

Accessories

LED Light Engines

Datasheet

Bright.
Compact.
Reliable.

At Lamina® we're **changing** the way you think
about **designing** with LEDs.

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lamina®
Bright Lights. Bright Ideas.®

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The company with the next
bright idea.

Introducing Lamina's Light Engine Accessories

Lamina® is pleased to offer you these accessories with our award winning LED array products. These parts have been carefully chosen and developed to work with our LED light engines to help you quickly prove out your design and even go to market if you find them appropriate. Our application engineers are ready to help you select the right parts for your project. Please do not hesitate to give us a call as we are eager to work with you.

Heat Sink Selection

Lamina's light engines should maintain LED die junction temperatures at or below maximum rated temperatures. Lamina's LED light engines provide very efficient transfer of heat from the individual LED die to the heat sink. Additionally, a heat sink with sufficient cooling capacity must be selected to maintain the LED die junction below the maximum rated temperature. Lamina's heat sinks have been sized for Lamina's standard products and to accommodate a range of desired operating conditions. Proper heat sink sizing is determined by a number of factors, including those listed below:

- Power Dissipated (Watts) - Determined by the light engine part number and associated drive parameters chosen for operating the LED Light Engine.
- Ambient Conditions - Ambient temperature, free or forced convection of air, etc.
- Thermal Path - Thermal interface material, light engine attachment method, and surface area and conductivity of fixture housing the heat sink.
- Desired lifetime and Lumen Maintenance - Lower LED junction temperatures result in longer lifetimes and higher light output over life. Increasing heat sink size will generally help to lower LED operating temperatures.
- Desired light output - LED luminous output is affected by the temperature at which the LEDs operate. Red and amber are more affected than blue, green and white. Increasing heat sink size will generally help to lower LED operating temperatures and result in higher light output.

Lamina®, working in cooperation with ThermaFlo (www.ThermaFlo.com), developed a selection of radial heat sinks to enable easy and rapid prototyping of designs with Lamina's light engines. These heat sinks have been designed to maximize the thermal performance of high brightness LED light engines while allowing design flexibility.

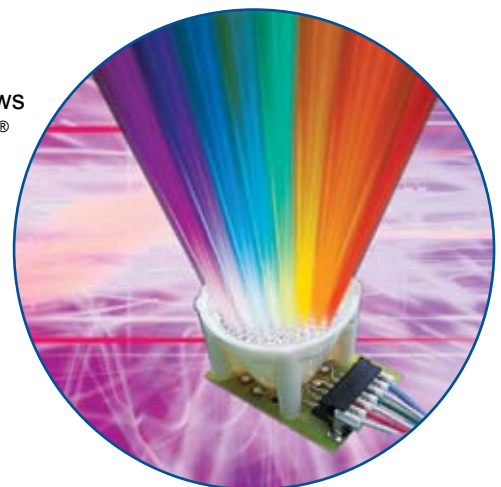
Lamina® heat sinks are:

- Designed for optimal Thermal Performance with Lamina's Atlas™ NT-4000, Titan™ NT-5000 families of light engines
- Radial Shaped for design flexibility
- Drilled and tapped for ease of assembly
- Anodized for enhanced thermal performance
- Designed for a wide range of mounting positions

Assembly Recommendations

Lamina's light engines are designed to attach to heat sinks using screws with thermal grease in the joint or by using conductive epoxy. All Lamina® heat sinks are drilled and tapped to accept the recommended fasteners. More information on recommended attachment methods can be found in **Lamina's Connection Guide** for Lamina's LED Light Engines at www.laminalighting.com.

**LED light engines have never
been this flexible.**



Atlas™ NT-4000 Heat Sink Mechanical Specifications

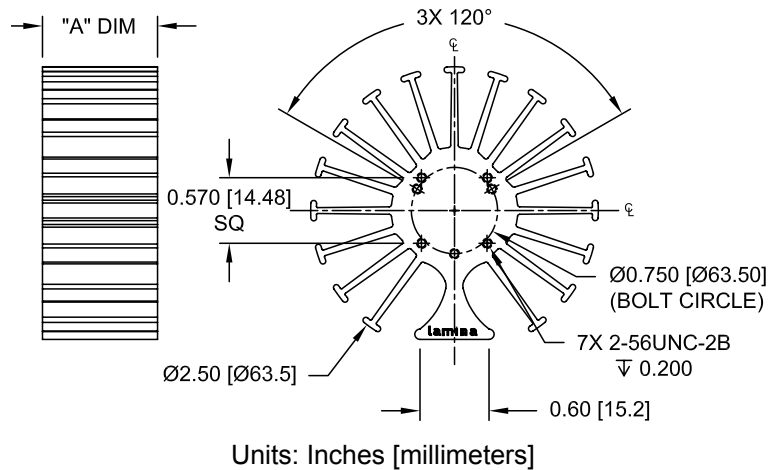


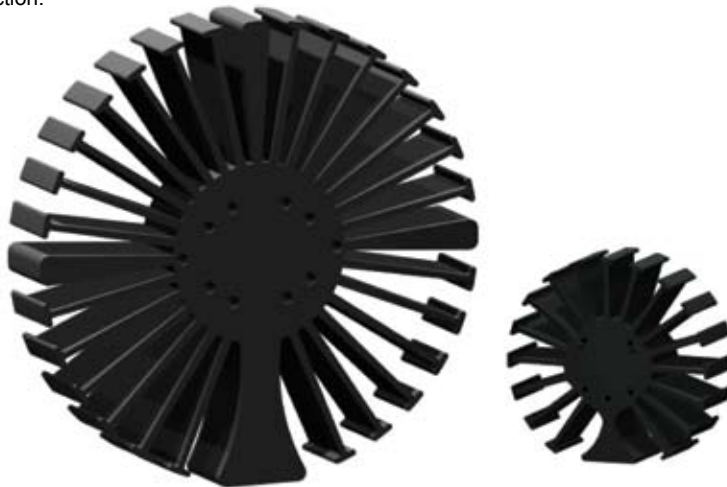
Figure 1.

Lamina's heat sinks come in four different thicknesses ("A" Dimension), from 0.5" (12.7 mm) to 1.5" (38.1 mm) thick. Table 1 lists the applicable sizes for Lamina's standard Atlas™ NT-4000 products.

Atlas™ NT-4000 Heat Compatibility	
Heat Sink Part Number	Dimensions "A"
HS-4050-0345	0.5"
HS-4075-0345	0.75"
HS-4100-0345	1.0"
HS-4150-0345	1.5"

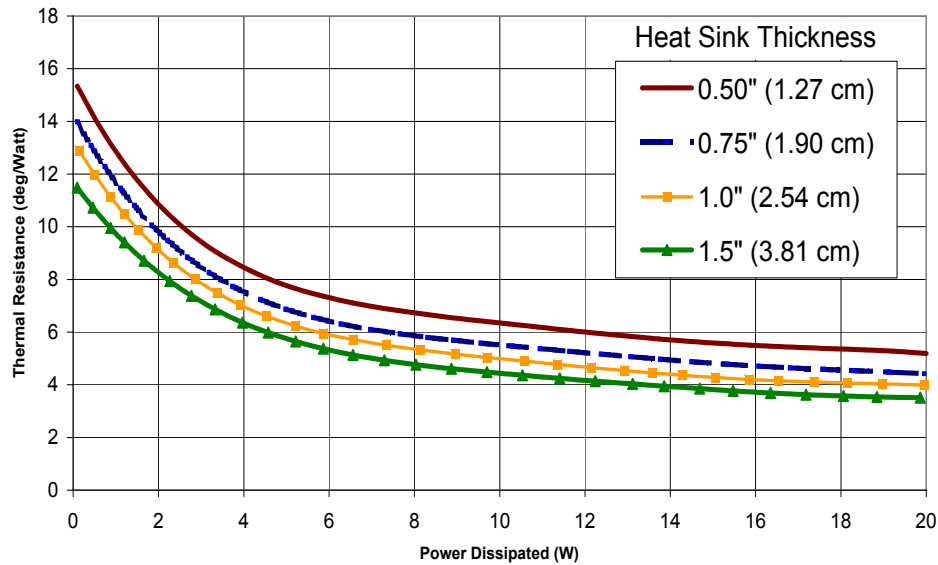
Table 1.

