

Product Specification**FCM-8519-1-T4 / FCM-8519-2-T4 Copper GBIC Transceiver**

Finisar's FCM-8519-1-T4/FCM-8519-2-T4 copper GBIC transceivers comply with GBIC Specification Revision 5.4¹. They are compatible with the Gigabit Ethernet 1000BASE-CX standard as specified in IEEE Draft P802.3z/D5.0² and with Fibre Channel FC-PH3³. The modules are available with both DB9 (FCM-8519-1-T4) and HSSDC (FCM-8519-2-T4) connectors.

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
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 GBIC specification calls for a range of 4.75V to 5.25 volts. The 6V maximum voltage is not allowed for continuous operation, however, TX_DISABLE circuitry in Finisar copper GBICs will function at 6V.

+5 Volt Electrical Power Interface						
Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
Supply Current	I_s	80		140	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**

Pin Name	Pin #	Description	Pin Name	Pin #	Description
RX_LOS	1	Receiver Loss of Signal CMOS Open Drain Output	RGND	11	GND
RGND	2	GND	-RX_DAT	12	-RX
RGND	3	GND	+RX_DAT	13	+RX
MOD_DEF(0)	4	TTL LOW (Tied to GND)	RGND	14	GND
MOD_DEF(1)	5	SCL CMOS Open Drain Serial Clock	VDDR	15	VCC
MOD_DEF(2)	6	SDA CMOS Open Drain Serial Data	VDDT	16	VCC
TX_DISABLE	7	Transmitter Disable, TTL Input	TGND	17	GND
TGND	8	GND	+TX_DAT	18	+TX
TGND	9	GND	-TX_DAT	19	-TX
TX_FAULT	10	TTL LOW (Tied to GND) - TX_FAULT Not Implemented	TGND	20	GND

Table 3. GBIC pin usage, HSSDC and DB9 copper modules

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 4. Low speed signals – electronic characteristics

Low Speed Signal Parameters						
Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
RX_LOS Assert Level	--		50		mV	
RX_LOS Deassert Level	--		90		mV	
RX_LOS Hysteresis	--		40		mV	
RX_LOS Assert Delay	t _{loss_on}		10	100	μsec	From detection of loss of signal to assertion of RX_LOS
RX_LOS Negate Delay	t _{loss_off}		10	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}		5	1000	μsec	Falling edge of TX_DISABLE to rise of output signal above 90% of nominal
TX Output Amplitude, TX_DISABLE Asserted				70	mV	Peak to peak

Table 5. Low speed signal parameters (preliminary)

TX_DISABLE is a TTL signal as described in Tables 3 and 4. RX_LOS is a CMOS open drain output. MOD_DEF(1) (SCL) and MOD_DEF(2) (SDA) are open drain CMOS signals (see section VII, “Serial Communication Protocol”). Note that all Finisar copper GBICs are 'module definition 4' since they support the serial identification protocol. MOD_DEF(1), MOD_DEF(2), and RX_LOS must be pulled up to host_Vcc.

For more detailed information, see sections 5.3.1 – 5.3.8 in the GBIC Specification Rev. 5.4¹.

IV. High Speed Electrical Interface

All high-speed PECL signals to and from the host board are AC coupled internally.

High Speed Electrical Host – GBIC Interface						
Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
Data Input Voltage From Host Board to GBIC	V_{in}	650		2000	mV	PECL differential peak - peak
Data Output Voltage from GBIC to Host Board	V_{out}	370		2000	mV	PECL differential peak - peak
Tx Input Impedance	Z_{in}		75		ohm	
Rx Output Impedance	Z_{out}		75		ohm	

Table 6. High-speed electrical interface - host to GBIC connector

All high speed PECL signals to and from the copper transmission line are AC coupled internally and terminated into 75 Ω (150 Ω differential).

