TLV320AIC1106EVM-K

This user's guide describes the characteristics, operation, and use of the TLV320AIC1106EVM-K evaluation module. A complete circuit description, schematic diagram, and bill of materials are included. Note that this evaluation module (EVM) is not provided with a graphical user interface; the USB is used only for powering up the EVM.

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1 EVM Overview

1.1 Features

- Full-featured evaluation board for the TLV320AIC1106 audio codec
- Selectable 13-bit linear or 8 bit µ-law companded conversion
- Differential microphone input with external gain setting
- Differential earphone output capable of driving a 32-Ω to 8-Ω load
- Microphone (MIC) and earphone (EAR) mute functions
- 2.048-MHz master clock rate
- Easy interfacing to multiple analog sources
- Analog output signals from the TLV320AIC1106 are available on top and bottom connectors.
- External microphone jack and electric microphone are included
- Digital control signals can be applied directly to top and bottom connectors

1.2 Introduction

The TLV320AIC1106EVM-K is a complete evaluation/demonstration kit, which includes a USB-based motherboard called the USB-MODEVM Interface board. Provisions are made for connecting all audio inputs and outputs either from the modular connectors or with onboard terminals and external microphone jack. An onboard electret microphone is also provided.

2 Analog Interface

For maximum flexibility, the TLV320AIC1106EVM is designed for easy interfacing to multiple analog sources. Samtec part numbers SSW-110-22-F-D-VS-K and TSM-110-01-T-DV-P provide a convenient 10-pin, dual-row, header/socket combination. These headers/sockets provide access to the analog input and output pins of the device. Table 1 summarizes the analog interface pinout for the TLV320AIC1106EVM.

Table 1. Analog Interface Pinout

Pin Number	Signal	Description
J1.1	EAROUT–	Earphone amplifier negative output
J1.2	EAROUT+	Earphone amplifier positive output
J1.3	NC	Not connected
J1.4	NC	Not connected
J1.5	NC	Not connected
J1.6	NC	Not connected
J1.7	NC	Not connected
J1.8	NC	Not connected
J1.9	AGND	Analog ground
J1.10	NC	Not connected
J1.11	AGND	Analog ground
J1.12	NC	Not connected
J1.13	AGND	Analog ground
J1.14	NC	Not connected
J1.15	NC	Not connected
J1.16	NC	Not connected
J1.17	AGND	Analog ground
J1.18	NC	Not connected
J1.19	AGND	Analog ground
J1.20	NC	Not connected
J2-1	NC	Not connected

Table 1. Analog Interface Pinout (continued)

Pin Number	Signal	Description
J2-2	NC	Not connected
J2-3	NC	Not connected
J2-4	NC	Not connected
J2-5	NC	Not connected
J2-6	NC	Not connected
J2-7	MIC–	ADC inverting input
J2-8	MIC+	ADC noninverting input
J2-9	AGND	Analog ground
J2-10	NC	Not connected
J2-11	AGND	Analog ground
J2-12	NC	Not connected
J2-13	AGND	Analog ground
J2-14	NC	Not connected
J2-15	NC	Not connected
J2-16	NC	Not connected
J2-17	AGND	Analog ground
J2-18	NC	Not connected
J2-19	AGND	Analog ground
J2-20	NC	Not connected

In addition to the analog headers, the analog inputs and outputs may also be accessed through alternate connectors, either screw terminals or audio jacks. The microphone input is tied to J9. Table 2 summarizes the screw terminals available on the TLV320AIC1106EVM.

Table 2. Alternate Analog Connectors

DESIGNATOR	PIN 1	PIN 2
J6	EAROUT–	EAROUT+
J8	MICIN+	MICIN–

3 Digital Interface

The TLV320AIC1106EVM is designed to interface easily with multiple control platforms. Samtec part numbers SSW-110-22-F-D-VS-K and TSM-110-01-T-DV-P provide a convenient 10-pin, dual-row, header/socket combination. These headers/sockets provide access to the digital control and serial data pins of the device. Table 3 summarizes the digital interface pinout for the TLV320AIC1106EVM.

Table 3. Digital Interface Pinout

PIN NUMBER	SIGNAL	DESCRIPTION
J3.1	NC	Not connected
J3.2	NC	Not connected
J3.3	NC	Not connected
J3.4	DGND	Digital ground
J3.5	NC	Not connected
J3.6	NC	Not connected
J3.7	NC	Not connected
J3.8	$\overline{\text{RESET}}$	Reset signal input
J3.9	NC	Not connected
J3.10	DGND	Digital ground
J3.11	NC	Not connected

Table 3. Digital Interface Pinout (continued)

