BROADCOM®

SELECTION GUIDE

Industrial Fiber-Optic Components, Cabling, and Accessories



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Table of Contents

Fiber-Optic Components for Industrial, Automation, Power Generation/Distribution, Transportation, Gaming, and Medical Applications 3
Industrial Fiber-Optic Transceivers 4
Flexible Link 5
650-nm Industrial Fiber-Optic Components 6
Miniature Link 820-nm/850-nm/1300-nm Industrial Fiber-Optic Components 8
Optical Arc Flash Detection 10
Optical Power Components 11
Optical Wireless Transceivers 12
Plastic Optical Fiber Cables 13
POF Connectors and Accessories 14
Upgrade Your Design 15

Fiber-Optic Components for Industrial, Automation, Power Generation/Distribution, Transportation, Gaming, and Medical Applications

Broadcom is the world's leading provider of fiber-optic transmitters, receivers, and transceivers. Broadcom offers unmatched quality with high-volume, cost-effective manufacturing techniques. Industry leaders and small firms alike turn to Broadcom for their fiber-optic needs.

The SFH-series (connectorless) has 650-nm fiber-optic components with the capability to work with unconnectorized plastic optical fiber (POF) for ease of installation. The Versatile Link package contains 650-nm discrete components that feature snap-in connector parts. The SMA/ST package is an extremely robust industrial-grade family with SMA or ST ports suitable for use in fieldbus applications. The Miniature Link family, which provides greater link lengths, is available with 820-nm and 1300-nm technology. These are discrete components that can use SMA, ST, SC, or FC connectors.

Fundamentals of Digital Fiber-Optic Links

Optical transmitters from these families include an LED. Transmitters are available with and without driver circuitry. Cost-effective driver ICs are available from many suppliers, and Broadcom offers application notes that demonstrate easy integration of these ICs into a transmitter circuit.

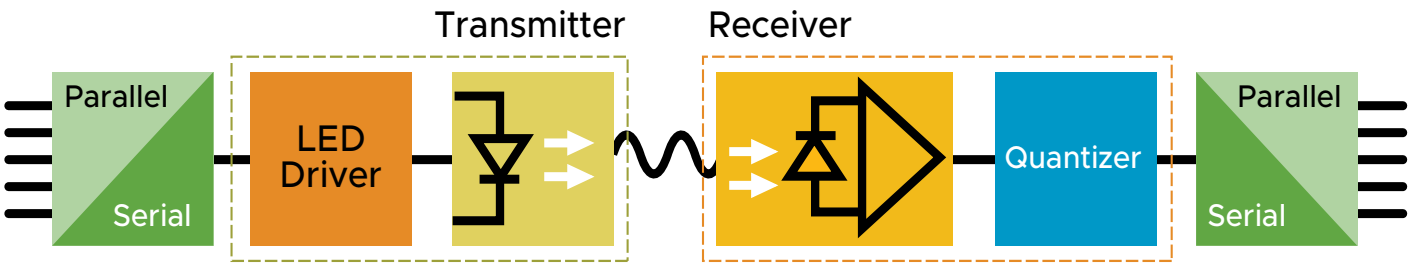
The optical receivers from DC up to 50 Mbaud include a photodiode, preamp, and quantizer circuit (shown in the following block diagram). These receivers have TTL outputs (DC coupled) and can be used with arbitrary timing (no duty factor restriction). Typical applications are RS-232, RS-485, SERCOS, INTERBUS-S, and PROFIBUS protocols.

The receivers for data rates from 1 Mbaud to 160 Mbaud include a photodiode, preamp, and analog outputs. They must be AC-coupled to a comparator or quantizer circuitry to provide digital logic levels (ECL, TTL). The AC coupling requires encoding of the serial data (Manchester, 4B/5B, scrambled coding), but provides better sensitivity than DC-coupled receivers.

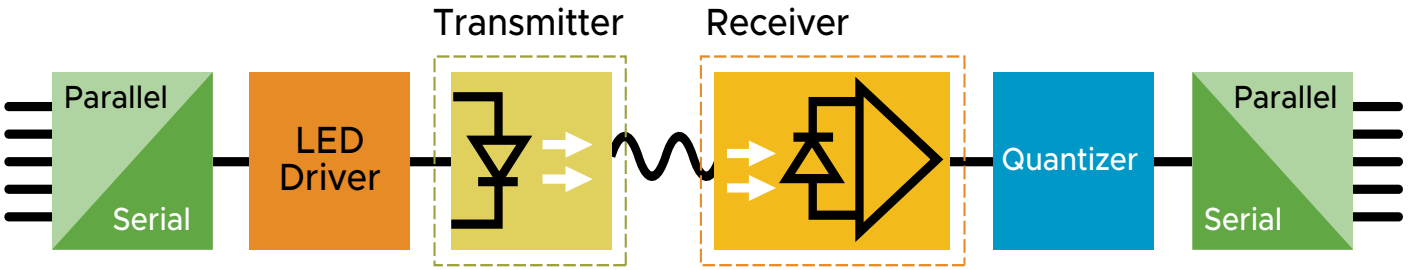
Plastic Optical Fiber Components

Broadcom is committed to the advancement of fiber-optic technologies and recognizes the importance of optical data transmission for today's growing data networking needs. Plastic optic fiber (POF) enables low-cost, high-voltage applications. providing safe galvanic isolation with the advantages of optical data transmission; suitable for automotive, industrial, and consumer markets.

