

DRV595 EVM

This user's guide provides an overview of the Texas Instruments (TI) DRV595, high-efficiency PWM power driver evaluation module. It includes a list of EVM features, a brief illustrated description of the module, a list of EVM specifications, how to connect this board, and a Quick-Start Guide.

Contents

1	Introduction	2
1.1	Feature Highlights	2
1.2	EVM Specifications	2
2	Operating Instructions List	3
2.1	Precaution	3
2.2	Operating Instruction List	3
3	Design Information	6
3.1	PCB Layout	6
3.2	Bill of Materials	7
3.3	PCB Schematics	8

List of Figures

1	DRV595EVM Physical Layout.....	3
2	Top View	4
3	Top Composite	6
4	Bottom Composite	6
5	Schematic	8

List of Tables

1	Typical Jumper Connections	4
2	Frequency Selection Guide	5
3	Bill of Materials	7

1 Introduction

The DRV595 PWM power driver evaluation module is a complete power stage solution. It consists of the TI DRV595DAP PWM power driver IC along with a few discrete passive components required for operation. It also includes jumpers for configuring the features of the device, test points for fault monitoring, and a full output filter that is easily modified. The jacks for the inputs, outputs, and power supply provide easy connection to any system, from an existing design to a bread-boarded prototype.

1.1 Feature Highlights

The DRV595 evaluation module includes the following features:

- Wide supply voltage range: 4.5 V – 26 V
- High efficiency generates less heat
- Multiple switching frequencies
- Single power supply reduces component count
- Integrated self-protection circuits including over-voltage, under-voltage, over-temperature, and short circuit.
- Jumpers for selecting device options
- Easy connections for inputs, outputs, and power supply

1.2 EVM Specifications

- Supply voltage range, V_{DD} — 4.5 V to 26 V
- Supply current, I_{DD} — 3.0-A max

CAUTION

Failure to observe ESD handling procedures can result in damage to EVM components.

2 Operating Instructions List

Use the following steps to quickly prepare the DRV595 EVM for use.

2.1 Precaution

CAUTION

Always ensure that the polarity and voltage of the external power connected to PVCC are within specification. Overvoltage or reverse-polarity power applied to this terminal will damage the evaluation module.

