Data Sheet
December 2001

D1861-Type 10 Gbits/s 1310 nm DML Module

Description

The D1861-type direct-modulated laser (DML) module is a cost-effective solution for 10 Gbits/s digital transmission up to 60 km using traditional intracity *SMF-28*™ single-mode fiber links. The 1310 nm wavelength eliminates the need for concern about dispersion control over most installed intracity fiber plants. The package contains a high-speed DFB laser chip, thermoelectric cooler, thermistor, optical isolator, and a rear-facet monitor photodiode that allows for external optical power control.

Features

- Direct-modulated 1310 nm laser module characterized for use in 10 Gbits/s operations up to 60 km
- Internal thermoelectric cooler (TEC) enables stable operation within a wide case temp. range: –5 °C to +80 °C
- Hermetically sealed optics, isolator on TEC
- Single-mode fiber pigtail
- *GPO*™ RF connector
- High relaxation frequency at low bias

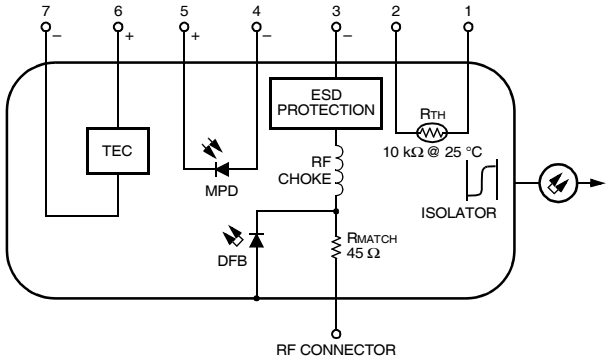


Figure 1. D1861-Type DML Electrical Schematic

Applications

Table 1. D1861-Type Application Overview

Application	Standard	Model
ITU G.691, GR-253 –1 dBm to –6 dBm	I-64.1r, OC-192 SR-1 0 km—7 km	D1861B (0 km—12 km)
ITU G691, GR-253 5 dBm to 1 dBm	S-64.1, OC-192 IR-1 0 km—20 km	D1861C2 (0 km—30 km)
ITU G.691, GR-253 7 dBm to 4 dBm	L-64.1, OC-192 LR-1 0 km—40 km	D1861C (0 km—40 km)
GR-253 13 dBm to 10 dBm	OC-192 VR-1 0 km—60 km	D1861E (0 km—60 km)
OIF	OIF, Serial VSR 0 m—600 m	D1861B (0 km—12 km)

