

Sumitomo Electric Industries, Ltd.  
Part No. : SLT5411/SLT5413 Series  
Document No. : HUW9723037-01J  
Date of issue : January 31, 2002



## **Technical Specification**

**of**

**1.5 $\mu$ m DFB Laser Diode Module  
for WDM External Modulation**

**SLT5411/SLT5413 series**

**Sumitomo Electric Industries, Ltd.**

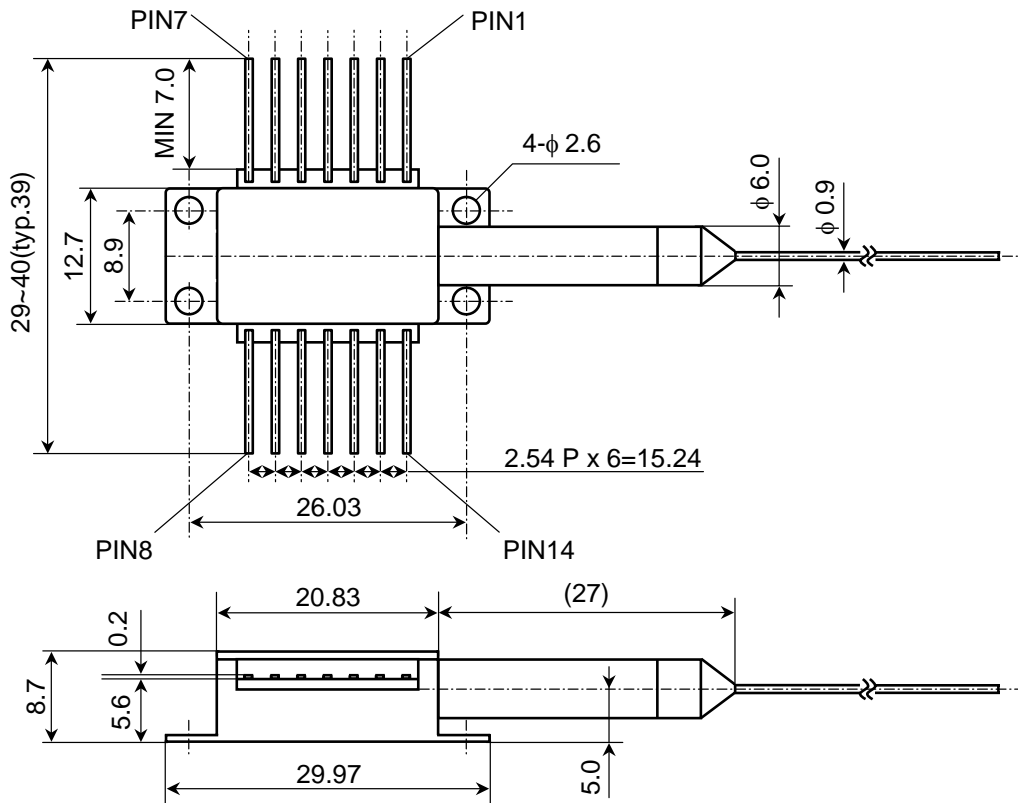
1. General

SLT5411/SLT5413 series are 1.5 $\mu$ m InGaAsP/InP MQW DFB laser diode modules designed for a CW optical source of WDM (Wavelength Division Multiplexing) application used with an external modulator.

A laser diode chip is mounted on a 14 pin butterfly package integrated with an optical isolator, an InGaAs monitor PD, a thermo-electric cooler, and a single mode polarization maintaining (PM) fiber pigtail.

2. Package dimension and pin assignment

(unit : mm, tolerance :  $\pm 0.15$  unless otherwise noted)



| Pin No. | Function           | Pin No. | Function        |
|---------|--------------------|---------|-----------------|
| 1       | Thermistor         | 14      | NC              |
| 2       | Thermistor         | 13      | LD Anode (*1)   |
| 3       | LD Cathode (DC)    | 12      | LD Cathode (RF) |
| 4       | Monitor PD Anode   | 11      | LD Anode (*1)   |
| 5       | Monitor PD Cathode | 10      | NC              |
| 6       | TEC Anode          | 9       | Case Ground     |
| 7       | TEC Cathode        | 8       | Case Ground     |

Note \*1 SLT5411 : Anode pins are connected to case ground  
 SLT5413 : Anode pins are floated against case ground

