



**SLD-CS** are high power, wide spectrum light source modules based on a miniature PCB controller with an SM or PM fiber coupled SLD module at a fixed wavelength within the 670-1630 nm spectral band. The SLD inside SLD-CS is protected against optical feedback by an appropriate isolator. SLD-CS can be supplied with or without a stand-alone AC-DC power supply-

Optical performance parameters are specified on the datasheets enclosed with each SLD-CS. There are two datasheets enclosed, one showing SLD-CS spectral parameters and settings, the other showing light-current and current-voltage characteristics of the SLD module inside the light source. A copy of any datasheet may be requested from Superlum at any time by referring to the serial number of your SLD-CS source.

SLD-CS light sources have two operation modes, "internal" and "external". In "internal mode", the SLD-CS output power is set by a built-in "set" potentiometer. In "external" mode, the SLD-CS power is determined by the DC voltage applied to the correspondent pin of the SLD-CS "ANALOG" connector.

SLD module operates in a constant Power (APC) mode in all standard SLD-CS light sources. Output power is stabilized by stabilizing SLD's chip back facet PD monitor photocurrent.

## **WARNING**

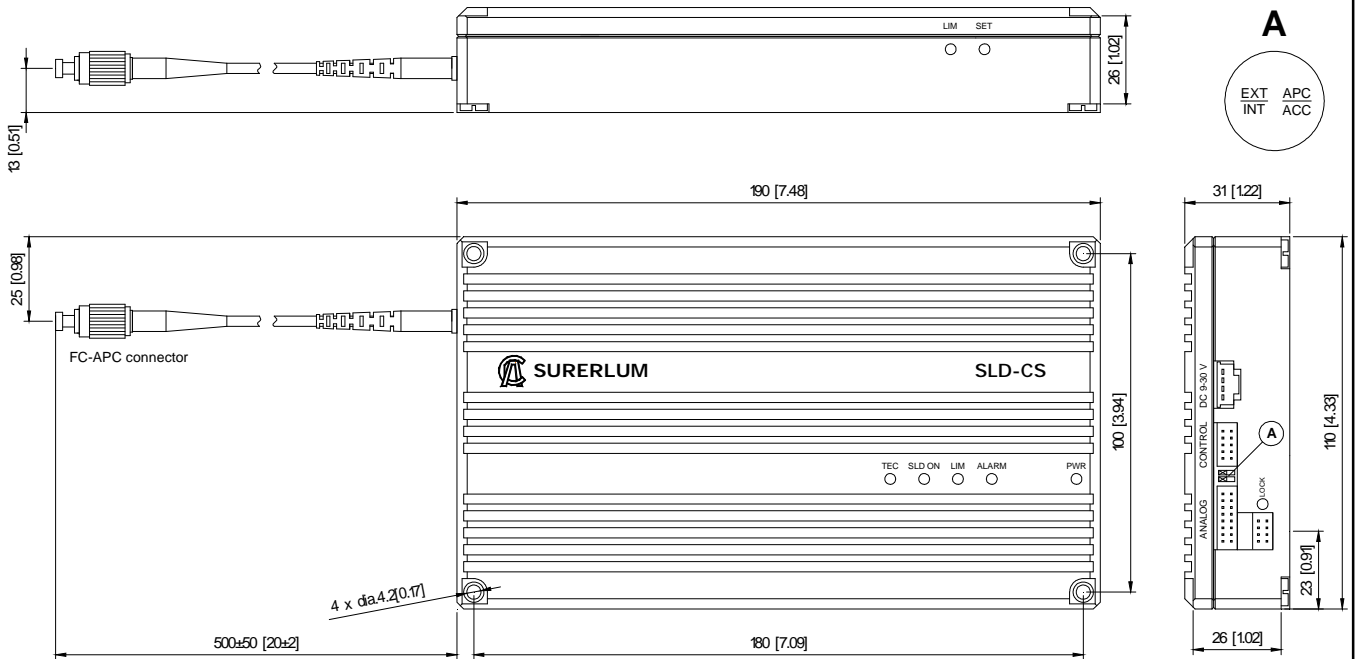
SLD-CS sources (except models at 680 nm) emit invisible light that may have a potential hazard associated with **CLASS 3R to 3B of IEC 60825-1** (Edition 2.0; 2007-03). **If required, please contact Superlum for more details about laser safety classification of SLD-CS light sources before using them.**

