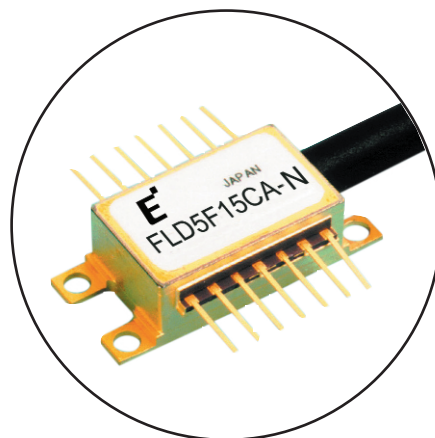


## FEATURES:

- CW light source with integrated wavelength locker
- Output Power: 13dBm (min.)
- Tunable over 4 ITU-I 100GHz spaced channels (2.4nm)
- Available at L-band ITU-T grid wavelengths between 1570.416 to 1607.035nm
- Wavelength stability better than  $\pm 25\text{pm}$  drift over 20 years operation and (0 to 70°C) case temperature variation
- Built-in optical isolator, Thermistor, TEC, Wavelength Monitor PIN-PD, Power Monitor PIN-PD
- Polarization maintaining (PANDA) fiber



## APPLICATIONS:

Long haul DWDM transmission system  
Metropolitan DWDM transmission system  
Optical Test Equipment

## DESCRIPTION:

The Eudyna Tunable LD module with Wavelength Locker (FLD5F15CA-N) is a high power CW laser (13dBm) with polarization maintaining fiber. It is intended for use with an external modulator. The oscillation wavelength can be tuned across a 2.4nm range (4 ITU-T 100GHz spaced channels) via adjustment of the chip temperature with the built-in TEC. The tuned wavelength can be locked onto the desired ITU-T grid channel via use of the built-in Wavelength Monitor. This laser is available at any of the 88 ITU-T wavelengths in the L-band (1570.416 to 1607.035nm). The device comes in a standard 14-pin butterfly package, and operates between 0 to 70°C.

## ABSOLUTE MAXIMUM RATINGS ( $T_c=25^\circ\text{C}$ , unless otherwise specified)

| Parameter                  | Symbol           | Condition     | Rating |       | Unit             |
|----------------------------|------------------|---------------|--------|-------|------------------|
|                            |                  |               | Min.   | Max.  |                  |
| Storage Temperature        | $T_{\text{stg}}$ | -             | -40    | +85   | $^\circ\text{C}$ |
| Operating Case Temperature | $T_{\text{op}}$  | -             | 0      | +70   | $^\circ\text{C}$ |
| Optical Output Power       | $P_f$            | CW            | -      | 30    | mW               |
| Laser Forward Current      | $I_F$            | CW            | -      | 250   | mA               |
| Laser Reverse Voltage      | $V_R$            | CW            | -      | 2     | V                |
| PD Reverse Voltage         | $V_{\text{DR}}$  | -             | -      | 20    | V                |
| PD Forward Current         | $I_{\text{PF}}$  | -             | -      | 10    | mA               |
| Cooler Voltage             | $V_c$            | Cooling       | -      | +5.00 | V                |
|                            |                  | Heating       | -2.50  | -     |                  |
| Cooler Current             | $I_c$            | Cooling       | -      | +1.85 | A                |
|                            |                  | Heating       | -0.60  | -     |                  |
| Thermistor Temperature     | $T_{\text{th}}$  | ATC Operation | -      | +70   | $^\circ\text{C}$ |
| Lead Soldering Time        | -                | 260°C         | -      | 10    | sec              |

OPTICAL AND ELECTRICAL CHARACTERISTICS ( $T_L=T_{set}$ , (CH.1 to CH.8)  $T_c=25^\circ\text{C}$ , BOL, unless otherwise specified)

