PRELIMINARY DATA SHEET

NEC

LASER DIODE

NX8560LJ-CC

EA MODULATOR INTEGRATED
1 550 nm MQW-DFB LASER DIODE MODULE
FOR 10 Gb/s APPLICATIONS

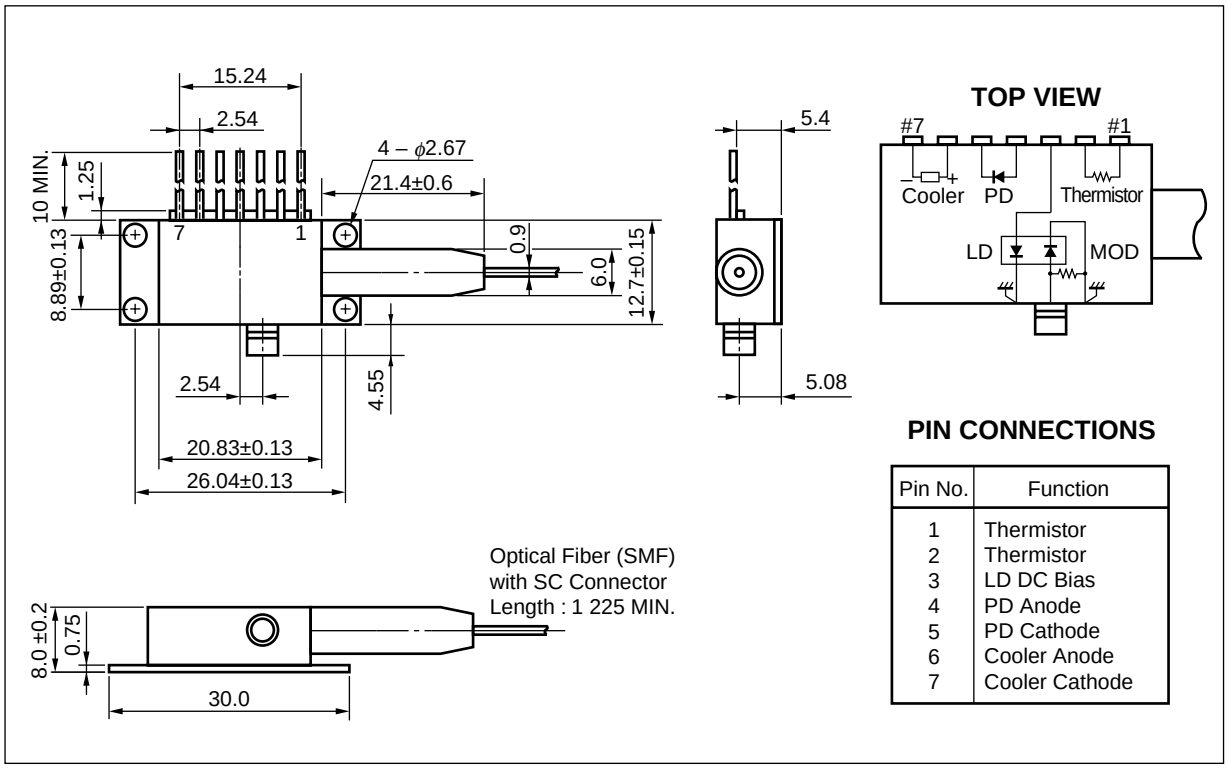
DESCRIPTION

The NX8560LJ-CC is an Electro-Absorption (EA) modulator integrated, 1 550 nm Multiple Quantum Well (MQW) structured Distributed Feed-Back (DFB) laser diode. It is capable of transmitting up to 40 km (dispersion: 800 ps/nm) for 10 Gb/s applications by using standard fiber.

