Gigabit Interface Converters Transceiver Module for Gigabit Ethernet

FEATURES

•Compliant with IEEE802.3z/D2 Gigabit Ethernet (1000BASE-SX) Specification

•Gigabit Interface Converter(GBIC) Revision 5.4 compliant [4]

•Data Link up to 500 m in 50/125 MMF, 220 m in 62.5/125 MMF

•Single + 3.3V Power Supply, Tx_DISABLE / Tx_FAULT / Rx_LOS TTL Logic

•Hot pluggable

•Laser Class 1 Product (Laser Klasse 1 Product) which comply with the requirements of IEC 60825-1 and IEC 60825-2

Ordering Information

GBIC - 1250 A 3 F S

Data Rate

Mode
A Multimode
B Singlemode

TTL Voltage
3   5V TTL
4   3.3V TTL

EEPROM
Blank   w/o EEPROM
S   w/i EEPROM

Link Distance
F 500 m
Q 10 km

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Reference
Storage temperature	Ts	-40		85	℃	
Supply voltage	Vcc	0		6	V	

Recommended Operating Conditions:

Parameter	Symbol	Min.	Typ.	Max.	Unit	Reference
Ambient Operating Temperature	T_A	0		70	℃	
Supply voltage	Vcc	3.135		3.465	V	
Transmitter Data input voltage-Low	$V_{IL} - V_{CC}$	-1.810		-1.475	V	
Transmitter Data input voltage-High	$V_{IH} - V_{CC}$	-1.165		-0.880	V	
Transmitter Differential Input Voltage	V_D			2	V	
Data Output Load	R_{DL}		75		Ω	

	TITLE				DATE:
DELTA ELECTRONICS, INC.	GBIC-1250A4FS				03/13/02'
	WRITTEN	CHECKED	APPROVED	DOCUMENT NO:	REV:
	Anna.Huang	Jason.Wang	Teddy.Kuo		S5

Gigabit Interface Converters Transceiver Module for

Gigabit Ethernet

Transmitter Electro-Optical Performance Specifications:

Parameter	Symbol	Min.	Typ.	Max.	Unit	Reference
Supply current	Icc			160	mA	
Launched power(avg.)	P_O	-9.5		-4	dBm	Note(1)
Optical extinction ratio		9			dB	Note(1)
Center wavelength	λc	830		860	nm	
Spectral width(RMS)	σ			4	nm rms	
Optical risetime	t_r			0.26	ns	Note(2)
Optical falltime	t_f			0.26	ns	Note(2)
Relative Intensity Noise	RIN			-116	DB/Hz	

Note(1).The maximum optical output power complies with the IEEE 802.3z/D2
  specification, and is class 1 laser eye safe.
Note(2).These are unfiltered 20-80% values.

Receiver Electro-Optical Performance Specifications:

Parameter	Symbol	Min.	Typ.	Max.	Unit	Reference
Supply current	Icc			130	mA	
Data output Vp-p		580			mV	
Optical input sensitivity(avg.)	P_{IN}			-17	dBm	Note(1)
Optical input saturation(avg.)	P_{SAT}	-3			dBm	
Optical wavelength	λ		850		nm	
Output Data risetime	t_r			0.4	ns	Note(2)
Output Data falltime	t_f			0.4	ns	Note(2)
Signal detect-Assert	P_A			-18	dBm	
Signal detect-Deassert	P_D	-30			dBm	
Signal detect-Hysteresis	$P_A - P_D$	1			dB	

Note(1).With BER better than or equal to 1×10^{-12} , measured in the center of the eye
  opening with 2^7-1 NRZ PRBS
Note(2).These are 20%~80% values

	TITLE				DATE:	
DELTA ELECTRONICS, INC.	**GBIC-1250A4FS**				03/13/02'	
	WRITTEN	CHECKED	APPROVED	DOCUMENT NO:		REV:
	Anna.Huang	Jason.Wang	Teddy.Kuo			S5