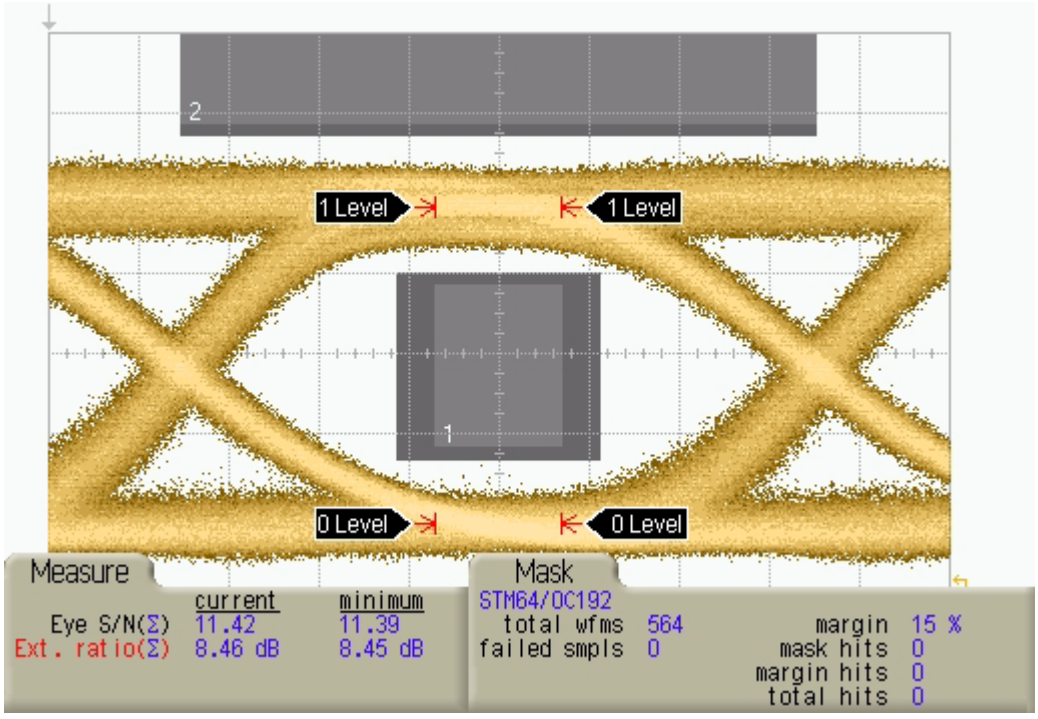
Absolute Maximum Ratings

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 operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability. RF input shall be ac coupled. It is recommended that a series inductor of 100 µH be placed external to the device on Pin 3.

Parameter	Symbol	Condition	Min	Max	Unit
Operating Temperature Range	TOP	—	–5	80	°C
Storage Case Temperature Range	Tstg	—	–40	85	°C
Laser Forward Bias	—	TEC On	—	150	mA
Pin 3, Max. Positive Voltage[1]	VR	—	—	1	V
Pin 3, Max. Positive Current[1]	IR	—	—	200	mA
Reverse Voltage Photodiode	VRPD	—	—	20	V
TEC Current	ITEC	—	—	1.7	A

1. RF connector ac coupled.

Characteristic Curve



1-1321 (F)

Figure 2. Filtered Optical Eye Pattern (0 km, Fourth Order Bessel Filter, 8.4 dB ER, 20 ps/div)

Electrical/Optical Characteristics

Table 2. D1861-Type Electrical and Optical Characteristics

(Case temperature, –5 °C to +80 °C; laser temperature, 30 °C; unless otherwise noted.)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Wavelength	λ	—	1290	—	1320	nm
Optical Output Power (EOL):	P_O					
D1861B		$I_{OP} = I_{TH} + 30$ mA	–6	–3	–1	dBm
D1861C2		$I_{OP} = I_{TH} + 30$ mA	1	4	5	dBm
D1861C		$I_{OP} = I_{TH} + 30$ mA	4	6	7	dBm
D1861D		$I_{OP} = I_{TH} + 30$ mA	7	8.5	10	dBm
D1861E		$I_{OP} = I_{TH} + 50$ mA	10	11	13	dBm
Threshold Current (BOL)	I_{TH}	—	2	—	30	mA
Wavelength Tuning Coefficient	$\Delta\lambda_T$	—	—	0.085	—	nm/°C
ac Side-mode Suppression Ratio	SMSR	I_{OP}	35	—	—	dB
Chromatic Dispersion Penalty (60 km, *SMF-28*, 200 ps/nm): D1861B and C	—	—[1]	—	—	1.0	dB
Optical Isolation	—	—	32	—	—	dB
High-frequency Cutoff (3 dB)	F_{HIGH}	I_{OP}[2]	14	—	—	Ghz
Low-frequency Cutoff (3 dB	F_{LOW}	I_{OP}[2]	—	—	30	kHz
Rf Return Loss, 50 Ω (0.1 Ghz—8 Ghz)	$\lvert S_{11}\rvert$	I_{OP}	10	—	—	dB
Rise/Fall Time, 10%—90%	t_R/t_F	—[1]	—	—	50	ps
Thermoelectric Cooler Current	I_{TEC}	—	—	—	1.3	A
Thermistor Resistance	R_{TH}	—	9.5	10	10.5	kΩ
Thermistor Coefficient	—	—	—	–4.4	—	%/°C
Monitor Photodiode Current	I_{MPD}	I_{OP}	40	—	1500	μA

1. 10 Gbits/s PRBS 2^{23}–1, ER = 8.2 dB, @ I_{OP}, T_{OP} = 25 °C, typical 50 mAp–p drive current.
2. Measurements made with 100 μH in series with pin 3 (laser cathode).

