

## **DRV8837EVM User's Guide**

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This document is provided with the DRV8837 customer evaluation module (EVM) as a supplement to the DRV8837 ([SLVSBA4](#)) datasheet. It details the hardware implementation of the EVM.

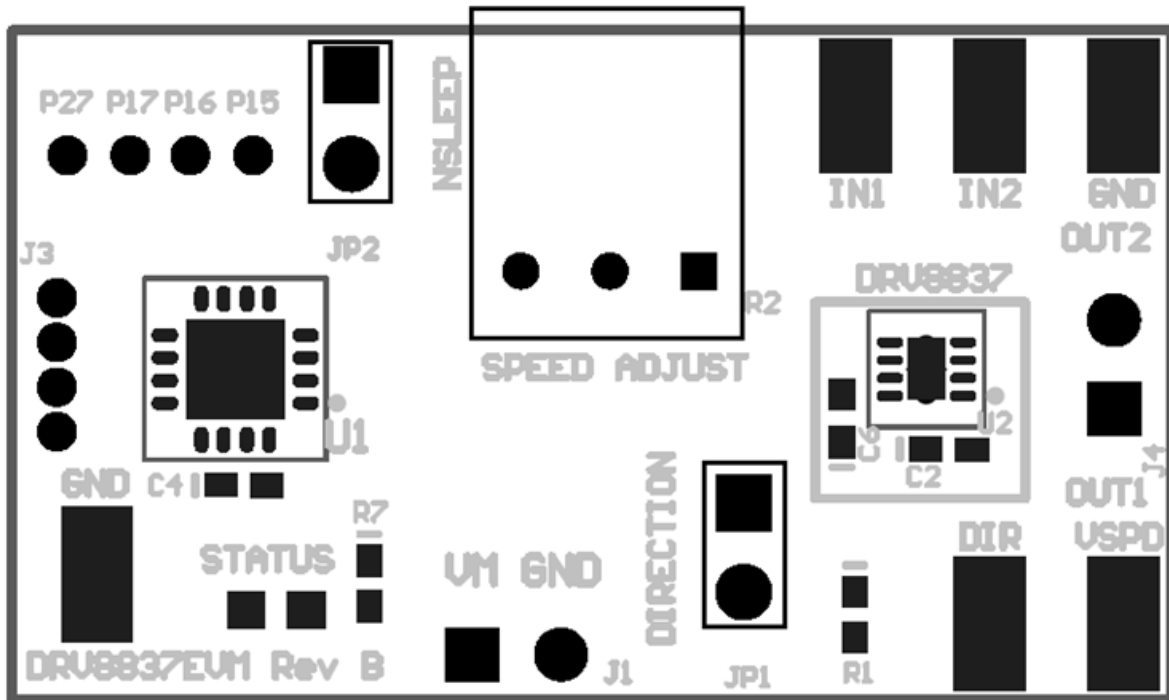
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1 PCB (TOP ASSEMBLY VIEW)



## 2 INTRODUCTION

The DRV8837EVM is a complete solution for evaluating the DRV8837 low voltage brushed DC motor driver. It includes a MSP430 microcontroller that is pre-programmed to take input from an analog potentiometer, for PWM speed control, and a direction jumper, to change motor direction. Power can be provided with the included micro-USB cable for 5 V or externally provided up to 11 V through the power header. To expand beyond the included firmware capability the MSP430 can easily be re-programmed via an external MSP430 USB Stick Development Tool available at [www.ti.com/tool/ez430-f2013](http://www.ti.com/tool/ez430-f2013). Unused pins on the micro-processor are brought out to plated thru holes on the EVM.

### 2.1 Power Connectors

The DRV8837EVM uses a combination of headers and a USB input jack (on bottom side) for the application/monitoring of power. For the EVM, only a single power supply rail is necessary and an onboard 3.3-V regulator provides power to the MSP430 micro and the logic core, VCC, of the DRV8837 motor driver. Minimum recommended  $V_{in}$  for the EVM is 1.8 V and maximum is 11 V. Please see the datasheet for the DRV8837 for complete voltage range information of the driver itself.

