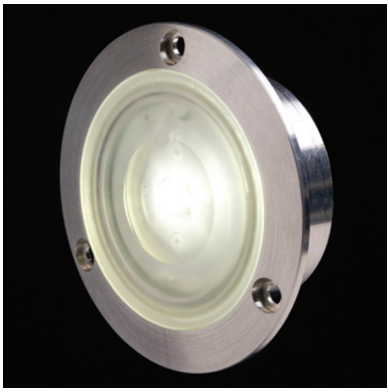
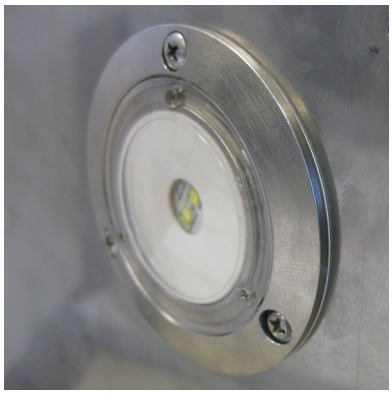
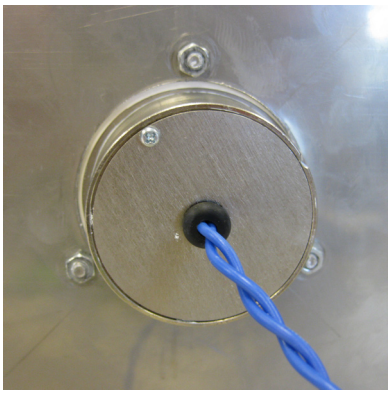


ULE21VW1-F-38W 180-degree LED floodlight



Mounting detail: front



Mounting detail: back

Application Note 21: Thermal Management Recommendations for the ULE21VW1-F Series Universal Light Engine

Optimal Thermal Management Delivers Maximum LED Brightness

Most high-power LED light engines require proper thermal management to guarantee optimal LED performance and reliability. This application note provides recommendations for managing the heat generated by the OptoElectronix™ ULE21VW1-F Series Universal Light Engine™ module.

ULE21VW1-F Safety-Protection Circuit

The OptoElectronix ULE21VW1-F Universal Light Engine module is a high-performance, integrated LED lighting system. OPTO engineers have developed a safety-protection circuit that regulates the amount of drive current into the LEDs to ensure that the LED junction temperature remains in a safe operating range at all times. The design uses a thermal sensor that feeds back information to the driver circuitry to maintain an LED junction temperature of less than 125° C. This design will decrease the LED drive current when needed, regardless of the environmental conditions. Environmental conditions are defined as the ambient temperature in combination with the thermal heat-sinking capacity of the mounting area.

In the worst environmental conditions, the ULE21VW1-F series LED light engine limits LED drive current as a self-preservation factor. It is critical to provide the best possible heat-sinking capacity to maximize light output, especially in elevated ambient temperatures.

ULE21VW1-F Mounting Information

LEDs are semiconductors, so LED light engines generate a significant amount of heat, which requires proper thermal management to keep the LED operating at optimal light output. This requires:

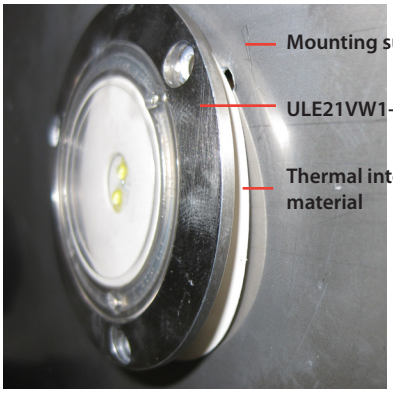
- Direct mounting to clean metal—not to wood, plastic, or painted metal
- A flat mounting area under the flange
- Adequate surface area for the installation, defined by the type of metal used, as shown in Table 1 below

The ULE21VW1-F must be mounted to a clean metal surface. Painted metal surfaces are less effective. The mounting area under the flange of the ULE21VW1-F must be flat to assure proper thermal conductance.