Typical Link Block Diagram from DC to 50 Mbaud



Typical Link Block Diagram from 1 Mbaud to 160 Mbaud



Industrial Fiber-Optic Transceivers

Providing a comprehensive line of high-performance fiber-optic transceivers, Broadcom products reliably support a wide range of industrial data networking standards and speeds.

Applications

- Factory automation at Fast Ethernet and Gigabit Ethernet speeds
- Fast Ethernet and Gigabit Ethernet networking
- Industrial applications
- Real-time Fast Ethernet networks

Connector Configuration		Data Rate	Reach	Fiber	Supply Voltage	Part Numbers	DMI	Evaluation Board
	SFF/LC	Fast Ethernet (100 Mb/s)	2000m	Multi-mode	3.3V	AFBR-59E5APZ	No	HFBR-0572
						AFBR-59E5APZ-HT		
	SFF/MT-RJ	Fast Ethernet (100 Mb/s)	2000m	Multi-mode	3.3V	AFBR-5903AZ	No	—
	SFP/LC	Gigabit Ethernet	2000m	Multi-mode	3.3V	AFBR-57L1APZ	Yes	—
		Fast Ethernet (100 Mb/s)	2000m	Multi-mode	3.3V	AFBR-57E6APZ	Yes	HFBR-0570
						AFBR-57E6APZC		
						AFBR-57E6APZ-HT		
	SFP/LC	DC to 50 Mbaud	2000m	Multi-mode	3.3V	AFBR-57B4APZ	Yes	—
	1×9/SC	Fast Ethernet (100 Mb/s)	2000m	Multi-mode	3.3V/5V	AFBR-5813QZ	No	—
						AFBR-5803AQZ		HFBR-0535
	1×9/ST					AFBR-5813TQZ		—
						AFBR-5803ATQZ		HFBR-0535
	2×9/SC	Fast Ethernet (100 Mb/s)	2000m	Multi-mode	3.3V/5V	AFBR-5823QZ	Yes	—
	2×9/ST					AFBR-5823TQZ		—
	SC-RJ Profinet	Fast Ethernet (100 Mb/s)	50m/100m	POF/HCS	3.3V	QFBR-5978AZ-2	Yes	—
	Versatile Link	Fast Ethernet (100 Mb/s)	50m	POF	3.3V	AFBR-5972Z	No	AFBR-0544Z
		250 Mbaud				AFBR-5972EZ	No	—

Transceiver with Bare Fiber Locking System		Data Rate	Reach	Fiber	Supply Voltage	Part Numbers	Monitor Output (MON)
	Connectorless	250 Mbaud	40m	POF	3.3V	AFBR-59F2Z	Analog

Flexible Link

The AFBR-5Fx85Z is an ultra-low power consumption 850-nm Flexible Link product that operates from DC to 50-Mbaud data transmission over multi-mode glass fiber cable. The Flexible Link family features a universal footprint, allowing designers to populate each PCB slot with a transceiver, dual-transmitter, or dual-receiver configuration as needed.

Applications

- Factory automation
- Energy storage
- Substation automation
- HVDC systems

Configuration		Part Number	Data Rate	Connector Type	Voltage	Link Distance / Fiber Cable
	Transceiver	AFBR-5FC85Z	DC to 50 Mbaud	LC	+3.3V	4000m / 50–125 µm 4000m / 62.5–125 µm 600m / 105–125 µm 500m / 200–230 µm
	Dual Receiver	AFBR-5FT85Z	DC to 50 Mbaud	LC	+3.3V	
	Dual Transmitter	AFBR-5FR85Z	DC to 50 Mbaud	LC	+3.3V	

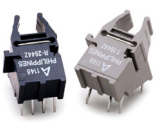
650-nm Industrial Fiber-Optic Components

Components listed here are compatible with both plastic (1-mm core diameter) and hard-clad silica (HCS) optical fibers. Plastic fiber, often specified in cost-effective solutions, is implemented in frequency conversion, power electronics control, and industrial fieldbuses. HCS is typically used for higher data rates and link lengths. Connectorization schemes include connectorless, ST, SMA, and Versatile Link.

Applications

- Factory automation
- Industrial networking and fieldbuses
- Audio visual links and data links, up to 160 Mbaud
- High-voltage conversion
- IGBT, GTO, and IGCT power electronics
- High-voltage galvanic isolation
- Gaming equipment
- Human-machine interfaces

