

ZLE38AVS Evaluation Board Hardware User Guide



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1 Revision History

1.1 Revision 1.0

Revision 1.0 is the first publication of this document.

2 Overview

This document describes the features of the ZLE38AVS circuit board. It focuses on the hardware circuit design and interfaces. This board is shipped as part of the ZLK38AVS Evaluation Kit.

The ZLE38AVS is designed to interface with a Raspberry Pi 3 Model B development board. This connectivity is done through the P2 (40 pin) header. The board also features:

- four on-board digital MEMS microphones
- two mono Class D amplifiers
- headphone jack
- FTDI USB to UART interface
- on-board FLASH memory

Further information regarding the use of the ZLE38AVS with the Raspberry Pi can be found in the documentation for the ZLK38AVS Evaluation Kit.

Figure 1 and Figure 2 highlight the connection interfaces on the ZLE38AVS Evaluation Board.

Note: As with any circuit board, use an anti-static grounded wrist strap when handling the Evaluation Board.

Figure 1 • ZLE38AVS Evaluation Board – Top

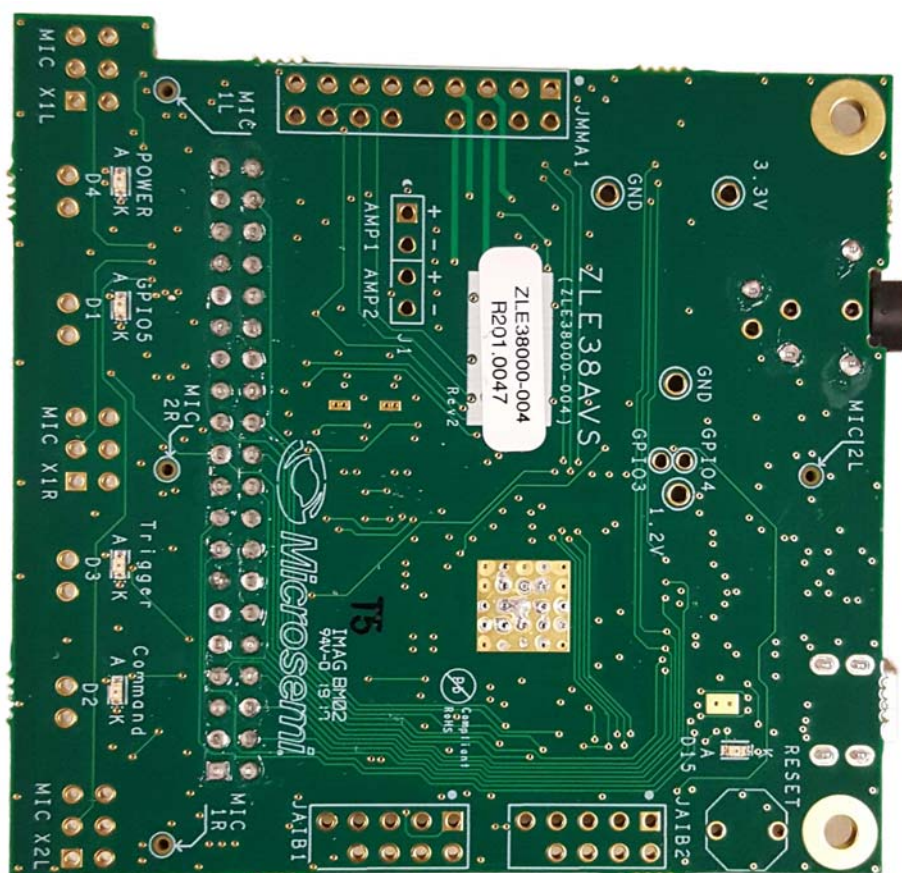
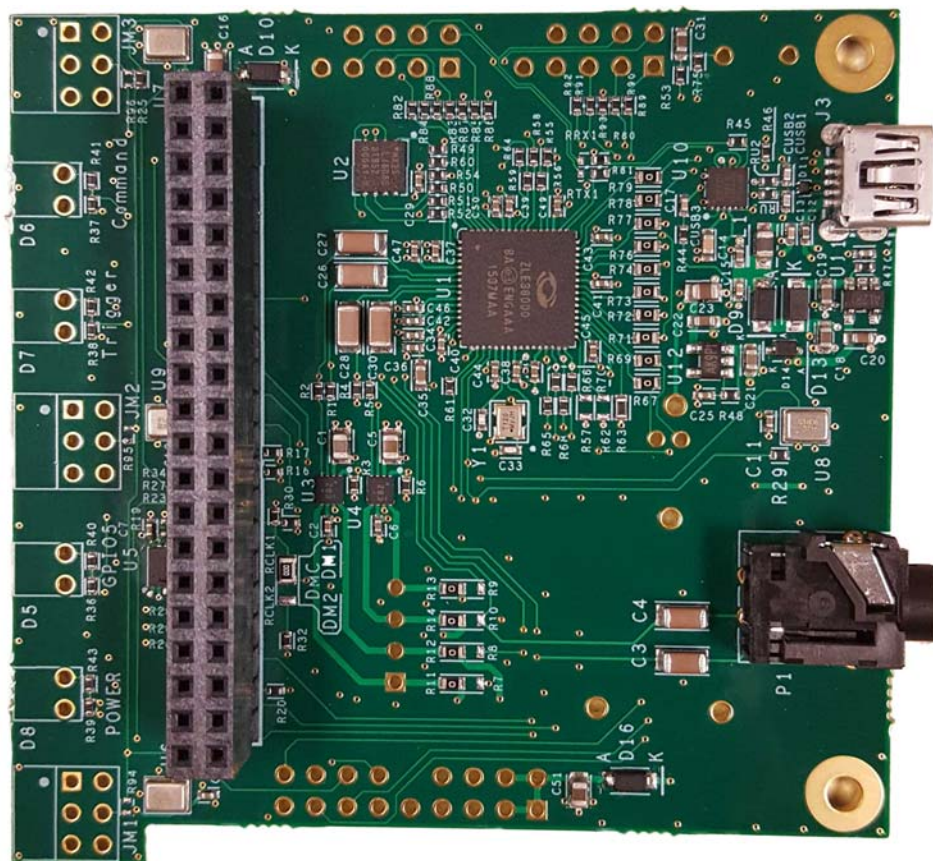


Figure 2 • ZLE38AVS Evaluation Board Interfaces – Bottom



2.1 USB/Power

When mounted on the Raspberry Pi, the ZLE38AVS receives power from the P2 header. It can also be powered from the mini-USB connector (J3). On board regulators convert either 5V rail to 3.3V and 1.2V rails for the Timberwolf processor and associated circuitry.

