

Product Specification

Short-Wavelength GBIC Transceiver

FTL-8519-3D

Product Features

- Up to 1.25Gb/s bi-directional data links
- 850nm VCSEL Laser Transmitter
- Optional Digital Diagnostics Functions
- Extended Operating Temperature Range (-10°C to +85°C)
- Compatible with 3.3V & 5V Systems
- Hot-Pluggable (complies with GBIC specification Rev. 5.5)
- Fully metallic enclosure for low EMI
- Low power dissipation
- RoHS compliant and Lead Free



Applications

- 1.0625Gb/s Fibre Channel
- 1.25 Gigabit Ethernet

Finisar's FTL-8519-3D 850nm GBIC transceivers comply with GBIC Specification Revision 5.5¹. They are compatible with the Gigabit Ethernet as specified in IEEE Std 802.3², Fibre Channel FC-PH, PH2, PH3³ and FC-PI-2 Rev. 10.0⁴. They are RoHS compliant and lead-free per Directive 2002/95/EC⁵ and Finisar Application Note AN-2038⁶.

Product Selection

| Part Number | Digital Diagnostics? |
|----------------|----------------------|
| FTL-8519-3D | No |
| FTL-8519-3D-DD | Yes |

I. Pin Out

| Pin Name | Pin # | Sequence |
|-----------------------------|-------|----------|
| RX_LOS | 1 | 2 |
| GND | 2 | 2 |
| GND | 3 | 2 |
| MOD_DEF(0) | 4 | 2 |
| MOD_DEF(1) | 5 | 2 |
| MOD_DEF(2) | 6 | 2 |
| TX_DISABLE | 7 | 2 |
| GND | 8 | 2 |
| GND | 9 | 2 |
| TX_FAULT (not supported) | 10 | 2 |
| GND | 11 | 1 |
| -RX_DAT | 12 | 1 |
| +RX_DAT | 13 | 1 |
| GND | 14 | 1 |
| V _{CC} | 15 | 2 |
| V _{CC} | 16 | 2 |
| GND | 17 | 1 |
| +TX_DAT | 18 | 1 |
| -TX_DAT | 19 | 1 |
| GND | 20 | 1 |

Table 1. GBIC to host connector pin assignment

“Sequence” indicates the order in which pins make contact when the device is hot plugged. Also see “Table 3: Signal Definitions” in the GBIC Specification Revision 5.5.¹

II. Electrical Power Interface

Finisar FTL-8519-3D GBICs have an extended power supply voltage range of 3.15 V to 5.5 V as described in Table 2. They are compatible with both 3.3V and 5 V systems.

| +5/3.3 Volt Electrical Power Interface | | | | | | |
|--|-------------|------|----------|-----|-------|--------------------------------|
| Parameter | Symbol | Min | Typ | Max | Units | Notes/Conditions |
| Supply Current | I_s | | 190 | 300 | mA | |
| Surge Current | I_{surge} | | | 330 | mA | Hot plug |
| Absolute Supply Voltage | V_{max} | -0.3 | | 6 | V | Not to be applied continuously |
| Operating Supply Voltage | V_{cc} | 3.15 | 3.3, 5.0 | 5.5 | V | |

Table 2. Electrical power interface

III. Low Speed Signals

RX_LOS, and TX_DISABLE are TTL signals as described in Table 3. MOD_DEF(1) (SCL) and MOD_DEF(2) (SDA), are open drain CMOS signals (see section VI, “Serial Communication Protocol”). Both MOD_DEF(1) and MOD_DEF(2) must be pulled up to host_Vcc. If host_Vcc is 3.3V, then they must be pulled to 3.3V. If host_Vcc is 5V, do not pull the MOD_DEF pins to 5V.

For more detailed information, see sections 5.3.1 – 5.3.8 in the GBIC Specification Rev. 5.5¹.

| Low Speed Signals, Electronic Characteristics | | | | | | |
|---|----------|----------------|----------------|-------|---|--|
| Parameter | Symbol | Min | Max | Units | Notes/Conditions | |
| GBIC Output LOW | V_{OL} | 0 | 0.5 | V | 4.7k to 10k pull-up to host_Vcc, measured at host side of connector | |
| GBIC Output HIGH | V_{OH} | host_Vcc - 0.5 | host_Vcc + 0.3 | V | 4.7k to 10k pull-up to host_Vcc, measured at host side of connector | |
| GBIC Input LOW | V_{IL} | 0 | 0.8 | V | 4.7k to 10k pull-up to Vcc, measured at GBIC side of connector* | |
| GBIC Input HIGH | V_{IH} | 2 | Vcc + 0.3 | V | 4.7k to 10k pull-up to Vcc, measured at GBIC side of connector* | |

