

DANCEVM-A

The Digital ANC EVM-A (DANCEVM-A) allows on-the-fly tuning of Digital Noise-Cancelling headphones using PurePath™ Studio.

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US ECCN: 3E991
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1 Introduction

This document describes the hardware and software configuration of the DANCEVM-A board.

2 Getting Started

The DANCEVM-A has 3 audio CODECs (AIC3254 and two AIC3256s) and an audio amplifier (TPA6130A2). For simplicity, these devices are labeled as follows:

1. Music Chip – AIC3254 (U10)
2. DANC_L – AIC3256 (U4)
3. DANC_R – AIC3256 (U3)
4. HP Amp – TPA6130A2 (U1)

Follow the steps in this section to configure the hardware and software for music playback. Further details can be found in the DANC Programmer Guide. Specifically, refer to its MiniDSP Code Loading Process section.

2.1 Hardware Setup

The default jumper settings are shown in [Figure 1](#). This assumes a hybrid ANC configuration. Refer to the EVM schematic ([Section 4.1](#)) and [Section 3](#) for details.

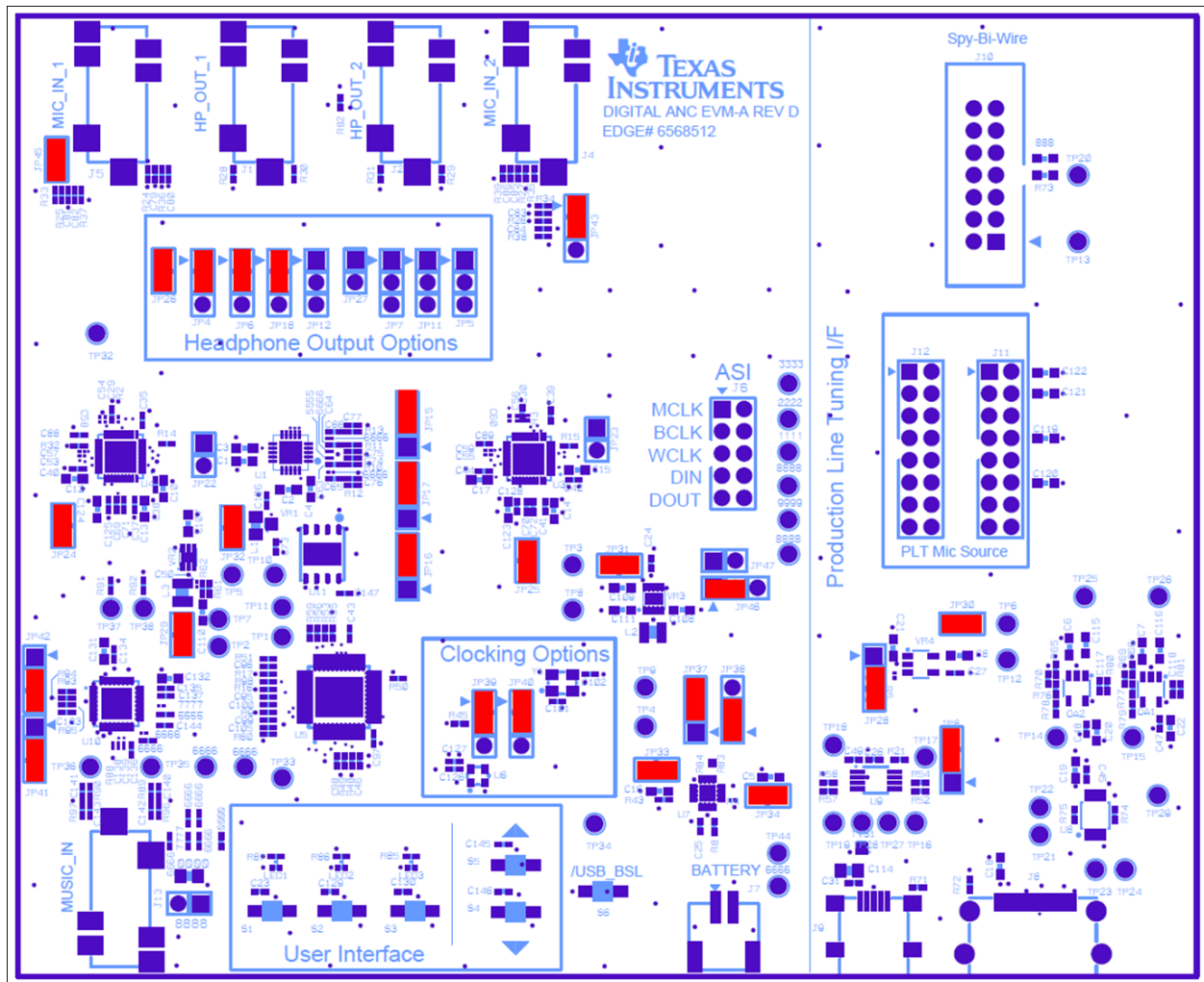


Figure 1. Default DANCEVM-A Jumper Settings

2.2 Loading Code from PurePath Studio

This subsection describes how to download the ANC code from PurePath Studio (PPS) into the DANCEVM-A chips through USB. Tuning details are not discussed in this document.

CAUTION

Never wear headphones while adjusting any PurePath Studio parameter. Setting an incorrect value will cause very loud speaker feedback.

1. Unzip the DANC Package and locate the DANC Programmer Guide. That document specifies where to obtain the required software packages.
2. Place the PurePath components found in `.\\Components` folder of the DANC Package into `[User]\\My Documents\\Texas Instruments Inc\\PurePath Studio (Portable Audio) MiniDSP 5.95\\UserComponentLibrary`.
3. Configure the board per the jumper settings shown in [Section 2.1](#), or as required by the application.
4. Connect a USB cable to the USB jack.
5. Open two instances of PurePath Studio.

6. In one instance, open the desired **Music Chip** process flow (for example, ATHY1-MUS-24.0000-3BQ-LOWPWR). It should look something similar to [Figure 2](#).
7. Set the TargetBoard property of the Framework to **USB**.

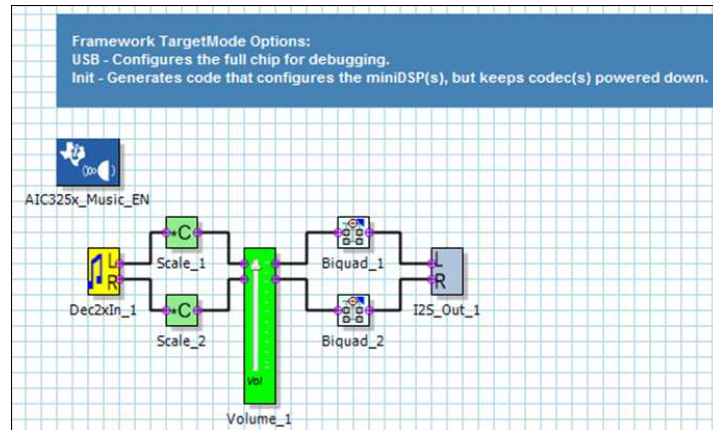


Figure 2. Generic Music Chip Process Flow

8. Select *Build*→*Download Code*. Select *FWIDMusic Chip*.

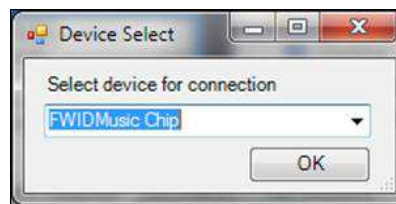


Figure 3. PPS Device Select (Music Chip)

9. Cancel any additional messages.
10. In the other PurePath instance open the desired **DANC** process flow (for example, ATHY1-DNC-24.0000-B-HY-LOWPWR_CASCADE). It should look something similar to [Figure 4](#).
11. Set the TargetBoard property of the Framework to **USB**.

