ISO1042DWV Isolated CAN Transceiver Evaluation Module

This user’s guide describes the evaluation module (EVM) for the ISO1042DWV isolated CAN transceiver. This EVM allows designers to evaluate device performance for fast development and analysis of isolated systems. The EVM supports evaluation of ISO1042 device in a 8-pin SOIC (DWV) package.

**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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Trademarks

All trademarks are the property of their respective owners.
1 Introduction

This user’s guide describes EVM operation with respect to the ISO1042 isolated CAN transceiver. The EVM includes test points for all main points where probing is necessary for evaluation such as GND, VCC, TXD, RXD, CANH, CANL. The EVM supports many options for CAN bus configuration. It is pre-configured with a split termination network with a common-mode capacitance and additional caps on the bus for protection. It also includes an option to populate a 120-Ω resistor which can be used with the EVM as a terminated line end (CAN is defined for 120-Ω impedance twisted pair cable). Protection components like TVS diodes and common mode (CM) Chokes are also provided with bypass paths if necessary. Using these options, the customer is allowed installation of the desired components. This guide describes the EVM schematic, layout and typical laboratory setup. A typical input and output waveform is also presented.

2 Overview

The ISO1042 device is a galvanically-isolated controller area network (CAN) transceiver that meets the specifications of the ISO11898-2 (2016) standard. The ISO1042 device offers ±70-V DC bus fault protection and ±30-V common-mode voltage range. The device supports up to 5-Mbps data rate in CAN FD mode allowing much faster transfer of payload compared to classic CAN. This device uses a silicon dioxide (SiO2) insulation barrier with a withstand voltage of 5000 VRMS. Used in conjunction with isolated power supplies, the device prevents noise currents on a data bus or other circuits from entering the local ground and interfering with or damaging sensitive circuitry.

3 Pin Configuration of the ISO1042DWV CAN Transceiver

Figure 1 shows the ISO1042 pin configuration.

![Figure 1. ISO1042DWV Pin Configuration](image-url)
4 ISO1042DWVEVM Board Block Diagram and Image

Figure 2 shows the board configuration for evaluation of the ISO1042DWV isolated CAN transceiver.

Figure 2. ISO1042DWVEVM Configuration

Figure 3 shows the photograph of the EVM.

Figure 3. ISO1042DWVEVM Photograph
5  EVM Schematics and Layout

Figure 4 shows the ISO1042DWVEVM schematic and Figure 5 shows the printed-circuit board (PCB) layout.

V<sub>CC</sub>: 2.25 V to 5.5 V (0.2 A)

