TAS5622-TAS5624DDVEVM

This user's guide provides specifications for the evaluation module (EVM) for TAS5622 and TAS5624 Digital Input Class-D Power Stages with the TAS5538 Digital Audio Processor with PWM Output from Texas Instruments. The user's guide also describes operation of the EVM and provides design information including schematic, bill of materials, and PCB layout.

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I^2C is a trademark of NXP B.V. Corp Netherlands.

1 Introduction

The TAS5622-TAS5624DDVEVM PurePath™ EVM demonstrates the current version of TAS5622DDV or TAS5624DDV integrated circuit power stage with TAS5538DGG from Texas Instruments (TI).

The TAS5622 and TAS5624 are high-performance, integrated Stereo Feedback Digital Amplifier Power Stages designed to drive 3Ω speakers at up to 200W per channel for TAS5624DDV and 165W per channel for TAS5622DDV. They require only a passive demodulation filter to deliver efficient high quality audio amplification.

TAS5538DGG is a high performance 32 bit (24 bit input) multi channel PurePath™ Digital Pulse Width Modulator (PWM) with fully symmetrical AD modulation scheme. The device also has Digital Audio Processing (DAP) that provides 48 bit signal processing, advanced performance and a high level of system integration.

This EVM can be configured as 2 BTL channels for stereo evaluation or 1 PBTL (parallel BTL) channel for subwoofer evaluation. Together with a TI Input-USB Board 3, it provides a complete stereo digital audio amplifier system which includes digital input (S/PDIF), analog inputs, interface to PC and DAP features like digital volume control, input and output mixers, automute, tone controls, loudness, EQ filters and dynamic range compression (DRC). There are configuration options for power stage failure protection.

NOTE: TAS5622-TAS5624DDVEVM IS SHIPPED WITH THE CURRENT VERSION OF TAS5624 INSTALLED. TO EVALUATE THE CURRENT VERSION OF TAS5622 PLEASE VISIT THE PRODUCT FOLDER AT www.ti.com AND REQUEST A FREE SAMPLE, AND REPLACE TAS5624 WITH TAS5622.

Table 1. TAS5622-TAS5624DDVEVM Specification

Key Parameters	Values
TAS5624 Power Supply Voltage	12 - 38 Vdc
TAS5622 Power Supply Voltage	12 - 34 Vdc
Number of Channels	2 x BTL or 1 x PBTL
Load Impedance BTL	3-8 Ohm
Load Impedance PBTL	1.5-4 Ohm
TAS5624 Output power BTL	200W / 3Ohm / 10%THD+N
TAS5624 Output power PBTL	400W / 1.5Ohm / 10%THD+N
TAS5622 Output power BTL	165W / 3Ohm / 10%THD+N
TAS5622 Output power PBTL	325W / 1.5Ohm / 10%THD+N
Dynamic Range (DNR)	>105 dB
PWM Processor	TAS5538DGG
Output Stage	TAS5624DDV or TAS5622DDV

NOTE: The heatsink in TAS5622-TAS5624DDVEVM is designed to comply with time requirements of the “Amplifier Rule”, US Federal Trade Commission 16 CFR 432, when the EVM is operated at power levels specified above. If continuous operation at specified output power is required it is necessary to provide forced air flow through the heatsink.

(The FTC regulation specifies operation in 25°C ambient temperature for one hour at 1/8 specified output power (25.0W per channel for TAS5624DDVEVM, 20.63W per channel for TAS5622DDVEVM) and then for 5 minutes at specified output power (200W per channel for TAS5624DDVEVM, 165W per channel for TAS5622DDVEVM). Then distortion vs. output power can be measured. TAS5622-TAS5624DDVEVM provides specified output power for several minutes or more without thermal shutdown. THD is not specified for this test but is typically near 10%.)

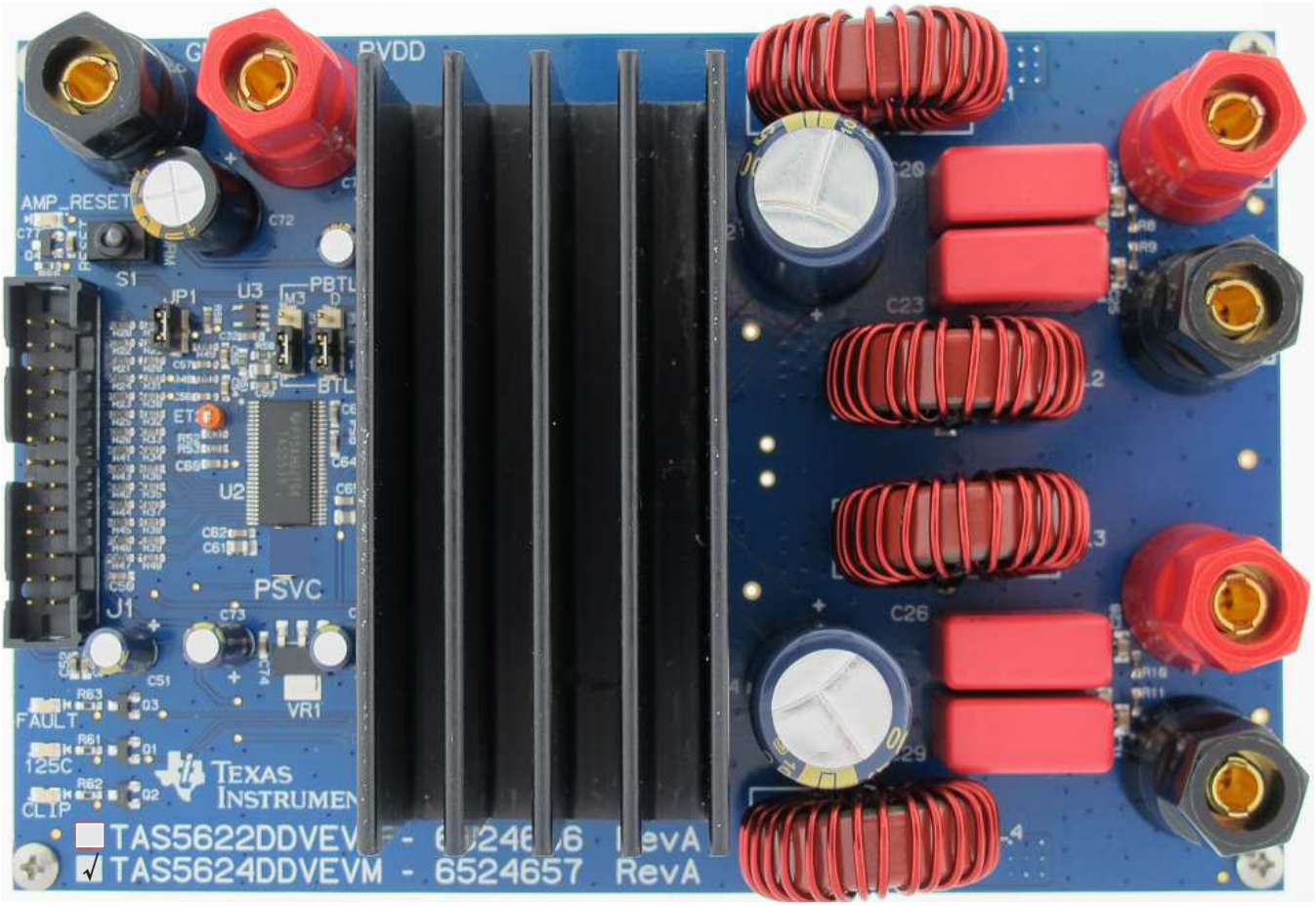


Figure 1. TAS5622-TAS5624DDVEVM

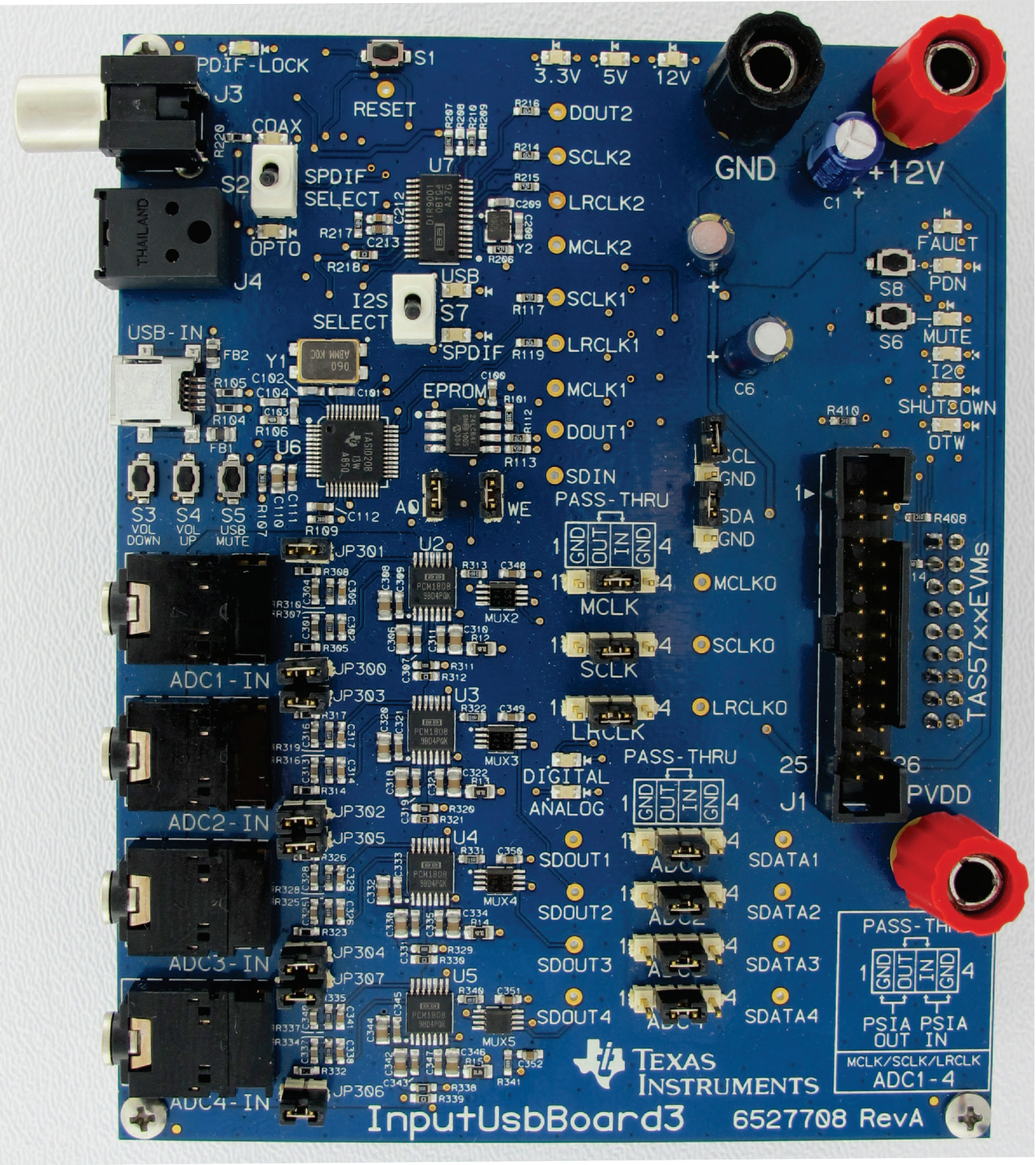


Figure 2. Input-USB Board3

Gerber (layout) files are available at: http://www.ti.com.

