Product Specification

10Gb/s RoHs Compliant Pluggable SFP+ Transceiver

ASFP6410S31C

Features:

- Hot pluggable
- 10Gb/s serial optical interface
- 1310nm DFB Laser and PIN receiver
- Up to 10km on 9/125um SMF
- SFP+ MSA package with duplex LC connector
- 2-wire interface for management
- SFI High Speed Electrical Interface
- Very low EMI and excellent ESD protection
- +3.3V single power supply
- Power consumption less than 1 W
- Operating case temperature: 0~+70℃

Applications:

- 10G Base-LR/LW
- 10GE Storage, 8G Fiber Channel
- Other optical links

Standard

- Compliant to SFP+ SFF-8431 and SFF-8432
- Compliant with SFF-8472 Rev 10.2
- Compliant with IEEE 802.3ae 10GBASE-LR and 10GBASE-LW
- Compliant with FCC Class B
- Compliant with IEC 60825-1 Class 1 laser eye safe
- Compliant with Telcordia GR-468-CORE
- RoHS Compliant

✧

Description:

ASFP6410S31C is a very compact 10Gb/s optical transceiver module for serial optical communication applications, supporting data-rate of 10.3125Gbps (10GBASE-LR) or 9.953Gbps (10GBASE-LW), and transmission distance up to 2~10 km on SMF.

The transceiver consists of two sections: The high performance a 1310nm DFB Laser, Transmitter and high sensitivity PIN integrated with a TIA. Receiver.

A block diagram of the ASFP6410S31C SFP+ optical transceiver is shown below

The module is hot pluggable into the 20-pin connector. The high-speed electrical interface is based on low voltage logic, with nominal 100 Ohms differential impedance and AC coupled in the module. The optical output can be disabled by LVTTL logic high-level input of TX_Disable. Loss of signal (RX_LOS) output is provided to indicate the loss of an input optical signal of receiver. The receiver RATE_SELECT pin is not used by the transceiver

A 2-wire interface (SCL, SDA) is used for serial ID, digital diagnostics and other control /monitor functions

- **Absolute Maximum Ratings**

Parameter	Symbol	Min	Max	Unit
Storage Temperature	T_{ST}	-40	+85	℃
Supply Voltage	V_{CC3}	-0.5	+4.0	V
Relative Humidity			85	%

- **Recommend Operation Environment:**

Parameter	Symbol	Min	Typ	Max	Unit
Date Rate			10.3125		Gb/s
Supply Voltage	V_{CC}	+3.14	3.3	+3.47	V
Supply Current	I_{CC}			300	mA
Power Dissipation	PD			1.0	W
Operating Temperature	T_{OP}	0	-	+70	℃

- **Optical Characteristics (Condition: T_a=T_{OP})**

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Transmitter						
Date Rate		9.958	10.3125	11.1	Gb/s	
Optical Wavelength	λ	1260		1355	nm	
Average output power	Po	-8.2		0.5	dBm	1
Optical Extinction Ratio	ER	3.5			dB	1
RMS spectral width	Δλ			0.45	nm	
Optical Modulation Amplitude	OMA	-5.2			dBm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average launch power of Tx OFF	Pave_off			-30	dBm	
Dispersion penalty				3.2	dB	
Optical Eye Mask		IEEE802.3-2005 Compliant Compliant with ITU-T G.691 and GR-253-CORE				
Receiver						
Date Rate			10.3125		Gb/s	
Optical Wavelength	λ	1260		1355	nm	
Receiver Sensitivity	R			-14.4	dBm	2
Stressed Receiver Sensitivity	R			-12.6	dBm	2
Maximum Input Power	PMAX	0.5			dBm	
LOS De-Assert	LOSD			-15	dBm	
LOS Assert	LOSA	-25			dBm	
LOS Hysteresis		0.5		4	dB	
Receiver Reflectance				-12	dB	

Notes:

Note 1) Measured at 10.3125b/s with PRBS 2^{31} – 1 NRZ test pattern.

Note 2) Under the ER worst case, measured at 10.3125 Gb/s with PRBS 2^{31} – 1 NRZ test pattern for BER < $1x10^{-12}$

● Electrical Characteristics (Condition: T_a=T_{OP})

Parameter		Symbol	Min	Typ	Max	Unit	Note
Transmitter:							
Differential input voltage swing			150		1600	mVpp	1
Transmit Disable Input	H	V_{IH}	2.0		Vcc+0.3	V	
	L	V_{IL}	0		0.8	V	
Transmit Enable Output	H	V_{OH}	2.4		Vcc+0.3	V	
	L	V_{OL}	0		0.4	V	2
Data Dependent Input Jitter		DDJ			0.1	UI	
Data Input Total Jitter		TJ			0.28	UI	
Input Differential Impedance		Zin	80	100	120	Ω	
Receiver							
Differential output voltage swing			500		700	mVpp	3
LOS Output	H	V_{OH}	2.4		Vcc+0.3	V	2
	L	V_{OL}	0		0.4	V	
Rx Output Rise and Fall Time		Tr/Tf	30			ps	20% to 80%
Onput Differential Impedance		Zon	80	100	120	Ω	

Note 1) TD+/- are internally AC coupled with 100Ω differential termination inside the module.

Note 2) Tx Fault and Rx LOS are open collector outputs, which should be pulled up with 4.7k to 10kΩ resistors on the host board. Pull up voltage between 2.0V and Vcc+0.3V.

