

Sumitomo Electric Industries, Ltd.  
Part No. : SLV5416 series  
Document No. : HUW 0225048-01B  
Date of issue : Feb. 14, 2003



**Technical Specification**

**of**

**1.5 $\mu$ m DFB Laser Diode Module  
for DWDM Analog Forward-Path  
or Return-Path Application**

**SLV5416 series**

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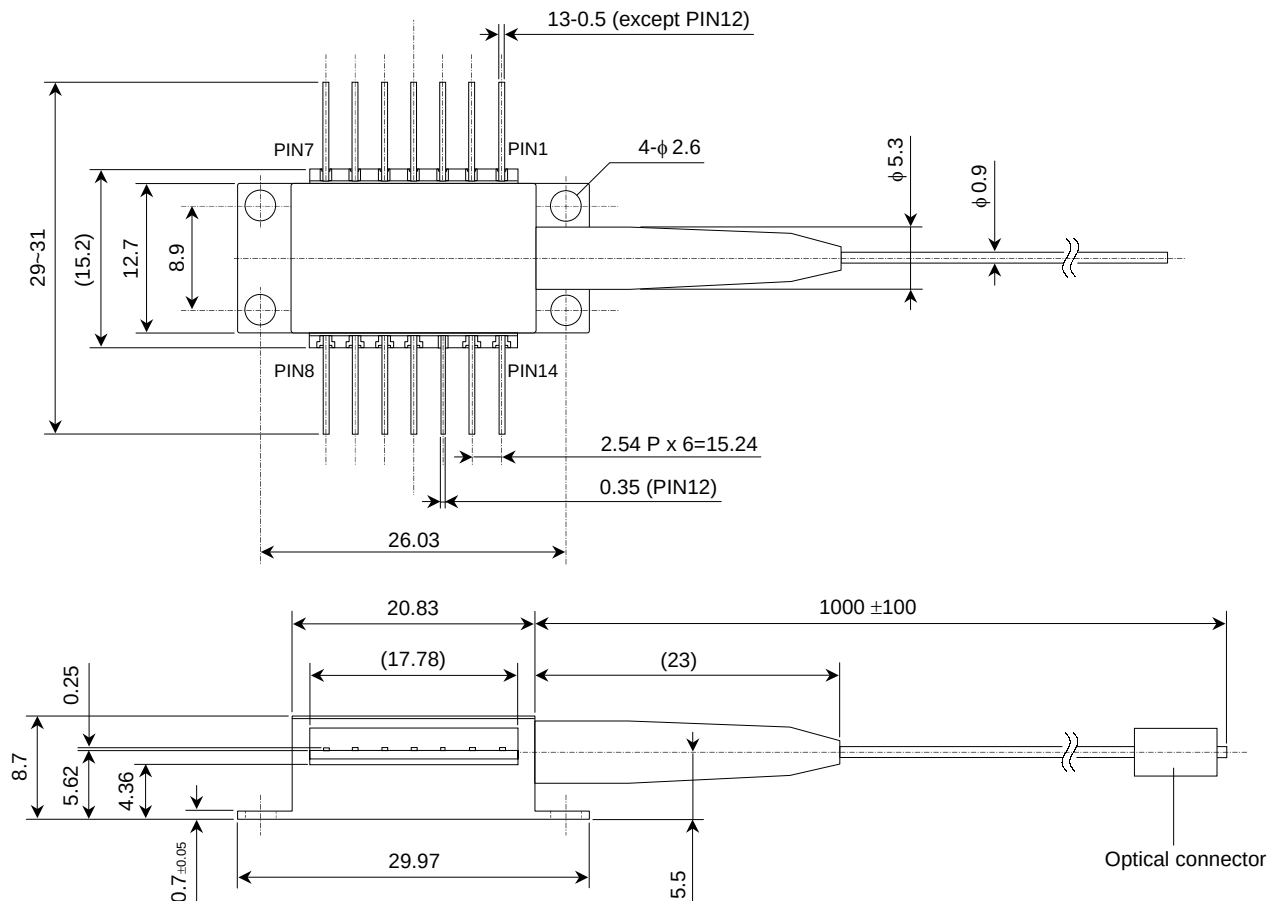
## 1. General

SLV5416 series are 1.5 $\mu$ m dense wavelength division multiplexing (DWDM) laser modules designed for analog applications. They are suited for either quadrature amplitude modulation (QAM) narrowcast forward path or QAM trunk line return path applications.