Versatile Link Packages/Connectors

Connector Configuration	Data Rate	Reach		Supply Voltage	Transmitter		Receiver		Temperature Range	Evaluation Board
		POF	HCS		Part Number	Interface	Part Number	Interface		
Horizontal 	DC to 40 kbaud	110m	—	5V	HFBR-1523Z	Pin-diode	HFBR-2523Z	Open collector	0°C to +70°C	
	DC to1 Mbaud	10m	—	5V	HFBR-1524Z	Pin-diode	HFBR-2524Z	Open collector	0°C to +70°C	
		45m	—	5V	HFBR-1522Z	Pin-diode	HFBR-2522Z	Open collector	0°C to +70°C	
		45m	—	5V	HFBR-1522ETZ	Pin-diode	HFBR-2522ETZ	Open collector	–40°C to +85°C	
	DC to 5 Mbaud	20m	—	5V	HFBR-1521Z	Pin-diode	HFBR-2521Z	Open collector	0°C to +70°C	
		20m	—	5V	HFBR-1521ETZ	Pin-diode	HFBR-2521ETZ	Open collector	–40°C to +85°C	
		58m	500m	3.3V/5V	AFBR-1521CZ	Pin-diode	AFBR-2521CZ	TTL	–40°C to +95°C	
	DC to 10 Mbaud	58m	500m	3.3V/5V	AFBR-1528CZ	Pin-diode	AFBR-2528CZ	TTL	–40°C to +95°C	
		40m	200m	3.3V/5V	AFBR-1529Z	Pin-diode	AFBR-2529Z	TTL	–40°C to +85°C	
	DC to 50 Mbaud	50m	120m	3.3V/5V	AFBR-1624Z	TTL	AFBR-2624Z	TTL	–40°C to +85°C	AFBR-0546Z AFBR-0548Z
		50m	120m	3.3V/5V	AFBR-1629Z	TTL	AFBR-2529Z	TTL	–40°C to +85°C	AFBR-0547Z
		50m	120m	3.3V/5V	AFBR-1629Z	TTL	AFBR-2529SIZ	TTL + RSSI	–40°C to +85°C	AFBR-0553Z
Vertical 	DC to 40 kbaud	110m	—	5V	HFBR-1533Z	Pin-diode	HFBR-2533Z	Open collector	0°C to +70°C	
	DC to 1 Mbaud	10m	—	5V	HFBR-1534Z	Pin-diode	HFBR-2534Z	Open collector	0°C to +70°C	
		45m	—	5V	HFBR-1532Z	Pin-diode	HFBR-2532Z	Open collector	0°C to +70°C	
	DC to 5 Mbaud	20m	—	5V	HFBR-1531Z	Pin-diode	HFBR-2531Z	Open collector	0°C to +70°C	
		20m	—	5V	HFBR-1531ETZ	Pin-diode	HFBR-2531ETZ	Open collector	–40°C to +85°C	
		50m	500m	3.3V/5V	AFBR-1639Z	TTL	AFBR-2531CZ	TTL	–40°C to +85°C	
		58m	500m	3.3V/5V	AFBR-1531CZ	Pin-diode	AFBR-2531CZ	TTL	–40°C to +95°C	
	DC to 10 Mbaud	40m	200m	3.3V/5V	AFBR-1539Z	Pin-diode	AFBR-2539Z	TTL	–40°C to +85°C	
	DC to 50 Mbaud	50m	120m	3.3V/5V	AFBR-1634Z	TTL	AFBR-2634Z	TTL	–40°C to +85°C	
		50m	120m	3.3V/5V	AFBR-1639Z	TTL	AFBR-2539Z	TTL	–40°C to +85°C	
Tilted 	DC to 1 Mbaud	45m	—	5V	HFBR-1542ETZ	Pin-diode	HFBR-2542ETZ	Open collector	–40°C to +85°C	
	DC to 5 Mbaud	20m	—	5V	HFBR-1541ETZ	Pin-diode	HFBR-2541ETZ	Open collector	–40°C to +85°C	
		50m	500m	3.3V/5V	AFBR-1644Z	TTL	AFBR-2541CZ	TTL	–40°C to +85°C	
		58m	500m	3.3V/5V	AFBR-1541CZ	Pin-diode	AFBR-2541CZ	TTL	–40°C to +95°C	
	DC to 50 Mbaud	50m	120m	3.3V/5V	AFBR-1644Z	TTL	AFBR-2644Z	TTL	–40°C to +85°C	AFBR-0546Z AFBR-0548Z

Fieldbus (SMA Connector)

Connector Configuration	Data Rate	Reach		Supply Voltage	Part Numbers		Evaluation Board
		POF	HCS		Transmitter	Receiver	
SMA 	DC to 2 Mbaud	50m	400m	5V	HFBR-1505CZ	HFBR-2505CZ	HFBR-0538Z
		50m	300m	5V	HFBR-1505CFZ	HFBR-2505CFZ	—
	2 Mbaud to 16 Mbaud	45m	—	3.3V/5V	HFBR-1506AFZ	HFBR-2555AFZ	—
		45m	100m	3.3V/5V	AFBR-1555ARZ	AFBR-2555ARZ	—

Connectorless

Connector Configuration	Data Rate	Reach		Supply Voltage	Part Numbers		Application Notes
		POF	HCS		Transmitter	Receiver	
V-Housing 	DC to 5 Mbaud	20m	—	5V	SP000063858 (SFH757V)	SP000063855 (SFH551/1-1V)	AN 5341 AN 5342
	100 Mbaud	20m	—	5V	SP000063858 (SFH757V)	SP000063852 (SFH250V)	AN 5341 AN 5342
LL-Housing 	DC to 5 Mbaud	20m	—	5V	SP000063871 (SFH757)	SP000063860 (SFH551/1-1)	AN 5341 AN 5342
	100 Mbaud	20m	—	5V	SP000063871 (SFH757)	SP000063866 (SFH250)	AN 5341 AN 5342

High Galvanic Isolation Link

Connector Configuration	Data Rate	Creepage & Clearance Distance	Supply Voltage	Part Number	Application Notes
 Certified to IEC 60747-5-5:2007	DC to 5 Mbaud	25 mm	3.3V/5V	AFBR-390525RZ	AFBR-39xxyyRZ-AN101
		50.4 mm		AFBR-390550RZ	
		75.8 mm		AFBR-390575RZ	
		101.2 mm		AFBR-390500RZ	
	DC to 50 Mbaud	25 mm	3.3V/5V	AFBR-395025RZ	AFBR-39xxyyRZ-AN101
		50.4 mm		AFBR-395050RZ	
		75.8 mm		AFBR-395075RZ	
		101.2 mm		AFBR-395000RZ	

As per IEC-60664-1 at 2000m above sea level and pollution degree 2, inhomogeneous field conditions can lead to partial discharge through the air for these voltages.

