DATA SHEET

NEC

LASER DIODE
NX8564LE-CC

EA MODULATOR INTEGRATED
1 550 nm MQW-DFB LASER DIODE MODULE
FOR 2.5 Gb/s DWDM ULTRALONG-REACH 360 km APPLICATIONS

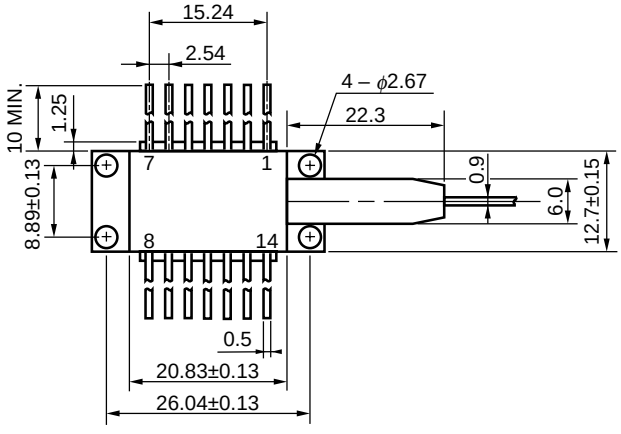
DESCRIPTION

The NX8564LE-CC is an Electro-Absorption (EA) modulator integrated, 1 550 nm Multiple Quantum Well (MQW) structured Distributed Feed-Back (DFB) laser diode. The module is capable of 2.5 Gb/s applications of over 360 km ultralong-reach and available for Dense Wavelength Division Multiplexing (DWDM) wavelengths based on ITU-T recommendations, enabling a wide range of applications.

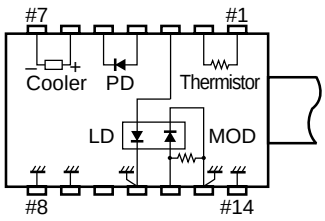
FEATURES

- Integrated electroabsorption modulator
- Very low dispersion penalty over 360 km
- Low modulation voltage
- Available for DWDM wavelength based on ITU-T recommendation (100 GHz grid, refer to ORDERING INFORMATION)
- 14-pin butterfly package with SC-UPC connector

★ PACKAGE DIMENSIONS (UNIT: mm)



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), 50 Ω RF Input
6	Cooler Anode		
7	Cooler Cathode	13	GND
		14	GND

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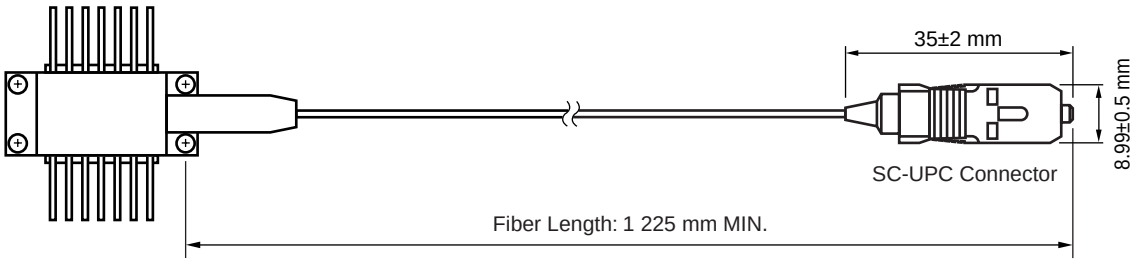
The mark ★ shows major revised points.