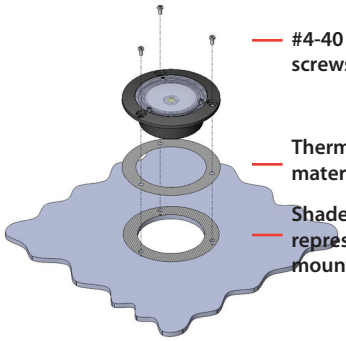
Table 1:
ULE21VW1-F Thermal Management Surface Area by Material

ULE Model	Material (Unpainted)	Material Thickness	Minimum Material Area
ULE21VW1-F-25W	Aluminum	0.050 in. (1.27 cm)	12 sq. in. (77.4 sq. cm)
ULE21VW1-F-25W	Stainless Steel	0.050 in. (1.27 cm)	36 sq. in. (232.3 sq. cm)
ULE21VW1-F-38W	Aluminum	0.050 in. (1.27 cm)	20 sq. in. (129.0 sq. cm)
ULE21VW1-F-38W	Stainless Steel	0.050 in. (1.27 cm)	64 sq. in. (412.9 sq. cm)
ULE21VW1-F-45W	Aluminum	0.050 in. (1.27 cm)	81 sq. in. (522.5 sq. cm)
ULE21VW1-F-45W	Stainless Steel	For maximum light output, mounting on stainless steel is not recommended.	
ULE21VW1-F-60W	Aluminum	0.050 in. (1.27 cm)	144 sq. in. (928.8 sq. cm)
ULE21VW1-F-60W	Stainless Steel	For maximum light output, mounting on stainless steel is not recommended.	

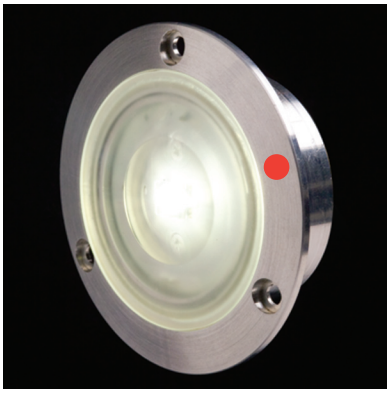
OptoElectronix is the leader in *The Art of LEDs* — the conception, design, and manufacture of cutting-edge, standard, highly efficient LED-based lighting.



Mounting detail



Mounting detail



Thermal couple contact point for unique luminaire designs

Different metals have different thermal transfer properties: Copper has the best thermal transfer properties of all common metals. Stainless steel has a less effective thermal transfer property than copper, and aluminum's thermal transfer properties lie between copper and stainless. Table 1 provides the minimum surface area of metal required for proper thermal management.

Preparing the Mounting Surface

If you are not using an automated punch press but are cutting holes manually, we recommend a 1⅝-inch-diameter hole cut in the mounting surface using a knockout punch set, such as a Greenlee 7211BB-1-1/4. Another, less desirable, option would be to use a quality hole saw capable of cutting through stainless steel (if applicable). It is very important to maintain a flat surface in the area where the ULE21VW1-F will be mounted for best thermal transfer.

Mounting the ULE21VW1-F to the Surface

We recommend using #4-40 machine screws or #4 sheet-metal screws to mount the ULE21VW1-F LED light engine. A thermal transfer material must be used between the flange of the ULE21VW1-F and the mounting surface. You can use either Berquist 400AC thermal interface material or high-quality thermal grease, such as Ceraminque by Arctic Silver, liberally applied under the mounting flange of the ULE21VW-F. We recommend a maximum torque of 4 inch-pounds (45 Newton-centimeters).

Recommendations for Unique Luminaire Designs

If heat-sinking with a defined area of sheet metal isn't appropriate for your light fixture design, we recommend that you test your design using a thermal couple contact point on the light engine flange, positioned as shown in the bottom left photograph, to monitor temperature and see how well the light fixture dissipates heat. This feedback will help you design the appropriate heat sinking into the fixture. Ideally, the fixture design should result in a maximum temperature of 40 to 50 degrees C at the contact point over a one-hour period.

Conclusion

Overall performance of ULE21VW1-F series LED light engines will meet or exceed specifications if you follow the thermal management techniques described in this application note. If you choose a different method, OptoElectronix LED light engines will not fail prematurely, but the LED will not deliver maximum light output under the most extreme environmental conditions.