

# Alcatel 1915 LMI

## 1.55 $\mu\text{m}$ WDM Laser Module

### 2.5 Gb/s Direct Modulation

### 10mW



## Description

This laser module contains an Alcatel SLMQW DFB laser with 25  $\Omega$  impedance matching designed for use in Wavelength Division Multiplexed (WDM) systems, high power direct modulation operations up to 2.5 Gbit/s. The module incorporates a thermoelectric cooler, precision thermistor, and optical isolator for stable operation under all conditions.

## Features

- 10 mW output power
- Low dispersion penalty
- Optimized for direct modulation at 2.5 Gbit/s
- Wavelength selection according to ITU-T G.692 from 1528.77 nm to 1570.42 nm
- High extinction Ratio

- 100 GHz spacing available
- Internal optical isolator
- 25  $\Omega$  RF impedance matching and DC bias RF filtering
- Industry - standard hermetic 14-pin butterfly package
- InGaAsP Distributed FeedBack SLMQW (DFB) laser

## Applications

- EDFA - free long span STM-16 and OC-48 DWDM transmission systems
- High-speed DWDM Metropolitan Area Networks
- Saturation Laser for WDM EDFA
- Instrumentation.

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## Electro-Opto Characteristics

Table 1

| Parameter                             | Sym                       | Conditions                                  | Min   | Typ. | Max  | Units      |
|---------------------------------------|---------------------------|---|-------|------|------|------------|
| Fiber-Coupled Peak Power              | $P_{peak}$                | @Twave                                      | 10    |      | -    | mW         |
| Threshold current                     | $I_{TH}$                  | @Twave                                      | 3     |      | 25   | mA         |
| External Diff. Efficiency             | $\eta$                    | @Twave                                      | 0.120 |      |      | W/A        |
| Laser forward voltage                 | $V_F$                     | @ $P_{Peak}$ = 10 mW ; pin 11 & 3           | -     |      | 2.5  | V          |
| Modulation current                    | $I_F$                     | @ $P_{Peak}$ = 10 mW ; pin 11 & 3<br>Note 1 | -     | 60   | 80   | mA         |
| Serial resistance                     | $R_S$                     | $P_{peak}$ = 10mW; pin 11 & 12              | 22    |      | 27   | $\Omega$   |
| $\Delta$ (Emitted -Target Wavelength) | $\Delta\lambda_e$         | @Twave<br>See Table 4 for $\Delta_{target}$ | -0.1  |      | +0.1 | nm         |
| Emission wavelength                   | $\lambda$                 | See table 4                                 | 1529  |      | 1570 | nm         |
| Side mode suppression                 | SMSR                      | @Twave ; Note 2                             | 40    |      | -    | dB         |
| Photodiode Current                    | $I_{PD}$                  | V = -5 V, @Pmean, Note 5                    | 30    |      | 300  | $\mu$ A    |
| Photodiode Dark Current               | $I_D$                     | V = -5 V                                    |       |      | 0.1  | $\mu$ A    |
| Photodiode Capacitance                | $C_M$                     | V = -5V @ 1MHz                              |       |      | 15   | pF         |
| Thermistor resistance                 | $R_{TH}$                  |   | 9.7   |      | 10.3 | k $\Omega$ |
| Coefficient of RTH                    |                           |   | -3    |      | -5   | %/°K       |
| Emitted $\lambda$ drift vs $I_F$      | $\Delta\lambda/I$         |   | -     | 3    | 6    | pm/mA      |
| Emitted $\lambda$ drift vs Twave      | $\Delta\lambda/\Delta Tw$ | 20°C ≤ Tsubmount ≤ 35°C                     | 80    |      | 100  | pm/°C      |
| Emitted $\lambda$ drift vs Tcase      | $\Delta\lambda/\Delta Tc$ | 0°C ≤ Tc ≤ 70°C                             | -     |      | 0.5  | pm/°C      |
| Relative Intensity Noise              | RIN                       | 100 MHz to 3 GHz @Pmean                     |       |      | -140 | dB/Hz      |
| Dispersion Penalty                    | $\Delta S$                | D = 1800 ps/nm, Note 2                      | -     |      | 2    | dB         |
| Linearity (kink) Note 3               | $\Delta P/\Delta I$       | 0.2 mW ≤ $P_{Peak}$ ≤ 10 mW                 |       |      | 15   | %          |
| Optical Isolation                     | OI                        | 0°C ≤ Tc ≤ 70°C                             | 30    |      | -    | dB         |
| Tracking Error Note 4                 | Q                         | @10 mW PPeak                                |       |      | 10   | %          |
| Extinction ratio                      | ER                        | 2.5Gb/s, D=1800ps/nm PRBS 2 <sup>23-1</sup> | 10    |      |      | dB         |
| Case Operating Temperature            | Tc                        |   | 0     |      | 70   | °C         |
| Tsubmount                             | Ts                        |   | 20    |      | 35   | °C         |
| TEC current EOL                       | $I_t$                     | @I(10mW), Ts = 20°C, Tc = 70°C              | -     |      | 1.2  | A          |
| TEC voltage EOL                       | $V_t$                     | @I(10mW), Ts = 20°C, Tc = 70°C              | -     |      | 2.4  | V          |

