Agilent Optical Components and Accessories



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Fiber Optic Components for Industrial, Medical & Ethernet Applications



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

Agilent fiber optic components for Industrial, Medical and Ethernet applications are available in 650nm and 820nm wavelengths, and in discrete forms.

Agilent's fiber optic components come in a selection of packages. The Versatile Link Package (HFBR-0500 series) contains 650 nm discrete components that feature snap-in connector parts. The SMA/ST Package (HFBR-0505 series) is a cost-effective family with transmitter and receiver housed separately in a small footprint 1x4 simplex SMA or ST port package. The Miniature Link Package (HFBR-0300/0400/ 0600 series) is available with 650nm, 820nm and 1300nm technology. These are discrete components that can use SMA/ST/SC/FC connectors.

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The following reference designs concentrate on links built with Agilent's 650 nm and 820 nm fiber optic products. All the optical transmitters from these families include an LED without driver circuitry. Low cost driver ICs are available from many suppliers, and these application notes will demonstrate easy integration of these ICs into a transmitter circuit.

The optical receivers from dc up to 10 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. For DC to 40 kBd, DC to 1 MBd, DC to 5MBD designs see application note AN1035 at: http://literature.agilent.com/litweb/pdf/ 5964-4027E.pdf

For DC to 10 MBd designs see application note AN1080 at: http://literature.agilent.com/litweb/pdf/ 5963-6756E.pdf

Typical link block diagram from dc to 10 MBd



Fundamentals of Digital Fiber Optic Links

The receivers for data rates from 1 MBd to 175 MBd include a photodiode, pre-amp 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.

The application notes describe costeffective solutions for digital fiber optic data communication links that are compatible with TTL logic for different data rate up to 160 MBd. For DC to 32 MBd designs see application note AN1121 at: http://literature.agilent.com/litweb/pdf/ 5968-5928E.pdf

For 2 to 70 MBd designs see application note AN1122 at: http://literature.agilent.com/litweb/pdf/ 5966-1270E.pdf

For 20 to 160MBd designs see application note AN1123 at: http://literature.agilent.com/litweb/pdf/ 5988-4791EN.pdf

Typical link block diagram from 1 MBd to 175 MBd





650 nm discrete optical components

Discrete components listed here are compatible with both Plastic (1 mm) and HCS (for higher data rate/link length) optical fibers. Plastic fiber often specified in cost-effective solutions will see implementations in frequency conversion, power electronics control and industrial fieldbuses. Connectors include SMA and Versatile Link.

Applications

- Industrial Control Data Link
- Industrial Field Buses
- Audio-Visual Links and Datalinks up to 160Mbd

650 nm	discrete	optical	components	selection	guide

Data Data	Transmitter	Dessiver	Distance (@	ֆ 0-70°C)	Compostore	Anglianting Nata
Data Kate		Receiver	POF	HCS	Connectors	Application Note
DC-40kBd	HFBR-1523 HFBR-1533	HFBR-2523 HFBR-2533	110 m		Versatile Link	AN1035
DC-1MBd	HFBR-1522 HFBR-1532	HFBR-2522 HFBR-2532	45 m		Versatile Link	AN1035
DC-2MBd	HFBR-1505C	HFBR-2505C	50 m		SMA	
DC-4MBd	HFBR-1604	HFBR-2602	40 m		SMA	
DC-5MBd	HFBR-1521 HFBR-1531	HFBR-2521 HFBR-2531	20 m		Versatile Link	AN1035
DC-10MBd	HFBR-1505A HFBR-1515B HFBR-1528	HFBR-2505A HFBR-2515B HFBR-2528	40 m	200 m	SMA ST Versatile Link	AN1080
DC-16MBd	HFBR-1506AM	HFBR-2506AM	40 m	200 m	SMA	
DC-32MBd	HFBR-1527 HFBR-1537	HFBR-2526 HFBR-2536	40 m	1000 m	Versatile Link	AN1121
32MBd	HFBR-1527 HFBR-1537	HFBR-2526 HFBR-2536	75 m	400 m	Versatile Link	AN1066
55MBd	HFBR-1527 HFBR-1537	HFBR-2526 HFBR-2536	60 m	240 m	Versatile Link	AN1066
125MBd	HFBR-1527 HFBR-1537	HFBR-2526 HFBR-2536	30 m	100 m	Versatile Link	AN1066
160MBd(N.A.= 0.375)	HFBR-1527 HFBR-1537	HFBR-2526 HFBR-2536	50 m	50 m	Versatile Link	AN1123
160MBd	HFBR-1312T	HFBR-2316T	2000 m		ST	AN1123

820 nm/1300 nm discrete optical components

These low-cost discrete components 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 the following selection guide are multimode fiber (62.5/125 µm), though 50/125 µm multimode glass fiber can be used.

