

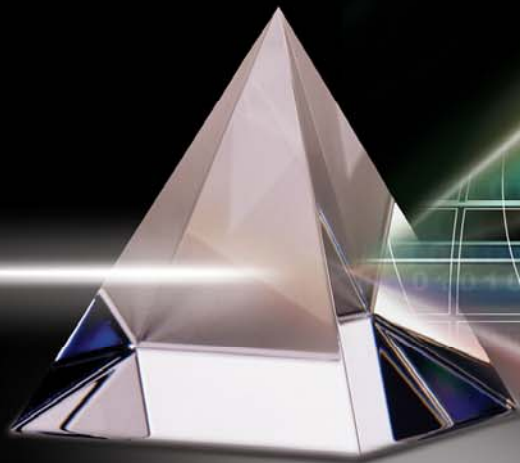
Visible LEDs and Assemblies

TT *electronics*
OPTEK Technology

A Part Of Everyday Technology

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COVERING THE FULL LIGHT SPECTRUM



Leadership in Manufacturing

As a global leader in compound semiconductor design and packaging, OPTEK begins with the most advanced High-Brightness Light Emitting Diode starting materials. The dice, or chips for OPTEK's Phosphored White, Blue, Blue-Green and Green are InGaN on sapphire and SiC. The Red, Orange, Amber and Yellow LEDs are made from the most advanced AlInGaP on gallium arsenide in the most robust of structures for new challenging applications in Solid State Lighting and Illumination.

Advanced chip technology is the heart of the device, whether it is an industry standard or application-specific surface mount power or leaded component. It is the advances in all of these materials that continues to expand the use of the LED beyond traditional status indicator applications.

Discrete LED Capabilities

OPTEK high-brightness LED applications range from outdoor LED Video Message signs to cell phone displays and camera flash. Design engineers in solid-state traffic and pedestrian signals find standard OPTEK product designed specifically for their use.

The following is a sample of the package portfolio and typical uses of OPTEK product in the Visible Spectrum.

High Brightness Through-hole LEDs	OPTEK offers all colors with high light output in a variety of diameters, shapes and viewing angles, using AlInGaP and InGaN material. Binning by wavelength, forward voltage, and luminous intensity is available.	Applications include displays and signs, indoors and in full sunlight; automotive interior and exterior lighting; information signage; architectural and decorative lighting.
Surface Mount	Reflective PLCC and chip LED packages are available in single- and multi-color packages, including tunable full-color RGB for dynamic and static lighting effects.	Surface mount LEDs provide bright light output with low V_f to backlight LCDs in handheld appliances. Reds, greens, and blues form pixels for outdoor and indoor signs, displays, and channel letters.
High Flux	OPTEK's 4-pin square-shaped LEDs are available in multiple viewing angles and 5 colors.	This package provides lighting solutions for automotive applications and is used in the signage industry in arrays and housings to replace neon.
High Power	1-watt and greater components complete with thermal management deliver bright solid-state lighting solutions.	For general illumination, emergency lighting, and task lighting, OPTEK offers long-life energy efficient devices and reduced maintenance costs.

LED Assembly and Special Product Capability


Thermally managed LED components and arrays are the key to safely and reliably replacing older technologies. These solutions are found in the OPTEK toolbox. You'll find a number of standard LED assemblies in this selection guide. You may consider this just a starting point in your search for the optimum solutions for your unique requirement.

Automotive interior and exterior lighting designers turn to OPTEK's optoelectronics engineering teams for application-specific lighting assemblies as well as discrete LEDs. When an application requires tight bin and rank segmentation or other special care, OPTEK LEDs are always the answer.


The extensive engineering support for customer designs using LEDs for color on demand is ready, willing and able to meet the challenge.

Visible LEDs


OVAL THROUGH-HOLE LED – Multiple Viewing Angles

Oval Through-Hole	Part Number	Size	Chip			Lens Color	I _v (mcd)		Typ. V _F	Viewing Angle °	Package #
			Material	Emitted Color	λD (nm)		at I _F =mA	Typ.			
	OVLHBKD8	5 mm	InGaN	Blue	470	Color Diffused	20	500	3.4	110° / 50°	200
	OVLHGKD8		InGaN	Green	525			1100	3.6		
	OVLHQKD8		AllnGaP	Red-Orange	618			800	2.3		
	OVLHRKD8		AllnGaP	Red	624			900	2.1		
	OVLJBGD8	4 mm	InGaN	Blue	470		20	300	3.6	100° / 50°	201
	OVLJGGD8		InGaN	Green	525			1200	3.6		
	OVLJRGD8		AllnGaP	Red	624			400	2.2		
	OVLKGBT6	4 mm	InGaN	Blue	470		20	300	3.4	100° / 60°	202
	OVLKGGT6		InGaN	Green	525			1100	3.3		
	OVLKQGT6		AllnGaP	Red-Orange	616			430	2.1		



5mm ROUND HIGH-INTENSITY THROUGH-HOLE LED

5mm Through-Hole	Part Number	Size	Chip			Lens Color	I _v (mcd)		Typ. V _F	Viewing Angle	Package #
			Material	Emitted Color	λD (nm)		at I _F =mA	Typ.			
	OVLGB0C6B9	5 mm	InGaN	Blue	470	Water Clear	20	3800	3.4	6°	203
	OVLGC0C6B9		InGaN	Blue-Green	505			9800	3.4		
	OVLGG0C5B9		InGaN	Green	525			5000	3.4		
	OVLGY0C9B9		AllnGaP	Yellow	589			10300	2.0		
	OVLGS0C8B9		AllnGaP	Red	623			8550	2.0		
	OVLFB3C7	5 mm	InGaN	Blue	470	Water Clear	20	1350	3.4	30°	204
	OVLFG3C7		InGaN	Green	525			5200	3.4		
	OVLFY3C7		AllnGaP	Yellow	589			5700	2.2		
	OVLFR3C7		AllnGaP	Red	623			5000	2.2		

5mm CYLINDER THROUGH-HOLE LED

5mm Through-Hole	Part Number	Size	Chip			Lens Color	I _v (mcd)		Typ. V _F	Viewing Angle	Package #
			Material	Emitted Color	λD (nm)		at I _F =mA	Typ.			
	OVL LB8C7	5 mm	InGaN	Blue	470	Water Clear	20	300	3.4	85°	207
	OVL LG8C7		InGaN	Green	525			670	3.4		
	OVL LY8C7		AllnGaP	Yellow	589			650	2.2		
	OVL LR8C7		AllnGaP	Red	623			570	2.2		


3mm ROUND THROUGH-HOLE LED

3mm Through-Hole	Part Number	Size	Chip			Lens Color	I _v (mcd)		Typ. V _F	Viewing Angle	Package #
			Material	Emitted Color	λD (nm)		at I _F =mA	Typ.			
	OVL AB6CB8	3 mm	InGaN	Blue	470	Water Clear	20	600	3.6	65°	205
	OVL AG6CB8		InGaN	Green	527			2000	3.6		
	OVL AS6CB8		AllnGaP	Red	628			1100	2.3		
	OVL B4C7	3 mm	InGaN	Blue	470	Water Clear	20	900	3.4	45°	206
	OVL B4C7		InGaN	Green	525			2000	3.4		
	OVL B4C7		AllnGaP	Yellow	589			2400	2.2		
	OVL B4C7		AllnGaP	Red	623			1800	2.2		


SURFACE MOUNT POWER LED – 6mm²

6mm ² SMD	Part Number	Package	Chip			Lens Color	Φ_V (lm)		Typ. V_F	Viewing Angle	Package #
			Material	Emitted Color	λ_D (nm, °K)		at I_F =mA	Typ.			
	OVSPBBCR4	6 mm ² Flat	InGaN	Blue	470nm	Water Clear	350	9	3.6	120°	220
	OVSPGBCR4		InGaN	Green	525nm		350	48	3.6		
	OVSPRBCR4		AllnGaP	Red	625nm		400	26	2.5		
	OVSPWBCR4		InGaN	White	7000°K		350	48	3.6		
	OVSPYBCR4		AllnGaP	Yellow	587nm		400	35	2.5		
	OVSPRBCR44	6 mm ² Dome	AllnGaP	Red	625nm		400	30	2.5	40°	221
	OVSPYBCR44		AllnGaP	Yellow	589nm		400	35	2.5	60°	
	OVSPWBCR44		InGaN	White	7000°K		350	52	3.6		
	OVS5RCR44		AllnGaP	Red	625nm		175	8	2.2	40°	
	OVS5YCR44		AllnGaP	Yellow	589nm		175	11	2.2		