PIN NUMBER	SIGNAL	DESCRIPTION
J3.12	NC	Not connected
J3.13	NC	Not connected
J3.14	$\overline{\text{RESET}}$	Reset signal input
J3.15	NC	Not connected
J3.16	NC	Not connected
J3.17	NC	Not connected
J3.18	DGND	Digital ground
J3.19	NC	Not connected
J3.20	NC	Not connected
J4.1	NC	Not connected
J4.2	NC	Not connected
J4.3	SCLK	Audio serial data shift clock (input/output)
J4.4	DGND	Digital ground
J4.5	NC	Not connected
J4.6	NC	Not connected
J4.7	FS1	Audio serial data bus frame synchronization (input/output)
J4.8	NC	Not connected
J4.9	NC	Not connected
J4.10	DGND	Digital ground
J4.11	DIN	Audio serial data bus data Input (input)
J4.12	NC	Not connected
J4.13	DOUT	Audio serial data bus data output (output)
J4.14	NC	Not connected
J4.15	NC	Not connected
J4.16	NC	Not connected
J4.17	MCLK	Master clock input
J4.18	DGND	Digital ground
J4.19	NC	Not connected
J4.20	NC	Not connected

4 Power Supplies

J5 provides connection to the common power bus for the TLV320AIC1106EVM. Power is supplied on the pins listed in Table 4.

Table 4. Power Supply Pinout

PIN NUMBER	Signal	Description
J5.1	NC	Not connected
J5.2	NC	Not connected
J5.3	5VA	5-V analog
J5.4	NC	Not connected
J5.5	DGND	Digital ground
J5.6	AGND	Analog ground
J5.7	NC	Not connected
J5.8	NC	Not connected
J5.9	3.3VD	3.3-volt digital
J5.10	NC	Not connected

The TLV320AIC1106EVM-K motherboard (the USB-MODEVM Interface board) supplies power to J5 of the TLV320AIC1106EVM. Power for the motherboard is supplied either through its USB connection or via terminal blocks on that board.

4.1 Stand-Alone Operation

When used as a stand-alone EVM, power can be applied directly to J5. The user must be sure to reference the supplies to the appropriate grounds on that connector.

CAUTION

Verify that all power supplies are within the safe operating limits shown on the product data sheet before applying power to the EVM.

4.2 USB-MODEVM Interface Power

The USB-MODEVM Interface board can be powered from several different sources:

- USB
- 6-Vdc to 10-Vdc ac/dc external wall supply (not included)
- Laboratory power supply

When powered from the USB connection, JMP6 must have a shunt from pins 1–2 (this is the default factory configuration). When powered from 6 V to 10 Vdc, either through the J8 terminal block or the J9 barrel jack, JMP6 must have a shunt installed on pins 2-3. If power is applied in any of these ways, onboard regulators generate the required supply voltages, and no further power supplies are necessary.

If laboratory supplies are used to provide the individual voltages required by the USB-MODEVM Interface, JMP6 must have no shunt installed. Voltages are then applied to J2 (+5VA), J3 (+5VD), J4 (+1.8VD), and J5 (+3.3VD). The +1.8VD and +3.3VD can also be generated on the board by the onboard regulators from the +5VD supply; to enable this configuration, the switches on SW1 need to be set to enable the regulators by placing them in the ON position (lower position, looking at the board with text reading right-side up). If +1.8VD and +3.3VD are supplied externally, disable the onboard regulators by placing SW1 switches in the OFF position.

Each power supply voltage has an LED (D1-D7) that lights when the power supplies are active.

5 EVM Operation

This section provides information on the analog input and output, digital control, and general operating conditions for the TLV320AIC1106EVM.

5.1 Analog Input

The analog input sources can be applied directly to J2 (top or bottom side). The analog inputs may also be accessed through J7 and screw terminal J8.

5.2 Analog Output

The analog outputs from the TLV320AIC1106 are available on J1 (top or bottom). They also may be accessed through J6.

5.3 Default Jumper Locations

Table 5 lists the jumpers found on the EVM and their respective factory default conditions.

Table 5. List of Jumpers

JUMPER	DEFAULT POSITION	JUMPER DESCRIPTION
W1	Not installed	Coupling for EAR. Either directly or via capacitor
W2	Installed	Connects EARVDD to 3.3VA
W3	Not installed	Connecting J7 through MK1
W4	Installed	Connecting left of J7 to MIC-
W5	Not installed	Adjusting MIC5 gain resistance
W6	Not installed	Adjusting MIC5 gain resistance
W7	2 to 3	Unmute/mute MIC
W8	2 to 3	Unmute/mute EAROUT
W9	Not installed	Selecting MCLK from MCLK input
W10	Installed	Selecting MCLK from SCLK input
W11	Installed	Connecting DVDD with 3.3VD
W12	2 to 3	/LINSEL Select

6 Kit Operation

This section provides information on using the TLV320AIC1106EVM-K, including setup, program installation, and program usage.

6.1 TLV320AIC1106EVM-K Block Diagram

A block diagram of the TLV320AIC1106EVM-K is shown in Figure 1. The evaluation kit consists of two circuit boards connected together. The motherboard is designated as the USB-MODEVM Interface board, whereas the daughterboard is the TLV320AIC1106EVM described previously in this manual.

