

GPON Class B+ SFP ONU Transceiver

1. Features

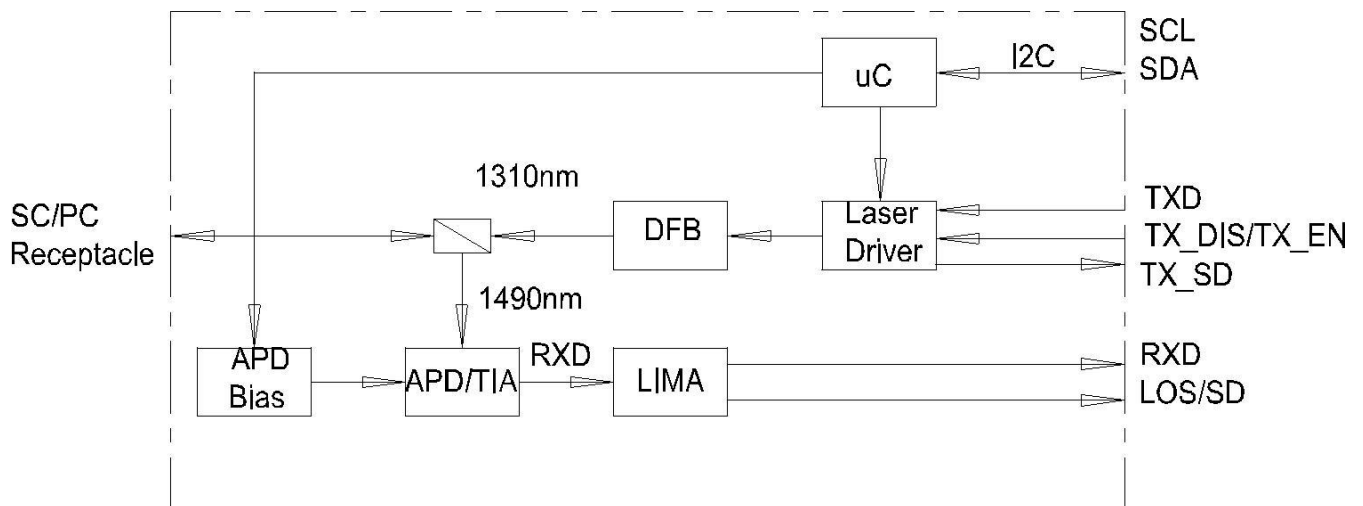
- SFP with SC/PC Connector Transceiver
- 1310nm DFB Tx
- 1490nm APD Rx
- Digital diagnostics SFF-8472 Compliant
- 1244 Mbps Burst mode Transmission
- 2488 Mbps continuous mode receiver Data Rate
- Provide TX Burst Mode Detection function
- Operation case temperature: -5~70°C or -40~85°C
- Class B+ link budget
- Complies with RoHS directive (2002/95/EC)



2. Application

- GPON ONU Class B+
- FTTx

3. Function Diagram



4. Recommended Operating Conditions

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T _{STG}	-40	85	°C
Operating Case Temperature	T _C	-5/-40	70/85	°C
Power Supply Voltage	V _{CC}	3.1	3.5	V
Total Power Supply Current	I _{CC}	-	300	mA

5. Transmitter Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units	Notes
Optical Transmitter Power	P ₀	0.5	-	5	dBm	1
Optical Transmitter Power off	P _{OFF}	-	-	-50	dBm	
Output Center Wavelength	λ	1260	-	1360	nm	
Output Spectrum Width	Δλ	-	-	1.0	nm	
Side Mode Suppression Ratio	SMSR	30	-	-	dB	
Extinction Ratio	ER	9	-	-	dB	
Optical Rise Time	-	-	-	260	ps	
Optical Fall Time	-	-	-	260	ps	
Optical Eye Diagram	Compliant with ITU-T G.984.5 Mask					
Burst Turn On Time	T _{ON}	-	-	12.8	ns	
Burst Turn Off Time	T _{OFF}	-	-	12.8	ns	
Tolerance to Tx Back Reflection	-	-	-	-15	dB	
Data Rate	-	-	1.244	-	Gb/s	
Data Input Voltage Swing	V _{IH} - V _{IL}	200	-	1600	mV	
Common-Mode Data Input Voltage	V _{CM}	1.125	-	V _{CC} - V _{IN} /2.5	V	2
Differential Input Impedance	Z _{IN}	80	100	120	ohm	
Tx_fault Output Voltage- High	V _{OH}	2.4	-	-	V	
Tx_fault Output Voltage- Low	V _{OL}	-	-	0.4	V	

