Atlas™ 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.®

Table of Contents

The company with the next *bright* idea.

Table of Contents continued

Introducing Atlas™ Light Engines

Lamina® LED light engines are manufactured by combining high brightness LEDs from industry-leading LED manufacturers with our own proprietary packaging technology. This technology is a breakthrough in thermal performance for LED packaging, a key factor in determining LED life and reliability. Unmatched thermal performance coupled with package interconnectivity allows Lamina to densely cluster multiple LEDs to achieve exceptionally high luminous intensity in very small footprints.

The Lamina® Atlas™ Series is available in 3050K Warm White, 4700K Daylight White and RGB. The Atlas™ 3050K Warm White delivers 160+ lumens from a single point. An enhanced red and orange color spectrum and a CRI of 80 make this product ideal for incandescent and halogen replacements. The Atlas™ RGB, through three independently controlled input/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.

Atlas™ LED light engines are configured with a single cavity populated with multiple LEDs to deliver the maximum usable light. Atlas™ makes possible applications which, until now, could only be accomplished with traditional lighting sources.

Features:

- Round footprint for design flexibility
- Designed for popular drive currents - 700mA – 1050mA
- Lamina® narrow, medium and wide beam optics available
- Isolated metal base - makes wiring in series or parallel possible on a common heat sink
- Integrated ESD protection - 4,000V HBM
- Superior thermal performance for improved reliability
- Long life and high lumen maintenance
- Available mounted to Lamina® EZConnect boards for solderless connection
- Lamina heat sinks and developer kits available for rapid prototyping

The unsurpassed technical benefits found in the Atlas™ result in unparalleled ease of design and integration. Additionally, Lamina provides unmatched product integration support. Our experienced Sales Application Engineers, knowledgeable in LED design integration, optics, heat sinks, and electronics are just a phone call away. To request a sample or to speak with a sales applications engineer, call us at 800-808-5822 or 609-265-1401.

LED Light Engines have never been this *flexible*.

Lamina's Light Engines

They feature the lowest thermal resistance of any LED package on the market. Our patented multi-layer on metal package design allows the most efficient path to dissipate the heat generated by the LED.

This low thermal resistance gives you the choice to use a smaller heat sink or to run your parts at a higher power rating while still maintaining a safe junction temperature.

Contact the Lamina sales department at Lamina to discuss your design and get expert advice for designing your LED based product.

Flux Characteristics - Lumens Junction Temperature, T_j =25ºC						
Product		Test Current (mA)	Typical (lm)	Min. (lm)	Drive Current (mA)	Typical (lm)
NT-42D1-0425 Warm White		700	129	97	1050	167
NT-42D0-0426 Daylight White		700	210	158	1050	282
NT-43F0-0424 RGB	R	350	59	44	525	98
	G	350	98	74	525	128
	B	350	19	14	525	26

Table 1.

Optical Characteristics, Whites						
Product	Color Temp. Min. (ºK)	Color Temp. Max. (ºK)	Total Incl. Angle	[1]View Angle	CRI Min.	CRI Typ.
NT-42D1-0425 Warm White	2750	3550	180º	108º	70	80
NT-42D0-0426 Daylight White	3950	6200	180º	110º	60	66

Table 2. Note: 1. 2θ, 1/2, Total off-axis angle from source center line where the intensity is 1/2 of the peak value.

Optical Characteristics, RGB					
Product		Dominant Wave Length Min. (nm)	Dominant Wave Length Max. (nm)	Total Incl. Angle	[1]View Angle
NT-43F0-0424 RGB	R	619	629	180º	116
	G	515	535	180º	113
	B	460	470	180º	132

Table 3. Note: 1. 2θ, 1/2, Total off-axis angle from source center line where the intensity is 1/2 of the peak value.

Typical Illuminance Characteristics - Lux					
Product	Drive Current (mA)	Distance from Source (Meters)			
		1	2	5	10
NT-42D1-0425 Warm White	700	48.2	12.1	1.9	0.48
NT-42D1-0425 Warm White	1050	65.4	16.4	2.6	0.65
NT-42D0-0426 Daylight White	700	72.9	18.2	2.9	0.73
NT-42D0-0426 Daylight White	1050	97.9	24.5	3.9	0.98
NT-43F0-0424 RGB, Red	350	19.1	4.8	0.8	0.19
NT-43F0-0424 RGB, Red	525	31.7	7.9	1.3	0.32
NT-43F0-0424 RGB, Green	350	33.4	8.4	1.3	0.33
NT-43F0-0424 RGB, Green	525	43.6	10.9	1.7	0.44
NT-43F0-0424 RGB, Blue	350	5.5	1.4	0.2	0.06
NT-43F0-0424 RGB, Blue	525	7.6	1.9	0.3	0.08

Table 4.

Driving Lamina Light Engines

Lamina's Atlas™ light engines are designed to operate under current controlled conditions, either constant current, PWM or other current control methods. The Atlas™ family is designed to operate using commercially available driver sources from many electronic power supply companies. Lamina's Application Engineering team can assist with the proper selection of drivers and can assist with guidance on your own drive current design.

Connecting power to high brightness LEDs in the past has been challenging. Lamina has developed EZConnect boards and wire harnesses to make assembly fast and reliable.

Electrical Performance Characteristics Junction Temperature, T_j =25ºC

Product		Forward Voltage (VDC) Typ.	Forward Voltage (VDC) Max.	Typical Power (W)	Typical Temperature Coefficient of Forward Voltage (mV/ºC)	Current (mA)	Typical Thermal Resistance Junction to Case (ºC/W)
NT-42D1-0425 Warm White		7.5	8.2	5.3	-6.12	700	3.0
NT-42D0-0426 Daylight White		7.6	8.2	5.3	-9.29	700	3.0
NT-43F0-0424 RGB	R	4.8	6.4	1.7	-3.55	350	6.0
	G	7.4	8.4	2.6	-5.2	350	6.0
	B	7.9	9.0	2.8	-7.87	350	6.0
	NT-43F0-0424 RGB Combined Typical					350	2.0

Table 5.

Minimum, Typical, and Absolute Maximum Ratings, Warm White NT-42D1-0425, Daylight White NT-42D0-0426

	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance[1]	T_R	-	3.0	3.5	ºC/W
Insulation Resistance[2]	-	1.0	-	-	MΩ
Electrical Isolation[3]	-	100	-	-	V
Reverse Current	-	-	-	50	mA
Reverse Voltage	-	-	-	5	V
LED Junction Temperature[4]	T_J	-	-	125	ºC
Storage Temperature	-	-40	-	+100	ºC
Assembly Temperature	-	-	-	210	ºC
ESD Sensitivity	HBM	-	-	4000	V
Current	mA	-	-	1400	mA DC

Table 6. Notes:
1. Thermal resistance including thermal grease (Wakefield P/N 120), as measured from LED junction to heat sink.
2. Insulation resistance between any terminal and base.
3. Electrical isolation voltage between any terminal and base.
4. Lower junction temperatures improve lumen maintenance.

Minimum, Typical, and Absolute Maximum Ratings, RGB NT-43F0-0424

	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance[1]	T_R	-	2.0	2.3	ºC/W
Thermal Resistance[5] RGB	T_R	-	6.0	7.0	ºC/W
Insulation Resistance[2]	-	1.0	-	-	MΩ
Electrical Isolation[3]	-	100	-	-	V
Reverse Current	-	-	-	50	mA
Reverse Voltage	-	-	-	5	V
LED Junction Temperature[4]	T_J	-	-	125	ºC
Storage Temperature	-	-40	-	+100	ºC
Assembly Temperature	-	-	-	210	ºC
ESD Sensitivity	HBM	-	-	4000	V
Current Per Color	mA	-	-	700	mA

Table 7. Notes:
1. Total thermal resistance all colors on, including thermal grease (Wakefield P/N 120), as measured from LED junction to heat sink.
2. Insulation resistance between any terminal and base.
3. Electrical isolation voltage between any terminal and base.
4. Lower junction temperatures improve lumen maintenance.
5. Thermal resistance including thermal grease (Wakefield P/N 120), as measured from LED junction to heat sink.

Spectral Distribution, NT-42D1-0425 Warm White @700mA, 25ºC Heat Sink

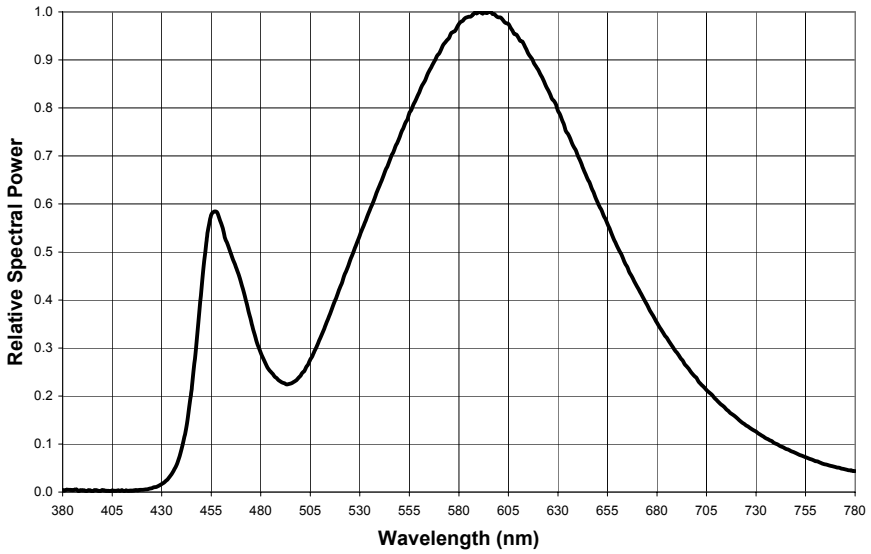


Figure 1.

