EVM User's Guide: ADC168M102REVM-PDK

ADC168M102REVM-PDK

Description

The ADC168M102R evaluation module (EVM) performance demonstration kit (PDK) is a platform for evaluating the performance of the ADC168M102R-SEP, a 16-bit, 8-channel, 1MSPS, simultaneous-sampling analog-to-digital converter (ADC). The evaluation kit includes the ADC168M102REVM board and the precision host interface (PHI) controller board that enables the accompanying computer software to communicate with the ADC over Universal Serial Bus (USB) for data capture, configuration, and analysis.

Get Started

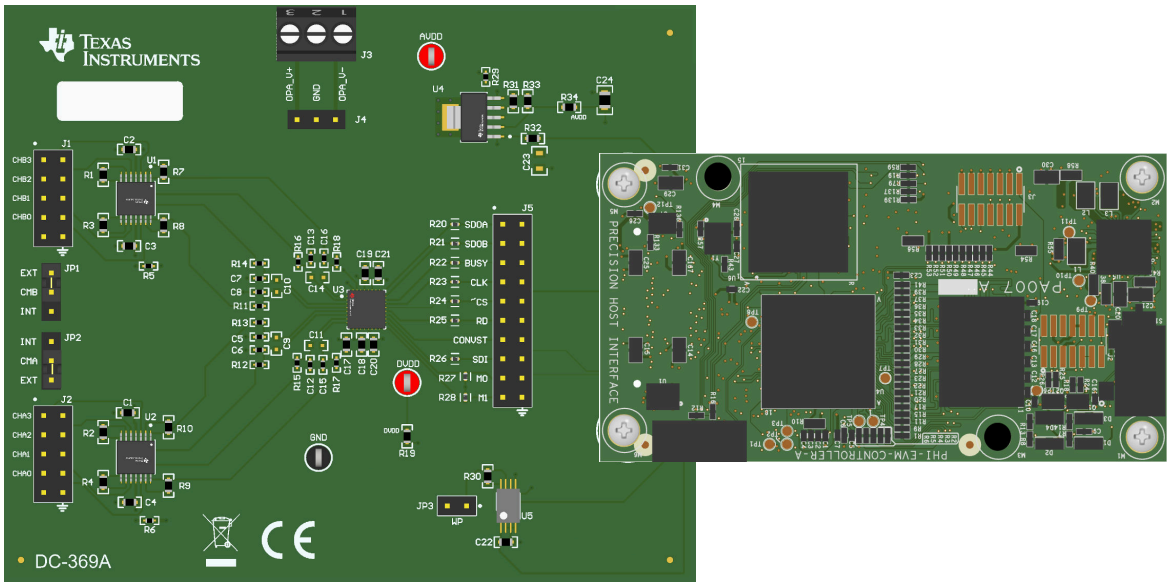
1. Order the ADC168M102REVM-PDK from ti.com
2. Connect a user supplied external ±8V power supply to the ADC168M102REVM board
3. Connect the ADC168M102REVM board to the PHI controller, and connect to the computer with the included USB cable
4. Refer to the ADC168M102R-SEP data sheet for IC details
5. Visit the E2E forums for support and questions

Features

- Radiation tolerant components, including ADC168M102R-SEP analog-to-digital converter, 2x OPA4H014-SEP op-amp, and TPS73801-SEP LDO
- Eight pseudo- or four fully differential inputs
- Simultaneous sampling of two channels
- Excellent AC performance:
  - SNR: 93dB
  - THD: –98dB
- Dual programmable and buffered 2.5V reference allows:
  - Two different input voltage range settings
  - Two-level PGA implementation
- Programmable auto-sequencer
- Integrated data storage (up to 4 per channel) for oversampling applications
- 2-bit counter for safety applications

Applications

- Satellite electrical power systems (EPS)
- Command and data handling (C&DH)
- Optical imaging payloads
- Motor controls
- Voltage, current, and temperature monitoring
- Accelerometers



1 Evaluation Module Overview

1.1 Introduction

The ADC168M102R-SEP is a 16-bit, 8-channel, 1MSPS, simultaneous-sampling, successive approximation register (SAR) ADC. The ADC168M102REVM-PDK is a platform for evaluating the performance of the ADC168M102R-SEP. The ADC168M102REVM board includes the ADC168M102R-SEP, and all the peripheral analog circuits necessary to showcase the performance of the ADC. The PHI board primarily serves three functions:

- Provides a communication interface from the EVM to the computer through a USB port
- Provides the digital input and output signals necessary to communicate with the ADC168M102R-SEP
- Supplies power to the ADC168M102R-SEP

1.2 Kit Contents

The ADC168M102REVM-PDK includes:

- ADC168M102R EVM board
- PHI Controller
- USB A to Micro USB Cable

Figure 1-1 demonstrates the connections between the kit contents.