Gigabit Interface Converters Transceiver Module for

Gigabit Ethernet

GBIC to host connector pin assignment

Pin Name	Pin#	Sequence	Sequence	Pin#	Pin Name
RX_LOS	1	2	1	11	RGND
RGND	2	2	1	12	-RX_DAT
RGND	3	2	1	13	+RX_DAT
MOD_DEF(0)	4	2	1	14	RGND
MOD_DEF(1)	5	2	2	15	VDDR
MOD_DEF(2)	6	2	2	16	VDDT
TX_DISABLE	7	2	1	17	TGND
TGND	8	2	1	18	+TX_DAT
TGND	9	2	1	19	-TX_DAT
TX_FAULT	10	2	1	20	TGND
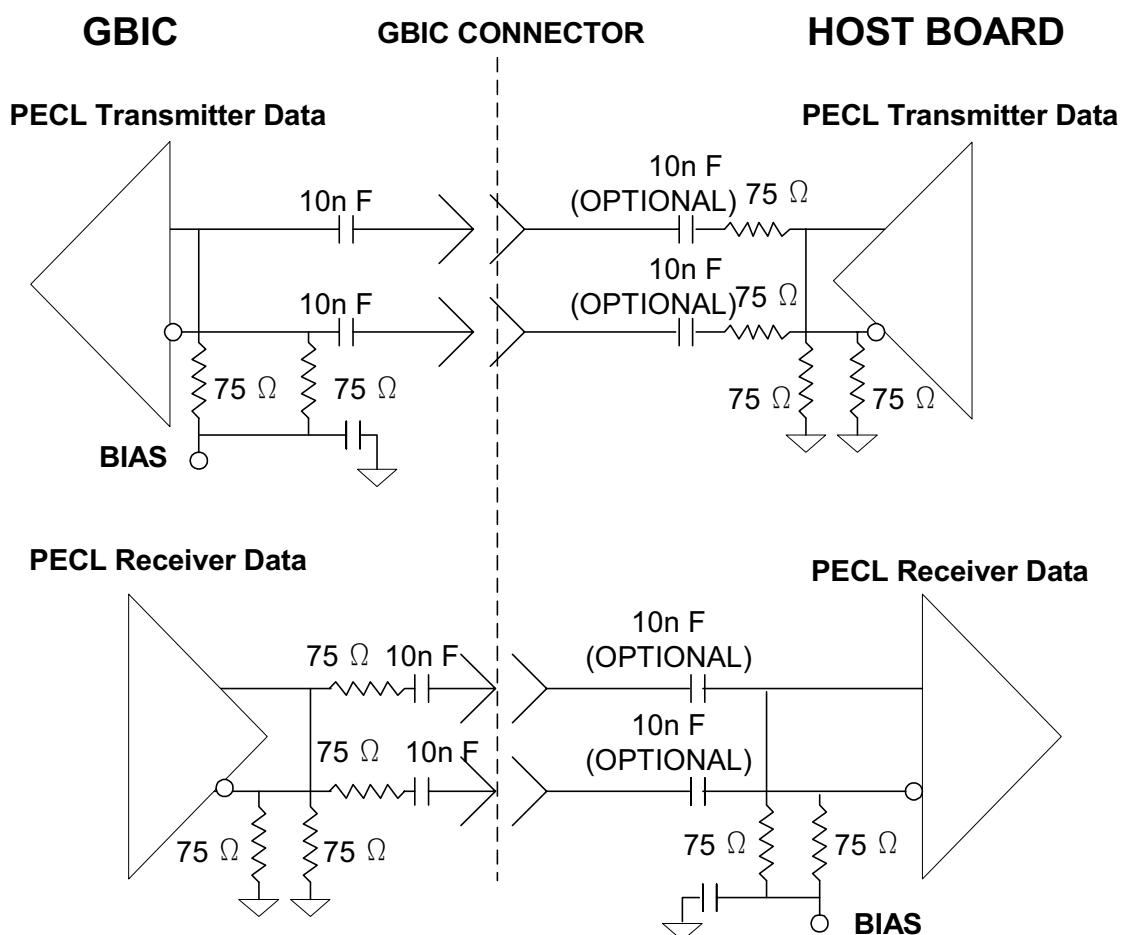
Overview of internal interface signal Definition