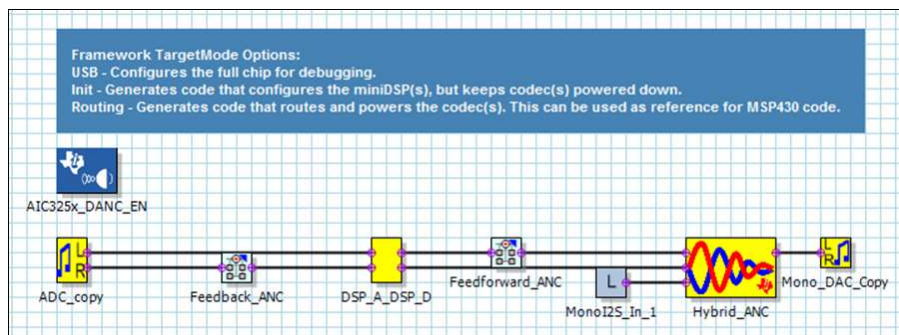


Figure 4. Generic DANC Chip Process Flow

12. Select *Build*→*Download Code*. Select *FWIDDANC_L Chip*.



Figure 5. PPS Device Select (DANC Chips)

13. Runtime parameters can be changed on-the-fly in either PurePath instance.
14. Click the **ANC** component in the **DANC** process flow. Observe the **Properties** window on the right. The **Control_Coeff** controls the master volume. The **ANC_Gain**, **Feedforward_Gain** and **Feedback_Gain** control the respective microphone gain into the ANC block. The **Music_Gain** controls the music mix level. All these gains are linear; a 0 disables the control.



Figure 6. Feedback ANC Component Properties

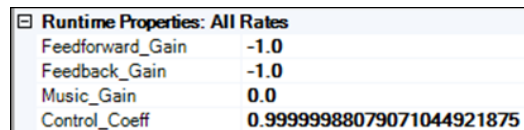


Figure 7. Hybrid ANC Component Properties

3 DANCEVM-A Default Jumper Settings

The DANCEVM-A default jumper settings are shown in [Table 1](#).

Table 1. DANCEVM-A Default Jumper Settings

Label	Default Position	Description	Label	Default Position	Description
Headphone Output Options (Sheet 5)			DANC Chip Options (Sheet 3 and Sheet 4)		
JP26	On	Grounds HP_OUT_1 sleeve	JP45	On	MIC_IN_1 tip connected to circuit
JP4	1-2	—	JP24	On	DANC_L HP not in GCHP
JP6	1-2	—	JP22	Off	DANC_L DOUT floating
JP18	1-2	—	JP43	1-2	MIC_IN_2 ring connected to DANC_R
JP12	Off	—	JP25	On	DANC_R HP not in GCHP
JP27	Off	Grounds HP_OUT_2 sleeve	JP23	Off	DANC_R DOUT floating
JP7	Off	—	JP45	On	MIC_IN_1 tip connected to circuit
JP11	Off	—	JP24	On	DANC_L HP not in GCHP
JP5	Off	—	JP22	Off	DANC_L DOUT floating
TPA6130A2 Input Options (Sheet 5)			Power Supply Options (Sheet 7)		
JP16	2-3	LM source = ground	JP46	1-2	Power Save disabled
JP17	2-3	RP source = DANC_R_LOL	JP47	Off	MSP PS control disabled
JP15	2-3	RM source = ground	JP37	2-3	EN1 = 0
Clocking Options (Sheet 6)			JP38	1-2	EN2 = 1
JP39	1-2	—	PLT Options (Sheet 8)		
JP40	1-2	—	JP28	2-3	VPLT disabled
Music Chip Options (Sheet 2)			JP8	2-3	PLT I ² C buffer disabled
JP48	Off	Ground loop break circuit enabled	PLT Microphone Source (Sheet 5)		
JP41	2-3	Music DIN source = '0'	J12	All Off	Selects between LO or HP
JP42	2-3	Music DOUT pin to DIN net	J11	All Off	Routes mics to the PLT
Current Measurement (Sheet 7 and Sheet 8)					
JP31	On	VSYS to VIO			
JP29	On	VSYS to DVDD			
JP32	On	VSYS to +1.8 V			
JP34	On	Battery to System			
JP33	On	Charger output to VSYS			
JP30	On	VSYS to VPLT			

4 DANCEVM-A Schematics, Layout Views and Bill of Materials

4.1 DANCEVM-A Schematics

The DANCEVM-A schematic is provided in the following pages.

Digital ANC EVM-A

1. Table of Contents
2. Music Chip
3. DANC_L Chip
4. DANC_R Chip
5. HP Amp Chip / ASI / Misc
6. MSP430 / Clocking
7. Power Supplies / Battery Charger
8. Production Line Tuning (PLT) Interface
9. Revision History

