

ISO71xx EVM User's Guide

This user's guide details the evaluation module (EVM) operation of a factory-installed ISO7131 triple-channel digital isolator. However, the EVM board may be reconfigured by a user for evaluation of any of TI's triple- and quad-channel isolators in the DBQ package. These devices include the ISO7140, ISO7141, and ISO7142. This guide also explains the user-configurable I/O loads for each available device.

CAUTION

This evaluation module (EVM) is made available for evaluating isolator parameter performance 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 0-V to 5.5-V operation range.

WARNING

Exceeding the specified input voltage range may cause unexpected operation, irreversible damage, or both, to the EVM. For Vcc1 and Vcc2, the specified voltage range is any combination of 2.7 V, 3.3 V, and 5 V. The input voltage range for the digital channels is 0 V to VCCX +0.5 V. After reading the device datasheet specifications, if there are questions concerning the input voltage range, contact a TI field representative prior to connecting power.

Applying loads outside of the specified output range may result in unintended operation, possible permanent damage, or both, to the EVM. After referring to the device datasheet, if there is uncertainty as to the load specification, contact a TI field representative.

During normal EVM operation, case temperatures greater than 60°C may be expected. The EVM is designed to operate properly above 60°C as long as the input and output ranges are maintained within data sheet specifications. When placing measurement probes near these devices during operation, be aware that these devices may be very warm to the touch.

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Overview

The ISO71xx digital isolators have a logic input and output buffer separated by a silicon dioxide (SiO₂) insulation barrier. Used with isolated power supplies, these devices block high voltage, isolate grounds, and prevent noise currents on a data bus or other circuits from entering the local ground and interfering with or damaging sensitive circuitry.

A binary input signal is conditioned, translated to a balanced signal, and then differentiated by the capacitive isolation barrier. Across the isolation barrier, a differential comparator receives the logic transition information, then sets or resets a flip-flop and the output circuit accordingly. A periodic update pulse is sent across the barrier to ensure the proper dc level of the output. If this dc-refresh pulse is not received for more than 4 μ s, the input is assumed to be unpowered or not being actively driven, and a failsafe circuit drives the output to a logic-high state. For the ISO7140FCC and ISO7141FCC isolators, the failsafe condition is the logic-low state.

CAUTION

Note that although these isolator devices provide galvanic isolation of up to 3000 Vrms, this EVM cannot be used for isolation voltage testing. It is designed for the evaluation of device operating parameters only and may be damaged if a voltage exceeding 5.5 V is applied anywhere in the circuit.

