

1 310 nm OPTICAL CATV/ANALOG APPLICATIONS
InGaAsP MQW-DFB LASER DIODE MODULE

DESCRIPTION

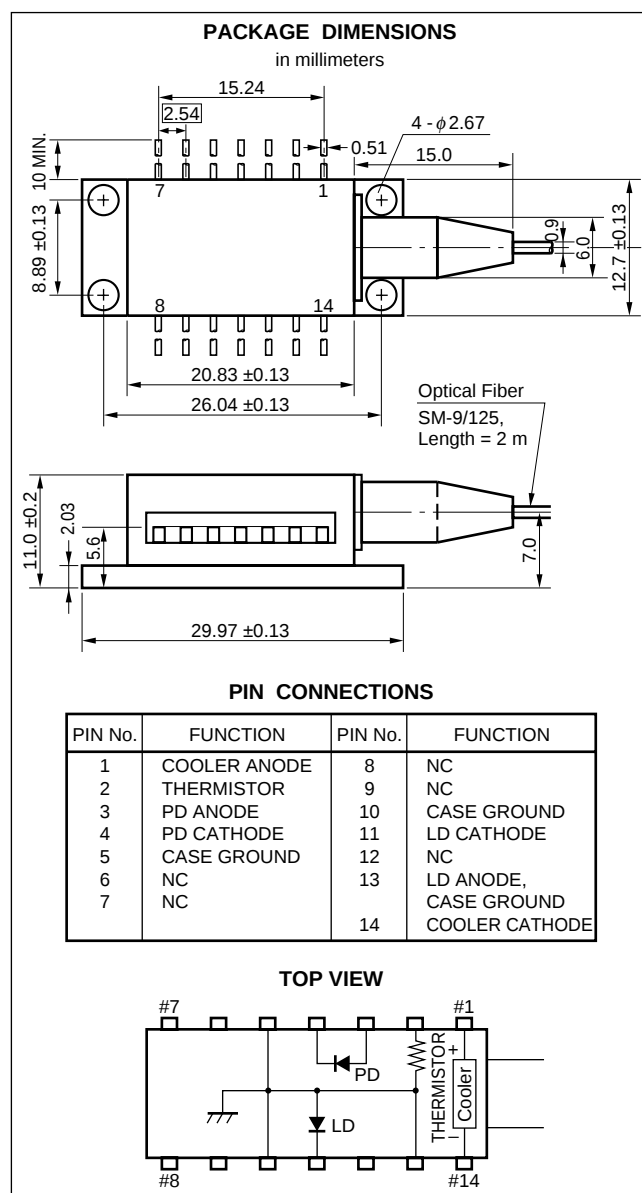
NDL7670P is a 1 310 nm DFB (Distributed Feed-Back) laser diode, that has a newly developed Multiple Quantum Well (MQW) structure, butterfly package module with optical isolator. It is especially designed for a 8 mW light source of CATV analog applications.

FEATURES

- Low noise $RIN = -155 \text{ dB/Hz MAX.}$
- Low distortion $CSO = -58 \text{ dBc}$
 $CTB = -65 \text{ dBc}$
- High output power $P_r = 8.0 \text{ mW MIN.}$
- Long wavelength $\lambda_p = 1 \text{ 310 nm}$
- High isolation 40 dB
- Internal InGaAs monitor PD
- Internal thermoelectric cooler
- Hermetically sealed 14 pin butterfly package
- Singlemode fiber pigtail
- Wide operating temperature range
- High reliability

ORDERING INFORMATION

Part Number	Available Connector
NDL7670P	Without Connector
NDL7670PC	With FC-UPC Connector
NDL7670PD	With SC-UPC Connector



ABSOLUTE MAXIMUM RATINGS ($T_c = 25\text{ }^{\circ}\text{C}$)

Parameter	Symbol	Ratings	Unit
Operating Case Temperature	T_c	-20 to +65	$^{\circ}\text{C}$
Storage Temperature	T_{stg}	-40 to +70	$^{\circ}\text{C}$
Lead Soldering Temperature (10 s)	T_{slid}	260	$^{\circ}\text{C}$
Optical Output Power	P_f	15	mW
Forward Current of LD	I_F	150	mA
Reverse Voltage of LD	V_R	2.0	V
Forward Current of PD	I_F	10	mA
Reverse Voltage of PD	V_R	20	V
Cooler Current	I_c	1.0	A
Cooler Voltage	V_c	2.0	V