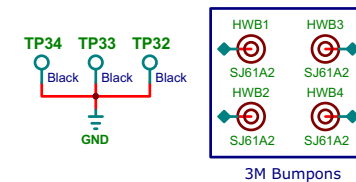


Figure 8. DANCEVM-A Schematic - Page 1 of 10

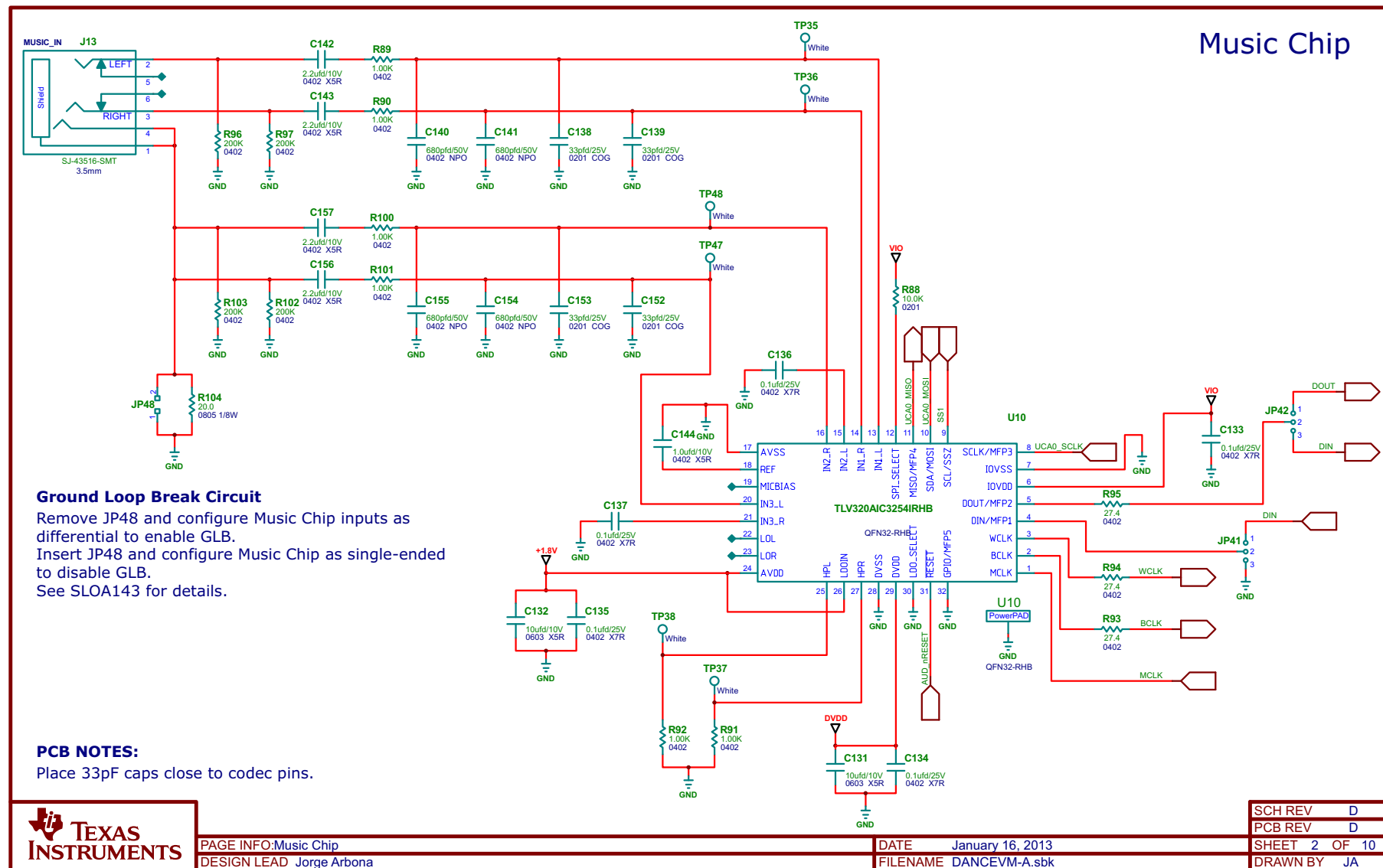


Figure 9. DANCEVM-A Schematic - Page 2 of 10

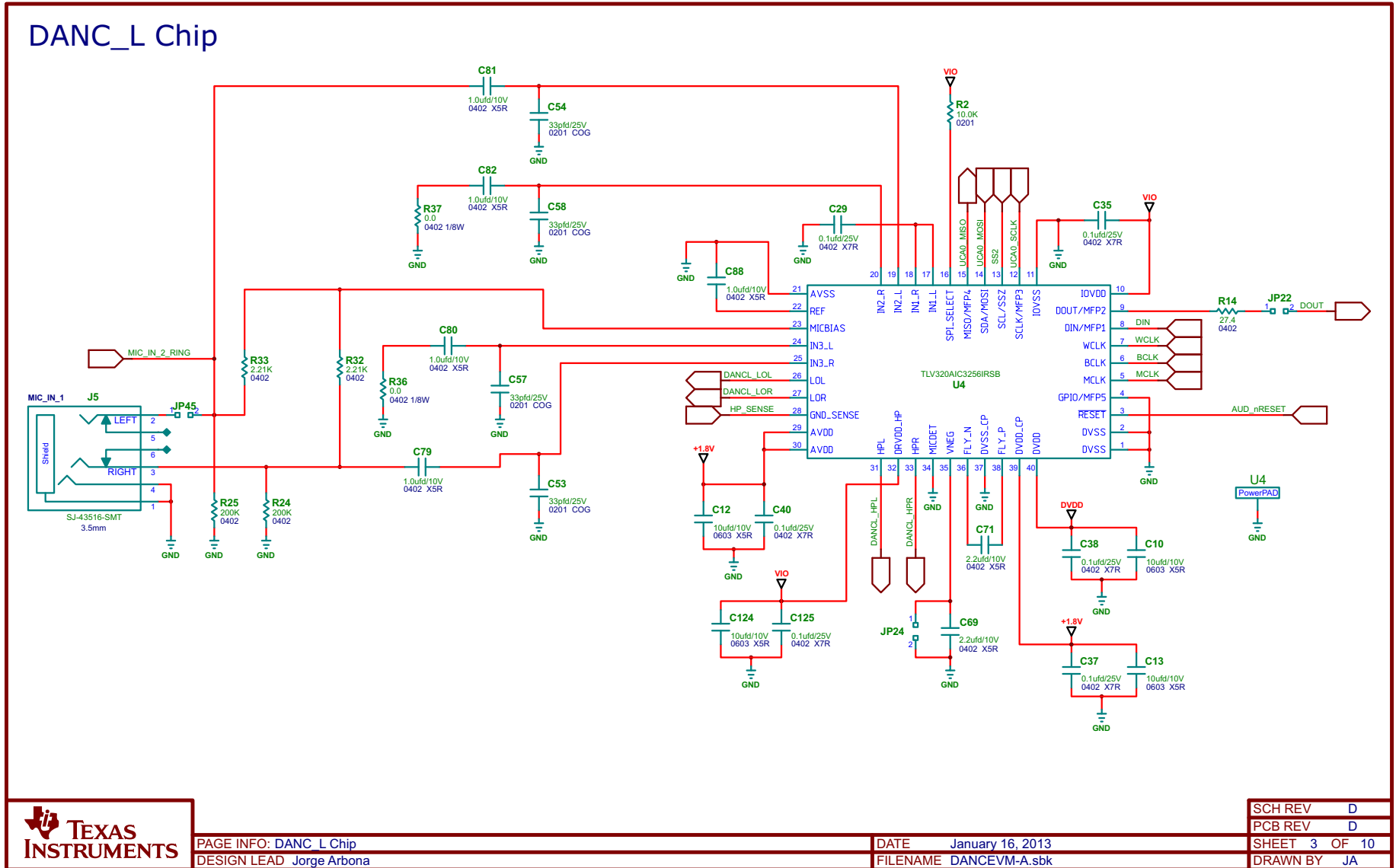


