Finisar® Transceiver

Product Specification

25GBASE-SR 100m SFP28 Finisar® Transceiver

FTLF8536P5xyz

PRODUCT FEATURES

- Up to 25.78 Gb/s bi-directional data links
- Hot-pluggable SFP+ footprint
- Built-in digital diagnostic functions
- 850nm Oxide VCSEL laser transmitter
- Duplex LC connector
- Bail latch or pull tab
- RoHS compliant
- 100m over M5F MMF (50/125 um OM4)
- 70m over M5E MMF (50/125um OM3)
- Metal enclosure, for lower EMI
- 1W maximum power consumption
- Single 3.3V power supply
- Single rate and dual rate
- Operating temperature range:

  C-temp: 0°C to 70°C

  E-temp: 0°C to 85°C

APPLICATIONS

- 25GE SR and 10GE SR Lite
- 100G SR4 fan out to 4x25GE SR
- eCPRI

Finisar® FTLF8536P5xyz SFP28 transceiver modules are designed for use in 25 Gigabit per second links over multimode fiber. They are compliant to IEEE802.3by, SFF-8472 Rev 12.2[b] and SFF-8402[g], and compatible with SFF-8432[a] and applicable portions of SFF-8431 Rev. 4.1[c]. The transceiver is RoHS compliant as described in Application Note AN-2038.

PRODUCT SELECTION

FTLF8536P5xyz
x=B: Bail latch
x=P: Pull tab
y=C: C-temp
y=N: E-temp
z=L: Single rate (25GbE only)
z=V: Dual rate (25GbE and 10GbE)

I. Pin Descriptions

Pin	Symbol	Name/Description	Ref.
1	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1
2	T_{FAULT}	Transmitter Fault.	2
3	T_{DIS}	Transmitter Disable. Laser output disabled on high or open.	3
4	SDA	2-wire Serial Interface Data Line (MOD-DEF2)	4
5	SCA	2-wire Serial Interface Clock (MOD-DEF1)	4
6	MOD_ABS	Module Absent, connected to V_{EET} or V_{EER}	4
7	RS0	Rx Rate Select Single rate (FTLF8536P5xyL): Not Connected (NC) Dual rate (FTLF8536P5xyV): Open or Low = 10.3 Gb/s Ethernet (Low Bandwidth) High = 25.78 Gb/s Ethernet (High Bandwidth)	5
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	6
9	RS1	Tx Rate Select Single rate (FTLF8536P5xyL): Not Connected (NC) Dual rate (FTLF8536P5xyV): Open or Low = 10.3 Gb/s Ethernet (Low Bandwidth) High = 25.78 Gb/s Ethernet (High Bandwidth)	5
10	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
11	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
12	RD-	Receiver Inverted DATA out. AC Coupled	
13	RD+	Receiver Non-inverted DATA out. AC Coupled	
14	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
15	V_{CCR}	Receiver Power Supply	
16	V_{CCT}	Transmitter Power Supply	
17	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1

Notes:
1. Circuit ground is internally isolated from chassis ground.
2. T_{FAULT} is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to Vcc + 0.3V. A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
3. Laser output disabled on T_{DIS} >2.0V or open, enabled on T_{DIS} <0.8V.

4. Should be pulled up with 4.7k – 10kohms on host board to a voltage between 2.0V and 3.6V. MOD_ABS pulls line low to indicate module is plugged in.
5. Rate select can also be set through the 2-wire bus in accordance with SFF-8472 v. 12.1[c]. Rx Rate Select is set at Bit 3, Byte 110, Address A2h. Tx Rate Select is set at Bit 3, Byte 118, Address A2h. Note: writing a "1" selects maximum bandwidth operation. Rate select is the logic OR of the input state of Rate Select Pin and 2-wire bus.
6. LOS is open collector output. Should be pulled up with 4.7k – 10kohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

