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AFBR-S10TR001Z

Compact 650 nm Analog Transceiver with Compact Versatile-Link Connector for Sensing Over POF

Data Sheet

Lead (Pb) Free
RoHS 6 fully compliant



Description

Avago Technologies' AFBR-S10TR001Z transceiver provides system designers with the ability to implement an optical arc flash sensor over 1 mm Plastic Optical Fiber (POF). It has a very compact design with a form factor similar to the RJ-45 connector. This transceiver features a compact and keyed Versatile-Link duplex connector and is compatible with existing simplex Versatile-Link connectors.

This product is lead free and compliant with RoHS.

Block Diagram

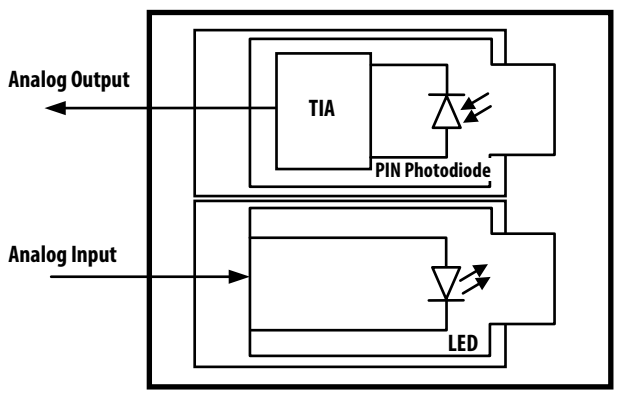


Figure 1. AFBR-S10TR001Z block diagram

Features

- Integrated LED for system self test applications
- Receiver consisting of a PD and a TIA integrated in a single IC
- High EMI robustness
- Fast slew rate
- Compact foot print
- Temperature range -40°C to 85°C
- RoHS compliant
- Versatile Link connector system

Applications

- Arc Flash Detection

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Transmitter

The transmitter contains a 650nm LED which can be directly driven by a current. The LED is packaged in an optical subassembly, part of the transmitter section. The optical subassembly couples the output optical power efficiently into POF fiber.