*Note V_{IH} and V_{IL} are the same for both 5V and 3.3V operation

Table 3. Low speed signals – electronic characteristics

| Low Speed Signal Parameters | | | | | | |
|-----------------------------|------------|-----|-----|------|-------|--|
| Parameter | Symbol | Min | Typ | Max | Units | Notes/Conditions |
| RX_LOS Assert Level | -- | -30 | | | dBm | |
| RX_LOS Deassert Level | -- | | | -19 | dBm | |
| RX_LOS Hysteresis | -- | 0.5 | | | dB | |
| RX_LOS Assert Delay | t_loss_on | | 44 | 100 | μsec | From detection of loss of signal to assertion of RX_LOS |
| RX_LOS Negate Delay | t_loss_off | | 44 | 100 | μsec | From detection of presence of signal to negation of RX_LOS |
| TX_DISABLE Assert Time | t_off | | | 10 | μsec | Rising edge of TX_DISABLE to fall of output signal below 10% of nominal |
| TX_DISABLE Negate Time | t_on | | | 1000 | μsec | Falling edge of TX_DISABLE to rise of output signal above 90% of nominal |
| TX_DISABLE Reset Time | t_reset | 10 | | | μsec | TX_DISABLE HIGH before TX_DISABLE set LOW |

Table 4. Low speed signal parameters

IV. High Speed Electrical Interface

All high-speed PECL signals are AC-coupled internally.

| High Speed Electrical Interface | | | | | | |
|---------------------------------|--------------------------------|-----|-----|-------------------|-------|---|
| Parameter | Symbol | Min | Typ | Max | Units | Notes/Conditions |
| Data Input Voltage | V _{in} | 650 | | 2000 | mV | PECL differential peak - peak |
| Data Output Voltage | V _{out} | 370 | | 2000 | mV | PECL differential peak - peak |
| PECL rise/fall | t _r ,t _f | | | 260 | psec | 20%-80% differential |
| Bit Error Rate | BER | | | 10 ⁻¹² | | PRBS 2 ⁷ - 1 test data pattern |
| Tx Input Impedance | Z _{in} | | 75 | | ohm | |
| Rx Output Impedance | Z _{out} | | 75 | | ohm | |

Table 5. High-speed electrical interface

V. Optical Parameters

| Optical Parameters | | | | | | |
|----------------------------------|-----------------|------|-----|------|-------|---|
| Parameter | Symbol | Min | Typ | Max | Units | Notes/Conditions |
| Transmitter Center Wavelength | λ_c | 820 | 850 | 860 | nm | |
| Transmitter Spectral Width (RMS) | $\Delta\lambda$ | | 0.5 | 0.85 | nm | RMS |
| Transmitter Optical Output Power | P_{out} | -9.5 | | -3.5 | dBm | Average Power |
| Transmitter Extinction Ratio | OMI | 9 | | | dB | |
| Relative Intensity Noise | RIN | | | -117 | dB/Hz | |
| Transmitter Eye Opening | -- | 60 | | | % | Conforms to IEEE 802.3 and Fibre Channel Eye Masks |
| Total Transmitter Jitter | TJ_{TX} | | | 180 | ps | Peak to peak, filtered |
| Transmitter Rise/Fall Time | T_r/T_f | | | 210 | ps | Unfiltered 20%-80% |
| Optical Input Wavelength | λ_{in} | 770 | | 860 | nm | |
| Optical Receiver Sensitivity | R_{XSENS} | | | -19 | dBm | BER < 10^{-12} w/ PRBS $2^7 - 1$ test data pattern @ 1.25Gb/s |
| Average Received Power | R_{XMAX} | | | 0 | dBm | |
| Max Reflectivity | | | | -14 | dB | |
| Total Receiver Jitter | TJ_{RX} | | | 180 | ps | Peak to peak, filtered in loopback |

Table 6. Optical parameters

VI. General Specifications

| General | | | | | | |
|--------------|--------|-----|--------------|-----|--------|--|
| Parameter | Symbol | Min | Typ | Max | Units | Notes/Conditions |
| Data Rate | BR | | 1.25, 1.0625 | | Gb/sec | Fibre Channel, IEEE 802.3 Compatible. Rate tolerance = ± 100 ppm |
| Fiber Length | L | | | 550 | m | 50 μ m 500MHz-km Fiber |
| Fiber Length | L | | | 275 | m | 62.5 μ m 200MHz-km Fiber |