2.2 Operating Instruction List

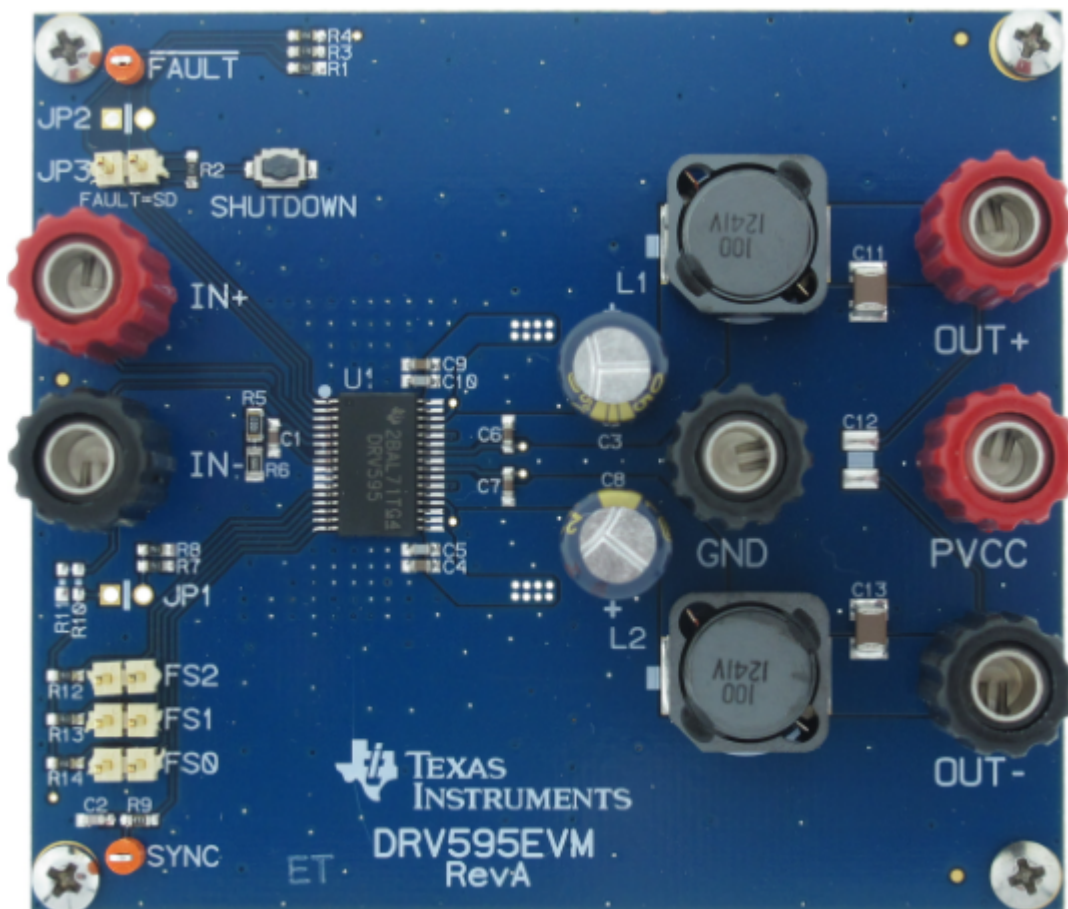


Figure 1. DRV595EVM Physical Layout

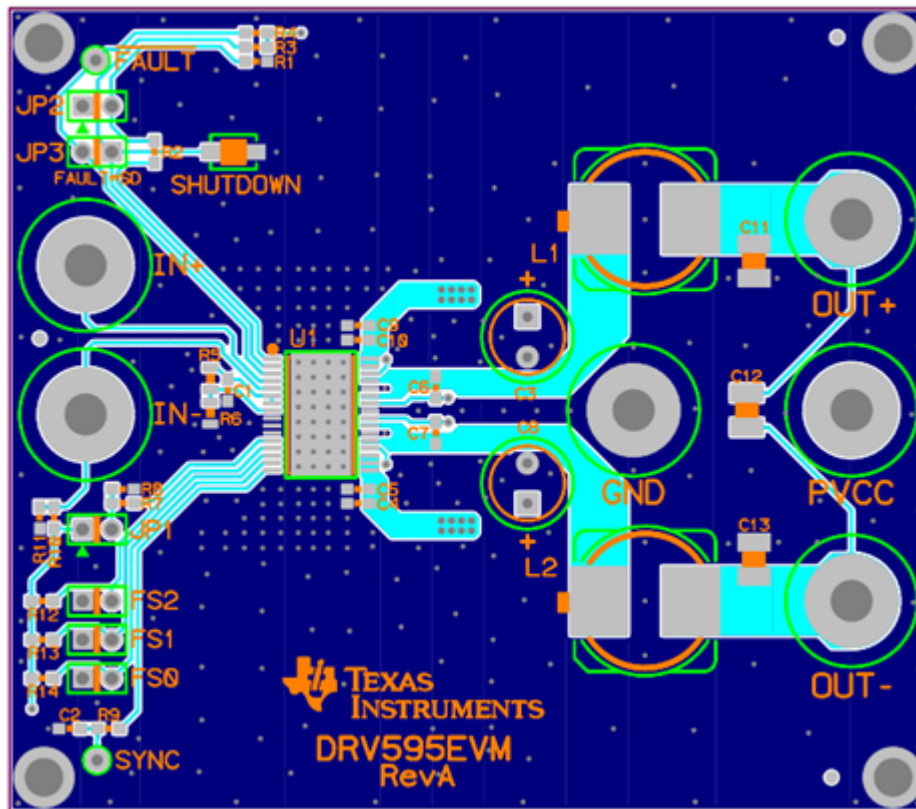


Figure 2. Top View

Table 1. Typical Jumper Connections

JP1	JP2	JP3	FS2	FS1	FS0
OFF	OFF	ON	ON	ON	ON

Power Supply

- Ensure that all external power sources are set to OFF.
- Connect a 4.5-V to 26-V power supply to (PVCC) and (GND), taking care to observe proper polarity.

Inputs and Outputs

- Connect a dc control voltage to (IN+) ranging from 0.5-V to 5.5-V. Alternately, the terminal (IN+) can be held to a fixed voltage with a resistor voltage divider, as shown in the schematic. A dc control voltage applied to IN- of the same magnitude provides 0-V output from OUT+ to OUT-.
- Connect a load across (OUT+) and (OUT-). The polarity of the connection depends on the operation of the dc control voltage. As the voltage at IN+ becomes greater than the voltage at IN-, the voltage at OUT+ increases, causing current to flow from OUT+ to OUT-. Similarly, as the voltage at IN+ decreases lower than IN-, the voltage at OUT- increases, causing current to flow from OUT- to OUT+.

