



NG-PON2 ONU Small Form Factor 10Gb/s (XFP)

PAN2XUXSS3I

Revision 1

Product Description:

The PAN2XUXSSA3I transceiver is a hot-pluggable high-performance module for single-fiber communication and is intended for NG-PON2 ONU application in an XFP housing. It can tune and operate in full 4 channels/wavelengths, according to ITU G.989.2, with 9.95328Gbps in both continuous-mode downstream and burst-mode upstream, and supports distances up to 20 km. The module transmitter can be controlled by the LVTTTL TX_BEN and TX_MOD_DIS functions, and the receiver has LVTTTL RX_LOS signaling.

This module also provides digital diagnostic information of its operating conditions and status, including module temperature, transmitter and receiver optical power and supply voltage according to ITU G989.2 recommendation.

Features:

- 10 Gbit/s laser diode
- 10 Gbit/s high-sensitive APD-TIA
- NG-PON2 compliant
- Class 3 tuning time
- I-Temp case temperature
- SC/APC interface

Applications:

- NG-PON2
- FTTH
- WDM systems

Revision History

Revision nr.	Description	Date
1	Initial release	November 2018

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units	Notes
Storage Ambient Temperature	T _{stg}	-40	+85	°C	
Module Supply Voltage	V _{CC33}	-	3.6	V	

Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Units	Notes
Case Operating Temperature	T _{CASE}	-40	25	85	°C	1
Module Supply Voltage	V _{CC33}	3.15	3.3	3.6	V	2
Current Consumption	I _{CC33}	-	1	-	A	
Peak Current Consumption	I _{CC33Peak}	-	1.8	2.5	A	3

Note 1: XFP module must be in direct contact (mechanically attached) to the XFP Cage for correct heat dissipation.

Note 2: Inductor/Ferrite bead for host filtering must be careful chosen, with low DCR. Module supply voltage should always be above the minimum specified.

Note 3: Duration is 500us and start with tuning request

Transmitter Electrical Characteristics

Parameter	Min	Typ	Max	Units	Notes
TX Differential Input Impedance	90	100	110	Ω	1
10Gb/s Tx Differential Input Amplitude	120	-	900	mV	
BEN = HIGH (Transmitter OFF / DISABLED)	2.0	-	V _{cc33}	V	
BEN = LOW (Transmitter ON / ENABLED)	0	-	0.8	V	

Note 1: Data pins are AC-Coupled

Receiver Electrical Characteristics

Parameter	Min	Typ	Max	Units	Notes
Rx Differential Output Impedance	90	100	110	Ω	1
10Gb/s Rx_Data Differential Output Voltage Amplitude (CML)	600	700	800	mV	
Rx_LOS = HIGH (Receiver OFF)	2	-	V _{cc33}	V	
Rx_LOS = LOW (Receiver ON)	0	-	0.5	V	

Note 1: Data pins are AC-Coupled

Transmitter Electro-Optical Characteristics

Parameter	Min	Typ	Max	Unit	Note
Laser Type	C-Band DML				
Operating Bit Rate		9.95	11.3	Gbps	9.95328 Gbit/s
Wavelength Band	1532		1540	nm	G989.2 narrow band
Tuned Spectral Excursion	f ₀ -20		f ₀ +20	GHz	f ₀ tuned channel
Tuning Range	100		400	GHz	4 Channel NG-PON2
Tuning Time	25	400	1000	ms	Class 3
Side Mode Suppression Ratio	30			dB	
Optical Path Penalty	0	0.5	2	dB	Optical Path Penalty, Output power and ER are traded according to G989.2 amendments
Output Power	+4		+9	dBm	
Extinction Ratio	4	4.6	6	dB	

Receiver Electro-Optical Characteristics

Parameter	Min	Typ	Max	Unit	Note
Receiver Type	APD/TIA Receiver				
Operating Bit Rate			10	Gbps	9.95328 Gbit/s
Wavelength Band	1596		1601	nm	
Bandwidth (-3dB)			12	GHz	
APD Responsivity	0.6	0.75		A/W	CW, M=1, $\lambda = 1597$ nm
APD Damage Power			-5	dBm	
Sensitivity	-28	-29		dBm	BER : 1×10^{-3} @ 10 Gbps EML source ER > 8.2 dB
Tuning Time	25	400	1000	ms	

