

### Features:

- 1.25Gbps bi-directional, single fiber transmission
- Industry standard MSA 2x5 electrical footprint
- Optional 2x7 electrical footprint for Digital Diagnostic support
- Digital Diagnostics per SFF MSA SFF-8472
- Simplex LC optical connector interface
- Rugged through-hole mounting and optional rear ground case posts
- Full-metal case to optimize EMI performance
- MIL-STD-883 mechanical shock and vibration compliant
- -40°C to +85°C operating temperature
- 1310/1550 DFB Lasers
- +3.3V Power Supply
- Parylene C conformal coating option
- AC-coupled data inputs and outputs with necessary internal terminations



**SFB-G-BX10 is ideal for harsh environments including military and aerospace applications.**



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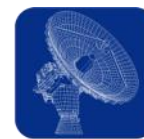
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SUBSEA NETWORKING



RADAR & SENSING



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### Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Notes
Maximum Supply Voltage	$V_{CC}$	-0.5	4.0	V	
Storage Temperature	$T_{sto}$	-55	105	°C	
Case Operating Temperature	$T_{OP}$	-40	85	°C	
Relative Humidity	RH	0	95	%	Based on conformal coating, (1)
SM Link Distance (9/125 $\mu$ m)	-	-	25	Km	(2)
Hot Bar Soldering Temperature	-	-	260	°C	10 seconds, leads only, (3)
Hand Lead Soldering Temperature	-	-	260	°C	10 seconds, leads only, (3)
Conformal Coating	-	0.8	1.2	mil	(4)

#### Notes:

- 1) SFB 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) Assuming a fiber loss of 0.5dB/km.
- 3) The components should not undergo Reflow Soldering under any circumstance.
- 4) See ruggedization notes on page X.

### General Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Data Rate	BR	-	1.25	-	Gbps	
Output Center Wavelength	$\lambda_c$	1260	1310	1360	nm	(1)
		1500	1550	1600		(2)
Average Output Optical Power	$P_{OUT}$	-8.5	-	-3	dBm	
Receiver Sensitivity	$RX_{SENS}$	-	-	-22	dBm	

#### Notes:

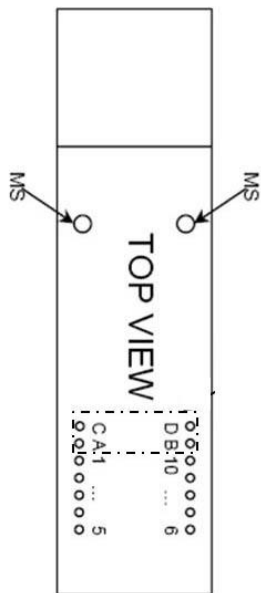
- 1) For SFB-G-BX10-35 configurations.
- 2) For SFB-G-BX10-53 configurations.

### Electrical Specifications (T<sub>OP</sub> = -40 to 85°C, V<sub>CC</sub> = 3.14 to 3.47 Volts)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
<b>Transmitter</b>						
Supply Current	I <sub>CC</sub>	-	-	125	mA	(1)
Input Differential Impedance	R <sub>in</sub>	90	100	110	Ω	
TX Single-Ended Input Voltage Swing	V <sub>DTX</sub>	100	-	1200	mV	AC Coupled
TX Disable Input Voltage	V <sub>D</sub>	2	-	V <sub>CC</sub>	V	LVTTTL
TX Enable Input Voltage	V <sub>EN</sub>	0	-	0.8	V	(2)
<b>Receiver</b>						
Supply Current	I <sub>CC</sub>	-	-	125	mA	(1)
Output Differential Impedance	Z <sub>OUT</sub>	90	100	110	Ω	
Rx Single-Ended Output Voltage Swing	V <sub>DRX</sub>	300	-	1000	mV	AC Coupled
Data Output Rise / Fall Time	t <sub>r</sub> / t <sub>f</sub>	-	-	260	ps	(4)
Signal Detect Assert	SD <sub>norm</sub>	2.0	-	V <sub>CC</sub>	V	(5)
Signal Detect De-Assert	SD <sub>fault</sub>	0	-	0.5	V	(5)
<b>Notes:</b>						
1) Maximum current is defined at maximum operating temperature at the maximum allowable V <sub>CC</sub> .						
2) Default is transmitter enabled using an internal 10 kΩ pull-down resistor.						
3) CML compatible, contact COTSWORKS applications engineering for further support.						
4) Measured at P <sub>IN</sub> = -18 dBm, 20%–80% values.						
5) SD is LVTTTL. Logic 1 indicates normal operation; logic 0 indicates no signal is detected.						

