



MEDICAL



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AEROSPACE



INSTRUMENTATION



UTILITIES



INDUSTRIAL



Solid-State Lighting Catalog



Data Display Products

LED Lamps
Panel Lights
Board Level Indicators

800-421-6815

datadisplay.com

for a FREE sample or prototype

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Since 1970, Data Display Products has pioneered the design and development of LED lamps, panel lights, and board-level indicators to provide primary status indication and backlighting of switches, lenses and legends. Through the years, dynamic advances in LED technology have resulted in greater intensities and a broad selection of colors. Our experienced applications engineers provide technical support, suggest and provide LED samples for evaluation, and design innovative Custom LED solutions for specific applications.

Located in El Segundo, California, our 45,000-square-foot manufacturing facility includes a flexible production line, a dedicated quality assurance department, surface-mount assembly equipment, a machine shop for product development, and an engineering lab for new product design and qualification. Data Display Products is registered to meet the requirements of ISO 9001, demonstrating our commitment to continuous improvement of our products, processes, and responsiveness to the needs of our customers.

Our highly qualified personnel include engineers and business professionals in all management positions. Many of the employees in management, production and engineering have been with the company for over 25 years. This experience, plus a proficient sales force contribute to DDP's continued success.

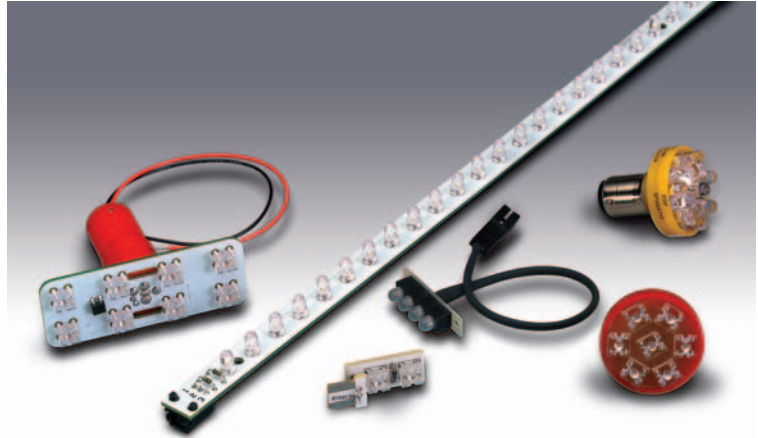
Constant technological innovation provides an exciting future for LED technology and Data Display Products is committed to being an integral part of that excitement. We pledge that our continuing new product development will always reflect the needs of our growing customer base.

Data Display Products offers complete electro-optical and mechanical design services – from concept to prototype, testing and manufacturing. Our custom engineered LED products and solutions are designed to meet your performance requirements and delivery schedule.

DDP custom LEDs are found in nearly every industry including aerospace, computer, industrial, telecommunications, and medical. Over 30 years of design experience, manufacturing expertise, and project management lie behind our ability to give you what you want, when you want it.

Talk to Us First

Involve our application and development engineers early in your design cycle to obtain the full benefits of our global expertise. We can often show you ways to simplify a design, increase its performance, or make it easier to manufacture.



Fast Development Cycles

We have a disciplined mechanical and electrical engineering staff dedicated to provide rapid prototyping so you can see your product in the form-fit-and-function stage.

High-Efficiency Manufacturing

Our advanced manufacturing capabilities allow us to ramp-up production fast and supply the volume you need. From in-house fabrication to high-speed automated assembly, to applications geared to high-mix, low-volume products, we can transform your needs into practical products.

Research & Development

DDP is a recognized leader in the development of LED technology. Our continuous investment in R&D assures our customers the latest LED indication and illumination technology.

Quality

At DDP, we combine ISO 9001 certification and quality management planning to deliver error-free products on time. Our design assurance planning helps ensure high quality and to offer the best value to our customers.

Tell Us What You Need

Let us know what you need. Contact our Technical Support Center or your local sales representative. Be as specific as you want. Or simply give us an idea of what you need. And of course, we will treat your information with the strictest confidentiality!

What is an LED?

A light-emitting diode (LED) is a solid-state semiconductor device that converts electrical energy directly into light. On its most basic level, the semiconductor is comprised of two regions. The p-region contains positive electrical charges while the n-region contains negative electrical charges. When voltage is applied and current begins to flow, the electrons move across the n-region into the p-region. The process of an electron moving through the p-n junction releases energy. The dispersion of this energy produces photons with visible wavelengths.

LED Colors

Human beings perceive different visible wavelengths of light as colors including red (longest wavelength), orange, yellow, green, blue, and violet (shortest wavelength). The color emitted from an LED can be identified by its peak wavelength (λ_{pk}). Peak wavelength is defined as the single peak wavelength of saturated color at the peak of the radiated spectrum (Figure 1). The nanometer (one-billionth of a meter) is the measurement unit for peak wavelength.

Different LED chip technologies produce distinct colors. The color of the light depends on the chip material used. LED chips are made from gallium-based crystals that contain one or more additional materials such as phosphorous. For example, AlInGaP and InGaN, are used for creating high brightness LEDs in all colors from blue through red.

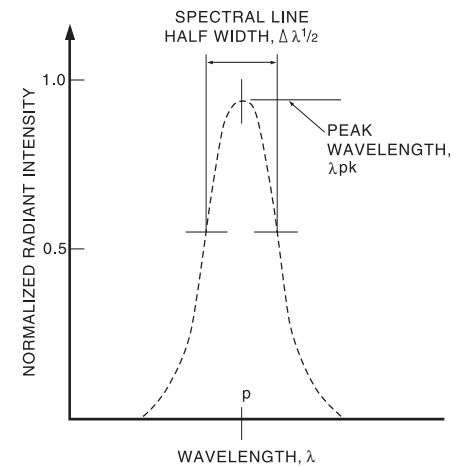


Figure 1

Comparison of chip technologies for wide angle, non-diffused LEDs

STANDARD INTENSITY				HIGH INTENSITY		
LED Color	Chip Material	λ_{pk} (nm)	Iv(mcd) @ 20mA	Chip Material	λ_{pk} (nm)	Iv(mcd) @ 20mA
Red	GaAsP/GaP	635	120	AlInGaP	634	5,300
Orange	—	—	—	AlInGaP	605	2,000
Amber	GaAsP/GaP	583	100	AlInGaP	592	5,300
Green	GaP	565	80	InGaN	520	2,400
Blue	—	—	—	InGaN	465	700
Cool White	—	—	—	InGaN	5,500 k	1,560
Warm White	—	—	—	InGaN	3,300 k	1,800

As a result of the LED fabrication process, peak wavelength can vary ± 5 nm; however, it may not be detectable. The sensitivity level of the human eye is highest in the 565 to 600 nm wavelength range of the visual light spectrum (Figure 2). Therefore, it is easier to perceive color variations in yellow and amber LEDs than other colors.

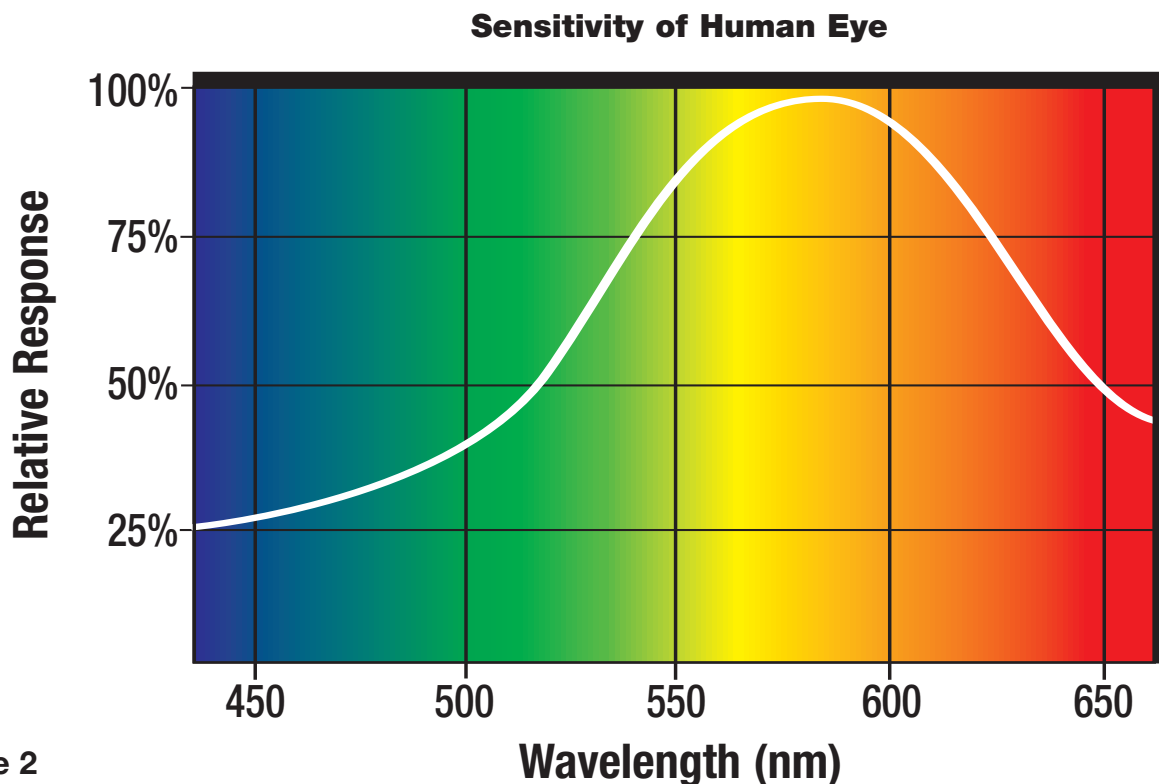


Figure 2

White LED Technology

Because red, blue, and green lights, mixed in varying quantities, can duplicate any color sensation, they are called primary additive colors. Equal intensities of all three lights added together produce the sensation of white light. However, to achieve this combination with a mixture of red, green, and blue LEDs requires a sophisticated electro-optical design to control the blend and diffusion of colors. Variations in LED color and intensity further complicate this approach.

DDP's White LED product line is based on a single InGaN blue LED chip with a phosphor coating. Phosphor emits white light when struck by blue or ultraviolet photons (Figure 3). Fluorescent bulbs work by a similar principle; ultraviolet emission from an electric discharge in the tube causes the phosphor to shine white. DDP offers two white LED products – Warm White (3,300 Kelvin^[1]) which is similar to the glow of an incandescent bulb, and Cool White (5,500-6,000 Kelvin^[1]) which is similar to a cool white fluorescent bulb. White LEDs are further identified by specific chromaticity coordinates near the center of the CIE^[2] diagram (Figure 4). The CIE^[2] diagram depicts all possible color coordinates on or inside the horseshoe curve. Pure colors lie on the curve, whereas the white point is in the center.

[1] Kelvin is a unit of measure used to assign a numeric value to the condition of light when we see a color. Color is intimately related to temperature. The lower the color temperature, the closer the color is to red; the higher the color temperature, the closer to blue.

[2] In 1931, the Commission Internationale de l'Eclairage (CIE) established the X-Y-Z tristimulus system for measuring color properties, based on the assumption that every color is a combination of three primary colors: red, green and blue.

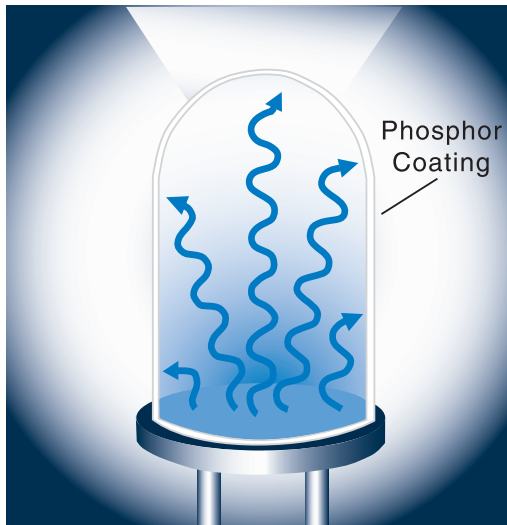
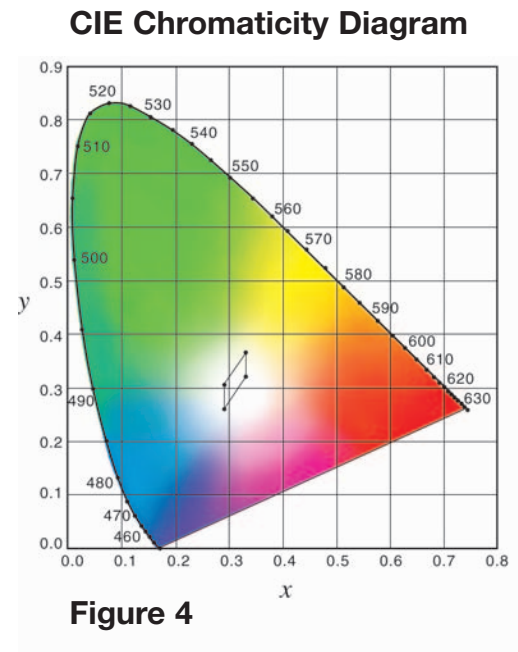


Figure 3



Measuring LED Intensity

Since LEDs are highly directional, light output can be measured at a single point (Figure 5). This on-axis luminous intensity value (I_v) is generally rated in terms of millicandela (mcd). The measurement of luminous intensity should not be confused with mean spherical candlepower (mscp) values used to quantify the light produced by incandescent bulbs. Mean spherical candlepower is defined as the average luminous intensity emitted within a sphere surrounding the light source.

LED light output varies with the type of chip, encapsulation, efficiency of individual wafer lots and operating current. Luminous intensity is roughly proportional to the amount of current (I_f) supplied to the LED; the greater the current, the higher the intensity. Of course, there are design limits. Generally, LEDs are designed to operate at 20 milliamps (mA). However, operating current must be reduced relative to the amount of heat in the application.

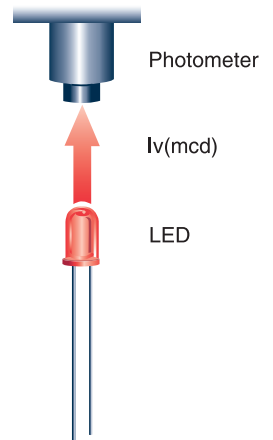


Figure 5

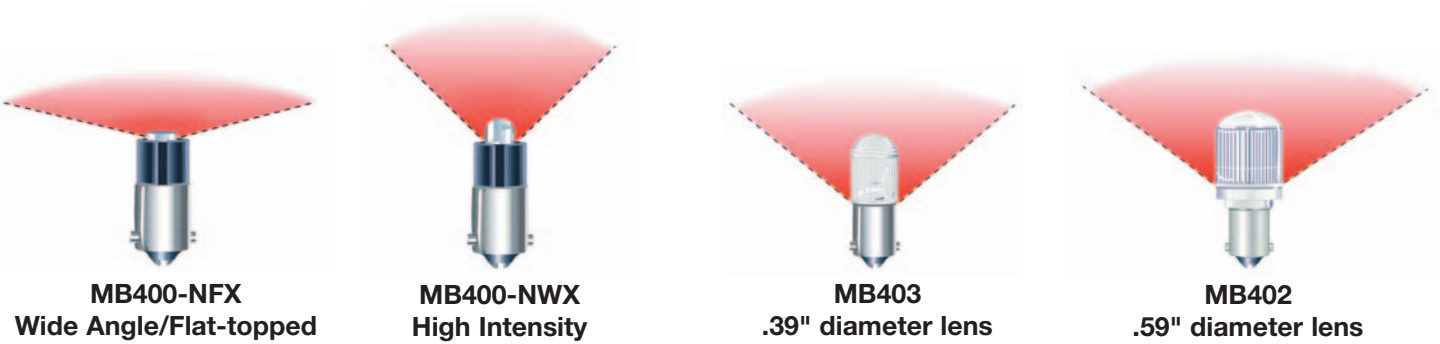
Visibility Considerations

Luminous intensity (I_v) is not the only representation of the total light output from an LED. Both the luminous intensity and the spatial radiation pattern (viewing angle) must be taken into account. If two LEDs have the same luminous intensity value, the lamp with the larger viewing angle will have the higher total light output.

LED viewing angle is a function of the LED chip type and the epoxy lens that distributes the light. The shape of the LED encapsulation acts as a lens magnifying the light from the LED chip. The off-axis point where the LED intensity is 50% of the on-axis intensity is known as theta one-half ($\theta^{1/2}$) (Figure 6). Two times $\theta^{1/2}$ is the LEDs' full viewing angle; however, light is visible beyond the $\theta^{1/2}$ point. Viewing angles listed in this catalog are identified by their full viewing angle ($2\theta^{1/2}$).

Generally, an LED with high luminous intensity will have a narrow viewing angle. This is because the light is concentrated in a tight beam. If the LED encapsulation is diffused, the light is scattered throughout the encapsulation so it will be visible over a wider area, but the intensity will be lower.

Increasing the number of LEDs in a design and utilizing secondary optics to distribute light can enhance visibility. To illustrate, consider four different LED options using the same lamp base:



In each case, the amount of visible light depends on how the LED is being viewed. The high intensity LED would be appropriate for direct viewing in high ambient light. The wide angle/flat-topped LED may be better suited to backlight a switch or small legend, while the lensed LEDs may be best to illuminate a larger lens.

LED Lifetime and Reliability

Because LEDs are solid-state devices they are not subject to catastrophic failure when operated within design parameters. By definition, a solid-state device controls current without heated filaments and is therefore very reliable. In comparison, incandescent bulbs radiate much of their energy in the non-visible spectrum, generating heat as well as light. This results in an unpredictable lifetime due to risk of filament burn out.

LED operating life is characterized by the degradation of LED intensity over time. When the LED degrades to half of its original intensity it is at the end of its useful life although the LED will continue to operate as output diminishes. High-quality GaP LEDs will operate upwards of 100,000 hours while InGaN LED lifetime should exceed 50,000 hours.

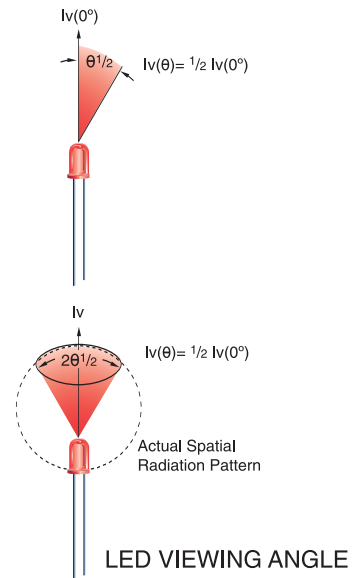


Figure 6

Voltage and Current Considerations

LEDs are current-driven devices, not voltage driven. Although drive current and light output are directly related, exceeding the maximum current rating will produce excessive heat within the LED chip due to excessive power dissipation. The result will be reduced light output and reduced operating life.

To ensure LED longevity and reliability, we consider heat dissipation and other degradation factors in the design of our LED products. For operation at any given voltage, we build-in a current limiting resistor, a full-bridge rectifier, a protection diode, or other circuitry to protect the LED.

Eye Safety Information

The need to place eye safety labeling on LED products is dependent upon the product design and the application. Only a few LEDs produce sufficient intensity to require eye safety labeling. However, for eye safety, do not stare into the light from any LED at close range.

Electro-Static Discharge

InGaN LEDs are class 1 ESD sensitive (MIL-STD-1686). Exceeding absolute maximum ratings may cause damage to, or possibly result in failure of these devices. Damaged LEDs can appear dim, dead, short, or with low voltage drop. Use appropriate ESD precautions during handling and operation.

Electro-Static Discharge

InGaN LEDs are class 1 ESD sensitive (MIL-STD-1686). Exceeding absolute maximum ratings may cause damage to, or possibly result in failure of these devices. Damaged LEDs can appear dim, dead, short, or with low voltage drop. Use appropriate ESD precautions during handling and operation.

RoHS

DDP is pleased to announce that RoHS compliant part numbers from our standard product line are now available. The majority of our discrete LED's, PCB mounted devices, and panel mount devices are compliant. Some lamp-based models are now available with more part numbers on the way in the near future. Please see our on-line RoHS-compliant product catalog listings on our website and look for the RoHS Compliant Icon:



DDP applications engineers are readily available to answer technical questions regarding DDP® LED technology. Whether designing DDP® LEDs into new OEM products or replacing incandescent bulbs with solid-state DDP® LED lamps, Data Display Products will support your efforts with technical advice and free samples for evaluation.

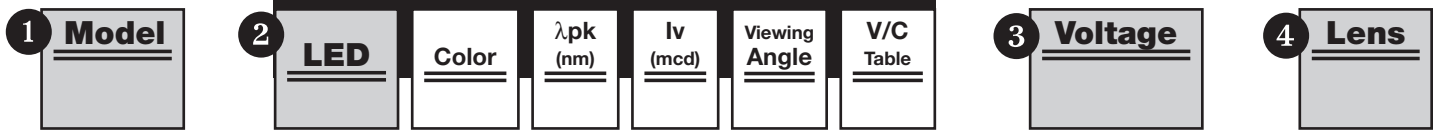
If a custom design is required, we will build to your specification or design a product to fit your application.

Phone: (800) 421-6815 or (310) 640-0442, 7:00 a.m. to 4:30 p.m. pacific time

Fax: (310) 640-7639

E-mail: techsupport@datadisplay.com

Catalog Table Heading



1 Model:
For each DDP® model number there are numerous configurations and options available. Part numbers may be assembled by selecting one component from each shaded column in a table.

2 LED:
Color/λ_{pk} (nm):
LEDs are grouped by intensity in descending order according to peak wavelength.

I_v (mcd):
Typical luminous intensity is rated at the LED's design current. Intensity values listed in this catalog are based on typical manufacturing yields; actual ratings may vary.

Viewing Angle:
Viewing angles listed are full viewing angles (2θ 1/2°).

3 Voltage:
Except for 120V, the operating voltages and corresponding design currents listed in the catalog are DC voltages. The maximum voltage/current should not be exceeded. Please consult the factory for voltages not listed.

Many models are available without an internal resistor (voltage option "2"). These devices are designed to operate with DC current and require an external series resistor. Please consult the discrete LED section of the catalog for operating parameters.

4 Lens:
Fresnel lenses enhance visibility by creating short focal lengths that disperse the LED light evenly with minimal loss. Various lens colors are available to match the LED output color. Additionally, clear, white, or smoke-colored lenses may be used with any color LED.

DDP® LEDs are warranted against defects of manufacture for 3 years from date of purchase, providing they have been subjected to normal use and service. Any replacement will be made at no charge except for necessary shipping charges.

To return products under warranty:

1. Call the factory for a return authorization number.
2. Return the products with the return authorization number prominently displayed, freight prepaid, to:

Data Display Products
445 South Douglas Street
El Segundo, California 90245-4630

This warranty is expressly in lieu of all other warranties expressed or implied and does not extend in any way to consequential or incidental damages, including injury to persons or damage to property.

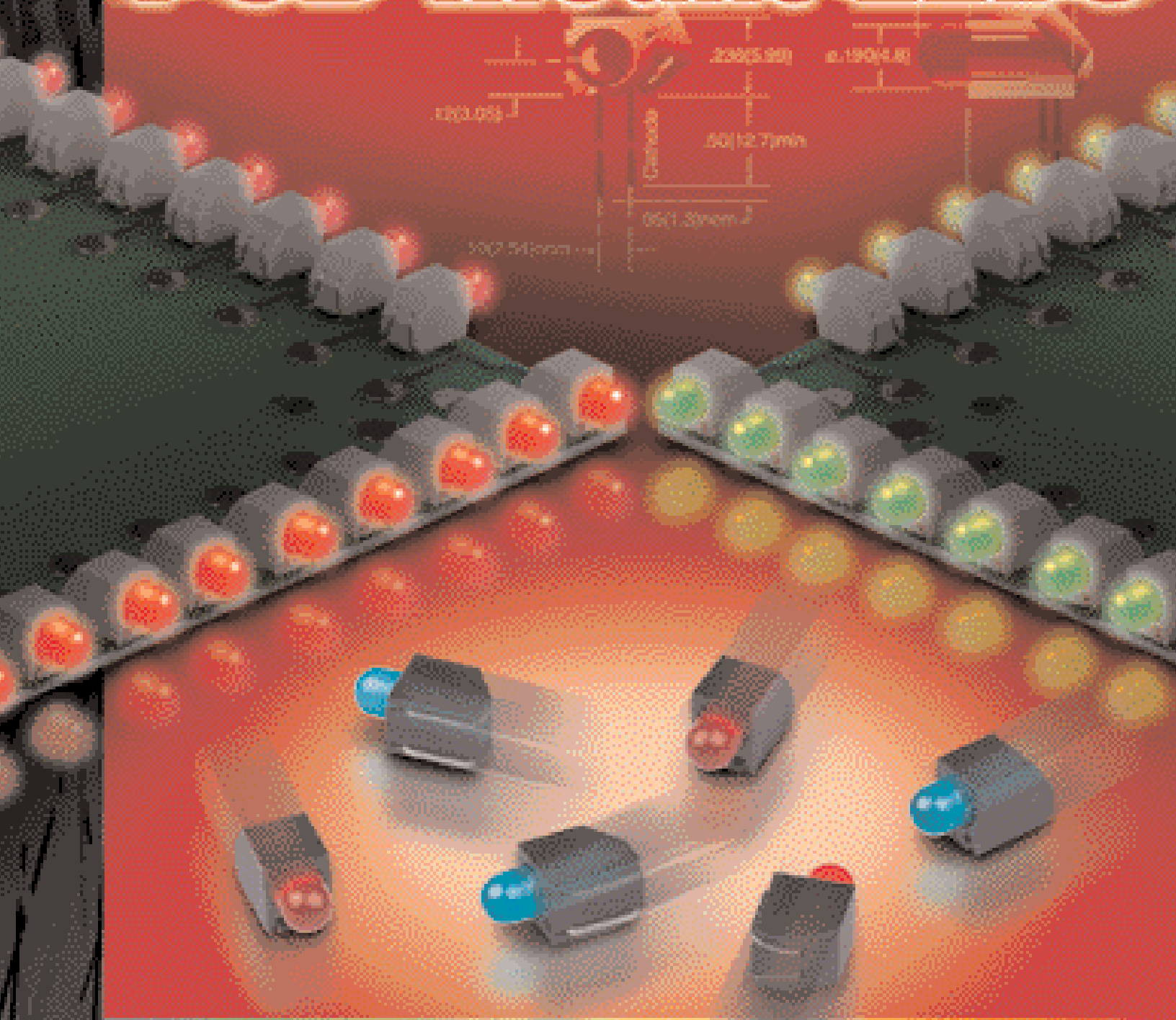
The terms of this warranty may not be amended, altered or extended except by an instrument in writing executed by an officer of Data Display Products.

Specifications are subject to change without notice.



Data Display Products®
www.datadisplay.com

PCB-Mount LEDs



- For Detailed LED Data, See Discrete Section, MODEL 080

1	Model	
PC080	Single Indicator	
PC084	Four LED Array	

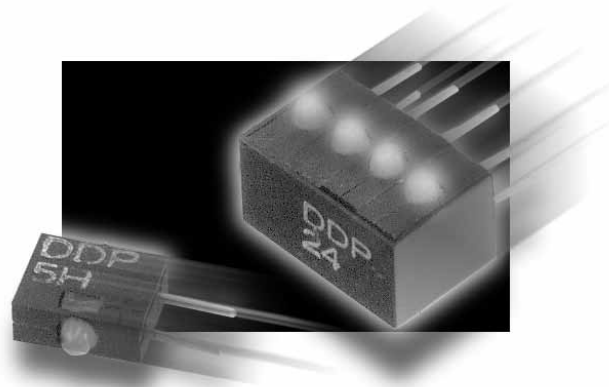
TO ORDER, FOLLOW THE EXAMPLE:

Select one BOLD component from each SHADED column in the tables below.		
1	2	3
Model	LED	Voltage
PC080	-R	2

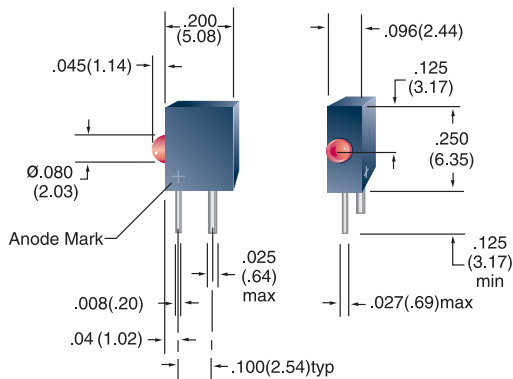
→ Part Number PC080-R2

2	LED	Color	λpk (nm)
-R	RED	RED	635
-A	AMB	AMB	583
-G	GRN	GRN	565

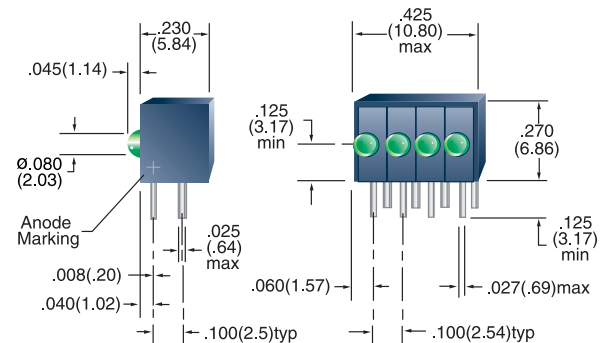
3	Voltage (Ta=25°C)	Design Vf/If	Max Vf/If	Iv ^[1] (mcd)
	2 ^[2]	External Resistor Required		6.0 ^[3]
	5	5V/17mA	8V/32mA	6.0
	L5	5V/3.5mA	6V/5mA	2.0
	5L	5V/9.5mA	6V/13mA	5.0
	12	12V/18mA	15V/22mA	6.0
	24	24V/9mA	28V/11mA	6.0



PC080



PC084



[1] Iv = typical luminous intensity @ specified voltage. (Ta=25°C).
 [2] Vf = 1.8V Typ/3.0V Max (-R), 2.0V Typ/3.0V Max (-A, -G) @ 20mA, Reverse Breakdown Voltage VR(IR=100µA) = 5VDC.
 [3] Iv = typical luminous intensity @ If = 20mA(Ta=25°C).

All dimensions are in inches (mm)
 Tolerances: .xx"(x) ±.025"(.63) / .xxx"(xx)±.010"(.25)
 Specifications are subject to change without notice.

