EVM User's Guide: SMARTDAC-DIY-EVM

SmartDAC-DIY Evaluation Module

Description

The SmartDAC-DIY-EVM is a supplemental board designed for prototype building and performance evaluation of all smart DAC EVMs (such as the DAC63204EVM, AFE539A4, and more.). The SmartDAC-DIY-EVM contains all tools needed to quickly assemble a system or prototype directly on the board. Additionally, the SmartDAC-DIY-EVM has the required interface to connect to various lab tools and measuring systems.

Get Started

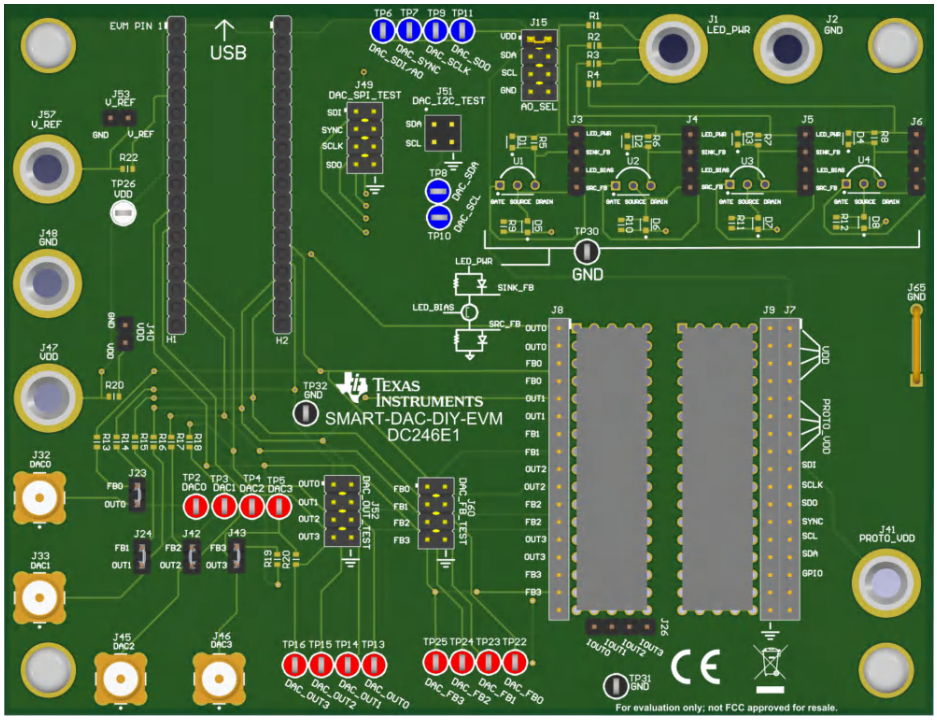
1. Order smart DAC EVM (Table 1-1).
2. Order SmartDAC-DIY-EVM.
3. Plug in smart DAC EVM into SmartDAC-DIY-EVM.

Features

- Headers that are compatible with all smart DAC EVMs
- SMA connectors for waveform and error testing
- Variety of ports and connection spaces
- Protoboard space
- Application specific breakout sections

Applications

- Barcode scanners
- Ultrasound
- Laser pointer
- LED biasing
- Network Interface Card/ Network Switches



1 Evaluation Module Overview

1.1 Introduction

This user's guide describes the characteristics, operation, and use of the SmartDAC-DIY evaluation module (EVM) and highlights all of the features available on the board.

The board features a pair of headers which are pin compatible with all of the currently available Smart DAC EVMs. Upon insertion, align the top left pin of a Smart DAC EVM with a pin labeled *EVM PIN 1* of header H1.

The board contains multiple access points for standard lab bench equipment for a convenient performance evaluation and prototype integration of a smart DAC. The board also features a protoboard space and application specific subsections.

The DIY EVM has sample schematic diagrams printed on the board to simplify the user experience.

