Superlum Broadband Light Sources

cBLMD-series (2nd Generation) Compact Broadband Light Source Modules with Extended Bandwidth.

Technical Product Specification

Document Number SL.3328.00.000D3
June 2017
Revision 001

RoHS
COMPLIANT
2002/95/EC

Superlum, Unit B3, Fota Point Enterprise Park, Carrigtwohill, Co. Cork, Ireland.
Phone: +353 21 4533666, Fax: +353 21 4533026, Web site: www.superlumdiodes.com, E-mail: sales@superlum.ie.

Revision History

Revision	Description	Date
001	Initial release.	June 2017

Contents

Product Description

Compact cBLMD series light source modules are the most powerful and very broadband light sources based on a combination of two or three SLDs with slightly different center wavelengths.

A built-in stable and reliable 12 V DC powered SLD current and temperature controller allows switching SLDs on and off either by a push button, or externally by a TTL-level signal, or from a PC via a USB port. SLDs operate in constant power mode in standard models. The LEDs on the front panel provide visual indication of the light source status.

The SLDs are pre-set at factory to achieve the best combination of spectrum width and output power. The parameters of each SLD may be varied using Companion Software to meet particular customer needs.

cBLMD modules should be put on an appropriate heatsink in order to achieve the widest possible operating temperature range. It is also possible to use cBLMD modules without a heatsink. However, this will limit the maximum ambient operating temperature to +35 °C.

Standard models have FC/APC mating sleeve. Other connectors are also available upon request.

SLDs may be very sensitive to optical feedback. There are cBLMD models with and without internal optical isolators. For models without isolators, optical feedback should not exceed −30 dB. If the optical feedback level is supposed to be higher, consult with a Superlum representative before placing an order.

This specification describes standard models offered by Superlum, although a flexible design and a great number of different SLD modules available for integration allow a lot of customized light sources to be designed, including sources with non-overlapped SLDs' spectra. **Custom models with a single SLD module are available upon request.**

Applications

- OCT, including Ultra High Resolution systems
- Fiber Optic Sensing
- Optical Metrology
- Testing of Optical Components
- Biomedical Imaging
- Low-Coherence Interferometry

Features

- High optical power
- Extremely wide emission spectra
- Coherence length* of 3 μm in some models
- Easy use — just apply DC voltage
- Compact design
- Excellent stability
- Low noise
- USB and TTL control
- Modulation (optional)
- +12 V DC supply
- Operating temperature range +5 to +45 °C

*coherence length is defined as full width at half maximum of the coherence function plotted versus mirror displacement.

Mechanical Specification

Mechanical drawing of the cBLMD light source module is shown in Figure 1.

