

# OSRAM LTC-Y3T300000-1B1

## Datasheet

## LED ENGINE LuxiTune

# LTC-Y3T300000-1B1

LuxiTune™ is the only tunable white light engine offering a halogen-style Warm Dimming and CCT Tuning in the same product.



## Applications

- Museum
- Retail
- Hospitality
- Residential
- Office

## Features

- Small form factor LED light engine consisting of a multi-channel emitter + driver + TIR lens
- Beam angle options: 24°/34°/45°
- Precisely tracks a short distance below the Black Body Locus
- Two modes of operation:
  - Warm dimming mode: Warms from 3000K to below 1800K as it dims halogen-style
  - CCT tuning mode: Tunes from 1800K to 6500K with independent brightness control
- Stable flux and CCT over operating temperature
- Accurate color rendition with CRI 92 @3000K
- Single 2 SDCM CCT bin at 3000K
- 72 lm/W light engine efficiency (emitter + driver + lens) at steady state (hot) use conditions
- Supports 0-10V, DMX-512A, DMX-RDM, DALI and Casambi BLE enabled controls
- Driver design meets UL low voltage guidelines
- Lead (Pb) free and RoHS compliant

## Description

LuxiTune™ is the only tunable white light engine offering a halogen-style Warm Dimming and CCT Tuning in the same product.

With high color rendering index (CRI) and unit-to-unit variations  $\leq 3$  SDCM over operating conditions, it delivers high quality, energy-efficient directional lighting for architectural, high end residential, hospitality, museum and retail applications. Based on LED Engin's proven LuxiGen™ emitter technology, LuxiTune is available in three beam angles and supports several control protocols, providing flexibility and freedom in lighting design.



## Ordering Information

Type	Description	Ordering Code
Use the following to order a basic unit without daughter cards.		
LTC-Y3T300000-1B1	LZC LuxiTune 1100lm Gen 3.1, 0-10V kit	Q65113A2999
Use the following to order a daughter card separately, one for each 0-10V LTC-Y3T300000-1B1 kit		
LTB4-DALI	DALI daughter card	Q65113A3184
LTB6-RDM1	DMX-RDM daughter card	Q65113A3183
LTB8-BLE3	BLE mesh daughter card (Casambi profile 6500K-1800K)	Q65113A3432
Use the following to order a TIR lens separately, one for each 0-10V LTC-Y3T300000-1B1 kit		
LLNF-4T08-H	Narrow Flood (24°) Lens and Holder	Q65113A3185
LLFL-6T08-H	Flood (34°) Lens and Holder	Q65113A3186
LLWF-6T08-H	Wide Flood (45°) Lens and Holder	Q65113A3187

There is no option to purchase a standalone basic 0-10V driver board without purchasing a full kit ending in -1B1.

The BLE, DMX-RDM, and DALI daughter cards are ordered separately, but without the right firmware version, they will not function as intended.

## Firmware Versions

Firmware revisions that are supported with released product are as follows.

Revision	Released	Supported functionalities
V1.20	April 2015	All functionalities with 0-10V, DMX512A, DALI – initial release ARD mode – initial release Dimming to <2% - initial release
V1.31	November 2015	All functionalities with 0-10V, DMX512A, DALI ARD mode - improvements DMX-RDM - initial release Smooth dimming to <1%– initial release
V1.60	October 2016	All functionalities with 0-10V, DMX512A, DALI, DMX-RDM BLE (Casambi) – initial release Dim to OFF standard for 0-10V – modification
V1.61	September 2017	Extended range tuning curve Extended range support in DMX & RDM parameters Extended range profile for Casambi
V1.62	January 2019	All functionalities in v1.61 DALI 102/209 registration as control gear

### LuxiTune Chromaticity Bin @ $T_b = 65^\circ\text{C}$ ; 100% intensity; 2 SDCM Single Bin

Bin coordinates are listed below in the table

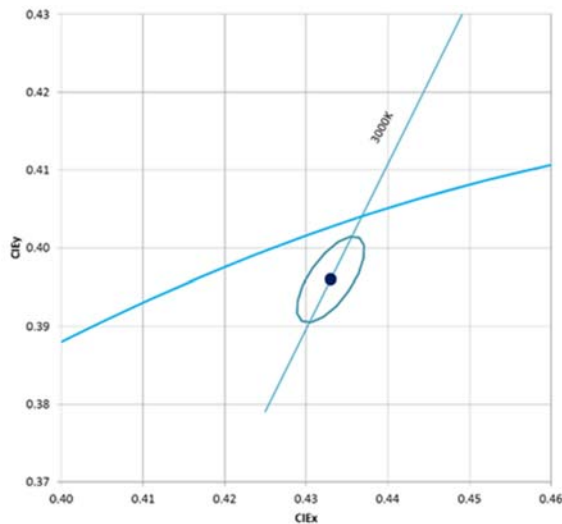


Figure 1: Single chromaticity bin plotted on excerpt from the CIE 1931 (2°) x-y chromaticity diagram

### Chromaticity Bin @ $T_b = 65^\circ\text{C}$ ; 3000K, 100% intensity, 2 SDCM

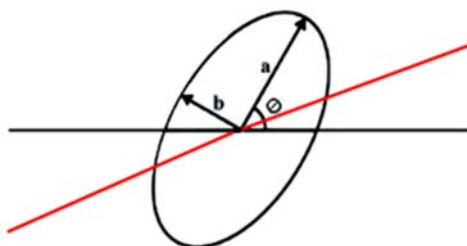
Table 1

Center point Cx	Center point Cy	Major axis a	Minor axis b	Rotation, $\phi$
0.4329	0.3957	0.0063	0.0026	56.3

### Chromaticity Bin @ $T_b = 15^\circ\text{C}-85^\circ\text{C}$ ; 3000K, 100% intensity, 3 SDCM

Table 2

Center point Cx	Center point Cy	Major axis a	Minor axis b	Rotation, $\phi$
0.4329	0.3957	0.0095	0.0040	56.5



## Operating Conditions @ $T_b = 15^{\circ}\text{C} - 85^{\circ}\text{C}$

Table 3

Parameter	Symbol	Min	Typical	Max	Unit
Input Voltage – Light Engine <sup>[1]</sup>	$V_{in}$	21.0	24.0	27.0	V
Input Current (@24VDC)	$I_{in}$		630	850	mA
On-mode Power @3000K, 100% intensity, $T_b=65^{\circ}\text{C}$	$P_{on}$		15	20 <sup>[2]</sup>	W
Standby Power (@0-10V)	$P_{min}$			0.2	W
Thermal Resistance, Electrical	$R_{j-b, el}^{[3]}$		1.1		$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Real	$R_{j-b, real}^{[3]}$		1.4		$^{\circ}\text{C}/\text{W}$
Storage Temperature Range	$T_{stg}$	-40		+110	$^{\circ}\text{C}$
Operating Temperature Range <sup>[4, 5, 6]</sup>	$T_b, T_0$	+15	25	+85	$^{\circ}\text{C}$

Notes for Table 3:

- Light Engine is defined as emitter + integrated driver + lens.
- The measured max power is 20W at 2100K, 85°C, 100% intensity.
- $R_{j-b}$  is the thermal resistance between the LED junction and the bottom of the MCPCB
- $T_c$  is referred to as  $T_b$  (emitter board) and  $T_0$  (driver board) in this product datasheet. The maximum of the 'Operating Temperature Range' is also referred to as 'rated maximum temperature  $T_c$ '. The temperature measurement point on the MCPCB,  $T_b$  is located next to the LED emitter and the other reference point,  $T_0$  is marked on the 0-10V driver board. See figures 16 and 17.  $T_b$  should not exceed 85°C and  $T_0$  should not exceed 85°C.
- LuxiTune is operational at temperatures below 15°C, however there is risk of condensation and unit needs to be protected against moisture.
- If  $T_b > 85^{\circ}\text{C}$ , the unit goes into thermal protection mode. The luminous flux is reduced in steps of 10% per 2°C until it turns "off" at  $T_b = 105^{\circ}\text{C}$ . Once the temperature drops to  $T_b < 65^{\circ}\text{C}$ , the brightness will be fully restored.

## Operating Characteristics @ $T_b = 15^{\circ}\text{C} - 85^{\circ}\text{C}$

Table 4

Parameters <sup>[1]</sup>	Symbol	Min	Typical	Max	Unit
Luminous Flux <sup>[2]</sup> – Light Engine <sup>[3]</sup> @3000K	$\Phi_V$	1000	1100	1200	lm
Useful Luminous Flux – Emitter only @3000K	$\Phi_{use}$		1250		lm
Efficiency – Light Engine @3000K			72		lm/W
Efficiency – Emitter only @3000K			84		lm/W
Color Rendering Index (CRI) @3000K	$R_a$		92		
Warm Dim Parameters	Symbol	Min	Typical	Max	Unit
Correlated Color Temperature	CCT		3000		K
Correlated Color Temperature @<0.5% intensity	CCT		1800		K
CCT Tuning Parameters	Symbol	Min	Typical	Max	Unit
Luminous Flux <sup>[2]</sup> – Light Engine @6500K	$\Phi_V$	880	1000		lm
Luminous Flux <sup>[2]</sup> – Light Engine @1800K	$\Phi_V$	825	1000		lm
Photobiological Safety Risk Group Classification according to IEC/TR 62778					
Light Engine			RG1		
$E_{thr}$ – Emitter			489lx		

Notes for Table 4:

1. All parameters measured at 100% intensity and  $T_b=65^{\circ}\text{C}$  unless stated otherwise.
2. Luminous flux performance guaranteed within published operating conditions. LED Engin maintains a tolerance of  $\pm 10\%$  on flux measurements.
3. Light Engine: Emitter + driver board + secondary lens.



### Beam Characteristics @ $T_b = 15^{\circ}\text{C}-85^{\circ}\text{C}$

Lens Description	Part number	Table 5		CBCP <sup>[3]</sup> 3000K; full intensity (cd)
		Beam angle <sup>[1]</sup> FWHM (degrees)	Field angle <sup>[2]</sup> (degrees)	
Narrow Flood	LLNF-4T08-H	24°	53°	2700
Flood	LLFL-6T08-H	34°	83°	1500
Wide Flood	LLFL-6T08-H	45°	89°	1250

Notes for Table 5:

1. Beam angle is defined as the full width at 50% of the max intensity (FWHM).
2. Field angle is defined as the full width at 10% of the max intensity.
3. CBCP (Center Beam Candlepower) is on-axis luminous intensity measured in candela.

### Typical Relative Intensity over Angle – TIR Optics

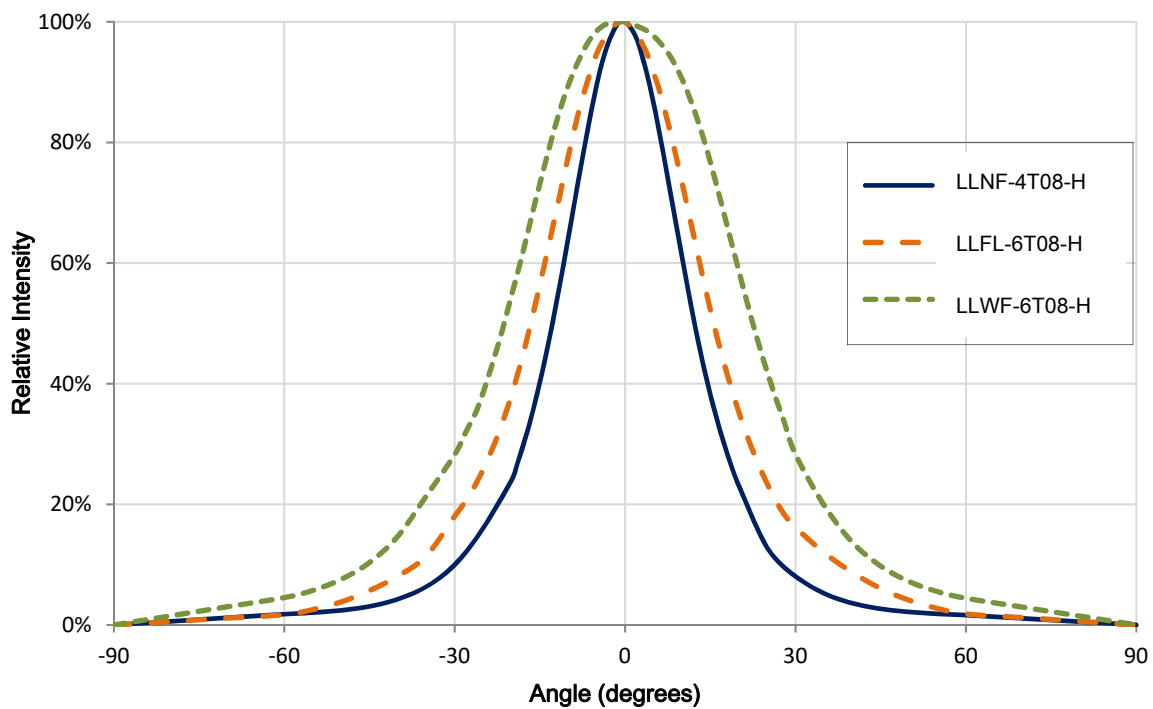


Figure 2: Typical relative intensity over angle

### Average Lumen Maintenance Projections

Based on long-term reliability testing, LED Engin projects that LuxiTune will deliver, on average, 70% Lumen Maintenance at >35,000 hours of operation at nominal operating conditions ( $T_b = 65^{\circ}\text{C}$ , 24VDC, 100% intensity, 3000K).