Single

- For Detailed LED Data, See Discrete Section, MODEL 125

1 Model	
PCH125	Right Angle Mount
PCH125-200	Right Angle Mount
PCV125	Vertical Mount
PCV125-200	Vertical Mount

TO ORDER, FOLLOW THE EXAMPLE:

Select one BOLD component from each SHADED column in the tables below.	
1 Model	2 LED
PCH125	-BCA

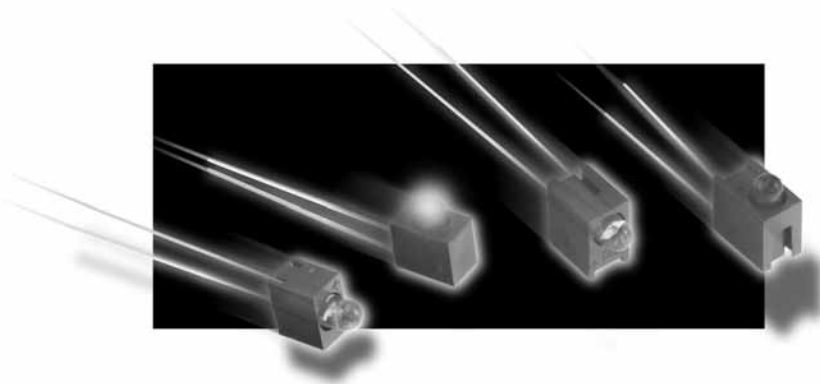
→Part Number PCH125-BCA

2 STANDARD INTENSITY - DIFFUSED ENCAPSULATION				
LED	Color	λ_{pk} (nm)	$I_v^{[1]}$ (mcd)	Viewing Angle
-BR	RED	635	14	60
-BA	AMB	583	14	60
-BG	GRN	565	14	60

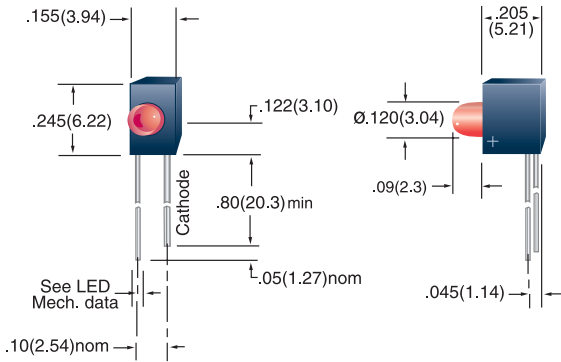
MEDIUM INTENSITY - TINTED ENCAPSULATION				
LED	Color	λ_{pk} (nm)	$I_v^{[1]}$ (mcd)	Viewing Angle
-BCR	RED	635	60	45
-BCA	AMB	583	30	45
-BCG	GRN	565	44	45

SPECIALTY LEDs					
LED	Color	λ_{pk} (nm)	$I_v^{[1]}$ (mcd)	Viewing Angle	Description
-RLP	RED	635	2.1	50	Low Power
-ALP	AMB	583	1.6	50	Low Power
-GLP	GRN	565	2.1	50	Low Power
-DRG	RED/GRN	635/567	4.3/3.7	118	Bi-Color, Cathode on right, longer lead
-BR5V	RED	635	8	60	Integrated Resistor for 5VDC
-BA5V	AMB	583	8	60	Integrated Resistor for 5VDC
-BG5V	GRN	565	8	60	Integrated Resistor for 5VDC
-BR12V	RED	635	8	60	Integrated Resistor for 12VDC
-BA12V	AMB	583	8	60	Integrated Resistor for 12VDC
-BG12V	GRN	565	8	60	Integrated Resistor for 12VDC

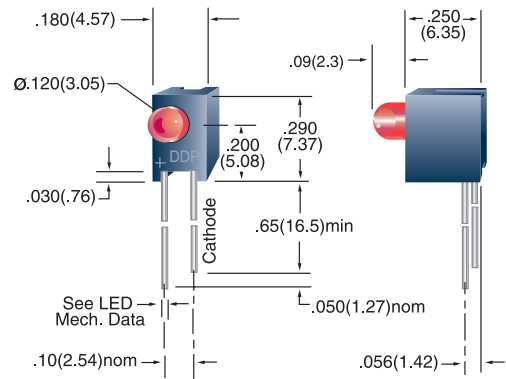
[1] I_v = typical luminous intensity @ $I_f = 20mA$ ($T_a = 25^\circ C$), Low Power LEDs @ $I_f = 2mA$, Integrated Resistor LEDs @ $V_f = 5VDC$ or @ $V_f = 12VDC$. Bi-color LEDs @ $I_f = 10mA$.



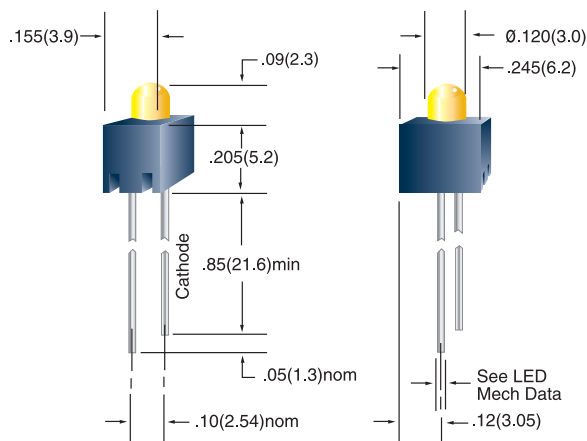
PCH125



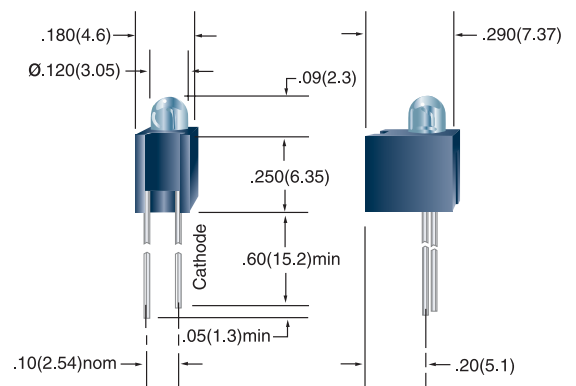
PCH125-200



PCV125



PCV125-200



All dimensions are in inches (mm)
 Tolerances: .xx"(.x) ±.025"(.63) / .xxx"(.xx)±.010"(.25)
 Specifications are subject to change without notice.

Arrays

- For Detailed LED Data, See Discrete Section, MODEL 125

TO ORDER, FOLLOW THE EXAMPLE:

Select one BOLD component from each SHADED column in the tables below.

1	Model	2	LED
	PCL1254		-BCA

→Part Number PCL1254-BCA

1	Model	
	PCL1254	Right Angle Four LED Array
	PCH125N-200 ^[1]	Right Angle Variable Array
	PCV125N-200 ^[1]	Vertical Mount Variable Array

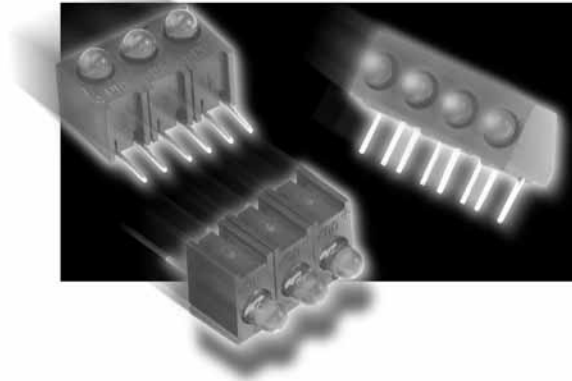
STANDARD INTENSITY - DIFFUSED ENCAPSULATION					
2	LED	Color	λ_{pk} (nm)	$I_v^{[2]}$ (mcd)	Viewing Angle
	-BR	RED	635	14	60
	-BA	AMB	583	14	60
	-BG	GRN	565	14	60

MEDIUM INTENSITY - TINTED ENCAPSULATION					
	LED	Color	λ_{pk} (nm)	$I_v^{[2]}$ (mcd)	Viewing Angle
	-BCR	RED	635	60	45
	-BCA	AMB	583	30	45
	-BCG	GRN	565	44	45

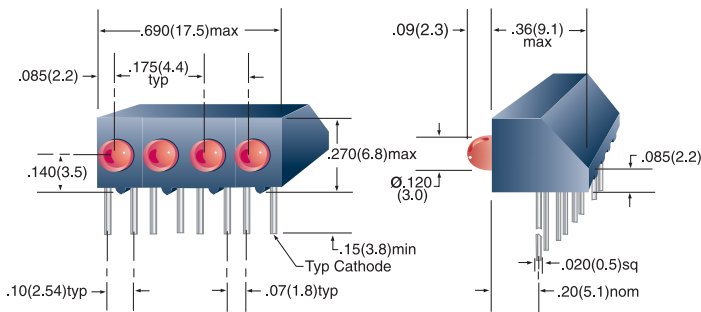
SPECIALTY LEDs						
	LED	Color	λ_{pk} (nm)	$I_v^{[2]}$ (mcd)	Viewing Angle	Description
	-RLP	RED	635	2.1	50	Low Power
	-ALP	AMB	583	1.6	50	Low Power
	-GLP	GRN	565	2.1	50	Low Power
	-DRG	RED/GRN	635/567	4.3/3.7	118	Bi-Color, Red Cathode
	-BR5V	RED	635	8	60	Integrated Resistor for 5VDC
	-BA5V	AMB	583	8	60	Integrated Resistor for 5VDC
	-BG5V	GRN	565	8	60	Integrated Resistor for 5VDC
	-BR12V	RED	635	8	60	Integrated Resistor for 12VDC
	-BA12V	AMB	583	8	60	Integrated Resistor for 12VDC
	-BG12V	GRN	565	8	60	Integrated Resistor for 12VDC

[1] Replace "N" with the number of LEDs in the array, 2 - 8 (e.g. PCH1253-200).

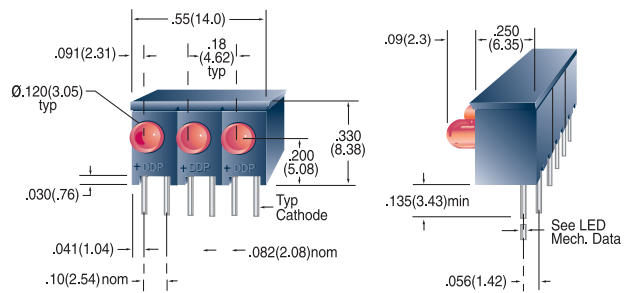
[2] I_v = typical luminous intensity @ $I_f = 20\text{mA}$ ($T_a = 25^\circ\text{C}$), Low Power LEDs @ $I_f = 2\text{mA}$, Integrated Resistor LEDs @ $V_f = 5\text{VDC}$ or @ $V_f = 12\text{VDC}$. Bi-color LEDs @ $I_f = 10\text{mA}$.



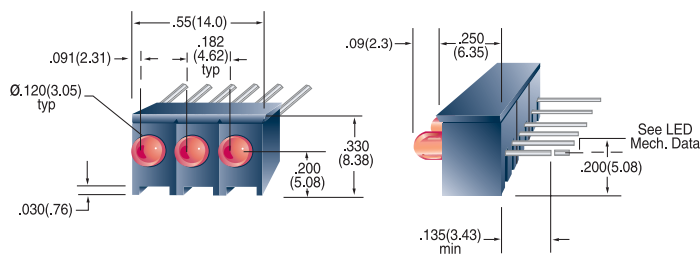
PCL1254



PCH1253-200



PCV1253-200



All dimensions are in inches (mm)
 Tolerances: .xx"(.x) ±.025"(.63) / .xxx"(.xx)±.010"(.25)
 Specifications are subject to change without notice.

Dual-Stacked

- For Detailed LED Data, See Discrete Section, MODEL 125

1	Model
	PCT125 Right Angle Mount

TO ORDER, FOLLOW THE EXAMPLE:

Select one BOLD component from each SHADED column in the tables below.		
1	Top LED	Bottom LED
PCT125	-BCR	/BCG

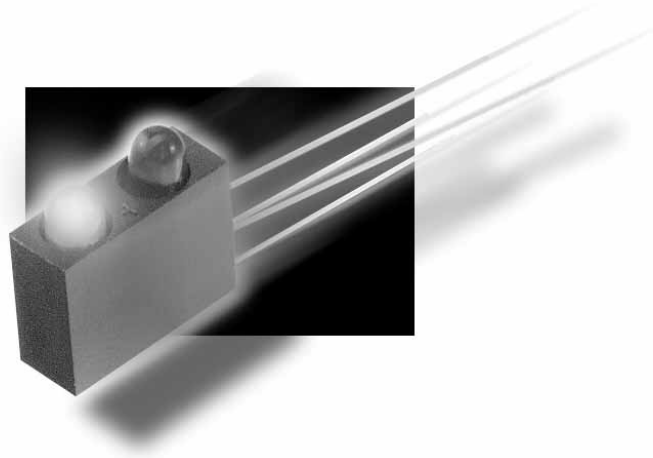
→ Part Number PCT125-BCR/BCG

STANDARD INTENSITY - DIFFUSED ENCAPSULATION						
2	Top LED	Bottom LED	Color	λ_{pk} (nm)	$I_v^{[1]}$ (mcd)	Viewing Angle
	-BR	/BR	RED	635	14	60
	-BA	/BA	AMB	583	14	60
	-BG	/BG	GRN	565	14	60

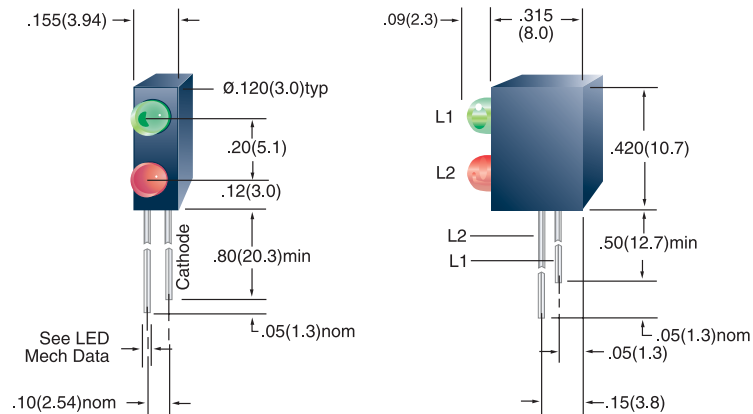
MEDIUM INTENSITY - TINTED ENCAPSULATION					
Top LED	Bottom LED	Color	λ_{pk} (nm)	$I_v^{[1]}$ (mcd)	Viewing Angle
-BCR	/BCR	RED	635	60	45
-BCA	/BCA	AMB	583	30	45
-BCG	/BCG	GRN	565	44	45

SPECIALTY LEDs						
Top LED	Bottom LED	Color	λ_{pk} (nm)	$I_v^{[1]}$ (mcd)	Viewing Angle	Description
-RLP	/RLP	RED	635	2.1	50	Low Power
-ALP	/ALP	AMB	583	1.6	50	Low Power
-GLP	/GLP	GRN	565	2.1	50	Low Power
-DRG	/DRG	RED/GRN	635/567	4.3/3.7	118	Bi-Color, Red Cathode on right, longer lead
-BR5V	/BR5V	RED	635	8	60	Integrated Resistor for 5VDC
-BA5V	/BA5V	AMB	583	8	60	Integrated Resistor for 5VDC
-BG5V	/BG5V	GRN	565	8	60	Integrated Resistor for 5VDC
-BR12V	/BR12V	RED	635	8	60	Integrated Resistor for 12VDC
-BA12V	/BA12V	AMB	583	8	60	Integrated Resistor for 12VDC
-BG12V	/BG12V	GRN	565	8	60	Integrated Resistor for 12VDC

[1] I_v = typical luminous intensity @ $I_f = 20\text{mA}$ ($T_a = 25^\circ\text{C}$), Low Power LEDs @ $I_f = 2\text{mA}$, Integrated Resistor LEDs @ $V_f = 5\text{VDC}$, or @ $V_f = 12\text{VDC}$. Bi-color LEDs @ $I_f = 10\text{mA}$.



PCT125



All dimensions are in inches (mm)
 Tolerances: .xx"(.x) ±.025"(.63) / .xxx"(.xx)±.010"(.25)
 Specifications are subject to change without notice.

Single

- For Detailed LED Data, See Discrete Section, MODEL 200

TO ORDER, FOLLOW THE EXAMPLE:

Select one BOLD component from each SHADED column in the tables below.

1 Model	2 LED
PCH200	-BCR

→ Part Number PCH200-BCR

1 Model	
PCL200	Right Angle Mount
PCL200C	Right Angle Mount, Center Pin
PCH200	Right Angle Mount
PCV200	Vertical Mount
PCLR200	Right Angle Mount, Variable
PCL201-200	Right Angle Mount
PCA200	Right Angle Mount
PCL245 ^[2]	45° Angle Mount

STANDARD INTENSITY - DIFFUSED ENCAPSULATION				
2 LED	Color	λ _{pk} (nm)	I _v ^[1] (mcd)	Viewing Angle
-BR	RED	635	14	60
-BA	AMB	583	16	60
-BG	GRN	565	10	60

MEDIUM INTENSITY - TINTED ENCAPSULATION				
LED	Color	λ _{pk} (nm)	I _v ^[1] (mcd)	Viewing Angle
-BCR	RED	635	120	35
-BCA	AMB	583	100	35
-BCG	GRN	565	80	24

SPECIALTY LEDs					
LED	Color	λ _{pk} (nm)	I _v ^[1] (mcd)	Viewing Angle	Description
-RLP	RED	635	2.3	50	Low Power
-ALP	AMB	583	2.1	50	Low Power
-GLP	GRN	565	2.3	50	Low Power
-LRG ^[3]	RED/GRN	660/565	90/40	60	Bi-Color, Red Cathode on right, longer lead
-RAG ^[4]	RED/AMB/GRN	630/565	6/6	60	Tri-Color, Common Cathode
-BR5V	RED	635	8	60	Integrated Resistor for 5VDC
-BA5V	AMB	583	8	60	Integrated Resistor for 5VDC
-BG5V	GRN	565	8	60	Integrated Resistor for 5VDC
-BR12V	RED	635	8	60	Integrated Resistor for 12VDC
-BA12V	AMB	583	8	60	Integrated Resistor for 12VDC
-BG12V	GRN	565	8	60	Integrated Resistor for 12VDC

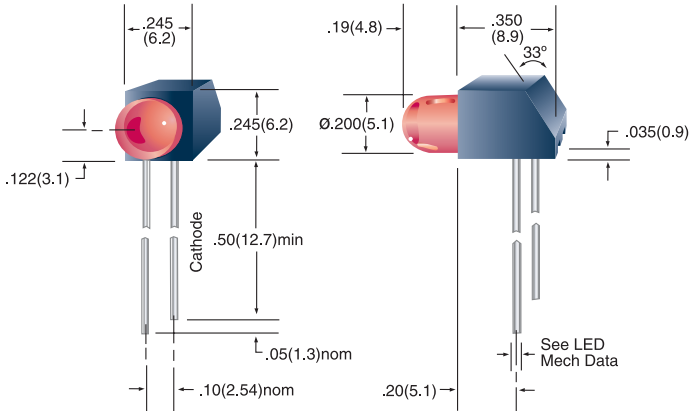
[1] I_v = typical luminous intensity @ I_f = 20mA (T_a=25°C), Low Power LEDs @ I_f = 2mA, Integrated Resistor LEDs @ V_f = 5VDC, or @ V_f = 12VDC.

[2] Not available with 5VDC & 12VDC Integrated Resistor LEDs.

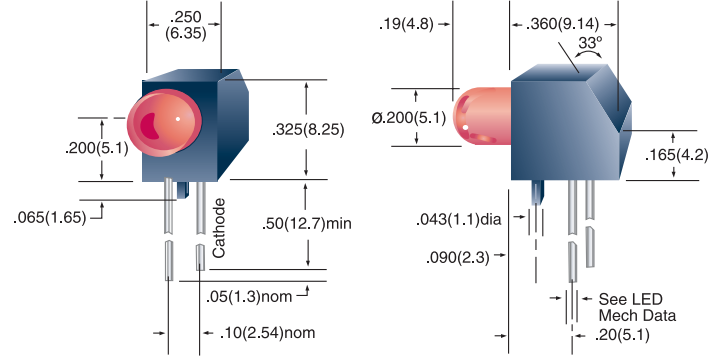
[3] Left lead = green cathode except PCL245.

[4] Only available with model PCH200.

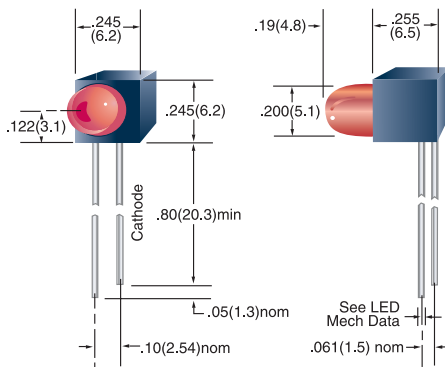
PCL200



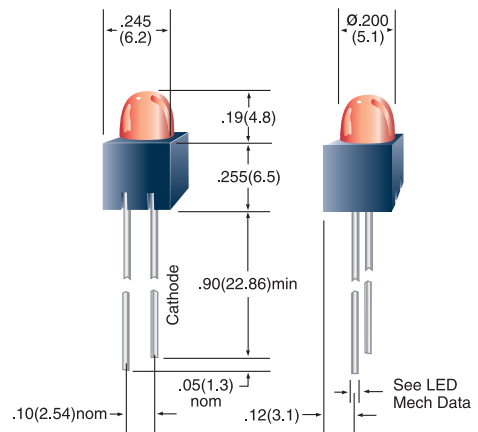
PCL200C



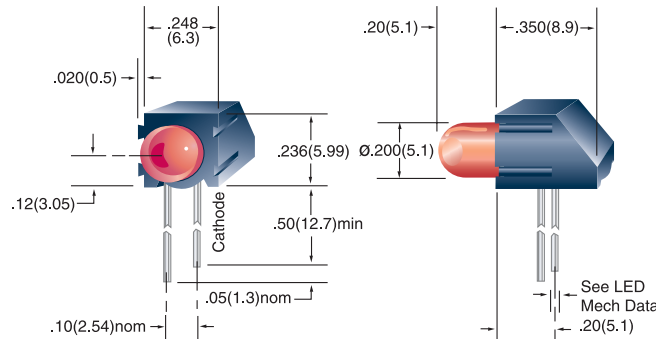
PCH200



PCV200



PCLR200

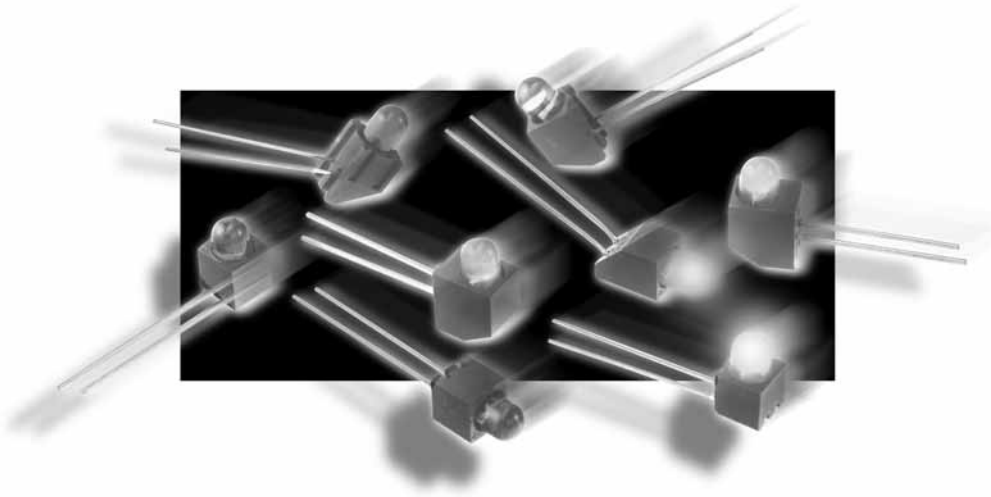


Continued . . .

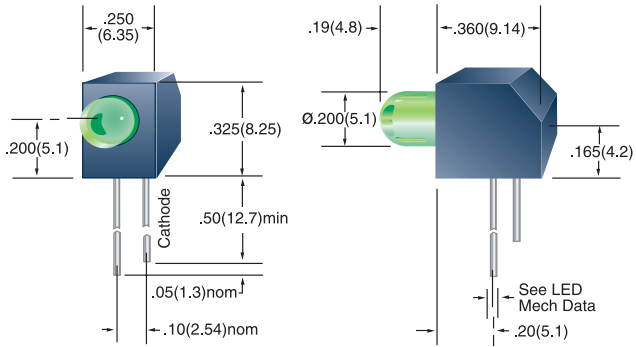
All dimensions are in inches (mm)
 Tolerances: .xx"(.x) ±.025"(.63) / .xxx"(.xx)±.010"(.25)
 Specifications are subject to change without notice.

Single

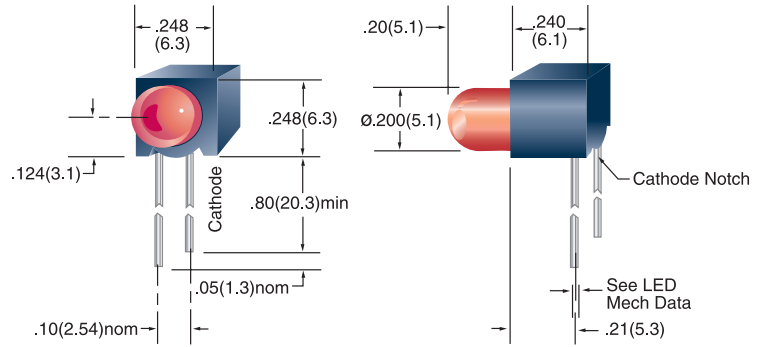
- For Detailed LED Data, See Discrete Section, MODEL 200



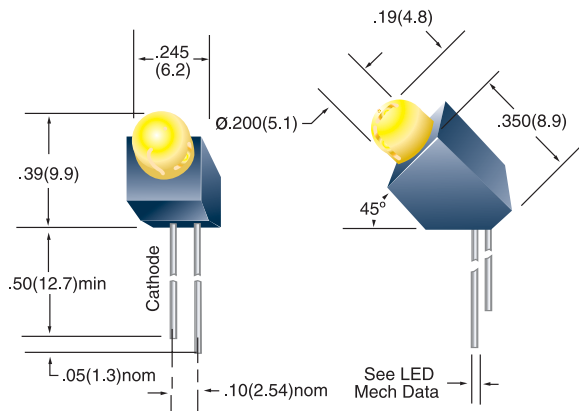
PCL201-200



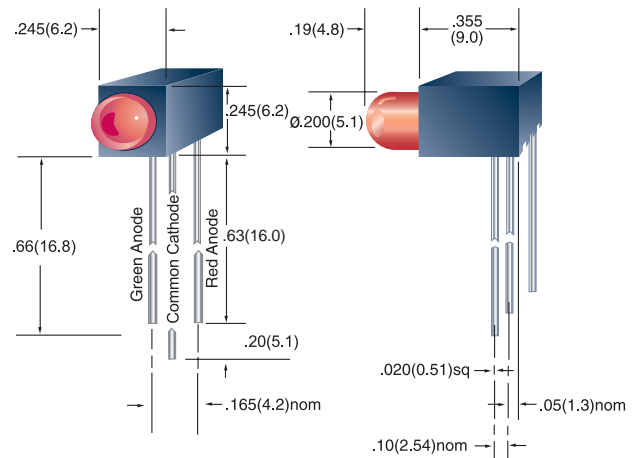
PCA200



PCL245

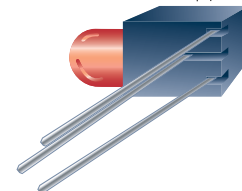


PCH200-RAG



All dimensions are in inches (mm)

Tolerances: .xx"(.x) ±.025"(.63) / .xxx"(.xx) ±.010"(.25)
 Specifications are subject to change without notice.



- For Detailed LED Data, See Discrete Section, MODEL 200

TO ORDER, FOLLOW THE EXAMPLE:

Select one BOLD component from each SHADED column in the tables below.

1 Model	2 LED
SM200	-RLP

→ Part Number SM200-RLP

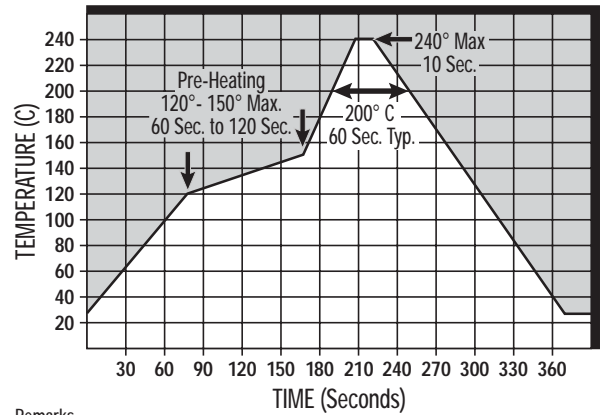
1	Model
SM200 ^[3]	Right Angle Surface Mount

STANDARD INTENSITY - DIFFUSED ENCAPSULATION				
LED	Color	λpk (nm)	Iv ^[1] (mcd)	Viewing Angle
-BR	RED	635	14	60
-BA	AMB	583	16	60
-BG	GRN	565	10	60

MEDIUM INTENSITY - TINTED ENCAPSULATION				
LED	Color	λpk (nm)	Iv ^[1] (mcd)	Viewing Angle
-BCR	RED	635	120	35
-BCA	AMB	583	100	35
-BCG	GRN	565	140	24

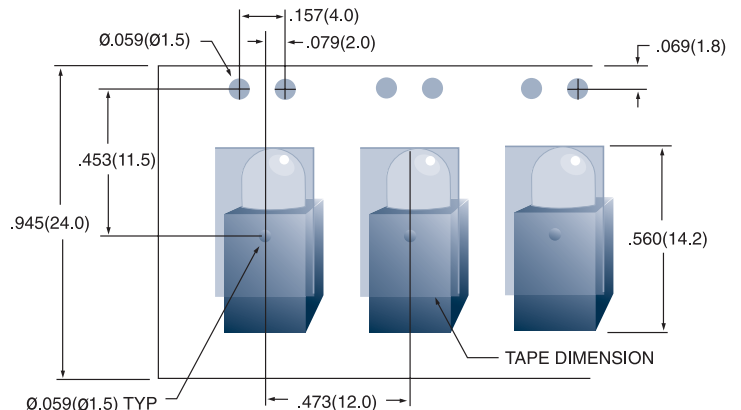
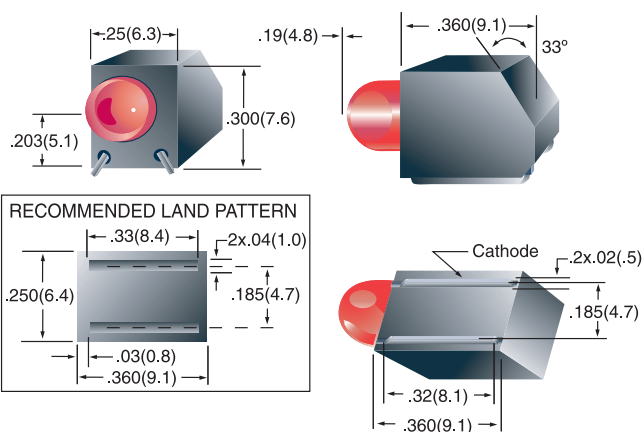
SPECIALTY LEDs					
LED	Color	λpk (nm)	Iv ^[1] (mcd)	Viewing Angle	Description
-RLP	RED	635	2.3	50	Low Power
-ALP	AMB	583	2.1	50	Low Power
-GLP	GRN	565	2.3	50	Low Power
-LRG ^[2]	RED/GRN	660/565	90/40	60	Bi-Color, Green Cathode

Typical Infrared Reflow Temperature Profile



Remarks

- Do not allow Pre-heating temperature to fluctuate more than ±6°C during temperature rise.
- The plastics used in the SM200 products are designed to withstand, for a short time, the peak temperatures encountered in normal IR reflow processes. Excessive exposure at or greater than peak temperatures is likely to cause the LED to fail.



[1] Iv = typical luminous intensity @ If = 20mA (Ta=25°C), Low Power LEDs @ If = 2mA.
 [2] Left lead = Green cathode.

[3] For tape and reel, add /TR after part number. Reel consists of 600 parts.

Arrays

- For Detailed LED Data, See Discrete Section, MODEL 200

TO ORDER, FOLLOW THE EXAMPLE:

Select one BOLD component from each SHADED column in the tables below.

1	Model	2	LED
PCLR2003		-BCR	

→ Part Number PCLR2003-BCR

1	Model
PCLR200N ^[1]	Right Angle Variable Array
PCL2004	Right Angle Four LED Array

STANDARD INTENSITY - DIFFUSED ENCAPSULATION				
LED	Color	λ _{pk} (nm)	I _v ^[2] (mcd)	Viewing Angle
-BR	RED	635	14	60
-BA	AMB	583	16	60
-BG	GRN	565	10	60

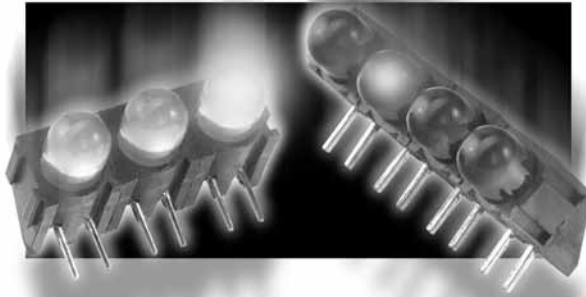
MEDIUM INTENSITY - TINTED ENCAPSULATION				
LED	Color	λ _{pk} (nm)	I _v ^[2] (mcd)	Viewing Angle
-BCR	RED	635	120	35
-BCA	AMB	583	100	35
-BCG	GRN	565	80	24

SPECIALTY LEDs					
LED	Color	λ _{pk} (nm)	I _v ^[2] (mcd)	Viewing Angle	Description
-RLP	RED	635	2.3	50	Low Power
-ALP	AMB	583	2.1	50	Low Power
-GLP	GRN	565	2.3	50	Low Power
-LRG ^[3]	RED/GRN	660/565	90/40	60	Bi-Color, Red Cathode

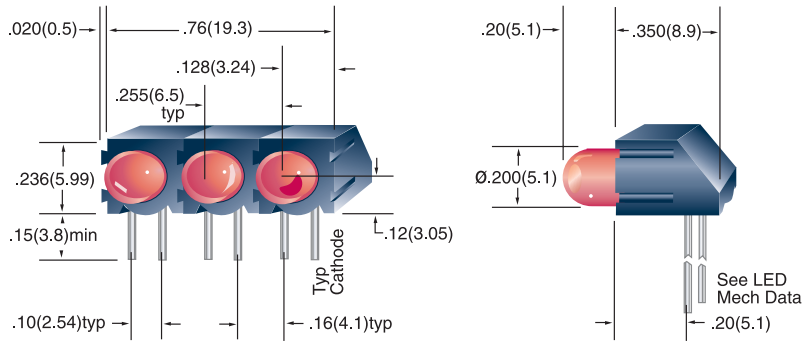
[1] Replace "N" with number of LEDs in the array, 2 - 4 (e.g. PCLR2003).