### Pin Configuration

PIN #	Symbol	Description	Notes
MS	MS	Mounting Studs	Chassis Ground
C	NC	No Connection	
A	SDA	Serial Data Interface I/O	Two Wire Data (Digital Diagnostics)
1	VEER	Receiver signal ground	Common with Transmitter Ground
2	VCCR	Receiver power supply	3.3V nominal
3	SD	Signal detect output	LVTTTL (Logic 1 = normal operation)
4	RD-	Receiver inverted data out	AC-coupled
5	RD+	Receiver non-inverted data out	AC-coupled
6	VCCT	Transmitter power supply	3.3V nominal
7	VEET	Transmitter signal ground	Common with Receiver Ground
8	TXDIS	Transmitter disable	LVTTTL
9	TD+	Transmitter non-inverted data in	AC-coupled
10	TD-	Transmitter inverted data in	AC-coupled
B	SCL	Serial Interface Clock Input	Two Wire Clock (Digital Diagnostics)
D	TX Fault	Transmitter Fault Condition	If implemented
<b>Notes:</b>			
1) Mounting studs and solder posts are chassis ground.			
2) Mounting studs are swaged gold-plated pins for solderability.			
3) Solder posts are an extension of the sheet metal case and are optional.			
4) See plating note in "Ordering Information."			
5) Only Pins 1–10 used for standard 2x5 footprint (Non-Diagnostic Capable)			



**Optical Characteristics** (T<sub>OP</sub> = -40 to 85°C, V<sub>CC</sub> = 3.14 to 3.47 Volts)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
<b>Transmitter</b>						
Average Output Optical Power	P <sub>OUT</sub>	-8.5	-	-3	dBm	(1)(2)(3)
Coupled Power Ratio	CPR	-	3	-	dBm	
Output Center Wavelength	λ <sub>C</sub>	1260	1310	1360	nm	(5)(6)
		1500	1550	1600		(5)(7)
Spectral Width (RMS)	σ	-	-	2.58	nm	(2)
Extinction Ratio	ER	9	-	-	dB	(2)
Optical Rise / Fall Time	t <sub>r</sub> / t <sub>f</sub>	-	-	260	ps	20%–80% (3)
Optical Isolation	-	30	-	-	dB	BOSA Transmitter Isolation
Relative Intensity Noise	RIN	-	-	-120	dB / Hz	(2)
Total Contributed Jitter	TJ	-	-	150	ps	
<b>Receiver</b>						
Receiver Sensitivity	RX <sub>SENS</sub>	-	-	-22	dBm	(2)(3)(4)
Receiver Saturation	RX <sub>SAT</sub>	0	-	-	dBm	(3)
Input Center Wavelength	λ <sub>C</sub>	1500	1550	1600	nm	(6)
		1260	1310	1360		(7)
Return Loss	RL	-	-	12	dB	(2)
Signal Detect Assert	SD <sub>A</sub>	-	-	-17	dBm	(4)
Signal Detect De-Assert	SD <sub>D</sub>	-38	-	-	dBm	(4)
Signal Detect Hysteresis	SD <sub>H</sub>	1	-	6	dBm	(4)
<b>Notes:</b>						
1) Class 1 laser eye safe, IEC-60825-1 compliant.						
2) Compliant to 802.3ah 1000BASE-BX10.						
3) Measured at the end of a 2-5m patch cord consisting of laser optimized B1.1 or B1.3 SMF fiber.						
4) Measured at 2 <sup>-7</sup> -1 PRBS, BER = 10 <sup>-12</sup> .						
5) Measured with an Optical Spectrum Analyzer at 25°C.						
6) For SFB-G-BX10-35 configurations.						
7) For SFB-G-BX10-53 configurations.						