Pin Name	Pin #	Name/Function	Signal Specification
Receiver Signals			
RGND	2,3,11,14	Receiver Ground (may be connected with TGND in GBIC)	Ground, to GBIC
VDDR	15	Receiver +3.3 volt (may be connected with VDDT in GBIC)	Power, to GBIC
-RX_DAT	12	Receive Data, Differential PECL	High speed serial, from GBIC
+RX_DAT	13	Receive Data, Differential PECL	High speed serial, from GBIC
RX_LOS	1	Receiver Loss of Signal, logic high, open collector compatible, 4.7 K to 10 K Ohm pull up to VDDT on host	Low speed, from GBIC
Transmitter Signals			
TGND	8,9,17,20	Transmitter Ground (may be connected with RGND internally)	Ground, to GBIC
VDDT	16	Transmitter +3.3 volt(may be connected with VDDR in GBIC)	Power, to GBIC
+TX_DAT	18	Transmit Data, Differential PECL	High speed serial, to GBIC
-TX_DAT	19	Transmit Data, Differential PECL	High speed serial, to GBIC
TX_DISABLE	7	Transmitter Disable, logic high, open collector compatible, 4.7 K to 10 K Ohm pull up to VDDT on GBIC	Low speed, to GBIC
TX_FAULT	10	Transmitter Fault, logic high, open collector compatible, 4.7 K to 10 K Ohm pull up to VDDT on host	Low speed, from GBIC
Control Signals			
MOD_DEF(0)	4	GBIC module definition and presence, bit 0, 4.7 K to 10 K Ohm pull up to VDDT on host	Low speed, from GBIC
MOD_DEF(1)	5	GBIC module definition and presence, bit 1, 4.7 K to 10 K Ohm pull up to VDDT on host	Low speed, from GBIC
MOD_DEF(2)	6	GBIC module definition and presence, bit 2, 4.7 K to 10 K Ohm pull up to VDDT on host	Low speed, from GBIC

Gigabit Interface Converters Transceiver Module for Gigabit Ethernet

Recommended Circuit Schematic :

GBIC		**GBIC CONNECTOR**		**HOST BOARD**	

PECL Transmitter Data

10n F

10n F (OPTIONAL) 75 Ω

10n F

10n F (OPTIONAL) 75 Ω

75 Ω   75 Ω

BIAS

75 Ω   75 Ω

PECL Transmitter Data

PECL Receiver Data

75 Ω 10n F

10n F (OPTIONAL)

75 Ω 10n F

10n F (OPTIONAL)

75 Ω   75 Ω

75 Ω   75 Ω

BIAS

PECL Receiver Data

	TITLE				DATE:
DELTA ELECTRONICS, INC.	GBIC-1250A4FS				03/13/02'
	WRITTEN	CHECKED	APPROVED	DOCUMENT NO:	REV:
	Anna.Huang	Jason.Wang	Teddy.Kuo		S5

Gigabit Interface Converters Transceiver Module for Gigabit Ethernet

GBIC module definition parameters :

Module Definition	MOD_DEF(0) pin 4	MOD_DEF(1) pin 5	MOD_DEF(2) pin 6	Interpretation by host Reference
0	NC	NC	NC	GBIC not present clause
1	NC	NC	TTL LOW	Copper Style 1 or Style 2 connector, 1.0625 Gbd, 100-TW-EL-S or 100-TP-EL-S, active inter-enclosure connection. and IEEE802.3 1000BASE-CX
2	NC	TTL LOW	NC	Copper Style 1 or Style 2 connector, 1.0625 Gbd, 100-TW-EL-S, or 100-TP-EL-S, active or passive intraenclosure connection
3	NC	TTL LOW	TTL LOW	Optical LW, 1.0625 Gbd 100-SM-LC-L
4	TTL LOW	SCL	SDA	Serial module definition protocol
5	TTL LOW	NC	TTL LOW	Optical SW, 1.0625 Gbd 100-M5-SN-I or 100-M6-SN-I
6	TTL LOW	TTL LOW	NC	Optical LW, 1.0625 Gbd 100-SM-LC-L and similar to 1.25 Gbd IEEE802.3z 1000BASE-LX, single mode
7	TTL LOW	TTL LOW	TTL LOW	Optical SW, 1.0625 Gbd 100-M5-SN-I or 100-M6-SN-I and 1.25 Gbd, IEEE 802.3z, 1000BASE-SX

