



TT electronics covers the full light spectrum

TT electronics is a focused, global electronics company supplying the world's leading manufacturers in the automotive, telecommunications, computing, industrial, aerospace & defense electronics markets. TT electronics' continuing investment in modern manufacturing equipment and the development of new technologies is based upon understanding our customers' needs and providing solutions. To support its global reach, TT electronics has established technical and manufacturing facilities in strategic countries to maintain a successful formula for close liaison with our customers in major markets across the globe. The close liaison with customers provides the opportunity to satisfy customer requirements today and in addition, aids our ability to recognize the emergence of new product technologies that will fulfill customer expectations in the future.

TT electronics companies have been at the forefront of supporting customers in the lighting and optoelectronics industry for more than 30 years. Today we are pleased to be a leading participant in the emerging market for solid-state lighting solutions using LED technology. Our early recognition of the need for more efficient lighting solutions served as the catalyst to align the core strengths of specific TT electronics companies to jointly develop new solutions for a burgeoning solid-state lighting market.

Core strengths and experience in the design, manufacture and application of compound semiconductor light sources, optics, thermal management substrate materials, microelectronic assembly, and interconnective systems have led to the development of a broad portfolio of TT electronics products and capabilities to globally satisfy solid-state applications in illumination, backlighting, and indication. TT electronics' companies; IRC Advanced Film Division, OPTEK Technology Inc., and Welwyn Components Limited are pleased to demonstrate an example of combined core strengths through our development of the first TT electronics LED Designer Kit.

You undoubtedly recognize a technical evolution is underway in the lighting industry and it is being lead by the continuing advancement in LED technology. Energy conservation, durability, long life and design flexibility are just a few of the benefits attributable to using advanced LED technology in applications for illumination, backlighting, and indication. Whether your requirements call for standard products or custom designed solutions, TT electronics' companies stand ready to support your solid-state lighting initiatives with engineering and manufacturing expertise to bring your ideas and innovation to light.

TT electronics subsidiaries reserves the right to make changes at any time in order to improve design and to supply the best product possible.



IRC Advance Film Division's expertise in resistive technologies has led to the development of the company's Anotherm aluminum substrate material which offers superior thermal management for use with LED technology. IRC's patented Anotherm substrate provides display system design engineers a lighter, cooler and less expensive method of mounting multiple visible LEDs. IRC's Advanced Film Division recently developed this economical anodized aluminum substrate material with superior thermal conductivity to address the problem of heat dissipation in direct-mounted LEDs and LED arrays. The thermally conductive aluminum alloy enables design engineers to mount visible LEDs and other components directly to it, eliminating the need for attached heat sinks, mounting hardware and the associated assembly costs. Economical solderable thick film conductors can be screen-printed directly to the Anotherm substrate to connect surface mount packaged components. The rugged Anotherm technology can operate in extreme temperatures – up to 400 degrees centigrade.

IRC has been a leader in resistor technology, including the industry's comprehensive range of current sense resistors, precision discrete networks, integrated passive components, and specialized power resistors. Resistive technologies include thin film tantalum nitride discrete and networks on ceramic and silicon substrates for precision high-frequency applications, thick film low- and high-resistance chips, wire wound resistors and assemblies, and cylindrical surface mount resistors. TT electronics IRC provides one of the industry's most comprehensive ranges of innovative resistor solutions for automotive, computer, communications, medical, industrial military and instrumentation markets worldwide.

TT electronics – IRC Advanced Film Division
4222 South Staples Street
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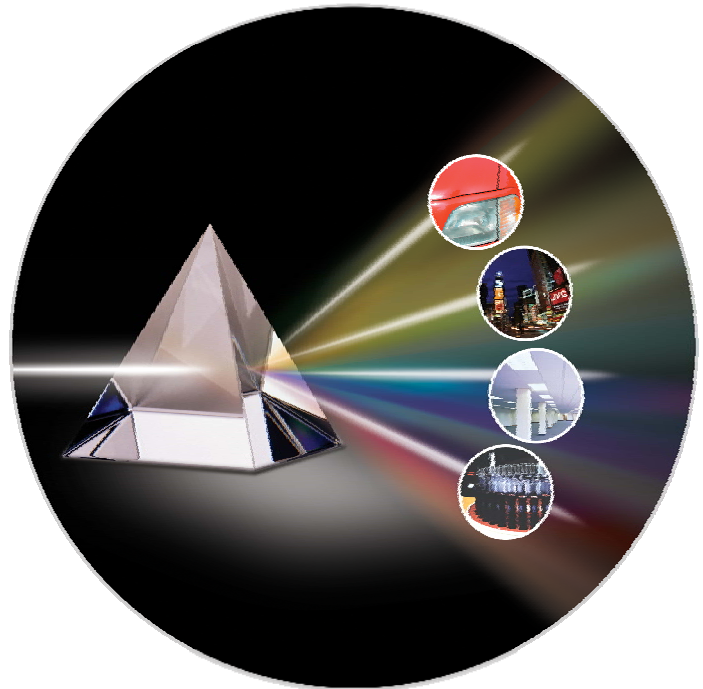
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IRC Advanced Film Division — www.irctt.com
OPTEK Technology, Inc. — www.optekinc.com
Welwyn Components Limited — www.welwyn-tt.com



OPTEK Technology has been in the business of successfully designing and manufacturing optoelectronic solutions for more than 35 years. Throughout its history OPTEK has developed a reputation for bringing to market innovative products and solutions to thousands of applications on a global basis. OPTEK has more than 35 years experience designing and manufacturing LED emitter and detector chips. Today OPTEK uses this extensive experience in LED chip design and manufacturing to work closely with its strategic III-V and silicon wafer fabrication partners to develop solutions according to OPTEK specifications and rigorous validation testing. The ability to leverage OPTEK's core design and manufacturing experience with select strategic partners enables rapid design and speed to market capabilities for visible, infrared, hybrid, subassembly, modules and subsystems products that are competitively priced.

OPTEK understands that visible and infrared products typically interface and/or interconnect with other systems and functions including human beings in order to perform desired tasks. OPTEK's technology covers the full light spectrum and they have 30+ years experience managing light via primary and/or secondary optics; from individually packaged standard products to complex assemblies and modules using various types of substrate materials and configurations. As a key member of the TT electronics group of companies, OPTEK has preferential access to patented substrate technology from other TT electronics divisions such as IRC Advance Film Division, and Welwyn Components Limited where each firm collaborates with the other to developed unique solutions for thermally managing LEDs. OPTEK works cooperatively with these TT electronics divisions to develop solutions using visible or infrared light sources. As a result of its long history in optoelectronic assemblies, hybrids, modules, and subsystems manufacturing, OPTEK has considerable expertise in application and manufacture of appropriate interconnectivity solutions between circuits and/or systems. The aggregation of skills and expertise within OPTEK enables a distinct capability to provide visible or infrared LED solutions in a variety of package configurations at various levels of complexity.



TT electronics – OPTEK Technology Inc.
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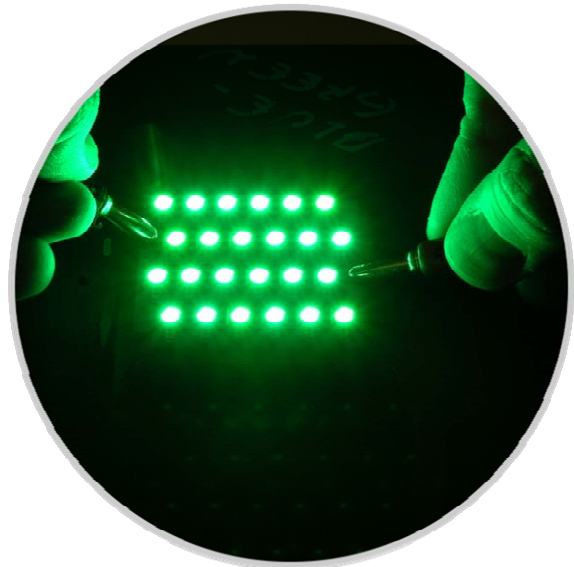
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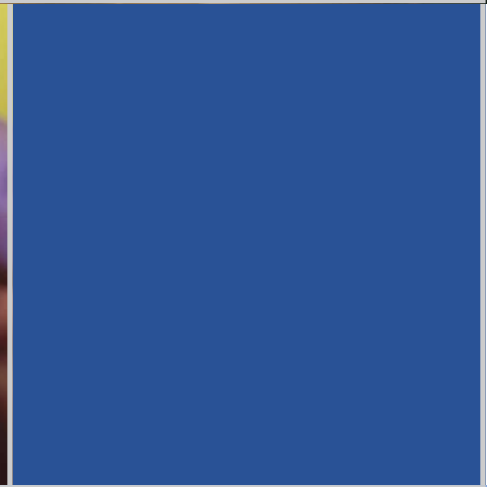
Working collaboratively with IRC and OPTEK, Welwyn Components designs substrates using Anotherm technology and (in less rigorous applications), other substrate technology to configure and thermally manage LED light sources. Using its expertise in microelectronic assemblies Welwyn Components designs and manufactures solid-state lighting solutions for a broad range of applications for its unique customer base in Europe.

Welwyn Components provides leading edge technology in custom microelectronic assemblies and resistive components for a broad range of applications. Based in the United Kingdom, Welwyn components offers local production combined with application, engineering design and technical sales assistance to help identify technology synergy and provide time to market solutions for your designs. A skilled workforce and significant investment in high volume automated production has created partnerships with major customers that position Welwyn as the market leader in Europe.

Welwyn's product range extends from thick film substrates and microelectronic assemblies, to integration of power and control circuits for industrial applications. Welwyn also produces photo image circuits on ceramic for high-density/high-frequency applications and chip and wire assemblies in hermitically sealed packages. In the resistive technology, Welwyn provides a worldwide market thick film resistors in surface mount technology, thin film axial resistor technology, wire wound resistors for power handling and precision resistors for instrumentation and medical applications.



