

SFP-GPON-1DH

GPON Optical Network Terminal (ONT)



- SFP-based ONT uplink
- 1244 Mbps Tx, 2488 Mbps Rx asymmetric data rate
- Compliant to FSAN G.984.2 specifications
- Subscriber location identifier (SLID)
- 28 dB link budget, 20 km reach

SFP-GPON-1DH Optical Network Terminal integrates a bi-directional optical transceiver and GPON MAC functionality. When plugged into a Customer Premises Equipment (CPE), SFP-GPON-1DH provides an asymmetric 1.244Gbps upstream / 2.488 Gbps downstream GPON uplink to the CPE, without requiring separate power supply with standard SFP port directly.

SFP-GPON-1DH operates in TC Layer GEM encapsulation mode and provides Subscriber Location Identifier (SLID), PON Link Status notification and Dying Gasp notification.

MARKET SEGMENTS AND APPLICATIONS

SFP-GPON-1DH features a sophisticated ONT management system, including alarms, provisioning, DHCP and IGMP functions for business customers and mobile backhaul applications.

SFP-GPON-1DH fits seamlessly into existing communications equipment, providing service providers with a smooth upgrade to GPON. It vastly decreases the installation costs of deploying fiber access in MDUs and enables service providers to improve their revenue streams, while decreasing OPEX.

INTEROPERABILITY

SFP-GPON-1DH can operate with GPON OLTs from all known providers.

MANAGEMENT AND SECURITY

SFP-GPON-1DH can be managed from the OLT over the GPON using G.988 OMCI.

When the OLT detects an anomaly, the unit shuts down TX power.

MONITORING AND DIAGNOSTICS

SFP-GPON-1DH provides standard digital diagnostics.

OPERATION AND MAINTENANCE

SFP-GPON-1DH provides PON link status, and dying gasp notifications.

OLT Configuration

To achieve the uplink connectivity to the services, SFP-GPON-1DH has to be provisioned on the OLT. Perform the following:

1. Insert SFP-GPON-1DH into the SFP slot.
2. Set the Autonegotiation mode on the physical port.
3. When SFP-GPON-1DH is up, it is discovered in the OLT under the New ONT section.
4. After SFP-GPON-1DH has been discovered, provision it on the OLT; configure all required parameters, such as VLAN association (S-VLAN, C-VLAN), bandwidth policing, and software information.
5. Verify connectivity by locating MAC addresses of the connected devices in the OLT MAC table.

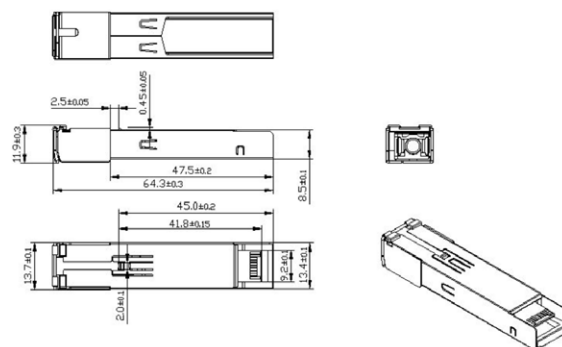


Figure 1. Mechanical Diagram

SFP-GPON-1DH

GPON Optical Network Terminal (ONT)

Specifications

CAPACITY

Data Rate (Asymmetric)

Tx: 1244 Mbps
Rx: 2488 Mbps

OPTICAL CHARACTERISTICS

Range

20 km (12.42 mi)

Link Budget

28 dB

Connector

Simplex SC
Integrated diplexer transceiver
SFP MSA
Internal calibration

Laser Source

1310 nm DFB

Fiber Type

SMF

MANAGEMENT

Sophisticated ONT management system, including alarms, provisioning, DHCP and IGMP functions

Can be managed from the OLT over the GPON using G.988 OMCI

DIAGNOSTICS

Digital diagnostics per SFF-8472

GENERAL

Environment

Operating and storage temperature:
-40 to +85°C (-40 to +185°F)
Humidity: up to 95%, non-condensing

Physical

Height: 12 mm (0.47 in)
Width: 13.8 mm (0.54 in)
Depth: 64.7 mm (2.54 in)
Weight: 30.0 g (1.0 oz)

