PRELIMINARY DATA SHEET

NEC

LASER DIODE

NX8571 Series

1 550 nm CW LIGHT SOURCE
InGaAsP MQW-DFB LASER DIODE MODULE
WITH WAVELENGTH MONITOR

DESCRIPTION

The NX8571 Series is a 1 550 nm Multiple Quantum Well (MQW) structured Distributed Feed-Back (DFB) laser diode module with wavelength monitor function.

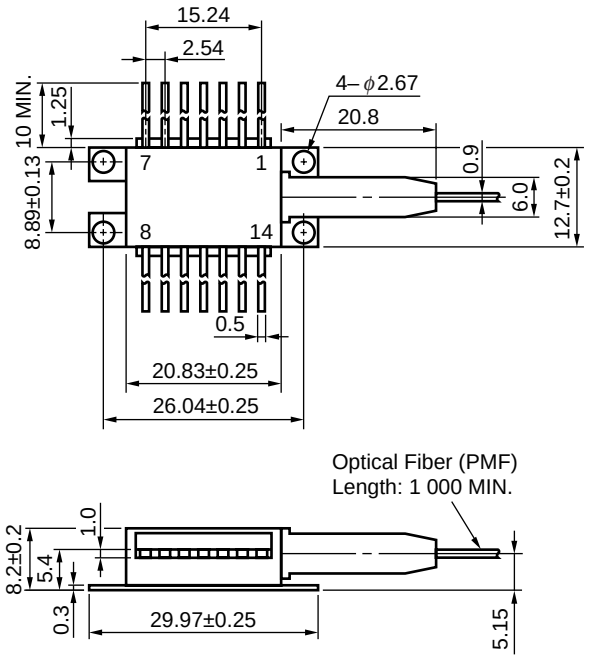
This device is designed as CW light source and ideal for transmission systems in which external modulators are used.

FEATURES

- Wavelength monitor function (Etalon Filter, Wavelength monitor PD)
- Output power P_f = 10 mW MIN.
- Available for DWDM wavelengths based on ITU-T recommendations (50 GHz grid)
- 4 chanel wavelength tunable capability for 50 GHz-spacing (NX8571S××××D)
- Internal thermo-electric cooler and isolator
- Hermetically sealed 14-pin butterfly package
- Polarization maintain fiber pigtail

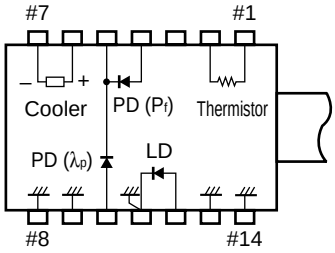
Document No. PL10136EJ01V0DS (1st edition)
Date Published April 2002 CP(K)
Printed in Japan

PACKAGE DIMENSIONS (UNIT: mm)



NX8571SA

TOP VIEW

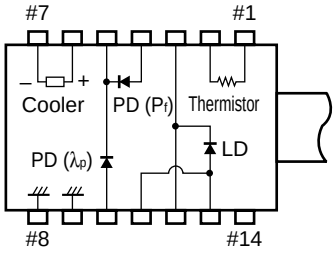


PIN CONNECTIONS

Pin No.	Function	Pin No.	Function
1	Thermistor	8	GND
2	Thermistor	9	GND
3	NC	10	PD (λ_p) Anode
4	PD (P_f) Anode	11	LD Cathode, GND
5	PD Cathode	12	LD Anode
6	Cooler Anode	13	GND
7	Cooler Cathode	14	GND