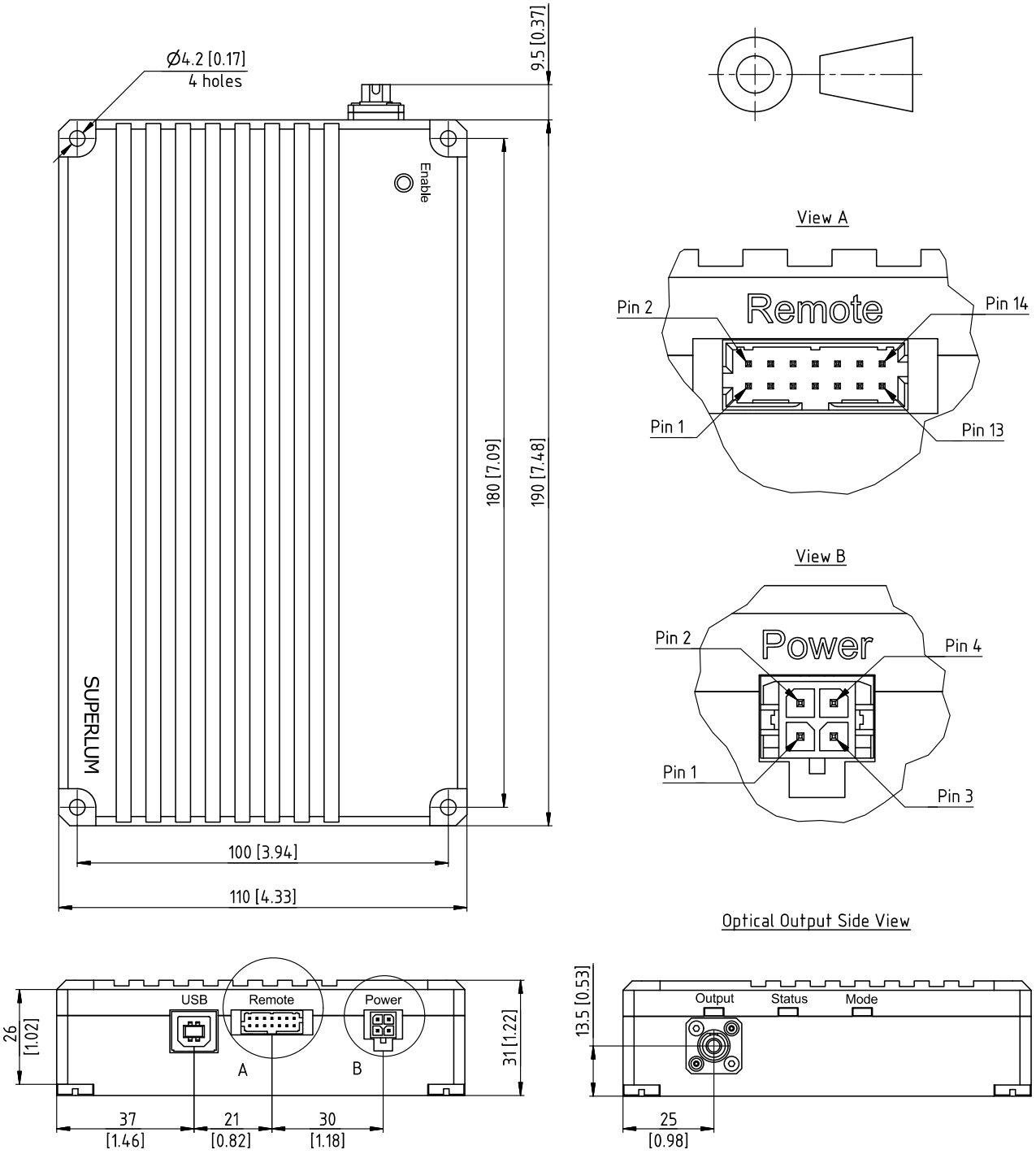

Figure 1. Drawing of cBLMD light source module. Dimensions are in millimeters [inches]. Three LEDs on the front panel ("Output", "Status" and "Mode") provide visual indication of the device status. The "ENABLE" push button on the top cover is used to manually switch optical output on/off.

Electrical Connections

Electrical connections of the standard cBLMD light source are shown in Figure 1. There are three connectors on the back panel: a 12 V DC power input, a remote control interface and a USB interface (a USB 2.0 Standard-B receptacle). The remote control interface allows the host to monitor the status of the light source and to switch SLDs on and off. It also provides remote interlock capability. Electrical Inputs/Outputs are described in Table 1. Electrical circuit diagram for the remote control interface is shown in Figure 2.

