

AFBR-T524Z/AFBR-R524Z

50 Megabaud Versatile Link Fiber Optic Transmitter and Receiver for 1mm POF



Data Sheet

Description

The AFBR-T524Z transmitter utilizes a 650nm LED source with integrated optics and driver IC for efficient coupling into 1mm Polymer Optical Fiber (POF). The AFBR-R524Z receiver incorporates a PIN detector and digital output IC. The transmitter input and receiver output are compatible with TTL logic families. The pair operates up to 50MBd at distances up to 50 meters with 1mm POF using bi-phase encoding scheme.

The transmitter is a 3-pin and the receiver is a 4-pin device, packed in Versatile Link housing. Versatile Link components can be interlocked (N-plexed together) to minimize space and to provide dual connections with the duplex connectors. Various simplex and duplex connectors, as well as POF cables are available for Versatile Link components. Please contact Avago Technologies for details or visit our company website at www.avagotech.com.

Features

- RoHS-compliant
- Data transmission at signal rates up to 50MBd
- Transmitter: integrated 650nm LED and driver IC with TTL input logic
- Receiver: integrated PIN diode and digitalizing IC with TTL output logic
- Up to 50 meters distance with 1mm Plastic Optical Fiber (POF)
- Operating temperature range of 0°C to +85°C
- Compatible with Avago's Versatile Link family of connectors, for easy termination of fiber

Applications

- Optical Transmitter and Receiver for 50MBd systems
- Industrial control and factory automation
- Extension of RS-232 and RS-485
- High voltage isolation
- Elimination of ground loops
- Reduces voltage transient susceptibility

Package and Handling Information

The Versatile Link package is made of a flame retardant VALOX¹® UL 94 V-0 material (UL file # E121562) and uses the same pad layout as a standard, eight pin dual-in-line package. These Versatile Link packages are stackable and are enclosed to provide a dust resistant seal. Snap action simplex, simplex latching, duplex, and duplex latching connectors are offered with simplex or duplex cables.

Package Housing Color

Versatile Link components and simplex connectors are color coded to eliminate confusion when making connections. Receivers are black and transmitters are grey.

Handling

Versatile Link components are auto-insertable. When wave soldering is performed with Versatile Link components, the optical port plug should be left in to prevent contamination of the port. Do not use reflow solder processes (i.e., infrared reflow or vapor-phase reflow). Non-halogenated water soluble fluxes (i.e., 0% chloride), not rosin based fluxes, are recommended for use with Versatile Link components.

Versatile Link components are moisture sensitive devices and are shipped in a moisture sealed bag. If the components are exposed to air for an extended period of time, they may require a baking step before the soldering process. Refer to the special labeling on the shipping tube for details.

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-methylpyrrolidone. Also, Avago does not recommend the use of cleaners that use halogenated hydrocarbons because of their potential environmental harm.

Interlocked (Stacked) Assemblies (refer to Figure 1)

Horizontal packages may be stacked by placing units with pins facing upward. Initially engage the inter-locking mechanism by sliding the L bracket body from above into the L slot body of the lower package. Use a straight edge, such as a ruler, to bring all stacked units into uniform alignment. This technique prevents potential harm that could occur to fingers and hands of assemblers from the package pins. Stacked horizontal packages can be disengaged if necessary. Repeated stacking and unstacking causes no damage to individual units.

Stacking Horizontal Modules

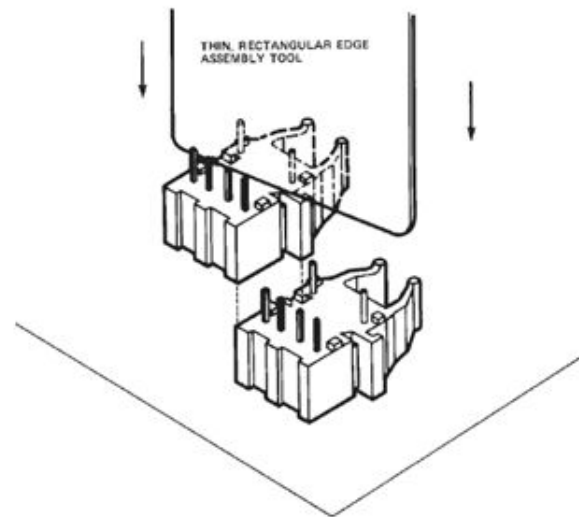
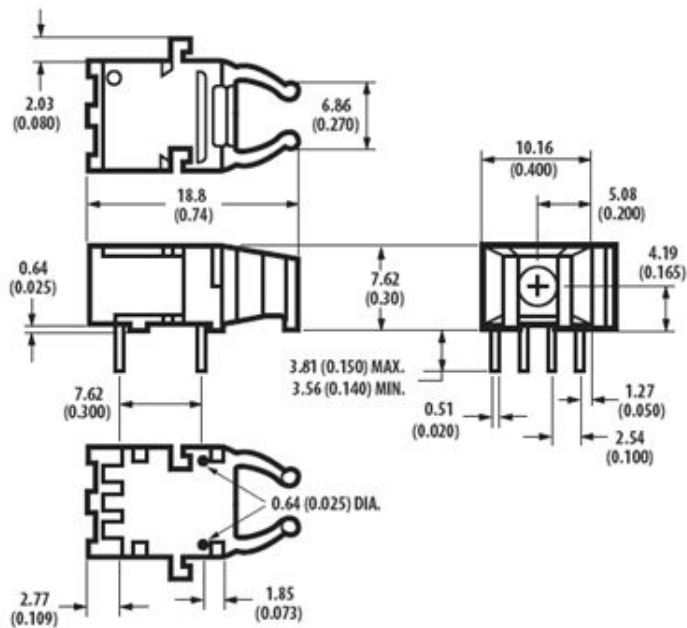