Receiver

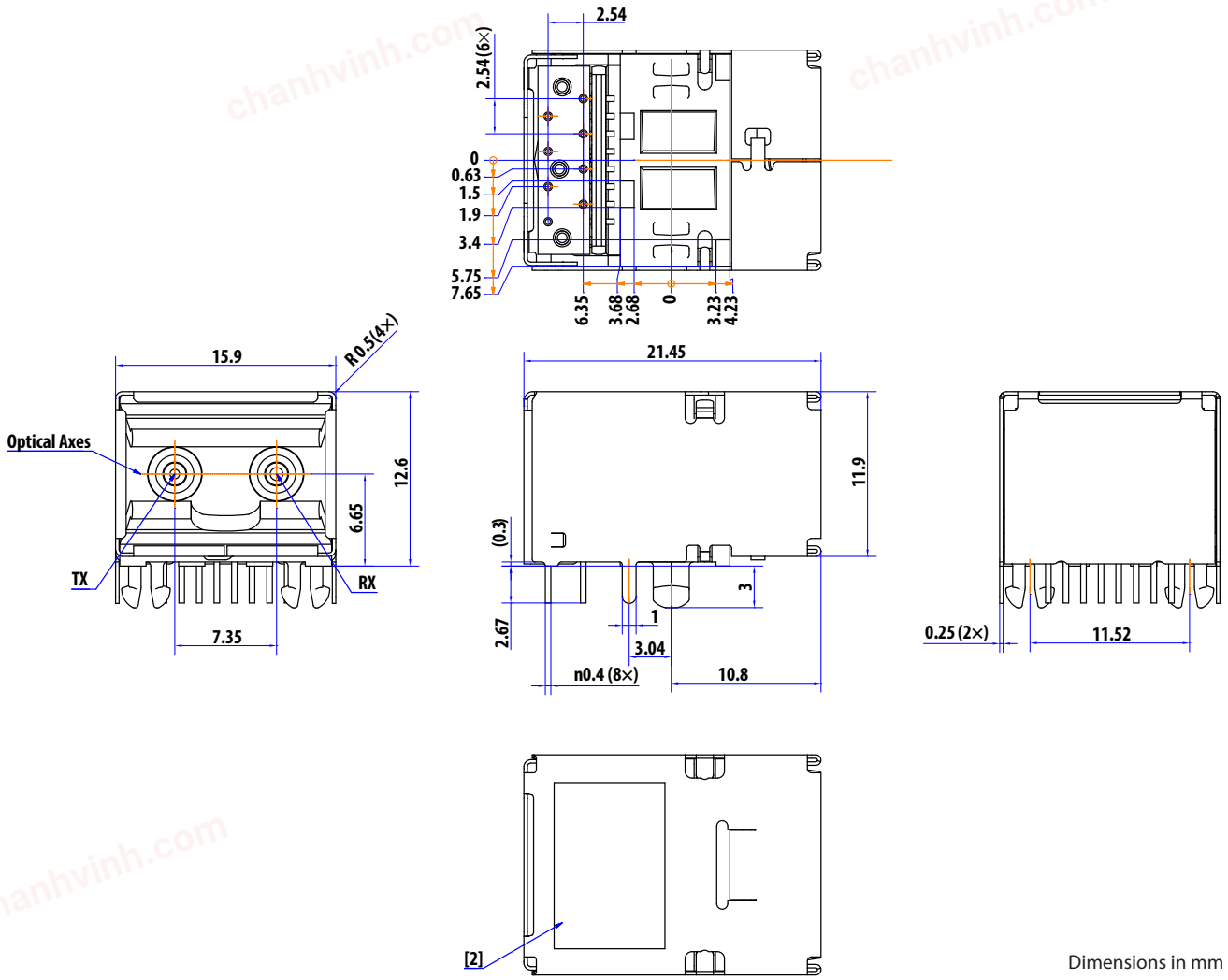
The receiver utilizes an ASIC with integrated photodiode and a linear transimpedance amplifier (TIA). It is packaged in an optical sub-assembly, part of the receiver section. This optical subassembly couples the optical power efficiently from POF fiber to the receiving photodiode. The output voltage is proportional to the coupled input optical power.

Package

The transceiver package consists of the opto-electrical subassembly and the housing as illustrated in the block diagrams in Figure 1. The package outline drawing and pin-outs are shown in Figures 2 and 3.

The opto-electrical subassembly utilizes a high volume assembly process together with low cost lens elements which result in a cost effective building block. It consists of the active LED and the receiver IC with integrated photodiode.

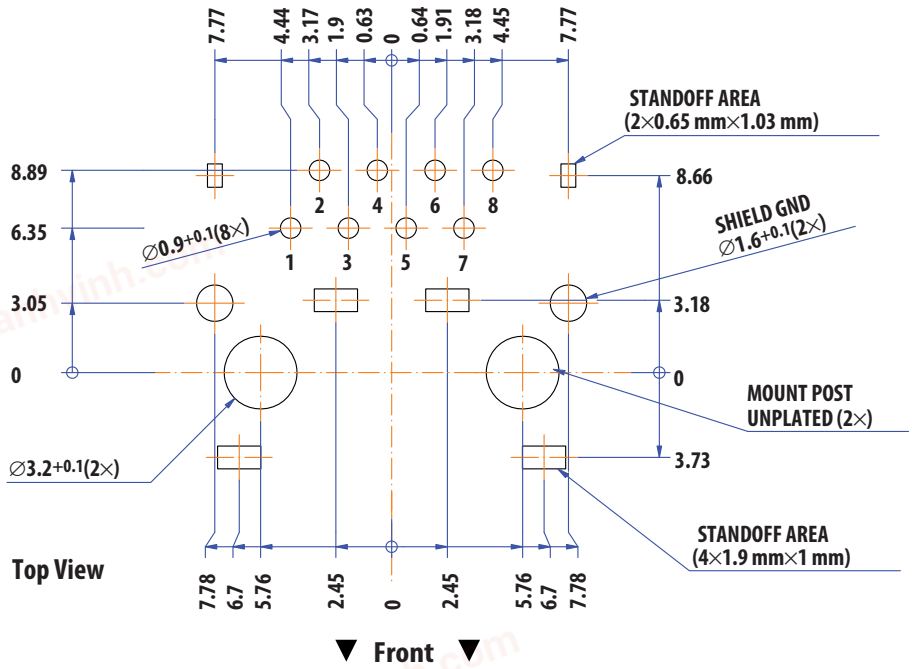
There are 8 signal pins, 4 EMI shield solder posts and 2 mounting posts, which exit the bottom of the housing. The solder posts are isolated from the internal circuit of the transceiver and are to be connected to chassis ground. The mounting posts are to provide mechanical strength to hold the transceiver to the application board.



