Finisar

Product Specification

CWDM GBIC Transceiver with APD Receiver

FTL-1619-XX

PRODUCT FEATURES

- Up to 1.25 Gb/s bi-directional data links
- RoHS compliant and Lead Free
- Standard GBIC footprint
- Uncooled CWDM-rated DFB laser transmitter
- Class 1 laser safety
- Very low jitter
- Metal enclosure for lower EMI
- Extended voltage range
- Low power dissipation
- Extended operating temperature range: 0°C to 70°C



APPLICATIONS

- Metro Access Rings and Point-to-Point for Gigabit Ethernet Networks and Fibre Channel SANs

Finisar's FTL-1619-xx CWDM GBIC transceivers are designed for operation in Metro Access Rings and Point-to-Point networks using Gigabit Ethernet[1] and Fibre Channel[2] networking equipment. The FTL-1619-xx is also designed to comply to GBIC Specification Revision 5.5[3*]. The transceiver is available in eight different CWDM wavelengths; and is RoHS compliant and lead-free per Directive 2002/95/EC[4] and Finisar Application Note AN-2038[5]. Digital diagnostics functions are available via an I^2C serial bus.

PRODUCT SELECTION

Wavelength	XX	Color Code Dot	Wavelength	XX	Color Code Dot
1470 nm	47	Gray	1550 nm	55	Yellow
1490 nm	49	Violet	1570 nm	57	Orange
1510 nm	51	Blue	1590 nm	59	Red
1530 nm	53	Green	1610 nm	61	Brown

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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. See "Table 3: Signal Definitions" in the GBIC Specification Revision 5.5[3] for a description of the function of each pin listed above.

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II. Electrical Power Interface

The GBIC specification calls for a range of 4.75V to 5.25 volts as described in Table 2. The maximum voltage of 6V is not to be applied continuously.

Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
Supply Current	I_s		280	350	mA	
Maximum Voltage	V_{max}			6	V	
Surge Current	I_{surge}			400	mA	
Input Voltage	V_{cc}	4.75	5.00	5.25	V	Referenced to GND
Power Supply Rejection	PSR	100			mV	See Note 1. Peak to Peak

Table 2. Electrical power interface

Note 1: Receiver sensitivity is compliant with power supply sinusoidal modulation of 20 Hz to 1.5 MHz up to specified value applied through the recommended power supply filtering network.

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 VIII, "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 Revision 5.5[3].

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

Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
RX_LOS Assert Level	--	-42	-39		dBm	Measured on Finisar Eval Card
RX_LOS Deassert Level	--		-37	-32	dBm	Measured on Finisar Eval Card
RX_LOS Hysteresis	--		1.0		dB	Measured on Finisar Eval Card
RX_LOS Assert Delay	t_loss_on			100	µsec	From detection of loss of signal to assertion of RX_LOS
RX_LOS Negate Delay	t_loss_off			150	µsec	From detection of presence of signal to negation of RX_LOS
TX_DISABLE Assert Time	t_off			1000	µsec	Rising edge to 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.

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
Duty Cycle	--		50		%	
PECL rise/fall	T_r,T_f			150	psec	20%-80% Differential
Bit Error Rate	BER			10^{-12}		PRBS 2^7 - 1 test data pattern
Tx Input Impedance	Z_{in}		75		ohm	Single ended impedance
Rx Output Impedance	Z_{out}		75		ohm	Single ended impedance