The EVM is delivered with cables and a TI Input-USB Board 3 to connect to an input source and to a PC for control. Refer to the section "Unpacking the EVM" below.

1.1 TAS5622-TAS5624DDVEVM Features

- Stereo PurePath Digital™ evaluation module.
- Self-contained protection system (overcurrent, overtemperature, undervoltage and missing PWM input).
- Standard I^2S and I^2C™ / Control connector for TI input board
- Double-sided plated-through PCB layout.

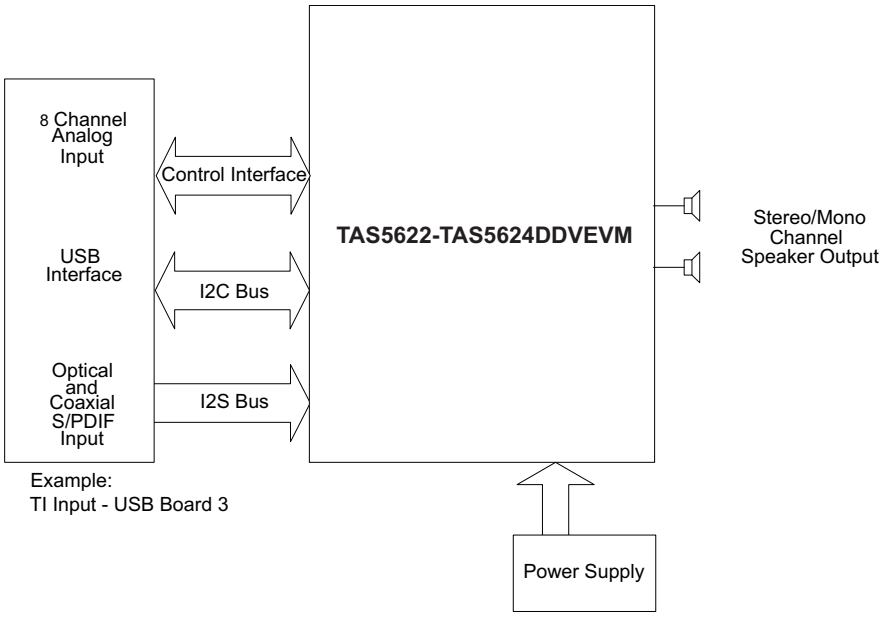


Figure 3. Integrated PurePath Digital™ Amplifier System

1.2 EVM Physical Structure

Physical structure of the TAS5622-TAS5624DDVEVM is illustrated in Figure 4.

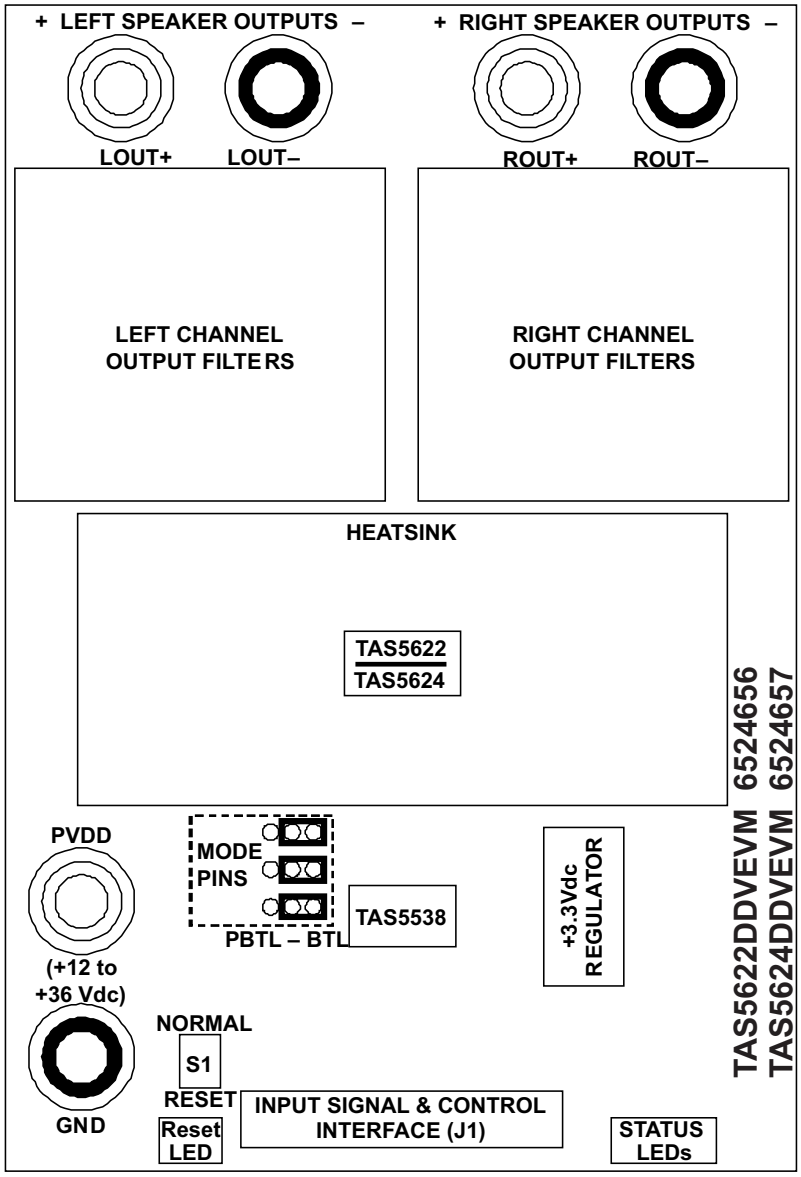


Figure 4. Physical Structure of the TAS5622-TAS5624DDVEVM (Approximate Layout)

2 Quick Setup Guide

This section describes the TAS5622-TAS5624DDVEVM power supplies and system interfaces. It provides information regarding handling and unpacking, absolute operating conditions, and switch and jumper positions. It also provides a step-by-step guide to setting up the TAS5622-TAS5624DDVEVM for device evaluation.

2.1 Electrostatic Discharge Warning

Many of the components of the TAS5622-TAS5624DDVEVM are susceptible to damage by electrostatic discharge (ESD). Customers are advised to observe proper ESD handling precautions when unpacking and handling the EVM, including the use of a grounded wrist strap at an approved ESD workstation.

CAUTION

Failure to observe ESD handling procedures can result in damage to EVM components.

2.2 Unpacking the EVM

Upon opening the TAS5622-TAS5624DDVEVM package, check to make sure that the following items are included:

- 1 pc. TAS5622-TAS5624DDVEVM using 1 TAS5538DGG and 1 TAS5622DDV or TAS5624DDV.
- 1 pc. TI Input-USB Board 3 for interfacing TAS5622-TAS5624DDVEVM to SPDIF/analog sources and PC for control.
- 1 pc. Signal and Control Interface IDC cable for connection to an I^2S front-end like the Input-USB Board 3.
- 1 pc. Cable for connecting Input-USB Board 3 to a USB port on a PC for TAS5538 control by software.
- If any of these items are missing, contact the nearest Texas Instruments Product Information Center to inquire about a replacement.

Connect the Input-USB Board 3 to the TAS5622/14LDDVEVM using the delivered IDC cable.

2.3 Power Supply Setup

2 power supplies are needed to power the TAS5622-TAS5624DDVEVM. Voltage and current requirements for the PVDD power supply are shown in the table below. Connect this power supply to the EVM using banana cables or wires secured to the power supply binding posts PVDD and GND. A second power supply, 12Vdc at 500mA, is required to power Input-USB Board 3. Connect the 12V power supply to the Input-USB Board 3 using banana cables or wires secured to the power supply binding posts +12V and GND.

Table 2. Recommended PVDD Power Supply Voltages

Description	Voltage Range	Current Requirements	Binding Post
TAS5624 Power Supply Voltage	12 - 38 Vdc	20 A	PVDD
TAS5622 Power Supply Voltage	12 - 34 Vdc	18 A	PVDD

CAUTION

NOTE: Applying voltages above specifications in Table 2 can cause permanent damage to the hardware. Verify polarity of power supply connections before powering the EVM.

NOTE: The length of the power supply cable must be minimized. Increasing length of PSU cable is likely to increase distortion for the amplifier at high output levels and low frequencies.

2.4 Speaker Connection

CAUTION

Both positive and negative speaker outputs are floating and cannot be connected to ground (e.g. through an oscilloscope). To measure a BTL output connect an oscilloscope probe to each side of the output, connect both ground clips to EVM ground and use the oscilloscope math functions to show the difference between the 2 probe signals.

2.5 Output Configuration BTL and PBTL

When changing mode from BTL to PBTL, make sure that the AMP_RESET switch is set to RESET before changing shunts on Mode headers M3, D and C.

- For BTL mode place a shunt on pins 1 and 2 of each header, at the positions marked BTL.
- For PBTL mode place a shunt on pins 3 and 2 of each header, at the positions marked PBTL.

