

HL1553

1.55 μm Laser Diode with EA Modulator

HITACHI

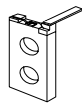
Description

The HL1553 is a 1.55 μm InGaAsP distributed-feedback laser diode (DFB-LD) with a multi-quantum well (MQW) structure. An electroabsorption (EA) modulator is integrated with the laser diode. It is suitable as a light source for high-bit-rate, long haul fiberoptic communication systems, such as 2.5 Gbps external modulation systems.

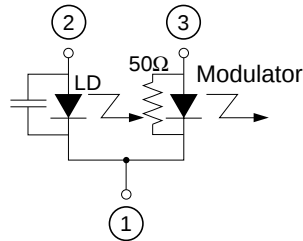
Features

- Long wavelength output: $\lambda_p = 1556 \text{ nm}$ Typ.
- High extinction ratio: 13 dB Min. at $V_{R(EA)} = -2 \text{ V}$
- Fast pulse response: $\text{tr}/\text{tf} \leq 125 \text{ ps}$
- Dynamic single longitudinal mode: $S_r = 40 \text{ dB}$ Typ.
- Package: open air package (chip on carrier) with micro strip-line

Package Type
• HL1553: AF



Internal Circuit
• HL1553



Absolute Maximum Ratings ($T_C = 25^\circ\text{C}$)

Item	Symbol	Value	Unit
LD forward current	I_F	100	mA
Optical output power ^{*1}	P_O	1.5	mW
Laser diode reverse voltage	$V_{R(LD)}$	2	V
Modulator reverse voltage	$V_{R(EA)}$	-5	V
Operating Temperature	T_{opr}	10 to 40	$^\circ\text{C}$
Storage temperature	T_{stg}	0 to 60	$^\circ\text{C}$

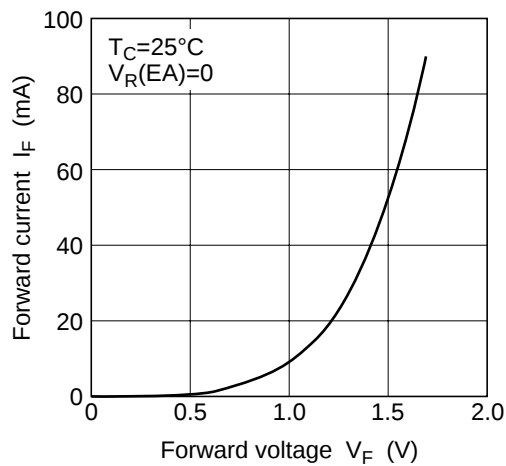
Note: 1. $T_C = 40^\circ\text{C}$; Life time of the HL1553 is determined under the conditions at $T_C = 40^\circ\text{C}$, $P_O = 1.5\text{ mW}$ ($V_{R(EA)} = 0$).

Optical and Electrical Characteristics ($T_C = 25^\circ\text{C}$)

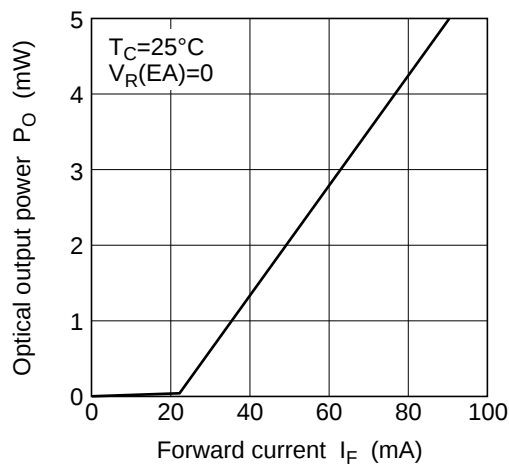
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Threshold current	I_{th}	—	20	40	mA	
Optical output power	P_O	3.0	—	—	mW	Kink free, $V_{R(EA)} = 0\text{ V}$
Slope efficiency	η_s	0.04	—	—	mW/mA	$I_{F(LD)} \leq 70\text{ mA}$, $V_{R(EA)} = 0\text{ V}$
Extinction ratio	ER	13	—	—	dB	$I_{F(LD)} = 70\text{ mA}$, $V_{R(EA)} = 0/-2\text{ V}$
Lasing wavelength	λ_p	1545	1556	1565	nm	2.5 Gbps (NRZ)
Side-mode suppression ratio	Sr	30	40	—	dB	2.5 Gbps (NRZ)
Beam divergence (parallel)	$\theta_{//}$	—	30	—	deg.	$P_O = 3\text{ mW}$, FWHM
Beam divergence (perpendicular)	$\theta_{\perp}$	—	40	—	deg.	$P_O = 3\text{ mW}$, FWHM
Rise time	t_r	—	—	125	ps	2.5 Gbps (NRZ)
Fall time	t_f	—	—	125	ps	2.5 Gbps (NRZ)
Cutoff frequency	S_{21}	4	—	—	GHz	$I_{F(LD)} = 70\text{ mA}$, $V_{R(EA)} = -1\text{ V}$
RF return loss	S_{11}	10	—	—	dB	$I_{F(LD)} = 70\text{ mA}$, $V_{R(EA)} = -1\text{ V}$, $f \leq 3\text{ GHz}$

