EVM User's Guide: ISOM-EVM

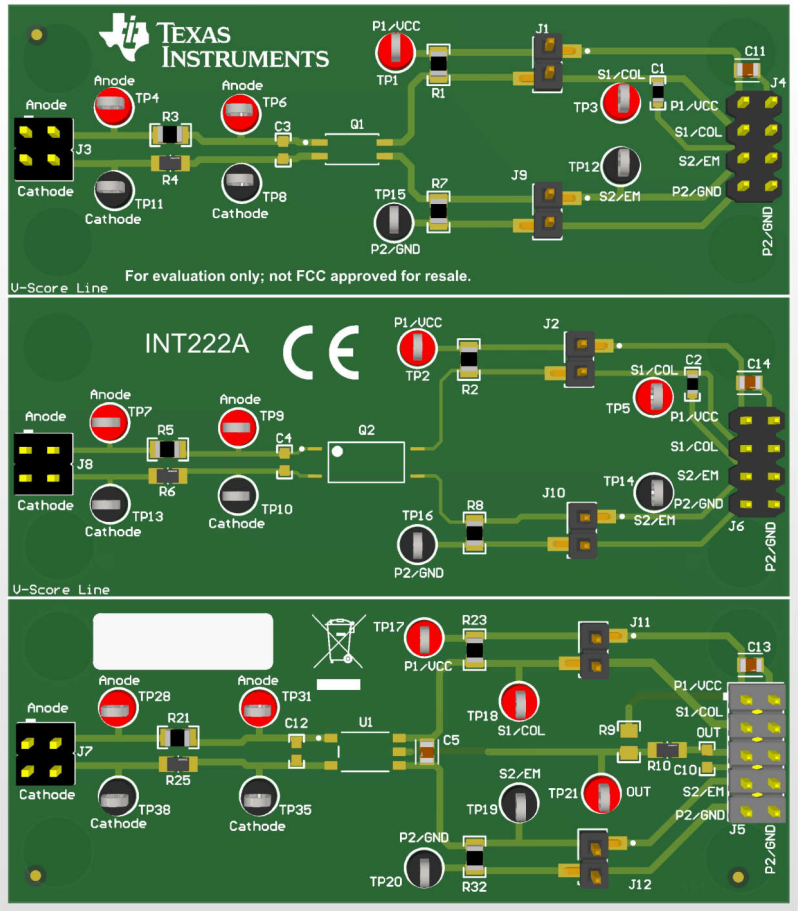
ISOM-EVM Universal Opto-emulator Evaluation Module

Description

Opto-emulators offers significant reliability and performance advantages compared to optocouplers, including wider temperature ranges and tight process controls resulting in small part-to-part variation. Since there is no aging effect or temperature variation to compensate for, the emulated diode-input stage consumes less power compared to optocouplers, which have LED aging and require higher bias currents over the device lifetime.

Features

- Platform for complete evaluation of opto-emulators with different package footprint options
- Break-away design allows for easy separation of board footprints
- Test points and jumper options
- Passives and footprints for basic modifications included
- One channel diode-emulator input
- Robust isolation barrier



ISOM8610DFGEVM

1 Evaluation Module Overview

1.1 Introduction

The ISOM-EVM supports evaluation of TI's Opto-emulators in a 5-pin DFF, 4-pin DFG, 4-pin DFH, and 4-pin DFS SOIC packages. The EVM can be reconfigured for evaluation for different Opto-emulators, different input signal, or other applications by changing the EVM configuration and component values. The EVM does not have Opto-emulator ICs mounted on the board to allow the user to mount a compatible IC of their own choosing. The user can break apart the board into three separate units to test the PCBs individually. The user's guide also covers the pin configuration of Opto-emulators, 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. The major components of the ISOM-EVM evaluation board are:

- Multiple Opto-emulator footprint compatibility
- Multiple on-board test points
- Input and output headers

To demonstrate functionality of the Opto-emulators, TI recommends the following (not included):

- Oscilloscope
- Signal generator

1.3 Specification

Opto-emulator devices are capable of being pin-compatible and drop-in replaceable with many optocoupler devices. Opto-emulators offer significant reliability and performance advantages compared to traditional optocouplers, low input current, and wider temperature ranges.

