PRODUCT FEATURES

- Up to 25.78Gbps Data Links
- DML laser transmitter and APD/TIA receiver
- Up to 40km on 9/125μm SMF
- Hot-pluggable SFP28 footprint
- Duplex LC/UPC type pluggable optical interface
- Low power dissipation<1.5W
- Metal enclosure, for lower EMI
- Support Digital Diagnostic Monitor interface
- Single +3.3V power supply
- Built-in CDR
- Case operating temperature: 0°C~+70°C

  -40°C ~ +85°C

APPLICATIONS

- 25GBASE-ER Ethernet
- CPRI 25G

COMPLIANCE

- SFF-8472 SFP28 MSA
- SFF-8431 SFF-8432
- RoHS 2.0

Ordering information

Part Number	Data Rate (Gb/s)	Media	Wavelength(nm)	Operating distance(km)	Temperature(℃)
IP-FFLK40B31C	25.78125	SMF	1310	40	0~70
IP-FFLK40B31I	25.78125	SMF	1310	40	-40~85

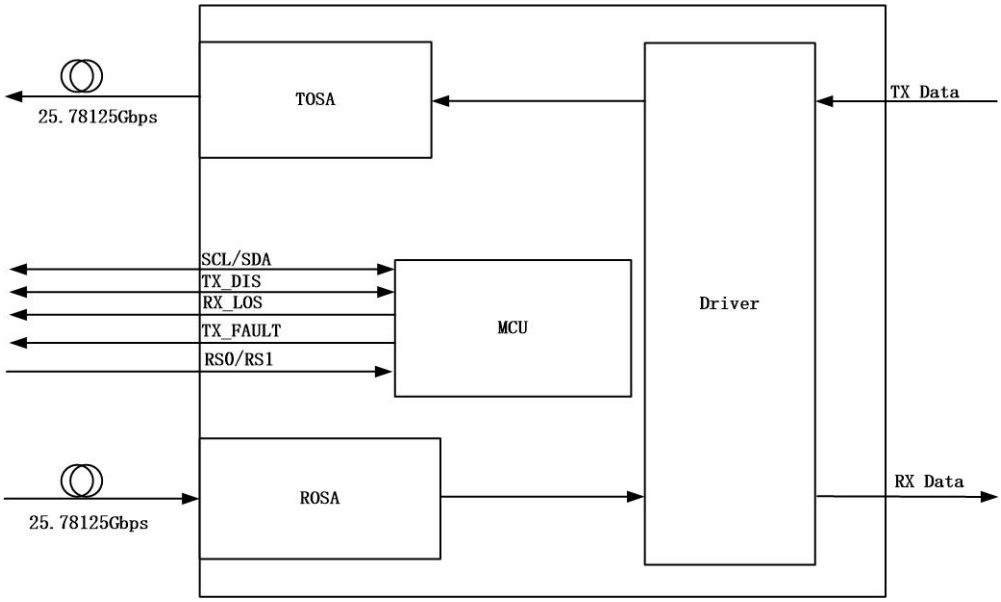
PRODUCT DESCRIPTION

IP-FFLK40B31 is a 25GBASE-ER Industrial Multi-Vendor MSA Compatible SFP28 (Small Form-Factor Pluggable 28) Transceiver, operating over Double Fiber Single-Mode Fiber (SMF) optical cable. It has minimum guaranteed optical budget of 16 dB, which in most cases is enough to reach 40 km on SMF. It consumes low power, operates base on 3.3V DC power supply and is offered in the industrial temperature range. It supports DDM/DOM optical diagnostics that provide real-time diagnostic information about the present operating conditions.

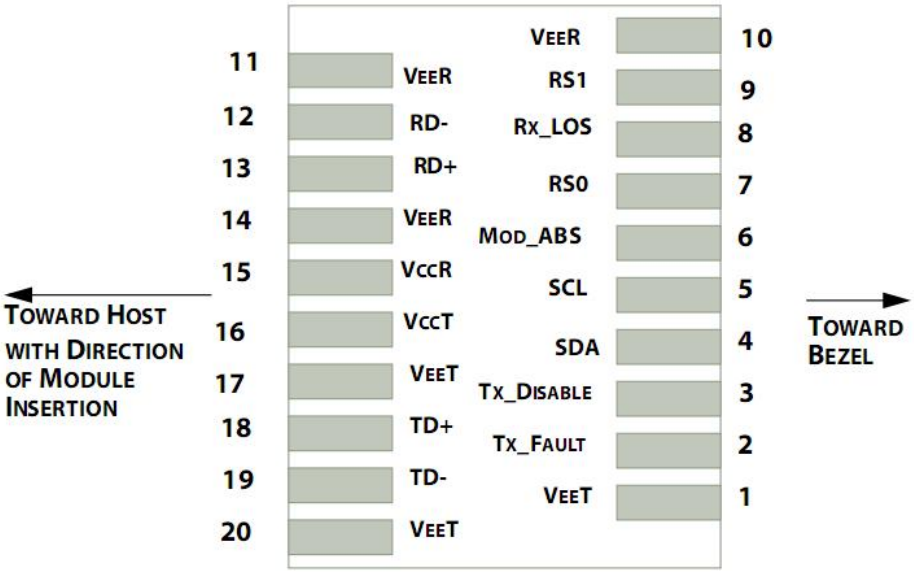
IP-FFLK40B31 is CE/RoHS certified and is compliant with product safety standards.It is fully compliant to SFF-8431 and SFF-8472 Multi Source Agreement (MSA), IEEE 802.3by 25 Gb/s specification. Consequently, compliance to above standards guarantees that module is compatible and works with majority of networking equipment, where is not implemented special algorithm for protection against third party modules.