★ FEATURES

- Integrated electroabsorption modulator
- Up to 40 km transmission 10 Gb/s (dispersion: 800 ps/nm)
- Low modulation voltage
- 7-pin butterfly package with GPO™ connector
- Available for DWDM wavelengths based on ITU-T recommendations
- Butterfly package with SC-UPC connector

★ PACKAGE DIMENSIONS (UNIT: mm, unless otherwise specified ±0.2 mm)



PIN CONNECTIONS

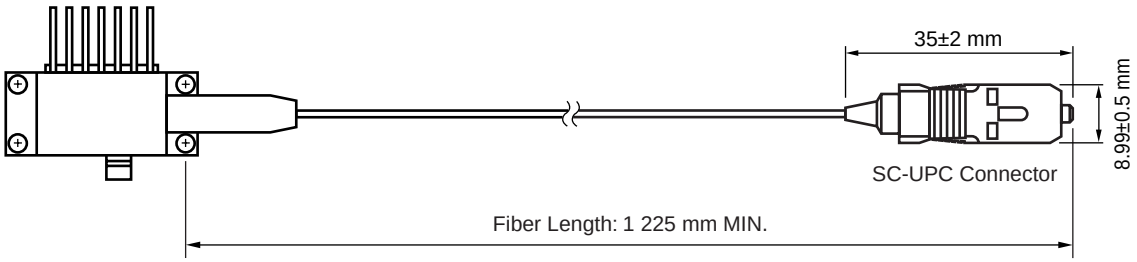
Pin No.	Function
1	Thermistor
2	Thermistor
3	LD DC Bias
4	PD Anode
5	PD Cathode
6	Cooler Anode
7	Cooler Cathode

Document No. PL10110EJ01V0DS (1st edition)
(Previous No. P14748EJ4V0DS00)
Date Published April 2002 CP(K)
Printed in Japan

The mark ★ shows major revised points.

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	1 225 MIN.	mm
Flammability	UL1581 VW-1	



★ **ORDERING INFORMATION: Wavelength is a certain point between 1 530 nm and 1 563 nm @ $T_{LD} = T_{set}$ (SC-UPC Connector)**

Part Number	Available Connector
NX8560LJ-CC	With SC-UPC Connector

★ **ORDERING INFORMATION: Wavelength on ITU-T grid @ $T_{LD} = T_{set}$**

Part Number With SC-UPC Connector	ITU-T Wavelength*1 (nm)	Frequency (THz)
NX8560LJ303-CC	1530.33	195.90
NX8560LJ311-CC	1531.11	195.80
NX8560LJ318-CC	1531.89	195.70
NX8560LJ326-CC	1532.68	195.60
NX8560LJ334-CC	1533.46	195.50
NX8560LJ342-CC	1534.25	195.40
NX8560LJ350-CC	1535.03	195.30
NX8560LJ358-CC	1535.82	195.20
NX8560LJ366-CC	1536.60	195.10
NX8560LJ373-CC	1537.39	195.00
NX8560LJ381-CC	1538.18	194.90
NX8560LJ389-CC	1538.97	194.80
NX8560LJ397-CC	1539.76	194.70
NX8560LJ405-CC	1540.55	194.60
NX8560LJ413-CC	1541.35	194.50
NX8560LJ421-CC	1542.14	194.40
NX8560LJ429-CC	1542.93	194.30
NX8560LJ437-CC	1543.73	194.20
NX8560LJ445-CC	1544.52	194.10
NX8560LJ453-CC	1545.32	194.00
NX8560LJ461-CC	1546.11	193.90
NX8560LJ469-CC	1546.91	193.80
NX8560LJ477-CC	1547.71	193.70
NX8560LJ485-CC	1548.51	193.60
NX8560LJ493-CC	1549.31	193.50
NX8560LJ501-CC	1550.11	193.40
NX8560LJ509-CC	1550.91	193.30
NX8560LJ517-CC	1551.72	193.20
NX8560LJ525-CC	1552.52	193.10