1.2 Kit Contents

The package includes:

1. SMARTDAC-DIY-EVM

1.3 Specification

Smart DACs support a list of various applications. SmartDAC-DIY EVM provides a convenient way to test the performance of smart DACs and easily integrate into prototype. The board contains SMA connectors, protoboard space and a variety of test points to make the above processes seamless. The smartDAC-DIY-EVM also supports a typical smart DAC application - LED biasing. The board contains space where such application can be assembled and measured.

1.4 Device Information

The Texas Instruments new smart DAC and AFE family is a precision DAC family designed to add simple logic to analog design without the need for run-time software. These devices have built in non-volatile memory (NVM) to store configurations, custom pulse-width modulation (PWM) generation, general purpose input/output (GPIO) control, force-sense output, and Hi-Z output even when VDD is disconnected for low-dropout regulators (LDO) or switched mode power supply (SMPS) voltage margining.

Some devices in the Smart AFE family add on programmable state-machine logic, look up tables, ADCs and DACs channels. As an example, the AFE539A4 has integrated proportional-integral (PI) controler for thermoelectrical cooling (TEC) control.

The table below shows the list of all supported devices by DIY-EVM.

Table 1-1. Supported Devices

DAC63204EVM
AFE539A4EVM
DAC63004WCSP-EVM

2 Hardware

2.1 Setup

Plug in a compatible smart DAC EVM into the H1 and H2 headers on the smartDAC-DIY-EVM. Configure all jumpers on smart DAC EVM before applying power to smartDAC-DIY-EVM.

2.1.1 Electrostatic Discharge Caution

CAUTION

Many of the components on the Smart DAC DIY EVM are susceptible to damage by electrostatic discharge (ESD). Observe proper ESD handling precautions when unpacking and handling the EVM, including the use of a grounded wrist strap at an approved ESD workstation.

2.1.2 Power Configurations

By default, most of Smart DAC EVMs use 5-V USB power. However, the DIY EVM provides multiple access points to connect an external VDD. Please read the appropriate smart DAC EVM user's guide for the required steps to disconnect VDD from USB. The DIY EVM provides 3 access points for both VDD and VREF. Please refer to the table below for more information:

Designator	Name	Component	Function
J47	VDD	Banana Jack	Provides external VDD
J40	VDD	Header	Provides VDD connection (pin2) and ground connection (pin1)
TP26	VDD	Test point	Provides external VDD
J57	V_REF	Banana jack	Provides connection to VREF pin
J53	V_REF	Header	Provides V_REF connection (pin2) and ground connection (pin1)

2.1.3 Jumper Information

The jumper setting plays an important role in Smart DAC DIY EVM. The table below identifies all of the available jumper positions and their functions.

Jumper	Default position	Available option	Description
J15	1-2 closed: A0 is connected to VDD	3-4: A0 is connected to SDA 5-6: A0 is connected to SCL 7-8: A0 is connected to GND	A0 select
J23	Closed: Short channel 0 of VOUT to VFB	Open: Disconnect channel 0 from VOUT off VFB	Channel 0 VFB select
J24	Closed: Short channel 1 of VOUT to VFB	Open: Disconnect channel 1 from VOUT off VFB	Channel 1 VFB select
J42	Closed: Short channel 2 of VOUT to VFB	Open: Disconnect channel 2 from VOUT off VFB	Channel 2 VFB select
J43	Closed: Short channel 3 of VOUT to VFB	Open: Disconnect channel 3 from VOUT off VFB	Channel 3 VFB select

Most smart DAC EVMs have 0 ohm resistor populated connecting VOUT pin to VFB pin. Make sure to depopulate those resistors before utilizing this subsection.

2.2 Hardware Description

The following sections provide detailed information on the DYI EVM hardware.

2.2.1 Theory of Operation

The reference Figure 2-1 shows a block diagram of DYI EVM. Plug in your smart DAC EVM into headers H1 and H2. The headers is pin compatible to all Smart DAC EVMs. Please note that not all pins on the header are utilized. If that is the case, then make sure that pin 1 on Smart DAC EVM connects to the closest to the edge of the board socket marked *EVM Pin 1* of H1 header.

