

**BTRS-9600MG / BTRS-9600AMG****1310 nm TX / 1550 nm RX , 3.3V / 2.5 Gbps RoHS Compliant Single-Fiber MM Transceiver****FEATURES**

- | Single Fiber Bi-Directional MM Transceiver
- | Speed up to 2.67 Gb/s
- | 1310 nm Transmitter
- | 1550 nm Receiver
- | Distance 0 to 300 m at 2.5 Gb/s
- | 0 to 70°C Operating: BTRS-9600MG
- | -20 to 85°C Operating: BTRS-9600AMG
- | 2x5 Package with SC Receptacle
- | LVTTTL Signal Detect Output
- | Single +3.3 V Power Supply
- | RoHS Compliant
- | PECL Differential Inputs and Outputs
- | Wave Solderable and Aqueous Washable
- | Class 1 Laser International Safety Standard IEC-60825 Compliant

**APPLICATIONS**

- | WDM OC-48/STM-16 Links
- | Gigabit Ethernet Interconnect
- | Fibre Channel Links

**DESCRIPTION**

The BTRS-9600MG series is high performance module for multi-mode single fiber communications by using 1310 nm transmitter and 1550 nm receiver. The transmitter section uses a multiple quantum well laser and is a class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses an integrated 1550 nm detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC. A PECL logic interface simplifies interface to external circuitry. LV-TTL Signal Detect is used.

**LASER SAFETY**

This multi-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.

**ORDER INFORMATION**

| P/No.        | Bit Rate (Gb/s) | Distance (m) | TX (nm) | RX (nm) | Voltage (V) | Package | Temp (°C) | TX Power (dBm) | RX Sens. (dBm) | RoHS Compliant |
|--------------|-----------------|--------------|---------|---------|-------------|---------|-----------|----------------|----------------|----------------|
| BTRS-9600MG  | 2.5             | 0 to 300     | 1310    | 1550    | 3.3         | SC, 2X5 | 0 to 70   | 0 to -10       | -16            | Yes            |
| BTRS-9600AMG | 2.5             | 0 to 300     | 1310    | 1550    | 3.3         | SC, 2X5 | -20 to 85 | 0 to -10       | -16            | Yes            |

| 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    | BTRS-9600MG<br>BTRS-9600AMG |
| Soldering Temperature    | ---    |          | 260      | °C    | 10 seconds on leads only    |
| Power Supply Voltage     | Vcc    | 0        | 3.6      | V     |                             |
| Input Voltage            | ---    | GND      | Vcc      | V     |                             |
| Output Current           | Iout   | 0        | 30       | mA    |                             |

| Recommended Operating Conditions |        |          |      |          |                                       |
|----------------------------------|--------|----------|------|----------|---------------------------------------|
| Parameter                        | Symbol | Min      | Typ  | Max      | Units / Notes                         |
| Power Supply Voltage             | Vcc    | 3.13     | 3.3  | 3.47     | V                                     |
| Operating Temperature            | Topr   | 0<br>-20 |      | 70<br>85 | °C / BTRS-9600MG<br>°C / BTRS-9600AMG |
| Data Rate                        |        | 1000     | 2488 | 2670     | Mb/s                                  |
| Power Supply Current             | Icc    |          |      | 260      | mA                                    |

| Transmitter Specifications (0°C < Topr < 70°C, 3.13V < Vcc < 3.47V) |                                   |                       |      |                 |         |                    |
|---------------------------------------------------------------------|-----------------------------------|-----------------------|------|-----------------|---------|--------------------|
| Parameter                                                           | Symbol                            | Min                   | Typ  | Max             | Units   | Notes              |
| <b>Optical</b>                                                      |                                   |                       |      |                 |         |                    |
| Optical Transmit Power                                              | P <sub>o</sub>                    | -10                   |      | 0               | dBm     | 1                  |
| Output Center Wavelength                                            | $\lambda$                         | 1270                  | 1310 | 1360            | nm      |                    |
| Output Spectrum Width                                               | $\sigma_{\lambda}$                |                       |      | 4               | nm      | RMS ( $\sigma$ )   |
| Output Eye                                                          | Compliant with IEEE 802.3z        |                       |      |                 |         |                    |
| Optical Rise Time                                                   | t <sub>r</sub>                    |                       |      | 150             | pps     | 20% to 80% Values  |
| Optical Fall Time                                                   | t <sub>f</sub>                    |                       |      | 150             | ps      | 20% to 80% Values  |
| Relative Intensity Noise                                            | RIN                               |                       |      | -120            | dB/Hz   |                    |
| <b>Electrical</b>                                                   |                                   |                       |      |                 |         |                    |
| Data Input Current – Low                                            | I <sub>IL</sub>                   | -350                  |      |                 | $\mu$ A |                    |
| Data Input Current – High                                           | I <sub>IH</sub>                   |                       |      | 350             | $\mu$ A |                    |
| Differential Input Voltage                                          | V <sub>IH</sub> - V <sub>IL</sub> | 300                   |      | 1600            | mV      |                    |
| Data Input Voltage – Low                                            | V <sub>IL</sub> - V <sub>CC</sub> | -2.0                  |      | -1.58           | V       | 2                  |
| Data Input Voltage -- High                                          | V <sub>IH</sub> - V <sub>CC</sub> | -1.1                  |      | -0.74           | V       | 2                  |
| Disable Input Voltage -- Low                                        | V <sub>TDIS,L</sub>               | 0                     |      | 0.8             | V       | TX Output Enabled  |
| Disable Input Voltage -- High                                       | V <sub>TDIS,H</sub>               | V <sub>CC</sub> - 1.3 |      | V <sub>CC</sub> | V       | TX Output Disabled |
| Shut Off Time for TxDis                                             | t <sub>DIS</sub>                  |                       |      | 1               | ms      |                    |

