1000BASE-T
Copper SFP Transceiver

Features:

- Operating data rate up to 1.25 Gbps
- Compact RJ-45 connector assembly
- Single 3.3V power supply and Low power dissipation
- Hot Pluggable
- 1000 BASE-T operation in the host systems with Serdes interface
- Support TX-Disable
- RoHS Compliant and Lead-Free
- Metal with lower EMI and excellent ESD performance

Applications:

- Switch to Switch interface
- Switch backplane applications
- File sever interface

Product Description

The 1000BASE-T Copper SFP Transceiver is small form factor pluggable transceiver. They are compatible with SFF-8074i Multi- Sourcing Agreement (MSA) and comply with Gigabit Ethernet standard as specified in IEEE Std 802.3. They are compliant with RoHS and lead-free per Directive 2002/95/EC. The physical layer IC (PHY) can be accessed via I2C bus, allowing access to all PHY settings and features.

Ordering information

Part No.	Data Rate	Distance*Note1	Interface	Bail color	Temp.*Note2	DDMI
TCS-GEM1-00NCR	1000M	100m	RJ45	NA	ST	NO
TCS-GEM1-00NIR	1000M	100m	RJ45	NA	IT	NO

Note1: Over unshielded twisted pair (UTP) Category 5 Cable

Note2: ST: -5 ~ +70deg C   IT: -40 ~ +85 deg C.

Regulatory compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883G Method 3015.7	Class 1C (>1000 V)
Electrostatic Discharge to the enclosure	EN 55024:1998+A1+A2 IEC-61000-4-2 GR-1089-CORE	Compliant with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022:2006 CISPR 22B :2006 VCCI Class B	Compliant with standards Noise frequency range: 30 MHz to 6 GHz. Good system EMI design practice required to achieve Class B margins. System margins depend on customer host board and chassis design.
Immunity	EN 55024:1998+A1+A2 IEC 61000-4-3	Compliant with standards. 1kHz sine-wave, 80% AM, from 80 MHz to 1 GHz. No effect on transmitter/receiver performance is detectable between these limits.
Component Recognition	UL and CUL EN60950-1:2006	TUV Certificate No. E344594 (CB:JPTUV-053877)
RoHS2.0	2011/65/EU	Compliant with standards

Absolute Maximum Ratings*Note3

Parameter	Symbol	Min	Max	Unit
Storage Temperature	TS	-40	+85	°C
Supply Voltage	V_{CC}	-0.5	4.0	V
Operating Humidity	-	5	95	%

Note3: Exceeding any one of these values may destroy the device permanently.

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Power Supply Voltage	V_{cc}	3.13	3.30	3.47	V
Power Supply Current	I_{cc}	-	-	400	mA
Surge current	Isurge			30	mA
Case Operating Temperature	ST_{op}	-5	-	+70	°C
	IT_{op}	-40	-	+85	°C
Data Rate (note4)	-		1000		Mbps

Transmission Distance (note5)		-		100	m

Low Speed Signals Electrical Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit
Output LOW	V_{OL}	0	-	0.5	V
Output HIGH	V_{OH}	Host_Vcc-0.5	-	Host_Vcc+0.3	V
Input LOW	V_{IL}	0	-	0.8	V
Input HIGH	V_{IH}	2	-	Vcc+0.3	V

High Speed Electrical Interface, Transmission Line-SFP

Parameter	Symbol	Min	Typ.	Max	Unit
Line Frequency (note6)		-		62.5	MHz

High Speed Electrical Interface, Host-SFP

Parameter	Symbol	Min	Typ.	Max	Unit
Differential data input swing	Zin	500	-	2400	mV
Differential data Output swing	Z_{Out}	350	-	1400	mV
Waiting time For Restarting (note7)		-	-	10	us
Rise/Fall Time		-	-	180	ms
Tx Input Impedance (note8)	Z_{In}	90	100	110	Ω
Rx Output Impedance(note8)	Z_{Out}	90	100	110	Ω

Note4. the module will operate as 1000BASE-T when the host system uses SERDES interface.