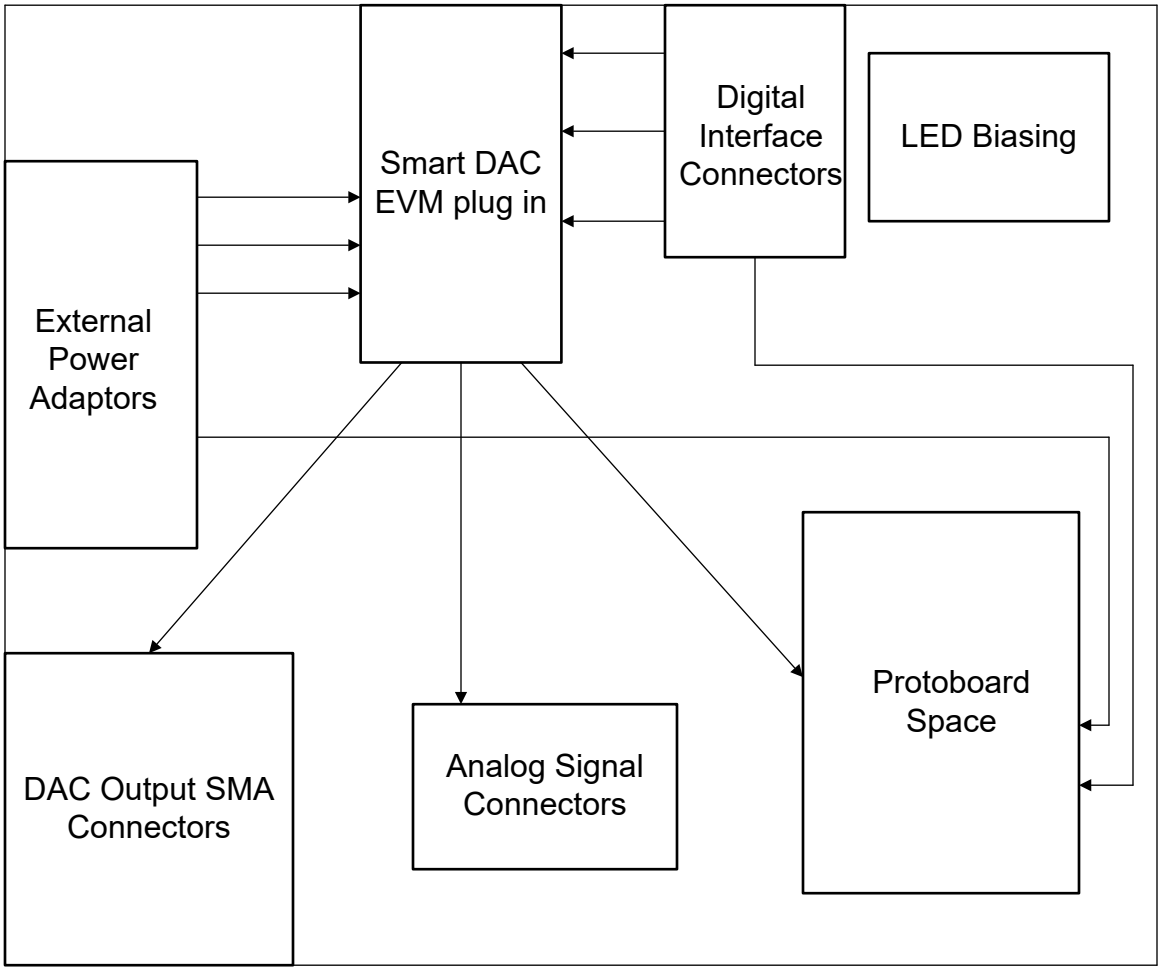


Figure 2-1. Hardware Block Diagram

2.2.1.1 Digital Interface

All of smart DACs support I²C communication protocols and most of them additionally support SPI and PMBus. The DIY EVM contains multiple access points for each digital communication protocol.

