DATA SHEET

NEC

LASER DIODE

NX8504BE-CC,NX8504CE-CC

1 550 nm InGaAsP MQW-DFB LASER DIODE COAXIAL MODULE FOR 622 Gb/s

DESCRIPTION

The NX8504BE-CC and NX8504CE-CC are 1 550 nm Multiple Quantum Well (MQW) structured Distributed Feed-Back (DFB) laser diode coaxial modules with an internal optical isolator.

These modules are ideal as a light source for Synchronous Digital Hierarchy (SDH) system, STM-4, long-haul L-4.2, L-4.3 ITU-T recommendations.

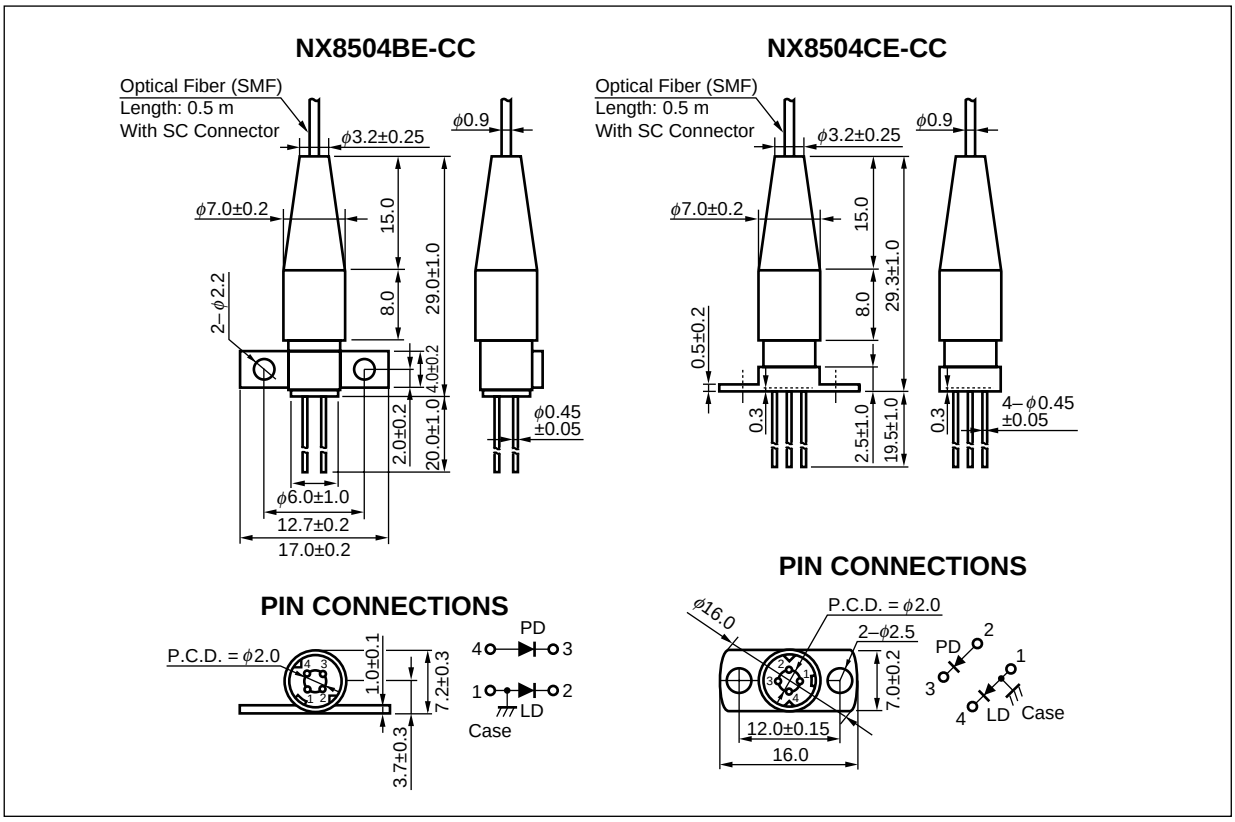
FEATURES

- Internal optical isolator
- Peak emission wavelength λ_p = 1 550 nm
- Optical output power P_f = 2.0 mW
- Wide operating temperature range T_C = –10 to +85°C
- InGaAs monitor PIN-PD
- With SC-UPC connector
- Based on Telcordia reliability

