

## Small Form Factor Bi-Directional Transceiver Module for Gigabit Ethernet



### FEATURES

- RoHS compliant
- IEEE802.3ah Gigabit Ethernet compliant
- SFF package with bi-directional SC receptacle
- Upstream 1.25Gbps transmitter with 1310nm FP Laser, and downstream 1.25Gbps receiver with 1490nm PIN-TIA
- Integrated with WDM filter to cut 1550nm and 1650nm optical signal off
- Single +3.3V power supply
- LVTTTL Transmitter Enable input and Rx Signal Detect output
- Laser Class 1 Product which comply with the requirements of IEC 60825-1 and IEC 60825-2

### Description

The SFBD-1250xxxx series are 3.3V small Form Factor Bi-Directional Transceiver Module designed expressly for high-speed communication applications that require rates of up to 1.25Gbit/sec. It is compliant with the Gigabit Ethernet standards, as well as the SFF Multisource Agreement (MSA).

The module consists 1310nm FP laser, InGaAs PIN, Pre-amplifier and WDM filter in a high-integrated optical sub-assembly, and it is contained in a standard SFF package with a 9/125um SC receptacle connector.

### Application

- IEEE 802.3ah 1000BASE-BX10-U
- GE-Media Converter
- Gigabit Ethernet P2P Optical Network
- FTTx WDM Broadband Access
- SFBD-1250A4Q1R data link up to 10km in 9/125um single mode fiber.

### 1. Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Storage Temperature	T <sub>s</sub>	-40		85	°C	
Storage Ambient Humidity	HA	5		95	%	
Power Supply Voltage	V <sub>CC</sub>	-0.3		4	V	
Signal Input Voltage		-0.3		V <sub>CC</sub> +0.3	V	
Receiver Damage Threshold		+3			dBm	
Lead Soldering Temperature	T <sub>SOLD</sub>			260	°C	
Lead Soldering Time	t <sub>SOLD</sub>			10	sec	

### 2. Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Ambient Operating Temperature	T <sub>A</sub>	0		70	°C	Without air flow
Ambient Humidity	HA	5		85	%	Non-condensing
Power Supply Voltage	V <sub>CC</sub>	3.13	3.3	3.47	V	
Power Supply Current	I <sub>CC</sub>			300	mA	
Power Supply Noise Rejection				100	mVp-p	100Hz to 1MHz
Data Rate		1.25 -100ppm	1.25	1.25 +100ppm	Gbps	
Transmission Distance				10	km	

### 3. Specification of Transmitter

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Average Launched Power	P <sub>O</sub>	-9		-3	dBm	Note (1)
Launched power (Peak.)	P <sub>P</sub>			0	dBm	
Extinction Ratio	ER	9			dB	
Center Wavelength	λ <sub>c</sub>	1260	1310	1360	nm	FP Laser
Spectrum Width (RMS)	σ	Compliant with IEEE 802.3ah			nm	Note (4)
Transmitter OFF Output Power	P <sub>Off</sub>			-45	dBm	
Optical Rise/Fall Time	t <sub>r</sub> /t <sub>f</sub>			260	ps	Note (2)
Total Jitter	t <sub>J</sub>			227	ps	Note (3)
Optical Return Loss Tolerance	ORLT			12	dB	
Relative Intensity Noise	RIN <sub>12</sub> OMA			-113	dB/Hz	
Optical Transmitter Reflectance				-6	dB	
Transmitter and Dispersion Penalty	TDP			3.3	dB	
Output Eye Mask {X1,X2,Y1,Y2,Y3}	Compliant with IEEE 802.3ah {0.22,0.375,0.20,0.20,0.30}					Note (5)

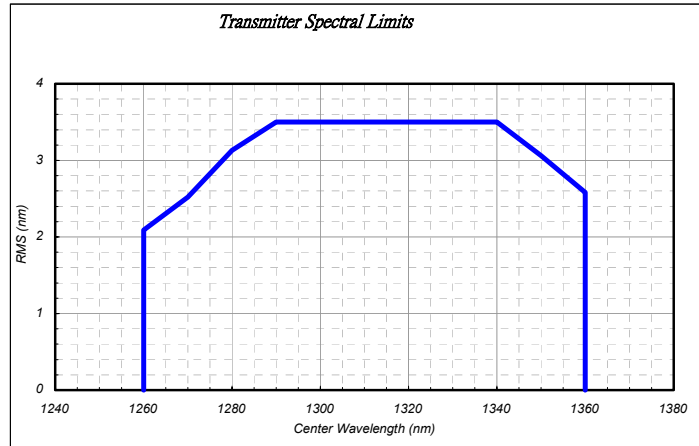
Note (1). Launched power (avg.) is power coupled into a single mode fiber with master connector.