## **WARNING**

Double-check maximum value of the set voltage ( $V_{set}$ ) applied to pin 9 of SLD-CS sources before powering them up in "external" operating mode. This voltage sets stabilized value of PD monitor current thus determining the output power of SLD-CS. **Never exceed "MAXIMUM  $V(int)$ " shown on the datasheets attached to each SLD-CS.** Use  $V_{set(max)} = I_{pd(max)} \times 1 \text{ V/mA}$ , where  $I_{pd(max)}$  is the value of "maximum PD monitor current" to calculate maximum value of  $V_{set}$ .

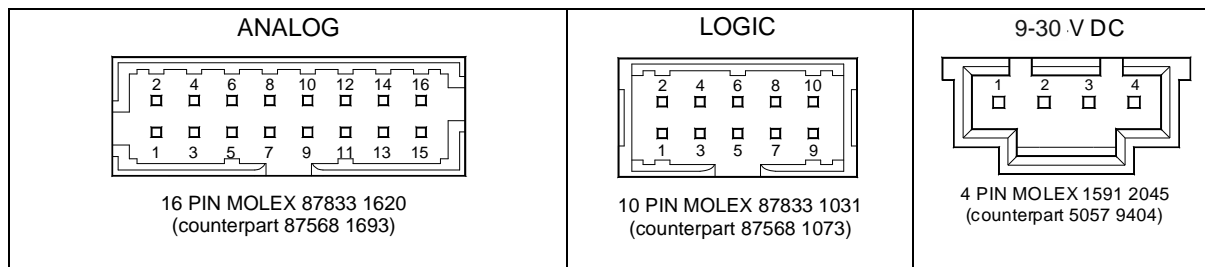
**Applying of the  $V_{set}$  exceeding the MAXIMUM  $V(int)$  will result in permanent damage and reduced lifetime, or may result in catastrophic failure of SLD chip.**

Drawing of SLD-CS light source module is shown in the Fig.1.



**Figure 1.** Drawing of SLD-CS light source module. All dimensions are in millimeters [inches]. On the front side of the device: “LIM” – potentiometer for setting the SLD current limit, “SET” – potentiometer for setting the SLD power or drive current in the “internal control” mode. Status LEDs on the top side: “TEC” (SLD temperature setpoint is reached), “SLD ON” (SLD is on), “LIM” (drive current limit is reached), “ALARM” (system error occurred), “PWR” (power is on). Operation mode switches on the right side: “EXT/INT” (“external control” mode/“internal control” mode), “APC/ACC” (Automatic Power Control/Automatic Current Control).

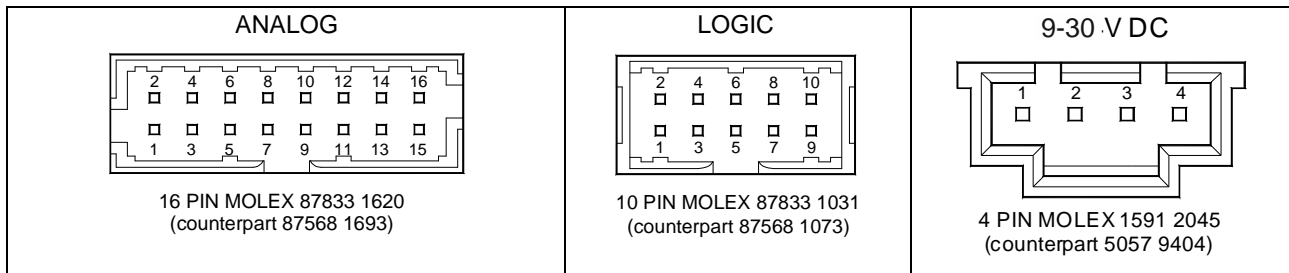
Electrical connections of a standard SLD-CS light source are shown in the Fig.2 below. Electrical Inputs/Outputs are described in the Table 1 below.



