

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

DESCRIPTION

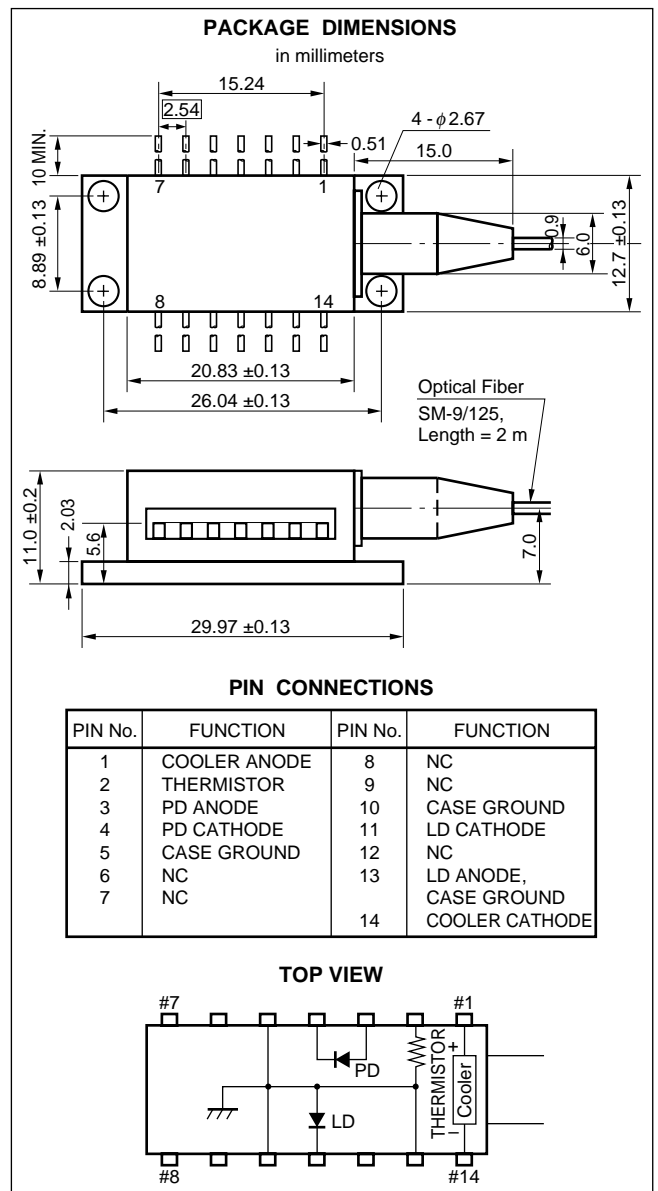
NDL7660P is a 1 310 nm DFB (Distributed Feed-Back) laser diode, that has a newly developed Multiple Quantum Well (MQW) structure, butterfly package module with optical isolator. It is especially designed for a 6 mW light source of CATV analog applications.

FEATURES

- Low noise RIN = -155 dB/Hz
- Low distortion CSO = -60 dBc
CTB = -65 dBc
- High output power $P_r = 6.0$ mW MIN.
- Long wavelength $\lambda_p = 1\ 310$ 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
NDL7660P	Without Connector
NDL7660PC	With FC-UPC Connector
NDL7660PD	With SC-UPC Connector



ABSOLUTE MAXIMUM RATINGS (T_c = 25 °C)

Parameter	Symbol	Ratings	Unit
Operating Case Temperature	T _c	-20 to +65	°C
Storage Temperature	T _{stg}	-40 to +70	°C
Lead Soldering Temperature (10 s)	T _{slid}	260	°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 °C, T_c = -20 °C to +65 °C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Threshold Current	I _{th}			20	35	mA
Forward Voltage	V _F	I _F = 30 mA	0.9	1.2	1.4	V
Optical Output Power from Fiber (Recommended Operating Point)	P _{op} ^{*1}		6.0			mW
Spontaneous Emission Power from Fiber	P _s	I _b = I _{th}			50	μW
Differential Efficiency from Fiber	η _d	P _f ≤ P _{op}	0.16	0.22		W/A
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}		-60	-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 to 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 = 5.5 dB