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

Part Number With SC-UPC Connector	ITU-T Wavelength[*1] (nm)	Frequency (THz)
NX8564LE311-CC	1531.11	195.80
NX8564LE318-CC	1531.89	195.70
NX8564LE326-CC	1532.68	195.60
NX8564LE334-CC	1533.46	195.50
NX8564LE342-CC	1534.25	195.40
NX8564LE350-CC	1535.03	195.30
NX8564LE358-CC	1535.82	195.20
NX8564LE366-CC	1536.60	195.10
NX8564LE373-CC	1537.39	195.00
NX8564LE381-CC	1538.18	194.90
NX8564LE389-CC	1538.97	194.80
NX8564LE397-CC	1539.76	194.70
NX8564LE405-CC	1540.55	194.60
NX8564LE413-CC	1541.34	194.50
NX8564LE421-CC	1542.14	194.40
NX8564LE429-CC	1542.93	194.30
NX8564LE437-CC	1543.73	194.20
NX8564LE445-CC	1544.52	194.10
NX8564LE453-CC	1545.32	194.00
NX8564LE461-CC	1546.11	193.90
NX8564LE469-CC	1546.91	193.80
NX8564LE477-CC	1547.71	193.70
NX8564LE485-CC	1548.51	193.60
NX8564LE493-CC	1549.31	193.50
NX8564LE501-CC	1550.11	193.40
NX8564LE509-CC	1550.91	193.30
NX8564LE517-CC	1551.72	193.20
NX8564LE525-CC	1552.52	193.10
NX8564LE533-CC	1553.32	193.00
NX8564LE541-CC	1554.13	192.90
NX8564LE549-CC	1554.94	192.80
NX8564LE557-CC	1555.74	192.70
NX8564LE565-CC	1556.55	192.60
NX8564LE573-CC	1557.36	192.50
NX8564LE581-CC	1558.17	192.40

***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)
NX8564LE589-CC	1558.98	192.30
NX8564LE597-CC	1559.79	192.20
NX8564LE606-CC	1560.60	192.10
NX8564LE614-CC	1561.41	192.00
NX8564LE622-CC	1562.23	191.90
NX8564LE745-CC	1574.54	190.40
NX8564LE753-CC	1575.36	190.30
NX8564LE761-CC	1576.19	190.20
NX8564LE770-CC	1577.02	190.10
NX8564LE778-CC	1577.85	190.00
NX8564LE786-CC	1578.68	189.90
NX8564LE795-CC	1579.51	189.80
NX8564LE803-CC	1580.35	189.70
NX8564LE811-CC	1581.18	189.60
NX8564LE820-CC	1582.01	189.50
NX8564LE828-CC	1582.85	189.40
NX8564LE836-CC	1583.69	189.30
NX8564LE845-CC	1584.52	189.20
NX8564LE853-CC	1585.36	189.10
NX8564LE862-CC	1586.20	189.00
NX8564LE870-CC	1587.04	188.90
NX8564LE878-CC	1587.88	188.80
NX8564LE887-CC	1588.72	188.70
NX8564LE895-CC	1589.56	188.60
NX8564LE904-CC	1590.41	188.50
NX8564LE912-CC	1591.25	188.40
NX8564LE921-CC	1592.10	188.30
NX8564LE929-CC	1592.94	188.20
NX8564LE937-CC	1593.79	188.10
NX8564LE946-CC	1594.64	188.00
NX8564LE954-CC	1595.48	187.90
NX8564LE963-CC	1596.33	187.80
NX8564LE971-CC	1597.18	187.70
NX8564LE980-CC	1598.04	187.60
NX8564LE988-CC	1598.89	187.50
NX8564LE997-CC	1599.74	187.40

***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)
NX8564LE6006-CC	1600.60	187.30
NX8564LE6014-CC	1601.45	187.20
NX8564LE6023-CC	1602.31	187.10
NX8564LE6031-CC	1603.16	187.00
NX8564LE6040-CC	1604.02	186.90
NX8564LE6048-CC	1604.88	186.80
NX8564LE6057-CC	1605.74	186.70
NX8564LE6066-CC	1606.60	186.60
NX8564LE6074-CC	1607.46	186.50
NX8564LE6083-CC	1608.32	186.40

