

CDCE6214-Q1 EVM

User's Guide



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CDCE6214-Q1 EVM User's Guide

The CDCE6214-Q1 EVM is an evaluation platform for the CDCE6214-Q1 ultra-low power clock generator. This evaluation module uses a USB interface to supply power and program the device.

Trademarks

All trademarks are the property of their respective owners.

What's Included

- CDCE6214-Q1EVM
- Micro-USB cable
- EVM disclaimer sheet

What's Required

- Windows PC
- Measurement equipment
 - Oscilloscope
 - Frequency counter (optional)
 - Spectrum analyzer (optional)

Quick Start

1.1 Install TICS Pro Software and Select Device

Request and download the latest TICS Pro software at <http://www.ti.com/tool/TICSPRO-SW>. Follow the instructions and install the TICS Pro software in the PC's default directory.

1. After launching TICS Pro, click the **Select Device** tab in the toolbar
2. Click **Clock Generator/Jitter Cleaner (Single Loop)** → **CDCE6214-Q1**.

1.2 Configure Jumpers

Refer to [Figure 1-1](#) to configure the jumpers:

1. Short J23 to power the on-board LDOs with a 5-V source from the USB. Short pins 2 and 3 of J26 to enable 1.8-V LDOs.
2. Short pin 2 of J6 and pin 1 of J9. Short pin 2 of J10 and pin 1 of J13. The purpose of this step is to connect SCL and SDA pins of DUT to the on-board microcontroller in order to enable I²C programming.
3. Short pin 1 and 2 of J12 to pull the REFSEL pin low.
4. Remove all other jumpers or leave them floating by connecting them to only one pin. The position of J25 is not important because the resistors required to enable a 3.3-V rail are not populated by default.

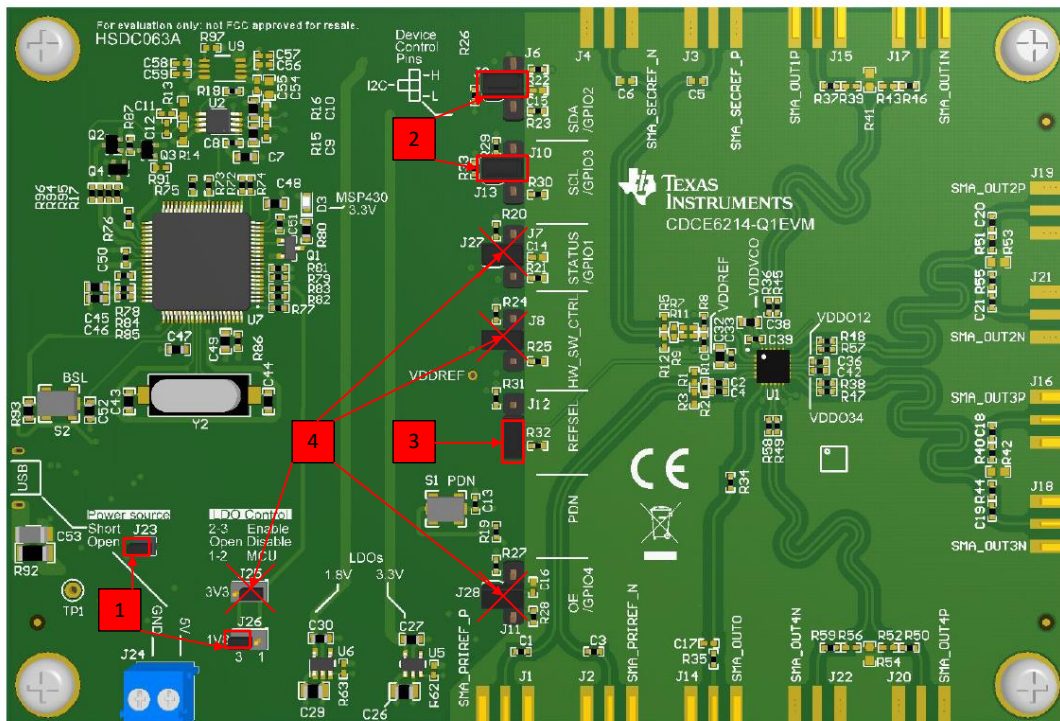


Figure 1-1. Jumper Configuration Guideline

1.3 Connect the EVM to the PC

1. Use a micro-B USB cable to connect the CDCE6214-Q1 EVM to the PC.
2. Watch the **Connection mode** field turn green on the screen.

If the connection mode stays red, follow the instructions listed in [Section 3.1](#).

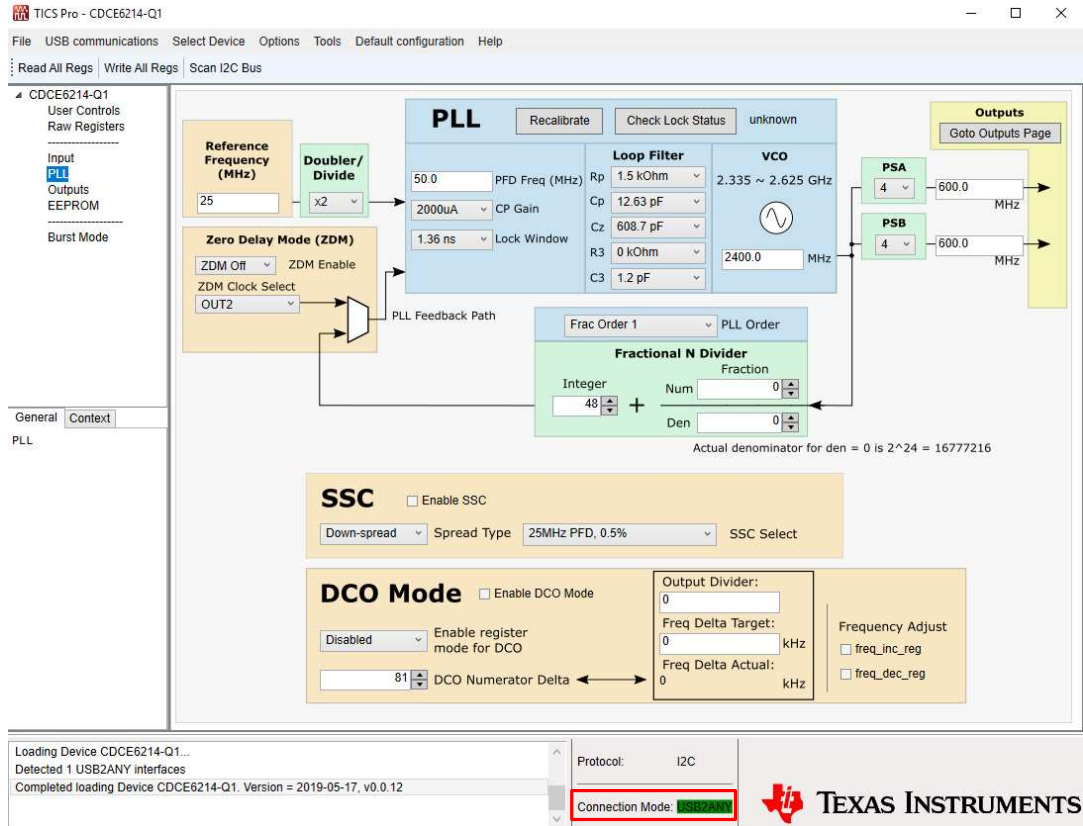


Figure 1-2. TICS Pro Snapshot With USB2ANY Connected

1.4 Scan I2C Bus

1. Click the **Scan I2C Bus** tab in the small toolbar.
2. Look for the "Device found at 0x67. Address will be updated." text in the message window.

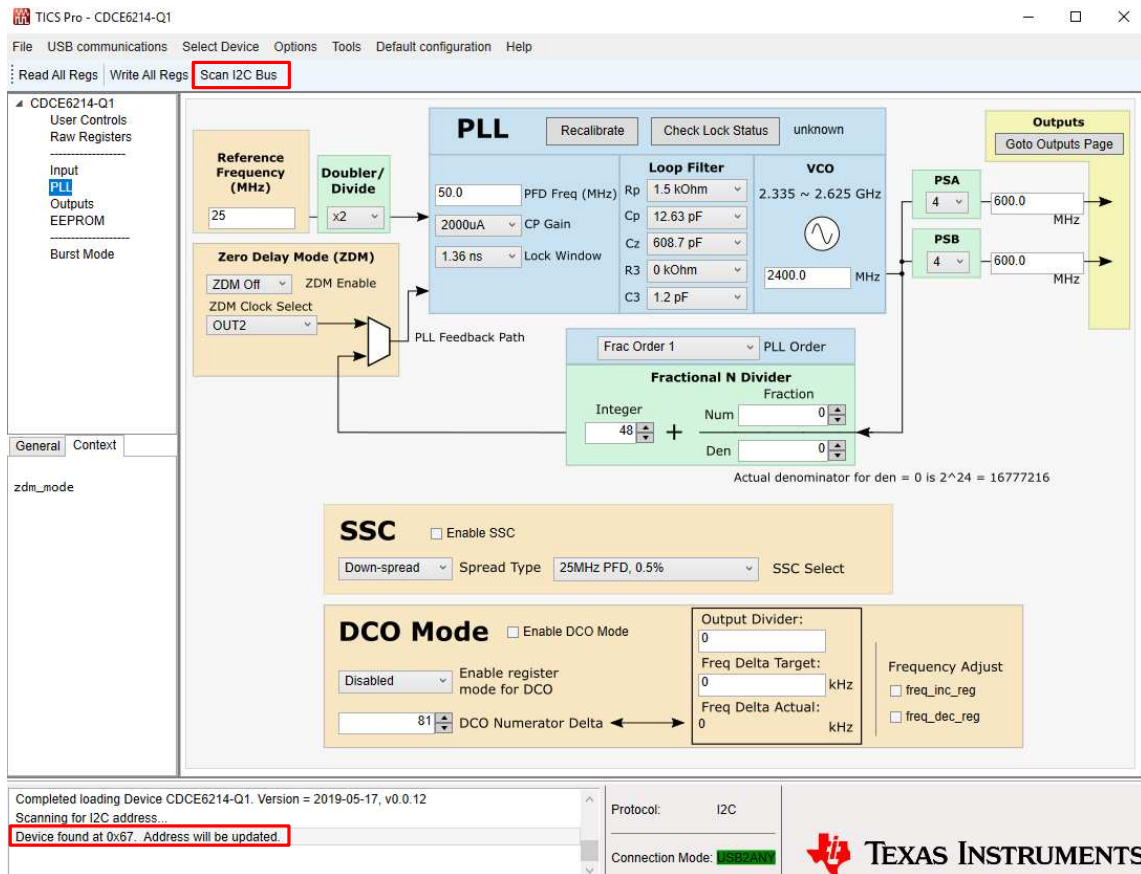


Figure 1-3. Scan I2C Bus

1.5 Load Default and Check Lock Status

NOTE: Hover over a register to read the register description in the lower-left pane of the TICS Pro window.

1. In the toolbar, go to **Default configurations** → **Silicon Default**.
2. After default registers are loaded, go to **PLL** tab and click the **Recalibrate** button, then click **Check Lock Status**.
3. Watch for the green "locked" text to confirm that the PLL is locked.