NX8571SC

TOP VIEW

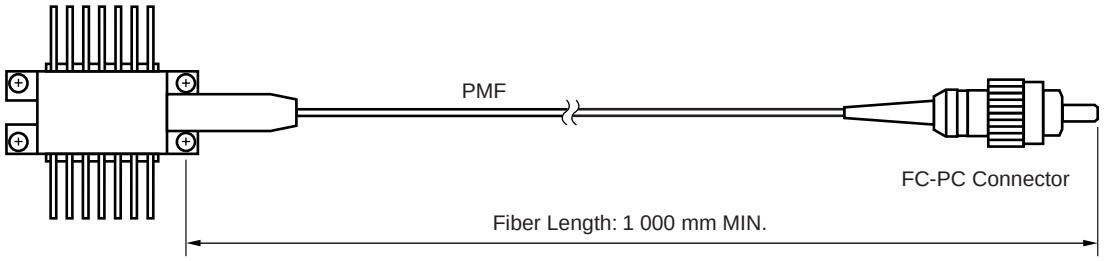


PIN CONNECTIONS

Pin No.	Function	Pin No.	Function
1	Thermistor	8	GND
2	Thermistor	9	GND
3	LD Cathode	10	PD (λ_p) Anode
4	PD (P_f) Anode	11	LD Anode
5	PD Cathode	12	LD Cathode
6	Cooler Anode	13	LD Anode
7	Cooler Cathode	14	NC

OPTICAL FIBER CHARACTERISTICS

Parameter	Specification	Unit
Outer Diameter	0.9±0.1	mm
Minimum Fiber Bending Radius	30	mm
Fiber Length	1 000 MIN.	mm



ORDERING INFORMATION

Part Number	Pin Connections (LD)	Wevelength	Available Connector
NX8571SC×××-BA	Anode floating	Fixed (Refer to **table A**)	With FC-PC Connector
NX8571SA×××-BA	Cathode ground		With FC-PC Connector
NX8571SC×××-CA *1	Anode floating		With SC-PC Connector
NX8571SA×××-CA *1	Cathode ground		With SC-PC Connector
NX8571SC×××D-BA	Anode floating	4 channel tunable	With FC-PC Connector
NX8571SA×××D-BA	Cathode ground	(Refer to **table B**)	With FC-PC Connector
NX8571SC×××D-CA *1	Anode floating		With SC-PC Connector
NX8571SA×××D-CA *1	Cathode ground		With SC-PC Connector

*1 SC Connector: option

Table A: Part number for fixed wavelength product (1/3)

Part Number With FC-PC Connector (Standard)	Channel	ITU-T Wavelength (nm)	Frequency (THz)	Monitor Slope
NX8571SC303-BA	1	1530.334	195.90	Negative
NX8571SC307-BA	2	1530.725	195.85	Positive
NX8571SC311-BA	3	1531.116	195.80	Negative
NX8571SC315-BA	4	1531.507	195.75	Positive
NX8571SC318-BA	5	1531.898	195.70	Negative
NX8571SC322-BA	6	1532.290	195.65	Positive
NX8571SC326-BA	7	1532.681	195.60	Negative
NX8571SC330-BA	8	1533.073	195.55	Positive
NX8571SC334-BA	9	1533.465	195.50	Negative
NX8571SC338-BA	10	1533.858	195.45	Positive
NX8571SC342-BA	11	1534.250	195.40	Negative
NX8571SC346-BA	12	1534.643	195.35	Positive
NX8571SC350-BA	13	1535.036	195.30	Negative
NX8571SC354-BA	14	1535.429	195.25	Positive
NX8571SC358-BA	15	1535.822	195.20	Negative
NX8571SC362-BA	16	1536.216	195.15	Positive
NX8571SC366-BA	17	1536.609	195.10	Negative
NX8571SC370-BA	18	1537.003	195.05	Positive
NX8571SC373-BA	19	1537.397	195.00	Negative
NX8571SC377-BA	20	1537.792	194.95	Positive
NX8571SC381-BA	21	1538.186	194.90	Negative
NX8571SC385-BA	22	1538.581	194.85	Positive
NX8571SC389-BA	23	1538.976	194.80	Negative
NX8571SC393-BA	24	1539.371	194.75	Positive
NX8571SC397-BA	25	1539.766	194.70	Negative
NX8571SC401-BA	26	1540.162	194.65	Positive
NX8571SC405-BA	27	1540.557	194.60	Negative
NX8571SC409-BA	28	1540.953	194.55	Positive
NX8571SC413-BA	29	1541.349	194.50	Negative
NX8571SC417-BA	30	1541.746	194.45	Positive
NX8571SC421-BA	31	1542.142	194.40	Negative
NX8571SC425-BA	32	1542.539	194.35	Positive
NX8571SC429-BA	33	1542.936	194.30	Negative
NX8571SC433-BA	34	1543.333	194.25	Positive
NX8571SC437-BA	35	1543.730	194.20	Negative
NX8571SC441-BA	36	1544.128	194.15	Positive

