

PT4-S1-4153D

Description

The **PT4-S1-4153D** series single mode 1310nm optical transceivers are small form pluggable (SFP) with LC connector. They are compatible with the Small Form Factor Pluggable Multi-Sourcing Agreement (MSA). They comply with Gigabit Ethernet as specified in IEEE Std 802.3z and Fibre Channel FC-P1 10.0.

The transmitter section uses a multiple quantum well laser, highly reliable Fabry-Perot (FP) at 1310 nm. Which is a class 1 laser compliant according to International Safety Standard IEC-825. The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC. A TTL logic interface simplifies interface to external circuitry. Operating temperature is from -40°C to 85 °C.



Features

- Up to 1.25Gb/s bi-directional data links
- Duplex LC connector
- S/W control of TXFAULT, RXLOS and TXDISABLE
- Power-On Hour Meter
- AC/AC Inputs and Outputs
- Differential LVPECL inputs and outputs
- Single power supply 3.3 V
- TTL signal detect indicator
- Operating Temperature : -40°C ~ 85 °C
- Hot Pluggable SFP footprint
- Distance up to
10 Km (9 /125) , 550 M (50/125) , 220 M (62.5/125)

Application

- Compliant with SONET/SDH standard
- Compliant with Fiber Channel standard
- Class 1 laser product complies with EN 60825-1
- Distributed multi-processing
- Switch to switch interface
- High speed I/O for file server
- Bus extension application
- Channel extender, data storage

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LASER SAFETY

This single mode transceiver is a Class 1 laser product. It complies with IEC 825 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated within the specified temperature and voltage limits. The optical ports of the module shall be terminated with an optical connector or with a dust plug.

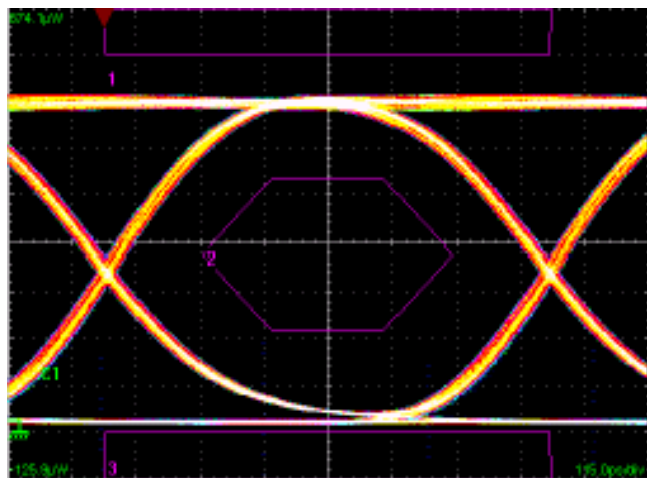
Absolute maximum ratings

PARAMETER	SYMBOL	MIN	MAX	UNITS	NOTE
Storage Temperature	T_S	-40	85	°C	
Supply Voltage	V_{CC}	---	5.0	V	
Input Voltage	----	GND	V_{CC}	V	
Soldering Temperature	T_{SOLD}	---	260	°C	10s on leads
Output Current	I_{out}	0	60	mA	
Operating Current	I_{OP}	---	400	mA	

