



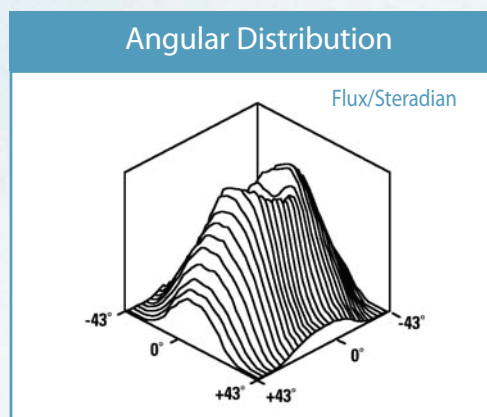
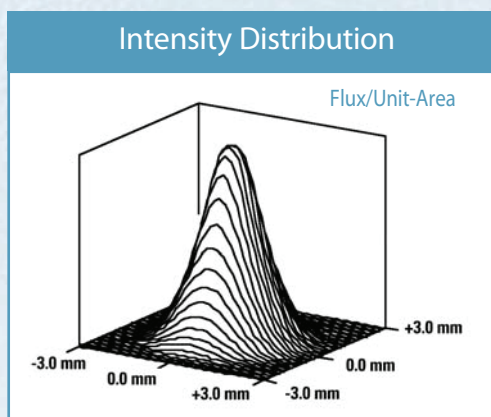
## ELLIPTICAL REFLECTORS

### The Short Arc Gap

USHIO's Sōlarc® single-ended lamps allow the equipment designer to capitalize on the lamp's unique short arc length. At 1.27mm, with a peak luminance at the cathode, the lamp begins to approximate a point source. Coupled with carefully designed lenses or reflectors with maximum light capture and the appropriate focus, the lamp can deliver high-intensity light to tightly controlled or divergent beam applications. The figure below shows the luminous intensity distribution of the arc. The two sources of peak intensity lie near the electrode tips.

### Highest Efficacy

Metal halide lamps are inherently very efficient, providing two to three times the efficacy of either halogen or xenon lamps. Optimizing the optical system using the short arc can provide an efficiency increase in many applications, allowing the Sōlarc lamp to deliver as much light as a halogen lamp with four to five times more wattage. High efficacy plus the resultant decreased demand for power allow the equipment designer to develop miniature, lighter weight, portable and even battery-powered product configurations.



### Bright White Light

Sōlarc lamps inherently exhibit a correlated color temperature comparable to the sun of 5,000K–7,000K. Halogen lamps normally operate in the 3,000°K–3,200°K range and vacuum incandescent lamps in the 2,600K–2,900K range. In visible terms, the lower color temperature dictates more red or yellow in the light. The higher color temperature enables realistic visualization of color rendering and contrast. While it is possible to operate halogen lamps up to 4,300K by the use of filters, it is at the expense of severely reducing the lamp's light output and life. The daylight color temperature of the Sōlarc lamp produces a whiter, "cooler" light, which reproduces the full range of colors. The output is color balanced, making it ideal for use with CCD video cameras.

## Excellent Light Maintenance

Unlike many metal halide lamps, Sōlarc lamps maintain much of their intensity and color balance throughout their life. In applications requiring white light, the life of the Sōlarc lamp could be many times that of a competing halogen lamp. Typically our lamps will maintain 75% of their initial intensity. Shifts in X and Y chromaticity values are typically less than 1.5%.

Lamp life is defined as a rated median life with a duty cycle of one hour on and 15 minutes off for 19, 22 and 25W lamps. The median life is the time at which 50% of the lamps are still operational. An application requiring a duty cycle with a longer “on” time for each start will extend the life, and shorter “on” times will reduce lamp life. The predominant symptom of end of life will be failure of the lamp to start.

## The Spectrum

A typical spectral distribution of reflectorized lamps is illustrated on pages 3 and 6. In general, the distribution is optimized for the visible range. The dichroic coating of the reflector reduces the projected infrared, but lamps can be manufactured which are uniquely rich in the mid and far infrared.

## Additional Cooling

Sōlarc lamps operate at relatively high temperatures and require adequate cooling. The reflectorized lamps are designed to let the heat pass through the reflector, simplifying the mechanical/thermal design. Ushio America can offer a test lamp with embedded thermocouples to evaluate the cooling design of your application.

