TPA6166A2 Multimedia Headset Interface

This user's guide describes the characteristics, operation, and use of the TPA6166A2EVM evaluation module (EVM). This document includes schematic diagrams, a printed circuit board (PCB) layout, and a bill of materials.

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1 Introduction

The TPA6166A2 evaluation module (TPA6166A2EVM) is a complete multimedia headset interface with headphone amplifier, and microphone pre-amp and bias, as well as advanced headset detection circuitry. All components and the evaluation module are Pb-free.

2 Description

The TPA6166A2EVM consists of a TPA6166A2 device and all necessary components to evaluate it. The EVM connects to a PC through a USB interface. It is controlled by easy-to-use, intuitive, graphical user interface (GUI)-based software.

3 Applications

This EVM is used in the following applications:

- Smart phones and wireless handsets
- Portable tablets

4 Features

The following features are available through this EVM:

- Ultra low power, high performance DirectPath™ Class-G headphone amplifier
- Fully differential Mic pre-amp with variable gain
- Choice of two Mic Bias voltages: 2 V and 2.6 V
- Advanced accessory insertion, removal, and type detection

5 Electrical Performance Specification

Table 1 lists the required power supply specifications.

Table 1. Supply Specifications

Supply voltage range, VDD	1.7 V – 1.9 V
Microphone Supply voltage, MICVDD	2.4 V – 3.6 V

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6 Schematic

Figure 1 and Figure 2 illustrate the EVM schematics.