Table A: Part number for fixed wavelength product (2/3)

Part Number With FC-PC Connector (Standard)	Channel	ITU-T Wavelength (nm)	Frequency (THz)	Monitor Slope
NX8571SC445-BA	37	1544.526	194.10	Negative
NX8571SC449-BA	38	1544.924	194.05	Positive
NX8571SC453-BA	39	1545.322	194.00	Negative
NX8571SC457-BA	40	1545.720	193.95	Positive
NX8571SC461-BA	41	1546.119	193.90	Negative
NX8571SC465-BA	42	1546.518	193.85	Positive
NX8571SC469-BA	43	1546.917	193.80	Negative
NX8571SC473-BA	44	1547.316	193.75	Positive
NX8571SC477-BA	45	1547.715	193.70	Negative
NX8571SC481-BA	46	1548.115	193.65	Positive
NX8571SC485-BA	47	1548.515	193.60	Negative
NX8571SC489-BA	48	1548.915	193.55	Positive
NX8571SC493-BA	49	1549.315	193.50	Negative
NX8571SC497-BA	50	1549.715	193.45	Positive
NX8571SC501-BA	51	1550.116	193.40	Negative
NX8571SC505-BA	52	1550.517	193.35	Positive
NX8571SC509-BA	53	1550.918	193.30	Negative
NX8571SC513-BA	54	1551.319	193.25	Positive
NX8571SC517-BA	55	1551.721	193.20	Negative
NX8571SC521-BA	56	1552.122	193.15	Positive
NX8571SC525-BA	57	1552.524	193.10	Negative
NX8571SC529-BA	58	1552.926	193.05	Positive
NX8571SC533-BA	59	1553.329	193.00	Negative
NX8571SC537-BA	60	1553.731	192.95	Positive
NX8571SC541-BA	61	1554.134	192.90	Negative
NX8571SC545-BA	62	1554.537	192.85	Positive
NX8571SC549-BA	63	1554.940	192.80	Negative
NX8571SC553-BA	64	1555.343	192.75	Positive
NX8571SC557-BA	65	1555.747	192.70	Negative
NX8571SC561-BA	66	1556.151	192.65	Positive
NX8571SC565-BA	67	1556.555	192.60	Negative
NX8571SC569-BA	68	1556.959	192.55	Positive
NX8571SC573-BA	69	1557.363	192.50	Negative
NX8571SC577-BA	70	1557.768	192.45	Positive
NX8571SC581-BA	71	1558.173	192.40	Negative
NX8571SC585-BA	72	1558.578	192.35	Positive

Table A: Part number for fixed wavelength product (3/3)

Part Number With FC-PC Connector (Standard)	Channel	ITU-T Wavelength (nm)	Frequency (THz)	Monitor Slope
NX8571SC589-BA	73	1558.983	192.30	Negative
NX8571SC593-BA	74	1559.389	192.25	Positive
NX8571SC597-BA	75	1559.794	192.20	Negative
NX8571SC602-BA	76	1560.200	192.15	Positive
NX8571SC606-BA	77	1560.606	192.10	Negative
NX8571SC610-BA	78	1561.013	192.05	Positive
NX8571SC614-BA	79	1561.419	192.00	Negative
NX8571SC618-BA	80	1561.826	191.95	Positive
NX8571SC622-BA	81	1562.233	191.90	Negative
NX8571SC626-BA	82	1562.640	191.85	Positive
NX8571SC630-BA	83	1563.047	191.80	Negative
NX8571SC634-BA	84	1563.455	191.75	Positive
NX8571SC638-BA	85	1563.863	191.70	Negative
NX8571SC642-BA	86	1564.271	191.65	Positive
NX8571SC646-BA	87	1564.679	191.60	Negative
NX8571SC650-BA	88	1565.087	191.55	Positive

Remark In case of cathode ground type, please replace SC with SA in part number.

