Lecture #04

Semiconductor Lasers :
Practical LD and Handling

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OUTLINES

Practical Laser Diodes and Handling

a. Device Specifications
b. Packaging
c. Safety of the Device
d. Safety of the User

escription

orlabs' LP1550-SAD2 Single Mode Pigtailed DFB Laser Diode is a standard TO-packaged diode that has en pigtailed to a 1 m long single mode fiber (SMF-28e) with an FC/APC connector. This fiber pigtailed er diode features an internal optical isolator to avoid back reflection for stable output power and gle longitudinal mode. Each unit is tested before shipment. Please refer to the unit-specific test tasheet for optimal operating parameters.

pecifications

Absolute Maximum Ratings	
Reverse Voltage (Max)	2 V
Reverse Voltage (Max)	10 V
solute Max Current	40 mA
solute Max Power	3 mW
orage Temperature	-10 to 65 °C
Physical Specifications	
n Code	5D
ber	SMF-28e
nnector	FC/APC

NOTICE

To avoid equipment damage from electrostatic discharge:

Wear ESD wriststrap when handling this device.

LP1550-SAD2 Specifications

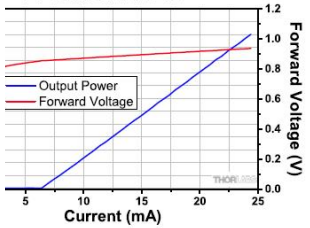
	Symbol	Min	Typical	Max
nter Wavelength*	λ_C	1547 nm	1550 nm	1553 nm
pical Output Power*	P_{op}	-	2.0 mW	-
erating Current @ P_{op} = 2 mW *	I_{op}	-	20 mA	40 mA
mperature Tuning Range	T_{TR}	15 °C	-	35 °C
reshold Current*	I_{TH}	-	6 mA	20 mA
le Mode Suppression Ratio (SMSR)	SMSR	35 dB	40 dB	-
avelength Shift over Current	$\Delta\lambda/\Delta I$	-	0.005 nm/mA	-
avelength Shift over Temperature	$\Delta\lambda/\Delta T$	-	0.1 nm/°C	-
erating Voltage @ P_{op} = 2 mW*	V_F	-	1.0 V	2.0 V
onitor Current @ P_{op}	I_{PD}	120 µA	-	1000 µA
pe Efficiency @ P_{op} = 2 mW *	$\Delta P/\Delta I$	-	0.2 mW/mA	-
ser Linewidth (-20 dB) @ P_{op} = 2 mW *	Δv	-	0.1 nm	1.0 nm

Temperature = 25 °C

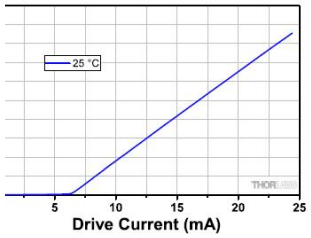
ce Specifications

THORLABS

LP1550-SAD2 LIV



1550-SAD2 Monitor vs. Drive Current



Slight variations in

July 7, 2015
QTN008233-S01, Rev A

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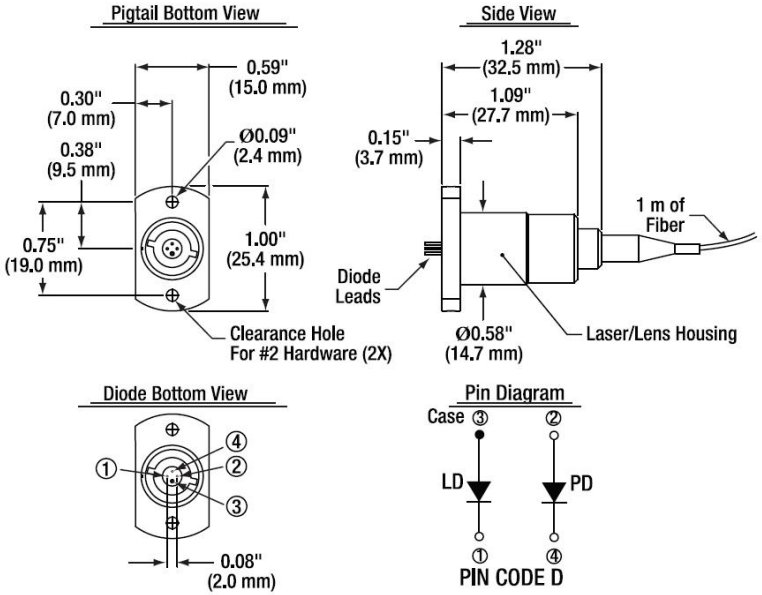
Drawing



