Feature

- ✧ Single fiber bi-directional data links with symmetric1.25Gbps upstream and 1.25Gbps downstream
- ✧ Integrated with micro-optics WDM filter for dual wavelength Tx/Rx operation at 1310/ 1490nm
- ✧ 1310nm burst-mode transmitter with FP laser
- ✧ 1490nm continuous-mode receiver with PIN-TIA
- ✧ Digital Diagnostic Monitoring Function(DDM)
- ✧ 0 to 70℃ operating temperature
- ✧ 2X10 SFF package with SC/PC pigtail
- ✧ Single 3.3V power supply
- ✧ LVPECL compatible data input/output interface
- ✧ LVTTL transmitter disable control
- ✧ LVTTL transmitter laser failure alarm
- ✧ LVTTL receiver signal-detected indication
- ✧ Low EMI and excellent ESD protection
- ✧ Class I laser safety standard IEC-60825 compliant
- ✧ RoHS Compliance
- ✧ Compliant with SFF MSA and SFF-8472
- ✧ Compliant with IEEE 802.3ah™-2004

Applications

- ✧ Gigabit Ethernet Passive Optical Networks (GE-PON) – ONU side

Description

HONU- 11C211L22 is Optical Network Unit (ONU) for IEEE802. 3ah-2004 1000BASE-PX20-U applications. The transceiver is the high performance module for 1.25Gbps data link in single fiber by using 1310nm burst-mode transmitter and 1490nm continuous- mode receiver. It is capable of serving up to 16 subscribers in advanced TDM P2MP FTTH equipment over distances of up to 20 km. The transmitter section uses a multiple quantum well 1310nm FP laser and is Class I laser compliant product according international safety standard IEC-60825.The receiver section uses an integrated 1490 nm PIN and preamplifier mounted an optical header and limiting post-amplifier IC. The LVTTL compatible Tx Disable feature controls the laser transmitter and the LVTTL compatible Rx Signal-Detect (SD) feature monitors the optical input signal, the device parameters can be accessed in real time by the I C data interface, including the ALARM and WARNING values for temperature, Vcc, Tx BIAS, Tx Burst Mode Optical Power and Rx receiver optical power.

Absolute Maximum Ratings

Absolute Maximum Ratings are those values, beyond which, some damages may occur to the devices. Exposure to conditions above the Absolute Maximum Ratings listed in Table 1 may negatively impact the reliability of the products.

Table 1 - Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Note
Storage Ambient Temperature	TSTG	-40	85	°C	
Operating Ambient Temperature	TOP	0	70	°C	
Operating Humidity	HOP	5	90	%	
Power Supply Voltage	VCC	0	4.0	V	
Input Voltage		GND	Vcc	V	
Soldering Temperature			400	°C	1
Bending Radius		30		mm	
Pigtail Fiber Contact Temperature			85	°C	

Note 1: Only for soldering by iron and 10 seconds on leads only

Recommended Operating Conditions

Table 2 - Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit	Note
Power Supply Voltage	VCC	3.13	3.3	3.47	V	3.3V±5%
Operating Ambient Temperature	TOPR	0		75	°C	
Operating Humidity Range	HOPR	5		95	%	
Data Rate(Upstream/Downstream)			1.25/1.25		Gbit/s	
Data Rate Drift -		-100		100	PPM	

Optical and Electrical Characteristics

Table 3 - Transmitter Optical and Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Note
Optical Center Wavelength	λC	1270		1350	nm	
Optical Spectrum Width(RMS)	Δλ			3.0	nm	
Average Launch Power (BOL)	P BOUT	0		+4	dBm	
Average Launch Power-OFF Transmitter	P EOFF			-45	dBm	1
Extinction Ratio	ER	9			dB	2
Rise/Fall Time (20%-80%)	TR/TF			260	ps	3
Optical Return Loss Tolerance				15	dB	
Transmitter Reflectance				-12	dB	

