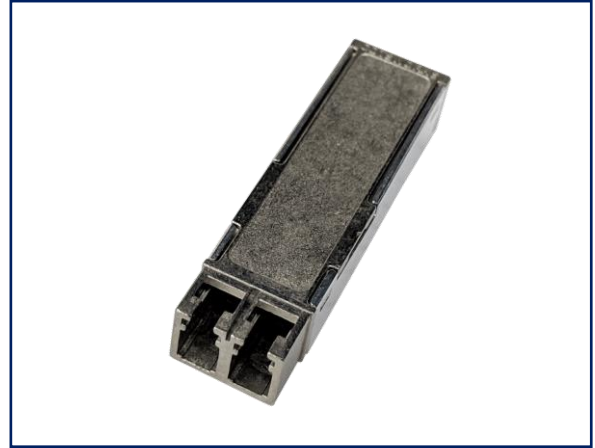


Features:

- 1.25Gb/s to 3.125 Gb/s duplex data links
- 1310nm Fabry-Perot laser transmitter and PIN receiver
- Class 1 Laser Int. Safety Std. IEC-825 compliant
- Standard reach of 10 km on 9/125 μ m SMF
- Industry Standard MSA 2x5 footprint
- MSA 2x7 option available providing Digital Diagnostics per SFF-8472
- Rugged LC connector housing
- -40 to 85C operating temperature -40 to 95C option
- Option for RoHS compliant and lead free per Directive 2002/95/EC
- Single 3.3V power supply
- AC Coupled Transmitter and Receiver Data
- Conformal coated for harsh environment use
- Pigtail Assembly option is available



The SFF-3G-LX is ideal for harsh environment connectivity because of its low cost, availability, and wide operating parameters



Commercial Aerospace



Military Aerospace



Military Tactical



Industrial Oil & Gas



Military Sensing



Undersea Networking

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max	Unit	Notes
Maximum Supply Voltage	V _{CC}	-0.5	4.5	V	
Storage Temperature	T _{sto}	-55	100	°C	
Case Operating Temperature	T _{OP}	-40	85	°C	
Relative Humidity	RH	0	85	%	Based on conformal coating
Lead Soldering Temperature			260	°C	10 seconds on leads only
Conformal Coating		0.8	1.2	mil	See ruggedization notes

Notes:

- 1) SFF transceivers may be water washed. The process must be followed by an 80°C bake for one hour to ensure the drying of any water inside the shell.
- 2) The components should not undergo Reflow Soldering under any circumstances.

General Specifications

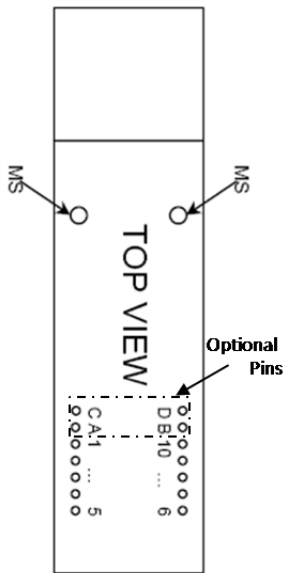
Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Supply Voltage	V _{CC}	3.14		3.47	V	
Power Dissipation	P _{DIS}			1.2	W	1.32W for T _{op} > 85°C
Data Rate	BR	1.25		3.125	Gb/s	

Electrical Specifications ($T_{OP} = -40$ to $85^{\circ}C$, $V_{CC} = 3.14$ to 3.47 Volts)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Supply Current	I_{CCTX}			275	mA	300mA for $T_{op} > 85^{\circ}C$
Differential Impedance	Z_{IN}		100		Ω	
Differential Voltage	V_{INPP}	200		2400	mV	LVPECL
Transmit Disable Voltage	V_{TXDIS}	2.0		V_{CC}	V	LVTTTL
Transmit Enable Voltage	V_{TXEN}	0		0.8	V	LVTTTL
Receiver						
Supply Current	I_{CCRX}			80	mA	
Differential Impedance	Z_{OUT}		100		Ω	
Differential Voltage	V_{DRX}	600		900	mV	AC-
Rise/Fall Time	t_r/t_f			130	ps	20% - 80%
Total Contributed Jitter	T_{JRX}			0.4	UI	pk-pk
Signal Detect Assert	SD_{norm}	2.0		V_{CC}	V	LVTTTL
Signal Detect De-Assert	SD_{fault}	0		0.8	V	LVTTTL

