

Product Specification

10Gb/s Duplex LC, SMF, 1550nm EML, PIN Receiver, ER 40km SFP+ Transceiver

FEATURES:

- Support multi-protocol from 8.5Gb/s to 11.3Gb/s
- Hot-Pluggable SFP+ footprint
- Cooled 1550nm EML laser transmitter
- PIN Receiver
- Duplex LC connector
- Up to 40 km on 9/125µm SMF
- Single +3.3V Power Supply
- Compliant with SFF-8431 SFF-8432 and IEE802.3ae
- Low power dissipation <1.8W typically
- Commercial operating temperature range: 0°C to 70°C
- RoHS compliant

APPLICATIONS:

- 10GBASE-ER/EW Ethernet
- 40km 10G Fiber channel
- SONET OC-192/SDH STM-64

DESCRIPTION:

UGS10E4D transceivers are Enhanced Small Form Factor Pluggable SFP+ transceivers designed for use in 10-Gigabit multi-rate links up to 40km of G.652 single mode fiber. They are compliant with SFF-8431, SFF-8432 and 10GBASE ER/EW; support 4x, 8x and 10x Fibre Channel. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472. UGS10E4D transceivers are RoHS compliant per Directive 2011/65/EU. The high performance 1550nm EML transmitter and high sensitivity PIN receiver provide superior performance for Ethernet applications at up to 40km links.

• **Absolute Maximum Ratings**

Parameter	Symbol	Min.	Typical	Max.	Unit
Storage Temperature	T _s	-40		+85	°C
Supply Voltage	V _{CC}	-0.5		4	V
Relative Humidity	RH	0		85	%

• **Electrical Characteristics (T_{OP} = T_c, V_{CC} = 3.0 to 3.60 Volts)**

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Supply Voltage	V _{CC}	3.00	3.30	3.60	V	
Supply Current	I _{CC}			450	mA	
Inrush Current	I _{surge}			I _{CC} +30	mA	
Maximum Power	P _{max}			1.8	W	
Transmitter Section:						
Input differential impedance	R _{in}		100		Ω	1
Single ended data input swing	V _{in PP}	180		700	mVp-p	2
Transmit Disable Voltage	V _D	2		V _{CC}	V	3
Transmit Enable Voltage	V _{EN}	V _{ee}		V _{ee} + 0.8	V	
Transmit Disable Assert Time	T _{dessert}			10	us	
Receiver Section:						
Rx Output Diff Voltage	V _o	300		850	mV	3
Data output rise time	t _r	30			ps	4
Data output fall time	t _f	30			ps	4
LOS Fault	V _{losfault}	2		V _{CC_host}	V	5
LOS Normal	V _{los norm}	V _{ee}		V _{ee} +0.8	V	5

Note:

1. Connected directly to TX data input pins. AC coupling from pins into laser driver IC.
2. Per SFF-8431 Rev 3.0
3. Into 100 ohms differential termination.
4. 20%~80%
5. LOS is an open collector output. Should be pulled up with 4.7k – 10kΩ on the host board. Normal operation is logic 0; loss of signal is logic 1. Maximum pull-up voltage is 5.5V.

• **Optical Parameters(T_{OP} = T_c, V_{CC} = 3.00 to 3.60 Volts)**

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
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Transmitter Section:						
Center Wavelength	λ_c	1530	1550	1565	nm	
Spectral Width	$\Delta\lambda$			0.3	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Optical Output Power	P_{out}	-3		2	dBm	
Optical Power OMA	P_{OMA}	-2.1			dBm	
Optical Rise/Fall Time	t_r / t_f			260	ps	
Laser Off Power	P_{off}			-30	dBm	
Extinction Ratio	ER	4			dB	
Transmitter Dispersion Penalty	TDP			3.0	dB	2
Relative Intensity Noise	RIN			-128	dB/Hz	3
Optical Return Loss Tolerance		21			dB	
Eye Mask for Optical Output	Compliant with IEEE802.3 z (class 1 laser safety)					
Receiver Section:						
Optical Input Wavelength		1260		1620	nm	
Receiver Overload	P_{ol}	0			dBm	5
RX Sensitivity	Sen			-15	dBm	4
Stressed Sensitivity (OMA)	Sen_{ST}				dBm	4
RX_LOS Assert	LOS_A	-30			dBm	
RX_LOS Deassert	LOS_D			-20	dBm	
RX_LOS Hysteresis	LOS_H	0.5			dB	
Receiver Reflectance	R_{rx}			-26	dB	

Note:

1. Average power figures are informative only, per IEEE802.3ae.
2. TWDP figure requires the host board to be SFF-8431 compliant. TWDP is calculated using the Matlab code provided in clause 68.6.6.2 of IEEE802.3ae.
3. 12dB reflection.
4. Conditions of stressed receiver tests per IEEE802.3ae. CSRS testing requires the host board to be SFF-8431 compliant.
5. Receiver overload specified in OMA and under the worst comprehensive stressed condition.

