NEC'S EA MODULATOR AND WAVELENGTH MONITOR INTEGRATED InGaAsP MQW DFB LASER DIODE MODULE FOR 2.5 Gb/s ULTRALONG-REACH 240, 360, 600 km DWDM APPLICATIONS

NX8567SA Series

FEATURES

- **INTEGRATED ELECTROABSORPTION MODULATOR**
- **WAVELENGTH MONITOR FUNCTION**
  (Etalon filter, Wavelength monitor PD)
- **VERY LOW DISPERSION PENALTY**
  NX8567SAS Series - over 240 km (4320 ps/nm)
  NX8567SAM Series - over 360 km (6480 ps/nm)
  NX8567SA Series - over 600 km (10800 ps/nm)
- **LOW MODULATION VOLTAGE**
- **AVAILABLE FOR DWDM WAVELENGHT BASED ON ITU-T RECOMMENDATION (50 GHz grid, refer to ordering information)**

DESCRIPTION

NEC's NX8567SA Series is an Electro-Absorption (EA) modulator and wavelength monitor integrated, 1 550 nm Multiple Quantum Well (MQW) structured Distributed Feed-Back (DFB) laser diode module. The module is capable of 2.5 Gb/s applications of over 240 km, 360 km, 600 km ultralong-reach and available for Dense Wavelength Division Multiplexing (DWDM) wavelengths based on ITU-T recommendations, enabling a wide range of applications

ELECTRO-OPTICAL CHARACTERISTICS (T_{LD} = Tset, T_C = -5 to +70°C, unless otherwise specified)

PART NUMBER				NX8567SA SERIES		
SYMBOLS	**PARAMETERS AND CONDITIONS**		**UNITS**	**MIN**	**TYP**	**MAX**
T_{SET}	Laser Set Temperature[1]		°C	20		35
I_{OP}	Operating Current		mA	50	60	80
V_{center}	Modulation Center Voltage[2]		V	-2.0	–	-0.5
V_{mod}	Modulation Voltage[2]		V	–	2	3
V_{FLD}	Forward Voltage of LD, I_{FLD} = I_{OP}		V	–	–	2.0
I_{TH}	Threshold Current		mA	–	7	20
P_f	Optical Output Power from Fiber,	I_{FLD} = I_{OP}, Under modulation[2] (NX8567SAM/SA Series)	dBm	-5	-2	–
		I_{FLD} = I_{OP}, Under modulation[2] (NX8567SAS Series)		0	+1	–
λ_P	Peak Emission Wavelength, I_{FLD} = I_{OP}, V_{EA} = 0 V		nm	1528	ITU-T[3]	1564
SMSR	Side Mode Suppression Ratio, I_{FLD} = I_{OP}, V_{EA} = 0 V		dB	30	40	–
ER	Extinction Ratio, I_{FLD} = I_{OP}, Under modulation[2]		dB	10	11	–
t_f	Rise Time, I_{FLD} = I_{OP}, 20-80%, Under modulation[2]		ps	–	–	125
t_r	Rise Time, I_{FLD} = I_{OP}, 80-20%, Under modulation[2]		ps	–	–	125

Notes:
1. Tset is a certain point between 20 and 35C for ITU-T grid wavelength
2. 2.48832 Gb/s, PRBS 223 -1, V_{EA} = V_{center} ±1/2 Vmod, I_{FLD} = I_{op}, TLD = Tset, NEC Test System
   V_{center} : a certain point between -2.0 and -0.5 V
   V_{mod} : a certain point 3 V or below
   I_{op} : a certain point between 50 and 80 mA
3. Available for DWDM wavelenght based on ITU-T recommendation (100 GHz grid). Please refer to ORDERING INFORMATION.
4. BER = 10^{-10}, NX8567SAS: 240 km (4320 ps/nm)
   BER = 10^{-10}, NX8567SAM: 360 km (6480 ps/nm)
   BER = 10^{-10}, NX8567SA: 600 km (10800 ps/nm)

ELECTRO-OPTICAL CHARACTERISTICS (T_{LD} = Tset, T_C = -5 to +70°C, Unless otherwise specified)

