

High Speed Data Converter System Evaluation Kit 10 MHz (HSDC-SEK-10)

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1 Introduction

1.1 Overview

This is the User's Guide for the HSDC-SEK-10. The kit includes five released Texas Instruments (TI) Evaluation Modules (EVM): TSW4806, TSW1405, TSW1406, TSW2110, and a TSW2200. Together, these five EVMs provide a low-cost solution for evaluating new and existing High Speed TI ADC and DAC EVMs. The five EVMs are shown in [Figure 1](#).

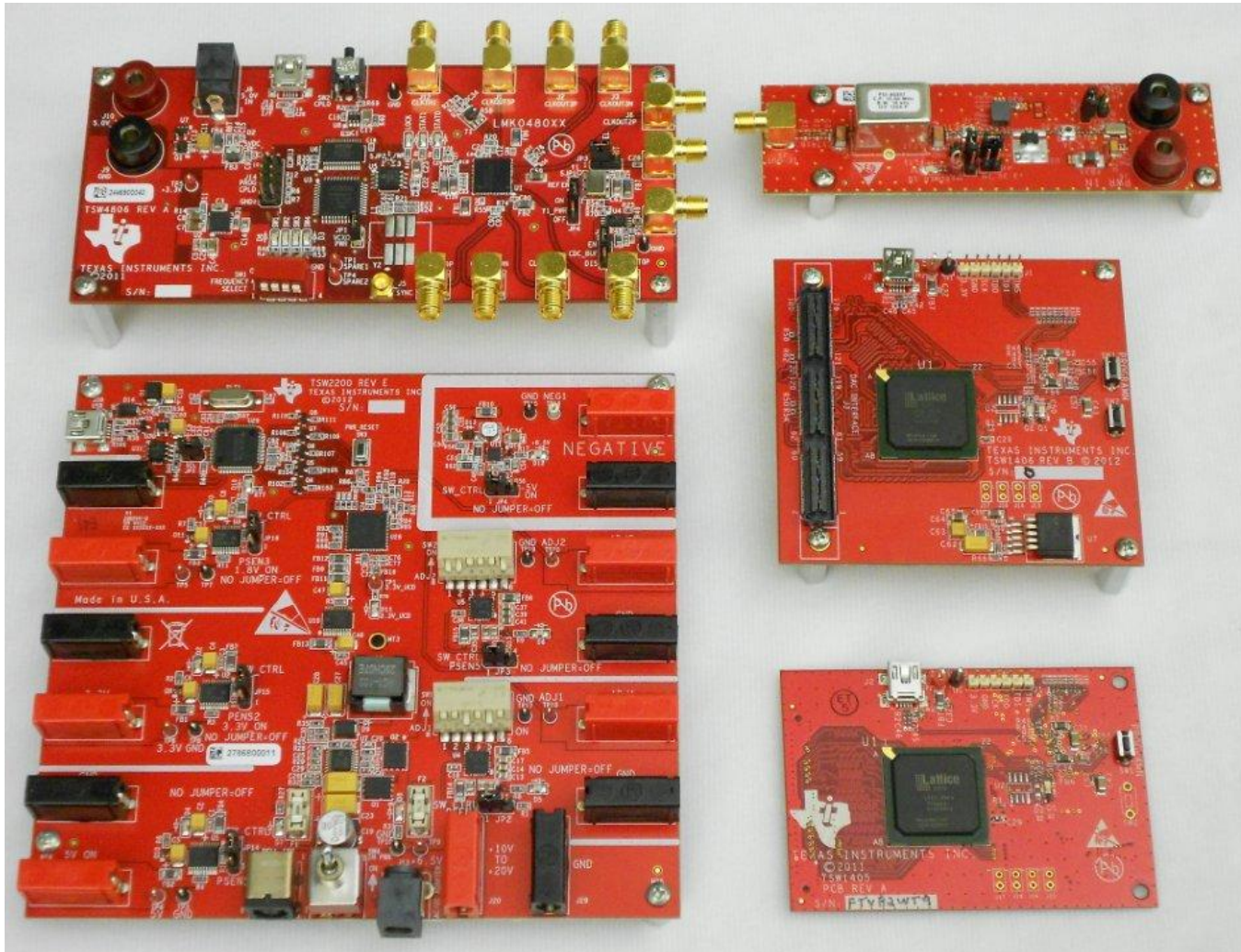


Figure 1. EVMs Included in the HSDC-SEK-10 EVM

For more information regarding the individual EVMs, refer to [Table 1](#) for the respective EVM User's Guide.

Table 1. HSDC-SEK-10 Reference Material

| EVM | User's Guide |
|------------|--------------------------|
| TSW4806EVM | SLAU454 |
| TSW2110EVM | SLAU438 |
| TSW1405EVM | SLWU079B |
| TSW1406EVM | SLWU079B |
| TSW2200EVM | SLWU081A |

The TSW4806EVM has an LMK04806 dual-PLL clock jitter cleaner and generator to provide a low-cost, low-noise, portable clocking solution that can be used with TI high-speed data converter EVMs. Together with the accompanying LabVIEW™-based Graphic User Interface (GUI), it is a complete clocking tool.

The TSW1405EVM is a pattern capture card which supports most LVDS-format TI ADC EVMs, with a capture buffer of 64K samples. Together with the accompanying Labview-based GUI, it is a complete system that captures and evaluates data samples from ADC EVM's. The TSW1405 draws its power from the USB connection to the PC for easy setup and operation.

The TSW1406EVM is a pattern generator card which supports pattern generation for most LVDS-format TI DAC EVMs, with a pattern size up to 64K samples. Together with the accompanying Labview-based GUI, it is a complete system that generates and sends desired test patterns to DAC EVMs. The TSW1406 draws its power from the USB connection to the PC for easy setup and operation.