## Accessories

Sōlarc lamps require a ballast to ignite and sustain operation. The ballast model numbers listed in the tables on pages 3 and 6 are specifically designed to operate Ushio America’s patented arc lamp technology. A special connector, C18A003, is required to connect the lamp and ballast. This connector assembly includes a polarized mating connector with 457 mm of silicone-jacketed wire rated for high-voltage pulses.

## Operating Characteristics

**Start/Restart:** Igniting the lamp requires short high-voltage pulses provided by the Ushio America ballast. The lamp will require some time, generally less than 50 seconds, to reach 90% of its light output. Color temperature will vary during start-up.

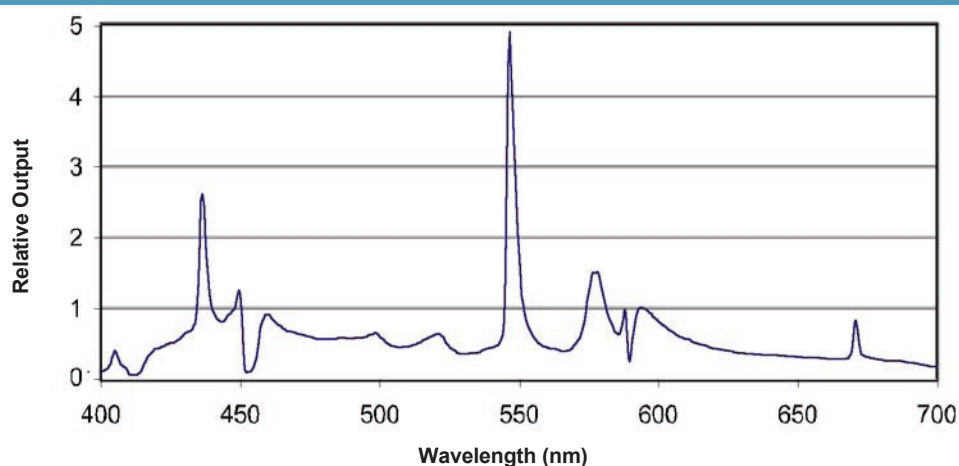
## Orientation and Cooling

The lamp data provided was characterized in the recommended horizontal operating position. The lamp may be operated in other mounting orientations but performance may vary significantly. To maximize lamp life, the anode and cathode seal areas must be maintained at 200°C to 285°C and 100°C to 150°C, respectively.

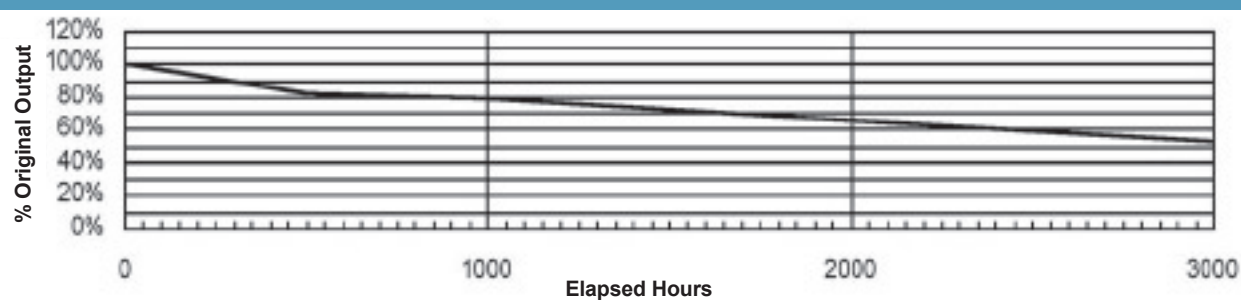
## Sōlarc® MR-16 Elliptical Lamp Performance Specifications

LAMP P/N	M50E014/M50E012	M50E021/AL-5060
Wattage	50W	50W
<b>Performance @ Rated Power: Luminous Flux</b>		
Lumens Through a 10 mm Aperture	1,300	2,500
Lumens Through a 8 mm Aperture	1,300	–
Lumens Through a 6 mm Aperture	–	2,000
Lumens Through a 4 mm Aperture	–	1,250
Lumens Through a 2 mm Aperture	–	400
Correlated Color Temperature (K)	6,500	5,700
Chromaticity (CIX, CIY)	0.308, 0.314	0.33, 0.37
Lamp Life (Hours)	2,500	
Lamp Maintenance and Spectrum	Refer to charts below	
Warm-Up Time to 90% Output	40 Seconds	
Restart Time to 90% Output	60 Seconds	
<b>Reflectorized Lamp Application Information</b>		<b>MR16</b>
Numerical Aperture	NA–0.42	NA–0.69
Spot Size @ Focal Plane F2	10 mm @ 50% Intensity	6 mm @ 50% Intensity
F2 Distance from Rim	47.2 mm / 38.0 mm	23.8 mm / 18.6 mm
<b>Ballast Requirements</b>		
Regulated Ballast P/N	B50R004R	
Input Voltage (VDC)	12.0–15.0	
Steady State Current (Amps)	5.6 @ 12 VDC	