Pin Information

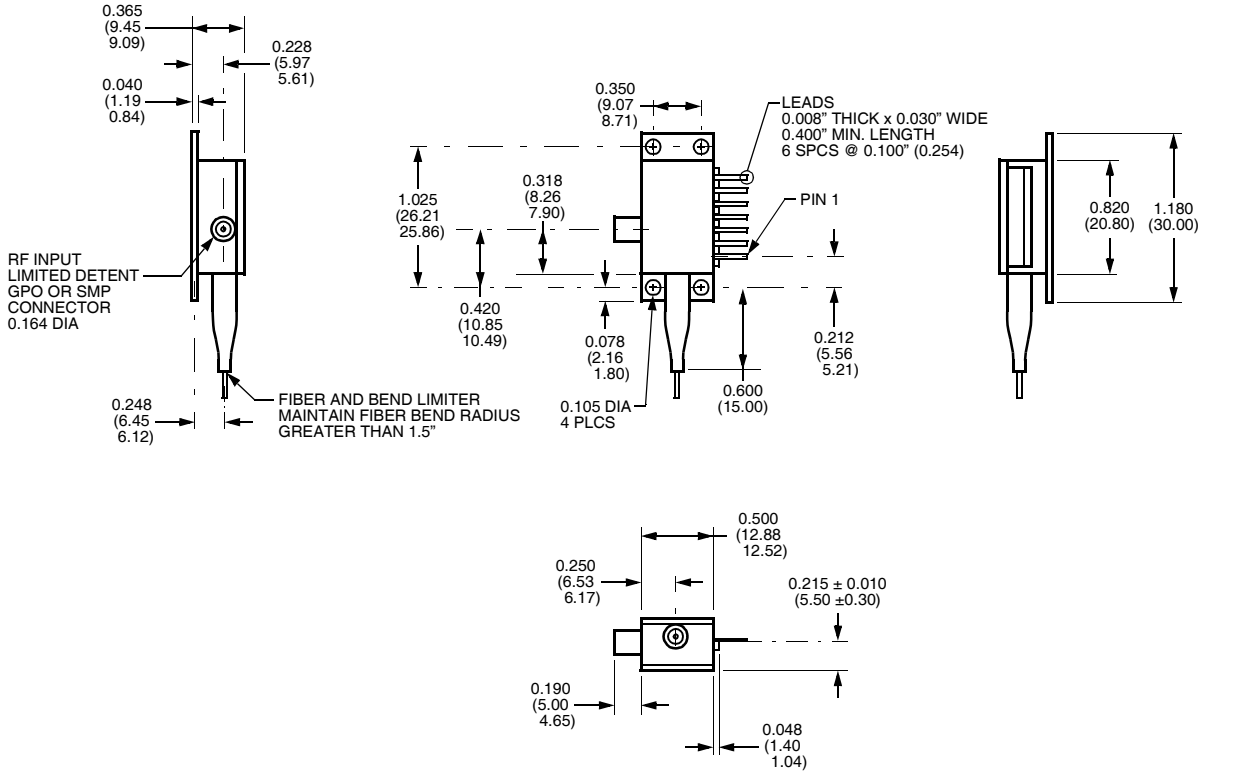
Table 3. Pin Descriptions

Pin No.	Description
1	Thermistor
2	Thermistor
3	Laser Cathode (–), dc Bias[1]
4	MPD Anode, (Negative Bias MPD)
5	MPD Cathode
6	Thermoelectric Cooler (+)[2]
7	Thermoelectric Cooler (–)

1. Laser anode is case ground mAp-p drive current.
2. A positive current into this pin cools the laser.

Outline Diagram

Dimensions are in inches and (millimeters).