- Note: 1. For the higher wattage Red and Amber light engines additional forced convection is necessary. Additional convection can be achieved by attaching a CPU style fan to the back of the heat sink, connecting the fan to the paddles of the heat sink.
2. Applicable heat sinks when operated at rated LED light engine power, 25°C ambient and unrestricted convection.



Heat Sinks

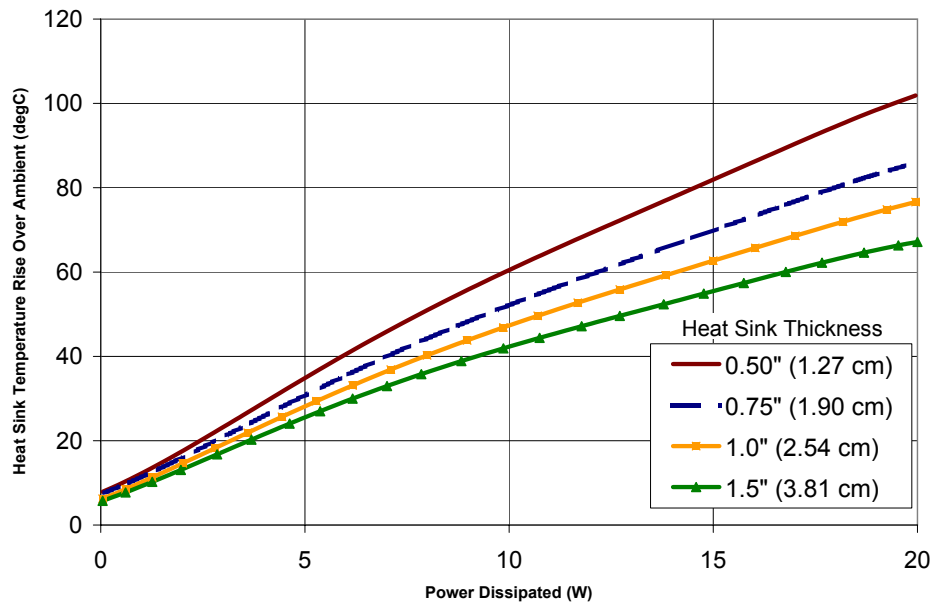
Atlas™ NT-4000 Heat Sink Thermal Resistance



Dimension "A"
See Table 1

Figure 2.

Atlas™ NT-4000 Heat Sink Temperature Rise Over Ambient

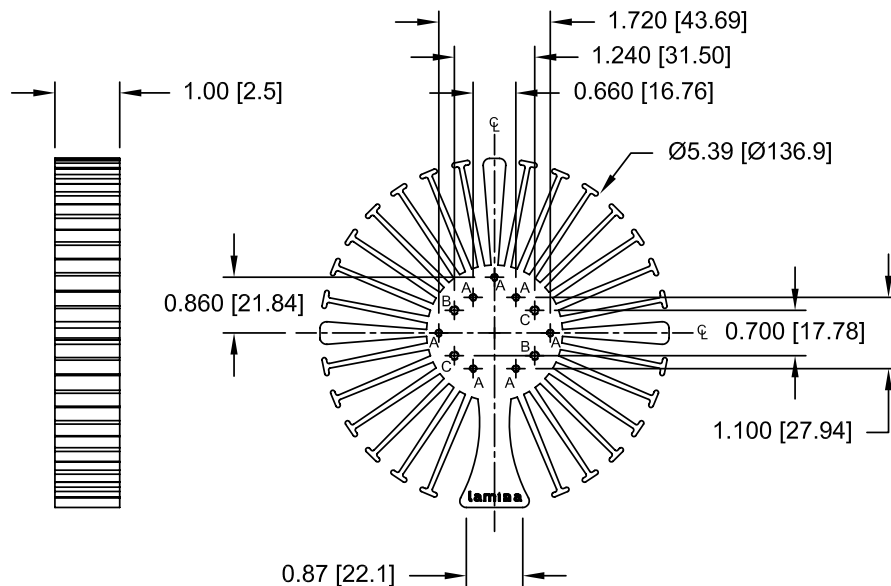


Dimension "A"
See Table 1

Figure 3.

Heat Sinks

Titan™ NT-5000 Heat Sink Mechanical Specifications HS-5100-0346

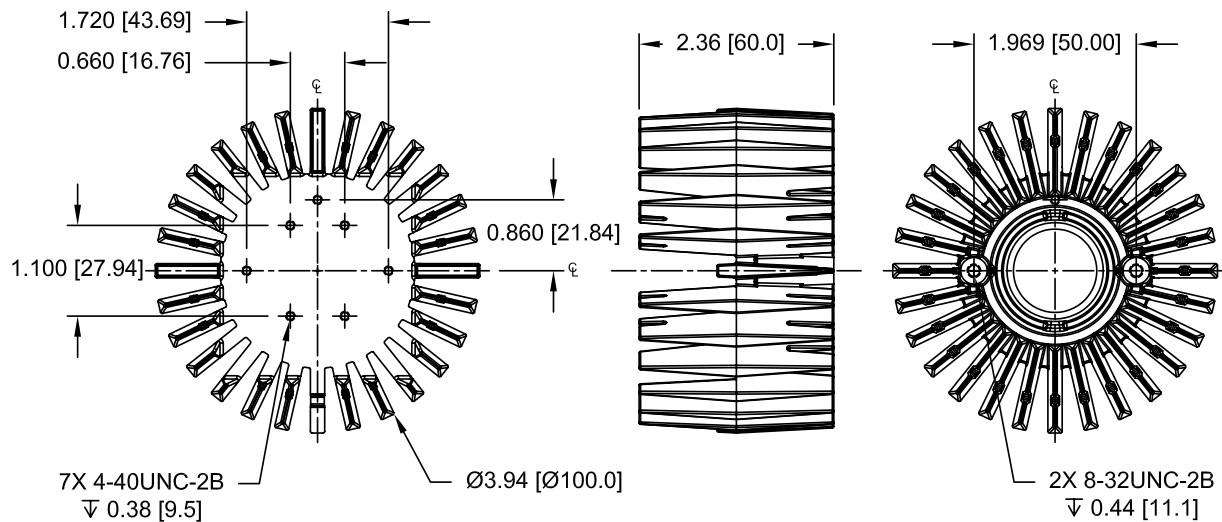


HOLE CHART		
SYM	QTY	DESCRIPTION
A	7	4-40UNC-2B ∇ 0.20
B	2	6-32UNC-2B ∇ 0.20
C	2	6-32UNC-2B THRU

Units: Inches [millimeters]

Figure 4.

Titan™ NT-5000 Heat Sink Mechanical Specifications HS-5200-0493



Units: Inches [millimeters]

Figure 5.

Heat Sinks

Titan™ NT-5000 Heat Sink Thermal Resistance

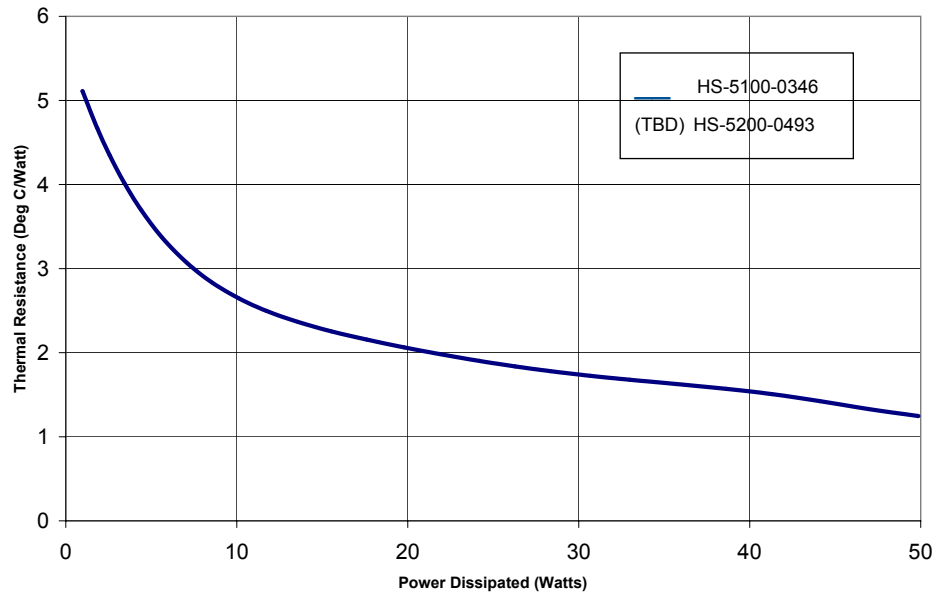


Figure 6.

