



ABSTRACT

This user's guide describes the characteristics, operation, and use of the ADC3660 evaluation module (EVM). This user's guide discusses how to set up and configure the software and hardware, and reviews various aspects of the program operation. Throughout this document, the terms evaluation board, evaluation module, and EVM are synonymous with the ADC3660EVM. In the following sections of this document, the ADC3660 evaluation board is referred to as the EVM and the ADC3660 device is referred to as the ADC device.

Table of Contents

1 Introduction	2
2 Equipment	3
2.1 Evaluation Board Feature Identification Summary.....	3
2.2 Required Equipment.....	4
3 Setup Procedure	5
3.1 Install High-Speed Data Converter (HSDC) Pro Software.....	5
3.2 Install the Configuration GUI Software.....	5
3.3 Connect the ADC EVM and TSW1400EVM.....	5
3.4 Connect the Power Supply and Mini-USB Connections.....	5
4 Device Configuration	7
4.1 Bypass Mode.....	8
4.2 Real Decimation Mode.....	14
4.3 Complex Decimation Mode.....	19
5 External Clocking Hardware Setup	25
5.1 Hardware Modifications.....	25
5.2 Hardware Setup: Real Decimation Mode.....	27
5.3 ADC35XX GUI: Real Decimation Mode: Ext. Clock	27
6 ADC3660EVM Power Meter	28

1 Introduction

The ADC3660EVM is an evaluation board used to evaluate the ADC3660 analog-to-digital converter (ADC) from Texas Instruments. The ADC3660EVM is a dual-channel, 14-bit ADC that can operate up to 65 Mega-samples per second (MSPS). The ADC3660 uses a serial CMOS (SCMOS) interface to output the data. The serialized CMOS interface supports output rates to 250 Mbps which translates to ~ 15 MSPS (2-wire) to ~ 3.75 MSPS (0.5-wire) output rates after complex decimation. Hence the ADC3660 can be operated in 'oversampling + decimating' mode using the internal decimation filter in order to improve the dynamic range and relax external anti-aliasing filter.

The ADC3660EVM is equipped with the following features:

- Transformer and FDA coupled analog inputs
- Transformer coupled or single-ended clock inputs
- INA226 current shunt monitors for evaluating power consumption
- FMC connector
- CDCE6214 clocking solution for on-board clocking

2 Equipment

This hardware setup procedure is written to use the onboard CDC clocking option. Internal clock operation.

2.1 Evaluation Board Feature Identification Summary

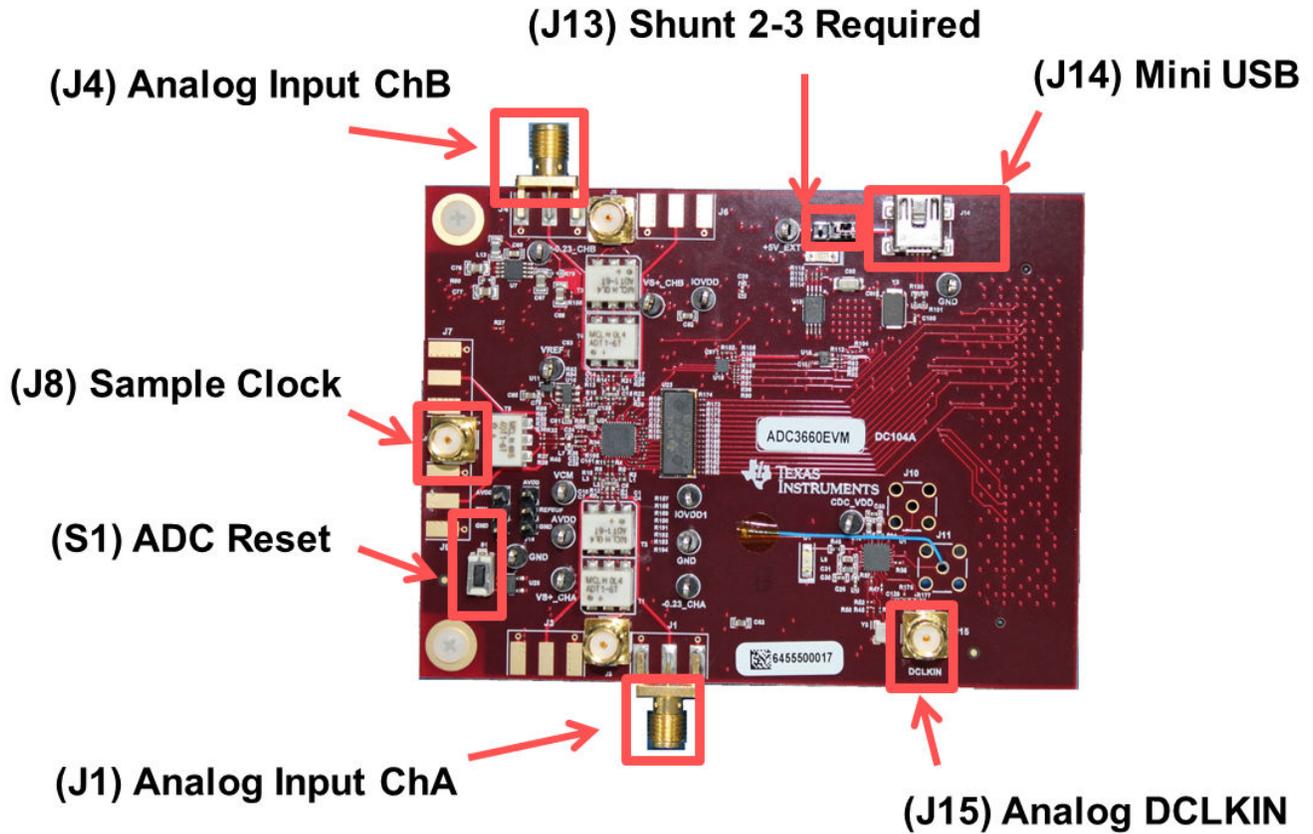


Figure 2-1. ADC3660EVM Feature Identification

Ensure that jumper J8 is shunted in the 2-3 position. This allows 5 V to be supplied to the ADC3660EVM through the mini-USB connector.

If an external 5-V supply is desired, J8 must be shunted in the 1-2 position, and the external 5 V can be connected to the test point labeled "+5 EXT".

Hardware Setup – Interposer

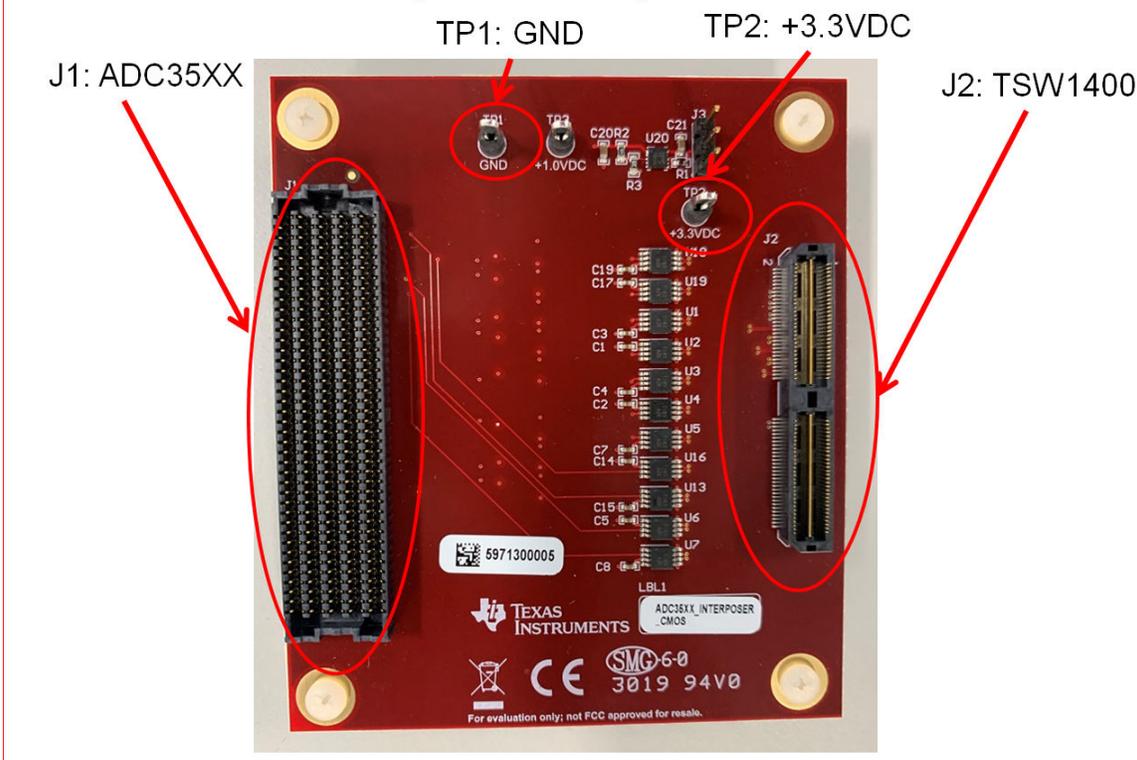


Figure 2-2. CMOS FPGA Interposer Card

2.2 Required Equipment

- The following equipment is included in the EVM evaluation kit:
 - ADC3660 Evaluation board (EVM)
 - CMOS FPGA Interposer Card
 - Power supply clips for Interposer Card
 - Mini-USB cable

The following equipment is **not** included in the EVM evaluation kit, but is required for evaluation of this EVM:

- TSW1400EVM data capture board and related items
- [HSDC Pro](#) software
- PC running Microsoft® Windows® 7, or 10
- Two low-noise signal generators for the sampling clock (optional: for external clock option) and analog input.

TI recommends the following generators:

- Rohde & Schwarz SMA100A
- Rohde & Schwarz SMA100B

Bandpass filter for the analog input signal. The following recommended bandpass filter will have:

- Bandpass filter, greater than or equal to 60-dB harmonic attenuation, less than or equal to 5% bandwidth, greater than 18-dBm power, less than 5-dB insertion loss
- Signal-path cables, SMA

3 Setup Procedure

This is the start of your concept.

3.1 Install High-Speed Data Converter (HSDC) Pro Software

Download the most recent version of the [HSDC Pro](#) software. Follow the installation instructions to install the software.

Download and install the [HSDC Pro Patch](#). This patch copies all the INI files required to the HSDC pro directory.

3.2 Install the Configuration GUI Software

Download the Configuration GUI software from the EVM tool folder at ADC3660EVM.

Extract and run the executable file, and follow the instructions.

3.3 Connect the ADC EVM and TSW1400EVM

Connect the ADC3660EVM FMC connector to J1 of the FPGA Interposer Card.

Connect J2 of the FPGA Interposer Card to J1 of the TSW1400EVM.

