NEC

LASER DIODE
NX6504 Series

1 550 nm FOR 156 Mb/s, 622 Mb/s
InGaAsP MQW-DFB LASER DIODE

DESCRIPTION

The NX6504 Series is a 1 550 nm Multiple Quantum Well (MQW) structured Distributed Feed-Back (DFB) laser diode with InGaAs monitor PIN-PD. This device is ideal for Synchronous Digital Hierarchy (SDH) system, STM-1, STM-4, ITU-T recommendations.

NX6504S Series

NX6504G Series

FEATURES

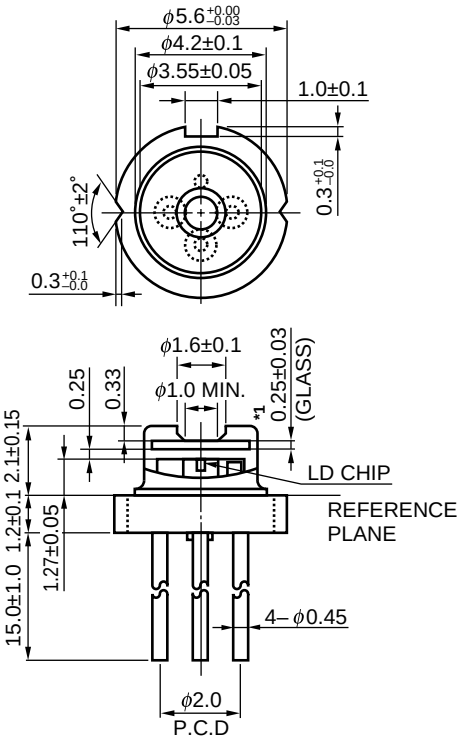
- Optical output power P_o = 5.0 mW
- Low threshold current I_{th} = 12 mA
- High speed t_r, t_f = 0.5 ns MAX.
- SMSR 45 dB
- Wide operating temperature range T_C = –10 to +85°C
- InGaAs monitor PIN-PD
- CAN package ϕ 5.6 mm
- Based on Telcordia reliability

Document No. PL10069EJ02V0DS (2nd edition)
Date Published November 2002 CP(K)
Printed in Japan

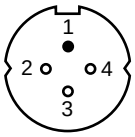
The mark ★ shows major revised points.

PACKAGE DIMENSIONS (UNIT: mm)

NX6504S Series

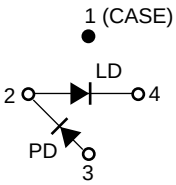


BOTTOM VIEW

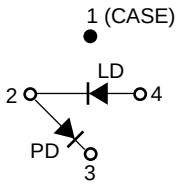


PIN CONNECTIONS

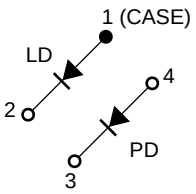
NX6504SH



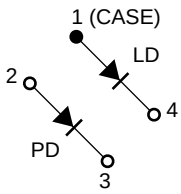
NX6504SI



NX6504SJ



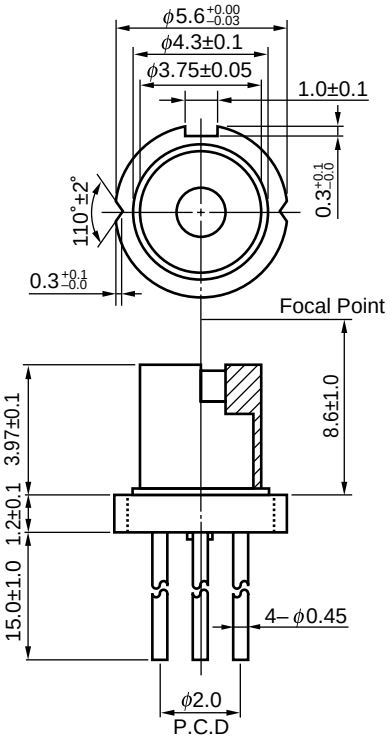
NX6504SK



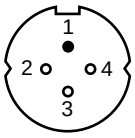
***1** n = 1.48 Bolosilicate Glass

★

NX6504G Series

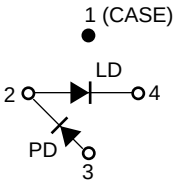


BOTTOM VIEW

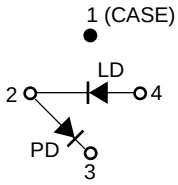


PIN CONNECTIONS

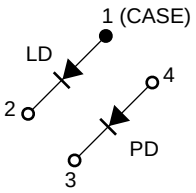
NX6504GH



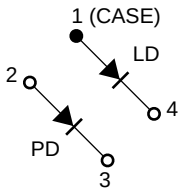
NX6504GI



NX6504GJ

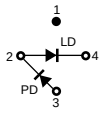
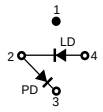
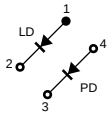
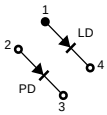