### Typical Relative Spectral Power Distribution

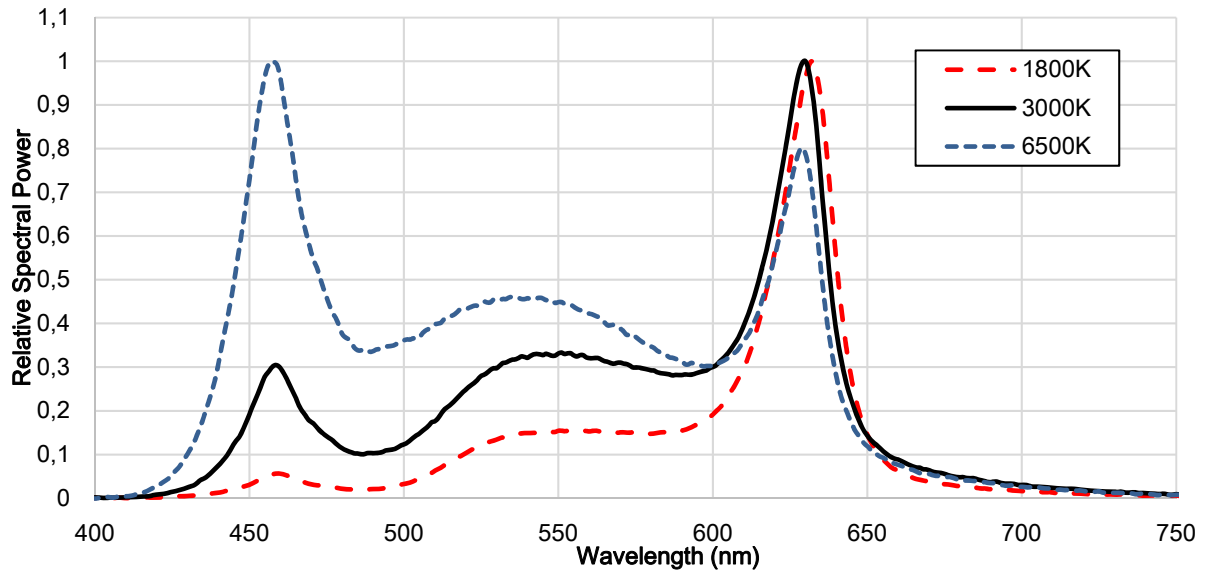


Figure 3: Typical relative spectral power vs. wavelength

### CCT Range in Warm Dimming Mode

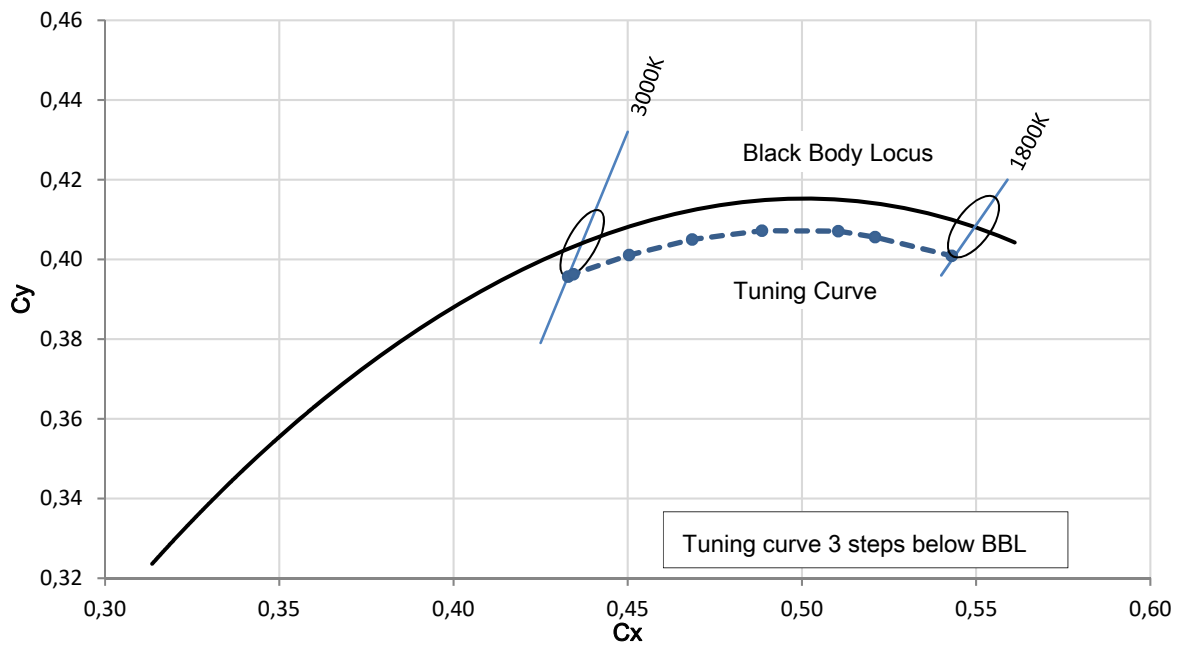


Figure 4: Typical CCT range in warm dim mode

### Relative Intensity vs. CCT in Warm Dimming Mode

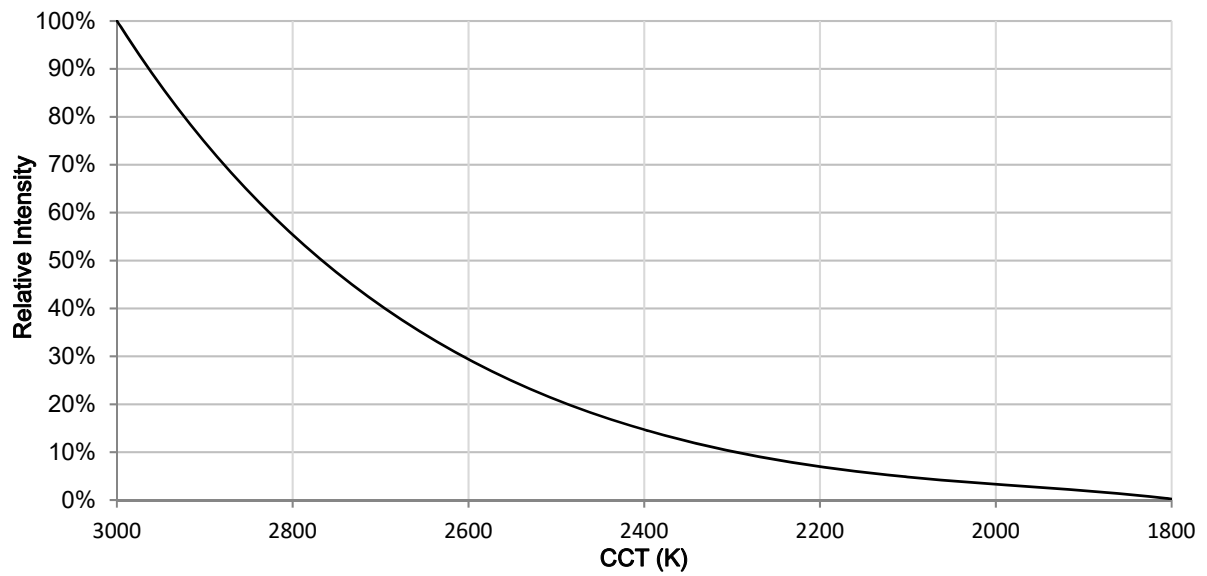


Figure 5: Intensity vs. CCT dimming profile in warm dim mode

### CCT vs. Control Voltage in Warm Dimming Mode

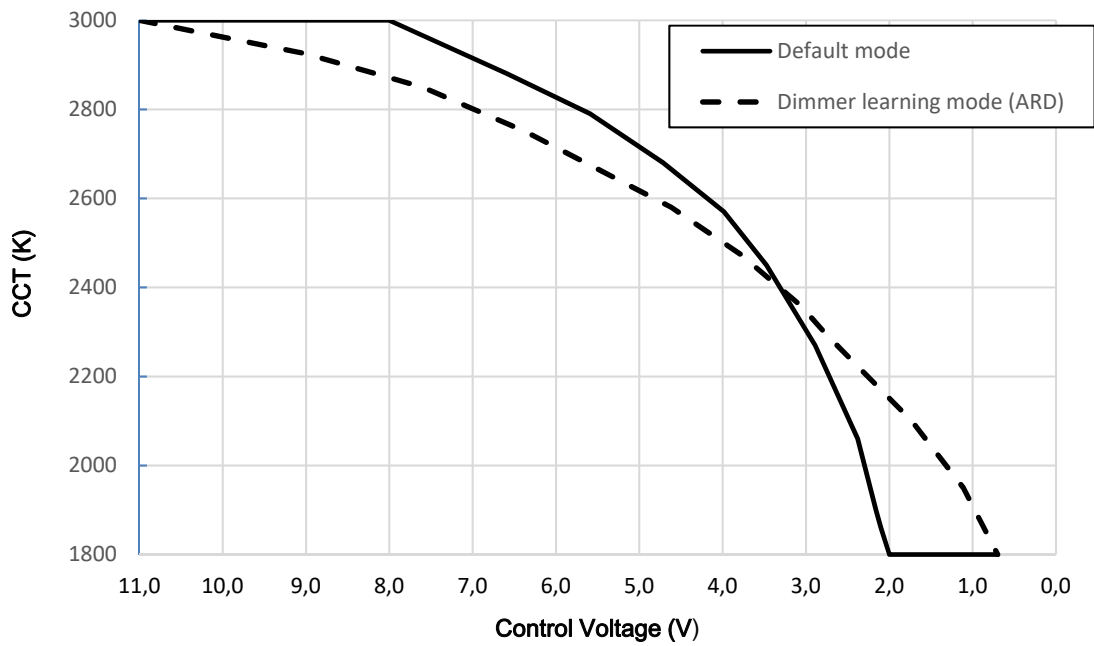


Figure 6: CCT vs. control voltage in warm dim mode

## Relative Intensity vs. Control Voltage in Warm Dimming Mode

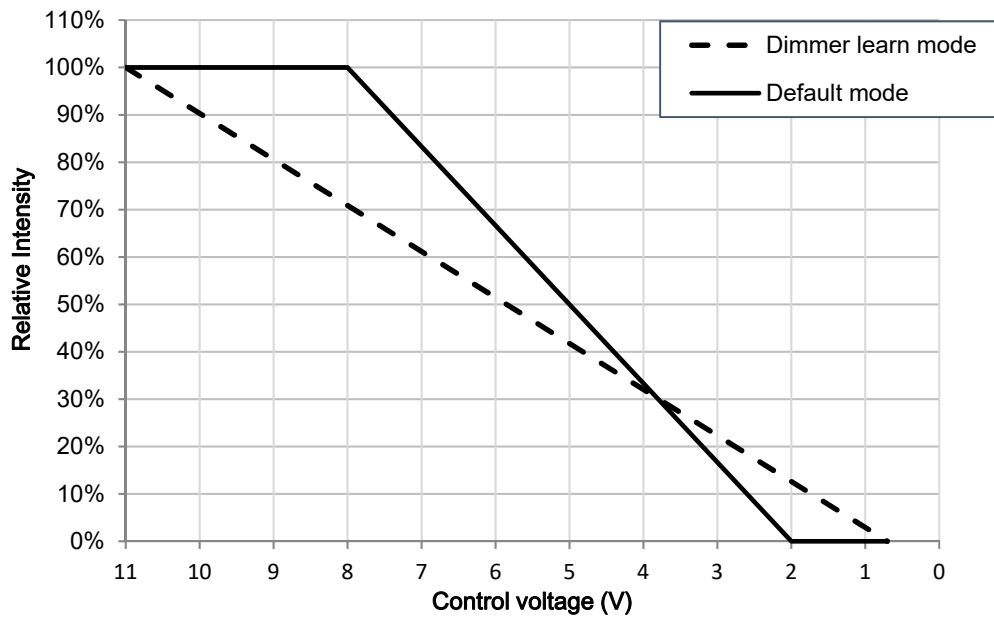


Figure 7: Intensity vs. control voltage in warm dim mode

Note for Figure 7:

1. LuxiTune driver has a linear response, i.e. it will produce linear output with linear dimmer and logarithmic output with logarithmic dimmer.