Filters Specification

Band Pass filter:

Parameter	Symbol	Min.	Max.	Unit	Note
Pass band insertion loss	IL		<0.3	dB	$\lambda=1596 \sim 1599.5$ nm
Reject band isolation	RB1	≥ 40		dB	$\lambda=1250 \sim 1590$ nm
	RB2	≥ 40		dB	$\lambda=1602.5 \sim 1640$ nm

Memory Map

Table 1 - Digital Diagnostic Monitoring

Address	Name of Fields	Value	Description
0	Identifier	0x06	XFP module
1	Signal Conditioner Control	0x20	Data rate control = 9.95 Gb/s
2-57	Alarm and Warning Flags	-	See Table 4
58	VPS Control	0x00	Not supported
59	VPS Control	0x00	Not supported
60-69	Reserved	-	PICadvanced reserved
70	Acceptable BER	0x00	Not required
71	Actual BER	0x00	Not required
72-73	Wavelength Set MSB	0x00	Optional. Alternative method by using channels number setting [112-113].
74-75	Wavelength Error LSB	0x00	
76	FEC – Amplitude Adjustment	0x00	Not required
77	FEC – Phase Adjustment	0x00	Not required
78-79	FEC - Reserved	0x00	Not required
80-87	Latched Interrupt Flag Fields	-	See Table 5
88-95	Interrupt Masking bits	-	Not required
96-97	Temperature	-	Implemented
98-99	3.3V Supply Voltage (VCC)	Varies	Internally measured module supply voltage.
100-101	TX Bias	Varies	Implemented
102-103	TX Power	Varies	Implemented
104-105	RX Power	Varies	Implemented



106-107	AUX 1	-	Not used
108-109	AUX 2	-	Not used
110	General Control / Status bits	-	Not implemented
111	CDR Control	-	Not implemented
112-113	Channels Number Setting	Varies [0x00-0x03]	TX Channel – 112 RX Channel - 113
114-115	Frequency Error	-	Not used
116-117	TX Optical Power	-	Not used
118	Serial Interface Read/Write Error Checking	-	Optional / Not implemented yet
119-122	Password Change Entry Area	XX XX XX XX (bytes)	Implemented.
123-126	Password Entry Area	XX XX XX XX (bytes)	Implemented. Defined by vendor
127	Page Select Byte	Varies	Page 1 - Default Page 2 - EEPROM Memory Page 3 – PICadvanced reserved

SERIAL ID Memory Map

Table 2- Base ID Field

Address	Name of Fields	Value	Description
128	Identifier	0x06	XFP module
129	External Identifier	0x98	3.5 W max. power dissipation; Module with RX CDR function; CLEI code present in table 02h.
130	Connector	0x01	SC Connector
131-138	Transceiver	0x00,0x00,0x00,0x00, 0x00,0x00,0x00,0x00	Not supported
139	Encoding	0x10	NRZ encoding mechanism
140	BR – Min	0x63	9.95 (Gbits/s)
141	BR – Max	0x71	11.3 (Gbits/s)
142	Length (SMF) - km	0x14	20 km
143	Length (E-50um)	0x00	Not supported
144	Length (50um)	0x00	Not supported
145	Length (62.5 um)	0x00	Not supported
146	Length (Copper)	0x00	Not supported
147	Device Technology	0xFF	Active wavelength control; Cooled Transmitter; APD Detector; Transmitter tunable
148-163	Vendor Name	PICADVANCED (ASCII)	
164	CDR Support	0xF8	CDR Support 9.95 to 11.3 Gb/s
165-167	Vendor OUI	-	Not implemented
168-183	Vendor PN	PAN2XUXSSA3I (ASCII)	



184-185	Vendor rev	0x04 (major number) 0x01 (minor number) (example)	Vendor Revision number (original)
186 - 187	Laser Wavelength	-	Not implemented yet – 4 Nominal Laser Wavelength (4 Channels)
188-189	Wavelength Tolerance	-	Not implemented yet
190	Max Case Temperature	0x55	Max case temperature = 85°C
191	CC_BASE	-	Checksum of byte 128-190

