DATASHEET

Multi-Channel Superluminescent Diode Source

Integrated Spectral Bench (ISB2)

Multi-SLED Light Source, 6 SLEDs: 1300nm, 1340nm, 1390nm, 1430nm, 1480nm, 1550nm, PM Fiber, High Degree of Polarization, Spectral Coverage: 1265nm-1605nm, FWHM: 340nm, CW: 1435nm, Light Output Power >40mW

DAYY Photonics Part Number: ASM000511

#DAY-ISB2-1300_1340_1390_1430_1480_1550-PM-HP-1265_1605-340-1435-40_DS_2023-01-01

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A. PRODUCT DESCRIPTION

The DAYY Photonics broadband multi-superluminescent diode source (Multi-SLED) ASM000511 combines six output beams as a single spectrum product. The system provides individual control of light sources through a digitally controlled interface. Individual SLED performance dashboards are provided for optimum set up calibration as required. The light source is integrated with a high-performance SLED driver and temperature control electronics in a rugged compact package. Power meters can be added for additional monitoring capability.

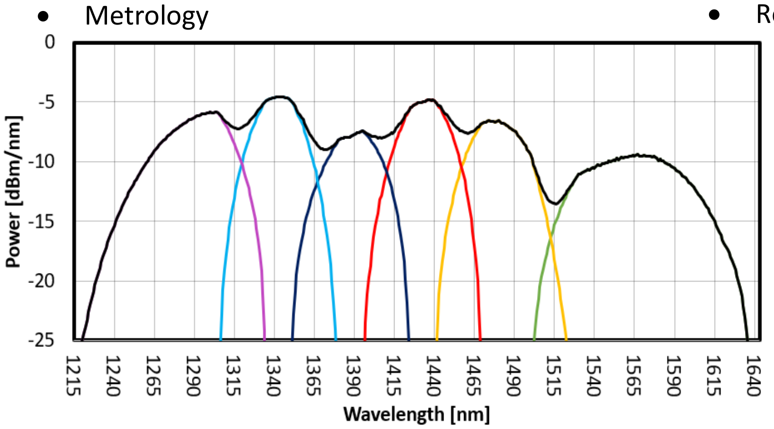
DAYY Photonics Spectral Stitching technique of integrating multiple wavelengths into a single broad spectrum is designed for optimum coupling efficiency into a single mode fiber. This brings exceptional flexibility and usability to the sensing marketplace. The Multi-SLED can be spectrally tailored to suit specific application needs and offer excellent back reflection immunity. This provides extremely high stability, making these sources ideal for the applications included below:

B. KEY FEATURES

- Six superluminescent diodes (SLEDs)
- All SLEDs can be run from 0 – 100% of maximum rating
- Fiber-coupled output power: >40mW
- Bandwidth FWHM > 340nm, @10dB > 390nm
- DAYY Photonics patented technology for spectral stitching provides optimum power and bandwidth
- Multiple communication interfaces: USB and RS-232
- Each SLED comes with a built-in independent monitor photodiode and one common thermoelectric cooler (TEC) for all SLEDs
- Internally optimized for maximum coupling efficiency with PM1550-XP Fiber
- Optional monolithic integration of a Broadband Dual Stage PMF Isolator (35dB)
- Light output: FC/APC Connector (Optional FC/PC or SMA)
- User friendly GUI and custom API available for test automation

C. APPLICATIONS

- Optical Component Testing
- Telecom Test Equipment
- Medical Optical Coherence Tomography
- Industrial Optical Coherence Tomography
- Metrology
- Biomedical Imaging Systems
- Optical Sensing
- White Light Interferometry & Chromatic Dispersion
- Research and Development



RoHS Pb FREE

REACH COMPLIANT

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D. ABSOLUTE MAXIMUM RATINGS (see note 1)

Parameter	Symbol	Condition	Minimum	Maximum	Unit
DRIVER POWER SUPPLY SPECIFICATIONS					
Input Power Supply Voltage	V_S	CW	10	14	V
Input Power Supply Current	I_S	CW	5	-	A
TEMPERATURE SPECIFICATIONS					
Case Temperature (see note 2)	T_{Case}		0	60	°C
Storage Temperature (see note 4)	T_{stg}	No condensation, Unbiased	-40	85	°C
Storage Humidity (see note 4)	RH_{stg}		5	85	%RH
Ambient Operating Temperature (See note 3)	T_{OP}		0	50	°C

Notes:

