

# PRELIMINARY DATA SHEET

# NEC

# LASER DIODE NX8560LJ-CC

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

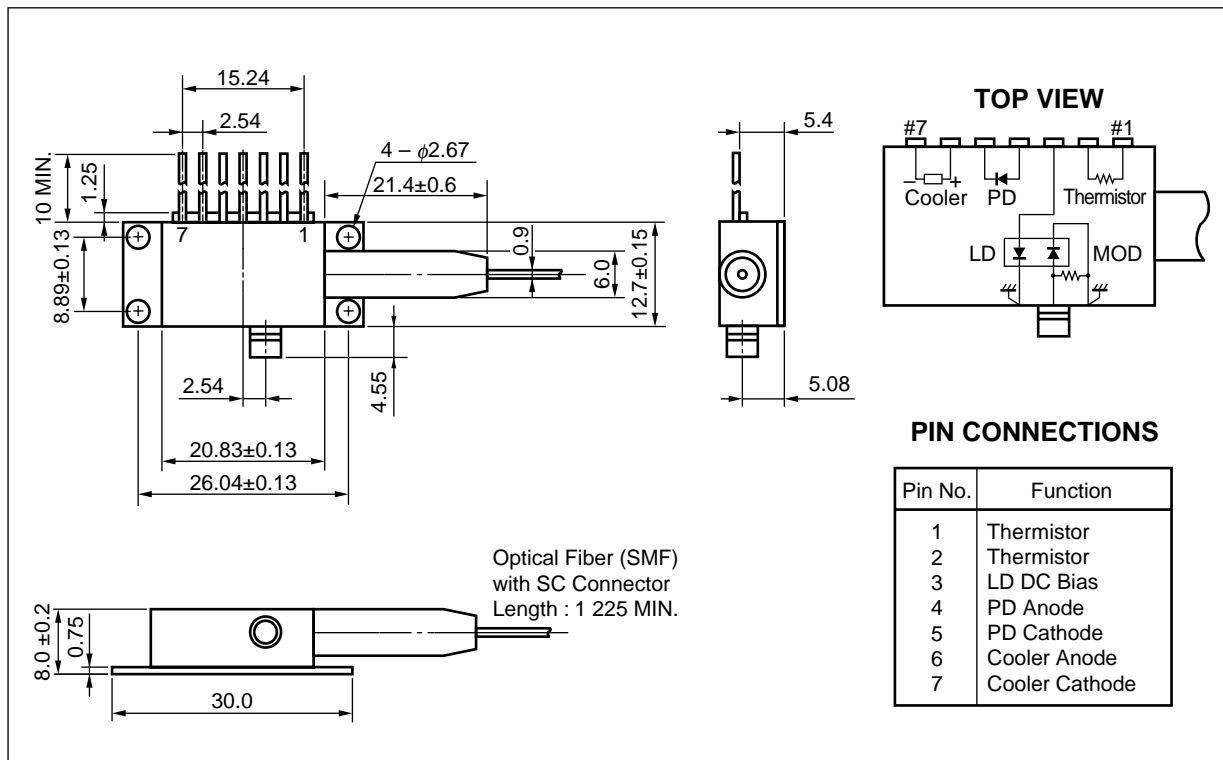
### DESCRIPTION

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

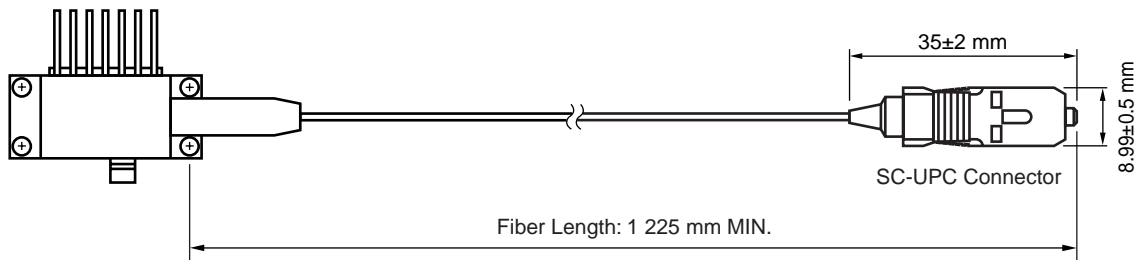
### ★ PACKAGE DIMENSIONS (UNIT: mm, unless otherwise specified ±0.2 mm)



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Not all devices/types available in every country. Please check with local NEC Compound Semiconductor Devices representative for availability and additional information.

