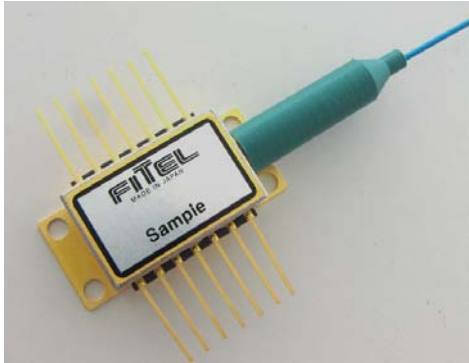


1550nm 2.5Gbit/s Directly Modulated DFB Laser module



Applications

- OC-48/STM-16 DWDM Transmission Systems

Descriptions

FRL15DDBx series of DFB laser module is designed for DWDM applications with 2.5Gbit/s direct modulation. The module is housed in an industry standard hermetically sealed 14-pin butterfly package, which contains optical isolator, thermoelectric cooler, power monitor photodiode. Precise wavelength selection is available according to ITU-T grid with 50 GHz spaced wavelength allocation.

Features

Low Driving Current, High Slope Efficiency
 High Side Mode Suppression Ratio
 Selected Wavelength According to ITU-T Grid (See Table.1)
 50GHz Spacing Available
 RoHS compliant package

Absolute Maximum Ratings

| Parameter | Symbol | Min | Max | Unit | Conditions |
|----------------------------|------------------|-----|-----|------|------------|
| Storage Temperature | Tstg | -40 | 85 | °C | - |
| Operating Case Temperature | Tc | -5 | 70 | °C | - |
| LD Reverse Voltage | V _{rLD} | - | 2 | V | - |
| LD Forward Current | I _{fLD} | - | 130 | mA | - |
| PD Reverse Voltage | V _{rPD} | - | 20 | V | - |
| PD Forward Current | I _{fPD} | - | 5 | mA | - |
| TEC Current | I _{tec} | - | 1.6 | A | - |
| TEC Voltage | V _{tec} | - | 2.6 | V | - |

Specifications (TLD=Tset, Tc=25°C, unless otherwise specified)