The TSW2110EVM uses a temperature-controlled crystal oscillator (TCXO) to generate a low-noise, 10-MHz sinewave. Using amplification, attenuation, and filtering, a 10-MHz signal is generated with low harmonic distortion output set to +10 dBm (2 Vpp), which can be used as an IF input to an ADC board.

The TSW2200EVM provides a multiple output power supply solution for powering other EVMs. This EVM provides fixed and adjustable supplies that can be used as simple on or off supplies or sequenced supplies for power-critical EVM setups.

This document outlines the basic steps and functions that are required to ensure the proper operation of HSDC-SEK-10, when used with ADC and DAC EVMs. The kit includes the five EVMs mentioned above along with power supplies and cables.

This guide shows how to quickly evaluate a typical TI ADC and DAC EVM (not included) with only a PC required for the ADC demo and a PC and spectrum analyzer required for the DAC demo. The EVM schematics, bill of materials (BOM), and layout files can be found in the design packages under the EVM product folder on www.ti.com.

2 HSDC-SEK-10 DAC Demonstration

This section describes the HSDC-SEK-10 pattern generator operation when testing with a TI DAC3162 EVM that has an LVDS input interface. [Figure 2](#) shows the HSDC-SEK-10 configured for testing a DAC3162EVM.

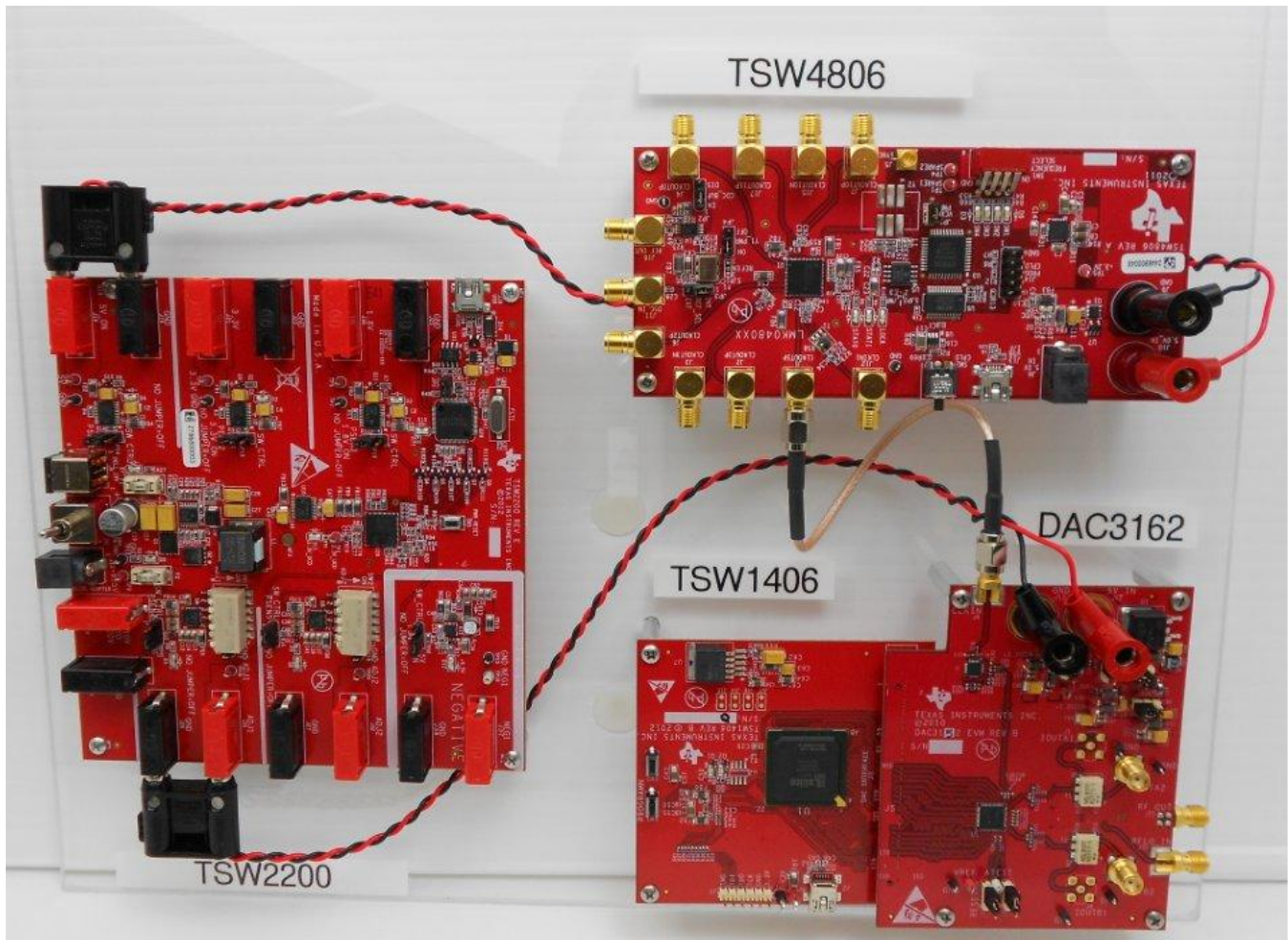


Figure 2. HSDC-SEK-10 DAC Demonstration

The block diagram for the HSDC-SEK-10 demo is shown in [Figure 3](#)