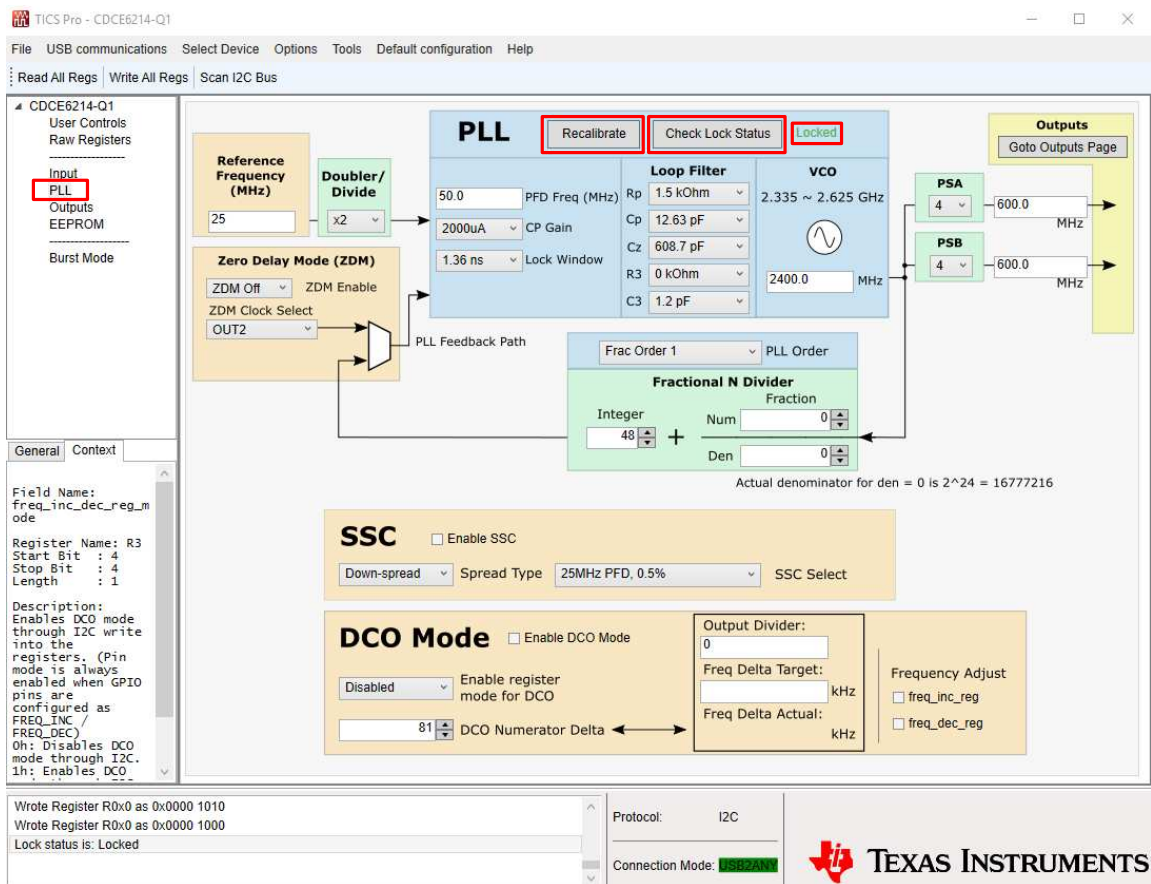


Figure 1-4. Check Lock Status

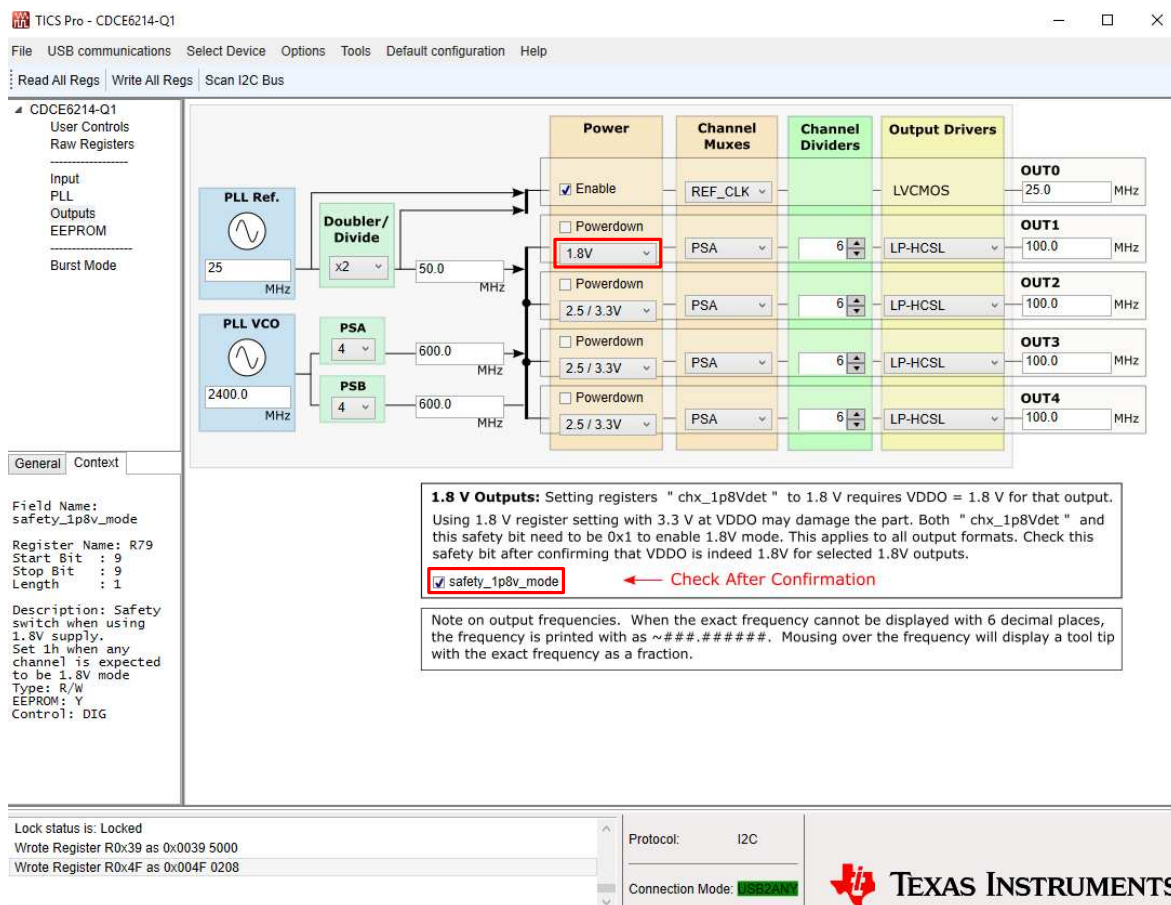
1.6 Check Outputs

Output 1 by default has no on-board termination resistors.

1. Connect SMA_OUT1P and SMA_OUT1N to two channels of an oscilloscope.
2. Change the oscilloscope termination to 1 MΩ or high impedance.
3. In the TICS Pro, click the **Outputs** tab and change the register **ch1_1p8vdet** to **1.8 V**
4. Check the **safety_1p8v_mode** checkbox

By default, 1.8-V LDO is enabled on the EVM. To view the correct waveform with 1.8-V VDDO supply, both **chx_1p8vdet** and **safety_1p8v_mode** must be set to 1. 100-MHz HCSL waveform should then be seen on oscilloscope.

NOTE: Only the SDA/GPIO2 and SCL/GPIO3 pins are connected to the on-board microcontroller. The other pins can only be configured by the on-board jumpers or connected to an external controller. They cannot be controlled by TICS Pro.



The screenshot shows the TICS Pro interface for configuring the CDCE6214-Q1. The main window displays a block diagram of the PLL and output drivers, and a configuration table for outputs. The configuration table is as follows:

Power	Channel Muxes	Channel Dividers	Output Drivers	Output
<input checked="" type="checkbox"/> Enable	REF_CLK		LVCMOS	OUT0: 25.0 MHz
<input type="checkbox"/> Powerdown	PSA	6	LP-HCSL	OUT1: 100.0 MHz
<input type="checkbox"/> Powerdown	PSA	6	LP-HCSL	OUT2: 100.0 MHz
<input type="checkbox"/> Powerdown	PSA	6	LP-HCSL	OUT3: 100.0 MHz
<input type="checkbox"/> Powerdown	PSA	6	LP-HCSL	OUT4: 100.0 MHz

The '1.8V' dropdown menu in the Power column for OUT1 is highlighted with a red box. Below the configuration table, a note states:

1.8 V Outputs: Setting registers "chx_1p8Vdet" to 1.8 V requires VDDO = 1.8 V for that output. Using 1.8 V register setting with 3.3 V at VDDO may damage the part. Both "chx_1p8Vdet" and this safety bit need to be 0x1 to enable 1.8V mode. This applies to all output formats. Check this safety bit after confirming that VDDO is indeed 1.8V for selected 1.8V outputs.

safety_1p8v_mode ← Check After Confirmation

Note on output frequencies. When the exact frequency cannot be displayed with 6 decimal places, the frequency is printed with as ~###.#####. Mousing over the frequency will display a tooltip with the exact frequency as a fraction.

Figure 1-5. Configure Outputs

Detailed Descriptions and Modes of Operations

2.1 Input Configuration

2.1.1 Input Selection

Two inputs—**PRIREF** (primary reference) and **SECREF** (secondary reference)—are selected by a combination of the register **refsel_sw** (R2[1:0]) and pin 4 **REFSEL**. Register R2[1:0] overrides pin 4.

2.1.2 Crystal Input

Load capacitor values listed in register **ip_xo_load** are series equivalent values of two single-ended internal capacitors in parallel with package parasitic capacitance (3 pF).

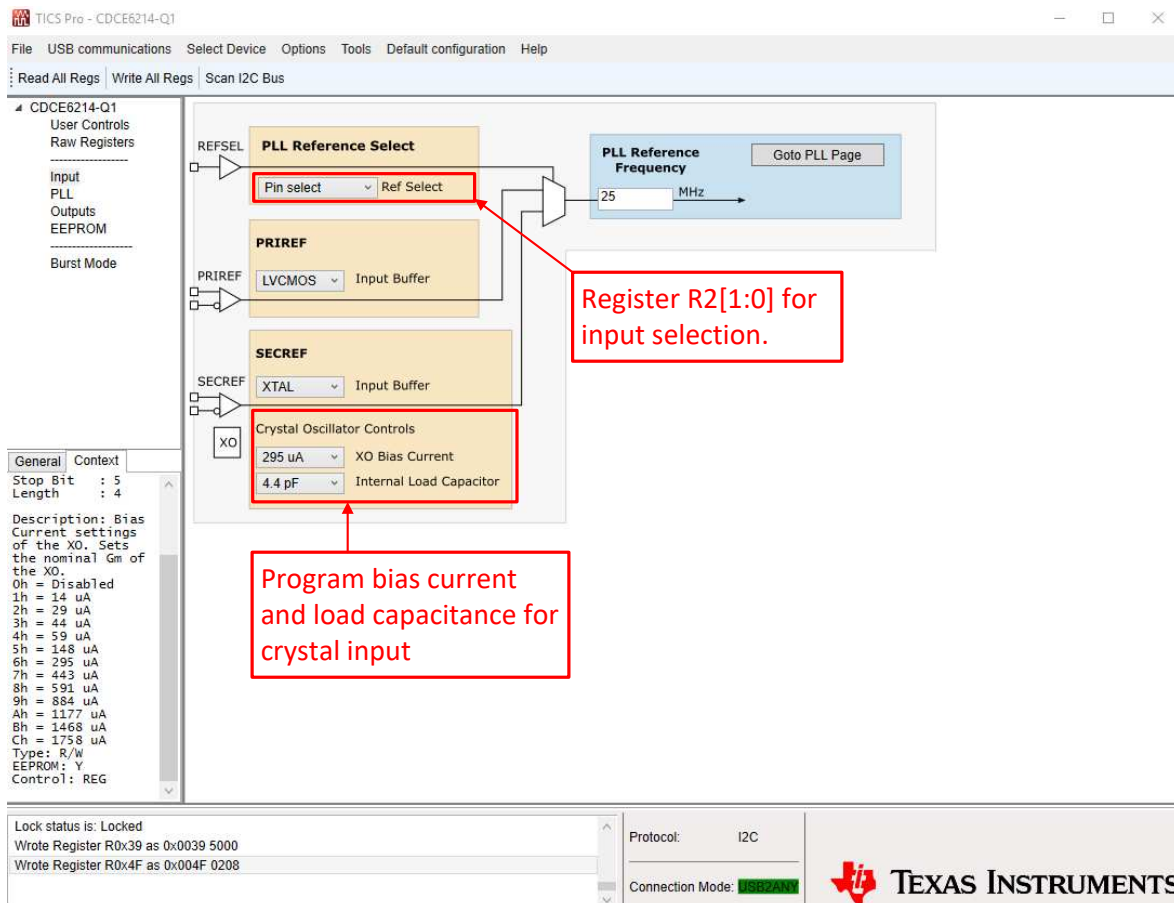


Figure 2-1. Input Configuration

2.2 PLL Configuration

On the TICS Pro **PLL** page, the user can change input doubler/divider, loop filter component values, charge pump gain, VCO frequency, fractional N divider, fraction order as well as prescaler A and B (PSA and PSB) separately.