1. *Please note that exceeding the Absolute Maximum Ratings above may cause device failure. DAYY Photonics does not bear responsibility for laser power damage that is attributed to electrostatic discharge, excessive current levels, and current spikes (transients).*
   Any attempts to increase the laser drive current above the pre-set limits or recommended specification limits, can damage the device, and nullify the warranty period. It should be emphasized that the current limit set points cannot be exceeded.
2. T_{Case} *and* T_{TEC} *are monitored by internal thermistor with external readout.*
3. *For optimum performance of the Integrated Spectral Bench (ISB2), the ISB2 must be operated within the specified temperature ranges. The Multi-SLED has an internal thermoelectric cooler (TEC) to remove heat from the light source and dissipate it through the ISB2 case. It is required to provide free air circulation around the ISB2 device. It is always recommended to cool down the unit with a fan, and/or to mount the ISB2 on an appropriate heatsink, capable of dissipating up to 15W. The thermal resistance between ISB2 metal case and heatsink can be minimized by applying thermal grease, thermal glue or thermal pad between the contact surfaces.* ***When the Multi-SLED is used without a heatsink, maximum ambient operating temperature is 35˚C.*** *The specification lists the operating temperature for the electrical/optical characteristics, which is the temperature of the ISB2 during the time that the specifications were measured. Variation in temperature beyond what is specified can have a significant effect on the optical characteristics, like changes in wavelength or drop in output power.*
4. *Storage temperature and relative humidity should be chosen so the dew point of the humid air around the package is below the storage temperature of the package, to avoid condensation inside the ISB2 enclosure.*

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E. OPTICAL AND ELECTRICAL SPECIFICATIONS (see note 5)

Parameter	Symbol	Condition	Minimum	Typical	Maximum	Unit
DRIVER POWER SUPPLY SPECIFICATIONS						
Input Power Supply Voltage	V_S	CW	10	12	14	V
Input Power Supply Current	I_S	CW	5	-	-	A
Input Power Supply Voltage Ripple and Noise	γ	CW	-	-	200	mVpp
OPTICAL SPECIFICATIONS						
Center Wavelength (see note 6) SLED 1 – 1550nm SLED 2 – 1480nm SLED 3 – 1430nm SLED 4 – 1390nm SLED 5 – 1340nm SLED 6 – 1300nm SLED 1+2+3+4+5+6	CWL	CW T_{OP} = 25˚C T_{TEC} = 21˚C I_{OP}	 1540 1470 1420 1380 1330 1290 1425	 1550 1480 1430 1390 1340 1300 1435	 1560 1490 1440 1400 1350 1310 1445	nm
PM Fiber Coupled Power (see note 7) SLED 1 – 1550nm SLED 2 – 1480nm SLED 3 – 1430nm SLED 4 – 1390nm SLED 5 – 1340nm SLED 6 – 1300nm SLED 1+2+3+4+5+6	P	CW T_{OP} = 25˚C T_{TEC} = 21˚C I_{OP}	 3 3 3 3 3 3	 5 6 8 6 8 7 40	-	mW
Bandwidth FWHM (see note 8) SLED 1 – 1550nm SLED 2 – 1480nm SLED 3 – 1430nm SLED 4 – 1390nm SLED 5 – 1340nm SLED 6 – 1300nm SLED 1+2+3+4+5+6	B_{FWHM}	CW T_{OP} = 25˚C T_{TEC} = 21˚C I_{OP}	-	 70 40 35 40 35 50 340	-	nm
Bandwidth @ -10dB SLED 1 – 1550nm SLED 2 – 1480nm SLED 3 – 1430nm SLED 4 – 1390nm SLED 5 – 1340nm SLED 6 – 1300nm SLED 1+2+3+4+5+6	$B_{@10dB}$	CW T_{OP} = 25˚C T_{TEC} = 21˚C I_{OP}	-	 90 65 60 65 60 90 390	-	nm
Spectrum Ripple (see note 9)	R	CW T_{OP} = 25˚C T_{TEC} = 21˚C I_{OP}	< 0.15	< 0.30	< 0.45	dB