ELECTRO-OPTICAL CHARACTERISTICS ($T_{LD} = 25\text{ }^{\circ}\text{C}$, $T_c = -20\text{ }^{\circ}\text{C}$ to $+65\text{ }^{\circ}\text{C}$)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Threshold Current	I_{th}			20	35	mA
Forward Voltage	V_F	$I_F = 30\text{ mA}$	0.9	1.2	1.4	V
Optical Output Power from Fiber (Recommended Operating Point)	P_{op}^{*1}		8.0			mW
Spontaneous Emission Power from Fiber	P_s	$I_b = I_{th}$			50	μW
Differential Efficiency from Fiber	η_d	$P_f \leq P_{op}$	0.16	0.22		mW/mA
Peak Emission Wavelength	λ_p	$P_f = P_{op}$	1 290	1 310	1 330	nm
Sub-mode Suppression Ratio	SMSR	$P_f = P_{op}$	30	35		dB
1 dB Bandwidth	f	$P_f = P_{op}$	900			MHz
Relative Intensity Noise	RIN^{*2}	$P_f = P_{op}$		-155	-150	dB/Hz
Composite Second Order Distortion	CSO^{*3}	$P_f = P_{op}$		-58	-55	dBc
Composite Triple Beat Distortion	CTB^{*3}	$P_f = P_{op}$		-65	-60	dBc
Carrier to Noise Ratio	CNR^{*3}	$P_f = P_{op}$	50			dBc
Isolation	I_s		35	40		dB

***1.** Recommended P_{op} value is supplied with each device.

***2.** Conditions : $P_f = P_{op}$, CW

Measuring Bandwidth: 50 MHz to 600 MHz

Optical Reflection -40 dB

***3.** Conditions : $P_f = P_{op}$, Optical Modulation Index = 3.5 %/channel

79 channel unmodulated carriers (55.25 MHz to 547.25 MHz)

Optical Reflection -40 dB, Optical Loss = 7.0 dB

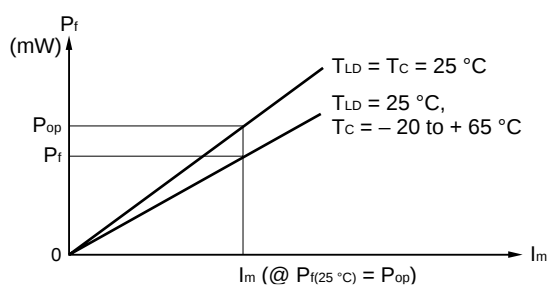
ELECTRO-OPTICAL CHARACTERISTICS

(Applicable to Monitor PD: $T_{LD} = 25\text{ }^{\circ}\text{C}$, $T_C = -20\text{ }^{\circ}\text{C}$ to $+65\text{ }^{\circ}\text{C}$)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Monitor Current	I_m	$V_R = 5\text{ V}$, $P_f = P_{op}$	50	200		μA
Dark Current	I_D	$V_R = 5\text{ V}$		2	10	nA
Tracking Error	γ^{*4}	$I_m = \text{const.}$			0.5	dB

