Product Specification
FTR-1319-5A-2.5 Long-Wavelength GBIC Transceiver

Finisar's FTR-1319-5A-2.5 1310nm GBIC transceivers function at 2.125Gb/sec and 2.5Gb/sec for operation in double rate Fibre Channel[6], InfiniBand and other systems requiring bandwidths up to 2.5Gb/sec. The FTR-1319-5A-2.5 is fully compliant with the GBIC Specification Rev. 5.4[1] in all respects except where deviations are required to accommodate the higher bit rate. 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^2C Test/Diagnostics Port"[4].

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_{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 5.4.[1]

II. +5 Volt Electrical Power Interface

Finisar GBICs have an extended power supply voltage range of 4.5V to 5.5V as described in Table 2. The 6V maximum voltage is not allowed for continuous operation, however, TX_FAULT and TX_DISABLE circuitry in Finisar GBICs will function at 6V.

+5 Volt Electrical Power Interface						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes/Conditions**
Supply Current	I_s		170	210	mA	
Maximum Voltage	V_{max}			6	V	
Surge Current	I_{surge}			+30	mA	Hot plug, above steady state current.
Input Voltage	V_{cc}	4.5	5	5.5	V	Referenced to GND

Table 2. +5 volt 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"). For more detailed information, see sections 5.3.1 – 5.3.8 in the GBIC Specification Rev. 5.4[1].

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	--	-30	-26	-22.5	dBm	2.5Gb/sec operation.
RX_LOS Deassert Level	--	-29.5	-24	-22	dBm	2.5Gb/sec operation.
RX_LOS Hysteresis	--	0.5	2		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 ot 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 laser 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_{in}	650		2000	mV	PECL differential peak - peak
Data Output Voltage	V_{out}	600		2000	mV	PECL differential peak - peak
Duty Cycle	--		50		%	
Transmit rise/fall	T_r,T_f		50/130	160	psec	20%-80% transmitter optical output, measured with 12GHz min. BW receiver.
Receiver rise/fall	RT_r, RT_f		90	160	psec	20%-80% receiver output measured with 20GHz scope.
Bit Error Rate	BER			10^{-12}	error/sec	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	1270	1310	1355	nm	
Transmitter Spectral Width (RMS)	$\Delta\lambda$		1.5	4	nm	RMS
Transmitter Optical Output Power	P_{out}	-9	-6	-3	dBm	Average power coupled into single mode fiber
Transmitter Extinction Ratio	OMI	9			dB	
Transmitter Eye Opening	--	60			%	Compliant with scaled FC[3] and OC-48[8] eye masks.
Optical Input Wavelength	λ_{in}	1270		1355	nm	
Optical Input Power	P_{in}	-18		-3	dBm	BER < 10^{-12} w/ PRBS 2^7 - 1 test data pattern @ 2.5Gb/s, 2.125Gb/s. Typical Sensitivity: -23.5dBm @ 2.125Gb/s -22.5dBm @ 2.5Gb/s

Table 6. Optical parameters

VI. General Specifications

General						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes/Conditions**
Data Rate	BR	0.1	2.5, 2.125		Gb/sec	
Fiber Length	L			225	m	50um 500MHz-km Fiber w/ mode conditioning patch cord for transmitter as specified in IEEE802.3z[2].
Fiber Lentgh	L			225	m	62.5um 500MHz-km Fiber w/ mode conditioning patch cord for transmitter as specified in IEEE802.3z[2].
Fiber Length	L			10000	m	9um Core Single Mode Fiber
Laser Safety	--	--	--	--	--	Meets IEC and CDRH Class 1 laser safety requirements

Table 7. General specifications

VII. Environmental Specifications

Finisar GBICs have an extended operating range from –10C to +85C case temperature as specified in Table 8. The GBIC requirement is only from 0C to 50C.

Environment						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes/Conditions**
Operating Temp	T_{op}	-10		85	C	
Storage Temp	T_{sto}	-10		85	C	

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 [1]. These GBICs use an Atmel AT24C01A 128 byte E^2PROM (with an address of 1010000X). For details on interfacing with the E^2PROM, see the Atmel data sheet titled "AT24C01A/02/04/08/16 2-Wire Serial CMOS E^2PROM."[5]

All Finisar optical GBICs also incorporate a microcontroller that monitors system parameters such as laser current, laser temperature, and, in the case of 1300nm parts, transmitted power. The microcontroller I^2C 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^2C Test/Diagnostics Port."[4]

CAUTION: The microcontroller implements the Philips I^2C protocol including clock stretching. For details, consult the Philips I^2C-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^2C Timing Requirements						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes/Conditions**
Atmel I^2C Clock Rate	C_{atmel}	0		100,000	Hz	Bus can be driven blind.
Finisar Microcontroller I^2C Clock Rate	C_1	10		100,000	Hz	Host must support clock stretching. Microcontroller times out if C < 10Hz.
Finisar Microcontroller I^2C Clock Rate	C_2	10		8000	Hz	Bus can be driven blind. Microcontroller times out if C < 10Hz.