Dimensions in mm

Figure 2. Package outline drawing

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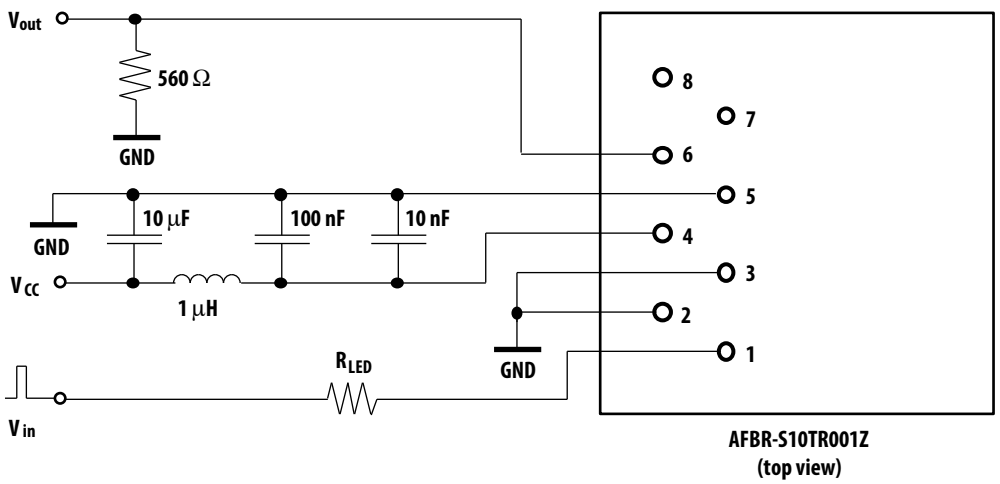


Pinout Description

Pin	Function
1	LED_A
2	LED_C
3	GND
4	VCC
5	GND
6	VOUT
7	N.C.
8	N.C

Dimensions in mm

Figure 3. PCB footprint and pin-out diagram



Note: To choose the appropriate value of R_{LED}, see Figures 5 and 6.

Figure 4. Recommended application circuit

Regulatory Compliance Table

Feature	Test Method	Performance
Electrostatic discharge (ESD) to the electrical Pins	ESD22-A114	Withstands up to 2000V HBM applied between the electrical pins.
Immunity	Variation of IEC 61000-4-3	Typically shows no measurable effect from a 15V/m field swept from 8MHz to 1GHz applied to the transceiver when mounted on a circuit board without chassis enclosure.
Eye Safety	EN 60825-1:52007	Laser class 1 product (LED radiation only). TÜV certificate: R 50217706. **CAUTION** – Use of controls or adjustments of performance or procedures other than those specified herein may result in hazardous radia-tion exposure
Component recognition	Underwriter Laboratories	UL File #: E173874

