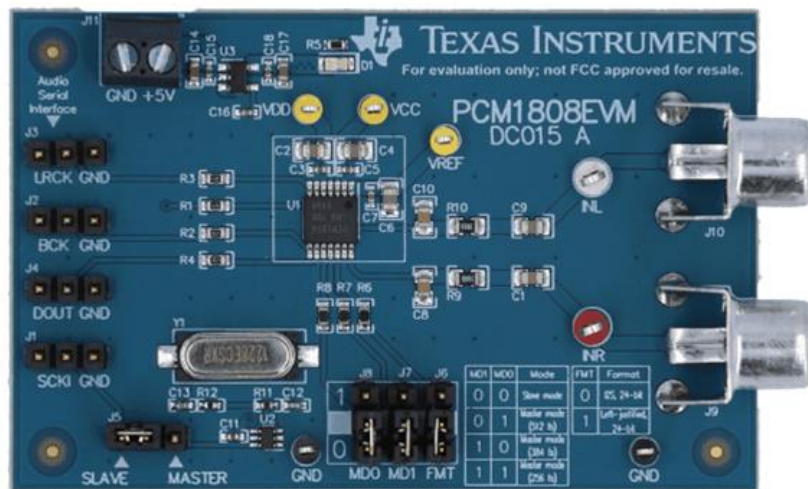


PCM1808 Evaluation Module

This user's guide describes the function and use of the PCM1808EVM. This document includes the hardware configuration instructions, a quick-start guide, jumper and connector descriptions, schematics, and printed-circuit board (PCB) layout that demonstrate TI's recommended practices for these devices.



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Trademarks

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1 Introduction

The PCM1808EVM is an evaluation module (EVM) designed to demonstrate the performance and functionality of the PCM1808 device. The PCM1808 is a high-performance, low-cost, single-chip, stereo analog-to-digital converter (ADC) with single-ended analog voltage input. The device is configured through logic-level mode selection pins and does not require a digital interface such as I2C or SPI to configure registers. As such, no software is necessary to interface with the EVM. The EVM is powered with a single 5-V supply. Access to the converter output is provided on the audio serial interface in I2S and LJ formats.

2 Power Supply

The PCM1808EVM is powered with a single 5-V power supply connected to J11. An onboard low-dropout regulator converts the 5-V supply to the 3.3-V rail used by the ADC. The analog supply, VCC, is fixed at 5-V and the digital supply, VDD, at 3.3 V. The power status of the EVM is indicated by LED (D1), which will illuminate when power is applied to the board.

3 Hardware Configuration

The format of the audio data and the operating mode of the ADC are controlled by the following pins: MD0, MD1, and FMT. These signals are referenced to VDD and can be set to high (1) or low (0). If no shunt is installed, then an internal 50-k Ω pulldown resistor will set the pin low so that the ADC remains in a defined state. [Table 1](#) shows the header numbers and their pin functions and [Table 2](#) and [Table 3](#) show the possible modes and output formats, respectively. In master mode, BCK and LRCK are outputs generated by internal divider circuitry from the SCKI input. Thus, SCKI must be a valid multiple of the intended sample rate. MD0 and MD1 are used to select the serial audio data communication timing and must be set prior to power on. The frequency of BCK is constant at 64 BCK/frame. In slave mode, BCK and LRCK work as input pins. The device accepts 64-BCK/frame or 48-BCK/frame format (only for a 384 fs system clock), but not 32-BCK/frame format. Although BCK and LRCK are no longer derived from SCKI in slave mode, a valid SCKI is still required for operation.