Parameter	Symbol	Min.	Typ.	Max.	Units	Notes
Tx_Dis Input Voltage- High	V _{IH}	2.0	-	V _{CC}	V	3
Tx_Dis Input Voltage- Low	V _{IL}	0	-	0.8	V	3
Tx_EN Input Voltage- High	V _{IH}	2.0	-	V _{CC}	V	4
Tx_EN Input Voltage- Low	V _{IL}	0	-	0.8	V	4

Note 1: 1.244Gbps continuous-mode , PRBS2²³-1.

Note 2: DC Couple.

Note 3: Available for HOLS-P3420345S-C/IL.

Note 4: Available for HOLS-P3420345S-C/IH.

6. Receiver Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units	Notes
Wavelength of Operation	-	1480	-	1500	nm	
Data Rate	-	-	2.488	-	Gb/s	
Sensitivity	Sen	-	-	-28	dBm	1
Saturation Optical Power	Sat	-8	-	-	dBm	1
SD Assert Level	SDA	-	-	-29	dBm	1
SD Deassert Level	SDD	-45	-		dBm	1
SD Hysteresis	HYS	0.5	-	6	dB	1
Reflectance of equipment	-	-	-	-20	dB	
Data Output Voltage Swing	V _{OH} -V _{OL}	200	-	1600	mV	
SD Voltage - High	V _{SDH}	2.4	-	V _{CC}	V	
SD Voltage - Low	V _{SDL}	0	-	0.4	V	
SD Assert Time	T _A	-	-	100	μs	
SD Deassert Time	T _D	-	-	100	μs	

Note 1: Measured with 1490nm, 2.488Gbps PRBS2²³-1 test pattern, ER=10dB, BER=1x10⁻¹⁰.

7. G984.5 Optical Characteristics

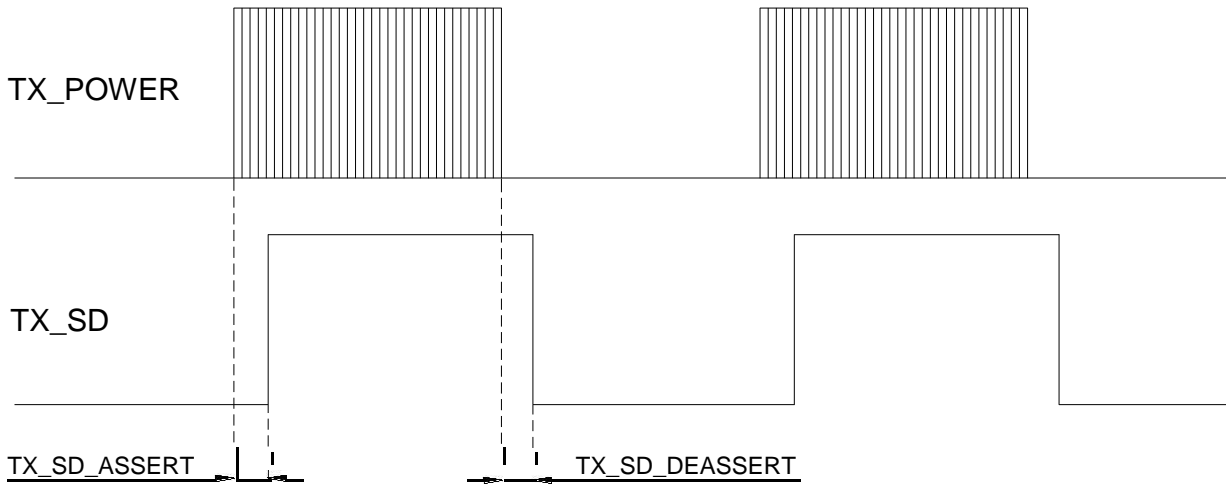
Parameter	Symbol	Min	Typ	Max	Unit
1310nm Tx to 1490nm Rx Crosstalk				-40	dB
1555nm Rx to 1490nm Isolation		30			dB
G.984.5 Wavelength Blocking Filter (1441 nm to 1450 nm)	WBF	7			dB
G.984.5 Wavelength Blocking Filter (1530 nm to 1539 nm)		7			dB
G.984.5 Wavelength Blocking Filter (1400 nm to 1441 nm)		22			dB
G.984.5 Wavelength Blocking Filter (1539 nm to 1625 nm)		22			dB

