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.

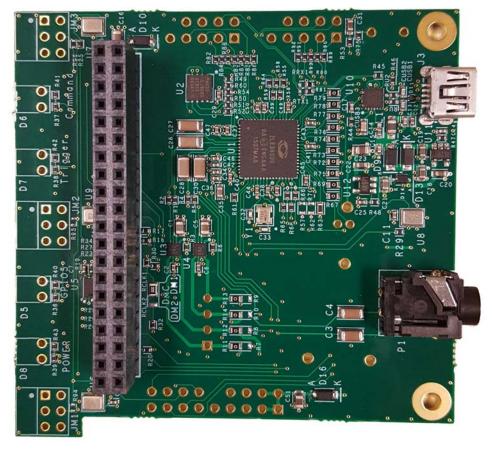
Note: As with any circuit board, use an anti-static grounded wrist strap when handling the Evaluation Board.

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.

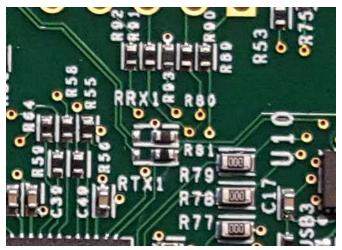
2.3 UART

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 JAIB1 and JAIB2 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 JAIB1/2. 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.

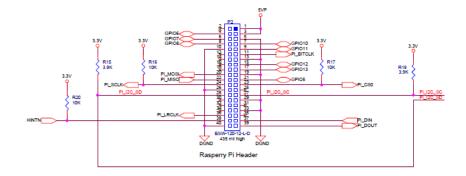
Figure 4 shows the pin out of the Raspberry Pi header. This header brings up:

- 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.

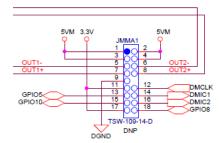
2.9 JMMA1 Header

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 µF 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