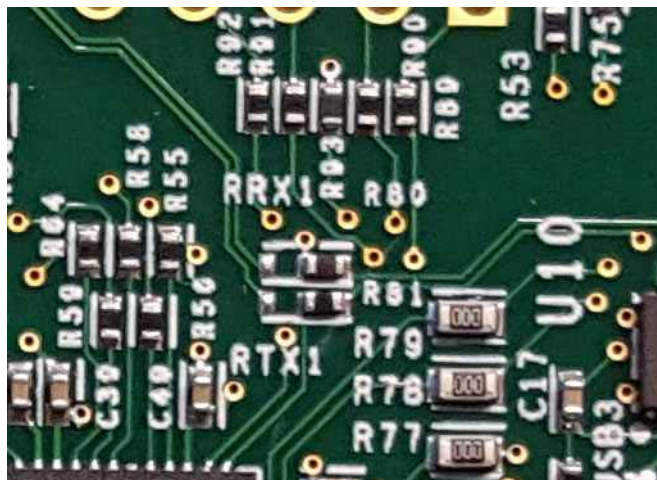
2.2 RESET

The ZLE38AVS has a single push button reset. This button is not populated by default, but is shown in silk on the topside of the board. Shorting the through holes on the board will reset the Timberwolf Processor.

2.3 UART

Control of the Timberwolf device may be done through the UART pins. These pins by default are routed to the on-board FTDI USB to UART interface. Use of the MiTuner GUI allows the processor to be configured and the FLASH programmed for operation.

By changing the location of two resistors the TX and RX UART pins can be routed to the JA1B1 and JA1B2 headers. This is provided for more advanced operation of the ZLE38AVS board. R80 should be moved to RRX1 and R81 should be moved to RTX1 to effect this change. This will route the UART signals to pins 2 and 4 on JA1B1/2. See [Figure 3](#), page 4 for the location of these resistors.

Figure 3 • AIB/UART Connection


2.4 Raspberry Pi 3.0

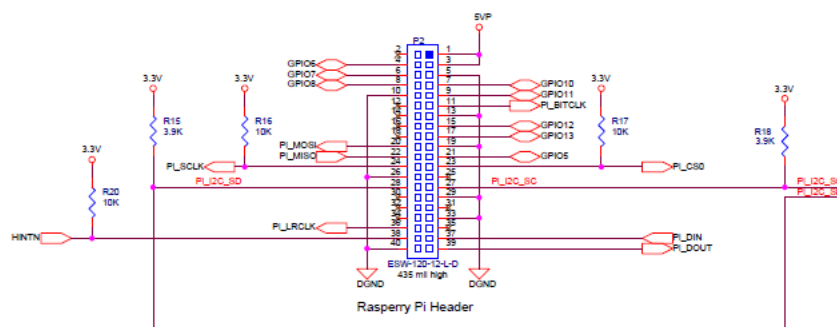
The ZLE38AVS is designed to sit upon the Raspberry Pi 3.0 board. The P2 header, mounted on the bottom of the board, connects to the 40 pin header on the R Pi Board. Two mounting holes are also provided on the ZLE38AVS board to allow for added stability.

Figure 4 shows the pin out of the Raspberry Pi header. This header brings up:

- I2S Bus
 - BITCLK pin 11
 - LRCLK pin 36
 - DIN pin 37
 - DOUT pin 39
- SPI Bus
 - SCLK pin 24
 - MOSI pin 20
 - MISO pin 22
 - CS0 pin 23

The SPI bus is directly connected to the Host Bus Interface (HBI) of the Timberwolf device using Chip Select 0 (CS0).

There are several GPIOs routed to the R-Pi header. Note that the 5V rail is routed through this connector, but the 3.3 V rail is not routed through this connector. The ZLE38AVS can source 5 V power from the Raspberry Pi.

Figure 4 • Raspberry Pi Connector


2.5 TDM Bus Routing

The Timberwolf processor device has two TDM bus interfaces. The default routing of the ZLE38AVS board is to route the I2S bus from the R-Pi header to the TDMA port on the Timberwolf Device. Both TDM bus interfaces are routed to the JAIB headers. TDMA is found on JAIB2 and TDMB is found on JAIB1.

2.6 SPI Control Bus

The Slave SPI port (Host Bus Interface) for the audio processor is fixed to be sourced by the Raspberry Pi. The Master SPI port is routed to an on-board flash memory device. Application firmware and configuration can be stored in flash memory, allowing the Timberwolf to boot from flash. Refer to the device datasheet and firmware manual for more information.

2.7 Audio Input

The ZLE38AVS has four digital MEMS microphones on-board. They are bottom ported microphones with small audio ports in the PCB to allow the acoustic signal to pass.

There is also a population option for three small digital microphone boards to be mounted on the board. MICX1L, MICX1R, and MICX2L can be populated with a digital microphone riser board. When this option is implemented, the DMIC_CLK signal must be routed to these populations. This is done by moving the RCLK1 resistor to the RCLK2 location. The on-board microphones may unnecessarily load the DMIC1/2 signals when using the optional boards. It is recommended that the series resistors (R22, R25, R29, and R33) be removed in this configuration.

Additional microphone inputs are also supported through the JMMA1 header (See [JMMA1 Header](#))

2.8 Audio Output

The ZLE38AVS has a stereo headphone jack (P1), as well as two differential class D amplifiers. The amplifier output can be found at the J1 through-holes. By default there is nothing populated here.

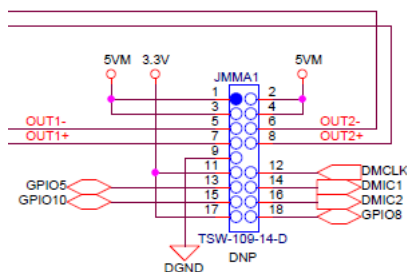
2.9 JMMA1 Header

This interface brings the DAC outputs and digital microphone inputs to the TW device. This header also brings various GPIOs from the TW devices to be used as LED indicator controls. The pin out of the JMMA1 header is found in [Figure 5](#). The first 12 pins were identified to be somewhat backward compatible with a previous evaluation board. To maintain this backward compatibility, the audio output signals (labeled OUT1/2) are routed after the two class D amplifiers on the ZLE38AVS.

If there is a need to have the DACs output come straight from the audio processor, a zero ohm resistor network option has been provided. By moving R11-R14 to the R7-R10 positions, the raw DAC output will be routed to the JMMA1 header.


Note: The DAC signals at the JMMA1 connector have passed through a 100 μ F DC blocking cap. It may be necessary to replace these with a zero ohm resistor or a capacitor of a different value, depending upon the architecture of the network connected to the JMMA1 board.