Table 3- Extended ID Field

192	Power Supply	0xAF	Maximum Power Dissipation (3.5W)
193	Power Supply	-	Not Supported
194	Power Supply	0x0A	Maximum Current required by 3.3V Supply (1000 mA)*
195	Power Supply	-	Not Supported
196-211	Vendor SN	1012000001 (ASCII) (Example)	Serial Number provided by Vendor
212-219	Vendor Date Code	YYMMDD00 (ASCII)	Vendor Manufacturing Date
220	Diagnostic Monitoring Type	0x08	No BER Support; Received Power measurement type: Average Power.
221	Enhanced Options	0x42	Soft TX Disable implemented Wavelength tunability
222	Aux Monitoring	0x00	Not used
223	CC_EXT	-	Checksum of byte 192 to 222
224- 225	Vendor rev	0x04 (major number) 0x01 (minor number) (example)	Vendor revision number (update)
226 - 255	Vendor Specific EEPROM	-	Not Filled

**Still under analysis*

Table 4 - Alarm and Warning Thresholds

Address	Name of Fields	Value	Description
2	Temp High Alarm MSB	0x01	95 °C
3	Temp High Alarm LSB	0x68	
4	Temp Low Alarm MSB	0x03	-45 °C
5	Temp Low Alarm LSB	0xEC	
6	Temp High Warning MSB	0x01	85 °C
7	Temp High Warning LSB	0x40	
8	Temp Low Warning MSB	0x00	-35 °C
9	Temp Low Warning LSB	0x14	
10	3.3 Voltage High Alarm MSB	0x8C	3.60 V



11	3.3 Voltage High Alarm LSB	0xA0	
12	3.3 Voltage Low Alarm MSB	0x77	3.05 V
13	3.3 Voltage Low Alarm LSB	0x24	
14	3.3 Voltage High Warning MSB	0x86	3.50 V
15	3.3 Voltage High Warning LSB	0xC4	
16	3.3 Voltage Low Warning MSB	0x7B	3.15 V
17	3.3 Voltage Low Warning LSB	0x0C	
18	Bias High Alarm MSB	0xC3	100 mA
19	Bias High Alarm LSB	0x50	
20	Bias Low Alarm MSB	0x09	5 mA
21	Bias Low Alarm LSB	0xC4	
22	Bias High Warning MSB	0xAF	90 mA
23	Bias High Warning LSB	0xC8	
24	Bias Low Warning MSB	0x13	10 mA
25	Bias Low Warning LSB	0x88	
26	TX Power High Alarm MSB	0x29	+12 dBm
27	TX Power High Alarm LSB	0x45	
28	TX Power Low Alarm MSB	0x04	+2 dBm
29	TX Power Low Alarm LSB	0x20	
30	TX Power High Warning MSB	0x14	9 dBm
31	TX Power High Warning LSB	0xAF	
32	TX Power Low Warning MSB	0x06	+4 dBm
33	TX Power Low Warning LSB	0x8A	
34	RX Power High Alarm MSB	0x9B	-7 dBm
35	RX Power High Alarm LSB	0xE2	
36	RX Power Low Alarm MSB	0x00	-33 dBm
37	RX Power Low Alarm LSB	0x64	
38	RX Power High Warning MSB	0x62	-9 dBm
39	RX Power High Warning LSB	0x5A	
40	RX Power Low Warning LSB	0x00	-30 dBm
41	RX Power Low Warning LSB	0xC8	
42-43	AUX 1 High Alarm	-	
44-45	AUX 1 Low Alarm	-	
46-47	AUX 1 High Alarm	-	Not used
48-49	AUX 1 Low Alarm	-	
50-51	AUX 1 High Alarm	-	
51-53	AUX 1 Low Alarm	-	
54-55	AUX 1 High Alarm	-	Not used
56-57	AUX 1 Low Alarm	-	

