

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 component 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 component 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

| | Min | Typical | Max | Units |
|---|------------|---------|------|--------|
| Available Wavelengths | See page 3 | | | nm |
| Operating Temperature Range | -40 | 25 | +85 | °C |
| Optical Output Power | 6 - 16 | - | - | mW |
| Adiabatic Chirp (measured at 500 MHz) | 40 | - | 100 | MHz/mA |
| Composite Second-Order Distortion (CSO) | - | - | -55 | dBc |
| Composite Triple Beat Distortion (CTB) | - | - | -64 | dBc |
| Carrier-to-Noise Ratio (CNR) | 52 | - | - | dB |
| Frequency Range | 5 | - | 2700 | MHz |
| RF Return Loss | 16 | - | - | dB |

Noise and distortion performance above assume 79 channel NTSC loading with no QAM, 0 dBm received optical power. See following pages for complete specifications and operating/test conditions.

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 Temperature Range | T_C | Continuous | -40 | +85 | °C |
| Storage Temperature Range | T_{STG} | Continuous | -40 | +85 | °C |
| Average RF Input Power | - | 60 seconds | - | 62 | dBmV |
| Laser Forward DC Current | - | Continuous | - | 150 | mA |
| Photodiode Reverse Voltage | V_{MPD} | Continuous | - | 10 | V |
| Laser Reverse Voltage, DC | - | Continuous | - | 1 | V |
| ESD | - | HBM: R = 1500 Ohm, C = 100pF | -500 | 500 | V |
| TEC Current | I_{TEC} | Continuous | -1.5 | 1.5 | A |

Electrical/Optical Characteristics

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

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|--------------------------------------|----------------------|--|--------------------|------------------|----------------------------|-------------------------|
| Operating Case Temperature | T_C | - | -40 | 25 | +85 | °C |
| Optical Output Power | P_O | 6 mW version 8 mW version 10 mW version 16 mW version | 6 8 10 16 | - - - - | 7.9 9.9 15.9 19.9 | mW |
| Threshold Current | I_{TH} | 25°C, BOL | - | - | 20 | mA |
| Slope Efficiency | η | | .07 | - | - | W/A |
| Operating Current | I_{OP} | BOL | - | - | 120 | mA |
| Operating Voltage | V_{OP} | 25°C, BOL | - | - | 2.5 | V |
| Wavelength | λ | ITU Grid | See page 3 | | | nm |
| λ Drift over T_C Range | $\Delta\lambda_{OP}$ | $I_F = 60$ mA, $T = T_{OP}$ | - | - | 40 | pm |
| Laser Adiabatic Chirp | FM | $I_F = 60$ mA, $T_{OP} = 25^\circ\text{C}$ @ 500 MHz | 40 | - | 100 | MHz/mA |
| Optical Return Loss | ORL | - | 40 | - | - | dB |
| Sidemode Suppression Ratio | SMSR | | 30 | - | - | dB |
| Optical Isolation | ISO | 25°C | 30 | - | - | dB |
| Relative Intensity Noise | RIN | $I_F = I_{TH} + 70$ mA | | - | -155 | dB/Hz |
| Nominal Input Impedance | Z_{IN} | - | 22 | 25 | 27 | Ω |
| MPD Responsivity | r_{PD} | $V_{RM} = 5$ V | 10 | - | 200 | $\mu\text{A}/\text{mW}$ |
| MPD Dark Current | I_D | $I_{OP} = 0$ mA $V_{RM} = 5$ V, $T_{OP} = 25^\circ\text{C}$ | | | 0.2 | μA |
| MPD Current Relative to Output Power | - | $V_{RM} = 5$ V, $T_{OP} = 25^\circ\text{C}$ | 10 | - | 200 | mA/W |
| Thermistor Resistance | R_{TH} | $T_{OP} = 25^\circ\text{C}$ | 9.5 | 10 | 10.5 | k Ω |
| Thermistor Temp. Coefficient | TC_{TH} | $T_{OP} = 25^\circ\text{C}$ | - | -4.4 | - | %/°C |
| TEC Voltage | V_{TEC} | - | -2.5 | - | 3.8 | V |