| Parameter                                                                 | Symbol                                  | Test Conditions                                                                | Limits   |       |       | Unit             |
|---------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------------------------------------------|----------|-------|-------|------------------|
|                                                                           |                                         |                                                                                | Min.     | Typ.  | Max.  |                  |
| Laser Set Temperature (BOL)                                               | $T_{set}$                               | -                                                                              | 11       | -     | 47    | $^\circ\text{C}$ |
| Laser Set Temperature (EOL)                                               | $T_{set}$                               | -                                                                              | 10       | -     | 48    | $^\circ\text{C}$ |
| Optical Output Power                                                      | $P_f$                                   | -                                                                              | 20       | -     | -     | mW               |
| Threshold Current                                                         | $I_{th}$                                | -                                                                              | 3        | -     | 45    | mA               |
| Forward Voltage                                                           | $V_F$                                   | -                                                                              | -        | -     | 2.2   | V                |
| Slope Efficiency                                                          | $\eta$                                  | -                                                                              | -        | 0.2   | -     | mW/mA            |
| Operating Forward Current                                                 | $I_{op}$                                | -                                                                              | -        | -     | 200   | mA               |
| Peak Wavelength                                                           | $\lambda_p$                             | CH.1 to CH.8, ORL>40dB                                                         | Note (4) |       |       | nm               |
| Wavelength Stability with Case Temperature and Aging                      | -                                       | $I_{m1}, I_{m2}=\text{constant}$ ,<br>$T_c=0$ to $70^\circ\text{C}$ , 20 years | -25      | -     | +25   | pm               |
| Wavelength Stability with LD Current Change                               | -                                       | $TLD=T_{set}$                                                                  | -        | -     | +25   | pm/mA            |
| Spectral Width (-3dB)                                                     | $\Delta\lambda$                         | ORL>40dB                                                                       | -        | 3     | 10    | MHz              |
| Side Mode Suppression                                                     | $S_r$                                   |                                                                                | 33       | -     | -     | dB               |
| Power Monitor Current                                                     | $I_{m1}$                                | $P_f=20\text{mW}$                                                              | 0.1      | -     | 1.8   | mA               |
| Power Monitor Dark Current                                                | $I_{dm1}$                               | $V_{pd}=5\text{V}$                                                             | -        | -     | 100   | nA               |
| Power Monitor Capacitance                                                 | $C_{t1}$                                | $V_{pd}=5\text{V}$ , $f=1\text{MHz}$                                           | -        | -     | 10    | pF               |
| Wavelength Monitor Current                                                | $I_{m2}$                                | $P_f=20\text{mW}$                                                              | 0.1      | -     | 1.8   | mA               |
| Wavelength Monitor Dark Current                                           | $I_{dm2}$                               | $V_{pd}=5\text{V}$                                                             | -        | -     | 100   | nA               |
| Wavelength Monitor Capacitance                                            | $C_{t2}$                                | $V_{pd}=5\text{V}$ , $f=1\text{MHz}$                                           | -        | -     | 10    | pF               |
| Wavelength difference between lock point and $I_{m2\text{peak}}$ (Note 2) | $\Delta\lambda_{\text{locked}}$         |                                                                                | 6.0      | -     | 33.0  | GHz              |
| $I_{m2}$ peak/bottom Ratio                                                | $I_{m2\text{peak}}/I_{m2\text{bottom}}$ |                                                                                | 1.0      | -     | 4.5   | dB               |
| Tracking Error (Note 3)                                                   | TE                                      | $I_{m1}, I_{m2}=\text{constant}$ ,<br>$T_c=0$ to $+70^\circ\text{C}$           | -0.5     | -     | +1.0  | dB               |
| Optical Isolation                                                         | $I_S$                                   | $T_c=0$ to $+70^\circ\text{C}$                                                 | 22       | -     | -     | dB               |
| Polarization Extinction Ratio                                             | PER                                     |                                                                                | 20       | -     | -     | dB               |
| Relative Intensity Noise                                                  | RIN                                     | CW, ORL>40dB<br>average of $f=\text{DC}$ to $7.5\text{GHz}$                    | -        | -     | -140  | dB/Hz            |
| Cooler Current                                                            | $I_c$                                   | $T_L=T_{set}$ ,<br>$T_c=+70^\circ\text{C}$                                     | -        | -     | 1.05  | A                |
| Cooler Voltage                                                            | $V_c$                                   |                                                                                | -        | -     | 3.80  | V                |
| Cooler Power                                                              | $P_c$                                   |                                                                                | -        | -     | 4.00  | W                |
| Thermistor Resistance                                                     | $R_{th}$                                | $T_L=25^\circ\text{C}$ , $T_c=+25^\circ\text{C}$                               | 9.5      | 10.0  | 10.5  | k $\Omega$       |
| Thermistor B Constant (Note 4)                                            | B                                       |                                                                                | 3,270    | 3,450 | 3,630 | K                |

