Data sheet

2.5 Gb/s Buried Het Laser 175 km Reach With Optional Etalon Stabilisation

This laser module employs the Bookham Technology strained layer MQW Buried Heterostructure DFB laser chip, and has been designed specifically for use in Wavelength Division Multiplexed (WDM) 2.5 Gb/s long distance optical fibre trunk systems. The device is packaged in a hermetically sealed 14-pin butterfly package incorporating an isolator and monitor photodiode for control of the power of the laser over life and all operating conditions.

The device is available with a number of power options depending on application and link span requirements.

The optional internal etalon wavelength stabilisation and low chirp performance makes this product compliant with 50GHz optical channel spacing.

Features

- 2.5 Gb/s operation
- +/-95pm wavelength stability over life without etalon locker
- Optional etalon wavelength stabilisation provides 50GHz optical channel spacing compliance for interlay or future upgrade
- Narrow spectral line-width
- Internal TEC with precision NTC thermistor for temperature control
- Entire C & L-band ITU wavelengths available (1527 nm to 1605 nm)
- Code reduction with single product for reaches up to 175 km
- GaInAsP SLMQW DFB single frequency laser chip
- InGaAs monitor photo-diode
- Hermetically sealed 14-pin butterfly package with optical isolator

Applications

- WDM
- On-off ramps
- Long-Haul
- DWDM on ITU Grid

Parameters

Parameter	Conditions	Min	Typ	Max	Unit
Threshold current (Ith)			10	22	mA
Slope efficiency by product	2 mW 3 mW 4 mW 10 mW	0.04 0.06 0.08 0.143		0.09 0.13 0.17 0.43	mW/mA
RF input reflection coef (S11)	(1)			-10	dB
Forward voltage			1.3	1.8	V
Peak wavelength (λp)	(2)	1527		1605	nm
Dispersion penalty at 175 km	(3)			2	dB
Time averaged spectral linewidth	-20 dB		0.1	0.6	nm
Side-mode suppression		32	40		dB
Optical rise/fall time	(4)			125	ps
Monitor photo current	Unlocked Etalon locked	50 40	250 250	1200 360	µA
Monitor dark current				100	nA
Thermistor resistance			10		kΩ
Heatpump current	70°C case temperature	250	600	900	mA
Heatpump voltage	70°C case temperature		1.0	2.4	V
Change of λp with laser temp.	20 to 35		0.09		nm/°C
Change in λ over life and operating conditions	Unlocked (5)	-45		+145	pm
Optical Spectral Window	Locked, over life & temperature including chirp (5)	-9		+9	GHz

(1) 50 Ω measurement system, f = dc - 3 GHz
(2) Submount temperature between 20°C & 35°C start of life to achieve required λ p
(3) Standard product dispersion penalty will be compliant to the specified link length of 175 km using an extinction ratio of 10 dB. Fibre dispersion characteristics are derived from the following equation

$$D(\lambda) = \frac{So}{4}(\lambda - \frac{\lambda_0^4}{\lambda^3}) ps/(nm.km)$$

Where So = 0.092 ps/(nm^2.km) and λ = 1302 nm
(4) Measurements determined from 20 - 80% pk - pk
(5) For more information on wavelength control and drift over life refer to applications note DR1670. To give symmetrical wavelength performance about the ITU channel wavelength (+/-95pm) offset the laser wavelength by –50pm at start of life set up

Absolute Maximum Ratings

Parameter	Min	Max	Unit
Case operating temperature	0	70	°C
Laser submount operating temperature (1)	20	35	°C
Storage temperature	-40	85	°C
Laser current above Ith		100	mA
Laser reverse voltage		1.0	V
Laser reverse current		10	µA
Monitor diode bias		-10	V
Heatpump voltage		2.4	V
Fibre bend radius	30		mm

Notes: (1) Product without locker can be tuned onto the next 100 GHz ITU channel in the red shift direction (2x100 GHz tunability) by increasing the submount temperature to a maximum of 43°C

Reliability/Quality

Meets Qualification requirements of Telcordia / Bellcore GR468-Core for central office environment.

Operating reliability <500 FITs1 in 15 years.