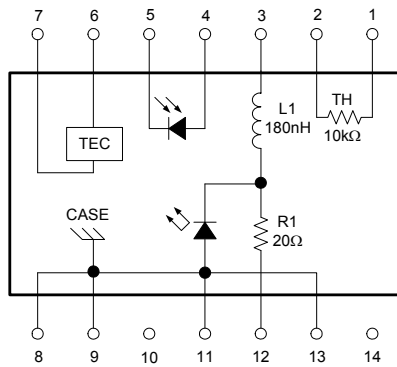
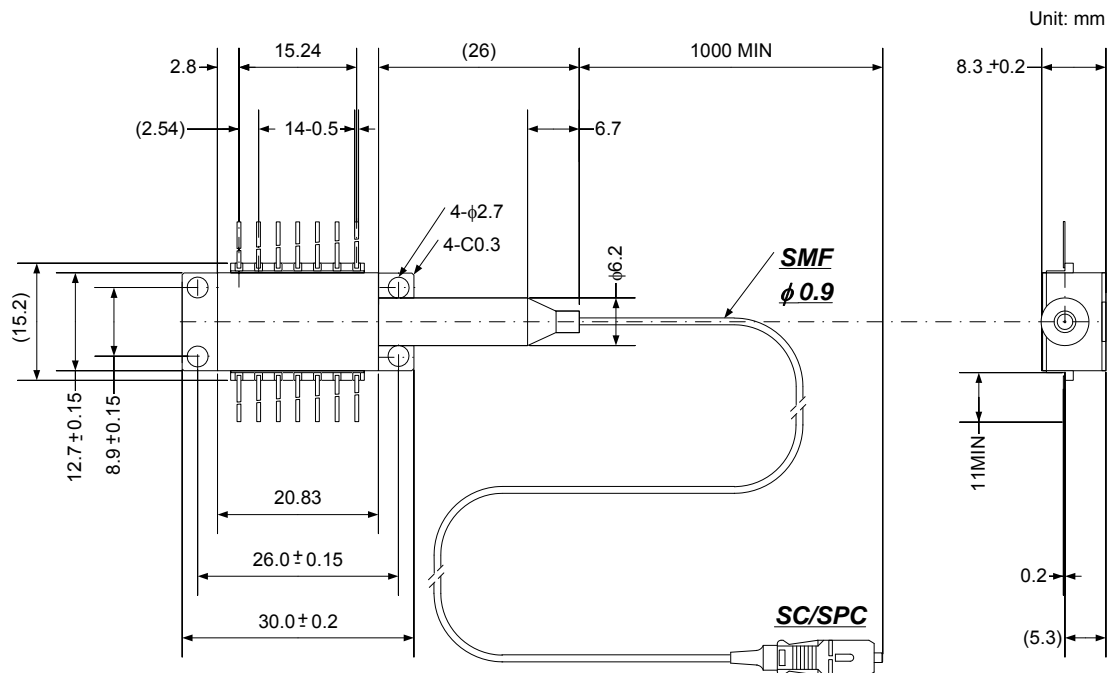
| Parameter | Symbol | Min | Typ | Max | Unit | Conditions |
|----------------------------------|------------------|-----------------------|------------------|-----------------------|-------|---|
| Optical Output Power | Pf | | | | mW | CW |
| FRL15DDB5 | | 5 | - | - | | |
| FRL15DDDBA | | 10 | - | - | | |
| LD Forward Current | If | | | | mA | Rated power, CW, BOL* ¹ |
| FRL15DDB5 | | - | - | 60 | | |
| FRL15DDDBA | | - | - | 100 | | |
| Submount Temperature | Tset | 20 | - | 35 | °C | <Pf>* ² , CW |
| LD Forward Voltage | Vf | - | - | 1.8 | V | Rated power, CW |
| Threshold Current | I _{th} | - | 10 | 20 | mA | BOL |
| Slope Efficiency | η | 0.10 | 0.20 | 0.35 | W/A | Rated power, CW |
| Input Impedance | Zin | - | 25 | - | Ω | |
| Wavelength | λ | λ _{ITU} -0.1 | λ _{ITU} | λ _{ITU} +0.1 | nm | <Pf>, CW, λ=1527.22~1610.06, See Table.1 |
| Spectral Width (-20dB fullwidth) | Δλ | - | - | 0.4 | nm | <Pf>* ² , 2.5Gb/s NRZ |
| Side Mode Suppression Ratio | SMSR | 35 | 45 | - | dB | <Pf>, CW |
| Dispersion Penalty | DP | - | - | 2 | dB | <Pf>, 2.5Gb/s NRZ, 1800ps/nm(100km) |
| Cut off Frequency | fc | 2 | - | - | GHz | <Pf>, -1.5dB Optical |
| Rise and Fall Time (10-90%) | tr, tf | - | - | 150 | ps | <Pf>, 2.5Gb/s NRZ |
| Optical Isolation | Iso | 25 | - | - | dB | |
| Relative Intensity Noise | RIN | - | - | -145 | dB/Hz | <Pf>, CW O _{pRL} < -25dB* ³ , 100MHz < f < 2.5GHz |
| Monitor Current | Im | | | | mA | <Pf>, CW, V _{TPD} =5V |
| FRL15DDB5 | | 0.02 | - | 1 | | |
| FRL15DDDBA | | 0.04 | - | 1 | | |
| Monitor Dark Current | Id | - | - | 100 | nA | V _{TPD} =5V |
| Tracking Error | TE | -0.5 | - | 0.5 | dB | Im=constant, Tc = -5 to 70°C |
| TEC Current | I _{tec} | - | - | 1.2 | A | Tc=70°C, <Pf>, CW |
| TEC Voltage | V _{tec} | - | - | 2.4 | V | Tc=70°C, <Pf>, CW |
| Thermistor B constant | B | - | 3900 | - | K | |
| Thermistor Resistance | R | 9.5 | - | 10.5 | kΩ | Tset=25°C |

