# 1754 C-Band DWDM 1550 nm DFB Laser Module

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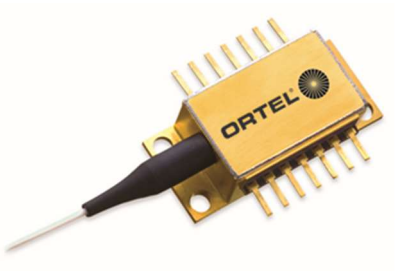
DATASHEET | JANUARY 2024 CATV




## Applications

- CATV Broadcast Networks
- Networks with Limited Fiber
- Architectures Using Separate Optical Wavelengths to Carry Targeted Services

## Features

- Standard ITU Grid Wavelengths
- Advanced Analog Chip Design
- Reduced Equipment Requirements in the Hub
- OC-48 Pin Out
- Telcordia Technologies™ 468 Compliant
- Wide Temperature Range – Stable Even in Harsh Environments
- RoHS Compliant

The 1754C laser module is a Dense Wavelength Division Multiplexing (DWDM) laser for analog CATV applications. It features a distributed-feedback (DFB) device that has been designed specifically for radio frequency (RF) and CATV applications. The 1754C laser module has a wide temperature range for reliable performance in harsh node environments and narrow transmitter designs. It also features low adiabatic chirp to maximize signal quality in short and long lengths of fiber. The laser's excellent inherent linearity minimizes degradation of the broadcast signals caused by quadrature amplitude modulated (QAM) channels.

The 1754C is available in all C-band ITU grid wavelengths.

## Performance Highlights

| Parameters | Min | Typical | Max | Units |
|---|---|---|---|---|
| Wavelength (Standard ITU Grid) | 1526 | - | 1563 | nm |
| Optical Output Power | 6.0 | - | 16.0 | mW |
| Operating Current | - | - | 120 | mA |
| Temperature Range | -40 | - | +85 | °C |
| Frequency Range | 5 | - | 2700 | MHz |
| Composite Second Order | - | - | -55 | dB |
| Composite Triple Beat | - | - | -64 | dB |
| Carrier to Noise Ratio | 52 | - | - | dB |
| Adiabatic Chirp | 40 | - | 100 | MHz/mA |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## Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

| Parameter | Symbol | Condition | Min | Max | Unit |
|---|---|---|---|---|---|
| Operating Case Temperature | $T_C$ | Continuous | -40 | +85 | °C |
| Storage Temperature Range | $T_{stg}$ | Continuous | -40 | 85 | °C |
| Laser Forward dc Current | - | Continuous | - | 150 | mA |
| Photodiode Reverse Voltage | $V_{RPD}$ | Continuous | - | 10 | V |
| Laser Reverse Voltage | - | Continuous | - | 2 | V |
| ESD | - | HMB: R = 1500 Ohm, C = 100 pF | -500 | 500 | V |
| TEC Current | $I_{TEC}$ | Continuous | -1.8 | 1.8 | A |
| RF Input Power | $P_{RFIN}$ | 60 Seconds | - | 62 | dBmV |

## Electrical/Optical Characteristics

Laser Temperature ($T_L$) = 25°C, $I_F = I_{OP}$, Beginning of Life (BOL)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Wavelength (Standard ITU Grid) | λ | - | 1526 | - | 1563 | nm |
| Optical Power | $P_{OUT}$ | 6 mW option | 6.0 | - | 7.9 | mW |
| | | 8 mW option | 8.0 | - | 9.9 | mW |
| | | 10 mW option | 10.0 | - | 15.9 | mW |
| | | 16 mW option | 16.0 | - | - | mW |
| Slope Efficiency | η | - | 0.07 | - | - | mW/mA |
| Optical Isolation | ISO | - | 30 | - | - | dB |
| Sidemode Suppression Ratio | SMSR | - | 35 | - | - | dB |
| Threshold Current | $I_{TH}$ | - | - | - | 30 | mA |
| Operating Current | $I_{OP}$ | - | - | - | 120 | mA |
| Monitor PD Current | MPDI | VRM=5V | 100 | - | 2500 | µA |
| Thermistor Resistance | $R_{TH}$ | TOP=25 °C | 9.5 | 10 | 10.5 | KOhm |
| Thermistor Temp. Coefficient | $T_{CTH}$ | TOP=25 °C | - | -4.4 | - | %/°C |
| TEC Current | $I_{TEC}$ | -40<TC<+85°C, IF = 100 mA | -1.4 | - | 1.4 | A |
| TEC Operation Temperature | $T_{OP}$ | - | 18 | | 35 | °C |
| Wavelength Drift as Tcase is changed | λΔ | $I_F$ = 60 mA, T = $T_{OP}$, Tc min→max | - | 0.04 | - | nm |
| Fiber Length | - | May include optical splice | 1.0 | 1.5 | - | M |
| Fiber Buffer | - | - | - | 900 | - | µm |
| Fiber Core / Cladding | - | - | - | 9 / 125 | - | µm |