Optical Eye Diagram	Compliant With IEEE Std 802.3ah™-2004					
Burst Turn On Time	Ton			30	ns	
Burst Turn Off Time	Toff			30	ns	
Data Input Differential Swing	V_{IN}	200		1600	mV	4
Input Differential Impedance	Z_{IN}	90	100	110	Ω	
Power Supply Current	ICC_TX			150	mA	
Transmitter Disable Voltage - Low	VTDIS L	0		0.8	V	5
Transmitter Disable Voltage - High	VTDIS,H	2.4		Vcc	V	
Laser Failure Alarm Voltage - Low	VLFA,L	0		0.8	V	6
Laser Failure Alarm Voltage - High	VLFA,H	2.4		Vcc	V	

Note 1: Launched into 9/125um Single Mode Fiber.
Note 2: Measured with PRBS 2^7-1 test pattern @1.25 Gbit/s.
Note 3: Measured with the Bessel-Thompson filter OFF, 20% to 80%.
Note 4: Compatible with LVPECL input, AC coupled internally.
Note 5: TX_DIS (See Pin Function Definitions)
Note 6: LAS_nFAIL (See Pin Function Definitions)

Table 4 - Receiver Optical and Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Note
Operating Wavelength		1480	1490	1500	nm	
Sensitivity	PSEN			-27	dBm	1
Saturation	Pov	-3			dBm	
SD Assert Level	PLOSA			-28	dBm	2
SD Deassert Level	PLOSD	-45			dBm	3
SD Hysteresis	PLOSA- PLOSD	0.5		5	dB	
Receiver Reflectance				-12	dB	
Power Supply Current	ICC_RX			150	mA	
Data Output Differential Swing	VOUT	400		1000	mV	4
SD Voltage - Low	VSD, L	0		0.8	V	
SD Voltage - High	VSD, H	2.4		VCC	V	
SD Assert Time	TASS			100	us	
SD Deassert Time	TDAS			100	us	

Note 1: Measured with a PRBS 2^{7-1} test pattern @1.25Gbit/s and ER=10dB, BER =$10^{-12.}$
Note 2: An increase in optical power above the specified level will cause Rx Signal-Detect (SD) output to switch from a low state to a high state.
Note 3: A decrease in optical power below the specified level will cause Rx Signal-Detect (SD) output to switch from a high state to a low state.

Note 4: LVPECL output, AC coupled internally, guaranteed in the full range of input optical power (-3dBm to -27dBm) (See Recommended Interface Circuit)

Table5- Digital Diagnostic Monitor Accuracy

Parameter	Unit	Accuracy	Range	Calibration
Tx Optical Power	dB	±3	Full temperature range	Internal
		±2	Room temperature	
Rx Optical Power	dB	±3	-3dBm to -26dBm	Internal
Bias Current	%	±10	Id:1-100mA, Recommended operating conditions	Internal
Power Supply Voltage	%	±3	Vcc: 3.0-3.6V, Recommended operating conditions	Internal
Internal Temperature	℃	±3	Recommended operating conditions	Internal

