

LASER DIODE
NX7301BA-CC, NX7301CH-CC**1 310 nm InGaAsP MQW-FP LASER DIODE**
COAXIAL MODULE FOR 156 Mb/s, 622 Mb/s**DESCRIPTION**

The NX7301BA-CC and NX7301CH-CC are 1 310 nm Multiple Quantum Well (MQW) structured Fabry-Perot (FP) laser diode coaxial modules with single mode fiber.

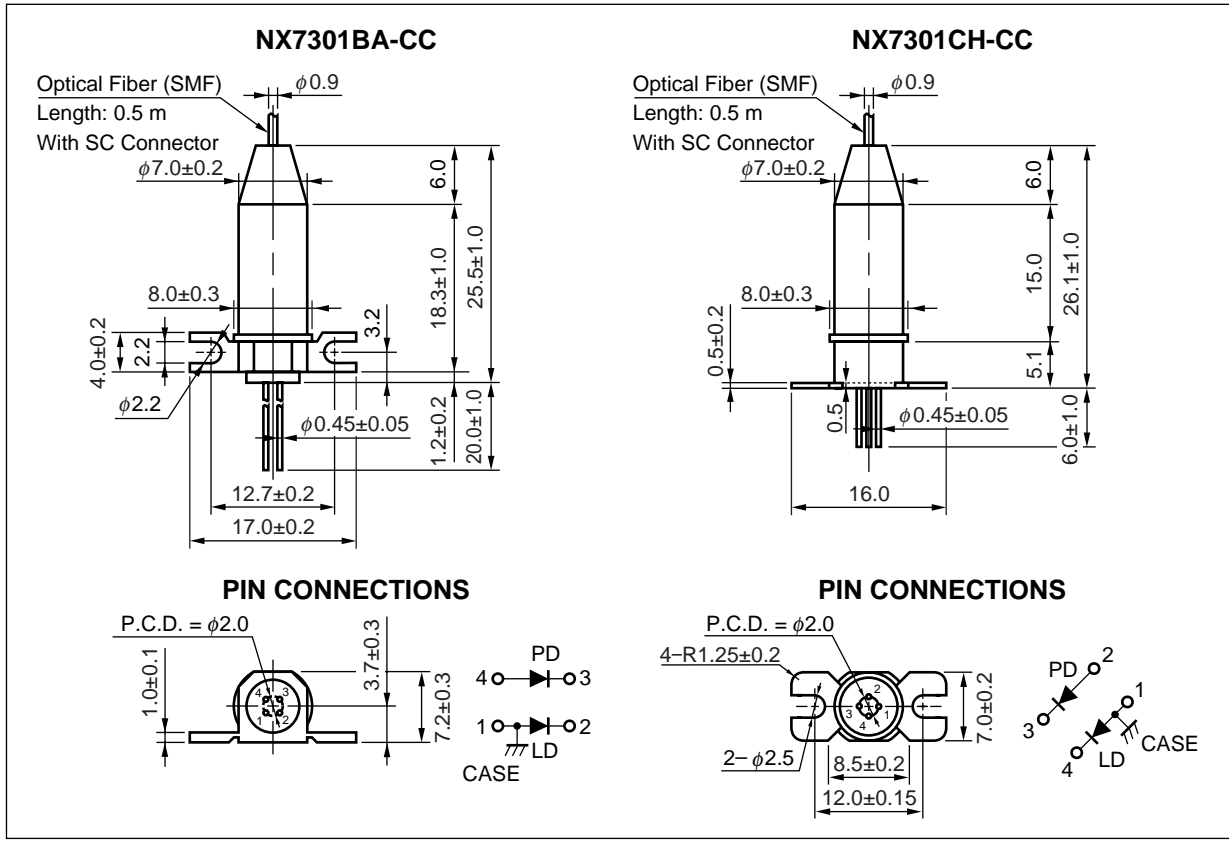
These modules are ideal as a light source for Synchronous Digital Hierarchy (SDH) system, STM-4, intraoffice I-4, and STM-1, intraoffice I-1, short-haul S-1.1 ITU-T recommendations.