## RF Characteristic

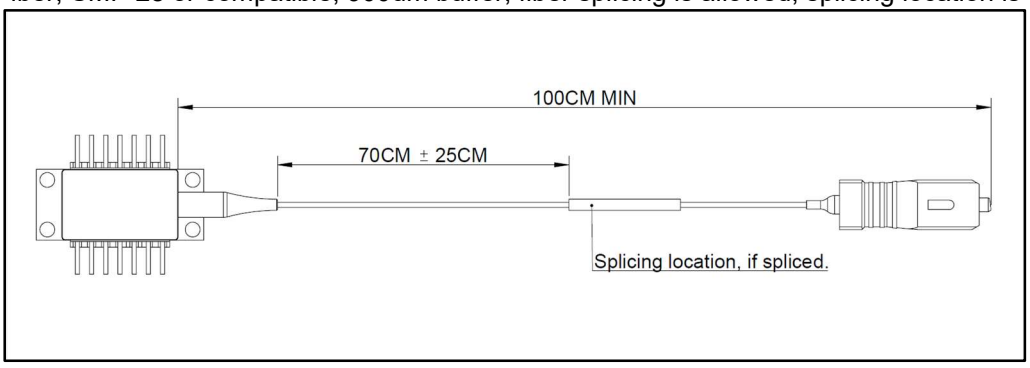
Laser Temperature ($T_L$) = 25°C, $I_F = I_{OP}$, Beginning of Life (BOL)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Frequency Range | F | - | 5 | - | 2700 | MHz |
| Frequency Response | S21 | $I_F$ = 60 mA, 5 MHz-2700 MHz | - | - | 4.0 | $dB_{p-p}$ |
| Composite Second Order (Note 2) | CSO | Measured at 61.25MHz and 547.25MHz, Note 2 | - | - | -55 | dB |
| Composite Triple Beat (Note 2) | CTB | Measured at 295.25MHz, Note 2 | - | | -64 | dB |
| Carrier to Noise Ratio (Note 2) | CNR | Measured at 61.25MHz and 547.25MHz, Note 2 | 52 | - | - | dB |
| Adiabatic Chirp | FM | $I_F$ = 75mA, T = 25 °C, measured at 300 MHz | 40 | - | 100 | MHz/mA |
| Nominal Input Impedance | $Z_{IN}$ | - | - | 25 | - | Ω |
| Relative Intensity Noise | RIN | - | - | -155 | -150 | dB/Hz |

1. In order to prevent reflection-induced distortion, the laser must be connected to an optical cable having a return loss of at least 55 dB for discrete reflections and 30 dB for distributed reflections.
2. Test conditions: $I_F$ = Iop, T = Top, OMI = 3.3%/channel, 79 Channel NTSC loading, 1m fiber link.

## Fiber Characteristics

**Standard Connector**: SC/APC
**Fiber Length**: Min 1.0 meter, with respect to end of package wall.
**Fiber Type**: SM Fiber, SMF-28 or compatible, 900um buffer, fiber splicing is allowed, splicing location is defined as below.




