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# DWDM 1.25 Gb/s DFB Laser Module with Integral Optical Isolator

## Technical Data

### Features

- **Center Wavelength between 1528 nm and 1602 nm**
- **Extended Wavelengths for use in systems requiring no amplifiers**
- **Modulation Capability up to 1.25 Gb/s**
- **30 dB Internal Optical Isolation**
- **25  $\Omega$  Impedance Matched**
- **Wide Operating Temperature Range: -20°C to +70°C**
- **Industry Standard Hermetic 14 PIN Butterfly Package**

### Applications

- **Metropolitan DWDM**
- **SONET/SDH Systems**
- **ATM, Ethernet and Proprietary Datacommunication Networks**
- **FTTC**

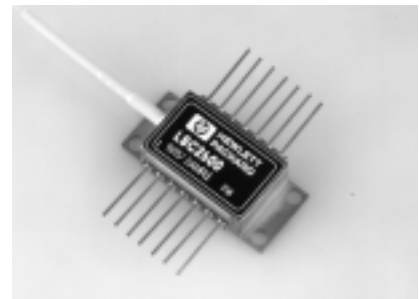
### Description

LSC26xx laser modules are highly reliable fiber optic light sources operating in the 1550 nm band. The internal DFB lasers are based upon InGaAsP ridge waveguide Multi Quantum Well technology and fabricated by the Metal Organic Vapor Phase Epitaxy (MOVPE) process, resulting in long lifetimes and modest threshold currents.

The LSC26xx package includes a photodiode for monitoring the laser output, a thermistor for monitoring laser heatsink temperature, and a Peltier effect thermoelectric cooler (TEC). A heatsink mounting flange is incorporated into the industry standard 14 PIN package, and the TEC supports  $\Delta T$  of  $\pm 50^\circ\text{C}$ .

### LSC26xx

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The LSC26xx also has 30 dB of optical isolation which is temperature controlled to maintain isolation over the full operating temperature range.

The LSC26xx family of parts gives full DWDM coverage in the EDFA 1550 nm window and offers extended wavelengths for use in systems which do not require amplifiers.

#### Laser Safety Warning

This device is a Class IIIb (3b) Laser Product. It may emit invisible laser radiation if operated with the fiber pigtail disconnected. To avoid possible eye damage do not look into an unconnected fiber pigtail during laser operation. Do not exceed specified operating limits.

### **Wavelength Control**

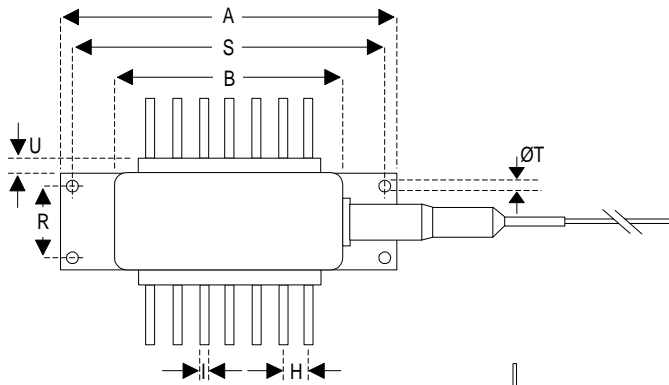
Wavelength tuning is achieved by adjusting the laser chip temperature. The laser chip temperature is monitored using the internal thermistor. The Peltier effect thermoelectric cooler deployed in the LSC26xx is capable of maintaining a  $\pm 50^{\circ}\text{C}$  temperature difference. The heating mode occurs when pin 7 is positive with respect to pin 6 and the reverse is required for cooling to happen.

### **R.F. Matching**

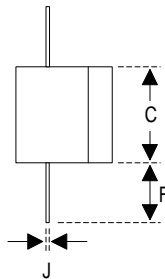
For optimum high-speed performance the r.f. matching of the drive current is important in directly modulated lasers. The LSC26xx has an internal 25 ohm matching circuit to allow ease of use. There are several options for providing laser DC bias to the LSC26xx. The most widely deployed option is dc biasing via pin 3 and modulating via pin 12. Alternatively, some laser driver ICs allow both modulation and biasing via their output pin (to LSC26xx pin 12) which results in pin 3 being unused. Under such a biasing scheme, it is recommended that pin 3 be decoupled to ground via a 100 nF capacitor to prevent any RF injection or pickup. The latter method is generally avoided due to the additional heat dissipation within the laser driver IC which impacts overall performance.

