HFBR-3810Z and HFBR-3810MSZ

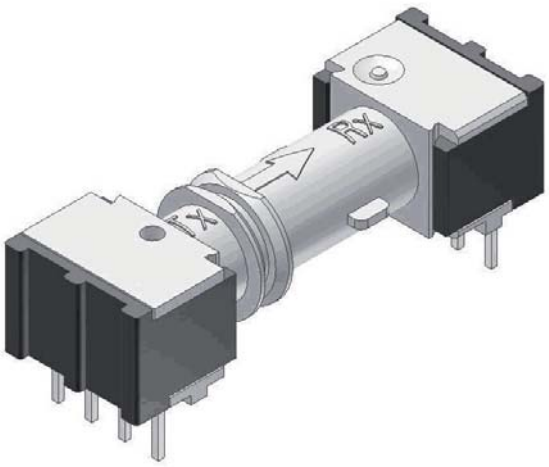
Short Fiber Optic Transmission Links for 10 MBd

Application Note 5489

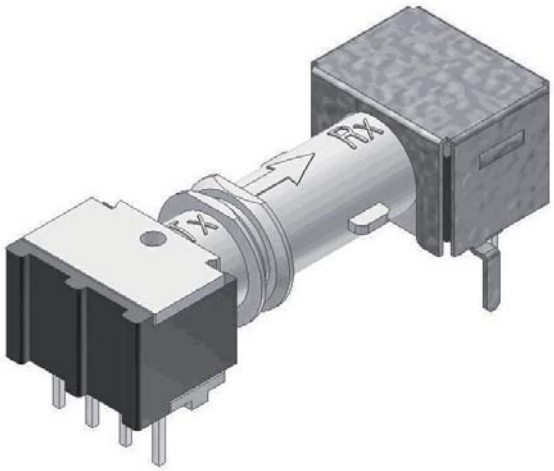
Introduction

HFBR-3810Z and HFBR-3810MSZ are short fiber optic transmission links providing galvanic insulation up to 12kV transient voltage. Both components are identical with the exception that the HFBR-3810MSZ has an additional metal shield cover for improved EMI performance.

In both fiber optic links the light signal travels from TX to RX through a tube made of highly reflective material, which helps in coupling the light to the receiver's photodiode.