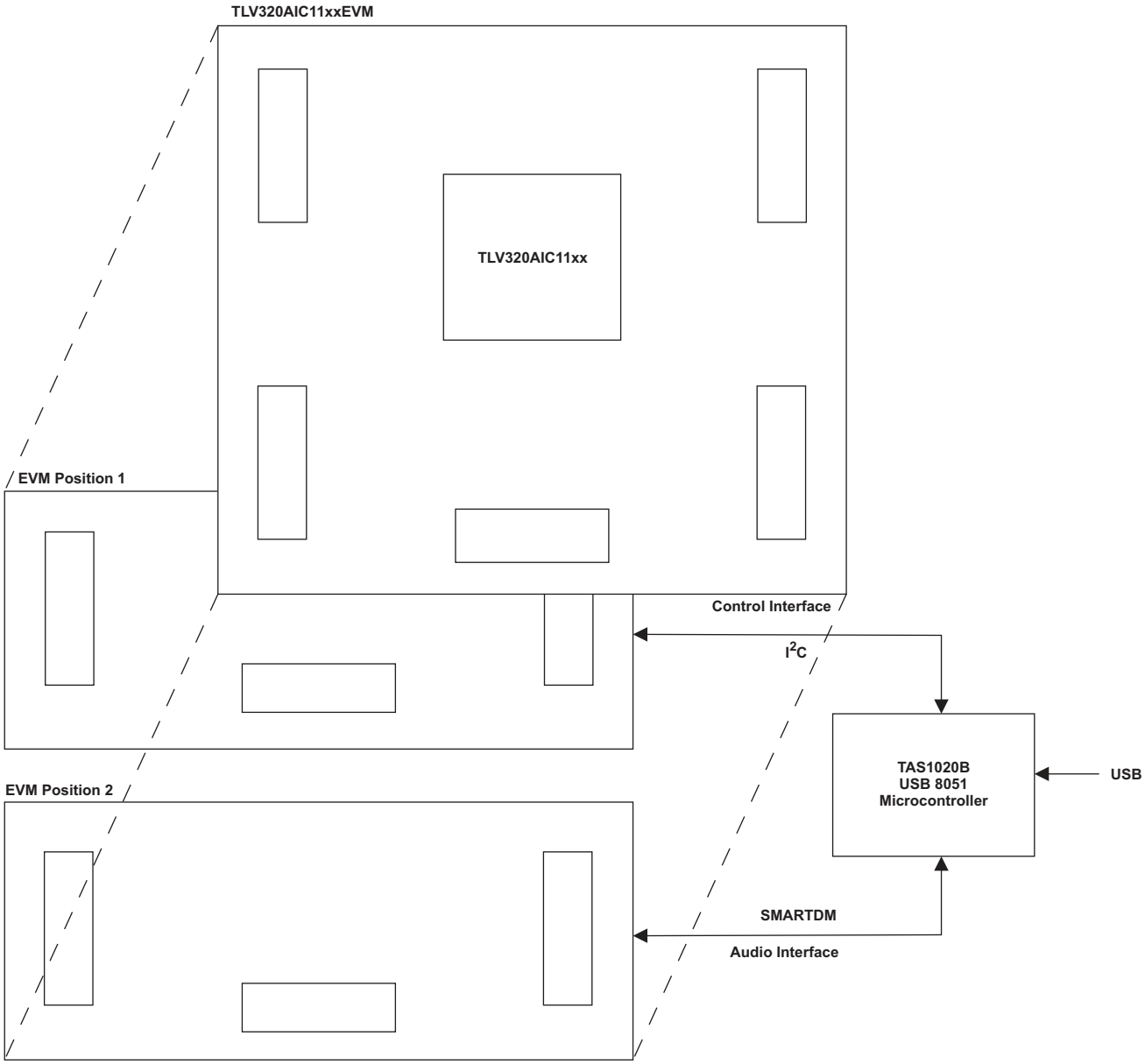


Figure 1. TLV320AIC1106EVM-K Block Diagram

The USB-MODEVM Interface board is intended to be used in USB mode, where control of the installed EVM is accomplished using the onboard USB controller device. Provision is made, however, for driving all the data buses (I²C™, PCM/ SMARTDM™) externally. The source of these signals is controlled by SW2 on the USB-MODEVM. Refer to Table 6 for details on the switch settings.

Additionally, SW3 on the USB-MODEVM (IOVDD SELECT) must be set up to 3.3V (SW3 position 1 on, SW3 positions 2-8 off).

Table 6. USB-MODEVM SW2 Settings

SW-2 SWITCH NUMBER	LABEL	SWITCH DESCRIPTION
1	A0	USB-MODEVM EEPROM I²C Address A0 ON: A0 = 0 OFF: A0 = 1
2	A1	USB-MODEVM EEPROM I²C Address A1 ON: A1 = 0 OFF: A1 = 1
3	A2	USB-MODEVM EEPROM I²C Address A2 ON: A2 = 0 OFF: A2 = 1
4	USB I²S	Digital Audio Bus Source Selection ON: Digital Audio Bus connects to TAS1020 OFF: Digital Audio Bus connects to USB-MODEVM J14
5	USB MCK	Digital Audio Bus MCLK Source Selection ON: MCLK connects to TAS1020 OFF: MCLK connects to USB-MODEVM J14
6	USB SPI	SPI Bus Source Selection ON: SPI Bus connects to TAS1020 OFF: SPI Bus connects to USB-MODEVM J15
7	USB RST	RST Source Selection ON: EVM Reset Signal comes from TAS1020 OFF: EVM Reset Signal comes from USB-MODEVM J15
8	EXT MCK	External MCLK Selection ON: MCLK Signal is provided from USB-MODEVM J10 OFF: MCLK Signal comes from either selection of SW2-5

For use with the TLV320AIC1106EVM, set SW-2 positions 1, 3, 6, and 7 to ON; set SW-2 positions 2, 4, 5, and 8 to OFF.