Document No. PL10177EJ01V0DS (1st edition)
(Previous No. P15233EJ2V0DS00)
Date Published July 2002 CP(K)
Printed in Japan

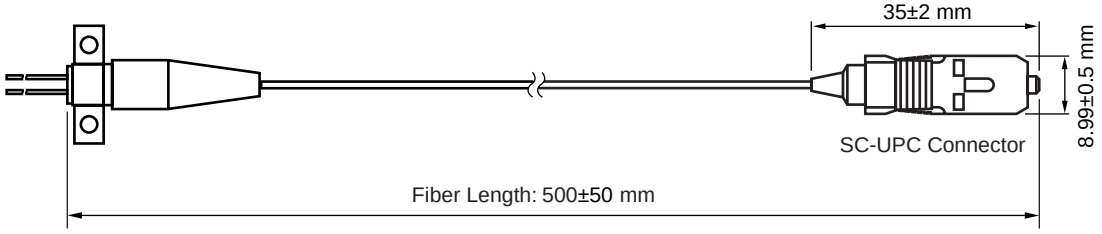
The mark ★ shows major revised points.

PACKAGE DIMENSIONS (UNIT : mm)



OPTICAL FIBER CHARACTERISTICS

Parameter	Specification	Unit
Mode Field Diameter	9.5±1	μm
Cladding Diameter	125±2	μm
Maximum Cladding Noncircularity	2	%
Maximum Core/Cladding Concentricity	1.6	%
Outer Diameter	0.9±0.1	mm
Cut-off Wavelength	1 100 to 1 270	nm
Minimum Fiber Bending Radius	30	mm
Fiber Length	500±50	mm
Flammability	UL1581 VW-1	



ORDERING INFORMATION

Part Number	Flange Type	Available Connector
NX8504BE-CC	Flat Mount Flange	With SC-UPC Connector
NX8504CE-CC	Vertical Mount Flange	

ABSOLUTE MAXIMUM RATINGS

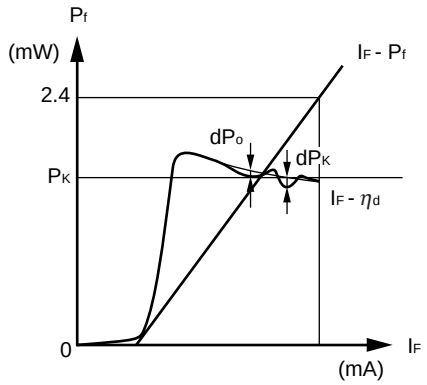
Parameter	Symbol	Ratings	Unit
Optical Output Power from Fiber	P_f	5	mW
Forward Current of LD	I_F	150	mA
Reverse Voltage of LD	V_R	2.0	V
Forward Current of PD	I_F	2.0	mA
Reverse Voltage of PD	V_R	15	V
Operating Case Temperature	T_C	−10 to +85	°C
Storage Temperature	T_{stg}	−40 to +85	°C
Lead Soldering Temperature	T_{sld}	260 (10 sec.)	°C
Relative Humidity (noncondensing)	RH	85	%

ELECTRO-OPTICAL CHARACTERISTICS (T_C = –10 to +85ºC, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Optical Output Power from Fiber	P_f	CW		2.0		mW
Operating Voltage	V_{op}	P_f = 2.0 mW		1.1	1.6	V
Threshold Current	I_{th}	T_C = 25°C		15	25	mA
			2		50	
Threshold Output Power	P_{th}	$I_F = I_{th}$			100	μW
Modulation Current	I_{mod}	P_f = 2.0 mW, T_C = 25°C	11	20	35	mA
		P_f = 2.0 mW	9		55	
Differential Efficiency	η_d	P_f = 2.0 mW, T_C = 25°C	0.060	0.100	0.150	W/A
		P_f = 2.0 mW	0.036		0.200	
Temperature Dependence of Differential Efficiency	$\Delta\eta_d$	$\Delta\eta_d = 10 \log \frac{\eta_d\ (@\ T_C\ °C)}{\eta_d\ (@\ 25°C)}$	–3	–1.6		dB
Kink (Refer to **DEFINITIONS**)	kink	P_f = Up to 2.4 mW			±20	%
Peak Emission Wavelength	λ_p	P_f = 2.0 mW	1 530	1 550	1 570	nm
Temperature Dependence of Peak Emission Wavelength	$\Delta\lambda/\Delta T$			0.10	0.12	nm/°C
Spectral Width	$\Delta\lambda$	P_f = 2.0 mW, –20 dB down width		0.3	1.0	nm
Side Mode Suppression Ratio	SMSR	P_f = 2.0 mW	30	40		dB
Rise Time	t_r	10-90%, P_{pk} = 2.0 mW, $I_F = I_{th}$			0.5	ns
Fall Time	t_f	90-10%, P_{pk} = 2.0 mW, $I_F = I_{th}$			0.5	ns
Monitor Current	I_m	V_R = 5 V, P_f = 2.0 mW	200	1 000	2 000	μA
Monitor Dark Current	I_D	V_R = 5 V, T_C = 25°C		1.0	50	nA
		V_R = 5 V		10	500	
Monitor PD Terminal Capacitance	C_t	V_R = 5 V, f = 1 MHz		1.0	20	pF
Linearity (Refer to **DEFINITIONS**)	LIN_m	V_R = 5 V, P_f = 0.2 to 2.0 mW			10	%
Tracking Error (Refer to **DEFINITIONS**)	γ	I_m = const.		0.5	1.0	dB

