BROADCOM®

SELECTION GUIDE

Industrial Fiber Optic Components, Cabling and Accessories

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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 650nm fiber-optic components with the capability to work with unconnectorized POF (plastic optical fiber) for ease of installation. The Versatile Link Package contains 650nm 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 820nm and 1300nm 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 we offer application notes that will demonstrate easy integration of these ICs into a transmitter circuit.

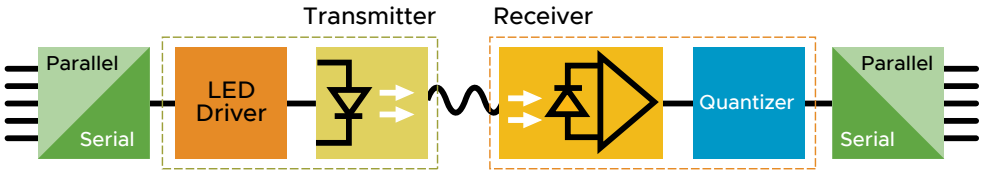
The optical receivers from DC up to 50 MBd include a photodiode, preamp, and quantizer circuit (shown in the block diagram below). These receivers have TTL outputs (dc coupled) and can be used with arbitrary timing (no duty factor restriction). Typical applications are RS232, RS485, SERCOS, INTERBUS-S and PROFIBUS protocols.

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

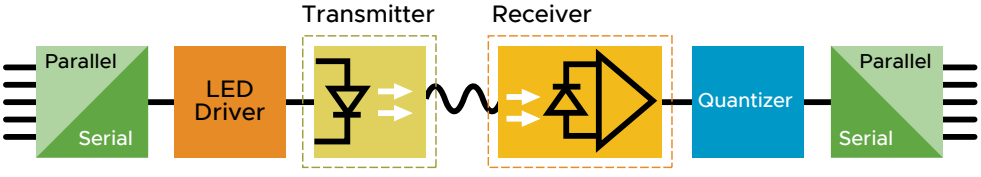
Plastic Optical Fiber (POF) Components

Broadcom is committed to the advancement of fiber optics 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 MBd



Typical link block diagram from 1 MBd to 160 MBd



Industrial Fiber Optic Transceiver

Providing a comprehensive line of high-performance fiber optic transceivers, Broadcom's 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

Industrial Fiber Optic Transceiver

Connector Configuration		Data Rate	Reach	Fiber	Supply Voltage	Part Numbers	DMI	Evaluation Board
	SFF/LC	Fast Ethernet (100 Mbps)	2000m	Multi-mode	3.3V	AFBR-59E5APZ	No	HFBR-0572
						AFBR-59E5APZ-HT		
	SFF/MT-RJ	Fast Ethernet (100 Mbps)	2000m	Multi-mode	3.3V	AFBR-5903AZ	No	
	SFP/LC	Gigabit Ethernet	2000m	Multi-mode	3.3V	AFBR-57L1APZ	Yes	
		Fast Ethernet (100 Mbps)	2000m	Multi-mode	3.3V	AFBR-57E6APZ	Yes	HFBR-0570
						AFBR-57E6APZC		
						AFBR-57E6APZ-HT		
	SFP/LC	DC-50 MBd	2000m	Multi-mode	3.3V	AFBR-57B4APZ	Yes	
						AFBR-57B4APZC		
	1x9/SC	Fast Ethernet (100 Mbps)	2000m	Multi-mode	3.3V/5V	AFBR-5813QZ	No	
						AFBR-5803AQZ		HFBR-0535
	1x9/ST					AFBR-5813TQZ		
						AFBR-5803ATQZ		HFBR-0535
	2x9/SC	Fast Ethernet (100 Mbps)	2000m	Multi-mode	3.3V/5V	AFBR-5823QZ	Yes	
	2x9/ST					AFBR-5823TQZ		
	SC-RJ Profinet®	Fast Ethernet (100 Mbps)	50/100m	POF/HCS®	3.3V	QFBR-5978AZ-2	Yes	
	Versatile Link	Fast Ethernet (100 Mbps)	50m	POF	3.3V	AFBR-5972Z	No	AFBR-0544Z
		250 MBd				AFBR-5972EZ (black) AFBR-5972BZ (blue)	No	