RF Characteristic

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

| Parameter | Symbol | Condition | Min | Typ | Max | Units |
|--|--------|--|-----|-----|-----|-------------------|
| Carrier-to-Noise Ratio ⁽¹⁾ | CNR | 79 NTSC, 3.3% OMI 1 m fiber min, 4.2 MHz NBW | 52 | - | - | dB |
| Composite Second-Order ⁽¹⁾ | CSO | 79 NTSC, 3.3% OMI 1 m fiber min | | | -55 | dBm |
| Composite Triple Beat ⁽¹⁾ | CTB | 79 NTSC, 3.3% OMI 1 m fiber min | - | | -64 | dBc |
| Frequency Response Flatness | S21 | 40 MHz to 890 MHz I _F = 60 mA, T _{OP} = 25°C | - | - | 1 | dB _{p-p} |
| | | 5 MHz to 2700 MHz I _F = 60 mA, T _{OP} = 25°C | | | 4 | dB _{p-p} |
| RF Return Loss resistive match 50Ω to 25Ω pad | S11 | 5 MHz to 2700 MHz I _F = 60 mA, T _{OP} = 25°C | 16 | - | - | dB |
| Carrier-to-Noise Ratio ⁽²⁾ | CNR | Channel Loading: Frequencies set at 7, 13, 19, 25, 31, and 37 MHz | 51 | - | - | dB |
| Composite Second-Order ⁽²⁾ | CSO | Receiver thermal noise 8 pA*Hz ^{-0.5} Photodiode responsivity ~1.1 A/W | - | - | -50 | dBm |
| Composite Triple Beat ⁽²⁾ | CTB | Noise Bandwidth 4.2 MHz | - | - | -60 | dBc |

(1). Broadband Forward Path

(2). Return Path. Guaranteed by design, not to test in production.

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.

ITU Grid Channel Numbering

| Channel | Wavelength (nm) | Channel | Wavelength (nm) | Channel | Wavelength (nm) |
|---------|-----------------|---------|-----------------|---------|-----------------|
| 62 | 1527.99 | 47 | 1539.77 | 32 | 1551.72 |
| 61 | 1528.77 | 46 | 1540.56 | 31 | 1552.52 |
| 60 | 1529.55 | 45 | 1541.35 | 30 | 1553.33 |
| 59 | 1530.33 | 44 | 1542.14 | 29 | 1554.13 |
| 58 | 1531.12 | 43 | 1542.94 | 28 | 1554.94 |
| 57 | 1531.90 | 42 | 1543.73 | 27 | 1555.75 |
| 56 | 1532.68 | 41 | 1544.53 | 26 | 1556.56 |
| 55 | 1533.47 | 40 | 1545.32 | 25 | 1557.36 |
| 54 | 1534.25 | 39 | 1546.12 | 24 | 1558.17 |
| 53 | 1535.04 | 38 | 1546.92 | 23 | 1558.98 |
| 52 | 1535.82 | 37 | 1547.72 | 22 | 1559.79 |
| 51 | 1536.61 | 36 | 1548.51 | 21 | 1560.61 |
| 50 | 1537.40 | 35 | 1549.32 | 20 | 1561.42 |
| 49 | 1538.19 | 34 | 1550.12 | 19 | 1562.23 |
| 48 | 1538.98 | 33 | 1550.92 | 18 | 1563.05 |