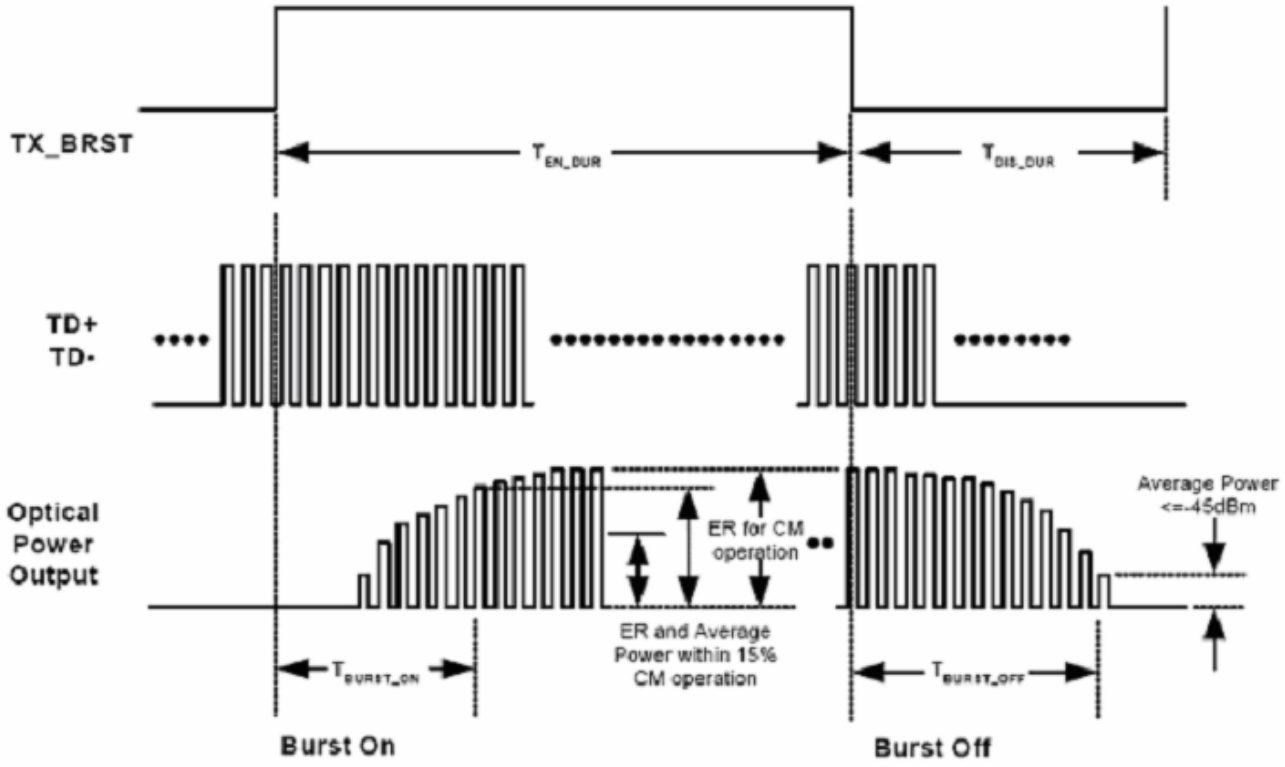

Figure 1 Timing Parameter Definition in Burst Mode Sequence

Recommended Interface Circuit

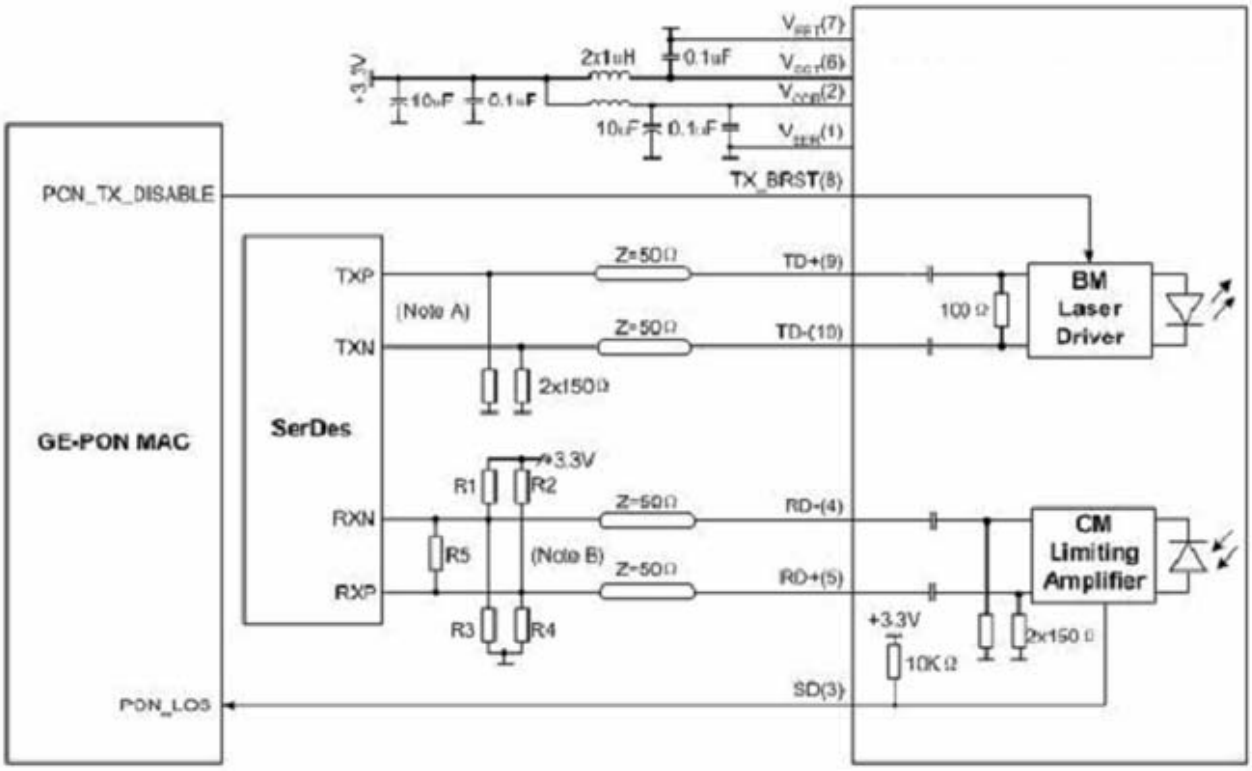

Figure 2 Recommended Interface Circuit

Note A: Open emitter output internally.
Note B: LVPECL output, AC coupled internally. Input stage in SerDes IC is assumed with high impedance and internal bias to Vcc-1.3V R1=R2=R3=R4=N.C, R5=100Ω. Input stage in SerDes IC is assumed without internal bias to Vcc-1.3V, R1=R2=82Ω, R3=R4=130Ω,R5=N.C

Pin Definitions

Table 6 show the 2X10 SFF pin information of electrical interface and mounting studs.

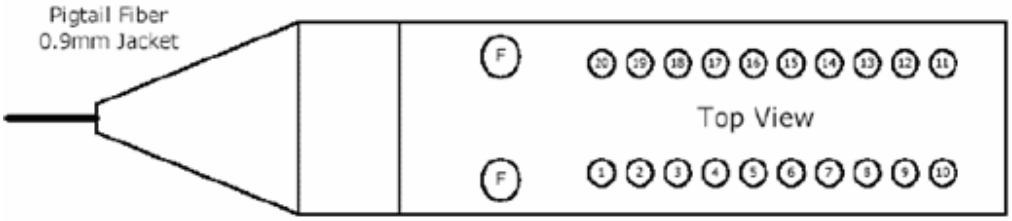

Figure 3 2X10 SFF Outline

Table 6 - Pin Function Definitions (EPON ONU SFF 2X10)

Pin No.	Name	Description	Notes
1	NC	Internally Connected	Do not use
2	VEER	Receiver Signal Ground	
3	VEER	Receiver Signal Ground	
4	NC	Internally Connected	Do not use
5	NC	Internally Connected	Do not use
6	VEER	Receiver Signal Ground	
7	VCCR	Receiver Power Supply	
8	SD	Receiver Signal-Detect Indication	1
9	RD-	Inverted Receiver Data Output	2
10	RD+	Non-inverted Receiver Data Output	
11	VCCT	Transmitter Power Supply	
12	VEET	Transmitter Signal Ground	
13	TX_DIS	Transmitter Disable	3
14	TD+	Transmitter Non-inverted Data Input	4
15	TD-	Transmitter Inverted Data Input	
16	VEET	Transmitter Signal Ground	
17	SCL	I^2C Serial Clock	LVTTL, External Pull-Up Required
18	SDA	I^2C Serial DATA	LVTTL, External Pull-Up Required
19	TX_Fault	Transmitter Fault	5
20	VEET	Transmitter Signal Ground	

Note 1: TTL logic output, with internal 10KΩ pull-up resistor.

Note 2: LVPECL AC coupled internally.

Note 3: Transmitter Enable Control pin, A low level Enable TX optical output.

Note 4: LVPECL input, AC coupled internally.

Note 5: TTL logic output, pulled up by a 4.7-10K. resistor on the host board.Laser Normal State: High; Laser Failure State: Low

Note6: NC pin should not be connected to any circuit of the host board.