FEATURES

- Center wavelength $\lambda_c = 1\ 310\ \text{nm}$
- Optical output power $P_r = 0.2\ \text{mW}$
- Low threshold current $I_{th} = 9\ \text{mA}$
- High cut-off frequency $f_c = 2.0\ \text{GHz}$
- Wide operating temperature range $T_c = -40\ \text{to}\ +85\ ^\circ\text{C}$
- InGaAs monitor PIN-PD
- With SC-UPC connector
- Based on Telcordia reliability

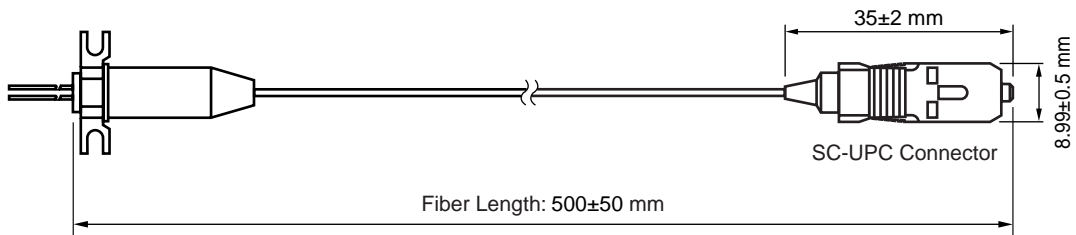
The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.
Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

★ 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
NX7301BA-CC	Flat Mount Flange	With SC-UPC Connector
NX7301CH-CC	Vertical Mount Flange	

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Ratings	Unit
Optical Output Power from Fiber	P_f	0.5	mW
Forward Current of LD	I_F	150	mA
Reverse Voltage of LD	V_R	2.0	V
Forward Current of PD	I_F	10	mA
Reverse Voltage of PD	V_R	20	V
Operating Case Temperature	T_c	-40 to +85	°C
Storage Temperature	T_{stg}	-40 to +85	°C
Lead Soldering Temperature	T_{slid}	260 (10 sec.)	°C
Relative Humidity (noncondensing)	RH	85	%

ELECTRO-OPTICAL CHARACTERISTICS ($T_c = -40$ to $+85$ °C, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Optical Output Power from Fiber	P_f			0.2		mW
Operating Voltage	V_{op}	$P_f = 0.2$ mW		1.2	1.5	V
Threshold Current	I_{th}	$T_c = 25$ °C	4	9	20	mA
			2		50	
Threshold Output Power	P_{th}	$I_F = I_{th}$			15	μW
Modulation Current	I_{mod}	$P_f = 0.2$ mW, $T_c = 25$ °C	7	15	20	mA
			5		40	
Differential Efficiency	η_d	$P_f = 0.2$ mW, $T_c = 25$ °C	0.010	0.015	0.025	W/A
			0.005		0.040	
Temperature Dependence of Differential Efficiency	$\Delta\eta_d$	$\Delta\eta_d = 10 \log \frac{\eta_d (@ T_c \text{ °C})}{\eta_d (@ 25 \text{ °C})}$	-3	-2		dB
Kink (Refer to DEFINITIONS)	kink	$P_f = U_p$ to 0.24 mW			±20	%
Center Wavelength	λ_c	$P_f = 0.2$ mW, RMS (-20 dB)	1 261	1 310	1 360	nm
Temperature Dependence of Center Wavelength	$\Delta\lambda/\Delta T$			0.4	0.5	nm/°C
Spectral Width	σ	$P_f = 0.2$ mW, RMS (-20 dB)		1.3	4.0	nm
Cut-off Frequency	f_c	-3 dB		2.0		GHz
Rise Time	t_r	10-90 %, $P_{pk} = 0.2$ mW, $I_F = I_{th}$		0.2	0.5	ns
Fall Time	t_f	90-10 %, $P_{pk} = 0.2$ mW, $I_F = I_{th}$		0.3	0.5	ns