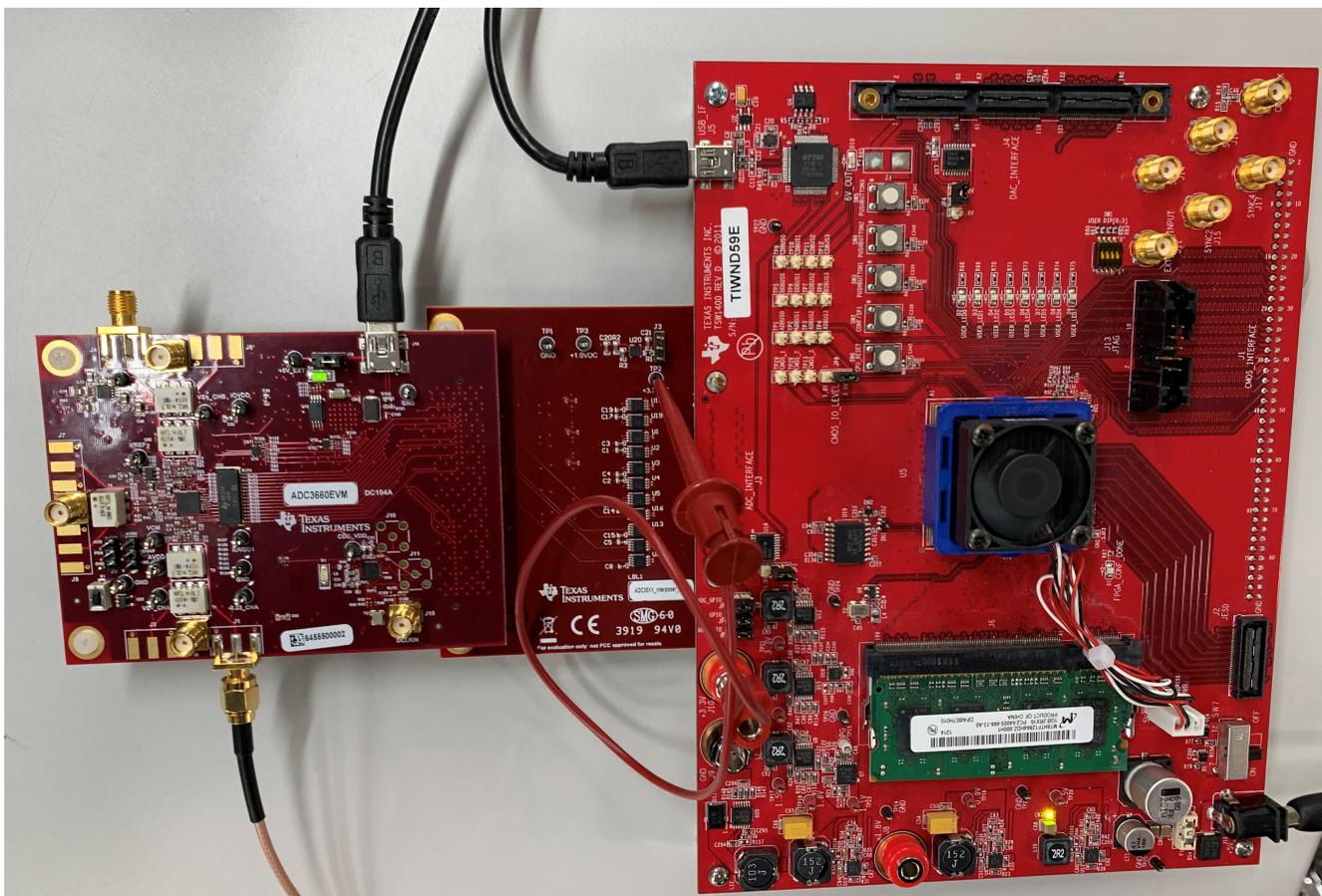


Figure 3-1. ADC3660EVM Full Setup

3.4 Connect the Power Supply and Mini-USB Connections

Use the following steps to connect the power supply and mini-USB connections:

1. Connect 3.3 VDC to TP2 of the FPGA Interposer card. Provide power supply ground to TP1, as required. J10 of the TSW1400EVM can be used to source this +3.3 VDC.

2. Connect the power cable to the TSW1400EVM at 5-V (minimum 3 A) power supply. Place the power switch (SW7) to the "On" position.
3. Connect the mini-USB cable to the TSW1400EVM (J2).
4. Connect the mini-USB cable to the ADC3660EVM (J14).

4 Device Configuration

Press the Reset button upon launching the ADC35XX GUI.

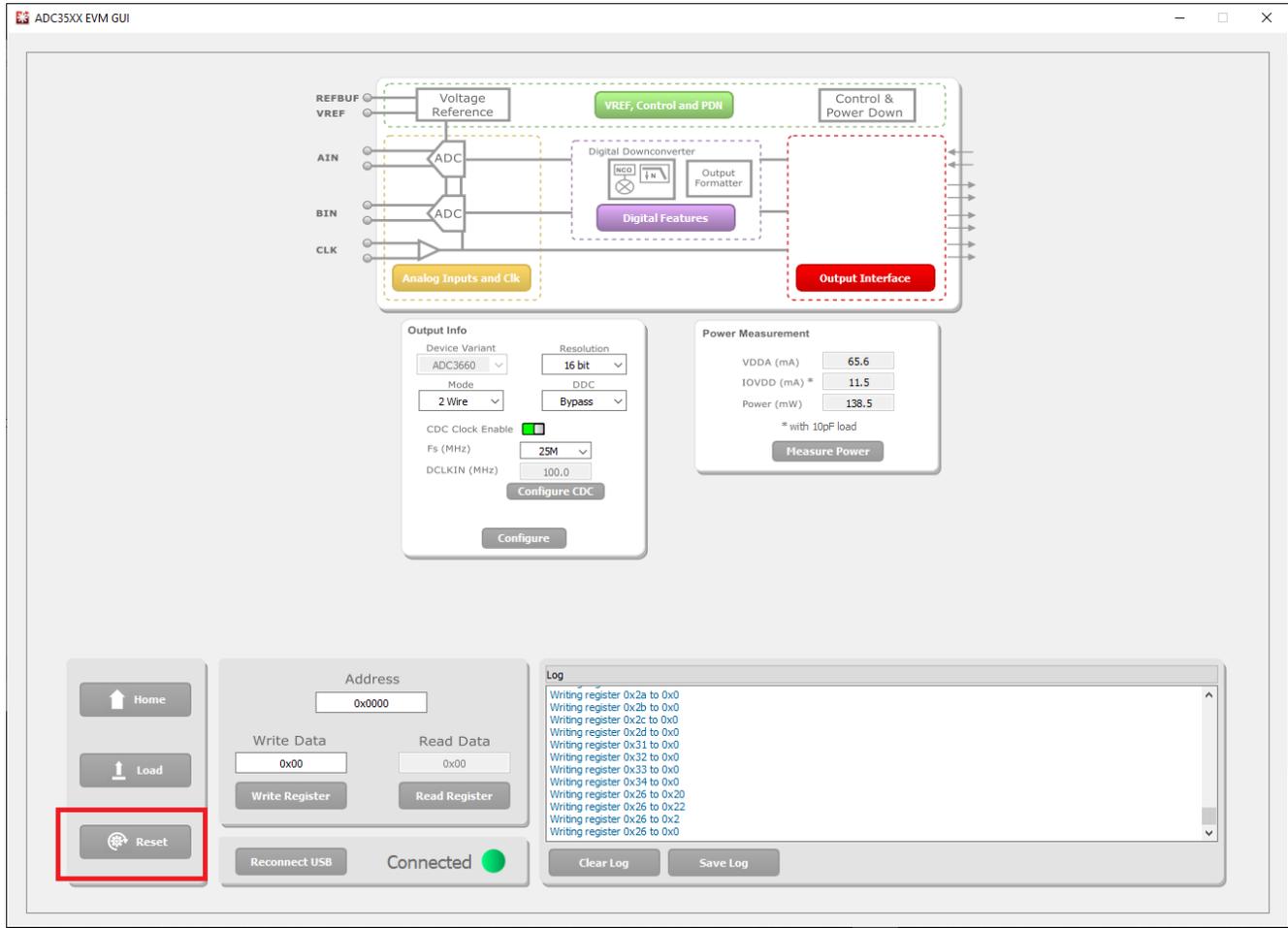


Figure 4-1. ADC35xx Software Reset

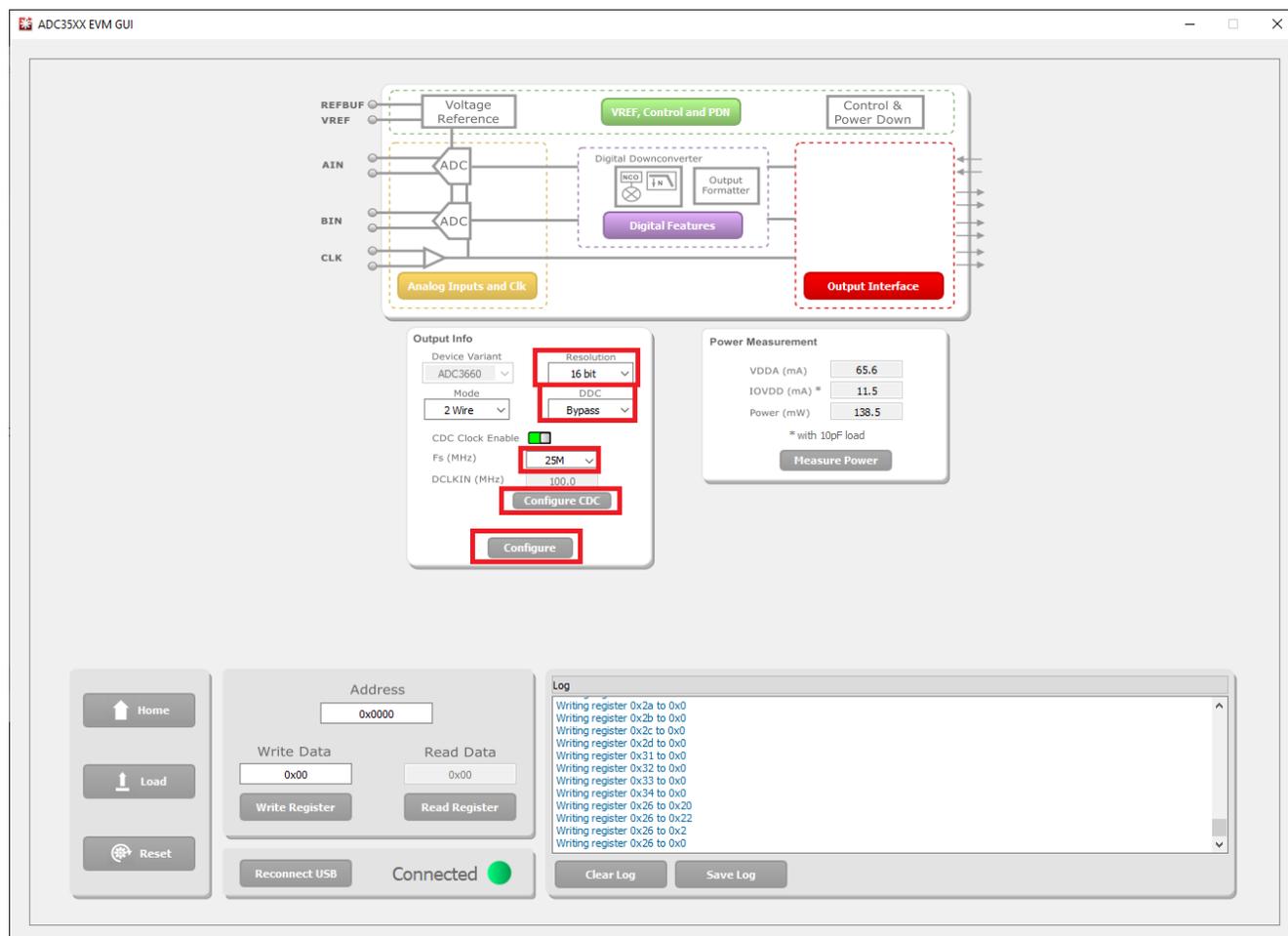
4.1 Bypass Mode

The following steps show how to configure the ADC3660EVM in Bypass mode.

