SUPERLUM

SLD-260-MP-TO9-PD-670: Medium Power TO-9 Packaged Free-Space SLDs at 670 nm.

Features:

- CW output power of up to 5.0 mW
- LD-like spatial brightness, single transverse mode output
- Bell-shaped LED-like spectrum with very small ripples

Applications:

- Atomic force microscopy
- Optical coherence tomography
- Optical sensors
- Optical measurements
- Low speckle illumination
- Others

TO-9 Package*

* Free-space SLD modules in "cooled" TOW packages with internal TEC and thermistor for SLD temperature stabilization are available upon request.

Specifications (at +25 °C case):

Parameter	Category	Min	Typ.	Max
Output power, P, mW	MP1	1.5	-	3.0
	MP2	3.0		5.0
Forward current, mA	All	-	-	160
Forward voltage, V	All	-	-	3.0
Central wavelength†, nm	All	660	670	680
Spectrum width†, nm	All	6.0	7.5	-
Residual spectral modulation depth†,% (Resolution 0.02 nm)	All	-	<1.0	2.0
Wavelength shift with temperature at P=3 mW, dλ/dT, nm/°C, to λ at +25 °C	All	-	0.28	-
Secondary coherence subpeaks†, (10 log), dB	All	-	-25	-
Polarization ratio†, dB	All	-	>20	-
Far field divergence in the p-n junction plane†, degrees	All	-	10	-
Far field divergence in the plane normal to p-n junction†, degrees	All	-	35	-
PD monitor photocurrent†, μA	MP1	50	-	-
	MP2	100	-	-
Operating temperature‡, °C	All	-20	-	+35
Storage temperature, °C	All	-55	-	+85

† At an output power of 3 mW (MP1) / 5 mW (MP2) and a case temperature of +25 °C.

‡ At +35 °C, maximum output power should not exceed 1.5 mW (MP1) or 2.5mW (MP2).

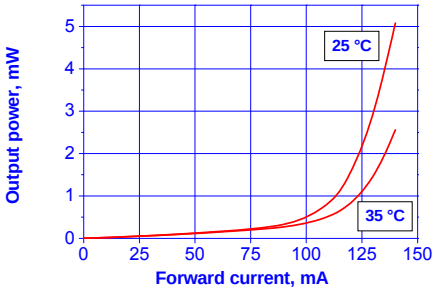
The following part numbers should be used when **ordering**:
SLD-260-MP(a)-(b)-PD-670,
where: (a) – power category (MP1 or MP2), (b) – package type.

Example: SLD-260-MP2-TO9-PD-670

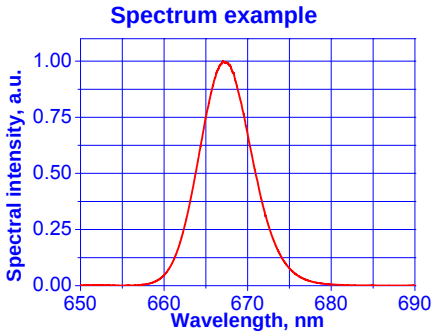
All specifications are subject to change without notice.

PERFORMANCE EXAMPLES

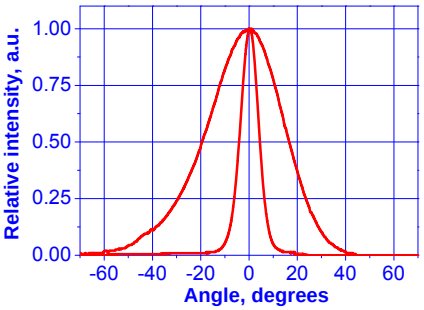
Light-current curves at different case temperatures



Spectrum example (5 mW)



Far field (5 mW)



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SUPERLUM

SLD-260-HP-TO9-PD-670: High Power TO-9 packaged Free-Space SLDs at 670 nm.

Features:

- CW output power of up to 15 mW
- LD-like spatial brightness, single transverse mode output
- Bell-shaped LED-like spectrum with very small ripples

Applications:

- Atomic force microscopy
- Optical coherence tomography
- Optical sensors
- Optical measurements
- Low speckle illumination
- Others

TO-9 Package

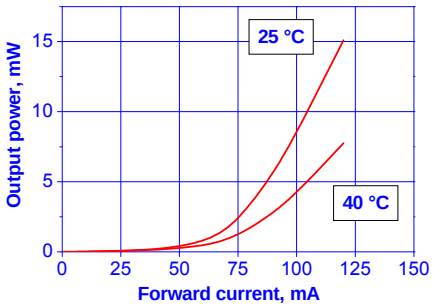
Specifications (at +25 °C case):

Parameter	Min	Typ.	Max
Output power*, P, mW	-	-	15
Forward current, mA	-	-	220
Forward voltage, V	-	-	3.0
Central wavelength†, nm	660	670	680
Spectrum width*, nm	6.0	7.5	-
Residual spectral modulation depth†,% (Resolution 0.02 nm)	-	<1.0	2.0
Wavelength shift with temperature at P>5mW, dλ/dT, nm/°C, to λ at +25 °C	-	0.28	-
Secondary coherence subpeaks*, (10 log), dB	-	-25	-
Polarization ratio*, dB	-	>20	-
Far field divergence in the p-n junction plane*, degrees	-	9	-
Far field divergence in the plane normal to p-n junction*, degrees	-	25	-
PD monitor photocurrent*, μA	50	-	-
Operating temperature†, °C	-20	-	+40
Storage temperature, °C	-55	-	+85

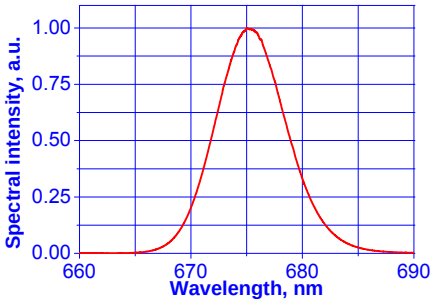
* At an output power of 15 mW and a case temperature of +25 °C.
† At +40 °C, maximum output power should not exceed 7.5 mW.

PERFORMANCE EXAMPLES

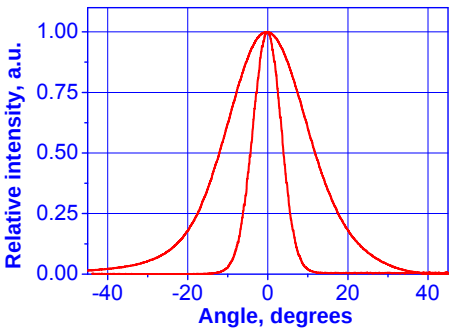
Light-current curves at different case temperatures



Spectrum example (15 mW)



Far field (15 mW)



The following part number should be used when **ordering**:

SLD-260-HP-TO9-PD-670

All specifications are subject to change without notice.

Rev.01.ST260TO9HP670.300817

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SUPERLUM

SLD-340-MP-TO9-PD-795: Medium power TO-9 packaged free-space SLD at 795 nm.

Features:

- CW output power of up to 20 mW
- LD-like spatial brightness, single transverse mode output
- LED-like bell-shaped spectrum with a very small ripples

Applications:

- Atomic force microscopy
- Optical coherence tomography
- Optical sensors
- Optical measurements
- Low speckle illumination
- Others

TO-9 Package

Specifications (at +25 °C case):

Parameter	Min	Typ.	Max
Output power, P, mW	–	–	20
Forward current, mA	–	–	140
Forward voltage, V	–	–	2.5
Central wavelength*, nm	785	795	805
Spectrum width*, nm	10	15	–
Residual spectral modulation depth*,% (Resolution 0.02 nm)	–	1.0	5.0
Wavelength shift with temperature P>5 mW, dλ/dT, nm/°C, to λ at +25 °C	–	0.24	–
Secondary coherence subpeaks*, (10 log), dB	–	−25†	–
Polarization ratio*, dB	–	10	–
Far field divergence in the p-n junction plane*, degrees	–	8	–
Far field divergence in the plane normal to p-n junction*, degrees	–	40	–
PD monitor photocurrent*, μA	100	–	–
Operating temperature‡, °C	−20	–	+55
Storage temperature, °C	−55	–	+85

* At an output power of 20 mW and a case temperature of +25 °C.
† Guaranteed secondary subpeaks below −20 dB upon request.
‡ At +55 °C, maximum output power should not exceed 10 mW.

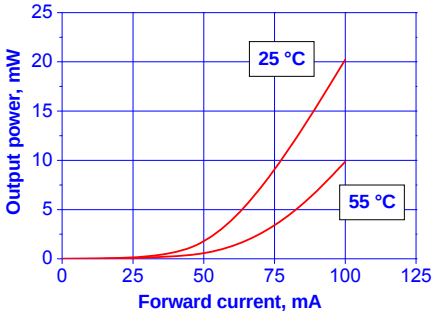
The following part number should be used when **ordering**:

SLD-340-MP-TO9-PD-795

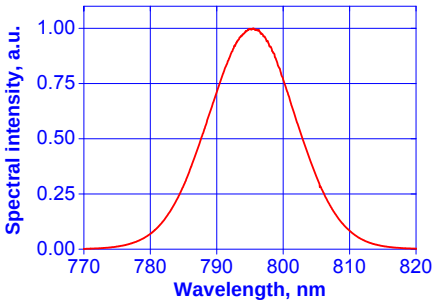
All specifications are subject to change without notice.

PERFORMANCE EXAMPLES

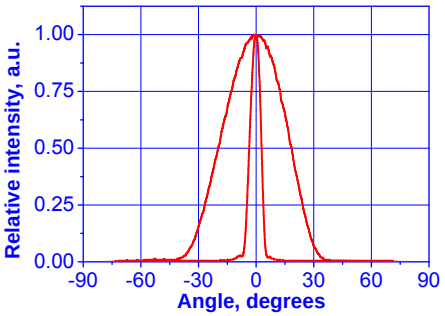
Light-current curves at different case temperatures



Spectrum example (20 mW)



Far field (20 mW)



Rev.01.ST340TO9MP795.300817

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SUPERLUM

SLD-380-MP-TO56-PD: Medium power TO56 packaged free-space SLD at 825 nm.

Features:

- CW output power of up to 5.0 mW
- Elliptical LD-like far field
- Bell-shaped spectrum with small residual Fabry-Perot modulation depth
- Low cost

Applications:

- optical illumination
- optical sensors
- optical measurements
- others

TO-56 Package

Specifications (at +25 °C):

Parameter	Min	Typ.	Max
Forward current at output power of 5.0mW, mA	-	130	150
Forward voltage, V	-	-	2,5
Center wavelength*, nm	810	825	840
Spectrum width, nm	20	25	-
Residual spectral modulation depth** at output power of 5 mW, %	-	4.0	5.0
Polarization ratio, dB	-	5	-
PD monitor photocurrent at output power of 5.0mW, µA	100	-	-
Operating temperature, °C	-20		+55
Storage temperature, °C	-55		+85

* other center wavelength upon request

** at an output power of 3 mW residual spectral modulation depth (ripple) is below 3%.

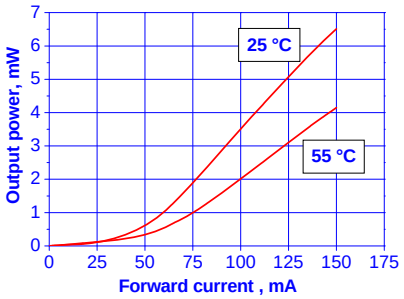
The following part number should be used when **ordering**:

SLD-380-MP-TO56-PD-825.

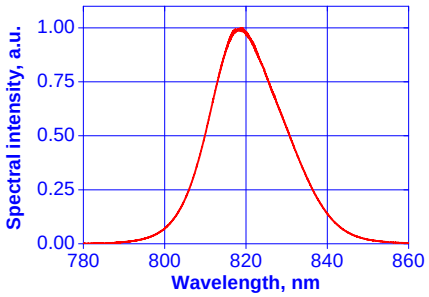
All specifications are subject to change without notice.

PERFORMANCE EXAMPLES

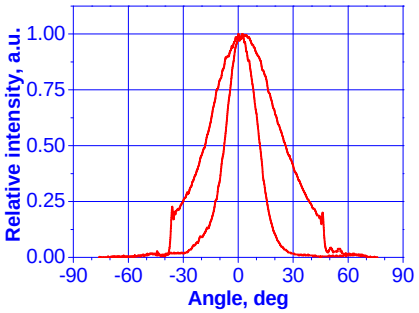
Light-current curves at different case temperatures

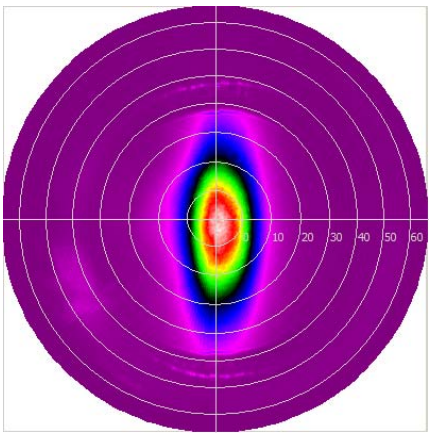


Spectrum example



Far field





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SUPERLUM

SLD-380-MP-TO9-PD-835: Medium-Power Free-Space SLD at 820 – 850 nm.

Features:

- CW output power of up to 20 mW
- LD-like spatial brightness, single transverse mode output
- LED-like bell-shaped spectrum with a very small ripples
- maximum parasitic secondary coherence subpeaks of −20 dB (10log)

Applications:

- Atomic force microscopy
- Optical coherence tomography
- Optical sensors
- Optical measurements
- Others

TO9 Package

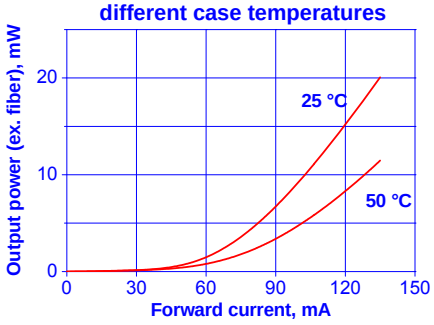
Specifications (at +25 °C)

Parameter	Min	Typ.	Max
Output power, P, mW	–	–	20
Forward current, mA	–	–	160
Forward voltage, V	–	–	2.6
Central wavelength*, nm	820	835	850
Spectrum width*, nm	15	17	–
Residual spectral modulation depth*,% (Resolution 0.02 nm)	–	1.0	2.0
Wavelength shift with temperature P>5 mW, dλ/dT, nm/°C, to λ at +25 °C	–	0.25	–
Secondary coherence subpeaks* (10 log), dB	–	−25†	−20
Polarization ratio, dB	–	5	–
Far field divergence in the p-n junction plane*, degrees	–	10	–
Far field divergence in the plane normal to p-n junction*, degrees	–	40	–
PD monitor photocurrent, μA	100	–	–
Operating temperature‡, °C	−20	–	+55
Storage temperature, °C	−55		+85

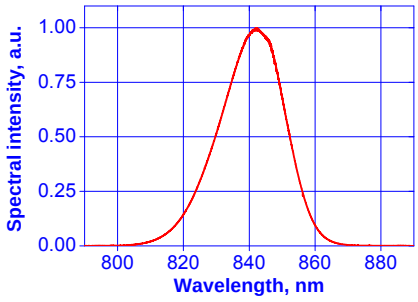
* At an output power of 20 mW and a case temperature of +25 °C.
† Guaranteed secondary subpeaks below −25 dB upon request.
‡ At +55 °C, maximum output power should not exceed 10 mW.

PERFORMANCE EXAMPLES

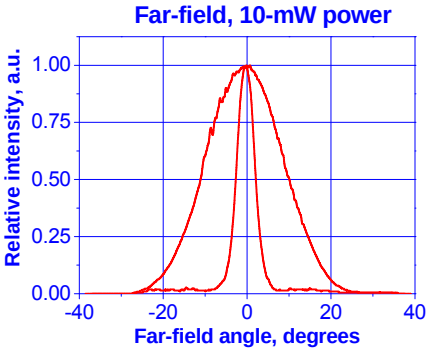
Light-current curves at different case temperatures



Spectrum example



Far-field, 10-mW power



The following part numbers should be used when **ordering**:

SLD-380-MP-TO9-PD-835.

All specifications are subject to change without notice.

Rev.01.ST380TO9MP835.300817

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SUPERLUM

SLD-340-HP-TO56-PD-850: High power TO-56 packaged free-space SLD at 850 nm.

Features:

- CW output power of up to 30 mW
- LD-like spatial brightness, single transverse mode output
- LED-like bell-shaped spectrum with a very small ripples

Applications:

- Atomic force microscopy
- Optical coherence tomography
- Optical sensors
- Optical measurements
- Low speckle illumination
- Others

TO-56 Package

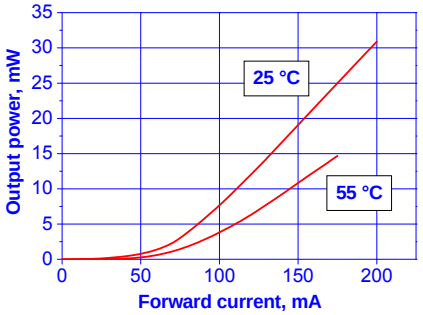
Specifications (at +25 °C case):

Parameter	Min	Typ.	Max
Output power, P, mW	–	–	30
Forward current, mA	–	–	210
Forward voltage, V	–	–	2.5
Central wavelength*, nm	840	850	860
Spectrum width*, nm	15	20	–
Residual spectral modulation depth*,% (Resolution 0.02 nm)	–	1.0	5.0
Wavelength shift with temperature P>5mW, dλ/dT, nm/°C, to λ at +25 °C	–	0.25	–
Secondary coherence subpeaks*, (10 log), dB	–	−25†	–
Polarization ratio*, dB	–	8	–
Far field divergence in the p-n junction plane*, degrees	–	10	–
Far field divergence in the plane normal to p-n junction*, degrees	–	40	–
PD monitor photocurrent*, μA	50	–	–
Operating temperature‡, °C	−20	–	+55
Storage temperature, °C	−55	–	+85

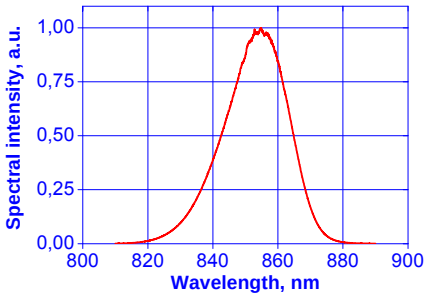
* At an output power of 30 mW and a case temperature of +25 °C.
† Guaranteed secondary subpeaks below −20 dB upon request.
‡ At +55 °C, maximum output power should not exceed 15 mW.

PERFORMANCE EXAMPLES

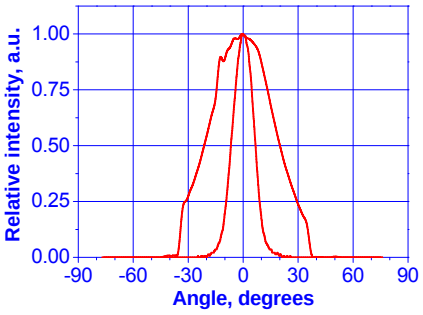
Light-current curves at different case temperatures



Spectrum example (30 mW)



Far field (30 mW)



The following part number should be used when **ordering**:

SLD-340-HP-TO56-PD-850

All specifications are subject to change without notice.

Rev.01.ST340TO56HP850.300817

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SUPERLUM

SLD-340-UHP-TO9-PD-840: Ultra high power TO-9 packaged free-space SLD at 840 nm.

Features:

- CW output power of up to 100 mW
- Spatial brightness comparable to that of high-power single mode laser diodes
- Wide spectrum (comparable to that of LEDs) with very small residual Fabry-Perot modulation depth

Applications:

- optical illumination
- optical sensors
- optical measurements
- others

TO9 Package

Free-space SLD modules in temperature stabilized packages with internal TEC and thermistor for SLD temperature stabilization are available upon request.

Specifications (at +25 °C):

Parameter	Min	Typ.	Max
Output power (in a cone N.A.=0.71), mW			100
Forward current, mA			450
Forward voltage, V			3.0
Peak wavelength at +25 °C, nm	830	840	850
Wavelength shift with temperature (around +25 °C), dλ/dT, nm/°C		0.25	
Spectrum width*, nm	20	25-30	
Residual spectral modulation depth*, %		3.0	5.0
Secondary coherence subpeaks* (10 log), dB		-20	
Polarization ratio, dB		5-10	
PD monitor photocurrent*, μA	300		
Output power variation with temperature (around +25 °C), dP/dT, at a constant forward current*, mW/°C		-0.7	
Operating temperature**, °C	-20		+50
Storage temperature , °C	-55		+85

* At an output power of 100 mW.
** At +50 °C, the maximum output power is limited to 50 mW.

The following part numbers should be used when **ordering**:

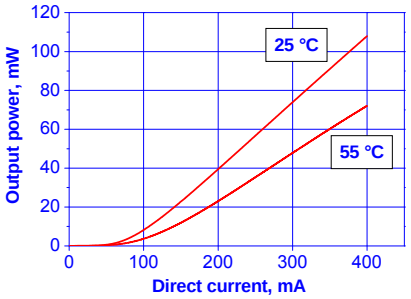
SLD-340-UHP-TO9-PD-840.

A maximum optical feedback of 10^{-3} is allowed to run HP series SLDs safely at full power

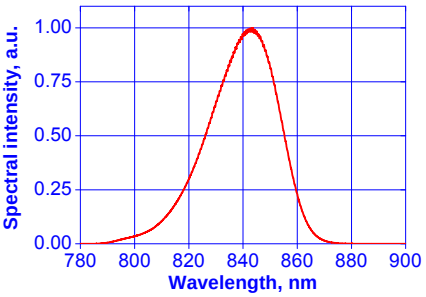
All specifications are subject to change without notice.

PERFORMANCE EXAMPLES

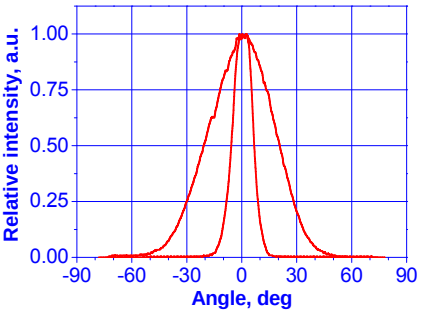
Light-current curves at different case temperatures



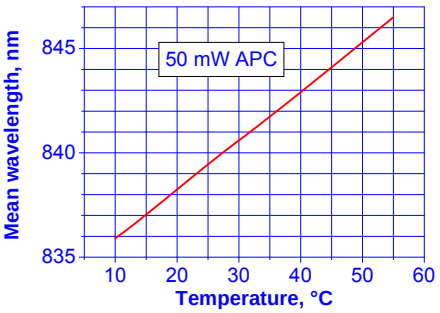
Spectrum example



Far field



Mean wavelength vs. case temperature



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SUPERLUM

SLD-340-MP-TO9-PD-880: Medium power TO-9 packaged free-space SLD at 880 nm.

Features:

- CW output power of up to 20 mW
- LD-like spatial brightness, single transverse mode output
- LED-like bell-shaped spectrum with a very small ripples

Applications:

- Atomic force microscopy
- Optical coherence tomography
- Optical sensors
- Optical measurements
- Low speckle illumination
- Others

TO-9 Package

Specifications (at +25 °C case):

Parameter	Min	Typ.	Max
Output power, P, mW	–	–	20
Forward current, mA	–	–	180
Forward voltage, V	–	–	2.5
Central wavelength*, nm	870	880	890
Spectrum width*, nm	30	40	–
Residual spectral modulation depth*,% (Resolution 0.02 nm)	–	1.0	5.0
Wavelength shift with temperature P>5 mW, dλ/dT, nm/°C, to λ at +25 °C	–	0.26	–
Secondary coherence subpeaks*, (10 log), dB	–	−25†	–
Polarization ratio*, dB	–	10	–
Far field divergence in the p-n junction plane*, degrees	–	12	–
Far field divergence in the plane normal to p-n junction*, degrees	–	40	–
PD monitor photocurrent*, μA	100	–	–
Operating temperature‡, °C	−20	–	+55
Storage temperature, °C	−55	–	+85

* At an output power of 20 mW and a case temperature of +25 °C.
† Guaranteed secondary subpeaks below −20 dB upon request.
‡ At +55 °C, maximum output power should not exceed 10 mW.

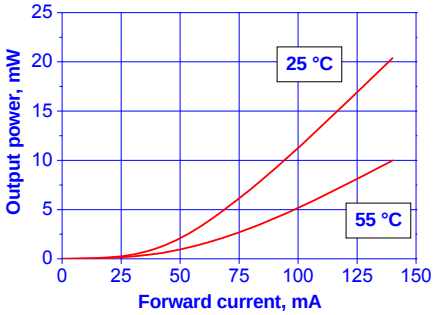
The following part number should be used when **ordering**:

SLD-340-MP-TO9-PD-880

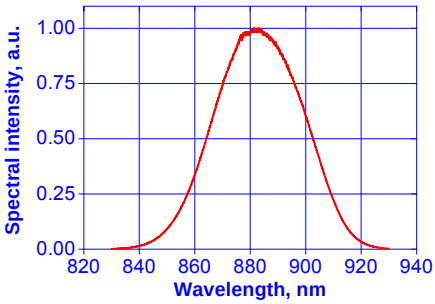
All specifications are subject to change without notice.