Table 5. High speed electrical interface

V. Optical Parameters

Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
Transmitter						
Transmitter Center Wavelength	λ_c	(x-6.5)	(x+1)	(x+6.5)	nm	Over temperature 0 to 70 °C case temperature. See Note 1 below.
Wavelength Temperature Dependence			0.09		nm/°C	
Spectral Width				1	nm	Full Width, -20dB from peak
Side Mode Suppression Ratio (SMSR)	SMSR	30			dB	
Optical Rise/Fall Time	t_r/t_f			200	ps	Unfiltered, 80% -20%
Transmitter Optical Output Power	P_{out}	+1.0	+3.0	+5.0	dBm	Average power coupled into single mode fiber
Transmitter Extinction Ratio	ER	9			dB	
Transmitter Eye Opening		10			%	Gigabit Ethernet eye mask margin
Transmitter Jitter				100	ps	Peak to peak, filtered
Dispersion Penalty at 100km				3.0	dB	See Note 4
Receiver						
Optical Return Loss	ORL	14			dB	
Optical Input Wavelength	λ_{in}	1450		1620	nm	
Receiver Jitter Generation				100	ps	See Note 5. Peak to peak
Receiver Optical Input Power (BER < 10^{-12} w/ PRBS 2^7-1)	P_{in}	-30		-7	dBm	@ 1.25Gb/s, PRBS 2^7-1 pattern

Table 6. Optical parameters

Note 1: The Transmitter Center Wavelength "x" is as specified by the customer. The current available wavelengths are: 1470, 1490, 1510, 1530, 1550, 1570, 1590, and 1610 nm. Please see the "Product Selection" section on page 1.
Note 2: Parameters are specified over temperature and at end of life unless otherwise noted.
Note 3: All parameters are measured on a Finisar GBIC Evaluation Card unless otherwise noted.
Note 4: SMF-28 fiber used. 100kms represents 2000ps/nm at 1610nm. Measured at 1.25Gb/s with a PRBS 2^7-1 pattern at a BER<10^{-10}.
Note 5: Jitter added by receiver.

VI. General Specifications

Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
Data Rate	BR	0.125*		1.25	Gb/sec	*Fast Ethernet compatible. Not compliant w/ all FE specifications
Total System Budget	--	31			dB	@1.25 Gb/s, BER $< 10^{-9}$ w/ PRBS 2^7-1. See Note 1

Note 1: Total system budget is defined as $P_{out} - P_{in}$ – typical connector losses

Table 7. General specifications

VII. Environmental Specifications

Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
Operating Temp	T_{op}	0		70	°C	Case temperature
Storage Temp	T_{sto}	-10		85	°C	
Eye Safety	--					CDRH and IEC-825 Class 1 Laser Product. See Note 1

Note 1: Complies with FDA performance standards for laser products except for deviations pursuant to Laser Notice No. 50, dated July 26, 2001.

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 Specification[3]. These GBICs use an Atmel AT24C01A 128 byte E^2PROM at address A0H. 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"[7].

Finisar's CWDM GBICs also support extended diagnostic features as described in Finisar Applications Note AN-2030, "Digital Diagnostic Monitoring Interface for Optical Transceivers"[6]. A controller IC that monitors system parameters such as laser current, module temperature, transmitter power, and received power is accessible at address A2H.

Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
I^2C Clock for Atmel (A0H) and Controller IC (A2H)	C_{atmel}	0		100,000	Hz	Bus can be driven blind.

Table 9. I^2C Timing Requirements

IX. Mechanical Specifications

Finisar CWDM GBICs conform to the mechanical specifications outlined in the GBIC Specification Revision 5.5, Section 6[3].