*4. Tracking Error : γ

$$\gamma = \left| 10 \log \frac{P_f}{P_{op}} \right|$$



ELECTRO-OPTICAL CHARACTERISTICS

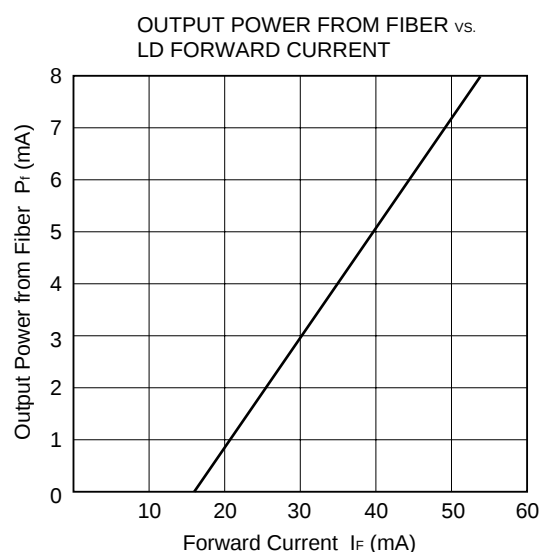
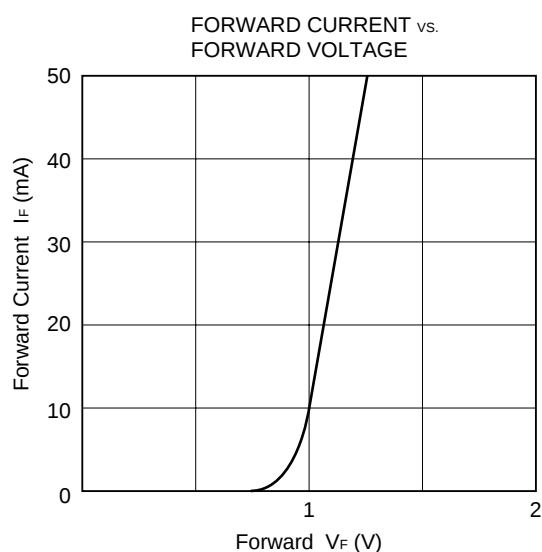
(Applicable to Thermistor and TE Cooler: $T_{LD} = 25\text{ }^{\circ}\text{C}$, $T_C = -20\text{ }^{\circ}\text{C}$ to $+65\text{ }^{\circ}\text{C}$)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Thermistor Resistance	R^{*5}	$T_{LD} = 25\text{ }^{\circ}\text{C}$	9.5	10	10.5	$\text{k}\Omega$
Cooler Current	I_C	$\Delta T = 40\text{ K}$		0.6	0.8	A
Cooler Voltage	V_C	$\Delta T = 40\text{ K}$		1.1	1.5	V
Cooling Capacity	ΔT^{*6}	$I_C = 0.8\text{ A}$, $P_f = P_{op}$	40			K

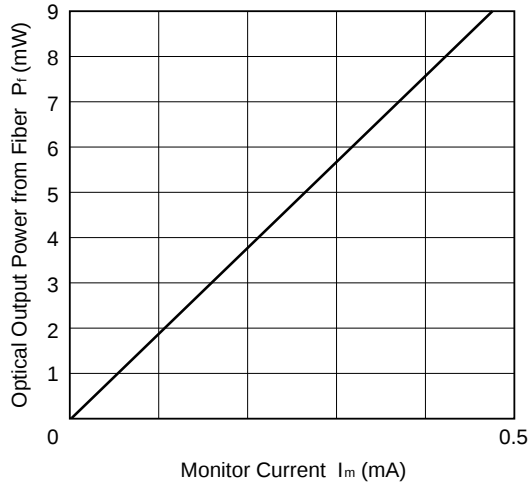
*5. B Constant = $3\,400 \pm 100\text{ K}$

*6. $\Delta T = |T_C - T_{LD}|$

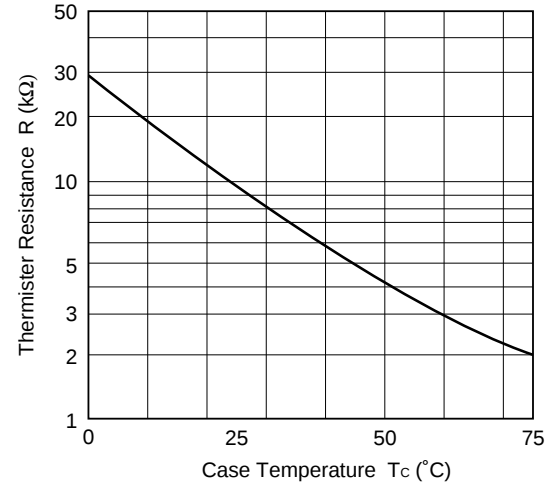
TYPICAL CHARACTERISTICS ($T_C = 25\text{ }^{\circ}\text{C}$)