[2] I_v = typical luminous intensity @ I_f = 20mA (T_a=25°C), Low Power LEDs @ I_f = 2mA.

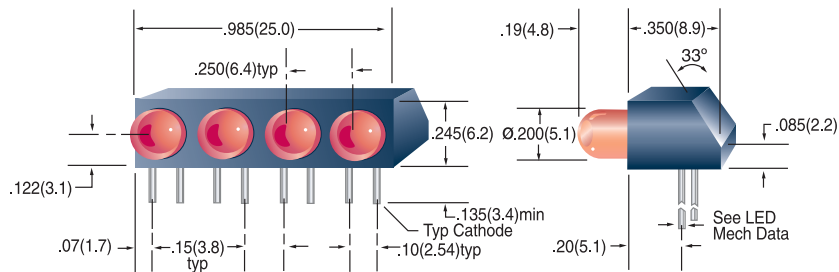
[3] Left lead = Green cathode.



PCLR2003



PCL2004



All dimensions are in inches (mm)
 Tolerances: .xx"(.x) ±.025"(.63) / .xxx"(.xx)±.010"(.25)
 Specifications are subject to change without notice.

Dual-Stacked

- For Detailed LED Data, See Discrete Section, MODEL 200

1	Model	
	PCT200	Right Angle Mount

TO ORDER, FOLLOW THE EXAMPLE:

Select one BOLD component from each SHADED column in the tables below.		
1	2	
Model	Top LED	Bottom LED
PCT200	-BCR	/BCG

→ Part Number PCT200-BCR/BCG

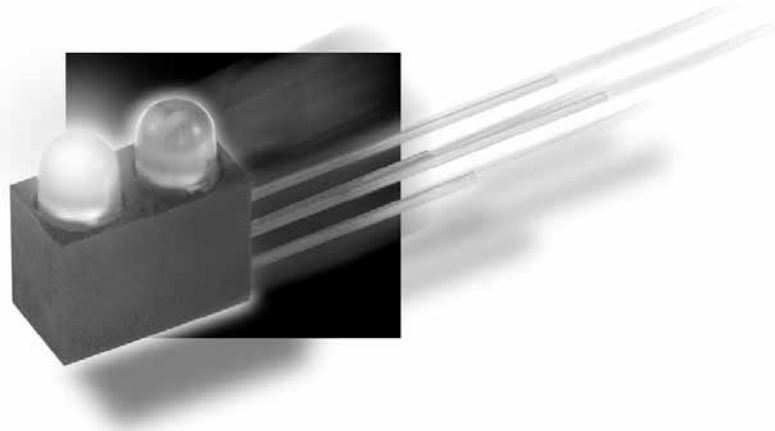
STANDARD INTENSITY - DIFFUSED ENCAPSULATION						
2	Top LED	Bottom LED	Color	λpk (nm)	Iv ^[1] (mcd)	Viewing Angle
		-BR	/BR	RED	635	14
	-BA	/BA	AMB	583	16	60
	-BG	/BG	GRN	565	10	60

MEDIUM INTENSITY - TINTED ENCAPSULATION					
Top LED	Bottom LED	Color	λpk (nm)	Iv ^[1] (mcd)	Viewing Angle
-BCR	/BCR	RED	635	120	35
-BCA	/BCA	AMB	583	100	35
-BCG	/BCG	GRN	565	80	24

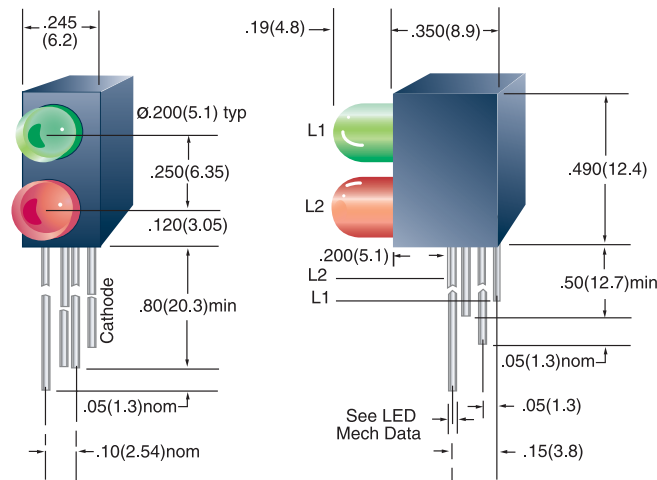
SPECIALTY LEDs						
Top LED	Bottom LED	Color	λpk (nm)	Iv ^[1] (mcd)	Viewing Angle	Description
-RLP	/RLP	RED	635	2.3	50	Low Power
-ALP	/ALP	AMB	583	2.1	50	Low Power
-GLP	/GLP	GRN	565	2.3	50	Low Power
-LRG ^[2]	/LRG	RED/GRN	660/565	90/40	60	Bi-Color, Red Cathode on right, longer lead
-BR5V	/BR5V	RED	635	8	60	Integrated Resistor for 5VDC
-BA5V	/BA5V	AMB	583	8	60	Integrated Resistor for 5VDC
-BG5V	/BG5V	GRN	565	8	60	Integrated Resistor for 5VDC
-BR12V	/BR12V	RED	635	8	60	Integrated Resistor for 12VDC
-BA12V	/BA12V	AMB	583	8	60	Integrated Resistor for 12VDC
-BG12V	/BG12V	GRN	565	8	60	Integrated Resistor for 12VDC

[1] Iv = typical luminous intensity @ If = 20mA (Ta=25°C), Low Power LEDs @ If = 2mA, Integrated Resistor LEDs @ Vf = 5VDC, or @ Vf = 12VDC.

[2] Left lead = Green cathode.



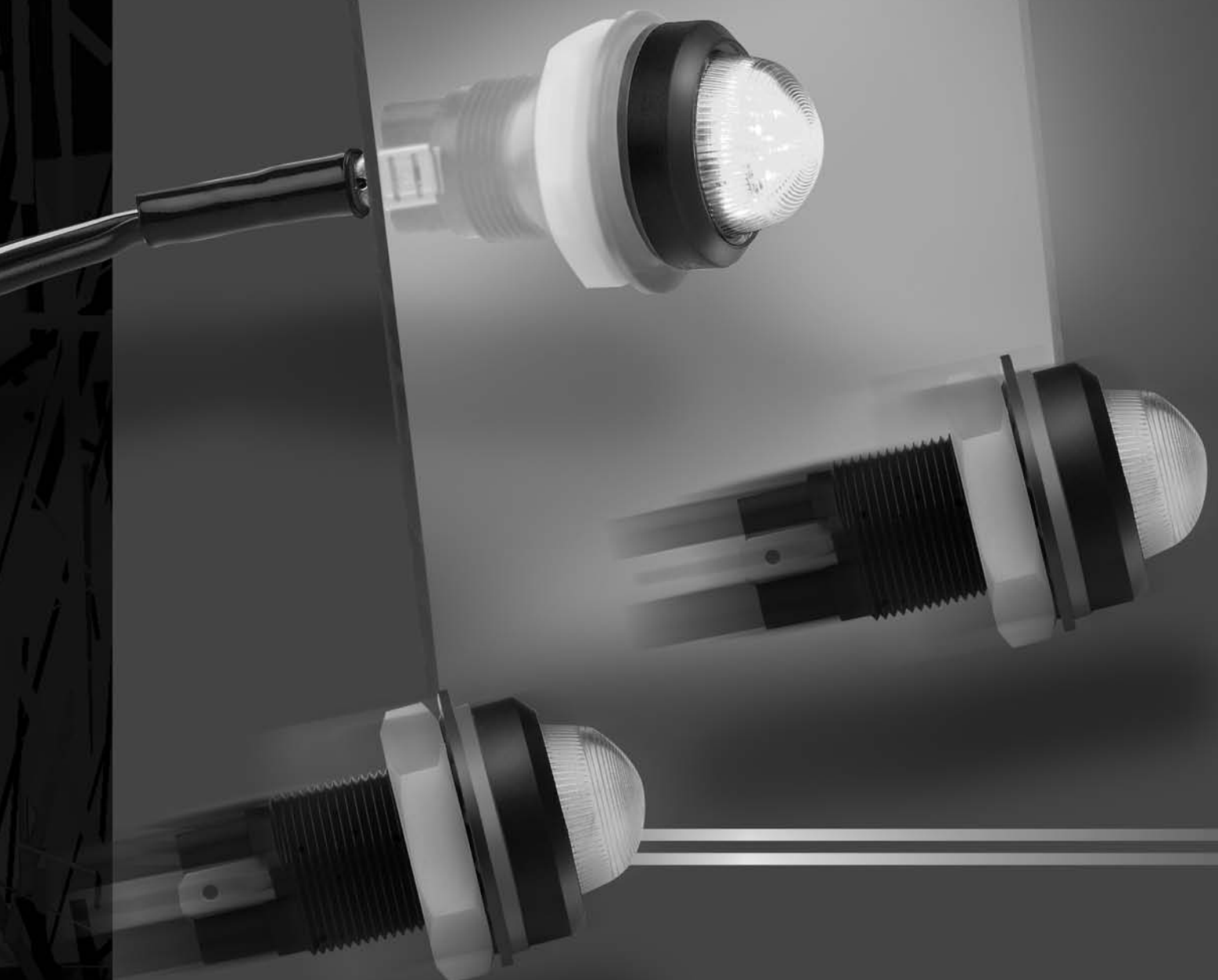
PCT200



All dimensions are in inches (mm)
 Tolerances: .xx"(.x) ±.025"(.63) / .xxx"(.xx)±.010"(.25)
 Specifications are subject to change without notice.



Panel-Mount LEDs



PRODUCT SELECTION WIZARD



Data Display Products®

Our menu-driven product
selection guide is available at
www.datadisplay.com.

You can assemble a part number
and request a sample based on
your application criteria.

WIDE ANGLE LENSED LEDs

Fresnel lens for Wide Angle Viewing

- Mates with Mounting Socket Model PS200 (Optional) - For Detailed LED Data, See Discrete Section, MODEL 125

1	Model
	PC3

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each SHADED column in the tables below.

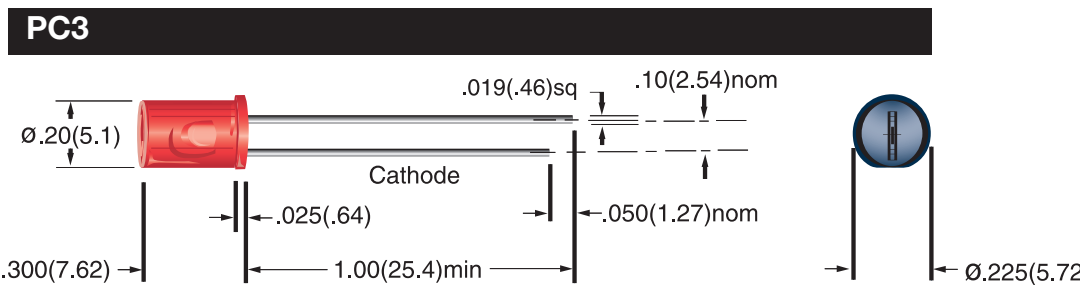
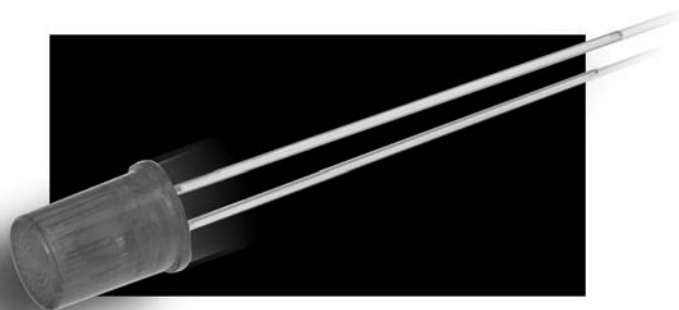
1	Model	2	LED	3	Voltage	4	Lens Color
	PC3		-BCG		2		-CG

→Part Number **PC3-BCG2-CG**

MEDIUM INTENSITY - TINTED ENCAPSULATION				
2	LED	Color	λ_{pk} (nm)	$I_v^{[1]}$ (mcd)
	-BCR	RED	635	60
	-BCA	AMB	583	30
	-BCG	GRN	565	44

3	Voltage (Ta=25°C)
	2
	External Resistor Required

4	Lens Color^[2]
	-CR Red
	-CA Amber
	-CY Yellow
	-CG Green
	-CW Water Clear
	-S Smoke



[1] I_v = typical luminous intensity @ $I_f = 20\text{mA}$ ($T_a = 25^\circ\text{C}$).

[2] Colored lenses must match LED colors (e.g. PC3-BCR2-CR). Water Clear (-CW) and Smoke (-S) lenses may be specified with any LED color.

All dimensions are in inches (mm)

Tolerances: .xx"(.x) $\pm 0.025"$ (.63) / .xxx"(.xx) $\pm 0.010"$ (.25)

Specifications are subject to change without notice.

- For Use with Discrete LEDs, Models 200 & PC3 - Mounting Diameter .250" (6.35) - RC200, KN40, LW40, HN40 Mounting Hardware Included

1

Model	Wires
PS200	W (optional)

2

Bezel Finish
-B Black
-S Silver

3

Voltage ^[1]
-5H
-12H
-15H
-24H
-28H
-48H

Voltage/Current	
Design Vf/If ^[2]	Max Vf/If ^[2]
V/C Table I	
5V/22mA	5.5V/28mA
12V/20mA	14V/25mA
15V/24mA	16.5V/28mA
24V/17mA	26V/20mA
28V/16.5mA	30V/18mA
48V/15mA	50V/16mA

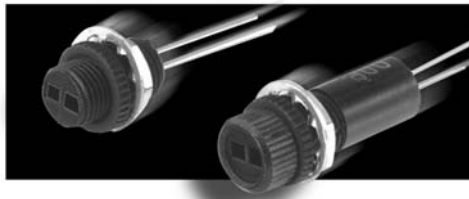
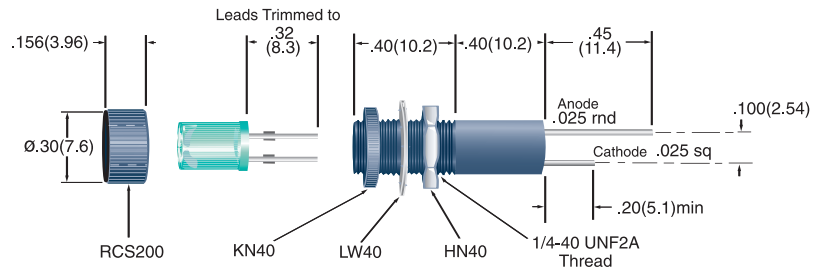
TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each numbered category in the tables below.

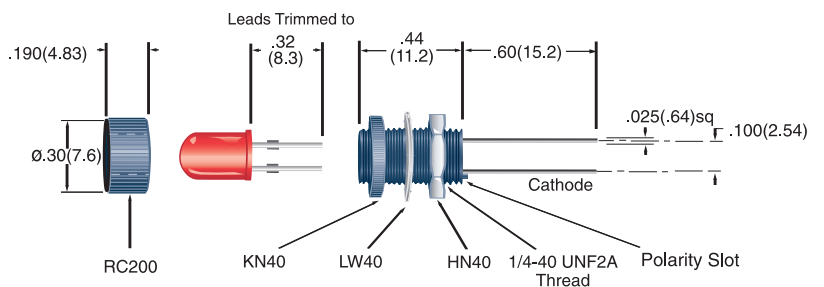
1	Model	Wires	2	Bezel Finish	3	Voltage
	PS200	W		-B		-12H

→ Part Number **PS200W-B-12H**

PS200 With Resistor *PC3 LED not Included*



PS200 Without Resistor *Discrete LED not Included*



[1] Ta=25°C. Voltages 5H through 48H are VDC. For AC operation, insert D after Voltage (e.g. 24HD).

D indicates built-in rectifier; not required for 5VAC. For a socket without a built-in resistor, omit Voltage (e.g. PS200-B).

[2] Design current will vary depending on LED used.

Standard Wire Leads:

6.0" total length(nominal)/.50" stripped (nominal), red anode/black cathode, 24 AWG TPB UL1061 insulation. Contact factory for other lengths, gauges and colors.

All dimensions are in inches (mm)

Tolerances: .xx"(x) ±.025"(.63) / .xxx"(xx)±.010"(.25)
Specifications are subject to change without notice.

.156" SNAP-IN PANEL LIGHT

T-1

- Mounting Diameter .155"(3.94) to .158"(4.01) - For Panels .031"(.79) to .125" (3.18) Thick - For Detailed LED Data, See Discrete Section, MODEL 125

1	Model	Wires
	P205	W (optional)

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each numbered category in the tables below.

1	Model	2	LED	3	Voltage
	P205		-BCR		2

→Part Number **P205-BCR2**

STANDARD INTENSITY - DIFFUSED ENCAPSULATION					
LED	Color	λpk (nm)	Iv ^[1] (mcd)	Viewing Angle	V/C Table ^[3]
-BR	RED	635	14	60	I
-BA	AMB	583	14	60	I
-BG	GRN	565	14	60	I

MEDIUM INTENSITY - TINTED ENCAPSULATION					
LED	Color	λpk (nm)	Iv ^[1] (mcd)	Viewing Angle	V/C Table ^[3]
-BCR	RED	635	60	45	I
-BCA	AMB	583	30	45	I
-BCG	GRN	565	44	45	I

HIGH INTENSITY - WATERCLEAR ENCAPSULATION					
LED	Color	λpk (nm)	Iv ^[1] (mcd)	Viewing Angle	V/C Table ^[3]
-NWR	RED	634	2180	35	I
-NWA	AMB	592	2180	35	I
-NWG	GRN	520	2000	45	II
-NWB	BLU	465	600	45	II
-NWW	WHT		1100	55	II

Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table I	
5V/22mA	5.5V/28mA
12V/20mA	14V/25mA
15V/24mA	16.5V/28mA
24V/17mA	26V/20mA
28V/16.5mA	30V/18mA

Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table II	
5V/15mA	5.5V/23mA
12V/15mA	14V/20mA
15V/15mA	16.5V/18mA
24V/15mA	26V/18mA
28V/15mA	30V/17mA

3	Voltage^[4]
	2
	5H
	12H
	15H
	24H
	28H

SPECIALTY LEDs						
LED	Color	λpk (nm)	Iv ^[1] (mcd)	Viewing Angle	V/C Table ^[3]	Description
-RLP ^[2]	RED	635	2.1	50	I	Low Power
-ALP ^[2]	AMB	583	1.6	50	I	Low Power
-GLP ^[2]	GRN	565	2.1	50	I	Low Power
-DRG	RED/GRN	635/567	4.3/3.7	118	I	Bi-Color, Red Cathode

[1] Iv = typical luminous intensity @ If = 20mA (Ta=25°C), Low Power LEDs @ If = 2mA. Bi-color LEDs @ If=10mA.

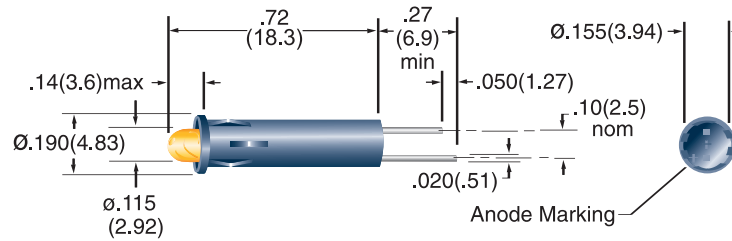
[2] Omit the H when selecting a voltage. (e.g. P205-RLP12).

[3] See Voltage/Current table for design specifications. Design current for low power LEDs = 2mA.

[4] Ta = 25°C. Voltage "2" indicates external resistor required. Voltages 5H through 28H are VDC. For AC operation, insert D after Voltage (e.g. 24HD). D indicates built-in rectifier; not required for 5H. Bi-Color not available in AC voltages.



P205



Standard Wire Leads:

6.0" total length(nominal)/.50" stripped (nominal), red anode/black cathode, 24 AWG TPB UL1061 insulation. Contact factory for other lengths, gauges and colors.

All dimensions are in inches (mm)

Tolerances: .xx"(.x) ±.025"(.63) / .xxx"(.xx)±.010"(.25)
Specifications are subject to change without notice.

.250" SNAP-IN PANEL LIGHT

T-1 Flush Mount Lens

- Mounting Diameter .249"(6.32) to .252"(6.40) - For Panels .031"(.79) to .125" (3.18) Thick - For Detailed LED Data, See Discrete Section, MODEL 125

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each numbered category in the tables below.

1	Model	Wire	2	LED	3	Voltage	4	Lens Color
	PR44	W		-BCG		12H		-CG

→Part Number **PR44W-BCG12H-CG**

1	Model	Wires	Description
	P44 PR44	W (optional)	Voltage = 2 (External Resistor Required) Voltages 5H - 28H

MEDIUM INTENSITY - TINTED ENCAPSULATION						
2	LED	Color	λ_{pk} (nm)	Iv ^[1] (mcd)	Viewing Angle	V/C Table ^[3]
	-BCR	RED	635	60	45	I
	-BCA	AMB	583	30	45	I
	-BCG	GRN	565	44	45	I

HIGH INTENSITY - WATERCLEAR ENCAPSULATION						
	LED	Color	λ_{pk} (nm)	Iv ^[1] (mcd)	Viewing Angle	V/C Table ^[3]
	-NWR	RED	660	2180	35	I
	-NWA	AMB	592	2180	35	I
	-NWG	GRN	520	2000	45	II
	-NWB	BLU	465	600	45	II
	-NWW ^[4]	CWHT		2070	60	II

Voltage/Current	
Design Vf/I _f	Max Vf/I _f
V/C Table I	
5V/22mA	5.5V/28mA
12V/20mA	14V/25mA
15V/24mA	16.5V/28mA
24V/17mA	26V/20mA
28V/16.5mA	30V/18mA

Voltage/Current	
Design Vf/I _f	Max Vf/I _f
V/C Table II	
5V/15mA	5.5V/23mA
12V/15mA	14V/20mA
15V/15mA	16.5V/18mA
24V/15mA	26V/18mA
28V/15mA	30V/17mA

3	Voltage ^[2]
	2
	5H
	12H
	15H
	24H
	28H

4	Lens Color ^[4]
	-CR Red
	-CA Amber
	-CY Yellow
	-CG Green
	-CB Blue
	-CW Water Clear
	-S Smoke

[1] Iv = typical luminous intensity @ If = 20mA (Ta=25°C).

[2] Ta=25°C. Voltages 5H - 28H are DC. For AC operation, insert D after voltage. D indicates built-in rectifier, not required for 5H (e.g. 24HD).

[3] See voltage/current table for design specifications.

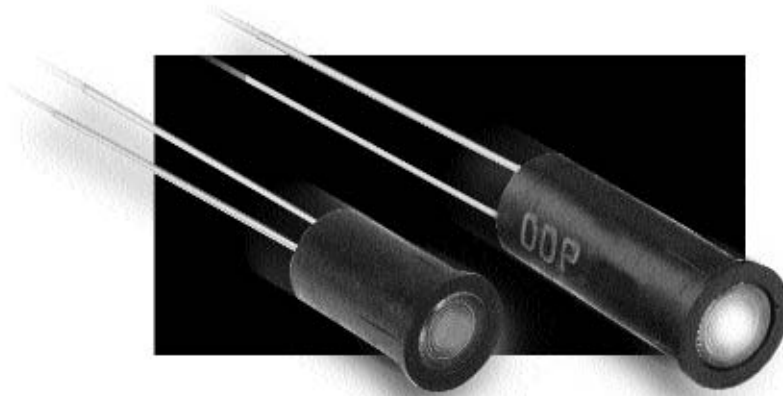
[4] Colored lenses must match LED colors (e.g. PR44-BCR5H-CR). Water Clear and Smoke lenses may be specified with any LED color. For White, select -CW Lens only.

Standard Wire Leads:

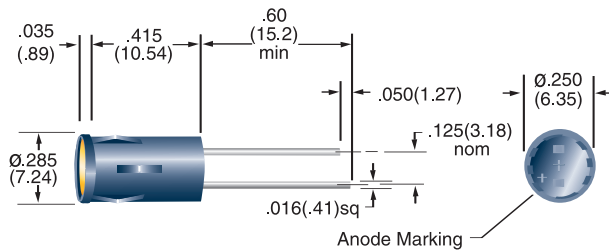
6.0" total length(nominal)/.50" stripped (nominal), red anode/black cathode, 24 AWG TPB UL1061 insulation. Contact factory for other lengths, gauges and colors.

All dimensions are in inches (mm)

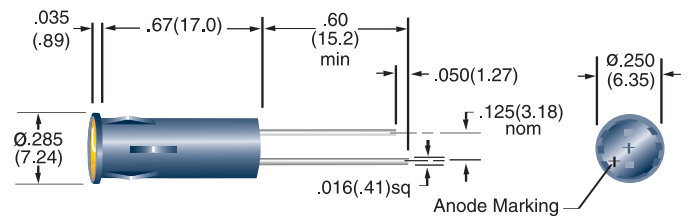
Tolerances: .xx"(.x) ±.025"(.63) / .xxx"(.xx)±.010"(.25)
Specifications are subject to change without notice.



P44



PR44



Standard Wire Leads:

6.0" total length(nominal)/.50" stripped (nominal), red anode/black cathode, 24 AWG TPB UL1061 insulation. Contact factory for other lengths, gauges and colors.

All dimensions are in inches (mm)

Tolerances: .xx"(x) ±.025"(.63) / .xxx"(xx)±.010"(.25)
Specifications are subject to change without notice.

.250" SNAP-IN PANEL LIGHT

T-1 3/4 Standard Profile

- Mounting Diameter .249"(6.32) to .252"(6.40) - For Panels .031"(.79) to .125" (3.18) Thick - For Detailed LED Data, See Discrete Section, MODEL 200

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each numbered category in the tables below.

1	Model	2	LED	3	Voltage
	PR405		-BR		12H

→Part Number **PR405-BR12H:**

1	Model	Wires	Description
	P405 PR405	W (optional)	Voltage = 2 (External Resistor Required) Voltages 5H - 120

STANDARD INTENSITY - DIFFUSED ENCAPSULATION						
2	LED	Color	λ_{pk} (nm)	Iv ^[1] (mcd)	Viewing Angle	V/C Table ^[2]
	-BR	RED	635	14	60	I
	-BA	AMB	583	16	60	I
	-BG	GRN	565	10	60	I

MEDIUM INTENSITY - TINTED ENCAPSULATION					
LED	Color	λ_{pk} (nm)	Iv ^[1] (mcd)	Viewing Angle	V/C Table ^[2]
-BCR	RED	635	120	35	I
-BCA	AMB	583	100	35	I
-BCG	GRN	565	80	24	I

HIGH INTENSITY - WATERCLEAR ENCAPSULATION					
LED	Color	λ_{pk} (nm)	Iv ^[1] (mcd)	Viewing Angle	V/C Table ^[2]
-NWR	RED	634	2800	30	I
-NWO	ORG	605	2000	30	I
-NWA	AMB	592	2800	30	I
-NWG	GRN	520	2400	45	II
-NWB	BLU	465	700	45	II
-NWW	CWHT		2500	50	II
-NWL	WWHT		1800	50	II
-NKR	RED	634	3600	15	I
-NKO	ORG	605	8000	15	I
-NKA	AMB	592	3600	15	I
-NKG	GRN	520	10000	15	II
-NKB	BLU	465	3000	15	II
-NKW	CWHT		9200	20	II
-NKL	WWHT		9200	15	II

SPECIALTY LEDs - DIFFUSED ENCAPSULATION						
LED	Color	λ_{pk} (nm)	Iv ^[1] (mcd)	Viewing Angle	V/C Table ^[3]	Description
-RLP ^[5]	RED	635	2.3	50	[3]	Low Power
-ALP ^[5]	AMB	583	2.1	50	[3]	Low Power
-GLP ^[5]	GRN	565	2.3	50	[3]	Low Power
-LRG	RED/GRN	660/565	90/40	60	I	Bi-Color, Red Cathode

Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table I	
5V/22mA	5.5V/28mA
12V/20mA	14V/25mA
15V/24mA	16.5V/28mA
24V/17mA	26V/20mA
28V/16.5mA	30V/18mA
48V/15mA	50V/16mA
60V/9mA	65V/10mA
120VAC/3.5mA	130VAC/4mA

Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table II	
5V/15mA	5.5V/23mA
12V/15mA	14V/20mA
15V/15mA	16.5V/18mA
24V/15mA	26V/18mA
28V/15mA	30V/17mA
48V/9.5mA	50V/10mA
60V/7mA	65V/8mA
120VAC/3.5mA	130VAC/4mA

3	Voltage^[3]
	2
	5H
	12H
	15H
	24H
	28H
	48H
	60H
	120 ^[4]

[1] Iv = typical luminous intensity @ If = 20mA (Ta=25°C), Low Power LEDs @ If = 2mA.

[2] See Voltage/Current table for design specifications. Design current for low power LEDs = 2mA.

[3] Ta = 25°C. Voltages 5H through 60H and VDC. For AC operation, insert D after Voltage (e.g. 24HD).

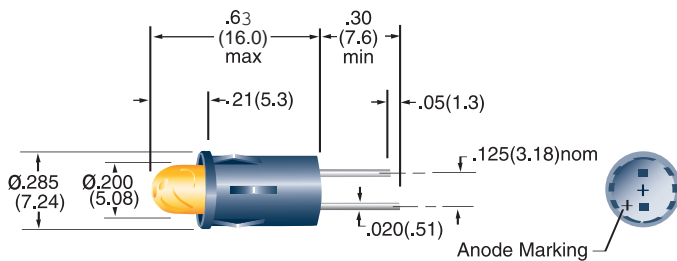
D indicates built-in rectifier, not required for 5H or 120VAC. DC operation not available for 120V. Bi-Color not available in AC voltages.

[4] Select high intensity LEDs only.

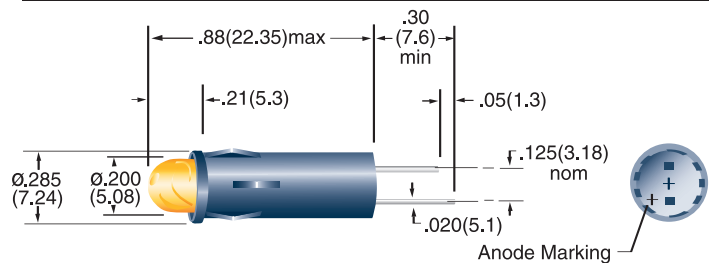
[5] Omit the H when selecting voltage (e.g. PR405-RLP12).



P405



PR405



Standard Wire Leads:

6.0" total length(nominal)/.50" stripped (nominal), red anode/black cathode, 24 AWG TPB UL1061 insulation. Contact factory for other lengths, gauges and colors.

All dimensions are in inches (mm)

Tolerances: $.xx"(.x) \pm .025"(.63)$ / $.xxx"(.xx) \pm .010"(.25)$
Specifications are subject to change without notice.

.190" MOUNT PANEL LIGHTS

30 Series

- Mounting Hardware Provided - For Detailed LED Data, See Discrete Section, MODEL 125

1	Model	Wires
	305 ^[1]	W
	31	(optional)
	34	

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each numbered category in the tables below.

