BROADCOM®

Data Sheet

AFBR-1715MZ

DC to 50-Mbaud, 850-nm VCSEL Miniature Link Fiber-Optic Transmitter

Description

The Broadcom® AFBR-1715MZ is a high-performance optical transmitter designed for a fiber-optic communication link with a data rate from DC to 50 Mbaud. The optical transmitter uses an 850-nm VCSEL source with integrated optics and driver IC to realize a low-powered device suitable for industrial applications with link distances up to several kilometers.

The AFBR-1715MZ has a nickel-plated aluminum port compliant with “industry-standard” ST connectors and supports 62.5/125µm and 105/125µm multimode fibers (MMF). The metal port is internally connected to four pins, electrically isolated from the signal ground. This allows the designer to connect the port to signal or to chassis ground to optimize the EMI/EMC behavior for the specific application.

Features

- Data rate support from DC to 50 Mbaud
- 62.5/125-µm or 105/125-µm MMF
- Operating temperature: –40°C to +85°C
- Single 3.3V power supply
- Metal ST-port
- Hermetically sealed package
- Excellent EMI and EMC behavior
- Low current consumption and low power dissipation
- Incorporates an 850-nm VCSEL and driver IC with an LVTTL input logic transmitter
- Class 1 FDA IEC 60825-1 laser safety compliant
- Manufactured in an ISO 9001 certified facility
- RoHS compliant

