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ADI ADAU1761 低功耗数字音频处理 CODEC 方案

ADI 公司的 ADAU1761 是低功耗集成了数字音频处理的立体声 CODEC,支持立体声 48kHz 录音,1.8V 播放时的功耗为 14mW.立体声 ADC 和 DAC 支持取样速率从 8kHz 到 96kHz 以及数字音量控制. 音频处理 SigmaDSP 核具有 28 位处理能力,能使设计者补偿麦克风,扬声器,放大器和听觉环境中现实世界的限制,通过均衡,多频带压缩,限幅和第三方算法来极大地改善音频质量.主要应用在智能手机/多媒体手机,数码相机/数码摄像机,手提媒体播放器/手提音频播放器等.本文介绍 ADAU1761 主要特性,功能方框图, 系统方框图以及评估板 EVAL-ADAU1761Z 功能方框图,电路图和材料清单(BOM).

The ADAU1761 is a low power, stereo audio codec with integrated digital audio processing that supports stereo 48 kHz record and playback at 14 mW from a 1.8 V analog supply. The stereo audio ADCs and DACs support sample rates from 8 kHz to 96 kHz as well as a digital volume control.

The SigmaDSP® core features 28-bit processing (56-bit double precision). The processor allows system designers to compensate for the real-world limitations of microphones, speakers, amplifiers, and listening environments, resulting in a dramatic improvement in the perceived audio quality through equalization, multiband compression, limiting, and third-party branded algorithms.

The SigmaStudio™ graphical development tool is used to program the ADAU1761. This software includes audio processing blocks such as filters, dynamics processors, mixers, and low level DSP functions for fast development of custom signal flows.

The record path includes an integrated microphone bias circuit and six inputs. The inputs can be mixed and muxed before the ADC, or they can be configured to bypass the ADC. The ADAU1761 includes a stereo digital microphone input.

The ADAU1761 includes five high power output drivers (two differential and three single-ended), supporting stereo head-phones, an earpiece, or other output transducer. AC-coupled or capless configurations are supported. Individual fine level controls are supported on all analog outputs. The output mixer stage allows for flexible routing of audio.

ADAU1761 主要特性:

SigmaDSP 28-/56-bit, 50 MIPS digital audio processor

Fully programmable with SigmaStudio graphical tool

24-bit stereo audio ADC and DAC: >98 dB SNR

Sampling rates from 8 kHz to 96 kHz

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Low power: 7 mW record, 7 mW playback, 48 kHz at 1.8 V

6 analog input pins, configurable for single-ended or differential inputs

Flexible analog input/output mixers

Stereo digital microphone input

Analog outputs: 2 differential stereo, 2 single-ended stereo, 1 mono headphone output driver

PLL supporting input clocks from 8 MHz to 27 MHz

Analog automatic level control (ALC)

Microphone bias reference voltage

Analog and digital I/O: 1.8 V to 3.65 V

I2C and SPI control interfaces

Digital audio serial data I/O: stereo and time-division multiplexing (TDM) modes

Software-controllable clickless mute

Software power-down

GPIO pins for digital controls and outputs

32-lead,5 mm × 5 mm LFCSP

−40℃ to +85℃ operating temperature range

ADAU1761 应用:

Smartphones/multimedia phones

Digital still cameras/digital video cameras

Portable media players/portable audio players

Phone accessories products

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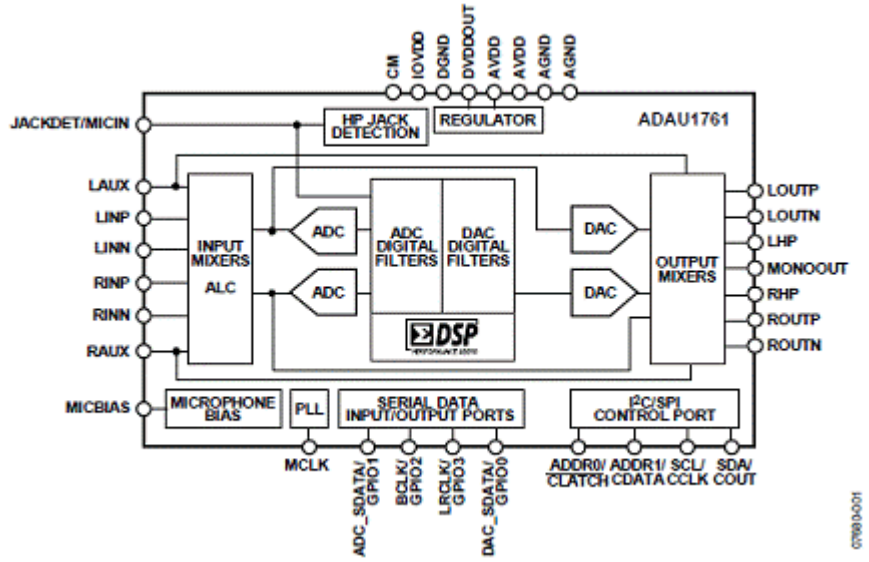