2.3 SSC, DCO and ZDM Modes

This section details the Spread Spectrum Clock (SSC) and Digitally-Controlled Oscillator (DCO) modes for the CDCE6214-Q1 EVM. Refer to data sheet for details on the Zero Delay Mode (ZDM).

2.3.1 Spread Spectrum Clock (SSC) Mode

1. Click the **Default Configuration** tab in the toolbar
2. Load **4x100MHz HCSL, SSC enabled, PCIe gen 1-3 compliant** for optimized register settings
3. On the **PLL** page, check the **Enable SSC** checkbox and change the spread type and modulation depth in the **SSC** box accordingly.

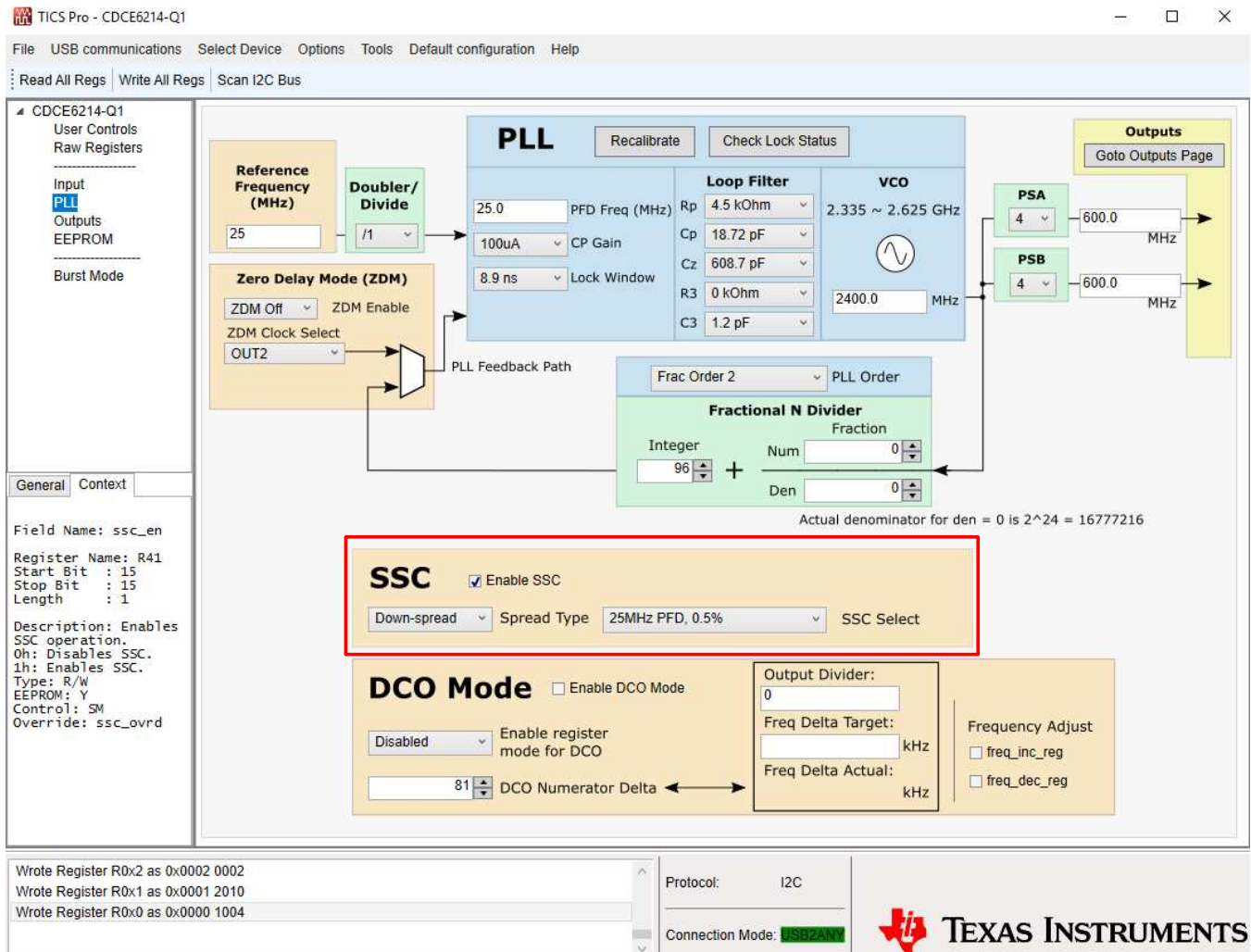


Figure 2-2. SSC Mode

2.3.2 Digitally-Controlled Oscillator (DCO) Mode for Frequency Increment and Decrement

1. On the **PLL** page, check the **Enable DCO mode** checkbox and set **Enable register mode for DCO** to **Enabled** in the **DCO Mode** box.
2. Enter the **Output Divider** value, which is equal to VCO frequency divided by output frequency.
3. Enter the **Freq Delta Target** value in kHz
4. After the step size is set, toggle bits **freq_inc_reg** and **freq_dec_reg** to increase or decrease frequency.
5. Observe the frequency change on a frequency counter, as oscilloscopes do not have enough frequency resolution.

Figure 2-3. DCO Mode

2.4 1.8-V and 3.3-V Power Supply

The 1.8-V LDO is enabled and disabled by jumper J26. The 3.3-V rail is disabled by default. To enable the 3.3-V rail, first populate the four 0-Ω resistors: R64, R66, R68, and R70. After the resistors are populated, the 3.3-V LDO is controlled by jumper J25.

WARNING
Do NOT enable 1.8-V and 3.3-V rails at the same time.

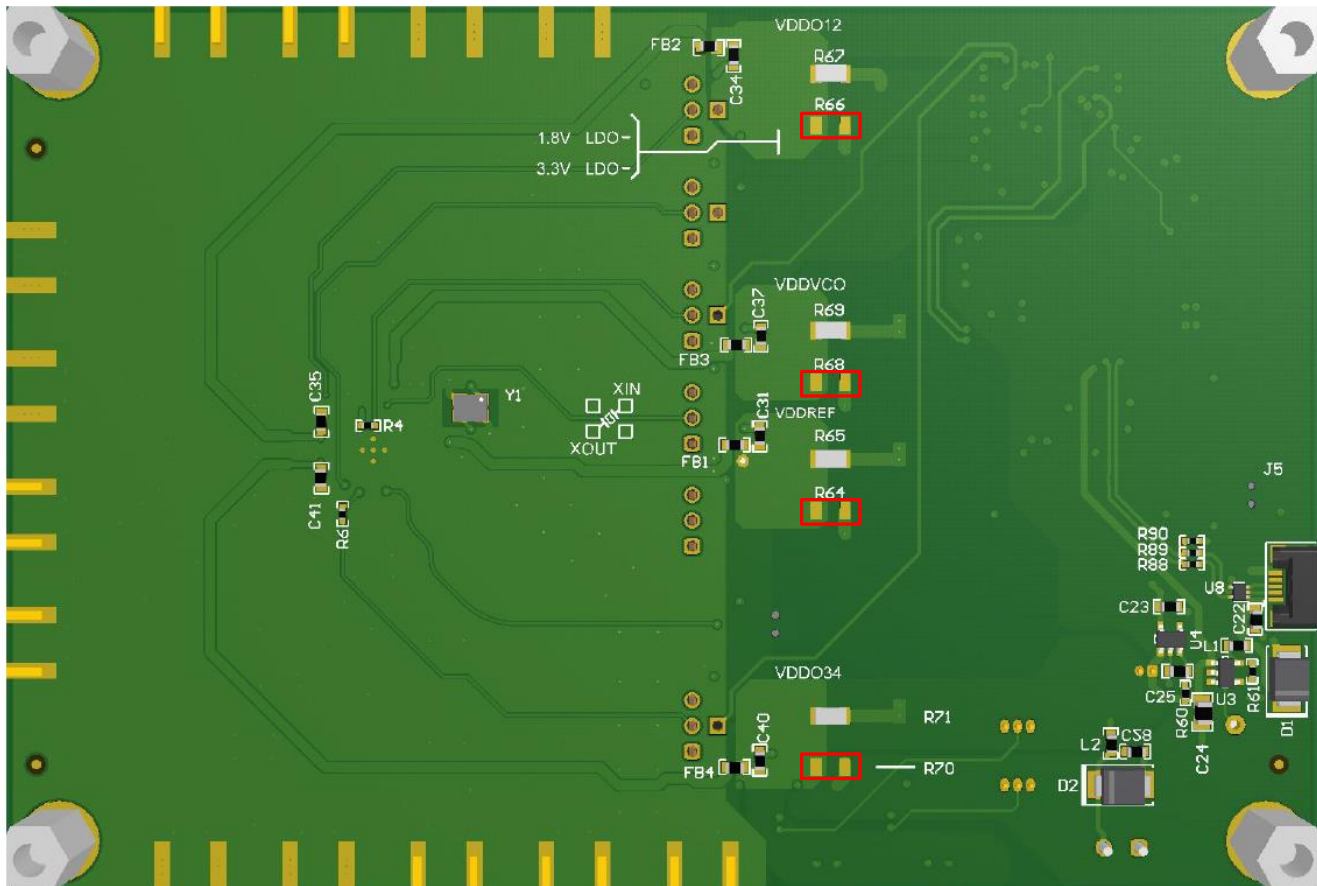


Figure 2-4. Board Rework Guide to Enable 3.3-V Supply

2.5 EEPROM

There are two ways to write to device EEPROM: direct access through a register content transfer.