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Parameter	Symbol	Condition	Minimum	Typical	Maximum	Unit
Spectral Coverage	SC	CW T_{OP} = 25˚C T_{TEC} = 21˚C I_{OP}	-	1265 – 1605	-	nm
Polarization Extinction Ratio (see note 10) SLED 1 – 1550nm SLED 2 – 1480nm SLED 3 – 1430nm SLED 4 – 1390nm SLED 5 – 1340nm SLED 6 – 1300nm	PER	CW T_{OP} = 25˚C T_{TEC} = 21˚C I_{OP}	19.0 20.1 19.5 17.8 18.0 17.8	-	-	dB
RIN	RIN	CW T_{OP} = 25˚C T_{TEC} = 21˚C I_{OP}	-	< -130	-	dB/Hz
Power Stability (After 1h warm up)	P_{STAB}	T_{OP} = 25˚C $\pm$ 2.5	-	< 0.1	-	dB
Warmup Time	W	CW T_{OP} = 25˚C T_{TEC} = 21˚C I_{OP}	15	30	60	Min.
CONSTANT CURRENT MODE						
Operating Current SLED 1 – 1550nm SLED 2 – 1480nm SLED 3 – 1430nm SLED 4 – 1390nm SLED 5 – 1340nm SLED 6 – 1300nm	I_{OP}	CW T_{OP} = 25˚C T_{TEC} = 21˚C I_{OP}	-	-	500 350 350 400 400 500	mA
Current Setting Resolution	R_{IOP_SET}				0.1	mA
SLED Current Reading Resolution	R_{IOP_READ}			0.1		mA
MODULATION MODE						
Waveform			-	Square	-	
Modulation Frequency Range	f_{mod}		0.016	-	1000	Hz
Duty Cycle	D		10	50	90	%
INTERNAL MONITOR DIODE						
Monitor Diode Current Reading	I_{mon}		-	-	500	uA
Monitor Diode Current Reading Resolution	RES_{Imon}		-	7.6	-	nA
LIGHT OUTPUT CONNECTOR						
Type of Fiber Connector			-	FC/PC, FC/APC, SMA	-	

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Parameter	Symbol	Condition	Minimum	Typical	Maximum	Unit
SLED TEC SPECIFICATIONS						
SLED TEC Temperature Setpoint	T_{SLED_SET}		0	-	40	°C
SLED TEC Temperature Setpoint Resolution	R_{TSLED_SET}		-	0.1	-	°C
SLED TEC Temperature Reading	T_{SLED_READ}		-40	-	100	°C
SLED TEC Temperature Reading Resolution	R_{TSLED_READ}		-	0.1	-	°C
TEMPERATURE SPECIFICATIONS						
Heatsink Temperature Reading Range	T_{HS}		-40	-	100	°C
Heatsink Temperature Reading Resolution	R_{THS}		-	0.1	-	°C
SLED 6 Temperature Reading	R_{THS6}		-40		75	°C

Notes:

5. *There may be differences in typical values of output power, power stability, wavelength and bandwidth, due to coupling efficiency. These values are references and there is no guarantee that each particular ISB2 module will have EXACTLY the typical values shown on the previous chart.*
6. *Center Wavelength is defined as the center point of the 3dB bandwidth of each individual SLED.*
7. *The ISB2 – Integrated Spectral Bench uses a Dual Stage Isolator for back reflection protection. Isolators are used to protect a source from back reflections or signals that may occur after the isolator. Back reflections can damage a laser source or cause it to amplitude modulate, or frequency shift. In high-power applications, back reflections can cause instabilities and power spikes. DAYY Photonics does not bear responsibility for laser power damage that is attributed to hot spots in the beam.*
8. *Multi-SLED FWHM is defined as the bandwidth from the lowest spectral dip, when all the SLEDs are on*
9. *Resolution of 0.1nm. Figure of merit does not include dips between SLEDs*
10. *Polarization Extinction Ratio is defined as the ratio of optical powers of perpendicular polarizations, expressed in decibels (dB).*

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F. PLOTS - Test performed at T_{OP}=25°C and T_{TEC}=21°C