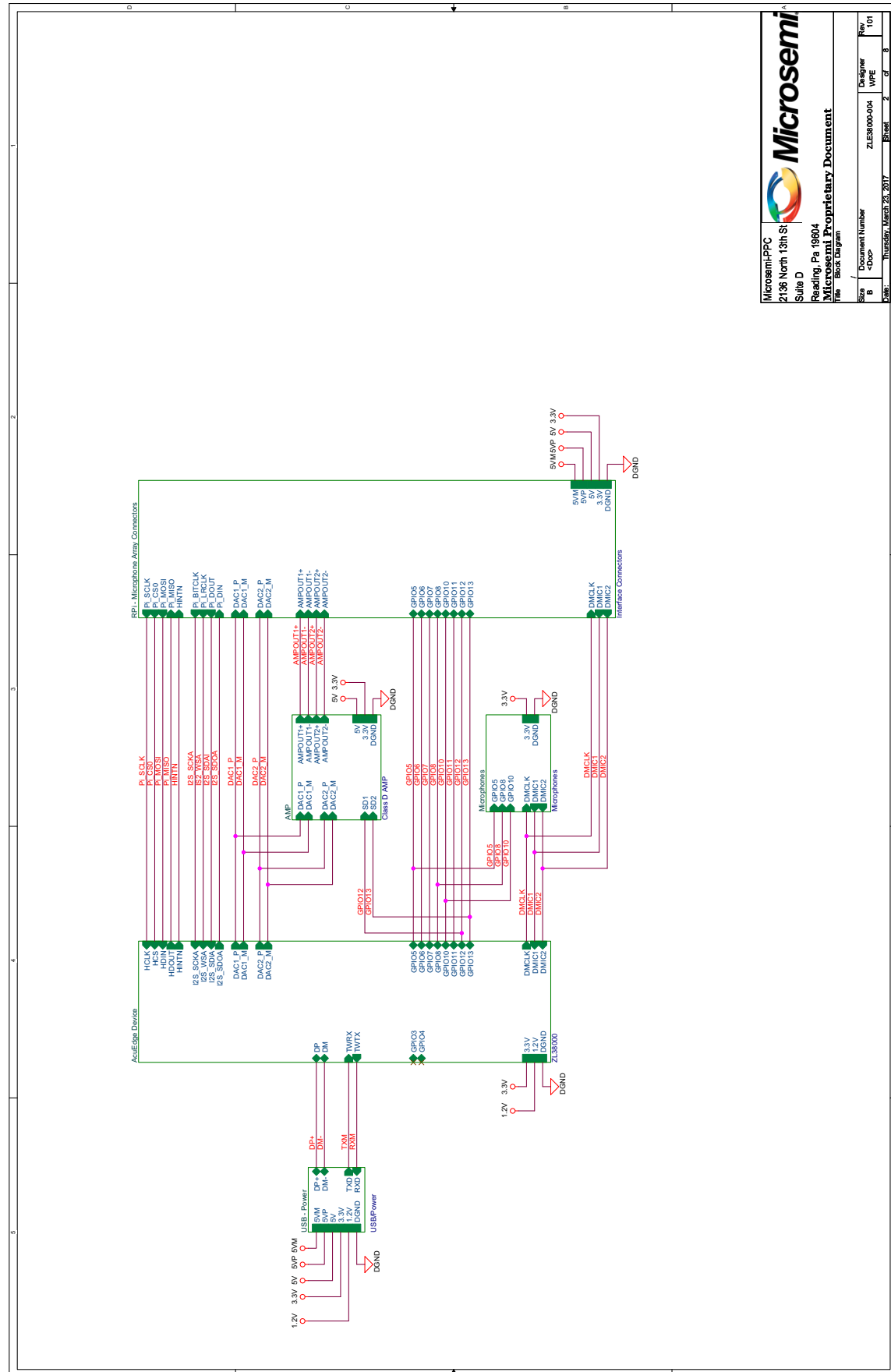
Figure 5 • JMMA1 Header

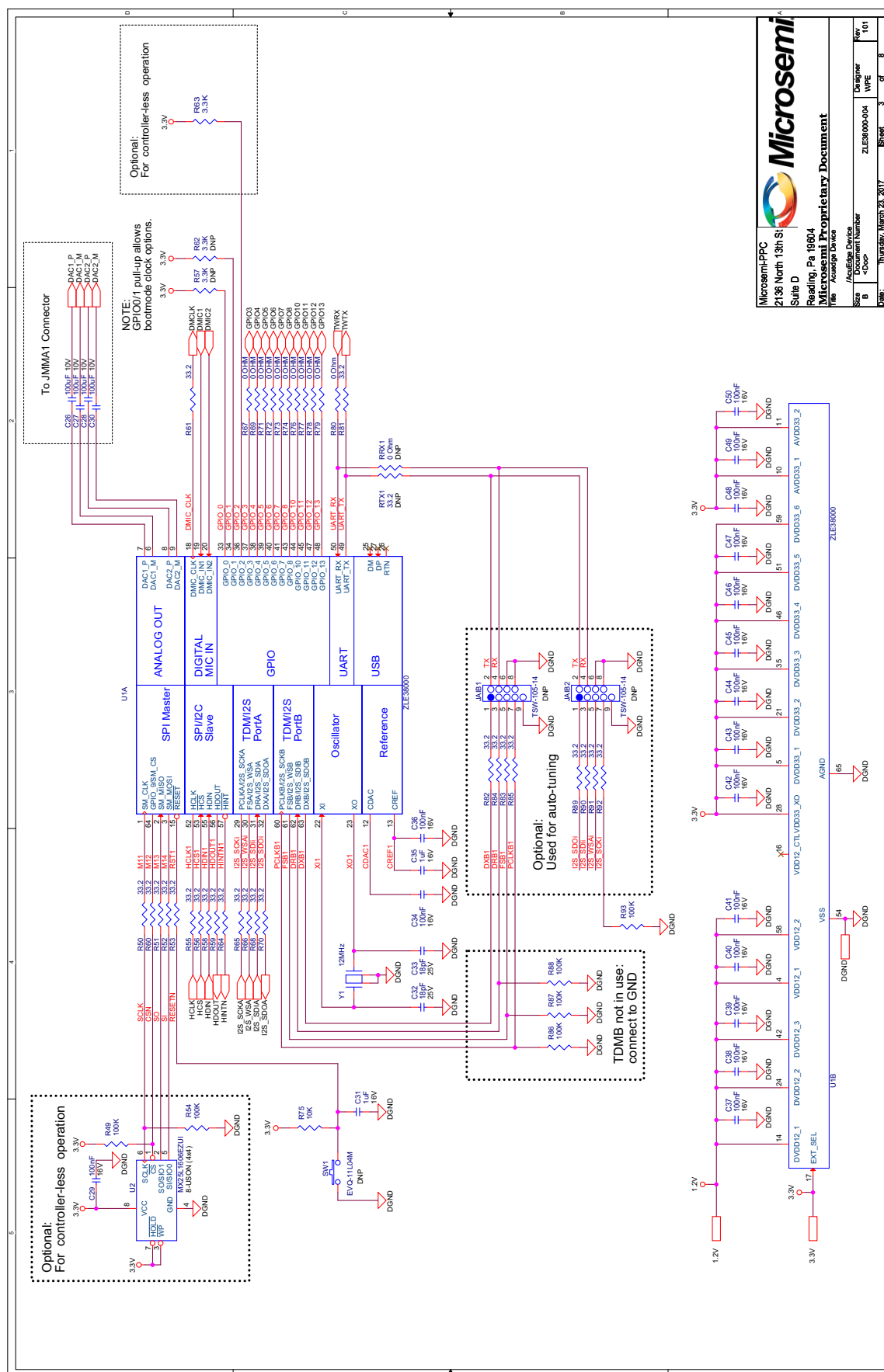


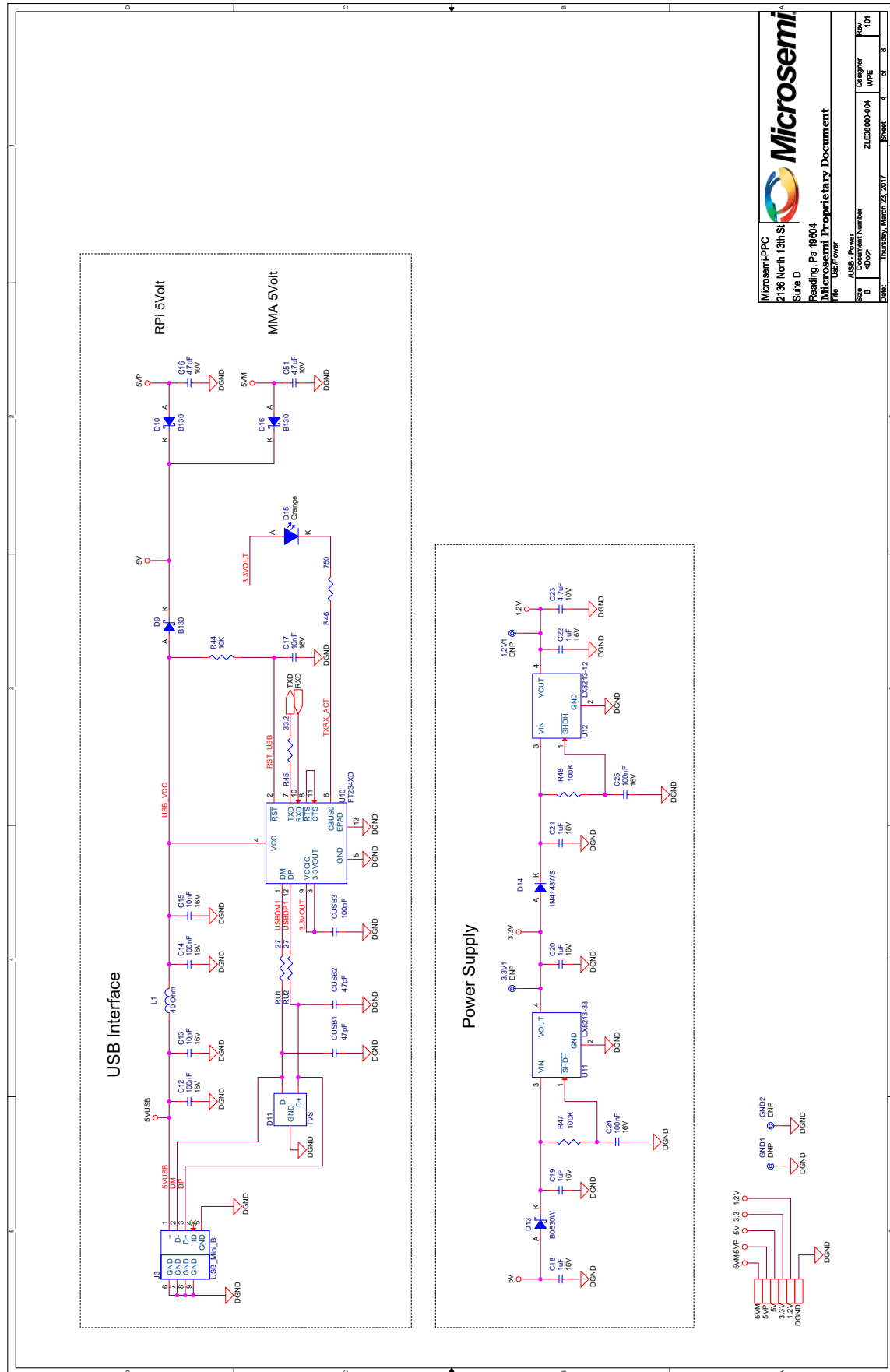