4.1.1 ADC35XX GUI: Bypass Mode Configuration

After launching the ADC35xx GUI perform the following steps:

- Under Resolution, select 16 bit.
- Select 25M under sampling rate
- Under DDC, Select Bypass.
- Ensure that "CDC Enable" is enabled
- Click Configure CDC
- Click Configure



The screenshot shows the ADC35XX EVM GUI with the following configuration settings highlighted in red boxes:

- Resolution:** 16 bit
- DDC:** Bypass
- Fs (MHz):** 25M
- CDC Clock Enable:** Checked (Green)
- Configure CDC:** Button
- Configure:** Button

The Power Measurement section shows the following values:

Parameter	Value
VDDA (mA)	65.6
IOVDD (mA) *	11.5
Power (mW)	138.5

* with 10pF load

The Log window shows the following messages:

```

Writing register 0x2a to 0x0
Writing register 0x2b to 0x0
Writing register 0x2c to 0x0
Writing register 0x2d to 0x0
Writing register 0x31 to 0x0
Writing register 0x32 to 0x0
Writing register 0x33 to 0x0
Writing register 0x34 to 0x0
Writing register 0x26 to 0x20
Writing register 0x26 to 0x22
Writing register 0x26 to 0x2
    
```

Figure 4-2. ADC35xx GUI settings for Bypass Mode

4.1.2 HSDC Pro: Bypass Mode

After pressing "Configure" within the ADC35xx GUI perform the following steps to setup HSDC pro:

- Launch HSDC Pro
- Select the TSW1400 and click OK

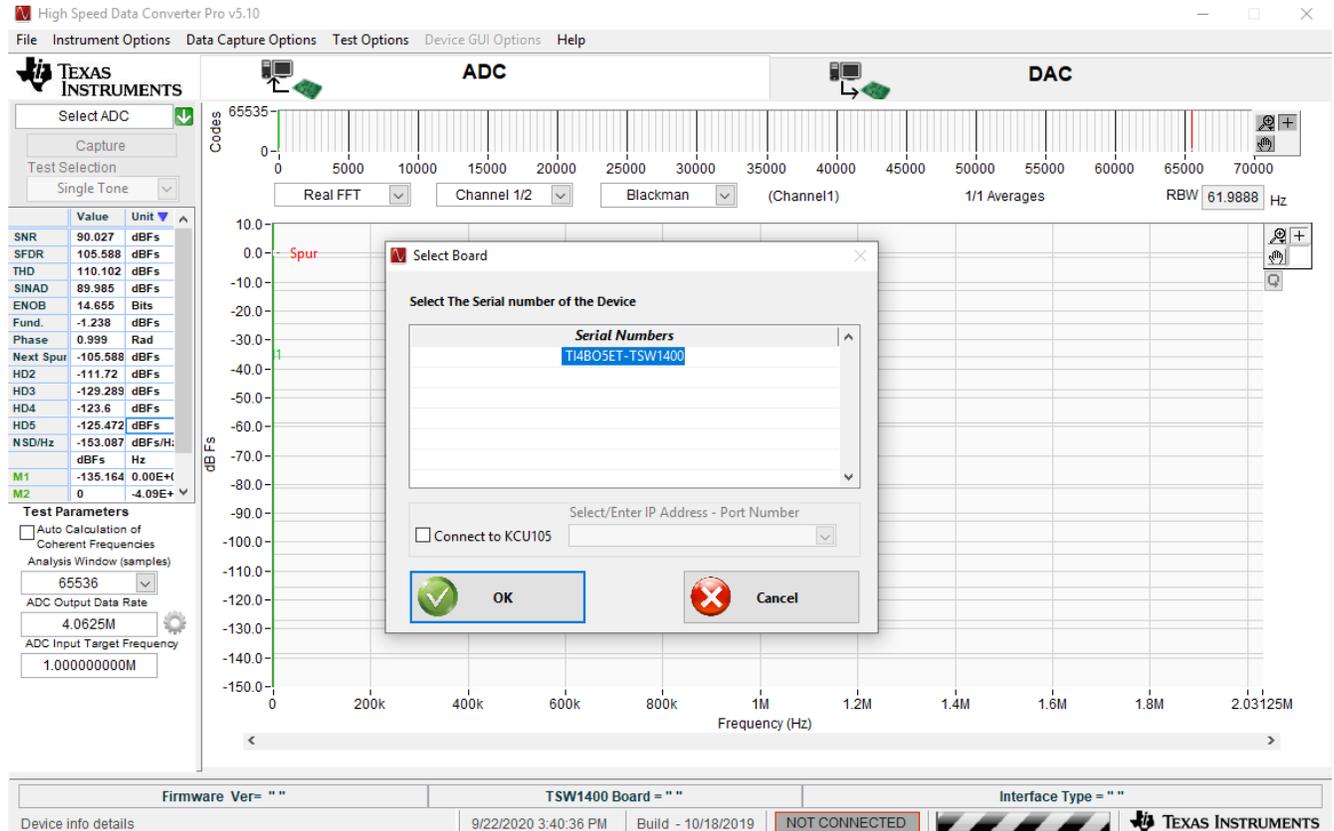


Figure 4-3. HSDC Pro: Connect to TSW1400

- Click OK for the no firmware loaded prompt.

- Select "ADC3660_2W_16bit_CMOS" to load firmware, and click Yes.

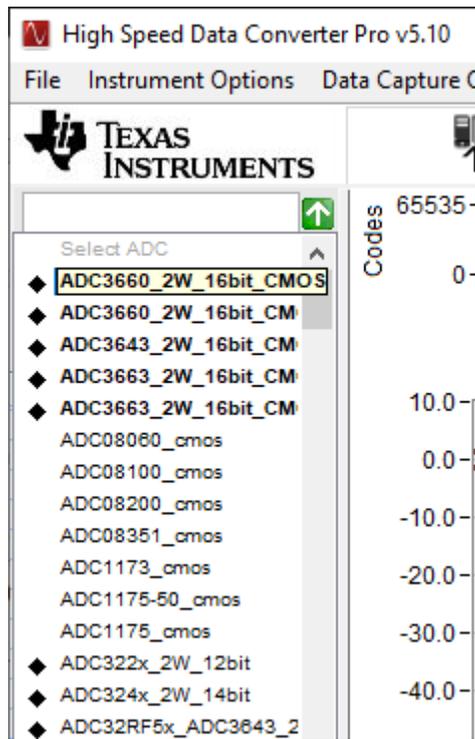


Figure 4-4. HSDC Pro ini file selection for Bypass Mode

- Click on the cog next to “ADC Output Data Rate”.

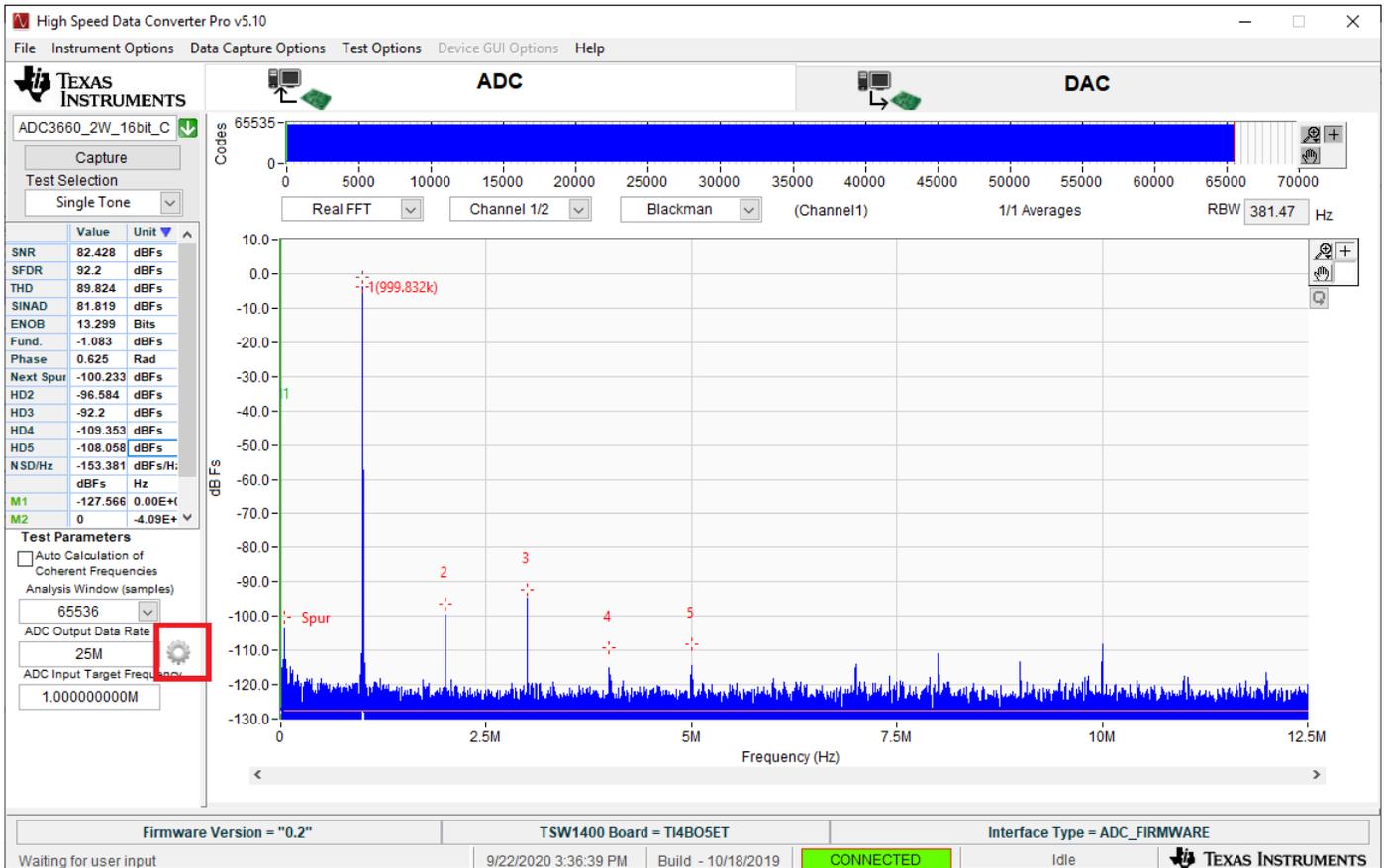


Figure 4-5. HSDC Pro Cog Wheel

- Enter 25M within the box that says “ADC Sampling Rate”
- Enter the input frequency of the input signal in the box that says "ADC Input Signal Frequency"
- Enter 0 in the box that says "NCO"
- Enter 1 in the box that says "Decimation"