***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_{Fm}	1	V
Reverse Voltage of Modulator	V_{Rm}	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 ºC, T_C = –20 to +70 ºC, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Laser Set Temperature	T_{set}	$I_{FLD} = I_{op}$, V_{Rm} = 0 V	20		35	°C
Operating Current	I_{op}	$T_{LD} = T_{set}$	50	60	100	mA
Modulation Center Voltage	V_{Rmc}	Under modulation[*1]	–1.5	–1.2	–0.5	V
Modulation Voltage	V_{Rmpp}	Under modulation[*1]	2		3	V
Forward Voltage of LD	V_{FLD}	$I_{FLD} = I_{op}$		1.6	2.0	V
Threshold Current	I_{th}	$T_{LD} = T_{set}$		7	20	mA
Optical Output Power from Fiber	P_f	$I_{FLD} = I_{op}$, $T_{LD} = T_{set}$, Under modulation[*1]	0.3	0.6		mW
Peak Emission Wavelength	λ_p	$I_{FLD} = I_{op}$, V_{Rm} = 0 V, $T_{LD} = T_{set}$	1 530	ITU-T[*2]	1 563	nm
			1 574		1 609	
Side Mode Suppression Ratio	SMSR	$I_{FLD} = I_{op}$, V_{Rm} = 0 V	30	37		dB
Extinction Ratio	ER	$I_{FLD} = I_{op}$, Under modulation[*1]	10	11		dB
Rise Time	t_r	$I_{FLD} = I_{op}$, 20-80%, Under modulation[*1]		70	125	ps
Fall Time	t_f	$I_{FLD} = I_{op}$, 80-20%, Under modulation[*1]		70	125	ps
Dispersion Penalty	DP	$I_{FLD} = I_{op}$, 360 km SMF under modulation[*1]		1.5	2.0	dB
Isolation	I_s		23			dB
Relative Intensity Noise	RIN	10 MHz to 10 GHz, V_{Rm} = 0 V, $T_{LD} = T_{set}$, $I_{FLD} = I_{op}$		–135	–130	dB
Input Return Loss	S_{11}	$I_{FLD} = I_{op}$, $V_{Rm} = 1/2V_{Rmpp}$, 50 Ω, f = 130 MHz to 2 GHz			–10	dB
		$I_{FLD} = I_{op}$, $V_{Rm} = 1/2V_{Rmpp}$, 50 Ω, f = 2 GHz to 2.5 GHz			–5	
		$I_{FLD} = I_{op}$, $V_{Rm} = 1/2V_{Rmpp}$, 50 Ω, f = 2.5 GHz to 3.5 GHz			–3	

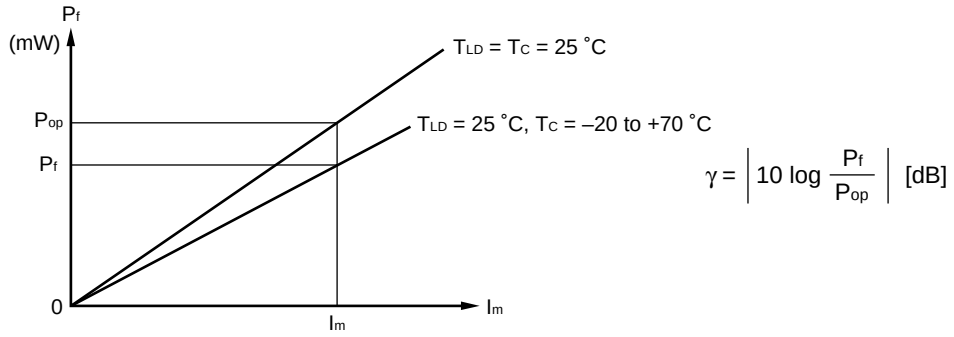
***1** 360 km SMF under modulation, 2.48832 Gb/s, PRBS 2^{23}–1, $V_{Rm} = V_{Rmc} \pm 1/2V_{Rmpp}$, BER = 10^{-9}, NEC Test System