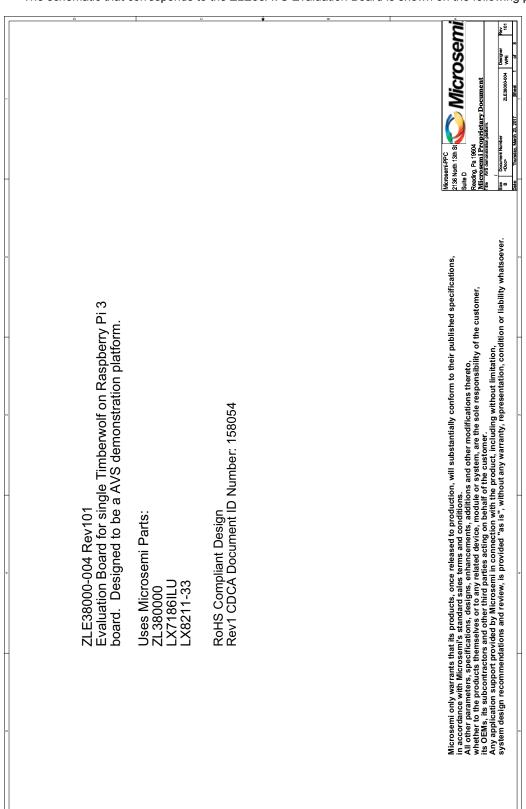




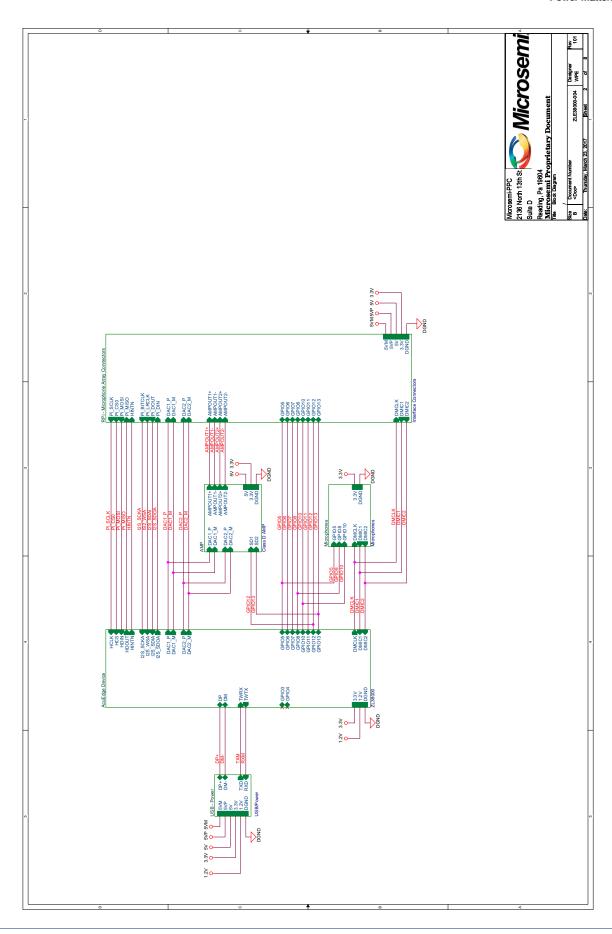


3 Evaluation Board Schematic

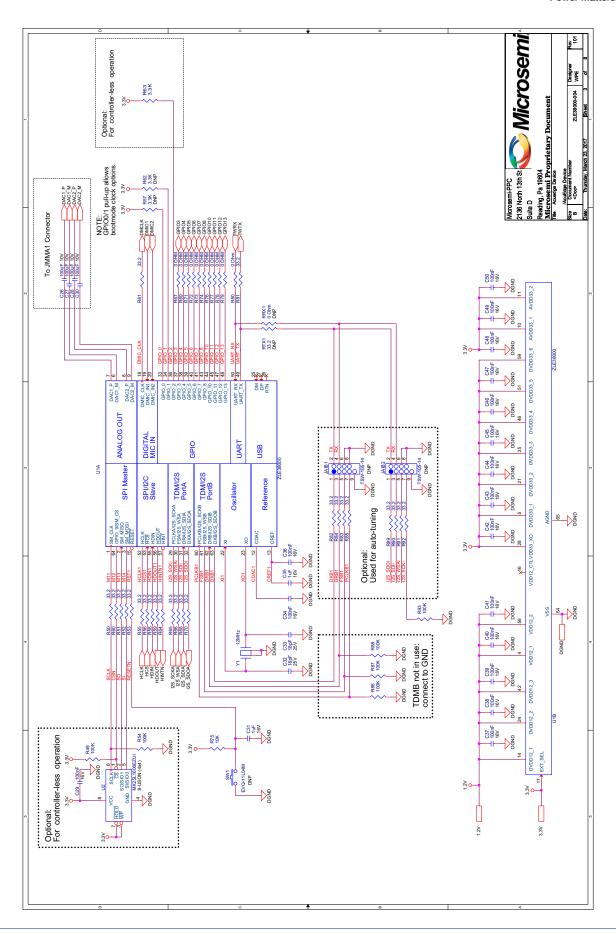
The schematic that corresponds to the ZLE38AVS Evaluation Board is shown on the following pages.