Designator	Name	Component	Function
J49	DAC_SPI_TEST	Header	Provides access to all SPI pins and ground
TP6,TP7,TP9,TP11	DAC_SPI_TESTPOINTS	Test points	Provides access to corresponding SPI pin
J51	DAC_I2C_TEST	Header	Provides access to all I2C pins and ground
TP8,TP10	DAC_I2C_TESPOPOINTS	Test points	Provides access to corresponding I2C pin
J15	A0_SEL	Header	Provides A0 selection to all Smart DACs that support external address selection

2.2.1.2 Analog

Most Smart DACs can either output a steady DC signal, a custom waveform or PWM. DIY EVM contains two different areas to measure performance of a DC signal output and an area to measure the performance of wave generation.

The analog sigmal testing area is always connected and has corresponding headers and test points on the board to be accessible using any lab equipment.

The waveform testing section is disconnected from the rest of the board. Place the following 0 Ohm resistors:

Resistor	Function
R13, R14	DAC Channel 0
R15, R16	DAC Channel 1
R17, R18	DAC Channel 2
R19, R20	DAC Channel 3

Each DAC channel is connected to a corresponding SMA connector on the board through the CHANNEL_X_FEEDBACK_SELECT header. Please refer to a table above for jumper configurations. If custom feedback signal is required, then disconnect the jumper, and connect feedback signal to the FBX pin of the header. Most smart DAC EVMS have 0 ohm resistor populated that connects feedback to the output. Make sure to disconnect those resistors before using these features.

2.2.1.3 Proto Space

The DIY EVM has a protoboard space which is included for prototype building an external circuit to connect to the smart DAC. The proto space consists of 2 planes with holes positioned at a standard breadboard (100 mil).

Unpopulated headers J8 and J26 provide an easy access for all analog smart DAC outputs.

Unpopulated header J9 on provides a ground connection.

Unpopulated header J7 provides access to VDD, digital communication signals, and custom power supplied only to protospace from banana jack (J41).

2.2.1.4 LED Biasing Sub Circuit

One popular applications with Smart DACs is LED biasing. The top right corner of the board is dedicated to a LED biasing module. The area supports both high-side and low-side LED biasing. A banana jack (J1) supplies power for this subsection of the board. The banana jack can be isolated by removing resistors R1 through R4.

LED biasing requires an external FET to set set up current throught the LED. The board provides an option between high side and low side configuration. Populate FET, LED and resistor on the board. Headers (J3, J4, J5 J6) provide connection to additional signals. Pin LED_PWR for the system. It is equal to the banana jack input (J1) if corresponding resistor is populated. SINK_FB pin provides feedback connection in case current sink configuration is used. It is not connected to anything so connection needs to be established to the corresponsing feedback pin of the DAC that is being used. LED_BIAS pin is the gate voltage for the FET. It must be connected to the corresponding output DAC channel. SRC_FB pin is the feedback connection for current

source configuration. It is not connected to anything so connection needs to be established to the corresponsing feedback pin of the DAC that is being used.

Please refer to the circuit diagram printed directly on the board for connection guidance.

3 Hardware Design Files

The following sections includes the hardware design files for smartDAC-DIY-EVM. This section includes the schematics, board layouts, and Bill of Materials (BOM).