Note 1: Modulation current =  $P_{Peak} / \eta * [(1 - ER) / (1 + ER)]$   
End Of Life criteria; delta IF/IF = 20% or delta IM / IM = 20% or delta ITH / ITH = 20%

Note 2 : 2.488 Gb/s, Pmean = 5 mW, BER = 10<sup>-10</sup>, ER = 10±1%, NRZ line code

Note 3 : relative deviation of dP / dI between 2 consecutive measurement points

Note 4 :  $Q = \text{Max} \{ | [P(70\text{ C}) - P(25\text{ C})] / P(25\text{ C}) | ; | [P(0\text{ C}) - P(25\text{ C})] / P(25\text{ C}) | \}$   
measurements @ 0 & 70°C are with  $I_F$  set at constant  $I_F$  (25 C)

Note 5 : Pmean=Peak/2

## Definitions

### T<sub>wave</sub>

T<sub>wave</sub> is the submount temperature at which the laser emission wavelength reaches the target wavelength with an accuracy of better than:  $\lambda_{\text{target}} \pm 0.1\text{nm}$ .

This temperature is calculated during manufacturing according to:

$T_{\text{wave}} = 25^{\circ}\text{C} + (1/C) * (\lambda_{\text{target}} - \lambda_{25^{\circ}\text{C}})$ , where C is the laser wavelength drift with temperature (in nm/°C).

### Emitted wavelength drift vs T<sub>case</sub>

Absolute value of maximum emitted wavelength deviation per unit of case temperature (°C) when T<sub>case</sub> varies from min to max operating conditions.

Wavelength is stabilized through the thermal regulation of the laser chip based on the thermistor reading.

### Emitted wavelength drift vs Laser Current

Maximum emitted wavelength deviation per unit of laser current (mA) when the DC output power varies around P<sub>mean</sub>.

## Absolute maximum ratings

Exposing the device to stresses above those listed in absolute maximum rating could cause permanent damage.

Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

### Environmental

Table 2

| Parameters                                | Min  | Max  | Unit |
|---|------|------|------|
| Storage temperature                       | - 40 | 85   | °C   |
| Operating temperature                     | -10  | 70   | °C   |
| Soldering temperature (3 seconds maximum) |      | 350  | °C   |
| Axial force on fiber (10 seconds max.)    |      | 10   | N    |
| Fiber bend radius                         | 30   |      | mm   |
| ESD (1) applied on PIN detector (Pin 4&5) |      | 100  | V    |
| ESD (1) on other Pin                      |      | 2000 | V    |

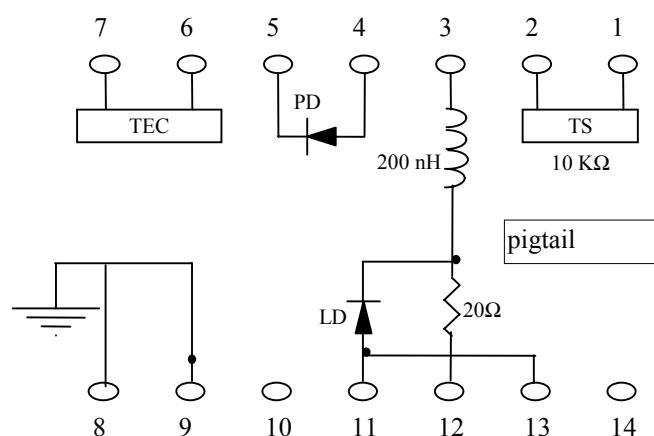
(1) Human body model

### Electro-optic

Table 3

| Parameters                 | Min | Max | Unit |
|----------------------------|-----|-----|------|
| Laser forward current      |     | 150 | mA   |
| Laser reverse voltage      |     | 2   | V    |
| Photodiode forward current |     | 1   | mA   |
| Photodiode reverse voltage |     | 20  | V    |
| Thermistor Voltage         |     | 9   | V    |
| Thermistor Current         |     | 250 | μA   |
| TEC Voltage                |     | 2.8 | V    |
| TEC Current                |     | 1.4 | A    |
| Packing Mounting Torque    |     | 0.2 | N.m  |

Note : all dimensions in mm



| N° | Description               | N° | Description          |
|----|---------------------------|----|----------------------|
| 1  | Thermistor                | 8  | Case Ground          |
| 2  | Thermistor                | 9  | Case Ground          |
| 3  | Laser DC bias (-)         | 10 | Not Connected        |
| 4  | Photodetector Anode (-)   | 11 | RF common (+)        |
| 5  | Photodetector Cathode (+) | 12 | Laser Modulation (-) |
| 6  | TEC (+)                   | 13 | RF common (+)        |
| 7  | TEC (-)                   | 14 | Not Connected        |

## Marking, packing and deliverable data

### Device marking

Each device includes the following information as a minimum:

1. Alcatel logo
2. Product family name: A 1915 LMI
3. Product code : 3CN 00466 XX
4. Serial number

### Packing

Each device is individually packed in an antistatic container and in such a manner as to prevent damage in transit.

