SFB-M-xx-xx
155Mbps
Rugged Single Fiber Optic Transceiver

Features:

- 125Mbps to 155Mbps bi-directional, single fiber transmission
- Industry standard MSA 2x5 electrical footprint
- Simplex LC optical connector interface
- Rugged through-hole mounting posts and 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
- EN-60825/IEC-825/CDRH Class 1 compliant 1310/1550 Fabry-Perot Lasers
- +3.3V Power Supply
- Parylene C conformal coating option
- Options for AC-coupled or DC-coupled data
- Options for LVPECL or LVTTL signal detect

The SFB-M-xx-xx is ideal for harsh environment connectivity because of its low cost, availability, and wide operating parameters

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V_{CC}	0	3.6	V	
Operating Temperature	T_{OP}	–40	85	°C	
Storage Temperature	T_{STG}	–55	100	°C	
Soldering Temperature	-	-	260	°C	(1)
Relative Humidity	RH	-	100	%	Non-condensing, (2)
MM Link Distance (62/125µm)	-	-	550	m	(3)
SM Link Distance (9/125µm)	-	-	20	km	(4)
Conformal Coating	-	0.8	1.2	mil	(5)

Notes:
1. 10 seconds, leads only. The parts should not undergo wave soldering.
2. Based on conformal coating.
3. MMF links cannot include any air gaps, such as those found in expanded beam connections.
4. Assuming a fiber loss of 0.5dB/km
5. Parylene C coating

General Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Power Supply Voltage	V_{CC}	3.1	3.3	3.5	V	
Data Rate	-	-	155	-	Mbps	
Optical Link Budget on Single-Mode	dB	16	20	22	dB	
Optical Link Budget on Multimode	dB	17	19	22	dB	

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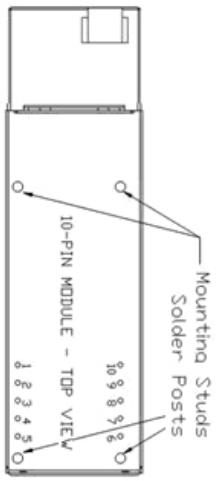
Electrical Specifications (T_{OP} = –40°C to +85°C, V_{CC} = 3.14V to 3.47V)

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Transmitter Specifications						
Supply Current	I_{CC}	-	-	150	mA	(1)
Tx Single-Ended Input Voltage Swing	V_{SI}	100	-	1200	mV_{P-P}	AC-coupled
Tx Input Differential Impedance	R_{IN}	90	100	110	Ω	
Transmitter Disable Voltage	V_{DIS}	2	-	V_{CC}	V	LVTTL
Transmitter Enable Voltage	V_{EN}	0	-	0.8	V	(2)
Receiver Specifications						
Supply Current	I_{CC}	-	-	100	mA	(1)
Output Differential Impedance	Z_{OUT}	90	100	110	Ω	
Data Output - Voltage Low	V_{OL}-V_{CC}	–2.0	-	–1.58	V	DC-coupled
Data Output - Voltage High	V_{OH}-V_{CC}	–1.1	-	–0.74	V	DC-coupled
Single-Ended Output Voltage Swing	V_{SE}	300	-	1000	mV	AC-coupled
Data Output Rise/Fall Time	t_r/t_f	-	-	2.2	ns	(3)
Signal Detect Output - Voltage Low	V_{SDL}	0.0	-	0.5	V	LVTTL
Signal Detect Output - Voltage High	V_{SDH}	2.0	-	V_{CC}	V	LVTTL
Signal Detect Output - Voltage Low	V_{SDL}	1.50	-	1.90	V	LVPECL, (4)(5)
Signal Detect Output - Voltage High	V_{SDH}	2.40	-	2.80	V	LVPECL, (4)(5)

Notes:

1. Maximum Current is defined at maximum operating temperature at the maximum allowable V_{CC}
2. Default is transmitter enabled using an internal 10k Ω pull-down resistor
3. Measured at P_{in} = –24dBm, 20%–80% values
4. LVPECL signal detect voltages valid for pull-down resistors ranging in value from 130Ω to 220Ω, measured with a DVM
5. Values represent nominal supply voltage of 3.3V