Opto-emulators replicates the characteristics of traditional optocouplers without the drawbacks of aging and thermal drift by using an input-diode emulator and output stage separated by a silicon oxide (SiO2) insulation barrier. Opto-emulators can be used to block high voltages, isolate grounds, and prevents noise currents from interfering with or damaging sensitive circuitry.

1.4 Device Information

The ISOM-EVM contains passive components required for operation of opto-emulators. The various components included in the evaluation module directly control the operation and functionality of opto-emulator devices. If necessary, components can be removed, added, or replaced to modify the behavior of the opto-emulator accordingly for any given application.

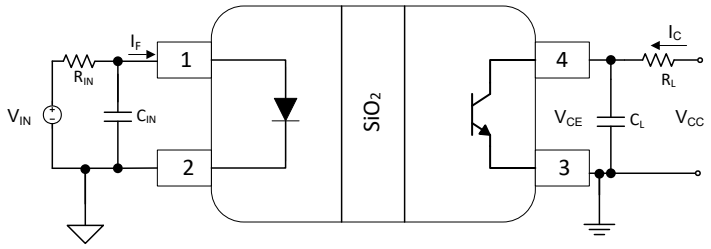
2 Hardware

2.1 EVM Setup and Operation

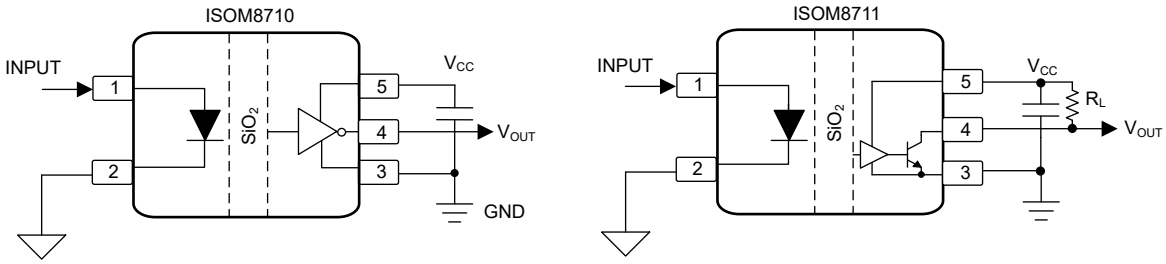
Basic EVM Setup

This section describes the setup and operation of the EVM for parameter performance evaluation. Figure 2-1 shows a typical test configuration of the ISOM-EVM.

ISOM811x Basic EVM Operation



ISOM871x Basic EVM Operation



ISOM86xx Basic EVM Operation

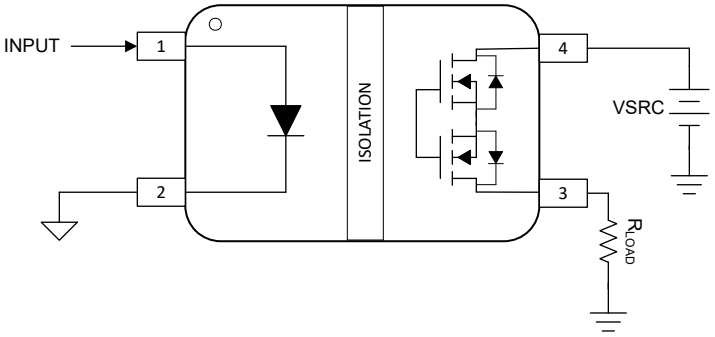


Figure 2-1. Basic EVM Operation

The simplest EVM setup is to test using a 5V input with and a $5V_{SRC}$. The input resistor is sized to accommodate up to 24V logic inputs. ISOM-EVM 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
R3, R5, R21	R3, R5, and R21 are sized for 5V - 24V operation. If a larger supply or smaller value is needed, then select a resistor that provides the desired I_F current to the anode.
R4, R6, R25	R4, R6, and R25 are 0Ω resistors, which allows for configurable EVM test conditions.
J1, J2, J11	Shunt J1, J2, or J11 to use the output as a high side output (emitter pin). Never shunt J1 and J9, J2 and J10, or J11 and J12 at the same time.
J9, J10, J12	Shunt J9, J10, J12 to use the output as a low side output (collector pin). Never shunt J1 and J9, J2 and J10, or J11 and J12 at the same time.