2.5.1 Direct Access

1. Under **Direct EEPROM Access**, click the **Write File to EEPROM** button
2. Select the .hxt EEPROM file.

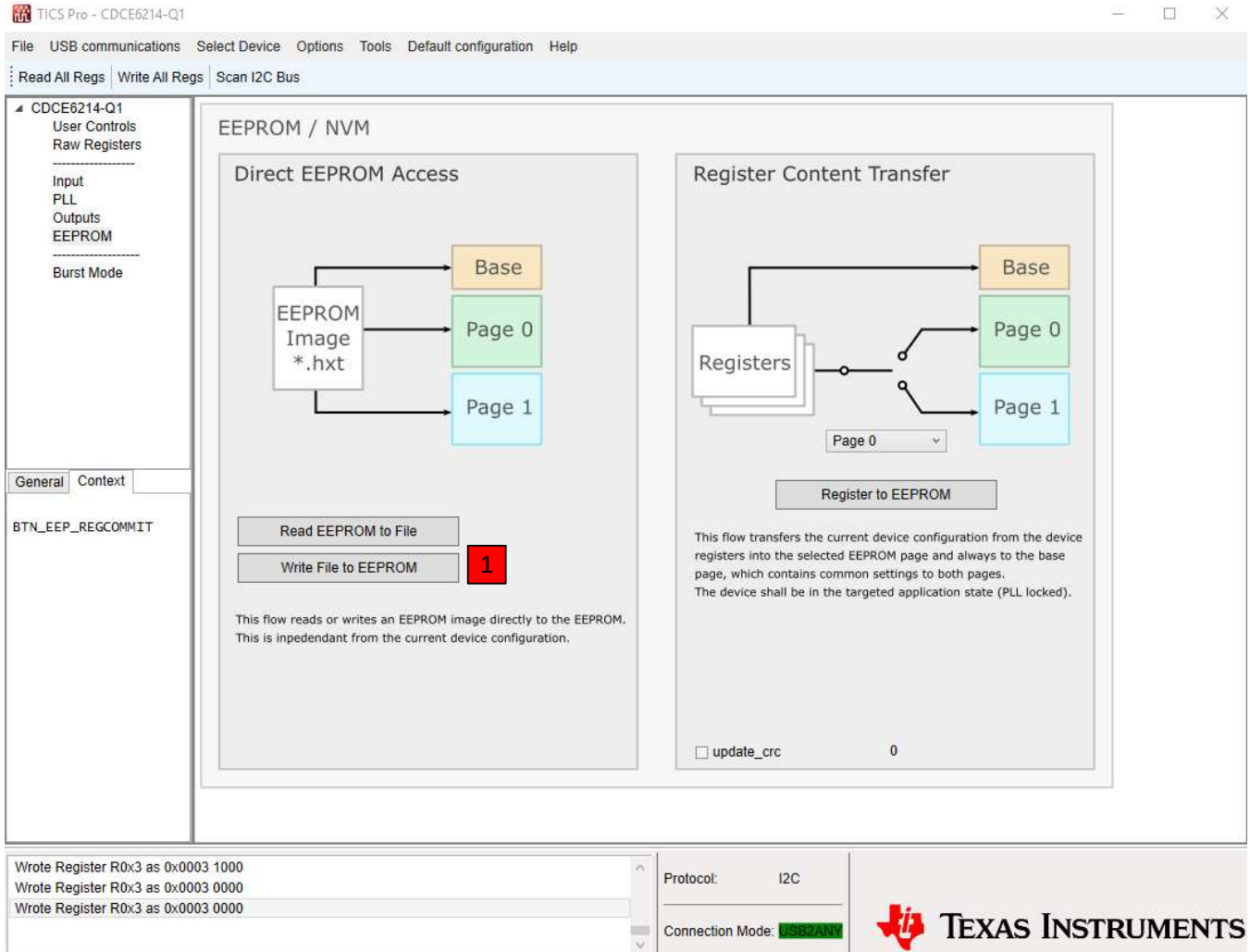


Figure 2-5. Direct Access to EEPROM

2.5.2 Register Content Transfer

1. Select the EEPROM page to write to from the **Register Content Transfer** drop-down menu
2. Click the **Register to EEPROM** button

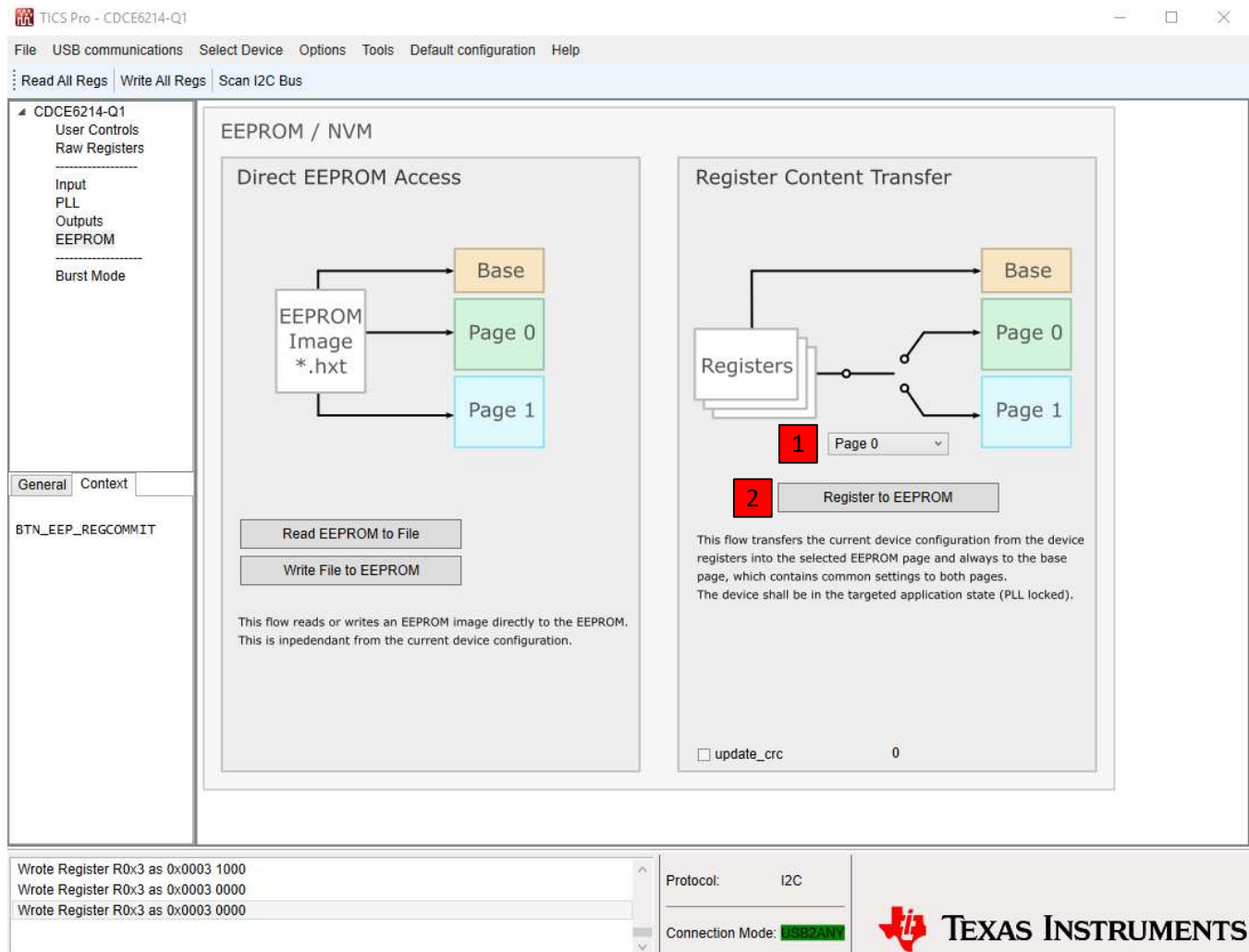


Figure 2-6. Register Content Transfer

2.5.3 Read EEPROM Content

To read EEPROM to .hxt file, click the **Read EEPROM to file** button under **Direct EEPROM Access**.

Frequently Asked Questions - FAQ

3.1 USB2ANY Cannot Be Detected by TICS Pro

3.1.1 Identify USB2ANY

1. In the TICS Pro, go to **USB communications** → **Interface** and make sure **USB2ANY** is selected in the **Interface** group.
2. Click **Identify** to see the blinking LED on the board.
If this does not work, try the next step.

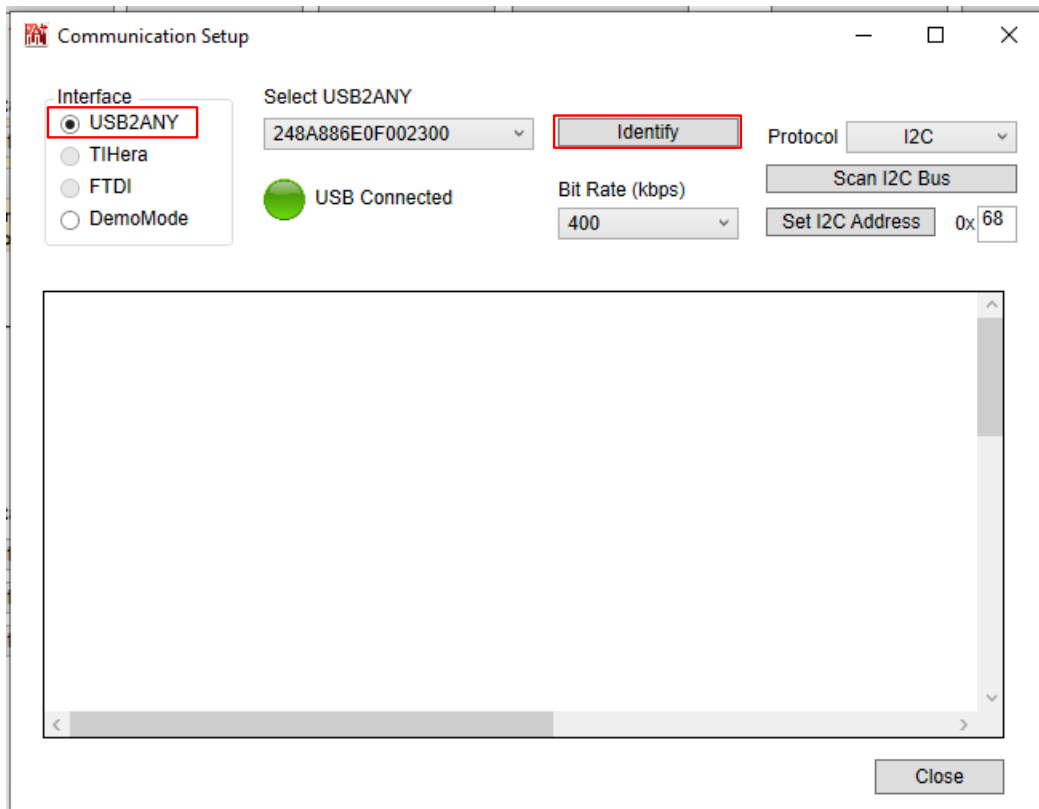


Figure 3-1. USB2ANY Connection

3.1.2 Upgrade USB2ANY Firmware

If you are having issues with the USB2ANY, you can reload the firmware using the USB2ANY firmware loader application. You can download it at <http://www.ti.com/tool/USB2ANY> (Explorer Software).

When the firmware is installed, navigate to the directory and select the USB2ANY firmware loader.

Remember that the S2 is the reset button in case you ever encounter a "hold down reset button while plugging the USB cable" message.

NOTE: The firmware loader only works on Windows 7 or lower versions of Windows system. The firmware does not work on the Windows 10 system at the time of this user manual publication.

3.2 Device Not Found

If USB2ANY is connected, but the message "device not found" appears after scanning I2C bus, go to **User Controls** page and make sure that the **I2C_EN** checkbox under the **Program Pins** is checked.