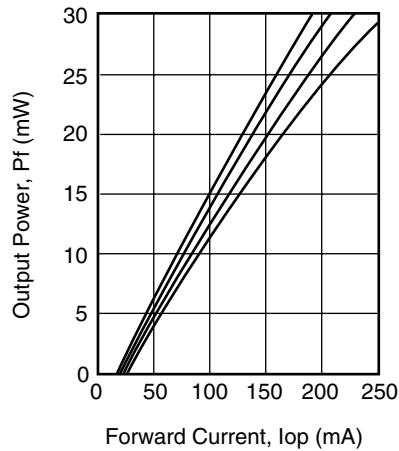
Note 1.  $TE=10\log[P_f(T_c)/P_f(25)]$

Note 2. Relation between resistance and temperature ( $^\circ\text{K}$ ) is:  $R_{th}(T) = R_{th}(25^\circ\text{C}) \cdot \exp[B(1/T - 1/298)]$

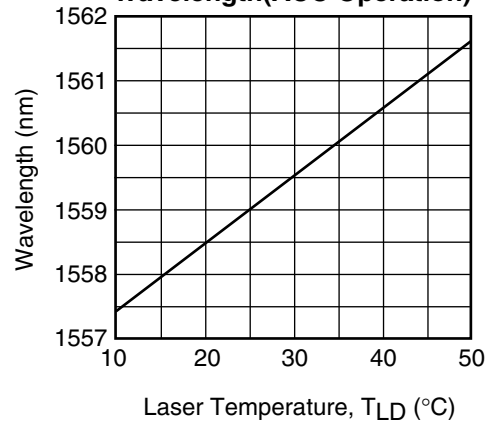
Note 3. At the shortest wavelength of each sub-band, wavelength at lock point is longer than  $I_{m2}$  peak. (Increasing wavelength shall give a decrease in wavelength monitor current) The value is written in frequency:  $f=c/\lambda_p$ ,  $c=2.99792458 \times 10^8\text{m/s}$

Note 4. Reference Table 1 for Wavelength Table

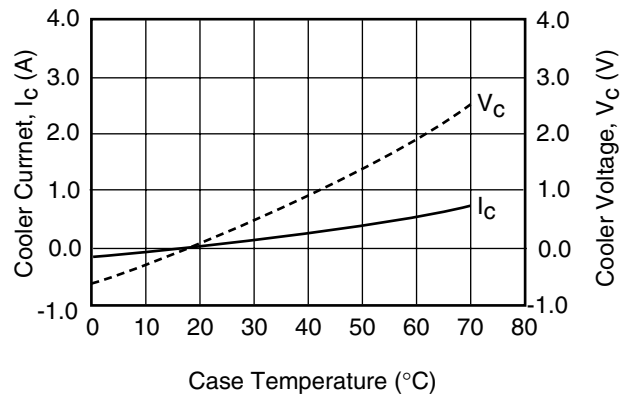
**Fig. 1 Forward Current vs Output Power**



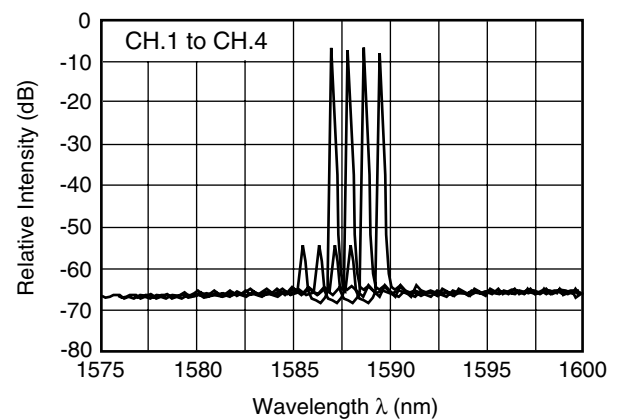
**Fig. 2 Temperature Dependence of Wavelength(ACC Operation)**



