

**BTR-7720G / BTR-7720-SPG / BTR-7720AG / BTR-7720A-SPG****1550 nm TX / 1310 nm RX , 3.3V / 1.25 Gb/s **RoHS Compliant** Single-Fiber Transceiver****FEATURES**

- | Single Fiber Bi-Directional Transceiver
- | 1550 nm DFB LD Transmitter
- | 1310 nm Receiver
- | 14 dB Link Power Budget At Least
- | Link distance up to 20 km
- | Industry Standard 1 x 9 Footprint
- | Single +3.3 V Power Supply
- | RoHS Compliant
- | 0 to 70°C Operating: BTR-7720G
- | -20 to 85°C Operating: BTR-7720AG
- | LVPECL Differential Inputs and Outputs
- | LVPECL Signal Detect Output: BTR-7720G
- | LVTTTL Signal Detect Output: BTR-7720CG
- | Wave Solderable and Aqueous Washable
- | Class 1 Laser International Safety Standard IEC-60825 Compliant

**DESCRIPTION**

The BTR-7720G series is high performance module for single fiber communications by using 1550 nm transmitter and 1310 nm receiver. The transmitter section uses a multiple quantum well 1550 nm DFB laser and is a class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses an integrated 1310 nm detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC. A PECL logic interface simplifies interface to external circuitry.

**LASER SAFETY**

This single mode transceiver is a Class 1 laser product. It complies with IEC-60825 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated within the specified temperature and voltage limits. The optical ports of the module shall be terminated with an optical connector or with a dust plug.

**APPLICATIONS**

- | WDM 1.25 Gb/s Links
- | SONET/SDH Equipment Interconnect
- | Fiber Channel 1.063 Gb/s Links

**ORDER INFORMATION**

| P/No.              | Bit Rate (Gb/s) | Distance (km) | TX (nm)  | RX (nm) | Voltage (V) | Package | Temp (°C)        | TX Power (dBm) | RX Sens. (dBm) | Signal Detect | RoHS Compliant |
|--------------------|-----------------|---------------|----------|---------|-------------|---------|------------------|----------------|----------------|---------------|----------------|
| BTR-7720CG         | 1.25            | 20            | 1550 DFB | 1310    | 3.3         | 1X9     | 0 to 70          | -3 to -8       | -22            | TTL           | Yes            |
| <b>BTR-7720ACG</b> | 1.25            | 20            | 1550 DFB | 1310    | 3.3         | 1X9     | <b>-20 to 85</b> | -3 to -8       | -22            | TTL           | Yes            |
| BTR-7720G          | 1.25            | 20            | 1550 DFB | 1310    | 3.3         | 1X9     | 0 to 70          | -3 to -8       | -22            | PECL          | Yes            |
| <b>BTR-7720AG</b>  | 1.25            | 20            | 1550 DFB | 1310    | 3.3         | 1X9     | <b>-20 to 85</b> | -3 to -8       | -22            | PECL          | Yes            |

Note: 1. BTR-XXXXXG is 1X9 SC receptacle type package.

2. BTR-XXXXX-APBBBG is 1X9 pigtail type package with different connector, A=S is SC connector, A=F is FC connector, A=T is ST connector, A=L is LC connector, A=M is MU connector; BBB is the length of fiber in cm.

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| Absolute Maximum Ratings |                  |          |                 |       |                          |
|--------------------------|------------------|----------|-----------------|-------|--------------------------|
| Parameter                | Symbol           | Min      | Max             | Units | Notes                    |
| Storage Temperature      | Tstg             | -40      | 85              | °C    |                          |
| Operating Temperature    | Topr             | 0<br>-20 | 70<br>85        | °C    | BTR-7720G<br>BTR-7720AG  |
| Soldering Temperature    | ---              |          | 260             | °C    | 10 seconds on leads only |
| Power Supply Voltage     | V <sub>cc</sub>  | 0        | 4.5             | V     |                          |
| Input Voltage            | ---              | GND      | V <sub>cc</sub> | V     |                          |
| Output Current           | I <sub>out</sub> | 0        | 30              | mA    |                          |