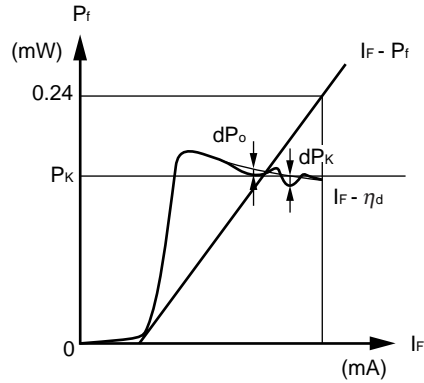
ELECTRO-OPTICAL CHARACTERISTICS

(Applicable to Monitor PD: T_c = -40 to +85 °C, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Monitor Current	I _m	V _R = 5 V, P _f = 0.2 mW	100	700	1 200	μA
Dark Current	I _D	V _R = 5 V, T _c = 25 °C		0.1	50	nA
		V _R = 5 V		10	500	
Terminal Capacitance	C _t	V _R = 5 V, f = 1 MHz			20	pF
Linearity (Refer to DEFINITIONS)	LIN _m	V _R = 5 V, P _f = 0.02 to 0.2 mW			±10	%
Tracking Error (Refer to DEFINITIONS)	γ	I _m = const.		0.5	1.0	dB

★ PARAMETER DEFINITIONS

Kink : kink

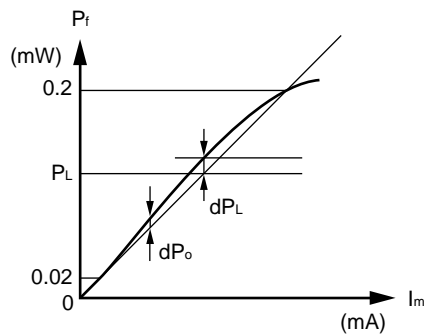


$$\text{kink} = \frac{|dP_k|}{P_k} \times 100 [\%]$$

$$dP_k = dP_o \text{ MAX.}$$

$$P_k \leq 0.24 \text{ (mW)}$$

Linearity : LIN_m

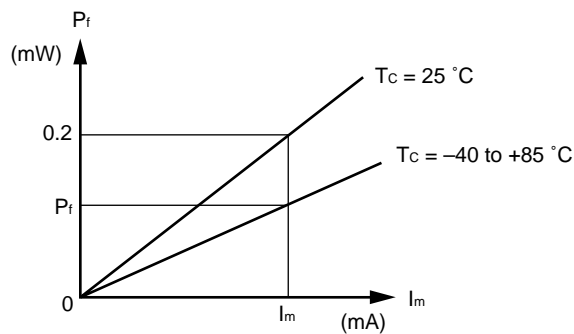


$$\text{LIN}_m = \frac{|dP_L|}{P_L} \times 100 [\%]$$

$$dP_L = dP_o \text{ MAX.}$$

$$0.02 < P_L < 0.2 \text{ (mW)}$$

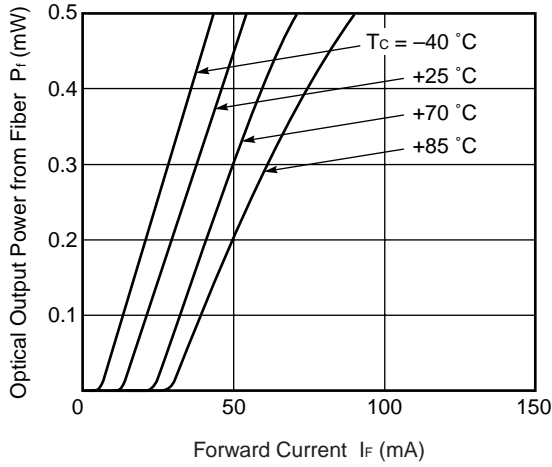
Tracking Error : γ



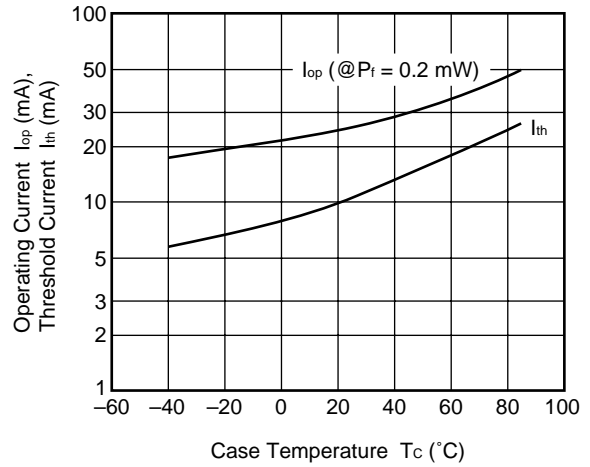
$$\gamma = \left| 10 \log \frac{P_f}{0.2} \right| [\text{dB}]$$