*¹ BOL : Beginning of Life *² <Pf> : Average Power (half of Pf) *³ O_{pRL} : Optical Return Loss

Optical Fiber Pigtail Specifications

| Parameter | Specification | Unit |
|----------------------|---|------|
| Fiber Type | Corning SMF-28 or equivalent Flame Retardant Hytrel Coating 0.9mm□ | - |
| Nominal Fiber Length | Min. 1,000 (Boot edge (fiber side) to connector edge) | mm |
| Connector Type | SC/SPC Connector | - |

Dimensions and Pin Assignments



| PIN No. | Object | PIN No. | Function |
|---------|--------------------|---------|-----------------------------|
| 1 | Thermistor | 8 | Case Ground |
| 2 | Thermistor | 9 | Case Ground |
| 3 | LD Cathode(-) | 10 | No Connect |
| 4 | Monitor Anode(-) | 11 | Laser Anode(+), Case Ground |
| 5 | Monitor Cathode(+) | 12 | Laser RF |
| 6 | TEC(+) | 13 | Laser Anode(+), Case Ground |
| 7 | TEC(-) | 14 | No Connect |

Table 1

| λ [nm] | ITU Freq. [THz] | λ Code | λ [nm] | ITU Freq. [THz] | λ Code | λ [nm] | ITU Freq. [THz] | λ Code | λ [nm] | ITU Freq. [THz] | λ Code |
|----------------|-----------------|----------------|----------------|-----------------|----------------|----------------|-----------------|----------------|----------------|-----------------|----------------|
| 1527.22 | 196.30 | 19630 | 1547.32 | 193.75 | 19375 | 1567.95 | 191.20 | 19120 | 1589.15 | 188.65 | 18865 |
| 1527.61 | 196.25 | 19625 | 1547.72 | 193.70 | 19370 | 1568.36 | 191.15 | 19115 | 1589.57 | 188.60 | 18860 |
| 1527.99 | 196.20 | 19620 | 1548.12 | 193.65 | 19365 | 1568.77 | 191.10 | 19110 | 1589.99 | 188.55 | 18855 |
| 1528.38 | 196.15 | 19615 | 1548.52 | 193.60 | 19360 | 1569.18 | 191.05 | 19105 | 1590.41 | 188.50 | 18850 |
| 1528.77 | 196.10 | 19610 | 1548.92 | 193.55 | 19355 | 1569.59 | 191.00 | 19100 | 1590.83 | 188.45 | 18845 |
| 1529.16 | 196.05 | 19605 | 1549.32 | 193.50 | 19350 | 1570.01 | 190.95 | 19095 | 1591.26 | 188.40 | 18840 |
| 1529.55 | 196.00 | 19600 | 1549.72 | 193.45 | 19345 | 1570.42 | 190.90 | 19090 | 1591.68 | 188.35 | 18835 |
| 1529.94 | 195.95 | 19595 | 1550.12 | 193.40 | 19340 | 1570.83 | 190.85 | 19085 | 1592.10 | 188.30 | 18830 |
| 1530.33 | 195.90 | 19590 | 1550.52 | 193.35 | 19335 | 1571.24 | 190.80 | 19080 | 1592.52 | 188.25 | 18825 |
| 1530.73 | 195.85 | 19585 | 1550.92 | 193.30 | 19330 | 1571.65 | 190.75 | 19075 | 1592.95 | 188.20 | 18820 |
| 1531.12 | 195.80 | 19580 | 1551.32 | 193.25 | 19325 | 1572.06 | 190.70 | 19070 | 1593.37 | 188.15 | 18815 |
| 1531.51 | 195.75 | 19575 | 1551.72 | 193.20 | 19320 | 1572.48 | 190.65 | 19065 | 1593.79 | 188.10 | 18810 |