Titan™ NT-5000 Heat Sink Temperature Rise Over Ambient

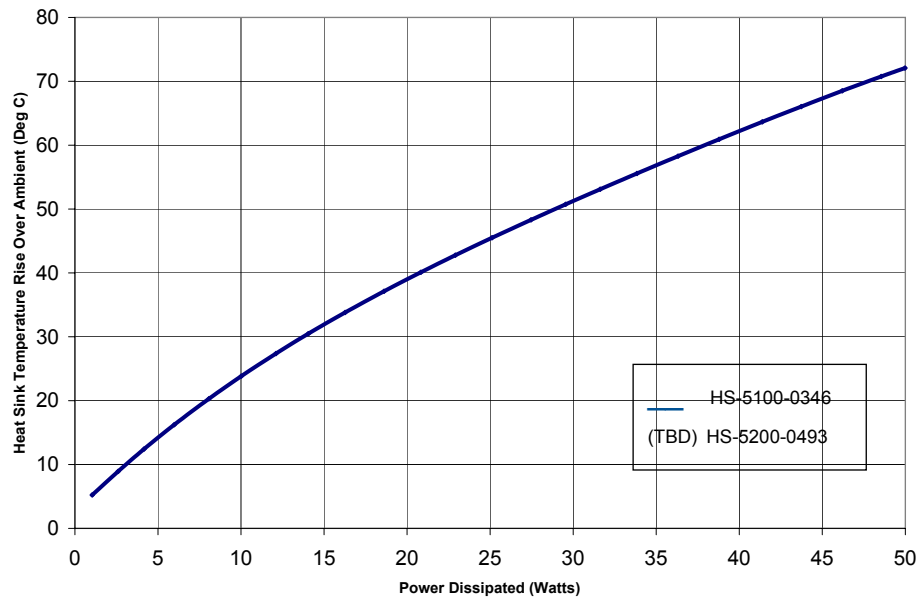


Figure 7.

Atlas™ NT-4000 OP Series

Lamina® now offers optics with narrow, medium and wide beam distributions designed for the Atlas product family. Lamina®, working with Fraen Corporation, has developed optics and optic holders based on Fraen's popular FHS series. Atlas optics are designed to produce homogeneous beam distributions with high collection efficiencies. The optic holders are designed to attach to Lamina's EZ Connect Board.



Photo courtesy of DG Lights
www.DGLights.com

Atlas™ NT-4000 Optical Characteristics	
General Characteristics	
Lens Material	Optical Grade PMMA
Holder Material	PC ABS
Operating Ambient Temperature Range	-10°C / +80°C
Storage Temperature Range	-10°C / +80°C

Table 2.

Atlas™ NT-4000 Optical Performance Warm White NT-42D1-0425 and Daylight White NT42D0-0426			
Lens Part Number	Type of Lens	Typical Total Beam Divergence ⁽¹⁾	Fig. #
OP-4LN2-0492	Narrow-Medium Beam	10°	8
OP-4FM1-0442	Medium Beam	30°	9
OP-4FW1-0441	Wide Beam	40°	9

Table 3. Notes: 1. The typical total divergence is the full angle measured where the luminous intensity is half of the peak value.

Atlas™ NT-4000 Optical Performance RGB NT-43F0-0424			
Lens Part Number	Type of Lens	Typical Total Beam Divergence RGB ⁽¹⁾	Fig. #
OP-4LN1-0457	Narrow-Medium Beam	10°	8
OP-4FM1-0442	Medium Beam	33°	9
OP-4FW1-0441	Wide Beam	45°	9

Table 4. Notes: 1. The typical total divergence is the full angle measured where the luminous intensity is half of the peak value.

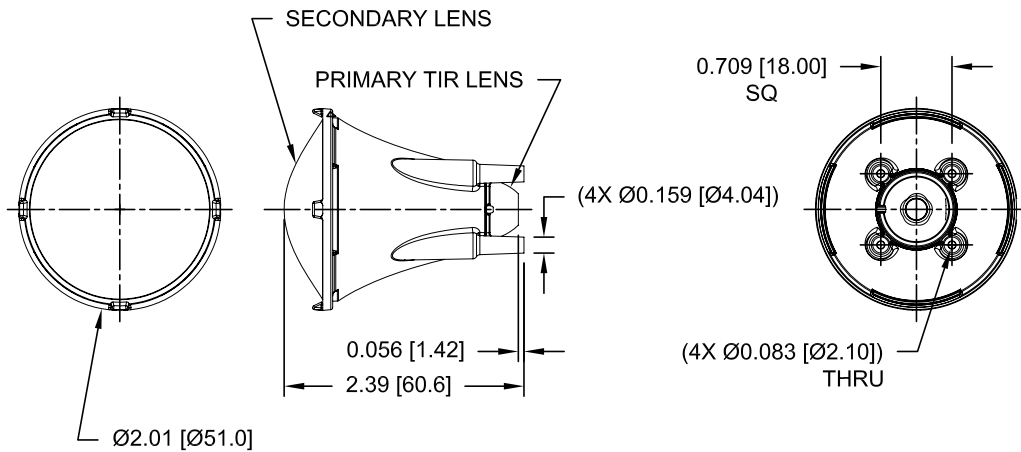


Atlas Medium & Wide Optics



Atlas Narrow Optics

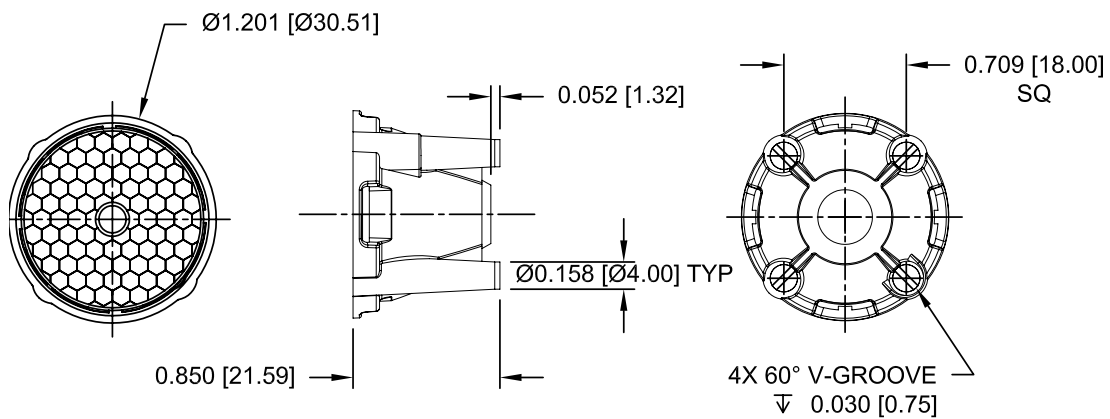
Atlas™ NT-4000 Narrow Optic Mechanical Dimensions



Units: Inches [millimeters]

Figure 8.

Atlas™ NT-4000 Medium & Wide Optic Mechanical Dimensions



Units: Inches [millimeters]

Figure 9.

