

## ***DAC124S085EVM Booster Pack User's Guide***

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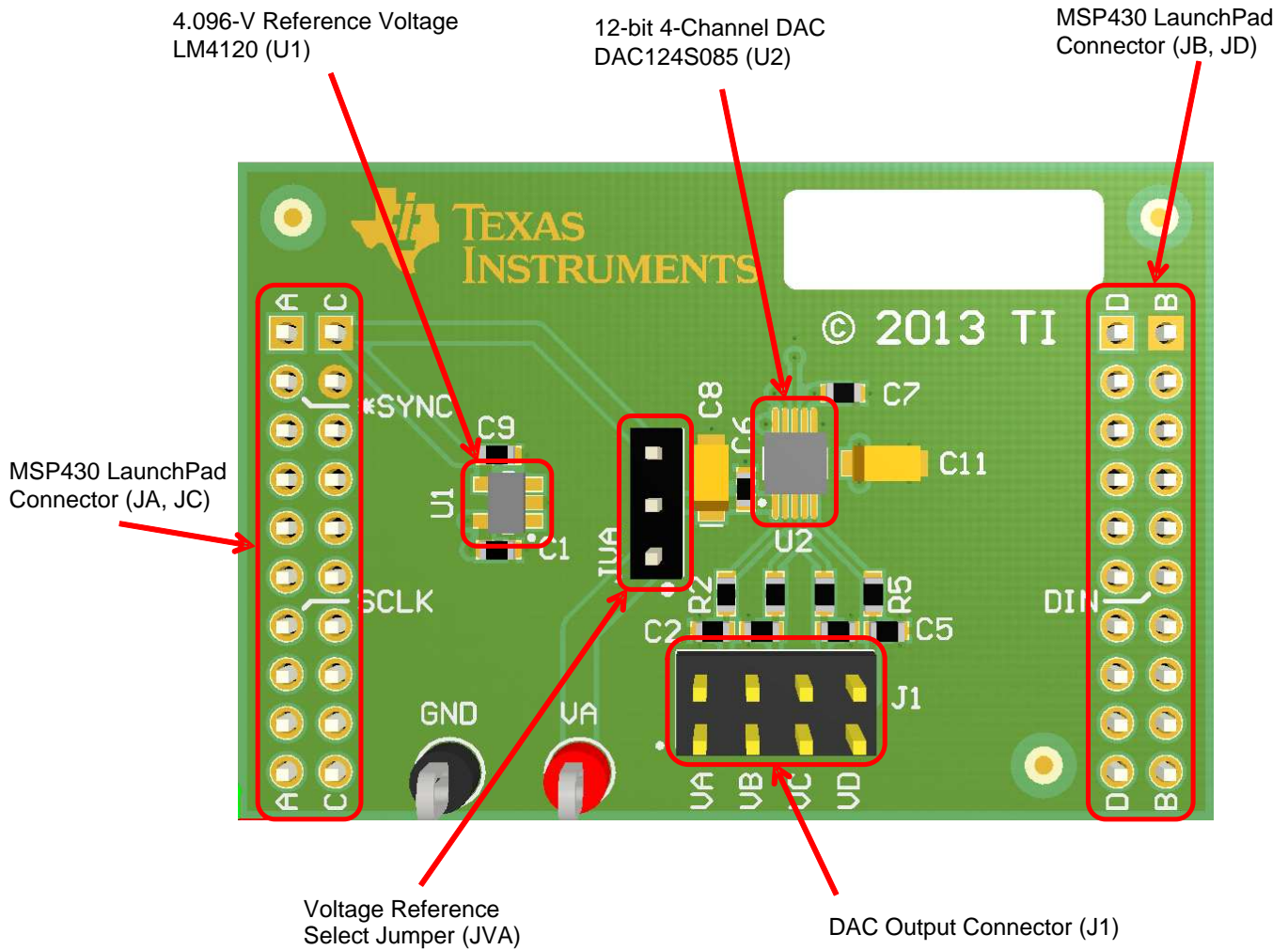
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This User's Guide is for the DAC124S085EVM Booster Pack. All users looking for an EVM for the DAC082S085, DAC102S085, DAC122S085, DAC084S085, DAC104S085, or DAC124S085 will have to purchase this EVM instead.