3 Evaluation Board Schematic

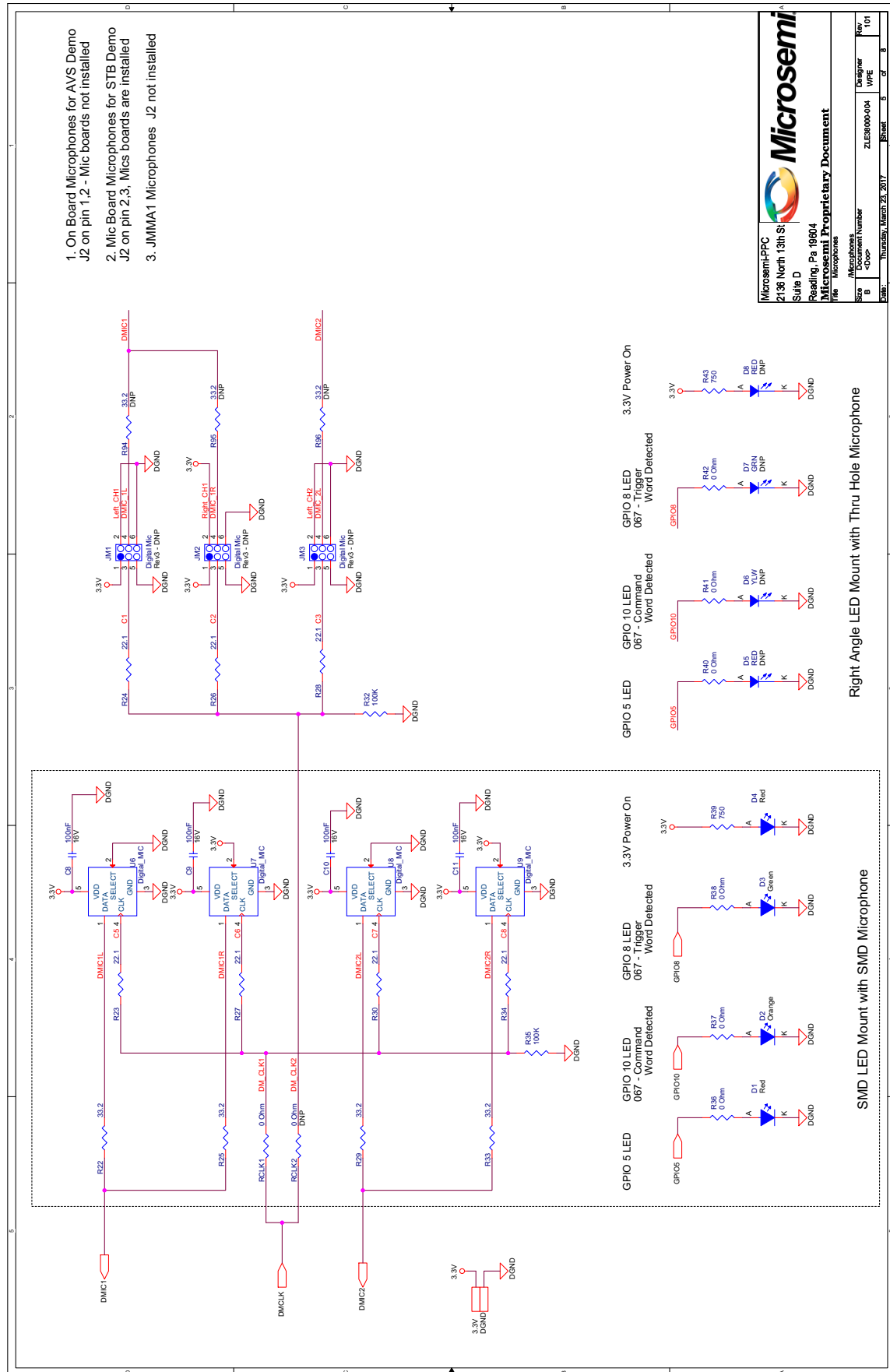
The schematic that corresponds to the ZLE38AVS Evaluation Board is shown on the following pages.