TYPICAL CHARACTERISTICS ($T_c = -40$ to $+85$ °C)

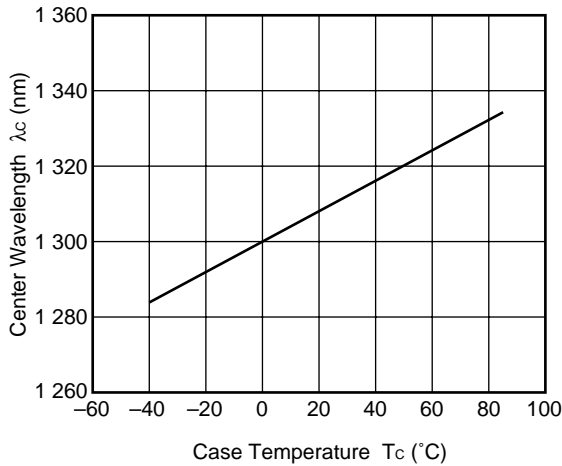
OPTICAL OUTPUT POWER FROM FIBER vs. FORWARD CURRENT



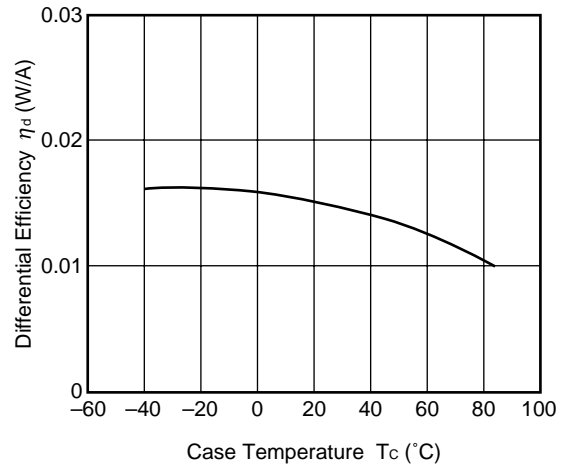
OPERATING CURRENT AND THRESHOLD CURRENT vs. CASE TEMPERATURE



TEMPERATURE DEPENDENCE OF CENTER WAVELENGTH

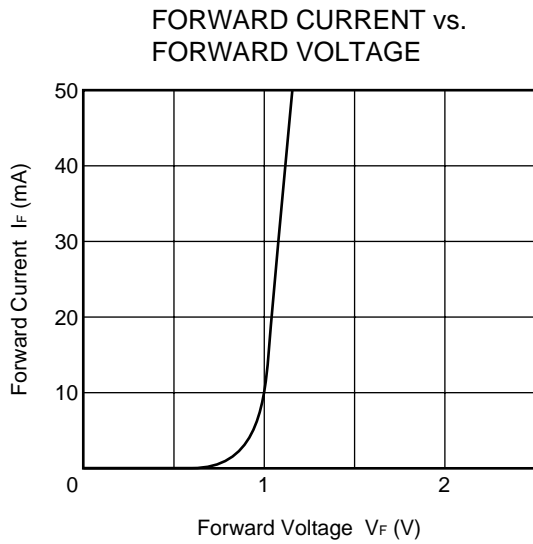
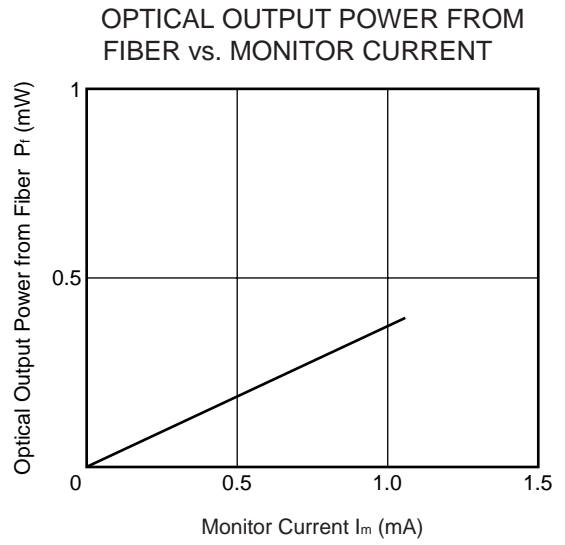
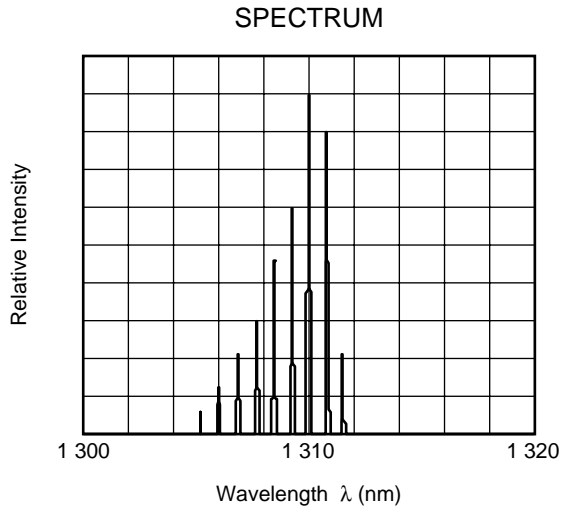


