User’s Guide
Universal Digital Isolator Evaluation Module

ABSTRACT
This user’s guide describes the universal digital isolator evaluation module (EVM). This EVM lets designers evaluate device performance for fast development and analysis of isolated systems. The EVM supports evaluation of any of the TI single-channel, dual-channel, triple-channel, quad-channel, or six-channels digital isolator devices in various packages: 8-pin SOIC (D), 8-pin WB SOIC (DWV), 16-pin QSOP (DBQ), 16-pin WB SOIC (DW), and 16-pin ultra WB SOIC (DWW).

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 0-V to 5.5-V recommended operating range.

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1 Introduction

This user’s guide describes EVM operation with respect to most digital isolator devices that come in standard pin-compatible packages. The EVM can be used for evaluation of any of TI single-channel, dual-channel, triple-channel, quad-channel, or six-channels digital isolator devices in various packages: 8-pin SOIC (D), 8-pin WB SOIC (DWV), 16-pin QSOP (DBQ), 16-pin WB SOIC (DW), and 16-pin ultra WB SOIC (DWW). This guide also describes the standard pin configurations of devices for each package, bill of materials, EVM schematic, PCB layout, and typical laboratory test setup. A typical input and output waveform is also presented.

2 Pin Configurations of Digital Isolators in Different Packages

The DIGI-ISO-EVM has provision for multiple device footprints that are unoccupied to allow for testing of various digital isolator devices from various isolator families. Figure 2-1 through Figure 2-18 show all possible device pin configurations of digital isolators with different channel options in different packages that can be tested on this EVM. The figures also provide reference to device footprint designators (like U1) of the EVM where a given digital isolator for a given channel option in a given package can be tested on the EVM. Table 2-1 can be used as a quick reference table to identify the device footprint designator where a digital isolator can be tested for a given channel and package options.

<table>
<thead>
<tr>
<th>Number of Channels</th>
<th>Digital Isolator Part Numbers That can be Tested</th>
<th>Example Part Number</th>
<th>Package</th>
<th>Location Where it can be Tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ISOxx10</td>
<td>ISO7710</td>
<td>D-8</td>
<td>U2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DWV-8</td>
<td>U1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DW-16</td>
<td>U3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ISO7810</td>
<td>DWW-16</td>
<td>U5</td>
</tr>
<tr>
<td>2</td>
<td>ISOxx2x</td>
<td>ISO7721</td>
<td>D-8</td>
<td>U2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DWV-8</td>
<td>U1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DW-16</td>
<td>U3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ISO7821</td>
<td>DWW-16</td>
<td>U5</td>
</tr>
<tr>
<td>3</td>
<td>ISOxx3x</td>
<td>ISO7731</td>
<td>DBQ-16</td>
<td>U6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DW-16</td>
<td>U4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ISO7831</td>
<td>DWW-16</td>
<td>U5</td>
</tr>
<tr>
<td>4</td>
<td>ISOxx4x</td>
<td>ISO7741</td>
<td>DBQ-16</td>
<td>U6</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>DW-16</td>
<td>U4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ISO7841</td>
<td>DWW-16</td>
<td>U5</td>
</tr>
<tr>
<td>6</td>
<td>ISOxx6x</td>
<td>ISO7762</td>
<td>DBQ-16</td>
<td>U7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DW-16</td>
<td>U8</td>
</tr>
</tbody>
</table>

Figure 2-1. Single-Channel Digital Isolator Pin Configuration for D-8 Package on U2 and DWV-8 Package on U1
Pin Configurations of Digital Isolators in Different Packages

Figure 2-2. Single-Channel Digital Isolator Pin Configuration for DW-16 Package on U3

Figure 2-3. Single-Channel Digital Isolator Pin Configuration for DWW-16 Package on U5

Figure 2-4. Dual-Channel (ISOxx20) Digital Isolator Pin Configurations for D-8 Package on U2 and DWV-8 Package on U1

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Figure 2-18. Six-Channel (ISOxx63) Digital Isolator Pin Configurations for DBQ-16 Package on U7 and DW-16 Package on U8
3 Universal Digital Isolator EVM Image

Figure 3-1 shows the 3D diagram of the EVM.

Figure 3-1. DIGI-ISO-EVM 3D Diagram
4 EVM Setup and Operation

This section describes the setup and operation of the EVM for parameter performance evaluation. Figure 4-1 shows the configuration for operating the universal digital isolator EVM for one device footprint using two power supplies.

Figure 4-1. Basic EVM Operation

Figure 4-2 shows typical input and output waveforms of the EVM for a 1-MHz clock. The input is shown as channel 1, and the output is shown as channel 2.

Figure 4-2. Typical Input and Output Waveform
5 Bill of Materials

Table 5-1 shows the bill of materials (BOM) for this EVM.

