DATA SHEET

NEC

LASER DIODE

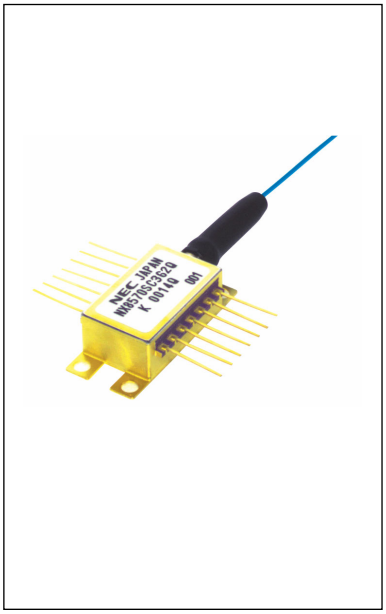
NX8570SCxxxQ-BA

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

DESCRIPTION

The NX8570SCxxxQ-BA is a 1 550 nm Multiple Quantum Well (MQW) structured Distributed Feed-Back (DFB) laser diode module with wavelength monitor function. This device is temperature tunable over 8 × 50 GHz channels. Available at both C-band (1 530.334 to 1 565.087 nm) and L-band (1 565.496 to 1 608.760 nm) ITU-T grid wavelengths.

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)
- Optical output power P_f = 20 mW MIN.
- Available for DWDM wavelengths based on ITU-T recommendations (50 GHz grid, please refer to the **ORDERING INFORMATION**)
- 8 channel wavelength tunable capability for 50 GHz-spacing
- Internal thermo-electric cooler and isolator
- Hermetically sealed 14-pin butterfly package
- Polarization maintain fiber pigtail

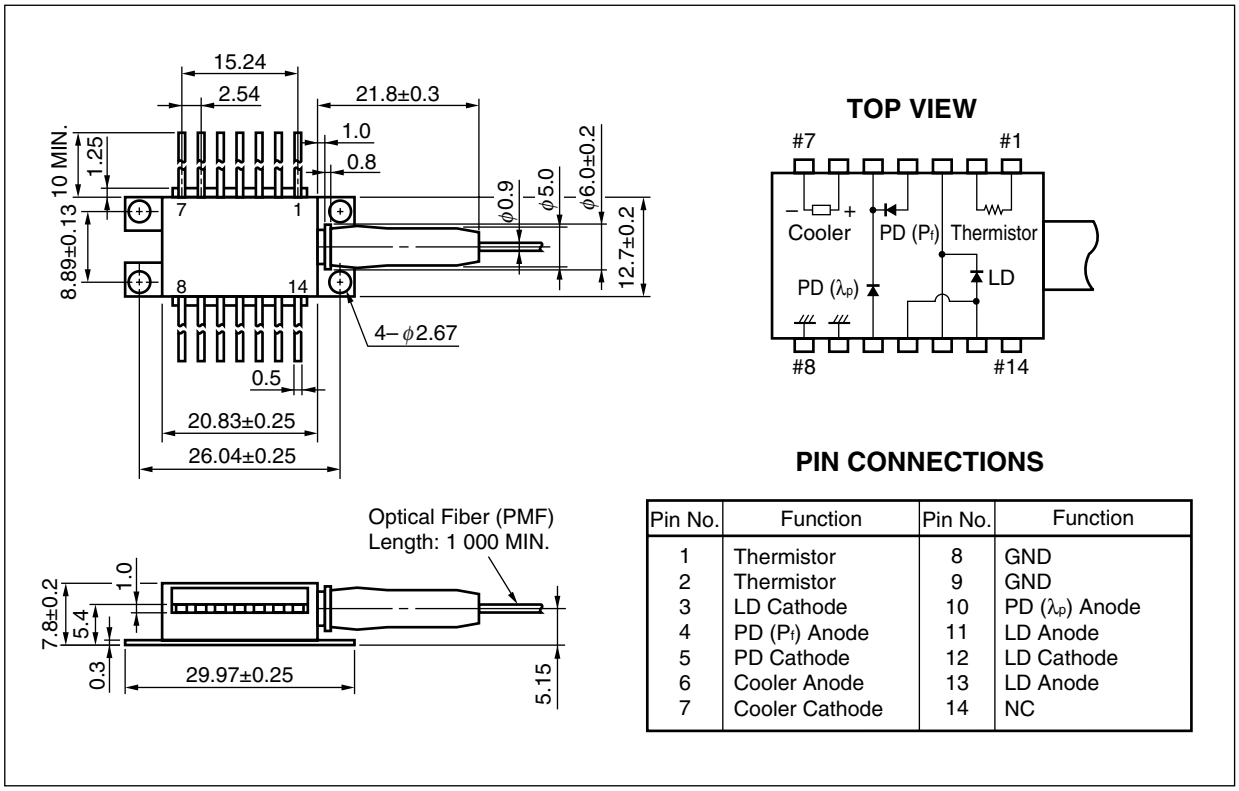
The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.
Not all devices/types available in every country. Please check with local NEC Compound Semiconductor Devices representative for availability and additional information.

