

**GBS-7010G (RoHS Compliant)**  
**5V / 1310 nm / 1.25 Gbps Single-Mode Gigabit Interface Converter (GBIC)**

**FEATURES**

- | Compliant with Gigabit Interface Converter (GBIC) Specification Rev. 5.5
- | Compliant with IEEE-802.3z / D5.0 Gigabit Ethernet 1000 BASE-LX
- | Compliant with Fibre Channel FC-PH-2 for 100-M5-SN-1 and 100-M6-SN-1
- | Hot Pluggable Module with Duplex SC Connector
- | 2 m to 10 km using Single-mode Optic Cable
- | 550 m using 62.5 μm Multi-mode Optic Cable
- | 550 m using 50 μm Multi-mode Optic Cable
- | SCA-2 Host Connector
- | Single +5 V Power Supply
- | RoHS Compliant
- | Differential PECL Inputs and Outputs
- | TTL RX-LOS Output
- | Class 1 Laser International Safety Standard IEC-60825 Compliant

**APPLICATIONS**

- | Switch to Switch Interface
- | High Speed Interface for File Servers
- | Bus Extension Application
- | Data Storage

**DESCRIPTION**

The GBS-7010G series optical transceivers meet the Gigabit Interface Converter (GBIC) specification Rev. 5.5. It satisfies the optical interface specifications defined in IEEE 802.3z Drift 5.0 for Gigabit Ethernet. This module is designed for single mode fiber and operates at a nominal wavelength of 1310 nm. 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 InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC. A PECL input / output logic interface is used. TTL RX-LOS output simplifies interface to external circuitry. A 20-pin SCA-2 host connector is used to connect the converter to the host system.

**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.

**ORDER INFORMATION**

| P/No.     | Bit Rate (Gb/s) | 1000 BASE | Distance (km) | Wavelength (nm) | Package | Temp. (°C) | TX Power (dBm) | RX Sens. (dBm) | RoHS Compliant |
|-----------|-----------------|-----------|---------------|-----------------|---------|------------|----------------|----------------|----------------|
| GBS-7010G | 1.25            | LX / LH   | 10            | 1310            | SC GBIC | 0 to 70    | -3 to -9       | -20            | Yes            |

| Absolute Maximum Ratings |        |      |     |       |       |
|--------------------------|--------|------|-----|-------|-------|
| Parameter                | Symbol | Min  | Max | Units | Notes |
| Storage Temperature      | Tstg   | -40  | 85  | °C    |       |
| Operating Temperature    | Topr   | -5   | 70  | °C    |       |
| Power Supply Voltage     | Vcc    | -0.5 | 6   | V     |       |
| Input Voltage            | ---    | -0.5 | Vcc | V     |       |
| Relative Humidity        | RH     | 5    | 95  | %     |       |

| Recommended Operating Conditions |                                   |      |      |      |       |
|----------------------------------|-----------------------------------|------|------|------|-------|
| Parameter                        | Symbol                            | Min  | Typ  | Max  | Units |
| Power Supply Voltage             | Vcc                               | 4.75 | 5    | 5.25 | V     |
| Power Supply Current             | I <sub>TX</sub> + I <sub>RX</sub> |      | 200  | 300  | mA    |
| Operating Temperature            | Topr                              | 0    |      | 70   | °C    |
| Data Rate                        |                                   | 1000 | 1250 |      | Mb/s  |

