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User Guide for

FEBFOD8012_CAN
Evaluation Board

Bi-Directional Logic Gate Optocoupler Provides Proven and Reliable Isolation to the Control Access Network (CAN) Interface

Featured Fairchild Product:
FOD8012

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Table of Contents

This user guide supports the evaluation board for the FOD8012. It should be used in conjunction with the FOD8012 datasheet as well as Fairchild's application notes and technical support team. Please visit Fairchild's website at www.fairchildsemi.com.

1. Introduction

The FOD8012 is an industry-first, full-duplex, bi-directional, logic-gate optocoupler with high noise immunity as well as proven and reliable optical isolation. It is highly integrated with two optically coupled channels arranged in a bi-directional configuration illustrated in Figure 1. The FOD8012 is housed in a compact 8-pin small-outline package. Each optocoupler channel consists of a high-speed AIGaAs LED driven by a CMOS buffer IC coupled to a CMOS detector IC.

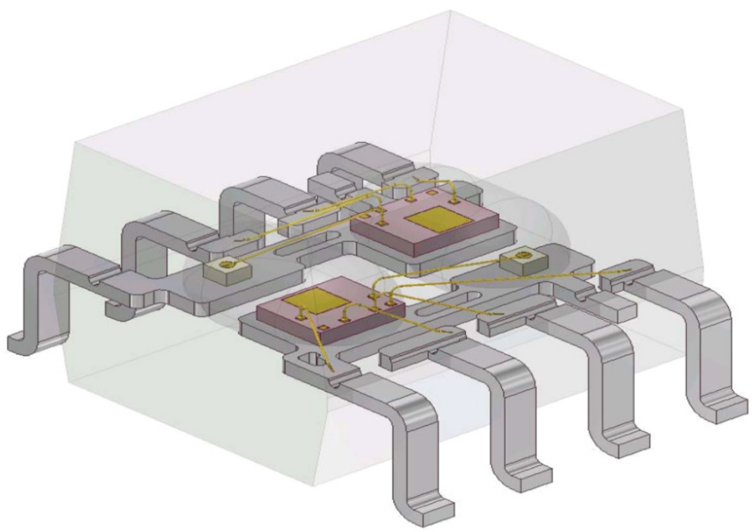


Figure 1. 3-Dimensional Illustration of the Internal Die Set of Fairchild's Optoplanar® Package Construction

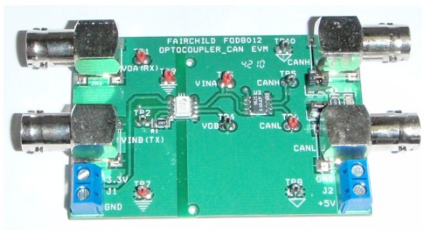
1.1. Description

The FOD8012 supports isolated communication between systems of digital signals without conducting ground loops or hazardous voltages. Unlike competitive devices, which provide less than 0.1 mm optical isolation gap, the FOD8012 features a 0.4 mm (minimum) optical isolation gap for proven, reliable isolation. The device also features a fast switching speed, up to 15 Mbit/s, and uses Fairchild's Optoplanar® packaging technology and optimized IC design to achieve high Common Mode Rejection (CMR) of 20 kV/µs minimum, allowing the device to operate in noisy industrial environments.

Additionally, the FOD8012 offers an extended industrial temperature range of -40°C to +110ºC and a 3.3 V or 5.0 V supply voltage to facilitate logic level translation. The device's high isolation voltage is certified by UL1577 and DIN_EN/IEC60747-5-2 for increased reliability.

2. Photographs

The evaluation includes the FOD8012, a bi-directional logic-gate optocoupler, that isolates the driver input and receiver output of a half-duplex 5 V CAN transceiver.