8. Digital Diagnostic Monitoring Accuracy

Parameter	Accuracy	Units	Notes
Transceiver Temperature	±3	°C	Temperature sensor
Power Supply Voltage	±3	%	Vcc=3.13~3.47V
TX Bias Current	±10	mA	
TX Optical Power	±3	dB	Average Power
RX Optical Power	±3	dB	Input power -28~-8dBm

9. Timing Characteristics for TX_SD

Parameter	Symbol	Min.	Typ.	Max.	Units
TX_SD Assert Time	T _{TX_SD_ASSERT}	-	-	100	ns
TX_SD Deassert Time	T _{TX_SD_DEASSERT}	-	-	100	ns



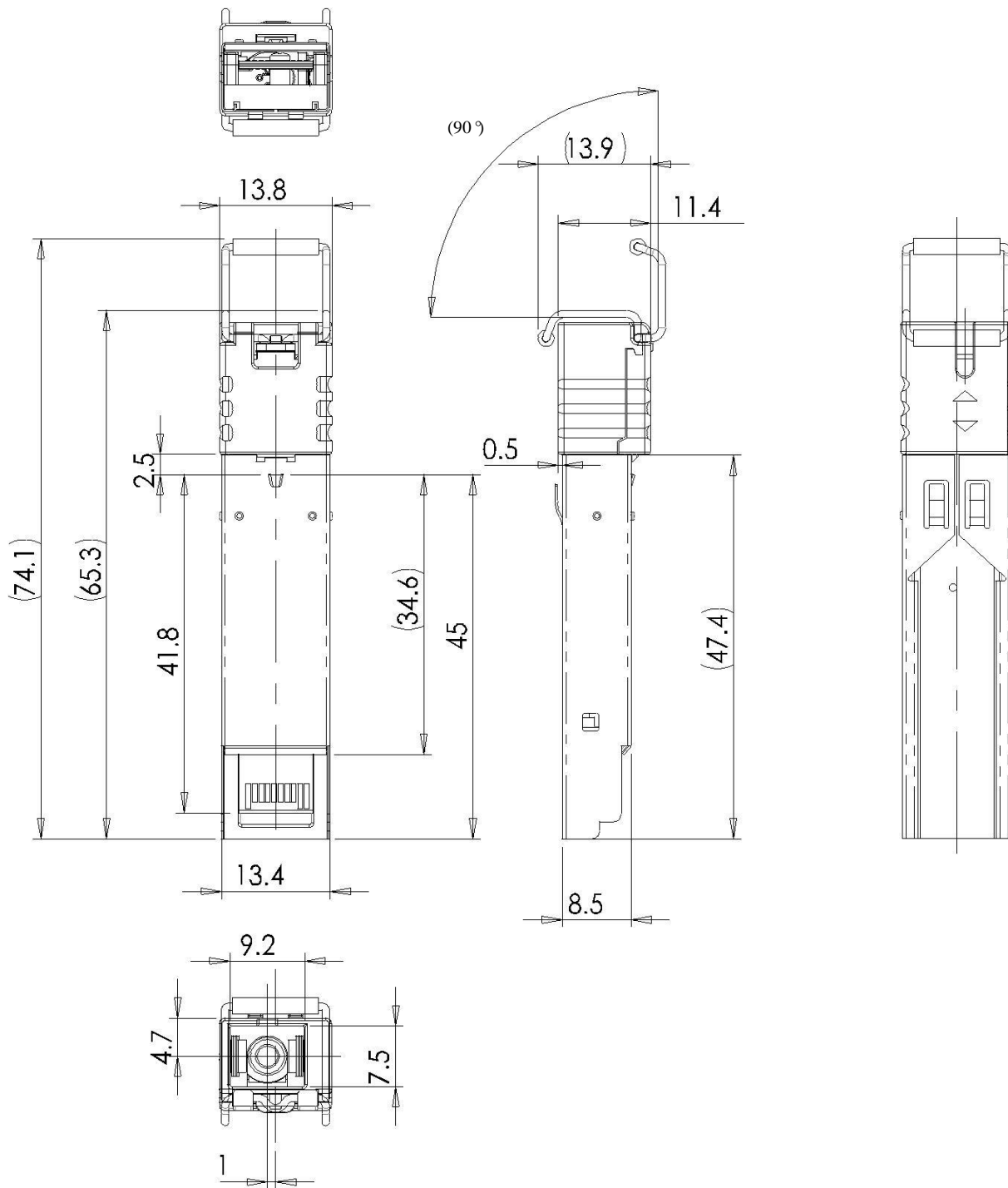
10. Pin Definitions

Pin#	Name	Function
1	VeeT	Transmitter Ground
2	TX_Fault	Transmitter Fault Indication, LVTTTL Output, Active High.
3	TX_DIS	Transmitter Burst Enable Input, LVTTTL, Active Low, Note 1.
	TX_EN	Transmitter Burst Enable Input, LVTTTL, Active High, Note 2.
4	SDA	I ² C Data
5	SCL	I ² C Clock
6	MOD-DEF(0)	Internally grounded
