

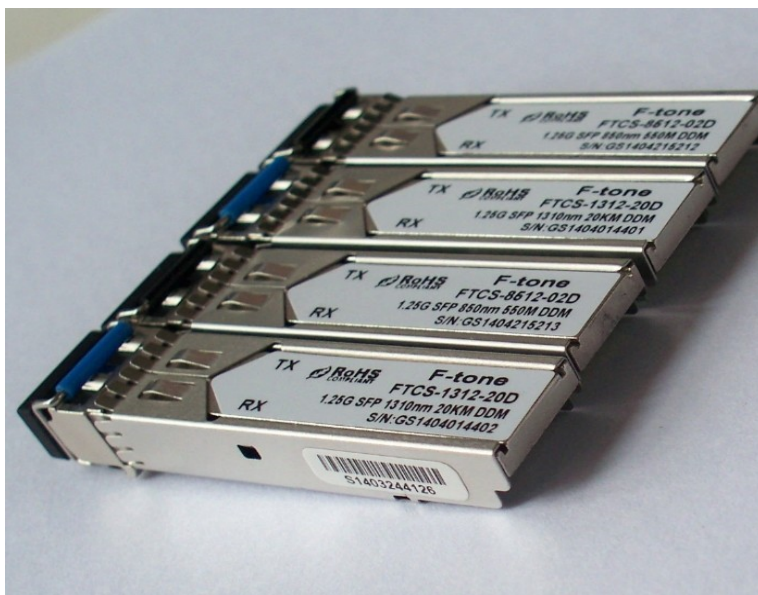
FTCS-1324-02xx 2.488Gbps SFP Optical Transceiver, 2km Reach

Features

- ◆ Up to 2.488Gb/s bi-directional data links
- ◆ 1310nm FP laser and PIN photodetector for 2km transmission
- ◆ Compliant with SFP MSA and SFF-8472 with duplex LC receptacle
- ◆ Digital Diagnostic Monitoring:
Internal Calibration or External Calibration
- ◆ Compatible with RoHS
- ◆ +3.3V single power supply
- ◆ Operating case temperature:
Standard : 0 to +70°C
Industrial : -40 to +85°C

Applications

- ◆ SDH STM-16 and SONET OC-48 system
- ◆ 2X Fiber Channel
- ◆ Switch to Switch interface
- ◆ Switched backplane applications
- ◆ Router/Server interface
- ◆ Other optical transmission systems

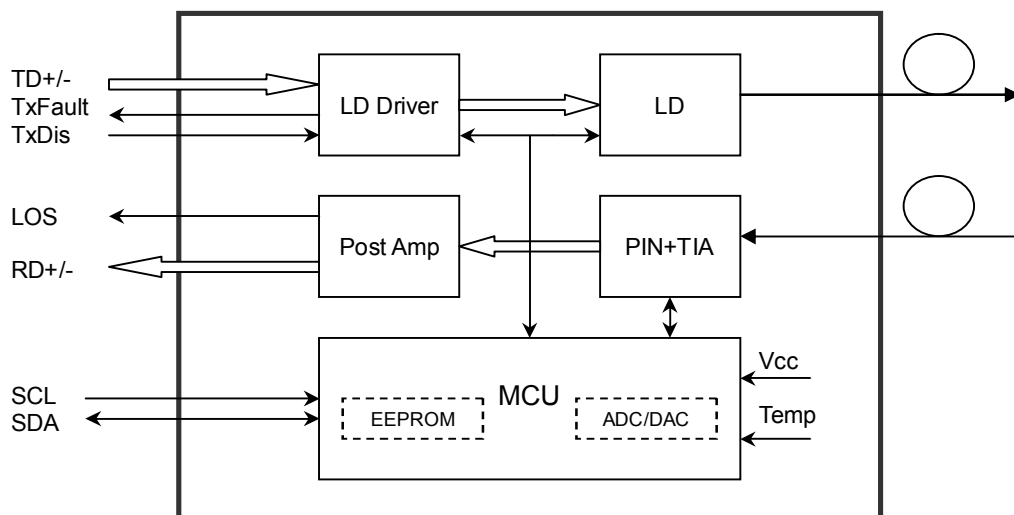


Description

The SFP transceivers are high performance, cost effective modules supporting dual data-rate of 2.488Gbps and 2km transmission distance with SMF.