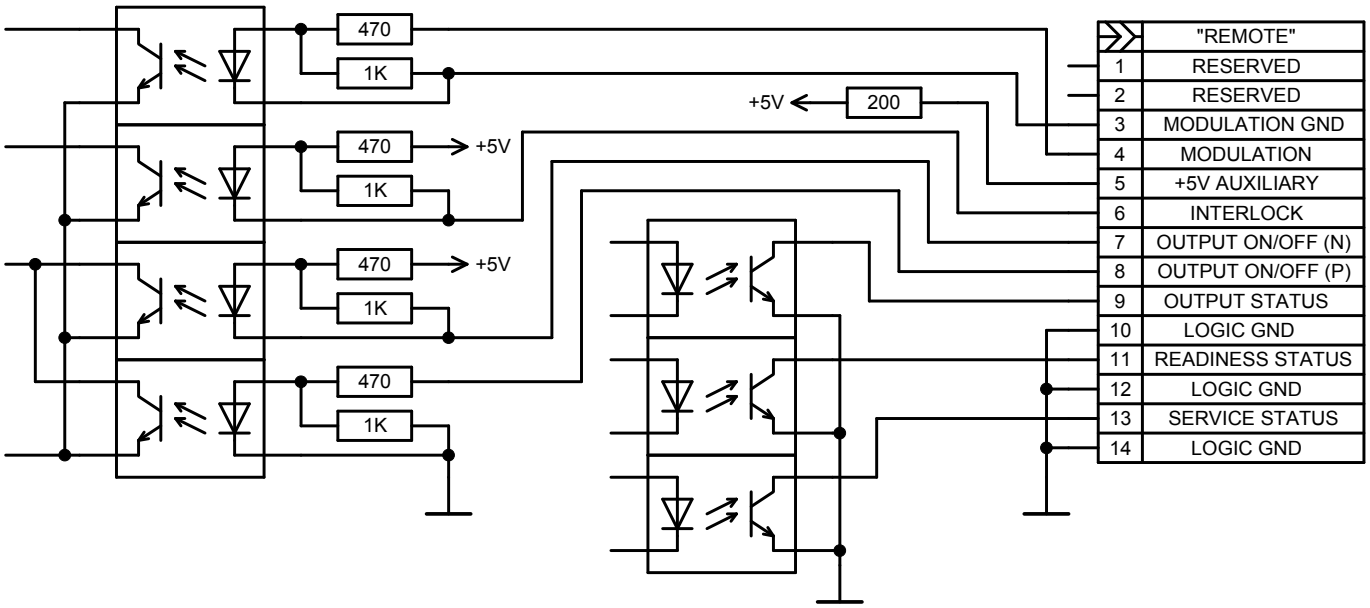

Figure 2. Electrical circuit diagram for the remote control interface starting with optocouplers at the left and ending with the “REMOTE” connector at the right.

Table 1. Pin function descriptions.

Pin		IN/OUT	Description
Number	**Name**		
DC power input			
1	GND		Power ground
2	+12 V	IN	+12 V DC
3	GND		Power ground
4	+12 V	IN	+12 V DC
NOTE: Power ground and the case of the cBLMD light source module are **not connected** inside the module.			
REMOTE port			
1	RESERVED		Reserved for future use.
2	RESERVED		Reserved for future use.
3	MODULATION GND		External modulation ground (for Pin 4).
4	MODULATION	IN	External modulation input.
5	+5V AUXILIARY	OUT	Auxiliary power supply output: +5V, 200 Ω output impedance. Use any LOGIC GND pin for the return.
6	INTERLOCK	IN	Remote interlock input. Use any LOGIC GND pin for the return. When this pin is left open-circuited, the optical output is disabled.
7	OUTPUT ON/OFF (N)	IN	Allows switching the optical output on/off. Connect this pin to any LOGIC GND pin to switch optical output ON.
8	OUTPUT ON/OFF (P)	IN	Allows switching the optical output on/off. Apply +5V DC voltage from an external power supply to this pin referenced to any LOGIC GND pin to switch optical output ON.
9	OUTPUT STATUS	OUT	Open collector. Goes to low impedance state when the optical output is ON.
10	LOGIC GND		Logic ground.
11	READINESS STATUS	OUT	Open collector. Goes to low impedance state when the module is ready.
12	LOGIC GND		Logic ground.
13	SERVICE STATUS	OUT	Open collector. Goes to low impedance state when service is required.
14	LOGIC GND		Logic ground.

Every cBLMD light source is delivered with companion software for remote control of the light source from a PC via a USB port. The companion software can be used to control the operating modes of cBLMD light source and to diagnose the status of each SLD.

Spectral Control Tool

The Spectral Control Tool is a new feature of cBLMD companion software. This tool can be used to adjust the optical spectrum of the cBLMD light source to meet customer-specific application requirements. The examples for a 3-SLD model are shown in figures below.

