

ISO7741TA Quad-Channel Digital Isolator with Integrated Transformer Driver Evaluation Module

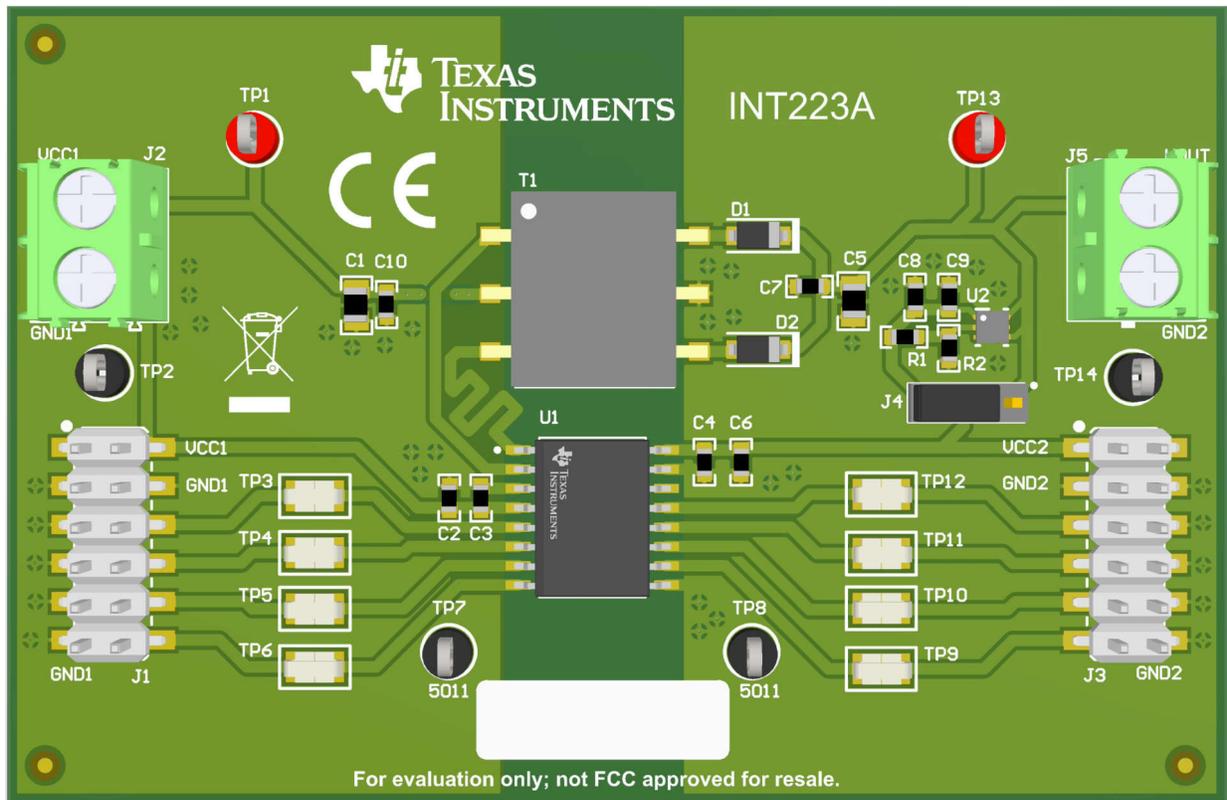


Description

ISO7741TADWEVM is an evaluation module (EVM) used to evaluate the 4-channel digital isolator with integrated transformer driver in a 16-pin DW SOIC package (DW-16). The EVM has additional footprints that gives the user flexibility to add components to test a variety of common applications. The EVM features multiple test points and jumper options to evaluate the device with minimal external components.

