

LuxiTune™ Generation 3.0 Tunable White 1100lm Light Engine For halogen-style warm dimming and CCT tuning

LTC-Q3T1xxxxH-1Bx

Key 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 1600K as it dims halogen-style
 - CCT tuning mode: Tunes from 2100K to 4300K with independent brightness control
- Stable flux and CCT over operating temperature
- Accurate color rendition with CRI 90
- Single 2 SDCM CCT bin at 3000K
- 63 lm/W light engine efficiency (emitter + driver + lens) at steady state (hot) use conditions
- Works with standard controllers for 0-10V, DMX-512A, DMX-RDM, DALI and BLE
- Driver design meets UL low voltage guidelines
- Lead (Pb) free and RoHS compliant



Typical Applications

- Down lighting
- Accent lighting
- Hospitality lighting
- Architectural lighting
- Track lighting

Description

LuxiTune™ is the only tunable white light engine capable of simulating a halogen-style Warm Dimming and CCT Tuning in the same product. LuxiTune delivers consistent and energy-efficient Lux-on-Target™ directional lighting for restaurants, entertainment, hotels and other hospitality lighting applications.

With a high color rendering index (CRI) throughout the dimming range, LuxiTune ensures accurate color rendition at all intensity levels. Furthermore, unit-to-unit variations of less than 3 SDCM over the operating conditions guarantees consistent light quality. LuxiTune, which is based on LED Engin's proven LuxiGen™ emitter technology, is available in three beam options: 24° / 34°/45°, providing flexibility and freedom in lighting design.

LuxiTune Ordering Part Number Options

Part Number	Description
Use the following to order a full kit, including daughter cards where applicable	
LTC-Q3T12447H-1B1	LZC LuxiTune 1100lm Gen 3.0, 0-10V kit - includes emitter, 0-10V driver board, cable, Narrow Flood (24°) Lens and Holder
LTC-Q3T13447H-1B1	LZC LuxiTune 1100lm Gen 3.0, 0-10V kit - includes emitter, 0-10V driver board, cable, Flood (34°) Lens and Holder
LTC-Q3T14547H-1B1	LZC LuxiTune 1100lm e Gen 3.0, 0-10V kit - includes emitter, 0-10V driver board, cable, Wide Flood (45°) Lens and Holder
LTC-Q3T12447H-1B3	LZC LuxiTune 1100lm Gen 3.0, DMX kit - includes emitter, 0-10V driver board, DMX-512A daughter card, cable, Narrow Flood (24°) Lens and Holder
LTC-Q3T13447H-1B3	LZC LuxiTune 1100lm Gen 3.0, DMX kit - includes emitter, 0-10V driver board, DMX-512A daughter card, cable, Flood (34°) Lens and Holder
LTC-Q3T14547H-1B3	LZC LuxiTune 1100lm Gen 3.0, DMX kit - includes emitter, 0-10V driver board, DMX-512A daughter card, cable, Wide Flood (45°) Lens and Holder
LTC-Q3T12447H-1B5	LZC LuxiTune 1100lm Gen 3.0, DALI kit - includes emitter, 0-10V driver board, DALI daughter card, cable, Narrow Flood (24°) Lens and Holder
LTC-Q3T13447H-1B5	LZC LuxiTune 1100lm Gen 3.0, DALI kit - includes emitter, 0-10V driver board, DALI daughter card, cable, Flood (34°) Lens and Holder
LTC-Q3T14547H-1B5	LZC LuxiTune 1100lm Gen 3.0, DALI kit - includes emitter, 0-10V driver board, DALI daughter card, cable, Wide Flood (45°) Lens and Holder
LTC-Q3T12447H-1B7	LZC LuxiTune 1100lm Gen 3.0, RDM kit - includes emitter, 0-10V driver board, DMX-RDM daughter card, cable, Narrow Flood (24°) Lens and Holder
LTC-Q3T13447H-1B7	LZC LuxiTune 1100lm Gen 3.0, RDM kit - includes emitter, 0-10V driver board, DMX-RDM daughter card, cable, Flood (34°) Lens and Holder
LTC-Q3T14547H-1B7	LZC LuxiTune 1100lm Gen 3.0, RDM kit - includes emitter, 0-10V driver board, DMX-RDM daughter card, cable, Wide Flood (45°) Lens and Holder
LTC-Q3T12447H-1B8	LZC LuxiTune 1100lm Gen 3.0, BLE kit - includes emitter, 0-10V driver board, Casambi BLE daughter card, cable, Narrow Flood (24°) Lens and Holder
LTC-Q3T13447H-1B8	LZC LuxiTune 1100lm Gen 3.0, BLE kit - includes emitter, 0-10V driver board, Casambi BLE daughter card, cable, Flood (34°) Lens and Holder
LTC-Q3T14547H-1B8	LZC LuxiTune 1100lm Gen 3.0, BLE kit - includes emitter, 0-10V driver board, Casambi BLE daughter card, cable, Wide Flood (45°) Lens and Holder
LTC-Q3T10000H-1Bx	LZC LuxiTune 1100lm Gen 3.0 kit, for ordering without TIR. No TIR secondary optics included. "x" can be 1, 3, 5, 7 or 8.
LTC-Q3T100000-1Bx	LZC LuxiTune 1100lm Gen 3.0 kit, for ordering without TIR or cable. No TIR secondary optics or cable included. "x" can be 1, 3, 5, 7 or 8.
Use the following to order a daughter card separately, one for each 0-10V kit	
LTB2-DMX1	DMX 512A daughter card
LTB4-DALI	DALI daughter card
LTB6-RDM1	DMX-RDM daughter card
LTB8-BLE1	BLE mesh daughter card (Casambi)
Use the following if ordering TIRs separately with a LTC-Q3T100000-1Bx or LTC-Q3T10000H-1Bx kit	
LLNF-4T08-H	Narrow Flood (24°) Lens and Holder
LLFL-6T08-H	Flood (34°) Lens and Holder

LLWF-6T08-H	Wide Flood (45°) Lens and Holder
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There is no option to purchase a standalone basic 0-10V driver board without purchasing a full kit ending in -1B1. There is an option to purchase DMX 512A, DMX-RDM, DALI and BLE daughter cards separately, but without a basic 0-10V kit and the right firmware version, they will not function as intended. There is an option to buy TIRs in holder separately, but please confirm the count when ordering to avoid double counting TIRs as part of a kit and purchased separately. A cable is provided with a full kit, except where specifically stated otherwise. LED Engin prefers that customers in production with LuxiTune source their own cables with additional guidance from LED Engin. Please specify carefully the part number and description when ordering with or without the cable.

LuxiTune Firmware

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

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

Bin coordinates are listed below in the table.

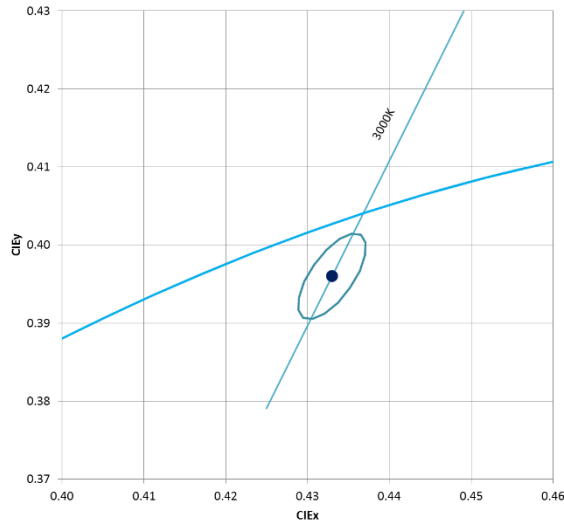


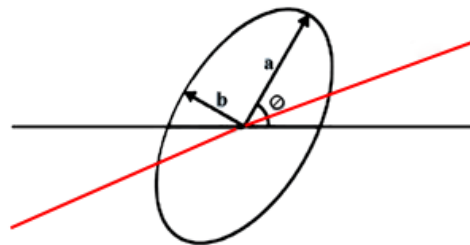
Figure 1: Single chromaticity bin plotted on excerpt from the CIE 1931 (2°) x-y chromaticity diagram.

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

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

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

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



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

Parameter	Symbol	Min	Typical	Max	Unit
Input Voltage - Light Engine ^[1]	V_{in}	21.0	24.0	27.0	V
Input Current (@24VDC)	I_{in}		720	1150	mA
Input Power	P_{in}		17.3	24 ^[2]	W
Standby Power	P_{min}			0.5	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 ^[4, 5, 6]	T_c, T_0	15	25	85	$^\circ\text{C}$

Notes:

- Light Engine is defined as emitter + driver board + lens.
- The measured max power is 21W at 2500K, 85 $^\circ\text{C}$, 100% intensity.
- R_{j-b} is the thermal resistance between the LED junction and the bottom of the MCPCB
- The temperature measurement point on the MCPCB, T_c is located next to the LED emitter and the other reference point, T_0 is marked on the 0-10V driver board. See figures 15 and 16. T_c should not exceed 85 $^\circ\text{C}$ and T_0 should not exceed 85 $^\circ\text{C}$.
- LuxiTune is operational at below 15 $^\circ\text{C}$, however there is risk of condensation and unit needs to be protected against moisture.
- If $T_c > 85^\circ\text{C}$, the unit goes into thermal protection mode. The luminous flux is reduced in steps of 10% per 2 $^\circ\text{C}$ until it turns "off" at $T_c = 105^\circ\text{C}$. Once the temperature drops to $T_c < 65^\circ\text{C}$, the brightness will be fully restored.

Optical Characteristics @ $T_c = 15^\circ - 85^\circ\text{C}$

Parameters	Symbol	Min	Typical	Max	Unit
Luminous Flux ^[2] – Light Engine ^[1] @3000K, 100% intensity, $T_c = 65^\circ\text{C}$	Φ_v	1045	1100	1200	lm
Luminous Flux ^[2] – Emitter only @3000K, 100% intensity	Φ_v		1250		lm
Efficiency – Light Engine ^[1] @3000K, 100% intensity			63		lm/W
Color Rendering Index (CRI) @3000K, 100% intensity	R_a		90		
Warm Dim Parameters					
	Symbol	Min	Typical	Max	Unit
Correlated Color Temperature @100% intensity	CCT		3000		K
Correlated Color Temperature @<0.5% intensity	CCT		1600		K
CCT Tuning Parameters					
	Symbol	Min	Typical	Max	Unit
Luminous Flux ^[2] – Light Engine ^[1] @4300K, 100% intensity	Φ_v	830	1000		lm
Luminous Flux ^[2] – Light Engine ^[1] @2100K, 100% intensity	Φ_v	830	940		lm

Notes:

- Light Engine: Emitter + driver board + 34 $^\circ$ secondary lens.
- Luminous flux performance guaranteed within published operating conditions. LED Engin maintains a tolerance of $\pm 10\%$ on flux measurements.

