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F i n i s a r

Product Specification

EPON Stick (EPON SFP ONU)
FTEN2115P1NUN; FTEN2x17P1CUN; FTEN2115P1NUN-BC and FTEN2x17P1CUN-BC;

PRODUCT FEATURES

- EPON ONU in MSA SFP Footprint

- Compliance with IEEE802.3ah[1]

- Optional CTC OAM Support, or DPoE[TM] Support

- Built-in Digital Diagnostics Functions

- Single fiber Bi-Directional SC Receptacle

- Compatibility with EPON OLTs and CPE Equipment

APPLICATIONS

- Providing Pluggable EPON ONU Interface for Ethernet Switches, Wireless Backhaul Equipment, Ethernet Demarcs, Routers, DSLAMs and other Customer Premises Equipment

Finisar's EPON Sticks are combination of a SFP transceiver with a built-in EPON ONU. They comply with IEEE802.3ah EPON standard and optionally, CTC OAM specifications, or DPoE[TM] specifications. Digital diagnostics functions are available via the 2-wire serial bus specified in the SFP MSA.

Note 1: Compliant with IEEE Std 802.3ah-2005 with one exception on RMS spectral width which is less than 4.0nm for PX10 modules including FTEN2x15P1NUN and FTEN2x15P1NUN-BC.

I.　　Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Power Supply Voltage	Vcc-Vee	-0.2		3.6	V	
Storage Temperature	T_S	-40		85	°C	

II.　　Operating Environment

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Power Supply Voltage	Vcc	+3.15		+3.45	V	
Operating Case Temperature	T_{OP}	-20		70	°C	FTEN2115P1NUN FTEN2x17P1CUN
		-30		85		FTEN2115P1NUN-BC FTEN2x17P1CUN-BC
Relative Humidity (Non-Condensing)	RH	0		85	%	

III.　　Electrical Characteristics (Top, VCC = 3.15 to 3.45 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	Vcc	3.15	3.3	3.45	V	
Supply Current	Icc		500	620	mA	Note 1
Transmitter						
Input Differential Impedance	R_{in}		100		Ω	Note 2
Differential Data Input Voltage	Vin,pp	200		1600	mV	
Transmit Disable Voltage	V_D	2.0		Vcc	V	
Transmit Enable Voltage	V_{EN}	0		0.8	V	
Receiver						
Output Differential Impedance			100		Ω	Note 2
Differential Data Output Voltage	Vout,pp, LVPECL	600		1100	mV	
LOS Low	-	0		0.8	V	
LOS High	-	2.0		Vcc	V	

IV. Optical Characteristics (Top, VCC = 3.15 to 3.45 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Cross-talk 1310nm Tx to 1490nm Rx				-40	dB	
Transmitter						
Data Rate (Continuous Wave)	BR		1250		Mb/s	
Center Wavelength (CW)	λ	1260	1310	1360	nm	PX10
	λ	1290	1310	1330	nm	PX20+
SMSR		30			dB	PX20+
Output Optical Power	P_{OUT}	-1		4	dBm	PX10; Note 3
		0		4		PX20+; Note 3
Burst turn on/off time	Ton/Toff			32	ns	
Optical Return Loss Tolerance				15	dB	
Average launch power of OFF Tx	P_{OFF}			-45	dBm	Note 3
Transmitter eye		Compliant with IEEE802.3ah				Note 4
Optical Extinction Ratio	ER	9			dB	
Receiver						
Data Rate	BR		1250		Mb/s	
Optical Center Wavelength	λ_C	1480		1500	nm	
Rx Sensitivity	R_{SENS}			-25	dBm	PX10; Note 5
				-27		PX20+; Note 5
Receiver Overload	P_{OVR}	-3			dBm	Note 5
Receiver Reflectance				-12	dB	
LOS Asserted	-	-40			dBm	
LOS De-Asserted	-			-25	dBm	PX10
	-			-27		PX20+
LOS Hysteresis	-		2		dB	

Note 1: Max current condition: 900/900Mbps, single stream, fixed frame length, 70 or 85°C case temperature, with airflow 1m/s.
Note 2: Internal AC coupled;
Note 3: Measured through a short patch cable;
Note 4: Measured with a PRBS 27-1 test pattern @1.25Gbps. Transmitter eye mask definition is {0.22UI, 0.375UI, 0.20UI, 0.20UI, 0.30UI};
Note 5: Measured with a PRBS 2^7-1 test pattern, OLT Tx ER=9dB, BER≤1×10^-10

V. Digital Diagnostic Functions

Finisar's EPON Stick supports the 2-wire serial communication protocol as defined in the SFP MSA[2].