High Speed GBIC – Transmission Line Interface						
Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
Transmit Output Amplitude	$V_{TX, out}$	1100		2000	mV	PECL differential peak - peak
Receive Input Amplitude	$V_{RX, in}$	400		2000	mV	PECL differential peak - peak
Transmitter Total Jitter at Line Output	J_t			223	ps	Input to GBIC from host < 192 ps jitter per IEEE802.3
Receiver Total Jitter at GBIC output	J_r			568	ps	Input to GBIC from line < 528ps jitter per IEEE802.3
Transmit Rise/Fall Time	$T_{rise/fall}$	85		327	ps	
Tx Output Impedance	$Z_{out, TX}$		75		ohm	
Rx Input Impedance	$Z_{in, RX}$		75		ohm	

Table 7. High-speed electrical interface – GBIC to line connector

Pin Name	Pin #
+TX	1
No Connection	2
-TX	3
No Connection	4
No Connection	5
-RX	6
No Connection	7
+RX	8

Table 8. HSSDC pin assignment

Pin Name	Pin #
+TX	1
No Connection	2
No Connection	3
No Connection	4
+RX	5
-TX	6
No Connection	7
No Connection	8
-RX	9

Table 9. DB9 pin assignment

V. General Specifications

General						
Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
Data Rate	BR	0.1	1.25, 1.0625		Gb/sec	Fibre Channel, IEEE 802.3 Compatible
Cable Length	L			28	m	
Bit Error Rate	BER			10^{-12}	error/sec	PRBS 2 ⁷ - 1 test data pattern through 28m cable
Duty Cycle	--		50		%	

Table 10. General specifications

VI. Environmental Specifications

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

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

Table 11. Environmental Specifications**VII. Serial Communication Protocol**

All Finisar copper GBICs are ‘Module Definition “4”’, and support the 2 wire serial communication protocol outlined in the GBIC Specification ¹. Finisar GBICs use an Atmel AT24C01A 128 byte E²PROM (with an address of 1010000X). For details on interfacing with the E²PROM, see the Atmel data sheet titled “AT24C01A/02/04/08/16 2-Wire Serial CMOS E²PROM.”⁵

I ² C Timing Requirements						
Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
Atmel I ² C Clock Rate	C _{atmel}	0		100,000	Hz	Bus can be driven blind.

Table 12. I²C timing requirements

VIII. Mechanical Specifications

Finisar GBICs conform to the mechanical specifications outlined in the GBIC Specification Revision 5.4, 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