Miniature Link 820-nm/850-nm/1300-nm Industrial Fiber-Optic Components

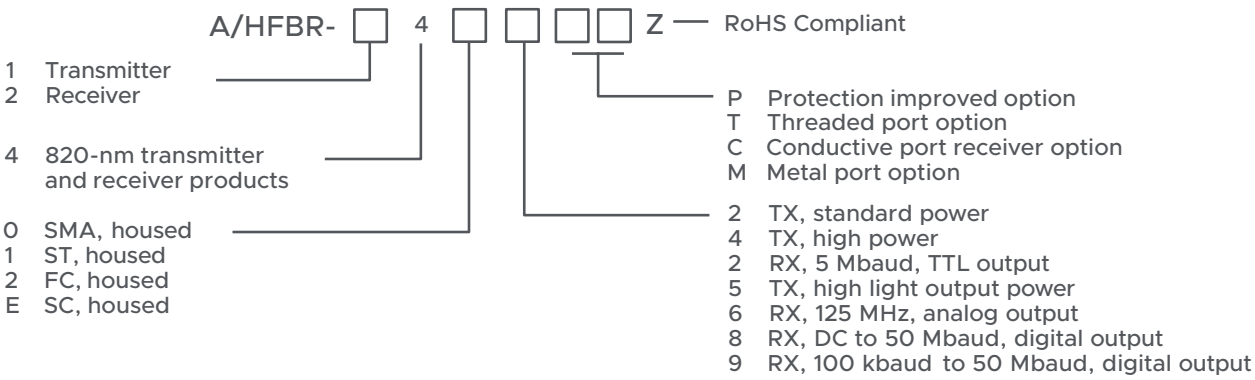
These cost-effective components with long link-length capabilities can be used to build high-performance Ethernet transceivers. Typical applications include FDDI, Token Ring, FOIRL, 10BASE-FL, and 100BASE-SX. The glass fiber specified in this selection guide is multi-mode fiber. Both 62.5-µm/125-µm and 50-µm/125-µm multi-mode glass fiber can be used.

Applications

- LAN applications, such as 10BASE-FL
- FDDI, Token Ring, 100BASE-SX
- Audio-video links and industrial data links
- Motorway infrastructure
- Wind turbine control systems and farm networking
- Hydro and solar power generation plants
- Media and fiber converters
- Railway control systems
- Locomotive in-car and car-to-car communications



Connector Configuration	Data Rate	Reach	Voltage	Part Number		Evaluation Board
				Transmitter	Receiver	
ST, SMA, FC	DC to 5 Mbaud	1500m	5V	HFBR-14X2PXZ	HFBR-24X2XZ	HFBR-0410Z
ST, SC, SMA	20 Mbaud	2700m	5V	HFBR-14X4PXZ	HFBR-24X6XZ	—
	32 Mbaud	2200m				
	55 Mbaud	1400m				
	125 Mbaud	700m				
	155 Mbaud	600m				
	160 Mbaud	500m				
	DC to 20 Mbaud	3000m	3.3V/5V	HFBR-14X4PXZ	AFBR-24X8XZ	AFBR-0550Z
	DC to 32 Mbaud	2200m				
	DC to 40 Mbaud	1500m				
	DC to 50 Mbaud	1000m				
	20 Mbaud	3000m	3.3V/5V	HFBR-14X4PXZ	AFBR-24X9XZ	AFBR-0550Z
	32 Mbaud	2200m				
	40 Mbaud	1500m				
	50 Mbaud	1000m				
ST	20 Mbaud	5000m	5V	HFBR-1312TZ	HFBR-2316TZ	—
	32 Mbaud	3200m				
	55 Mbaud	3200m				
	125 Mbaud	2800m				
	155 Mbaud	2700m				
	160 Mbaud	2000m				
	DC to 50 Mbaud	4000m	3.3V	AFBR-1715MZ	AFBR-24x8xZ	—
ST, SC, SMA	50 Mbaud	2000m	3.3V/5V	HFBR-14X4XZ	HFBR-24X8XZ	AFBR-0549Z


A/HFBR- □ 4 □ □ □□ Z
RoHS Compliant
1 Transmitter
2 Receiver
4 820-nm transmitter and receiver products
0 SMA, housed
1 ST, housed
2 FC, housed
E SC, housed
P Protection improved option
T Threaded port option
C Conductive port receiver option
M Metal port option
2 TX, standard power
4 TX, high power
2 RX, 5 Mbaud, TTL output
5 TX, high light output power
6 RX, 125 MHz, analog output
8 RX, DC to 50 Mbaud, digital output
9 RX, 100 kbaud to 50 Mbaud, digital output

Optical Arc Flash Detection

Arc flash accidents in electrical power distribution networks are a constant threat to both network infrastructure and human life. Optical systems are increasingly used to detect and prevent such events with high success.

Broadcom components for optical arc flash detection help the system engineer build an efficient and reliable arc flash protection system. The sensor transceiver is very compact, robust, and low light sensitive, and it has built-in self-test functionality. The POF sensor fiber shows high sensitivity to the arc flash light and is equipped with a robust transparent jacket.