7 EVM Bill of Materials

Table 7 and Table 8 contain a complete bill of materials for the modular TLV320AIC1106EVM and the USB-MODEVM Interface board.

Table 7. TLV320AIC1106EVM Bill of Materials

Reference Designator	Description	Manufacturer	Mfr Part Number
U1	PCM CODEC WITH MICROPHONE AMPS AND SPEAKER DRIVER, ROHS	Texas Instruments	TLV320AIC1106PW
U2	LOW POWER SINGLE POSITIVE-EDGE-TRIGGERED D-FLIP-FLOP ROHS	Texas Instruments	SN74AUP1G74DCU
U3	VOLT REG 3.3V 800mA SOT223-DCY ROHS	Texas Instruments	REG1117-3.3
MK1	ELECTRET CONDENSER MIC OMNI 1.5V –44dB ROHS	Projects Unlimited	AOM-4544P-2-R
C4,C5	CAP SMD1210 CERM 0.22UFD 50V 10% X7R ROHS	AVX	12105C224KAT2A
C1,C3,C6,C7,C8,C11	CAP SMD0603 CERM 0.1UFD 50V 10% X7R ROHS	TDK	C1608X7R1H104K
C2,C9,C10,C12	CAP SMD0805 CERM 10UFD 10V 10% X7R ROHS	MURATA	GRM21BR71A106KE51L
R1, R2	RESISTOR SMD0603 2.00K OHM 1% THICK FILM 1/10W ROHS	PANASONIC	ERJ-3EKF2001V
R7,R8,R9,R10	RESISTOR SMD0603 10K 5% 1/10W ROHS	PANASONIC	ERJ-3GEYJ103V
R11	RESISTOR SMD1206 0.0 OHM 5% 1/4W ROHS	PANASONIC	ERJ-8GEY0R00V
R3,R4	RESISTOR,SMT,0603,THICK FILM,1%,1/10W, 34.0K	VISHAY/DALE	CRCW060334K0FKEA
R5,R6	RESISTOR,SMT,0603,THICK FILM,1%,1/10W, 511K	VISHAY/DALE	CRCW0603511KFKEA
W1,W3,W4,W5,W6,W9,W10,W14	HEADER THRU MALE 2 PIN 100LS GOLD ROHS	SULLINS	PBC02SAAN
W7,W8,W12	HEADER THRU MALE 3 PIN 100LS GOLD ROHS	SULLINS	PBC03SAAN
P3,P4	HEADER SMT 2x10 100LS TSM SERIES ROHS	SAMTEC	TSM-110-01-L-DV-P
P5	HEADER SMT 2x5 100LS TSM SERIES ROHS	SAMTEC	TSM-105-01-L-DV-P
J1,J2,J3,J4	SOCKET-HEADER SMT 2x10 100LS SSW SERIES ROHS	SAMTEC	SSW-110-22-F-D-VS-K
J5	HEADER SMT 2x5 100LS SSW SERIES ROHS	SAMTEC	SSW-105-22-F-D-VS-K
J7	JACK AUDIO MINI(3.5MM ,4-COND PCB-RA ROHS	CUI STACK	SJ-43516-SMT
J6,J8	TERMINAL BLOCK 2PIN 6A/125V GRAY 3.5mm PITCH 16-28AWG ROHS	On Shore Technology	ED555/2DS
SW1	SQUARE LIGHT TOUCH SWITCH,SMT,SPST,HIGH-DENSITY, SPACE SAVING	PANASONIC	EVQ5PN05K
TP1,TP2,TP3,TP4,TP5,TP6,TP7,TP8,TP9,TP10,TP11,TP12,TP13,TP14,TP15,TP16,TP17,TP18,TP19	PC TESTPOINT, WHITE, ROHS	Keystone electronics	5002
TP24	PC TESTPOINT, RED, ROHS	Keystone electronics	5000
TP20,TP21,TP21,TP22	PC TESTPOINT BLACK 063 HOLE ROHS	Keystone electronics	5011
W2,W11	Bus Wire (18-22 Gauge)	N/A	N/A