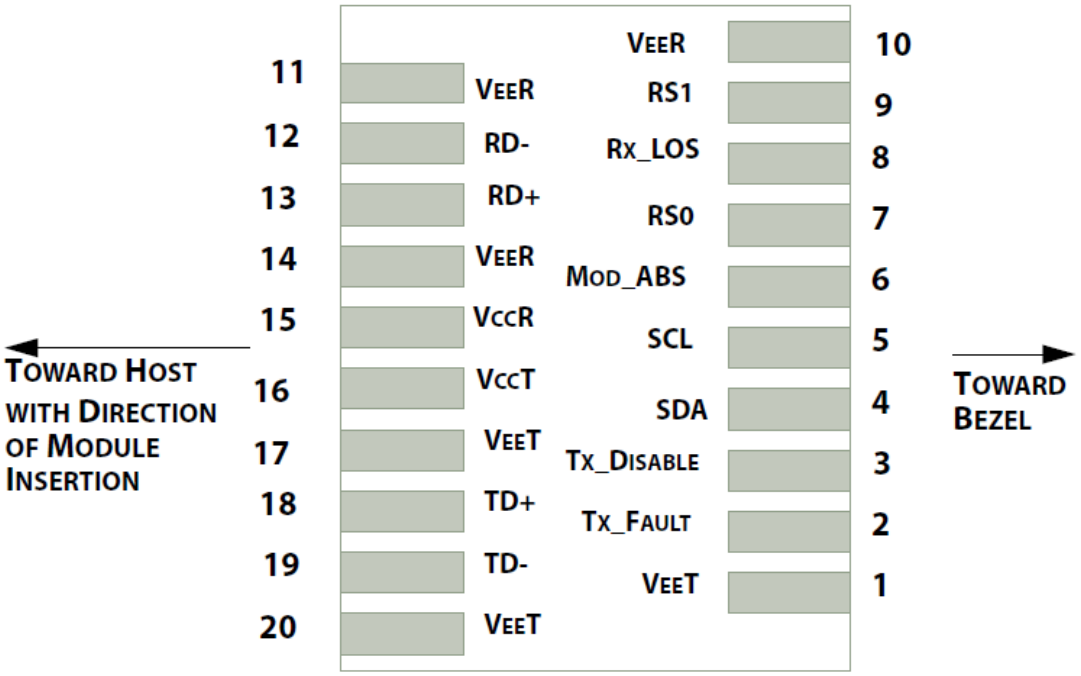


Diagram of Host Board Connector Block Pin Numbers and Names

II. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Maximum Supply Voltage	Vcc	-0.5		4.0	V	
Storage Temperature	T_S	-40		85	°C	
Case Operating Temperature	T_C				°C	
C-temp (FTLF8536P5xCz)		0		70		
E-temp (FTLF8536P5xNz)		0		85		
Relative Humidity (Non-condensing)	RH	0		85	%	1

Notes:
1. Non Condensing

III. Electrical Characteristics (T_A, V_{CC} = 3.15 to 3.46 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	Vcc	3.15		3.46	V	
Supply Current	Icc			290	mA	1
Transmitter						
Input differential impedance	R_{in}		100		Ω	2
Single-ended data input swing	Vin,pp	125		450	mV	3
Inner Eye Height	EH6	95			mV	
Transmit Disable Voltage	V_D	2		Vcc	V	4
Transmit Enable Voltage	V_{EN}	Vee		Vee+0.8	V	
Receiver						
Single ended data output swing	Vout,pp	185		425	mV	5
LOS Fault	$V_{LOS\ fault}$	2		V_{CCHOST}	V	6
LOS Normal	$V_{LOS\ norm}$	Vee		Vee+0.8	V	6
Power Supply Rejection	PSR	100			mVpp	7

Notes:
1. With established link. The total power dissipation could exceed 1W when the module is trying to establish link at operating case temperature below 25ºC
2. Connected directly to TX data input pins. AC coupling from pins into laser driver IC.
3. The minimum value represents the minimum outer eye amplitude.
4. Or open circuit.
5. Into 100 ohms differential termination.
6. LOS is an open collector output. Should be pulled up with 4.7k – 10kohms on the host board. Normal operation is logic 0; loss of signal is logic 1. Maximum pull-up voltage is 5.5V.
7. Receiver sensitivity is compliant with power supply sinusoidal modulation of 20 Hz to 1.5 MHz up to specified value applied through the recommended power supply filtering network.

