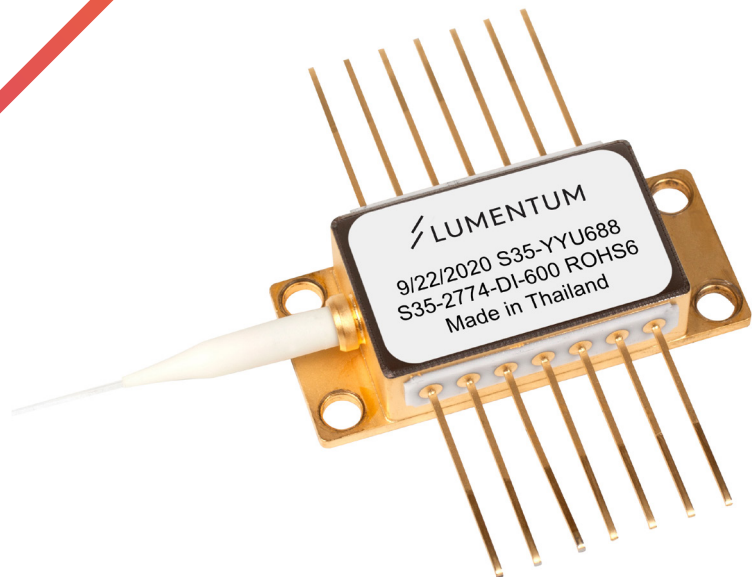


600 mW Fiber Bragg Grating Stabilized 14xx nm Pump Modules with Ultra-Low Power Consumption

S35 Series



The Lumentum S35 series 14xx nm, Laser Diode pump is wavelength selected using grating-stabilized, polarization maintaining (PM) fiber. It offers up to 600 mW in 1420 to 1470 nm range and up to 550mW in 1471 to 1510 nm range. It is housed in an industry-standard, 14-pin butterfly package.

The S35 laser is ideal for distributed or discrete Raman amplification applications (1420 to 1480 nm for C- and L-band coverage). It also provides up to 600 mW of power and high thermal efficiency to enable longer links and spans, lower bit-error rate (BER), and greater wavelength coverage for high speed and ultra-long-haul (ULH) systems.