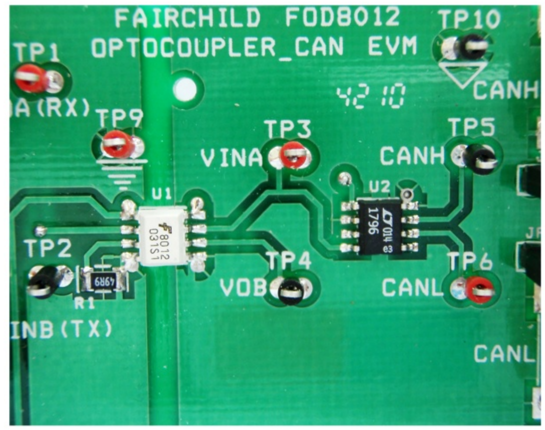


Figure 2. Photographs of the FEBFOD8012_CAN Board

3. Printed Circuit Board

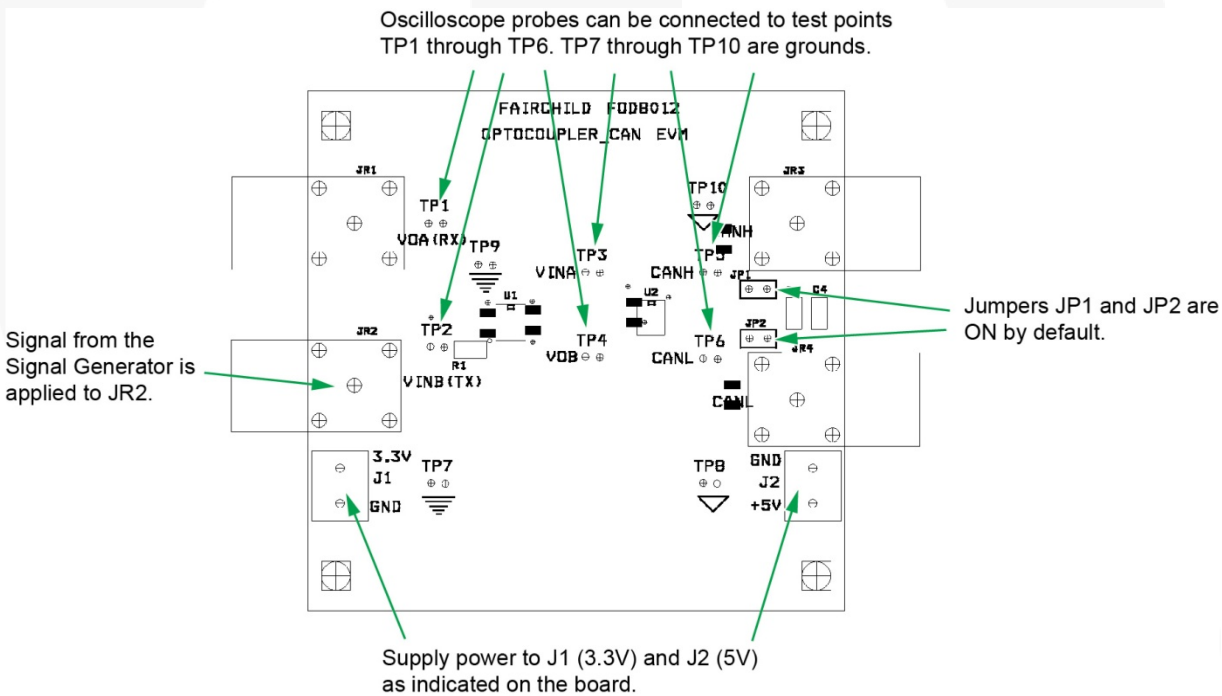


Figure 3. FEBFOD8012_CAN Board Setup

3.1. Board Setup and Operation

The FEBFOD8012_CAN evaluation board enables users to make a quick and accurate assessment of Fairchild's FOD8012 in a bi-directional data transmission application. The setup requires two power supply sources. V_{DD1} (J1) is on one side of the isolation barrier with V_{DD2} and V_{CC} (J2) is on the other side of the isolation barrier, sharing the same power supply source. A square wave is applied to one of the FOD8012 channels (VINB / VOB), which in turn drives the CAN transceiver. The resulting CAN output is fed back to the input of the other FOD8012 channel (VINA / VOA). This completes the bi-directional data transmission loop. Test points located at selected positions (as indicated in Figure 3 and Figure 4) allow the user to probe the signals and measure the switching characteristics of the device.

3.2. Test Procedures and Conditions

The following steps and Figure 3 describe the setup of the FEBFOD8012_CAN board.

1. Jumpers JP1 and JP2 are connected on the board by default. They connect the CAN transceiver output to the resistive and capacitive loads R2 (60 Ω) and C4 (100 pF), respectively. The user has the flexibility of connecting the CAN driver output / receiver inputs to another load / signal source using the BNC (CANH and CANL) connectors and removing the jumpers (not covered in this document).
2. With the power off, connect the power supplies to the board. They are set to 3.3 V (J1) or 5.0 V (J2) as specified on the board. Make sure that the supply voltages do not exceed the absolute maximum rating of the devices, as this may damage the device.
3. Turn on the power supplies.
4. Connect the output of the signal generator to the BNC connector (JR2). The signal generator settings are: square wave = 62.5 kHz, duty cycle = 50%, amplitude = 3.3 V, output impedance = 50 Ω.
5. Enable the signal generator. The signal waveforms can be probed at various test points, as shown in Figure 3:
   - TP1: VOA (RX) is the output voltage from channel-A of the FOD8012.
   - TP2: VINB (TX) is the input voltage to channel-B of the FOD8012. Signal from the signal generator is applied here.
   - TP3: VINA is the input voltage to channel-A of the FOD8012. This signal is supplied by the CAN transceiver.
   - TP4: VOB is the output voltage from channel-B of the FOD8012, which in turn drives the input of the CAN transceiver.
   - TP5 & TP6: CANH and CANL are the CAN transceivers outputs.
   - TP7 to TP10: grounds.

