SFP Pluggable 4/2/1G FC/GbE FP and DFB Transceiver RoHS 6/6

JSH-42L3AD3-5, JSH-42L3AD3-5G, JSH-42L3AD3-20

Key Features

- International Class 1 laser safety certified
- RoHS directive compliant (lead-free)
- 4x,2x,1x (ANSI) Fibre Channel compliant
- Gigabit Ethernet compatible
- Long wavelength (LW)
- JSH-42L3AD3-5 max. distance of 5 km
- JSH-42L3AD3-20 max. distance of 20 km
- Digital Diagnostic Monitoring Interface SFF-8472 compliant
- EMI Emissions below Class B
- Single +3.3 V power supply
- -15°C ambient to 85°C case operation
- UL and CSA approved
- Optional interrupt on alarms and warnings

Applications

- Fibre Channel
- Ethernet networking
- Client/Server environments
- Distributed multi-processing
- Fault tolerant applications
- Visualization, real-time video, collaboration
- Channel extenders, data storage, archiving
- Data acquisition

These JDSU SFPs are integrated fiber optic transceivers that provide a high-speed serial link at a signaling rate up to 4.25 Gb/s. They conform to the American National Standards Institute's (ANSI) Fibre Channel, and SFF-8472 specifications.

The JSH-42L3AD3-5 supports a maximum fiber distance of 5 km and is available with blue color identification or gray color identificaiton (JSH-42L3AD3-5G). The JSH-42L3AD3-20 supports a maximum fiber distance of 20 km. These transceivers operate on singlemode fiber only.

The transceiver is ideally suited for Fibre Channel applications which include point to point links as well as Fibre Channel Arbitrated Loop (FC-AL). It can also be used for other serial applications where high data rates are required. This specification applies to a hot-pluggable (SFP) module which is an electrical surface-mount connector assembly.

The transceiver features a microprocessor with imbedded non-volatile RAM. Vital product data is stored in the NVRAM and several optical and electrical characteristics of the transceiver are computed "Real-Time" with the results written to memory. This data can all be accessed by a two-wire serial interface at the SFP connector.

Encoded (8B/10B), serial differential signals traverse the connector interfacing the transceiver to the host card. The serial data modulates the laser and is sent out over the outgoing fiber of a duplex cable.

The transceiver is a certified Class 1 laser safe product. The optical power levels, under normal operation, are at eye safe levels. Optical fiber cables can be connected and disconnected without shutting off the laser transmitter.

The transceiver is also compliant with the RoHS Directive from the European Union - Directive 2002/95/EC on the Restriction Of use of certain Hazardous Substances. The largest change with optical transceivers comes with the removal of all lead-based parts and soldering. Now it is a lead-free part.

Laser Safety Compliance

The JDSU transceiver is a CLASS 1 LASER PRODUCT as defined by the international standard IEC 60825-1, Am.2 (2001). The product also complies with U.S.A. regulations for Class 1 products contained in 21 CFR 1040.10 and 1040.11. Laser emissions from Class 1 laser products are not considered hazardous when operated according to product specifications. Operating the product with a power supply voltage exceeding 5.0 volts may compromise the reliability of the product, and could result in laser emissions exceeding Class 1 limits identified in IEC 60825-1, Am.2 (2001); under these circumstances, viewing the transmitter port with optical aides (i.e., eye loupes) should be avoided.

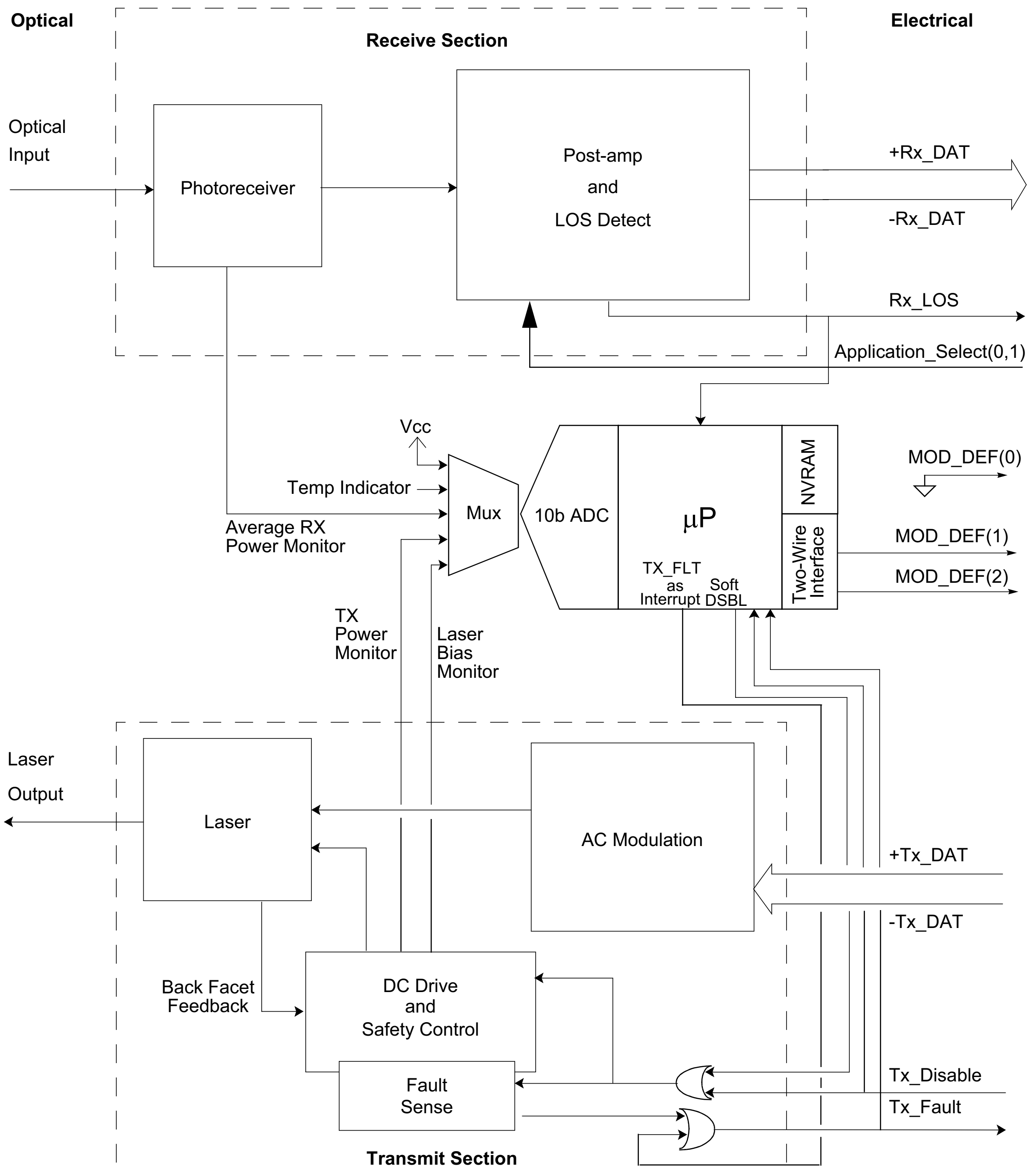
ESD Notice

It is advised that normal static precautions be taken in the handling and assembly of the transceiver to prevent damage and/or degradation which may be introduced by electrostatic discharge.

Pin Definitions

Pin #	Pin Name	Type	Sequence	Pin #	Pin Name	Type	Sequence
1	Tx Ground	Ground	1	11	Rx Ground	Ground	1
2	Tx_Fault	Signal Out	3	12	-Rx_DAT	Data Out	3
3	Tx_Disable	Signal In	3	13	+Rx_DAT	Data Out	3
4	MOD_DEF(2)	Input/Output	3	14	Rx Ground	Ground	1
5	MOD_DEF(1)	Input/Output	3	15	Rx Power	Power	2
6	MOD_DEF(0)	Input/Output	3	16	Tx Power	Power	2
7	Reserved	Signal In	3	17	Tx Ground	Ground	1
8	Rx_LOS	Signal Out	3	18	+Tx_DAT	Data In	3
9	Reserved	Signal In	3	19	-Tx_DAT	Data In	3
10	Rx Ground	Ground	1	20	Tx Ground	Ground	1

Block Diagram



Transmit Section

The input, an AC coupled differential data stream from the host, enters the AC Modulation section of the laser driver circuitry where it modulates the output optical intensity of a semiconductor laser. The DC Drive circuit incorporates an automatic power control (APC) loop which maintains the laser at the correct preset power level. In addition, safety circuits in the DC Drive will shut off the laser, or guarantee safe launch power if a fault is detected. The transceiver provides the AC coupling for the +Tx/-Tx lines. No AC coupling capacitors are required on the host card for proper operation. There are two outputs from the transmitter section that deliver signals proportional to the average transmitted optical power and also the laser average bias current. These signals are digitized and processed within the transceiver for the Digital Diagnostic Monitoring feature.