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# 1 DAC124S085 BoosterPack Components



**Figure 1. DAC124S085EVM Evaluation Board**

**Table 1. Device and Package Configurations**

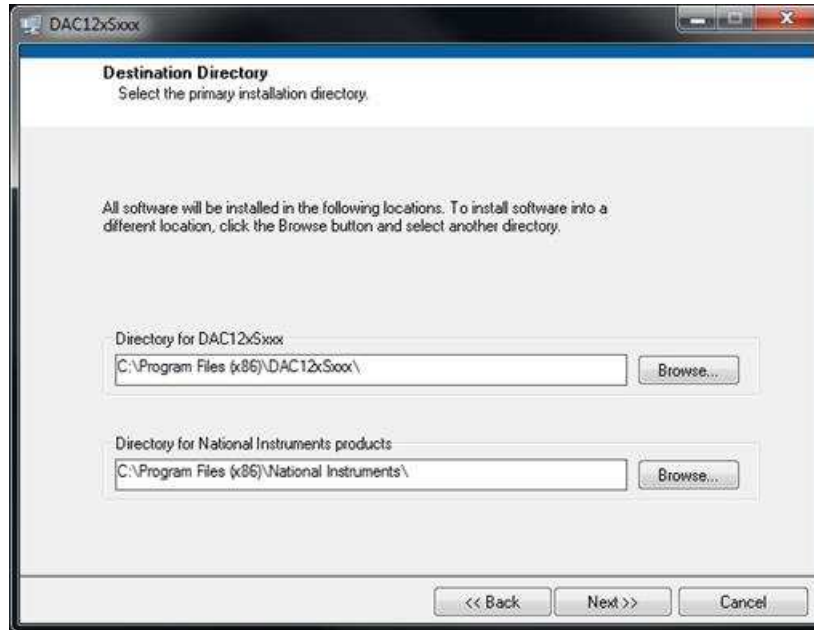
| DEVICE | IC             | PACKAGE  |
|--------|----------------|----------|
| U1     | LM4120IM5-4.1  | SOT-23   |
| U2     | DAC124S085CIMM | VSSOP-10 |

## 2 Software Installation

### 2.1 Graphical User Interface (GUI)

To use the DAC124S085EVM install the DAC12xSxxx software:

1. The DAC12xSxxx software is located on the [product page](#), scroll down to the software section, and download the latest evaluation software.
2. Unzip the downloaded file into a known directory, and run the setup.exe file located in [Unzip location]\DAC12xSxxx\EVM\_GUI\DAC12xSxxx\_Installer\_v1.zip\DAC12xSxxx\_Installer\Installer\Volume. Follow the pop-screen instructions by clicking the Next button to install the software.



**Figure 2. DAC12xSxxx Installation Directory**

3. When the installation is finished, click Finish button.

## 2.2 LaunchPad Firmware Upgrade

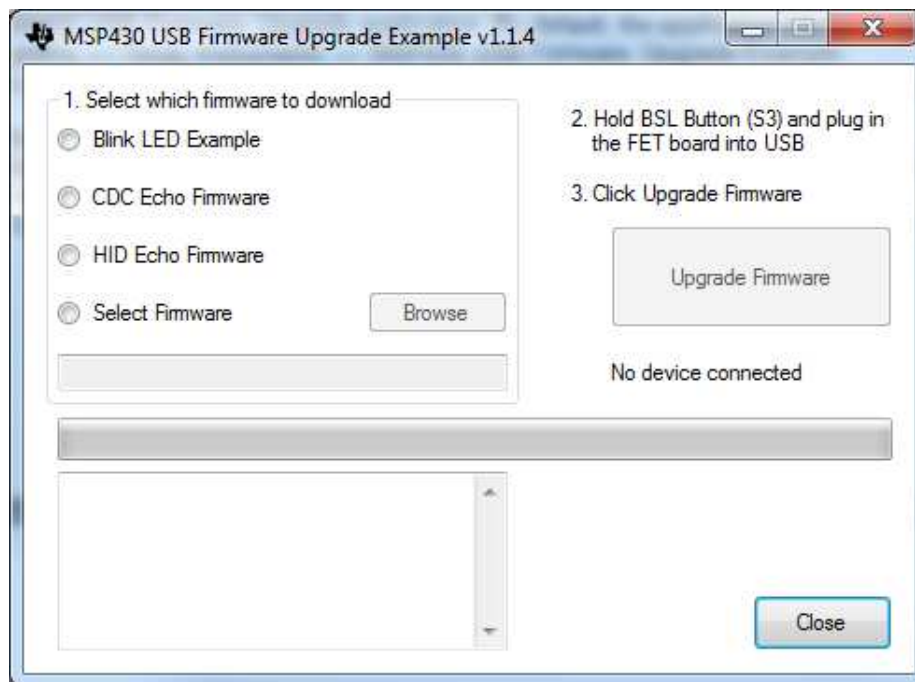
The MSP430F5529 LaunchPad board can be purchased at [www.ti.com/tool/msp-exp430f5529lp](http://www.ti.com/tool/msp-exp430f5529lp).

### 2.2.1 MSP430 Firmware Upgrade Application Installation

1. Navigate to [www.ti.com/tool/msp430usbdevpack](http://www.ti.com/tool/msp430usbdevpack), and click Get Software.
2. Scroll down to the end of the page to find the USB Collateral Installers section.
3. Click on MSP430\_USB\_Firmware\_Upgrade\_Example-x-x-x-Setup.exe to download the tool; the page redirects to a submission form.
4. Complete the information requested and submit the form; if approved, a download button appears.
5. Run the installation file and follow the on-screen instructions until completion. When asked about the setup type, select Application Only. Click Finish when done.

