

PRELIMINARY DATA SHEET



NEC's EA MODULATOR AND WAVELENGTH MONITOR INTEGRATED 1550 nm MQW-DFB LASER DIODE MODULE FOR 10 Gb/s APPLICATIONS

NX8560SJ Series

FEATURES

- INTEGRATED ELECTRO-ABSORPTION MODULATOR
- WAVELENGTH MONITOR FUNCTION
- 10 Gb/s TRANSMISSION UP TO 40 KM SSMF
- 7-PIN BUTTERFLY PACKAGE WITH GPO™ CONNECTOR
- AVAILABLE FOR DWDM WAVELENGTH BASED ON ITU-T RECOMMENDATION

DESCRIPTION

NEC's NX8560SJ Series is an Electro-Absorption (EA) Modulator and wavelength monitor intergraded, 1550 nm Multiple Quantum Well (MQW) structured Distributed Feed-Back (DFB) laser diode module. 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 (TLD = TSET, Tc = -5 + 70°C, BOL unless otherwise specified)

| PART NUMBER | | | NX8560SJ Series | | |
|---------------------|---|-------|-----------------|--------------------|------|
| SYMBOLS | PARAMETERS AND CONDITIONS | UNITS | MIN | TYP | MAX |
| TSET | Laser Set Temperature ¹ | °C | 20 | | 35 |
| I _{op} | Operating Current | mA | 50 | 60 | 80 |
| V _{CENTER} | Modulation Center Voltage | V | -2.0 | | -0.5 |
| V _{MOD} | Modulation Voltage | 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 from Fiber, Under modulation ² | dBm | -3 | -2 | |
| λ _p | Peak Emission Wavelength, I _{FLD} = I _{op} , V _{EA} = 0 V, TLD = TSET | nm | 1528 | ITU-T ³ | 1564 |
| SMSR | Side Mode Suppression Ratio, I _{FLD} = I _{op} , V _{EA} = 0 V | dB | 30 | > 37 | |
| ER | Extinction Ratio, Under modulation ² | dB | 10 | 11 | |
| t _r | Rise Time, 20-80%, Under modulation ² | ps | | | 40 |
| t _f | Fall Time, 80-20%, Under modulation ² | ps | | | 40 |
| DP | Dispersion Penalty, 800 ps/nm under modulation ^{2,4} | dB | | | 2.0 |
| I _s | Optical Isolation | dB | 23 | | |
| S ₁₁ | RF Return Loss, I _{FLD} = I _{op} , V _{EA} = 1 V, 50 Ω, f = 130 MHz to 5 GHz | dB | | -10 | -8 |
| | I _{FLD} = I _{op} , V _{EA} = 1 V, 50 Ω, f = 5 GHz to 10 GHz | dB | | -8 | -5 |

Note:

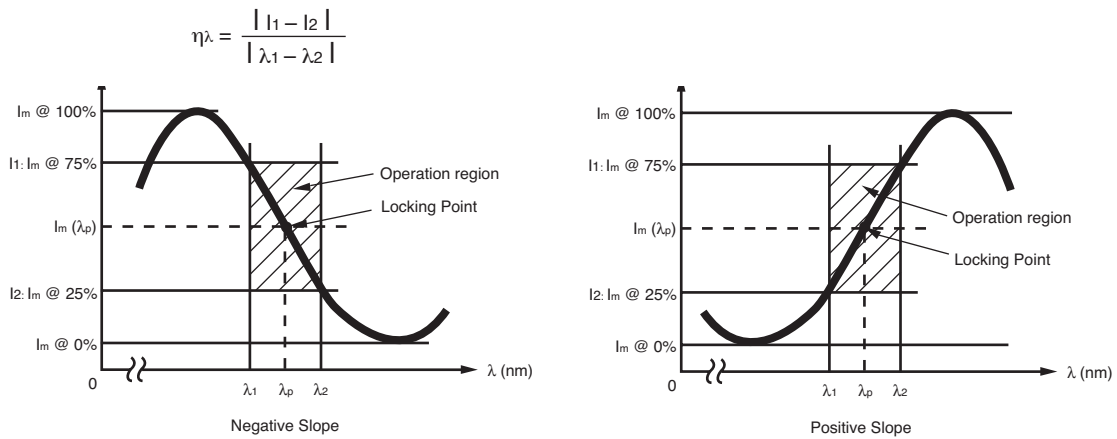
1. TSET is a certain point between 20°C and 35°C for ITU-T grid wavelength.
2. 40 km SMF under modulation, 9.95328 GB/S, PRBS 2²³⁻¹, V_{EA} = V_{CENTER} ± 1/2V_{MOD}, I_{FLD} = I_{op}, NEC Test System
V_{center}: a certain point between -2.0 V and -0.5 V.
V_{mod}: a certain point 3 V or below.
I_{op}: a certain point between 50 mA and 80 mA.
3. Available for DWDM wavelength based on ITU-T recommendations (50 GHz grid). Please refer to ordering information.
4. BER = 10⁻¹⁰.