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

650nm Industrial Fiber Optic Components

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

Applications

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

Versatile Link Package/Connector

Connector Configuration	Data Rate	Reach		Supply Voltage	Transmitter		Receiver		Temperature Range	Evaluation Board
		POF	HCS		Part Number	Interface	Part Number	Interface		
Horizontal 	DC-40kBd	110m		5V	HFBR-1523Z	Pin-diode	HFBR-2523Z	Open collector	0 to 70°C	HFBR-0503Z
	DC-1MBd	10m		5V	HFBR-1524Z	Pin-diode	HFBR-2524Z	Open collector	0 to 70°C	
		45m		5V	HFBR-1522Z	Pin-diode	HFBR-2522Z	Open collector	0 to 70°C	HFBR-0502Z
		45m		5V	HFBR-1522ETZ	Pin-diode	HFBR-2522ETZ	Open collector	-40 to +85°C	
	DC-5MBd	20m		5V	HFBR-1521Z	Pin-diode	HFBR-2521Z	Open collector	0 to 70°C	HFBR-0501Z
		20m		5V	HFBR-1521ETZ	Pin-diode	HFBR-2521ETZ	Open collector	-40 to +85°C	
		58m	500m	3.3V/5V	AFBR-1521CZ	Pin-diode	AFBR-2521CZ	TTL	-40 to +95°C	
	DC-10MBd	58m	500m	3.3V/5V	AFBR-1528CZ	Pin-diode	AFBR-2528CZ	TTL	-40 to +95°C	
		40m	200m	3.3V/5V	AFBR-1529Z	Pin-diode	AFBR-2529Z	TTL	-40 to +85°C	
	DC-50MBd	50m	120m	3.3V/5V	AFBR-1624Z	TTL	AFBR-2624Z	TTL	-40 to +85°C	AFBR-0546Z AFBR-0548Z
		50m	120m	3.3V/5V	AFBR-1629Z	TTL	AFBR-2529Z	TTL	-40 to +85°C	AFBR-0547Z
		50m	120m	3.3V/5V		TTL	AFBR-2529SIZ	TTL + RSSI	-40 to +85°C	AFBR-0553Z
Vertical 	DC-40kBd	110m		5V	HFBR-1533Z	Pin-diode	HFBR-2533Z	Open collector	0 to 70°C	HFBR-0503Z
	DC-1MBd	10m		5V	HFBR-1534Z	Pin-diode	HFBR-2534Z	Open collector	0 to 70°C	
		45m		5V	HFBR-1532Z	Pin-diode	HFBR-2532Z	Open collector	0 to 70°C	HFBR-0502Z
	DC-5MBd	20m		5V	HFBR-1531Z	Pin-diode	HFBR-2531Z	Open collector	0 to 70°C	HFBR-0501Z
		20m		5V	HFBR-1531ETZ	Pin-diode	HFBR-2531ETZ	Open collector	-40 to +85°C	
		50m	500m	3.3V/5V	AFBR-1639Z	TTL	AFBR-2531CZ	TTL	-40 to +85°C	
		58m	500m	3.3V/5V	AFBR-1531CZ	Pin-diode	AFBR-2531CZ	TTL	-40 to +95°C	
	DC-10MBd	40m	200m	3.3V/5V	AFBR-1539Z	Pin-diode	AFBR-2539Z	TTL	-40 to +85°C	
	DC-50MBd	50m	120m	3.3V/5V	AFBR-1634Z	TTL	AFBR-2634Z	TTL	-40 to +85°C	
		50m	120m	3.3V/5V	AFBR-1639Z	TTL	AFBR-2539Z	TTL	-40 to +85°C	
Tilted 	DC-1MBd	45m		5V	HFBR-1542ETZ	Pin-diode	HFBR-2542ETZ	Open collector	-40 to +85°C	HFBR-0502Z
	DC-5MBd	20m		5V	HFBR-1541ETZ	Pin-diode	HFBR-2541ETZ	Open collector	-40 to +85°C	HFBR-0501Z
		50m	500m	3.3V/5V	AFBR-1644Z	TTL	AFBR-2541CZ	TTL	-40 to +85°C	
		58m	500m	3.3V/5V	AFBR-1541CZ	Pin-diode	AFBR-2541CZ	TTL	-40 to +95°C	
	DC-50MBd	50m	120m	3.3V/5V	AFBR-1644Z	TTL	AFBR-2644Z	TTL	-40 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-2MBd	50m	400m	5V	HFBR-1505CZ	HFBR-2505CZ	HFBR-0538Z
		50m	300m	5V	HFBR-1505CFZ	HFBR-2505CFZ	
		20m		5V	HFBR-1602Z	HFBR-2602Z	
		20m		5V	HFBR-1604Z	HFBR-2602Z	
	2MBd - 16MBd	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-5MBd	20m		5V	SP000063858 (SFH757V)	SP000063855 (SFH551/1-1V)	AN5341 AN5342
	100MBd	20m		5V	SP000063858 (SFH757V)	SP000063852 (SFH250V)	
LL-Housing 	DC-5MBd	20m		5V	SP000063871 (SFH757)	SP000063860 (SFH551/1-1)	AN5341 AN5342
	100MBd	20m		5V	SP000063871 (SFH757)	SP000063866 (SFH250)	