Note5. Over unshielded twisted pair (UTP) Category 5 Cable

Note6. Signal transmission bandwidth pre-lane of RJ45 port. 5-level encoding, per IEEE 802.3

Note7.From TX_Disable rising edge to Link Down
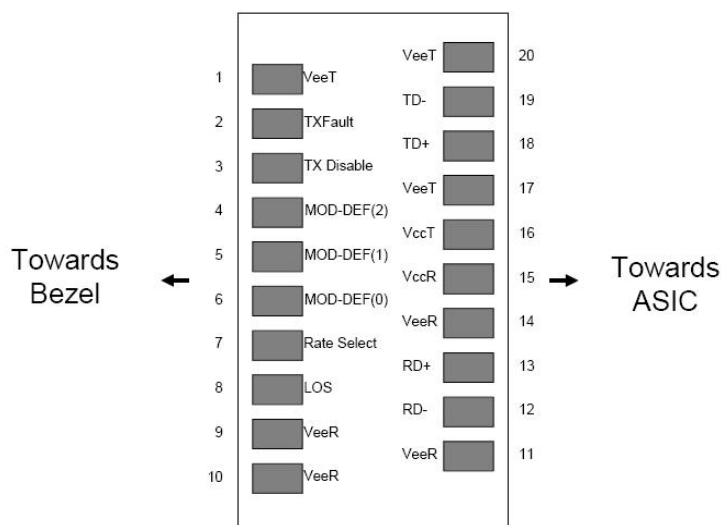
Note8.AC-coupled

SFP Transceiver Electrical Pad Layout

Diagram of Host Board Connector Block Pin Numbers and Names

Pin Function Definitions:

Pin Num.	Name	Function
1	$V_{ee}T$	Transmitter Ground
2	TX Fault	Transmitter Fault(Note 9)
3	TX Disable	Transmitter Disable(Note 10)
4	MOD_DEF2	Module Definition 2 (Note 11)
5	MOD_DEF1	Module Definition 1 (Note 11)
6	MOD_DEF0	Module Definition 0 (Note 11)
7	Rate Select	No connect
8	LOS	Loss of Signal indication (Note 12)
9	$V_{ee}R$	Receiver Ground
10	$V_{ee}R$	Receiver Ground
11	$V_{ee}R$	Receiver Ground
12	RD-	Inverted Received Data Out (Note 13)
13	RD+	Non-inverted Received Data Out (Note 13)
14	$V_{ee}R$	Receiver Ground
15	V_{CCR}	Receiver Power Supply (Note 14)
16	V_{CCT}	Transmitter Power Supply (Note 14)
17	$V_{ee}T$	Transmitter Ground
18	TD+	Non-Inverted Transmit Data in (Note 15)
19	TD-	Inverted Transmit Data in (Note 15)
20	$V_{ee}T$	Transmitter Ground

Note9. Not Support and tied to GND within the module

Note10. TX disable is used to enable or disable PHY within the module.

Low (0 − 0.8V): PHY enabled   (>0.8, < 2.0V): Undefined

High (2.0 − 3.465V): PHY Disabled   Open: PHY Disabled

Note11. Mod-Def 0, 1, 2. These are the module definition pins. They should be pulled up to VCCT/VCCR through a 4.7K − 10KΩ resistor on the host board.

Mod-DEF0 is grounded by the module to indicate that the module is present

Mod-DEF1 is the clock line of two wire serial interface for serial ID

Mod-DEF2 is the data line of two wire serial interface for serial ID

Note12. Los is used as link indication feature for each rate.

Note13. RD-/+: These are the differential receiver outputs. They are AC coupled 100 Ω Differential lines which should be terminated with 100 Ω (differential) at host. The AC coupling is done inside the module and not be required on host.

Note14. VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V±5% at the SFP connector pin. Maximum supply current is 400 mA.

Note15. TD-/+: These are the differential transmitter inputs. They are AC coupled, Differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and not be required on host.