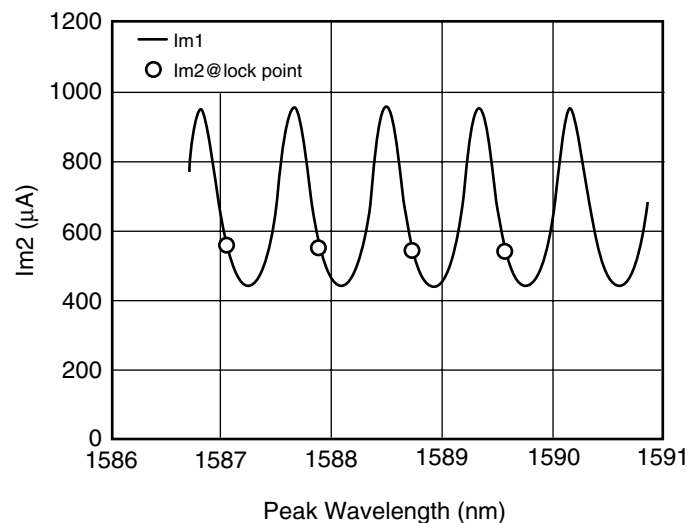
**Fig. 3 Cooler Voltage -Current**



**Fig.4 Spectrum**



**Fig. 5 Filter Curve**



# FLD5F15CA-N Tunable LD Module with Wavelength Locker

Table 1 Wavelength Table

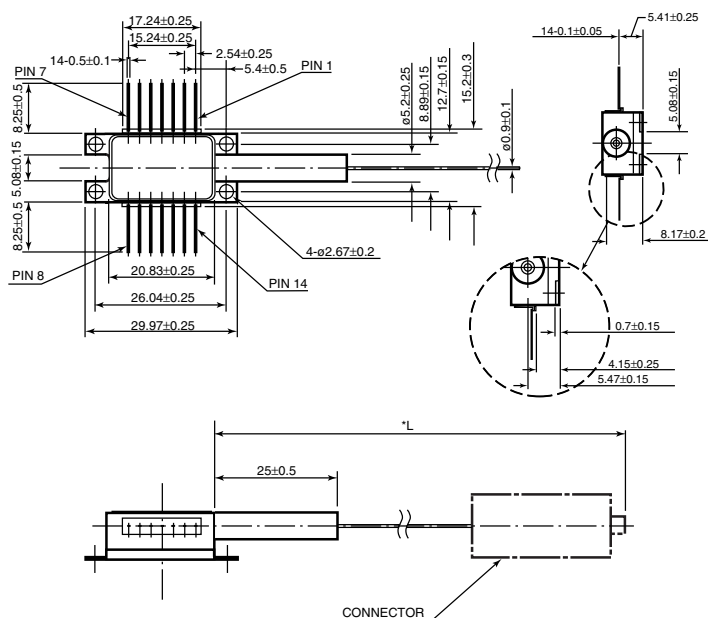
| Part Number     | Wavelength (nm)<br>(TL-Tset)<br>(in vacuum) | Tolerance (nm) | Part Number     | Wavelength (nm)<br>(TL-Tset)<br>(in vacuum) | Tolerance (nm) |
|-----------------|---------------------------------------------|----------------|-----------------|---------------------------------------------|----------------|
| FLD5F15CA-N9090 | 1570.416                                    | ±0.01          | FLD5F15CA-N8885 | 1587.463                                    | ±0.01          |
|                 | 1571.239                                    | ±0.01          |                 | 1588.304                                    | ±0.01          |
|                 | 1572.063                                    | ±0.01          |                 | 1589.146                                    | ±0.01          |
|                 | 1572.888                                    | ±0.01          |                 | 1589.989                                    | ±0.01          |
| FLD5F15CA-N9085 | 1570.828                                    | ±0.01          | FLD5F15CA-N8850 | 1590.411                                    | ±0.01          |
|                 | 1571.651                                    | ±0.01          |                 | 1591.255                                    | ±0.01          |
|                 | 1572.476                                    | ±0.01          |                 | 1592.100                                    | ±0.01          |
|                 | 1573.301                                    | ±0.01          |                 | 1592.946                                    | ±0.01          |
| FLD5F15CA-N9050 | 1573.714                                    | ±0.01          | FLD5F15CA-N8845 | 1590.833                                    | ±0.01          |
|                 | 1574.540                                    | ±0.01          |                 | 1591.678                                    | ±0.01          |
|                 | 1575.368                                    | ±0.01          |                 | 1592.523                                    | ±0.01          |
|                 | 1576.196                                    | ±0.01          |                 | 1593.369                                    | ±0.01          |
| FLD5F15CA-N9045 | 1574.127                                    | ±0.01          | FLD5F15CA-N8810 | 1593.793                                    | ±0.01          |
|                 | 1574.954                                    | ±0.01          |                 | 1594.641                                    | ±0.01          |
|                 | 1575.782                                    | ±0.01          |                 | 1595.489                                    | ±0.01          |
|                 | 1576.610                                    | ±0.01          |                 | 1596.339                                    | ±0.01          |
| FLD5F15CA-N9010 | 1577.025                                    | ±0.01          | FLD5F15CA-N8805 | 1594.217                                    | ±0.01          |
|                 | 1577.855                                    | ±0.01          |                 | 1595.065                                    | ±0.01          |
|                 | 1578.686                                    | ±0.01          |                 | 1595.914                                    | ±0.01          |
|                 | 1579.518                                    | ±0.01          |                 | 1596.764                                    | ±0.01          |
| FLD5F15CA-N9005 | 1577.440                                    | ±0.01          | FLD5F15CA-N8770 | 1597.189                                    | ±0.01          |
|                 | 1578.270                                    | ±0.01          |                 | 1598.041                                    | ±0.01          |
|                 | 1579.102                                    | ±0.01          |                 | 1598.893                                    | ±0.01          |
