# TWC

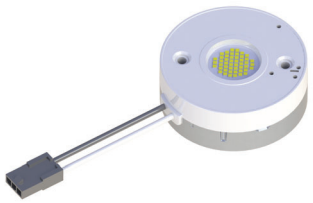
# AC Input Tunable White LED Modules with Casambi Dimming

| Input Voltage | Max. Source Lumens | Typ. Input Power | CCT Range | CRI | Dimming Method | Dimming Range |
|---|---|---|---|---|---|---|
| 120 - 277 Vac | 1500 lm<br>2000 lm<br>2500 lm | 14 W<br>19 W<br>24 W | 1800 - 6500 K | 90+ | Casambi | 1-100% |

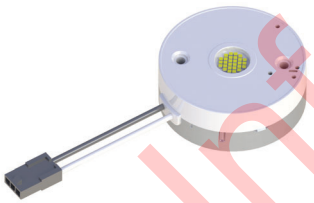
**TWC (with Diffuser Lens)**

Diameter: 50 mm (1.97 in)
Height: 19 mm (0.75 in)

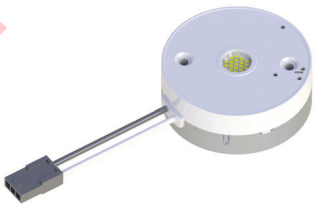
Light Emitting Surface: 19 mm
Optical Source Size 14.8 mm

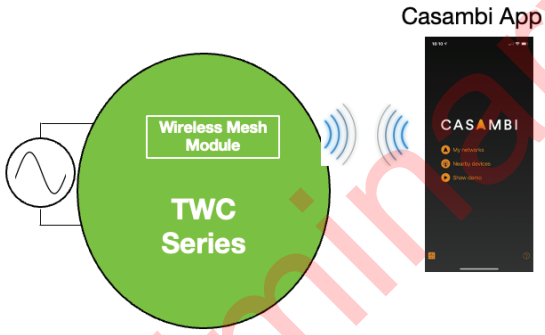


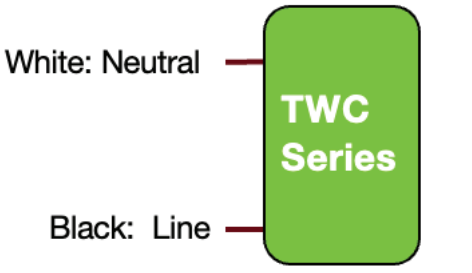
Light Emitting Surface: 12 mm
Optical Source Size 10 mm



Light Emitting Surface: 9 mm
Optical Source Size 8 mm






Wiring Diagram

## KEY FEATURES

- Casambi Wireless control
- Integrated AC to DC driver electronics
- Zhaga compliant footprint
- 3 modes of operation: Tunable white, Static White, Warm Dim
- Designed for field replaceability with front heat sink mounting
- Meets UL8750 Safety-Related Electronics Circuits (SREC) requirements
- Approved for use as thermal cutout for fixture per UL1598
- Configureable maximum light output (40%, 60%, 80%, 100%) Configureable tunable CCT range
- Warm dim ranges:
  3050–1800 K (MR16 Halogen profile)
  2700–1800 K (Incandescent profile)
- CA Title 24, IEEE 1789-2015, & Energy Star Compliant
- Compliant Color consistency of < 3 step (2 step typical) MacAdam ellipse
- On board overtemperature protection (OTP) with thermal foldback
- Circadian Rhythm lighting support with a controller

CA Title 24

# AC Input Tunable White LED Modules with Casambi Dimming

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## 1 - ORDERING INFORMATION

### 1.1 TWC - Base Part Numbers

| Part Number | Light Emitting Surface (LES) (mm) | Maximum Input Power (W) | Typical Source Lumens (lm) | Typical Efficacy (lm/W) @ 4000 K | Notes |
|---|---|---|---|---|---|
| TWC-A5009W-15-9-CNS | 9 | 14 | 1500 | 105 | Side Leads |
| TWC-A5012W-20-9-CNS | 12 | 19 | 2000 | 105 | Side Leads |
| TWC-A5019W-25-9-CNS | 19 | 24 | 2500 | 105 | Side Leads |