Table B: Part number for 4 channel tunable product (1/3)

Part Number With FC-PC Connector (Standard)	Channel	ITU-T Wavelength (nm)	Frequency (THz)	Monitor Slope
NX8571SC315D-BA	1	1530.334	195.90	Negative
	2	1530.725	195.85	Positive
	3	1531.116	195.80	Negative
	4	1531.507	195.75	Positive
NX8571SC330D-BA	5	1531.898	195.70	Negative
	6	1532.290	195.65	Positive
	7	1532.681	195.60	Negative
	8	1533.073	195.55	Positive
NX8571SC346D-BA	9	1533.465	195.50	Negative
	10	1533.858	195.45	Positive
	11	1534.250	195.40	Negative
	12	1534.643	195.35	Positive
NX8571SC362D-BA	13	1535.036	195.30	Negative
	14	1535.429	195.25	Positive
	15	1535.822	195.20	Negative
	16	1536.216	195.15	Positive
NX8571SC377D-BA	17	1536.609	195.10	Negative
	18	1537.003	195.05	Positive
	19	1537.397	195.00	Negative
	20	1537.792	194.95	Positive
NX8571SC393D-BA	21	1538.186	194.90	Negative
	22	1538.581	194.85	Positive
	23	1538.976	194.80	Negative
	24	1539.371	194.75	Positive
NX8571SC409D-BA	25	1539.766	194.70	Negative
	26	1540.162	194.65	Positive
	27	1540.557	194.60	Negative
	28	1540.953	194.55	Positive
NX8571SC425D-BA	29	1541.349	194.50	Negative
	30	1541.746	194.45	Positive
	31	1542.142	194.40	Negative
	32	1542.539	194.35	Positive
NX8571SC441D-BA	33	1542.936	194.30	Negative
	34	1543.333	194.25	Positive
	35	1543.730	194.20	Negative
	36	1544.128	194.15	Positive

Table B: Part number for 4 channel tunable product (2/3)

Part Number With FC-PC Connector (Standard)	Channel	ITU-T Wavelength (nm)	Frequency (THz)	Monitor Slope
NX8571SC457D-BA	37	1544.526	194.10	Negative
	38	1544.924	194.05	Positive
	39	1545.322	194.00	Negative
	40	1545.720	193.95	Positive
NX8571SC473D-BA	41	1546.119	193.90	Negative
	42	1546.518	193.85	Positive
	43	1546.917	193.80	Negative
	44	1547.316	193.75	Positive
NX8571SC489D-BA	45	1547.715	193.70	Negative
	46	1548.115	193.65	Positive
	47	1548.515	193.60	Negative
	48	1548.915	193.55	Positive
NX8571SC505D-BA	49	1549.315	193.50	Negative
	50	1549.715	193.45	Positive
	51	1550.116	193.40	Negative
	52	1550.517	193.35	Positive
NX8571SC521D-BA	53	1550.918	193.30	Negative
	54	1551.319	193.25	Positive
	55	1551.721	193.20	Negative
	56	1552.122	193.15	Positive
NX8571SC537D-BA	57	1552.524	193.10	Negative
	58	1552.926	193.05	Positive
	59	1553.329	193.00	Negative
	60	1553.731	192.95	Positive
NX8571SC553D-BA	61	1554.134	192.90	Negative
	62	1554.537	192.85	Positive
	63	1554.940	192.80	Negative
	64	1555.343	192.75	Positive
NX8571SC569D-BA	65	1555.747	192.70	Negative
	66	1556.151	192.65	Positive
	67	1556.555	192.60	Negative
	68	1556.959	192.55	Positive
NX8571SC585D-BA	69	1557.363	192.50	Negative
	70	1557.768	192.45	Positive
	71	1558.173	192.40	Negative
	72	1558.578	192.35	Positive

Table B: Part number for 4 channel tunable product (3/3)