Features

- High-performance, 5000-VRMs reinforced quad-channel digital isolators
- Integrated push-pull transformer driver
- Wide supply and level translation range for IO: 2.25V to 5.5V
- High signaling rate: up to 100Mbps
- High output load current: 0.7A at 5V
- Multiple test points and connection headers that allow for quick device evaluation



1 Evaluation Module Overview

1.1 Introduction

The [ISO7741TADWEVM](#) user's guide describes the functionality of the [ISO7741TA](#) Quad-Channel Digital Isolator with Integrated Push-Pull Transformer Driver Evaluation Module (EVM). The ISO7741TADWEVM supports evaluation of TI's ISO7741TA in 16-pin wide-body SOIC package (DW-16). This user's guide describes EVM operation with 5V input and 5V output voltage configuration. The EVM can be reconfigured for evaluation with lower input / output voltage by changing the component values. The user's guide also presents the EVM schematic, bill of materials, PCB layout and typical laboratory setup.

CAUTION

This evaluation module is made available for evaluation of 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 operating range.

1.2 Kit Contents

The evaluation module kit contains a PCB evaluation board for device ISO7741TA with a default configuration for 5V input/output operation. The major components of the ISO7741TA evaluation module are:

- ISO7741TA isolator with integrated transformer driver
- Push-pull transformer
- Low-dropout (LDO) voltage regulator
- On-board input and output connections
- Multiple on-board test points

To demonstrate functionality of the ISO7741TA, TI recommends the following (not included):

- DC power supply
- Oscilloscope and multimeter
- Signal generator

1.3 Specification

ISO7741TADWEVM is an evaluation module used to evaluate quad-channel high-performance, 5000-VRMS reinforced digital isolators with integrated transformer driver ISO7741TA in 16-Pin WB SOIC package (Package Code-DW). The EVM supports wide supply voltage range of operation from 2.25V to 5.5V supporting a maximum data rate of 100Mbps. The ISO7741TADWEVM also generates isolated supply output supporting 0.7A of output current at 5V output voltage. Various components included in the evaluation module directly control the operation and functionality of the device ISO7741TA. If necessary, then components can be removed, added, or replaced to modify the behavior of the ISO7741TA accordingly for a given application.

1.4 Device Information

The ISO7741TA is a high-performance, quad-channel digital isolator with integrated transformer driver with 5000VRMS isolation ratings per UL 1577. The ISO7741T device provides high electromagnetic immunity and low emissions at low power consumption, while isolating CMOS or LVCMOS digital I/Os. Each isolation channel has a logic input and output buffer separated by a double capacitive silicon dioxide (SiO₂) insulation barrier. If the input power or signal is lost, default output is *high* for devices without suffix F and *low* for devices with suffix F.

The ISO7741TA includes a low-noise, low-EMI push-pull transformer driver, specifically designed for small form factor, isolated power supplies. The transformer driver drives low-profile, center-tapped transformers from a 2.25V to 5.5V DC power supply. Very low noise and EMI are achieved by slew rate control of the output switch voltage and through Spread Spectrum Clocking (SSC). The transformer driver consists of an oscillator followed by a gate drive circuit that provides the complementary output signals to drive ground-referenced N-channel power switches. The two N-channel Power-MOSFET switches are rated 1A to support start-up under high loads. The internal protection features include a 1.7A current limiting, under-voltage lockout, thermal shutdown, and break-before-make circuitry. ISO7741TA include a soft-start feature that prevents high inrush current during power up with large load capacitors. ISO7741TA has a 160kHz internal oscillator to minimize emissions whereas

while keeping smaller transformer size. The ISO7741TA is available in a 16-pin DW package. The device operation is characterized for a temperature range from -40°C to 125°C.

2 Hardware

2.1 Pin Configuration of the ISO7741TA

Figure 2-1 shows the ISO7741TA pin configuration in 16-pin SOIC (DW-16).

