PRELIMINARY DATA SHEET

NEC

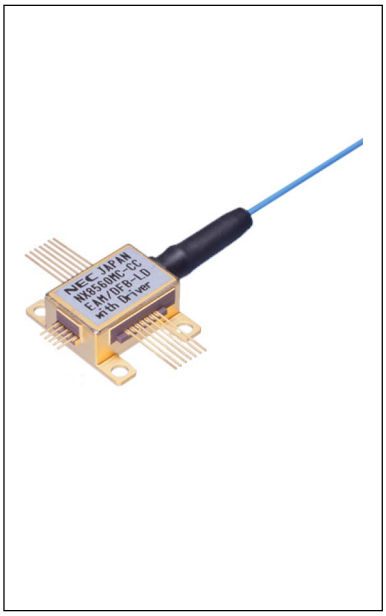
LASER DIODE

NX8560MC Series

EA MODULATOR INTEGRATED
1 550 nm MQW-DFB LASER DIODE MODULE WITH DRIVER
FOR 10 Gb/s APPLICATIONS

DESCRIPTION

The NX8560MC Series is an Electro-Absorption (EA) modulator integrated, 1 550 nm Multiple Quantum Well (MQW) structured Distributed Feed-Back (DFB) laser diode module with an internal driver IC. It is capable of transmitting up to 40 km standard single mode fiber (dispersion: 800 ★ ps/nm) for 10 Gb/s applications.



FEATURES

- Integrated electroabsorption modulator
- Internal driver IC
- Up to 40 km transmission 10 Gb/s (dispersion: 800 ps/nm)
- 19-pin mini butterfly package

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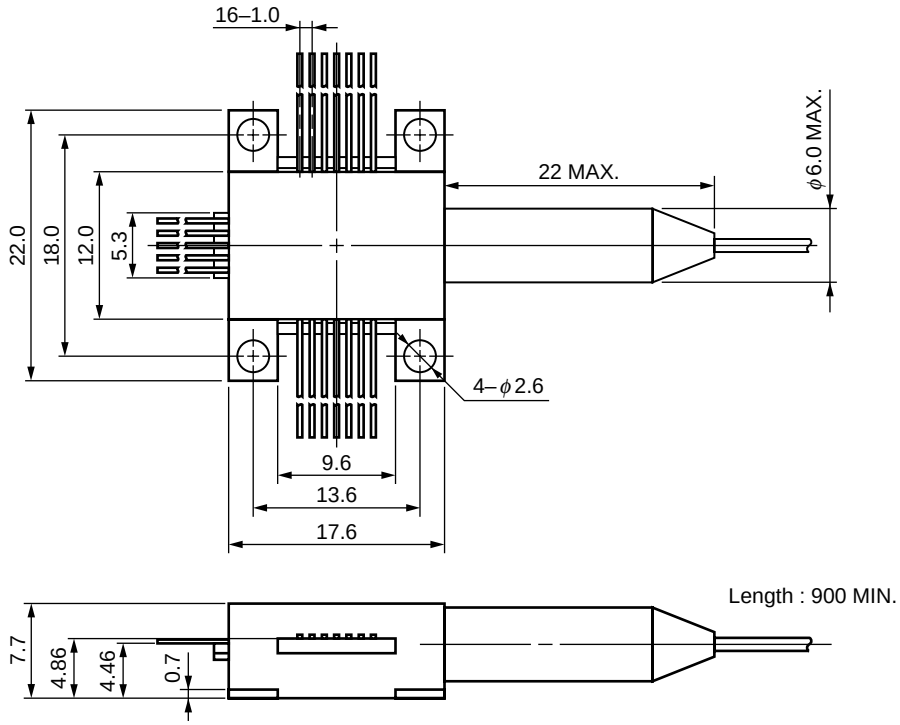
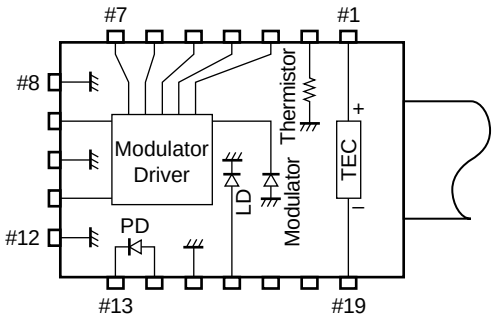
The mark ★ shows major revised points.

