ISO7821LL, ISO7821LLS, ISO7820LL Reinforced Isolated Dual-LVDS Buffer Evaluation Module

This user's guide describes the reinforced, isolated dual-LVDS buffer evaluation module (EVM) for the ISO7821LL, ISO7821LLS, and ISO7820LL devices. This EVM allows designers to evaluate device performance for fast development and analysis of isolated systems. The EVM supports evaluation of any of the Texas Instrument's isolated dual-LVDS buffers in a 16-pin DW package.

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 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 the ISO7821LL, ISO7821LLS, and ISO7820LL reinforced, isolated dual-LVDS buffers. However, the EVM can be reconfigured for evaluation of any of TI's isolated dual-LVDS buffers in a 16-pin DW package. This guide also describes the available channel configurations of the ISO7821LL, ISO7821LLS, and ISO7820LL devices, the EVM schematic, and typical test setup. A typical input and output waveform is also presented.

2 Overview

The ISO7821LL, ISO7821LLS, and ISO7820LL devices are TI's new digital isolator family capable of galvanic isolations up to 8000 V_{PK}. These isolators provide high electromagnetic immunity and low emissions at low-power consumption, while isolating the LVDS bus signal. Each isolation channel has an LVDS receiver and transmitter separated by a silicon-oxide (SiO_2) insulation barrier. Used with isolated power supplies, these devices block high voltages, 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.

3 Pin Configurations of the ISO7821LL, ISO7821LLS, ISO7820LL Isolated Dual-LVDS Buffers

Figure 1 shows the pin configurations for the ISO7821LL, ISO7821LLS, and ISO7820LL isolated dual-LVDS buffers.

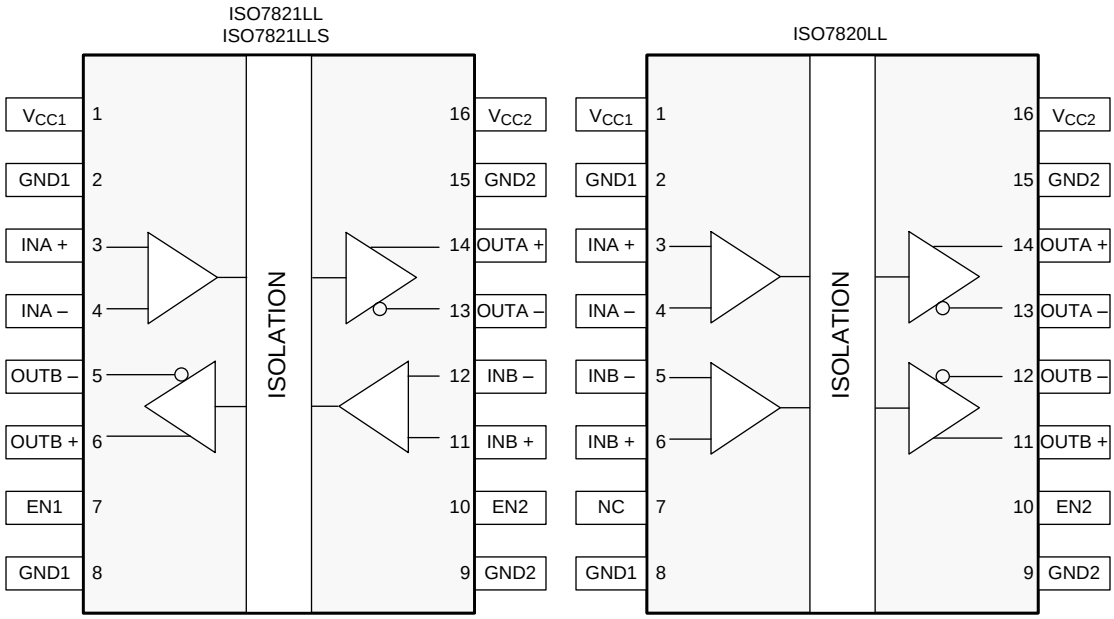


Figure 1. ISO7821LL, ISO7821LLS, ISO7820LL Reinforced Isolated Dual-LVDS Buffer Pin Configurations

4 ISO782xLLx – EVM Board Block Diagram and Image

Figure 2 shows the typical board configuration for evaluation of the ISO7821LL isolated dual-LVDS buffer.

