AFBR-3905xxRZ

High Voltage Galvanic Insulation Link for DC to 5MBaud

BROADCOM®

Data Sheet



Description

Avago Technologies' AFBR-3905xxZ is a high voltage galvanic insulation link for DC to 5MBaud. The AFBR-3905xxZ consists of an optical transmitter and receiver operating at 650nm wavelength. Pin to pin distance of approximately 25 to 101 mm provides transient voltage suppression in the range of 15kV to 50kV.

Applications

- Drives/Inverters
- Galvanic insulation on one single PCB
- Medium Voltage Power Distributions
- Regulated Distribution Transformers
- Smart Grid on-board Insulations

Ordering Information

Part Number	Length	mm	Voltage Suppression
AFBR-390525RZ	1 inch	25	15kV
AFBR-390550RZ	2 inch	50.4	27kV
AFBR-390575RZ	3 inch	75.8	40kV
AFBR-390500RZ	4 inch	101.2	50kV

Features

- Data transmission at signal rates of DC to 5MBaud
- DC coupled receiver with CMOS/TTL output for easy designs: no data encoding or digitizing circuitry required
- High noise immunity through receiver IC with integrated photodiode
- RoHS compliant
- Transient voltage suppression in the range of 15kV to 50kV according IEC 60644
- Laser class 1 according to IEC-60825
- Certified according to IEC-60747-5-5
- Housing Material UL-V0 with CTI ≥ 600
- Optional 3.3V or 5V power supply

AFBR-3905xxRZ DC to 5MBaud Data Link

Absolute Maximum Ratings

Parameter		Symbol	Min.	Max.	Units	
Signaling Rate		f_s	DC	5	MBd	
Storage and Operating Tempe	erature	T _{S,O}	-40	+85	°C	
Receiver Supply Voltage		V _{DD}	-0.5	+5.5	V	
Receiver Output Current		I _{OAV}		10	mA	
Transmitter Peak Forward Inp	ut Current	I _{F,PK}		30	mA	
Transmitter Reverse Input Vol	tage	V _R		3	V	
Lead Soldering Cycle [1, 2]	Temp	T _{SOL}		+260	°C	
	Time			10	sec	

Notes:

1. 1.6mm below seating plane; wave soldering only

2. MSL class 3

Attention

Stresses above those listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Recommended Operating Conditions

Parameter	Symbol	Min.	Max.	Units	
Ambient Temperature	T _A	-40	85	°C	
Rx Power Supply Voltage [1]	V _{CC}	3.135 4.75	3.465 5.25	V V	
Transmitter Average Forward Current	I _{F,AV}	5	10	mA	
Signaling Rate	f _s	DC	5	MBd	

Notes:

1. <100mVp-p Noise

All the data in this specification refers to the operating conditions above and over lifetime unless otherwise stated.

Insulation Characteristics

Parameter	Symbol	Min.	Max.	Units
Apparent charge at Sample Test stage and Type Test stage after subgroup 1 (method a) [1]	q _{pd}		5	рС
Apparent charge at Routine Test stage and Type Test stage, Preconditioning (method b) [2]	q _{pd}		5	рС
Maximum Transient Voltage, peak ^[3]	VIOTM_1inch VIOTM_2inch VIOTM_3inch VIOTM_4inch	15 27 40 50		kV
Maximum Transient Voltage, effective ^[3]	VISO_1inch VISO_2inch VISO_3inch VISO_4inch	10.5 19 28.1 35.2		kV
Maximum Working Voltage, peak ^[4]	VIORM_1inch VIORM_2inch VIORM_3inch VIORM_4inch	4.25 8.5 12.75 17.00		kV
Maximum Working Voltage, effective ^[4]	VIOWM_1inch VIOWM_2inch VIOWM_3inch VIOWM_4inch	3 6 9 12		kV
Insulation Resistance @ T _{amb,max} , min.100°C	R _{IO}	10 ¹¹		Ω
Insulation Resistance @ T _S	R _{IO}	10 ⁹		Ω
Creepage Distance	1inch 2inch 3inch 4inch	25 50.4 75.8 101.2		mm
Clearance Distance	1inch 2inch 3inch 4inch	25 50.4 75.8 101.2		mm
Surge Isolation Voltage	V _{IOSM}	12		kV
Comparative Tracking Index	CTI	600		
Pollution degree ^[5]		2		
Climatic category ^[6]		40/085/21		
Maximum ambient Safety temperature	T _S	110		°C
Maximum input current	I _{SI}	60		mA
Maximum output current	I _{SO}	30		mA
Maximum input power dissipation	P _{SI}	330		mW
Maximum output power dissipation	P_{SO}	165		mW