PACKAGE DIMENSIONS (UNIT: mm, unless otherwise specified ±0.2 mm)



TOP VIEW



PIN CONNECTIONS

Pin No.	Function	Pin No.	Function	Pin No.	Function
1	TEC Anode	8	Case GND	13	Monitor PD Cathode
2	Thermistor	9	$D_{IN}B$	14	Monitor PD Anode
3	Vb	10	Case GND	15	Case GND
4	Vm	11	D_{IN}	16	LD Bias (Anode)
5	Vss	12	Case GND	17	NC
6	Vx2			18	NC
7	Vx1			19	TEC Cathode

OPTICAL FIBER CHARACTERISTICS

Parameter	Specification	Unit
Mode Field Diameter	9.3±0.5	μm
Cladding Diameter	125±1	μm
Tight Buffer Diameter	900±100	μm
Cut-off Wavelength	< 1 270	nm
Attenuation 1 525 to 1 575 nm	< 0.3	dB/km
Minimum Fiber Bending Radius	30	mm
Fiber Length	900 MIN.	mm
Flammability	UL1581 VW-1	

ORDERING INFORMATION

Part Number	Chromatic Dispersion	Available Connector
NX8560MC-CC	800 ps/nm	With SC-UPC Connector
NX8560MC-BC		With FC-UPC Connector
NX8560MCS-CC	500 ps/nm	With SC-UPC Connector
NX8560MCS-BC		With FC-UPC Connector

ABSOLUTE MAXIMUM RATINGS

	Parameter	Symbol	Ratings	Unit
	Storage Temperature	T_{stg}	−40 to +85	°C
	Operating Case Temperature	T_C	0 to +75	°C
	Forward Current of LD	I_{FLD}	150	mA
	Reverse Voltage of LD	V_{RLD}	2.0	V
	Driver Power Supply Voltage	Vss	−6 to 0	V
	Modulator Modulation Control Voltage	Vm	Vss to Vss + 1.2 (0.3 MAX.)	V
	Modulator Bias Control Voltage	Vb	Vss to Vss + 2.4 (0.3 MAX.)	V
	Cross Point Control Voltage	Vx1, Vx2	Vss to Vss + 2.4 (0.3 MAX.)	V
	Forward Current of PD	I_{FPD}	2	mA
	Reverse Voltage of PD	V_{RPD}	15	V
★	Cooler Current	I_C	2.0	A
★	Cooler Voltage	V_C	2.6	V
	Lead Soldering Temperature	T_{sld}	350 (3 sec.)	°C

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Reverse Voltage of PD	V_{RPD}		5		V
Cooler Current	I_C			1.5	A
Cooler Voltage	V_C			2.5	V
Driver Power Supply Voltage	Vss		−5.2		V

ELECTRO-OPTICAL CHARACTERISTICS

(T_{LD} = 25°C, T_C = 0 to +75°C, BOL, unless otherwise specified)

Parameter	Symbol	Conditions		MIN.	TYP.	MAX.	Unit
Laser Set Temperature	T_{set}			20	25	35	°C
Forward Voltage of LD	V_{FLD}	$I_{FLD} = I_{op}$				2.0	V
Operating Current	I_{op}	$T_{LD} = T_{set}$		50	60	80	mA
Threshold Current	I_{th}	$T_{LD} = T_{set}$			7	20	mA
Optical Output Power from Fiber	P_f	Under modulation*1	NX8560MC	–1		+2	dBm
			NX8560MCS	–5		–1	
Peak Emission Wavelength	λ_p	$I_{FLD} = I_{op}$, V_{EA} = 0 V, $T_{LD} = T_{set}$		1 530		1 565	nm
Side Mode Suppression Ratio	SMSR	$I_{FLD} = I_{op}$, V_{EA} = 0 V		30			dB
Extinction Ratio	ER	Under modulation*1	NX8560MC	10			dB
			NX8560MCS	8.2			
Input Return Loss	S_{11}	$I_{FLD} = I_{op}$, V_{EA} = –1 V, f = 130 MHz to 10 GHz			–10		dB
Rise Time	t_r	20-80%, Under modulation*1				40	ps
Fall Time	t_f	80-20%, Under modulation*1				40	ps
Dispersion Penalty	DP	Under modulation*1, 2				2.0	dB
Optical Isolation	I_s			25			dB
Driver Power Supply Voltage	Vss			–5.5	–5.2	–5.0	V
Driver Power Supply Current	Iss					300	mA
Modulator Modulation Control Voltage	Vm			Vss		Vss+1.0	V
Modulator Bias Control Voltage	Vb			Vss		Vss+2.2	V
Cross Point Control Voltage	Vx1, Vx2	Cross point: 50%		Vss+0.8		Vss+2.2	V
Data Input Voltage	D_{IN}, $D_{IN}B$	Differential input, AC-coupled		0.5		1.0	Vpp

***1** 9.95328 Gb/s, PRBS 2^{31}–1, $I_{FLD} = I_{op}$, $T_{LD} = T_{set}$, NEC Test System

I_{op} : a certain point between 50 and 80 mA

Vm : a certain point between Vss and Vss+1.0 V

Vb : a certain point between Vss and Vss+2.2 V

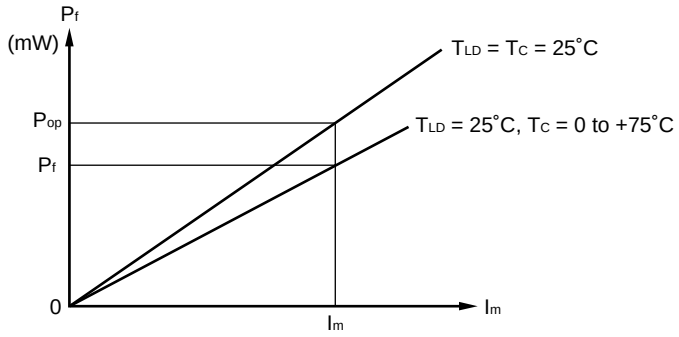
Vx1 (Vx2) : a certain point between Vss+0.8 V and Vss+2.2 V

