

#### Fortinet Compatible 1000BASE-T SFP Transceiver FS-TRAN-GC-HPC Datasheet

### **PRODUCT FEATURES**

- 100% Fortinet Compatible FS-TRAN-GC
- Up to 1.25 Gb/s bi-directional data links
- Hot-pluggable SFP transceiver module
- 1000BASE-T Copper
- Gigabit Ethernet over Cat5 Cable
- Low power dissipation (1.05W typical)
- Compact RJ-45 connector assembly
- Access to physical layer IC via 2-wire serial bus
- Up to 100m transmission distance
- 1000BASE-T operation in host systems with SERDES interface
- 10/100/1000Mbps compliant in host systems with SGMII interface
- Commercial temperature range (0°C to +70°C)



### **GENERAL**

FS-TRAN-GC-HPC Copper Small Form Pluggable (SFP) transceivers are a high performance, cost effective module compliant with the Gigabit Ethernet and 1000- BASE-T standards as specified in IEEE 802. 3-2002 and IEEE 802.3ab, which supporting 1000Mbps data- rate up to 100 meters reach over unshielded twisted-pair CAT 5 cable. The Fortinet compatible SFPs support 1000 Mbps (or 10/100/1000Mbps) full duplex data-links with a 100m reach over unshielded twisted-pair CAT 5 cable. The module provides standard serial ID information compliant with SFP MSA, which can be accessed with address of A0h via the 2wire serial CMOS EEPROM protocol.



#### **PIN DESCRIPTIONS**

Pin	Symbol	Name/Description	Ref.
1	VeeT	Transmitter Ground (Common with Receiver Ground)	1
2	TX Fault	Transmitter Fault. Not Supported	
3	TX Disable	Transmitter Disable. PHY disabled on high or open	2
4	MOD_DEF(2)	Module Definition 2. Data line for Serial ID	3
5	MOD_DEF(1)	Module Definition 1. Clock line for Serial ID	3
6	MOD_DEF(0)	Module Definition 0. Grounded within the module	3
7	Rate Select	No connection required	
8	LOS	Loss of Signal indication	4
9	VeeR	Receiver Ground (Common with Transmitter Ground)	1
10	VeeR	Receiver Ground (Common with Transmitter Ground)	1
11	VeeR	Receiver Ground (Common with Transmitter Ground)	1
12	RD-	Receiver Inverted DATA out. AC Coupled	
13	RD+	Receiver Non-Inverted DATA out. AC Coupled	
14	VeeR	Receiver Ground (Common with Transmitter Ground)	1
15	VccR	Receiver Power Supply	
16	VccT	Transmitter Power Supply	
17	VeeT	Transceiver Ground (Common with Transmitter Ground)	1
18	TD+	Transceiver Non-Inverted DATA in. AC Coupled	
19	TD-	Transmitter Inverted DATA in. AC Coupled	
20	VeeT	Transmitter Ground (Common with Receiver Ground)	1

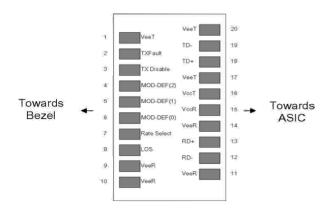
Notes:

1. Circuit ground is connected to chassis ground

2. PHY disabled on TDIS > 2.0V or open, enabled on TDIS < 0.8V

3. Should be pulled up with 4.7k – 10k Ohms on host board to a voltage between 2.0 V and 3.6 V.MOD\_DEF(0) pulls line low to indicate module is plugged in.

4. LVTTL compatible with a maximum voltage of 2.5V. Not supported on GE-GB-P.



**Pin-out of Connector Block on Host Board** 



## +3.3 Volt Electrical Power Interface

The GE-GB-P has an input voltage range of 3.3 V +/- 5%. The 4 V maximum voltage is not allowed for continuous operation.