Figure 10. DANCEVM-A Schematic - Page 3 of 10

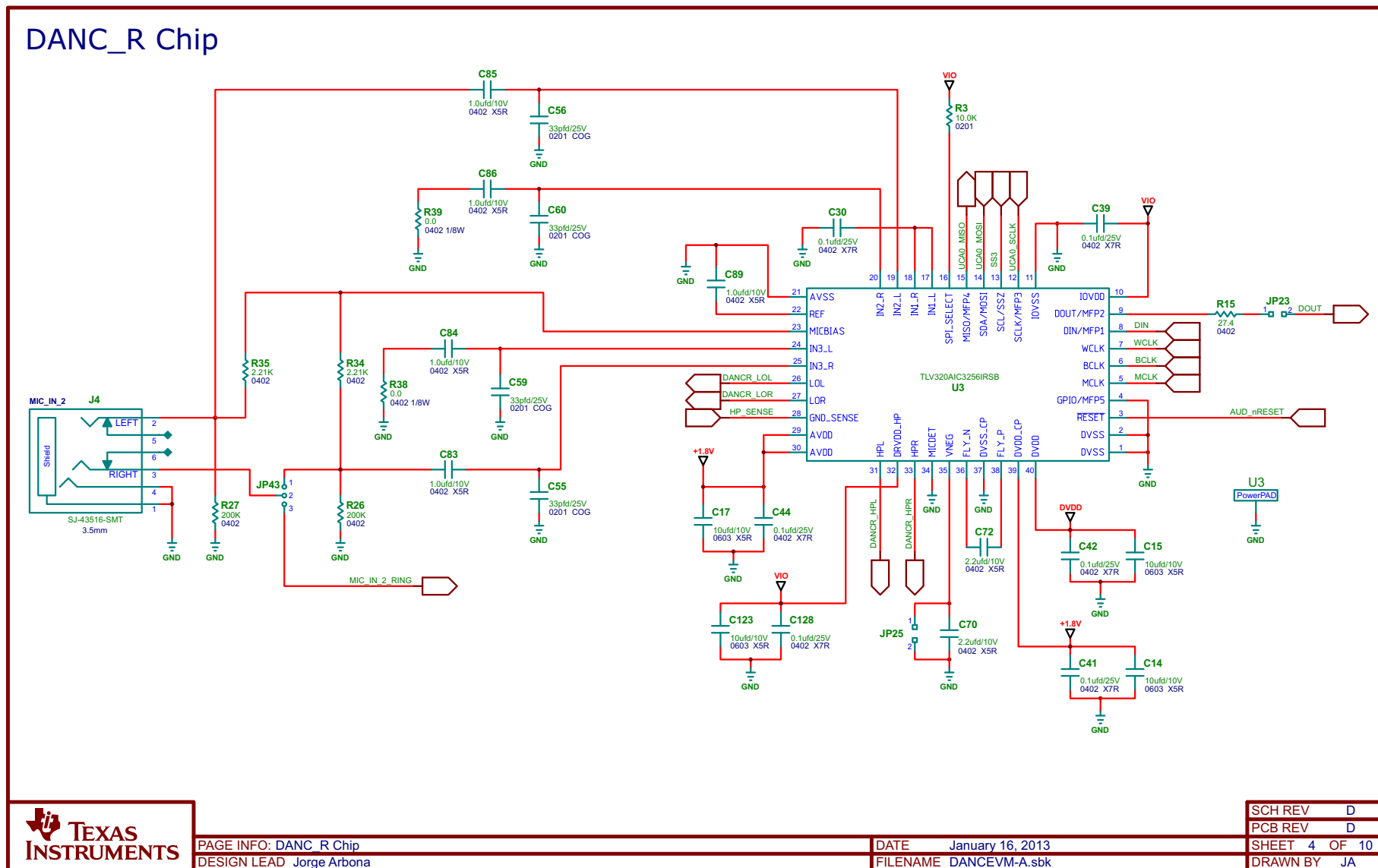


Figure 11. DANCEVM-A Schematic - Page 4 of 10

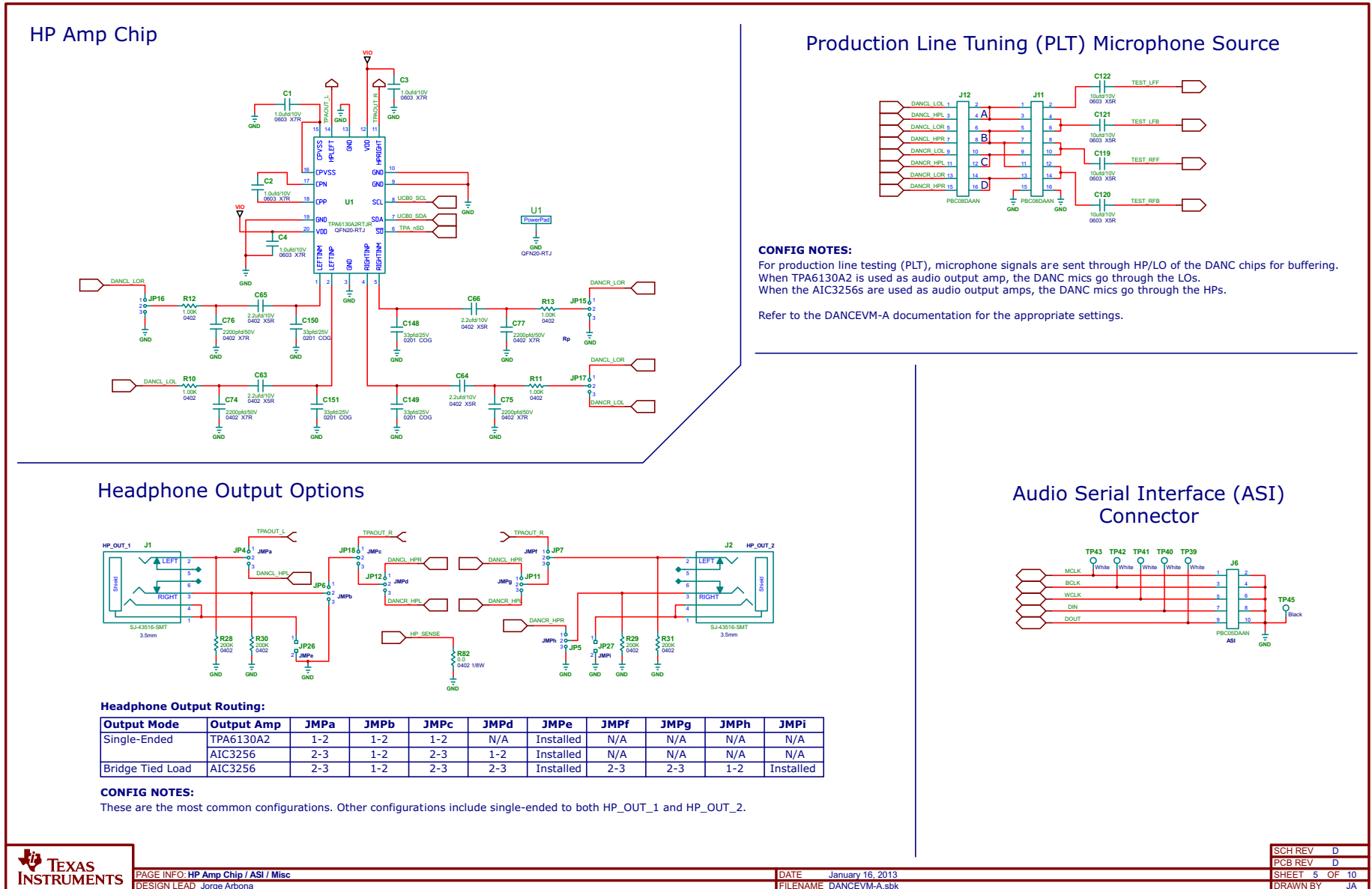


Figure 12. DANCEVM-A Schematic - Page 5 of 10

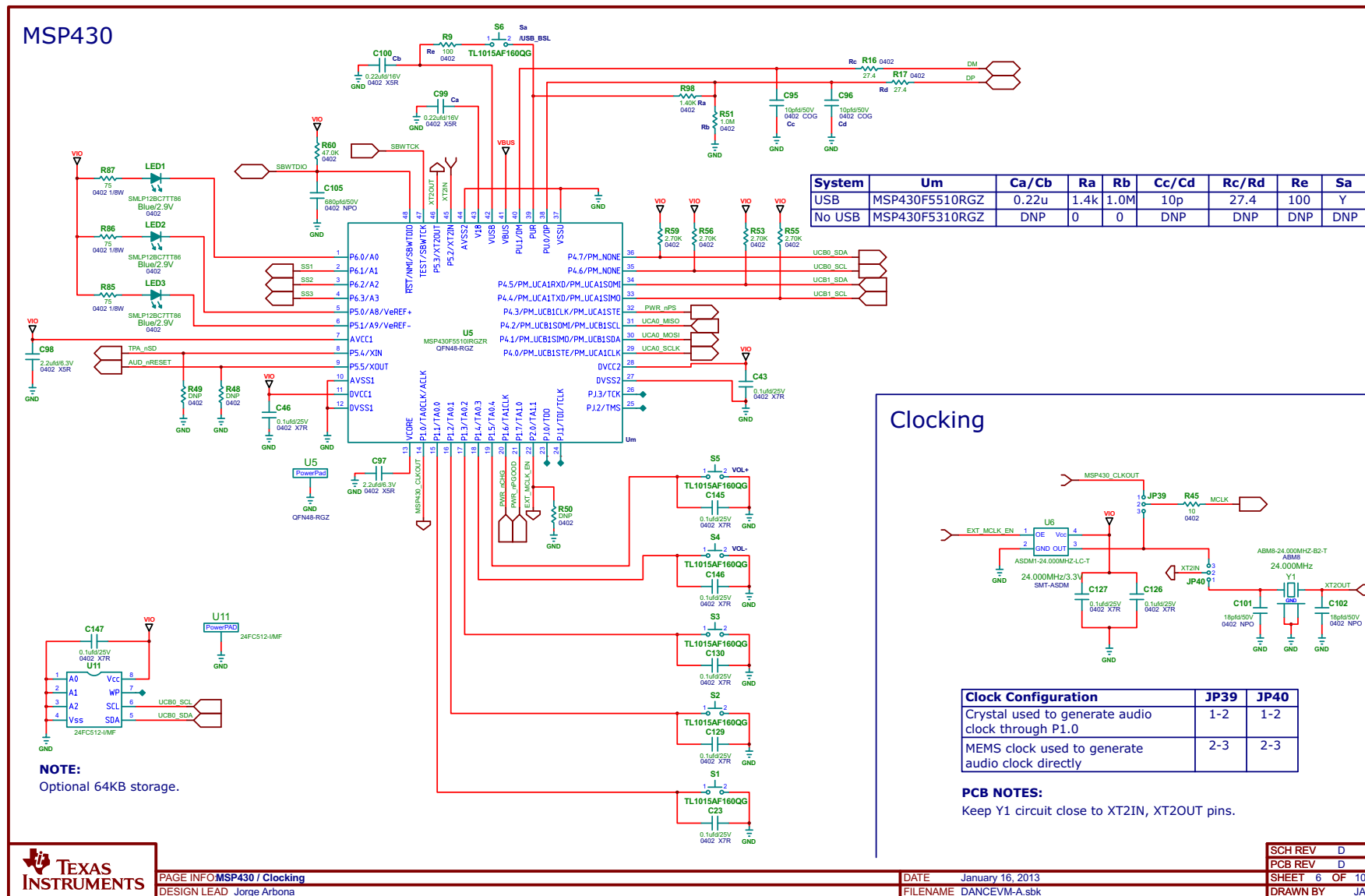