Electrical Schematics

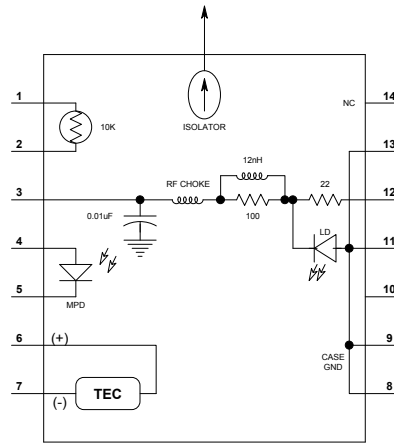


Figure 1. 1754C Laser Simplified Schematic

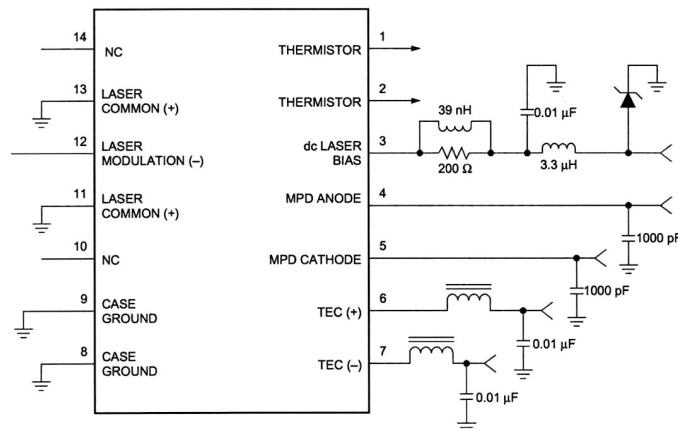
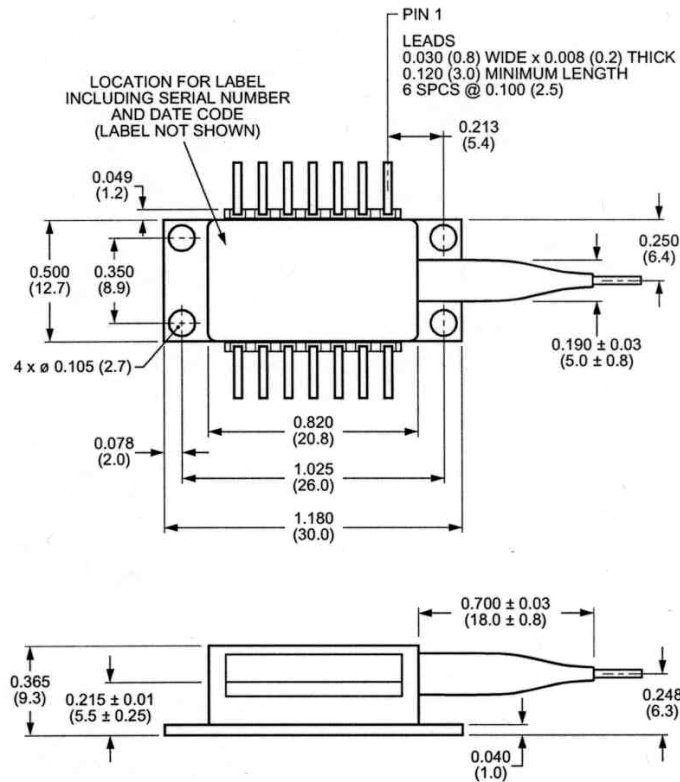


Figure 2. 1754C Circuit Schematic

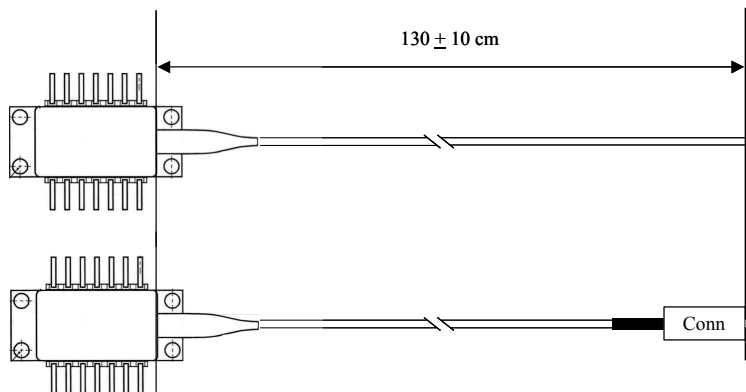
Pin Definitions

| Pin | Description |
|-----|-----------------------------|
| 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 (+), Case GND |
| 12 | Laser Modulation (-) |
| 13 | Laser Common (+), Case GND |
| 14 | NC |

Outline Diagram (Dimensions are in inches and millimeters)



Fiber type: 0.9 mm O.D. jacketed single mode 9/125 mm (SMF-28)
 Fiber length: 130 cm + 10 cm, measured as shown below
 Nominal pin lead length: 0.2 inch (from external package wall)



Laser Safety

This product meets the appropriate standard in Title 21 of the Code of Federal Regulations (CFR). FDA/CDRH Class 1 laser product. This device has been classified with the FDA/CDRH under accession number 0220309.