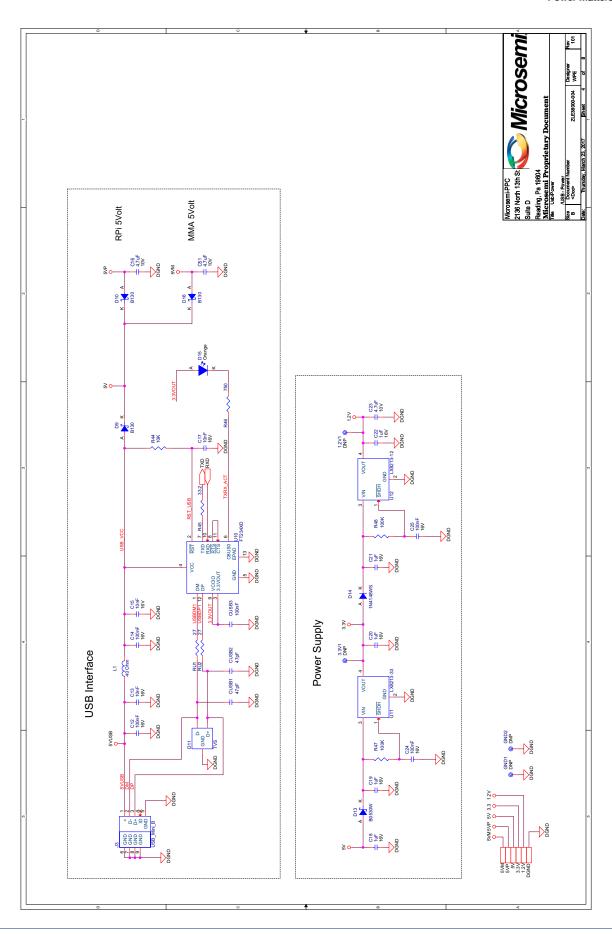




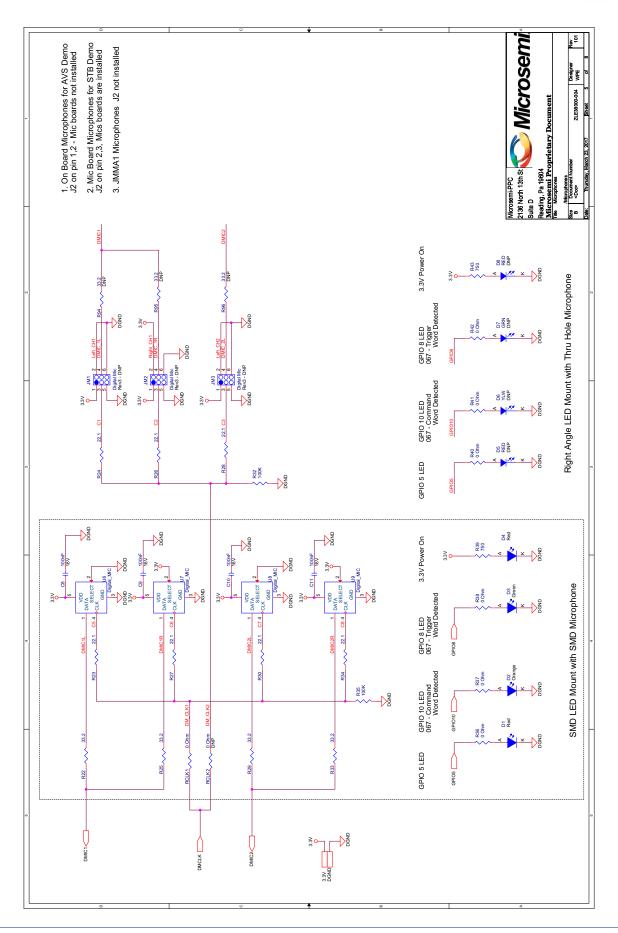




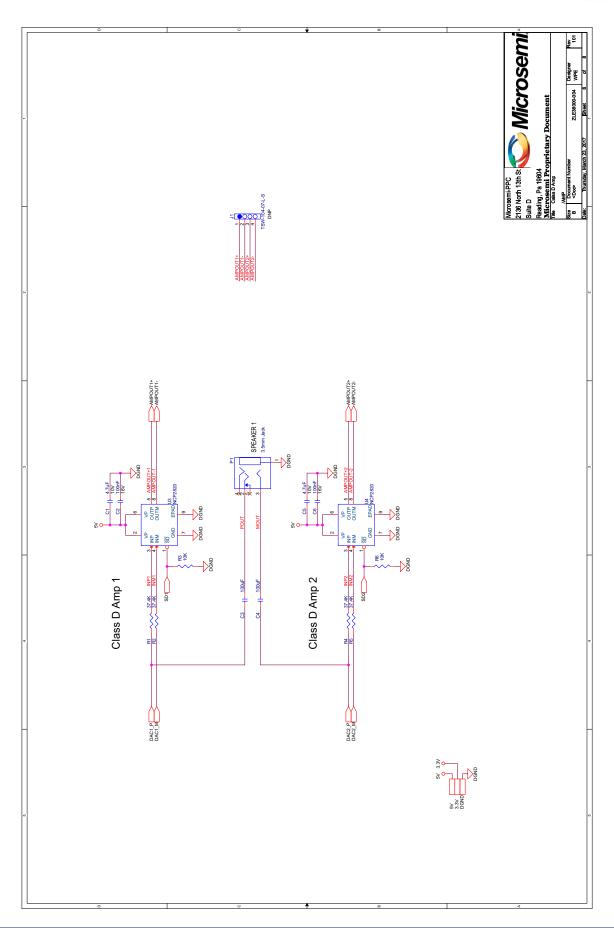




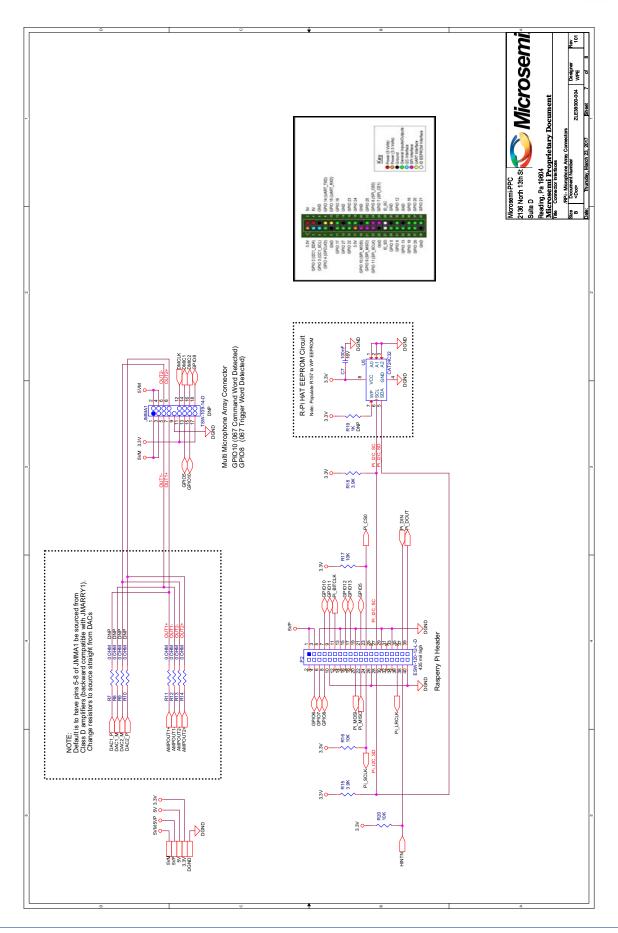




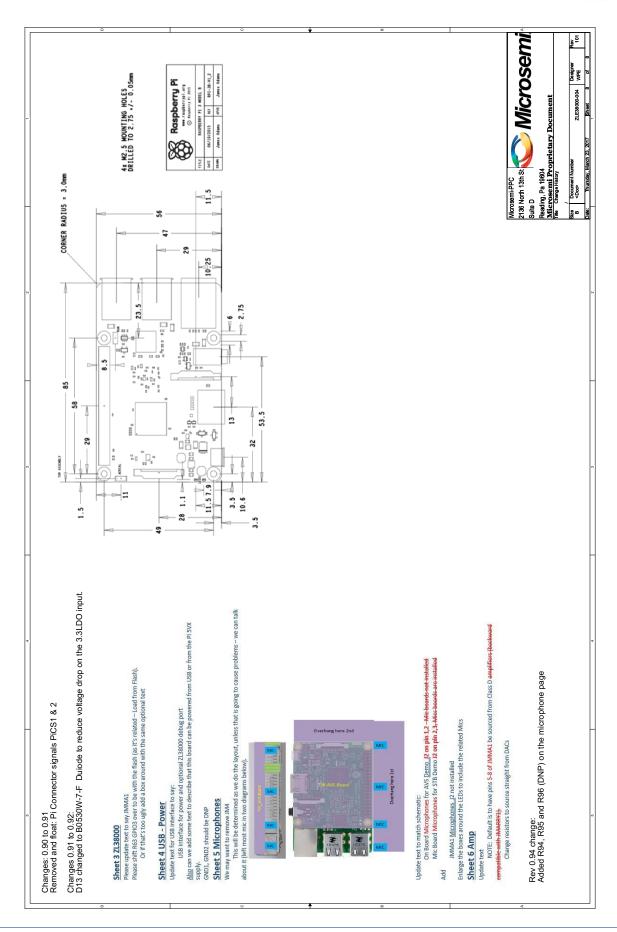




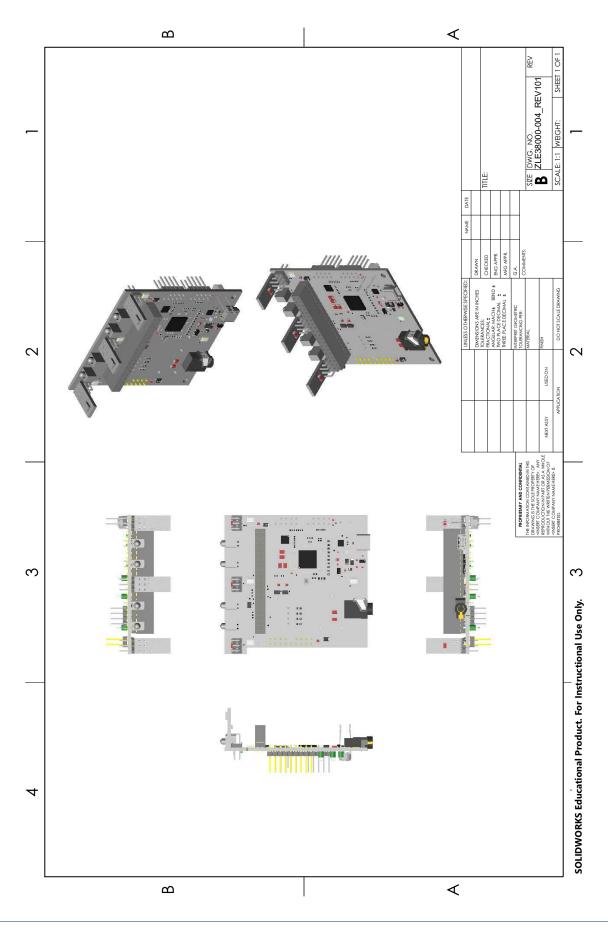














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4 R7,R8,R9,R10 O OHM ERJ-3GEYOROOV Panasonic Digkey PO.OGCT-ND O.1 Watt 100V 5% DNP 14 R11,R12,R13,R14,R67,R69,R71,R72,R73,R74,R76,R77,R78,R79 0 OHM ERJ-3GEYOROOV Panasonic Digkey PO.OGCT-ND 0.1 Watt 100V 5% DNP 1 R15,R13 R14,R67,R69,R71,R72,R73,R74,R76,R77,R78,R79 1X ERJ-2KR739DIX Panasonic Digkey P1.00KLT-ND 0.1 Watt 50V 1% DNP 1 R22,R22,R23,R55,R56,R58,R50,R51,R52,R56,R58,R50,R61,R62 R64,R65,R66,R68,R72,R28,R40,R41,R42,R60 R01,W4T 100V 1% DNP DNP 1 R23,R23,R24,R65,R66,R68,R72,R28,R40,R41,R42,R60 100,R64 P22,11C-ND 0.063 Watt 50V 1% DNP 1 R32,R32,R47,R68,R43,R54,R66,R68,R7R8,R40,R41,R42,R60 0.0hm ERJ-2GERGOX Panasonic Digkey P22,11C-ND 0.063 Watt 50V 1% 1 R33,R43,R46 R64,R65,R47,R42,R43,R46,R46,R46,R46,R46,R46,R46,R46,R46,R46	30	7	17,R20,R44,R75	10K	ERJ-2GEJ103X			P10KJTR-ND		0.063 Watt	200	2%			ES0402
14 R11,R12,R13,R14,R67,R69,R71,R72,R73,R74,R76,R77,R78,R79 O O HM ER1-3GEVOROV Panasonic Diglecy POGCCT-ND O 1 Watt 100V 5% 2 R15,R18 R15,R18 1 (1 Watt R0V 1% R12,RR5991X Panasonic Diglecy P1.00KLT-ND 0.1 Watt 50V 1% 2 