## LSC26xx Mechanical Outline

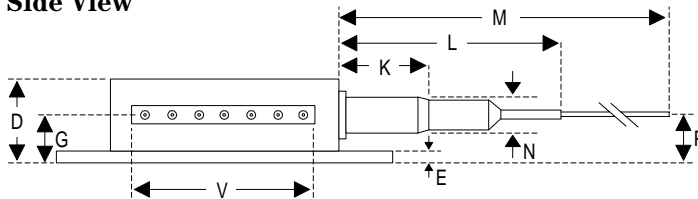
### Top View



### Back View



### Side View

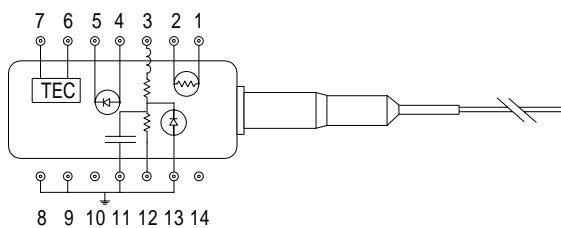


Dim	Min	Nom	Max
A	29.6	-	30.4
B	20.6	-	21.1
C	12.45	-	12.95
D	8.4	-	9.0
E	-	0.75	-
F	-	12.0	-
G	5.40	-	5.90
H	-	2.54	-
I	-	0.50	-
J	-	0.20	-
K	-	7.0	-
L	-	30.0	-
M	400	-	-
N	-	2.0	-
P	4.5	-	6.5
R	8.7	-	9.1
S	25.8	-	26.2
T	2.50	-	2.70
U	-	0.75	-
V	-	17.8	-