NX6504GK

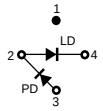
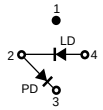
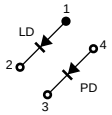
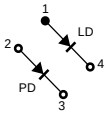


ORDERING INFORMATION

NX6504S Series

Part Number	Package	Pin Connections
NX6504SH	4-pin CAN with flat glass cap	
NX6504SI		
NX6504SJ		
NX6504SK		

NX6504G Series

Part Number	Package	Pin Connections
NX6504GH	4-pin CAN with aspherical lens cap	
NX6504GI		
NX6504GJ		
NX6504GK		

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Ratings	Unit
Optical Output Power	P_o	10	mW
Forward Current of LD	I_F	150	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	–10 to +85	°C
Storage Temperature	T_{stg}	–40 to +85	°C
Lead Soldering Temperature	T_{sld}	350 (3 sec.)	°C
Relative Humidity (noncondensing)	RH	85	%

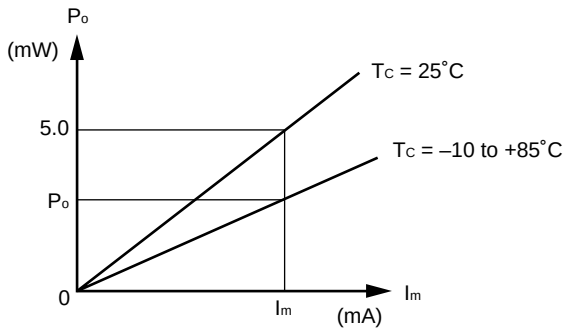
ELECTRO-OPTICAL CHARACTERISTICS (T_C = 25°C, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Operating Voltage	V_{op}	P_o = 5.0 mW, T_C = –10 to +85°C		1.0	1.5	V
Threshold Current	I_{th}			12	25	mA
		T_C = 85°C		35	50	
Threshold Output Power	P_{th}	T_C = –10 to +85°C, I_F = I_{th}			200	μW
Differential Efficiency	η_d		0.15	0.25		W/A
Temperature Dependence of Differential Efficiency	$\Delta\eta_d$	$\Delta\eta_d = 10 \log \frac{\eta_d \text{ (@ 85°C)}}{\eta_d \text{ (@ 25°C)}}$	–3.0	–1.5		dB
Peak Emission Wavelength	λ_p	P_o = 5.0 mW, RMS (–20 dB) T_C = –10 to +85°C	1 530		1 570	nm
Side Mode Suppression Ratio	SMSR	P_o = 5.0 mW, T_C = –10 to +85°C	30	45		dB
Vertical Beam Angle[*1]	$\theta_\perp$	P_o = 5.0 mW, FAHM[*2]		30	40	deg.
Lateral Beam Angle[*1]	$\theta_{//}$	P_o = 5.0 mW, FAHM[*2]		25	35	deg.
Rise Time	t_r	10-90%		0.05	0.5	ns
Fall Time	t_f	90-10%		0.2	0.5	ns
★ Monitor Current	I_m	V_R = 5 V, P_o = 5.0 mW	200	600	1 000	μA
Monitor Dark Current	I_D	V_R = 5 V		0.1	10	nA
		V_R = 5 V, T_C = –10 to +85°C			500	
Monitor PD Terminal Capacitance	C_t	V_R = 5 V, f = 1 MHz		6	20	pF
Tracking Error[*3]	γ	I_m = const. (@ P_o = 5.0 mW, T_C = 25°C) T_C = –10 to +85°C	–1.0		1.0	dB