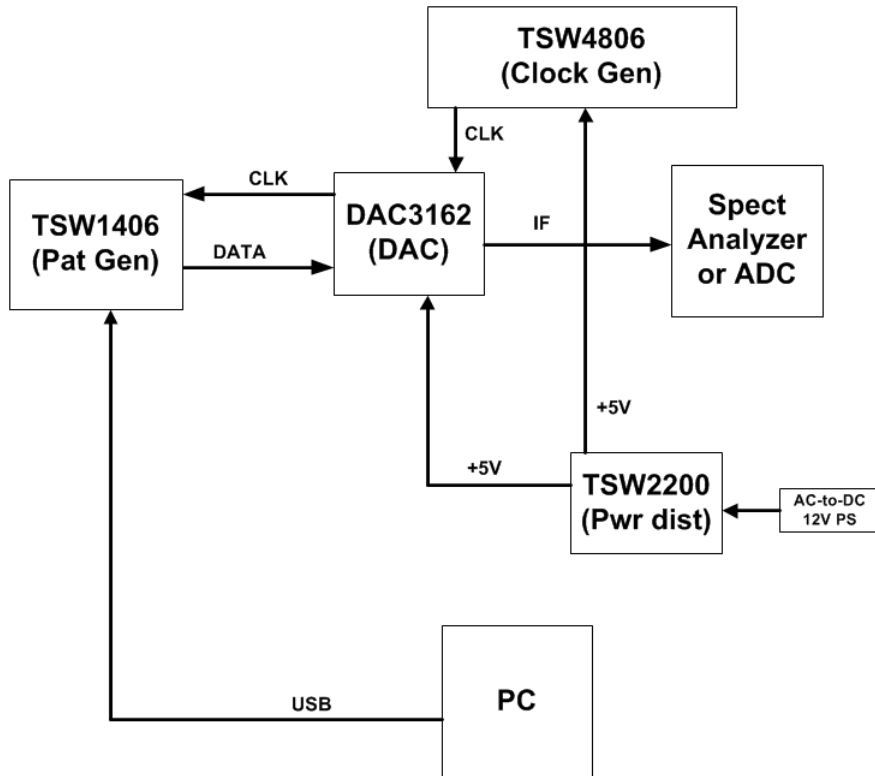


Figure 3. HSDC-SEK-10 DAC Demonstration Block Diagram

3 DAC Test with DAC3162EVM

Section 3.1 and Section 3.2 describe the setup and pattern generation test using the DAC3162EVM

3.1 Setup

- Connect the provided 12-VDC power supply to J13 of the TSW2200EVM.
- Set switches 1, 2, 4, and 6 to the *Open* position on SW1 to set J18 (adjustable output) of the TSW2200EVM to +5 VDC. Connect this output to J10 of the TSW4806EVM. Provide the return by connecting J19 of the TSW2200EVM to J9 of the TSW4806EVM.
- Connect J5 of the DAC3162EVM to connector J3 of the TSW1406EVM.
- Provide +5 VDC from J31 of the TSW2200EVM to J12 of the DAC3162EVM. Provide the return by connecting J26 of the TSW200EVM to J13 of the DAC3162EVM.
- Provide a 0.5-Vrms, 245.76-MHz clock to the DAC3162EVM by connecting a SMA cable from J1 of the TSW4806EVM to J9 of the DAC3162EVM.
- Connect IOUTA2 (J2) to a spectrum analyzer.
- Connect a USB cable from J2 of the TSW1406EVM to a host computer. D1 on the TSW1406 should illuminate, indicating the board is powered up from the USB source.
- Power up the TSW2200EVM using SW4.
- Download the latest version of the TSW140x High Speed Data Capture/Pattern Generator Card software files and User's Guide manual to a local location on a host PC. These can be found on the TI website by entering *TSW1400EVM* in the search parameter window at www.ti.com.
- Start the High Speed Data Converter Pro GUI as described in the User's Guide ([SLWU079B](#)).

3.2 Pattern Generation Test

The TSW140x GUI will first attempt to connect to the EVM USB interface. If the GUI identifies a valid board serial number, a pop-up will open displaying this value, as shown in Figure 4. The serial number also has an EVM type number attached to it. This indicates to the GUI which of the three TSW140x boards is being used. It is possible to connect several TSW1400 EVMs to one host PC but the GUI can only connect to one at a time. If multiple boards are connected to the PC, the pop-up displays all of the serial numbers found. It is then up to the user to select which board the GUI will be associated.



Figure 4. TSW1406EVM Serial Number

- Click the **OK** button to connect the GUI to the board.

- In the *Select DAC* box, select *DAC3162*, as shown in [Figure 5](#)