PERFORMANCE EXAMPLES

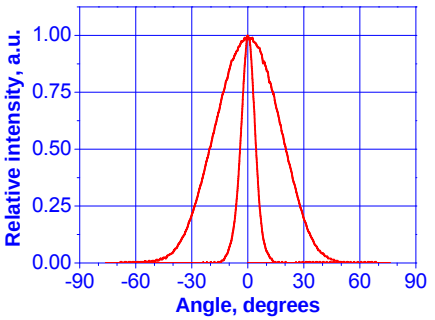
Light-current curves at different case temperatures



Spectrum example (20 mW)



Far field (20 mW)



Rev.01.ST340TO9MP880.300817

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Phone: +353 21 4533666, Fax: +353 21 4533026, Web site: www.superlumdiodes.com, E-mail: sales@superlum.ie.

SUPERLUM

SLD-480-MP-TO9-PD-920: Medium power TO-9 packaged free-space SLD at 920 nm.

Features:

- CW output power of up to 20 mW
- LD-like spatial brightness, single transverse mode output
- LED-like bell-shaped spectrum with a very small ripples

Applications:

- Atomic force microscopy
- Optical coherence tomography
- Optical sensors
- Optical measurements
- Low speckle illumination
- Others

TO-9 Package

Specifications (at +25 °C case):

Parameter	Min	Typ.	Max
Output power, P, mW	–	–	20
Forward current, mA	–	–	150
Forward voltage, V	–	–	2.5
Central wavelength*, nm	910	920	930
Spectrum width*, nm	25	30	–
Residual spectral modulation depth*,% (Resolution 0.02 nm)	–	1.0	5.0
Wavelength shift with temperature P>5 mW, dλ/dT, nm/°C, to λ at +25 °C	–	0.27	–
Secondary coherence subpeaks*, (10 log), dB	–	−25†	–
Polarization ratio*, dB	–	20	–
Far field divergence in the p-n junction plane*, degrees	–	14	–
Far field divergence in the plane normal to p-n junction*, degrees	–	40	–
PD monitor photocurrent*, μA	100	–	–
Operating temperature‡, °C	−20	–	+55
Storage temperature, °C	−55	–	+85

* At an output power of 20 mW and a case temperature of +25 °C.
† Guaranteed secondary subpeaks below −20 dB upon request.
‡ At +55 °C, maximum output power should not exceed 10 mW.

The following part number should be used when **ordering**:

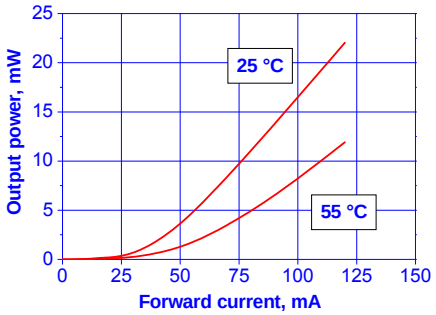
SLD-480-MP-TO9-PD-920

All specifications are subject to change without notice.

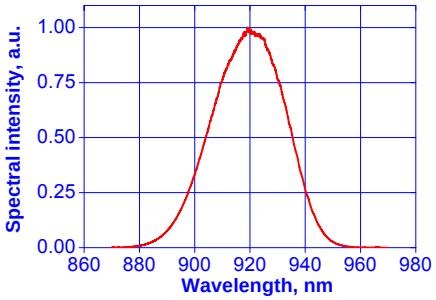
Rev.01.ST480TO9MP920.300817

PERFORMANCE EXAMPLES

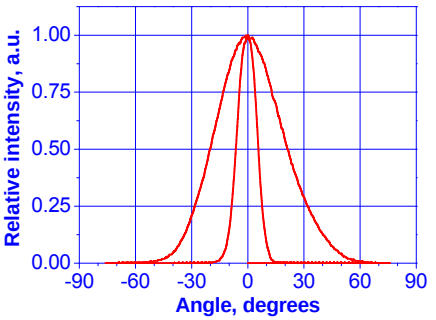
Light-current curves at different case temperatures



Spectrum example (20 mW)



Far field (20 mW)



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SUPERLUM

SLD-480-UHP-TO9-PD-960: Ultra high power TO9 packaged free-space SLD at 960 nm.

Features:

- CW output power of up to 90 mW
- Spatial brightness comparable to that of high-power single mode laser diodes
- Wide spectrum (comparable to that of LEDs) with very small residual Fabry-Perot modulation depth

Applications:

- optical illumination
- optical sensors
- optical measurements
- others

TO9 Package

Free-space SLD modules in temperature stabilized packages with internal TEC and thermistor for SLD temperature stabilization are available upon request.

Specifications (at +25 °C):

Parameter	Min	Typ.	Max
Output power, mW, in a cone N.A.=0.71			90
Forward current, mA			450
Forward voltage, V			3,0
Peak wavelength at +25 °C, nm	950	960	970
Wavelength shift around +25 °C, dλ/dT, nm/°C		0.2	
Spectrum width*, nm	40	45-50	
Residual spectral modulation depth*, %		3.0	6.0
Secondary coherence subpeaks* (10 log), dB		-20	
Polarization ratio, dB		16	
PD monitor photocurrent*, μA	300		
Power shift around +25 °C, dP/dT, mW/°C, at a constant forward current*		-0.7	
Operating temperature**, °C	-20		+50
Storage temperature, °C	-55		+85

* At an output power of 90 mW
** At +50 °C, the maximum output power is limited to 50 mW

The following part numbers should be used when **ordering**:

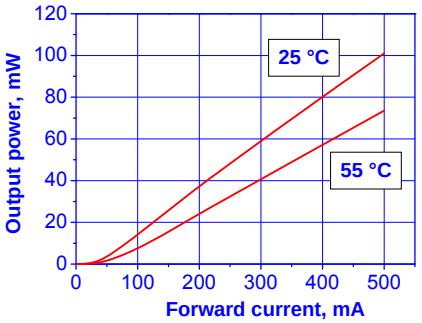
SLD-480-UHP-TO9-PD-960.

A maximum optical feedback of 10^{-3} is allowed to run UHP series SLDs safely at full power

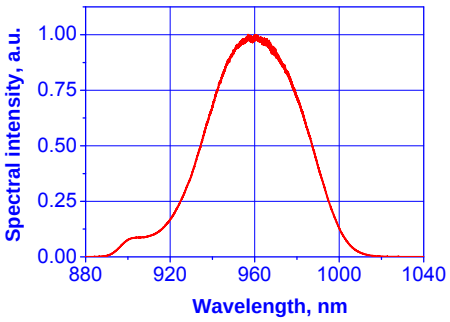
All specifications are subject to change without notice.

PERFORMANCE EXAMPLES

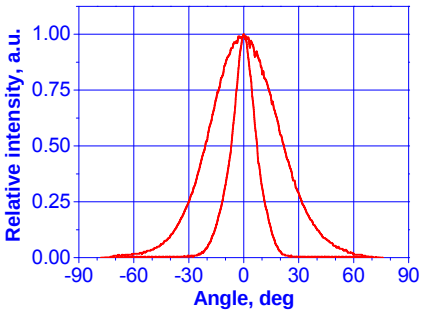
Light-current curves at different case temperatures



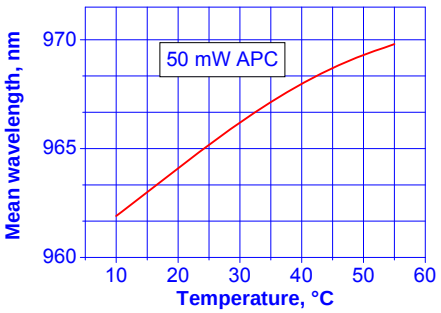
Spectrum example



Far field



Mean wavelength vs. case temperature



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SUPERLUM

SLD-530-UHP-TO9-PD-1040: Ultra high power TO-9 packaged free-space SLD at 1045 nm.

Features:

- CW output power of up to 80 mW
- Spatial brightness comparable to that of high-power single mode laser diodes
- Wide spectrum (comparable to that of LEDs) with very small residual Fabry-Perot modulation depth

Applications:

- optical illumination
- optical sensors
- optical measurements
- others

TO9 Package

Free-space SLD modules in temperature stabilized packages with internal TEC and thermistor for SLD temperature stabilization are available upon request.

Specifications (at +25 °C):

Parameter	Min	Typ.	Max
Output power (in a cone N.A.=0.71), mW			80
Forward current, mA			450
Forward voltage, V			3.0
Peak wavelength at +25 °C, nm	1030	1045	1050
Wavelength shift around +25 °C, dλ/dT, nm/°C		0.2	
Spectrum width*, nm	30	35-45	
Residual spectral modulation depth*, %		3.0	5.0
Secondary coherence subpeaks* (10 log), dB		-20	
Polarization ratio, dB		5-10	
PD monitor photocurrent*, μA	300		
Output power variation with temperature (around +25 °C), dP/dT, at a constant forward current*, mW/°C		-0.6	
Operating temperature**, °C	-20		+50
Storage temperature, °C	-55		+85

* At an output power of 80 mW
** At +50 °C, the maximum output power is limited to 50 mW

The following part numbers should be used when **ordering**:

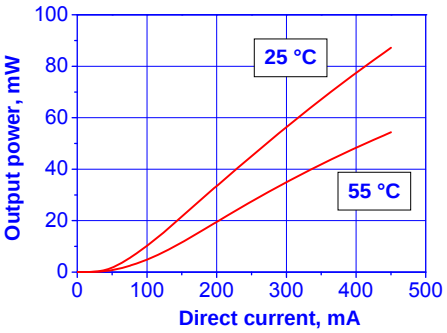
SLD-530-UHP-TO9-PD-1040.

A maximum optical feedback of 10^{-3} is allowed to run HP series SLDs safely at full power.

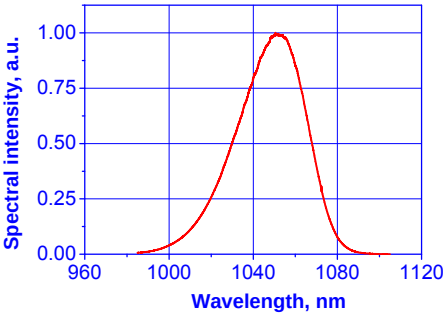
All specifications are subject to change without notice.

PERFORMANCE EXAMPLES

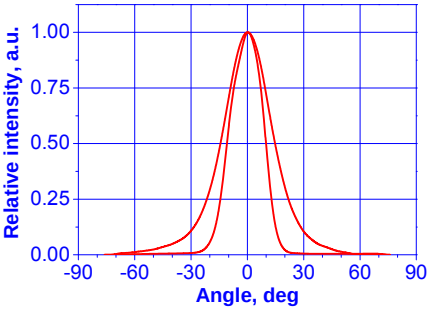
Light-current curves at different case temperatures



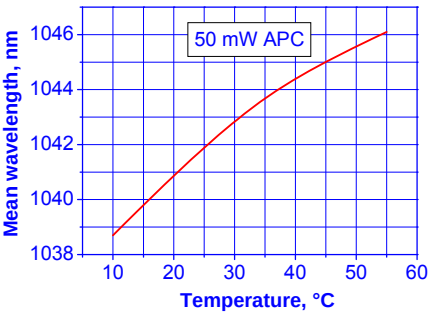
Spectrum example



Far field



Mean wavelength vs. case temperature



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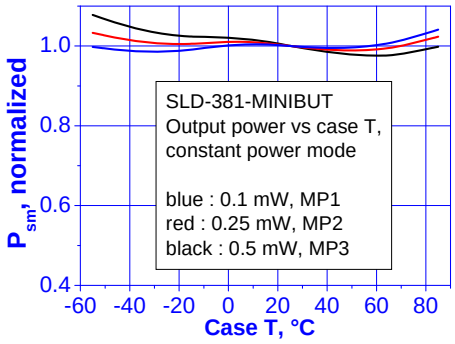
SUPERLUM

SLD-381-MINIBUT: miniature uncooled SM fiber coupled SLD modules at 830 nm with high output power for high temperature applications

Features:

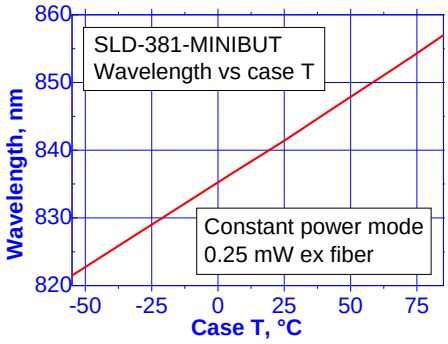
- **miniature uncooled package, only 10 x 4 x 8 mm frame size, ideal for miniaturization of fiberoptic gyros and other sensors**
- **developed for constant power mode operation; excellent stability of fiber-to-SLD coupling block**
- **0.1 mW, 0.2 mW and 0.3 mW minimum SM fiber at +85 °C**
- **operation and storage T range extension above +85 °C up to +105 °C upon request!**
- **very flat spectrum with negligible residual Fabry-Perot modulation depth : rated maximum 1%, typically below 0.5%**
- **PM fiber coupled versions available**

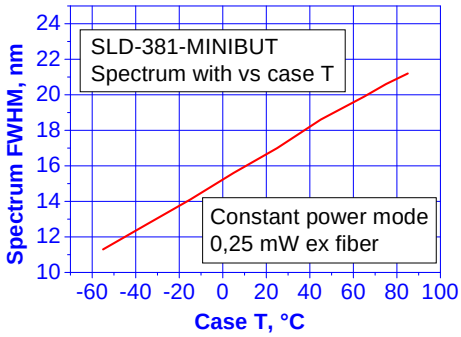
PERFORMANCE EXAMPLES



Parameter	Cat.	Min	Typ	Max
Output power ex SM fiber, mW, @ case temperature +85 °C, P(+85)	MP1	0.1	0.15	-
	MP2	0.2	0.25	-
	MP3	0.3	0.45	-
Absolute maximum output power ex SM fiber @ case temperature +25 °C, P(+25)	MP1	-	-	1.0
	MP2	-	-	1.5
	MP3	-	-	2.0
Forward current, mA	All	-	-	160
Forward voltage, V	All	-	-	2.7
PD monitor photocurrent at 0.1 mW fiber output power, mA	All	0.03		
Peak wavelength*, nm (case @+25 °C)	All	770	830	860
Spectrum width, FWHM, nm, (case @ +25 °C)	All	15	20	-
Residual spectral modulation depth at P(+85) power, %	All	-	<0.5	1.0
Residual spectral modulation depth at P(+25) output power, %	All	-	-	2.0
Operating temperature (case), °C	All	-55	-	+85
Storage temperature, °C	All	-55	-	+85

* Peak wavelength is not guaranteed to be 830 nm, unless explicitly requested by the customer.





The following part numbers should be used when **ordering**:

SLD-381-(a)-MINIBUT-(c)-PD,
where:
(a) – power category (MP1 or MP2),
(c) – fiber type (SM or PM).

Example: SLD-381-MP2-MINIBUT-SM-PD.

Attention: two package styles available with different baseplates, please check package drawings

All specifications are subject to change without notice.

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Phone: +353 21 4533666, Fax: +353 21 4533026, Web site: www.superlumdiodes.com, E-mail: sales@superlum.ie.

SUPERLUM

SLD-561-MINIBUT-MP: Miniature Uncooled SM Fiber Coupled SLD Modules at 1300 nm for Wide Temperature Range Applications

Features:

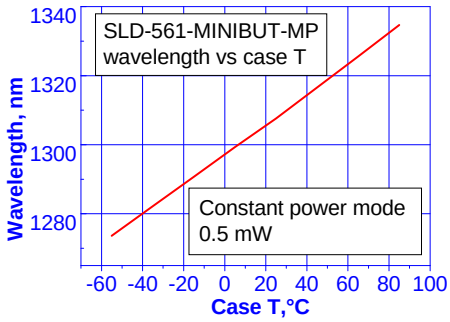
- **miniature uncooled package, only 10 × 4 × 8 mm frame size, excellent for miniaturization of fiberoptic gyros and other sensors**
- **up to 0.5 mW ex SM fiber from -55 to +70 °C**
  up to 0.25 mW ex SM fiber from -55 to +85 °C
- **flat spectrum with residual Fabry-Perot modulation depth of below 5%**
- **PM fiber coupled versions are available**

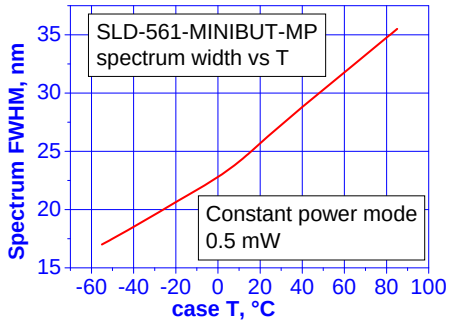
Specifications:

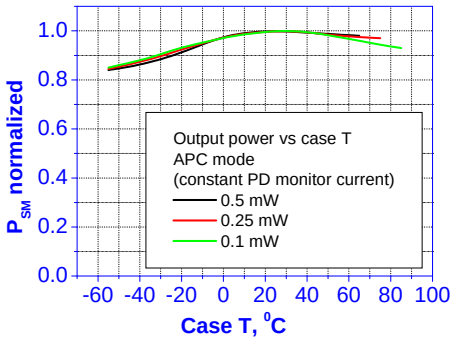
Parameter	Min	Typ.	Max
Output power ex SM fiber (case @+25 °C), mW	1.0	-	-
Output power ex SM fiber (case @ +70 °C), mW	0.5	-	-
Output power ex SM fiber (case @ +85 °C), mW	0.25	-	-
Forward current, mA	-	-	250
Forward voltage, V	-	-	2.0
Peak wavelength* (case @+25 °C), nm	1270	1300	1330
Spectrum width, FWHM** (case @ +25 °C), nm	20	25	-
Residual spectral modulation depth at 0.5 mW SM fiber output, %	-	-	5.0
Residual spectral modulation depth at 1.0 mW SM fiber output, %	-	-	10.0
Slow / fast polarization ratio (PM polarized modules)**, dB	7.0	-	-
Operating temperature (case), °C	-55	-	+85
Storage temperature, °C	-55	-	+85

* Peak wavelength is not guaranteed to be 1300 nm, unless explicitly requested by the customer.
** Specified at full power.

PERFORMANCE EXAMPLES







The following part numbers should be used when **ordering**:

SLD-561-MP-MINIBUT-(c),
where:
(c) – fiber type (SM or PM).

Example: SLD-561-MP-MINIBUT-SM.

All specifications are subject to change without notice.

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Phone: +353 21 4533666, Fax: +353 21 4533026, Web site: www.superlumdiodes.com, E-mail: sales@superlum.ie.

Features:

- Medium power 670 nm band SM fiber-coupled SLD modules
- Bell-shaped spectrum
- Maximum secondary coherence subpeaks intensity below −20 dB (10 log), below −30 dB upon request
- FC/APC terminated fiber pigtails, other connectors upon request

Applications:

- Optical sensors
- Optical coherence tomography
- Optical measurements
- Atomic force microscopy
- Others

Packages:

- **fiber-coupled** –Butterfly; DIL and other packages are available upon request

Specifications (Nominal Emitter Stabilization Temperature +25 °C)

Parameter	Category	Min	Typ.	Max
Output power, P_{op}, ex SM fiber, mW	MP1	0.5	–	1.0
	MP2	1.0	–	2.0
Forward current at P_{op}, mA	All	–	–	160
Forward voltage at P_{op}, V	All	–	2.6	3.0
Central wavelength* at P_{op}, nm	All	660	670	680
Spectrum width at P_{op}, FWHM, nm	All	6.0	7.5	–
Residual spectral modulation depth† at P_{op}, %	All	–	1.0	2.0
Secondary coherence subpeaks† at P_{op}, dB (10 log)	All	–	−25	−20
Slow /fast polarization ratio (PM modules) at P_{op}, dB	All	7.5	10	–
Operating temperature‡ at P_{op}, °C	All	−55	–	+80
Storage temperature at P_{op}, °C	All	−55	–	+85
PD monitor photocurrent at P_{op}, μA	MP1	50	–	–
	MP2	100	–	–
Cooler current, A	All	–	–	1.2
Cooler voltage, V	All	–	–	3.5

* A central wavelength 670 nm is not guaranteed. Contact Superlum representative if you require a tighter tolerance of central wavelength.

† Rated at maximum power, typically decreases linearly with power, not guaranteed at maximum power of a particular power category

‡ Butterfly packaged SLDs

The following part numbers should be used when **ordering**:

SLD-261-MP(a)-(b)-(c)-PD-670-FC/APC,
where: (a) – power category (MP1 or MP2),
(b) – package type (DBUT – standard),
(c) – type of fiber—SM (isotropic) or PM (polarization maintaining),
PD – monitor photodiode, FC/APC – connector type.

Example: SLD-261-MP1-DBUT-SM-PD-670-FC/APC

See the next page for performance examples ➔

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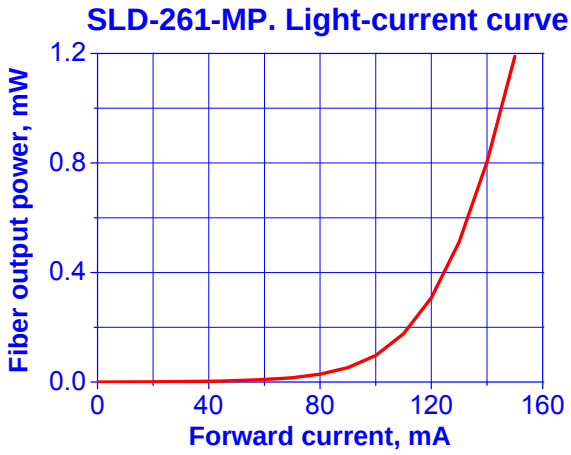
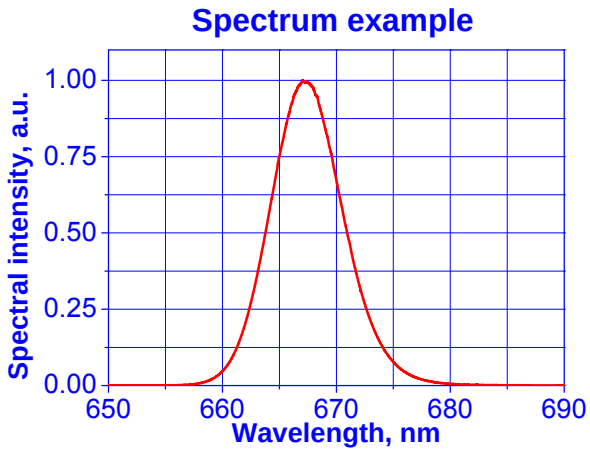
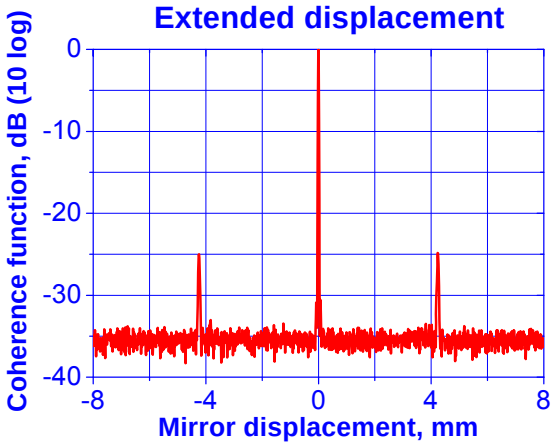
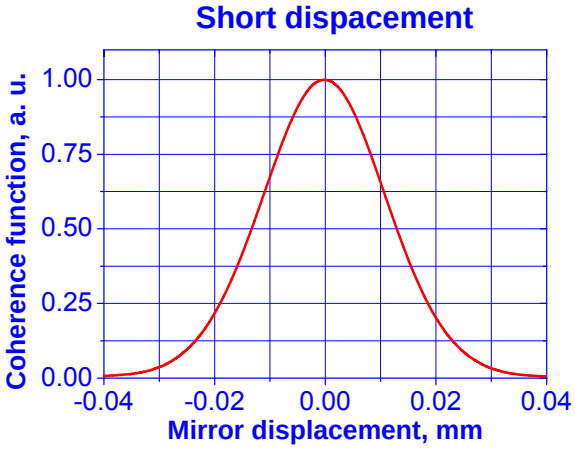
TYPICAL PERFORMANCE EXAMPLES









Mirror displacement = Optical path difference / 2

Examples demonstrate typical performance only.
Actual performance may vary from sample to sample and from lot to lot.

All specifications are subject to change without notice.

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SUPERLUM

SLD-260-HP-TOW-PD-670: High power TOW-packaged free-space SLDs at 670 nm

Features:

- CW output power of up to 15 mW
- LD-like spatial brightness, single transverse mode output
- Bell-shaped LED-like spectrum with very small ripples

Applications:

- Optical sensors
- Optical coherence tomography
- Optical measurements
- Atomic force microscopy
- Low speckle illumination
- Others

Specifications (Nominal Emitter Stabilization Temperature +25 °C)

Parameter	Min	Typ.	Max
Output power*, P, mW	-	-	15
Forward current P, mA	-	-	220
Forward voltage, V	-	2.6	3.0
Central wavelength** , nm	660	670	680
Spectrum width at, FWHM, nm	6.0	7.5	-
Residual spectral modulation depth , %	-	<1.0	2.0
Secondary coherence subpeaks, dB (10 log)	-	<-20	-
Polarization ratio (PM modules), dB	-	>20	-
Operating temperature, °C	-55	-	+55
Storage temperature, °C	-55	-	+85
PD monitor photocurrent at P, µA	100	-	-
Cooler current, A	-	-	1.2
Cooler voltage, V	-	-	3.5

* A central wavelength of 670 nm is not guaranteed. Contact Superlum representative if you require a tighter tolerance of central wavelength.

