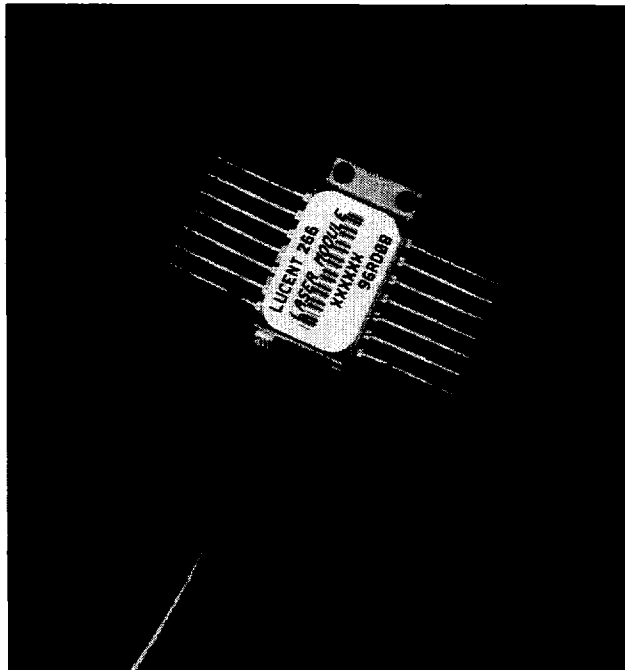




266-Type 2.5 Gbits/s Electroabsorption Modulated Isolated Laser Module (EM-ILM) for Ultra Long-Reach Applications (>600 km)



The 266 EM-ILM, featuring an integrated modulator and laser chip, provides a compact, cost-effective solution for extended-reach transmissions.

Features

- Integrated electroabsorptive modulator
- 1.5 μm wavelength
- Characterized for 2.5 Gbits/s operation
- Very low dispersion penalty over 600 km
- Low modulation voltage
- Temperature stabilized
- Wavelengths selectable to ITU-T standards

Applications

- SONET/SDH extended-reach applications
- High-capacity WDM system applications
- High-speed data communications
- Digitized video

Description

The 266 EM-ILM is a 1.5 μm laser with an integrated electroabsorptive modulator packaged in an industry-standard, 14-pin butterfly package. The device has been designed to be used in 2.5 Gbits/s extended-reach applications where the distances between regenerators is in excess of 150 km. To boost the transmitter power high enough to reach the receiver, the device typically is coupled with an erbium-doped fiber amplifier (EDFA) such as Lucent Technologies Microelectronics Group's 1713 EDFA. Transmission distances can be extended with the use of line EDFAs. The standard product is specified for use up to 360 km (266S Series) and 600 km (266L Series).

The 266 EM-ILM can replace external modulators in many applications. The nominal input impedance for the modulator is 50 Ω . By integrating the modulator with the laser chip, the device offers a compact, cost-effective solution for extended-reach transmission applications. It can also be specified for WDM applications where wavelength selection is required. Lucent is providing devices compatible with the ITU-T wavelengths standards.

The package also contains a thermoelectric cooler, thermistor, backfacet monitor, and an optical isolator.

Module Characteristics

Package Type	14-pin butterfly with internal isolator
Fiber	Standard single mode
Connector	ST [®]
RF Input	50 Ω
Bit Rate	2.5 Gbits/s