Spectral Distribution, NT-42D0-0426 Daylight White @700mA, 25ºC Heat Sink

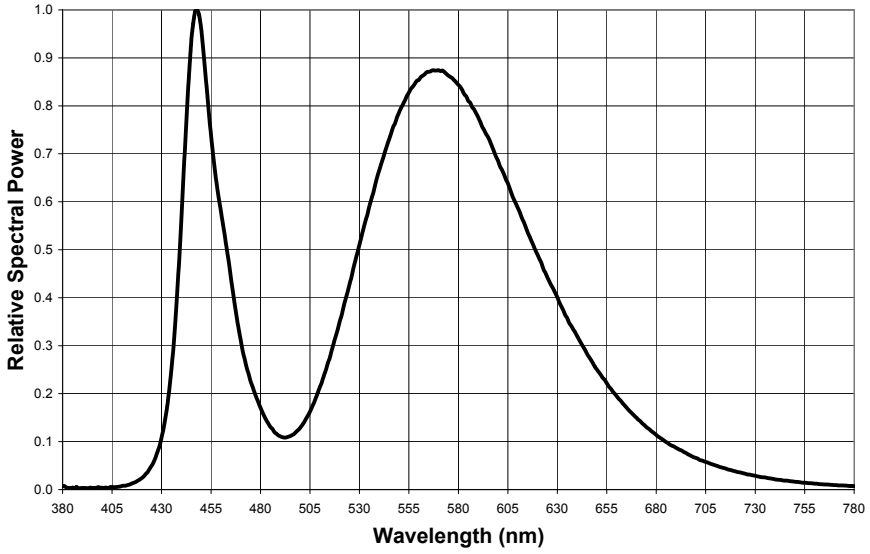


Figure 2.

Spectral Distribution, NT-43F0-0424 RGB @350mA, 25ºC Heat Sink

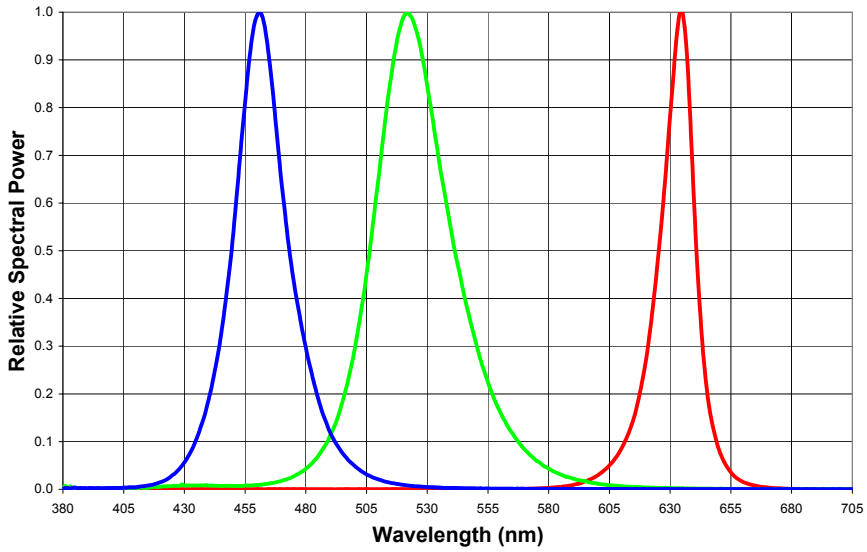
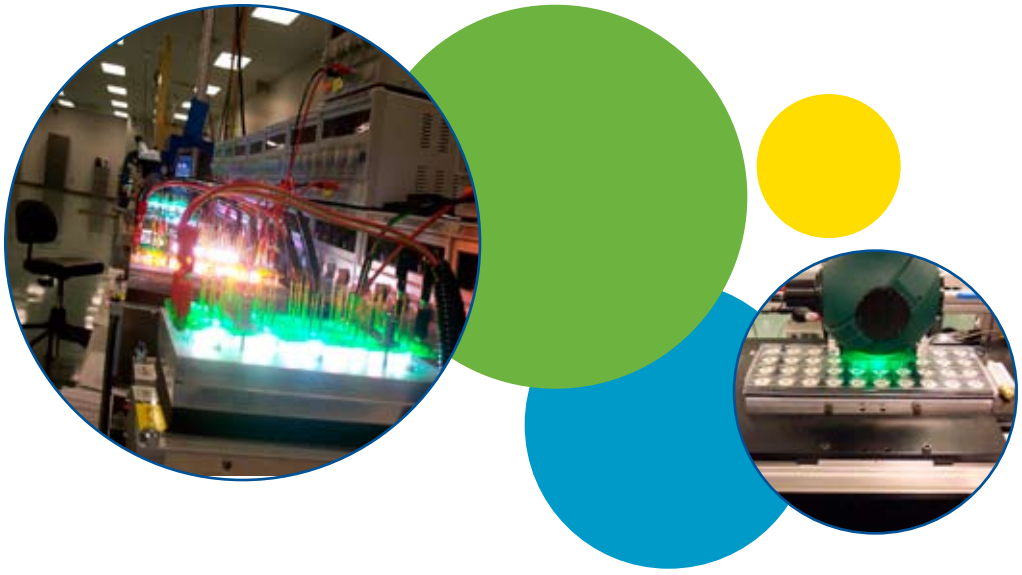


Figure 3.



Forward Current vs. Forward Voltage, Warm White NT-42D1-0425

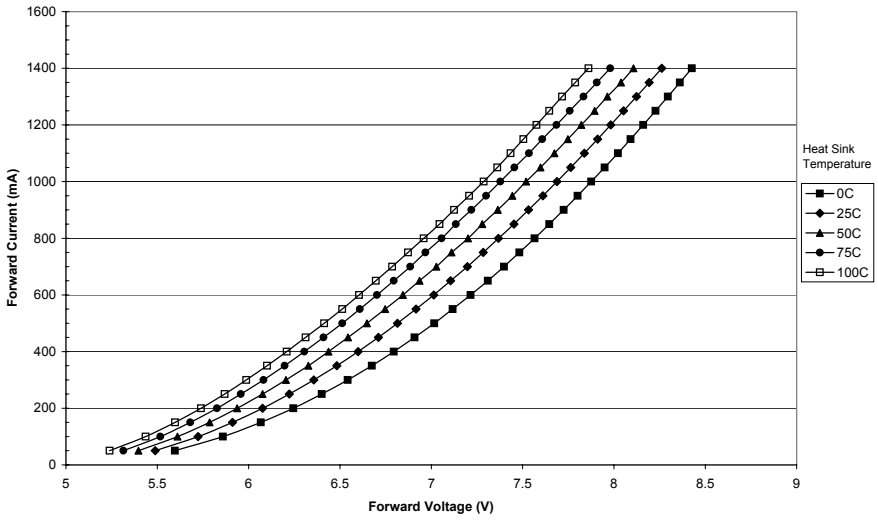


Figure 4.
Typical Relative Forward Current vs. Forward Voltage NT-42D1-0425.

Forward Current vs. Forward Voltage, Daylight White NT-42D0-0426

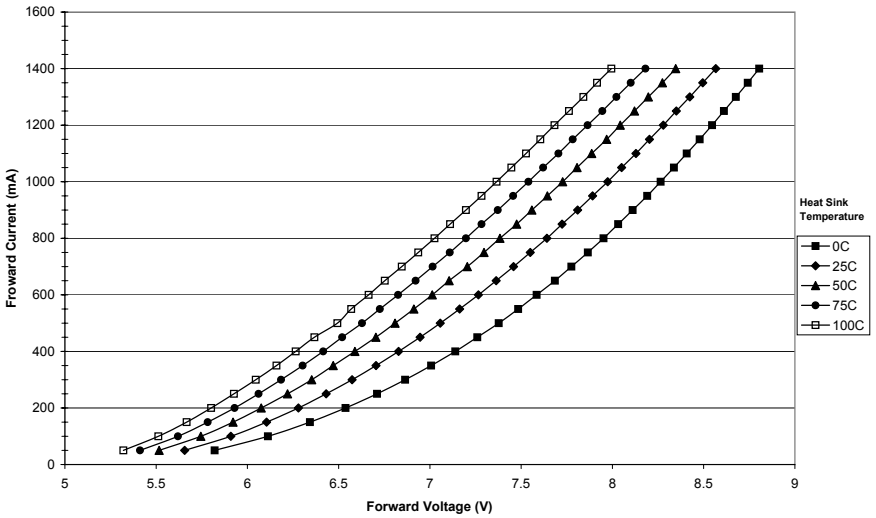
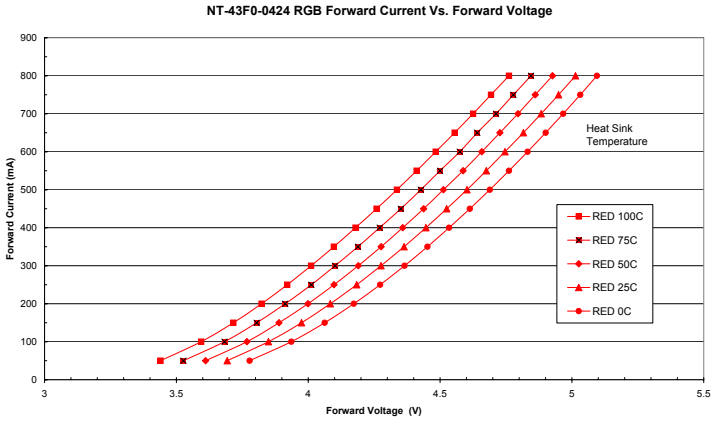


Figure 5.
Typical Relative Forward Current vs. Forward Voltage NT-42D0-0426.