All Versions of this laser are Class 1 laser product, tested according to IEC 60825-1:2007/EN 60825-1:2007

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

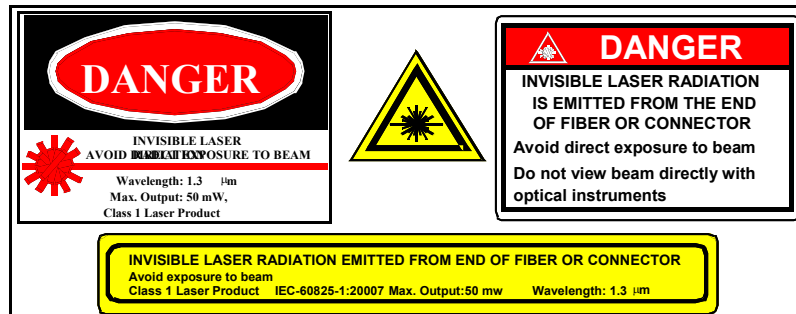
Wavelength = 1.5 μm .

Maximum power = 30 mW.

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

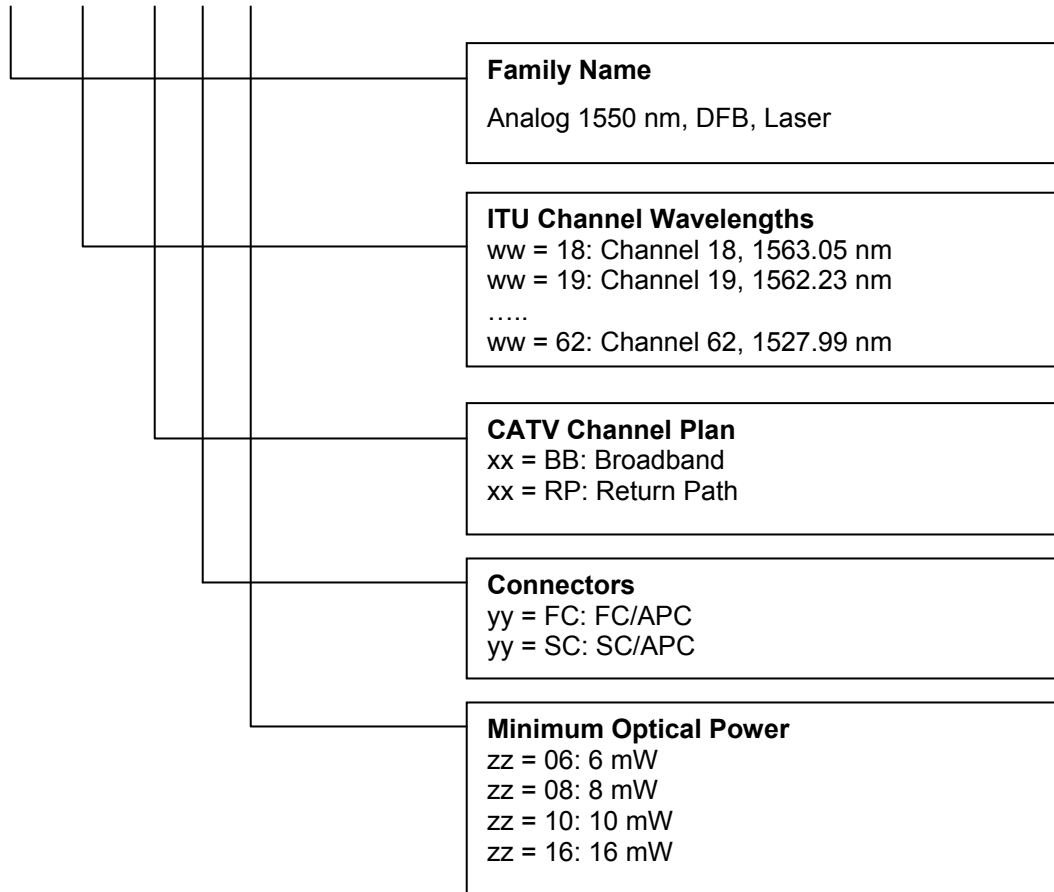
Product is not shipped with power supply.

Caution: Use of controls, adjustments and procedures other than those specified herein may result in hazardous laser radiation exposure.



Ordering Code Definitions

1754C – ww – xx – yy – zz



Example

1754C-32-BB-SC-08: 1754C, ITU channel 32, 1551.72 nm, SC/APC connector, 8 mW minimum optical power.