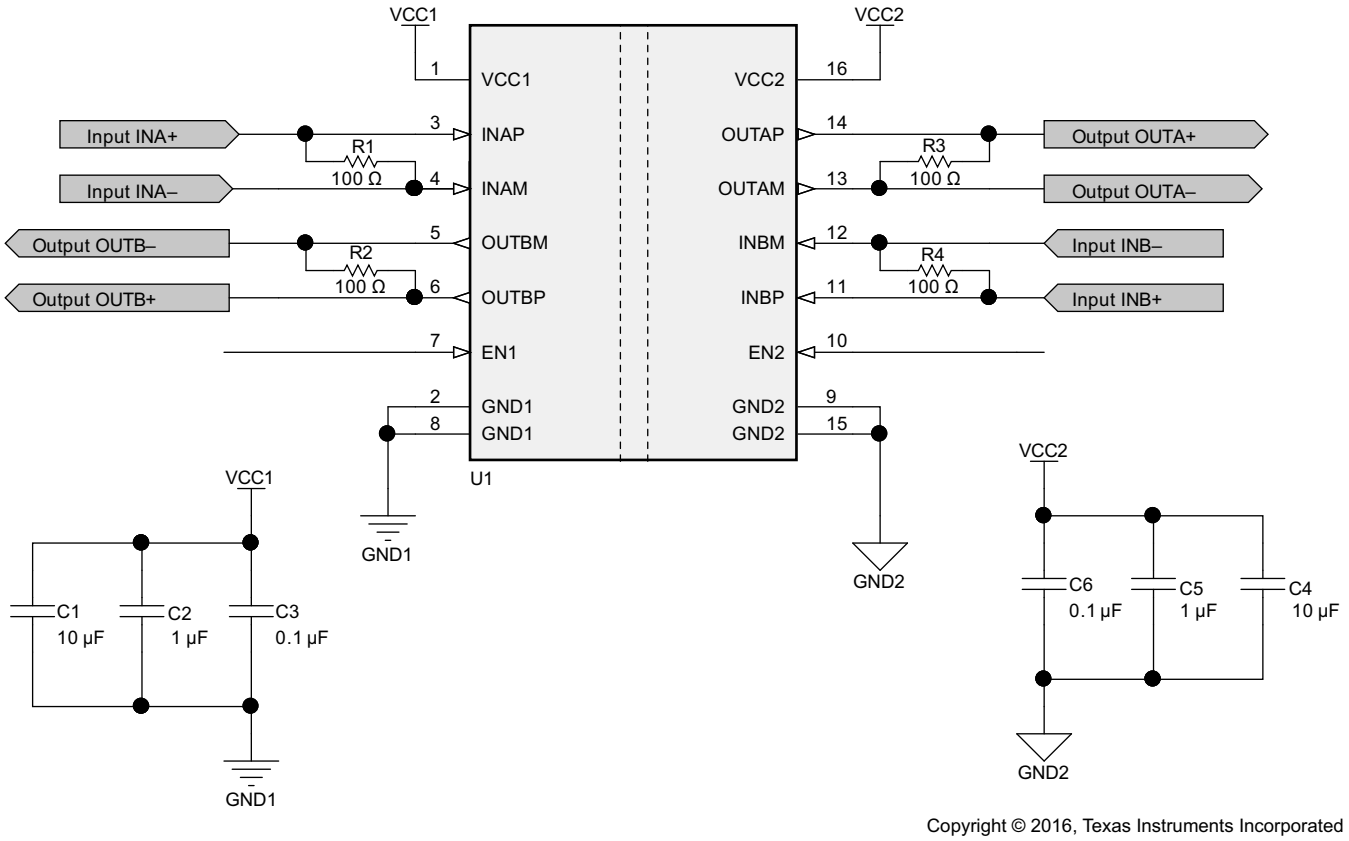


Figure 2. ISO7821LL EVM Configuration

Figure 3 shows a photograph of the EVM.