★ ***2** BER = 10^{-12}

ELECTRO-OPTICAL CHARACTERISTICS (Applicable to Monitor PD: $T_{LD} = T_{set}$, T_C = 0 to +75ºC)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Monitor Current	I_m	V_{RPD} = 5 V, $I_{FLD} = I_{op}$, V_{EA} = 0 V	100		1 500	μA
Dark Current	I_D	V_{RPD} = 5 V, V_{EA} = 0 V			10	nA
Terminal Capacitance	C_t	V_{RPD} = 5 V, f = 1 MHz			15	pF
Tracking Error	γ *1	I_m = const.			0.5	dB

***1** $\gamma = \left| 10 \log \frac{P_f}{P_{op}} \right|$



(@P_f (25˚C) = P_{op})

ELECTRO-OPTICAL CHARACTERISTICS
(Applicable to Thermistor and TEC: T_{LD} = 25ºC, T_C = 0 to +75ºC)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Thermistor Resistance	R		9.5	10.0	10.5	kΩ
B Constant	B		3 350	3 450	3 550	K
Cooler Current	I_C	$\Delta T = 75°C - T_{set}$			1.5	A
Cooler Voltage	V_C	$\Delta T = 75°C - T_{set}$			2.5	V

USAGE CAUTIONS

1. Pins #9 and 11 are to be connected to DC-blocking capacitors.
2. Pins #3 to 7 are recommended to be connected to RF-bypass (shunt) capacitors.
3. "Turn on order" for the power supply of driver IC:
   - At first, Vb, Vm, Vx1 (Vx2) are to be turned on.
   - After that, Vss is to be turned on.
4. "Turn off order" for the power supply of driver IC:
   - At first, Vss is to be turned off.
   - After that, Vb, Vm, Vx1 (Vx2) are to be turned off.

   Among Vb, Vm, Vx1, Vx2, there are no turn-on/off order specified.

★ EA MODULATOR INTEGRATED DFB-LD FAMILY

Part Number	Absolute Maximum Ratings		Electro-Optical Characteristics		Application	Package
	T_C (°C)	T_{stg} (°C)	P_f [*1] (mW)	λ_p (nm)		
			MIN.	TYP.		
NX8560MC Series	0 to +75	–40 to +85	–1 dBm	1 550	10 Gb/s: STM-64	19-pin mini BFY
NX8560MCS Series	0 to +75	–40 to +85	–5 dBm	1 550	10 Gb/s: STM-64	19-pin mini BFY
NX8560LJ Series	–20 to +70	–40 to +85	–3 dBm	1 550 [*2]	10 Gb/s: STM-64	BFY with GPO™
			–1 dBm	1 550		
NX8560SJ Series	–5 to +70	–40 to +85	–3 dBm	1 550 [*2]	10 Gb/s: STM-64 with λ monitoring PD	BFY with GPO
NX8564LE Series	–20 to +70	–40 to +85	–5 dBm	1 550 [*2]	2.5 Gb/s: STM-16, 360 km	BFY
NX8565LE Series	–20 to +70	–40 to +85	–5 dBm	1 550 [*2]	2.5 Gb/s: STM-16, 600 km	BFY
NX8566LE Series	–20 to +70	–40 to +85	0 dBm	1 550 [*2]	2.5 Gb/s: STM-16, 240 km	BFY
NX8567SA Series	–5 to +70	–40 to +85	–5 dBm	1 550 [*2]	2.5 Gb/s: STM-16, 600 km with λ monitoring PD	BFY
NX8567SAM Series	–5 to +70	–40 to +85	–5 dBm	1 550 [*2]	2.5 Gb/s: STM-16, 360 km with λ monitoring PD	BFY
NX8567SAS Series	–5 to +70	–40 to +85	0 dBm	1 550 [*2]	2.5 Gb/s: STM-16, 240 km with λ monitoring PD	BFY

***1** Under modulation

***2** Available for DWDM Wavelengths based on ITU-T recommendations

REFERENCE

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

- **PATENT**

  USP 4,826,295

  CA 1,286,848

  EP 143 000

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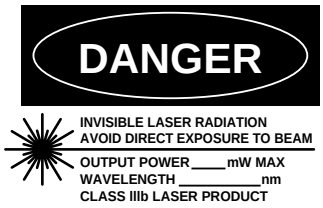
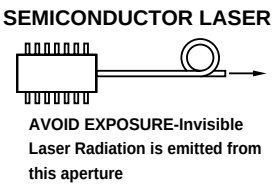
SAFETY INFORMATION ON THIS PRODUCT





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.

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