TT electronics – Welwyn Components Limited
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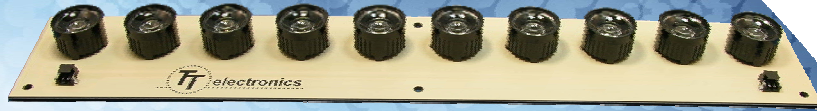
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OPA733
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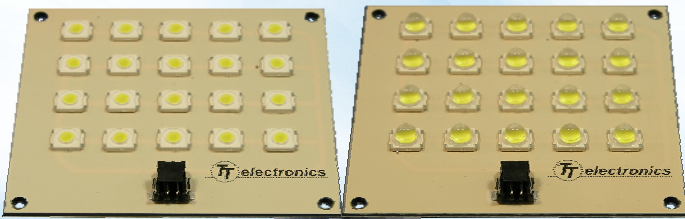
OPA742
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OPA740
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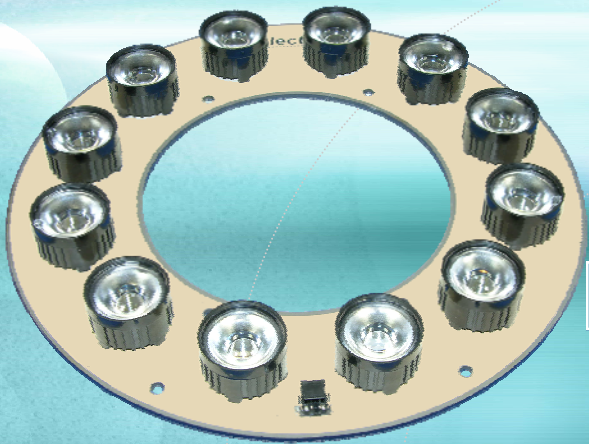
OPA729
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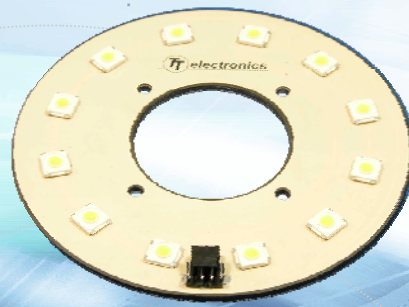
OPA731
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OPA739
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OPA741
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OPA730
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LD350 & LD700
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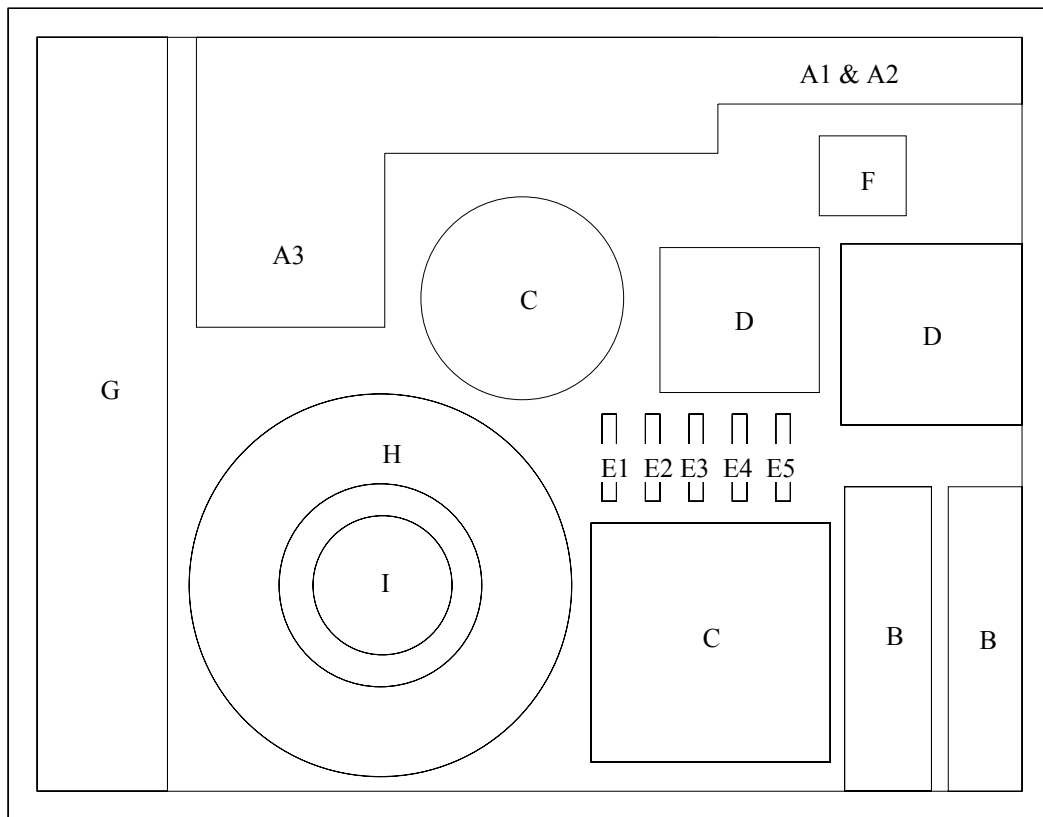


LD1400
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Electrical connector on assemblies are AMP part number 2-292173-2

Area	Part #	Description	Page #
A1 A2 A3	LD350 LD700 LD1400	Power cube 350 mA with 110 VAC power cord. Power cube 700 mA with 110 VAC power cord. Power cube 1400 mA with 110 VAC power cord.	A23
B	OPA729	Linear 10/1 watt, LED—Power with LD700	A14
C	OPA730	Round Flood 12/1 watt, LED—Power with LD700	A15
D	OPA731	Square Flood 20/1 watt, LED—Power with LD1400	A16
E1 E2 E3 E4 E5	OPA733R OPA733Y OPA733G OPA733B OPA733W	Round Spot 1 watt, Red LED—Power with LD350 Round Spot 1 watt, Yellow LED—Power with LD350 Round Spot 1 watt, Green LED—Power with LD350 Round Spot 1 watt, Blue LED—Power with LD350 Round Spot 1 watt, White LED—Power with LD350	A17
F	OPA739	Square 3/1 watt, LED—Power with LD350	A18
G	OPA740	Linear with Lens 10/1 watt, LED—Power with LD700	A19
H	OPA741	Ring with Lens 12/1 watt, LED—Power with LD700	A20
I	OPA742	Round Spot with Lens 1 watt, LED—Power with LD350	A21



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In days of old, light in darkness came from fire sustained by whale oil, or even an electric current heating a tungsten wire contained in a glass bubble. The tools that enable change, the empowering *next light source* is no longer at the end of a long tunnel. The Semiconductor revolutionized the last half of the 20th Century, and today it is Compound Semiconductors that TT electronics is harnessing with packaging innovations that enable solid state lighting to be practical.

Visible LEDs became sunlight viewable just a few years back, while continuing to need only small relative powering. Now we are accustomed to multicolor and sophisticated video cell phones and PDA's. We have outdoor LED Video, and the backlighting of large area screens and televisions, and these solid-state devices are replacing older, more power hungry traditional light sources at a growing pace. That future is now and today billions of color combinations can be manipulated by software. The Internet a world away controls architectural LED designs while bridges, skylines and tunnels are changing into "eye candy". We are just getting started.

LED Illumination provides such power savings that the Republic of South Korea is building the Gwangju Project, "the City of Light". This community of 150,000; is being built by the universities, government support and the industrial leadership. Here, and throughout the world where mankind turns to technology, the driving force is again the mind of the engineer. The right tools make imagination the only limiting factor.



A Part of Everyday Technology

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IRC Advanced Film Division — www.irctt.com
OPTEK Technology, Inc. — www.optekinc.com
Welwyn Components Limited — www.welwyn-tt.com

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OPA731 (20 watt Square Plate)	A-16
OPA733 (1 watt Round Spot)	A-17
OPA739 (3 watt Square Plate)	A-18
OPA740 (10 watt Linear Plate with Lens)	A-19
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OPA742 (1 watt Round Spot with Lens)	A-21
LD350, LD700 & LD1400 (Power Sources)	A-23
APPLICATION NOTE	B-1

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Notifications:

Please note the lighting modules, assemblies, components and accessories contained in this design kit are not intended to represent the full capability of solid-state lighting solutions from TT electronics. Please contact TT electronics to discuss your specific needs and allow us the privilege of working with you to deliver your next solid-state lighting solution.

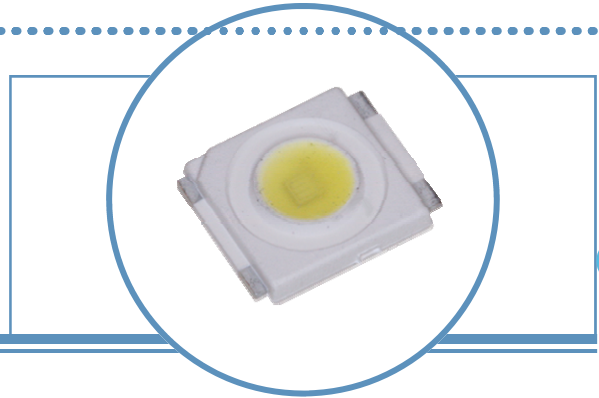
Please note Anotherm substrates, LED components, LED drivers and accessories can also be purchased separately on a stand-alone basis. Anotherm thermal management substrates can be purchased from IRC Advance Film Division and Welwyn Components Limited. LED components, LED drivers, and lenses can be purchased separately from OPTEK Technology Inc.

Notes:

1-Watt SMD 6mm (120° Viewing Angle)

OVSP_BCR4 Series

- Robust energy-efficient design with long operating life
- Low thermal resistance
- Exceptional spatial uniformity
- Optional optics to suit application
- Available in yellow, blue, green, red and white

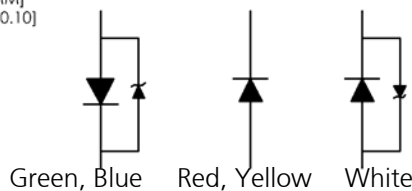
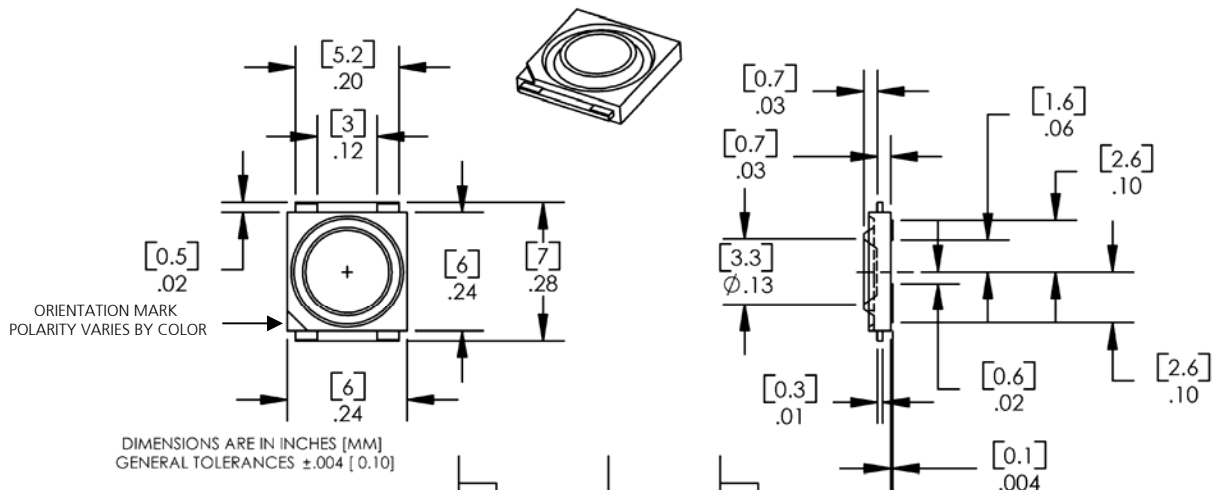


The **OVSPxBCR4 Series** is an energy-efficient packaged LED source that offers high luminance, and a long operating lifespan. These devices offer a 120° viewing angle and an ultra-low profile (1.5mm) making them highly suitable for conventional lighting and specialized applications. Optional optics are offered to suit application. Please contact OPTEK for more information.

Applications

- Automotive exterior and interior lighting
- Architectural indoor and outdoor lighting
- General lighting
- Electronic signs and signals

Part Number	Viewing Angle	Emitted Color	Typical Luminous Flux (lm)	Typical On-Axis Intensity (cd)	Lens Color
OVSPBBCR4	120°	Blue	9	3.4	Water Clear
OVSPGBCR4		Green	48	18.2	Water Clear
OVSPRCR4		Red	26	9	Water Clear
OVSPYBCR4		Yellow	35	11.25	Water Clear
OVSPWBCR4		White	48	18	Water Clear



DO NOT LOOK DIRECTLY AT LED WITH UNSHIELDED EYES OR DAMAGE TO RETINA MAY OCCUR.