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<sub>LD</sub> = T<sub>set</sub> (SC-UPC Connector)**

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

- ★ **ORDERING INFORMATION: Wavelength on ITU-T grid @ T<sub>LD</sub> = T<sub>set</sub>**

Part Number	ITU-T Wavelength <sup>*1</sup> (nm)	Frequency (THz)
With SC-UPC Connector		
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	ITU-T Wavelength <sup>*1</sup>	Frequency
With SC-UPC Connector	(nm)	(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 <sub>i</sub>	10	mW
Forward Current of LD	I <sub>FLD</sub>	150	mA
Reverse Voltage of LD	V <sub>RLD</sub>	2.0	V
Forward Voltage of Modulator	V <sub>FEA</sub>	1	V
Reverse Voltage of Modulator	V <sub>REA</sub>	4	V
Forward Current of PD	I <sub>FPD</sub>	1	mA
Reverse Voltage of PD	V <sub>RPD</sub>	10	V
Cooler Current	I <sub>c</sub>	1.5	A
Cooler Voltage	V <sub>c</sub>	2.5	V
Operating Case Temperature	T <sub>c</sub>	-20 to +70	°C
Storage Temperature	T <sub>stg</sub>	-40 to +85	°C
Lead Soldering Temperature	T <sub>slid</sub>	260 (10 sec.)	°C

★ **ELECTRO-OPTICAL CHARACTERISTICS**  
**(T<sub>LD</sub> = 25°C, T<sub>c</sub> = 25°C, BOL, unless otherwise specified)**

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Laser Set Temperature	T <sub>set</sub>	*1	20		35	°C
Operating Current	I <sub>op</sub>	T <sub>LD</sub> = T <sub>set</sub>	50	60	80	mA
Modulation Center Voltage	V <sub>center</sub>		-2.0		-0.5	V
Modulation Voltage	V <sub>mod</sub>		2.0		3.0	V
Forward Voltage of LD	V <sub>FLD</sub>	I <sub>FLD</sub> = I <sub>op</sub>			2.0	V
Threshold Current	I <sub>th</sub>	T <sub>LD</sub> = T <sub>set</sub>		6	20	mA
Optical Output Power from Fiber	P <sub>f</sub>	Under modulation <sup>2</sup>	-1.0			dBm
Peak Emission Wavelength	λ <sub>p</sub>	I <sub>FLD</sub> = I <sub>op</sub> , V <sub>EA</sub> = 0 V, T <sub>LD</sub> = T <sub>set</sub>	1 530	ITU-T <sup>3</sup>	1 563	nm
Side Mode Suppression Ratio	SMSR	I <sub>FLD</sub> = I <sub>op</sub> , V <sub>EA</sub> = 0 V	30			dB
Extinction Ratio	ER	Under modulation <sup>2</sup>	10	11		dB
Rise Time	t <sub>r</sub>	20-80%, Under modulation <sup>2</sup>			40	ps
Fall Time	t <sub>f</sub>	80-20%, Under modulation <sup>2</sup>			40	ps
Dispersion Penalty	DP	40 km SMF under modulation <sup>2,4</sup>			2.0	dB
Optical Isolation	I <sub>s</sub>		23			dB
Input Return Loss	S <sub>11</sub>	I <sub>FLD</sub> = I <sub>op</sub> , V <sub>EA</sub> = -1 V, f = 130 MHz to 5 GHz		-10	-8	dB
		I <sub>FLD</sub> = I <sub>op</sub> , V <sub>EA</sub> = -1 V, f = 5 GHz to 10 GHz		-8	-5	

\*1 NX8560LJ-CC : T<sub>set</sub> is a certain point between 20°C and 35°C

NX8566LJxxx-CC : T<sub>set</sub> 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<sup>23</sup>-1, V<sub>EA</sub> = V<sub>center</sub> ± 1/2V<sub>mod</sub>, I<sub>FLD</sub> = I<sub>op</sub>, T<sub>LD</sub> = T<sub>set</sub>, NEC Test System

V<sub>center</sub> : a certain point between -0.5 V and -1.5 V

V<sub>mod</sub> : a certain point between 2 V and 3 V

I<sub>op</sub> : 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.