7	TX_SD	Transmitter Signal Detected Indication, LVTTTL Output, Active High.
8	SD	Receiver Signal Detected Indication, LVTTTL Output, Active High.
9	VeeR	Receiver Ground
10	VeeR	Receiver Ground
11	VeeR	Receiver Ground
12	RD-	Inverted Receiver Data Output, CML, AC coupled
13	RD+	Receiver Data Output, CML, AC coupled
14	VeeR	Receiver Ground
15	VccR	Receiver Power
16	VccT	Transmitter Power
17	VeeT	Transmitter Ground
18	TD+	Transmitter Data Input, LVPECL or CML, DC coupled (internally 100 ohms differential termination).
19	TD-	Inverted Transmitter Data Input, LVPECL or CML, DC coupled (internally 100 ohms differential termination).
20	VeeT	Transmitter Ground

Note 1: Available for HOLS- HOLS-P3420345S-C/IL.

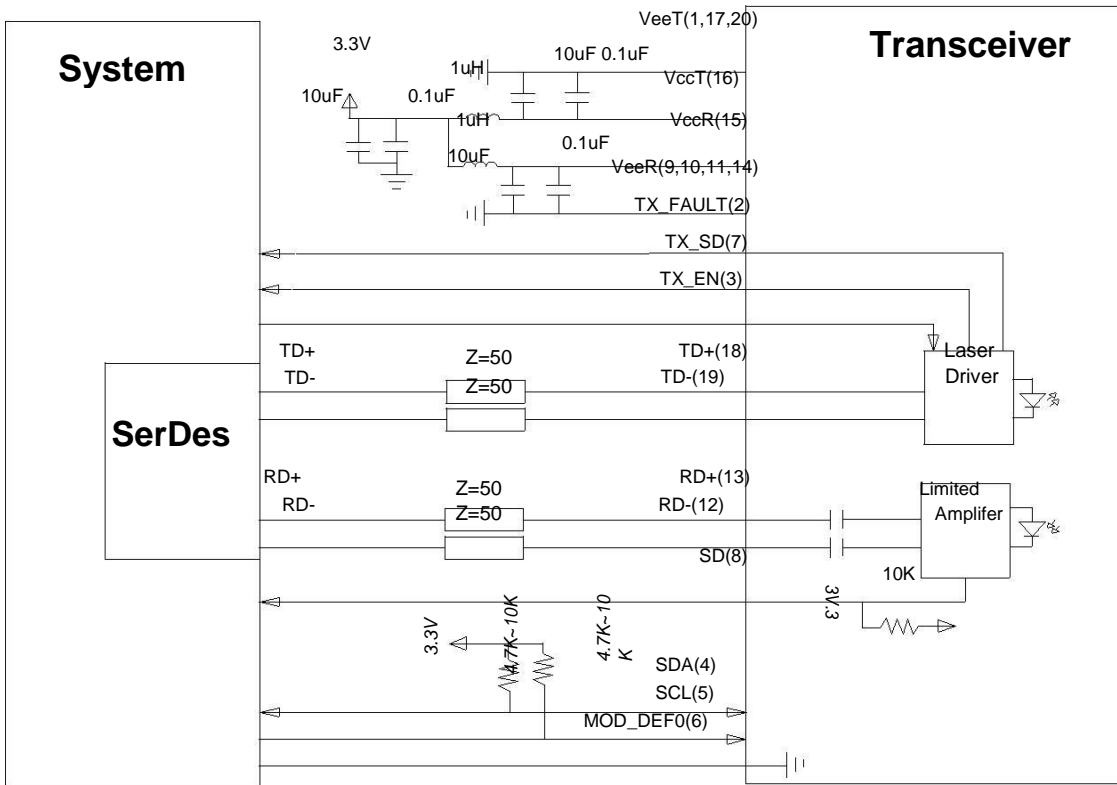
Note 2: Available for HOLS- HOLS-P3420345S-C/IH.