Table 7. General specifications

VII. Environmental Specifications

Note that the GBIC Specification requires an ambient temperature range of 0 to 50°C. Finisar GBICs have an extended range from -10°C to +85°C case temperature as specified in Table 8.

| Environment | | | | | | |
|-------------------|------------------|-----|-----|-----|-------|--|
| Parameter | Symbol | Min | Typ | Max | Units | Notes/Conditions |
| Operating Temp | T _{op} | -10 | | 85 | °C | Case Temperature |
| Relative Humidity | RH | 0 | | 85 | % | Non Condensing |
| Storage Temp | T _{sto} | -40 | | 85 | °C | |
| Eye Safety | -- | | | | | CDRH and IEC-825 Class 1 Laser Product |

Table 8. Environmental Specifications

VIII. Serial Communication Protocol

All Finisar optical GBICs implement serial identification features described for ‘Module Definition “4”’ as outlined in Annex D of the GBIC Specification¹. These GBICs use an Atmel AT24C01A 128 byte E²PROM at address A0H. For details on interfacing with the E²PROM, see the Atmel data sheet titled “AT24C01A/02/04/08/16 2-Wire Serial CMOS E²PROM.”⁷

The FTL-8519-3D also supports extended diagnostic features as described in Finisar Applications Note AN-2030, “Digital Diagnostic Monitoring Interface for Optical Transceivers”⁸, and additional information is available in SFF standard titled: “Digital Diagnostic Monitoring Interface for Optical Transceivers”⁹ (SFF-8472 Rev. 9.3). A controller IC that monitors system parameters such as laser current, module temperature, transmitter power, and received power is accessible at address A2H.

I2C clock speed, digital diagnostic accuracy and digital diagnostic range can be found in the table below. Values in the table represent the worst-case values over temperature, voltage, and life.

| Parameter | Symbol | Min | Typ | Max | Units | Notes/Conditions |
|-------------------------------------|---------------------------|-----|-----|---------|-------|--|
| I ² C Clock Speed | | 0 | | 100,000 | Hz | Bus can be driven blind |
| Accuracy | | | | | | |
| Internal Transceiver Temperature | DD _{Temperature} | -3 | | +3 | °C | Measured at controller IC |
| Internal Transceiver Supply Voltage | DD _{Voltage} | -3 | | +3 | % | Measured at controller IC |
| Tx Bias Current | DD _{Bias} | -10 | | +10 | % | |
| Tx Output Power | DD _{TxPower} | -3 | | +3 | dB | 100% tested in production tested at room temp to ±2 dB |
| Received Average Power | DD _{RxPower} | -3 | | +3 | dB | 100% tested in production tested at room temp to ±2 dB |
| Range | | | | | | |
| Internal Transceiver Temperature | DD _{Temperature} | -40 | | 100 | °C | |
| Internal Transceiver Supply Voltage | DD _{Voltage} | 3.0 | | 6.0 | V | |
| Tx Bias Current | DD _{Bias} | 0 | | 15 | mA | |
| Tx Output Power | DD _{TxPower} | -12 | | -2 | dBm | |
| Received Average Power | DD _{RxPower} | -20 | | 1 | dBm | |

Table 9. Digital Diagnostic Accuracy and Range Limits

X. Mechanical Specifications

Finisar GBICs are compatible with the mechanical specifications outlined in the GBIC Specification Revision 5.5, Section 6¹.

| Insertion, Extraction, and Retention Forces | | | | | | |
|---|----------------|-----|-----|-----|---------|------------------------|
| Parameter | Symbol | Min | Typ | Max | Units | Notes/Conditions |
| GBIC insertion | F _I | 0 | | 20 | Newtons | ~4.5 lbs |
| GBIC extraction | F _E | 0 | | 15 | Newtons | ~3.3 lbs |
| GBIC retention | F _R | 130 | | N/A | Newtons | Straight out ~29.3 lbs |

