

## Product Specification

### 40km Extended GBIC Transceiver

#### FTR-1419

#### Product Features

- Up to 1.25Gb/s bi-directional data links
- 1310nm DFB Laser Transmitter
- “Smart” Digital Diagnostics Functions
- Extended Operating Temperature Range (0°C to +70°C)
- Extended Power Supply Voltage (Operate at 3.3V and 5V)
- Hot-Pluggable (complies with GBIC specification Rev. 5.4)
- Fully metallic enclosure for low EMI
- Low power dissipation



#### Applications

- 1.0625Gb/s Fibre Channel
- 1.25 Gigabit Ethernet

Finisar’s FTR-1419 Extended GBIC transceivers have a maximum fiber length of 40 km, and comply with GBIC Specification Revision 5.4<sup>1\*</sup>. They are compatible with the Gigabit Ethernet standard as specified in IEEE Std 802.3<sup>2\*</sup> and Fibre Channel FC-P1<sup>3\*</sup>. Additional real time diagnostic functions are also available via the 2-wire serial bus specified for Module Definition “4” GBICs. For details, see Finisar Application Note AN-2025, “Using the Finisar GBIC I<sup>2</sup>C Test/Diagnostics Port”<sup>4</sup>.

**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	10	2
GND	11	1
-RX_DAT	12	1
+RX_DAT	13	1
GND	14	1
V <sub>CC</sub>	15	2
V <sub>CC</sub>	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. See “Table 3: Signal Definitions” in the GBIC Specification Revision 5.4<sup>1</sup> for a description of the functions of each pin listed above.

**II. Electrical Power Interface**

Finisar FTR-1419 GBICs have an extended power supply voltage range of 3.15V to 5.5V as described in Table 2. They are compatible with both 5V and 3.3V systems. The GBIC specification calls for a range of only 4.75V to 5.25 volts. The 6V maximum voltage is not allowed for continuous operation, however, TX\_FAULT and TX\_DISABLE circuitry in Finisar GBICs will function at 6V.

Electrical Power Interface						
Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
Supply Current	$I_s$		180	240	mA	
Maximum Voltage	$V_{max}$			6	V	
Surge Current	$I_{surge}$			+30	mA	Hot plug, above steady state current
Input Voltage	$V_{cc}$	3.15	3.3 / 5	5.5	V	Referenced to GND

**Table 2. Electrical power interface**

### III. Low Speed Signals

RX\_LOS, TX\_DISABLE, and TX\_FAULT 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 3.3V, 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. 5.4<sup>1</sup>.

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**

Low Speed Signal Parameters						
Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
RX_LOS Assert Level	--	-31			dBm	
RX_LOS Deassert Level	--			-20	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		5	10	μsec	Rising edge of TX_DISABLE to fall of output signal below 10% of nominal
TX_DISABLE Negate Time	t_on		63	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
TX_FAULT Initialize Time	t_init			300	msec	From power on after VCC > 4.5 V
TX_FAULT Assert Time	t_fault			100	μsec	From occurrence of fault.

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 <sub>in</sub>	650		2000	mV	PECL differential peak - peak
Data Output Voltage	V <sub>out</sub>	370		2000	mV	PECL differential peak - peak
Duty Cycle	--		50		%	
PECL rise/fall	T <sub>r</sub> , T <sub>f</sub>		125	260	psec	20%-80% Differential
Bit Error Rate	BER			10 <sup>-12</sup>		PRBS 2 <sup>7</sup> - 1 test data pattern
Tx Input Impedance	Z <sub>in</sub>		75		Ohm	
Rx Output Impedance	Z <sub>out</sub>		75		Ohm	