11. Outline Drawing

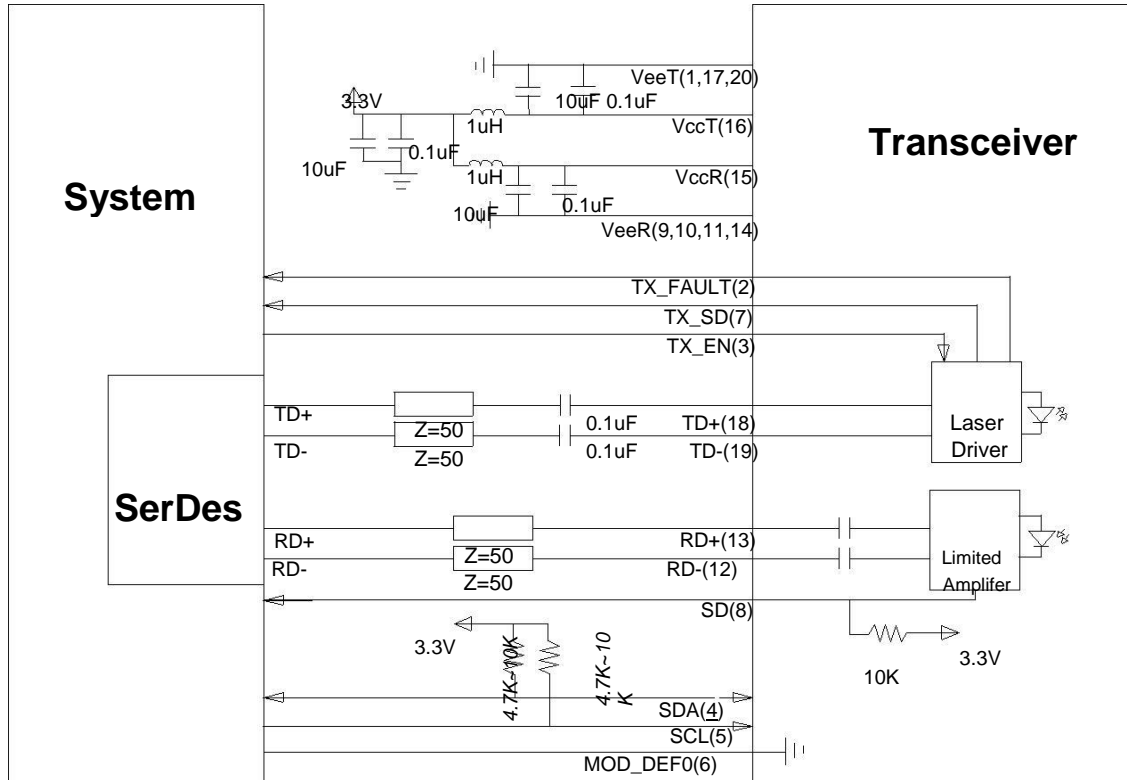


12. Recommended Application Circuit

TX DC Couple:



TX AC Couple:



13. EEPROM serial ID memory contents (A0h)

Address (DEC)	Field Size (Byte)	Name of Field	Hex	Description
0	1	Identifier	03	SFP
1	1	Ext. Identifier	04	
2	1	Connector	01	SC
3-10	8	Transceiver	00 00 00 00 00 00 00 00	not defined
11	1	Encoding	03	NRZ
12	1	BR, Nominal	0C	1.2 Gbps
13	1	Reserved	00	Reserved
14	1	Length (9um)-km	14	20(km)
15	1	Length (9um)	C8	200(100m)
16	1	Length (50um)	00	Not Support
17	1	Length (62.5um)	00	Not Support
18	1	Length (Copper)	00	Not Support
19	1	Reserved	00	Reserved
20-35	16	Vendor name	xxx	"Honlus"
36	1	Reserved	00	Reserved
37-39	3	Vendor OUI	00 00 00	OUI
40-55	16	VendorPN	xxx	"HOLS-P3420345S-C/IL"
			xxx	"HOLS-P3420345S-C/IH"
56-59	4	Vendor Rev	31 20 20 20	Revision
60-61	2	Wavelength	05 1E	1310nm Laser Wavelength
62	1	Reserved	00	Reserved
63	1	CC_BASE	xx	Check sum of byte 0-62
64-65	2	Options	00 1C	SD, TX_FAULT and TX_DISABLE
66	1	BR, max	00	Not Support
67	1	BR, min	00	Not Support
68-83	16	Vendor SN	xx.....xx	ASCII
84-91	8	Date code	xx.....xx 20 20	Year, Month, Day
92	1	Diagnostic Monitoring Type	58	Externally Calibrated Received power measurement type-Average Power

Address (DEC)	Field Size (Byte)	Name of Field	Hex	Description
93	1	Enhanced Options	F0	Alarm/warning flags implemented Soft TX_DISABLE control and monitoring implemented Soft TX_FAULT monitoring implemented Soft RX_LOS monitoring implemented
94	1	SFF-8472 Compliance	02	Diagnostics Compliance(SFF-8472 V9.5)
95	1	CC_EXT	xx	Check sum of byte 64-94
96-255	160	Vendor specific	xx	Vendor specific

14. EEPROM serial ID memory contents (A2h)

Address	Field Size (Byte)	Name of Field	Hex	Description
00~01	2	Temp High Alarm Thresholds	xx	MSB at low address, 90°C
02~03	2	Temp Low Alarm Thresholds	xx	MSB at low address, -10°C
04~05	2	Temp High Warning Thresholds	xx	MSB at low address, 85°C
06~07	2	Temp Low Warning Thresholds	xx	MSB at low address, -5°C
08~09	2	Voltage High Alarm Thresholds	xx	MSB at low address, 3.6V
10~11	2	Voltage Low Alarm Thresholds	xx	MSB at low address, 3.0V
12~13	2	Voltage High Warning Thresholds	xx	MSB at low address, 3.5V
14~15	2	Voltage Low Warning Thresholds	xx	MSB at low address, 3.1V
16~17	2	Bias High Alarm Thresholds	xx	MSB at low address, 90mA
18~19	2	Bias Low Alarm Thresholds	xx	MSB at low address, 1mA
20~21	2	Bias High Warning Thresholds	xx	MSB at low address, 70mA
22~23	2	Bias Low Warning Thresholds	xx	MSB at low address, 2mA
24~25	2	TX Power High Alarm Thresholds	xx	MSB at low address, 5dBm
26~27	2	TX Power Low Alarm Thresholds	xx	MSB at low address, -1dBm