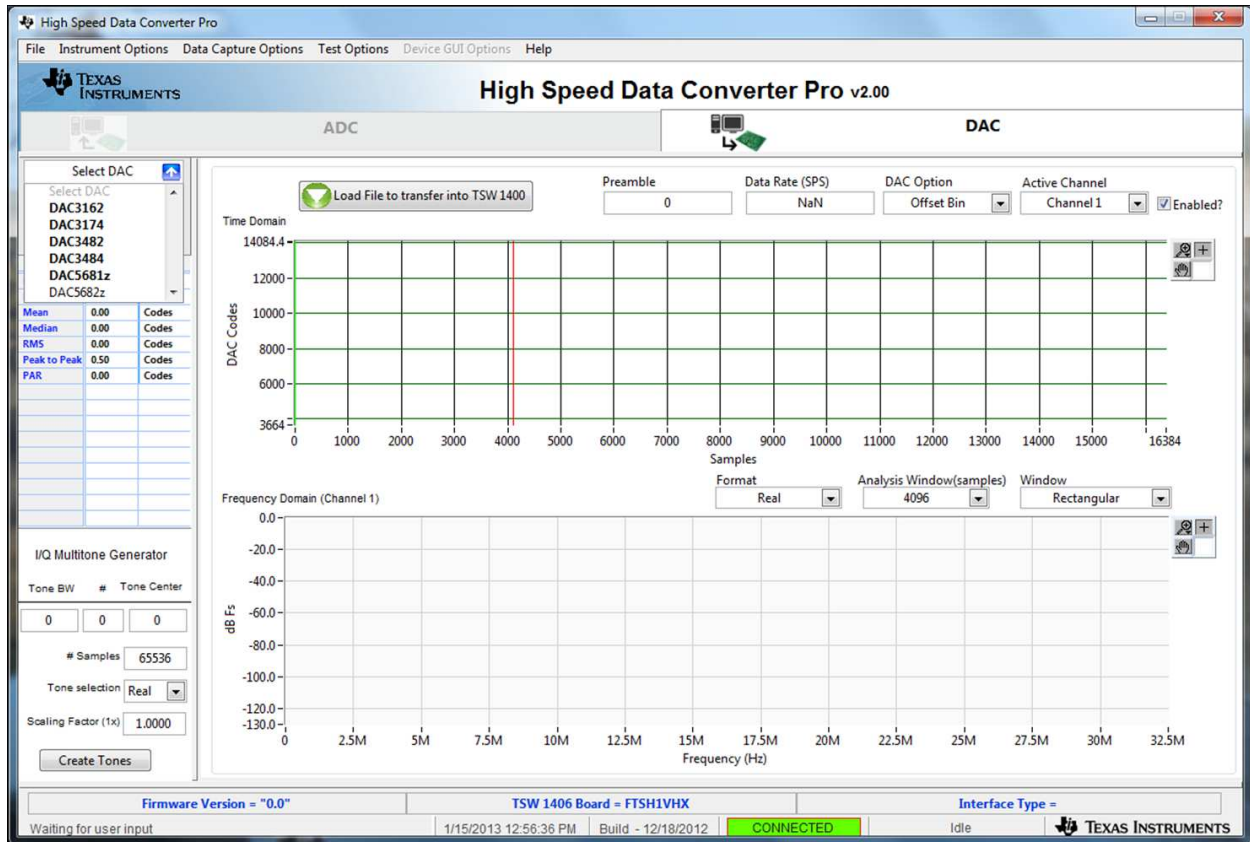


Figure 5. Selecting Device Firmware

- The following message appears: *Do you want to update the firmware for DAC*. Clicking the **Yes** button loads the firmware.
- After the firmware is loaded, LED D1 on the TSW1406EVM will turn on.
- In the top center of the GUI, set the *Data Rate* to *245.76M* (for 245.76 megahertz).

- In the *I/Q Multi-tone Generator* section of the GUI, located in the lower left of the GUI, set the parameters to generate a single tone centered at 25 MHz. After the parameters are entered click the **Create Tones** button. The GUI now looks as shown in [Figure 6](#).