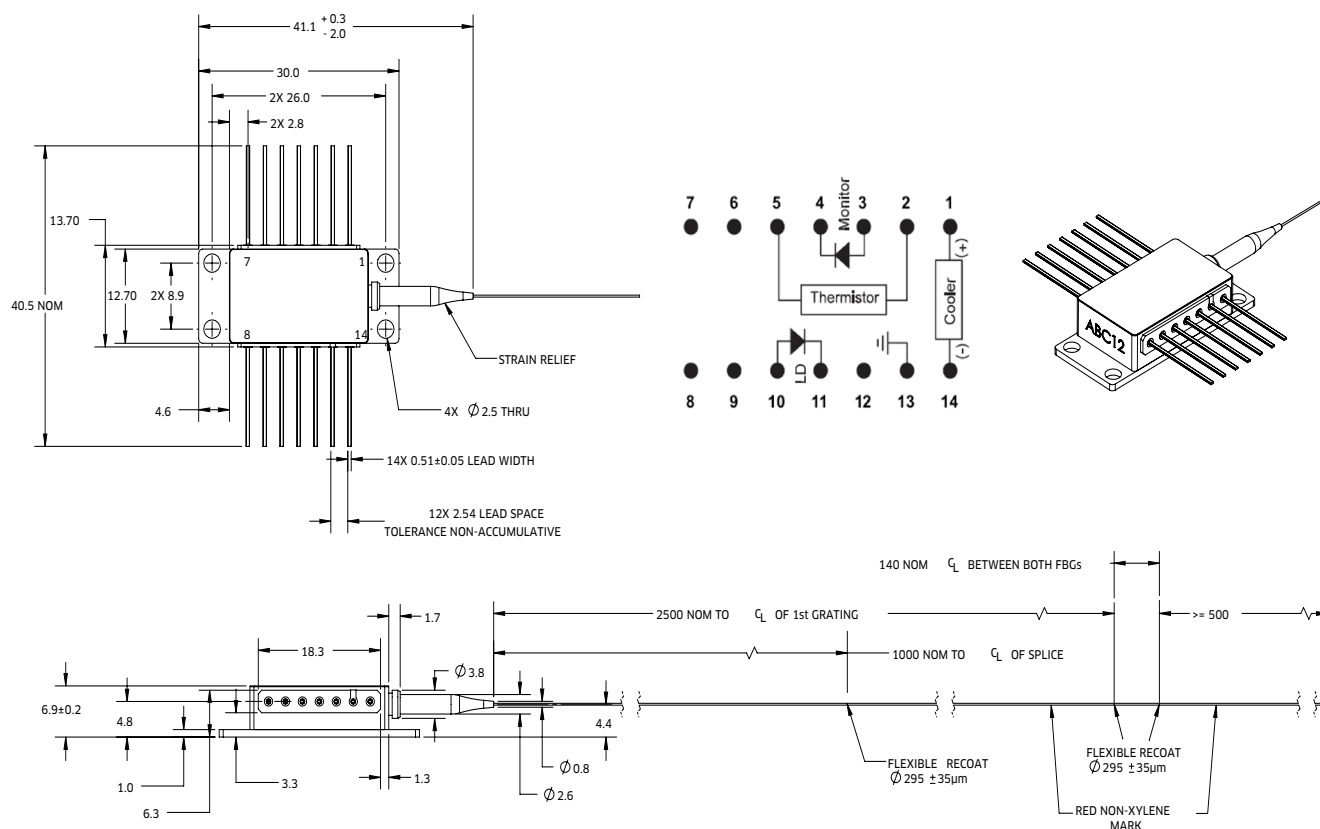
Key Features

- Up to 600 mW
- Fiber Bragg grating stabilization
- High thermal efficiency
- Integrated thermoelectric cooler, thermistor, and monitor diode
- Robust high-power operation (0 to 70°C)

Applications

- High-speed and ultra-long-haul systems
- Distributed or discrete Raman amplification

Dimensions Diagram



Pin Assignments

Pin	Description
1	Cooler (+)
2	Thermistor
3	Monitor PD anode
4	Monitor PD cathode
5	Thermistor
6	N/C
7	N/C
8	N/C
9	N/C
10	Laser anode
11	Laser cathode
12	N/C
13	Case ground
14	Cooler (-)

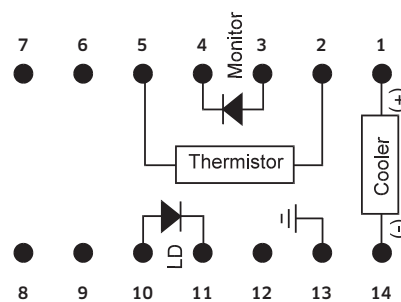


Table 1 Absolute Maximum Ratings

Parameter	Symbol	Test Conditions	Minimum	Maximum
Package				
Operating case temperature	T_c		-5°C	70°C
Storage temperature	T_{stg}		-40°C	75°C
Lead soldering temperature		Applied to pins for <10 s, $T_{case} < 75^\circ\text{C}$	–	300°C
Laser Diode				
LD reverse voltage	V_r		–	2 V
LD forward current	$I_{f,max}$		–	3000 mA
LD reverse current			–	10 μA
LD electrostatic discharge (ESD)	$V_{ESD,LD}$	$C = 100\text{ pF}$, $R = 1.5\text{ k}\Omega$, HBM		500 V
Monitor Photodiode				
PD reverse voltage	$V_{r,PD}$		–	20 V
PD forward current	$I_{f,PD}$		–	10 mA
Thermoelectric Cooler				
TEC current	I_{TEC}		-1.0 A	4.0 A
TEC voltage	V_{TEC}		–	4.5 V
Thermistor				
Thermistor forward current	$I_{f,TH}$		–	5 mA
Fiber Pigtail				
Fiber temperature			-40°C	85°C
Tensile stress			–	5.0 N
Fiber bend radius			16 mm	–