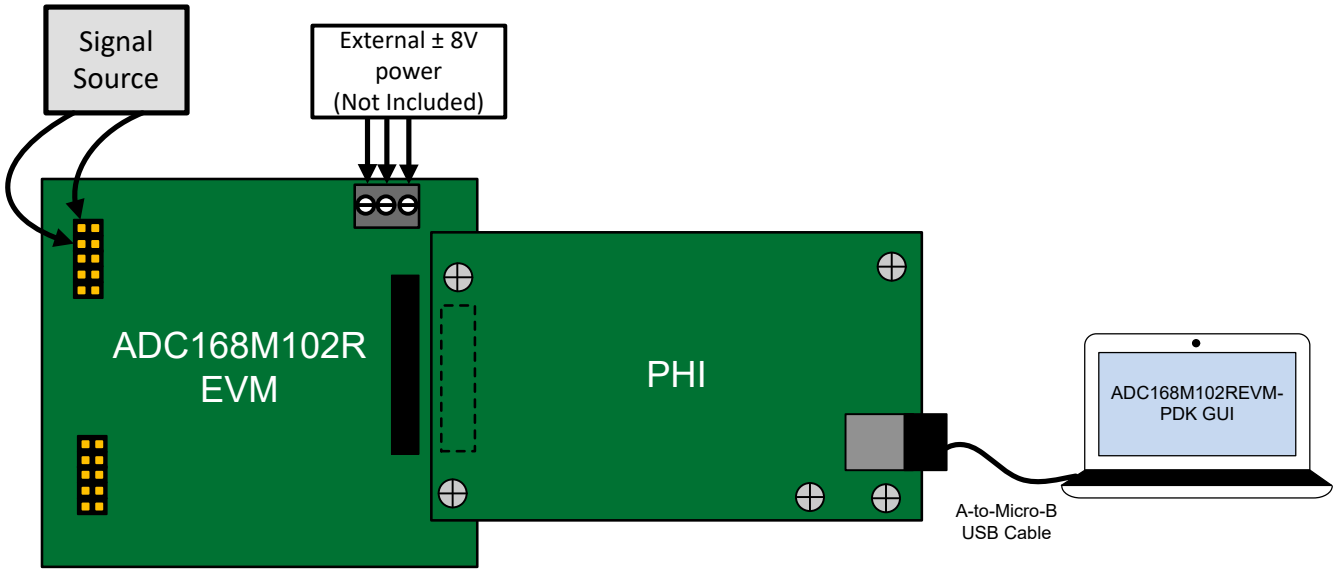


Figure 1-1. System Connection for Evaluation

1.3 Specifications

Parameter		Conditions	Value
Temperature		Recommended operating free-air temperature range, T_A	15°C ≤ T_A ≤ 35°C
AVDD		Default	5V (nominal)
		External (R34 removed)	2.7V ≤ AVDD ≤ 5.5V
DVDD		Default	3.3V (nominal)
		External (R19 removed)	2.3V ≤ DVDD ≤ 5.5V
External OPA_V-		Applied on J3[1] or J4 [1]	-10V ≤ OPA_V- ≤ 0.35V
External OPA_V+		Applied on J3[3] or J4[3]	6V ≤ OPA_V+ ≤ 10V
V_{REF}		Internal Reference Voltage	2.5V
		External Reference Voltage (applied at JP1[1] or JP2[1])	2.485V ≤ V_{REF} ≤ 2.525V
V_{IN}	Absolute input voltage	CHxxx to AGND	–0.1V ≤ V_{IN} ≤ AVDD + 0.1V
FSR	Full-scale analog input range	(CHxxP – CHxxN) or CHxx to CMx	-V_{REF} ≤ FSR ≤+V_{REF}
Sampling rate	Max recommended sampling rate based on design		200ksps

1.4 Device Information

Please refer to ADC168M102R-SEP data sheet for complete specifications.

Device Specification	Value	
Package size	5mm x 5mm	
Operating temperature range	-55°C to 125°C	
AVDD supply voltage	Half-clock mode	2.7V to 5.5V
	Full-clock mode	4.5V to 5.5V
DVDD supply voltage	3V and 3.3V levels	2.3V to 3.6V
	5V levels, half-clock mode only	4.5V to 5.5V

2 Hardware

2.1 Power Supplies

Figure 2-1 shows the circuit for the TPS73801-SEP low-dropout (LDO) voltage regulator. The PHI controller supplies 5.5V to the TPS73801-SEP LDO. The TPS73801-SEP regulates the 5.5V from the PHI to 5V, and supplies a clean 5V signal. The ADC168M102R-SEP uses the 5V signal to power the AVDD supply. Remove resistor R32 to disable the output of the TPS73801-SEP. Remove resistor R34 to disconnect the output of the TPS73801-SEP, and provide an external AVDD source to TP2.

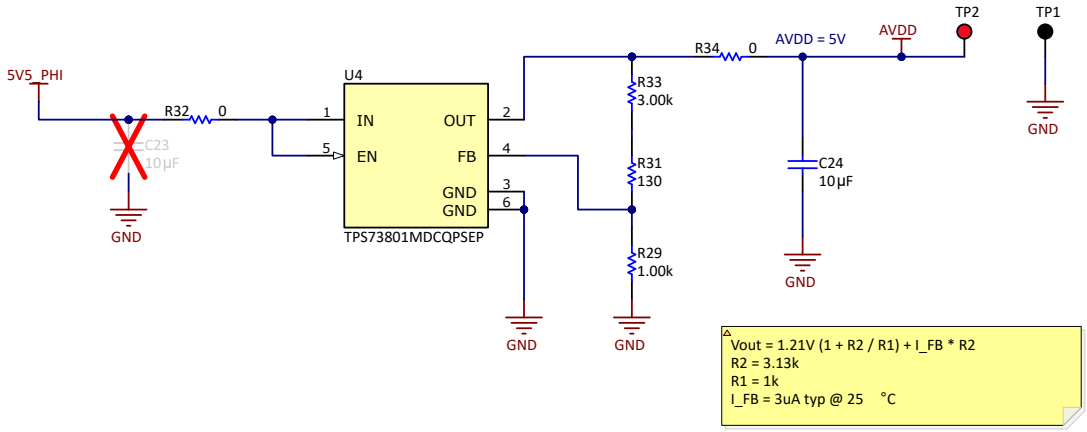


Figure 2-1. TPS73801-SEP Circuit

DVDD is supplied directly by the PHI controller board through USB. Remove resistor R19 to disconnect DVDD sourced from the PHI, and provide an external DVDD source to TP3.

An external bipolar power supply is necessary to meet the common-mode voltage requirement and output swing from rail limit of the OPA4H014-SEP amplifier. The OPA4H014-SEP has a good power supply noise rejection ratio of ±0.1µV/V, so an additional voltage regulator is not required.

OPA_V+ must be between 6V and 10V to allow input signals to reach the positive full-scale range of the ADC168M102R-SEP. OPA_V- must be between -10V and -0.35V to allow input signals to reach values near 0V.

2.2 EVM Analog Input

The ADC168M102R-SEP accepts differential, and pseudo-differential inputs (referenced to CMx pins). Figure 2-2 shows the input range of the ADC168M102R-SEP in differential mode.