### 3. Absolute maximum ratings

| Parameter                           | Symbol | Min. | Max. | Unit |
|-------------------------------------|--------|------|------|------|
| Storage temperature                 | Tstg   | -40  | 85   | °C   |
| Operating case temperature          | Tc     | -20  | 65   | °C   |
| LD forward current                  | IfL    | –    | 200  | mA   |
| LD reverse voltage                  | VrL    | –    | 2    | V    |
| PD reverse current                  | IrP    | –    | 2    | mA   |
| PD reverse voltage                  | VrP    | –    | 15   | V    |
| Thermistor current                  | Itherm | –    | 0.5  | mA   |
| Thermistor voltage                  | Vtherm | –    | 5    | V    |
| TEC current                         | Ic     | –    | 1.4  | A    |
| Electro static Discharge (ESD) (*2) | VESD   | –    | 500  | V    |
| Package mounting screw torque(*3)   | Npt    | –    | 0.2  | Nm   |
| Lead soldering temperature          | Stemp  | –    | 260  | °C   |
| Lead soldering time                 | Stime  | –    | 10   | sec  |

Note \*2 A human-body model (HBM, C=100pF, R=1.5kΩ) is employed.

Note \*3 Without buffer materials under the package

### 4. Electrical and optical characteristics

(Unless otherwise noted, T<sub>LD</sub>=19~31°C, BOL)

| Parameter                     | Symbol | Condition                           | Min. | Typ. | Max. | Unit  |
|-------------------------------|--------|-------------------------------------|------|------|------|-------|
| Threshold current             | Ith    | CW                                  | –    | 10   | 25   | mA    |
| Operating current             | Iop    | CW A Pf=10mW                        | –    | –    | 100  | mA    |
|                               |        | (*4) B Pf=20mW                      | –    | –    | 120  | mA    |
| Forward voltage               | Vf     | CW, If=Iop                          | –    | –    | 2    | V     |
| Monitor current               | Im     | CW, If=Iop                          | 50   | –    | 1000 | μA    |
| Side mode suppression ratio   | SMSR   | CW, If=Iop                          | 35   | –    | –    | dB    |
| Relative intensity noise      | RIN    | CW, If=Iop, DC~2.5GHz               | –    | –    | -140 | dB/Hz |
| Polarization extinction ratio | PER    | CW, If=Iop, launched into slow axis | 20   | –    | –    | dB    |
| Monitor dark current          | Id     | VrP=5V                              | –    | 1    | 10   | nA    |
| Monitor capacitance           | C      | VrP=5V, f=1MHz                      | –    | –    | 12   | pF    |
| Peak wavelength               | λp     | CW, If=Iop                          | –    | (*4) | –    | nm    |
| Peak wavelength drift         | Dλ     | CW, Pf=Pop, 25 years                | –    | –    | 0.2  | nm    |
| Line width                    | Δλ     | CW, If=Iop                          | –    | –    | 10   | MHz   |

Note \*4 See ordering information (Section 7)

5. Thermal characteristics

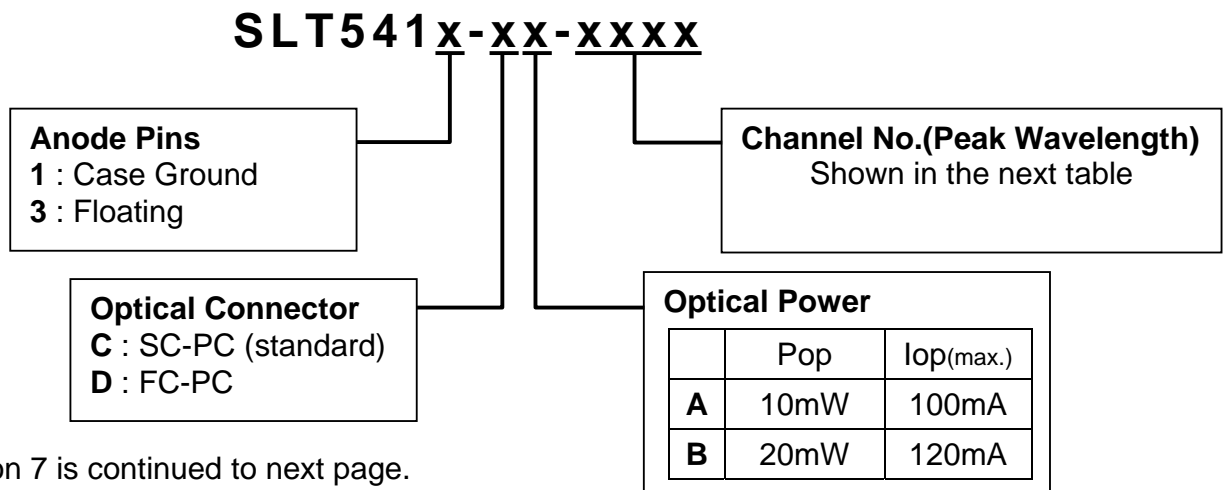
| Parameter                                   | Symbol                           | Condition  | Min. | Typ. | Max. | Unit  |
|---|----------------------------------|--|------|------|------|-------|
| Thermistor resistance                       | R <sub>th</sub>                  | T <sub>LD</sub> =25°C  | 9.5  | 10   | 10.5 | kΩ    |
| Thermistor B const.                         | B                                | 25°C/75°C  | 3800 | 3900 | 4000 | K     |
| TEC current                                 | I <sub>c</sub>                   | T <sub>LD</sub> =19°C, T <sub>c</sub> =65°C<br>Pf=Pop                | -    | -    | 1    | A     |
| TEC voltage                                 | V <sub>c</sub>                   | T <sub>LD</sub> =19°C, T <sub>c</sub> =65°C<br>Pf=Pop                | -    | -    | 2    | V     |
| Peak wavelength drift with case temperature | Dλ <sub>p</sub> /DT <sub>c</sub> | CW, I <sub>f</sub> =I <sub>op</sub> ,<br>T <sub>c</sub> =-20 to 65°C | -1   | -    | 1    | pm/°C |