## CCT Range in CCT Tuning Mode

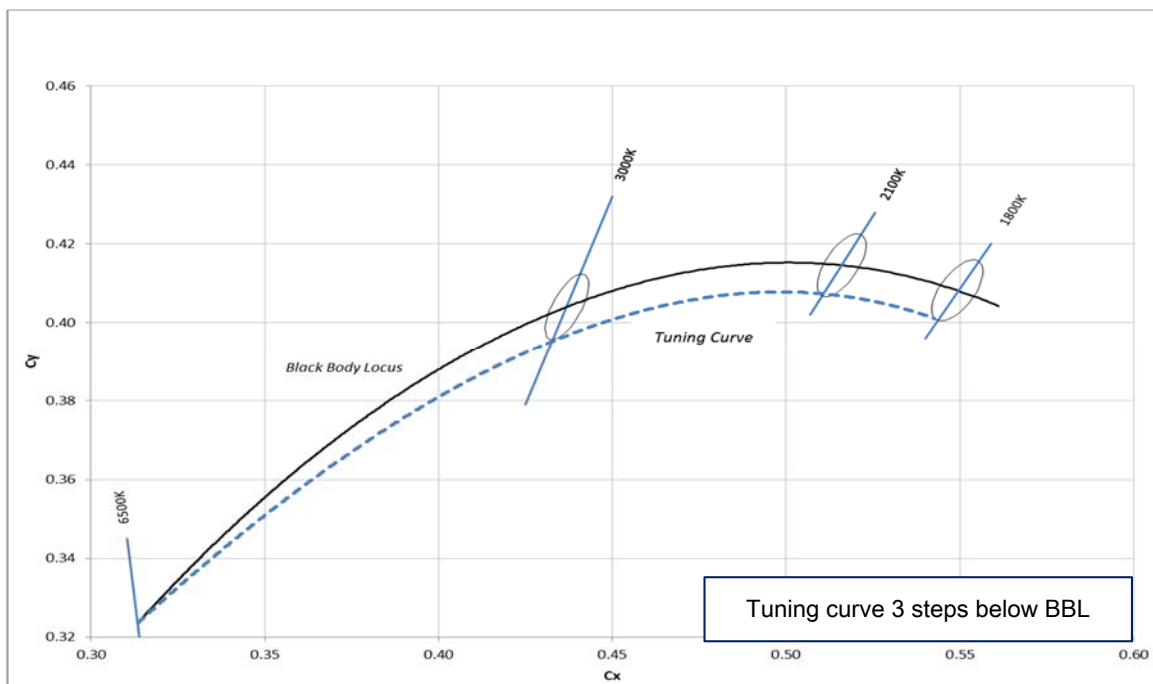


Figure 8: Typical CCT range in CCT tuning mode

### Relative Intensity vs. CCT in CCT Tuning Mode

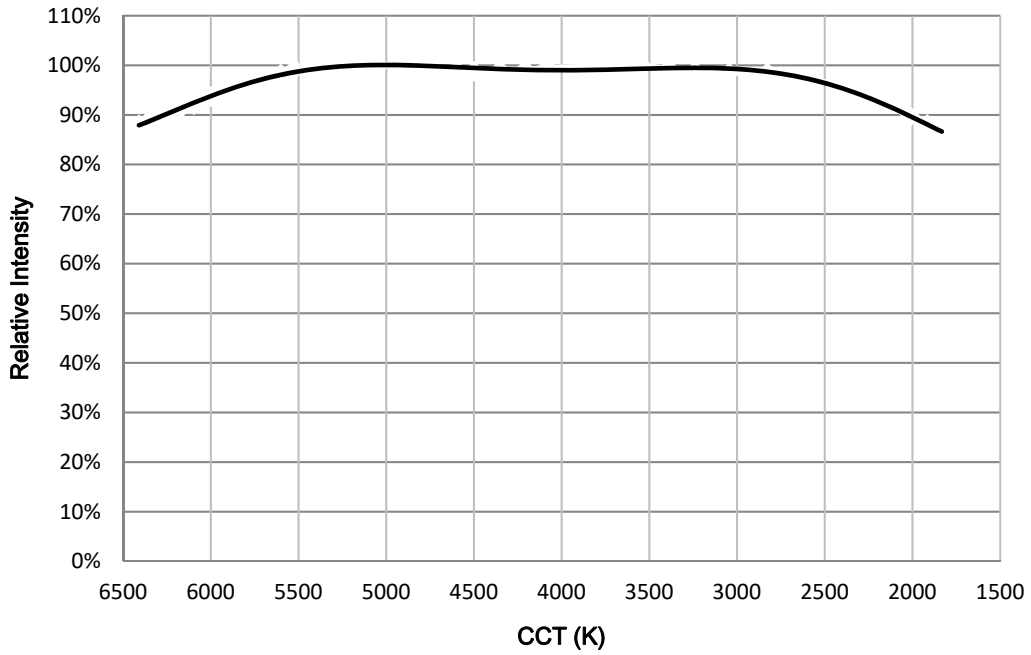


Figure 9: Relative Intensity vs. CCT in CCT tuning mode

### CCT vs. Control Voltage in CCT Tuning Mode

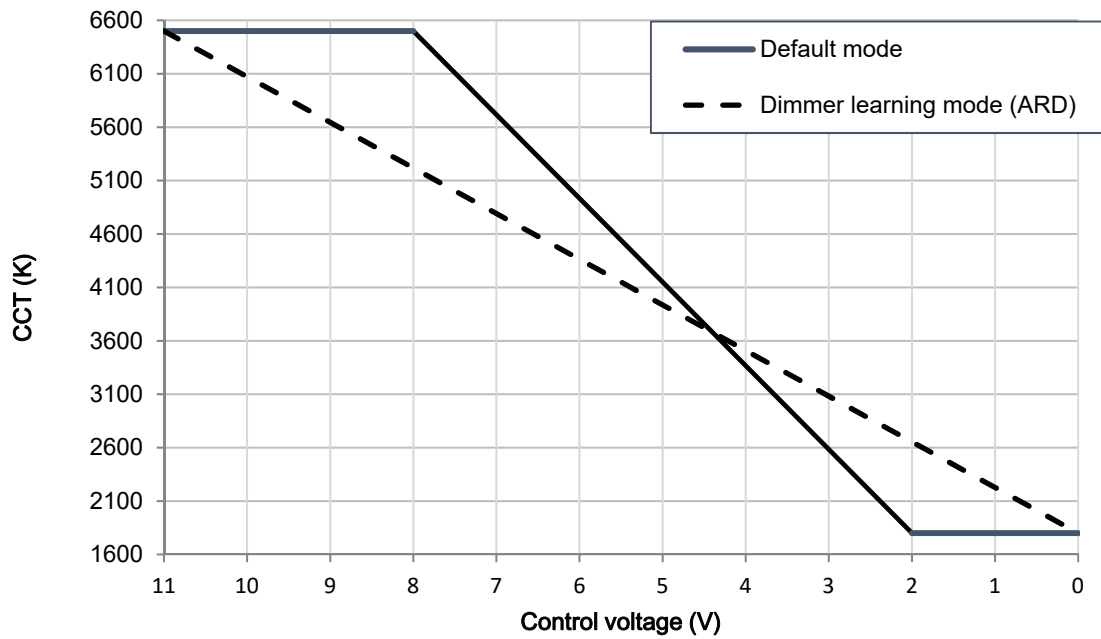


Figure 10: CCT vs. control voltage in CCT tuning mode

### Relative Intensity vs. Control Voltage in CCT Tuning Mode

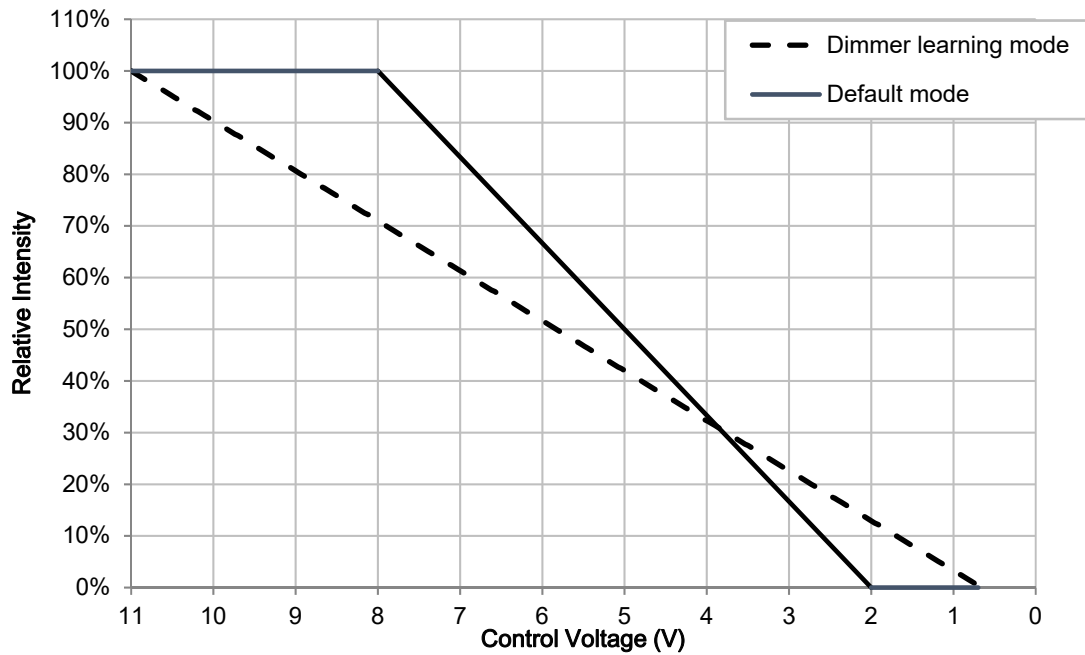


Figure 11: Relative intensity vs. control voltage in CCT tune mode

Note for Figure 11:

1. LuxiTune driver has a linear response, i.e. it will produce linear output with linear dimmer and logarithmic output with logarithmic dimmer.

### CRI vs. CCT in CCT Tuning Mode

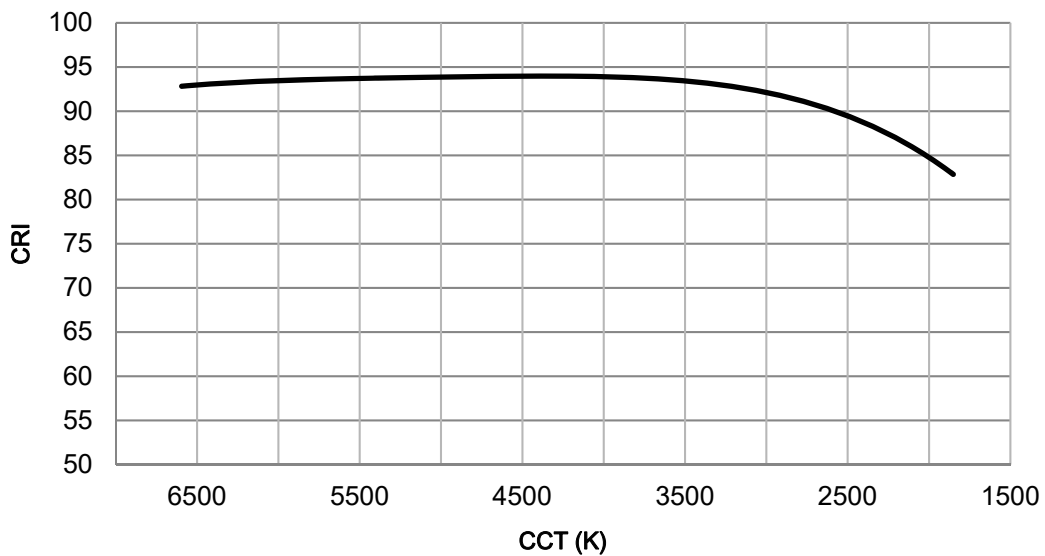


Figure 12: CRI vs. CCT in CCT tune mode

## LuxiTune Light Engine – Without Secondary Lens

### Mechanical Dimensions (mm)

LED Engin recommends that customers purchase the LuxiTune light engine with the supported secondary optics as the optics is optimized for color mixing and efficiency. However, some luminaire manufacturers have their unique secondary optics that they would like to use with LuxiTune. The following mechanical dimensions are provided as a guidance.

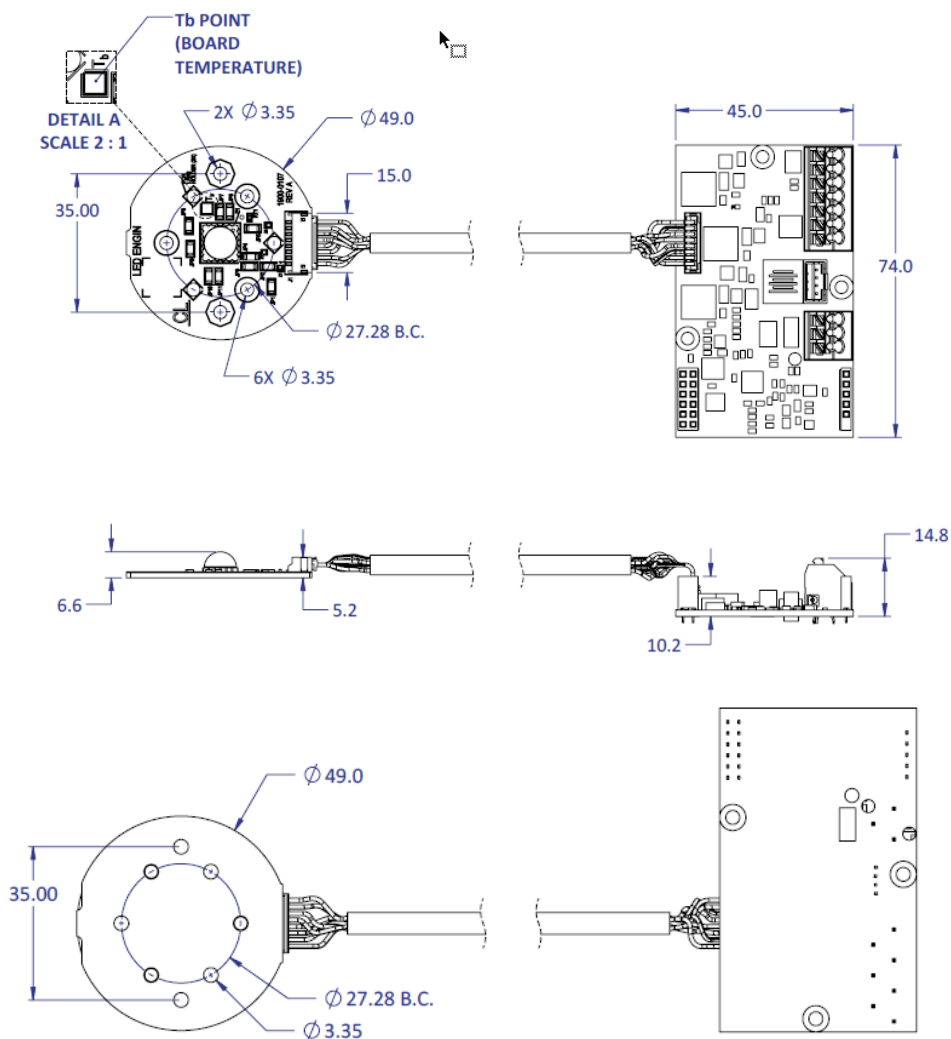


Figure 13: Mechanical dimensions of LuxiTune light engine – without secondary lens

Notes for Figure 13:

1. Unless otherwise noted, all dimensions are typical values.
2. Suggested location of optional heat spreader for 0-10V driver in dotted lines. Heat spreader should keep clearance with solder pads. Refer to thermal section.