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| Transmitter Specifications (0°C < Topr < 70°C, 4.75V < Vcc < 5.25V) |                                   |                       |      |                       |                  |                  |
|---|-----------------------------------|-----------------------|------|-----------------------|------------------|------------------|
| Parameter   | Symbol                            | Min                   | Typ  | Max                   | Units            | Notes            |
| <b>Optical</b>  |                                   |                       |      |                       |                  |                  |
| Optical Transmit Power  | P <sub>O</sub>                    | -9                    | ---  | -3                    | dBm              | 1                |
| Output Center Wavelength  | λ                                 | 1275                  | 1310 | 1350                  | nm               |                  |
| Output Spectrum Width   | Δλ                                | ---                   | ---  | 2.5                   | nm               | RMS (σ)          |
| Extinction Ratio  | E <sub>R</sub>                    | 9                     | ---  | ---                   | dB               |                  |
| Coupled Power Ratio   | CPR                               | 9                     |      |                       | dB               |                  |
| Optical Rise Time   | t <sub>r</sub>                    |                       |      | 0.26                  | ns               | 20% to 80% value |
| Optical Fall Time   | t <sub>f</sub>                    |                       |      | 0.26                  | ns               | 20% to 80% value |
| Relative Intensity Noise  | RIN                               |                       |      | -120                  | dB/Hz            |                  |
| Total Jitter  | TJ                                |                       |      | 227                   | ps               | 2                |
| Max. Po at TX-Disable Asserted                                      |                                   |                       |      | -35                   | dBm              |                  |
| <b>Electrical</b>   |                                   |                       |      |                       |                  |                  |
| Differential Input Voltage  | V <sub>IH</sub> - V <sub>IL</sub> | 0.65                  |      | 2.0                   | V <sub>p-p</sub> |                  |
| Transmit Fault Load   | TX-FAULT <sub>LOAD</sub>          | 4.7                   |      | 10                    | kΩ               | 3                |
| Transmit Fault Output-Low   | V <sub>TX-FAULT-L</sub>           | 0.0                   |      | 0.5                   | V                |                  |
| Transmit Fault Output-High  | V <sub>TX-FAULT-H</sub>           | V <sub>cc</sub> - 0.5 |      | V <sub>cc</sub> + 0.3 | V                |                  |
| TX-Disable Input - Low  | V <sub>TX-DISABLE-L</sub>         | 0                     |      | 0.8                   | V                |                  |
| TX-Disable Input - High   | V <sub>TX-DISABLE-H</sub>         | 2.0                   |      | V <sub>cc</sub> + 0.3 | V                |                  |
| TX-Disable Assert Time  | t <sub>off</sub>                  |                       |      | 10                    | μs               |                  |
| TX-Disable Negate Time  | t <sub>on</sub>                   |                       |      | 1                     | ms               |                  |
| Time to initialize, includes reset of TX-FAULT                      | t <sub>int</sub>                  |                       |      | 300                   | ms               |                  |
| TX FAULT from fault to assertion                                    | t <sub>fault</sub>                |                       |      | 100                   | μs               |                  |
| TX-Disable time to start reset                                      | t <sub>reset</sub>                | 10                    |      |                       | μs               |                  |

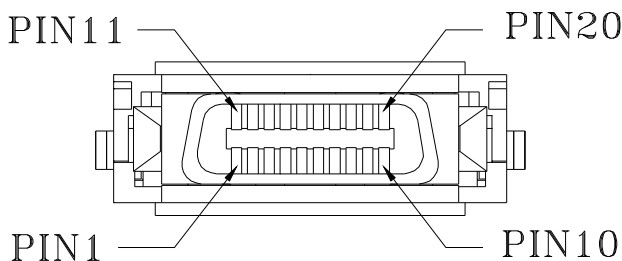
- Notes: 1. Output power is power coupled into a 9/125 μm single mode fiber.  
 2. Measured with a 2<sup>7</sup>-1 PRBS.  
 3. Pull-up resistor on host Vcc.

