

Product Specification

1000BASE-T Copper GBIC Transceivers

FCM-8520/8521-3

Product Features

- Up to 1.25Gb/s bi-directional data links
- Extended operating temperature range (0°C to +75°C)
- Hot-pluggable
- Fully metallic enclosure for low EMI
- Low power (1.5W typical)
- Access to physical layer IC via 2-wire serial bus



Applications

- 1.25 Gigabit Ethernet over Cat 5 cable

Finisar's FCM-8520/8521-3 1000BASE-T Copper GBIC transceivers are based on the GBIC Specification Revision 5.5¹. They are compatible with the Gigabit Ethernet and 1000BASE-T standards as specified in IEEE Std 802.3z² and IEEE Std 802.3ab³.

The FCM-8520-3 uses the GBIC's RX_LOS pin for link indication, and 1000BASE-X auto-negotiation must be disabled on the host system. The FCM-8521-3 is compatible with 1000BASE-X auto-negotiation, but does not have a link indication feature (RX_LOS is internally grounded). See AN-2032, "Commonly Asked Questions Regarding Auto-negotiation on Finisar's 1000BASE-T GBICs"⁴, for a more complete explanation on the differences between the two models.

PRODUCT SELECTION

| Part Number | Link Indicator on RX_LOS Pin | Compatible with 1000BASE-X Auto-negotiation |
|-------------|------------------------------|---|
| FCM-8520-3 | Yes | No |
| FCM-8521-3 | No | Yes |

I. GBIC to Host Connector 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 |
| GND | 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 |

Note: RX_LOS is used for link indication on the FCM-8520-3, and is internally grounded on the FCM-8521-3

Table 1. GBIC to host connector pin assignment

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

II. +5V Volt Electrical Power Interface

The FCM-8520/8521-3 has an extended input voltage range of 4.5 to 5.5 V, compared to the GBIC standard of 4.25 to 5.25 V. The 6V maximum voltage is not allowed for continuous operation.

| +5 Volt Electrical Power Interface | | | | | | |
|---|-------------|-----|-----|-----|-------|--|
| Parameter | Symbol | Min | Typ | Max | Units | Notes/Conditions |
| Supply Current | I_s | | 310 | 375 | mA | 1.7W max power over full range of voltage and temperature. See Note 1. |
| Input Voltage | V_{cc} | 4.5 | 5 | 5.5 | V | Referenced to GND. |
| Maximum Voltage | V_{max} | | | 6 | V | |
| Surge Current | I_{surge} | | | 450 | mA | Hot plug. See Note 1. |

Table 2. +5 Volt electrical power interface

Note:

1. **Caution:** Power consumption and inrush current are higher than the specified values in the GBIC Specification Rev 5.5¹.

III. Low-Speed Signals

RX_LOS is a TTL signals as described in Table 3 and 4. MOD_DEF(1) (SCL) and MOD_DEF(2) (SDA), are open drain CMOS signals (see section VII, "Serial Communication Protocol"). Both MOD_DEF(1) and MOD_DEF(2) must be pulled up to host_Vcc. 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 | |

Table 3. Low-speed signals, electronic characteristics

| High-Speed Electrical Interface, Transmission Line-GBIC | | | | | | |
|--|--------------|-----|-----|-----|-------|--|
| Parameter | Symbol | Min | Typ | Max | Units | Notes/Conditions |
| Line Frequency | f_L | | 125 | | MHz | 5-level encoding, per IEEE 802.3ab. |
| Tx Output Impedance | $Z_{out,TX}$ | | 100 | | Ohm | Differential, for all frequencies between 1MHz and 125MHz. |
| Rx Input Impedance | $Z_{in,RX}$ | | 100 | | Ohm | Differential, for all frequencies between 1MHz and 125MHz. |

Table 4. High-speed electrical interface, transmission line-GBIC

IV. High-Speed Electrical Interface

All high-speed signals are AC-coupled internally.

| High-Speed Electrical Interface, Host-GBIC | | | | | | |
|---|---------------|------|-----|------|-------|--------------------------|
| Parameter | Symbol | Min | Typ | Max | Units | Notes/Conditions |
| Differential Input Voltage | V_{indiff} | 0.50 | | 2.00 | V | Differential peak - peak |
| Differential Output Voltage | $V_{outdiff}$ | 0.37 | | 2.00 | V | Differential peak - peak |
| Rise/Fall Time | T_r, T_f | | 250 | | psec | 20%-80% Differential |
| Tx Input Impedance | Z_{in} | | 75 | | Ohm | |
| Rx Output Impedance | Z_{out} | | 75 | | Ohm | |

Table 5. High-speed electrical interface, host-GBIC

V. General Specifications

| General | | | | | | |
|----------------|--------|-----|-----|------|--------|---|
| Parameter | Symbol | Min | Typ | Max | Units | Notes/Conditions |
| Data Rate | BR | | | 1.25 | Gb/sec | IEEE 802.3 compatible. See Notes 1 and 2 below. |
| Cable Length | L | | | 100 | m | Category 5 UTP. BER $<10^{-10}$ |

Table 6. General specifications

Notes:

1. Clock tolerance is ± 50 ppm
2. The FCM-8520/8521-3 is a full-duplex device in the "Preferred Master" mode.
3. Automatic crossover detection is enabled. External crossover cable is not required

VI. Environmental Specifications

The FCM-8520-3 has an extended range from 0°C to +75°C case temperature as specified in Table 8.