- V_{pd(m)} = 1.6 x V_{IORM} (=6.8kV for 1inch, =13.6kV for 2inch, =20.4kV for 3inch, =27.2kV for 4inch), V_{ini,a} = V_{IOTM}, t_{ini,a} = 60s; t_m = 10s
 V_{pd(m)} = 1.875 x V_{IORM} (=8kV for 1inch, =16kV for 2inch, =24kV for 3inch, =32kV for 4inch), V_{ini,b} = V_{IOTM}, t_{ini,b} = 1s; t_m = 1s
 Altitude up to 2000m above sea level

- 4. Pollution degree 2; please note that inhomogeneous field conditions may lead to partial discharge through air for these voltages
 5. According IEC-60064-1
- 6. According IEC-60068-1

Electrical Input Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Forward Voltage [1]	V_{F}	1.6		2.2	V
Forward Voltage Temperature Coefficient	$\Delta V_F / \Delta T$		-1.8		mV/°C
Reverse Input Breakdown Voltage [2]	V _{BR}	3.0	13		V
Diode Capacitance [3]	C ₀		30		рF

Notes:

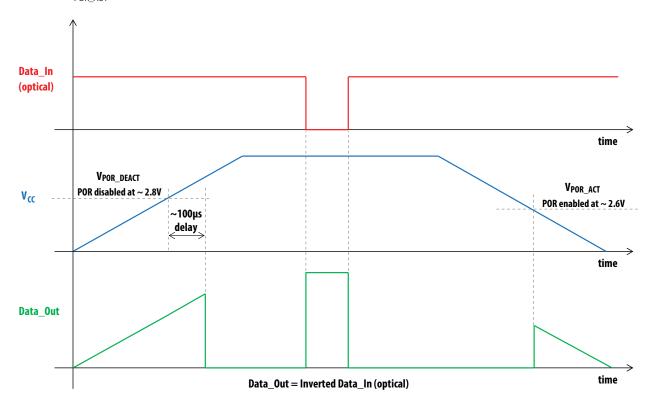
- 1. $I_{F,dc} = 10 \text{mA}$
- 2. $I_{F,dc} = -10 \mu A$
- 3. $V_F = 0V$; f = 1MHz

Electrical Output Signal Characteristics

Parameter	Symbol	Min.	Тур.	Max.	Units
High Level Output Voltage	V _{OH}	2.5	V_{CC}	V _{CC} +0.3	V
Low Level Output Voltage	V _{OL}		0.22	0.4	V
Output Risetime (10-90%) [1, 2]	t _r			10	ns
Output Falltime (90-10%) [1, 2]	t _f			10	ns
Power Supply Noise Immunity [3]	PSNI	0.1	0.4		Vpp
Vcc level to deactivate POR [4]	V _{POR DEACT}		2.8		V
Vcc level to activate POR [4]	V _{POR_ACT}		2.6		V
POR deactivate delay time [4]	t _{POR-DEACT_D}	EL	100		μs

Notes:

- 1. CL = 20pF, RL = 50kOhm
- 2. In the recommended drive circuit
- 3. Peak-to-peak sine wave
- 4. Power-on reset (POR) is active below V_{POR_DEACT}. Once V_{POR_DEACT} is reached the POR remains active for t_{POR-DEACT_DEL}. During power down POR starts at V_{POR_ACT}.