|                 | 1579.934                                    | ±0.01          |                 | 1599.746                                    | ±0.01          |
| FLD5F15CA-N8970 | 1580.350                                    | ±0.01          | FLD5F15CA-N8765 | 1597.615                                    | ±0.01          |
|                 | 1581.184                                    | ±0.01          |                 | 1598.467                                    | ±0.01          |
|                 | 1582.018                                    | ±0.01          |                 | 1599.320                                    | ±0.01          |
|                 | 1582.854                                    | ±0.01          |                 | 1600.173                                    | ±0.01          |
| FLD5F15CA-N8965 | 1580.767                                    | ±0.01          | FLD5F15CA-N8730 | 1600.600                                    | ±0.01          |
|                 | 1581.601                                    | ±0.01          |                 | 1601.455                                    | ±0.01          |
|                 | 1582.436                                    | ±0.01          |                 | 1602.311                                    | ±0.01          |
|                 | 1583.271                                    | ±0.01          |                 | 1603.168                                    | ±0.01          |
| FLD5F15CA-N8930 | 1583.690                                    | ±0.01          | FLD5F15CA-N8725 | 1601.028                                    | ±0.01          |
|                 | 1584.527                                    | ±0.01          |                 | 1601.883                                    | ±0.01          |
|                 | 1585.365                                    | ±0.01          |                 | 1602.740                                    | ±0.01          |
|                 | 1586.203                                    | ±0.01          |                 | 1603.597                                    | ±0.01          |
| FLD5F15CA-N8925 | 1584.108                                    | ±0.01          | FLD5F15CA-N8690 | 1604.026                                    | ±0.01          |
|                 | 1584.946                                    | ±0.01          |                 | 1604.885                                    | ±0.01          |
|                 | 1585.784                                    | ±0.01          |                 | 1605.744                                    | ±0.01          |
|                 | 1586.623                                    | ±0.01          |                 | 1606.605                                    | ±0.01          |
| FLD5F15CA-N8890 | 1587.043                                    | ±0.01          | FLD5F15CA-N8685 | 1604.455                                    | ±0.01          |
|                 | 1587.884                                    | ±0.01          |                 | 1605.314                                    | ±0.01          |
|                 | 1588.725                                    | ±0.01          |                 | 1606.174                                    | ±0.01          |
|                 | 1589.568                                    | ±0.01          |                 | 1607.035                                    | ±0.01          |

# Tunable LD Module with Wavelength Locker

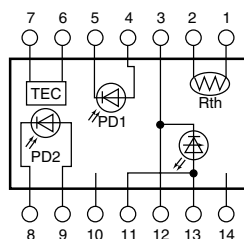
# FLD5F15CA-N

## "CA" PACKAGE

UNIT: mm



## TOP VIEW



| #  | PIN DESIGNATIONS           |
|----|----------------------------|
| 1  | Thermistor                 |
| 2  | Thermistor                 |
| 3  | LD Cathode                 |
| 4  | Power Monitor Anode        |
| 5  | Power Monitor Cathode      |
| 6  | Thermoelectric Cooler (+)  |
| 7  | Thermoelectric Cooler (-)  |
| 8  | Wavelength Monitor Cathode |
| 9  | Wavelength Monitor Anode   |
| 10 | NC                         |
| 11 | LD Anode                   |
| 12 | LD Cathode                 |
| 13 | LD Anode                   |
| 14 | NC                         |

\* Pigtail length (L) and connector type are specified in the detail (individual) specification.  
L = 1500MIN. for standard

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