GBIC timing parameters for GBIC management

| Parameter	Symbol	Min.	Max.	Unit	Unit Conditions
TX_DISABLE assert time	t_off		10	μsec	rising edge of TX_DISABLE to fall of output signal below 10% of nominal
TX_DISABLE negate time	t_on		1	mec	Falling edge of TX_DISABLE to rise of output signal above 90% of nominal
Time to initialize, includes reset of TX_FAULT	t_init		300	msec	From power on or hot plug after V DD T > 3.0 volts or From negation of TX_DISABLE during reset of TX_FAULT.
TX_FAULT from fault to assertion	t_fault		100	μsec	From occurrence of fault (output safety violation or V DD T < 3.0 volts)
TX_DISABLE time to start reset	t_rest	10		μsec	TX_DISABLE HIGH before TX_DISABLE set LOW
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		100	μsec	From detection of presence of signal to negation of RX_LOS
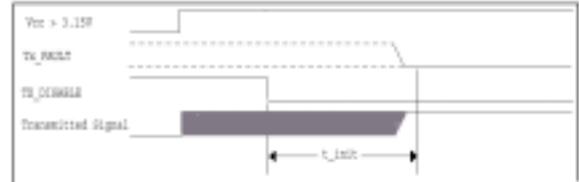
Gigabit Interface Converters Transceiver Module for Gigabit Ethernet
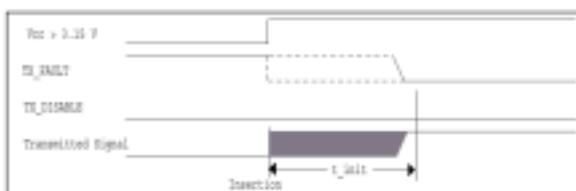
GBIC timing parameters :
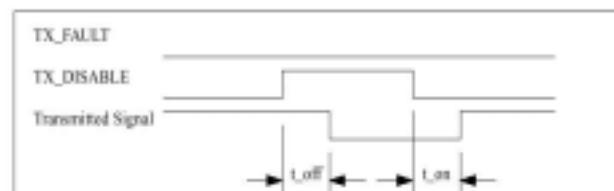
Power on initialization of GBIC, TX_DISABLE negated
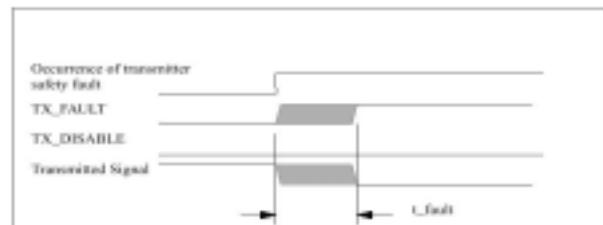
Power on initialization of GBIC, TX_DISABLE asserted
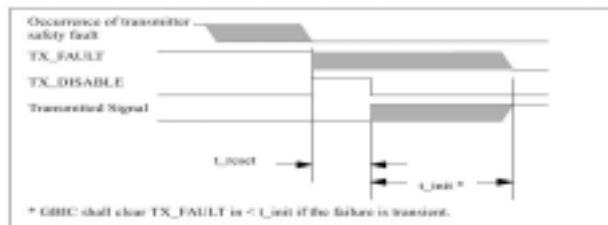
Example of initialization during hot plugging, TX_DISABLE negated
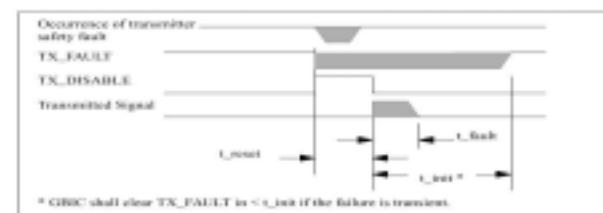
Management of GBIC during normal operation, TX_DISABLE implemented

Detection of transmitter safety fault condition

Successful recovery from transient safety fault condition

Unsuccessful recovery from safety fault condition

Timing of RX_LOS detection

	TITLE				DATE:
DELTA ELECTRONICS, INC.	GBIC-1250A4FS				03/13/02'
	WRITTEN	CHECKED	APPROVED	DOCUMENT NO:	REV:
	Anna.Huang	Jason.Wang	Teddy.Kuo		S5

Gigabit Interface Converters Transceiver Module for Gigabit Ethernet

Serial ID Identification

A GBIC having module definition 4 provides access to sophisticated identification information that describes the GBIC's capabilities, standard interfaces, manufacturer, and other information. The serial interface uses the 2-wire serial CMOS E 2 PROM protocol defined for the ATMEL AT24C 01A/02/04 family of components (see 5.2.1). The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