Forward Current vs. Forward Voltage, Red NT-43F0-0424

Figure 6A.

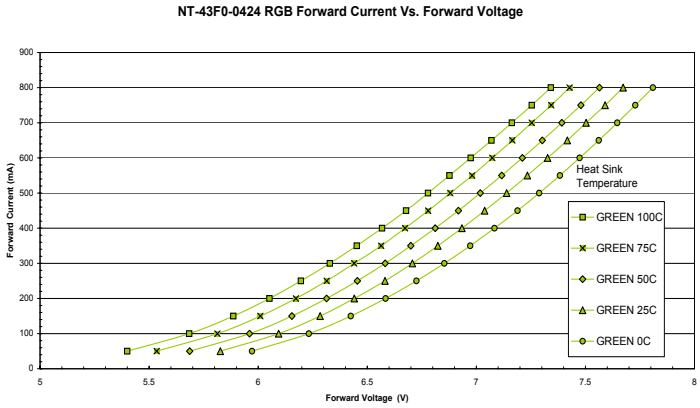
Typical Relative Forward Current vs. Forward Voltage, Red NT-43F0-0424



Forward Current vs. Forward Voltage, Green NT-43F0-0424

Figure 6B.

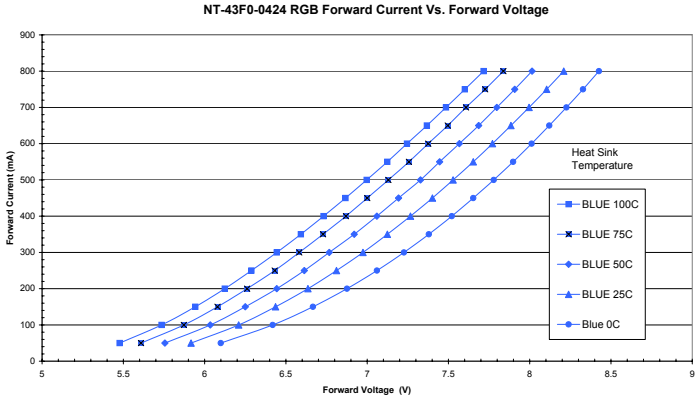
Typical Relative Forward Current vs. Forward Voltage, Green NT-43F0-0424



Forward Current vs. Forward Voltage, Blue NT-43F0-0424

Figure 6C.

