TS3DDR4000 EVM User's Guide

This document is the EVM User's guide for the TS3DDR4000-EVM which provides an easy evaluation of TI's 12-bit 1:2 high speed DDR3/DDR3/DDR4 switch/multiplexer.

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1 About this Manual

This user's guide describes the TS3DDR4000 evaluation module (EVM) and its intended use. This guide contains the EVM schematics, bill of materials, and board layer information.

2 Information About Cautions and Warnings

The information in a caution or a warning is provided for personal protection. Read each caution and warning carefully.



CAUTION

This EVM contains components that can potentially be damaged by electrostatic discharge. Always transport and store the EVM in its supplied ESD bag when not in use. Handle using an antistatic wristband. Operate on an antistatic work surface. For more information on proper handling, see the *Electrostatic Discharge (ESD)* application note (SSYA008).

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3 Introduction

The TS3DDR4000-EVM is an evaluation module for TI's 12-bit, 1:2 high-speed DDR3/DDR3/DDR4 switch/multiplexer. The EVM allows for easy evaluation of the control inputs and connectivity. This EVM is not designed for high speed signal integrity evaluation.

3.1 List of Hardware Items for Operation

The following items are required for EVM evaluation:

- TS3DDR4000-EVM
- Power Supply

Figure 1 illustrates the TS3DDR4000-EVM board.

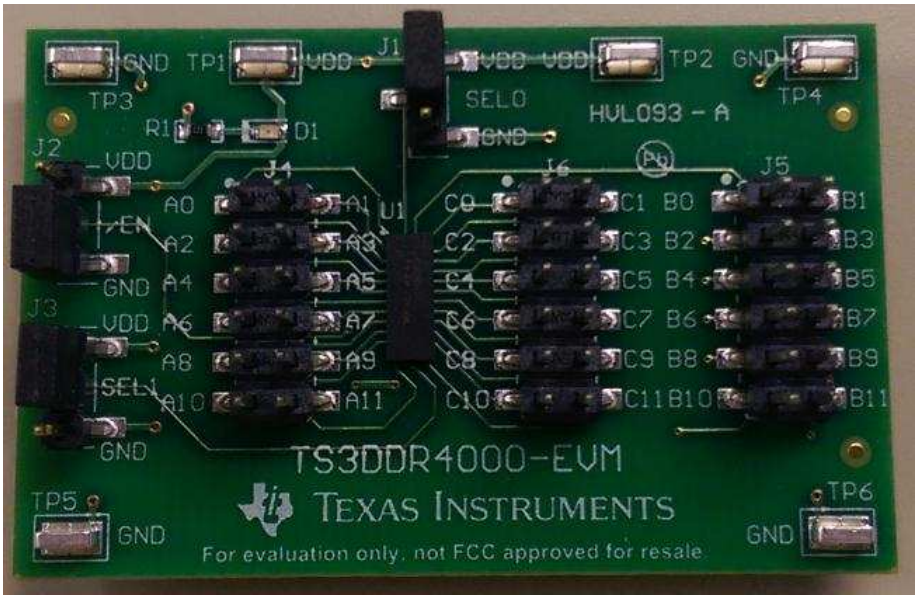


Figure 1. TS3DDR4000-EVM

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4 TS3DDR4000-EVM Connections Overview

4.1 TS3DDR4000 Breakout Connections

All the data lines for the TS3DDR4000 are broken out to header test points for easy evaluation of DC performance. The A data lines are broken out to J4, B data lines to J5, and C data lines to J6.