The transceiver consists of three sections: a FP laser transmitter, a PIN photodiode integrated with a trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I laser safety requirements.

The transceivers are compatible with SFP Multi-Source Agreement (MSA) and SFF-8472. For further information, please refer to SFP MSA.



Absolute Maximum Ratings

Table 1 - Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage	Vcc	-0.5	4.5	V
Storage Temperature	Ts	-40	+85	°C
Operating Humidity	-	5	85	%

Recommended Operating Conditions

Table 2 - Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	Standard	Tc	0	+70	°C
	Industrial			+85	°C
Power Supply Voltage	Vcc	3.13	3.3	3.47	V
Power Supply Current	Icc			300	mA
Data Rate			2.488		Gbps

Optical and Electrical Characteristics

FTCS-1324-02xx : (FP and PIN, 1310nm, 2km Reach)

Table 3 - Optical and Electrical Characteristics

Parameter		Symbol	Min	Typical	Max	Unit	Notes
Transmitter							
Centre Wavelength		λ_c	1260	1310	1360	nm	
Spectral Width (RMS)		σ			4	nm	
Average Output Power		P _{out}	-10		-3	dBm	1
Extinction Ratio		ER	9			dB	
Optical Rise/Fall Time (20%~80%)		tr/ta			0.16	ns	
Data Input Swing Differential		V _{IN}	400		1800	mV	2
Input Differential Impedance		Z _{IN}	90	100	110	Ω	
TX Disable	Disable		2.0		V _{cc}	V	
	Enable		0		0.8	V	
TX Fault	Fault		2.0		V _{cc}	V	
	Normal		0		0.8	V	
Receiver							
Centre Wavelength		λ_c	1260		1580	nm	
Receiver Sensitivity					-18	dBm	3
Receiver Overload			-3			dBm	3
LOS De-Assert		LOS _D			-20	dBm	
LOS Assert		LOS _A	-30			dBm	
LOS Hysteresis			1		4	dB	
Data Output Swing Differential		V _{out}	370		1800	mV	4
LOS	High		2.0		V _{cc}	V	
	Low				0.8	V	

Notes:

1. The optical power is launched into SMF.
2. PECL input, internally AC-coupled and terminated.
3. Measured with a PRBS 2²³-1 test pattern @2488Mbps, BER $\leq 1 \times 10^{-12}$.
4. Internally AC-coupled.

Timing and Electrical

Table 4 - Timing and Electrical

Parameter	Symbol	Min	Typical	Max	Unit
Tx Disable Negate Time	t_on			1	ms
Tx Disable Assert Time	t_off			10	μs
Time To Initialize, including Reset of Tx Fault	t_init			300	ms
Tx Fault Assert Time	t_fault			100	μs
Tx Disable To Reset	t_reset	10			μs
LOS Assert Time	t_loss_on			100	μs
LOS De-assert Time	t_loss_off			100	μs
Serial ID Clock Rate	f_serial_clock			400	KHz
MOD_DEF (0:2)-High	V _H	2		V _{cc}	V
MOD_DEF (0:2)-Low	V _L			0.8	V