Data Address	Field Size (Bytes)	Name of field	Description of field
		BASE OF FIELDS	
0	1	Identifier	Type of serial transceiver (see table D.2)
1	1	Ext. Identifier	Extended identifier of type of serial transceiver (See table D.3)
2	1	Connector	Code for connector type (see table D.4)
3-10	8	Transceiver	Code for electronic compatibility or optical compatibility (see table D.5)
11	1	Encoding	Code for serial encoding algorithm (see table D.6)
12	1	BR, Nominal	Nominal bit rate, units of 100 MBits/sec.
13-14	2	Reserved	
15	1	Length (9µ)	Link length supported for 9/125 mm fiber, units of 100 m
16	1	Length (50µ)	Link length supported for 50/125 mm fiber, units of 10 m
17	1	Length (62.5µ)	Link length supported for 62.5/125 mm fiber, units of 10 m
18	1	Length (Copper)	Link length supported for copper, units of meters
19	1	Reserved	
20-35	16	Vendor name	GBIC vendor name (ASCII)
36	1	Reserved	
37-39	3	Vendor OUI	GBIC vendor IEEE company ID
40-55	16	Vendor PN	Part number provided by GBIC vendor (ASCII)
56-59	4	Vendor rev	Revision level for part number provided by vendor (ASCII)
60-62	3	Reserved	
63	1	CC_BASE	Check code for Base ID Fields (addresses 0 to 62)
		EXTENDED ID FIELDS	
64-65	2	Options	Indicates which optional GBIC signals are implemented (see table D.7)
66	1	BR, max	Upper bit rate margin, units of %
67	1	BR, min	Lower bit rate margin, units of %
68-83	16	Vendor SN	Serial number provided by vendor (ASCII)
84-91	8	Date code	Vendor's manufacturing date code (see table D.8)
92-94	3	Reserved	
95	1	CC_EXT	Check code for the Extended ID Fields (addresses 64 to 94)
		VENDOR SPECIFIC ID FIELDS	
96-127	32	Read-only	Vendor specific data, read only
128-511	384	Reserved	
512-n			Vendor specific

Table D.1 : Serial ID Data Field

	TITLE				DATE:
DELTA ELECTRONICS, INC.	GBIC-1250A4FS				03/13/02'
	WRITTEN	CHECKED	APPROVED	DOCUMENT NO:	REV:
	Anna.Huang	Jason.Wang	Teddy.Kuo		S5

Gigabit Interface Converters Transceiver Module for Gigabit Ethernet

Identifier

The identifier value specifies the physical device described by the serial information. This value shall be included in the serial data. The defined identifier values are shown in **table D.2.**

Value	Description of physical device
00h	Unknown or unspecified
01h	GBIC
02h	Module/connector soldered to motherboard
03-7Fh	Reserved
80-FFh	Vendor specific

Table D.2 : Identifier values

Extended Identifier

The extended identifier value provides additional information about the transceiver. At present, extended identifier values are specified only for the identifier value of 01h (GBIC). The Extended Identifier value is reserved for all other identifier values. The defined extended identifier values for the GBIC are shown in **table D.3.**

Value	Description of physical device
00h	GBIC definition is not specified or the GBIC definition is not compliant with a defined MOD_DEF. See product specification for details.
01h	GBIC is compliant with MOD_DEF 1
02h	GBIC is compliant with MOD_DEF 2
03h	GBIC is compliant with MOD_DEF 3
04h	GBIC function is defined by serial ID only
05h	GBIC is compliant with MOD_DEF 5
06-7Fh	Reserved
80-FFh	Vendor specific

**Table D.3 : Extended Identifier values
for Identifier 01h (GBIC)**

DELTA ELECTRONICS, INC.	TITLE GBIC-1250A4FS				DATE: 03/13/02'	
	WRITTEN	CHECKED	APPROVED	DOCUMENT NO:		REV:
	Anna.Huang	Jason.Wang	Teddy.Kuo			S5

Gigabit Interface Converters Transceiver Module for

Gigabit Ethernet

Connector

The Connector value indicates the external connector provided on the interface.This value shall be included in the serial data. The defined connector values are shown in **table D.4.**