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-5MBd	25 mm	3.3V/5V	AFBR-390525RZ	AFBR-39xxyyRZ-AN100
		50.4 mm		AFBR-390550RZ	
		75.8 mm		AFBR-390575RZ	
		101.2 mm		AFBR-390500RZ	
	DC-50MBd	25 mm		AFBR-395025RZ	
		50.4 mm		AFBR-395050RZ	
		75.8 mm		AFBR-395075RZ	
		101.2 mm		AFBR-395000RZ	

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

Miniature Link 820nm/850nm/1300nm 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. Glass fiber specified in this selection guide are multimode fiber both 62.5/125 µm and 50/125 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 datalinks
- Motorway infrastructures
- Wind turbine control system and farm networking
- Hydro and solar power generation plants
- Media and fiber converters
- Railway control systems
- Locomotive in-car and car-to-car communications

820nm/850nm/1300nm Industrial Fiber Optic Components

Connector Configuration	Data Rate	Reach	Voltage	Part Number		Evaluation Board
				Transmitter	Receiver	
ST, SMA, FC	DC-5 MBd	1500m	5V	HFBR-14X2PXZ	HFBR-24X2PXZ	HFBR-0410Z
ST, SC, SMA	20 MBd	2700m	5V	HFBR-14X4PXZ	HFBR-24X6PXZ	
	32 MBd	2200m				
	55 MBd	1400m				
	125 MBd	700m				
	155 MBd	600m				
	160 MBd	500m				
	DC-20 MBd	3000m	3.3V/5V	HFBR-14X4PXZ	AFBR-24X8PXZ	AFBR-0550Z
	DC-32 MBd	2200m				
	DC-40 MBd	1500m				
	DC-50 MBd	1000m				
	20 MBd	3000m	3.3V/5V	HFBR-14X4PXZ	AFBR-24X9PXZ	AFBR-0550Z
	32 MBd	2200m				
	40 MBd	1500m				
	50 MBd	1000m				
ST	20 MBd	5000m	5V	HFBR-1312TZ	HFBR-2316TZ	
	32 MBd	3200m				
	55 MBd	3200m				
	125 MBd	2800m				
	155 MBd	2700m				
	160 MBd	2000m				
	DC-50 MBd	4000m	3.3V	AFBR-1715TZ	AFBR-24x8xZ	
ST, SC, SMA	50 MBd	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's components for optical arc flash detection help the system engineer to build an efficient and reliable arc flash protection system. The sensor transceiver is very compact, robust, low light sensitive and with inbuilt self-test functionality. The POF sensor fiber shows high sensitivity to the arc flash light and is equipped with a robust transparent jacket. Both form a perfect system together with Broadcom's simplex and duplex VL connectors and mating connectors. An evaluation kit and supporting literature is available for support.

Sensor Receiver/Transceiver

	Configuration	Part Number	Description	Connector Type	Rx Responsivity	Tx Optical Power	Voltage	Remark
	Sensor Transceiver	AFBR-S10TR001Z	Compact TRx with integrated LED for heartbeat and with ASIC for PD and TIA functionality	Duplex VL AFBR-4526Z	45V/mW @650nm	-1 dBm @30 mA, 650nm	5V	
	Sensor Receiver (Horizontal Connector)	AFBR-S10RX021Z	Versatile Link-based RX with ASIC for PD and TIA functionality	Simplex VL	45V/mW @650nm	NA	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 ASIC for PD and TIA functionality	Simplex VL	45V/mW @650nm	NA	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 line sensor, 500m spool. Captures light that meets the fiber and guides it along the fiber	-40 to +85°C	Core: PMMA Jacket: PE, transparent	Core and Cladding: 1 mm Jacket: 2.2 mm	0.48	0.21 dB/m

Point Sensor

	Configuration	Part Number	Description	Operating Temperature	App Note	Remark
	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 to +85°C	AFBR-S10PS01XZ-AN101	
	Sensor Connector	AFBR-S10PS011Z	Black crimpless non-latching connector is used to connect the sensor head AFBR-S10PS010Z to a duplex POF with 1 mm/2.2 mm fiber dimensions	-40 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 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

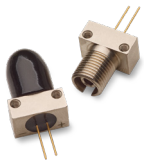
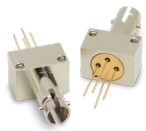
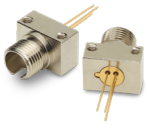
Broadcom`s optical power components supply electrically isolated power for remote sensors, isolated probes and gate drivers in industrial applications. With high efficiency across the full industrial operating temperature range, the optical power components permit system integrators optimal cost efficiency.