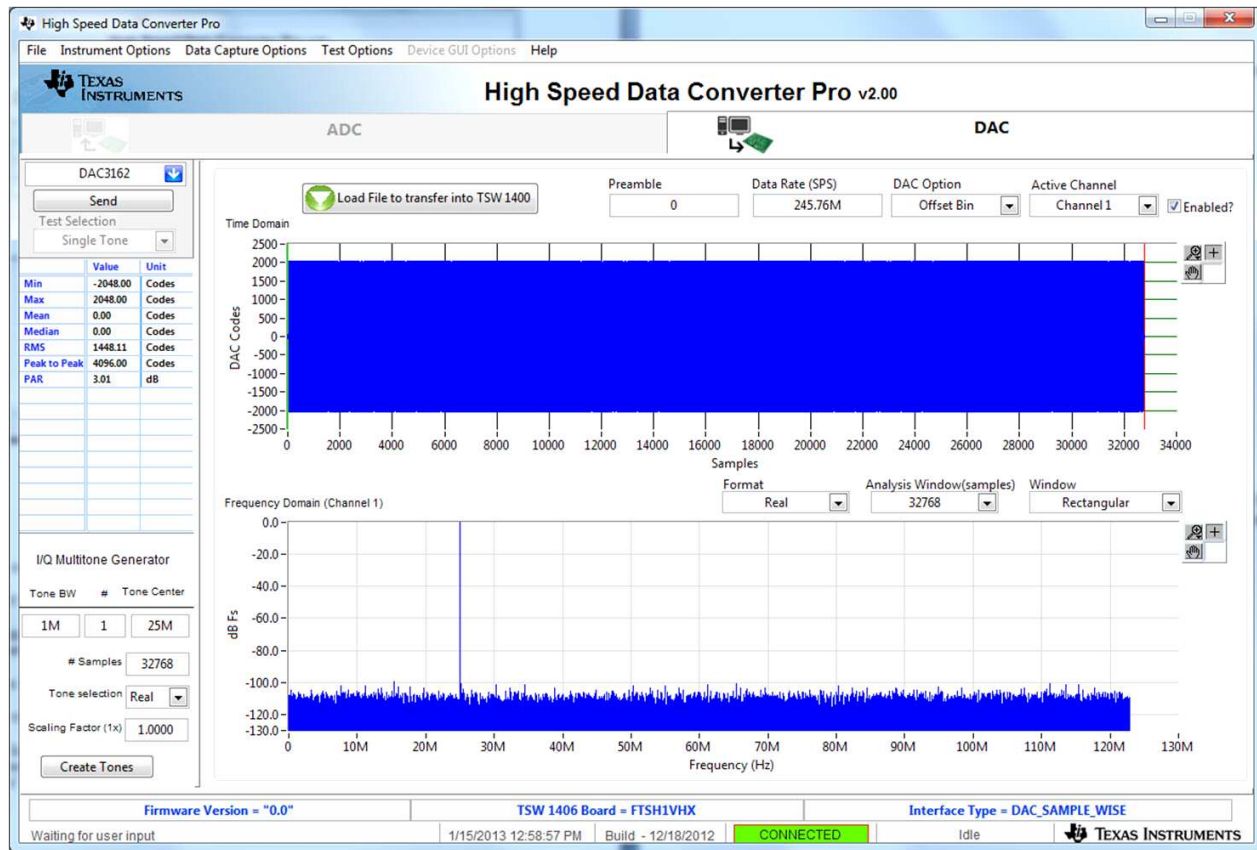


Figure 6. Loaded Test Pattern Time and Frequency Domain Plots

- In the top left of the GUI, click the **Send** button to start the Pattern Generator. The IOUTA2 and IOUTB2 SMA's now have a 25-MHz output tone, as shown in [Figure 7](#).
- End of pattern generation test.

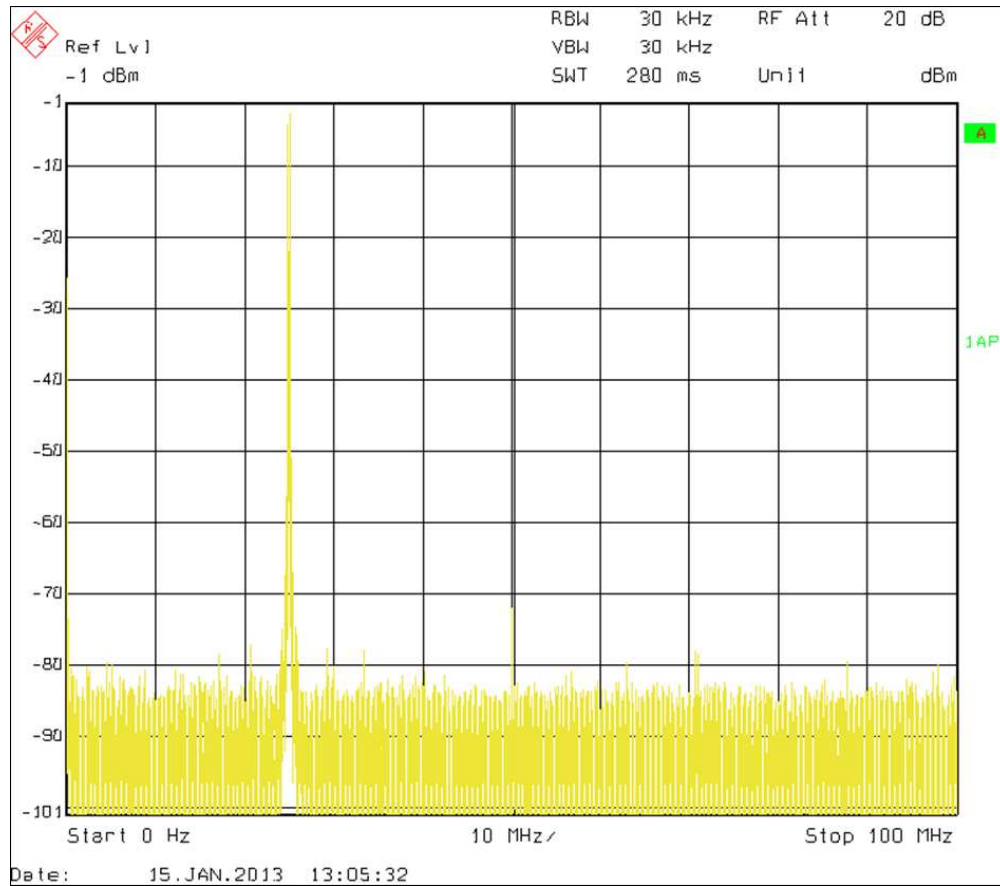


Figure 7. DAC3162EVM Output

4 HSDC-SEK-10 ADC Demonstration

This section describes the HSDC-SEK-10 data capture operation when testing with a TI ADS4249EVM that has an LVDS output interface. [Figure 8](#) shows the HSDC-SEK-10 configured for testing an ADS4249EVM.

