NEC 1550 nm OPTICAL FIBER COMM. EA MODULATOR INTEGRATED MQW-DFB LASER DIODE MODULE FOR 2.5 Gb/s D-WDM ULTRALONG-REACH APPLICATIONS (360 km)

NDL7911P SERIES

FEATURES

- **INTEGRATED ELECTROABSORPTION MODULATOR**
- **VERY LOW DISPERSION PENALTY OVER 360 km**
- **LOW MODULATION VOLTAGE**
- **WAVELENGTH SELECTABLE FOR ITU-T STANDARDS**
- **14-PIN BUTTERFLY PACKAGE**

DESCRIPTION

The NDL7911P Series is an EA modulator integrated 1550 nm DFB-LD module for 2.5 Gb/s. The newly developed bandgap energy controlled selective MOVPE technology is utilized as the fabrication method. It is designed for 2.5 Gb/s D-WDM ultralong-reach applications.

ELECTRO-OPTICAL CHARACTERISTICS (T_{LD} = 25°C, T_C = -20 to +70°C, unless otherwise specified)

PART NUMBER PACKAGE OUTLINE			NDL7911P		
SYMBOLS	**PARAMETERS AND CONDITIONS**	**UNITS**	**MIN**	**TYP**	**MAX**
T_{SET}	Laser Set Temperature	°C	20		35
I_{OP}	Operating Current	mA	50		100
V_{Rmc}	Modulation Center Voltage	V	0.5		1.5
V_{Rmpp}	Modulation Voltage	V	2		3
V_{FLD}	Forward Voltage of LD, $I_{FLD} = I_{OP}$	V			1.8
I_{TH}	Threshold Current	mA		7	20
P_f	Optical Output Power from Fiber, V_{Rm} = 0 V, $I_{FLD} = I_{OP}$	mW	0.5		
λ_P	Peak Emission Wavelength, $I_{FLD} = I_{OP}$, V_{Rm} = 0 V, $T_{LD} = T_{SET}$	nm	Specified to ITU-T[1]		
$\Delta\upsilon$	Spectral Line Width, $I_{FLD} = I_{OP}$, -20 dB, Under modulation[2]	GHz		4	
SMSR	Side Mode Suppression Ratio, $I_{FLD} = I_{OP}$, V_{Rm} = 0 V	dB	30		
ER	Extinction Ratio, $I_{FLD} = I_{OP}$, Under modulation[1]	dB	10		
f_C	Cut-off Frequency, $I_{FLD} = I_{OP}$, V_{Rm} = 1/2 V_{Rmpp}, -3 dB, 50 Ω	GHz	3.2		
t_f	Rise Time, $I_{FLD} = I_{OP}$, 20-80%, Under modulation[2]	ps			125
t_r	Rise Time, $I_{FLD} = I_{OP}$, 80-20%, Under modulation[2]	ps			125
P_e	Transmission Penalty Due to Dispersion, $I_{FLD} = I_{OP}$, Under modulation[2], 360 km standard fiber[3]	dB			2
ISOL	Isolation	dB	30		

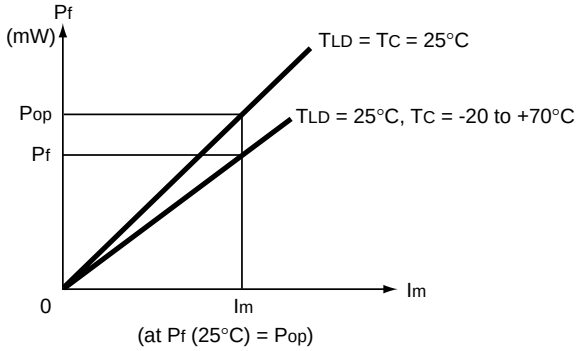
Notes:
1. Please refer to Ordering Information.
2. 2.48832 Gb/s, PRBS 2^{23-1}, $V_{RM} = V_{RMC} \pm 1/2V_{RMPP}$, NEC Test System.
3. 360 km stqandard fiber NEC Test System, Transmission penalty at $B_{ER} = 10^{-9}$