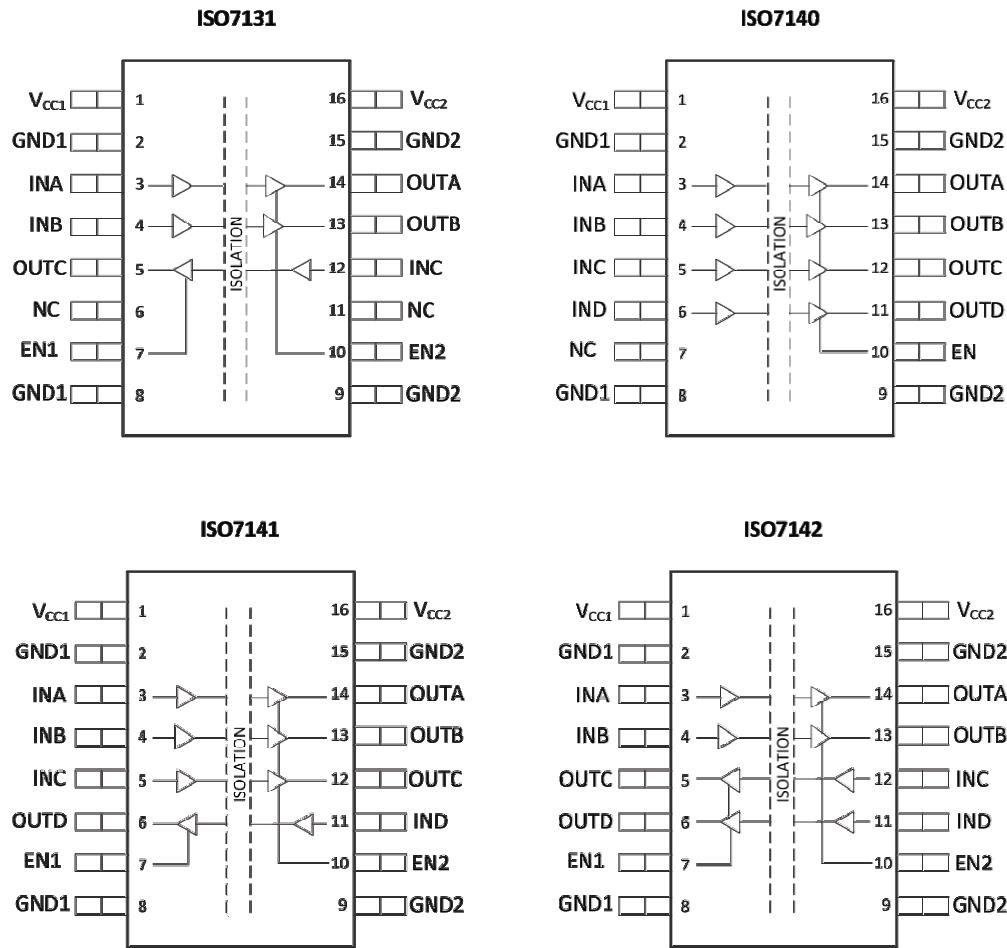


Figure 1. ISO7131, ISO7140, ISO7141, and ISO7142 Pinout

EVM Schematics of the Triple and Quad Isolators

This multifunctional EVM is designed with the signal paths displayed in [Figure 2](#) through [Figure 5](#) for the evaluation of the ISO7131, ISO7140, ISO7141 and ISO7142.

Note that each input channel has a 50- Ω load resistor to ground. Each output channel has a 4.7-pF load capacitor to ground. These are not populated by default. Instead, there are pads on the board for the user to install either a resistor or capacitor, depending on the desired configuration.