### 1.2 AC Input Power Cable (Ordered Separately)

| Description | Part Number |
|---|---|
| 2-wire AC Input Power Cable Assembly for Bianco, Black/White, 400 mm (15,7 in), for North America | AC-BIA-NA |
| 2-wire AC Input Power Cable Assembly for Bianco, Black/White, 610 mm (24 in), for North America | AC-BIA-NA-610 |
| 2-wire AC Input Power Cable Assembly for Bianco, Black/White, 100 mm (3.94 in), for North America | AC-BIA-NA-100 |
| 2-wire AC Input Power Cable Assembly for Bianco, Black/White, 413 mm (15.7 in), with quick disconnect, for North America | AC-BIA-NAQD |
| 2-wire AC Input Power Cable Assembly, Black/White, 400 mm (15.7 in), with quick disconnect and flyings leads, for North America | AC-NAQD-FL |

# AC Input Tunable White LED Modules with Casambi Dimming

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## 1 - ORDERING INFORMATION

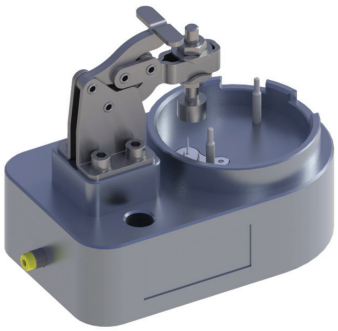
### 1.3 TWC - Secondary Optic Compatibility (Ordered Separately)

| Part Number | Lens Adapter | | |
|---|---|---|---|
| | LADA-BIA50-19-TIRA | LADA-BIA50-12-TIRA | LADA-BIA50-09-TIRA |
| Description | Optics adapter for LEDR, 19 mm aperture | Optics adapter for LEDR, 12 mm aperture | Optics adapter for LEDR, 9 mm aperture |
| TWC-A5019W | √ | X | X |
| TWC-A5012W | √ | √ | X |
| TWC-A5009W | √ | √ | √ |

| Part Number | Lens | |
|---|---|---|
| | LEDR-BIA50-MN5024-50 | LEDR-BIA50-MN5024-24 |
| Description | 50 mm outer diameter, 24 mm aperture TIR lens, 50° beam angle | 50 mm outer diameter, 24 mm aperture TIR lens, 24° beam angle |
| TWC-A5019W | √ | X |
| TWC-A5012W | X | √ |
| TWC-A5009W | X | √ |

### 1.4 Programming Tools (Ordered Separately)

| Description | Part Number |
|---|---|
| Programming Cradle for 50 mm Diameter Light Engines, Requires PROG-JACK-USB for Connecting to Computer | PROG-BIA50-CRADLE |
| Programming Cable, USB to 3.5 mm Audio Jack | PROG-JACK-USB |



PROG-BIA50-CRADLE

PROG-JACK-USB

# AC Input Tunable White LED Modules with Casambi Dimming

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## 2 - OPERATIONAL SPECIFICATIONS

### 2.1 Electrical Specifications (@ 25 °C Ambient Temperature)

| Specification | Units | Minimum | Typical | Maximum | Notes |
|---|---|---|---|---|---|
| Input Voltage Range | Vac | 90 | 120, 277 | 305 | - |
| Input Frequency Range | Hz | 47 | 50/60 | 63 | |
| Input Current | mA | - | - | 230 mA @ 120 Vac<br>100 mA @ 277 Vac | |
| Power Factor | | 0.9 | > 0.9 | | At nominal input voltage and 100% output |
| Total Harmonic Distortion (THD) | % | - | - | 20 % | At nominal input voltage, and from 100% to 40% of rated lumen output |
| Inrush Current | A | Meets NEMA-410 requirements | | | At any point on the sine wave and 25 °C |
| Leakage Current | mA | - | - | 0.32 mA @ 120 Vac<br>0.75 mA @ 277 Vac | Measured per IEC60950-1 |
| Input Harmonics | Complies with IEC 61000-3-2 for Class C equipment | | | | |
| Standby Power | mW | - | - | XX mW @ 120 Vac<br>XX mW @ 277 Vac | |
| Start Time | ms | - | ≤ 300 | 500 | |

# AC Input Tunable White LED Modules with Casambi Dimming

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## 2 - OPERATIONAL SPECIFICATIONS