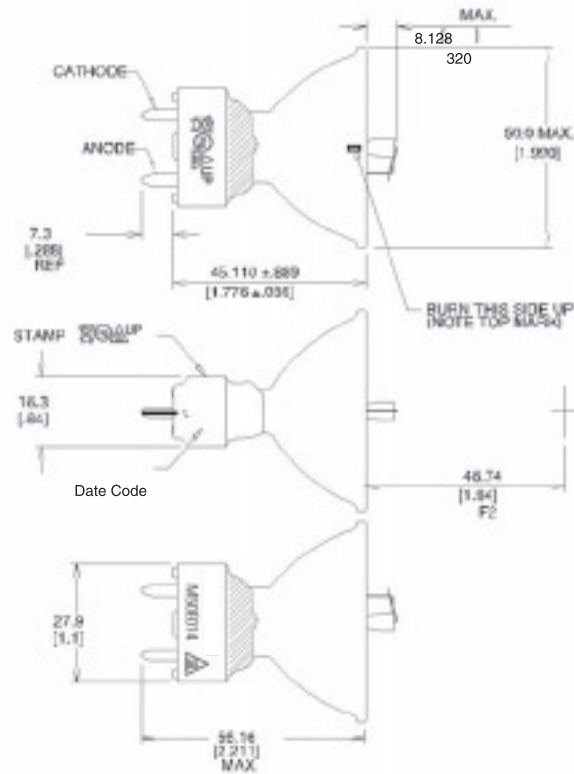
### 50W Typical Spectral Output (Reference)