• Pin Assignment

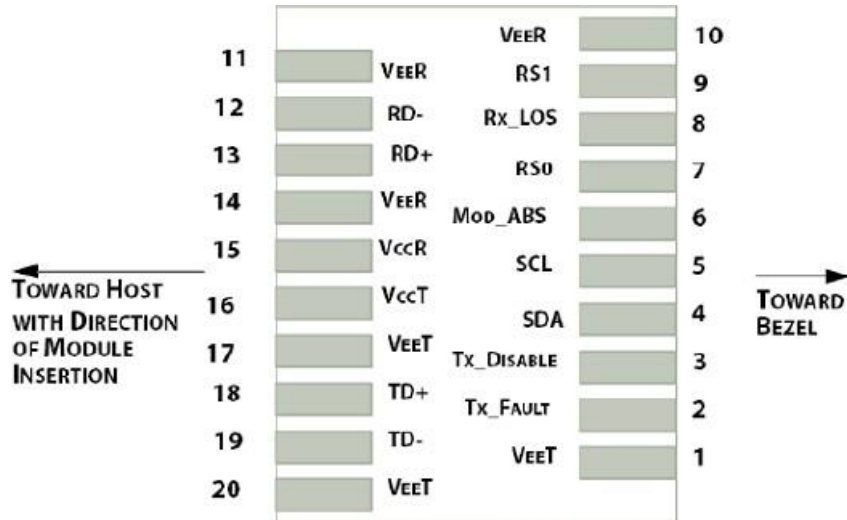


Figure2:Diagram of Host Board Connector Block Pin Numbers and Names

• **Pin Description**

Pin No	Name	Function	Notes
1	VeeT	Transmitter Ground	1
2	TX Fault	Transmitter Fault Indication	2
3	TX Disable	Transmitter Disable	3
4	SDL	2 wire serial interface data input/output (SDA)	
5	SCL	2 wire serial interface clock input (SCL)	
6	MOD-ABS	Module Absent, connect to VeeR or VeeT in the module	2
7	RS0	Rate select0, optionally control SFP+ receiver. When high, input data rate >4.5Gb/s; when low, input data rate <=4.5Gb/s	
8	LOS	Loss of Signal	4
9	RS1	Rate select0, optionally control SFP+ transmitter. When high, input data rate >4.5Gb/s; when low, input data rate <=4.5Gb/s	
10	VeeR	Receiver Ground	1
11	VeeR	Receiver Ground	1
12	RD-	Inv. Received Data Out	
13	RD+	Received Data Out	
14	VeeR	Receiver Ground	1
15	VccR	Receiver Power	

16	VccT	Transmitter Power	
17	VeeT	Transmitter Ground	1
18	TD+	Transmit Data In	
19	TD-	Inv. Transmit In	
20	VeeT	Transmitter Ground	1

Notes:

1. The module ground pins shall be isolated from the module case.
2. This pin is an open collector/drain output pin and shall be pulled up with 4.7K-10Kohms to Host_Vcc on the host board.
3. This pin shall be pulled up with 4.7K-10Kohms to VccT in the module.
4. This pin is an open collector/drain output pin and shall be pulled up with 4.7K-10Kohms to Host_Vcc on the host board.

• **SFP Module EEPROM Information and Management**

The SFP modules implement the 2-wire serial communication protocol as defined in the SFP-8472. The serial ID information of the SFP modules and Digital Diagnostic Monitor parameters can be accessed through the I²C interface at address A0h and A2h.