Optic Relative Luminous Intensity Curve, Warm White NT-42D1-0425 and Daylight White NT-42D0-0426

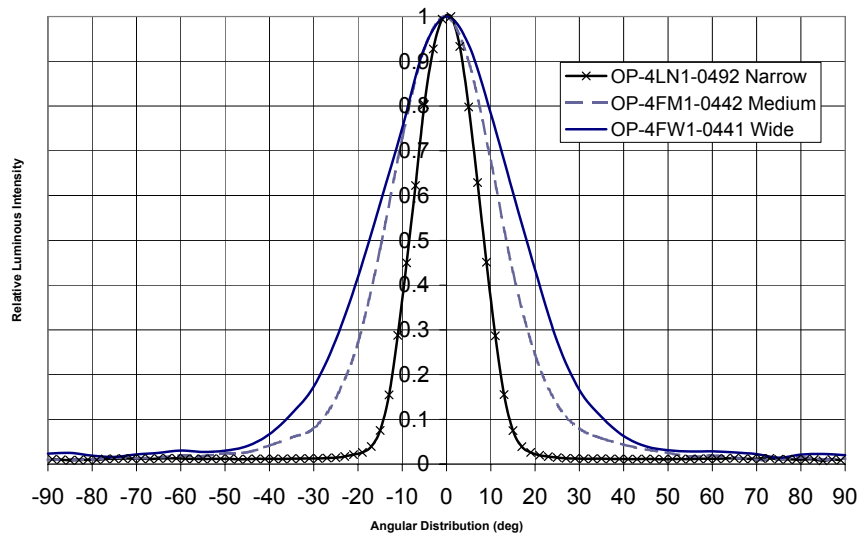


Figure 10.

Atlas™ NT-42D1-0425 and NT-42D0-0426 Illuminance Cone @ Junction Temperature $T_j = 25^\circ\text{C}$

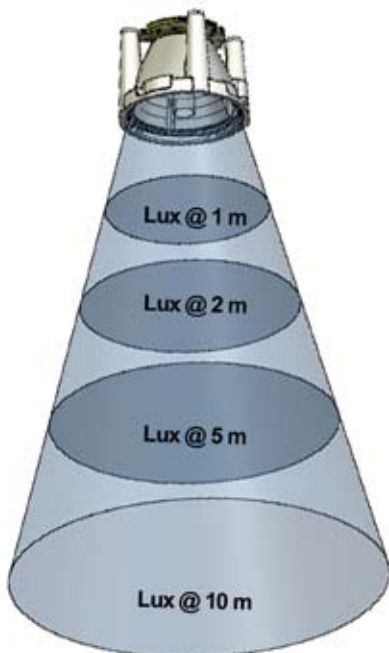


Figure 11.

Typical Illuminance Characteristics - Lux					
Product	Drive Current (mA)	Distance from Source (Meters)			
		1	2	5	10
Warm White Light Engine - NT-42D1-0425					
OP-4LN2-0492 - Narrow	700	1045	261	42	11
OP-4FM1-0442 - Medium	700	273	68	11	3
OP-4FW1-0441 - Wide	700	185	46	7	2
Daylight White Light Engine - NT-42D0-0426					
OP-4LN2-0492 - Narrow	700	1705	426	68	17
OP-4FM1-0442 - Medium	700	447	112	18	5
OP-4FW1-0441 - Wide	700	296	74	12	3

Table 5.

Relative Luminous Intensity Curve, RGB NT-43F0-0424 Light Engine with Narrow Optic

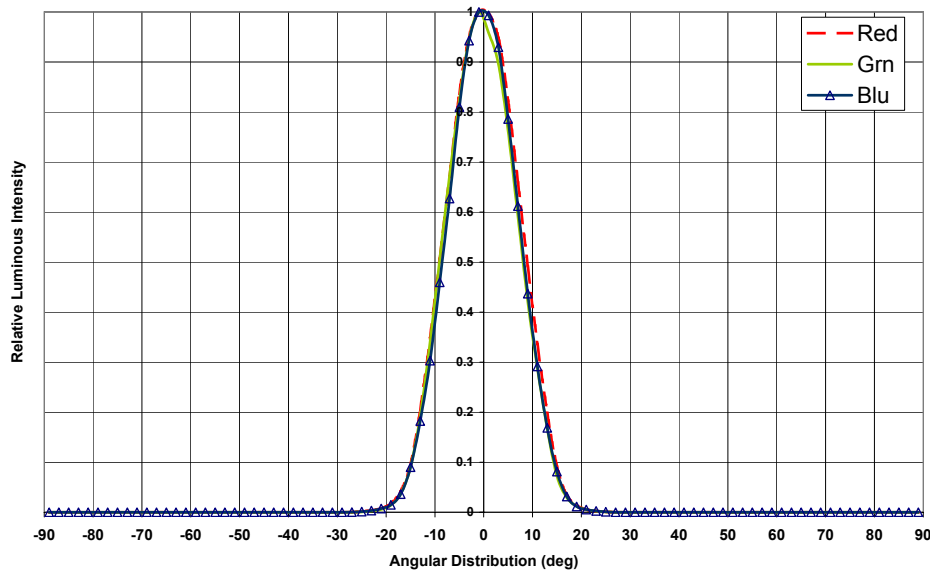


Figure 12.

Relative Luminous Intensity Curve, RGB NT-43F0-0424 Light Engine with Medium Optic

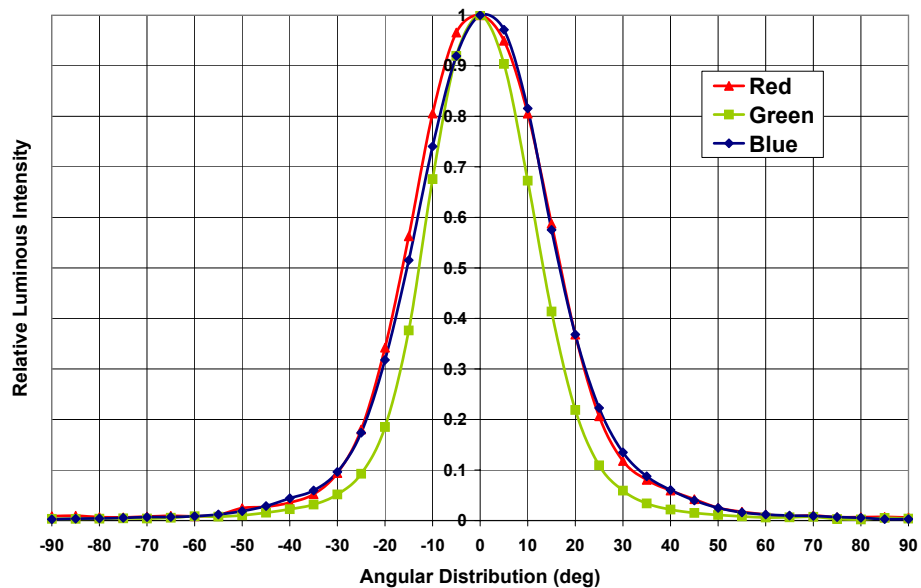


Figure 13.