Address	Field Size (Byte)	Name of Field	Hex	Description
28~29	2	TX Power High Warning Thresholds	xx	MSB at low address, 4dBm
30~31	2	TX Power Low Warning Thresholds	xx	MSB at low address, 0dBm
32~33	2	RX Power High Alarm Thresholds	xx	MSB at low address, -2dBm
34~35	2	RX Power Low Alarm Thresholds	xx	MSB at low address, -28dBm
36~37	2	RX Power High Warning Thresholds	xx	MSB at low address, -3dBm
38~39	2	RX Power Low Warning Thresholds	xx	MSB at low address, -27dBm
40~55	16	Reserved	xx	Reserved
56~59	4	Rx_PWR(4)	xx	Single precision floating point calibration data - Rx optical power. Bit7 of byte 56 is MSB. Bit 0 of byte 59 is LSB. For "internally calibrated" devices, Rx_PWR(4) should be set to zero , and useless.
60~63	4	Rx_PWR(3)	xx	Single precision floating point calibration data - Rx optical power. Bit 7 of byte 60 is MSB. Bit 0 of byte 63 is LSB. For "internally calibrated" devices, Rx_PWR(3) should be set to zero , and useless.
64~67	4	Rx_PWR(2)	xx	Single precision floating point calibration data, Rx optical power. Bit 7 of byte 64 is MSB, bit 0 of byte 67 is LSB. For "internally calibrated" devices, Rx_PWR(2) should be set to zero, and useless.
68~71	4	Rx_PWR(1)	xx	Single precision floating point calibration data, Rx optical power. Bit 7 of byte 68 is MSB, bit 0 of byte 71 is LSB. For "internally calibrated" devices, Rx_PWR(1) should be set to 1 , and useless.
72~75	4	Rx_PWR(0)	xx	Single precision floating point calibration data, Rx optical power. Bit 7 of byte 72 is MSB, bit 0 of byte 75 is LSB. For "internally calibrated" devices, Rx_PWR(0) should be set to zero , and useless.
76~77	2	Tx_I(Slope)	xx	Fixed decimal (unsigned) calibration data, laser bias current. Bit 7 of byte 76 is MSB, bit 0 of byte 77 is LSB. For "internally calibrated" devices, Tx_I(Slope) should be set to 1, and useless.
78~79	2	Tx_I(Offset)	xx	Fixed decimal (signed two's complement) calibration data, laser bias current. Bit 7 of byte 78 is MSB, bit 0 of byte 79 is LSB. For "internally calibrated" devices, Tx_I(Offset) should be set to zero , and useless.
80~81	2	Tx_PWR(Slope)	xx	Fixed decimal (unsigned) calibration data, transmitter

Address	Field Size (Byte)	Name of Field	Hex	Description
				coupled output power. Bit 7 of byte 80 is MSB, bit 0 of byte 81 is LSB. For "internally calibrated" devices, Tx_PWR(Slope) should be set to 1, and useless.
82~83	2	Tx_PWR(Offset)	xx	Fixed decimal (signed two's complement) calibration data, transmitter coupled output power. Bit 7 of byte 82 is MSB, bit 0 of byte 83 is LSB. For "internally calibrated" devices, Tx_PWR(Offset) should be set to zero, and useless.
84~85	2	T (Slope)	xx	Fixed decimal (unsigned) calibration data, internal module temperature. Bit 7 of byte 84 is MSB, bit 0 of byte 85 is LSB. For "internally calibrated" devices, T(Slope) should be set to 1, and useless.
86~87	2	T (Offset)	xx	Fixed decimal (signed two's complement) calibration data, internal module temperature. Bit 7 of byte 86 is MSB, bit 0 of byte 87 is LSB. For "internally calibrated" devices, T(Offset) should be set to zero, and useless.
88~89	2	V (Slope)	xx	Fixed decimal (unsigned) calibration data, internal module supply voltage. Bit 7 of byte 88 is MSB, bit 0 of byte 89 is LSB. For "internally calibrated" devices, V(Slope) should be set to 1, and useless.
90~91	2	V (Offset)	xx	Fixed decimal (signed two's complement) calibration data, internal module supply voltage. Bit 7 of byte 90 is MSB. Bit 0 of byte 91 is LSB. For "internally calibrated" devices, V(Offset) should be set to zero, and useless.
92~94	3	Reserved	xx	Reserved
95	1	Checksum	xx	Byte 95 contains the low order 8 bits of the sum of bytes 0-94
96	1	Temperature MSB	xx	Internally measured module temperature.
97	1	Temperature LSB	xx	
98	1	Vcc MSB	xx	Internally measured supply voltage in transceiver.
99	1	Vcc LSB	xx	
100	1	TX Bias MSB	xx	Internally measured TX Bias Current.
101	1	TX Bias LSB	xx	
102	1	TX Power MSB	xx	Measured TX output power.
103	1	TX Power LSB	xx	
104	1	RX Power MSB	xx	Measured RX input power.
105	1	RX Power LSB	xx	
106~109	4	Reserved	xx	Reserved
110	1 Bit	Reserved	x	Reserved
	1 Bit	Soft TX Disable	x	Read/write bit that allows software disable of laser. Writing '1' disables laser.
	1 Bit	Reserved	x	Reserved