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Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause 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.	Unit	Notes
Storage Temperature	T_S	-40	+85	°C	
Case Operating Temperature	T_C	-40	+85	°C	Note 1,2
Lead Soldering Temperature	T_{sold}		260	°C	Note 3
Lead Soldering Time	t_{sold}		10	s	Note 3
Transmitter Peak Forward Input Current	$I_{F,PK}$		50	mA	Note 5
Transmitter Average Forward Input Current	$I_{F,AVG}$		30	mA	
Transmitter Reverse Input Voltage	V_{TxR}		3	V	
Receiver Supply Voltage	V_{CC}		6	V	
Electrostatic Discharge Voltage Capability HBM	ESD HBM		2000	V	Note 4
Electrostatic Discharge Voltage Capability CDM	ESD CDM		500	V	

Notes:
1. Operating the product outside the maximum rated case operating temperature range will compromise its reliability and may damage the product.
2. The temperature is measured using a thermocouple connected to the housing.
3. The transceiver is Pb-free wave solderable.
4. ESD Capability for all Pins HBM (Human Body Model) according JESD22-A114
5. For $I_{F,PK}$ > 30 mA, pulse width must not exceed 20µs and the duty cycle ≤ 1/1000.

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Case Operating Temperature	T_C	-40		+85	°C	Note 6, 7
Transmitter Peak Forward Input Current	$I_{F,PK}$		35	50	mA	Note 8
Transmitter Average Forward Input Current	$I_{F,AVG}$			30	mA	
Receiver Supply Voltage	V_{CC}	4.75	5	5.25	V	

Notes:
6. The temperature is measured using a thermocouple connected to the housing.
7. Electrical and optical specifications of the product are guaranteed across recommended case operating temperature range unless otherwise specified.
8. For $I_{F,PK}$ > 30 mA, pulse width must not exceed 20µs and the duty cycle ≤ 1/1000.

Transmitter Electrical Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Peak Launched Power, 1mm POF, IFDC=30mA	P_{T30}	-6	-1	2	dBm	Note 9
Peak Launched Power, 1mm POF, IFDC=10mA	P_{T10}	-11	-6	-3	dBm	Note 9
Forward Voltage	V_F	1.4	1.9	2.3	V	IFDC=3… 30mA
Peak Emission Wavelength	λ_P	630	650	685	nm	
Spectral width	FWHM		30		nm	
Optical Rise Time (10%-90%)	t_R			100	ns	Note 10
Optical Fall Time (90%-10%)	t_F			100	ns	Note 10

Notes:
9. Optical power measured with polished connector end face at the end of 0.5 meters of 1 mm diameter POF with a numerical aperture (NA) of 0.5. Eye safety class 1.
10. Using a simple driver circuitry without peaking.

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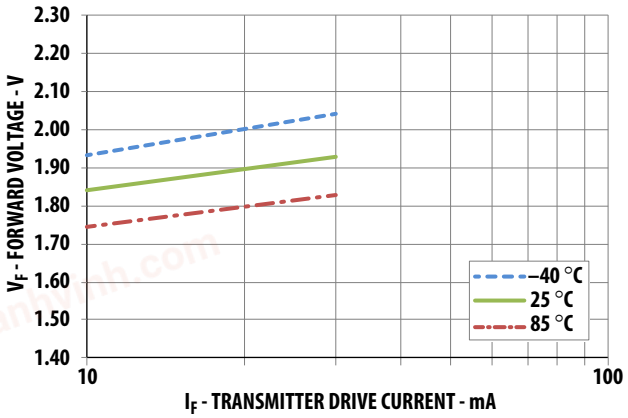