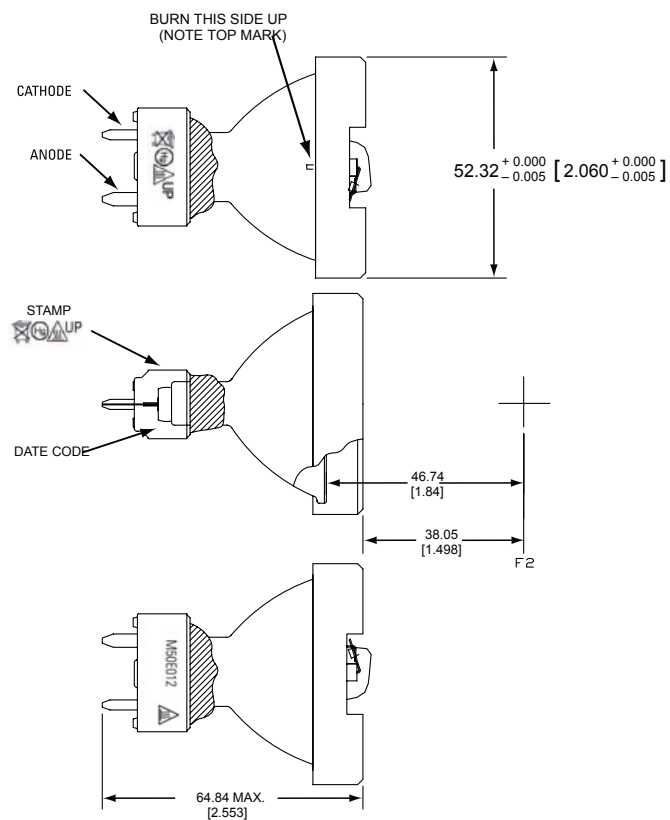
### Typical Light Maintenance–50W Lamp



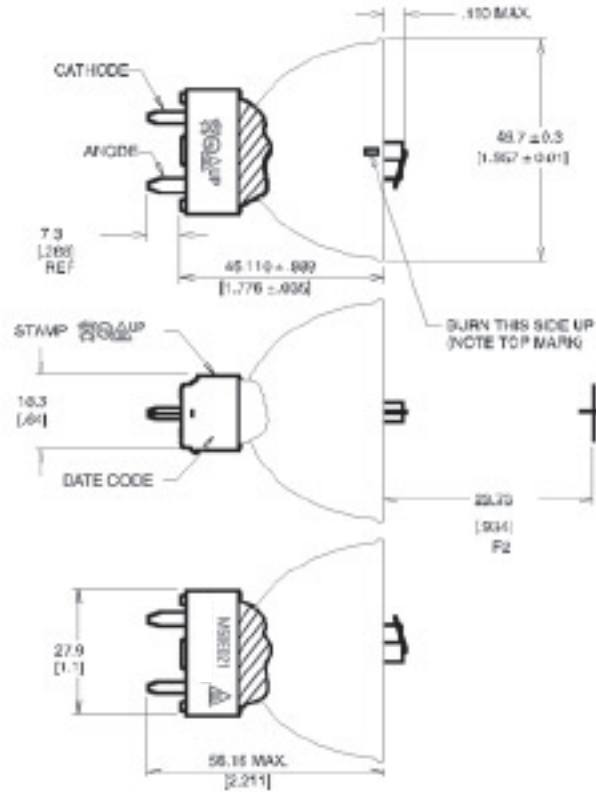
### M50E014 (Measurements are in mm [inches].)



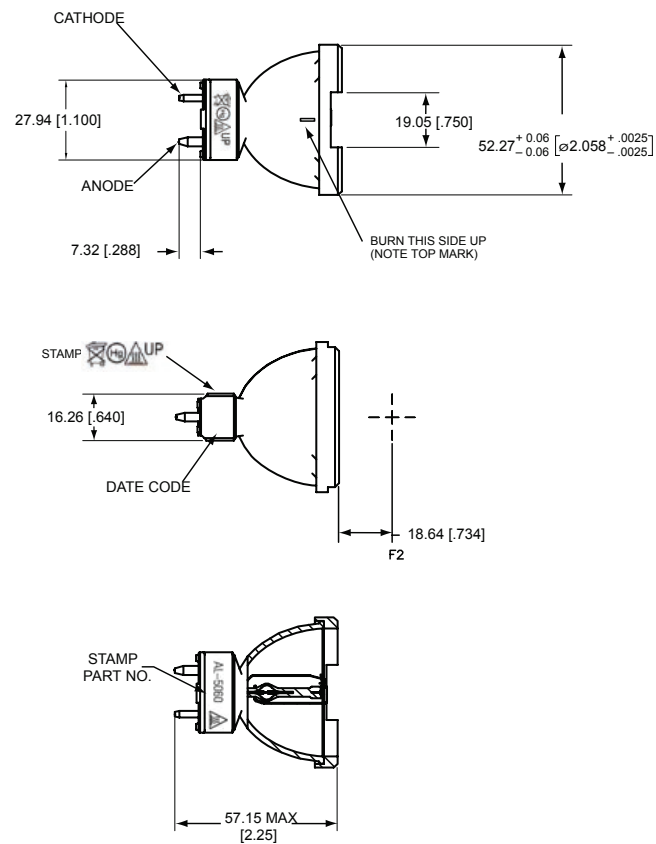
### M50E012 (Measurements are in mm [inches].)



### M50E021 (Measurements are in mm [inches].)



### AL50-60 (Measurements are in mm [inches].)







## B50R004R BALLAST

USHIO America's ballast products are designed to operate with USHIO America Sölarc® lamp products only. The ballast consists of an internal regulator that delivers constant power to the Sölarc lamp. This design is ideally suited for both battery and AC power supply-driven applications where both small size and high efficiency are needed. The new wattage setting feature allows you to select your lamp wattage within a 10W range to achieve a 20% light output difference. The ballast is a self-contained system with all the necessary starting, regulating and safety features to meet any application, from commercial to medical.

### Performance Specifications

Electrical (all measurements are at 25°C)

<b>Absolute Maximum Input Voltage</b> .....	<b>16.0 VDC</b>
<b>Minimum Safe Input Voltage Range</b> .....	<b>11.0 VDC</b>
Operating Input Voltage Range .....	12.0 VDC to 15.0 VDC
Input Current Range .....	5.6 A @ 12.0 VDC, 4.4 A @ 15.0 VDC
Lamp Run-Up (Cold) .....	2.0 A/sec
Nominal Lamp Voltage .....	55V ± 6V
Inrush Current .....	~15 A < 100 µsec
Time to Shut Down .....	3.0 sec nominal
Ignition Voltage .....	~9 kV Peak
Output Wattage .....	Switchable in 3 increments: 50, 55, 60W*
Efficiency .....	~78% @ 15.0 VDC and 25°C

### Environmental

Storage Temperature Range .....	-40°C to +105°C
Operating Temperature Range .....	0°C to +70°C
Air Flow Requirements .....	10 cfm @ 25°C ambient

\*The B50R004R is factory preset at 50-watts operation. If other wattage settings are desired, refer to user-selectable "Power Setting" diagram on the back of this datasheet. Consult the factory for technical assistance per lamp and ballast. Cooling, lamp life and output performance will change depending on ballast wattage setting.