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1-Watt SMD 6mm (120° Viewing Angle)

Absolute Maximum Ratings $T_A = 25^\circ\text{C}$

	Red, Yellow	Green, Blue	White
DC Forward Current	400mA	350mA	350mA
Peak Pulsed Forward Current ¹	500mA	1000mA	1000mA
Reverse Voltage	12V	Not designed for reverse bias	
Junction Temperature ²	125°C	120°C	125°C
Power Dissipation	1200mW		
Storage and Operating Temperature	-40° ~ +100 ° C		
ESD Threshold (HBM)	2000V		

Notes:

1. Pulse width $t_p \leq 10\mu\text{s}$, Duty cycle = 0.1
2. Thermal conductivity = 20K/W for red, yellow, green, blue; and 18K/W for white

Optical and Electrical Characteristics—Red, Yellow ($I_F = 400\text{ mA}$, $T_A = 25^\circ\text{C}$)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	
V_F	Forward Voltage	2.2	2.5	2.8	V	
Φ	Luminous Flux	Red	21	26	33	lm
		Yellow	27	35	42	lm
λ_D	Dominant Wavelength	Red	620	625	630	nm
		Yellow	585	587	597	nm
I_R	Reverse Current	----	100	----	μA	
$2\theta_{1/2}$	50% Power Angle	----	120	----	deg	

Optical and Electrical Characteristics—Blue, Green ($I_F = 350\text{ mA}$, $T_A = 25^\circ\text{C}$)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	
V_F	Forward Voltage	----	3.6	4.0	V	
Φ	Luminous Flux	Blue	5.8	9	12	lm
		Green	38	48	60	lm
λ_D	Dominant Wavelength	Blue	464	470	476	nm
		Green	525	530	535	nm
$2\theta_{1/2}$	50% Power Angle	----	120	----	deg	

Optical and Electrical Characteristics—White ($I_F = 350\text{ mA}$, $T_A = 25^\circ\text{C}$)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS
V_F	Forward Voltage	----	3.6	4.0	V
Φ	Luminous Flux	39	48	63	lm
I_R	Reverse Current	----	10	----	μA
$2\theta_{1/2}$	50% Power Angle	----	120	----	deg

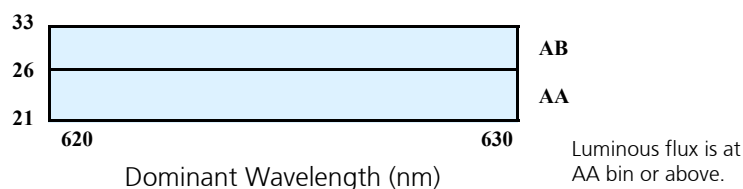
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1-Watt SMD 6mm (120° Viewing Angle)

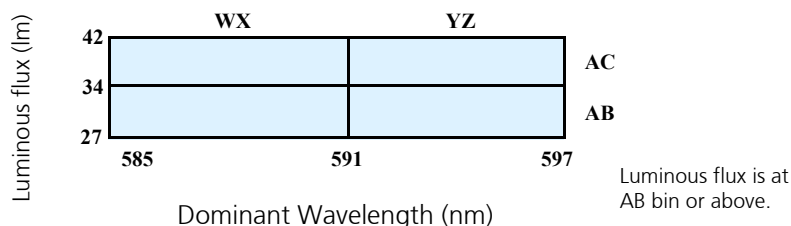
Standard Bins

Lamps are sorted to luminous flux (Φ) and dominant wavelength (λ_D) bins shown. Orders may be filled with any or all bins contained as below.

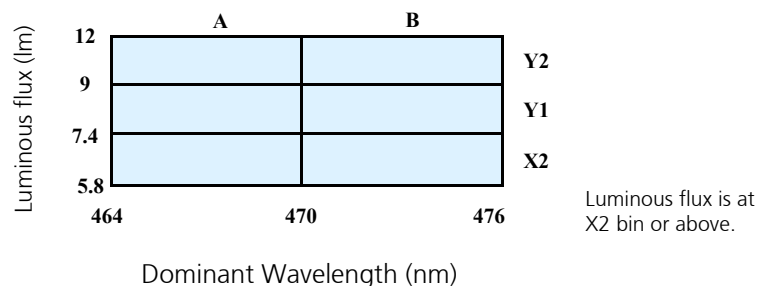
OVSPRBCR4 (RED) ($I_F = 400$ mA)



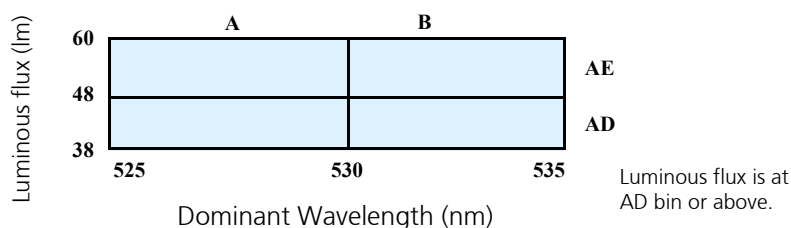
OVSPYBCR4 (YELLOW) ($I_F = 400$ mA)



OVSPBCR4 (BLUE) ($I_F = 350$ mA)



OVSPGBCR4 (GREEN) ($I_F = 350$ mA)



Important Notes:

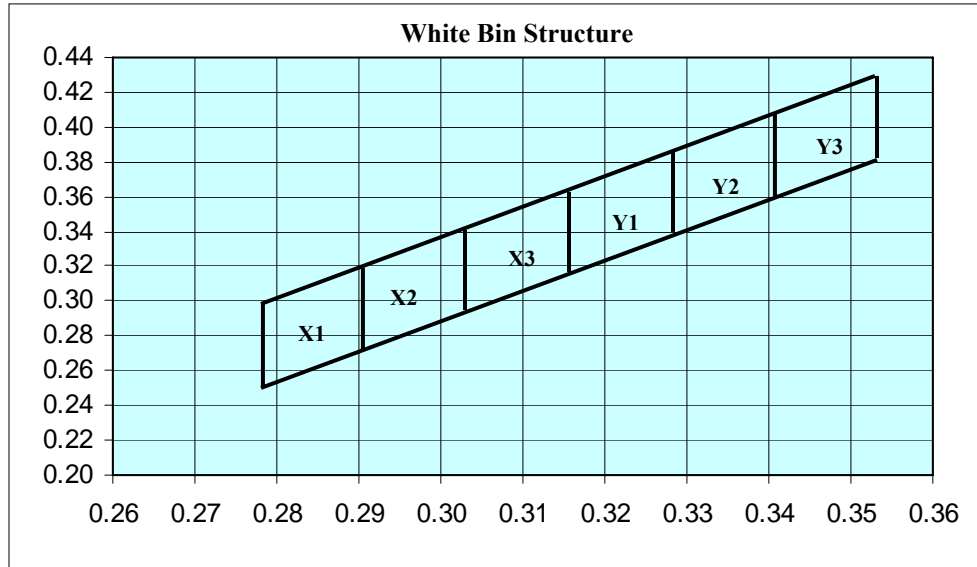
1. All ranks will be included per delivery, rank ratio will be based on the chip distribution.
2. To designate luminous flux ranks, please contact OPTeK.
3. Pb content <1000PPM.

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1-Watt SMD 6mm (120° Viewing Angle)

Standard Bins ($I_f = 350 \text{ mA}$) **OVSPWBCR4 (White)**

Lamps are sorted to luminous flux (Φ), chromaticity coordinates, and correlated color temperature (CCT) bins shown. Orders may be filled with any or all bins contained as below.



Bin		1	2	3	4
X ₁	C _x	0.2775	0.29	0.29	0.2775
	C _y	0.243	0.265	0.31	0.288
X ₂	C _x	0.29	0.3025	0.3025	0.29
	C _y	0.265	0.286	0.331	0.31
X ₃	C _x	0.3025	0.315	0.315	0.3025
	C _y	0.286	0.308	0.353	0.331
Y ₁	C _x	0.315	0.3275	0.3275	0.315
	C _y	0.308	0.33	0.375	0.353
Y ₂	C _x	0.3275	0.34	0.34	0.3275
	C _y	0.33	0.351	0.396	0.375
Y ₃	C _x	0.34	0.3525	0.3525	0.34
	C _y	0.351	0.373	0.418	0.396

Color Bin	Minimum CCT (K)	Maximum CCT (K)
Y3	4500	5000
Y2	5000	5500
Y1	5500	6000
X3	6000	7000
X2	7000	8000
X1	8000	10000

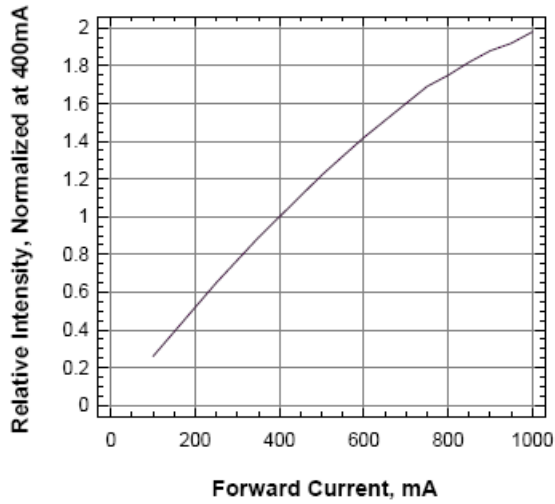
Bin	Luminous Flux (lm)	
	Min	Max
AD	39	50
AE	50	63

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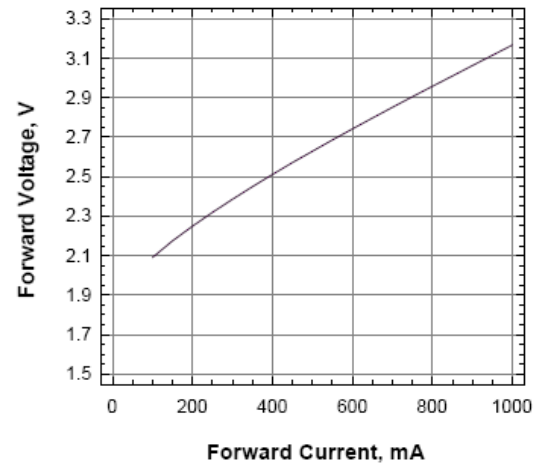
1-Watt SMD 6mm (120° Viewing Angle)