Figure 13. DANCEVM-A Schematic - Page 6 of 10

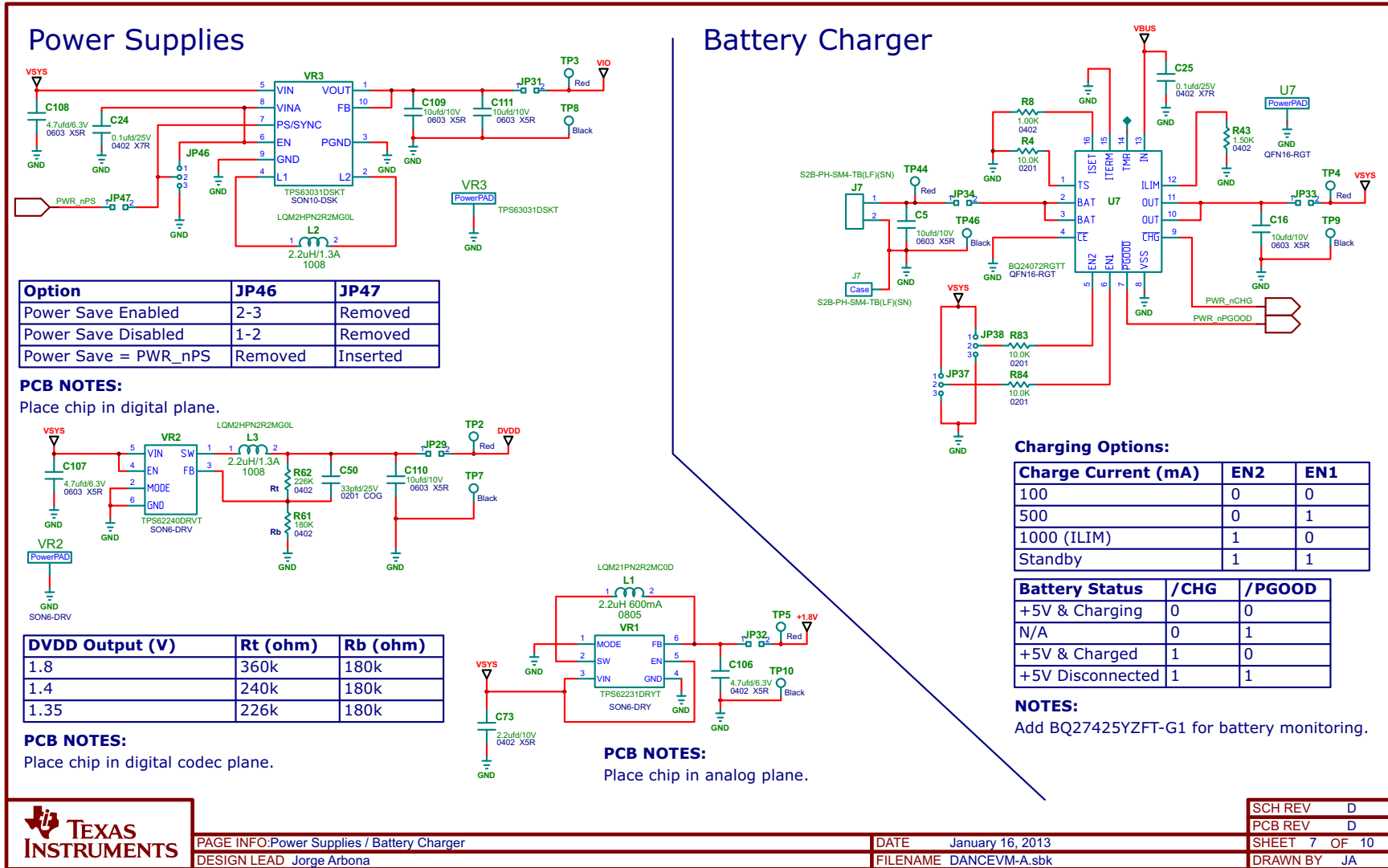
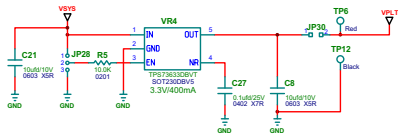


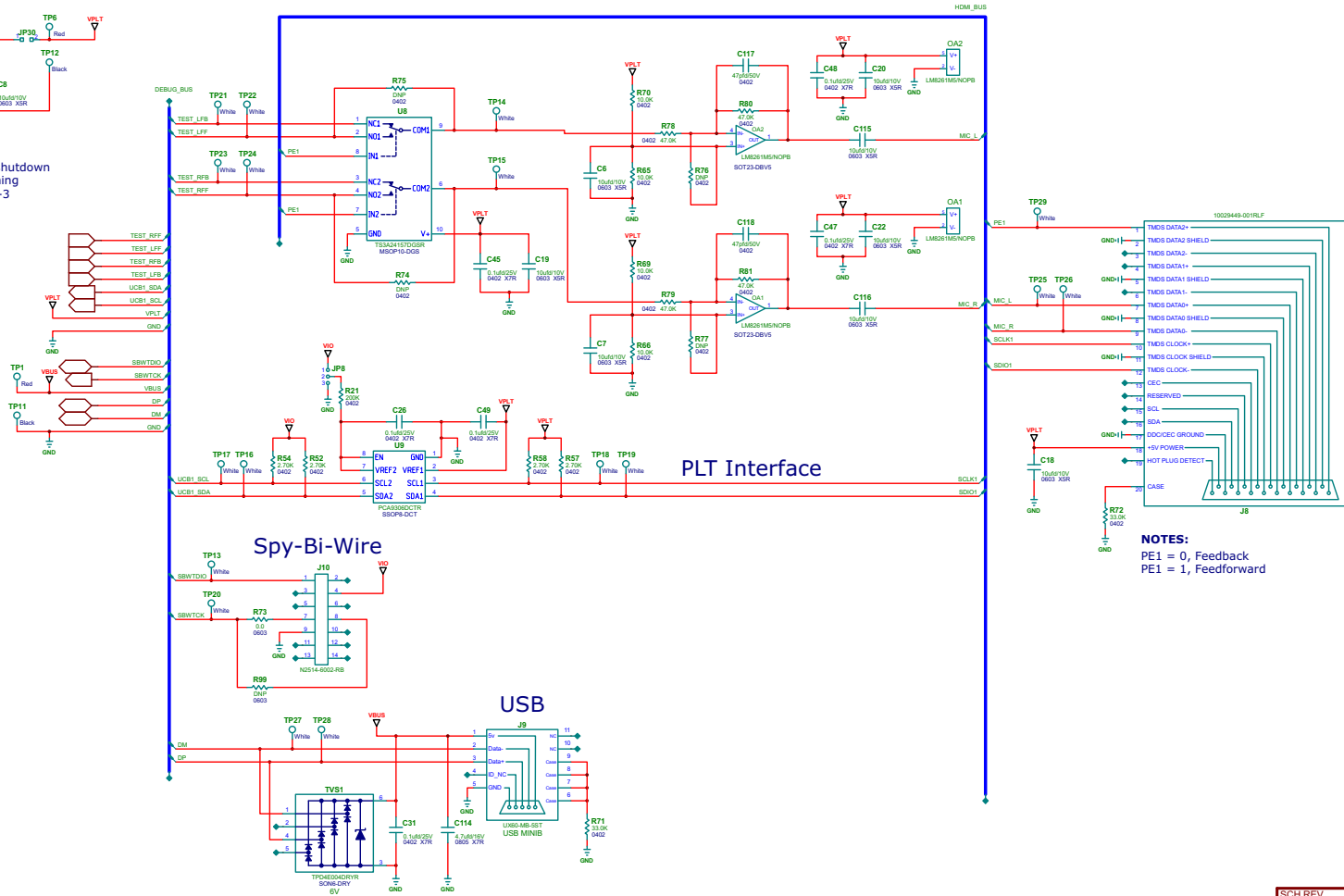
Figure 14. DANCEVM-A Schematic - Page 7 of 10