Evaluation Module Jumpers

- Jumper JP1 (HI-Z) should be OFF for normal operation. When JP1 is ON, the output of DRV595 is disabled. This jumper is for fast disabling or enabling of outputs.
- Jumper JP2 (MODSEL) gives the option of running in either 1SPW modulation or BD modulation. When JP1 is ON, the DRV595 operates on 1SPW mode. The 1SPW mode alters the normal modulation scheme in order to achieve higher efficiency with a slight penalty in ripple current and more attenuation required in the output filter selection. When JP1 is OFF, the DRV595 operates in BD mode. In BD mode, the device allows for smaller ripple current through the TEC load.

- Jumper JP3 (SDZ = FAULTZ) should be ON for normal operation. When Jumper JP3 is ON, the FAULTZ signal is connected to SDZ. When Jumper JP3 is OFF, the SDZ is disconnected from FAULTZ, so the fault signal can't affect shutdown.
- The FS0-FS2 is for oscillator frequency selection.

Table 2. Frequency Selection Guide

FS2	FS1	FS0	Min	Typ	Max	Unit
ON	ON	ON	376	400	424	kHz
ON	ON	OFF	470	500	530	
ON	OFF	ON	564	600	636	
ON	OFF	OFF	940	1000	1060	
OFF	ON	ON	1128	1200	1278	
OFF	ON	OFF	Reserved			
OFF	OFF	ON				
OFF	OFF	OFF				