Diagnostics

Table 5 – Diagnostics Specification

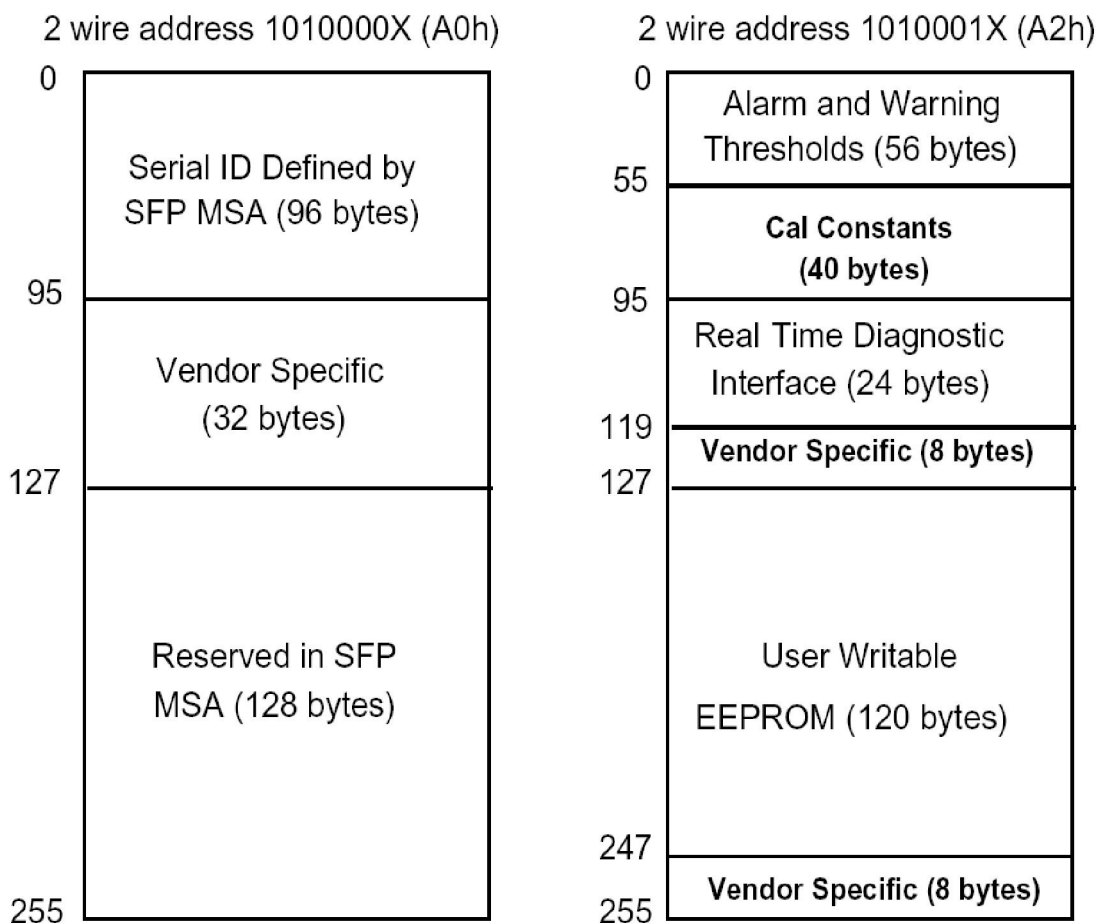
Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to +70	°C	±3°C	Internal / External
	-40 to +85			
Voltage	3.0 to 3.6	V	±3%	Internal / External
Bias Current	0 to 100	mA	±10%	Internal / External
TX Power	-10 to -3	dBm	±3dB	Internal / External
RX Power	-23 to -3	dBm	±3dB	Internal / External