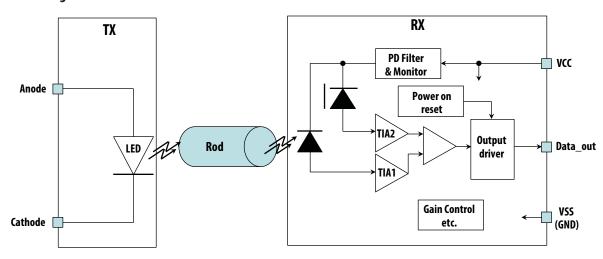
Specified Link Performance, $T_A = -40^{\circ}$ C to $+85^{\circ}$ C, DC to 5MBaud, unless otherwise noted.

Parameter	Symbol	Min.	Тур	Max.	Unit	Condition
Signaling Rate	f_S	DC		5	MBd	NRZ
Pulse Width Distortion [1]	PWD	-30		30	ns	5MBaud
Propagation Delay [2]	t _D			80	ns	5MBaud
Skew [3]	t_S			20	ns	5MBaud
Supply Current Rx [4]	I _{CC}		6	10	mA	

Notes:

- 1. $\pm 15\%$ of the nominal pulse width, provided no pulse width distortion at the electrical input
- 2. determined from 50% of the rising edge of data_in to 50% of the consecutive rising egde of data_out
- 3. Variations of tD between multiple devices measured for same input conditions and same external signal delay
- 4. $C_L = 20pF, RL = 50kOhm$

Block Diagram - AFBR-3905xxRZ



The Rx Data_out signal is inverted which means that light_on will lead to Data_out low.

POR remains active during V_{CC} power up, typically until 100 μ s after 2.8V is reached. POR follows V_{CC} while active.

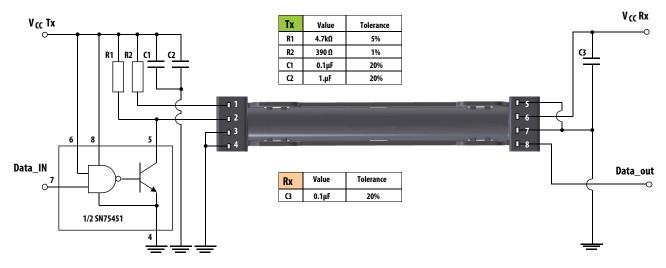
Recommended chemicals for Cleaning/Degreasing

Alcohols: methyl, isopropyl, isobutyl.

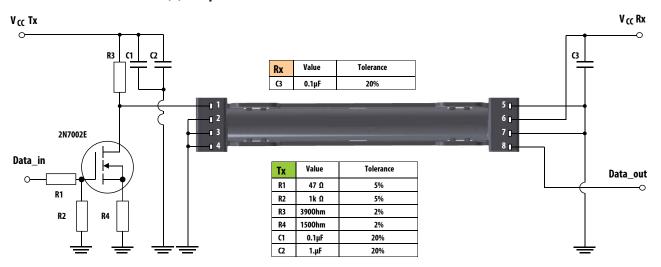
Aliphatics: hexane, heptanes Other: soap solution, naphtha

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

Recommended Drive Circuit (a) - Top View



Recommended Drive Circuit (b) - Top View



Pin Description

Pin number	Transmitter	Pin number	Receiver
1	Anode	5	No function [1]
2	Cathode	6	VCC
3	No function [1]	7	GND
4	No function [1]	8	Data_out

Notes

 $1. \ \ \, \text{It is recommended to connect this pin to signal ground} \\$

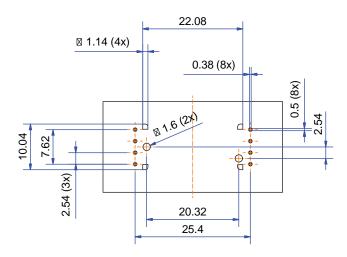
Pinning Schematic



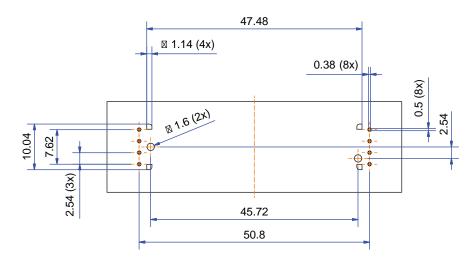
Footprint (Top View)