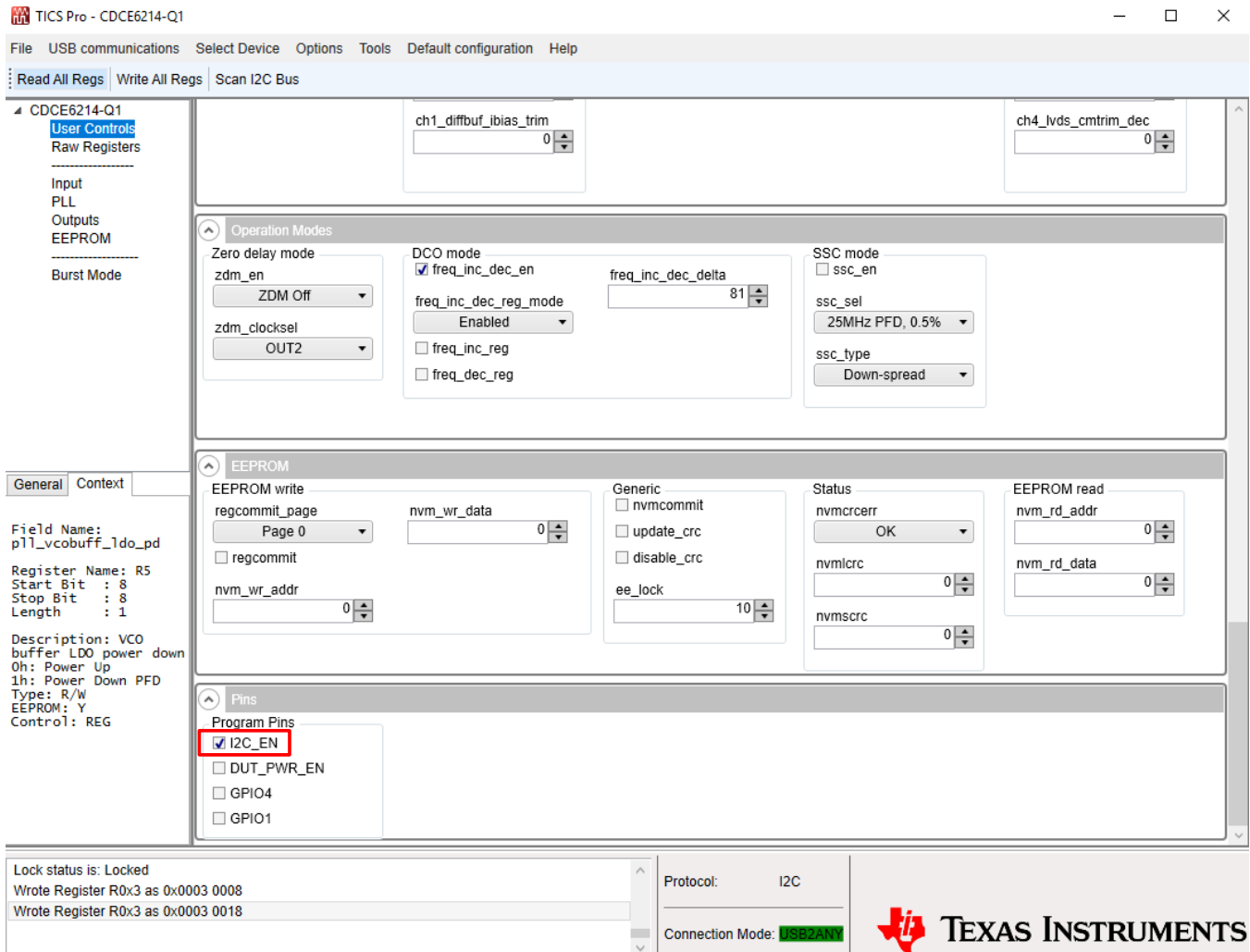


Figure 3-2. I2C_EN

3.3 How to Use External Microcontroller and External Power Supply

You can use an external USB2ANY (<http://www.ti.com/tool/USB2ANY>) and blue wire the EVM.

3.3.1 Use 3.3-V External Power Supply

First, follow the instructions on [Section 2.4](#) to rework the board and enable 3.3-V rail. Then follow these steps below:

1. Short J23. Short pins 2 and 3 of J25 and remove jumper for J26 to enable 3.3-V LDO and disable 1.8-V LDO.
2. Short pins 2 and 3 of J6 and pins 2 and 3 of J10. The purpose is to disconnect the SDA and SCL pins

of DUT from on-board microcontroller and pull the SDA/SCL to VDDREF (3.3 V) through a 4.7-kΩ resistor.

3. Short pins 1 and 2 of J12 to use SECREF and on-board crystal.
4. Remove all other jumpers (J7, J8, and J11).
5. Connect GND, 5 V to ground, and the 5-V supply separately.
6. Connect SDA (pin 2 of J6), SCL (pin 2 of J10), and GND to USB2ANY.

Refer to [Figure 3-3](#) for details on how to connect these three wires to USB2ANY.

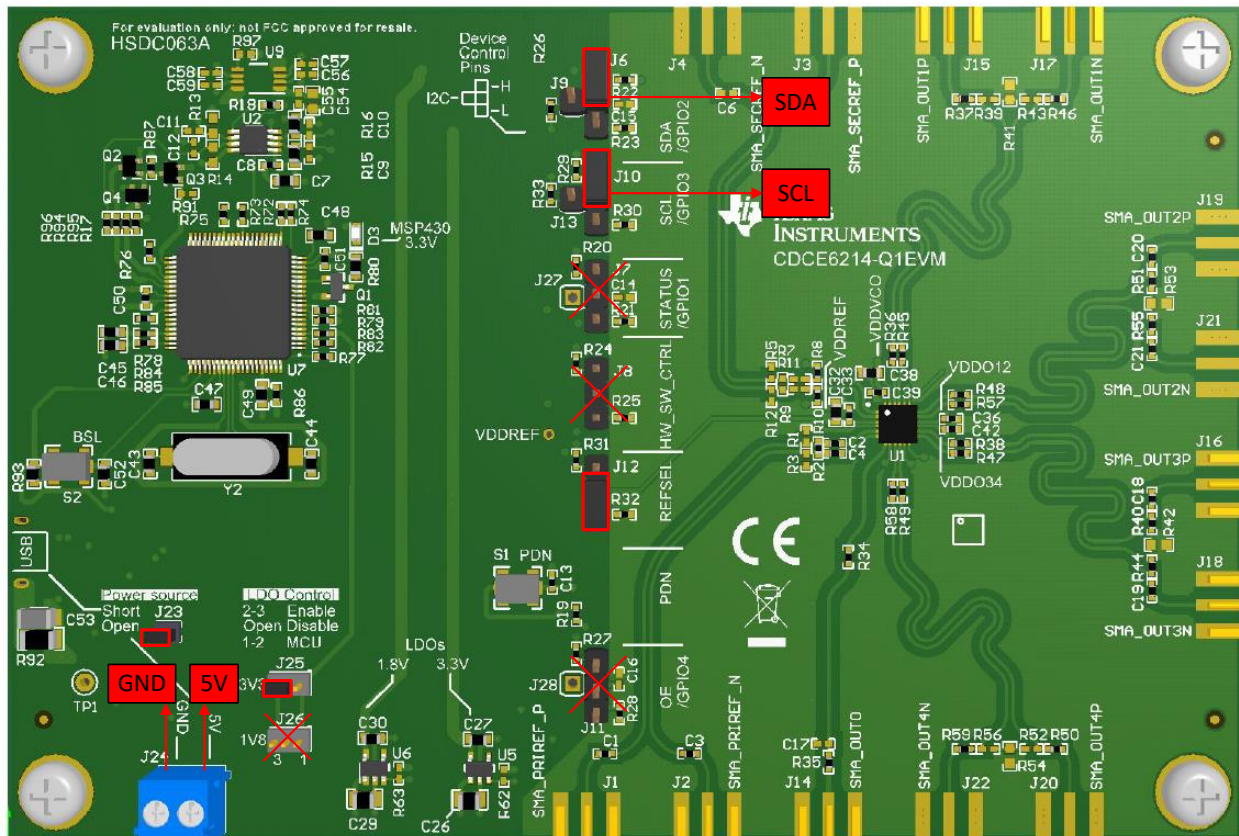


Figure 3-3. EVM Blue Wire Guide

3.3.2 Connect SDA, SCL, and GND to USB2ANY

Refer to [Figure 3-4](#) and connect the SDA, SCL and GND to pin 1, pin 2, and pin 5 of USB2ANY (J4 in [Figure 3-4](#)) separately. The rectangle on the top indicates the slot of USB2ANY box.

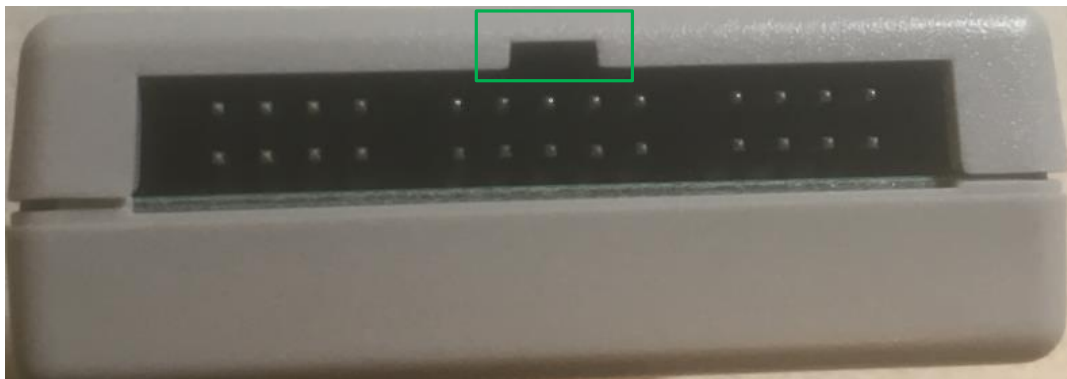
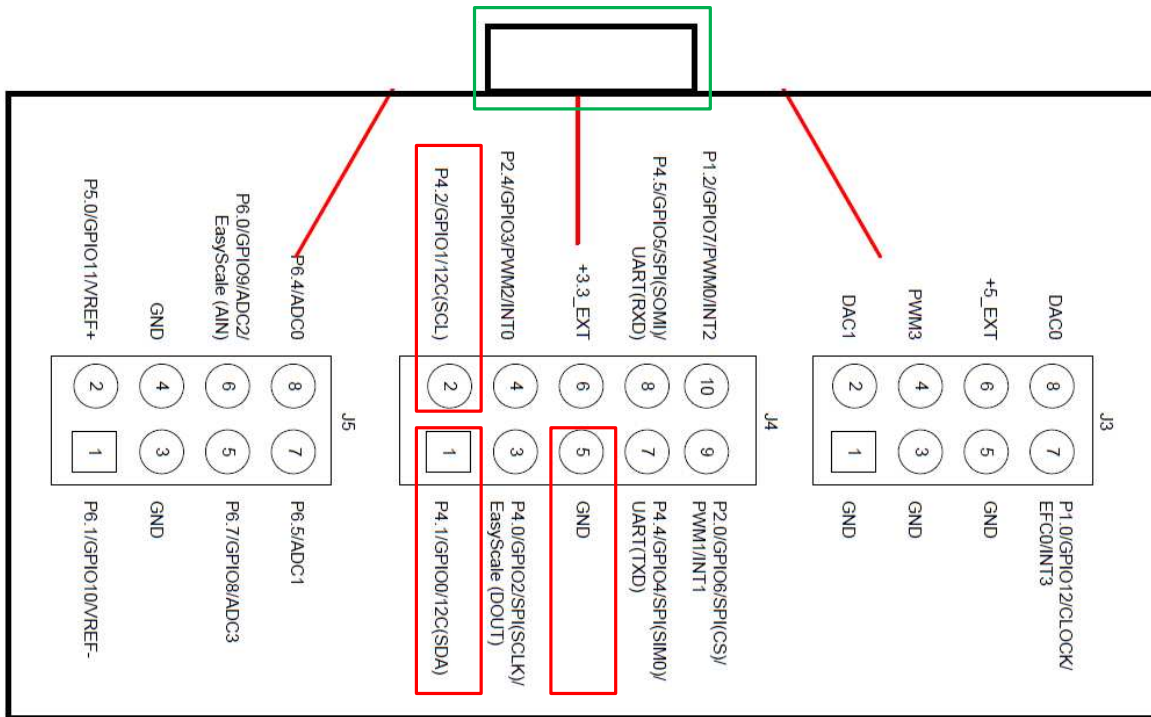