***1** The value which omitted and computed the 3rd place below the decimal point

Part Number With SC-UPC Connector	ITU-T Wavelength*1 (nm)	Frequency (THz)
NX8560LJ533-CC	1553.32	193.00
NX8560LJ541-CC	1554.13	192.90
NX8560LJ549-CC	1554.94	192.80
NX8560LJ557-CC	1555.74	192.70
NX8560LJ565-CC	1556.55	192.60
NX8560LJ573-CC	1557.36	192.50
NX8560LJ581-CC	1558.17	192.40
NX8560LJ589-CC	1558.98	192.30
NX8560LJ597-CC	1559.79	192.20
NX8560LJ606-CC	1560.60	192.10
NX8560LJ614-CC	1561.41	192.00
NX8560LJ622-CC	1562.23	191.90
NX8560LJ630-CC	1563.04	191.80

***1** The value which omitted and computed the 3rd place below the decimal point

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}	260 (10 sec.)	°C

★ ELECTRO-OPTICAL CHARACTERISTICS

(T_{LD} = 25°C, T_C = 25°C, BOL, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Laser Set Temperature	T_{set}	***1**	20		35	°C
Operating Current	I_{op}	$T_{LD} = T_{set}$	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}	$T_{LD} = T_{set}$		6	20	mA
Optical Output Power from Fiber	P_f	Under modulation[*2]	–1.0			dBm
Peak Emission Wavelength	λ_p	$I_{FLD} = I_{op}$, V_{EA} = 0 V, $T_{LD} = T_{set}$	1 530	ITU-T[*3]	1 563	nm
Side Mode Suppression Ratio	SMSR	$I_{FLD} = I_{op}$, V_{EA} = 0 V	30			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 GHz to 10 GHz		–8	–5	

***1** NX8560LJ-CC : T_{set} is a certain point between 20°C and 35°C
NX8566LJ×××-CC : T_{set} is set at a certain point between 20°C and 35°C for ITU-T grid wavelength

***2** 40 km SMF under modulation, 9.95328 Gb/s, PRBS 2^{23}–1, $V_{EA} = V_{center} \pm 1/2V_{mod}$, $I_{FLD} = I_{op}$, $T_{LD} = T_{set}$, NEC Test System
V_{center} : a certain point between –0.5 V and –1.5 V
V_{mod} : a certain point between 2 V and 3 V
I_{op} : a certain point between 50 mA and 80 mA

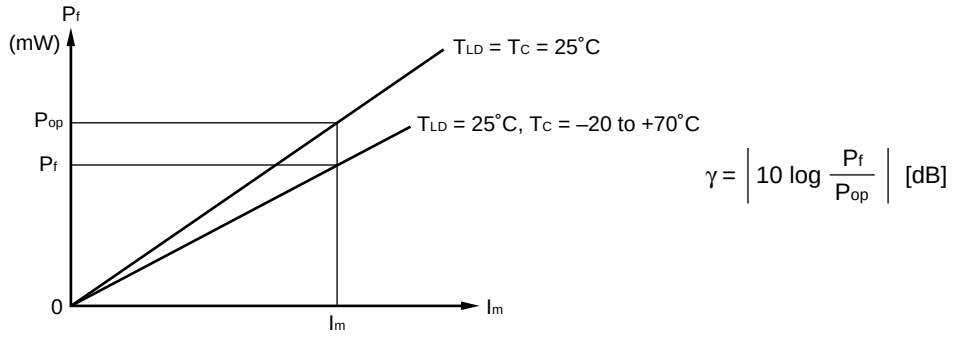
***3** Available for DWDM wavelengths based on ITU-T recommendations (100 GHz grid).
Please refer to ORDERING INFORMATION.