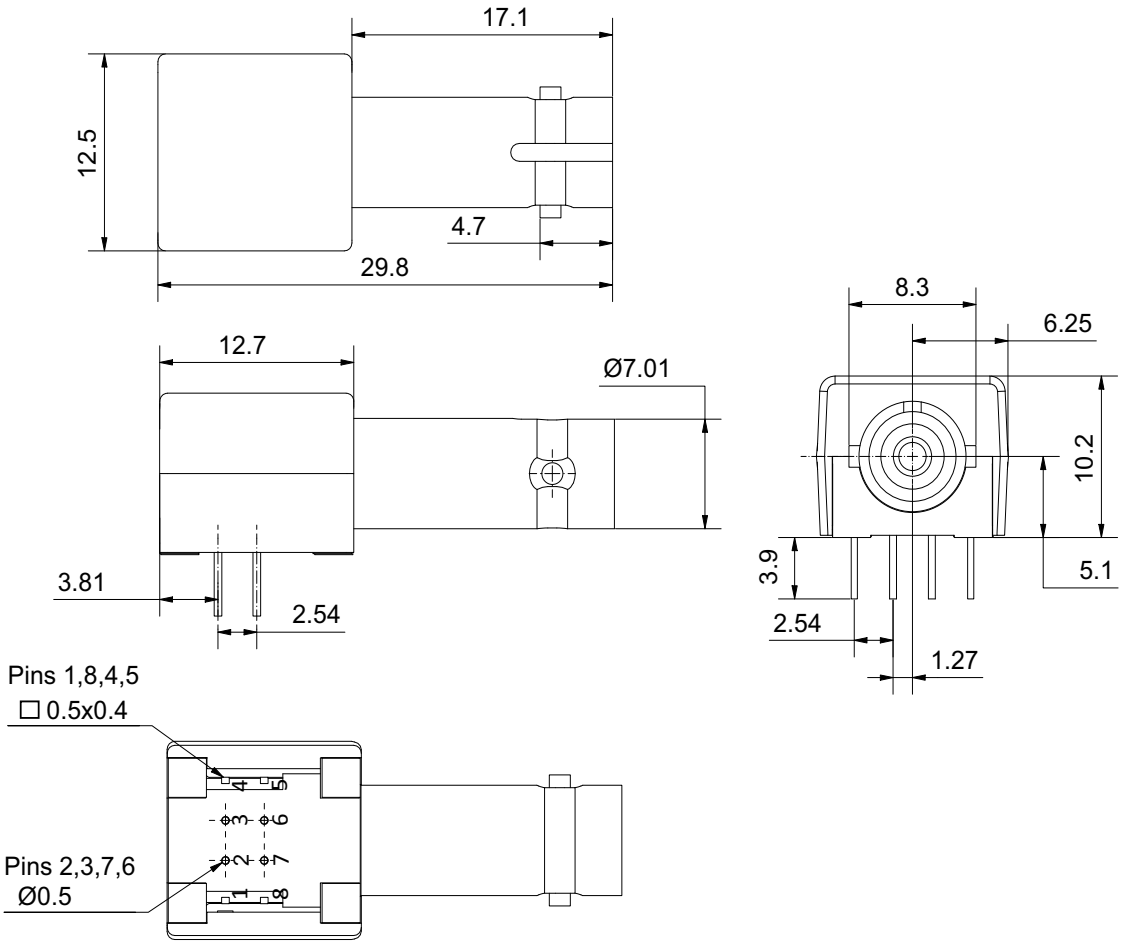
Applications

- Power substation automation
- HVDC
- Industrial networking over MMF

Regulatory Compliance

Feature	Test Method	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	JEDEC JESD22-A114	HBM Class 2 (2000V to <4000V)
Product Safety Laser Safety	EN62368-1 EN60825-1 EN60825-2 FDA/CDRH	Laser Class 1 Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019
RoHS Compliance	—	Reference to RoHS Directive 2011/65EU Annex II and RoHS RL (EU) 2015-863
Moisture Sensitivity Level (MSL)	J-STD-020D	1 (Unlimited floor lifetime)

Mechanical Dimensions

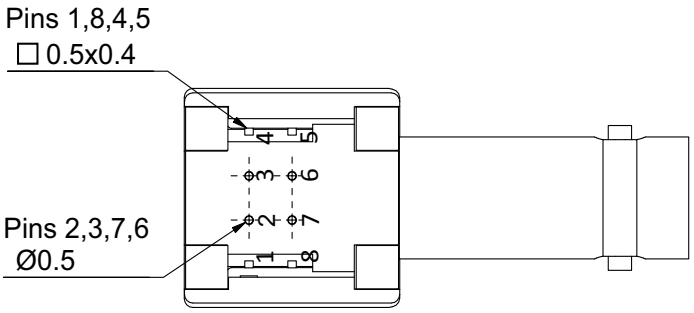


NOTE:

- Dimensions are in millimeters (mm).
- A finished hole diameter of at least 1.02 mm (0.04 in.) is recommended for all eight pins to ensure smooth mounting on the PCB.

Pin Description

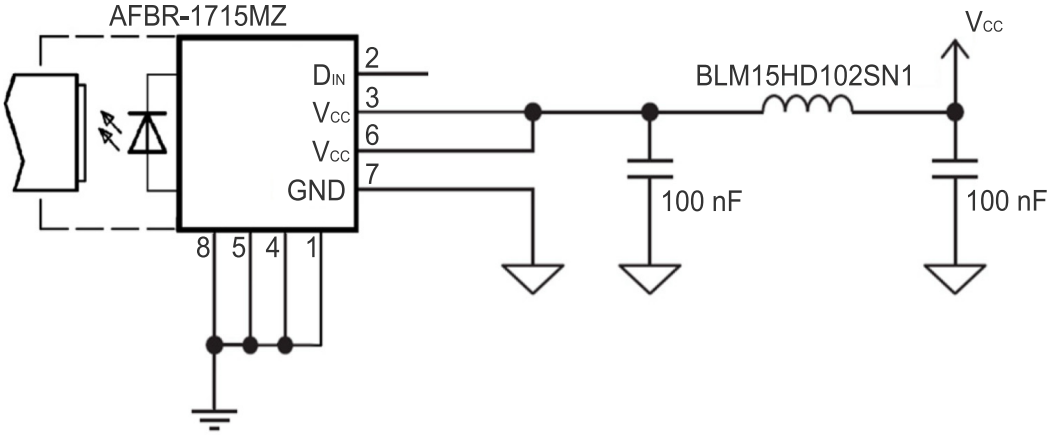
Bottom View



Pin	Name (Function)	Notes
1	Port	a
2	D_{IN} (TX Data In [LVTTL])	
3	V_{CC} (3.3V Supply Voltage)	
4	Port	a
5	Port	a
6	V_{CC} (3.3V Supply Voltage)	
7	GND (Signal Ground)	
8	Port	a

a. The metal port is connected to the outer four pins (1, 4, 5, and 8) through a port grounding path insert.