3.1 Schematic

This section contains the schematics for the Smart DAC DIY EVM

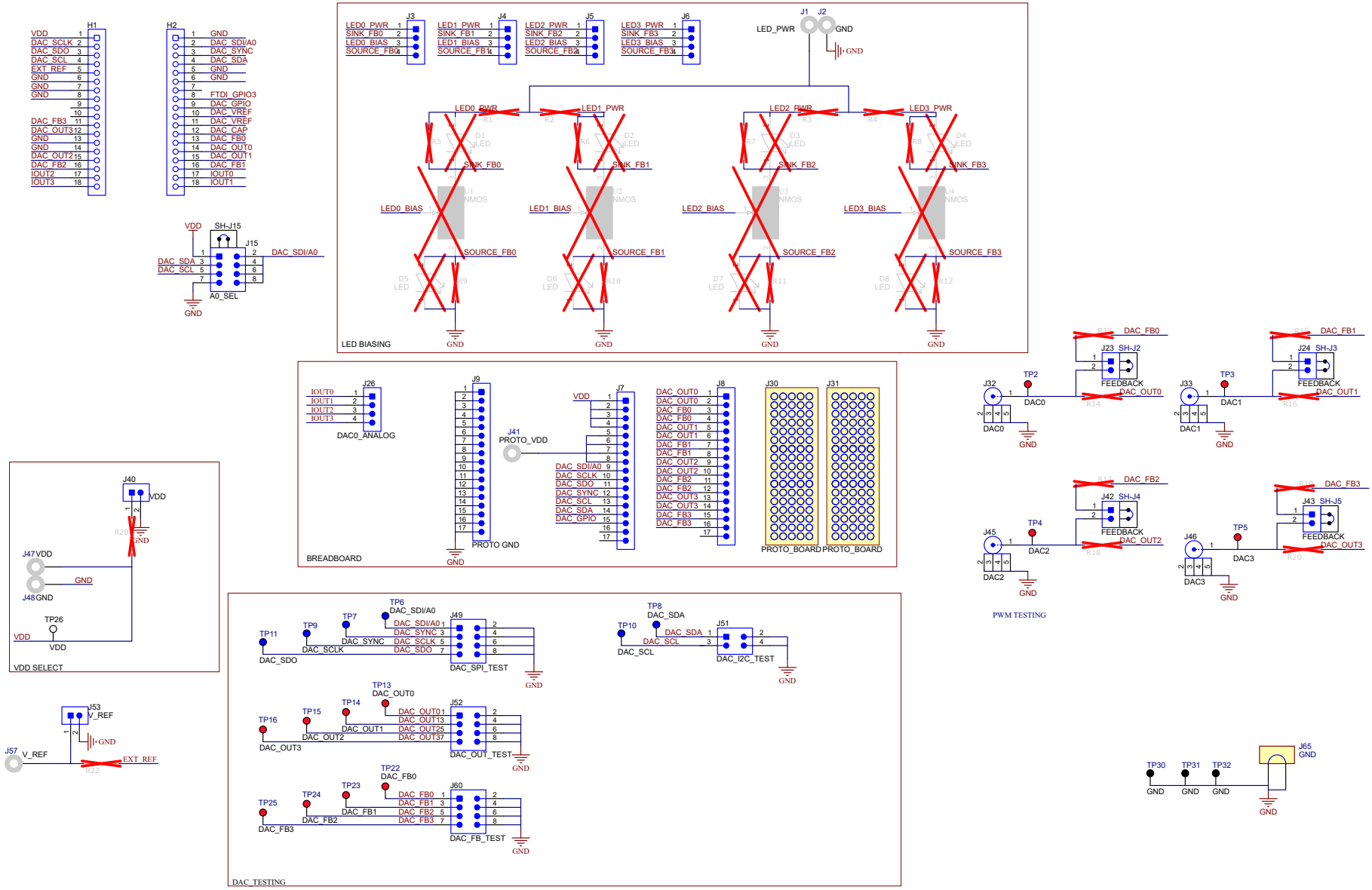


Figure 3-1. Smart DAC DIY EVM Schematic

3.2 PCB Layout

This section contains the printed circuit board (PCB) layout diagrams for the DAC63204EVM.