### 2.2 Photometric Specifications (@ 60 °C Substrate Temperature, $T_s$)

| Specification | Range | Notes |
|---|---|---|
| Lumens | ≤ 1500, 2000, 2500 lm | Listed light output and efficacy refers to light output from the source. Diffuser lenses and additional optics will affect final light output and efficacy. See page 6 for characterization charts. |
| Efficacy (LPW) | 105 lm/W | |
| CCT (Tunable Range) | 1800–6500K | - |
| CCT (Warm Dim Range) | 3050–1800 K (MR16 Halogen profile)<br>2700–1800 K (Incandescent profile) | Warm Dim profile selectable via Casambi app. |
| CRI (Ra) | 90+ | 2700–6000 K |
| CRI (R9) | 50+ | 2700–6000 K |
| Nominal Color Consistency (Duv) | ± 0.0033 | < 3 step MacAdam ellipse (SDCM) at 100% output (2 step typical). |
| Lumen Maintenance | L70 (70% of initial lumens) at 50,000 hours at Tc ≤ 75°C. | |
| Flicker | Compliant with IEEE 1789-2015. | |

# AC Input Tunable White LED Modules with Casambi Dimming

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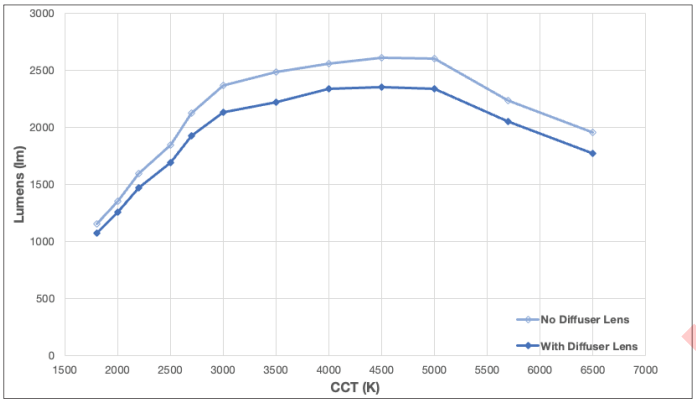
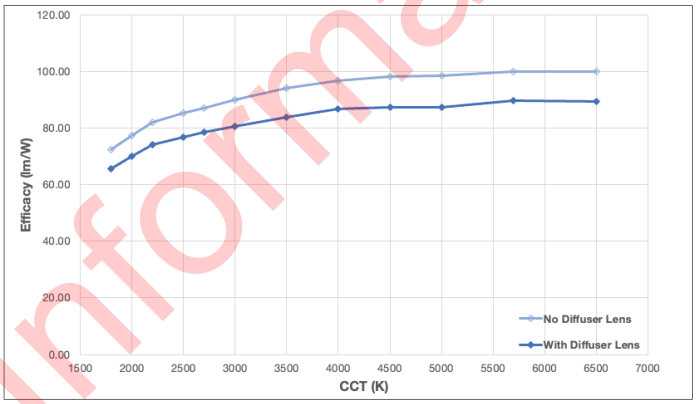
## 2 - OPERATIONAL SPECIFICATIONS