R22,R25,R23,R35,R56,R58,R56,R58,R56,R58,R56,R58,R56,R58,R56,R66,R68,R788,R59 23.1 ER1-2RK1381X Panasonic Diglecy P1.00KLT-ND 0.063 Watt 50V 1% DNP 2 R64,R65,R66,R68,R70,R81,R82,R83,R93,R48 100 ER1-2RK1381X Panasonic Diglecy P22.1LT-ND 0.063 Watt 50V 1% 3 R33,R35,R47,R88,R93 100 ER1-2RC10104X Panasonic Diglecy P100LT-ND 0.063 Watt 50V 1% 4 R33,R35,R47,R88,R93 100 ER1-2RC10104X Panasonic Diglecy P100LT-ND 0.063 Watt 50V 1% 5 R53,R32,R32,R47,R88,R43,R46 100 0.0 hm ER1-2RC100X Panasonic Diglecy P33,CIT-ND 0.043 Watt 50V	31			0 OHM	ERJ-3GEYOROOV			P0.0GCT-ND		0.1 Watt	100V	2%			ES0603
2 R15,R18 FRJ 28RG 39DX Panasonic Digkey P3.90K.TR-ND 0.1 Wart SOV 1% 1 R19 R12 R64,R65,R66,R68,R70,R81,R62,R83,R65,R66,R64. IX ERJ.2RKF1001X Panasonic Digkey P1.00K(CT-ND 0.1 Wart SOV 1% DNP 29 R64,R65,R66,R68,R70,R81,R82,R83,R84,R85,R89,R90,R91,R92 33.2 ERJ.2RKF3R1X Panasonic Digkey P22.1LCT-ND 0.063 Wartl SOV 1% DNP 7 R32,R85,R47,R86,R87,R88,R93 0.00m ERJ.2RKF3ZXIX Panasonic Digkey P10.0CT-ND 0.063 Wartl SOV 1% DNP 7 R32,R35,R47,R86,R87,R88,R93 0.00m ERJ.2RKF3ZXIX Panasonic Digkey P10.0CT-ND 0.063 Wartl SOV 1% DNP 3 R39,R43,R46 0.00m ERJ.2RGF320X Panasonic Digkey P10.0CT-ND 0.063 Wartl SOV 1% DNP 4 R56,R37,R38,R47,R46 R56 R67,R62 R67,R62 R67,R62 R67,R62 R67,R62 R67,R62 R67,R62	32		R13,R14,R67,R69,R71,R72,R73,R74,R76,R77,R78,R79	0 OHM	ERJ-3GEYOR00V			P0.0GCT-ND		0.1 Watt	100V	2%			ES0603