An InGaAsP/InP MQW DFB 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 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      | Case Ground            |
| 3       | LD Cathode (DC)    | 12      | LD Cathode (RF)        |
| 4       | Monitor PD Anode   | 11      | LD Anode (Case Ground) |
| 5       | Monitor PD Cathode | 10      | NC                     |
| 6       | TEC Anode          | 9       | Case Ground            |
| 7       | TEC Cathode        | 8       | Case Ground            |

### 3. Absolute maximum ratings

| Parameter                           | Symbol | Min. | Max. | Unit |
|-------------------------------------|--------|------|------|------|
| Storage temperature                 | Tstg   | -40  | 85   | °C   |
| Operating case temperature          | Tc     | -40  | 85   | °C   |
| LD forward current                  | IfL    | –    | 150  | 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) (*1) | VESD   | –    | 500  | V    |
| Package mounting screw torque(*2)   | Npt    | –    | 0.2  | Nm   |
| Lead soldering temperature          | Stemp  | –    | 260  | °C   |
| Lead soldering time                 | Stime  | –    | 10   | sec  |
| RF input power                      | Prf    | –    | 62   | dBmV |

Note \*1 A human-body model (HBM, C=100pF, R=1.5kΩ) is employed.

Note \*2 Without buffer materials under the package

4. Electrical and optical characteristics  
(Unless otherwise noted,  $T_{LD}=29\sim 41^{\circ}\text{C}$ , BOL)

| Parameter                                      | Symbol          | Condition                                                         | Min. | Typ.   | Max. | Unit   |
|------------------------------------------------|-----------------|-------------------------------------------------------------------|------|--------|------|--------|
| Threshold current                              | I <sub>th</sub> | CW                                                                | –    | 10     | 30   | mA     |
| Bias current                                   | I <sub>b</sub>  | CW                                                                | –    | –      | 120  | mA     |
| Optical power                                  | P <sub>op</sub> | I <sub>f</sub> =I <sub>op</sub>                                   | (*3) | –      | –    | mW     |
| Slope efficiency                               | Se              | CW, I <sub>f</sub> =I <sub>th</sub> +20mA ~ I <sub>th</sub> +60mA | 0.1  | –      | –    | W/A    |
| Forward voltage                                | V <sub>f</sub>  | CW, I <sub>f</sub> =I <sub>op</sub>                               | –    | –      | 2    | V      |
| Monitor current                                | I <sub>m</sub>  | CW, I <sub>f</sub> =I <sub>op</sub> , V <sub>rP</sub> =5V         | 50   | –      | 500  | μA     |
| Monitor dark current                           | I <sub>d</sub>  | V <sub>rP</sub> =5V                                               | –    | 1      | 30   | nA     |
| Monitor capacitance                            | C               | V <sub>rP</sub> =5V, f=1MHz                                       | –    | –      | 20   | pF     |
| Input impedance                                | Z <sub>in</sub> | –                                                                 | –    | 25     | –    | Ω      |
| Frequency range                                | Fr              | Return Path                                                       | 5    | –      | 210  | MHz    |
|                                                |                 | Forward Path                                                      | 40   | –      | 860  |        |
| Frequency response                             | -               | 5-210MHz and 40-860MHz,<br>I <sub>f</sub> =60mA                   | –    | +/-0.5 | –    | dB     |
| RF return loss                                 | RL              | 5-210MHz and 40-860MHz,<br>I <sub>f</sub> =60mA                   | –    | >16    | –    | dB     |
| Relative intensity noise                       | RIN             | I <sub>f</sub> =I <sub>th</sub> +70mA                             | –    | <-155  | –    | dB/Hz  |
| Composite second order                         | CSO             | I <sub>f</sub> =I <sub>op</sub> , OMI=10%, (*4), (*5)             | –    | –      | -50  | dBc    |
| Composite triple beat                          | CTB             | I <sub>f</sub> =I <sub>op</sub> , OMI=10%, (*4), (*6)             | –    | –      | -60  | dBc    |
| Adiabatic chirp                                | AC              | I <sub>f</sub> =60mA, f=500MHz                                    | 100  | –      | 200  | MHz/mA |
| Peak wavelength                                | λ <sub>p</sub>  | CW, I <sub>f</sub> =I <sub>op</sub>                               | –    | (*3)   | –    | nm     |
| Peak wavelength drift with<br>case temperature | Dλ              | CW, I <sub>f</sub> =60mA<br>from -40 to 85°C                      | –    | –      | 0.04 | nm     |
| Side mode suppression ratio                    | SMSR            | CW, I <sub>f</sub> =I <sub>op</sub>                               | 30   | –      | –    | dB     |
| Optical return loss                            | ORL             | T <sub>c</sub>                                                    | 40   | –      | –    | dB     |

Note \*3 See ordering information (Section 7)

Note \*4 8ch loading; 559.25, 565.25, 571.25, 577.25, 583.25, 589.25, 595.25, 601.25MHz.  
Transmission of 40km SM fiber.

Note \*5 Measured at 42MHz.

Note \*6 Measured at 559.25MHz, 583.25 MHz and 601.25MHz.