FIG. 1: ISB2 SPECTRUM

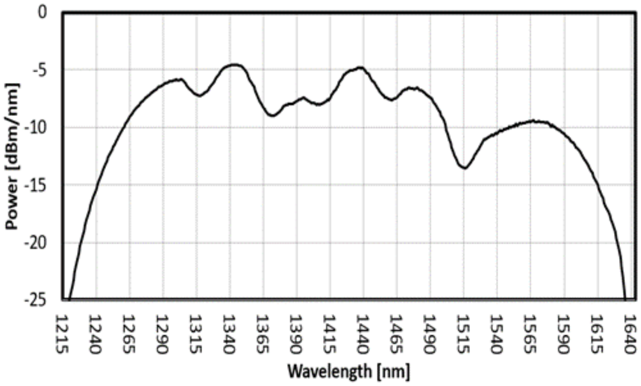

FIG. 2: SLED 1 SPECTRUM

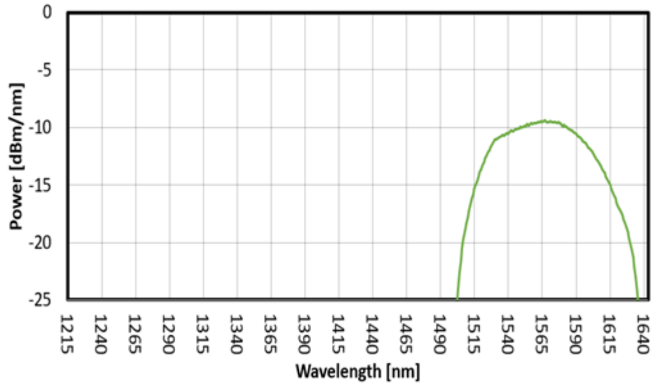

FIG. 3: SLED 2 SPECTRUM

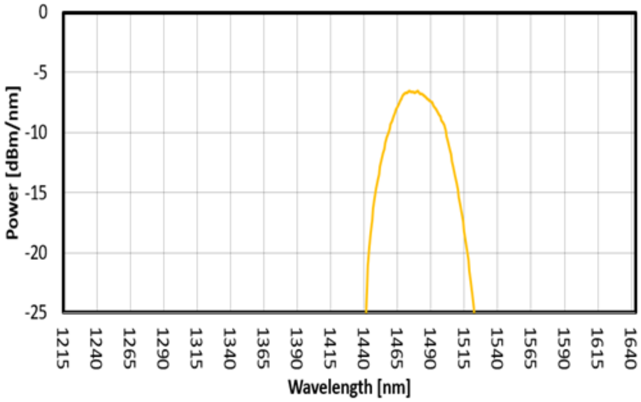

FIG. 4: SLED 3 SPECTRUM

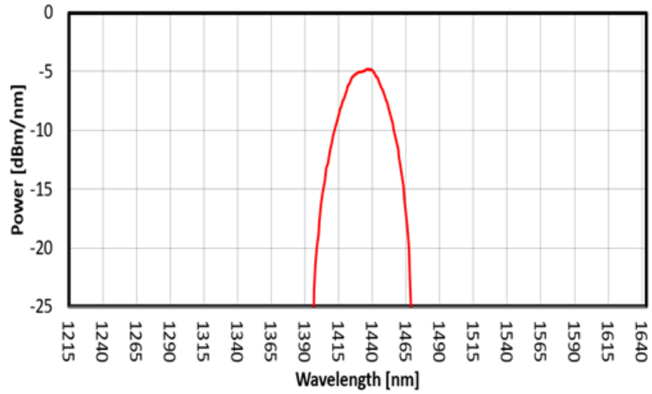

FIG. 5: SLED 4 SPECTRUM

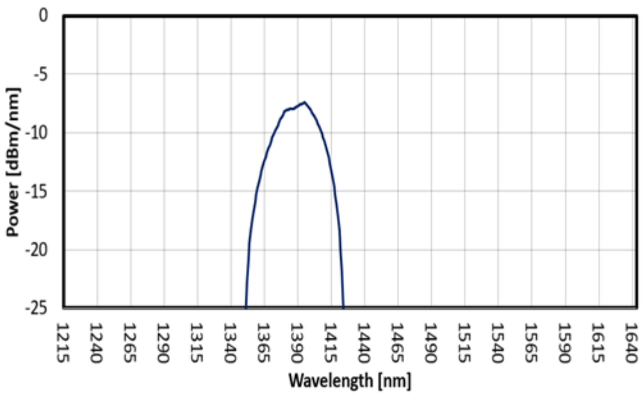

FIG. 6: SLED 5 SPECTRUM

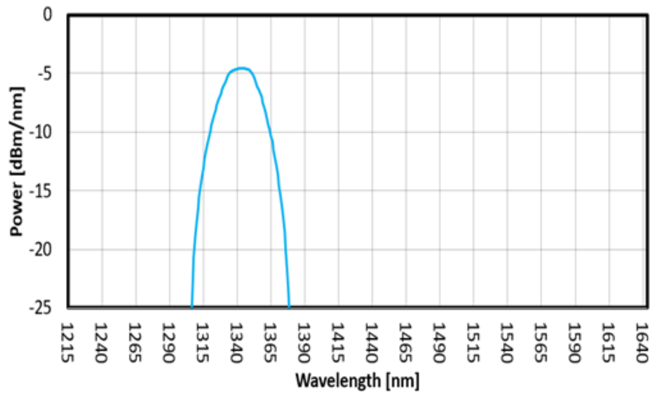

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FIG. 7: SLED 6 SPECTRUM

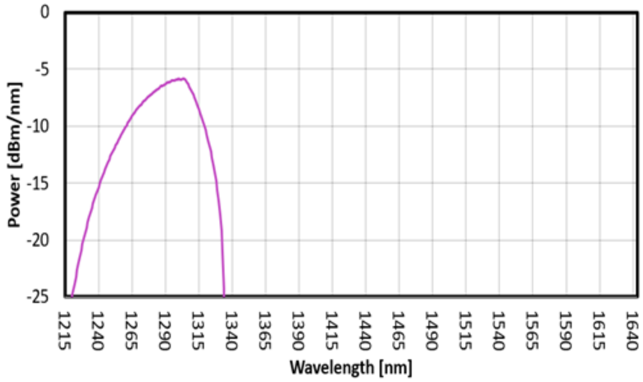

FIG. 8: SLED 1 OUTPUT POWER VS CURRENT

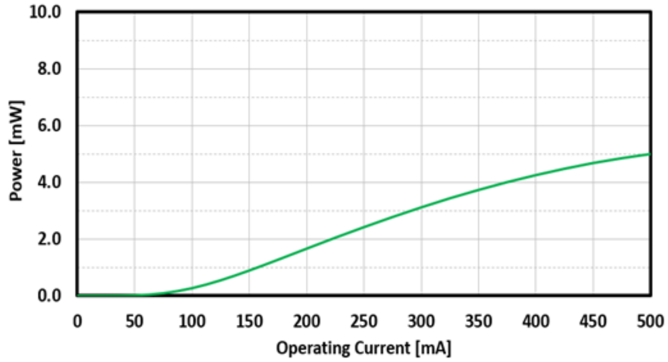