### Application Notes

Increase airflow requirements by 1 cfm for every 2°C rise above 25°C. Do not allow the temperature of the MOSFET attached to the heat sink to rise above 90°C. Additional heat sinking is possible by screwing more thermally conducting material to the top of the heat sink. Use a #2 screw and thermal compound to ensure proper conduction.



## Mounting

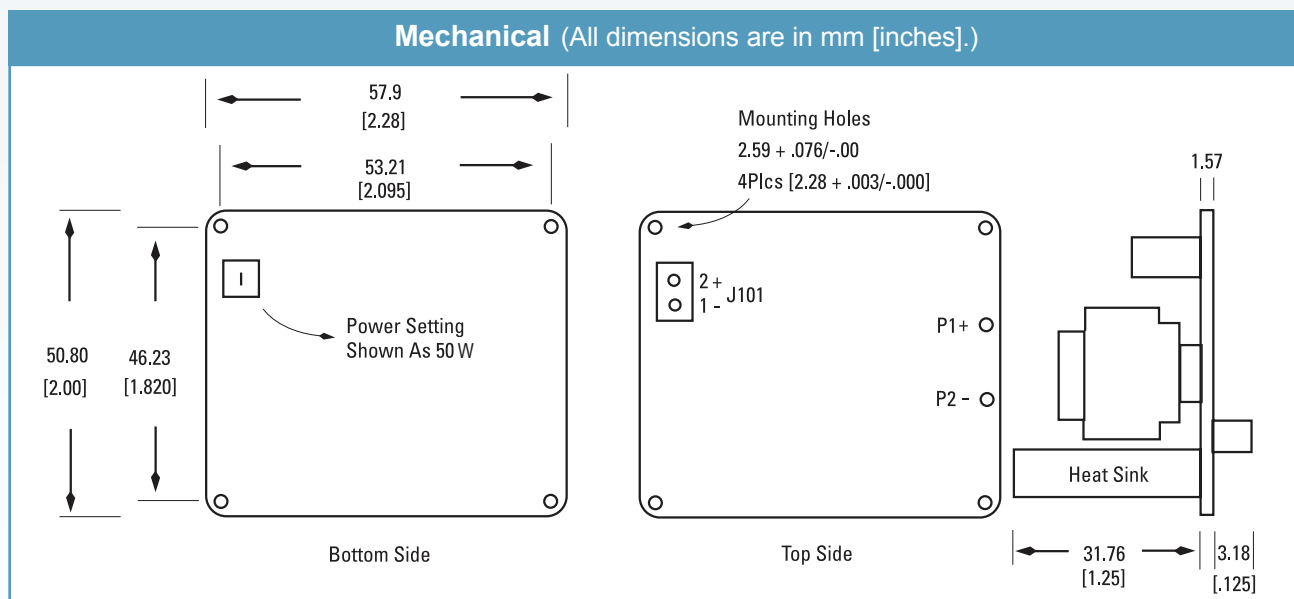
Mount the ballast using the four holes in the corners with a #2 screw. The heat sink should not be used for mounting because it is electrically floating. Since there is high voltage on the board, spacing of 6.35mm [0.25 inches] on all sides is required or appropriate insulating material must be used.

## Safety

This ballast, as well as all others produced by USHIO America for the Sōlarc arc lamp, has been designed to pass commercial and medical safety regulations world-wide when applied correctly. Since it is a secondary device, it is part of the end product's approval. It also may conform to any EMC directives when the ballast and the lamp are enclosed in a metal or metal-coated enclosure. Proper interlocking for lamp replacement is always recommended. There is a risk of electric shock when using the ballast without proper precautions.

## Connections

Input Power ..... Molex Part Number 09-05-1021 – J101 pin 2: +  
J101 pin 1: –  
Lamp Connection ..... P1 + Soldered High-Voltage Wires  
P2 – Soldered High-Voltage Wires



## Power Settings—User Selectable



Factory preset at 50W operation.

Set switch for discrete wattage settings (50, 55, 60W) as shown here.