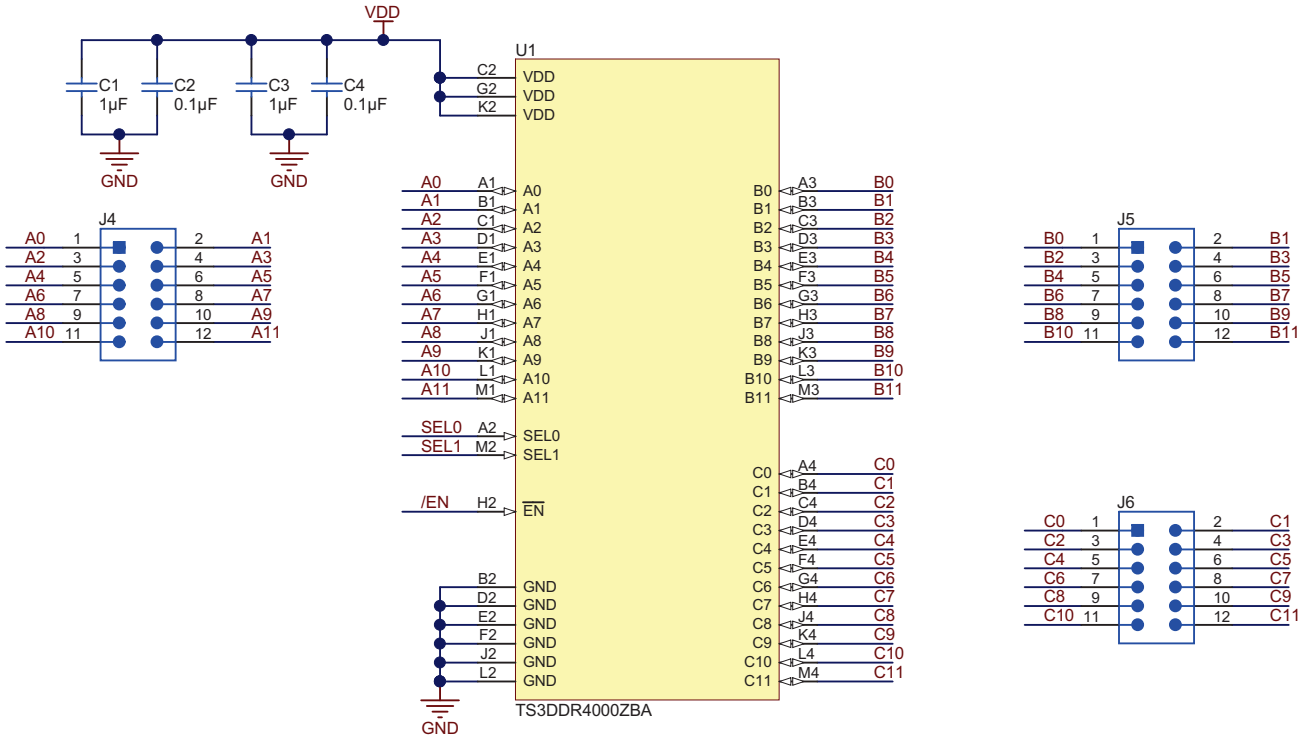


Figure 2. TS3DDR4000 Breakout Connections

All pins are labeled in silkscreen for easy reference as shown in Figure 3.

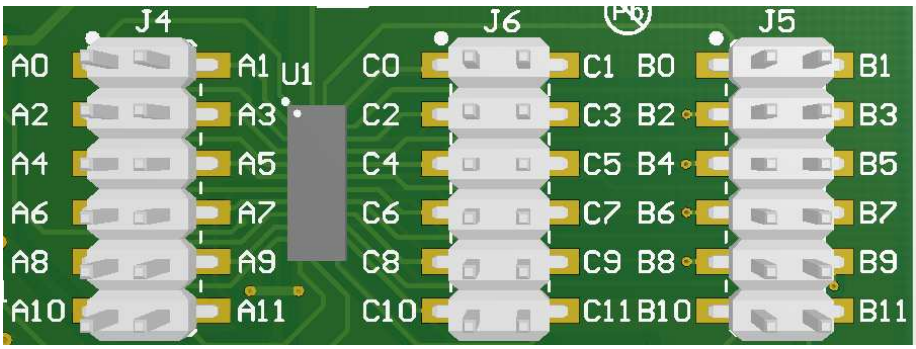


Figure 3. Silkscreen Labeling of Data Lines

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4.2 Power

The TS3DDR4000 EVM requires an external supply to operate. When powered, the power consumption of the board will be less than 10 mA. When power is connected, the power indicator LED D1 will be lit.