In PBTL mode the load must be connected according to Figure 5:

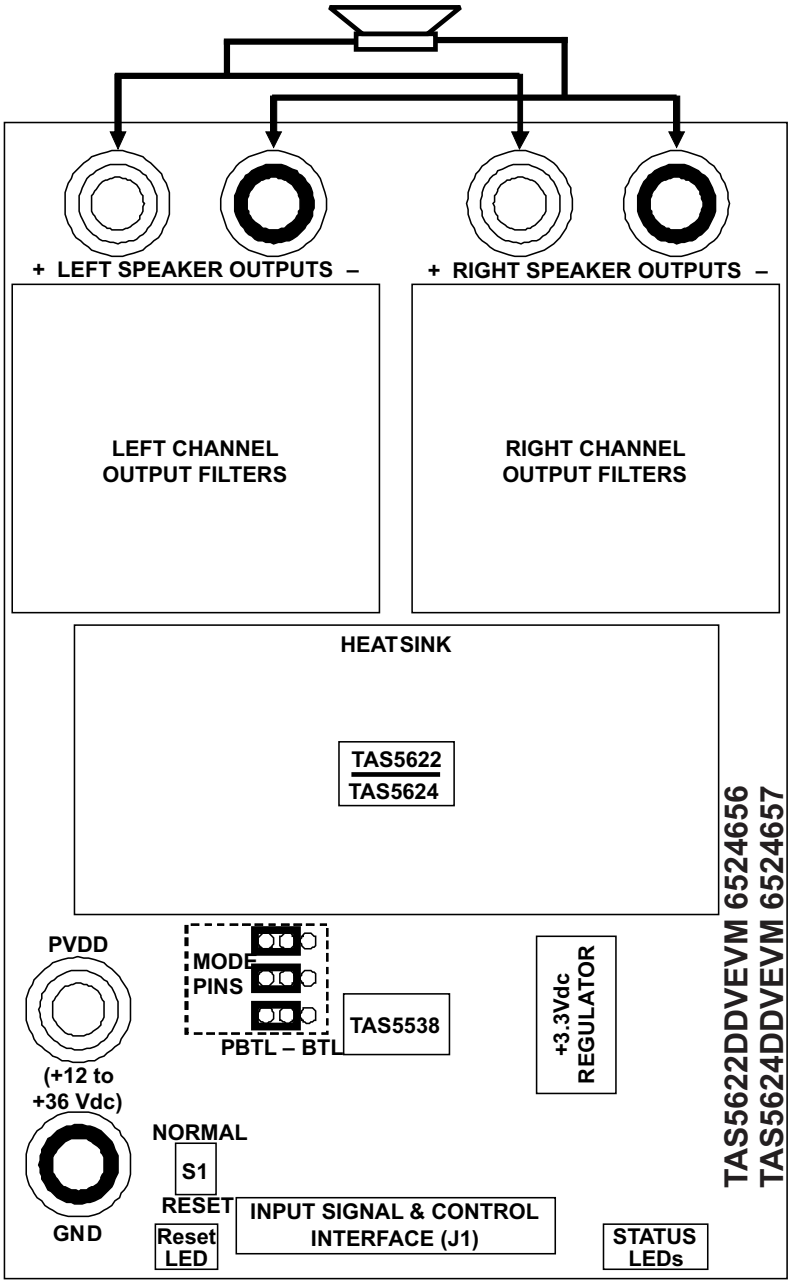


Figure 5. PBTL Mode Configuration

2.6 GUI Software Installation and EVM Startup

The TAS5622-TAS5624DDVEVM is controlled by the Input-USB Board 3 with the TAS5538 GUI. The TAS5538 GUI provides control of all registers in TAS5538. Download the current version of the GUI zip file "TAS5538_xxxx.zip" from the TAS5622DDVEVM folder or the TAS5624DDVEVM folder on http://www.ti.com to a convenient location on the host PC. Create a new folder at a convenient location and extract the files from the zip file to the new folder. Be sure to check the box labeled “Use folder names” during extraction. Then connect the USB cable between the host PC and jack USB-IN on the Input-USB Board 3. Then turn on the 12V power supply and the PVDD power supply in that order.

Start the GUI by opening "TAS55XX_GUI.exe" in the new folder. Startup will take a few seconds and the following window will open.

Click CONNECT and then READ, to verify that the data in register **0x00** read **6C**.

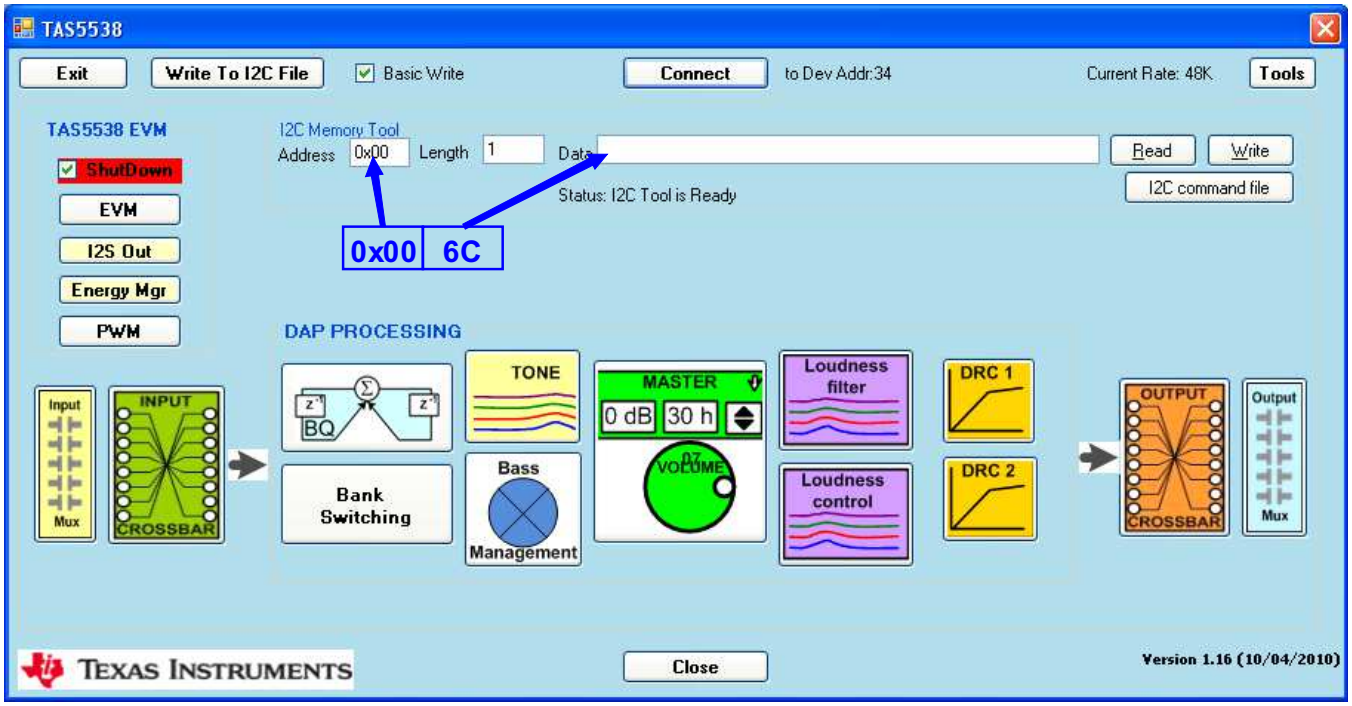


Figure 6. TAS5538 GUI Window

NOTE: If the address that is read is not **6C**, make sure the USB is connected to the PC and check for HID enumeration.

– Open the PC device manager. Right-click My Computer on desktop and open Properties, then Hardware, then Device Manager.

– Expand "Human Interface Devices".

– Plug and unplug the USB cable from Input-USB Board 3 and confirm that an HID icon appears.

Uncheck "ShutDown" and click the "Master Volume" icon to open the following window.

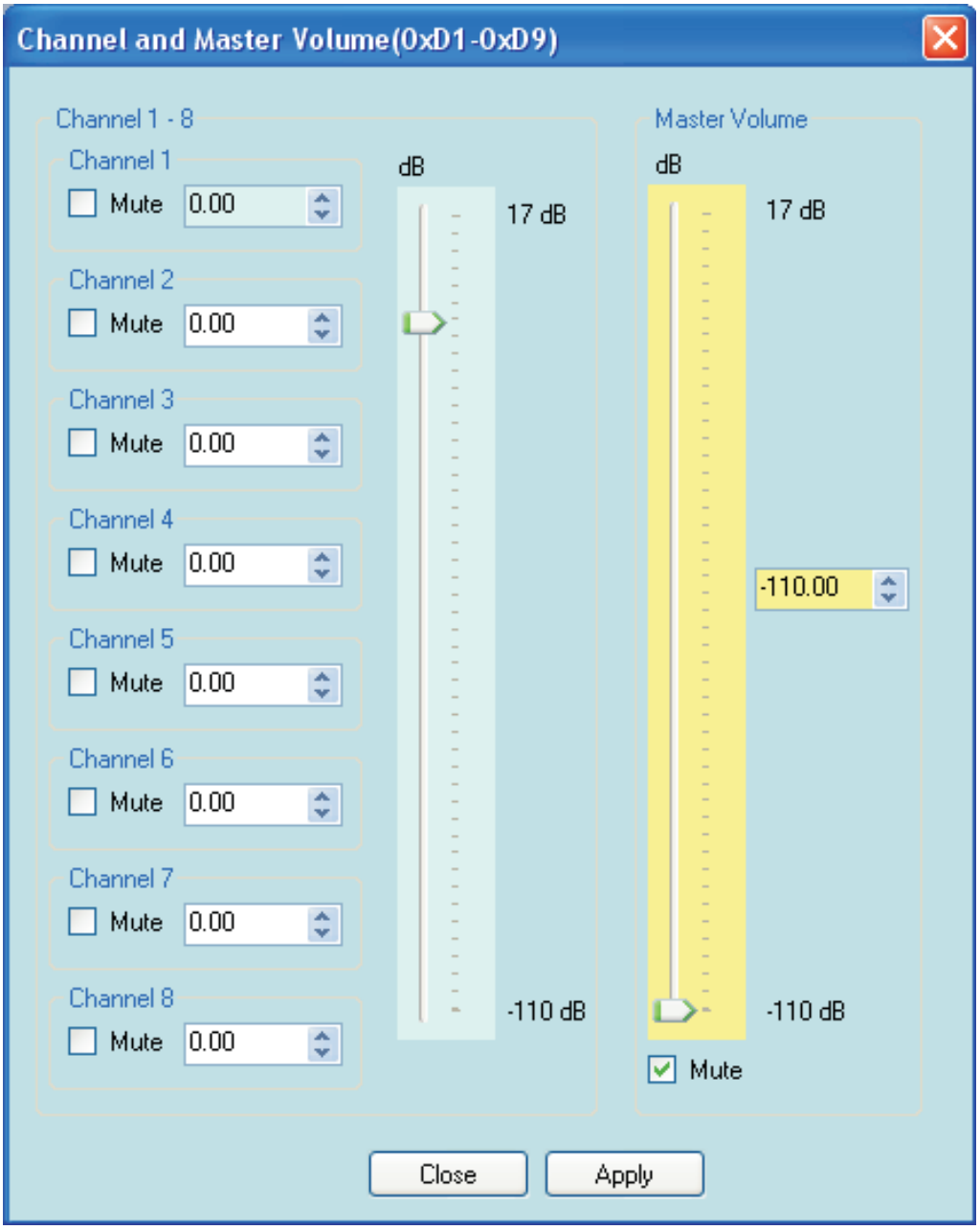


Figure 7. Channel and Master Volume GUI

Uncheck mute and increase volume to the desired level, and close the window. Then press the MUTE switch on Input-USB Board 3 to extinguish the MUTE LED. The EVM should now operate.

NOTE: In some cases when power is cycled on the DUT or Input-USB Board 3 but the GUI is not closed, it will be necessary to take an action like checking and unchecking mute to force I2C communication to refresh TAS5538. In some cases the startup process must be repeated.