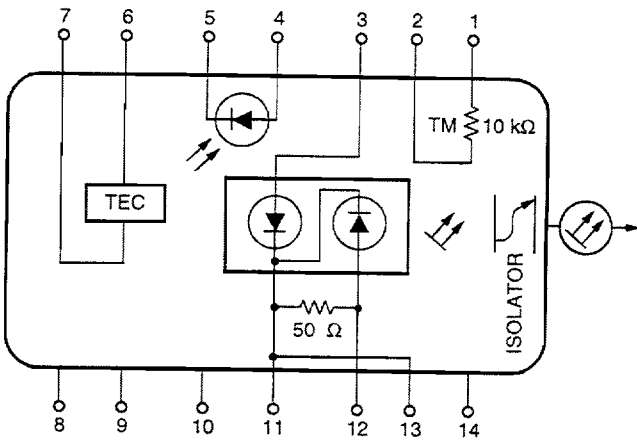


Figure 1. 266 EM-ILM Schematic

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Pin Information

Table 1. Pin Assignments

Pin Number	Description
1	Thermistor
2	Thermistor
3	Laser anode
4	Monitor anode
5	Monitor cathode
6	TEC (+)
7	TEC (-)
8	Case ground
9	Case ground
10	No connection
11	Laser/modulator ground
12	Modulator anode (-)/50 Ω RF input
13	Laser/modulator ground
14	No connection

Target Specifications

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operations sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Table 2. Absolute Maximum Ratings

Parameter	Conditions	Limit	Unit
Laser Diode Reverse Voltage	CW	2	V
Laser Diode Forward Current	CW	150	mA
Optical Output Power	CW	10	mW
Modulator Reverse Voltage	—	5	V
Modulator Forward Voltage	—	1	V
Monitor Diode Reverse Voltage	—	10	V
Monitor Diode Forward Current	—	1	mA
Storage Temperature Range	—	-40 to +85	$^{\circ}$ C
Operating Temperature Range	—	0 to 70	$^{\circ}$ C

Target Specifications (continued)

Characteristics

Table 3. Optical and Electrical Specifications

Parameter	Symbol	Conditions	Min	Max	Unit
Laser: Laser TOP (temperature of laser submount) = 15 °C to 35 °C, except where noted.					
Threshold Current (BOL)	I _{TH}	T _{LASER CHIP} = TOP	5	35	mA
Forward Voltage	V _F	I _f = I _{OP} @ TOP, V _M = 0 V	—	2.0	V
Operating Current	I _{OP}	T _{LASER CHIP} = TOP, V _M = 0 V	30	100	mA
Threshold Power	P _{TH}	T _{LASER CHIP} = TOP I _f = I _{TH} , V _M = 0 V	—	80	μW
Fiber Output Power (peak)	P _{PK}	T _{LASER CHIP} = TOP V _M = 0 V, I _f = I _{OP}	0	—	dBm
Peak Wavelength (wavelength can be specified to the ITU-T wavelength channels)	λ ₀	V _M = 0 V, T _{LASER CHIP} = TOP I _f = I _{OP}	1530	1563	nm
Side-Mode Suppression Ratio	SMSR	V _M = 0 V, I _f = I _{OP} , TOP	30	—	dB
Dispersion Penalty, 266S Series	DP	2.5 Gbits/s, V _{LOW} = -1.5 V to -2.5 V V _{HIGH} = 0 V I _f = I _{OP} @ TOP Dispersion = 6200 ps/nm BER = 10 ⁻¹⁰	—	1.5	dB
Dispersion Penalty, 266L Series	DP	2.5 Gbits/s V _{LOW} = -1.5 V to -2.5 V V _{HIGH} = 0 V I _f = I _{OP} @ TOP Dispersion = 10200 ps/nm BER = 10 ⁻¹⁰	—	2.0	dB
Time Resolved Spectroscopy (chirp), 266S Series	TRSP-P	2.5 Gbits/s V _{LOW} = -1.5 V to -2.5 V V _{HIGH} = 0 V I _f = I _{OP} @ TOP Dispersion = 6200 ps/nm BER = 10 ⁻¹⁰	—	0.3	A
Time Resolved Spectroscopy (chirp), 266L Series	TRSP-P	2.5 Gbits/s V _{LOW} = -1.5 V to -2.5 V, V _{HIGH} = 0 V I _f = I _{OP} @ TOP Dispersion = 10200 ps/nm BER = 10 ⁻¹⁰	—	0.2	A

Target Specifications (continued)