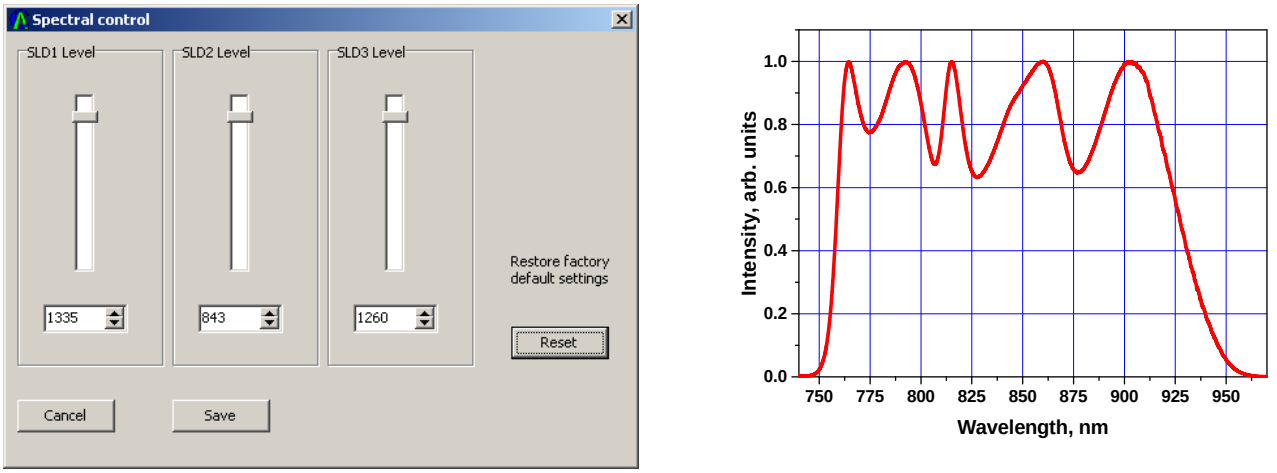

Figure 3. Factory settings (all intensity peaks of the 3 SLDs are equal)

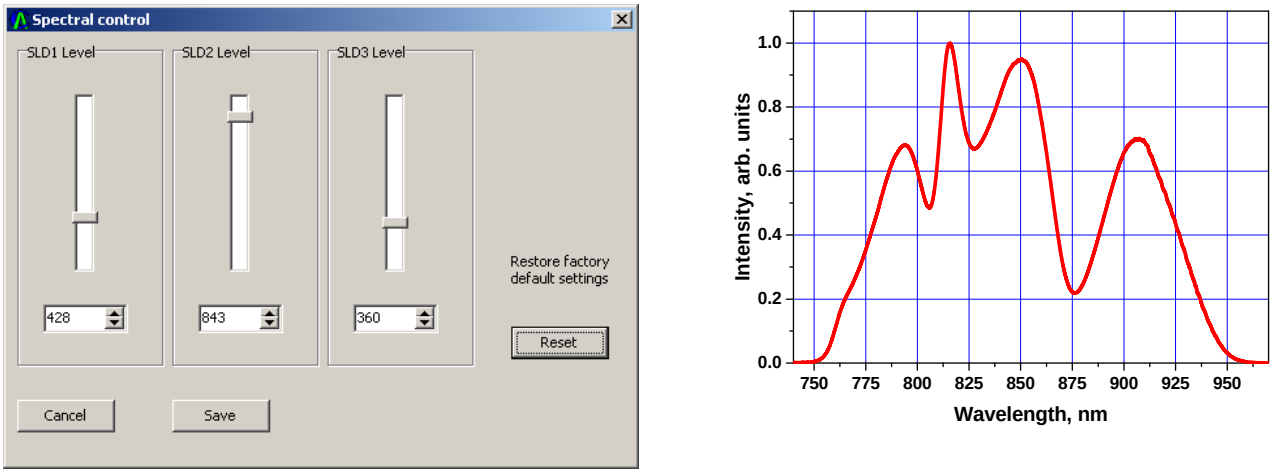

Figure 4. SLD1 and SLD3 power levels were lowered. SLD2 power level remains at factory settings

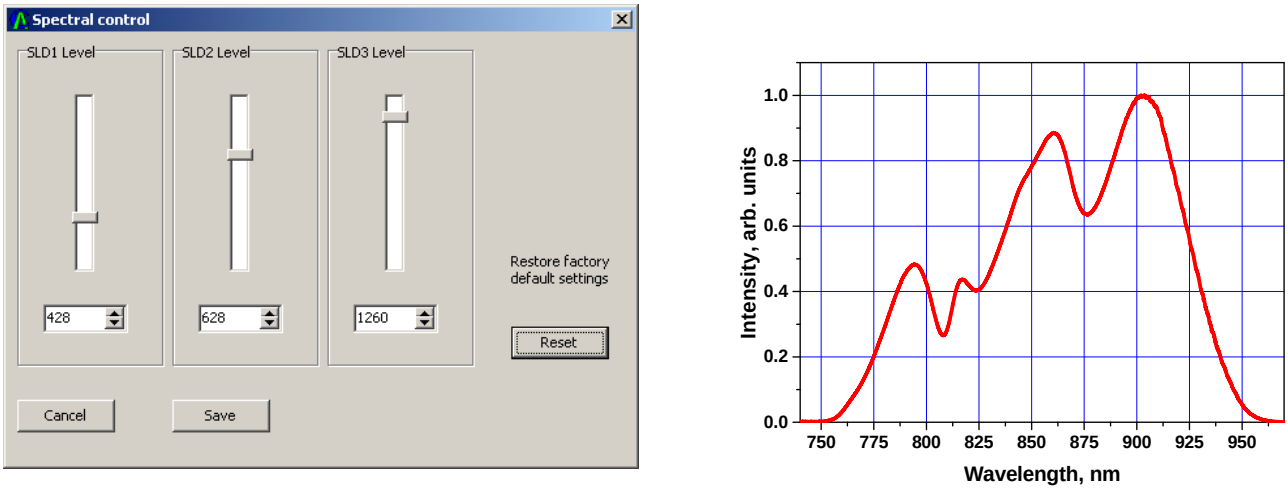

Figure 5. SLD1 and SLD2 power levels were lowered. SLD3 power level remains at factory settings

Fiber and Optical Connector Specifications

Table 2 describes the fiber and connector used in standard cBLMD models.