An SPDIF input may be provided to Input-USB Board 3 by coax to jack COAX or by optical connection to jack OPTO. Alternatively an analog input may be connected to jack ADC1_IN. An analog input will override an SPDIF input.

2.7 Self-Protection and Fault Reporting

The TAS5622 and TAS5624 are self-protecting devices that provide overtemperature, overcurrent, undervoltage and missing-PWM-input protection, with extensive fault reporting. For full descriptions of these functions consult data sheet SLAS845 for TAS5622A and data sheet SLAS844 for TAS5624A.

3 Related Documentation from Texas Instruments

The following table lists data sheets that provide detailed descriptions of integrated circuits from TI that are used in the TAS5622-TAS5624DDVEVM. These data sheets can be obtained at http://www.ti.com.

Table 3. Related Documentation from Texas Instruments

Part Number	Literature Number
TAS5538	SLES255
TAS5622A	SLAS845
TAS5624A	SLAS844
TPS3825-33	SLVS165
TLV1117-33C	SLVS561

3.1 Additional Documentation

1. *System Design Considerations for True Digital Audio Power Amplifiers* (SLAA117)
2. *Digital Audio Measurements* (SLAA114)
3. *PSRR for PurePath Digital Audio Amplifiers* (SLEA049)
4. *Power Rating in Audio Amplifier* (SLEA047)
5. *PurePath Digital AM Interference Avoidance* (SLEA040)
6. *Click & Pop Measurements Technique* (SLEA044)
7. *Power Supply Recommendations for DVD-Receivers* (SLEA027)
8. *Implementation of Power Supply Volume Control* (SLEA038)

Appendix A Design Information

This appendix includes design information for the TAS5622-TAS5624DDVEVM. This information is presented in the following order.

- Table 4 EVM Bill of Materials
- Section A.1 EVM Custom Component Vendors
- Section A.2 TAS5622-TAS5624LDDVEVM PCB Specification
- Section A.3 EVM PCB Layers
- Section A.4 EVM and Input-USB Board 3 Schematics

Table 4. Bill of Materials for TAS5624DDVEVM

Manu Part No.	Qty	Ref Des	Vendor Part No.	Description	Vendor	Manu
TI-SEMICONDUCTORS						
TAS5624DDV	1	U1	TAS5624DDV	150W-STEREO/300W-MONO PUREPATH DIGITAL AMP HTSSOP44-DDV ROHS	Texas Instruments	Texas Instruments
TAS5538DGG	1	U2	TAS5538DGG	8 CHANNEL HD COMPATIBLE AUDIO PROCESSOR TSSOP56-DGG ROHS	Texas Instruments	Texas Instruments
TPS3825-33DBVT	1	U3	296-2636-1	PROCESSOR SUPERVISORY CIRCUITS 2.93V 200ms SOT23-DBV5 ROHS	Digi-Key	Texas Instruments
TLV1117-33CDCYR	1	VR1	296-21112-1-ND	VOLT REG LDO 3.3V 800mA SOT223-DCY ROHS	Digi-Key	Texas Instruments
SEMICONDUCTORS						
2N7002	4	Q1, Q2, Q3, Q4	2N7002NCT	N-FET 60V 115mA 200mW 7.5 OHM@10V SOT23-DBV3 ROHS	Digi-Key	Fairchild
SML-LXT0805SRW-TR	3	125C, FAULT, AMP_RESET	67-1555-1	LED, RED 2.0V SMD0805 ROHS	Digi-Key	Lumex Opto
SML-LXT0805YW-TR	1	CLIP	67-1554-1	LED, YELLOW 2.0V SMD0805 ROHS	Digi-Key	Lumex Opto
CAPACITORS						
C1206C102K1RACTU	4	C21, C24, C27, C30	399-1222-1	CAP SMD1206 CERM 1000PFD 100V 1% C0G ROHS	Digi-Key	Kemet
GRM188R71H472KA01D	2	C54, C55	490-1506-1	CAP SMD0603 CERM 4700PFD 50V 10% X7R ROHS	Digi-Key	Murata
GRM21BR72A103KA01L	5	C22, C25, C28, C31, C70	490-1652-1	CAP SMD0805 CERM 0.01UFD 100V 10% X7R ROHS	Digi-Key	Murata
GRM188R71H333KA61D	4	C16, C17, C18, C19	490-3286-1-ND	CAP SMD0603 CERM 0.033UFD 50V 10% X7R ROHS	Digi-Key	Murata
GRM188R71C473KA01D	2	C56, C57	490-1529-1	CAP SMD0603 CERM 0.047UFD 16V 10% ROHS	Digi-Key	Murata
GRM188R71C104KA01D	17	C2, C3, C4, C7, C32, C50, C52, C53, C59, C60, C62, C63, C64, C65, C74, C76, C77	490-1532-1-ND	CAP SMD0603 CERM 0.1UFD 16V 10% X7R ROHS	Digi-Key	Murata
MKP4 -.68/250/20	4	C20, C23, C26, C29	MKP4 -0.68/250/20	CAP POLYPRO FILM MKP4 0.68UFD 250V 20% ROHS	WIMA	WIMA
C1608X7R1C105K	2	C5, C6	445-1604-1	CAP SMD0603 CERM 1.0UFD 16V 10% X7R ROHS	Digi-Key	TDK
GRM21BR71H105KA12L	5	C8, C9, C10, C11, C71	490-4736-1-ND	CAP SMD0805 CERM 1.0UFD 50V 10% X7R ROHS	Digi-Key	Murata
GRM21BR61C106KE15L	3	C58, C61, C66	490-3886-1	CAP SMD0805 CERM 10UFD 16V 10% X5R ROHS	Digi-Key	Murata
CAPACITORS						
EEU-FC1C470	4	C1, C51, C73, C75	P11196	CAP 47UFD 16V RAD ALUM ELEC FC ROHS	Digi-Key	Panasonic

Table 4. Bill of Materials for TAS5624DDVEVM (continued)

Manu Part No.	Qty	Ref Des	Vendor Part No.	Description	Vendor	Manu
UKZ1H470MPM	1	C72	493-3194	CAP ALUM ELEC KZ RADIAL 47UFD 50V 20% ROHS	Digi-Key	Nichicon
EEU-FC1H102	2	C12, C14	P10333-ND	CAP ALUM ELEC FC RADIAL 1000UFD 50V 20% ROHS	Digi-Key	Panasonic
RESISTORS						
RMCF0402ZT0R00	2	R12, R13	RMCF0402ZT0R00CT	ZERO OHM JUMPER SMT 0402 0 OHM 1/16W,5% ROHS	Digi-Key	Stackpole Electronics
ERJ-3GEY0R00V	1	R51	P0.0GCT	RESISTOR SMD0603 0.0 OHM 5% THICK FILM 1/10W ROHS	Digi-Key	Panasonic
ERJ-3GEYJ1R0V	1	R50	P1.0GCT	RESISTOR SMD0603 1.0 OHMS 1% THICK FILM 1/10W ROHS	Digi-Key	Panasonic
ERJ-3GEYJ3R3V	8	R1, R7, R8, R9, R10, R11, R14, R60	P3.3GCT	RESISTOR SMD0603 3.3 OHMS 5% 1/10W ROHS	Digi-Key	Panasonic
ERJ-3GEYJ470V	19	R27, R28, R29, R30, R31, R32, R33, R34, R35, R36, R37, R38, R39, R40, R54, R55, R56, R57, R58	P47GCT	RESISTOR SMD0603 47 OHMS 5% 1/10W ROHS	Digi-Key	Panasonic
CRCW0603100RFKEA	3	R4, R5, R6	541-100HCT	RESISTOR SMD0603 100 OHM 1/10W 1% ROHS	Digi-Key	Vishay
ERJ-3GEYJ471V	2	R48, R49	P470GCT	RESISTOR SMD0603 470 OHMS 5% 1/10W ROHS	Digi-Key	Panasonic
ERJ-3GEYJ472V	4	R61, R62, R63, R65	P4.7KGCT	RESISTOR SMD0603 4.7K OHMS 5% 1/10W ROHS	Digi-Key	Panasonic
ERJ-3EKF1002V	14	R20, R21, R22, R23, R24, R25, R26, R41, R42, R43, R44, R45, R46, R47	P10.0KHCT	RESISTOR SMD0603 10.0K 1% THICK FILM 1/10W ROHS	Digi-Key	Panasonic
RMCF0603FT15K0	1	R52	RMCF0603FT15K0CT	RESISTOR SMD0603 15.0K OHMS 1% 1/10W ROHS	Digi-Key	Stackpole Electronics
RC0603FR-0718KL	1	R53	311-18.0KHRCT	RESISTOR SMD0603 THICK FILM 18.0K OHMS 1% 1/10W ROHS	Digi-Key	Yageo
RC0603FR-0730KL	1	R2	311-30.0KHRCT	RESISTOR SMD0603 THICK FILM 30.0K 1% 1/10W ROHS	Digi-Key	Yageo
ERJ-3GEYJ473V	1	R3	P47KGCT	RESISTOR SMD0603 47K OHMS 5% 1/10W ROHS	Digi-Key	Panasonic
INDUCTORS						
MA5173-AE	4	L1, L2, L3, L4	MA5173-AE	SHIELDED POWER INDUCTOR 7uH 12A ROHS	Coil Craft	Coil Craft
HEADERS						
N2526-6002-RB	1	J1	MHC26K-ND	HEADER SHROUDED 100LS MALE GOLD 2X13 PINS ROHS	Digi-Key	3M
PBC02SAAN	1	JP1	S1011E-02-ND	HEADER THRU MALE 2 PIN 100LS GOLD ROHS	Digi-Key	Sullins
PBC03SAAN	3	C, D, M3	S1011E-03-ND	HEADER THRU MALE 3 PIN 100LS GOLD ROHS	Digi-Key	Sullins
TESTPOINTS AND SWITCHES						
5003	1	ET2	5003K	PC TESTPOINT, ORANGE, ROHS	Digi-Key	Keystone Electronics
G12AP-RO	1	S1	360-1758	SWITCH THRU SPDT STRAIGHT ULTRA MINIATURE ROHS	Digi-Key	NKK
BINDING POSTS						
5018-0	3	GND, LOUT-, ROUT-	565-5018-0	BINDING POST, BLACK 60V 30A GOLD ROHS	Mouser	Pomona

Table 4. Bill of Materials for TAS5624DDVEVM (continued)

Manu Part No.	Qty	Ref Des	Vendor Part No.	Description	Vendor	Manu
5018-2	3	PVDD, LOUT+, ROUT+	565-5018-2	BINDING POST, RED 60V 30A GOLD ROHS	Mouser	Pomona
SHUNTS						
SPC02SYAN	4	JP1, C(1-2), D(1-2), M3(1-2)	S9001	SHUNT, BLACK AU FLASH 0.100LS	Digl-Key	Sullins
HEAT SINKS AND HARDWARE						
ATSTI1OP-519-C1-R3	1	HS1	ATSTI1OP-519-C1-R3	HEATSINK ALUMINUM ATS 36x78mm 36.8mm PITCH ROHS	ATS	ATS
92000A118	2	HS1	92000A118	PHILIPS PANHEAD SCREW M3x8mm STAINLESS STEEL ROHS	McMaster-Carr	McMaster-Carr
92148A150	2	HS1	92148A150	SPLIT WASHER M3 STAINLESS STEEL ROHS	McMaster-Carr	McMaster-Carr
94868A178	4	NA	94868A178	STANDOFF M3x25mm 4.5mm DIA HEX STAINLESS STEEL F-F ROHS	McMaster-Carr	McMaster-Carr
92000A118	4	NA	92000A118	PHILIPS PANHEAD SCREW M3x8mm STAINLESS STEEL ROHS	McMaster-Carr	McMaster-Carr
92148A150	4	NA	92148A150	SPLIT WASHER M3 STAINLESS STEEL ROHS	McMaster-Carr	McMaster-Carr
Component Count:	163					
COMPONENTS NOT ASSEMBLED						
CR1, CR2, CR3, CR4, L+, L-, OA, OB, OC, OD, R+, R-, PVDD_AB, PVDD_CD, M1, M2, GNDx2, PSVC						

A.1 EVM Custom Component Vendors

TAS5622DDVEVM and TAS5624DDVEVM include inductors and heatsinks from 2 custom component vendors designed specifically for the EVMs. These vendors carry stock for small orders on their shelves..