Document No. PL10276EJ02V0DS (2nd edition)
Date Published September 2005 CP(K)
Printed in Japan

The mark ★ shows major revised points.

© NEC Compound Semiconductor Devices, Ltd. 2003, 2005

★ **PACKAGE DIMENSIONS (UNIT : mm)**

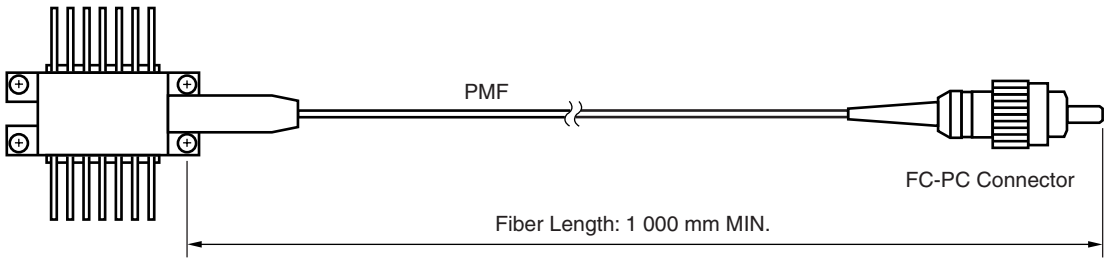


PIN CONNECTIONS

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	25	mm
Fiber Length	1 000 MIN.	mm



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 ($T_{LD} = T_{set}$, T_C = –5 to +70°C, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Laser Set Temperature	T_{set}	8 channel tunable	5		55	°C
Forward Voltage	V_F	P_f = 20 mW	0.9	1.2	2.5	V
Threshold Current	I_{th}			20	40	mA
Operation Current	I_{op}	P_f = 20 mW		120	167	mA
Optical Output Power from Fiber	P_f	I_F = 167 mA, $T_{LD} = T_{set}$	20			mW
Peak Emission Wavelength	λ_p	P_f = 20 mW, CW, $T_{LD} = T_{set}$	1 530	ITU-T[*1]	1 609	nm
Wevelength Stability	–	$T_{LD} = T_{set}$, applicable to wavelength monitor, E.O.L	–20		+20	pm
Spectral Line Width	$\Delta\nu$	P_f = 20 mW, CW, 3 dB down		1	2	MHz
Side Mode Suppression Ratio	SMSR	P_f = 20 mW, CW	35	45		dB
Relative Intensity Noise	RIN	P_f = 20 mW, 20 MHz to 3 GHz			–150	dB/Hz
Isolation	I_s		30			dB
Polarization Extinction Ratio[*2]	ext	P_f = 20 mW, CW	20			dB

***1** Available for DWDM wavelengths based on ITU-T recommendations (50 GHz grid, please refer to the **ORDERING INFORMATION**)

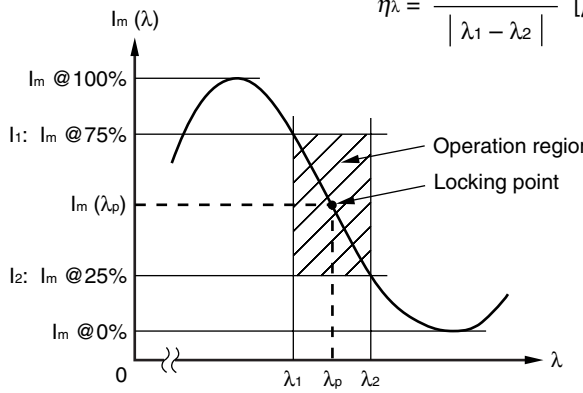
***2** Polarization state of LD is aligned parallel to the slow axis.