## Electrical Schematics

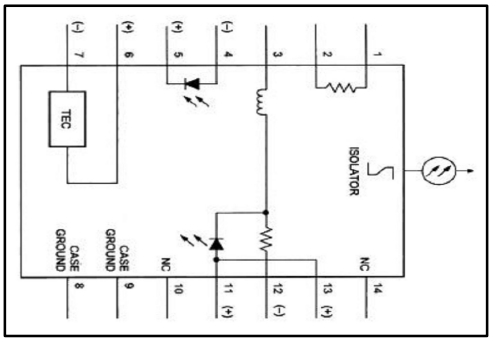



Figure 1. 1754 Laser Schematic

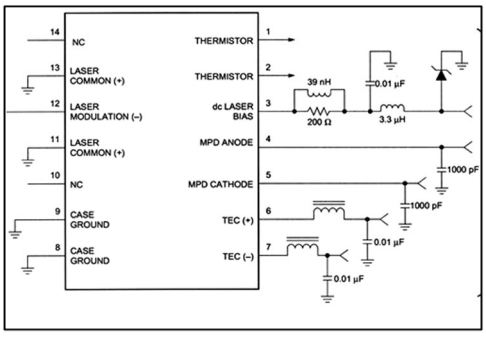
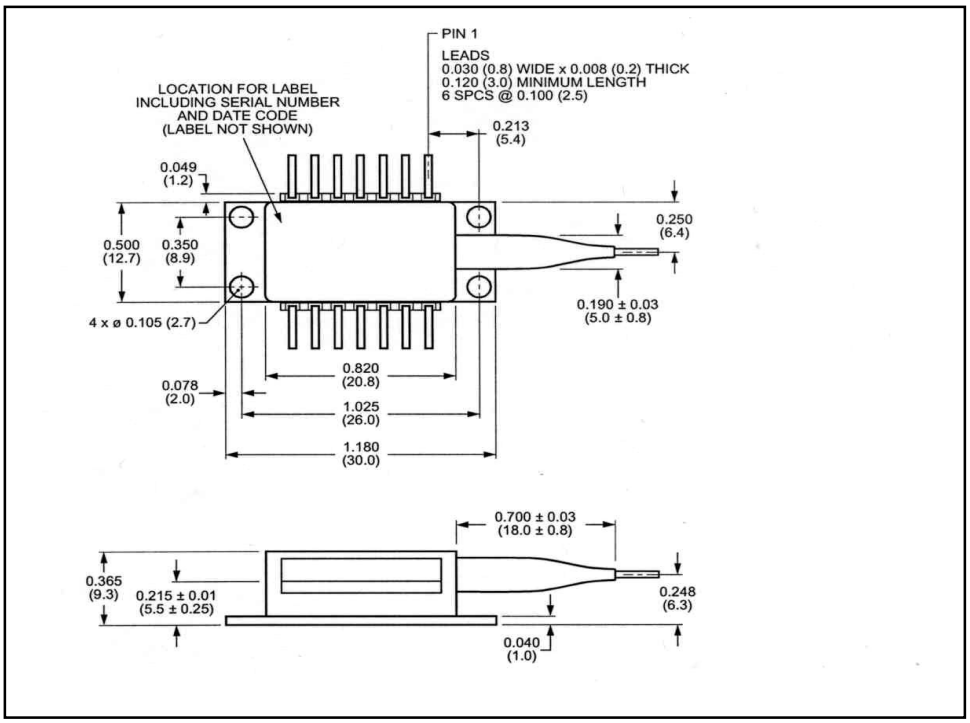



