



FTF-S16G-S31L-010D

16G Fiber Channel, 1310nm, single-mode, 10km



Description

FTF-S16G-S31L-010D series SFP+ transceiver can be used to setup a reliable, high speed serial data link over single-mode fiber. Maximum link span over SM fiber can reach 10km. Casing made fully from metal alloys ensures very good EMI immunity. Module is fully compliant with SFP+ MSA specification and it is available in two hardware versions:

Model	Operating case temperature
FTF-S16G-S31L-010D	0~70°C
FTF-S16G-S31L-010DI	-40~85°C

Host device can access module internal EEPROM memory and DDMI via I²C interface.

Built-in digital diagnostic interface (DOM, DDMI) allows a network administrator to monitor module parameters such as: transmitted and received optical power, temperature, supply voltage and laser current. Those information and data are very helpful e.g. in prediction and prevention of connection failures. A module is available in various dedicated versions, which can be compatible with devices from vendors such as Cisco, HP, Juniper, Extreme Networks, Alcatel-Lucent, 3Com, Linksys and more.

Applications

- Fiber Channel (16G FC)
- Tri-Rate 4.25/8.5/14.025 Gb/s Fibre Channel Rate



Key features

- LC Duplex receptacle
- Transmission distance up to 10km*
- DFB laser diode 1310nm transmitter, PIN receiver
- Throughput up to 14.025Gb/s bi-directional data links
- Fully compliant with SFP+ MSA INF-8431 and INF-8472 rev. 11.3
- Hot-Pluggable
- RoHS compliant
- Class 1 laser safety
- Low power dissipation (<1W)
- Metal case for low EMI
- Operating case temperature* : 0~70°C / -40~85°C

Specification

Supported transmission technology

Fibre Channel

Speed supported for Ethernet technology

N/A

Speed supported for Fibre Channel technology

4.25Gbps, 8.5Gbps, 14.025Gbps

Transmission medium

Single-mode fiber 9/125µm

Transmission distance**

10km

Receptacle type

LC Duplex

Wavelength

1310nm

Output power

-5~+2dBm

Receiver sensitivity

-12dBm (at 14.025G)

Power supply voltage

3.3V

Total power consumption

< 1W

Operating environment – temperature*

0~70°C / -40~+85°C

Operating environment - humidity

5~95% non-condensing

Dimensions

Compliant with SFP+ Multi-Source Agreement

* - standard / industrial version

** - transmission distance depends on optical link attenuation and speed



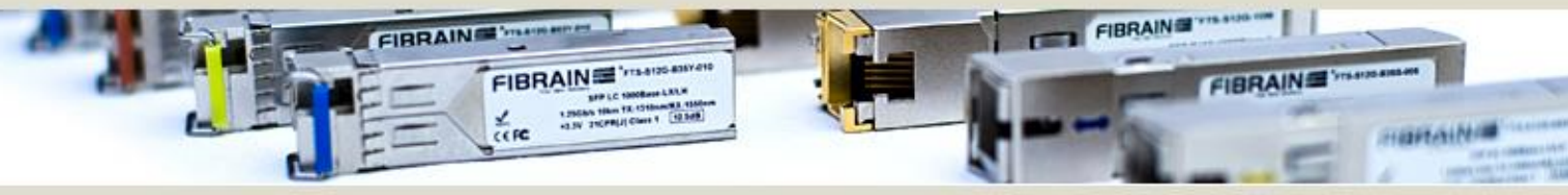
Detailed technical specification

Pin Description

Pin	Name	Function/Description	Engagement order	Notes
1	VeeT	Transmitter Ground	1	8
2	TX Fault	Transmitter Fault Indication	3	1
3	TX Disable	Transmitter Disable-Module disables on high or open	3	2
4	SDA	Module Definition 2-Two wire serial ID interface	3	3
5	SCL	Module Definition 1-Two wire serial ID interface	3	3
6	MOD_ABS	Module Definition 0-Grounded in module	3	3
7	RS0	Not Used	3	-
8	RX_LOS	Receiver Loss of Signal	3	4
9	RS1	Not Used	1	-
10	VeeR	Receiver Ground	1	8
11	VeeR	Receiver Ground	1	8
12	RD-	Inverse Received Data out	3	5
13	RD+	Received Data out	3	5
14	VeeR	Receiver Ground	1	8
15	VccR	Receiver Power - +3.3V±5%	2	6
16	VccT	Transmitter Power - +3.3 V±5%	2	6
17	VeeT	Transmitter Ground	1	8
18	TD+	Transmitter Data In	3	7
19	TD-	Inverse Transmitter Data In	3	7
20	VeeT	Transmitter Ground	1	8

Notes:

- TX Fault is open collector/drain output which should be pulled up externally with a 4.7KΩ-10KΩ resistor on the host board. When high, this output indicates a laser fault of some kind. Low indicates normal operation.
- TX Disable input is used to shut down the laser output per the state table below. It is pulled up to Vcc within the module.
Low (0 – 0.8V): Transmitter on
Open or High (2.0 – VccT): Transmitter Disabled
- Mod-Def 0, 1, 2. These are the module definition pins. They should be pulled up to Vcc with a 4.7KΩ-10KΩ resistor on the host board
Mod-Def 0 is grounded by the module to indicate that the module is present.
Mod-Def 1 is clock line of two wire serial interface for optional serial ID.
Mod-Def 2 is data line of two wire serial interface for optional serial ID.
- LOS - when high, output indicates the received optical power is below the worst case receiver sensitivity. Low indicates normal operation.
- These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω differential at the user SERDES. The AC coupling is done inside the module and thus not required on the host board.
- VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V±5% at the SFP connector pin. The in-rush current will typically be no more than 30mA above steady state supply current after 500ns.
- TD-/+: These are the differential transmitter inputs. They are AC coupled differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on host board.
- The module signal grounds are isolated from the module case.



Electrical parameters

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter Differential Input Volt	+/-TX_DAT	180		700	mV p-p	1
Receiver Differential Output Volt	+/-RX_DAT	300		850	mV p-p	2
Tx_Disable	Transmitter Enable	V _{IL}	0	0.8	V	
	Transmitter Disable	V _{IH}	2.0	V _{CC}	V	
Tx_Fault	Normal Operation	V _{OL}	0	0.8	V	3
	Transmitter Fault	V _{OH}	2.0	V _{CC}	V	3
Rx_LOS	Normal Operation	V _{OL}	0	0.8	V	3
	Loss of Signal (LOS)	V _{OH}	2.0	V _{CC}	V	3
Throughput	B			14.025	Gb/s	
Total current requirement				550	mA	

Notes:

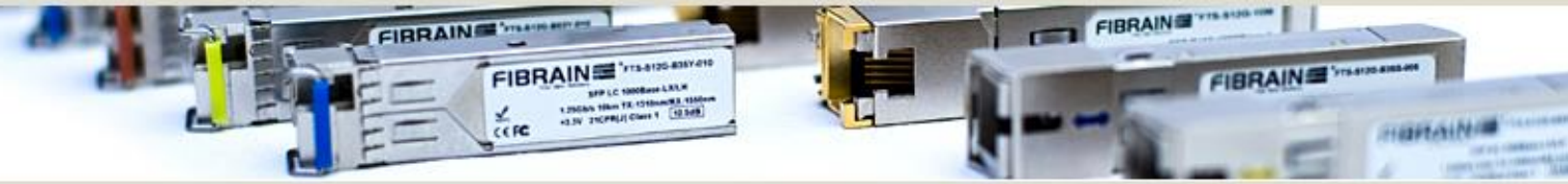
- Internally AC coupled and terminated to 100Ω differential load.
- Internally AC coupled, but requires a 100Ω differential termination or internal to Serializer/Deserializer.
- It is open collector/drain output which should be pulled up externally to V_{CC} with a 4.7KΩ-10KΩ resistor on the host board. LOS: logic 0 indicates normal operation; logic 1 indicates no signal detected.

Transmitter parameters

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Launch optical power, 14.025 Gb/s	P _{o,RH}	-5		2	dBm	1,2
Launch optical power, 4.25 Gb/s, 8.5 Gb/s	P _{o,RL}	-5		-1	dBm	3
Central wavelength	λ _c	1295	1310	1325	nm	4
Transmitter and Dispersion penalty (at 8.5Gbps)	TDP			3.2	nm	7
Transmitter and Dispersion penalty (at 14.025Gbps)	TDP			4.4	dB	7
Spectral width (at 14.025Gbps)	Δλ			1	nm	4,5
Optical rise/fall time (at 4.25Gb/s)	T _{rise} /T _{fall}			90	ps	8
Optical Return Loss Tolerance	ORLT			12	dB	
Eye diagram	Compliant with requirements					

Notes:

- Class 1 Laser Safety per FDA/CDRH and EN (IEC) 60825 regulations.
- High Bandwidth Mode. Class 1 Laser Safety per FDA/CDRH and EN (IEC) 60825 regulations.
- Low Bandwidth Mode. Class 1 Laser Safety per FDA/CDRH and EN (IEC) 60825 regulations.
- Also specified to meet curves in FC-PI-5 Rev 6.10 Figures 23, 24, and 25, which allow trade-off between wavelength, spectral width and OMA for 4.25 and 8.5 Gb/s operation.
- 20dB spectral width.
- Equivalent extinction ratio specification for Fibre Channel. Allows smaller ER at higher average power.
- For 14.025 and 8.5 Gb/s operation, Jitter values for gamma T and gamma R are controlled by TDP.
- Unfiltered, 20-80%. Complies with IEEE 802.3 (Gig. E), FC 4x eye masks when filtered.