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

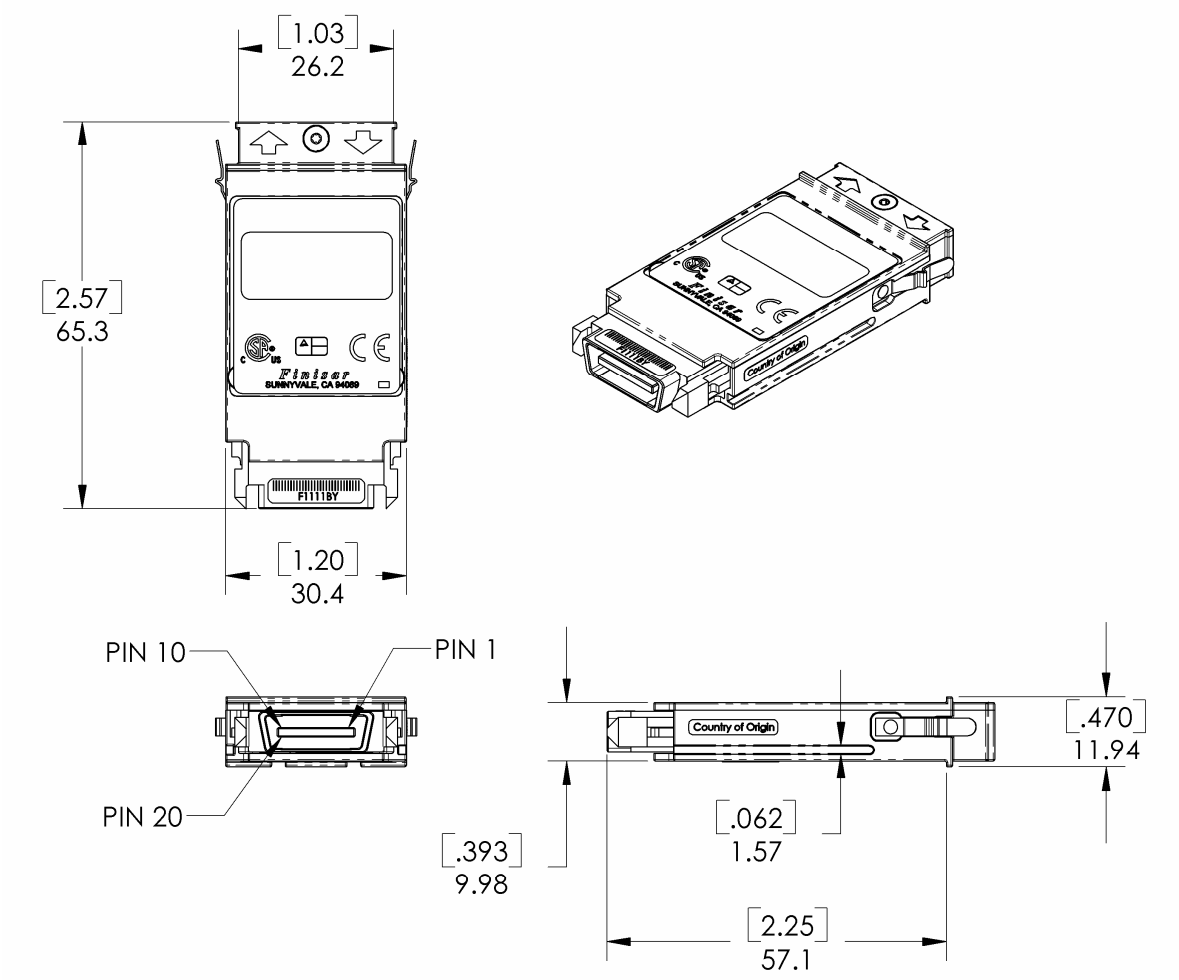


Figure 1. FTL-1619-XX Outline Drawing

X. References

1. IEEE Std 802.3, 2000 Edition, Clause 38. IEEE Standards Department, 2000.

2. "Fibre Channel Physical and Signaling Interface (FC-PH, FC-PH2, FC-PH3)". American National Standard for Information Systems.

3. "Gigabit Interface Converter (GBIC) Revision 5.5". (*) Sun Microsystems Computer Company et. al., August 16, 1999.http://playground.sun.com/pub/OEmod/

4. 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.

5. "Application Note AN-2038: Finisar Implementation Of RoHS Compliant Transceivers", Finisar Corporation, January 21, 2005.

6. "Application Note AN-2030: Digital Diagnostic Monitoring Interface for SFP Optical Transceivers", Finisar Corporation, April 2002.

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

(*) Neither GBIC, FC-PH, nor IEEE802.3 specifies a 14xx/15xx/16xx nm single mode interface. The FTL-1619-XX complies with these specifications except for the following optical parameters: laser wavelength, receiver sensitivity, and transmit output power. See Table 6 for details.

XI. For More Information

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