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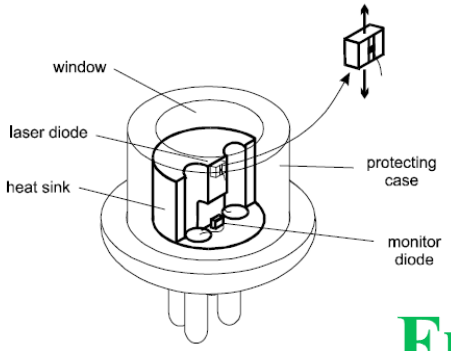
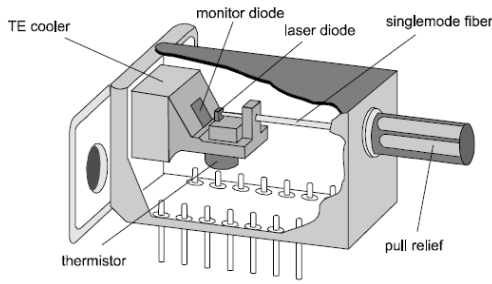
ications

Laser Diodes : Packaging



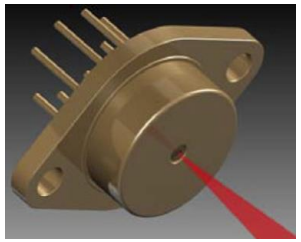
Device Packages



Free Space output

Will have glass window at the top for the light output

TO-3 Window Can



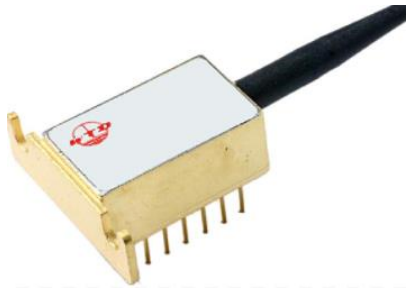
Similar to power transistor

SOT- 148 Window Can

Fiber Pigtail

Light output is from the fiber

14 Pin DIL or DIP Package



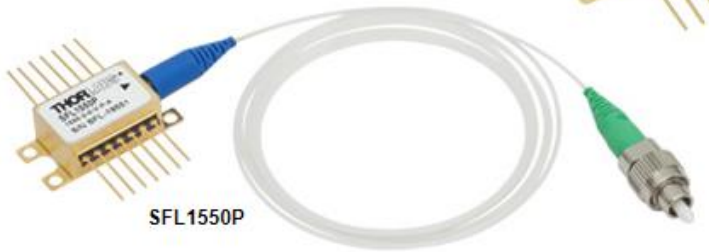
14 Pin Butterfly Package

Laser Diodes : Packaging

Pigtailed External Cavity (ECL) Single-Frequency Lasers, Butterfly Package

- Narrow Linewidth, Single-Frequency Laser Diodes
- 1550 nm or 1620 nm Center Wavelength
- Integrated TEC Element
- FC/APC Terminated

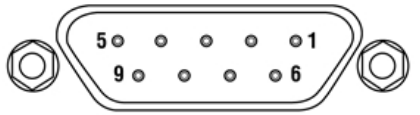
SFL1550S



SFL1550P

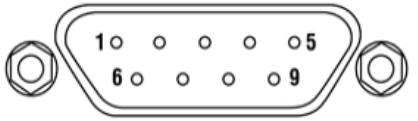
Application Idea
SFL1550S Installed in the CLD1015 Compact Laser Diode Controller