1 R12 R22	33	2		3.9K	ERJ-2RKF3901X		Digikey	P3.90KLTR-ND		0.1 Watt	200	1%			ES0402
R22,R22,R23,R23,R45,R60,R51,R22,R33,R5,R66,R58,R59,R60,R61,L ERL-2RKF33R2X Panasonic Digikey P33,21TR-ND 0.063 Wartl 50V 1% PASSILITAND 0.063 Wartl 50V 1% 1% PASSILITAND 0.063 Wartl 50V 1% 1 1 1 1 1 1 1	34	1	R19	1K	ERJ-2RKF1001X			P1.00KLCT-ND		0.1 Watt	200	1%]		ES0402
29 R64/R65/R66/R68/R9/R91,R82.R83,R84,R85,R89,R90,R91,R92 33.2 ERJ-2RK723RZX Panasonic Digiley P33.21R-ND 0.063 Wattl 50V 1% 70 R32,R32,R42,R85,R83,R83,R93 100K ERJ-2RK72RXX RA1-2RC910AX Panasonic Digiley P00CICT-ND 0.063 Wattl 50V 1% 7 R35,R37,R38,R40,R41,R42,R80 0.0hm ERJ-2GCR00X Panasonic Digiley P00LCT-ND 0.063 Wattl 50V 5% 3 R35,R42,R43,R46 0.0hm ERJ-2GCR00X Panasonic Digiley P70LT-ND 0.063 Wattl 50V 5% 4 R55,R62 0.0hm ERJ-2GCR30X Panasonic Digiley P3.3GCTR-ND 0.063 Wattl 50V 5% 5 0.0hm ERJ-2RCF32DX Panasonic Digiley P3.3GCTR-ND 0.10 Watt 100V 1% 6 0.0hm ERJ-2RCF33DX Panasonic Digiley P3.3GCTR-ND 0.10 Watt 100V 1% 1 R63 R65,R62 R64 P3.3CTR-ND 0.10 Watt 100V 1%															
10 R32,R32,R47,R42,R27,R35,R34,R42 1.2.1 ERL2,RRF2,Z34,X1 Tenasonic Oligkey P22,11C1-ND 0.063 Wart15OV 1% 7 R32,R32,R47,R82,R43,R42,R42,R42,R42,R42,R42 1.00K ERL2,GEGROOX Panasonic Oligkey P100/LC1-ND 0.063 Wart15OV 1% 3 R39,R43,R46 R41,R42,R80 0.0hm ERL2,GEGROOX Panasonic Oligkey P70,CIT-ND 0.063 Wart15OV 1% 4 