Receive Section

The incoming modulated optical signal is converted to an electrical signal by the photoreceiver. This electrical signal is then amplified and converted to a differential serial output data stream and delivered to the host. A signal strength detector indicates whether light is present or not at the input to the photoreceiver. This signal is provided to the host as a loss-of-signal (Rx_LOS) status line. The transceiver provides the AC coupling for the +Rx/-Rx lines. No AC coupling capacitors are required on the host card for proper operation. There is an output from the pre-amplifier in the photoreceiver that is proportional to the average optical power incident on the photodiode. This signal is digitized and processed within the transceiver as part of the Digital Diagnostic Monitoring feature.

Digital Diagnostic Monitoring

The digital diagnostic monitoring feature is compliant with document SFF-8472, "Digital Diagnostic Monitoring Interface for Optical Transceivers" [5]. In addition to transmitted optical power, laser-bias current and received optical power, there are also sensors for transceiver temperature and supply voltage which are all multiplexed to the analog-to-digital converter. After the signals are digitized, they are processed and compared to alarm levels for the optional alarm features and interrupts. The real-time values of each monitored parameter can be read and used for evaluating the status of the link. Also, the alarm/warning bits can be used to provide transceiver status or enable an interrupt notification. A user-writable non-volatile RAM scratch space for customer use is limited to 100,000 write cycles.

Optional Monitor TX_FAULT Alarm/Warning Interrupt

The transceiver provides programmable Alarm/Warning Interrupt Enable bits. They are used by the transceiver to generate a TX_FAULT signal usable as an interrupt to the host for an alarm/warning condition. This is an extension to the polling architecture of SFF-8472 and allows for interrupt driven host microcode.

Two-Wire Protocol for Serial ID and Digital Diagnostic Monitoring Information

Product specific information is stored in the device and is accessible via a standard two-wire interface. Some of the data is non-volatile and some is updated real time with data that characterizes critical conditions of the transceiver. While most registers are read only, some registers can be written by the customer for use as scratch space or to set interrupt enables or clear interrupt indicators.

There are two data addresses which can be used to access two different sets of data. The page address 0b1010000X is used for the set of Serial ID data and the page address 0b1010001X is used for the set of Digital Diagnostic Monitoring information.

Critical timings for communicating to the module on the two-wire interface are shown in Two-Wire Interface Figure 8 on page 8. For more information on the Serial ID protocol, see Two-Wire Interface Timing Specifications on page 14.

Two-wire Data Read

To read data from the device, the following sequence must occur on the Two-wire interface (refer to Two-Wire Interface Figure 2 on page 7, Two-Wire Interface Figure 3 on page 7, and Two-Wire Interface Figure 4 on page 7 throughout these steps):

1. To read data from the device, the following sequence must occur on the Two-wire interface (refer to Two-Wire Interface Figure 2 on page 7, Two-Wire Interface Figure 3 on page 7, and Two-Wire Interface Figure 4 on page 7 throughout these steps):

2. Send a start signal to the module.
   A start signal is presented by toggling the data line from high to low while the clock is high (see Two-Wire Interface Figure 2 on page 7).
   Send the write data sequence.
   The write data sequence consists of the bits 0b10100000 for the Serial ID data or 0b10100010 for the Digital Diagnostic Monitoring information.

3. Receive an acknowledge signal.
   One zero bit is the acknowledge signal.
   Once this sequence has been acknowledged, the user will send the memory address to start reading from.

4. Send the address of the first byte to be read during the subsequent sequence.

5. Receive an acknowledge signal.

6. Send a start signal.

7. Send the read data sequence.
   The read data sequence consists of the bits 0b10100001 for the Serial ID data or 0b10100011 for the Digital Diagnostic Monitoring information.

8. Receive an acknowledge signal.
   Once this sequence has acknowledged, the user will begin receiving data bytes.

9. Receive a data byte.

10. Send an acknowledge signal to receive the next, consecutive data byte, or send a no-acknowledge signal followed by a stop signal to stop receiving data.
    A stop signal is presented by toggling the data line from low to high while the clock is high (see Two-Wire Interface Figure 2 on page 7).

Two-wire Data Write

To write data to the Digital Diagnostic Monitoring data address of the device (writes are not allowed to the Serial ID data address), the following sequence must occur on the Two-wire interface (refer to Two-Wire Interface Figure 1 on page 7, Two-Wire Interface Figure 2 on page 7, and Two-Wire Interface Figure 3 on page 7 throughout these steps):

1. Send a start signal to the module.
   A start signal is presented by toggling the data line from high to low while the clock is high (see Two-Wire Interface Figure 2 on page 7).

2. Send the data write sequence.
   The write data sequence consists of the bits 0b10100000 for the Serial ID data or 0b10100010 for the Digital Diagnostic Monitoring information.

3. Receive an acknowledge signal.
   One zero bit is the acknowledge signal.

4. Send the address of the first byte to be written during the subsequent sequence.
   Valid byte addresses are 0b01101110 for one byte, and byte addresses 0b10000000 thorough 0b11110111.

5. Receive an acknowledge signal.

6. Send a data byte.

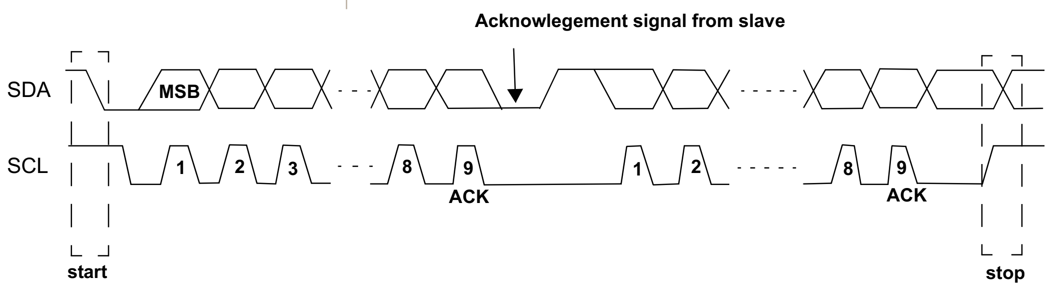
7. Receive an acknowledge signal.

8. Send the next, consecutive data byte (reference Two-Wire Interface Figure 7 on page 8), or send a stop signal to stop sending data (reference Two-Wire Interface Figure 6 on page 8).

A stop signal is presented by toggling the data line from low to high while the clock is high (see Two-Wire Interface Figure 2 on page 7).