Figure 3-4. USB2ANY Pin Connection

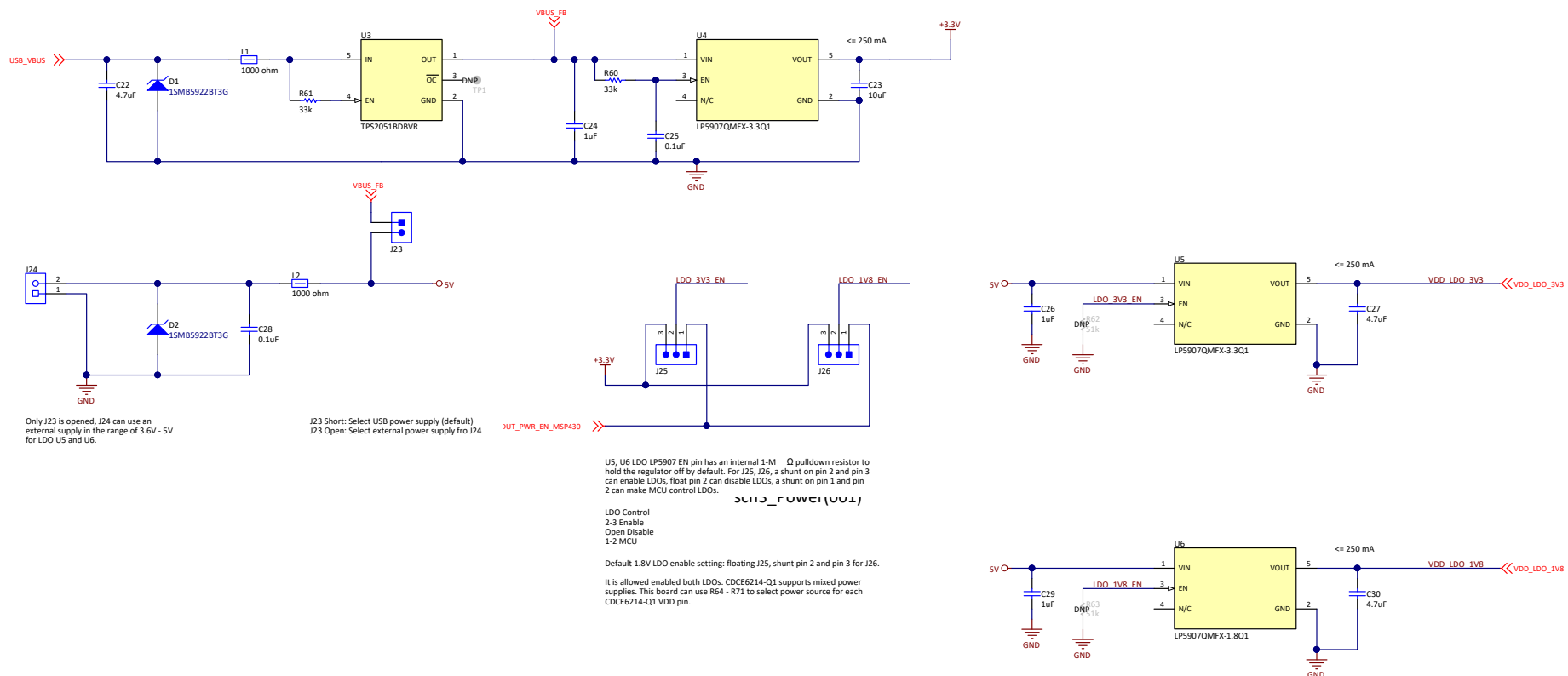
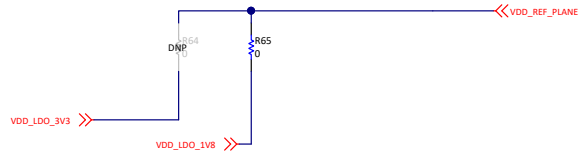
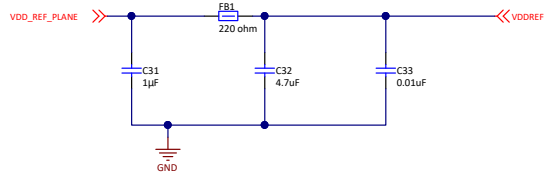


Figure 4-2. Power

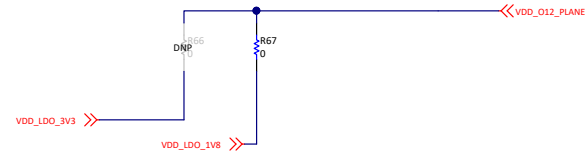
VDDREF



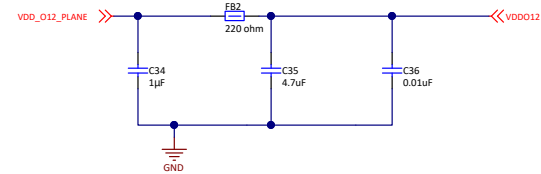
R64 or R65 can select a power source for a VDD pin.
Only one 0 Ohm resistor can be soldered between them.
Default 1.8V: R64 is DNP. R65 is 0 Ohm.



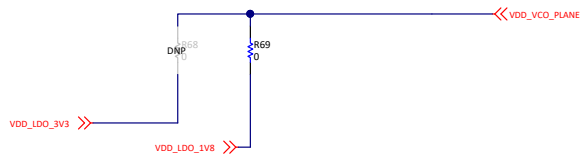
VDDO12



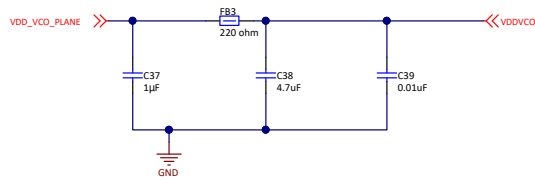
R66 or R67 can select a power source for a VDD pin.
Only one 0 Ohm resistor can be soldered between them.
Default 1.8V: R66 is DNP. R67 is 0 Ohm.



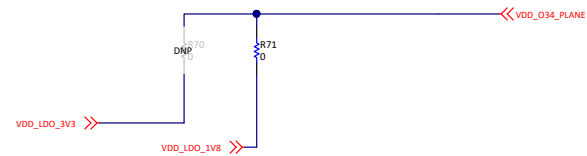
VDDVCO



R68 or R69 can select a power source for a VDD pin.
Only one 0 Ohm resistor can be soldered between them.
Default 1.8V: R68 is DNP. R69 is 0 Ohm.



VDDO34



R70 or R71 can select a power source for a VDD pin.
Only one 0 Ohm resistor can be soldered between them.
Default 1.8V: R70 is DNP. R71 is 0 Ohm.