| Recommended Operating Conditions |                 |          |      |          |                                   |
|----------------------------------|-----------------|----------|------|----------|-----------------------------------|
| Parameter                        | Symbol          | Min      | Typ  | Max      | Units                             |
| Power Supply Voltage             | V <sub>cc</sub> | 3.13     | 3.3  | 3.47     | V                                 |
| Operating Temperature            | Topr            | 0<br>-20 |      | 70<br>85 | °C / BTR-7720G<br>°C / BTR-7720AG |
| Data Rate                        |                 |          | 1250 | 1300     | Mb/s                              |
| Power Supply Current             | I <sub>cc</sub> |          |      | 280      | mA                                |

| Transmitter Specifications (0°C < Topr < 70°C, 3.13V < V <sub>cc</sub> < 3.47V) |                                   |      |     |       |       |                   |
|---------------------------------------------------------------------------------|-----------------------------------|------|-----|-------|-------|-------------------|
| Parameter                                                                       | Symbol                            | Min  | Typ | Max   | Units | Notes             |
| <b>Optical</b>                                                                  |                                   |      |     |       |       |                   |
| Optical Transmit Power                                                          | P <sub>o</sub>                    | -8   | --- | -3    | dBm   | 1                 |
| Output Center Wavelength                                                        | λ                                 | 1480 |     | 1580  | nm    |                   |
| Output Spectrum Width                                                           | Δλ                                | ---  | --- | 1     | nm    | -20 dB width      |
| Side Mode Suppression Ratio                                                     | SMSR                              | 30   |     |       | dB    |                   |
| Extinction Ratio                                                                | E <sub>R</sub>                    | 9.0  | --- | ---   | dB    |                   |
| Output Eye                                                                      | Compliant with IEEE 802.3z        |      |     |       |       |                   |
| Optical Rise Time                                                               | t <sub>r</sub>                    |      |     | 0.26  | ns    | 20% to 80% Values |
| Optical Fall Time                                                               | t <sub>f</sub>                    |      |     | 0.26  | ns    | 20% to 80% Values |
| Relative Intensity Noise                                                        | RIN                               |      |     | -120  | dB/Hz |                   |
| Total Jitter                                                                    | TJ                                |      |     | 0.227 | ns    | 2                 |
| <b>Electrical</b>                                                               |                                   |      |     |       |       |                   |
| Data Input Current – Low                                                        | I <sub>IL</sub>                   | -350 |     |       | μA    |                   |
| Data Input Current – High                                                       | I <sub>IH</sub>                   |      |     | 350   | μA    |                   |
| Differential Input Voltage                                                      | V <sub>IH</sub> - V <sub>IL</sub> | 300  |     |       | mV    |                   |
| Data Input Voltage – Low                                                        | V <sub>IL</sub> - V <sub>CC</sub> | -2.0 |     | -1.58 | V     | 3                 |
| Data Input Voltage – High                                                       | V <sub>IH</sub> - V <sub>CC</sub> | -1.1 |     | -0.74 | V     | 3                 |

Notes: 1. Output power is power coupled into a 9/125 μm single mode fiber.

2. Measured with a 2<sup>7</sup>-1 PRBS.

3. These inputs are compatible with 10K, 10KH and 100K ECL and LVPECL inputs.

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| Receiver Specifications (0°C < Topr < 70°C, 3.15 V < Vcc < 3.47V) |                                   |      |     |                      |       |                         |
|-------------------------------------------------------------------|-----------------------------------|------|-----|----------------------|-------|-------------------------|
| Parameter                                                         | Symbol                            | Min  | Typ | Max                  | Units | Notes                   |
| <b>Optical</b>                                                    |                                   |      |     |                      |       |                         |
| Sensitivity                                                       | ---                               | ---  | --- | -22                  | dBm   | 1                       |
| Maximum Input Power                                               | Pin                               | -3   | --- | ---                  | dBm   |                         |
| Signal Detect -- Asserted                                         | Pa                                | ---  | --- | -22                  | dBm   | Transition: low to high |
| Signal Detect -- Deasserted                                       | Pd                                | -31  | --- | ---                  | dBm   | Transition: high to low |
| Signal detect -- Hysteresis                                       |                                   | 1.0  | --- |                      | dB    |                         |
| Wavelength of Operation                                           |                                   | 1260 |     | 1360                 | nm    | 2                       |
| Optical Return Loss                                               | ORL                               | 14   |     |                      | dB    |                         |
| <b>Electrical</b>                                                 |                                   |      |     |                      |       |                         |
| Data Output Voltage -- Low                                        | V <sub>OL</sub> - V <sub>CC</sub> | -2.0 |     | -1.58                | V     | 3                       |
| Data Output Voltage -- High                                       | V <sub>OH</sub> - V <sub>CC</sub> | -1.1 |     | -0.74                | V     | 3                       |
| SD Output Voltage -- Low                                          | V <sub>OL</sub> - V <sub>CC</sub> | -2.0 |     | -1.58                | V     | BTR-7720G               |
| SD Output Voltage -- High                                         | V <sub>OH</sub> - V <sub>CC</sub> | -1.1 |     | -0.74                | V     |                         |
| SD Output Voltage -- Low                                          | V <sub>OL</sub>                   | 0    |     | 0.8                  | V     | BTR-7720CG              |
| SD Output Voltage -- High                                         | V <sub>OH</sub>                   | 2.0  |     | V <sub>CC</sub> +0.3 | V     |                         |