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

ELECTRO-OPTICAL CHARACTERISTICS
(Applicable to Monitor PD: T_{LD} = 25°C, T_C = –20 to +70°C)

	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

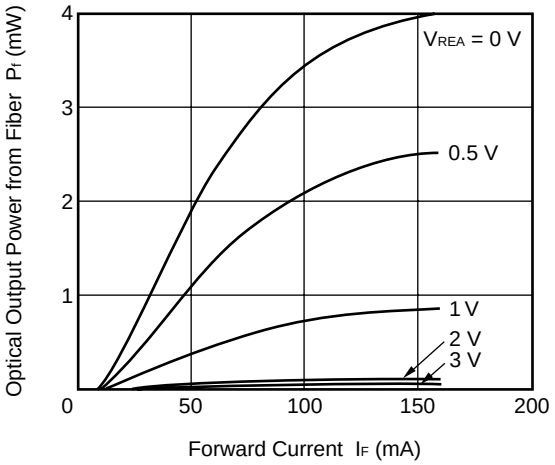


ELECTRO-OPTICAL CHARACTERISTICS
(Applicable to Thermistor and TEC: T_{LD} = 25°C, T_C = –20 to +70°C)

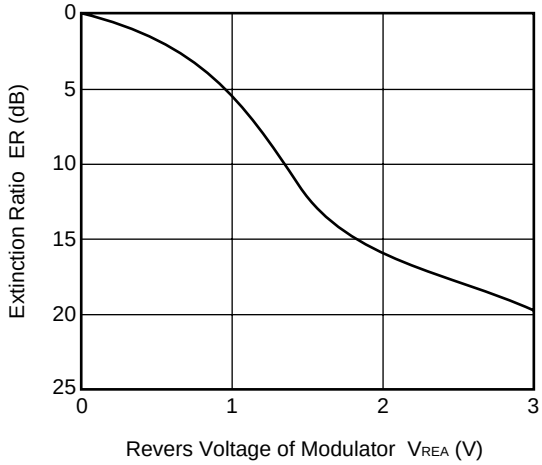
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Thermistor Resistance	R	T_{LD} = 25°C	9.5	10.0	10.5	kΩ
B Constant	B		3 350	3 450	3 550	K
Cooler Current	I_C	ΔT = 50°C			1.2	A
Cooler Voltage	V_C	ΔT = 50°C			2.4	V

★ **TYPICAL CHARACTERISTICS (T_{LD} = 25°C, unless otherwise specified)**

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



EXTINCTION RATIO vs. MODULATOR VOLTAGE



Remark The graphs indicate nominal characteristics.

DFB-LD FAMILY

	Part Number	Absolute Maximum Ratings		Electro-Optical Characteristics (T_C = 25°C)			Application	Package
		T_C (°C)	T_{stg} (°C)	I_{th} (mA)	P_f (mW)	λ_p (nm)		
				TYP.	MIN.	TYP.		
	NX8300BE-CC NX8300CE-CC	0 to +75	−40 to +85	15	2[*1]	1 310	2.5 Gb/s: STM-16 (S-16.1, L-16.1)	Coaxial
	NX8303BG-CC NX8303CG-CC	−10 to +85	−40 to +85	15	2[*1]	1 310	622 Mb/s: STM-4 (L-4.1)	Coaxial
	NX8503BG-CC NX8503CG-CC	−10 to +85	−40 to +85	15	2[*1]	1 550	156 Mb/s: STM-1 (L-1.2, L-1.3) 622 Mb/s: STM-4 (L-4.2, L-4.3)	Coaxial
	NX8504BE-CC NX8504CE-CC	−10 to +85	−40 to +85	15	2[*1]	1 550	622 Mb/s: STM-4 (L-4.2, L-4.3)	Coaxial
★	NX8560LJ-CC	−20 to +70	−40 to +85	6	−1 dBm	1 550[*2]	≤ 10 Gb/s: STM-64	BFY with GPO
	NX8562LB	−20 to +65	−40 to +85	20	20	1 550[*2]	CW Light Source for external modulator	BFY
	NX8563LB	−20 to +65	−40 to +85	20	10	1 550[*2]	CW Light Source for external modulator	BFY
★	NX8564LE-CC	−20 to +70	−40 to +85	7	−2 dBm[*1]	1 550[*2]	2.5 Gb/s: STM-16, 360 km EA modulator integrated	BFY
★	NX8565LE-CC	−20 to +70	−40 to +85	7	−2 dBm[*1]	1 550[*2]	2.5 Gb/s: STM-16, 600 km EA modulator integrated	BFY
★	NX8566LE-CC	−20 to +70	−40 to +85	7	0 dBm	1 550[*2]	2.5 Gb/s: STM-16, 240 km EA modulator integrated	BFY
★	NX8570 Series	−20 to +70	−40 to +85	20	20	1 550[*2]	CW Light Source with λ monitoring PD	BFY
★	NX8571 Series	−20 to +70	−40 to +85	20	10	1 550[*2]	CW Light Source with λ monitoring PD	BFY