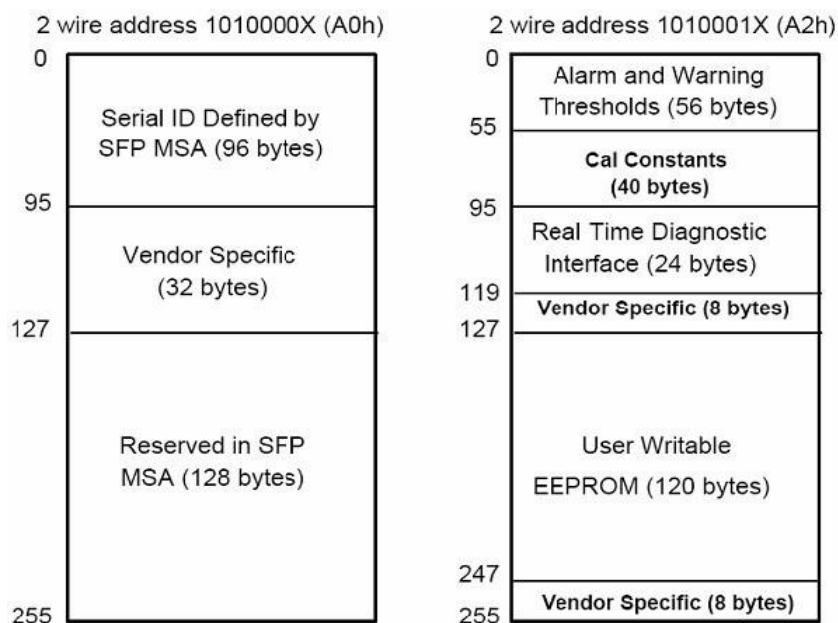
The memory is mapped in Table 1.

Detailed ID information (A0h) is listed in Table 2.

And the DDM specification at address A2h.

For more details of the memory map and byte definitions, please refer to the SFF-8472, "Digital Diagnostic Monitoring Interface for Optical Transceivers". The DDM parameters have been internally calibrated.

Table 1. Digital Diagnostic Memory Map (Specific Data Field Descriptions)



• **EEPROM Serial ID Memory Contents (A0h)**

Data Address	Length (Byte)	Name of Length	Description and Contents
Base ID Fields			
0	1	Identifier	Type of Serial transceiver (03h=SFP)
1	1	Reserved	Extended identifier of type serial transceiver (04h)
2	1	Connector	Code of optical connector type (07=LC)
3-10	8	Transceiver	10GBASE-ER
11	1	Encoding	64B/66B
12	1	BR,Nominal	Nominal baud rate, unit of 100Mbps
13	1	Reserved	(0000h)
14	1	Length(9um,km)	Link length supported for 9/125um fiber, units of km
15	1	Length(9um)	Link length supported for 9/125um fiber, units of 100m
16	1	Length(50um)	Link length supported for 50/125um fiber, units of 10m
17	1	Length(62.5um)	Link length supported for 62.5/125um fiber, units of 10m
18	1	Length(Copper)	Link length supported for copper, units of meters
19	1	Reserved	
20-35	16	Vendor Name	SFP vendor name:
36	1	Reserved	
37-39	3	Vendor OUI	SFP transceiver vendor OUI ID
40-55	16	Vendor PN	Part Number: "xxxxxxx" (ASCII)
56-59	4	Vendor rev	Revision level for part number
60-61	2	Wavelength	Laser wavelength
62	1	Reserved	
63	1	CCID	Least significant byte of sum of data in address 0-62
Extended ID Fields			
64-65	2	Option	Indicates which optical SFP signals are implemented(001Ah = LOS, TX_FAULT, TX_DISABLE all supported)
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 (ASCII)
84-91	8	Date code	Manufacturing date code
92	1	Diagnostic Type	Diagnostics

93	1	Enhanced Options	Diagnostics
94	1	SFF-8472	Diagnostics
95	1	CCEX	Check code for the extended ID Fields (addresses 64 to 94)
Vendor Specific ID Fields			
96-127	32	Readable	Vendor specific date, read only
128-255	128	Reserved	Reserved for SFF-8079

• Digital Diagnostic Monitor Characteristics

Data Address	Parameter	Accuracy	Unit
96-97	Transceiver Internal Temperature	±3.0	°C
98-99	VCC3 Internal Supply Voltage	±5.0	%
100-101	Laser Bias Current	±10	%
102-103	Tx Output Power	±3.0	dBm
104-105	Rx Input Power	±3.0	dBm

• Regulatory Compliance

The transceiver complies with international Electromagnetic Compatibility (EMC) and international safety requirements and standards (see details in Table following).

Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1(>1000 V)
Electrostatic Discharge (ESD) to the Duplex LC Receptacle	IEC 61000-4-2 GR-1089-CORE	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022 Class B (CISPR 22B) VCCI Class B	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2	Compatible with Class 1 laser product.