1	Model	2	LED	3	Voltage	4	Lens Diffusion	5	Lens Color	6	Bezel Color
	34		-BCR		24H		-C		R		0

→ Part Number **34-BCR24H-CR0**

STANDARD INTENSITY - DIFFUSED ENCAPSULATION						
2	LED	Color	λ_{pk} (nm)	$I_v^{[2]}$ (mcd)	Viewing Angle	V/C Table ^[3]
	-BR	RED	635	14	60	I
	-BA	AMB	583	14	60	I
	-BG	GRN	565	14	60	I

MEDIUM INTENSITY - TINTED ENCAPSULATION						
2	LED	Color	λ_{pk} (nm)	$I_v^{[2]}$ (mcd)	Viewing Angle	V/C Table ^[3]
	-BCR	RED	635	60	45	I
	-BCA	AMB	583	30	45	I
	-BCG	GRN	565	44	45	I

HIGH INTENSITY - WATERCLEAR ENCAPSULATION						
2	LED	Color	λ_{pk} (nm)	$I_v^{[2]}$ (mcd)	Viewing Angle	V/C Table ^[3]
	-NWR	RED	634	2180	35/35	I
	-NWA	AMB	592	2180	35/35	I
	-NWG	GRN	520	2000	45	II
	-NWB	BLU	465	600	45	II
	-NWW ^[6]	CWHT		2070	60	II

Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table I	
5V/22mA	5.5V/28mA
12V/20mA	14V/25mA
15V/24mA	16.5V/28mA
24V/17mA	26V/20mA
28V/16.5mA	30V/18mA
48V/15mA	50V/16mA
60V/9mA	65V/10mA
120VAC/3.5mA	130VAC/4mA

Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table II	
5V/15mA	5.5V/23mA
12V/15mA	14V/20mA
15V/15mA	16.5V/18mA
24V/15mA	26V/18mA
28V/15mA	30V/17mA
48V/9.5mA	50V/10mA
60V/7mA	65V/8mA
120VAC/3.5mA	130VAC/4mA

3	Voltage^[4]
	2
	5H
	12H
	15H
	24H
	28H
	48H
	60H
	120 ^[8]

4	Lens Diffusion
	-C Clear
	-N Diffused

5	Lens Color	
	R Red	B Blue
	A Amber	W Water Clear
	Y Yellow	
	G Green	-S Smoke ^[7]

SPECIALTY LEDs							
2	LED	Color	λ_{pk} (nm)	$I_v^{[2]}$ (mcd)	Viewing Angle	V/C Table ^[3]	Description
	-RLP ^[5]	RED	635	2.1	50	[3]	Low Power
	-ALP ^[5]	AMB	583	1.6	50	[3]	Low Power
	-GLP ^[5]	GRN	565	2.1	50	[3]	Low Power
	-DRG ^[6]	RED/GRN	635/567	4.3/3.7	118	I	Bi-Color, Red Cathode

6	Bezel Color
	0 Black
	9 White

[1] Model 305 has no lens. Omit Lens Diffusion and Color (e.g. 305-NWG5H-0).

[2] I_v = typical luminous intensity @ $I_f = 20mA (T_a = 25^\circ C)$. I_v is measured without lenses. For Low Power LEDs, $I_f = 2mA$. For Bi-color LEDs, $I_f = 10mA$.

[3] See Voltage/Current table for design specifications. Design current for low power LEDs = 2mA.

[4] $T_a = 25^\circ C$. Voltage "2" indicates external resistor required. Voltages 5H through 60H are VDC. For AC operation, insert D after Voltage (e.g. 24HD). D indicates built-in rectifier; not required for 5H or 120VAC or greater. DC operation not available for 120V. Bi-Color not available in AC voltages.

[5] Omit H when selecting a voltage (e.g. 31-RLP12).

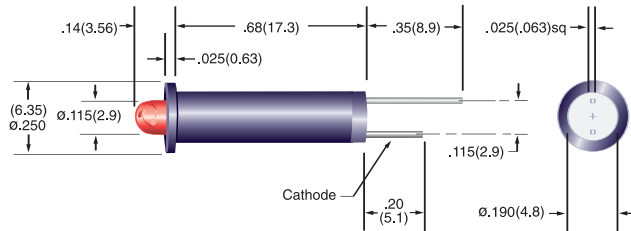
[6] Select -CW or -NW lens only.

[7] Omit Lens Diffusion when selecting smoked lens (e.g. 31-NWG28H-S0).

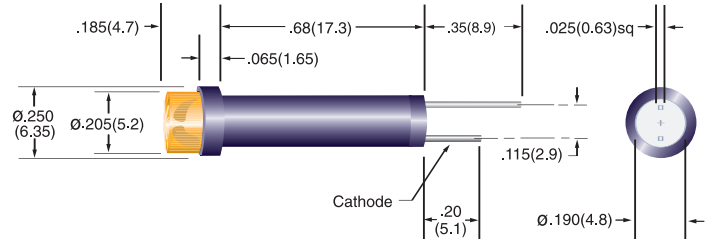
[8] Select high intensity LEDs only.



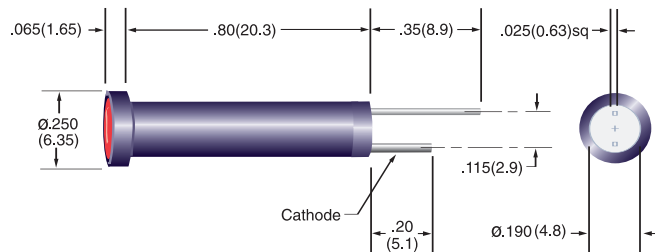
305 (no lens)



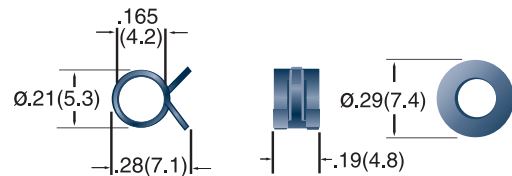
31



34 (flush lens)



TC3 & NW3, Mounting Hardware



Standard Wire Leads:

6.0" total length(nominal)/.50" stripped (nominal), red anode/black cathode, 24 AWG TPB UL1061 insulation. Contact factory for other lengths, gauges and colors.

All dimensions are in inches (mm)

Tolerances: .xx"(.x) ±.025"(.63) / .xxx"(.xx)±.010"(.25)
Specifications are subject to change without notice.

.250" MOUNT PANEL LIGHTS

40 Series

- Mounting Hardware Provided - For Detailed LED Data, See Discrete Section, MODEL 200

1 Model	Wires
C ^[1] (optional)	W (optional)
405 ^[2]	
41	
44	
46	
461	
464	

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each numbered category in the tables below.

1 Model	2 LED	3 Voltage	4 Lens Diffusion	5 Lens Color	6 Bezel Color
41	-BCG	5H	-C	G	0

→ Part Number **41-BCG5H-CG0**

STANDARD INTENSITY - DIFFUSED ENCAPSULATION					
2 LED	Color	λpk (nm)	Iv ^[3] (mcd)	Viewing Angle	V/C Table ^[5]
-BR ^[4]	RED	635	14	60	I
-BA ^[4]	AMB	583	16	60	I
-BG ^[4]	GRN	565	10	60	I

MEDIUM INTENSITY - TINTED ENCAPSULATION					
LED	Color	λpk (nm)	Iv ^[3] (mcd)	Viewing Angle	V/C Table ^[5]
-BCR	RED	635	120	35	I
-BCA	AMB	583	100	35	I
-BCG	GRN	565	80	24	I

HIGH INTENSITY - WATERCLEAR ENCAPSULATION					
LED	Color	λpk (nm)	Iv ^[3] (mcd)	Viewing Angle	V/C Table ^[5]
-NWR	RED	634	2800	30	I
-NWO	ORG	605	2000	30	I
-NWA	AMB	592	2800	30	I
-NWG	GRN	520	2400	45	II
-NWB	BLU	465	700	45	II
-NWW ^[8]	CWHT		2500	50	II
-NWL ^[8]	WWHT		1800	50	II
-NKR	RED	634	3600	15	I
-NKO	ORG	605	8000	15	I
-NKA	AMB	592	3600	15	I
-NKG	GRN	520	10000	15	II
-NKB	BLU	465	3000	15	II
-NKW ^[8]	CWHT		9200	20	II
-NKL ^[8]	WWHT		9200	15	II

Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table I	
5V/22mA	5.5V/28mA
12V/20mA	14V/25mA
15V/24mA	16.5V/28mA
24V/17mA	26V/20mA
28V/16.5mA	30V/18mA
48V/15mA	50V/16mA
60V/9mA	65V/10mA
120VAC/3.5mA	130VAC/4mA

Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table II	
5V/15mA	5.5V/23mA
12V/15mA	14V/20mA
15V/15mA	16.5V/18mA
24V/15mA	26V/18mA
28V/15mA	30V/17mA
48V/9.5mA	50V/10mA
60V/7mA	65V/8mA
120VAC/3.5mA	130VAC/4mA

3 Voltage ^[6]
2
5H
12H
15H
24H
28H
48H
60H
120 ^[9]

4 Lens Diffusion
-C Clear
-N Diffused

5 Lens Color	
R Red	B Blue
A Amber	W Water Clear
Y Yellow	
G Green	-S Smoke ^[10]

SPECIALTY LEDs						
LED	Color	λpk (nm)	Iv ^[3] (mcd)	Viewing Angle	V/C Table ^[5]	Description
-RLP ^[7]	RED	635	2.3	50	[5]	Low Power
-ALP ^[7]	AMB	583	2.1	50	[5]	Low Power
-GLP ^[7]	GRN	565	2.3	50	[5]	Low Power
-LRG ^[8]	RED/GRN	660/565	90/40	60	I	Bi-Color, Red Cathode
-RAG ^[8]	RED/AMB/GRN	630/565	6/6/6	60	I	Tri-Color, Common Cathode
-GAR ^[8]	GRN/AMB/RED	635/565	5/5/5	50	I	Tri-Color, Common Anode

6 Bezel Color
0 Black
9 White

[1] The C option specifies a pin length = .20" for panel lights mounted in the PS40 or PS44 socket (pg. 44). Mounting hardware is included with the socket. Do not select the W option.

[2] Model 405 has no lens. Omit the Lens Diffusion and Color (e.g. 405-BG5H-0).

[3] Iv = typical luminous intensity @ If = 20mA (Ta = 25°C). Iv is measured without lenses. For Low Power LEDs, If = 2mA.

[4] Use with Model 405 only.

[5] See Voltage/Current table for design specifications. Design current for low power LEDs = 2mA.

[6] Ta = 25°C. Voltage "2" indicates external resistor required. Voltages 5H through 60H are VDC.

For AC operation, insert D after Voltage (e.g. 24HD), D indicates built-in rectifier; not required for 5H or 120VAC. DC operation not available for 120V. Bi-Color and Tri-Color not available in AC voltages.

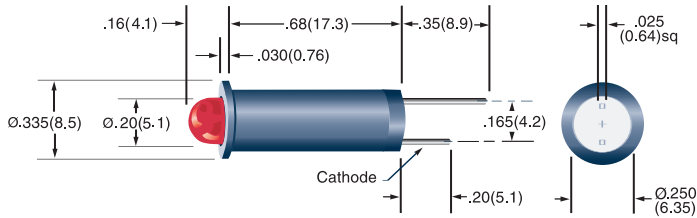
[7] Omit H when selecting a voltage (e.g. 41-RLP12-CWO).

[8] Select -CW or -NW lens only. -RAG Wire Leads: green anode/black cathode/red anode. -GAR Wire Leads: green cathode/black anode/red cathode. Common lead is the first lead clockwise from reference mark on header. Tri-Color 5 or 12 volt, omit H in part number.

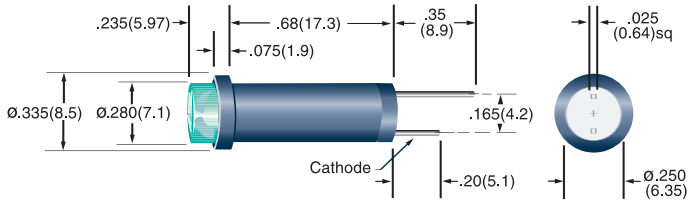
[9] Select high intensity LEDs only.

[10] Omit lens diffusion when selecting smoked lens. (e.g. 46-NWR-S0).

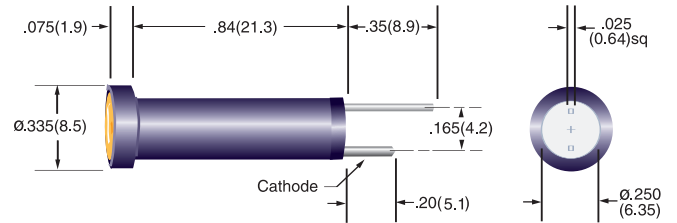
405 (no lens)



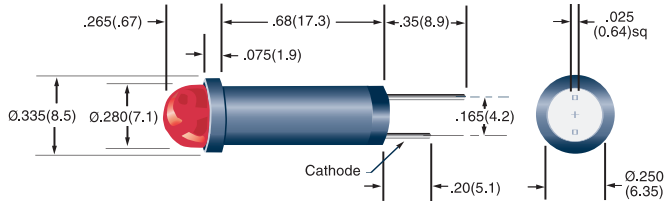
41



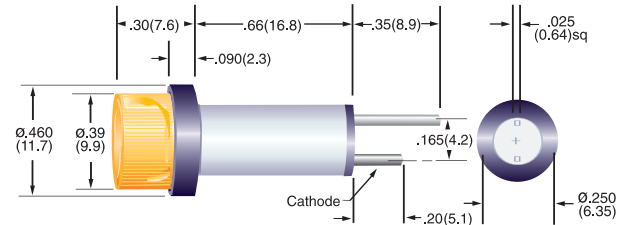
44 (flush lens)



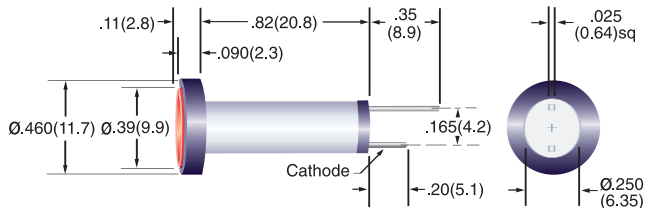
46



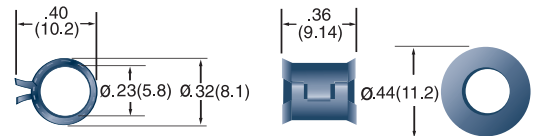
461



464



TC4 & NW4, Mounting Hardware see note [1]



Standard Wire Leads:

6.0" total length(nominal)/.50" stripped (nominal), red anode/black cathode, 24 AWG TPB UL1061 insulation. Contact factory for other lengths, gauges and colors.

All dimensions are in inches (mm)

Tolerances: .xx"(.x) ±.025"(.63) / .xxx"(.xx)±.010"(.25)
Specifications are subject to change without notice.

40 Series Mounting Hardware

- Sockets for 40 Series Panel Lights

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each SHADED column in the tables below.

1	Model/ Part #	2	# of Pins
	PS40		-2

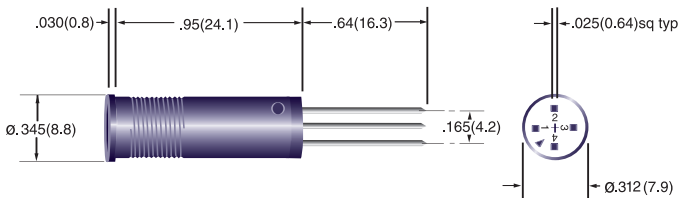
→Part Number **PS40-2**

40 SERIES SOCKETS & WIRING PLUGS		
1	Model	Description
	PS40	Sockets for use with Models C405, C41, C46, C461
	PS44	Sockets for use with Models C44, C464
	SH40	Wiring Plug for use with 40 or C40 series
	CSH40	Wiring Plug for use with C40 series

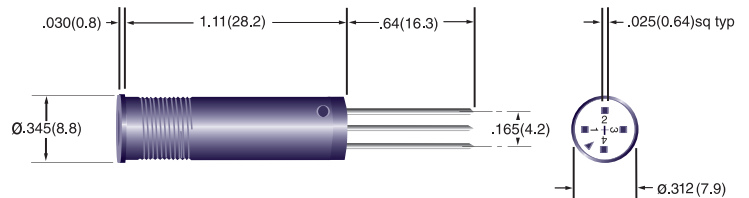
2		Number of Pins	Configuration
		-2	2, 4
		-3	1, 2, 4
		-4	1, 2, 3, 4

40 SERIES HARDWARE	
Part Number	Description
CS24	Gold Plated Crimp Terminals
CS24T	Tin Plated Crimp Terminals
TC4	40 Series Mounting Clip
NW4	40 Series Mounting Washer

PS40 TC5 & NW5 mounting hardware provided

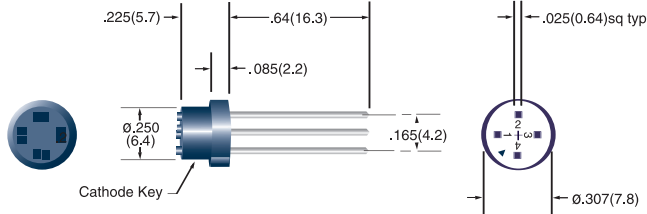


PS44 TC5 & NW5 mounting hardware provided

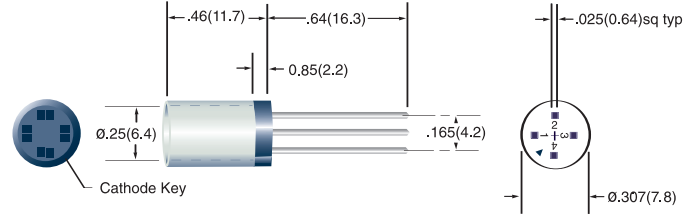




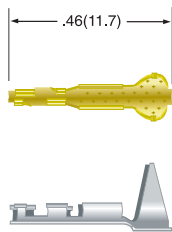
SH40



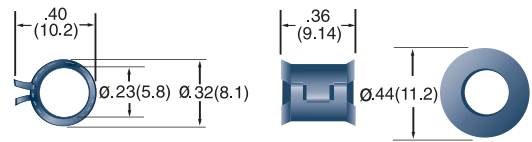
CSH40



CS24 & CS24T 22AWG to 28AWG



TC4 & NW4, Mounting Hardware



All dimensions are in inches (mm)

Tolerances: .xx"(.x) ±.025"(.63) / .xxx"(.xx)±.010"(.25)
Specifications are subject to change without notice.

.290" MOUNT PANEL LIGHTS

90 Series

- Mounting Hardware Provided - For Detailed LED Data, See Discrete Section, MODEL 200

1	Model	Wires
C ^[1] (optional)	905 ^[2] 91 94 96 961 964	W (optional)

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each numbered category in the tables below.

1	Model	2	LED	3	Voltage	4	Lens Diffusion	5	Lens Color	6	Bezel Color
	94		-LRG		12H		-C		W		0

→ Part Number **94-LRG12H-CW0**

2 STANDARD INTENSITY - DIFFUSED ENCAPSULATION					
LED	Color	λpk (nm)	Iv ^[3] (mcd)	Viewing Angle	V/C Table ^[5]
-BR^[4]	RED	635	14	60	I
-BA^[4]	AMB	583	16	60	I
-BG^[4]	GRN	565	10	60	I

MEDIUM INTENSITY - TINTED ENCAPSULATION					
LED	Color	λpk (nm)	Iv ^[3] (mcd)	Viewing Angle	V/C Table ^[5]
-BCR	RED	635	120	35	I
-BCA	AMB	583	100	35	I
-BCG	GRN	565	80	24	I

HIGH INTENSITY - WATERCLEAR ENCAPSULATION					
LED	Color	λpk (nm)	Iv ^[3] (mcd)	Viewing Angle	V/C Table ^[5]
-NWR	RED	634	2800	30	I
-NWO	ORG	605	2000	30	I
-NWA	AMB	592	2800	30	I
-NWG	GRN	520	2400	45	II
-NWB	BLU	465	700	45	II
-NWW^[8]	CWHT		2500	50	II
-NWL^[8]	WWHT		1800	50	II
-NKR	RED	634	3600	15	I
-NKO	ORG	605	8000	15	I
-NKA	AMB	592	3600	15	I
-NKG	GRN	520	10000	15	II
-NKB	BLU	465	3000	15	II
-NKW^[8]	CWHT		9200	20	II
-NKL^[8]	WWHT		9200	15	II

SPECIALTY LEDs - DIFFUSED ENCAPSULATION						
LED	Color	λpk (nm)	Iv ^[3] (mcd)	Viewing Angle	V/C Table ^[5]	Description
-RLP^[7]	RED	635	2.3	50	[5]	Low Power
-ALP^[7]	AMB	583	2.1	50	[5]	Low Power
-GLP^[7]	GRN	565	2.3	50	[5]	Low Power
-LRG^[8]	RED/GRN	660/565	90/40	60	I	Bi-Color, Red Cathode

Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table I	
5V/22mA	5.5V/28mA
12V/20mA	14V/25mA
15V/24mA	16.5V/28mA
24V/17mA	26V/20mA
28V/16.5mA	30V/18mA
48V/15mA	50V/16mA
60V/9mA	65V/10mA
120VAC/3.5mA	130VAC/4mA

Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table II	
5V/15mA	5.5V/23mA
12V/15mA	14V/20mA
15V/15mA	16.5V/18mA
24V/15mA	26V/18mA
28V/15mA	30V/17mA
48V/9.5mA	50V/10mA
60V/7mA	65V/8mA
120VAC/3.5mA	130VAC/4mA

3	Voltage ^[6]
	2
	5H
	12H
	15H
	24H
	28H
	48H
	60H
	120 ^[9]

4	Lens Diffusion
	-C
	Clear
	-N
	Diffused

5	Lens Color
	R Red B Blue
	A Amber W Water Clear
	Y Yellow
	G Green -S Smoke ^[10]

6	Bezel Color
	0
	Black
	9
	White

[1] The C option specifies a pin length = .20" for panel lights mounted in the PS90 or PS90T socket (pg. 48). Mounting hardware is included with the socket. Do not select the W option. C and standard pins are not solderable.

[2] Model 905 has no lens. Omit Lens Diffusion and Color (e.g. 905-BG5H-0).

[3] Iv = typical luminous intensity @ If = 20mA (Ta = 25°C). Iv is measured without lenses. For Low Power LEDs, If = 2mA.

[4] Use with Model 905 only.

[5] See Voltage/Current table for design specifications. Design current for low power LEDs = 2mA.

[6] Ta = 25°C. Voltage "2" indicates external resistor required. Voltages 5H through 60H are VDC. For AC operation, insert D after Voltage (e.g. 24HD). D indicates built-in rectifier; not required for 5H or 120VAC. DC operation not available for 120V. Bi-Color not available in AC voltages.

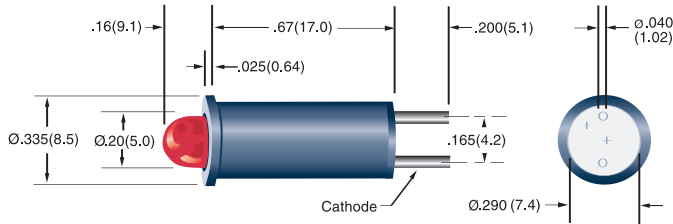
[7] Omit H when selecting a voltage (e.g. 91-RLP12-CW0).

[8] Select -CW or -NW Lens only.

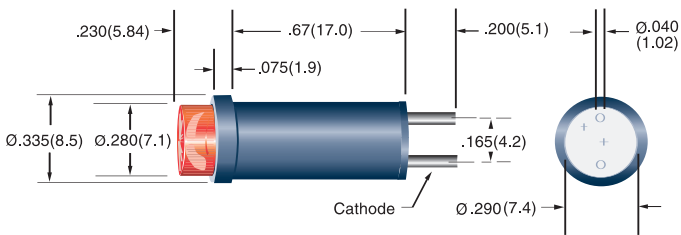
[9] Select high intensity LEDs only.

[10] Omit Lens Diffusion when selecting smoked lens (e.g. 91-NWG24H-S0).

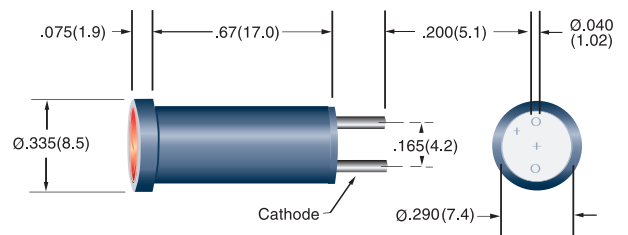
905 (no lens)



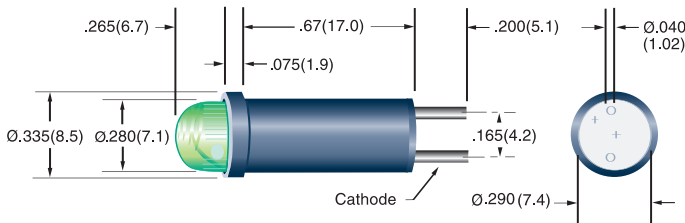
91



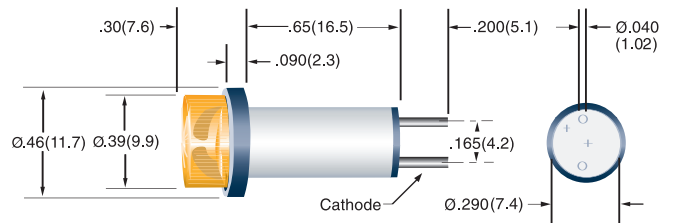
94 (flush lens)



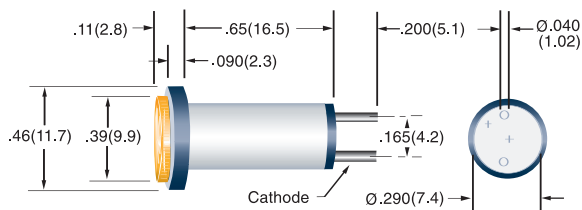
96



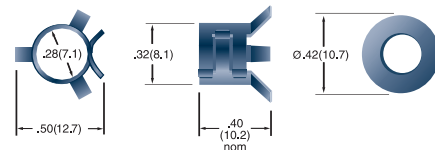
961



964



TC9 & NW9 Mounting Hardware



Standard Wire Leads:

6.0" total length(nominal)/.50" stripped (nominal), red anode/black cathode, 24 AWG TPB UL1061 insulation. Contact factory for other lengths, gauges and colors.

All dimensions are in inches (mm)

Tolerances: .xx"(.x) $\pm.025$ "(.63) / .xxx"(.xx) $\pm.010$ ".(25)
Specifications are subject to change without notice.

.290" MOUNT PANEL LIGHT SOCKETS

90 Series Mounting Hardware

- Sockets for 90 Series Panel Lights
- Mounting Hole Diameter: Ø.375" - Ø.385"
- Panel Thickness: Max: 0.80"

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each SHADED column in the tables below.

1 Model	2 Lens Diffusion	3 Lens Color
L92	-C	R

→ Part Number **L92-CR**

90 SERIES SOCKETS & HARDWARE

1 Model	Description	Mating Components
PS90 ^[1]	90 Series Socket, Solder Terminals	C905, C91, C94, C96, C961, C964
PS90T ^[1]	90 Series Socket, Turret Terminals	C905, C91, C94, C96, C961, C964
RC90	Retaining Collar	PS90, PS90T
SH90	Wiring Plug	905, 91, 94, 96, 961, 964, C905, C91, C94, C96, C961, C964
CSH90	Wiring Plug with collar	905, 91, 94, 96, 961, 964, C905, C91, C94, C96, C961, C964
TC9	90 Series Mounting Clip	905, 91, 94, 96, 961, 964, C905, C91, C94, C96, C961, C964
NW9	90 Series Mounting Washer (neoprene)	905, 91, 94, 96, 961, 964, C905, C91, C94, C96, C961, C964

90 SERIES LENS

(For use with PS90 or PS90T Socket with Model C905 Panel Light)

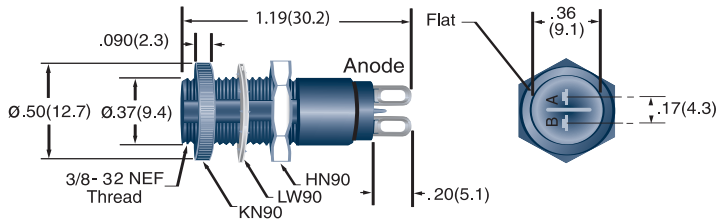
1 Model	2 Lens Diffusion	3 Lens Color
L92	-C Clear	R Red
	-N Diffused	A Amber
		Y Yellow
		G Green
		B Blue
		W Water Clear
		-S Smoke ^[2]



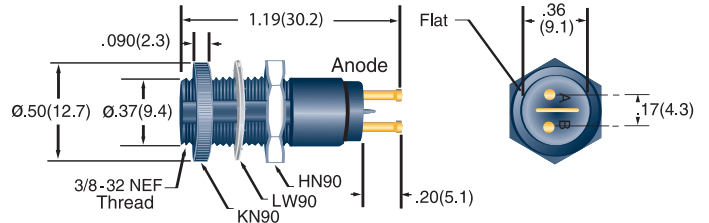
[1] Hardware Assembled.

[2] Omit Lens Diffusion Code (e.g. L92-S).

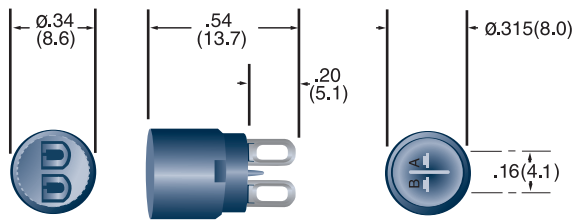
PS90



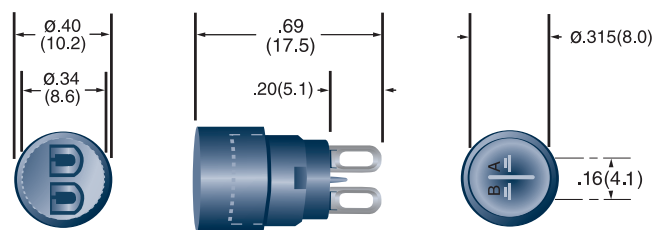
PS90T



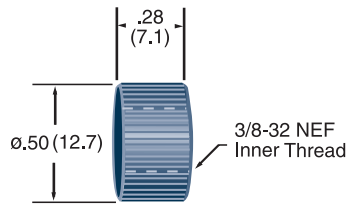
SH90



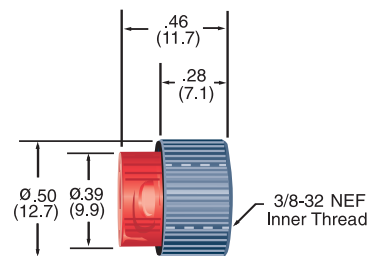
CSH90



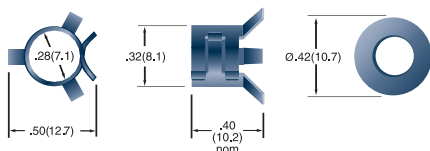
RC90-B



L92



TC9 & NW9 Mounting Hardware



All dimensions are in inches (mm)

Tolerances: $.xx(.x) \pm .025"(.63)$ / $.xxx(.xx) \pm .010"(.25)$

Specifications are subject to change without notice.

.290" MOUNT PANEL LIGHT SOCKETS



Water-Tight

- Sockets for model C905 - For Splash Down Environments (not submersible)

Mounting Hole Diameter: $\varnothing.375"$ - $\varnothing.385"$
Maximum Panel Thickness Max: 0.80"

1 Socket Model

PS90
PS90T

2 Lens Model

-L92

3 Lens Diffusion

-C
Clear

-N
Diffused

4 Lens Color

R Red B Blue
A Amber W Water Clear
Y Yellow -S Smoke^[1]
G Green

5 Water Tight

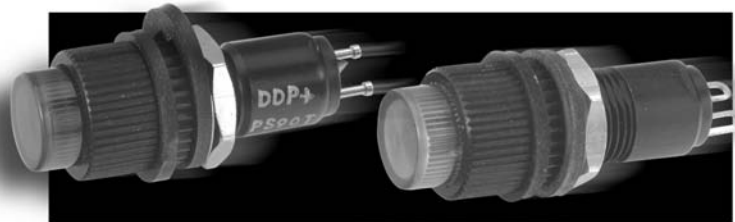
-WT

TO ORDER, FOLLOW THE EXAMPLE:

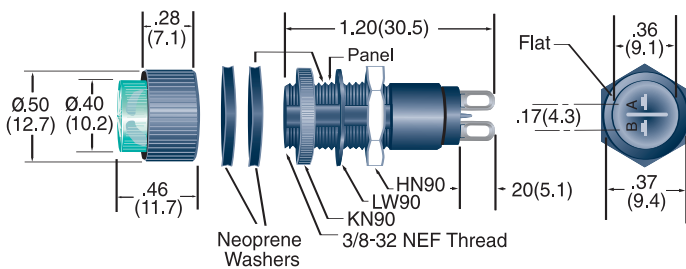
Select one **BOLD** component from each numbered category in the tables below.

