**Description**

The Alcatel 1915 LMM contains an Alcatel DFB laser with monolithically integrated electro-absorption modulator (ILM). The modulation voltage is applied to the modulator section while the DFB laser operates CW. Without the complexity of LiNbO3 external modulators, the Alcatel 1915 LMM is dedicated to STM64/OC-192 bit rate with reduced size and reduced cost. This device allows 10 Gbit/s data transmission with an extinction ratio higher than 10 dB and less than 2 V modulation voltage.

The Alcatel 1915 LMM is optimised for 10 Gbit/s TDM and WDM transmission systems supporting dispersion from 50 ps/nm to 1600 ps/nm.

**Features**

- 7-pin package with either GPO or K connector RF input
- High frequency RF connector package with 50 Ω RF impedance
- InGaAsP monolithically integrated DFB laser and modulator chip
- Low drive voltage (≤ 2 Vpp)
- Very low dispersion penalty over 2 km for 10 Gbit/s operation (over 50 ps/nm)
- Internal optical isolator, monitor photodiode, thermistor and thermo-electric cooler
- High power available

**Applications**

- STM-64 and OC-192 transmission systems
- Terminals for submarine transmission systems
- Short reach 10 Gbit/s applications

**Optical characteristics**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symb.</th>
<th>Conditions</th>
<th>Min</th>
<th>Typical</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threshold current</td>
<td>Ith</td>
<td>CW, Vbias = 0 V</td>
<td>5</td>
<td>17</td>
<td>35</td>
<td>mA</td>
</tr>
<tr>
<td>Operating current</td>
<td>Iop</td>
<td>CW, Vbias = 0 V</td>
<td>50</td>
<td>80</td>
<td>100</td>
<td>mA</td>
</tr>
<tr>
<td>Optical output power</td>
<td>PAVE</td>
<td>Iop, Vbias (1)</td>
<td>-3</td>
<td>0 dBm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laser forward voltage</td>
<td>Vf</td>
<td>CW, Iop, Vbias = 0 V</td>
<td></td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modulator bias voltage</td>
<td>Vbias</td>
<td>See (1)</td>
<td>-2</td>
<td>0 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modulator drive voltage</td>
<td>Vbias</td>
<td>See (1)</td>
<td>-2</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dynamic extinction ratio</td>
<td>DER</td>
<td>Iop, (1)</td>
<td>10</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emission wavelength</td>
<td>λm</td>
<td></td>
<td>1527</td>
<td>1570 nm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Side mode suppression ratio</td>
<td>SMR</td>
<td></td>
<td>35</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cut off frequency</td>
<td>S21</td>
<td>- 3 dB, Vbias = - 1 V</td>
<td>8</td>
<td>GHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RF return loss</td>
<td>S11</td>
<td>DC to 7 GHz</td>
<td>10</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dispersion penalty</td>
<td>δS</td>
<td>See (1)</td>
<td>2</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tracking error</td>
<td>TR</td>
<td>Tsubmount = 25 °C, Tcase = 70°C</td>
<td>- 0.5</td>
<td>0.5 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rise time / Fall time</td>
<td>Ttr/Tf</td>
<td>See (1)</td>
<td>30</td>
<td>45 ps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitor diode current</td>
<td>Im</td>
<td>Iop, VM = - 5 V</td>
<td>20</td>
<td>1500 μA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dark current</td>
<td>Id</td>
<td></td>
<td>0.1</td>
<td>μA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEC current</td>
<td>It</td>
<td>ΔT = 45 °C, I = 120 mA, T = 70 °C, Vbias = - 1 V</td>
<td>1</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEC voltage</td>
<td>V</td>
<td>ΔT = 45 °C, I = 120 mA, T = 70 °C, Vbias = - 1 V</td>
<td>2</td>
<td>2.5 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermistor resistance</td>
<td>Rth</td>
<td></td>
<td>9.5</td>
<td>10.5 KΩ</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes**:

- All limits start of life, Tcase in the range [0°C ; 70°C], Tsubmount = 25 °C, monitor bias = - 5 V, unless otherwise stated.
- [1] BER = 10^-10; 9.953 Gbit/s modulation; 2³¹-1 PRBS, NZR line code
- [2] 50 ps/nm dispersion, assuming fiber with an average dispersion of 18 ps/nm/km