Part Number With FC-PC Connector (Standard)	Channel	ITU-T Wavelength (nm)	Frequency (THz)	Monitor Slope
NX8571SC602D-BA	73	1558.983	192.30	Negative
	74	1559.389	192.25	Positive
	75	1559.794	192.20	Negative
	76	1560.200	192.15	Positive
NX8571SC618D-BA	77	1560.606	192.10	Negative
	78	1561.013	192.05	Positive
	79	1561.419	192.00	Negative
	80	1561.826	191.95	Positive
NX8571SC634D-BA	81	1562.233	191.90	Negative
	82	1562.640	191.85	Positive
	83	1563.047	191.80	Negative
	84	1563.455	191.75	Positive
NX8571SC650D-BA	85	1563.863	191.70	Negative
	86	1564.271	191.65	Positive
	87	1564.679	191.60	Negative
	88	1565.087	191.55	Positive

Remark In case of cathode ground type, please replace SC with SA in part number.

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Ratings	Unit
Forward Current of LD	I_F	300	mA
Reverse Voltage of LD	V_R	2.0	V
Forward Current of PD	I_F	10	mA
Reverse Voltage of PD	V_R	20	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 = –5 to +70°C, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Laser Set Temperature	T_{set}	Fixed wavelength	20		35	°C
		4 channel tunable	15		35	
Forward Voltage	V_F	P_f = 10 mW	0.9	1.2	2.5	V
Threshold Current	I_{th}			20	40	mA
Operation Current	I_{op}	P_f = 10 mW		70	167	mA
Optical Output Power from Fiber	P_f	I_F = 167 mA, $T_{LD} = T_{set}$	20			mW
Threshold Output Power from Fiber	P_{th}	$I_F = I_{th}$			100	μW
Peak Emission Wavelength	λ_p	P_f = 10 mW, CW, $T_{LD} = T_{set}$	1 530	ITU-T [*1]	1 566	nm
Wevelength Stability	–	$T_{LD} = T_{set}$, applicable to wavelength monitor, E.O.L	−20		+20	pm
Spectral Line Width	$\Delta\nu$	P_f = 10 mW, CW, 3 dB down		1	5	MHz
Side Mode Suppression Ratio	SMSR	P_f = 10 mW, CW	33	45		dB
Relative Intensity Noise	RIN	P_f = 10 mW, 20 MHz to 3 GHz			−145	dB/Hz
Isolation	I_S		30			dB
Polarization Extinction Ratio[*2]	ext	P_f = 10 mW, CW	20			dB

***1** Available for DWDM wavelengths based on ITU-T recommendations (50 GHz grid).
Please refer to table A and B.

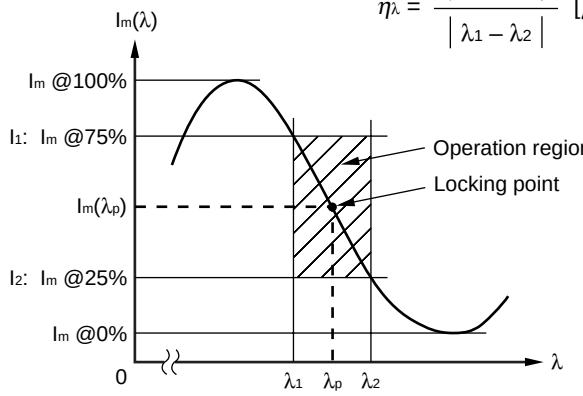
***2** Polarization state of LD is aligned parallel to the slow axis.

ELECTRO-OPTICAL CHARACTERISTICS
(Applicable to Monitor PD: $T_{LD} = T_{set}$, T_C = –5 to +70°C)