Power

Supply Voltage

Min: V_{CC-Rx} : -0.3 V

: V_{CC-Tx} : -0.3 V

Max: V_{CC-Rx} : +4.2 V

: V_{CC-Tx} : $V_{CC-Rx}+1$

Operating Voltage

3.14 – 3.46V

Total Tx and Rx Supply Current

600 mA

Table 1. Optical Characteristics - Transmitter

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Center Wavelength Range	λ_c	1290	1310	1330	nm	
Average Output Power	P_{OUT}	0.5	-	5	dBm	
Average Output Power (Laser Off)	$P_{OUT-OFF}$	-	-	-40	dBm	
Side Mode Suppression Ratio	SMSR	30	-	-	dB	
Spectral Width (-20dB)	λ_{20}	-	-	1	nm	
Extinction Ratio	ER	10	-	-	dB	1
Optical Rise and Fall Time(20%-80%)	T_R/T_F	-	-	250	ps	
Jitter Generation	JG	-	-	0.2	UI	2
Transmitter Output Eye	Compliant with G.984.2 Figure 1					

Notes:

1. Measured by Ethernet package with random payload
2. 4kHz to 10MHz

Table 2. Optical Characteristics - Receiver

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Center Wavelength Range	λ_c	1480	1490	1500	nm	
Overload		-8	-	-	dBm	
Sensitivity	Sen	-28	-	-	dBm	3
Signal Detect Assertion Level	SDA	-	-	-29	dBm	
Signal Detect De-Assertion Level	SDD	-45	-	-	dBm	
Hysteresis	$P_{SDA-SDD}$	0.5	-	-	dB	
1310nm Tx to 1490nm Rx Crosstalk		-	-	-47	dB	
1555nm Rx to 1490nm Isolation		30	-	-	dB	
(1550-1560nm) Ext to 1490 Rx Isolation		34	-	-	dB	
Back Reflection @ 1310nm		-	-	-12	dB	
Back Reflection @ 1490nm		-	-	-27	dB	
Rx Reflectance		-	-	-20	dB	
1530nm to 1490nm Rx Isolation		7	-	-	dB	
1539nm to 1490nm Rx Isolation		22	-	-	dB	
1625nm to 1490nm Rx Isolation		22	-	-	dB	

Table 3. Electrical Characteristics - Transmitter

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Differential Data Input Voltage	$V_{IN,P-P}$	300	-	1800	mVpp	4
Input Differential Impedance	Z_{IN}	-	100	-	Ω	5
Tx Burst Enable Time	$T_{BURST,EN}$	-	-	12.86	ns	6
Tx Burst Disable Time	$T_{BURST,DIS}$	-	-	12.86	ns	6
Tx Disable Assert Time	$T_{DIS,A}$	-	-	10	μs	
Tx Disable De-assert Time	$T_{DIS,D}$	-	-	1	ms	

Table 4. Electrical Characteristics - Receiver

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Differential Data Input Voltage		300	-	1200	mV	7
Signal Detect Output HIGH Voltage	$V_{SD,High}$	2.4	-	-	V	8
Signal Detect Output LOW Voltage	$V_{SD,Low}$	0	-	0.8	V	9
Data Output Rise and Fall Time	T_R/T_F	-	160	-	ps	7

Notes:

3. Measured with Ethernet package with random payload and ER=8.2dB, BER =10⁻¹²
4. TXD+/- . AC-coupled
5. TXD+/-
6. 16 bits data @1244Mbps
7. CML output, AC coupled (0.1 μF)
8. LVTTTL with internal 1k Ω pull up resistor. Asserts HIGH when input data amplitude is above threshold.
9. LVTTTL De-asserts LOW when input data amplitude is below threshold.