Typical Characteristics Curves

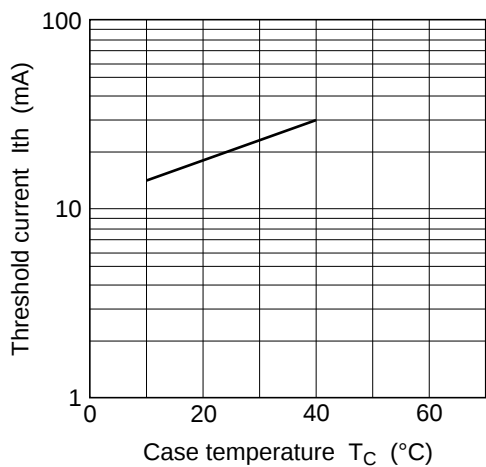
Forward Current vs. Forward Voltage



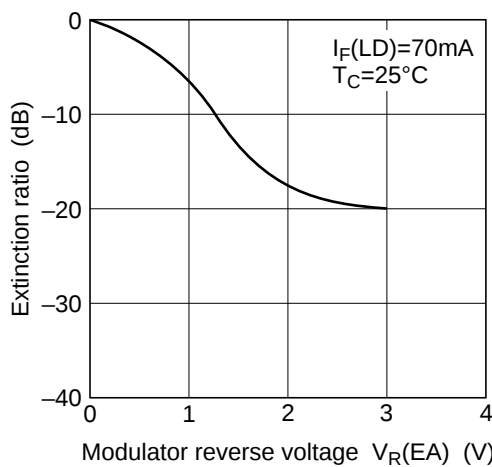
Optical Output Power vs. Forward Current



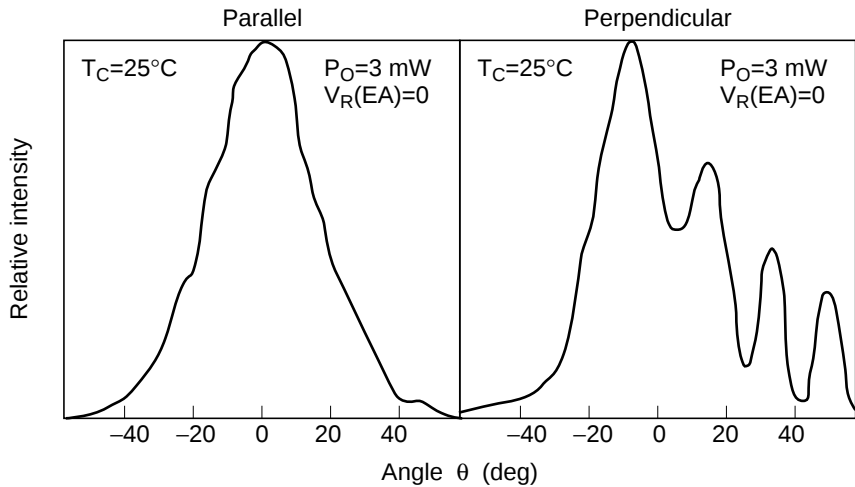
Threshold Current vs. Case Temperature



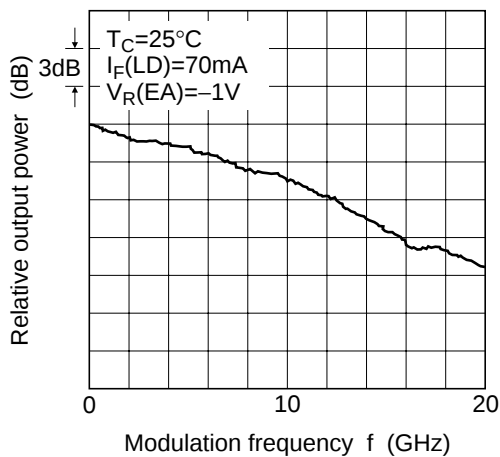
Extinction Ratio vs. Modulator Reverse Voltage