TOP-VIEW SURFACE MOUNT LED with FLAT LENS

PLCC4 SMD	Part Number	Package	Chip			Lens Color	I_V (mcd)		Typ. V_F	Viewing Angle	Package #
			Material	Emitted Color	λ_D (nm)		at I_F =mA	Typ.			
	OVSABBC2R8	PLCC4	InGaN	Blue	470	Water Clear	30	200	3.9	120°	210
	OVSACBC2R8		InGaN	Blue-Green	505			560	3.9		
	OVSAGBC2R8		InGaN	Green	527			700	3.9		
	OVSAAABC2R8		AllnGaP	Amber	591		50	700	2.6		
	OVSASBC2R8		AllnGaP	Red	628			900	2.5		
	OVSABBC2R8		InGaN	White	—			1050	3.4		

TOP-VIEW SURFACE MOUNT LED with DOMED LENS


PLCC4 SMD	Part Number	Package	Chip			Lens Color	I_V (mcd)		Typ. V_F	Viewing Angle	Package #
			Material	Emitted Color	λ_D (nm)		at I_F =mA	Typ.			
	OVSAABLCR8	PLCC4	AllnGaP	Amber	594	Water Clear	50	1650	2.6	60°	211
	OVSQBLCR8		AllnGaP	Red-Orange	618			2800	2.5		
	OVSASBLCR8		AllnGaP	Red	628			900	2.5		

SIDE EMITTING SURFACE MOUNT LED







RA PLCC SMD	Part Number	Package	Chip			Lens Color	I_V (mcd)		Typ. V_F	Viewing Angle	Package #
			Material	Emitted Color	λ_D (nm)		at I_F =mA	Typ.			
	OVSR9BBCR8	RA PLCC	InGaN	Blue	470	Water Clear	20	120	3.6	120°	212
	OVSR9CBCR8		InGaN	Blue-Green	505			400	3.6		
	OVSR9GBCR8		InGaN	Green	527			560	3.6		
	OVSR9ABCR8		AllnGaP	Amber	594			350	2.3		
	OVSR9RBCR8		AllnGaP	Red	624			400	2.3		
	OVSR9WBCR8		InGaN	White	—			600	3.4		

SUPER FLUX 4-PIN LED – 7.6mm²


*Dome Height = 1.9mm

7.6mm ² Through-hole	Part Number	Package	Chip			Lens Color	Φ _v (mlm)		Typ. V _F	Viewing Angle	Package #
			Material	Emitted Color	λD (nm)		at I _F =mA	Typ.			
	OVFSB6C8	7.6 mm ²	InGaN	Blue	470	Water Clear	30	850	4.0	60°	209
	OVFSG6C8		InGaN	Green	527			2500	4.0		
	OVFSAAC8		AllInGaP	Amber	591		70	5000	2.5	100°	
	OVFSQ4C8		AllInGaP	Red-Orange	618			4500	2.6	40°	
	OVFSRAC8		AllInGaP	Red	624			4500	2.5	100°	
	OVFSW6C8		InGaN	White	---		30	1200	4.0	60°	





WHITE InGaN SURFACE MOUNT LED

Package	Part Number	Lens Color	Intensity/Flux		Typ. V _F	Viewing Angle	Package #	
			at I _F =mA	Typ.				
	PLCC2	OVS9WBCR4	Water Clear	20	750 mcd	3.2	120°	213
	RA 2.8x1.2x.8	OVSRWACR6		20	1000 mcd	3.4	x120°, y110°	214
	PLCC4	OVS AWBCR4		30	1050 mcd	3.4	120°	210
	6X6 Flat	OVS PWBCR4		350	48 lm	3.6	120°	220
		OVS3WBCR4		120	7 lm			
		OVS5WBCR4		150	21 lm			
	6X6 Dome	OVS PWBCR44		350	52 lm	3.6	60°	221
		OVS3WBCR44	120	7 lm				
	RA PLCC	OVS R9WBCR8	20	600 mcd	3.4	120°	212	


WHITE InGaN THROUGH-HOLE LED

Package	Part Number	Lens Color	Intensity/Flux		Typ. V _F	Viewing Angle	Package #	
			at I _F =mA	Typ.				
	Round 3 mm	OVLAW4CB6	Water Clear	20	1000 mcd	3.4	45°	205
	Round 5 mm	OVLEW1CB9		20	18000 mcd	3.4	15°	203
	Round 5 mm	OVLEW3CB6		20	2100 mcd	3.4	30°	216
		OVLEW5CB6			1600 mcd	3.4	50°	208
		4-pin Flux		OVFSW6C8	30	1200 mlm	4.0	60°


FULL-COLOR (R/G/B) SURFACE MOUNT LED

Package		Part Number	Lens Color	I_v (mcd)				Typ. V_f	Viewing Angle	Package #
				at I_f =mA	R	Typ. G	B			
	Top-view Chip LED 2.4x2.4x.95	OVSTRGBAC6	Water Clear	20	100	333	88	R=2.8 G=3.9 B=3.9	110°	219
	PLCC4 3.2x2.8x1.9	OVSARGB3R8		20	300	450	110	R=2.3 G=3.6 B=3.6	120°	222
	PLCC6 6.0x5.0x2.5	OVSTRGBBCR8		3x50	1000	900	280	R=2.5 G=4.5 B=4.5	120°	223
	6X6 Flat 1watt	OVSPRGBCR4		3x250	21 lm	32 lm	7.51 lm	R=2.3 G=3.5 B=3.5	130°	215

SECONDARY OPTICS FOR OVSP SERIES

Package	Part Number	Size (mm)	Viewing Angle	Shipping Container	Package Quantity / Tray	
	Lens with holder	OVLENS154	20 diam	15	Tray	72
	Lens with holder	OVLENS234	20 diam	23	Tray	72


1-WATT LEDNIUM SERIES, FLUSH MOUNT, LOW PROFILE 1.10mm

Package	Optek Part No.	Size	Emitted Color	λ_D (nm) Typ	Forward Current (mA)	Typical Iv/flux (lm)	Typical VF	Viewing Angle	Package #
	OVTL01LGAA	5.2 x 5.9mm	Amber	595	350	38	2.3	135°	224
	OVTL01LGAB		Blue	460	350	15	3.4		
	OVTL01LGAG		Green	515	350	52	3.6		
	OVTL01LGAR		Red	625	350	53	2.3		
	OVTL01LGAW		Cool White	7000 °K	350	50	3.4		
	OVTL01LGAWD		Daylight White	5800 °K	350	45	3.4		
	OVTL01LGAWW		Warm White	3500 °K	350	30	3.4		

1-WATT LEDNIUM SERIES, SURFACE MOUNT, LOW PROFILE 1.50mm


Package	Optek Part No.	Size	Emitted Color	λ_D (nm) Typ	Forward Current (mA)	Typical Iv/flux (lm)	Typical VF	Viewing Angle	Package #
	OVTL01LGAAS	5.2 x 5.9mm	Amber	595	350	38	2.3	135°	225
	OVTL01LGABS		Blue	460	350	15	3.4		
	OVTL01LGAGS		Green	515	350	52	3.6		
	OVTL01LGARS		Red	625	350	53	2.3		
	OVTL01LGAWS		Cool White	7000 °K	350	50	3.4		
	OVTL01LGAWDS		Daylight White	5800 °K	350	45	3.4		
	OVTL01LGAWWS		Warm White	3500 °K	350	30	3.4		

10- WATT LEDNIUM SERIES

Package	Part Number	Lens Color	Die		Forward Voltage V_F @ 600mA			Flux @ 1.05A	Viewing Angle	Package #
			Emitted Color	λ_D (nm)	Min. (V)	Typ. (V)	Max. (V)	Typ. (lm)		
	OVTL09LG3B	Water Clear	Blue	460 nm	9.5	10.2	11.2	117	120°	226
	OVTL09LG3G		Green	515 nm	10.3	11.0	11.9	423		
	OVTL09LG3A		Amber	595 nm	6.3	7.0	7.9	297		
	OVTL09LG3R		Red	625 nm	6.3	7.0	7.9	423		
	OVTL09LG3WD		Daylight White	5800 (°K)	8.9	9.1	9.25	TBD		
	OVTL09LG3WW		Warm White	3500 (°K)	8.9	9.1	9.25	TBD		
	OVTL09LG3W		Cool White	7000 (°K)	9.5	10.2	11.2	387		
	OVTL09LG3M		Red/ Green/ Blue	625 nm 515 nm 460 nm	8.4	8.6	8/8	266		

OPA729—10 Watt Light Bar on Anotherm® Heat Spreader


Electrical / Optical Characteristics: $T_A=25^{\circ}\text{C}$, $I_F=700\text{mA}$ | Green dot Power Supply I