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(02h)
1	1	Reserved	Extended identifier of type serial transceiver (04h)
2	1	Connector	Code of optical connector type (0Bh=SC/PC)

3-10	8	Transceiver	Gigabit Ethernet 1000Base-BX
11	1	Encoding	8B10B (01h)
12	1	BR,Nominal	Nominal baud rate, unit of 100Mbps
13-14	2	Reserved	(0000h)
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
18	1	Length(Copper)	Link length supported for copper, units of meters
19	1	Reserved	
20-35	16	Vendor Name	SFP vendor name: Hi-Optel
36	1	Reserved	
37-39	3	Vendor OUI	SFP transceiver vendor OUI ID
40-55	16	Vendor PN	Part Number: "HONU-xxxxxx" (ASCII)
56-59	4	Vendor rev	Revision level for part number
60-62	3	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	Hi-Optel's Manufacturing date code
92-94	3	Reserved	
95	1	CCEX	Check code for the extended ID Fields (addresses 64 to
Vendor Specific ID Fields			
96-127	32	Readable	Hi-Optel specific date, read only

Serial ID Memory Contents: (A2H)

Address	# Bytes	Name	Description
00-01	2	Temp High Alarm	MSB at low address
02-03	2	Temp Low Alarm	MSB at low address
04-05	2	Temp High Warning	MSB at low address
06-07	2	Temp Low Warning	MSB at low address
08-09	2	Voltage High Alarm	MSB at low address
10-11	2	Voltage Low Alarm	MSB at low address
12-13	2	Voltage High Warning	MSB at low address
14-15	2	Voltage Low Warning	MSB at low address

16-17	2	Bias High Alarm	MSB at low address
18-19	2	Bias Low Alarm	MSB at low address
20-21	2	Bias High Warning	MSB at low address
22-23	2	Bias Low Warning	MSB at low address
24-25	2	TX Power High Alarm	MSB at low address
26-27	2	TX Power Low Alarm	MSB at low address
28-29	2	TX Power High Warning	MSB at low address
30-31	2	TX Power Low Warning	MSB at low address
32-33	2	RX Power High Alarm	MSB at low address
34-35	2	RX Power Low Alarm	MSB at low address
36-37	2	RX Power High Warning	MSB at low address
38-39	2	RX Power Low Warning	MSB at low address
40-55	16	Reserved	Reserved for future monitored quantities

Address	#Bytes	Name	Description
56-59	4	Rx_PWR(4)	Single precision floating point calibration data - Rx optical power. Bit 7 of byte 56 is MSB. Bit 0 of byte 59 is LSB.
60-63	4	Rx_PWR(3)	Single precision floating point calibration data - Rx optical power. Bit 7 of byte 60 is MSB. Bit 0 of byte 63 is LSB.
64-67	4	Rx_PWR(2)	Single precision floating point calibration data - Rx optical power. Bit 7 of byte 64 is MSB, bit 0 of byte 67 is LSB.
68-71	4	Rx_PWR(1)	Single precision floating point calibration data - Rx optical power. Bit 7 of byte 68 is MSB, bit 0 of byte 71 is LSB.
72-75	4	Rx_PWR(0)	Single precision floating point calibration data - Rx optical power. Bit 7 of byte 72 is MSB, bit 0 of byte 75 is LSB.
76-77	2	Tx_I(Slope)	Fixed decimal (unsigned) calibration data, laser bias current. Bit 7 of byte 76 is MSB, bit 0 of byte 77 is LSB.
78-79	2	Tx_I(Offset)	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
80-81	2	Tx_PWR(Slope)	Fixed decimal (unsigned) calibration data,transmittercoupled output power.Bit 7 of byte 80 is MSB, bit 0 of byte81 is LSB.
82-83	2	Tx_PWR(Offset)	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.
84-85	2	T(Slope)	Fixed decimal (unsigned) calibration data,internal module temperature.Bit 7 of byte 84 is MSB, bit 0 of byte 85 is LSB.
86-87	2	T(Offset)	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.

88-89	2	V(Slope)	Fixed decimal (unsigned) calibration data,internal module supply voltage.Bit 7 of byte 88 is MSB, bit 0 of byte 89 is LSB.
90-91	2	V(Offset)	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.
92-95	4	Reserved	Reserved