Recommended operating conditions

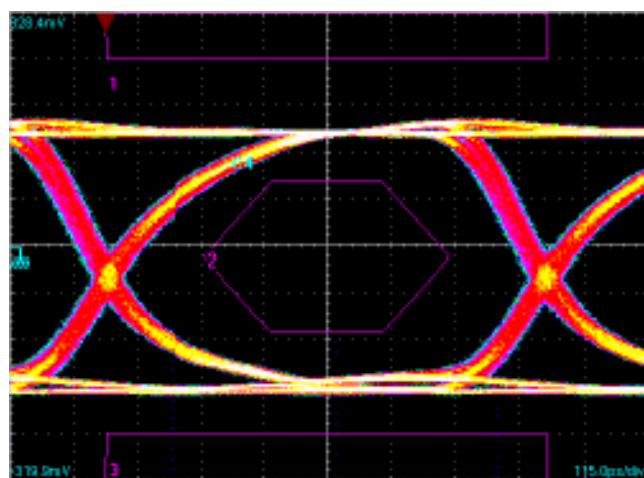
PARAMETER	SYMBOL	MIN	Typ	MAX	UNITS
Ambient Operating Temperature	T_{AMB}	-40	---	85	°C
Supply Voltage	V_{CC}	3.15	3.3	3.45	V
Supply Current	$I_{TX} + I_{RX}$	---	---	300	mA
Data Rate	---	---	1.25	---	Gb/s

Transmitter



Signal Pattern PRBS~7

Receiver



Signal Pattern PRBS~7

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Transmitter optical Specifications (-40 °C < Topr < 85 °C , 3.15 V < Vcc < 3.45 V)

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	NOTE
Optical						
Output Optical Power	P _{out}	-9	---	-3	dBm	1
Extinction Ratio	ER	9	---	---	dB	
Output Eye	Compliant with Bellcore TR-NWT-000253 and ITU recommendation G.957					
Center Wavelength	λ _C	1270	1310	1360	nm	
Spectral Width(FWHM)	Δλ	---	---	5	nm	RMS(σ)
Side Mode Suppression Ratio	SNSR	30	---	---	dB	
Rise/Fall Time	T _r , T _f	---	---	0.26	ns	2
Relative Intensity Noise	RIN	---	---	-200	dB/Hz	
Total jitter	T _j	---	---	227	ps	3
Deterministic Jitter	T _{DDJ}	---	---	80	ps	
Random Jitter	T _{RJ}	---	---	147	ps	
Electrical						
Power Supply Current	I _{cc}	---	---	160	mA	4
Max P _{out} Tx Disable -Asserted	P _{off}	---	---	-35	dBm	
Differential Input Voltage	V _{IH} -V _{IL}	0.4	---	1.6	mV	5
Data Input Voltage-Low	V _{IL} - V _{CC}	-2.0	---	-1.58	V	
Data Input Voltage-High	V _{IH} - V _{CC}	-1.1	---	-0.47	V	
Transmit Fault Output-Low	TX_FAULT _L	0	---	0.8	V	
Transmit Fault Output-High	TX_FAULT _H	2.0	---	V _{CC}	V	
TX_DISABLE Assert Time	t _{off}	---	---	10	μs	
TX_DISABLE Negate Time	t _{on}	---	---	1	ms	
Time to initialize, include reset of TX_FAULT	t _{init}	---	---	300	ms	
TX_FAULT from fault to assertion	t _{fault}	---	---	7	ms	
TX_DISABLE time to start reset	t _{reset}	10	---	---	μs	

Notes:

- Output power is coupled into a 9/125 μm single-mode fiber.
- 20% to 80% Values. Maximum t_r, t_f times tested against eye mask.
- Measured with a 2⁷-1 PRBS with 72 ones and 72 zeros.
- Maximum current is specified at V_{cc} = Maximum @ maximum temperature.
- These inputs are compatible with 10K, 10KH and 100K LVECL and LVPECL inputs.

PT4-S1-4153D**Receiver optical Specifications (-40 °C < Topr < 85 °C , 3.15 V < Vcc < 3.45 V)**