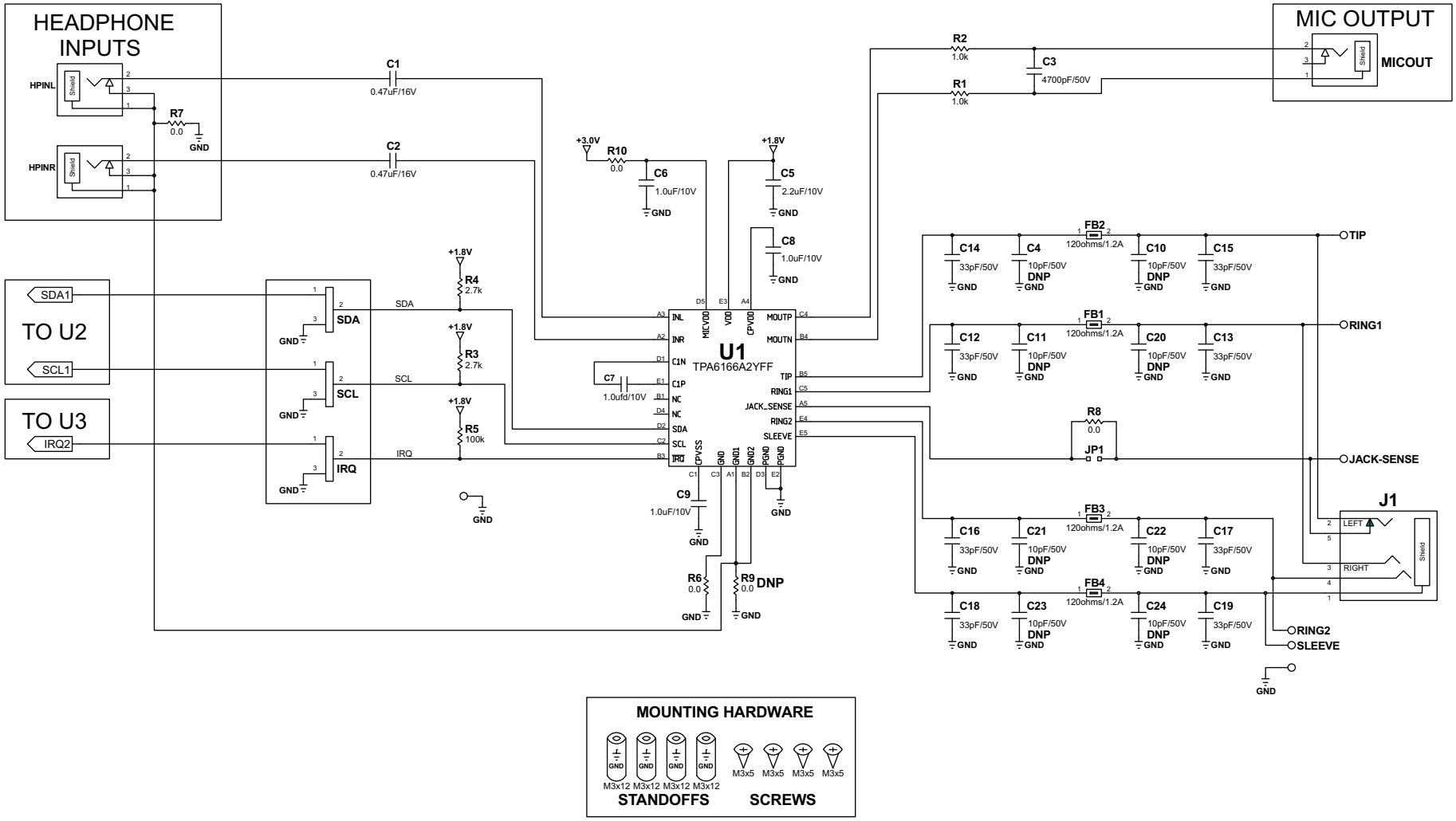


Figure 1. TPA6166A2EVM Schematic

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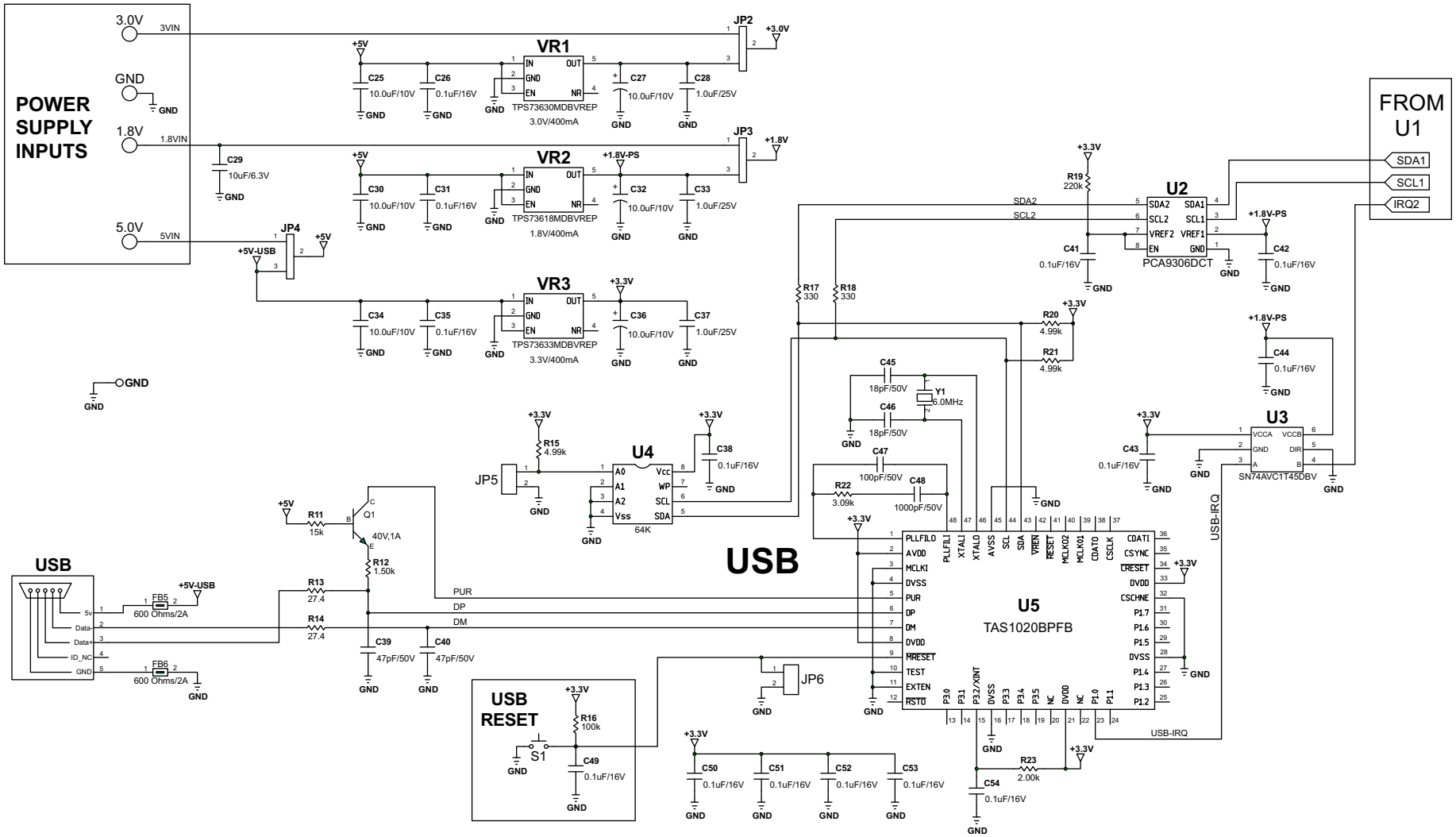


Figure 2. TPA6166A2EVM Schematic

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7 Operation

This section describes how to operate the TPA6166A2EVM.

7.1 Summary of Operation Instructions

Follow the procedures below to quickly set up the TPA6166A2EVM and begin evaluation (upon connecting to the USB):

1. Install the GUI. Use a PC running Microsoft® Windows® XP or higher. See Section 7.2 for details.
2. Connect the EVM to the PC and power up the EVM. Use a micro-USB cable. See Section 7.3 for details.
3. Run the GUI.
4. Connect inputs and outputs. See Section 7.4 for details.
5. Plug in a supported accessory. See Section 7.5 for details.