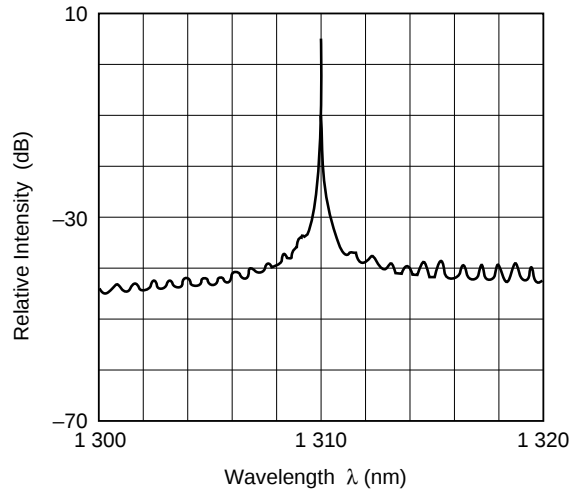
OUTPUT POWER FROM FIBER vs.
LD MONITOR CURRENT



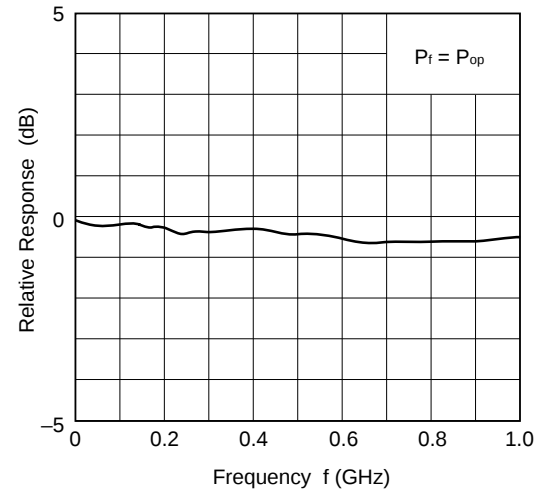
TYPICAL THERMISTOR RESISTANCE vs.
CASE TEMPERATURE



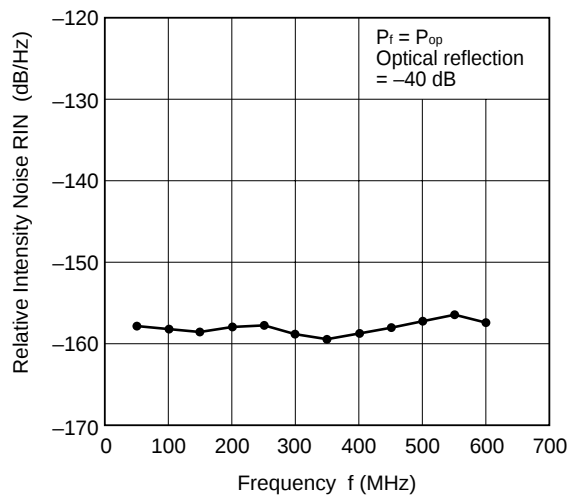
LONGITUDINAL MODE



FREQUENCY RESPONSE



RIN vs. FREQUENCY



DFB LASER DIODE FAMILY FOR CATV/ANALOG APPLICATIONS

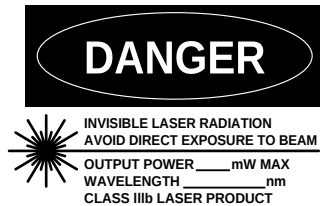
Features Packages	P _{op} : Operating point power (min. value)						Remarks
	3 mW min.	4 mW min.	6 mW min.	8 mW min.	12 mW min.	15 mW min.	
14 pin BFY module with SMF	NDL7680P	NDL7650P	NDL7660P	NDL7670P	NDL7672P	NDL7673P	BFY module with monitor PD, TEC, thermistor, isolator

REFERENCE

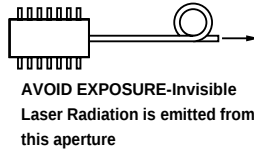
Document Name	Document No.
NEC semiconductor device reliability/quality control system	LEI-1201
Quality grade on NEC semiconductor devices	IEI-1209
Semiconductor device mounting technology manual	C10535E
Guide to quality assurance for semiconductor devices	MEI-1202
Semiconductor selection guide	X10679E

CAUTION

Within this module there exists GaAs (Gallium Arsenide) material which is a harmful substance if ingested. Please do not under any circumstance break the hermetic seal.



SEMICONDUCTOR LASER



NEC Corporation

NEC Building, 7-1, Shiba 5-chome,
Minato-ku, Tokyo 108-01, Japan

Type number: _____

Manufactured: _____

Serial Number: _____

This product conforms to FDA
regulations as applicable
to standards 21 CFR Chapter 1.
Subchapter J.

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Anti-radioactive design is not implemented in this product.