Laser Diode Connector
D-type Female



Pin #	Signal
1	Interlock and Status Pin (LDC Specific)
2	Photodiode Cathode PDC
3	Laser Diode Anode LDA
4	Photodiode Anode PDA
5	Interlock and Status Return
6	Laser Diode Voltage (-) VLD(-)
7	Laser Diode Cathode LDC
8	Not Used
9	Laser Diode Voltage (+) VLD(+)

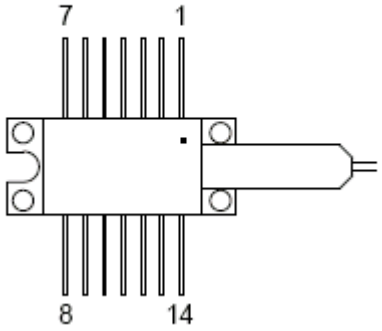
TEC Connector
D-type Male



Pin #	Signal
1	TEC Lockout (+)
2	+Thermistor TH+
3	-Thermistor TH_GND
4	TEC (+)
5	TEC (-) and TEC Lockout (-)
6	Not Used
7	Not Used
8	Not Used
9	Not Used

Pin Identification			
1	TEC +	14	TEC -
2	Thermistor	13	Case
3	NC	12	NC
4	NC	11	LD +
5	Thermistor	10	LD -
6	NC	9	NC
7	NC	8	NC

Type 1 14 Pin Butterfly Pin Diagram



LM14S2

Handling LDs: Safety of User

Classification		Output power P_{out}	Precautions
Class I		Few µW to few tens of µw	Safe lasers
Class II		< 1mW	Avoid direct exposure to the eyes
Class	IIIa	1mW to 10 mW	Avoid direct exposure
	IIIb	10mW to 100 mW	Laser googles and avoid direct exposure on body parts
Class IV		> Few hundred mW	Need all safety precautions and "interlocking arrangement "

Handling LDs: Safety of Devices

All high speed devices are sensitive to ESD

$$i = \frac{dq}{dt}$$

- **If the charges passes through a very short time the current will be very high.**
- **Devices very high speed then current will be very high**
- **Important in the high speed components**

Grounded Mats
Grounded Straps : wire have to go to the central node with a 1 mega ohm resistance