The following part number should be used when **ordering**:

Example: SLD-260-HP-TOW(1 or 2)-PD-670.

Packages available are TOW1 and TOW2.

See the next page for performance examples ➔

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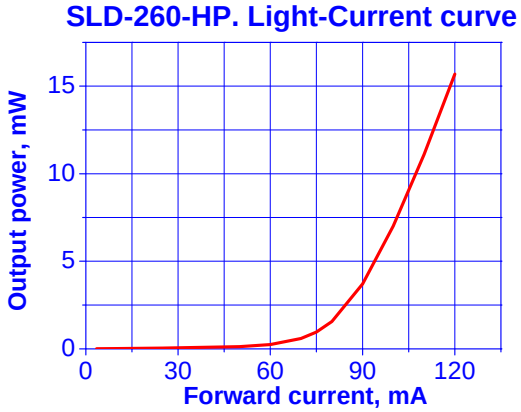
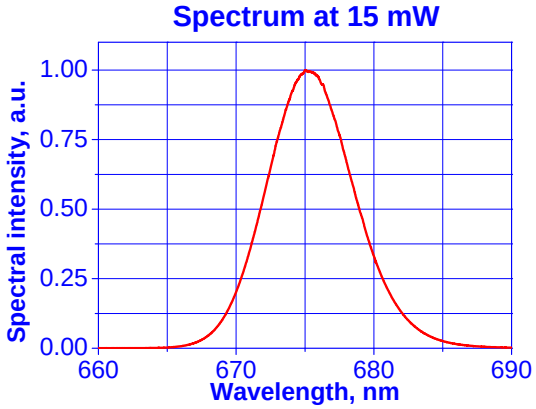
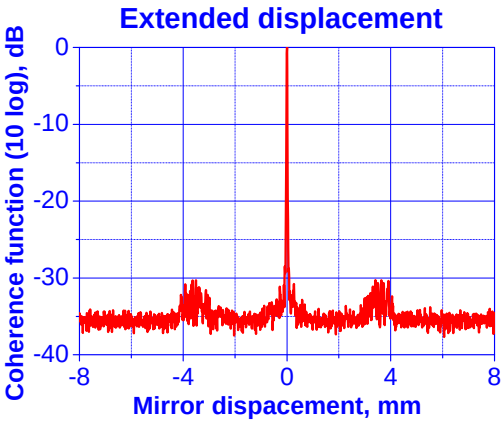
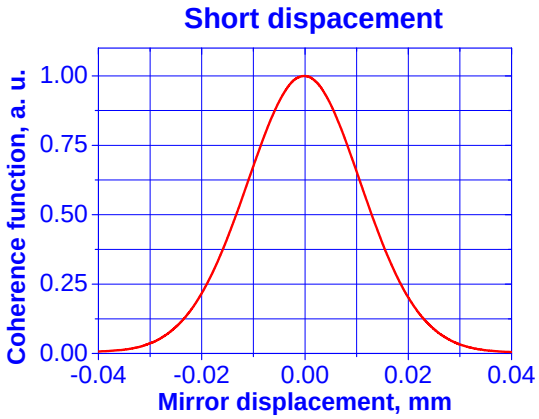
TYPICAL PERFORMANCE EXAMPLES

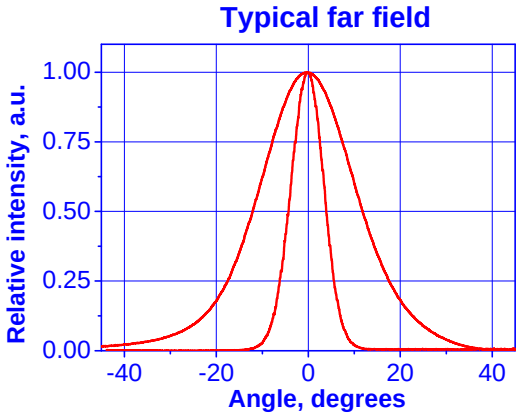








Mirror displacement = Optical path difference / 2



Examples demonstrate typical performance only.
Actual performance may vary from sample to sample and from lot to lot.
All specifications are subject to change without notice.

Rev.01.ST260TOWHP670.300817

SLD-261-HP-670: High power fiber-coupled SLD at 670 nm

Features:

- High power 670 nm band SM fiber-coupled SLD modules
- Bell-shaped spectrum
- FC/APC terminated fiber pigtails, other connectors upon request

Applications:

- Optical sensors
- Optical coherence tomography
- Optical measurements
- Atomic force microscopy
- Others

Packages:

- **fiber-coupled** –Butterfly; DIL and other packages are available upon request

Specifications (Nominal Emitter Stabilization Temperature +25 °C)

Parameter	Category	Min	Typ.	Max
Output power, P_{op}, ex SM fiber, mW	HP1	4	–	5
	HP2	8	–	10
Forward current at P_{op}, mA	All	–	150	220
Forward voltage at P_{op}, V	All	–	2.6	3.0
Central wavelength* at P_{op}, nm	All	660	670	680
Spectrum width at P_{op}, FWHM, nm	All	6.0	7.5	–
Residual spectral modulation depth at P_{op}, %	All	–	1.0	2.0
Secondary coherence subpeaks at P_{op}, dB (10 log)	All	–	< −20	–
Slow / fast polarization ratio (PM modules) at P_{op}, dB	All	7.5	10	–
Operating temperature† at P_{op}, °C	All	−55	–	+75
Storage temperature at P_{op}, °C	All	−55	–	+85
PD monitor photocurrent at P_{op}, µA	All	100	–	–
Cooler current, A	All	–	–	1.2
Cooler voltage, V	All	–	–	3.5

* A central wavelength of 830 nm is not guaranteed. Contact Superlum representative if you require a tighter tolerance of central wavelength.

† Butterfly packaged SLDs

The following part numbers should be used when **ordering**:

SLD-261-(a)-(b)-(c)-PD-670-FC/APC,
where: (a) – power category (HP1 or HP2),
(b) – package type (DBUT – standard),
(c) – type of fiber—SM (isotropic) or PM (polarization maintaining),
PD – monitor photodiode, FC/APC – connector type.

Example: SLD-261-HP2-DBUT-SM-PD-670-FC/APC

See the next page for performance examples ➔

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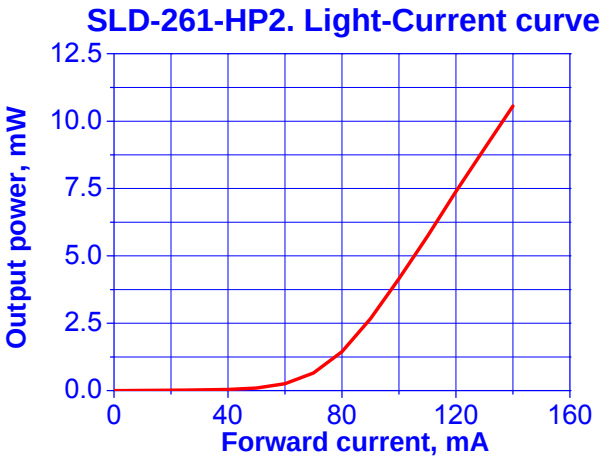
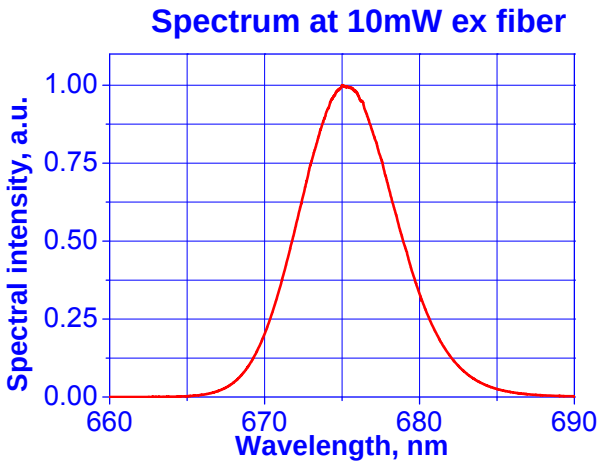
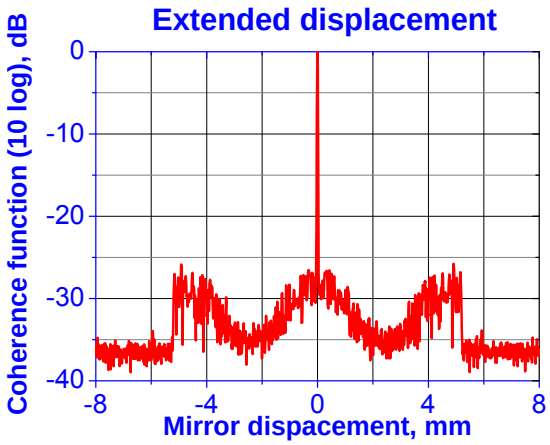
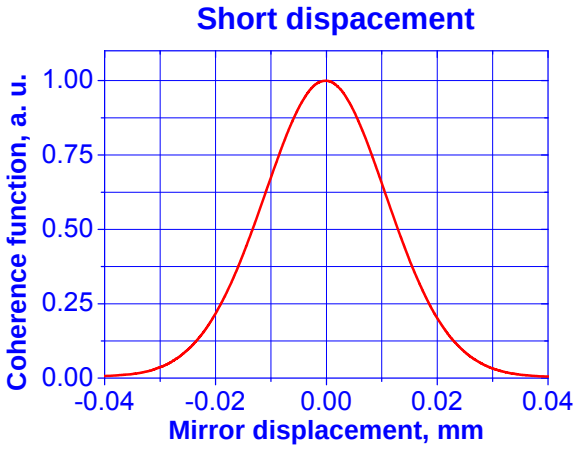
TYPICAL PERFORMANCE EXAMPLES









Mirror displacement = Optical path difference / 2

Examples demonstrate typical performance only.
Actual performance may vary from sample to sample and from lot to lot.

All specifications are subject to change without notice.

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SUPERLUM

Preliminary! SLD-260-UHP-TOW-PD-670: Ultra High Power TOW-packaged Free-Space SLDs at 670 nm

Features:

- CW output power of up to 25 mW
- LD-like spatial brightness, single transverse mode output
- Bell-shaped LED-like spectrum with very small ripples

Applications:

- Optical sensors
- Optical coherence tomography
- Optical measurements
- Atomic force microscopy
- Low speckle illumination
- Others

Specifications (Nominal Emitter Stabilization Temperature +25 °C)

Parameter	Min	Typ.	Max
Output power, P, mW	–	–	25
Forward current P, mA	–	150	–
Forward voltage, V	–	2.6	3.0
Central wavelength* , nm	660	670	680
Spectrum width at, FWHM, nm	6.0	7.5	–
Residual spectral modulation depth , %	–	<1.0	2.0
Secondary coherence subpeaks, dB (10 log)	–	<−20	–
Polarization ratio (PM modules), dB	–	>20	–
Operating temperature, °C	−55	–	+55
Storage temperature, °C	−55	–	+85
PD monitor photocurrent at P, μA	100	–	–
Cooler current, A	–	–	1.2
Cooler voltage, V	–	–	3.5

* A central wavelength of 670 nm is not guaranteed. Contact Superlum representative if you require a tighter tolerance of central wavelength.

The following part number should be used when **ordering**:

Example: SLD-260-UHP-TOW(1 or 2)-PD-670.

Packages available are TOW1 and TOW2.

See the next page for performance examples ➔

Rev.01.ST260TOWUHP670.300817

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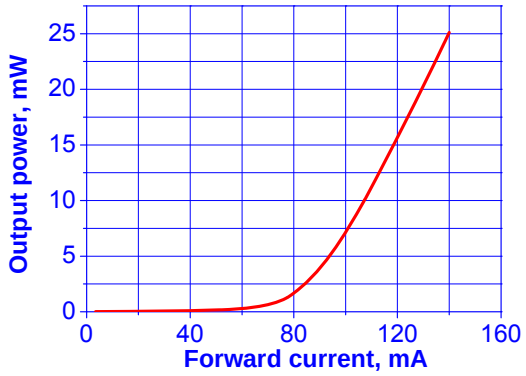
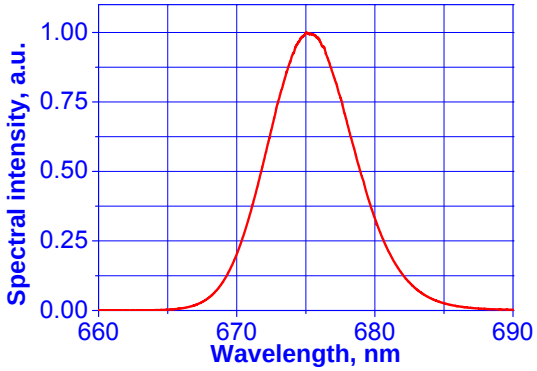
TYPICAL PERFORMANCE EXAMPLES

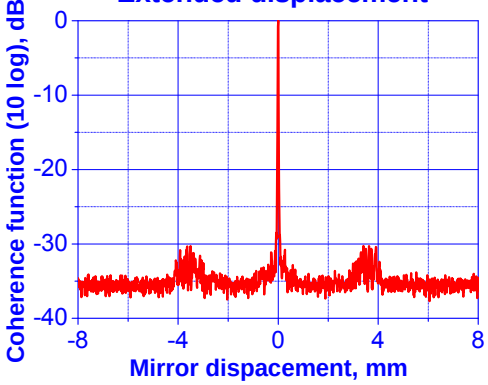
SLD-260-UHP. Light-Current curve



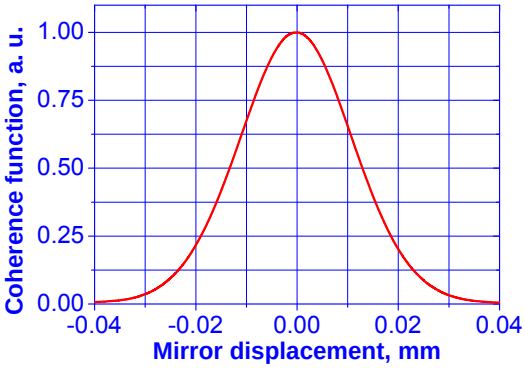
Spectrum at 25mW



Extended displacement

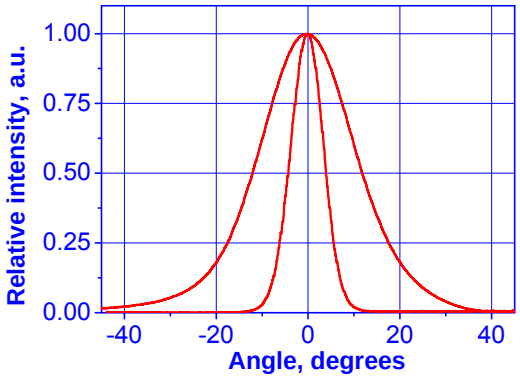


Short dispacement



Mirror displacement = Optical path difference / 2

Typical far field



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Rev.01.ST260TOWUHP670.300817

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SUPERLUM

Preliminary! SLD-261-UHP-DBUT-SM-PD-670: Ultra High Power DBUT-packaged fiber coupled SLDs at 670 nm

Features:

- Output power of up to 15 mW
- LD-like spatial brightness, single transverse mode output
- Bell-shaped LED-like spectrum with very small ripples

Applications:

- Optical sensors
- Optical coherence tomography
- Optical measurements
- Atomic force microscopy
- Low speckle illumination
- Others

Specifications (Nominal Emitter Stabilization Temperature +25 °C)

Parameter	Min	Typ.	Max
Output power, P, mW	–	–	15
Forward current P, mA	–	160	–
Forward voltage, V	–	–	3.0
Central wavelength* , nm	660	670	680
Spectrum width at, FWHM, nm	6.0	7.5	–
Residual spectral modulation depth , %	–	2.0	5.0
Secondary coherence subpeaks, dB (10 log)	–	<−20	–
Polarization ratio (PM modules), dB	–	>20	–
PD monitor photocurrent at P, µA	100	–	–
Operating temperature, °C	−55	–	+55
Storage temperature, °C	−55	–	+85
Cooler current, A	–	–	1.2
Cooler voltage, V	–	–	3.5

* A central wavelength of 670 nm is not guaranteed. Contact Superlum representative if you require a tighter tolerance of central wavelength.

Additional & customized:

- PD monitors
- FC/APC terminated pigtails
- PM pigtails

The following part number should be used when **ordering**:

SLD-261-UHP-DBUT-(a)-PD-670,
where: (a) – type of fiber—SM (isotropic) or PM (polarization maintaining).

Example: SLD-261-UHP-DBUT-SM-PD-670.

A maximum feedback of 10^{-3} is allowed to run UHP series SLDs safely at full power.

See the next page for performance examples ➔

Rev.01.ST261DBUTUHP670.291017

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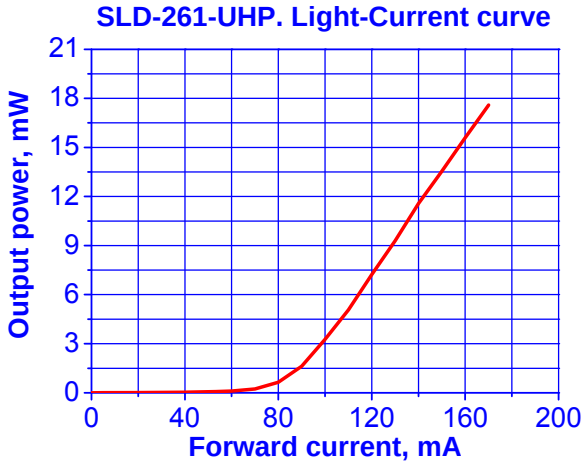
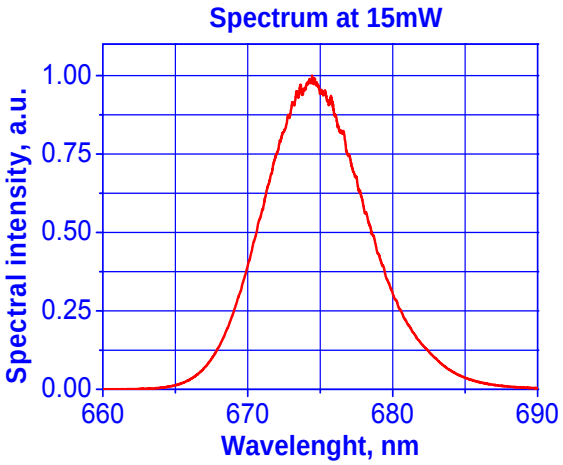
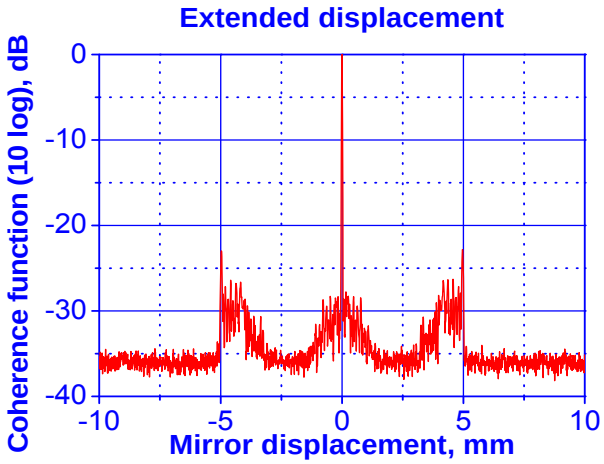
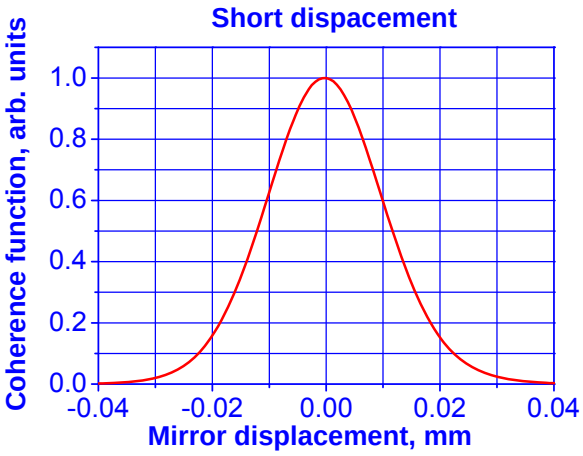
TYPICAL PERFORMANCE EXAMPLES









Examples demonstrate typical performance only.
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All specifications are subject to change without notice.

Rev.01.ST261DBUTUHP670.291017

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SUPERLUM

SLD-33-MP: wide-spectrum SLD modules for 750-800 nm spectral band

Features:

- very wide optical spectrum
- short coherence length
- negligible residual Fabry-Perot modulation depth
- SM or PM pigtails (polarized or pseudo-depolarized output emission ex PM fiber)
- PD monitors
- FC/APC terminated pigtails

Applications:

- high resolution OCT
- Bragg grating sensors
- fiber sensors
- optical measurements

Packages:

- fiber coupled: **DIL, Butterfly**
- free space: **TOW**

Specifications (Nominal Emitter Stabilization Temperature +25 °C)

Parameter	Min	Typ	Max
Output power, SM fiber pigtail, SLD-331, mW	1.0	1.2	-
Free space output power, in a cone N.A.=0.71, SLD-330*, mW	3.0	4.0	-
Forward current†, mA	-	150	220
Forward voltage, V	-	2	2.6
Central wavelength, nm	770	780	790
Spectrum width, FWHM, nm	45	50	-
Residual spectral modulation depth, %	-	1.0	2.0
Secondary coherence subpeaks (Reflectivity), dB (10 log)	-	−25	−20
Spectral flatness‡, dB	-	-	2.0
Slow / fast polarization ratio (PM fiber-coupled modules), dB**	-	2.5	-
Operating temperature††, °C	−55	-	+80
Cooler current, A	-	-	1.2
Cooler voltage, V	-	-	3.5

* TOW packaged SLDs;

† Current is specially adjusted to get the highest output power with equal intensity of spectral lobes; different for different modules;

‡ Spectral Flatness parameter describes spectral intensity dropout between spectral lobes;

** Pseudo-depolarized versions (light is launched into the fiber at 45 degrees to the birefringent axes) are available upon request;

†† Butterfly packaged SLDs.

The following part numbers should be used when **ordering**:

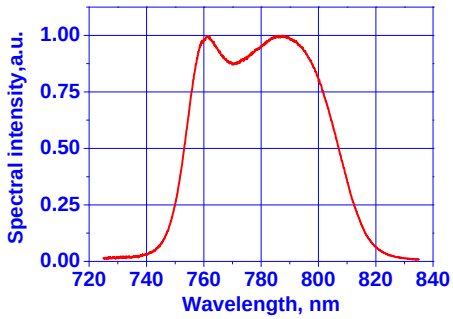
SLD-33(a)-(b)-(c)-(d)-(e),
where: (a) – 0 (free space) or 1 (fiber pigtailed),
(b) – power category (MP), (c) – package type,
(d) – type of fiber, SM or PM (for fiber coupled modules),
(e) – PD (if a PD monitor is required).

Example: SLD-331-MP-DBUT-SM-PD.

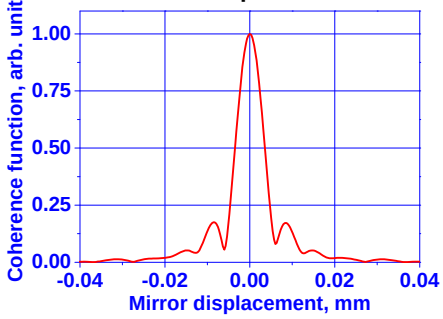
All specifications are subject to change without notice.

PERFORMANCE EXAMPLES

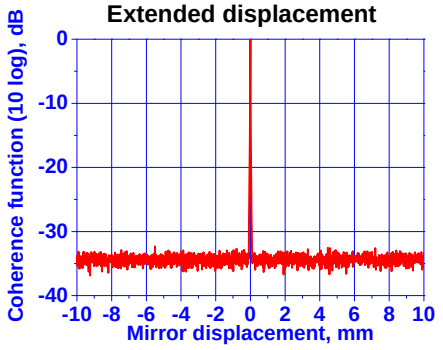
Optical spectrum, 1 mW ex SM fiber



Short displacement



Extended displacement



Mirror displacement = Optical path difference / 2

A lot of customized solutions are available — contact us with your detailed requirements!

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Phone: +353 21 4533666, Fax: +353 21 4533026, Web site: www.superlumdiodes.com, E-mail: sales@superlum.ie.