**Figure 2.** Pin configurations for SLD-CS control ports and power supply connectors.

Detailed description of input/output control and power supply connectors is presented in Table 1 below.

Electrical connections of the standard SLD-CS light source are shown in Figure 2 (see below). Electrical Inputs/Outputs are described in Table 1 (see below). The DC power input accepts +9 to +30 V / 1.2 A (max) from an external power supply unit.



**Figure 2.** Pin configurations for SLD-CS control ports and power supply connectors.

**Table 1.** Pin function descriptions.

Pin number	Name	IN/OUT	Description/structure
<b>DC power input (4 pin MOLEX Connector P/N 1591 2045)</b>			
1,2	+9 to +30 V	IN	+9 to +30 V DC
3,4	GND		Power ground
<b>Attention:</b> Power ground, Analog ground and case of SLD-CS light source are connected inside the device.			
<b>LOGIC CONTROL (10 pin MOLEX Connector P/N 87833 1031)</b>			
1	STATUS TEC	OUT	Open collector. Goes to low impedance state when the SLD temperature setpoint is <b>NOT</b> reached.
3	STATUS SLD	OUT	Open collector. Goes to low impedance state when SLD is ON.
5	STATUS LIM	OUT	Open collector. Goes to low impedance state when the SLD current limit is reached.
7	SLD ON/OFF	IN	SLD ON/OFF; <b>SLD is ON when 5 V is applied, OFF when 0 V is applied</b> ; 200 Ω and LED of optocoupler in series.
9	ALARM	OUT	Open collector. Goes to low impedance state in case of system error
2,4,6,8,10	LOGIC GND		Logic ground.
<b>Attention:</b> It is not recommended to connect Logic ground to Analog ground as it may result in increased noise.			
<b>ANALOG CONTROL (16 pin MOLEX Connector P/N 87833 1620)</b>			
1	+5 V AUX	OUT	+5V DC auxiliary output; 20 mA max.
3	SLD I LIMIT	OUT	Analog output; Indicates the set SLD current limit.
5	REF OUT	OUT	Reference voltage output, 4.5 V; R= 50 Ω.
7	PD OUT	OUT	Analog output; Indicates the back-facet PD monitor current.
9	SLD I SET	IN	Analog input; the voltage on this pin sets the SLD current (ACC) or sets the PD monitor current (APC)*.
11	SLD I REAL	OUT	Analog output; Indicates the real SLD current.
13	SLD I SETC	OUT	Analog output; Indicates the set SLD current.
15	TEC I	OUT	Analog output; Indicates the TEC current.
2,4,6,8,10,12,14,16	ANALOG GND		Analog ground.
<b>Attention:</b> Power ground, Analog ground and case of SLD-CS light source are connected inside the device.			

\* To enable this input, the “external control” mode must be selected with the “EXT/INT” operation mode switch.

## Absolute Maximum Ratings

Table 2 (see below) presents absolute maximum ratings of SLD-CS light sources.

**Table 2. Absolute maximum ratings\*.**

Parameter		Value
DC supply voltage		35 V
Optical power		Depends on SLD and pre-set current limit
Voltages - "ANALOG" I/O	"ANALOG" pin 1	4.5 V min., 5.5 V max.
Voltages - "ANALOG" I/O	"ANALOG" pins except pin 1	-0.3 to 7 V
Voltages - "LOGIC" I/O	Pin 7 SLD ON/OFF	-5 to 5.5 V
Voltages - "LOGIC" I/O	Open collectors	50 V
Electric current – "Analog" I/O	"ANALOG" pin 1	20 mA
Electric current – "Analog" I/O	"ANALOG" pins except pin 1	10 mA
Electric current – "LOGIC" I/O	Open collectors	100 mA
Electric current – "LOGIC" I/O	Pin 7 SLD ON/OFF	20 mA
Short circuit – "Analog" I/O		2 s maximum
Operating temperature (case)		0 to +50 °C
Storage temperature		-20 to +70 °C, depending on isolator used

\* **NOTICE:** Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only. Functional operation of devices at these, or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## SLD-CS status LEDs

SLD-CS sources also allow easy visual control of SLD status by four indicating LEDs on the top. Statuses of indicating LEDs on top cover are shown in the Table 3 below.