Applications

- · LAN applications such as 10Base-FL
- FDDI
- Token Ring
- 100Base-SX
- Audio Video Links and Industrial Datalinks



820 nm discrete optical components selection guide

Data Rate	Transmitter	Receiver	Distance (@ 0-70°C) 62.5/125 µm MM fiber	Connectors	Application Note
DC-5MBd	HFBR-14X4	HFBR-24X2	2000 m	ST, SMA, FC	
20MBd	HFBR-14X4	HFBR-24X6	2700 m	ST, SC, SMA	AN1038
20Mbd	HFBR-1312T	HFBR-2316T	5000 m	ST	AN1038
32MBd	HFBR-14X4	HFBR-24X6	2200 m	ST, SC, SMA	AN1065
32MBd	HFBR-1312T	HFBR-2316T	3200 m	ST	AN1065
55MBd	HFBR-14X4	HFBR-24X6	1400 m	ST, SC, SMA	AB78
55MBd	HFBR-1312T	HFBR-2316T	3200 m	ST	AB78
125MBd	HFBR-14X4	HFBR-24X6	700 m	ST, SC, SMA	AB78
125MBd	HFBR-1312T	HFBR-2316T	2800 m	ST	AB78
155MBd	HFBR-14X4	HFBR-24X6	600 m	ST, SC, SMA	AB78
155MBd	HFBR-1312T	HFBR-2316T	2700 m	ST	AB78
160MBd	HFBR-14X4	HFBR-24X6	500 m	ST, SC, SMA	AN1123
160MBd	HFBR-1312T	HFBR-2316T	2000 m	ST	AN1123

Plastic Optical Fiber Cable

The HFBR-R/EXXYYY 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 UL VW-1 flame retardant specification (UL file #E89328) Cables are available in unconnectorized or connectorized options. Compatible with Agilent Versatile Link family of connectors and Fiber Optic components. 1mm diameter Plastic Optical Fiber(POF) offered in 2 grades: Low Cost Standard POF with 0.22dB/m typical attenuation, or High Performance Extra Low Loss POF with 0.19dB/m typical attenuation.

Applications

- Industrial Data Links for Factory Automation and Plant Control
- Intra-System Links; Board-to-Board, 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 Isolation
- Gaming Equipment
- Datacommunications

Plastic Optical Fiber Specifications: HFBR-R/EXXYYY

Parameter		Symbol	Min.	Тур.	Max	Unit	Condition	
	Standard Cable Type "R"		0.15	0.22	0.27	dB/m	Source is HFBR-15XX (660nm LED, 0.5NA) L=50meters	
Cable Attenuation	Extra Low Loss Type "E"	a _o	0.15	0.19	0.23			
Reference Attenuation	Standard Cable Type "R"		0.12	0.19	0.24	dB/m	Source is 650nm, 0.5NA monochrom-	
	Extra Low Loss Type "E"	^a R	0.12	0.16	0.19		eter, L=50meters	
Numerical Aperture		NA	0.46	0.47	0.5		>2meters	
Diameter, Core and Cladding		Dc	0.94	1	1.06	mm		



POF and HCS Connectors and Accesories

Crimp Style:

The HFBR-4501, HFBR-4503 and HFBR-4506 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 retardantVALOX UL94 V-0 material (UL file # E121562)



Crimpless Style:

The HFBR-453X series connectors are an enhanced version of the HFBR-4501 and HFBR-4503 low-cost connectors for plastic optical fiber, compatible with Agilent'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-453X 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-453X series connectors are for use with Plastic Optical Fiber only.

Ordering Guide for POF and HCS Connectors and Accessories

Plastic Optical Fiber Connectors

HFBR-4501/11	Gray/Blue Simplex Connector/Crimp Ring
HFBR-4503/13	Gray/Blue Simplex Latching Connector with Crimp Ring
HFBR-4506/16	Parchment/Gray Duplex Connector with Crimp Ring
HFBR-4505/15	Gray/Blue Adapter (Bulkhead/Feedthrough)
HFBR-4531/32	Crimpless Simplex Non-latching/Latching Connector

Plastic Optical Fiber Accessories

HFBR-4522	500 HFBR-0500 Products Port Plugs
HFBR-4525	1000 Simplex Crimp Rings
HFBR-4526	500 Duplex Crimp Rings
HFBR-4593	Polishing Kit (one polishing tool, two pieces 600 grit abrasive paper, and two pieces 3 µm pink lapping film)
HFBR-4597	Plastic Fiber Crimping Tool

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Agilent's communications solutions include leading-edge components, test, monitoring, management, and sub-systems for optical and wireless systems and networks. Agilent has an extremely broad range of technology and system expertise to help customers stay ahead in the fast-moving communications industry.

Agilent's semiconductor solutions for the connected world include fiber-optic and IC products for networking, radio frequency and infrared devices for mobile communications, image sensors for cameras and optical computer mice, storage area network solutions, and applications specific IC for networking and imaging.

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