Pin Configuration



PIN #	Symbol	Description	Notes
1	V_{EER}	Receiver signal ground	0V
2	V_{CCR}	Receiver power supply	3.3V nominal
3	SD	Signal detect output	LVTTL or LVPECL
4	RD–	Receiver data out –	AC- or DC-coupled LVPECL
5	RD+	Receiver data out +	AC- or DC-coupled LVPECL
6	V_{CCT}	Transmitter signal power	3.3V nominal
7	V_{EET}	Transmitter signal ground	0V
8	T_{DIS}	Transmitter disable	LVTTL
9	TD+	Transmitter data in +	AC-coupled LVPECL
10	TD–	Transmitter data in –	AC-coupled LVPECL

Note:

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.

See plating note in “Ordering Information.”

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Optical Characteristics (T_{OP} = –40°C to +85°C, V_{CC} = 3.14V to 3.47V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter Specifications						
Transmit Power: *SMF*	P_{o-SMF}	–13.5	-	–8.5	dBm	(1)(2)
Transmit Power: *MMF*	P_{o-MMF}	–9	-	–3.5	dBm	(1)(3)
Coupled Power Ratio	CPR	-	3	-	dB	
Output Center Wavelength	λ_T	1260	1310	1360	nm	1310 Tx/1550 Rx option (6)
Output Center Wavelength	λ_T	1500	1550	1600	nm	1550 Tx/1310 Rx option (6)
Output Spectral Width	σ	-	-	3	nm	RMS
Extinction Ratio	ER	9	-	-	dB	
Optical Rise/Fall Time	t_r/t_f	-	-	2.2	ns	20% to 80% values
Optical Isolation		30	-	-	dB	BOSA transmitter isolation
Relative Intensity Noise	RIN	-	-	–116	dB/Hz	
Total Contributed Jitter	TJ	-	-	200	ps	(5)
Receiver Specifications						
Receiver Sensitivity	RX_{SENS}	-	-	–33	dBm	9/125 µm SMF
Receiver Saturation	P_{in}	–3	-	-	dBm	(4)
Signal-Detect Assert	P_a	-	-	–25	dBm	
Signal-Detect De-assert	P_d	–45	-	-	dBm	
Signal-Detect Hysteresis	P_h	1	-	4	dB	
Optical Return Loss (ORL)	ORL	12	-	-	dB	
Wavelength of Operation	λ_R	1500	1550	1600	nm	1310 Tx/1550 Rx option
Wavelength of Operation	λ_R	1260	1310	1360	nm	1550 Tx/1310 Rx option

Notes:
1. Class 1 laser eye safe, IEC-60825-1 compliant
2. Measured at the end of a 2m SMF fiber optic cable
3. Measured at the end of a 2m 62.5µm MMF fiber optic cable
4. Measured using 9µm SMF and optical attenuator
5. Measured with SMF at 2^{23}-1 PRBS
6. Measured with an Optical Spectrum Analyzer at 25°C