Sensor Transceiver/Receiver

	Configuration	Part Number	Description	Connector Type	Rx Responsivity	Tx Optical Power	Voltage	Notes
	Sensor Transceiver	AFBR-S10TR001Z	Compact TRx with an integrated LED for heartbeat and with an ASIC for PD and TIA functionality.	Duplex VL AFBR-4526Z	45V/mW @ 650 nm	–1 dBm @ 30 mA, 650 nm	5V	—
	Sensor Receiver (Horizontal Connector)	AFBR-S10RX021Z	Versatile Link-based Rx with an ASIC for PD and TIA functionality.	Simplex VL	45V/mW @ 650 nm	N/A	5V	To be used with transmitter: AFBR-1539Z or AFBR-1639Z (integrated LED driver).
	Sensor Receiver (Vertical Connector)	AFBR-S10RX031Z	Versatile Link-based Rx with an ASIC for PD and TIA functionality.	Simplex VL	45V/mW @ 650 nm	N/A	5V	To be used with transmitter: AFBR-1539Z or AFBR-1639Z (integrated LED driver).

Line Sensor

	Configuration	Part Number	Description	Operating Temperature	Fiber Material	Fiber Diameter	NA	Attenuation
	Line Sensor	AFBR-TUS500Z	Simplex SI POF with transparent jacket to be used as a line sensor, 500m spool. Captures light that meets the fiber and guides it along the fiber.	–40°C to +85°C	Core: PMMA Jacket: PE, transparent	Core & Cladding: 1 mm Jacket: 2.2 mm	0.48	0.21 dB/m

Point Sensor

	Configuration	Part Number	Description	Operating Temperature	App Note	Notes
	Sensor Head	AFBR-S10PS010Z	To be mounted to the construction near to the place of the expected arc flash. Does not contain a fiber pigtail but can be connected to a fiber via the sensor connector AFBR-S10PS011Z.	–40°C to +85°C	AFBR-S10PS01XZ-AN101	—
	Sensor Connector	AFBR-S10PS011Z	Black crimpless nonlatching connector is used to connect the sensor head AFBR-S10PS010Z to a duplex POF with 1-mm/2.2-mm fiber dimensions.	–40°C to +85°C	AFBR-S10PS01XZ-AN101	Recommended fiber AFBR-HUD500Z.
	Sensor Connector Kit for Field Installation	AFBR-S10PS012Z	A compilation of sensor connectors AFBR-S10PS011Z and special polishing tools and polishing paper (3 polishing kits per 50 connectors).	–40°C to +85°C	AFBR-S10PS01XZ-AN101	When placing an order for AFBR-S10PS012Z, the quantity value must relate to the number of connectors, not to the number of packages.

Optical Power Components

Broadcom optical power components supply electrically isolated power for remote sensors, isolated probes, and gate drivers in industrial applications. With high efficiency across the full industrial operating temperature range, the optical power components permit system integrators optimal cost efficiency.

The optical power converter is a photovoltaic device that generates electrical power when illuminated by light from a laser. Outputs range from 10 mW to 10W depending on the laser power input delivered over optical fiber. With a choice of voltage outputs of 4, 6, and 12 volts, most common electronic circuitry, sensors, and data communication links can be powered while ensuring 100 percent galvanic isolation.

Applications

Optical power converters power devices including:

- Current sensors in electric train and utility applications
- E-field and H-field probes
- Probes for IGBT and SiC MOSFET testing
- Power conditioning circuitry
- Sensors in aircraft, mining, and particle physics applications
- Undetectable powering over 15 km of distance
- Wireless transmitters

Optical Power Converters

Connector Configuration	Part Number	Fiber Type	Output Voltage	Optical Wavelength	Max. Output Power	Operating Temperature
FC 	AFBR-POC204L	Multi-mode Glass	3.7V	800 nm – 850 nm	800 mW	–40°C to +85°C
	AFBR-POC206L	Multi-mode Glass	5.6V	800 nm – 850 nm	800 mW	–40°C to +85°C
ST 	AFBR-POC404L	Multi-mode Glass	3.7V	800 nm – 850 nm	800 mW	–40°C to +85°C
	AFBR-POC406L	Multi-mode Glass	5.6V	800 nm – 850 nm	800 mW	–40°C to +85°C
ST 	AFBR-POC306A1	Multi-mode Glass	5.6V	800 nm – 850 nm	3000 mW	–40°C to +85°C
	AFBR-POC306A5	Multi-mode Glass	5.0V	940 nm – 990 nm	3000 mW	–40°C to +85°C
FC 	AFBR-POC205A2	Multi-mode Glass	5.0V	840 nm – 860 nm	750 mW	–40°C to +85°C
	AFBR-POC205A8	Single-mode and Multi-mode Glass	4.1V	1460 nm – 1500 nm	800 mW	–40°C to +85°C
	AFBR-POC205A9	Single-mode and Multi-mode Glass	4.1V	1490 nm – 1550 nm	800 mW	–40°C to +85°C

Optical Power Lasers

Connector Configuration	Part Number	Fiber Type	Optical Wavelength	Average Power Output	Operating Temperature
FC/PC 	AFBR-POL2120	Multi-mode Glass	800 nm – 850 nm	2W	+15°C to +45°C
FC/PC 	AFBR-POMEK2204	Multi-mode Glass	800 nm – 850 nm	2W	+15°C to +45°C

Optical Wireless Transceivers

Wireless transmission of data has been an evolving technology since the original invention of radio transmitting and receiving systems. Depending on the distance or the data rate required for such communication, a variety of other technologies have been introduced to date. Growing worldwide demand for full-duplex, bidirectional, and rotationally symmetric transceivers gave birth to optical wireless communication (OWC) in the form of a Broadcom original component.