Advanced Thermal Solutions (ATS), in Norwood, MA, USA, provide a heatsink optimized for these EVMs, ATS-TI1OP-519-C1. Information on this heatsink can be obtained from Leonard Alter at lalter@qats.com. ATS design and manufacture a large line of off-the-shelf and patented high performance heatsinks. They also design and manufacture research quality thermal test and measurement equipment and offer thermal evaluation and design services. Information about their products and services is available at www.qats.com.

Coilcraft, in Cary, IL, USA, provide a 7µH inductor optimized for these EVMs, MA5173-AE. Information on this component can be found in the data sheet for the MA5172 inductor family at www.coilcraft.com. Coilcraft make a variety of other inductors for Class D amplifiers, most of which are AEC-Q200 Grade 1 certified for automotive applications. Free evaluation samples and on-line ordering are available at www.coilcraft.com.

A.2 TAS5622-TAS5624LDDVEVM PCB Specification

PCB IDENTIFICATION:	TAS5622-TAS5624DDVEVM_RevA
PCB TYPE:	DOUBLE-SIDED PLATED-THROUGH
PCB SIZE:	142 x 96 mm
LAMINATE TYPE:	FR4
LAMINATE THICKNESS:	1.6mm
COPPER THICKNESS:	70 µm (2 ounce) (INCLUDING PLATING EXTERIOR LAYER)
COPPER PLATING IN HOLES:	70 µm (2 ounce)
MINIMUM HOLE DIAMETER:	0.3 mm (12 mils)
SILKSCREEN:	WHITE - REMOVE SILKSCREEN FROM SOLDER & PRE-TINNED AREAS
SOLDER MASK:	BLUE
APPROX. HOLE COUNT:	570
PROTECTIVE COATING:	ENIG (ELECTROLESS NICKEL / IMMERSION GOLD)
ELECTRICAL TEST:	PCB MUST BE ELECTRICAL TESTED
COMMENTS:	FAB NOTES ARE IN THE DRILL DRAWING FILE