Additionally, Finisar's EPON Stick (SFP-ONU) provides a unique enhanced digital diagnostic monitoring interface which allows real-time access to a device's operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage. It also defines a sophisticated system of alarms and warning flags which alerts end-users when certain operating parameters are outside of a factory-set normal range.

The SFP MSA defines a 256-byte memory map in EEPROM that is accessible over a 2-wire serial interface at the 8 bit address 1010000X (A0h). The digital diagnostic monitoring interface makes use of the 8 bit address 1010001X (A2h), A0h stores static information including product and vendor IDs while A2h contains real-time diagnostic data.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through a 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL) is generated by the host. The positive edge clocks data into the SFP transceiver into segments of the EEPROM that are not write-protected. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

For more information, please contact Finisar.

Digital diagnostics for the EPON Stick (SFP-ONU) are internally calibrated by default.

VI.   Pin Descriptions

Pin	Symbol	Name/Description	Notes
1	VeeT	Transmitter Ground (Common with Receiver Ground)	
2	TX Fault	Transmitter Fault.	PIN Note 1
3	TX Disable	Transmitter Disable.	PIN Note 2, Module disables on high or open
4	MOD-DEF2	Module Definition 2.	PIN Note 3, 2 wire serial ID interface
5	MOD-DEF1	Module Definition 1.	PIN Note 3, 2 wire serial ID interface
6	MOD_DEF0	Module Definition 0.	PIN Note 3, Grounded within the Module
7	Rate Select	Not Connected	PIN 7 can be changed to Dying Gasp Trigger upon customer request
8	LOS	LOS of Signal	PIN Note 4
9	VeeR	Receiver Ground (Common with Transmitter Ground)	PIN Note 5
10	VeeR	Receiver Ground (Common with Transmitter Ground)	PIN Note 5
11	VeeR	Receiver Ground (Common with Transmitter Ground)	PIN Note 5
12	RD-	Receiver Inverted DATA out.	PIN Note 6
13	RD+	Receiver Non-inverted DATA out.	PIN Note 6
14	VeeR	Receiver Ground (Common with Transmitter Ground)	PIN Note 5
15	VccR	Receiver Power Supply	PIN Note 7, 3.3V±5%
16	VccT	Transmitter Power Supply	PIN Note 7, 3.3V±5%
17	VeeT	Transmitter Ground (Common with Receiver Ground)	PIN Note 5
18	TD+	Transmitter Non-Inverted DATA in.	PIN Note 8
19	TD-	Transmitter Inverted DATA in.	PIN Note 8
20	VeeT	Transmitter Ground (Common with Receiver Ground)	PIN Note 5
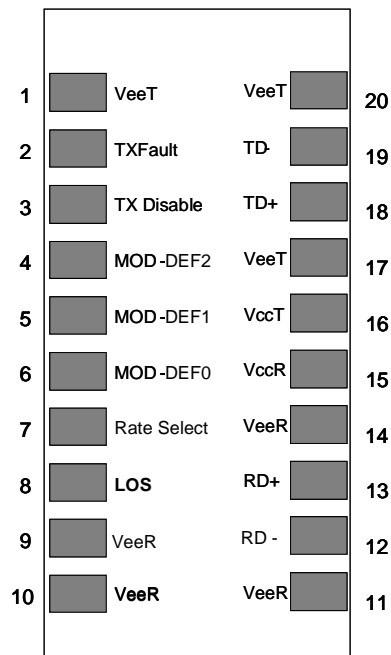
Pinout of Connector Block on Host equipment

PIN Notes:
1. TX Fault is an open collector/drain output, which should be pulled up with a 4.7K–10KΩ resistor on the host board. Pull up voltage between 2.0V and VccT, R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.
2. TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7–10 KΩ resistor. Its states are:
   Low (0 – 0.8V):   Transmitter on
   (>0.8, < 2.0V):   Undefined
   High (2.0 – 3.465V):   Transmitter Disabled
   Open: Transmitter Disabled.
3. Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7K – 10KΩ resistor on the host board. The pull-up voltage shall be VccT or VccR.
   Mod-Def 0 is grounded by the module to indicate that the module is present
   Mod-Def 1 is the clock line of two wire serial interface for serial ID
   Mod-Def 2 is the data line of two wire serial interface for serial ID.
4. LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. Pull up voltage between 2.0V and VccT, R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.
5. VeeR and VeeT may be internally connected within the SFP module.