Broadcom OWC is the first-of-its-kind optical transceiver based on a robust and industry-proven technology. It uses an 850-nm laser diode to transmit and receive data at 1.25 Gb/s, 5 Gb/s, and 8 Gb/s. A single link consists of two transceivers separated by a distance of up to 100 mm. An OWC link enables nearly lossless communication while securing the data transmission from EMI interference and providing full galvanic isolation. The centro-symmetry of the design allows for infinite rotation around the central axis while maintaining the key functional parameters of operation.

Applications

- Industrial data links for factory-enclosed and isolated communication for medical interfaces of vital sign monitors and CT scanners
- Scanning LiDAR
- Industrial rotating joints
- Precision robotic arm joints – medical and industrial
- Slip ring data communication
- Drone docking and data download
- PCB board-to-board communication, backbone connections
- Endoscope communication
- Harsh environments through window communication

Configuration	Data Rate (Gb/s)	Part Number	Link Distance (mm)	Laser Eye Safety	Directionality	Operating Temperature
	1.25	AFBR-FS13B25	20 – 100	Class 1	Bidirectional, full duplex	–40°C to +85°C
	5	AFBR-FS50B00	30 – 100	Class 1	Bidirectional, full duplex	0°C to +85°C
	8	AFBR-FS80B60	30 – 60	Class 3R	Bidirectional, full duplex	0°C to +85°C
	5	AFBR-FS50B00-LT	30 – 100	Class 3R	Bidirectional, full duplex	–40°C to +85°C

Plastic Optical Fiber Cables

The HFBR-E/R/HxxyyZ series of plastic fiber-optic cables is constructed of a single-step index fiber, sheathed in a black polyethylene jacket. The duplex fiber consists of two simplex fibers joined with a zipcord web. Standard attenuation and extra-low-loss POF cables are identical except for attenuation specifications. Polyethylene jackets on all plastic fiber cables comply with the UL VW-1 flame retardant specification (UL file #E89328). Cables are available in unconnectorized or connectorized options.

Compatible with the Versatile Link family of connectors and fiber-optic components, Broadcom offers 1-mm diameter (2.2-mm outer diameter) POF in two grades: standard POF with 0.22-dB/m typical attenuation or high-performance extra-low-loss POF with 0.19-dB/m typical attenuation.

The Broadcom AFBR-HUX500Z is a halogen-free, robust plastic optical fiber (POF) cable. The cable comes in a single spool of 500m POF consisting of a step-index fiber sheathed in a black polyethylene jacket with an outer diameter of 2.2 mm (simplex dimension, duplex: 2×2.2 mm). The jacket has a blue marking. The POF inside the covering jacket has a diameter of 1 mm.

The cable complies with the UL VW-1 flame retardant specification (UL file #E116331 / Style #5538).

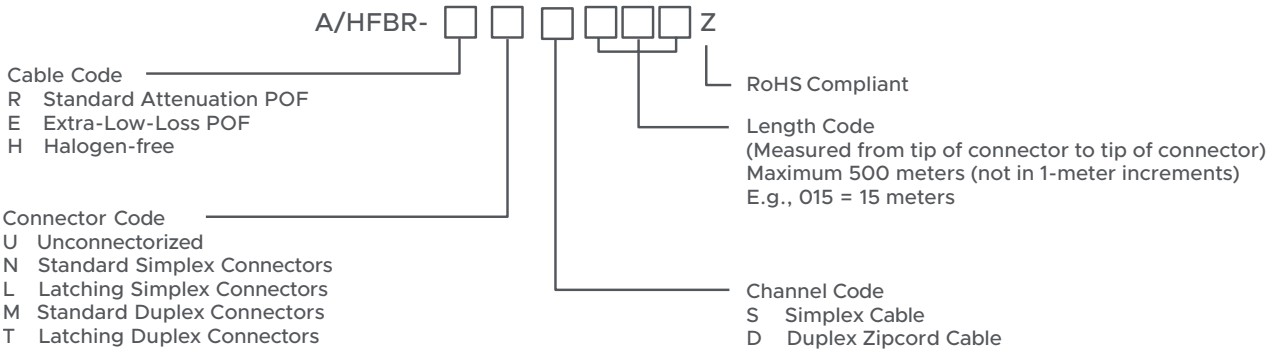
Applications

- Industrial data links for factory automation and plant control
- Intrasystem links: board-to-board or rack-to-rack
- Telecommunication switching systems
- Computer-to-peripheral data links, PC bus extension
- Proprietary LANs
- Digitized video
- Medical instruments
- Reduction of lightning and voltage transient susceptibility
- High-voltage galvanic isolation
- Power electronics
- Gaming equipment
- Data communications



Plastic Optical Fiber Specifications: A/HFBR-E/R/HxxyyZ

Parameter		Symbol	Min.	Typ.	Max.	Unit	Condition
Cable Attenuation Source: 660-nm LED, 0.5 NA (HFBR-15xxZ) Length: 50m	Standard cable type “R”	α°	0.15	0.22	0.27	dB/m	TA = –40°C to +85°C
	Extra-low-loss type “E”		0.15	0.19	0.23		
	Halogen-free type “H”		0.15	0.19	0.23		
Reference Attenuation Source: 650-nm LED, 0.5 NA (Monochrometer) Length: 50m	Standard cable type “R”	α^R	0.12	0.19	0.24	dB/m	TA = –40°C to +85°C
	Extra-low-loss type “E”		0.12	0.16	0.19		
	Halogen-free type “H”		0.15	0.19	0.23		
Numerical Aperture	—	NA	0.46	0.47	0.50	—	>2 meters
Diameter, Core, and Cladding	—		0.94	1.00	1.06	mm	—