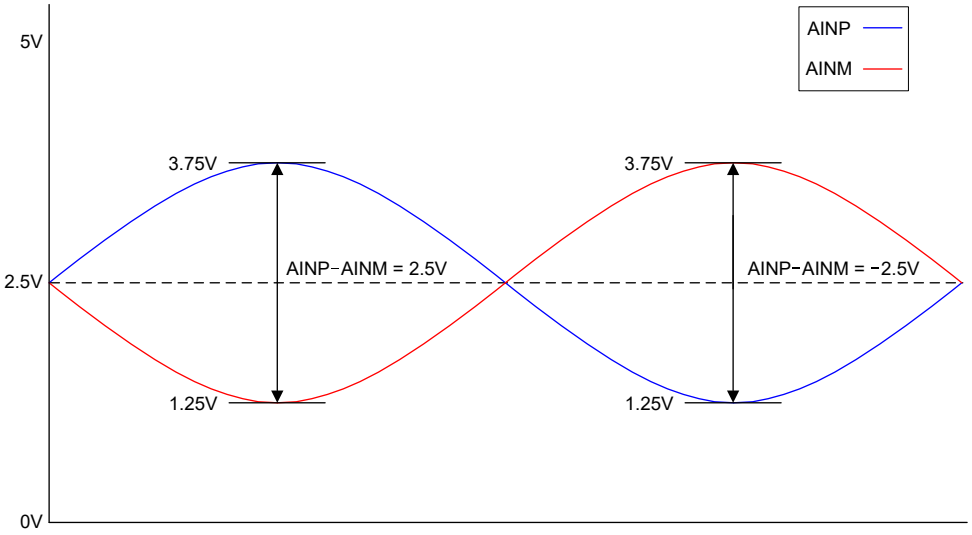


Figure 2-2. Analog Input Range (Differential)

Due to the EVM implementation, the recommendation is to operate at a sampling rate of 200ksps or less for best performance.

Figure 2-3 shows one differential channel of the circuit for the signal conditioning circuit that features the OPA4H014-SEP op-amp. Inputs connect to header J2 for channel A, and header J1 for channel B. The CMx_EXT pins (J1[9] and J2[9]) can be used to provide external inputs to the CMA and CMB pins of the ADC168M102R-SEP. Jumpers JP1 and JP2 should be in the "CMx_EXT" position, where "x" is the respective channel, to route the CMx_EXT inputs from header J1 and J2 to the ADC.

The differential filter capacitors (C9, C10, C11, and C14) are optional, and are unpopulated by default.

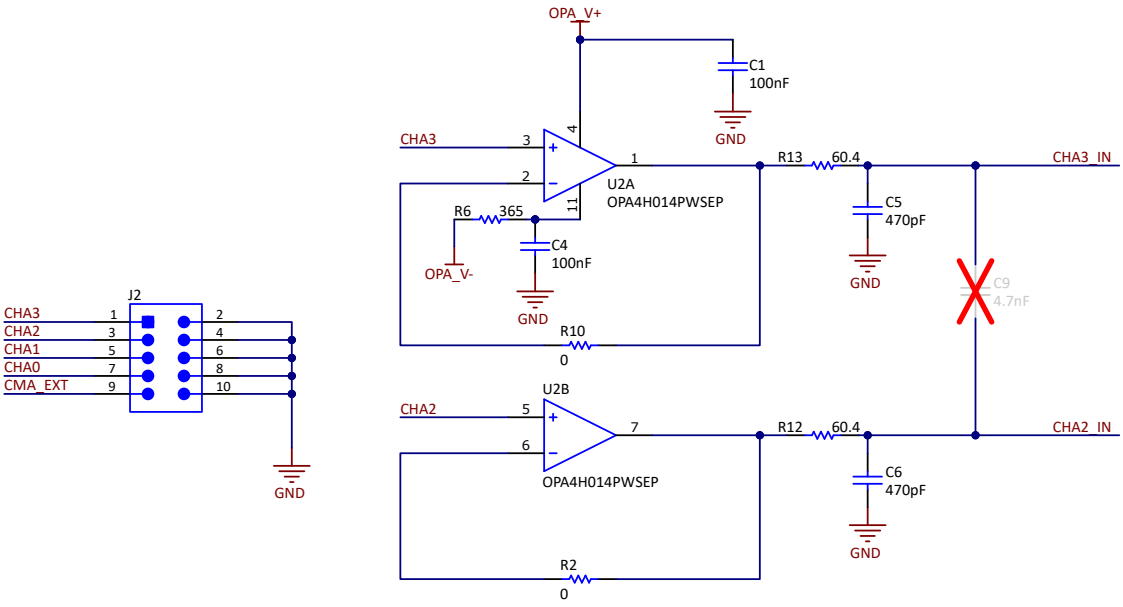


Figure 2-3. OPA4H014-SEP Circuit

2.3 ADC Circuit

Figure 2-4 shows the connections to the ADC168M102R-SEP device. The AVDD and DVDD supplies are decoupled with 1µF capacitors. The analog inputs are supplied by the outputs of the OPA4H014-SEP circuits. The REFIO1 and REFIO2 pins require 22µF capacitors connected close to the pins. Header J5 provides a way to probe the digital communication pins with an oscilloscope or logic analyzer. Additionally, it provides a way to connect an external controller for use with the ADC168M102R-SEP.