**Table 3. Statuses of indicating LEDs on top cover**

LED name	Status
POWER	Orange – mains DC 9-30 V applied to the controller
TEC	Blue – SLD temperature stabilization is in process Blank – SLD temperature is stabilized
SLD ON	Green- SLD emits light Blank – SLD does not emit light
ALARM	Blank – system OK Red – system error
LIMIT	Yellow when SLD real current equals to preset limit

## Electrical Parameters

Electrical parameters are described in Table 4 below. Scaling coefficients of control outputs are described in Table 5 below.

**Table 4. Electrical characteristics of SLD-CS sources.**

Parameter	Note	Min.	Typ.	Max.	Unit
DC supply voltage		9	-	30	V
DC supply current *		-	-	1.2	A
DC supply peak current †		-	-	1.2	A
SLD ON/OFF via "LOGIC" I/O	10 mA min.	4.0	5.0	5.5	V
Output power set via "ANALOG" I/O (input, 0-max)	APC mode	0.0	-	Data sheet	V
SLD drive current set via "ANALOG" I/O (input) ‡	ACC mode	0.0	-	4.0	V
ANALOG I/O – The set value of SLD current (output)		0.0	-	4.0	V
ANALOG I/O – The real value of SLD current (output)		0.0	-	0.4	V



ANALOG I/O – SLD current limit (output)		0.0	-	4.0	V
ANALOG I/O – TEC current (output)	0.3 V=-1.5A TEC 2.7 V=1.5A TEC	0.0	-	2.7	V
ANALOG I/O – Real PD monitor current (output)		0.0	-	4.0	V
ANALOG I/O – Reference voltage for control of SLD current	10 mA max.	4.477	4.50 0	4.523	V
ANALOG I/O – 5 V DC auxiliary output	20 mA max.	4.9	5.0	5.1	V

\* Depends on DC voltage applied. DC supply power of up to 11 W should be available to achieve stable operation at extremes of operating temperature range.

† Short-term peak current to assure rapid switching-on at temperature extremes.

‡ Optional only.

**Table 5. Detailed description of analog outputs (“ANALOG” I/O connector)**

PIN & name	Description	Scale	Voltage	Note
Pin 1, +5 V AUX	+5 V DC auxiliary output	-	5 V	± 2%
Pin 3, SLD I LIMIT	SLD current limit	1 V= 100 mA	0 – 4 V	± 5%
Pin 5, REF OUT	Reference voltage output	-	4.5 V	± 0.5%
Pin 7, PD OUT	PD monitor photocurrent	1 V=1 mA	0 – 4 V	
Pin 11, SLD I REAL	Real current through SLD	1 mV= 1mA	0 – 0.4 V	
Pin 13, SLD I SETC	Set PD monitor current *	1 V= 1 mA	0 – 4 V	
Pin 15, TEC I	TEC current	0.3 V=-1.5A TEC 2.7 V=1.5A TEC	0 – 2.7 V	

\* changes to set SLD drive current in ACC mode, 1 V=100 mA drive current

## First time switching on and routine use in “internal” mode.

SLD-CS light source is set to “internal” operation mode and constant power (APC) SLD driving unless otherwise specified. Applying 9-30 V DC “mains” powers up SLD temperature control circuit. Applying 5V to the pin 7 “SLD ON/OFF” of “LOGIC” connector switches SLD light on and off. SLD emits light when +5 V is applied to the pin 7. SLD will not emit light if its temperature is not stabilized independently on the voltage applied to the pin 7.

PD monitor current value is set to the “maximum PD monitor current” value shown on the datasheet. Preset SLD current limit is set to the “end-of-life” SLD current which depends on SLD module. **Do not attempt to change the preset value of SLD current limit (by the “LIMIT” pot, see fig. 1) before getting full approval from Superlum.**

I.1. Firmly fix SLD-CS light source module to an appropriate heat sink. Ensure there is free air circulation around the module. Ensure INT/EXT switch is set to INT and APC/ACC switch is set to APC.