FIG. 9: SLED 2 OUTPUT POWER VS CURRENT

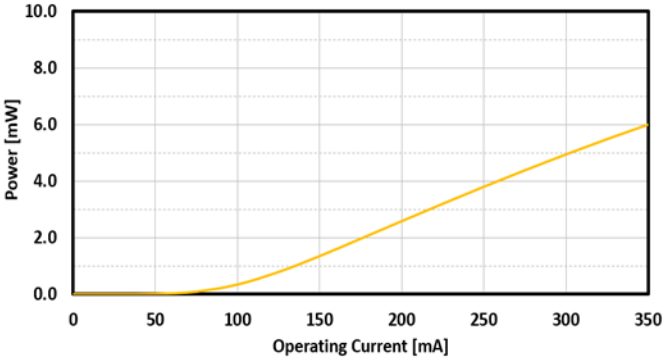

FIG. 10: SLED 3 OUTPUT POWER VS CURRENT

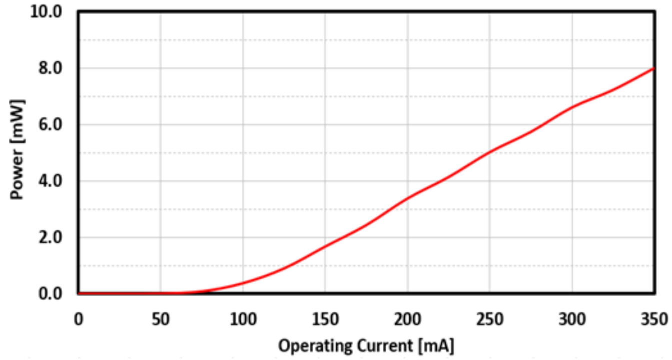

FIG. 11: SLED 4 OUTPUT POWER VS CURRENT

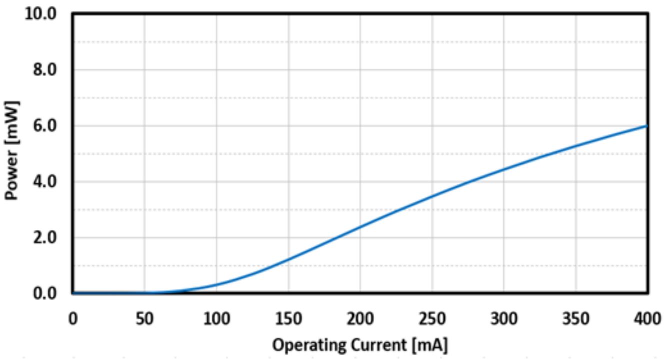

FIG. 12: SLED 5 OUTPUT POWER VS CURRENT

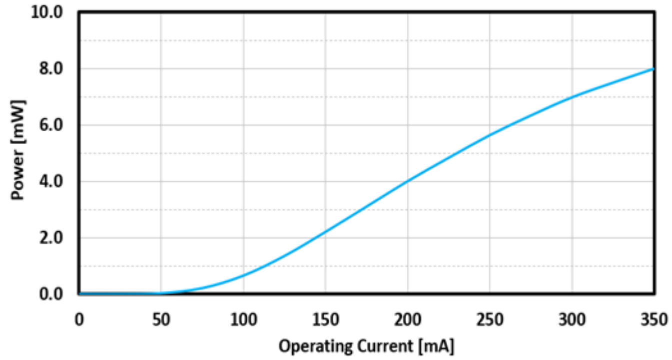

FIG. 13: SLED 6 OUTPUT POWER VS CURRENT

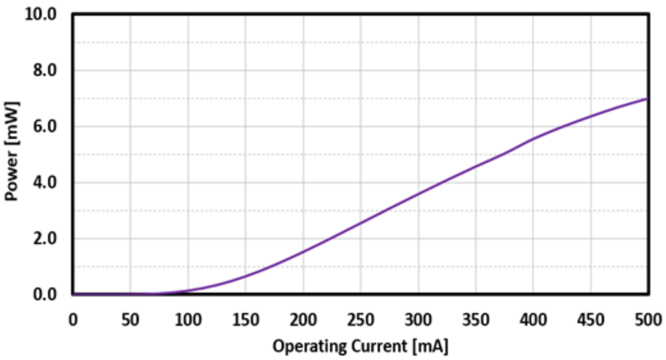

FIG. 14: ISB2 TYPICAL POWER STABILITY

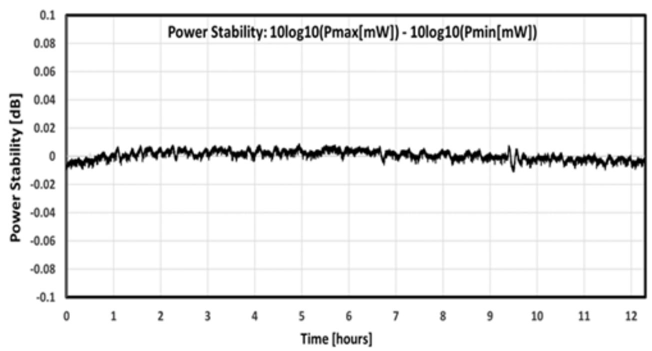

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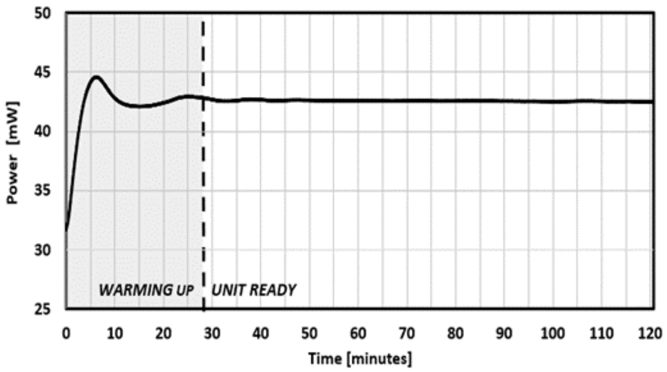