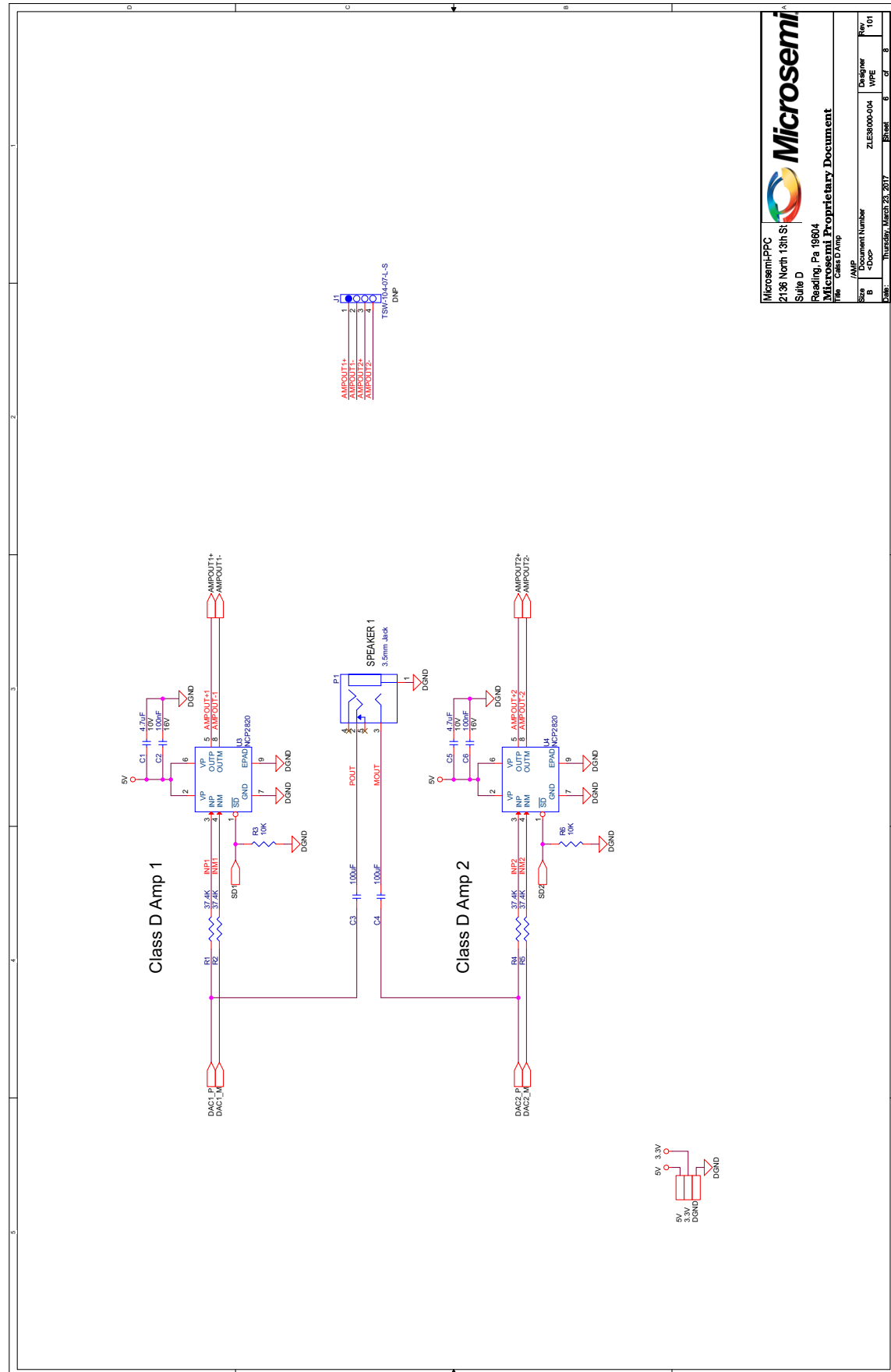
<p>ZLE38000-004 Rev101 Evaluation Board for single Timberwolf on Raspberry Pi 3 board. Designed to be a AVS demonstration platform.</p> <p>Uses Microsemi Parts: ZL380000 LX7186ILU LX8211-33</p> <p>RoHS Compliant Design Rev1 CDCA Document ID Number: 158054</p>	 Microsemi Microsemi-EPIC 2138 North 13th St Suite D Reading, Pa 19604 Microsemi Proprietary Document Not for redistribution without permission. Size B Document Number ZLE38000-004 Rev 101 Date Thursday, March 26, 2017 Filed of 8