Table 8. USB-MODEVM Bill of Materials

Designators	Description	Manufacturer	Mfg. Part Number
R4	10Ω 1/10W 5% chip resistor	Panasonic	ERJ-3GEYJ100V
R10, R11	27.4Ω 1/16W 1% chip resistor	Panasonic	ERJ-3EKF27R4V
R20	75Ω 1/4W 1% chip resistor	Panasonic	ERJ-14NF75R0U
R19	220Ω 1/10W 5% chip resistor	Panasonic	ERJ-3GEYJ221V
R14, R21, R22	390Ω 1/10W 5% chip resistor	Panasonic	ERJ-3GEYJ391V
R13	649Ω 1/16W 1% chip resistor	Panasonic	ERJ-3EKF6490V
R9	1.5kΩ 1/10W 5% chip resistor	Panasonic	ERJ-3GEYJ152V
R1, R2, R3, R5, R6, R7, R8	2.7kΩ 1/10W 5% chip resistor	Panasonic	ERJ-3GEYJ272V
R12	3.09kΩ 1/16W 1%	Panasonic	ERJ-3EKF3091V
R15, R16	10kΩ 1/10W 5%	Panasonic	ERJ-3GEYJ103V
R17, R18	100kΩ 1/10W 5%	Panasonic	ERJ-3GEYJ104V
RA1	10kΩ 1/8W Octal isolated resistor array	CTS Corporation	742C163103JTR
C18, C19	33pF 50V ceramic chip capacitor, ±5%, NPO	TDK	C1608C0G1H330J
C13, C14	47pF 50V ceramic chip capacitor, ±5%, NPO	TDK	C1608C0G1H470J
C20	100pF 50V ceramic chip capacitor, ±5%, NPO	TDK	C1608C0G1H101J
C21	1000pF 50V ceramic chip capacitor, ±5%, NPO	TDK	C1608C0G1H102J
C15	0.1μF 16V ceramic chip capacitor, ±10%,X7R	TDK	C1608X7R1C104K
C16, C17	0.33μF 16V ceramic chip capacitor, ±20%,Y5V	TDK	C1608X5R1C334K
C9, C10, C11, C12, C22, C23, C24, C25, C26, C27, C28	1μF 6.3V ceramic chip capacitor, ±10%, X5R	TDK	C1608X5R0J105K
C1, C2, C3, C4, C5, C6, C7, C8	10μF 6.3V ceramic chip capacitor, ±10%, X5R	TDK	C3216X5R0J106K
D1	50V, 1A, Diode MELF SMD	Micro Commercial Components	DL4001
D2	Yellow Light Emitting Diode	Lumex	SML-LX0603YW-TR
D3, D4, D6, D7	Green Light Emitting Diode	Lumex	SML-LX0603GW-TR
D5	Red Light Emitting Diode	Lumex	SML-LX0603IW-TR
Q1, Q2	N-Channel MOSFET	Zetex	ZXMN6A07F
X1	6MHz Crystal SMD	Epson	MA-505 6.000M-C0
U8	USB streaming controller	Texas Instruments	TAS1020BPFB
U2	5V LDO regulator	Texas Instruments	REG1117-5
U9	3.3V/1.8V dual output LDO regulator	Texas Instruments	TPS767D318PWP
U3, U4	Quad, 3-state buffers	Texas Instruments	SN74LVC125APW
U5, U6, U7	Single IC buffer driver with open drain o/p	Texas Instruments	SN74LVC1G07DBVR
U10	Single 3-state buffer	Texas Instruments	SN74LVC1G125DBVR
U1	64K 2-Wire serial EEPROM I^2C	Microchip	24LC64I/SN
	USB-MODEVM PCB	Texas Instruments	6463995
TP1, TP2, TP3, TP4, TP5, TP6, TP9, TP10, TP11	Miniature test point terminal	Keystone Electronics	5000
TP7, TP8	Multipurpose test point terminal	Keystone Electronics	5011
J7	USB type B slave connector thru-hole	Mill-Max	897-30-004-90-000000
J1, J2, J3, J4, J5, J8	2-position terminal block	On Shore Technology	ED555/2DS

Table 8. USB-MODEVM Bill of Materials (continued)

Designators	Description	Manufacturer	Mfg. Part Number
J9	2.5mm power connector	CUI Stack	PJ-102B
J10	BNC connector, female, PC mount	AMP/Tyco	414305-1
J11A, J12A, J21A, J22A	20-pin SMT plug	Samtec	TSM-110-01-L-DV-P
J11B, J12B, J21B, J22B	20-pin SMT socket	Samtec	SSW-110-22-F-D-VS-K
J13A, J23A	10-pin SMT plug	Samtec	TSM-105-01-L-DV-P
J13B, J23B	10-pin SMT socket	Samtec	SSW-105-22-F-D-VS-K
J6	4-pin double row header (2x2) 0.1"	Samtec	TSW-102-07-L-D
J14, J15	12-pin double row header (2x6) 0.1"	Samtec	TSW-106-07-L-D
JMP1–JMP4	2-position jumper, 0.1" spacing	Samtec	TSW-102-07-L-S
JMP8–JMP14	2-position jumper, 0.1" spacing	Samtec	TSW-102-07-L-S
JMP5, JMP6	3-position jumper, 0.1" spacing	Samtec	TSW-103-07-L-S
JMP7	3-position dual row jumper, 0.1" spacing	Samtec	TSW-103-07-L-D
SW1	SMT, half-pitch 2-position switch	C&K Division, ITT	TDA02H0SK1
SW2	SMT, half-pitch 8-position switch	C&K Division, ITT	TDA08H0SK1
JMP8-JMP14	2-position jumper, 0.1" spacing	Samtec	TSW-102-07-L-S