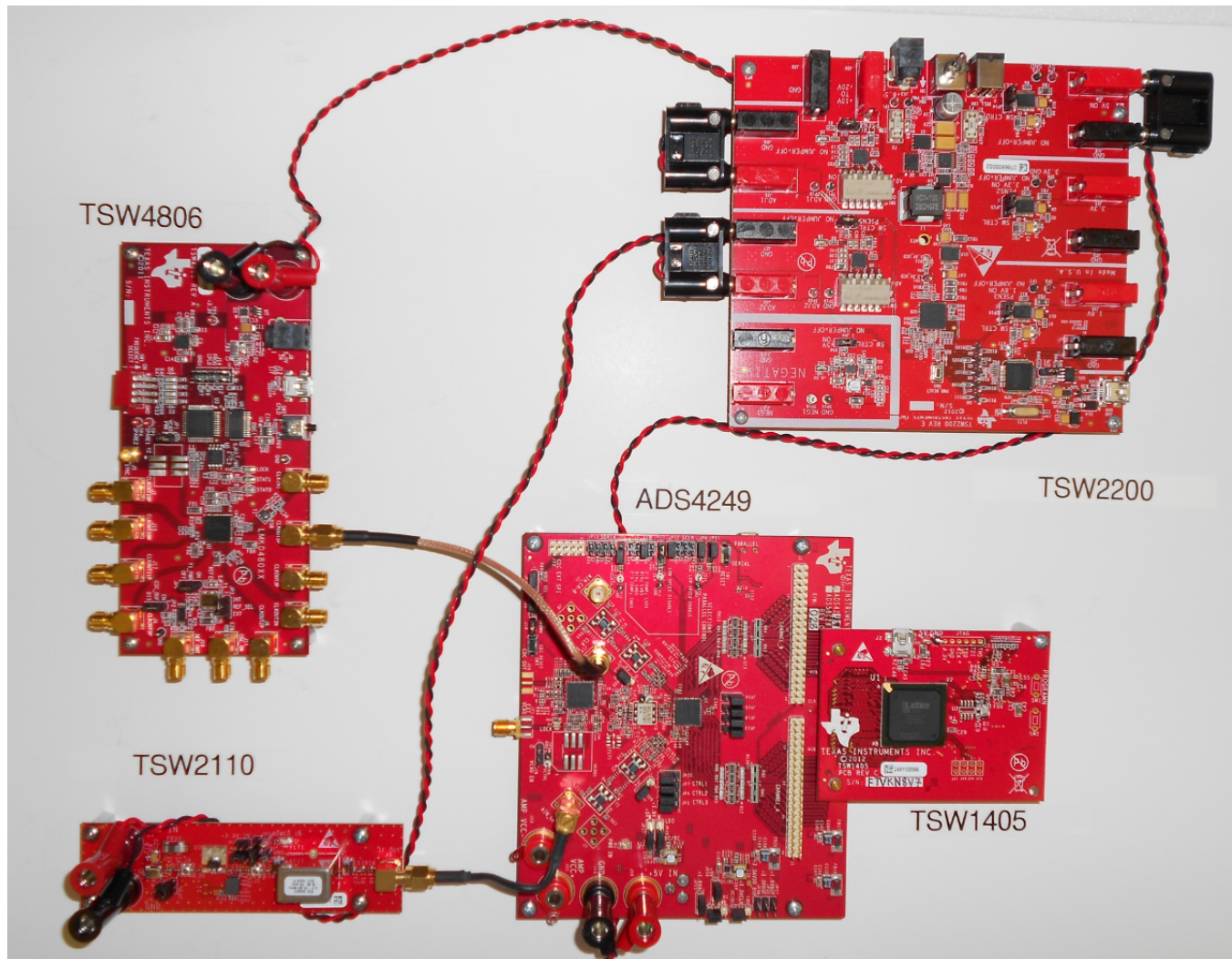


Figure 8. HSDC-SEK-10 ADC Demonstration

The block diagram for the HSDC-SEK-10 demo is shown in [Figure 9](#)

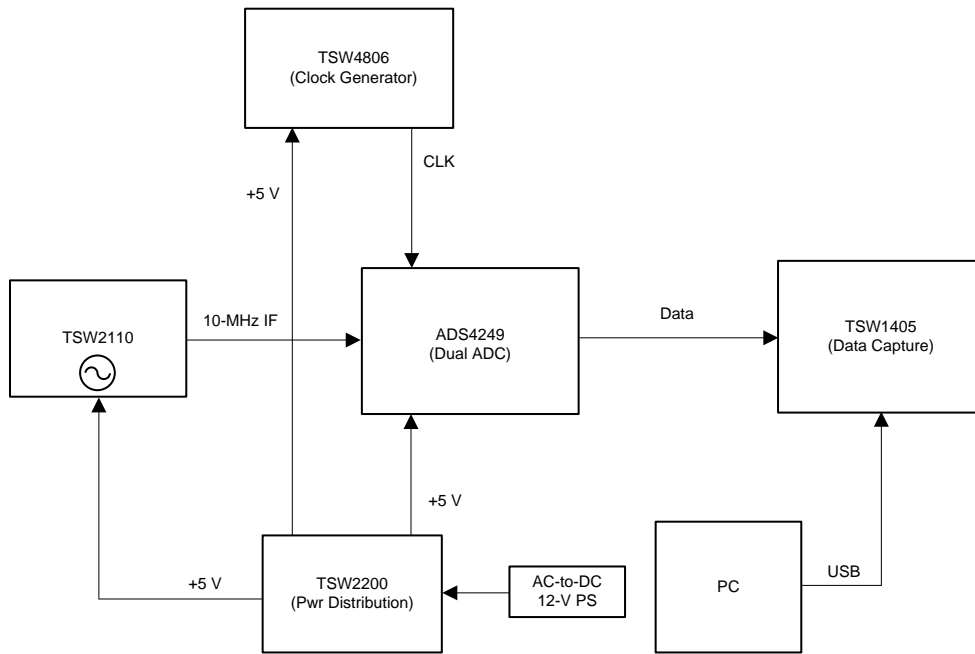


Figure 9. HSDC-SEK-10 ADC Demonstration Block Diagram

5 ADC Data Capture Test with the ADS4249EVM

Section 5.1 describes the setup for the ADC Data Capture Test with the ADS4249EVM