R39,R43,R46 R41,R42,R80 B.R.2,REF3OX Panasonic Oligkey P73,CIT-ND 0.01 Wart 15OV 1% 5 R57,R62 R62,R62 P33,CIT-ND 0.1 Wart 15OV 1% DNP 1 R63 R63 R74 R84,R6733RX Panasonic Digkey P33,CIT-ND 0.1 Wart 15OV 1% 4 R94,R95,R96,RTX1 R33 ERL2,RR733RX Panasonic Digkey P33,CIT-ND 0.03 Wart 15OV 1% 9 R84 R94,R95,R96,RTX1 R94,R95,R96,RTX1 R94,R95,R96,RTX1 R94,R95,R96,RTX1 R94,R95,R96,RTX1 R94,R95,R	32			33.2	ERJ-2RKF33R2X		Digikey	P33.2LTR-ND		0.063 Watt	500	1%			ES0402
10 R32,R35,R4J,R45,R4J,R45,R4B,R37,R8B,R33 100K ERJ-2GEIDGAX Panasonic Digited P100KCI-ND 0.063 Wattl50V 1% 7 R36,R37,R3B,R40,R41,R42,R80 0.0hm ERL-2GEROROX Panasonic Digited P0.00T-ND 0.063 Wattl50V 5% P0.00T-ND 2 R57,R62 3.3K ERL-3ERF350X Panasonic Digited P3.3KGTR-ND 0.1 Watt 5% DNP 1 R63 3.3K ERL-3ERF3301V Panasonic Digited P3.3KGTR-ND 0.1 Watt 100V DNP 4 R94/95,R96,RTX1 3.3X ERL-3ERF3301X Panasonic Digited P3.3CHT-ND 0.1 Watt 100V DNP	9		R23, R24, R26, R27, R28, R30, R34	22.1	ERJ-ZRKFZZR1X		П	P22.1LCT-ND		0.063 Watt	200	1%			ES0402
7 R35,R37,R35,R40,R41,R42,R80 O Ohm ERX-2GEDROXX Panasonic Digitey DIGITERIO 0.063 Wattl50V 5% 2 R57,R62 ERV-2RKF750OX Panasonic Digitey P75GLTR-ND 0.063 Wattl50V 1% 1 R63 3.3K ERJ-2REF33Q1V Panasonic Digitey 0.1 Watt SO 5% DNP 4 R94,R95,R96,RTX1 3.3K ERJ-2REF33Q1V Panasonic Digitey 0.1 Watt SO 1% DNP 4 R94,R95,R96,RTX1 3.3 ERJ-2REF33R2X Panasonic Digitey P33,21TR-ND 0.1 Watt SO 1% DNP	37			100K	ERJ-2GEJ104X			P100KJCT-ND		0.063 Watt	500	1%			ES0402