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

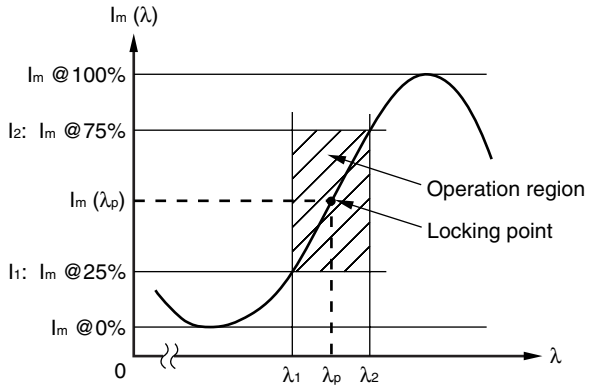
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Monitor Current (P_f Monitor)	I_m (P_f)	P_f = 20 mW, V_R = 5 V	30		300	μA
Monitor Current (λ_p Monitor)	I_m (λ_p)	P_f = 20 mW, V_R = 5 V, Locking point	15		150	μA
Operation Region *1	I_m (λ)		25		75	%
	$\lvert\lambda_1-\lambda_2\rvert$		90			pm
Discrimination Slope *1	η_λ		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

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

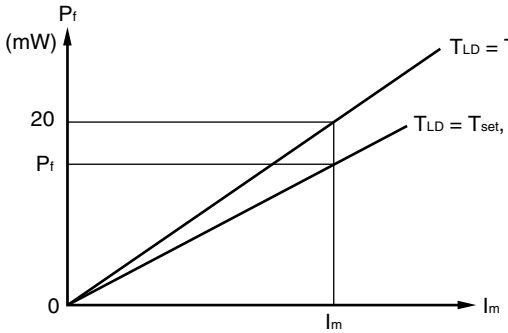


Negative Slope (Odd channel)



Positive Slope (Even channel)

***2** Tracking Error: γ



$$\gamma = \left| 10 \log \frac{P_f}{20} \right| \ [dB]$$

ELECTRO-OPTICAL CHARACTERISTICS (Applicable to Thermistor and TEC: $T_{LD} = T_{set}$, 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	T_{LD} = 25°C	3 350	3 450	3 550	K
Cooler Current	I_C	$\Delta T = 70 - T_{set}$, P_f = 20 mW			1.5	A
Cooler Voltage	V_C	$\Delta T = 70 - T_{set}$, P_f = 20 mW			3.0	V

ORDERING INFORMATION

NX8570SC □□□ Q-BA

- With FC-PC connector
- 8 channel tunable
- Wavelength code : Refer to **Table A**
- Anode froating

Table A: DWDM wavelength base on ITU-T recommendations (@ T_{LD} = T_{set}) (1/7)

Wavelength Code 8 channel tunable	ITU-T Wavelength *1 (nm)	Frequency (THz)	Monitor Slope
330Q	1 530.33	195.90	Negative
	1 530.72	195.85	Positive
	1 531.11	195.80	Negative
	1 531.50	195.75	Positive
	1 531.89	195.70	Negative
	1 532.29	195.65	Positive
	1 532.68	195.60	Negative
	1 533.07	195.55	Positive
362Q	1 533.46	195.50	Negative
	1 533.85	195.45	Positive
	1 534.25	195.40	Negative
	1 534.64	195.35	Positive
	1 535.03	195.30	Negative
	1 535.42	195.25	Positive
	1 535.82	195.20	Negative
	1 536.21	195.15	Positive
393Q	1 536.60	195.10	Negative
	1 537.00	195.05	Positive
	1 537.39	195.00	Negative
	1 537.79	194.95	Positive
	1 538.18	194.90	Negative
	1 538.58	194.85	Positive
	1 538.97	194.80	Negative
	1 539.37	194.75	Positive

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

Table A: DWDM wavelength base on ITU-T recommendations (@ $T_{LD} = T_{set}$) (2/7)