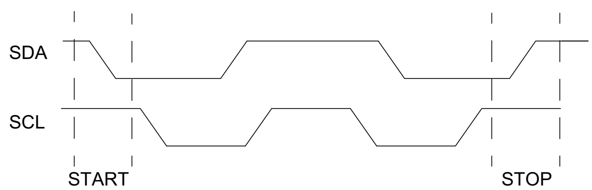
Two-Wire Interface Figure 1

Data transfer on the Two-wire interface



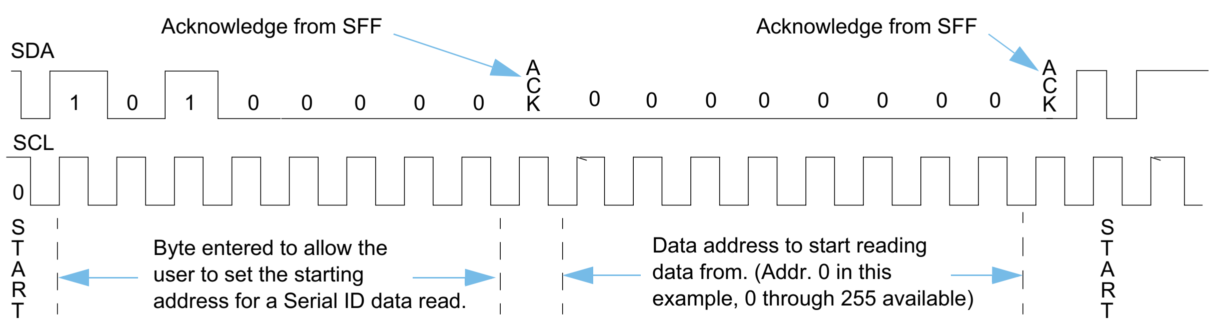
Two-Wire Interface Figure 2

Start and Stop Timing



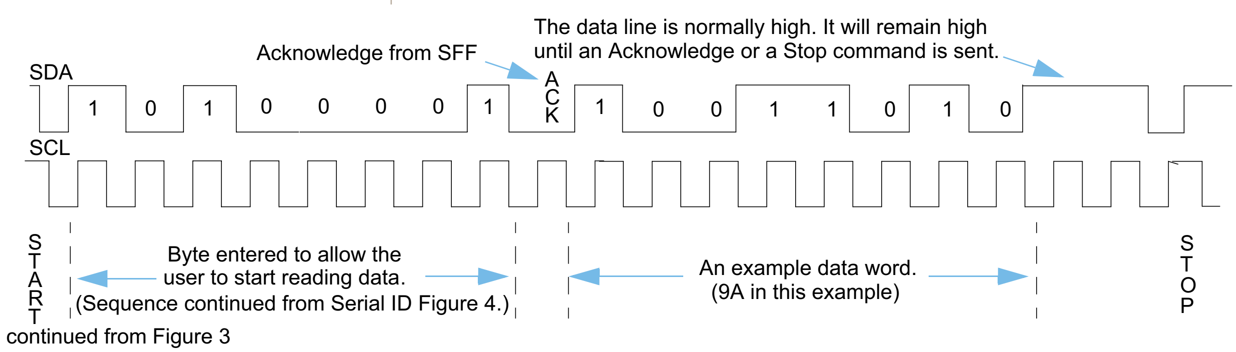
Two-Wire Interface Figure 3

Set Data Address Sequence for Read Timing



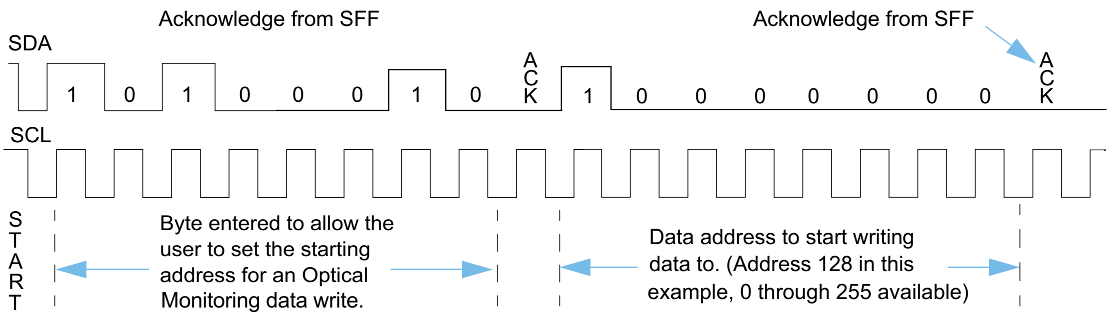
Two-Wire Interface Figure 4

Read Data Sequence Timing



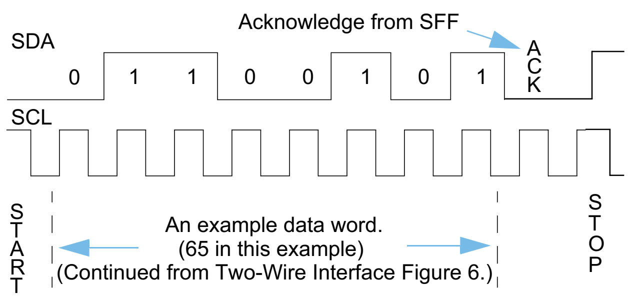
Two-Wire Interface Figure 5

Set Data Address Sequence for Write Timing



Two-Wire Interface Figure 6

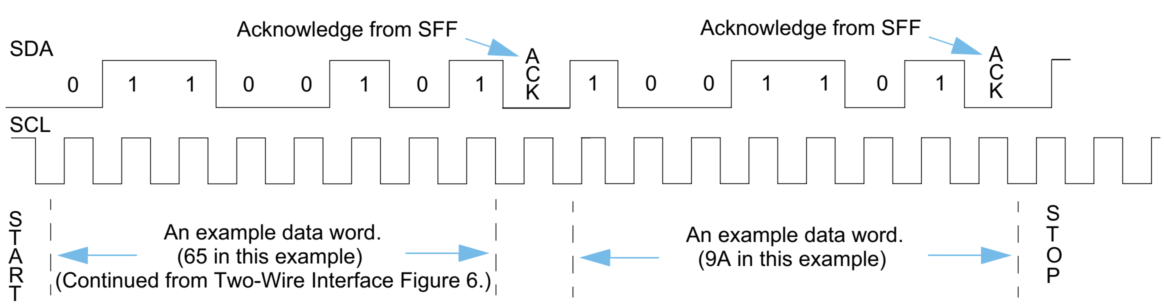
Write Data (Single-Byte) Sequence Timing



Note: The first byte after a start condition must always be the address byte for the transceiver (either A0 or A2 with the low order bit indicating write/read) or there will not be an acknowledge.

Two-Wire Interface Figure 7

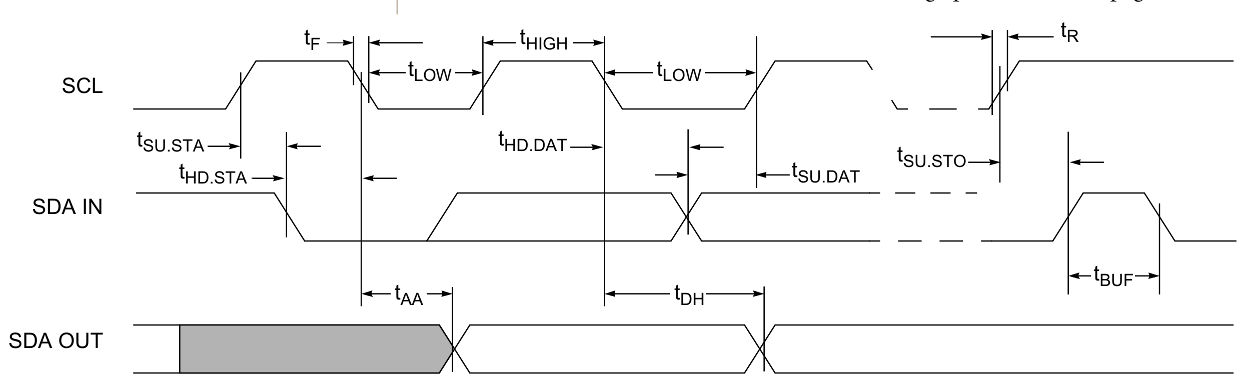
Write Data (Multi-Byte) Sequence Timing



Two-Wire Interface Figure 8

Critical Timings

Parameters are defined in Two-Wire Interface Timing Specifications on page 14.



Absolute Maximum Ratings

Parameter	Symbol	Min	Typical	Max	Units
Storage temperature[1]	T_S	-40		85	°C
Relative humidity–storage[1,2]	RH_S	0		90	%
Supply voltage[1]	V_{CC}	-0.5		5.0	V
TTL DC input voltage[1]	V_I	0		V_{CC} + 0.7	V
Non-volatile write cycles				100,000	cycles

1. Stresses listed may be applied one at a time without causing permanent damage. Exposure to these values for extended periods may affect reliability. Specification Compliance is only defined within Specified Operating Conditions.
2. Non-condensing environment.