3 R434/R45. FROM STATE (RF) SMOX ERJ.2RRF-7500X Panasonic Digleky P30LI RAND 0.0683 Wattl50V 1% DNP 1 R63 R825/R622 3.34 ERJ.2RRF3301V Panasonic Digleky P3.3GKHCT-ND 0.1 Watt 100V 1% DNP 4 R94,R95,R96,RTX1 33.2 ERJ.2RRF33R2X Panasonic Digleky P33.2/IR-ND 0.1 Watt 100V 1% DNP 4 R94,R95,R96,RTX1 33.2 ERJ.2RRF33R2X Panasonic Digleky P33.2/IR-ND 0.0038 Wattl50V 1% DNP	38	_		0 Ohm	ERJ-2GE0R00X		Digikey	P0.0JCT-ND		0.063 Watt	200	2%			ES0402
2 R57,R62 3.3K ERJ-3cF732X Panasonic Digiter P3.3KGTR-ND 0.1 Wart 50V 5% DNP 1 R63 3.3K ERJ-2RF330Y Panasonic Digitery P3.30KHCI-ND 0.1 Wart 100V 1% DNP 4 R044/R95,R96,RTXI 33.2 ERL-2RF330X Panasonic Digitery P33.21FR-ND 0.063 Wart50V 1% DNP 4 R044/R95,R96,RTXI 23.2 ERL-2RF330X Panasonic Digitery 933.21FR-ND 0.063 Wart50V 1% DNP	33	m ·	.R46	750	ERJ-2RKF 7500X		Digikey	P750LTR-ND		0.063 Watt	500	1%			ES0402
1 K63 1 R63 2.3K ERJ-2KF3301V Panasonic Digitey P3.3GKHCI-ND 0.1 Wartt 1.00V 1% 2.32 ERJ-2KF3302X Panasonic Digitey P32.2LTR-ND 0.0063 Wat10V 1% DNP	8	2		3.3K	ERJ-3GEY332X			P3.3KGTR-ND		0.1 Watt	50V	2%			ES0603
4 K944/S, K95, K1XI 23.2 EFU-2RN 23.2 FIR-2RN 23.2 FIR-2R	41		AVING BOOK BUILD	3.3K	ERJ-3EKF3301V			P3.30KHCT-ND		0.1 Watt	1000	1%			ES0603
	47	_	95, K96,K1 X1	33.2	ERJ-ZKKF33KZX			P33.ZLIK-ND		0.063 Watt	200	1%			ES0402