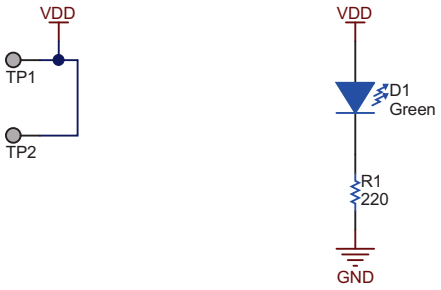


Figure 4. VDD Input and Indicator Diode

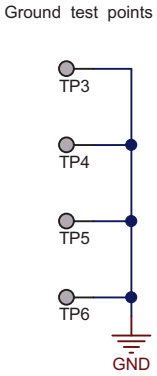


Figure 5. Ground Test Points

4.3 Select and Enable Jumper Operation

Jumpers J1, J2, and J3 provide an easy means of selecting a high or low input to these. Using included jumpers with the EVM, short pins 1 and 2 to connect the pin to VDD. Short pins 2 and 3 to connect the pin to ground. Table 1 contains the logic control information for the select and enable lines.

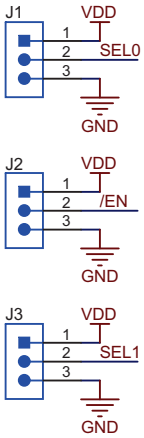


Figure 6. SEL0, SEL1, /EN Jumpers

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Table 1. Logic Control

Control Pins			Jumper Position[1]			Function
/EN	SEL0	SEL1	J1	J2	J3	
H	-	-	-	1-2	-	Power-down mode All channels OFF (isolated)
L	L	L	2-3	2-3	2-3	Port A to Port B ON Port A to Port C OFF (isolated)
L	L	H	2-3	2-3	1-2	B[0, 1, 4, 5, 8, 9] M M A[0, 1, 4, 5, 8, 9] A[2, 3, 6, 7, 10, 11] M M C[2, 3, 6, 7, 10, 11] All other channels OFF (isolated)
L	H	L	1-2	2-3	2-3	A[0, 1, 4, 5, 8, 9] M M C[0, 1, 4, 5, 8, 9] A[2, 3, 6, 7, 10, 11] M M B[2, 3, 6, 7, 10, 11] All other channels OFF (isolated)
L	H	H	1-2	2-3	1-2	Port A to Port B OFF (isolated) Port A to Port C ON

(1) Jumper position indicates which pins are shorted. If pins 1-2 are shorted that select/enable lines is connected to VDD. If pins 2-3 are shorted that select/enable lines is connected to ground.

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5 Board Documentation

This section contains the schematic, bill of materials, and printed-circuit board (PCB) layouts.

5.1 Schematic

Figure 7 shows the TS3DDR4000 EVM schematic.