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

7. VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP connector pin. Inductors with DC resistance of less than 0.5Ω should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. VccR and VccT may be internally connected within the SFP transceiver module.

8. 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 is thus not required on the host board.

VII.   Mechanical Specifications
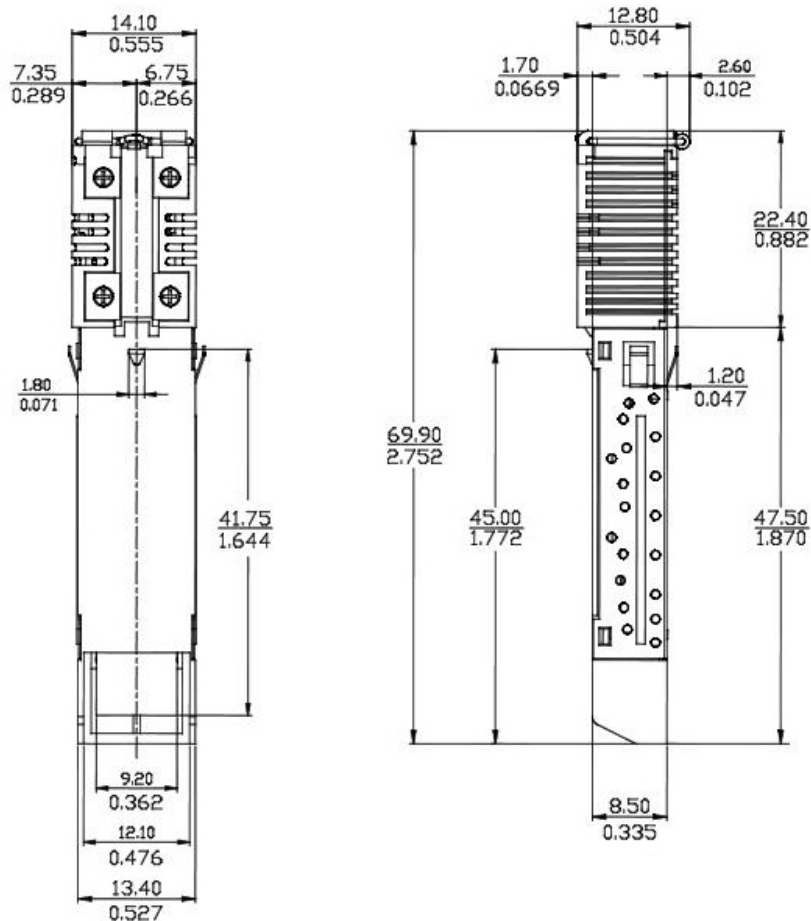
EPON Stick (SFP-ONU)

VIII.   Regulatory Compliance

FTEN2x15P1NUN modules meet the Class 1 eye safety requirements of EN (IEC) 60825 and the electrical safety requirements of EN (IEC) 60950.

FTEN2x17P1NUN modules are Class 1M laser products, meaning that they are eye safe under normal "unaided" viewing conditions. Laser radiation may be hazardous if viewed with magnifying optics.

These products are certified by TÜV and CSA and copies of certificates are available at Finisar Corporation upon request.

IX.   References

1.   IEEE Standard for Information Technology-Telecommunications and information exchange between systems- Local and metropolitan area networks-Common specifications Part3.

2.   Small Form Factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA), September 2000. Documentation is currently available at Finisar upon request.

X.   Ordering Information

Part Number	Link Budget	Operating Case Temperature	EPON OAM
FTEN2115P1NUN	PX10	-20 ~ 70 °C	CTC
FTEN2115P1NUN-BC	PX10	-30 ~ 85 °C	CTC
FTEN2217P1CUN	PX20+	-20 ~ 70 °C	DPoE Compatible
FTEN2217P1CUN-BC	PX20+	-30 ~ 85 °C	DPoE Compatible

XI.   For More Information

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