VM for the DRV8837 is directly taken off the USB jack supply or J1 power supply header. J1 header is located on the top side of the EVM near the bottom center of the board. The USB jack is located on the bottom side of the board. Please choose one method ONLY for providing power to the EVM.

As previously mentioned, the MSP430 comes pre-programmed to control basic DC motor operation. If it is desired to change the firmware via the external ez430 development tool, it is not necessary or recommended to provide any input power to the DRV8837EVM. Power is provided from the ez430 board.

### 2.2 Test Points

Test points are provided and labeled for the inputs to the DRV8837 motor driver and also the control signals back to the MCU. The inputs are labeled "IN1" and "IN2". The control signals to the MCU are labeled as "VSPD" for the analog voltage from the onboard potentiometer and "DIR" for the digital input defining motor direction. Two "GND" test points are also provided.

## 2.3 Jumpers

There are two jumpers on the EVM that are normally installed.

One jumper controls the direction of the DC motor and the other controls the low power state, or sleep state, on the DRV8837.

### 2.3.1 Direction Select (JP1) Jumper

JP1 can be found in [Figure 1](#). Installing the jumper provides a logic LOW signal to a GPIO on the micro-controller. Depending on the motor connections across J4, the motor will spin either counter-clockwise or clockwise. Removing the jumper provides a logic HIGH to the micro-controller and the input polarity of the signals to the DRV8837 is flipped. This will rotate the motor in the opposite direction.

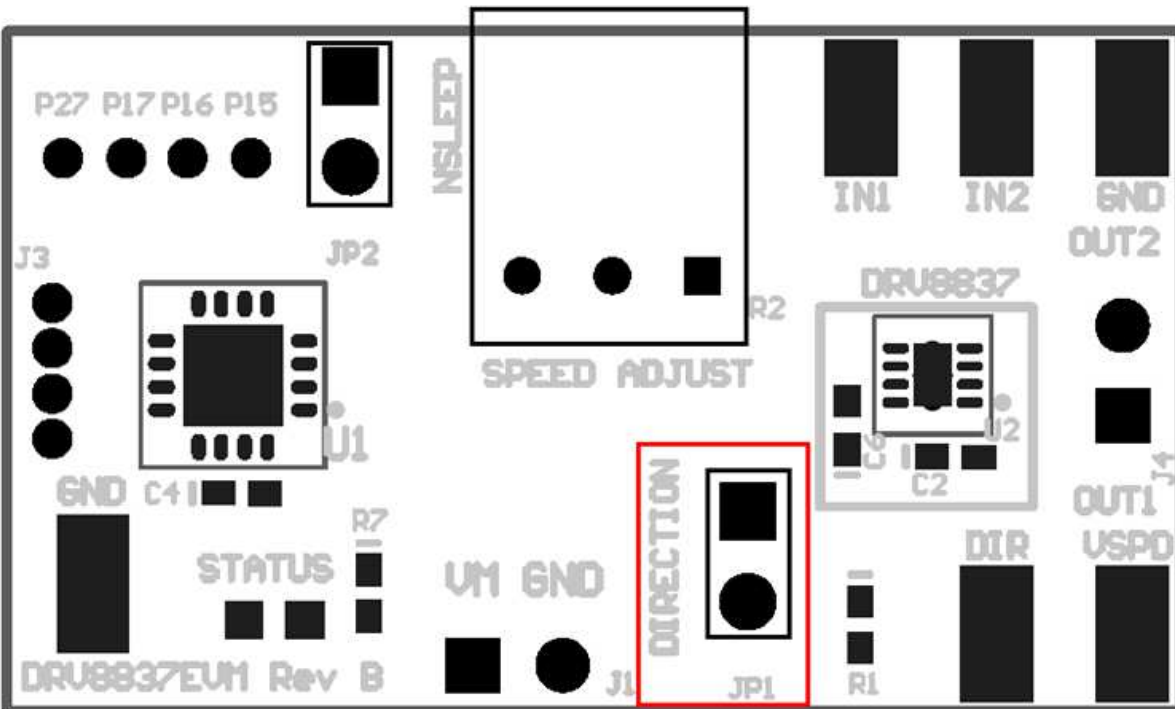


Figure 1. Direction Select (JP1) Jumper

### 2.3.2 Sleep Select (JP2) Jumper

JP2 can be found in Figure 2. Installing the jumper will place the DRV8837 in an ACTIVE state and the motor will spin. Removing the jumper will place the DRV8837 in a low power consumption, or sleep state, and the motor outputs along with internal circuitry will be turned OFF.