ELECTRO-OPTICAL CHARACTERISTICS (Applicable to Monitor PD: TLD = TSET, Tc = -5 to +70°C, BOL)

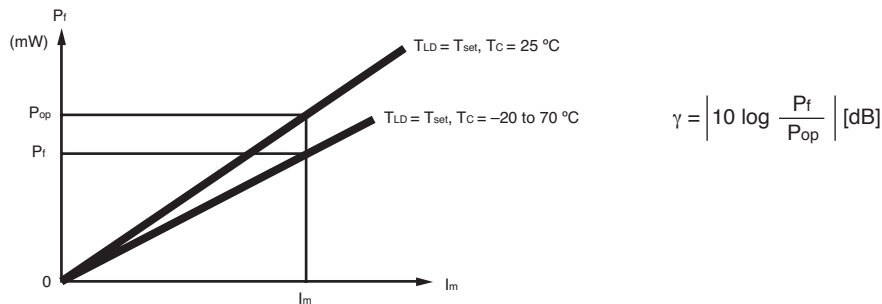
| PART NUMBER | | | NX8560SJ-CC | | |
|---------------------------|--|------------|-------------|-----|-----|
| SYMBOLS | PARAMETERS AND CONDITIONS | UNITS | MIN | TYP | MAX |
| $I_m (P_f)$ | Monitor Current, $V_{RPD} = 5V, I_{FLD} = I_{OP}$ | μA | 10 | | 200 |
| $I_m (\lambda_p)$ | Monitor Current, $V_{RPD} = 5V, I_{FLD} = I_{OP}$, Locking point | μA | 5 | | 100 |
| $I_m (\lambda)$ | Operation Region ¹ | % | 25 | | 75 |
| $ \lambda_1 - \lambda_2 $ | | nm | 90 | | |
| $\eta\lambda^{-1}$ | Discrimination Slope, $V_{RPD} = 5V, I_{FLD} = I_{OP}$, Locking point | $\mu A/pm$ | 0.24 | | |
| I_D | Dark Current, $V_{RPD} = 5V, V_{EA} = 0V$ | nA | | | 10 |
| C_t | Terminal Capacitance, $V_{RPD} = 5V, f = 1Mhz$ | pF | | | 15 |
| γ^2 | Tracking Error, $I_m = const.$ | dB | | | 0.5 |

Note:

1. Operation region, Discrimination slope, Slope assignment.



2. Tracking Error: γ



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

| PART NUMBER | | | NX8560SJ Series | | |
|-------------|-----------------------------------|------------|-----------------|------|------|
| SYMBOLS | PARAMETERS AND CONDITIONS | UNITS | MIN | TYP | MAX |
| R | Thermistor Resistance, TLD = 25°C | k Ω | 9.5 | 10.0 | 10.5 |
| B | B Constant | K | 3350 | 3450 | 3550 |
| Ic | Cooler Current, TLD = Tset | A | | | 1.2 |
| Vc | Cooler Voltage, TLD = Tset | V | | | 2.4 |