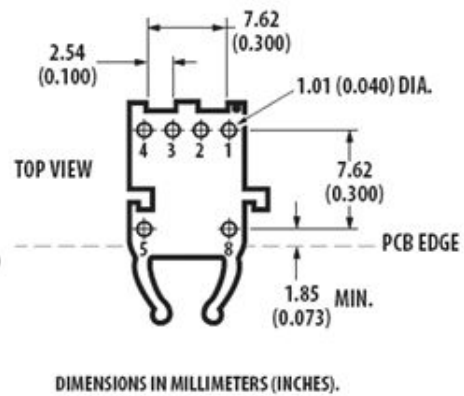
Figure 1. Interlocked (stacked) horizontal or vertical packages

1. VALOX[®] is a registered trademark of the General Electric Corporation.

Mechanical Dimensions



Printed Circuit Board Layout Dimension



Pin Description Transmitter

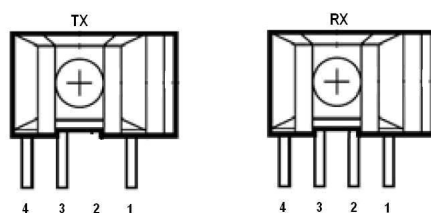
Fiber port facing front, pins downward, 1=Rightmost pin to 4=Leftmost pin

| Pin | Name | Function/Description | Notes |
|-----|------------------|--|-------|
| 1 | V _{CCT} | Transmitter Power 5V ± 5% | |
| 2 | No Pin | No physical pin is available | |
| 3 | V _{EET} | Transmitter Ground | |
| 4 | Data In | Transmitter Data Input | 1, 2 |
| 5 | NC | Not Connected, physical pin is available | 3 |
| 8 | NC | Not Connected, physical pin is available | 3 |

Pin Description Receiver

Fiber port facing front, pins downward, 1=Rightmost pin to 4=Leftmost pin

| Pin | Name | Function/Description | Notes |
|-----|------------------|--|-------|
| 1 | Data Out | Receiver Data Output | 2 |
| 2 | V _{EER} | Receiver Ground | |
| 3 | V _{CCR} | Receiver Power 5V ± 5% | |
| 4 | NC | Not Connected, physical pin is available | 4 |
| 5 | NC | Not Connected, physical pin is available | 3, 4 |
| 8 | NC | Not Connected, physical pin is available | 3, 4 |



Regulatory Compliance

| Feature | Test Method | Performance |
|---|-------------------------|---------------|
| Electrostatic Discharge (ESD) to the Electrical Pins Human Body Model | MIL-STD-883 Method 3015 | Min +/- 2000V |
| Eye Safety | IEC 60825-1,2 | Class 1 |

Specified Link Performance, $T_A = 0^\circ\text{C}$ to $+85^\circ\text{C}$, 50MBd

| Parameter | Min | Max | Unit | Condition | Note |
|---|-----|-----|--------|--|------|
| Link Distance with Extra Low Loss POF cable | 0.1 | 50 | meters | 0°C to $+85^\circ\text{C}$ | 5 |
| Link Distance with Standard Loss POF cable | 0.1 | 45 | meters | 0°C to $+85^\circ\text{C}$ | 5 |

Notes:

- Logic 1 input will turn the light on and the logic 0 will turn the light off.
- TTL compatible data output.
- Pin 5 and 8 are for mounting and retaining purposes, but are electrically connected.
- It is recommended to connect this pin to ground to reduce coupling of electrical noise.
- POF is HFBR-R/EXXYYYYZ plastic (1 mm) optical fiber. Worst case attenuation used (0.23 dB/m for extra low loss POF and 0.27dB/m for standard loss POF cable from 0°C to $+85^\circ\text{C}$ at 660 nm).