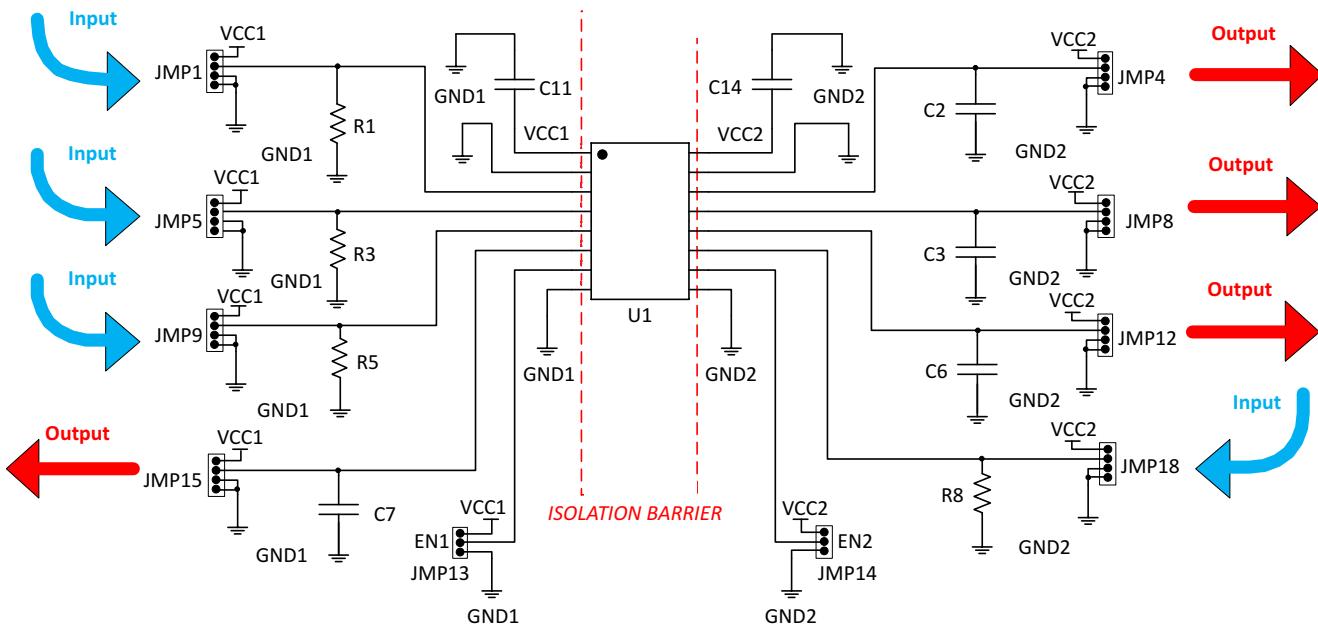


Figure 2. ISO7131 Opposing-Channel Direction EVM Schematic

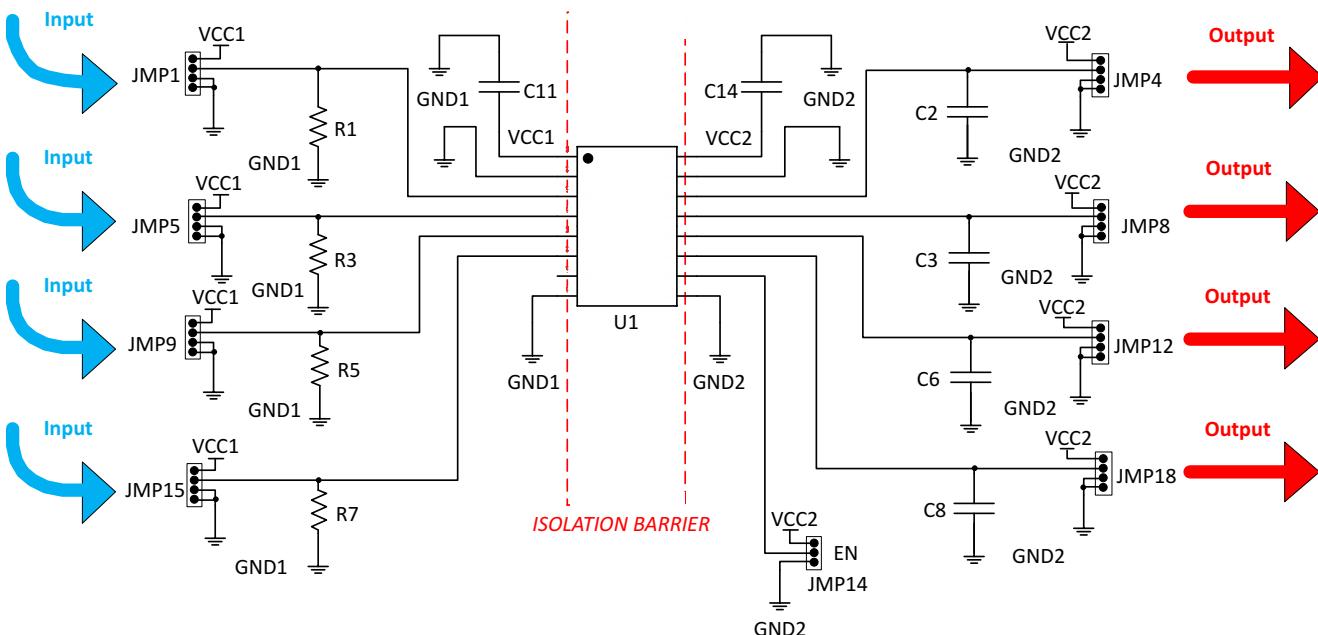


Figure 3. ISO7140 Same-Channel Direction EVM Schematic

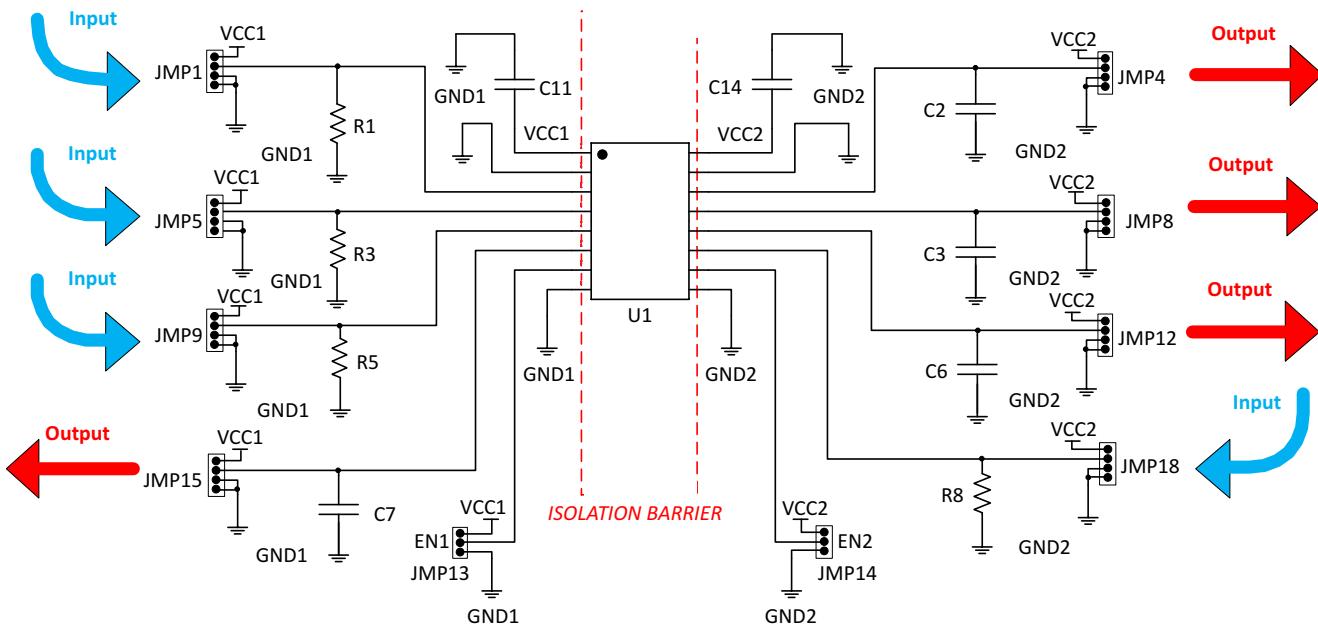


Figure 4. ISO7141 Opposing-Channel Direction EVM Schematic

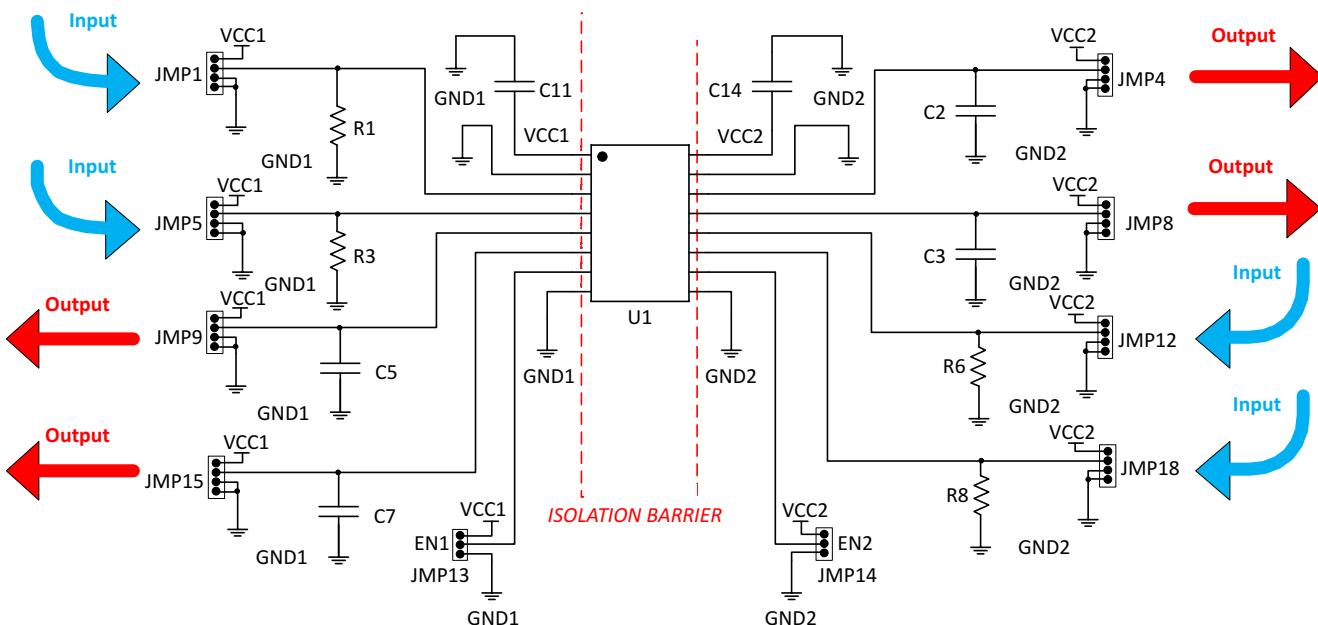


Figure 5. ISO7142 Opposing-Channel Direction EVM Schematic

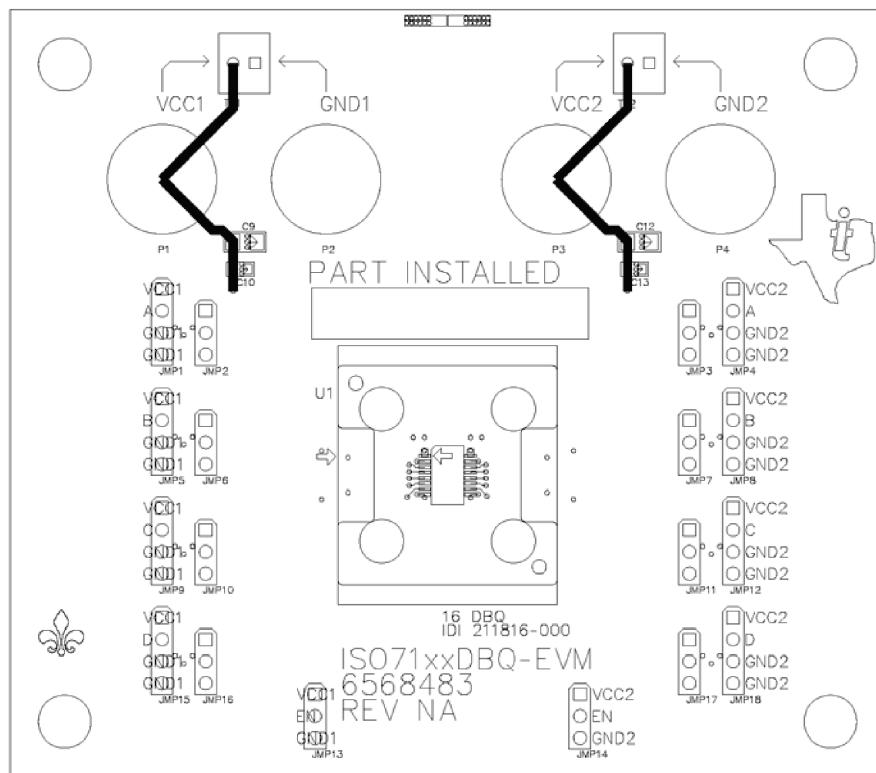


Figure 6. Top Layer

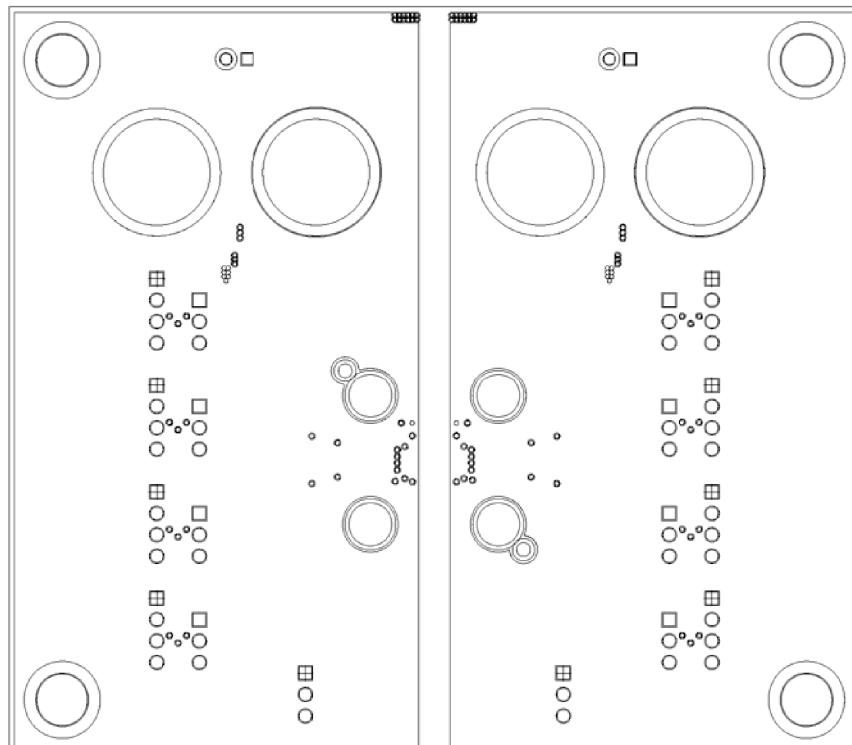


Figure 7. Layer 2

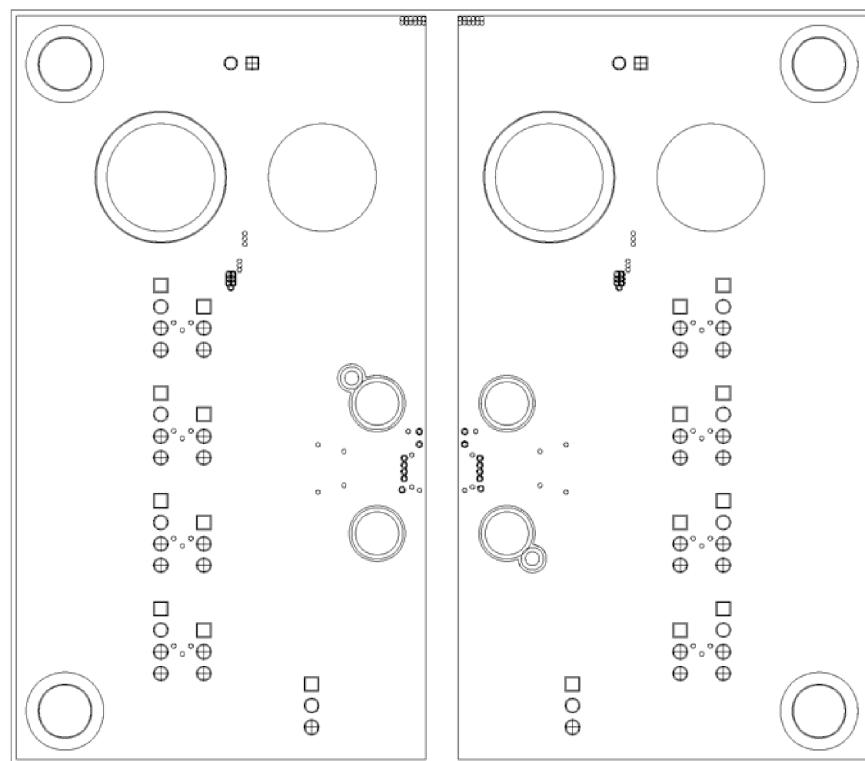


Figure 8. Layer 3

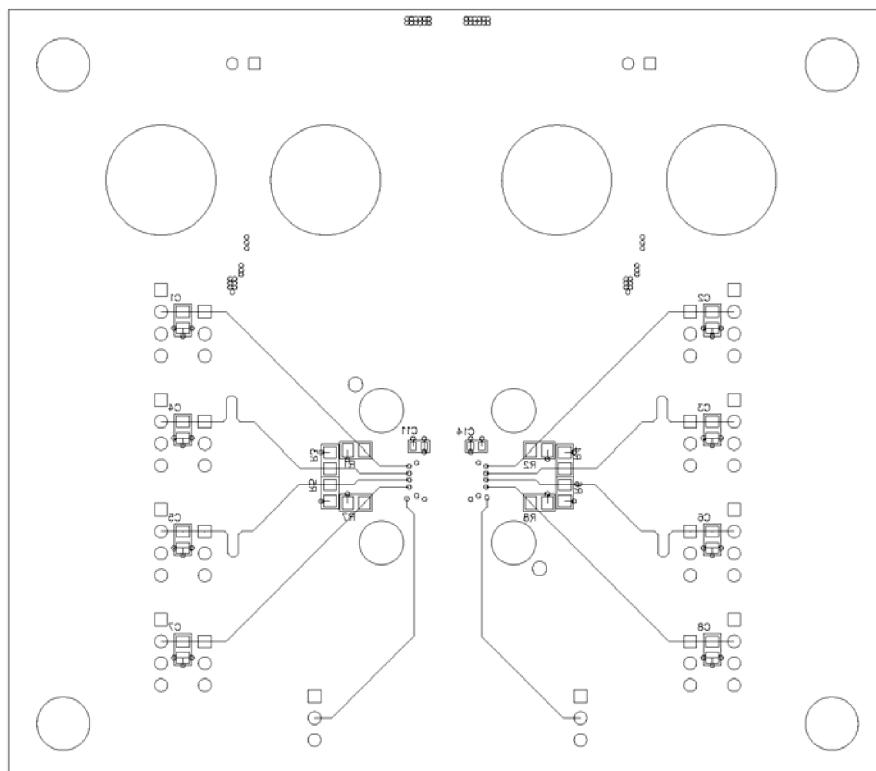


Figure 9. Bottom Layer

Table 1. Bill of Materials

| Designator | Value | Description | Package | MFG |
|---|---|---------------------------------------|---------|-----|
| C1-C8 | Not populated User selectable ⁽¹⁾ | Capacitor | 0805 | Any |
| C10, C13 | 1µF | Power Supply Decoupling Capacitors | 0603 | Any |
| C11, C14 | 0.1uF | Power Supply Decoupling Capacitors | 0402 | Any |
| C9, C12 | 10uF | Power Supply Decoupling Capacitors | 1206 | Any |
| U1 | ISO7131CC | Digital Isolator | 16-DBQ | TI |
| JMP1, JMP4, JMP5, JMP8, JMP9, JMP12, JMP15, JMP18 | 1 x 4 Jumper | Jumper | 0.1" | Any |