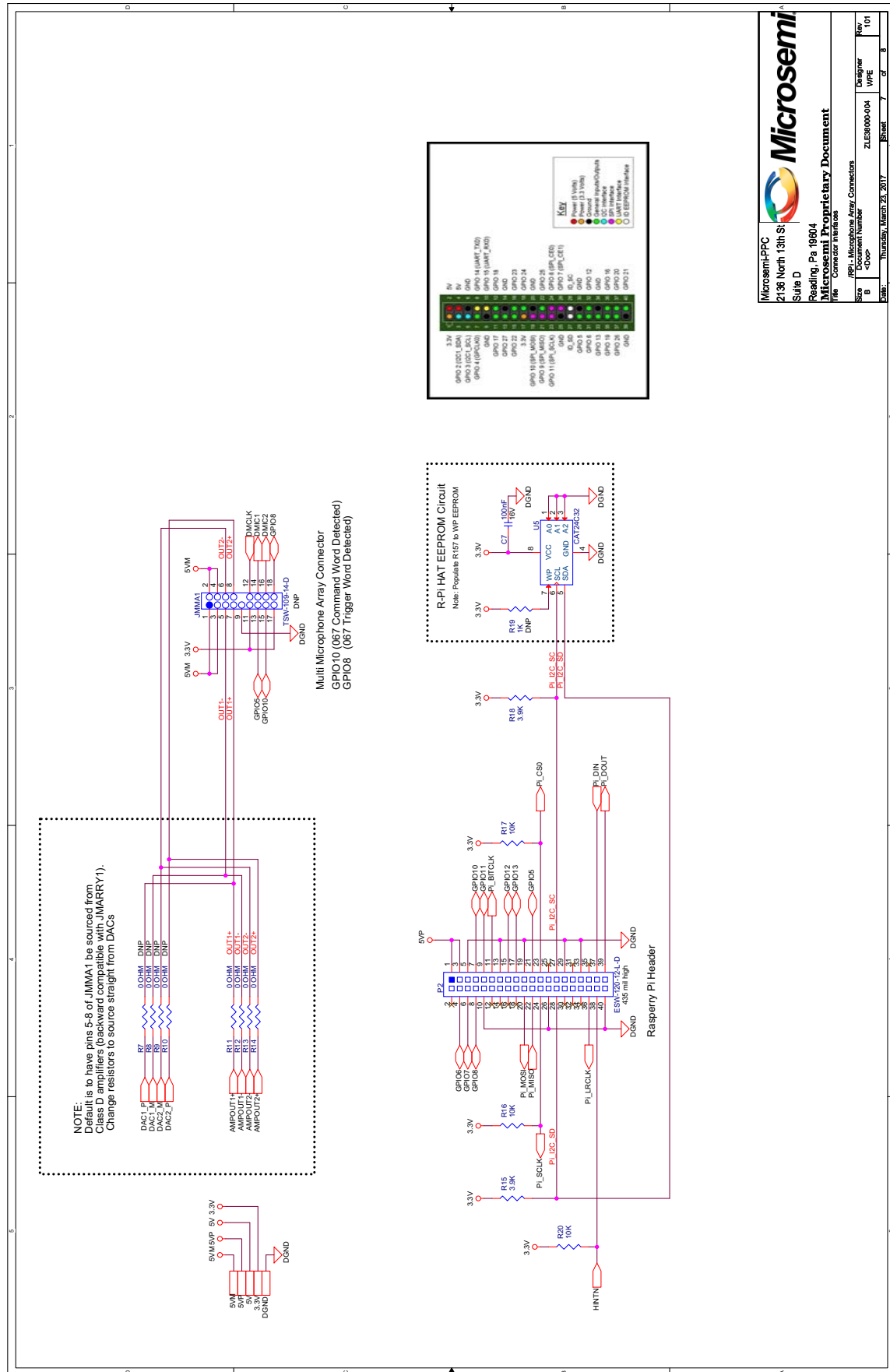


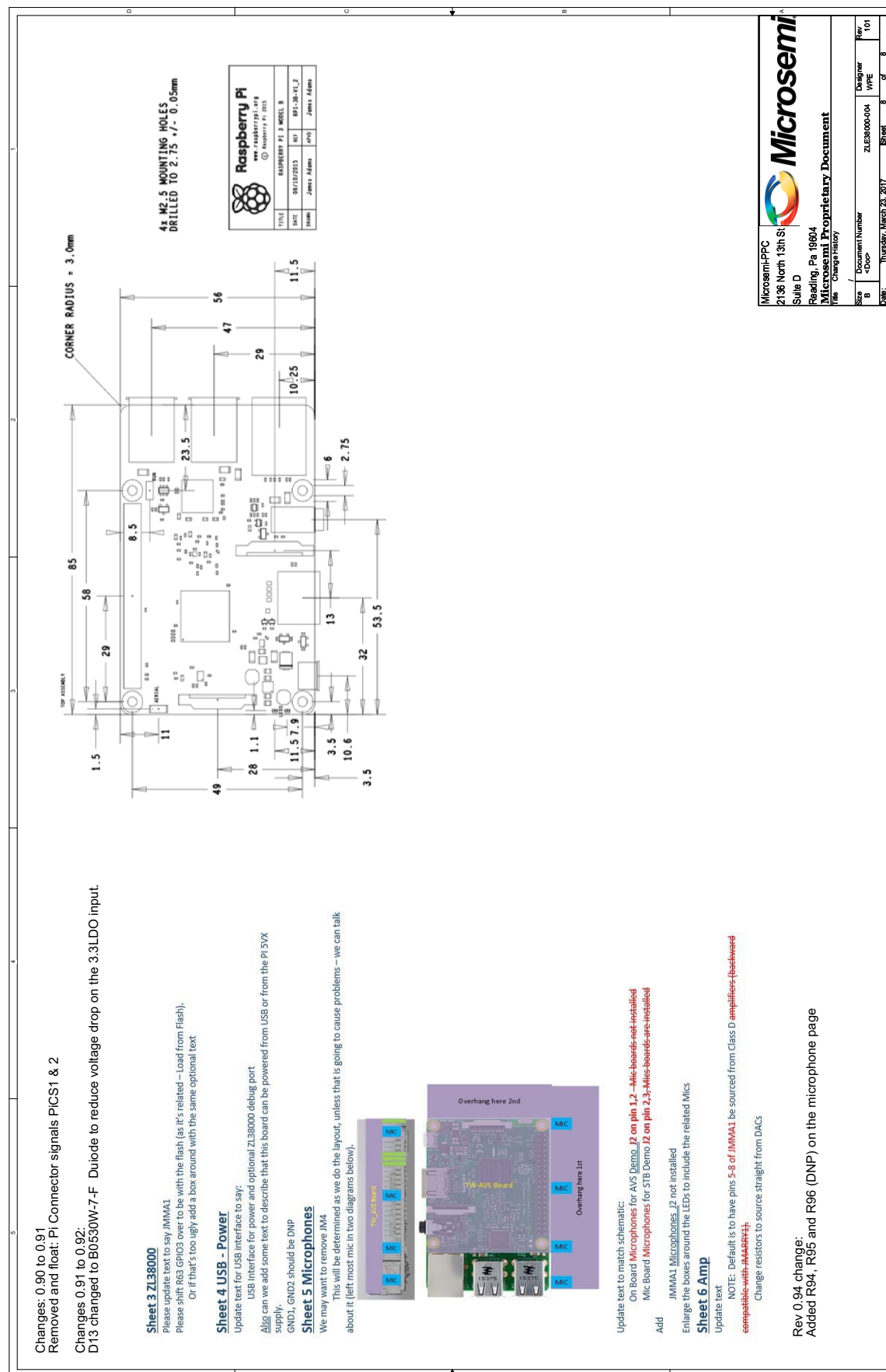


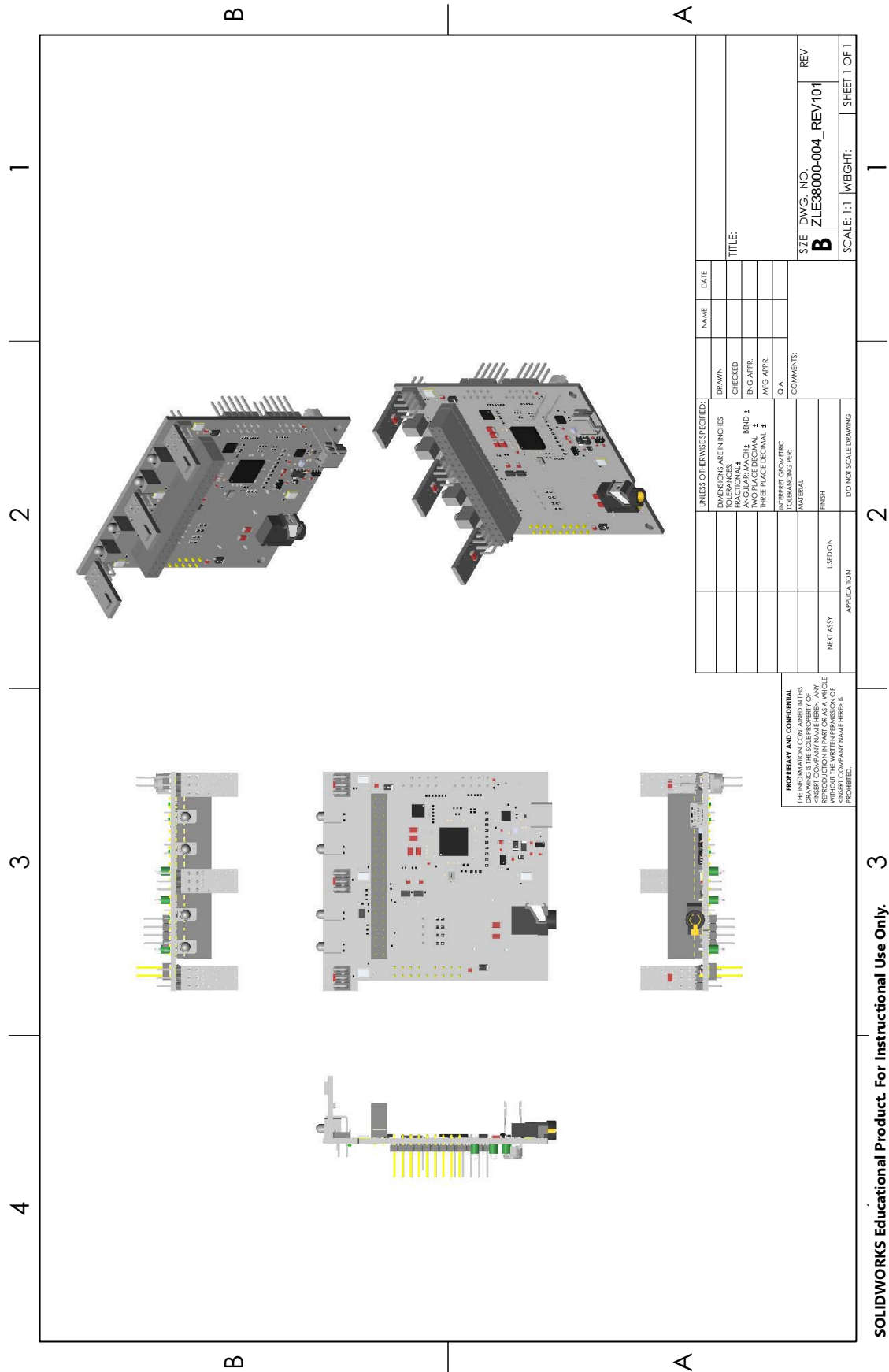












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Designer = WPE
RevCode = 101
Title = AVS demonstration platform.
Doc =