4. Schematic

The FEBFOD8012_CAN board is designed to assist evaluation of the FOD8012 timing sequence and AC test performance with a CAN transceiver. It should be used in conjunction with the product datasheet.

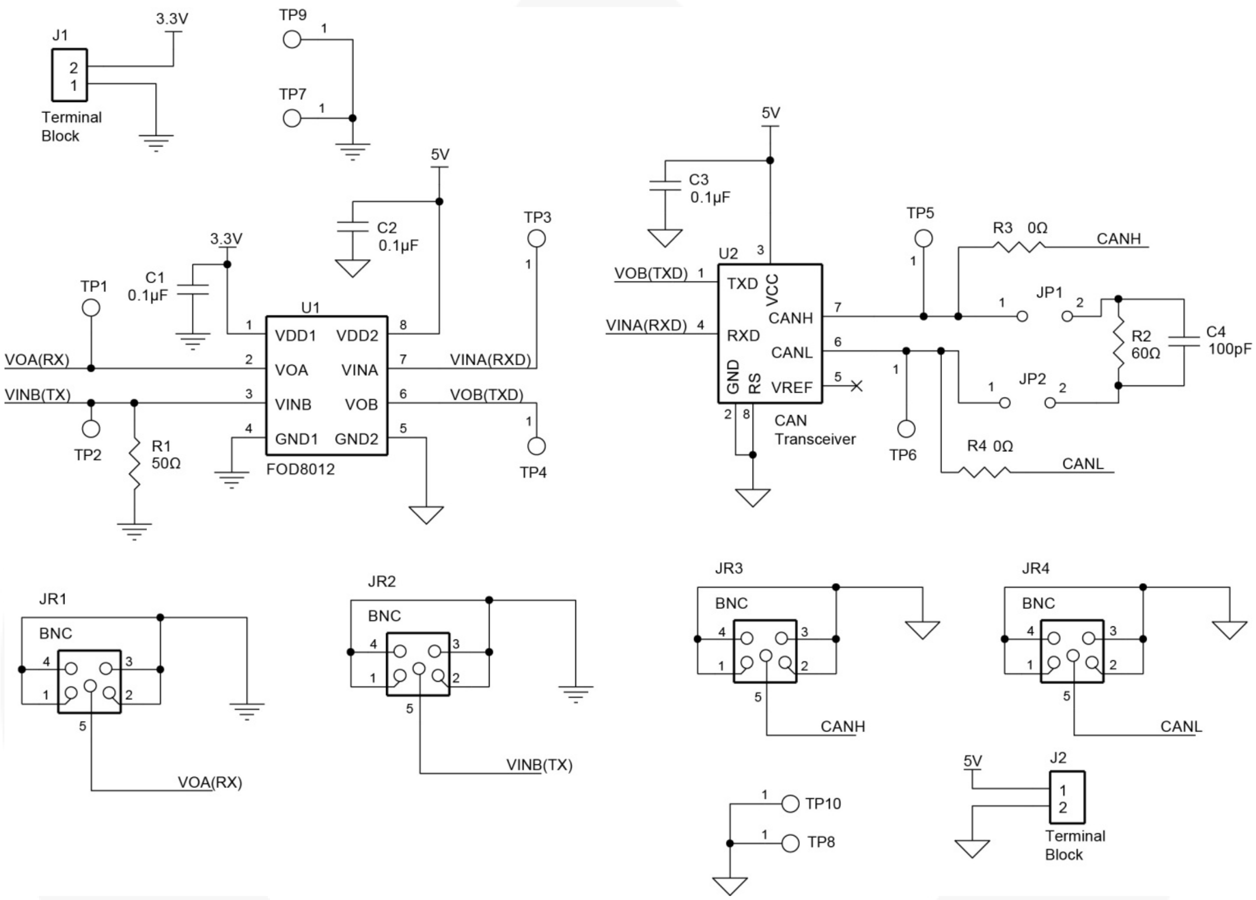


Figure 4. Evaluation Board Schematic

5. Scope Shots

The scope shots in Figure 5 through Figure 7 illustrate normal operation of the CAN data transfer via the isolated channels of the FOD8012. Refer to Figure 4 for the schematic.