6. Use the GUI to control the evaluation. See Section 7.6 for details.

7.2 Install and Run the Graphical User Interface

Download the PurePath™ Console from www.ti.com. Once the PurePath Console is installed, select the TPA6166A2 plugin to start the GUI. The front panel of the GUI looks like Figure 3. Refer to Section 7.6 for a detailed description of the GUI. Connect the EVM before running the GUI.

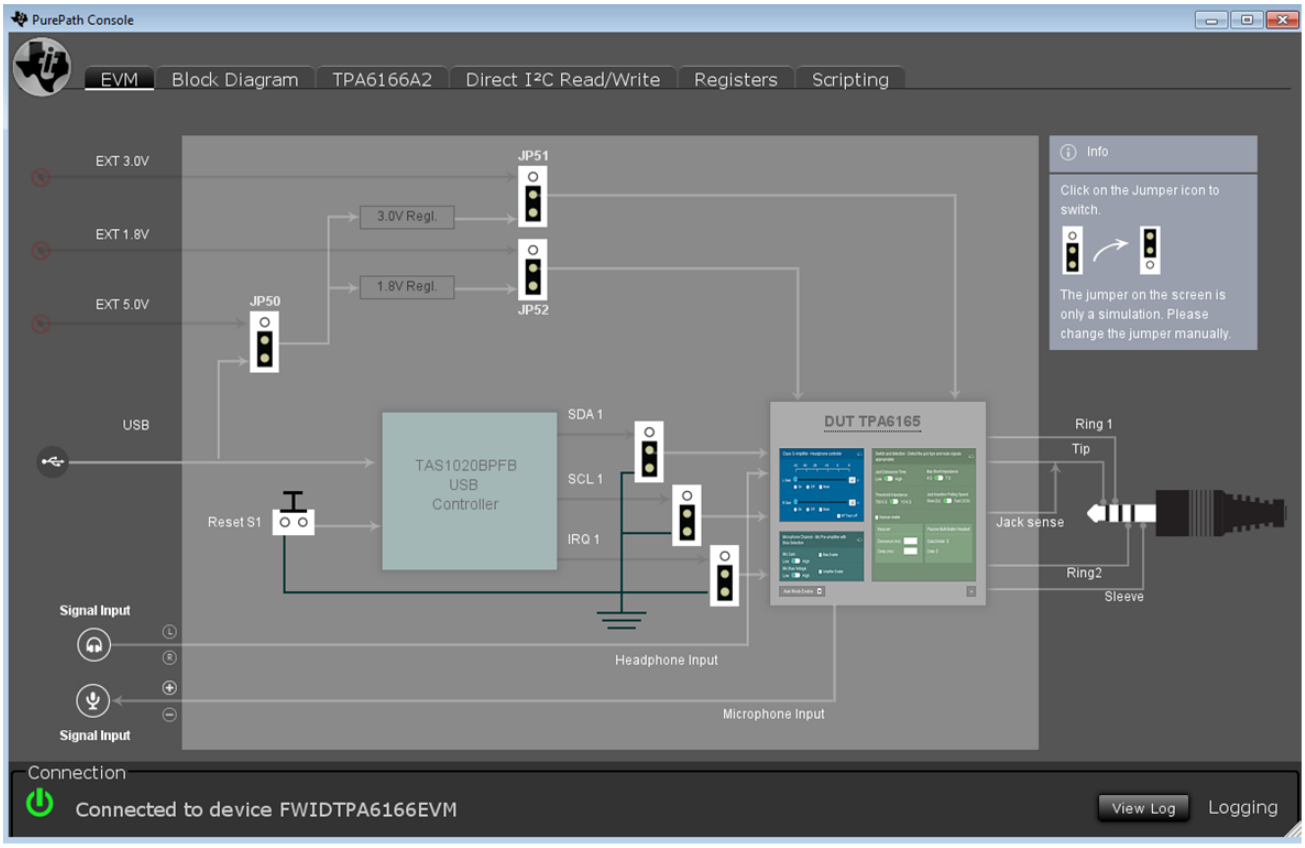


Figure 3. PurePath Console

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7.3 EVM Connections and Power Up

The EVM is configured to power up from the USB by default. If the EVM is not in this mode, ensure that jumpers are inserted between the middle pin and the *USB* pin of the following jumpers: JP2, JP3 and JP4. Then, using a micro-USB cable, connect the EVM to a PC running Windows XP or higher.