IV. Optical Characteristics (T_A, V_{CC} = 3. 15 to 3.46 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Transmitter						
Average Output Power	P_{OUT}	-8.4		2.4	dBm	1
Optical Wavelength	λ	840		860	nm	
Spectral Width (RMS)	σ			0.60	nm	
Optical Modulation Amplitude 25.78Gb/s (Single and Dual Rate) 10.3Gb/s (Dual Rate only)	OMA	 -6.4 -5.2		 3	dBm	
Launch power in OMA minus TDEC		-7.3			dBm	
Transmitter Dispersion Penalty @ 10.3Gb/s	TDP			3.9	dB	
Transmitter and Dispersion Eye Closure @ 25.7Gb/s	TDEC			4.3	dB	
Average Launch Power of OFF transmitter	P_{OFF}			-30	dBm	
Optical Return Loss Tolerance	ORLT			12	dB	
Extinction Ratio @ 25.78Gb/s	ER	2			dB	
Receiver						
Damage Threshold	Rx_{Damage}	3.4			dBm	2
Stressed Receiver OMA Sensitivity 25.78Gb/s (Single and Dual Rate) 10.3Gb/s (Dual Rate only)	Rx_{SENS}			 -5.2 -7.5	dBm	3
Unstressed Receiver OMA Sensitivity @ 10.3Gb/s	Rx_{SENS}			-11.1	dBm	4
Average Receiver Power @ 25.78Gb/s	Rx_{MAX}	-10.3		2.4	dBm	5
Optical Center Wavelength	λ_C	840		860	nm	
Optical Return Loss		12			dB	
LOS De-Assert	LOS_D			-13	dBm	
LOS Assert	LOS_A	-30			dBm	
LOS Hysteresis		0.5			dB	

Notes:
1. Class 1 Laser Safety limit per FDA/CDRH, and EN (IEC) 60825 laser safety standards.
2. The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level. The receiver does not have to operate correctly at this input power.
3. Measured with conformance test signal at TP3 (see IEEE P802.3bm 95.8.8) for BER 5E-5.
4. Unstressed receiver OMA sensitivity is informative.
5. Average receive power (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.

V. General Specifications

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Data Rate Dual Rate Single Rate	BR		 25.78 and 10.3 25.78		Gb/s	
Bit Error Rate	BER	5E-5 1E-12				1 2
Fiber Length on 50/125µm high-bandwidth (OM3/M5E) MMF	L			70	m	
Fiber Length on 50/125µm high-bandwidth (OM4/M5F) MMF	L			100	m	

Notes:
1. At 25.78Gb/s Ethernet data rate (IEEE 802.3by)
2. At 10.3Gb/s Ethernet data rate (Dual Rate only)

VI. Environmental Specifications

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Case Operating Temperature C-temp (FTLF8536P5xCz) E-temp (FTLF8536P5xNz)	T_{op}	 0 0		 70 85	°C	
Storage Temperature	T_{sto}	-40		85	°C	

VII. Regulatory Compliance

The FTLF8536P5xyz transceivers are RoHS compliant. Copies of certificates are available from II-VI Incorporated upon request.

FTLF8536P5xyz transceiver modules are Class 1 laser eye safety compliant per IEC 60825-1.

CAUTION: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

VIII. Digital Diagnostic Functions

Finisar® FTLF8536P5xyz SFP28 transceivers support the 2-wire serial communication protocol as defined in the SFP MSA[f]. It is very closely related to the E^{2}PROM defined in the GBIC standard, with the same electrical specifications.

The standard SFP serial ID provides access to identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information.

Additionally, Finisar® SFP transceivers provide a enhanced digital diagnostic monitoring interface, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage. It also defines a sophisticated system of alarm and warning flags, which alerts end-users when particular operating parameters are outside of a factory set normal range.

The SFP MSA defines a 256-byte memory map in E^{2}PROM that is accessible over a 2-wire serial interface at the 8 bit address 1010000X (A0h). The digital diagnostic monitoring interface makes use of the 8 bit address 1010001X (A2h), so the originally defined serial ID memory map remains unchanged. The interface is identical to, and is thus fully backward compatible with both the GBIC Specification and the SFP Multi Source Agreement. The complete interface is described in Finisar Application Note AN-2030: "Digital Diagnostics Monitoring Interface for SFP Optical Transceivers".