SUPERLUM

SLD-33-HP: very wide-spectrum, high power SLD modules for 750-800 nm spectral band

Features:

- **3 power categories: an output power of up to 25mW ex SM fiber and a spectral width (FWHM) of 50 nm**
- Short coherence length
- Negligible residual Fabry-Perot modulation depth

Packages:

- **Fiber coupled –** Butterfly, DIL
- **Free space –** TOW

Additional & customized:

- PD monitors
- FC/APC terminated pigtails
- PM pigtails (polarized or depolarized output emission ex PM fiber)

Specifications (Nominal Emitter Stabilization Temperature +25 °C)

Parameter	Category	Min	Typ	Max
Output power, SM fiber pigtail, SLD-331-HP, mW	HP1	5	7.5	-
	HP2	10	15	-
	HP3	20	25	-
Free space output power, in a cone N.A=0.71*, mW	HP1	10	15	-
	HP2	20	30	-
	HP3	40	50	-
Forward current †, mA	HP1	-	190	230
	HP2	-	260	300
	HP3	-	350	400
Forward voltage, V	All	-	-	2.6
Central wavelength, nm	All	775	785	795
Spectral width (FWHM), nm	All	40	50	-
Residual spectral modulation depth, %	All	-	2.0	5.0
Secondary coherence subpeaks (Reflectivity), dB (10 log)	All	-	-25	-
Spectral flatness ‡, dB	All	-	-	2.0
Slow / fast polarization ratio** (PM-polarized modules), dB	All	-	7.0	-
Operating temperature ††, °C		-55	-	+80
Cooler current , A		-	-	1.2
Cooler voltage, V		-	-	3.5

* TOW packaged SLDs;
† current is specially adjusted to get highest output power with equal intensity of spectral lobes; different for different modules;
‡ Spectral Flatness parameter describes spectral intensity dropout between spectral lobes;
** Pseudo-depolarized versions (light is launched into the fiber with its polarization oriented at 45° to the birefringent axes) are available upon request;
†† Butterfly packaged SLDs.

Note: SLD spectra for the batches in stock are available upon request.

The following part numbers should be used when **ordering**:

SLD-33(a)-(b)-(c)-(d)-(e),
where: (a) – 0 (free space) or 1 (fiber pigtailed);
(b) – power category HP1, HP2 or HP3; (c) – package type;
(d) – SM or PM (fiber coupled modules); (e) – PD (if PD monitor is required).

Example: SLD-331-HP1-DIL-SM-PD.

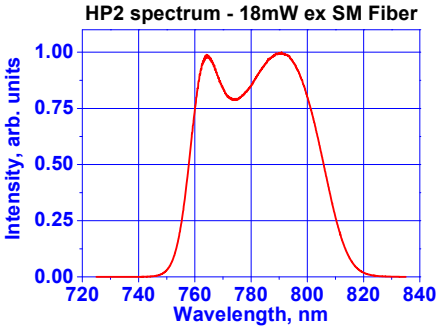
A maximum feedback of 10^{-3} is allowed to run HP SLDs safely at full power.

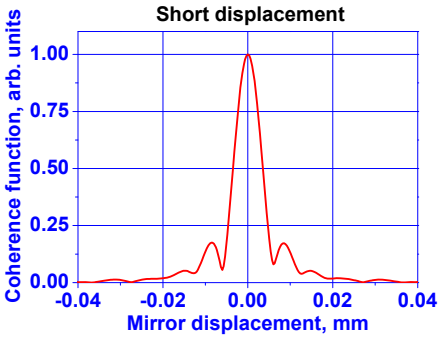
All specifications are subject to change without notice.

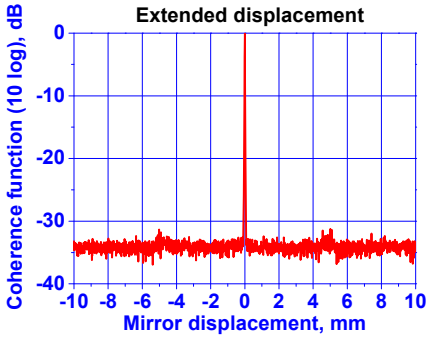
Applications:

- fiberoptic sensors
- Bragg grating sensors
- optical coherence tomography
- optical measurements

PERFORMANCE EXAMPLES







Mirror displacement = Optical path difference / 2

A lot of customized solutions are available — contact us with your detailed requirements!

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SUPERLUM

SLD-34-MP: Superluminescent diodes at 840 - 860 nm with broad bell-shaped spectrum

Features:

- very wide bell-shaped optical spectrum
- no sidelobes in the coherence function
- negligible residual Fabry-Perot modulation depth
- internal PD monitor
- FC/APC terminated pigtails

Packages:

- fiber coupled – Butterfly, DIL
- free space – TOW

Additional and customized:

- PM pigtails (slow axis alignment; 45 degree orientation upon request)

Specifications (nominal emitter stabilization temperature +25°C)

Parameter		Category	Min	Typ.	Max
Output power, SM fiber pigtail, SLD-341, mW		MP1	0.8	1.0	-
		MP2	1.5	2.0	-
Output power, Glass window, SLD-340, mW		MP1	2.0	2.5	-
		MP2	3.0	4.0	-
Forward current, mA		MP1	-	170	200
		MP2	-	180	220
Forward voltage, V		All	-	-	2.8
Central wavelength, nm	SLD-34 at 840	All	830	840	850
	SLD-34 at 860	All	850	860	870
Spectrum width, FWHM, nm		MP1	55	60	-
		MP2	45	50	-
Residual spectral modulation depth, %		MP1	-	-	1.0
		MP2	-	-	2.0
Secondary coherence subpeaks (Reflectivity), dB (10 log)		All	-	-25	-
Slow / fast polarization ratio (PM modules)*, dB		All	-	7.0	-
Operating temperature, °C		All	-55	-	+80
Cooler current, A		All	-	-	1.2
Cooler voltage, V		All	-	-	3.5

* Pseudo-depolarized versions (light is launched into the fiber with its polarization oriented at 45° to the birefringent axes) are available upon request

The following part numbers should be used when **ordering**:

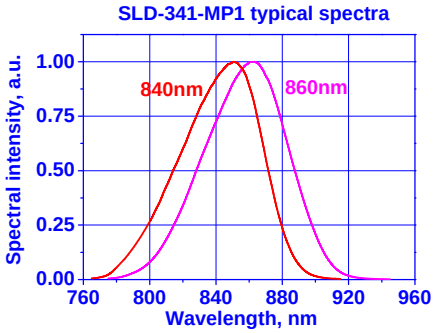
SLD-34(a)-(b)-(c)-(d)-(e)-(f),
where:
(a) – 0 (free space) or 1 (fiber pigtailed),
(b) – power category (MP1, MP2), (c) – package type,
(d) – SM (isotropic) or PM (polarization maintaining) fiber (pigtailed versions only),
(e) – PD (if PD monitor is required), (f) – central wavelength.

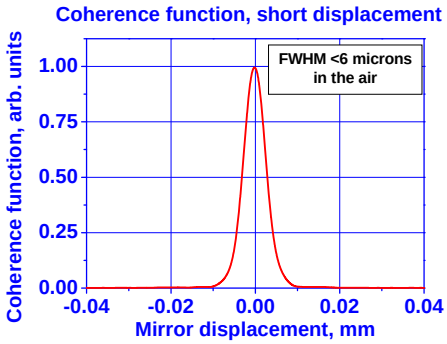
Example: SLD-341-MP1-DBUT-SM-PD-840.

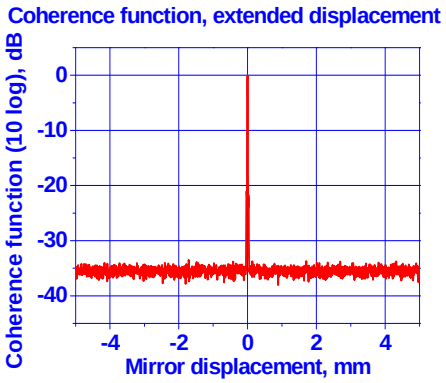
Applications:

- high resolution OCT
- fiber sensors
- Bragg grating sensors
- optical measurements

PERFORMANCE EXAMPLES







Mirror displacement = Optical path difference /2

All specifications are subject to change without notice.

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SUPERLUM

SLD-34-HP: High-power SLDs at 810, 840, 860, 880 nm with broad bell-shaped spectrum

Features:

- very wide bell-shaped optical spectrum
- no sidelobes in the coherence function
- negligible residual Fabry-Perot modulation depth
- internal PD monitor
- FC/APC terminated pigtails

Packages:

- fiber coupled – Butterfly, DIL
- free space – TOW

Additional and customized:

- PM pigtails (slow axis alignment; 45 degree orientation upon request)
- 4-mW SMF model with reduced sensitivity to feedback

Specifications (nominal emitter stabilization temperature +25°C)

Parameter		Category	Min	Typ	Max
Output power, SM fiber pigtail, SLD-341, mW		HP1	6.0	8.0	-
		HP2	15.0	20.0	-
Output power, Glass window SLD-340, mW		HP1	12.0	16.0	-
		HP2	30.0	40.0	-
Forward current, mA		HP1	-	200	260
		HP2	-	260	300
Forward voltage, V		All	-	-	2.8
Central wavelength, nm	SLD-34 at 810	All	800	810	820
	SLD-34 at 840	All	830	840	850
	SLD-34 at 860	All	850	860	870
	SLD-34 at 880	All	870	880	890
SLD-34 centered at 810 nm					
Spectrum width, FWHM, nm		HP1	25	30	-
		HP2	20	25	-
SLD-34 centered at 840 nm					
Spectrum width, FWHM, nm		HP1	35	40	-
		HP2	30	35	-
SLD-34 centered at 860 nm					
Spectrum width, FWHM, nm		HP1	40	45	
		HP2	35	40	
SLD-34 centered at 880 nm					
Spectrum width, FWHM, nm		HP1	45	50	
		HP2	40	45	
Residual spectral modulation depth, %		All		2.0	5.0
Secondary coherence subpeaks (Reflectivity), dB (10 log)		All	-	-25	-
Slow / fast polarization ratio (PM modules)*, dB		All	-	10.0	-
Operating temperature, °C		All	-55	-	+70
Cooler current, A		All	-	-	1.2
Cooler voltage, V		All	-	-	3.5

* Pseudo-depolarized versions (light is launched into the fiber with its polarization oriented at 45° to the birefringent axes) are available upon request

The following part numbers should be used when **ordering**:

SLD-34(a)-(b)-(c)-(d)-(e)-(f),
where: (a) – 0 (free space) or 1 (fiber pigtailed),
(b) – power category (HP1, HP2), (c) – package type,
(d) – SM (isotropic) or PM (polarization maintaining) fiber (pigtailed versions only),
(e) – PD (if PD monitor is required), (f) – central wavelength.

Example: SLD-341-HP2-DBUT-SM-PD-840.

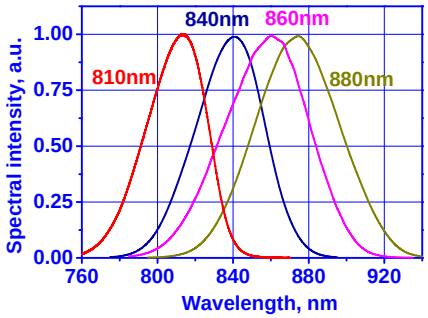
A maximum feedback of 10^{-3} is allowed to run HP series SLDs safely at full power.

Applications:

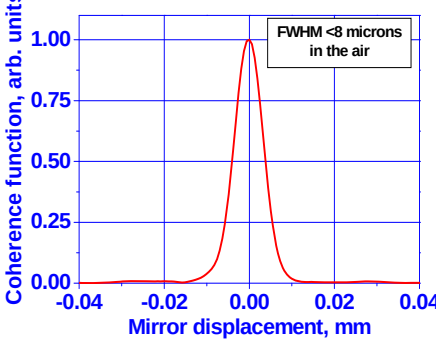
- high resolution OCT
- fiber sensors
- Bragg grating sensors
- optical measurements

PERFORMANCE EXAMPLES

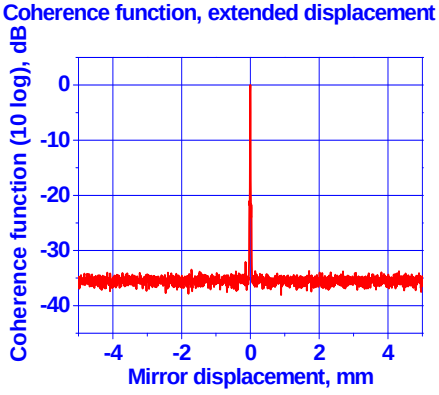
SLD-341 typical spectra



Coherence function, short displacement



Coherence function, extended displacement



Mirror displacement = Optical path difference /2

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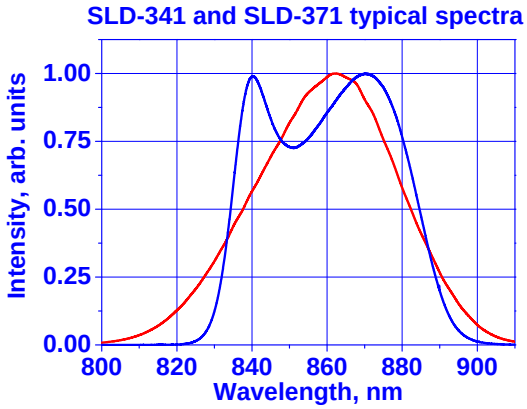
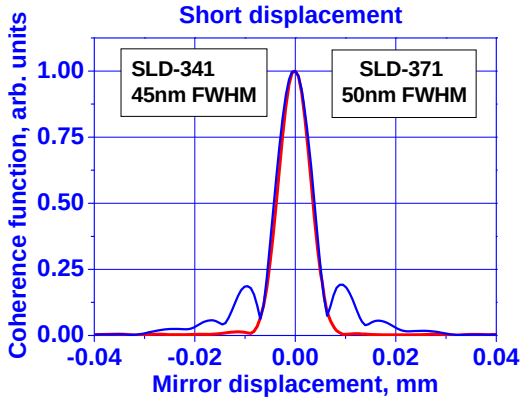
PERFORMANCE EXAMPLES (CONTINUED)

Comparison of performance parameters of SLD-341-HP and SLD-371-HP.

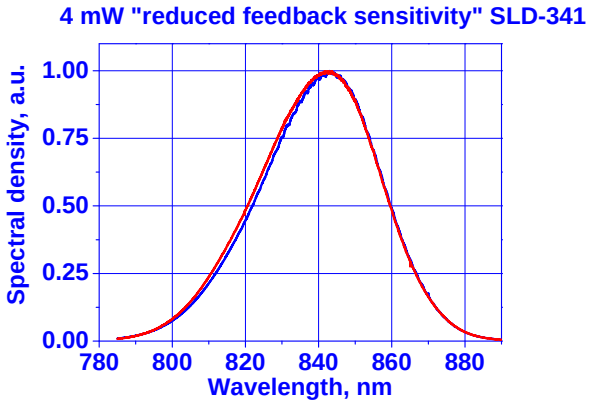


Red line – SLD-341-HP1. Blue line – SLD-371-HP1.

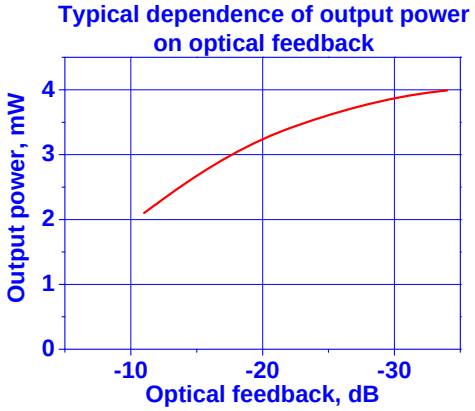


A comparison of central peaks of the coherence function of a "bell-shaped" SLD-341-HP1 (red line) and a "double-hump" SLD-371-HP1 (blue line).

Performance examples of SLD-341 with reduced sensitivity to optical feedback.



Spectra of SLDs with reduced sensitivity to optical feedback.
Red – no feedback, 4mW ex fiber.
Blue – 4% (-14dB) feedback (power dropped to 2.7 mW).



Reduced feedback sensitivity 4-mW SMF SLD – output power vs. optical feedback.

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SUPERLUM

SLD-35-MP: extremely wide-spectrum SLD modules for 790-890 nm spectral band

Features:

- very wide optical spectrum
- short coherence length
- negligible residual Fabry-Perot modulation depth
- SM or PM pigtails (polarized or pseudo-depolarized output emission ex PM fiber)
- PD monitors
- FC/APC terminated pigtails

Applications:

- ultra-high resolution OCT
- Bragg grating sensors
- fiber sensors
- optical measurements

Packages:

- fiber coupled: **DIL, Butterfly**
- free space: **TOW**

Specifications (Nominal Emitter Stabilization Temperature +25 °C)

Parameter	Min	Typ	Max
Output power, SM fiber pigtail, SLD-351, mW	1.0	1.25	-
Free space output power, in a cone N.A.=0.71, SLD-350*, mW	4.0	6.0	-
Forward current†, mA	-	150	220
Forward voltage, V	-	2	2.6
Central wavelength, nm	820	845	870
Spectrum width, FWHM, nm	57	62	-
Residual spectral modulation depth, %	-	1.0	2.0
Secondary coherence subpeaks (Reflectivity), dB (10 log)	-	−25	−20
Spectral flatness‡, dB	-	2.0	2.5
Slow / fast polarization ratio (PM fiber-coupled modules), dB**	-	7.0	-
Operating temperature††, °C	−55	-	+80
Cooler current, A	-	-	1.2
Cooler voltage, V	-	-	3.5

* TOW packaged SLDs;

† Current is specially adjusted to get the highest output power with equal intensity of spectral lobes; different for different modules;

‡ Spectral Flatness parameter describes spectral intensity dropout between spectral lobes;

** Pseudo-depolarized versions (light is launched into the fiber at 45 degrees to the birefringent axes) are available upon request;

†† Butterfly packaged SLDs.

Very broad spectrum SLDs (80 nm FWHM) are available upon request!

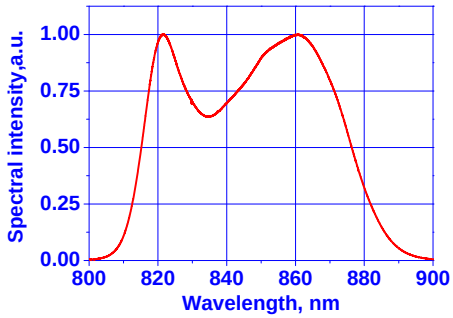
The following part numbers should be used when **ordering**:

SLD-35(a)-(b)-(c)-(d)-(e),
where: (a) – 0 (free space) or 1 (fiber pigtailed),
(b) – power category (HP), (c) – package type,
(d) – type of fiber, SM or PM (for fiber coupled modules),
(e) – PD (if a PD monitor is required).

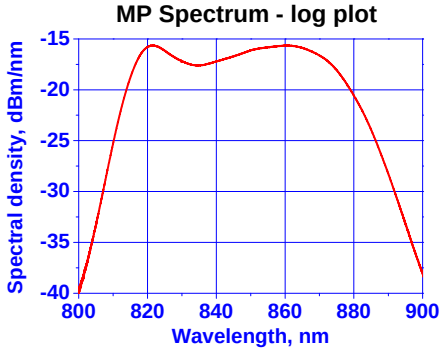
Example: SLD-351-MP-DBUT-SM-PD.

PERFORMANCE EXAMPLES

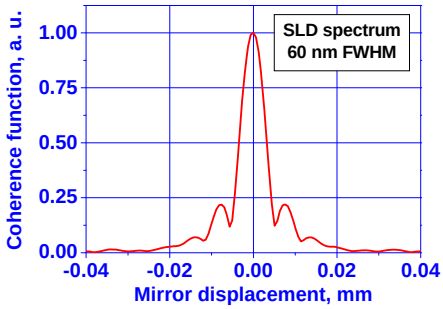
Spectrum - linear plot



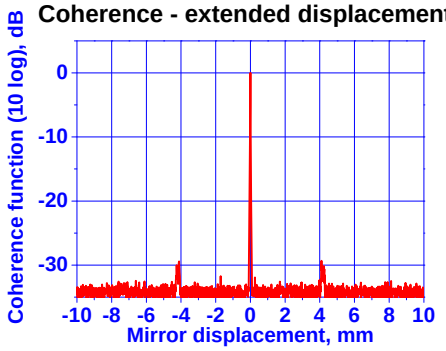
MP Spectrum - log plot



Coherence - Short displacement



Coherence - extended displacement



Mirror displacement = Optical path difference / 2

All specifications are subject to change without notice.

A lot of customized solutions are available — contact us with your detailed requirements!

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SUPERLUM

SLD-35-HP: extremely wide-spectrum, high-power SLD modules for 780 – 900 nm spectral band

Features:

- **3 power categories: SLDs with an output power of up to 25 mW ex SM-fiber and a 3-dB spectrum width of 62 – 65 nm**
- centered at about 830, 850 and 865 nm
- very short coherence length
- negligible residual Fabry-Perot modulation depth; <1% (<0.05 dB) upon request

Packages:

- ***fiber coupled*** – Butterfly, DIL
- ***free space*** – TOW

Special versions:

- **modules with reduced sensitivity to optical feedback**

Applications

- ultra-high resolution OCT
- Bragg grating sensors
- fiber sensors
- optical measurements
- others

Specifications (nominal emitter stabilization temperature is +25 °C)

Parameter	Cat.	Min	Typ.	Max
Output power ex SM fiber, mW, SLD-351	HP1	5	7.5	
	HP2	10	15	
	HP3	20	25	
Free space output power, mW, in a cone N.A=0.71, SLD-350*	HP1	10	15	
	HP2	20	30	
	HP3	40	50	
Forward current**, mA	HP1,2		250	300
	HP3		300	400
Forward voltage, V	All			3.0
Central wavelength, nm	HP1		830	
	HP2		850	
	HP3		865	
Spectrum width, FWHM, nm	All	57	62	
Residual spectral modulation depth, %	All		2.0	5.0
Secondary coherence subpeaks (Reflectivity), dB (10 log)	All		-25	
Spectral flatness***, dB	All		2.7	<3.0
Slow/fast polarization ratio (PM-fiber coupled polarized modules), dB	All		7.0	
Operating temperature****, °C		-55		+80
Storage temperature, °C	All	-55		+85
Cooler current , A				1.2
Cooler voltage, V				3.5

* - TOW-packaged SLDs;

** - current is specially adjusted to get the highest output power with equal intensity of spectral humps; different for different modules;

*** - describes spectral intensity dropout between spectral humps

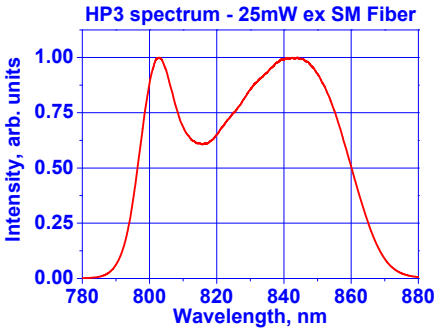
**** - HP1-rated butterfly-packaged SLDs; more details upon request

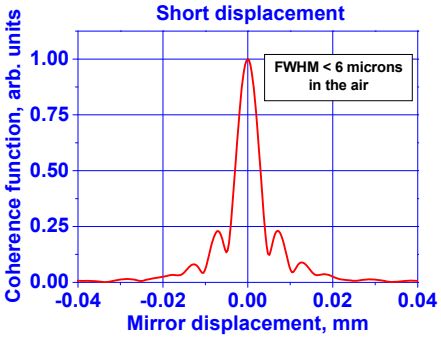
The following part numbers should be used when **ordering**:
SLD-35(a)-(b)-(c)-(d)-(e)-XXX,
where:
(a) – 0 (free space) or 1 (fiber pigtailed),
(b) – power category, HP1, HP2 or HP3,
(c) – package type, (d) – SM or PM (for fiber coupled modules),
(e) – PD (if PD monitor is required),
XXX – wavelength (830, 850, 865; a ±10-nm tolerance is guaranteed).

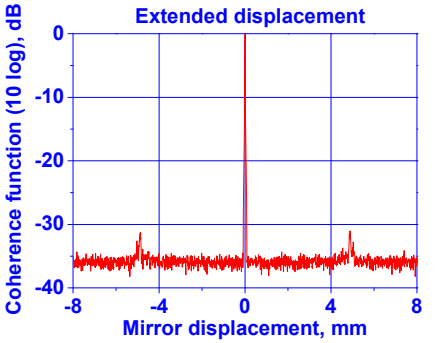
Example: SLD-351-HP1-DIL-SM-PD-855.

A maximum feedback of 10^{-3} is allowed to run HP series SLDs safely at full power. Models with reduced sensitivity to optical feedback are available upon request.