***1** TYP.

***2** Available for DWDM Wavelengths based on ITU-T recommendations

REFERENCE

Document Name	Document No.
Optical semiconducrtor devices for fiberoptic communications Selection Guide	P12480E
Opto-Electronics Devices Pamphlet	P13623E
Opto-Electronics Devices (CD-ROM)	P12944X
NEC semiconductor device reliability/quality control system[*1]	C11159E
Quality grades on NEC semiconductor devices[*1]	C11531E
SEMICONDUCTOR SELECTION GUIDE –Products and Packages–[*1]	X13769E

***1** Published by NEC Corporation

- **PATENT**

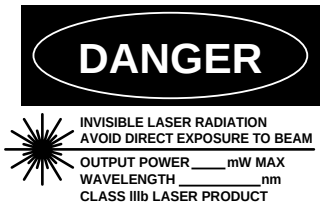
  USP 4,826,295

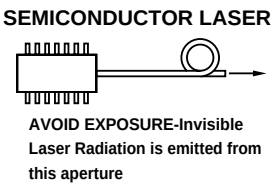
  CA 1,286,848

  EP 143 000

- **GPO is a trademark of Gilbert Engineering Co., Inc.**

SAFETY INFORMATION ON THIS PRODUCT





Warning Laser Beam	A laser beam is emitted from this diode during operation. The laser beam, visible or invisible, directly or indirectly, may cause injury to the eye or loss of eyesight. • Do not look directly into the laser beam. • Avoid exposure to the laser beam, any reflected or collimated beam.
Caution GaAs Products	The product contains gallium arsenide, GaAs. GaAs vapor and powder are hazardous to human health if inhaled or ingested. • Do not destroy or burn the product. • Do not cut or cleave off any part of the product. • Do not crush or chemically dissolve the product. • Do not put the product in the mouth. Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.
Caution Optical Fiber	A glass-fiber is attached on the product. Handle with care. • When the fiber is broken or damaged, handle carefully to avoid injury from the damaged part or fragments.

▶Business issue

NEC Compound Semiconductor Devices, Ltd.
5th Sales Group, Sales Division TEL: +81-3-3798-6372 FAX: +81-3-3798-6783 E-mail: salesinfo@csd-nec.com

NEC Compound Semiconductor Devices Hong Kong Limited
Hong Kong Head Office TEL: +852-3107-7303 FAX: +852-3107-7309
Taipei Branch Office TEL: +886-2-8712-0478 FAX: +886-2-2545-3859
Korea Branch Office TEL: +82-2-528-0301 FAX: +82-2-528-0302

NEC Electron Devices European Operations http://www.nec.de/
TEL: +49-211-6503-101 FAX: +49-211-6503-487

California Eastern Laboratories, Inc. http://www.cel.com/
TEL: +1-408-988-3500 FAX: +1-408-988-0279

▶Technical issue

NEC Compound Semiconductor Devices, Ltd. http://www.csd-nec.com/
Sales Engineering Group, Sales Division
E-mail: techinfo@csd-nec.com FAX: +81-44-435-1918