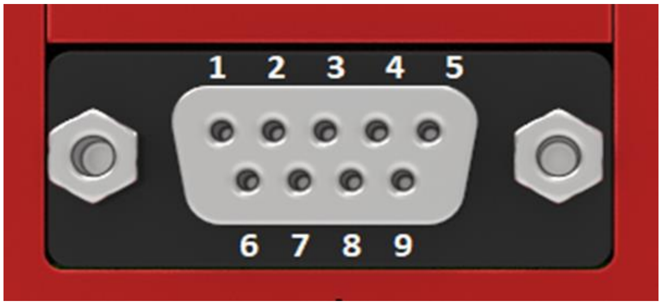
FIG. 15: WARM-UP TIME



G. CONNECTORS

Item	Description
A	FC/APC Connector (Optional: FC/PC, SMA)
B	Power Barrel Connector Jack 2.00mm ID, 5.50mm OD, 9.5 mm Length. Center Positive ⊖—◐—⊕ Input: AC 100-240V Output: 12V 5V min
C	USB 2.0 Type B
D	RJ45 for MODBUS TCP/IP Communication – Being discontinued
E	D-SUB 9 Positions for RS-232 Communication
F	Switches to change between PC Mode - Manual Mode and to turn SLED on when operating in Manual Mode

H. D-SUB CONNECTOR PIN OUT



Pin #	Function RS-232
1	Not used
2	Tx
3	Rx
4	Not used
5	GND
6	Not used
7	Not used
8	Not used
9	Not used

