



# LASER DIODE

# NX8530NH, NX8531NH

## 1 550 nm InGaAsP MQW-DFB LASER DIODE MODULE

### 2.5 Gb/s DIRECTLY MODULATION LIGHT SOURCE FOR DWDM APPLICATIONS

#### DESCRIPTION

The NX8530NH and NX8531NH are 1 550 nm Multiple Quantum Wells (MQW) structured Distributed Feed-Back (DFB) laser diode module TOSA integrated a mini-TEC, with InGaAs monitor PIN-PD in a ceramic package designed for SFP transceivers and other types of modules with LC receptacle.

#### FEATURES

- Optical output power  $P_{AVG} = 0$  dBm MIN. (NX8530NH)  
 $P_{AVG} = 4$  dBm MIN. (NX8531NH)
- Available for DWDM C-band and L-band wavelengths based on ITU-T recommendations  
(100 GHz grid, please refer to the **ORDERING INFORMATION**)
- Built-in mini thermo-electric cooler with low power consumption
- Miniature 18.5 mm package with LC receptacle



The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.



**ORDERING INFORMATION**

NX8530NH

NX8531NH

Wavelength Code : Refer to **Table A**

**Table A: DWDM wavelength based on ITU-T recommendations (@T<sub>LD</sub> = T<sub>set</sub>) (1/2)**

Wavelength Code	ITU-T Wavelength <sup>*1</sup> (nm)	Frequency (THz)	Wavelength Code	ITU-T Wavelength <sup>*1</sup> (nm)	Frequency (THz)
279	1 527.99	196.20	485	1 548.51	193.60
287	1 528.77	196.10	493	1 549.32	193.50
295	1 529.55	196.00	501	1 550.12	193.40
303	1 530.33	195.90	509	1 550.92	193.30
311	1 531.12	195.80	517	1 551.72	193.20
318	1 531.90	195.70	525	1 552.52	193.10
326	1 532.68	195.60	533	1 553.33	193.00
334	1 533.47	195.50	541	1 554.13	192.90
342	1 534.25	195.40	549	1 554.94	192.80
350	1 535.04	195.30	557	1 555.75	192.70
358	1 535.82	195.20	565	1 556.55	192.60
366	1 536.61	195.10	573	1 557.36	192.50
373	1 537.40	195.00	581	1 558.17	192.40
381	1 538.19	194.90	589	1 558.98	192.30
389	1 538.98	194.80	597	1 559.79	192.20
397	1 539.77	194.70	606	1 560.61	192.10
405	1 540.56	194.60	614	1 561.42	192.00
413	1 541.35	194.50	622	1 562.23	191.90
421	1 542.14	194.40	630	1 563.05	191.80
429	1 542.94	194.30	638	1 563.86	191.70
437	1 543.73	194.20	646	1 564.68	191.60
445	1 544.53	194.10	654	1 565.50	191.50
453	1 545.32	194.00	663	1 566.31	191.40
461	1 546.12	193.90	671	1 567.13	191.30
469	1 546.92	193.80	679	1 567.95	191.20
477	1 547.72	193.70	687	1 568.77	191.10

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

**Table A: DWDM wavelength based on ITU-T recommendations (@T<sub>LD</sub> = T<sub>set</sub>) (2/2)**

Wavelength Code	ITU-T Wavelength <sup>*1</sup> (nm)	Frequency (THz)	Wavelength Code	ITU-T Wavelength <sup>*1</sup> (nm)	Frequency (THz)
695	1 569.59	191.00	904	1 590.41	188.50
704	1 570.42	190.90	912	1 591.26	188.40
712	1 571.24	190.80	921	1 592.10	188.30
720	1 572.06	190.70	929	1 592.95	188.20
728	1 572.89	190.60	937	1 593.79	188.10
737	1 573.71	190.50	946	1 594.64	188.00
745	1 574.54	190.40	954	1 595.49	187.90
753	1 575.37	190.30	963	1 596.34	187.80
761	1 576.20	190.20	971	1 597.19	187.70
770	1 577.03	190.10	980	1 598.04	187.60
778	1 577.86	190.00	988	1 598.89	187.50
786	1 578.69	189.90	997	1 599.75	187.40
795	1 579.52	189.80	6006	1 600.60	187.30
803	1 580.35	189.70	6014	1 601.46	187.20
811	1 581.18	189.60	6023	1 602.31	187.10
820	1 582.02	189.50	6031	1 603.17	187.00
828	1 582.85	189.40	6040	1 604.03	186.90
836	1 583.69	189.30	6048	1 604.88	186.80
845	1 584.53	189.20	6057	1 605.74	186.70
853	1 585.36	189.10	6066	1 606.60	186.60
862	1 586.20	189.00	6074	1 607.47	186.50
870	1 587.04	188.90	6083	1 608.33	186.40
878	1 587.88	188.80	6091	1 609.19	186.30
887	1 588.73	188.70	6100	1 610.06	186.20
895	1 589.57	188.60			