Wavelength Code 8 channel tunable	ITU-T Wavelength *1 (nm)	Frequency (THz)	Monitor Slope
425Q	1 539.76	194.70	Negative
	1 540.16	194.65	Positive
	1 540.55	194.60	Negative
	1 540.95	194.55	Positive
	1 541.34	194.50	Negative
	1 541.74	194.45	Positive
	1 542.14	194.40	Negative
	1 542.53	194.35	Positive
457Q	1 542.93	194.30	Negative
	1 543.33	194.25	Positive
	1 543.73	194.20	Negative
	1 544.12	194.15	Positive
	1 544.52	194.10	Negative
	1 544.92	194.05	Positive
	1 545.32	194.00	Negative
	1 545.72	193.95	Positive
489Q	1 546.11	193.90	Negative
	1 546.51	193.85	Positive
	1 546.91	193.80	Negative
	1 547.31	193.75	Positive
	1 547.71	193.70	Negative
	1 548.11	193.65	Positive
	1 548.51	193.60	Negative
	1 548.91	193.55	Positive
521Q	1 549.31	193.50	Negative
	1 549.71	193.45	Positive
	1 550.11	193.40	Negative
	1 550.51	193.35	Positive
	1 550.91	193.30	Negative
	1 551.31	193.25	Positive
	1 551.72	193.20	Negative
	1 552.12	193.15	Positive

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

Table A: DWDM wavelength base on ITU-T recommendations (@ $T_{LD} = T_{set}$) (3/7)

Wavelength Code 8 channel tunable	ITU-T Wavelength *1 (nm)	Frequency (THz)	Monitor Slope
553Q	1 552.52	193.10	Negative
	1 552.92	193.05	Positive
	1 553.32	193.00	Negative
	1 553.73	192.95	Positive
	1 554.13	192.90	Negative
	1 554.53	192.85	Positive
	1 554.94	192.80	Negative
	1 555.34	192.75	Positive
585Q	1 555.74	192.70	Negative
	1 556.15	192.65	Positive
	1 556.55	192.60	Negative
	1 556.95	192.55	Positive
	1 557.36	192.50	Negative
	1 557.76	192.45	Positive
	1 558.17	192.40	Negative
	1 558.57	192.35	Positive
618Q	1 558.98	192.30	Negative
	1 559.38	192.25	Positive
	1 559.79	192.20	Negative
	1 560.20	192.15	Positive
	1 560.60	192.10	Negative
	1 561.01	192.05	Positive
	1 561.41	192.00	Negative
	1 561.82	191.95	Positive
650Q	1 562.23	191.90	Negative
	1 562.64	191.85	Positive
	1 563.04	191.80	Negative
	1 563.45	191.75	Positive
	1 563.86	191.70	Negative
	1 564.27	191.65	Positive
	1 564.67	191.60	Negative
	1 565.08	191.55	Positive

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

Table A: DWDM wavelength base on ITU-T recommendations (@ $T_{LD} = T_{set}$) (4/7)

Wavelength Code 8 channel tunable	ITU-T Wavelength *1 (nm)	Frequency (THz)	Monitor Slope
683Q	1 565.49	191.50	Negative
	1 565.90	191.45	Positive
	1 566.31	191.40	Negative
	1 566.72	191.35	Positive
	1 567.13	191.30	Negative
	1 567.54	191.25	Positive
	1 567.95	191.20	Negative
	1 568.36	191.15	Positive
716Q	1 568.77	191.10	Negative
	1 569.18	191.05	Positive
	1 569.59	191.00	Negative
	1 570.00	190.95	Positive
	1 570.41	190.90	Negative
	1 570.82	190.85	Positive
	1 571.23	190.80	Negative
	1 571.65	190.75	Positive
749Q	1 572.06	190.70	Negative
	1 572.47	190.65	Positive
	1 572.88	190.60	Negative
	1 573.30	190.55	Positive
	1 573.71	190.50	Negative
	1 574.12	190.45	Positive
	1 574.54	190.40	Negative
	1 574.95	190.35	Positive
782Q	1 575.36	190.30	Negative
	1 575.78	190.25	Positive
	1 576.19	190.20	Negative
	1 576.61	190.15	Positive
	1 577.02	190.10	Negative
	1 577.44	190.05	Positive
	1 577.85	190.00	Negative
	1 578.27	189.95	Positive

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

Table A: DWDM wavelength base on ITU-T recommendations (@ $T_{LD} = T_{set}$) (5/7)