- Press okay

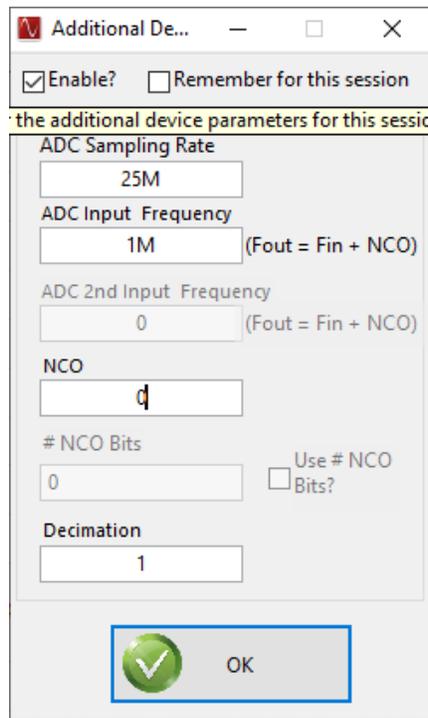


Figure 4-6. Bypass Mode HSDC Pro Parameters

- Press Capture

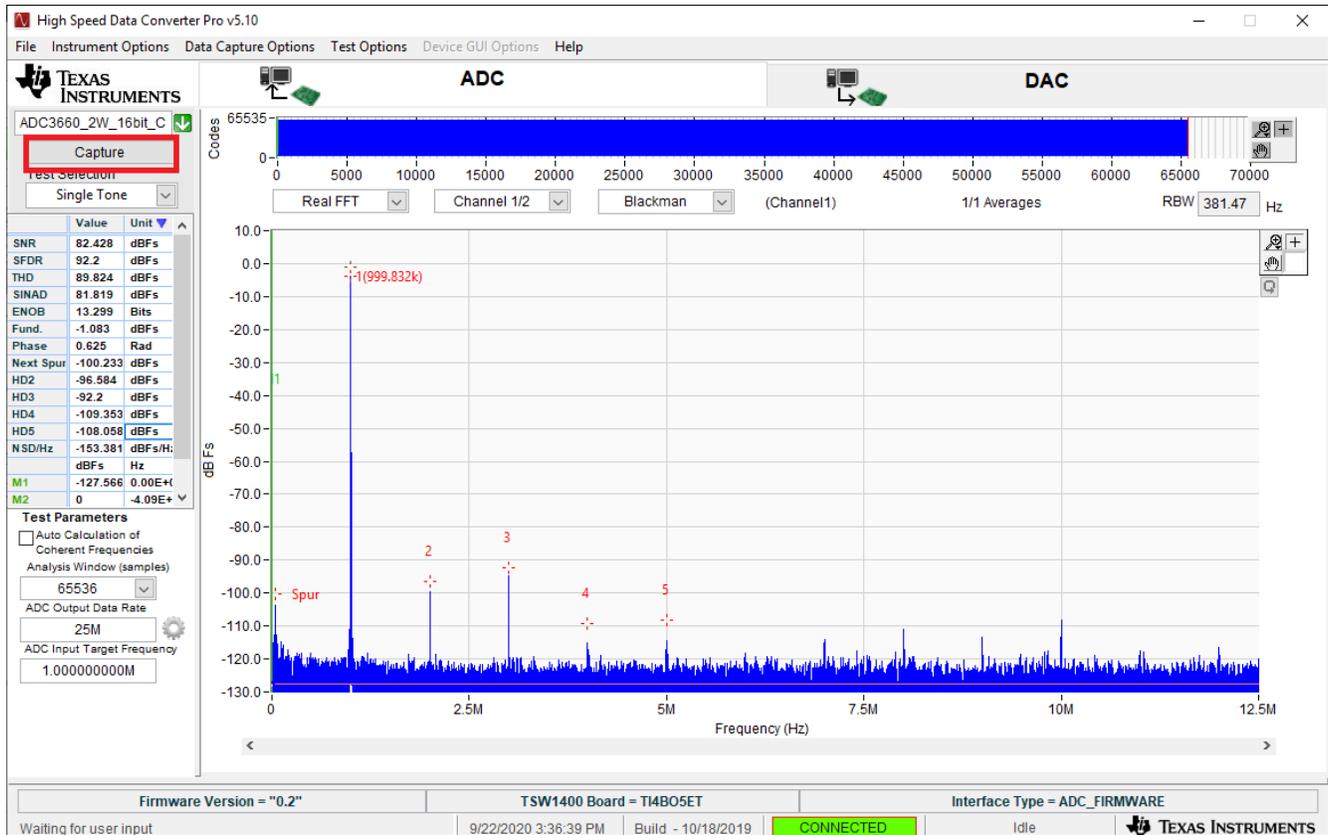


Figure 4-7. Bypass Mode Capture

- The analog input signal power may need to be adjusted to reach -1 dBFS.

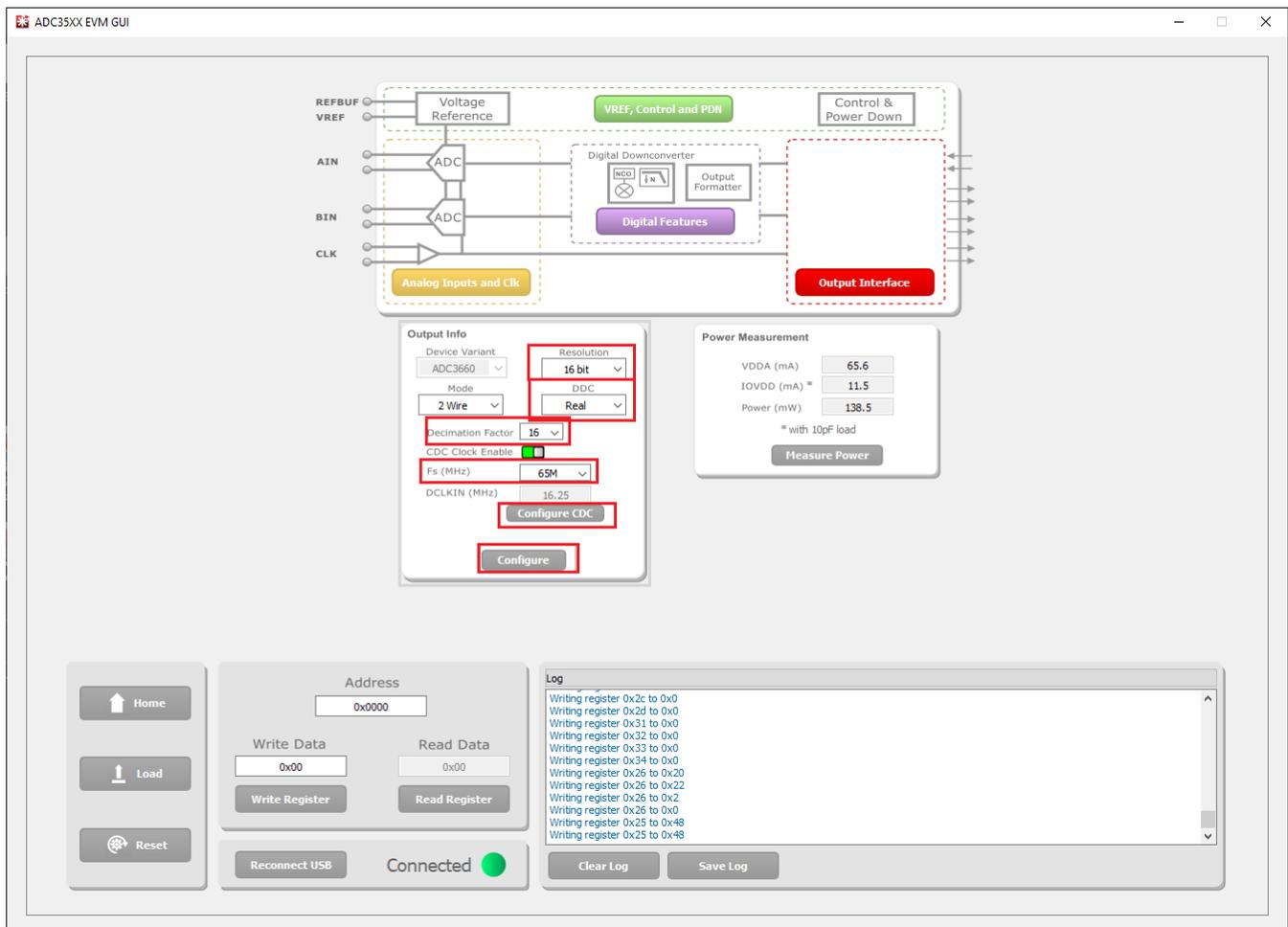
4.2 Real Decimation Mode

The following software configuration steps will program the ADC3660EVM in Real Decimation mode.

4.2.1 ADC35XX GUI: Real Decimation Mode Configuration

After launching the ADC35xx GUI perform the following steps:

- Under Resolution, select 16 bit.
- Under DDC, Select Real.
- For Decimation Factor, select 16.
- For Fs(MHz), select 65M.
- Click Configure CDC
- Click Configure



The screenshot displays the ADC35XX EVM GUI with the following configuration details:

- Block Diagram:** Shows the ADC system architecture including Voltage Reference, Digital Downconverter (DDC), Output Formatter, and Digital Features. Inputs include REFBUF, VREF, AIN, BIN, and CLK.
- Output Info Panel:**
 - Device Variant: ADC3660
 - Resolution: 16 bit
 - Mode: 2 Wire
 - DDC: Real
 - Decimation Factor: 16
 - CDC Clock Enable:
 - Fs (MHz): 65M
 - DCLKIN (MHz): 16.25
 - Buttons: Configure CDC, Configure
- Power Measurement Panel:**
 - VDDA (mA): 65.6
 - IOVDD (mA) *: 11.5
 - Power (mW): 138.5
 - * with 10pF load
 - Button: Measure Power
- Control Panel:**
 - Buttons: Home, Load, Reset
 - Address: 0x0000
 - Write Data: 0x00
 - Read Data: 0x00
 - Buttons: Write Register, Read Register
 - Status: Reconnect USB, Connected
 - Buttons: Clear Log, Save Log
- Log Window:**

```

Writing register 0x2c to 0x0
Writing register 0x2d to 0x0
Writing register 0x31 to 0x0
Writing register 0x32 to 0x0
Writing register 0x33 to 0x0
Writing register 0x34 to 0x0
Writing register 0x26 to 0x20
Writing register 0x26 to 0x22
Writing register 0x26 to 0x2
Writing register 0x26 to 0x0
Writing register 0x25 to 0x48
Writing register 0x25 to 0x48
                    
```

Figure 4-8. ADC35xx GUI settings for Real Decimation Mode

4.2.2 HSDC Pro: Real Decimation Mode

After pressing "Configure" within the ADC35xx GUI perform the following steps to setup HSDC pro:

- Launch HSDC Pro
- Select the TSW1400 and click OK
- Click OK for the no firmware loaded prompt.
- Select "ADC3660_2W_16bit_CMOS.ini" to load firmware, and click Yes.

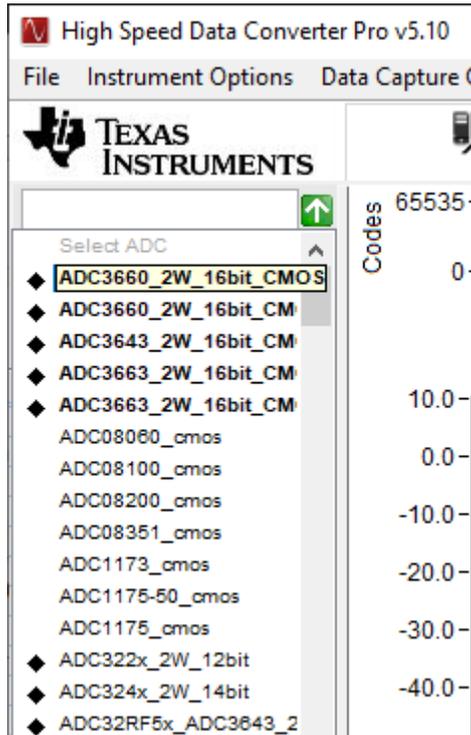


Figure 4-9. Real Decimation HSDC Pro INI File

Click on the cog next to “ADC Output Data Rate”.

