



NEC's EA MODULATOR INTEGRATED InGaAsP MQW DFB LASER DIODE MODULE WITH DRIVER FOR 10 Gb/s APPLICATIONS

**NX8560MC
SERIES**

FEATURES

- **INTEGRATED ELECTROABSORPTION MODULATOR**
- **INTERNAL DRIVER IC**
- **UP TO 40 km TRANSMISSION 10 Gb/s**
(Dispersion: 800 ps/nm)
- **19-PIN MINI-BUTTERFLY PACKAGE**

DESCRIPTION

NEC's NX8560MC Series is an Electro-Absorption (EA) Modulator integrated, 1550 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 with built in wavelength monitor.

ELECTRO-OPTICAL CHARACTERISTICS (T_{LD} = 25°C, T_c = 0 to +75°C, BOL unless otherwise specified)

PART NUMBER			NX8560MC Series		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
T _{SET}	Laser Set Temperature	°C	20	25	35
V _{FLD}	Forward Voltage of LD, I _{FLD} = I _{op}	V			2.0
I _{op}	Operating Current, T _{LD} = T _{set}	mA	50	60	80
I _{TH}	Threshold Current, T _{LD} = T _{set}	mA		7	20
P _f	Optical Output from Fiber, Under modulation ¹ NX8560MC NX8560MCS	dBm dBm	-1 -5		+2 -1
λ _p	Peak Emission Wavelength, I _{FLD} = I _{op} , V _{EA} = 0 V, T _{LD} = T _{SET}	nm	1530		1565
SMSR	Side Mode Suppression Ratio, I _{FLD} = I _{op} , V _{EA} = 0 V	dB	30		
ER	Extinction Ratio, Under modulation ¹ NX8560MC NX8560MCS	dB dB	10 8.2		
S ₁₁	Input Return Loss, I _{FLD} = I _{op} , V _{EA} = 1 V, f = 130 MHz to 10 GHz	dB		-10	
t _r	Rise Time, 20-80%, Under modulation ¹	ps			40
t _f	Fall Time, 80-20%, Under modulation ¹	ps			40
DP	Dispersion Penalty, under modulation ^{1, 2}	dB			2.0
ISOL	Optical Isolation	dB	25		
V _{SS}	Driver Power Supply Voltage	V	-5.5	-5.2	-5.0
I _{SS}	Driver Power Supply Current	mA			300
V _{MOD}	Modulator Modulation Control Voltage	V	V _{SS}		V _{SS} +1.0
V _B	Modulator Bias Control Voltage	V	V _{SS}		V _{SS} +2.2
V _{x1} , V _{x2}	Cross Point Control Voltage, Cross Point: 50%	V	V _{SS} +0.8		V _{SS} +2.2
D _{IN} , D _{INB}	Data Input Voltage, Differential input, AC-coupled	V _{pp}	0.5		1.0

Notes:

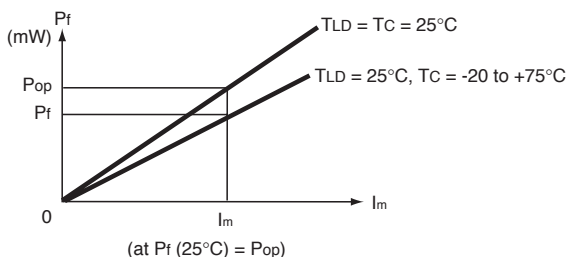
- 9.95328 Gb/s, PRBS 2³¹-1, I_{FLD} = I_{op}, T_{LD} = T_{SET}, NEC Test System.
I_{op}: a certain point between 50 mA and 80 mA.
V_m: a certain point between V_{SS} and V_{SS}+1.0 V.
V_b: a certain point between V_{SS} and V_{SS}+2.2 V.
V_{x1} (V_{x2}): a certain point between V_{SS}+0.8 V and V_{SS}+2.2 V
- BER = 10⁻¹⁰

ELECTRO-OPTICAL CHARACTERISTICS (Applicable to Monitor PD: T_{LD} = T_{SET}, T_C = 0 to +75°C)

PART NUMBER			NX8560MC Series		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
I _m	Monitor Current, V _{RPD} = 5V, I _{FLD} = I _{OP} , V _{EA} = 0 V	μA	100		1500
I _D	Dark Current, V _{RPD} = 5 V, V _{EA} = 0 V	nA			10
C _t	Terminal Capacitance, V _{RPD} = 5 V, f = 1 Mhz	pF			15
γ ¹	Tracking Error, I _m = const.	dB			0.5

Note:

$$1. \gamma = 10 \log \frac{P_f}{P_{op}}$$



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

PART NUMBER			NX8560MC Series		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
R	Thermistor Resistance	kΩ	9.5	10.0	10.5
B	B Constant	K	3350	3450	3550
I _c	Cooler Current, ΔT = 75°C – T _{set}	A			1.5
V _c	Cooler Voltage, ΔT = 75°C – T _{set}	V			2.5

USAGE CAUTIONS

- Pins #9 and 11 are to be connected to DC-blocking capacitors.
- It is recommended to connect Pins #3 through 7 to the RF-bypass (shunt) capacitors.
- "Turn on order" for the power supply of driver IC:
 - At first, V_b, V_m, V_{x1} (V_{x2}) are to be turned on.
 - After that, V_{ss} is to be turned on.
- "Turn off order" for the power supply of driver IC:
 - At first, V_{ss} is to be turned off.
 - After that, V_b, V_m, V_{x1} (V_{x2}) are to be turned off.

Among V_b, V_m, V_{x1}, V_{x2}, there is no turn on/off order specified.