Note 3) RD+/- outputs are internally AC coupled, and should be terminated with 100Ω (differential) at the user SERDES.

Pin Assignment:

Diagram of Host Board Connector Block Pin Numbers and Name

Pin Function Definitions

PIN #	Name	Function	Notes
1	VeeT	Module transmitter ground	Note1
2	Tx Fault	Module transmitter fault	Note 2
3	Tx Disable	Transmitter Disable; Turns off transmitter laser output	Note 3
4	SDL	2 wire serial interface data input/output (SDA)	
5	SCL	2 wire serial interface clock input (SCL)	
6	MOD-ABS	Module Absent, connect to VeeR or VeeT in the module	Note 2
7	RS0	Optionally Receiver Rate Select	
8	LOS	Receiver Loss of Signal Indication	Note4
9	RS1	Optionally Transmitter Rate Select, (not functional for this product)	
10	VeeR	Module receiver ground	Note 1
11	VeeR	Module receiver ground	Note 1
12	RD-	Receiver inverted data out put	
13	RD+	Receiver non-inverted data out put	
14	VeeR	Module receiver ground	Note 1
15	VccR	Module receiver 3.3V supply	
16	VccT	Module transmitter 3.3V supply	
17	VeeT	Module transmitter ground	Note 1
18	TD+	Transmitter inverted data out put	
19	TD-	Transmitter non-inverted data out put	
20	VeeT	Module transmitter ground	Note1

Note 1) The module ground pins shall be isolated from the module case.

Note 2) This pin is an open collector/drain output pin and shall be pulled up with 4.7K-10Kohms to Host_Vcc on the host board.

Note 3) This pin shall be pulled up with 4.7K-10Kohms to VccT in the module.

Note 4) This pin is an open collector/drain output pin and shall be pulled up with 4.7K-10Kohms to Host_Vcc on the host board.

SFP+ Module EEPROM Information. and Management

The SFP+ modules implement the 2-wire serial communication protocol as defined in the SFP+ -8472.

The serial ID information of the SFP+ modules and Digital Diagnostic Monitor parameters can be accessed through the I2C interface at address A0h and A2h. The memory is mapped in Table 1. Detailed ID information(A0h) is listed in Table 2. And the DDM specification at address A2h. For more details of the memory map and byte definitions, please refer to the SFF-8472, “Digital Diagnostic Monitoring Interface for Optical Transceivers”.

The DDM parameters have been internally calibrated.

Table 1. Digital Diagnostic Memory Map (Specific Data Field Descriptions)

Table 2 - EEPROM 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 (03h=SFP+)
1	1	Reserved	Extended identifier of type serial transceiver (04h)
2	1	Connector	Code of optical connector type (07=LC)
3-10	8	Transceiver	
11	1	Encoding	64B66B (06h)
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 10m
18	1	Length(Copper)	Link length supported for copper, units of meters
19	1	Reserved	
20-35	16	Vendor Name	
36	1	Reserved	
37-39	3	Vendor OUI	SFP+ transceiver vendor OUI ID
40-55	16	Vendor PN	Part Number: “HSFP+10-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	Manufacturing date code
92-94	3	Reserved	
95	1	CCEX	Check code for the extended ID Fields (addresses 64 to 94)
Vendor Specific ID Fields			
96-127	32	Readable	Specific date, read only
128-255	128	Reserved	Reserved for SFF-8079

Digital Diagnostic Monitor Characteristics

Data Address	Parameter	Range	Accuracy	Unit
96-97	Transceiver Internal Temperature	-10 to +80℃	±3.0	℃
98-99	Laser Bias Current	8 to 90mA	±10	%
100-101	Tx Output Power	-8.5 to +1dBm	±3.0	dBm
102-103	Rx Input Power	-15.5 to 0.5dBm	±3.0	dBm
104-105	VCC3 Internal Supply Voltage	+3.0V to +3.7V	±3.0	%

Regulatory Compliance

The HXFP-3831MF complies with international Electromagnetic Compatibility (EMC) and international safety requirements and standards (see details in Table following).

Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1(>1000 V)
Electrostatic Discharge (ESD) to the Duplex LC Receptacle	IEC 61000-4-2 GR-1089-CORE	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022 Class B (CISPR 22B) VCCI Class B	Compatible with standards

Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2	Compatible with Class 1 laser product.

Mechanical Dimensions:

Recommended Circuit:

Recommended Host Board Power Supply Circuit

Recommended High-speed Interface Circuit

Mechanical Dimensions:

Recommended Circuit:

Note A: Circuit assumes open emitter output

Note B: Circuit assumes high impedance internal bias @Vcc-1.3V

Part Number Definition and Ordering Information:

Company	A
Package	SFP+:SFP+ BFP: BIDI SFP+ B19: BIDI 1x9
Data Rate	1G: 1.25G FE: 125M 01: 155M 04: 622M 16: 2488M~2667M 64: 9.958G~11.1G
Distance	xx: xxKM
Fiber Mode	S: Single Mode M: Multi Mode X: Not defined
Wavelength	31: 1310nm 55: 1550nm 85: 850nm 47: 1470nm 49: 1490nm 51: 1510nm 53: 1530nm 55: 1550nm 57: 1570nm 59: 1590nm 61: 1610nm XX: Not defined
Temperature	C: 0 – 70℃ I: -45~+85℃
DDM	D: with DDM Blank: without DDM
Connector	Blank: LC S: SC P: Pigtail/SC

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