Value	Description of physical device
00h	Unknown or unspecified
01h	Fibre Channel definition of SC connector
02h	Fibre Channel definition of style 1 copper connector
03h	Fibre Channel definition of style 2 copper connector
04h	Fibre Channel definition of BNC/TNC
05h	Fibre Channel definition of coaxial headers
06h-7Fh	Reserved
05h-FFh	Vendor specific

Table D.4 : Connector values

TITLE		DATE:	
GBIC-1250A4FS		03/13/02'	
WRITTEN	CHECKED	APPROVED	DOCUMENT NO:	REV:
Anna.Huang	Jason.Wang	Teddy.Kuo		S5

DELTA ELECTRONICS, INC.

Gigabit Interface Converters Transceiver Module for Gigabit Ethernet

Transceiver

The following bit significant indicators define the electronic or optical interfaces that are supported by the GBIC. At least one bit shall be set in this field. For Fibre Channel GBICs, the Fibre Channel speed, transmission media, transmitter technology, and distance capability shall all be indicated. The defined transceiver values are shown in **table D.5.**

Data Addr	Bit	Description of transceiver	Data Addr	Bit	Description of transceiver
Reserved Standard Compliance Codes			Fibre Channel link length		
3	7-0	Reserved	7	7	Reserved
4	7-0	Reserved	7	6	short distance (S)
SONET Compliance Codes			7	5	intermediate distance (I)
5	7	Reserved	7	4	long distance (L)
5	6	OC 12, single mode long reach	Fibre Channel transmitter technology		
5	5	OC 12, single mode intermediate reach	7	3-2	Reserved
5	4	OC 12 multi-mode short reach	7	1	Longwave laser (LC)
5	3	Reserved	7	0	Electrical inter-enclosure (EL)
5	2	OC 3, single mode long reach	8	7	Electrical intra-enclosure (EL)
5	1	OC 3, single mode intermediate reach	8	6	Shortwave laser w/o OFC (SN)
5	0	OC 3, multi-mode short reach	8	5	Shortwave laser w/ OFC (SL)
Gigabit Ethernet Compliance Codes			8	4	
6	7-4	Reserved	Fibre Channel transmission media		
6	3	1000BASE-T 8 0-3 Reserved	8	0-3	Reserved
6	2	1000BASE-CX	9	7	Twin Axial Pair (TW)
6	1	1000BASE-LX	9	6	Shielded Twisted Pair (TP)
6	0	1000BASE-SX	9	5	Miniature Coax (MI)
			9	4	Video Coax (TV)
			9	3	Multi-mode, 62.5μ (M6)
			9	2	Multi-mode, 50 μ (M5)
			9	1	Reserved
			9	0	Single Mode (SM)
			Fibre Channel speed		
			10	7-5	Reserved
			10	4	400 MBytes/Sec
			10	3	Reserved
			10	2	200 MBytes./Sec
			10	1	Reserved
			10	0	100 MBytes./Sec

a. Bit 7 is the high order bit and is transmitted first in each byte.

Table D.5: Transceiver codes

DELTA ELECTRONICS, INC.	TITLE GBIC-1250A4FS			DATE: 03/13/02'	
	WRITTEN	CHECKED	APPROVED	DOCUMENT NO:	REV:
	Anna.Huang	Jason.Wang	Teddy.Kuo		S5

Gigabit Interface Converters Transceiver Module for Gigabit Ethernet

GBIC Serial ID Memory(0202D01584)