1	2	3	4	5
Socket Model	Lens Model	Lens Diffusion	Lens Color	Water Tight
PS90	-L92	-C	-Y	-WT

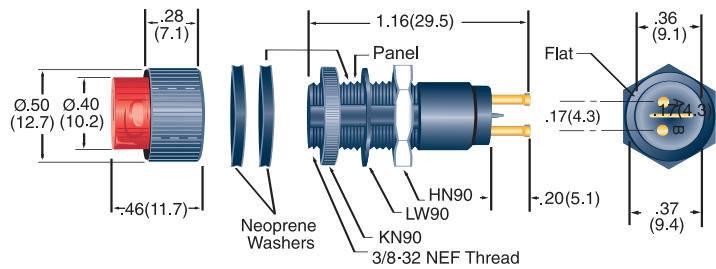
→Part Number **PS90T-L92-CY-WT**



PS90, Water Tight



PS90T, Water Tight



[1] Omit Lens Diffusion Code (e.g. PS90T-L92-S-WT).

All dimensions are in inches (mm)

Tolerances: $.xx"(.x) \pm .025"(.63)$ / $.xxx"(.xx) \pm .010"(.25)$
Specifications are subject to change without notice.

PRODUCT SELECTION WIZARD



Data Display Products®

Our menu-driven product
selection guide is available at
www.datadisplay.com.

You can assemble a part number
and request a sample based on
your application criteria.

.312" MOUNT PANEL LIGHTS

50 Series

- Mounting Hardware Provided - For Detailed LED Data, See Discrete Section, MODEL 200

1 Model	Wires
51	W
53 ^[1]	(optional)
54	
56	
561	
564	

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each numbered category in the tables below.

1 Model	2 LED	3 Voltage	4 Lens Diffusion	5 Lens Color	6 Bezel Color
54	-ALP	2	-C	A	9

→ Part Number **54-ALP2-CA9**

MEDIUM INTENSITY - TINTED ENCAPSULATION					
2 LED	Color	λpk (nm)	Iv ^[2] (mcd)	Viewing Angle	V/C Table ^[3]
-BCR	RED	635	120	35	I
-BCA	AMB	583	100	35	I
-BCG	GRN	565	80	24	I

Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table I	
5V/22mA	5.5V/28mA
12V/20mA	14V/25mA
15V/24mA	16.5V/28mA
24V/17mA	26V/20mA
28V/16.5mA	30V/18mA
48V/15mA	50V/16mA
60V/9mA	65V/10mA
120VAC/3.5mA	130VAC/4mA

3 Voltage ^[4]
2
5H
12H
15H
24H
28H
48H
60H
120 ^[5]

HIGH INTENSITY - WATERCLEAR ENCAPSULATION					
LED	Color	λpk (nm)	Iv ^[2] (mcd)	Viewing Angle	V/C Table ^[3]
-NWR	RED	634	2800	30	I
-NWO	ORG	605	2000	30	I
-NWA	AMB	592	2800	30	I
-NWG	GRN	520	2400	45	II
-NWB	BLU	465	700	45	II
-NWW ^[7]	CWHT		2500	50	II
-NWL ^[7]	WWHT		1800	50	II
-NKR	RED	634	3600	15	I
-NKO	ORG	605	8000	15	I
-NKA	AMB	592	3600	15	I
-NKG	GRN	520	10000	15	II
-NKB	BLU	465	3000	15	II
-NKW ^[7]	CWHT		9200	20	II
-NKL ^[7]	WWHT		9200	15	II

Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table II	
5V/15mA	5.5V/23mA
12V/15mA	14V/20mA
15V/15mA	16.5V/18mA
24V/15mA	26V/18mA
28V/15mA	30V/17mA
48V/9.5mA	50V/10mA
60V/7mA	65V/8mA
120VAC/3.5mA	130VAC/4mA

4 Lens Diffusion
-C Clear
-N Diffused

5 Lens Color
R Red B Blue
A Amber W Water Clear
Y Yellow
-S Smoke ^[8]
G Green

SPECIALTY LEDs						
LED	Color	λpk (nm)	Iv ^[2] (mcd)	Viewing Angle	V/C Table ^[3]	Description
-RLP ^[6]	RED	635	2.3	50	[3]	Low Power
-ALP ^[6]	AMB	583	2.1	50	[3]	Low Power
-GLP ^[6]	GRN	565	2.3	50	[3]	Low Power
-LRG ^[7]	RED/GRN	660/565	90/40	60	I	Bi-Color, Red Cathode
-RAG ^[7]	RED/AMB/GRN	630/565	6/6/6	60	I	Tri-Color, Common Cathode
-GAR ^[7]	GRN/AMB/RED	635/565	5/5/5	50	I	Tri-Color, Common Anode

6 Bezel Color
0 Black
9 White

[1] Model 53 is available with Clear (-C) Lens only.

[2] Iv = typical luminous intensity @ If = 20mA (Ta = 25°C). Iv is measured without lenses. For Low Power LEDs, If = 2mA.

[3] See Voltage/Current table for design specifications. Design current for low power LEDs = 2mA.

[4] Ta = 25°C. Voltage 2 indicates external resistor required. Voltages 5H through 60H are VDC.

[5] For AC operation, insert D after Voltage (e.g. 24HD), D indicates built-in rectifier; not required for 5H or 120VAC. DC operation not available for 120V. Bi-Color and Tri-Color not available in AC voltages.

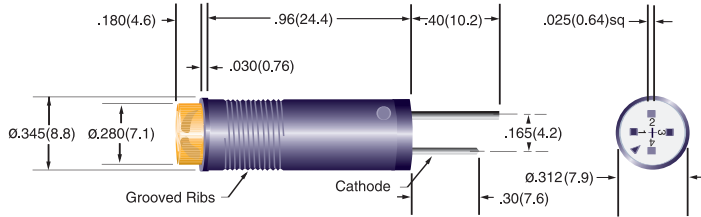
[6] Select high intensity LEDs only.

[7] Omit H when selecting a voltage (e.g. 51-RLP12-CW0).

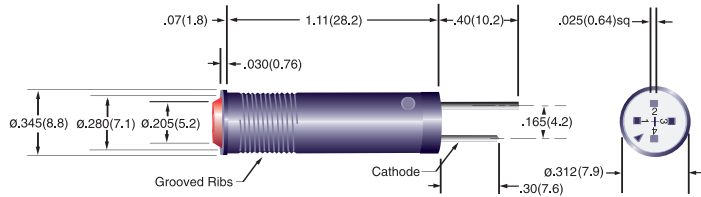
[8] Select -CW or -NW lens only. -RAG wire leads: green anode/black cathode/red anode. -GAR wire leads: green cathode/black anode/red cathode. Common lead is the first lead clockwise from reference mark on header. Tri-Color 5 or 12 volt, omit H in part number.

[9] Omit Lens Diffusion when selecting smoked lens (e.g. 51-NWA12H-S0).

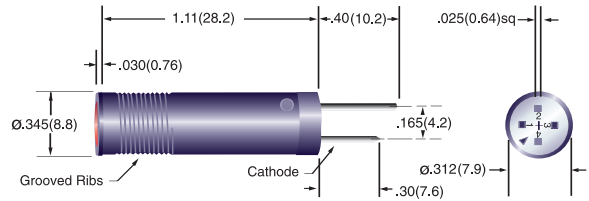
51



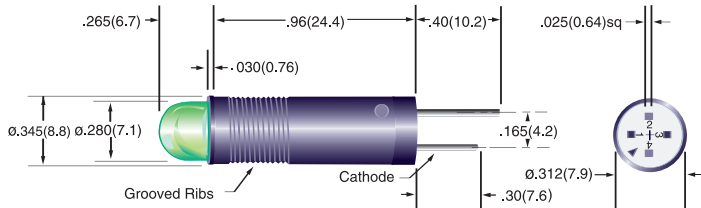
53



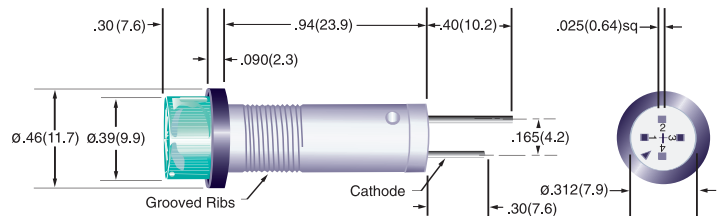
54 (flush lens)



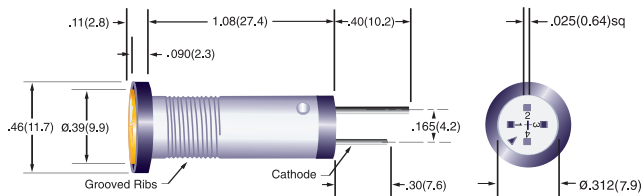
56



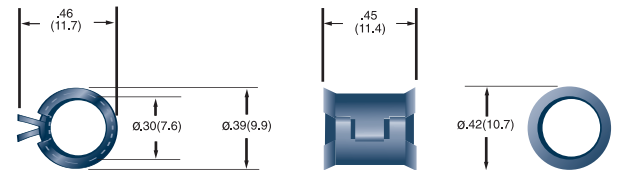
561



564



TC5 & NW5 Mounting Hardware



Standard Wire Leads:

6.0" total length(nominal)/.50" stripped (nominal), red anode/black cathode, 24 AWG TPB UL1061 insulation. Contact factory for other lengths, gauges and colors.

All dimensions are in inches (mm)

Tolerances: .xx"(.x) $\pm .025$ "(.63) / .xxx"(.xx) $\pm .010$ "(.25)
Specifications are subject to change without notice.

.230" PANEL MOUNT REFLECTOR

T-1, Water-Tight Optional

- Reflective Chrome-Plated Body - Mounting Hardware Provided - Maximum Panel Thickness .125"(PMRL125); .070"(PMRL125, Water-Tight)
- For Detailed LED Data, See Discrete Section, MODEL 125

1	Model	Wires
	PMRL125	W (optional)

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each numbered category in the tables below.

1	Model	Wire	2	LED	3	Voltage	4	Water Tight
	PMRL125	W		-BCG		12H		

→Part Number **PMRL125W-BCG12H**

STANDARD INTENSITY - DIFFUSED ENCAPSULATION						
2	LED	Color	λ_{pk} (nm)	$I_v^{[1]}$ (mcd)	Viewing Angle	V/C Table^[2]
	-BR	RED	635	14	60	I
	-BA	AMB	583	14	60	I
	-BG	GRN	565	14	60	I

MEDIUM INTENSITY - TINTED ENCAPSULATION						
2	LED	Color	λ_{pk} (nm)	$I_v^{[1]}$ (mcd)	Viewing Angle	V/C Table^[2]
	-BCR	RED	635	60	45	I
	-BCA	AMB	583	30	45	I
	-BCG	GRN	565	44	45	I

HIGH INTENSITY - WATERCLEAR ENCAPSULATION						
2	LED	Color	λ_{pk} (nm)	$I_v^{[1]}$ (mcd)	Viewing Angle	V/C Table^[2]
	-NWR	RED	634	2180	35	I
	-NWA	AMB	592	2180	35	I
	-NWG	GRN	520	2000	45	II
	-NWB	BLU	465	600	45	II
	-NWW	WHT	1100	1100	55	II

Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table I	
5V/22mA	5.5V/28mA
12V/20mA	14V/25mA
15V/24mA	16.5V/28mA
24V/17mA	26V/20mA
28V/16.5mA	30V/18mA
48V/15mA	50V/16mA
60V/9mA	65V/10mA
120VAC/3.5mA	130VAC/4mA

Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table II	
5V/15mA	5.5V/23mA
12V/15mA	14V/20mA
15V/15mA	16.5V/18mA
24V/15mA	26V/18mA
28V/15mA	30V/17mA
48V/9.5mA	50V/10mA
60V/7mA	65V/8mA
120VAC/3.5mA	130VAC/4mA

3	Voltage^[3]
	2
	5H
	12H
	15H
	24H
	28H
	48H
	60H
	120 ^[4]

4	Water Tight^[5]
	-WT (optional)

SPECIALTY LEDs - DIFFUSED ENCAPSULATION							
2	LED	Color	λ_{pk} (nm)	$I_v^{[1]}$ (mcd)	Viewing Angle	V/C Table^[2]	Description
	-RLP ^[6]	RED	635	2.1	50	[2]	Low Power
	-ALP ^[6]	AMB	583	1.6	50	[2]	Low Power
	-GLP ^[6]	GRN	565	2.1	50	[2]	Low Power
	-RG	RED/GRN	630/565	5.0/5.0	72	I	Bi-Color, Red Cathode

[1] I_v = typical luminous intensity @ $I_f = 20mA (T_a = 25^\circ C)$. For Low Power LEDs, $I_f = 2mA$.

[2] See Voltage/Current table for design specifications. Design current for low power LEDs = 2mA.

[3] $T_a = 25^\circ C$. Voltage "2" indicates external resistor required. Voltages 5H through 60H are VDC. For AC operation, insert D after Voltage (e.g. 24HD). D indicates built-in rectifier, not required for 5H or 120VAC. DC operation not available for 120VAC. Bi-Color not available in AC voltages.

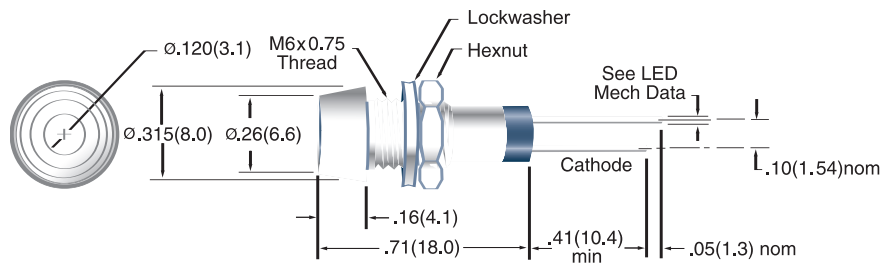
[4] Select high intensity LEDs only.

[5] Drip-proof (not submersible), supplied with two neoprene gaskets.

[6] Omit H when selecting a voltage (e.g. PMRL125-RLP12).



PMRL125



Standard Wire Leads:

6.0" total length(nominal)/.50" stripped (nominal), red anode/black cathode, 24 AWG TPB UL1061 insulation. Contact factory for other lengths, gauges and colors.

All dimensions are in inches (mm)

Tolerances: .xx"(.x) $\pm .025"$ (.63) / .xxx"(.xx) $\pm .010"$ (.25)
Specifications are subject to change without notice.

.312" PANEL MOUNT REFLECTOR

T-1³/₄, Water-Tight Optional

- Reflective Chrome-Plated Body - Mounting Hardware Provided - Maximum Panel Thickness .160"(PMRL200); .100"(PMRL200, Water-Tight)
 - For Detailed LED Data, See Discrete Section, MODEL 200

1	Model	Wires
	PMRL200	W (optional)

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each numbered category in the tables below.

1	Model	Wire	2	LED	3	Voltage	4	Water Tight
	PMRL200	W		-BCA		12H		

→Part Number **PMRL200W-BCA12H**

STANDARD INTENSITY - DIFFUSED ENCAPSULATION						
2	LED	Color	λ pk (nm)	Iv ^[1] (mcd)	Viewing Angle	V/C Table ^[2]
	-BR	RED	635	14	60	I
	-BA	AMB	583	16	60	I
	-BG	GRN	565	10	60	I

MEDIUM INTENSITY - TINTED ENCAPSULATION						
2	LED	Color	λ pk (nm)	Iv ^[1] (mcd)	Viewing Angle	V/C Table ^[2]
	-BCR	RED	635	120	35	I
	-BCA	AMB	583	100	35	I
	-BCG	GRN	565	80	24	I

HIGH INTENSITY - WATERCLEAR ENCAPSULATION						
2	LED	Color	λ pk (nm)	Iv ^[1] (mcd)	Viewing Angle	V/C Table ^[2]
	-NWR	RED	634	2800	30	I
	-NWO	ORG	605	2000	30	I
	-NWA	AMB	592	2800	30	I
	-NWG	GRN	520	2400	45	II
	-NWB	BLU	465	700	45	II
	-NWW	CWHT		2500	50	II
	-NWL	WWHT		1800	50	II
	-NKR	RED	634	3600	15	I
	-NKO	ORG	605	8000	15	I
	-NKA	AMB	592	3600	15	I
	-NKG	GRN	520	10000	15	II
	-NKB	BLU	465	3000	15	II
	-NKW	CWHT		9200	20	II
	-NKL	WWHT		9200	15	II

Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table I	
5V/22mA	5.5V/28mA
12V/20mA	14V/25mA
15V/24mA	16.5V/28mA
24V/17mA	26V/20mA
28V/16.5mA	30V/18mA
48V/15mA	50V/16mA
60V/9mA	65V/10mA
120VAC/3.5mA	130VAC/4mA

Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table II	
5V/15mA	5.5V/23mA
12V/15mA	14V/20mA
15V/15mA	16.5V/18mA
24V/15mA	26V/18mA
28V/15mA	30V/17mA
48V/9.5mA	50V/10mA
60V/7mA	65V/8mA
120VAC/3.5mA	130VAC/4mA

3	Voltage ^[3]
	2
	5H
	12H
	15H
	24H
	28H
	48H
	60H
	120 ^[4]

4	Water Tight ^[5]
	-WT (optional)

SPECIALTY LEDs - DIFFUSED ENCAPSULATION						
LED	Color	λ pk (nm)	Iv ^[1] (mcd)	Viewing Angle	V/C Table ^[3]	Description
-RLP ^[6]	RED	635	2.3	50	[3]	Low Power
-ALP ^[6]	AMB	583	2.1	50	[3]	Low Power
-GLP ^[6]	GRN	565	2.3	50	[3]	Low Power
-LRG	RED/GRN	660/565	90/40	60	I	Bi-Color, Green Cathode
-RAG ^[7]	RED/AMB/GRN	630/565	6/6/6	60	I	Tri-Color, Common Cathode
-GAR ^[7]	GRN/AMB/RED	635/565	5/5/5	50	I	Tri-Color, Common Anode

[1] Iv = typical luminous intensity @ If = 20mA (Ta = 25°C). For Low Power LEDs, If = 2mA.

[2] See Voltage/Current table for design specifications. Design current for low power LEDs = 2mA.

[3] Ta = 25°C. Voltage "2" indicates external resistor required. Voltages 5H through 60H are VDC. For AC operation, insert D after Voltage (e.g. 24HD). D indicates built-in rectifier, not required for 5H or 120VAC. DC operation not available for 120V. Bi-Color and Tri-Color not available in AC voltages.

[4] Select high intensity LEDs only

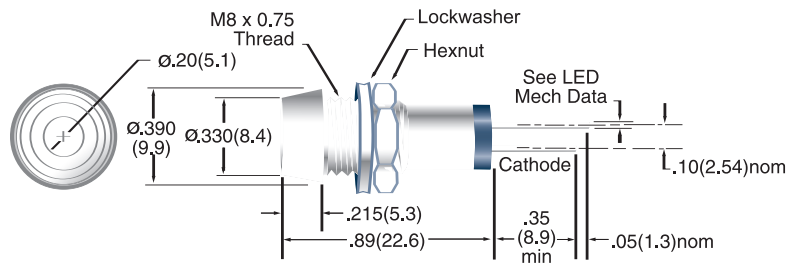
[5] Drip-proof (not submersible), supplied with two neoprene gaskets.

[6] Omit H when selecting a voltage (e.g. PMR200-RLP12).

[7] -RAG Wire Leads: green anode/black cathode/red anode. -GAR Wire Leads: green cathode/black anode/red cathode. Tri-Color 5 or 12 volt, omit H from part number.



PMRL200



Standard Wire Leads:

6.0" total length(nominal)/.50" stripped (nominal), red anode/black cathode, 24 AWG TPB UL1061 insulation. Contact factory for other lengths, gauges and colors.

All dimensions are in inches (mm)

Tolerances: .xx"(.x) ±.025"(.63) / .xxx"(.xx)±.010"(.25)
Specifications are subject to change without notice.

.312" MOUNT PANEL LIGHT

74S Series

- Black Anodized Aluminum Body - For Detailed LED Data, See Discrete Section, Model 200

1	Model	Wires
	74S	W (optional)

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each numbered category in the tables below.

1	Model	2	LED	3	Voltage	4	Lens Diffusion	5	Lens Color
	74S		-NWR		120		-C		R

→Part Number **74S-NWR120-CR**

HIGH INTENSITY - WATERCLEAR ENCAPSULATION						
2	LED	Color	λ_{pk} (nm)	$I_v^{[1]}$ (mcd)	Viewing Angle	V/C Table ^[2]
	-NWR	RED	634	2800	30	I
	-NWO	ORG	605	2000	30	I
	-NWA	AMB	592	2800	30	I
	-NWG	GRN	520	2400	45	II
	-NWB	BLU	465	700	45	II
	-NWW	CWHT		2500	50	II
	-NWL	WWHT		1800	50	II

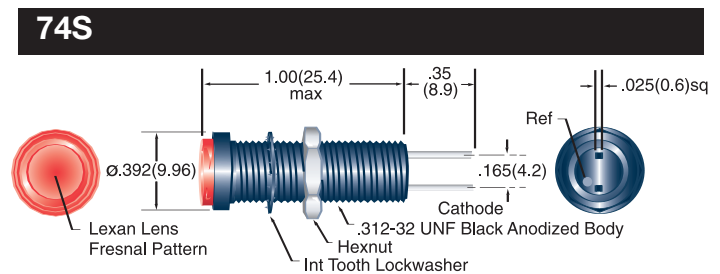
Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table I	
5V/22mA	5.5V/28mA
12V/20mA	14V/25mA
15V/24mA	16.5V/28mA
24V/17mA	26V/20mA
28V/16.5mA	30V/18mA
48V/15mA	50V/16mA
60V/9mA	65V/10mA
120VAC/3.5mA	130VAC/4mA

3	Voltage^[3]
	2
	5H
	12H
	15H
	24H
	28H
	48H
	60H
	120

Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table II	
5V/15mA	5.5V/23mA
12V/15mA	14V/20mA
15V/15mA	16.5V/18mA
24V/15mA	26V/18mA
28V/15mA	30V/17mA
48V/9.5mA	50V/10mA
60V/7mA	65V/8mA
120VAC/3.5mA	130VAC/4mA

4	Lens Diffusion
	-C Clear

5	Lens Color	
	R Red	G Green
	A Amber	W Water Clear
	Y Yellow	



[1] I_v = typical luminous intensity @ $I_f = 20mA (T_a = 25^\circ C)$. I_v is measured without lenses.
 [2] See Voltage/Current table for design specifications.

[3] $T_a = 25^\circ C$. Voltages 5H through 60H are VDC. For AC operation, insert D after Voltage (e.g. 24HD), D indicates built-in rectifier; not required for 5H or 120VAC. DC operation not available for 120V.

Standard Wire Leads:
 6.0" total length(nominal)/.50" stripped (nominal), red anode/black cathode, 24 AWG TPB UL1061 insulation. Contact factory for other lengths, gauges and colors.

All dimensions are in inches (mm)
 Tolerances: .xx"(.x) $\pm .025$ ".(63) / .xxx"(.xx) $\pm .010$ ".(25)
 Specifications are subject to change without notice.

- For Detailed LED Data, See Discrete Section, Model 200

1	Model	Wires
	P81 P84	W (optional)

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each numbered category in the tables below.

1	Model	2	LED	3	Voltage	4	Lens
	P81		-G		24		-CG

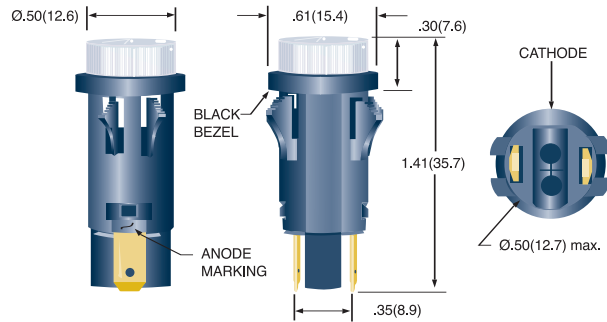
→Part Number **P81-G24-CG**

HIGH INTENSITY - WATERCLEAR ENCAPSULATION						
2	LED	Color	λ_{pk} (nm)	I_v [1] (mcd)	Viewing Angle	V/C Table[2]
	-R	RED	634	780	75	I
	-O	ORG	605	360	75	I
	-A	AMB	592	600	75	I
	-G	GRN	520	780	75	II
	-B	BLU	465	168	75	II
	-W	CWHT		280	75	II

Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table I	
5V/22mA	5.5V/28mA
6V/21mA	7V/27mA
12V/20mA	14V/25mA
15V/24mA	16.5V/28mA
24V/17mA	26V/20mA
28V/16.5mA	30V/18mA
48V/15mA	50V/16mA
60V/9mA	65V/10mA
120VAC/3.5mA	130VAC/4mA

3	Voltage ^[4]
	2
	5
	6
	12
	15
	24
	28
	48
	60
	120

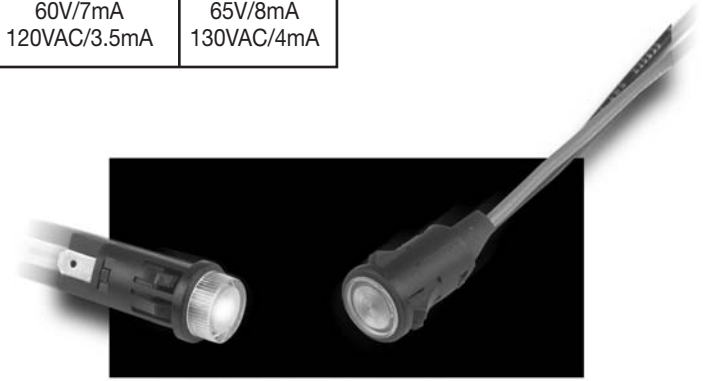
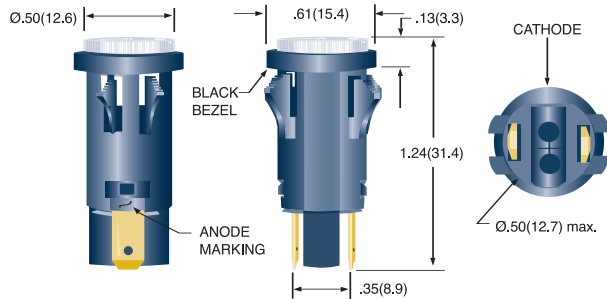
P81



Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table II	
5V/15mA	5.5V/23mA
6V/15mA	7V/25mA
12V/15mA	14V/20mA
15V/15mA	16.5V/18mA
24V/15mA	26V/18mA
28V/15mA	30V/17mA
48V/9.5mA	50V/10mA
60V/7mA	65V/8mA
120VAC/3.5mA	130VAC/4mA

4	Lens
-CR	Red
-CA	Amber
-CG	Green
-CB	Blue
-CW	Water Clear

P84



[1] I_v = typical luminous intensity @ $I_f = 20mA(T_a=25^\circ C)$. I_v is measured without lenses.
 [2] See Voltage/Current table for design specifications.
 [3] $T_a = 25^\circ C$. Voltages 5 through 60 are VDC. For AC operation, insert D after Voltage (e.g 24D), D indicates built-in rectifier; not required for 5VDC or 120VAC. DC operation not available for 120V.

Standard Wire Leads:
 6.0" total length(nominal)/.50" stripped (nominal), red anode/black cathode, 18 AWG stranded UL1015 insulation. Contact factory for other lengths, gauges and colors.

All dimensions are in inches (mm)
 Tolerances: .xx"(.x) $\pm .025"$ (.63) / .xxx"(.xx) $\pm .010"$ (.25)
 Specifications are subject to change without notice.

17/32" MOUNT PANEL LIGHT WITH LENS

High Intensity, Wide Angle

1	Model
	1732

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each SHADED column in the tables below.

1	Model	2	LED	3	Voltage	4	Lens	5	Bi-Polar
	1732		-B		24		-CB		

→Part Number **1732-B24-CB**

2	LED	Color	λpk (nm)	Iv^[1] (mcd)	V/C Table^[2]
	-R	RED	634	2180	I
	-A	AMB	592	2180	I
	-G	GRN	520	2000	II
	-B	BLU	465	600	II
	-W	CWHT		2500	II
	-L	WWHT		1800	II

Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table I	
5V/22mA	5.5V/28mA
6V/21mA	7V/27mA
12V/20mA	14V/25mA
15V/24mA	16.5V/28mA
24V/17mA	26V/20mA
28V/16.5mA	30V/18mA
48V/15mA	50V/16mA
60V/9mA	65V/10mA
120VAC/3.5mA	130VAC/4mA

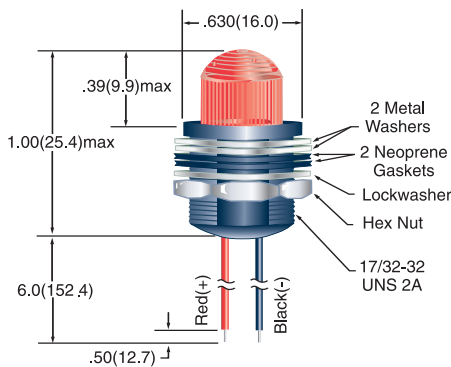
3	Voltage^[3]
	5
	6
	12
	15
	24
	28
	48
	60
	120



Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table II	
5V/15mA	5.5V/23mA
6V/15mA	7V/25mA
12V/15mA	14V/20mA
15V/15mA	16.5V/18mA
24V/15mA	26V/18mA
28V/15mA	30V/17mA
48V/9.5mA	50V/10mA
60V/7mA	65V/8mA
120VAC/3.5mA	130VAC/4mA

4	Lens
	-CR Red
	-CA Amber
	-CG Green
	-CB Blue
	-CW Water Clear

1732



[1] Iv = typical luminous intensity @ If = 20mA (Ta=25°C). Luminous intensity is measured without the lens.

[2] See Voltage/Current table for design specifications.

[3] Ta = 25°C. Voltages 5 through 60 are VDC. For AC operation, insert AC after Voltage (e.g. 24AC), not required for 120V. Contact factory for VAC design currents. For 120VDC insert DC after Voltage (e.g. 120DC).

Standard Wire Leads:

6.0" total length(nominal)/.50" stripped (nominal), red anode/black cathode, 24 AWG TPB UL1061 insulation. Contact factory for other lengths, gauges and colors.

All dimensions are in inches (mm)

Tolerances: .xx"(x) ±.025"(.63) / .xxx"(xx)±.010"(.25)
Specifications are subject to change without notice.

1	Model	Wires
	1116	W (optional)

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each numbered category in the tables below.