Notes: 1. Output power is power coupled into a 62.5/125  $\mu$ m multi-mode fiber.

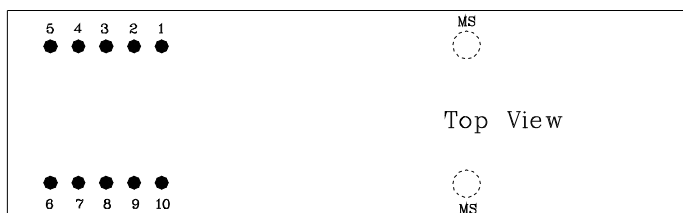
2. These inputs are compatible with 10K, 10KH and 100K ECL and LVPECL inputs.

| Receiver Specifications (0°C < Topr < 70°C, 3.13 V < Vcc < 3.47V) |                                   |       |     |                      |         |                         |
|-------------------------------------------------------------------|-----------------------------------|-------|-----|----------------------|---------|-------------------------|
| Parameter                                                         | Symbol                            | Min   | Typ | Max                  | Units   | Notes                   |
| <b>Optical</b>                                                    |                                   |       |     |                      |         |                         |
| Sensitivity                                                       | ---                               | ---   | --- | -16                  | dBm     | 1                       |
| Maximum Input Power                                               | P <sub>in</sub>                   | -3    | --- | ---                  | dBm     |                         |
| Signal Detect -- Asserted                                         | P <sub>a</sub>                    | ---   | --- | -16                  | dBm     | Transition: low to high |
| Signal Detect -- Deasserted                                       | P <sub>d</sub>                    | -31   | --- | ---                  | dBm     | Transition: high to low |
| Signal detect -- Hysteresis                                       |                                   | 1.0   | --- |                      | dB      |                         |
| Wavelength of Operation                                           |                                   | 1480  |     | 1580                 | nm      | 2                       |
| Optical Return Loss                                               | ORL                               | 20    |     |                      | dB      |                         |
| <b>Electrical</b>                                                 |                                   |       |     |                      |         |                         |
| Data Output Voltage Swing                                         | V <sub>OH</sub> - V <sub>OL</sub> | 0.575 |     | 0.930                | V       |                         |
| SD Output Voltage -- Low                                          | V <sub>OL</sub>                   | 0     |     | 0.8                  | V       |                         |
| SD Output Voltage -- High                                         | V <sub>OH</sub>                   | 2.0   |     | V <sub>CC</sub> +0.3 | V       |                         |
| Signal Detect Assert Time                                         | A <sub>S</sub> MAX                |       |     | 100                  | $\mu$ s | OFF to ON               |
| Signal Detect Deassert Time                                       | A <sub>N</sub> SMAX               |       |     | 300                  | $\mu$ s | ON to OFF               |

Notes: 1. Minimum sensitivity and saturation levels at BER 1E-10 for a 2<sup>23</sup>-1 PRBS.