A.3 EVM PCB Layers

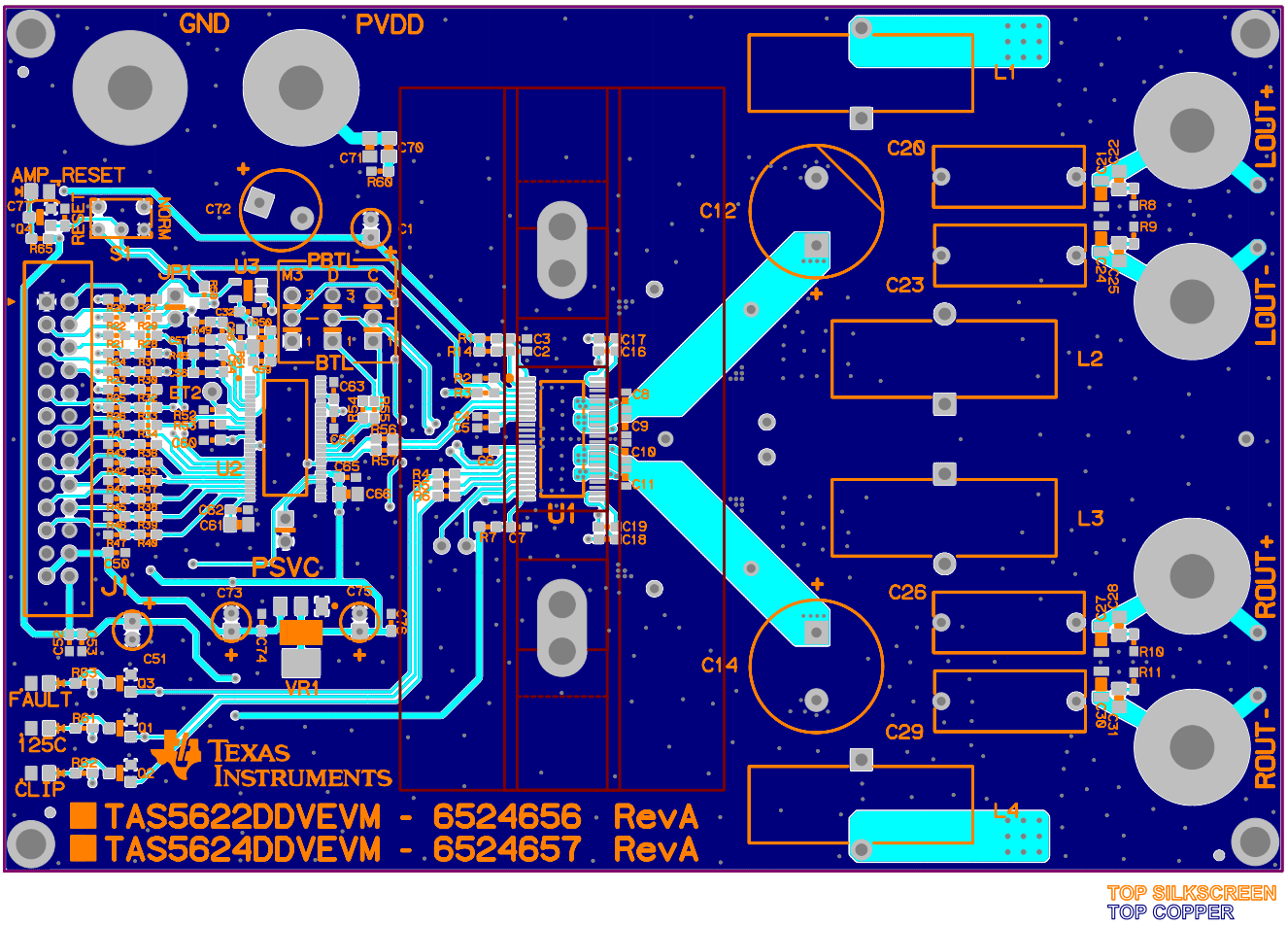


Figure 8. Top Composite PCB Layer

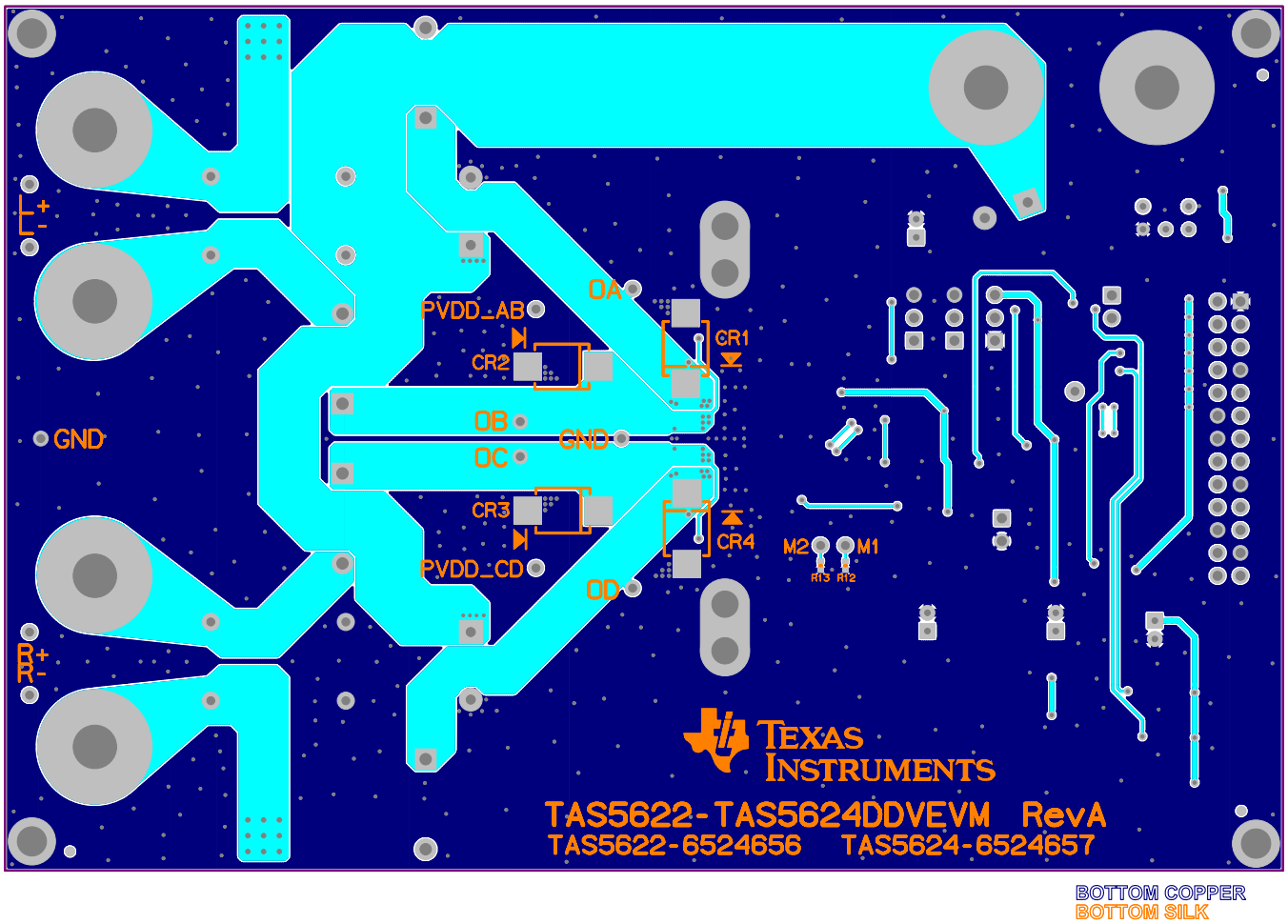
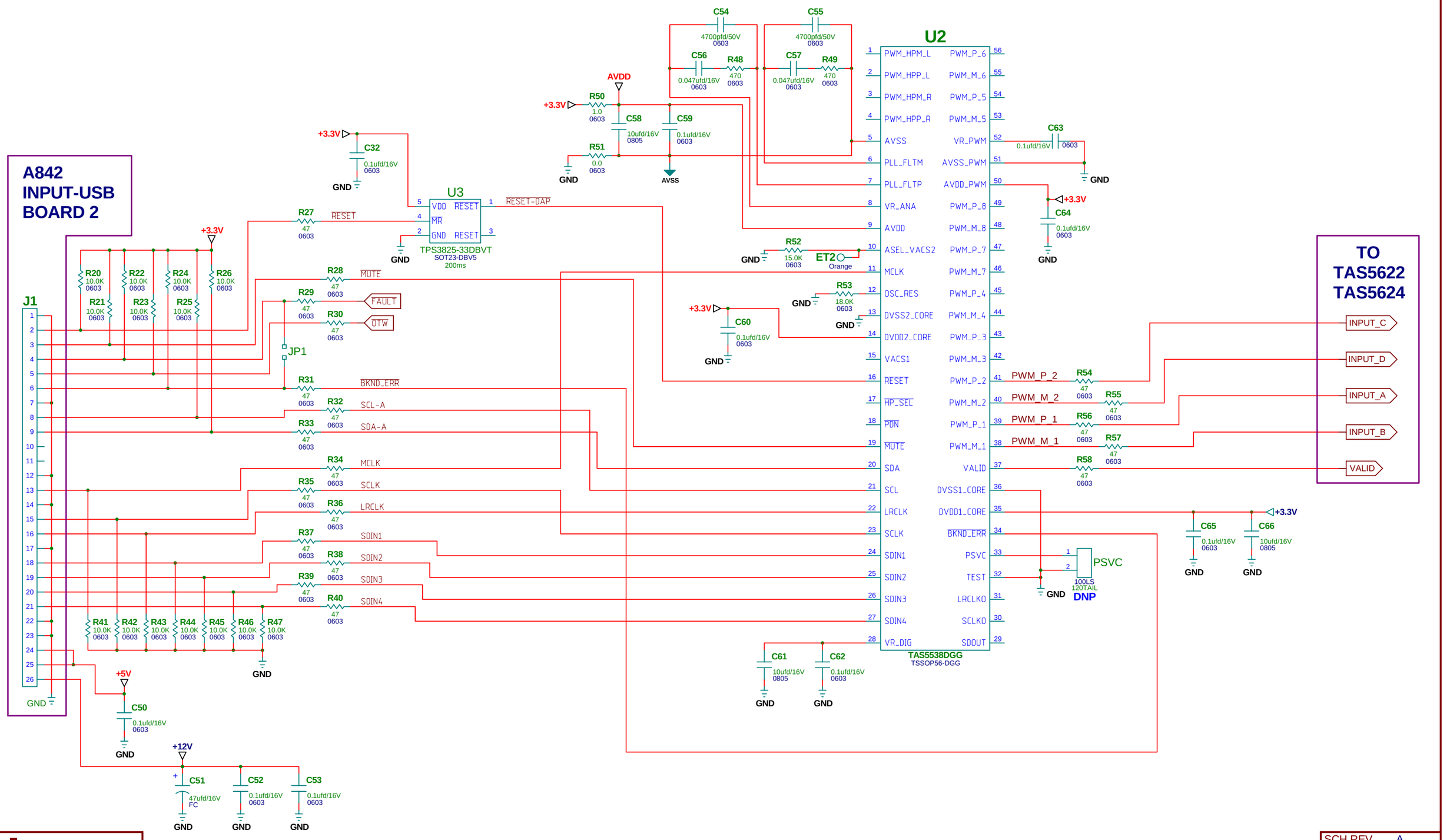


Figure 9. Bottom Composite PCB Layer

A.4 EVM and Input-USB Board 3 Schematics

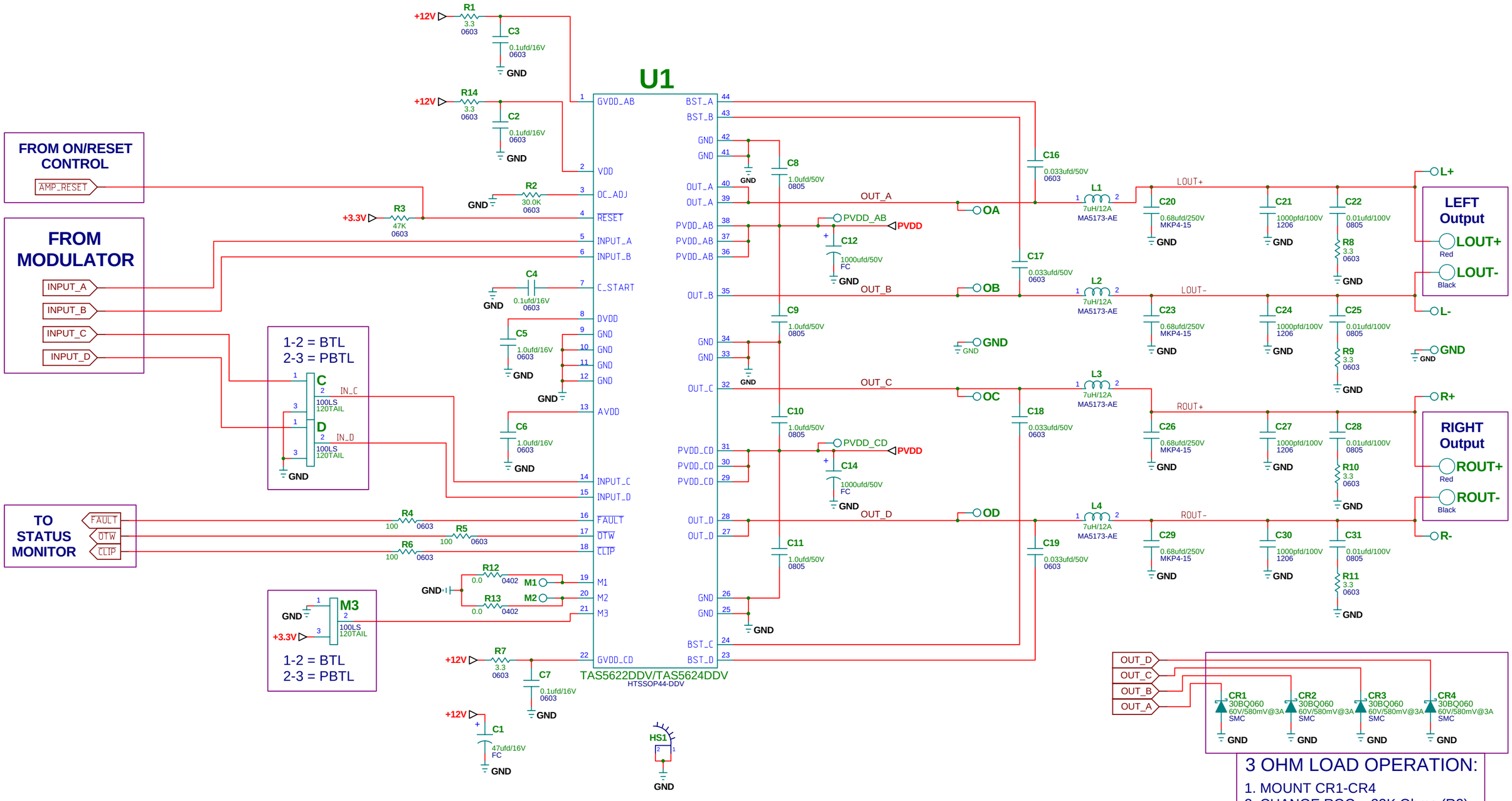
The EVM and Input-USB Board 3 Schematics are appended to this User's Guide PDF.

TAS5622DDV/TAS5624DDV EVALUATION BOARD



TEXAS INSTRUMENTS			SCH REV A
			PCB REV A
PAGE INFO: DIGITAL AUDIO PROCESSOR I/O		DATE MARCH 7, 2012	SHEET 1 OF 5
DESIGN LEAD STEPHEN CRUMP	EDGE # TAS5622-6524656 / TAS5624-6524657	FILENAME TAS5622-TAS5624DDVEVM_RevA.sbk	DRAWN BY LDN

TAS5622DDV/TAS5624DDV EVALUATION BOARD



TEXAS INSTRUMENTS			SCH REV A
			PCB REV A
PAGE INFO: POWER AMPLIFIER		DATE MARCH 7, 2012	SHEET 2 OF 5
DESIGN LEAD STEPHEN CRUMP	EDGE # TAS5622-6524656 / TAS5624-6524657	FILENAME TAS5622-TAS5624DDVEVM_RevA.sbk	DRAWN BY LDN

TAS5622DDV/TAS5624DDV EVALUATION BOARD

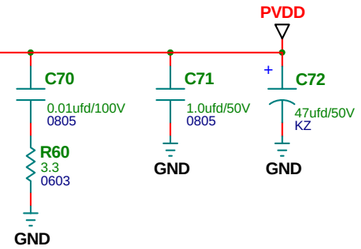
MAIN POWER IN

PVDD — Red

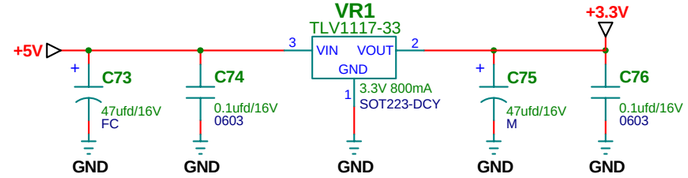
GND — Black

GND

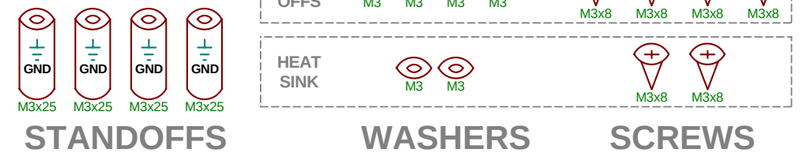
PVDD RANGE= xxV-38V



5V TO 3.3V DC-DC CONVERTER



HARDWARE



FROM U1

OTW

CLIP

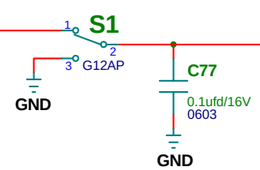
FAULT

STATUS MONITORS

FROM MODULATOR

VALID

ON/RESET CONTROL



S3 SETTINGS

1-2/6-5 ON

3-2/4-5 RESET

TO U1

AMP_RESET

PAGE INFO:	POWER SUPPLY, STATUS MONITORS, ON/OFF CONTROL		DATE	MARCH 7, 2012	SCH REV A
DESIGN LEAD	STEPHEN CRUMP	EDGE # TAS5622-6524656 / TAS5624-6524657	FILENAME	TAS5622-TAS5624DDVEVM_RevA.sbk	PCB REV A
					SHEET 3 OF 5
					DRAWN BY LDN