Table 2-1. Component Configurations (continued)

Component	Description
C3, C4, C12	C3, C4, and C12 can be used to add capacitance to the input diode.
R9	If a pullup resistor is desired, populate R9.
R10 , C10	One or more of these components can be added or modified to test the device with additional output impeadance, resistive or capacitive loads.

2.2 Pin Configuration of Opto-emulators

Figure 2-2 shows the ISOM8110 Single-Channel Opto-emulator with analog transistor output pin configuration.

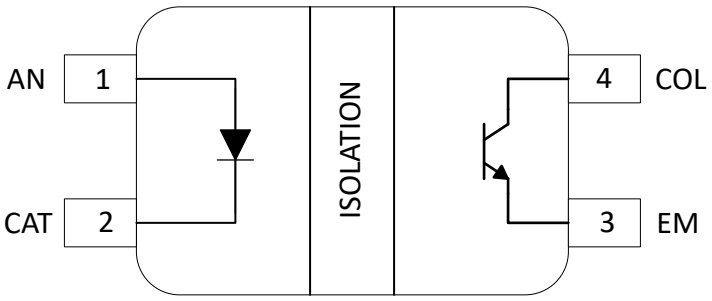


Figure 2-2. ISOM8110 Single-Channel Opto-emulator with Analog Transistor Output Pin Configuration

Figure 2-3 shows the ISOM8710 High-Speed Single-Channel Opto-emulator pin configuration.

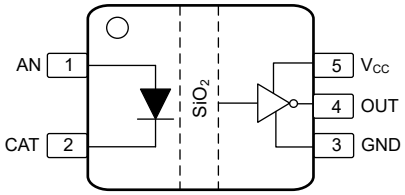


Figure 2-3. ISOM8710 High-Speed Single-Channel Opto-emulator Pin Configuration

Figure 2-4 shows the ISOM8610 Normally Open Opto-Emulator Switch with Integrated FETs Output pin configuration.

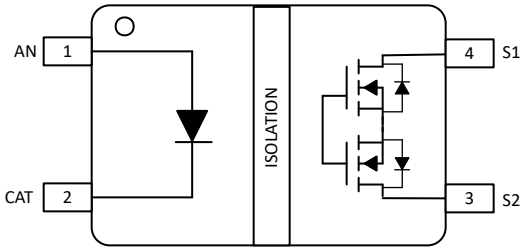


Figure 2-4. ISOM8610 Normally Open Opto-Emulator Switch with Integrated FETs Output Pin Configuration

3 Hardware Design Files

3.1 Schematics

The ISOM-EVM has several footprints that gives the user flexibility to test a variety of common applications, such as the 4-pin DFH (top section), 4-pin DFS (middle section), 5-pin DFF (bottom section), and 4-pin DFG (bottom section) packages. These sections can be separated into smaller boards. The user can also mount any desired Opto-emulator device to a different compatible footprint.

Other positions on the board can be modified as well. For example, the resistors can be changed to accommodate different current requirements, and capacitors can be added to test the device with resistive or capacitive loading. See the ISOM-EVM Figure 3-1, Figure 3-2, and Figure 3-3 for the EVM schematics and see Table 2-1 for more information on alternate EVM configurations.