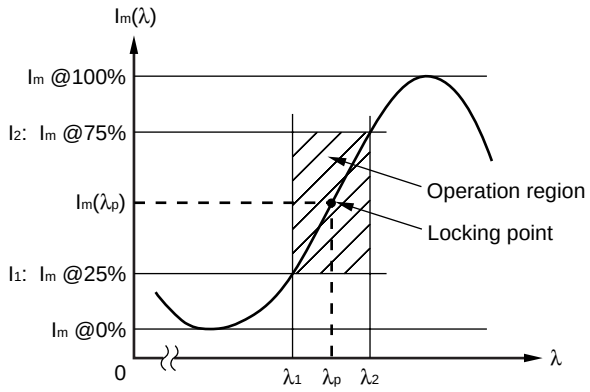
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Monitor Current (P_f Monitor)	$I_m(P_f)$	P_f = 10 mW, V_R = 5 V	20		200	μA
Monitor Current (λ_p Monitor)	$I_m(\lambda_p)$	P_f = 10 mW, V_R = 5 V, Locking point	10		100	μA
Operation Region*1	$I_m(\lambda)$		25		75	%
	$\lvert\lambda_1-\lambda_2\rvert$		90			pm
Discrimination Slope*1	$\eta\lambda$		0.05			μA/pm
Dark Current	I_D	V_R = 5 V		2	10	nA
Tracking Error	γ*2	I_m = const.			0.5	dB

***1** Operation region, Discrimination slope, Slope assignment

$$\eta\lambda = \frac{\lvert I_1 - I_2 \rvert}{\lvert \lambda_1 - \lambda_2 \rvert} \ [\mu A/pm]$$

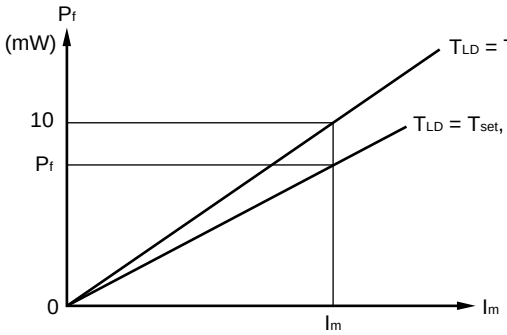


Negative Slope (Odd channel)



Positive Slope (Even channel)

***2** Tracking Error: γ



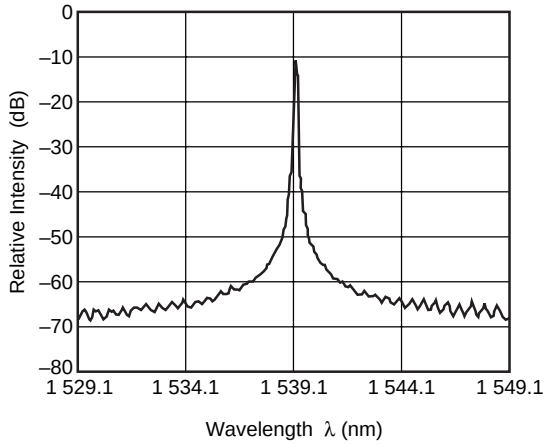
$$\gamma = \left| 10 \log \frac{P_f}{10} \right| \ [dB]$$

ELECTRO-OPTICAL CHARACTERISTICS
(Applicable to Thermistor and TEC: T_{LD} = 25°C, T_C = –5 to +70°C)

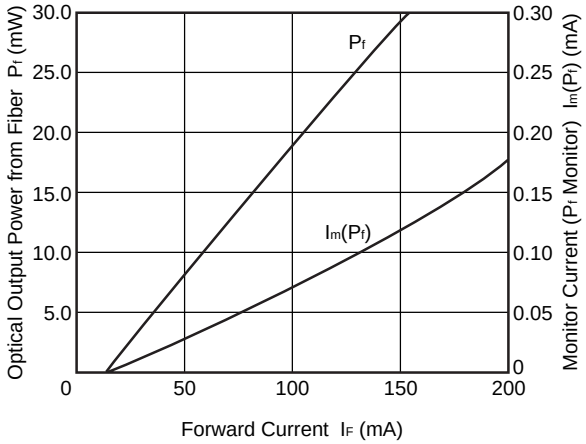
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Thermistor Resistance	R	T_{LD} = 25°C	9.5	10.0	10.5	kΩ
B Constant	B		3 350	3 450	3 550	K
Cooler Current	I_C	$\Delta T = 70 - T_{set}$, P_f = 10 mW		1.0	1.3	A
Cooler Voltage	V_C	$\Delta T = 70 - T_{set}$, P_f = 10 mW		2.4	3.2	V