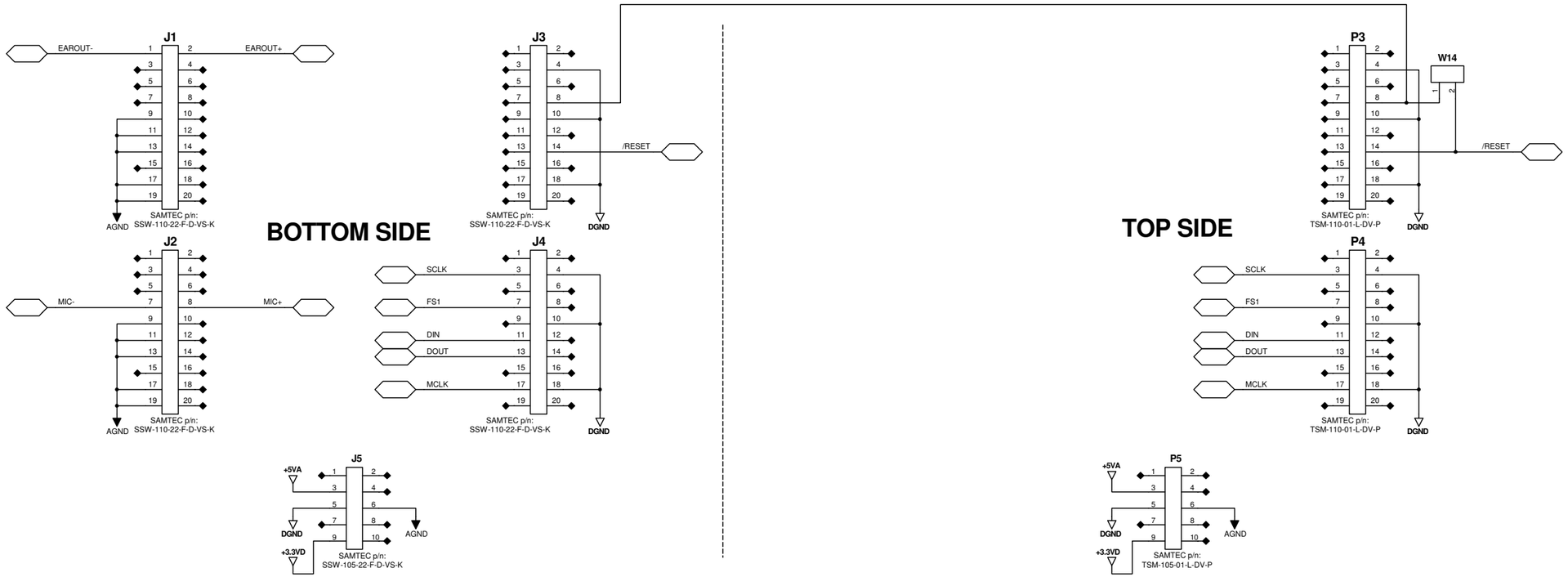
In addition to this list is a jumper plug from Samtec with manufacturer part number SNT-100-BK-T.

Appendix A TLV320AIC1106EVM Schematic

Appearing on the following pages, the schematic diagram is provided as a reference.