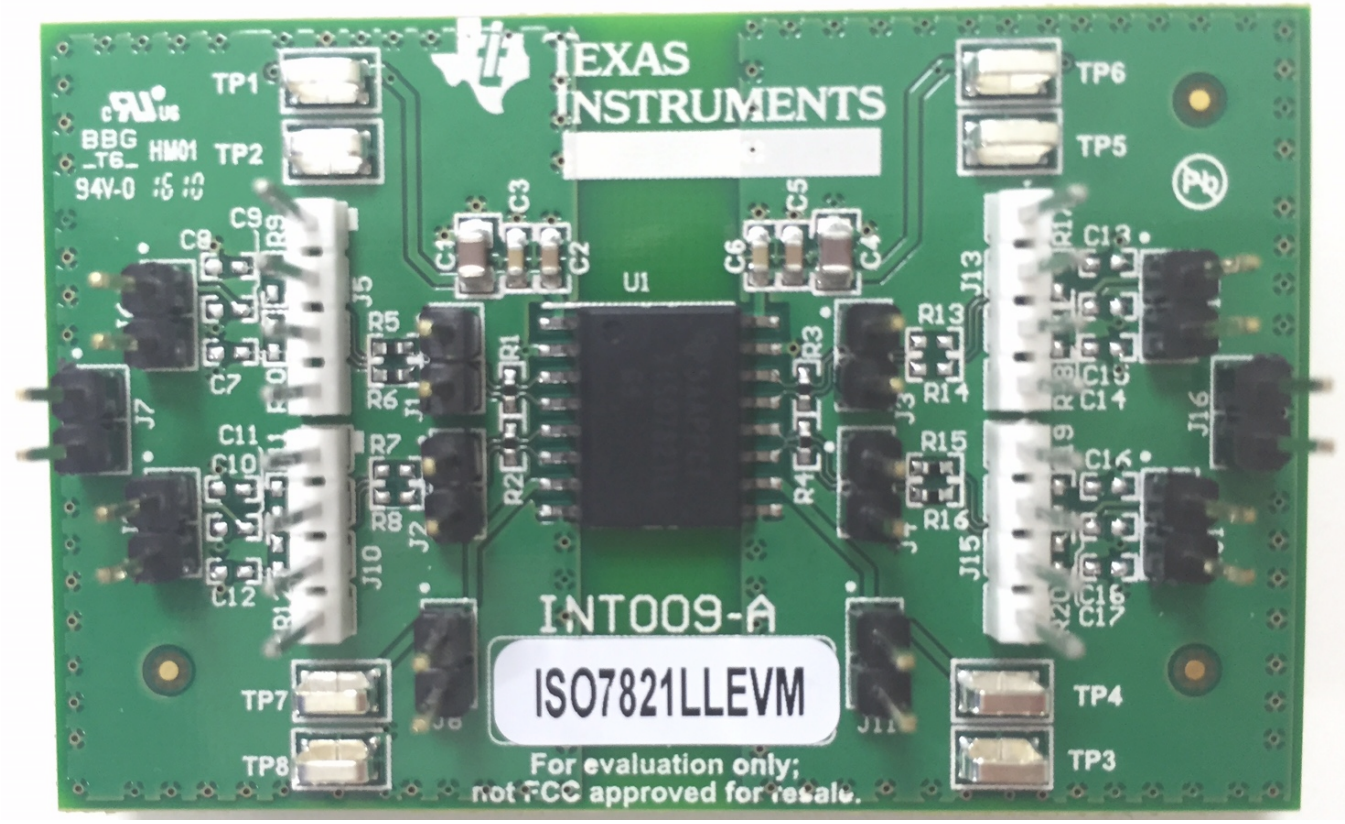
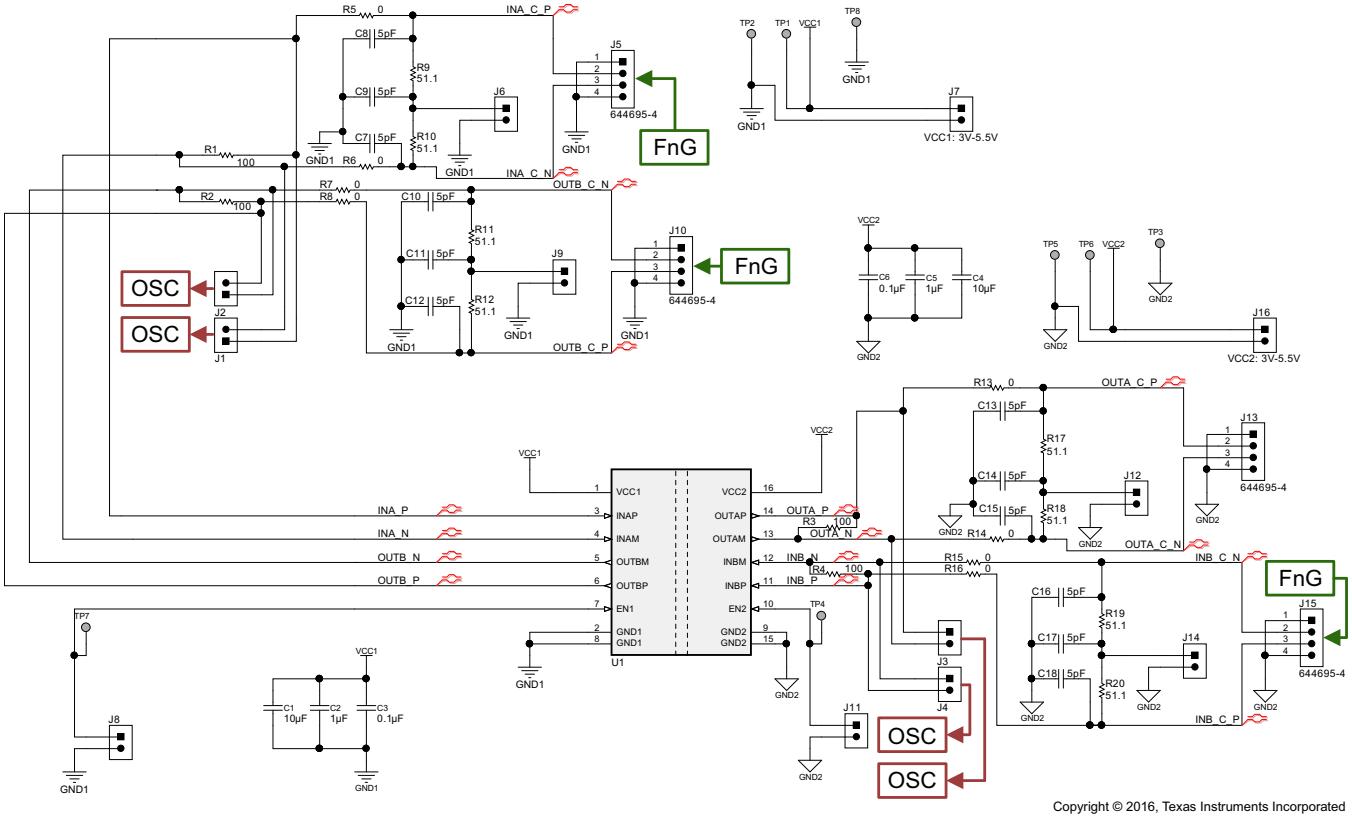