| Receiver Specifications (0°C < Topr < 70°C, 4.75 V < Vcc < 5.25V) |                                   |      |     |                 |                  |                         |
|---|-----------------------------------|------|-----|-----------------|------------------|-------------------------|
| Parameter   | Symbol                            | Min  | Typ | Max             | Units            | Notes                   |
| <b>Optical</b>  |                                   |      |     |                 |                  |                         |
| Sensitivity   | ---                               | ---  | --- | -20             | dBm              | 4                       |
| Maximum Input Power   | P <sub>in</sub>                   | -3   |     | ---             | dBm              | 4                       |
| Signal detect – Hysteresis  |                                   | 1.0  | --- |                 | dB               |                         |
| Wavelength of Operation   |                                   | 1100 | --- | 1600            | nm               |                         |
| Optical Return Loss   | ORL                               | 12   |     |                 | dB               |                         |
| RX-LOS – Asserted   | P <sub>a</sub>                    | ---  | --- | -20             | dBm              | Transition: low to high |
| RX-LOS – Deasserted   | P <sub>d</sub>                    | -31  | --- | ---             | dBm              | Transition: high to low |
| <b>Electrical</b>   |                                   |      |     |                 |                  |                         |
| Differential Output Voltage                                       | V <sub>OH</sub> - V <sub>OL</sub> | 0.37 |     | 2.0             | V <sub>p-p</sub> |                         |
| Data Output Rise Time   | T <sub>RX-DAT</sub>               |      |     | 0.35            | ns               |                         |
| Data Output Fall Time   | T <sub>fRX-DAT</sub>              |      |     | 0.35            | ns               |                         |
| RX-LOS of Light Load  | RX-LOS <sub>LOAD</sub>            | 4.7  |     | 10              | kΩ               | 5                       |
| RX-LOS Output Voltage --- Low                                     | V <sub>RX-LOS-L</sub>             | 0    |     | 0.5             | V                |                         |
| RX-LOS Output Voltage --- High                                    | V <sub>RX-LOS-H</sub>             | 2.4  |     | V <sub>cc</sub> | V                |                         |
| RX-LOS Assert Time (off to on)                                    | T <sub>A,RX-LOS</sub>             |      |     | 100             | μs               |                         |
| RX-LOS Deassert Time (on to off)                                  | T <sub>D,RX-LOS</sub>             |      |     | 100             | μs               |                         |

- Notes: 4. Minimum sensitivity and saturation levels at BER=1E-12 for a 2<sup>7</sup>-1 PRBS.  
 5. Pull-up resistor on host Vcc.

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PIN ASSIGNMENT



| PIN | Signal Name       | Sequence | Description  |
|-----|-------------------|----------|--|
| 1   | RX-LOS            | 2        | Receiver Loss of Signal, logic high, open collector compatible, 4.7K to 10K ohm pull-up to V <sub>CC</sub> T on host |
| 2   | R <sub>GND</sub>  | 2        | Receiver Ground  |
| 3   | R <sub>GND</sub>  | 2        | Receiver Ground  |
| 4   | MOD-DEF(0)        | 2        | TTL Low  |
| 5   | MOD-DEF(1)        | 2        | SCL Serial Clock Signal  |
| 6   | MOD-DEF(2)        | 2        | SDA Serial Data Signal   |
| 7   | TX-DIABLE         | 2        | Transmitter Disable, logic high, open collector compatible   |
| 8   | T <sub>GND</sub>  | 2        | Transmitter Ground   |
| 9   | T <sub>GND</sub>  | 2        | Transmitter Ground   |
| 10  | TX-FAULT          | 2        | Transmitter Fault, logic high, open collector compatible, 4.7K to 10K ohm pull-up to V <sub>CC</sub> T on GBIC       |
| 11  | R <sub>GND</sub>  | 1        | Receiver Ground  |
| 12  | -RX-DAT           | 1        | Receiver Data Bar, Differential PECL, AC coupled   |
| 13  | +RX-DAT           | 1        | Receiver Data, Differential PECL, AC coupled   |
| 14  | R <sub>GND</sub>  | 1        | Receiver Ground  |
| 15  | V <sub>CC</sub> R | 2        | Receiver +5V Supply  |
| 16  | V <sub>CC</sub> T | 2        | Transmitter +5V Supply   |
| 17  | T <sub>GND</sub>  | 1        | Transmitter Ground   |
| 18  | +TX-DAT           | 1        | Transmitter Data, Differential PECL, AC coupled  |
| 19  | -TX-DAT           | 1        | Transmitter Data Bar, Differential PECL, AC coupled  |
| 20  | T <sub>GND</sub>  | 1        | Transmitter Ground   |

A sequence value of 1 indicates that the signal is in the first group to engage during plugging of a module. A sequence value of 2 indicates that the signal is the second and last group. The two guide pins on the connector are electrically connected to the transceiver circuit ground. These two guide pins make contact with circuit prior to sequence 1 signals.