Specified Operating Conditions

Parameter	Symbol	Min	Typical	Max	Units
Operating temperature	T_{OP}	-15		85[1]	°C
Operating temperature[2]	T_{OP}	-40		-15	°C
Supply voltage (±10%)	V_{CC}	3.0	3.3	3.6	V
Relative humidity operating	RH_{OP}	5		90	%

1. Case temperature
2. Compatible operation (BER<10^{-12})

Power Supply Interface

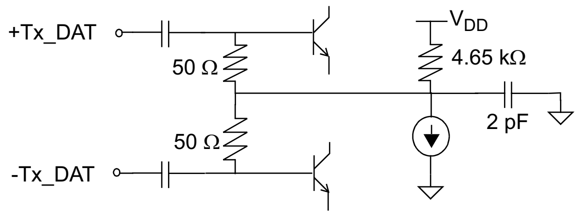
Parameter	Symbol	Min	Typical	Max	Units
V_{CC} current (combined Tx and Rx) JSH-42L3AD3-20	I_{VCC}		200	300	mA
V_{CC} current (combined Tx and Rx) JSH-42L3AD3-5	I_{VCC}		240	300	mA
Total power dissipation (combined Tx and Rx) JSH-42L3AD3-20	P		650	1000[1]	mW
Total power dissipation (combined Tx and Rx) JSH-42L3AD3-5	P		800	1000[1]	mW
Ripple & noise				100	mV(pk-pk)

1. At 3.3 volts

Transmit Signal Interface (from host to transceiver)

Parameter	Symbol	Min	Max	Units
Amplitude[1]	V_o	300	2400	mV
Deterministic jitter[2]	$DJ_{elec-xmit}$		0.14	UI
Total jitter[2]	$TJ_{elec-xmt}$		0.26	UI
Rise/fall[3]		60		ps
Differential skew			20	ps
Input return loss[4]			-11	dB
Return loss[4]	SDD_{11}		-9	dB

1. At 100 Ω, differential peak-to-peak, the figure below shows the simplified circuit schematic for the transceiver high-speed differential input lines. The input data lines have AC coupling capacitors. The capacitors are not required on the host card.

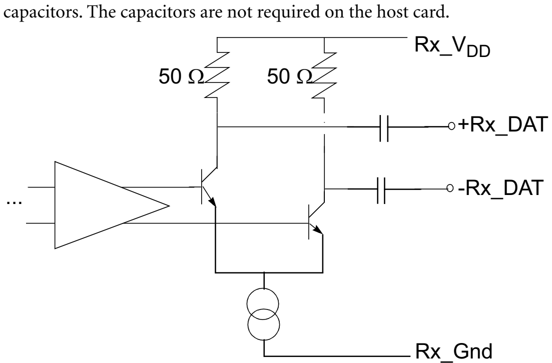


2. Deterministic jitter (DJ) and total jitter (TJ) values are measured according to the methods defined in ANSI T11.2. Jitter values at the output of a transmitter or receiver section assume worst case jitter values at its respective input. [1UI(Unit Interval)=235.3 ps at 4.25Gb/s]
3. Rise and fall times are measured from 20 - 80%, 100Ω differential.
4. At 2.125 GHz

Receive Signal Interface (from transceiver to host)

Parameter	Symbol	Min	Max	Units
Amplitude[1, 2]	V_o	600	1600	mV
Deterministic jitter[3]	$DJ_{elec-rcv}$		0.39	UI
Total jitter[3]	$TJ_{elec-rcv}$		0.64	UI
Common mode voltage (rms)			30	mV
Return loss[4]	SDD_{22}		-9	dB
Return loss[4]	SCC_{22}		-7	dB

1. At 100 Ω, differential peak-to-peak, the figure below shows the simplified circuit schematic for the transceiver high-speed differential output lines. The output data lines have AC coupling capacitors. The capacitors are not required on the host card.



2. 600 mV Min for "AD3" part numbers.
3. Deterministic jitter (DJ) and total jitter (TJ) values are measured according to the methods defined in [2]. Jitter values at the output of a transmitter or receiver section assume worst case jitter values at its respective input. [1UI(Unit Interval)=235.3 ps at 4.25Gb/s].
4. At 2.125 GHz

Control Electrical Interface

Parameter	Symbol	Min	Max	Unit
Voltage Levels				
TTL output (from transceiver)[1]	V_{OL}	0.0	0.50	V
	V_{OH}	V_{DD} -0.5	V_{DD} +0.3	V
TTL input (to transceiver)[2]	V_{IL}	0.0	0.8	V
	V_{IH}	2.0	V_{DD} +0.3	V
Serial ID SCL and SDA lines[1]	V_{IL}	0.0	V_{DD} x 0.3	V
	V_{IH}	V_{DD} x 0.7	V_{DD} +0.5	V
Timing Characteristics				
Tx_Disable assert time	t_off		10	µs
Tx_Disable de-assert time	t_on		1	ms
Tx_Disable time to start reset	t_reset	10		µs
Two-wire initialization time	t_serial		250	ms
Initialization time	t_init		300	ms
Tx_Fault assert time	t_fault		100	µs
Rx_LOS assert delay	t_loss_on		100	µs
Rx_LOS de-assert delay	t_loss_off		100	µs

1. A 4.7-10 kΩ pull-up resistor to V_{DD}T is required.
2. A 10 kΩ pull-up resistor to V_{DD} is present on the transceiver.

Optical Receiver

Parameter	Symbol	Min	Typical	Max.	Unit
Operating wavelength	λ	1270		1365	nm
Return loss of receiver	RL	12			dB
OMA operational range - 4.25 Gb/s [1,2]	OMA_{op}	29	10	2000	µW (pk-pk)
OMA operational range - 2.125 Gb/s [1,2]	OMA_{op}	15	6	2000	µW (pk-pk)
OMA operational range - 1.0625 Gb/s [1,2]	OMA_{op}	15	6	2000	µW (pk-pk)
Rx_LOS assert level[3]	P_{off}	-30		-20	dBm (avg)
Rx_LOS de-assert (negate) Level[3]	P_{on}			-20.5	dBm (avg)
Rx_LOS hysteresis[3]		0.5	2	5	dB (optical)
Receiver electrical 3 dB upper cutoff frequency	BW_{Rx}			5000	MHz

1. The minimum and maximum values of the average received power in dBm give the input power range to maintain a BER $< 10^{-12}$ when the data is sampled in the center of the receiver eye. These values take into account power penalties caused by the use of a laser transmitter with a worst-case combination of spectral width, extinction ratio and pulse shape characteristics.
2. Optical Modulation Amplitude (OMA) is defined as the difference in optical power between a logic level one and a logic level zero. The Optical Modulation Amplitude is defined in terms of average optical power (P_{AVG} in µW) and extinction ratio (ER) as given by $OMA=2P_{AVG}((ER-1)/(ER+1))$. The extinction ratio, defined as the ratio of the average optical power (in µW) in a logic level one to the average optical power in a logic level zero measured under fully modulated conditions in the presence of worst case reflections, must be the absolute (unit less linear) ratio and not expressed in dB. For example, the specified OMA at 4.25 Gb/s is equivalent to an average power of -17.3 dBm at an ER of 9 dB. At 1.0625 Gb/s and 2.125 Gb/s, the specified OMA is equivalent to an average power of -20.2 dBm at an ER of 9 dB. Typical values below the minimum specification indicate margin beyond the specification.
3. The Rx_LOS has hysteresis to minimize "chatter" on the output line. In principle, hysteresis alone does not guarantee chatter-free operation. The transceiver, however, presents an Rx_LOS line without chatter, where chatter is defined as a transient response having a voltage level of greater than 0.5 volts (in the case of going from the negate level to the assert level) and of any duration that can be sensed by the host logic.