Pin Configuration

PIN #	Symbol	Description	Logic Family
1	V_{EER}	Receiver Ground (Common with Transmitter Ground)	NA
2	V_{CCR}	Receiver Power Supply	NA
3	SD	Signal Detect. Logic 1 indicates normal operation.	LVTTTL
4	RD-	Receiver Inverted DATA out. AC Coupled	See Rx
5	RD+	Receiver Non-inverted DATA out. AC Coupled	See Rx
6	V_{CCT}	Transmitter Power Supply	NA
7	V_{EET}	Transmitter Ground (Common with Rx Ground)	NA
8	T_{DIS}	Transmitter Disable	LVTTTL
9	TD+	Transmitter Non-Inverted DATA in, AC Coupled	See Tx
10	TD-	Transmitter Inverted DATA in, AC Coupled	See Tx
A	SDA	Two Wire Digital Diagnostics Data Interface	LVTTTL
B	SCL	Two Wire Digital Diagnostics Clock Interface	LVTTTL
C	Reserved		NA
D	TX_FAULT	Transmitter Fault Indication – High Indicates a fault condition	LVTTTL
MS	MS	Mounting studs are for mechanical attachment and are connected to chassis ground. Chassis ground is internally isolated from circuit grounds. Connection to user's ground planes is recommended.	NA





Optical Characteristics (T_{OP} = -40 to 85°C, V_{CC} = 3.135 to 3.465 Volts)

Parameter	Symbol	Min.	Typ	Max.	Unit	Notes
Transmitter						
Output Power (9/125 SMF)	P _{OUT}	-5		1	dBm	(1)
Optical Wavelength	λ	1270	131	1355	nm	(2)
Spectral Width	σ _{LX}			2.5	nm	(2)
Extinction Ratio:	ER	9			dB	(3)
Optical Rise/Fall Time:	t _r /t _f			150	ps	180ps for T _{op} > 85°C (3)(4)(6)
Relative Intensity Noise	RIN			-120	dB/Hz	(3) FCPI-4 (δ _R - γ _R)
Total Jitter Contribution	TX _{TJ}			0.4	UI	pk-pk
Receiver						
Receiver Sensitivity@1.25Gbps	RX _{SENS1}			-22	dBm	(1)(4)(5)
Receiver	RX _{SENS2}			-18	dBm	
Overload	RX _{MAX}	0			dBm	
Optical Center Wavelength	λ _c	1200	1310	1600	nm	
Return Loss	RL	12			dB	
Signal Detect Assert	P _A			-24	dBm	(1)(5)
Signal Detect De-Assert	P _D	-35			dBm	(1)(5)
Signal Detect Hysteresis	P _A - P _D	1			dB	
Notes:						
1) Measured using a broad area detector optical power meter.						
2) Measured using an optical spectrum analyzer.						
3) Measured using a high-speed oscilloscope.						
4) Measured using a BERT set running PRBS 2 ⁷ -1 at 3.125Gbps.						
5) Measured using a 9μm single-mode variable optical attenuator.						
6) 20% - 80%						

Digital Diagnostics Information

COTSWORKS' SFF parts include additional pins to read and write I2C information per the MSA SFF 8472 specification. While typically implemented in pluggable modules such as SFPs, all that is required to enable this functionality is two additional pins and internal circuitry in the transceiver. The circuitry in the COTSWORKS' SFF is a microcontroller providing EEPROM storage and accessing optical and electrical information from the laser and receiver.