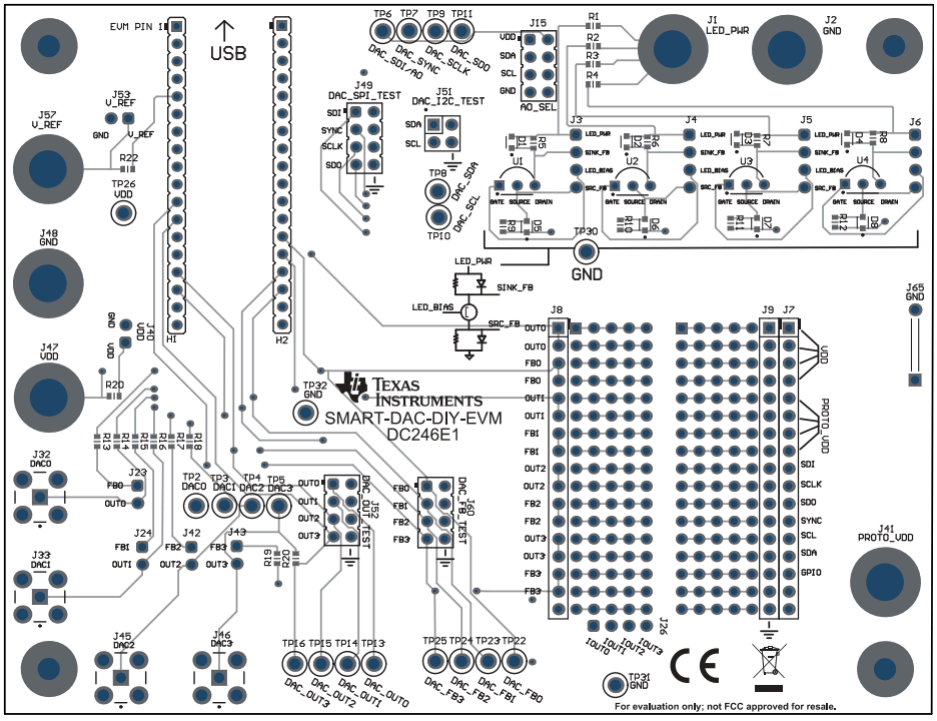


Figure 3-2. Smart DAC DIY Component (Top View)

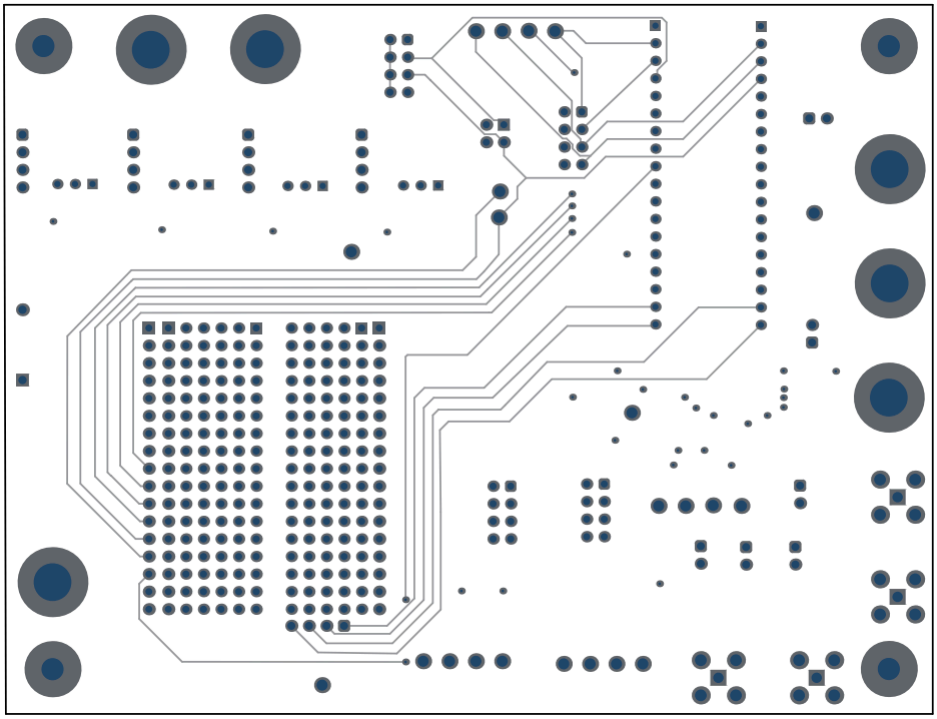


Figure 3-3. Smart DAC DIY Component (Bottom View)