Table 10. Insertion, extraction, and retention forces

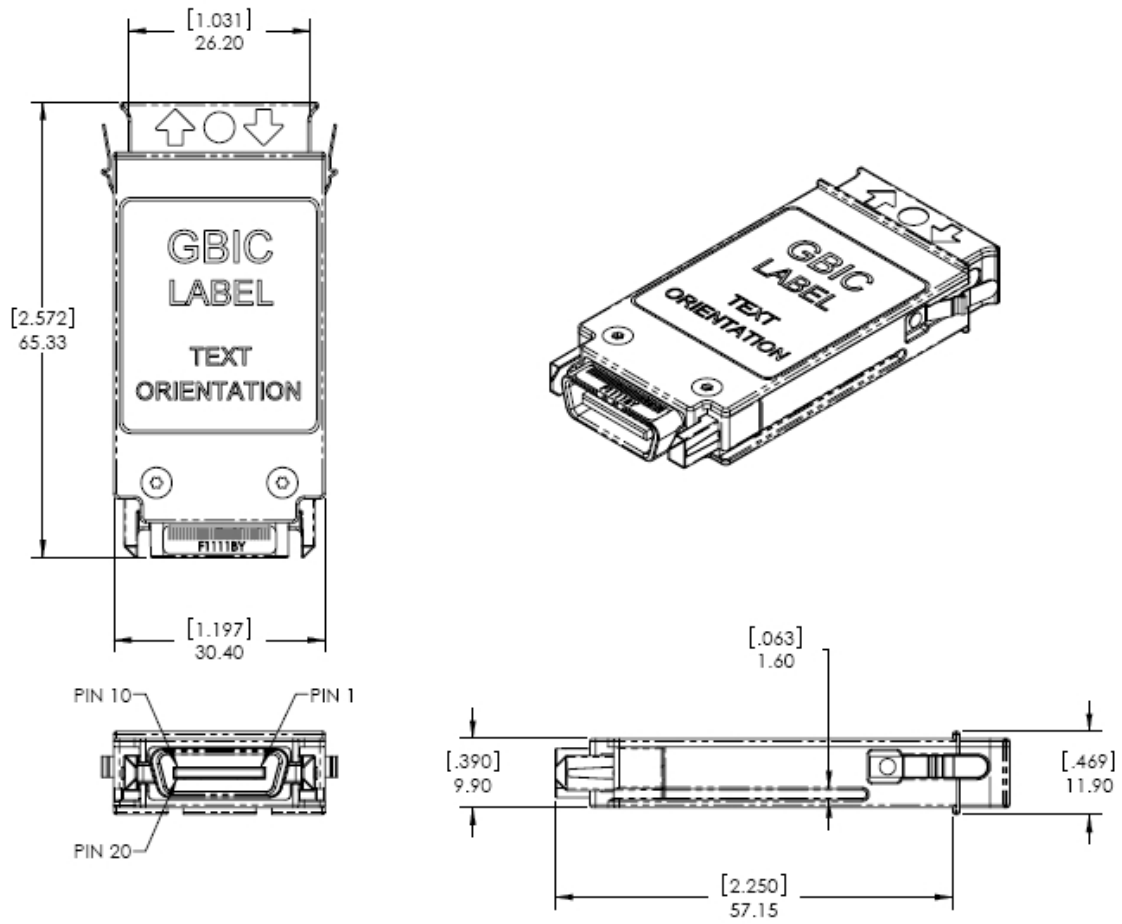


Figure 1. GBIC Outline Drawing

XI. References

1. “Gigabit Interface Converter (GBIC) Revision 5.5”. Sun Microsystems Computer Company et. al., September 27, 2000. <http://playground.sun.com/pub/OEmod/>
2. IEEE Std 802.3. IEEE Standards Department, 2002.
3. “Fibre Channel Physical and Signaling Interface (FC-PH, FC-PH2, FC-PH3)”. American National Standard for Information Systems.
4. Fibre Channel Draft Physical Interface Specification (FC-PI-2 Rev. 10.0). American National Standard for Information Systems.
5. Directive 2002/95/EC of the European Council Parliament and of the Council, “on the restriction of the use of certain hazardous substances in electrical and electronic equipment.” January 27, 2003.
6. “Application Note AN-2038: Finisar Implementation of RoHS Compliant Transceivers”, Finisar Corporation, March 2005.
7. “AT24C01A/02/04/08/16 2-Wire Serial CMOS E²PROM”. Atmel Corporation. www.Atmel.com
8. “Application Note AN-2030: Digital Diagnostic Monitoring Interface for Optical Transceivers”, Finisar Corporation, April 2002.
9. “Digital Diagnostics Monitoring Interface for Optical Transceivers”. SFF Document Number SFF-8472, Revision 9.3.

XI. For More Information

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