The EVM powers itself from the USB (5.0 V) and generates 3.0-V and 1.8-V supplies for the TPA6166A2 using on-board voltage regulators as well as a 3.3 V for the TAS1020B chip which is used to convert USB to I^2C and vice versa.

Alternatively, to power the TPA6166A2 using external power supplies, use the jumper settings in Table 2. It is not possible to power the TAS1020B chip from an external 3.3-V supply.

Table 2. TPA6166A2 Jumper Settings

Jumper	Connect Middle Pin To	Function
JP4	*5.0-V* pin of jumper	Use external 5.0-V supply instead of USB power
JP2	*3.0-V* pin of jumper	Use external 3.0-V supply instead of 3.0 V from on-board regulator
JP3	*1.8-V* pin of jumper	Use external 1.8-V supply instead of 1.8 V from on-board regulator

Once the USB cable is connected to the PC, the I^2C status indicator in the bottom half of the GUI should turn green as shown in Figure 4.

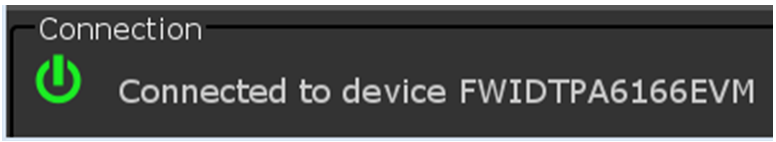


Figure 4. Established I^2C Connection (Shown with Green Indicator Light)

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7.4 Input and Output Connections

7.4.1 Headphone Input

For headphone amplifier evaluation, connect the left and right signal sources to HPINL (black) and HPINR (red) RCA input connectors on the EVM.

7.4.2 Microphone Output

For microphone pre-amp and mic-bias evaluation, connect the microphone output available on the MICOUT (black) RCA connector to the measurement equipment or external amplifier system.

7.4.3 I^2C Connection

By default, pins SDA and SCL of the TPA6166A2 are driven by the on-board TAS1020B which is controlled by the GUI running on the PC through the USB. If the EVM is not in this default mode, insert jumpers between the middle-pin and *USB* pin of the following jumpers: SDA, SCL.

To use an external I^2C master instead of the on-board TAS1020B, remove the jumpers between the middle-pin and *USB* pin of jumpers SDA and SCL and connect the external I^2C signals between the middle-pin and GND of jumpers SDA and SCL. Ensure that SDA and SCL are not swapped. Ensure that the I^2C master does not have pull up resistors or that the I^2C master's pull-up resistors pull up SDA and SCL to 1.8 V. Voltages greater than 1.8 V may cause device damage.

7.4.4 IRQ Connection

By default, the $\overline{IRQ}$ pin of the TPA6166A2 is connected to the on-board TAS1020B which is controlled by the GUI running on the PC through the USB. If the EVM is not in this default mode, insert a jumper between the middle-pin and the *USB* pin of the IRQ jumper.

To stop the $\overline{IRQ}$ signal from going to the on-board TAS1020B and to process it using an external device, remove the jumper between the middle-pin and the *USB* pin of jumper IRQ, and connect the middle-pin and GND of jumper IRQ to the external device. Ensure that $\overline{IRQ}$ does not have pull-up resistors or that the I^2C master's pull-up resistors pull up $\overline{IRQ}$ to 1.8 V. Voltages greater than 1.8 V may cause device damage.

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7.5 Plug In a Supported Accessory

Connect a supported accessory to the 3.5-mm jack J1. For a list of supported accessories, refer to the TPA6166A2 data sheet (SLAS997) under *Accessory detection*. As soon as the accessory is inserted, the GUI should indicate the type of accessory inserted.

7.6 PurePath Console GUI Evaluation

Use the PurePath Console GUI to control the device during evaluation. This section gives a short description of the main features of the GUI.

The GUI window consists of the following tabs: *EVM*, *Block Diagram*, *TPA6166A2*, *Direct I2C Read/Write*, *Registers*, and *Scripting*.

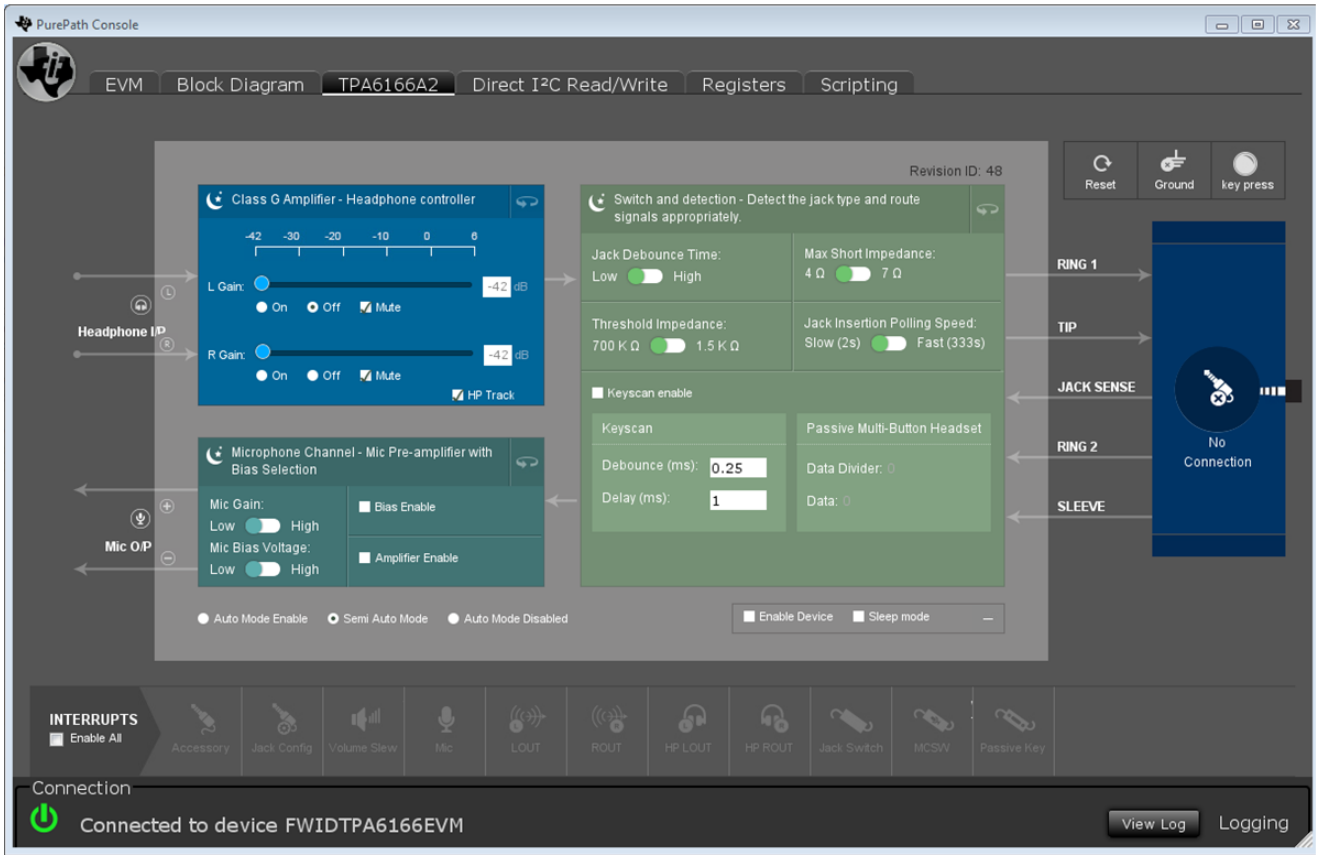


Figure 5. TPA6166A2 Panel Details

8 Device Evaluation Options

8.1 Current Measurement Connections

One or both of the jumpers JP2 and JP3 can be removed and current meters can be installed to measure TPA6166A2 current consumption

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9 EVM Assembly Drawings and PCB Layout

Figure 6 through Figure 11 illustrate the TPA6166A2EVM assembly drawings and PCB layout.