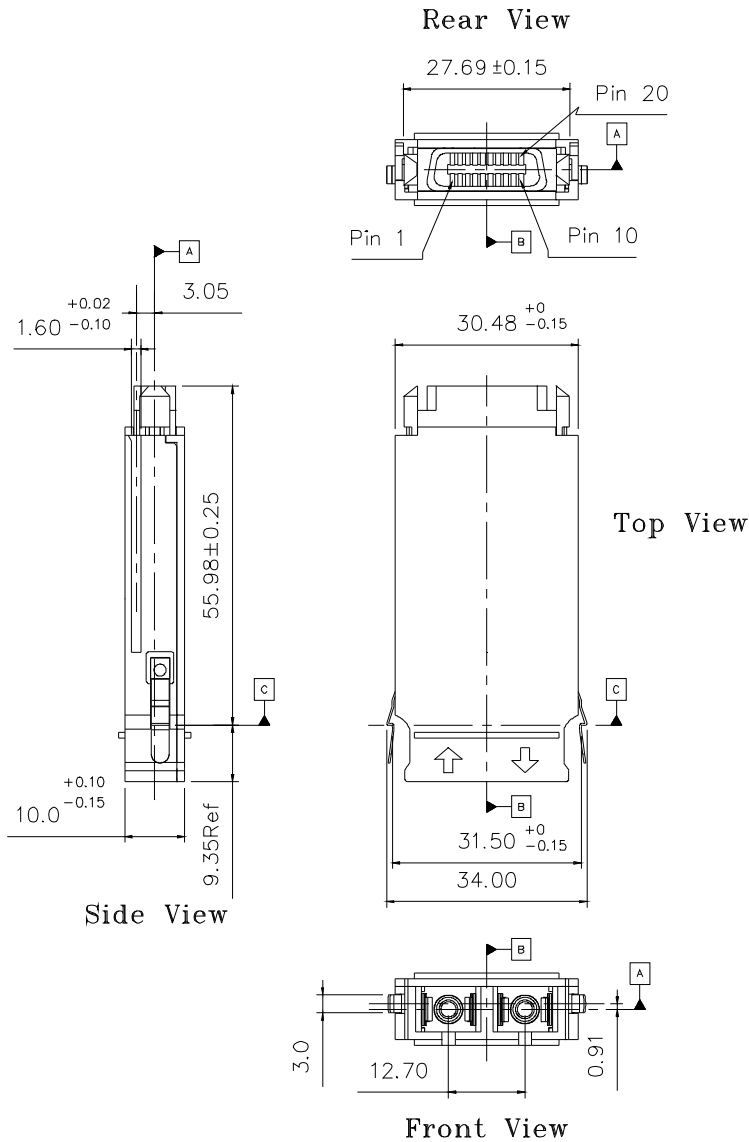
### Module Definition

| Module Definition | MOD-DEF(0)<br>PIN 4 | MOD-DEF (1)<br>PIN 5 | MOD-DEF (2)<br>PIN 6 | Interpretation by<br>Host            |
|-------------------|---------------------|----------------------|----------------------|--------------------------------------|
| 4                 | TTL Low             | SCL                  | SDA                  | Serial module definition<br>protocol |

Module Definition 4 specifies a serial definition protocol. For this definition, upon power up, MOD-DEF(1:2) appear as no connector (NC) and MOD-DEF(0) is TTL LOW. When the host system detects this condition, it activates the serial protocol. The protocol uses the 2-wire serial CMOS E<sup>2</sup>PROM protocol of the ATMEL AT24C01A/02/04 family of components.

PACKAGE DIAGRAM

Units in mm



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