Figure 5. Typical forward voltage vs. drive current

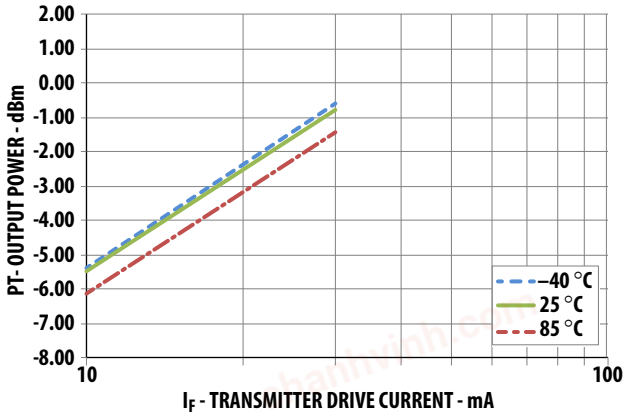


Figure 6. Typical optical output power vs. drive current

Receiver Electrical and Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Maximum Photosensitivity Wavelength	λ_{SMAX}		650		nm	
Photosensitivity Spectral Range	λ_{SR}	300		1100	nm	
Responsivity		30	50	70	V/mW	Notes 11, 12
Pulse Output Rise Time (10%-90%)	t_R		40		ns	Note 13
Pulse Output Fall Time (90%-10%)	t_F		60		ns	Note 13
Pulse Width Distortion (in overdrive)	PWD_{OD}			1	µs	Notes 14, 15
Pulse Width Distortion (linear operating range)	PWD_{LIN}	-0.5		0.5	µs	Notes 11, 15
Supply Current	I_{CC}		7	12	mA	Iout=0mA
Output Current	I_{OUT}			10	mA	Note 16
Slew Rate	SR		75		V/us	Note 17
Output Load Impedance	Z_L	500			Ω	For V_{CC}=5.0V
Maximum Output Voltage	V_{OMAX}	4			V	

Notes:
11. Value measured at an optical input power of -12dBm.
12. Verified at 650 nm.
13. Simulated and verified with the 2k||16pF load. For full swing of the output voltage.
14. Value measured for an optical input pulse of -5dBm peak, PW=10µs, duty cycle = 1/1000. Typically, overdrive condition appears at optical peak input power above -10dBm.
15. Optical input pulse PW=10µs, duty cycle = 1/1000.
16. Short circuit to GND or V_{CC} can be considerable higher (up to 60-80mA), however this operation is not allowed for longer than 30 seconds and may cause permanent damage.
17. RL = 2 kΩ, CL = 16 pF.

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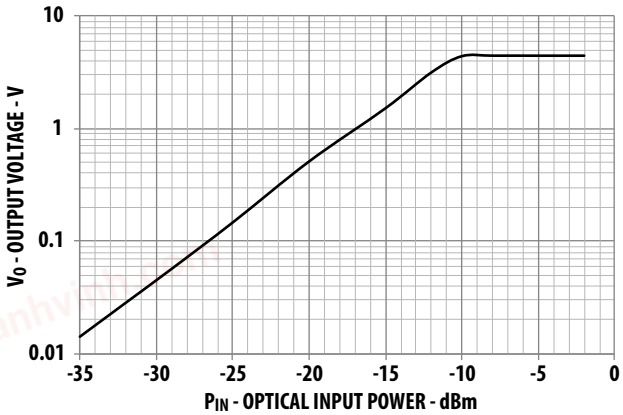


Figure 7. Typical output voltage vs. optical input power (logarithmic scale)

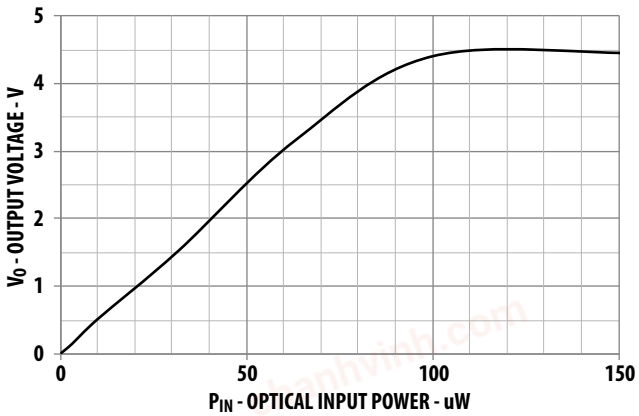


Figure 8. Typical output voltage vs. optical input power (linear scale)

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