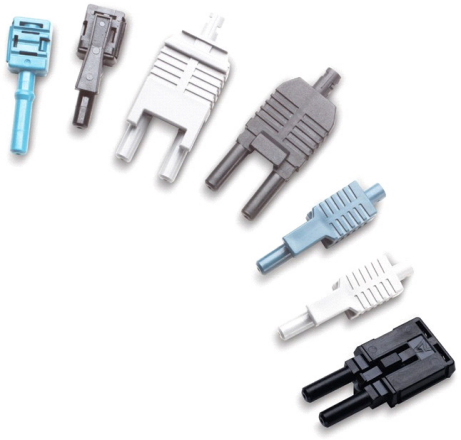
POF Connectors and Accessories

Crimp Style

The HFBR-4501Z, HFBR-4503Z, and HFBR-4506Z connector styles are available for termination of plastic optical fiber: simplex, simplex latching, duplex, and duplex latching. All connectors provide a snap-in action when mated to Versatile Link components. Simplex connectors are color coded to facilitate identification of transmitter and receiver connections. Duplex connectors are keyed so that proper orientation is ensured during insertion. The connectors are made of a flame retardant VALOX UL94 V-0 material (UL file # E121562).

Crimpless Style

The HFBR-453xZ series connectors are an enhanced version of the HFBR-4501Z and HFBR-4503Z connectors for plastic optical fiber, compatible with the Broadcom Versatile Link series transmitters and receivers. This design uses a simple, snap-together concept, which eliminates the need for crimping. User labor and tool cost are reduced together with the yield loss due to installation errors. The HFBR-453xZ series connectors are available in two styles: latching and nonlatching. For a duplex connector, two nonlatching simplex connectors can be snapped together. The connectors are made of a rugged, flame-resistant plastic, which is good for industrial and other harsh environments. The HFBR-453xZ series connectors are for use with plastic optical fiber only.



Plastic Optical Fiber Connectors

Part Number	Description
HFBR-4501Z/4511Z	Gray/blue simplex connector with crimp ring.
HFBR-4503Z/4513Z	Gray/blue simplex latching connector with crimp ring.
HFBR-4505Z/4515Z	Gray/blue mating adapter for two simplex nonlatching POF connectors.
HFBR-4506Z/4516Z	Parchment/gray duplex connector with crimp ring.
HFBR-4531Z/4532Z	Black crimpless simplex nonlatching/latching connector.
HFBR-4533Z/4535Z	Blue/gray crimpless simplex nonlatching connector.
AFBR-4526Z/452BZ	Black/blue crimpless latching connector (mating transceiver: AFBR-5972xZ).
AFBR-4536EZ/4536DZ	Duplex bulkhead connector suitable for duplex connector AFBR-452xZ.

Plastic Optical Fiber Accessories

Part Number	Description
HFBR-4522Z	Bag of 500 HFBR-0500 Versatile Link port plugs.
HFBR-4525Z	Bag of 1000 simplex crimp rings.
HFBR-4526Z	Bag of 500 duplex crimp rings.
HFBR-4593Z	Polishing kit (one polishing tool, two pieces of 600-grit abrasive paper and two pieces of 3-µm pink lapping film).
AFBR-4594Z	Polishing kit for the AFBR-4526Z (one polishing tool, two pieces 600-grit abrasive paper, and two pieces of 3-µm pink lapping film).
HFBR-4597Z	Crimping tool 4.5 mm – 5.5 mm for simplex/duplex crimp rings.
HFBR-4595Z	Simple cutting tool for polymer optical fiber.