| 1531.90 | 195.70 | 19570 | 1552.12 | 193.15 | 19315 | 1572.89 | 190.60 | 19060 | 1594.22 | 188.05 | 18805 |
| 1532.29 | 195.65 | 19565 | 1552.52 | 193.10 | 19310 | 1573.30 | 190.55 | 19055 | 1594.64 | 188.00 | 18800 |
| 1532.68 | 195.60 | 19560 | 1552.93 | 193.05 | 19305 | 1573.71 | 190.50 | 19050 | 1595.07 | 187.95 | 18795 |
| 1533.07 | 195.55 | 19555 | 1553.33 | 193.00 | 19300 | 1574.13 | 190.45 | 19045 | 1595.49 | 187.90 | 18790 |
| 1533.47 | 195.50 | 19550 | 1553.73 | 192.95 | 19295 | 1574.54 | 190.40 | 19040 | 1595.91 | 187.85 | 18785 |
| 1533.86 | 195.45 | 19545 | 1554.13 | 192.90 | 19290 | 1574.95 | 190.35 | 19035 | 1596.34 | 187.80 | 18780 |
| 1534.25 | 195.40 | 19540 | 1554.54 | 192.85 | 19285 | 1575.37 | 190.30 | 19030 | 1596.76 | 187.75 | 18775 |
| 1534.64 | 195.35 | 19535 | 1554.94 | 192.80 | 19280 | 1575.78 | 190.25 | 19025 | 1597.19 | 187.70 | 18770 |
| 1535.04 | 195.30 | 19530 | 1555.34 | 192.75 | 19275 | 1576.20 | 190.20 | 19020 | 1597.62 | 187.65 | 18765 |
| 1535.43 | 195.25 | 19525 | 1555.75 | 192.70 | 19270 | 1576.61 | 190.15 | 19015 | 1598.04 | 187.60 | 18760 |
| 1535.82 | 195.20 | 19520 | 1556.15 | 192.65 | 19265 | 1577.03 | 190.10 | 19010 | 1598.47 | 187.55 | 18755 |
| 1536.22 | 195.15 | 19515 | 1556.56 | 192.60 | 19260 | 1577.44 | 190.05 | 19005 | 1598.89 | 187.50 | 18750 |
| 1536.61 | 195.10 | 19510 | 1556.96 | 192.55 | 19255 | 1577.86 | 190.00 | 19000 | 1599.32 | 187.45 | 18745 |
| 1537.00 | 195.05 | 19505 | 1557.36 | 192.50 | 19250 | 1578.27 | 189.95 | 18995 | 1599.75 | 187.40 | 18740 |
| 1537.40 | 195.00 | 19500 | 1557.77 | 192.45 | 19245 | 1578.69 | 189.90 | 18990 | 1600.17 | 187.35 | 18735 |
| 1537.79 | 194.95 | 19495 | 1558.17 | 192.40 | 19240 | 1579.10 | 189.85 | 18985 | 1600.60 | 187.30 | 18730 |
| 1538.19 | 194.90 | 19490 | 1558.58 | 192.35 | 19235 | 1579.52 | 189.80 | 18980 | 1601.03 | 187.25 | 18725 |
| 1538.58 | 194.85 | 19485 | 1558.98 | 192.30 | 19230 | 1579.93 | 189.75 | 18975 | 1601.46 | 187.20 | 18720 |
| 1538.98 | 194.80 | 19480 | 1559.39 | 192.25 | 19225 | 1580.35 | 189.70 | 18970 | 1601.88 | 187.15 | 18715 |
| 1539.37 | 194.75 | 19475 | 1559.79 | 192.20 | 19220 | 1580.77 | 189.65 | 18965 | 1602.31 | 187.10 | 18710 |
| 1539.77 | 194.70 | 19470 | 1560.20 | 192.15 | 19215 | 1581.18 | 189.60 | 18960 | 1602.74 | 187.05 | 18705 |
| 1540.16 | 194.65 | 19465 | 1560.61 | 192.10 | 19210 | 1581.60 | 189.55 | 18955 | 1603.17 | 187.00 | 18700 |