### 2.3 Lumen and Color Performance Data (PLACEHOLDER)

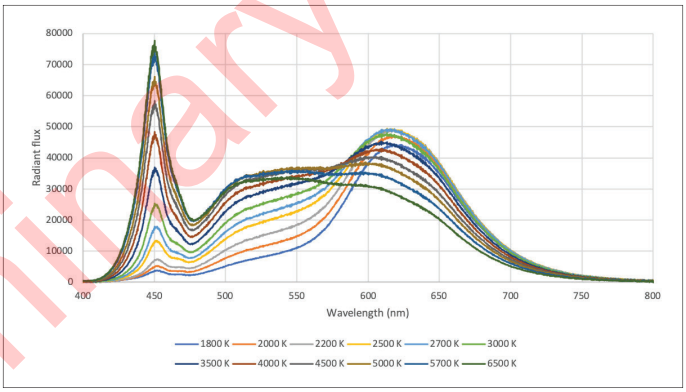
Typ. Lumen Output at Various CCT Points



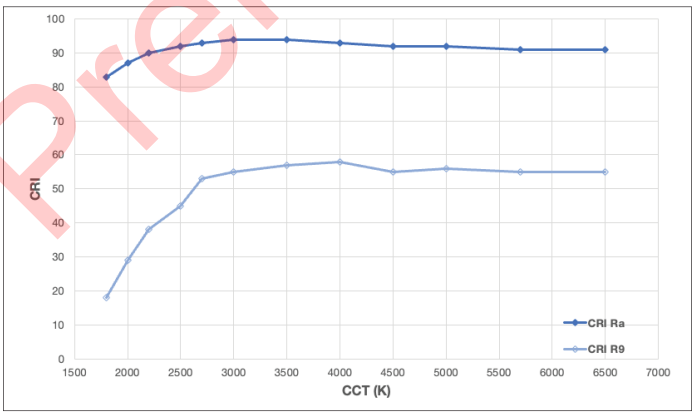

Typ. Efficacy (LPW) at Various CCT Points



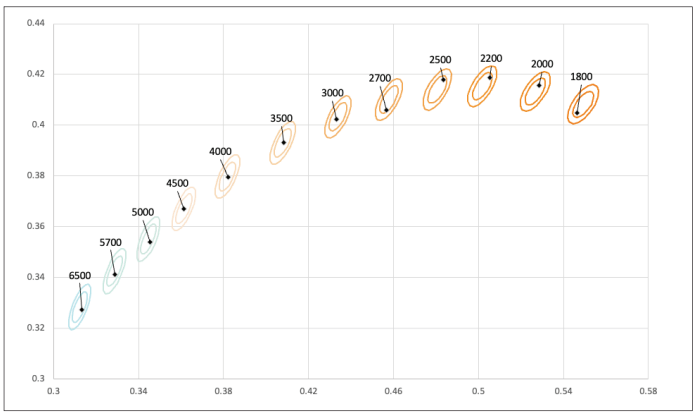

Spectral Power Data (SPD) at Various CCT Settings




CRI (Ra and R9) at Various CCT Points




12 Selectable CCT Points in the CIE 1931 Color Space



# AC Input Tunable White LED Modules with Casambi Dimming

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## 2 - OPERATIONAL SPECIFICATIONS

### 2.4 Environmental and Safety Specifications

| Specification | Units | Minimum | Maximum | Notes |
|---|---|---|---|---|
| Operating Ambient Temperature (Ta) | °C | -20 | 40 | - |
| Maximum Case Temperature (Tc) | °C | - | 90 | |
| Storage Temperature | °C | -40 | 85 | |
| Humidity | % | 5 | 95 | Non-condensing. |
| Acoustic Noise | dBA | - | 24 | Measured at a distance of 1 foot (30 cm) |

| Specification | Notes |
|---|---|
| Mechanical Shock Protection | As per EN60068-2-27. |
| Vibration Protection | As per EN60068-2-6 & EN60068-2-64. |
| MTBF | > 200,000 hours when operated at nominal input conditions, and at $T_c$ < 75 °C. |
| Driver Lifetime | 50,000 hours at $T_c$ = 75 °C maximum case hot spot temperature. |
| Conducted & Radiated EMI | Compliant with FCC CFR Title 47 Part 15 Class B at 120 Vac, Class A at 277 Vac. |

| Specification | Type | Standard | Notes |
|---|---|---|---|
| Harmonic Current Emissions | - | IEC 61000-3-2 | For Class C equipment. |
| Immunity Compliance | ESD (Electostatic Discharge) | IEC 61000-4-2 | 6 kV contact discharge, 8 kV air discharge, level 3. |
| | Electrical Fast Transient | IEC 61000-4-4 | 2 kV on AC power port for 1 minute, 1 kV on signal/ control lines. |
| | Surge | IEC 61000-4-5 | 2 kV line to line (differential mode) / 2 kV line to common mode ground. |
| | | ANSI/IEEE c62.41.1-2002 & c62.41.2-2002 category A, 2.5 kV ring wave. | |
| | High Pot or Dielectric Voltage Withstand | 2200 Vdc | Tested between 0–10 V leads and AC input. |

| Safety Agency | Notes |
|---|---|
| UL | UL recognized component. Safety-Rated Electronic Circuit (SREC) rated |
| NEMA | SSL-1-2016 |
| CA Title 24 | Compliant |
| ENERGY STAR® | Compliant |