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PART NUMBER PACKAGE OUTLINE			NDL7911P		
SYMBOLS	**PARAMETERS AND CONDITIONS**	**UNITS**	**MIN**	**TYP**	**MAX**
Applicable to Monitor PD					
I_m	Monitor Current, I_{FLD} = I_{OP}, V_{Rm} = 0 V	μA	20		1000
I_D	Dark Current, V_{RPD} = 5 V	nA			10
γ[1]	Tracking Error, I_m = const.	dB			0.5
C_t	Monitor Capacitance, V_{RPD} = 5 V, f = 1 MHz	pF			15
Applicable to Thermistor and TEC					
R	Thermistor Resistance	kΩ	9.5	10.0	10.5
B	B Constant	K	3300	3400	3500
I_C	Cooler Current, ΔT = 70 — T_{set}	A			1.5
V_C	Cooler Voltage, ΔT = 70 — T_{set}	V			2.5

Note:

1. $\gamma = \left| 10 \log \frac{P_f}{P_{OP}} \right|$



(at P_f (25°C) = P_{op})

ABSOLUTE MAXIMUM RATINGS[1]

(T_C = 25°C, unless otherwise specified)

SYMBOLS	PARAMETERS	UNITS	RATINGS
P_f	Optical Output Power from Fiber	mW	10
I_{FLD}	Forward Current of LD	mA	150
V_{RLD}	Reverse Voltage of LD	V	2.0
V_{Fm}	Forward Voltage of Modulator	V	1
V_{Rm}	Reverse Voltage of Modulator	V	5
I_{FPD}	Forward Current of PD	mA	1
V_{RPD}	Reverse Voltage of PD	V	10
I_C	Cooler Current	A	1.5
V_C	Cooler Voltage	V	2.5
T_C	Operating Case Temperature	°C	-20 to +70
T_{STG}	Storage Temperature	°C	-40 to +85
T_{SLD}	Lead Soldering Temp. (10 s)	°C	260

Note:

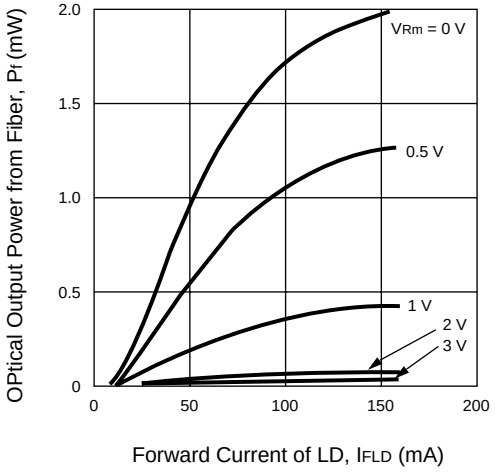
1. Operation in excess of any one of these parameters may result in permanent damage.

ORDERING INFORMATION

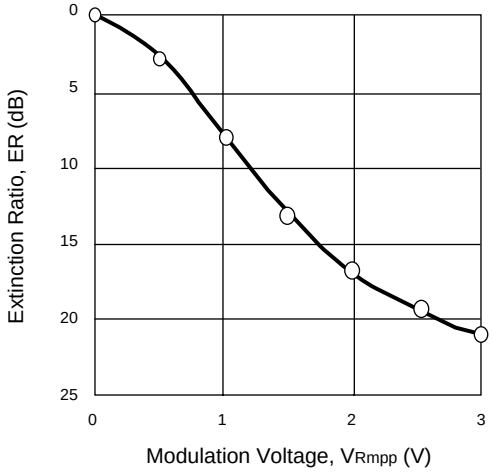
PART NUMBER With SC-PC Connector	PART NUMBER With FC-PC Connector	ITU-T Wavelength (nm)	Frequency (THz)
NDL7911PD477	NDL7911PC477	1547.72	193.7
NDL7911PD485	NDL7911PC485	1548.51	193.6
NDL7911PD493	NDL7911PC493	1549.32	193.5
NDL7911PD501	NDL7911PC501	1550.12	193.4
NDL7911PD509	NDL7911PC509	1550.92	193.3
NDL7911PD517	NDL7911PC517	1551.72	193.2
NDL7911PD525	NDL7911PC525	1552.52	193.1
NDL7911PD533	NDL7911PC533	1553.33	193.0
NDL7911PD541	NDL7911PC541	1554.13	192.9
NDL7911PD549	NDL7911PC549	1554.94	192.8
NDL7911PD557	NDL7911PC557	1555.75	192.7
NDL7911PD565	NDL7911PC565	1556.55	192.6
NDL7911PD573	NDL7911PC573	1557.36	192.5
NDL7911PD581	NDL7911PC581	1558.17	192.4
NDL7911PD589	NDL7911PC589	1558.98	192.3
NDL7911PD597	NDL7911PC597	1559.79	192.2
NDL7911PD606	NDL7911PC606	1560.61	192.1