Table 5 - Latched Interrupt Flag Fields

Address	Name of Fields	Value	Description
80[7]	L-Temp High Alarm	Varies	Latched High Temp Alarm
80[6]	L-Temp Low Alarm	Varies	Latched Low Temp Alarm
80[5]	Reserved	-	Not used
80[4]	Reserved	-	Not used
80[3]	L-TX Bias High Alarm		Latched High TX Bias Alarm
80[2]	L-TX Bias Low Alarm	Varies	Latched Low TX Bias Alarm



80[1]	L-TX Power High Alarm	Varies	Latched High TX Power Alarm
80[0]	L-TX Power Low Alarm	Varies	Latched Low TX Power Alarm
81[7]	L-RX Power High Alarm	Varies	Latched High RX Power Alarm
81[6]	L-RX Power Low Alarm	Varies	Latched Low RX Power Alarm
81[5]	L-AUX1 High Alarm	-	Not used
81[4]	L-AUX1 Low Alarm	-	Not used
81[3]	L-AUX2 High Alarm	-	Not used
81[2]	L-AUX2 Low Alarm	-	Not used
81[1]	Reserved	-	Not used
81[0]	Reserved	-	Not used
82[7]	L-Temp High Warning	Varies	Latched High Temp Warning
82[6]	L-Temp Low Warning	Varies	Latched Low Temp Warning
82[5]	Reserved	-	Not used
82[4]	Reserved	-	Not used
82[3]	L-TX Bias High Warning	Varies	Latched High TX Bias Warning
82[2]	L-TX Bias Low Warning	Varies	Latched Low TX Bias Warning
82[1]	L-TX Power High Warning	Varies	Latched High TX Power Warning
82[0]	L-TX Power Low Warning	Varies	Latched Low TX Power Warning
83[7]	L-RX Power High Warning	Varies	Latched High RX Power Warning
83[6]	L-RX Power Low Warning	Varies	Latched Low RX Power Warning
83[5]	L-AUX1 High Warning	-	Not used
83[4]	L-AUX1 Low Warning	-	Not used
83[3]	L-AUX2 High Warning	-	Not used
83[2]	L-AUX2 Low Warning	-	Not used
83[1]	Reserved	-	Not used
83[0]	Reserved	-	Not used
84[7]	L-TX_NR	-	Not used
84[6]	L-TX_Fault	-	Not implemented yet
84[5]	L-TX CDR Not Locked	-	Not implemented yet
84[4]	L-RX_NR	-	Not used
84[3]	L-RX_LOS	-	Not implemented yet
84[2]	L-RX CDR Not Locked	-	Not implemented yet
84[1]	L-MOD_NR	-	Not used
84[0]	L-Reset Complete	-	Not used
85[7]	L-APD Supply Fault	Varies	Latched APD Supply Fault
85[6]	L-TEC Fault	Varies	Latched TEC fault
85[5]	L-Wavelength Unlocked	-	Not implemented yet
85[4]	Reserved	-	Not used
85[3]	Reserved	-	Not used
85[2]	Reserved	-	Not used
85[1]	Reserved	-	Not used
85[0]	Reserved	-	Not used
86[7]	L-VCC5 High Alarm	-	Not used
86[6]	L-VCC5 Low Alarm	-	Not used
86[5]	L-VCC3 High Alarm	Varies	VCC3 High Alarm Flag
86[4]	L-VCC3 Low Alarm	Varies	VCC3 Low Alarm Flag
86[3]	L-VCC2 High Alarm	-	Not used
86[2]	L-Vee5 Low Alarm	-	Not used
86[1]	L-Vee5 High Alarm	-	Not used
86[0]	L-Vee5 Low Alarm	-	Not used
87[7]	L-VCC5 High Warning	-	Not used



87[6]	L-VCC5 Low Warning	-	Not used
87[5]	L-VCC3 High Warning	Varies	VCC3 High Warning Flag
87[4]	L-VCC3 Low Warning	Varies	VCC3 Low Warning Flag
87[3]	L-VCC2 High Warning	-	Not used
87[2]	L-Vee5 Low Warning	-	Not used
87[1]	L-Vee5 High Warning	-	Not used
87[0]	L-Vee5 Low Warning	-	Not used

Note: Interrupt flag is enable when value is “1”.