## LuxiTune Light Engine – With Secondary Lens

### Mechanical Dimensions (mm)

The standard LuxiTune light engine is sold with supported secondary optics optimized for color mixing and efficiency. The following mechanical dimensions are provided as a guidance for luminaire design.

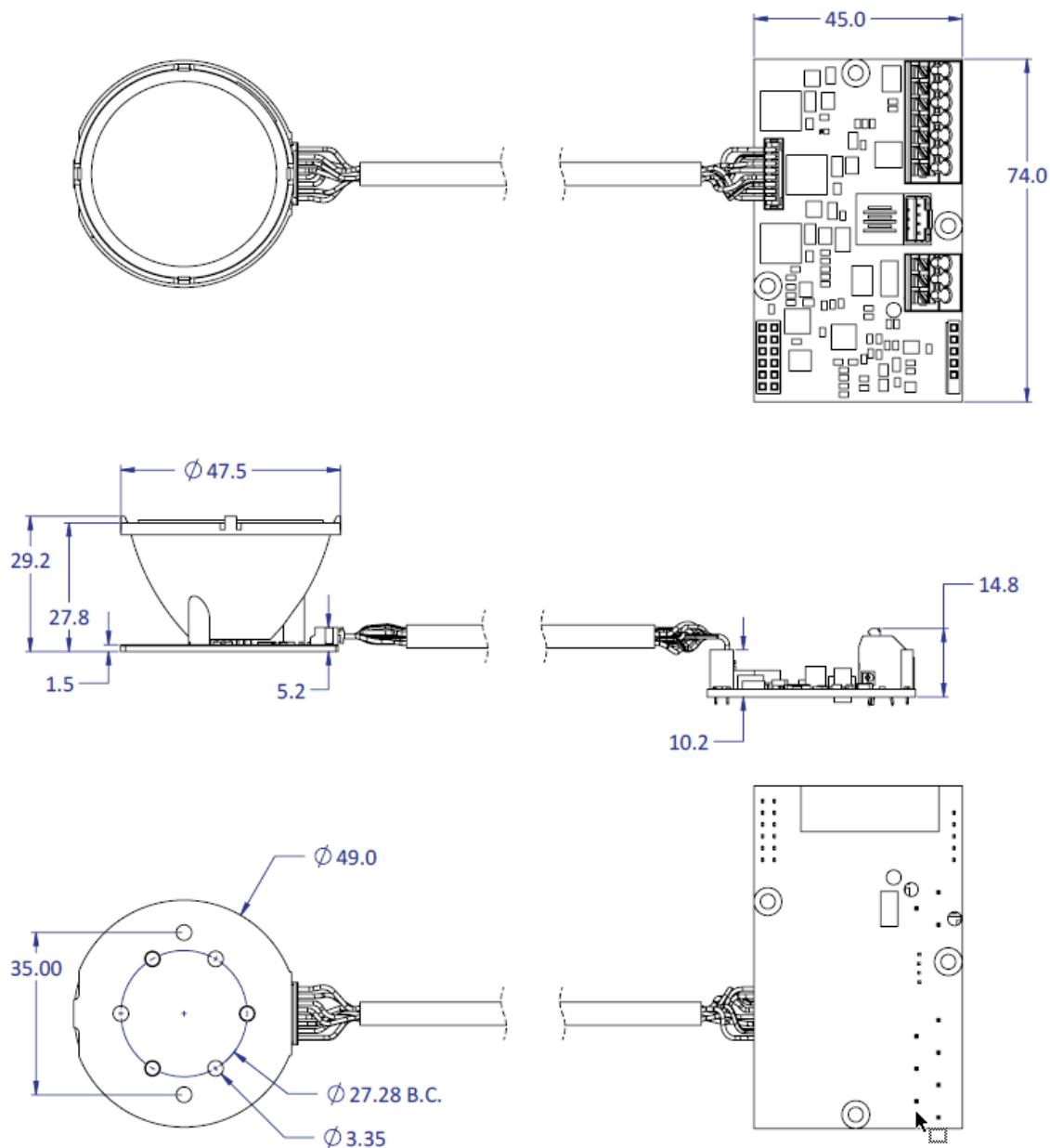


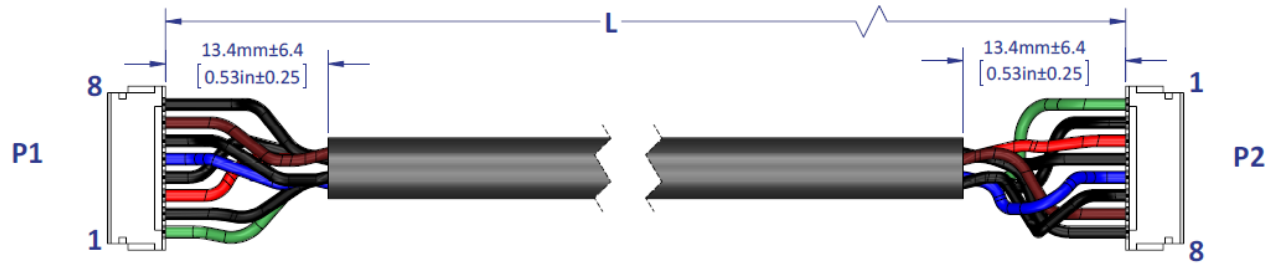
Figure 14: Mechanical dimensions of LuxiTune light engine – with secondary lens

Notes for Figure 14:

1. Unless otherwise noted, all dimensions are typical values.
2. Suggested location of optional heat spreader for 0-10V driver in dotted lines. Heat spreader should keep clearance with solder pads. Refer to thermal section.



### Cable Assembly Example (not available for order)



ITEM NO.	PartNo	DESCRIPTION	QTY.
1	JST PN: ZHR-8	Conn Housing ZH 8Pos 1.5mm White	2
2	JST PN: SZH-002T-P0.5	Conn Term Crimp ZH 26-28 Awg	16
3	Custom (N/A)	Twisted Pair Cable	1

**Note:**

- Length L can be any length up to 30in. Longer is not recommended.

Wire Code		
P1		P2
1	Green	1
2	Black	2
3	Red	3
4	Black	4
5	Blue	5
6	Black	6
7	Brown	7
8	Black	8

Figure 15: Schematic for cable connecting MCPCB and 0-10V driver board

## Lens Assembly Instructions

Lens holder legs may be inserted into MCPCB mounting holes. An epoxy or polyurethane-based adhesive should be used to adhere the lens holder to the MCPCB.

While there are many suitable adhesives, LED Engin recommends Dow Corning 3145 RTV.

Cyanoacrylate adhesives (superglue) must not be used, because they are known to cause lens contamination effects due to “blooming” of the adhesive.

## Lens Cleaning

For the removal of dust, use a lint-free soft cloth.

For the removal of stains, use a neutral detergent, i.e. dishwashing soap.

Do not use any solvents, abrasive liquids or abrasive fabrics because they may damage the optical grade lens surfaces.

## Thermal and Mechanical Design Considerations

### Heat Sink Thermal Resistance

Thermal design is critical for optimal performance of the LuxiTune engine; therefore it is important to choose an efficient heat sink. Design attributes such as heat sink size and shape, active or passive cooling options, material, surface finish etc. need to be selected such that the thermal resistance of the heat sink is optimized for the specific environment the fixture will be operating in.

The MCPCB thermal reference point referred to as  $T_b$  is marked in Figure 17 and is used to control the performance of the light engine. In the case of insufficient cooling, the light engine will be protected by the driver. The driver continuously monitors the temperature of the emitter board and will reduce the power in steps of 10% per 2°C when the temperature  $T_b$  rises above 85°C. At a  $T_b$  of 105°C the light engine will be turned off.

The temperature at  $T_b$  is correlated to the junction temperature  $T_j$  of the dies in the emitter and is also an indicator for thermal design. LED Engin recommends that the following thermal resistance values are met in the luminaire design.

Table 6

$T_{\text{ambient}}^{[1]}$ (°C)	$T_b$ (°C)	Max. $P_d^{[2]}$ (W)	$T_j$ (°C)	Required minimum heat sink $R_{\text{th}}(\text{heatsink} + \text{TIM})$ (°C/W)
25	85 <sup>[3]</sup>	14.8	103	4.1
45				2.7
55				2.0

Table 7

$T_{\text{ambient}}^{[1]}$ (°C)	$T_b$ (°C)	Max. $P_d^{[2]}$ (W)	$T_j$ (°C)	Required minimum heat sink $R_{\text{th}}(\text{heatsink} + \text{TIM})$ (°C/W)
25	65	14.8	83	2.7
45				1.4
55				0.7

Notes for Tables 6 & 7:

- $T_{\text{ambient}}$  is defined as the air temperature surrounding the heat sink. For example, if the heat sink is mounted inside an enclosed fixture, then  $T_{\text{ambient}}$  is the temperature of the air inside the fixture.
- $P_d$  is the thermal power dissipation. Max  $P_d$  is at highest CCT point
- Max  $T_b$  recommended is 85°C for LTC.

## Thermal Design Guidance

A good thermal design requires very good heat transfer from the LuxiTune MCPCB to the heat sink. In order to minimize air gaps and contact resistance between the MCPCB and the heat sink, it is common practice to use thermal interface materials (TIM) such as thermal pastes, thermal pads, phase change materials and thermal epoxies. Each material has its pros and cons depending on the design. Thermal interface materials are most efficient when the mating surfaces of the board and the heat sink are flat and smooth. Rough and uneven surfaces may have gaps with higher thermal resistances, increasing the overall thermal resistance of this interface. It is critical that the thermal resistance of the interface is low, allowing for an efficient heat transfer to the heat sink and keeping LuxiTune MCPCB temperatures low.

LED Engin recommends the use of the following thermal interface materials:

- Bergquist's Gap Pad 5000S35, 0.020in thick
  - Part Number: Gap Pad® 5000S35 0.020in/0.508mm
  - Thickness: 0.020in/0.508mm
  - Thermal conductivity: 5 W/m-K
  - Continuous use max temperature: 200°C
- 3M's Acrylic Interface Pad 5590H
  - Part number: 5590H @ 0.5mm
  - Thickness: 0.020in/0.508mm
  - Thermal conductivity: 3 W/m-K
  - Continuous use max temperature: 100°C
  - Using M3 Screw (or #4 screw), with polycarbonate or glass-filled nylon washer (#4) the recommended torque range is: 20 to 25 oz-in (1.25 to 1.56 lbf-in or 0.14 to 0.18 N-m)

The LuxiTune 0-10V driver board also has a temperature reference point  $T_0$  marked on it as shown in Figure 16. It is essential that the maximum value of  $T_0$  not exceed 85°C when the light engine is integrated into a fixture and is in regular use. As designed and tested, the 0-10V driver board for the LTC 1100lm unit does not require a heat spreader to maintain  $T_0 < 85^\circ\text{C}$  in operation. However, if the luminaire design is such that higher temperatures may result in use and the driver board is exposed to these temperatures, the heat spreader must be applied for thermal management. The suggested location of the heat spreader is shown in Figures 13 and 14, Note 2.

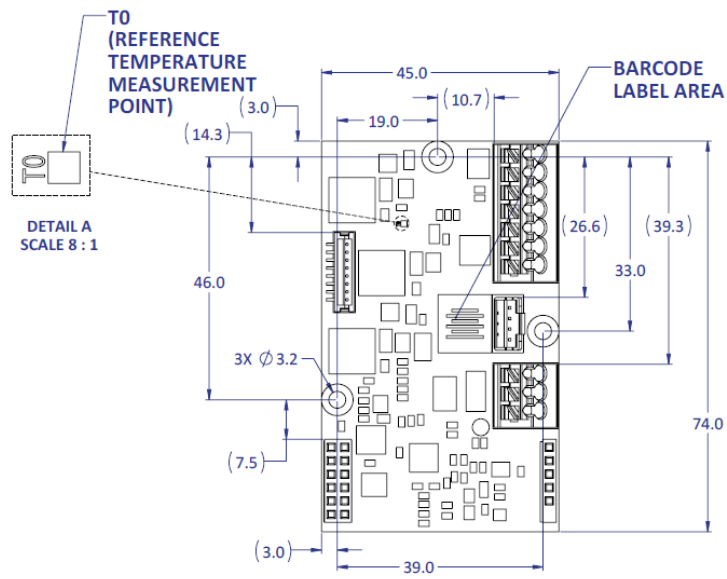


Figure 16: Temperature reference point  $T_0$  on 0-10V driver board

Note for Figure 16:

1. Unless otherwise noted, all dimensions are typical values.

## Mechanical Mounting Considerations

The mounting of LuxiTune MCPCB is a critical process step. Excessive mechanical stress in the board can cause the board to warp, which can lead to emitter substrate cracking and subsequent cracking of the LED dies. To relax some of the stress, it is advisable to use polycarbonate or glass-filled nylon washers between the screw head and the board and to follow the torque range listed above.

LED Engin recommends the following steps to avoid mechanically over-stressing the MCPCB:

- Inspect MCPCB and heat sink for flatness and smoothness.
- Select appropriate torque for mounting screws. Screw torque depends on the mounting method (thermal interface materials, screws, and washer). Follow the torque range listed above.
- Always use three M3 or #4-40 screws with #4 plastic washers.
- When fastening the three screws, it is recommended to tighten the screws in multiple small steps.
- Always use plastic washers in combinations with the three screws. This helps maintain, roughly, constant pressure on the board as the assembly heats up.
- In designs with non-tapped holes using self-tapping screws, it is common practice to follow a method of three turns tapping a hole clockwise, followed by half a turn anti-clockwise, until the appropriate torque is reached.
- Using M3 Screw (or #4 screw), with polycarbonate or glass-filled nylon washer (#4) the recommended torque range is: 20 to 25 oz-in (1.25 to 1.56 lbf-in or 0.14 to 0.18 N-m).