**Attention : SLD-CS may be used without heat sinks at temperatures up to +40 C (depending on parameters of SLD module inside SLD-CS). However, proper heat dissipation from SLD-CS body is required to ensure stable operation at elevated temperatures, especially when the power consumption of SLD chip exceeds 0.5W. SLD chip power consumption may be checked by the Test Report enclosed to every SLD-CS light source module. Heat must be dissipated from the baseplate of SLD-CS module. System design must ensure free air circulation around top cover if SLD-CS sits on a heat sink, as well as free air circulation around SLD-CS baseplate if a lightsource is used without additional heat sink.**

I.2. Connect FC/APC connector to an appropriate optical power meter.



I.3. Connect AC-DC power supply to the light source module (or use your own DC supply). Obtain all required connections to LOGIC and ANALOG I/O connectors of the SLD-CS. Note only +5 V DC must be applied to pin 7 of LOGIC connector to switch the SLD emission on and off in “internal” control mode. Other DC voltage must be applied to pin 9 of the ANALOG connector to set SLD drive current (or PD monitor current) in “external” operation mode. Other outputs allow full control of SLD-CS status but are not required to switch the SLD emission on and off.

I.4. Connect AC-DC power supply to 110-220 V AC (or apply DC power by switching-on your own power supply). “Power” indicating LED will go orange. “TEC” LED will go blue for a very short time, a few seconds maximum, depending on SLD-CS case temperature. It will go blank then. Blank “TEC” LED and orange “POWER” LED means that the SLD inside SLD-CS is ready to emit light.

I.5. Apply +5 V DC to the pin 7 SLD ON/OFF of LOGIC connector. “SLD ON” LED will go green at the same time, indicating that the SLD is emitting light. Measure SLD power and compare results with the datasheets. Ensure output power is the same as that specified in the datasheets.

I.5. (Recommended) Connect light source to an appropriate spectrum analyzer. Measure SLD spectrum. Center wavelength and spectrum width must be the same as that in the datasheets.

I.6. It is recommended to switch off SLD light output by switching off +5 V DC applied to pin 7 of the LOGIC connector when SLD light it is not in use, keeping 9-30 V DC “mains” applied. Switching off the “mains” 9-30 V DC may result in a longer switching-on time of SLD emission, due to the time required to stabilize SLD chip temperature.

### **Important notice**

***It is possible to change SLD power by tuning “SET” pot (see Fig.1). Please always wear an Antistatic Wrist Strap if attempting to do so. Please also note that SLD spectrum may change when you change SLD drive current. In some models, especially in those based on SLD - 331, 371, 351, 371, 471, 521, 541, these changes may be very strong.***

### **Routine use in “external” mode.**

I.7. If external control of SLD power is required set EXT/INT switch to “EXT” position. ***NO VOLTAGES must be applied to SLD-CS light source module when operation mode is changed between EXT and INT.***

### **WARNING**

Double-check maximum value of the set voltage (Vset) to be applied to pin 9 of SLD-CS sources before powering them up in “external” operating mode. This voltage sets stabilized value of PD monitor current thus determining the output power of SLD-CS. Never exceed “MAXIMUM V(int)” shown on the datasheets attached to each SLD-CS. Use  $V_{set(max)} = I_{pd(max)} \times 1 \text{ V/mA}$ , where  $I_{pd(max)}$  is the value of “maximum PD monitor current” to calculate maximum value of Vset.

***Applying of the Vset exceeding the MAXIMUM V(int) will result in permanent damage and reduced lifetime, or may result in catastrophic failure of SLD chip.***

I.8. Apply the “mains” 9-30 V DC. Obtain STATUS LEDs lit according to I.4.

I.9. Apply set voltage Vset correspondent to required PD monitor current to the pin 9 of ANALOG connector. Calculate Vs voltage basing on  $V_{set} = I_{pd} \times 1 \text{ V/mA}$  ( 1 V applied corresponds to 1 mA PD monitor current)



I.10. Apply 5 V to the pin 7 of LOGIC connector. SLD will emit light.

***Important Notice***

***SLD-CS may be modulated (on/off) with a rate of up to 50 kHz (50% duty). Please use pin 7 of the LOGIC connector to do that.***