EVM User's Guide: ISOM8110DFGEVM

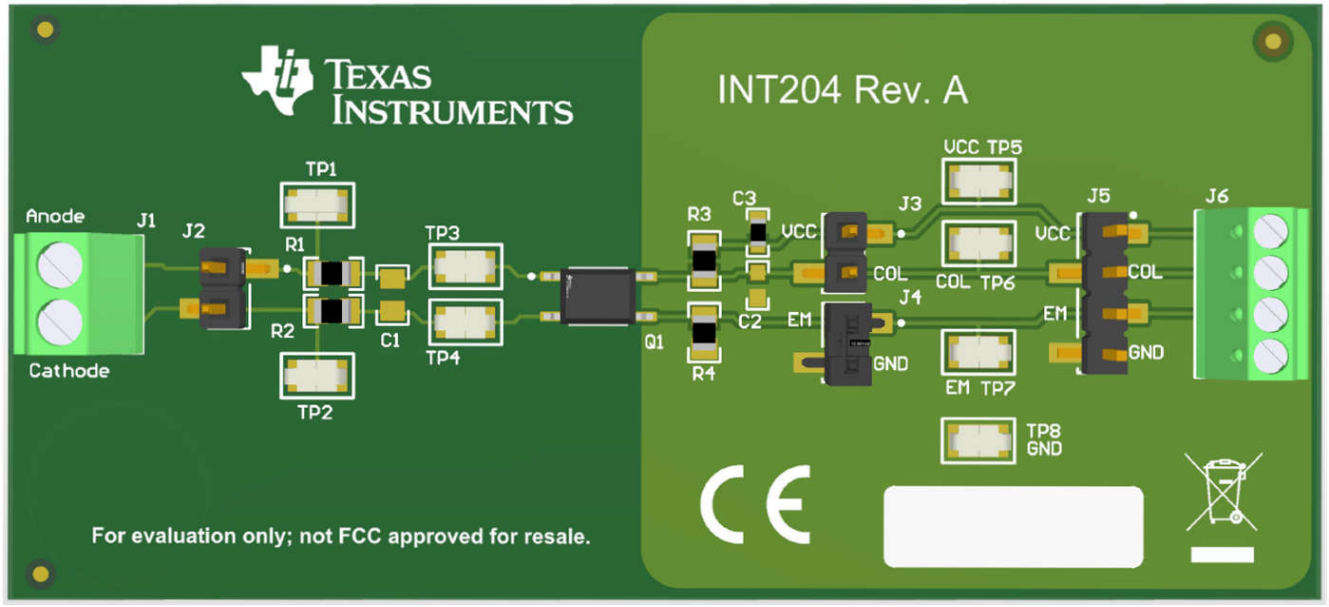
ISOM8110 Single-Channel Opto-Emulator with Analog Transistor Output Evaluation Module

Description

The ISOM8110 opto-emulator offers significant reliability and performance advantages compared to optocouplers, including high bandwidth, low turn-off delay, low power consumption, wider temperature ranges, tight CTR and process controls resulting in small part-to-part skew. Since there is no aging effect or temperature variation to compensate for, the emulated diode-input stage consumes less power than optocouplers.

Features

- Platform for complete evaluation of the ISOM8110DFG
- Test points and jumper options
- Passives and footprints for basic modifications included
- Drop-in upgradable and pin-compatible for popular phototransistor optocouplers
- 1 channel diode-emulator input
- Current transfer ratio (CTR): at IF = 5 mA, VCE = 5 V – ISOM8110: 100% to 155%
- High collector-emitter voltage: VCEO (max) = 80 V
- Robust isolation barrier



ISOM8110DFGEVM CAD Image

1 Evaluation Module Overview

1.1 Introduction

The ISOM8110DFGEVM user's guide describes the functionality of the ISOM8110 Single-Channel Opto-Emulator with Analog Transistor Output Evaluation Module (EVM). The ISOM8110DFGEVM supports evaluation of TI's ISOM8110 Opto-Emulator in a 4-pin DFG SOIC package. This user's guide describes EVM operation with respect to the ISOM8110 under 5 V operation. The EVM can be reconfigured for evaluation with a larger input signal or other applications by changing the EVM configuration and component values. The user's guide also covers the channel configuration of the ISOM8110, EVM schematic, and typical setup.

CAUTION

This evaluation module is made available for isolator parameter performance evaluation only and is not intended for isolation voltage testing. To prevent damage to the EVM, any voltage applied as a supply or digital input/output must be maintained within the recommended operating conditions of the device.