Table 1. PCM1808EVM Headers and Jumpers

Designator	Function
J1	Audio serial interface: system clock input
J2	Audio serial interface: bit-clock input or output
J3	Audio serial interface: latch-enable input or output
J4	Audio serial interface: digital data output
J5	System clock source
J6	FMT select
J7	MD1 select
J8	MD0 select
J9	Analog audio input: right
J10	Analog audio input: left
J11	+5-V supply input

Table 2. PCM1808 Mode Settings

MD1	MD0	Interface Mode
0	0	Slave mode (256 fs, 384 fs, 512 fs auto-detection)
0	1	Master mode (512 fs)
1	0	Master mode (384 fs)
1	1	Master mode (256 fs)

Table 3. PCM1808 Format Settings

FMT	Format
0	I2S, 24bit
1	Left-justified, 24 bit

All hardware pins are tied low by default, placing the device in slave mode and I2S, 24-bit audio format. For more information on the operating modes and clock timing of the PCM1808 device, see the [PCM1808 Single-Ended, Analog-Input 24-Bit, 96-kHz Stereo ADC Data Sheet](#).

4 Interfacing With the EVM

4.1 PCM1808EVM Inputs

The right and left audio inputs to the PCM1808EVM can be applied through the RCA connectors (J9 and J10, respectively) or directly to the test points (TP4 and TP5, respectively). The single-ended audio inputs pass through an optional anti-aliasing filter made by R9 and C8 for the right input and R10 and C10 for the left input. The capacitors can be left de-populated and the resistors replaced with 0- Ω resistors if the filter is not desired. An input high-pass filter is created by the 1- μ F capacitors (C1 and C9) and 60-k Ω input impedance.

4.2 PCM1808EVM Output

The digital I/O of the PCM1808EVM are provided by J1 through J4; the functions are outlined in [Table 1](#). The first two pins of each header are duplicated signals to allow for signal input and monitoring. The third pin of each is connected to GND.

5 Board Layout

Figure 1 to Figure 4 illustrate the EVM board layout.