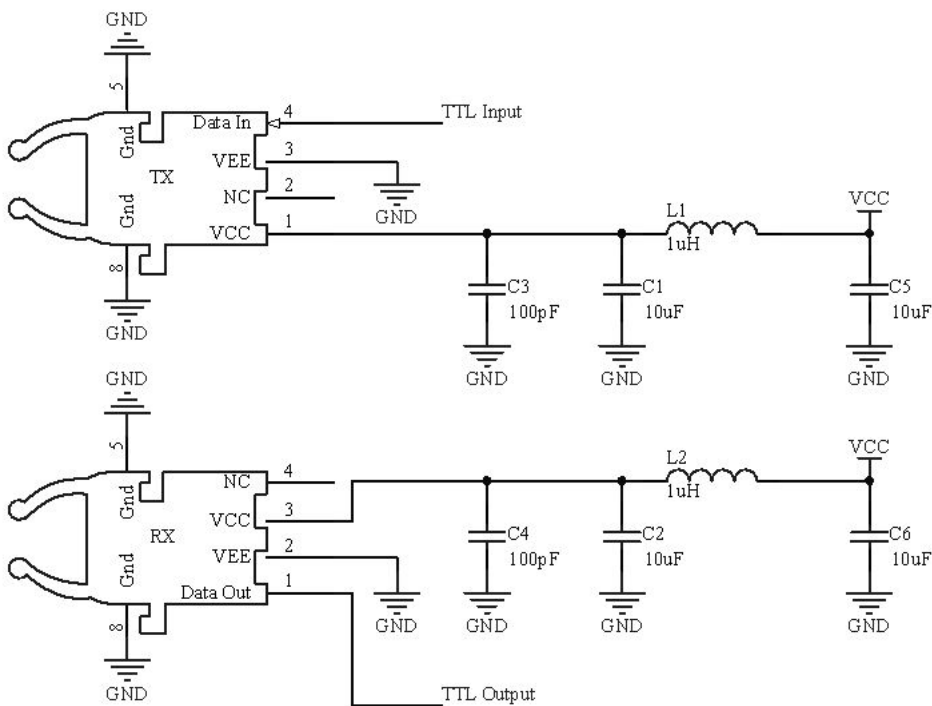


Figure 2. Recommended Transmitter and Receiver Application Circuit

Absolute Maximum Ratings

| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
|---------------------------|------------------------------------|------|---------|----------------------|-------|-------|
| Storage Temperature | T _s | -40 | | 85 | °C | 6 |
| Ambient Temp, no air flow | T _c | 0 | | 85 | °C | 6, 7 |
| Relative Humidity | RH | 0 | | 85 | % | 6 |
| Supply Voltage | V _{CCT} /V _{CCR} | -0.5 | | 7 | V | 6 |
| Data Input Voltage | V _{IN} | -0.5 | | V _{CC} +0.5 | V | 6 |
| Data Output Current | I _O | | | 10 | mA | 6,8 |
| Data Rate | | 8 | | 50 | MBaud | 9 |

Notes:

- Absolute Maximum Ratings are those values beyond which damage to the device may occur if these limits are exceeded for other than a short period of time.
- Measured at the housing.
- A safety resistor of 50ohm (minimum) is to be connected between Data Out and the receiving circuitry. The receiving circuitry must be powered up within 50ms after receiving the data to prevent permanent damage to the OEC.
- Bi-phase encoded

Recommended Operating Conditions

| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
|---------------------------|------------------------------------|------|---------|------|------|--------|
| Ambient Temp, no air flow | T _A | 0 | 25 | 85 | °C | 10, 11 |
| Supply Voltage | V _{CCT} /V _{CCR} | 4.75 | 5 | 5.25 | V | 10 |

Notes:

- Recommended operating conditions are those values outside of which functional performance is not intended, device reliability is not implied, and damage to the device may occur over an extended period of time. See Reliability Data Sheet for specific reliability performance.
- Measured at the housing.

Process Compatibility

| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
|--------------------|-------------------|-----|---------|-----|------|----------|
| Solder Environment | T _{SOLD} | | | 260 | °C | 12,14,15 |
| | t _{SOLD} | | | 10 | sec | 13,14,15 |

Notes:

- Maximum temperature refers to peak temperature.
- Maximum time refers to time spent at peak temperature.
- Solder surface to be at least 1mm below lead frame stops.
- Product is moisture sensitive level 2A.

AFBR-T524Z Transmitter

The AFBR-T524Z transmitter incorporates a 650nm LED and integrated driver IC in a light gray, nonconductive plastic Versatile Link housing. Its input data is compatible with TTL logic level. This transmitter can operate from 8MBd to 50MBd with bi-phase encoded scheme using 1mm plastic optical fiber (POF).