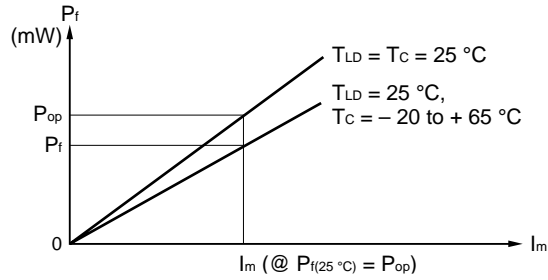
ELECTRO-OPTICAL CHARACTERISTICS

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

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

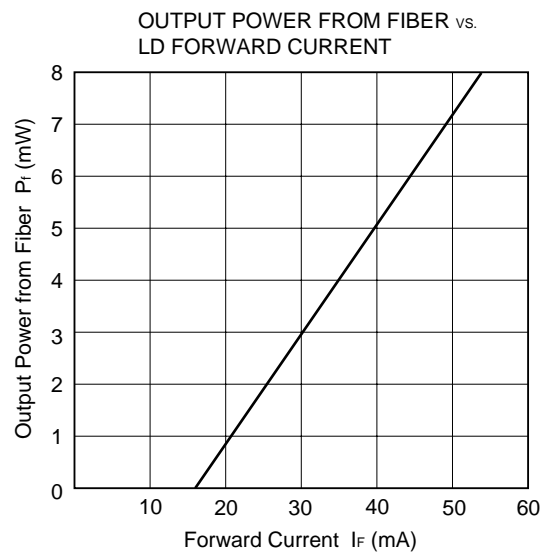
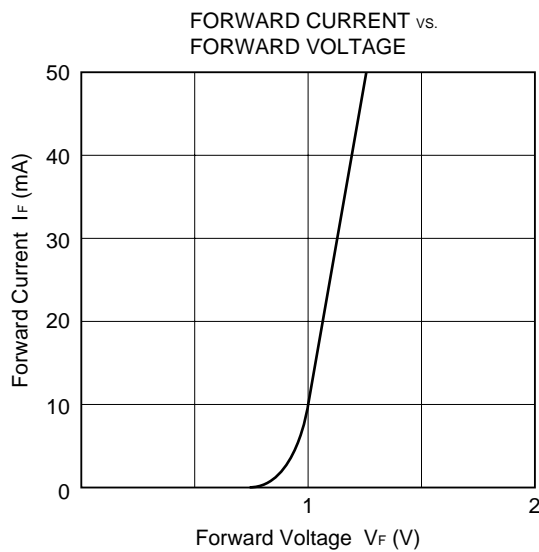
(Applicable to Thermistor and TE Cooler: $T_{LD} = 25\text{ °C}$, $T_c = -20\text{ °C}$ to $+65\text{ °C}$)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Thermistor Resistance	R^{*5}	$T_{LD} = 25\text{ °C}$	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

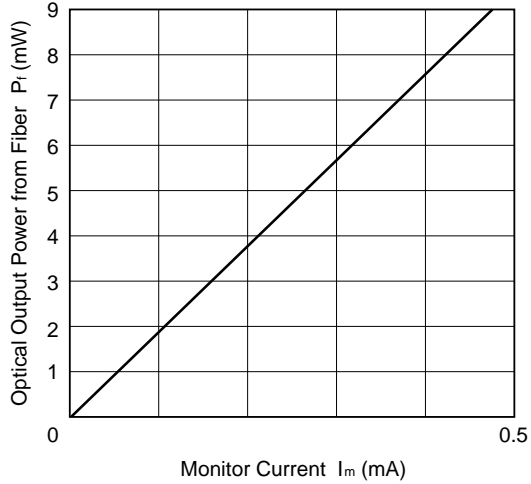
*5. B Constant = $3\,400 \pm 100\text{ K}$

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

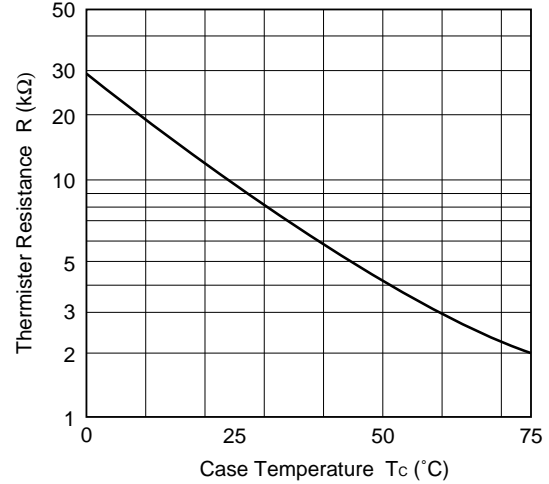
TYPICAL CHARACTERISTICS ($T_c = 25\text{ °C}$)