Table 5. High-speed electrical interface

**V. Optical Parameters**

Optical Parameters						
Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
Transmitter Center Wavelength	$\lambda_c$	1300		1340	nm	
Side Mode Suppression Ratio (SMSR)	SMSR	30			dB	
Transmitter Optical Output Power	$P_{out}$	-2		+3	dBm	Average power coupled into single mode fiber
Transmitter Extinction Ratio	OMI	7			dB	
Transmitter Eye Opening	--	60			%	Conforms to IEEE 802.3 and Fibre Channel Eye Masks
Optical Rise / Fall Time	$t_r / t_f$			200	ps	Unfiltered, 80% - 20%
Optical Input Wavelength	$\lambda_{in}$	1270		1570	nm	
Total Transmitter Jitter				160	ps	Peak to peak, filtered
Optical Input Power	$P_{in}$	-23		-1	dBm	BER < $10^{-12}$ w/ PRBS $2^7 - 1$ test data pattern @ 1.25Gb/s/ 1.0625Gb/s
Total Receiver Jitter				160	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
Fiber Length*	L	0		40	km	9um core single mode fiber
Total System Budget	--	23			dB	

\*An attenuation of <0.55 dB/km is assumed. Fiber loss budget plus all other system penalties must not exceed 23 dB.

**Table 7. General specifications**

## VII. Environmental Specifications

The GBIC Standard requires an ambient temperature range of 0°C to +50°C. Finisar FTR-1419 GBICs have an extended range from 0°C to +70°C case temperature as specified in Table 8.

Environment						
Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
Operating Temp	T <sub>op</sub>	0		70	°C	
Storage Temp	T <sub>sto</sub>	-10		85	°C	
Eye Safety	--					CDRH and IEC-825 Class 1 Laser Product

Table 8. Environmental specifications

## VIII. Serial Communication Protocol

All Finisar optical GBICs are ‘Module Definition “4”’ and support the 2 wire serial communication protocol outlined in the GBIC Specification <sup>1</sup>. These GBICs use an Atmel AT24C01A 128 byte E<sup>2</sup>PROM (with an address of 1010000X). For details on interfacing with the E<sup>2</sup>PROM, see the Atmel data sheet titled “AT24C01A/02/04/08/16 2-Wire Serial CMOS E<sup>2</sup>PROM.”<sup>5</sup>

All Finisar optical GBICs also incorporate a microcontroller that monitors system parameters such as laser current, laser temperature, and, in the case of 1300nm/1550nm parts, transmitted power. The microcontroller I<sup>2</sup>C address is 1010111X, so it won’t conflict with the AT24C01A. For a complete description of how to use Finisar’s extended features, see Finisar’s Application Note AN-2025: “Using the Finisar GBIC I<sup>2</sup>C Test/Diagnostics Port.”<sup>4</sup>

**CAUTION:** The microcontroller implements the Philips I<sup>2</sup>C protocol including clock stretching. For details, consult the Philips I<sup>2</sup>C-Bus Specification. Clock stretching allows a fast master to communicate with a slow slave device, and it requires that the host monitor the clock line every time it releases the line high. If a host does not implement clock stretching (drives the bus blind), it must run the clock below 8kHz, so that Finisar’s microcontroller has time to process instructions. If clock stretching is supported, the clock may be run at up to 100kHz.

I <sup>2</sup> C Timing Requirements						
Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
Atmel I <sup>2</sup> C Clock Rate	C <sub>atmel</sub>	0		100,000	Hz	Bus can be driven blind.
Finisar Microcontroller I <sup>2</sup> C Clock Rate	C <sub>1</sub>	10		100,000	Hz	Host must support clock stretching. Microcontroller times out if C < 10Hz.
Finisar Microcontroller I <sup>2</sup> C Clock Rate	C <sub>2</sub>	10		8000	Hz	Bus can be driven blind. Microcontroller times out if C < 10Hz.