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through a 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL, Mod Def 1) is generated by the host. The positive edge clocks data into the SFP transceiver into those segments of the E^{2}PROM that are not write-protected. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA, Mod Def 2) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

For more information, please see the SFP MSA documentation[c,f] and Finisar Application Note AN-2030.

TX Equalization Control @ 25G
Tx input equalization control can be accessed through 2-wire serial interface at byte address 114 (A2h). Tx input equalization control for 25GE is located at the upper 4 bits of byte 114 (A2h) while the lower 4 bits are reserved for rate low in the case of dual rate application.

RX Emphasis Control @ 25G
Rx output emphasis control can be accessed through 2-wire serial interface at byte address 115 (A2h). Rx output emphasis control for 25GE is located at the upper 4 bits of

byte 115 (A2h) while the lower 4 bits are reserved for rate low in the case of dual rate application.

IX. Digital Diagnostic Specifications

FTLF8536P5xyz transceivers can be used in host systems that require either internally or externally calibrated digital diagnostics.

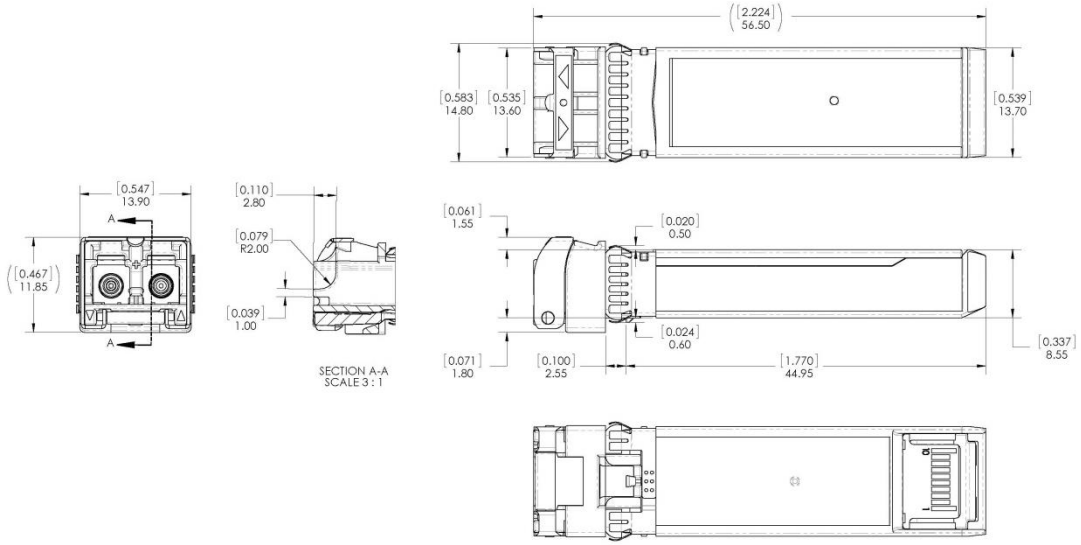
Parameter	Symbol	Units	Min	Max	Accuracy	Ref.
Transceiver temperature C-temp (FTLF8532P5xCz) E-temp (FTLF8532P5xNz)	D_{DDTemp}	ºC	0 0	+70 +85	±5ºC	
Transceiver supply voltage	$D_{DDVoltage}$	V	3.14	3.45	±3%	
Transmitter bias current	D_{DDBias}	mA	0	20	±10%	1
Transmitter output power	$D_{DDTx\text{-}Power}$	dBm	-9	+2.4	±3dB	
Receiver average optical input power	$D_{DDRx\text{-}Power}$	dBm	-11	+2.4	±3dB	

Notes:

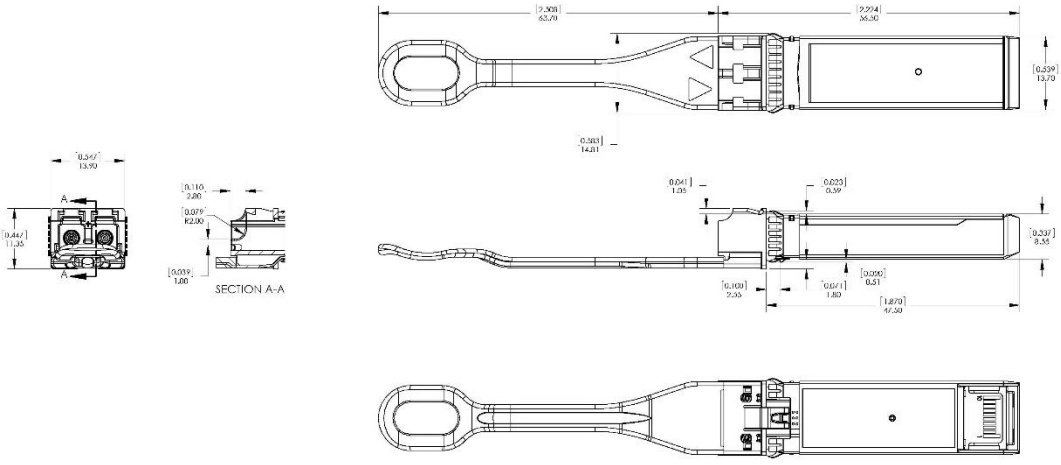
1. Accuracy of Measured Tx Bias Current is 10% of the actual Bias Current from the laser driver to the laser.

X. Mechanical Specifications

Finisar® FTLF8536P5xyz SFP28 transceivers are compatible with the SFF-8432[b] specification for improved pluggable form factor.