### 2.2.2 Firmware Upgrade

1. Open the MSP430 USB Firmware Upgrade application. By default, the application can be launched from Start >> Programs >> Texas Instruments >> MSP430 USB Firmware Upgrade Example.
2. Click Next to proceed on the first prompt; read and accept the license agreement, and click Next to continue.



**Figure 3. USB Firmware Upgrade Window**

3. Enable the Select Firmware button and browse to the downloaded firmware `dac12xsxxx_fw-v0.87.txt`.
4. Press the BSL button on the MSP430 LaunchPad and connect to the PC with a USB cable; if detected, the text on the Firmware Upgrade tool will change from No device connected to Found 1 device.
5. Click the Upgrade Firmware button to program the LaunchPad. Close the application when done.

### 2.3 Update USB Driver

1. Before launching the DAC12xSxxx software, connect the DAC124S085EVM board to a USB port of your PC. Go to Device Manager and find “MSP43-USB Example”. Right-click and select Update Driver Software.

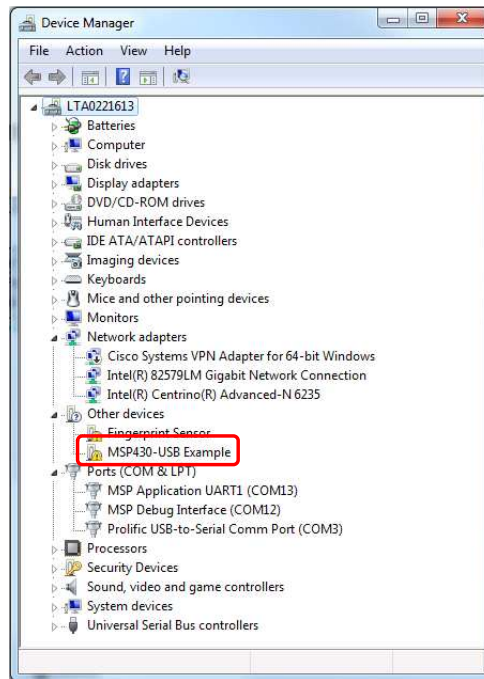
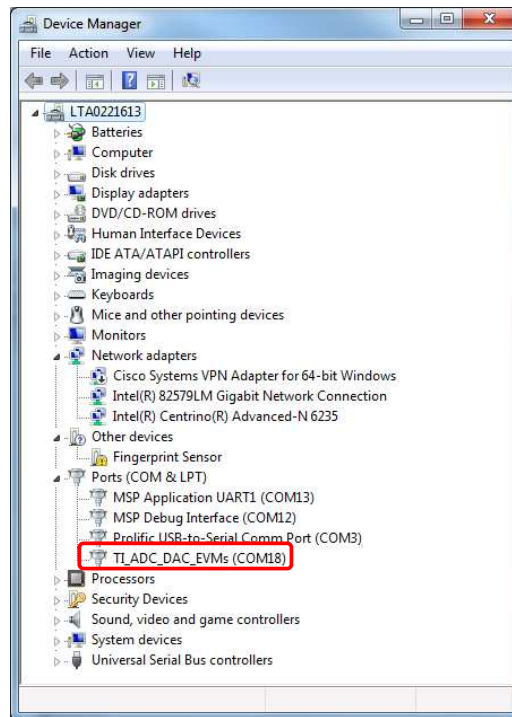


Figure 4. Driver Not Installed

2. On the next screen, select the Browse my computer for driver software option and go to the directory of your install files and select the TI\_ADC\_DAC\_EVMs\_Driver.inf file.
3. If prompted with a warning window, select Install this Driver Anyway. Close the installation window when it is done. The device manager should now display a TI\_ADC\_DAC\_EVMs item followed by a COM port number.