Table 2. Fiber and connector.

	Type	Comments
Fiber type	SM	Corning HI780 fiber
Mode field diameter / Numerical Aperture (NA)	5 µm / 0.14	
Connector type	FC/APC	A fiber pigtailed output with an FC/APC connector is available upon request.
Connector key type	Tight-fit/narrow	

Environmental Specifications

Table 3. Environmental specifications.

Parameter	Condition	Min	Typ	Max	Unit
Storage temperature		−20	–	+60*	°C
Operating temperature	cBLMD mounted on a heatsink dissipating 35 W	+5	–	+45*	°C

* For models containing 3 SLDs and optical isolator. Operating temperature range is wider for modules without isolators. Light source modules must be fixed onto an appropriate heatsink in order to achieve the widest possible operating temperature range. However, it is also possible to use cBLMD without a heatsink, although in a limited range of ambient temperatures. The highest operating temperature without heatsinking is +35 °C in case of a free air circulation around the package for modules containing 3 SLDs and an isolator.

Electrical and Optical Characteristics

Table 4 provides a summary of electrical specifications for the cBLMD light source.

Table 4. Electrical specifications.

Parameter	Condition	Min	Typ	Max	Unit
DC power input					
Supply voltage	Referenced to GND	9.0	12.0	15.0	V
Supply current		–	–	2.5	A
Ripple and noise	Peak-to-peak value	–	–	60	mV
REMOTE port					
Input voltage (input pins)	Referenced to LOGIC GND	0	5	6	V
Input current (input pins)		–	–	10	mA
Output voltage (output pins except the +5V AUXILIARY pin)	Referenced to LOGIC GND	–	–	20	V
Output current (output pins)		–	–	10	mA

Main optical parameters of standard cBLMD light source modules are presented in Table 5, although Superlum offers a lot of custom-made light sources. A flexible design and a great number of different SLD modules available to choose from makes it possible to tailor the performance characteristics of the light sources to meet specific customer application requirements. Other electro-optical parameters of standard light sources are shown in Table 6. The weight of the standard light source containing 3 SLDs and an optical isolator is 950 grams.

Standard cBLMD broadband light sources may have 2 or 3 SLDs inside. The model number starting with “cBLMD-D” indicates that the light source contains 2 SLDs. The model number starting with “cBLMD-T” indicates that the light source contains 3 SLDs. An "-I" suffix to a model number indicates that the model contains an optical isolator.

Note that UBB-series devices (ultra-broadband) are characterized by a 6-dB spectral width, while all other devices are characterized by a 3-dB spectral width (FWHM). The spectral flatness within the 6-dB bandwidth may exceed 3 dB but never exceeds 4 dB.

Table 5. Standard cBLMD models—optical parameters.

Model number	Power, mW		Center wavelength, nm	3 dB spectrum width, nm		Ripple, %		Spectral flatness
	Min	Typ		Min	Typ	Typ	Max	
2-SLD models								
cBLMD-D-840-HP-I	9.0	10.0	840±10	90	100	2.0	5.0	≤ 45 %
cBLMD-D-860-G-HP2	15.0	20.0	860±10	60	70	2.0	5.0	Bell-shaped
cBLMD-D-860-G-HP2-I	10.0	12.0	860±10	60	70	2.0	5.0	Bell-shaped
cBLMD-D-880-HP-I	6.0	7.0	880±10	95	100	2.0	5.0	≤ 30 %
cBLMD-D-890-HP1	5.0	6.0	890±10	140	150	2.0	5.0	≤ 45 %
cBLMD-D-890-UBB-HP	8.0	10.0	890±10	180 (6 dB)	190 (6 dB)	2.0	5.0	≤ 4 dB
3-SLD models								
cBLMD-T-850-MP	5.0	6.0	850±10	155	165	2.0	5.0	≤ 45 %
cBLMD-T-850-HP	12.0	15.0	850±10	155	165	2.0	5.0	≤ 45 %
cBLMD-T-850-HP-I	8.0	10.0	850±10	155	165	2.0	5.0	≤ 45 %
cBLMD-T-860-HP	12.0	15.0	860±10	125	135	2.0	5.0	≤ 35 %
cBLMD-T-860-HP-I	8.0	10.0	860±10	125	135	2.0	5.0	≤ 35 %
cBLMD-T-870-HP	6.0	8.0	875±10	170	180	2.0	5.0	≤ 45 %

Table 6. Standard cBLMD models—stability and noise*.