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

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

Notes:

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

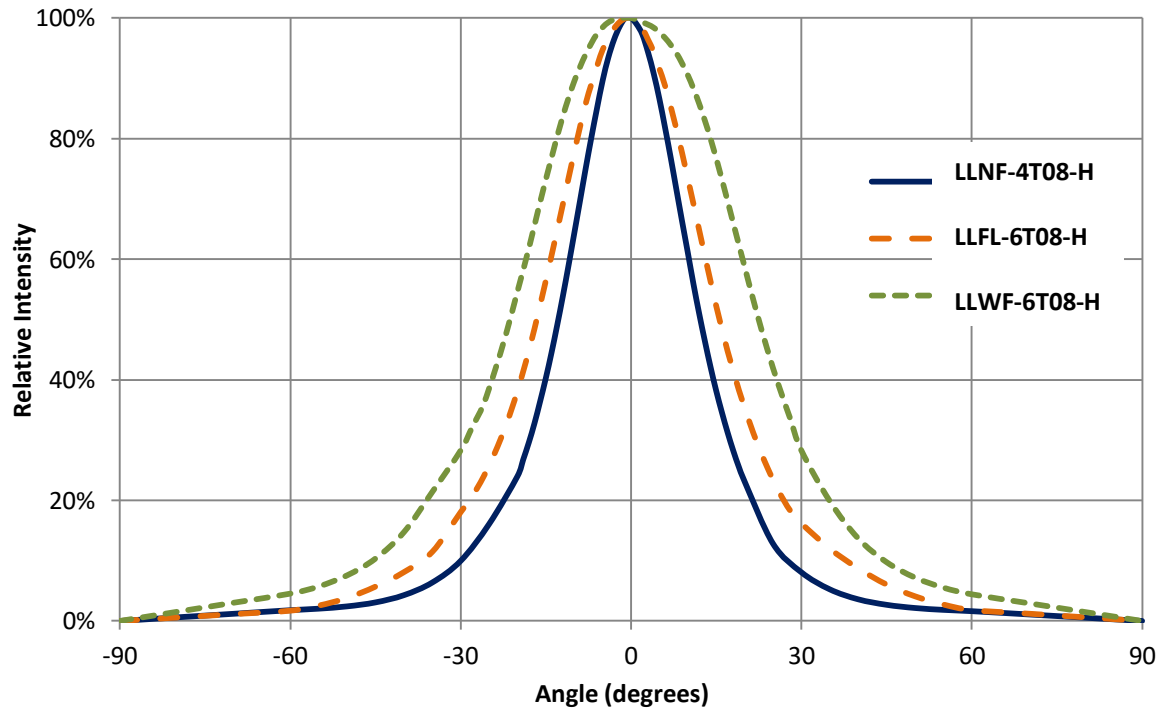


Figure 2: Typical relative intensity over angle

Average Lumen Maintenance Projections

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

Typical Relative Spectral Power Distribution

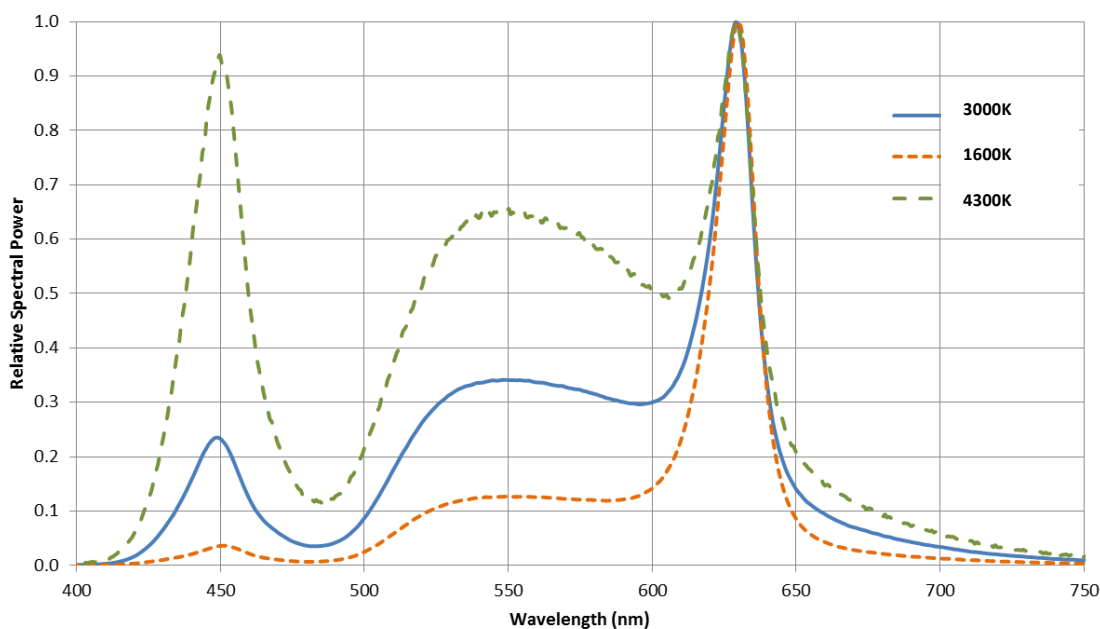


Figure 3: Typical relative spectral power vs. wavelength

CCT Range in Warm Dimming Mode

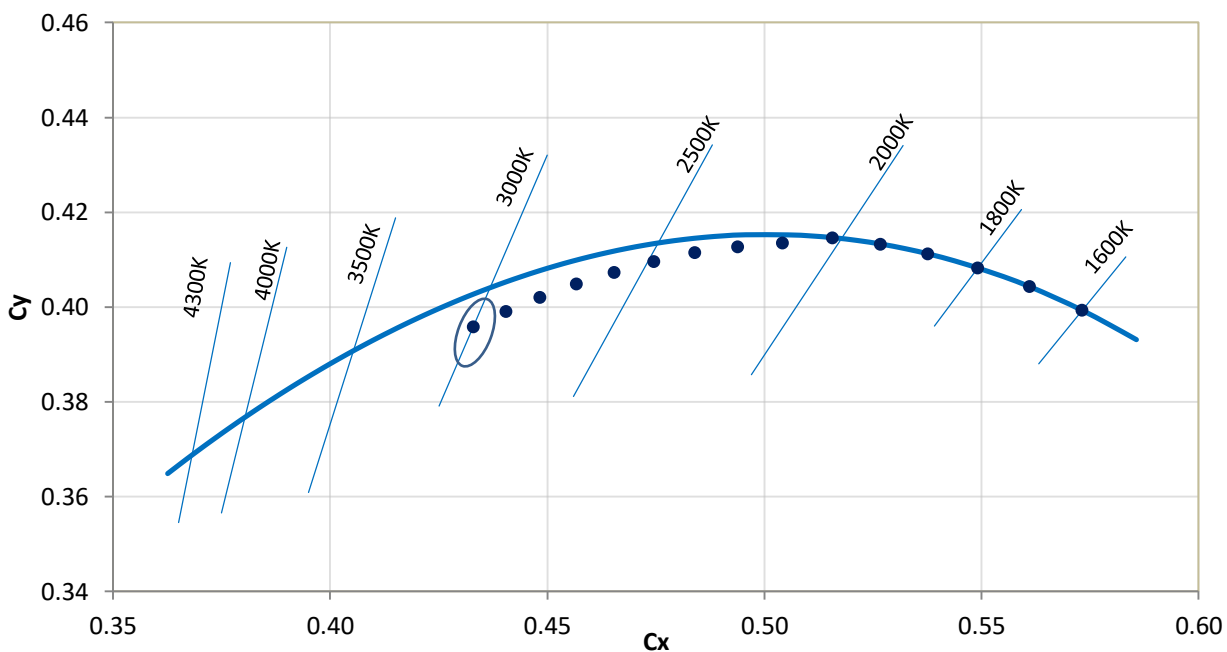


Figure 4: Typical CCT range in warm dim mode

Relative Intensity vs. CCT in Warm Dimming Mode

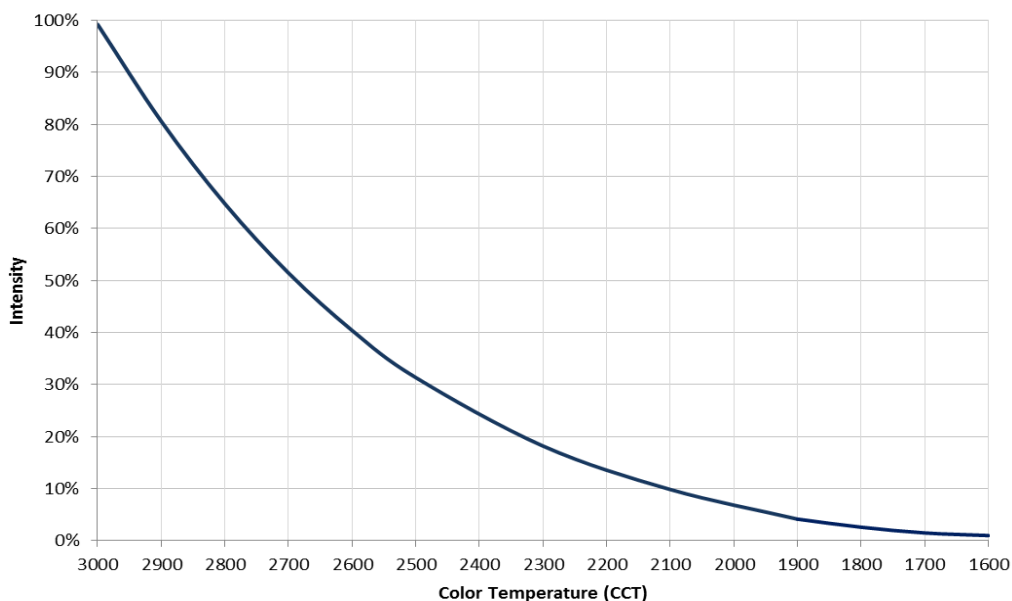


Figure 5: Intensity vs. CCT dimming profile in warm dim mode

CCT vs. Control Voltage in Warm Dimming Mode

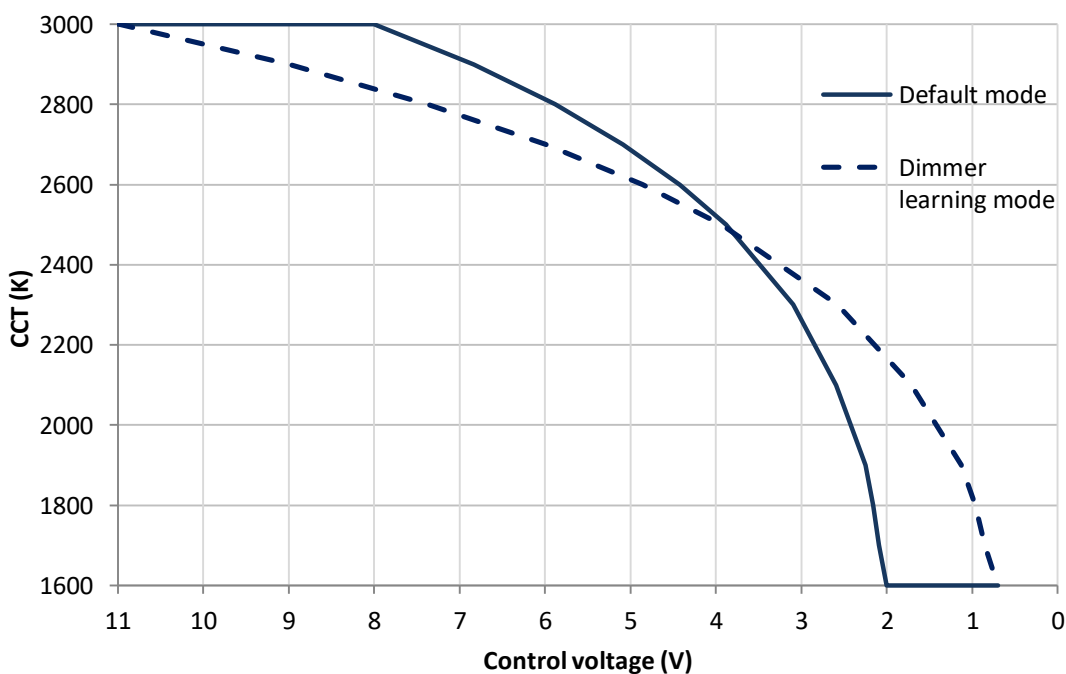


Figure 6: CCT vs. control voltage in warm dim mode

Relative Intensity vs. Control Voltage in Warm Dimming Mode

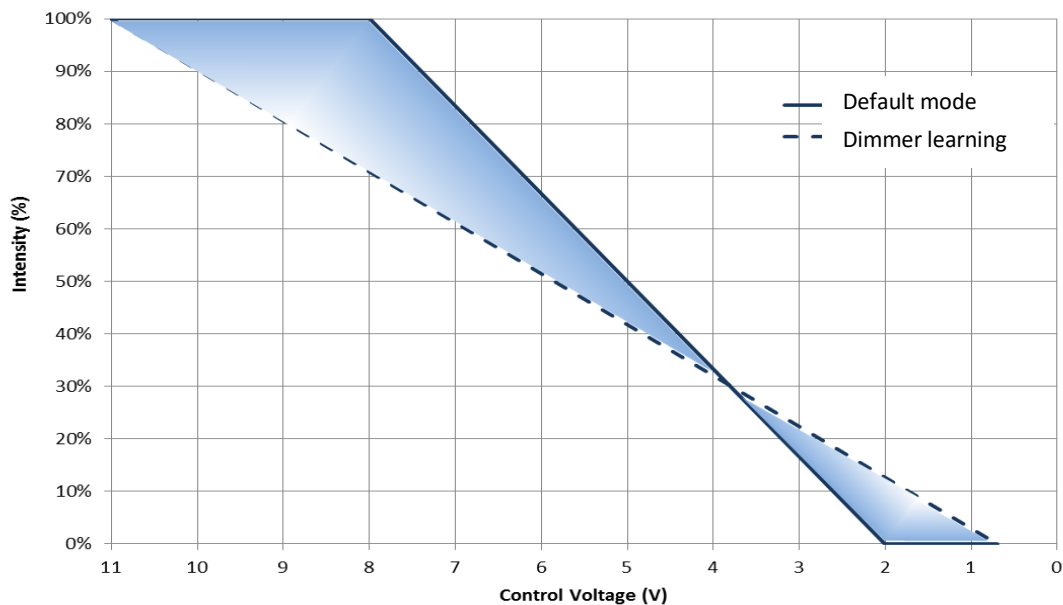


Figure 7: Intensity vs. control voltage in warm dim mode

Notes:

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

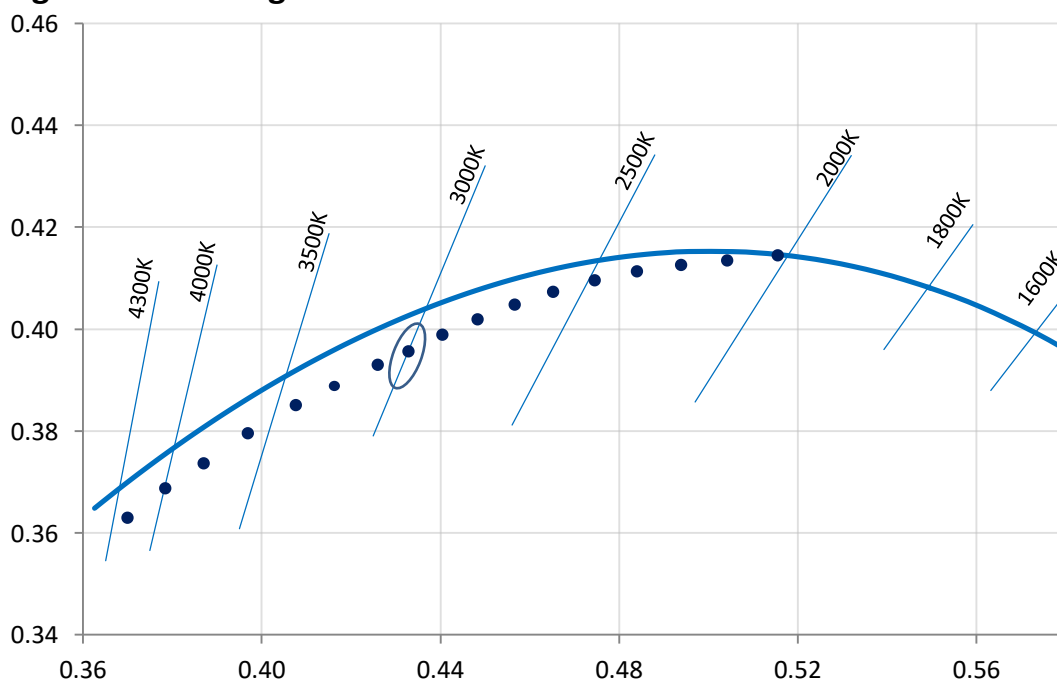


Figure 8: Typical CCT range in CCT tuning mode

Relative Intensity vs. CCT in CCT Tuning Mode

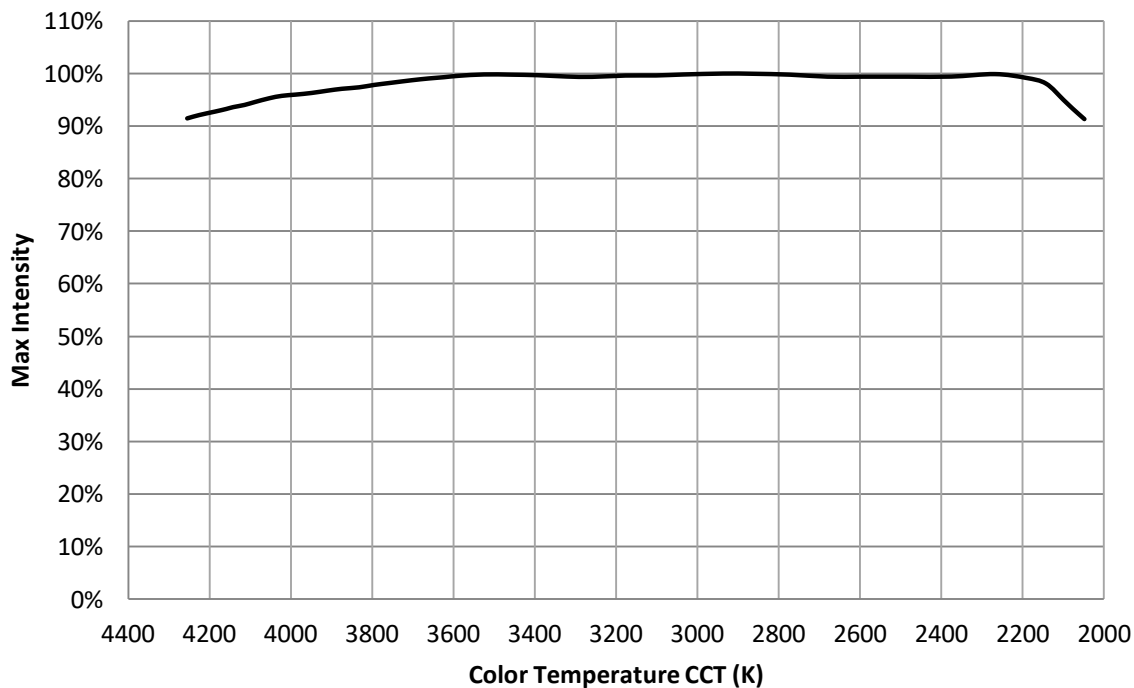


Figure 9: Relative Intensity vs. CCT in CCT tuning mode

CCT vs. Control Voltage in CCT Tuning Mode

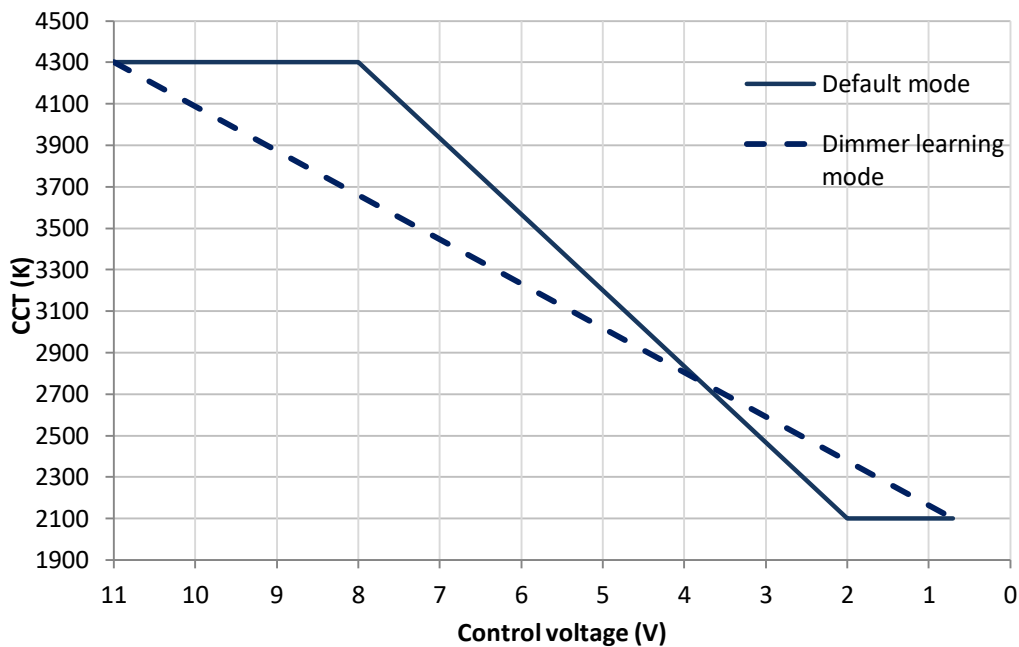


Figure 10: CCT vs. control voltage in CCT tuning mode

Relative Intensity vs. Control Voltage in CCT Tuning Mode

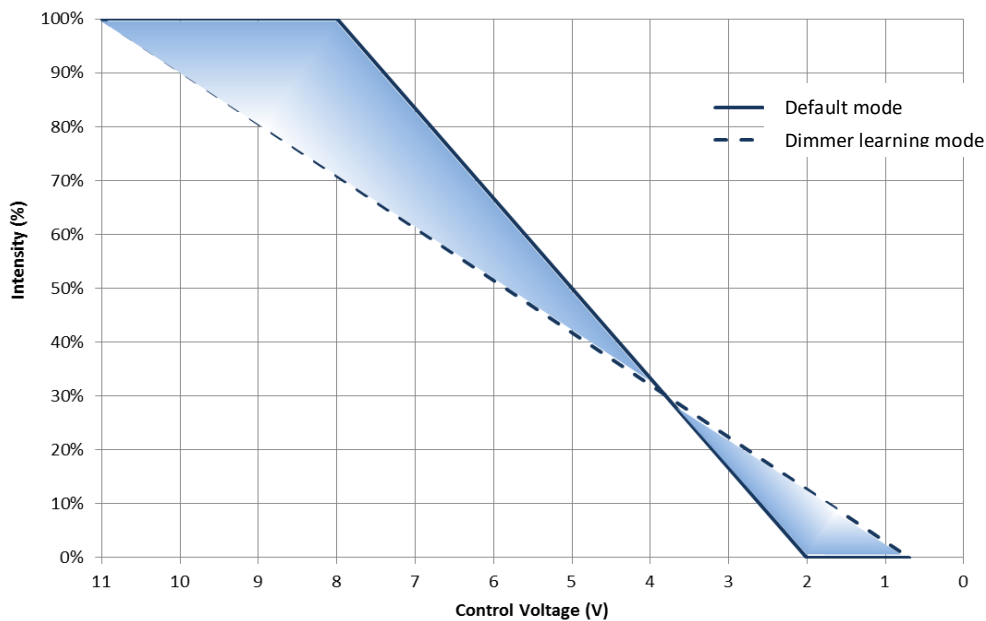


Figure 11: Relative intensity vs. control voltage in CCT tune mode

Notes:

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