Typical Relative Forward Current vs. Forward Voltage, Blue NT-43F0-0424



Relative Luminous Flux vs. Junction Temperature, Warm White NT-42D1-0425

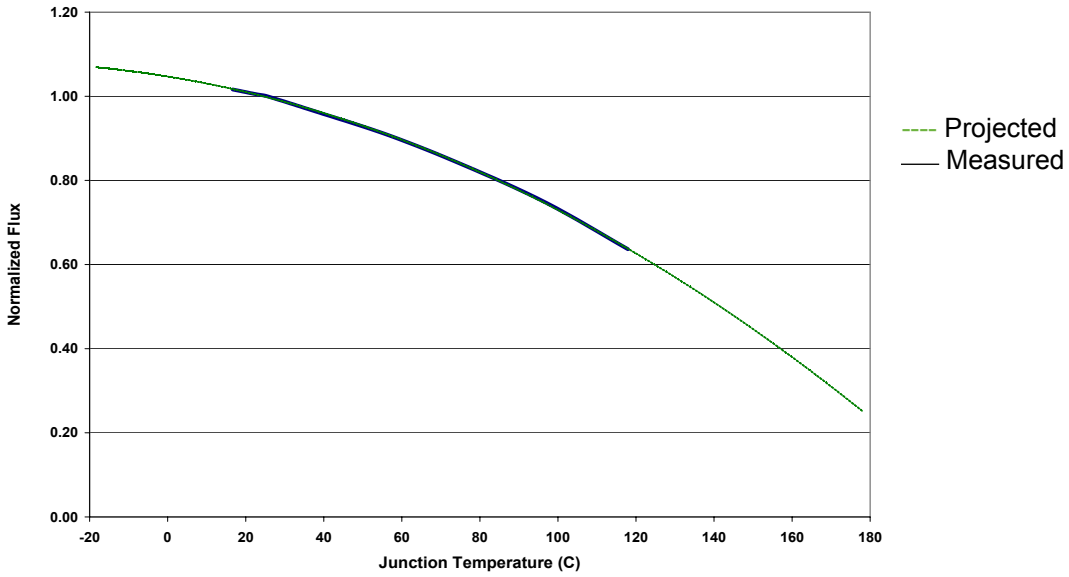


Figure 7.
Typical Relative Flux vs. Junction Temperature NT-42D1-0425

Relative Luminous Flux vs. Junction Temperature, Daylight White NT-42D0-0426

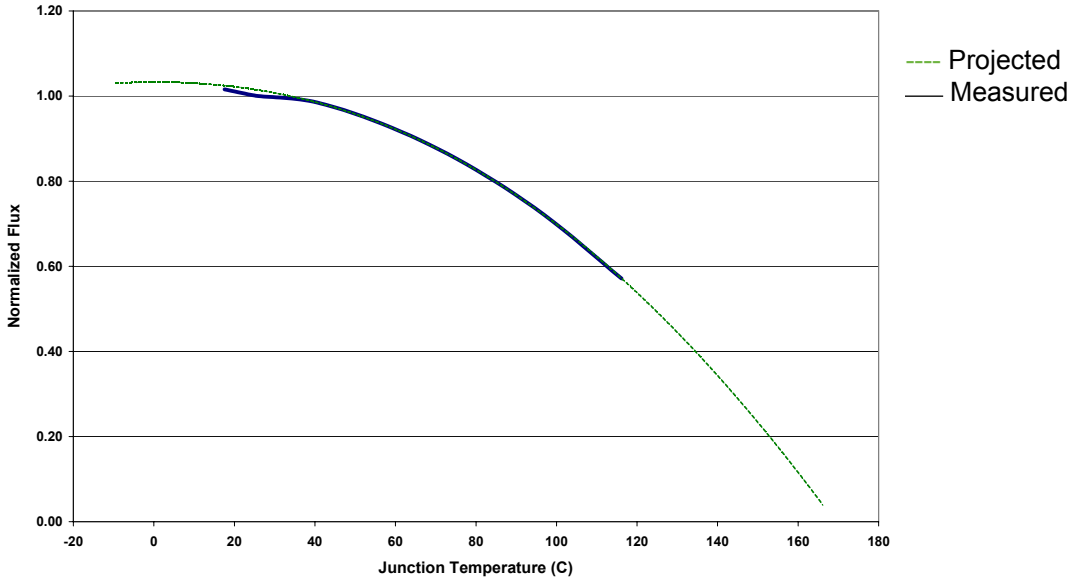


Figure 8.
Typical Relative Flux vs. Junction Temperature NT-42D0-0426

Relative Luminous Flux vs. Junction Temperature @350mA, RGB NT-43F0-0424

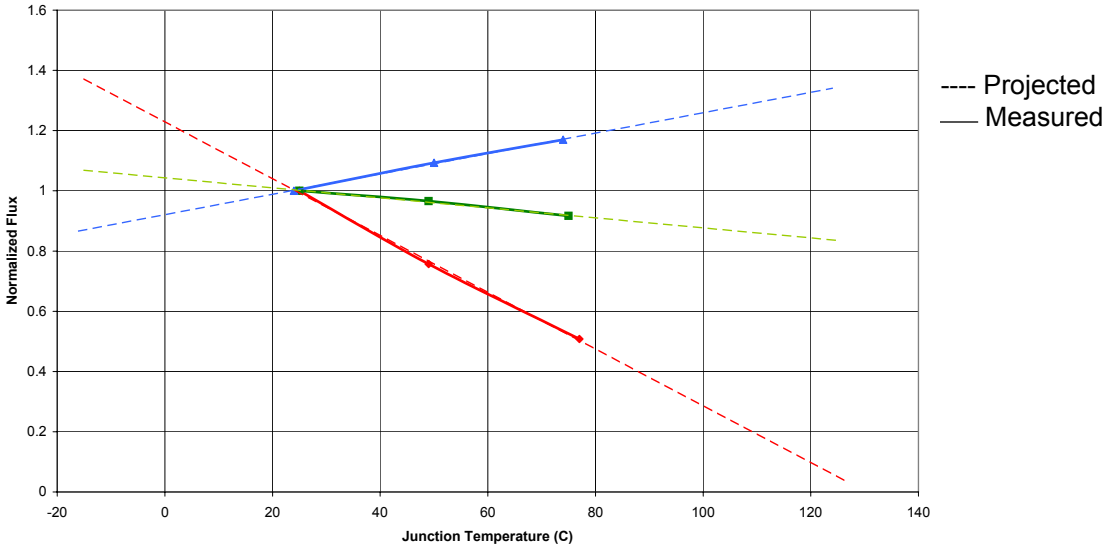


Figure 9.
Typical Relative Flux vs. T_J, NT-43F0-0424

Photos courtesy of DG Lights
www.DGLights.com

Flux vs. Current, Warm White NT-42D1-0425

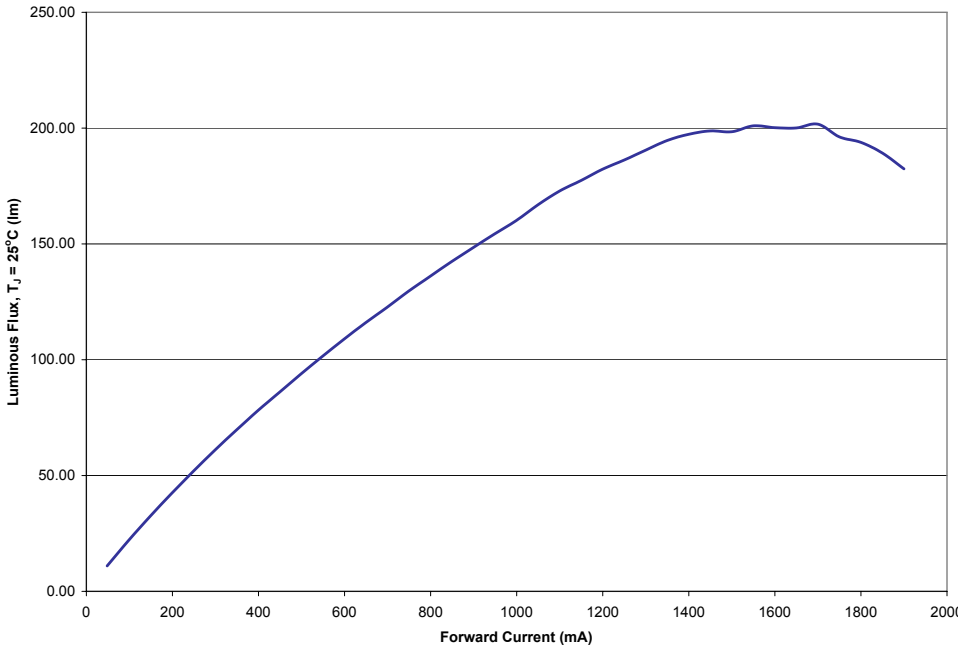


Figure 10.
Typical Relative Flux vs. Current, Warm White NT-42D1-0425.

Flux vs. Current, Daylight White NT-42D0-0426

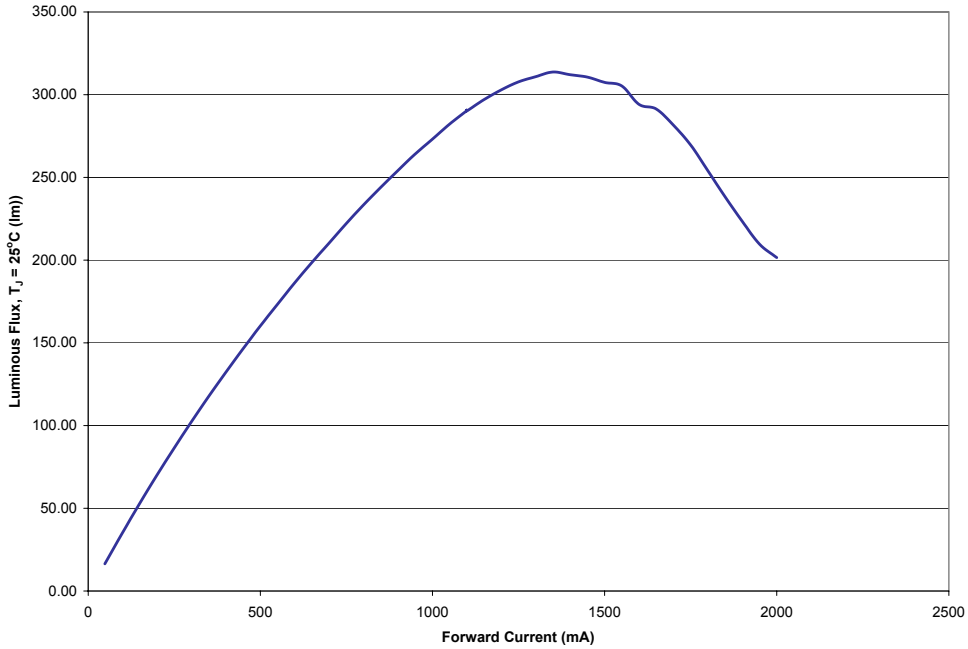


Figure 11.
Typical Relative Flux vs. Current, Daylight White NT-42D0-0426.

Flux vs. Current, RGB NT-43F0-0424

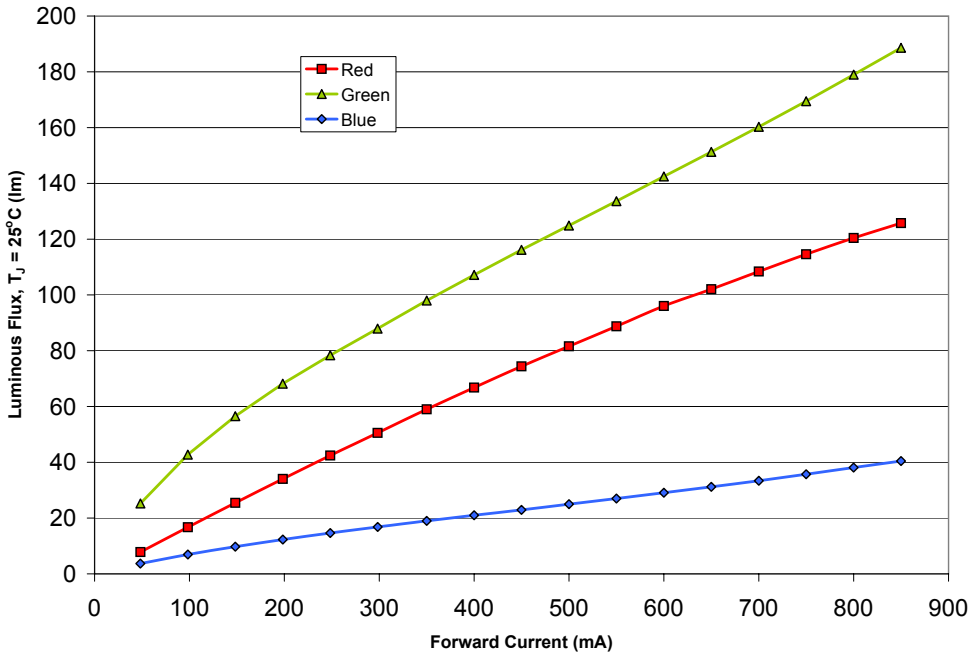


Figure 12.
Typical Relative Flux vs. Current, RGB NT-43F0-0424.