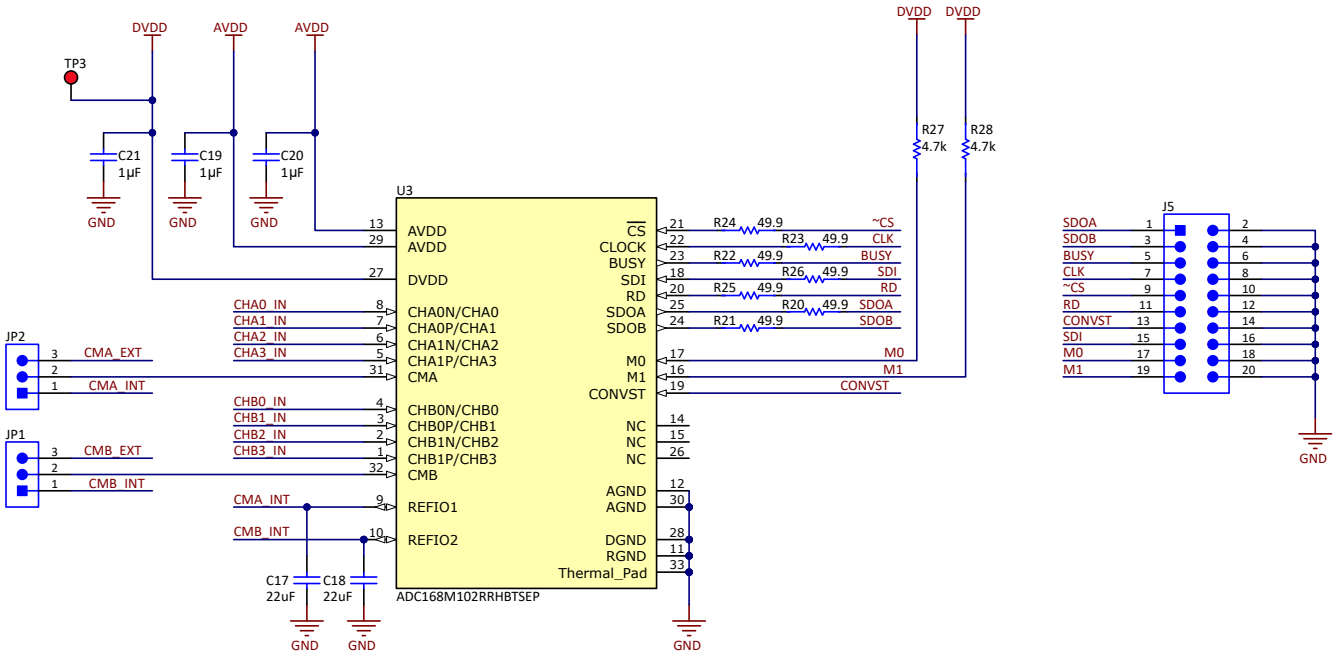


Figure 2-4. ADC168M102R-SEP Decoupling and Digital Interface

By default, jumpers JP1 and JP2 are configured in the "CMx_EXT" position. Place the shunts to the "CMx_INT" position to use the output of the REFDACs from the REFIO pins as the input to the CMA or CMB pins.

2.4 Jumper Information

By default, jumpers JP1 and JP2 are populated in the "CMx_EXT" positions.

Table 2-1. Default Jumper Configuration

Jumper JP1	Pins 2-3 (CMB_EXT)
Jumper JP2	Pins 2-3 (CMA_EXT)

3 Hardware Design Files

This section contains the ADC168M102REVM schematics, PCB layouts, and bill of materials (BOM).