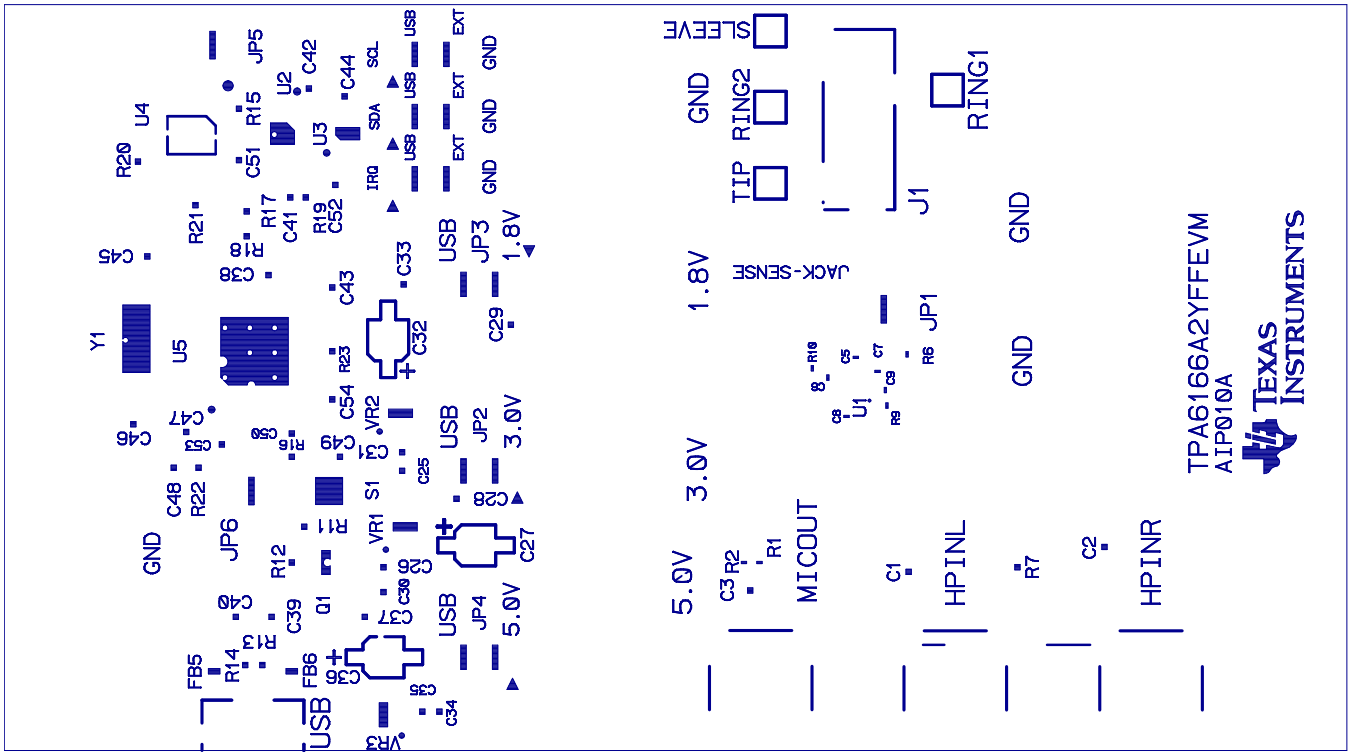


Figure 6. TPA6166A2EVM Silk Screen Top Layer

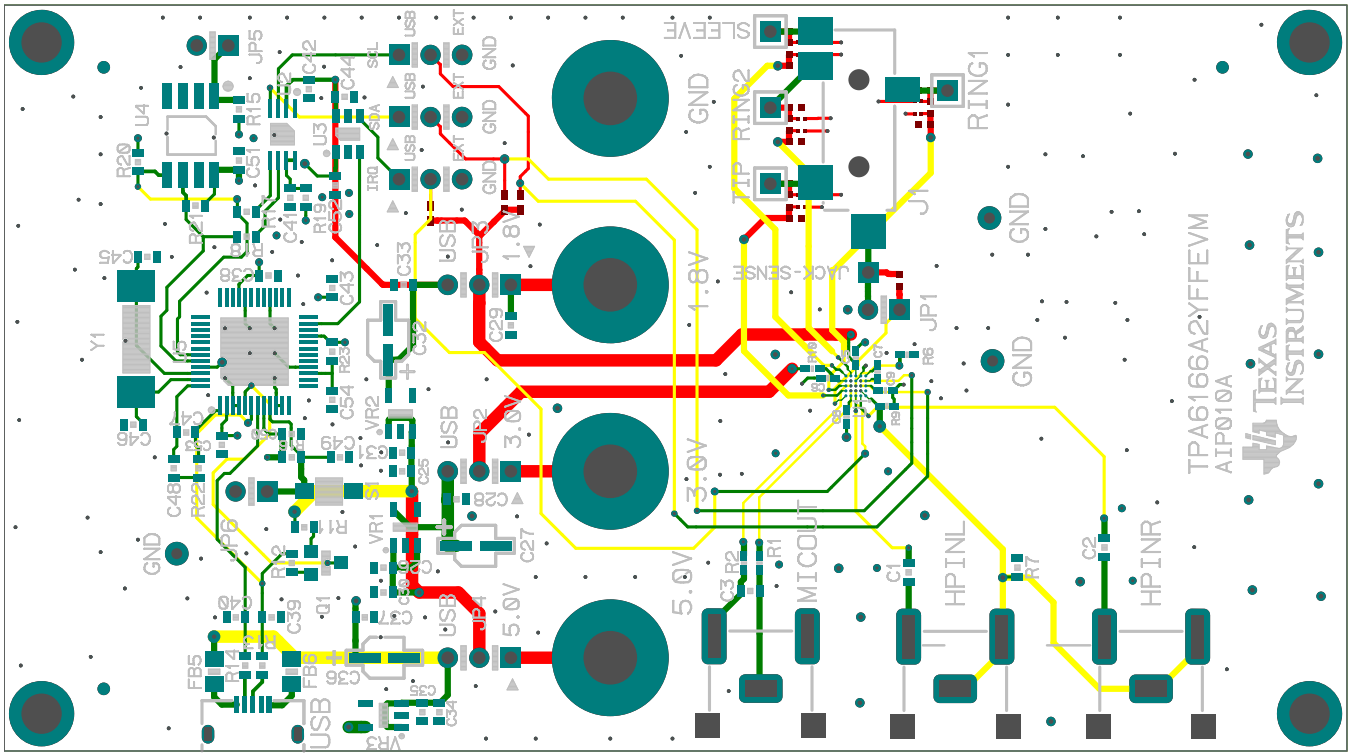


Figure 7. TPA6166A2EVM X-Ray Silk Screen Layer

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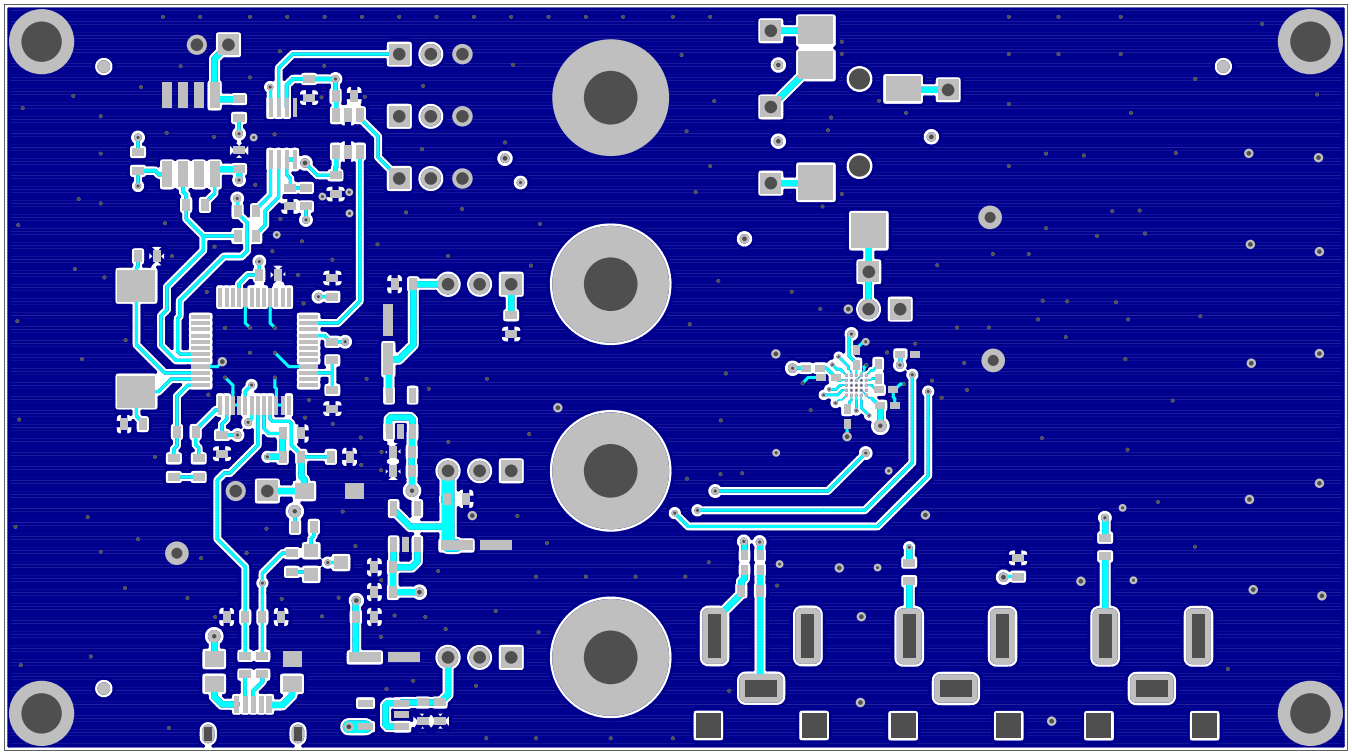