HFBR-3810Z



HFBR-3810MSZ

Marking

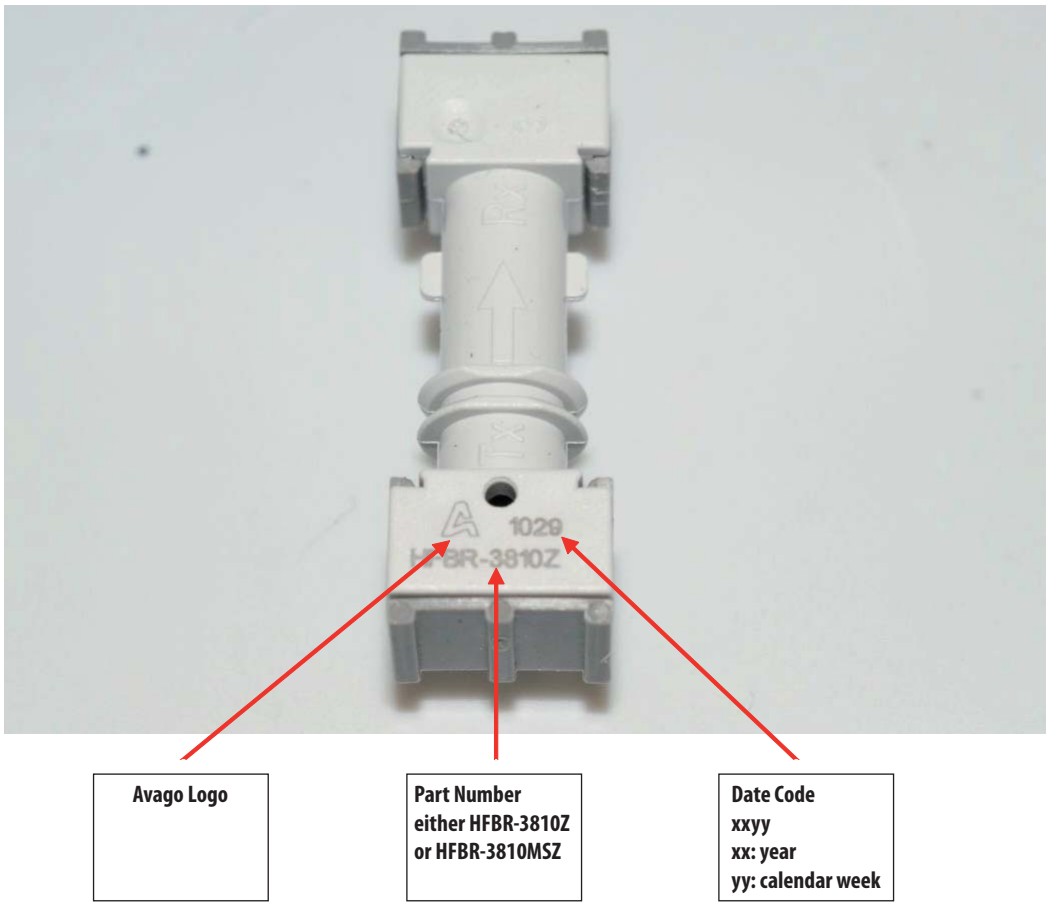


Figure 1. Product Label Information

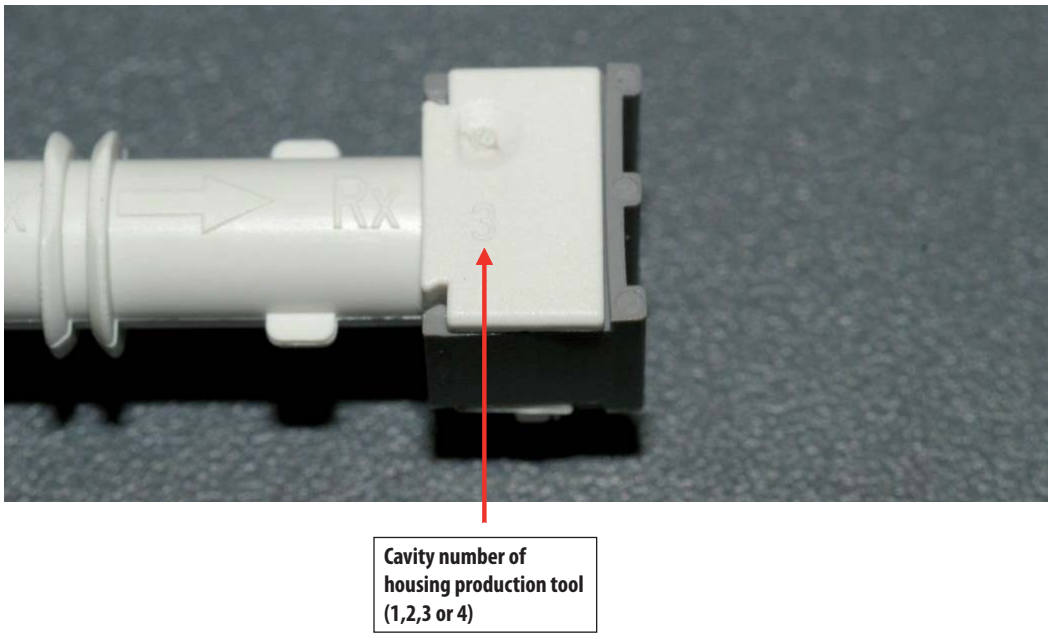
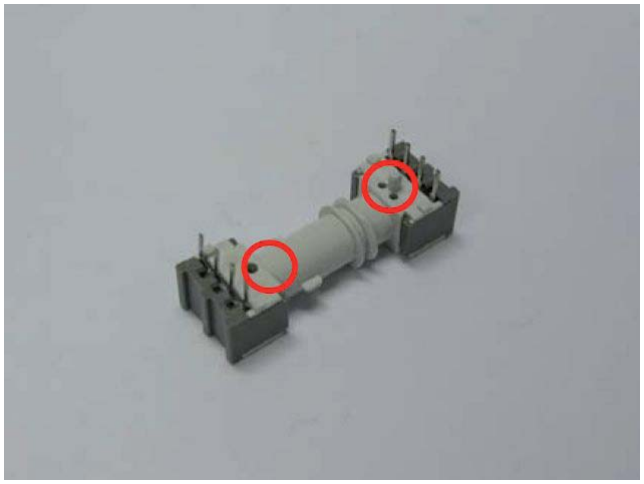


Figure 2. Cavity Number Information

Housing Holes

Top View



Bottom View

Figure 3. Housing Holes

Holes are placed at various locations on the housing to prevent the creation of a microclimate inside the housing. These holes ensure the temperature outside and inside of the housing are the same. The hole on the top of the housing at the TX side also provides visual access to a red LED which, when lit, indicates that the transmitter is on.