Recommended Application Circuit

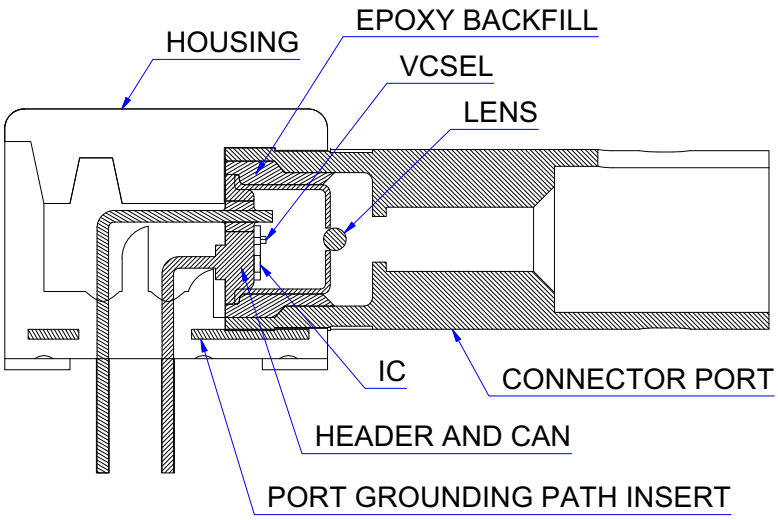


Product Build-Up Illustration

The metal ST connector port is conductively connected to the port grounding path insert, which is embedded in the lower part of the plastic housing. See Figure 1.

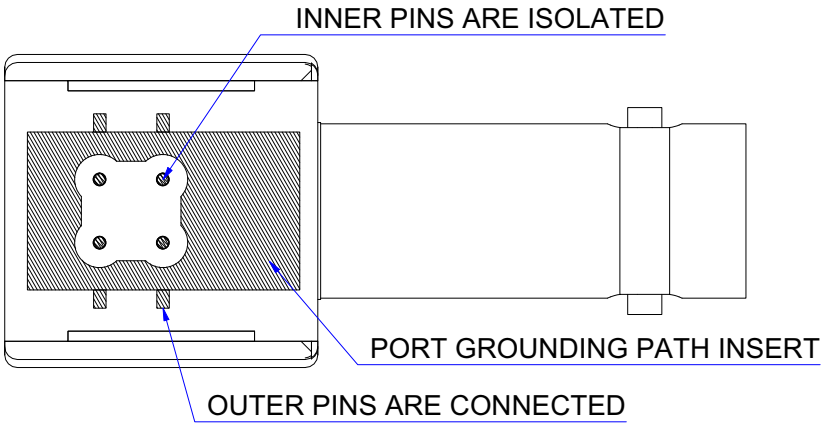
A 850-nm VCSEL and a driver IC are applied to the header with a metal can and integrated lens.

Figure 1: Simplified Cross-sectional Side View



The four inner pins (2, 3, 6 and 7) of the header are isolated from the port grounding path insert, whereas the outer four pins (1, 4, 5, and 8) are electrically connected. See Figure 2.

Figure 2: Simplified Cross-sectional Bottom View of Housing



Package Information

The AFBR-1715MZ transmitter is housed in a low-cost, dual-inline package that is made of high-strength, heat-resistant, chemically resistant, and UL 94V-O flame-retardant ULTEM plastic (UL File #E121562). There is an internal electrical connection (port grounding path insert) between the metal port and the four outer pins. Signal ground is separate from these four pins to give flexibility in connecting the port to signal or chassis ground. The package is designed for auto-insertion and wave soldering, so it is ideal for high-volume production applications.

Handling and Design Information

The AFBR-1715MZ product comes with a protective port cap that covers the optics.

NOTE: Port caps are made to protect the optical path during assembly. They are not meant to remain on the part for a long period. These caps vary by port style. When soldering, it is advisable to leave the protective cap on the unit to keep the optics clean. Good system performance requires clean port optics and cable ferrules to avoid obstructing the optical path.

Clean compressed air is often sufficient to remove particles of dirt. Methanol on a cotton swab also works well.

Recommended Chemicals for Cleaning/Degreasing

- Alcohols: methyl, isopropyl, isobutyl.
- Aliphatics: hexane, heptane; Other: soap solution, naphtha.