Figure 3. ISO7821LL EVM Photograph

5 EVM Setup and Operation

This section describes the setup and operation of the EVM for parameter performance evaluation. Figure 4 shows the configuration for operating the ISO7821LL, ISO7821LLS, and ISO7820LL isolated dual-LVDS buffer EVM using two power supplies.



OSC = oscilloscope
FnG = function generator

Figure 4. EVM Setup for Operation

To setup the EVM, use the following steps:

Step 1. Connect the V_{CC1} power supply to J7 and the V_{CC2} power supply to J16.

Step 2. Set the supply voltages, V_{CC1} and V_{CC2}, to 5 V and 200-mA compliance.

Step 3. Connect the function generator for the ISO7821LL and ISO7821LLS EVMs to J5 and J15 and for the ISO7820LL EVM to J5 and J10 on differential inputs (connect the FnG + signal to pin 2 (INx+), the FnG – signal to pin 3 (INx–), and the FnG ground to pin 1 and pin 4).

Step 4. Set the output square wave of the function generator to 50 MHz for the ISO7821LL and ISO7820LL EVMs and 75 MHz for the ISO7821LLS EVM with a 1.2-V DC bias (unbalanced) ± 400 mV_{PP}. Connect the positive output of the function generator to one differential line and the negative output to another differential line.

Step 5. Enable both the positive and negative differential outputs of the function generator.

Step 6. Probe (preferably using differential probes) the signals at J1, J2, J3 and J4.

For the ISO7821LL and ISO7821LLS EVM, the differential output is at J2 and J3. For the ISO7820LL EVM, the differential output is at J3 and J4. The differential output is a 1.2-V DC bias with ±400 mV_{PP} when measured with single ended probes and is a 0-V DC bias with ±800 mV_{PP} when measured with differential probes.