Laser Safety Information

Class IIIb Laser Product

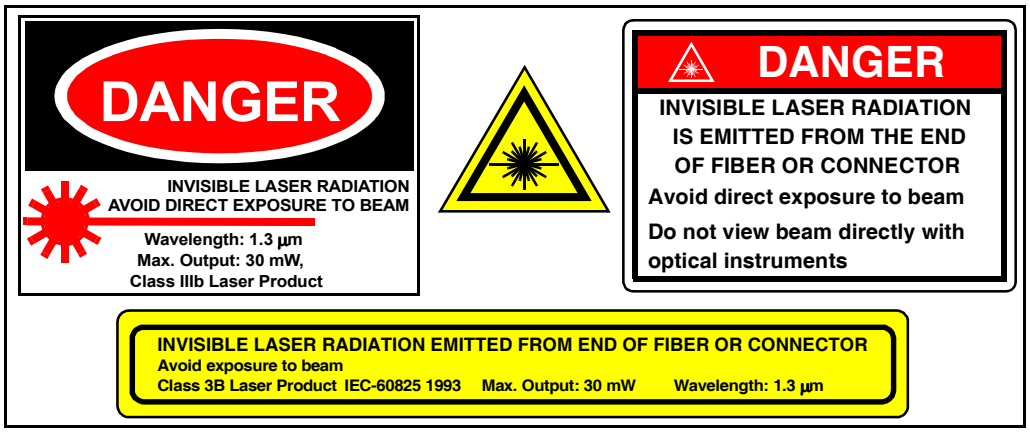
FDA/CDRH Class IIIb laser product. All versions are Class IIIb laser products per CDRH, 21 CFR 1040 Laser Safety requirements. All versions are Class 3B laser products per *IEC** 60825-1:1993. The device has been classified with the FDA under an accession number to be determined.

This product complies with 21 CFR 1040.10 and 1040.11.
SMF-28 single-mode fiber pigtail and connector
Wavelength = 1310 nm
Maximum power = 30 mW

Because of size constraints, laser safety labeling (including an FDA Class IIIb label) 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.**



Ordering Information

Table 4. Ordering Information[1]

Device Code	Description	Connector	Pigtail	Comcode
D1861B023	10 Gbits/s DML, 1310 nm,	FC/SPC	*SMF-28* (1 m min)	TBD
D1861B040	10 Gbits/s DML, 1310 nm,	SC/UPC Standard	*SMF-28* (1 m min)	TBD
D1861B050	10 Gbits/s DML, 1310 nm,	LC	*SMF-28* (1 m min)	TBD
D1861C023	10 Gbits/s DML, 1310 nm,	FC/SPC	*SMF-28 (1 m min)*	TBD
D1861C040	10 Gbits/s DML, 1310 nm,	SC/UPC Standard	*SMF-28 (1 m min)*	TBD
D1861C050	10 Gbits/s DML, 1310 nm,	LC	*SMF-28 (1 m min)*	TBD
D1861D023	10 Gbits/s DML, 1310 nm,	FC/SPC	*SMF-28* (1 m min)	TBD
D1861D040	10 Gbits/s DML, 1310 nm,	SC/UPC Standard	*SMF-28* (1 m min)	TBD
D1861D050	10 Gbits/s DML, 1310 nm,	LC	*SMF-28* (1 m min)	TBD
D1861C2023	10 Gbits/s DML, 1310 nm,	FC/SPC	*SMF-28* (1 m min)	TBD
D18612C040	10 Gbits/s DML, 1310 nm,	SC/UPC Standard	*SMF-28* (1 m min)	TBD
D1861C2050	10 Gbits/s DML, 1310 nm,	LC	*SMF-28* (1 m min)	TBD
D1861E023	10 Gbits/s DML, 1310 nm,	FC/SPC	*SMF-28* (1 m min)	TBD
D1861E040	10 Gbits/s DML, 1310 nm,	SC/UPC Standard	*SMF-28* (1 m min)	TBD
D1861E050	10 Gbits/s DML, 1310 nm,	LC	*SMF-28* (1 m min)	TBD

1. Other options available. For additional ordering information, please contact an Agere Systems account manager at Opto West, 1-800-362-3891 (for sales staff, please press option 2).

GPO is a trademark of Gilbert Engineering Co., Inc.
SMF-28 is a trademark of Corning Incorporated.
IEC is a registered trademark of The International Electrotechnical Commission

For additional information, contact your Agere Systems Account Manager or the following:
INTERNET: **http://www.agere.com**
E-MAIL: **docmaster@agere.com**
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1-800-372-2447, FAX 610-712-4106 (In CANADA: **1-800-553-2448**, FAX 610-712-4106)
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DS02-009METR (Replaces DS00-273OPTO, DS01-125OPTO, DS01-126OPTO, DS01-127OPTO)