Relative Luminous Intensity Curve, RGB NT-43F0-0424 Light Engine with Wide Optic

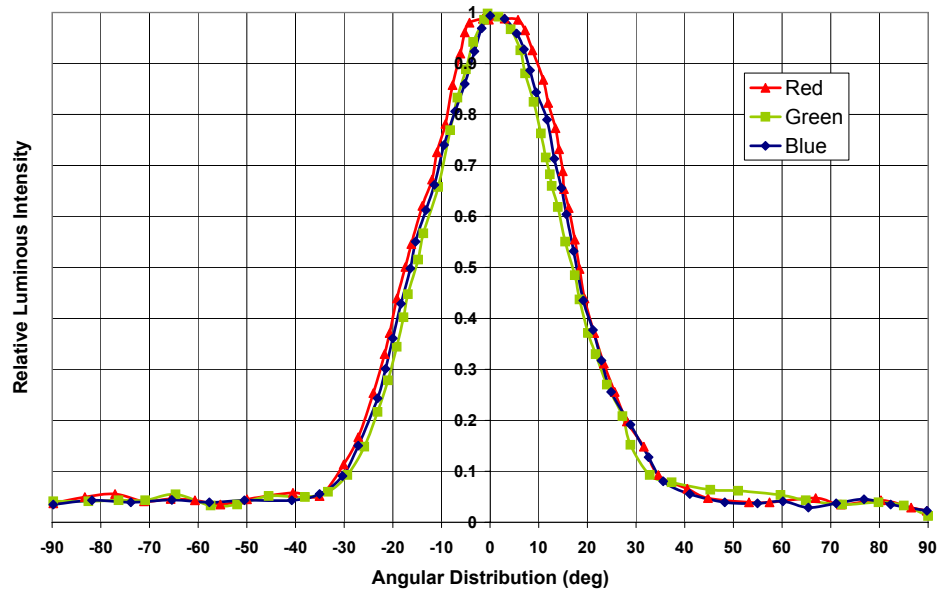


Figure 14.

Atlas™, RGB NT-43F0-0424 Illuminance Cone @ Junction Temperature $T_j = 25^\circ\text{C}$

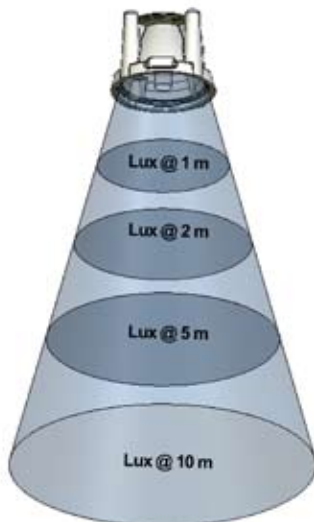


Figure 15.

Typical Illuminance Characteristics - Lux RGB NT-43F0-0424 Light Engine

Product	Drive Current (mA)	Distance from Source (Meters)			
		1	2	5	10
OP-4LN1-0457 Narrow					
Red	350	429	107	17	4
Green	350	776	194	31	8
Blue	350	149	37	6	2
OP-4FM1-0442 Medium					
Red	350	97	24	4	1
Green	350	167	42	7	2
Blue	350	30	7	1	0.3
OP-4FW1-0441 Wide					
Red	350	91	23	4	0.9
Green	350	84	21	3	0.8
Blue	350	21	5	0.9	0.2

Table 6.

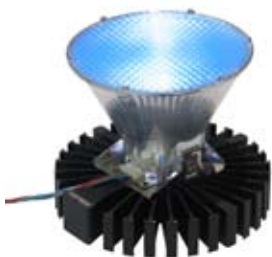
Titan™ NT-5000 Optic - OP Series

Lamina's Titan™ Series is available in 3050K Warm White, 4700K Daylight White and RGB. The Titan 3050K Warm White delivers 600+ lumens from a single point. Enhanced red and orange color spectrum and a CRI of 80 make this product ideal for incandescent and halogen replacements. The Titan RGB, through three independently controlled input and output channels (red, green and blue), produces any of 16,000,000 beautifully saturated and blended colors (including white with variable color temperature) from a single point source.

Lamina® now offers optics with narrow, medium, and wide beam distributions designed for the NT-5000 product family.

The optics were designed in collaboration with Transducin Optics, LLC.

Each optic is supplied with an optic mount that is compatible with Lamina® heat sinks, interchangeable lens for medium and wide beam, and assembly instructions.



Titan Optical Characteristics

General Characteristics	
Lens Material	Optical Grade PMMA
Reflector Material	ABS
Holder Material	Steel
Operating Ambient Temperature Range	-10°C / +50°C
Storage Temperature Range	-10°C / +50°C

Table 7.

Titan™ Optical Performance Warm White NT-52D0-0429 and Daylight White NT52D1-0430

Lens Part Number	Type of Lens	Typical total beam divergence ^[1]
OP-5LN1-0451	Narrow Beam ^[2]	10
OP-5LN2-0445	Narrow-Medium Beam	25
OP-5LM3-0455	Medium Beam ^[2]	30
OP-5LW4-0456	Wide Beam ^[2]	45

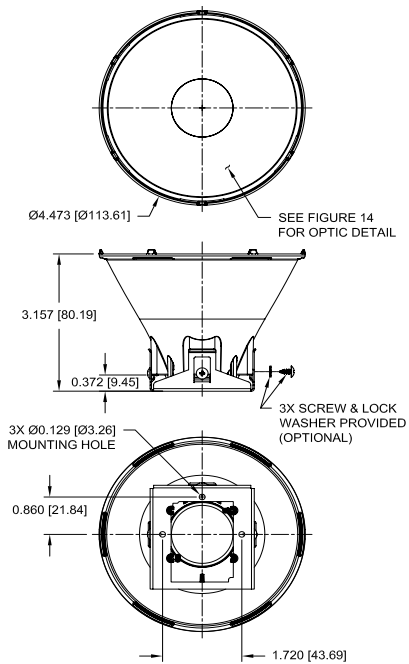
Table 8. Notes: 1. The typical total divergence is the full angle measured where the luminous intensity is half of the peak value.
2. In development.

Titan™, RGB Optical Performance RGB NT-53F0-0428

Lens Part Number	Type of Lens	Typical Total Beam Divergence ^[1]
OP-5LN2-0445	Narrow-Medium Beam	20
OP-5LM3-0455	Medium Beam ^[2]	30
OP-5LW4-0456	Wide Beam ^[2]	45

Table 9. Notes: 1. The typical total divergence is the full angle measured where the luminous intensity is half of the peak value.
2. In development.

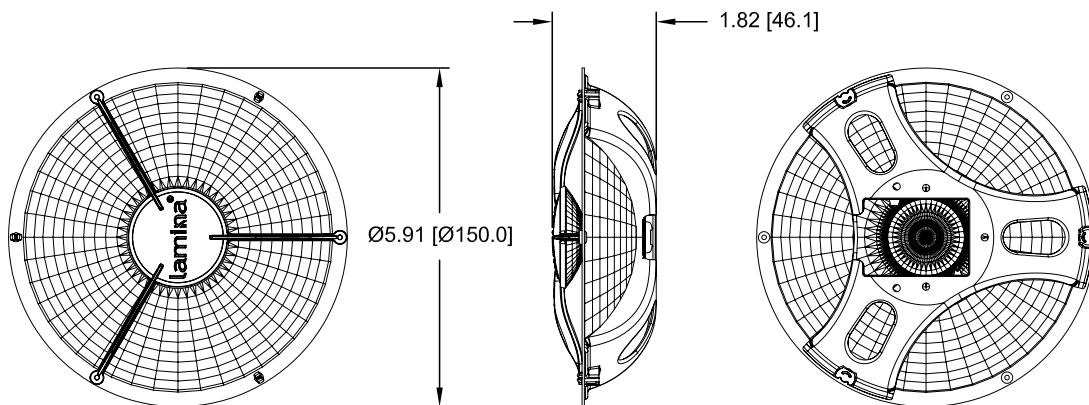
Titan™ Optic Mechanical Dimensions OP-5LN2-0445, OP-5LM3-0455 and OP-5LW4-0456



Units: Inches [millimeters]

Figure 16.

Titan™ Optic Mechanical Dimensions OP-5LN1-0451



Units: Inches [millimeters]

Figure 17.