The packaging shall include the following information:

1. Alcatel logo
2. Product family name: A 1915 LMI
3. Product code : 3CN 00466 XX
4. Serial number
5. Hazard warning label (ESD)
6. Laser Safety Class Label

### Deliverable data

The following data shall be supplied with each device:

1. L(I)/V(I) curves @ Tcase/ Tsubmount = 25°C/25°C
2. TEC current and voltage @ Tcase/Tsubmount=25°C/70°C, P=10mW
3. Values of Twave and Thermistor @ Tsubmount =Twave
4. Values of laser forward current, monitoring photocurrent, laser threshold current and external differential efficiency @ Tsubmount =Twave
5. Peak wavelength at Tcase/Tchip=25°C and under modulation
6. Dispersion penalty

Product testing shall be carried out at a level that ensures conformity to the customer specification

## Safety and handling

### Safety and IEC.825 Classification

Take appropriate precautions to prevent undue exposure to naked eye.

This product is classified Class 3A Laser Product according to IEC.825

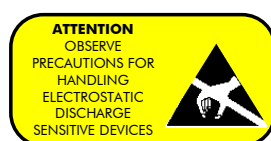
### Handling

This product, in line with all similar devices, is sensitive to electrostatic discharge. Take precautions to prevent ESD; use wrist straps, grounded work surfaces and recognized anti-static techniques when handling the laser. Handle the laser module by its package only, never hold it by leads or pigtail.

For package mounting the following procedure should be carefully followed:

1. In order to achieve the ultimate thermal performance of the device, thermal paste can be usefully added on the support
2. Tighten screws up to 200 mN/m - Do not exceed this mounting torque.
3. Assure that the leads are aligned and in contact with appropriate contact pads.

Care should be taken to avoid supply transient and over voltage. Over voltage above the maximum specified in absolute maximum rating section (table3) may cause permanent damage to the device.



## Ordering information

Alcatel 1915 LMI

| Nominal power | Connector type | Part number  |
|---------------|----------------|--------------|
| 10 mW         | FC/PC          | 3CN 00466 ## |

## defines the wavelength and the connector according to the following table .

Table 4

| $\lambda$<br>(1) | THz    | Connector<br>FC/PC | $\lambda$ | THz    | Connector<br>FC/PC |
|------------------|--------|--------------------|-----------|--------|--------------------|
| 1528,77          | 196,10 | BM                 | 1550,12   | 193,40 | DT                 |
| 1529,55          | 196,00 | BP                 | 1550,92   | 193,30 | DV                 |
| 1530,33          | 195,90 | BR                 | 1551,72   | 193,20 | DX                 |
| 1531,12          | 195,80 | BT                 | 1552,52   | 193,10 | DZ                 |
| 1531,90          | 195,70 | BV                 | 1553,33   | 193,00 | EB                 |
| 1532,68          | 195,60 | BX                 | 1554,12   | 192,90 | ED                 |
| 1533,47          | 195,50 | BZ                 | 1554,94   | 192,80 | EF                 |
| 1534,25          | 195,40 | CB                 | 1555,75   | 192,70 | EH                 |
| 1535,04          | 195,30 | CD                 | 1556,55   | 192,60 | EK                 |
| 1535,82          | 195,20 | CF                 | 1557,36   | 192,50 | EM                 |
| 1536,61          | 195,10 | CH                 | 1558,17   | 192,40 | EP                 |
| 1537,40          | 195,00 | CK                 | 1558,98   | 192,30 | ER                 |
| 1538,19          | 194,90 | CM                 | 1559,79   | 192,20 | ET                 |
| 1538,98          | 194,80 | CP                 | 1560,61   | 192,10 | EV                 |
| 1539,77          | 194,70 | CR                 | 1561,42   | 192,00 | EX                 |
| 1540,56          | 194,60 | CT                 | 1562,23   | 191,90 | EZ                 |
| 1541,35          | 194,50 | CV                 | 1563,05   | 191,80 | FB                 |
| 1542,14          | 194,40 | CX                 | 1563,86   | 191,70 | FD                 |
| 1542,94          | 194,30 | CZ                 | 1564,68   | 191,60 | FF                 |
| 1543,73          | 194,20 | DB                 | 1565,49   | 191,50 | FH                 |
| 1544,53          | 194,10 | DD                 | 1566,31   | 191,40 | FK                 |
| 1545,32          | 194,00 | DF                 | 1567,13   | 191,30 | FM                 |
| 1546,12          | 193,90 | DH                 | 1567,95   | 191,25 | FP                 |
| 1546,92          | 193,80 | DK                 | 1568,77   | 191,20 | FS                 |
| 1547,72          | 193,70 | DM                 | 1569,59   | 191,15 | FU                 |
| 1548,51          | 193,60 | DP                 | 1570,42   | 191,10 | FW                 |
| 1549,32          | 193,50 | DR                 |           |        |                    |

(1) in vacuum

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