Figure 5 shows the typical waveforms for the channel 1 and channel 2 outputs for the ISO7821LL device using differential probes. Figure 6 shows the typical waveforms for the channel 1 and channel 2 outputs for the ISO7821LL device using single-ended probes. Figure 7 shows the typical eye diagram for the ISO7821LL device at a 100-Mbps data rate. Figure 8 shows the typical eye diagram for the ISO7821LLS device at a 150-Mbps data rate.

To check the common mode voltage of the 1.2-V DC bias, use the following steps:

- For the ISO7821LL and ISO7821LLS EVMs:
  - Step 1. Depopulate R2 and R3
  - Step 2. Populate C10, C11, C12, C13, C14, C15, R7, R8, R11, R12, R13, R14, R17, and R18
  - Step 3. Probe J9 and J12
- For the ISO7820LL EVM:
  - Step 1. Depopulate R3 and R4
  - Step 2. Populate C13, C14, C15, C16, C17, C18, R13, R14, R15, R16, R17, R18, R19, and R20
  - Step 3. Probe J12 and J14

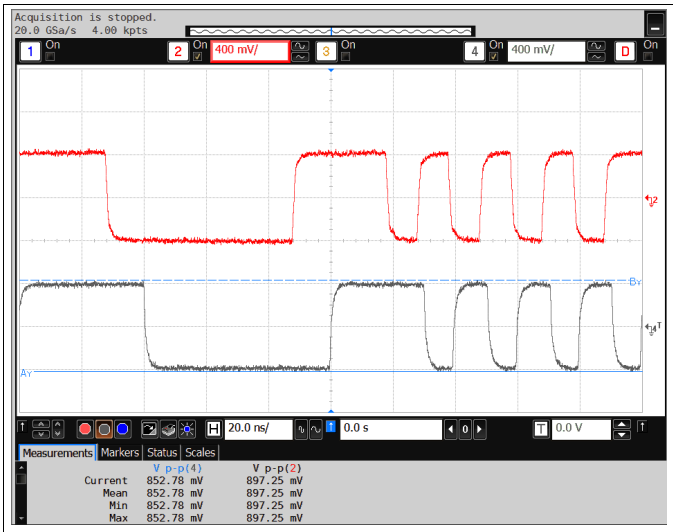


Figure 5. Typical Input and Output Waveforms—Differential Probes

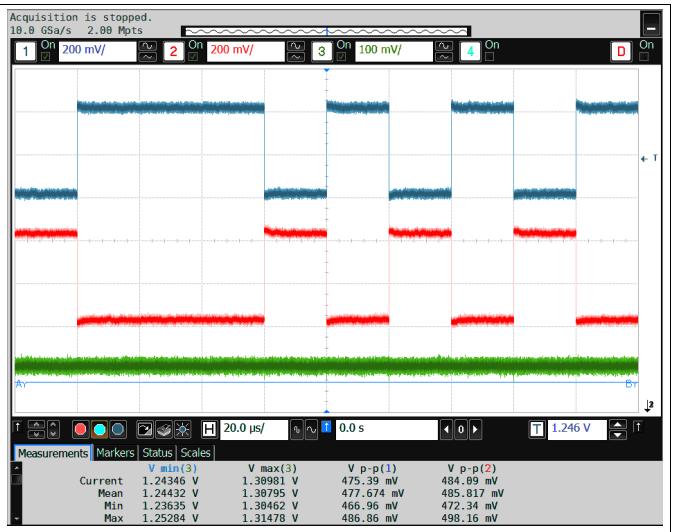


Figure 6. Typical Output Waveforms—Single-Ended Probes

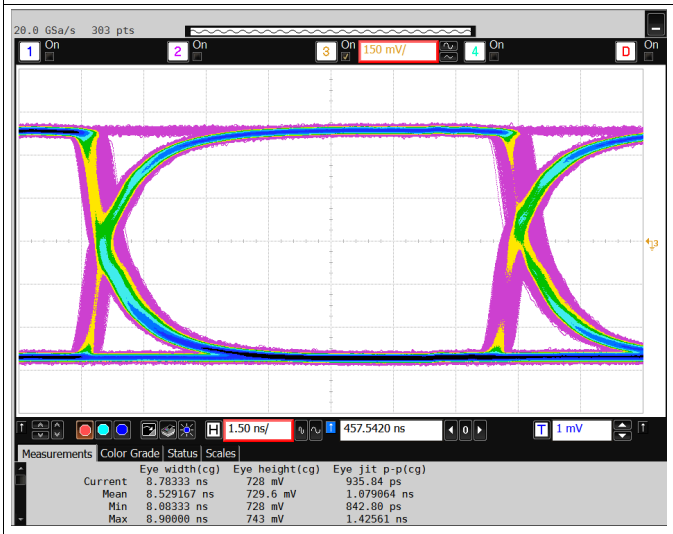


Figure 7. Eye Diagram at 100-Mbps Data Rate

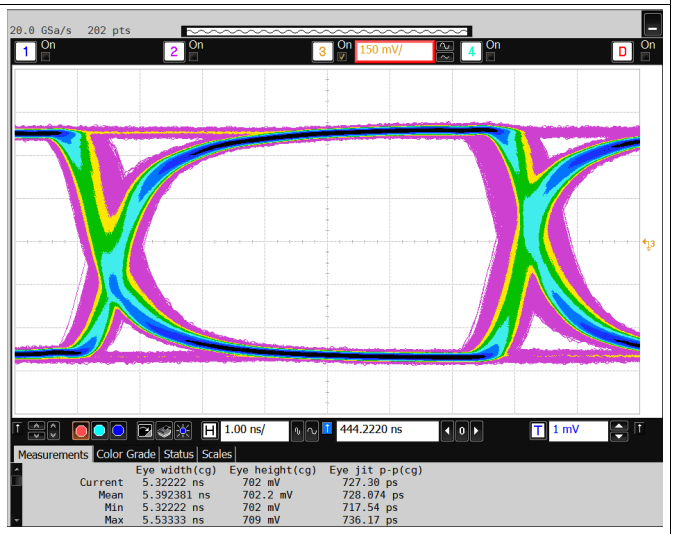


Figure 8. Eye Diagram at 150-Mbps Data Rate

6 Bill of Materials

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

Table 1. Bill of Materials

Designator	Quantity	Description	Value	Package Reference	PartNumber	Manufacturer
PCB	1	Printed Circuit Board			INT009-001 (for ISO7821LLDWR) INT009-002 (for ISO7820LLDWR) INT009-003 (for ISO7821LLSDWR)	Any
H1, H2, H3, H4	4	Bumpon, Hemisphere, 0.44 X 0.20, Clear		440x200 mil	SJ-5303 (CLEAR)	#M
U1	1	High-Performance, 8000 VPK Reinforced Isolated Dual LVDS Buffer, DW0016B		DW0016B	ISO7821LLDWR	Texas Instruments