Production Line Tuning (PLT)



NOTES:

A separate supply is used to keep system shutdown current independent of Production Line Tuning block. JP28 can set to 2-3 and JP8 set to 2-3 when measuring battery life of the system.



NOTES:
PE1 = 0, Feedback
PE1 = 1, Feedforward



Figure 15. DANCEVM-A Schematic - Page 8 of 10

DANCEVM-A REV C

REVISION HISTORY			
REVISION	DESCRIPTION	DATE	APPROVAL
C	RELEASE	November 6, 2012	JA
D	<ul style="list-style-type: none"> - Added jumper options for TPS63031 power save. - Added ground loop break circuit for Music Chip. - Changed Spy-bi-wire capacitor from 2.2nF to 680pF. 	December 10, 2012	JA

	PAGE INFO: REVISION HISTORY	EDGE # 6568512	DATE January 16, 2013	SCH REV D
	DESIGN LEAD Jorge Arbona	FILENAME DANCEVM-A.sbk	DRAWN BY JA	PCB REV D
				SHEET 9 OF 10

Figure 16. DANCEVM-A Schematic - Page 9 of 10

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Figure 17. DANCEVM-A Schematic - Page 10 of 10

4.2 DANCEVM-A Layout Views

The DANCEVM-A layout views are provided in the following pages.

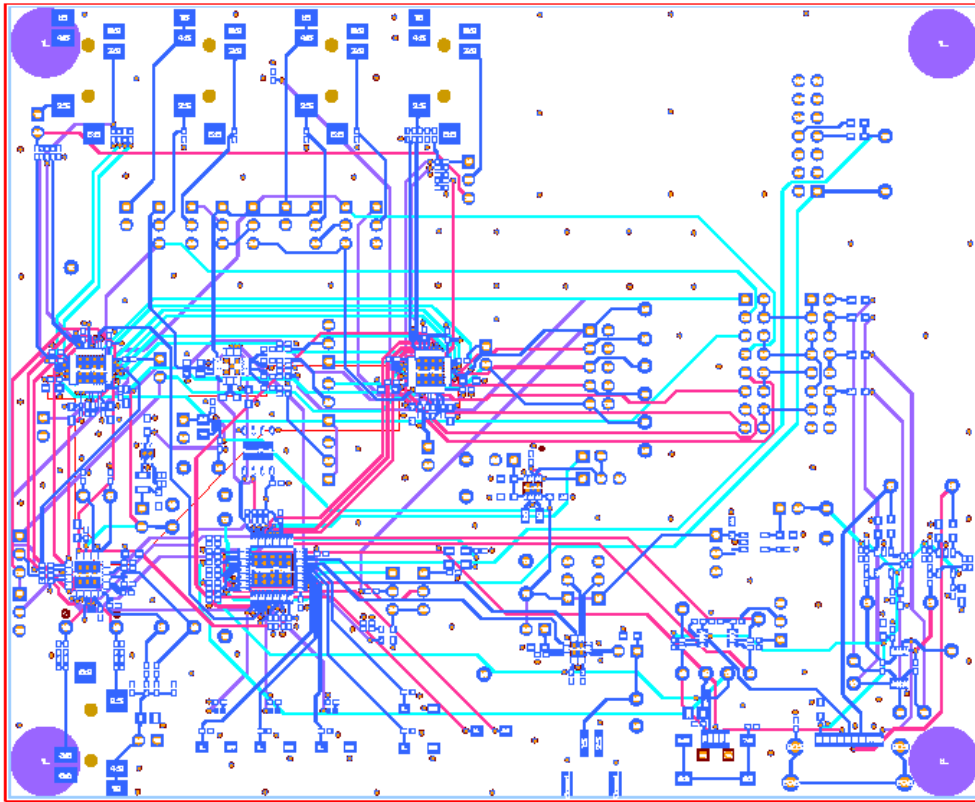


Figure 18. DANCEVM-A Layout View

4.3 DANCEVM-A Bill of Materials

The DANCEVM-A bill of materials is provided in [Table 2](#).