Digital Diagnostic Memory Map

The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

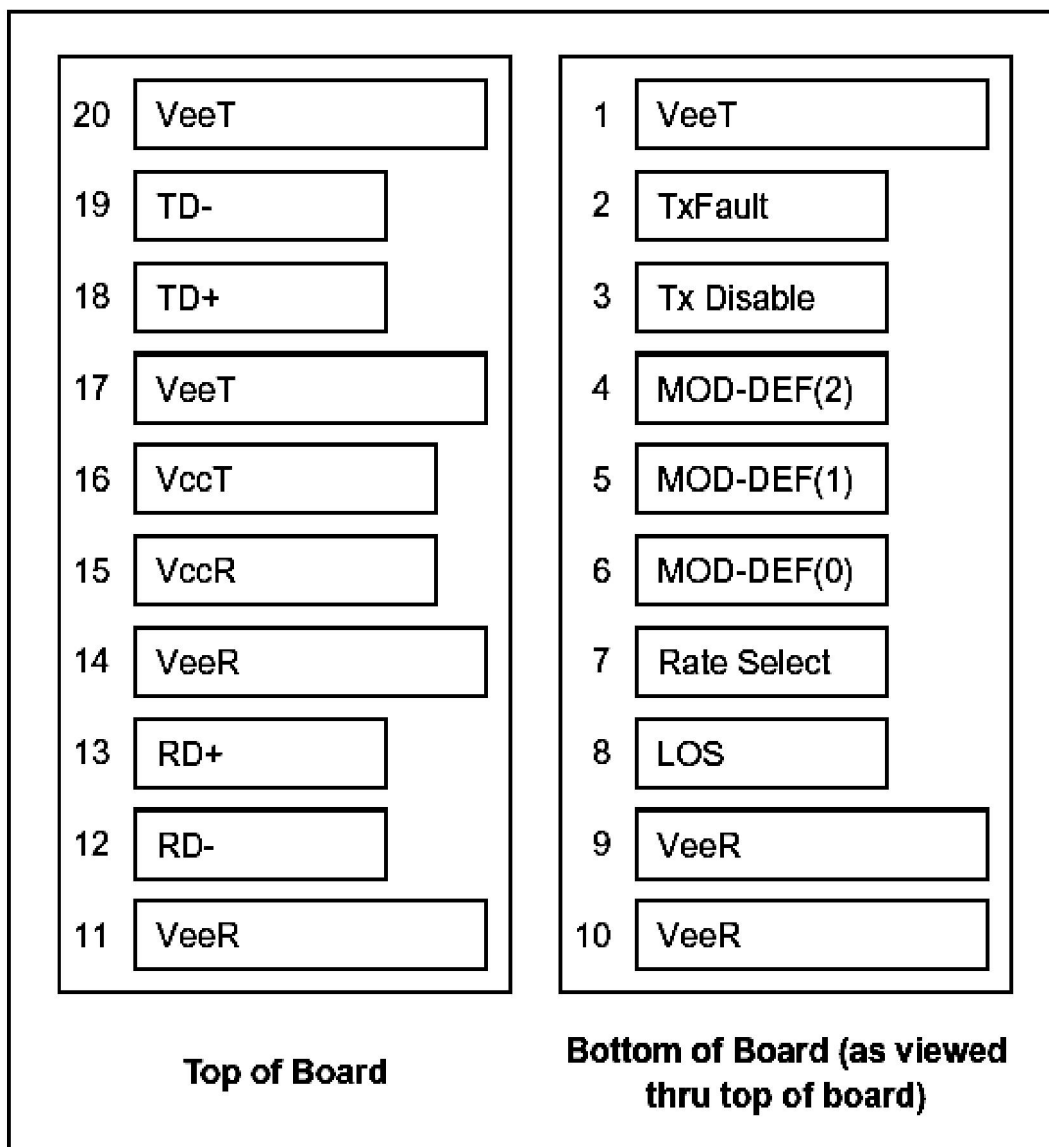
The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map specific data field defines as following.