XFP Pinout

Bottom of the board	Pin	Pin	Top of the Board
GND	1	30	GND
NC	2	29	TXP
NC	3	28	TXN
TX_SD	4	27	GND
BEN_Z	5	26	GND
NC	6	25	NC
GND	7	24	NC
VCC33	8	23	GND
VCC33	9	22	NC
SCL	10	21	MOD_DIS
SDA	11	20	NC
MOD_ABS	12	19	GND
NC	13	18	RXP
RX_LOS	14	17	RXN
GND	15	16	GND

Pin Description

Pin Name	Pin Number	Logic	Description	Notes
GND	1		Module Ground	1
NC	2		Not connected	
NC	3		Not connected	
TX_SD	4	LVTTTL-O	Transmitter Signal Detect. Is asserted high when transmitter is transmitting optical power	
BEN	5	LVTTTL-I	Burst Enable. Assert low to transmit optical power	
NC	6		Not connected	
GND	7		Module Ground	1
VCC33	8		Module 3.3V Power Supply	2
VCC33	9		Module 3.3V Power Supply	2
SCL	10	LVTTTL-I	2-wire Serial Interface Clock Line	3
SDA	11	LVTTTL-IO	2-wire Serial Interface Data Line	3
MOD_ABS	12	LVTTTL-O	Module Absent. Connected internally to module ground	3
NC	13		Not connected	
RX_LOS	14	LVTTTL-O	RX Loss of Signal. Is asserted low in normal operation	3
GND	15		Module Ground	1

GND	16		Module Ground	1
RXN	17	CML-O	RX inverted Data output	4
RXP	18	CML-O	RX non-inverted Data output	4
GND	19		Module Ground	1
NC	20		Not connected	
MOD_DIS	21	LVTTTL-I	Transmitter module disable. Assert high to enable the transmitter.	
NC	22		Not connected	
GND	23		Module Ground	1
NC	24		Not connected	
NC	25		Not connected	
GND	26		Module Ground	1
GND	27		Module Ground	1
TXN	28	CML-I	TX inverted Data output	4
TXP	29	CML-I	TX non-inverted Data output	4
GND	30		Module Ground	1

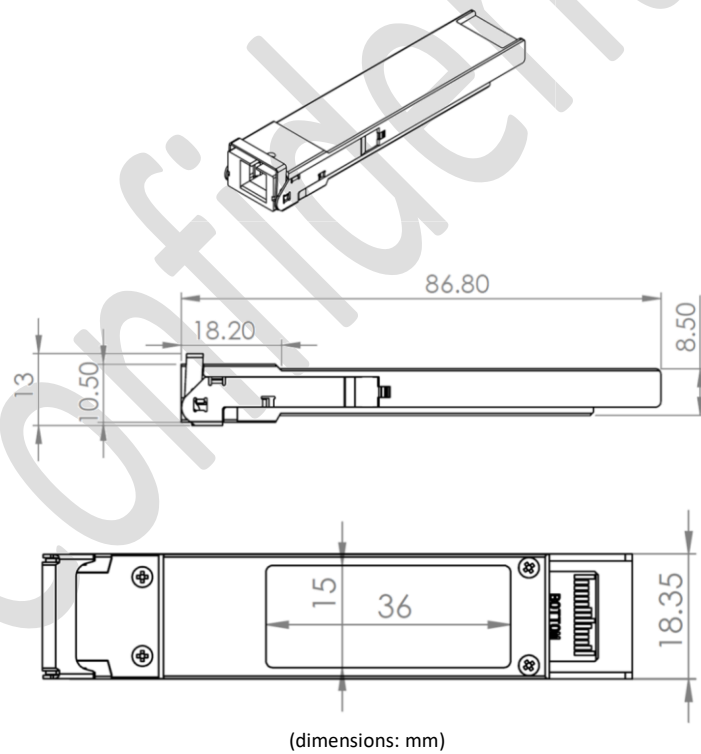
Note 1: The module signal ground contacts, should be isolated from the module case.

Note 2: Proper filtering is needed. Module supply voltage should always be above the minimum specified.

Note 3: Use 4.7K-10K pull-up resistors.

Note 4: AC-coupled.