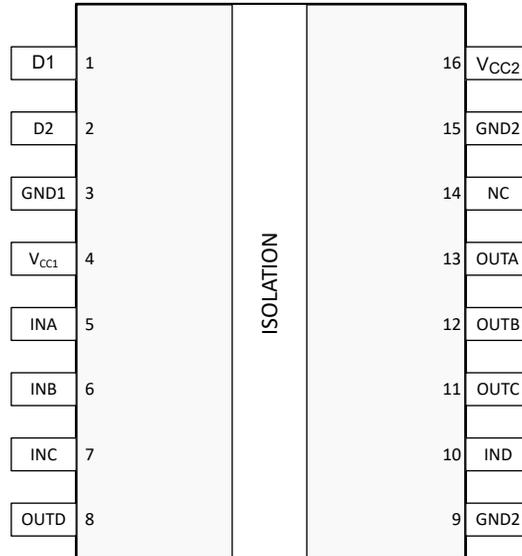


Figure 2-1. ISO7741TA Quad-Channel Digital Isolator with Integrated Transformer Driver Pin Configuration

2.2 ISO7741TADWEVM 3D Image

ISO7741TADWEVM 3D Image shows the 3D image of the EVM.

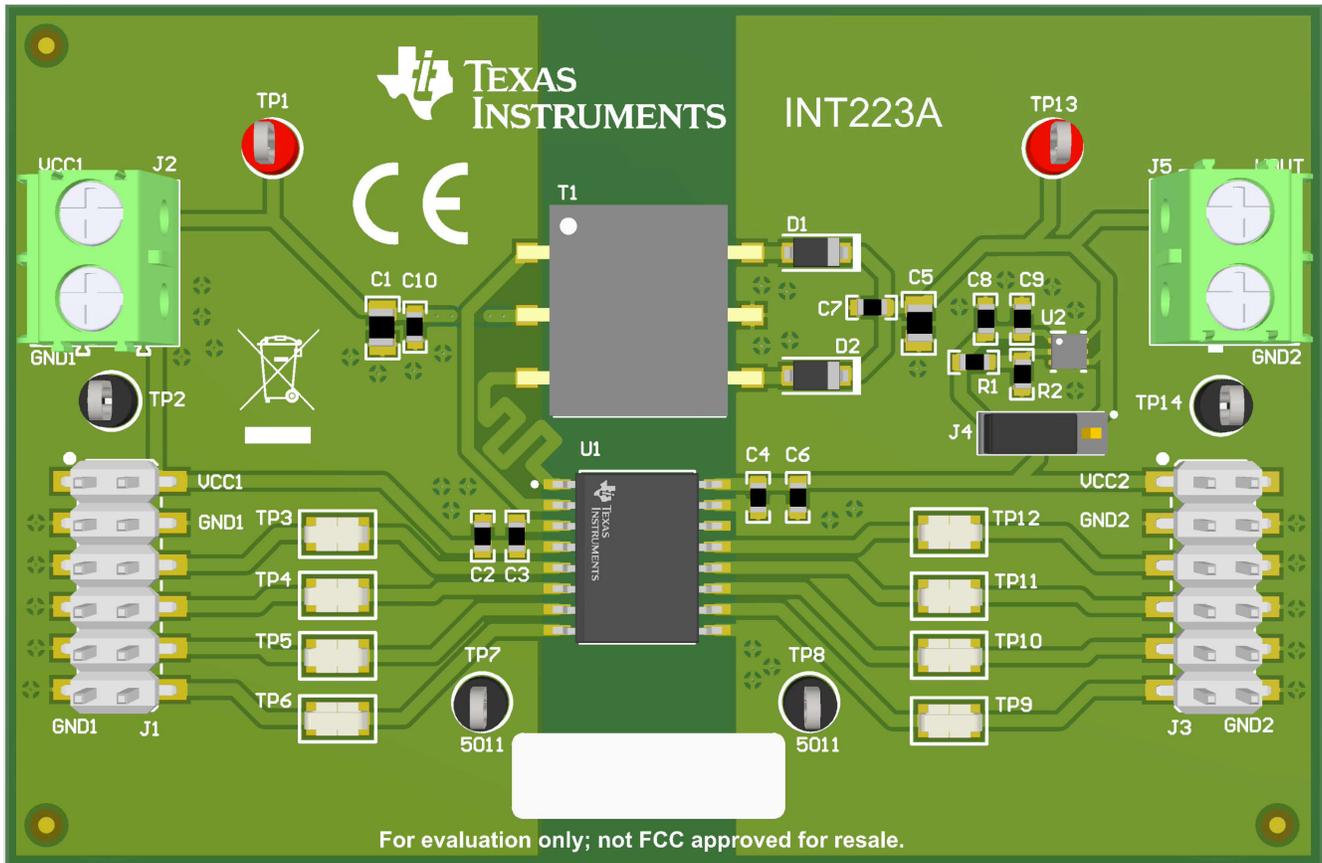


Figure 2-2. ISO7741TADWEVM 3D Image

2.3 EVM Setup and Operation

This section describes the typical test setup and operation of the EVM for evaluating the device. [Figure 2-3](#) shows a typical test configuration for operating the ISO7741TADWEVM using a single power supply to power VCC1 of the device. VCC2 of device is powered by the isolated power supply