PART NUMBER				NX8567SA SERIES		
SYMBOLS	PARAMETERS AND CONDITIONS		UNITS	MIN	TYP	MAX
DP	Dispension Penalty, I_{FLD} = I_{op}, SMF Under modulation[2,4]		dB	–	–	2
Is	Isolation		dB	23	–	–
S_{11}	Input Return Loss	I_{FLD} = I_{op}, V_{EA} = -1 V, 50 Ω 130 MHz to 2 GHz	dB	–	–	-8
		I_{FLD} = I_{op}, V_{EA} = -1 V, 50 Ω 2 GHz to 2.5 GHz		–	–	-5

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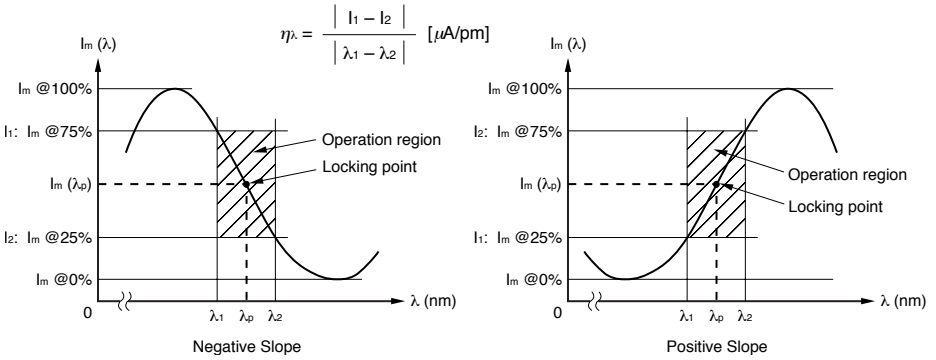
ELECTRO-OPTICAL CHARACTERISTICS (Applicable to Monitor PD, T_{LD} = Tset, T_C = -5 to +70°C, BOL)

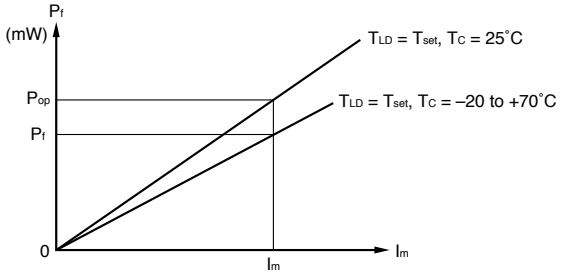
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
I_m (Pf)	Monitor Current (P_f Monitor), V_{RPD} = 5 V, I_{FLD} = I_{op}	μA	10	–	200
I_m (λp)	Monitor Current (λp Monitor), V_{RPD} = 5 V, I_{FLD} = I_{op}, Locking point	μA	5	–	100
I_m (λ)	Operation Region	%	25	–	75
$\|\lambda_1-\lambda_2\|$		pm	90	–	–
ηλ	Discrimination Slope[1], V_{RPD} = 5 V, I_{FLD} = I_{op}, Locking point	μA/pm	0.24	–	–
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[2]	Tracking Error, Im(Pf) = const.	dB	–	–	0.5

Note:
1. Operating region, Discrimination slope, Slope assignment

$$\eta\lambda = \frac{|\ I_1 - I_2\ |}{|\ \lambda_1 - \lambda_2\ |}\ [\mu A/pm]$$



2. Tracking error: γ



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

ELECTRO-OPTICAL CHARACTERISTICS (Applicable to Thermistor and TEC, T_C = -5 to +70°C)

PART NUMBER			NX8567SA SERIES		
SYMBOLS	**PARAMETERS AND CONDITIONS**	**UNITS**	**MIN**	**TYP**	**MAX**
R	Thermistor Resistance, T_{LD} = 25°C	kΩ	9.5	10.0	10.5
B	B Constant	K	3350	3450	3550
I_C	Cooler Current, $T_{LD} = T_{set}$	A			1.2
V_C	Cooler Voltage, $T_{LD} = T_{set}$	V			2.4

ABSOLUTE MAXIMUM RATINGS[1]