D/A	Data	D/A	Data	D/A	Data	D/A	Data	D/A	Data	D/Ar	Data
00	01	25	20	50	34 4	75	32 2	100	20	125	20
01	04	26	20	51	46 F	76	30 0	101	20	126	20
02	01	27	20	52	53 S	77	32 2	102	20	127	20
03	00	28	20	53	20	78	34 4	103	20	128	20
04	00	29	20	54	20	79	30 0	104	20		
05	00	30	20	55	20	80	31 1	105	20		
06	01	31	20	56	30	81	35 5	106	20		
07	20	32	20	57	30	82	34 4	107	20		
08	40	33	20	58	30	83	35 5	108	20		
09	0C	34	20	59	30	84	30 0	109	20		
10	01	35	20	60	00	85	32 2	110	20		
11	01	36	00	61	00	86	30 0	111	20		
12	0C	37	00	62	00	87	32 2	112	20		
13	00	38	00	63	CB	88	30 0	113	20		
14	00	39	00	64	00	89	31 1	114	20		
15	00	40	47 G	65	1A	90	35 5	115	20		
16	32	41	42 B	66	00	91	30 0	116	20		
17	16	42	49 I	67	00	92	00	117	20		
18	00	43	43 C	68	30	93	00	118	20		
19	00	44	2D -	69	30	94	00	119	20		
20	44 D	45	31 1	70	30	95	BB	120	20		
21	45 E	46	32 2	71	30	96	20	121	20		
22	4C L	47	35 5	72	30	97	20	122	20		
23	54 T	48	30 0	73	30	98	20	123	20		
24	41 A	49	41 A	74	30 0	99	20	124	20		

	TITLE			DATE:	
DELTA **DELTA ELECTRONICS, INC.**	GBIC-1250A4FS			03/13/02'	
	WRITTEN	CHECKED	APPROVED	DOCUMENT NO:	REV:
	Anna.Huang	Jason.Wang	Teddy.Kuo		S5

Gigabit Interface Converters Transceiver Module for Gigabit Ethernet
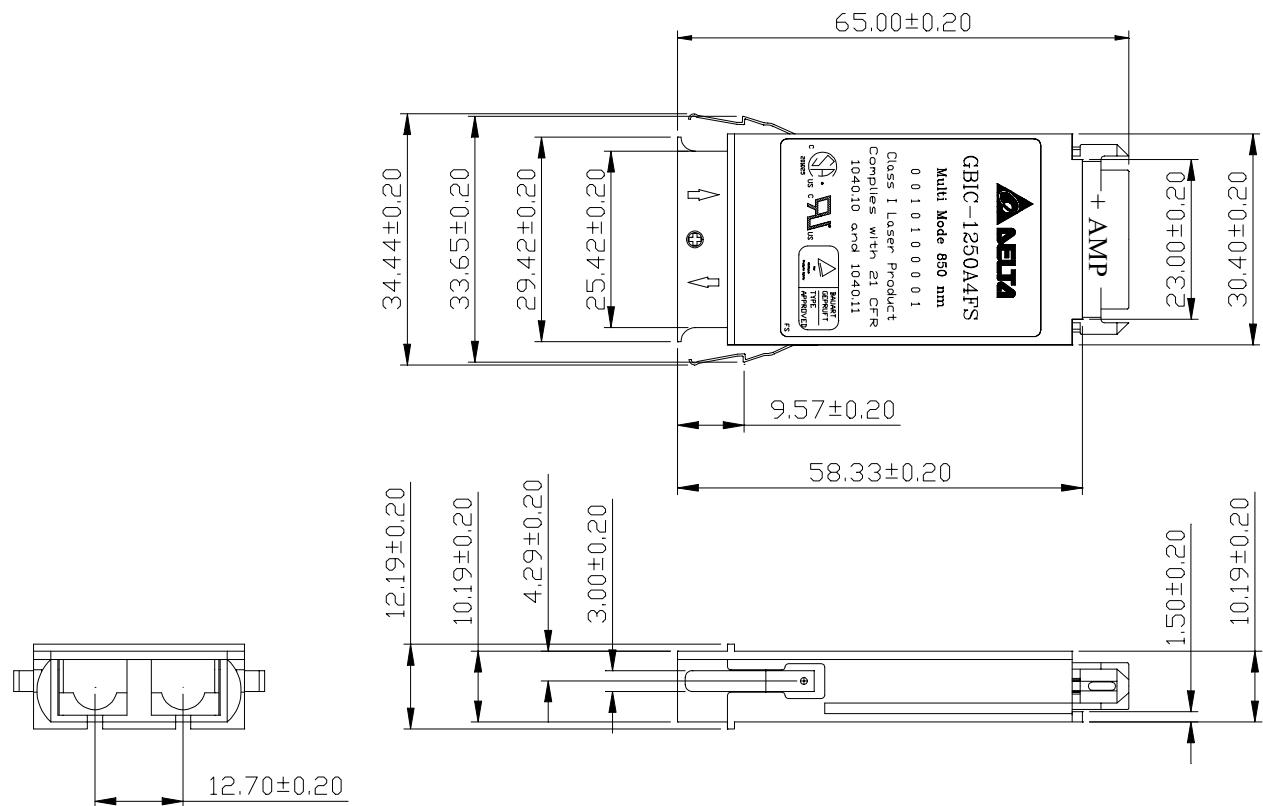
GBIC Serial ID Memory(0202D01584)