Figure 8. TPA6166A2EVM Top Copper

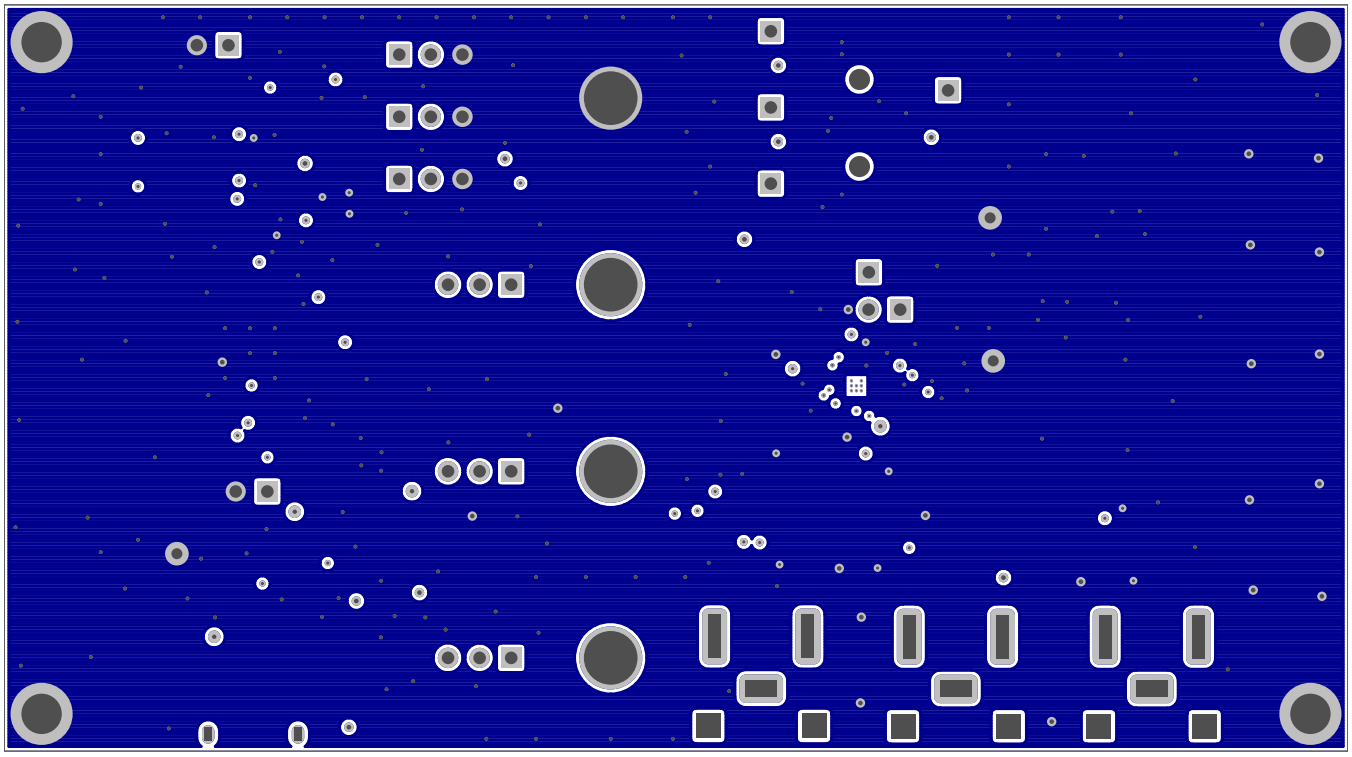


Figure 9. TPA6166A2EVM Copper Layer 2

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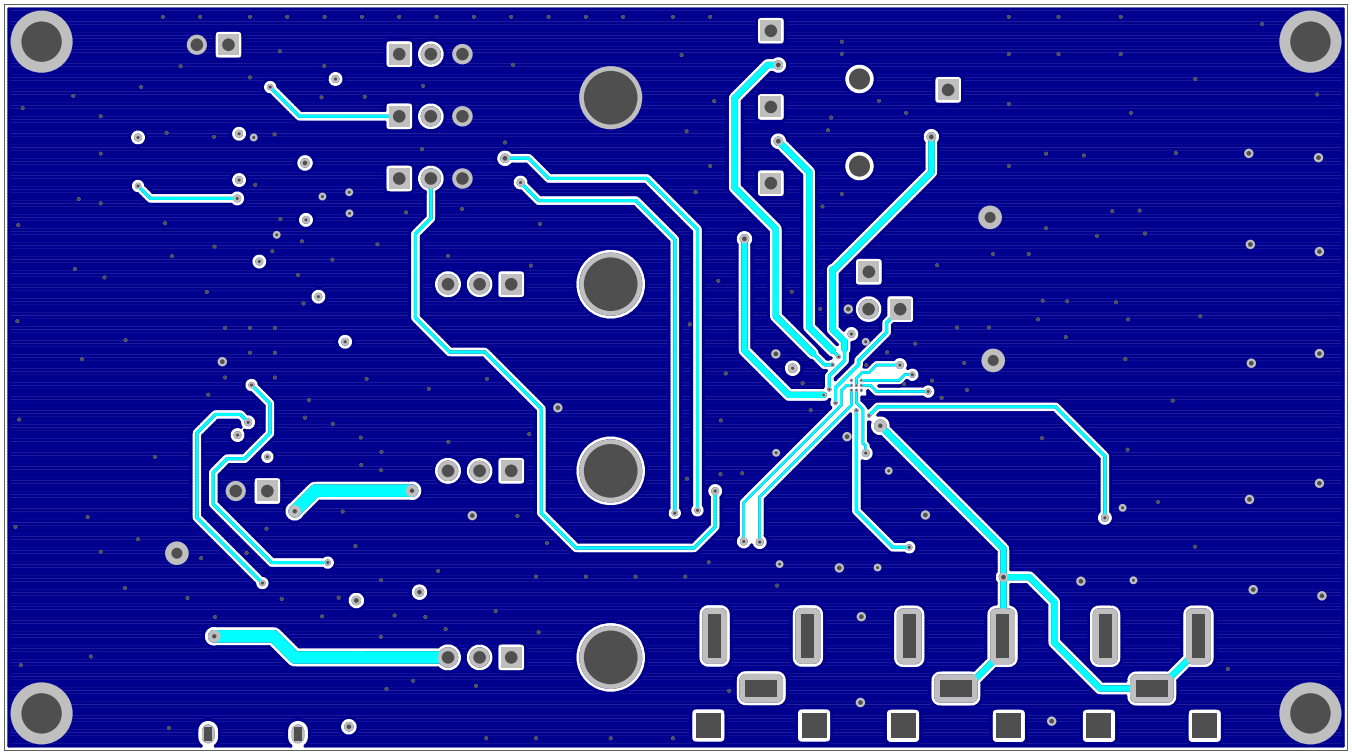


Figure 10. TPA6166A2EVM Copper Layer 3

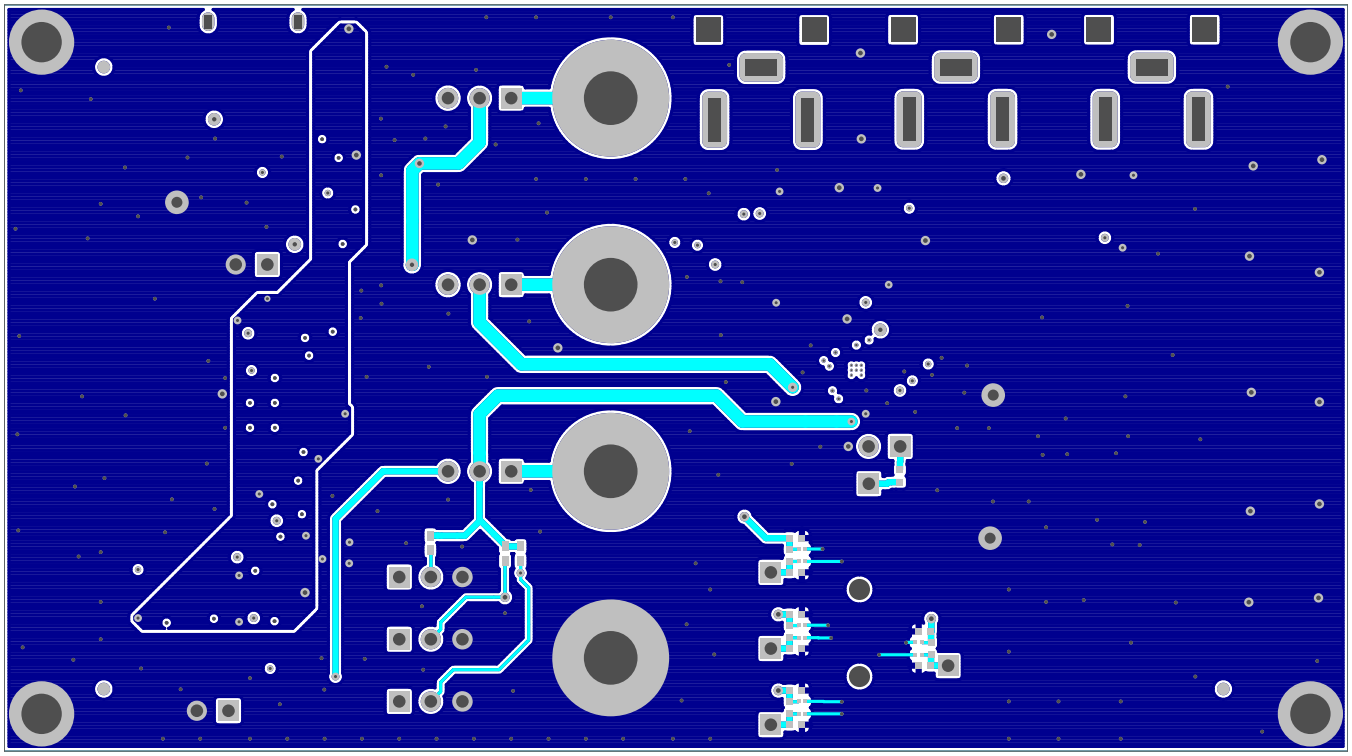


Figure 11. TPA6166A2EVM Bottom Copper

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10 List of Materials

Table 3 lists the BOM for the TPA6166A2EVM.