Photo courtesy of
Providence Performing Arts

Photo courtesy of DG Lights
www.DGLights.com

Efficacy vs. Current, Warm White NT-42D1-0425

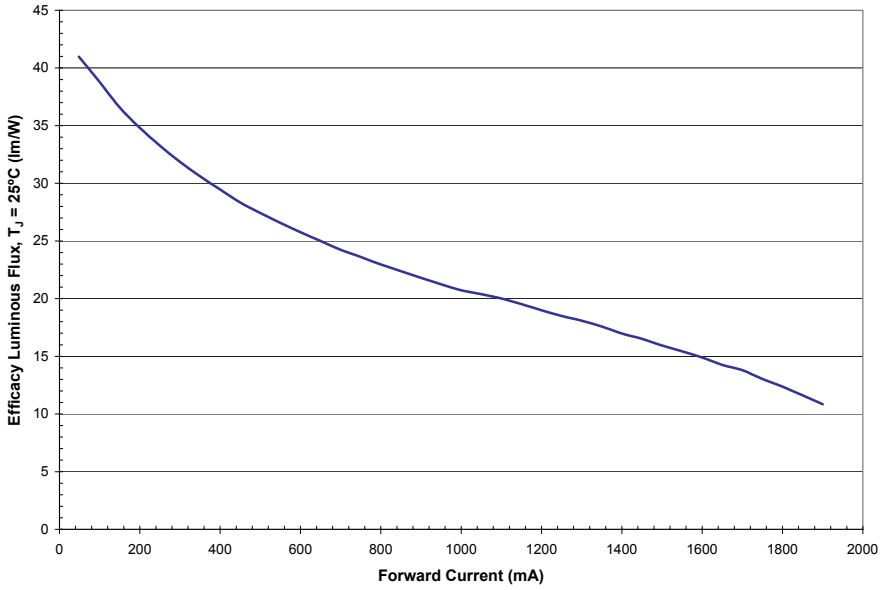


Figure 13.
Typical Relative Efficacy vs. Current Warm White NT-42D1-0425

Efficacy vs. Current, Daylight White NT-42D0-0426

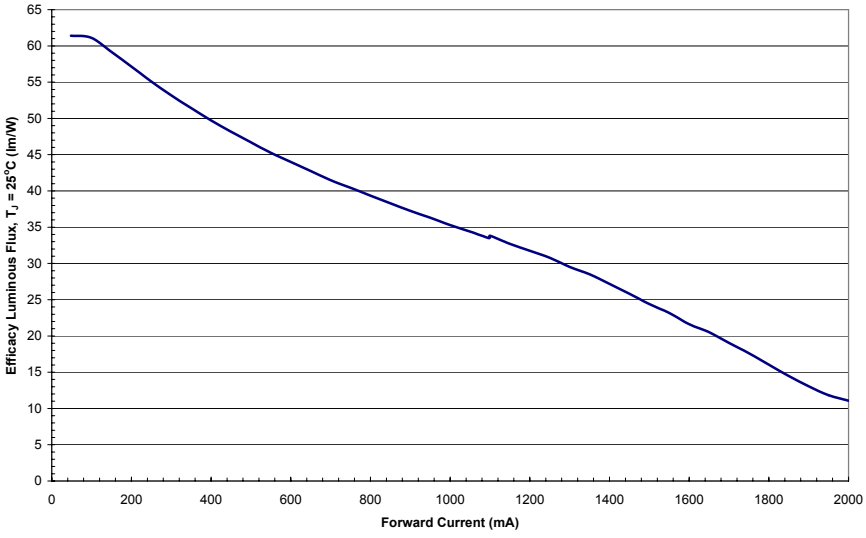


Figure 14.
Typical Relative Efficacy vs. Current Daylight White NT-42D0-0426

Efficacy vs. Current, RGB NT-43F0-0424

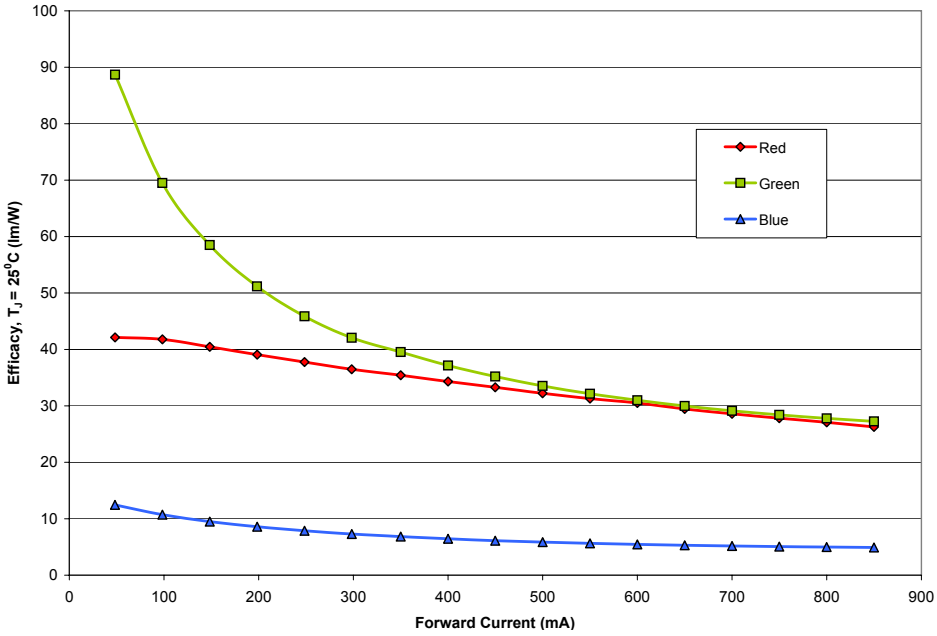


Figure 15.
Typical Relative Efficacy vs. Current, RGB NT-43F0-0424.

Photos courtesy of DG Lights
www.DGLights.com

Bin Structure,
Warm White NT-42D1-0425

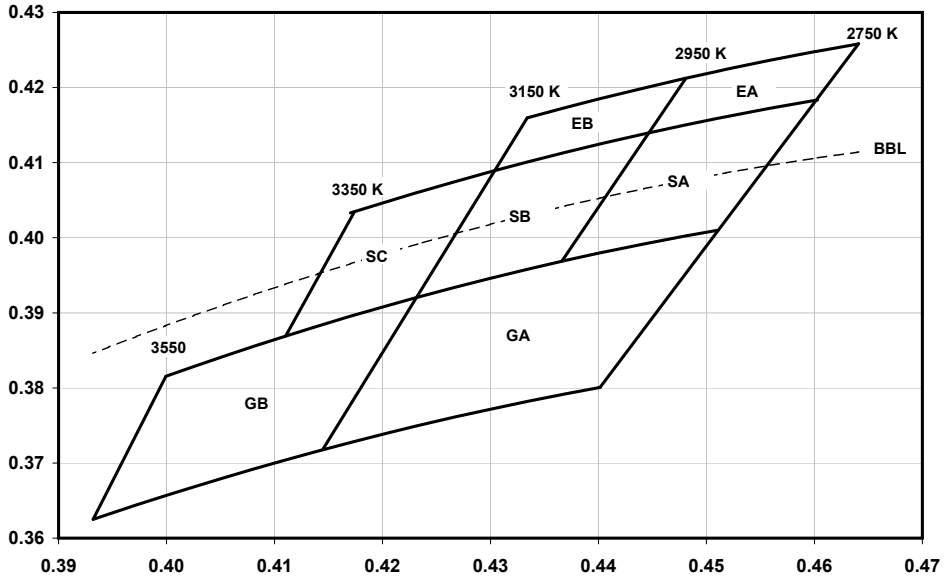


Figure16. CIE Reference 1931, 2°

Bin Code	X	Y	Typical CCT (°K)
EB	0.4481 0.4448 0.4305 0.4334	0.4212 0.4140 0.4089 0.4159	3050
EA	0.4641 0.4603 0.4448 0.4481	0.4258 0.4183 0.4140 0.4212	2850
SC	0.4305 0.4232 0.4110 0.4174	0.4089 0.3920 0.3869 0.4034	3250
SB	0.4448 0.4366 0.4232 0.4305	0.4140 0.3968 0.3920 0.4089	3050

Bin Code	X	Y	Typical CCT (°K)
SA	0.4603 0.4510 0.4366 0.4448	0.4183 0.4009 0.3968 0.4140	2850
GB	0.4232 0.4144 0.3932 0.3999	0.3920 0.3717 0.3625 0.3815	3350
GA	0.4510 0.4401 0.4144 0.4232	0.4009 0.3800 0.3717 0.3920	2950

Table 8. Note: Typical relative Warm White Bin NT-42D1-0425.

Bin Structure,
Daylight White NT-42D0-0426

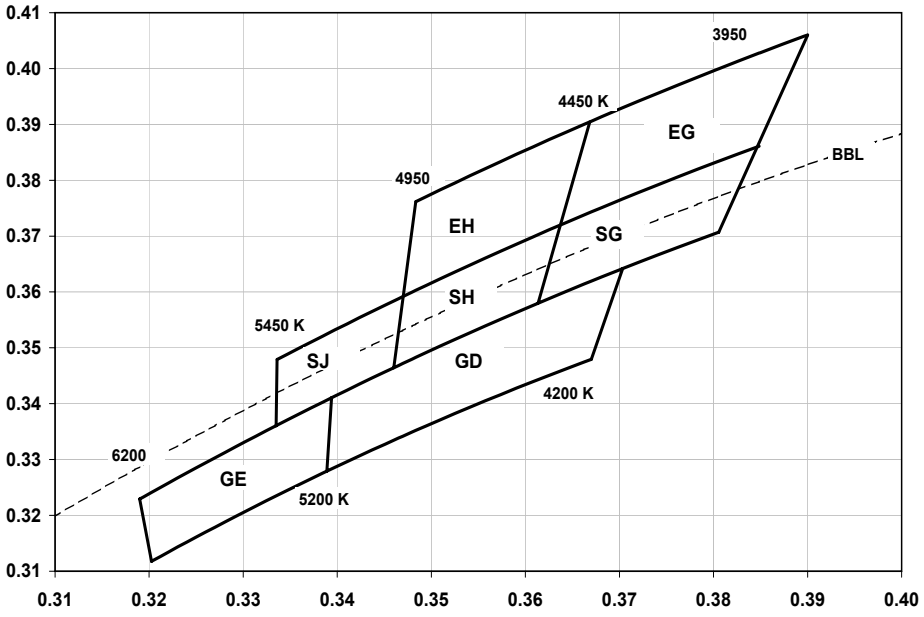


Figure 17. CIE Reference 1931, 2°

Bin Code	X	Y	Typical CCT (°K)
EH	0.3668 0.3637 0.3469 0.3483	0.3904 0.3719 0.3591 0.3761	4700
EG	0.3900 0.3848 0.3637 0.3668	0.4060 0.3861 0.3719 0.3904	4200
SJ	0.3469 0.3460 0.3335 0.3336	0.3591 0.3464 0.3360 0.3479	5200
SH	0.3637 0.3613 0.3460 0.3469	0.3719 0.3580 0.3464 0.3591	4700

Bin Code	X	Y	Typical CCT (°K)
SG	0.3848 0.3805 0.3613 0.3637	0.3861 0.3706 0.3580 0.3719	4200
GE	0.3394 0.3389 0.3202 0.3190	0.3410 0.3279 0.3117 0.3229	5700
GD	0.3703 0.3670 0.3389 0.3394	0.3641 0.3479 0.3279 0.3410	4700

Figure 9. Note: Typical relative Daylight White Bin NT-42D0-0426.

Projected Lumen Maintenance

Lifetime for solid-state devices (LEDs) is typically defined in terms of lumen maintenance - the percentage of initial light output remaining after a specified period of time.

The NT-42D1-0425 - Warm White and NT-42D0-0426 - Daylight White will deliver 70% lumen maintenance at 50,000 hours of operation at a forward current of 700mA. This projection is based on constant current operation with junction temperature maintained at or below 120ºC. The NT-43F0-0424 - RGB will deliver, 70% lumen maintenance at 50,000 hours of operation at a forward current of 350mA. This projection is based on constant current operation with junction temperature maintained at or below 120ºC.

This performance is based on independent test data. Lamina's historical data from tests run on similar material systems, and internal reliability testing. Observation of design limits included in this data sheet is required in order to achieve this project lumen maintenance.