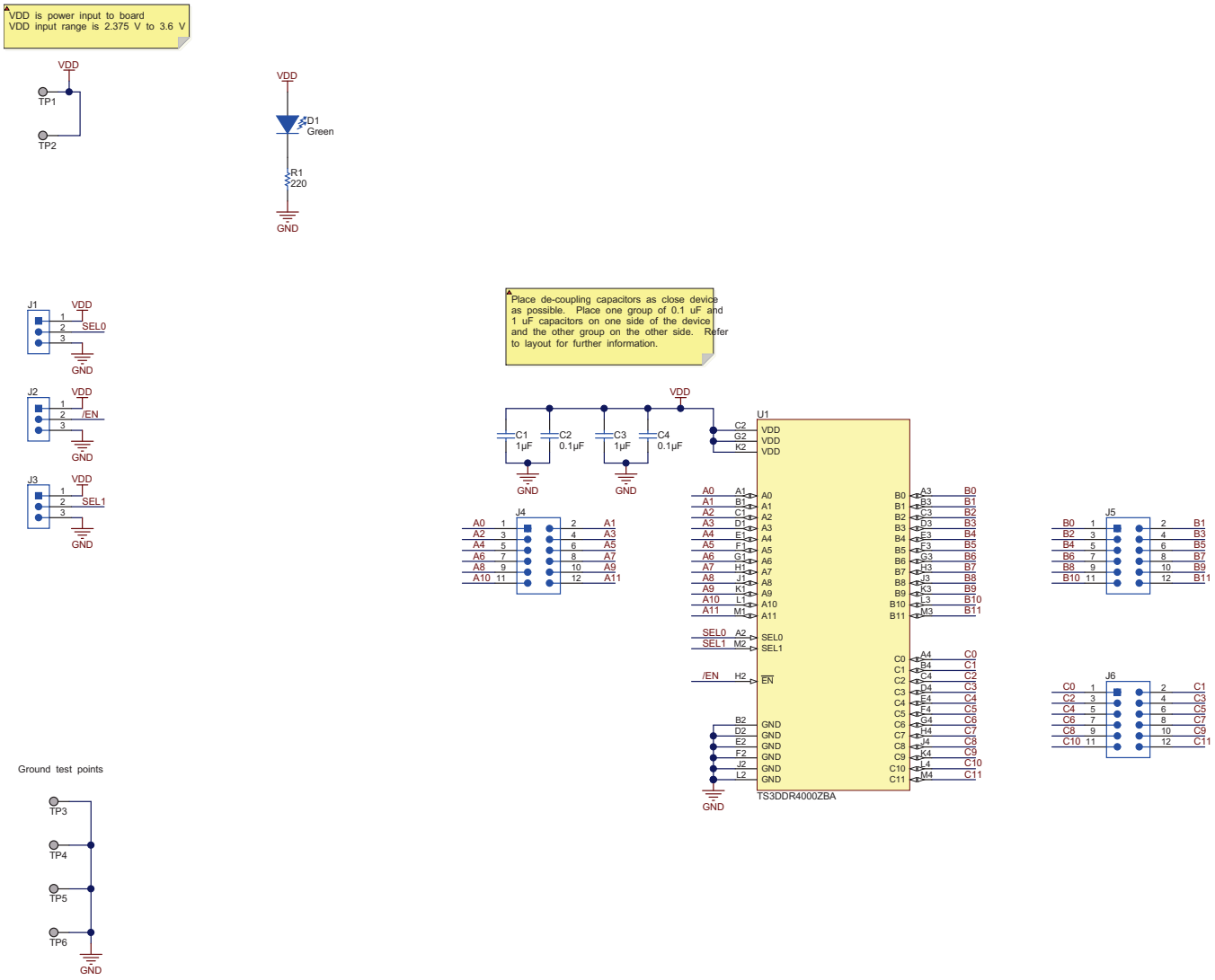


Figure 7. TS3DDR4000 EVM Schematic

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5.2 Bill of Materials

Table 2 lists the TS3DDR4000 EVM BOM.