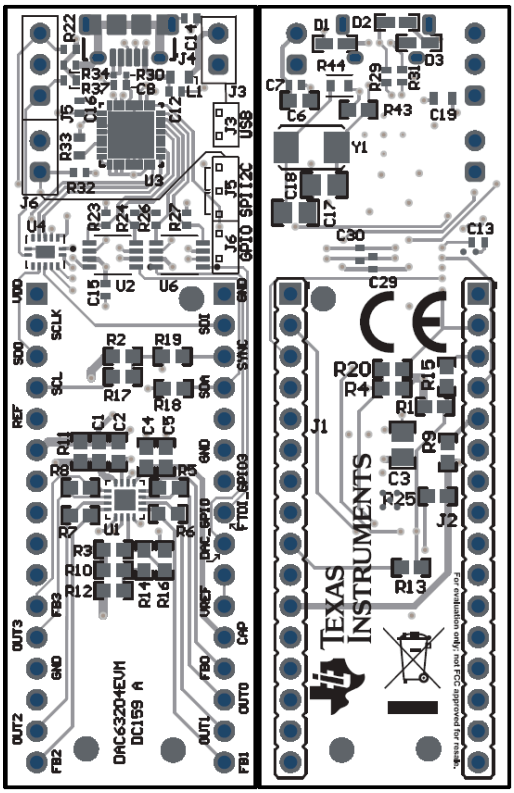


Figure 3-4. DAC63204EVM PCB Components Layout

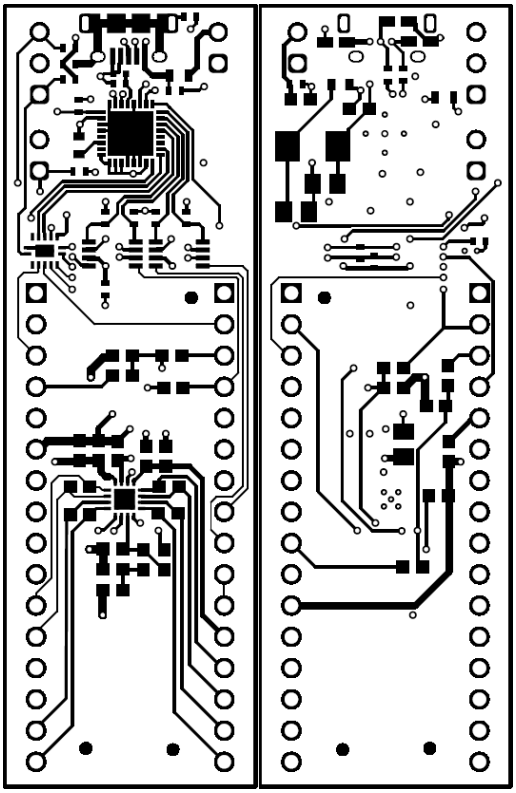


Figure 3-5. DAC63204EVM PCB Layers

3.3 Bill of Materials

This section contains the bill of materials for the Smart DAC DIY EVM.