Figure 5. Driver Authentication Warning

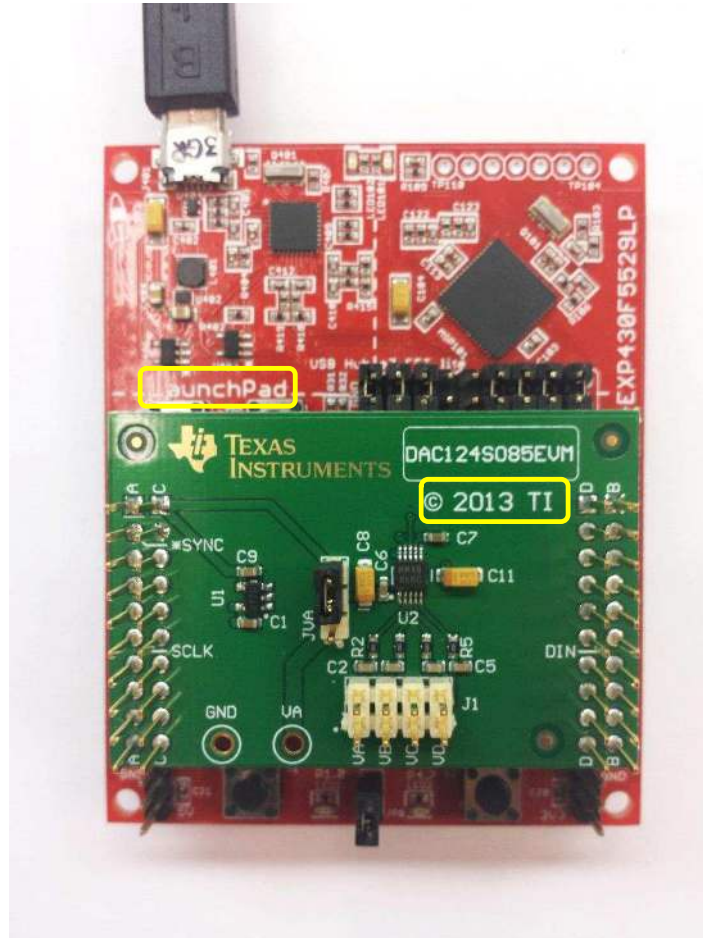


**Figure 6. Driver Installed**

### 3 DAC124S085 BoosterPack Setup and Operation

#### 3.1 Connections

1. Attach the DAC124S085EVM BoosterPack onto the MSP430 LaunchPad using connectors, JA, JB, JC, and JD. The proper orientation of the LaunchPad and DAC124S085EVM is when the text “LaunchPad” and “2013 TI” are in the same direction.



**Figure 7. DAC124S085EVM Attached to MSP430**

2. Connect the USB cable from the LaunchPad to the PC.



### 3.2 Launching the Software

1. The DAC12xSxxx GUI software can be run by clicking on Start >> All Program >> DAC12xSxxx. After running the GUI, select DAC124S085.



Figure 8. Part Select

2. GUI descriptions:

- DB[15:12]: These 4 bits control different channels and output modes. See the DAC124S085 [data sheet](#) for more details.
- DB[11:0]: These 12 bits are for setting the DAC output codes.
- DB[11:0] output type: This field changes DB[11:0] to either binary, decimal, or hexadecimal type.

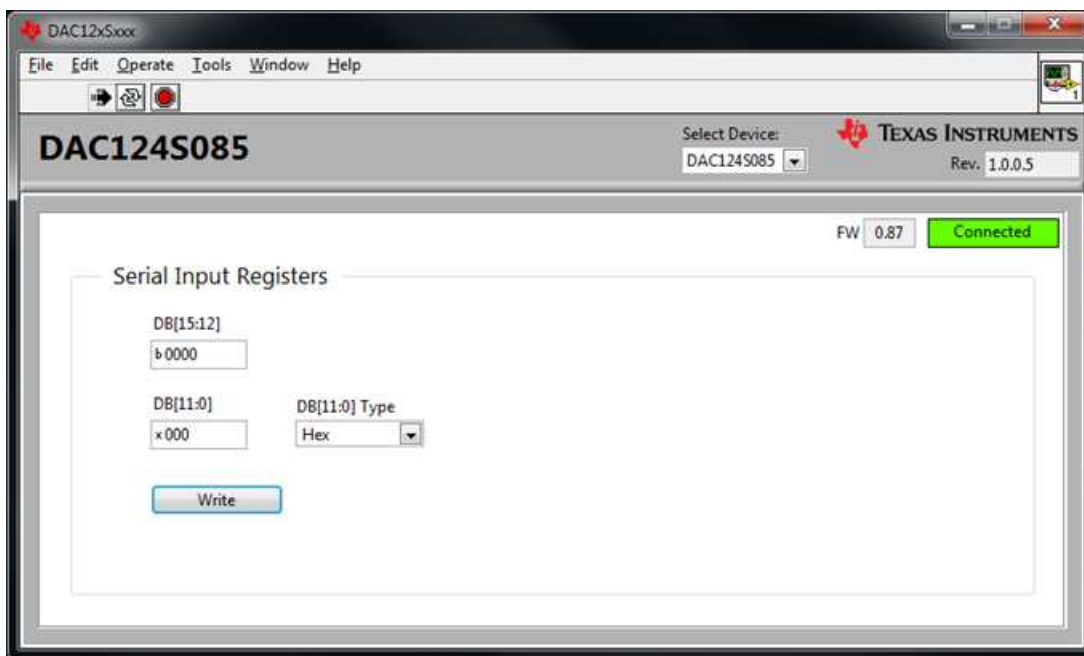


Figure 9. Selectable Fields in GUI



3. Quick start:
  - (a) Input 0000 to DB[15:12] to go into normal operation mode.
  - (b) Input 800 to DB[11:0] to output 2.048V ( $V_{ref}/2$ ).
  - (c) Click Write to send the command to the DAC124S085 part.