Table 2 Fiber Pigtail

Parameter	Minimum	Typical	Maximum	Unit
Extinction ratio		30		dB/100 m
Cutoff wavelength	1300		1400	nm
Mode field diameter at 1550 nm	10		11	μm
Cladding diameter	122	125	128	μm
UV coating (buffer) diameter	230	245	260	μm
Recoat diameter	260	295	330	μm
Pigtail length		3.4		m
Fiber bend radius	16			mm
Bragg grating distance from package		2.5		m
Splice distance from package	0.3			m

Table 3 Power Consumption^{1,2}

Wavelength	Power	Operating Current I_{op}	Operating Voltage V_{op}		TEC Current I_{TEC}	TEC Voltage V_{TEC}	Total Power Dissipation	Total Power Consumption	
(nm)	(mW)	BOL (mA)	BOL (V)	EOL (V)	EOL (A)	EOL (V)	EOL (W)	EOL (W)	Typical (W)
1420 to 1470 nm included	300	1300	1.32	1.38	1.40	1.75	4.20	4.50	3.36
	320	1365	1.35	1.41	1.45	1.80	4.43	4.75	3.51
	340	1435	1.38	1.44	1.50	1.85	4.66	5.00	3.69
	360	1510	1.41	1.47	1.55	1.90	5.14	5.50	3.88
	380	1590	1.43	1.50	1.60	1.95	5.62	6.00	4.08
	400	1670	1.46	1.53	1.65	2.00	6.10	6.50	4.31
	420	1760	1.49	1.56	1.75	2.05	6.58	7.00	4.55
	430	1840	1.51	1.59	1.80	2.10	7.07	7.50	4.67
	450	1920	1.54	1.62	1.90	2.20	7.55	8.00	4.93
	500	2150	1.62	1.71	2.10	2.40	8.50	9.00	5.66
	550	2400	1.70	1.80	2.30	2.60	10.00	10.55	6.49
1471 to 1495nm included	600	2600	1.79	1.91	2.60	2.90	11.90	12.50	7.43
	300	1470	1.35	1.41	1.65	1.95	5.00	5.30	3.86
	320	1550	1.38	1.44	1.70	2.00	5.20	5.50	4.01
	340	1630	1.41	1.47	1.80	2.05	5.70	6.00	4.19
	360	1720	1.44	1.50	1.85	2.10	6.10	6.50	4.38
	380	1810	1.48	1.53	1.90	2.15	6.60	7.00	4.58
	400	1900	1.52	1.57	2.00	2.20	7.10	7.50	4.81
	420	2000	1.56	1.62	2.10	2.30	8.10	8.50	5.05
	430	2050	1.58	1.66	2.15	2.40	8.60	9.00	5.17
	450	2150	1.62	1.71	2.20	2.60	9.10	9.50	5.43
	500	2400	1.70	1.80	2.45	2.80	10.50	11.00	6.16
1496 to 1510 nm included	550	2600	1.79	1.91	2.65	2.95	12.00	12.50	6.99
	300	1650	1.42	1.48	1.82	2.06	5.9	6.2	4.4
	400	2150	1.62	1.71	2.20	2.60	9.1	9.5	5.7
	450	2420	1.71	1.81	2.47	2.82	10.85	11.3	6.6
	500	2650	1.81	1.94	2.70	2.98	12.7	13.2	7.7