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

| SYMBOLS | PARAMETERS | UNITS | RATINGS |
|------------------|----------------------------------|-------|------------|
| P _f | Optical Output 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 | 4 |
| 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 Temperature (3 s) | °C | 350 |

Note:

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

ORDERING INFORMATION

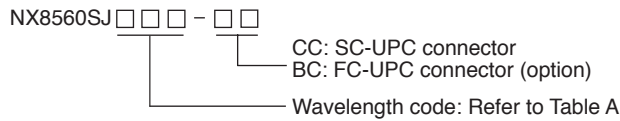


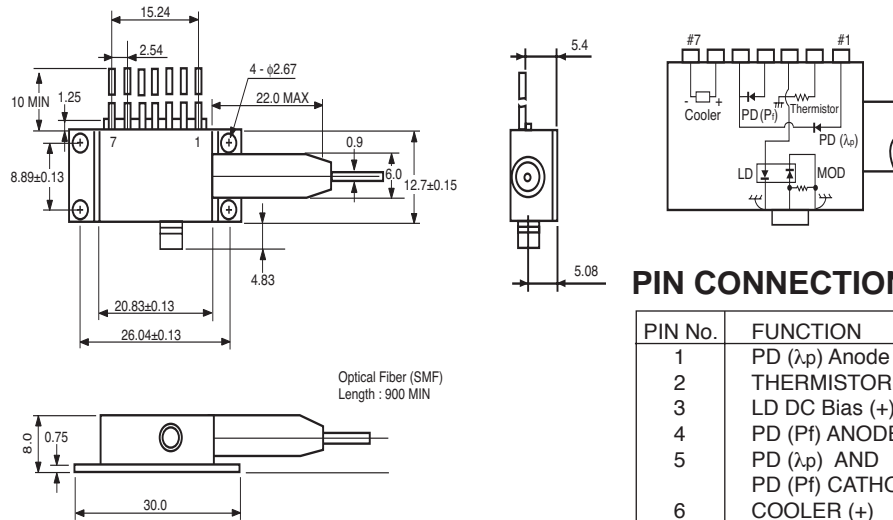
TABLE A: DWDM wavelengths based on ITU-T recommendations (@ TLD = Tset)

| Wavelength Code | ITU-T Wavelength ** (nm) | Frequency (THz) | Wavelength Code | ITU-T Wavelength ** (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:

- 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)

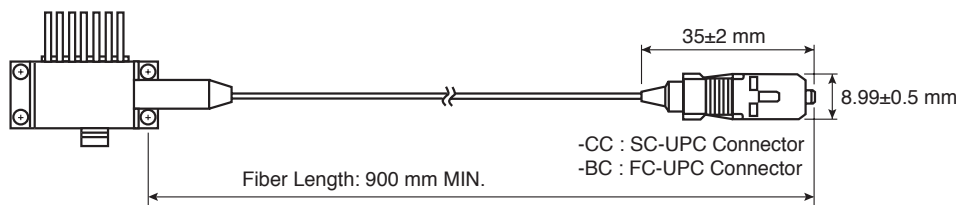


PIN CONNECTIONS

| PIN No. | FUNCTION |
|---------|----------------------------------|
| 1 | PD (λp) Anode (-) |
| 2 | THERMISTOR |
| 3 | LD DC Bias (+) |
| 4 | PD (P _f) ANODE (-) |
| 5 | PD (λp) AND |
| 6 | PD (P _f) CATHODE (+) |
| 6 | COOLER (+) |
| 7 | COOLER (-) |

OPTICAL FIBER CHARACTERISTICS

| PARAMETER | UNITS | SPECIFICATIONS |
|------------------------------|-------|----------------|
| 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 | dB/km | <0.3 |
| Minimum Fiber Bending Radius | mm | 30 |
| Fiber Length | mm | 900 MIN |
| Flammability | | UL1581 VW-1 |



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.

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