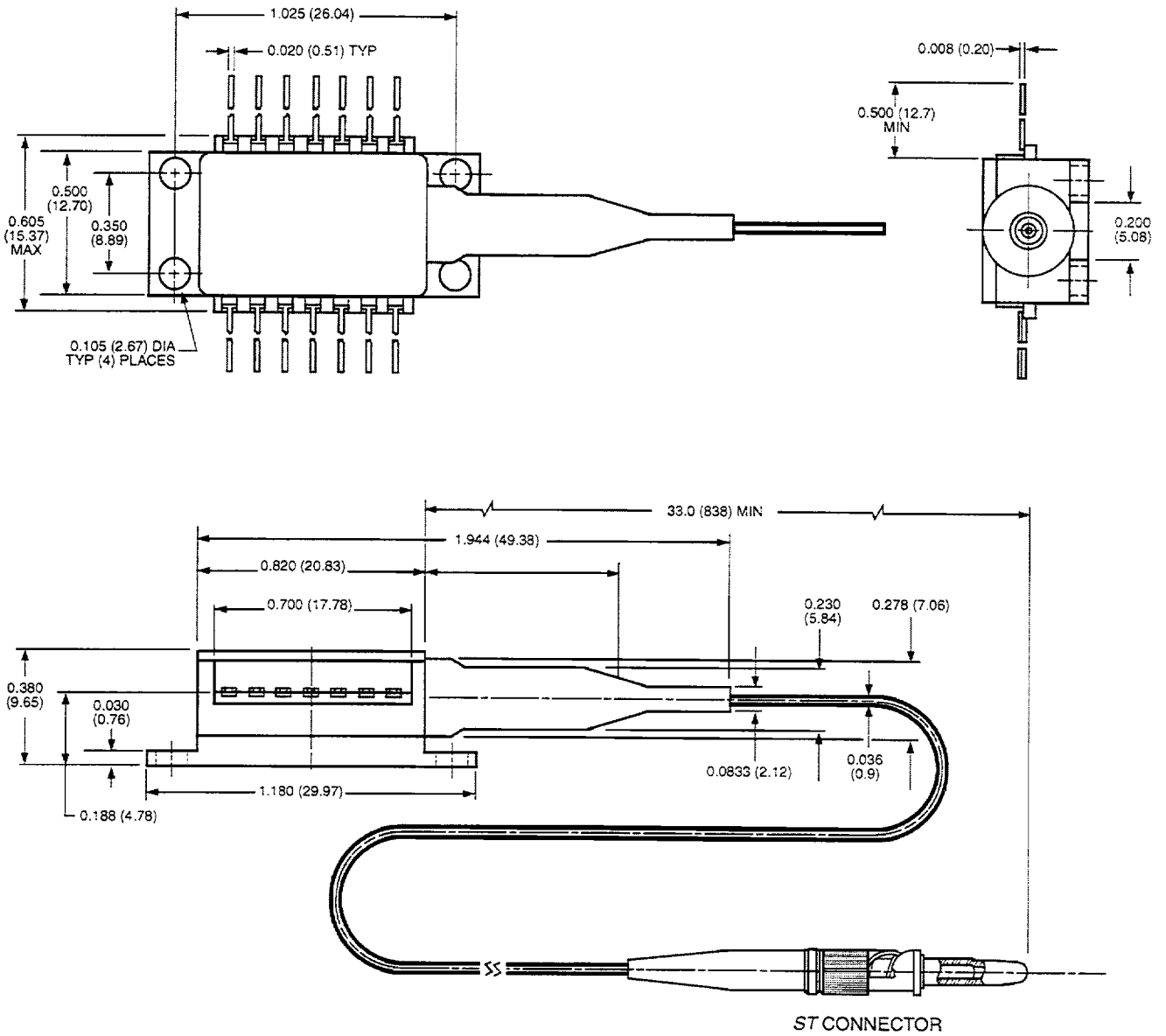
Characteristics (continued)

Table 3. Optical and Electrical Specifications (continued)