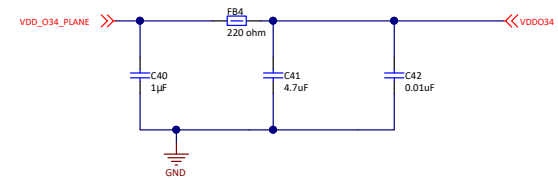


Figure 4-3. Power Filter Distribution

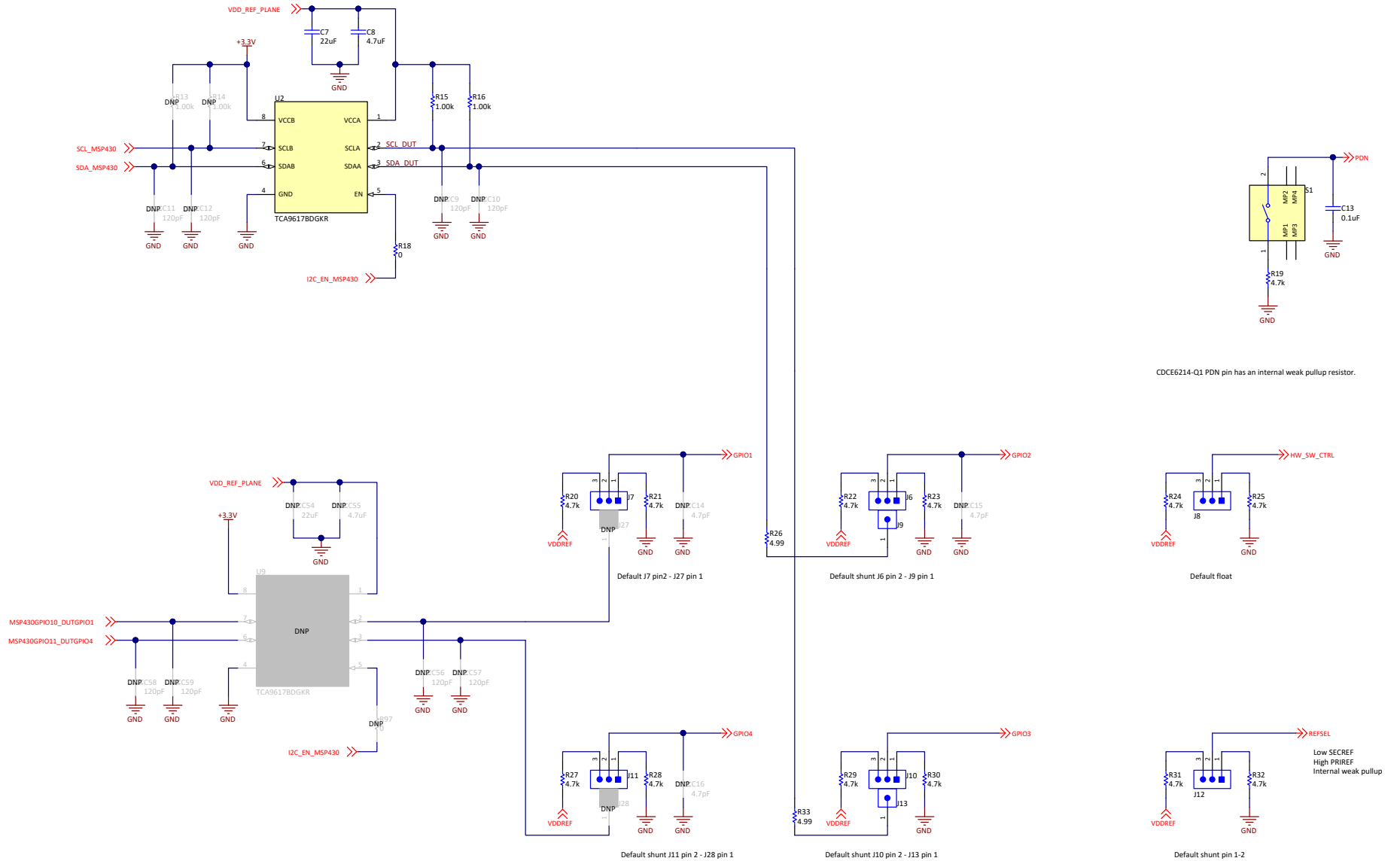


Figure 4-4. Level Shifter

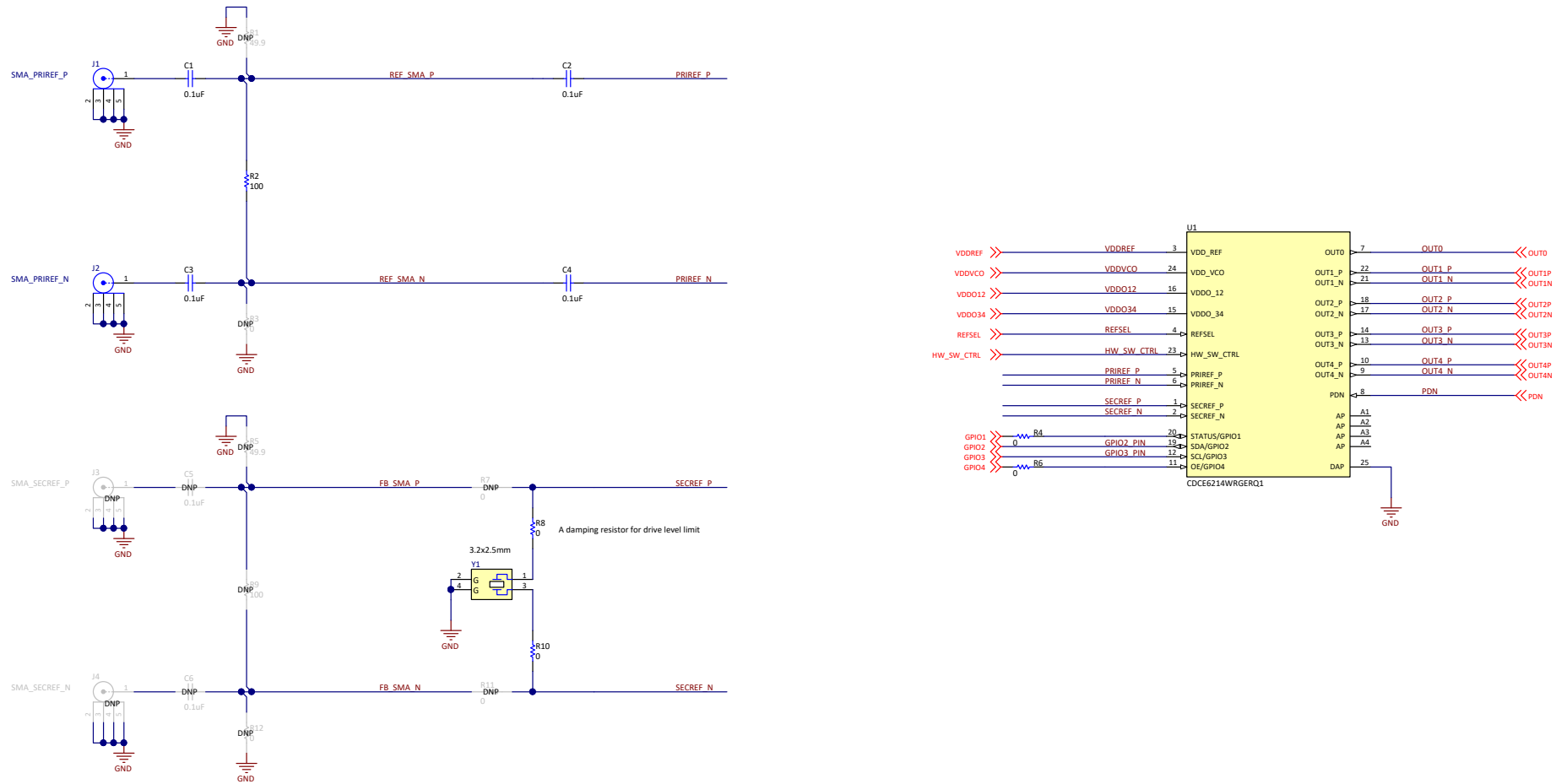
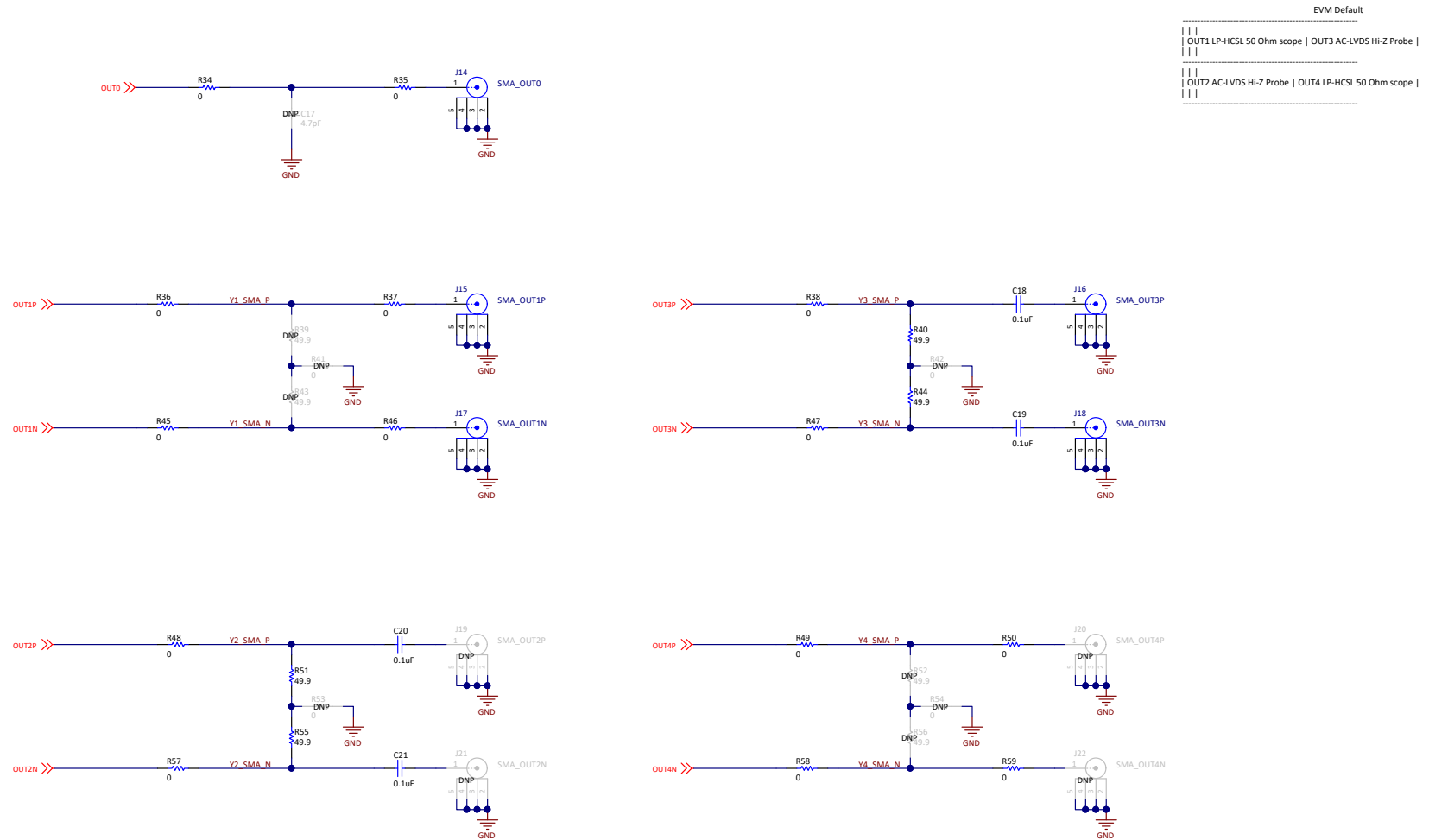
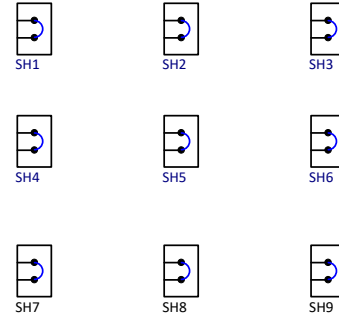
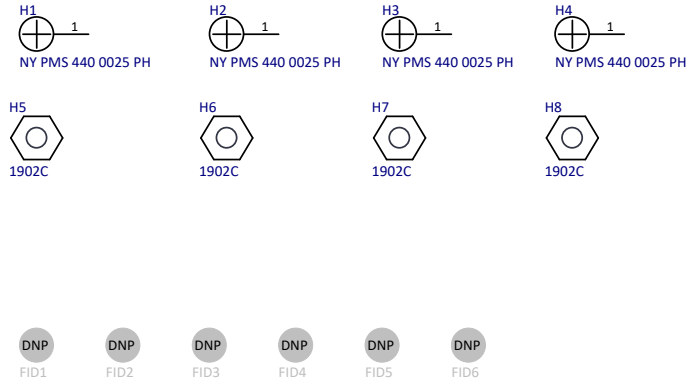


Figure 4-5. Input and Clock Generator



Text String Text String

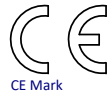
Figure 4-6. Outputs



Shunt Table		
Shunt	Pinheader	Contacts
SH1	J6	2-4
SH2	J7	2
SH3	J8	2
SH4	J11	2
SH5	J10	2-4
SH6	J12	1-2
SH7	J23	1-2
SH8	J25	1-2
SH9	J26	2-3

PCB Number: HSDC063
 PCB Rev: A

PCB LOGO
 Texas Instruments



PCB LOGO
 FCC disclaimer

PCB LOGO
 WEEE logo

ZZ1
Assembly Note
 These assemblies are ESD sensitive, ESD precautions shall be observed.

ZZ2
Assembly Note
 These assemblies must be clean and free from flux and all contaminants. Use of no clean flux is not acceptable.

ZZ3
Assembly Note
 These assemblies must comply with workmanship standards IPC-A-610 Class 2, unless otherwise specified.