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Pin Definitions

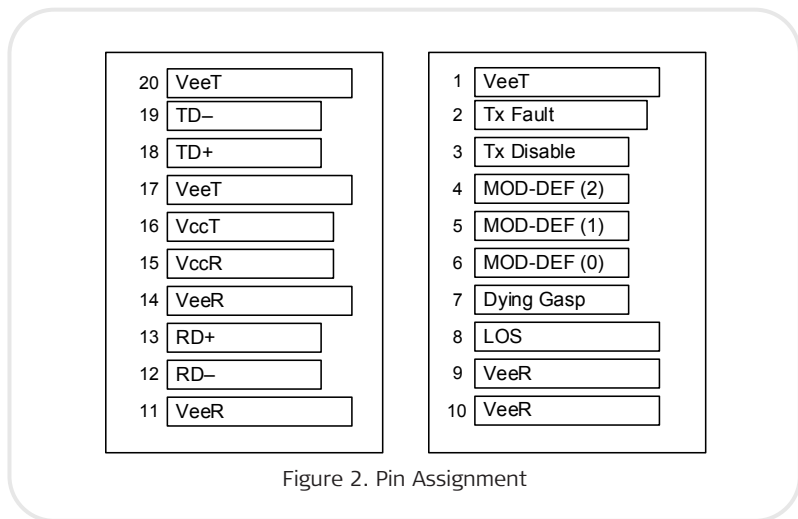


Figure 2. Pin Assignment

Table 5. Pin Definition

Pin	Symbol	Logic	Name/Description	Note
1	VeeT	NA	Module Transmitter Ground	
2	Tx	Fault	Transmitter fault indication	1
3	TX_DISABLE	LVTTL-I	Transmitter Shut-off	
4	SDA	LVTTL-I/O	2-Wire Serial Interface Data Line (MOD-DEF2)	2
5	SCL	LVTTL-I	2-Wire Serial Interface Clock (MOD-DEF1)	2
6	MOD_ABS	NA	Module Absent, connected to VeeT or VeeR in the module	
7	DYING	GASP	Dying Gasp message indicator	3
8	LOS	LVTTL-O	Loss of Signal	
9	VeeR	NA	Module Receiver Ground	4
10	VeeR	NA	Module Receiver Ground	
11	VeeR	NA	Module Receiver Ground	
12	RXD-	CML-O	Receiver Inverted Data Output	
13	RXD+	CML-O	Receiver Non-Inverted Data Output	
14	VeeR	NA	Module Receiver Ground	
15	VCCR	NA	Module Receiver 3.3V Supply	
16	VCCT	NA	Module Transmitter 3.3V Supply	
17	VeeT	NA	Module Transmitter Ground	
18	TXD+	CML-I	Transmitter Non-Inverted Data Input, CML, 100ohm differential impedance	
19	TXD-	CML-I	Transmitter Inverted Data Input, CML, 100ohm differential impedance	
20	VeeT	NA	Module Transmitter Ground	

Notes:

1. This PIN default solution is TX Fault based on SFP MSA.
2. This PIN is an open collector/drain output pin and shall be pulled up with 4.7K-10K ohms to a Host.Vcc on the host board.
3. PIN7 can support Dying Gasp function. Dying Gasp function is managed by software. If software turn off the dying gasp function, no influence to the module if logical "0" or "1". If software turn on the function, no influence to the module if logical "1", if logical "0", the module will report dying gasp to OLT and the module will repeating restart.
4. This PIN default solution is VeeR based on SFP MSA.

**Electrically Erasable Programmable
Read-Only Memory (EEPROM)**

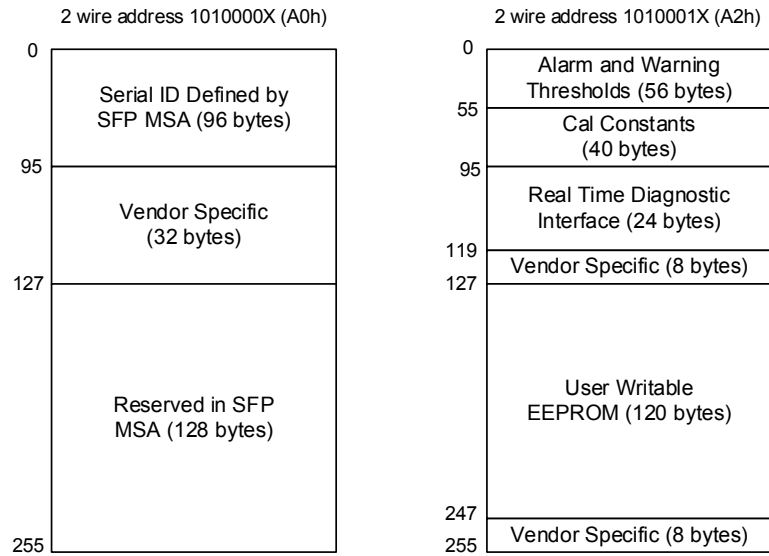


Figure 3. EEPROM Diagram

Table 6. EEPROM Memory Content (A2h)