# AC Input Tunable White LED Modules with Casambi Dimming

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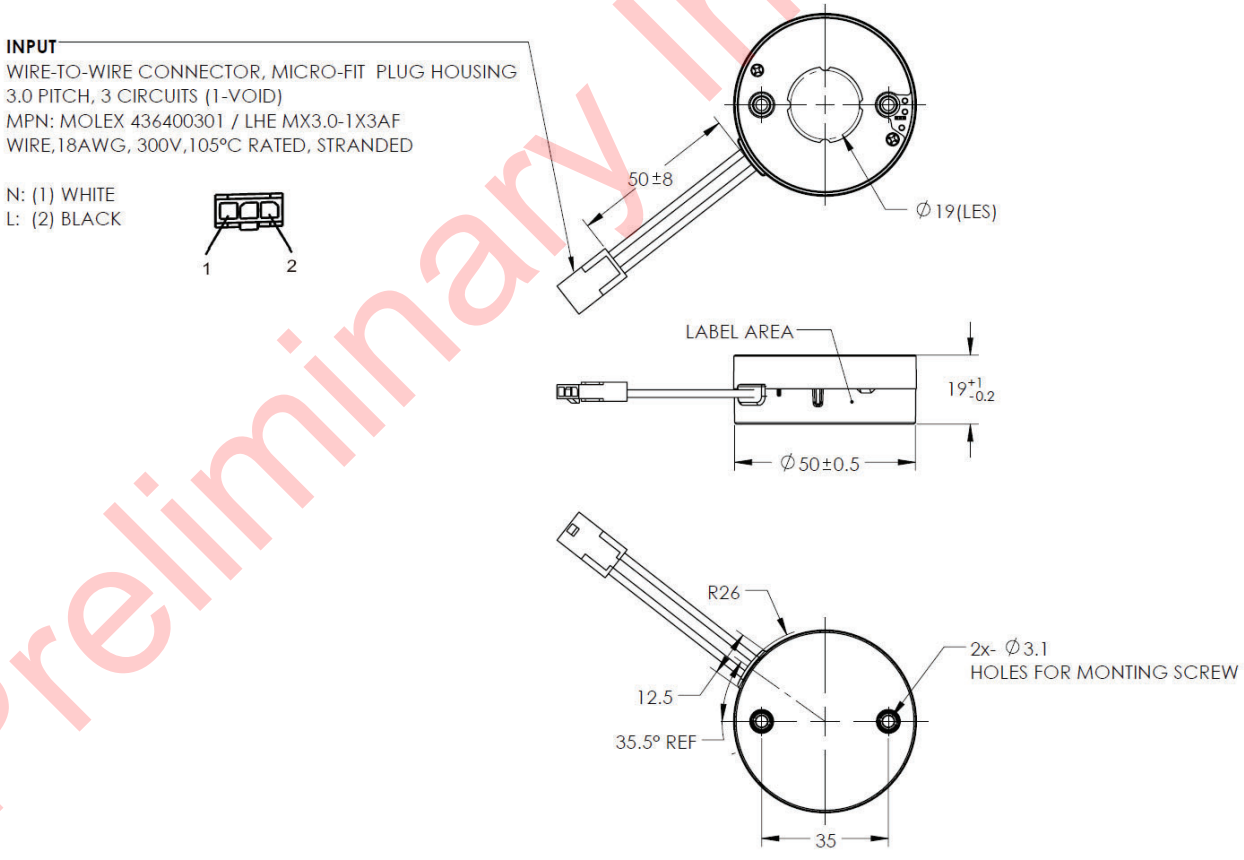
## 3 - MECHANICAL SPECIFICATIONS

| Specification | | Notes |
|---|---|---|
| **Dimensions** | **Diameter:** | 50 mm (nominal 1.97 in) |
| | **Height:** | 19 mm (nominal 0.71 in) |
| **Light Emitting Surface (LES)** | | 19 mm, 12 mm, 9 mm |
| **TWC Weight** | | 71 g (2.5 oz) |
| **Heat Sink Attachment** | | Front-mount, countersunk, M3 x 0.5 x 25 mm<br>Recommended torque: 0.59-0.79 N*m (5.2-6.9 lb*in) |

Note: See next section for details on the cable assemblies for TWC.




Note: All dimensions are in millimeters.