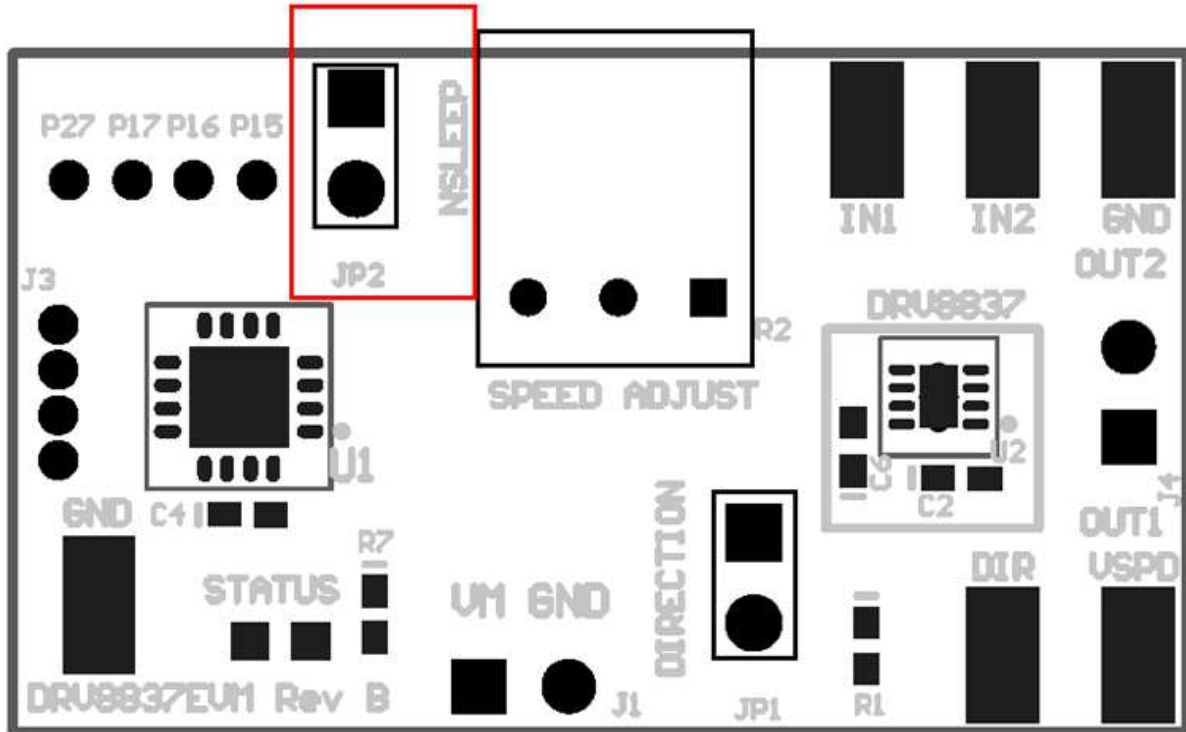


Figure 2. Sleep Select (JP2) Jumper

## 2.4 Speed Adjust Potentiometer (R2)

The speed adjust potentiometer can be found in [Figure 3](#). Turning the wheel towards the JP2 jumper will reduce the input PWM duty cycle to the DRV8837 and the motor will turn slower until it stops. Turn the wheel towards the motor outputs and the motor will spin faster. You can also observe the STATUS LED highlighted in the below figure. It will blink faster or slower depending on the PWM commanded to the DRV8837 inputs and proportional to motor speed.