Optical Transmitter

Parameter	Symbol	Min	Typical	Max.	Unit
Spectral center wavelength (JSH-42L3AD3-5)	λ_C	1285		1350	nm
Spectral center wavelength (JSH-42L3AD3-20)	λ_C	1300		1325	nm
Spectral width (JSH-42L3AD3-5)	$\Delta\lambda$			2.0	nm (rms)
Spectral width (JSH-42L3AD3-20)	$\Delta\lambda$			0.2	nm (rms)
Side mode supression ratio (JSH-42L3AD3-20)	SMSR	30			dB
Launched optical power[1]	PT	-8.4		-1.0	dBm (avg)
Extinction ratio	ER		6		dB
Optical rise/fall time[2]	T_{rise}/T_{fall}			90	ps
Optical modulation amplitude (JSH-42L3AD3-5)[3]	OMA	190			µW (pk-pk)
Optical modulation amplitude (JSH-42L3AD3-20)[3]	OMA	290			µW (pk-pk)
Relative intensity noise[4]	RIN_{12}			-118	dB/Hz

1. Launched optical power is measured at the end of a two meter section of a singlemode fiber. The maximum and minimum of the allowed range of average transmitter power coupled into the fiber are worst case values to account for manufacturing variances, drift due to temperature variations, and aging effects. The minimum launched optical power specified assumes an infinite extinction ratio at the minimum specified OMA.
2. Optical transition time is the time interval required for the rising or falling edge of an optical pulse to transition between the 20% and 80% amplitudes relative to the logical 1 and 0 levels. This is measured through a 4th order Bessel -Thompson filter with 0.75 * Data Rate 3-dB bandwidth and corrected to the full bandwidth value.
3. Optical Modulation Amplitude (OMA) is defined as the difference in optical power between a logic level one and a logic level zero. The Optical Modulation Amplitude is defined in terms of average optical power (P_{AVG} in µW) and extinction ratio (ER) as given by $OMA=2P_{AVG}((ER-1)/(ER+1))$. In this expression, the extinction ratio, the ratio of the average optical power (in µW) in a logic level one to the average optical power in a logic level zero measured under fully modulated conditions in the presence of worst case reflections, must be the absolute (unit less linear) ratio and not expressed in dB. The specified Optical Modulation Amplitude is equivalent to an average power of -7.3 dBm at an extinction ratio of 9 dB.
4. RIN_{12} is the laser noise, integrated over a specified bandwidth, measured relative to average optical power with 12dB return loss. See ANSI Fibre Channel Specification Annex A.5.

Optical Cable and Connector

Parameter	Symbol	Min	Typical	Max	Units
9/125 µm Cable (Singlemode 1310nm)					
Length - 4.25 Gb/s (JSH-42L3AD3-5)	L	2		5000	m
Length - 4.25 Gb/s (JSH-42L3AD3-20)	L	2		20000	m
Length - 2.125 Gb/s (JSH-42L3AD3-5)	L	2		11000	m
Length - 2.125 Gb/s (JSH-42L3AD3-20)	L	2		28000	m
Length - 1.0625 Gb/s (JSH-42L3AD3-5)	L	2		20000	m
Length - 1.0625 Gb/s (JSH-42L3AD3-20)	L	2		28000	m
Attenuation @ λ = 1310 nm	μ_c		0.3	0.35	dB/km
LC Optical Connector (Multimode)					
Nominal attenuation[1]	μ_{con}		0.2	0.4	dB
Attenuation standard deviation[1]	σ_{con}		0.1		dB
Connects/disconnects[1]				250	cycles

1. The optical interface connector dimensionally conforms to the industry standard LC type connector. A dual keyed LC receptacle mechanically aligns the optical transmission fiber to the SFP.

Electrical Connector

Parameter	Symbol	Max	Units
Insertion/removal cycles		100	Cycles

Dust Plug / Aqueous Wash

A JDSU process/dust plug provided with the module must be in place for any dry-air cleaning processes. The module cannot be immersed in any cleaning solvents nor withstand an aqueous wash. Only the process/dust plug provided with the module is allowed. If the process/dust plug is not contaminated during non-installed use, it may be re-used.

Two-Wire Interface Timing

Parameter	Symbol	Min	Max	Units
Clock frequency[1]	f_{SID}		100	kHz
Clock pulse width low[1]	t_{LOW}	4.7		µs
Clock pulse width high[1]	t_{HIGH}	4.0		µs
Clock low to data out valid[1]	t_{AA}	0.1	4.5	µs
Initialization time[3]	t_{serial}		250	ms
Time the data line must be free before a new transmission can start[1]	t_{BUF}	4.7		µs
Start hold time[1]	$t_{HD.STA}$	4.0		µs
Start set-up time[1]	$t_{SU.STA}$	4.7		µs
Data in hold time[1]	$t_{HD.DAT}$	0		µs
Data in set-up time[1]	$t_{SU.DAT}$	200		ns
Inputs rise time[1]	t_R		1.0	µs
Inputs fall time[1]	t_F		300	ns
Stop set-up time[1]	$t_{SU.STO}$	4.7		µs
Data out hold time[1]	t_{DH}	100		ns
Vdd hold time for user write[2]	t_{VddH}	25+(N x 10)		ms

1. See Two-Wire Interface Figure 8 on page 8 for timing relationships. See Two-Wire Protocol for Serial ID and Digital Diagnostic Monitoring Information on page 5 for information on protocol.
2. The Vdd supply to the transceiver must remain valid for 25 + (N x 10) ms, where N is the number of bytes desired to write to the scratch space (bytes 128-247 in 0xA2 address). For example: A single byte write will require 35 ms of valid supply voltage after the Stop bit for that instruction is completed. A sequential multi-byte write of the entire 120 bytes into the user scratch space will require the supply to remain valid for at least 1.23 s after the stop bit is completed.
3. The time from application of 3.0 V or greater Vdd supply at the transceiver voltage inputs to when the transceiver will be capable of responding to a start sequence on the two-wire interface.

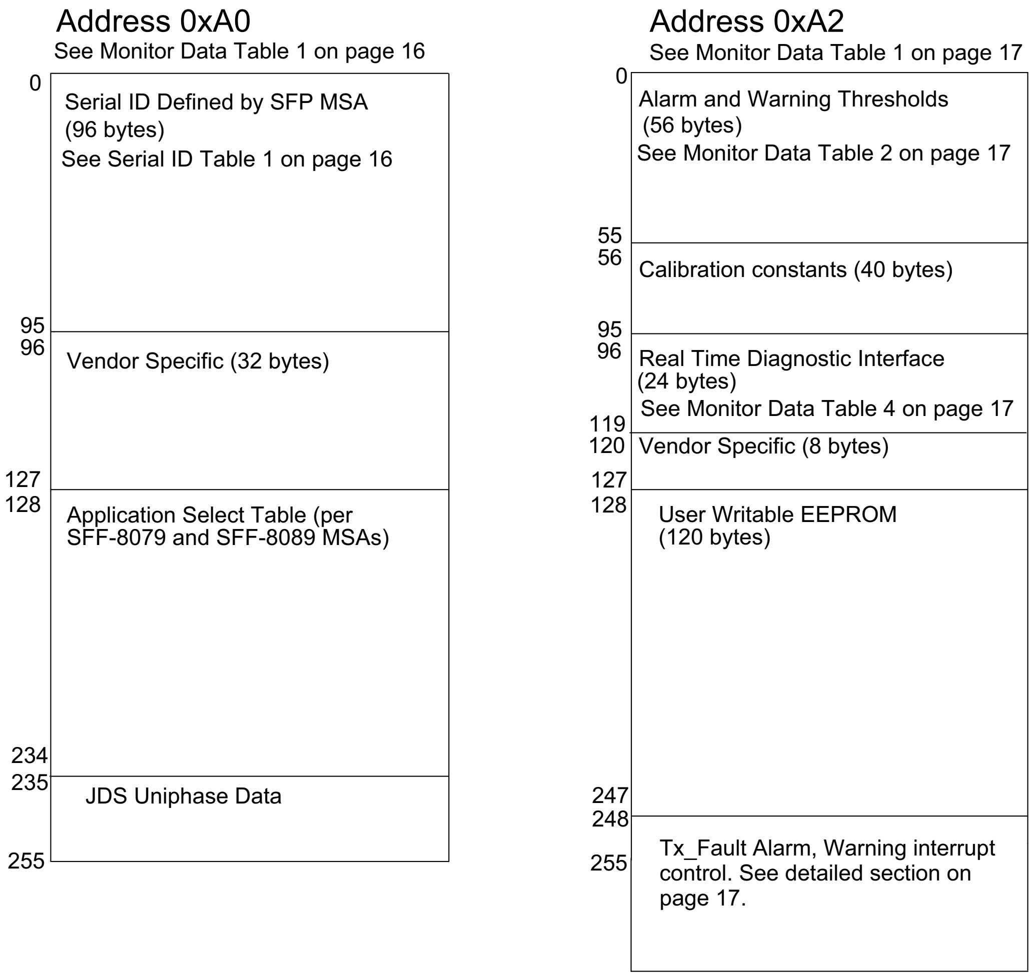
SFF 8472 Monitored Values

Parameter	Min	Max	Units
Received optical power meter dynamic range[1]	-20	+1.0	dBm
Received optical power meter accuracy[2, 3]	-2.0	+2.0	dB
Transmitted optical power meter dynamic range[2]	-9	-1.0	dBm
Transmitted optical power meter accuracy[2]	-2.0	+2.0	dB
Laser bias current meter dynamic range[2]	4.0	90	mA
Laser bias current meter accuracy[2]	-0.90	+0.90	mA
Power supply voltage meter dynamic range[2]	2.8	4.5	V
Power supply voltage meter accuracy[2]	-0.10	0.10	V
Transceiver temperature meter dynamic range[2]	-40	100	°C
Transceiver temperature meter accuracy[2]	-3	+3	°C