All dimensions in mm

## LSC26xx Pin Connections and Block Diagram

### Top View



### Pin Connections

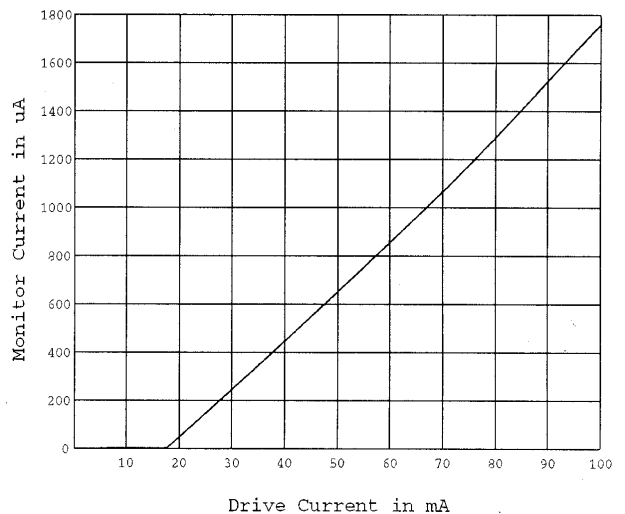
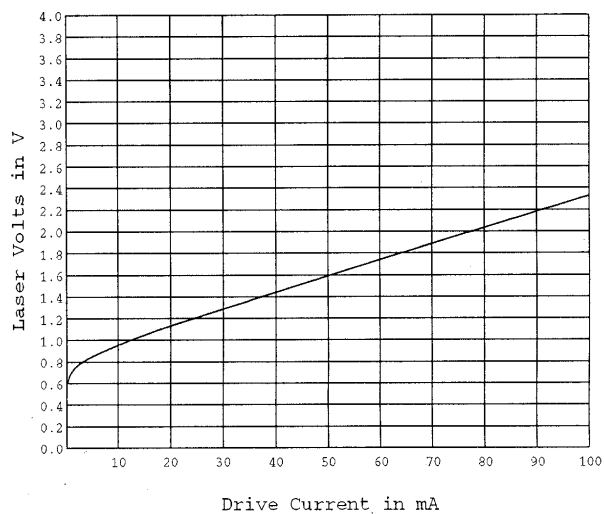
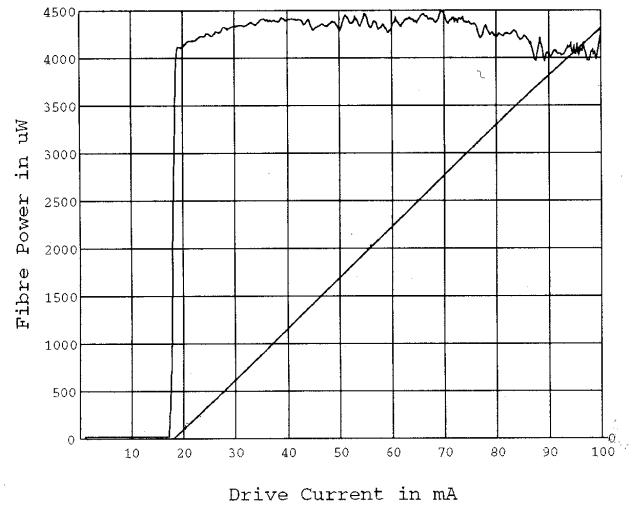
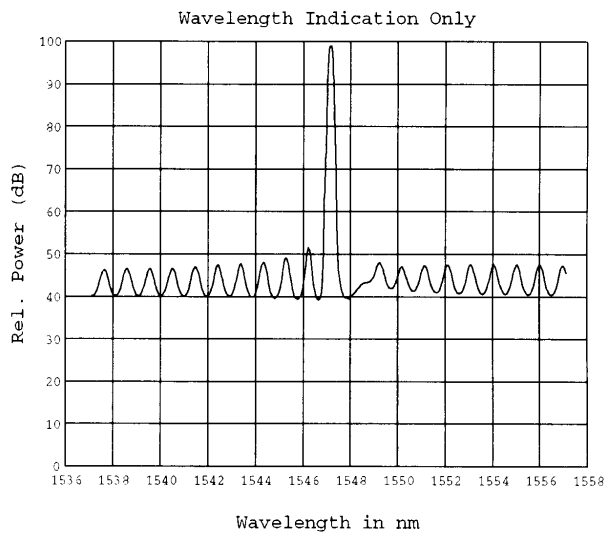
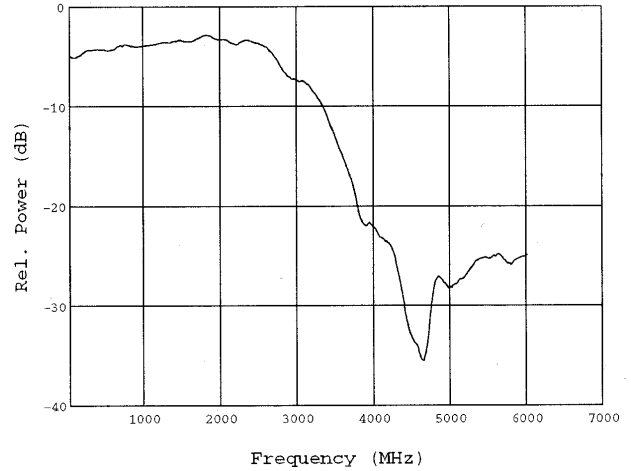
1	Thermistor
2	Thermistor
3	Laser dc bias
4	Monitor Anode
5	Monitor Cathode
6	TEC -ve when heating
7	TEC +ve when heating
8	Ground
9	Ground
10	Not connected
11	Ground
12	Laser modulation
13	Ground
14	Not connected

## LSC26xx Typical Operating Characteristics

PRODUCT TYPE : LSC26xx  
 MODULATION BIT RATE : 1.25 Gb/s  
 MODULATION DEPTH : 10% Extinction Ratio

Thermistor res @ +25°C : kohm 10.393  
 Wavelength : nm 1547.73  
 Thermistor res on channel : kohm 10.980  
 Dark current : nA 0.48

Threshold Current (I<sub>th</sub>) : mA 16.00  
 Power at I<sub>th</sub> : μW 0.00  
 Power at I<sub>th</sub> + 40 mA : μW 2123.00  
 Slope efficiency : mW/mA 0.053



## Absolute Maximum Ratings at +25°C

Absolute limiting (maximum) ratings mean that no catastrophic damage will occur if the product is subjected to these ratings for short periods, provided that each limiting parameter is in isolation and all other parameters have values within the performance specification. It should not be assumed that limiting values of more than one parameter can be applied to the product at the same time.