Address A0h Data Fields

A0h Address (dec)	# Bytes	Name	Description	Value (hex)
Base ID Fields				
00	1	Identifier	Type of transceiver	02
01	1	Ext. Identifier	Extended identifier of type of transceiver	04
02	1	Connector	Code for connector type	07
03	8	Transceiver	Code for electronic or optical compatibility	04
04				12
05				00
06				02
07				22
08				00
09				01





10				05
11	1	Encoding	Code for high speed serial encoding algorithm	01
12	1	BR, Nominal	Nominal signaling rate, units of 100 MBd	1F
13	1	Rate Identifier	Type of rate select functionality	00
14	1	Length (SMF, km)	Link length supported for single mode fiber, units of km	0F
15	1	Length (SMF)	Link length supported for single mode fiber, units of 100 m	96
16	1	Length (50um)	Link length supported for 50 um OM2 fiber, units of 10 m	00
17	1	Length (62.5um)	Link length supported for 62.5 um OM1 fiber, units of 10 m	00
18	1	Length (OM4 or copper cable)	Link length supported for 50um OM4 fiber, units of 10m. Alternatively copper or direct attach cable, units of m	00
19	1	Length (OM3)	Link length supported for 50 um OM3 fiber, units of 10 m	00
20	16	Vendor Name	SFP vendor name (ASCII)	43
21				4F
22				54
23				53
24				57
25				4F
26				52
27				4B
28				53
29				20
30				20
31				20
32				20
33				20
34				20
35				20
36	1	Transceiver	Code for electronic or optical compatibility	00
37	3	Vendor OUI	SFP vendor IEEE company ID	00
38				00
39				00
40	16	Vendor PN	Part number provided by SFP vendor (ASCII)	53
41				46
42				46
43				33
44				47
45				4C
46				58
47				XX
48				XX
49				XX
50				XX
51				XX
52				XX
53				XX
54				XX
55				XX
56	4	Vendor rev	Revision level for part number provided by vendor (ASCII)	30
57				30
58				30