Note (2). These are unfiltered 20-80% values.

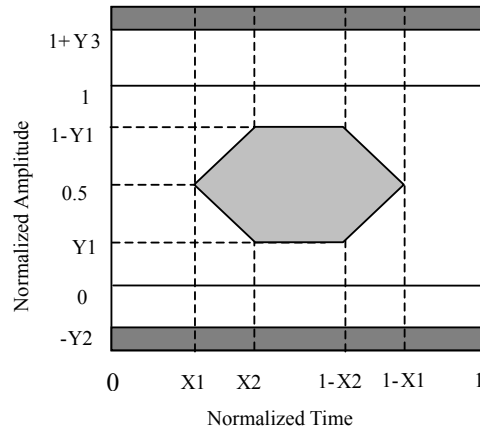
Note (3). Measure at 2<sup>7</sup>-1 NRZ PRBS pattern

Note (4): Spectral Width (RMS)

Center Wavelength nm	RMS spectral width(max) nm
1260	2.09
1270	2.52
1280	3.13
1290	3.50
1295	
1297	
1329	
1331	
1340	3.06
1350	
1360	2.58



Note (5). Transmitter eye mask definition



#### 4. Specification of Receiver

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Input Optical Wavelength	$\lambda_{IN}$	1480	1490	1500	nm	PIN-PD
Receiver Sensitivity	$P_{IN}$			-23	dBm	Note (1)
Input Saturation Power (Overload)	$P_{SAT}$	-3			dBm	
Signal Detect -Assert Power	$P_A$			-24	dBm	
Signal Detect -Deassert Power	$P_D$	-44			dBm	Note (2)
Signal Detect Hysteresis	$P_A-P_D$	0.5	2	5	dB	
Data Output Rise/Fall time	$t_r/t_f$			260	ps	Note (3)
Optical Receiver Reflectance				-12	dB	Note (4)
Optical Isolation from External Source	1260 to 1360nm			-43	dB	
	1550 to 1560nm			-33	dB	
	1640 to 1665nm			-33	dB	

Note (1). Measured with Light source 1490nm, ER=9dB; BER =  $<10^{-12}$  @ PRBS =  $2^7-1$  NRZ

Note (2). When SD deasserted, the data output is Low-level (fixed)

Note (3). These are 20%~80% values.

Note (4). Measured at wavelength of 1490nm.

## 5. Electrical Interface Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
<b>Transmitter</b>						
Total Supply Current	$I_{CC}$			A	mA	Note (1)
Differential line input Impedance	$R_{IN}$	90	100	110	Ohm	
Differential Data Input Swing	$V_{DT}$	400		1600	mV <sub>p-p</sub>	Note (2)
Transmitter Disable Input-High	$V_{DISH}$	2		$V_{CC}$	V	LVTTTL
Transmitter Disable Input-Low	$V_{DISL}$	0		0.8	V	
<b>Receiver</b>						
Total Supply Current	$I_{CC}$			B	mA	Note (1)
Differential Data Output Swing	$V_{DR}$	400	800	1200	mV <sub>p-p</sub>	Note (2)
Signal Detect Output Voltage-High	$V_{LOSH}$	2		$V_{CC}+0.3$	V	Note (3)
Signal Detect Output Voltage-Low	$V_{LOSL}$	0		0.8	V	

Note (1). A (TX)+ B (RX) = 300mA (Not include termination circuit)

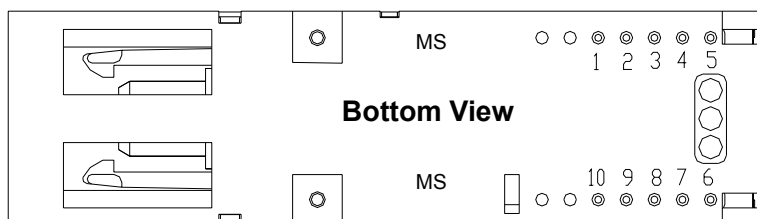
Note (2). Internally AC coupled, but requires a 100Ohm differential termination at or internal to Serializer/Deserializer.