3.1 Schematics

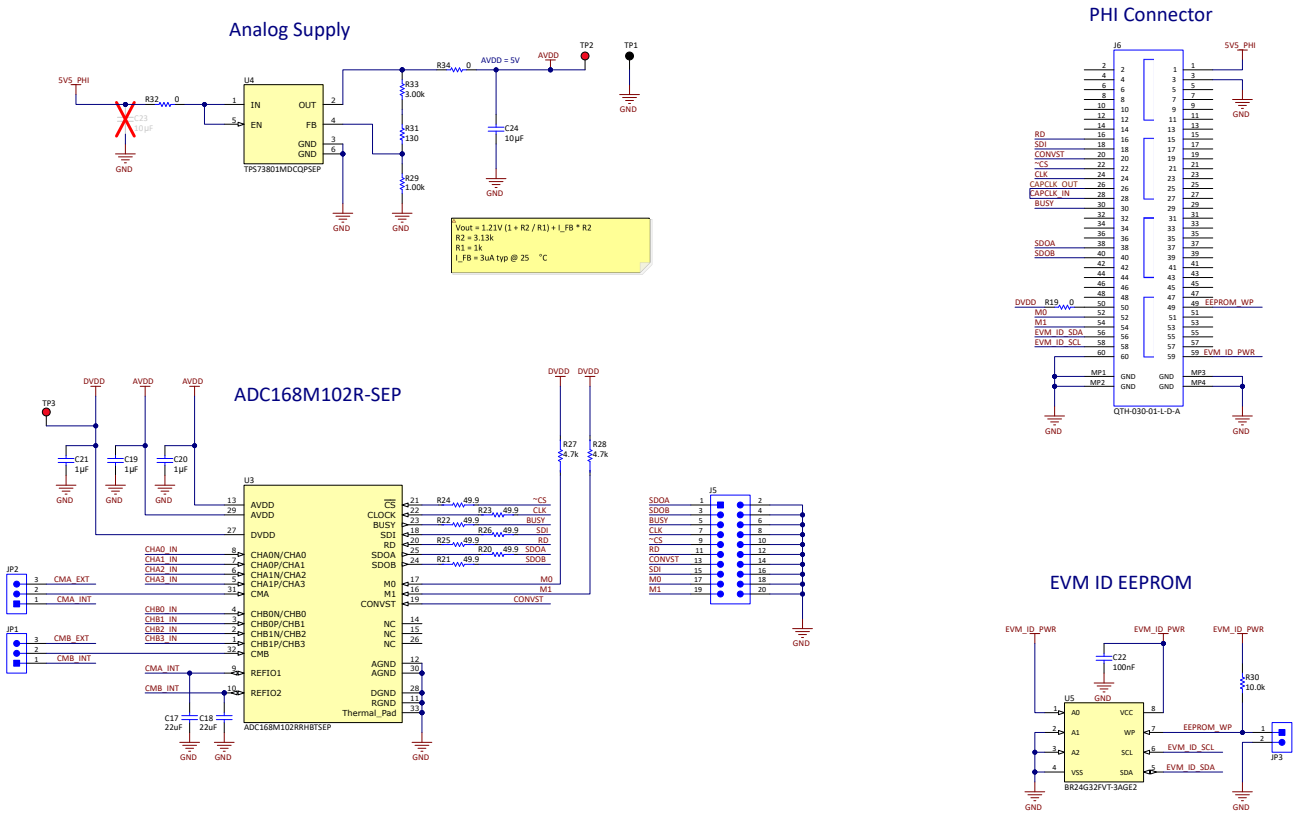


Figure 3-1. ADC168M102REVM ADC Interface and Analog Supply

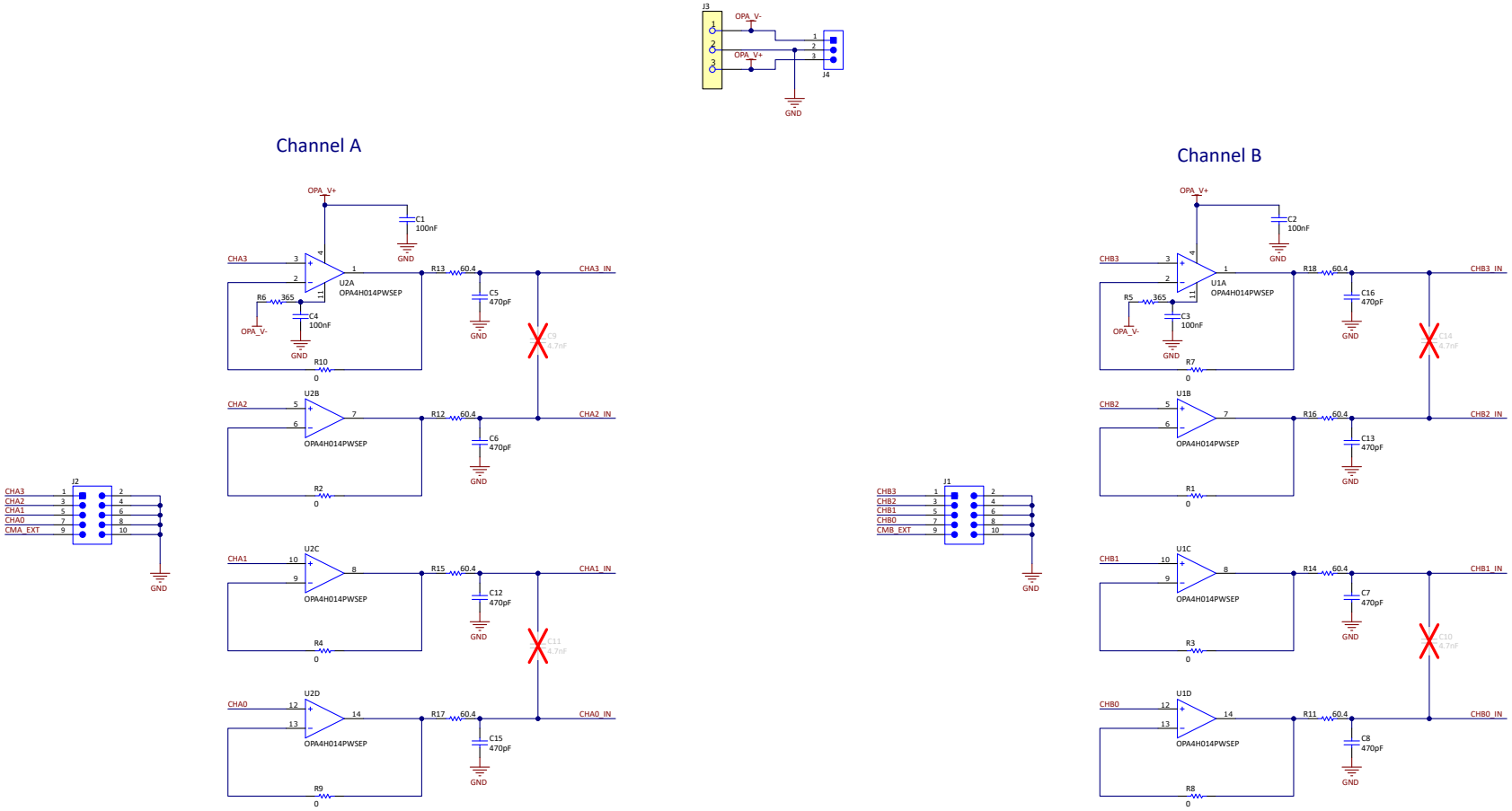


Figure 3-2. ADC168M102REVM Input Amplifiers

3.2 PCB Layer Plots

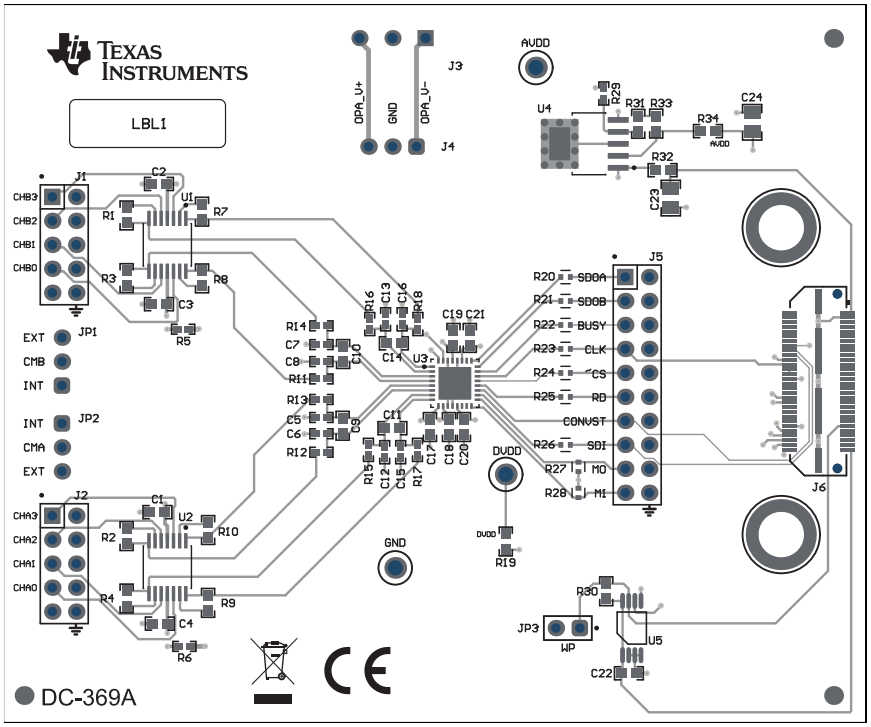


Figure 3-3. ADC168M102REVM Top View

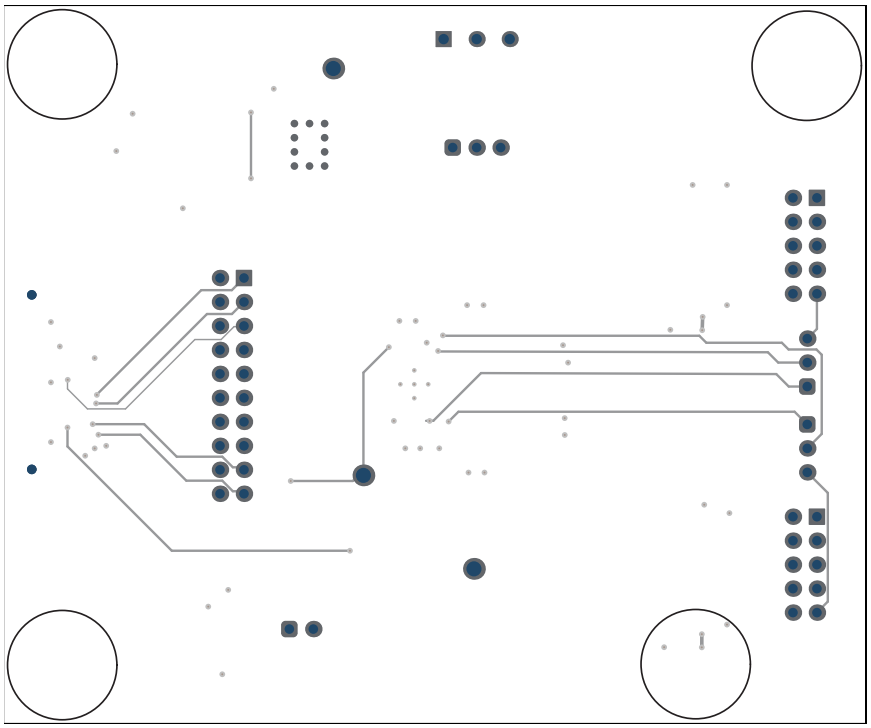


Figure 3-4. ADC168M102REVM Bottom View

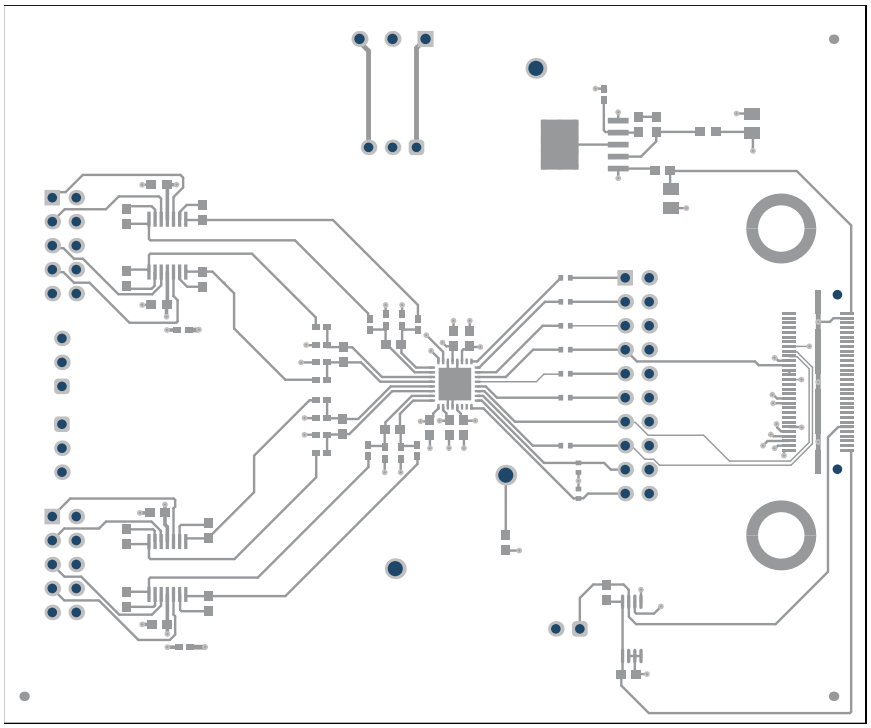


Figure 3-5. ADC168M102REVM Top Layer

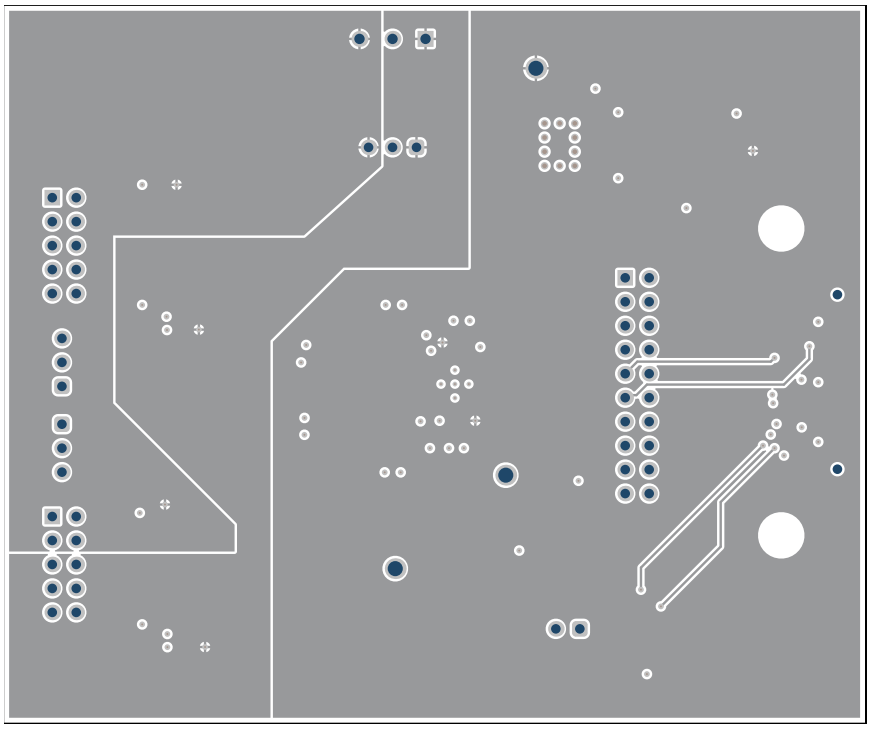


Figure 3-6. ADC168M102REVM Power Layer

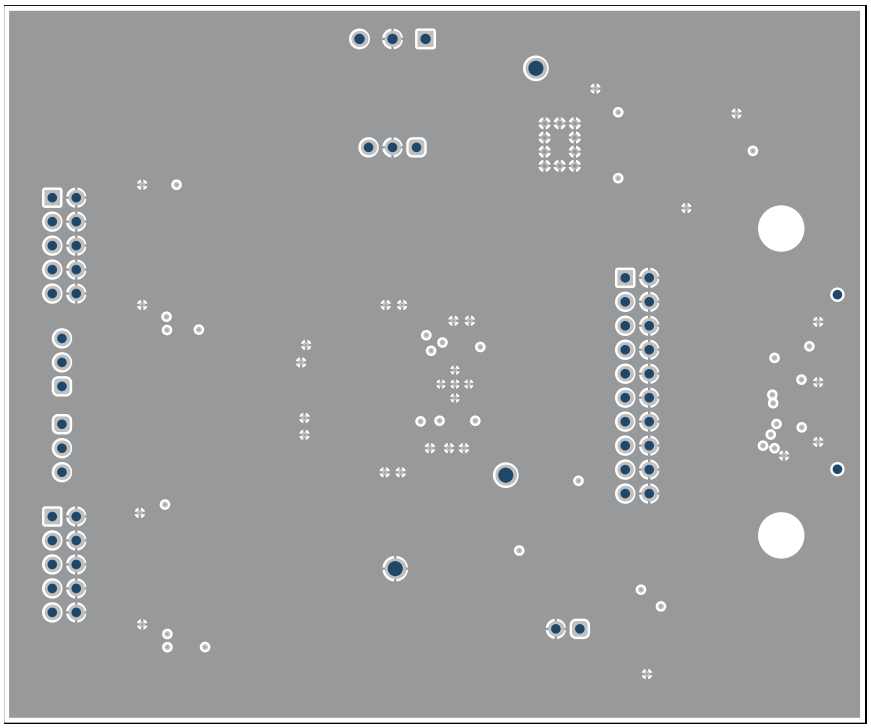


Figure 3-7. ADC168M102REVM Ground Layer

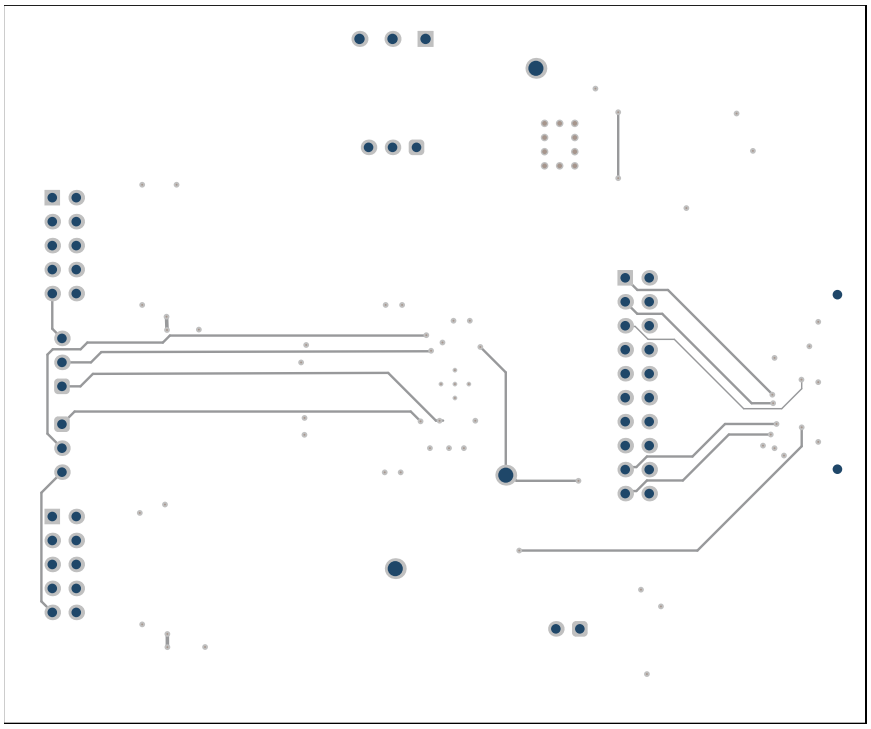


Figure 3-8. ADC168M102REVM Bottom Layer

3.3 Bill of Materials (BOM)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
!PCB1	1		Printed Circuit Board		DC-369	Any
@H1, @H2	2		Machine Screw Pan PHILLIPS M3		RM3X4MM 2701	APM HEXSEAL
C1, C2, C3, C4, C22	5	0.1uF	CAP, CERM, 0.1 uF, 25 V, +/- 5%, X7R, 0603	0603	C0603C104J3RACTU	Kemet
C5, C6, C7, C8, C12, C13, C15, C16	8	470pF	CAP, CERM, 470 pF, 50 V, +/- 5%, C0G/NP0, 0402	0402	GRM1555C1H471JA01D	MuRata
C17, C18	2	22uF	CAP, CERM, 22 µF, 16 V,+/- 20%, X5R, 0603	0603	CL10A226MO7JZNC	Samsung
C19, C20, C21	3	1uF	CAP, CERM, 1 µF, 10 V,+/- 10%, X7R, 0603	0603	LMK107B7105KA-T	Taiyo Yuden
C24	1	10uF	CAP, CERM, 10 µF, V,+/- 10%, X7R, 0805	0805	GRM21BR71A106KA73L	MuRata