1. Actual optical power incident on the receiver. This range, when coupled with the accuracy specified means that the power meter can read from -18 dBm to +3 dBm when input optical power is in the range -16 dBm to +1 dBm.
2. When transceiver is operated within its specified temperature and power supply voltage dynamic operating ranges.
3. When optical input power is within the optical power meter specified dynamic operating range.

Two-Wire Interface Memory Map

Below is a summary of the transceiver memory map. The transceiver provides multiple application selection capability in accordance with SFF-8079+. Modifications to the memory map in support of this feature are to be determined. Additional details can be found in the sections that follow.



Serial ID Data Descriptions (Page/Device Address 0xA0)

All ID information is stored in eight-bit parameters addressed from 0x00 to 0x7F. All numeric information fields have the lowest address in the memory space storing the highest order byte. The highest order bit is always transmitted first. All numeric fields will be padded on the left with zeros. All character strings are ordered with the first character to be displayed located in the lowest address of the memory space. All character strings will be padded on the right with ASCII spaces (0x20) to fill empty bytes.

Check Codes

The check codes contained within the identification data are one byte codes that can be used to verify that the data in previous addresses is valid. CC_BASE check code is the lower eight bits of the sum of the contents of bytes 0-62. CC_EXT check code is the lower eight bits of the sum of the contents of bytes 64-94.

Serial ID Table 1

Data Fields - Page/Device Address 0xA0

Data Address	Field Size (Bytes)	Value (Hex)	Value (Binary)	Value (ASCII)	Name of Field	Description of Field
Base ID Fields						
0	**1**	**03**	**00000011**		**Identifier**	**SFP transceiver**
1	**1**	**04**	**00000100**		**Ext. Identifier**	**Extended identifier of type of serial transceiver**
2	**1**	**07**	**00000111**		**Connector**	**LC connector**
3	**8**	**00**	**00000000**		**Transceiver Codes**	**Reserved**
4	**8**	**00**	**00000000**			**SONET**
5	**8**	**00**	**00000000**			**SONET**
6	**8**	**00**	**00000000**			**No GbE Compliance**
7	**8**	**12**	**00010010**			**Long Distance Longwave Laser**
8	**8**	**00**	**00000000**			
9	**8**	**01**	**00000001**			**Singlemode fiber**
10	**8**	**15**	**00010101**			**4G, 2G, 1G FC**
11	**1**	**01**	**00000001**		**Encoding**	**8b/10b Encoding**
12	**1**	**2B**	**00101011**		**BR, nominal**	**Nominal bit rate in units of 100 Mb/s.**
13	**1**	**00**	**00000000**		**Reserved**	
14	**1**	**05 or 14**	**00000101 or 00010100**	**5 or 20**	**Fiber Length (singlemode) (km)**	**Link length supported for 9/125 µm fiber in units of km**
15	**1**	**32 or C8**	**00110010 or 11001000**	**50 or 200**	**Fiber Length (singlemode) (100m)**	**Link length supported for 9/125 µm fiber in units of 100 meters**
16	**1**	**00**	**00000000**		**Fiber Length (50/125µm) (10m)**	**Link length supported for 50/125 µm fiber in units of 10 meters**
17	**1**	**00**	**00000000**		**Fiber Length (62.5/125µm) (10m)**	**Link length supported for 62.5/125 µm fiber in units of 10 meters**
18	**1**	**00**	**00000000**		**Length (coppper)**	**Link length supported for copper in units of meters**
19	**1**	**00**	**00000000**		**Reserved**	
20	16	4A		J	Vendor name	SFP transceiver vendor name (ASCII)
21	16	44		D	Vendor name	SFP transceiver vendor name (ASCII)
22	16	53		S	Vendor name	SFP transceiver vendor name (ASCII)
23	16	20		(space)	Vendor name	SFP transceiver vendor name (ASCII)
24	16	55		U	Vendor name	SFP transceiver vendor name (ASCII)
25	16	4E		N	Vendor name	SFP transceiver vendor name (ASCII)
26	16	49		I	Vendor name	SFP transceiver vendor name (ASCII)
27	16	50		P	Vendor name	SFP transceiver vendor name (ASCII)
28	16	48		H	Vendor name	SFP transceiver vendor name (ASCII)
29	16	41		A	Vendor name	SFP transceiver vendor name (ASCII)
30	16	53		S	Vendor name	SFP transceiver vendor name (ASCII)
31	16	45		E	Vendor name	SFP transceiver vendor name (ASCII)
32	16	20		(space)	Vendor name	SFP transceiver vendor name (ASCII)
33	16	20		(space)	Vendor name	SFP transceiver vendor name (ASCII)
34	16	20		(space)	Vendor name	SFP transceiver vendor name (ASCII)
35	16	20		(space)	Vendor name	SFP transceiver vendor name (ASCII)
36	1	00	00000000		Reserved	
37	3	00	00000000		Vendor OUI	SFP transceiver vendor IEEE company ID
38	3	01	00000001		Vendor OUI	SFP transceiver vendor IEEE company ID
39	3	9C	10011100		Vendor OUI	SFP transceiver vendor IEEE company ID
40	16	4A	01001010	J	Vendor Part Number	Part number provided by the SFP transceiver vendor (ASCII)
41	16	53	01010011	S	Vendor Part Number	Part number provided by the SFP transceiver vendor (ASCII)