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.

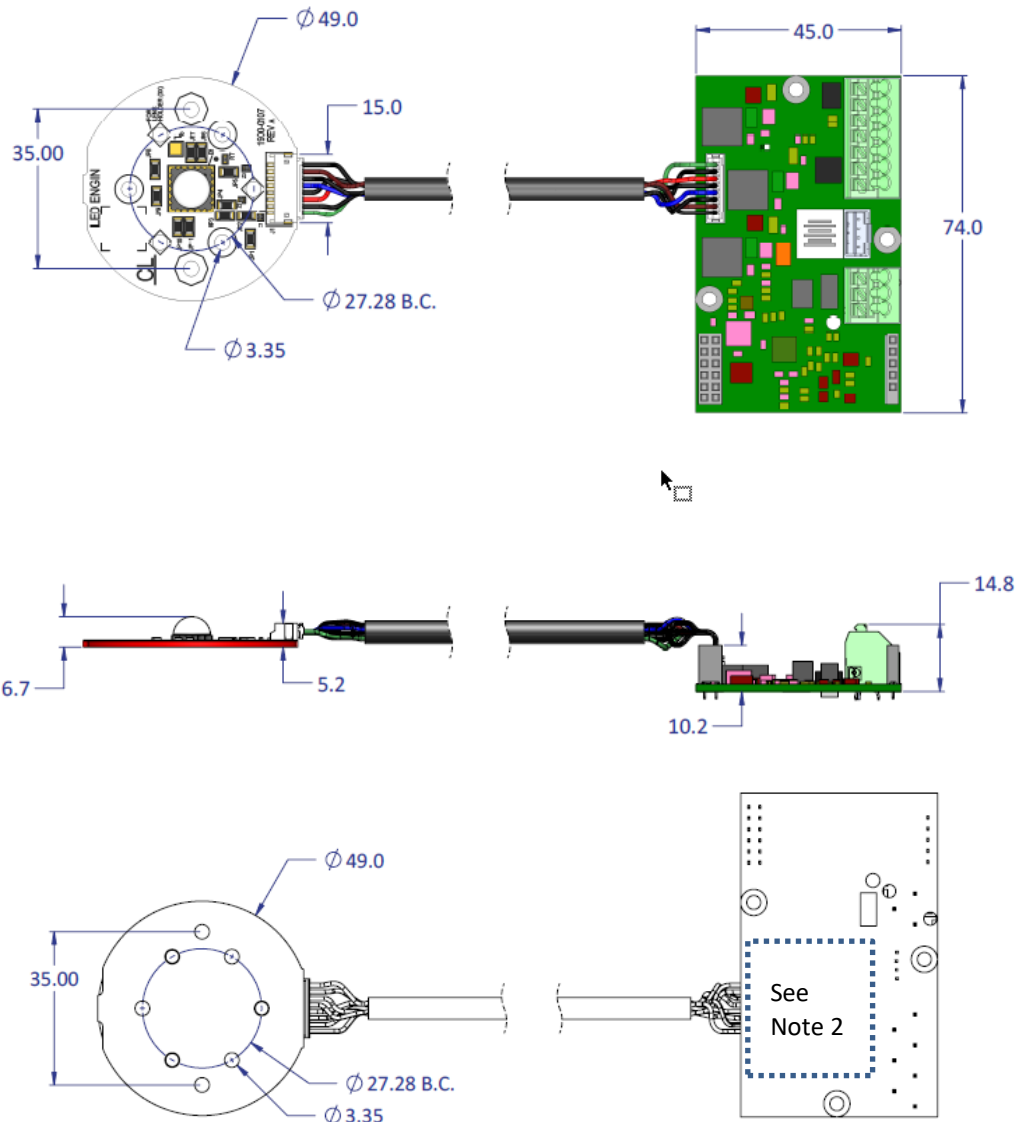


Figure 12: Mechanical dimensions of LuxiTune light engine – without secondary lens

Notes

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

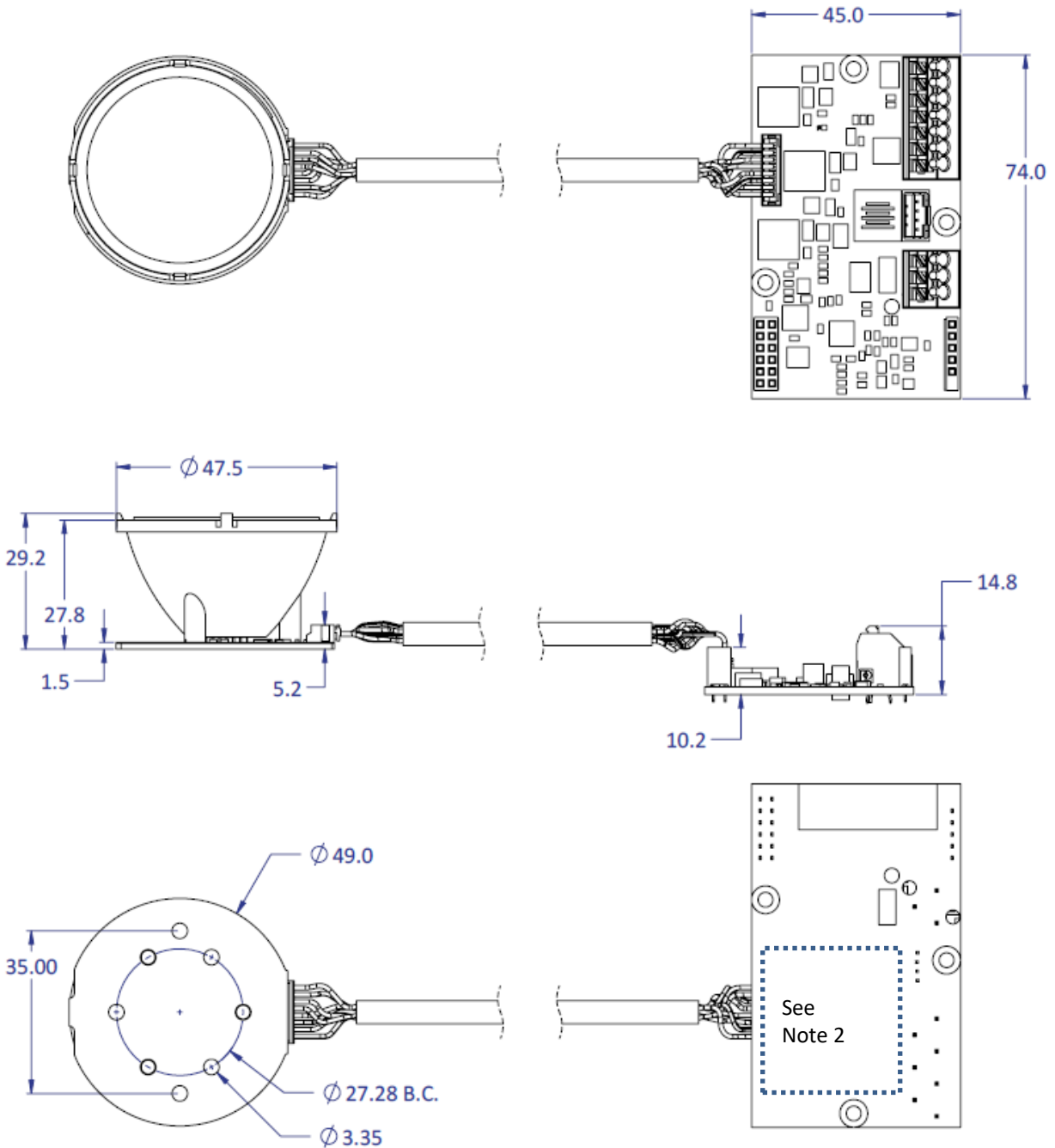


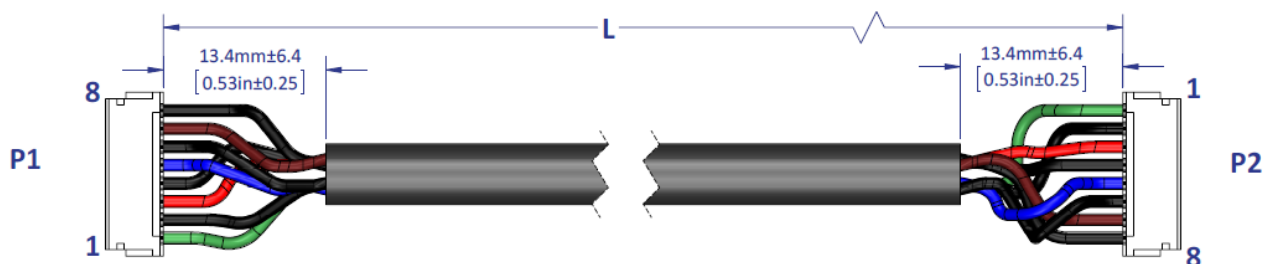
Figure 13: Mechanical dimensions of LuxiTune light engine – with secondary lens

Notes

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

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



Notes

1. Length L can be any length up to 30in when customer is sourcing cable. Longer is not recommended. LED Engin supplied standard cable is 30in.