Typical Electro-Optical Characteristics Curves—Red, Yellow

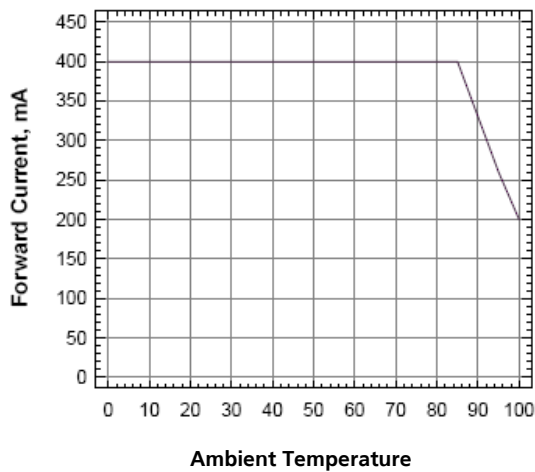
Relative Intensity Vs Forward Current



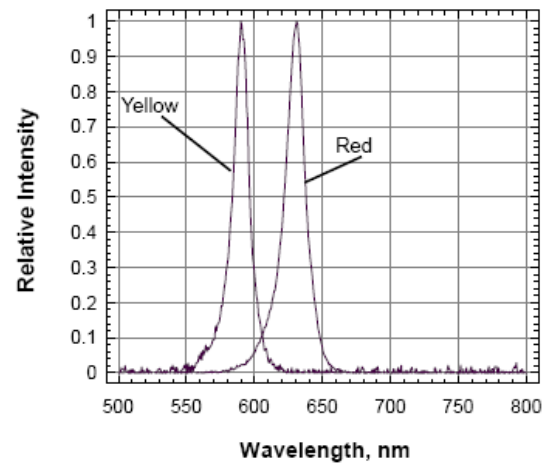
Forward Voltage Vs Forward Current



Forward Current Vs Ambient Temperature



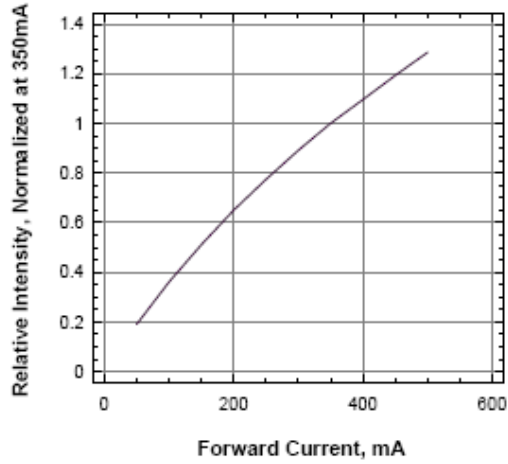
Relative Intensity Vs Wavelength



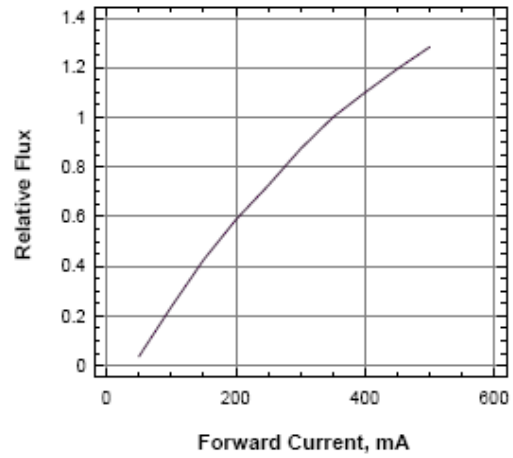
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Typical Electro-Optical Characteristics Curves—Blue, Green

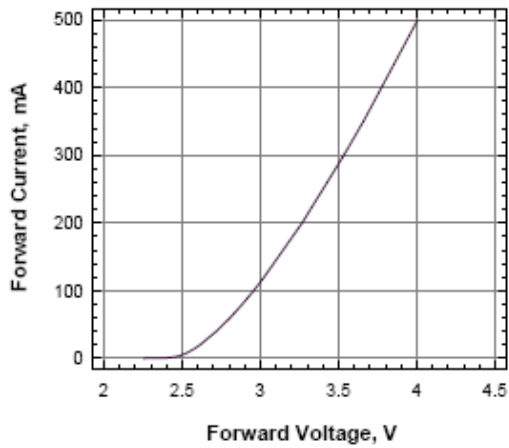
Wavelength Vs Forward Current



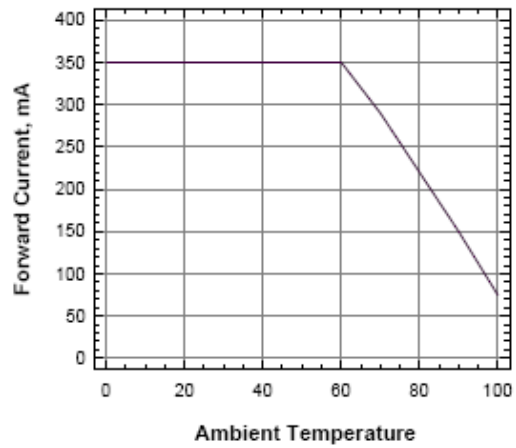
Relative Flux Vs Forward Current



Relative Intensity Vs Forward Current



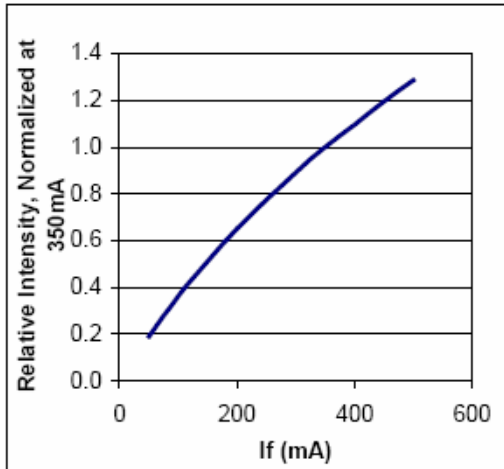
Forward Current Vs Ambient Temperature



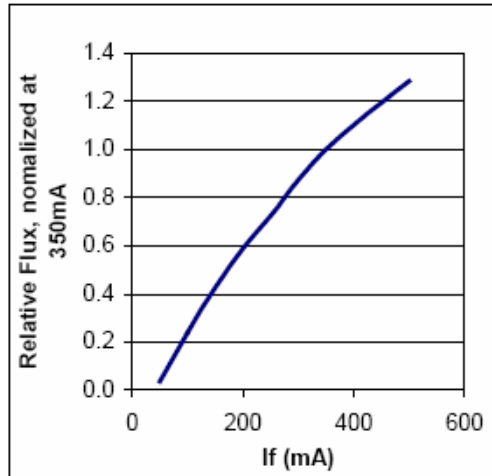
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Typical Electro-Optical Characteristics Curves—White

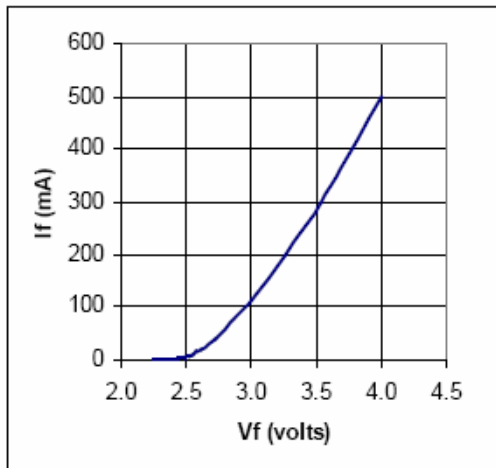
Relative luminous intensity vs. forward current.



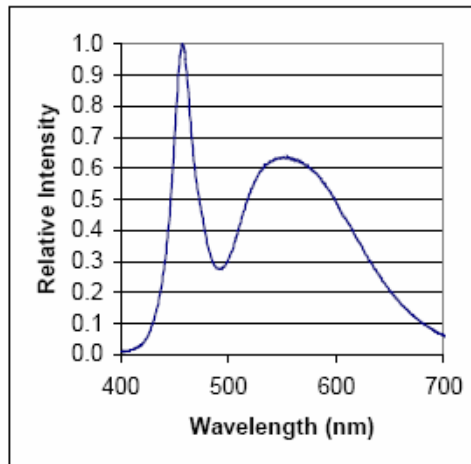
Flux vs. forward current.



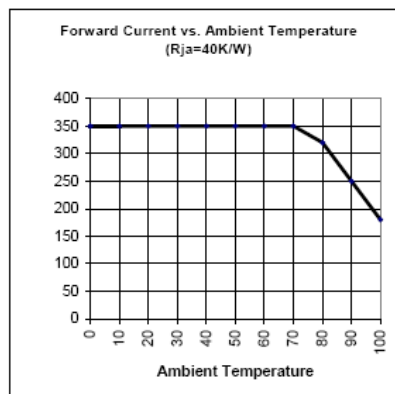
Forward current vs. forward voltage.



Relative Spectra Emission

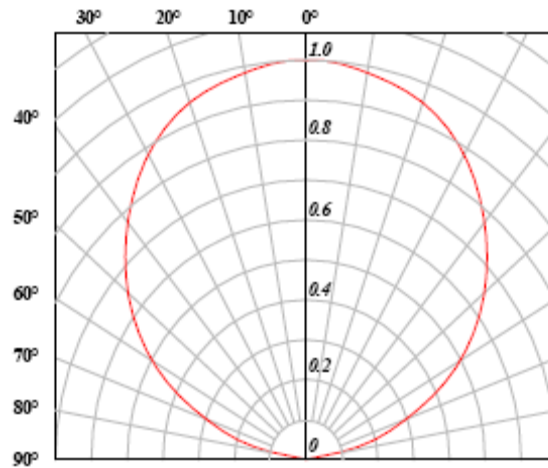


Maximum Permissible Current



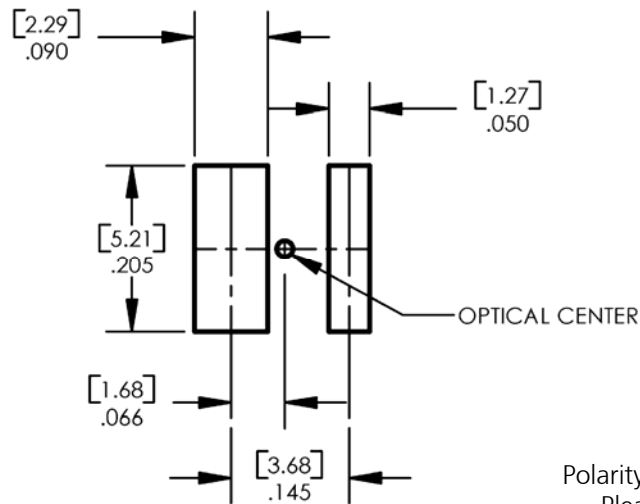
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Radiation Pattern—All Colors



Solder Pad Design

Note: Metal core circuit board (MCPCB) is highly recommended for high density applications. Please consult sales and marketing for additional information.



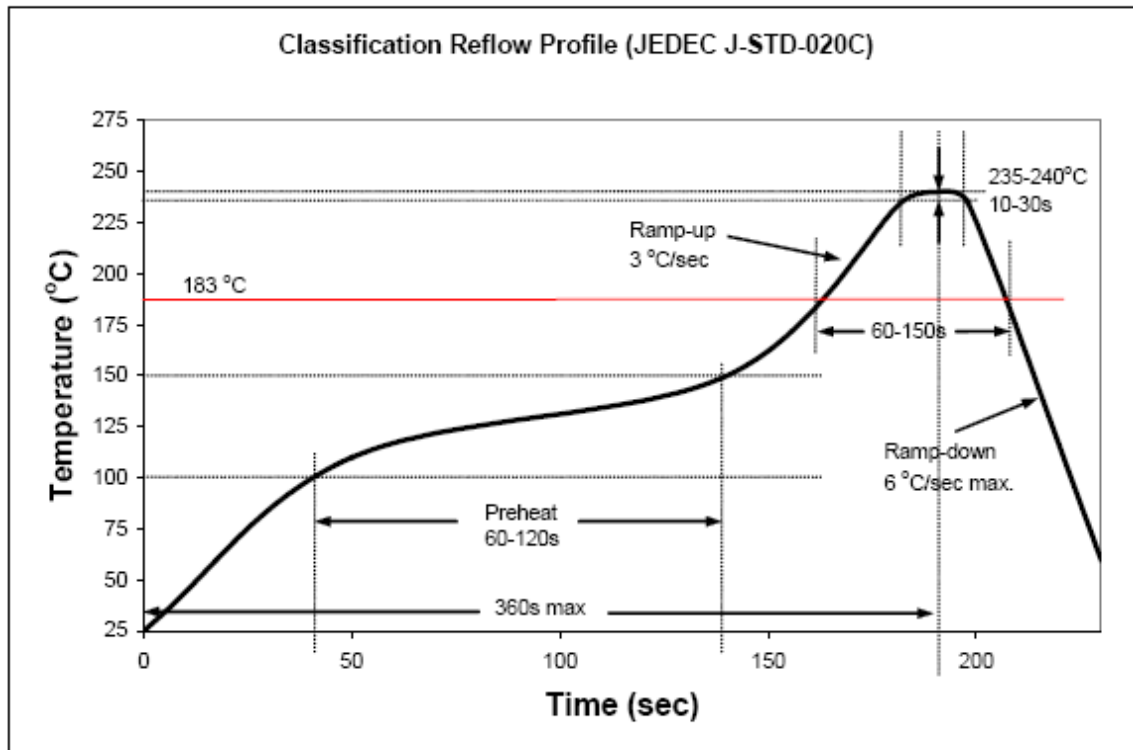
Polarity varies with color.
Please see Page 1.