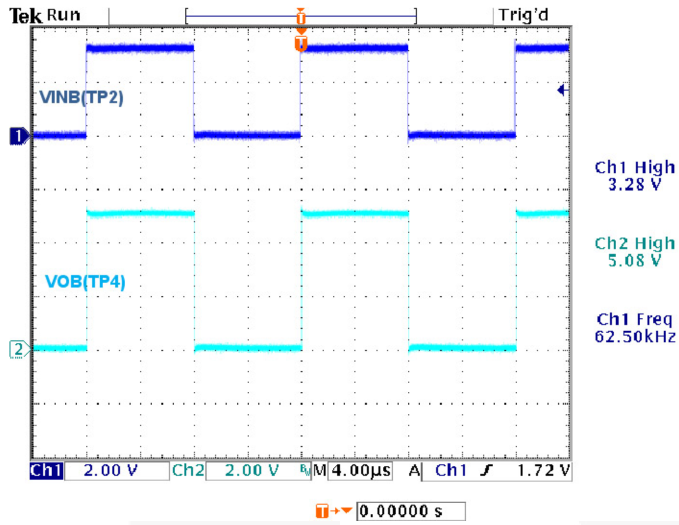


Figure 5. VINB is the Input Signal; FOD8012 Output Signal, VOB, Drives CAN Transceiver

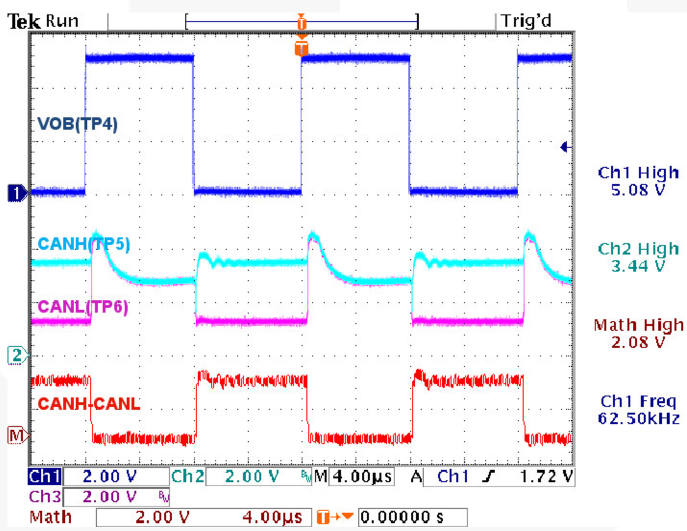


Figure 6. FOD8012 Output Signal, VOB, Drives CAN Transceiver; Resulting CAN Output Signals, CANH and CANL, are Single-Ended Output Signals; $V_{(CANH–CANL)}$ = Differential Output Signal

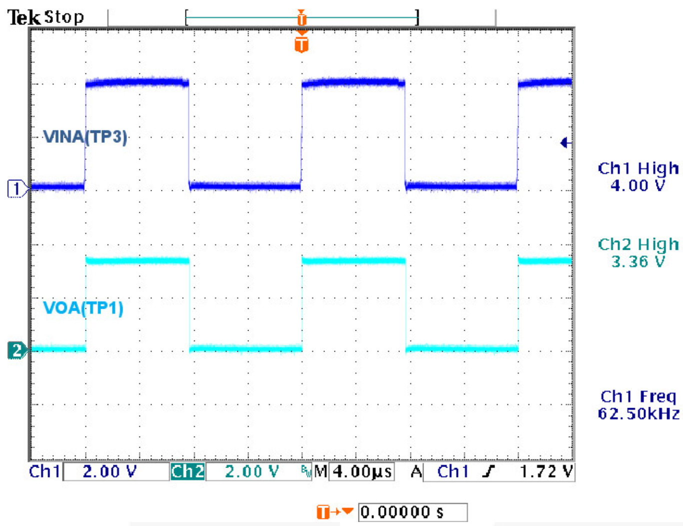


Figure 7. Output Signal from CAN Transceiver Drives Input, VINA, of FOD8012, VOA = FOD8012 Output Signal

6. Conclusion

The FEBFOD8012_CAN evaluation board allows the user to evaluate the performance of the FOD8012 in a bi-directional data-transmission application with the CAN transceiver. Measurement results clearly demonstrate the high-speed performance of the FOD8012.

7. Revision History

Rev.	Date	Description
1.0.0	August 2012	Initial Release

WARNING AND DISCLAIMER

Replace components on the Evaluation Board only with those parts shown on the parts list (or Bill of Materials) in the Users' Guide. Contact an authorized Fairchild representative with any questions.

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