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 14: 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, and it is important to choose a suitable heat sink. Design attributes such as heat sink size and shape, active or passive cooling options, material, surface finishes, and etc. need to be selected so 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_c is marked in Fig. 16 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_c rises above 85°C. At a T_c of 105°C the light engine will be turned off.

The temperature at T_c 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.

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

$T_{\text{ambient}}^{[1]}$ (°C)	T_c (°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:

- T_{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_{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_c recommended is 85C 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 hybrid board temperatures low.

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

1. 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
 - 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)

2. 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. It is recommended 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 is an option for thermal management. The suggested location of the heat spreader is shown in Figures 12 and 13, Note 2.

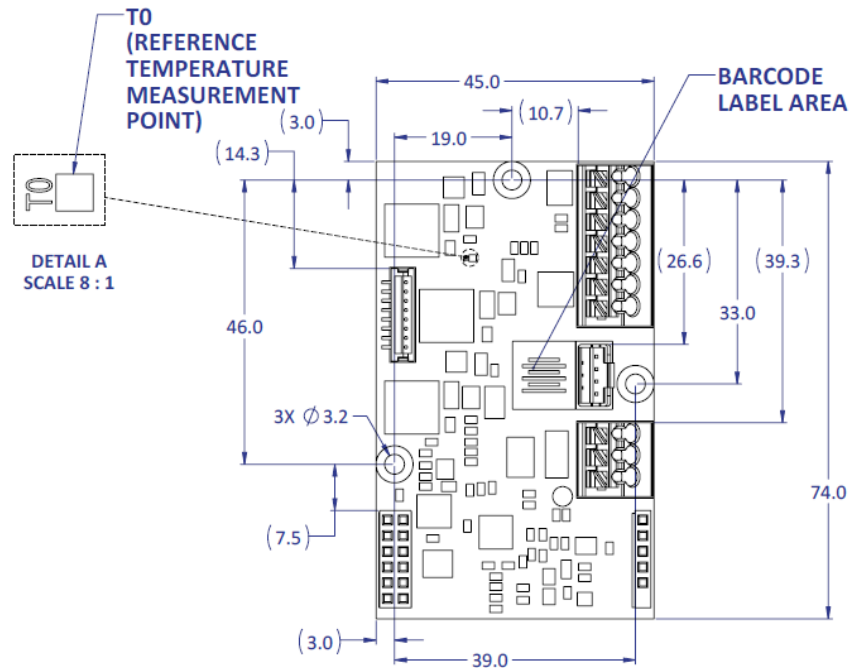


Figure 15: Temperature reference point T_0 on 0-10V driver board

Notes

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

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:

1. Inspect hybrid board and heat sink for flatness and smoothness.
2. 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.
3. Always use three M3 or #4-40 screws with #4 plastic washers.
4. When fastening the three screws, it is recommended to tighten the screws in multiple small steps.
5. Always use plastic washers in combinations with the three screws. This helps maintain, roughly, constant pressure on the board as the assembly heats up.
6. 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.

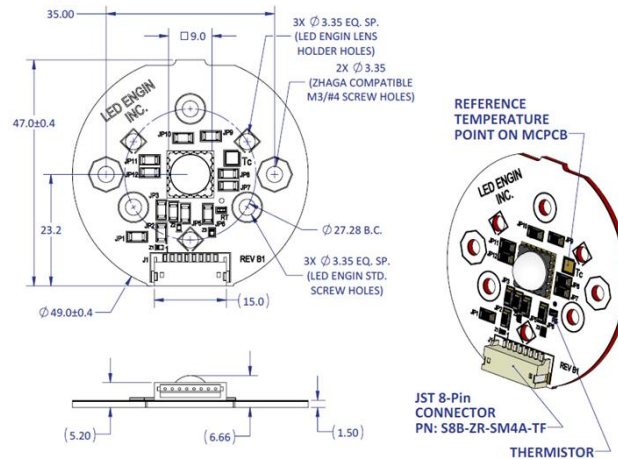


Figure 16: Mounting screw holes in LuxiTune MCPCB

Notes

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 ($T_c = +15 \dots +85^\circ\text{C}$). When the MCPCB temperature exceeds 85°C ($T_c > 85^\circ\text{C}$), 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 ($T_c = 105^\circ\text{C}$). When the temperature drops again and reaches 65°C ($T_c < 65^\circ\text{C}$), the light intensity is fully restored.

Electrical Interfaces

Connectors

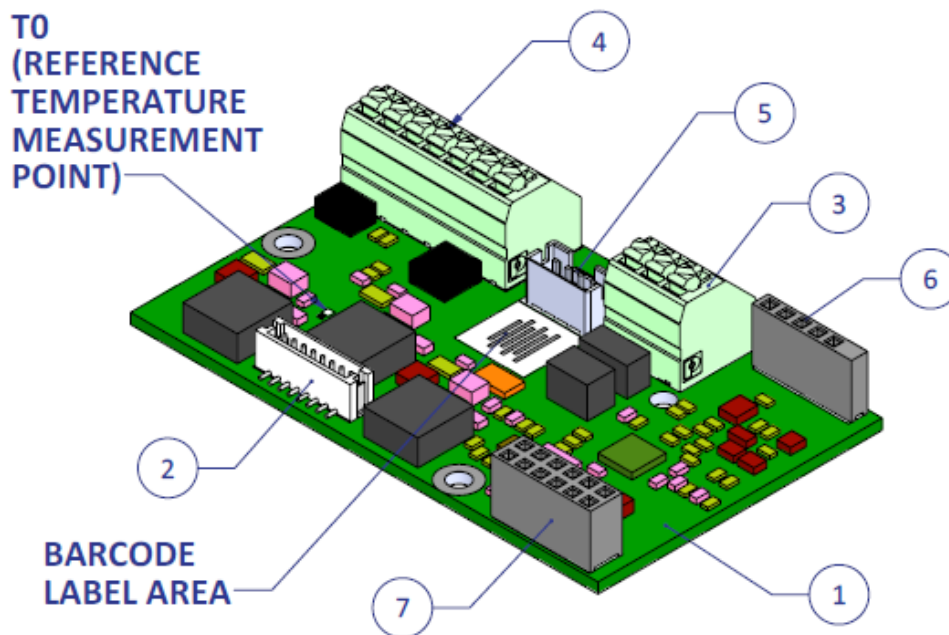
J8 - 7-pin connector is used for supply power, 0-10V dimming signals and automatic range dimmer option (see page 14 for detailed instructions)

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)



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 17: Schematic of 0-10V driver board

24VDC Power Supply Requirements

Class 2 power supply
 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 Fig 18 for actual wiring instructions and tables below for pin description.

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)

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

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

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

Input Voltage	Manufacturer	Part Number	Maximum Output Power
90-305VAC	Roal	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

0(1)-10V Wiring Diagram

Refer to J8 table in earlier section for pin description.

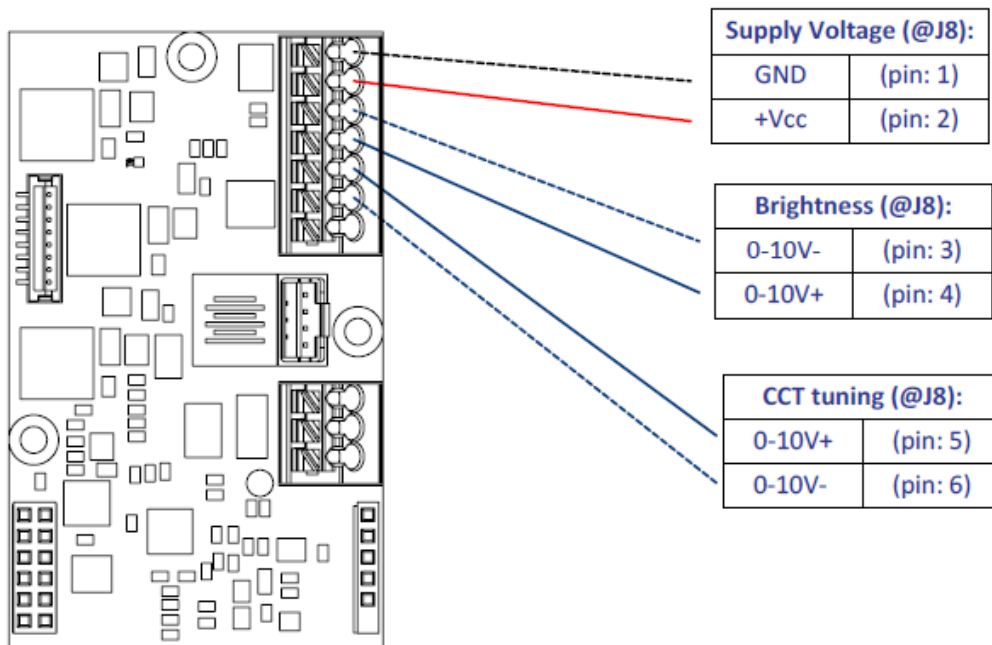


Figure 18: Wiring diagram for 0-10V dimming and CCT control

Dimming and Tuning Control Functions

LuxiTune works with the following control inputs:

1. 0-10V
2. DMX512-A
3. DMX-RDM
4. DALI
5. BLE

0-10V Control Functions

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

1. All 0-10V dimmers with either current sink (IEC60929) or current source configuration.
2. All 1-10V dimmers with either current sink (IEC60929) or current source configuration.
3. 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 Fig 18 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.

Self-learning ARD Mode:

LuxiTune Automatic Range Dimming mode (ARD) allows the LuxiTune module to learn the actual voltage range of a dimmer. In this mode, LuxiTune learns the minimum dimmer voltage between 0.7V and 2V and sets it to the lowest light intensity level (~0.5% of max lumens) that the unit can be dimmed to. Similarly, it learns the maximum dimmer voltage between 8V and 11V and sets it to the maximum intensity of light (max lumens). Down to 0.7V, the light engine does not switch off, but stays at the lowest intensity level. Below 0.7V, the light will turn off.

Note:

The input voltage should not be larger than 11V. If slightly larger than 11 volt the unit will interpret the input signal incorrectly which can result in a non-standard and delayed dimming response.

The following sequence will setup the ARD self-learning feature:

1. Getting into the ARD learning mode: This can be done in 3 ways

- a. Change the state of P1 when the units is off
- b. Change the state of P1 when the unit is on
- c. Briefly change the state of P1 when the unit is on. (>2sec and <5 sec)

The state of P1 can be changed by connecting or disconnecting P1 (J8, pin 7) to GND (pin 6).

The light engine will flash 3 times with an orange color indicating going into learning mode. The intelligent driver will reset any previous learning and start from 2-8V learning any new DIM/CCT range.