**Digital Diagnostics Information**

COTSWORKS' SFB 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 are two additional pins and internal circuitry in the transceiver. The circuitry in the COTSWORKS' SFB is a microcontroller providing EEPROM storage and accessing optical and electrical information from the laser and receiver. The pinout for the transceiver appears on a previous page. For more information on Digital Diagnostics, visit <https://cotsworks.com/support-documents/digital-diagnostic-overviews/>

**Address A0h Data Fields (SFB-G-BX10)**

A0h Address (dec)	# Bytes	Name	Description	Value (hex)
<b>Base ID Fields</b>				
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				10
05				10
06				02
07				42



08				00
09				0D
10				01
11	1	Encoding	Code for high-speed serial encoding algorithm	01
12	1	BR, Nominal	Nominal signaling rate, units of 100 MBd	0D
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	0A
15	1	Length (SMF)	Link length supported for single mode fiber, units of 100m	15
16	1	Length (50µm)	Link length supported for 50µm OM2 fiber, units of 10m	00
17	1	Length (62.5µm)	Link length supported for 62.5µm OM1 fiber, units of 10m	00
18	1	Length (OM4 or copper cable)	Link length supported for 50µm OM4 fiber, units of 10m. Alternatively copper or direct attach cable, units of m	00
19	1	Length (OM3)	Link length supported for 50µm OM3 fiber, units of 10m	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				42
43				47
44				42
45				58
46				31
47				30
48				33 / 35
49				35 / 33
50				XX
51				XX
52				XX
53				XX