# Recommend Software Configuration for PHY IC

TCS-GEM1-00NCR uses the Marvell 88E1111 Physical Layer IC (PHY) to convert between the SGMII interface and 10/100/1000M BASE-T interfaces. This chip have a number of useful features available on internal registers that can be accessed via the 2-wire bi-directional serial interface at address 0xAC. Each register is 2 bytes wide and details for accessing the register can be found at:

http://www.Marvell.com

Recommended Circuit
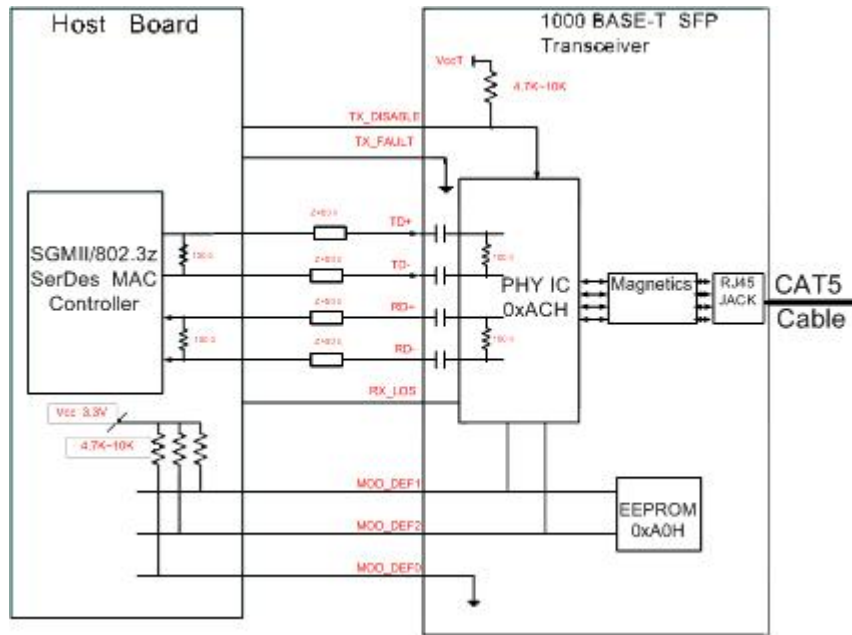
Mechanical Dimension

5
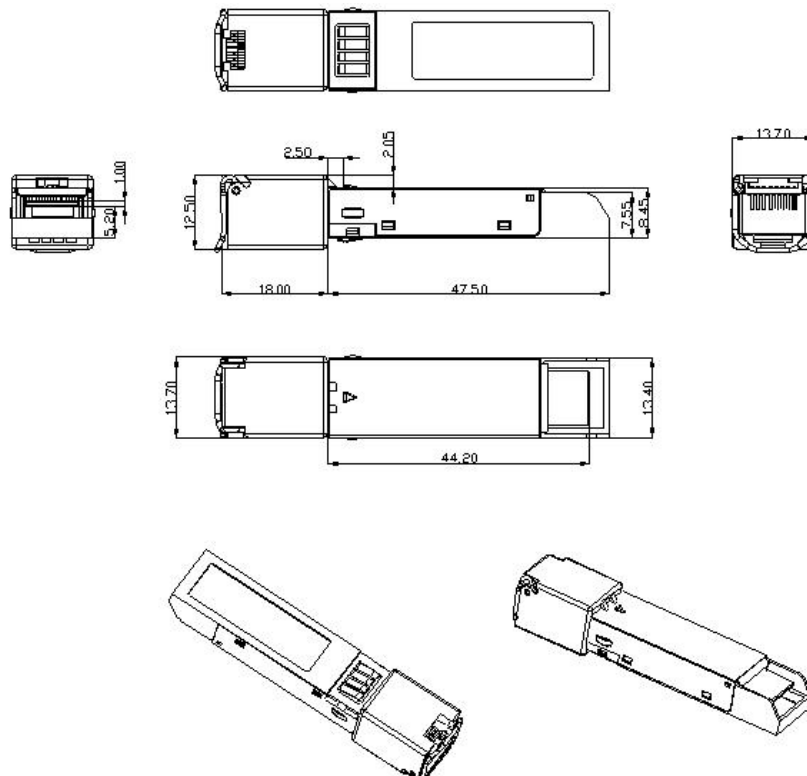
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