D/A	Data	D/A	Data	D/A	Data	D/A	Data	D/A	Data	D/Ar	Data
00	01	25	20	50	34 4	75	32 2	100	20	125	20
01	04	26	20	51	46 F	76	30 0	101	20	126	20
02	01	27	20	52	53 S	77	32 2	102	20	127	20
03	00	28	20	53	20	78	34 4	103	20	128	20
04	00	29	20	54	20	79	30 0	104	20		
05	00	30	20	55	20	80	31 1	105	20		
06	01	31	20	56	30	81	35 5	106	20		
07	20	32	20	57	30	82	38 8	107	20		
08	40	33	20	58	30	83	34 4	108	20		
09	0C	34	20	59	30	84	30 0	109	20		
10	01	35	20	60	00	85	32 2	110	20		
11	01	36	00	61	00	86	30 0	111	20		
12	0C	37	00	62	00	87	32 2	112	20		
13	00	38	00	63	CB	88	30 0	113	20		
14	00	39	00	64	00	89	32 2	114	20		
15	00	40	47 G	65	1A	90	30 0	115	20		
16	32	41	42 B	66	00	91	30 0	116	20		
17	16	42	49 I	67	00	92	00	117	20		
18	00	43	43 C	68	30	93	00	118	20		
19	00	44	2D -	69	30	94	00	119	20		
20	44 D	45	31 1	70	30	95	BA	120	20		
21	45 E	46	32 2	71	30	96	20	121	20		
22	4C L	47	35 5	72	30	97	20	122	20		
23	54 T	48	30 0	73	30	98	20	123	20		
24	41 A	49	41 A	74	30 0	99	20	124	20		

	TITLE			DATE:	
DELTA ELECTRONICS, INC.	GBIC-1250A4FS			03/13/02'	
	WRITTEN	CHECKED	APPROVED	DOCUMENT NO:	REV:
	Anna.Huang	Jason.Wang	Teddy.Kuo		S5

Gigabit Interface Converters Transceiver Module for Gigabit Ethernet

65.00±0.20

34.44±0.20
33.65±0.20
29.42±0.20
25.42±0.20

GBIC-1250A4FS
Multi Mode 850 nm
001010000

Class 1 Laser Product
Complies with 21 CFR
1040.10 and 1040.11

+ AMP

23.00±0.20
30.40±0.20

9.57±0.20

58.33±0.20

12.19±0.20
10.19±0.20
4.29±0.20
3.00±0.20

1.50±0.20
10.19±0.20

12.70±0.20

		TITLE			DATE:	
		GBIC-1250A4FS			03/13/02'	
DELTA ELECTRONICS, INC.	WRITTEN	CHECKED	APPROVED	DOCUMENT NO:	REV:	
	Anna.Huang	Jason.Wang	Teddy.Kuo		S5	

Gigabit Interface Converters Transceiver Module for Gigabit Ethernet

Regulatory Compliance

Test Item	Reference	Qty'	Evaluation
(#1) Electromagnetic Interference EMI	FCC Class B EN 55022 Class B CISPR 22	5	
(#2) Immunity： Radio Frequency Electromagnetic Field	EN 61000-4-3 IEC 1000-4-3	5	
(#3) Immunity： Electrostatic Discharge to the Duplex SC Receptacle	EN 61000-4-2 IEC 1000-4-2 IEC 801.2	5	(1) Satisfied with electrical characteristics of product spec. (2) No physical damage
(#4) Electrostatic Discharge to the Electrical Pins	MIL-STD-883C Method 3015.4 EIAJ#1988.3.2B Version 2, Machine model	5	

	TITLE	DATE:
DELTA ELECTRONICS, INC.	GBIC-1250A4FS	03/13/02'

WRITTEN	CHECKED	APPROVED	DOCUMENT NO:	REV:
Anna.Huang	Jason.Wang	Teddy.Kuo		S5