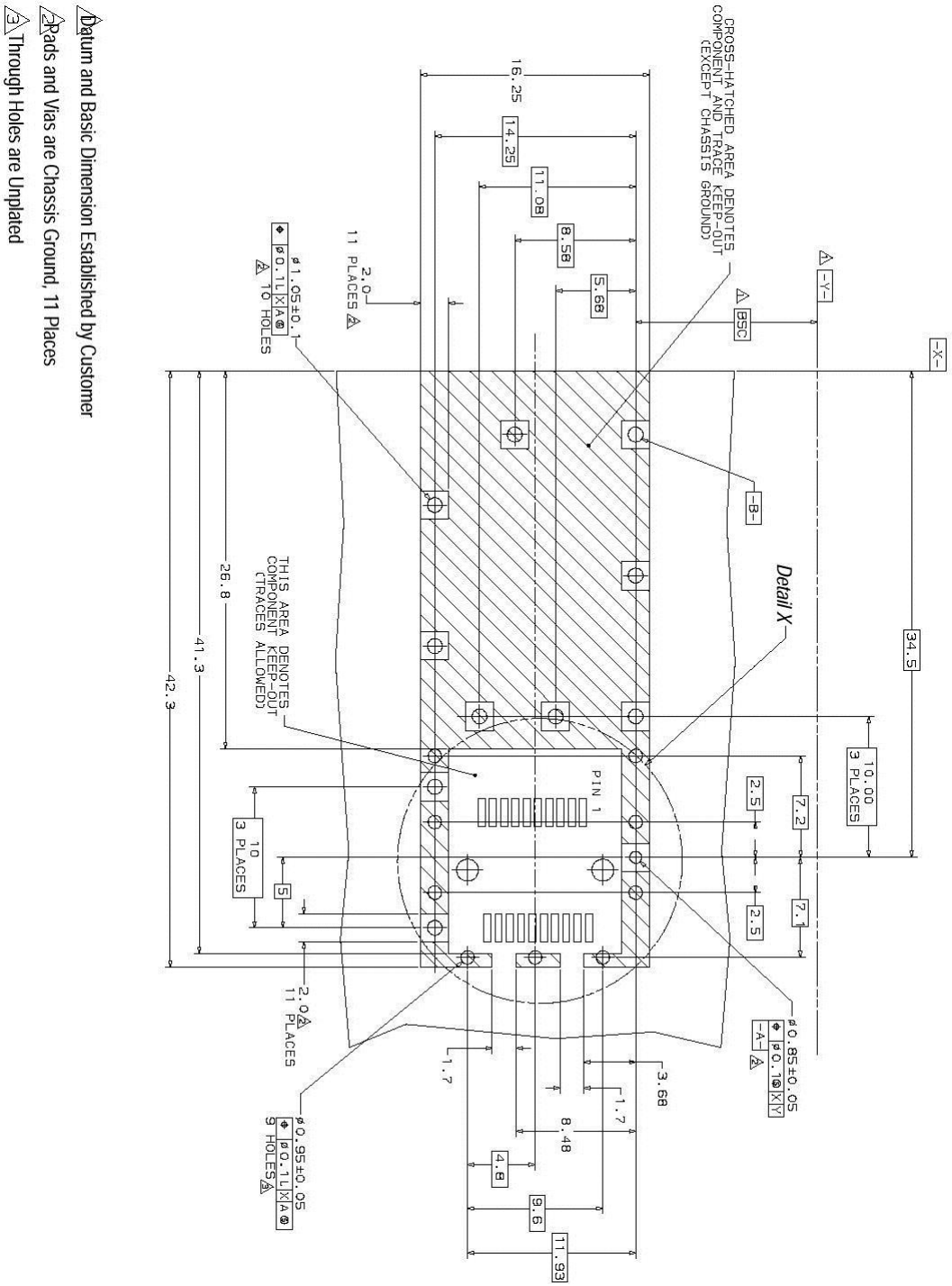


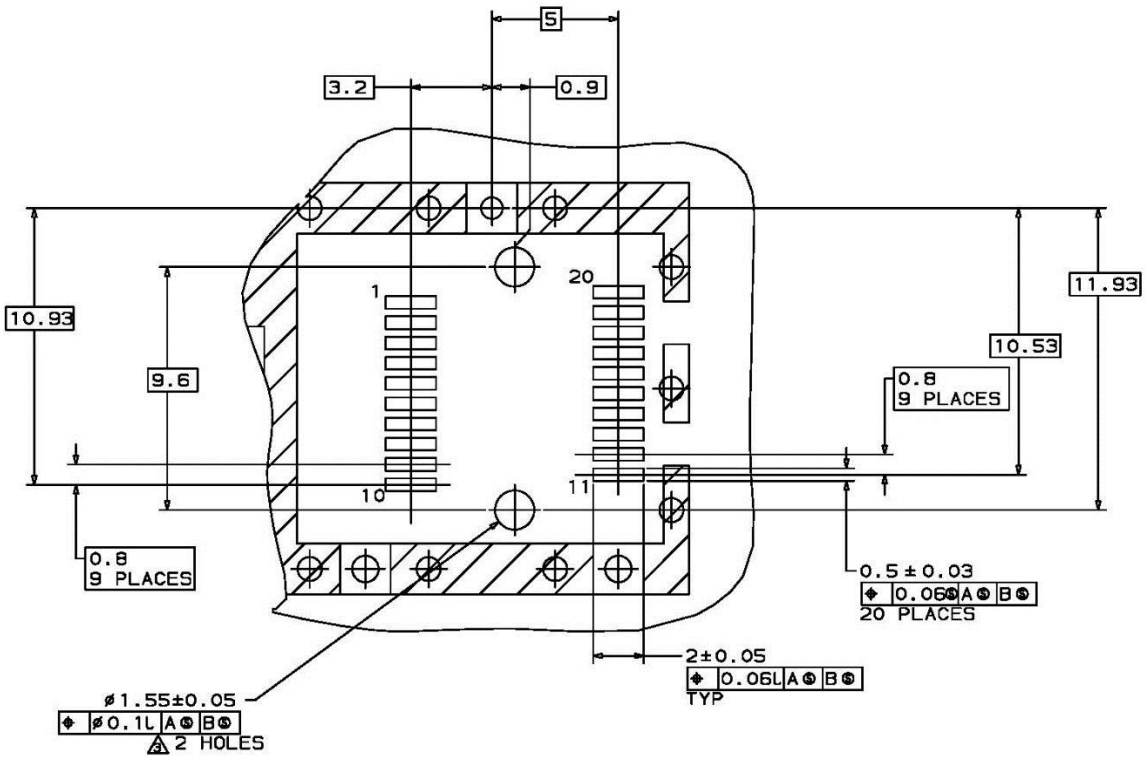
FTLF8536P5Byz (Bail latch)

