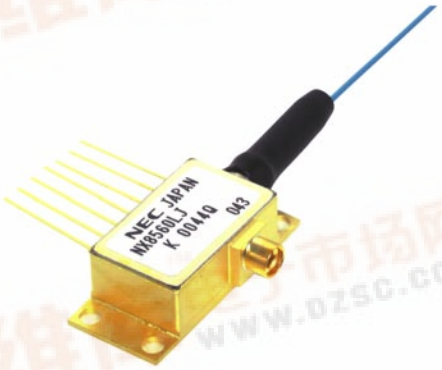
CEL

NEC's EA MODULATOR INTEGRATED InGaAsP MQW DFB LASER DIODE IN BUTTERFLY PACKAGE WITH GPO CONNECTOR FOR 10 Gb/s DWDM APPLICATIONS

NX8560LJ SERIES

FEATURES

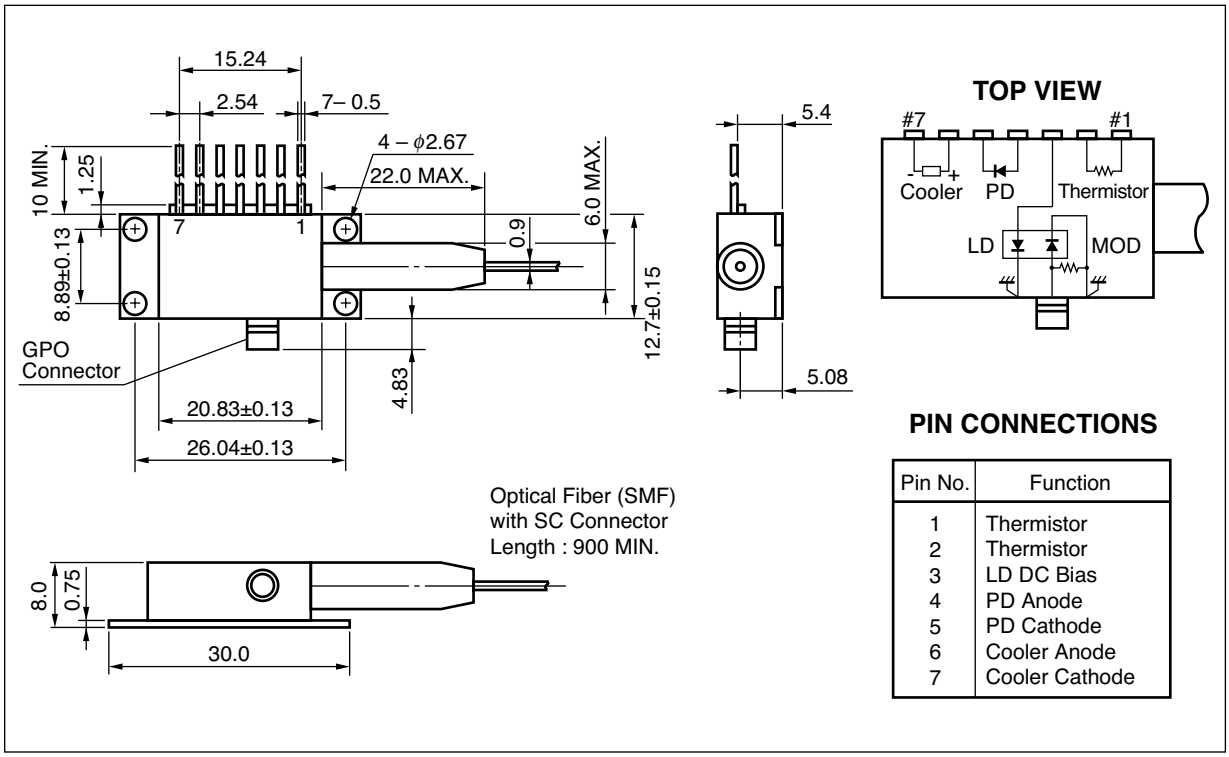
- **INTEGRATED ELECTROABSORPTION MODULATOR**
- **UP TO 40 km TRANSMISSION CAPABILITY WITH STANDARD SINGLE MODE FIBER** (dispersion 800 ps/nm)
- **LOW MODULATION VOLTAGE**
- **7-PIN BUTTERFLY PACKAGE WITH GPO™ CONNECTOR**
- **AVAILABLE FOR DWDM WAVELENGTH BASED ON ITU-T RECOMMENDATION**



DESCRIPTION

NEC's NX8560LJ Series are an Electro-Absorption (EA) Modulator integrated, 1550 nm Multiple Quantum Well (MQW) structured Distributed Feed-Back (DFB) laser diodes. It is capable of transmitting up to 40 km for 10 Gb/s applications by using standard fiber dispersion 800 ps/nm and is available for Dense Wavelength Multiplexing (DWDM) wavelength based on ITU-T recommendations.