Handling LDs: Set-up of a Laser

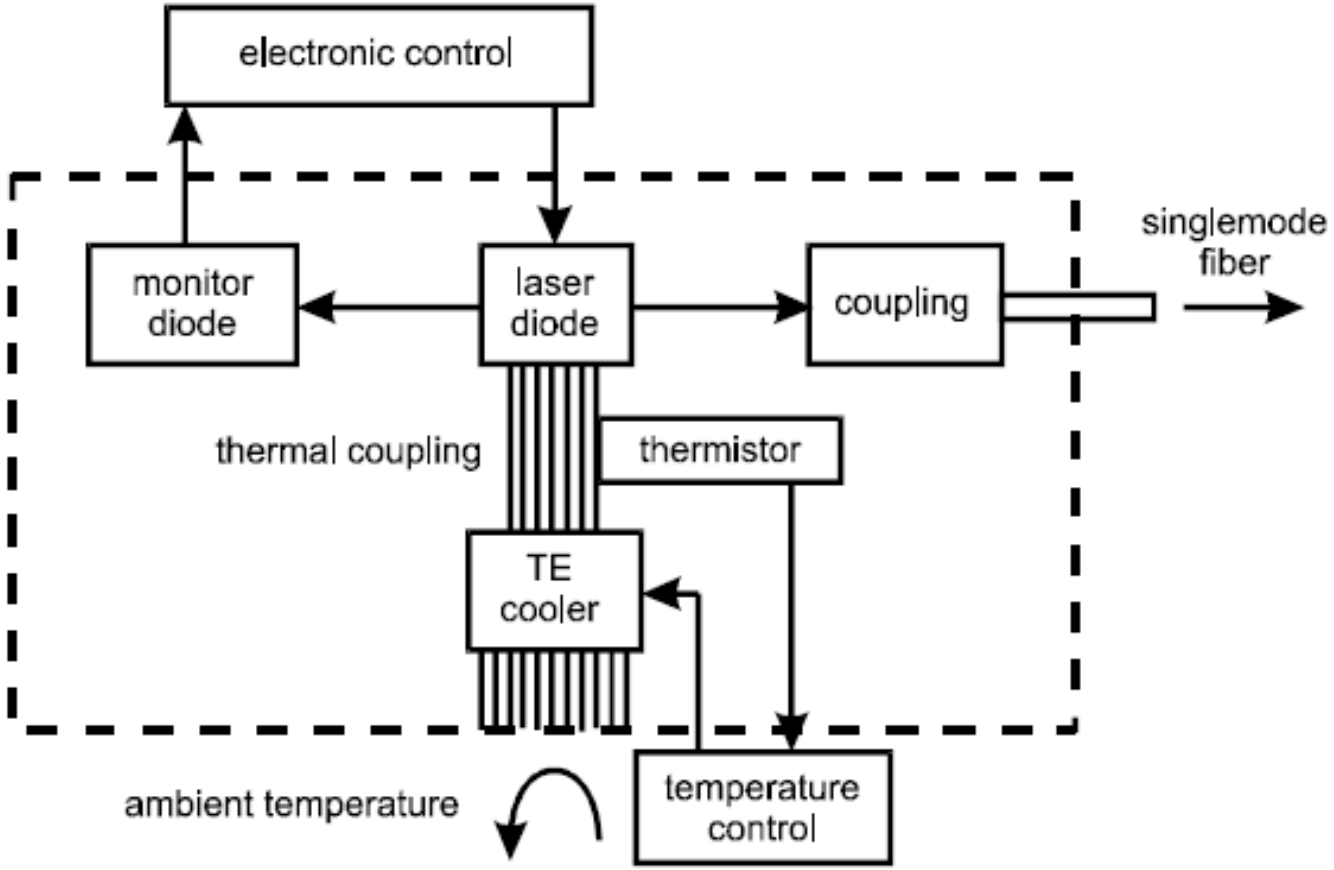
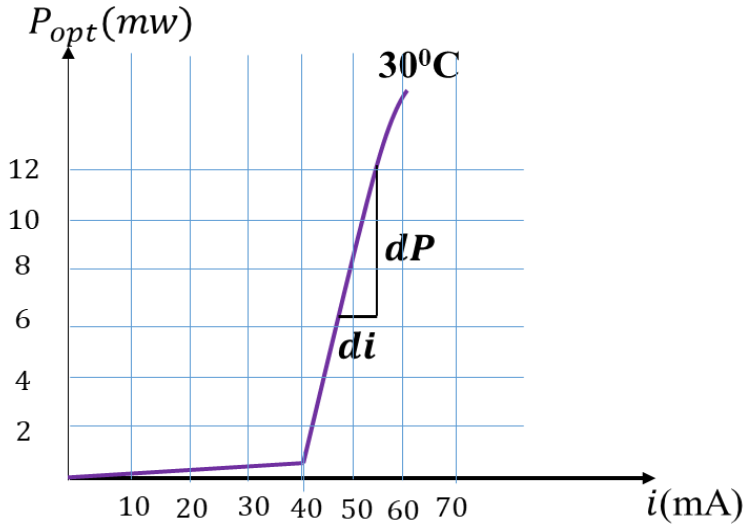


Figure Set up of a laser module

Assignment

1. For the given typical parameter of laser diode as follows, what is the transparent current at T=30^{o}C and T=40 ^{o}C. Also, plot the graph for $P_{optical}$ when the temperature is raised to 40^{o}C showing threshold current.

   Scattering loss due to inhomogeneity = 20 cm^{-1};
   Absorption co-efficient= 600 cm^{-1};
   Length of the cavity= 285 μm;
   Reflectivity of cavity mirrors are 32%



Temperature coefficient T_0 = 140K

Any Queries