Byte	Bit	Name	Description
Converted analog values. Calibrated 16 bit data			
96	All	Temperature MSB	Internally measured module temperature.
97	All	Temperature LSB	
98	All	Vcc MSB	Internally measured supply voltage in transceiver.
99	All	Vcc LSB	
100	All	TX Bias MSB	Internally measured TX Bias Current.
101	All	TX Bias LSB	
102	All	TX Power MSB	Measured TX output power.
103	All	TX Power LSB	
104	All	RX Power MSB	Measured RX input power.
105	All	RX Power LSB	
106	All	Reserved MSB	Reserved for 1st future definition of digitized analog input
107	All	Reserved LSB	Reserved for 1st future definition of digitized analog input
108	All	Reserved MSB	Reserved for 2nd future definition of digitized analog input
109	All	Reserved LSB	Reserved for 2nd future definition of digitized analog input
Optional Status/Control Bits			
110	7	TX Disable State	Digital state of the TX Disable Input Pin. Not supported.
110	6	Soft TX Disable	Read/write bit that allows software disable of laser. Not supported.
110	5	Reserved	
110	4	RX Rate Select State	Digital state of the SFP RX Rate Select Input Pin. Not supported.
110	3	Soft RX Rate Select	Read/write bit that allows software RX rate select.
			Not supported.
110	2	TX Fault	Digital state of the TX Fault Output Pin.
110	1	LOS	Digital state of the LOS Output Pin.
110	0	Data Ready	Indicates transceiver has achieved power up and data is ready
111	7-0	Reserved	Reserved.

Byte	Bit	Name	Description
Reserved Optional Alarm and Warning Flag Bits			
112	7	Temp High Alarm	Set when internal temperature exceeds high alarm level.
112	6	Temp Low Alarm	Set when internal temperature is below low alarm level.
112	5	Vcc High Alarm	Set when internal supply voltage exceeds high alarm level.
112	4	Vcc Low Alarm	Set when internal supply voltage is below low alarm level.
112	3	TX Bias High Alarm	Set when TX Bias current exceeds high alarm level.
112	2	TX Bias Low Alarm	Set when TX Bias current is below low alarm level.
112	1	TX Power High Alarm	Set when TX output power exceeds high alarm level.
112	0	TX Power Low Alarm	Set when TX output power is below low alarm level.
113	7	RX Power High Alarm	Set when Received Power exceeds high alarm level.
113	6	RX Power Low Alarm	Set when Received Power is below low alarm level.
113	5	Reserved Alarm	
113	4	Reserved Alarm	
113	3	Reserved Alarm	
113	2	Reserved Alarm	
113	1	Reserved Alarm	
113	0	Reserved Alarm	
114	All	Reserved	
115	All	Reserved	
116	7	Temp High Warning	Set when internal temperature exceeds high warning level.
116	6	Temp Low Warning	Set when internal temperature is below low warning level.
116	5	Vcc High Warning	Set when internal supply voltage exceeds high warning level.
116	4	Vcc Low Warning	Set when internal supply voltage is below low warning level.
116	3	TX Bias High Warning	Set when TX Bias current exceeds high warning level.
116	2	TX Bias Low Warning	Set when TX Bias current is below low warning level.
116	1	TX Power High Warning	Set when TX output power exceeds high warning level.
116	0	TX Power Low Warning	Set when TX output power is below low warning level.
117	7	RX Power High Warning	Set when Received Power exceeds high warning level.
117	6	RX Power Low Warning	Set when Received Power is below low warning level.
117	5	Reserved Warning	
117	4	Reserved Warning	
117	3	Reserved Warning	
117	2	Reserved Warning	
117	1	Reserved Warning	
117	0	Reserved Warning	

118	All	Reserved	
119	All	Reserved	

Byte	# Byte	Name	Description
120-127	8	Vendor Specific	00h.
128-255	128		Writable Memory

Mechanical Design Diagram

The form factor is 2×10 SFF with pigtail fiber. The pigtail fiber has a length 520 - 550mm and 30mm minimum bending radius. The fiber connector type is SC/PC. The mechanical design diagram is shown in Figure 4. (Dimension in mm)