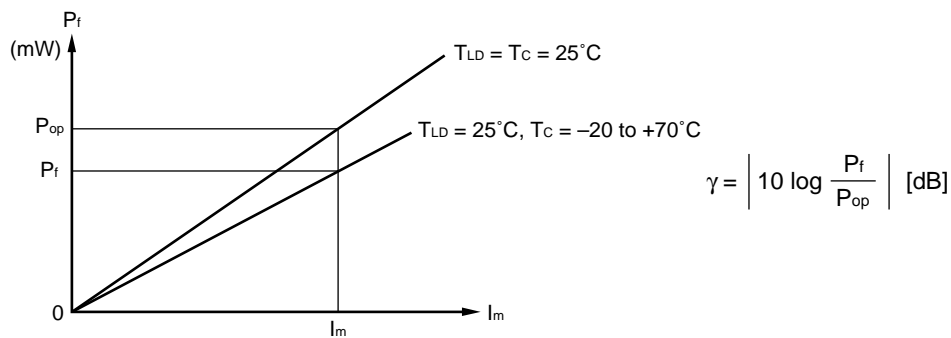
\*4 BER = 10<sup>-10</sup>

**ELECTRO-OPTICAL CHARACTERISTICS**

(Applicable to Monitor PD:  $T_{LD} = 25^{\circ}\text{C}$ ,  $T_c = -20$  to  $+70^{\circ}\text{C}$ )

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
★ Monitor Current	$I_m$	$V_{RPD} = 5\text{ V}$ , $I_{FLD} = I_{op}$ , $V_{EA} = 0\text{ V}$	30		1 100	$\mu\text{A}$
★ Dark Current	$I_D$	$V_{RPD} = 5\text{ V}$ , $V_{EA} = 0\text{ V}$			10	nA
Terminal Capacitance	$C_t$	$V_{RPD} = 5\text{ V}$ , $f = 1\text{ MHz}$			15	pF
Tracking Error	$\gamma^1$	$I_m = \text{const.}$			0.5	dB

\*1 Tracking Error:  $\gamma$

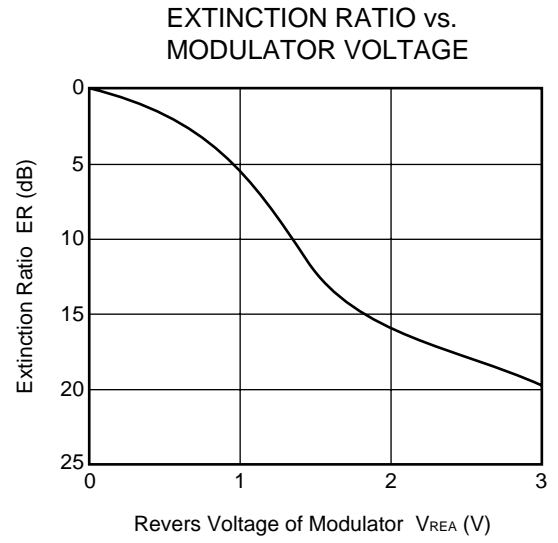
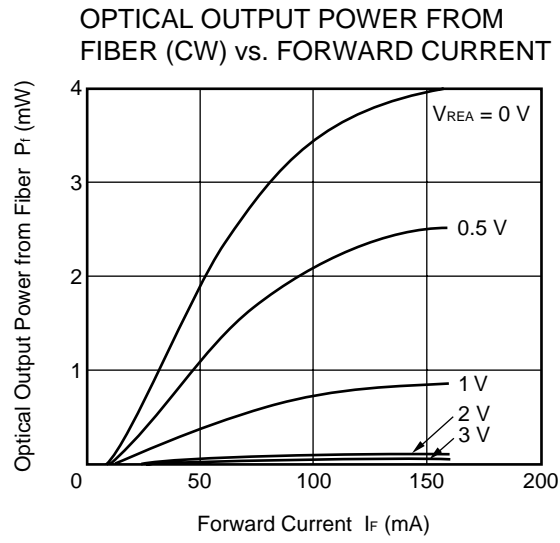


**ELECTRO-OPTICAL CHARACTERISTICS**

(Applicable to Thermistor and TEC:  $T_{LD} = 25^{\circ}\text{C}$ ,  $T_c = -20$  to  $+70^{\circ}\text{C}$ )