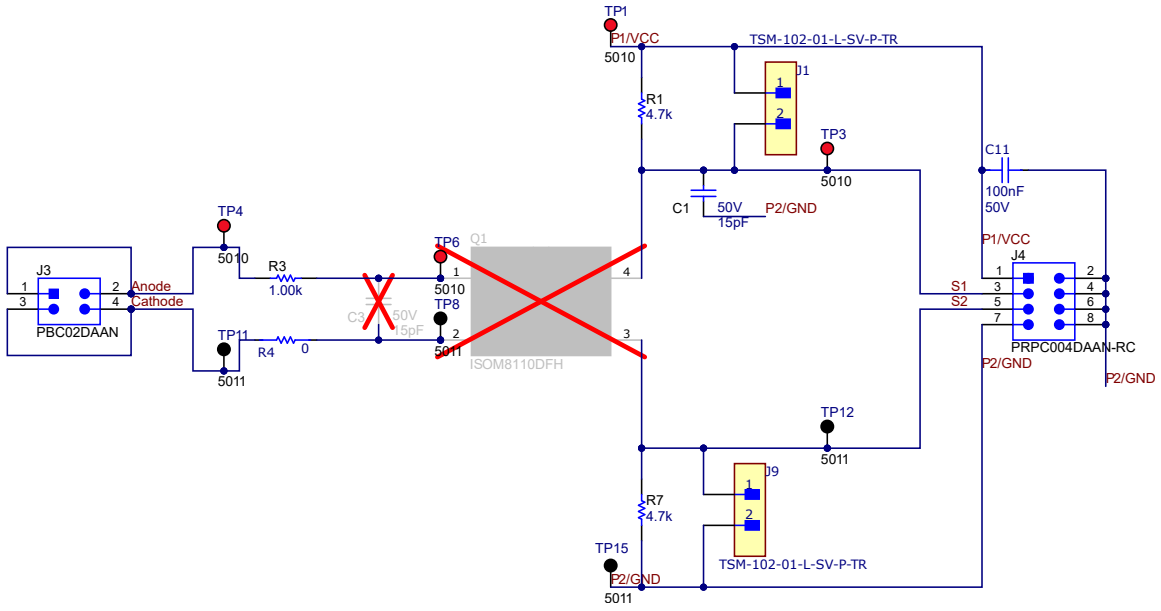


Figure 3-1. DFH Package

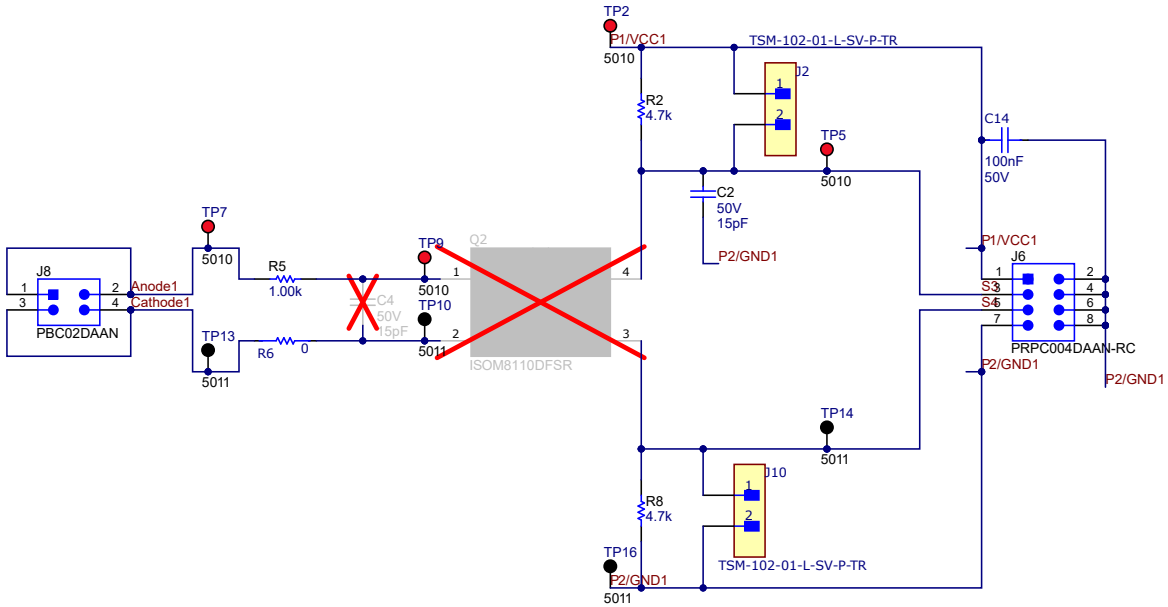


Figure 3-2. DFS Package

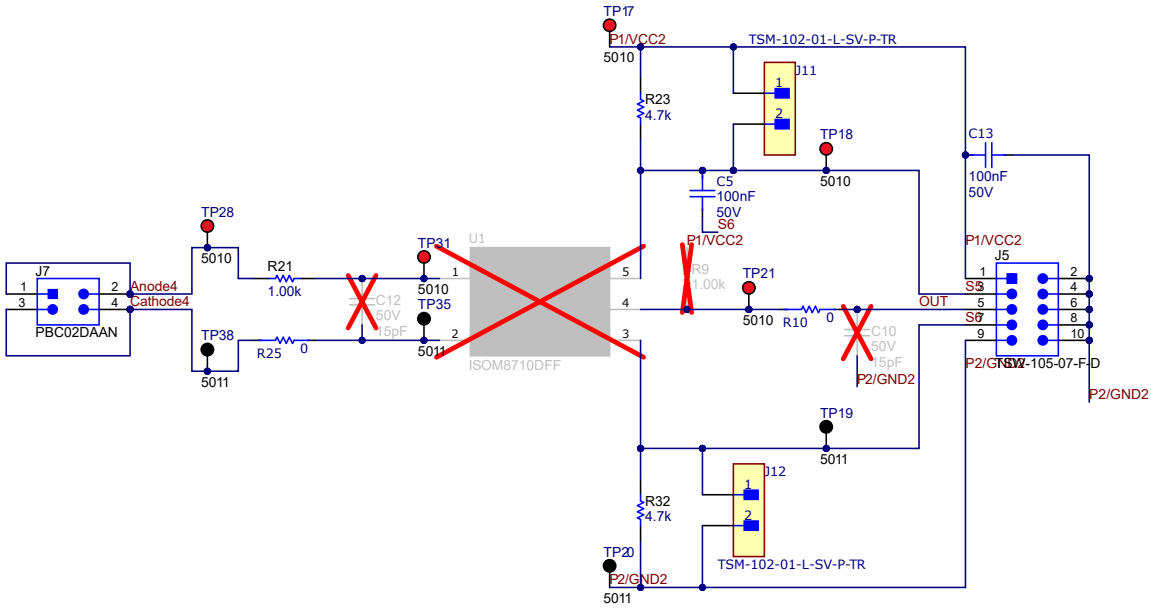


Figure 3-3. DFF and DFG Package

3.2 PCB Layout and 3D Diagram

Figure 3-4 and Figure 3-5 show the printed-circuit board (PCB) layout top and bottom, respectively, and Figure 3-6 shows a 3D diagram of the EVM PCB.