Table 3-1. Bill of Materials

Designator	Qty	Description	Package Reference	Part Number	Manufacturer
!PCB	1	Printed Circuit Board		DC246	Any
H1, H2	2	Receptacle, 2.54mm, 18x1, Gold, TH	Receptacle, 2.54mm, 18x1, TH	801-41-018-10-001000	Mill-Max
H1, H2, H3, H4	4	Machine Screw, Round, #4-40 x 1/4, Nylon, Philips panhead	Screw	NY PMS 440 0025 PH	B&F Fastener Supply
H5, H6, H7, H8	4	Standoff, Hex, 0.5"L #4-40 Nylon	Standoff	1902C	Keystone
J1, J2, J41, J47, J48, J57	6	Standard Banana Jack, Uninsulated, 5.5mm	Keystone_575-4	575-4	Keystone
J3, J4, J5, J6, J26	5	Header, 2.54 mm, 4x1, Gold, TH	Header, 2.54mm, 4x1, TH	61300411121	Wurth Elektronik
J7, J8, J9	3	Header, 100mil, 17x1, Gold, TH	17x1 header	TSW-117-08-G-S	Samtec
J15, J49, J52, J60	4	Header, 2.54mm, 4x2, Gold, TH	Header, 2.54mm, 4x2, TH	TSW-104-08-L-D	Samtec
J23, J24, J40, J42, J43, J53	6	Header, 2.54 mm, 2x1, Gold, TH	Header, 2.54mm, 2x1, TH	61300211121	Wurth Elektronik
J30, J31	2				
J32, J33, J45, J46	4	SMA Connector Jack, Female Socket 50Ohm Through Hole Solder	CONN_SMA_PTH	6.0312E+13	Wurth Electronics
J51	1	Header, 100mil, 2x2, Gold, TH	2x2 Header	TSW-102-07-G-D	Samtec
J65	1		JUMPER2	D3082-05	Harwin
LBL1	1	Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	PCB Label 0.650 x 0.200 inch	THT-14-423-10	Brady
SH-J2, SH-J3, SH-J4, SH-J5	4	Shunt, 2.54mm, Gold, Black	Shunt, 2.54mm, Black	60900213421	Wurth Elektronik
SH-J15	1	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec
TP2, TP3, TP4, TP5, TP13, TP14, TP15, TP16, TP22, TP23, TP24, TP25	12	Test Point, Multipurpose, Red, TH	Red Multipurpose Testpoint	5010	Keystone Electronics
TP6, TP7, TP8, TP9, TP10, TP11	6	Test Point, Multipurpose, Blue, TH	Blue Multipurpose Testpoint	5127	Keystone Electronics
TP26	1	Test Point, Multipurpose, White, TH	White Multipurpose Testpoint	5012	Keystone
TP30, TP31, TP32	3	Test Point, Multipurpose, Black, TH	Black Multipurpose Testpoint	5011	Keystone Electronics
D1, D2, D3, D4, D5, D6, D7, D8	0	Red 630 nm LED Indication - Discrete 2 V 0603 (1608 Metric)	0603	APG1608SURKC/T	Kingbright
FID1, FID2, FID3	0	Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A
R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15, R16, R17, R18, R19, R20, R22	0	0 Ohms ±1% Chip Resistor 0603 (1608 Metric) Thick Film	0603	CR160000F	Meritek Electronics
U1, U2, U3, U4	0	100 mA Adjustable Output Negative Voltage Regulator, LP0003A (TO-92-3)	LP0003A	LM337LZ/NOPB	Texas Instruments

4 Additional Information

Trademarks

All trademarks are the property of their respective owners.

5 Related Documentation from Texas Instruments

The following document provides information regarding Texas Instruments integrated circuits used in the assembly of the Smart DAC DIY EVM. This user's guide is available from the TI web site under literature number SLAU898. Any letter appended to the literature number corresponds to the document revision that is current at the time of the writing of this document. Newer revisions can be available from the TI web site at www.ti.com, or call the Texas Instruments Literature Response Center at (800) 477-8924 or the Product Information Center at (972) 644-5580. When ordering, identify the document by both title and literature number.

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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 DEGREDATION 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/lsds/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。

https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-delivered-in-japan.html

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.

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3.3.3 *Notice for EVMs for Power Line Communication:* Please see http://www.tij.co.jp/lsds/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。https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-for-power-line-communication.html

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.

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.

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