Parameter	Symbol	Conditions	Min	Max	Unit
Modulator					
Extinction Ratio	ER _{DC}	V _M = 0 V to -2.5 V	12	—	dB
Extinction Ratio	ER _{RF}	V _M = 0 V to -2.5 V, 2.5 Gbits/s	10	—	dB
RF Return Loss (0 GHz to 2 GHz)	S ₁₁	V _M = -V _{PP} /2 I _f = I _{OP}	10	—	dB
RF Return Loss (2 GHz to 3 GHz)	S ₁₁	V _M = -V _{PP} /2 I _f = I _{OP}	7	—	dB
RF Return Loss (3 GHz to 5 GHz)	S ₁₁	V _M = -V _{PP} /2 I _f = I _{OP}	3	—	dB
-3 dB Bandwidth	BW	V _M = -V _{PP} /2 I _f = I _{OP}	3.5	—	GHz
Rise/Fall Time (20% to 80%)	tr/TF	—	—	125	ps
Monitor Diode					
Monitor Current	I _{BD}	T _{LASER CHIP} = T _{OP} V _{BD} = 5 V, I _f = I _{OP}	120	1800	μA
Dark Current	I _D	T _{LASER CHIP} = T _{OP} , V _{BD} = -5 V	—	0.1	μA
Capacitance	C	V _{BD} = 5 V, f = 1 MHz	—	15	pF
Thermistor					
Resistance	R _{THERM}	T = 25 °C	9.5	10.5	kΩ
Thermistor Current	I _{TC}	—	10	100	μA
Thermistor B Constant	B	—	3700	4100	—
Thermoelectric Cooler					
TEC Current	I _{TEC}	T _{LASER CHIP} = 15 °C T _{CASE} = 70 °C	—	1.5	A
TEC Voltage	V _{TEC}	T _{LASER CHIP} = 15 °C T _{CASE} = 70 °C	—	3.0	V
TEC Power	P _{TEC}	T _{LASER CHIP} = 15 °C T _{CASE} = 70 °C	—	4.0	W
TEC Capacity	ΔT	T _{CASE} = 70 °C	55	—	°C
Laser Module					
Optical Isolation	—	T _{CASE} = 0 °C to 65 °C T _{CASE} = 65 °C to 70 °C	23 21	— —	dB dB

Outline Diagram

Dimensions are in inches and (millimeters). Tolerances are ± 0.005 in. (± 0.127 mm).



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Ordering Information

Table 4. Ordering Information

Parameter		Device Description			
ITU-T Wave-length (nm)	Frequency (THz)	266S Series 360 km, Standard Fiber		266L Series 600 km, Standard Fiber	
		Code	Comcode	Code	Comcode
1532.68	195.6	266S56	107834228	266L56	107834327
1533.46	195.5	266S55	107834210	266L55	107834319
1534.25	195.4	266S54	107834236	266L54	107834301
1535.04	195.3	266S53	107834244	266L53	107834293
1535.82	195.2	266S52	107834251	266L52	107834285
1536.61	195.1	266S51	107806861	266L51	107807190
1537.4	195	266S5A	107806879	266L5A	107807208
1538.19	194.9	266S49	107806887	266L49	107807216
1538.98	194.8	266S48	107806895	266L48	107807224
1539.77	194.7	266S47	107806903	266L47	107807232
1540.56	194.6	266S46	107806911	266L46	107807240
1541.35	194.5	266S45	107806929	266L45	107807257
1542.14	194.4	266S44	107806937	266L44	107807265
1542.94	194.3	266S43	107806945	266L43	107807273
1543.73	194.2	266S42	107806952	266L42	107807281
1544.53	194.1	266S41	107806960	266L41	107807299
1545.32	194	266S4A	107806978	266L4A	107807307
1546.12	193.9	266S39	107806986	266L39	107807315
1546.92	193.8	266S38	107806994	266L38	107807323
1547.72	193.7	266S37	107807000	266L37	107807331
1548.51	193.6	266S36	107807018	266L36	107807349
1549.31	193.5	266S35	107807026	266L35	107807356
1550.12	193.4	266S34	107807034	266L34	107807364
1550.92	193.3	266S33	107807042	266L33	107807372
1551.72	193.2	266S32	107807059	266L32	107807380
1552.52	193.1	266S31	107807067	266L31	107807398
1553.33	193	266S3A	107807075	266L3A	107807406
1554.13	192.9	266S29	107807083	266L29	107807414
1554.94	192.8	266S28	107807091	266L28	107807422
1555.75	192.7	266S27	107807109	266L27	107807430
1556.55	192.6	266S26	107807117	266L26	107807448
1557.36	192.5	266S25	107807125	266L25	107807455
1558.17	192.4	266S24	107807133	266L24	107807463
1558.98	192.3	266S23	107807141	266L23	107807471
1559.79	192.2	266S22	107807158	266L22	107807489
1560.61	192.1	266S21	107807166	266L21	107807497
1561.42	192	266S2A	107807174	266L2A	107807505
1562.23	191.9	266S19	107834269	266L19	107834277
1530 to 1565	—	266SW	107807182	266LW	107807513
1530 to 1565	—	266TWS	107770307	—	—