Upgrade Your Design

New Package | New Features | Better Performance

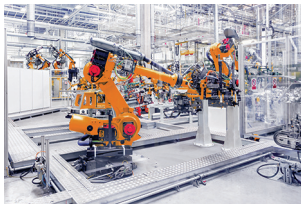
Existing Parts	Upgrade Parts	Upgrade Features	Footprint Information
Versatile Link Transmitters and Receivers			
HFBR-1521Z / HFBR-2521Z HFBR-1531Z / HFBR-2531Z HFBR-1521ETZ / HFBR-2521ETZ HFBR-1531ETZ / HFBR-2531ETZ HFBR-1522Z / HFBR-2522Z HFBR-1532Z / HFBR-2532Z HFBR-1522ETZ / HFBR-2522ETZ HFBR-1532ETZ / HFBR-2532ETZ	AFBR-1521CZ / AFBR-2521CZ AFBR-1531CZ / AFBR-2531CZ AFBR-1541CZ / AFBR-2541CZ	• –40°C to +95°C operating temperature range • 3.3V or 5V operating voltage • Highly efficient transmitter • TTL/CMOS receiver output • Lower power consumption • Low propagation delay with guaranteed maximum part-to-part skew • High dynamic receiver optical input range	Same footprint, changes to Tx driver and Rx output interface required. Optical backward compliant, but check power budget.
HFBR-1528Z / HFBR-2528Z	AFBR-1528CZ / AFBR-2528CZ	• –40°C to +95°C operating temperature range • 3.3V or 5V operating voltage • Highly efficient transmitter • Lower power consumption • Low propagation delay with guaranteed maximum part-to-part skew • High dynamic receiver optical input range	Same footprint, changes to Tx driver and Rx output interface required. Optical backward compliant, but check power budget.
HFBR-1521Z / HFBR-1521ETZ HFBR-1522Z / HFBR-1522ETZ HFBR-1528Z / AFBR-1529Z	AFBR-1629Z AFBR-1639Z	• –40°C to +85°C operating temperature range • 3.3V or 5V operating voltage • Transmitter with integrated driver • Highly efficient transmitter • TTL/CMOS compatible input • Low power consumption	Same footprint, but digital input, no external driver required.
HFBR-1528Z / HFBR-2528Z	AFBR-1629Z / AFBR-2529Z	• DC to 50 Mbaud • Lower power consumption • Higher EMI immunity • Lower propagation delay time • Power on reset	Tx: Same footprint, but digital input, no external driver required. Rx: Drop-in replacement.
AFBR-2529Z	AFBR-2529SIZ	• Additional safety function with RSSI feature	Drop-in replacement.
Plastic Optical Fiber (POF) Cable and Connectors			
HFBR-RUDxxxZ HFBR-EUDxxxZ	AFBR-HUDxxxZ	• Halogen free	Drop-in replacement.
HFBR-4501Z / HFBR-4511Z HFBR-4503Z / HFBR-4513Z HFBR-4506Z	HFBR-4531Z HFBR-4532Z HFBR-4533Z HFBR-4535Z	• Simplified POF connector termination, no crimp tool required • No metal at connector, preferred in high-voltage and medical applications	Drop-in replacement.
Miniature Link Transmitters and Receivers			
HFBR-1412xZ HFBR-1414xZ	HFBR-1412xPZ HFBR-1414xPZ	• ESD enhanced device: 2-kV HBM	Drop-in replacement.
HFBR-2416xZ	AFBR-2418xZ AFBR-2419xZ	• Integrated quantizer • Digital TTL/CMOS compatible output • Analog receiver signal strength indicator output • Reduced design effort and PCB space • Enhanced EMC performance • Short propagation delay • Lower power consumption • 3.3V or 5V supply voltage	Same footprint, but digital output along with RSSI.
High Galvanic Insulation Link			
HFBR-3810xZ	AFBR-390525RZ	• VDE certification as per IEC 60747-5-5 • Lower power consumption • Shorter propagation delay with guaranteed maximum part-to-part skew	Similar footprint.
HFBR-3810xZ	AFBR-3905xxRZ AFBR-3950xxRZ	• VDE certification as per IEC 60747-5-5 • Up to 50-kV peak transient voltage suppression • Up to 12-kV effective working voltage • Four creepage / clearance length options • Two speed options: DC to 5 Mbaud and DC to 50 Mbaud	Different footprints.

Existing Parts	Upgrade Parts	Upgrade Features	Footprint Information
Fast Ethernet POF and MM GOF			
AFBR-5972Z	AFBR-5972EZ AFBR-5972BZ	• 45% lower maximum power consumption • Better EMI immunity for highest system robustness • LVDS I/Os for direct interface to FPGAs • Up to 250 Mbaud link rate for higher bandwidth requirements	Same footprint, but different electrical interface.
HFBR-5961ALZ	AFBR-59E4APZ-LH	• 60% lower maximum power consumption • Integrated data I/O AC coupling • Integrated Tx data input termination	Same footprint, same optical interface, change of external data I/O termination required.
HFBR-57E5APZ	AFBR-57E6APZ	• 50% lower maximum power consumption	Drop-in replacement.
AFBR-59E4APZ	AFBR-59E5APZ	• About 40% lower power consumption	Drop-in replacement.
AFBR-59E4APZ-HT	AFBR-59E5APZ-HT	• About 40% lower power consumption	Drop-in replacement.
AFBR-59E5APZ	AFBR-59E5APZ-HT	• 95°C maximum operating temperature • Four additional housing leads for improved signal grounding and heat dissipation	Four additional housing leads.
AFBR-57E6APZ	AFBR-57E6APZ-HT	• 95°C maximum operating temperature	Drop-in replacement.
AFBR-5803ATQZ AFBR-5803ATZ AFBR-5803TZ	AFBR–5813TQZ	• Reduced power dissipation: ~50% lower • 0.5 watt (maximum) and 0.3 watt (typical) • Low profile housing	MSA compliant. Pin-to-pin compatible. 3.3V supply only.
AFBR-5803AQZ AFBR-5803AZ AFBR-5803Z	AFBR–5813QZ	• Reduced power dissipation: ~50% lower • 0.5 watt (maximum) and 0.3 watt (typical) • Low profile housing	MSA compliant. Pin-to-pin compatible. 3.3V supply only.
AFBR-5803xTxx	AFBR–5823TQZ	• Diagnostics for enhanced system reliability • Reduced power dissipation: ~50% lower • 0.5 watt (maximum) and 0.3 watt (typical) • Low profile housing	2×9 pinout. 3.3V supply only.
AFBR-5803xxx	AFBR–5823QZ	• Diagnostics for enhanced system reliability • Reduced power dissipation: ~50% lower • 0.5 watt (maximum) and 0.3 watt (typical) • Low profile housing	2×9 pinout. 3.3V supply only.

Connecting everything®







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