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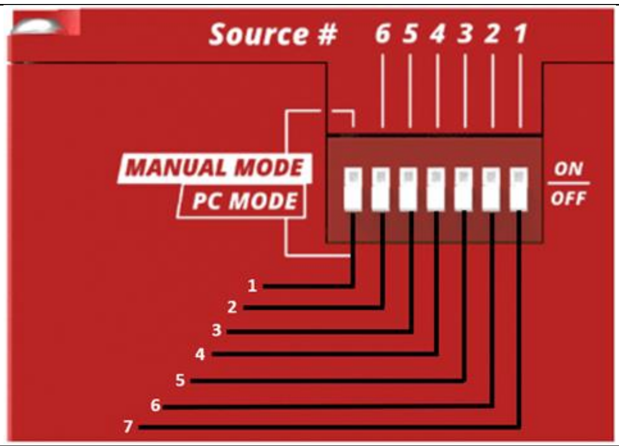
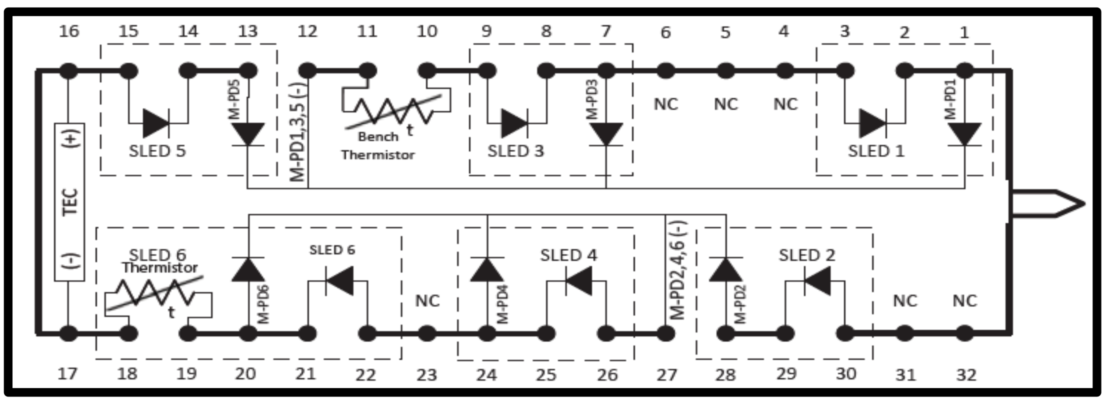
I. MANUAL CONTROL



Pin #	UP	DOWN
1	Light Source in Manual Mode	Light Source in PC Mode
2	N/A	N/A
3	N/A	N/A
4	N/A	N/A
5	N/A	N/A
6	SLED 2 ON	SLED 2 OFF
7	SLED 1 ON	SLED 1 OFF

J. OSE2 32-PIN BUTTERFLY PACKAGE PIN OUT



External Pin Assignment – Multi-SLED: 6 SLEDs							
1	M-PD1 (+)	**9**	SLED 3(+)	**17**	TEC (-)	**25**	SLED 4 (-)
2	SLED 1 (-)	**10**	Thermistor	**18**	SLED 6 Thermistor	**26**	SLED 4 (+)
3	SLED 1 (+)	**11**	Thermistor	**19**	SLED 6 Thermistor	**27**	M-PD2,4,6 (-)
4	NC	**12**	M-PD1,3,5 (-)	**20**	M-PD6 (+)	**28**	M-PD2 (+)
5	NC	**13**	M-PD5 (+)	**21**	SLED 6 (-)	**29**	SLED 2 (-)
6	NC	**14**	SLED 5 (-)	**22**	SLED 6 (+)	**30**	SLED 2 (+)
7	M-PD3 (+)	**15**	SLED 5 (+)	**23**	NC	**31**	NC
8	SLED 3 (-)	**16**	TEC (+)	**24**	M-PD4 (+)	**32**	NC