PERFORMANCE EXAMPLES







Mirror displacement = Optical path difference / 2

See the next page for more examples ➔

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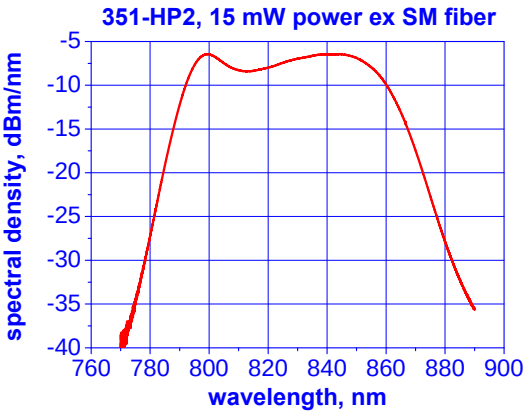
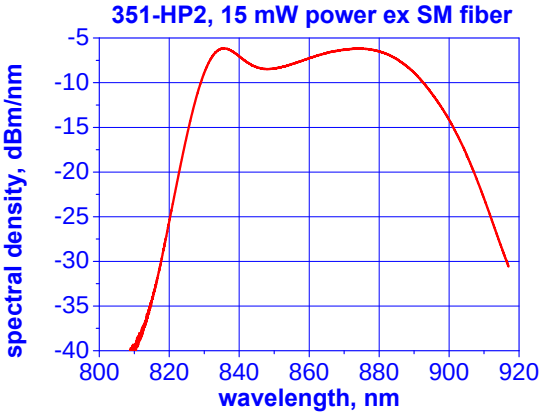
MORE PERFORMANCE EXAMPLES

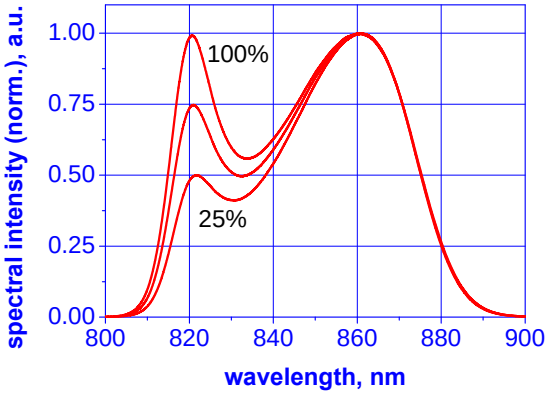


65 nm wide SLD at 830 nm – spectral density

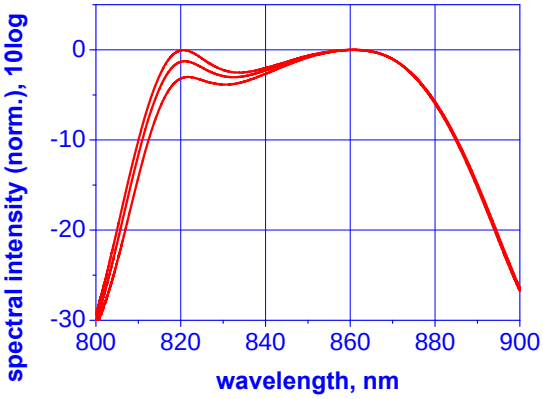


60 nm wide SLD at 860 nm – spectral density

Spectrum of SLD-351 depends on output power/drive current. The figure below shows a typical example of SLD spectrum at full power, 50% of full power, and 25 % of full power



Spectrum at 25%, 50% and 100% optical power (linear plot)



Spectrum at 25%, 50% and 100% optical power (log plot)

All specifications are subject to change without notice.

SUPERLUM

SLD-M381, SLD-M341, SLD-M531: High-power SLD modules at 840 nm, 855 nm and 1065 nm with MM fiber pigtails.

Features:

- 100 mW ex 50/125 µm, 250 µm coated, step-index fiber
- wide optical spectrum

Applications:

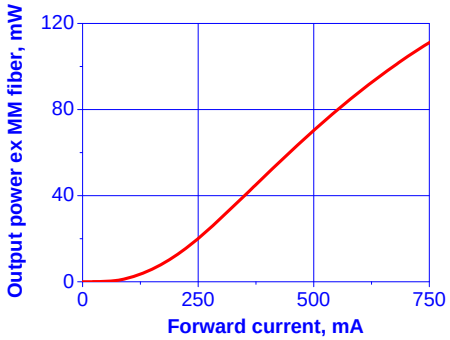
- fiberoptic sensors
- optical measurements
- low speckle illumination

Packages:

- ***fiber coupled –*** Butterfly

PERFORMANCE EXAMPLES

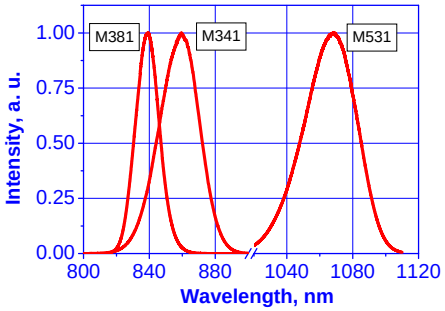
Typical light-current characteristic



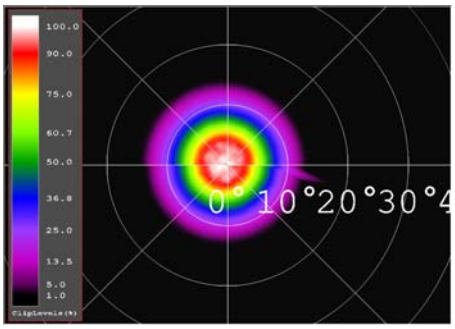
Specifications
(nominal emitter stabilization temperature is +25 °C)

Parameter		Min.	Typ.	Max.
Output power ex 50/125 MMF, mW			100	110
Forward current, mA			750	900
Forward voltage, V				2.8
Mean wavelength, nm	SLD-M381	825	840	855
	SLD-M341	840	855	870
	SLD-M531	1045	1065	1080
Spectrum width, nm	SLD-M381	12	15	
	SLD-M341	20	25	
	SLD-M531	35	40	
Operating temperature, °C		-55		+60
Storage temperature, °C		-55		+85
Cooler current, A				2.5
Cooler voltage, V				3.8

Typical spectra at 100 mW ex MM fiber



Far field emission pattern



The following part numbers should be used when **ordering**:

SLD-M381-DBUT-MM-PD-FC/APC,
or
SLD-M341-DBUT-MM-PD-FC/APC,
or
SLD-M531-DBUT-MM-PD-FC/APC,

where: PD – monitoring photodiode, FC/APC – connector type.

All specifications are subject to change without notice.

A lot of customized solutions are available—contact us with your detailed requirements.
Free-space TO-9 packaged modules are available upon request.

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SUPERLUM — Pilot4-AC: 110/220V AC SLD Controller

Features:

- Driving of all types of cooled modules of SUPERLUM.
- Stabilization of SLD temperature at any value within the range of +10 °C to +40 °C, with the indication of the set temperature.
- Stabilization of SLD direct current at any value from 0 mA to 400 mA with the indication of the set current value. Higher current ranges are available on request.
- Remote monitoring of the SLD status and turning the SLD power on/off by external logic.
- High level of SLD protection against overloading.
- Low noise.

Accessories:

- Mounts for modules (DIL, BUT, TOW)
- Connecting cables
- External low pass filter

Stability and noise

All PILOT controllers allow excellent stability of SLD modules; typical short-term (15 minutes, 22 ± 0.1 °C ambient) and long-term (3 hours, 22 ± 0.5 °C) stability of SLD modules driven by PILOTs is 500 ppm and 3000 ppm, correspondingly.
No any excess noise to SLD intensity noise is added by PILOT-4 in frequency range 0.05 – 10 MHz; external LPF allows no excess noise starting 1 kHz frequency.

Technical parameters

Current source, constant current mode		**SLD protection section**	
SLD current range*	0 to 400 mA		
SLD voltage, maximum	3V	SLD current limit range*	5 to 400 mA
Set resolution **	0.1 mA	Set resolution**	0.1 mA
Accuracy (50 to 400 mA)	0.5 mA	Accuracy (50 to 400 mA)	1 mA
TEC controller section		**PD monitor section**	
Thermistor range	6.000 to 19.999 kOhm		
Stabilization T range***	+10 to +40 °C	PD monitor reverse voltage	5 V
Accuracy	0.1 °C	PD monitor current range	0 to 20 mA
Maximum TEC current	1200 mA	Display resolution	0.001 mA
Maximum TEC voltage	5.0 V		

* - up to 500 mA upon request
** - corresponds to LCD resolution
***- it is considered that 10K3CG2 of BetaTherm Ltd. Thermistors are used in SLD modules

General Data

Supply voltage	110/220 V AC
Cable connectors	9 pin D-SUB
Operating temperature	0 to +40 °C
Weight	1.2 kg

All specifications are subject to change without notice.

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SLD-mCS/sCS-series Miniature High Power Broadband Light Source Modules

Technical Product Specification

Document ID: SL.RD.01.001.170215
March 2017
Revision: 002

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Phone: +353 21 4533666, Fax: +353 21 4533026, Web site: www.superlumdiodes.com, E-mail: sales@superlum.ie.

Description

SLD-mCS/sCS-series Miniature Broadband SLD Light Source Modules are wide-spectrum SM- or PM-fiber coupled light source modules for applications requiring a reliable, high-power, stable and low-noise SLD light source with a wide and flat spectrum and a short coherence length.

SLD-mCS/sCS devices substitute SLD-MS light sources, providing better stability, higher efficiency, wider operating range and lower noise. They can be built using any SUPERLUM SLD if its drive current is less than 400 mA. They may be powered by a wide range of supply voltages, from 9 V to 30 V DC, and allow the use of switched-mode DC power supplies.

Guaranteed operation temperature range is 0…+50 °C (case). Light source modules for a harsh environment applications, for example, for operation in extended temperature ranges (up to -40…+85 °C) are available upon request (depends on the P/N of the SLD used, i.e. the SLD drive current and voltage).

SLD-mCS/sCS sources allow different control modes of SLDs. Modules with internal PD monitor may be driven in Constant Current (ACC) and Constant Power (APC) modes. SLD power can be set by internal potentiometer ("internal" control operation mode, INT) or controlled by 0-4 V analog voltage ("external" control operation mode, EXT). Operation modes can be selected using easily accessible jumpers.

SLD-mCS/sCS sources ensure very high stability of SLD output over entire operating temperature range and low SLD noise. Particularly, the design of the controller used in both sources ensures that in the range from 10 kHz to 1 MHz there is no excess noise except for the SLD's intrinsic quantum noise. In all standard models (i.e. those based on standard SLDs of Superlum) the SLD can be modulated (ON/OFF) at the rate of up to 50 kHz.

SLD-mCS sources have FC/APC-terminated fiber pigtailed output. As a standard, the fiber is protected by a 3 mm tube.

SLD-sCS sources have FC/APC mating sleeve. About 1 m long, terminated with FC/APC connectors on both ends, 900 µm buffered fiber cable is always enclosed to the SLD-sCS. The SLD-sCS has a little bigger chassis than the SLD-mCS. This allows the integration of additional elements like, for example, output power monitors, small size isolators and others.

SLD-mCS/sCS sources have two control ports, "LOGIC" port for switching SLD ON/OFF and error indications, and "ANALOG" port for readout of SLD parameters and SLD power setting in "EXT" mode.

When ordering the light sources with standard SLDs inside, just add "mCS" or "sCS" to SLD P/N not referring SLD module package type. For example, SLD-mCS-371-HP1-SM-PD describes SLD-mCS with a standard SMF fiber coupled SLD-371-HP1 module inside. Only butterfly packaged modules may be integrated into to SLD-mCS and SLD-sCS.

Drawings

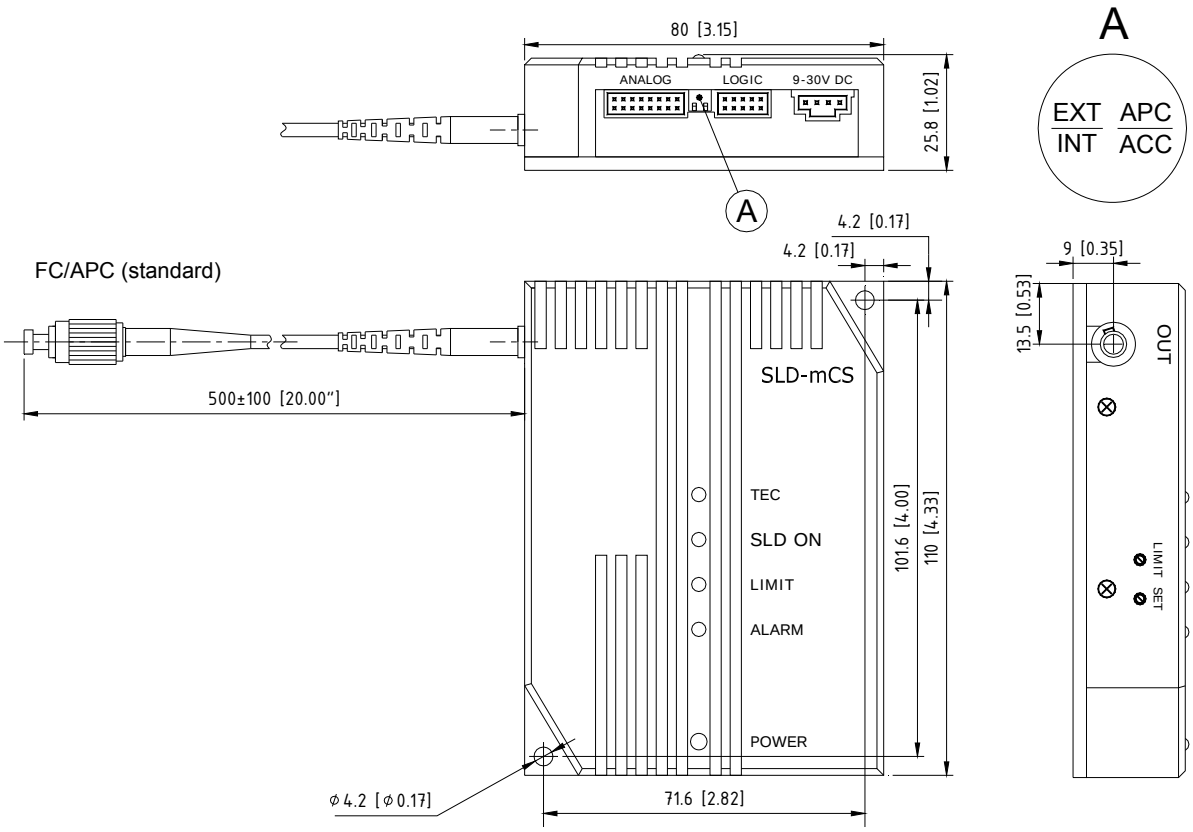

Figure 1, a. Drawing of SLD-mCS light source module. All dimensions are in millimeters [inches]. On the left side of the device: "LIMIT" – potentiometer for setting the SLD current limit, "SET" – potentiometer for setting the SLD power or drive current in "internal control" mode. SLD-mCS status LEDs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

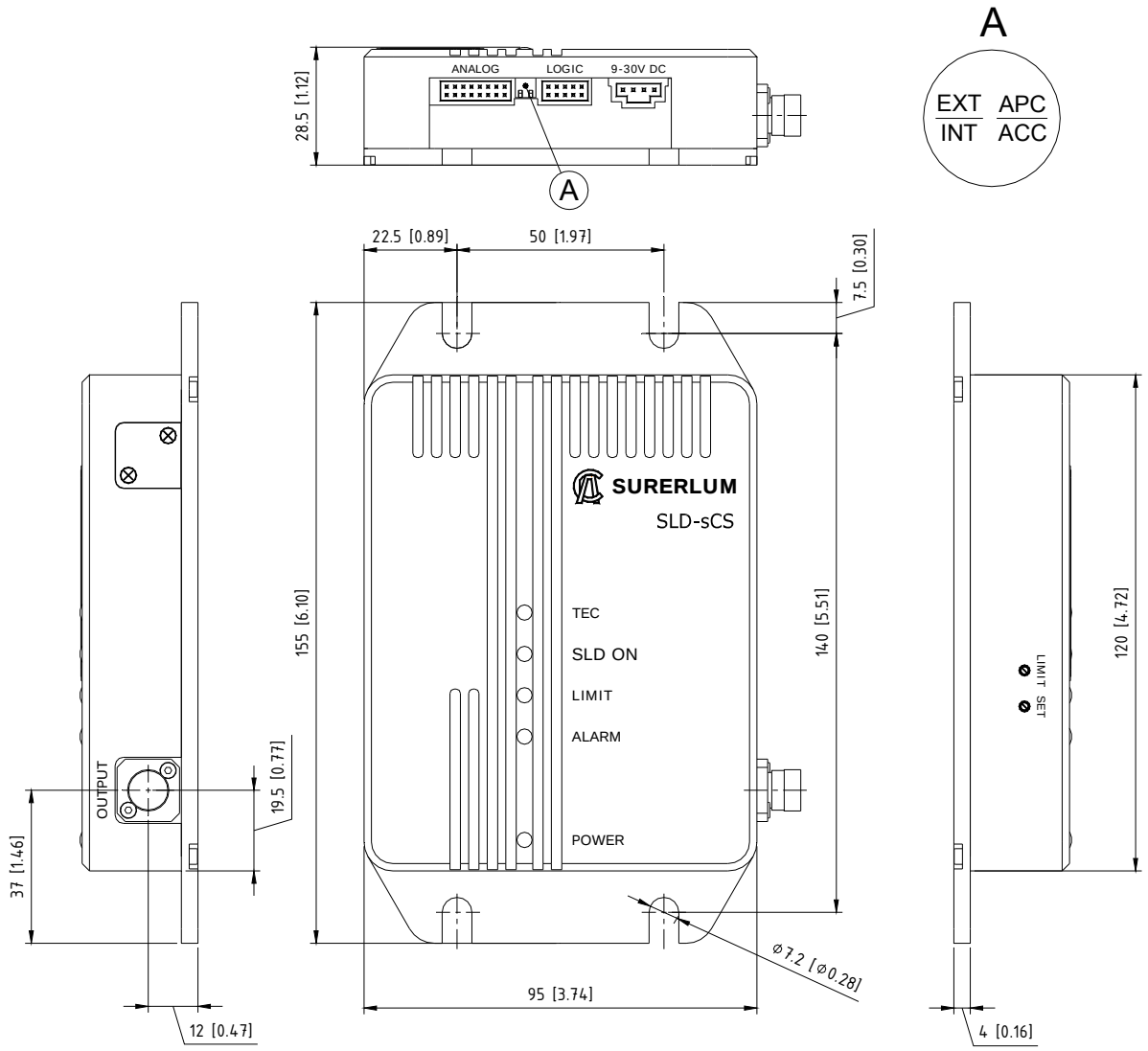

Figure 1, b. Drawing of SLD-sCS light source module. All dimensions are in millimeters [inches]. On the left side of the device: "LIMIT" – potentiometer for setting the SLD current limit, "SET" – potentiometer for setting the SLD power or drive current in "internal control" mode. SLD-sCS status LEDs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

Pinouts

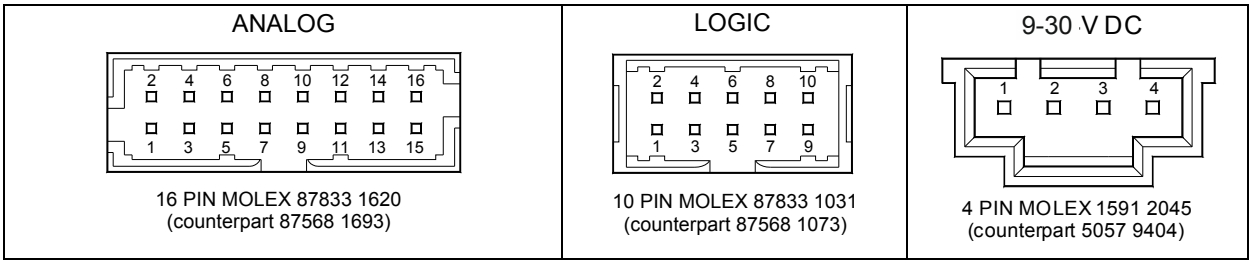

Figure 2. Pin configurations for SLD-mCS/sCS control ports and power supply connectors.

Table 1. Pin function descriptions.

Pin number	Name	IN/OUT	Description/structure
DC power input (4 pin MOLEX Connector P/N 1591 2045)			
1,2	+9 to +30 V	IN	+9 to +30 V DC
3,4	GND		Power ground
***Attention*: Power ground, Analog ground and case of SLD-mCS/sCS light source are connected inside the device.**			
LOGIC CONTROL (10 pin MOLEX Connector P/N 87833 1031)			
1	STATUS TEC	OUT	Open collector. Goes to low impedance state when the SLD temperature setpoint is ***NOT*** 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; **SLD is ON when 5 V is applied**, **OFF when 0 V is applied**; 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.
***Attention*: It is not recommended to connect Logic ground to Analog ground as it may result in increased noise.**			
ANALOG CONTROL (16 pin MOLEX Connector P/N 87833 1620)			
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.
***Attention*: Power ground, Analog ground and case of SLD-mCS/sCS 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. Absolute maximum ratings*.

Parameter		Value
DC supply voltage		35 V
DC supply peak current		1.2 A
Optical power		Depends on SLD and pre-set current limit
SLD drive current		According to the SLD Datasheet
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

*** 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.

Electrical Characteristics

Table 3. Electrical characteristics of SLD-mCS/sCS 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	-	4.0	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	0.3	-	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	4.500	4.523	V
ANALOG I/O – 5 V DC 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 4. Detailed description of analog outputs ("ANALOG" I/O connector)

PIN & name	Description	Scale	Voltage	Note
Pin 1, +5 V AUX	+5 V DC output	-	5 V	± 2%
Pin 3, SLD I LIMIT	SLD current limit	1 V= 100 mA	0 – 4 V	
Pin 5, REF OUT	Reference output voltage	-	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 SLD current (ACC)	1 V= 100 mA	0 – 4 V	
Pin 15, TEC I	TEC current	0.3 V=-1.5A TEC 2.7 V=1.5A TEC	0.3 – 2.7 V	

Optical Characteristics

Optical characteristics of any SLD-mCS/sCS light source module are determined by the SLD module used. In case of SLD-sCS, additional losses in FC/APC connections (up to 20% and more) shall be considered, depending on SLD wavelength. The insertion loss of the cable provided by Superlum does not exceed 10%.

The typical output power drift at 0…+50 °C is below 200 ppm/°C after warming up (depending on the P/N of the SLD inside the light source). The typical long-term (8 hours) power stability at temperatures near +25 ° is well below 1000 ppm after 30 minutes of warming up. Some examples are shown in the figures below.

Recommended external control circuits

Standard SLD-mCS/sCS sources are set to ACC mode and "internal" SLD control mode (except the special cases when other settings are specified in the related documents). It is recommended to contact Superlum before changing the control modes from factory presets to user ones.

For the SLD-mCS/sCS module to emit light (1) power must be applied to the power connector; (2) a +5 V TTL signal must be applied to pin 7 of “LOGIC” connector, as suggested in Figure 3; and (3) the SLD temperature must stabilize at a preset value. When power is applied, it takes some time for the temperature to stabilize. Note that a protection circuit prevents the SLD from switching on until its temperature reaches the setpoint. If only power is applied, the light source module powers on, the SLD temperature stabilizes at the preset level, but the SLD remains off.

It is strongly recommended to switch off the SLD when not in use. If the SLD is not in use for a short time, it is recommended to switch it off, but to keep power to the light source. The SLD temperature will be kept at the preset level as long as power to the light source is maintained. It will greatly decrease the SLD switch-on time, given that the process of temperature stabilization inside the package may take seconds (depending on ambient temperature).

In addition, the simple external circuit shown in Figure 4 can be used to monitor the SLD status from a convenient location, while the SLD- mCS/sCS module itself is out of sight. The external indicating LED in Figure 4 is on when the SLD emits light.

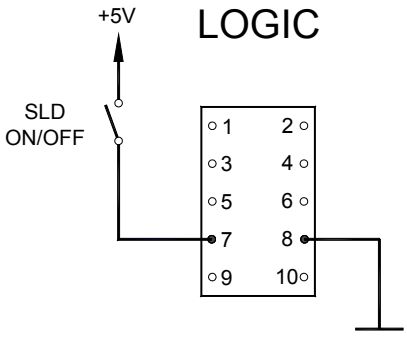

Figure 3. External circuit for switching SLD on and off remotely. “LOGIC” – 10 pin I/O connector of SLD-CS source.

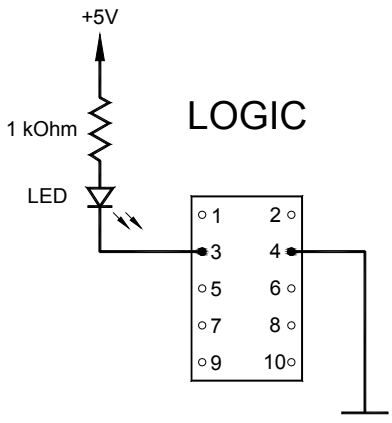

Figure 4. External circuit for remote monitoring of SLD status. “LOGIC” – 10 pin I/O connector of SLD-CS source.

SLD emission can be switched on automatically when power is applied to SLD-mCS/sCS light source module. For this purpose, it is only necessary to connect pin 1 of “Analog Control” connector (+5 V DC auxiliary output) and pin 7 of “Logic Control” connector, and analog and logic grounds by a separate wire. *Note that this option is highly NOT recommended with SLDs classified as Class 3B laser light sources, particularly with SLDs emitting more than 10 mW power in 800-900 nm range, by safety considerations.*

SLD power can be controlled externally by applying a voltage to pin 9 of “ANALOG” I/O. Figure 5 shows suggested circuit diagrams for “external control” of SLD power by (a) using the 4.5 V DC reference voltage output of SLD-mCS/sCS module and (b) applying an external DC voltage. The front panel switch “EXT/INT” (See Fig.1) should be switched to “EXT” (“external control” mode). It is recommended that the control mode settings (“external control” or “internal control”) are specified when ordering. Note that changing the output power by the “SET” potentiometer (See Fig.1.) is disabled when the operation mode is changed to “external control” mode. Also note that fast modulation is not possible via pin 9 of “ANALOG” I/O — it is possible only through pin 7 of “LOGIC” I/O.