**Absolute maximum ratings**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating case temperature</td>
<td>0</td>
<td>70</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40</td>
<td>85</td>
<td>°C</td>
</tr>
<tr>
<td>Laser forward current</td>
<td></td>
<td>150</td>
<td>mA</td>
</tr>
<tr>
<td>Laser reverse voltage</td>
<td>2</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Modulator forward voltage</td>
<td>1</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Modulator reverse voltage</td>
<td>5</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Photodiode forward current</td>
<td>1</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>Photodiode reverse voltage</td>
<td>20</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>TEC Voltage</td>
<td>2.8</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>TEC Current</td>
<td>1.4</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>ESD applied on modulator</td>
<td>500</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>ESD applied on laser [1]</td>
<td>2000</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Lead soldering time (at 260°C)</td>
<td>10</td>
<td>s</td>
<td></td>
</tr>
<tr>
<td>Packing Mounting Screw Torque</td>
<td>0.2</td>
<td>nm</td>
<td></td>
</tr>
</tbody>
</table>

[1] Human body model. Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only.
Major Characteristics

Fig. 1 Return Loss Response

- Frequency (GHz)
  - Return Loss (5 dB/div)
  - 50 Ω Test
  - If = 80 mA,
  - Pave,
  - Tcase = 25 °C

Fig. 2 Typical Bit Error Rate

- Bit Error Rate
- 9.953 Gbit/s,
- 2²³-1 PRBS,
- NRZ line code,
- If = 80 mA,
- Pave,
- Tcase = 25 °C
- DER ≥ 10 dB

Fig. 3 Typical Extinction Ratio versus Bias Voltage

- Vbias (V)
  - SER (dB)
  - 0 km
  - 2 km fiber

Fig. 4 Typical Filtered Output Eye Diagram
with a Driver circuit (without fiber ;
see recommended circuit in Application Note)
9.953 Gbit/s, 2²³-1 PRBS NRZ, Tc=25 °C,
Tsubmount = 25 °C, If = 80 mA, Pave and DER≥10 dB
Qualification, Reliability and Standards

Alcatel Optronics policy for all products is to carry out a complete qualification program. This qualification is based on manufacturers' qualification in agreement with Telcordia GR-468-Core (Generic Reliability Assurance Requirements for Optoelectronic Devices Used in Telecommunications Equipment - Central Office Level), MIL STD 883E (Test method and procedures for microelectronics) and following the standards ITU-T G652 and G-691. All products pass strict tests before shipping. Failure criteria are defined during the product qualification process.

Device marking

The device shall be legibly and permanently marked with the following information:
- Alcatel logo
- Product family name: A 1915 LMM
- Product code: 3CN number (see Ordering information section)
- Serial number

Shipment packing

Each device is individually packed in an anti-static container and in such a manner as to prevent damage in transit. The packing shall include the following information:
- Alcatel logo
- Product family name: A 1915 LMM
- Product code: 3CN number (see Ordering information section)
- Serial number
- Hazard warning label (ESD)
- Laser Safety Class Label

Deliverable data

The following data shall be supplied with each device:
- L(I) / V(I) / Ipd(I) curves
- Values for Vmod, Von (On-state voltage), DER, SO (received optical power without fiber), ΔS and Pave for Iop
- Plot of SER vs Vmod @ I = 80 mA over the range 0 V to -3 V

Laser Safety information

Take appropriate precautions to prevent undue exposure to the naked eye. This product is classified Class 3A Laser Product according to IEC-60825-1. FDA/CDRH Class IIIb laser product. All versions are Class IIIb laser products per CDRH, 21 CFR 1040 Laser. Safety requirements under accession number 0120546-00.

Handling

This product is sensitive to electrostatic discharge and should not be handled except at a static free workstation. Take precautions to prevent ESD; use wrist straps, grounded work surfaces and recognised anti-static techniques when handling the Alcatel 1915 LMM module. Handle the laser module by its package only, never hold it by its pigtail. Care should be taken to avoid supply transient and over voltage. Over voltage above the maximum specified in absolute maximum rating section may cause permanent damage to the device.
Mechanical details

Pin out

<table>
<thead>
<tr>
<th>N°</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Thermistor</td>
</tr>
<tr>
<td>2</td>
<td>Thermistor</td>
</tr>
<tr>
<td>3</td>
<td>Laser DC bias (+)</td>
</tr>
<tr>
<td>4</td>
<td>Photodetector Anode (-)</td>
</tr>
<tr>
<td>5</td>
<td>Photodetector Cathode (+)</td>
</tr>
<tr>
<td>6</td>
<td>TEC (+)</td>
</tr>
<tr>
<td>7</td>
<td>TEC (-)</td>
</tr>
</tbody>
</table>

Ordering information

Alcatel 1915 LMM

<table>
<thead>
<tr>
<th>Application</th>
<th>Part number</th>
<th>Electrical Connector</th>
<th>Optical Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 50 ps/nm</td>
<td>3CNO0317AA</td>
<td>K type</td>
<td>FC/PC type</td>
</tr>
<tr>
<td>&lt; 50 ps/nm</td>
<td>3CNO0320AA</td>
<td>GPO type</td>
<td>FC/PC type</td>
</tr>
</tbody>
</table>

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