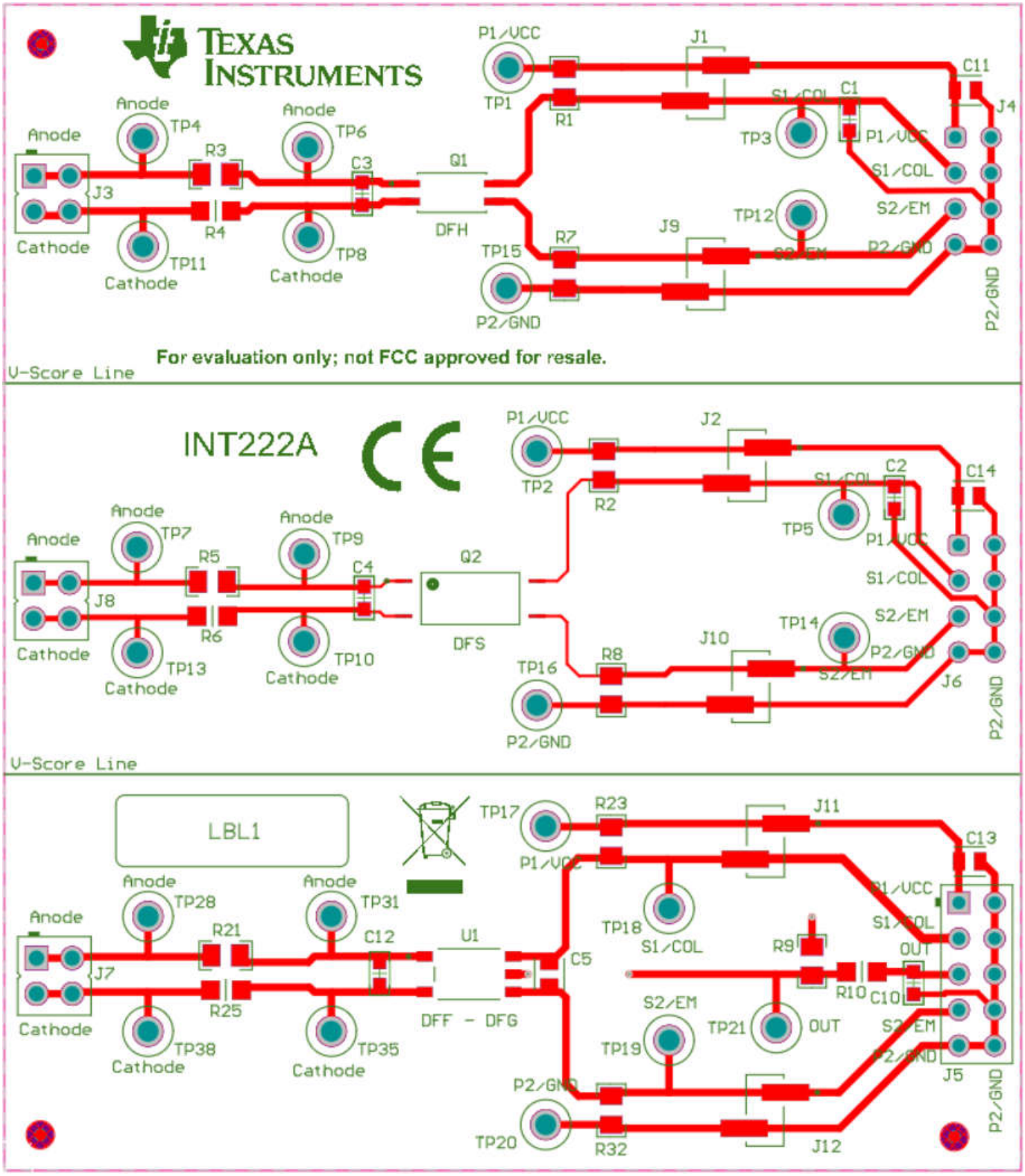


Figure 3-4. ISOM-EVM PCB Layout - Top

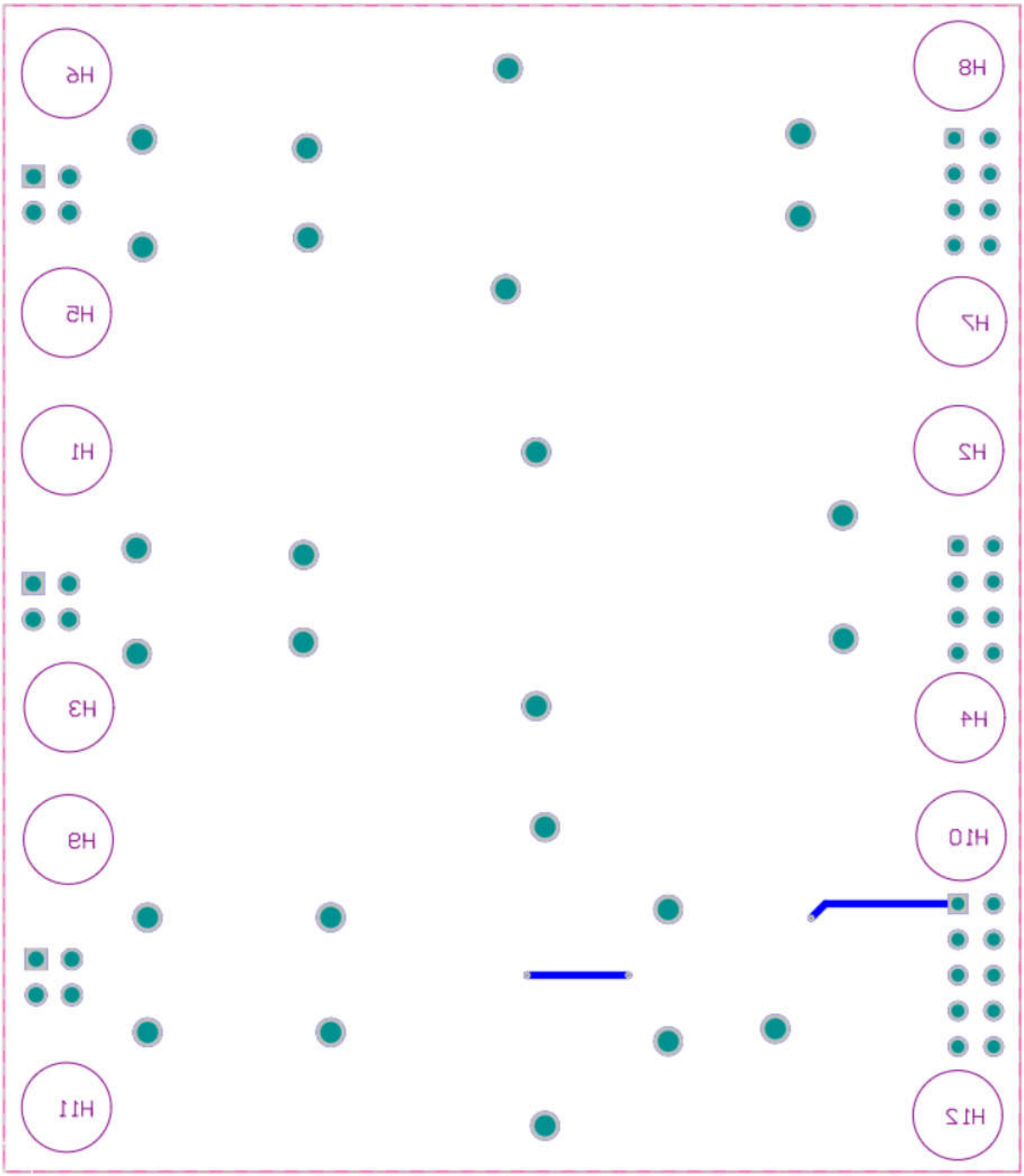


Figure 3-5. ISOM-EVM PCB Layout - Bottom

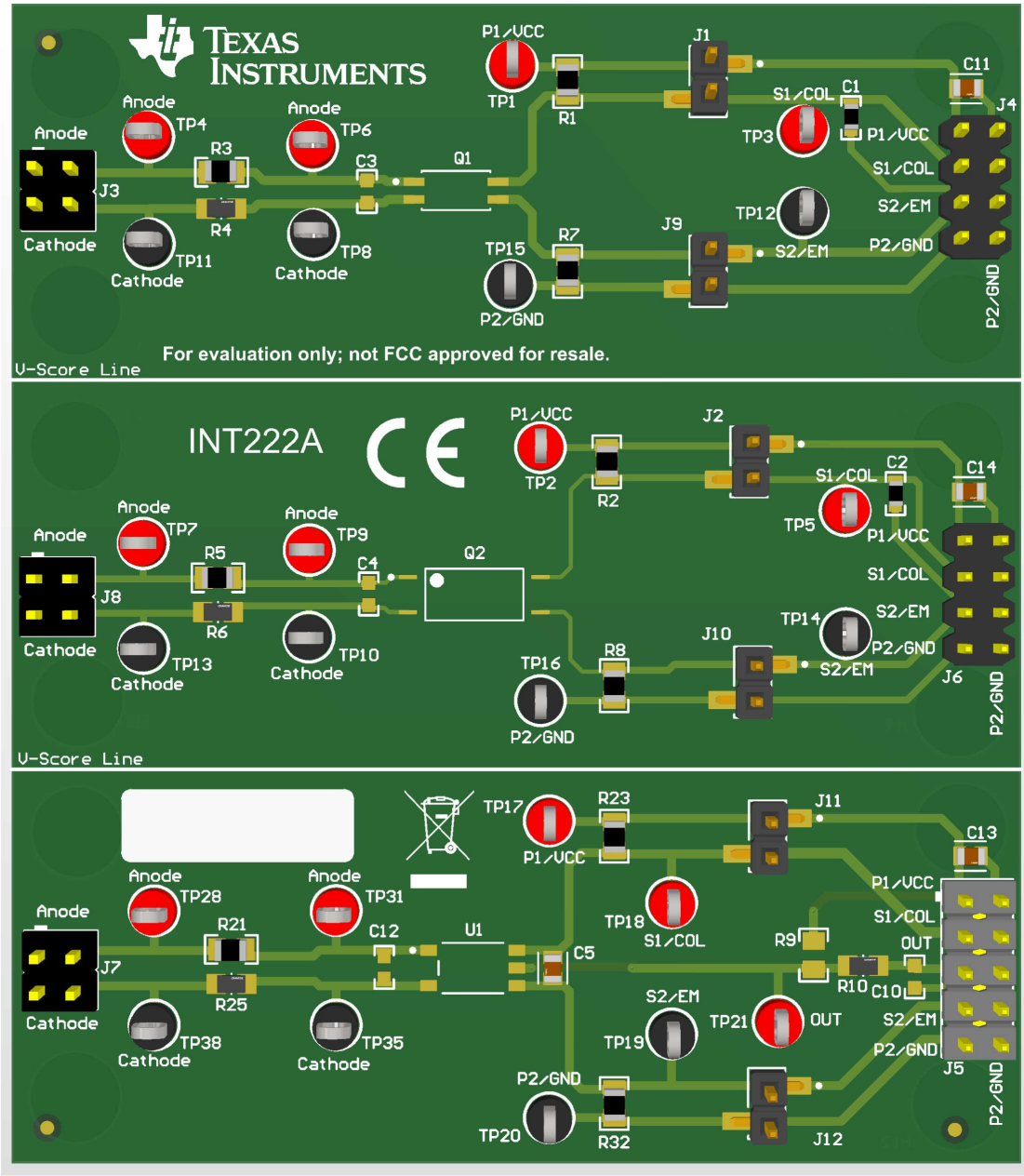


Figure 3-6. ISOM-EVM PCB 3D Diagram

3.3 Bill of Materials

Table 3-1 lists the bill of materials (BOM) for the ISOM8610DFGEVM.

Table 3-1. Bill of Materials

Item #	Designator	Manufacturer	Description
	J1, J2, J9, J10, J11, J12	Samtec	Connector Header Surface Mount 2 position 0.100" (2.54mm)