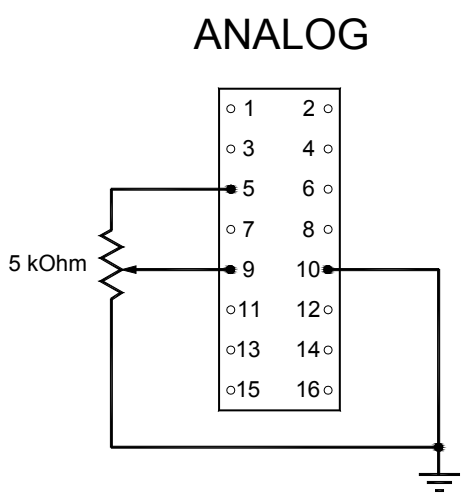

Figure 5 (a). External control of output power using 4.5 V DC reference voltage output of SLD-CS.

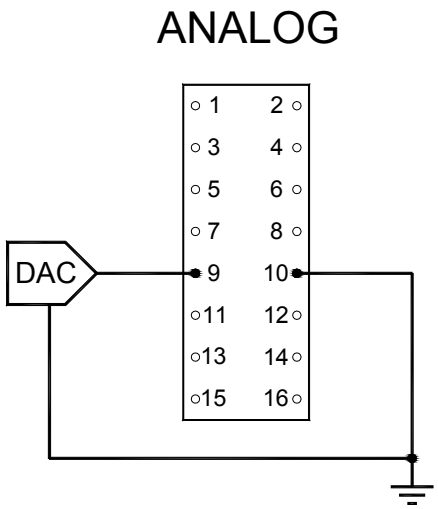

Figure 5 (b). External control of output power using external DC voltage.

Mounting

For the SLD-mCS/sCS to operate within the specified ambient temperature range, it is required to mount the device to an appropriate heatsink and to provide free air circulation around the top cover. An SLD-mCS/sCS light source can be used without a heatsink, but this will limit the maximum operating temperature of the device. Free air circulation around the SLD-mCS/sCS is required in this case, and forced-air (fan) cooling or similar measures are recommended. For selected models, the maximum operating ambient temperature without a heatsink is as high as +50 °C (please contact Superlum for more details).

Laser hazard classification

All standard SLD-mCS/sCS sources except models at 680 nm emit invisible light. It may have a potential hazard associated with CLASS 3R or 3B of IEC 60825-1 (Edition 2.0; 2007-03).

The SLD-mCS/sCS 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 that any equipment incorporating this component may be subject to these standards. Standard SLD-mSC/sCS 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 control interfaces.

Please contact Superlum for more details about laser safety issues for each particular model of SLD-mSC/sCS light source modules.

Superlum Broadband Light Sources

SLD-CS-series Compact High Power Broadband Light Source Modules.

Technical Product Specification

Document ID: SL.RD.04.002.150508
December 2015
Revision: 002

RoHS
COMPLIANT
2002/95/EC

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Product description

SLD-CS devices are very high power compact broadband SM-fiber light source modules at different wavelengths in the 670-1100 nm spectral range for applications requiring a reliable, powerful, stable and low-noise SLD light source with a broad and flat spectrum and short coherence length.

The light source incorporates a high-precision miniature current and temperature controller that provides a current source for the SLD module and maintains a constant temperature of the SLD. The controller operates from a wide supply voltage range from 9 to 30 V DC. A low-noise DC-DC converter protects the SLD and the controller circuitry from power supply voltage variations (steady state voltage changes, ripple, and noise). The controller has a number of SLD protection features including adjustable overcurrent protection. The main SLD parameters can be monitored via “ANALOG” I/O connector. The overall light source status can be monitored via “LOGIC” I/O connector. The SLD power can be changed either by a potentiometer (customer accessible) or by applying a DC voltage to the appropriate pin of “ANALOG” I/O connector. In the standard version, the SLD can be modulated (ON/OFF) at up to 50 kHz. The modulation frequency can be increased to 100 kHz upon request. The LEDs on the top cover provide a visual indication of the light source status.

Standard models have FC/APC-terminated, 50 cm long single mode fiber pigtail. The fiber is protected by a 3 mm tube. A 900-micron loose tube is available upon request.

The SLD is protected by an appropriate optical isolator in all standard models.

Light source modules must be put onto an appropriate heatsink in order to achieve the widest possible operating temperature range. However, it is also possible to use SLD-CS without a heatsink, although in a limited range of ambient temperatures. Particularly, the maximum operating ambient temperature without a heatsink is +40 °C for all models and up to +50 °C for selected models (free air circulation around the package is required). It may also depend on the isolator used.

Applications

- Optical Fiber Sensing
- Optical Coherence Tomography
- Optical Metrology
- Testing of Optical Components
- Biomedical Imaging
- Low Coherence Interferometry

Features

- Ease of use
- Very high power and wide spectrum
- Different center wavelengths in 670-1100 nm window
- Wide range of supply voltage (9-30 V DC)
- External or internal control of SLD power
- Main SLD parameters and overall light source status monitoring capability
- Adjustable overcurrent protection
- Constant power (APC mode); Constant current (ACC mode) upon request
- SMF output (PMF upon request)
- Optically isolated output
- Operating temperature range of 0 °C to +50 °C
- Fast modulation
- Excellent stability
- Low noise

Mechanical specifications

Drawing of a standard SLD-CS light source is shown in Figure 1.

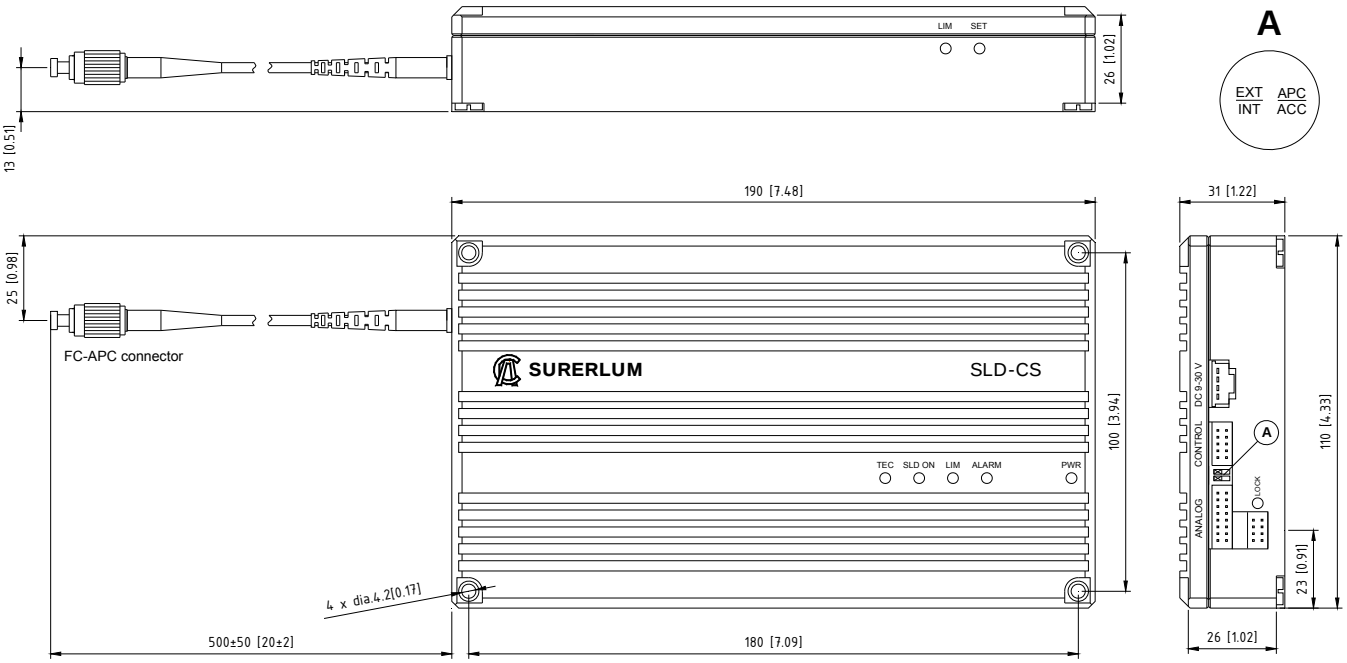

Figure 1. Drawing of SLD-CS light source module. All dimensions are in millimeters [inches]. On the front side of the device: “LIM” – potentiometer for setting the SLD current limit, “SET” – potentiometer for setting the SLD power or drive current in the “internal control” mode. Status LEDs on the top 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

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.

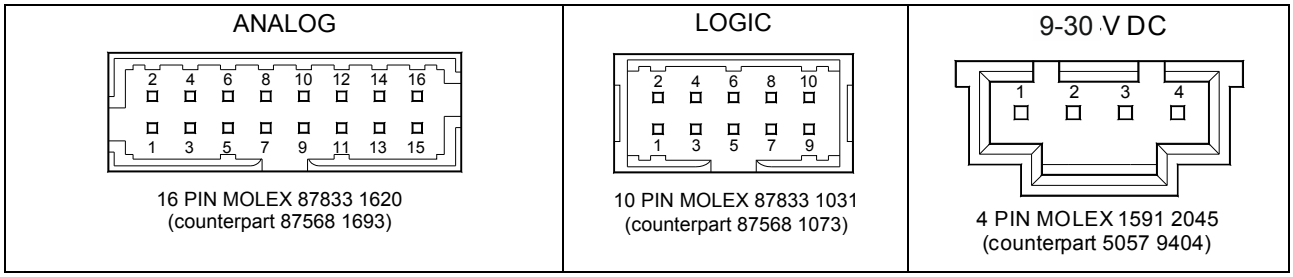

Figure 2. Pin configurations for SLD-CS control ports and power supply connectors.

Table 1. Pin function descriptions.

Pin number	Name	IN/OUT	Description/structure
DC power input (4 pin MOLEX Connector P/N 1591 2045)			
1,2	+9 to +30 V	IN	+9 to +30 V DC
3,4	GND		Power ground
***Attention*: Power ground, Analog ground and case of SLD-CS light source are connected inside the device.**			
LOGIC CONTROL (10 pin MOLEX Connector P/N 87833 1031)			
1	STATUS TEC	OUT	Open collector. Goes to low impedance state when the SLD temperature setpoint is ***NOT*** 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; **SLD is ON when 5 V is applied**, **OFF when 0 V is applied**; 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.
***Attention*: It is not recommended to connect Logic ground to Analog ground as it may result in increased noise.**			
ANALOG CONTROL (16 pin MOLEX Connector P/N 87833 1620)			
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.
***Attention*: 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.

Electrical and Optical Characteristics

SLD is driven in automatic power control mode in all standard SLD-SC light sources. In this mode, the output power is held constant by adjusting the SLD drive current utilizing the SLD back-facet monitor photodiode (PD monitor) for feedback. Optical parameters of standard models are shown in the Table 3 (see below). Standard models are based on the most high-power and wide-spectrum SLD modules at a given wavelength. **Note that any fiber coupled temperature controlled SLD of Superlum may be used in SLD-CS if SLD current does not exceed 400 mA.**

Table 3. Standard models of SLD-CS light sources – optical performance and other parameters.

Model number	Power, mW		Wavelength, nm	3 dB spectrum width, nm		Ripple %	Minimum isolation*, dB
	Min.	Typ.		Min.	Typ.		
SLD-CS-261-HP-SM-670-I	4.0	5.0	670 ± 10	6.0	7.0	<5	-30
SLD-CS-331-HP3-SM-785-I	15.0	20.0	785 ± 10	40	45	<5	-30
SLD-CS-381-HP3-SM-795-I	15.0	20.0	795 ± 5	13	15	<5	-30
SLD-CS-371-HP3-SM-840-I	15.0	20.0	840 ± 10	45	50	<5	-30
SLD-CS-341-HP3-SM-840-I †	20.0	25.0	840 ± 10	20	25	<5	-30
SLD-CS-341-HP2-SM-880-I	10.0	15.0	880 ± 10	30	40	<5	-30
SLD-CS-531-HP3-SM-1050-I	15.0	20.0	1050 ± 10	30	35	<5	-30
SLD-CS-541-HP3-SM-1050-I	10.0	15.0	1050 ± 10	60	70	<5	-30

Other parameters (all models)	
Long-term power stability (8 h) ‡	Better than 5000 ppm after 0.5 h warming-up at +25±0.1 °C case temp
Modulation rate	50 kHz; optional up to 100 kHz (TTL ON/OFF)
Weight	950 g

* At a mean wavelength.
† Special SLD-341-HP3 selection
‡ Typical performance (depends on the optical isolator used).

Electrical characteristics are shown in Table 4 (see below). Scale factors for the monitoring outputs are listed in Table 5.

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	-	4.0	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)	0V=-1.5A TEC 3V=1.5A TEC	0.0	-	3.0	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	4.500	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	
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 SLD current (ACC)	1 V= 100 mA	0 – 4 V	
Pin 15, TEC I	TEC current	0V=-1.5A TEC 3V=1.5A TEC	0 – 3 V	

Recommended external control circuits

Standard SLD-CS sources are set to APC mode and "internal" SLD control mode (except in the special cases when other settings are specified in the related documents). ***Note that switching to ACC mode is not possible if not agreed upon before ordering.***

For the SLD-CS module to emit light (1) power must be applied to the power connector; (2) a +5 V TTL signal must be applied to pin 7 of "LOGIC" connector, as suggested in Figure 3; and (3) the SLD temperature must stabilize at a preset value. When power is applied, it takes some time for the temperature to stabilize. Note that a protection circuit prevents the SLD from switching on until its temperature reaches the setpoint. If only power is applied, the light source module powers on, the SLD temperature stabilizes at the preset level, but the SLD remains off.

It is strongly recommended to switch off the SLD when not in use. If the SLD is not in use for a short time, it is recommended to switch it off, but to keep power to the light source. The SLD temperature will be kept at the preset level as long as power to the light source is maintained. It will greatly decrease the SLD switch-on time, given that the process of temperature stabilization inside the package may take seconds (depending on ambient temperature).

In addition, the simple external circuit shown in Figure 4 can be used to monitor the SLD status from a convenient location, while the SLD-CS module itself is out of sight. The external indicating LED in Figure 4 is on when the SLD emits light.

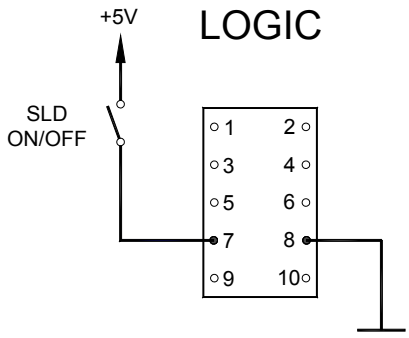

Figure 3. External circuit for switching SLD on and off remotely. "LOGIC" – 10 pin I/O connector of SLD-CS source.

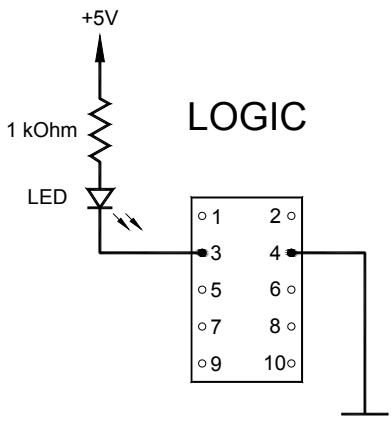

Figure 4. External circuit for remote monitoring of SLD status. "LOGIC" – 10 pin I/O connector of SLD-CS source.

SLD emission can be switched on automatically when power is applied to SLD-CS light source module. For this purpose, it is only necessary to connect pin 1 of "Analog Control" connector (+5 V DC auxiliary output) and pin 7 of "Logic Control" connector, and analog and logic grounds by a separate wire.

SLD power can be controlled externally by applying a voltage to pin 9 of “ANALOG” I/O. Figure 5 shows suggested circuit diagrams for “external control” of SLD power by (a) using the 4.5 V DC reference voltage output of SLD-CS module and (b) applying an external DC voltage. The front panel switch “EXT/INT” (See Fig.1) should be switched to “EXT” (“external control” mode). It is recommended that the control mode settings (“external control” or “internal control”) be specified when ordering. Note that changing the output power by the “SET” potentiometer (See Fig.1.) is disabled when the operation mode is changed to “external control” mode. Also note that fast modulation is not possible via pin 9 of “ANALOG” I/O — it is possible only through pin 7 of “LOGIC” I/O.

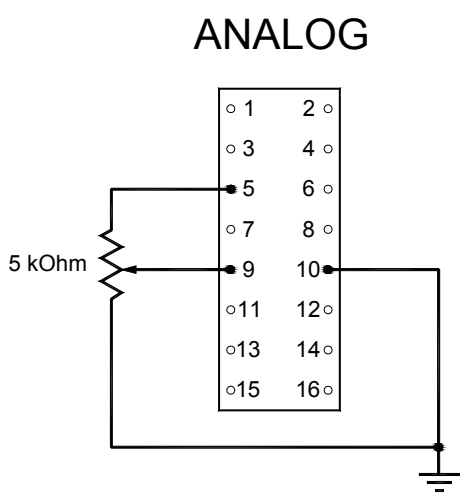

Figure 5 (a). External control of output power using 4.5 V DC reference voltage output of SLD-CS.

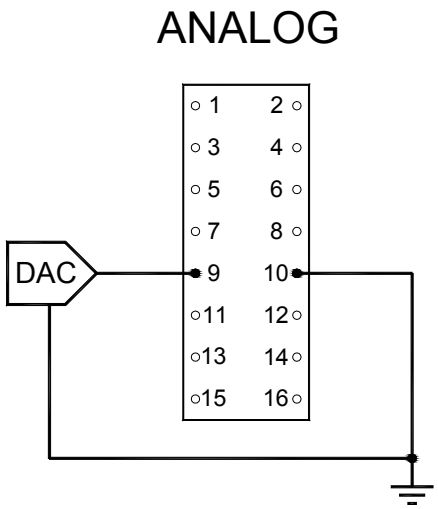

Figure 5 (b). External control of output power using external DC voltage.

Mounting

For the SLD-CS to operate within the specified ambient temperature range, it is required to mount the device to an appropriate heatsink and to provide free air circulation around the top cover. An SLD-CS light source can be used without a heatsink, but this will limit the maximum operating temperature of the device. Free air circulation around the SLD-CS is required in this case, and forced-air (fan) cooling or similar measures are recommended. For selected models, the maximum operating ambient temperature without a heatsink is as high as +50 °C (please contact Superlum for more details).

Laser hazard classification

All standard SLD-CS sources except models at 680 nm emit invisible light. It may have a potential hazard associated with CLASS 3R or 3B of IEC 60825-1 (Edition 2.0; 2007-03).

The SLD-CS 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 that any equipment incorporating this component may be subject to these standards. Standard SLD-SC 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 control interfaces.

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

Note: Superlum also offers advanced SLD-CS light source modules providing all basic protection means required for Class 3B Laser Sources.

Superlum Broadband Light Sources

BLM2-D-series Miniature Broadband Light Source Modules with Extended Bandwidth.

Technical Product Specification

Document ID: SL.RD.04.003.150508
May 2015
Revision: 001

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Product Description

Miniature BLM2-D series light source modules are powerful and very broadband light sources based on a combination of two SLDs with slightly different center wavelengths.

A built-in, stable and reliable dual-channel digital SLD current and temperature controller allows the switching of SLDs on and off either by a pushbutton (located on the front), or externally by TTL, or from a PC via an RS-232 port (USB upon request). SLDs operate in a constant power mode in standard models. The LEDs on the top cover provide a visual indication of the light source status.

The controller should be powered by a stabilized 5 V DC power supply. Linear DC power supplies are recommended. Pulse type DC power sources may result in considerably increased noise.

Operating parameters of each SLD are pre-set in order to achieve the best combination of spectrum width and output power. Superlum may provide a password key allowing the change of SLD parameters via RS-232 (USB).

BLM2-D modules should be put on an appropriate heatsink in order to achieve the widest possible operating temperature range. It is also possible to use BLM2-D modules without a heatsink. However, this will limit the maximum ambient operating temperature by +40 °C.

Standard models have FC/APC (narrow key) mating sleeve. Other connectors are available upon request. Models with a fiber pigtail terminated with an FC/APC connector or with other angled connectors are also available upon request.

This specification describes standard models offered by Superlum. However, the flexible design of the light source 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.

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
- Very wide emission spectra
- Coherence length* of 4.5 μm and less (in air)
- Easy use - just apply DC voltage
- Miniature design
- Excellent stability
- Low noise
- RS-232 and TTL control
- USB upon request
- +5V DC supply
- Operating temperature range 0 to +55 °C

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

Mechanical specification

Mechanical drawing of a BLM2-D light source module is shown in Figure 1.

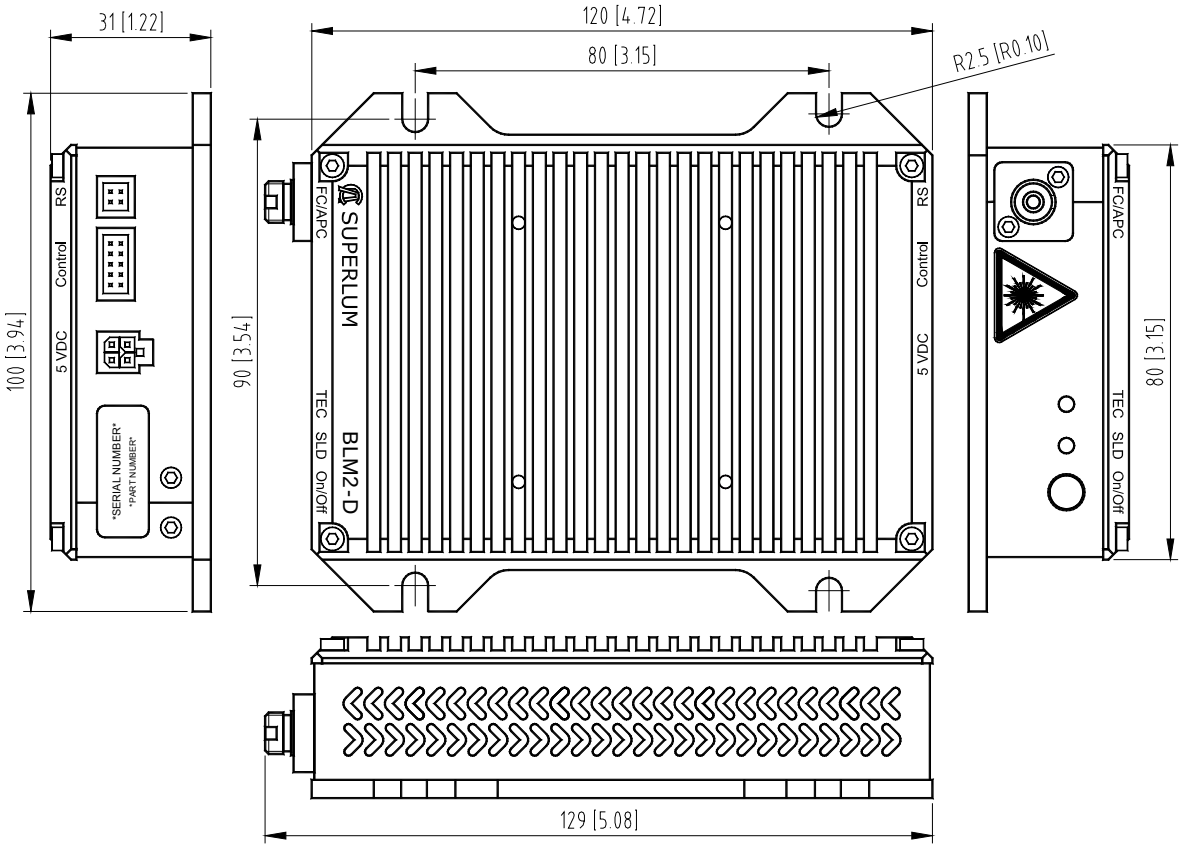

Figure 1. Drawing of the BLM2-D light source module. Dimensions are in millimeters [inches]. TEC, SLD – BLM2-D status LED. ON/OFF – emission on/off switching button.

Electrical Connections

Electrical connections of a standard BLM2-D light source are shown on the Figure 2 (a) and Figure 2 (b) (see below). Electrical Inputs/Outputs are described in Table 1. There are separate connectors for 5V DC power input, for remote control and external switching of SLDs on and off by TTL, and for RS-232 (or USB) interface.
The DC power input accepts +5 V / 3.5 A (max) from an external power supply unit.

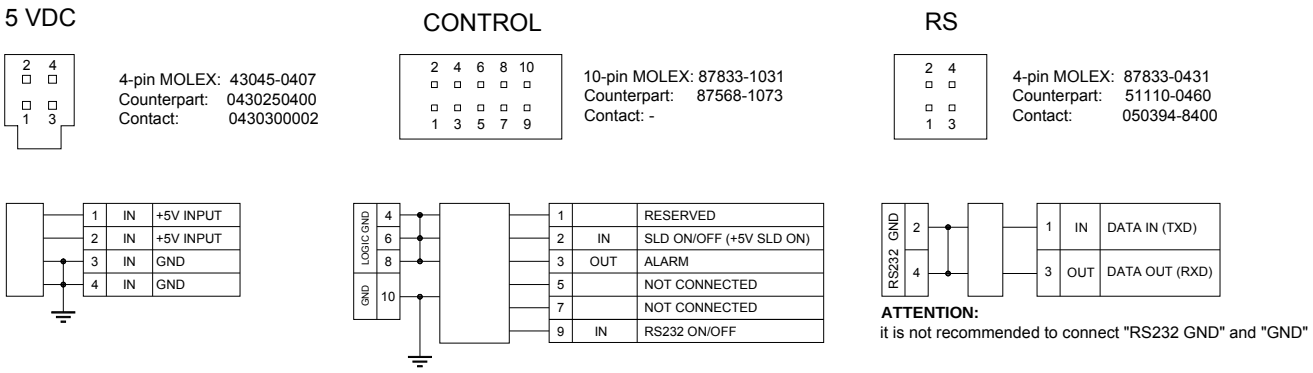

Figure 2 (a). Pin-outs of BLM2-D connectors.