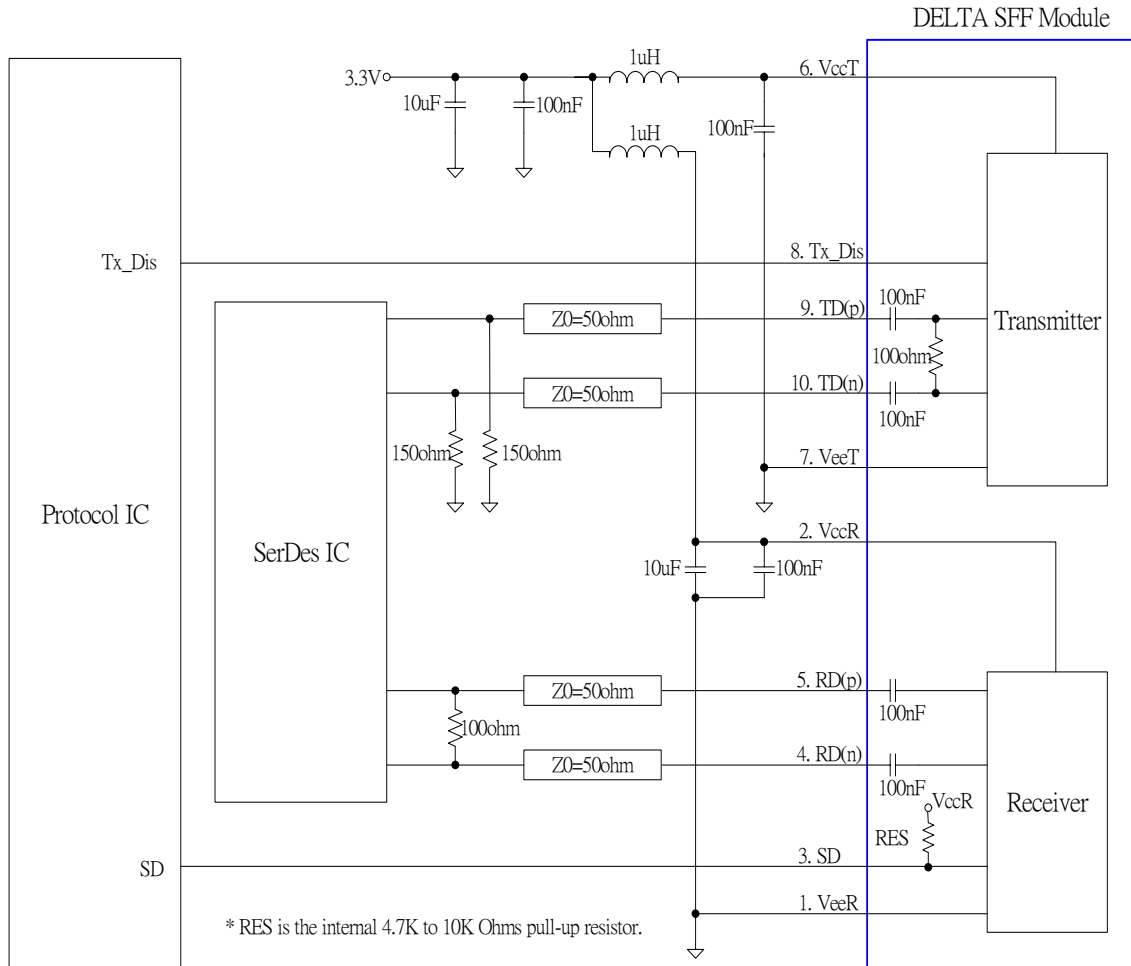
Note (3). LVTTTL logic output, internal 4.7K~10K Ohm pull-up resistor. External load on host board is unnecessary.

## 6. Pin Description

Tx/Rx	Pin No.	I/O	Pin Name	Description
Rx	1		VeeR	Receiver Ground
	2		VccR	+3.3V Receiver Power Supply
	3	O	SD	Normal Optical Input indicated by logic "High", and No Optical Input indicated by logic "Low". (LVTTTL)
	4	O	RD(n)	Inverted Receiver Data Output (AC-Coupled CML output)
	5	O	RD(p)	Non-Inverted Receiver Data Output (AC-Coupled CML output)
Tx	6		VccT	+3.3V Transmitter Power Supply
	7		VeeT	Transmitter Ground
	8	I	Tx_Dis	LVTTTL Logic "High" to Disable Transmitter, and Enable Transmitter by Logic "Low".
	9	I	TD(p)	Non-Inverted Transmitter Data Input (AC-Coupled LVPECL input)
	10	I	TD(n)	Inverted Transmitter Data Input (AC-Coupled LVPECL input)
			MS	Mounting studs/ connect this pin to Chassis ground