If pushed by the dimming control it will move from the default 2-8V to the maximum 0.7-11V range.

2. Learn dim range:

- a. Adjust DIM controller to min/max settings. Fixture will follow and store DIM controller travel. (If the controller stays between 2-8V or >11V (=open pins) then the defaults 2-8V range will be used)
- 3. Learn CCT range:**
 - a. Adjust CCT controller to min/max settings. Fixture will follow and store CCT controller travel. (If the controller stays between 2-8V or >11V (=open pins) then the defaults 2-8V range will be used)
- 4. Getting out of ARD mode:** (This can be done in 3 ways)
 - a. Power power-cycle the light engine(s).
 - b. Change the state of P1 when the unit is on
 - c. Briefly change the state of P1 when the unit is on. (>2sec and <5 sec)

The light engine will flash 3 times a green color indicating going out of the learning mode. The intelligent driver will stop learning any new DIM/CCT range.

The light engine will now use the new range for DIM and CCT and remember it's last P1 state so that it's ready to be put into the learning mode again if needed.

Notes

1. When the power is turned "off" and "on" (power cycling) and no mode change has taken place, the emitter will not blink but will immediately begin functioning and adjust to the set dimming level.
2. When a new/different dimmer is connected, the LuxiTune unit needs to be placed again into ARD learning mode again, so that it's ready to learn the voltage range of the new dimmer. (Start again from step 1)
3. The ARD sequence works in both Warm Dimming and CCT Tuning mode.

Compatible Dimmers & Controls

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

Common 0(1)-10V Dimmers

Supplier	Model	Log/Linear	Voltage Range
Lutron	Diva, DVTV (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:

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.

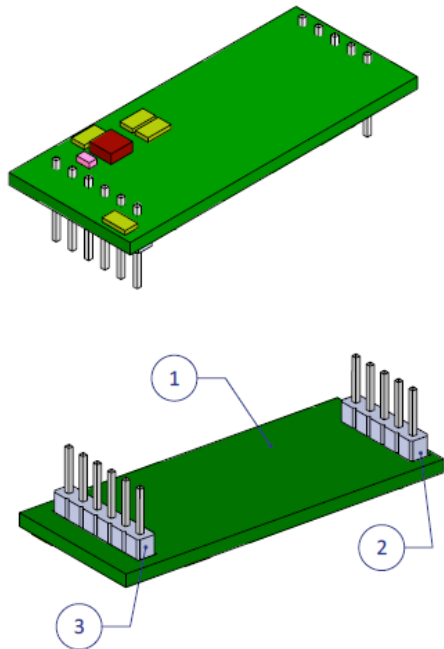
DMX 512-A Control Functions

LuxiTune works with the following DMX 512-A control inputs:

- DMX 512-A standardized digital lighting control protocol

- DMX control units that do not follow USITT DMX512-A specifications, can cause unexpected behavior.

LuxiTune DMX input pin3 (D+), pin 2 (D-), pin 1 (GND) on the J7 expansion connector are non-isolated. DMX ground is shared with the ground from the power supply. See Fig 19 and 20 for information on connecting DMX card to the 0-10V driver board.



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 19: DMX 512-A daughter card

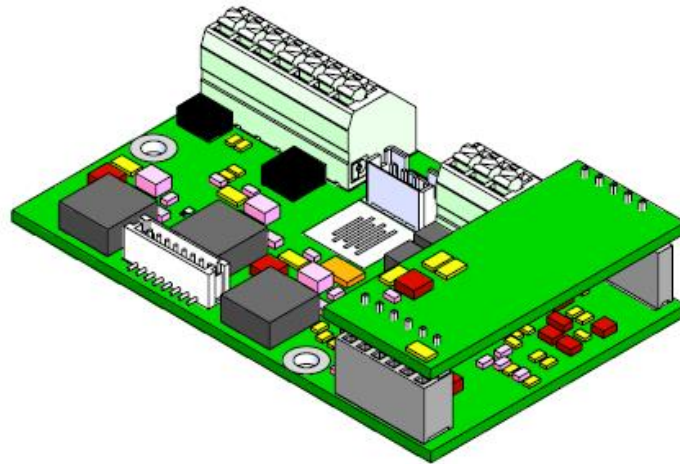


Figure 20: DMX 512-A card plugged in to 0-10V driver board

DMX Control Options:

1. Warm dim mode: In this mode, LuxiTune warms as it dims. It uses only one DMX-channel.
2. 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:

Address Function

- | | |
|----|---|
| 01 | Base address low; Sets the DMX base address of a LuxiTune module. LuxiTune can only use DMX address <1> to <64>. |
| 02 | NA; Reserved for future use. Use <0> as default |
| 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, 4300K to 2100K 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, 4300K to 2100K
DMX 006	<30>	Smoothing on at 30 (default value)

DMX 512-A Control Options

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*	000-001	199	091	008		Halogen dimming mode (4300-2100K)	
					000-255	DMX Smoothing (0=off, 1-255=on, 30=default)	
						Ch1 = Brightness with CCT change (0-255)	
001-511*	000-001	199	091	009		Halogen dimming mode (3000-1600K)	
					000-255	DMX Smoothing (0=off, 1-255=on, 30=default)	
						Ch1 = Brightness with CCT change (0-255)	
001-511*	000-001	199	091	016	(default)	CCT tuning mode (4300-2100K)	
					000-255	DMX Smoothing (0=off, 1-255=on, 30=default)	
						Ch1 = Brightness (0-255)	
						Ch2 = CCT setting (0-255)	
001-511*	000-001	199	091	017		CCT tuning mode (3000-1600K)	
					000-255	DMX Smoothing (0=off, 1-255=on, 30=default)	
						Ch1 = Brightness (0-255)	
						Ch2 = CCT setting (0-255)	
001-511*	000-001	199	091	024		rev. CCT tuning mode (4300-2100K)	
					000-255	DMX Smoothing (0=off, 1-255=on, 30=default)	
						Ch1 = CCT setting (0-255)	
						Ch2 = Brightness (0-255)	
001-511*	000-001	199	091	025		rev. CCT tuning mode (3000-1600K)	
					000-255	DMX Smoothing (0=off, 1-255=on, 30=default)	
						Ch1 = CCT setting (0-255)	
						Ch2 = Brightness (0-255)	
001-511*	000-001	199	091	032		WW/CW tuning mode (4300-2100K)	
					000-255	DMX Smoothing (0=off, 1-255=on, 30=default)	
						Ch1 = WarmWhite (0-255)	
						Ch2 = CoolWhite (0-255)	
001-511*	000-001	199	091	033		WW/CW tuning mode (3000-1600K)	
					000-255	DMX Smoothing (0=off, 1-255=on, 30=default)	
						Ch1 = WarmWhite (0-255)	
						Ch2 = CoolWhite (0-255)	
001-511*	000-001	199	091	040		CW/WW tuning mode (4300-2100K)	
					000-255	DMX Smoothing (0=off, 1-255=on, 30=default)	
						Ch1 = CoolWhite (0-255)	
						Ch2 = WarmWhite (0-255)	
001-511*	000-001	199	091	041		CW/WW tuning mode (3000-1600K)	
					000-255	DMX Smoothing (0=off, 1-255=on, 30=default)	
						Ch1 = CoolWhite (0-255)	
						Ch2 = WarmWhite (0-255)	

* When DMX 002 = 0, then DMX 001= 1-255, if DMX 002= 1, then DMX 001= 256-511. (Basically 255+the value of DMX 001 = DMX address)

Common DMX 512-A Controllers

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:

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 512-A Wiring Diagram

Please be aware that our implementation of DMX is “grounded”. There is NO isolation between the DMX data lines or the DMX ground nor is there electrical isolation on the DMX lines.

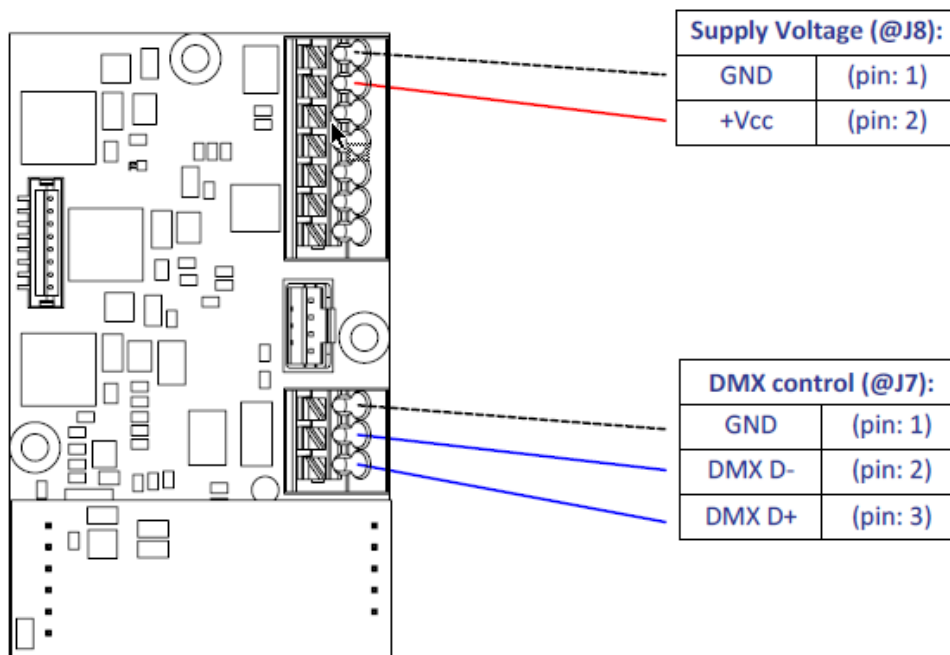
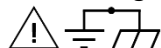
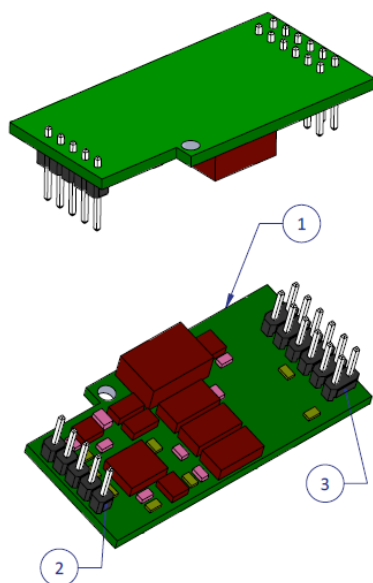


Figure 21: Wiring diagram for DMX 512-A control

DMX-RDM Implementation

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 Fig 21 for the DMX-512A card, except that the DMX-RDM is isolated and the comment preceding Fig 21 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