1	Model	2	LED	3	Voltage	4	Lens
	1116W		-R		12		-CW

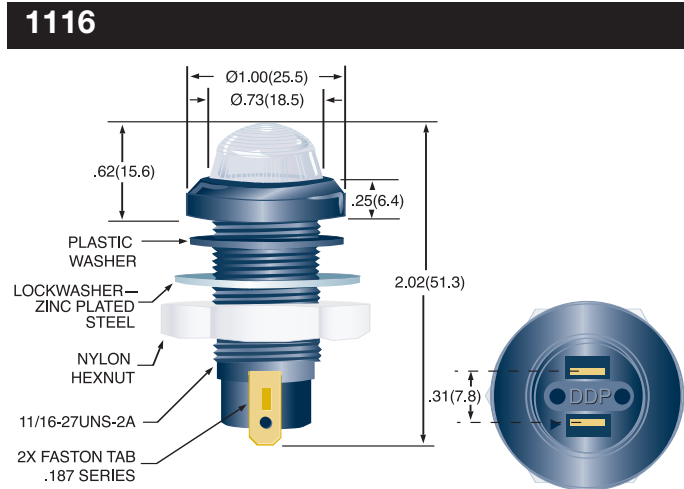
→Part Number **1116W-R12-CW**

2	LED	Color	λ.pk (nm)	Iv^[1] (mcd)	V/C Table^[2]
	-R	RED	634	2800 (*4)	I
	-O	ORG	609	2000 (*4)	I
	-A	AMB	592	2800 (*4)	I
	-G	GRN	520	2400 (*2)	II
	-B	BLU	465	700 (*2)	II
	-W	CWHT		2500 (*2)	II
	-L	WWHT		1800 (*2)	II

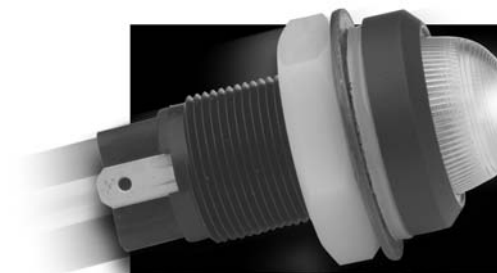
Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table I	
5V/75mA	5.5V/85mA
6V/40mA	7V/60mA
12V/30mA	14V/40mA
15V/30mA	16.5V/35mA
24V/30mA	26V/35mA
28V/25mA	30V/28mA
48V/20mA	52V/22mA
60V/16mA	65V/18mA
120VAC/9.5mA	130VAC/10.5mA

3	Voltage^[3]
	5
	6
	12
	15
	24
	28
	48
	60
	120

4	Lens
	-CW



Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table II	
5V/26mA	5.5V/35mA
6V/28mA	7V/39mA
12V/15mA	14V/22mA
15V/15mA	16.5V/19mA
24V/15mA	26V/18mA
28V/15mA	30V/18mA
48V/9mA	50V/9.5mA
60V/6.5mA	65V/7.2mA
120VAC/5mA	130VAC/5.5mA



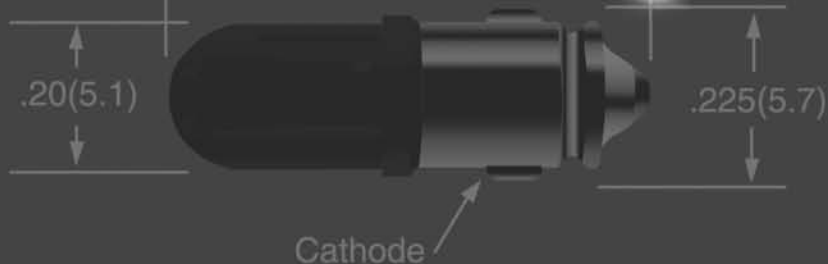
[1] Iv = typical luminous intensity @ If = 20mA(Ta=25°C). (*4) = 4 LEDs per package; (*2) = 2 LEDs per package.
 [2] See Voltage/Current table for design specifications.
 [3] Ta = 25°C. Voltages 6 through 60 are VDC. For AC operation, insert D after Voltage (e.g 24AC), not required for 120V. Contact factory for VAC design currents. For 120 VDC, insert DC after Voltage (e.g. 120DC).

Standard Wire Leads:
 6.0" total length(nominal)/.50" stripped (nominal), red anode/black cathode, 18 AWG stranded UL1015 insulation. Contact factory for other lengths, gauges and colors.

All dimensions are in inches (mm)
 Tolerances: .xx"(x) ±.025"(.63) / .xxx"(xx)±.010"(.25)
 Specifications are subject to change without notice.



LED Lamps



- For Detailed LED Data, See Discrete Section, MODEL 200

1 Model^[1]

BP202 ^[5]	Bi-Pin
MB200	Bayonet
MF200 ^[6]	Flange
MG200	Groove
MS200	Screw
WB201	Wedge

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each SHADED column in the tables below.

1 Model	2 LED	3 Voltage
WB201	-BCG	12H

→Part Number **WB201-BCG12H**

2 MEDIUM INTENSITY - TINTED ENCAPSULATION

LED	Color	λpk (nm)	Iv ^[2] (mcd)	Viewing Angle	V/C Table ^[3]
-BCR	RED	635	120	35	I
-BCA	AMB	583	100	35	I
-BCG	GRN	565	80	24	I

Voltage/Current

Design Vf/If	Max Vf/If
V/C Table I	
5V/22mA	5.5V/28mA
6V/21mA	7V/27mA
12V/20mA	14V/25mA
15V/24mA	16.5V/28mA
24V/17mA	26V/20mA
28V/16.5mA	30V/18mA

3 Voltage^[4]

2
5H
6H
12H
15H
24H
28H

HIGH INTENSITY- WATERCLEAR ENCAPSULATION

LED	Color	λpk (nm)	Iv ^[2] (mcd)	Viewing Angle	V/C Table ^[3]
-NWR	RED	634	2800	30	I
-NWO	ORG	605	2000	30	I
-NWA	AMB	592	2800	30	I
-NWG	GRN	520	2400	45	II
-NWB	BLU	465	700	45	II
-NWW	CWHT		2500	50	II
-NWL	WWHT		1800	50	II
-NKR	RED	634	3600	15	I
-NKO	ORG	605	8000	15	I
-NKA	AMB	592	3600	15	I
-NKG	GRN	520	10000	15	II
-NKB	BLU	465	3000	15	II
-NKW	CWHT		9200	20	II
-NKL	WWHT		9200	15	II

Voltage/Current

Design Vf/If	Max Vf/If
V/C Table II	
5V/15mA	5.5V/23mA
6V/15mA	7V/25mA
12V/15mA	14V/20mA
15V/15mA	16.5V/18mA
24V/15mA	26V/18mA
28V/15mA	30V/17mA

WIDE ANGLE/FLAT-TOPPED-WATERCLEAR ENCAPSULATION

LED	Color	λpk (nm)	Iv ^[2] (mcd)	Viewing Angle	V/C Table ^[3]
-NFR	RED	634	780	75	I
-NFA	AMB	592	600	75	I
-NFG	GRN	520	780	75	II
-NFB	BLU	465	168	75	II
-NFW	WHT		280	75	II

SPECIALTY LEDs

LED	Color	λpk (nm)	Iv ^[2] (mcd)	Viewing Angle	V/C Table ^[3]	Description
-RLP ^[7]	RED	635	2.3	50	[3]	Low Power
-ALP ^[7]	AMB	583	2.1	50	[3]	Low Power
-GLP ^[7]	GRN	565	2.3	50	[3]	Low Power
-LRG	RED/GRN	660/565	90/40	60	I	Bi-Color, Red Cathode

[1] All Models are center anode (note cathode notch for BP202, BP203 and WB201). Insert C after Model for center cathode (e.g. MF200C).

[2] Iv = typical luminous intensity @ If = 20mA (Ta=25°C). Low Power LEDs = 2mA.

[3] See Voltage/Current table for design specifications. Design current for low power LEDs = 2mA.

[4] Ta = 25°C. Voltage 2 indicates external resistor required. Voltages 5H through 28H are VDC.

[5] For AC operation, insert D after Voltage (e.g. 24HD). D indicates built-in rectifier; not required for 5H.

[5] Optional Socket available. See Model BPS-1 (pg. 72).

[6] Optional Socket available. See Model MFS1-B (pg. 74).

[7] Omit "H" Voltage designation (e.g. MG200-RLP12).

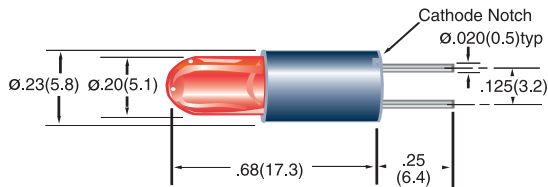
Continued...

T-1 3/4 SUB-MINIATURE LAMP

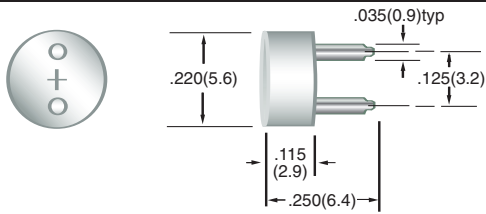
Single-Chip

- For Detailed LED Data, See Discrete Section, MODEL 200

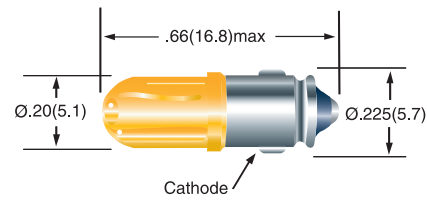
BP202



BPS-1 (Socket for BP202 Lamp)

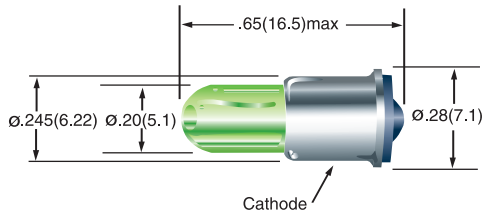


MB200



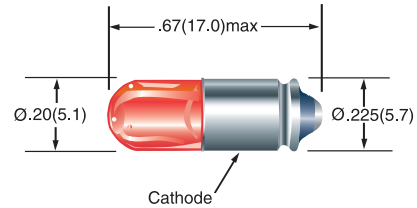
Available with Center Cathode

MF200



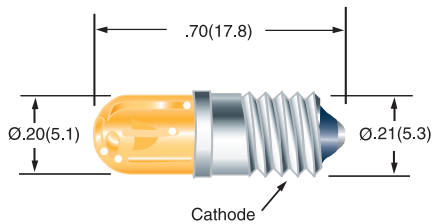
Available with Center Cathode

MG200



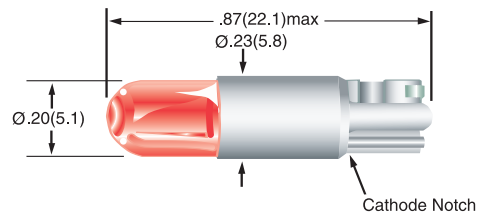
Available with Center Cathode

MS200



Available with Center Cathode

WB201



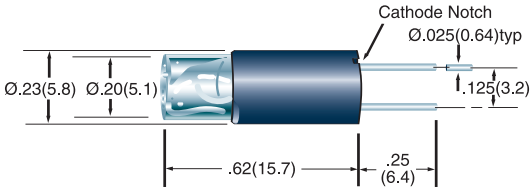
All dimensions are in inches (mm)

Tolerances: .xx"(.x) ±.025"(.63) / .xxx"(.xx)±.010"(.25)

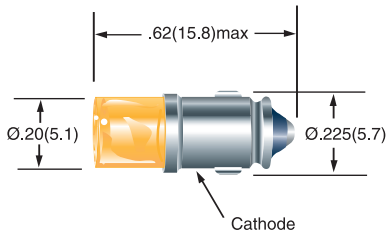
Specifications are subject to change without notice.

Wide Angle LED Lamps

BP202, NFX Series (75°)

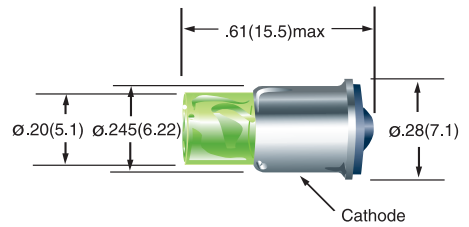


MB200, NFX Series (75°)



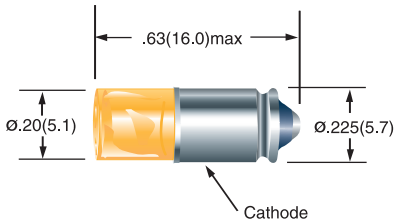
Available with Center Cathode

MF200, NFX Series (75°)



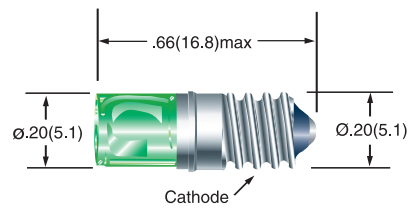
Available with Center Cathode

MG200, NFX Series (75°)



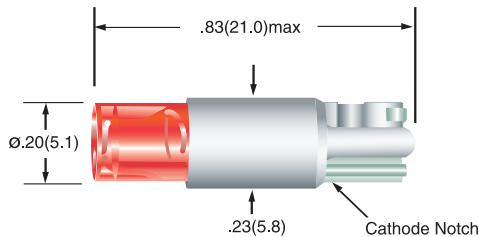
Available with Center Cathode

MS200, NFX Series (75°)



Available with Center Cathode

WB201, NFX Series (75°)



All dimensions are in inches (mm)

Tolerances: .xx"(x) ±.025"(.63) / .xxx"(xx)±.010"(.25)

Specifications are subject to change without notice.

T-1 3/4 SUB-MINIATURE LAMP

Socket and Fresnel Lens

- Flange Base Socket for Model MF200

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each SHADED column in the tables below.

1 Socket		
MFS1-B		
1 Model	2 Lens Diffusion	3 Lens Color
MF61	-C	R

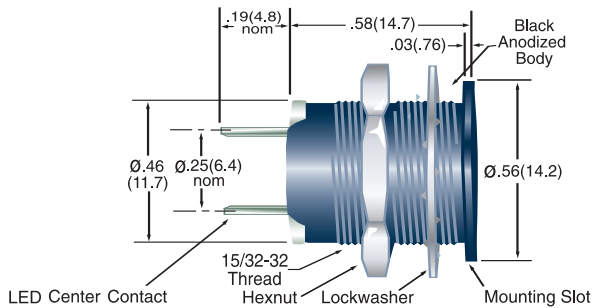
→ Part Number **MFS1-B** (Socket)
MF61-CR (Model MF61, Clear Red Lens)

SOCKET	
1 Part #	Description
MFS1-B ^[1]	For Use With Model MF200 and MF61 lens

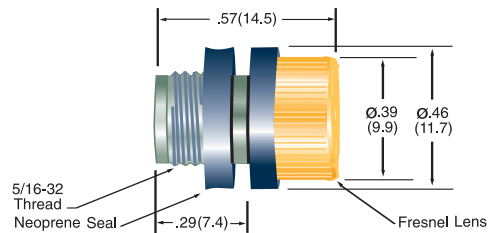
Lens (For Use With MFS1-B Socket)		
1 MODEL	2 Lens Diffusion	3 Lens Color
MF61	-C Clear	R Red
	-N Diffused	A Amber
		Y Yellow
		G Green
		B Blue
		W Water Clear
		-S ^[2] Smoke



MFS1-B



MF61



[1] For Mounting Diameter .470" +/- .005"; Panel Thickness 1/16" to 5/16".

[2] Do not select a Diffusion Code (e.g. MF61-S).

All dimensions are in inches (mm)

Tolerances: .xx"(.x) ±.025"(.63) / .xxx"(.xx)±.010"(.25)

Specifications are subject to change without notice.

- For Detailed LED Data, See Discrete Section, MODEL 200

1 Model^[1]

MB400	Bayonet
MBL400	Bayonet
MF400	Flange
MFL400	Flange
MS400	Screw
MSL400	Screw

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each SHADED column in the tables below.

1 Model	2 LED	3 Voltage
MS400	-NWG	24H

→Part Number **MS400-NWG24H**

2 HIGH INTENSITY-WATERCLEAR ENCAPSULATION

LED	Color	λpk (nm)	Iv ^[2] (mcd)	Viewing Angle	V/C Table ^[3]
-NWR	RED	634	2800	30	I
-NWO	ORG	605	2000	30	I
-NWA	AMB	592	2800	30	I
-NWG	GRN	520	2400	45	II
-NWB	BLU	465	700	45	II
-NWW	CWHT		2500	50	II
-NWL	WWHT		1800	50	II
-NKR	RED	634	3600	15	I
-NKO	ORG	605	8000	15	I
-NKA	AMB	592	3600	15	I
-NKG	GRN	520	10000	15	II
-NKB	BLU	465	3000	15	II
-NKW	CWHT		9200	20	II
-NKL	WWHT		9200	15	II

Voltage/Current

Design Vf/If	Max Vf/If
V/C Table I	
5V/22mA	5.5V/28mA
6V/21mA	7V/27mA
12V/20mA	14V/25mA
15V/24mA	16.5V/28mA
24V/17mA	26V/20mA
28V/16.5mA	30V/18mA
48V/15mA	50V/16mA
60V/9mA	65V/10mA
120VAC/3.5mA	130VAC/4mA

3 Voltage^[4]

2
5H
6H
12H
15H
24H
28H
48H
60H
120

WIDE ANGLE/FLAT-TOPPED-WATERCOLOR ENCAPSULATION

LED	Color	λpk (nm)	Iv ^[2] (mcd)	Viewing Angle	V/C Table ^[3]
-NFR	RED	634	780	75	I
-NFA	AMB	592	600	75	I
-NFG	GRN	520	780	75	II
-NFB	BLU	465	168	75	II
-NFW	WHT		280	75	II

Voltage/Current

Design Vf/If	Max Vf/If
V/C Table II	
5V/15mA	5.5V/23mA
6V/15mA	7V/25mA
12V/15mA	14V/20mA
15V/15mA	16.5V/18mA
24V/15mA	26V/18mA
28V/15mA	30V/17mA
48V/9.5mA	50V/10mA
60V/9mA	65V/10mA
120VAC/3.5mA	130VAC/4mA



[1] All Models are center anode. Insert C after Model for center cathode (e.g. MBL400C).

[2] Iv = typical luminous intensity @ If = 20mA (Ta=25°C).

[3] See Voltage/Current table for design specifications.

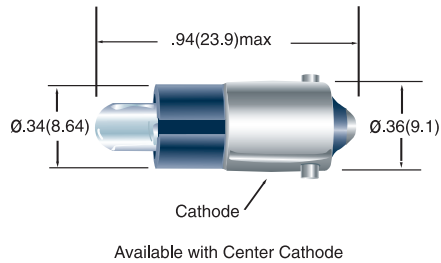
[4] Ta = 25°C. Voltage "2" indicates external resistor required. Voltages 5H through 60H are VDC. For AC operation, insert D after Voltage (e.g. 24HD). D indicates built-in rectifier: not required for 5H or 120VAC. For 120VDC, insert DC after Voltage (e.g. 120DC).

Continued...

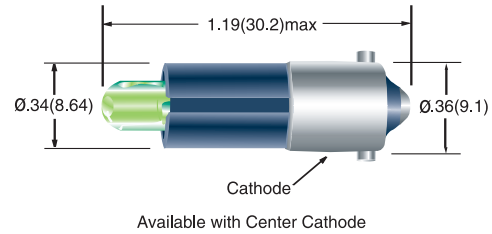
T-3¹/₄ MINIATURE LAMP

Single-Chip - For Small Lens Applications

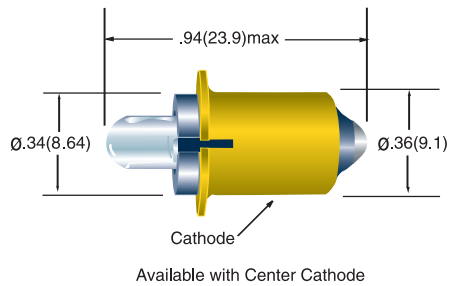
MB400



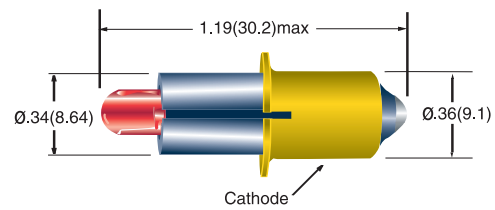
MBL400



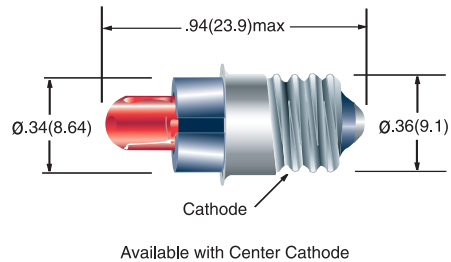
MF400



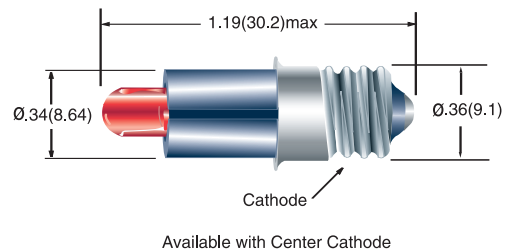
MFL400



MS400



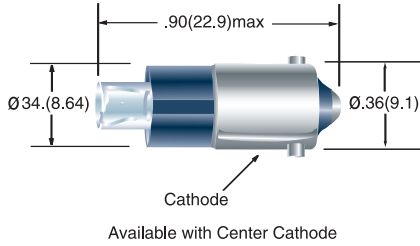
MSL400



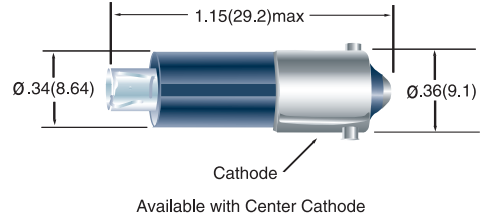
All dimensions are in inches (mm)
 Tolerances: .xx"(.x) ±.025"(.63) / .xxx"(.xx)±.010"(.25)
 Specifications are subject to change without notice.

Wide Angle LED Lamps

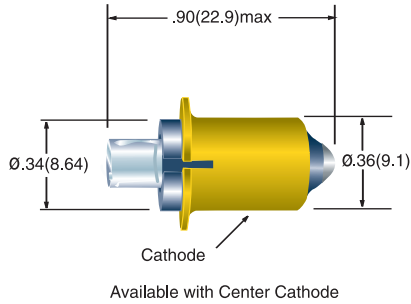
MB400, NFX Series (75°)



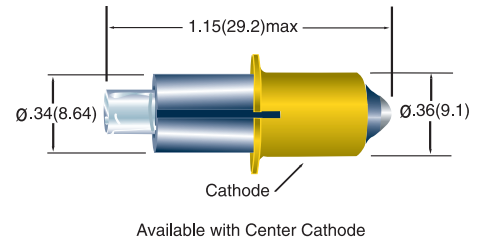
MBL400, NFX Series (75°)



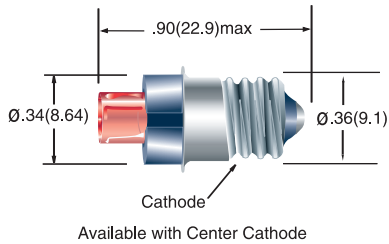
MF400, NFX Series (75°)



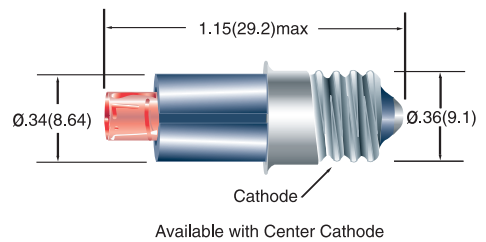
MFL400, NFX Series (75°)



MS400, NFX Series (75°)



MSL400, NFX Series (75°)



All dimensions are in inches (mm)

Tolerances: .xx"(.x) ±.025"(.63) / .xxx"(.xx)±.010"(.25)
 Specifications are subject to change without notice.

T-3¹/₄ MINIATURE LAMP WITH LENS

High Intensity, Wide Angle - For Small - Medium Lens Applications

- Fresnel Lens; Bayonet or Screw Base

1 Model^[1]	
MB403	Bayonet
MS403	Screw

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each SHADED column in the tables below.

1	2	3	4	5
Model	LED	Voltage	Lens	Bi-Polar
MB403	-R	28	-CR	

→Part Number **MB403-R28-CR**

2	LED	Color	λpk (nm)	Iv^[2] (mcd)	V/C Table^[3]
	-R	RED	634	2180	I
	-A	AMB	592	2180	I
	-G	GRN	520	2400	II
	-B	BLU	465	700	II
	-W	WHT		1560	II

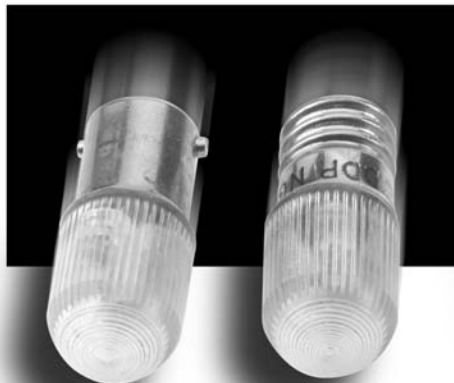
Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table I	
5V/22mA	5.5V/28mA
6V/21mA	7V/27mA
12V/20mA	14V/25mA
15V/24mA	16.5V/28mA
24V/17mA	26V/20mA
28V/16.5mA	30V/18mA
48V/15mA	50V/16mA
60V/9mA	65V/10mA
120VAC/3.5mA	130VAC/4mA

3	Voltage^[4]
	5
	6
	12
	15
	24
	28
	48
	60
	120

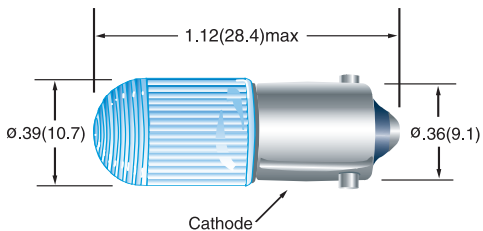
Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table II	
5V/15mA	5.5V/23mA
6V/15mA	7V/25mA
12V/15mA	14V/20mA
15V/15mA	16.5V/18mA
24V/15mA	26V/18mA
28V/15mA	30V/17mA
48V/9.5mA	50V/10mA
60V/7mA	65V/8mA
120VAC/3.5mA	130VAC/4mA

4	Lens
	-CR Red
	-CA Amber
	-CG Green
	-CB Blue
	-CW Water Clear

5	Bi-Polar
	-BP Optional

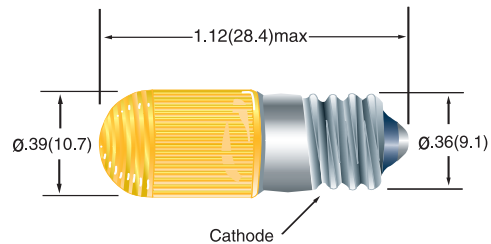


MB403



Available with Center Cathode

MS403



Available with Center Cathode

[1] MB403 and MS403 are center anode. Insert C after Model for center cathode (e.g. MB403C).

[2] Iv = typical luminous intensity @ If = 20mA (Ta=25°C). Luminous intensity is measured without the lens. (*2) = 2 LEDs per package.

[3] See Voltage/Current table for design specifications.

[4] Ta = 25°C. Voltages 5 through 60 are VDC. For AC operation, insert AC after Voltage (e.g. 24AC), not required for 120V. Contact factory for VAC design currents. For 120VDC insert DC after Voltage (e.g. 120DC).

All dimensions are in inches (mm)

Tolerances: .xx"(.x) ±.025"(.63) / .xxx"(.xx)±.010"(.25)
Specifications are subject to change without notice.

T-3¹/₄ MINIATURE LAMP WITH LENS

High Intensity, Wide Angle - For Medium to Large Lens Applications

- Fresnel Lens; Bayonet or Screw Base

1 Model^[1]	
MB402	Bayonet
MS402	Screw

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each SHADED column in the tables below.

1 Model	2 LED	3 Voltage	4 Lens	5 Bi-Polar
MB402	-R	12	-CR	-BP

→Part Number **MB402-R12-CR-BP**

2 LED	Color	λpk (nm)	Iv^[2] (mcd)	V/C Table^[3]
-R	RED	634	2800 (*4)	I
-O	ORG	609	2000 (*4)	I
-A	AMB	592	2800 (*4)	I
-G	GRN	520	2400 (*2)	II
-B	BLU	465	700 (*2)	II
-W	CWHT		2500 (*2)	II
-L	WWHT		1800 (*2)	II

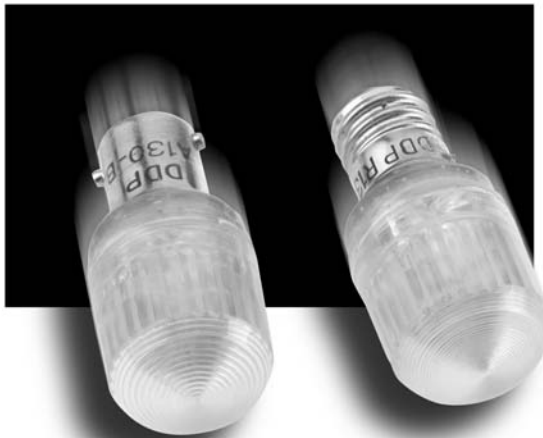
Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table I	
5V/75mA	5.5V/85mA
6V/40mA	7V/60mA
12V/30mA	14V/40mA
15V/30mA	16.5V/35mA
24V/30mA	26V/35mA
28V/25mA	30V/28mA
48V/20mA	52V/22mA
60V/16mA	65V/18mA
120VAC/9.5mA	130VAC/10.5mA

3 Voltage^[4]
5
6
12
15
24
28
48
60
120

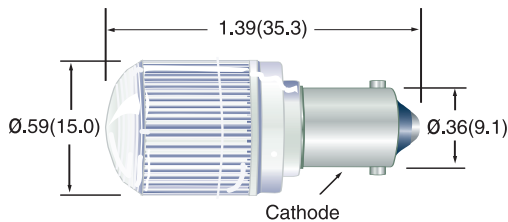
Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table II	
5V/26mA	5.5V/35mA
6V/28mA	7V/39mA
12V/15mA	14V/22mA
15V/15mA	16.5V/19mA
24V/15mA	26V/18mA
28V/15mA	30V/18mA
48V/9mA	50V/9.5mA
60V/6.5mA	65V/7.2mA
120VAC/5mA	130VAC/5.5mA

4 Lens
-CR Red
-CA Amber
-CG Green
-CB Blue
-CW Water Clear

5 Bi-Polar
-BP Optional

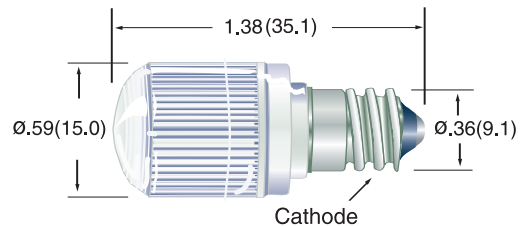


MB402



Available with Center Cathode

MS402



Available with Center Cathode

All dimensions are in inches (mm)
 Tolerances: .xx"(.x) ±.025"(.63) / .xxx"(.xx)±.010"(.25)
 Specifications are subject to change without notice.

[1] MB402 and MS402 are center anode. Insert C after Model for center cathode (e.g. MB402C).
 [2] Iv = typical luminous intensity @ If = 20mA (Ta=25°C). Luminous intensity is measured without the lens. (*2) = 2 LEDs per package.
 [3] See Voltage/Current table for design specifications.
 [4] Ta = 25°C. Voltages 6 through 60 are VDC. For AC operation, insert AC after the Voltage (e.g. 24AC), not required for 120V. Contact factory for VAC design currents. For 120VDC insert DC after Voltage (e.g. 120DC).

T-4 1/2 CANDELABRA LAMP WITH LENS

High Intensity, Wide Angle

- Fresnel Lens; Bayonet, Double Contact Bayonet, or Screw Base

1 Model ^[1]	
MB502	Bayonet
MS502	Screw
DCB502	Double Contact Bayonet

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each SHADED column in the tables below.

1 Model	2 LED	3 Voltage	4 Lens	5 Bi-Polar
MB502	-R	12	-CR	-BP

→ Part Number **MB502-R12-CR-BP**

2 LED	Color	λpk (nm)	Iv ^[2] (mcd)	V/C Table ^[3]
-R	RED	634	2800 (*4)	I
-O	ORG	609	2000 (*4)	I
-A	AMB	592	2800 (*4)	I
-G	GRN	520	2400 (*2)	II
-B	BLU	465	700 (*2)	II
-W	CWHT		2500 (*2)	II
-L	WWHT		1800 (*2)	II

Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table I	
5V/75mA	5.5V/85mA
6V/40mA	7V/60mA
12V/30mA	14V/40mA
15V/30mA	16.5V/35mA
24V/30mA	26V/35mA
28V/25mA	30V/28mA
48V/20mA	52V/22mA
60V/16mA	65V/18mA
120VAC/9.5mA	130VAC/10.5mA

3 Voltage ^[4]
5
6
12
15
24
28
48
60
120

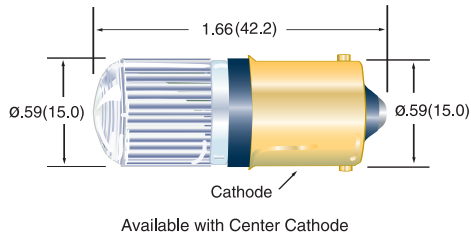
Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table II	
5V/26mA	5.5V/35mA
6V/28mA	7V/39mA
12V/15mA	14V/22mA
15V/15mA	16.5V/19mA
24V/15mA	26V/18mA
28V/15mA	30V/18mA
48V/9mA	50V/9.5mA
60V/6.5mA	65V/7.2mA
120VAC/5mA	130VAC/5.5mA

4 Lens
-CR Red
-CA Amber
-CG Green
-CB Blue
-CW Water Clear

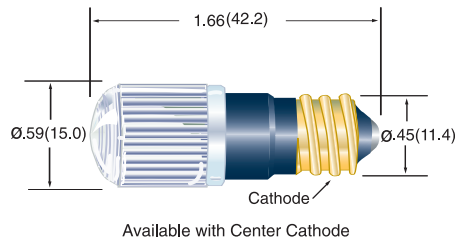
5 Bi-Polar
-BP ^[5] Optional



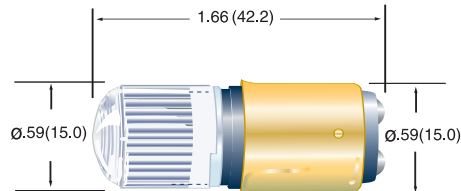
MB502



MS502



DCB502



[1] MB502 and MS502 are center anode. Insert C after Model for center cathode (e.g. MB502C).