Notes:

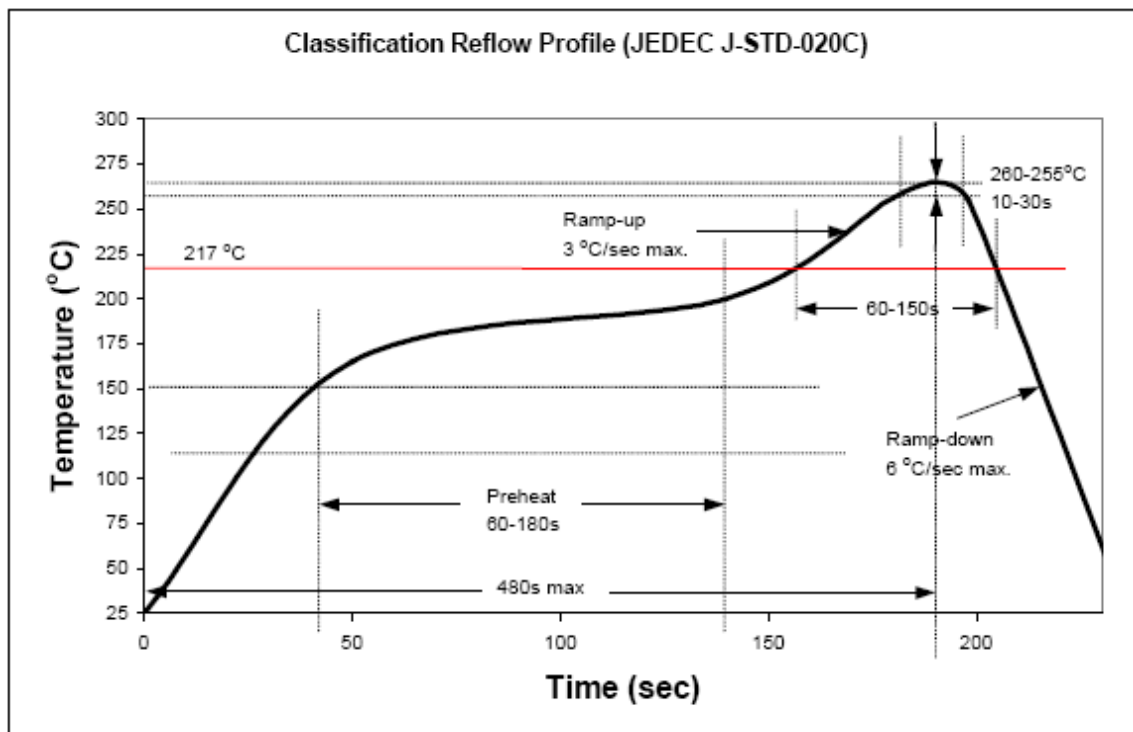
1. All ranks will be included per delivery. Rank ratio will be based on the chip distribution.
2. Pb content <1000 PPM.
3. To designate luminous intensity ranks, please contact OPTEK.

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Recommended Sn-Pb IR-Reflow Soldering Profile.

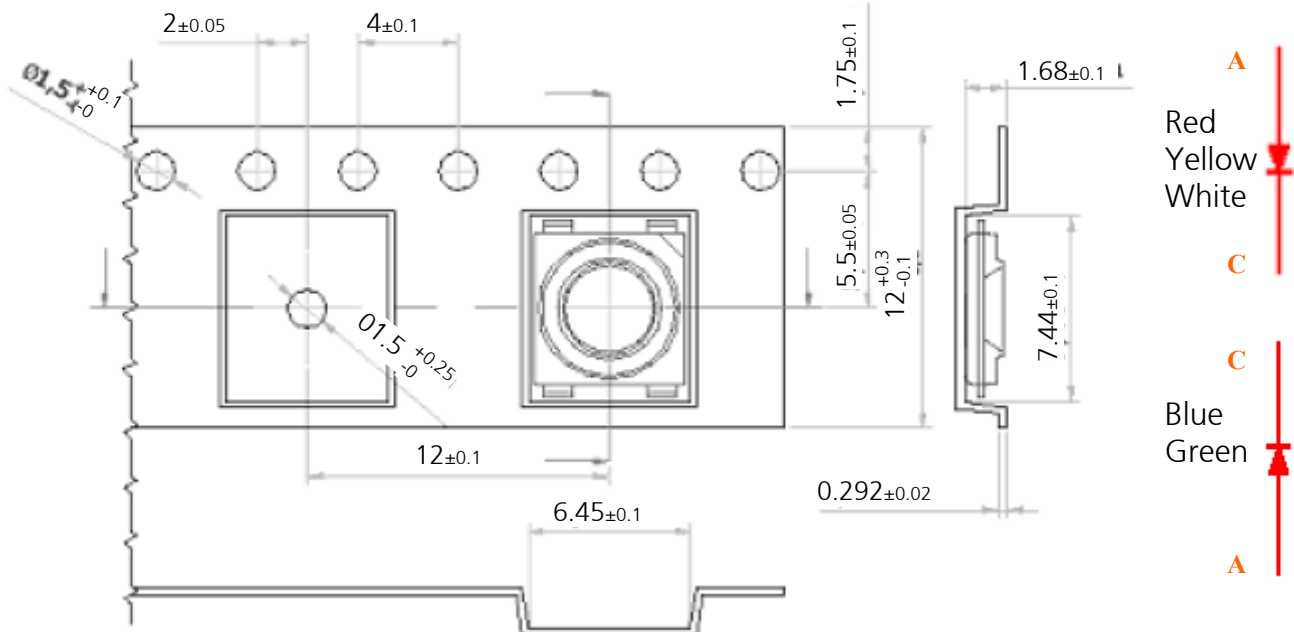


Recommended Pb Free IR-Reflow Soldering Profile.

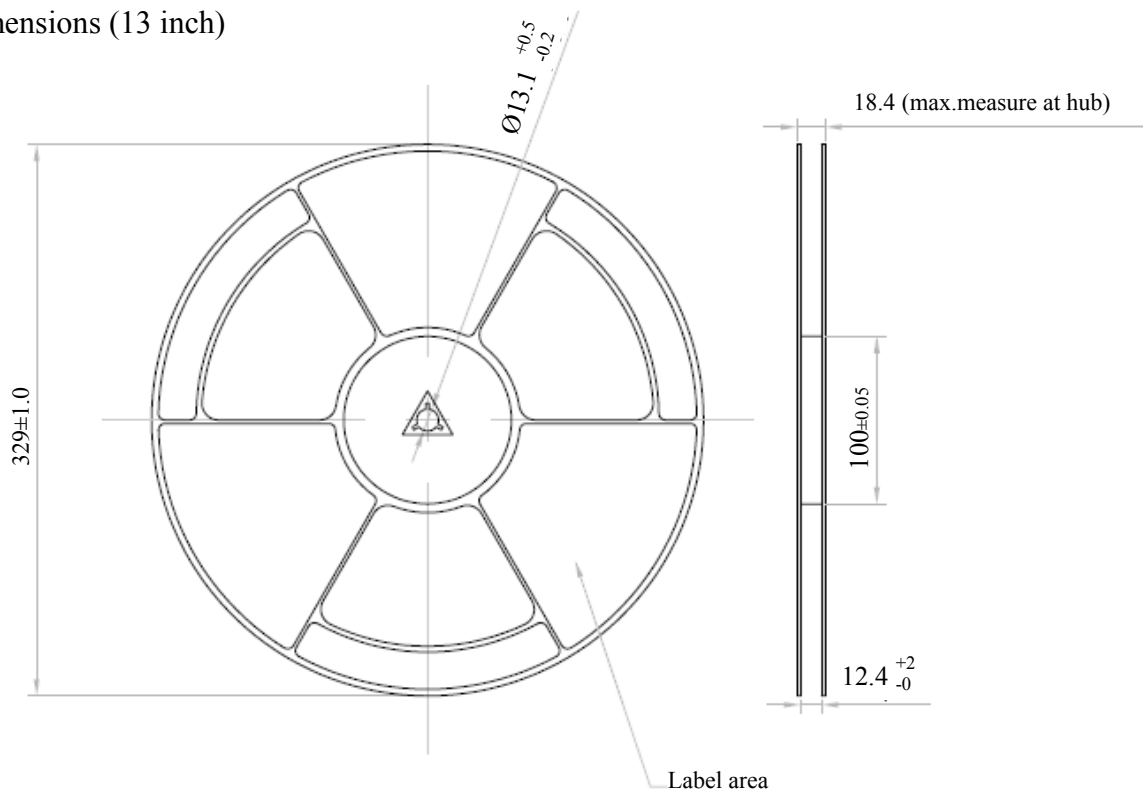


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Taping and Orientation
 Loaded quantity 1400 pieces per reel

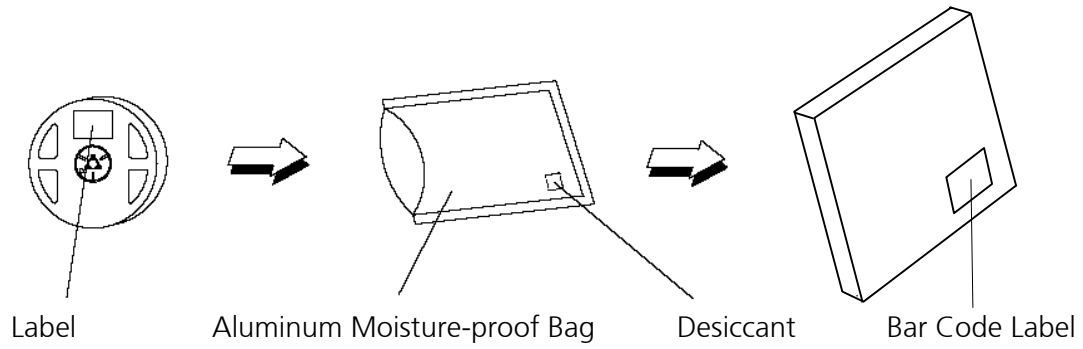


Reel Dimensions (13 inch)



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Moisture Resistant Packaging