1.2 Kit Contents

This evaluation module contains one PCB evaluation board containing one ISOM8110DFG device. The major components of the ISOM8110 evaluation board are:

- ISOM8110DFG Opto-Emulator
- Multiple on-board test points

To demonstrate functionality of the ISOM8110DFG, TI recommends the following (not included):

- Oscilloscope
- Signal Generator

1.3 Specification

The ISOM8110 device is capable of being pin-compatible and drop-in replaceable with many opto-coupler devices with transistor outputs. Opto-emulators offer significant reliability and performance advantages compared to traditional opto-couplers, including tighter current transfer ratio (CTR), low input current, and wider temperature ranges.

The ISOM8110 Opto-Emulator replicates the characteristics of traditional opto-couplers without the drawbacks of aging and thermal drift by using a input-diode emulator and output stage separated by a silicon oxide (SiO2) insulation barrier. When used with isolated power supplies, these devices block high voltages, isolate grounds, and prevent noise currents from interfering with or damaging sensitive circuitry.

1.4 Device Information

The ISOM8110DFGEVM contains one ISOM8110 and all other passive components required for operation. The various components included in the evaluation module directly control the operation and functionality of the ISOM8110. If necessary, then components can be removed, added, or replaced to modify the behavior of the ISOM8110 accordingly for any given application.

2 Hardware

2.1 EVM Setup and Operation

Basic EVM Setup

This section describes the setup and operation of the EVM for parameter performance evaluation. Figure 2-1 shows a typical test configuration of the ISOM8110 Opto-Emulator EVM using a current source.

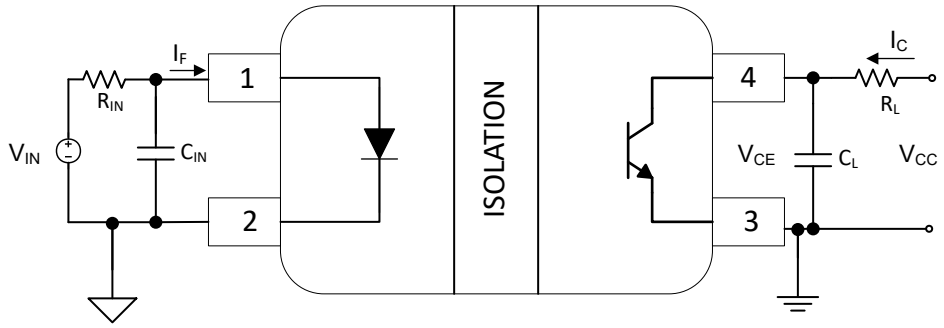


Figure 2-1. Basic EVM Operation

ISOM8110DFGEVM has *do not populate* (DNP) footprints for components which can be populated to apply different test conditions to the device. Section 2.1 lists and describes possible test configurations that can be achieved by modifying different components on the EVM.

Table 2-1. Component Configurations

Component	Description
R1	R1 is sized for 5 V operation. If a larger supply is needed, then select a resistor that provides the proper I_F current to the anode.
J3	Shunt J3 to use the output as a high side output (emitter pin). **Never shunt J3 and J4 at the same time.**
J4	Shunt J4 to use the output as a low side output (collector pin). **Never shunt J3 and J4 at the same time.**
C1, C2	C1 and C2 can be used to add capacitance to the input diode or collector output, respectively.

2.2 Pin Configuration of the ISOM8110 Single-Channel Opto-Emulator with Analog Transistor Output

Figure 2-2 shows the ISOM8110 Single-Channel Opto-Emulator with Analog Transistor Output pin configuration.

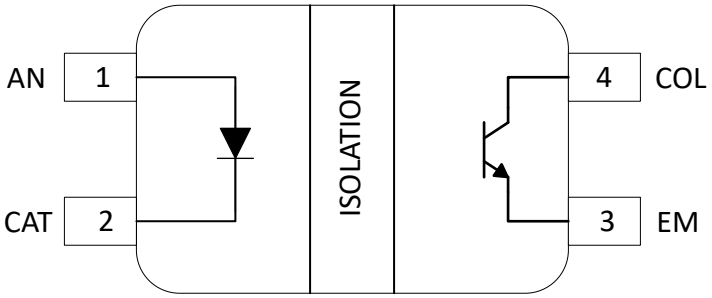


Figure 2-2. ISOM8110 Single-Channel Opto-Emulator with Analog Transistor Output Pin Configuration

3 Hardware Design Files

3.1 Schematics

The ISOM8110DFGEVM has additional footprints that gives the user flexibility to test a variety of common applications.

Other positions on the board can be modified as well. For example, R1 can be changed to accommodate different current requirements, and C2 can be added to test the device with resistive or capacitive loading. See ISOM8110DFGEVM for the EVM schematic and see Table 2-1 for more information on alternate EVM configurations.