***1** Applicable to only NX6504S Series

***2** FAHM: Full Angle at Half Maximum

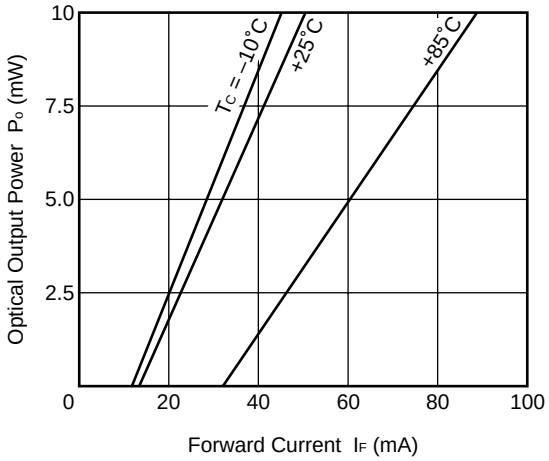
***3** Tracking Error: γ



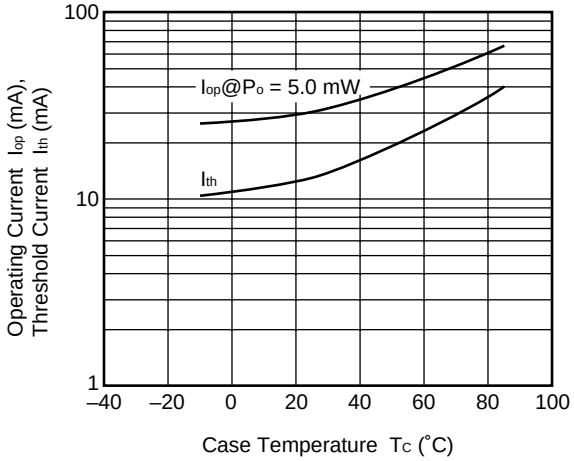
$$\gamma = \left| 10 \log \frac{P_o}{5.0} \right| \text{[dB]}$$

★ TYPICAL CHARACTERISTICS (T_C = –10 to +85°C)

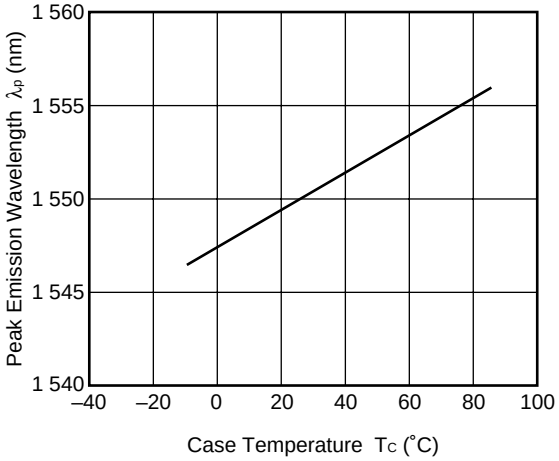
OPTICAL OUTPUT POWER vs. FORWARD CURRENT



OPERATING CURRENT AND THRESHOLD CURRENT vs. CASE TEMPERATURE



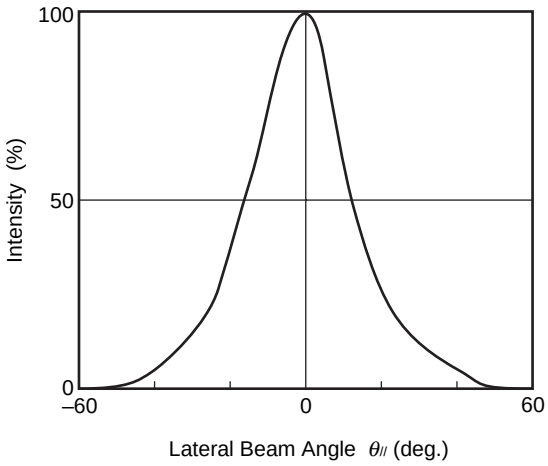
TEMPERATURE DEPENDENCE OF PEAK EMISSION WAVELENGTH



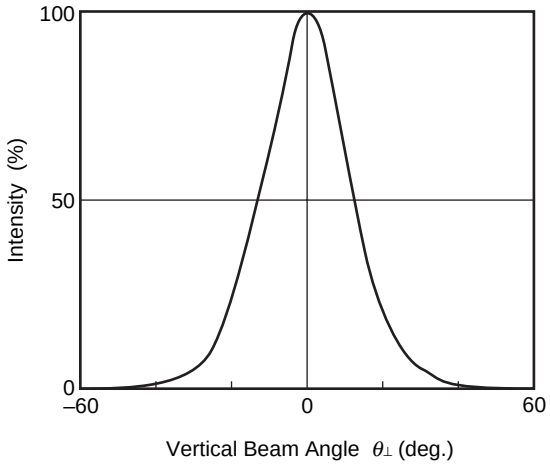
Remark The graphs indicate nominal characteristics.