FID1, FID2, FID3	3		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A
H1, H2	2		ROUND STANDOFF M3 STEEL 5MM	ROUND STANDOFF M3 STEEL 5MM	9774050360R	Wurth Elektronik
H3, H4, H5, H6	4		Bumpon, Hemisphere, 0.44 X 0.20, Clear	Transparent Bumpon	SJ-5303 (CLEAR)	3M
J1, J2	2		Header, 100mil, 5x2, Gold, TH	5x2 Header	TSW-105-07-G-D	Samtec
J3	1		39357 Series 3.5mm Pitch Straight PCB Trm Blk w/ Solder Term, Through Hole, 3 Way	CONN_TB-3	393570003	Molex
J4, JP1, JP2	3		Header, 100mil, 3x1, Gold, TH	3x1 Header	TSW-103-07-G-S	Samtec
J5	1		Header, 100mil, 10x2, Gold, TH	10x2 Header	TSW-110-07-G-D	Samtec
J6	1		Header(Shrouded), 19.7mil, 30x2, Gold, SMT	Header (Shrouded), 19.7mil, 30x2, SMT	QTH-030-01-L-D-A	Samtec
JP3	1		Header, 100mil, 2x1, Gold, TH	2x1 Header	TSW-102-07-G-S	Samtec
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
R1, R2, R3, R4, R7, R8, R9, R10, R19, R32, R34	11	0	RES, 0, 5%, 0.1 W, 0603	0603	RC0603JR-070RL	Yageo
R5, R6	2	365	RES, 365, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW0402365RFKED	Vishay-Dale
R11, R12, R13, R14, R15, R16, R17, R18	8	60.4	RES, 60.4, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW040260R4FKED	Vishay-Dale

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
R20, R21, R22, R23, R24, R25, R26	7	49.9	49.9 Ohms ±0.1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Thin Film	0402	RT0402BRD0749R9L	Yageo