Notes: 1. Minimum sensitivity and saturation levels at BER=1E-12 for a 2<sup>7</sup>-1 PRBS.

2. At least 30 dB optical isolation for the wavelength 1480 to 1580 nm.

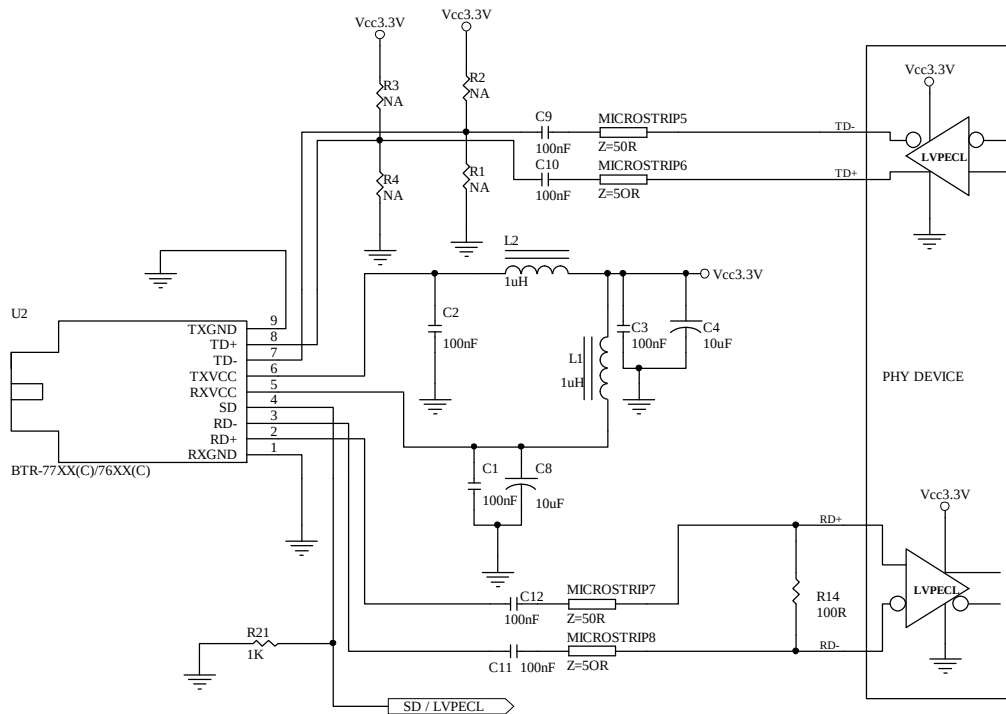
3. These outputs are compatible with 10K, 10KH and 100K ECL and LVPECL outputs.

## CONNECTION DIAGRAM

|                           |            |          |
|---------------------------|------------|----------|
| Receiver Signal Ground    | 1 (Rx GND) | ○        |
| Receiver Data Out         | 2 (RD+)    | N/C      |
| Receiver Data Out Bar     | 3 (RD-)    |          |
| Signal Detect             | 4 (SD)     |          |
| Receiver Power Supply     | 5 (Rx Vcc) | TOP VIEW |
| Transmitter Power Supply  | 6 (Tx Vcc) |          |
| Transmitter Data In Bar   | 7 (TD-)    |          |
| Transmitter Data In       | 8 (TD+)    | N/C      |
| Transmitter Signal Ground | 9 (Tx GND) | ○        |

| PIN | Symbol | Notes                                                      |
|-----|--------|------------------------------------------------------------|
| 1   | Rx GND | Directly connect this pin to the receiver ground plane     |
| 2   | RD+    | See recommended circuit schematic                          |
| 3   | RD-    | See recommended circuit schematic                          |
| 4   | SD     | Active high on this indicates a received optical signal    |
| 5   | Rx Vcc | +3.3V dc power for the receiver section                    |
| 6   | Tx Vcc | +3.3V dc power for the transmitter section                 |
| 7   | TD-    | See recommended circuit schematic                          |
| 8   | TD+    | See recommended circuit schematic                          |
| 9   | Tx GND | Directly connect this plan to the transmitter ground plane |