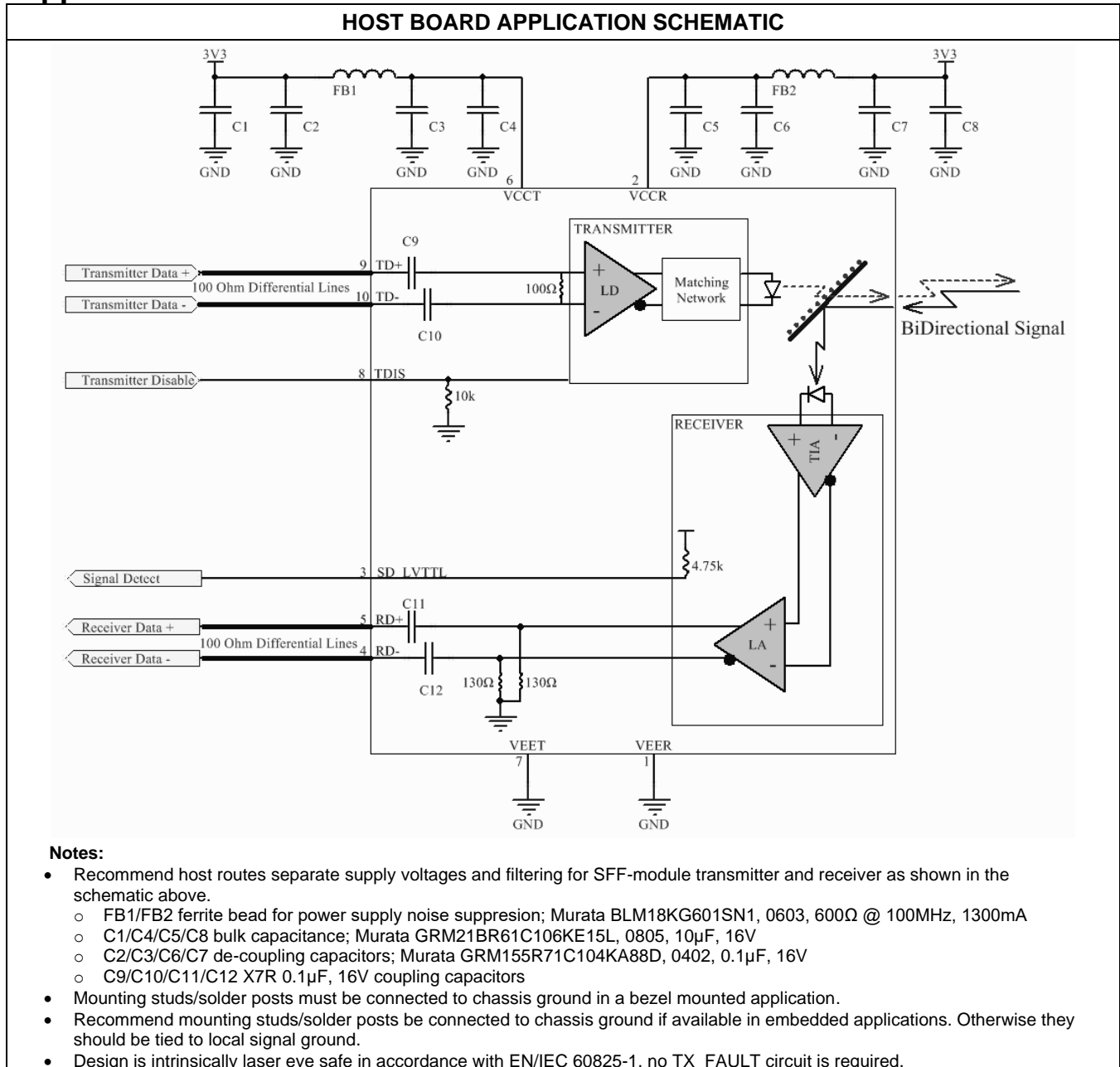




54				30
55				30
56				30
57	4	Vendor rev	Revision level for part number provided by vendor (ASCII)	30
58				30
59				30
60				05 / 06
61	2	Wavelength	Laser wavelength	1E / 0E
62	1	Unallocated		00
63	1	CC_BASE	Check code for Base ID Fields (addresses 0 to 62)	XX
<b>Extended ID Fields</b>				
64	2	Options	Indicates which optional transceiver signals are implemented	00
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	00
94	1	SFF-8472 Compliance	Indicates which revision of SFF-8472 the transceiver complies with	05
95	1	CC_EXT	Check code for the Extended ID Fields (addresses 64 to 94)	XX



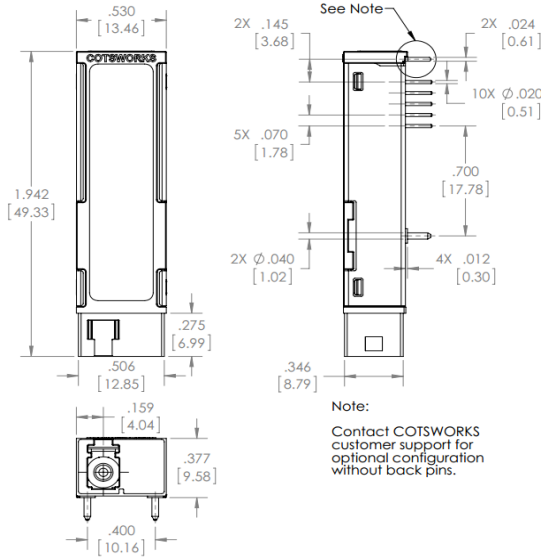
## Application Schematics



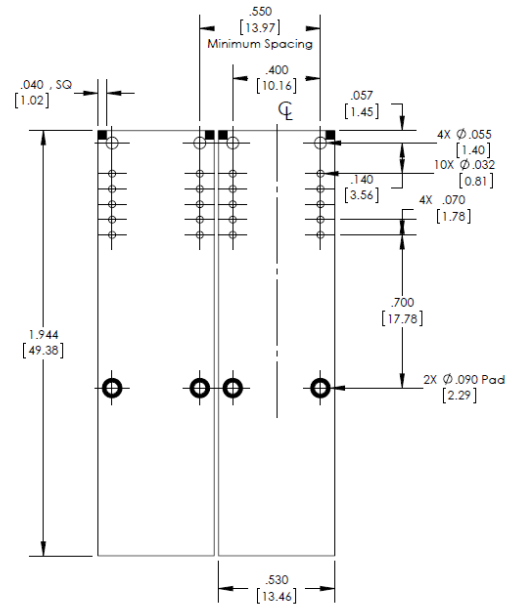


## Standard Mechanical Dimensions

### 2x5 Pin Option (No Digital Diagnostics)

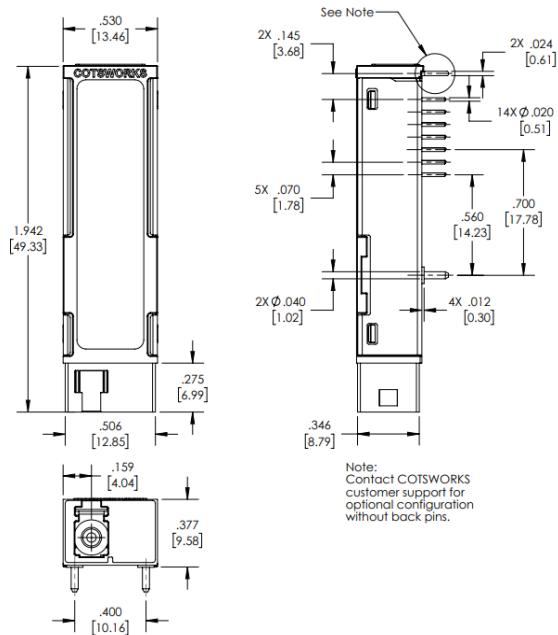


Dimensions in inches [mm]