Table 2. TS3DDR4000 EVM Bill of Materials

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer
!PCB1	1		Printed Circuit Board		HVL093	Any
C1, C3	2	1uF	CAP, CERM, 1uF, 6.3V, +/-10%, X7R, 0603	0603	GRM188R70J105KA01D	MuRata
C2, C4	2	0.1uF	CAP, CERM, 0.1uF, 6.3V, +/-10%, X7R, 0603	0603	GRM188R70J104KA01D	MuRata
D1	1	Green	LED, Green, SMD	1.6x0.8x0.8mm	LTST-C190GKT	Lite-On
FID4, FID5, FID6	3		Fiducial mark. There is nothing to buy or mount.	Fiducial	N/A	N/A
H1, H2, H3, H4	4		Bumpon, Hemisphere, 0.44 X 0.20, Clear	Transparent Bumpon	SJ-5303 (CLEAR)	3M
J1, J2, J3	3		Header, 100mil, 3x1, Gold, SMT	Samtec_TSM-103-01-X-SV	TSM-103-01-L-SV	Samtec
J4, J5, J6	3		Header, 100mil, 6x2, SMT	Header, 6x2, SMT	0015912120	Molex
R1	1	220	RES, 220 ohm, 5%, 0.1W, 0603	0603	CRCW0603220RJNEA	Vishay-Dale
SH-J1, SH-J2, SH-J3	3	1x2	Shunt, 100mil, Gold plated, Black	Shunt	969102-0000-DA	3M
TP1, TP2, TP3, TP4, TP5, TP6	6		Test Point, Miniature, SMT	Test Point, Miniature, SMT	5019	Keystone
U1	1		12-bits 1:2 High Speed DDR2/DDR3/DDR4 Switch/Multiplexer, ZBA0048A	ZBA0048A	TS3DDR4000ZBA	Texas Instruments
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	Fiducial	N/A	N/A

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5.3 PCB Layout

Figure 8 through Figure 9 illustrate the TS3DDR4000 EVM PCB layouts.