The Optical Power Converter is a photovoltaic device generating electrical power when illuminated by light from a laser. Outputs range from 10mW 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 communications links can be powered while ensuring 100 percent galvanic isolation.

Applications

Optical power converters power devices include:

- 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

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

Optical Wireless Transceivers

Wireless transmission of data has been a technology evolving 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 the OWC – Optical Wireless Communication, in a form of a Broadcom's original component.

Broadcom's 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 Gbps, 5 Gbps and potentially more. A single link consists of two transceivers separated by a distance of up to 100mm. OWC link enables nearly lossless communication while securing the data transmission from EMI interferences and providing a full galvanic isolation. 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 environment 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 to +85°C
	5	AFBR-FS50B00	30 - 100	Class 1	Bidirectional, full duplex	0 to +85°C

Plastic Optical Fiber Cables

The HFBR-E/RXXYYZ series of plastic fiber optic cables are 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 ULVW-1 flame retardant specification (UL file #E89328). Cables are available in unconnectorized or connectorized options.

Compatible with our Versatile Link family of connectors and fiber optic components, we offer 1mm diameter (outer diameter 2.2 mm) 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: 2x2.2 mm). The jacket has a blue marking. The POF inside the covering jacket has a diameter of 1 mm.

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

Applications

- Industrial data links for factory automation and plant control
- Intra-system links: board-to-board or rack-to-rack
- Telecommunications 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: 660nm 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: 650nm, 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	

A/HFBR- □ □ □ □□□ Z

Cable Code
R Standard Attenuation POF
E Extra Low Loss POF
H Halogen-free

Connector Code
U Unconnectorized
N Standard Simplex Connectors
L Latching Simplex Connectors
M Standard Duplex Connectors
T Latching Duplex Connectors

RoHS Compliant

Length Code
(Measured from tip of connector to tip of connector)
Maximum 500 meters (not in 1 meter increments.)
E.g., 015 = 15 meters

Channel Code
S Simplex Cable
D Duplex Zipcord Cable

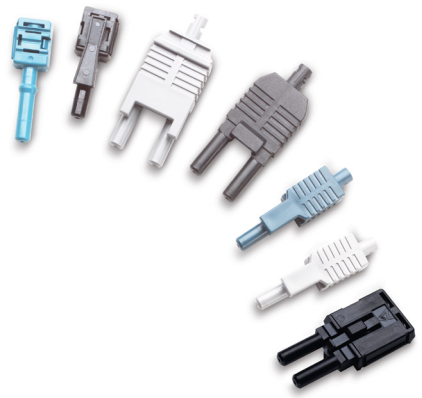
POF Connectors and Accessories

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 Broadcom's 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 error. The HFBR-453XZ series connectors are available in two-styles: latching and non-latching. For a duplex connector, two non-latching 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 non-latching POF connectors
HFBR-4506Z/4516Z	Parchment/gray duplex connector with crimp ring
HFBR-4531Z/4532Z	Black crimpless simplex non-latching/latching connector
HFBR-4533Z/4535Z	Blue/gray crimpless simplex non-latching 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 600 grit abrasive paper and two pieces 3µm pink lapping film)
AFBR-4594Z	Polishing kit for AFBR-4526Z (one polishing tool, two pieces 600 grit abrasive paper, and two pieces 3µm pink lapping film)
HFBR-4597Z	Crimping tool 4.5 - 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