[2] Iv = typical luminous intensity per LED @ If = 20mA (Ta=25°C). (*4) = 4 LEDs per package; (*2) = 2 LEDs per package.

[3] See Voltage/Current table for design specifications.

[4] Ta = 25°C. Voltages 6 through 60 are VDC. For AC operation, insert AC after the Voltage (e.g. 24AC), not required for 120V. Contact factory for VAC design currents. For 120VDC, insert DC after Voltage (e.g. 120DC) - except DCB502 - (Bi-Polar Standard).

[5] DCB502 is only available in Bi-Polar. Omit -BP designation.

All dimensions are in inches (mm)

Tolerances: .xx"(x) ±.025"(.63) / .xxx"(xx)±.010"(.25)
Specifications are subject to change without notice.

- For Detailed LED Data, See Discrete Section, MODEL 200.

1 Model	
2SB	ANSI No. 2
5SB	ANSI No. 5
55SB	T5.5

TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each SHADED column in the tables below.

1 Model	2 LED	3 Voltage
2SB	-BCG	12H

→ Part Number **2SB-BCG12H**

2 MEDIUM INTENSITY - TINTED ENCAPSULATION					
LED	Color	λ _{pk} (nm)	I _v ^[1] (mcd)	Viewing Angle	V/C Table ^[2]
-BCR	RED	635	120	35	I
-BCA	AMB	583	100	35	I
-BCG	GRN	565	80	24	I

Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table I	
5V/22mA	5.5V/28mA
6V/21mA	7V/27mA
12V/20mA	14V/25mA
15V/24mA	16.5V/28mA
24V/17mA	26V/20mA
28V/16.5mA	30V/18mA
48V/15mA	50V/16mA
60V/9mA	65V/10mA
120VAC/3.5mA	130VAC/4mA

3 Voltage ^[3]	
2	
5H	
6H	
12H	
15H	
24H	
28H	
48H	
60H	
120 ^[4]	

HIGH INTENSITY - WATERCLEAR ENCAPSULATION					
LED	Color	λ _{pk} (nm)	I _v ^[1] (mcd)	Viewing Angle	V/C Table ^[2]
-NWR	RED	634	2800	30	I
-NWO	ORG	605	2000	30	I
-NWA	AMB	592	2800	30	I
-NWG	GRN	520	2400	45	II
-NWB	BLU	465	700	45	II
-NWW	CWHT		2500	50	II
-NWL	WWHT		1800	50	II
-NKR	RED	634	3600	15	I
-NKO	ORG	605	8000	15	I
-NKA	AMB	592	3600	15	I
-NKG	GRN	520	10000	15	II
-NKB	BLU	465	3000	15	II
-NKW	CWHT		9200	20	II
-NKL	WWHT		9200	15	II

Voltage/Current	
Design Vf/If	Max Vf/If
V/C Table II	
5V/15mA	5.5V/23mA
6V/15mA	7V/25mA
12V/15mA	14V/20mA
15V/15mA	16.5V/18mA
24V/15mA	26V/18mA
28V/15mA	30V/17mA
48V/9.5mA	50V/10mA
60V/9mA	65V/10mA
120VAC/3.5mA	130VAC/4mA

WIDE ANGLE/FLAT-TOPPED-WATERCLEAR ENCAPSULATION					
LED	Color	λ _{pk} (nm)	I _v ^[1] (mcd)	Viewing Angle	V/C Table ^[2]
-NFR	RED	634	780	75	I
-NFA	AMB	592	600	75	I
-NFG	GRN	520	780	75	II
-NFB	BLU	465	168	75	II
-NFW	CWHT		280	75	II

SPECIALTY LEDs						
LED	Color	λ _{pk} (nm)	I _v ^[1] (mcd)	Viewing Angle	V/C Table ^[2]	Description
-RLP ^[5]	RED	635	2.3	50	[2]	Low Power
-ALP ^[5]	AMB	583	2.1	50	[2]	Low Power
-GLP ^[5]	GRN	565	2.3	50	[2]	Low Power
-LRG	RED/GRN	660/565	90/40	60	I	Bi-Color

[1] I_v = typical luminous intensity @ If = 20mA (Ta=25°C); Low Power LEDs @ If = 2mA.

[2] See Voltage/Current table for design specifications. Design current for low power LEDs = 2mA.

[3] Ta = 25°C. Voltage "2" indicates external resistor required. Voltages 5H through 60H are VDC. For AC operation, insert D after the Voltage (e.g. 24HD). D indicates built-in rectifier; not required for 5H or 120VAC. 120VDC operation not available.

[4] Select high intensity LEDs only.

[5] Omit "H" Voltage designation (e.g. 2SB-RLP12).

Continued...

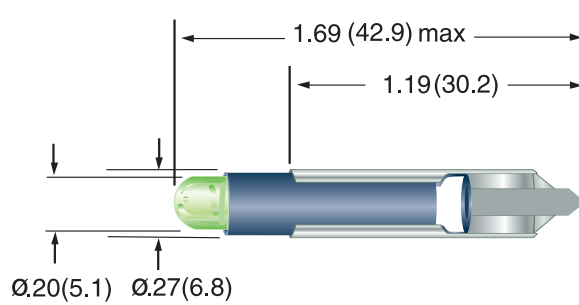
T-2 SLIDE BASED LAMP

Single-Chip

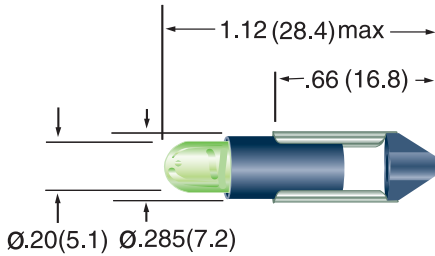
- For Detailed LED Data, See Discrete Section, MODEL 200.



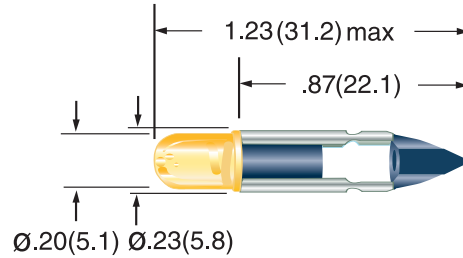
2SB



5SB



55SB

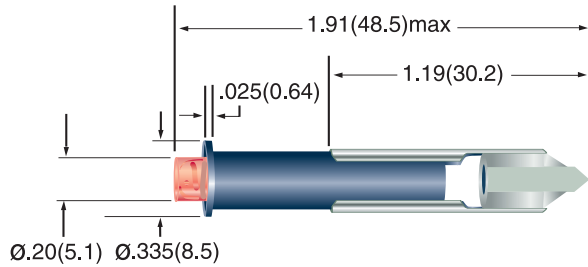


All dimensions are in inches (mm)

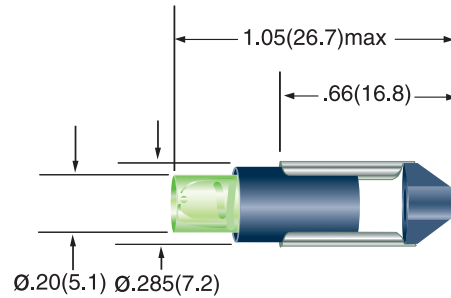
Tolerances: .xx"(.x) ±.025"(.63) / .xxx"(.xx)±.010"(.25)
Specifications are subject to change without notice.

Wide Angle LED Lamps

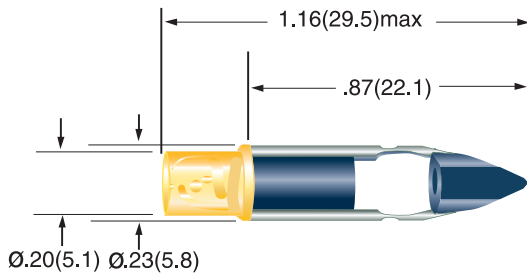
2SB, NFX Series (75°)



5SB, NFX Series (75°)



55SB, NFX Series (75°)



All dimensions are in inches (mm)

Tolerances: .xx"(.x) ±.025"(.63) / .xxx"(.xx)±.010"(.25)

Specifications are subject to change without notice.

SL2 SERIES LED STACK LIGHT LAMPS

T-4 1/2 Candelabra Single and Double-Contact Bayonet Base

- Designed to easily fit in a variety of industrial stack lights
- Up to 100,000 hours of maintenance-free status indication
- Immune to false indication due to PLC leakage currents
- Protected from voltage spikes, surges and ESD damage
- 360° visibility, even in high ambient lighting conditions

Fits:
Allen-Bradley
Square D
Telemecanique
IDEC
Cutler-Hammer
AND MORE!

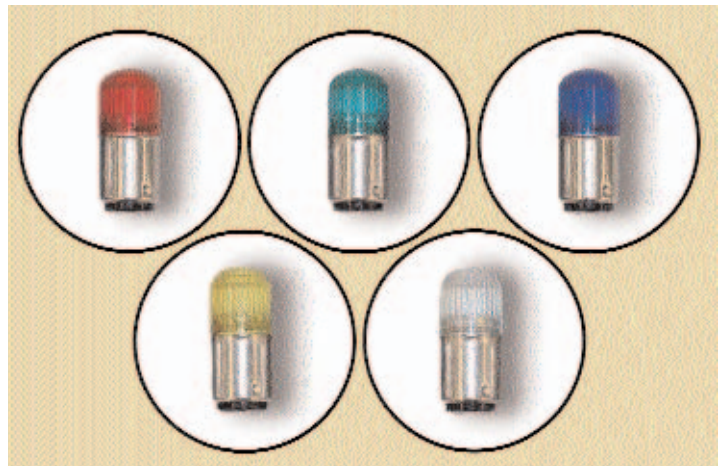


1 Model	Description
MB502	Bayonet
MS502	Screw
DCB502	Dbl Contact Bayonet

2 Color	Description
-R	RED
-A	AMB
-G	GRN
-B	BLU
-W	WHT

3 Voltage	Description
12	12 VAC/DC
24	24 VAC/DC
120	120 VAC

4 Style
-SL2



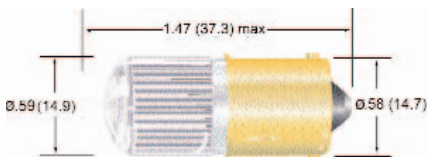
TO ORDER, FOLLOW THE EXAMPLE:

Select one **BOLD** component from each SHADED column ibelow.

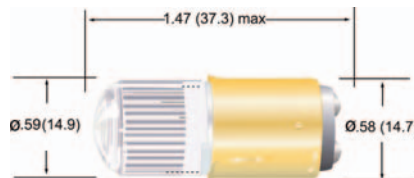
1 Model	2 Color	3 Voltage	4 Style
MB502	-R	24	-SL2

→Part Number **MB502-R24-SL2**

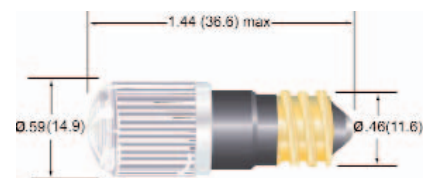
MB502



DCB502



MS502



All dimensions are in inches (mm)

Specifications are subject to change without notice.
 Other options are available. Contact us for evaluation samples.

This cross-reference includes industry-standard incandescent bulbs and corresponding DDP® LED lamps. Many configurations, options, and colors are available within each model. We strongly suggest evaluating samples of any product prior to purchase.

DDP® LED lamps offer significant cost-saving advantages over incandescent bulbs:

- 100,000-hour life vs. unpredictable incandescent bulb life
- cooler operation
- lower operating current
- vibration and shock resistance

Over the past twenty-five years, DDP engineers have designed a vast product line to provide direct replacement of almost any incandescent bulb being used in illuminated push buttons, pilot lights, switches, or other indicator light applications.

Furthermore, DDP can modify most standard products or design an LED lamp to fit unique or custom applications. For technical support, please call the factory to discuss your application: **(800) 421-6815**.

To cross an incandescent bulb:

1. Locate the incandescent bulb number and the equivalent DDP® LED lamp number in the cross-reference. The “X” in the DDP part number is a variable representing the LED color (e.g. “R” for red). For detailed specifications, refer to the page number listed.
2. Verify your application parameters (actual supply voltage, built in resistor, socket type, polarity, ambient light conditions). Bi-polar options are available for most models. If necessary, call the factory for assistance.
3. Request a sample. For assistance, call the factory or e-mail: **techsupport@datadisplay.com**.

Incandescent Lamp #	Design Voltage	Base Description	DDP® Model #	Catalog Page #	Suggested DDP® Part Number
3S6/5	120VAC	Candelabra Screw	MS502	74	MS502-X120-CW-BP
5ESB	5	Slide Number 5	5SB	75	5SB-NFX5H
6ESB	6	Slide Number 5	5SB	75	5SB-NFX6H
6S6	120VAC	Candelabra Screw	MS502	74	MS502-X120-CW-BP
12MB	12	Miniature Bayonet	MB403	72	MB403-X12-CX-BP
12PSB	12	Slide Number 5	5SB	75	5SB-NFX12H
12RB	12	Miniature Bayonet	MB402	73	MB402-X12-CW-BP
12RC	12	Candelabra Screw	MS502	74	MS502-X12-CW-BP
17	28	Sub-Miniature Wedge	WB201	65	WB201-NFX28H
18	14	Sub-Miniature Wedge	WB201	65	WB201-NFX15H
24CSB	24	Slide Number 5	5SB	75	5SB-NFX24H
24E	24	# 2 Slide Base	2SB	75	2SB-NFX24H
24ESB	24	Slide Number 5	5SB	75	5SB-NFX24H
24MB	24	Miniature Bayonet	MB403	72	MB403-X24-CW-BP
24PSB	24	Slide Number 5	5SB	75	5SB-NFX24H
24RB	24	Miniature Bayonet	MB402	73	MB402-X24-CW-BP
24RC	24	Candelabra Screw	MS502	74	MS502-X24-CW-BP
24X	24	# 2 Slide Base	2SB	75	2SB-NFX24H
28ESB	28	Slide Number 5	5SB	75	5SB-NFX28H
28MB	28	Miniature Bayonet	MB403	72	MB403-X28-CX-BP
28PSB	28	Slide Number 5	5SB	75	5SB-NFX28H
28RB	28	Miniature Bayonet	MB402	73	MB402-X28-CW-BP
28RC	28	Candelabra Screw	MS502	74	MS502-X28-CW-BP
37	14	Sub-Miniature Wedge	WB201	65	WB201-NFX15H
44	6.3VAC	Miniature Bayonet	MB403	72	MB403-X6AC-CX
46	6.3VAC	Miniature Screw	MS403	72	MS403-X6AC-CX
47	6.3VAC	Miniature Bayonet	MB403	72	MB403-X6AC-CX
48D	48	Slide Number 3	2SB	75	2SB-NFX48H
48ESB	48	Slide Number 5	5SB	75	5SB-NFX48H
48MB	48	Miniature Bayonet	MB403	72	MB403-X48-CX-BP
48PSB	48	Slide Number 5	5SB	75	5SB-NFX48H
48RB	48	Miniature Bayonet	MB402	73	MB402-X48-CW-BP
48RC	48	Candelabra Screw	MS502	74	MS502-X48-CW-BP
52	14.4VAC	Miniature Screw	MS403	72	MS403-X15AC-CX
53	14.4VAC	Miniature Bayonet	MB403	72	MB403-X15AC-CX
55	7	Miniature Bayonet	MB403	72	MB403-X6-CX
56	5	Sub-Miniature Wedge	WB201	65	WB201-NFX5H
57	14	Miniature Bayonet	MB403	72	MB403-X15-CX-BP
60MB	60	Miniature Bayonet	MB403	72	MB403-X60-CX-BP
60PSB	60	Slide Number 5	5SB	75	5SB-NWX60H
60RB	60	Miniature Bayonet	MB402	73	MB402-X60-CW-BP
60RC	60	Candelabra Screw	MS502	74	MS502-X60-CW-BP
73	14	Sub-Miniature Wedge	WB201	65	WB201-NFX15H
74	14	Sub-Miniature Wedge	WB201	65	WB201-NFX15H
79	6	Sub-Miniature Wedge	WB201	65	WB201-NFX6H
82	6.5	Double Contact Bayonet	DCB502	74	DCB502-X6-CW
84	6.3VAC	Sub-Miniature Wedge	WB201	65	WB201-NFX6H
85	28	Sub-Miniature Wedge	WB201	65	WB201-NFX28H
86	6.3VAC	Sub-Miniature Wedge	WB201	65	WB201-NFX6H
120MB	120VAC	Miniature Bayonet	MB403	72	MB403-X120-CX

Continued . . .

Incandescent Lamp #	Design Voltage	Base Description	DDP® Model #	Catalog Page #	Suggested DDP® Part Number
120PSB	120VAC	Slide Number 5	5SB	75	5SB-NWX120
120RB	120VAC	Miniature Bayonet	MB402	73	MB402-X120-CW
120RC	120VAC	Candelabra Screw	MS502	74	MS502-X120-CW
216	14.4VAC	Miniature Bayonet	MB403	72	MB403-X15AC-CX
239	6.3VAC	Miniature Bayonet	MB403	72	MB403-X6AC-CX
240	6.3VAC	Miniature Bayonet	MB403	72	MB403-X6AC-CX
256	14	Miniature Bayonet	MB403	72	MB403-X15-CX-BP
302	28	Double Contact Bayonet	DCB502	74	DCB502-X28-CW
304	28	Double Contact Bayonet	DCB502	74	DCB502-X28-CW
306	28	Double Contact Bayonet	DCB502	74	DCB502-X28-CW
308	28	Double Contact Bayonet	DCB502	74	DCB502-X28-CW
313	28	Miniature Bayonet	MB403	72	MB403-X28-CX-BP
316	6	Miniature Bayonet	MB403	72	MB403-X6-CX
327	28	Sub-Miniature Flange	MF200	65	MF200-NFX28H
328	6	Sub-Miniature Flange	MF200	65	MF200-NFX6H
330	14	Sub-Miniature Flange	MF200	65	MF200-NFX15H
334	28	Sub-Miniature Groove	MG200	65	MG200-NFX28H
335	28	Sub-Miniature Screw	MS200	65	MS200-NFX28H
336	14	Sub-Miniature Groove	MG200	65	MG200-NFX15H
337	6	Sub-Miniature Groove	MG200	65	MG200-NFX6H
342	6	Sub-Miniature Screw	MS200	65	MS200-NFX6H
345	6	Sub-Miniature Flange	MF200	65	MF200-NFX6H
349	6.3VAC	Sub-Miniature Flange	MF200	65	MF200-NFX6H
350	6.3VAC	Sub-Miniature Flange	MF200	65	MF200-NFX6H
356	28	Miniature Bayonet	MB403	72	MB403-X28-CX-BP
363	14	Miniature Bayonet	MB403	72	MB403-X15-CX-BP
369	28	Sub-Miniature Screw	MS200	65	MS200-NFX28H
370	18	Sub-Miniature Flange	MF200	65	MF200-NFX24H
373	14	Sub-Miniature Screw	MS200	65	MS200-NFX15H
376	28	Sub-Miniature Flange	MF200	65	MF200-NFX28H
377	6.3VAC	Sub-Miniature Flange	MF200	65	MF200-NFX6H
378	6.3VAC	Sub-Miniature Screw	MS200	65	MS200-NFX6H
379	6.3VAC	Sub-Miniature Groove	MG200	65	MG200-NFX6H
380	6.3VAC	Sub-Miniature Flange	MF200	65	MF200-NFX6H
381	6.3VAC	Sub-Miniature Flange	MF200	65	MF200-NFX6H
382	14	Sub-Miniature Flange	MF200	65	MF200-NFX15H
383	14	Sub-Miniature Screw	MS200	65	MS200-NFX15H
385	28	Sub-Miniature Flange	MF200	65	MF200-NFX28H
386	14	Sub-Miniature Groove	MG200	65	MG200-NFX15H
387	28	Sub-Miniature Flange	MF200	65	MF200-NFX28H
388	28	Sub-Miniature Groove	MG200	65	MG200-NFX28H
394	12	Sub-Miniature Flange	MF200	65	MF200-NFX12H
398	6.3VAC	Sub-Miniature Groove	MG200	65	MG200-NFX6H
399	28	Sub-Miniature Screw	MS200	65	MS200-NFX28H
459	22	Sub-Miniature Flange	MF200	65	MF200-NFX24H
623	28	Single Contact Bayonet	MB502	74	MB502-X28-CW
755	6.3VAC	Miniature Bayonet	MB403	72	MB403-X6AC-CW
756	14	Miniature Bayonet	MB403	72	MB403-X15-CX-BP
757	28	Miniature Bayonet	MB403	72	MB403-X28-CX-BP
1204	28	Double Contact Bayonet	DCB502	74	DCB502-X28-CW

Continued . . .

Incandescent Lamp #	Design Voltage	Base Description	DDP® Model #	Catalog Page #	Suggested DDP® Part Number
1252	28	Double Contact Bayonet	DCB502	74	DCB502-X28-CW
1302	6.3VAC	Miniature Bayonet	MB403	72	MB403-X6AC-CX
1437	24	Miniature Bayonet	MB403	72	MB403-X24-CX-BP
1445	14.4VAC	Miniature Bayonet	MB403	72	MB403-X15AC-CX
1446	12	Miniature Screw	MS403	72	MS403-X12-CX-BP
1449	14	Miniature Screw	MS403	72	MS403-X15-CX-BP
1450	24	Miniature Bayonet	MB403	72	MB403-X24-CX-BP
1483	6	Miniature Screw	MS403	72	MS403-X6-CX
1487	14	Miniature Screw	MS403	72	MS403-X15-CX-BP
1488	14	Miniature Bayonet	MB403	72	MB403-X15-CX-BP
1495	28	Miniature Bayonet	MB402	73	MB402-X28-CW-BP
1638	28	Double Contact Bayonet	DCB502	74	DCB502-X28-CW
1692	28	Double Contact Bayonet	DCB502	74	DCB502-X28-CW
1768	6	Sub-Miniature Screw	MS200	65	MS200-NFX6H
1775	6.3VAC	Sub-Miniature Screw	MS200	65	MS200-NFX6H
1810	6.3VAC	Miniature Bayonet	MB403	72	MB403-X6AC-CX
1813	14.4VAC	Miniature Bayonet	MB403	72	MB403-X15AC-CX
1815	14	Miniature Bayonet	MB403	72	MB403-X15-CX-BP
1818	24	Miniature Bayonet	MB403	72	MB403-X24-CX-BP
1819	28	Miniature Bayonet	MB403	72	MB403-X28-CX-BP
1820	28	Miniature Bayonet	MB403	72	MB403-X28-CX-BP
1821	28	Miniature Screw	MS403	72	MS403-X28-CX-BP
1829	28	Miniature Bayonet	MB403	72	MB403-X28-CX-BP
1835	55	Miniature Bayonet	MB403	72	MB403-X60-CX-BP
1843	28	Miniature Bayonet	MB403	72	MB403-X28-CX-BP
1847	6.3VAC	Miniature Bayonet	MB403	72	MB403-X6AC-CX
1850	5	Miniature Bayonet	MB403	72	MB403-X5-CX
1855	6.3VAC	Miniature Bayonet	MB402	73	MB402-X6AC-CX
1864	28	Miniature Bayonet	MB403	72	MB403-X28-CX-BP
1866	6.3VAC	Miniature Bayonet	MB403	72	MB403-X6AC-CX
1873	28	Miniature Bayonet	MB403	72	MB403-X28-CX-BP
1889	14	Miniature Bayonet	MB403	72	MB403-X15-CX-BP
1891	14	Miniature Bayonet	MB403	72	MB403-X15-CX-BP
1892	14.4VAC	Miniature Bayonet	MB403	72	MB403-X15AC-CX
1893	14	Miniature Bayonet	MB403	72	MB403-X15-CX-BP
1895	14	Miniature Bayonet	MB403	72	MB403-X15-CX-BP
2314	28	Sub-Miniature Bi-Pin	BP202	65	BP202-NFX28H
2324	28	Sub-Miniature Bi-Pin	BP202	65	BP202-NFX28H
2335	14	Sub-Miniature Bi-Pin	BP202	65	BP202-NFX15H
2337	6.3VAC	Sub-Miniature Bi-Pin	BP202	65	BP202-NFX6H
3149	5	Sub-Miniature Bi-Pin	BP202	65	BP202-NFX5H
7001	24	Sub-Miniature Bi-Pin	BP202	65	BP202-NFX24H
7003	24	Sub-Miniature Bi-Pin	BP202	65	BP202-NFX24H
7327	28	Sub-Miniature Bi-Pin	BP202	65	BP202-NFX28H
7328	6	Sub-Miniature Bi-Pin	BP202	65	BP202-NFX6H
7330	14	Sub-Miniature Bi-Pin	BP202	65	BP202-NFX15H
7332	5	Sub-Miniature Flange	MF200	65	MF200-NFX5H
7333	5	Sub-Miniature Flange	MF200	65	MF200-NFX5H
7335	5	Sub-Miniature Flange	MF200	65	MF200-NFX5H
7341	28	Sub-Miniature Flange	MF200	65	MF200-NFX28H

Continued . . .

Incandescent Lamp #	Design Voltage	Base Description	DDP® Model #	Catalog Page #	Suggested DDP® Part Number
7349	6.3VAC	Sub-Miniature Bi-Pin	BP202	65	BP202-NFX6H
7361	5	Sub-Miniature Bi-Pin	BP202	65	BP202-NFX5H
7371	12	Sub-Miniature Bi-Pin	BP202	65	BP202-NFX12H
7373	14	Sub-Miniature Bi-Pin	BP202	65	BP202-NFX15H
7376	28	Sub-Miniature Bi-Pin	BP202	65	BP202-NFX28H
7377	6.3VAC	Sub-Miniature Bi-Pin	BP202	65	BP202-NFX6H
7380	6.3VAC	Sub-Miniature Bi-Pin	BP202	65	BP202-NFX6H
7381	6.3VAC	Sub-Miniature Bi-Pin	BP202	65	BP202-NFX6H
7382	14	Sub-Miniature Bi-Pin	BP202	65	BP202-NFX15H
7387	28	Sub-Miniature Bi-Pin	BP202	65	BP202-NFX28H
7876	28	Sub-Miniature Bi-Pin	BP202	65	BP202-NFX28H
7945	6	Sub-Miniature Bi-Pin	BP202	65	BP202-NFX6H
8362	14	Sub-Miniature Screw	MS200	65	MS200-NFX15H
8369	28	Sub-Miniature Screw	MS200	65	MS200-NFX28H
8384	28	Sub-Miniature Screw	MS200	65	MS200-NFX28H
8918	14	Sub-Miniature Flange	MF200	65	MF200-NFX15H

ELECTRO-OPTICAL CHARACTERISTICS @ Ta = 25°C

Model No.	Color	Tint	Peak Wavelength λ_{pk} (nm)	Chip Material	Luminous Intensity Iv (mcd)		Viewing Angle 2 θ 1/2 (deg)	Forward Voltage Vf@If=20mA		Reverse Breakdown Voltage@ (IR=1000 μ A)
					Typical	@		Typical	@	
O80-R	RED	D	635	GaAsP/GaP	3	10mA	90	1.8	10mA	5VDC
O80-A	AMB	D	583	GaAsP/GaP	3	10mA	90	2.0	10mA	5VDC
O80-G	GRN	D	565	GaP	3	10mA	90	2.0	10mA	5VDC

ABSOLUTE MAXIMUM RATINGS @ Ta = 25°C

Model No.	Power Dissipation (mW)	Derating Factor (mA/°C)	Maximum Continuous Current (mA)	Peak Forward Current@100KHz 5% Duty Cycle (mA)	Operating Temperature (°C)	Storage Temperature (°C)
O80-R	90	1.8	30	90	-55< +100	-55< +100
O80-A	46	1.6	20	60	-55< +100	-55< +100
O80-G	81	1.8	30	90	-40< +100	-55< +100

ELECTRO-OPTICAL CHARACTERISTICS @ Ta = 25°C

Model No.	Fig.	Color	Tint	Peak Wavelength λpk (nm)	Chip Material	Luminous Intensity Iv (mcd)		Viewing Angle 2θ 1/2 (deg)	Forward Voltage Vf@If=20mA		Reverse Break-down Voltage@ (IR=100µA)
						Typical	@		Typical	@	
125-BR	1	RED	D	635	GaAsP/GaP	14	20mA	60	1.9/2.4	10mA	5VDC
125-BA	1	AMB	D	583	GaAsP/GaP	14	20mA	60	2.0/2.4	10mA	5VDC
125-BG	1	GRN	D	565	GaP	14	20mA	60	2.1/2.7	10mA	5VDC
125-BCR	1	RED	D	635	GaAsP/GaP	60	20mA	45	1.9/2.4	10mA	5VDC
125-BCA	1	AMB	D	583	GaAsP/GaP	30	20mA	45	2.0/2.4	10mA	5VDC
125-BCG	1	GRN	D	565	GaP	44	20mA	45	2.1/2.7	10mA	5VDC
125-RLP	1	RED	T	635	GaAsP/GaP	2.1	2mA	50	1.8/2.0	2mA	5VDC[2]
125-ALP	1	AMB	T	583	GaAsP/GaP	1.6	2mA	50	1.9/2.5	2mA	5VDC[2]
125-GLP	1	GRN	T	565	GaP	2.1	2mA	50	1.8/2.2	2mA	5VDC[2]
125-DRG	2	RED/GRN	D	635/567	GaAsP/GaP	4.3/3.7	10mA	118	2.1/2.1	20mA	5VDC
125-RG	3	RED/GRN	D	630/565	GaAsP/GaP/GaP	5.0/5.0	20mA	72	2.0 or 2.1/2.6	20mA	5VDC
125-BR5V	1	RED	D	635	GaAsP/GaP	8.0	5VDC	60	5.0/7.5	10mA	5VDC
125-BA5V	1	AMB	D	583	GaAsP/GaP	8.0	5VDC	60	5.0/7.5	10mA	5VDC
125-BG5V	1	GRN	D	565	GaP	8.0	5VDC	60	5.0/7.5	10mA	5VDC
125-BR12V	1	RED	D	635	GaAsP/GaP	8.0	12VDC	60	12.0/15.0	13mA	5VDC
125-BA12V	1	AMB	D	583	GaAsP/GaP	8.0	12VDC	60	12.0/15.0	13mA	5VDC
125-BG12V	1	GRN	D	565	GaP	8.0	12VDC	60	12.0/15.0	13mA	5VDC
125-NWR	4	RED	WC	634	IGaAs	2180	20mA	45	2.3/2.8	20mA	5VDC
125-NWA	4	AMB	WC	592	AllnGaP	2180	20mA	45	2.3/2.8	20mA	5VDC
125-NWG	5	GRN	WC	520	InGaN	2000	20mA	45	3.5/4.0	20mA	5VDC[2]
125-NWB	5	BLUE	WC	465	InGaN	600	20mA	45	3.6/4.0	20mA	5VDC[2]
125-NWW	6	WHT	WC		GaN	1100	20mA	55	3.4/4.0	20mA	5VDC

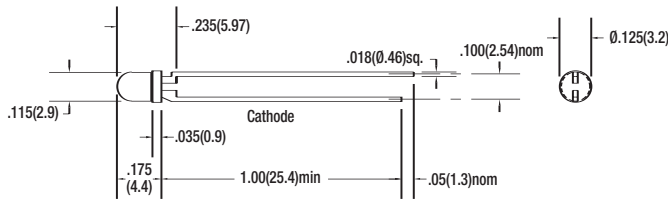


Figure 1

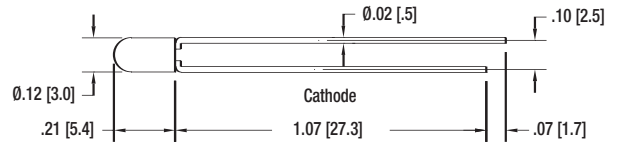


Figure 2

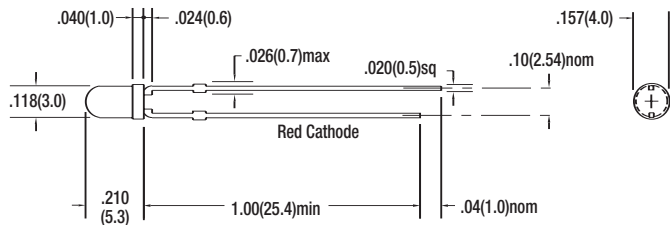


Figure 3

[1] @ TA = 50°C
 [2] @ (IR=50µA)
 [3] D=Diffused, T=Tinted, WC=Water Clear.