Table 3. TPA6166A2EVM List of Materials

Item	MFG Part Number	MFG	Qty	Ref Designators	Description
1	TPA6166A2YFF	TEXAS INSTRUMENTS	1	U1	3.5mm JACK DETECT AND HEADSET INTERFACE IC WCSP25-YFF ROHS
2	PCA9306DCTR	TEXAS INSTRUMENTS	1	U2	DUAL BIDIR I2C BUS AND SMBUS VOLT LEVEL TRANS SSOP8-DCT ROHS
3	SN74AVC1T45DBVR	TEXAS INSTRUMENTS	1	U3	1BIT DUAL SUPPLY XCVR W/CONFIG VOLTAGE SOT23-DBV6 ROHS
4	24LC64-I/SN	MICROCHIP	1	U4	64K I2C SERIAL EEPROM SOP8-D ROHS
5	TAS1020BPFB	TEXAS INSTRUMENTS	1	U5	USB STREAMING CONTROLLER TQFP48-PFB ROHS
6	TPS73630MDBVREP	TEXAS INSTRUMENTS	1	VR1	VOLT REG 3.0V 400MA LDO CAP FREE NMOS SOT23-DBV5 ROHS
7	TPS73618MDBVREP	TEXAS INSTRUMENTS	1	VR2	VOLT REG 1.8V 400MA LDO CAP FREE NMOS SOT23-DBV5 ROHS
8	TPS73633MDBVREP	TEXAS INSTRUMENTS	1	VR3	VOLT REG 3.3V 400MA LDO CAP FREE NMOS SOT23-DBV5 ROHS
9	MMBT2222A-7-F	DIODES INC.	1	Q1	TRANSISTOR NPN GENERAL PURPOSE 40V 1A SOT23 DBV3 ROHS
10	FQ1045A-6.000	FOX	1	Y1	CRYSTAL SMT 6.0MHz 30ppm FQ1045A ROHS
11	0603YD474KAT2A	AVX	2	C1, C2	CAP SMD0603 CERM 0.47UFD 16V 10% X5R ROHS
12	GRM188R71H472KA01D	MURATA	1	C3	CAP SMD0603 CERM 4700PFD 50V 10% X7R ROHS
13	GRM0335C1H100JA01D	MURATA	0	C4, C10, C11, C20, C21, C22, C23, C24	CAP SMD0201 CERM 10pF 50V NPO 5% ROHS
14	C1005X5R1A225K	TDK CORP	1	C5	CAP SMD0402 CERM 2.2UFD 10V 10% X5R ROHS
15	C1005X5R1A105K	TDK CORP	4	C6, C7, C8, C9	CAP SMD0402 CERM 1.0UFD 10V 10% X5R ROHS
16	GRM1555C1H330JA01D	MURATA	8	C12, C13, C14, C15, C16, C17, C18, C19	CAP SMD0402 CERM 33PFD 5% 50V COG ROHS
17	LMK107BJ106MALTD	TAIYO YUDEN	3	C25, C30, C34	CAP SMD0603 CERM 10.0UFD 10V 20% X5R ROHS
18	GRM188R71C104KA01D	MURATA	14	C26, C31, C35, C38, C41, C42, C43, C44, C49, C50, C51, C52, C53, C54	CAP SMD0603 CERM 0.1UFD 16V 10% X7R ROHS
19	AVE106M16A12T-F	CORNELL DUBILIER	3	C27, C32, C36	CAP ALUM-ELECT SMD-AVE TYPE A 10UFD 16V 20% ROHS
20	TMK107BJ105KA-T	TAIYO YUDEN	3	C28, C33, C37	CAP SMD0603 CERM 1.0UFD 25V 10% X5R ROHS
21	GRM188R60J106ME47D	MURATA	1	C29	CAP SMD0603 CERM 10UFD 6.3V 20% X5R ROHS
22	GRM1885C1H470JA01D	MURATA	2	C39, C40	CAP SMD0603 CERM 47PFD 50V 5% COG ROHS
23	C1608C0G1H180J	TDK CORP.	2	C45, C46	CAP SMD0603 CERM 18PFD 50V 5% COG ROHS
24	GRM1885C1H101JA01D	MURATA	1	C47	CAP SMD0603 CERM 100PFD 50V 5% COG ROHS
25	C1608C0G1H102J	TDK CORP.	1	C48	CAP SMD0603 CERM 1000PFD 50V 5% COG ROHS
26	ERJ-2GEJ102X	PANASONIC	2	R1, R2	RESISTOR SMD0402 1.0K OHMS 5% THICK FILM 1/16W ROHS
27	CRCW04022K70JNED	VISHAY	2	R3, R4	RESISTOR SMD0402 2.7K OHMS 5% THICK FILM 1/16W ROHS
28	ERJ-2GEJ104	PANASONIC	1	R5	RESISTOR SMD0402 THICK FILM 100K OHMS 1/16W 5% ROHS
29	RMCF0402ZT0R00	STACKPOLE ELECTRONICS	3	R6, R8, R10	ZERO OHM JUMPER SMT 0402 0 OHM 1/16W,5% ROHS
30	ERJ-3GEY0R00V	PANASONIC	1	R7	RESISTOR SMD0603 0.0 OHM 5% THICK FILM 1/10W ROHS
31	RMCF0402ZT0R00	STACKPOLE ELECTRONICS	0	R9	ZERO OHM JUMPER SMT 0402 0 OHM 1/16W,5% ROHS
32	ERJ-3GEYJ153V	PANASONIC	1	R11	RESISTOR SMD0603 15K OHM 5% THICK FILM 1/10W ROHS
33	ERJ-3EKF1501V	PANASONIC	1	R12	RESISTOR SMD0603 1.50K OHM 1% THICK FILM 1/10W ROHS
34	CRCW060327R4FKEA	VISHAY	2	R13, R14	RESISTOR SMD0603 27.4 OHM 1/10W 1% ROHS
35	ERJ-3EKF4991V	PANASONIC	3	R15, R20, R21	RESISTOR SMD0603 4.99K OHM 1% THICK FILM 1/10W ROHS
36	RMCF0603JT100K	STACKPOLE ELECTRONICS	1	R16	RESISTOR SMD0603 100K OHMS 5% 1/10W ROHS

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Table 3. TPA6166A2EVM List of Materials (continued)