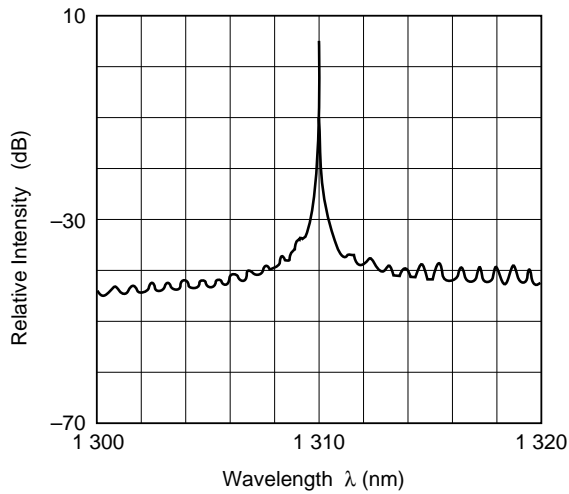
OUTPUT POWER FROM FIBER vs. LD MONITOR CURRENT



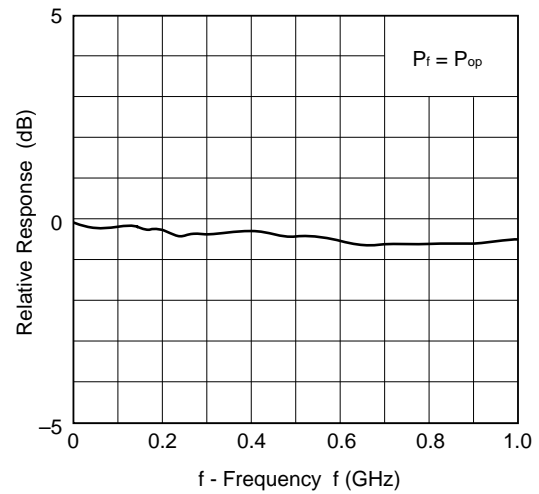
TYPICAL THERMISTOR RESISTANCE vs. CASE TEMPERATURE



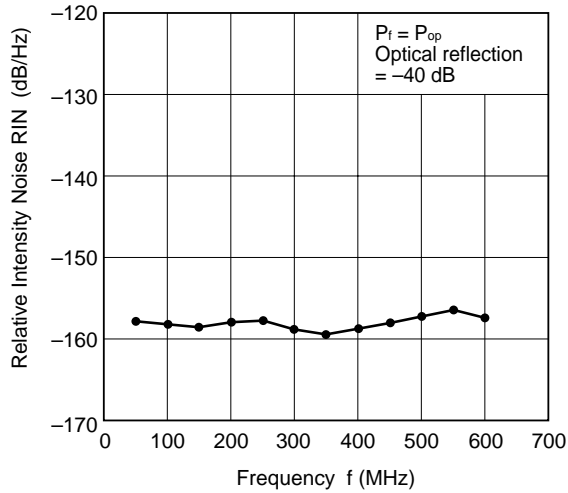
LONGITUDINAL MODE



FREQUENCY RESPONSE



RIN vs. FREQUENCY



DFB LASER DIODE FAMILY FOR CATV/ANALOG APPLICATIONS

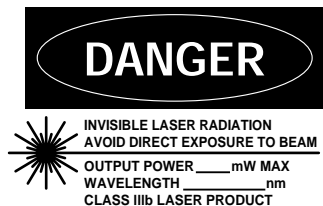
Features Packages	P _{op} : Operating point power (min. value)						Remarks
	3 mW min.	4 mW min.	6 mW min.	8 mW min.	12 mW min.	15 mW min.	
14 pin BFY module with SMF	NDL7680P	NDL7650P	NDL7660P	NDL7670P	NDL7672P	NDL7673P	BFY module with monitor PD, TEC, thermistor, isolator

REFERENCE

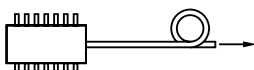
Document Name	Document No.
NEC semiconductor device reliability/quality control system	LEI-1201
Quality grade on NEC semiconductor devices	IEI-1209
Semiconductor device mounting technology manual	C10535E
Guide to quality assurance for semiconductor devices	MEI-1202
Semiconductor selection guide	X10679E

CAUTION

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



SEMICONDUCTOR LASER



AVOID EXPOSURE-Invisible
Laser Radiation is emitted from this aperture

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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Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

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Anti-radioactive design is not implemented in this product.