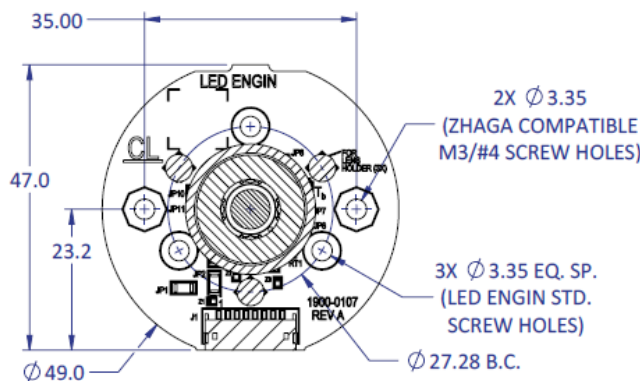


Figure 17: Mounting screw holes in LuxiTune MCPCB

Note for Figure 17:

1. Unless otherwise noted, the tolerance = +/- 0.2mm.

## Thermal Feedback and Protection

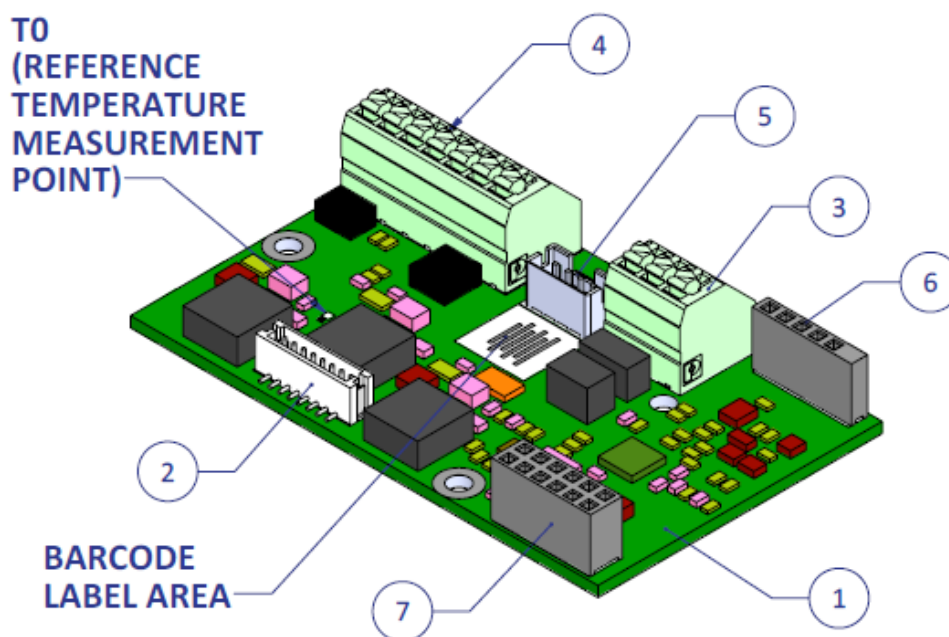
The LuxiTune light engine has a closed loop thermal feedback mechanism which controls luminous flux such that it is constant over the entire operating temperature range of 15°C - 85°C ( $T_b = +15 \dots +85^\circ\text{C}$ ).

When the MCPCB temperature exceeds 85°C ( $T_b > 85^\circ\text{C}$ ), the LuxiTune emitter goes into thermal protection mode. The light intensity is reduced in steps of 10% per 2°C until the emitter turns “off” when it reaches 105°C ( $T_b = 105^\circ\text{C}$ ). When the temperature drops again and reaches 65°C ( $T_b < 65^\circ\text{C}$ ), the light intensity is fully restored.

## Electrical Interfaces

### Connectors

- J8 - 7-pin connector is used for supply power, 0-10V dimming signals and automatic range dimmer option (see page 14 for detailed instructions).
- J7 - 3-pin connector is used for add-on card I/O interface (DMX/DALI/ZigBee).
- J11 – Reserved for driver commission.
- J10 - Emitter interface connector.
- J6 & J9 – Add-on card interface (DMX/DALI/ZigBee).
- The terminal wires should have cross section 0.5-1.5 mm<sup>2</sup> corresponding to 16-24 AWG.



ITEM NO.	PartNo	DESCRIPTION	QTY.
1	1910-00030	LTP/LTC LuxiTune Driver PCB Board	1
2	JST PN: B8B-ZR-SM4-TF	(@ J10): CONN HEADER ZH TOP 8POS 1.5MM	1
3	Phoenix Contact PN: 1985205	(@ J7): TERM BLOCK PCB 3POS 3.5MM GREEN	1
4	Phoenix Contact PN: 1985247	(@ J8): TERM BLOCK PCB 7POS 3.5MM GREEN	1
5	TE Connectivity PN: 1735446-4	(@ J11): CONN HEADER 4PS 2MM VERT W/LATCH	1
6	SULLINS PN: PPTC061LFBN-M562RC	(@ J6): CONN HEADER FEM 6POS .1" SGL TIN, NO PIN HOLE IN POS 1	1
7	SULLINS PN: PPTC062LFBN-RC	(@ J9): CONN HEADER FMAL 12PS .1" DL TIN	1

Figure 18: Schematic of 0-10V driver board



## 24VDC Power Supply Requirements

This LuxiTune product requires an AC-to DC power supply that meets the following requirements. The input to the LuxiTune driver from the AC-DC power supply is constant voltage, but the output from the integrated driver to the LuxiTune light source is constant current.

Class 2 / SELV power supply, max current 1.5A

Minimum Output Voltage: 21V

Maximum Output Voltage: 27V

Minimum Output Power: 24W

## 24VDC Power Supply Wiring

Connect 24VDC power supply Vout+ to LuxiTune connector J8, pin 2 (Vin+).

Connect 24VDC power supply Vout- to LuxiTune connector J8, pin 1 (GND)

LuxiTune must not be connected in reverse polarity, because reverse operation can cause permanent damage to the drive circuitry.

See Figure 19 for actual wiring instructions and tables below for pin description.

Table 8

J8 (Driver board layout item 4)

Pin	Name	Description
1	GND	Common ground
2	Vcc	21-27V, supply power
3	GND	Common ground
4	DIM	Dimming 0-10V input.
5	CCT	CCT tuning 0-10V input.
6	GND	Common ground
7	P1	Programmable pin for control of the auto-range dimming (ARD)

Table 9

J7 (Driver board layout item 3)

Pin	Name	Description
1	GND	Common ground
2	P2	Configurable pin, D- for DMX or DA for DALI
3	P3	Configurable pin, D+ for DMX or DA for DALI

Table 10

J11 (Driver board layout item 5)

Pin	Name	Description
1	Rx	Serial receive
2	Tx	Serial transmit
3	+5V	Supply voltage output
4	GND	Common ground

Table 11

J10 (Driver board layout item 2)

Pin	Name	Description
1	GA	LED Ch1 anode (+)
2	GK	LED Ch1 cathode (-)
3	RA	LED Ch2 anode (+)
4	RK	LED Ch2 cathode (-)
5	WA	LED Ch3 anode (+)
6	WK	LED Ch3 cathode (-)
7	NTC	NTC thermistor connection
8	GND	NTC thermistor return

### Recommended Power Supplies

Table 12

Input Voltage	Manufacturer	Part Number	Maximum Output Power
90-305VAC	Efore	RSLP035-24	36W
90-264VAC	Mean Well	DR-30-24	30W
90-264VAC	Mean Well	MDR-40-24	40W
90-264VAC	Mean Well	PLC-45-24	45W
90-264VAC	Mean Well	DR-45-24	45W
100-240VAC	MagTech	GFP451DA-2419EW	45W
220-240VAC	Osram	ELEMENT 30/220-240/24 G2 <sup>1)</sup>	30W

Note for Table 12:

1. Only for applications in Europe.

---

## 0(1)-10V Wiring Diagram

Refer to J8 table in earlier section for pin description.

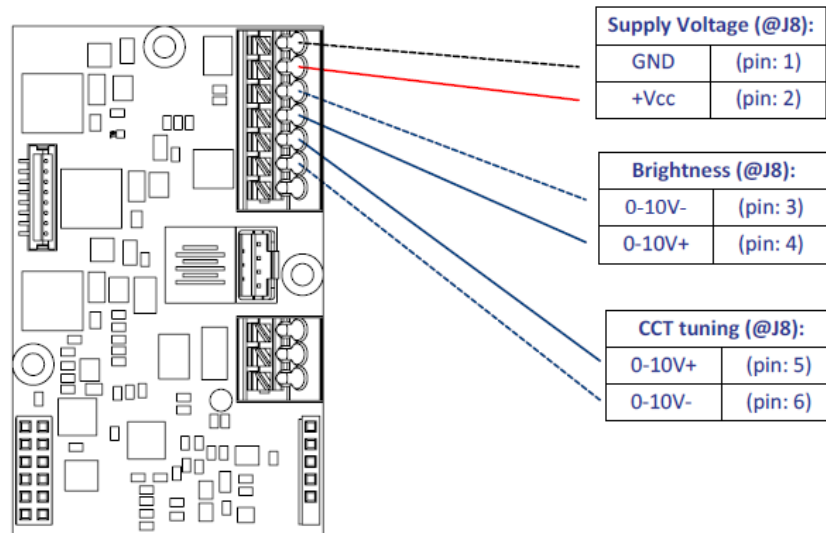


Figure 19: Wiring diagram for 0-10V dimming and CCT control

## Dimming and Tuning Control Functions

LuxiTune works with the following control inputs:

- 0-10V
- DMX 512-A
- DMX-RDM
- DALI
- BLE

## Insulation of Control Circuits

Table 13

Control Protocol	Insulation between control circuit and Class 2/SELV circuit on the LuxiTune driver board and daughter cards	Details	Requirements for controller between mains supply of the controller and the control circuit
0-10V	None	Same ground for Class 2/SELV circuit and 0-10V interface	Double or reinforced insulation
DALI	Supplementary insulation	Designed for mains voltage up to 300 Vrms	At least basic insulation
DMX-RDM DMX 512-A	Supplementary insulation	Designed for mains voltage up to 300 Vrms	Double or reinforced insulation

## 0-10V Control Functions

LuxiTune implementation of the 0-10V interface in non-isolated. The following are supported:

- All 0-10V dimmers with either current sink (IEC60929) or current source configuration.
- All 1-10V dimmers with either current sink (IEC60929) or current source configuration.
- All 0-100K Ohm variable resistors.

### Default Control Range:

There are 2 inputs for 0-10V, one for Dim and one for CCT. See wiring diagram in Figure 19 for connecting to the driver board. As connected, the unit will self-detect whether it needs 1 handle (in WD mode, uses 1 x 0-10V for Dim) or 2 handles (in TW mode, uses 2 x 0-10V for Dim & CCT).

The units are programmed as *Dim to off* in the factory. The default input control range is 2V for <0.5%, 8V for 100% and <2V for 0% (See figures 6 and 8). *Dim to min*, where the control range is 2V for <0.5%, 8V for 100% and <0.7V for 0% is possible but not the default.

LuxiTune uses the 0-10V input for CCT to select between warm-dim and CCT tune modes. If the CCT input is >11.5V, the unit switches to warm-dim mode (3000K at 100%). The built-in hysteresis requires <10.5V to switch back to CCT tune mode.

### Compatible Dimmers & Controls

LuxiTune has been tested internally with these products and found to be compatible.

## Common 0(1)-10V Dimmers

Table 14

Supplier	Model	Log/Linear	Voltage Range
Lutron	Diva, DFTV (logarithmic)	Log	0-10V
Lutron	Nova-T, NTFTV	Log	0-10V
Lutron	Diva, NFTV	Log	0-10V
Lutron	Grafik Eye -GRX-TVI with GRX3503	Log	0-10V
Lutron	Energi Savr Node - QSN-4T16-S	Log	0-10V
Lutron	TVM2 Module	Log	0-10V
Leviton	IP710-DLX	Linear	0-10V
Lightolier	V2000FAMU	Linear	0-10V
Lightolier	ZP600FAM120	Linear	0-10V
Lightolier	MP1500FAM120	Linear	0-10V
Jung	240-10	Linear	1-10V
Gira	0308 00	Linear	1-10V
Merten	5729	Linear	1-10V
Busch-Jaeger	2112U-101	Linear	1-10V
Hunt	PS-(LED)-010	Linear	0-10V
Pass & Seymour	CD4FB-W	Linear	0-10V
Watt Stopper	DCLV1	Linear	0-10V

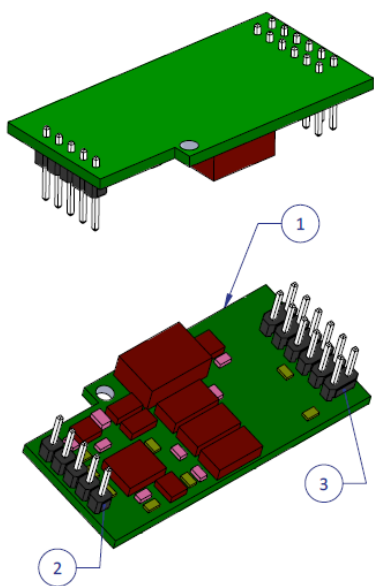
## Notes for Table 14:

1. This table only lists a small subset of available dimmer. LuxiTune works with any 0-10V dimmer.
2. Depending on the type of dimmer selected, make sure that its installation meets local electrical wiring standards. Observe electrical isolation requirements with dimmers that connect to 220VAC/110VAC mains.