| 1540.56 | 194.60 | 19460 | 1561.01 | 192.05 | 19205 | 1582.02 | 189.50 | 18950 | 1603.60 | 186.95 | 18695 |
| 1540.95 | 194.55 | 19455 | 1561.42 | 192.00 | 19200 | 1582.44 | 189.45 | 18945 | 1604.03 | 186.90 | 18690 |
| 1541.35 | 194.50 | 19450 | 1561.83 | 191.95 | 19195 | 1582.85 | 189.40 | 18940 | 1604.46 | 186.85 | 18685 |
| 1541.75 | 194.45 | 19445 | 1562.23 | 191.90 | 19190 | 1583.27 | 189.35 | 18935 | 1604.89 | 186.80 | 18680 |
| 1542.14 | 194.40 | 19440 | 1562.64 | 191.85 | 19185 | 1583.69 | 189.30 | 18930 | 1605.31 | 186.75 | 18675 |
| 1542.54 | 194.35 | 19435 | 1563.05 | 191.80 | 19180 | 1584.11 | 189.25 | 18925 | 1605.74 | 186.70 | 18670 |
| 1542.94 | 194.30 | 19430 | 1563.46 | 191.75 | 19175 | 1584.53 | 189.20 | 18920 | 1606.17 | 186.65 | 18665 |
| 1543.33 | 194.25 | 19425 | 1563.86 | 191.70 | 19170 | 1584.95 | 189.15 | 18915 | 1606.61 | 186.60 | 18660 |
| 1543.73 | 194.20 | 19420 | 1564.27 | 191.65 | 19165 | 1585.37 | 189.10 | 18910 | 1607.04 | 186.55 | 18655 |
| 1544.13 | 194.15 | 19415 | 1564.68 | 191.60 | 19160 | 1585.78 | 189.05 | 18905 | 1607.47 | 186.50 | 18650 |
| 1544.53 | 194.10 | 19410 | 1565.09 | 191.55 | 19155 | 1586.20 | 189.00 | 18900 | 1607.90 | 186.45 | 18645 |
| 1544.92 | 194.05 | 19405 | 1565.50 | 191.50 | 19150 | 1586.62 | 188.95 | 18895 | 1608.33 | 186.40 | 18640 |
| 1545.32 | 194.00 | 19400 | 1565.91 | 191.45 | 19145 | 1587.04 | 188.90 | 18890 | 1608.76 | 186.35 | 18635 |
| 1545.72 | 193.95 | 19395 | 1566.31 | 191.40 | 19140 | 1587.46 | 188.85 | 18885 | 1609.19 | 186.30 | 18630 |
| 1546.12 | 193.90 | 19390 | 1566.72 | 191.35 | 19135 | 1587.88 | 188.80 | 18880 | 1609.62 | 186.25 | 18625 |
| 1546.52 | 193.85 | 19385 | 1567.13 | 191.30 | 19130 | 1588.30 | 188.75 | 18875 | 1610.06 | 186.20 | 18620 |
| 1546.92 | 193.80 | 19380 | 1567.54 | 191.25 | 19125 | 1588.73 | 188.70 | 18870 | | | |

Wavelength values are referenced to vacuum.

Wavelength (λ) and ITU frequency (f) have a relationship as $\lambda[\text{nm}] = 299792458 / f[\text{THz}] / 1000$.

FITEL code is expressed as a 5 digit integer rounded from $100 \times f$ [THz].

Ordering Information

FRL15DDB□ – A31 – □□□□□ – E

| |
|----------------------|
| Optical Output Power |
| 5: 5mW |
| A: 10mW |

| |
|-----------------|
| Wavelength code |
|-----------------|

Safety Information

This product complies with 21 CFR 1040.10 and 1040.11, Class 3b laser product. Invisible laser radiation is emitted from the end of the fiber or connector. Avoid direct exposure to the beam.



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