ABSOLUTE MAXIMUM RATINGS @ Ta = 25°C

Model No.	Power Dissipation (mW)	Derating Factor (mA/°C)	Maximum Continuous Current (mA)	Peak Forward Current@100KHz 5% Duty Cycle (mA)	Operating Temperature (°C)	Storage Temperature (°C)
125-BR	135	1.8	30	90	-55<+100	-55<+100
125-BA	85	1.6	20	60	-55<+100	-55<+100
125-BG	135	1.8	30	90	-20<+100	-55<+100
125-BCR	135	1.8	30	90	-55<+100	-55<+100
125-BCA	85	1.6	20	60	-55<+100	-55<+100
125-BCG	135	1.8	30	90	-20<+100	-55<+100
125-RLP	24	.36	7	7	-55<+100	-55<+100
125-ALP	36	.54	7	7	-55<+100	-55<+100
125-GLP	24	.36	7	7	-20<+100	-55<+100
125-DRG	100	1.6	30	100	-25<+85	-25<+100
125-RG	100	1.5	30	120	-55<+100	-55<+100
125-BR5V	-	.071V/°C ^[1]	15	-	-40<+85	-55<+100
125-BA5V	-	.071V/°C ^[1]	15	-	-40<+85	-55<+100
125-BG5V	-	.071V/°C ^[1]	15	-	-20<+85	-55<+100
125-BR12V	-	.086V/°C ^[1]	20	-	-40<+85	-55<+100
125-BA12V	-	.086V/°C ^[1]	20	-	-40<+85	-55<+100
125-BG12V	-	.086V/°C ^[1]	20	-	-20<+85	-55<+100
125-NWR	80	1.6	30	160	-40<+100	-40<+100
125-NWA	80	1.7	30	160	-40<+100	-40<+100
125-NWG	120	2.1	30	100	-30<+85	-40<+100
125-NWB	120	2.1	30	100	-30<+85	-40<+100
125-NWW	120	0.4mA/°C 1	30	100	-40<+100	-40<+100

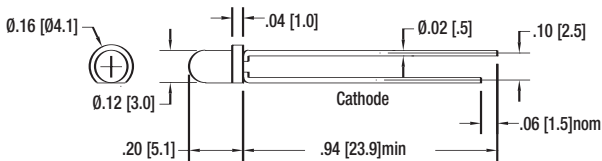


Figure 4

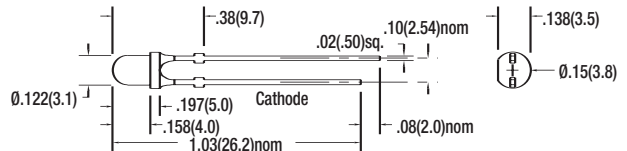


Figure 5

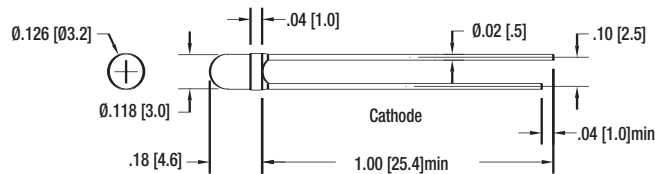


Figure 6

ELECTRO-OPTICAL CHARACTERISTICS @ Ta = 25°C

Model No.	Fig.	Color	Tint	Peak Wavelength λ _{pk} (nm)	Chip Material	Luminous Intensity Iv (mcd)		Viewing Angle 2θ 1/2 (deg)	Forward Voltage Vf@If=20mA		Reverse Break-down Voltage@ (IR=100µA)
						Typical	@		Typical	@	
200-BR	7	RED	D	635	GaAsP/GaP	14	20mA	60	2.2/2.6	20mA	5VDC
200-BA	7	AMB	D	583	GaAsP/GaP	16	20mA	60	1.9/2.4	10mA	5VDC
200-BG	7	GRN	D	565	GaP	10	20mA	60	1.9/2.4	10mA	5VDC
200-BCR	7	RED	T	635	GaAsP/GaP	120	20mA	35	2.1/2.7	10mA	5VDC
200-BCA	7	AMB	T	583	GaAsP/GaP	100	20mA	35	1.9/2.4	10mA	5VDC
200-BCG	7	GRN	T	565	GaP	80	20mA	24	2.0/2.4	10mA	5VDC
200-RLP	7	RED	D	635	GaAsP/GaP	2.3	2mA	50	2.1/2.7	10mA	5VDC
200-ALP	7	AMB	D	583	GaAsP/GaP	2.1	2mA	50	1.8/2.0	2mA	5VDC
200-GLP	7	GRN	D	565	GaP	2.3	2mA	50	1.9/2.5	2mA	5VDC
200-LRG	8	RED/GRN	D	660/565	GaAlAs/GaP	90/40	20mA	60	1.8/2.2	2mA	5VDC
200-RAG	9	RED/GRN	D	630/565	GaAsP/GaP/GaP	6/6	20mA	60	1.8/2.4 or 2.1/2.8	20mA	6VDC
200-GAR	10	RED/GRN	D	635/565	GaAsP/GaP/GaP	5/5	20mA	50	2.0 or 2.4/3.0	20mA	5VDC
200-BR5V	11	RED	D	635	GaAsP/GaP	8.0	5VDC	60	2.0 or 2.1/2.4	20mA	5VDC
200-BA5V	11	AMB	D	583	GaAsP/GaP	8.0	5VDC	60	5.0/7.5	10mA	5VDC
200-BG5V	11	GRN	D	565	GaP	8.0	5VDC	60	5.0/7.5	10mA	5VDC
200-BR12V	11	RED	D	635	GaAsP/GaP	8.0	12VDC	60	5.0/7.5	10mA	5VDC
200-BA12V	11	AMB	D	583	GaAsP/GaP	8.0	12VDC	60	12.0/15.0	13mA	5VDC
200-BG12V	11	GRN	D	565	GaP	8.0	12VDC	60	12.0/15.0	13mA	5VDC
200-NWR	15	RED	WC	634	AllnGaP	2800	20mA	30	12.0/15.0	13mA	5VDC
200-NWO	12	ORNG	WC	605	AllnGaP	2000	20mA	30	2.3/2.8	20mA	5VDC
200-NWA	15	AMB	WC	592	AllnGaP	2800	20mA	30	1.9/2.4	20mA	5VDC
200-NWG	13	GR	WC	520	InGaN	2400	20mA	45	2.3/2.8	20mA	5VDC ^[2]
200-NWB	13	BLUE	WC	465	InGaN	700	20mA	45	3.5/4.0	20mA	5VDC ^[2]
200-NWW	13	WHT	WC		InGaN	1560	20mA	50	3.6/4.0	20mA	5VDC ^[2]
200-NKR	15	RED	WC	634	AllnGaP	3600	20mA	15	3.6/4.0	20mA	5VDC
200-NKO	12	ORNG	WC	605	AllnGaP	8000	20mA	15	2.3/2.8	20mA	5VDC
200-NKA	15	AMB	WC	592	AllnGaP	3600	20mA	15	1.9/2.4	20mA	5VDC
200-NKG	13	GRN	WC	520	InGaN	10000	20mA	15	2.3/2.8	20mA	5VDC ^[2]
200-NKB	13	BLUE	WC	465	InGaN	3000	20mA	15	3.5/4.0	20mA	5VDC ^[2]
200-NKW	13	WHT	WC		InGaN	5600	20mA	20	3.6/4.0	20mA	5VDC ^[2]
DF200-NFR	14	RED	WC	634	AllnGaP	780	20mA	75	3.6/4.0	20mA	5VDC
DF200-NFA	14	AMB	WC	592	AllnGaP	600	20mA	75	2.2/2.8	20mA	5VDC
DF200-NFG	14	GRN	WC	520	InGaN	780	20mA	75	2.3/2.8	20mA	5VDC
DF200-NFB	14	BLUE	WC	465	InGaN	168	20mA	75	3.3/4.0	20mA	5VDC
DF200-NFW	14	WHT	WC		InGaN	280	20mA	75	3.4/4.0	20mA	5VDC

[1] @ TA = 50°C
 [2] @ (IR=50µA)
 [3] D=Diffused, T=Tinted, WC=Water Clear.

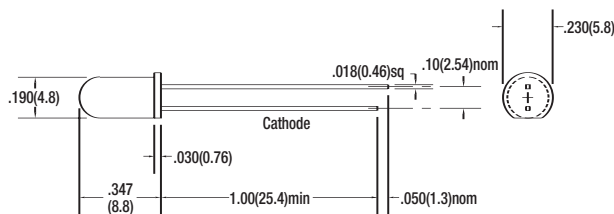


Figure 7

ABSOLUTE MAXIMUM RATINGS @ Ta = 25°C

Model No.	Power Dissipation (mW)	Derating Factor (mA/°C)	Maximum Continuous Current (mA)	Peak Forward Current@100KHz 5% Duty Cycle (mA)	Operating Temperature (°C)	Storage Temperature (°C)
200-BR	135	1.8	30	90	-55<+100	-55<+100
200-BA	85	1.6	20	60	-55<+100	-55<+100
200-BG	135	1.8	30	90	-20<+100	-55<+100
200-BCR	135	1.8	30	90	-55<+100	-55<+100
200-BCA	85	1.6	20	60	-55<+100	-55<+100
200-BCG	135	1.8	30	90	-20<+100	-55<+100
200-RLP	24	.32	7	7	-55<+100	-55<+100
200-ALP	36	.48	7	7	-55<+100	-55<+100
200-GLP	24	.32	7	7	-20<+100	-55<+100
200-LRG	100	1.6	40/30	200/120	-55<+100	-55<+100
200-RAG	100	1.5	30	90	-40<+100	-55<+100
200-GAR	100	1.5	30	160	-40<+85	-40<+100
200-BR5V	-	.071V/°C [1]	15	-	-40<+85	-55<+100
200-BA5V	-	.071V/°C [1]	15	-	-40<+85	-55<+100
200-BG5V	-	.071V/°C [1]	15	-	-20<+85	-55<+100
200-BR12V	-	.086V/°C [1]	20	-	-40<+85	-55<+100
200-BA12V	-	.086V/°C [1]	20	-	-40<+85	-55<+100
200-BG12V	-	.086V/°C [1]	20	-	-20<+85	-55<+100
200-NWR	80	1.3	30	160	-40<+100	-40<+100
200-NWO	120	1.3	50	100	-40<+100	-40<+120
200-NWA	80	1.3	30	160	-40<+100	-40<+100
200-NWG	120	2.1	30	100	-30<+85	-40<+100
200-NWB	120	2.1	30	100	-30<+85	-40<+100
200-NWW	120	2.1	30	100	-30<+85	-40<+100
200-NKR	80	1.3	30	160	-40<+100	-40<+100
200-NKO	120	1.3	50	100	-40<+100	-40<+120
200-NKA	80	2.1	30	160	-40<+100	-40<+100
200-NKG	120	2.1	30	100	-30<+85	-40<+100
200-NKB	120	2.1	30	100	-30<+85	-40<+100
200-NKW	120	1.3	30	100	-30<+85	-40<+100
DF200-NFR	80	1.3	30	160	-40<+100	-40<+100
DF200-NFA	80	1.3	30	160	-40<+100	-40<+100
DF200-NFG	120	1.3	30	100	-40<+100	-40<+100
DF200-NFB	120	1.3	30	100	-40<+100	-40<+100
DF200-NFW	120	1.3	30	100	-40<+100	-40<+100

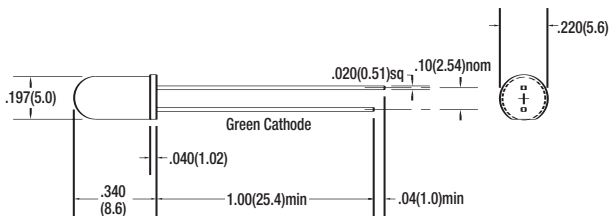


Figure 8

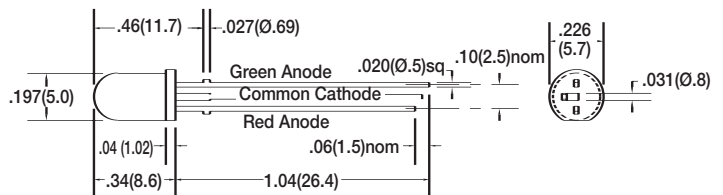


Figure 9

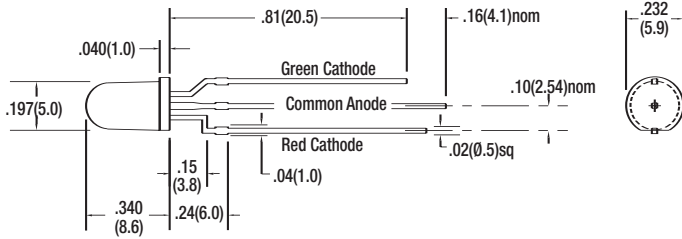


Figure 10

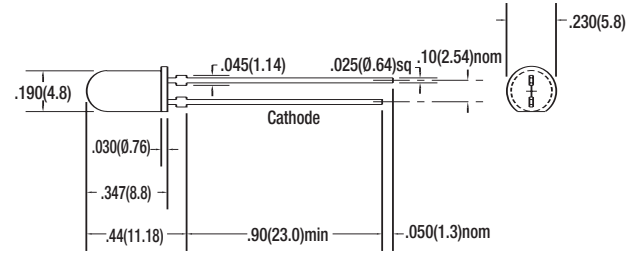


Figure 11

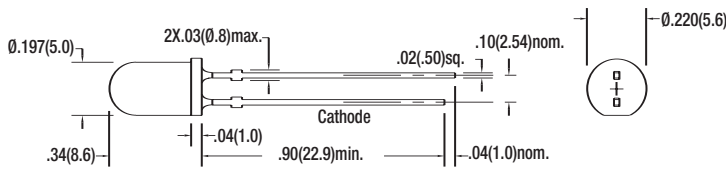


Figure 12

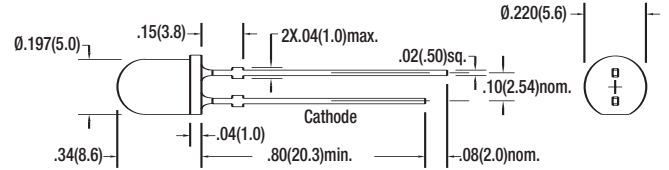


Figure 13

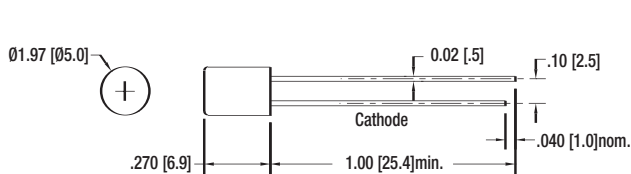


Figure 14

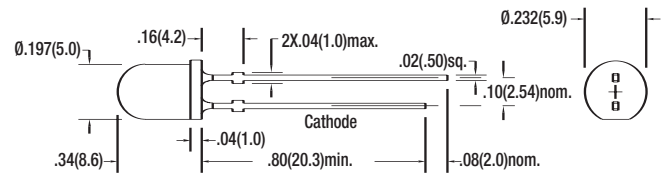
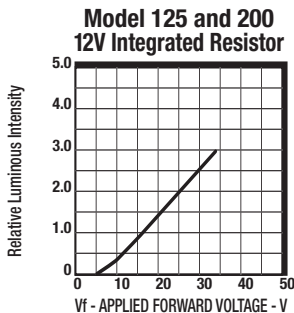
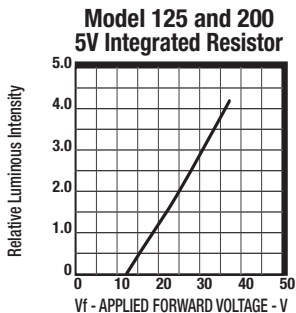
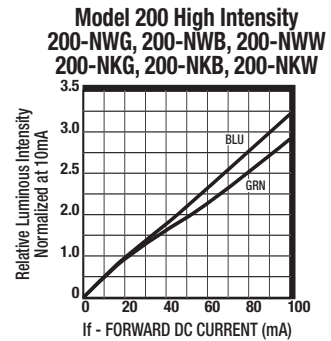
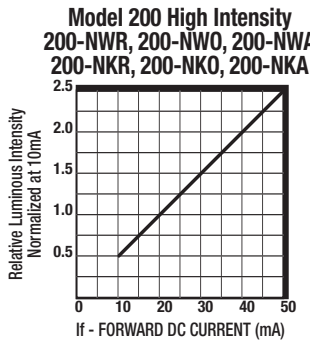
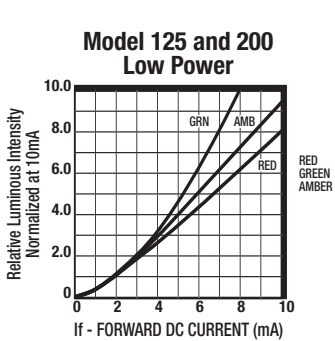
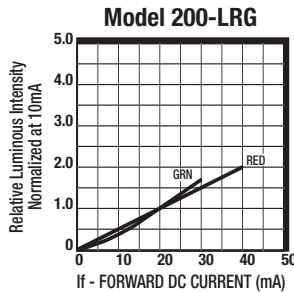
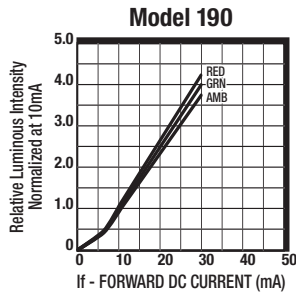
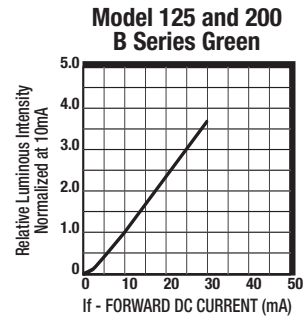
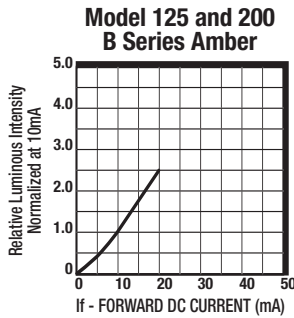
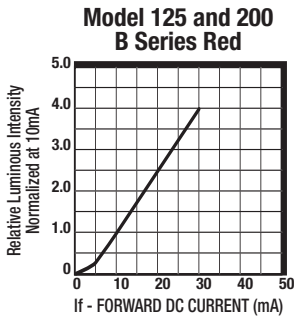
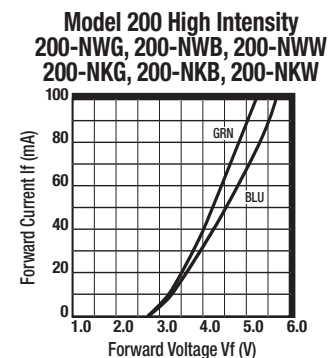
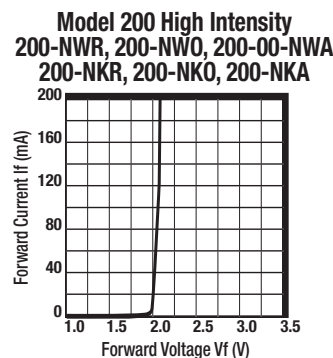
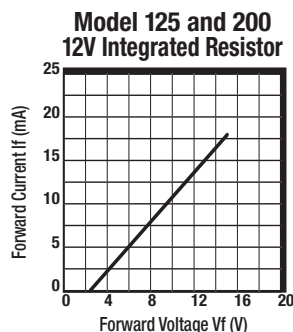
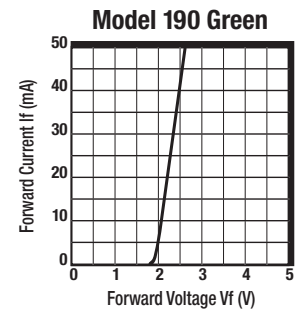
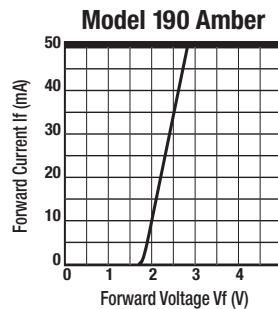
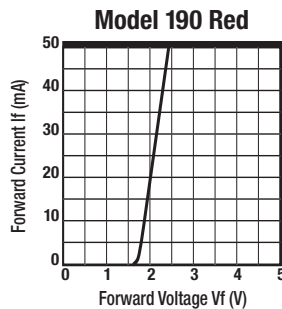
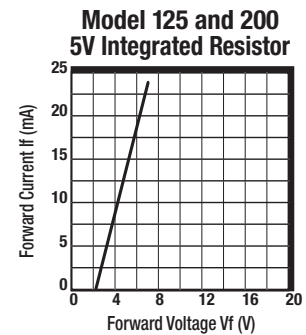
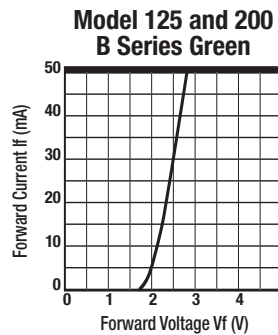
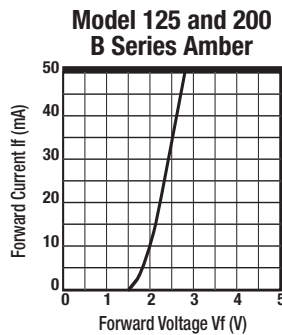
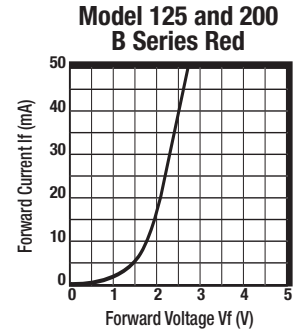
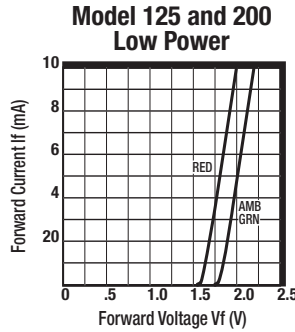
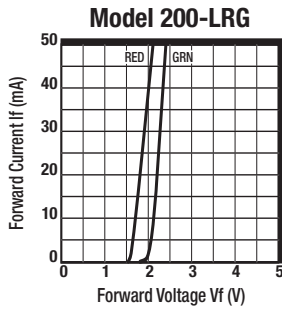


Figure 15

**RELATIVE LUMINOUS INTENSITY (mcd) vs FORWARD CURRENT (mA)
NOMRALIZED AT 20mA, UNLESS OTHERWISE INDICATED
ALL INFORMATION AT Ta = 25°C**



FORWARD CURRENT (mA) vs FORWARD VOLTAGE (Vf) @ Ta = 25°C



Active component

A component that changes the amplitude of a signal between input and output.

Ambient Temperature (T_a)

The surrounding temperature within an environment.

Anode

The positively charged terminal or electrode toward which electrons flow.

AWG

Abbreviation for "American Wire Gauge."

A gauge that assigns a number value to the diameter of a wire.

Bezel

The faceted collar of a panel-mount LED indicator visible from the front.

Binning

During fabrication, LEDs grow in the form of a crystal wafer. A 2-inch diameter wafer can carry more than 20,000 LED chips. Color and intensity variations are common across a wafer. LEDs can be "binned" into various groups by wavelength, luminous intensity, voltage drops, and other characteristics.

Backlighting

Use of an LED as a light source to illuminate a lens or legend from behind without protrusion through the panel.

Bi-Color LED

A single LED device containing two different colored LED dice. The different colored dice can be illuminated independently or together.

Bridge Rectifier

A circuit using four diodes to provide full wave rectification by converting an AC voltage to DC voltage.

Candela

A unit of luminous intensity equal to 1/60th of the normal intensity of one square centimeter of a blackbody radiating at the temperature of solidification of platinum.

Candle Power

Luminous intensity expressed in candelas.

Cathode

The terminal or electrode that is negatively charged and from which electrons flow.

CIE Chromaticity Diagram

In 1931 (Commission Internationale de l'Eclairage (CIE) established the X-Y-Z tristimulus system for measuring color properties, based on the assumption that every color is a combination of three primary colors: red, green and blue. The CIE Chromaticity Diagram is a two dimensional color space that defines all of the colors perceived by the human eye. Pure colors are located on the extreme outer edges of the diagram and white is located in the center.

Color Temperature

Color temperature is a simplified way to characterize the spectral properties of a light source. While in reality the color of light is determined by how much each point on the spectral curve contributes to its output, the result can still be summarized on a linear scale. Technically, color temperature refers to the temperature to which one would have to heat a theoretical "black body" source to produce light of the same visual color.

Continuous Forward Current

The maximum continuous operating current the LED can withstand without diminishing its operating life.

Current

Measured in amperes, it is the flow of electrons through a conductor. Also known as electron flow.

Current-Limiting Resistor

A resistor is added in series between the power source and the LED to regulate the current delivered to the device (see Ohm's Law).

Die

The chip within the LED package; the plural form is dice.

Diffused Encapsulation

Glass particles are suspended within the epoxy lens of the LED diffusing the light over a wide viewing area. The encapsulation may be white or colored to match the LED output.

Diode

A two terminal device that conducts in only one direction.

Dominant Wavelength (λ_d)

A measure of the hue sensation perceived by the human eye.

Electroluminescence

The conversion of electrical energy into light via non-thermal means.

Electrostatic Discharge (ESD)

A sudden redistribution of static charge which can be damaging to sensitive components.

Encapsulation

A hard rugged epoxy surrounding the LED die, providing diffusion and lensing of the LED light.

Flow Soldering

Flow or wave soldering technique in large scale electronic assembly to solder all the connections on a printed circuit board by moving the board over a wave of molten solder.

Foot Candle

A measure of illumination in which one unit equals the amount of light delivered by a one-candela light source to a one square-foot surface one foot away.

Forward Bias

A P-N junction bias which allows current to flow through

the junction. Forward bias decreases the resistance of the depletion layer.

Forward Current

Current through a diode in the direction of its greatest conduction.

Forward Voltage (V_f)

The operating voltage of the LED. The typical rating is the voltage at which the LED will light. The maximum rating is the voltage that, if exceeded, will diminish LED lifetime.

Fresnel Lens

A thin optical lens consisting of concentric rings of segmental lenses and having a short focal length.

Incandescent Lamp

A light source where voltage passes through a filament to create heat which, in turn, creates light.

Kelvin

Kelvin is a unit of measure for color temperature used to assign a numeric value to the condition of light when we see a color. The reason this measurement is called a "temperature" is because it was derived from a theoretical object called a "black body radiator." When the radiator is heated, it changes from black to red to yellow to white to blue. The lower the Kelvin rating, the "warmer" or more yellow the light. The higher the rating, the "cooler" or more blue the light. When describing a light source as having a Kelvin rating, it refers to a light source that emits energy across the entire visible range from 300 to 700nm.

Lamp Size

Industry standard classifications for lamps sizes are based on descriptive designators referring to the diameter of the lamp. "T-1" is the base designation for a 1/8" diameter lamp. Other designations are based on the T-1 standard, i.e., T-1^{3/4} is 1^{3/4} multiplied by 1/8, or .219".

Continued...

Lead Frame

The metal structure to which an LED die is attached for mechanical and electrical function.

Light-Emitting Diode (LED)

A light-emitting diode (LED) is a solid-state semiconductor device that converts electrical energy directly into light.

Luminous Flux

Luminous Flux is defined as the total electromagnetic energy emitted by the light source into a sphere (360°) surrounding the light source.

Luminous Intensity (I_v)

Luminous Intensity is equal to the amount of luminous flux emitted into a very small solid angle at a defined angular orientation from the light source. The measurement for luminous intensity is the lumen or candela.

Mean Spherical Candle Power (MSCP)

The average luminous intensity of a lamp illuminating in all directions. The measurement is made by placing the lamp in the center of a sphere.

Millicandela (mcd)

One thousandth of a candela.

Nanometer (nm)

The nanometer (one-billionth of a meter) is the measurement unit for peak wavelength. Visible light falls in the range of 380 to 700nm.

Ohm

Unit of resistance symbolized by the Greek capital letter omega (Ω).

Ohm's Law

Relationship between voltage, current and resistance. Ohm's law states that current in a resistance varies in direct proportion to voltage applied and inversely proportional to resistance.

Operating Current

The amount of current an LED is designed to draw from the power source.

Operating Temperature

The temperature range over which an LED is designed to operate safely.

P-N Junction

The positive-negative junction of a semi-conductor diode. The p-region contains positive electrical charges while the n-region contains negative electrical charges. When voltage is applied and current begins to flow, the electrons move across the n region into the p region. The process of an electron moving through the p-n junction releases energy. The dispersion of this energy produces photons with visible wavelengths.

Passive Component

A Component that does not amplify a signal. Resistors and capacitors are examples.

Peak Forward Current

Forward current driven during pulse operation.

Peak Wavelength (λ_{pk})

Peak Wavelength is defined as the single wavelength of saturated color at the peak of the radiated spectrum.

Photometer

An instrument for measuring a property of light, especially luminous intensity or flux. A photo-meter uses special colored filters to replicate the response of the human eye. Light intensity is measured in candle power, usually by comparison with a standard source.

Power Dissipation

Amount of heat energy generated by a device in one second when current flows through it.

Printed Circuit Board

Insulating board containing conductive tracks for circuit connections.

Resistance

Symbolized "R" and measured in ohms. Opposition to current flow and dissipation of energy in the form of heat.

Resistor

Component made of material that opposes flow of current and therefore has some value of resistance.

Reverse Breakdown Voltage

Amount of reverse bias that will cause a P-N junction to break down and conduct in the reverse direction.

Storage Temperature

The temperature range over which an LED is designed to be stored safely in the off-state.

Surface-Mount (SMT) LED

SMT LEDs are soldered to the surface of the circuit board. The LED die is integrated into the package design. SMT components can be assembled faster and with better quality than through-hole components.

Through-Hole LED

This kind of package is soldered "through holes" to the circuit board. The LED chip is seated in a reflector and light is emitted by a lens integrated into the package. Different radiation characteristics are produced as a function of chip-to-lens spacing and the shape of the lens.

Tinted Encapsulation

Color added to the LED epoxy lens to identify the LED color when it is in the off-state. The tint does not affect the luminous intensity or viewing angle.

Tri-Color LED

A single LED device containing two different colored LED dice and three leads. The different colored dice can be illuminated independently or together with a common anode or cathode.

Viewing Angle

Viewing Angle is the total cone angle in degrees encompassing the central, high luminous intensity portion of the LED beam from the on-axis peak to the off-axis point where the LED intensity is 50% of the on-axis intensity. This off-axis point is known as theta one-half ($\theta^{1/2}$). Two times $\theta^{1/2}$ is the LEDs' full viewing angle; however, light is visible beyond the $\theta^{1/2}$ point.

Voltage (V)

Term used to designate electrical pressure or force that causes current to flow.

Voltage Drop

Voltage or difference in potential developed across a component due to current flow.

Waterclear Encapsulation

An LED lens without tint or color. The LED color cannot be determined in the off state.

Wavelength (λ)

Distance between two points of corresponding phase and is equal to waveform velocity divided by frequency.

Zener Diode

Semiconductor diode in which reverse breakdown voltage current causes the diode to develop a constant voltage. Used as a clamp for voltage regulation.

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SH40	44
SH90	48
SM200	23
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TC4	43
TC5	53
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NOTES

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