★ PARAMETER DEFINITIONS

Kink : kink

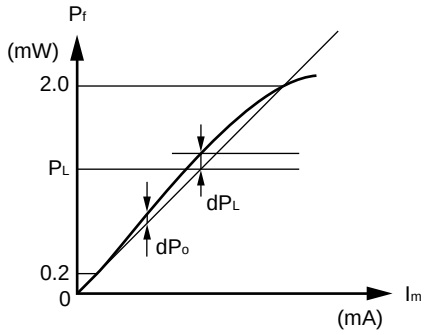


$$\text{kink} = \frac{|dP_K|}{P_K} \times 100\ [\%]$$

$dP_K = dP_o$ MAX.

$P_K \leq 2.4$ (mW)

Linearity : LIN_m

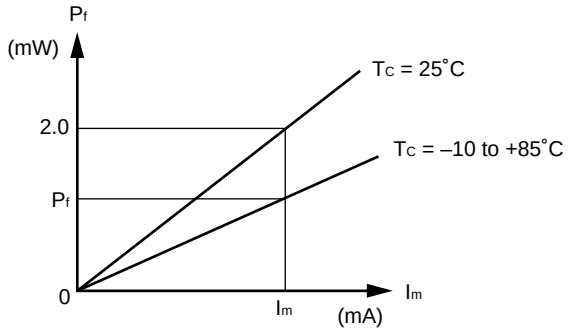


$$LIN_m = \frac{|dP_L|}{P_L} \times 100\ [\%]$$

$dP_L = dP_o$ MAX.

$0.2 < P_L < 2.0$ (mW)

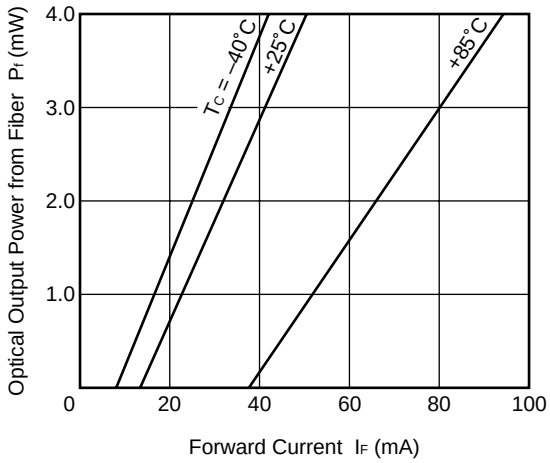
Tracking Error : γ



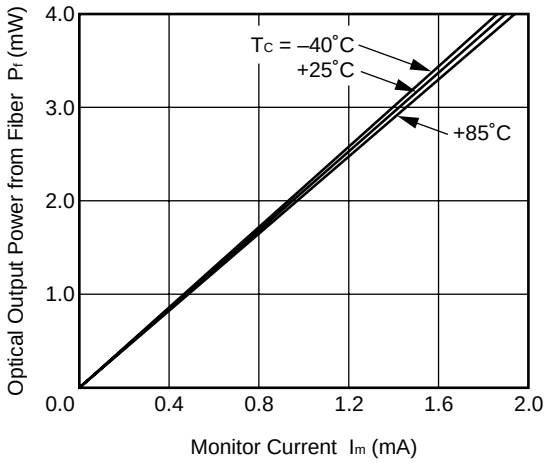
$$\gamma = \left| 10 \log \frac{P_f}{2.0} \right| [\text{dB}]$$