Table 2. Bill of Materials for DANCEVM-A REVD

Qty.	Ref Designators	Description	Vendor	Vendor Part No.	Manufacturer	MANU Part No.
AIP SEMICONDUCTORS						
1	U10	LO PWR AUDIO CODEC, EMBEDDED miniDSP STEREO CLASS-D AMP ROHS	DIGI-KEY	296-23776-1	TEXAS INSTRUMENTS	TLV320AIC3254IRHB
2	U3,U4	POWER TUNED CODEC HEADPHONE AMPS MINIDSP QFN40-RSB ROHS	TEXAS INSTRUMENTS	TLV320AIC3256RSB	TEXAS INSTRUMENTS	TLV320AIC3256IRSB
1	U1	138mW DIRECTPATH STEREO HP AMP I2C QFN20-RTJ ROHS	DIGI-KEY	296-21656-1-ND	TEXAS INSTRUMENTS	TPA6130A2RTJR
1	VR1	3MHz ULTRA STEP DOWN CONVERTER SON6-DRY ROHS	MOUSER	595-TPS62231DRYT	TEXAS INSTRUMENTS	TPS62231DRYT
TI SEMICONDUCTORS						
1	U5	MIXED SIGNAL MICROCONTROLLER QFN48-RGZ ROHS	DIGI-KEY	296-28135-1-ND	TEXAS INSTRUMENTS	MSP430F5510IRGZR
1	VR2	2.25MHz 300mA STEP DOWN CONVERTER SON6-DRV ROHS	DIGI-KEY	296-22467-1-ND	TEXAS INSTRUMENTS	TPS62240DRVT
1	VR3	HI-EFFICIENCY BUCK BOOST CONVERTER WITH 1A SWITCHES SON10-DSK ROHS	DIGI-KEY	296-23904-1-ND	TEXAS INSTRUMENTS	TPS63031DSKT
1	U7	1.5A USB-FRIENDLY LI-ION BATT CHARGER QFN16-RGT ROHS	MOUSER	595-BQ24072RGTT	TEXAS INSTRUMENTS	BQ24072RGTT
1	U8	DUAL SPDT ANALOG SWITCH 0.65 OHMS MSOP10-DGS ROHS	DIGI-KEY	296-22856-1-ND	TEXAS INSTRUMENTS	TS3A24157DGSR
2	OA1, OA2	OP AMP RRIO HI OUTPUT CURRENT SOT23-DBV5 ROHS	DIGI-KEY	LM8261M5CT-ND	TEXAS INSTRUMENTS	LM8261M5/NOPB
1	VR4	VOLT REG 3.3V 400MA LDO CAP FREE NMOS SOT23-DBV5 ROHS	DIGI-KEY	296-15819-1	TEXAS INSTRUMENTS	TPS73633DBVT
1	U9	DUAL BIDIR I2C BUS AND SMBUS VOLT LEVEL TRANS SSOP8-DCT ROHS	DIGI-KEY	296-18509-1	TEXAS INSTRUMENTS	PCA9306DCTR
NON-TI SEMICONDUCTORS						
1	U11	512K I2C SERIAL EEPROM DFN8-MF ROHS	DIGI-KEY	24FC512-I/MF-ND	MICROCHIP	24FC512-I/MF
TVSs						
1	TVS1	ESD PROTECTION DIODE ARRAY 5x 6V SON6-DRY ROHS	DIGI-KEY	296-23618-1-ND	TEXAS INSTRUMENTS	TPD4E004DRYR
LEDs						
3	LED1, LED2, LED3	LED BLUE SMD0402 2.9V 10mA ROHS	DIGI-KEY	511-1615-1-ND	ROHM SEMICONDUCTOR	SMLP12BC7TT86
OSCILLATORS						
1	U6	OSCILLATOR SMT 24.000MHz 3.3V OUT-ENABLE ROHS	DIGI-KEY	535-9790-1-ND	ABRACON CORP	ASDM1-24.000MHZ-LC-T
1	Y1	CRYSTAL SMT ABM8 SERIES 24.000MHz 18ppm 10PF ROHS	DIGI-KEY	535-9138-1-ND	ABRACOM	ABM8-24.000MHZ-B2-T

Table 2. Bill of Materials for DANCEVM-A REVD (continued)

Qty.	Ref Designators	Description	Vendor	Vendor Part No.	Manufacturer	MANU Part No.
CAPACITORS-SMT						
26	C5, C6, C7, C8, C10, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C115, C116, C119, C120, C121, C122, C123, C124, C131, C132	CAP SMD0603 CERM 10ufd 10V 10% X5R ROHS	DIGI-KEY	445-7486-1-ND	TDK CORP	C1608X5R1A106K
36	C23, C24, C25, C26, C27, C29, C30, C31, C35, C37, C38, C39, C40, C41, C42, C43, C44, C45, C46, C47, C48, C49, C125, C126, C127, C128, C129, C130, C133, C134, C135, C136, C137, C145, C146, C147	CAP SMD0402 CERM 0.1ufd 25V 10% X7R ROHS	DIGI-KEY	445-7348-1-ND	TDK CORP	C1005X7R1E104K
17	C50, C53, C54, C55, C56, C57, C58, C59, C60, C138, C139, C148, C149, C150, C151, C152, C153	CAP SMD0201 CERM 33PFD 25V COG 5% ROHS	DIGI-KEY	490-1255-1	MURATA	GRM0335C1E330JD01D
5	C105, C140, C141, C154, C155	CAP SMD0402 CERM 680PFD 5% 50V NPO ROHS	DIGI-KEY	490-3240-1-ND	MURATA	GRM1555C1H681JA01D
13	C63, C64, C65, C66, C69, C70, C71, C72, C73, C142, C143, C156, C157	CAP SMD0402 CERM 2.2UFD 10V 10% X5R ROHS	DIGI-KEY	445-7392-1-ND	TDK CORP	C1005X5R1A225K
11	C79, C80, C81, C82, C83, C84, C85, C86, C88, C89, C144	CAP SMD0402 CERM 1.0UFD 10V 10% X5R ROHS	DIGI-KEY	445-4114-1-ND	TDK CORP	C1005X5R1A105K
4	C1, C2, C3, C4	CAP SMD0603 CERM 1.0UFD 10V 10% X7R ROHS	DIGI-KEY	490-3899-1-ND	MURATA	GRM188R71A105KA61D
2	C95, C96	CAP SMD0402 CERM 10pfd 50V +0.5pfd COG ROHS	DIGI-KEY	445-1235-1-ND	TDK CORP.	C1005C0G1H100D
2	C97, C98	CAP SMD0402 CERM 0.22UFD 6.3V 10% X5R ROHS	DIGI-KEY	445-1267-1	TDK CORP	C1005X5R0J224
2	C99, C100	CAP SMD0402 CERM 0.22UFD 16V 10% X5R ROHS	DIGI-KEY	587-1452-1	TAIYO YUDEN	EMK105BJ224KV-F
2	C101, C102	CAP SMD0402 CERM 18PFD 50V NPO 5% ROHS	DIGI-KEY	490-1281-1	MURATA	GRM1555C1H180JZ01D
1	C106	CAP SMD0402 CERM 4.7UFD 6.3V X5R 10% ROHS	DIGI-KEY	490-5408-1-ND	MURATA	GRM155R60J475ME87D
2	C107, C108	CAP SMD603 CERM 4.7UFD 6.3V 20% X5R ROHS	DIGI-KEY	445-1417-1	TDK	C1608X5R0J475M
3	C109, C110, C111	CAP SMD0603 CERM 10UFD 10V 20% X5R ROHS	DIGI-KEY	PCC2479TR-ND	PANASONIC	ECJ-1VB1A106M
1	C114	CAP SMD0805 CERM 4.7UFD 16V 10% X7R ROHS	DIGI-KEY	490-4522-1-ND	MURATA	GRM21BR71C475KA73L
2	C117, C118	CAP SMD0402 CERM 47pfd 50V 5% COG ROHS	DIGI-KEY	709-1121-1-ND	JOHANSON	500R07N470JV4T
4	C74, C75, C76, C77	CAP SMD0402 CERM 2200PFD 50V 10% X7R ROHS	DIGI-KEY	445-1257-1-ND	TDK CORP.	C1005X7R1H222K
RESISTORS-SMT						
7	R2, R3, R4, R5, R83, R84, R88	RESISTOR SMD0201 10.0K 1% 1/20W ROHS	DIGI-KEY	RHM10KABCT-ND	ROHM	MCR006YZPF1002
11	R8, R10, R11, R12, R13, R89, R90, R91, R92, R100, R101	RESISTOR SMD0402 1.00K 1% 1/16W 100ppm ROHS	DIGI-KEY	541-1.00KLCT	VISHAY	CRCW04021K00FKED

Table 2. Bill of Materials for DANCEVM-A REVD (continued)