Fig 22. DMX-RDM daughter card

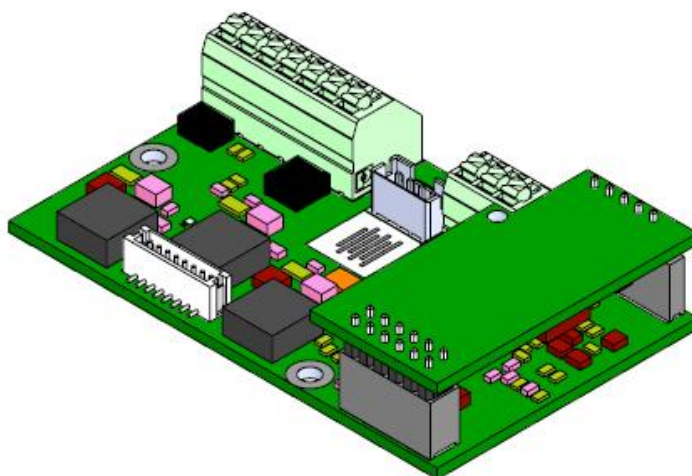
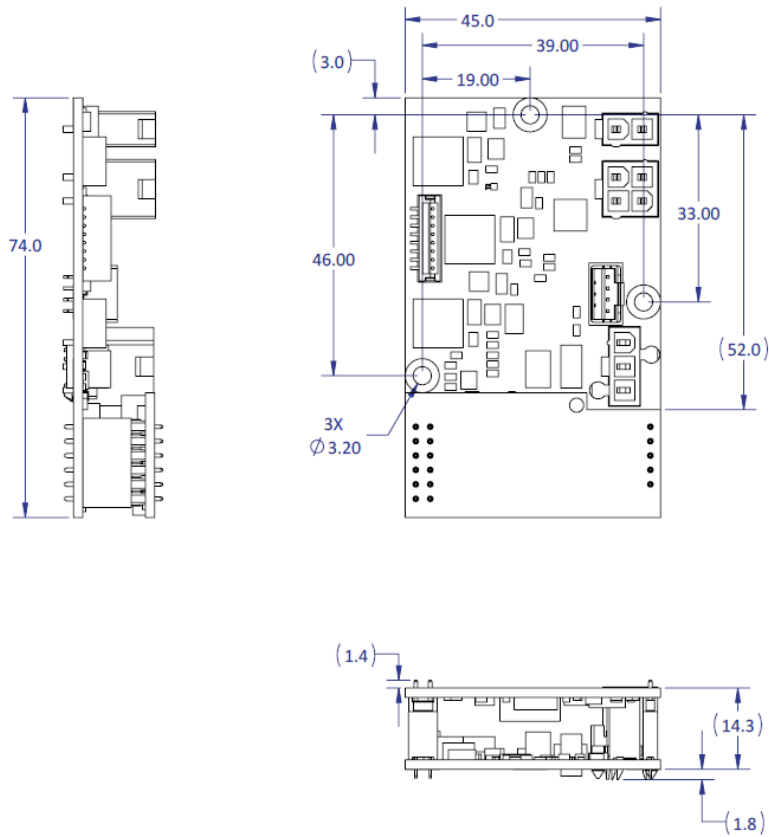


Fig 23. DMX-RDM card connected to 0-10V driver board



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

Fig 24. Dimensions of 0-10V driver board with optional DMX-RDM card

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 4300K 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.

Item	Personality	# of Slots	Slot 1 Handle	Slot 2 Handle	Description
1	Warm Dimming 4300K SQ	1	Brightness	n.a.	Warm dim 1800-4300K, square law response
2	Warm Dimming 3000K SQ	1	Brightness	n.a.	Warm dim 1800-3000K, square law response
3	Warm Dimming 4300K	1	Brightness	n.a.	Warm dim 1800-4300K, linear response
4	Warm Dimming 3000K	1	Brightness	n.a.	Warm dim 1800-3000K, linear response
5	Tunable White 4300K SQ	2	CCT	Brightness	CCT tuning 2100-4300K, square law response
6	Tunable White 3000K SQ	2	CCT	Brightness	CCT tuning 1900-3000K, square law response
7	Tunable White 4300K	2	CCT	Brightness	CCT tuning 2100-4300K, linear response
8	Tunable White 3000K	2	CCT	Brightness	CCT tuning 1900-3000K, linear response
9	Tunable White R 4300K SQ	2	Brightness	CCT	CCT tuning 2100-4300K, square law response, handles reversed
10	Tunable White R 3000K SQ	2	Brightness	CCT	CCT tuning 1900-3000K, square law response, handles reversed
11	Tunable White R 4300K	2	Brightness	CCT	CCT tuning 2100-4300K, linear response, handles reversed
12	Tunable White R 3000K	2	Brightness	CCT	CCT tuning 1900-3000K, linear response, handles reversed
13	Warm Cool Group 4300K SQ	2	Brightness for warm white	Brightness for cool white	CCT tuning 2100-4300K, square law response
14	Warm Cool Group 3000K SQ	2	Brightness for warm white	Brightness for cool white	CCT tuning 1900-3000K, square law response
15	Warm Cool Group 4300K	2	Brightness for warm white	Brightness for cool white	CCT tuning 2100-4300K, linear response
16	Warm Cool Group 3000K	2	Brightness for warm white	Brightness for cool white	CCT tuning 1900-3000K, linear response
17	Cool Warm Group 4300K SQ	2	Brightness for cool white	Brightness for warm white	CCT tuning 2100-4300K, square law response, handles reversed
18	Cool Warm Group 3000K SQ	2	Brightness for cool white	Brightness for warm white	CCT tuning 1900-3000K, square law response, handles reversed
19	Cool Warm Group 4300K	2	Brightness for cool white	Brightness for warm white	CCT tuning 2100-4300K, linear response, handles reversed
20	Cool Warm Group 3000K	2	Brightness for cool white	Brightness for warm white	CCT tuning 1900-3000K, linear response, handles reversed

Common DMX RDM Controllers

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

Note:

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

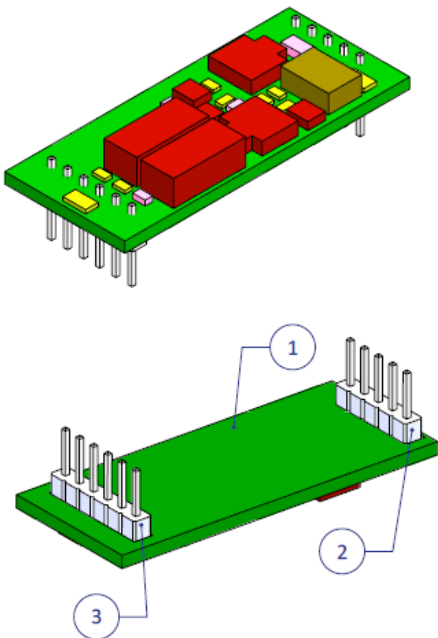
DALI Control Functions

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 Fig 25. This will connect the DALI control input to pin 2 (DA) and pin 3 (DA) of connector J7 on the motherboard. See Fig 27.

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_cooltest=0) or resetting the ARD function 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 25: DALI daughter card

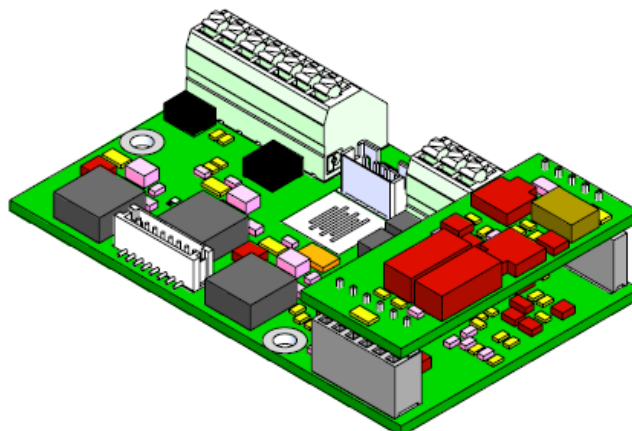


Figure 26: DALI card plugged in to 0-10V driver board

DALI Wiring Diagram

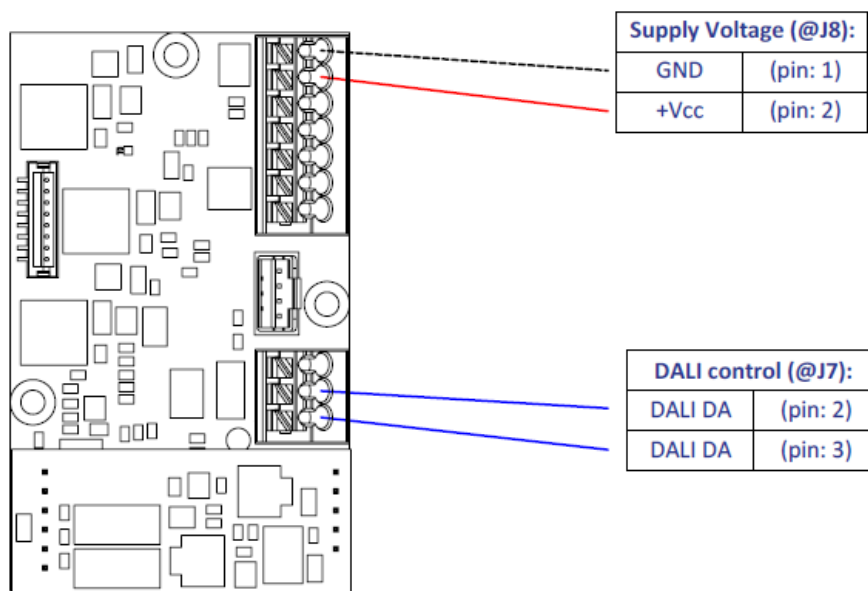


Figure 27: Wiring diagram for DALI control

Common DALI Controllers

Supplier	Model (for CCT tune, DT8 compatible)
Lunatone	DALI Cross Switch
Hadler	DALI uP
Tridonic	DALI TouchPanel 02
LumiTech	HMI DALI Touchpanel DT8

	Model (for dim to warm, standard DT6 compatible)
Leviton	Dali Controller On/Off, pn.CD250-C

Note:

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

BLE Mesh & Casambi App Control Functions

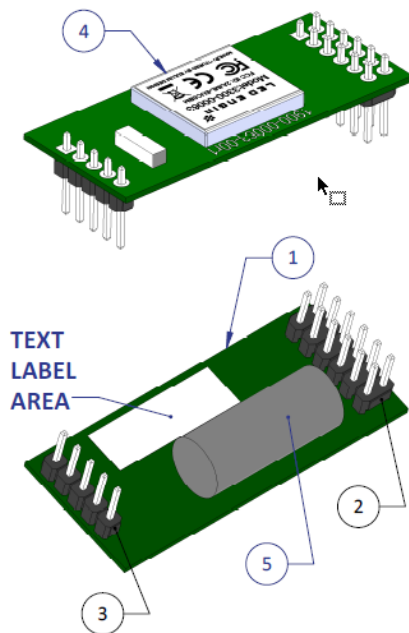
LuxiTune Gen 3 light engine can be controlled wirelessly using a Bluetooth (BLE) daughter card, in conjunction with the Casambi App for iOS and Android devices. The Casambi Bluetooth App can be downloaded from the Apple store or Google Play store for iOS and Android devices. In case of Android devices, 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 and CE certified 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 2100K to 4300K 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



ITEM NO.	PartNo	DESCRIPTION	Default /QTY.
1	1910-00063-00	Bluetooth Casambi PCB Board	1
2	(@ J1), SULLINS PN: PRPC006DAAN-RC	(@ J1): CONN HEADER .100" DUAL STR 12POS	1
3	(@J2), SULLINS PN: PRPC005SAAN-RC	(@J2): CONN HEADER .100" SNGL STR 5POS	1
4	LB-3300-00063	FCC and CE Label	1
5	Nichicon PN: UHE0J12MPD	1200µF 6.3V Aluminum Capacitors Radial	1

Figure 28: BLE daughter card

In order for LuxiTune to function with the Casambi wireless App, a Bluetooth (BLE) daughter card, shown in Fig 28, must be connected to the 0-10V driver board. Align the double and single row of pins on the BLE module (shown in Fig. 28) with the double row header (J9) and single row header (J6) on the LuxiTune driver board (shown in Fig 17). Plug the BLE card so that the pins are pushed into the headers as shown in Fig. 29 below.