SYMBOLS	PARAMETERS	UNITS	RATINGS
P_f	Optical Output Power from Fiber	mW	10
I_{FLD}	Forward Current of LD	mA	150
V_{RLD}	Reverse Voltage of LD	V	2.0
V_{Fm}	Forward Voltage of Modulator	V	1
V_{Rm}	Reverse Voltage of Modulator	V	5
I_{FPD}	Forward Current of PD	mA	1
V_{RPD}	Reverse Voltage of PD	V	10
I_C	Cooler Current	A	1.5
V_C	Cooler Voltage	V	2.5
T_C	Operating Case Temperature	°C	-5 to +70
T_{STG}	Storage Temperature	°C	-40 to +85
T_{SLD}	Lead Soldering Temp. (3 s)	°C	350

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

ORDERING INFORMATION

NX8567SA□□□□-□□

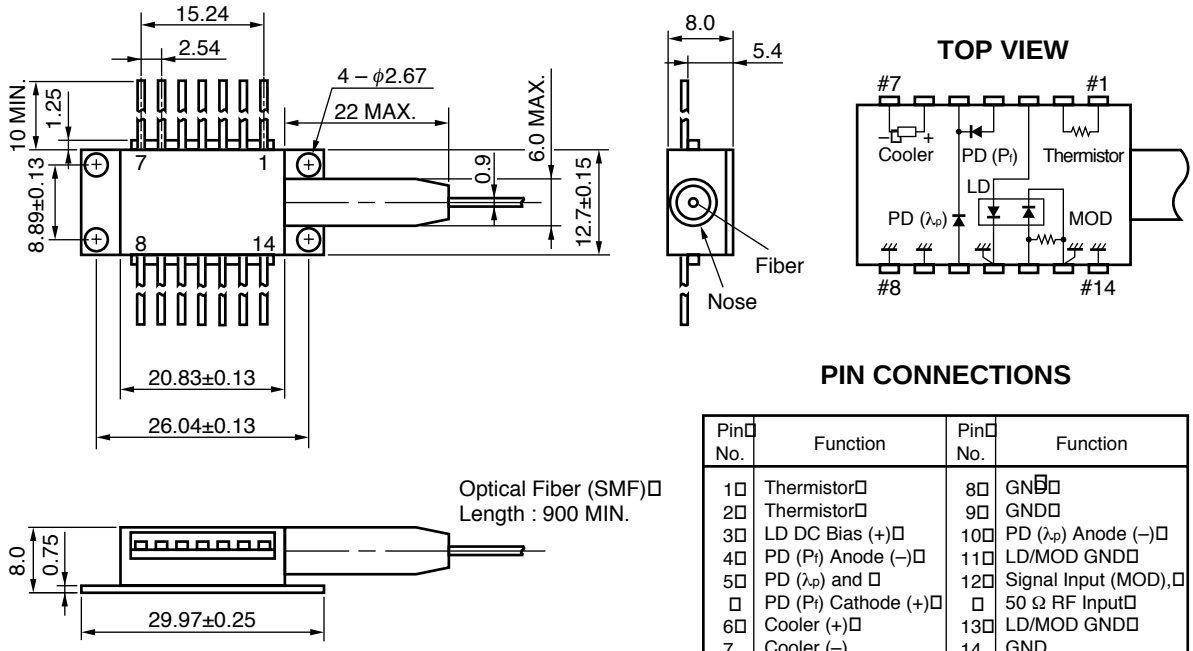
- CC□ SC-UPC connector (standard)□
  BC□ FC-UPC connector (option)
- Wavelength code : Refer to **Table A**
- Without□ 600 km (10800 ps/nm) □
  M□ : 360 km (6480 ps/nm)□
  S□ : 240 km (4320 ps/nm)

TABLE A: DWDM wavelengths based on ITU-T recommendations (@ TLD = Tset)