generated by the push-pull isolated power supply. Push-pull isolated power supply consists of the integrated push-pull transformer driver, the external push-pull transformer, rectifier diodes, filtering capacitors and the optional LDO [TPS7A2601](#). Jumper J4 allows to power VCC2 of ISO7741TA in one of two ways, either directly from the push-pull power supply output (when pins 1 and 2 shorted) or through the regulated LDO output (when pins 2 and 3 shorted).

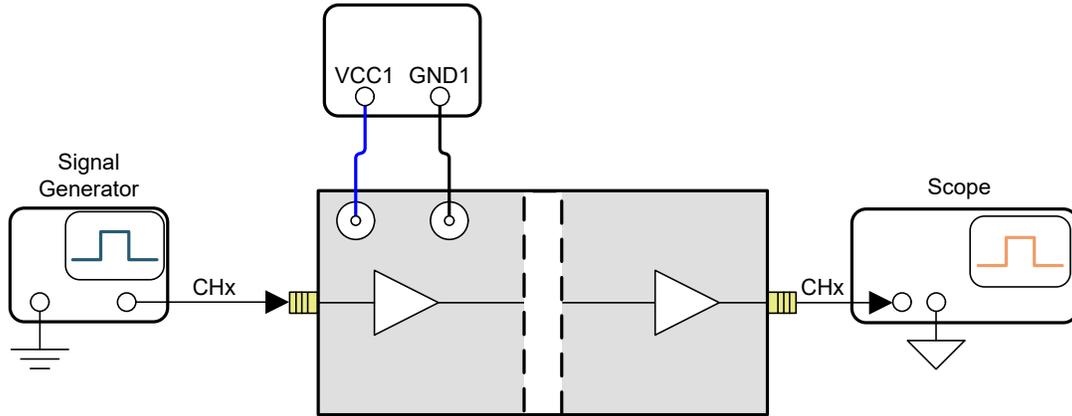


Figure 2-3. Typical EVM Test Setup

3 Hardware Design Files

3.1 Schematics

Figure 3-1 shows the ISO7741TADWEVM schematic.