***2** Available for DWDM wavelength based on ITU-T recommendation (100 GHz grid).
Please refer to ORDERING INFORMATION.

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	I_{FLD} = I_{op}, V_{Rm} = 0 V	20	100	1 000	μA
★ Dark Current	I_D	V_{RPD} = 5 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



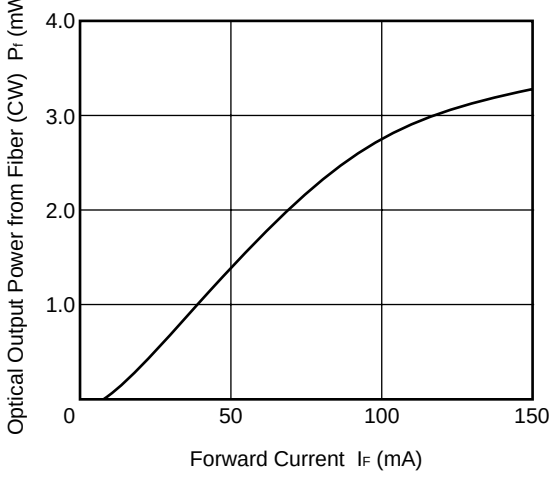
$$\gamma = \left| 10 \log \frac{P_f}{P_{op}} \right| \text{ [dB]}$$

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

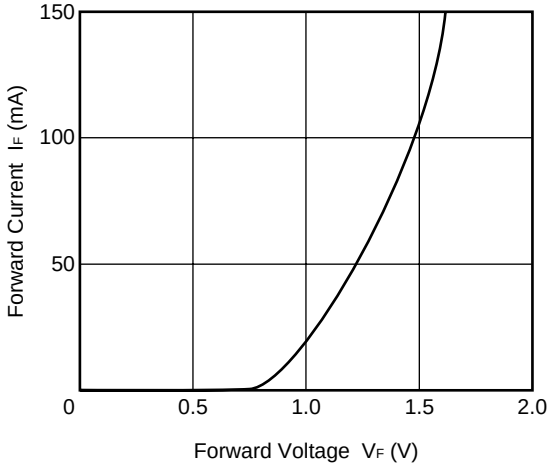
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Thermistor Resistance	R	T_{LD} = 25 °C	9.5	10.0	10.5	kΩ
B Constant	B		3 350	3 450	3 550	K
Cooler Current	I_C	ΔT = 50 °C, I_{op} = 150 mA			1.2	A
Cooler Voltage	V_C	ΔT = 50 °C, I_{op} = 150 mA			2.4	V

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

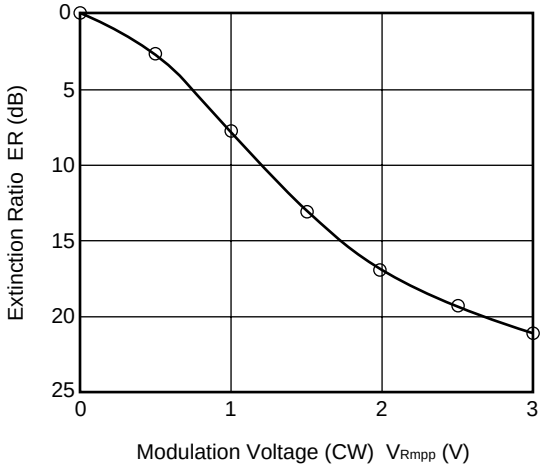
OPTICAL OUTPUT POWER FROM FIBER (CW) vs. FORWARD CURRENT