Part Number	Typical Forward Voltage (V)	Luminous Flux (lm)	Beam Angle	Color	λ_D (nm)	Package #
OPA729Y	12.5	350	120°	Yellow	587	232
OPA729B	18.0	90		Blue	470	
OPA729G	18.0	480		Green	530	
OPA729R	12.5	260		Red	625	
OPA729W	18.0	480		White	7000 °K	
OPA729YD	12.5	350	40°	Yellow	587	233
OPA729BD	18.0	90		Blue	470	
OPA729GD	18.0	480		Green	530	
OPA729RD	12.5	260		Red	625	
OPA729WD	18.0	480	60°	White	7000 °K	

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 I



Part Number	Typical Forward Voltage (V)	Luminous Flux (lm)	Beam Angle	Color	λ_D (nm)	Package #
OPA740Y23	12.5	297	23°	Yellow	587	228
OPA740B23	18.0	76		Blue	470	
OPA740G23	18.0	408		Green	530	
OPA740R23	12.5	221		Red	625	
OPA740W23	18.0	408		White	7000 °K	

OPA731—20 Watt Light Flood on Anotherm® Heat Spreader

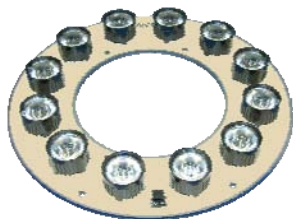
Electrical / Optical Characteristics: $T_A=25^{\circ}\text{C}$, $I_F=1.4\text{A}$ | Red dot Power Supply I



Part Number	Typical Forward Voltage (V)	Luminous Flux (lm)	Beam Angle	Color	λ_D (nm)	Package #
OPA731Y	12.5	700	120°	Yellow	587	234
OPA731B	18.0	180		Blue	470	
OPA731G	18.0	960		Green	530	
OPA731R	12.5	520		Red	625	
OPA731W	18.0	960		White	7000 °K	
OPA731YD	12.5	700	40°	Yellow	587	235
OPA731BD	18.0	180		Blue	470	
OPA731GD	18.0	960		Green	530	
OPA731RD	12.5	520		Red	625	
OPA731WD	18.0	960	60°	White	7000 °K	

OPA741—12 Watt Light Ring on Anotherm® Heat Spreader with Lens

Electrical / Optical Characteristics: $T_A=25^{\circ}\text{C}$, $I_F=700\text{mA}$ | Green dot Power Supply 1



Part Number	Typical Forward Voltage (V)	Luminous Flux (lm)	Beam Angle	Color	λ_D (nm)	Package #
OPA741Y23	15.0	357	23°	Yellow	587	229
OPA741B23	21.6	92		Blue	470	
OPA741G23	21.6	490		Green	530	
OPA741R23	15.0	265		Red	625	
OPA741W23	21.6	490		White	7000 °K	

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 1



Part Number	Typical Forward Voltage (V)	Luminous Flux (lm)	Beam Angle	Color	λ_D (nm)	Package #
OPA730Y	15.0	420	120°	Yellow	587	236
OPA730B	21.6	108		Blue	470	
OPA7309G	21.6	576		Green	530	
OPA730R	15.0	312		Red	625	
OPA730W	21.6	576		White	7000 °K	
OPA730YD	15.0	420	40°	Yellow	587	237
OPA730BD	21.6	108		Blue	470	
OPA730GD	21.6	576		Green	530	
OPA730RD	15.0	312		Red	625	
OPA730WD	21.6	576	60°	White	7000 °K	

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 1



Part Number	Typical Forward Voltage (V)	Luminous Flux (lm)	Beam Angle	Color	λ_D (nm)	Package #
OPA739Y	7.5	105	120°	Yellow	587	230
OPA739B	10.8	27		Blue	470	
OPA739G	10.8	144		Green	530	
OPA739R	7.5	78		Red	625	
OPA739W	10.8	144		White	7000 °K	
OPA739YD	7.5	105	40°	Yellow	587	231
OPA739BD	10.8	27		Blue	470	
OPA739GD	10.8	144		Green	530	
OPA739RD	7.5	78		Red	625	
OPA739WD	10.8	144	60°	White	7000 °K	


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 I



	Part Number	Typical Forward Voltage (V)	Luminous Flux (lm)	Beam Angle	Color	λ_D (nm)	Package #
	OPA742Y23	2.5	22	23°	Yellow	587	227
	OPA742B23	3.6	8		Blue	470	
	OPA742G23	3.6	41		Green	530	
	OPA742R23	2.5	30		Red	625	
	OPA742W23	3.6	41		White	7000 °K	

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 I

	Part Number	Typical Forward Voltage (V)	Luminous Flux (lm)	Beam Angle	Color	λ_D (nm)	Package #
	OPA733Y	2.5	26	120°	Yellow	587	238
	OPA733B	3.6	9		Blue	470	
	OPA733G	3.6	48		Green	530	
	OPA733R	2.5	35		Red	625	
	OPA733W	3.6	48		White	7000 °K	
	OPA733YD	2.5	26	40°	Yellow	587	239
	OPA733BD	3.6	9		Blue	470	
	OPA733GD	3.6	48		Green	530	
	OPA733RD	2.5	35		Red	625	
	OPA733WD	3.6	48	60°	White	7000 °K	

Power Cubes*

	Advance Part Number	Input Voltage	Input Power	Output Current	Output Voltage	Dot Color
	LED-120A-0350C-33F	120 VAC 60 Hz	15 Watts Max	350 mA	2.6 to 32.6 VDC	Blue
	LED-120A-0700C-24F	120 VAC 60 Hz	17 Watts Max	700 mA	7.8 to 24.6 VDC	Green
	LED-120A-1400C-24F	120 VAC 60 Hz	51 Watts Max	1400 mA	7.8 to 24.6 VDC	Red

* Power Cubes may be purchased from:

Advance — 10275 Higgins Road — Rosemont, IL. 60018 — 800-322-2086

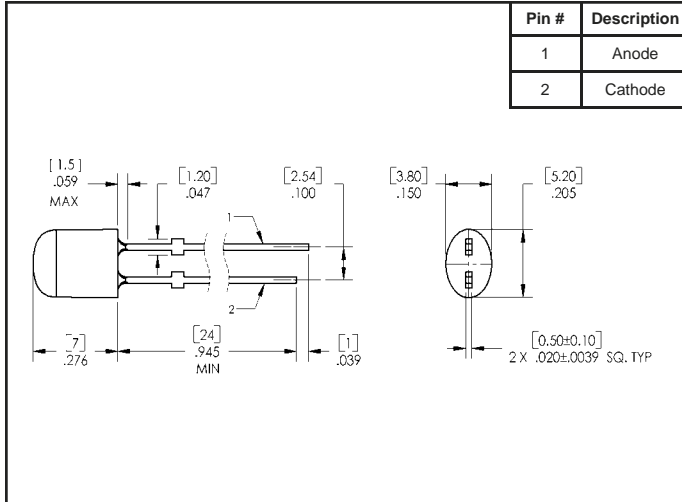
OPTEK's In-House VLED Lab

We have a state-of-the-art in-house visible LED lab to help our customers make the transition from traditional light sources to solid-state solutions. Our expertise with the equipment and years of optical experience gives you:

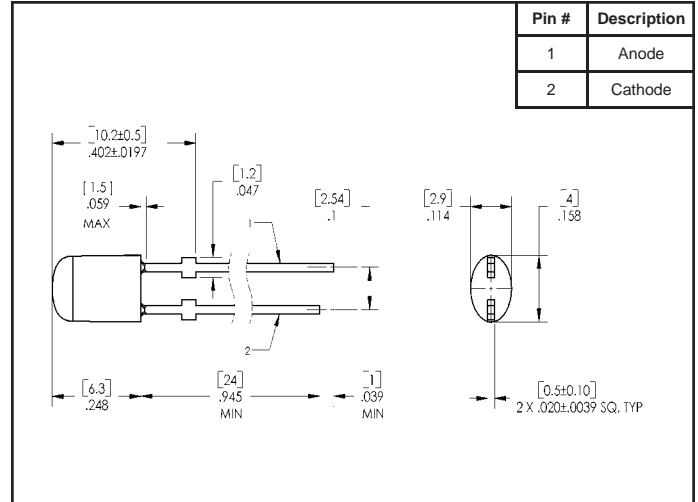
- Spectral analysis of LEDs in both ultraviolet and visible wavelength spectrums for analysis
- Detailed analysis on custom LED assemblies which validate the light output of the entire array as well as individual components
- Validation data for reliability testing as well as full-failure analysis
- Optimization of thermal management designs

The OPTEK visible LED lab enables us to provide you the full spectrum of data required to ensure your lighting designs are efficient, long lasting and at optimum light output.