Figure 4. ISO1042DWVEVM Schematic

Figure 5. ISO1042DWV PCB Layout
6 Bill of Materials

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

Table 1. Bill of Materials

<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>J1, J2</td>
<td>Header, 100mil, 6x1, Tin, TH</td>
<td>Sullins Connector Solutions</td>
<td>PEC06SAAN</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>C1, C4, C10</td>
<td>CAP, CERM, 10 uF, 35 V, +/- 10%, X5R, 0805</td>
<td>MuRata</td>
<td>GRM21BR6YA106KE43L</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>C2, C5, C11</td>
<td>CAP, CERM, 1 uF, 50 V, +/- 10%, X5R, 0603</td>
<td>MuRata</td>
<td>GRM188R61H105KAALD</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>C3, C6, C12</td>
<td>CAP, CERM, 0.1 uF, 25 V, +/- 5%, X7R, 0603</td>
<td>AVX</td>
<td>06033C104JAT2A</td>
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<td>5</td>
<td>C7</td>
<td>CAP, CERM, 4700 pF, 50 V, +/- 10%, X7R, 0603</td>
<td>MuRata</td>
<td>GRM188R71H472KA01D</td>
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<td>6</td>
<td>C8, C9</td>
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<td>MuRata</td>
<td>GRM1885C2A680JA01D</td>
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<tr>
<td>7</td>
<td>R1, R5</td>
<td>RES, 0.5, 0.25 W, 1206</td>
<td>Vishay-Dale</td>
<td>CRCW12060000Z0EA</td>
<td>0</td>
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<tr>
<td>8</td>
<td>R2, R4</td>
<td>RES, 59.0, 1%, 0.25 W, 1206</td>
<td>Vishay-Dale</td>
<td>CRCW120659R0FKEA</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>R3</td>
<td>RES, 120, 1%, 1 W, AEC-Q200 Grade 0, 2512</td>
<td>Vishay-Dale</td>
<td>CRCW2512120RFKEG</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>L1</td>
<td>Coupled inductor, 51 µH, 0.2 A, 1 ohm, AEC-Q200 Grade 0, SMD</td>
<td>TDK</td>
<td>ACT45B-510-2P-TL003</td>
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<tr>
<td>11</td>
<td>D1</td>
<td>Diode, TVS, Bi, 7 V, SOT-23</td>
<td>Bourns</td>
<td>CDSOT23-SM712</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>U1</td>
<td>ISO1042DWV, DW0008 (SOIC-8)</td>
<td>Texas Instruments</td>
<td>ISO1042DWV</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10</td>
<td>Test Point, Miniature, SMT</td>
<td>Keystone</td>
<td>5019</td>
<td>10</td>
</tr>
<tr>
<td>14</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>
</tbody>
</table>

7 EVM Setup and Operation

This section describes the setup and operation of the EVM for parameter performance evaluation. Figure 6 shows the configuration for operating the ISO1042DWEVM using two power supplies.

Figure 6. Basic EVM Operation
7.1 Protection Configurations

The EVM also has footprints for various protection schemes to enhance robustness for extreme system level EMC requirements. Figure 7 summarizes these options.

Figure 7 shows typical input and output waveforms of the EVM for a 5-Mbps signal. TXD is shown as Channel 1, the CAN bus is shown as Channel 2, Channel 3 and RXD is shown as Channel 4.

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Footprint Reference</th>
<th>Use Case</th>
<th>Population and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series resistors or common mode</td>
<td>R1/R5 or L1</td>
<td>Direct CAN transceiver to bus connection</td>
<td>R1 and R5 populated with 0Ω</td>
</tr>
<tr>
<td>choke</td>
<td></td>
<td>Series resistance protection, CAN transceiver to bus connection</td>
<td>R1 and R14 populated with MELF resistor as necessary for harsh EMC environment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CM choke (bus filter)</td>
<td>L1 populated with CM choke to filter noise as necessary for harsh EMC environment (Default Population)</td>
</tr>
<tr>
<td>Bus filtering caps and transient</td>
<td>C8/C9</td>
<td>Bus Filter</td>
<td>Filter noise as necessary for harsh EMC environment. Use filter caps in combination with L1 CM choke</td>
</tr>
<tr>
<td>protection</td>
<td></td>
<td>Transient and ESD protection</td>
<td>To add extra protection for system level transients and ESD protection. TVS diode population option via D1 footprint or varistor population through C2/C7 footprint.</td>
</tr>
</tbody>
</table>

![Figure 7. Typical Input and Output Waveforms](image-url)
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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.

      **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/lstds/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/lstds/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 (which for 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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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.

4.3.2 EVMs 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 assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure 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. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.

4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User’s handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

5. Accuracy of Information: To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.
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10. **Governing Law:** These terms and conditions shall be governed by and interpreted in accordance with the laws of the State of Texas, without reference to conflict-of-laws principles. User agrees that non-exclusive jurisdiction for any dispute arising out of or relating to these terms and conditions lies within courts located in the State of Texas and consents to venue in Dallas County, Texas. Notwithstanding the foregoing, any judgment may be enforced in any United States or foreign court, and TI may seek injunctive relief in any United States or foreign court.
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