Addr.	Field Size (Bytes)	Name of Field	Hex	Description	
0	00	2	Temp High Alarm	64 00	100°C (I temp)
2	02	2	Temp Low Alarm	CE 00	-50°C (I temp)
4	04	2	Temp High Warning	5F 00	95°C (I temp)
6	06	2	Temp Low Warning	D8 00	-40°C (I temp)
8	08	2	Voltage High Alarm	8C A0	3.6V
10	0A	2	Voltage Low Alarm	75 30	3.0V
12	0C	2	Voltage High Warning	88 B8	3.5V
14	0E	2	Voltage Low Warning	79 18	3.1V
16	10	2	Bias High Alarm	AF C8	90mA
18	12	2	Bias Low Alarm	00 00	0mA
20	14	2	Bias High Warning	88 B8	70mA
22	16	2	Bias Low Warning	00 00	0mA
24	18	2	TX Power High Alarm	7B 86	5dBm
26	1A	2	TX Power Low Alarm	22 D0	-0.5dBm
28	1C	2	TX Power High Warning	6E 17	4.5dBm
30	1E	2	TX Power Low Warning	27 10	0dBm
32	20	2	RX Power High Alarm	07 CB	-7dBm
34	22	2	RX Power Low Alarm	00 0F	-28dBm

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Table 6. EEPROM Memory Content (A2h) – cont.

Addr.	Field Size (Bytes)	Name of Field	Hex	Description	
36	24	2	RX Power High Warning	06 30	-8dBm
38	26	2	RX Power Low Warning	00 14	-27dBm
40-45	28-2D	6	MAC address	xx xx xx xx xx xx	MAC Address
46-55	2E-37	10	Reserved	00....000	Reserved
56	38	4	RX_PWR(4) Calibration	00 00 00 00	4th order RSSI calibration coefficient
60	3C	4	RX_PWR(3) Calibration	00 00 00 00	3rd order RSSI calibration coefficient
64	40	4	RX_PWR(2) Calibration	00 00 00 00	2nd order RSSI calibration coefficient
68	44	4	RX_PWR(1) Calibration	3F 80 00 00	1st order RSSI calibration coefficient
72	48	4	RX_PWR(0) Calibration	00 00 00 00	0th order RSSI calibration coefficient
76	4C	2	TX_I(Slope) Calibration	01 00	Slope for Bias calibration
78	4E	2	TX_I(Offset) Calibration	00 00	Offset for Bias calibration
80	50	2	TX_PWR(Slope) Calibration	01 00	Slope for TX Power calibration
82	52	2	TX_PWR(Offset) Calibration	00 00	Offset for TX Power calibration
84	54	2	T(Slope) Calibration	01 00	Slope for Temperature calibration
86	56	2	T(Offset) Calibration	00 00	Offset for Temperature calibration, in units of 256ths C
88	58	2	V(Slope) Calibration	01 00	Slope for VCC calibration
90	5A	2	V(Offset) Calibration	00 00	Offset for VCC calibration
92	5C	3	Reserved	00 00 00	Reserved
95	5F	1	Checksum	xx	Checksum
96	60	2	Transceiver Temperature	xx xx	Temperature in C/256
98	62	2	Supply Voltage	xx xx	Vcc
100	64	2	TX Bias Current	xx xx	BIASMON
102	66	2	TX Optical Output Power	xx xx	Back facet monitor
104	68	2	RX Optical Input Power	xx xx	RSSI
106	6A	2	Reserved	00 00	Reserved
108	6C	2	Reserved	00 00	Reserved
110	6E.7	1 bit	TX_DIS State	x	Soft TX disable state
	6E.6	1 bit	Soft TX Disable	x	Write bit that allows software disable laser output
	6E.5	1 bit	Reserved	0	Reserved
	6E.4	1 bit	Rate Select State	0	NOT SUPPORTED
	6E.3	1 bit	Rate Select	0	NOT SUPPORTED
	6E.2	1 bit	TX_FAULT	x	Digital state of the Tx Fault Output
	6E.1	1 bit	Rx LOS	x	Digital state of the Rx LOS Output
	6E.0	1 bit	Data Ready Bar	x	Indicates transceiver has achieved power up and data is ready
111	6F.7	1 bit	Reserved	0	Reserved
	6F.6	1 bit	Reserved	0	Reserved
	6F.5	1 bit	Reserved	0	Reserved
	6F.4	1 bit	Reserved	0	Reserved
	6F.3	1 bit	Reserved	0	Reserved