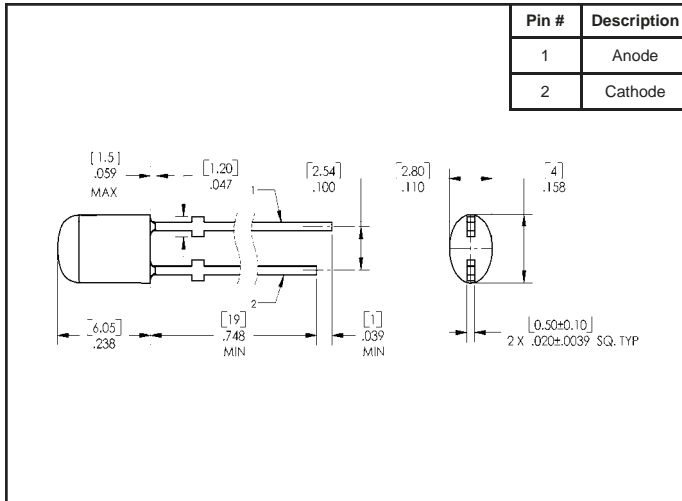




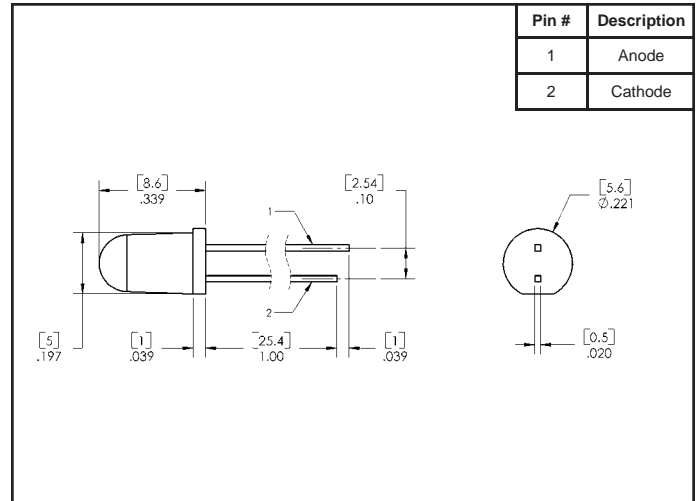
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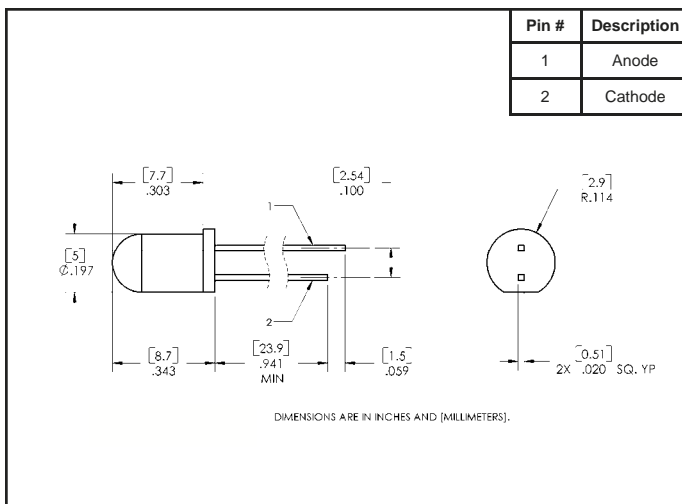
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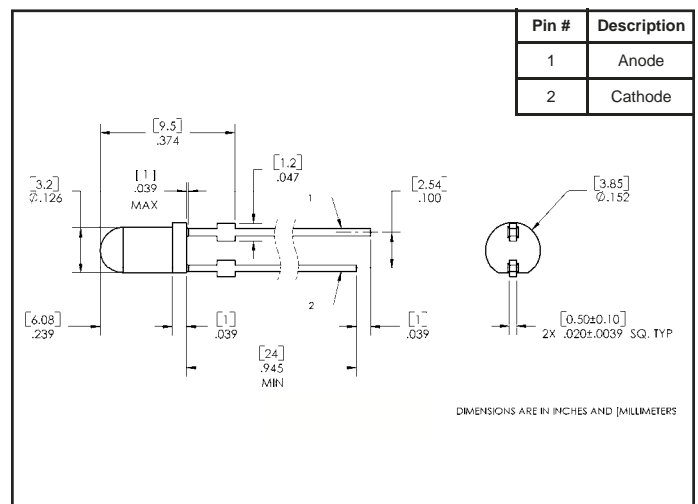
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Package # 203

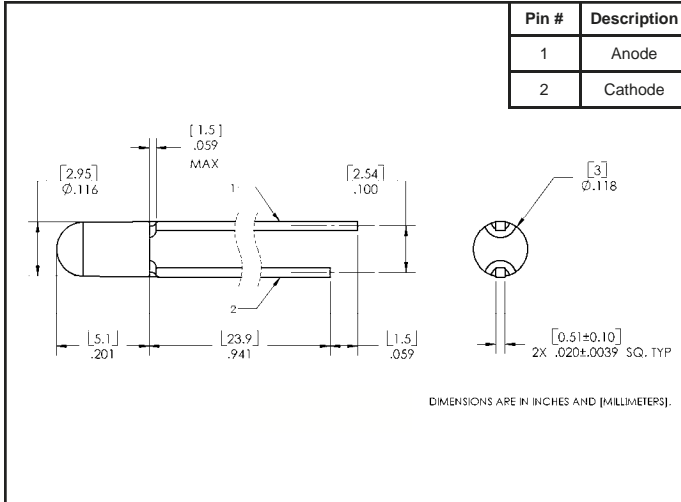


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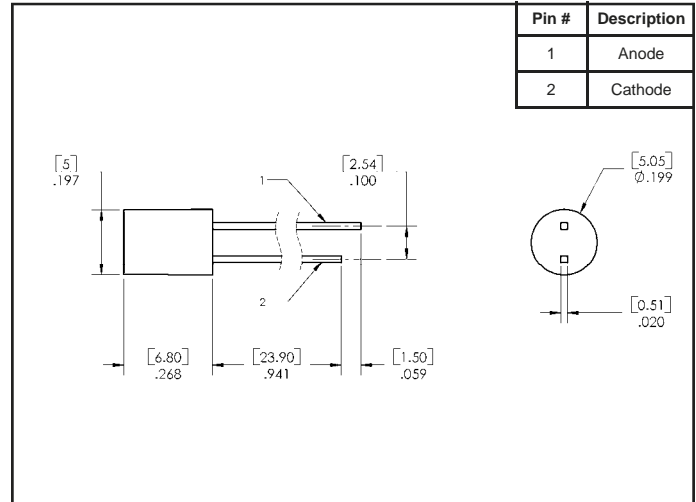


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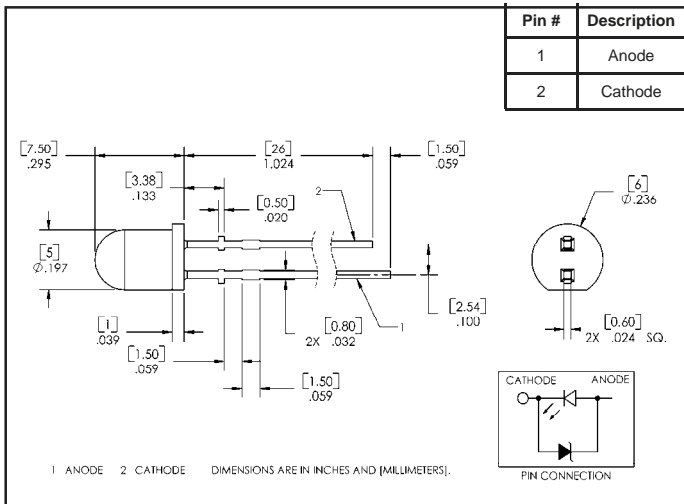
Package Drawings