Serial ID Table 1

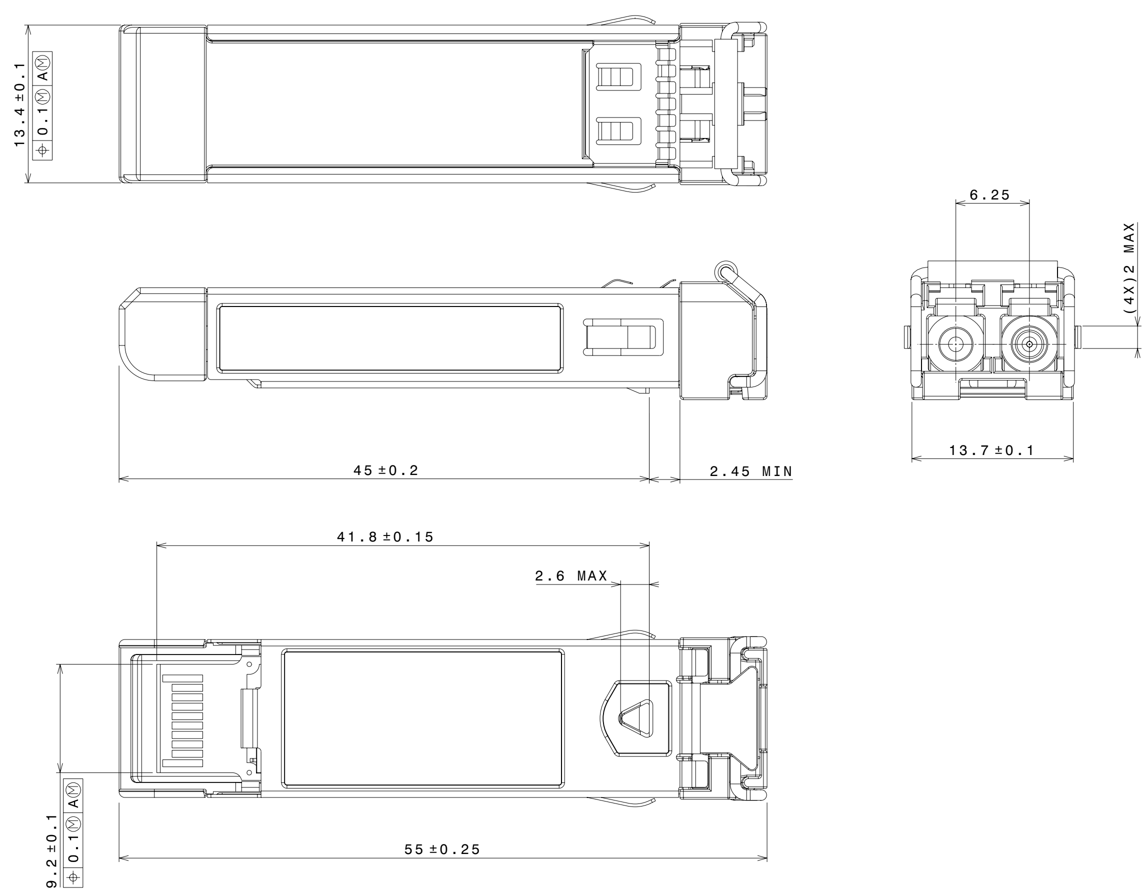
Data Fields - Page/Device Address 0xA0

Data Address	Field Size (Bytes)	Value (Hex)	Value (Binary)	Value (ASCII)	Name of Field	Description of Field
Base ID Fields						
42	16	48	01001000	H	Vendor Part Number	Part number provided by the SFP transceiver vendor (ASCII)
43	16	2D	00101101	-	Vendor Part Number	Part number provided by the SFP transceiver vendor (ASCII)
44	16	34	00110100	4	Vendor Part Number	Part number provided by the SFP transceiver vendor (ASCII)
45	16	32	00110010	2	Vendor Part Number	Part number provided by the SFP transceiver vendor (ASCII)
46	16	4C	01010011	L	Vendor Part Number	Part number provided by the SFP transceiver vendor (ASCII)
47	16	33	00110101	3	Vendor Part Number	Part number provided by the SFP transceiver vendor (ASCII)
48	16	41	01000001	A	Vendor Part Number	Part number provided by the SFP transceiver vendor (ASCII)
49	16	44	01000010	D	Vendor Part Number	Part number provided by the SFP transceiver vendor (ASCII)
50	16	33	00110010	3	Vendor Part Number	Part number provided by the SFP transceiver vendor (ASCII)
51	16	2D	00101101	-	Vendor Part Number	Part number provided by the SFP transceiver vendor (ASCII)
52	16	35	00110101	5 or 2	Vendor Part Number	Part number provided by the SFP transceiver vendor (ASCII)
53	16	20	00100000	space, 0 or G	Vendor Part Number	Part number provided by the SFP transceiver vendor (ASCII)
54	16	20	00100000	(space)	Vendor Part Number	Part number provided by the SFP transceiver vendor (ASCII)
55	16	20	00100000	(space)	Vendor Part Number	Part number provided by the SFP transceiver vendor (ASCII)
56	4	20	00100000	(space)	Vendor revision	Revision level for part number provided by vendor (ASCII)
57	4	20	00100000	(space)	Vendor revision	Revision level for part number provided by vendor (ASCII)
58	4	20	00100000	(space)	Vendor revision	Revision level for part number provided by vendor (ASCII)
59	4	20	00100000	(space)	Vendor revision	Revision level for part number provided by vendor (ASCII)
60	2	05	00000101		Wavelength	Wavelength of the laser in nm with byte 60 as MSB. (1310 nm)
61	2	1E	00011110		Wavelength	Wavelength of the laser in nm with byte 60 as MSB. (1310 nm)
62	1	00	00000000		Reserved	
63	1				CC_BASE	Check code for Base ID Fields (addresses 0 to 62)
Extended ID Fields						
64	2	00	00000000		Options	Tx_Disable, Tx_Fault, Loss of Signal all implemented
65	2	1A	00011010		Options	Tx_Disable, Tx_Fault, Loss of Signal all implemented
66	1	05	00000101		BR, maximum	Upper bit rate margin, units of percent (5%)
67	1	05	00000101		BR, minimum	Lower bit rate margin, units of percent (5%)
68-83	16				Vendor Serial Number	Serial number provided by the vendor (ASCII)
84-91	8				Date Code	Vendor's manufacturing date code

Serial ID Table 1 Data Fields - Page/Device Address 0xA0

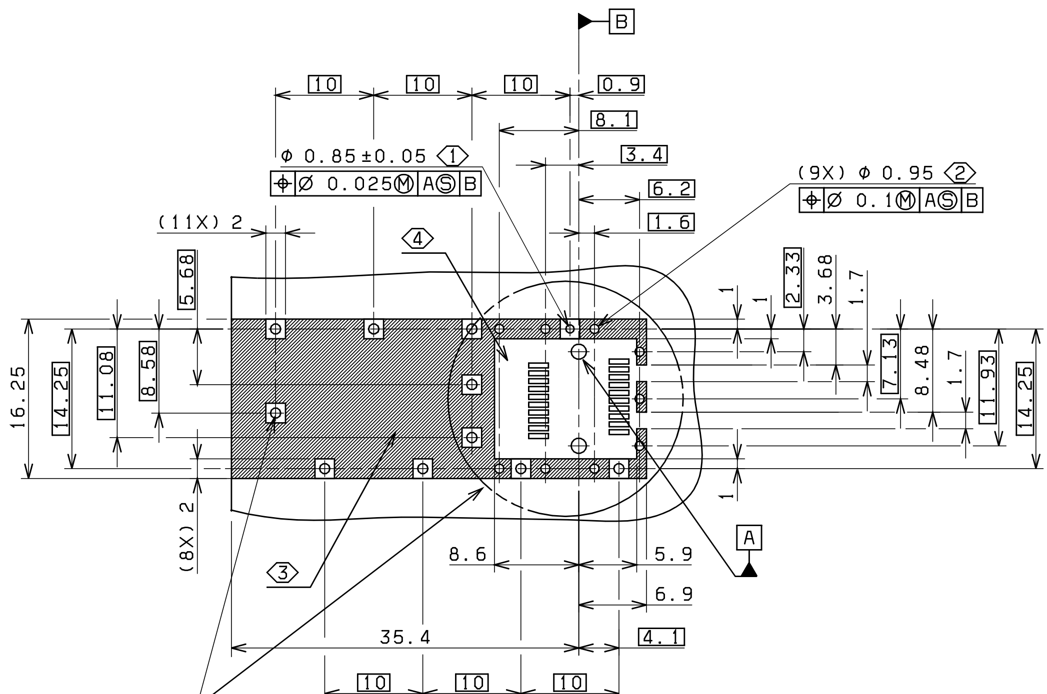
Data Address	Field Size (Bytes)	Value (Hex)	Value (Binary)	Value (ASCII)	Name of Field	Description of Field
Extended ID Fields						
92	1	68	01101000		Digital Diagnostic Options	DDM Implemented, Internally calibrated, Rx power measurement type is average power
93	1	F0	11110000		Enhanced Options	Optional warning flags implemented, Soft Tx_Disable, Soft Tx_Fault, Soft Rx_LOS
94	1	01	00000010		SFF-8472 Compliance	Includes functionality described in Rev 9.5 SFF-9472
95	1				CC_EXT	Check code for the Extended ID Fields (addresses 64-94)
Vendor Specific ID Fields						
96-127	32			"MICROCODE COPYRIGHT 2002 JDSU"	Read Only	Vendor specific data, read only

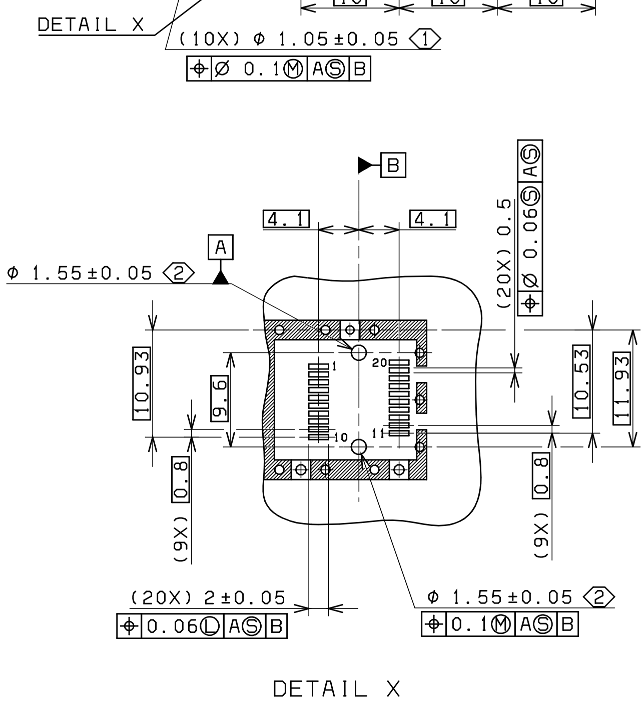
Dimensions Diagram Specifications in mm unless otherwise noted.