Dimensions in mm

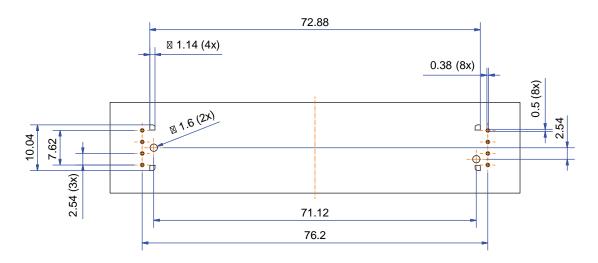
AFBR-390525RZ



AFBR-390550RZ



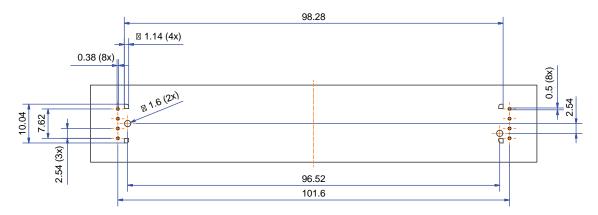
AFBR-390575RZ



Footprint (Top View)

Dimensions in mm

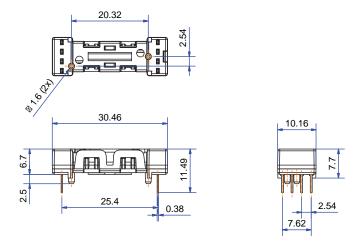
AFBR-390500RZ



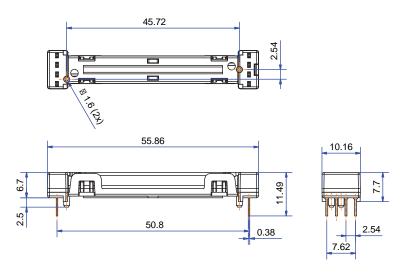
Mechanical Dimensions

Dimensions in mm

AFBR-390525RZ



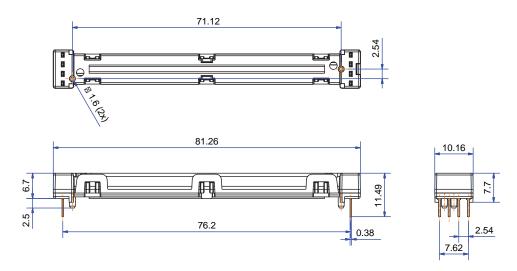
AFBR-390550RZ



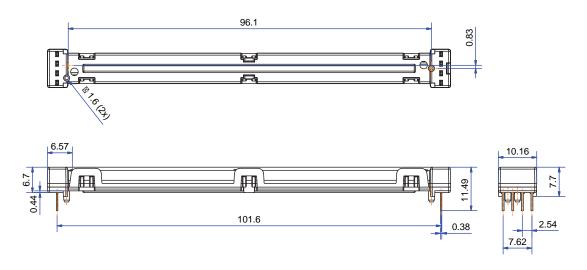
Mechanical Dimensions

Dimensions in mm

AFBR-390575RZ



AFBR-390500RZ





IMPORTANT NOTE:

AFBR-3905xxRZ devices must not be bent under any circumstances.



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

Broadcom, the pulse logo, Connecting everything, Avago Technologies, and the A logo are the trademarks of Broadcom in the United States, certain other countries and/or the EU.

Copyright © 2015–2016 Broadcom. All Rights Reserved.

The term "Broadcom" refers to Broadcom Limited and/or its subsidiaries. For more information, please visit www.broadcom.com. Broadcom reserves the right to make changes without further notice to any products or data herein to improve reliability, function, or design.

Information furnished by Broadcom is believed to be accurate and reliable. However, Broadcom does not assume any liability arising out of the application or use of this information, nor the application or use of any product or circuit described herein, neither does it convey any license under its patent rights nor the rights of others.