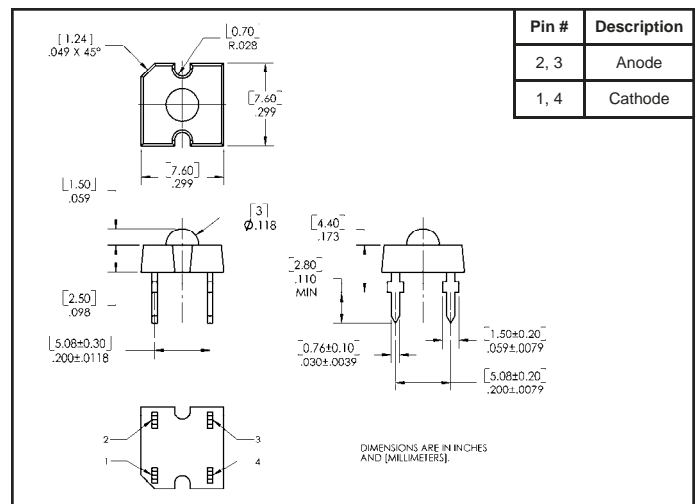
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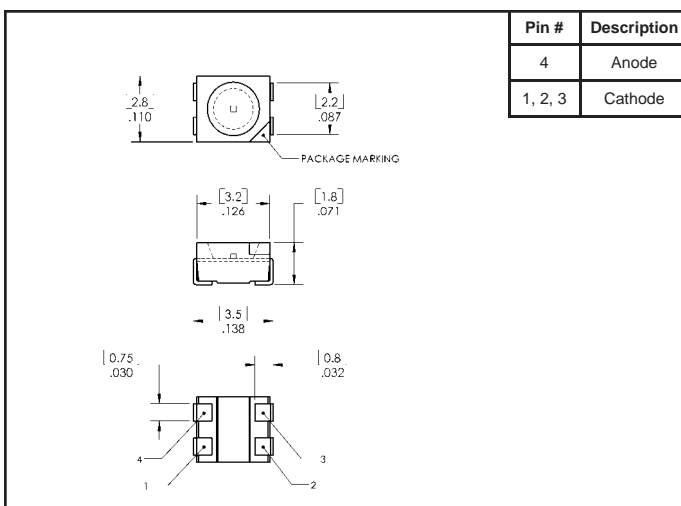
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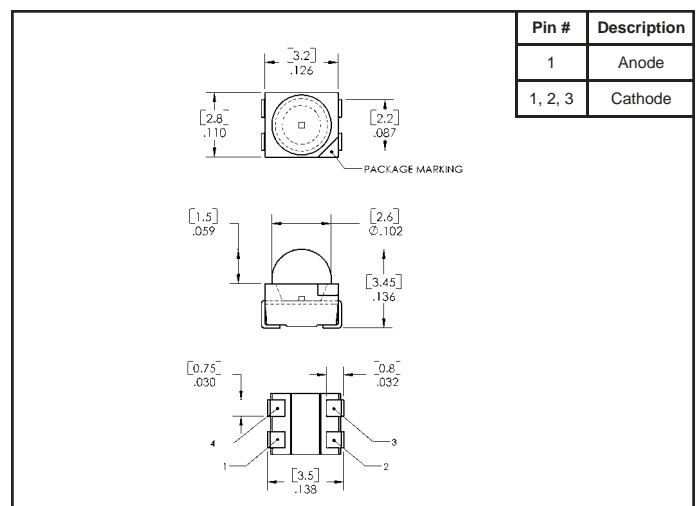
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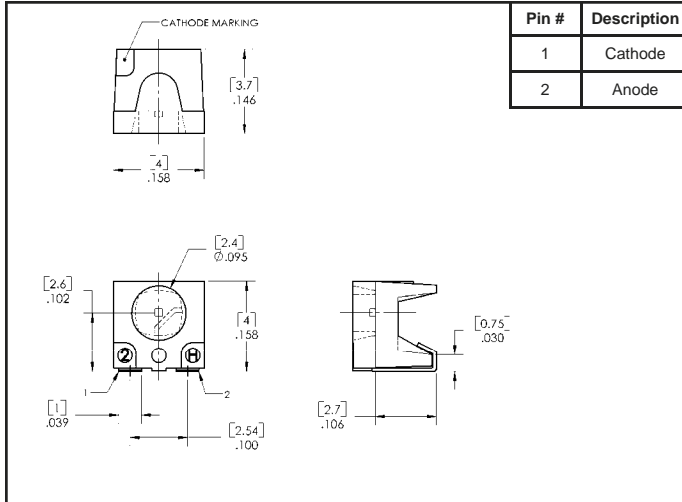
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Package # 210