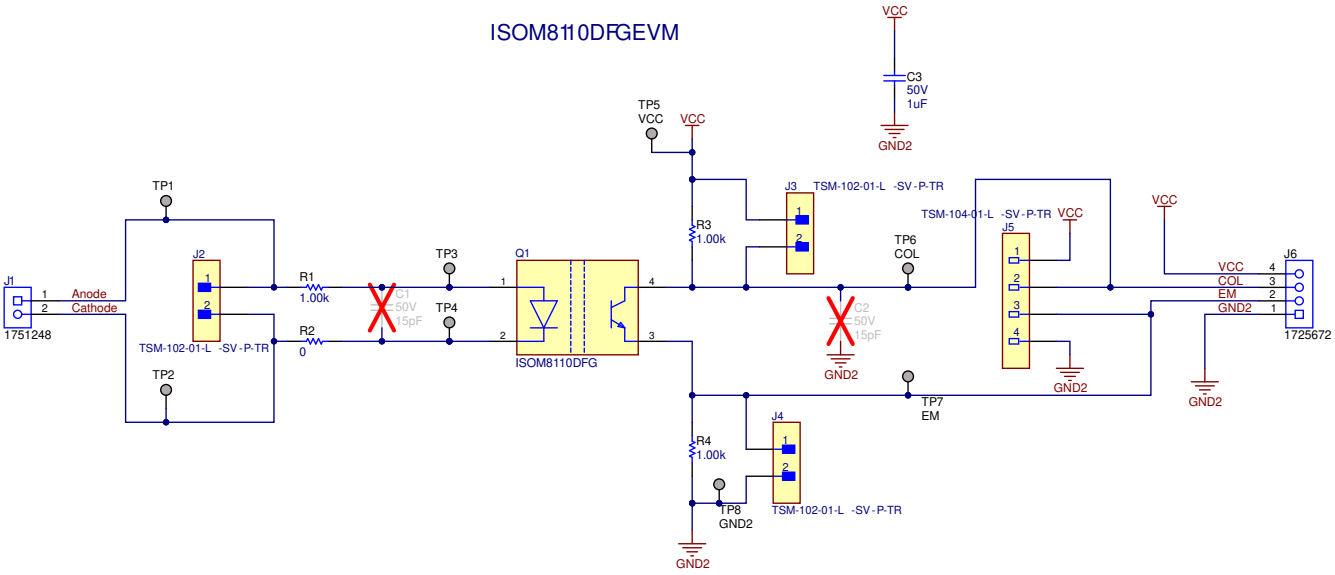


Figure 3-1. ISOM8110DFGEVM Schematic

3.2 PCB Layout and 3D Diagram

Figure 3-2 and Figure 3-3 show the printed-circuit board (PCB) layout top and bottom, respectively, and Figure 3-4 shows a 3D diagram of the EVM PCB.