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

**ABSOLUTE MAXIMUM RATINGS**

Parameter	Symbol	Ratings	Unit
Forward Current of LD	I <sub>FLD</sub>	300	mA
Reverse Voltage of LD	V <sub>RLD</sub>	2.0	V
Forward Current of PD	I <sub>FDP</sub>	2.0	mA
Reverse Voltage of PD	V <sub>RPD</sub>	20	V
Operating Case Temperature	T <sub>C</sub>	-5 to +75	°C
Storage Temperature	T <sub>stg</sub>	-40 to +85	°C
Lead Soldering Temperature	T <sub>slid</sub>	350 (3 sec.)	°C
Cooler Current	I <sub>C</sub>	0.9	A
Cooler Voltage	V <sub>C</sub>	1.8	V

**ELECTRO-OPTICAL CHARACTERISTICS (T<sub>LD</sub> = T<sub>set</sub>, T<sub>C</sub> = -5 to +75°C, BOL)**

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Laser Set Temperature	T <sub>set</sub>		35		50	°C
Operating Voltage	V <sub>op</sub>		0.9		2.0	V
Threshold Current	I <sub>th</sub>		5	20	40	mA
Optical Output Power (average)	P <sub>AVG</sub>	I <sub>F</sub> = I <sub>op</sub> , T <sub>LD</sub> = T <sub>set</sub> (NX8530NH)	0		4	dBm
		I <sub>F</sub> = I <sub>op</sub> , T <sub>LD</sub> = T <sub>set</sub> (NX8531NH)	4		7	
Operating Current	I <sub>op</sub>				100	mA
Threshold Output Power	P <sub>th</sub>	I <sub>F</sub> = I <sub>th</sub>			100	μW
Slope Efficiency	η	CW (NX8530NH)	0.04	0.1		W/A
		CW (NX8531NH)	0.08	0.18		
Peak Emission Wavelength	λ <sub>p</sub>	P <sub>t</sub> = 10 mW, CW, T <sub>LD</sub> = T <sub>set</sub>	1 528	ITU-T <sup>-1</sup>	1 563	nm
			1 564		1 610	
Side Mode Suppression Ratio	SMSR	CW, I <sub>F</sub> = I <sub>op</sub>	30	35		dB
Relative Intensity Noise	RIN	CW, I <sub>F</sub> = I <sub>op</sub> , f = 20 MHz to 3 GHz			-140	dB/Hz
Rise Time	t <sub>r</sub>	20-80%, T <sub>C</sub> = 25°C			120	ps
Fall Time	t <sub>f</sub>	80-20%, T <sub>C</sub> = 25°C			120	ps
Electrical Input Return Loss	S <sub>11</sub>	f = 50 MHz to 3 GHz	6			dB
		f = 3 GHz to 5 GHz	3			
Band Width	BW	-3 dB, I <sub>F</sub> = I <sub>op</sub>	2.5			GHz
Dispersion Penalty	DP	T <sub>C</sub> = 25°C <sup>2</sup>			2.0	dB

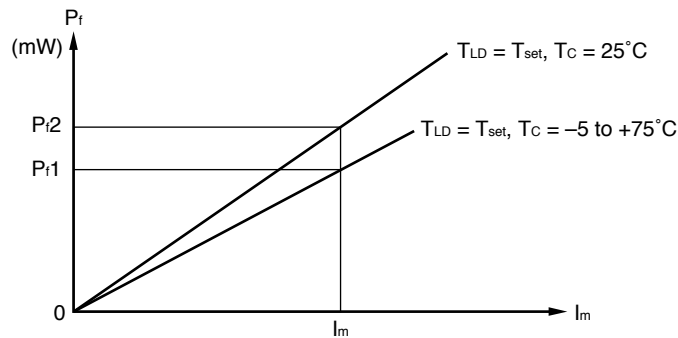
\*1 Available for DWDM wavelengths based on ITU-T recommendations (100 GHz grid, please refer to the **ORDERING INFORMATION**)

\*2 2.48832 Gb/s, PRBS 2<sup>23</sup>-1, NRZ, Extinction Ratio ≥ 9.0 dB, 2 400 ps/nm

**ELECTRO-OPTICAL CHARACTERISTICS**  
 (Applicable to Monitor PD:  $T_{LD} = T_{set}$ ,  $T_c = -5$  to  $+75^\circ\text{C}$ )