Titan™ Relative Luminous Intensity Curve Warm White NT-52D1-0430 and Daylight White NT-52D0-0429 Optics

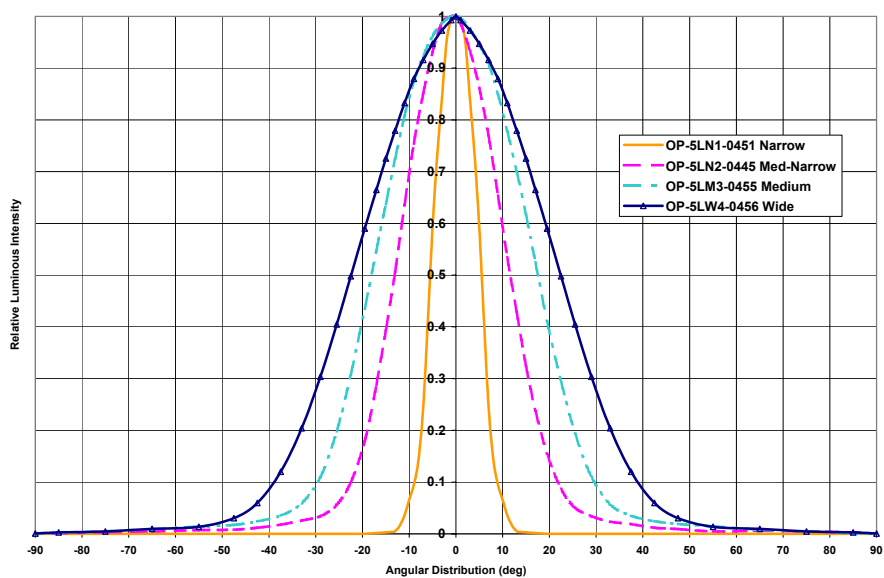


Figure 18.

OP-5LN2-0445 Med-Narrow Luminous Intensity Distribution NT-53F0-0428 RGB Optic

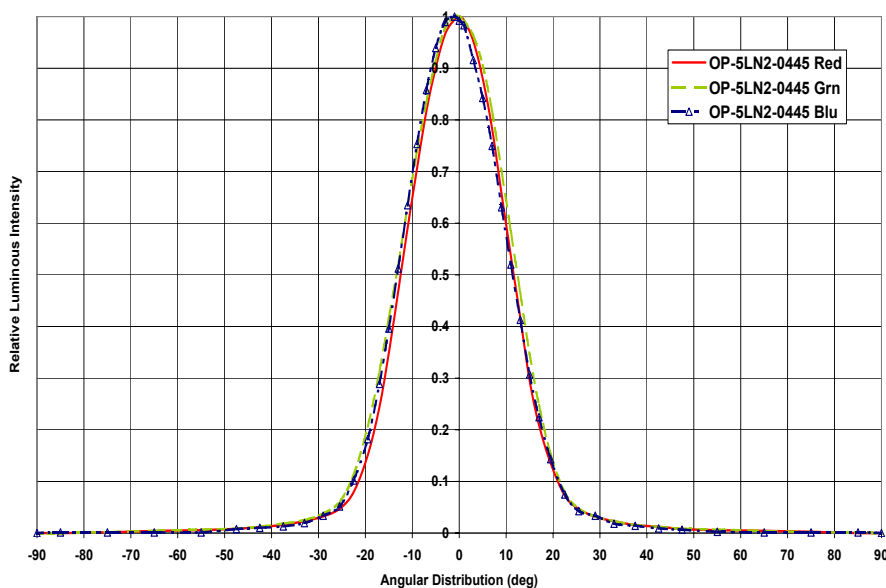


Figure 19.

OP-5LM3-0455 Medium Luminous Intensity Distribution NT53F0-0428 RGB

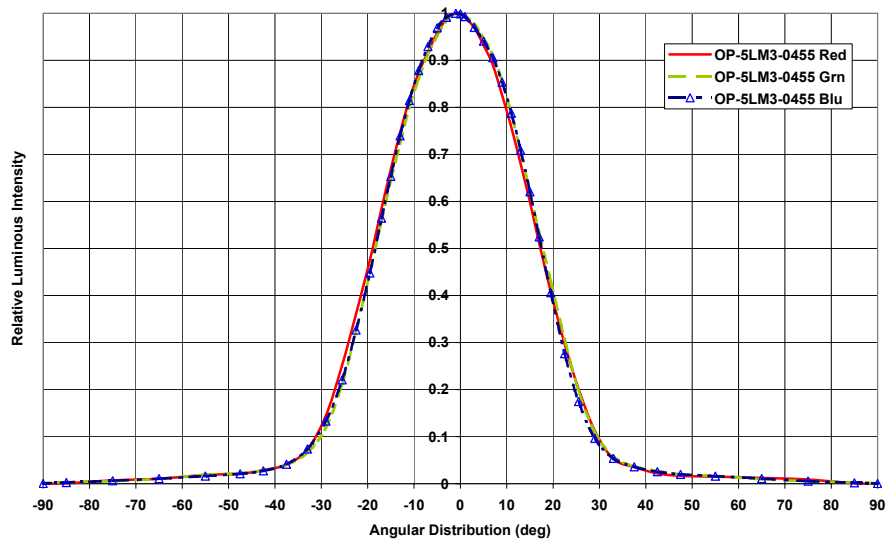


Figure 20.

OP-5LW4-0456 Wide Luminous Intensity Distribution NT-53F0-0428 RGB

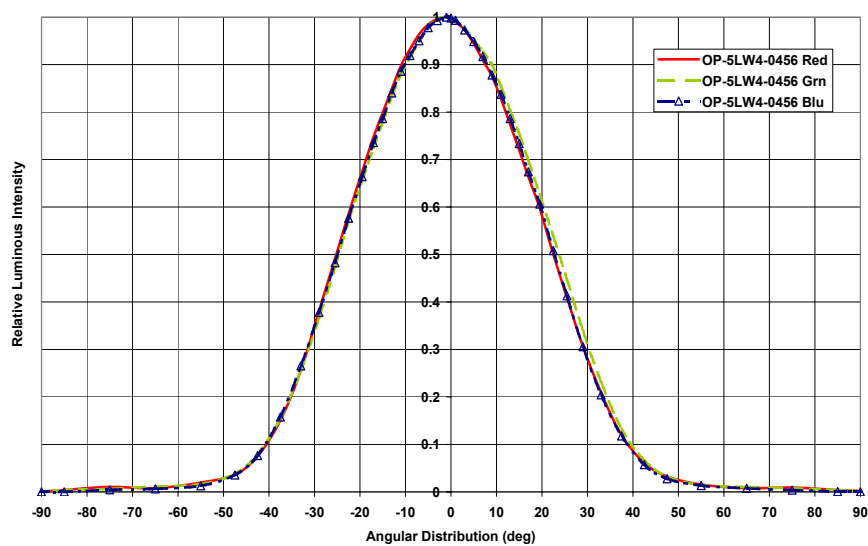


Figure 21.

Illuminance Cone @ Junction Temperature $T_j = 25^\circ\text{C}$

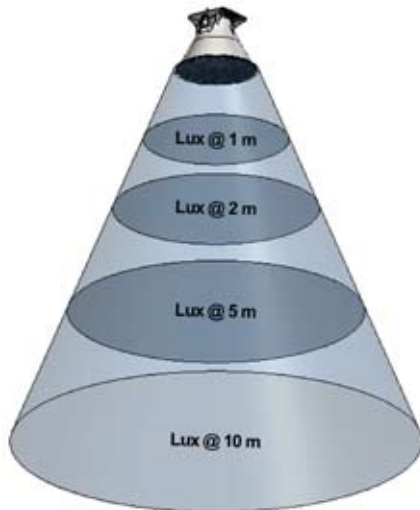


Figure 22.

**Typical Illuminance Characteristics - Lux
Titan Narrow Optic OP-5LN1-0451 (Preliminary)**

Product	Drive Current (mA)	Distance from Source (Meters)			
		1	2	5	10
NT-52D1-0430 Warm White	1050	4822	1206	193	48
NT-52D0-0429 Daylight White	1050	7825	1956	313	78

Table 10.

**Typical Illuminance Characteristics - Lux
Titan Narrow-Medium Optic OP-5LN2-0445**

Product	Drive Current (mA)	Distance from Source (Meters)			
		1	2	5	10
NT-52D1-0430 Warm White	1050	1884	471	75	19
NT-52D0-0429 Daylight White	1050	3069	767	123	31
NT-53F0-0428 RGB, Red	1050	1008	252	40	10
NT-53F0-0428 RGB, Green	1050	1063	266	43	11
NT-53F0-0428 RGB, Blue	1050	293	73	12	3

Table 11.