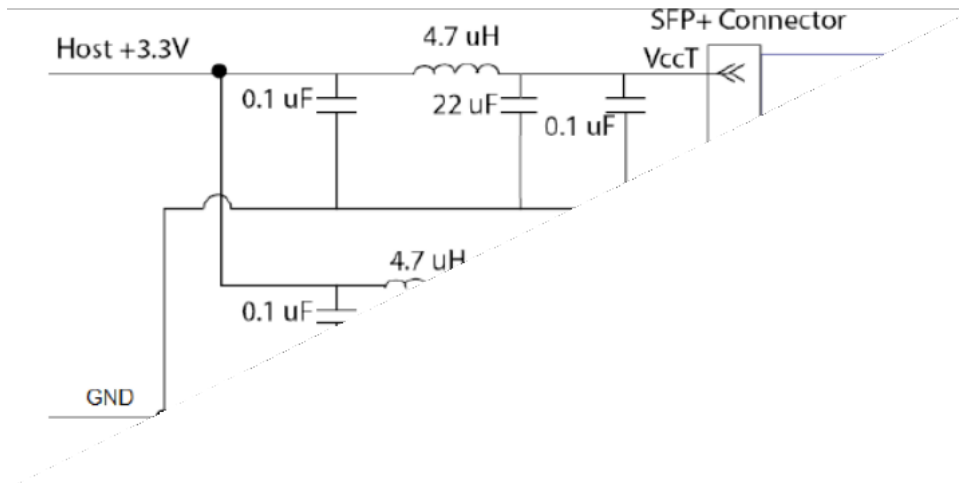
• References

1. IEEE Std 802.3, 2002 Edition, Clause 38, PMD Type 1000BASE-LX. IEEE Standards Department, 2002.
2. "Fibre Channel Physical and Signaling Interface (FC-PH, FC-PH2, FC-PH3)". American National Standard for Information Systems.
3. "Fibre Channel Draft Physical Interface Specification (FC-PI 13.0)". American

National Standard for Information Systems.

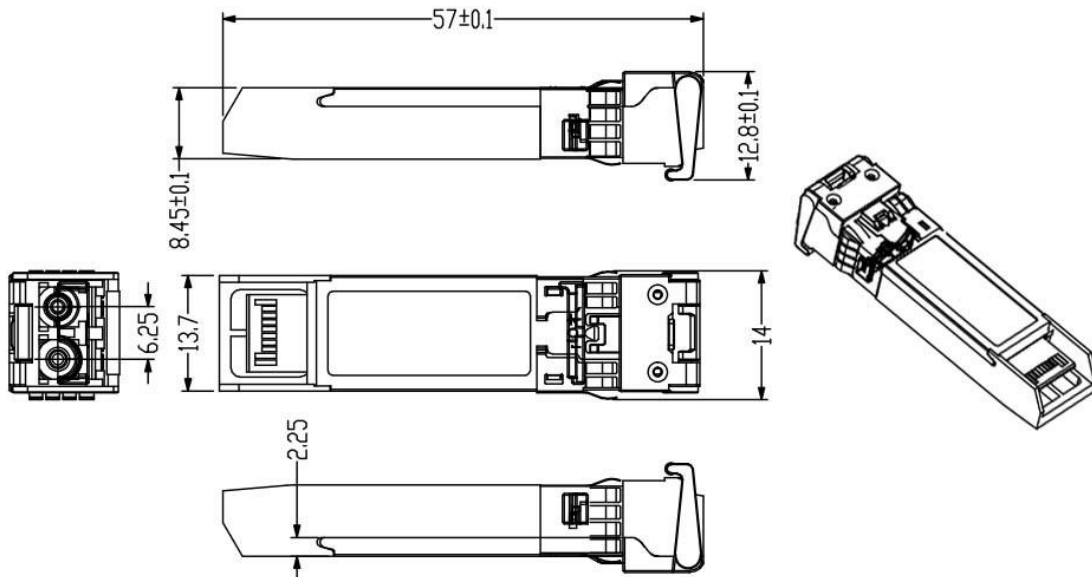
4. Small Form-factor Pluggable (SFP) Transceiver Multi-source Agreement (MSA)
September 14, 2000.

- **Recommended Circuit:**



Recommended Host Board Power Supply Circuit

- **Mechanical Dimensions**



Mechanical Drawing