Projected Lumen Maintenance, Warm White NT-42D1-0425

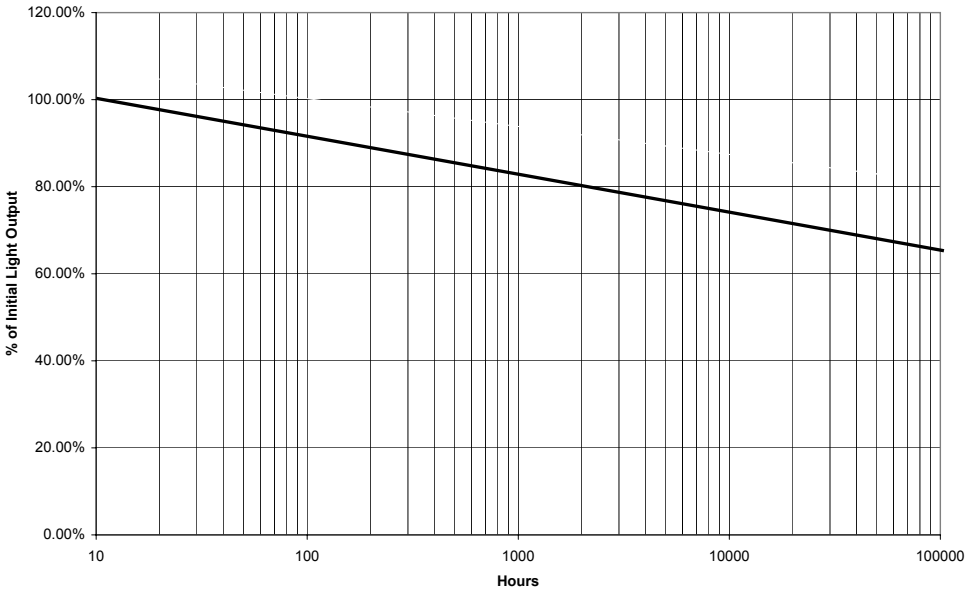


Figure 18.

Projected Lumen Maintenance, Daylight White NT-42D0-0426

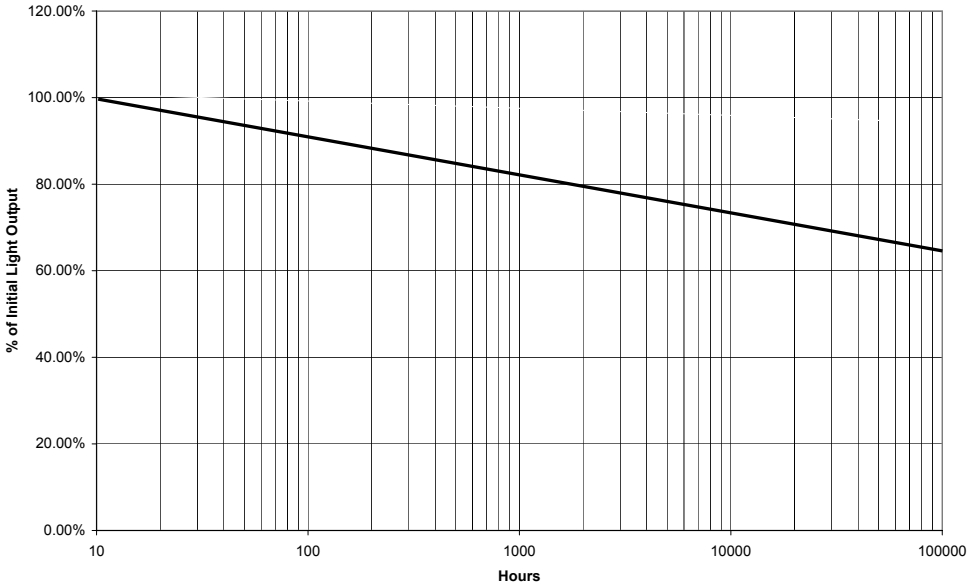


Figure 19.

Projected Lumen Maintenance, RGB NT-43F0-0424

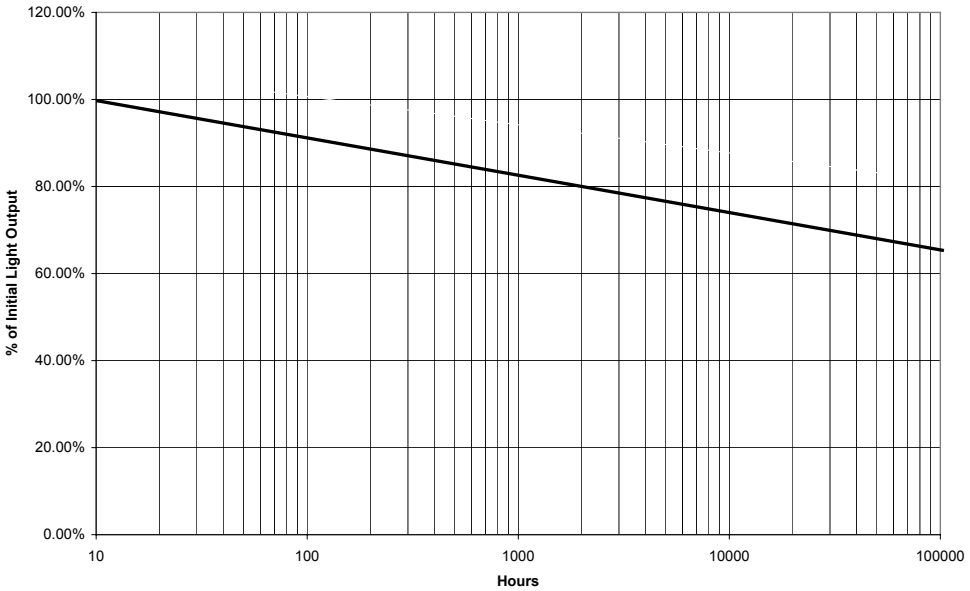


Figure 20.

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

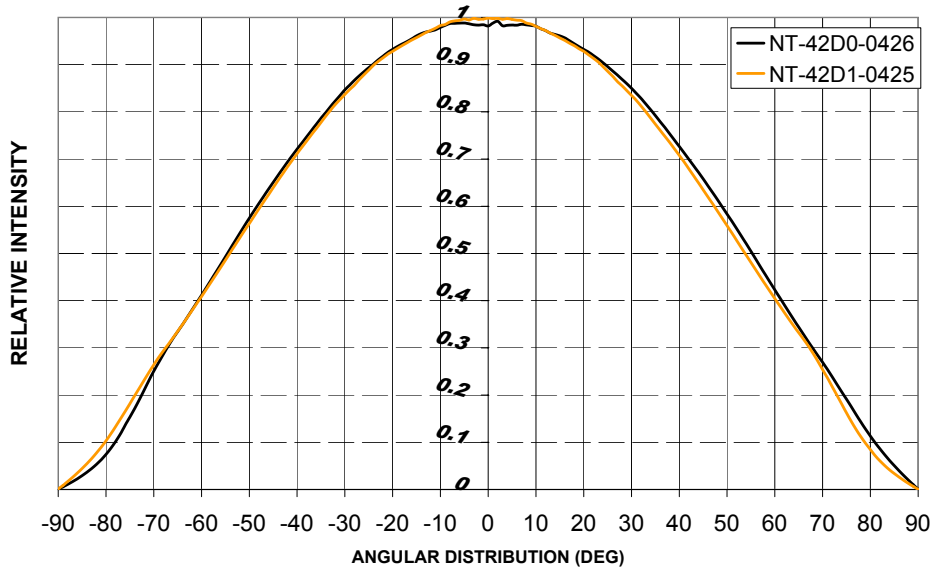


Figure 21.
Typical Relative Luminous Intensity/Distribution NT-42D1-0425, NT-42D0-0426

Relative Luminous Intensity, RGB NT-43F0-0424

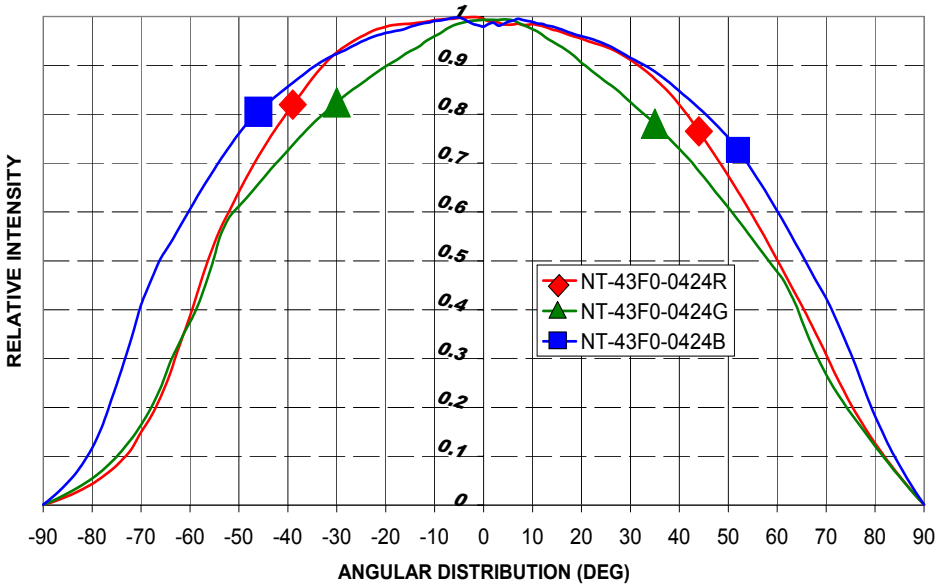


Figure 22.
Typical Relative Luminous Intensity/Distribution NT-43F0-0424

Typical Beam Pattern - Lamina's Atlas™ LED light engines project a 108° - 132° (2θ,1/2, 50% of peak value) Lambertian radiation pattern. Narrower beam distributions can be produced by use of selected popular LED optics. Please contact Lamina Application Engineering for support with your optical needs.