Table 9. I^2C timing requirements

IX. Interoperability With 1.0625gb/sec and 1.25Gb/sec Systems

Finisar FTR-1319-5A-2.5 2.5 gigabit transceivers make use of a receiver preamp/postamp combination that is capable of inter-operating with 1.25Gb/sec or 1.0625Gb/sec systems. Limited testing has shown successful inter-operation at 1.0625Gb/sec even with parts that exhibit considerable relaxation oscillation. Finisar 1310nm transmitters do not exhibit relaxation oscillation, so there is no interoperability issue. Other vendor's 1310nm 1.0625/1.25 Gb/sec parts may have some oscillation, but even those parts have been shown to inter-operate. For details please contact Finisar's technical support department. At these lower bit rates, the FTR-1319-5A-2.5 meets the requirements of FC-PH1, PH2, PH3[3], and IEEE802.3z/D5.0[2].

X. Mechanical Specifications

Finisar GBICs conform to the mechanical specifications outlined in the GBIC Specification Revision 5.4, Section 6[1].

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

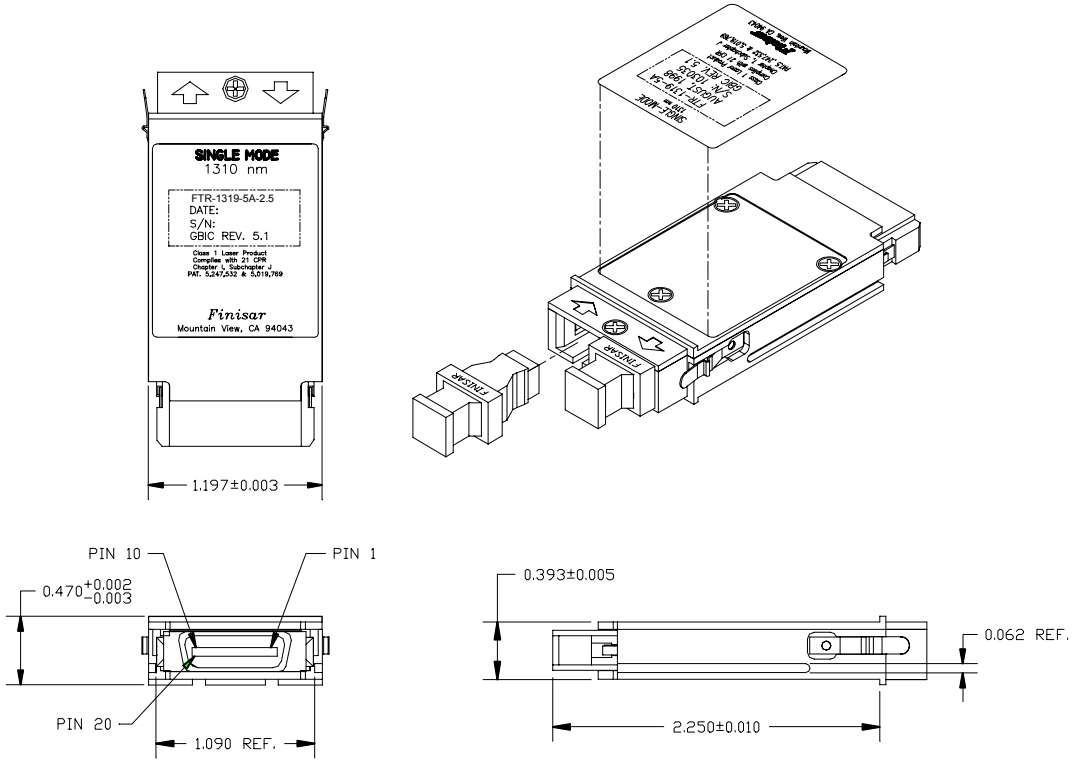

Figure 1. GBIC Outline Drawing

XI. References

1. "Gigabit Interface Converter (GBIC) Revision 5.4". Sun Microsystems Computer Company et. al., August 16, 1999. http://playground.sun.com/pub/OEmod/

2. "IEEE Draft P802.3z/D5.0 'Media Access Control (MAC) Parameters, Physical Layer, Repeater and Management Parameters for 1000Mb/s Operation'". IEEE Standards Department, 1998.

3. "Fibre Channel Physical and Signaling Interface (FC-PH, FC-PH2, FC-PH3)". 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.

5. "AT24C01A/02/04/08/16 2-Wire Serial CMOS E^2PROM". Atmel Corporation. www.Atmel.com.

6. "Fibre Channel Physical Interface - Working Draft." FC-PI v1, Rev. 5.2. October, 1999.