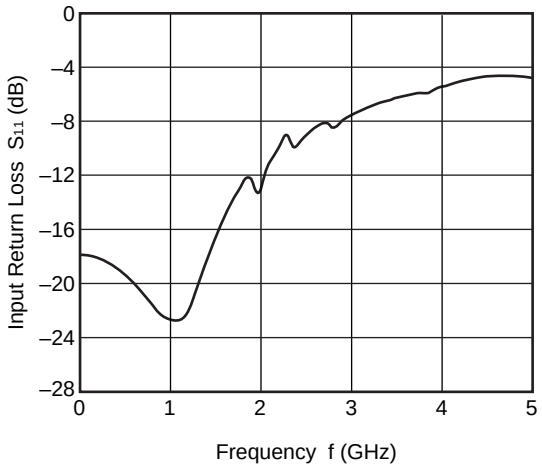
FORWARD CURRENT vs. FORWARD VOLTAGE



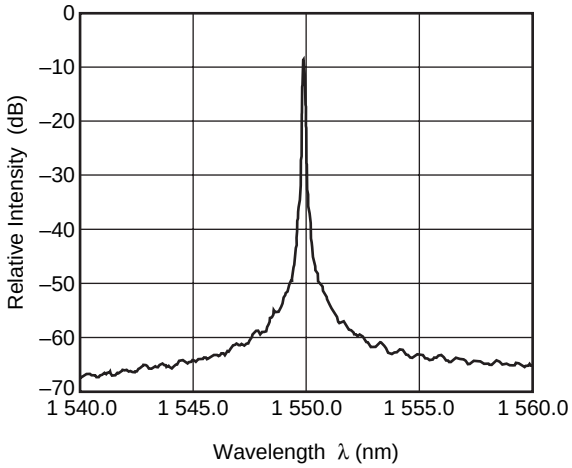
EXTINCTION RATIO vs. MODULATION VOLTAGE (CW)



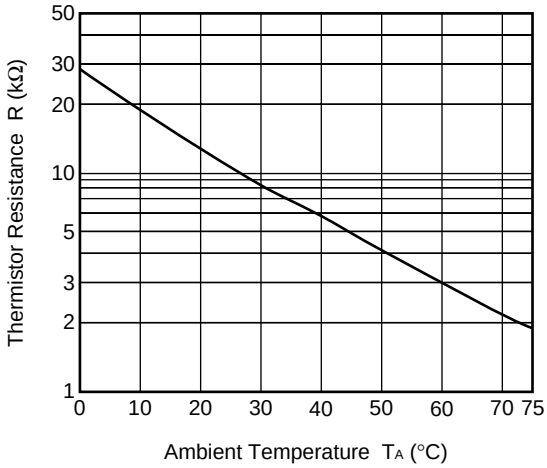
INPUT RETURN LOSS CHARACTERISTICS (S_{11})



SPECTRUM



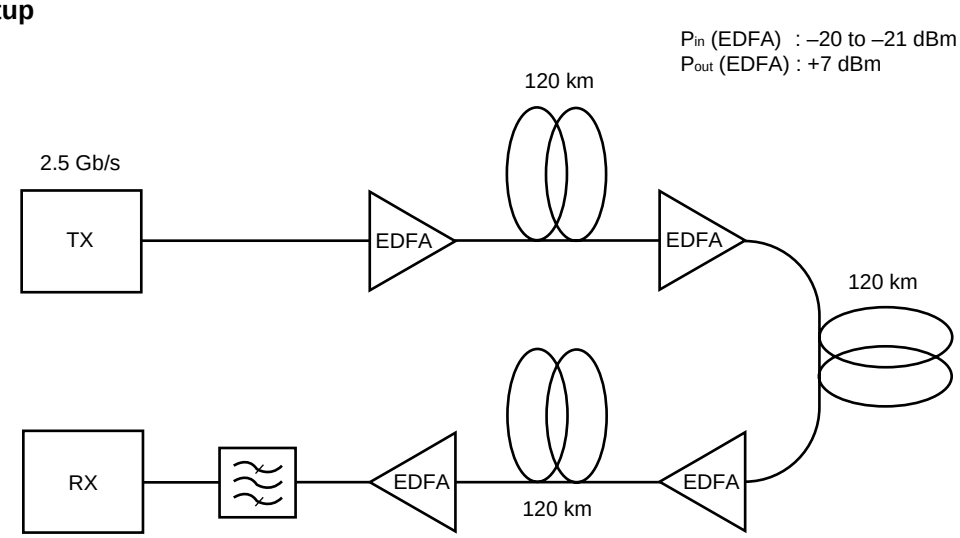
THERMISTOR RESISTANCE vs. AMBIENT TEMPERATURE