1- Assumes laser die submount held at <35°C by internal thermoelectric cooler, mean forward current of 35 mA, and end of life limits based on 10 mA increase in Ith and 25% change in laser efficiency. FIT rate data for other end of life criteria, including minimum extinction ratio requirements, are available upon request.

Outline Drawing

Dimensions in mm

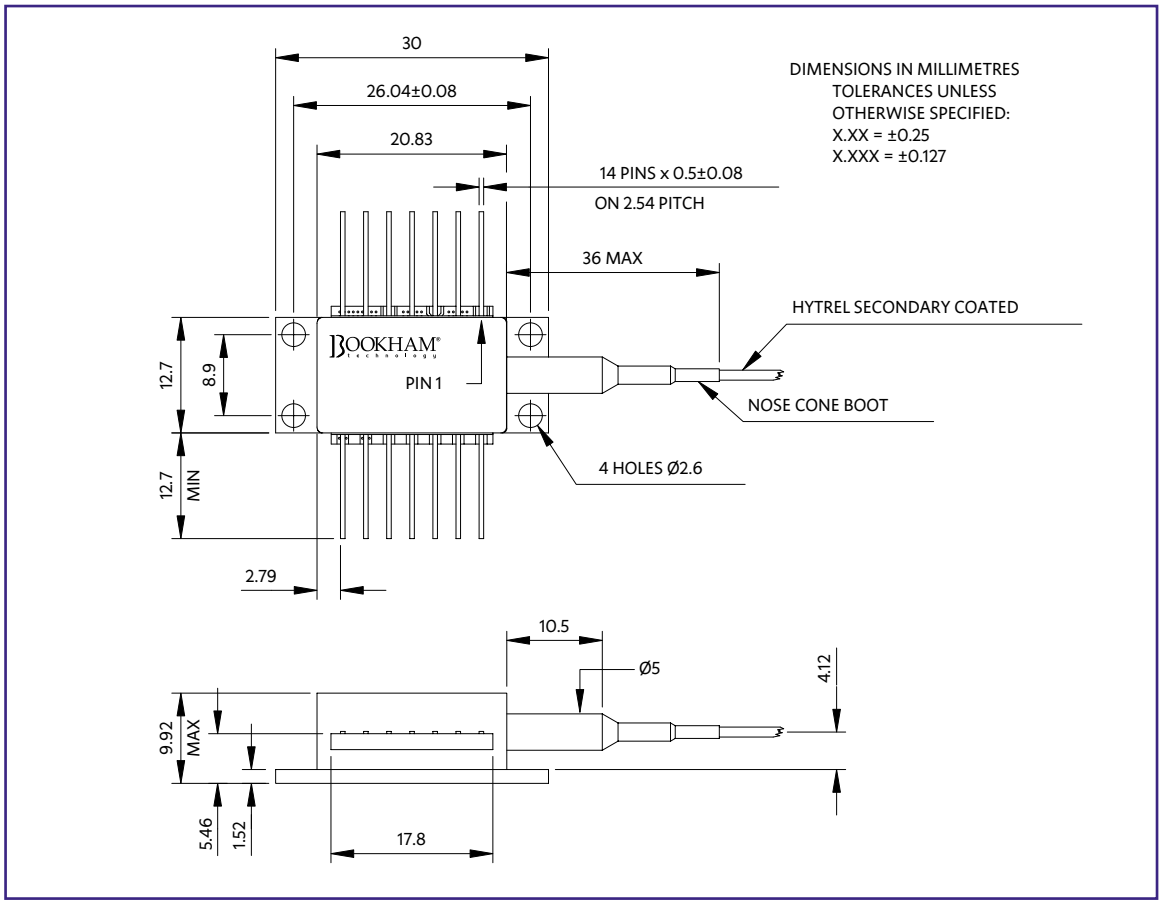

Figure 1: Outline Drawing

Note: Devices can be supplied with the leads trimmed to a length of 3.81 mm.
Please see Ordering Information section.

*Instructions for use – LC25W****A/LC25EW****A*

Pin 1 and Pin 2 Thermistor

The thermistor is used in a control loop in conjunction with the thermo-electric cooler to maintain the laser submount temperature at the required value for wavelength. Operating current should be less than 100 µA to prevent self-heating errors.