Doc = ZLE38000-004

Item#	Quantity	Part Reference	Value	Part Number	Manufacturer	Distributor	Dist Part Number	Current	Power	Voltage	Tolerance	Type	Note	PCB Footprint
1	2	L2V1.3.3V1		C0805C475K88ACTU	Kobicon	Mouse	151-206-RC			10V	10%	X7R	DNP	TP52
2	5	C1,C5,C16,C23,C51	4.7uF		Kemet	Digikey	399-7416-1-ND			10V	10%	X7R		CAP0005
3	28	C2,C6,C7,C8,C9,C10,C11,C12,C14,C24,C25,C29,C34,C36,C37,C38,C	100nF	C0402C104K4RACTU	Kemet	Mouse	80-C0402C104K4R			16V	10%	X7R		CAP0402
4	6	C3,C4,C26,C27,C28,C30	100uF	C3216X5R1A107M160ACTU	TDK	Digikey	445-6007-1-ND			10V	20%	X5R		CAP1206
5	3	C13,C15,C17	10nF	C0402C103K4RACTU	Kemet	Digikey	399-1038-1-ND			10V	10%	X7R		CAP0402
6	7	C18,C19,C20,C21,C22,C31,C35	1uF	C0603C105K4RACTU	Kemet	Mouse	80-C0603C105K4R			16V	10%	X7R		CAP0603
7	2	C32,C33	18pF	C0402C180J3GACAUTO	Kemet	Digikey	399-6831-1-ND			25V	5%	NPO		CAP0402
8	2	CUSB1,CUSB2	47pF	GRM1555C1H470Z01D	Murata	Digikey	490-1287-2-ND			50V	5%	COG		CAP0402
9	1	CUSB3	100nF	C0603C104K3RACTU	Kemet	Digikey	399-1281-1-ND			25V	10%	X7R		CAP0603
10	2	D1,D4	LS129K-G12-1-Z Red	LS129K-G12-1-Z	Osram	Digikey	475-2506-1-ND	2mA		1.8Vf				LED0603
11	2	D2,D15	LO129K-G21L-24-Z Orange	LO129K-G21L-24-Z	Osram	Digikey	475-1194-1-ND	2mA		1.8Vf				LED0603
12	1	D3	LG129K-G21L-24-Z Green	LG129K-G21L-24-Z	Osram	Digikey	475-2709-6-ND	2mA		1.7Vf				LED0603
13	2	D5,D8	RED	5511109F	Dialight	Digikey	350-1677-ND	2mA		1.7V			DNP	LED_551-xx09F
14	1	D6	YLW	5511209F	Dialight	Digikey	350-1679-ND	2mA		1.8V			DNP	LED_551-xx09F
15	1	D7	GN	5511309F	Dialight	Digikey	350-1681-ND	2mA		1.9V			DNP	LED_551-xx09F
16	3	D9,D10,D16	B130	B130JAW-7-F	Diodes Inc	Digikey	B130JAW-FDICT-ND			30V		Schottky		SOD123_KA
17	1	D11	TVS	TPD2E5B30DRTR	TI	Digikey	296-25509-1-ND			5.5V		SOT3		
18	1	D13	B0630W	B0630W7-F	Diodes Inc	Digikey	B0630W-FDICT-ND			30V		Schottky		SOD123_KA
19	1	D14	1M4148WS	1M4148WS-7-F	Diodes Inc	Digikey	1M4148WS-FDICT-ND	150mA		75Vf				SOD323_AK
20	2	GND1,GND2	151-208-RC_TestPoint_NoPh	151-208-RC	Kobicon	Mouse	151-208-RC						DNP	TP52
21	1	J1	TSW-104-07-L-S	TSW-104-07-L-S	Samtec	Digikey	WM5462TR-ND						DNP	TSW-104-07-L-S
22	1	J3	USB_Mini_B	0513870578	Molex	Digikey	1M4148WS-FDICT-ND						DNP	Molex_513870578_USB
23	2	JM1,JM2,JM3	TSW-105-14	TSW-105-14-L-D-010	Samtec	Digikey	WM5462TR-ND						DNP	TSW-105-14-L-D-010
24	3	JM1,JM2,JM3	Digital Mic	LeVNA380400255	Microsemi								Rev3 - DNP	HDR6_DIGITAL_MIC
25	1	JMMA1	40 Ohm	M10805K400R-10	Samtec	Digikey	240-2389-1-ND	1.5 Amp					DNP	TSW-109-14-L-D-010
26	1	L1	3.5mm Jack	SI-43514	CUI	Digikey	CP-43514-ND							IND0805
27	1	P1	ESW-120-12-L-D	ESQ-120-01-G-D	Samtec	Digikey								TSW-120-12-L-D
28	1	P2	R1,R2,R4,R5	EU-2RK53742X	Panasonic	Digikey	P374KICT-ND		0.063 Watt	50V	1%			RES0402
29	4	R3,R6,R16,R17,R20,R44,R75	10K	EU-2GE1103X	Panasonic	Digikey	P10KICT-ND		0.063 Watt	50V	5%			RES0402
30	7	R7,R8,R9,R10	0 OHM	EU-3GEY0R00V	Panasonic	Digikey	P005CT-ND		0.1 Watt	100V	5%		DNP	RES0603
31	4	R11,R12,R13,R14,R67,R69,R71,R72,R73,R74,R76,R77,R78,R79	0 OHM	EU-3GEY0R00V	Panasonic	Digikey	P005CT-ND		0.1 Watt	100V	5%			RES0603
32	14	R15,R18	3.9K	EU-2RK53901X	Panasonic	Digikey	P3190KICT-ND		0.1 Watt	50V	1%			RES0402
33	2	R15,R18	3.9K	EU-2RK53901X	Panasonic	Digikey	P3190KICT-ND		0.1 Watt	50V	1%			RES0402
34	1	R19	1K	EU-2RK51001X	Panasonic	Digikey	P100KICT-ND		0.1 Watt	50V	1%		DNP	RES0402
35	29	R22,R25,R29,R33,R45,R50,R51,R52,R53,R55,R56,R58,R59,R60,R61,R64,R65,R66,R68,R70,R81,R82,R83,R84,R85,R89,R90,R91,R92	33.2	EU-2RK533R2X	Panasonic	Digikey	P332LTR-ND		0.063 Watt	50V	1%			RES0402
36	7	R23,R24,R26,R27,R28,R30,R34	22.1	EU-2RK522R1X	Panasonic	Digikey	P221ICT-ND		0.063 Watt	50V	1%			RES0402
37	10	R32,R35,R47,R48,R49,R54,R86,R87,R88,R93	100K	EU-2GE1104X	Panasonic	Digikey	P100KICT-ND		0.063 Watt	50V	1%			RES0402
38	7	R36,R37,R38,R40,R41,R42,R80	0 Ohm	EU-2GE0R00X	Panasonic	Digikey	P00ICT-ND		0.063 Watt	50V	5%			RES0402
39	3	R39,R43,R46	750	EU-2RK57500X	Panasonic	Digikey	P750LTR-ND		0.063 Watt	50V	1%			RES0402
40	2	R57,R62	3.3K	EU-3GEV332X	Panasonic	Digikey	P333KGT-ND		0.1 Watt	50V	5%		DNP	RES0603
41	1	R63	3.3K	EU-3KEK3301V	Panasonic	Digikey	P333KGT-ND		0.1 Watt	100V	1%			RES0603
42	4	R94,R95,R96,RTX1	33.2	EU-2RK533R2X	Panasonic	Digikey	P332LTR-ND		0.063 Watt	50V	1%		DNP	RES0402
43	1	RC1K1	0 Ohm	EU-3GEY0R00V	Panasonic	Digikey	P00ACT-ND		0.1 Watt	150V	1%			RES0005

OPN = ZLE38000-004

Item	Quantity	Part Reference	Value	Part Number	Manufacturer	Distributed	Dist Part Number	Current	Power	Voltage	Tolerance	Type	Note	PCB Footprint
44	1	RCLK2	0 Ohm	ERJ-6GEY0R00V	Panasonic	Digikey	P0.0ACT-ND		0.1 Watt	150V	1%		DNP	RES0805
45	1	RRX1	0 Ohm	ERJ-2GE0R00X	Panasonic	Digikey	P0.0CT-ND		0.063 Watt	50V	5%		DNP	RES0402
46	2	RU1, RU2	27	ERJ-2RK627R0X	Panasonic	Digikey	P27.0CT-ND		0.063 Watt	50V	1%		DNP	RES0402
47	1	SW1		EVQ-11L04M	Panasonic	Digikey	P8078STB-ND						DNP	SW_200
48	1	U1		ZLE38000	Microsemi								MTS	QFN64_1W
49	1	U2		MX25LI606EZUI	Macronix	Digikey	1092-1056-ND			3.3V				USON8_4x4mm
50	2	U3, U4		NCP2820	On Semi	Digikey	NCP2820MUTBG05CT-ND		2.65Watt	5.5 Volt		Class D		UDFN8
51	1	U5		CAT24C32	ON Semi	Digikey	CAT24C32HUJ41-GT305CT-ND			3.3V				UDFN8_E
52	4	U6, U7, U8, U9		SPH1668LM4H-1	Knowles	Mouser	721-SPH1668LM4H-1							KNOWLES_SPH_MIC
53	1	U10		FT234XD-R	FTDI	Digikey	768-1178-1-ND							DFN12
54	1	U11		LX8213-33SE	Microsemi	Digikey	LX8213-33SECT-ND	300mA		3.3Vout				SOT23-5
55	1	U12		LX8213-12SE	Microsemi	Digikey	LX8213-12SECT-ND	300mA		1.2Vout				SOT23-5
56	1	Y1	12MHz	82-12.000MAA1-T	TXC Corporation	Digikey	887-1487-1-ND				+/- 30ppm			TXC_8Z_OSC



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