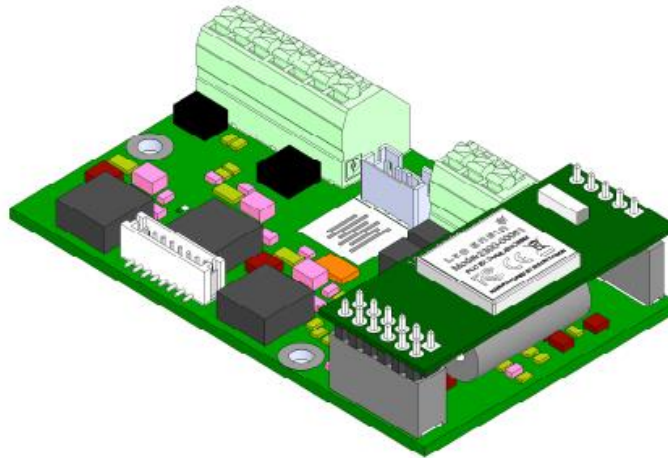


Figure 29: BLE card plugged in to 0-10V driver board

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 Fig 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 2100K to 4300K, a jumper is required between the pins on header J8 as shown in Fig. 30.

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

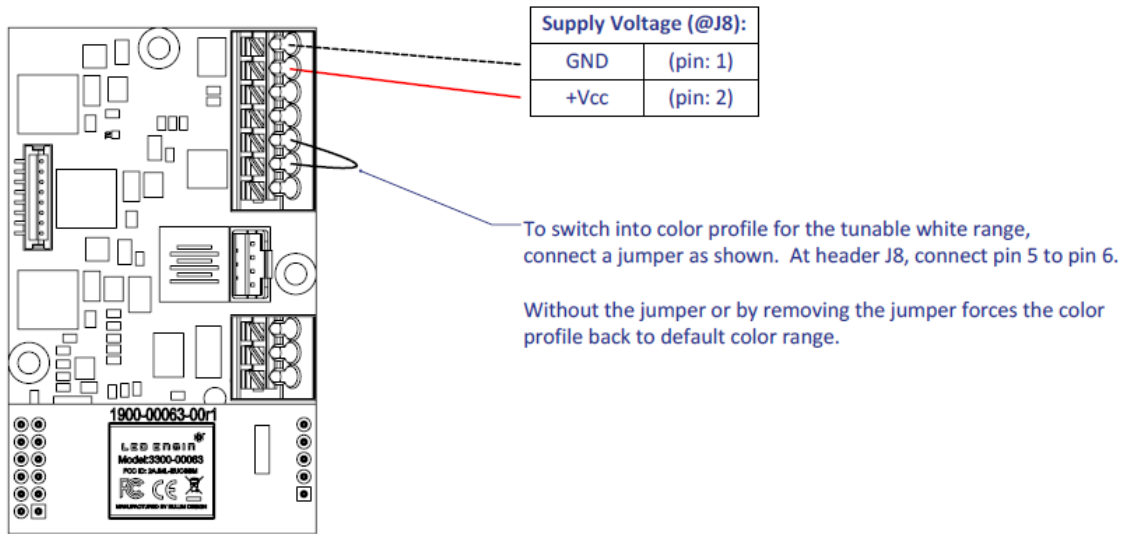


Figure 30: Wiring diagram for switching color profiles

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 Fig 28.
T005-xxxxxxx 13 character QR code is an unique identifier for matched emitter board and 0-10V driver board
T005 first 4 characters on 0-10V driver board & emitter MCPCB indicate standard tunable LTC
xxxxxxx last 8 characters indicate an 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 as follows.
 - Type: QR code 13 char, 16x16 dots, 4x4mm
 - Code content example: example T005-00000012 refers to unit 12 of type T005
 - QR code labels are printed twice for each unit – once on emitter MCPCB and once on 0-10V driver board
 - Primary label dimensions: 0.375" x 0.375"
 - Label type: high temperature resistant (polyimide based)
 - Location and position of primary label: on the driver board (T005) and on the MCPCB (T005)

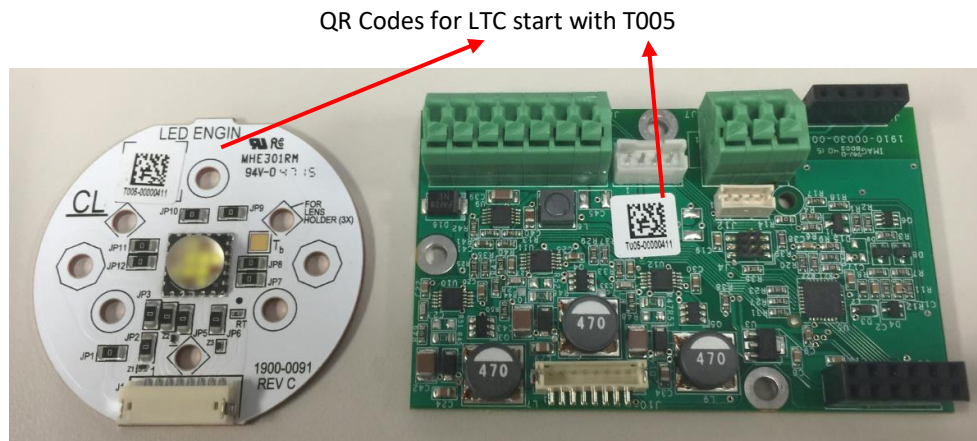


Fig 28. LuxiTune QR codes on matched pair

- Packaging for the LuxiTune matched pair units is as follows
 - Anti-static coated plastic carrier holds a single driver board/emitter board matched pair.
 - Up to 8 plastic carriers are packed in an ESD bag, which then go inside a pizza box
 - 1st box/ Pizza box (14" x 14" x 2") can fit 8 sets (2x4 arrangement; each set is 3" x 6.5" x 1").
 - Outer box/ Shipper box (15" x 15" x 15") can fit 7 pizza boxes.
 - Can fit 56 sets into shipper (outer box), depending on number of sets ordered.

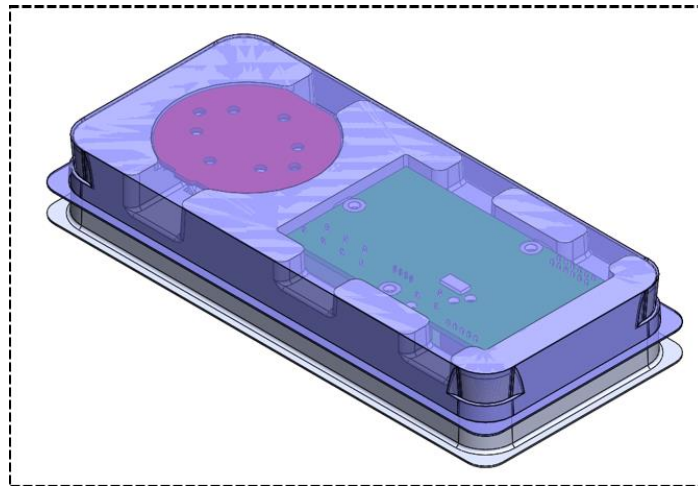


Fig 29. Plastic carrier for LuxiTune units

- Daughter cards are typically packaged in ESD bags for smaller volumes
 - Connector pins on daughter cards are protected by ESD foam
 - ESD bags are shipped in standard shippers depending on quantity ordered
- Anti-static coated plastic carrier with lid that can hold 44 DMX-RDM daughter cards is available for high volume orders.
 - Stackable trays
 - Identification label with part number applied to a set of stacked trays

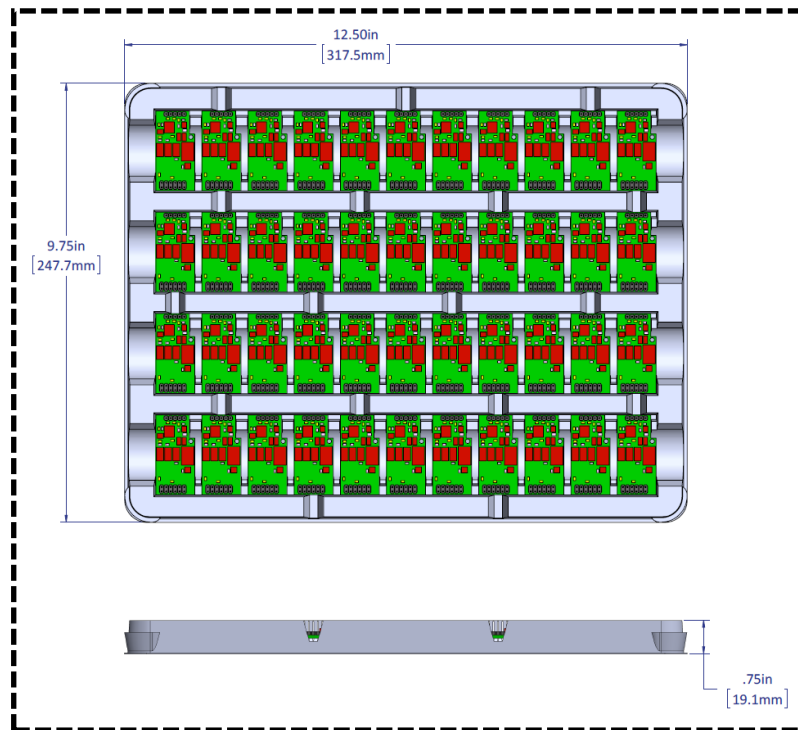


Fig 30: Tray for RDM card

- Cables, when ordered, are shipped separately from the matched pairs. Cables can be used interchangeably.

- Any LTC compatible TIR optics ordered are 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.

RoHS Compliance

LuxiTune products do not contain any restricted hazardous substances (RoHS) with levels above the threshold limits permitted in accordance with EU Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment. Declarations for this product can be obtained from your local LED Engin representative.

About LED Engin

LED Engin, an OSRAM business 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 or +1 408 922-7200.