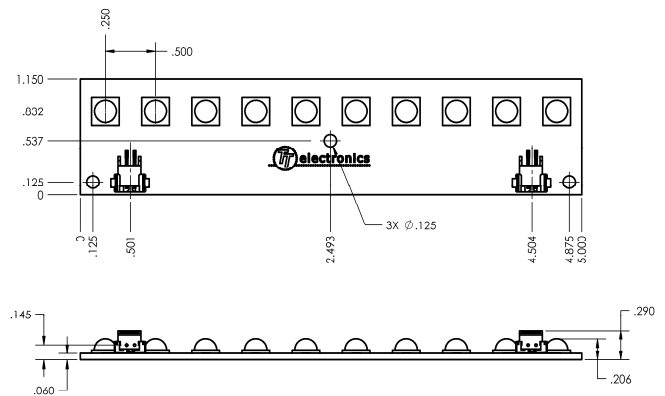
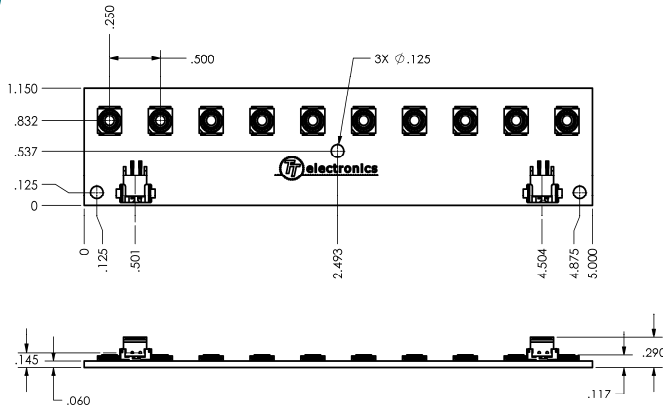
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OPA729—10 Watt Light Bar on Anotherm Heat Spreader

OPA729_



OPA729_D

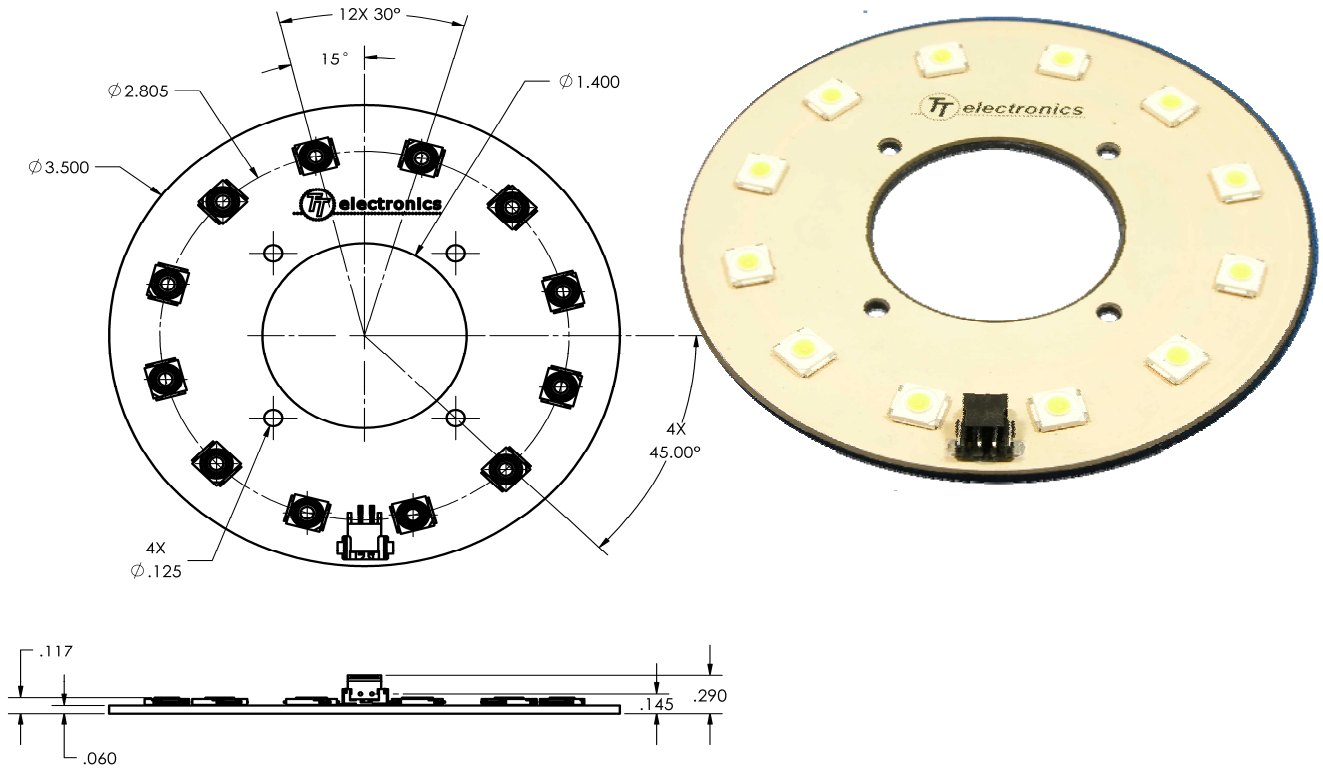


Electrical / Optical Characteristics: $T_A=25^\circ\text{C}$, $I_F=700\text{mA}$ [Green Dot Power Supply See page A-23]

Part Number	Typical Forward Voltage (V)	Luminous Flux (lm)	Beam Angle	Color
OPA729Y	12.5	350	120°	Yellow
OPA729B	18.0	90		Blue
OPA729G	18.0	480		Green
OPA729R	12.5	260		Red
OPA729W	18.0	480		White
OPA729YD	12.5	350	40°	Yellow
OPA729BD	18.0	90		Blue
OPA729GD	18.0	480		Green
OPA729RD	12.5	260		Red
OPA729WD	18.0	480	60°	White

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OPA730—12 Watt Light Ring on Anotherm Heat Spreader

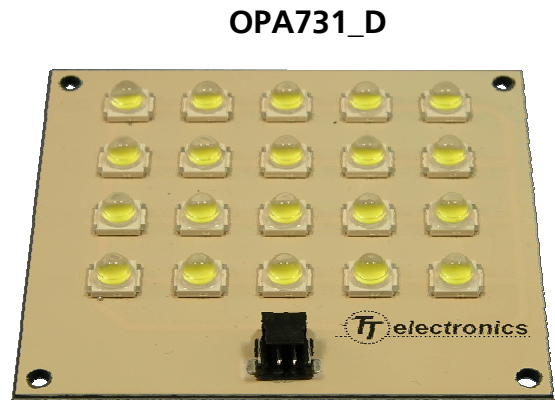
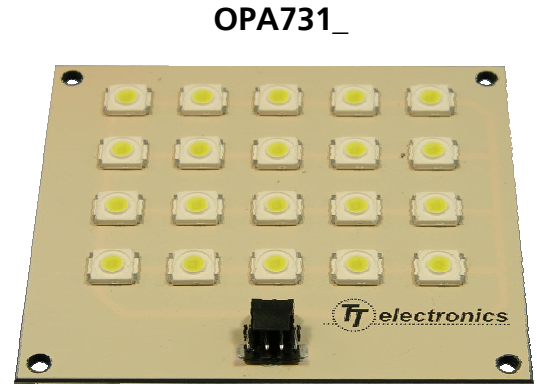
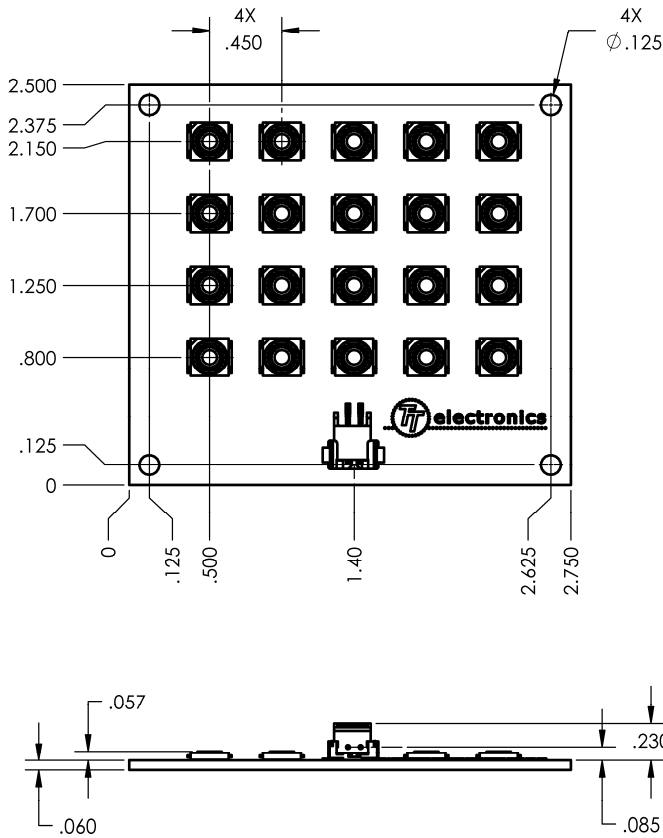


Electrical / Optical Characteristics: $T_A=25^\circ\text{C}$, $I_F=700\text{mA}$ [Green Dot Power Supply See page A-23]

Part Number	Typical Forward Voltage (V)	Luminous Flux (lm)	Beam Angle	Color
OPA730Y	15.0	420	120°	Yellow
OPA730B	21.6	108		Blue
OPA7309G	21.6	576		Green
OPA730R	15.0	312		Red
OPA730W	21.6	576		White
OPA730YD	15.0	420	40°	Yellow
OPA730BD	21.6	108		Blue
OPA730GD	21.6	576		Green
OPA730RD	15.0	312		Red
OPA730WD	21.6	576	60°	White

TT electronics subsidiaries reserves the right to make changes at any time in order to improve design and to supply the best product possible.

OPA731—20 Watt Light Flood on Anotherm Heat Spreader

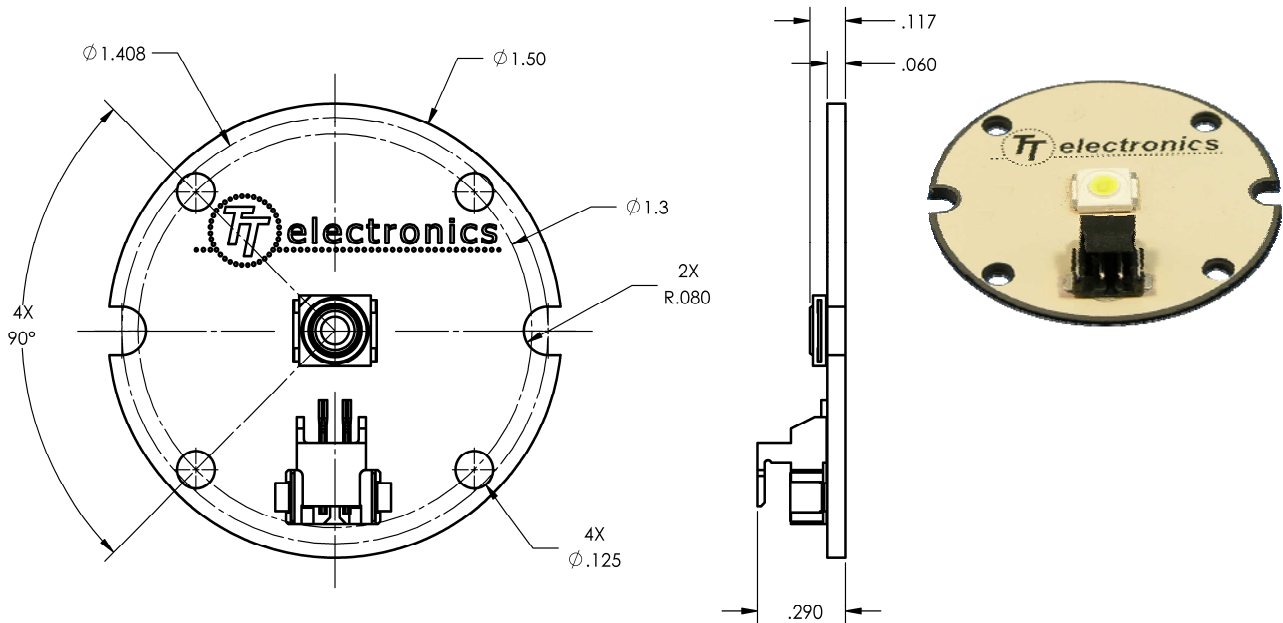


Electrical / Optical Characteristics: $T_A=25^\circ\text{C}$, $I_F=1.4\text{A}$ [Red Dot Power Supply See page A-23]