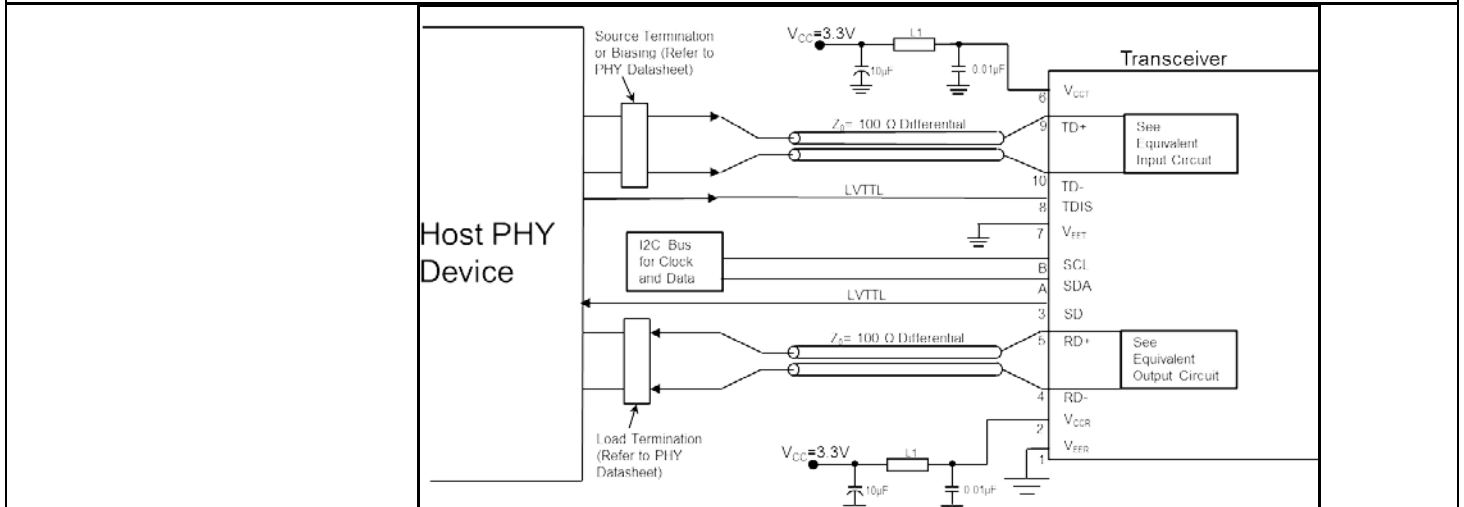


59				30
60	2	Wavelength	Laser wavelength	05
61				1E
62	1	Unallocated		00
63	1	CC_BASE	Check code for Base ID Fields (addresses 0 to 62)	XX
Extended ID Fields				
64	2	Options	Indicates which optional transceiver signals are implemented	10
65				14
66	1	BR, max	Upper bit rate margin, units of %	00
67	1	BR, min	Lower bit rate margin, units of %	00
68	16	Vendor SN	Serial number provided by vendor (ASCII)	XX
69				XX
70				XX
71				XX
72				XX
73				XX
74				XX
75				XX
76				XX
77				XX
78				XX
79				XX
80				XX
81				XX
82				XX
83				XX
84	8	Date code	Vendor's manufacturing date code	XX
85				XX
86				XX
87				XX
88				XX
89				XX
90				20
91				20
92	1	Diagnostic Monitoring Type	Indicates which type of diagnostic monitoring is implemented (if any) in the transceiver	68
93	1	Enhanced Options	Indicates which optional enhanced features are implemented (if any) in the transceiver	70
94	1	SFF-8472 Compliance	Indicates which revision of SFF-8472 the transceiver complies with	08
95	1	CC_EXT	Check code for the Extended ID Fields (addresses 64 to 94)	XX



Application Schematics

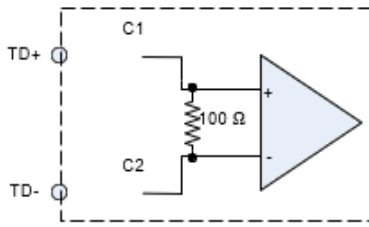
Host Board Application Schematic



Notes:

- 1) L1 & L2 = 600Ω @ 100MHz or better
- 2) Mounting Studs are isolated from Signal Ground and may be connected to Chassis Ground or Signal Ground if Chassis Ground is not available
- 3) Pins A & B are optional and only come on the DD option