<table>
<thead>
<tr>
<th>Item</th>
<th>Designator</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Part Number</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C1, C2, C3, C4, C5, C6, C19, C24, C25, C30</td>
<td>CAP, CERM, 0.1 uF, 25 V, ±5%, X7R, 0603</td>
<td>AVX</td>
<td>06033C104JAT2A</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C20, C21, C22, C23, C26, C27, C28, C29</td>
<td>CAP, CERM, 1 uF, 25 V, ±10%, X5R, 0603</td>
<td>TDK</td>
<td>C1608X5R1E105K080AC</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>H1, H2, H3, H4</td>
<td>Bumpon, Hemisphere, 0.44 X 0.20, Clear</td>
<td>3M</td>
<td>SJ-5303 (CLEAR)</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>J1, J2, J3, J4</td>
<td>Header, 100mil, 6x2, Gold, TH</td>
<td>TE Connectivity</td>
<td>87227-6</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>LBL1</td>
<td>Thermal Transfer Printable Labels, 0.650&quot; W x 0.200&quot; H - 10,000 per roll</td>
<td>Brady</td>
<td>THT-14-423-10</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>P1, P2, P3, P4, P5, P8, P9, P10, P11, P14, P15, P16</td>
<td>Header, 2.54 mm, 2x1, Gold, TH</td>
<td>Wurth Elektronik</td>
<td>61300211121</td>
<td>12</td>
</tr>
<tr>
<td>7</td>
<td>P6, P7, P12, P13</td>
<td>Header, 2.54 mm, 5x2, Gold, TH</td>
<td>Wurth Elektronik</td>
<td>613010211121</td>
<td>4</td>
</tr>
</tbody>
</table>
6 EVM Schematic and PCB Layout

The universal digital isolator EVM is designed to accommodate various digital isolators with different channel options in different packages. To evaluate any of the digital isolator devices in a given package, populate the device of interest on the DIGI-ISO-EVM PCB according to the footprint positions suggested in section 2. No other component requires any modification on the EVM. Figure 6-1 shows the DIGI-ISO-EVM schematic and Figure 6-2 shows the printed-circuit board (PCB) layout of the EVM.

Figure 6-1. DIGI-ISO-EVM Schematic
Figure 6-2. DIGI-ISO-EVM PCB Layout
STANDARD TERMS FOR EVALUATION MODULES

1. **Delivery:** TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, and/or documentation which may be provided together or separately (collectively, an “EVM” or “EVMs”) to the User (“User”) in accordance with the terms set forth herein. User's acceptance of the EVM is expressly subject to the following terms.

1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of TI semiconductors products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM (“Software”) shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms that accompany such Software.

1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.

2 **Limited Warranty and Related Remedies/Disclaimers:**

2.1 These terms do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.

2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for a nonconforming EVM if (a) the nonconformity was caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI, (b) the nonconformity resulted from User's design, specifications or instructions for such EVMs or improper system design, or (c) User has not paid on time. Testing and other quality control techniques are used to the extent TI deems necessary. TI does not test all parameters of each EVM. User's claims against TI under this Section 2 are void if User fails to notify TI of any apparent defects in the EVMs within ten (10) business days after delivery, or of any hidden defects within ten (10) business days after the defect has been detected.

2.3 TI's sole liability shall be at its option to repair or replace EVMs that fail to conform to the warranty set forth above, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

**WARNING**

Evaluation Kits are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems.

User shall operate the Evaluation Kit within TI's recommended guidelines and any applicable legal or environmental requirements as well as reasonable and customary safeguards. Failure to set up and/or operate the Evaluation Kit within TI's recommended guidelines may result in personal injury or death or property damage. Proper set up entails following TI's instructions for electrical ratings of interface circuits such as input, output and electrical loads.

NOTE:
EXPOSURE TO ELECTROSTATIC DISCHARGE (ESD) MAY CAUSE DEGRADATION OR FAILURE OF THE EVALUATION KIT; TI RECOMMENDS STORAGE OF THE EVALUATION KIT IN A PROTECTIVE ESD BAG.
3 Regulatory Notices:

3.1 United States

3.1.1 Notice applicable to EVMs not FCC-Approved:

**FCC NOTICE:** This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

3.1.2 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**

**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.

**FCC Interference Statement for Class B EVM devices**

**NOTE:** 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.

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.

3.3 Japan

3.3.1 Notice for EVMs delivered in Japan: Please see http://www.tij.co.jp/l/sds/ti_ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。
http://www.tij.co.jp/l/sds/ti_ja/general/eStore/notice_01.page

3.3.2 Notice for Users of EVMs Considered “Radio Frequency Products” in Japan: EVMs entering Japan may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (for which the avoidance of doubt are stated strictly for convenience and should be verified by User):
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,
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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3.3.3 Notice for EVMs for Power Line Communication: Please see http://www.tij.co.jp/l/sds/ti_ja/general/eStore/notice_02.page
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3.4 European Union

3.4.1 For EVMs subject to EU Directive 2014/30/EU (Electromagnetic Compatibility Directive):
This is a class A product intended for use in environments other than domestic environments that are connected to a low-voltage power-supply network that supplies buildings used for domestic purposes. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.
4  EVM Use Restrictions and Warnings:

4.1 EVMS ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.

4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

4.3 Safety-Related Warnings and Restrictions:

4.3.1 User shall operate the EVM within TI’s recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should 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 also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user 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, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.

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