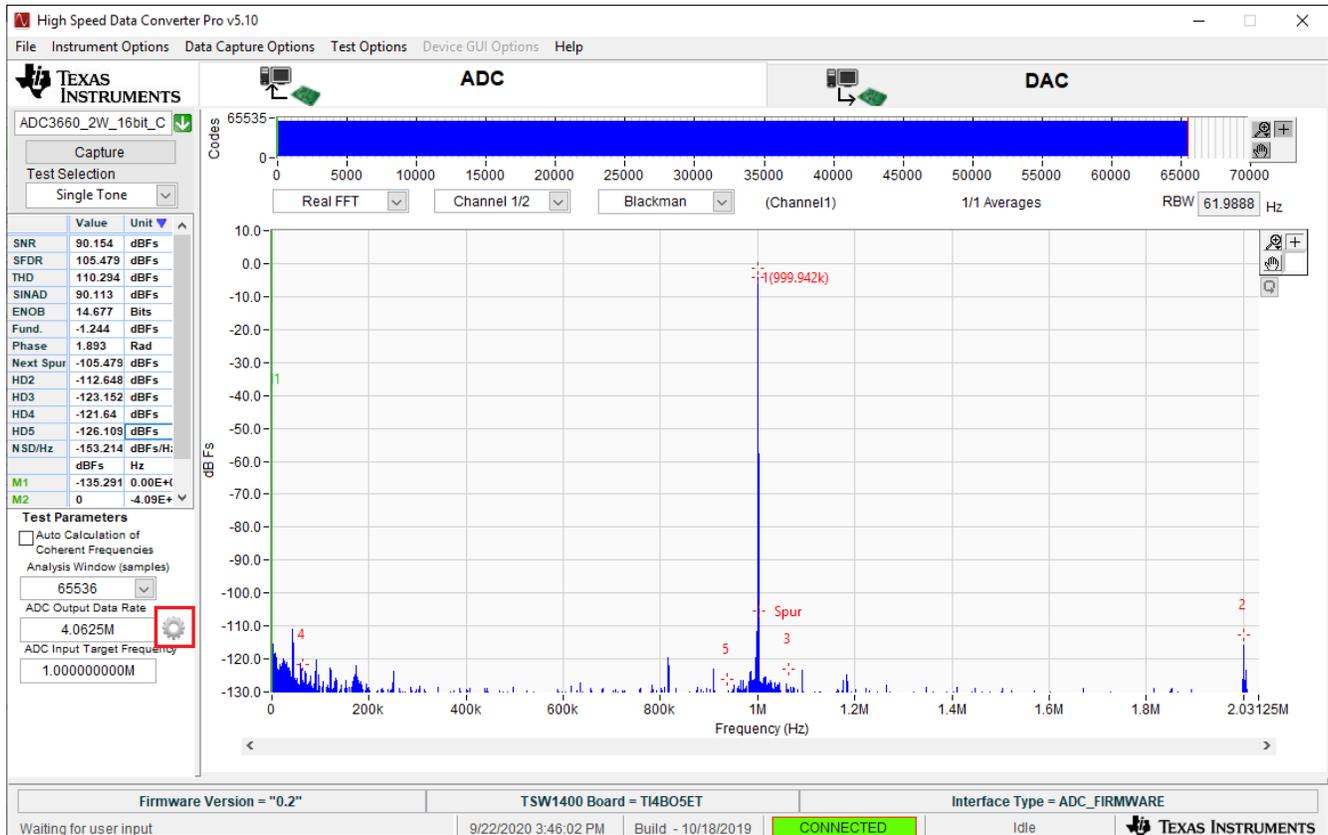


Figure 4-10. HSDC Pro Cog Wheel

In the new dialogue box, enter 65M in “ADC Sampling Rate”

- Enter 1M in “ADC Input Frequency”
- Enter 16 in “Decimation”.
- Click Ok.

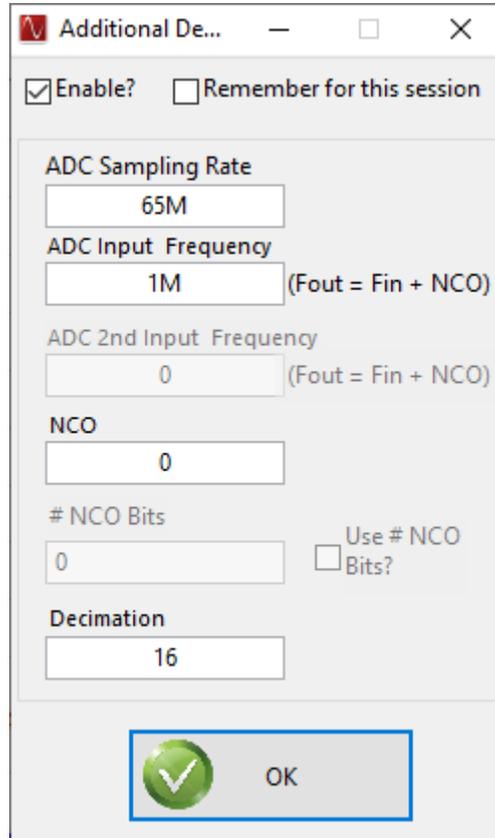


Figure 4-11. Real Decimation Mode HSDC Pro Parameters

- Click the Capture button

- In order to adjust the noise floor, from -130 dBFs to -150 dBFs by clicking on -130 and entering -150 before pressing enter. You should see the noise floor adjusted.

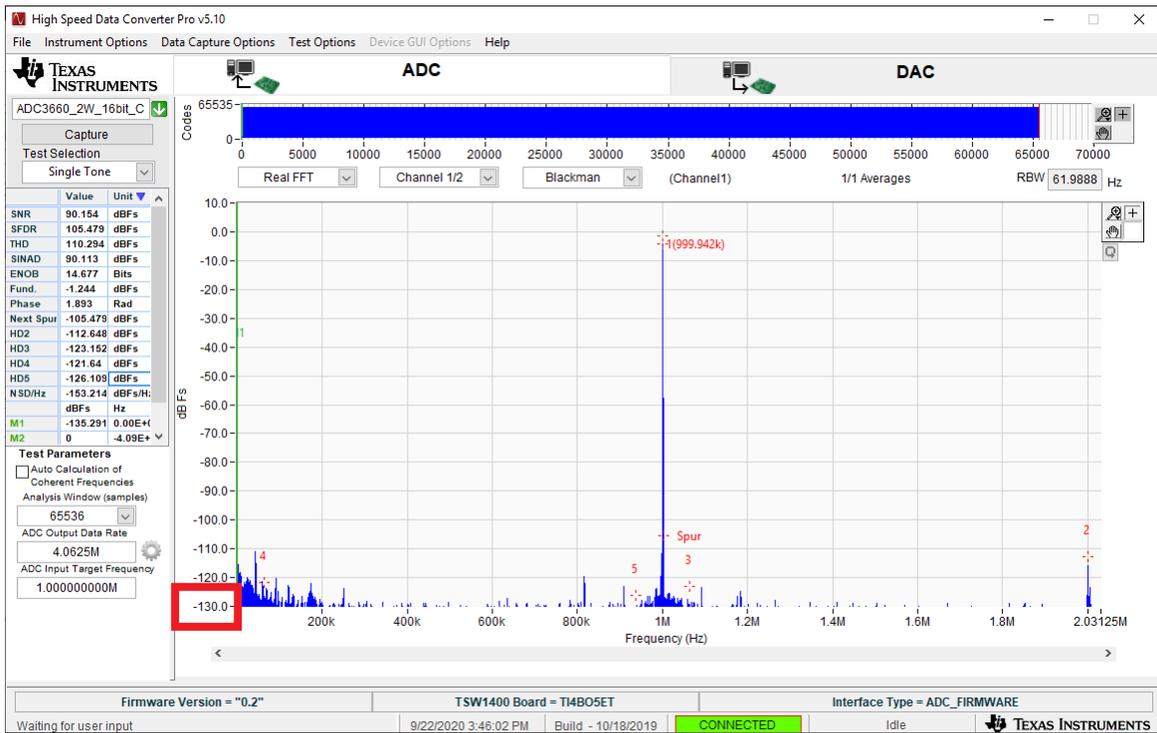


Figure 4-12. Real Decimation Noise Floor at -130 dBFs

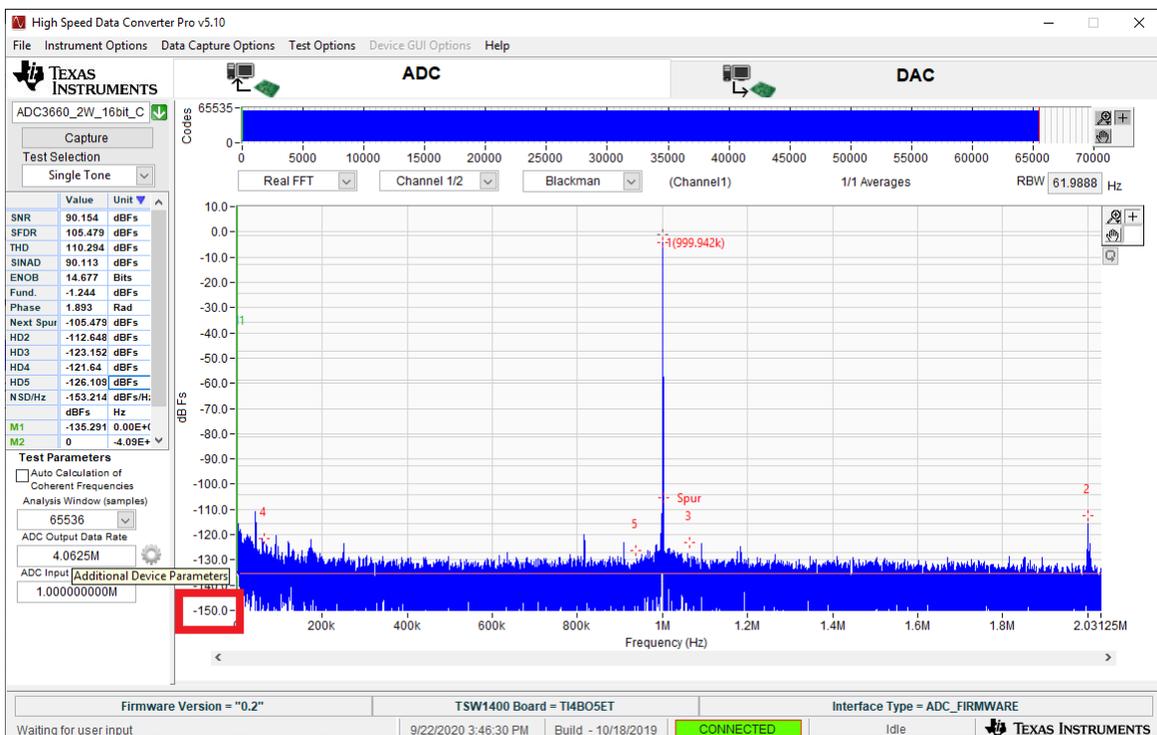


Figure 4-13. Real Decimation Noise Floor at -150 dBFs

4.3 Complex Decimation Mode

The following software configuration steps will program the ADC3660EVM in Complex Decimation mode.