Part Number	Typical Forward Voltage (V)	Luminous Flux (lm)	Beam Angle	Color
OPA731Y	12.5	700	120°	Yellow
OPA731B	18.0	180		Blue
OPA731G	18.0	960		Green
OPA731R	12.5	520		Red
OPA731W	18.0	960		White
OPA731YD	12.5	700	40°	Yellow
OPA731BD	18.0	180		Blue
OPA731GD	18.0	960		Green
OPA731RD	12.5	520		Red
OPA731WD	18.0	960	60°	White

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OPA733—1 Watt Light Spot on Anotherm Heat Spreader

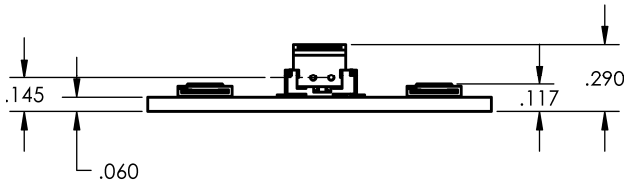
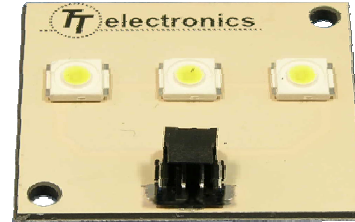
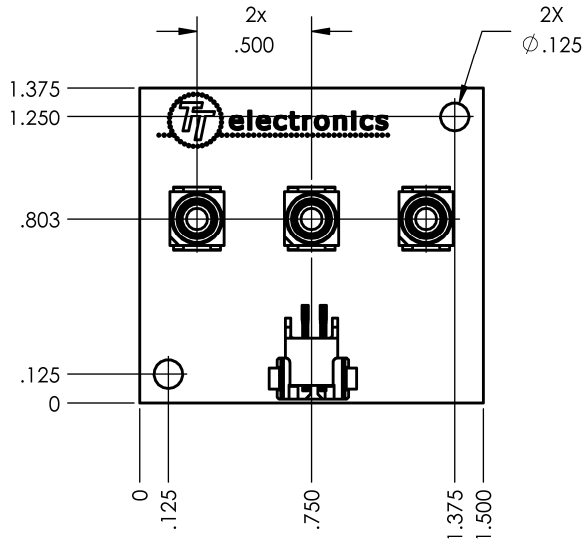


Electrical / Optical Characteristics: $T_A=25^\circ\text{C}$, $I_F=350\text{mA}$ [Blue Dot Power Supply See page A-23]

Part Number	Typical Forward Voltage (V)	Luminous Flux (lm)	Beam Angle	Color
OPA733Y	2.5	26	120°	Yellow
OPA733B	3.6	9		Blue
OPA733G	3.6	48		Green
OPA733R	2.5	35		Red
OPA733W	3.6	48		White
OPA733YD	2.5	26	40°	Yellow
OPA733BD	3.6	9		Blue
OPA733GD	3.6	48		Green
OPA733RD	2.5	35		Red
OPA733WD	3.6	48	60°	White

TT electronics subsidiaries reserves the right to make changes at any time in order to improve design and to supply the best product possible.

OPA739—3 Watt Light Bar on Anotherm Heat Spreader

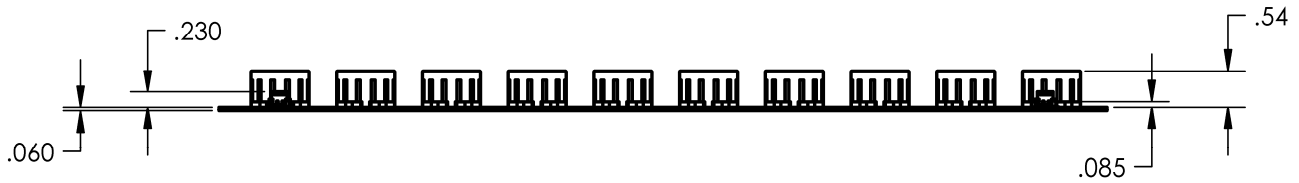
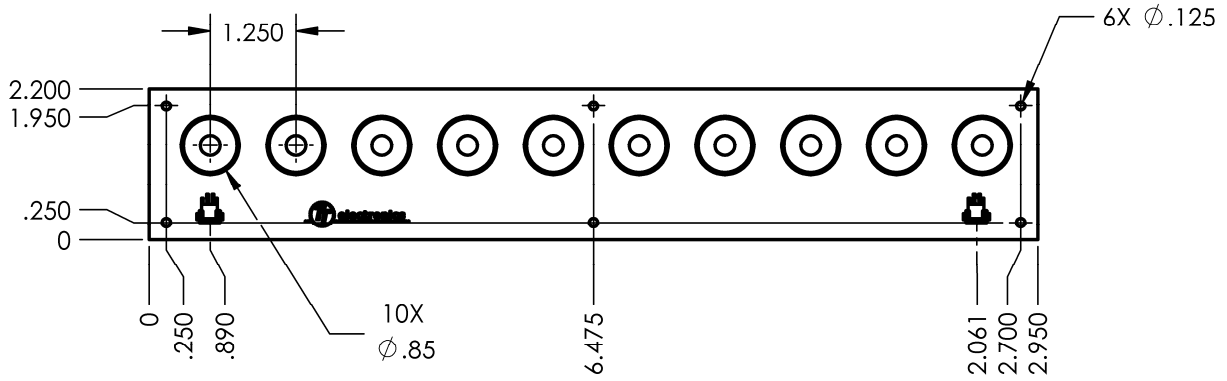


Electrical / Optical Characteristics: $T_A=25^\circ\text{C}$, $I_F=350\text{mA}$ [Blue Dot Power Supply See page A-23]

Part Number	Typical Forward Voltage (V)	Luminous Flux (lm)	Beam Angle	Color
OPA739Y	7.5	105	120°	Yellow
OPA739B	10.8	27		Blue
OPA739G	10.8	144		Green
OPA739R	7.5	78		Red
OPA739W	10.8	144		White
OPA739YD	7.5	105	40°	Yellow
OPA739BD	10.8	27		Blue
OPA739GD	10.8	144		Green
OPA739RD	7.5	78		Red
OPA739WD	10.8	144	60°	White

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OPA740—10 Watt Light Bar on Anotherm Heat Spreader with Lens

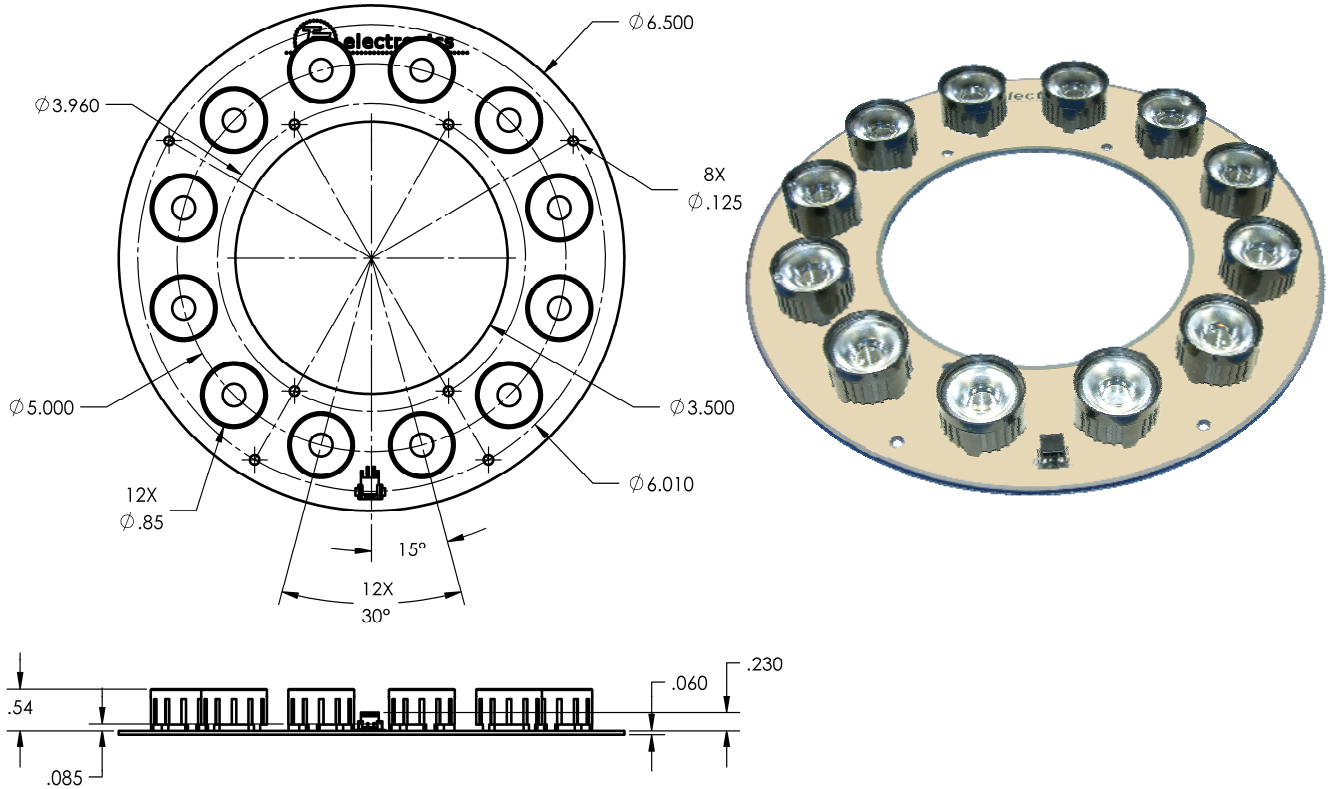


Electrical / Optical Characteristics: $T_A=25^\circ\text{C}$, $I_F=700\text{mA}$ [Green Dot Power Supply See page A-23]

Part Number	Typical Forward Voltage (V)	Luminous Flux (lm)	Beam Angle	Color
OPA740Y23	12.5	297	23°	Yellow
OPA740B23	18.0	76		Blue
OPA740G23	18.0	408		Green
OPA740R23	12.5	221		Red
OPA740W23	18.0	408		White

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OPA741—12 Watt Light Ring on Another therm Heat Spreader with Lens