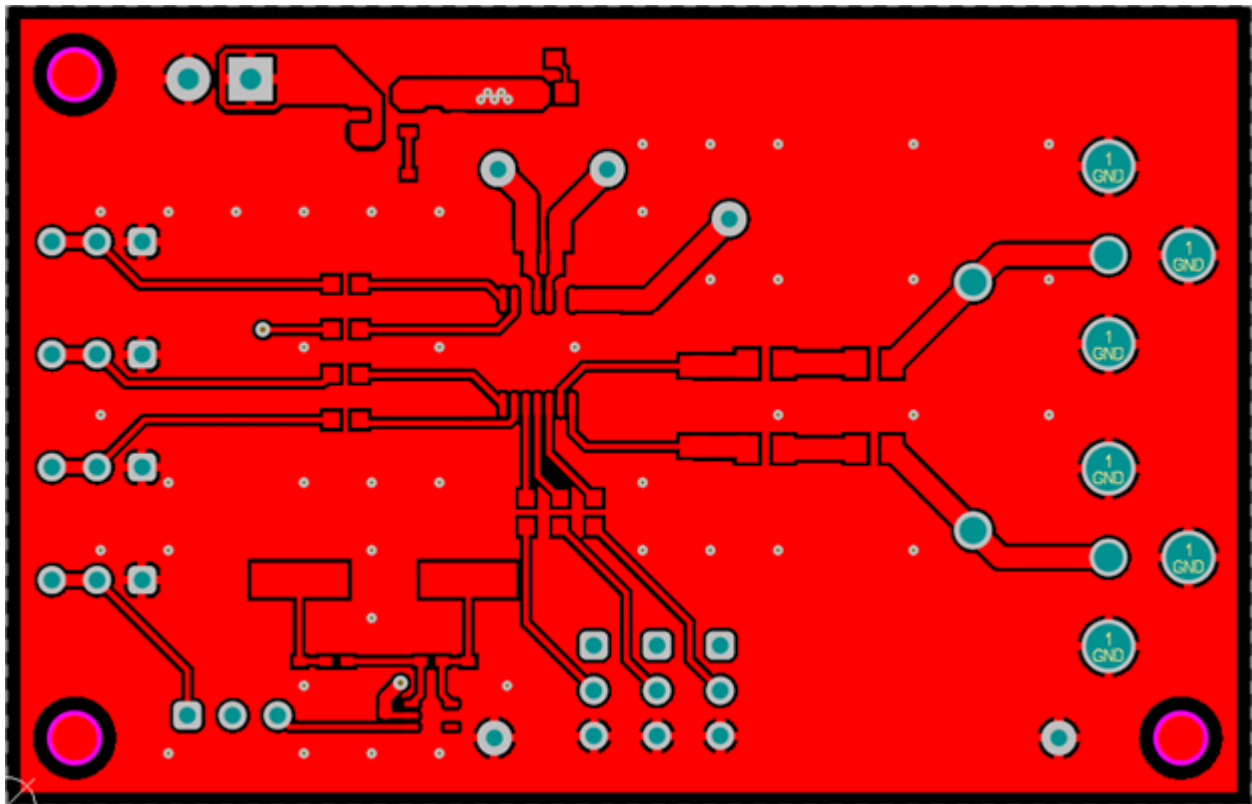


Figure 1. PCM1808EVM Top Layer

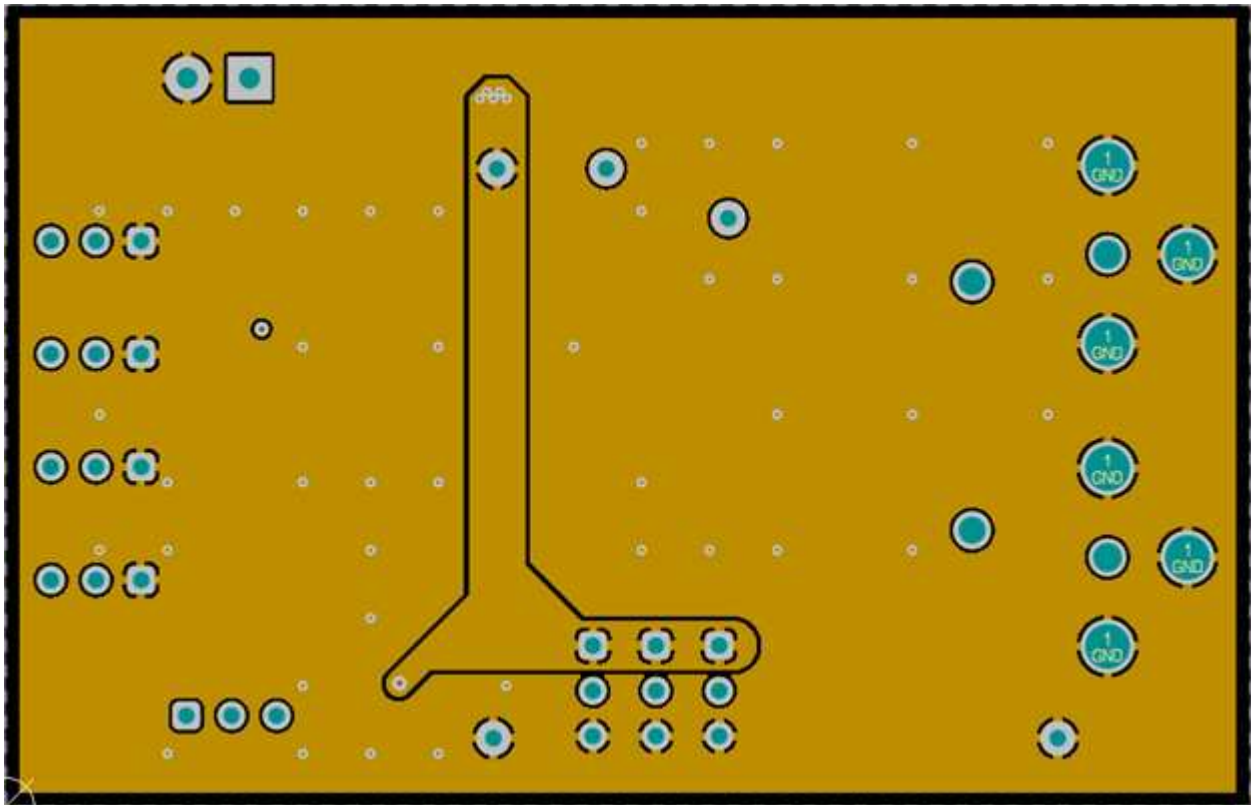


Figure 2. PCM1808EVM Power Plane 1