## DMX 512-A Control Functions

LuxiTune works with the following DMX 512-A control input: DMX 512-A standardized digital lighting control protocol

The DMX-RDM card is used with the LuxiTune 0-10V driver board for DMX-512A control. See Figures 20 and 21 for information on connecting the RDM card to the 0-10V driver board, and Figure 22 for actual wiring. See DMX Controls sections for DMX-512A functionality



ITEM NO.	PartNo	Description	QTY.
1	1910-00034	RDM PCB Board	1
2	SULLINS PN: PRPC005SAAN-RC	CONN HEADER .100" SNGL STR 5POS	1
3	SULLINS PN: PRPC006DAAN-RC	CONN HEADER .100" DUAL STR 12POS	1

Figure 20: DMX-RDM daughter card for DMX 512-A

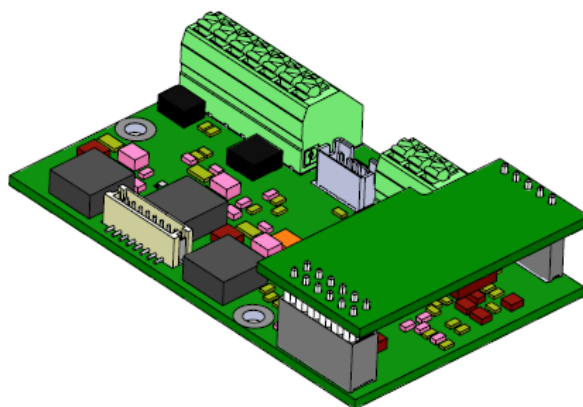


Figure 21: DMX-RDM card plugged in to 0-10V driver board for DMX-512A control

### **DMX Control Options:**

- Warm dim mode: In this mode, LuxiTune warms as it dims. It uses only one DMX-channel.
- CCT tuning mode: In this mode, LuxiTune CCT tunes on the black body curve. It uses two DMX-channels, one for Brightness control and one for CCT tuning.

### **Smoothing Options:**

The smoothing option can provide a smoother response if there are large steps in the control signal. This could be the case with DMX systems that only offer 100 steps instead of the standard 256 steps. This option can be set with DMX address 06 and default value 30.



---

**Commissioning via DMX Controls:**

For customized settings of LuxiTune engine, a setup mode allows DMX controls to be used to put LuxiTune into specific modes.

The following sequence puts LuxiTune in setup mode:

1. Connect the 0-10V CCT (pin5 of J8) to the GND (pin 3 or 6 of J8).
2. Disconnect Pin 4 (0-10V Brightness) from dimmer. Pin 4 should not be connected to anything (“open pin”).
3. After 1 second the LuxiTune DMX input is ready to receive DMX data. (pin 3 (D+) and pin 2 (D-) of J2)

In setup mode, DMX addresses have the following functions:

<u>Address</u>	<u>Function</u>
01	Base address low; Sets the DMX base address of a LuxiTune module.
02	Base address high; 0 = 1-255, 1 = 256-511
03	Code; Use <199>; Enables LuxiTune module to accept setup data
04	Code; Use <91>; Enables LuxiTune module to accept setup data
05	Mode; Select a mode of operation. (see control options table for current modes of operation)
06	Settings; Select value associated with a specific mode of operation. (see control options table for current values)

**Example:**

Program the following settings into LuxiTune module:

- a) DMX base address to <15>
- b) CCT tuning mode, 6500K to 1800K with smoothing.

Enter the following data:

DMX 001	<15>	Address for the module (15 for brightness control and 16 for CCT tuning)
DMX 002	<0>	MSB, DMX 001 @0=1-255, @1=256-511
DMX 003	<199>	Code
DMX 004	<91>	Code
DMX 005	<16>	CCT tuning mode, 6500K to 1800K
DMX 006	<30>	Smoothing on at 30 (default value)

**DMX 512-A Control Options:**

Table 15

DMX 001	DMX 002	DMX 003	DMX 004	DMX 005	DMX 006	Function
(LSB)*	(MSB)	(Code)	(Code)	(Mode)	(Setting 1)	(DMX channel function in operation)
001-511	001-001	199	091	008		<b>Halogen dimming mode (6500K - 1800K)</b>
					000-255	DMX Smoothing (0=off, 1-255=on, 30 = default)
						<b>Ch1</b> = Brightness with CCT change (0-255)
001-511	001-001	199	091	009		<b>Halogen dimming mode (3000K -1800K)</b>
					000-255	DMX Smoothing (0=off, 1-255=on, 30 = default)
						<b>Ch1</b> = Brightness with CCT change (0-255)
<b>001-511</b>	001-001	199	091	<b>016</b>	<b>(default)</b>	<b>CCT tuning mode (6500K - 1800K)</b>
					000-255	DMX Smoothing (0=off, 1-255=on, 30 = default)
						<b>Ch1</b> = Brightness (0-255)
						<b>Ch2</b> = CCT setting (0-255)
001-511	001-001	199	091	017		<b>CCT tuning mode (3000K -1800K)</b>
					000-255	DMX Smoothing (0=off, 1-255=on, 30 = default)
						<b>Ch1</b> = Brightness (0-255)
						<b>Ch2</b> = CCT setting (0-255)
001-511	001-001	199	091	024		<b>reversed CCT tuning mode (6500K - 1800K)</b>
					000-255	DMX Smoothing (0=off, 1-255=on, 30 = default)
						<b>Ch1</b> = CCT setting (0-255)
						<b>Ch2</b> = Brightness (0-255)
001-511	001-001	199	091	025		<b>reversed CCT tuning mode (3000K -1800K)</b>
					000-255	DMX Smoothing (0=off, 1-255=on, 30 = default)
						<b>Ch1</b> = CCT setting (0-255)
						<b>Ch2</b> = Brightness (0-255)
001-511	001-001	199	091	032		<b>WW/CW tuning mode (6500K - 1800K)</b>
					000-255	DMX Smoothing (0=off, 1-255=on, 30 = default)
						<b>Ch1</b> = Warm White (0-255)
						<b>Ch2</b> = Cool White (0-255)
001-511	001-001	199	091	033		<b>WW/CW tuning mode(3000K -1800K)</b>
					000-255	DMX Smoothing (0=off, 1-255=on, 30 = default)
						<b>Ch1</b> = Warm White (0-255)
						<b>Ch2</b> = Cool White (0-255)
001-511	001-001	199	091	040		<b>CW/WW tuning mode (6500K - 1800K)</b>
					000-255	DMX Smoothing (0=off, 1-255=on, 30 = default)
						<b>Ch1</b> = Cool White (0-255)
						<b>Ch2</b> = Warm White (0-255)
001-511	001-001	199	091	041		<b>WW/CW tuning mode (3000K -1800K)</b>
					000-255	DMX Smoothing (0=off, 1-255=on, 30 = default)
						<b>Ch1</b> = Cool White (0-255)
						<b>Ch2</b> = Warm White (0-255)

\* When DMX002 = 0, DMX001 = 1-255. If DMX002 = 1, DMX001 = 256-511. Basically 255+ value of DMX002 is the DMX address

**Common DMX 512-A Controllers**

Table 16

Supplier	Model
Nicolaudie	STICK
Enttec	DMX USB PRO, OPEN DMX
Lutron	LUT-DMX, QSE-CI-DMX, GRX-CI-PRG
E-cue	Glass Touch Series
Acuity	Fresco
Pathway Connect	Pathport Uno 6154
Philips	Color Kinetics ColorDial, Lightolier Lytemode DMX
ETC	Mosaic
Leviton	Remembrance
Cooper	SCD96-NA, DMX Output Interface
Rako	RADMX

Notes for Table 16:

1. The DMX control unit has to adhere closely to the USITT DMX512-A specification. Incorrect timing of the controller can cause unexpected response.
2. Not all DMX controller user interfaces come with 2 separate handles set up for CCT and intensity, but most can be programmed to support CCT tuning and warm dimming.

**DMX-RDM Card Wiring Diagram for DMX 512-A**

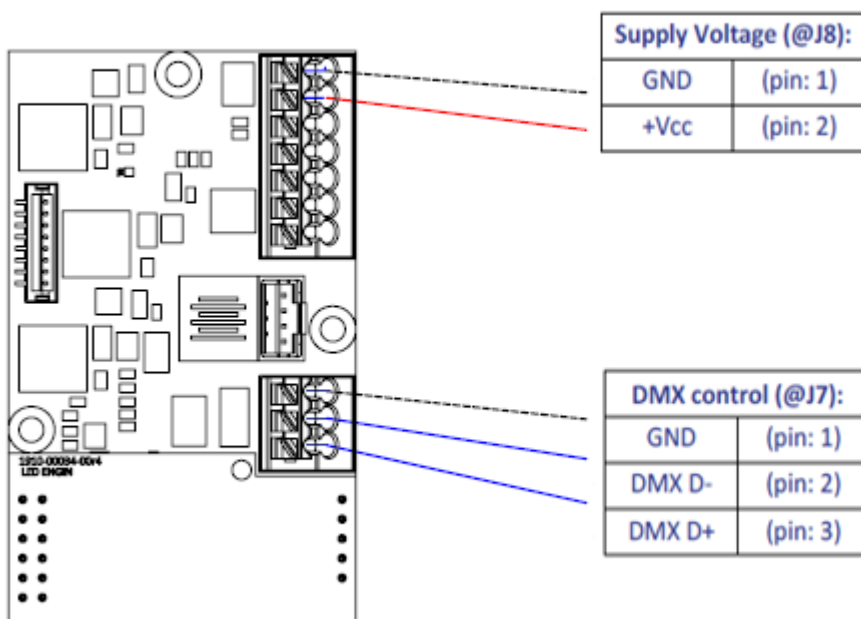
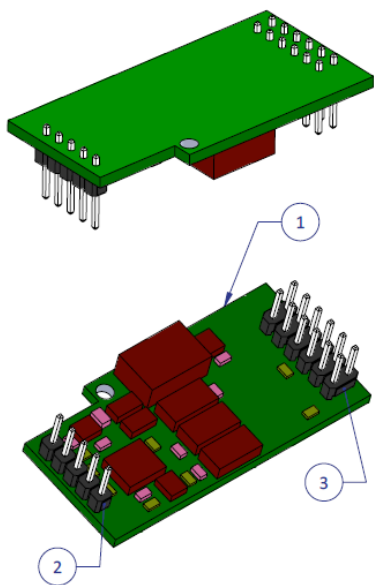


Figure 22: Wiring diagram with RDM card for DMX 512-A control

## DMX-RDM Control Functions

DMX-RDM supported is ANSI E1.20 - 2010 RDM, Remote Device Management Over USITT DMX512 Networks with end of line termination as in spec. DMX-RDM option requires a daughter card that plugs into the 0-10V driver board. DMX-RDM is isolated to 2.5KV. The control functions for DMX-RDM are the same as those of DMX-512A in the sections above. The wiring diagram for the DMX-RDM daughter card is also the same as in Figure 22 for the DMX-512A card, except that the DMX-RDM is isolated and the comment preceding Figure 22 on isolation does not apply.



ITEM NO.	PartNo	Description	QTY.
1	1910-00034	RDM PCB Board	1
2	SULLINS PN: PRPC005SAAN-RC	CONN HEADER .100" SNGL STR 5POS	1
3	SULLINS PN: PRPC006DAAN-RC	CONN HEADER .100" DUAL STR 12POS	1

Figure 23: DMX-RDM daughter card

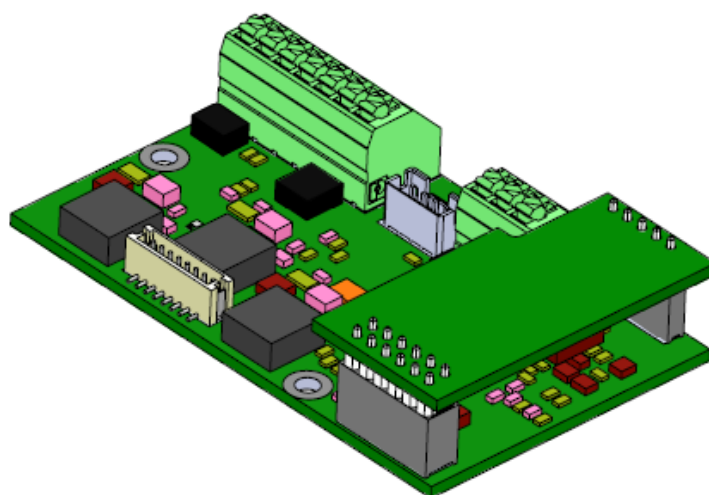


Figure 24: DMX-RDM card connected to 0-10V driver board

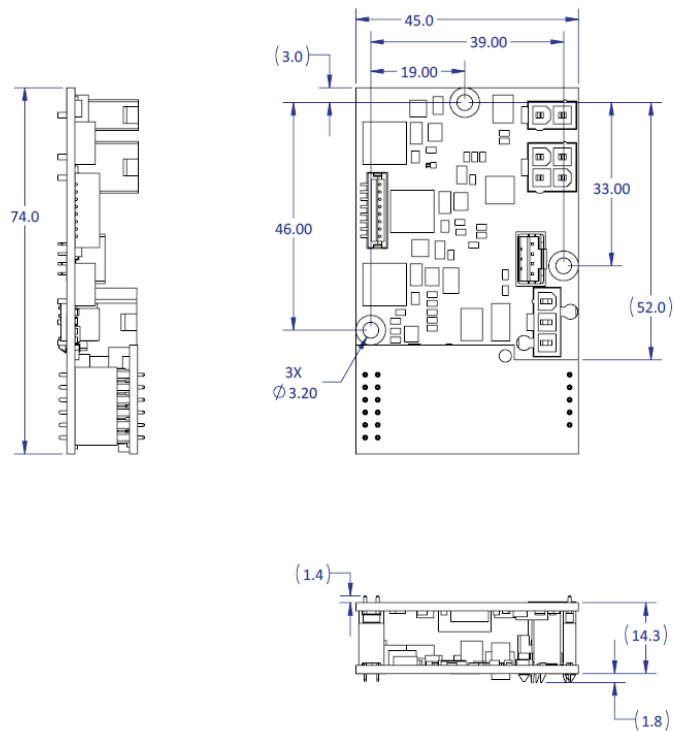


Figure 25: Dimensions of 0-10V driver board with optional DMX-RDM card

Notes for Figure 25:

1. All dimensions in mm.
2. Unless otherwise noted, all dimensions are typical values.

Table 17

Standard PID definition	Req	Get	Set	LED Engin PID Implementation
Disc_Unique_Branch	yes	yes		
Disc_Mute	yes	yes		
Disc_Un_Mute	yes	yes		
Supported_Parameters	yes	yes		
Parameter_Description	yes	yes		
Device_Info	yes	yes		
Software_Version_Label	yes	yes		
DMX_Start_Address	yes	yes	yes	
Identify_Device	yes	yes	yes	
Device_Model_Description		yes		X3Ev3 __ v.__ yyyy-mm-dd
Manufacturer_Label		yes		LEDEngin Inc
Device_Label		yes	yes	LuxiTune
DMX_Personality		yes	yes	See table below for Personalities
DMX_Personality_Description		yes		See table below for Personalities

The following UID range is assigned to all LED Engin products, including LuxiTune. 075f:00000000 – 075f:xxxxxxx.