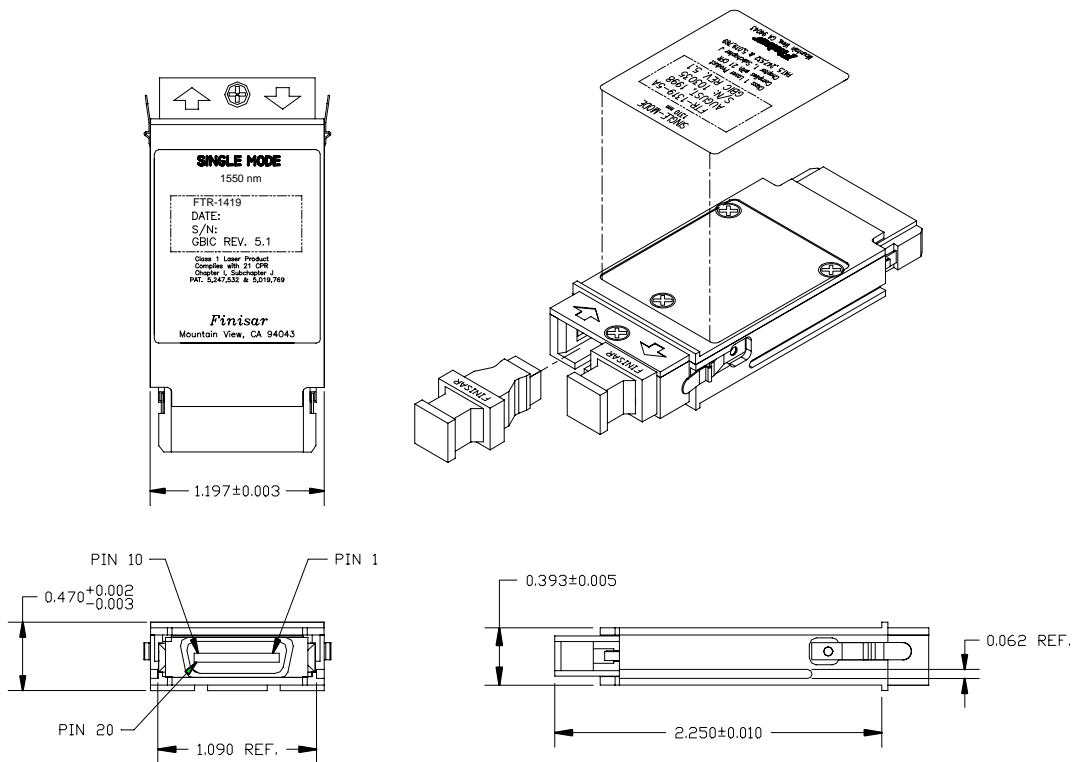
**Table 9. I<sup>2</sup>C timing requirements**

### IX. Mechanical Specifications

Finisar GBICs are compatible with the mechanical specifications outlined in the GBIC Specification Revision 5.4, Section 6<sup>1</sup>.

Insertion, Extraction, and Retention Forces						
Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
GBIC insertion	F <sub>I</sub>	0		20	Newtons	~4.5 lbs
GBIC extraction	F <sub>E</sub>	0		15	Newtons	~3.3 lbs
GBIC retention	F <sub>R</sub>	130		N/A	Newtons	Straight out ~29.3 lbs

**Table 10. Insertion, extraction, and retention forces**



**Figure 1. GBIC outline drawing**



**X. References**

1. “Gigabit Interface Converter (GBIC) Revision 5.4”. Sun Microsystems Computer Company et al., August 16, 1999. <http://playground.sun.com/pub/OEmod/>
2. IEEE Std 802.3, 2000 Edition. IEEE Standards Department, 2000.
3. “Fibre Channel Draft Physical Interface Specification (FC-PI 10.0)”. American National Standard for Information Systems.
4. “Application Note AN-2025: Using the Built in Test/Diagnostics Port”. Finisar Corporation, September 1998. [www.finisar.com](http://www.finisar.com)
5. “AT24C01A/02/04/08/16 2-Wire Serial CMOS E<sup>2</sup>PROM”. Atmel Corporation. [www.Atmel.com](http://www.Atmel.com)

\* The GBIC Standard, FC-PI and IEEE 802.3 do not specify a 1310nm single-mode interface for 40km applications. The FTR-1419 complies with these standards except for the following optical parameters: extinction ratio, receiver sensitivity and transmit output power. See Table 6 for details.

**XII. For More Information**

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