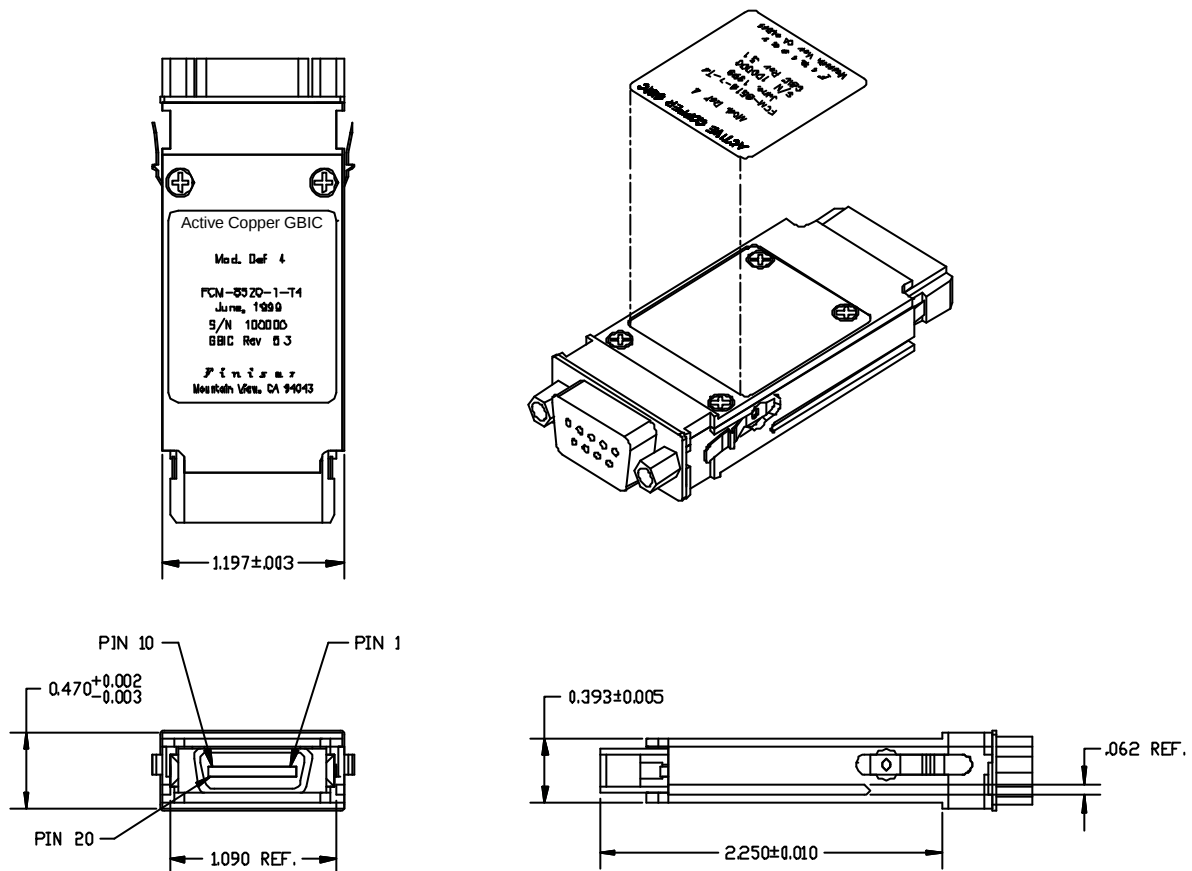


Figure 1. GBIC Outline Drawing (DB9)

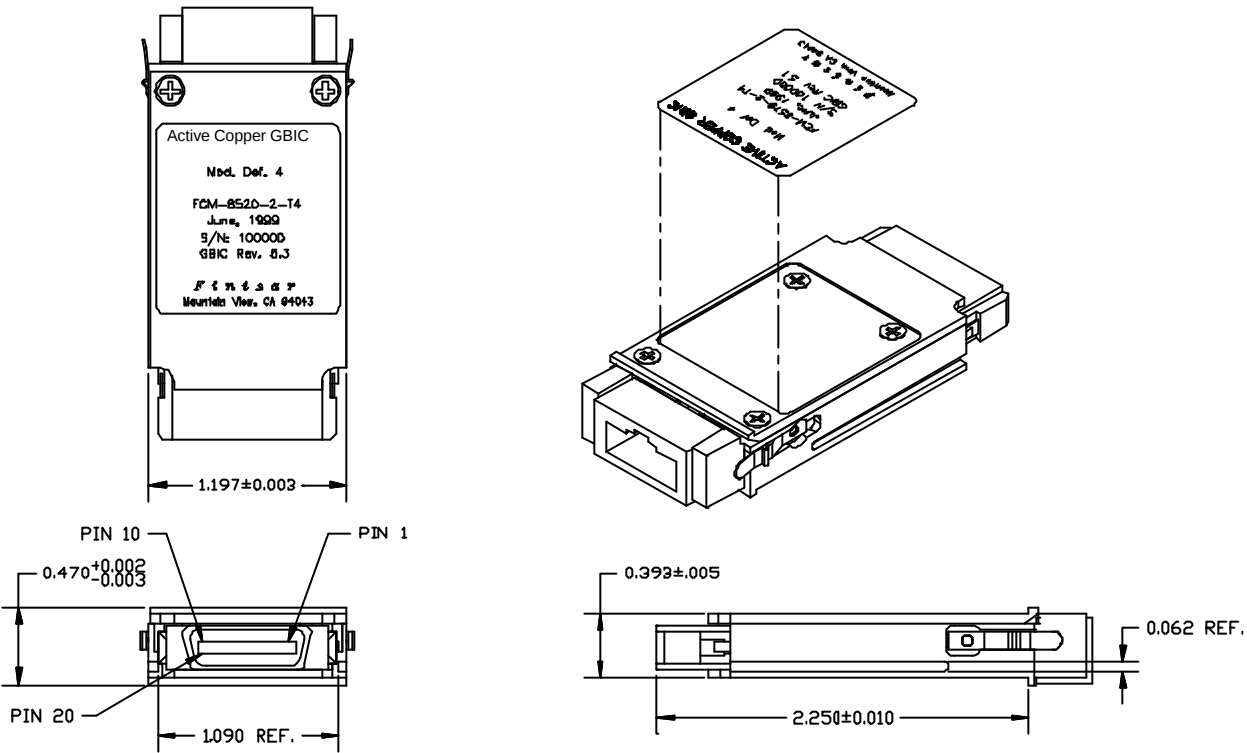


Figure 2. GBIC Outline Drawing (HSSDC)

IX. 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. “AT24C01A/02/04/08/16 2-Wire Serial CMOS E²PROM”. Atmel Corporation. www.Atmel.com