The following PIDs are supported by the DMX-RDM control interface for LuxiTune.

Multiple DMX Personalities are supported in the LED Engin standard DMX-RDM implementations. See table below for the complete list. The first 4 modes support Warm Dimming only. LuxiTune will default to the following.

Personality: Tunable White 6500K SQ. SQ refers to a square law for intensity control as it dims from 100-0%. The endpoints for intensity square law profile are same as the linear profile. CCT control is always linear.

Table 18

Item	Personality	# of slots	Slot 1 Handle	Slot 2 Handle	Description
1	Warm Dimming 6500K SQ	1	Brightness	n.a.	Warm dim 1800K-6500K, square law response
2	Warm Dimming 3000K SQ	1	Brightness	n.a.	Warm dim 1800K-3000K, square law response
3	Warm Dimming 6500K	1	Brightness	n.a.	Warm dim 1800K-6500K, linear response
4	Warm Dimming 3000K	1	Brightness	n.a.	Warm dim 1800K-3000K, linear response
5	Tunable White 6500K SQ	2	CCT	Brightness	CCT tuning 1800K-6500K, square law response
6	Tunable White 3000K SQ	2	CCT	Brightness	CCT tuning 1800K-3000K, square law response
7	Tunable White 6500K	2	CCT	Brightness	CCT tuning 1800K-6500K, linear response
8	Tunable White 3000K	2	CCT	Brightness	CCT tuning 1800K-3000K, linear response
9	Tunable White R 6500K SQ	2	Brightness	CCT	CCT tuning 1800K-6500K, square law response, handles reversed
10	Tunable White R 3000K SQ	2	Brightness	CCT	CCT tuning 1800K-3000K, square law response, handles reversed
11	Tunable White R 6500K	2	Brightness	CCT	CCT tuning 1800K-6500K, linear response, handles reversed

## DATASHEET

12	Tunable White R 3000K	2	Brightness	CCT	CCT tuning 1800K-3000K, linear response, handles reversed
13	Warm Cool Group 6500K SQ	2	Brightness for warm white	Brightness for cool white	CCT tuning 1800K-6500K, square law response
14	Warm Cool Group 3000K SQ	2	Brightness for warm white	Brightness for cool white	CCT tuning 1800K-3000K, square law response
15	Warm Cool Group 6500K	2	Brightness for warm white	Brightness for cool white	CCT tuning 1800K-6500K, linear response
16	Warm Cool Group 3000K	2	Brightness for warm white	Brightness for cool white	CCT tuning 1800K-3000K, linear response
17	Cool Warm Group 6500K SQ	2	Brightness for cool white	Brightness for warm white	CCT tuning 1800K-6500K, square law response, handles reversed
18	Cool Warm Group 3000K SQ	2	Brightness for cool white	Brightness for warm white	CCT tuning 1800K-3000K, square law response, handles reversed
19	Cool Warm Group 6500K	2	Brightness for cool white	Brightness for warm white	CCT tuning 1800K-6500K, linear response, handles reversed
20	Cool Warm Group 3000K	2	Brightness for cool white	Brightness for warm white	CCT tuning 1800K-3000K, linear response, handles reversed

## Common DMX RDM Controllers

Table 19

Supplier	Model
Open Lighting Project	RDM test suite
Acuity	Fresco
Pathway Connect	Pathport
DMXister	DMXister test suite
NXP	NXP RDM SDK

Note for Table 19:

1. Not all DMX RDM controller user interfaces come with 2 separate handles set up for CCT and intensity, but most can be programmed to support CCT tuning and warm dimming.

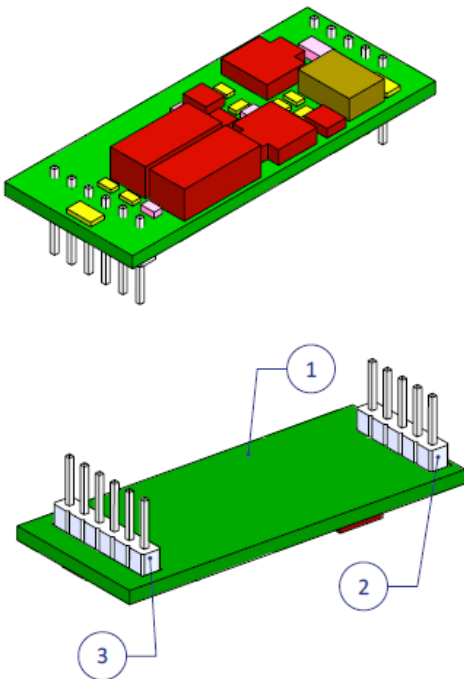
## DALI Control Functions

The LuxiTune unit can be operating in two different modes:

- Halogen-style warm dimming mode, DALI device type 6 (DT6) compatible (Control gear 102).
- CCT tuning mode, DALI device type 8 (DT8) compatible (Control gear: 209 Color control).

To add DALI functionality to the motherboard first remove the power from the driver board and then place the DALI extension board on connector J6 & 9 (dual Header). See Figure 26. This will connect the DALI control input to pin 2 (DA) and pin 3 (DA) of connector J7 on the motherboard. See Figure 27 for view and Figure 28 for wiring.

By default the unit will start up in warm dimming mode with base address 0, but when it receives a DT8 command (dim warm/cool) it will switch to the CCT tuning mode. It cannot switch automatically back. Only a special DALI command (SetTcPHY\_colest=0) will set it back to the warm dimming mode. This should not be done dynamically as there are only a limited amount of resets possible (10,000).



ITEM NO.	PartNo	DESCRIPTION	QTY.
1	1910-00032	DALI/DMX Board	1
2	SULLINS PN: PRPC005SAAN-RC	CONN HEADER .100" SNGL STR 5POS	1
3	SULLINS PN: PRPC006SAAN-RC	CONN HEADER .100" SNGL STR 6POS	1

Figure 26: DALI daughter card



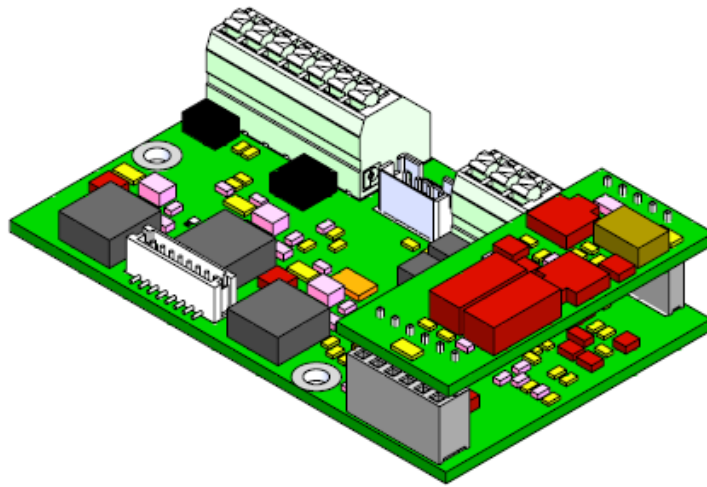


Figure 27: DALI card plugged in to 0-10V driver board

**DALI Wiring Diagram**

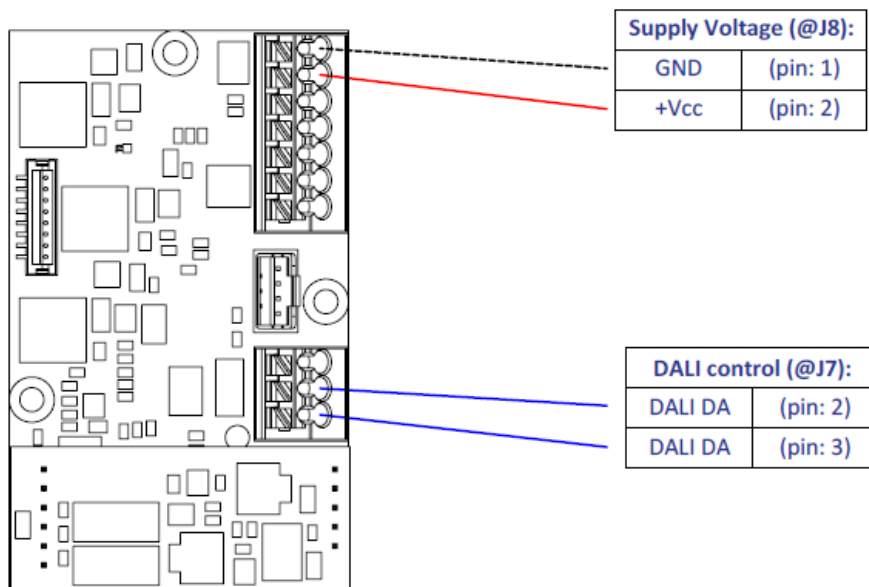


Figure 28: Wiring diagram for DALI control

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**Common DALI Controllers**

Table 20

Supplier	Model (for CCT tune, DT8 compatible)
Lunatone	DALI Cross Switch
Hadler	DALI uP
Tridonic	DALI TouchPanel 02
LumiTech	HMI DALI Touchpanel DT8
Zumtobel	LiteCom
Osram	DALI PRO CONT-4 RTC
	Model (for dim to warm, standard DT6 compatible)
Leviton	Dali Controller On/Off, pn.CD250-C

Note for Table 20:

1. Not all DALI controllers are available in the US, most are sold in Europe only.

## BLE Mesh & Casambi App Control Functions

LuxiTune Gen 3 light engine can be controlled wirelessly using a Bluetooth (BLE) daughter card, in conjunction with the Casambi App for iOS and Android devices. The Casambi Bluetooth App can be downloaded from the Apple store or Google Play store for iOS and Android devices. In case of Android devices, we recommend using the higher end devices, since the BLE hardware in some low-end Android devices are not as effective at signal detection over a large physical area, where the light fixtures might be located.

<https://casambi.com/downloads.html>

The BLE card is FCC, CE and UKCA conform as indicated on the label on the card.

LuxiTune uses two different color profiles that the Casambi interface recognizes (not to be confused with 2 handles for CCT and intensity). The CCT range from 1800K to 3000K, which is for warm dimming applications, is one of the profiles. The second profile is from 1800K to 6500K used for tunable white or CCT tuning applications. The LuxiTune unit can be set up for either color profile since Casambi can support one color profile at a time. The information below explains the setup for operating LuxiTune Gen 3 with the BLE card and shows how to switch between supported color profiles.

BLE Daughter Card

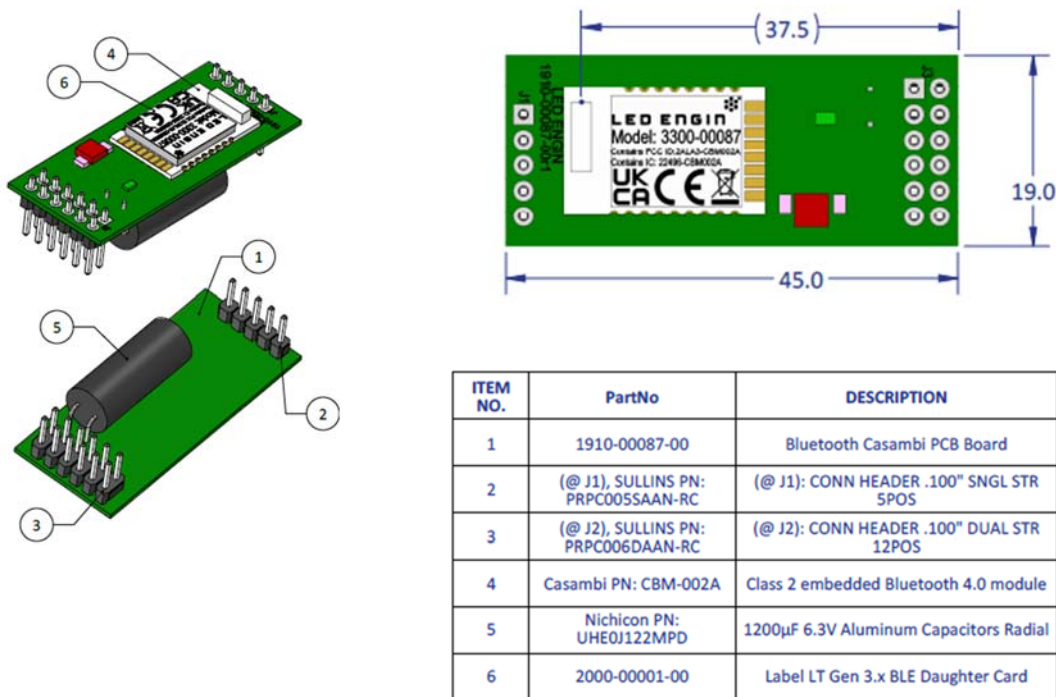


Figure 29: BLE daughter card

In order for LuxiTune to function with the Casambi wireless App, a Bluetooth (BLE) daughter card, shown in Figure 29, must be connected to the 0-10V driver board. Align the double and single row of pins on the BLE module (shown in Figure 29) with the double row header (J9) and single row header (J6) on the LuxiTune driver board (shown in Figure 18). Plug the BLE card so that the pins are pushed into the headers as shown in Figure 30 below.