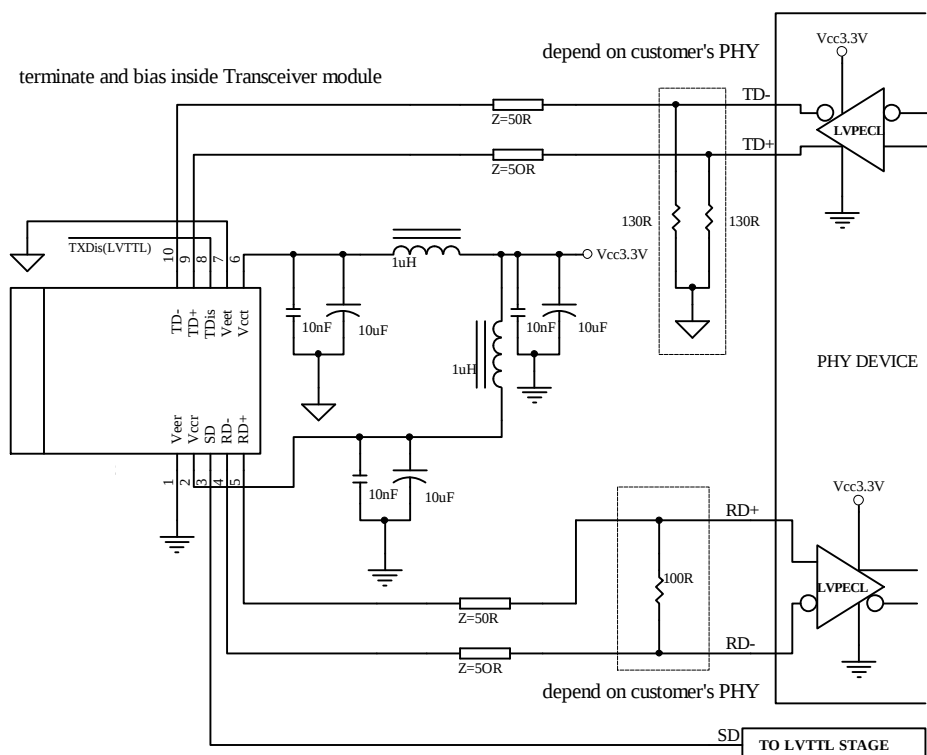
2. At least 30 dB optical isolation for the wavelength 1260 to 1360 nm.

## CONNECTION DIAGRAM



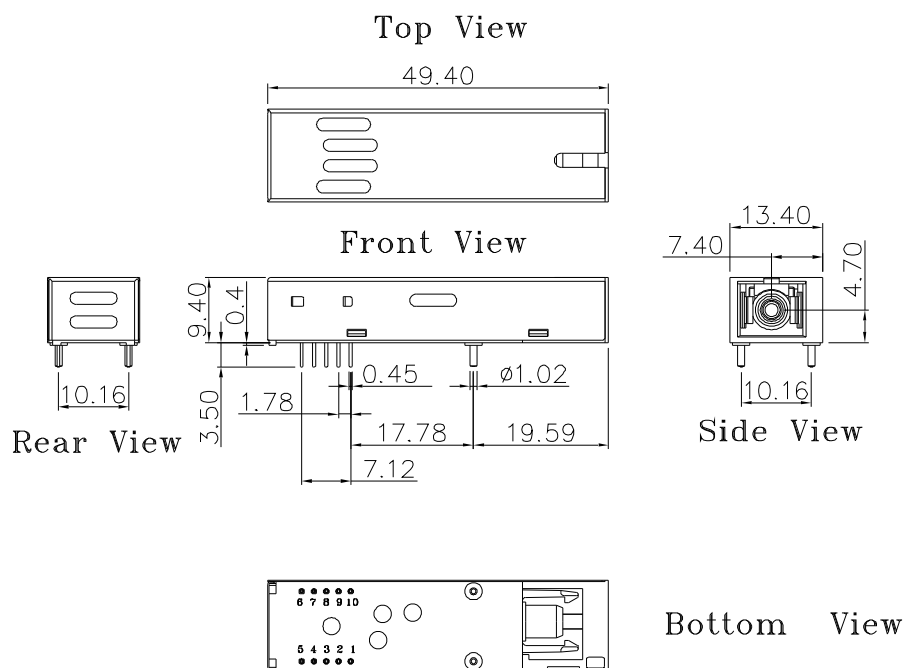
| PIN | Symbol     | Notes                                                                                                                           |
|-----|------------|---------------------------------------------------------------------------------------------------------------------------------|
| 1   | $V_{EE}^r$ | Directly connect this pin to the receiver ground plane                                                                          |
| 2   | $V_{CC}^r$ | +3.3V dc power for the receiver section                                                                                         |
| 3   | SD         | Active high on this indicates a received optical signal.                                                                        |
| 4   | RD-        | Receiver Dataout Bar. See recommended circuit schematic                                                                         |
| 5   | RD+        | Receiver Dataout. See recommended circuit schematic                                                                             |
| 6   | $V_{CC}^t$ | +3.3V dc power for the transmitter section                                                                                      |
| 7   | $V_{EE}^t$ | Directly connect this plan to the transmitter ground plane                                                                      |
| 8   | TxDis      | Transmitter Disable. Connect this pin to +3.3V TTL logic "1" to disable module<br>To enable module connect to TTL logic low "0" |
| 9   | TD+        | Transmitter Data In. See recommended circuit schematic                                                                          |
| 10  | TD-        | Transmitter Data In Bar. See recommended circuit schematic                                                                      |
| MS  | MS         | Mounting Studs. Connect to Chassis Ground                                                                                       |

## RECOMMENDED CIRCUIT SCHEMATIC



## PACKAGE DIAGRAM

Units in mm



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