Related Product Information

Table 5. Related Product Information

Description	Part Number	Document Number
1.5 μm EDFA (980 nm pump(s))	1712-Type	DS96-086LWP
1.5 μm EDFA (1480 nm pump(s))	1713-Type	DS96-134LWP
1.5 μm EDFA Optical Gain Block (1480 nm pump(s))	1714-Type	DS95-003LWP
1.5 μm EDFA Optical Gain Block (1480 nm pump(s))	1715-Type	DS95-004LWP
1.5 μm EDFA Optical Gain Block (980 nm pump(s))	1718-Type	DS95-223LWP
1.5 μm EDFA (analog applications)	1720-Type	DS96-028LWP

Laser Safety Information

Class III b Laser Product

This product complies with 21 CFR 1040.10 and 1040.11.

Single-mode connector

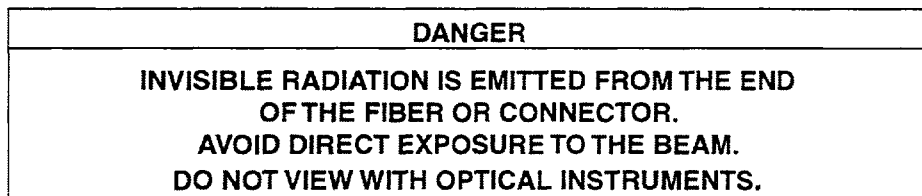
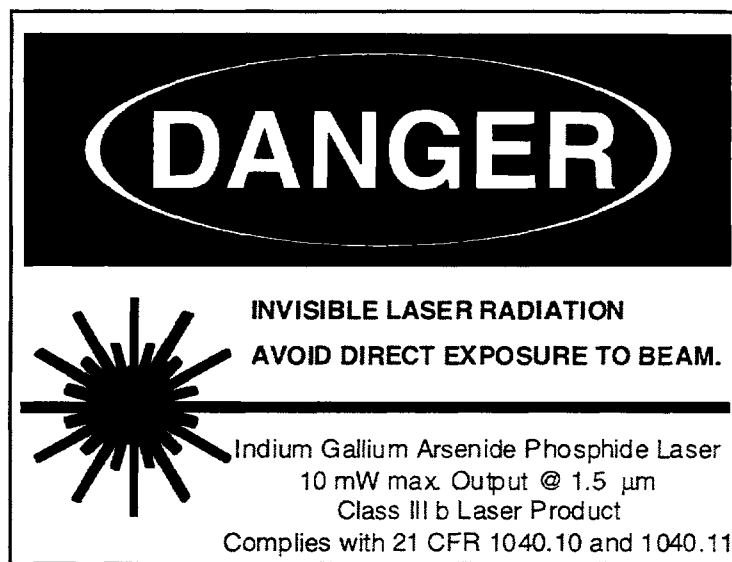
Wavelength = 1.5 μm

Maximum power = 10 mW

Because of size constraints, laser safety labeling is not affixed to the module but attached to the outside of the shipping carton.

Product is not shipped with power supply.

Caution: Use of controls, adjustments, and procedures other than those specified herein may result in hazardous laser radiation exposure.



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