# AC Input Tunable White LED Modules with Casambi Dimming

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## 4 - CABLE ASSEMBLIES

### 4.1 2-Wire AC Input Power Cable Assemblies for TWC

#### General Specifications for Power Cable Assemblies

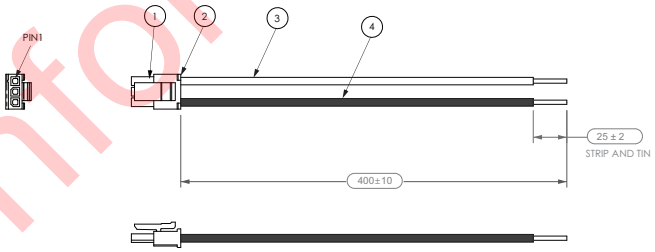
| Item No. | Part No. | Manufacturer | Description | Quantity |
|---|---|---|---|---|
| 1 | 3016H-1*03 | ECI | Connector 3-Pin | 1 |
| 2 | 3016P-L | ECI | Connector Crimp | 2 |

#### For North America

Part Number: AC-BIA-NA

Length: 400 mm (nominal 16 in.)

| Item No. | Part No. | Wire Description | Wire Color | Input | Qty. |
|---|---|---|---|---|---|
| 3 | UL 1430 | Wire Stranded Tinned 18 AWG (Pin-1) | White | Neutral | 1 |
| 4 | UL 1430 | Wire Stranded Tinned 18 AWG (Pin-3) | Black | Line | 1 |

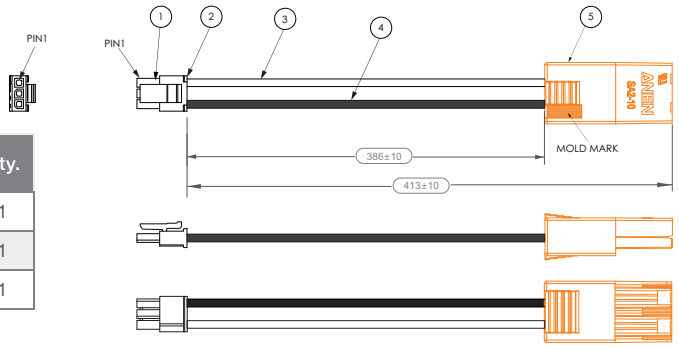



#### For North America, with Quick Disconnect

Part Number: AC-BIA-NAQD

Length: 413 mm (nominal 16.25 in.)

| Item No. | Part No. | Description | Color | Input | Qty. |
|---|---|---|---|---|---|
| 3 | UL 1430 | Wire Stranded Tinned 18 AWG (Pin-1) | White | Neutral | 1 |
| 4 | UL 1430 | Wire Stranded Tinned 18 AWG (Pin-3) | Black | Line | 1 |
| 5 | SA2-10, SINGLE | NBC ELECTRONIC 2-Pin Connector | Orange | N/A | 1 |

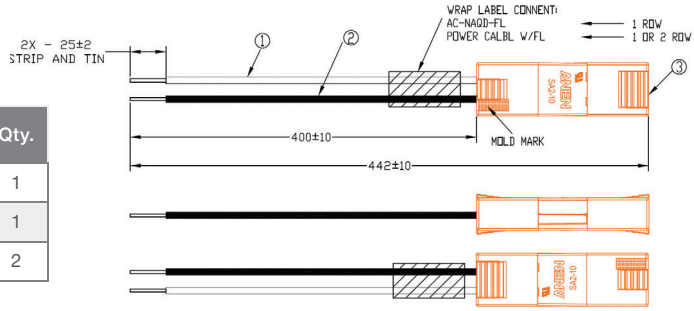



#### For North America, with Quick Disconnect

Part Number: AC-NAQD-FL

Length: 413 mm (nominal 16.25 in.)

| Item No. | Part No. | Description | Color | Input | Qty. |
|---|---|---|---|---|---|
| 1 | UL 1430 | Wire Stranded Tinned 18 AWG (Pin-1) | White | Neutral | 1 |
| 2 | UL 1430 | Wire Stranded Tinned 18 AWG (Pin-3) | Black | Line | 1 |
| 3 | SA2-10 | NBC ELECTRONIC 2-Pin Connector | Orange | N/A | 2 |




Note: All dimensions are in millimeters.