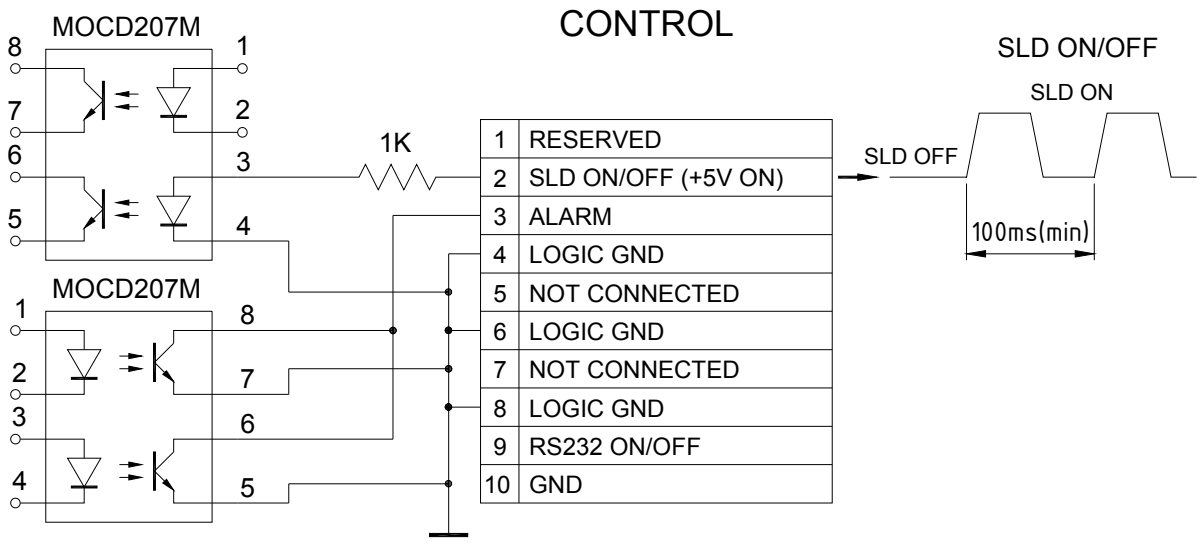

Figure 2 (b). Structure of electrical outputs—"Control" output.

Table 1. Pin function descriptions.

Pin number	Name	IN/OUT	Description/structure
DC power input, 5V DC: 4 pin MOLEX Connector P/N 43045 0407 (counterpart P/N 0430250400)			
1,2	+5 V	IN	+5 V DC
3,4	GND	IN	Power ground
***Attention*: Power ground and the case of BLM2-D light sources are connected inside the device. It is recommended to connect Logic ground to Power ground.			
RS: 4 pin MOLEX Connector P/N 87833 0431 (counterpart P/N 511100460)			
1	TXD	IN	DATA IN
2	RXD	OUT	DATA OUT
3	RS-232 GND	OUT	RS-232 ground
***Attention*: it is *NOT* recommended to connect RS-232 ground to either Power ground or Logic ground.			
"CONTROL": 10 pin MOLEX Connector P/N 87568 1031 (counterpart P/N 87568 1073)			
1	RESERVED		Reserved for future use.
2	SLD ON/OFF	IN	Allows switching SLDs on and off by applying TTL signals (+5 V switches SLD on). 1kΩ and LED optocoupler in series.
3	ALARM	OUT	Open collector. Goes to low impedance state in case of a fatal error; works in intermittent mode (alternates between low and high impedance states at a rate of 1 Hz) if service is required.
4	LOGIC GND		Logic ground.
5	N/C		Not connected.
6	LOGIC GND		Logic ground.
7	N/C		Not connected.
8	LOGIC GND		Logic ground.
9	RS232 ON/OFF	IN	Shortening to Power ground (pin 10) disables the RS-232 interface.
10	GND		Power ground. Shortening pin 9 to pin 10 disables the RS-232 interface.
***Attention*: It is recommended to connect Logic ground to Power ground.			

Every BLM2-D is delivered with companion software for remote control of the light source from a PC via the RS-232 (USB) port. The companion software can be also used to enable/disable TTL control in the PROGRAM mode, and to diagnose the status of each SLD.

Absolute Maximum Ratings

Table 2 (see below) presents absolute maximum ratings of BLM2-D light sources.

Table 2. Absolute maximum ratings*.

Parameter	Condition	Min	Typ	Max	Unit
Storage temperature		−20	–	+80	°C
Operating temperature	BLM2-D mounted on a heatsink dissipating 15 W	0	–	+55 †	°C
Humidity, non-condensing		–	–	75	% RH
DC supply voltage		4.75	5.00	5.25	V
DC supply current ‡		2.0	–	3.5	A
DC supply ripple and noise	1 kHz to 200 kHz frequency range	–	–	20	mV
“INTERNAL MODE SWITCH” input	Pin 1 connector “Control”	4	5	30	V
“SLD ON/OFF” input	Pin 2 connector “Control”	4	5	30	V
ALARM output	Pin 3 connector “Control”; open collector	–	–	150	mA

* NOTICE: Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device 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.

† 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 BLM2-D without a heatsink, although in a limited range of ambient temperatures. The highest operating temperature without heatsinking is +40 °C in the case of a free air circulation around the package.

‡ DC power supply should be capable to produce up to 3.5A. A less powerful power supply may be used, but it will limit the operating temperature range. It is prohibited to use a power supply with a maximum current of less than 2.0 A.

Electrical and Optical Characteristics

Main optical parameters of standard BLM2-D light source modules are presented in Table 3 (see below). Please note that the flexible design of the light source and the great number of different SLD modules available to choose from allow a variety of light sources to be designed to meet a custom specification of optical parameters. Other electro-optical parameters of light sources are shown in Table 4. The weight of the standard light source module is 400 grams.

Table 3. Standard BLM2-D models– optical parameters.

Model number	Power, mW		Wavelength, nm	3 dB spectrum width, nm		Ripple, %		Spectral flatness, %
	Min.	Typ.		Min.	Typ.	Typ.	Max.	
BLM2-D-810-B-5	5.0	7.0	810 ± 10	90	100	2.0	5.0	≤ 45
BLM2-D-840-B-10	10.0	12.0	840 ± 10	90	100	2.0	5.0	≤ 45
BLM2-D-860-G-5	5.0	7.0	860 ± 10	70	80	2.0	5.0	Bell-shaped
BLM2-D-880-B-10	8.0	10.0	880 ± 10	90	100	2.0	5.0	≤ 30
BLM2-D-880-B-MP	1.0	1.5	880 ± 10	190	200	0.5	2.0	≤ 45

Table 4. Standard BLM2-D models– other electro-optical parameters

Parameter	Condition	Min	Typ	Max	Unit
Temperature dependent optical drift	0 to +40 °C	–	75	-	ppm/°C
Relative Intensity Noise (RIN)	10 kHz to 2 MHz	–	−130	−125	dB/Hz
Long-term optical power stability	8 h after 60 min warming up	–	–	4000	ppm
"Ready-to-work" time	After DC power supplied	–	–	7	s
Cold start settling time (system warm-up)		20*	–	60 †	min
Rise time of optical signal		30	50	100	ms
Fall time of optical signal		1	–	3	µs

* At +25 °C.
† At high and low extremes of operating temperature range.

Fiber and Optical Connector Specifications

Table 5 (see below) describes fiber and connectors used in standard BLM2-D models.

Table 5. Fibers and connectors.

	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	

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 +40 °C or even less (depending on P/N). Free air circulation around BLM2-D 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 (Edition 2.0; 2007-03), depending on a particular P/N.

The BLM2-D 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 that any equipment incorporating this component may be subject to these standards. BLM2-D 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 easily implemented using "Control" or RS-232 or USB interfaces.

Please contact Superlum for more details about laser safety issues for each particular model of BLM2-D light source modules.

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

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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.

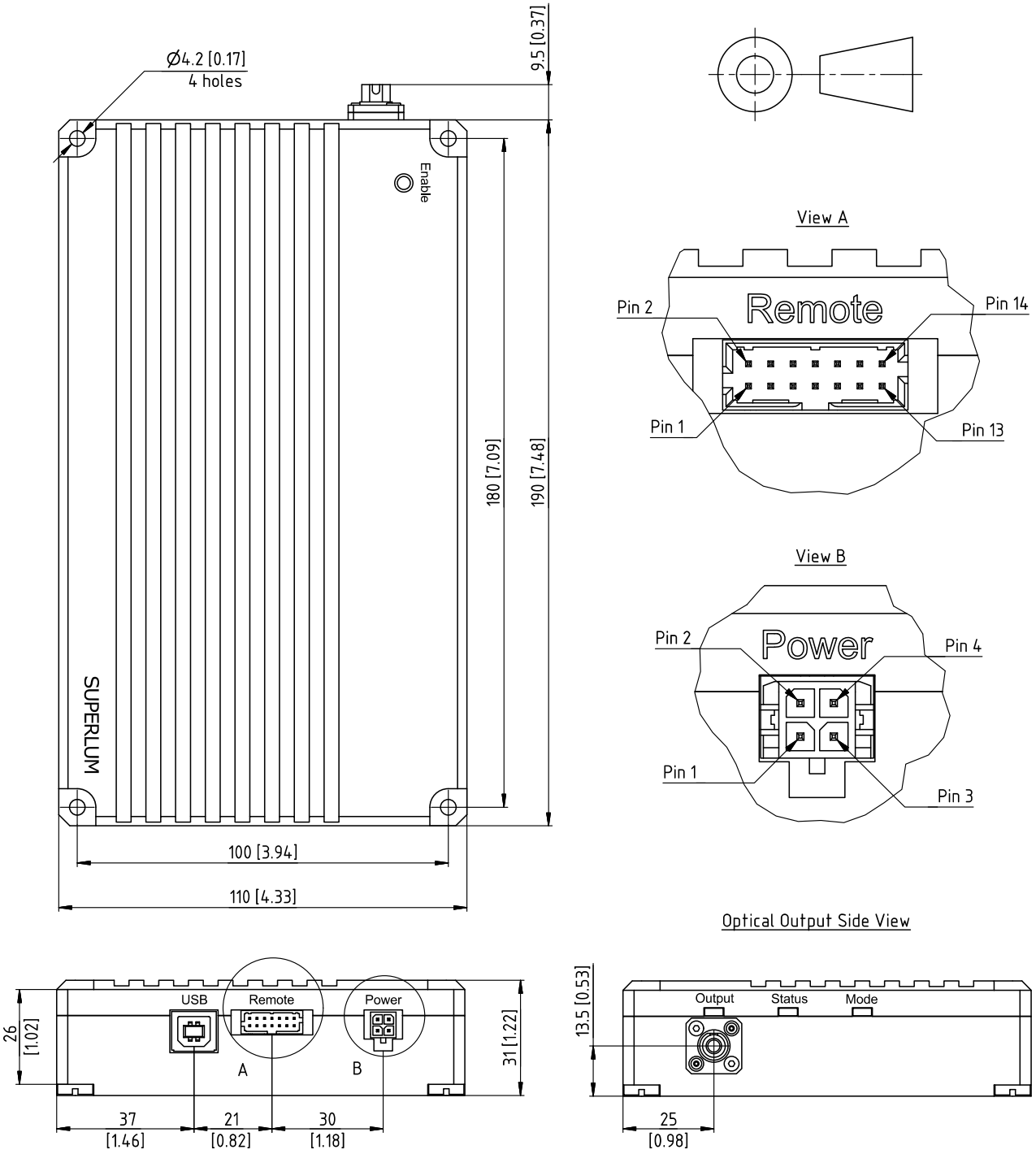


Figure 1. Drawing of cBLMD light source module. Dimensions are in millimeters [inches]. Three LEDs on the front panel ("Output", "Status" and "Mode") provide visual indication of the device status. The "ENABLE" push button on the top cover is used to manually switch optical output on/off.

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.

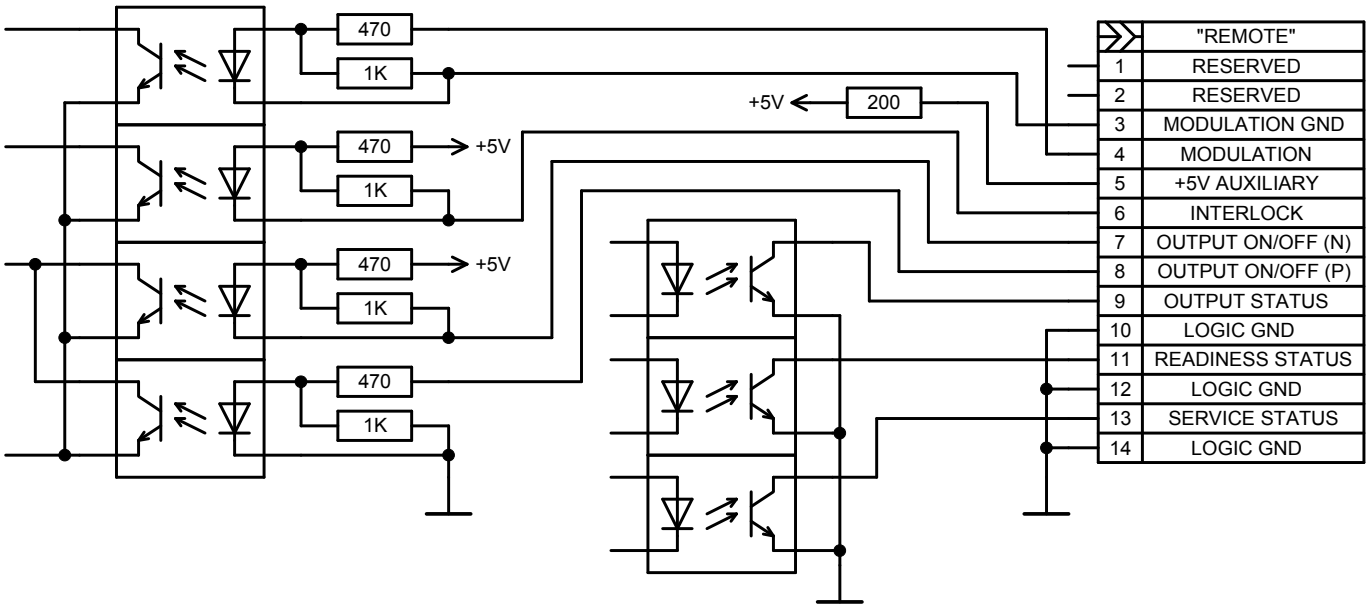


Figure 2. Electrical circuit diagram for the remote control interface starting with optocouplers at the left and ending with the “REMOTE” connector at the right.

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.

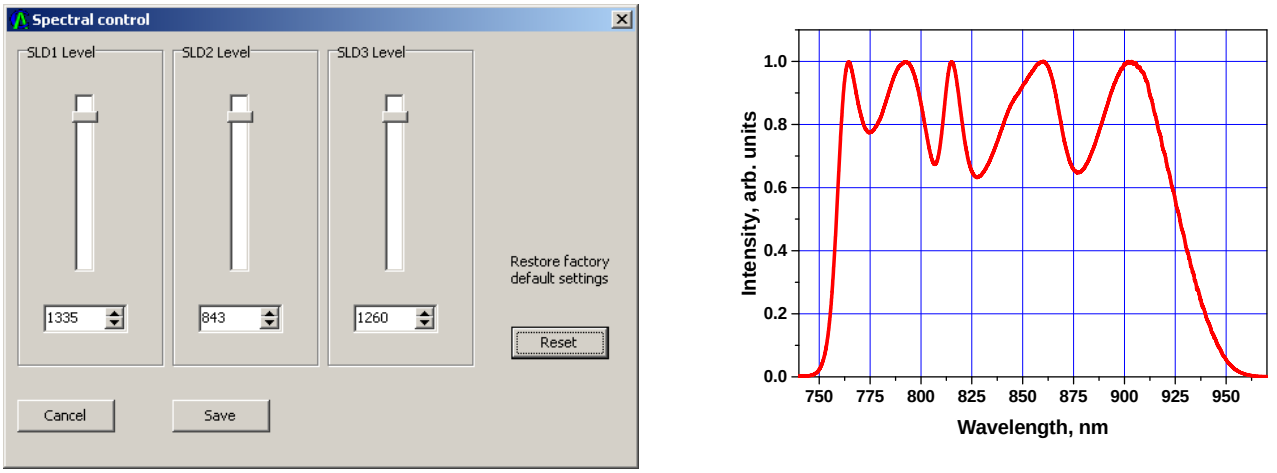


Figure 3. Factory settings (all intensity peaks of the 3 SLDs are equal)

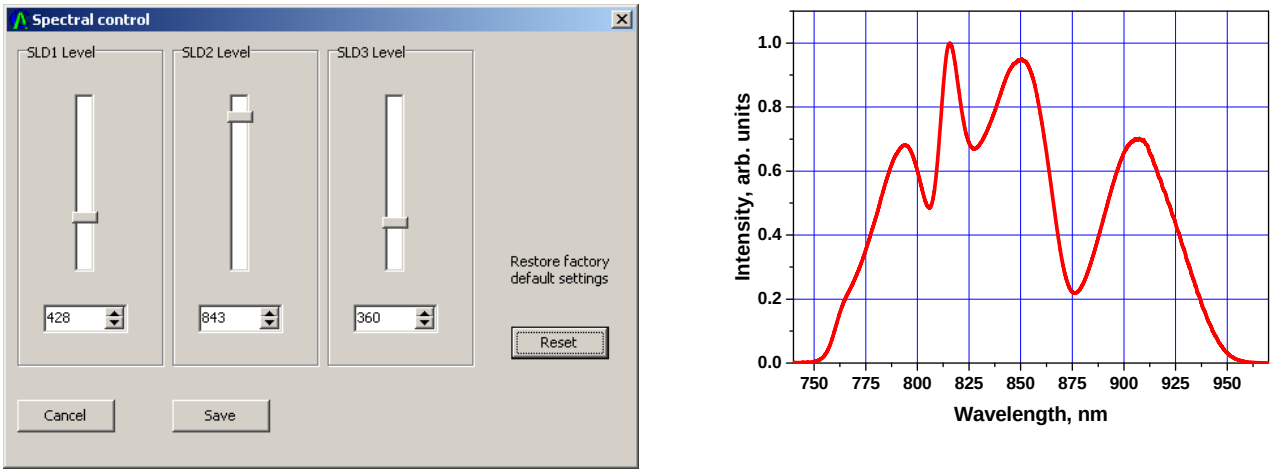


Figure 4. SLD1 and SLD3 power levels were lowered. SLD2 power level remains at factory settings

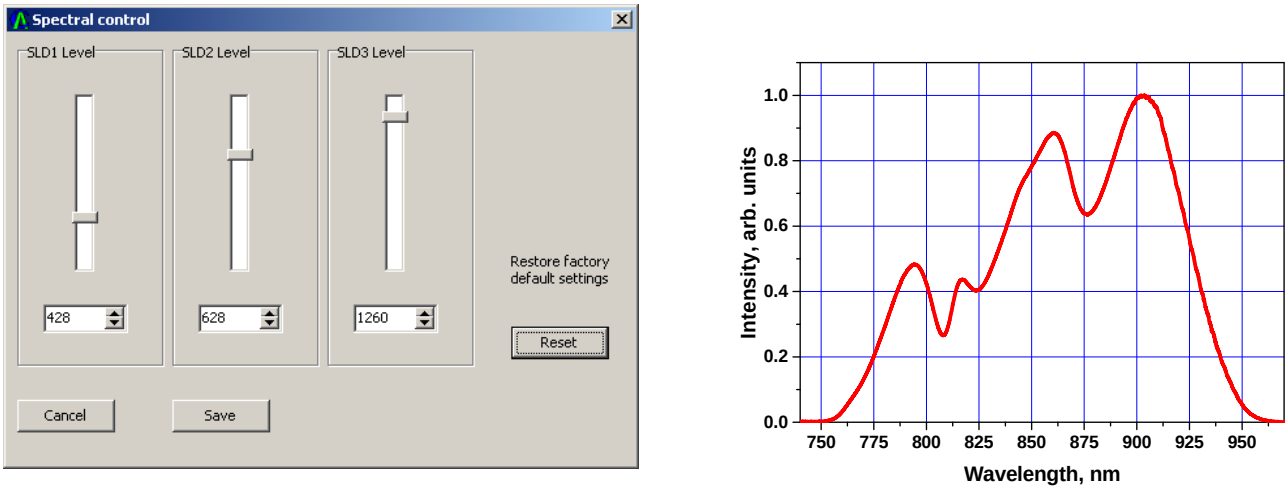


Figure 5. SLD1 and SLD2 power levels were lowered. SLD3 power level remains at factory settings

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

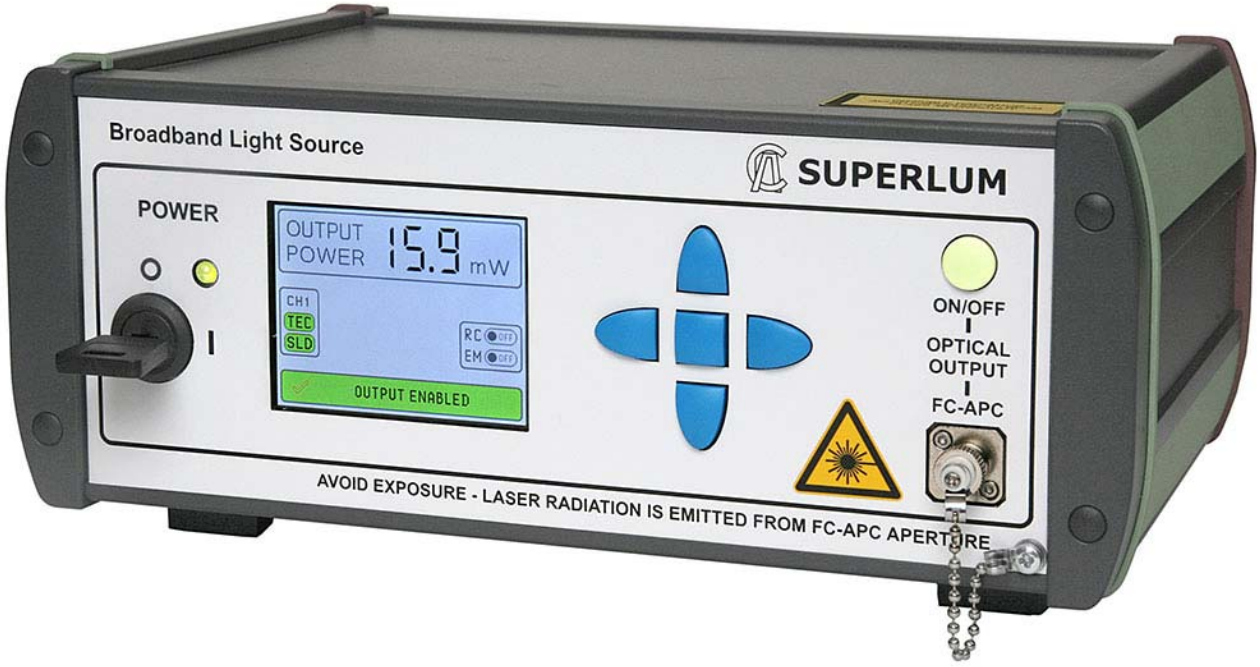
Given that the 2nd generation of cBLMD devices has the 14-pin REMOTE connector, rather than the 10-pin connector found on the 1st generation of cBLMD devices, an effort was made to ensure there was functional compatibility between the generations of cBLMD devices such that the 2nd generation could be 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	

M-S-series BroadLighter. Benchtop Broadband Light Source.

Technical Product Specification



Document ID: SL.RD.04.001.150723
July 2015
Revision: 001

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Product Description

Superlum M-S-series BroadLighters are high-power, wide spectrum and low coherence AC powered benchtop light sources based on a single mode fiber coupled superluminescent diode modules (SLD) of Superlum.

Superlum offers two types of M-S BroadLighters, namely, with and without a Variable Optical Attenuator (VOA). The former has the suffix "-VA" in the model number. In both designs, output power is changeable within 0–100% with the step of 10%. Spectral performance is guaranteed at the full (100%) output power.

In M-S-series light sources without VOAs, the optical output power is changed by varying the SLD drive current, entailing a change in the shape of the SLD spectrum. The change is not significant for models with a bell-shaped spectrum but may be large for models with a complex, multi-humped spectrum (see the examples below).