4 Board Layout

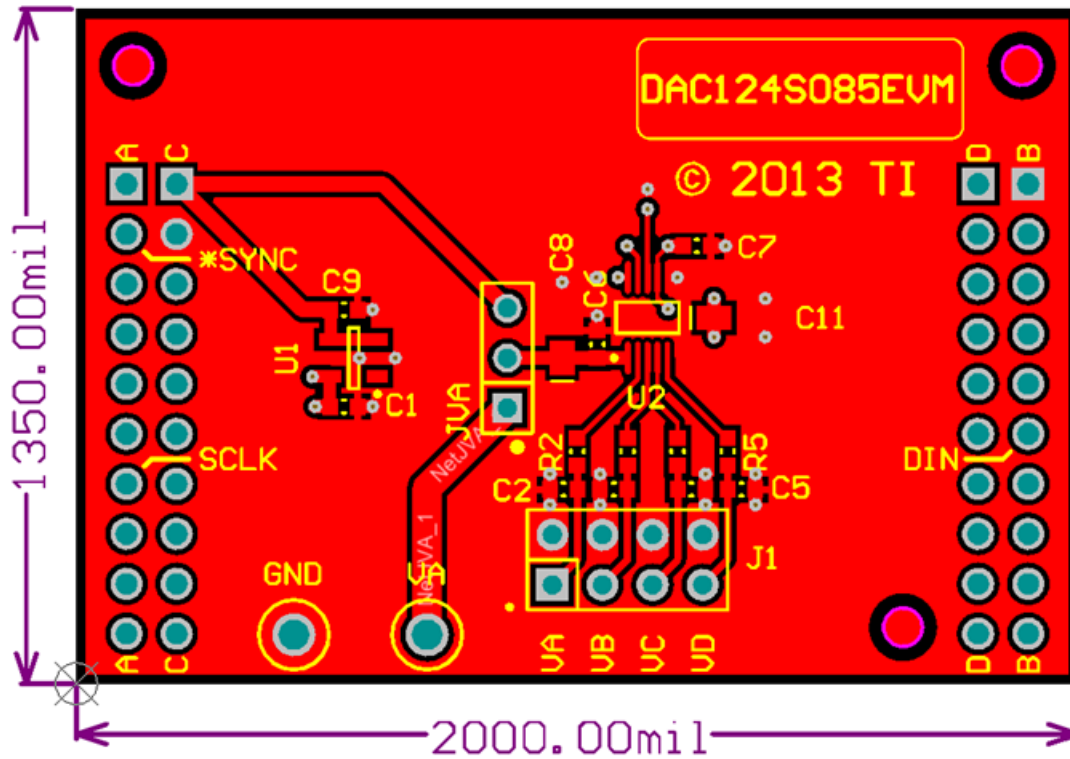


Figure 10. Top Assembly Layer

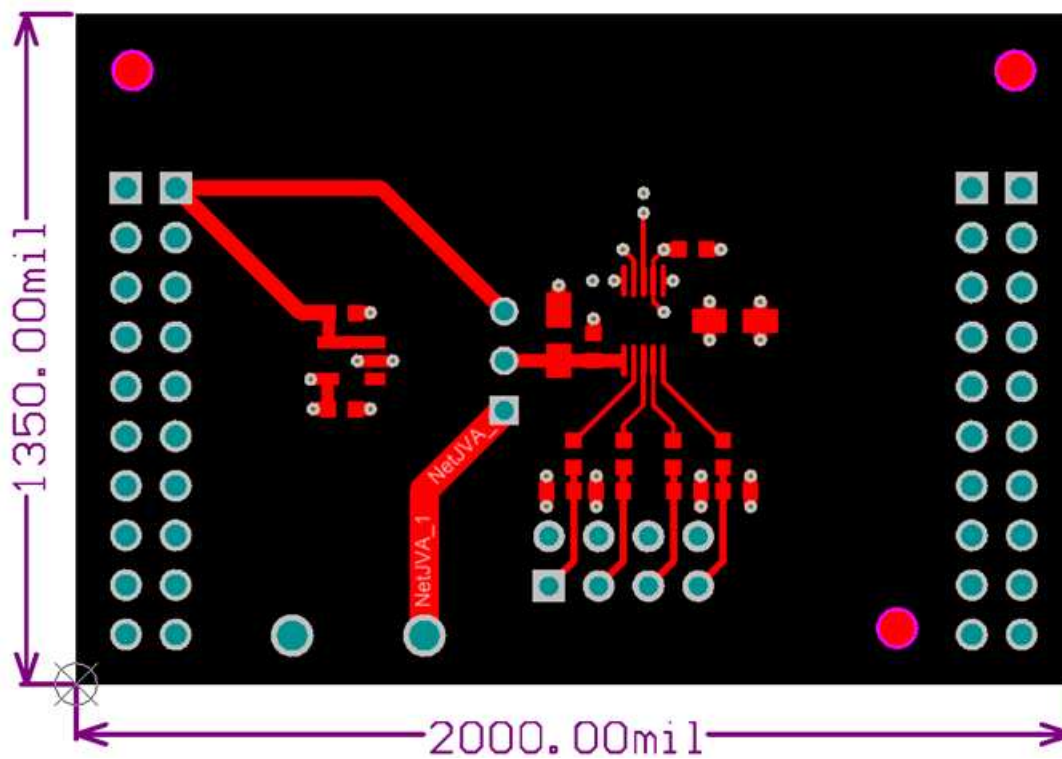


Figure 11. Top Layer Routing

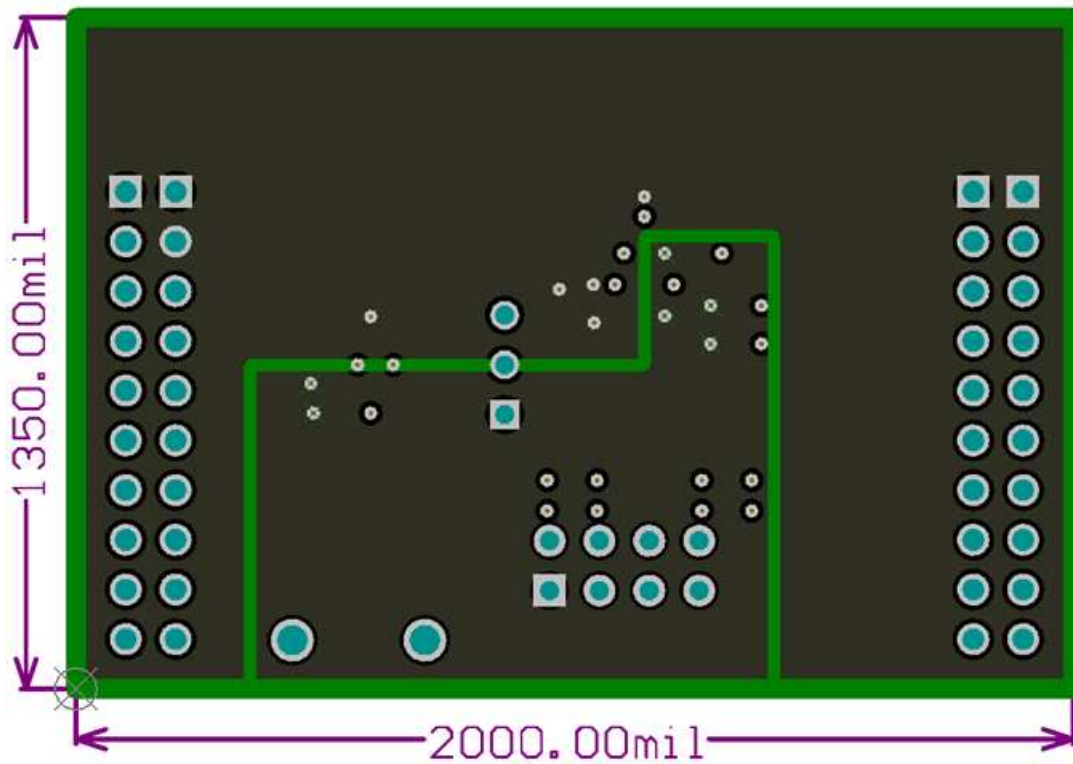


Figure 12. Power Layer Routing

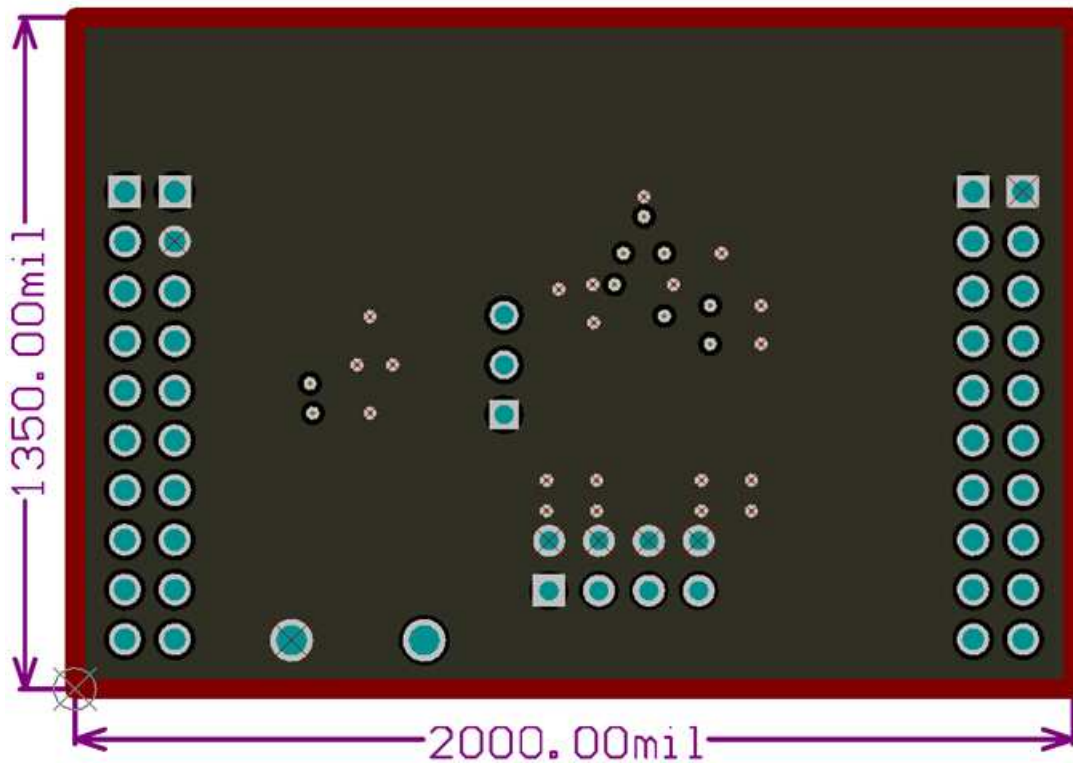


Figure 13. Ground Layer Routing

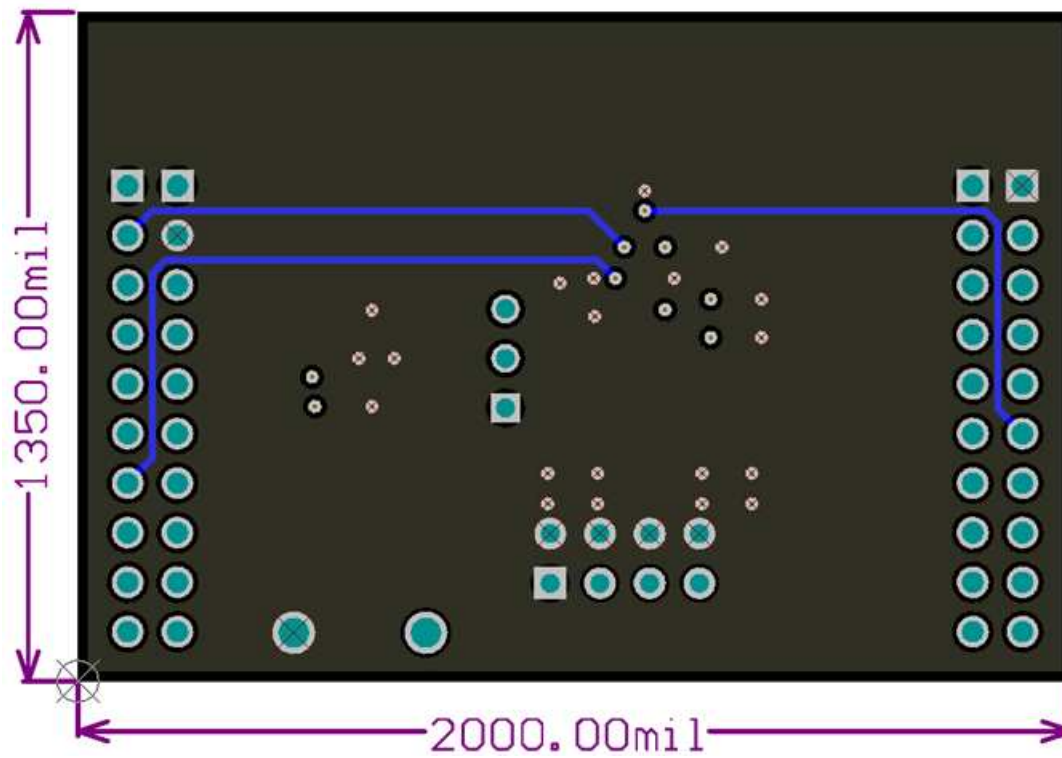


Figure 14. Bottom Layer Routing

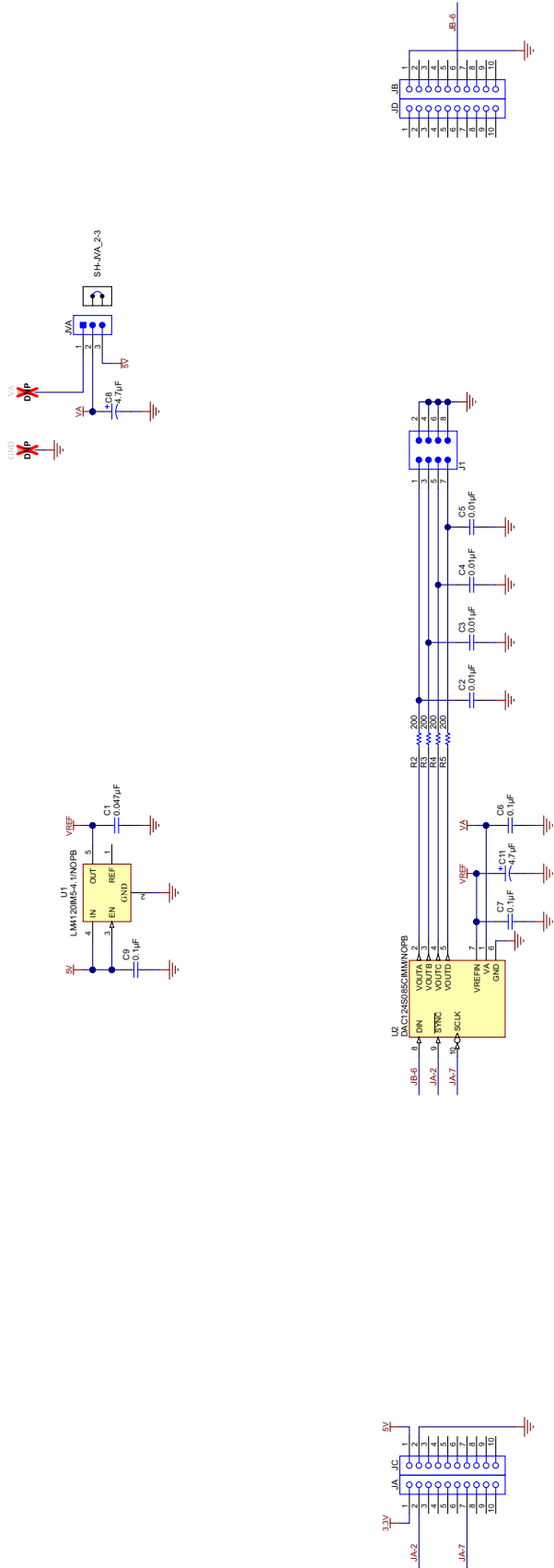


Figure 15. DAC124S085EVM Schematic

## 5 Bill of Materials

**Table 2. DAC124S085 Bill of Materials**

| Designator       | Quantity | Value   | Description   | Part Number         | Manufacturer                |
|------------------|----------|---------|---|---------------------|-----------------------------|
| !PCB             | 1        |         | Printed Circuit Board   | SV601043            | Any                         |
| C1               | 1        | 0.047uF | CAP, CERM, 0.047uF, 6.3V, +/-10%, X7R, 0603   | GRM188R70J473KA01D  | MuRata                      |
| C2, C3, C4, C5   | 4        | 0.01uF  | CAP, CERM, 0.01uF, 25V, +/-10%, X7R, 0603   | GRM188R71E103KA01D  | MuRata                      |
