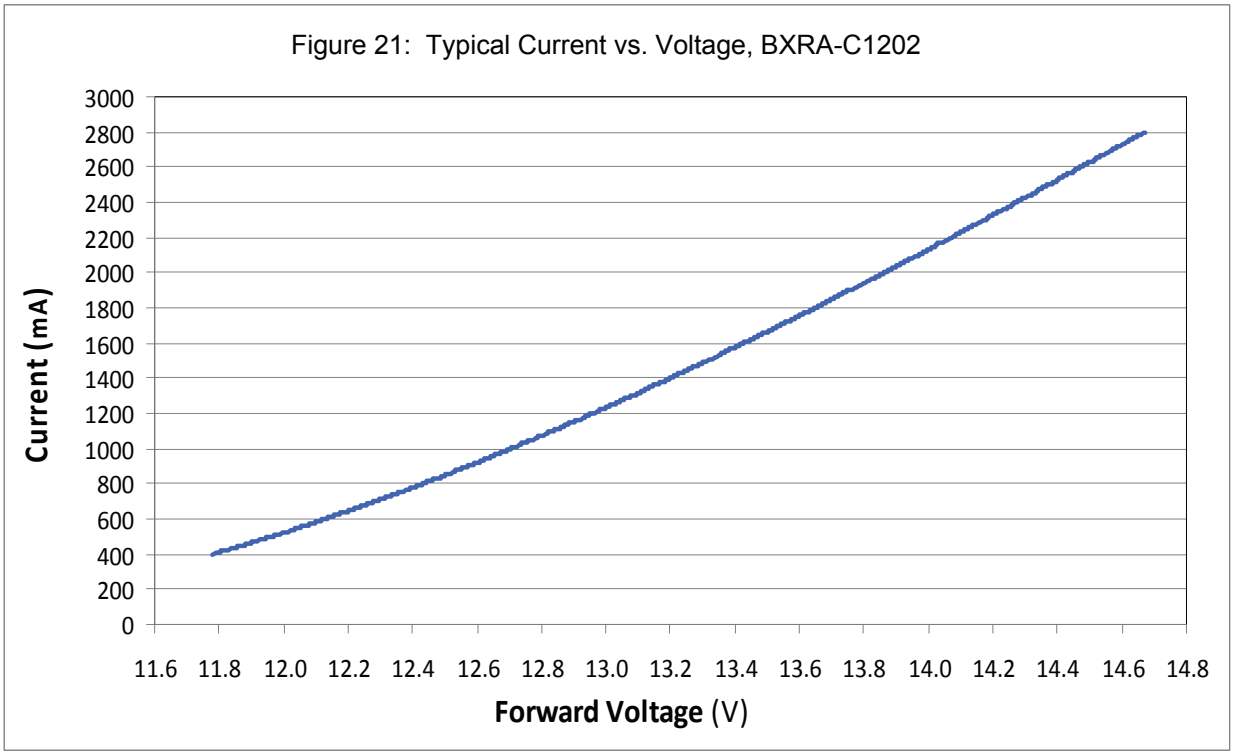


Figure 22: Typical Current vs. Voltage, BXRA-N1203, BXRA-W1203