TYPICAL PERFORMANCE CURVES (T_{LD} = +25°C)

OPTICAL OUTPUT POWER FROM FIBER vs. FORWARD CURRENT OF LD (CW)

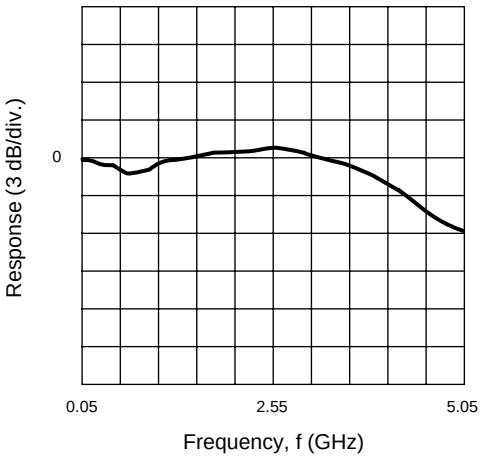


EXTINCTION RATIO vs. MODULATION VOLTAGE (CW)

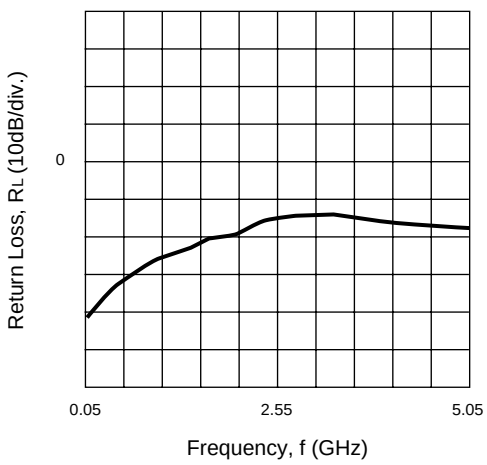


TYPICAL PERFORMANCE CURVES (T_{LD} = +25°C)

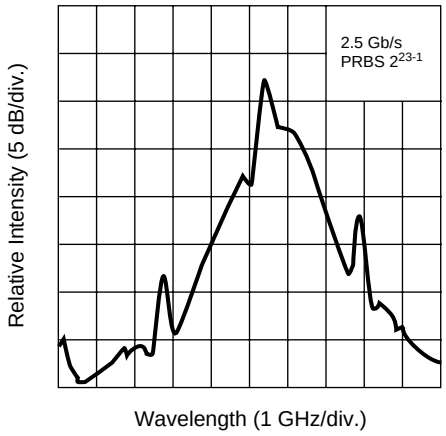
FREQUENCY RESPONSE (S_{21})



RETURN LOSS CHARACTERISTICS (S_{11})