ABSOLUTE MAXIMUM RATINGS¹(T_C = 25°C, unless otherwise specified)

SYMBOLS	PARAMETERS	UNITS	RATINGS
I _{FLD}	Forward Current of LD	mA	150
V _{RLD}	Reverse Voltage of LD	V	2.0
V _{SS}	Driver Power Supply Voltage	V	-6 to 0
V _m	Modulation Control Voltage of Modulator	V	V _{SS} to V _{SS} + 1.2 (0.3 MAX)
V _b	Bias Control Voltage of Modulator	V	V _{SS} to V _{SS} + 2.4 (0.3 MAX)
V _{x1} , V _{x2}	Cross Point Control Voltage	V	V _{SS} to V _{SS} + 2.4 (0.3 MAX)
I _{FPD}	Forward Current of PD	mA	2
V _{RPD}	Reverse Voltage of PD	V	15
I _c	Cooler Current	A	1.5
V _c	Cooler Voltage	V	2.5
T _C	Operating Case Temperature	°C	0 to +75
T _{STG}	Storage Temperature	°C	-40 to +85
T _{SLD}	Lead Soldering Temperature (3 sec.)	°C	350

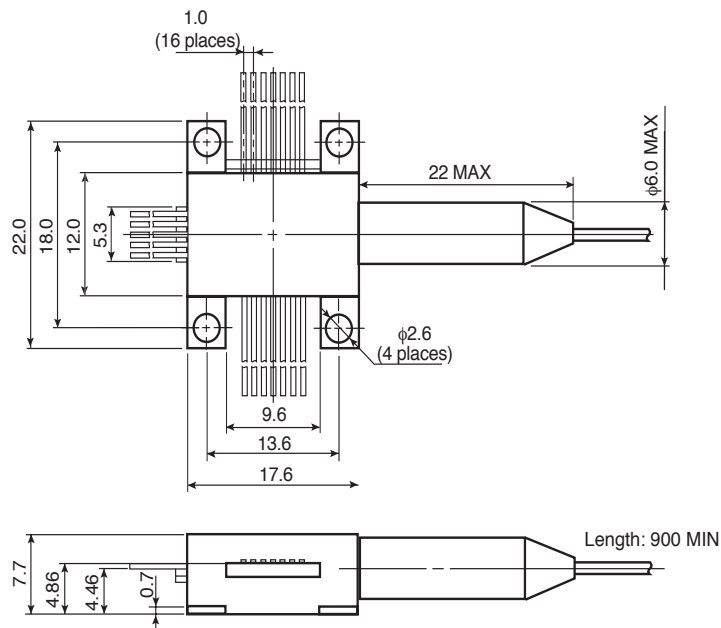
Note:

1. Operation in excess of any one of these parameters may result in permanent damage.

RECOMMENDED OPERATING CONDITIONS

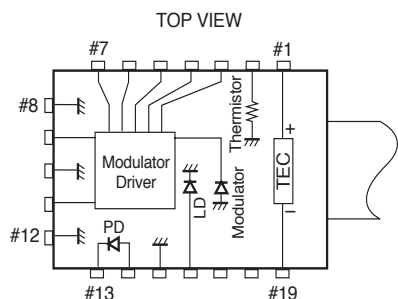
SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V _{RPD}	Reverse Voltage of PD	V		5	
I _c	Cooler Current	A			1.5
V _c	Cooler Voltage	V			2.5
V _{SS}	Driver Power Supply Voltage	V	-5.2		

OUTLINE DIMENSIONS (Units in mm, unless otherwise specified ± 0.2 mm)



OPTICAL FIBER DIMENSIONS (Units in mm)

Parameter	Unit	Specification
Mode Field Diameter	μm	9.3 ± 0.5
Cladding Diameter	μm	125 ± 1
Tight Buffer Diameter	μm	900 ± 100
Cut-off wavelength	nm	< 1270
Attenuation 1525 to 1575 nm	dB/km	< 0.3
Minimum Fiber Bending Radius	mm	30
Fiber Length	mm	900 MIN
Flammability	UL1581 VW-1	



PIN CONNECTIONS

PIN No.	FUNCTION	PIN No.	FUNCTION	PIN No.	FUNCTION
1	TEC Anode	8	Case GND	13	Monitor PD Cathode
2	THERMISTOR	9	DINB	14	Monitor PD Anode
3	Vb	10	Case GND	15	Case GND
4	Vm	11	DIN	16	LD Bias (Anode)
5	Vss	12	Case GND	17	NC
6	Vx2			18	NC
7	Vx1			19	TEC Cathode

ORDERING INFORMATION

PART NUMBER	CHROMATIC DISPERSION	AVAILABLE CONNECTOR
NX8560MC-CC-AZ*	800 ps/nm	With SC-UPC Connector
NX8560MC-CC-AZ*		With FC-UPC Connector
NX8560MCS-CC-AZ*	500 ps/nm	With SC-UPC Connector
NX8560MCS-BC-AZ*		With FC-UPC Connector

*NOTE:

Please refer to the last page of this data sheet, "Compliance with EU Directives" for Pb-Free RoHS Compliance Information.

Life Support Applications

These NEC products are not intended for use in life support devices, appliances, or systems where the malfunction of these products can reasonably be expected to result in personal injury. The customers of CEL using or selling these products for use in such applications do so at their own risk and agree to fully indemnify CEL for all damages resulting from such improper use or sale.

CEL California Eastern Laboratories, Your source for NEC RF, Microwave, Optoelectronic, and Fiber Optic Semiconductor Devices.

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NEC

A Business Partner of NEC Compound Semiconductor Devices, Ltd.

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.

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