		High-Performance, 8000 VPK Reinforced Isolated Dual LVDS Buffer, DW0016B		DW0016B	ISO7820LLDWR	Texas Instruments
		High-Performance, 8000 VPK Reinforced Isolated Dual LVDS Buffer, DW0016B		DW0016B	ISO7821LLSDWR	Texas Instruments
J1, J2, J3, J4, J6, J7, J8, J9, J11, J12, J14, J16	12	CONN HEADER 2POS .100" T/H GOLD		Header, 100mil, 2x1, Gold, TH	HTSW-102-07-G-S	Samtec
C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18	DNP	CAP, CERM, 5 pF, 50 V, ± 5%, C0G/NP0, 0402	5 pF	0402	GRM1555C1H5R0CA01D	MuRata
C2, C5	2	CAP, CERM, 1 µF, 50 V, ± 10%, X5R, 0603	1 µF	0603	GRM188R61H105KAALD	MuRata
C1, C4	2	CAP, CERM, 10 µF, 35 V, ± 10%, X5R, 0805	10 µF	0805	GRM21BR6YA106KE43L	MuRata
FID1, FID2, FID3	0	Fiducial mark. There is nothing to buy or mount.		Fiducial	N/A	N/A
R5, R6	2	RES, 0, 5%, 0.063 W, 0402	0 Ω	0402	ERJ-2GE0R00X	Panasonic
R13, R14	0	RES, 0, 5%, 0.063 W, 0402	0 Ω	0402	ERJ-2GE0R00X	Panasonic
R7, R8	DNP	RES, 0, 5%, 0.063 W, 0402	0 Ω	0402	ERJ-2GE0R00X (for ISO7821LLDWR and ISO7821LLSDWR)	Panasonic
	2	RES, 0, 5%, 0.063 W, 0402	0 Ω	0402	ERJ-2GE0R00X (for ISO7820LLDWR)	Panasonic
R15, R16	2	RES, 0, 5%, 0.063 W, 0402	0 Ω	0402	ERJ-2GE0R00X (for ISO7821LLDWR and ISO7821LLSDWR)	Panasonic
	DNP	RES, 0, 5%, 0.063 W, 0402	0 Ω	0402	ERJ-2GE0R00X (for ISO7820LLDWR)	Panasonic
R1, R2, R3, R4	4	RES, 100, 1%, 0.063 W, 0402	100 Ω	0402	CRCW0402100RFKED	Vishay-Dale
R9, R10, R11, R12, R17, R18, R19, R20	DNP	RES, 51.1, 1%, 0.063 W, 0402	51.1 Ω	0402	CRCW040251R1FKED	Vishay-Dale
J5, J10, J13, J15	4	CONN HEADER VERT 4POS .100 TIN		Header, 100mil, 4x1, Tin, TH	644695-4	TE Connectivity
C3, C6	2	CAP, CERM, 0.1 µF, 25 V, ± 5%, X7R, 0603	0.1 µF	0603	06033C104JAT2A	AVX
TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8	8	Test Point, Miniature, SMT		Test Point, Miniature, SMT	5019	Keystone