R27, R28	2	4.7k	Res Thick Film 1.0 x 0.5 mm 4.7K Ohm 5% 0.063W(1/16W) 100ppm/ C Molded SMD Paper T/R	0402	RC0402JR-074K7L	YAGEO
R29	1	1.00k	RES, 1.00 k, 0.1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	ERA-2APB102X	Panasonic
R30	1	10.0k	RES, 10.0 k, 1%, 0.1 W, 0603	0603	RC0603FR-0710KL	Yageo
R31	1	130	RES, 130, 0.5%, 0.1 W, 0603	0603	RT0603DRE07130RL	Yageo America
R33	1	3.00k	RES, 3.00 k, 0.1%, 0.1 W, 0603	0603	RG1608P-302-B-T5	Susumu Co Ltd
SH-J1, SH-J2	2		Single Operation 2.54mm Pitch Open Top Jumper Socket	Single Operation 2.54mm Pitch Open Top Jumper Socket	M7582-05	Harwin
TP1	1		Test Point, Multipurpose, Black, TH	Black Multipurpose Testpoint	5011	Keystone Electronics
TP2, TP3	2		Test Point, Multipurpose, Red, TH	Red Multipurpose Testpoint	5010	Keystone Electronics
U1, U2	2		11-MHz, Precision, Low-Noise, RRO, JFET Op Amp in Space-Enhanced Plastic	TSSOP14	OPA4H014PWSEP	Texas Instruments
U3	1		ADC168M102RRHBTSEP	VQFN32	ADC168M102RRHBTSEP	Texas Instruments
U4	1		LDO Regulator Pos 1.21V to 20V 1A 6-Pin(5+Tab) SOT-223 Tube	SOT223-6	TPS73801MDCQPSEP	Texas Instruments
U5	1		I2C BUS EEPROM (2-Wire), TSSOP-B8	TSSOP-8	BR24G32FVT-3AGE2	Rohm
C9, C10, C11, C14	0	4700pF	CAP, CERM, 4700 pF, 100 V, +/- 5%, C0G/NP0, 0603	0603	C0603C472J1GAC7867	Kemet
C23	0	10uF	CAP, CERM, 10 µF, V,+/- 10%, X7R, 0805	0805	GRM21BR71A106KA73L	MuRata