+3.3 Volt Electrical Power Interface								
Parameter	Symbol	Min	Тур	Max	Unit	Notes		
Supply Current	ls		320	375	mA	1.2W max power over full range of voltage and temperature		
Input Voltage	Vcc	3.13	3.3	3.47	V	Referenced to GND		
Maximum Voltage	Vmax			4	V			
Surge Current	Isurge			30	mA	Hot plug able steady state current		

### **Low-Speed Signals**

MOD\_DEF(1) (SCL) and MOD\_DEF(2) (SDA), are open drain CMOS signals (see section VII, "Serial Communication Protocol"). Both MOD\_DEF(1) and MOD\_DEF(2) must be pulled up to host\_Vcc.

Low-Speed Signals, Electronic Characteristics								
Parameter	Symbol	Min	Max	Unit	Notes			
SFP Output LOW	VOL	0	0.5	V	4.7k to 10k pull-up to host_Vcc, measured at host side of connector			
SFP Output HIGH	VOH	host_Vcc - 0.5	host_Vcc + 0.3	V	4.7k to 10k pull-up to host_Vcc, measured at host side of connector			
SFP Input LOW	VIL	0	0.8	V	4.7k to 10k pull-up to Vcc, measured at SFP side of connector			
SFP Input HIGH	VIH	2	Vcc + 0.3	V	4.7k to 10k pull-up to Vcc, measured at SFP side of connector			

## **High-Speed Electrical Interface**

All high-speed signals are AC-coupled internally

High-Speed Electrical Interface, Transmission Line-SFP								
Parameter	Symbol	Min	Тур	Max	Unit	Notes		
Line Frequency	fL	-	125	-	MHz	5-level encoding, per IEEE 802.3		
Tx Output Impedance	Zout,TX	-	100	-	Ohm	Differential, for all Frequencies between 1MHz and 125 MHz		
Rx Input Impedance	Zin,RX	-	100	-	Ohm	Differential, for all Frequencies between 1MHz and 125 MHz		



## **High-Speed Electrical Interface**

High-Speed Electrical Interface, Host-SFP								
Parameter	Symbol	Min	Тур	Max	Unit	Notes		
Single ended data input swing	Vinsing	250	-	1200	mV	Single ended		
Single ended data output swing	Voutsing	350	-	800	mV	Single ended		
Rise/Fall Time	Tr,Tf	-	175	-	psec	20% - 80%		
Tx Input Impedance	Zin	-	50	-	Ohm	Single ended		
Rx Output Impedance	Zout	-	50	-	Ohm	Single ended		

## **General Specifications**

FS-TRAN-GC-HPC General Specifications								
Parameter	Symbol	Min	Тур	Max	Unit	Notes		
Data Rate	BR	10	-	1,000	Mb/sec	IEEE 802.3 compatible. See Notes 2 through 4 below		
Cable Length	L	-	-	100	m	Category 5 UTP. BER <10-12		

Notes:

1. Clock tolerance is +/- 50 ppm

2. By default, the GE-GB-P is a full duplex device in preferred master mode

3. Automatic crossover detection is enabled. External crossover cable is not required

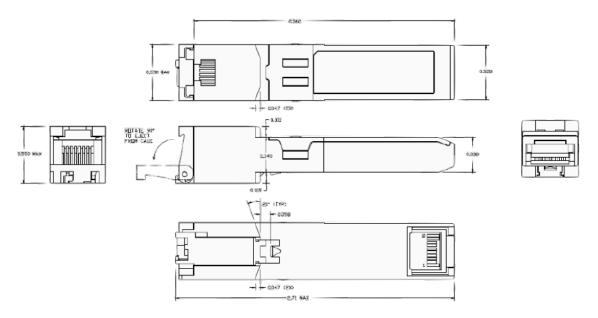
4. 1000 BASE-T operation requires the host system to have an SGMII interface with no clocks, and the module PHY to be configured per Application Note AN-2036. With a SERDES that does not support SGMII, the module will operate at 1000BASE-T only.

### **Environmental Specifications**

Temperature Specifications							
Parameter Symbol Min Typ Max Unit				Notes			
Operating Temperature	Тор	0	-	85	°C	Case temperature	
Storage Temperature	Tsto	-40	-	85	°C	Ambient temperature	



# **Mechanical Specifications**



**FS-TRAN-GC-HPC Mechanical Dimensions** 

## **Ordering Information**

Part Number	Product Description
FS-TRAN-GC-HPC	Fortinet Compatible 1000BASE-T Copper SFP Transceiver