TAS5622DDV/TAS5624DDV EVALUATION BOARD

REVISION HISTORY

REVISION	DESCRIPTION	DATE	APPROVAL
A	INITIAL RELEASE	MARCH 7, 2012	SC

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TEXAS INSTRUMENTS

INPUT-USB BOARD #3

FROM EVMs

SDIN

MiniB USB INPUT

USB-IN

USB MINIB

FB1 600 Ohms/2A 0805

FB2 600 Ohms/2A 0805

USB

Q1 MMBT2222A SOT23-DBV3 40V,1A

R102 15.0K 0603

R103 1.50K 0603

R104 27.4 0603

R105 27.4 0603

PUR

DP

DM

C105 47pfd/50V 0603

C106 47pfd/50V 0603

VR1 TPS73633DBVT SOT230DBV5 3.3V/400mA

C107 10ufd/10V 0805

C108 0.1ufd/16V 0603

C109 1.0ufd/25V 0603

EPROM

A0

64K SOP8-D(SOIC)

R100 10.0K 0603

C100 0.1ufd/16V 0603

R101 10.0K 0603

WE

SDA-USB

SCL-USB

R110 4.99K 0603

R111 4.99K 0603

R112 47 0603

R113 47 0603

C101 27pfd/50V 0603

C102 27pfd/50V 0603

Y1 6.0 MHz ABMM

C103 100pfd/50V 0603

R106 3.09K 0603

C104 1000pfd/50V 0603

U6 TAS1020BPFB TQFP48-PFB

PLLFILO, AVDD, MCLKI, DVSS, PUR, DP, DM, DVDD, MRESET, TEST, EXTEN, RSTO

PLLFILI, XTALI, XTALO, AVSS, SCL, SDA, VREN, RESET, MCLKO2, MCLKO1, CDATO, CSCLK

CDATI, CSYNC, CRESET, DVDD, CSCHNE, P1.7, P1.6, P1.5, DVSS, P1.4, P1.3, P1.2

P3.0, P3.1, P3.2/XINT, DVSS, P3.3, P3.4, P3.5, NC, DVDD, NC, P1.0, P1.1

R107 10.0K 0603

C110 10ufd/10V 0805

C111 0.1ufd/16V 0603

R109 10.0K 0603

C112 0.1ufd/16V 0603

R115 47 0603 MCLK-USB

R116 47 0603 SDOUT-USB

R117 47 0603 SCLK-USB

R118 47 0603 SDIN

R119 47 0603 LRCLK-USB

R114 10.0K 0603

RESET-USB

MCLK1 Orange

DOUT1 Orange

SCLK1 Orange

LRCLK1 Orange

I2C ACTIVITY

Q3 SOT23-DBV3

4.7K

I2C

R404 357 0603

0805 Yellow

TO EVMs

SCL

SDA

RESET

TO I2S SELECT

MCLK-USB

SDOUT-USB

SCLK-USB

LRCLK-USB

SDA

SCL

SYSTEM RESET

R10 4.7 1/4W 0805

R108 4.99K 0603

C121 0.1ufd/16V 0603

C120 10ufd/10V 0805

U1 TPS3825-33DBV SOT23-DBV5 200ms

S1

C122 0.1ufd/16V 0603

AND1 74LVC1G08 SOT23-DBV5

C123 0.1ufd/16V 0603

RESET

RESET-USB

S3

S4

S5

C113 0.1ufd/16V 0603

C114 0.1ufd/16V 0603

C115 0.1ufd/16V 0603

C116 0.1ufd/16V 0603

C117 0.1ufd/16V 0603

C118 0.1ufd/16V 0603

C119 0.1ufd/16V 0603

TEXAS INSTRUMENTS			SCH REV A
			PCB REV A
PAGE INFO: USB INTERFACE, RESET		DATE JULY 12, 2011	SHEET 1 OF 7
DESIGN LEAD TUAN LUU	EDGE # 6527708	FILENAME InputUsbBoard3.sbk	DRAWN BY LDN

INPUT-USB BOARD #3

COAX SPDIF

J3

R200 75 0603

C200 0.047ufd/16V 0603

R201 100 0603

R202 1.0M 0603

INV1 SN74LVC1GU04DBV SOT23-DBV5

C201 1.0ufd/10V 0603

C202 0.047ufd/16V 0603

R203 2.00K 0603

OPTICAL SPDIF

J4 TORX147PL(F,T)

C204 0.1ufd/16V 0603

SPDIF SELECT

R205 49.9 0603

S2

SPDIF-SEL

2-3 = COAX
1-2 = OPTO

C206 0.1ufd/16V 0603

SPDIF SELECT LEDs

Q8 SOT23-DBV3

4.7K

COAX 0805 Green R220 357 0603

OPTO 0805 Green R221 357 0603

FROM SYSTEM RESET

RESET

PSK Select

R207 10.0K 0603

R208 DNP 0603

R209 DNP 0603

R210 10.0K 0603

R204 7.50K 0603

INV2 SN74LVC1GU04DBV SOT23-DBV5

C203 1.0ufd/10V 0603

MUX1 74LVC2G157DCT SSOP8-DCT

COAX-IN

OPTO-IN

C205 0.1ufd/16V 0603

U7 DIR9001PW TSSOP28-PW

RXIN

C207 0.1ufd/16V 0603

R206 470 0603

Y2 12.288 MHz ABM8G

R218 0.0 0603

R219 0.0 0603

C208 18pfd/50V 0603

C209 18pfd/50V 0603

C211 0.1ufd/16V 0603

C210 10ufd/10V 0805

R212 100 0603

R213 47 0603 MCLK-SPDIF

R214 47 0603 SCLK-SPDIF

R215 47 0603 LRCLK-SPDIF

R216 47 0603 DOUT-SPDIF

C212 4700pfd/50V 0603

R217 680 0603

C213 0.068ufd/16V 0603

SPDIF LOCK

Q2 SOT23-DBV3

4.7K

SPDIF-LOCK 0805 Blue

R211 392 0603

TO ADCs / I2S SELECT

MCLK-SPDIF

SCLK-SPDIF

LRCLK-SPDIF

MCLK2 Orange

SCLK2 Orange

LRCLK2 Orange

DOUT2 Orange

TO ADC MUXES

DOUT-SPDIF

TEXAS INSTRUMENTS			SCH REV A
			PCB REV A
PAGE INFO: SPDIF INTERFACE		DATE JULY 12, 2011	SHEET 2 OF 7
DESIGN LEAD TUAN LUU	EDGE # 6527708	FILENAME InputUsbBoard3.sbk	DRAWN BY LDN

INPUT-USB BOARD #3

ANALOG INPUTS

ADC1-IN, ADC2-IN, ADC3-IN, ADC4-IN — each: Shield, L, R, NC, NO, 0.0 0603 to AGND

R300 (ADC1-IN), R301 (ADC2-IN), R302 (ADC3-IN), R303 (ADC4-IN)