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Thermistor Resistance	R	$T_{LD} = 25^{\circ}\text{C}$	9.5	10.0	10.5	$\text{k}\Omega$
B Constant	B		3 350	3 450	3 550	K
Cooler Current	$I_c$	$\Delta T = 50^{\circ}\text{C}$			1.2	A
Cooler Voltage	$V_c$	$\Delta T = 50^{\circ}\text{C}$			2.4	V

★ TYPICAL CHARACTERISTICS ( $T_{LD} = 25^{\circ}\text{C}$ , unless otherwise specified)



**Remark** The graphs indicate nominal characteristics.

DFB-LD FAMILY

Part Number	Absolute Maximum Ratings		Electro-Optical Characteristics (T <sub>c</sub> = 25°C)			Application	Package
	T <sub>c</sub> (°C)	T <sub>stg</sub> (°C)	I <sub>th</sub> (mA)	P <sub>f</sub> (mW)	λ <sub>p</sub> (nm)		
			TYP.	MIN.	TYP.		
NX8300BE-CC NX8300CE-CC	0 to +75	-40 to +85	15	2 <sup>*1</sup>	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 <sup>*1</sup>	1 310	622 Mb/s: STM-4 (L-4.1)	Coaxial
NX8503BG-CC NX8503CG-CC	-10 to +85	-40 to +85	15	2 <sup>*1</sup>	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 <sup>*1</sup>	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 <sup>*2</sup>	≤ 10 Gb/s: STM-64	BFY with GPO
NX8562LB	-20 to +65	-40 to +85	20	20	1 550 <sup>*2</sup>	CW Light Source for external modulator	BFY
NX8563LB	-20 to +65	-40 to +85	20	10	1 550 <sup>*2</sup>	CW Light Source for external modulator	BFY
★ NX8564LE-CC	-20 to +70	-40 to +85	7	-2 dBm <sup>*1</sup>	1 550 <sup>*2</sup>	2.5 Gb/s: STM-16, 360 km EA modulator integrated	BFY
★ NX8565LE-CC	-20 to +70	-40 to +85	7	-2 dBm <sup>*1</sup>	1 550 <sup>*2</sup>	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 <sup>*2</sup>	2.5 Gb/s: STM-16, 240 km EA modulator integrated	BFY
★ NX8570 Series	-20 to +70	-40 to +85	20	20	1 550 <sup>*2</sup>	CW Light Source with λ monitoring PD	BFY
★ NX8571 Series	-20 to +70	-40 to +85	20	10	1 550 <sup>*2</sup>	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 semiconductor 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 <sup>*1</sup>	C11159E
Quality grades on NEC semiconductor devices <sup>*1</sup>	C11531E
SEMICONDUCTOR SELECTION GUIDE –Products and Packages– <sup>*1</sup>	X13769E

\*1 Published by NEC Corporation

- **PATENT**  
 USP 4,826,295  
 CA 1,286,848  
 EP 143 000

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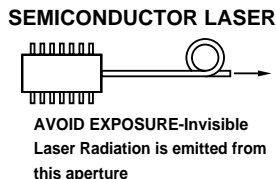
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M8E 00.4-0110

**SAFETY INFORMATION ON THIS PRODUCT**



<p><b>Warning</b> Laser Beam</p>	<p>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.</p> <ul style="list-style-type: none"> <li>• Do not look directly into the laser beam.</li> <li>• Avoid exposure to the laser beam, any reflected or collimated beam.</li> </ul>
<p><b>Caution</b> GaAs Products</p>	<p>The product contains gallium arsenide, GaAs. GaAs vapor and powder are hazardous to human health if inhaled or ingested.</p> <ul style="list-style-type: none"> <li>• Do not destroy or burn the product.</li> <li>• Do not cut or cleave off any part of the product.</li> <li>• Do not crush or chemically dissolve the product.</li> <li>• Do not put the product in the mouth.</li> </ul> <p>Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.</p>
<p><b>Caution</b> Optical Fiber</p>	<p>A glass-fiber is attached on the product. Handle with care.</p> <ul style="list-style-type: none"> <li>• When the fiber is broken or damaged, handle carefully to avoid injury from the damaged part or fragments.</li> </ul>

► **Business issue**

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► **Technical issue**

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