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	NOTE
Sensitivity	P _{IN}	---	-26	-24	dBm	1
Maximum Input Power	P _{IN}	-9	---	---	dBm	
Center Wavelength	λ _C	1270	1310	1360	nm	
Signal Detect-Asserted	P _A	-31	---	---	dBm	Average
Signal Detect-Deasserted	P _D	---	---	-20	dBm	Average
Signal Detect-Hysteresis	P _A -P _D	---	2.0	---	dB	
Wavelength of Operation		1100	---	1600	nm	
Electrical						
Power Supply Current	I _{CC}	---	---	100	mA	2
Differential Output Voltage	V _{DIFF}	0.37	---	2.0	V	
Data Output Voltage-Low	V _{OL} - V _{CC}	-2.0	---	-1.58	V	3
Data Output Voltage-High	V _{OH} - V _{CC}	-1.1	---	-0.47	V	
Signal Detect Assert Time	T _{SD +}	---	---	100	μs	
Signal Detect Deassert Time	T _{SD -}	---	---	100	μs	
Receiver Loss of Signal Output Voltage-Low	RX_LOSL	0	---	0.5	V	
Receiver Loss of Signal Output Voltage-High	RX_LOSH	2.4	---	V _{CC}	V	
Receiver Loss of Signal Assert Time (off to on)	t _{A, RX_LOS}	---	---	100	μs	
Receiver Loss of Signal Assert Time (on to off)	t _{D, RX_LOS}	---	---	100	μs	

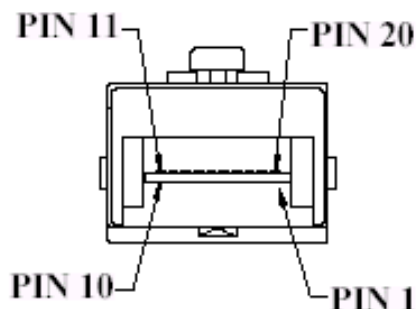
Notes:

1. Minimum sensitivity and saturation levels at BER=1E-12 for a 2⁷-1 PRBS with 72 ones and 72 zeros.
2. The current excludes the output load current.
3. These outputs are compatible with 10K, 10KH and 100K LVECL and LVPECL outputs.

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Pin Assignment

Pin-Out



Pin	Signal Name	Description
1	T _{GND}	Transmit Ground
2	TX_FAULT	Transmit Fault
3	TX_DISABLE	Transmit Disable
4	MOD_DEF (2)	SDA Serial Data Signal
5	MOD_DEF (1)	SCL Serial Clock Signal
6	MOD_DEF (0)	TTL Low
7	RATE SELECT	Open Circuit
8	RX_LOS	Receiver Loss of Signal, TTL High, open collector
9	R _{GND}	Receiver Ground
10	R _{GND}	Receiver Ground
11	R _{GND}	Receiver Ground
12	RX-	Receive Data Bar, Differential PECLL, ac coupled
13	RX+	Receive Data, Differential PECLL, ac coupled
14	R _{GND}	Receiver Ground
15	V _{CCR}	Receiver Power Supply
16	V _{CCT}	Transmitter Power Supply
17	T _{GND}	Transmitter Ground
18	TX+	Transmit Data, Differential PCEL, ac coupled
19	TX-	Transmit Data Bar, Differential PCEL, ac coupled
20	T _{GND}	Transmitter Ground

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Transmitter Section

The transmitter section consists of a 1310 nm InGaAsP laser in an eye safe optical sub assembly (OSA) which mates to the fiber cable. The laser OSA is driven by a LD driver IC which converts differential input LVPECL logic signals into an analog laser driving current.

TX_FAULT

When sensing an improper power level in the laser driver, the SFP set this signal high and turns off the Laser.

TX_FAULT can be reset with the TX_DISABLE line. The signal is in TTL level.

TX_DISABLE

The TX_DISABLE signal is high (TTL logic "1") to turn off the laser output. The laser will turn on within 1ms when TX_DISABLE is low (TTL logic "0").

Receiver Section

The receiver utilizes an InGaAs PIN photodiode mounted together with a trans-impedance preamplifier IC in an OSA. This OSA is connected to a circuit providing post-amplification quantization, and optical signal detection.

Receive Loss (RX_LOS)

The RX_LOS is high (logic "1") when there is no incoming light from the companion transceiver. This signal is normally used by the system for the diagnostic purpose. The signal is operated in TTL level.