Parameter	Minimum	Maximum	Units
Laser Forward Current	-	150	mA
Laser Reverse Voltage	-	3.3	V
Photodiode Forward Current	-	2.5	mA
Photodiode Reverse Voltage (Vr)	-	-10	V
Fiber Pull Strength	-	10	N
Operating Temperature (Case)	-20	+85	°C
Storage Temperature	-40	+85	°C
Mechanical Shock	MIL-STD 883, Method 2002, Test Condition B		
Vibration	MIL-STD 883, Method 2007, Test Condition A		
TEC Current	-	1.1	A
TEC Voltage	-	3.0	V

## Performance Specifications - Laser

Parameter	Minimum	Typical	Maximum	Units
Threshold Current (I <sub>th</sub> ) [1]	10	-	35	mA
Peak Wavelength [2] [3]	1528	-	1602	nm
Spectral Width (-30 dB) Modulated [3]	-	-	0.6	nm
Peak Wavelength Change with Chip Temperature [1]	-	0.08	0.2	nm/°C
Sidemodes suppression ratio (Modulated) [3]	34	-	-	dB
Tracking Error, +75°C case, +25°C chip [4]	-	-	0.5	dB
	-	-	0.5	dB
Flatness of Frequency Response (300 MHz to 2 GHz)	-	-	±1.5	dB
Slope Efficiency [1]	0.05	-	-	mW/mA
Output Power (Peak Power, pk) [1]	2	-	-	mW
Center Wavelength Drift with Case Temperature	-	0.2	0.5	pm/°C

## Dispersion Penalty [5]

Data Rate	Distance [6]	Dispersion Penalty (maximum)
1.25 Gb/s	120 km	2 dB
622 Mb/s	400 km	2 dB

### Notes

1. Laser chip temperature between +20°C and +30°C.
2. Exact peak wavelength is specified in the table on page 7.
3. At PRBS 2<sup>23</sup>-1, 1.25 Gb/s, Extinction Ratio = 10%, Mean Output Power >1 mW.
4. Fiber output power change for constant monitor output current.
5. At PRBS 2<sup>23</sup>-1, Extinction Ratio = 10%, Mean Output Power >1 mW.
6. Fiber dispersion 17 ps/nm/km.

### Performance Specifications - Monitor Photodiode

Parameter	Minimum	Maximum	Units
Photocurrent (I <sub>m</sub> ) at 2 mW (pk Power)	0.2	2.0	mA
Dark Current (V <sub>r</sub> = -5 V) at +25°C	-	100	nA

### Thermistor

Parameter	Symbol	Test Conditions T <sub>CHIP</sub> = +25°C, Pf = Rated pk power	Test Limits		Units
			Min.	Max.	
Resistance	R <sub>t</sub>		9.5	10.5	kΩ
Temperature Coefficient of R <sub>t</sub>	ΔR <sub>t</sub> /ΔT		Typ. -4.4		%dR/K
β Constant	β	0°C to +50°C	Typ. 3900		K

### TEC

Parameter	Symbol	Test Conditions T <sub>CHIP</sub> = +25°C, Pf = Rated pk power	Test Limits		Units
			Min.	Max.	
TEC Cooling Current	I <sub>c</sub>	ΔT = -45°C, T <sub>CASE</sub> = +70°C	-	1.0	A
TEC Heating Current	I <sub>h</sub>	ΔT = +45°C, T <sub>CASE</sub> = -20°C	-	1.0	A
Voltage	V <sub>c</sub>	T <sub>CASE</sub> = -20°C, to +70°C	-	3.0	V

**Fiber Pigtail:** Tight jacketed, self-mode stripping, single mode fiber

Parameter	Minimum	Maximum	Units
Length	0.4	-	m
Spot Size (Mode Radius)	4.5	5.5	μm
Cladding Diameter	122	128	μm
Core/Cladding Concentricity	-	1.0	μm
Secondary Jacket Diameter	0.8	1.0	mm
Effective Cut-off Wavelength	1150	1240	nm

The pigtail length can be customized to your specific length, with a connector, to a tolerance of ±25 mm.