5.1 Setup

- Connect the provided 12-VDC power supply to J13 of the TSW220EVM.
- Set switches 1, 2, 4, and 6 to the *Open* position on SW2 to set J32 (adjustable output ADJ2) of the TSW2200EVM to +5 VDC. Connect this output to J5 of the TSW2110EVM. Provide the return by connecting J27 of the TSW2200EVM to J6 of the TSW2110EVM.
- Set switches 1, 2, 4, and 6 to the *Open* position on SW1 to set J31 (adjustable output ADJ1) of the TSW2200EVM to +5VDC. Connect this output to J10 of the TSW4806EVM. Provide the return by connecting J26 of the TSW2200EVM to J9 of the TSW4806EVM.
- Connect J8 of the ADS4249EVM to connector J3 of the TSW1405EVM.
- Provide +5 VDC from J18 of the TSW2200EVM to J10 of the ADS4249EVM. Provide the return by connecting J19 of the TSW200EVM to J12 of the ADS4249EVM.
- Provide a 0.5-Vrms, 245.76-MHz clock to the ADS4249EVM by connecting a SMA cable from J1 of the TSW4806EVM to J19 of the ADS4249EVM.
- Provide a 10MHz IF analog input by connecting a SMA cable from J3 of the TSW2110EVM to J6 of the ADS4249EVM.
- Connect a USB cable from J2 of the TSW1405EVM to a host computer.
- Power up the TSW2200EVM using SW4.
- Download the latest version of the TSW140x High Speed Data Capture/Pattern Generator Card software files and User's Guide manual to a local location on a host PC. These can be found on the TI website by entering *TSW1400EVM* in the search parameter window at www.ti.com.
- Start the High Speed Data Converter Pro GUI as described in the User's Guide ([SLWU079B](#)).
- Click on the **OK** button to connect the GUI to the board.
- In the Select ADC box, click on the drop-down arrow. A new window opens. Select *ADS424x*, as shown in [Figure 10](#).

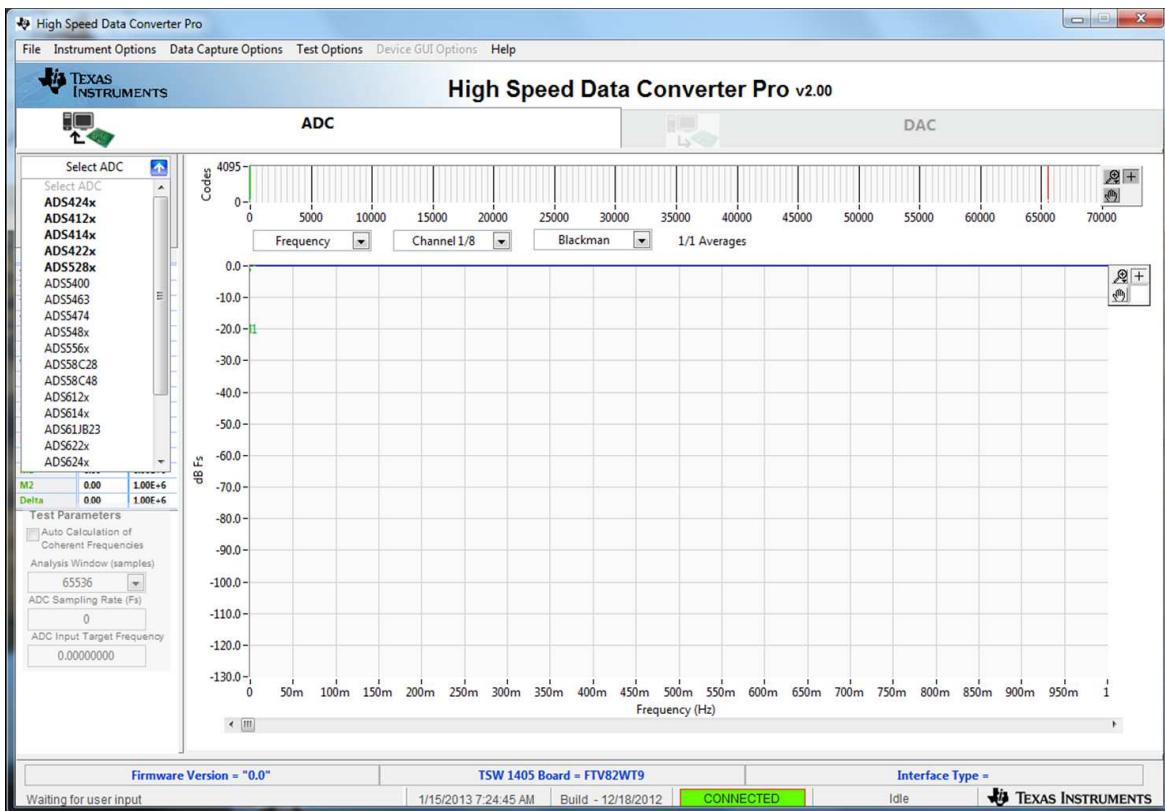


Figure 10. Selecting Device Firmware

- The following message appears: *Do you want to update the firmware for ADC.* Clicking the **Yes** button loads the firmware.
- After the firmware is loaded, LED D1 on the TSW1405EVM will turn on.
- When the firmware is finished downloading, set the *Test Selection* to *Single Tone*.
- Make sure the *Auto Calculation of Coherent Frequencies* setting is unselected. This is located in the lower-left side of the GUI.
- Set the ADC Sampling Rate to *245.76M*.
- Set the ADC Input Target Frequency to *10M*.
- Verify the GUI is set to Capture Channel 1 data.
- Clicking the **Capture** button on the left side of the GUI panel starts the transfer of data into the TSW1405.

- The TSW1405 GUI should now look as shown in Figure 11.