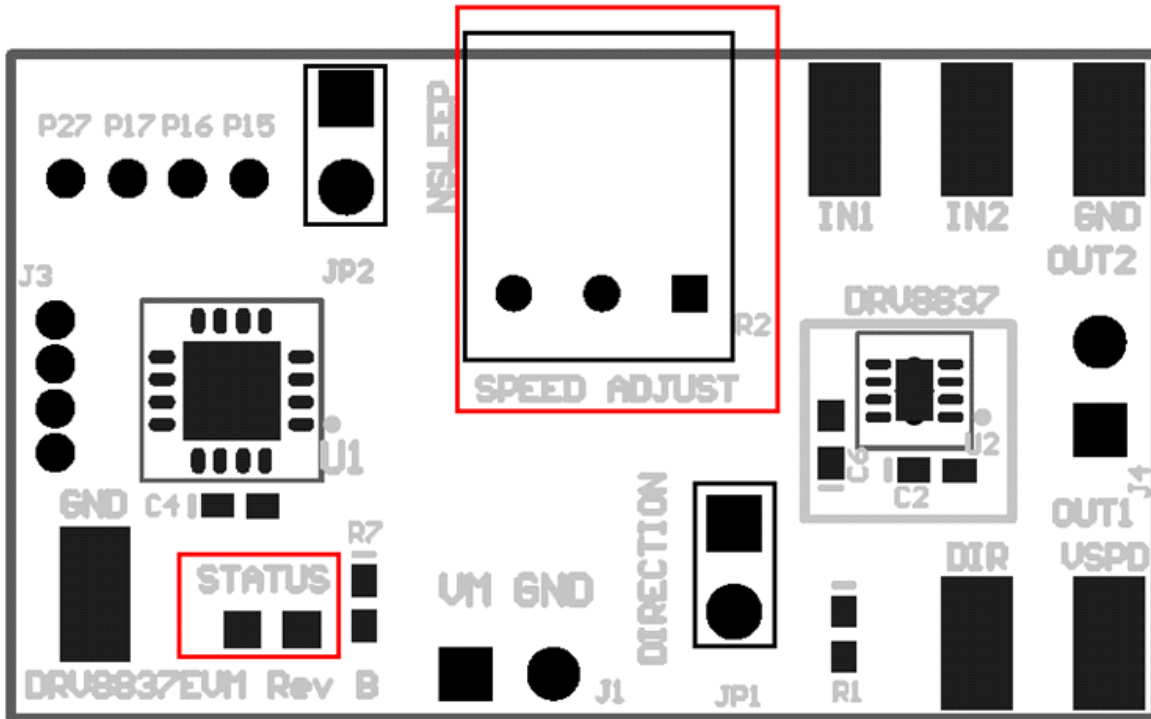


Figure 3. Speed Adjust Potentiometer (R2)

## 2.5 Motor Outputs

Connect a DC motor across OUT1 and OUT2. Polarity is not critical.

## 2.6 Operation of the EVM

1. Connect a DC motor across OUT1 and OUT2.
2. Adjust "SPEED ADJUST" potentiometer to minimum voltage by turning all the way towards the JP2 jumper. This will minimize the motor speed.
3. Apply power to J1 header or with external USB cable plugged into a computer USB jack.
4. Adjust SPEED ADJUST potentiometer towards the motor outputs and motor will start to turn. Continue adjusting as desired.
5. To change direction, remove or install the JP1 jumper.

### CAUTION

The motor will be hot when under excessive load or shaft lock. Be careful when handling the motor under these conditions.

## 3 SCHEMATIC AND BILL OF MATERIALS

The following pages contain the DRV8837EVM schematic and bill of materials.