Guide Post

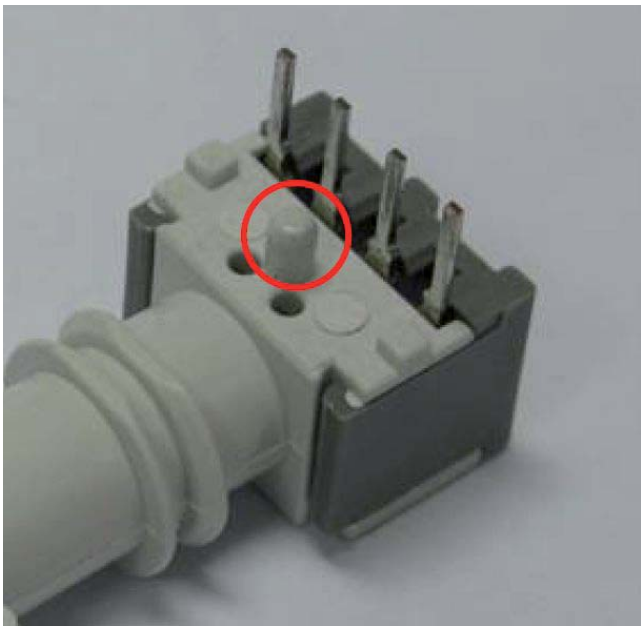


Figure 4. Guide Post (Bottom View)

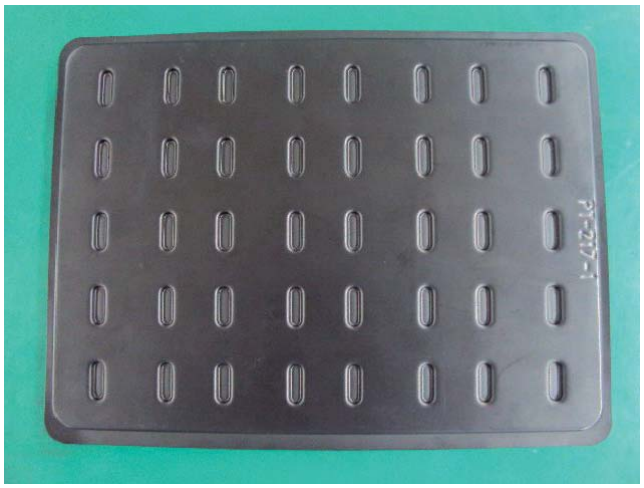
A guide post situated at the bottom of the TX side ensures proper orientation of the unit on the PCB board.

Dry packing

The HFBR-3810Z and HFBR-3810MSZ are placed in antistatic blister packing and shipped in a Moisture Barrier Bag (MBB) together with desiccants and a humidity indicator in accordance with the JEDEC J-STD-33B specifications. In this fashion, protection against humidity in the environment is ensured. Labels similar to the one in Figure 5 are used to clearly indicate that the devices are moisture sensitive.

Figure 5. Moisture Warning Label

Top Tray (Top View)



Bottom Tray (Top View)

Units on Bottom Tray (Top View)

Close Up View of Metal Shield Part (Top View)

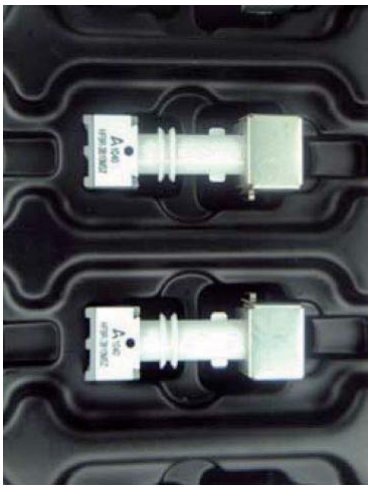


Figure 6. Anti-static Blister Pack (20 devices per pack)

Floor life and maximum storage time (shelf life)

The moisture sensitivity classification for these links is MSL3 according to JEDEC J-STD-020D.

Unopened moisture-barrier-bagged devices can be stored up to 12 months in an environment with a temperature between 5°C and 40°C and a relative humidity (RH) not exceeding 90%.

Unpacked devices can be kept in a production environment up to 168 hours, provided the temperature does not exceed 30°C and the relative humidity (RH) does not exceed 60%.

Baking

When the devices are inserted and soldered to a PCB within 48 hours from the time they are removed from the MBB, the moisture level in the mold material is low enough to ensure minimum mechanical stress while soldering.

If the devices are kept on the production floor for more than 48 hours after removal from the MBB, it is advisable to bake the modules before soldering.