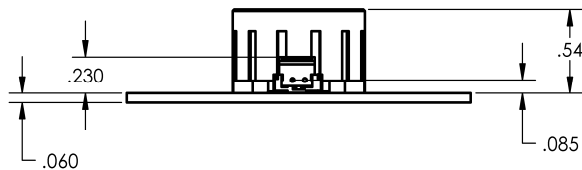
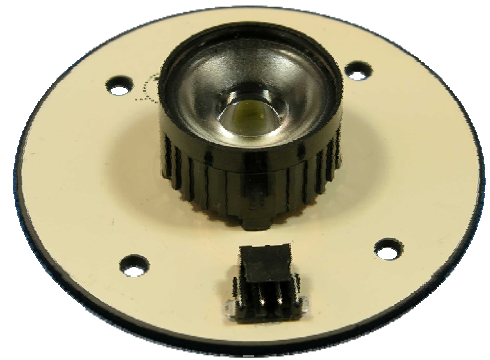
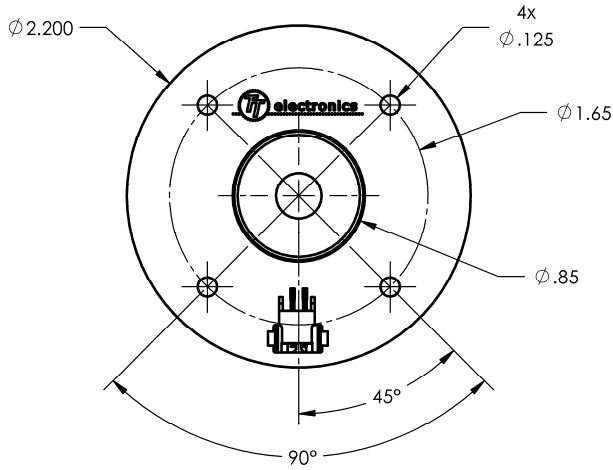


Electrical / Optical Characteristics: $T_A=25^{\circ}\text{C}$, $I_F=700\text{mA}$ [Green Dot Power Supply See page A-23]

Part Number	Typical Forward Voltage (V)	Luminous Flux (lm)	Beam Angle	Color
OPA741Y23	15.0	357	23°	Yellow
OPA741B23	21.6	92		Blue
OPA741G23	21.6	490		Green
OPA741R23	15.0	265		Red
OPA741W23	21.6	490		White

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OPA742—1 Watt Light Spot on Anotherm Heat Spreader with Lens



Electrical / Optical Characteristics: $T_A=25^\circ\text{C}$, $I_F=350\text{mA}$ [Blue Dot Power Supply See page A-23]

Part Number	Typical Forward Voltage (V)	Luminous Flux (lm)	Beam Angle	Color
OPA742Y23	2.5	22	23°	Yellow
OPA742B23	3.6	8		Blue
OPA742G23	3.6	41		Green
OPA742R23	2.5	30		Red
OPA742W23	3.6	41		White

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Notes:

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Method to operate the drivers.

1. Connect the VLED assembly to the driver before applying power to the driver. If there is no load on the driver when it is powered, there will be 30 volts on the output. If you then connect the 30 volts to an assembly, it could over-stress the assembly.

2. Remove power from the driver before removing the LED assembly. If the VLED assembly is removed from the driver first, there will be 30 volts on the driver when you connect the next VLED assembly. The charge may remain on the output for a long time.

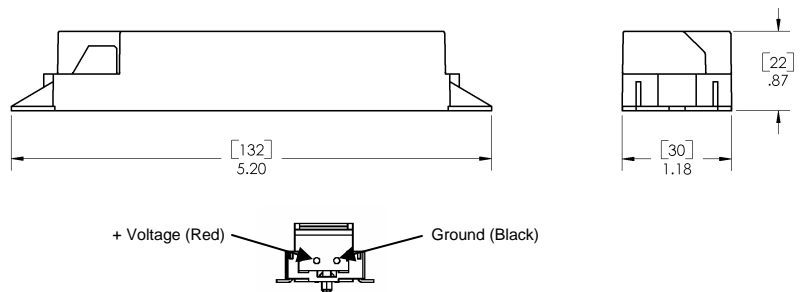
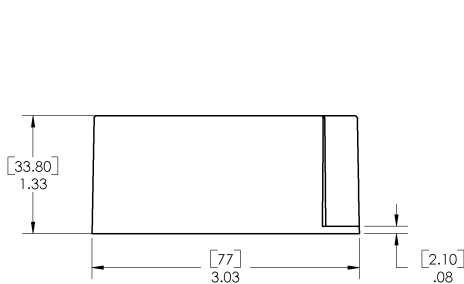
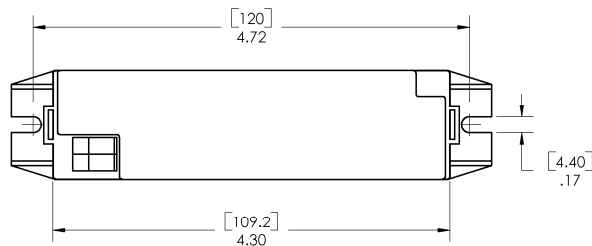
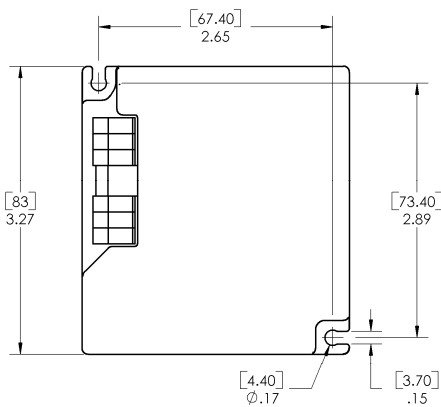
If the driver has been powered with no load on the output, the best method for removing the 30V charge is to connect the driver to the OPA730 ring VLED assembly. The more VLEDs in series, the less likely the no-load voltage charge will damage the assembly.



LD1400



LD350 & LD700



Part Number	Input Voltage	Input Power	Output Current	Output Voltage	Dot Color
LD350	120 VAC 60 Hz	15 Watts Max	350 mA	2.6 to 32.6 VDC	Blue
LD700	120 VAC 60 Hz	17 Watts Max	700 mA	7.8 to 24.6 VDC	Green
LD1400	120 VAC 60 Hz	51 Watts Max	1400 mA	7.8 to 24.6 VDC	Red

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Insulated Aluminum Substrates

Thermal Solutions for Hi Brightness LED Applications

TT electronics is a leading designer and manufacturer of electronic components. As a result of our experience with power components, Anotherm[®] substrates were developed as an innovative method of addressing thermal problems.

Anotherm[®] substrates consist of a highly thermally conductive aluminum alloy substrate, with a special anodized aluminum oxide electrically insulating layer chemically grown on the aluminum core. This high temperature anodized layer offers good electrical isolation and excellent thermal transfer. Screen-printed, solderable conductors are then applied to the board and fired.

The result is a low cost, rigid circuit board with unsurpassed thermal efficiency. The completely inorganic construction results in substrate characteristics that maintain their properties even at high continuous operating temperatures. This process also allows the use of a wide range of substrate configurations including finned and multi-up arrays.

Hi brightness, high power LEDs benefit from Anotherm[®] substrates, allowing excellent heat transfer from the LED package, resulting in more light output and operation at higher power levels.

Substrate Characteristics

Material

The base material for the Anotherm[®] substrates is an aluminum alloy, either 3000 or 6000 series. This aluminum alloy has a high thermal conductivity and low cost. The thermal expansion coefficient of this material corresponds favorably with traditional P.C. board materials. Long term thermal shock testing confirms the ruggedness of the dielectric medium without delamination or degradation.

Dielectric Layer

The insulation system used on the Anotherm[®] substrate system is an anodically grown coating (similar to hard coat anodizing), that deposits a dense, thin film of aluminum oxide approximately 0.0017" thick (0.043mm) onto the aluminum surface. This inorganic dielectric layer gives a high quality insulation that is not affected by temperature or chemicals.

Anotherm substrates offer very high thermal conductivities with low thermal resistance from the die or chip to the substrate for power LED applications.

This results in:

- **Reduced operating temperature**
- **Higher operating power/density**
- **Improved reliability and reduced failures due to thermally induced problems.**

Conductors

Silver alloy conductors are screen printed and fixed onto the insulating dielectric layer. The standard conductor thickness is approximately 20 microns, although thicker conductors can be printed for higher current carrying capability.

Multiple Layers

Anotherm[®] substrates are ideal for applications requiring single layers on the front or backside of the board. When multiple layers or printed crossovers are required, polymer materials are used. As a result, the excellent thermal conductivity properties of Anotherm[®] substrates are lost in the additional layers. However, these traces can be used for carrying low power and control signals.

Solder Masks

Printed solder masking is available using a polymeric formulation.

Heatsinks

One interesting characteristic of this technology is the capability of printing solderable conductors directly onto heatsinks, thereby simplifying the assembly of power systems.

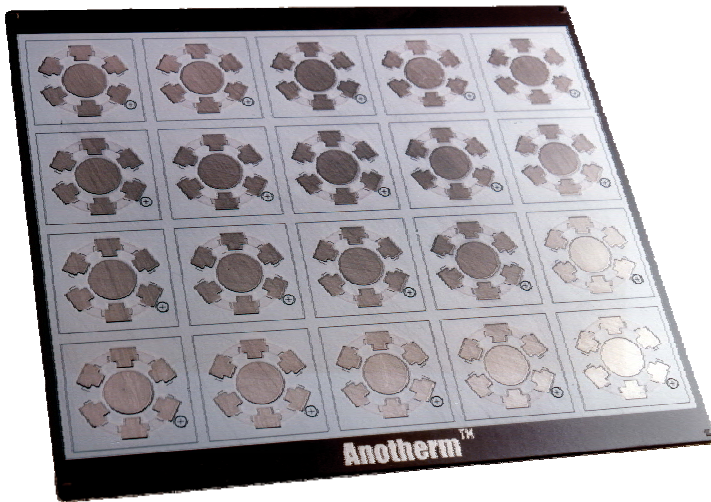
TT electronics subsidiaries reserves the right to make changes at any time in order to improve design and to supply the best product possible.

Reliability

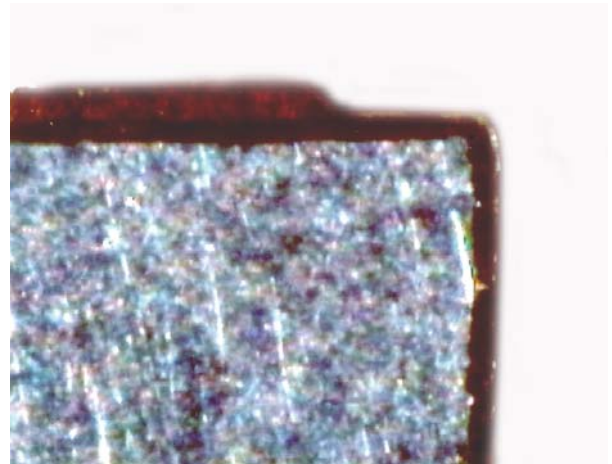
Another[®] substrates have been proven through millions of unit-hours of successful operation as power resistors for automotive HVAC fan speed applications, many in very harsh applications. They have successfully passed requirements presently in use for automotive, and class 8 truck applications.

Soldering

The use of solders containing silver (such as common alloys SN62Pb36Ag2 or Sn96Ag4) and most lead free RoHS compliant solder is required when soldering to Another[®]. The reflow profile should have a minimum time above the solder liquidus temperature to minimize leaching.



Printed traces are available on finned heatsinks.



Magnified sectioned view of Another[®] substrate and trace. The anodized insulation layer gives excellent continuous coverage, even around sharp corners.

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