Qty.	Ref Designators	Description	Vendor	Vendor Part No.	Manufacturer	MANU Part No.
7	R14, R15, R16, R17, R93, R94, R95	RESISTOR SMD0402 THICK FILM 27.4 OHMS 1/10W 1% ROHS	DIGI-KEY	P27.4LCT-ND	PANASONIC	ERJ-2RKF27R4X
13	R21, R24, R25, R26, R27, R28, R29, R30, R31, R96, R97, R102, R103	RESISTOR SMD0402 THICK FILM 200K OHMS 1% 1/16W ROHS	DIGI-KEY	311-200KLRCT-ND	YAGEO	RC0402FR-07200KL
4	R32, R33, R34, R35	RESISTOR SMD0402 THICK FILM 2.21K OHMS 1% 1/16W ROHS	DIGI-KEY	311-2.21KLRCT-ND	YAGEO	RC0402FR-072K21L
5	R36, R37, R38, R39, R82	ZERO OHM JUMPER SMT 0402 0 OHM 1/16W, 5% ROHS	DIGI-KEY	541-0.0JCT	VISHAY	CRCW04020000Z0ED
1	R45	RESISTOR SMD0402 10 OHMS 1/16W 1% ROHS	DIGI-KEY	541-10JCT	VISHAY	CRCW040210R0JNED
1	R51	RESISTOR SMD0402 1.0M OHMS 1% 1/16W ROHS	DIGI-KEY	RMCF0402FT1M00CT	STACKPOLE ELECTRONICS	RMCF0402FT1M00
1	R9	RESISTOR SMD0402 100 OHMS 1% 1/16W ROHS	DIGI-KEY	RMCF0402FT100RCT-ND	STACKPOLE ELECTRONICS	RMCF0402FT100R
8	R52, R53, R54, R55, R56, R57, R58, R59	RESISTOR SMD0402 THICK FILM 2.70K OHMS 1% 1/16W ROHS	DIGI-KEY	311-2.70KLRCT-ND	YAGEO	RC0402FR-072K7L
5	R60, R78, R79, R80, R81	RESISTOR SMD0402 47.0K OHMS 1% 1/16W ROHS	DIGI-KEY	RMCF0402FT47K0CT-ND	STACKPOLE ELECTRONICS	RMCF0402FT47K0
3	R85, R86, R87	RESISTOR SMD0402 75 OHMS 1/8W 1% ROHS	DIGI-KEY	541-75.0YCT	VISHAY	CRCW040275R0FKEDHP
1	R61	RESISTOR SMD0402 180K OHMS 1% 1/16W ROHS	DIGI-KEY	541-180KLCT-ND	VISHAY	CRCW0402180KFKED
1	R62	RESISTOR SMD0402 226K OHMS 1% 1/16W ROHS	DIGI-KEY	541-226KLCT-ND	VISHAY	CRCW0402226KFKED
1	R43	RESISTOR SMD0402 THICK FILM 1.50K OHMS 1/10W 1% ROHS	DIGI-KEY	P1.50KLCT-ND	PANASONIC	ERJ-2RKF1501X
4	R65, R66, R69, R70	RESISTOR SMD0402 10.0K OHMS 1% 1/16W ROHS	DIGI-KEY	541-10.0KLCT	VISHAY	CRCW040210K0FKED
2	R71, R72	RESISTOR SMD0402 THICK FILM 33.0K OHMS 1% 1/16W ROHS	DIGI-KEY	311-33.0KLRCT-ND	YAGEO	RC0402FR-0733KL
1	R73	RESISTOR SMD0603 0.0 OHM 5% THICK FILM 1/10W ROHS	DIGI-KEY	P0.0GCT	PANASONIC	ERJ-3GEY0R00V
1	R98	RESISTOR SMD0402 1.40K 1%, 1/16W ROHS	DIGI-KEY	P1.40KLCT-ND	PANASONIC	ERJ-2RKF1401X
1	R104	RESISTOR SMD0805 20.0 OHMS 1% 1/8W THICK FILM ROHS	DIGI-KEY	541-20.0CCT	VISHAY	CRCW080520R0FKEA
INDUCTORS-SMT						
1	L1	INDUCTOR CERM SMD0805 2.2uH 600mA 50MHZ 20% ROHS	DIGI-KEY	490-4994-1	MURATA	LQM21PN2R2MCO0D
FERRITES BEADS-SMT						
2	L2, L3	INDUCTOR SMD1008 2.2uH 1.3A 100mOHMS 40MHz 20% ROHS	DIGI-KEY	490-5114-1-ND	MURATA	LQM2HPN2R2MG0L
HEADERS-MALE						
20	JP4, JP5, JP6, JP7, JP8, JP11, JP12, JP15, JP16, JP17, JP18, JP28, JP37, JP38, JP39, JP40, JP41, JP42, JP43, JP46	HEADER THRU MALE 3 PIN 100LS 120 TAIL GOLD ROHS	DIGI-KEY	S1011E-03-ND	SULLINS	PBC03SAAN

Table 2. Bill of Materials for DANCEVM-A REVD (continued)

Qty.	Ref Designators	Description	Vendor	Vendor Part No.	Manufacturer	MANU Part No.
15	JP22, JP23, JP24, JP25, JP26, JP27, JP29, JP30, JP31, JP32, JP33, JP34, JP45, JP47, JP48	HEADER THRU MALE 2 PIN 100LS 120 TAIL GOLD ROHS	DIGI-KEY	S1011E-02	SULLINS	PBC02SAAN
1	J6	HEADER THRU MALE 2X5 PIN 100LS 120 TAIL GOLD ROHS	DIGI-KEY	S2011E-05	SULLINS	PBC05DAAN
2	J11, J12	HEADER THRU MALE 2X8 100LS 120 TAIL GOLD ROHS	DIGI-KEY	S2011E-08	SULLINS	PBC08DAAN
1	J7	HEADER 2 Pin-MALE SMT 2mm PITCH SIDE ENTRY ROHS	DIGI-KEY	455-1749-2	JST	S2B-PH-SM4-TB(LF)(SN)
1	J10	HEADER SHROUDED 100LS MALE GOLD 2X7 PINS ROHS	DIGI-KEY	MHC14K	3M	N2514-6002-RB
JACKS/CONNECTORS						
5	J1, J2, J4, J5, J13	JACK AUDIO-STEREO MINI(3.5MM , 4-COND SMT-RA ROHS	DIGI-KEY	CP-43516SJCT	CUI STACK	SJ-43516-SMT
1	J8	JACK HDMI TYPE A SMD RIGHT ANGLE ROHS	DIGI-KEY	609-1010-1-ND	FCI	10029449-001RLF
1	J9	JACK USB MINIB SMT-RA 5PIN ROHS	DIGI-KEY	H2959CT	HIROSE	UX60-MB-5ST
TESTPOINTS						
28	TP13, TP14, TP15, TP16, TP17, TP18, TP19, TP20, TP21, TP22, TP23, TP24, TP25, TP26, TP27, TP28, TP29, TP35, TP36, TP37, TP38, TP39, TP40, TP41, TP42, TP43, TP47, TP48	PC TESTPOINT, WHITE, ROHS	DIGI-KEY	5002K	KEYSTONE ELECTRONICS	5002
7	TP1, TP2, TP3, TP4, TP5, TP6, TP44	PC TESTPOINT, RED, ROHS	DIGI-KEY	5000K	KEYSTONE ELECTRONICS	5000
11	TP7, TP8, TP9, TP10, TP11, TP12, TP32, TP33, TP34, TP45, TP46	PC TESTPOINT, BLACK, ROHS	DIGI-KEY	5001K	KEYSTONE ELECTRONICS	5001
SWITCHES-SMT						
6	S1, S2, S3, S4, S5, S6	SWITCH, MOM, 160G SMT 4X3MM ROHS	DIGI-KEY	EG4344CT	E-SWITCH	TL1015AF160QG
STANDOFFS AND HARDWARE						
4	HWB1, HWB2, HWB3, HWB4	BUMPON RUBBER BLACK 0.375in x 0.235in ROHS	DIGI-KEY	SJ5748-0-ND	3M	SJ61A2
COMPONENTS NOT ASSEMBLED						
7	R48, R49, R50, R74, R75, R76, R77	R0402_DNP	NO VENDOR DATA	NO VENDOR PARTNUM DATA	NO MANUFACTURER DATA	R0402_DNP
1	R99	R0603_DNP	NO VENDOR DATA	NO VENDOR PARTNUM DATA	NO MANUFACTURER DATA	R0603_DNP
Component Count: 346						

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