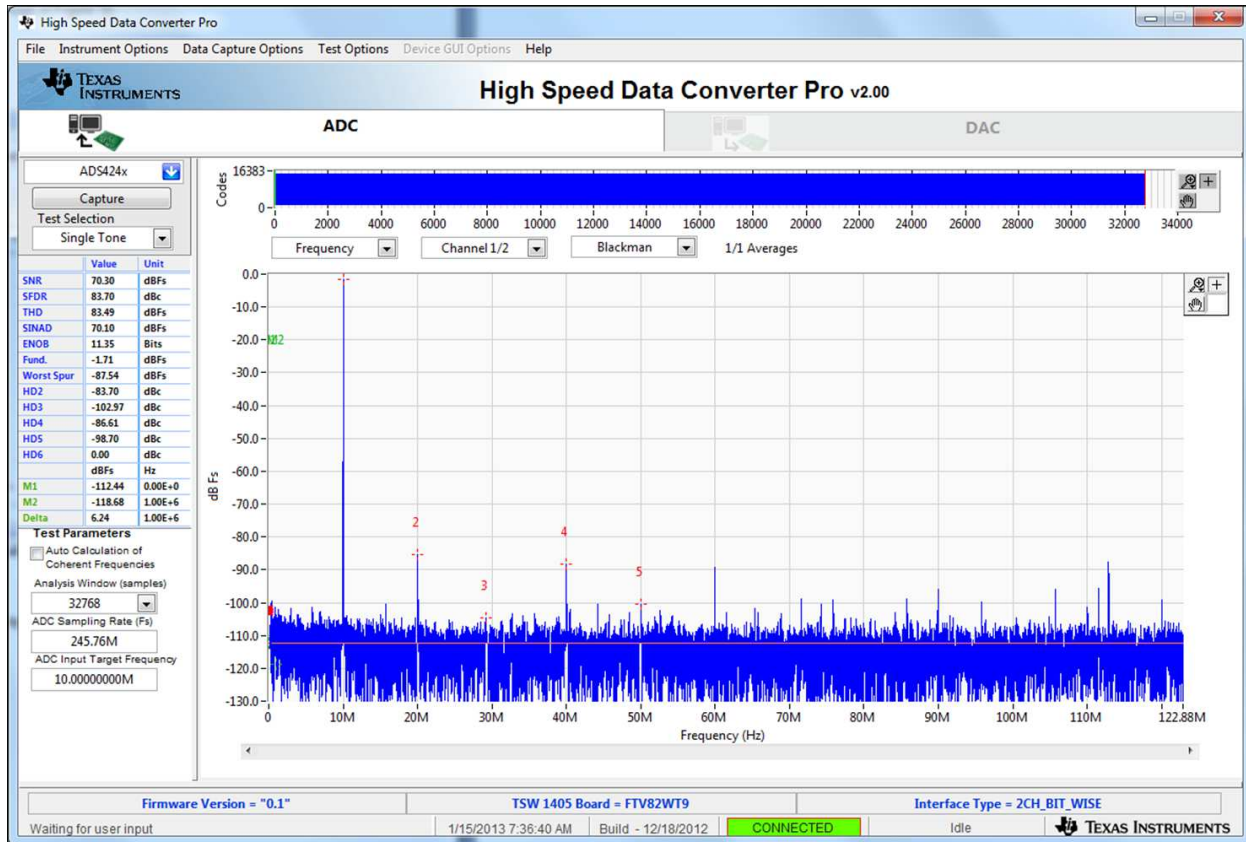


Figure 11. ADS4249 Single Tone FFT Capture Results

- End of ADC data capture test.

6 Summary

Evaluation of ADC and DAC devices can be costly due to requirements such as high speed pattern generator and capture cards, programmable clean-clock source, clean power supplies, and low-noise signal generators. This high-cost lab equipment can create barriers for customers to evaluate devices. Using the HSDC-SEK-10, a low cost evaluation tool solution, removes these equipment and cost barriers.

The five EVMs that come with the HSDC-SEK-10 provide an easy-to-use, low-cost solution for evaluating new and existing High-Speed ADC and DAC EVMs from Texas Instruments. These tools are simple to use, easily portable and require only one 110-120 VAC source for power.

Contact your local TI sales representative or visit www.ti.com for more information regarding existing and new tools.

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As noted in the EVM User's Guide and/or EVM itself, this EVM and/or accompanying hardware may or may not be subject to the Federal Communications Commission (FCC) and Industry Canada (IC) rules.

For EVMs **not** subject to the above rules, this evaluation board/kit/module is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION OR EVALUATION PURPOSES ONLY and is not considered by TI to be a finished end product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. Operation of the equipment may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

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.

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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:

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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.

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REGULATORY COMPLIANCE INFORMATION

As noted in the EVM User's Guide and/or EVM itself, this EVM and/or accompanying hardware may or may not be subject to the Federal Communications Commission (FCC) and Industry Canada (IC) rules.

For EVMs **not** subject to the above rules, this evaluation board/kit/module is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION OR EVALUATION PURPOSES ONLY and is not considered by TI to be a finished end product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. Operation of the equipment may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

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.

【Important Notice for Users of this Product in Japan】

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

<http://www.tij.co.jp>

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<http://www.tij.co.jp>

EVALUATION BOARD/KIT/MODULE (EVM) WARNINGS, RESTRICTIONS AND DISCLAIMERS

For Feasibility Evaluation Only, in Laboratory/Development Environments. Unless otherwise indicated, this EVM is not a finished electrical equipment and not intended for consumer use. It is intended solely for use for preliminary feasibility evaluation in laboratory/development environments by technically qualified electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems and subsystems. It should not be used as all or part of a finished end product.

Your Sole Responsibility and Risk. You acknowledge, represent and agree that:

1. You have unique knowledge concerning Federal, State and local regulatory requirements (including but not limited to Food and Drug Administration regulations, if applicable) which relate to your products and which relate to your use (and/or that of your employees, affiliates, contractors or designees) of the EVM for evaluation, testing and other purposes.
2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure 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.
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.

Safety-Critical or Life-Critical Applications. If you intend to evaluate the components for possible use in safety critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, such as devices which are classified as FDA Class III or similar classification, then you must specifically notify TI of such intent and enter into a separate Assurance and Indemnity Agreement.

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TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

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