Address	Field Size (Byte)	Name of Field	Hex	Description
	1 Bit	Reserved	x	Reserved
	1 Bit	Reserved	x	Reserved
	1 Bit	TX Fault	x	Tx Fail Status: 1=TX Fail; 0=TX Normal
	1 Bit	LOS	x	Signal Detect Status. Active High.
	1 Bit	Reserved	x	Reserved
111	1	Reserved	xx	Reserved
112	1 Bit	Temp High Alarm	x	Set when internal temperature exceeds high alarm level.
	1 Bit	Temp Low Alarm	x	Set when internal temperature is below low alarm level.
	1 Bit	Vcc High Alarm	x	Set when internal supply voltage exceeds high alarm level.
	1 Bit	Vcc Low Alarm	x	Set when internal supply voltage is below low alarm level.
	1 Bit	TX Bias High Alarm	x	Set when TX Bias current exceeds high alarm level.
	1 Bit	TX Bias Low Alarm	x	Set when TX Bias current is below low alarm level.
	1 Bit	TX Power High Alarm	x	Set when TX output power exceeds high alarm level.
	1 Bit	TX Power Low Alarm	x	Set when TX output power is below low alarm level.
113	1 Bit	RX Power High Alarm	x	Set when Received Power exceeds high alarm level.
	1 Bit	RX Power Low Alarm	x	Set when Received Power is below low alarm level.
	1 Bit	Reserved	x	Reserved
	1 Bit	Reserved	x	Reserved
	1 Bit	Reserved	x	Reserved
	1 Bit	Reserved	x	Reserved
	1 Bit	Reserved	x	Reserved
	1 Bit	Reserved	x	Reserved
114	1	Reserved	xx	Reserved
115	1	Reserved	xx	Reserved
116	1 Bit	Temp High Warning	x	Set when internal temperature exceeds high warning level.
	1 Bit	Temp Low Warning	x	Set when internal temperature is below low warning level.
	1 Bit	Vcc High Warning	x	Set when internal supply voltage exceeds high warning level.
	1 Bit	Vcc Low Warning	x	Set when internal supply voltage is below low warning level.
	1 Bit	TX Bias High warning	x	Set when TX Bias current exceeds high warning level.
	1 Bit	TX Bias Low Warning	x	Set when TX Bias current is below low warning level.
	1 Bit	TX Power High Warning	x	Set when TX output power exceeds high warning level.
	1 Bit	TX Power Low Warning	x	Set when TX output power is below low warning level.
117	1 Bit	RX Power High Warning	x	Set when Received Power exceeds high warning level.

Address	Field Size (Byte)	Name of Field	Hex	Description
	1 Bit	RX Power Low Warning	x	Set when Received Power is below low warning level.
	1 Bit	Reserved	x	Reserved
	1 Bit	Reserved	x	Reserved
	1 Bit	Reserved	x	Reserved
	1 Bit	Reserved	x	Reserved
	1 Bit	Reserved	x	Reserved
	1 Bit	Reserved	x	Reserved
118	1	Reserved	xx	Reserved
119	1	Reserved	xx	Reserved
120-127	8	Vendor Specific	xx	Vendor Specific
128-247	120	User EEPROM	00	User writable EEPROM
248-255	8	Vendor Specific	00	Vendor Specific

15. Ordering Information

Part Number	PIN 3 Definition	Product description	RoHS Compliant	Notes
HOLS-P3420345S-CL	TX_DIS	GPON Class B+ ONU SFP, -5~70°C	RoHS-6	1
HOLS-P3420345S-IL	TX_DIS	GPON Class B+ ONU SFP, -40~85°C	RoHS-6	1
HOLS-P3420345S-CH	TX_EN	GPON Class B+ ONU SFP, -5~70°C	RoHS-6	2
HOLS-P3420345S-IH	TX_EN	GPON Class B+ ONU SFP, -40~85°C	RoHS-6	2

Note 1: TX_DIS: Low level input active Transmitter.

Note 2: Tx_EN: High level input active Transmitter.