TYPICAL CHARACTERISTICS (T_C = 25°C, unless otherwise specified)

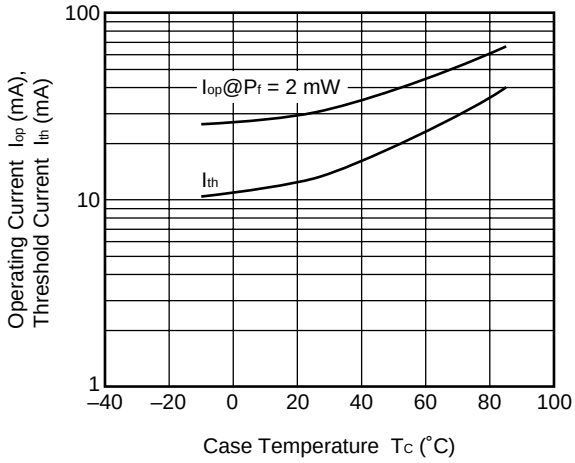
OPTICAL OUTPUT POWER FROM FIBER vs. FORWARD CURRENT



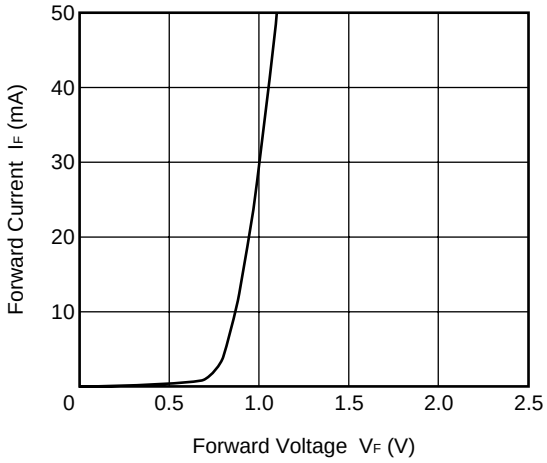
OPTICAL OUTPUT POWER FROM FIBER vs. MONITOR CURRENT



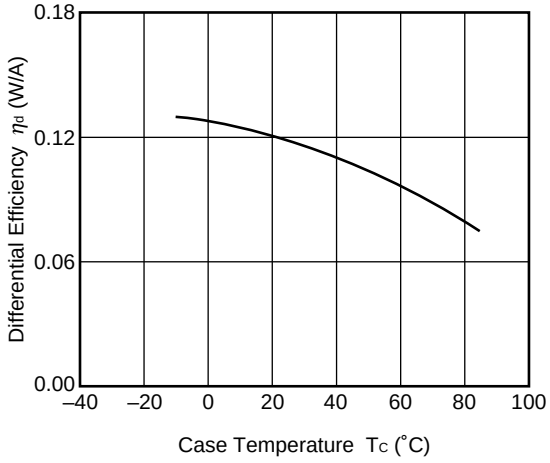
OPERATING CURRENT AND THRESHOLD CURRENT vs. CASE TEMPERATURE



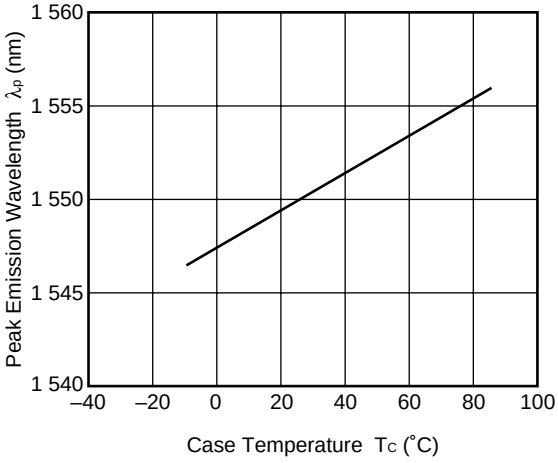
FORWARD CURRENT vs. FORWARD VOLTAGE



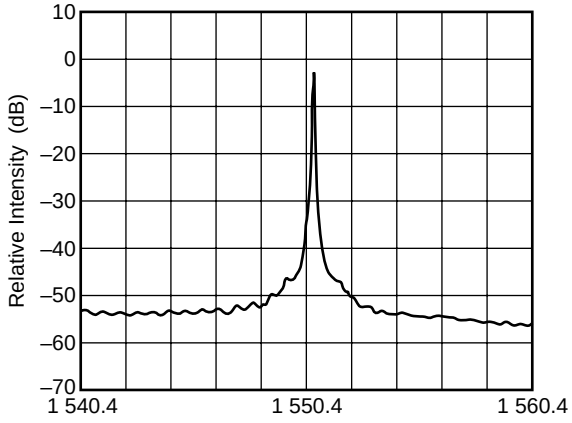
TEMPERATURE DEPENEDENCE OF DIFFERENTIAL EFFICIENCY



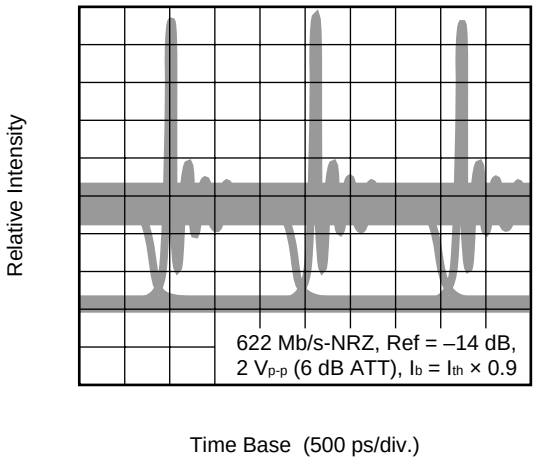
TEMPERATURE DEPENDENCE OF PEAK EMISSION WAVELENGTH



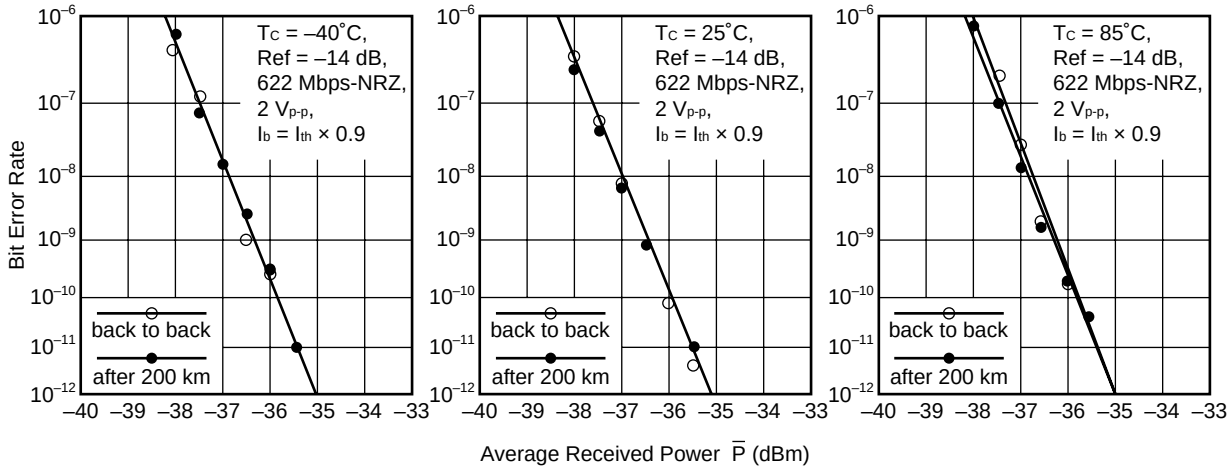
SPECTRUM



EYE DIAGRAM



ERROR RATE CHARACTERISTICS



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
★	NX8304BE-CC NX8304CE-CC	–40 to +85	–40 to +85	15	2 *1	1 310	For fiberoptic communications	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

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

- **The information in this document is current as of July, 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.

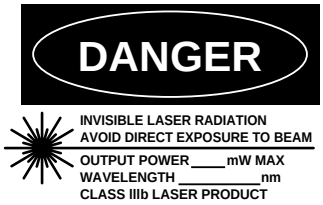
  (Note)

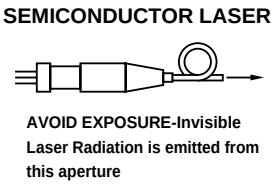
  (1) "NEC" as used in this statement means NEC Corporation, NEC Compound Semiconductor Devices, Ltd. and also includes its majority-owned subsidiaries.

  (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