**Typical Illuminance Characteristics - Lux
Titan Optic Medium OP-5LM3-0455**

Product	Drive Current (mA)	Distance from Source (Meters)			
		1	2	5	10
NT-52D1-0430 Warm White	1050	997	249	40	10
NT-52D0-0429 Daylight White	1050	1624	406	65	16
NT-53F0-0428 RGB, Red	1050	526	131	21	5
NT-53F0-0428 RGB, Green	1050	573	143	23	6
NT-53F0-0428 RGB, Blue	1050	146	37	6	2

Table 12.

**Typical Illuminance Characteristics - Lux
Titan Optic Wide OP-5LW4-0456**

Product	Drive Current (mA)	Distance from Source (Meters)			
		1	2	5	10
NT-52D1-0430 Warm White	1050	618	155	25	6
NT-52D0-0429 Daylight White	1050	1007	252	40	10
NT-53F0-0428 RGB, Red	1050	325	81	13	3
NT-53F0-0428 RGB, Green	1050	361	90	14	4
NT-53F0-0428 RGB, Blue	1050	93	23	4	1

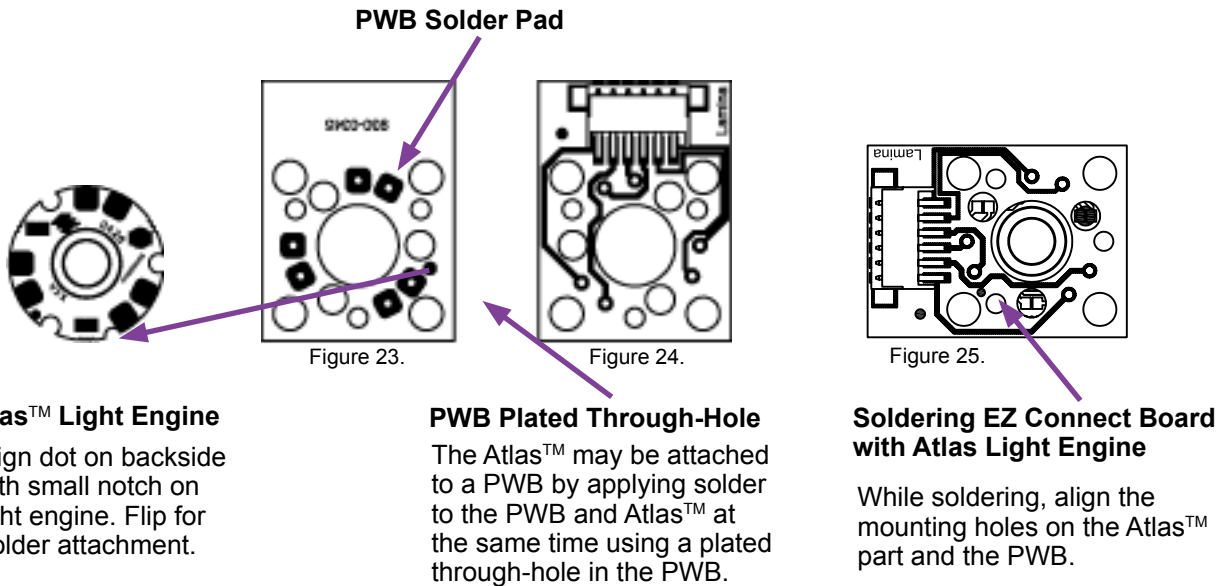
Table 13.

Soldering EZ Connect Board to Lamina's Light Engines

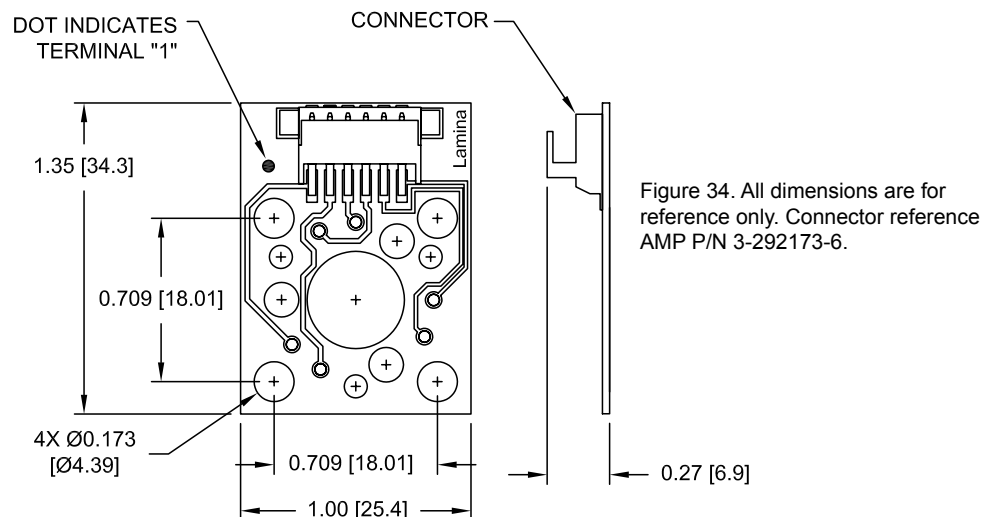
Atlas™ NT-4000

Electrical connections may be made between a PWB and Atlas™ products with lead free solder (Sn96 / Ag 3.5 / Cu0.5) using localized heating on the Atlas™ terminals.

- Mounting holes for Lamina® Optics
- Standard AMP connector
- Mating color coded wiring harness available



Atlas™ NT-4000 EZ Connect Board EZ-4000-0357

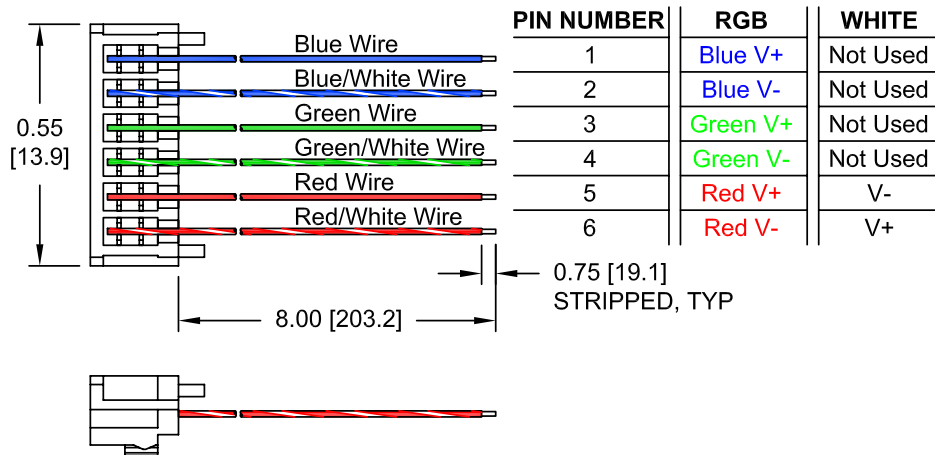


Units: Inches [millimeters]

Figure 26.