6. Fiber specification

| Parameter             | Min.                 | Typ. | Max. | Unit |
|-----------------------|----------------------|------|------|------|
| Fiber type            | Single mode PM fiber |      |      | -    |
| Mode field diameter   | 8.5                  | 9.5  | 10.5 | μm   |
| Cladding diameter     | 122                  | 125  | 128  | μm   |
| Outer jacket diameter | -                    | 0.9  | -    | mm   |
| Pigtail length        | 1.5                  | 2.0  | 2.5  | m    |
| Bending radius        | 40                   | -    | -    | mm   |
| Optical connector     | (*5)                 |      |      | -    |

Note \*5 See ordering information (Section 7)

7. Ordering information



Section 7 is continued to next page.

Channels between 1528 and 1565nm

| Channel No. | Frequency (THz) | Wavelength (nm) | Channel No. | Frequency (THz) | Wavelength (nm) | Channel No. | Frequency (THz) | Wavelength (nm) |
|-------------|-----------------|-----------------|-------------|-----------------|-----------------|-------------|-----------------|-----------------|
| F620        | 196.20          | 1527.99         | F465        | 194.65          | 1540.16         | F310        | 193.10          | 1552.52         |
| F615        | 196.15          | 1528.38         | F460        | 194.60          | 1540.56         | F305        | 193.05          | 1552.93         |
| F610        | 196.10          | 1528.77         | F455        | 194.55          | 1540.95         | F300        | 193.00          | 1553.33         |
| F605        | 196.05          | 1529.16         | F450        | 194.50          | 1541.35         | F295        | 192.95          | 1553.73         |
| F600        | 196.00          | 1529.55         | F445        | 194.45          | 1541.75         | F290        | 192.90          | 1554.13         |
| F595        | 195.95          | 1529.94         | F440        | 194.40          | 1542.14         | F285        | 192.85          | 1554.54         |
| F590        | 195.90          | 1530.33         | F435        | 194.35          | 1542.54         | F280        | 192.80          | 1554.94         |
| F585        | 195.85          | 1530.72         | F430        | 194.30          | 1542.94         | F275        | 192.75          | 1555.34         |
| F580        | 195.80          | 1531.12         | F425        | 194.25          | 1543.33         | F270        | 192.70          | 1555.75         |
| F575        | 195.75          | 1531.51         | F420        | 194.20          | 1543.73         | F265        | 192.65          | 1556.15         |
| F570        | 195.70          | 1531.90         | F415        | 194.15          | 1544.13         | F260        | 192.60          | 1556.55         |
| F565        | 195.65          | 1532.29         | F410        | 194.10          | 1544.53         | F255        | 192.55          | 1556.96         |
| F560        | 195.60          | 1532.68         | F405        | 194.05          | 1544.92         | F250        | 192.50          | 1557.36         |
| F555        | 195.55          | 1533.07         | F400        | 194.00          | 1545.32         | F245        | 192.45          | 1557.77         |
| F550        | 195.50          | 1533.47         | F395        | 193.95          | 1545.72         | F240        | 192.40          | 1558.17         |
| F545        | 195.45          | 1533.86         | F390        | 193.90          | 1546.12         | F235        | 192.35          | 1558.58         |
| F540        | 195.40          | 1534.25         | F385        | 193.85          | 1546.52         | F230        | 192.30          | 1558.98         |
| F535        | 195.35          | 1534.64         | F380        | 193.80          | 1546.92         | F225        | 192.25          | 1559.39         |
| F530        | 195.30          | 1535.04         | F375        | 193.75          | 1547.32         | F220        | 192.20          | 1559.79         |
| F525        | 195.25          | 1535.43         | F370        | 193.70          | 1547.72         | F215        | 192.15          | 1560.20         |
| F520        | 195.20          | 1535.82         | F365        | 193.65          | 1548.11         | F210        | 192.10          | 1560.61         |
| F515        | 195.15          | 1536.22         | F360        | 193.60          | 1548.51         | F205        | 192.05          | 1561.01         |
| F510        | 195.10          | 1536.61         | F355        | 193.55          | 1548.91         | F200        | 192.00          | 1561.42         |
| F505        | 195.05          | 1537.00         | F350        | 193.50          | 1549.32         | F195        | 191.95          | 1561.83         |
| F500        | 195.00          | 1537.40         | F345        | 193.45          | 1549.72         | F190        | 191.90          | 1562.23         |
| F495        | 194.95          | 1537.79         | F340        | 193.40          | 1550.12         | F185        | 191.85          | 1562.64         |
| F490        | 194.90          | 1538.19         | F335        | 193.35          | 1550.52         | F180        | 191.80          | 1563.05         |
| F485        | 194.85          | 1538.58         | F330        | 193.30          | 1550.92         | F175        | 191.75          | 1563.45         |
| F480        | 194.80          | 1538.98         | F325        | 193.25          | 1551.32         | F170        | 191.70          | 1563.86         |
| F475        | 194.75          | 1539.37         | F320        | 193.20          | 1551.72         | F165        | 191.65          | 1564.27         |
| F470        | 194.70          | 1539.77         | F315        | 193.15          | 1552.12         | F160        | 191.60          | 1564.68         |