## 5. Thermal characteristics

| Parameter             | Symbol | Condition                                       | Min. | Typ. | Max. | Unit |
|-----------------------|--------|-------------------------------------------------|------|------|------|------|
| Thermistor resistance | Rth    | T <sub>LD</sub> =35°C                           | 6.1  | 6.6  | 7.1  | kΩ   |
| Thermistor B const.   | B      | 25°C / 75°C                                     | 3800 | 3900 | 4000 | K    |
| TEC current           | Ic     | T <sub>LD</sub> =29°C, Tc =85°C<br>If=60mA, BOL | —    | —    | 1.0  | A    |
| TEC voltage           | Vc     |                                                 | —    | —    | 2.0  | V    |
| TEC current (EOL)     | Ic2    | T <sub>LD</sub> =29°C, Tc =85°C<br>If=60mA, EOL | —    | —    | 1.1  | A    |
| TEC voltage (EOL)     | Vc2    |                                                 | —    | —    | 2.2  | V    |

## 6. Fiber specification

| Parameter             | Min.                                 | Typ. | Max. | Unit |
|-----------------------|--------------------------------------|------|------|------|
| Fiber type            | Single mode fiber                    |      |      | —    |
| Mode field diameter   | 8.5                                  | 9.5  | 10.5 | μm   |
| Cladding diameter     | 122                                  | 125  | 128  | μm   |
| Outer jacket diameter | —                                    | 0.9  | —    | mm   |
| Bending radius        | 40                                   | —    | —    | mm   |
| Optical connector     | See ordering information (Section 7) |      |      | —    |

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## 7. Ordering information

### SLV5416-xx-Fxxx

|          | Optical Connector |
|----------|-------------------|
| <b>C</b> | SC-PC             |
| <b>D</b> | FC-PC             |
| <b>Q</b> | SC-Angled PC      |
| <b>X</b> | No connector      |

ChannelNo. (Peak Wavelength)  
shown in the table below

|          | Optical Power(Pop) |
|----------|--------------------|
| <b>A</b> | 6mW                |
| <b>B</b> | 8mW                |
| <b>C</b> | 10mW               |

| Channel No. | Frequency (THz) | Wavelength (nm) | Channel No. | Frequency (THz) | Wavelength (nm) |
|-------------|-----------------|-----------------|-------------|-----------------|-----------------|
| F620        | 196.2           | 1527.99         | F390        | 193.9           | 1546.12         |
| F610        | 196.1           | 1528.77         | F380        | 193.8           | 1546.92         |
| F600        | 196.0           | 1529.55         | F370        | 193.7           | 1547.72         |
| F590        | 195.9           | 1530.33         | F360        | 193.6           | 1548.51         |
| F580        | 195.8           | 1531.12         | F350        | 193.5           | 1549.32         |
| F570        | 195.7           | 1531.90         | F340        | 193.4           | 1550.12         |
| F560        | 195.6           | 1532.68         | F330        | 193.3           | 1550.92         |
| F550        | 195.5           | 1533.47         | F320        | 193.2           | 1551.72         |
| F540        | 195.4           | 1534.25         | F310        | 193.1           | 1552.52         |
| F530        | 195.3           | 1535.04         | F300        | 193.0           | 1553.33         |
| F520        | 195.2           | 1535.82         | F290        | 192.9           | 1554.13         |
| F510        | 195.1           | 1536.61         | F280        | 192.8           | 1554.94         |
| F500        | 195.0           | 1537.40         | F270        | 192.7           | 1555.75         |
| F490        | 194.9           | 1538.19         | F260        | 192.6           | 1556.56         |
| F480        | 194.8           | 1538.98         | F250        | 192.5           | 1557.36         |
| F470        | 194.7           | 1539.77         | F240        | 192.4           | 1558.17         |
| F460        | 194.6           | 1540.56         | F230        | 192.3           | 1558.98         |
| F450        | 194.5           | 1541.35         | F220        | 192.2           | 1559.79         |
| F440        | 194.4           | 1542.14         | F210        | 192.1           | 1560.61         |
| F430        | 194.3           | 1542.94         | F200        | 192.0           | 1561.42         |
| F420        | 194.2           | 1543.73         | F190        | 191.9           | 1562.23         |
| F410        | 194.1           | 1544.53         | F180        | 191.8           | 1563.05         |
| F400        | 194.0           | 1545.32         | F170        | 191.7           | 1563.86         |

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## 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<br>by | Checked<br>by | Approved<br>by |
|----------------|--------------|------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|----------------|
| HUW0225048-01A | Jan./20/2003 | <Preliminary>                                                                                                                | A.Hamakawa         | T. Kounosu    | M. Yoshimura   |
| HUW0225048-01B | Feb./14/2003 | Connector types are added.<br>Q: SC-Angled PC<br>X: No connector<br>Absolute maximum ratings<br>is revised<br>IfL 200->150mA | H.Koseki           | T.Kounosu     | M. Yoshimura   |