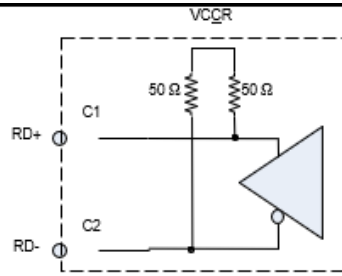
Equivalent Input Circuit



Optical Transmit Input Equivalent Circuit

100 ohm differential input, AC coupled, CML compatibility
C1, C2 = 0.1uF

Equivalent Output Circuit

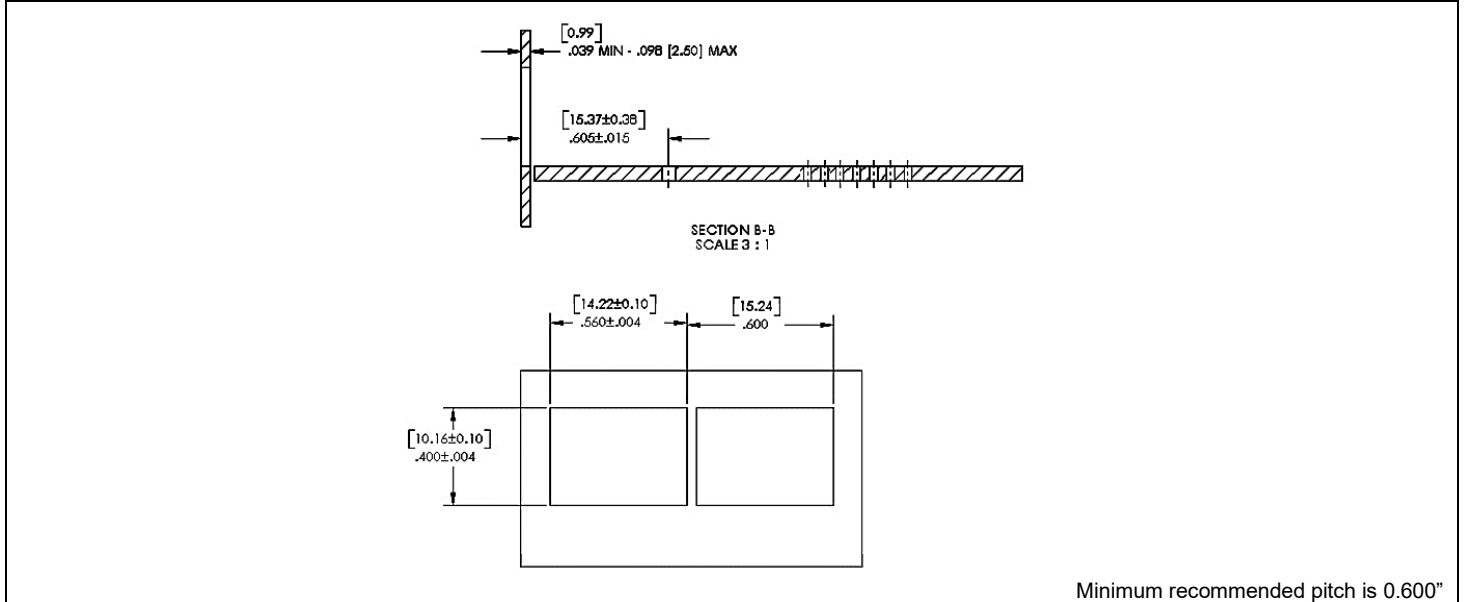


Optical Receive Output Equivalent Circuit

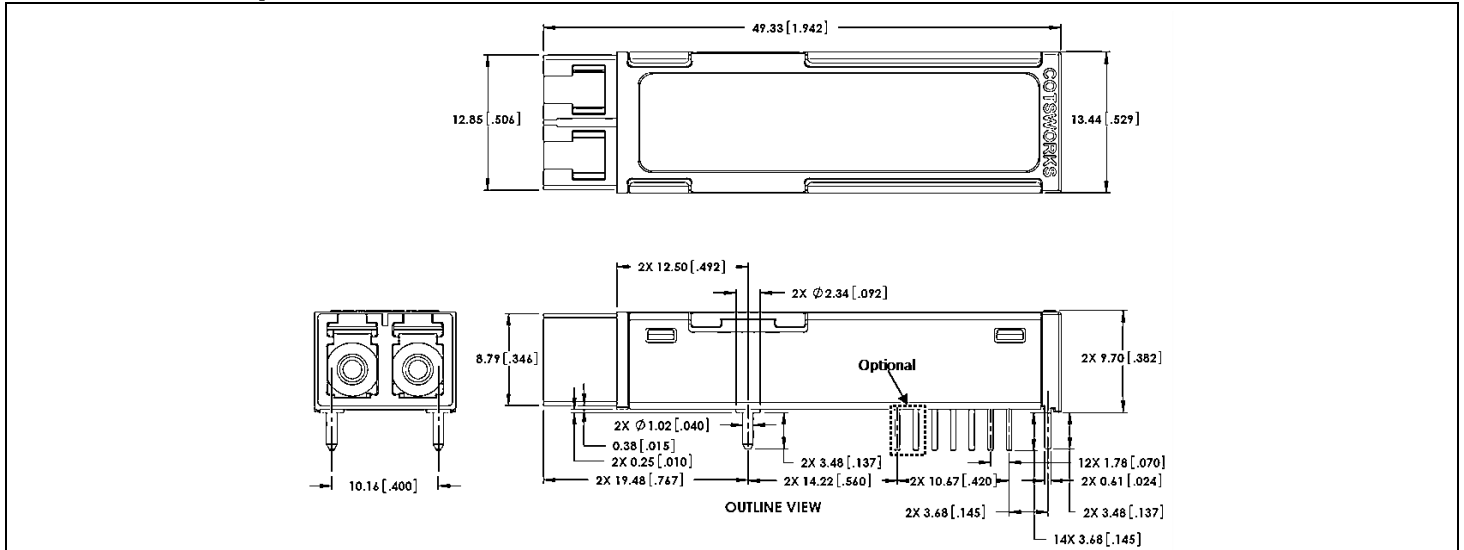
50 ohm single-ended output, AC coupled, CML compatibility
C1, C2 = 0.1uF