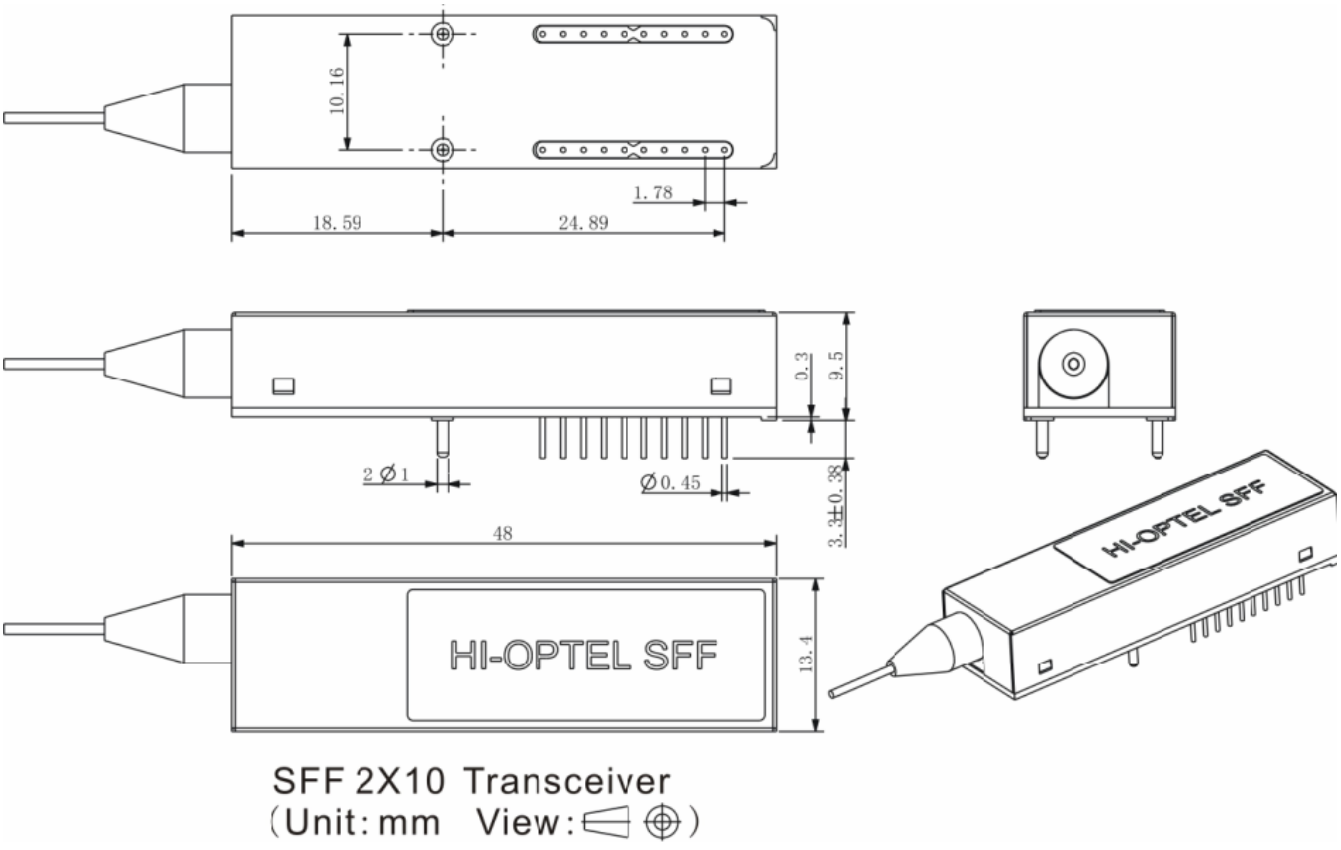

Figure 4: Mechanical Diagram

Ordering Information:

HONU-□□□□□□□□□□□

A B C D E F G H I J

A	Downstream Data Rate	1= 1.25Gb/s	2 = 2.5Gb/s	
B	Upstream Data Rate	1 = 1.25Gb/s	2 = 2.5Gb/s	
C	Operating Temperature	C = 0~70℃	E = -20~70℃	H = -40~85℃
D	Transmission Distance	1 = 10KM	2 = 20KM	
E	Wavelength	1 =TX1310nm/RX1490nm		
F	LD/PD Type	1 = FP/PIN	2 = FP/APD	3 = DFB/PIN
		4 = DFB/APD		
G	TX Enable	L = Low Level	H = High Level	
H	Package Type	1 = SFF 2X5Pin	2 = SFF 2X10 Pin	3 = SFP
I	Connector	1 = SC/PC Receptacle	2 = SC/PC with Pigtail	3 = SC/APC with Pigtail
J	Customer Specific Code	NO = Blank		