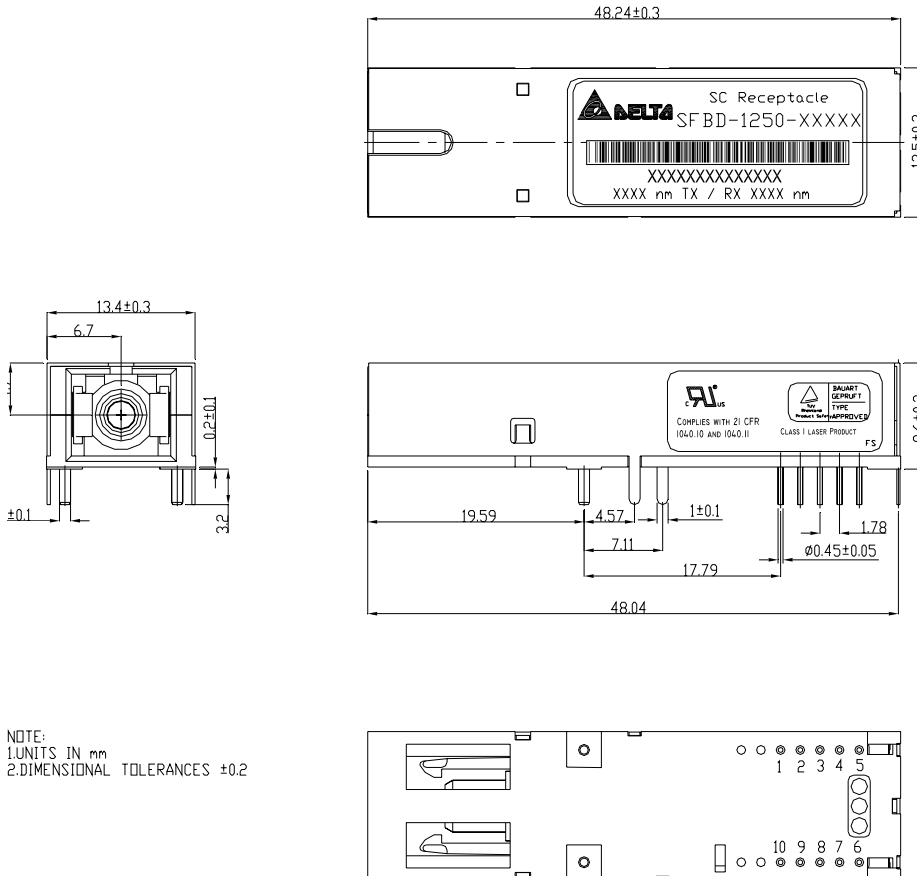
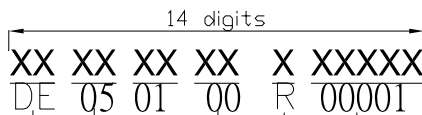
Note (1). EMI shielding lead must be connected to Signal ground



**7. Recommended Interface Circuit (AC Coupling)**


**8. Outline Dimensions**

Parameter	Unit	Description	Note
Mechanical Dimensions	mm	48.3x13.5x9.6	
Connector Type	-	SC/UPC connector	IEC-61754-4


**S/ N**


S/N : (00001~99999)  
 Rework : Rework=R or No-rework=0  
 Vender NOTE : Free or 00  
 Week (52Weeks/Year) : 1月2日=01  
 Year : 2005=05  
 Vender CODE : DELTA=DE

**9. Regulatory Compliance**

Feature	Test Method	Reference	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	Human Body Model (HBM)	MIL-STD-883E Method 3015.7 EIA-JESD22-A114	(1) Satisfied with electrical characteristics of product spec.  (2) No physical damage
	Machine Model (MM)	EIA-JESD22-A115	
Electrostatic Discharge (ESD) to the Simplex Receptacle	Contact Discharge	IEC/EN 61000-4-2	
	Air Discharge	IEC/EN 61000-4-2	
Radio Frequency Electromagnetic Field Immunity		IEC/EN 61000-4-3	
Electromagnetic Interference (EMI)		FCC Part 15 Class B EN 55022 Class B (CISPR 22A)	
Laser Eye Safety	FDA/CDRH	FDA 21CFR 1040.10, 1040.11	CDRH File # 0420993
	TUV	IEC/EN 60825-1 IEC/EN 60825-2	TUV Certificate # R50032471
Component Recognition	TUV	IEC/EN 60950	
	UL/CSA	UL 60950	UL File # E239394

**Appendix A. Document Revision**

Version No.	Date	Description
S0	2007-04-12	Preliminary datasheet

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