Do not use partially halogenated hydrocarbons (such as 1.1.1 trichloroethane), ketones (such as MEK), acetone, chloroform, ethyl acetate, methylene dichloride, phenol, methylene chloride, or N-methylpyrolldone. Also, Broadcom does not recommend the use of cleaners that use halogenated hydrocarbons because of their potential environmental harm.

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause catastrophic damage to the device. Limits apply to each parameter in isolation, all other parameters having values within the recommended operation conditions. It should not be assumed that limiting values of more than one parameter can be applied to the products at the same time. Exposure to the absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Min.	Max.	Units	Notes
Storage Temperature	T_S	–40	+85	°C	
Supply Voltage	V_{CC}	–0.3	3.6	V	
Data Input Voltage	V_{IN}	–0.5	V_{CC}	V	
Lead Soldering Temperature	T_{SOLD}	—	260	°C	a, b
Lead Soldering Time	t_{SOLD}	—	10	seconds	a

a. 1.6 mm below the seating plane.

b. The product has moisture sensitive level 1.

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Units	Notes
Ambient Operating Temperature	T_A	–40	—	+85	°C	a
Supply Voltage	V_{CC}	3.0	3.3	3.6	V	
Data Rate	DR	DC	—	50	Mbaud	b

a. Electrical and optical specifications of the product are guaranteed across the recommended ambient operating temperature range only.

b. Characterized with a PRBS 2^7-1 pattern at 50 Mbaud.

Transmitter Electrical Characteristics

T_A = –40°C to +85°C, V_{CC} = 3.3V ± 0.3V

Parameter	Symbol	Min.	Typ.	Max.	Units	Notes
Supply Current	I_{CC}	—	6.5	10	mA	a
Power Dissipation	P_{DISS}	—	—	36	mW	a
Data Input Voltage – Low	V_{INL}	0	—	0.8	V	
Data Input Voltage – High	V_{INH}	2	—	V_{CC}	V	
Data Input Capacitance	C_{IN}	—	5	—	pF	a
Data Input Resistance	R_{IN}	—	80	—	kΩ	a
Propagation Delay	t_{TD}	—	6	15	ns	a

a. Typical value at 3.3V and 25°C.

Transmitter Optical Characteristics

T_A = –40°C to +85°C, V_{CC} = 3.3V ± 0.3V

Parameter	Symbol	Min.	Typ.	Max.	Units	Notes
Optical Output Power Peak (62.5/125 µm or 105/125 µm)	P_O	–8.2	–1.5	+2	dBm	a, b
Extinction Ratio	EXT	10	—	—	dB	c
Logic-Low Optical Output Power Peak	$P_{O\_LOGIC\_LOW}$	—	—	–37	dBm	d
Central Wavelength	λ_C	805	845	865	nm	a
Spectral Width – FWHM	$\Delta\lambda$	—	0.5	5	nm	a
Optical Rise Time (20% to 80%)	t_R	—	2.3	4	ns	a, e
Optical Fall Time (80% to 20%)	t_F	—	2.0	3	ns	a, e
Pulse Width Distortion	t_{PWD1}	–7	—	+2	ns	e, f
Pulse Width Distortion	t_{PWD2}	–5	—	+2	ns	e, g

a. Typical values at 3.3V and 25°C.

b. Valid for operations without a mechanical load that affects the fiber-port coupling. A mechanical load that affects the fiber-port coupling can lead to a decline in coupling efficiency especially when using 62.5-µm MMF. To keep this effect low, the installation of a fiber relief or the use of 105-µm MMF is recommended.

c. Measured with a PRBS 2^7-1 pattern at 50 Mbaud and 62.5-µm MMF.

d. DC to 2.5 MHz.

e. Measured with a 120-MHz optical/electrical converter. Measured with a PRBS 2^7-1 pattern at 50 Mbaud and 62.5-µm MMF.

f. Distortion-free electrical input. Measured with a long sequence of low pulses followed by a short high pulse (20 ns).

g. Distortion-free electrical input. Measured at a 50% threshold using a rising edge trigger while applying a PRBS 2^7-1 pattern at 50 Mbaud and 62.5-µm MMF.

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