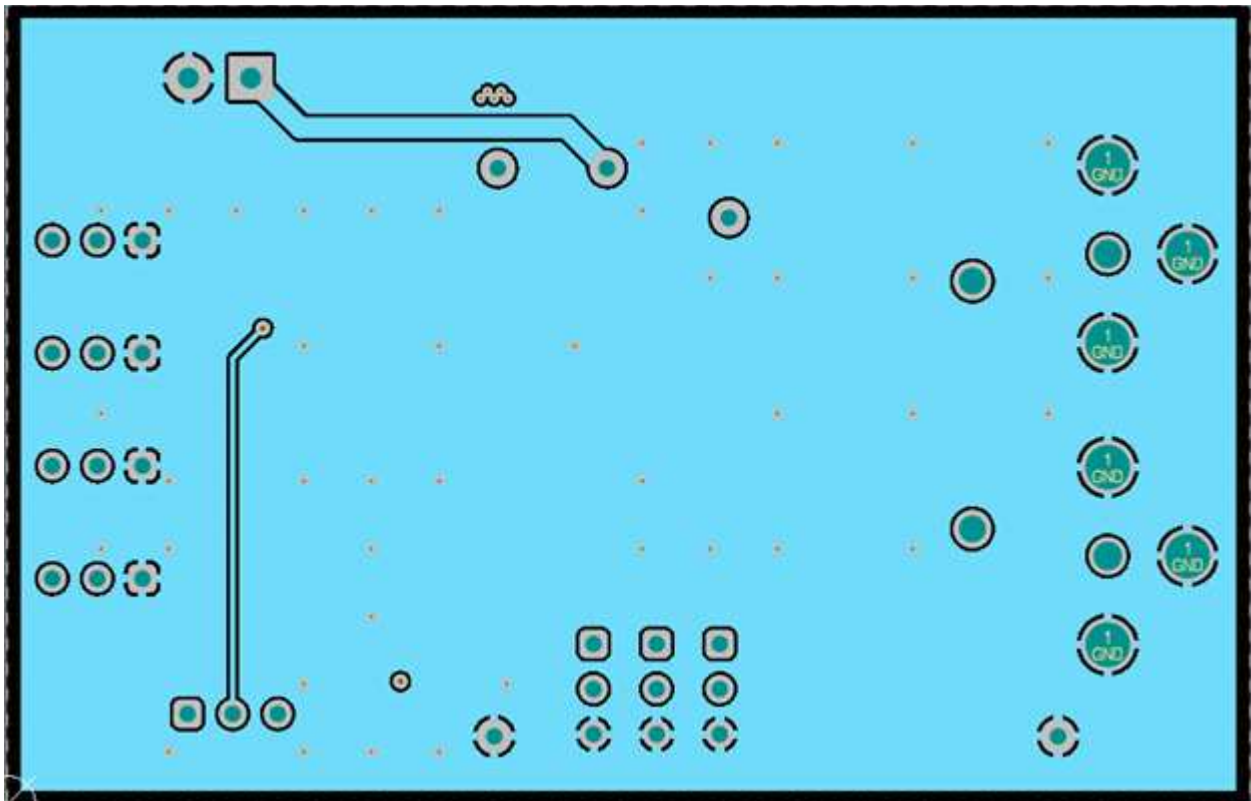


Figure 3. PCM1808EVM Power Plane 2

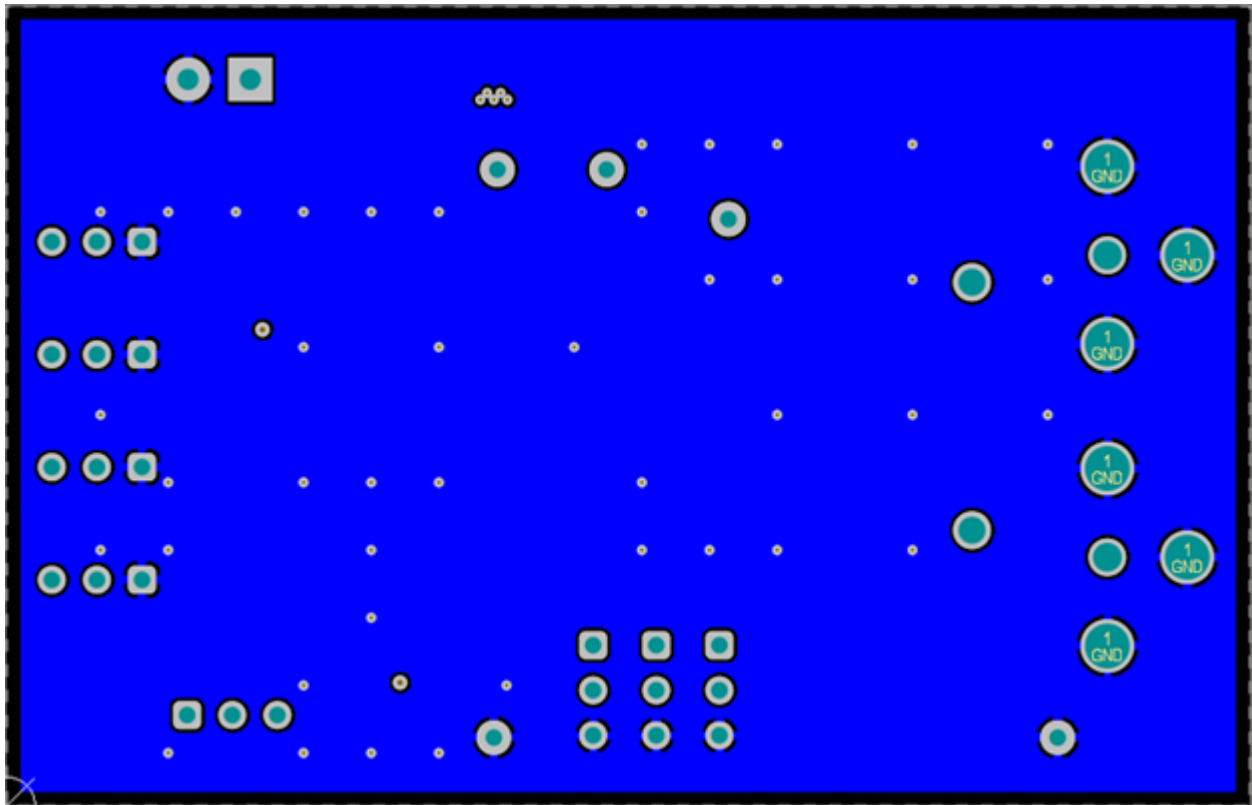


Figure 4. PCM1808EVM Bottom Layer

6 Schematic and Bill of Materials

This section contains the EVM schematic and bill of materials.

6.1 Schematic

Figure 5 illustrates the EVM schematic.