7 EVM Schematics and Layout

Separate orderable EVMs are available for each isolated dual-LVDS buffer (ISO7821LL, ISO7821LLS, and ISO7820LL). The EVMs must be modified only in the placement of the 100-Ω termination resistors at the input and output (only if needed) of each channel. Figure 9 shows the ISO7821LL, ISO7821LLS, and ISO7820LL EVM schematic and Figure 10 shows the printed-circuit board (PCB) layout.

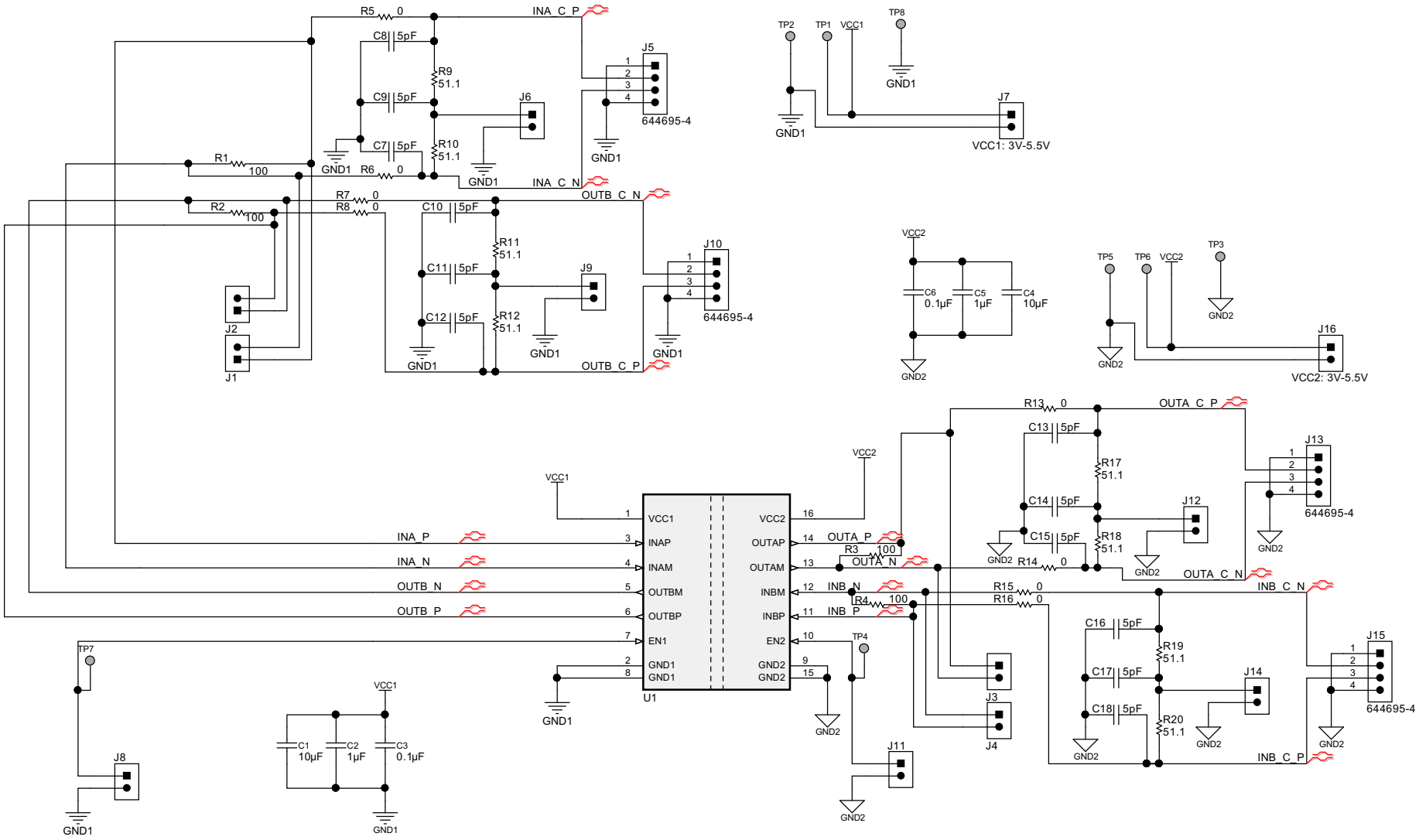


Figure 9. ISO7821LL, ISO7820LL, and ISO7821LLS EVM Schematic

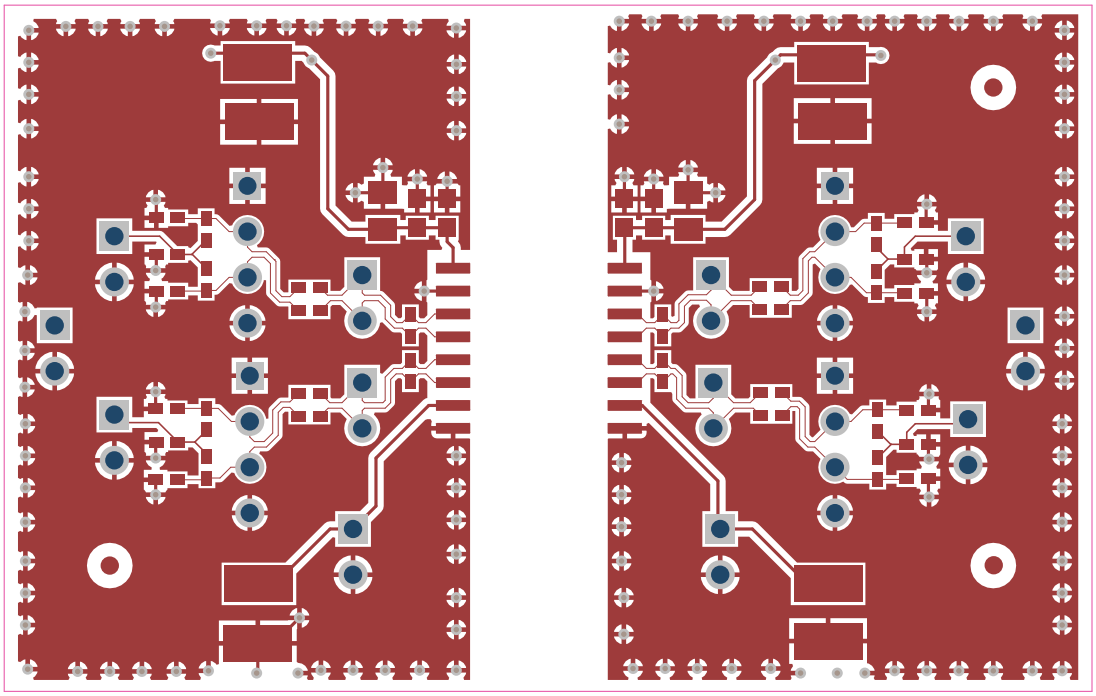


Figure 10. ISO7821LL, ISO7820LL, and ISO7821LLS EVM PCB Layout

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   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 and conditions 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 and conditions 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 any defects that are 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. Moreover, TI shall not be liable for any defects that result from User's design, specifications or instructions for such EVMs. Testing and other quality control techniques are used to the extent TI deems necessary or as mandated by government requirements. TI does not test all parameters of each EVM.

   2.3 If any EVM fails to conform to the warranty set forth above, TI's sole liability shall be at its option to repair or replace such EVM, 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.

3 *Regulatory Notices:*

   3.1 *United States*

      3.1.1 *Notice applicable to EVMs not FCC-Approved:*

      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*

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-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.

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/lsds/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/lsds/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 by Radio Law of Japan to follow the instructions below with respect to EVMs:

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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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.

6. *Disclaimers:*

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