Pin Definitions

Pin Diagram



Pin Descriptions

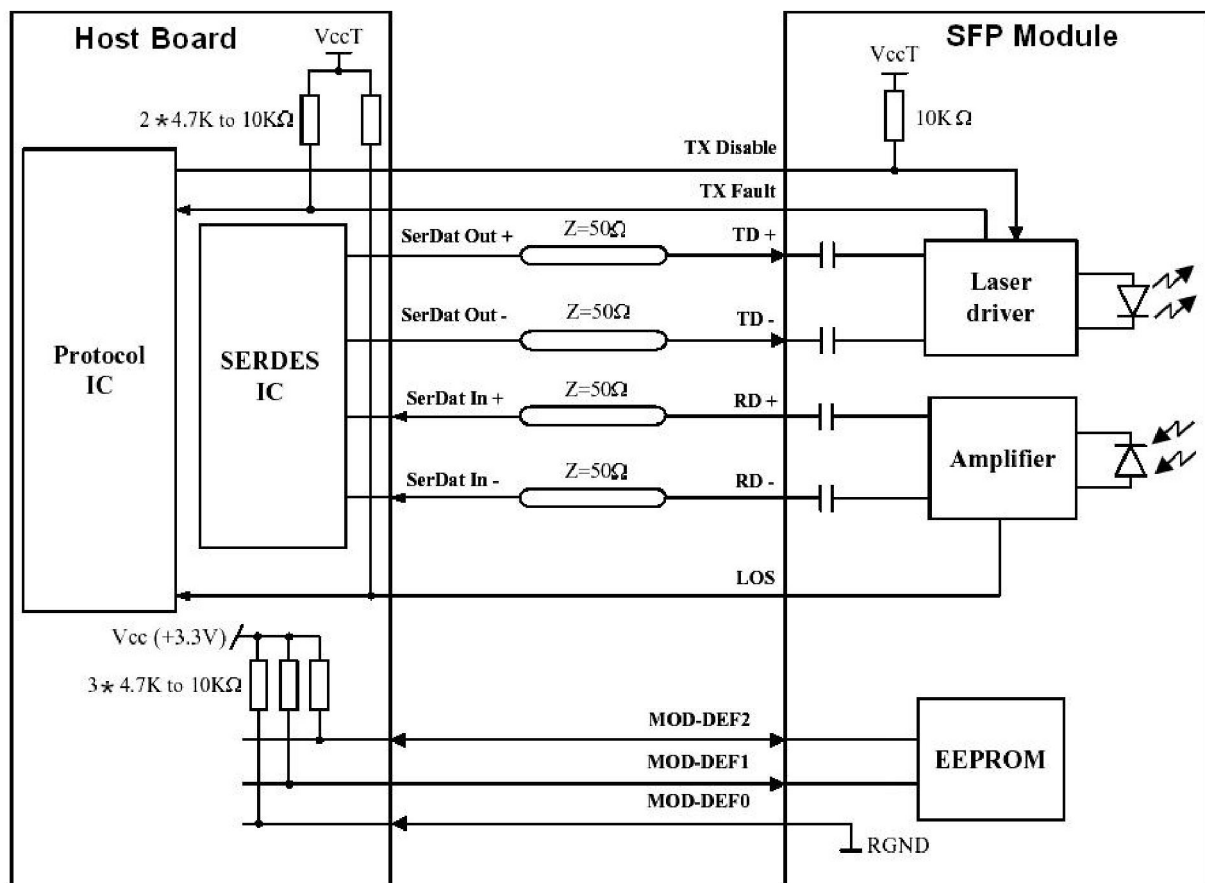
Pin	Signal Name	Description	Plug Seq.	Notes
1	V _{EET}	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	Note 1
3	TX DISABLE	Transmitter Disable	3	Note 2
4	MOD_DEF(2)	SDA Serial Data Signal	3	Note 3
5	MOD_DEF(1)	SCL Serial Clock Signal	3	Note 3
6	MOD_DEF(0)	TTL Low	3	Note 3
7	Rate Select	Not Connected	3	
8	LOS	Loss of Signal	3	Note 4
9	V _{EER}	Receiver ground	1	
10	V _{EER}	Receiver ground	1	
11	V _{EER}	Receiver ground	1	
12	RD-	Inv. Received Data Out	3	Note 5
13	RD+	Received Data Out	3	Note 5
14	V _{EER}	Receiver ground	1	
15	V _{CCR}	Receiver Power Supply	2	
16	V _{CCT}	Transmitter Power Supply	2	
17	V _{EET}	Transmitter Ground	1	
18	TD+	Transmit Data In	3	Note 6
19	TD-	Inv. Transmit Data In	3	Note 6
20	V _{EET}	Transmitter Ground	1	

Notes:

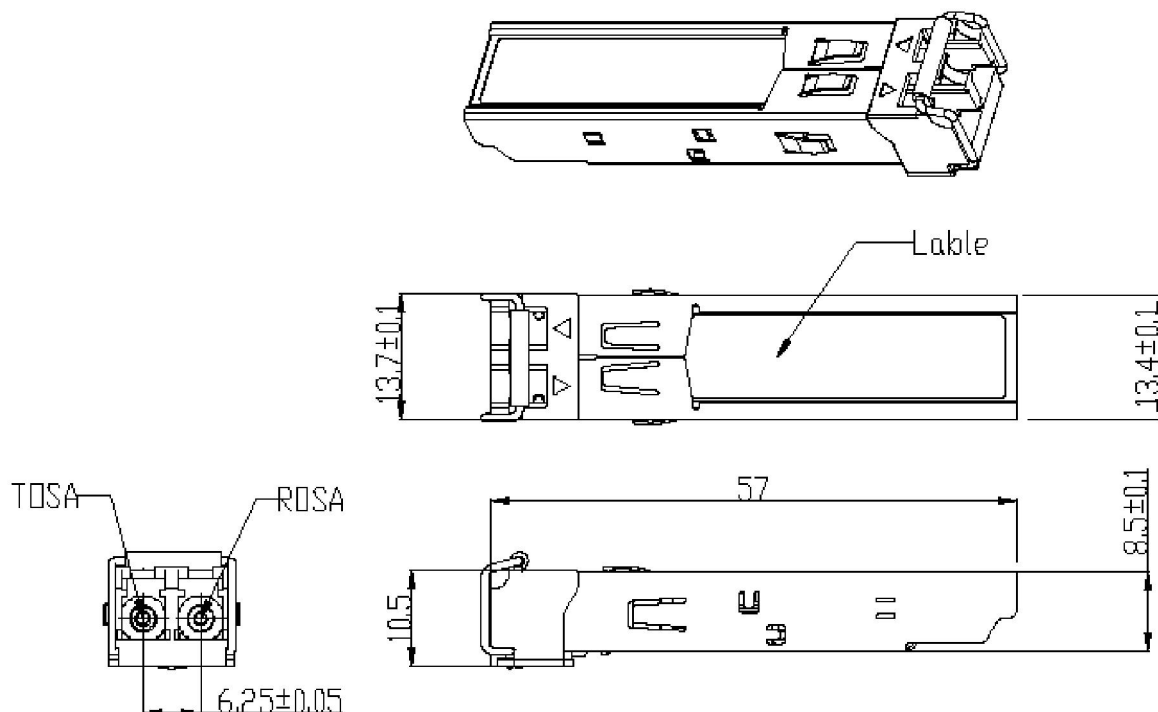
Plug Seq.: Pin engagement sequence during hot plugging.

- 1) TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and V_{cc}+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.
- 2) TX Disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7k~10kΩ resistor. Its states are:
 Low (0 to 0.8V): Transmitter on
 (>0.8V, < 2.0V): Undefined
 High (2.0 to 3.465V): Transmitter Disabled
 Open: Transmitter Disabled
- 3) Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7k~10kΩ resistor on the host board.
 The pull-up voltage shall be V_{ccT} or V_{ccR}.
 Mod-Def 0 is grounded by the module to indicate that the module is present
 Mod-Def 1 is the clock line of two wire serial interface for serial ID
 Mod-Def 2 is the data line of two wire serial interface for serial ID
- 4) LOS is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor. Pull up voltage between 2.0V and V_{cc}+0.3V. Logic 1 indicates loss of signal; Logic 0 indicates normal operation. In the low state, the output will be pulled to less than 0.8V.
- 5) RD-/+ : These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.
- 6) TD-/+ : These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

Recommended Interface Circuit



Mechanical Dimensions



Regulatory Compliance

F-tone Networks SFP transceiver is designed to be Class I Laser safety compliant and is certified per the following standards:

Feature	Agency	Standard
Laser Safety	FDA	CDRH 21 CFR 1040 annd Laser Notice No. 50
Product Safety	UL	UL and CUL EN60950-2:2007
Environmental protection	SGS	RoHS Directive 2002/95/EC
EMC	WALTEK	EN 55022:2006+A1:2007 EN 55024:1998+A1+A2:2003

Ordering information

Part Number	Product Description
FTCS-1324-02	1310nm, 2.488Gbps, 2km, 0oC ~ +70oC
FTCS-1324-02D	1310nm, 2.488Gbps, 2km, 0°C ~ +70°C, With Digital Diagnostic Monitoring
FTCS-1324-02I	1310nm, 2.488Gbps, 2km, -40oC ~ +85oC
FTCS-1324-02DI	1310nm, 2.488Gbps, 2km, -40°C ~ +85°C, With Digital Diagnostic Monitoring

Important Notice

Performance figures, data and any illustrative material provided in this data sheet are typical and must be specifically confirmed in writing by F-TONE before they become applicable to any particular order or contract. In accordance with the F-TONE policy of continuous improvement specifications may change without notice.

The publication of information in this data sheet does not imply freedom from patent or other protective rights of F-TONE or others. Further details are available from any F-TONE sales representative.