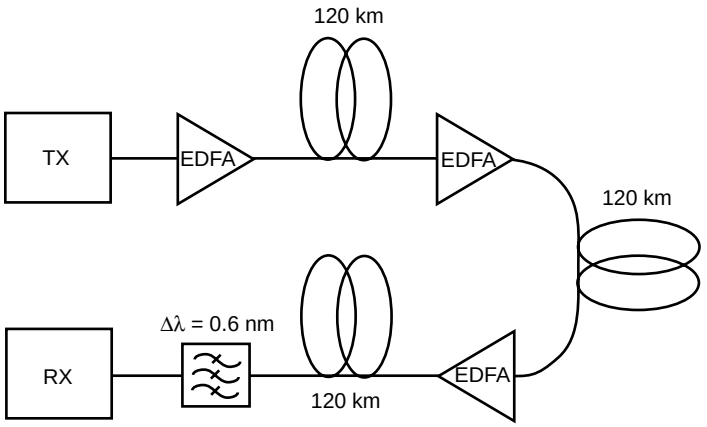


SPECTRAL LINE WIDTH

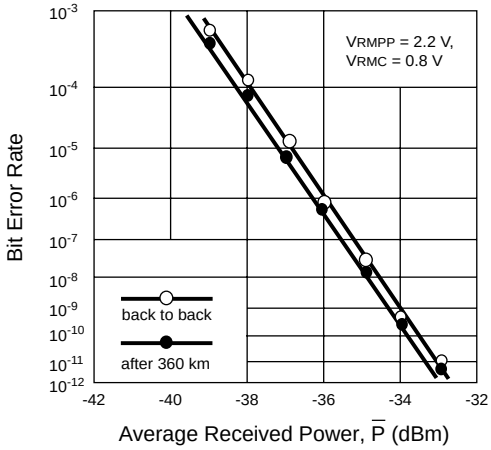


600 km STANDARD FIBER TRANSMISSION EXAMPLE

P_{IN} (EDFA) : -20 to -21 dBm
P_{OUT} (EDFA) : +8 dBm

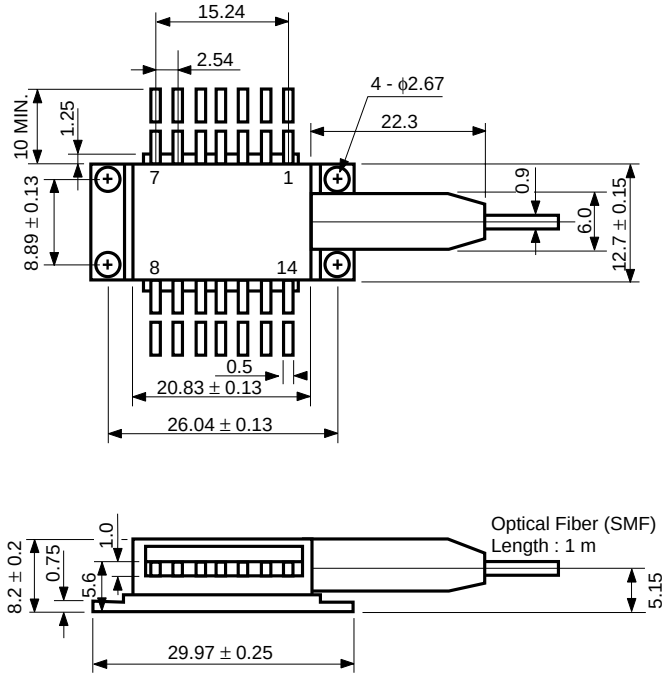


ERROR RATE CHARACTERISTICS

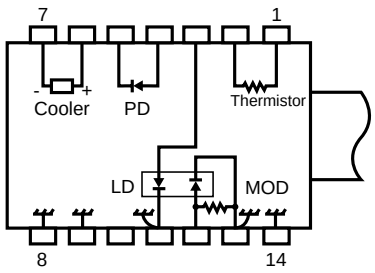


OUTLINE DIMENSIONS (Units in mm)

NDL7911P



Top View



PIN CONNECTIONS

Pin No.	Function	Pin No.	Function
1.	Thermistor	8.	GND
2.	Thermistor	9.	GND
3.	LD DC Bias	10.	NC
4.	PD Anode	11.	GND
5.	PD Cathode	12.	Signal Input (MOD)
6.	Cooler Anode		50 Ω RF Input
7.	Cooler Cathode	13.	GND
		14.	GND