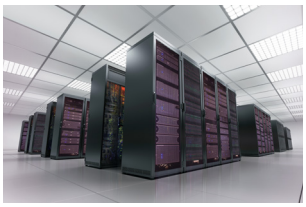
Existing Parts	Upgrade Parts	Upgrade Features	Footprint Information
Versatile Link Transmitters and Receivers			
HFBR-1521Z / HFBR-2521Z HFBR-1531Z / HFBR-2531Z HFBR-1521ETZ / HFBR-2521ETZ HFBR-1531ETZ / HFBR-2531ETZ HFBR-1522Z / HFBR-2522Z HFBR-1532Z / HFBR-2532Z HFBR-1522ETZ / HFBR-2522ETZ HFBR-1532ETZ / 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 • High efficient transmitter • TTL/CMOS receiver output • Lower power consumption • Low propagation delay with guaranteed max. part-to-part skew • High dynamic receiver optical input range	Same footprint, changes to Tx driver and Rx output interface required. Optical backwards 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 • High efficient transmitter • Lower power consumption • Low propagation delay with guaranteed max. part-to-part skew • High dynamic receiver optical input range	Same footprint, changes to Tx driver and Rx output interface required. Optical backwards compliant, but check power budget.
HFBR-1521Z / ETZ HFBR-1522Z / ETZ HFBR-1528Z / AFBR-1529Z	AFBR-1629Z AFBR-1639Z	• Transmitter with integrated driver • TTL/CMOS compatible input • High efficient transmitter • Low power consumption • -40°C to +85°C operating temperature range • 3.3V or 5V operating voltage	Same footprint, but digital input, no external driver required
HFBR-1528Z / HFBR-2528Z	AFBR-1629Z / AFBR-2529Z	• DC to 50MBd • 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 & 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: 2kV 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

Upgrade Your Design (continued)

New Package | New Features | Better Performance

Existing Parts	Upgrade Parts	Upgrade Features	Footprint Information
High Galvanic Insulation Link			
HFBR-3810xZ	AFBR-390525RZ	• VDE Certification as per IEC 60747-5-5 • Lower power consumption • Shorter propagation delay with guaranteed max 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 MBd and DC to 50 MBd	Different footprints
Fast Ethernet POF & MM GOF			
AFBR-5972Z	AFBR-5972EZ AFBR-5972BZ	• 45% lower max power consumption • Better EMI Immunity for highest system robustness • LVDS I/Os for direct interface to FPGAs • Up to 250MBd link rate for higher bandwidth requirements	Same footprint, but different electrical interface
HFBR-5961ALZ	AFBR-59E4APZ-LH	• 60% lower max power consumption • Integrated data I/O AC coupling • Integrated Tx data inputs termination	Same footprint, same optical interface, change of external data I/O termination required
HFBR-57E5APZ	AFBR-57E6APZ	• 50% lower max 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 max operating temperature • Four additional housing leads for improved signal grounding and heat dissipation	Four additional housing leads
AFBR-57E6APZ	AFBR-57E6APZ-HT	• 95°C max operating temperature	Drop-in replacement
AFBR-5803ATQZ AFBR-5803ATZ AFBR-5803TZ	AFBR–5813TQZ	• Reduced power dissipation: ~50% lower • 0.5 Watt (max) and 0.3 Watt (typical) • Low profile housing	MSA compliant Pin-2-pin compatible 3.3 V supply only
AFBR-5803AQZ AFBR-5803AZ AFBR-5803Z	AFBR–5813QZ	• Reduced power dissipation: ~50% lower • 0.5 Watt (max) and 0.3 Watt (typical) • Low profile housing	MSA compliant Pin-2-pin compatible 3.3 V supply only
AFBR-5803xTxx	AFBR–5823TQZ	• Diagnostics for enhanced system reliability • Reduced power dissipation: ~50% lower • 0.5 Watt (max) and 0.3 Watt (typical) • Low profile housing	2x9 pin-out 3.3 V supply only
AFBR-5803xxx	AFBR–5823QZ	• Diagnostics for enhanced system reliability • Reduced power dissipation: ~50% lower • 0.5 Watt (max) and 0.3 Watt (typical) • Low profile housing	2x9 pin-out 3.3 V supply only

Connecting everything®





Broadcom Inc. is a global infrastructure technology leader built on 60 years of innovation, collaboration and engineering excellence.

With roots based in the rich technical heritage of AT&T/Bell Labs, Lucent and Hewlett-Packard/Agilent, Broadcom focuses on technologies that connect our world. Through the combination of industry leaders Avago Technologies, LSI, Broadcom Corporation, Brocade, CA Technologies, Symantec enterprise security business, and VMware, the company has the size, scope and engineering talent to lead the industry into the future.

Broadcom is a dynamic, diversified technology leader with disciplined, world-class management. Our products span from semiconductors to enterprise software to security solutions, and we have a strong commitment to investing in R&D.

Broadcom's category-leading product portfolio serves critical markets including cloud, data center, networking, broadband, wireless, storage, industrial, and enterprise software. Our solutions include service provider and enterprise networking and storage, mobile device and broadband connectivity, mainframe, cybersecurity, and private and hybrid cloud infrastructure.

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