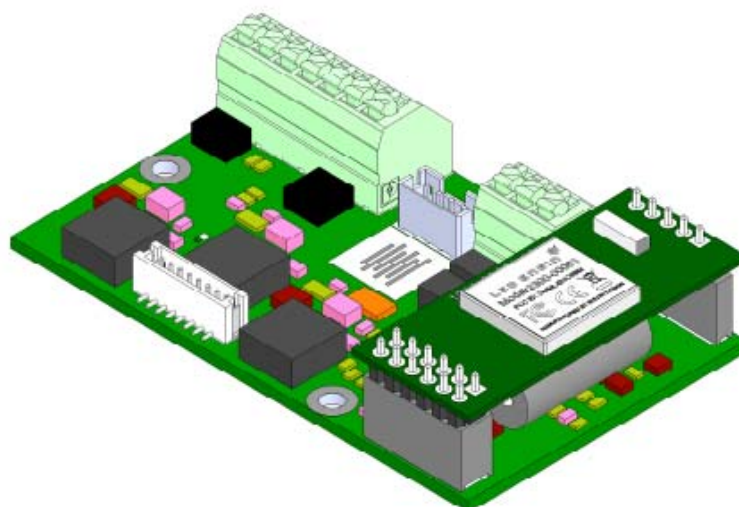


Figure 30: BLE card plugged in to 0-10V driver board

## Switching Color Profiles

The color profile for the luminaire using the LuxiTune BLE card will have to be pre-set by the luminaire manufacturer at the factory. The end user of the luminaire is not expected to be able to switch between profiles in the typical use scenario. The color profiles can be switched by using a jumper. By default, there should be no jumper on the LuxiTune driver board and it should look like it does in Figure 17. Position 5 should be open on header J8. This sets LuxiTune to the default color profile of 1800K to 3000K, for warm dimming.

To switch into the color profile for the tunable white range 1800K to 6500K, a jumper is required between the pins on header J8 as shown in Figure 31.

Removing the jumper, forces the color profile back to the default 1800K to 3000K range.

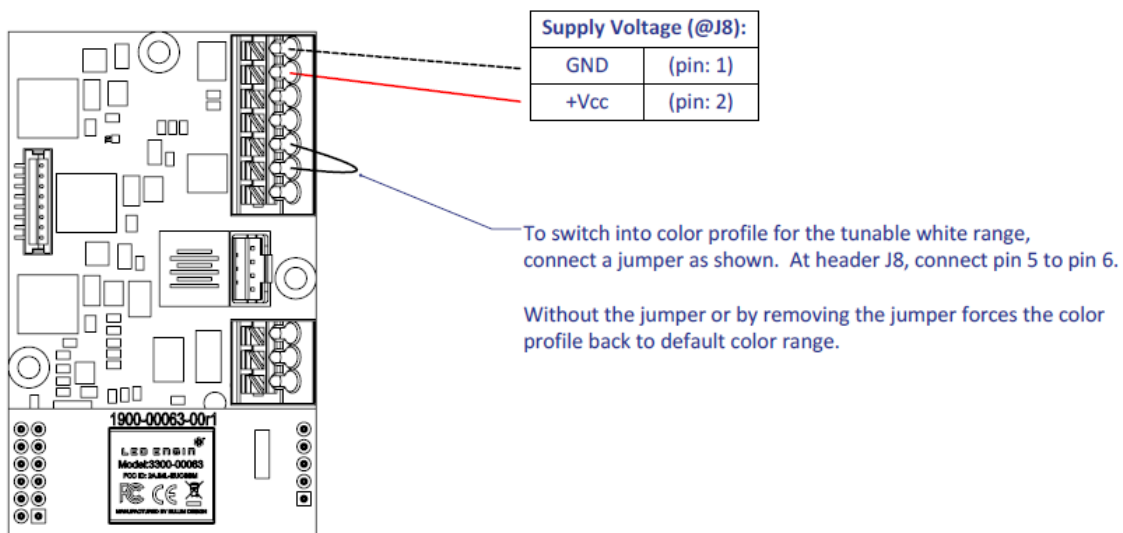


Figure 31: Wiring diagram for switching color profiles

## Packaging & Traceability

- Traceability is enabled by a QR code for tracking matching parts. The unique code consists of the following characters, which can be either letters or numbers. See example below in Figure 32.

T008-xxxxxxx	13 character QR code is an unique identifier for matched 0-10V driver board
E008-xxxxxxx	13 character QR code is an unique identifier for matched emitter board
T008/E008	first 4 characters on 0-10V driver board & emitter MCPCB indicate 1800K-6500K tunable range
xxxxxxx	last 8 characters indicate unique product serial number (serial # 12 in -00000012)

- The QR code on the matching driver and emitter boards is printed in text and barcode format on labels.
  - Type: QR code 13 char, 16x16 dots, 4x4mm
  - Primary label dimensions: 0.375"x0.375"
  - Label type: high temperature resistant (polyimide based)
  - Location and position of primary label: on the driver board (T008) and on the MCPCB (E008)

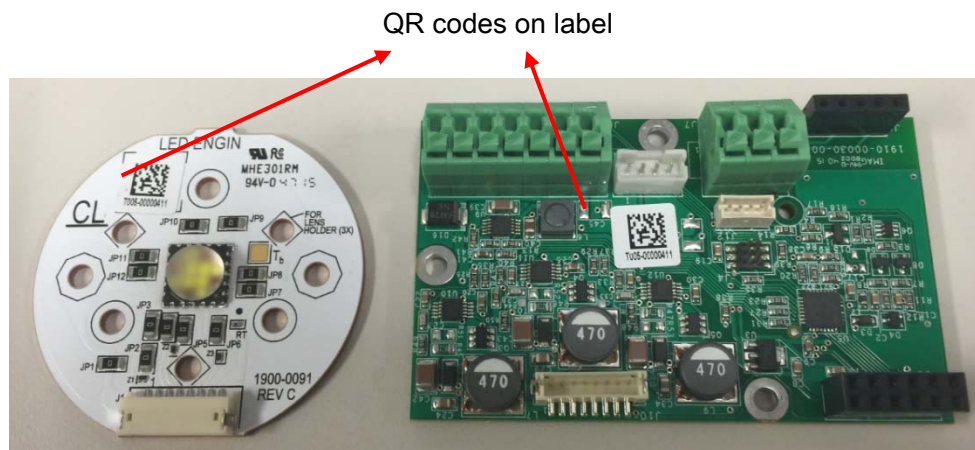


Figure 32: LuxiTune QR codes on matched pair

- Packaging for the LuxiTune matched pair units is as follows:
  - Plastic Tray & Lid 165x76x25.4mm holds a single driver board/emitter board matched pair
  - 8 sets of Tray or 8 pairs are packed in an ESD Bag 235x510mm
  - 2 ESD Bags or 16 sets of Tray are packed in one Pizza Box 365x324x57mm. 1 x BPL Label per Pizza Box
  - Outer Box / Shipping Carton 395x350x445mm can fit up to 7 pizza boxes depending on number of sets ordered. 1 x BPL Label per Outer Box

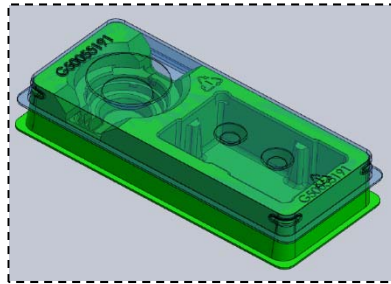


Figure 33: Plastic Tray & Lid for LuxiTune modules

- Packaging for LuxiTune daughter cards units is as follows:
  - Plastic Tray & Lid 360x140x16.7mm holds 15 daughter cards
  - 1 set of Tray is packed in 1 Pizza Box 384\*154\*24mm. 1 x BPL Label per Pizza Box
  - For Bluetooth daughter cards, a simplified Declaration of Conformity with 2011/65/EU and amendments and 2014/53/EU is added to the Pizza Box
  - Outer Box / Shipping Carton 414\*180\*160mm can fit up to 5 Pizza Boxes depending on number of sets ordered. 1 x BPL Label per Outer Box

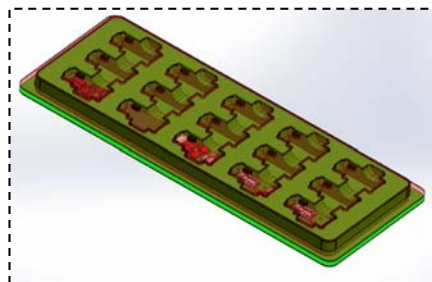


Figure 34: Tray & Lid for LuxiTune daughter cards

- Any LTC compatible TIR optics ordered is also shipped separately from the matched pairs and be used interchangeably

## Notes

### UL

LuxiTune driver assembly meets UL guidelines for low voltage electronic circuit designs. Existing luminaire products using LuxiTune have passed UL testing and are UL and cUL listed.

### CE

The LuxiTune product(s) are in conformity with the relevant Union harmonization legislation for CE. For additional information and actual declaration, please contact OSRAM Opto Semiconductors GmbH, at Leibnizstrasse 4, 93055 Regensburg, Germany.

2014/30/EU and amendments	Directive of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility; Official Journal of the EU L96, 29/03/2014, p. 79-106
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2011/65/EU and amendments	Directive of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment; Official Journal of the EU L174, 1/07/2011, p. 88-110
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2009/125/EC and amendments	Directive of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of Ecodesign requirements for energy-related products
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(EU) 2019/2020 and amendments	COMMISSION REGULATION (EU) 2019/2020 of 1 October 2019 laying down Ecodesign requirements for light sources and separate control gears pursuant to Directive 2009/125/EC of the European Parliament and of the Council and repealing Commission Regulations (EC) No 244/2009, (EC) No 245/2009 and EU) No 1194/2012
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## Ecodesign regulation information

### The reference control settings

Full load: light output 100%

CCT: 3000K

These values can be set by using either of the control protocols described in this datasheet.

### How to remove lighting control parts

All daughter cards listed in this datasheet are considered lighting control parts for DALI, DMX512A, DMX-RDM, ZigBee and Bluetooth Casambi protocols. By removing them from the driver board in turn-off state, LuxiTune disconnects from the control parts.

### List of compatible dimmers

The list of dimmers compatible with either of the control protocols described in this datasheet, is located under each respective controls chapter of this datasheet.

### Disposal

Separate control gear and light sources must be disposed of at certified disposal companies in accordance with Directive 2012/19/EU (WEEE) in the EU and with Waste Electrical and Electronic Equipment (WEEE) Regulations 2013 in the UK. For this purpose, collection points for recycling centers and take-back systems (CRSO) are available from retailers or private disposal companies, which accept separate control gear and light sources free of charge. In this way, raw materials are conserved, and materials are recycled.

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### Attention please!

The information describes the type of component and shall not be considered as assured characteristics.

Terms of delivery and rights to change design reserved. Due to technical requirements components may contain dangerous substances.

For information on the types in question please contact our Sales Organization.

If printed or downloaded, please find the latest version on our website.

### Packing

Please use the recycling operators known to you. We can also help you – get in touch with your nearest sales office. By agreement we will take packing material back, if it is sorted. You must bear the costs of transport. For packing material that is returned to us unsorted or which we are not obliged to accept, we shall have to invoice you for any costs incurred.

### Product and functional safety devices/applications or medical devices/applications

Our components are not developed, constructed or tested for the application as safety relevant component or for the application in medical devices.

Our products are not qualified at module and system level for such application.

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## About LED Engin

LED Engin, an OSRAM brand based in California's Silicon Valley, develops, manufactures, and sells advanced LED emitters, optics and light engines to create uncompromised lighting experiences for a wide range of entertainment, architectural, general lighting and specialty applications. LuxiGen™ multi-die emitter and secondary lens combinations reliably deliver industry-leading flux density, upwards of 5000 quality lumens to a target, in a wide spectrum of colors including whites, tunable whites, multi-color and UV LEDs in a unique patented compact ceramic package. Our LuxiTune™ series of tunable white lighting modules leverage our LuxiGen emitters and lenses to deliver quality, control, freedom and high density tunable white light solutions for a broad range of new recessed and downlighting applications. The small size, yet remarkably powerful beam output and superior in-source color mixing, allows for a previously unobtainable freedom of design wherever high-flux density, directional light is required. LED Engin is committed to providing products that conserve natural resources and reduce greenhouse emissions; and reserves the right to make changes to improve performance without notice.

For more information, please contact [LEDE-Sales@osram.com](mailto:LEDE-Sales@osram.com) or +1 408 922-7200.



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Tobelbader Strasse 30, 8141 Premstaetten, Austria

Phone +43 3136 500-0

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