Wavelength Code 8 channel tunable	ITU-T Wavelength *1 (nm)	Frequency (THz)	Monitor Slope
816Q	1 578.68	189.90	Negative
	1 579.10	189.85	Positive
	1 579.51	189.80	Negative
	1 579.93	189.75	Positive
	1 580.35	189.70	Negative
	1 580.76	189.65	Positive
	1 581.18	189.60	Negative
	1 581.60	189.55	Positive
849Q	1 582.01	189.50	Negative
	1 582.43	189.45	Positive
	1 582.85	189.40	Negative
	1 583.27	189.35	Positive
	1 583.69	189.30	Negative
	1 584.10	189.25	Positive
	1 584.52	189.20	Negative
	1 584.94	189.15	Positive
883Q	1 585.36	189.10	Negative
	1 585.78	189.05	Positive
	1 586.20	189.00	Negative
	1 586.62	188.95	Positive
	1 587.04	188.90	Negative
	1 587.46	188.85	Positive
	1 587.88	188.80	Negative
	1 588.30	188.75	Positive
916Q	1 588.72	188.70	Negative
	1 589.14	188.65	Positive
	1 589.56	188.60	Negative
	1 589.98	188.55	Positive
	1 590.41	188.50	Negative
	1 590.83	188.45	Positive
	1 591.25	188.40	Negative
	1 591.67	188.35	Positive

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

Table A: DWDM wavelength base on ITU-T recommendations (@ $T_{LD} = T_{set}$) (6/7)

Wavelength Code 8 channel tunable	ITU-T Wavelength *1 (nm)	Frequency (THz)	Monitor Slope
950Q	1 592.10	188.30	Negative
	1 592.52	188.25	Positive
	1 592.94	188.20	Negative
	1 593.36	188.15	Positive
	1 593.79	188.10	Negative
	1 594.21	188.05	Positive
	1 594.64	188.00	Negative
	1 595.06	187.95	Positive
984Q	1 595.48	187.90	Negative
	1 595.91	187.85	Positive
	1 596.33	187.80	Negative
	1 596.76	187.75	Positive
	1 597.18	187.70	Negative
	1 597.61	187.65	Positive
	1 598.04	187.60	Negative
	1 598.46	187.55	Positive
6018Q	1 598.89	187.50	Negative
	1 599.32	187.45	Positive
	1 599.74	187.40	Negative
	1 600.17	187.35	Positive
	1 600.60	187.30	Negative
	1 601.02	187.25	Positive
	1 601.45	187.20	Negative
	1 601.88	187.15	Positive
6053Q	1 602.31	187.10	Negative
	1 602.74	187.05	Positive
	1 603.16	187.00	Negative
	1 603.59	186.95	Positive
	1 604.02	186.90	Negative
	1 604.45	186.85	Positive
	1 604.88	186.80	Negative
	1 605.31	186.75	Positive

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

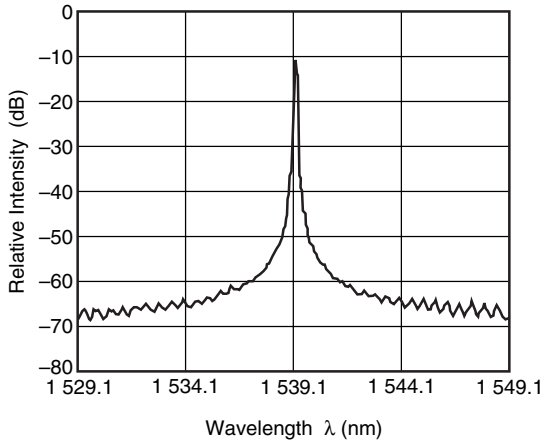
Table A: DWDM wavelength base on ITU-T recommendations (@ $T_{LD} = T_{set}$) (7/7)

Wavelength Code 8 channel tunable	ITU-T Wavelength *1 (nm)	Frequency (THz)	Monitor Slope
6087Q	1 605.74	186.70	Negative
	1 606.17	186.65	Positive
	1 606.60	186.60	Negative
	1 607.03	186.55	Positive
	1 607.46	186.50	Negative
	1 607.89	186.45	Positive
	1 608.32	186.40	Negative
	1 608.76	186.35	Positive

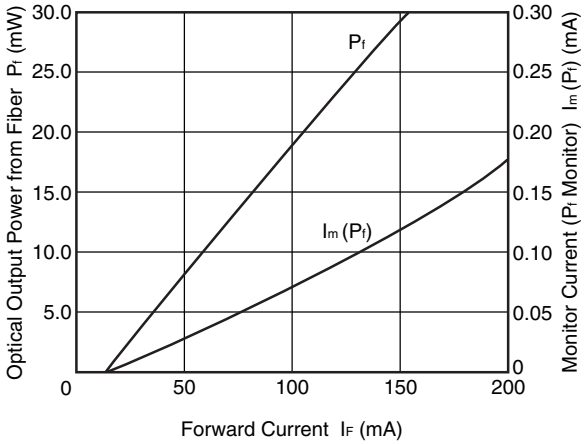
***1** The value which omitted and computed the 3rd place below the decimal point