4.3.1 ADC35XX GUI: Complex Decimation Configuration

After launching the ADC35xx GUI perform the following steps:

- Under Resolution, select 16 bit.
- Under DDC, Select Complex.
- For Decimation Factor, select 8.
- For Fs(MHz), select 65M.
- Click Configure CDC

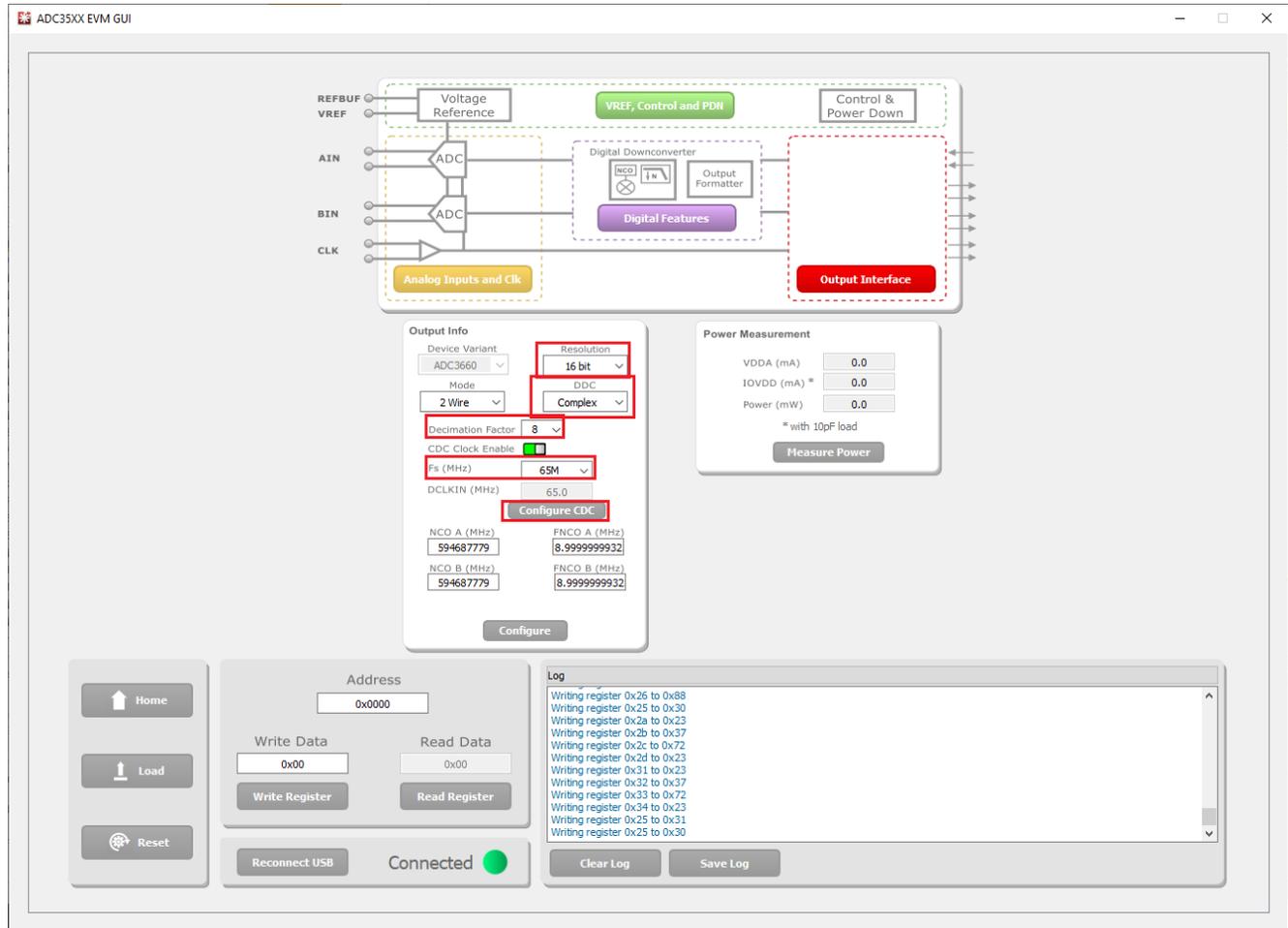


Figure 4-14. ADC35xx GUI settings for Complex Decimation Mode

Enter 9M as the NCO frequency for NCOA and NCOB

- Select Configure

The screenshot shows the ADC35XX EVM GUI with the following configuration details:

- Output Info:**
 - Device Variant: ADC3660
 - Resolution: 16 bit
 - Mode: 2 Wire
 - DDC: Complex
 - Decimation Factor: 8
 - CDC Clock Enable:
 - Fs (MHz): 65M
 - DCLKIN (MHz): 65.0
 - Configure CDC:
 - NCO A (MHz): 594687779
 - FNCO A (MHz): 8.999999932
 - NCO B (MHz): 594687779
 - FNCO B (MHz): 8.999999932
 - Configure:
- Power Measurement:**
 - VDDA (mA): 0.0
 - IOVDD (mA): 0.0
 - Power (mW): 0.0
 - * with 10pF load
 - Measure Power:
- Log:**
 - Writing register 0x26 to 0x88
 - Writing register 0x25 to 0x30
 - Writing register 0x2a to 0x23
 - Writing register 0x2b to 0x37
 - Writing register 0x2c to 0x72
 - Writing register 0x2d to 0x23
 - Writing register 0x31 to 0x23
 - Writing register 0x32 to 0x37
 - Writing register 0x33 to 0x72
 - Writing register 0x34 to 0x23
 - Writing register 0x25 to 0x21
 - Writing register 0x25 to 0x30

Figure 4-15. ADC35xx GUI NCO settings

4.3.2 HSDC PRO: Complex Decimation Mode

After pressing "Configure" within the ADC35xx GUI perform the following steps to setup HSDC pro:

- Launch HSDC Pro
- Select the TSW1400 and click OK
- Click OK for the no firmware loaded prompt.
- Select "ADC3660_2W_16bit_CMOS_Complex.ini" to load firmware, and click Yes.

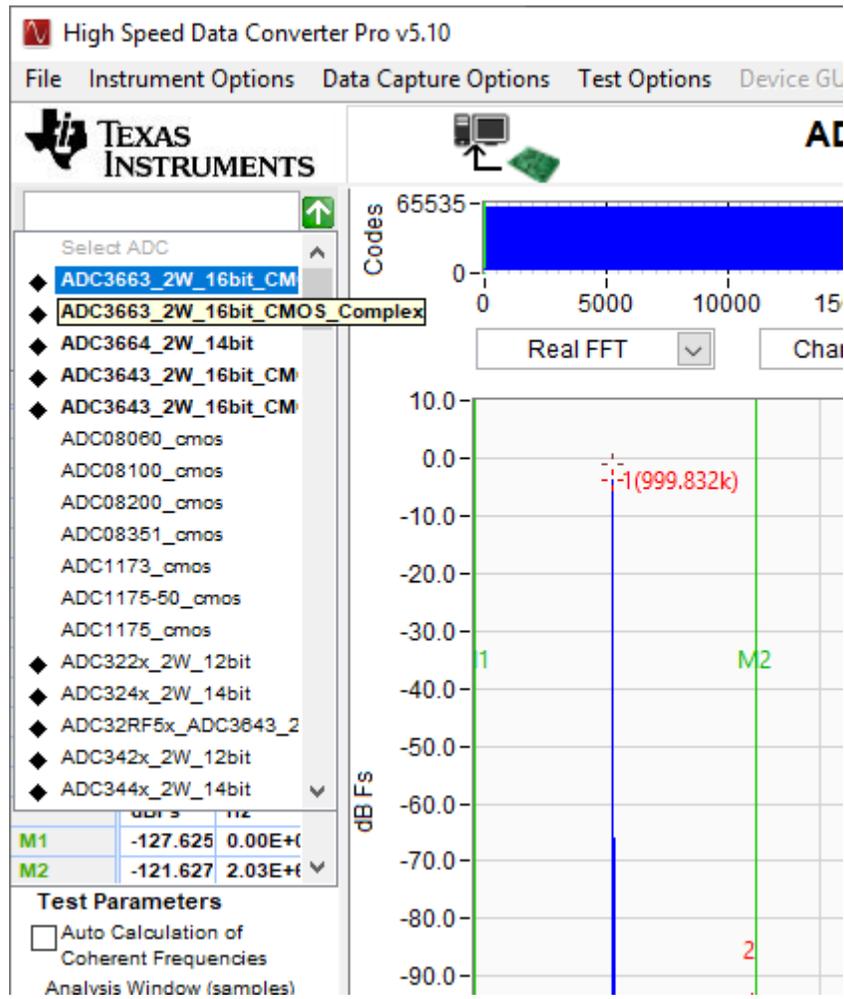


Figure 4-16. Complex Decimation HSDC Pro INI file

Click on the cog next to “ADC Output Data Rate”.

- In the new dialogue box, check the enable box
- enter 65M for “ADC Sampling Rate”
- enter 10M for “ADC Input Frequency”
- Enter 9M for "NCO"
- enter 8 in “Decimation”.
- Click Ok.