## RECOMMENDED CIRCUIT SCHEMATIC

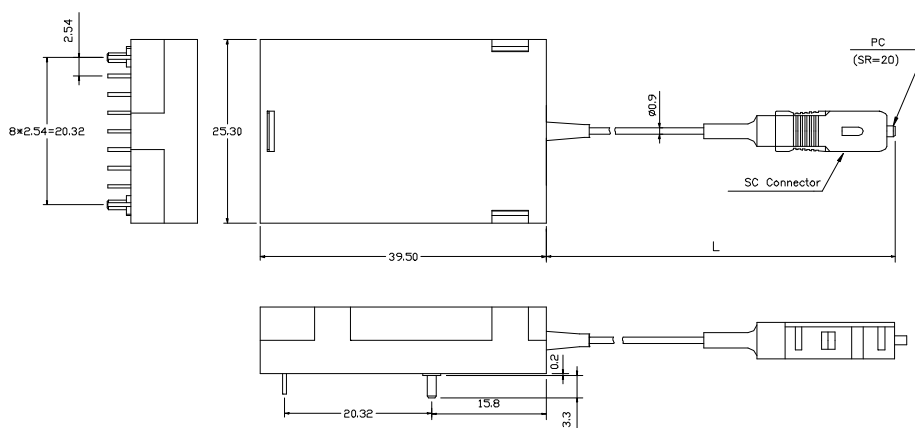


The split-load terminations for ECL signals need to be located at the input of devices receiving those ECL signals. The power supply filtering is required for good EMI performance. Use short tracks from the inductor L1/L2 to the module Rx Vcc and Tx Vcc. A GND plane under the module is required for good EMI and sensitivity performance.

## PACKAGE DIAGRAM

Units in mm

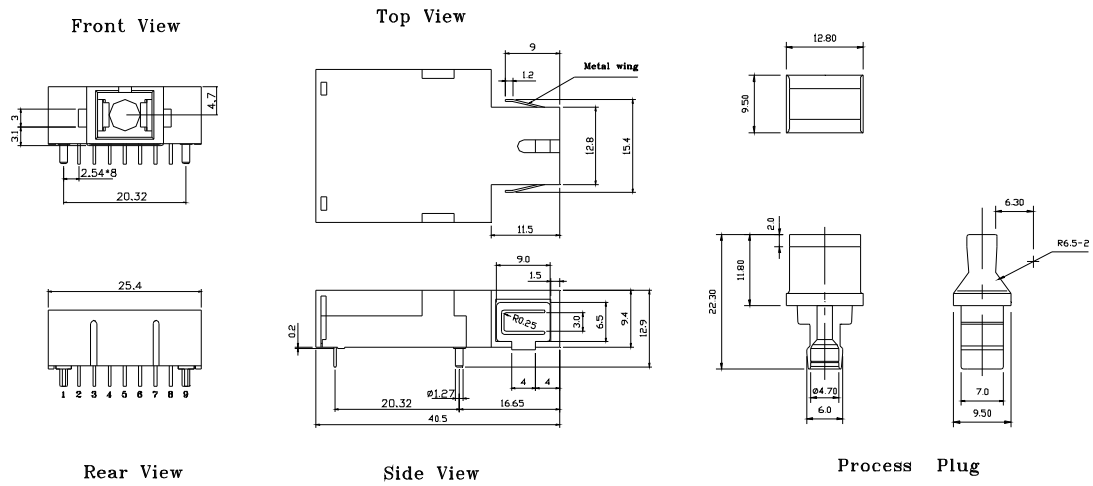
### 1) Pigtail Type



## BTR-7720-SP50G / BTR-7720A-SP50G

Note: Length L is  $50 \pm 3$  cm. Other pigtail's length is available upon request.

## 2) Receptacle Type



BTR-7720G / BTR-7720AG

**Note:** Specifications subject to change without notice.