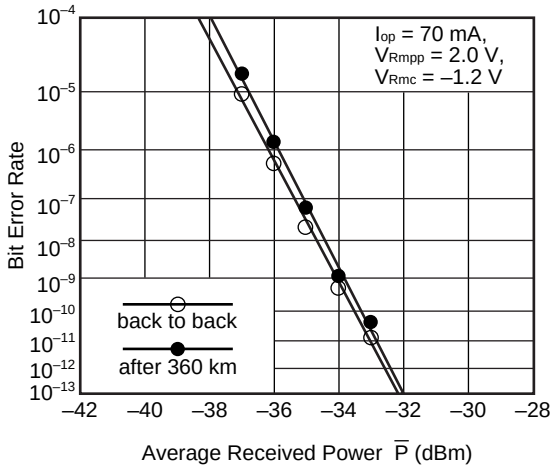
Remark The graphs indicate nominal characteristics.

★ 360 km STANDARD FIBER TRANSMISSION EXAMPLE

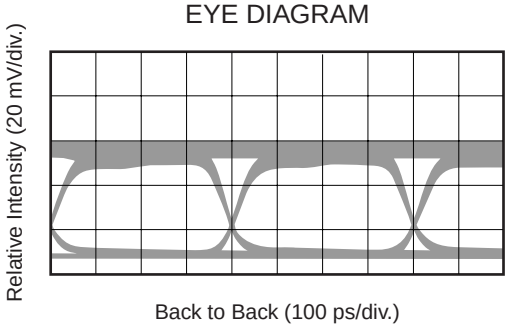
Test Setup

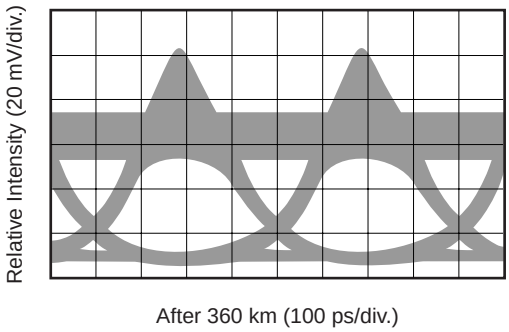


ERROR RATE CHARACTERISTICS



EYE DIAGRAM





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)	Coaxial
						622 Mb/s: STM-4 (L-4.2, L-4.3)	
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	−2 dBm	1 550	≤ 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	0.6[*1]	1 550[*2]	2.5 Gb/s: STM-16 EA modulator integrated	BFY
NX8565LE-CC	−20 to +70	−40 to +85	7	0.6[*1]	1 550[*2]	2.5 Gb/s: STM-16 EA modulator integrated	BFY
NX8570SA	−20 to +70	−40 to +85	20	20	1 550[*2]	CW Light Source with λ monitoring PD	BFY
NX8571SA	−20 to +70	−40 to +85	20	10	1 550[*2]	CW Light Source with λ monitoring PD	BFY

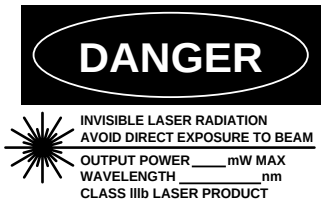
***1** TYP.

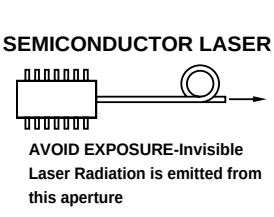
***2** Available for DWDM Wavelength based on ITU-T recommendation

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	C11159E
Quality grades on NEC semiconductor devices	C11531E
SEMICONDUCTOR SELECTION GUIDE –Products and Packages–	X13769E

SAFETY INFORMATION ON THIS PRODUCT





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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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.
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