AIC1106_PW_EVM_REVA

USB_MODEVM (MOTHERBOARD) INTERFACE CONNECTIONS



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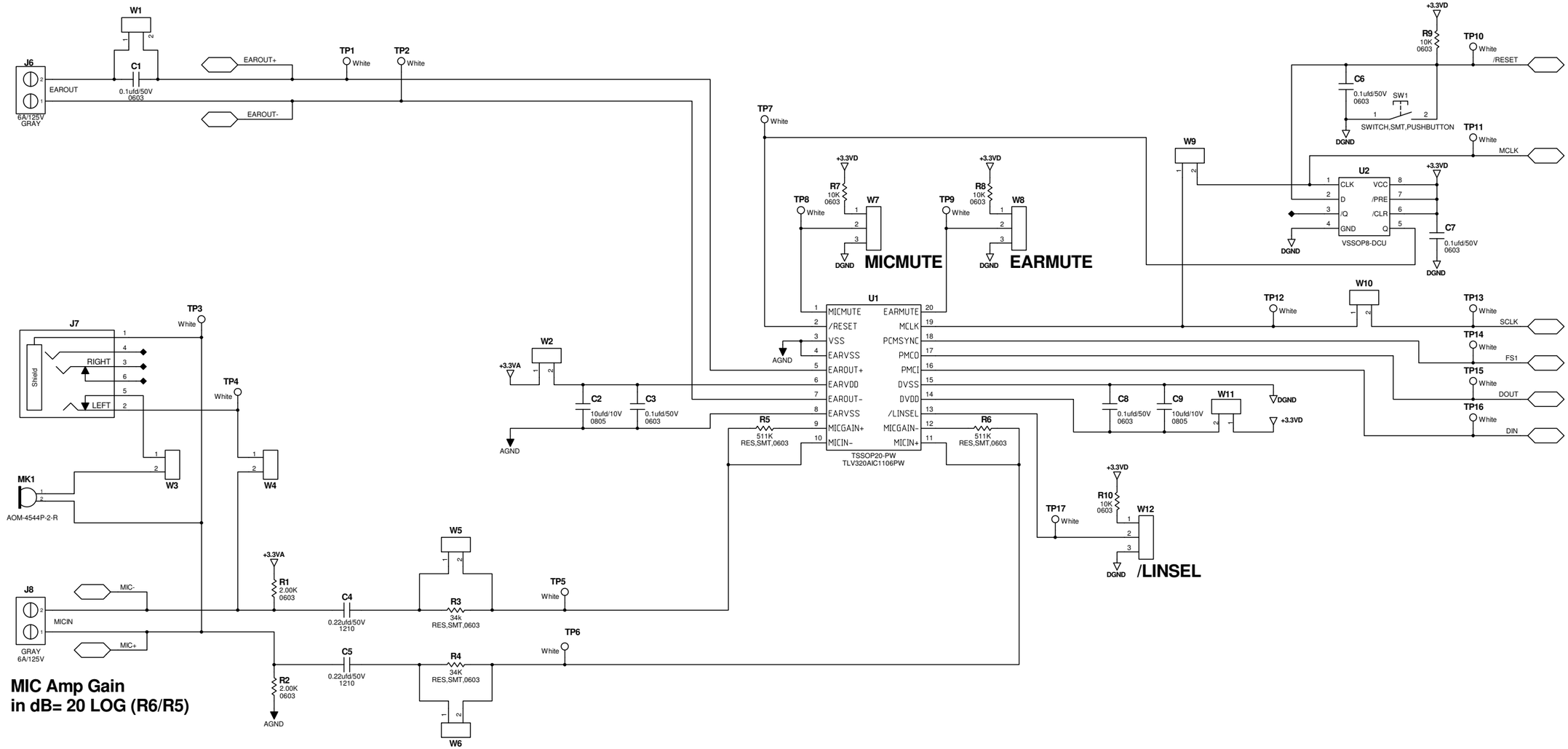
AIC1106_PW_EVM_REVA



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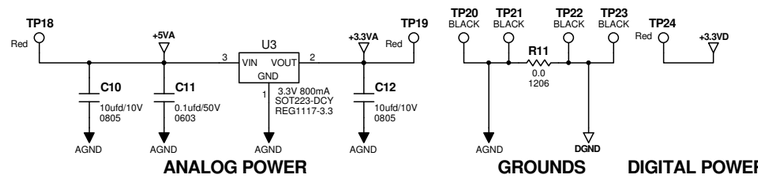

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Appendix B USB-MODEVM Schematic

Appearing on the following pages, the schematic diagram is provided as a reference.

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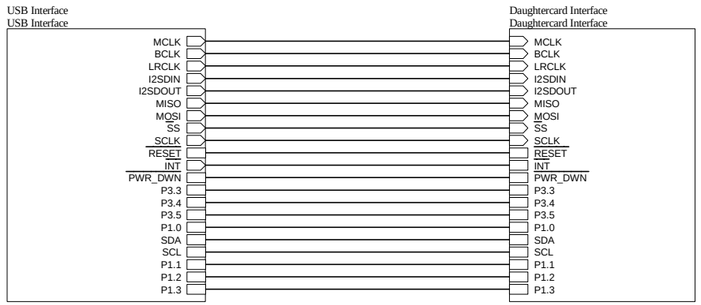