Table 6. EEPROM Memory Content (A2h) - cont.

Addr.	Field Size (Bytes)	Name of Field	Hex	Description	
6F.2	1 bit	Reserved	x	Reserved	
6F.1	1 bit	Reserved	0	Reserved	
6F.0	1 bit	Reserved	x	Reserved	
112	70.7	Temperature too high alarm	x	Temperature too high alarm	
	70.6	Temperature too low alarm	x	Temperature too low alarm	
	70.5	VCC too high alarm	x	VCC too high alarm	
	70.4	VCC too low alarm	x	VCC too low alarm	
	70.3	BIASMON too high alarm	x	BIASMON too high alarm	
	70.2	BIASMON too low alarm	x	BIASMON too low alarm	
	70.1	TX Power too high alarm	x	TX Power too high alarm	
	70.0	TX Power too low alarm	x	TX Power too low alarm	
113	71.7	RX Power too high alarm	x	RX Power too high alarm	
	71.6	RX Power too low alarm	x	RX Power too low alarm	
	71.5	ROGUE ONU alarm	x	ROGUE ONU alarm, "0" = no ROGUE ONU alarm, "1" = ROGUE alarm	
	71.4	Reserved interrupt status bit	x	Reserved interrupt status bit	
	71.3	Reserved interrupt status bit	x	Reserved interrupt status bit	
	71.2	Reserved interrupt status bit	x	Reserved interrupt status bit	
	71.1	Reserved interrupt status bit	x	Reserved interrupt status bit	
71.0	Reserved interrupt status bit	x	Reserved interrupt status bit		
114	72	1	Reserved	00	Reserved
115	73	1	Reserved	00	Reserved
116	74.7	Temperature too high warning	x	Temperature too high warning	
	74.6	Temperature too low warning	x	Temperature too low warning	
	74.5	VCC too high warning	x	VCC too high warning	
	74.4	VCC too low warning	x	VCC too low warning	
	74.3	BIASMON too high warning	x	BIASMON too high warning	
	74.2	BIASMON too low warning	x	BIASMON too low warning	
	74.1	TX Power too high warning	x	TX Power too high warning	
	74.0	TX Power too low warning	x	TX Power too low warning	
117	75.7	RX Power too high warning	x	RX Power too high warning	
	75.6	RX Power too low warning	x	RX Power too low warning	
	75.5	Reserved interrupt status bit	0	Reserved interrupt status bit	
	75.4	Reserved interrupt status bit	0	Reserved interrupt status bit	
	75.3	Reserved interrupt status bit	0	Reserved interrupt status bit	
	75.2	Reserved interrupt status bit	0	Reserved interrupt status bit	
	75.1	Reserved interrupt status bit	0	Reserved interrupt status bit	
	75.0	Reserved interrupt status bit	0	Reserved interrupt status bit	
118	76	1	Reserved	00	Reserved
119	77	1	Reserved	00	Reserved
120	78	8	Vendor Specific	00 00 00 00 00 00 00 00	Vendor Specific

SFP-GPON-1DH

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Ordering

RECOMMENDED CONFIGURATIONS

SFP-GPON-1DH

GPON optical network terminal SFP

Table 7. Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1 (>500V for data pins, >2000V for other pins)
Electrostatic Discharge (ESD) to the Duplex LC Receptacle	IEC 61000-4-2	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022 Class B (CISPR 22B) VCCI Class B	Compatible with standards
Immunity	IEC 61000-4-3	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2	Compatible with Class I laser product
RoHS	2011/65/EC	Compatible with standards

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