TYPICAL CHARACTERISTICS (T_{LD} = 25ºC, unless otherwise specified)

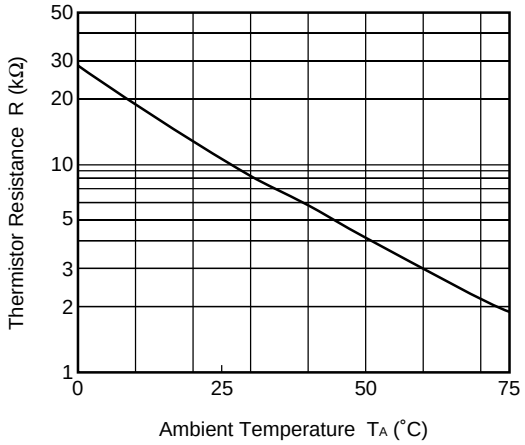
SPECTRUM



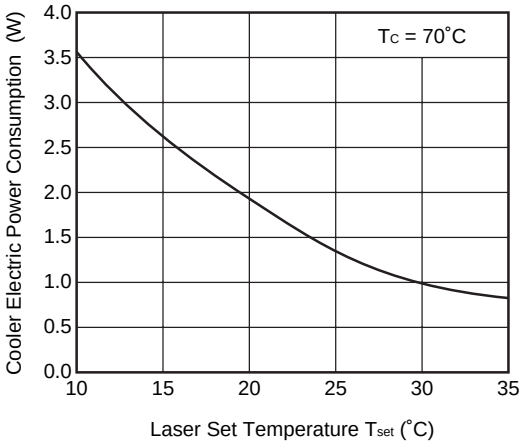
OPTICAL OUTPUT POWER FROM FIBER, MONITOR CURRENT (P_f MONITOR) vs. FORWARD CURRENT



THERMISTOR RESISTANCE vs. AMBIENT TEMPERATURE



COOLER ELECTRIC POWER CONSUMPTION vs. LASER SET TEMPERATURE



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	−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

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

- **The information in this document is current as of April 2002. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC's data sheets or data books, etc., for the most up-to-date specifications of NEC semiconductor products. Not all products and/or types are available in every country. Please check with an NEC sales representative for availability and additional information.**
- No part of this document may be copied or reproduced in any form or by any means without prior written consent of NEC. NEC assumes no responsibility for any errors that may appear in this document.
- NEC does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC semiconductor products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC or others.
- Descriptions of circuits, software and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software and information in the design of customer's equipment shall be done under the full responsibility of customer. NEC assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.
- While NEC endeavours to enhance the quality, reliability and safety of NEC semiconductor products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in NEC semiconductor products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment, and anti-failure features.
- NEC semiconductor products are classified into the following three quality grades:
  "Standard", "Special" and "Specific". The "Specific" quality grade applies only to semiconductor products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of a semiconductor product depend on its quality grade, as indicated below. Customers must check the quality grade of each semiconductor product before using it in a particular application.

  "Standard": Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

  "Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

  "Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.

  The quality grade of NEC semiconductor products is "Standard" unless otherwise expressly specified in NEC's data sheets or data books, etc. If customers wish to use NEC semiconductor products in applications not intended by NEC, they must contact an NEC sales representative in advance to determine NEC's willingness to support a given application.

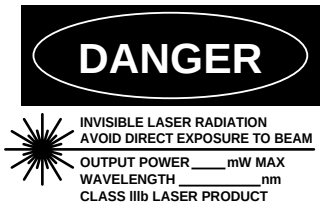
  (Note)

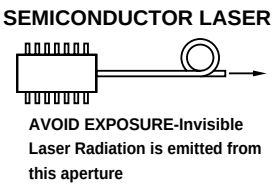
  (1) "NEC" as used in this statement means NEC Corporation, NEC Compound Semiconductor Devices, Ltd. and also includes its majority-owned subsidiaries.

  (2) "NEC semiconductor products" means any semiconductor product developed or manufactured by or for NEC (as defined above).

M8E 00.4-0110

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