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

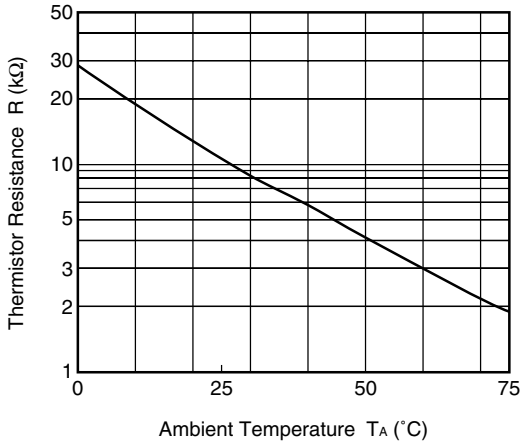
SPECTRUM



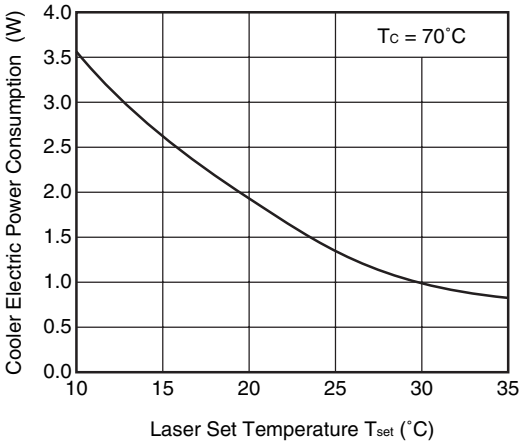
OPTICAL OUTPUT POWER FROM FIBER, MONITOR CURRENT (P_f MONITOR) vs. FORWARD CURRENT



THERMISTOR RESISTANCE vs. AMBIENT TEMPERATURE



COOLER ELECTRIC POWER CONSUMPTION vs. LASER SET TEMPERATURE



Remark The graphs indicate nominal characteristics.

REFERENCE

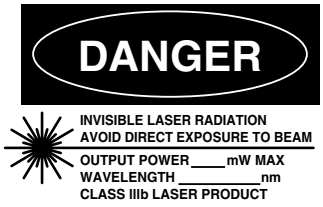
Document Name	Document No.
OPTICAL SEMICONDUCTOR DEVICES FOR FIBEROPTIC COMMUNICATIONS SELECTION GUIDE	PL10161E
Opto-Electronics Devices Pamphlet	PX10160E

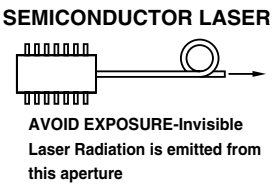
When the product(s) listed in this document is subject to any applicable import or export control laws and regulation of the authority having competent jurisdiction, such product(s) shall not be imported or exported without obtaining the import or export license.

- **The information in this document is current as of September, 2005. 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	This product uses gallium arsenide (GaAs). GaAs vapor and powder are hazardous to human health if inhaled or ingested, so please observe the following points. • Follow related laws and ordinances when disposing of the product. If there are no applicable laws and/or ordinances, dispose of the product as recommended below. 1. Commission a disposal company able to (with a license to) collect, transport and dispose of materials that contain arsenic and other such industrial waste materials. 2. Exclude the product from general industrial waste and household garbage, and ensure that the product is controlled (as industrial waste subject to special control) up until final disposal. • Do not burn, destroy, cut, crush, or chemically dissolve the product. • Do not lick the product or in any way allow it to enter the mouth.
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.

▶**For further information, please contact**

NEC Compound Semiconductor Devices, Ltd. **http://www.ncsd.necel.com/**
E-mail: salesinfo@ml.ncsd.necel.com (sales and general)
techinfo@ml.ncsd.necel.com (technical)
Sales Division TEL: +81-44-435-1573 FAX: +81-44-435-1579

NEC Compound Semiconductor Devices Hong Kong Limited
E-mail: ncsd-hk@elhk.nec.com.hk (sales, technical and general)
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: +82-2-558-2120 FAX: +82-2-558-5209

NEC Electronics (Europe) GmbH **http://www.ee.nec.de/**
TEL: +49-211-6503-0 FAX: +49-211-6503-1327

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

0504