4 Additional Information

4.1 Trademarks

All trademarks are the property of their respective owners.

5 Related Documentation

The following related documents are available through the Texas Instruments website at www.ti.com.

Device	Literature Number
ADC168M102R-SEP	SBASAW9
OPA4H014-SEP	SBOSA94
TPS73801-SEP	SLVSER5

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 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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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。

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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/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.

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.

7. *USER'S INDEMNITY OBLIGATIONS AND REPRESENTATIONS.* USER WILL DEFEND, INDEMNIFY AND HOLD TI, ITS LICENSORS AND THEIR REPRESENTATIVES HARMLESS FROM AND AGAINST ANY AND ALL CLAIMS, DAMAGES, LOSSES, EXPENSES, COSTS AND LIABILITIES (COLLECTIVELY, "CLAIMS") ARISING OUT OF OR IN CONNECTION WITH ANY HANDLING OR USE OF THE EVM THAT IS NOT IN ACCORDANCE WITH THESE TERMS. THIS OBLIGATION SHALL APPLY WHETHER CLAIMS ARISE UNDER STATUTE, REGULATION, OR THE LAW OF TORT, CONTRACT OR ANY OTHER LEGAL THEORY, AND EVEN IF THE EVM FAILS TO PERFORM AS DESCRIBED OR EXPECTED.

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