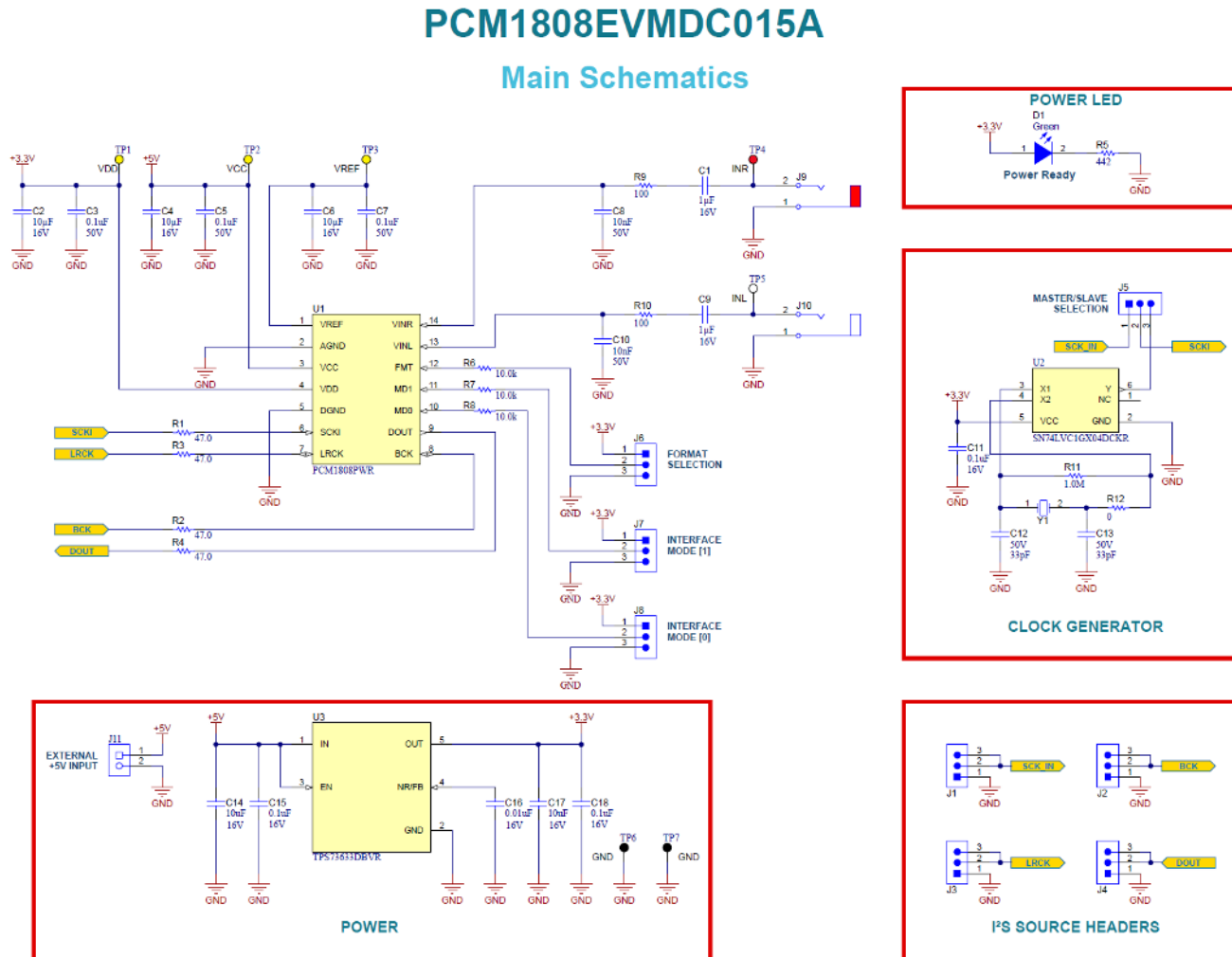


Figure 5. PCM1808EVM Schematic

6.2 Bill of Materials

Table 4 lists the EVM bill of materials.