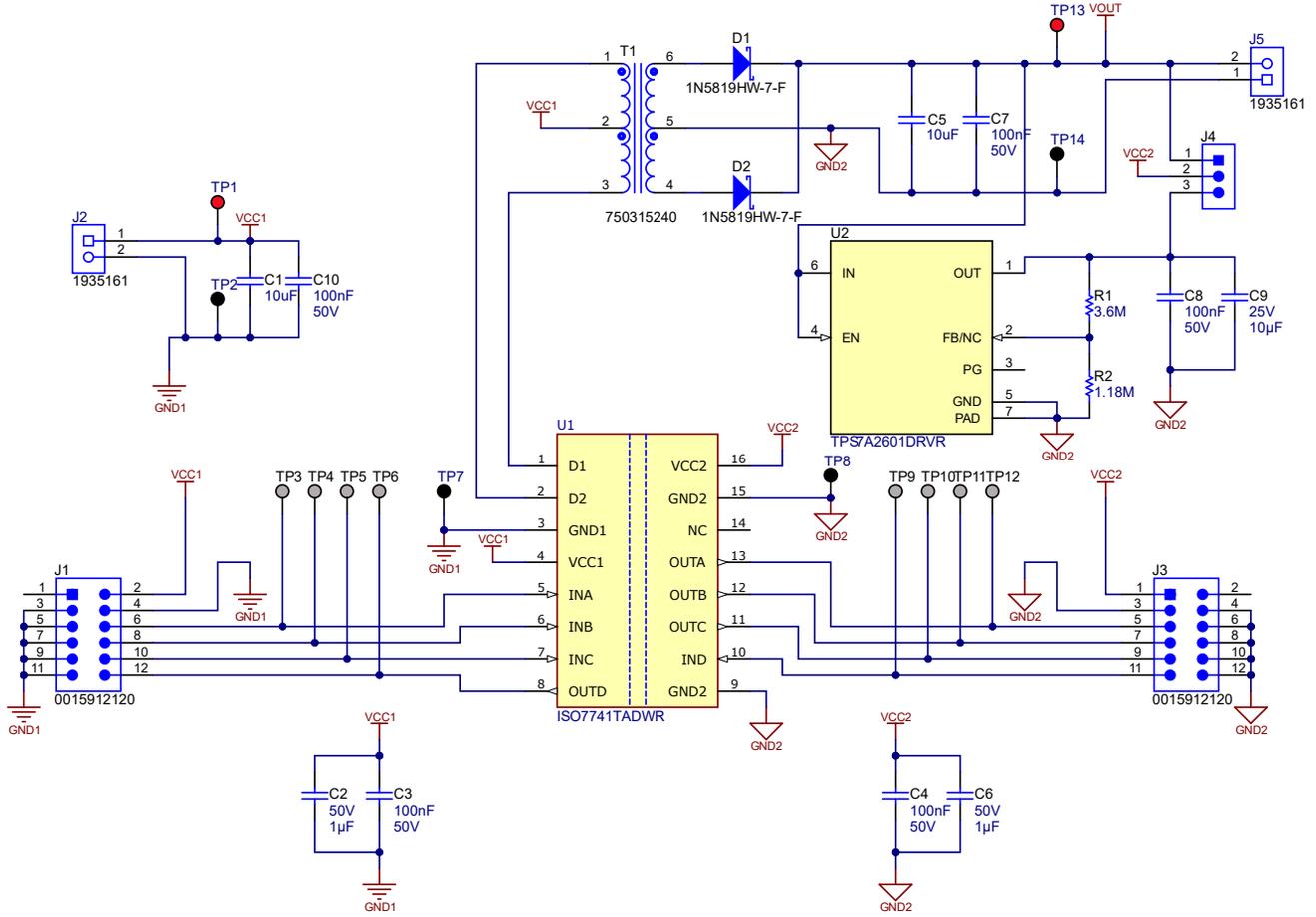


Figure 3-1. ISO7741TADWEVM Schematic

3.2 PCB Layouts

Figure 3-2 and Figure 3-3 show the top and bottom views of the PCB layout of the EVM.