Interconnects

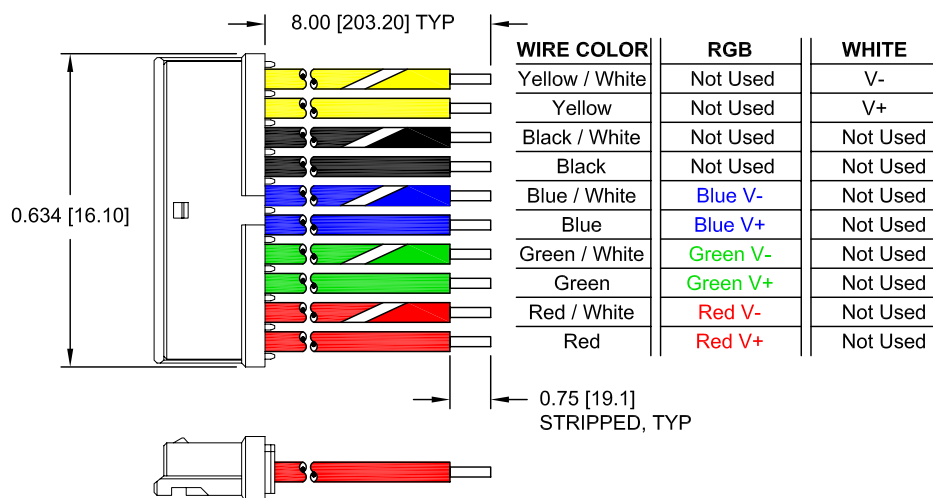
Atlas™ NT-4000 EZ Connect Wiring Harness EZ-46WH-0354



Units: Inches [millimeters]

Figure 27.
The same wire harness is used for RGB and White parts.
Connector reference AMP P/N 173977-6.

Titan™ NT-5000 Wiring Harness NT-50WH-0427



Units: Inches [millimeters]

Figure 28.
The same wire harness is used for RGB and White parts.
Connector reference Molex Header 87438-1043 and Crimp Terminal 87421-0000.

Patents

Lamina's light engines may be covered by pending patents and/or one or more of the following U.S. and/or International patents 5876536, 6709749 B, 595880, 6017642, 5565262, 5681444, 5653834, 5581876, 5847935, 5514451, 5747931, 5925203, 5725808, 5929510, 5858145, 5866240, 5953203, 6055151, 614076, 6011330, 6399230, 6914501, 6168490, 6191934, 614075, 6160469, 6300267, 6471805, 6518502, 6739047, 6720859, 6759940, 6518502, 6670856 B1, 6720859, 6713862 B2, WO 00/47399, WO 00/26152, WO 98/19339, 5082804, ZL99808762.9, 69623930, 69628549, 69629572, 805785, 69628549, 843621, 932500, 805785, 812258, 843621, 932500, 805785, 812258, 843621, 932500, 805785, 812258, 843621, 932500, 3327556, 3267299, 3226281, 3405545, 320630, 295695, 284068, 546471, 805785, 812258, 843621, 6455930, 6759940, 6713862, 7095053 7098483.

Electrical Connections

The Atlas™ LED light engines are available with or without Lamina's EZ Connect Board. EZ Connect adapter boards have AMP connectors for solderless connections to Lamina's wiring harness.

As with many electrical devices, RMA type solder flux should be used to prepare the solder pads before application of solder. Ensure proper strain relief of wires attached to the light engine to prevent damage to the light engines solder pads. For more information refer to Lamina's Connection application note AN-05 which can be found on the website at www.laminalighting.com.

Functional test: Parts may be tested using a constant current source set at 25% of specified drive current specified per specification, drawing or datasheet for no more than two seconds without heat sink. Voltage compliance of power source should not exceed forward voltage plus 5 volts.

1. Optical and electrical specifications are given for the specified drive @ 25°C junction temperature.
2. When using constant current LED drivers with high compliance voltage (Advance, LEDworks, etc. or a custom driver) the output of the supply must be connected to the part before power is applied to the input of the supply.

Assembly Recommendations

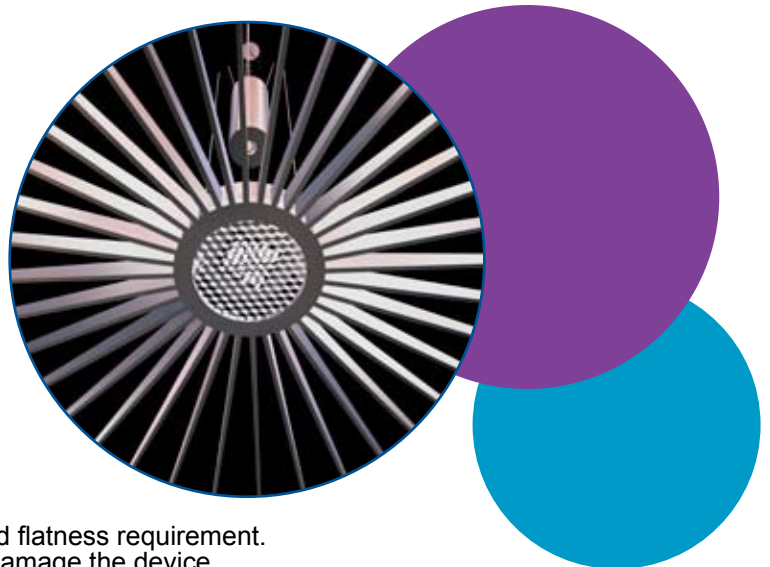
Lamina's Atlas™ Series Light Engines are designed for attachment to a heat sink with conductive epoxy or thermal grease in the joint. For attachment using screws, a 2-56 UNC round head or metric equivalent M2 X 0.4 cheese head screw, 18-8 SS is recommended. When mounting the light engine, position the three screws in the center of each of the three slots. Tighten the three screws evenly, first to about 0.89 inch pounds (10 Newton-centimeter), and then tighten each to a maximum torque of 4 inch pounds (45 Newton-centimeter). Flatness requirement of the surface that the light engine is mounted to is 0.001 inch/inch (1mm/meter).

Packaging - Receiving Parts and Packaging Trays

Your parts will arrive in either custom fitted trays or bulk packaging when appropriate. This packaging was designed or specified to provide the necessary protection during shipment and to take up the least amount of space in your storage area.

Notes

1. These products use silicone materials for superior optical performance. Do not expose the part to fluids that may react with silicone compounds. See Dow Chemical Form 45-0113D-01, Silicone Fluid Resistance Guide.
2. Ray trace models are available upon request.
3. Lamina® may make process or materials changes affecting the performance or other characteristics of our products. The products supplied after such changes will continue to meet published specifications, but may not be identical to product supplied as samples or under prior orders.
4. All specifications are based on mounting the LED array to a heat sink using the specified hardware and thermal grease (e.g. Wakefield P/N 120). The heat sink must meet the specified flatness requirement. Mounting using screws and thermal tape may damage the device.



Photos courtesy of OY Light
www.oilight.com

Lamina® Light Engines Comply with the RoHS Directive

In February of 2003 the European Union released The Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive (2002/95/EC) restricting the use of Lead, Cadmium, Mercury, Hexavalent Chromium and PBB/PBDE flame retardant materials in electrical and electronic products sold in Europe beginning July 1, 2006. More information regarding the requirements of this standard can be found by using the link above, or at http://europa.eu.int/eur-lex/pri/en/oj/dat/2003/l_037/l_03720030213en00190023.pdf.

Lamina® LED Light Engines are compliant with all of the criteria proposed by the European RoHS Directive 2002/95/EC for hazardous material content in electronic and electrical equipment as listed in Annex 1A and 1B of the WEEE Directive.

In addition to containing no mercury, Lamina's LED Light Engines have the following environmental advantages over traditional light sources:

- High Energy Efficiency
- Long Lifetime
- Fully Dimmable
- Very low IR and UV radiation

For attachment of electrical connections Lamina® recommends the use of lead-free solder. See Lamina's application note for more information.



Warranty Statement

Lamina®, Inc. (Seller) extends warranty on goods produced by the Seller for one (1) year from original date of shipment, that the goods sold hereunder are new and free from substantive defects in workmanship and materials. This warranty extends only to the Buyer and not to indirect purchasers or users. Seller's liability under the foregoing warranty is limited to replacement of goods or repair of defects or refund of the purchase price at the Seller's sole option. The above warranty does not apply to defects resulting from the improper or inadequate maintenance, unauthorized modification, improper use or operation outside of Seller's specifications for the product, abuse, neglect or accident. THE ABOVE WARRANTY IS EXCLUSIVE AND NO OTHER WARRANTY, WHETHER WRITTEN OR ORAL, IS EXPRESSED OR IMPLIED. Lamina, INC. SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. - Lamina®. - June 21, 2006.

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