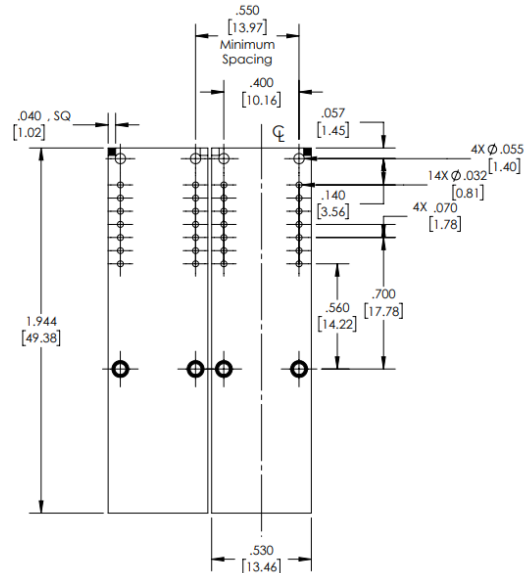


Dimensions in inches [mm]

### 2x7 Pin Option (Digital Diagnostics)



Dimensions in inches [mm]



Dimensions in inches [mm]





### Ruggedization Notes

- Parylene Type 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.
- Contact COTSWORKS for all MSDS and case composition information.

### Reference Information

- 1) IEEE 802.3ah CL59 1000BASE-BX10.
- 2) IEC-60825-1 Laser Eye Safety.

### Regulatory Compliance

- COTSWORKS transceivers are Class 1 Laser Products and comply with US FDA regulations.
- These products are designed to comply with the 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 2011/65/EU covering restriction on certain hazardous substances (RoHS).
- Contact COTSWORKS support for a product compliance matrix.

### 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 -35 1310Tx / 1550Rx Configuration

SFB-G-BX10	-35	-X	-X	-X	-X	-X
<b>SFF Form Factor</b>	<b>Wavelength</b>	<b>Pins and Diagnostics</b>	<b>Ruggedization</b>	<b>Operating Temperature Range</b>	<b>Post Option</b>	<b>Calibration Profile</b>
Single Fiber	35:	N:	N:	A:	N:	():
1.25 Gbps	1310Tx /	2x5 – No	Non-coated	-40 to +85°C	No Posts	400KHz
DFB Transmitter	1550Rx	Diagnostics			P:	& 1.25Gbps
		2x7 – Digital	R:		Solder Posts	-1:
		Diagnostics	Parylene			1.25Gbps

#### Example part number: SFB-G-BX10-35-D-R-A-N-1

[Single Fiber Bi-Directional SFF, 1.25 Gbps MAX Data Rate, 1310nm DFB Transmitter and 1550nm Receiver, Digital Diagnostics, Parylene-Coated, -40 to +85°C Operating Temperature Range, No Solder Posts]





### Ordering Information -53 1550Tx / 1310Rx 1.25Gb/s Configuration

SFB-G-BX10	-53	-X	-X	-X	-X
<b>SFF Form Factor</b>	<b>Wavelength</b>	<b>Pins and Diagnostics</b>	<b>Ruggedization</b>	<b>Operating Temperature Range</b>	<b>Post Option</b>
<b>Single Fiber</b>	53: 1550Tx / 1310Rx	N: 2x5 – No Diagnostics	N: Non-coated	A: –40 to +85°C	N: No Posts
<b>1.25 Gbps</b>		D: 2x7 – Digital Diagnostics	R: Parylene		P: Solder Posts
<b>DFB Transmitter</b>					

#### Example part number: SFB-G-BX10-53-D-R-A-N

[Single Fiber Bi-Directional SFF, 1.25 Gbps MAX Data Rate, 1550nm DFB Transmitter and 1310nm Receiver, Digital Diagnostics, Parylene-Coated, –40 to +85°C Operating Temperature Range, No Solder Posts]

*\*Solder post option includes 90/10 tin/lead plating to enable soldering to host PCB while mitigating tin-whiskering concerns. No post option includes no plating.*

Contact COTSWORKS for mechanical dimensional information, lead times and other configuration options.

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