Baking is done by removing the devices from the storage tube and placing them in a shallow container in such a way that the package bodies do not touch each other. Then the devices are placed in a bake oven and heated to 75°C for 20 hours. After this procedure, the moisture content of the devices will be low enough to prevent excessive moisture-induced stress during soldering. As a general guideline, baking is recommended before every soldering procedure, and can be done as often as necessary.

Electrostatic discharge (ESD) protection

These devices are sensitive to electrostatic discharge and must therefore be handled with appropriate care in an ESD protected area which should be clearly indicated as shown in Figure 7.

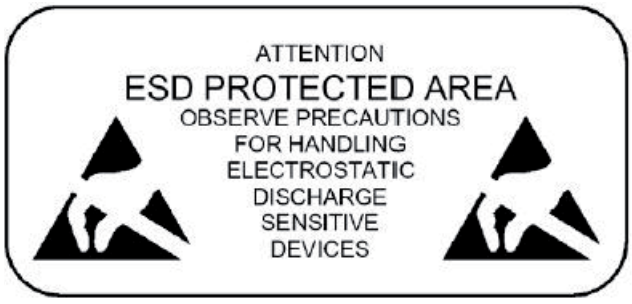


Figure 7. Warning Sign for ESD Protected Area

An ESD event may damage or degrade device performance. Therefore, in accordance with DIN 61340-5-1 standard procedures, the following ESD preventive measures should be adhered to at all times when handling, transporting and/or storing these devices. An ESD preventative program that overlooks or circumvents any of these procedures, materials and facilities may prove insufficient to prevent ESD damage.

- ESD floors
- ESD tables, ESD work surfaces and ESD storage facilities (e.g., trolleys and carts)
- ESD wrist straps/connectors for wrist straps
- ESD footwear and garments (cotton or special approved materials)
- ESD gloves or finger cots
- ESD chairs
- ESD tools (e.g., nippers)
- ESD prevention at equipment parts – equipment parts that may directly contact the device leads must be made of dissipative materials wherever possible. If dissipative materials cannot be used for technical reasons, metals whose natural non-conductive surface layer are sufficiently thin (breakdown voltage <10 V) must be used. Conductive machine parts that may contact the device leads directly must be connected to ground without a series resistor.
- ESD packing materials

ESD classification

These devices have passed the following ESD test:

Human Body Model (HBM) with U = ±800 V in accordance with the JEDEC standard JESD22-A114 (ESD Sensitivity).

Device mounting

The devices are designed for through-hole mounting on a PCB. The minimum distance from the package to the PCB is mechanically established by the design of the device housing.

Solderability/soldering process

The qualification test "Resistance to soldering heat – Standard soldering technique (RSH-ST)" was performed with a solder temperature of 260° C for 10 seconds (distance to package: 3 mm) in accordance with JEDEC standard JESD22-B106D. Only a wave soldering process is recommended for this part.

Washing

The washing process must be done using easily vaporizing materials like methyl, isopropyl or isobutyl. After washing, it is mandatory to provide sufficient drying time at high temperature.

Recommended chemicals:

- Alcohols like methyl, isopropyl, isobutyl
- Aliphatics like hexane or heptane
- Soap solutions
- Naphtha
- De-ionized water

Do not use chemicals like:

- (Partially) halogenated hydrocarbons
- Ketones (eg. MEK)
- Acetone
- Chloroform
- Ethyl acetate
- Phenol
- Methylene chloride
- Methylene dichloride
- N-methylpyrrolidone

In general, it is sufficient to use simple cleaning agents like alcohols or soap solutions. More aggressive chemicals like halogenated hydrocarbons are detrimental to the environment and hazardous to human health, and should therefore be avoided whenever possible.

Galvanic insulation

HFBR-3810Z and HFBR-3810MSZ are designed to provide galvanic insulation up to 12 kV transient voltage between the TX and RX sections, in accordance with IEC60664-1-{ed1.2}.

Part Number	Insulation Voltage (Transient)	Maximum Altitude
HFBR-3810Z	12 kV	3000 m above sea level
HFBR-3810MSZ	12 kV	2000 m above sea level

Flammability classification

The Flammability class for these devices is UL94-V0

Eye safety

The devices emit light with a wavelength of 650 nm (red). These products are designed to avoid damage to the unprotected eye. To indicate the classification of the light source, a label as depicted in Figure 8 can be used, however these labels are not mandatory on the product according to IEC 60825 version 1.2 paragraph 1.1.