## Ordering Information

**LSC26xx - xx**

Connector Type:  
FP = FC/PC Polish

Channel Number

HP Part No.	Wavelength (nm) [7]	Frequency (THz)	HP Part No.	Wavelength (nm) [7]	Frequency (THz)	HP Part No.	Wavelength (nm) [7]	Frequency (THz)
LSC2698	1528.773	196.1	LSC2630	1553.329	193.0	LSC2660	1577.855	190.0
LSC2699	1529.553	196.0	LSC2631	1554.134	192.9	LSC2661	1578.686	189.9
LSC2601	1530.334	195.9	LSC2632	1554.940	192.8	LSC2662	1579.518	189.8
LSC2602	1531.116	195.8	LSC2633	1555.747	192.7	LSC2663	1580.350	189.7
LSC2603	1531.898	195.7	LSC2634	1556.555	192.6	LSC2664	1581.184	189.6
LSC2604	1532.681	195.6	LSC2635	1557.363	192.5	LSC2665	1582.018	189.5
LSC2605	1533.465	195.5	LSC2636	1558.173	192.4	LSC2666	1582.854	189.4
LSC2606	1534.250	195.4	LSC2637	1558.983	192.3	LSC2667	1583.690	189.3
LSC2607	1535.036	195.3	LSC2638	1559.794	192.2	LSC2668	1584.527	189.2
LSC2608	1535.822	195.2	LSC2639	1560.606	192.1	LSC2669	1585.365	189.1
LSC2609	1536.609	195.1	LSC2640	1561.419	192.0	LSC2670	1586.203	189.0
LSC2610	1537.397	195.0	LSC2641	1562.233	191.9	LSC2671	1587.043	188.9
LSC2611	1538.186	194.9	LSC2642	1563.047	191.8	LSC2672	1587.884	188.8
LSC2612	1538.976	194.8	LSC2643	1563.863	191.7	LSC2673	1588.725	188.7
LSC2613	1539.766	194.7	LSC2644	1564.679	191.6	LSC2674	1589.568	188.6
LSC2614	1540.557	194.6	LSC2645	1565.496	191.5	LSC2675	1590.411	188.5
LSC2615	1541.349	194.5	LSC2646	1566.314	191.4	LSC2676	1591.255	188.4
LSC2616	1542.142	194.4	LSC2647	1567.133	191.3	LSC2677	1592.100	188.3
LSC2617	1542.936	194.3	LSC2648	1567.952	191.2	LSC2678	1592.946	188.2
LSC2618	1543.730	194.2	LSC2649	1568.773	191.1	LSC2679	1593.793	188.1
LSC2619	1544.526	194.1	LSC2650	1569.594	191.0	LSC2680	1594.641	188.0
LSC2620	1545.322	194.0	LSC2651	1570.416	190.9	LSC2681	1595.489	187.9
LSC2621	1546.119	193.9	LSC2652	1571.239	190.8	LSC2682	1596.339	187.8
LSC2622	1546.917	193.8	LSC2653	1572.063	190.7	LSC2683	1597.189	187.7
LSC2623	1547.715	193.7	LSC2654	1572.888	190.6	LSC2684	1598.041	187.6
LSC2624	1548.515	193.6	LSC2655	1573.714	190.5	LSC2685	1598.893	187.5
LSC2625	1549.315	193.5	LSC2656	1574.540	190.4	LSC2686	1599.746	187.4
LSC2626	1550.116	193.4	LSC2657	1575.368	190.3	LSC2687	1600.600	187.3
LSC2627	1550.918	193.3	LSC2658	1576.196	190.2	LSC2688	1601.455	187.2
LSC2628	1551.721	193.2	LSC2659	1577.025	190.1	LSC2689	1602.311	187.1
LSC2629	1552.524	193.1						

7. Wavelength is adjusted using chip temperature.

### Handling Precautions

1. The LSC26xx can be damaged by current surges or overvoltage.
2. Power supply transient precautions should be taken.
3. Normal handling precautions for electrostatic sensitive devices should be taken.

### CDRH Certification

Hewlett-Packard Ltd.  
Whitehouse Road  
Ipswich, Suffolk IP1 5PB  
England


Manufactured: \_\_\_\_\_ Serial No: \_\_\_\_\_

Model No: \_\_\_\_\_

This product conforms to the applicable requirements of 21 CFR 1040 at the date of manufacture.

### Laser Warning

**DANGER**



Invisible LASER Radiation -  
Avoid direct exposure to beam

Peak power	10 mW
Wavelength	1550 nm

Class III b LASER product

[www.hp.com/go/fiber](http://www.hp.com/go/fiber)

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Data subject to change.

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