| C6, C7, C9       | 3        | 0.1uF   | CAP, CERM, 0.1uF, 10V, +/-10%, X7R, 0603  | C0603C104K8RACTU    | Kemet                       |
| C8, C11          | 2        | 4.7uF   | CAP, TA, 4.7uF, 10V, +/-10%, 1.4 ohm, SMD   | TPSA475K010R1400    | AVX                         |
| J1               | 1        |         | Header, TH, 100mil, 4x2, Gold plated, 230 mil above insulator   | TSW-104-07-G-D      | Samtec                      |
| JA, JB, JC, JD   | 4        |         | Connector, Receptacle, 100mil, 10x1, Gold plated, TH  | SSW-110-23-F-S      | Samtec                      |
| JVA              | 1        |         | Header, 100mil, 3x1, Tin plated, TH   | PEC03SAAN           | Sullins Connector Solutions |
| LBL1             | 1        |         | Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll                                | THT-14-423-10       | Brady                       |
| R2, R3, R4, R5   | 4        | 200     | RES, 200 ohm, 1%, 0.1W, 0603  | CRCW0603200RFKEA    | Vishay-Dale                 |
| SH-JVA_2-3       | 1        | 1x2     | Shunt, 100mil, Gold plated, Black   | 382811-6            | AMP                         |