The low jitter and low bit error rate optical assembly features a DML laser transmitter and APD/TIA receiver. It utilizes internal clock and data recovery (CDR) units on transmitter and the receiver chains for low jitter compliance. The differential AC coupled Tx and Rx data interfaces are CML compatible. The device is Class I laser safety compliant.

1. Block Diagram



2. Pin Assignment



Pin out of Connector Block on Host Boar

3. Pin Descriptions

Pin	Symbol	Name/Description	Notes
1	V_{EET}	Transmitter Ground	
2	TF_{AULT}	Transmitter Fault Indication	1
3	T_{DIS}	Transmitter Disable-Module disables on high or open	
4	SDA	2-wire Serial Interface Data Line (MOD-DEF2)	
5	SCL	2-wire Serial Interface Clock (MOD-DEF1)	
6	MOD_ABS	Module Absent, connected to VEET	
7	RS0	Rx Rate Select	2
8	Rx_LOS	Loss of Signal indication. Logic 0 indicates normal operation.	1
9	RS1	Tx Rate Select	2
10	V_{EER}	Receiver Ground	
11	V_{EER}	Receiver Ground	
12	RD-	Receiver Inverted DATA out	3
13	RD+	Receiver Non-inverted DATA out	3
14	V_{EER}	Receiver Ground	
15	V_{CCR}	Receiver Power Supply	
16	V_{CCT}	Transmitter Power Supply	
17	V_{EET}	Transmitter Ground	
18	TD+	Transmitter Non-Inverted DATA in	4
19	TD-	Transmitter Inverted DATA in	4
20	V_{EET}	Transmitter Ground	

Notes:

1. Shall be pulled up with 4.7k-10k ohms to a voltage between 3.1V and 3.5V on the host board.
2. The pins are pulled low to VEET with a >30k resistor in the module.

3. The 100Ohms differential Rx Data output is internally AC coupled and terminated.
4. The 100Ohms differential Tx Data input is internally AC coupled and terminated.

4. Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Storage Temperature	T_S	-40		85	ºC	
Relative Humidity	RH	0		85	%	
Power Supply Voltage	V_{CC}	0		3.6	V	
Operating Case Temperature	T_A	0		70	ºC	C-Temp
		-40		85	ºC	I-Temp

5. Recommended Operating Environment

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Case Operating Temperature	T_{case}	0		70	ºC	IP-FFLK40B31C
		-40		85	ºC	IP-FFLK40B31I
Ambient Humidity	H_A	5		85	%	Non-condensing
Transmission Distance				40	km	
Coupled Fiber	Single mode fiber					9/125um G.652

6. Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Supply Voltage	V_{CC}	3.13	3.30	3.47	V	
Supply Current	I_{CC}			394	mA	IP-FFLK40B31C
				455	mA	IP-FFLK40B31I
Transmitter						
Input different impedance	R_{in}	80	100	120	Ω	1
Differential data input swing	V_{pp}	200		800	mV	
Transmitter Disable Voltage	V_{DIS}	2		V_{CC}	V	
Transmitter Enable Voltage	V_{EN}	0		0.8	V	
Receiver						
Output different impedance	R_{out}	80	100	120	Ω	
Differential data output swing	V_{pp}	200		800	mV	2
Loss of Signal Assert	V_{LOSA}	2		V_{CC}	V	3
Loss of Signal De-assert	V_{LOSD}	0		0.8	V	3

Notes:

1.Connected directly to TX data input pins. AC coupled thereafter.

2.Into 100Ω differential termination.

3.Loss of Signal is LVTTL. Logic “0” indicates normal operation; logic “1” indicates no signal detected.