TEMPERATURE DEPENDENCE OF DIFFERENTIAL EFFICIENCY



Remark The graphs indicate nominal characteristics.

★ TYPICAL CHARACTERISTICS (T_c = 25 °C)



Remark The graphs indicate nominal characteristics.

★ FP-LD FAMILY

Part Number	Absolute Maximum Ratings		Electro-Optical Characteristics (T _c = -40 to +85 °C)				Applications	Package
	T _c (°C)	T _{stg} (°C)	P _i (mW)	λ _c (nm)		σ (nm)		
				TYP.	MIN.			
NX7300BA-CC NX7300CH-CC	-40 to +85	-40 to +85	0.7	1 266	1 360	4.0	2.5 Gb/s: STM-16 (I-16)	Coaxial
NX7301BA-CC NX7301CH-CC	-40 to +85	-40 to +85	0.2	1 261	1 360	4.0	156 Mb/s: STM-1 (I-1, S-1.1)	Coaxial
							622 Mb/s: STM-4 (I-4)	
NX7302BA-CC NX7302CH-CC	-40 to +85	-40 to +85	0.2	1 274	1 356	2.5	622 Mb/s: STM-4 (S-4.1)	Coaxial
NX7303BA-CC NX7303CH-CC	-40 to +85	-40 to +85	1.0	1 263	1 360	4.0	156 Mb/s: STM-1 (L-1.1)	Coaxial
NX7304BG-CC	-40 to +85	-40 to +85	2.0 ^{*1}	1 260	1 360	4.0	For fiberoptic communications	Coaxial

*1 MIN.

REFERENCE

Document Name	Document No.
Optical semiconductor 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

[MEMO]

SAFETY INFORMATION ON THIS PRODUCT



SEMICONDUCTOR LASER



AVOID EXPOSURE-Invisible
Laser Radiation is emitted from
this aperture

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.

<p>Warning Laser Beam</p>	<p>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.</p> <ul style="list-style-type: none"> • Do not look directly into the laser beam. • Avoid exposure to the laser beam, any reflected or collimated beam.
<p>Caution GaAs Products</p>	<p>The product contains gallium arsenide, GaAs. GaAs vapor and powder are hazardous to human health if inhaled or ingested.</p> <ul style="list-style-type: none"> • 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. <p>Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.</p>
<p>Caution Optical Fiber</p>	<p>A glass-fiber is attached on the product. Handle with care.</p> <ul style="list-style-type: none"> • When the fiber is broken or damaged, handle carefully to avoid injury from the damaged part or fragments.

The export of this product from Japan is prohibited without governmental license. To export or re-export this product from a country other than Japan may also be prohibited without a license from that country. Please call an NEC sales representative.

- **The information in this document is current as of May, 2001. 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 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).