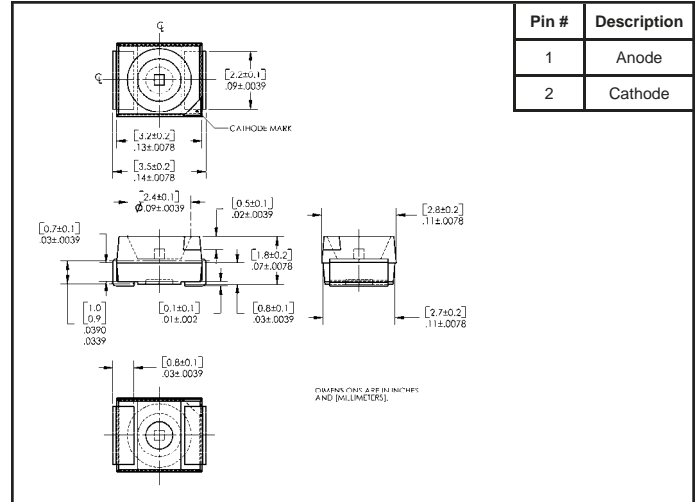


Package # 211



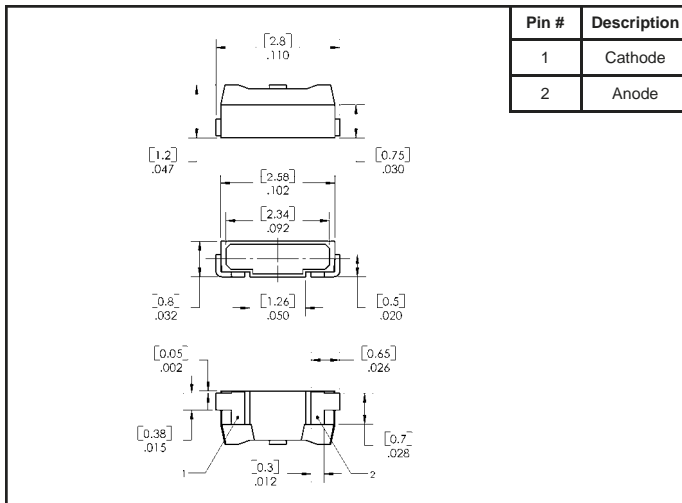
Pin #	Description
1	Cathode
2	Anode

Package # 212



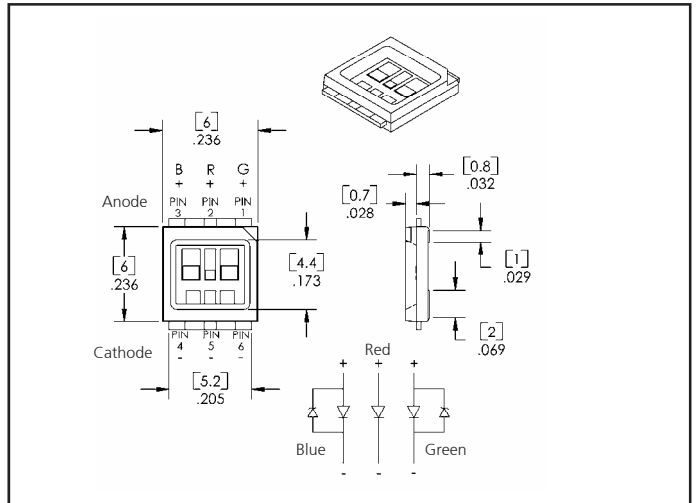
Pin #	Description
1	Anode
2	Cathode

Package # 213

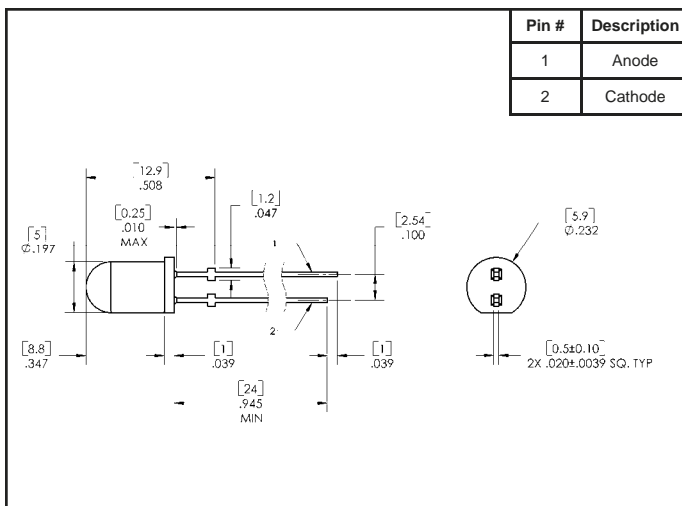


Pin #	Description
1	Cathode
2	Anode

Package # 214

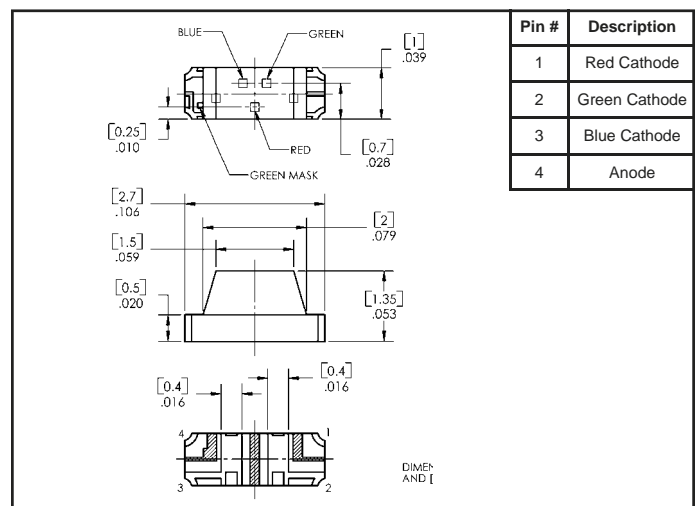


Package # 215



Pin #	Description
1	Anode
2	Cathode

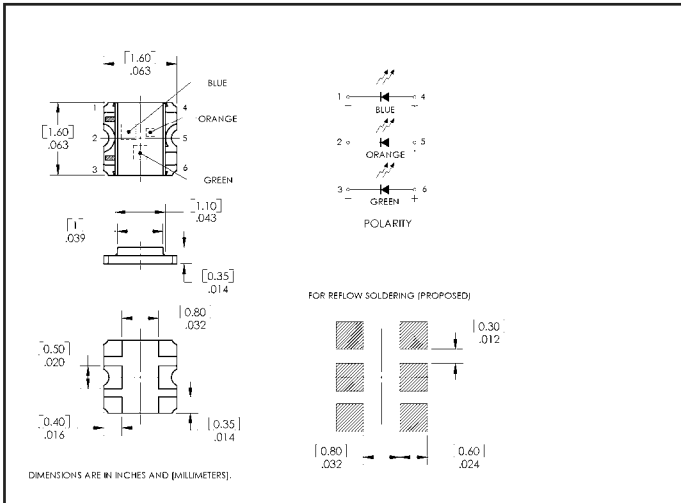
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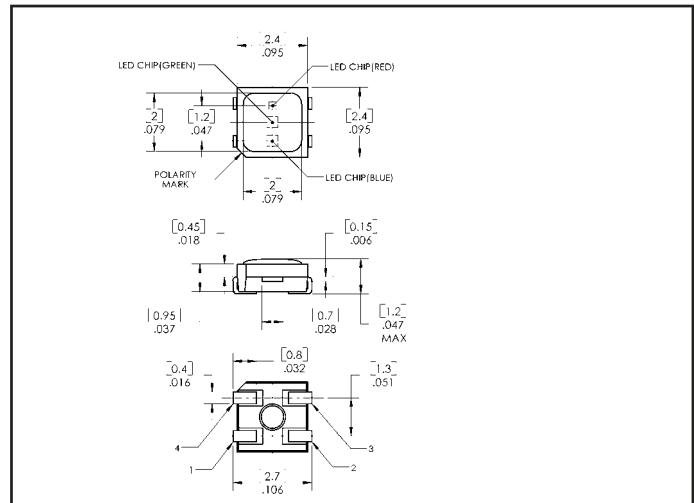
Pin #	Description
1	Red Cathode
2	Green Cathode
3	Blue Cathode
4	Anode