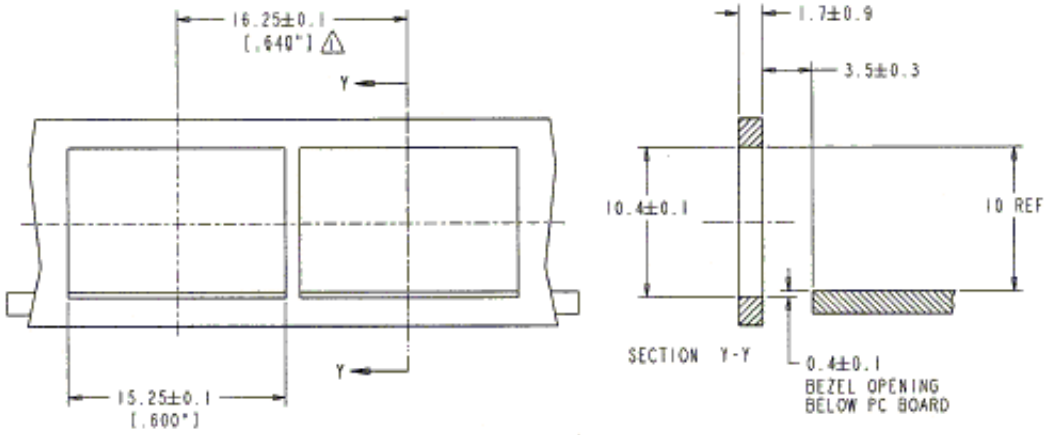


FTLF8536P5Pyz (Pull tab)

XI. PCB Layout and Bezel Recommendations







NOTES:

1. MINIMUM PITCH ILLUSTRATED, ENGLISH DIMENSIONS ARE FOR REFERENCE ONLY
2. NOT RECOMMENDED FOR PCI EXPANSION CARD APPLICATIONS

XII. Ordering Information

Part Number	Unlocking Mechanism	Operating Temp Range	Data Rate
FTLF8536P5BCL	Bail latch	0°C to 70°C	25GbE only
FTLF8536P5BCV	Bail latch	0°C to 70°C	25GbE and 10GbE
FTLF8536P5BNL	Bail latch	0°C to 85°C	25GbE only
FTLF8536P5BNV	Bail latch	0°C to 85°C	25GbE and 10GbE
FTLF8536P5PCL	Pull tab	0°C to 70°C	25GbE only
FTLF8536P5PCV	Pull tab	0°C to 70°C	25GbE and 10GbE
FTLF8536P5PNL	Pull tab	0°C to 85°C	25GbE only
FTLF8536P5PNV	Pull tab	0°C to 85°C	25GbE and 10GbE

XIII. References

a. "Improved Pluggable Form Factor", SFF Document Number SFF-8432, Revision 5.0, July 16, 2007.

b. "Digital Monitoring Interface for Optical Transceivers", SFF Document Number SFF-8472, Revision 12.2.

c. "Enhanced Small Form Factor Pluggable Module 'SFP+' ", SFF Document Number SFF-8431, Revision 4.1, July 6, 2009; Addendum Jun 21, 2013.

d. Directive 2011/65/EU of the European Council Parliament and of the Council, "on the restriction of the use of certain hazardous substances in electrical and electronic equipment". 08-June 2011, which supercedes the previous ROHS Directive 2002/95/EC.

e. Small Form Factor Pluggable (SFP) Transceiver Multi-source Agreement (MSA), September 14, 2000 which is available as SFF Document Number INF-8074, Revision 1.0 May 12, 2001

f. "0.8mm Card Edge Connector for 16Gb/s Applications", SFF Document Number SFF-8081, Revision 0.2, December 21, 2009.

g. SFF-8402, Revision 0.2

XIV. For More Information

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