# AC Input Tunable White LED Modules with Casambi Dimming

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## 5 - HEAT SINKING RECOMMENDATIONS

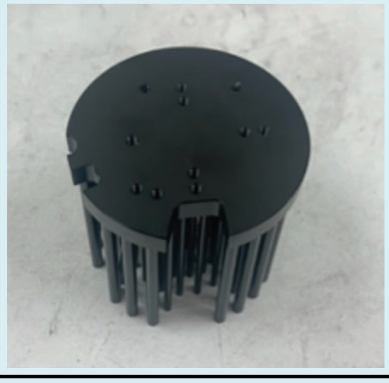
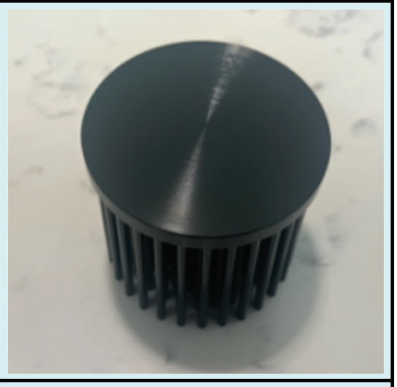
In most applications, a heat sink that would be used to cool the COB the TWC replaces will be sufficient to cool the engine. However, with color products, the LPW is significantly lower than static white products. For example, a heatsink being used to cool a white COB with an LPW of 150+ will not sufficiently cool a color product at the same lumens. Color applications tend to achieve an efficacy of 80-100 LPW.

The TWC is tested on standard heatsinks with known thermal resistance, using three sizes shown below. These heatsinks offer a starting point as to how large a heatsink needs to be to support a given Lumen output.

To verify this, once mounted to the planned heatsink, thermocouple the Tc point on the base of the engine. A target temperature of less than Tc 70C at the max ambient temperature for the application indicates sufficient heat sinking.

If the measured temperature is above this, the heatsink will need to be changed. The TWC will fold back lumens if the LED array temperature exceeds 85C which will happen at approximately 70C Tc.

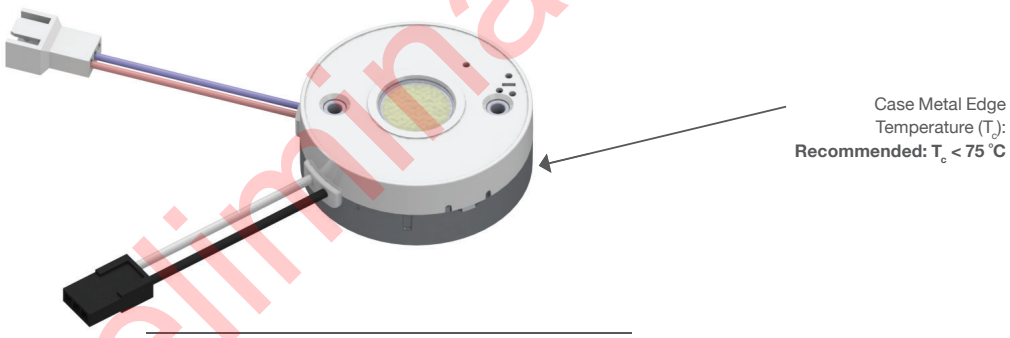
A thermal conductive material of greater than 8W/m*K is recommended for mounting the engine to the heatsink.

| Manufacturer | Mechatronix | Mechatronix | Mechatronix |
|---|---|---|---|
| Model | GH36D 9980-B | LPF67A68-8-B | LPF70A50-5-B |
| |  |  |  |
| | GH36D 9980-B, 120 Vac, Rev. X04, 4000K CCT | LPF67A68-8-B, 120 Vac, Rev. X04, 4000K CCT | LPF70A50-5-B, 120 Vac, Rev. X04, 4000K CCT |
| Light Engine Output (Lumen) | Ts at Ta of 40 °C | Ts at Ta of 40 °C | Ts at Ta of 40 °C |
| 850 | | | |
| 1000 | | | 69.1 |
| 1250 | | | 74.5 |
| 1500 | | 72.8 | 79.9 |
| 2000 | | 82.5 | 91.5 |
| 2500 (Max) | 64.9 | 85.3 | 97.4 |

## 6 - TEMPERATURE MEASUREMENT POINTS

The thermal management characteristics of the heat sink used with the TWC should be validated by measuring its **case temperature ($T_c$)**. This test should be done with the TWC installed in the fixture at ambient temperature and air flow conditions similar to the end-use installation. It is recommended that the thermal management system be designed for a $T_c < 75$ ˚C.

TWC has on-board over temperature protection (OTP) which will throttle the currents to the LED arrays. The CCT at which the unit is operating will be maintained in this mode, but the output lumens will drop. This ensures that the LEDs are not subjected to abnormal temperatures.




Case Temperature ($T_c$) Measurement Point



Note: All dimensions are in millimeters.

## 7 - LABELING

The XX is used as an example to illustrate a typical label.

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