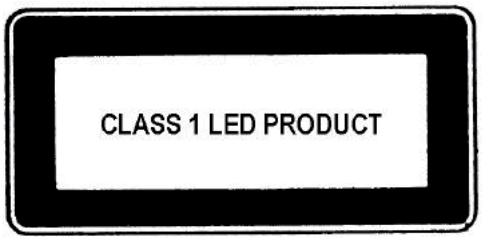


Figure 8. LED Eye Safety Label

Table 1. Regulatory Compliance Overview

Feature	Test Standard	Performance Classification
Moisture Sensitivity Classification	JEDEC J-STD-020D	MSL 3
Human Body Model (HBM)	JESD22-A114	Class 1B
Galvanic Insulation	IEC60664-1{ed1.2}	12 kV
Flammability Classification		UL94-V0
Eye Safety	IEC 60825 version 1.2	Class 1

Design consideration

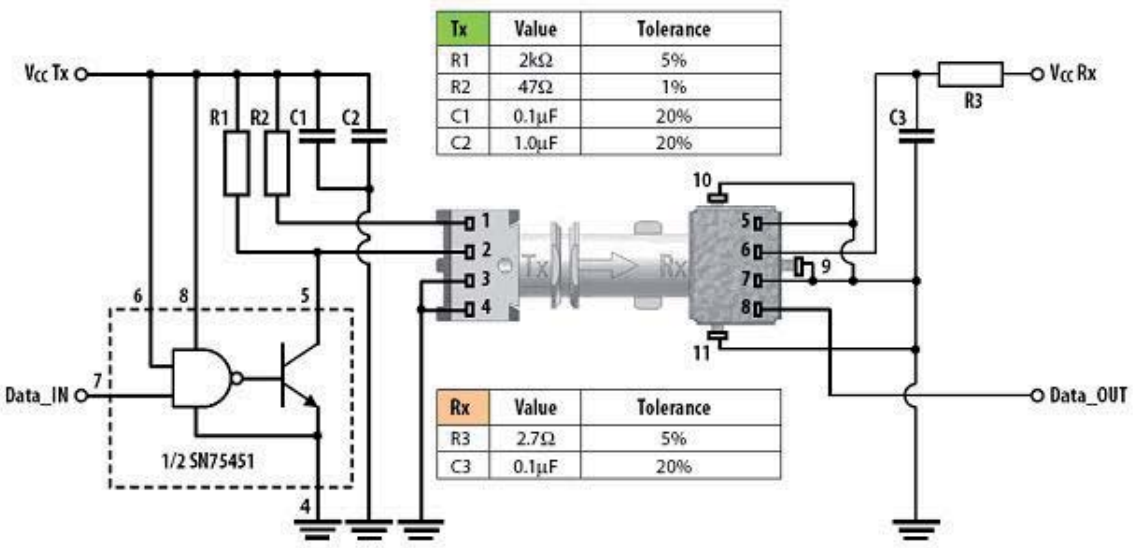
Figure 9 shows the typical electrical connection for HFBR-3810Z and HFBR-3810MSZ. An SN75451 IC is used to sink the LED forward current from the cathode (pin 2). As the SN75451's output is an open collector, R1 is used to connect pin 2 to VCC. This helps to turn off the LED faster when the SN75451's output is switched off.

R2 connects the anode (pin 1) and VCC in order to control the amount of forward current flowing through the LED. Avago has characterized and verified that an R2 of 47ohms provides the optimum performance.

The receiver output (pin 8) is a push-pull output stage that can be connected directly to an FPGA or DSP with a TTL/CMOS input stage.

PCB layout rules

- Decoupling caps C1, C2 and C3 should be placed as close as possible to the device's VCC. Tantalum or ceramic chip capacitors are recommended.
- TX GND and RX GND, TX VCC and RX VCC should be separated to eliminate noise coupling to the VCC and GND plane.
- To achieve the high-voltage isolation specified in the datasheet there should not be any copper between the TX and RX pins underneath the device.
- The GND pins of the transceiver need to be directly connected to a contiguous ground plane provided in the circuit board to provide a low-inductance power supply ground.
- The dimensions of the conductors on the PCB, especially the VCC and GND traces, must be maximized to reduce parasitic inductance and to increase heat transfer from leads to the PCB plane. Other heat generating devices must not be placed near the devices.



Pin description

Pin No.	Transmitter
1	Anode
2	Cathode
3	GND
4	GND

Pin No.	Receiver
5	GND
6	VCC(5V)
7	GND
8	Data_OUT
9, 10, 11	GND (shield option [1])

Figure 9. Electrical Application Circuit (Values for R1 and R2 are mandatory)

For product information and a complete list of distributors, please go to our web site: **www.avagotech.com**

AV02-2702EN - November 24, 2010