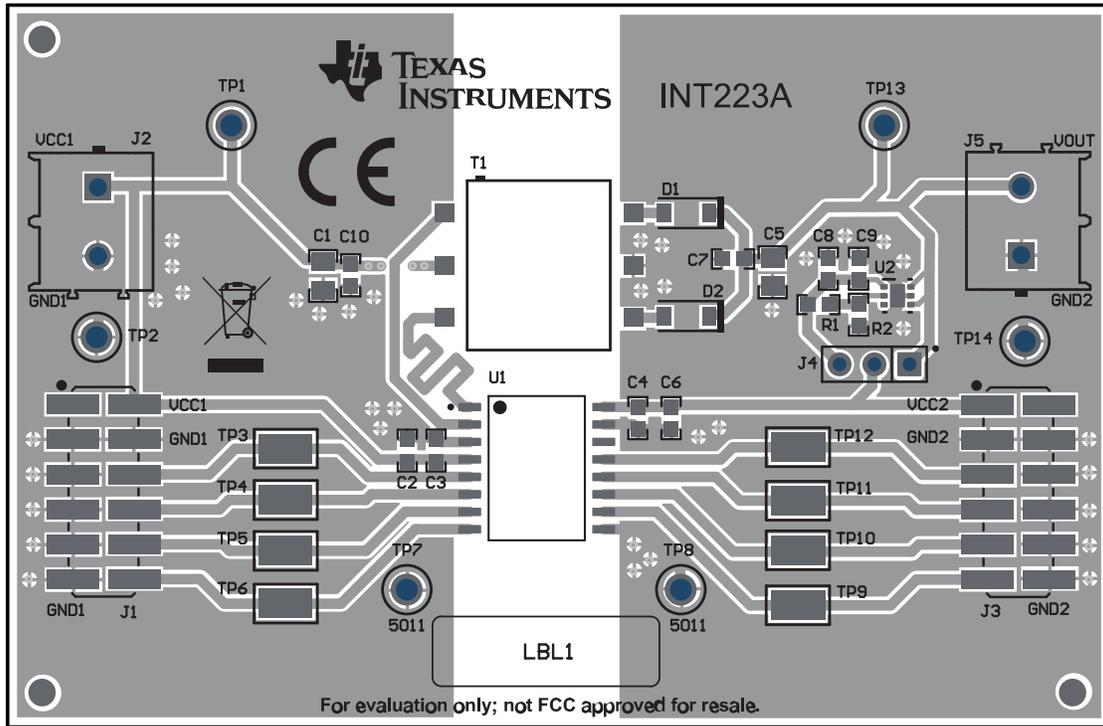


Figure 3-2. ISO7741TADWEVM PCB Layout - Composite Top View

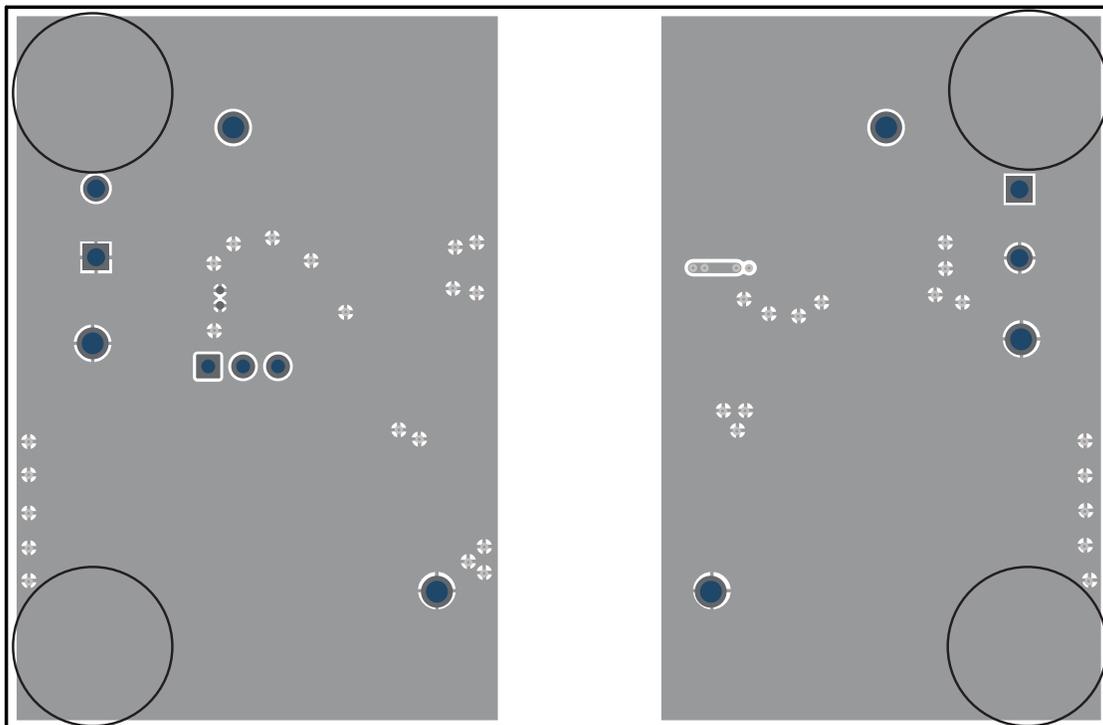


Figure 3-3. ISO7741TADWEVM PCB Layout - Composite Bottom View

3.3 Bill of Materials

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

Table 3-1. Bill of Materials

Item	Designator	Value	Description	Part Number	Manufacturer
1	C1, C5	10uF	CAP, CERM, 10uF, 35V, +/- 10%, X5R, 0805	GRM21BR6YA106KE43L	MuRata
2	C2, C6	1uF	CAP, CERM, 1uF, 50V, +/- 20%, X5R, AEC-Q200 Grade 3, 0603	GRT188R61H105ME13D	MuRata
3	C3, C4, C7, C8, C10	0.1uF	CAP, CERM, 0.1uF, 50V, +/- 10%, X7R, 0603	C0603C104K5RAC7867	Kemet
4	C9	10uF	CAP, CERM, 10uF, 25V, +/- 10%, X5R, 0603	GRM188R61E106KA73D	MuRata
5	D1, D2	40V	Diode, Schottky, 40V, 1A, SOD-123	1N5819HW-7-F	Diodes Inc.
6	H1, H2, H3, H4		Bumpon, Hemisphere, 0.44 X 0.20, Clear	SJ-5303 (CLEAR)	3M
7	J1, J3		Header, 100mil, 6x2, SMT	15912120	Molex
8	J2, J5		Therminal Block, 5mm, 2-pole, TH	1935161	Phoenix Contact
9	J4		Header, 100mil, 3x1, Gold, TH	HTSW-103-07-G-S	Samtec
11	R1	3.6Meg	RES, 3.6M, 5%, 0.1W, AEC-Q200 Grade 0, 0603	CRCW06033M60FKEA	Vishay-Dale
12	R2	1.18Meg	RES, 1.18M, 1%, 0.1W, AEC-Q200 Grade 0, 0603	CRCW06031M18FKEA	Vishay-Dale
13	SH-J1	1x2	Shunt, 100mil, Flash Gold, Black	SPC02SYAN	Sullins Connector Solutions
14	T1	110uH	Transformer, 110 uH, SMT	750315240	Würth Elektronik
15	TP1, TP13		Test Point, Multipurpose, Red, TH	5010	Keystone Electronics
16	TP2, TP7, TP8, TP14		Test Point, Multipurpose, Black, TH	5011	Keystone Electronics
17	TP3, TP4, TP5, TP6, TP9, TP10, TP11, TP12		Test Point, Miniature, SMT	5019	Keystone
18	U1		High-Speed, Reinforced Quad-Channel Digital Isolator	ISO7741TADWR	Texas Instruments
19	U2		500mA, 18V, Ultra-Low-IQ, Low Drop-Out Linear Voltage Regulator With Power Good, DRV0006A (WSON-6)	TPS7A2601DRVR	Texas Instruments

4 Additional Information

4.1 Trademarks

All trademarks are the property of their respective owners.

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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.
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 - 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 with 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/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。

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

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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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.
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 - 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.
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8.2 *Specific Limitations.* IN NO EVENT SHALL TI'S AGGREGATE LIABILITY FROM ANY USE OF AN EVM PROVIDED HEREUNDER, INCLUDING FROM ANY WARRANTY, INDEMNITY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS, , EXCEED THE TOTAL AMOUNT PAID TO TI BY USER FOR THE PARTICULAR EVM(S) AT ISSUE DURING THE PRIOR TWELVE (12) MONTHS WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED. THE EXISTENCE OF MORE THAN ONE CLAIM SHALL NOT ENLARGE OR EXTEND THIS LIMIT.

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