Table 4 Electro-Optical Performance³

Parameter	Symbol	Test Conditions	Minimum	Maximum
Spectrum				
Target wavelength ⁴ (in vacuum)	λ_t	I_{op}	1420 nm	1510 nm
Power in band ($\lambda_t \pm 2$ nm)	P_{band}	$I(100 \text{ mW}) \leq I \leq I_{op}$	80%	—
Spectral bandwidth, RMS	$\Delta\lambda_{RMS}$	$P_{op, RMS}$	—	2.0 nm
Polarization extinction ratio	R_e	$T_{case} = 25^\circ\text{C}$	13 dB	
Laser Diode				
Threshold current	I_{th}	Wavelength 1420 to 1495 nm included		220 mA BOL
		Wavelength 1496 to 1510 nm included		250 mA BOL
End-of-lifetime operating current	$I_{op, EOL}$		$1.12 \times I_{op, BOL}$	
Monitor Photodiode				
Monitor current	I_{MPD}	$I_{op}, V_{r,PD} = 5 \text{ V}$	0.5 $\mu\text{A}/\text{mW}$	5.0 $\mu\text{A}/\text{mW}$
Monitor dark current	I_d	$V_{r,PD} = 5 \text{ V}$	—	300 nA
Monitor diode capacitance	C_{MPD}	$V_{r,PD} = 5 \text{ V}, 1 \text{ kHz}$	—	20 pF
Front-to-rear tracking ratio	TR	I_m constant, 100 mW to P_{op}	0.85	1.15
Front-to-rear tracking error	TE	I_m constant, at P_{op}	~15%	15%
Thermoelectric Cooler Operation				
Power consumption	P_{con}			8 W EOL
Thermistor resistance	R_{th}	At 25°C	9.5 k Ω	10.5 k Ω
		At 35°C	6.2 k Ω	6.86 k Ω
Mean thermistor B constant	B_{avg}	T_c	3700 K	4100 K

1. $I_{op, EOL} = 1.12 \times I_{op, BOL}$

2. Maximum values are shown

3. Laser submount temperature $T_c = 35^\circ\text{C}$, unless otherwise stated; case temperature $T_c = 0$ to 70°C , unless otherwise stated (maximum $\Delta T = 35^\circ\text{C}$); fiber Bragg grating temperature $T_{fbg} = 25^\circ\text{C}$, unless otherwise stated

4. Customer specified

User Safety

Safety and Operating Considerations

The laser light emitted from this laser diode is invisible and may be harmful to the human eye. Avoid looking directly into the fiber when the device is in operation.

CAUTION: THE USE OF OPTICAL INSTRUMENTS WITH THIS PRODUCT INCREASES EYE HAZARD.

Operating the laser diode outside of its maximum ratings may cause device failure or a safety hazard. Power supplies used with this component cannot exceed maximum peak optical power. CW laser diodes may be damaged by excessive drive current or switching transients. When using power supplies, the laser diode should be connected with the main power on and the output voltage at zero. The current should be increased slowly while monitoring the laser diode output power and the drive current. Careful attention to heat sinking and proper mounting of this device is required to ensure specified performance over its operating life. To maximize thermal transfer to the heat sink, the heat-sink mounting surface must be flat to within .001 inch and the mounting screws must be torqued down to 1.5 in/lb.

ESD PROTECTION—Electrostatic discharge (ESD) is the primary cause of unexpected laser diode failure. Take extreme precaution to prevent ESD. Use wrist straps, grounded work surfaces, and rigorous antistatic techniques when handling laser diodes.

Labeling

Laser Safety

The Lumentum pump laser module emits hazardous invisible laser radiation.

Due to the small size of the pump module, the box packaging is labeled with the laser radiation hazard symbol and safety warning labels shown below.



14-pin module label



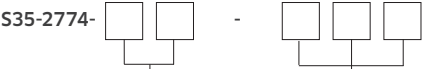
Shipping box label



Output power and laser emission indicator label

Ordering Information

For more information on this or other products and their availability, please contact your local Lumentum account manager or Lumentum directly at customer.service@lumentum.com



Wavelength	Code
Lumentum-assigned wavelength code provided when order is placed	

Maximum Operating Power	Code
300 mW	300
320 mW	320
340 mW	340
360 mW	360
380 mW	380
400 mW	400
420 mW	420
430 mW	430
450 mW	450
500 mW	500
550 mW	550
600 mW	600

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