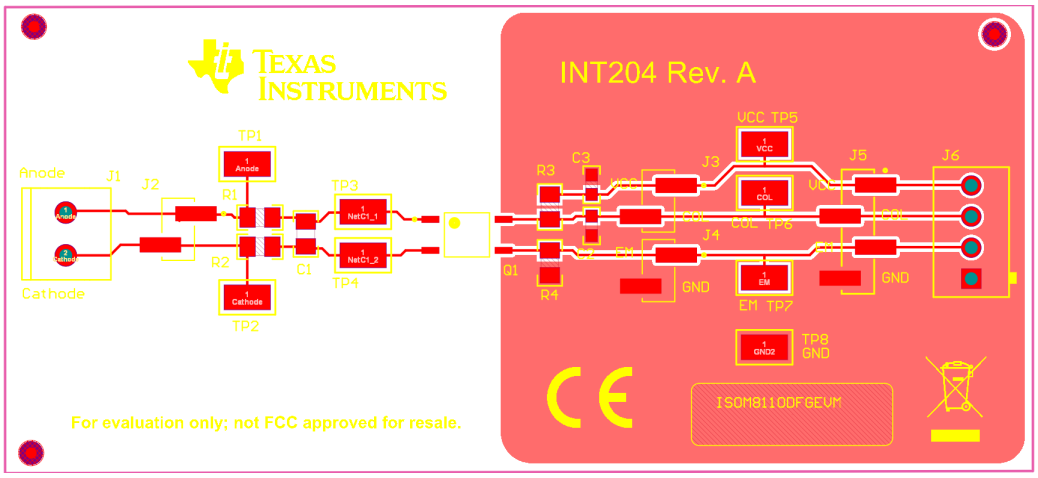


Figure 3-2. ISOM8110DFGEVM PCB Layout - Top

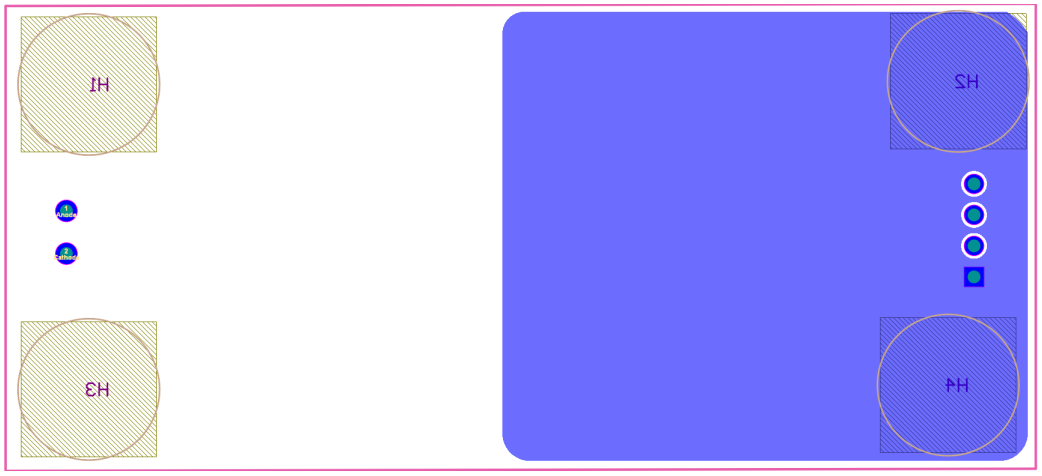


Figure 3-3. ISOM8110DFGEVM PCB Layout - Bottom

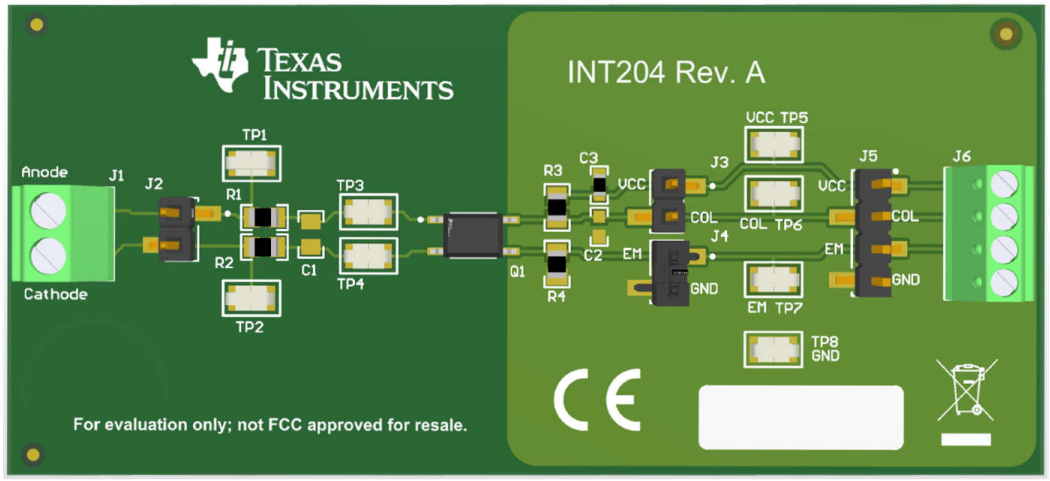


Figure 3-4. ISOM8110DFGEVM PCB 3D Diagram

3.3 Bill of Materials

Table 3-1 lists the bill of materials (BOM) for the ISOM8110DFGEVM.

Table 3-1. Bill of Materials

Item #	Designator	Manufacturer	Description
1	C3	TDK	CAP, CERM, 1 uF, 50 V, +/- 10%, X5R, 0603
2	H1, H2, H3, H4	3M	Bumpon, Hemisphere, 0.44 X 0.20, Clear
3	J1	Phoenix Contact	Conn Term Block, 2POS, 3.5mm, TH
4	J2, J3, J4	Samtec	Connector Header Surface Mount 2 position 0.100" (2.54mm)
5	J5	Samtec	Connector Header Surface Mount 4 position 0.100" (2.54mm)
6	J6	Phoenix Contact	Terminal Block, 4x1, 2.54 mm, Green, TH
7	Q1	Texas Instruments	3.75-kVRMS, Single-Channel Opto-Emulator with Transistor Output
8	R1, R3, R4	Panasonic	RES, 1.00 k, 1%, 0.25 W, 0805
9	R2	Yageo America	RES, 0, 5%, 0.125 W, 0805
10	SH-J1	Samtec	Shunt, 100mil, Gold plated, Black
11	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8	Keystone	Test Point, Miniature, SMT
12	C1	Yageo America	CAP, CERM, 15 pF, 50 V, +/- 5%, C0G/NP0, 0805
13	C2	MuRata	CAP, CERM, 15 pF, 50 V, +/- 5%, C0G/NP0, AEC-Q200 Grade 1, 0603

4 Additional Information

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NOTE:

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CAUTION

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

3.2 *Canada*

3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247*

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. Operation is subject to the following two conditions:

(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur

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https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-delivered-in-japan.html

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1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
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