Table 4. Bill of Materials

Designator	QTY	Description	Part Number	Manufacturer
PCB1	1	Printed Circuit Board	DC015	Any
C1, C9	2	CAP, CERM, 1 uF, 16 V, ±10%, X7R, 0805	GRM21BR71C105KA01L	MuRata
C2, C4, C6	3	CAP, CERM, 10 uF, 16 V, ±10%, X7R, 0805	CL21B106KOQNNNE	Samsung Electro-Mechanics
C3, C5, C7	3	CAP, CERM, 0.1 uF, 50 V, ±10%, X7R, 0402	C1005X7R1H104K050BB	TDK
C8, C10	2	CAP, CERM, 0.01 uF, 50 V, ±10%, X7R, 0805	08055C103KAT2A	AVX
C11, C15, C18	3	CAP, CERM, 0.1 uF, 16 V, ±10%, X7R, 0402	GCM155R71C104KA55D	MuRata
C12, C13	2	CAP, CERM, 33 pF, 50 V, ±5%, C0G/NP0, 0402	C1005C0G1H330J050BA	TDK
C14, C17	2	CAP, CERM, 10 uF, 16 V, ±20%, X5R, 0603	GRM188R61C106MAALD	MuRata
C16	1	CAP, CERM, 0.01 uF, 16 V, ±10%, X5R, 0402	GRM155R61C103KA01D	MuRata
D1	1	LED, Green, SMD	LTST-C170KGKT	Lite-On
H1, H2, H3, H4	4	Bump, Hemisphere, 0.25 X 0.075, Clear	SJ5382	3M
J1, J2, J3, J4, J5, J6, J7, J8	8	Header, 100mil, 3x1, Gold, TH	TSW-103-07-G-S	Samtec
J9	1	RCA Jack, 1Pos, Tin, Red, R/A, TH	RCJ-012	CUI Inc.
J10	1	RCA Jack, 1Pos, Tin, White, R/A, TH	RCJ-013	CUI Inc.
J11	1	Terminal Block, 3.5mm Pitch, 2x1, TH	ED555/2DS	On-Shore Technology
L1	1	Ferrite Bead, 220 ohm @ 100 MHz, 2.2 A, 0603	MPZ1608S221A	TDK
R1, R2, R3, R4	4	RES, 47.0, 1%, 0.1 W, 0603	RC0603FR-0747RL	Yageo
R5	1	RES, 442, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	CRCW0603442RFKEA	Vishay-Dale
R6, R7, R8	3	RES, 10.0 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	CRCW060310K0FKEA	Vishay-Dale
R9, R10	2	RES, 100, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	CRCW0805100RFKEA	Vishay-Dale
R11	1	RES, 1.0 M, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	CRCW04021M00JNED	Vishay-Dale
R12	1	RES, 0, 5%, 0.063 W, 0402	RC0402JR-070RL	Yageo America
SH1, SH2, SH3, SH4	4	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Samtec
TP1, TP2, TP3	3	Test Point, Miniature, Yellow, TH	5004	Keystone
TP4	1	Test Point, Compact, Red, TH	5005	Keystone
TP5	1	Test Point, Compact, White, TH	5007	Keystone
TP6, TP7	2	Test Point, Miniature, Black, TH	5001	Keystone
U1	1	99dB SNR Stereo ADC with Single-Ended Inputs, PW0014A (TSSOP-14)	PCM1808PWR	Texas Instruments
U2	1	Crystal Oscillator Driver, DCK0006A (SOT-SC70-6)	SN74LVC1GX04DCKR	Texas Instruments
U3	1	Single Output Low Noise LDO, 400 mA, Fixed 3.3 V Output, 1.7 to 5.5 V Input, with Reverse Current Protection, 5-pin SOT-23 (DBV), -40 to 85 degC, Green (RoHS & no Sb/Br)	TPS73633DBVR	Texas Instruments
Y1	1	Crystal, 12.288 MHz, 20 pF, SMD	ECS-122.8-20-5PX-TR	ECS Inc.

7 Related Documentation

1. Texas Instruments, [PCM1808 Single-Ended, Analog-Input 24-Bit, 96-kHz Stereo ADC Data Sheet](#)

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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:

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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.

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http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_01.page

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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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