In M-S-series BroadLighters with VOAs, SLD itself always emits 100% of its power. The output power is changed with the help of a broadband VOA that is placed after the SLD module and the optical isolator. For these BroadLighters, changes of optical spectrum with output power are negligible (see the examples below). As a rule, Superlum offers M-S-series light sources with VOAs when the light source is based on an SLD with multi-humped spectrum. However, M-S-series devices with VOAs and SLDs with bell-shaped spectrum are available upon request. M-S-series light sources with VOAs are recommended for applications requiring changeable output power but stable spectral shape and center wavelength.

All standard light sources have an appropriate built-in optical isolator to protect the SLD from optical feedback.

Optical performance parameters

M-S-series Broadlighters without VOA.

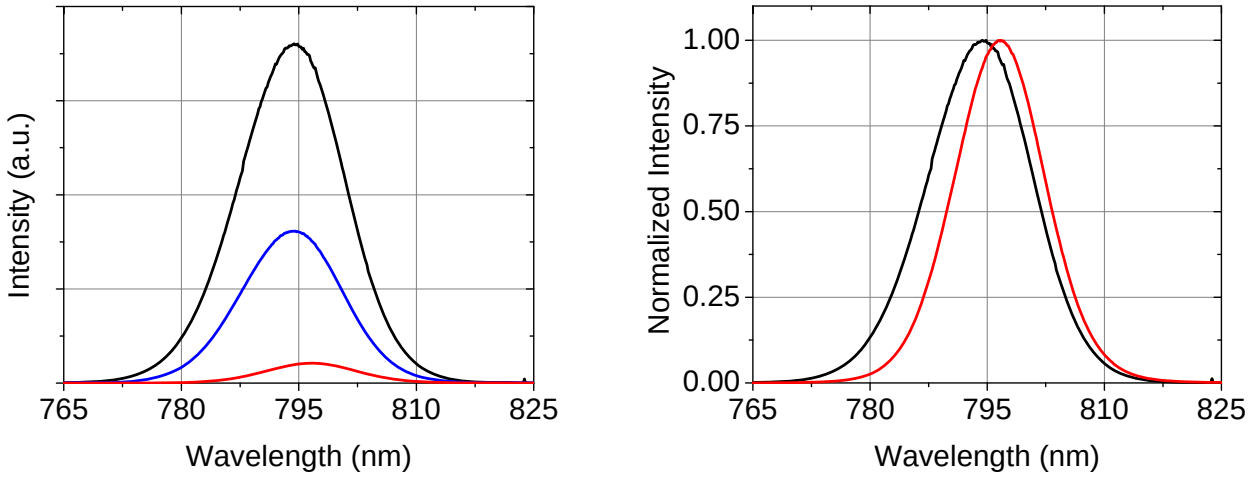
Model number	Power, mW		Wavelength, nm	3 dB spectrum width, nm		Spectral ripple, %	Minimum isolation, dB	Spectral shape
	Min.	Typ.		Min.	Typ.			
M-S-670-G-I-4	4.0	5.0	670 ± 10	4.0	5.0	<5	-30	Bell-shaped
M-S-785-B-I-15	15.0	20.0	785 ± 10	40	45	<5	-30	Multi-humped
M-S-795-G-I-15	15.0	20.0	795 ± 5	13	15	<5	-30	Bell-shaped
M-S-840-B-I-7	7.0	9.0	840 ± 10	45	50	<5	-30	Multi-humped
M-S-840-B-I-15	15.0	20.0	840 ± 10	45	50	<5	-30	Multi-humped
M-S-840-G-I-20	20.0	25.0	840 ± 10	20	25	<5	-30	Bell-shaped
M-S-840-G-I-30	30.0	35.0	840 ± 10	20	25	<5	-30	Bell-shaped
M-S-850-G-I-20	20.0	25.0	850 ± 10	15	20	<5	-30	Bell-shaped
M-S-880-G-I-10	10.0	15.0	880 ± 10	30	40	<5	-30	Bell-shaped
M-S-930-B-I-8	8.0	10.0	930 ± 10	90	95	<5	-30	Multi-humped
M-S-1050-G-I-15	15.0	20.0	1050 ± 10	30	35	<5	-30	Bell-shaped
M-S-1050-B-I-10	10.0	15.0	1050 ± 10	60	70	<5	-30	Multi-humped

M-S-series Broadlighters with VOA. Optical Performance Parameters

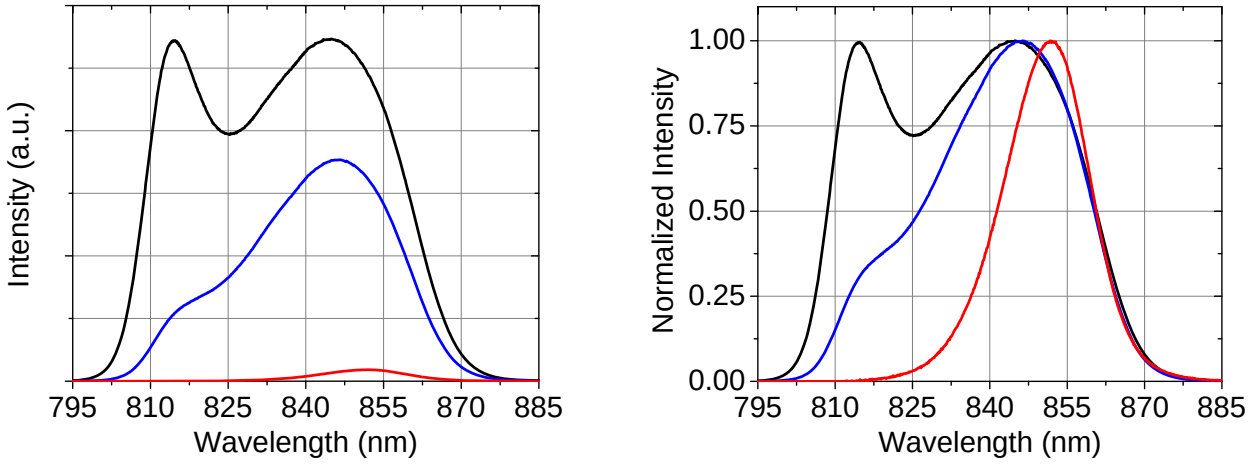
Model number	Power, mW		Wavelength, nm	3 dB spectrum width, nm		Spectral ripple, %	Minimum isolation, dB	Spectral shape
	Min.	Typ.		Min.	Typ.			
M-S-785-B-I-15-VA	15.0	16.0	785 ± 10	40	45	<5	-30	Multi-humped
M-S-840-B-I-15-VA	15.0	16.0	840 ± 10	45	50	<5	-30	Multi-humped

Notes :
- minimum isolation at the center wavelength is shown;
- in all light sources with multi-humped spectrum spectral density never drops below 3 dB at any wavelength within specified 3 dB bandwidth. Details about spectral flatness within 3 dB bandwidth are available upon request.

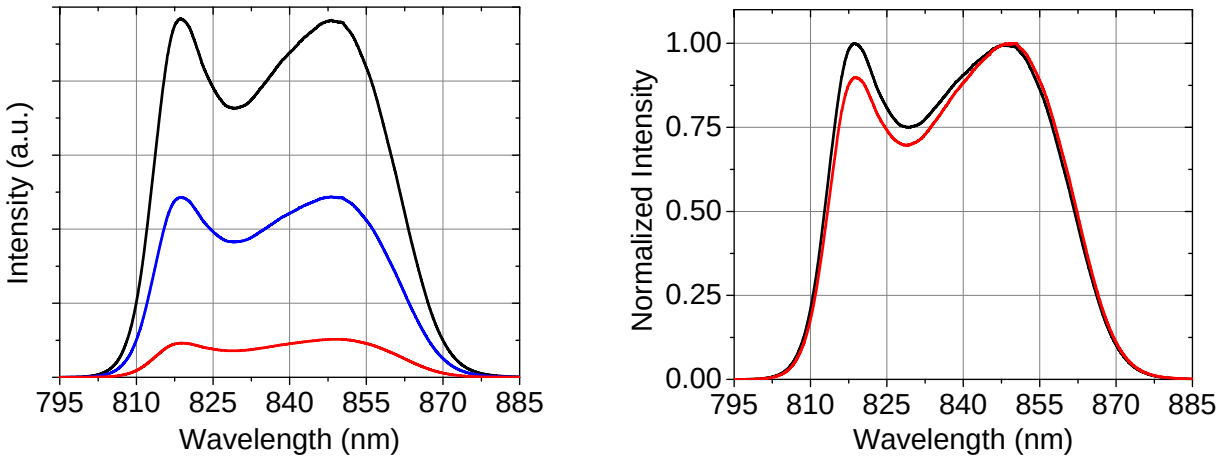
Performance Examples – M-S light sources with and without VOAs



Spectrum of BroadLighter M-S-795-G-I-15. Left – optical spectrum at output levels: 100% (20 mW SMF, black line); 50% (10 mW SMF, blue line); 10% (2 mW SMF, red line). Right – same but normalized: 100% (black line); 10% (red line).



Spectrum of BroadLighter M-S-840-B-I-15. Left – optical spectrum at output levels: 100% (20 mW SMF, black line); 50% (10 mW SMF, blue line); 10% (2 mW SMF, red line). Right – same but normalized: 100% (black line); 10% (red line).



Spectrum of BroadLighter M-S-840-B-I-15-VA. Left – optical spectrum at output levels: 100% (15 mW SMF, black line); 50% (7.5 mW SMF, blue line); 10% (1.5 mW SMF, red line). Right – same but normalized: 100% (black line); 10% (red line).

Physical Specifications

- Overall dimensions (W×H×D): 251×112×192 mm.
- Weight (max): 4 kg.

Electrical Power Specifications

- 100-240 V AC, 50/60 Hz, 40 VA MAX.

Environmental Specifications

- Operating temperature range: +5 °C to +35 °C.
- Storage temperature range: -30 °C to +70 °C.
- Operating relative humidity: < 80%, non-condensing.

Note: Operating and storage temperatures may be different for different models. The ranges shown are valid for all standard models.

Stability

- Long-term (8 h): maximum drift 0.5%.
- Short term (15 min) : maximum drift 0.1%

Laser Safety Measures

The most of high-power SLDs of Superlum are Class 3B according to IEC/EN 60825-1:2014. All M-S-series BroadLighter light sources are equipped with the master key control, remote interlock connection, visual/audible alarm (including a “beep” and 3-seconds delay of switching the emission on after pushing the ON button), and information and warning stickers.

Additionally, each M-series Broadlighter features a built-in protection against optical power overshoot. It is based on an output power monitor placed before the output FC/APC socket and an electrical circuit which immediately switches the emission off if the optical power exceeds the maximum value shown in the Acceptance Test Report (delivered with each device) by more than 30%.

Warranty

Superlum provides 2 years/10,000 operating hours (whichever happens first) warranty for every M-series Broadlighter including S-, D-, T- and Q- devices, except devices with output power exceeding 30 mW from SM-fiber and custom made instruments. For M-series Broadlighters with output power exceeding 30 mW, the warranty period is 2 years/7,500 operating hours unless otherwise specified in writing by Superlum. Operating hours are tracked by a built-in hour meter which records the total time the device emits light. Warranty may be extended to 2 years without limitation of operating hours for the most of S- and D- models, and for some T- models upon request. Custom made instruments have warranty of one year unless otherwise specified in the contract documents.

Service

SLD parameters degrade in time due to aging. Unexpected device failure may cause serious problems, especially in “sensitive” applications like a permanent use at manufacturing lines, permanent process monitoring systems, and others. Superlum provides a unique service of monitoring the parameters of the SLD installed in the M-series Broadlighter. The customer may, at any time, generate a test file with the main parameters of the SLD, and email the file to Superlum. Superlum will analyse the data, including changes (if any) in the SLD parameters with respect to initial values, and email comments (including recommendations regarding probability of failure in case of further use) within 2 working days upon receipt of the file. This service is extremely useful for applications at manufacturing floors, permanent tests during manufacturing process, 24/7 sensing/monitoring systems, especially those used in sensitive applications, and others.

Acceptance Test Report

Each device is delivered with the Acceptance Test Report (ATR) showing at least optical power, spectral data and plot of spectrum at maximum output power, and some other relevant details. An example of ATR is presented in the end of this document.

Package Contents

- BroadLighter-M Broadband Light Source
- AC Power Cord.
- Master Key.
- Optical Patchcable.
- Quick Start Guide.
- Acceptance Test Report.
- CD-ROM with the companion software.
- USB Interface Cable.

ACCEPTANCE TEST REPORT (Example Only)

Date: 17.06.2015

Superlum BroadLighters M-S-790-B-I-15-VA SM Fiber Light Source at 790 nm Serial No. M00013

Optical Performance Parameters

Parameter	Rated	Actual
SM fiber output power, mW	>15	19.6
Mean wavelength, nm	785	788.9
Spectrum width, nm	>40	41.2
Maximum spectral ripple, %	<5	0.2
Spectral Flatness, dB	=<2	1.25
Long-term stability, %*		<0.5
Short-term stability, %**		<0.1

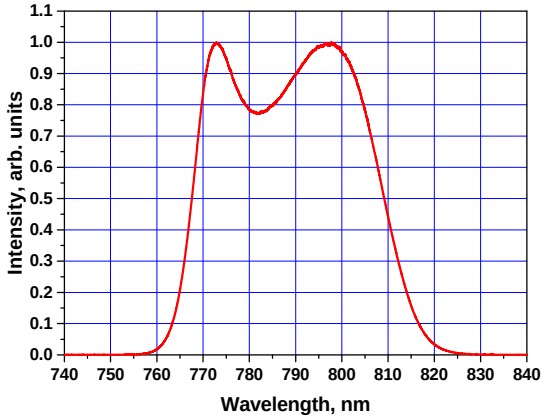
Other specifications

Operating temperature range, ^{o}C	+5…+35
Physical dimensions, mm:	251x112x192
Weight, kg	4
Optical Output	FC/APC socket
Fiber	Corning Pure-Mode HI 780

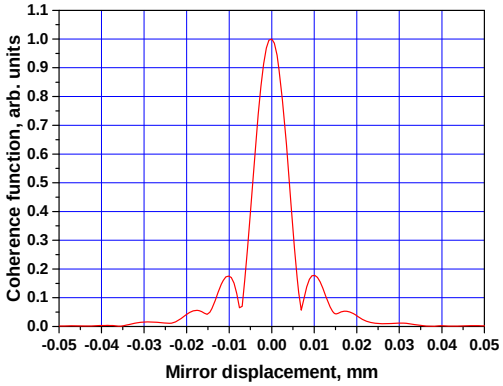
* 8 h, measurements every minute 100 ms integration.

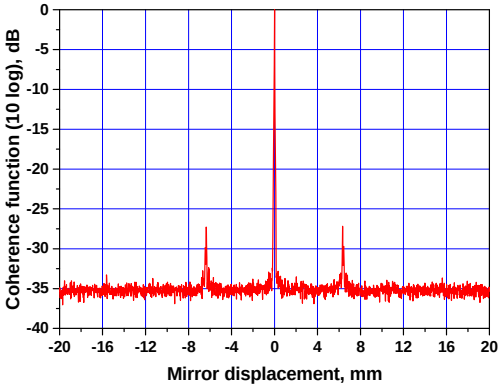
** 15 minutes, measurements every second, 100 ms integration. All measurements after 1 h warm-up. Ambient temperature 20±2 ^{o}C.

Optical Spectrum at maximum output power



Coherence at maximum output power





Spectrum may be altered by attenuation.

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M-D,T,Q-series BroadLighter. Benchtop Broadband Light Source with Extended Bandwidth.

Technical Product Specification

Document ID: SL.RD.04.002.150723
April 2017
Revision: 002

RoHS COMPLIANT 2002/95/EC

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Product Description

Superlum M-D,T,Q-series BroadLighters, the second generation of D,T,Q-series BroadLighter light sources, are high-power, extremely wide-spectrum, very low-coherent, AC-powered benchtop light sources. The M-series BroadLighter is based on a combination of spectrally shifted single mode fiber coupled superluminescent diode modules (SLDs). M-D-series BroadLighters have 2 SLDs inside, M-T-series BroadLighters have 3 SLDs combined, and there are 4 SLDs in M-Q-series devices. The most wide-spectrum D and T versions have a 3-dB spectrum width of up to 150-200 nm, and Q devices provide up to 300-nm-wide spectrum. Output power exceeds 15 mW in selected models.

The devices are optimized to provide the best combination of output power and spectrum width. Changing the power of just one of the combined SLDs may result in considerable change of output spectrum of the BroadLighter. For this reason, by default, changing the output power is not possible in M-D,T,Q-models, although this feature can be added on request. Some models can be equipped with a Variable Optical Attenuator (VOA), but it is subject to availability of a high-performance and broadband VOA at the corresponding spectral band.

Most models are offered in two versions, with and without an optical isolator. The high-power (HP) models without isolators may withstand optical feedback of -30…-25 dB (depending on the model). The models with isolators are designed for applications with optical feedback exceeding -25…-30 dB (they have the suffix "-I" in the model number). The medium-power (MP) models are much less sensitive to optical feedback and so they may be used without isolators in case of a stronger feedback (contact Superlum for details).

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.

M-D-series Broadlighters. Optical Performance Parameters

Model number	Power, mW		Wavelength, nm	3 dB spectrum width, nm		Spectral ripple, %
	Min.	Typ.		Min.	Typ.	
M-D-810-HP*	10.0	12.0	810 ± 10	90	100	<5
M-D-840-HP*	12.0	15.0	840 ± 10	90	100	<5
M-D-840-HP-I*	9.0	10.0	840 ± 10	90	100	<5
M-D-880-MP	1.0	1.5	880 ± 10	190	200	<5
M-D-880-HP	8.0	10.0	880 ± 10	90	100	<5
M-D-880-HP-I	6.0	8.0	880 ± 10	90	100	<5
M-D-890-UBB-HP	8.0	10.0	890 ± 10	180 (6 dB)	190 (6 dB)	<5
M-D-980-HP1	4.0	6.0	980 ± 10	180	200	<5

*- available with VOA upon request

M-T,Q-series Broadlighters. Optical Performance Parameters

Model number	Power, mW		Wavelength, nm	3 dB spectrum width, nm		Spectral ripple, %
	Min.	Typ.		Min.	Typ.	
M-T-850-MP*	5.0	6.0	850 ± 10	155	165	<5
M-T-850-HP*	12.0	15.0	850 ± 10	155	165	<5
M-T-850-HP-I*	8.0	10.0	850 ± 10	155	165	<5
M-T-860-HP*	12.0	15.0	860 ± 10	125	135	<5
M-D-860-HP-I*	8.0	10.0	860 ± 10	125	135	<5
M-T-870-HP	6.0	7.0	875 ± 10	170	180	<5

(Table continues on the next page)

M-T,Q-series Broadlighters. Optical Performance Parameters (Continued)

Model number	Power, mW		Wavelength, nm	3 dB spectrum width, nm		Spectral ripple, %
M-Q-870-HP	6.0	7.0	870 ± 10	190	200	<5
M-Q-920-HP	3.0	4.0	920 ± 10	275	300	<5

*- available with VOA upon request

Physical Specifications

- Overall dimensions (W×H×D): 251×112×192 mm.
- Weight (max): 4 kg.

Electrical Power Specifications

- 100-240 V AC, 50/60 Hz, 40 VA MAX.

Environmental Specifications

- Operating temperature range: +5 °C to +35 °C.
- Storage temperature range: -30 °C to +70 °C.
- Operating relative humidity: < 80%, non-condensing.

Note: Operating and storage temperature may be different for different models. The ranges shown are valid for all standard models.

Stability

- Long-term (8 h): maximum drift 0.5%.
- Short term (15 min) : maximum drift 0.1%

Laser Safety Measures

All M-series Broadlighters of Superlum are Class 3R or Class 3B light sources according to IEC/EN 60825-1:2014. All M-D-series BroadLighter light sources are equipped with the master key control, remote interlock connection, visual/audible alarm (including a “beep” and 3-seconds delay of switching the emission on after pushing the ON button), and information and warning stickers.

Additionally, each M-series BroadLighter features a built-in protection against optical power overshoot. It is based on an output power monitor placed before the output FC/APC socket and an electrical circuit which immediately switches the emission off if the optical power exceeds the maximum value shown in the Acceptance Test Report (delivered with each device) by more than 30%.

Warranty

Superlum provides 2 years/10,000 operating hours (whichever happens first) warranty for every M-series Broadlighter including S-, D-, T- and Q- devices, except devices with output power exceeding 30 mW from SM-fiber and custom made instruments. For M-series BroadLighters with output power exceeding 30 mW, the warranty period is 2 years/7,500 operating hours unless otherwise specified in writing by Superlum. Operating hours are tracked by a built-in hour meter which records the total time the device emits light. Warranty may be extended to 2 years without limitation of operating hours for the most of S- and D- models, and for some T- models upon request. Custom made instruments have warranty of one year unless otherwise specified in the contract documents.

Service

SLD parameters degrade in time due to aging. Unexpected device failure may cause serious problems, especially in “sensitive” applications like a permanent use at manufacturing lines, permanent process monitoring systems,

and others. Superlum provides a unique service of monitoring the parameters of the SLDs installed in M-series BroadLighters. The customer may, at any time, generate a test file with the main parameters of SLDs, and e-mail the file to Superlum. Superlum will analyse the data, including the changes (if any) in the SLDs parameters with respect to initial values, and email comments (including recommendations regarding probability of failure in case of further use) within 2 working days upon receipt of the file. This service is extremely useful for applications at manufacturing floors, permanent tests during the manufacturing process, 24/7 sensing/monitoring systems, especially those used in sensitive applications, and others.

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- Quick Start Guide.
- Acceptance Test Report.
- CD-ROM with the companion software.
- USB Interface Cable.

ACCEPTANCE TEST REPORT (Example Only)

Date: 08.09.2015

Superlum BroadLighters M-T-850-HP SM Fiber Light Source at 850 nm Serial No. M00015

Optical Performance Parameters

Parameter	Rated	Actual
SM fiber output power, mW	>12	16.2
Mean wavelength, nm	840	844.6
Spectrum width, nm	>155	168.7
Maximum spectral ripple, %	<5	0.8
Spectral flatness, %	=<45	37
Long-term stability, %*		<0.5
Short-term stability, %**		<0.1

Other specifications

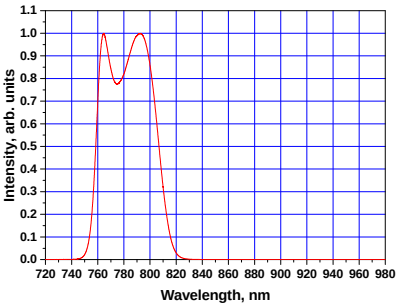
Operating temperature range, ^{o}C	+5…+35
Physical dimensions, mm:	251x112x192
Weight, kg	4
Optical Output	FC/APC socket
Fiber	Corning Pure-Mode HI 780

* 8 h, measurements every minute 100 ms integration.

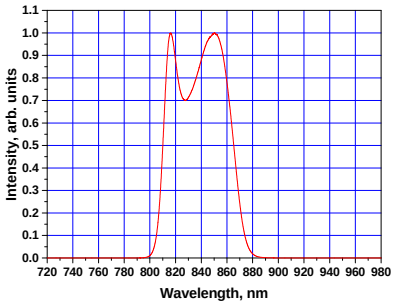
** 15 minutes, measurements every second, 100 ms integration. All measurements after 1 h warm-up. Ambient temperature 20±2 ^{o}C.

Optical Spectra

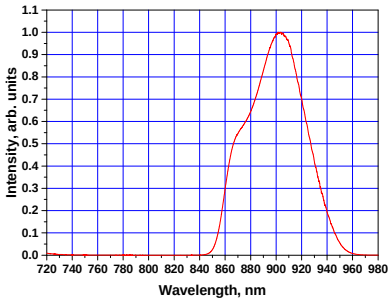
Channel #1



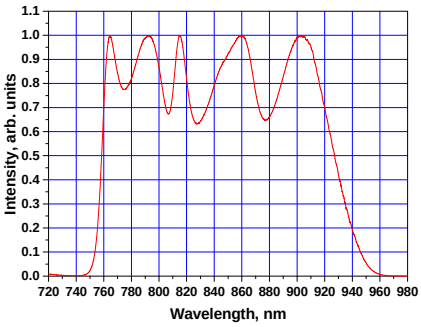
Channel #2



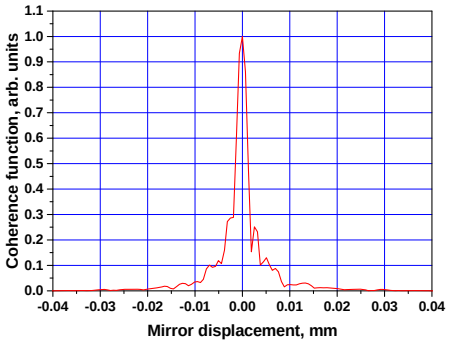
Channel #3

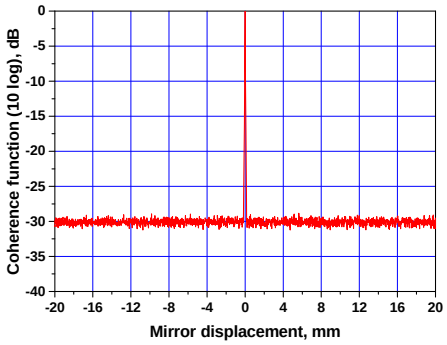


Combined Output



Coherence





A maximum optical feedback of 10^{-3} is allowed to run the BroadLighter safely at full power