Wavelength Code	ITU-T Wavelength *1 (nm)	Frequency (THz)	Wavelength Code	ITU-T Wavelength *1 (nm)	Frequency (THz)
287	1528.773	196.10	457	1545.720	193.95
291	1529.163	196.05	461	1546.119	193.90
295	1529.553	196.00	465	1546.518	193.85
299	1529.553	195.95	469	1546.917	193.80
303	1530.334	195.90	473	1547.316	193.70
307	1530.725	195.85	477	1547.715	193.70
311	1531.116	195.80	485	1548.515	193.60
315	1531.507	195.75	489	1548.915	193.55
318	1531.898	195.70	493	1549.315	193.50
322	1532.290	195.65	497	1549.715	193.45
326	1532.681	195.60	501	1550.116	193.40
330	1533.073	195.55	505	1550.517	193.35
334	1533.465	195.50	509	1550.918	193.30
338	1533.073	195.45	513	1551.319	193.25
342	1534.250	195.40	517	1551.721	193.20
346	1534.643	195.35	521	1552.122	193.15
350	1535.036	195.30	525	1552.524	193.10
354	1535.429	195.25	529	1552.926	193.05
358	1535.822	195.20	533	1553.329	193.00
362	1536.216	195.15	537	1553.731	192.95
366	1536.643	195.10	541	1554.134	192.90
370	1537.003	195.05	545	1554.537	192.85
373	1537.397	195.00	549	1554.940	192.80
377	1537.792	194.95	553	1555.343	192.75
381	1538.186	194.90	557	1555.747	192.70
385	1538.581	194.85	561	1556.151	192.65
389	1538.976	194.80	565	1556.555	192.60
393	1539.371	194.75	569	1556.959	192.55
397	1539.766	194.70	573	1557.363	192.50
401	1540.162	194.65	577	1557.768	192.45
405	1540.557	194.60	581	1558.173	192.40
409	1540.953	194.55	585	1558.578	192.30
413	1541.349	194.50	589	1558.983	192.30
417	1541.746	194.45	593	1559.389	192.25
421	1542.142	194.40	597	1559.794	192.20
425	1542.539	194.35	602	1560.200	192.15
429	1542.936	194.30	606	1560.606	192.10
433	1543.333	194.25	610	1561.013	192.05
437	1543.730	194.20	614	1561.419	192.00
441	1544.128	194.15	618	1561.826	191.95
445	1544.526	194.10	622	1562.233	191.90
449	1544.924	194.05	626	1562.640	191.85
453	1545.322	194.00	630	1563.047	191.80

Note:
1. λ monitor slope: Channel frequency for 191.80 THz + 2n × 0.05 THz is assigned on negative slope.
   Channel frequency for 191.80 THz + (2n + 1) × 0.05 THz is assigned on positive slope.
   n is a positive integer including zero.

OUTLINE DIMENSIONS (Units in mm)

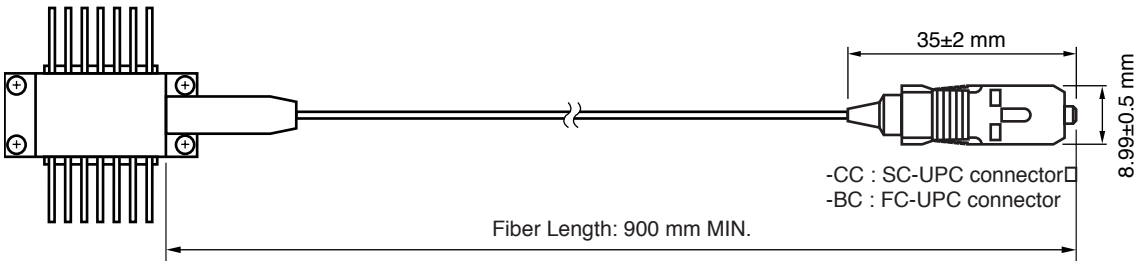


PIN CONNECTIONS

Pin No.	Function	Pin No.	Function
1	Thermistor	8	GND
2	Thermistor	9	GND
3	LD DC Bias (+)	10	PD (λp) Anode (–)
4	PD (Pf) Anode (–)	11	LD/MOD GND
5	PD (λp) and	12	Signal Input (MOD),
	PD (Pf) Cathode (+)		50 Ω RF Input
6	Cooler (+)	13	LD/MOD GND
7	Cooler (–)	14	GND

OPTICAL FIBER CHARACTERISTICS

PARAMETER	UNITS	SPECIFICATION
Mode Field Diameter	μm	9.3±0.5
Cladding Diameter	μm	125±1
Tight Buffer Diameter	μm	900±100
Cut-off Wavelenght	nm	< 1270
Attenuation 1525 to 1575 nm	dB/km	< 0.3
Minimum Fiber Bending Radius	mm	30
Fiber Length	mm	1225 MIN
Flammability	UL1581VW-1	



Life Support Applications

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