TEXAS INSTRUMENTS

DATA ACQUISITION PRODUCTS
HIGH-PERFORMANCE ANALOG DIVISION
SEMICONDUCTOR GROUP

6730 SOUTH TUCSON BLVD., TUCSON, AZ 85706 USA

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DRAWN BY **I. C. SPOTTS**			
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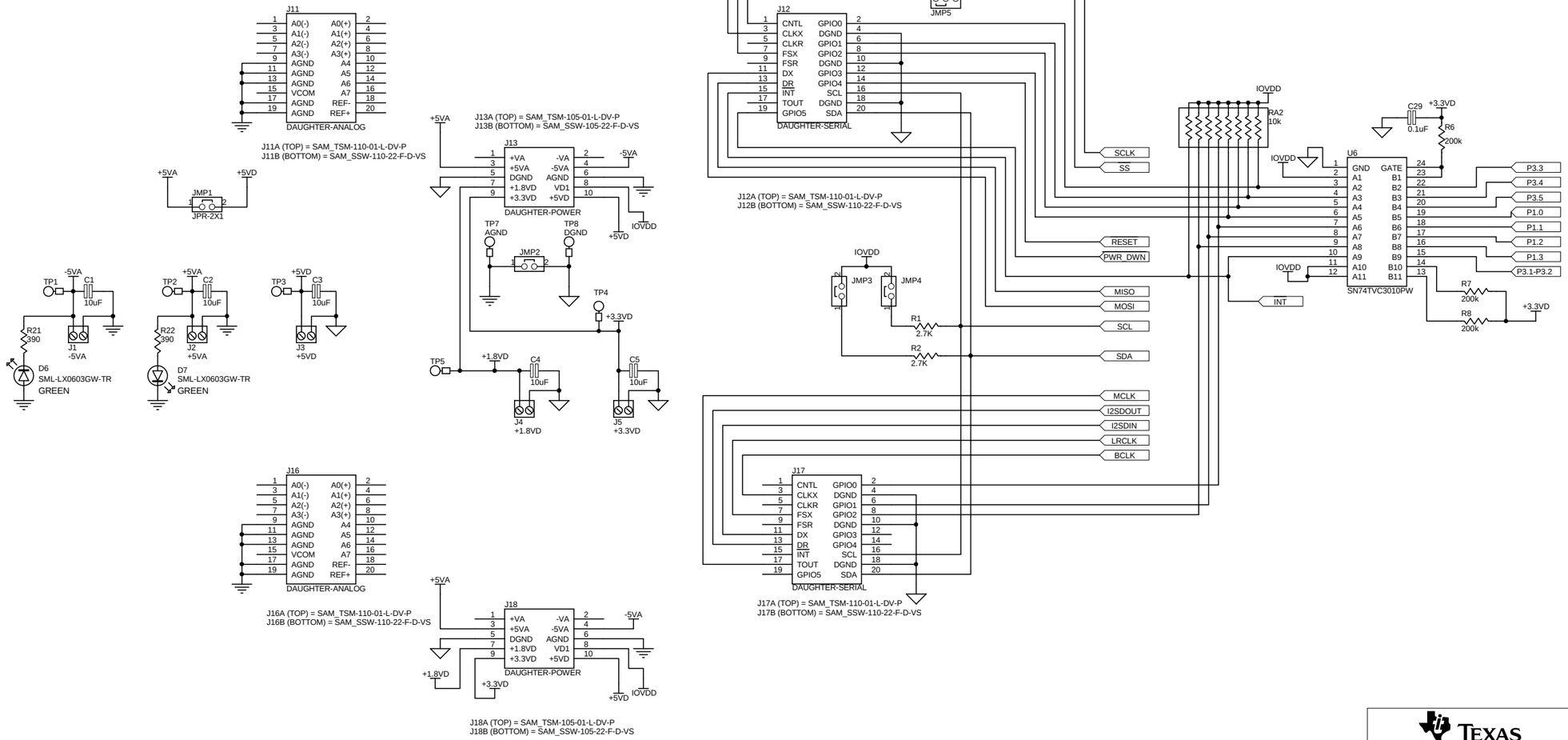

TEXAS INSTRUMENTS

DATA ACQUISITION PRODUCTS
HIGH-PERFORMANCE ANALOG DIVISION
SEMICONDUCTOR GROUP

6730 SOUTH TUCSON BLVD., TUCSON, AZ 85706 USA

TITLE **USB-MODEVM INTERFACE**

ENGINEER **RICK DOWNS**			
DRAWN BY **ROBERT BENJAMIN**			
DOCUMENT CONTROL NO. **6463996**	SIZE **B**	DATE **3-Apr-2007**	REV **D**
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24LC64I/SN
EXT MCK
USB MCK
SN74AVC4T245PW
USB I2S
SN74AVC4T245PW
MCLK
I2SDIN
BCLK
LRCLK
I2SDOUT
SN74AVC1T45DBV
EXTERNAL AUDIO DATA
PWR_DWN
SN74LVC1G126DBV
SN74LVC1G125DBV
EXT MCLK
SW DIP-8
USB RST
SN74AUP1G125DBV
MISO
MOSI
SS
SCLK
RESET
EXTERNAL SPI
INT
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IOVDD SELECT
USB SLAVE CONN
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XTALI
PLLFILI
PLLFILO
MCLKI
PUR
DP
DM
DVSS
AVSS
MRESET
TEST
EXTEN
RSTO
P3.0
P3.1
P3.2/XINT
P3.3
P3.4
P3.5
NC
P1.7
P1.6
P1.5
P1.4
P1.3
P1.2
P1.1
P1.0
DVDD
AVDD
JMP7
JPR-1X3
TP11
MRESET
USB ACTIVE
SML-LX0603YW-TR
YELLOW
P3.5
P3.4
P3.3
P3.1-P3.2
6VDC-10VDC IN
CUI-STACK PJ102-BH
2.5 MM
DL4001
REG1117-5
EXT PWR IN
PWR SELECT
SML-LX0603GW-TR
GREEN
TPS767D318PWP
RED
3.3VD ENABLE
1.8VD ENABLE
REGULATOR ENABLE
TPS73201DBV
SML-LX0603GW-TR
GREEN
SN74AVC1G06DBV
SML-LX0603GW-TR
GREEN
IOVDD SELECT

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6730 SOUTH TUCSON BLVD., TUCSON, AZ 85706 USA

ENGINEER **RICK DOWNS**	TITLE **USB-MODEVM INTERFACE**		
DRAWN BY **ROBERT BENJAMIN**			
DOCUMENT CONTROL NO. **6463996**	SIZE **B**	DATE **3-Apr-2007**	REV **D**
SHEET **1** OF **2**	FILE **C:\01_TI\designs\USB_MODEVM\usb-modevm_revD\USB Motherboard - ModEvm.ddb - Documents\SCH\USB Interface**		

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