| JMP2, JMP3, JMP6, JMP7, JMP10, JMP11, JMP13, JMP14, JMP16, JMP17 | 1 x 3 Jumper | Jumper | 0.1" | Any |
| R1-R8 | Not populated User selectable ⁽¹⁾ | Resistor | 0805 | Any |
| TB1, TB2 | 2-pin female | Terminal block | 0.1" | Any |

⁽¹⁾ Refer to the device datasheet ([SLLSEF1](#)) for allowable load values.

EVM Setup and Operation

The basic setup has two power supplies (TB1, TB2, P1-P4) to evaluate isolator performance with any combination of 2.7 V, 3.3 V, or 5 V for VCC1 and VCC2. If both sides are to be evaluated at the same supply voltage, only one power supply is required and can be used to power both sides of the EVM.

CAUTION

Note that although these devices provide galvanic isolation of up to 3000 Vrms, this EVM cannot be used for isolation voltage testing. It is designed for the evaluation of device operating parameters only and may be damaged if a voltage exceeding 5.5 V is applied anywhere in the circuit.

For the ISO7131, ISO7141, and ISO7142 isolators, JMP13 and JMP14 should be set to VCC1 and VCC2, respectively, for normal operation.

For the ISO7140, JMP14 should be set to VCC2 for normal operation (JMP13 is not needed).

EVALUATION BOARD/KIT/MODULE (EVM) ADDITIONAL TERMS

Texas Instruments (TI) provides the enclosed Evaluation Board/Kit/Module (EVM) under the following conditions:

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods.

Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

Please read the User's Guide and, specifically, the Warnings and Restrictions notice in the User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For additional information on TI's environmental and/or safety programs, please visit www.ti.com/esh or contact TI.

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REGULATORY COMPLIANCE INFORMATION

As noted in the EVM User's Guide and/or EVM itself, this EVM and/or accompanying hardware may or may not be subject to the Federal Communications Commission (FCC) and Industry Canada (IC) rules.

For EVMs **not** subject to the above rules, this evaluation board/kit/module is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION OR EVALUATION PURPOSES ONLY and is not considered by TI to be a finished end product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. Operation of the equipment may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

General Statement for EVMs including a radio

User Power/Frequency Use Obligations: This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant

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

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.

FCC Interference Statement for Class B EVM devices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- 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.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

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

Concerning EVMs including radio transmitters

This device complies with Industry Canada licence-exempt RSS standard(s). 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.

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.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

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.

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 isotope 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.

【Important Notice for Users of this Product in Japan】

This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product 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,
2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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EVALUATION BOARD/KIT/MODULE (EVM) WARNINGS, RESTRICTIONS AND DISCLAIMERS

For Feasibility Evaluation Only, in Laboratory/Development Environments. Unless otherwise indicated, this EVM is not a finished electrical equipment and not intended for consumer use. It is intended solely for use for preliminary feasibility evaluation in laboratory/development environments by technically qualified electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems and subsystems. It should not be used as all or part of a finished end product.

Your Sole Responsibility and Risk. You acknowledge, represent and agree that:

1. You have unique knowledge concerning Federal, State and local regulatory requirements (including but not limited to Food and Drug Administration regulations, if applicable) which relate to your products and which relate to your use (and/or that of your employees, affiliates, contractors or designees) of the EVM for evaluation, testing and other purposes.
2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard.
3. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

Certain Instructions. It is important to operate this EVM within TI's recommended specifications and environmental considerations per the user guidelines. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, some circuit components may have case temperatures greater than 60°C as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use these EVMs.

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