★ TYPICAL CHARACTERISTICS (T_C = 25°C)

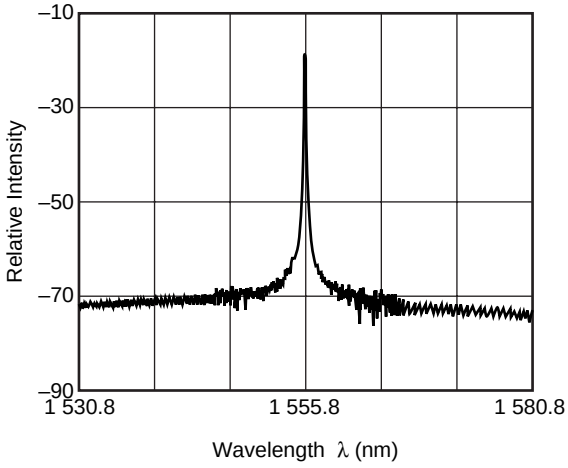
FAR FIELD PATTERN ($\theta_{//}$)
(NX6504S SERIES ONLY)



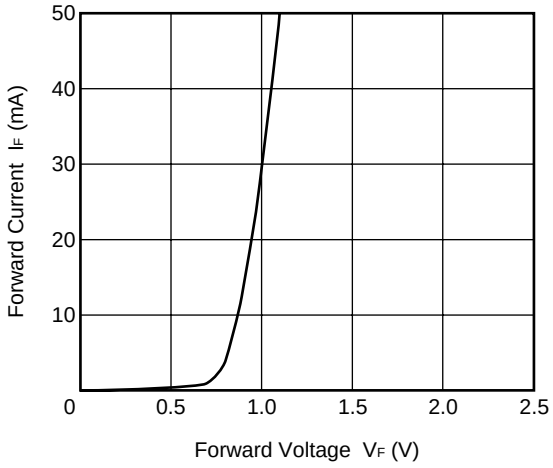
FAR FIELD PATTERN ($\theta_{\perp}$)
(NX6504S SERIES ONLY)



SPECTRUM



FORWARD CURRENT vs.
FORWARD VOLTAGE



Remark The graphs indicate nominal characteristics.

LD CAN PACKAGES FAMILY FOR OPTICAL FIBER COMMUNICATIONS

Part Number	Absolute Maximum Ratings		Electro-Optical Characteristics				Application	Package
			@T_C = 25°C	@T_C				
	T_C (°C)	T_{stg} (°C)	I_{th} (mA)	P_o (mW)	λ (nm)			
			TYP.	TYP.	MIN.	MAX.		
NX5302 Series	−40 to +85	−40 to +85	10	5	1 263	1 360	156 Mb/s: STM-1 (I-1, S-1.1, L-1.1)	CAN
							622 Mb/s: STM-4 (I-4, S-4.1)	
★ NX5306 Series	−40 to +85	−40 to +85	10	5	1 263	1 360	156 Mb/s: STM-1 (I-1, S-1.1, L-1.1)	CAN
							622 Mb/s: STM-4 (I-4, S-4.1)	
★ NX5307 Series	−40 to +85	−40 to +85	10	10	1 266	1 360	2.5 Gb/s: STM-16	CAN
NX6301 Series	−40 to +85	−40 to +85	13	5	1 280	1 335	156 Mb/s: STM-1	CAN
							622 Mb/s: STM-4	
NX6504 Series	−10 to +85	−40 to +85	12	5	1 530	1 570	156 Mb/s: STM-1	CAN
							622 Mb/s: STM-4	

REFERENCE

Document Name	Document No.
OPTICAL SEMICONDUCTOR DEVICES FOR FIBEROPTIC COMMUNICATIONS SELECTION GUIDE	PX10161E
Opto-Electronics Devices Pamphlet	PX10160E
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

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

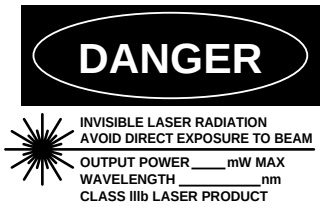
  (Note)

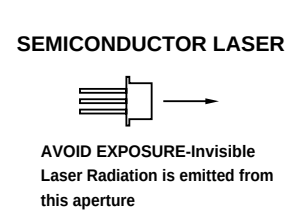
  (1) "NEC" as used in this statement means NEC Corporation, NEC Compound Semiconductor Devices, Ltd. and also includes its majority-owned subsidiaries.

  (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.

▶**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 Electronics (Europe) GmbH http://www.ee.nec.de/
TEL: +49-211-6503-01 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