Relative Luminous Intensity, (Polar)
Warm White NT-42D1-0425 and Daylight White NT-42D0-0426

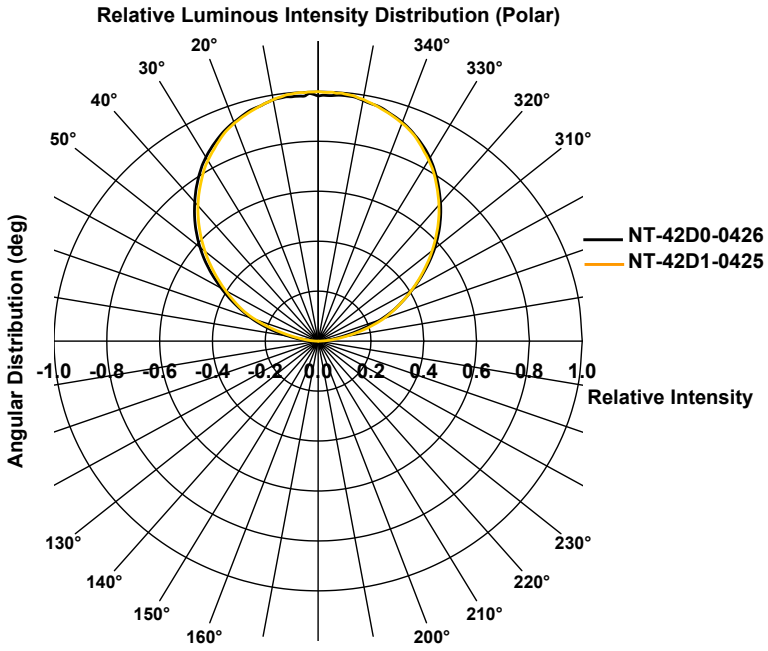


Figure 23.
Typical Relative Luminous Intensity Distribution, Whites NT-42D1-0425, NT-42D0-0426

Relative Luminous Intensity, (Polar)
RGB NT-43F0-0424

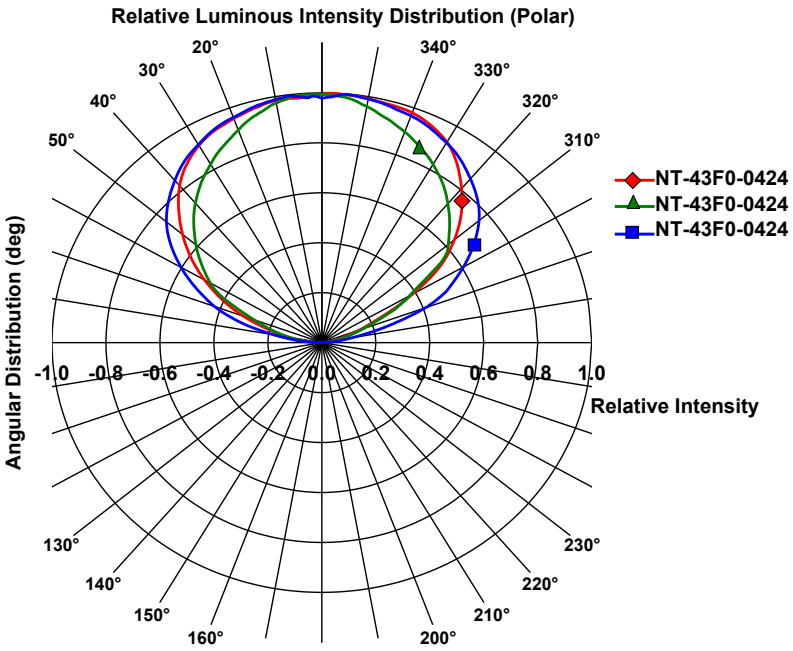


Figure 24.
Typical Relative Luminous Intensity Distribution, RGB NT-43F0-0424

Mechanical Dimensions, Warm White NT-42D1-0425 and Daylight White NT-42D0-0426

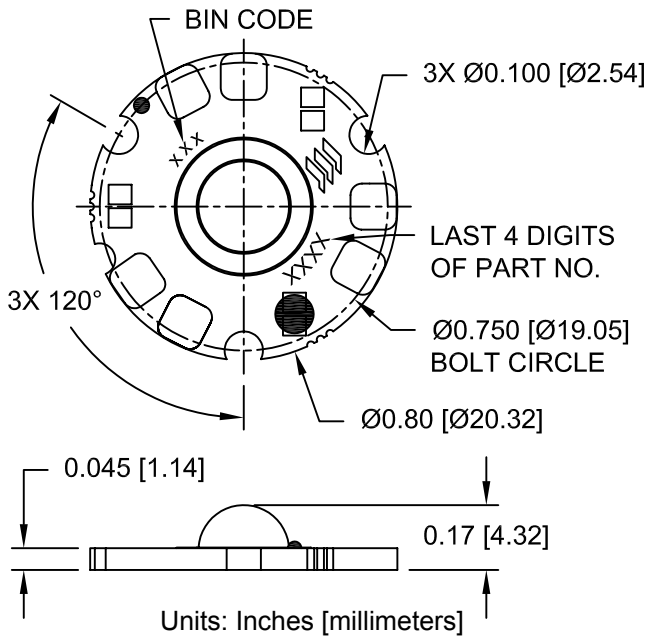


Figure 25.
All dimensions are for reference only Mechanical NT-42D1-0425. NT-42D0-0426. Do not handle device by the lens. Care must be taken to avoid damage to the lens. Drawing not to scale.

Mechanical Dimensions, RGB NT-43F0-0424

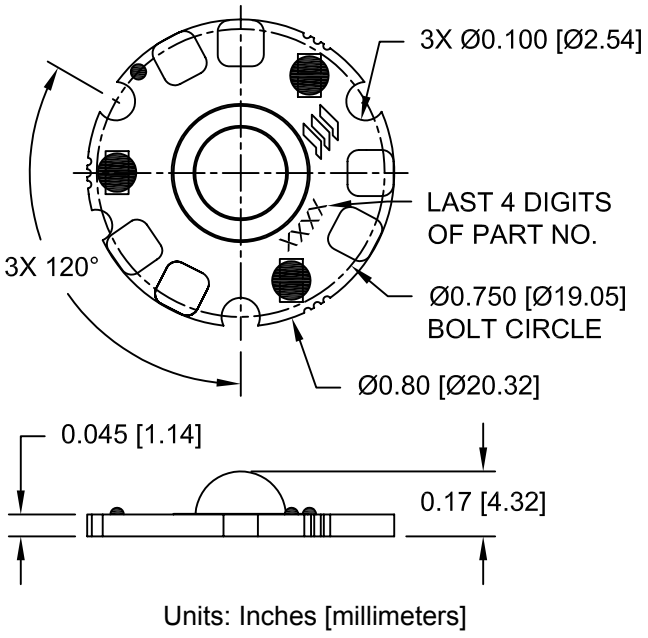
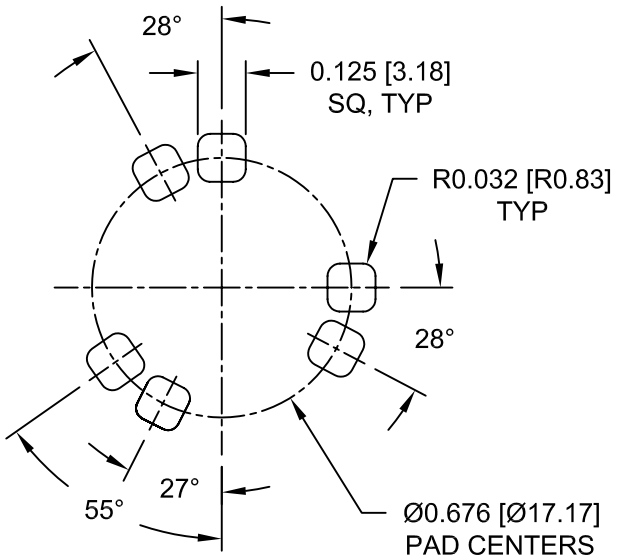


Figure 26.
All dimensions are for reference only Mechanical NT-43F0-0424 Do not handle device by the lens. Care must be taken to avoid damage to the lens. Drawing not to scale.

Solder Pad Design



Units: Inches [millimeters]

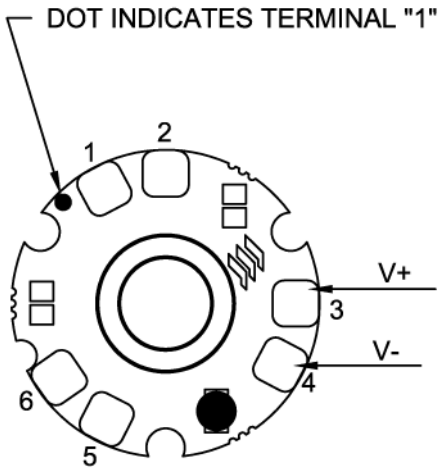
Figure 27.
For optimal thermal performance thermal grease or epoxy should be added beneath the entire surface of the LED array. All dimensions are for reference only.