Receiver parameters

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
OMA Sensitivity = 4.25 Gb/s	RxSENS			-15.4	dBm	1
OMA Sensitivity = 8.5 Gb/s	RxSENS			-13.7	dBm	1
OMA Sensitivity = 14.025 Gb/s	RxSENS			-12.0	dBm	2
Central wavelength	λ_c	1260	1310	1370	nm	
Receiver overload	P _{MAX}	2			dBm	
RX_LOS Asserted	S _A	-30			dBm	
RX_LOS De-Asserted	S _D			-16	dBm	
Optical Return Loss	ORL	12			dB	

Notes:

1. Measured with PRBS 2⁷-1 at 10⁻¹² BER.
2. Measured with PRBS 2³¹-1 at 10⁻¹² BER.

General Specifications

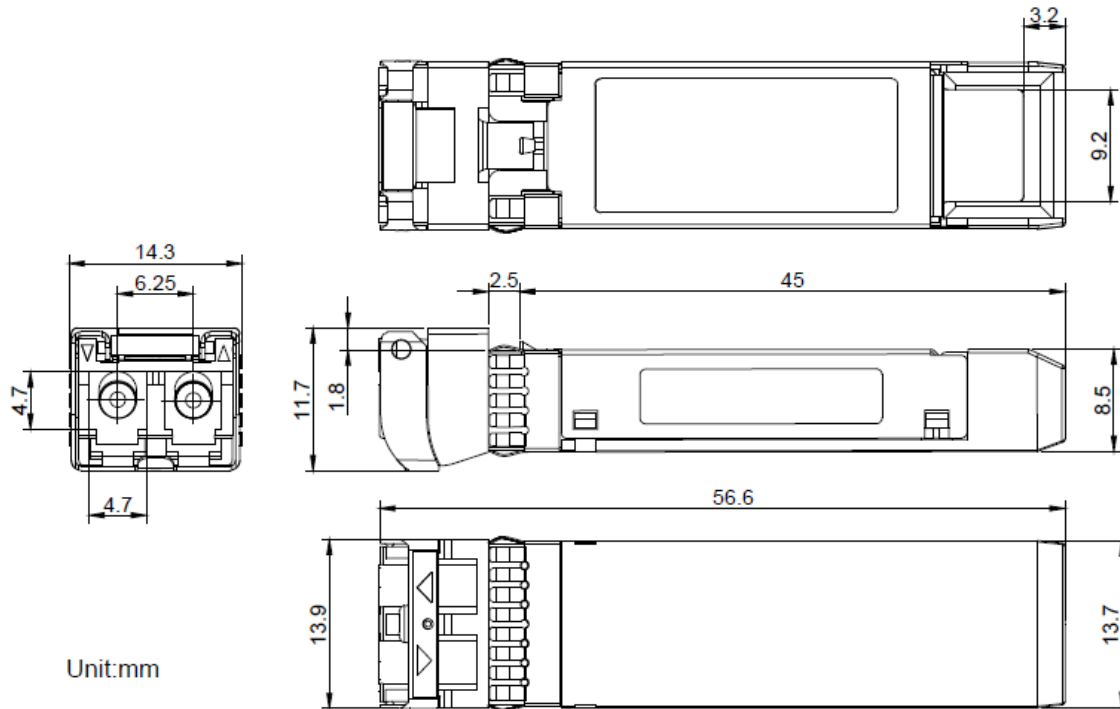
Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Data Rate	BR	4.25		14.025	Gb/s	1
Bit Error Rate	BER			10 ⁻¹²		2
Supported Link Length on 9/125 μ m SMF, 4.25, 8.5, 14.025 Gb/s	L _{MAX1}		10		km	3

Notes:

1. 4x/8x/16x Fibre Channel compliant.
2. Tested with a PRBS 2⁷-1 test pattern for 4.25 and 8.5Gb/s operation. Tested with a PRBS 2³¹-1 test pattern for 14.025Gb/s operation.
3. Distances are based on FC-PI-5 Rev. 6.10 and IEEE 802.3 standards.



Mechanical specification



Recommended environment conditions

Parameter	Symbol	Min	Typ	Max	Unit
Operating Temperature Range (industrial)	T	-40	-	85	°C
Operating Temperature Range (standard)	T	0	25	70	°C
Supply Voltage	V _{CC}	3.135	3.3	3.465	V
Relative Humidity	RH	5	-	95	%

Ordering information

FTF-S16G-S31L-010**D**– 1310nm, 10km, single-mode, LC duplex, **DDMI**, commercial temperature (0~70°C)
 FTF-S16G-S31L-010**DI**– 1310nm, 10km, single-mode, LC duplex, **DDMI**, **extended temperature** (-40~85°C)

For further information regarding host device PCB layout recommendation, power supply requirements, EEPROM memory map, DDMI specification please check:

[SFF-8472 - Description of EEPROM and Digital Diagnostic Monitoring Interface](#) and [SFF-8431 - Technical specification for SFP+ transceiver](#)

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