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Monitor Current	$I_m$	$P_f = 5$ mW (NX8530NH)	0.08		2.0	mA
		$P_f = 10$ mW (NX8531NH)				
Dark Current	$I_D$	$V_R = 5$ V			100	nA
Tracking Error	$\gamma^{*1}$	$I_m = \text{const.}$	-1.0		1.0	dB

$$*1 \gamma = \left| 10 \log \frac{P_{f1}}{P_{f2}} \right|$$



**ELECTRO-OPTICAL CHARACTERISTICS**  
 (Applicable to Thermistor and TEC:  $T_{LD} = T_{set}$ ,  $T_c = -5$  to  $+75^\circ\text{C}$ , BOL)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Thermistor Resistance	R	$T_{LD} = 25^\circ\text{C}$	9.5	10.0	10.5	k $\Omega$
B Constant	B		3 350	3 450	3 550	K
Cooler Current	$I_c$	$\Delta T = 40^\circ\text{C}$ (NX8530NH)			0.4	A
		$\Delta T = 40^\circ\text{C}$ (NX8531NH)			0.5	
Cooler Voltage	$V_c$	$\Delta T = 40^\circ\text{C}$ (NX8530NH)			1.0	V
		$\Delta T = 40^\circ\text{C}$ (NX8531NH)			1.5	

**REFERENCE**

Document Name	Document No.
Opto-Electronics Devices Pamphlet	PX10160E



• **The information in this document is current as of June, 2008. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC Electronics data sheets or data books, etc., for the most up-to-date specifications of NEC Electronics products. Not all products and/or types are available in every country. Please check with an NEC Electronics 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 the prior written consent of NEC Electronics. NEC Electronics assumes no responsibility for any errors that may appear in this document.

• NEC Electronics 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 Electronics 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 Electronics 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 a customer's equipment shall be done under the full responsibility of the customer. NEC Electronics assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.

• While NEC Electronics endeavors to enhance the quality, reliability and safety of NEC Electronics 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 Electronics products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment and anti-failure features.

• NEC Electronics products are classified into the following three quality grades: "Standard", "Special" and "Specific".

The "Specific" quality grade applies only to NEC Electronics products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of an NEC Electronics product depend on its quality grade, as indicated below. Customers must check the quality grade of each NEC Electronics 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.

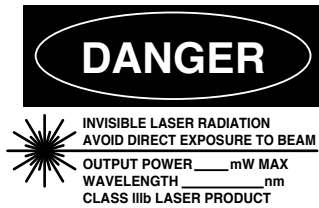
The quality grade of NEC Electronics products is "Standard" unless otherwise expressly specified in NEC Electronics data sheets or data books, etc. If customers wish to use NEC Electronics products in applications not intended by NEC Electronics, they must contact an NEC Electronics sales representative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

(Note)

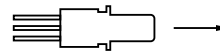
(1) "NEC Electronics" as used in this statement means NEC Electronics Corporation and also includes its majority-owned subsidiaries.

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

**SAFETY INFORMATION ON THIS PRODUCT**



**SEMICONDUCTOR LASER**



**AVOID EXPOSURE-Invisible  
Laser Radiation is emitted from  
this aperture**

<p><b>Warning</b> 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"> <li>• Do not look directly into the laser beam.</li> <li>• Avoid exposure to the laser beam, any reflected or collimated beam.</li> </ul>
<p><b>Caution</b> GaAs Products</p>	<p>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.</p> <ul style="list-style-type: none"> <li>• 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.             <ol style="list-style-type: none"> <li>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.</li> <li>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.</li> </ol> </li> <li>• Do not burn, destroy, cut, crush, or chemically dissolve the product.</li> <li>• Do not lick the product or in any way allow it to enter the mouth.</li> </ul>
<p><b>Caution</b> Optical Fiber</p>	<p>A glass-fiber is attached on the product. Handle with care.</p> <ul style="list-style-type: none"> <li>• When the fiber is broken or damaged, handle carefully to avoid injury from the damaged part or fragments.</li> </ul>

Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (\*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL’s understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

Restricted Substance per RoHS	Concentration Limit per RoHS (values are not yet fixed)	Concentration contained in CEL devices	
		-A	-AZ
Lead (Pb)	< 1000 PPM	Not Detected	(*)
Mercury	< 1000 PPM	Not Detected	
Cadmium	< 100 PPM	Not Detected	
Hexavalent Chromium	< 1000 PPM	Not Detected	
PBB	< 1000 PPM	Not Detected	
PBDE	< 1000 PPM	Not Detected	

If you should have any additional questions regarding our devices and compliance to environmental standards, please do not hesitate to contact your local representative.

**Important Information and Disclaimer:** Information provided by CEL on its website or in other communications concerning the substance content of its products represents knowledge and belief as of the date that it is provided. CEL bases its knowledge and belief on information provided by third parties and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. CEL has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. CEL and CEL suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall CEL’s liability arising out of such information exceed the total purchase price of the CEL part(s) at issue sold by CEL to customer on an annual basis.

See CEL Terms and Conditions for additional clarification of warranties and liability.