7. Optical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Transmitter						
Average Output Power	P_{OUT}	-3		6	dBm	
Extinction Ratio	ER	4			dB	
Center Wavelength	λ	1290	1310	1330	nm	
Side Mode Suppression Ratio	SMSR	30			dBm	
Spectrum Width (RMS)	σ			1	nm	
Transmitter OFF Output Power	P_{Off}			-30	dBm	
Output Eye Mask	Compatible with IEEE 802.3by					
Receiver						
Input Optical Wavelength	$λ_{IN}$		1310		nm	
Rx Sensitivity	R_{SENS}			-19	dBm	1
Input Saturation Power (Overload)	P_{SAT}	-6			dBm	
Loss of Signal Assert	P_A	-30			dBm	
Loss of Signal De-assert	P_D			-20	dBm	
LOS Hysteresis	P_D - P_A	0.5		6	dB	

Notes:

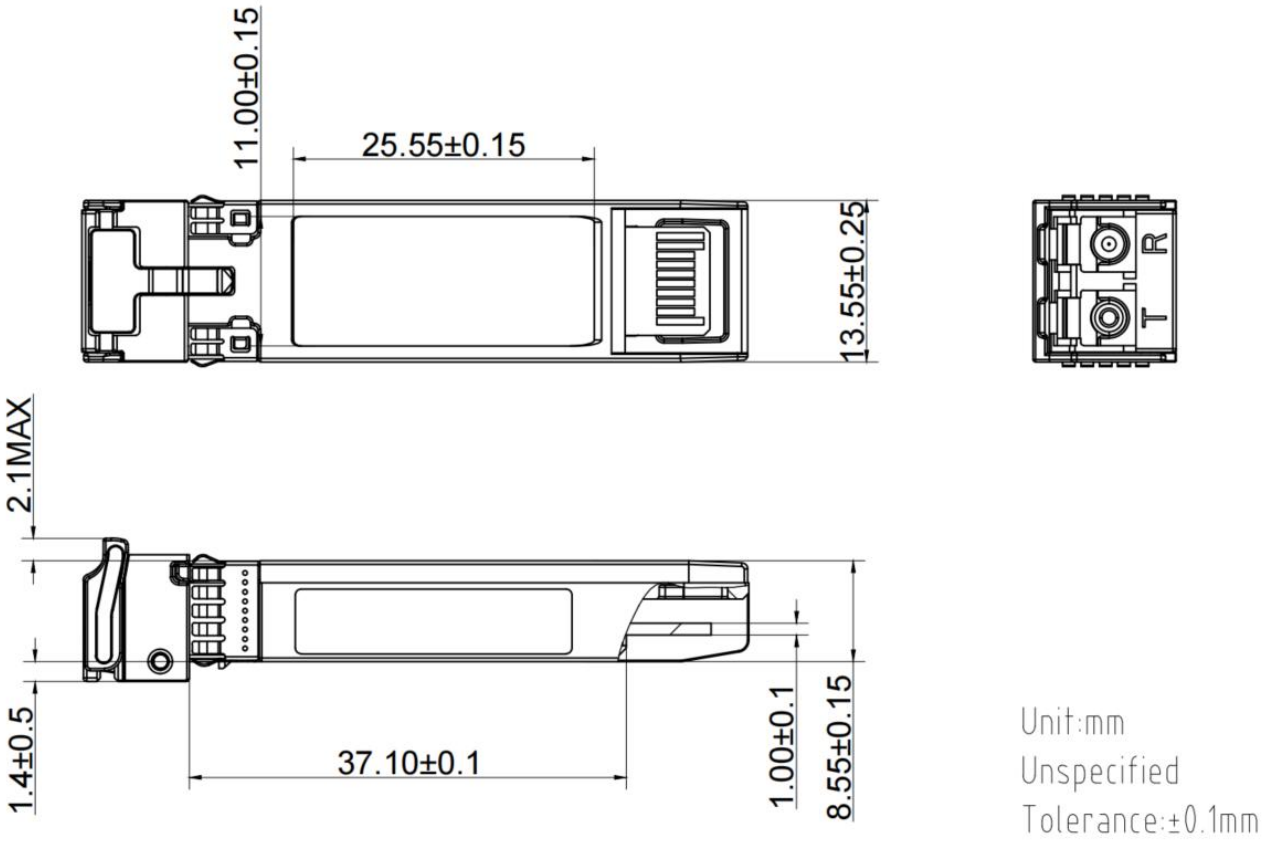
1.Measured with a PRBS 2^31-1 test pattern, @25.78125Gb/s, BER<5E-5.

8. Digital Diagnostic Monitor Characteristics

IP-FFLK40B31 supports the I^2C-based Diagnostic Monitoring Interface (DMI) defined in document SFF-8472. The host can access real-time performance of transmitter and receiver optical power, temperature, supply voltage and bias current.

Parameter	Accuracy	Unit
Case Temperature	±3	℃
Supply Voltage	±3%	V
Tx Bias Current	±10%	mA
Tx Optical Power	±3	dB
Rx Optical Power	±3	dB

9. Mechanical Dimensions



10. Contact Information

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11. Revision History

Version No.	Date	Description
1.0	Feb. 23, 2024	Preliminary datasheet.
1.1	Jun.30, 2024	Update contact information.
2.0	Oct. 25, 2024	Updata the Product Features, Product Description, Absolute Maximum Ratings, Recommended Operating Environment, Electrical Characteristics, Optical Characteristics.