R304 0.0 0603 ADC-EN

FROM SPDIF

- MCLK-SPDIF
- SCLK-SPDIF
- LRCLK-SPDIF
- DOUT-SPDIF

U2 (ADC1) — PCM1808PW TSSOP14-PW

JP300, JP301

R305 4.99K 0603, R308 4.99K 0603

C300 470pfd/50V 0603, C303 470pfd/50V 0603

R306 4.99K 0603, R309 4.99K 0603

C301 1.0ufd/16V 0603, C304 1.0ufd/16V 0603

R307 100 0603, R310 100 0603

C302 0.022ufd/25V 0603, C305 0.022ufd/25V 0603

+5V — R311 1.0 0603 — C306 10ufd/10V 0805, C307 0.1ufd/16V 0603

R312 0.0 0603 GND — C308 10ufd/10V 0805, C309 0.1ufd/16V 0603

VINL, VINR, VCC, AGND, VREF, SCKI, BCK, LRCK, DOUT, VDD, FMT, MD1, MD0, DGND

C311 0.1ufd/16V 0603, C310 10ufd/10V 0805

R12 4.7 1/4W 0805 +3.3V

R313 100 0603 DOUT-ADC1

U3 (ADC2) — PCM1808PW TSSOP14-PW

JP302, JP303

R314 4.99K 0603, R317 4.99K 0603

C312 470pfd/50V 0603, C315 470pfd/50V 0603

R315 4.99K 0603, R318 4.99K 0603

C313 1.0ufd/16V 0603, C316 1.0ufd/16V 0603

R316 100 0603, R319 100 0603

C314 0.022ufd/25V 0603, C317 0.022ufd/25V 0603

+5V — R320 1.0 0603 — C318 10ufd/10V 0805, C319 0.1ufd/16V 0603

R321 0.0 0603 GND — C320 10ufd/10V 0805, C321 0.1ufd/16V 0603

C323 0.1ufd/16V 0603, C322 10ufd/10V 0805

R13 4.7 1/4W 0805 +3.3V

R322 100 0603 DOUT-ADC2

U4 (ADC3) — PCM1808PW TSSOP14-PW

JP304, JP305

R323 4.99K 0603, R326 4.99K 0603

C324 470pfd/50V 0603, C327 470pfd/50V 0603

R324 4.99K 0603, R327 4.99K 0603

C325 1.0ufd/16V 0603, C328 1.0ufd/16V 0603

R325 100 0603, R328 100 0603

C326 0.022ufd/25V 0603, C329 0.022ufd/25V 0603

+5V — R329 1.0 0603 — C330 10ufd/10V 0805, C331 0.1ufd/16V 0603

R330 0.0 0603 GND — C332 10ufd/10V 0805, C333 0.1ufd/16V 0603

C335 0.1ufd/16V 0603, C334 10ufd/10V 0805

R14 4.7 1/4W 0805 +3.3V

R331 100 0603 DOUT-ADC3

U5 (ADC4) — PCM1808PW TSSOP14-PW

JP306, JP307

R332 4.99K 0603, R335 4.99K 0603

C336 470pfd/50V 0603, C339 470pfd/50V 0603

R333 4.99K 0603, R336 4.99K 0603

C337 1.0ufd/16V 0603, C340 1.0ufd/16V 0603

R334 100 0603, R337 100 0603

C338 0.022ufd/25V 0603, C341 0.022ufd/25V 0603

+5V — R338 1.0 0603 — C342 10ufd/10V 0805, C343 0.1ufd/16V 0603

R339 0.0 0603 GND — C344 10ufd/10V 0805, C345 0.1ufd/16V 0603

C347 0.1ufd/16V 0603, C346 10ufd/10V 0805

R15 4.7 1/4W 0805 +3.3V

R340 100 0603 DOUT-ADC4

ADC MUXES

MUX2 74LVC2G157DCT SSOP8-DCT: DOUT-ADC1, DOUT-SPDIF, ADC-EN, GND, VCC, A, B, G, A/B, Y

C348 0.1ufd/16V 0603 +3.3VD2 GND

SDOUT1 Orange

MUX3 74LVC2G157DCT SSOP8-DCT: DOUT-ADC2, DOUT-SPDIF, ADC-EN, GND

C349 0.1ufd/16V 0603 +3.3VD2 GND

SDOUT2 Orange

MUX4 74LVC2G157DCT SSOP8-DCT: DOUT-ADC3, DOUT-SPDIF, ADC-EN, GND

C350 0.1ufd/16V 0603 +3.3VD2 GND

SDOUT3 Orange

MUX5 74LVC2G157DCT SSOP8-DCT: DOUT-ADC4, DOUT-SPDIF, ADC-EN, GND

C351 0.1ufd/16V 0603 +3.3VD2 GND

SDOUT4 Orange

TO I2S SELECT

SDOUT1, SDOUT2, SDOUT3, SDOUT4

TO PSIA DATA SELECT

ADC/SPDIF SELECT LEDs

+3.3VD2 — R341 1.00K 0603 — C352 0.1ufd/16V 0603 GND

Q9 SOT23-DBV3 (E, B, C) — 4.7K

ANALOG 0805 Green — R342 357 0603 GND

DIGITAL 0805 Green — R343 357 0603 +3.3VD2

PAGE INFO: ADC INPUTS		DATE JULY 12, 2011	SCH REV A
DESIGN LEAD TUAN LUU	EDGE # 6527708	FILENAME InputUsbBoard3.sbk	PCB REV A
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			DRAWN BY LDN

TEXAS INSTRUMENTS

INPUT-USB BOARD #3

FROM SYSTEM RESET

RESET

FROM USB

SCL

SDA

FROM SPDIF

MCLK-SPDIF

SCLK-SPDIF

LRCLK-SPDIF

I2S-SEL CTRL

S7

R402 49.9 0603

I2S-SEL

C409 0.1ufd/16V 0603

Q10 SOT23-DBV3

2-3 = SPDIF
1-2 = USB

SPDIF 0805 Green R415 357 0603

USB 0805 Green R416 357 0603

FROM USB

MCLK-USB

SCLK-USB

LRCLK-USB

SDOUT-USB

FROM ADC MUXES

SDOUT1

SDOUT2

SDOUT3

SDOUT4

S6

R400 10.0K 0603

C400 4.7ufd/16V 0805

C401 0.1ufd/16V 0603

INV3 74LVC1G14DBV SOT23-DBV5

C402 0.1ufd/16V 0603

C403 0.1ufd/16V 0603

R401 10.0K 0603

FF1 SN74LVC2G74DCT SSOP8-DCT

C404 0.1ufd/16V 0603

R410 10.0K 0603

R411 0.0 0603

MUTE-LED

MUTE 0805 Yellow R403 357 0603

Q4 SOT23-DBV3 OTW 0805 Red R405 357 0603

Q5 SOT23-DBV3 SHUTDOWN 0805 Red R406 357 0603

Q6 SOT23-DBV3 FAULT 0805 Red R407 357 0603

R412 100K 0603

R413 100K 0603

R414 100K 0603

MUTE

RESET

I2S SELECT

MUX6 74LVC2G157DCT SSOP8-DCT

C405 0.1ufd/16V 0603

C406 0.1ufd/16V 0603

MUX7 74LVC2G157DCT SSOP8-DCT

MUX8 74LVC2G157DCT SSOP8-DCT

C407 0.1ufd/16V 0603

C408 0.1ufd/16V 0603

MUX9 74LVC2G157DCT SSOP8-DCT

PSIA CLOCK SELECT

MCLK-MUX → MCLK → MCLK-OUT → MCLKO Orange

SCLK-MUX → SCLK → SCLK-OUT → SCLKO Orange

LRCLK-MUX → LRCLK → LRCLK-OUT → LRCLKO Orange

PSIA OUT = 1/2, PSIA IN = 3/4
JUMPER 2-3 FOR PASS-THRU

PSIA DATA SELECT

SDOUT1-MUX → ADC1 → SDATA1 → SDATA1 Orange

SDOUT2 → ADC2 → SDATA2 → SDATA2 Orange

SDOUT3 → ADC3 → SDATA3 → SDATA3 Orange

SDOUT4 → ADC4 → SDATA4 → SDATA4 Orange

PSIA OUT = 1/2, PSIA IN = 3/4
JUMPER 2-3 FOR PASS-THRU

POWER DOWN

R408 10.0K 0603

S8

Q7 SOT23-DBV3

PDN 0805 Yellow R409 357 0603

To EVMs

RESET
MUTE
SHUTDOWN
OTW
SCL
SDA
MCLK-OUT
SCLK-OUT
LRCLK-OUT
SDATA1
SDATA2
SDATA3
SDATA4
+5V C410 0.1ufd/16V 0603
+12V C411 0.1ufd/16V 0603
J1
J2
+3.3V
FAULT
RESET
PDN
MUTE
SCLK-OUT
LRCLK-OUT
SDATA1
SCL
SDA
PVDD Red
MCLK-OUT
+3.3V

SDIN Orange

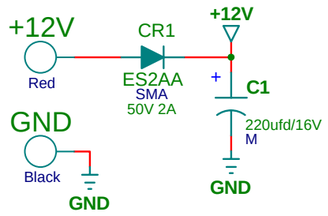
TO USB

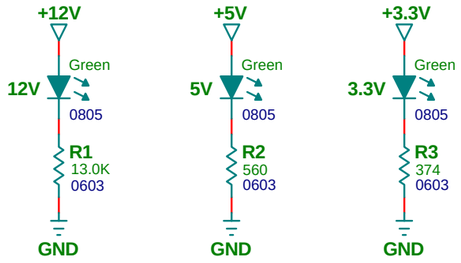
SDIN

TEXAS INSTRUMENTS			SCH REV A
PAGE INFO: PSIA INPUT, DATA SELECT, EVM CONNECTOR		DATE JULY 12, 2011	PCB REV A
DESIGN LEAD TUAN LUU	EDGE # 6527708	FILENAME InputUsbBoard3.sbk	SHEET 4 OF 7
			DRAWN BY LDN

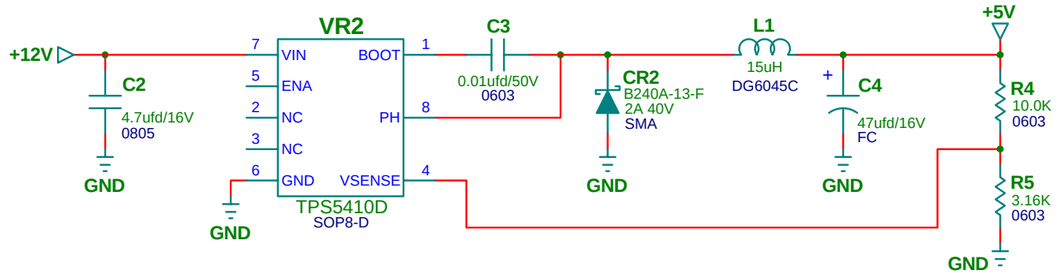
INPUT-USB BOARD #3

MAIN POWER IN

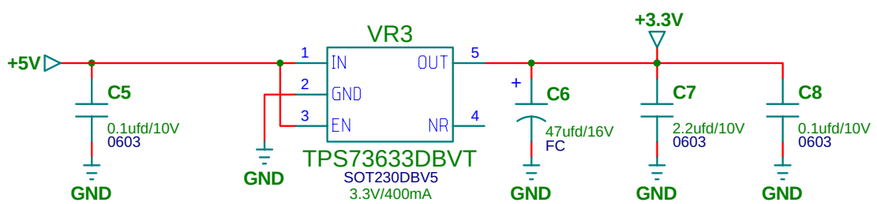




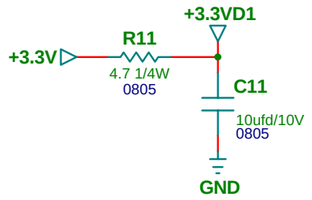
PVDD TO 5V SWITCHER



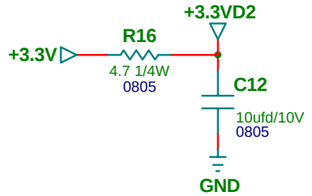
5V TO 3.3V DC-DC CONVERTER



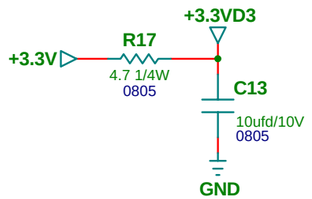
SPDIF



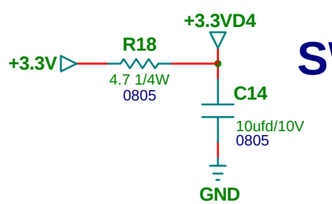
ADC MUXES



I2S SELECT MUXES

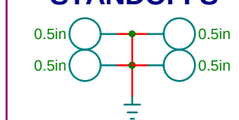


SWITCHES AND LEDs



BOM ONLY

STANDOFFS



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PAGE INFO: POWER INPUTS AND SUPPLIES		DATE JULY 12, 2011	SCH REV A
DESIGN LEAD TUAN LUU	EDGE # 6527708	FILENAME InputUsbBoard3.sbk	PCB REV A
			SHEET 5 OF 7
			DRAWN BY LDN

INPUT-USB BOARD #3

REVISION HISTORY

REVISION	DESCRIPTION	DATE	APPROVAL
A	INITIAL RELEASE	JULY 12, 2011	TL

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As noted in the EVM User's Guide and/or EVM itself, this EVM and/or accompanying hardware may or may not be subject to the Federal Communications Commission (FCC) and Industry Canada (IC) rules.

For EVMs **not** subject to the above rules, this evaluation board/kit/module is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION OR EVALUATION PURPOSES ONLY and is not considered by TI to be a finished end product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. Operation of the equipment 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: This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. 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 Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

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

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

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.

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.

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.

【Important Notice for Users of this Product in Japan】

This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product 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 this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

Texas Instruments Japan Limited
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2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure 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.
3. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

Certain Instructions. It is important to operate this EVM within TI's recommended specifications and environmental considerations per the user guidelines. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please 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 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 the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use these EVMs.

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