3 Design Information

3.1 PCB Layout

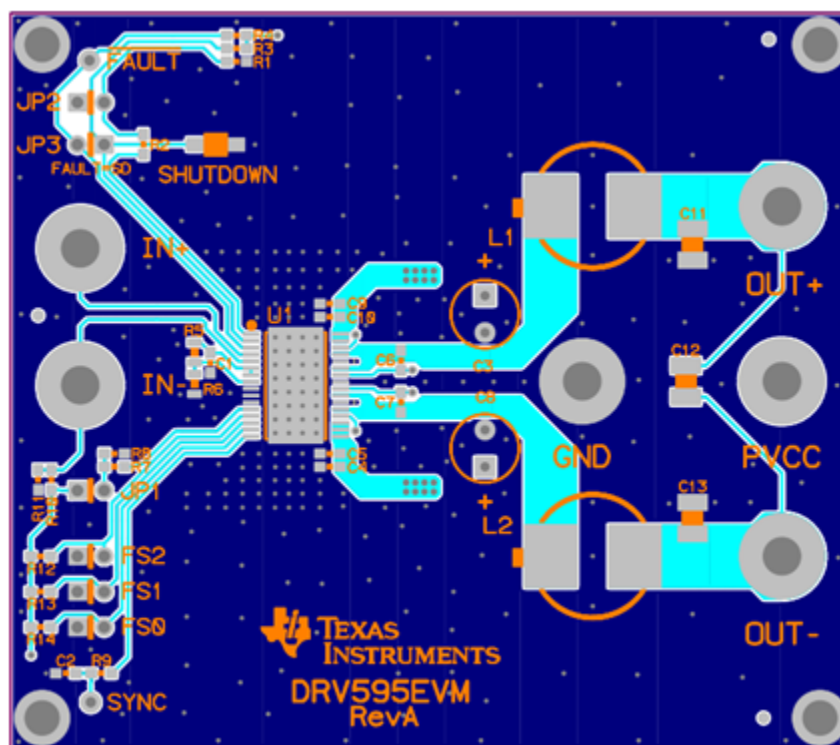


Figure 3. Top Composite

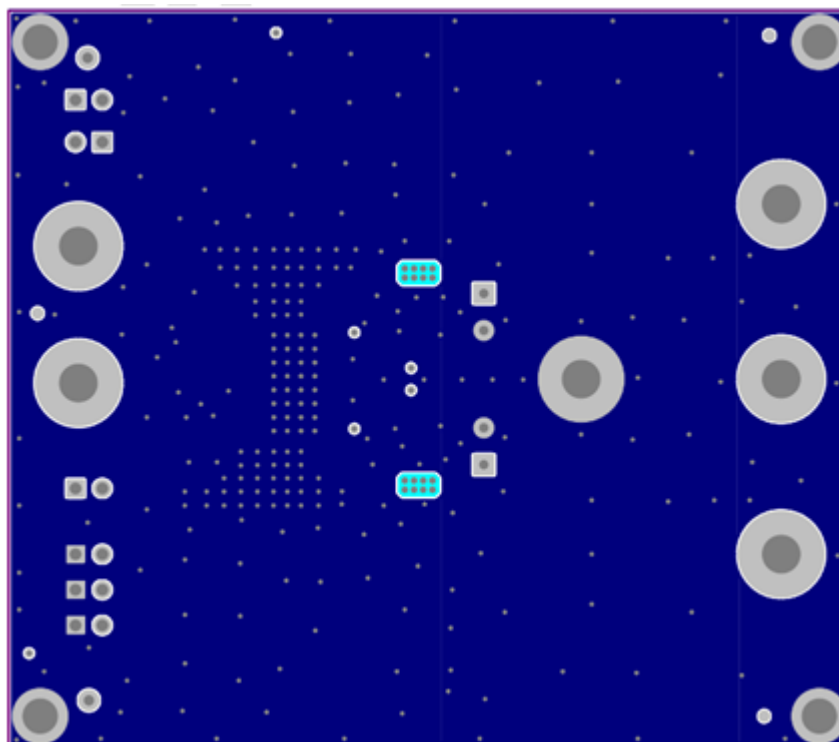


Figure 4. Bottom Composite

3.2 Bill of Materials

Table 3. Bill of Materials

MANU Part No.	MANU	Qty	REF Designators	Description
DRV595DAP	TEXAS INSTRUMENTS	1	U1	PWM TEC DRIVER 15V 3A HTSSOP32-DAP ROHS
C1608X7R1C105K	TDK	1	C1	CAP SMD0603 CERM 1.0UFD 16V 10% X7R ROHS
GRM1885C1H470JA01D	MURATA	1	C2	CAP SMD0603 CERM 47PFD 50V 5% COG ROHS
EEU-FC1V221L	PANASONIC	2	C3, C8	CAP THRU ALUM-ELECT FC SERIES 220ufd 35V 20% 8x3.5x15mm ROHS
GRM188R71H104KA93D	MURATA	2	C4, C9	CAP SMD0603 CERM 0.1UFD 50V 10% X7R ROHS
C1608C0G1H102J	TDK CORP.	2	C5, C10	CAP SMD0603 CERM 1000PFD 50V 5% COG ROHS
06033D224KAT2A	AVX	2	C6, C7	CAP SMD0603 CERM 0.22UFD 25V 10% X5R ROHS
GRM32ER7YA106KA12L	MURATA	3	C11, C12, C13	CAP SMD1210 CERM 10UFD 35V 10% X7R ROHS
RMCF0603JT100K	STACKPOLE ELECTRONICS	9	R1, R2, R3, R4, R7, R8, R12, R13, R14	RESISTOR SMD0603 100K OHMS 5% 1/10W ROHS
MCR10ERTF1003	ROHM	1	R5	RESISTOR SMD0805 100.0 KOHMs 1% 1/8W ROHS
MCR10ERTF2002	ROHM	1	R6	RESISTOR SMD0805 20.0 KOHMs 1% 1/8W ROHS
ERJ-3GEYJ473V	PANASONIC	1	R9	RESISTOR SMD0603 47K OHMS 5% 1/10W ROHS
931BS-100M	TOKO	2	L1, L2	INDUCTOR 10uH 5.8A TYPE D128C ROHS
PBC02SAAN	SULLINS	4	FS0, FS1, FS2, JP3	HEADER THRU MALE 2 PIN 100LS GOLD ROHS
5003	KEYSTONE ELECTRONICS	2	SYNC, FAULT	PC TESTPOINT, ORANGE, ROHS
TL1015AF160QG	E-SWITCH	1	SHUTDOWN	SWITCH, MOM, 160G SMT 4X3MM ROHS
7006	KEYSTONE ELECTRONICS	3	IN+, OUT+, PVCC	BINDING POST, RED, 15A ECONO ROHS
7007	KEYSTONE ELECTRONICS	3	GND, IN-, OUT-	BINDING POST, BLACK, 15A ECONO ROHS
94868A178	MCMaster-CARR	4	STANDOFFS	STANDOFF M3x25mm 4.5mm DIA HEX STAINLESS STEEL F-F ROHS
92148A150	MCMaster-CARR	4	STANDOFF HARDWARE	WASHER SPLIT-LOCK M3 6.2mm OD 0.7mm THICK STAINLESS STEEL ROHS
92000A118	MCMaster-CARR	4	STANDOFF HARDWARE	SCREW M3x8 PHILIPS PANHEAD STAINLESS STEEL ROHS