Transmitter Electrical Characteristics

($T_A = 0^\circ\text{C}$ to $+85^\circ\text{C}$, $V_{CC_T} = 5V \pm 5\%$)

| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
|--------------------------------------|------------|------|---------|--------------|---------------|-------|
| Supply Current (Optical Power ON) | I_{CCT} | | | 40 | mA | 1 |
| Optical Power ON Delay | t_{ON2} | | | 7 | μs | 4 |
| Optical Power OFF Delay | t_{OFF2} | | | 50 | μs | 3 |
| Input Voltage – Low | V_{IL} | -0.3 | | 0.8 | V | 2 |
| Input Voltage – High | V_{IH} | 2.0 | | $V_{CC}+0.3$ | V | 2 |
| Data Input Capacitance | C_{IN} | | | 7 | pF | |
| Data Input Resistance | R_{IN} | 2 | | | $k\Omega$ | |

Notes:

- For 50% duty cycle data.
- Standard TTL compatible input.
- After a static 0 is received on Data In for t_{OFF2} μs , the transmitter optical output power drops to a level below -50dBm.
- After modulated data is received on Data In for t_{ON2} μs , the transmitter exits the "OFF" state to enter normal operating "ON" state.

Transmitter Optical Characteristics

($T_A = 0^\circ\text{C}$ to $+85^\circ\text{C}$, $V_{CC_T} = 5V \pm 5\%$)

| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
|---|-------------|------|---------|-----|------|-------|
| Output Optical Power (Average), Normal Power | P_N | -8.5 | -6 | -2 | dBm | 5 |
| Output Optical Power (Average), OFF | P_S | | | -50 | dBm | |
| Extinction Ratio | ER | 10 | | | dB | |
| Spectrum Central Wavelength | λ_c | 635 | | 670 | nm | 6 |
| Rise Time (20%–80%) | t_{RT} | | | 6.0 | ns | |
| Fall Time (20%–80%) | t_{FT} | | | 6.0 | ns | |
| Pulse Width Variation | PWV | 18 | | 22 | ns | 7,8 |

Notes:

- Measured for 50% duty cycle data after 1meter 0.5 NA 1mm POF with polished connector end face using a large area detector.
- Central wavelength is defined as:

$$\lambda_c = \frac{\sum_{i=1}^N P_i \lambda_i}{\sum_{i=1}^N P_i};$$

Ref: EIA/TIA standard FOTP-127/6.1, 1991

- Pulse width is measured at 50% threshold using a rising edge trigger and a worst case bi-phase test pattern.
- Electrical input is bi-phase coded at 25Mbps (50MBd)

AFBR-R524Z Receiver

The AFBR-R524Z receiver consists of a PIN photodiode and digitalizing IC to produce an output level that is compatible with TTL logic.

Receiver Electrical Characteristics

($T_A = 0^\circ\text{C}$ to $+85^\circ\text{C}$, $V_{CCR} = 5V \pm 5\%$)

| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
|----------------------------|-----------|------|---------|---------------|------|---------------------------------|
| Supply Current | I_{CCR} | | | 35 | mA | |
| Data Output Voltage – Low | V_{OL} | -0.3 | | 0.4 | V | 1,4 $I_{OL}=1.6\text{mA}$ |
| Data Output Voltage – High | V_{OH} | 2.5 | 3.0 | $V_{CCR}+0.3$ | V | 1,5 $I_{OH}=-150\mu\text{A}$ |
| Rise Time (10%–90%) | t_{RR} | | | 9.9 | ns | 2,3 |
| Fall Time (10%–90%) | t_{FR} | | | 9.9 | ns | 2,3 |
| Pulse Width Variation | PWV | 14.9 | | 28 | ns | 6,7 |

Notes:

1. Standard TTL output.
2. Measured with $R_L = 50\text{k}\Omega$ and $C_L = 15\text{pF}$
3. Optical Power generated by a standard Avago Technologies Transmitter, with ideal alignment to the photodiode using a 1mm POF (NA=0.5).
4. Data Output Voltage – Low corresponds with Input Optical Power Low.
5. Data Output Voltage – High corresponds with Input Optical Power High.
6. Optical input is bi-phase coded at 25Mbps (50MBd)
7. Pulse width is measured at 50% threshold using a rising edge trigger and a worst case bi-phase test pattern.

Receiver Optical Characteristics

($T_A = 0^\circ\text{C}$ to $+85^\circ\text{C}$, $V_{CCR} = 5V \pm 5\%$)

| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
|-------------------------------|-----------|-----|---------|-----|------|-------|
| Input Optical Power (Average) | P_{IN} | -24 | | -2 | dBm | 6 |
| Optical Spectrum Range | λ | 630 | | 685 | nm | |

Notes:

6. Optical input is bi-phase coded at 25Mbps (50MBd)

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

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