Item	MFG Part Number	MFG	Qty	Ref Designators	Description
37	ERJ-3GEYJ331V	PANASONIC	2	R17, R18	RESISTOR SMD0603 330 OHMS 5% 1/10W ROHS
38	ERJ-3EKF2203V	PANASONIC	1	R19	RESISTOR SMD0603 220K 1% THICK FILM 1/10W ROHS
39	ERJ-3EKF3091V	PANASONIC	1	R22	RESISTOR SMD0603 3.09K OHM 1% THICK FILM 1/10W ROHS
40	RMCF0603FT2K00	STACKPOLE ELECTRONICS	1	R23	RESISTOR SMD0603 2.00K OHMS 1% 1/10W ROHS
41	MPZ1005S121C	TDK	4	FB1, FB2, FB3, FB4	FERRITE BEAD, 120 Ohms 1.2A 100MHz SM0402 ROHS
42	MPZ2012S601A	TDK	2	FB5, FB6	FERRITE BEAD SMD0805 600 Ohms 2A ROHS
43	SJ-43515TS-SMT	CUI STACK	1	J1	JACK AUDIO-STEREO MINI(3.5MM 3-COND SMT-RA ROHS
44	PBC02SAAN	SULLINS	3	JP1, JP5, JP6	HEADER THRU MALE 2 PIN 100LS 120 TAIL GOLD ROHS
45	PBC03SAAN	SULLINS	6	IRQ, JP2, JP3, JP4, SCL, SDA	HEADER THRU MALE 3 PIN 100LS 120 TAIL GOLD ROHS
46	PBC01SAAN	SULLINS	5	TIP, RING1, RING2, SLEEVE, JACK-SENSE	HEADER THRU MALE 1 PIN GOLD ROHS
47	PJRAN1X1U01X	SWITCHCRAFT	2	HPINL, MICOUT	JACK, RCA 3-PIN PCB-RA BLACK ROHS
48	PJRAN1X1U03X	SWITCHCRAFT	1	HPINR	JACK, RCA 3-PIN PCB-RA RED ROHS
49	ZX62WD1-B-5PC	HIROSE	1	USB	JACK USB FEMALE TYPEB MICRO SMT-RA 5PIN ROHS
50	5001	KEYSTONE ELECTRONICS	3	GNDx3	PC TESTPOINT, BLACK, ROHS
51	TL1015AF160QG	E-SWITCH	1	S1	SWITCH, MOM, 160G SMT 4X3MM ROHS
52	3760-2	POMONA	3	1.8V, 3.0V, 5.0V	BINDING POST, RED 60V/15A TIN ROHS
53	3760-0	POMONA	1	GND	BINDING POST, BLACK 60V/15A TIN ROHS
54	24434	KEYSTONE ELECTRONICS	4	STANDOFFS	Standoff, Hex, 12mm, M3, Aluminum
56	MPMS 003 0005 PH	BUILDING FASTENER	4	STANDOFF SCREWS	MACHINE SCREW PAN PHILLIPS M3
57	969102-0000-DA	3M	6	IRQ, JP2, JP3, JP4, SCL, SDA	SHUNT BLACK AU FLASH 0.100LS OPEN TOP ROHS
		TOTAL	125		
	Special Notes to this Bill of Materials				
	SN1	These assemblies are ESD sensitive, observe ESD precautions.			
	SN2	These assemblies must be clean and free from flux and all contaminants. Use of no-clean flux is not acceptable.			
	SN3	These assemblies must comply with workmanship standards IPC-A-610 Class 2.			
	SN4	Ref designators marked with an asterisk ('**') cannot be substituted. All other components can be substituted with equivalent MFG's components.			

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11 Related Documentation from Texas Instruments

Refer to the following related documentation for more information about the TPA6166A2:

TPA6166A2 data sheet, SLAS997.

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6. User assumes all responsibility, obligation, and any corresponding liability for proper and safe handling and use of EVMs.
7. Should any EVM not meet the specifications indicated in the user's guide or other documentation accompanying such EVM, the EVM may be returned to TI within 30 days from the date of delivery for a full refund. THE FOREGOING LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY TI TO USER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. TI SHALL NOT BE LIABLE TO USER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES RELATED TO THE HANDLING OR USE OF ANY EVM.
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9. User assumes sole responsibility to determine whether EVMs may be subject to any applicable federal, state, or local laws and regulatory requirements (including but not limited to U.S. Food and Drug Administration regulations, if applicable) related to its handling and use of EVMs and, if applicable, compliance in all respects with such laws and regulations.
10. User has sole responsibility to ensure the safety of any activities to be conducted by it and its employees, affiliates, contractors or designees, with respect to handling and using EVMs. Further, user is responsible to ensure that any interfaces (electronic and/or mechanical) between EVMs 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.
11. User shall employ reasonable safeguards to ensure that user's use of EVMs will not result in any property damage, injury or death, even if EVMs should fail to perform as described or expected.
12. User shall be solely responsible for proper disposal and recycling of EVMs consistent with all applicable federal, state, and local requirements.

Certain Instructions. User shall operate EVMs within TI's recommended specifications and environmental considerations per the user's guide, accompanying documentation, and any other applicable requirements. Exceeding the specified ratings (including but not limited to input and output voltage, current, power, and environmental ranges) for EVMs may cause property damage, personal injury or death. If there are questions concerning these ratings, 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 result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the applicable EVM user's 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, some circuit components may have case temperatures greater than 60°C as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using EVMs' schematics located in the applicable EVM user's guide. When placing measurement probes near EVMs during normal operation, please be aware that EVMs may become very warm. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use EVMs.

Agreement to Defend, Indemnify and Hold Harmless. User agrees to defend, indemnify, and hold TI, its directors, officers, employees, agents, representatives, affiliates, 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 and/or use of EVMs. User's indemnity shall apply whether Claims arise under law of tort or contract or any other legal theory, and even if EVMs fail to perform as described or expected.

Safety-Critical or Life-Critical Applications. If user intends to use EVMs in evaluations of safety critical applications (such as life support), and a failure of a TI product considered for purchase by user for use in user's product would reasonably be expected to cause severe personal injury or death such as devices which are classified as FDA Class III or similar classification, then user must specifically notify TI of such intent and enter into a separate Assurance and Indemnity Agreement.

RADIO FREQUENCY REGULATORY COMPLIANCE INFORMATION FOR EVALUATION MODULES

Texas Instruments Incorporated (TI) evaluation boards, kits, and/or modules (EVMs) and/or accompanying hardware that is marketed, sold, or loaned to users may or may not be subject to radio frequency regulations in specific countries.

General Statement for EVMs Not Including a Radio

For EVMs not including a radio and not subject to the U.S. Federal Communications Commission (FCC) or Industry Canada (IC) regulations, TI intends EVMs to be used only for engineering development, demonstration, or evaluation purposes. EVMs are not finished products typically fit for general consumer use. EVMs may nonetheless generate, use, or radiate radio frequency energy, but have not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or the ICES-003 rules. Operation of such EVMs may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

General Statement for EVMs including a radio

User Power/Frequency Use Obligations: For EVMs including a radio, the radio included in such EVMs is intended for development and/or professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability in such EVMs and their development application(s) must comply with local laws governing radio spectrum allocation and power limits for such EVMs. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by TI unless user has obtained appropriate experimental and/or development licenses from local regulatory authorities, which is the sole responsibility of the user, including its acceptable authorization.

U.S. Federal Communications Commission Compliance

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 could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

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 its own expense.

FCC Interference Statement for Class B EVM devices

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.

Industry Canada Compliance (English)

For EVMs Annotated as IC – INDUSTRY CANADA Compliant:

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.

Concerning EVMs Including Radio Transmitters

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.

Canada Industry Canada Compliance (French)

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

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.

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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Important Notice for Users of EVMs Considered "Radio Frequency Products" in Japan

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

If user uses EVMs in Japan, user is required by Radio Law of Japan to follow the instructions below with respect to EVMs:

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.

http://www.tij.co.jp

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In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI’s goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

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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