	J3, J7, J8	Sullins Connector	Header, 2.54mm, 2x2, Gold, TH
	J4, J6	Sullins Connector	Header, 2.54mm, 4x2, Gold, TH
	J5	Samtec	Header, 2.54mm, 5x2, Gold, Black, TH
	R1, R2, R7, R8, R23, R32	Panasonic	RES, 4.7 k, 5%, 0.125 W, AEC-Q200 Grade 0, 0805
	R3, R5, R21	Panasonic	RES, 1.00 k, 1%, 0.25 W, 0805
	R4, R6, R10, R25	Ohmite	0 Ohms Jumper 0.245W Chip Resistor 0805 (2012 Metric) - Metal Element
	TP0, TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP9, TP17, TP18, TP21, TP28, TP31	Keystone	Test Point, Multipurpose, Red, TH
	TP10, TP11, TP12, TP13, TP14, TP15, TP16, TP19, TP20, TP35, TP38	Keystone	Test Point, Multipurpose, Black, TH
	C1, C2, C3, C4, C10, C12	Wurth Elektronik	CAP, CERM, 15 pF, 50 V, +/- 5%, C0G/NP0, 0603
	C5, C11, C13, C14	KEMET	0.1 µF ±10% 50V Ceramic Capacitor X7R 0805 (2012 Metric)
	H1, H2, H3, H4, H5, H6, H7, H8, H9, H10, H11, H12	3M	Bumpon, Hemisphere, 0.25 X 0.075, Clear

4 Additional Information

4.1 Trademarks

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