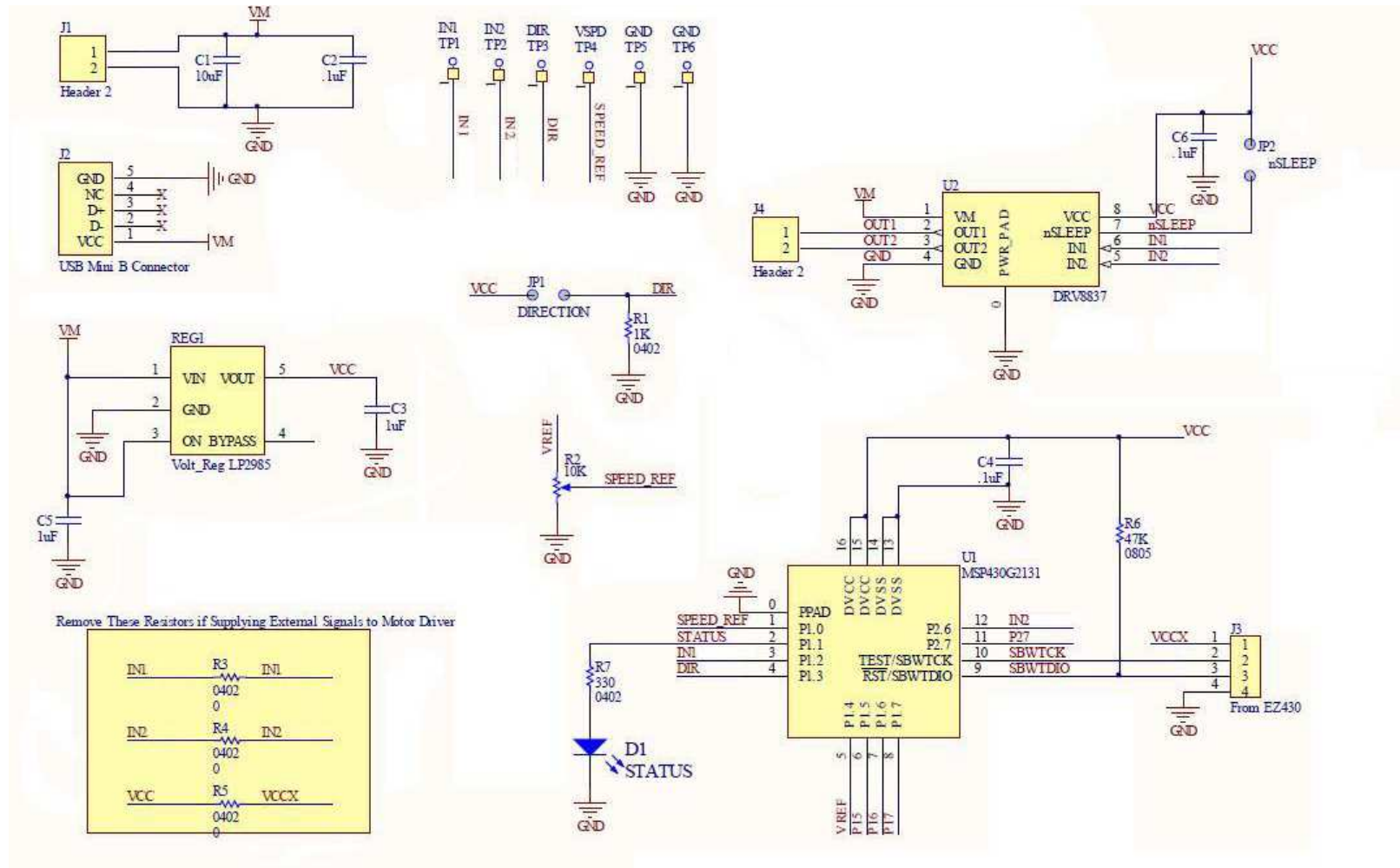


Figure 4. DRV8837EVM Schematic



**Table 1. DRV8837EVM Bill of Materials**

Item No.	Qty	Designator	Value	DigiKey Part #	Manufacturer	Part No.	Description
1	1	C1	10uF	445-7645-1-ND	TDK Corporation	C2012X5R1C106 M/0.85	CAP CER 10UF 16V 20% X5R 0805
2	3	C2, C4, C6	.1uF	490-3261-1-ND	Murata Electronics North America	GRM155R71C104 KA88D	CAP CER 0.1UF 16V 10% X7R 0402
3	1	C3	1uF	311-1438-1-ND	Yageo	CC0402KRX5R5B B105	CAP CER 1UF 6.3V 10% X5R 0402
4	1	C5	1uF	445-4979-1-ND	TDK Corporation	C1005X5R1C105 M	CAP CER 1UF 16V 20% X5R 0402
5	1	D1	LED GREEN	754-1116-1-ND	Kingbright Corporation	APT1608CGCK	LED 1.6X0.8MM 570NM GRN CLR SMD
6	4	J1, J4, JP1, JP2	2-Pin Header	3M9447-ND	3M	961102-6404-AR	CONN HEADER VERT SGL 2POS GOLD
7	1	J2	Micro USB AB	A97799CT-ND	TE Connectivity	1981584-1	CONN RCPT MICRO USB TYPE AB
8	1	J3	4-Pin Socket	ED90474-ND	Mill-Max Manufacturing Corp	851-43-004-20-001000	SOCKET .050" GRID SIP 4 POS R/A
9	1	R1	1K	P1.0KJCT-ND	Panasonic - ECG	ERJ-2GEJ102X	RES 1.0K OHM 1/10W 5% 0402 SMD
10	1	R2	10K	3352T-103LF-ND	Bourns Inc.	3352T-1-103LF	POT 10K OHM THUMBWHEEL CERM ST
11	3	R3, R4, R5	0	311-0.0JRCT-ND	Yageo	RC0402JR-070RL	RES 0.0 OHM 1/16W 0402 SMD
12	1	R6	47K	P47KJCT-ND	Panasonic - ECG	ERJ-2GEJ473X	RES 47K OHM 1/10W 5% 0402 SMD
13	1	R7	330	P330JCT-ND	Panasonic - ECG	ERJ-2GEJ331X	RES 330 OHM 1/10W 5% 0402 SMD
14	1	REG1	3.3V	296-18476-1-ND	Texas Instruments	LP2985-33DBVR	IC LDO REG 3.3V 150MA SOT23-5
15	2	SHNT1, SHNT2	Jumper	3M9580-ND	3M	969102-0000-DA	SHUNT JUMPER .1" BLACK GOLD
16	6	TP1, TP2, TP3, TP4, TP5, TP6	TP	534-5019 (Mouser)	Keystone Electronics	5019	PC TEST POINT MINIATURE SMT
17	1	U1	MCU	296-27472-1-ND	Texas Instruments	MSP430G2131IRS A16R	VALUE LINE MIXED SIGNAL MICROCONTROLLER
18	1	U2	DRV8837	Supplied	Texas Instruments	Supplied	LOW VOLTAGE H-BRIDGE IC
19	1	5V Brushed DC Motor	N/A	P14355-ND	NMB	PPN7PA12C1	LOW VOLTAGE DC BRUSHED MOTOR

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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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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.

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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.