Item Quantit	ty Part Reference	Value	Part Number	Manufacturer	Distributor	Distributor Dist Part Number	Current Power		Voltage Tolerance Type	ance Type	Note	PCB Footprint
44 1	RCLK2	0 Ohm	ERJ-6GEYOROOV	Panasonic	Digikey	P0.0ACT-ND		0.1 Watt 1	150V 1%		DNP	RES0805
45 1	RRX1	0 Ohm	ERJ-2GE0R00X	Panasonic	Digikey	P0.0JCT-ND		0.063 Watt 50V	00 2%		DNP	RES0402
46 2	RU1,RU2	27	ERJ-2RKF27R0X	Panasonic	Digikey	P27.0LCT-ND		0.063 Watt 50V	00 1%			RES0402
47 1	SW1	EVQ-11L04M	EVQ-11L04M	Panasonic	Digikey	P8078STB-ND					DNP	SW_200
48 1	U1	ZLE38000	ZLE38000	Microsemi							MTS	QFN64_TW
49 1	U2	MX25L1606EZUI	MX25L1606EZUI-12G	Macronix	Digikey	1092-1056-ND		6	3.3V			USON8_4x4mm
50 2	U3,U4	NCP2820	NCP2820MUTBG	On Semi	Digikey	NCP2820MUTBGOSCT-ND		2.65Watt 5	5.5 Volt	Class D	D	DFN8
51 1	US	CAT24C32	CAT24C32HU4I-GT3	ON Semi	Digikey	CAT24C32HU4I-GT3OSCT-ND		6	3.3V			UDFN8_E
52 4	60,80,70,80	Digital_MIC	SPH1668LM4H-1	Knowles	Mouser	721-SPH1668LM4H-1						KNOWLES_SPH_MIC
53 1	U10	FT234XD	FT234XD-R	FTDI	Digikey	768-1178-1-ND						DFN12
54 1	U11	LX8213-33	LX8213-33ISE	Microsemi	Digikey	LX8213-33ISECT-ND	300mA	3	3.3Vout			SOT23-5
55 1	U12	LX8213-12	LX8213-12ISE	Microsemi	Digikey	LX8213-12ISECT-ND	300mA	1	.2Vout			SOT23-5
56 1	γ1	12MHz	8Z-12.000MAAJ-T	TXC Corporation Digikey		887-1487-1-ND			+/- 30pm	maa		TXC 82 OSC



Power Matters.*

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