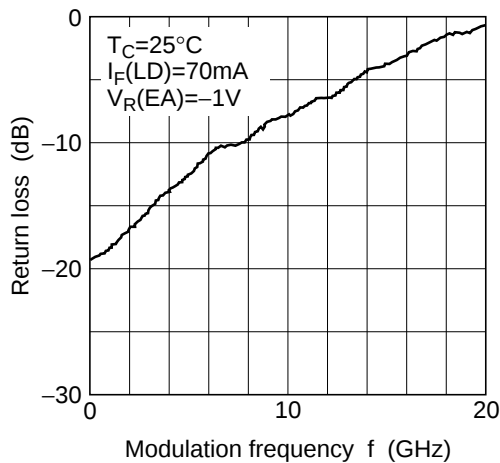
Far Field Pattern



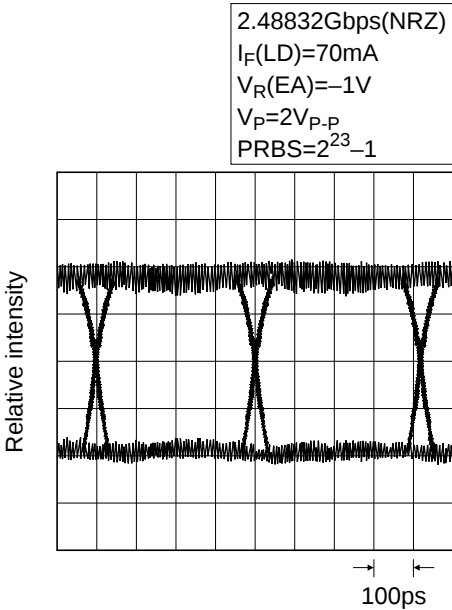
Frequency Response Characteristics



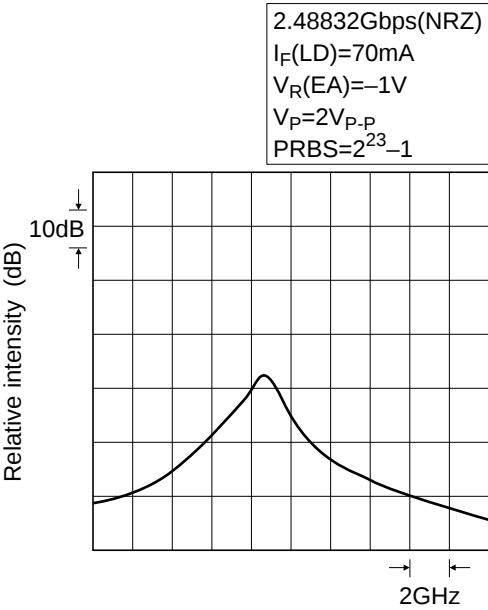
Return Loss Characteristics

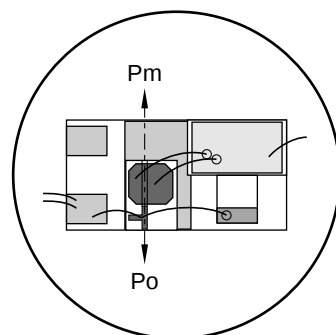
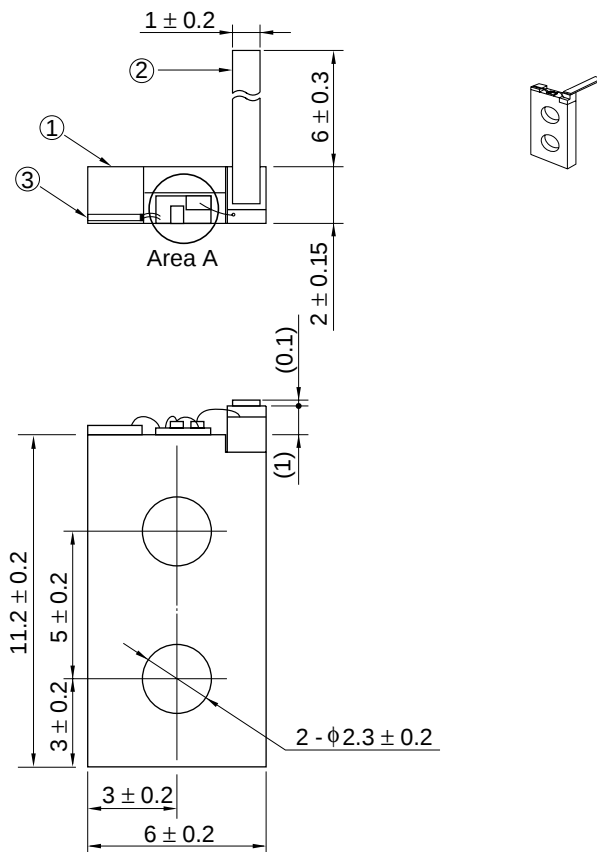


Optical Pulse Response



Lasing Spectrum





Enlargement of Area A

Hitachi Code	LD/AF
JEDEC	—
EIAJ	—
Weight (reference value)	1.1 g

Datasheet Title

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