PACKAGE DIMENSIONS (Units in mm)

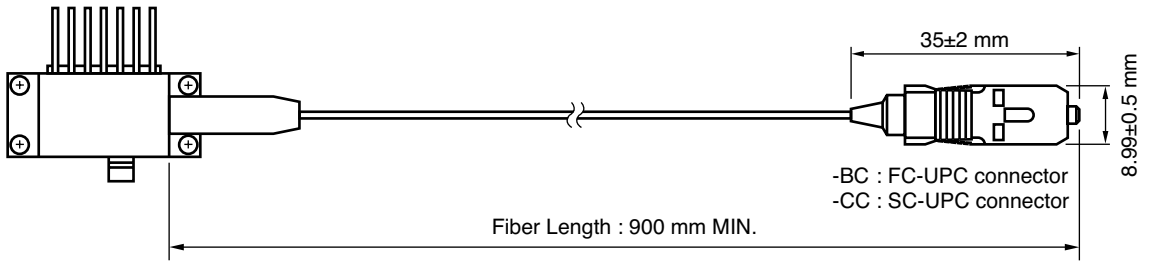


PIN CONNECTIONS

Pin No.	Function
1	Thermistor
2	Thermistor
3	LD DC Bias
4	PD Anode
5	PD Cathode
6	Cooler Anode
7	Cooler Cathode

OPTICAL FIBER CHARACTERISTICS

PARAMETER	SPECIFICATION	UNIT
Mode Field Diameter	9.3±0.5	μm
Cladding Diameter	125±1	μm
Tight Buffer Diameter	900±100	μm
Cut-off Wavelength	< 1 270	nm
Attenuation 1 525 to 1 575 nm	< 0.3	dB/km
Minimum Fiber Bending Radius	30	mm
Fiber Length	900 MIN.	mm
Flammability	UL1581 VW-1	



ORDERING INFOMATION

PART NUMBER	PACKAGE
NX8560LJ-AZ *	7-Pin Butterfly Package with GPO™ Connector

NX8560LJ□□□-□□

- CC : SC-UPC connector (standard)
- BC : FC-UPC connector (option)

- Without wavelength code : Wavelen
  1 528 to 1
- With wavelength code : Refer to T

***NOTE:**
Please refer to the last page of this data sheet, “Compliance with EU Directives” for Pb-Free RoHS Compliance Infomation.

Table A: DWDM wavelength base on ITU-T recommendations (@ $T_{LD} = T_{set}$)

Wavelength Code	ITU-T Wavelength *1 (nm)	Frequency (THz)	Wavelength Code	ITU-T Wavelength *1 (nm)	Frequency (THz)
287	1528.77	196.10	501	1550.11	193.40
295	1529.55	196.00	509	1550.91	193.30
303	1530.33	195.90	517	1551.72	193.20
311	1531.11	195.80	525	1552.52	193.10
318	1531.89	195.70	533	1553.32	193.00
326	1532.68	195.60	541	1554.13	192.90
334	1533.46	195.50	549	1554.94	192.80
342	1534.25	195.40	557	1555.74	192.70
350	1535.03	195.30	565	1556.55	192.60
358	1535.82	195.20	573	1557.36	192.50
366	1536.60	195.10	581	1558.17	192.40
373	1537.39	195.00	589	1558.98	192.30
381	1538.18	194.90	597	1559.79	192.20
389	1538.97	194.80	606	1560.60	192.10
397	1539.76	194.70	614	1561.41	192.00
405	1540.55	194.60	622	1562.23	191.90
413	1541.35	194.50	630	1563.04	191.80
421	1542.14	194.40			
429	1542.93	194.30			
437	1543.73	194.20			
445	1544.52	194.10			
453	1545.32	194.00			
461	1546.11	193.90			
469	1546.91	193.80			
477	1547.71	193.70			
485	1548.51	193.60			
493	1549.31	193.50			

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNIT
Optical Output Power from Fiber	P_f	10	mW
Forward Current of LD	I_{FLD}	150	mA
Reverse Voltage of LD	V_{RLD}	2.0	V
Forward Voltage of Modulator	V_{FEA}	1	V
Reverse Voltage of Modulator	V_{REA}	4	V
Forward Current of PD	I_{FPD}	1	mA
Reverse Voltage of PD	V_{RPD}	10	V
Cooler Current	I_C	1.5	A
Cooler Voltage	V_C	2.5	V
Operating Case Temperature	T_C	−20 to +70	°C
Storage Temperature	T_{stg}	−40 to +85	°C
Lead Soldering Temperature	T_{sld}	350 (3 sec.)	°C