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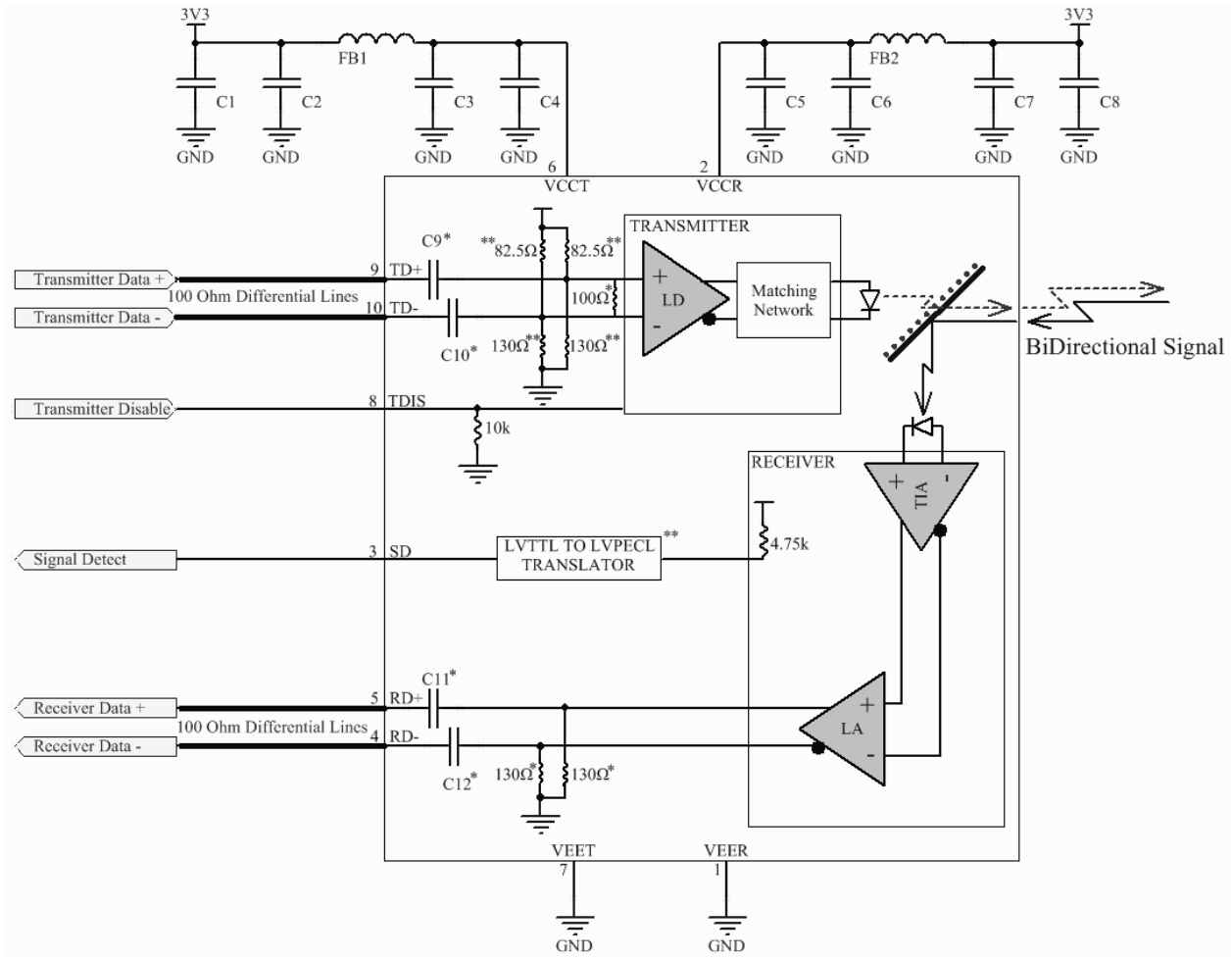
Application Schematics

Recommended Host Board Application Schematic
(AC-Coupled)



Notes:

- Configuration above is shown for AC-Coupled LVPECL transmitter inputs
- Configuration above is shown for AC-Coupled LVPECL receiver outputs
- Configuration above is shown for LVTTL SD
- Recommend host routes separate supply voltages and filtering for SFF-module transmitter and receiver as shown in the schematic above
  - FB1/FB2 ferrite bead for power supply noise suppresion; Murata BLM18KG601SN1, 0603, 600Ω @ 100MHz, 1300mA
  - C1/C4/C5/C8 bulk capacitance; Murata GRM21BR61C106KE15L, 0805, 10µF, 16V
  - C2/C3/C6/C7 de-coupling capacitors; Murata GRM155R71C104KA88D, 0402, 0.1µF, 16V
  - C9/C10/C11/C12 X7R 0.1µF, 16V coupling capacitors;
- Mounting studs/solder posts must be connected to chassis ground in a bezel mounted application
- Recommend mounting studs/solder posts be connected to chassis ground if available in embedded applications. Otherwise they should be tied to local signal ground
- * Denotes optional components populated in the configuration shown
- ** Denotes optional components not populated in the configuration shown
- For alternate configurations please contact COTSWORKS application engineering for recommended application schematic recommendations