3.3 PCB Schematics

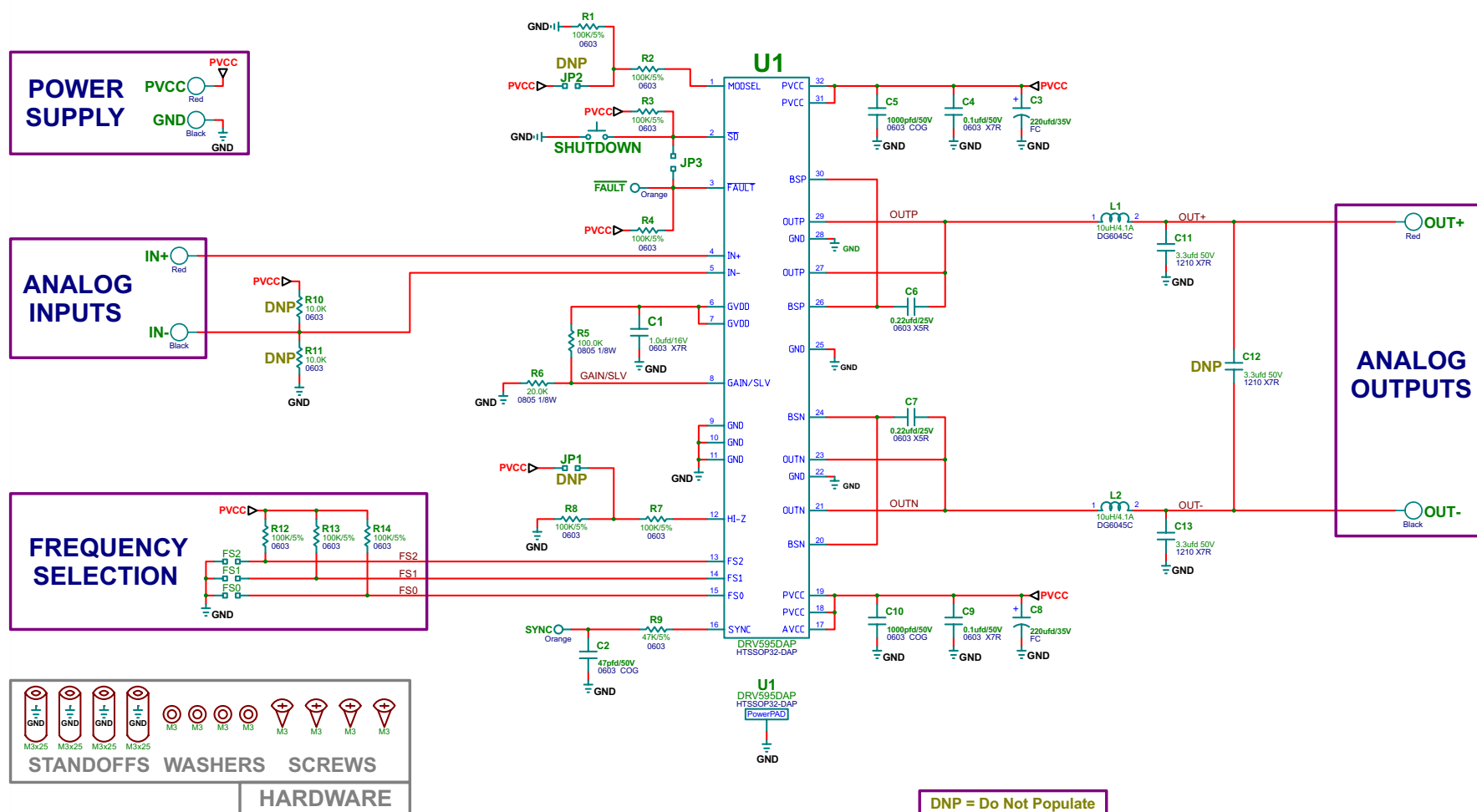


Figure 5. Schematic

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General Statement for EVMs including a radio

User Power/Frequency Use Obligations: This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

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

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

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.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Concerning EVMs including radio transmitters

This device complies with Industry Canada licence-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.

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.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

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.

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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This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product 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 this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

Texas Instruments Japan Limited
(address) 24-1, Nishi-Shinjuku 6 chome, Shinjuku-ku, Tokyo, Japan

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東京都新宿区西新宿 6 丁目 2 4 番 1 号

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3. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

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