Parameter	Condition	Min	Typ	Max	Unit
Temperature dependent drift of output power	+5 to +45 °C	–	100	–	ppm/°C
Relative Intensity Noise (RIN)	10 kHz to 2 MHz	–	−130	−125	dB/Hz
Long-term optical power stability, at a case temperature of 25±1 °C	8 h after a 30-minute warm-up	–	2500	–	ppm
System warm-up time	+5 to +45 °C	20 †	30	90 ‡	min

* Note that this table presents parameters for models containing 3 SLDs with no optical isolator. Models with 2 SLDs inside will provide better stability and may have wider operating temperature range. Stability of modules with optical isolators depends on the isolator used.
† At +25 °C.
‡ At extremes of operating temperature range.

Mounting / Heatsinking

Light sources should be mounted to an appropriate heatsink capable of dissipating up to 15 W. Free air circulation around the top cover is required. A light source may be used without a heatsink, but it will limit the maximum operating temperature to +35 °C. Free air circulation around the cBLMD is absolutely required when it is used without a heatsink.

Laser Safety Considerations

The product emits invisible light that may have a potential hazard associated with CLASSES 3R-3B of IEC 60825-1 depending on a particular model number.

The cBLMD light source is designed for use as a component for integration into photonics equipment and it is, therefore, out of scope of applicable standards related to laser safety, such as IEC 60825-1. Note, however, that any equipment incorporating this component may be subject to these standards. cBLMD modules do not have ***ALL*** the laser safety features (like remote interlock, key operated master control, warning signals and labels). However, these features can be implemented using “Remote” or USB interfaces.

Please contact Superlum for more details about laser safety issues for each particular model of cBLMD light source modules.

Compatibility Considerations: Migrating from cBLMD (1st Gen) to cBLMD (2nd Gen)

Hardware Considerations

The indicator LEDs were moved to the front panel. The ENABLE push button was moved to the upper-left corner of the top cover. See Figure 1 for details.

The connector locations on the back panel were shifted slightly.

The 2nd generation of cBLMD devices has a new REMOTE connector. The 14-pin connector is used, rather than the 10-pin connector found on the 1st generation of cBLMD devices. See **Pin-Out Compatibility** section below.

Software Considerations

To ensure correct operation, use the Companion Software version that is shipped with the 2nd generation of cBLMD devices. The version shipped with the previous generation is not compatible with the new generation.

Pin-Out Compatibility

Given that the 2nd generation of cBLMD devices has the 14-pin REMOTE connector, rather than the 10-pin connector found on the 1st generation of cBLMD devices, an effort was made to ensure there was functional compatibility between the generations of cBLMD devices such that the 2nd generation could be easily adapted into a design that previously had used the 1st generation. Table 7 demonstrates how the pins of the 14-pin REMOTE connector of the 2nd generation map to the pins of the 10-pin REMOTE connector of the 1st generation of cBLMD devices.

Table 7. Pin compatibility mapping.

cBLMD (2nd Gen)		cBLMD (1st Gen)		Comments
Pin Number	Pin Name	Pin Number	Pin Name	
1	RESERVED	–	–	These pins must be left not connected.
2	RESERVED	–	–	
3	MODULATION GND	–	–	
4	MODULATION	–	–	
5	+5V AUXILIARY	1	+5V AUX	
6	INTERLOCK	2	INTERLOCK	
7	OUTPUT ON/OFF (N)	3	SLD ON/OFF	
8	OUTPUT ON/OFF (P)	–	–	This pin has no direct matching pin in the cBLMD (1st Gen) but can be either connected to logic ground or left not connected.
9	OUTPUT STATUS	5	EMISSION	
10	LOGIC GND	6	LOGIC GND	
11	READINESS STATUS	7	READY	
12	LOGIC GND	8	LOGIC GND	
13	SERVICE STATUS	9	SERVICE REQUIRED	
14	LOGIC GND	10	LOGIC GND	