For etalon stabilised devices the thermistor is used for the initial set up of the submount temperature at the required wavelength value. Operating current should be less than 100 µA to prevent self-heating errors. Once the initial submount temperature has been achieved control of the TEC current is handed over to the etalon locking circuit to achieve fine tuning.

Pin 3 Laser DC bias (-)

Laser bias current (negative with respect to package ground) is applied via this pin which forms one side of the bias-T connection to the laser cathode.

Pin 4 Monitor anodes, Pin 5 Common Monitor cathode

The back facet monitor provides a mean power reference for the laser and is normally operated with a 5 V reverse bias.

For etalon stabilised devices the monitor diodes are arranged in the package such that they give an equal monitor current when the laser wavelength is matched to the ITU grid. A reverse bias must be applied equally across each of the monitors, this is commonly achieved by applying 5 V to Pin 5.

Pin 6 TEC (+), Pin 7 TEC (-)

Applying a positive voltage on pin 6 with respect to pin 7 will cause the internal submount to be cooled relative to the case temperature. Reversing the polarity will raise the submount temperature relative to the case. The TEC supply should be capable of delivering up to 0.9 A at 2.4 V.

Pin 8, 9, 11, 13 Case ground

These pins must be grounded in all applications

Pin 10

This pin is not connected for the LC25W product and it should be grounded if possible. For the Etalon locked product this pin is used for the monitor long anode. The monitor diodes are arranged such that they give an equal monitor current when the laser wavelength is matched to the ITU grid. A reverse bias must be applied equally across each of the monitors, this is commonly achieved by applying 5 V to pin 5.

Pin 12 Laser modulation (-)

The data input (modulation current) is applied via this pin which is a nominal 25 Ohm impedance coplanar line. For 10mW applications the end of life modulation current is 90mA maximum. For all other applications 60mA maximum modulation current should be provisioned.

Pin 14 N/C

This pin is not connected. It should be grounded if possible.

Connections

	Without Etalon		With Etalon
Pin	Function	Pin	Function
1	Thermistor	1	Thermistor
2	Thermistor	2	Thermistor
3	Laser DC bias (-)	3	Laser DC bias (-)
4	Monitor Anode (-)	4	Monitor Short Anode (-)
5	Monitor Cathode (+)	5	Monitor Cathode (+)
6	TEC (+)	6	TEC (+)
7	TEC (-)	7	TEC (-)
8	Case Ground	8	Case Ground
9	Case Ground	9	Case Ground
10	Not Connected	10	Monitor Long Anode (-)
11	Case Ground	11	Case Ground
12	Laser Modulation (-)	12	Laser Modulation (-)
13	Case Ground	13	Case Ground
14	Not Connected	14	Not Connected

Safety Information

Laser safety classifications:
IEC 60825-1: Edition 1.2 Class 1M
21 CFR Ch.1 (4-1-97 Edition) Class IIIb

Electrostatic discharge:
ESD threshold >500 V
TA-TSY-000870 class 3.

Ordering Information

LC25

[Etalon Option]	[Wavelength]	[Power Option]	[Reach]	[Connector]
W = none	****	**E** = 2 mWpk	**A** = 175 km -	**C28** = SC/PC
EW = Etalon		**C** = 3 mWpk		**C34** = FC/PC
		A = 4 mWpk		**C57** = LC
		B = 10 mWpk		**C59** = MU

**** = Last four digits of wavelength value E.g. for λp = 1545.32 nm **** = 4532

Product without locker can be tuned onto the next 100 GHz ITU channel in the red shift direction (2x100 GHz tunability) i.e. an LC25W4135CA-C28 can be tuned to service the 1542.14 nm ITU channel.

Fibre length 1130 to 1190 mm

Other connector types are available on request.

E.g. **LC25W4532BA-C28** is a 10 mW 1545.32 nm device with an SC connector for use in a 175 km application.

E.g. **LC25EW4532EA-C28** is a 2 mW 1545.32 nm device with an SC connector for use in a 175 km application with optional etalon stabilisation.

Trimmed lead option

Devices can be supplied with the leads trimmed to a length of 3.81 mm typ. This option can be specified by adding a 'K' suffix after the reach option.

E.g. LC25W4532BAK-C28 is a 10 mW 1545.32 nm device with an SC connector and a lead length of 3.81 mm typical, for use in a 175 km application.

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