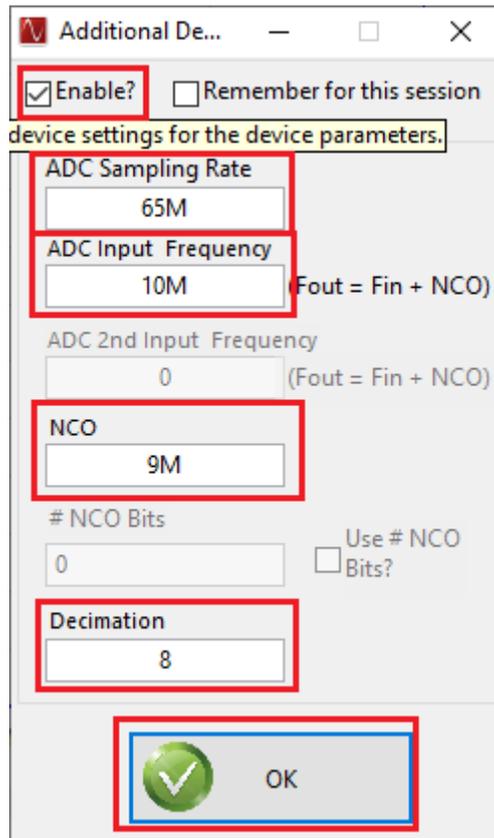


Figure 4-17. Complex Decimation Mode HSDC Pro Parameters

- Press Capture

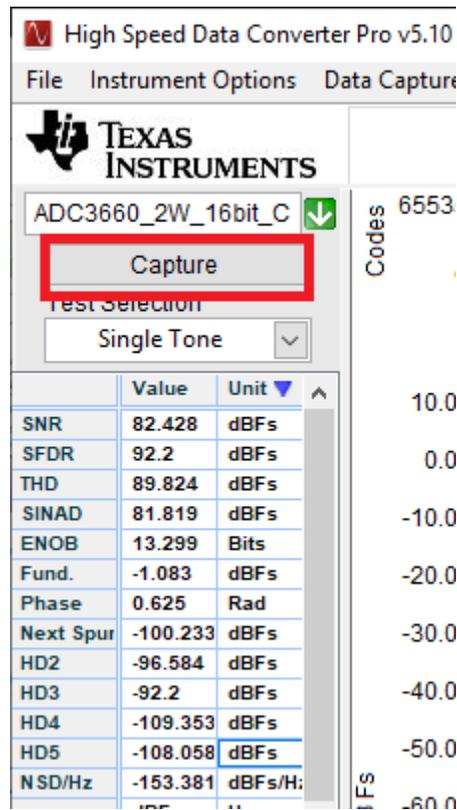


Figure 4-18. Complex Mode Capture

Select "Complex FFT" in the circled drop down box

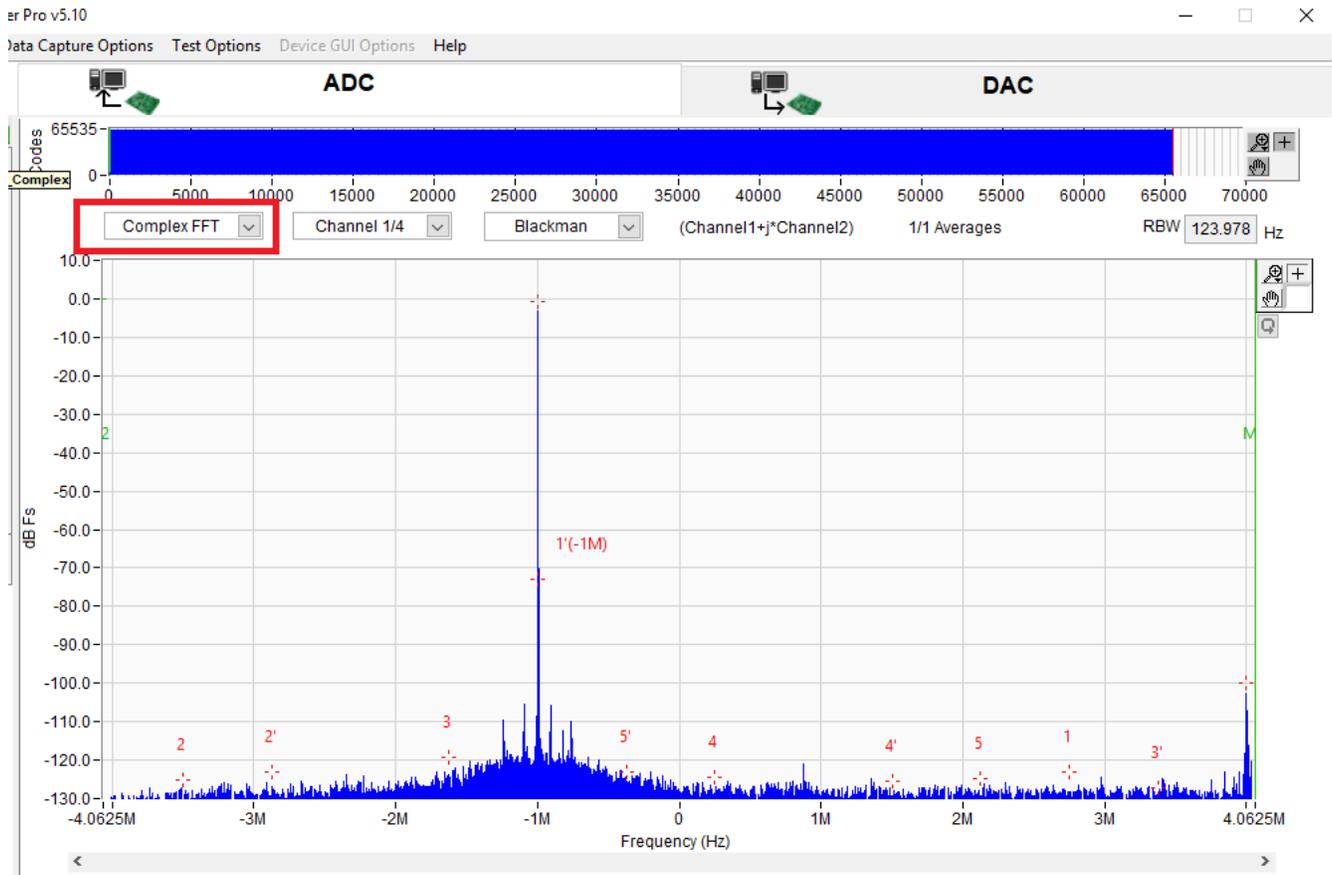


Figure 4-19. Select Complex FFT

5 External Clocking Hardware Setup

The following section shows how to configure and program the ADC3660EVM for external clock operation.

5.1 Hardware Modifications

The following hardware modifications must be made in order to operate the ADC3660EVM using an external sampling and data clock .

- DNI R176
- Replace C129 with 0-Ω resistor.

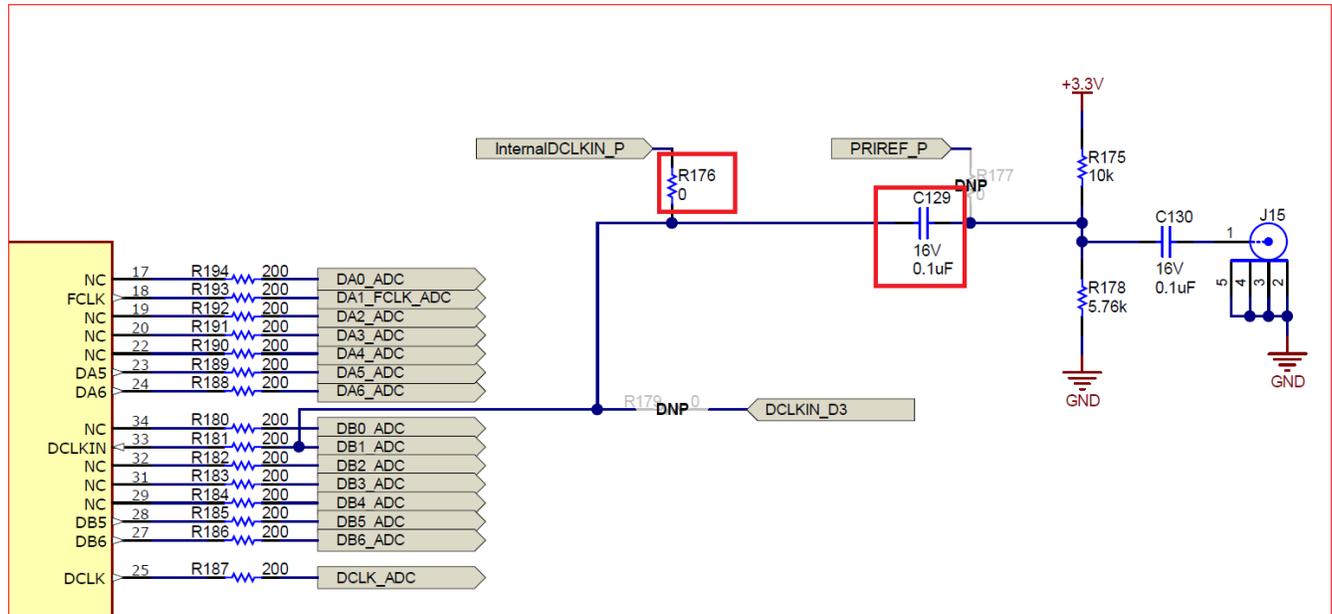


Figure 5-1. ADC3660EVM Schematic Snippet: DCLKIN

- DNI R32, R40
- Install R36, R37
- Connect sample clock to J8. Connect DCLKIN to J15.

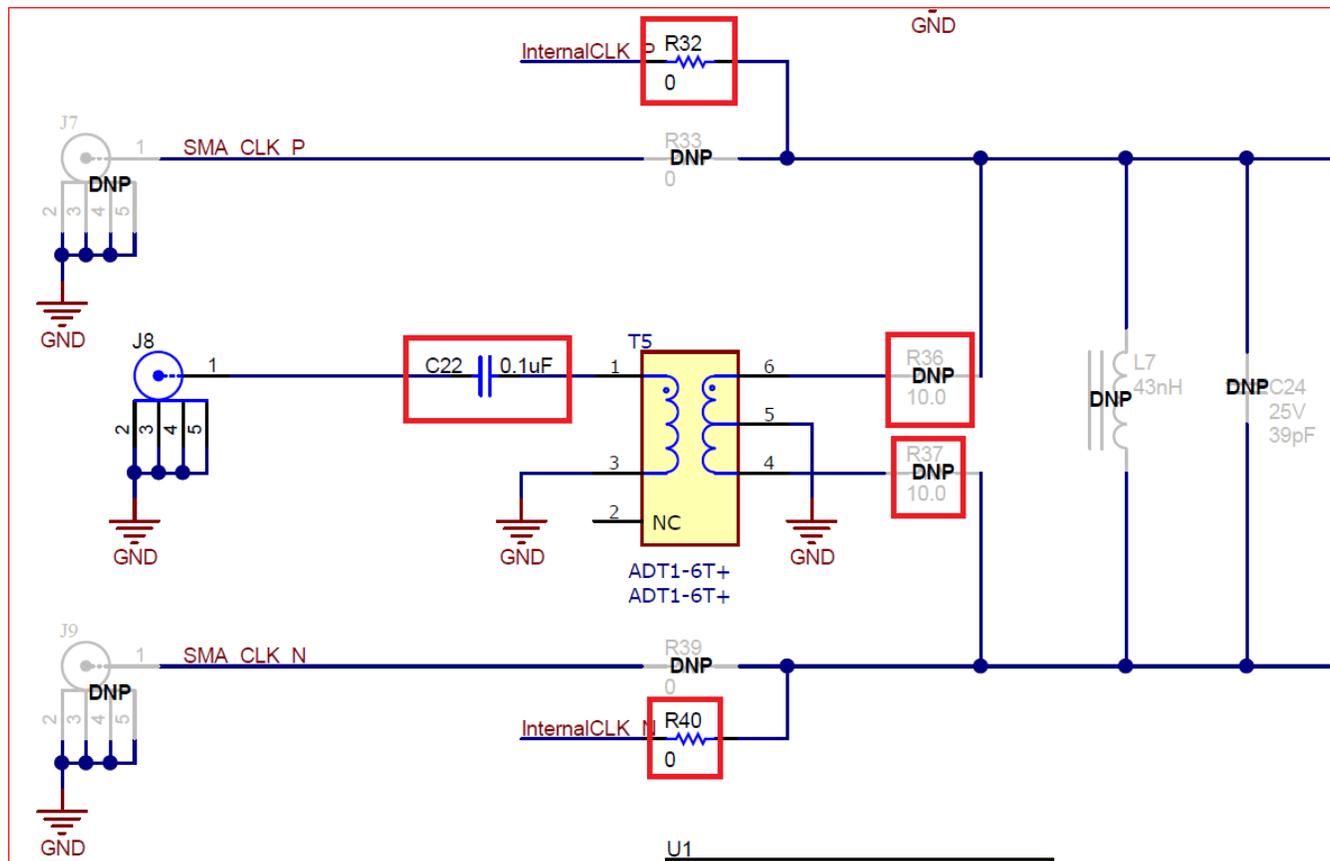


Figure 5-2. ADC3660EVM Schematic Snippet: Sample Clock

5.2 Hardware Setup: Real Decimation Mode

- On ADC3660EVM, shunt J14 (2-3) to use USB power.
- Connect ADC sampling clock source (SMA100A used) to J8. Set signal power to +15 dBm. 65 MSPS used in this example.
- Connect DCLKIN clock source (SMA100A used) to J10. Set signal power to +13 dBm. 16.25 MHz used in this example

ADC sampling clock source and DCLKIN source must be frequency locked. If this is not performed, the captured data is not recognizable.

- Connect Analog input source (SMA100A used) to J2 for CHA. 1 MHz used in this example (with bandpass filter).
- Connect Mini-USB cable from PC to J15 on ADC3660EVM.
- Push button S1 to reset ADC
- IRun the ADC35xx GUI

5.3 ADC35XX GUI: Real Decimation Mode: Ext. Clock

To program the ADC3660EVM follow the steps written in the previous section titled "ADC35xx GUI: Real Decimation Configuration". The only change when using external clock is CDC clock enable must be disabled before selecting "Configure CDC" in the ADC35xx as shown in [Figure 5-3](#).