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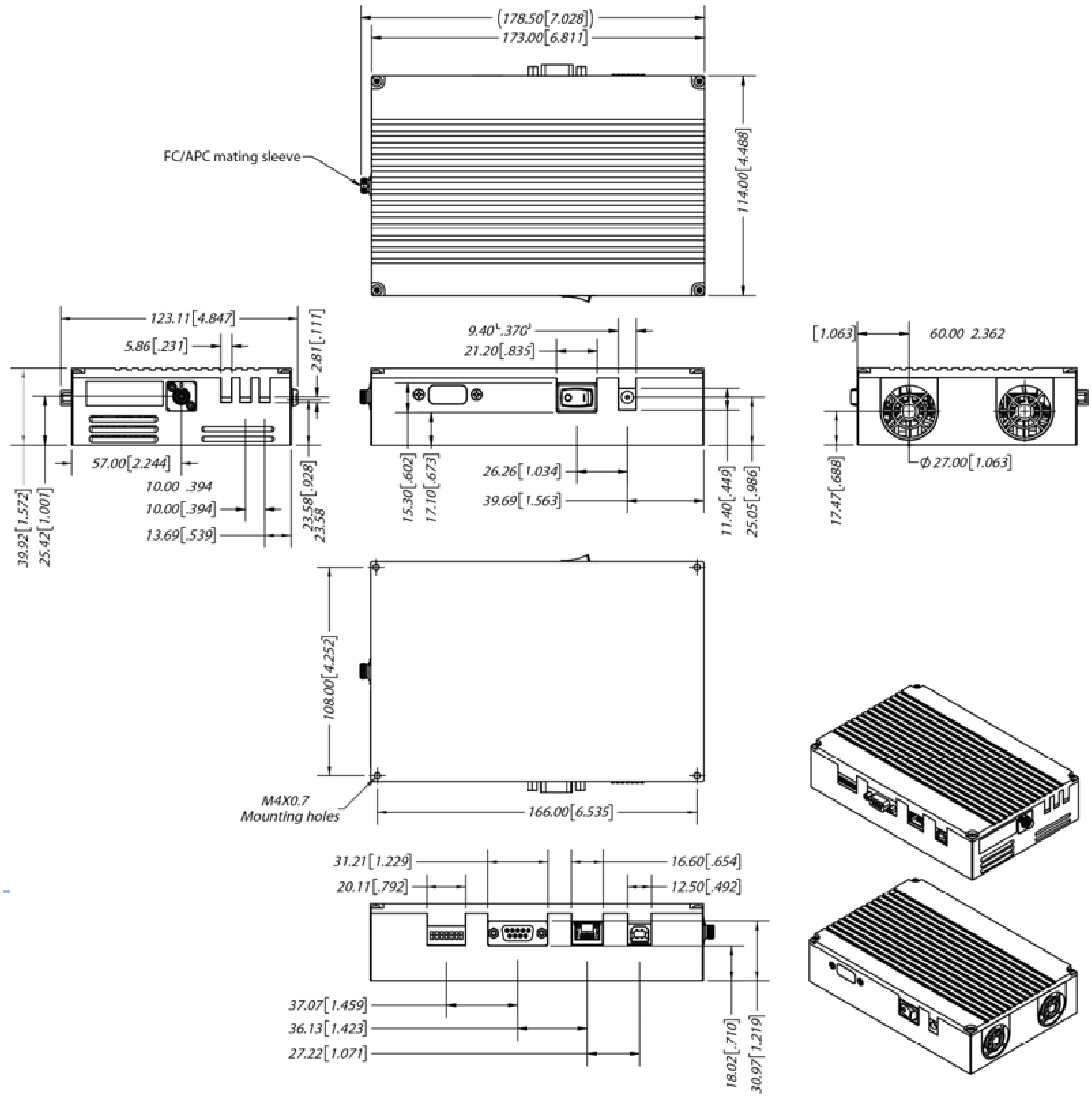
K. MECHANICAL DIAGRAM – ISB2



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L. SAFETY

All statements regarding safety of operation and technical data will only apply when the unit is operated correctly.

The driver must not be operated in environments susceptible to explosion hazards. Do not obstruct the air ventilation slots. If any parts of the driver, or electronics are broken or exposed, contact DAYY Photonics technical support and do not attempt to operate the unit.

The Multi-SLED Integrated Spectral Bench (ISB2) is a Class 1M laser product. It is safe for all conditions of use except when passed through magnifying optics such as microscopes and telescopes. It produces a beam that is divergent. If light is re-focused use protective eye wear.

M. APPLICATION PROTOCOL INTERFACE (API)

DAYY Photonics driver utilizes the MODBUS Protocol for communications. Users can find numerous detailed specifications for the protocol on the internet. MODBUS is used widely in industrial applications. The driver is designed to use this protocol over all of its communication interfaces, MODBUS – RTU is a master/slave protocol and is employed by the USB or RS232 port.

The MODBUS specification has outlined how a user can adapt the overall packet structure to suit each interface requirement. The primary section of a MODBUS packet is known as the Protocol Data Unit (PDU) and it is independent of the underlying communication interface. The PDU includes additional byte fields for the MODBUS transaction per the Application Data Unit (ADU).

A high-level overview of MODBUS Protocol can be found on the Multi-SLED Integrated Spectral Bench User Manual. If users want to develop their own API, the ISB2 Register Map is available upon request. Please contact technical support: techsupport@dayyphotonics.com.

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