| Environmental Specifications | | | | | | |
|-------------------------------------|------------------|------------|------------|------------|--------------|-------------------------|
| Parameter | Symbol | Min | Typ | Max | Units | Notes/Conditions |
| Operating Temperature | T _{op} | 0 | | 75 | °C | Case temperature |
| Storage Temperature | T _{sto} | -40 | | 85 | °C | Ambient temperature |

Table 7. Environmental specifications

VII. Serial Communication Protocol

All Finisar GBICs are ‘Module Definition “4”’ and support the 2-wire serial communication protocol outlined in the GBIC Specification¹. These GBICs use an Atmel AT24C01A 128 byte E²PROM with an address of A0h. For details on interfacing with the E²PROM, see the Atmel data sheet titled “AT24C01A/02/04/08/16 2-Wire Serial CMOS E²PROM.”⁵

The 1000BASE-T physical layer IC can also be accessed via the 2-wire serial bus at address A4h. For details interfacing with the PHY IC, see Marvell data sheet titled “Alaska Ultra 88E1011/88E1001S Integrated Gigabit Ethernet Transceiver”⁶ (Marvell document number MV-5100281-00).

| Serial Bus Timing Requirements | | | | | | |
|---------------------------------------|---------------|------------|------------|------------|--------------|-------------------------|
| Parameter | Symbol | Min | Typ | Max | Units | Notes/Conditions |
| I ² C Clock Rate | | 0 | | 100,000 | Hz | |

Table 8. Serial bus timing requirements

VIII. Mechanical Specifications

The host-side of the FCM-8520-3 conforms to the mechanical specifications outlined in the GBIC Specification Revision 5.5, Section 6¹. The front portion of the GBIC (part extending beyond the face plate of the host) is larger to accommodate the RJ-45 connector. See Figure 1 below for details.

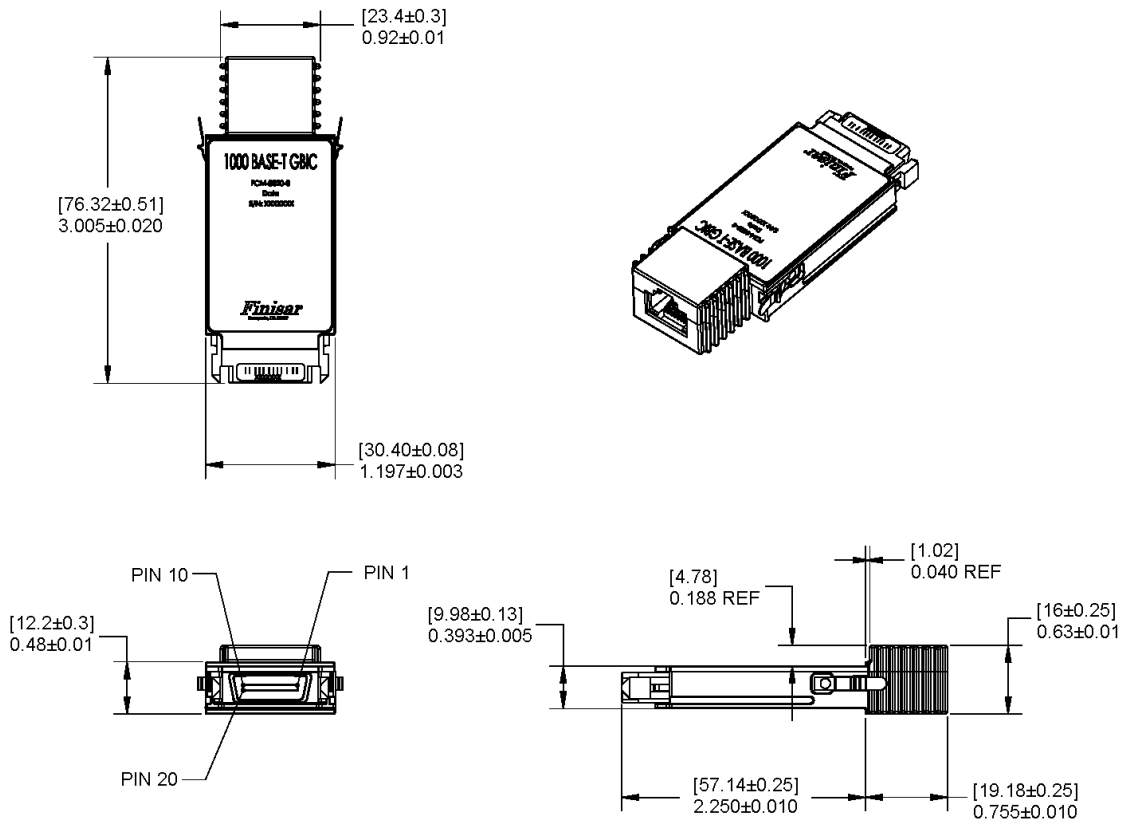


Figure 1. FCM-8520/8521-3 mechanical dimensions

IX. 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 802.3z. IEEE Standards Department, 2000.
3. "IEEE Std 802.3ab-1999 'Physical Layer Parameters and Specifications for 1000 Mb/s Operation Over 4-Pair of Category 5 Balanced Copper Cabling, Type 1000BASE-T'". IEEE Standards Department, 1999.
4. "Application Note AN-XXXX: Commonly Asked Questions Regarding Auto-negotiation on Finisar's 1000BASE-T GBICs", Finisar Corporation, February 2003
5. "AT24C01A/02/04/08/16 2-Wire Serial CMOS E²PROM". Atmel Corporation. www.Atmel.com
6. "Alaska Ultra 88E1011/88E1001S Integrated 10/100/1000 Gigabit Ethernet Transceiver". Marvell Corporation. www.marvell.com

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