Panel Cutout



Mechanical Specifications



SFF-3G-LX mechanical dimensions are defined by the Small Form Factor (SFF) Transceiver Multi-source Agreement (MSA). July 5, 2000. Mechanicals do not show optional EMI shield.



Ruggedization Notes

- Parylene C coating can be used for conformal coating with a 1.0 mil ± 0.2 mil thickness through a deposition process.
 - Parylene Type C has a 5600 VPM rating, withstands high temperatures, and is extremely resistant to oil/dirt, and object impact.
- This part is also available in a pigtail fiber optic version. Contact COTSWORKS for more information.
- Contact COTSWORKS for all MSDS, case composition, and burn analysis.

Reference Information

- 1) IEEE Standard 802.3, 2002 Edition, 1000BASE-X. IEEE Standards Department, 2002
- 2) "Fibre Channel Draft Physical Interface Specification (FC-PI-2 Rev. 10.0)". American National Standard for Information Systems
- 3) Infiniband 1.2.1 specification,
- 4) 3.125 Gb/s XAUI specification, IEEE 802.3ae, section 47
- 5) ARINC 818 specification at 3.1875Gb/s, <https://www.arinc818.com/>
- 6) Directive 2002/95/EC of the European Council Parliament and of the Council, "on the restriction of the use of certain hazardous substances in electrical and electronic equipment." January 27, 2003

Regulatory Compliance

- COTSWORKS transceivers are Class 1 Laser Products and are designed to comply with US FDA regulations.
- These products are designed to comply with Class 1 eye safety requirements of EN (IEC) 60825 and the electrical safety requirements of EN (IEC) 60950.
- This part has an option for compliance with Directive 2002/95/EC covering restriction on certain hazardous substances (RoHS). Contact COTSWORKS for more information.

Warnings

Handling Precautions:

This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended.

Laser Safety:

Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.

Ordering Information

SFF-3G-LX	-X	-DPLX	-LC	-X	-X	-X	-X	-X
SFF Form Factor	Pins and Diagnostics	Duplex LC Connector		Ruggedized Coating	Operating Temp Range	EMI Shield	RoHS Level	Posts
3 Gbps Max Data Rate	(): 2x5 <u>No Diagnostics</u>			(): Non-coated	A: -40 to 85°C	(): No Shield	(): Level 5	(): Posts
Long Reach (10km over SMF)	D: 2x7 <u>Digital Diagnostics</u>			R: Parylene	M: -40 to 95°C	E: Shield	6: Level 6	NP: No Posts

Example part number: SFF-3G-LX-D-DPLX-LC-R-A
[3G SFF Duplex LC transceiver, Digital Diagnostics, Parylene-coated, Industrial temperature range, posts]

Contact COTSWORKS for mechanical dimensional information and other configuration options.

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