Host Card Footprint

Specifications in mm unless otherwise noted.





NOTES:

⟨1⟩ PADS AND VIAS ARE CHASSIS GROUND.

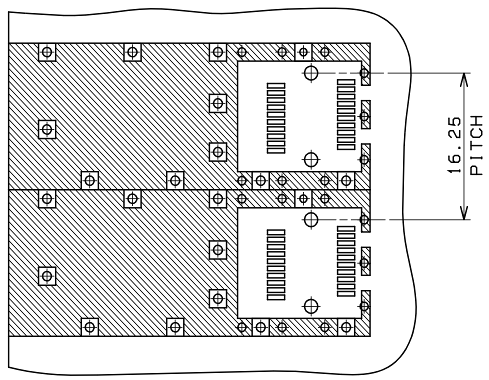
⟨2⟩ THROUGH HOLES, PLATING TO CHASSIS GROUND OPTIONAL.

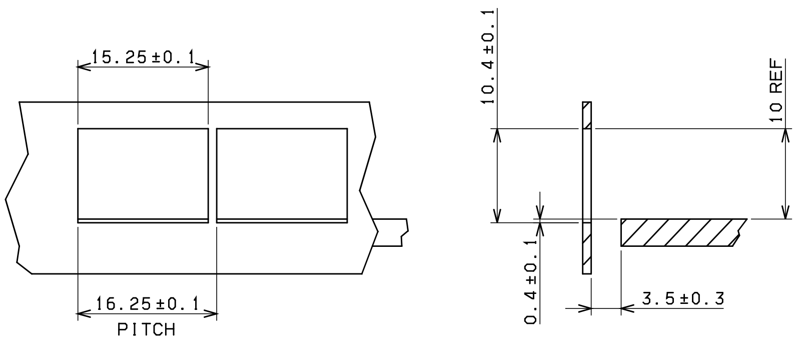
⟨3⟩ CROSS-HATCHED AREA DENOTES COMPONENT AND TRACE KEEPOUT (EXCEPT CHASSIS GROUND).

⟨4⟩ THIS AREA DENOTES COMPONENT KEEP-OUT (TRACES ALLOWED).

Host Card Footprint (Continued)

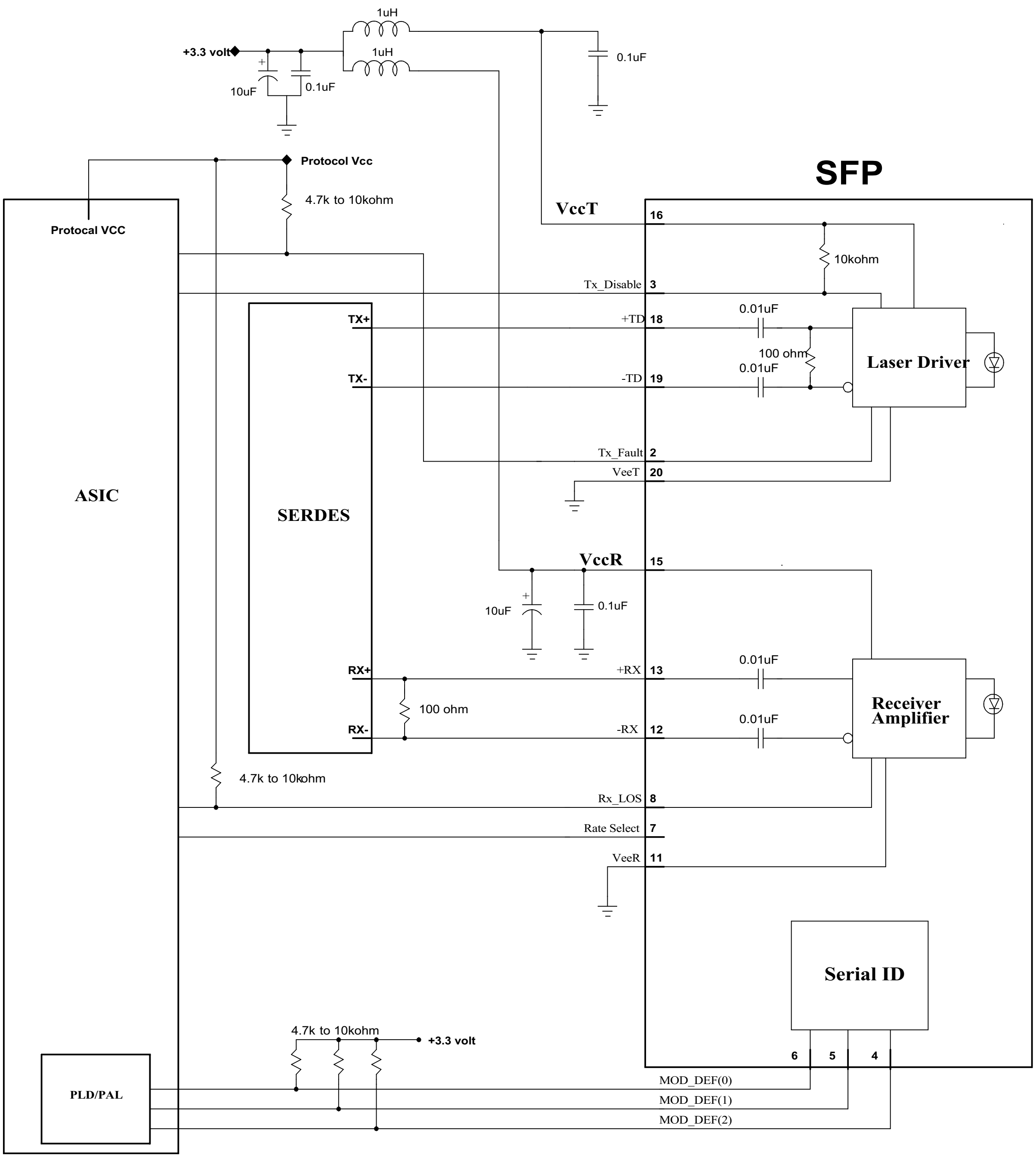
Specifications in mm unless otherwise noted.





Suggested Transceiver/Host Interface

Specifications in mm unless otherwise noted.



Order Information

For more information on this or other products and their availability, please contact your local JDSU account manager or JDSU directly at 1-800-498-JDSU (5378) in North America and +800-5378-JDSU worldwide or via e-mail at customer.service@jdsu.com.

ProductCode[1]	Signaling Rate	Wavelength	Distance Supported	Laser Type
JSH-42L3AD3-5	1.0625 Gb/s, 2.125 Gb/s, or 4.25 Gb/s	1310 nm	5 km	FP (Fabry-Perot)
JSH-42L3AD3-5G	1.0625 Gb/s, 2.125 Gb/s, or 4.25 Gb/s	1310 nm	5 km	FP (Fabry-Perot)
JSH-42L3AD3-20	1.0625 Gb/s, 2.125 Gb/s, or 4.25 Gb/s	1310 nm	20 km	DFB (Distributed Feedback)

1. All transceivers come with a blue bail cover, except those that end with a "5G". "5G" come with a gray bail cover.

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