| U1               | 1        |         | Precision Micropower Low Dropout Voltage Reference, 5-pin SOT-23, Pb-Free                               | LM4120IM5-4.1/NOPB  | Texas Instruments           |
| U2               | 1        |         | 12-Bit Micro Power QUAD Digital-to-Analog Converter with Rail-to-Rail Output, 10-pin Mini SOIC, Pb-Free | DAC124S085C1MM/NOPB | Texas Instruments           |
| FID1, FID2, FID3 | 0        |         | Fiducial mark. There is nothing to buy or mount.  | N/A                 | N/A                         |
| GND              | 0        | Black   | Test Point, TH, Multipurpose, Black   | 5011                | Keystone Electronics        |
| VA               | 0        | Red     | Test Point, TH, Multipurpose, Red   | 5010                | Keystone Electronics        |

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- 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.

##### **Industry Canada Compliance (English)**

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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.

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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.

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Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

### Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

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### EVMs entering Japan are NOT certified by TI as conforming to Technical Regulations of Radio Law of Japan.

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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.

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No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

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

### Applications

|                               |  |
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| Computers and Peripherals     | <a href="http://www.ti.com/computers">www.ti.com/computers</a>                           |
| Consumer Electronics          | <a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>                   |
| Energy and Lighting           | <a href="http://www.ti.com/energy">www.ti.com/energy</a>                                 |
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