Figure 2. 1754 Suggested Matching Circuit

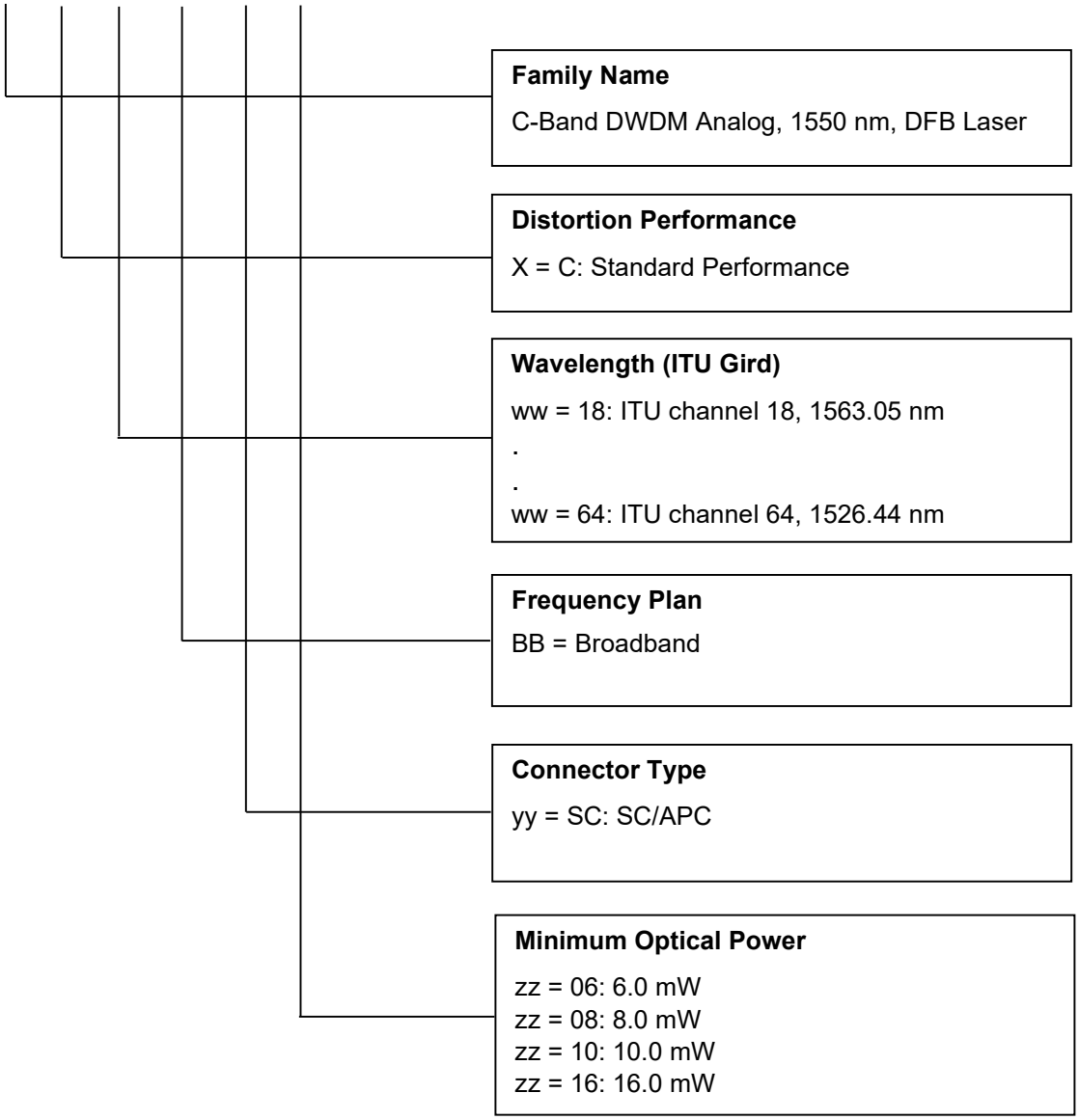
## Outline Dimensions and Pin Definitions (Dimensions are in inches and mm)




| Pin | Function |
|---|---|
| 1 | Thermistor |
| 2 | Thermistor |
| 3 | DC Laser Bias (-) |
| 4 | MPD Anode (-) |
| 5 | MPD Cathode (+) |
| 6 | Thermal Electric Cooler (+) |
| 7 | Thermal Electric Cooler (-) |
| 8 | Case Ground |
| 9 | Case Ground |
| 10 | NC |
| 11 | Laser Common (+) |
| 12 | Laser Modulation (-) |
| 13 | Laser Common (+) |
| 14 | NC |

## Ordering Information

**1754X – ww – BB – yy – zz**



**Family Name**

C-Band DWDM Analog, 1550 nm, DFB Laser

**Distortion Performance**

X = C: Standard Performance

**Wavelength (ITU Gird)**

ww = 18: ITU channel 18, 1563.05 nm
.
.
ww = 64: ITU channel 64, 1526.44 nm

**Frequency Plan**

BB = Broadband

**Connector Type**

yy = SC: SC/APC

**Minimum Optical Power**

zz = 06: 6.0 mW
zz = 08: 8.0 mW
zz = 10: 10.0 mW
zz = 16: 16.0 mW

## Example

**1754C-18-BB-SC-10:** DWDM DFB Laser, Standard Performance, 1563.05 nm, SC/APC connector, 10 mW Power

## Laser Safety

This product meets the appropriate standard in Title 21 of the Code of Federal Regulations (CFR). FDA/CDRH Class 1M laser product. This device has been classified with the FDA/CDRH under accession number 0220191.

All Versions of this laser are Class 1M laser product, tested according to IEC 60825-1:2014/EN 60825-1:2014

Single-mode fiber pigtail with SC/APC connectors (standard).

Wavelength = 1.5 μm.

Maximum power = 30 mW.

Because of size constraints, laser safety labeling (including an FDA class 1M label) is not affixed to the module, but attached to the outside of the shipping carton.

Product is not shipped with power supply.

**Caution: Use of controls, adjustments and procedures other than those specified herein may result in hazardous laser radiation exposure. Viewing the laser output with telescopic optical instruments (for example, telescopes and binoculars) may pose an eye hazard and thus the user should not direct the beam into an area where such instruments are likely to be used.**