Thermal Design

Proper thermal design is essential to achieving maximum life and performance. There are many ways you can reduce the junction temperature of your product and increase its useful life. Heat sinks, both active and passive, come in many styles and sizes. Choosing the correct heat sink for your design will maximize the performance and add to the unique aesthetic quality of your product. Thermal tape is not recommended for attachment to heat sinks.

The thermal design experts at Lamina are ready to assist you with your design. Visit www.laminalighting.com where you can download helpful white papers and get specifications for our other products including heat sinks, optics and drivers the Atlas™ Light Engines.

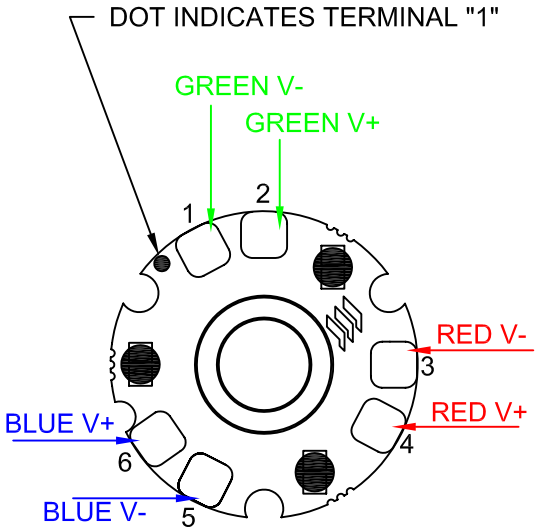
Electrical Connections,
Warm White NT-42D1-0425 and Daylight White NT-42D0-0426



Units: Inches [millimeters]

Figure 28.
Do not handle device by the lens.
Care must be taken to avoid damage to the lens. Drawing not to scale.

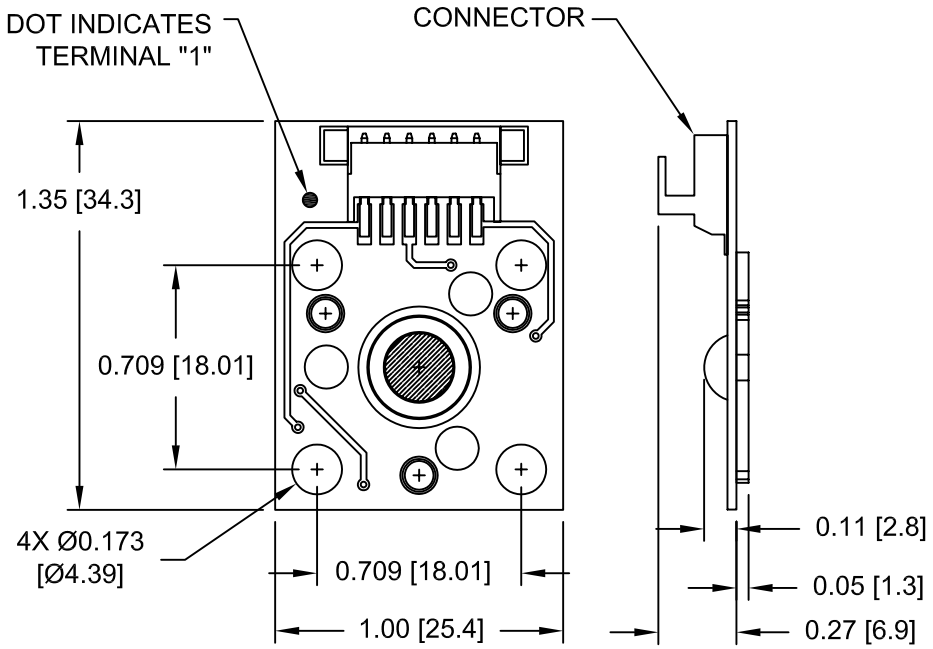
Electrical Connections,
RGB NT-43F0-0424



Units: Inches [millimeters]

Figure 29.
Do not handle device by the lens.
Care must be taken to avoid damage to the lens. Drawing not to scale.

EZConnect Light Source
EZ-43F0-0431 RGB, EZ-42D1-0432 Warm White, EZ-42D0-0433 Daylight White



Units: Inches [millimeters]

Figure 30.

Light Engine Mounted on EZConnect Board
All dimensions are for reference only. Connector reference AMP P/N 3-292173-6.
For EZConnect Wire Harness see Lamina P/N EZ-46WH-0354

Packaging Tape & Reel

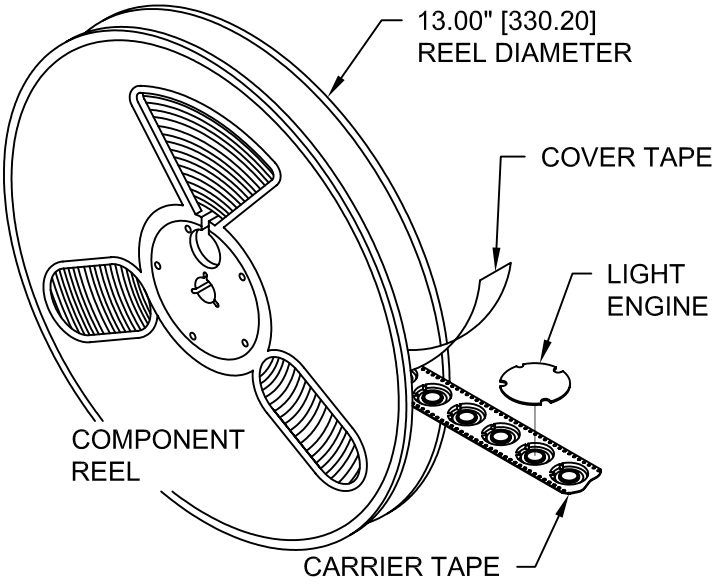
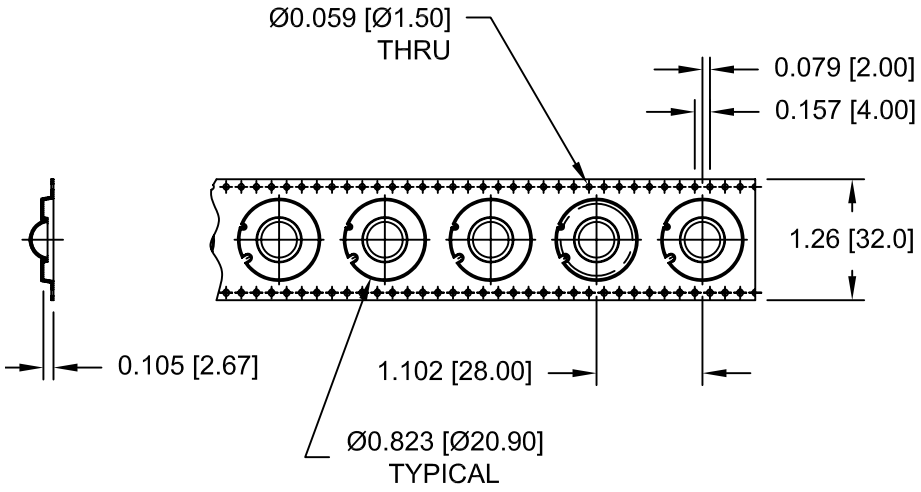


Figure 31.
250 parts are on the real.

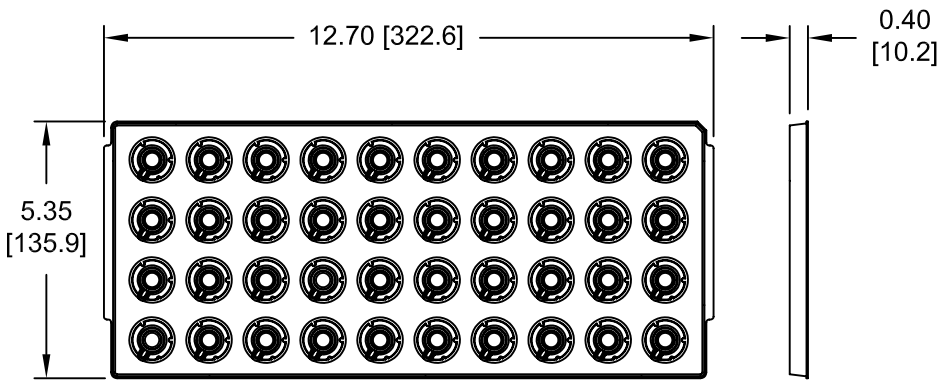
Carrier Tape



Units: Inches [millimeters]

Figure 32.
Carrier Tape made from ESD dissipative material.

Packing Trays



TRAY HOLDS 40 UNITS

Units: Inches [millimeters]

Figure 33.
Packaging Trays made from static dissipative material.

Photos courtesy of DG Lights
www.DGLights.com

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 EZConnect board. EZConnect adapter boards have AMP connectors for solderless connections to Lamina's wiring harness.

As with many electrical devices, non-acid 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 Drive Current for no more than two seconds without heat sink.

1. Optical and electrical specifications are given for the specified drive @ 25ºC 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 screw down for flange mount devices with 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).

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.

Receiving Parts and Packaging Trays

Your parts will arrive in either custom fitted trays or on easy to use tape and reel packaging. This packaging was designed to provide the necessary protection during shipment and to take up the least amount of space in your storage area.

Notes

1. "This product uses 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. These 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 Wakefield 120. The heat sink must meet the specified flatness requirement. Mounting using screws and thermal tape may damage the device."

Lamina Light Engines Comply with RoHS Restrictions

Lamina® Atlas™ 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.

Warranty Statement

Lamina® (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 , Inc. - June 21, 2006

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