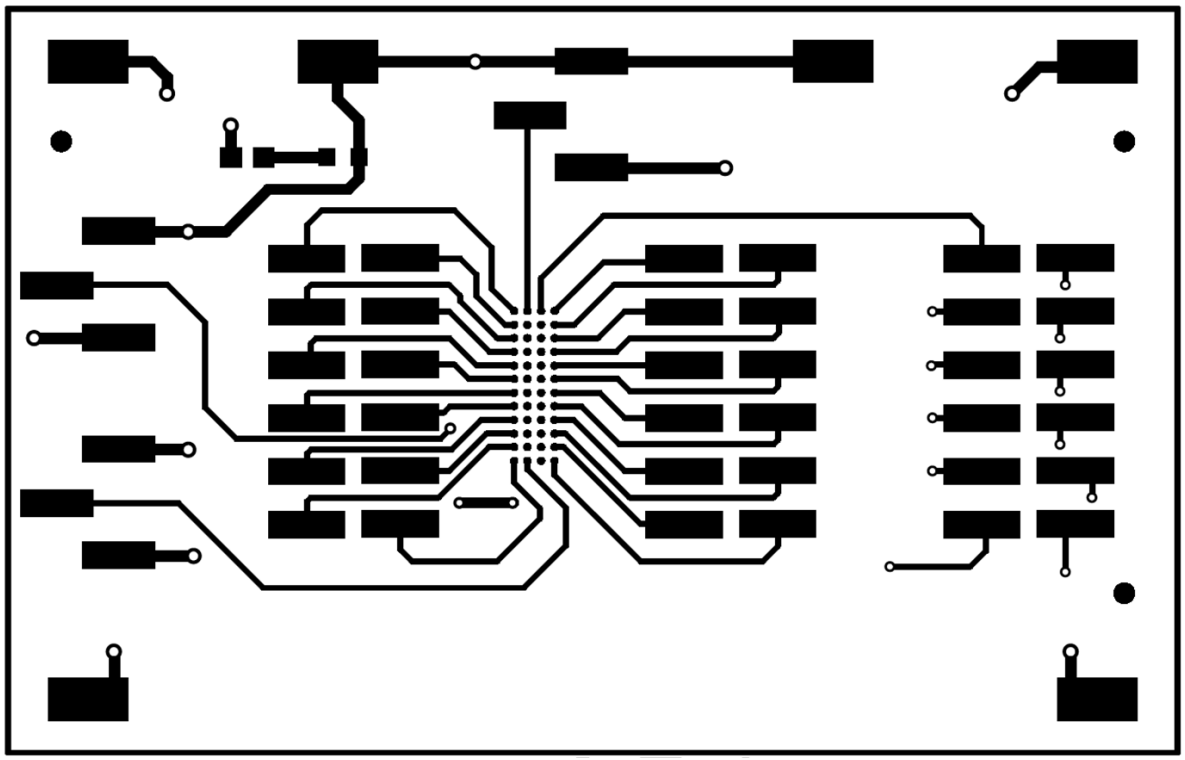


Figure 8. Top Copper

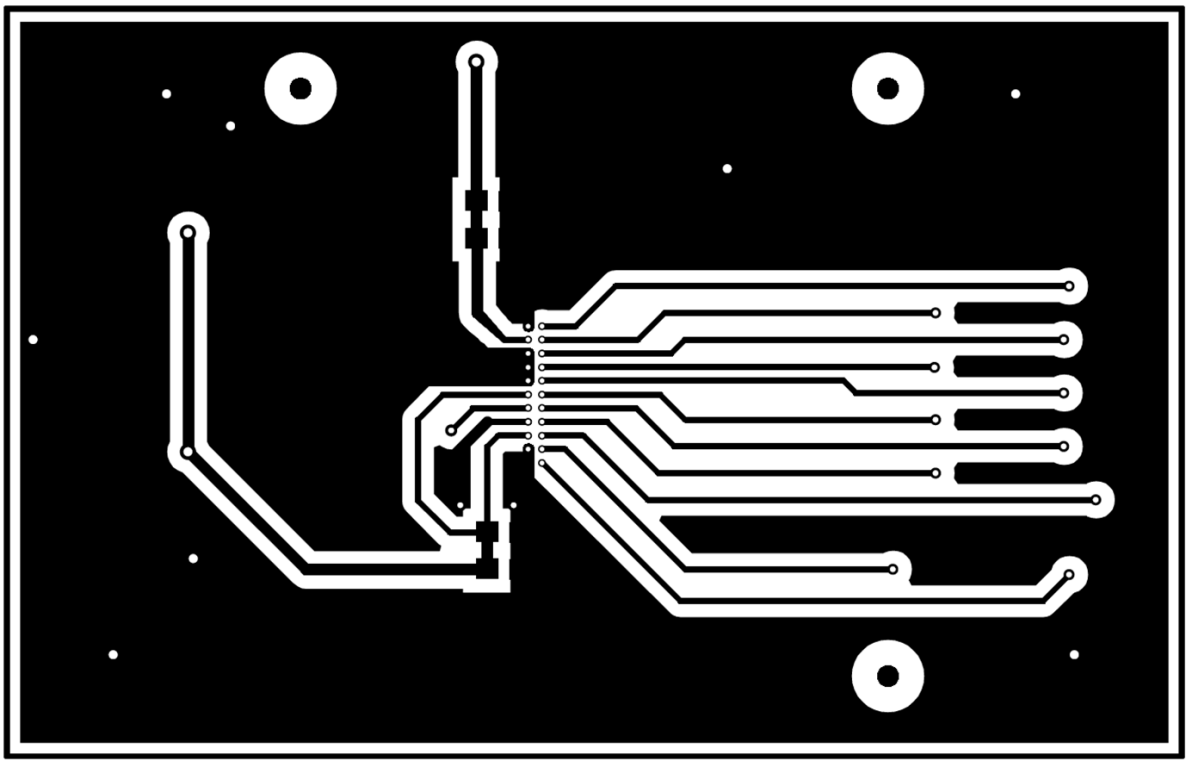


Figure 9. Bottom Copper

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6 Related Documentation

- Product page: http://www.ti.com/product/TS3DDR4000
- TS3DDR4000 Datasheet (SCDS356)
- Link to tools: http://www.ti.com/product/TS3DDR4000/toolssoftware

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      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.

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      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

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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

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If User uses EVMs in 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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4.3.2 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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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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