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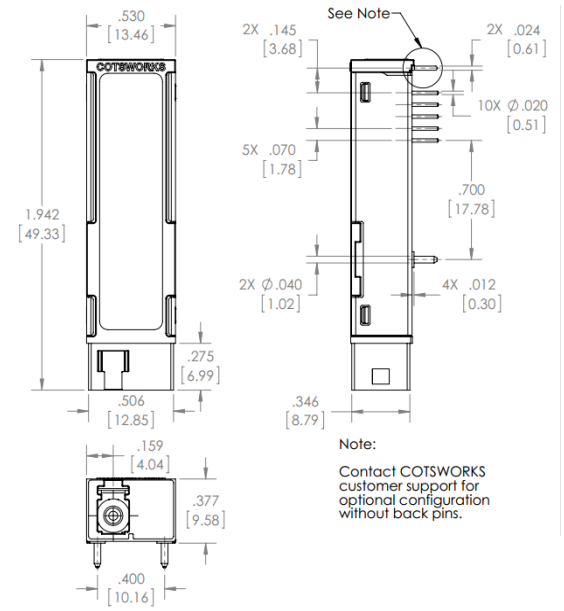
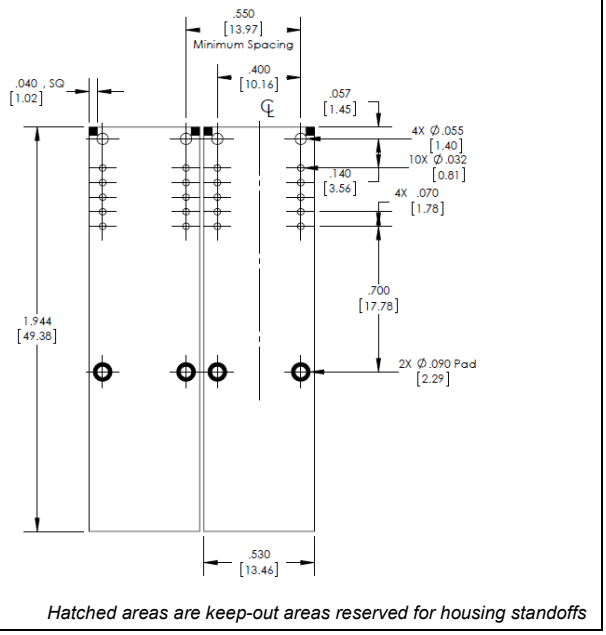
Mechanical Dimensions

Dimensions are defined by the Small Form Factor (SFF) Transceiver Multi-source Agreement (MSA). July 5, 2000.





Hatched areas are keep-out areas reserved for housing standoffs

Ruggedization Notes

- A conformal coating of at least 0.8mil and not exceeding 1.2mil is applied to the PWB on both sides. The coating material is Parylene® Type C. It is applied to meet Type C Military specification 46085C.
- Contact COTSWORKS for MSDS, case composition and burn analysis information.

Warnings

Handling Precautions: This device is susceptible to damage from 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

SFB-M-	xx	-xx-	x	-x-	x
SFF Form Factor **Single Fiber** **155Mbps**	**Wavelength** 35: *1310Tx/1550Rx* 53: *1550Tx/1310Rx*	**Coupling & SD Logic** AT: *AC coupled, TTL SD* DP: *DC coupled, PECL SD*	**Coating** (): *Non-coated* R: *Parylene*	**Operating Temp Range** *A:* *–40 to 85°C*	**Post Option** (): *No Posts* P: *Solder Posts**

Example part number: SFB-M-35-DP-R-A-P
[Single Fiber (bi-directional) SFF, 155Mbps, 1310nm Tx, 1550nm RX, DC-coupled, PECL signal detect logic, Parylene-coated, industrial operating temp range, 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.*