ELECTRO-OPTICAL CHARACTERISTICS (TC = -25°C, unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Laser Set Temperature	T_{set}	***1**	20		35	°C
Operating Current	I_{op}		50	60	80	mA
Modulation Center Voltage	V_{center}		–2.0		–0.5	V
Modulation Voltage	V_{mod}			2.0	3.0	V
Forward Voltage of LD	V_{FLD}	$I_{FLD} = I_{op}$			2.0	V
Threshold Current	I_{th}			7	20	mA
Optical Output Power from Fiber	P_f	Under modulation*2, Single channel	–3	–2		dBm
		Under modulation*2, DWDM wavelength based on ITU-T recommendations	–1			
Peak Emission Wavelength	λ_p	$I_{FLD} = I_{op}$, V_{EA} = 0 V, $T_{LD} = T_{set}$	1 528	ITU-T*3	1 565	nm
Side Mode Suppression Ratio	SMSR	$I_{FLD} = I_{op}$, V_{EA} = 0 V	30	> 37		dB
Extinction Ratio	ER	Under modulation*2	10	> 11		dB
Rise Time	t_r	20-80%, Under modulation*2			40	ps
Fall Time	t_f	80-20%, Under modulation*2			40	ps
Dispersion Penalty	DP	40 km SMF under modulation*2, 4			2.0	dB
Optical Isolation	I_s		23			dB
Input Return Loss	S_{11}	$I_{FLD} = I_{op}$, V_{EA} = –1 V, f = 130 MHz to 5 GHz		–10	–8	dB
		$I_{FLD} = I_{op}$, V_{EA} = –1 V, f = 5 to 10 GHz		–8	–5	

***1** NX8560LJ Series : T_{set} is a certain point between 20 and 35°C
NX8560LJ××× Series : T_{set} is set at a certain point between 20 and 35°C for ITU-T grid wavelength

***2** 40 km SMF under modulation, 9.95328 Gb/s, PRBS 2^{23}–1, $V_{EA} = V_{center} \pm 1/2V_{mod}$, $I_{FLD} = I_{op}$, NEC Test System
V_{center} : a certain point between –2.0 and –0.5 V
V_{mod} : a certain point 3 V or below
I_{op} : a certain point between 50 and 80 mA

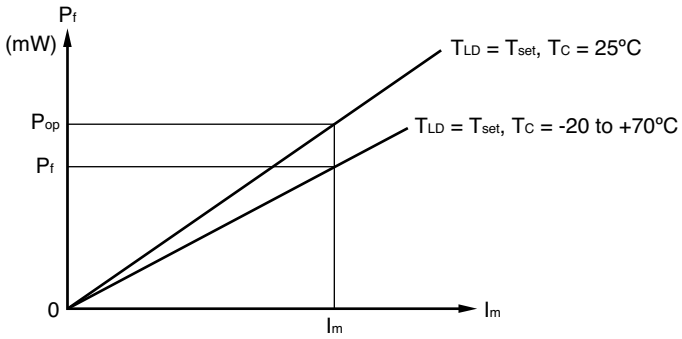
***3** Available for DWDM wavelengths based on ITU-T recommendations (100 GHz grid).
Please refer to **ORDERING INFORMATION**.

***4** BER = 10^{-10}

ELECTRO-OPTICAL CHARACTERISTICS (Applicable to Monitor PD: $T_{LD} = T_{set}$, T_C = -20 to +70ºC)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Monitor Current	I_m	V_{RPD} = 5 V, $I_{FLD} = I_{op}$, V_{EA} = 0 V	30		1 100	μA
Dark Current	I_D	V_{RPD} = 5 V, V_{EA} = 0 V			10	nA
Terminal Capacitance	C_t	V_{RPD} = 5 V, f = 1 MHz			15	pF
Tracking Error	γ *1	I_m = const.			0.5	dB

***1** Tracking Error: γ



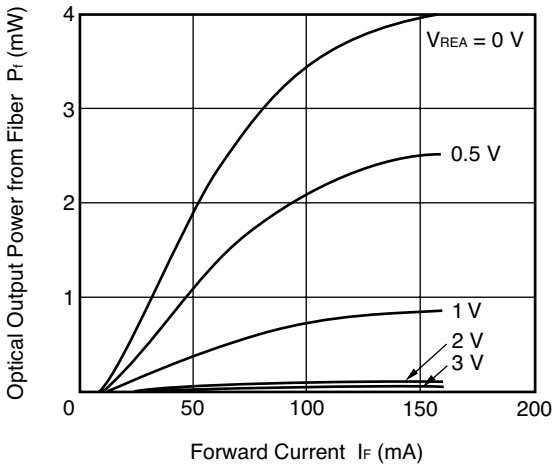
$$\gamma = \left| 10 \log \frac{P_f}{P_{op}} \right| \text{ [dB]}$$