Package # 217

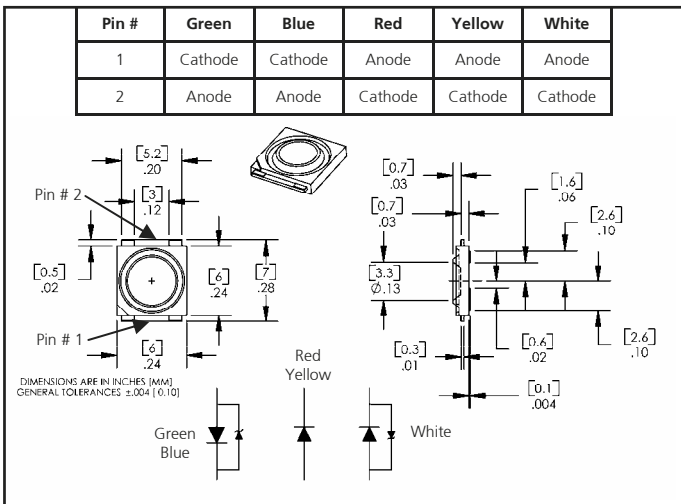
Package Drawings



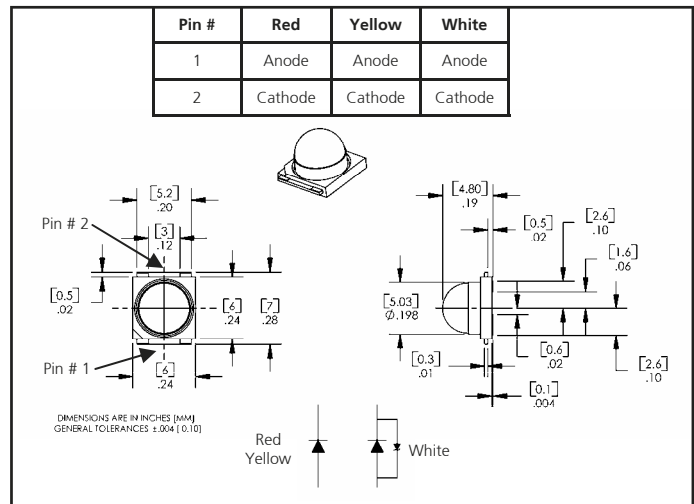
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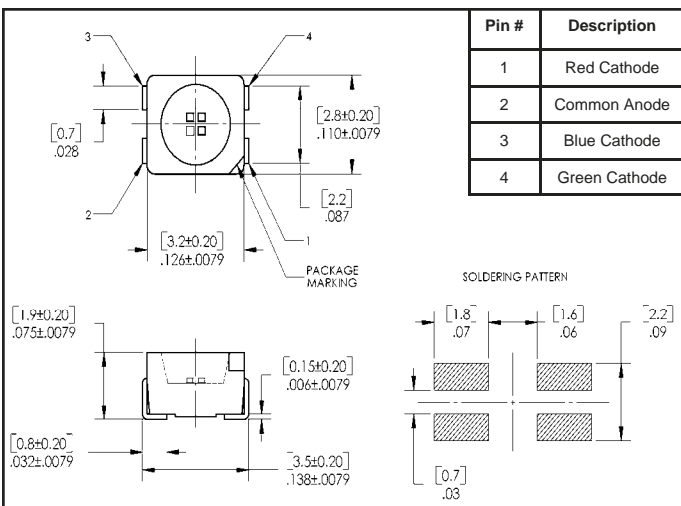
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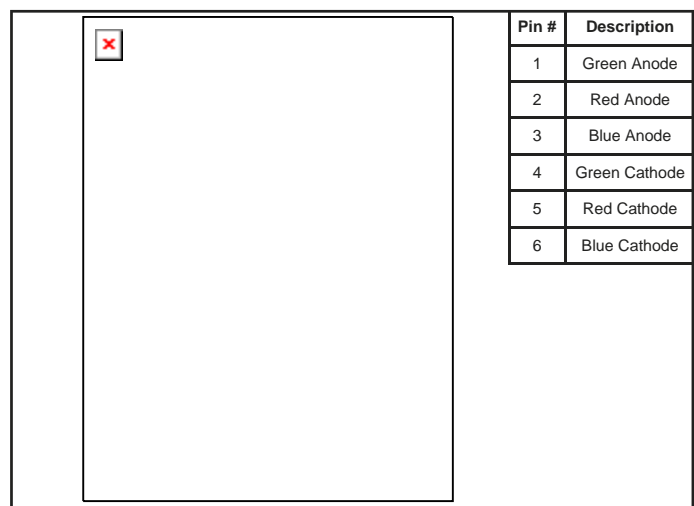
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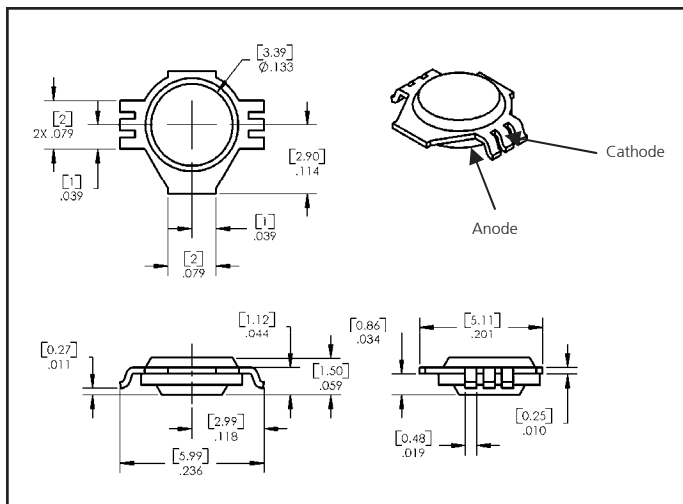
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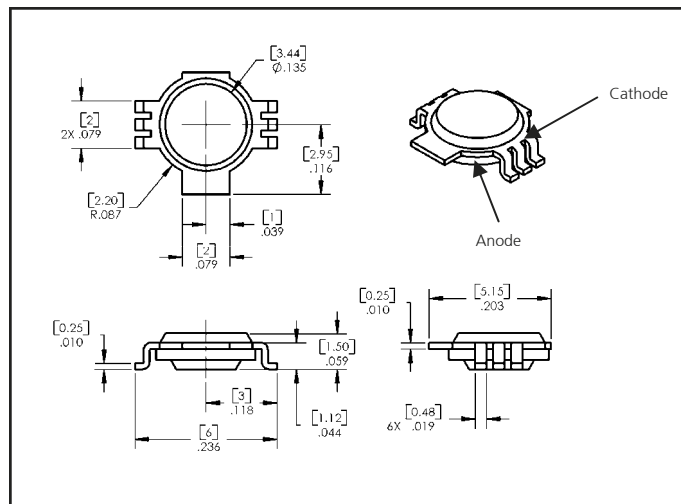
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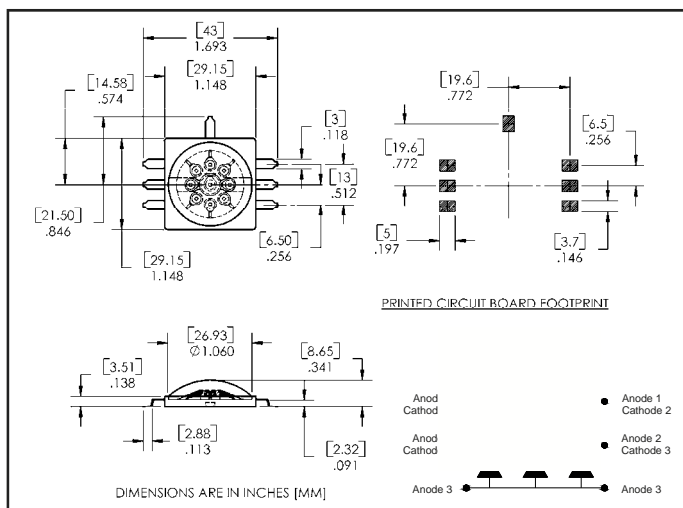
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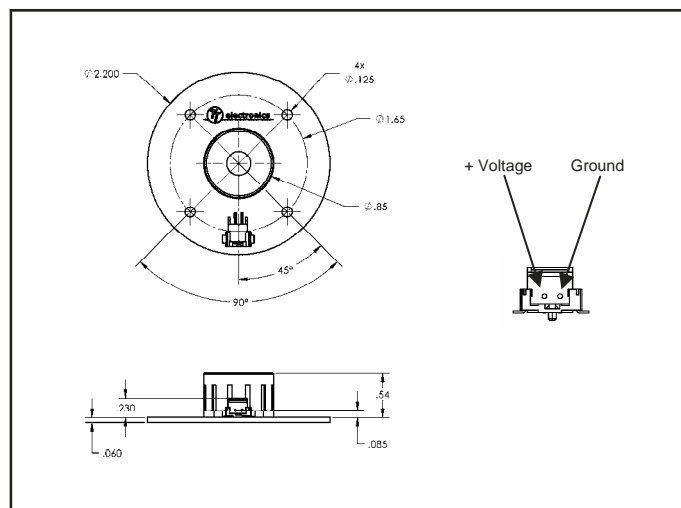
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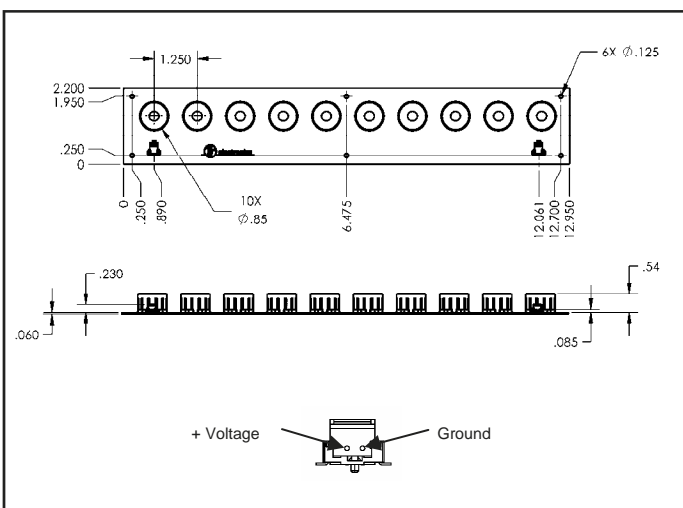
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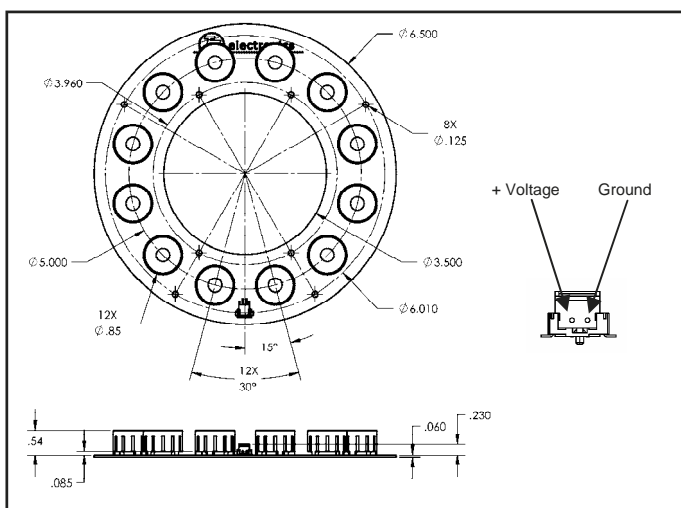
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Package # 227

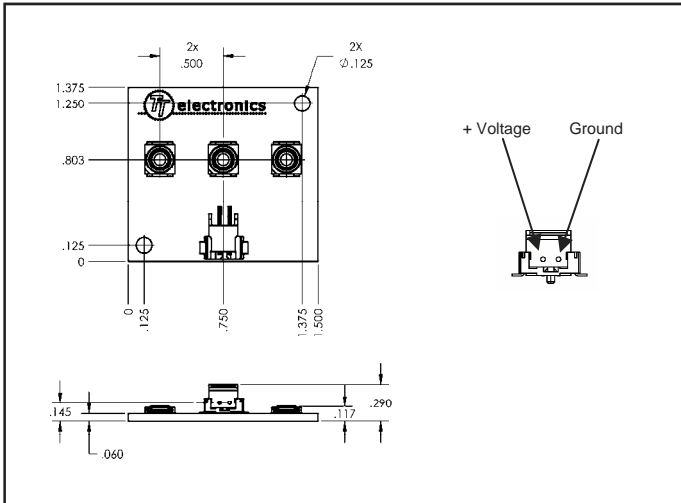


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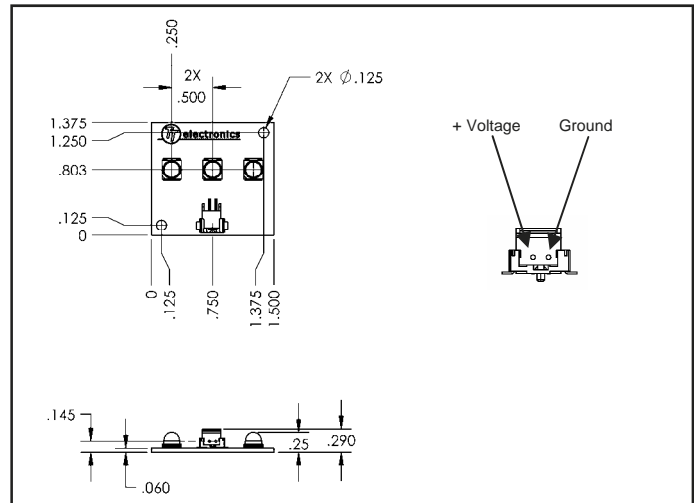


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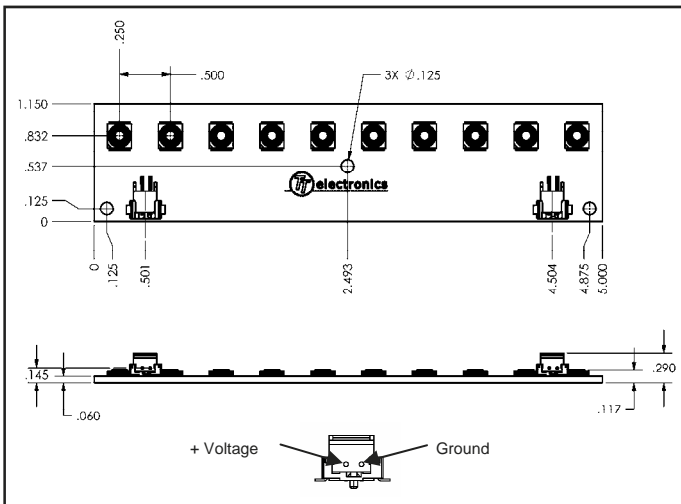
Package Drawings