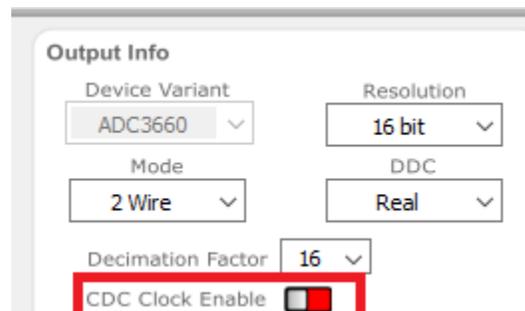
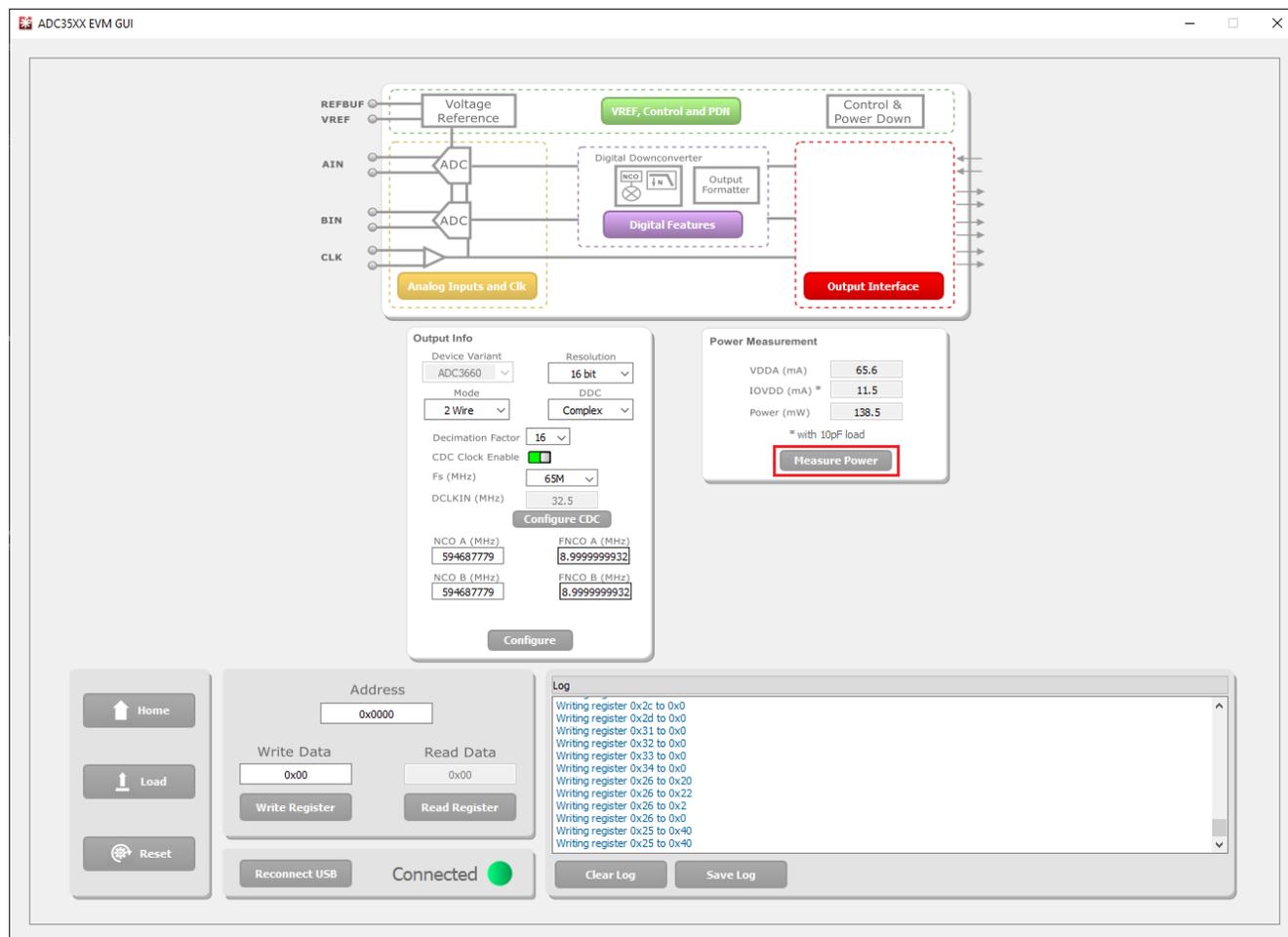


Figure 5-3. ADC35XX GUI: Disable CDC Clock Enable

6 ADC3660EVM Power Meter

The ADC3660EVM is equipped with on-board current shunt monitors that are able to measure the current consumption on the +1.8VDC rails (AVDD and IOVDD). The user has the ability to read the ADC3660EVM's power consumption on the front page of the ADC35XX GUI. Click the "Measure Power" button to refresh the current values.



The screenshot displays the ADC35XX EVM GUI. At the top, a block diagram shows the ADC3660 architecture, including Voltage Reference, Analog Inputs and Clk, Digital Downconverter, Digital Features, and Output Interface. Below the diagram, the 'Output Info' section shows configuration parameters: Device Variant (ADC3660), Resolution (16 bit), Mode (2 Wire), Decimation Factor (16), CDC Clock Enable (checked), Fs (65M), and DCLKIN (32.5). The 'Power Measurement' section displays VDDA (mA) at 65.6, IOVDD (mA) at 11.5, and Power (mW) at 138.5, with a note '* with 10pF load'. A red box highlights the 'Measure Power' button. The bottom of the GUI features a 'Log' window showing register write operations and a 'Connected' status indicator.

Figure 6-1. ADC3660EVM Power Meter

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STANDARD TERMS FOR EVALUATION MODULES

1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, and/or documentation which may be provided together or separately (collectively, an "EVM" or "EVMs") to the User ("User") in accordance with the terms set forth herein. User's acceptance of the EVM is expressly subject to the following terms.
 - 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 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 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 a nonconforming EVM if (a) the nonconformity was 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, (b) the nonconformity resulted from User's design, specifications or instructions for such EVMs or improper system design, or (c) User has not paid on time. Testing and other quality control techniques are used to the extent TI deems necessary. TI does not test all parameters of each EVM. User's claims against TI under this Section 2 are void if User fails to notify TI of any apparent defects in the EVMs within ten (10) business days after delivery, or of any hidden defects with ten (10) business days after the defect has been detected.
 - 2.3 TI's sole liability shall be at its option to repair or replace EVMs that fail to conform to the warranty set forth above, 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.

WARNING

Evaluation Kits 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 shall operate the Evaluation Kit within TI's recommended guidelines and any applicable legal or environmental requirements as well as reasonable and customary safeguards. Failure to set up and/or operate the Evaluation Kit within TI's recommended guidelines may result in personal injury or death or property damage. Proper set up entails following TI's instructions for electrical ratings of interface circuits such as input, output and electrical loads.

NOTE:

EXPOSURE TO ELECTROSTATIC DISCHARGE (ESD) MAY CAUSE DEGRADATION OR FAILURE OF THE EVALUATION KIT; TI RECOMMENDS STORAGE OF THE EVALUATION KIT IN A PROTECTIVE ESD BAG.

3 Regulatory Notices:

3.1 United States

3.1.1 Notice applicable to EVMs not FCC-Approved:

FCC NOTICE: 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 or RSS-247

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. 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/lstds/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/lstds/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 to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

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.

【無線電波を送信する製品の開発キットをお使いになる際の注意事項】 開発キットの中には技術基準適合証明を受けていないものがあります。技術適合証明を受けていないものご使用に際しては、電波法遵守のため、以下のいずれかの措置を取っていただく必要がありますのでご注意ください。

1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。
2. 実験局の免許を取得後ご使用いただく。
3. 技術基準適合証明を取得後ご使用いただく。

なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。

上記を遵守頂けない場合は、電波法の罰則が適用される可能性があることをご留意ください。日本テキサス・インスツルメンツ株式会社
東京都新宿区西新宿 6 丁目 2 4 番 1 号
西新宿三井ビル

3.3.3 *Notice for EVMs for Power Line Communication:* Please see http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_02.page
電力線搬送波通信についての開発キットをお使いになる際の注意事項については、次のところをご覧ください。http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_02.page

3.4 European Union

3.4.1 *For EVMs subject to EU Directive 2014/30/EU (Electromagnetic Compatibility Directive):*

This is a class A product intended for use in environments other than domestic environments that are connected to a low-voltage power-supply network that supplies buildings used for domestic purposes. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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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:*
 - 6.1 EXCEPT AS SET FORTH ABOVE, EVMS AND ANY MATERIALS PROVIDED WITH THE EVM (INCLUDING, BUT NOT LIMITED TO, REFERENCE DESIGNS AND THE DESIGN OF THE EVM ITSELF) ARE PROVIDED "AS IS" AND "WITH ALL FAULTS." TI DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, REGARDING SUCH ITEMS, INCLUDING BUT NOT LIMITED TO ANY EPIDEMIC FAILURE WARRANTY OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADE SECRETS OR OTHER INTELLECTUAL PROPERTY RIGHTS.
 - 6.2 EXCEPT FOR THE LIMITED RIGHT TO USE THE EVM SET FORTH HEREIN, NOTHING IN THESE TERMS SHALL BE CONSTRUED AS GRANTING OR CONFERRING ANY RIGHTS BY LICENSE, PATENT, OR ANY OTHER INDUSTRIAL OR INTELLECTUAL PROPERTY RIGHT OF TI, ITS SUPPLIERS/LICENSORS OR ANY OTHER THIRD PARTY, TO USE THE EVM IN ANY FINISHED END-USER OR READY-TO-USE FINAL PRODUCT, OR FOR ANY INVENTION, DISCOVERY OR IMPROVEMENT, REGARDLESS OF WHEN MADE, CONCEIVED OR ACQUIRED.
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8. *Limitations on Damages and Liability:*

8.1 *General Limitations.* IN NO EVENT SHALL TI BE LIABLE FOR ANY SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF THESE TERMS OR THE USE OF THE EVMS , REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. EXCLUDED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, COST OF REMOVAL OR REINSTALLATION, ANCILLARY COSTS TO THE PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, RETESTING, OUTSIDE COMPUTER TIME, LABOR COSTS, LOSS OF GOODWILL, LOSS OF PROFITS, LOSS OF SAVINGS, LOSS OF USE, LOSS OF DATA, OR BUSINESS INTERRUPTION. NO CLAIM, SUIT OR ACTION SHALL BE BROUGHT AGAINST TI MORE THAN TWELVE (12) MONTHS AFTER THE EVENT THAT GAVE RISE TO THE CAUSE OF ACTION HAS OCCURRED.

8.2 *Specific Limitations.* IN NO EVENT SHALL TI'S AGGREGATE LIABILITY FROM ANY USE OF AN EVM PROVIDED HEREUNDER, INCLUDING FROM ANY WARRANTY, INDEMNITY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS, , EXCEED THE TOTAL AMOUNT PAID TO TI BY USER FOR THE PARTICULAR EVM(S) AT ISSUE DURING THE PRIOR TWELVE (12) MONTHS WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED. THE EXISTENCE OF MORE THAN ONE CLAIM SHALL NOT ENLARGE OR EXTEND THIS LIMIT.

9. *Return Policy.* Except as otherwise provided, TI does not offer any refunds, returns, or exchanges. Furthermore, no return of EVM(s) will be accepted if the package has been opened and no return of the EVM(s) will be accepted if they are damaged or otherwise not in a resalable condition. If User feels it has been incorrectly charged for the EVM(s) it ordered or that delivery violates the applicable order, User should contact TI. All refunds will be made in full within thirty (30) working days from the return of the components(s), excluding any postage or packaging costs.

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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