ELECTRO-OPTICAL CHARACTERISTICS (Applicable to Thermistor and TEC: T_C = -20 to +70ºC)

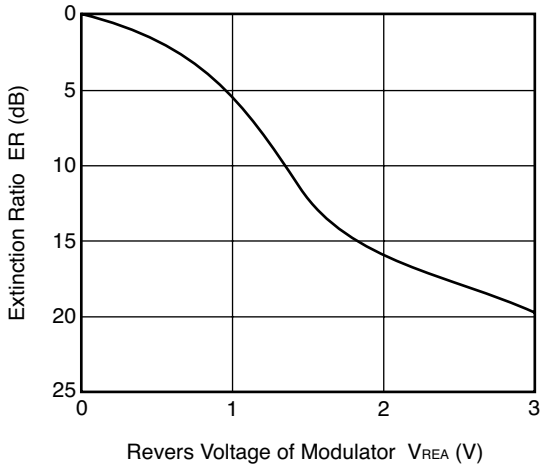
PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Thermistor Resistance	R	T_{LD} = 25°C	9.5	10.0	10.5	kΩ
B Constant	B		3 350	3 450	3 550	K
TEC Current	I_C	$T_{LD} = T_{set}$			1.2	A
TEC Voltage	V_C	$T_{LD} = T_{set}$			2.4	V

TYPICAL CHARACTERISTICS (T_C = 25°C, unless otherwise specified)

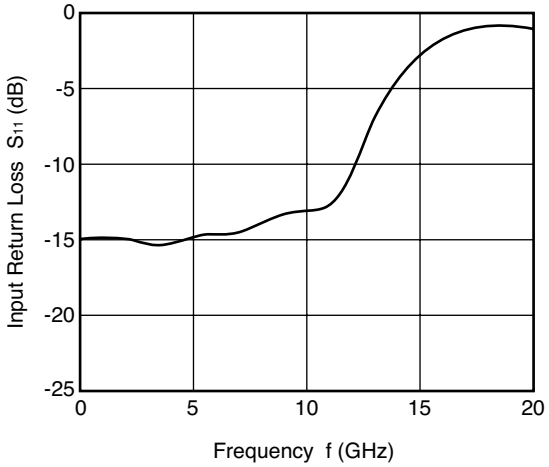
OPTICAL OUTPUT POWER FROM FIBER (CW) vs. FORWARD CURRENT



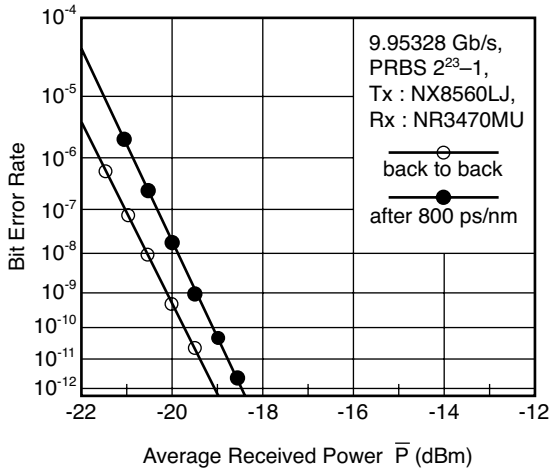
EXTINCTION RATIO vs. MODULATOR VOLTAGE



INPUT RETURN LOSS CHARACTERISTICS (S_{11})



ERROR RATE CHARACTERISTICS



Remark The graphs indicate nominal characteristics.

CEL California Eastern Laboratories

4590 Patrick Henry Drive
Santa Clara, CA 95054-1817
Telephone: (408) 919-2500
Facsimile: (408) 988-0279

Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL's understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

Restricted Substance per RoHS	Concentration Limit per RoHS (values are not yet fixed)	Concentration contained in CEL devices	
Lead (Pb)	< 1000 PPM	-A	-AZ
		Not Detected	(*)
Mercury	< 1000 PPM	Not Detected	
Cadmium	< 100 PPM	Not Detected	
Hexavalent Chromium	< 1000 PPM	Not Detected	
PBB	< 1000 PPM	Not Detected	
PBDE	< 1000 PPM	Not Detected	

If you should have any additional questions regarding our devices and compliance to environmental standards, please do not hesitate to contact your local representative.