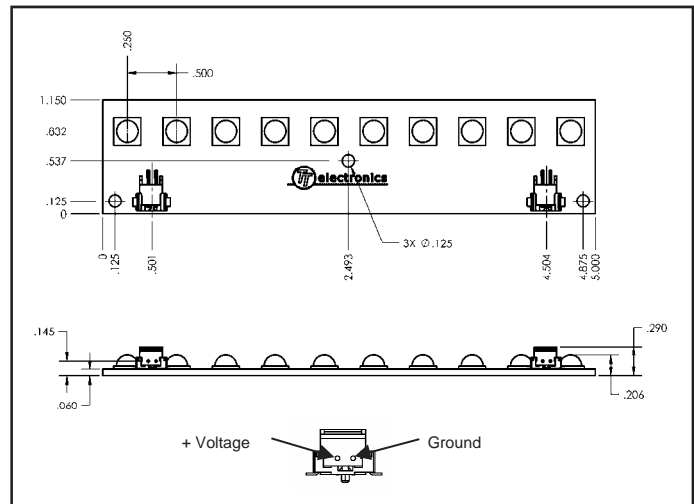
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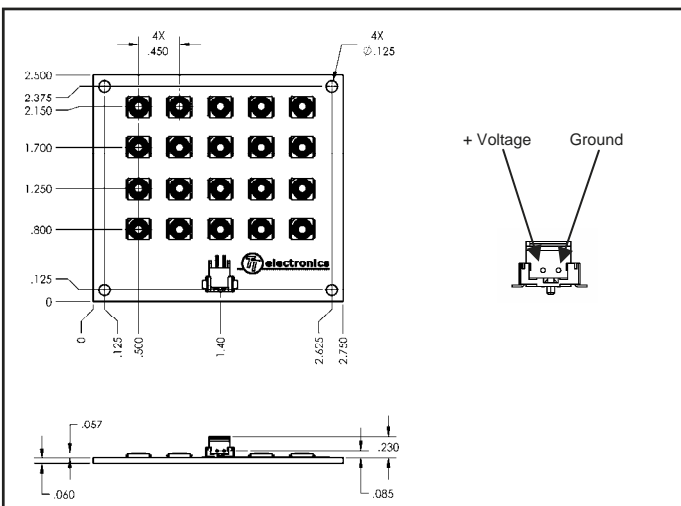
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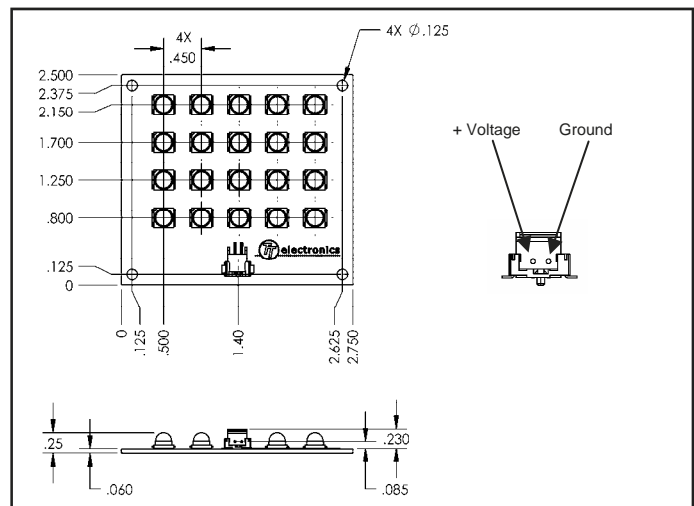
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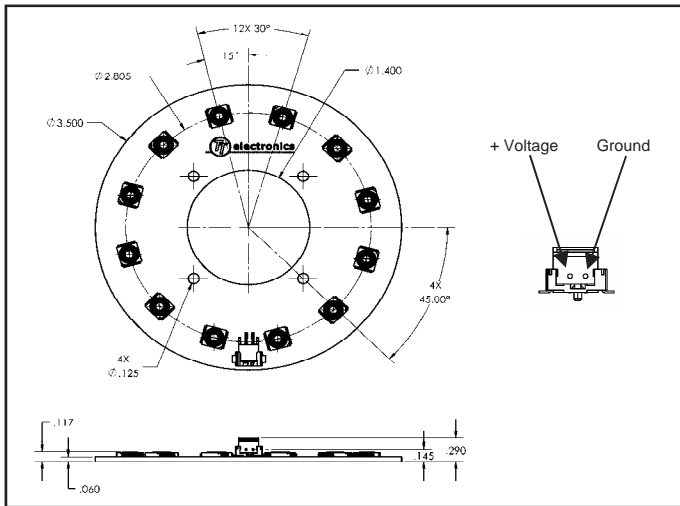
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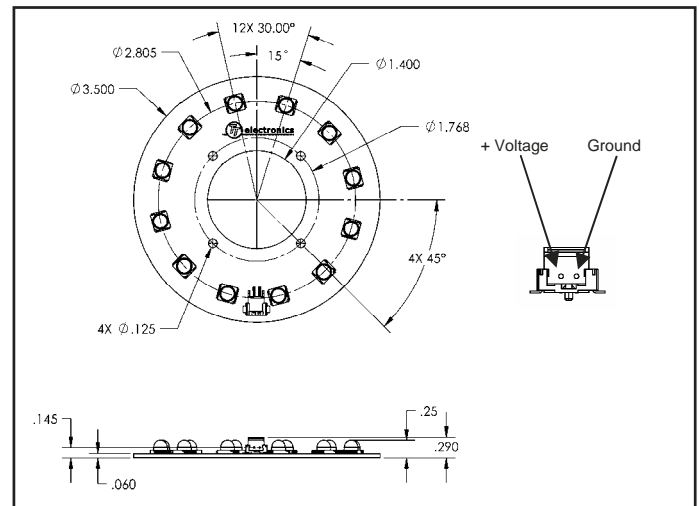
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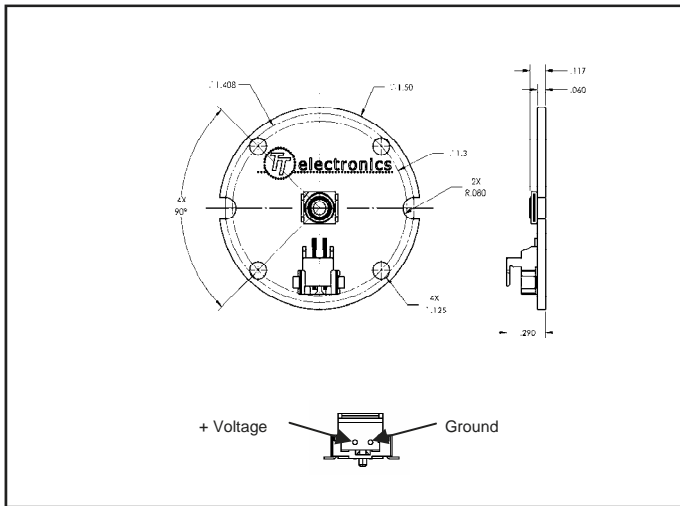
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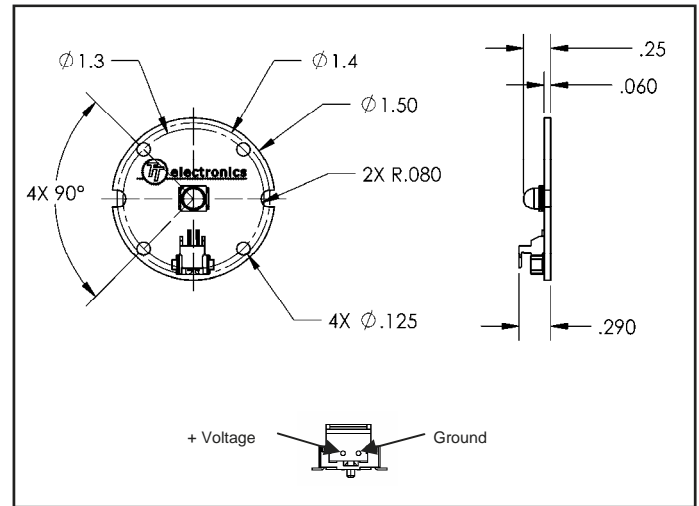
Package # 236



Package # 237



Package # 238



Package # 239

Notes:

Notes:



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