**Certain Instructions.** It is important to operate this EVM within TI's recommended specifications and environmental considerations per the user guidelines. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please 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 result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM User's 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, some circuit components may have case temperatures greater than 60°C as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use these EVMs.

**Agreement to Defend, Indemnify and Hold Harmless.** You agree to defend, indemnify and hold TI, its licensors and their representatives harmless from and against any and all claims, damages, losses, expenses, costs and liabilities (collectively, "Claims") arising out of or in connection with any use of the EVM that is not in accordance with the terms of the agreement. This obligation shall apply whether Claims arise under law of tort or contract or any other legal theory, and even if the EVM fails to perform as described or expected.

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Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
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DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
OMAP Mobile Processors	<a href="http://www.ti.com/omap">www.ti.com/omap</a>
Wireless Connectivity	<a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a>

### Applications

Automotive and Transportation	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
Communications and Telecom	<a href="http://www.ti.com/communications">www.ti.com/communications</a>
Computers and Peripherals	<a href="http://www.ti.com/computers">www.ti.com/computers</a>
Consumer Electronics	<a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>
Energy and Lighting	<a href="http://www.ti.com/energy">www.ti.com/energy</a>
Industrial	<a href="http://www.ti.com/industrial">www.ti.com/industrial</a>
Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
Space, Avionics and Defense	<a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a>
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