Channels between 1565 and 1610nm

| Channel No. | Frequency (THz) | Wavelength (nm) | Channel No. | Frequency (THz) | Wavelength (nm) | Channel No. | Frequency (THz) | Wavelength (nm) |
|-------------|-----------------|-----------------|-------------|-----------------|-----------------|-------------|-----------------|-----------------|
| F155        | 191.55          | 1565.09         | E975        | 189.75          | 1579.93         | E795        | 187.95          | 1595.06         |
| F150        | 191.50          | 1565.50         | E970        | 189.70          | 1580.35         | E790        | 187.90          | 1595.49         |
| F145        | 191.45          | 1565.90         | E965        | 189.65          | 1580.77         | E785        | 187.85          | 1595.91         |
| F140        | 191.40          | 1566.31         | E960        | 189.60          | 1581.18         | E780        | 187.80          | 1596.34         |
| F135        | 191.35          | 1566.72         | E955        | 189.55          | 1581.60         | E775        | 187.75          | 1596.76         |
| F130        | 191.30          | 1567.13         | E950        | 189.50          | 1582.02         | E770        | 187.70          | 1597.19         |
| F125        | 191.25          | 1567.54         | E945        | 189.45          | 1582.44         | E765        | 187.65          | 1597.62         |
| F120        | 191.20          | 1567.95         | E940        | 189.40          | 1582.85         | E760        | 187.60          | 1598.04         |
| F115        | 191.15          | 1568.36         | E935        | 189.35          | 1583.27         | E755        | 187.55          | 1598.47         |
| F110        | 191.10          | 1568.77         | E930        | 189.30          | 1583.69         | E750        | 187.50          | 1598.89         |
| F105        | 191.05          | 1569.18         | E925        | 189.25          | 1584.11         | E745        | 187.45          | 1599.32         |
| F100        | 191.00          | 1569.59         | E920        | 189.20          | 1584.53         | E740        | 187.40          | 1599.75         |
| F095        | 190.95          | 1570.01         | E915        | 189.15          | 1584.95         | E735        | 187.35          | 1600.17         |
| F090        | 190.90          | 1570.42         | E910        | 189.10          | 1585.36         | E730        | 187.30          | 1600.60         |
| F085        | 190.85          | 1570.83         | E905        | 189.05          | 1585.78         | E725        | 187.25          | 1601.03         |
| F080        | 190.80          | 1571.24         | E900        | 189.00          | 1586.20         | E720        | 187.20          | 1601.46         |
| F075        | 190.75          | 1571.65         | E895        | 188.95          | 1586.62         | E715        | 187.15          | 1601.88         |
| F070        | 190.70          | 1572.06         | E890        | 188.90          | 1587.04         | E710        | 187.10          | 1602.31         |
| F065        | 190.65          | 1572.48         | E885        | 188.85          | 1587.46         | E705        | 187.05          | 1602.74         |
| F060        | 190.60          | 1572.89         | E880        | 188.80          | 1587.88         | E700        | 187.00          | 1603.17         |
| F055        | 190.55          | 1573.30         | E875        | 188.75          | 1588.30         | E695        | 186.95          | 1603.60         |
| F050        | 190.50          | 1573.71         | E870        | 188.70          | 1588.73         | E690        | 186.90          | 1604.03         |
| F045        | 190.45          | 1574.13         | E865        | 188.65          | 1589.15         | E685        | 186.85          | 1604.46         |
| F040        | 190.40          | 1574.54         | E860        | 188.60          | 1589.57         | E680        | 186.80          | 1604.88         |
| F035        | 190.35          | 1574.95         | E855        | 188.55          | 1589.99         | E675        | 186.75          | 1605.31         |
| F030        | 190.30          | 1575.37         | E850        | 188.50          | 1590.41         | E670        | 186.70          | 1605.74         |
| F025        | 190.25          | 1575.78         | E845        | 188.45          | 1590.83         | E665        | 186.65          | 1606.17         |
| F020        | 190.20          | 1576.20         | E840        | 188.40          | 1591.26         | E660        | 186.60          | 1606.60         |
| F015        | 190.15          | 1576.61         | E835        | 188.35          | 1591.68         | E655        | 186.55          | 1607.04         |
| F010        | 190.10          | 1577.03         | E830        | 188.30          | 1592.10         | E650        | 186.50          | 1607.47         |
| F005        | 190.05          | 1577.44         | E825        | 188.25          | 1592.52         | E645        | 186.45          | 1607.90         |
| F000        | 190.00          | 1577.86         | E820        | 188.20          | 1592.95         | E640        | 186.40          | 1608.33         |
| E995        | 189.95          | 1578.27         | E815        | 188.15          | 1593.37         | E635        | 186.35          | 1608.76         |
| E990        | 189.90          | 1578.69         | E810        | 188.10          | 1593.79         | E630        | 186.30          | 1609.19         |
| E985        | 189.85          | 1579.10         | E805        | 188.05          | 1594.22         | E625        | 186.25          | 1609.62         |
| E980        | 189.80          | 1579.52         | E800        | 188.00          | 1594.64         | E620        | 186.20          | 1610.06         |