Figure 4-7. EVM Hardware

4.2 Layout

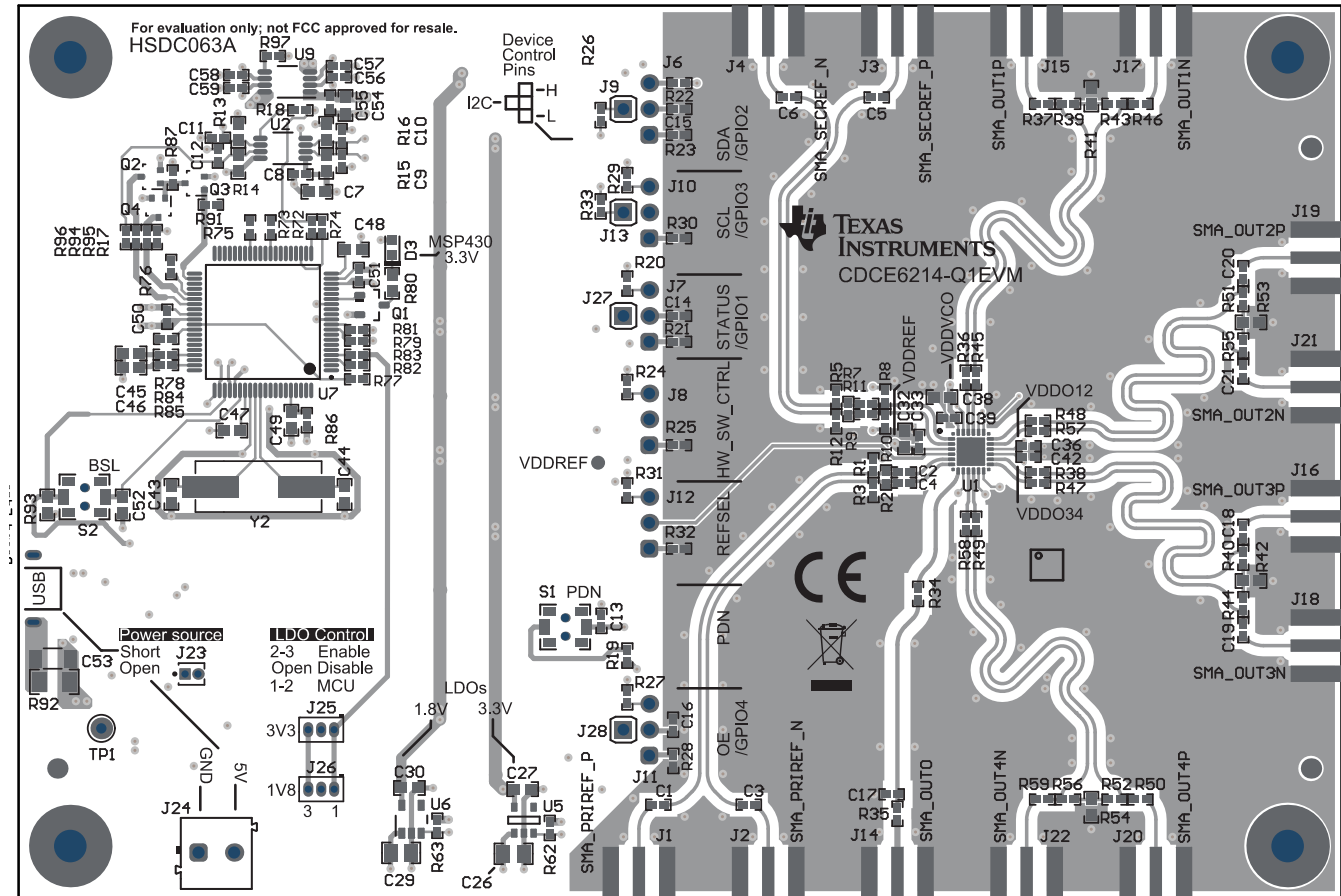


Figure 4-8. PCB Layer 1: Top Layer Composite

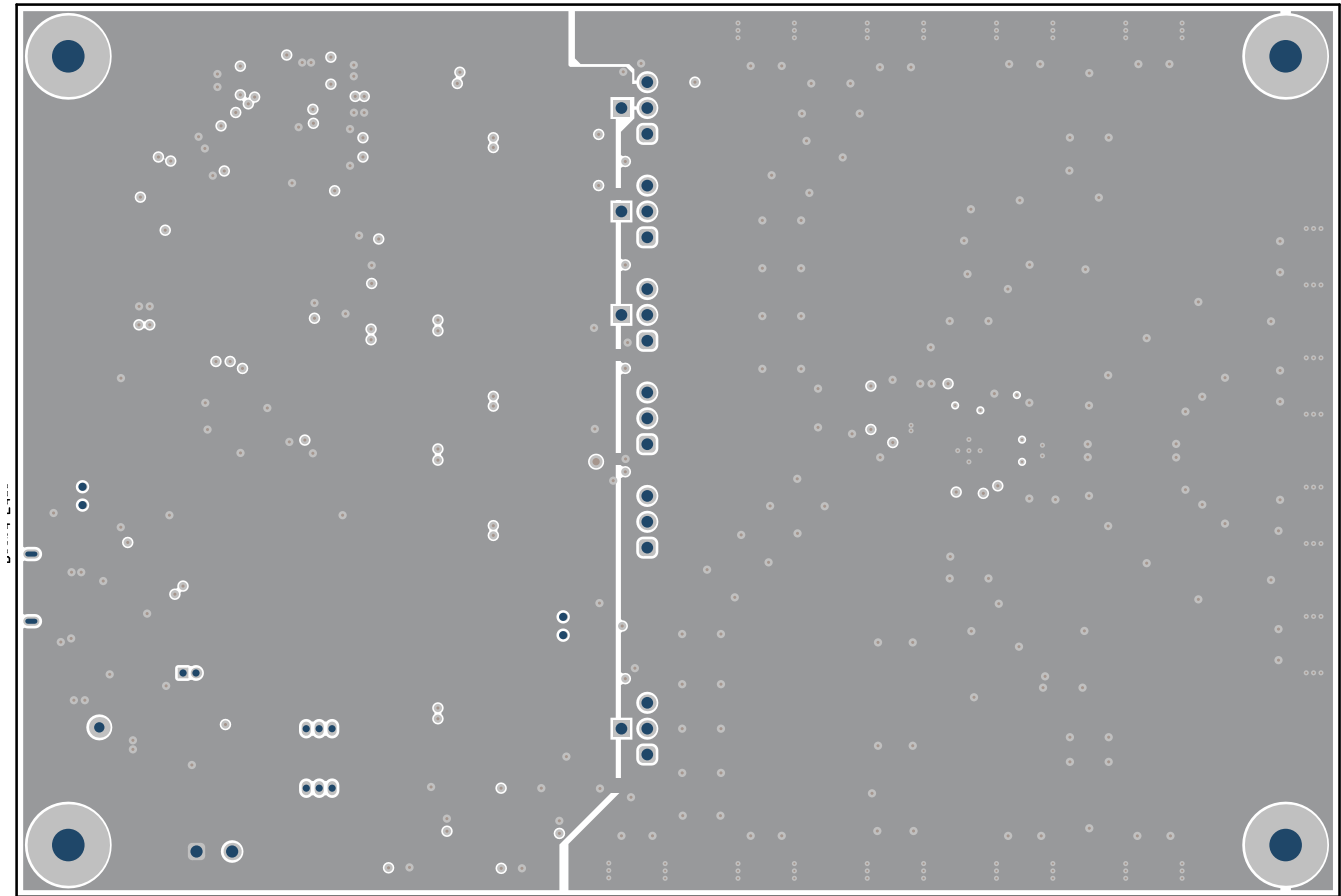


Figure 4-9. PCB Layer 2: Middle Layer

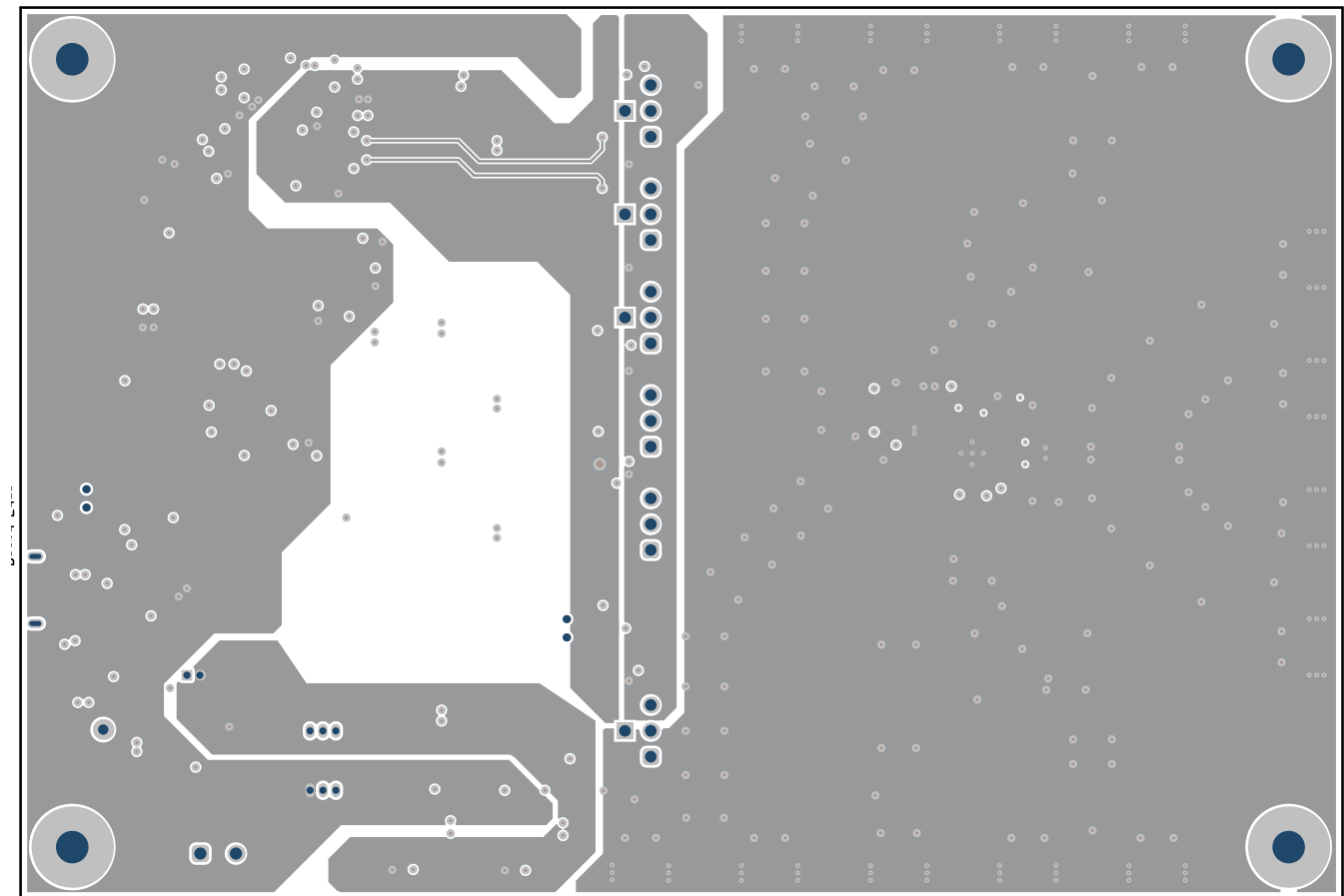


Figure 4-10. PCB Layer 3: Middle Layer

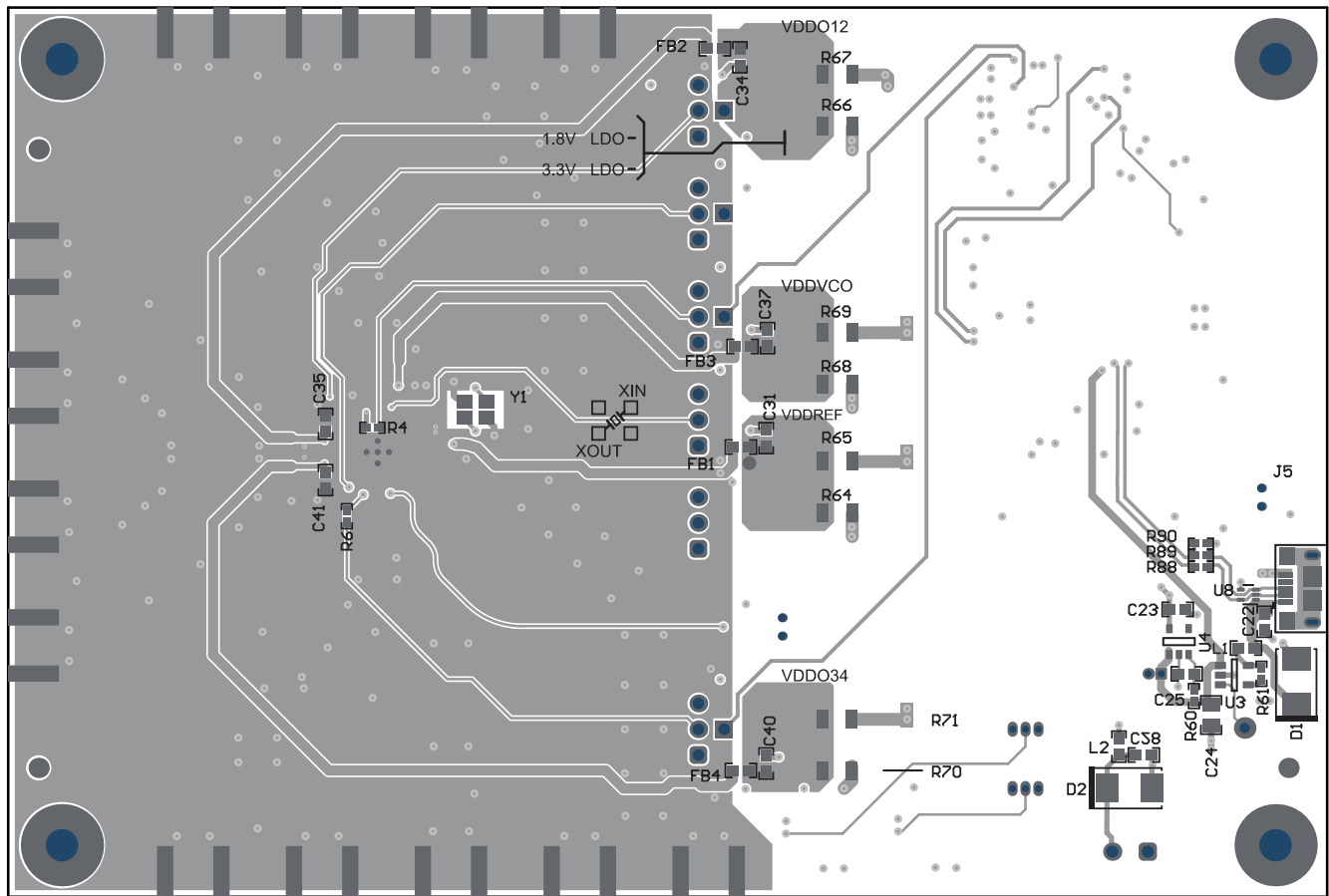


Figure 4-11. PCB Layer 4: Bottom Layer Composite

Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (July 2019) to A Revision	Page
• Added optional equipment	3
• Changed <i>Configure Jumpers</i> instructions	4
• Added <i>Connect the EVM to the PC</i> section	5
• Changed register 0x68 to 0x67 in <i>Scan I2C Bus</i> instructions	6
• Changed <i>Load Default and Check Lock Status</i> instructions	7
• Changed <i>Check Outputs</i> instructions	8
• Changed <i>Input Configuration</i> instructions	9
• Added sections to the <i>SSC, DCO and ZDM Modes</i> section	10
• Changed 3.3-V LDOs to 3.3-V rails in the <i>1.8-V and 3.3-V Power Supply</i> section	12
• Added <i>EEPROM</i> section	13
• Added <i>Device Not Found</i> section	16
• Changed <i>Use 3.3-V Power Supply and Configure Jumpers</i> section to <i>Use 3.3-V External Power Supply</i>	16

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
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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.
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 - 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。

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2. 実験局の免許を取得後ご使用いただく。
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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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8.2 *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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