Case outline and dimensions:



Laser Safety:

This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to laser notice nr. 50, dated June 24, 2007.

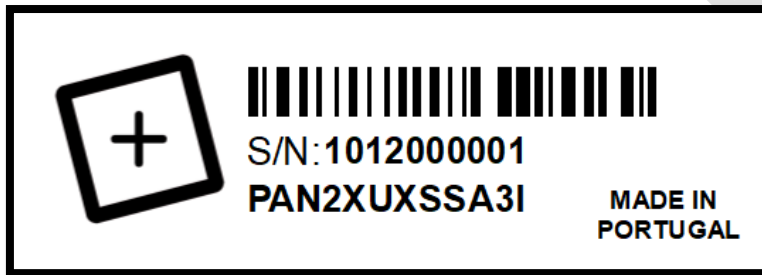
All versions of this product are a Class 1 laser product, tested according to IEC 60825-1:2014.



Caution – Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Branding Information:

Unit label:



Top Label (placed on the XFP):



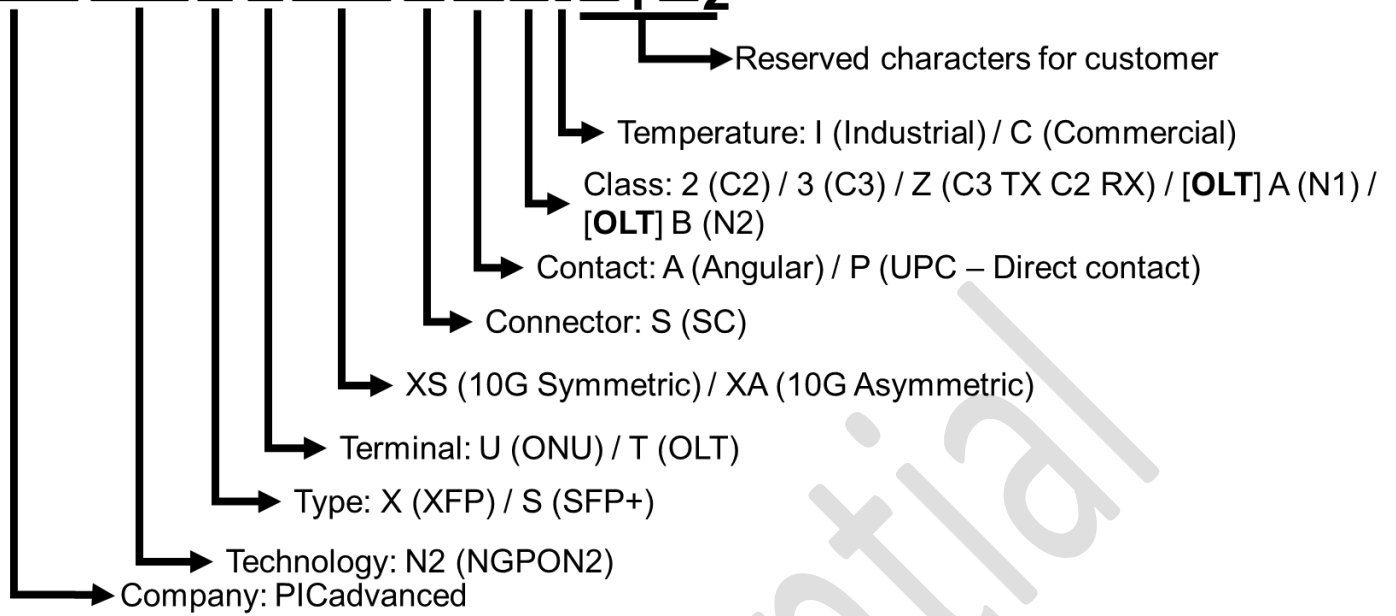
Unit box dimensions:

ID: 4.625"x2"x1.1875" (117mm x 51mm x 30mm)

OD: 5.3125"x2.25"x1.3125" (135mm x 57mm x 33mm)

Part Number Breakdown:

PAN2XUXSSA2IY₁Y₂



Order information:

Please contact PICadvanced for ordering and quotation: global@picadvanced.com