8. Precaution

Class 3B in the radiation safety standard applies to all versions of this product. Mishandling may result in hazardous laser radiation exposure.

Refer to the document IRO-D01002 in terms of the usage of this product and safety precautions.

REVISION RECORD

| Document No.   | Date         | Description   | Incorporated by | Checked by | Approved by |
|----------------|--------------|---|-----------------|------------|-------------|
| HUW9723037-01A | Oct./28/1997 | Initial issue   | A.Miki          | G.Sasaki   | T.Fujitani  |
| HUW9723037-01B | Mar./11/1998 | Fiber length is revised.  | A.Miki          | G.Sasaki   | T.Fujitani  |
| HUW9723037-01C | June/16/1998 | 20mW option is added.   | A.Miki          | T.Fujitani | T.Fujitani  |
| HUW9723037-01D | June/23/1998 | Availability of 50GHz spacing is added.   | A.Miki          | T.Fujitani | T.Fujitani  |
| HUW9723037-01E | July/2/1998  | Maximum of Iop is revised. Channel number is added.   | A.Miki          | T.Fujitani | T.Fujitani  |
| HUW9723037-01F | Jan./7/1999  | Package mounting screw torque is added.<br>RIN, SMSR, PER, $\Delta\lambda$ and Channels are revised.  | N.Kushida       | A.Miki     | T.Fujitani  |
| HUW9723037-01G | Mar./12/1999 | Channels between 1564nm and 1610nm are added. Nose of PKG is miniaturized. Max. of Storage Temp., Thermistor characteristics are revised. SLT5413(Anode floating) is added. | T.Nakabayashi   | A.Miki     | T.Fujitani  |
| HUW9723037-01H | Feb./22/2000 | PKG drawing is revised. Lead pin length and hole diameter is changed.   | T.Nakabayashi   | N.Kushida  | T.Fujitani  |
| HUW9723037-01I | Mar./8/2001  | FC/PC connector specification is added.   | T.Kounosu       | N.Kushida  | K.Tanida    |
| HUW9723037-01J | Jan/31/2002  | IfL, Iop and Precaution are revised. Itherm, Vtherm, VESD, Pigtail length and $D\lambda_p/DTC$ are added.   | N.Kushida       | T.Kounosu  | K.Tanida    |