图 1.ADAU1761 功能方框图

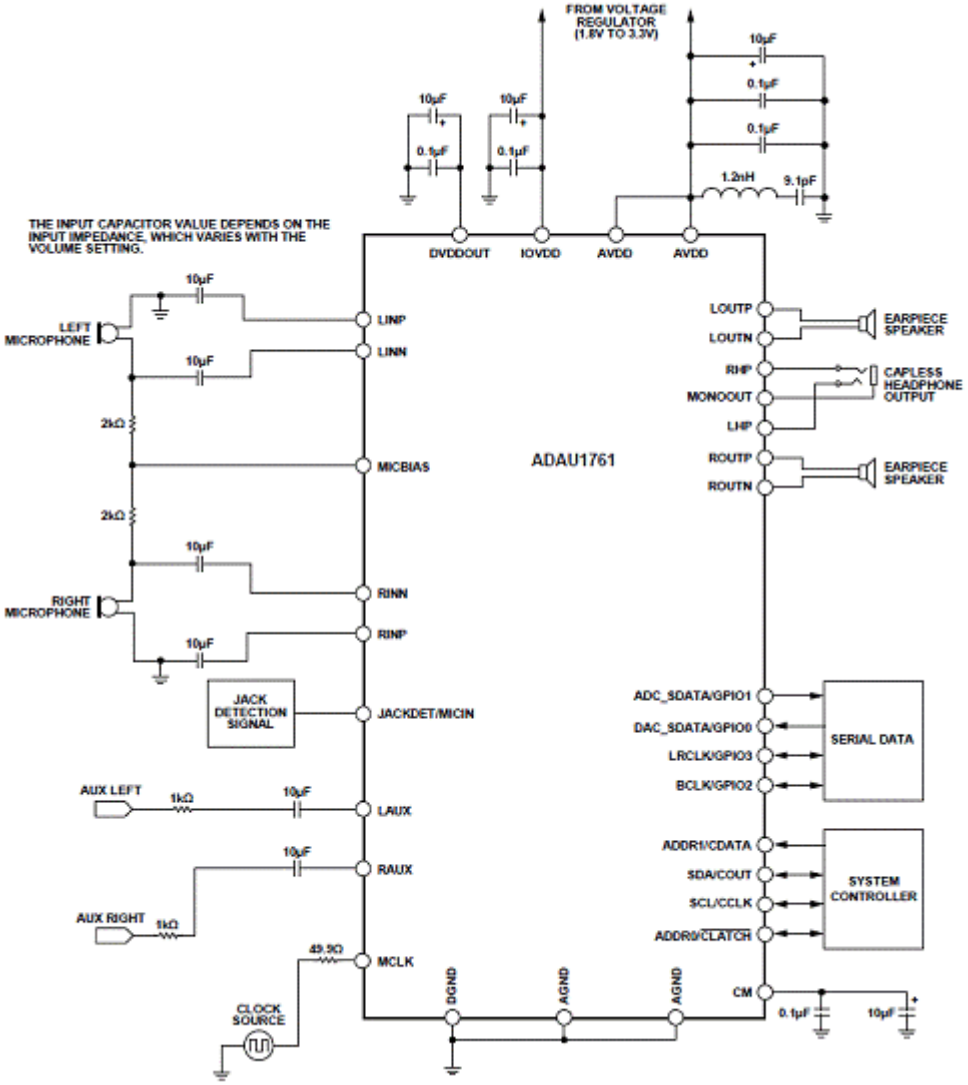

图 2.ADAU1761 系统方框图

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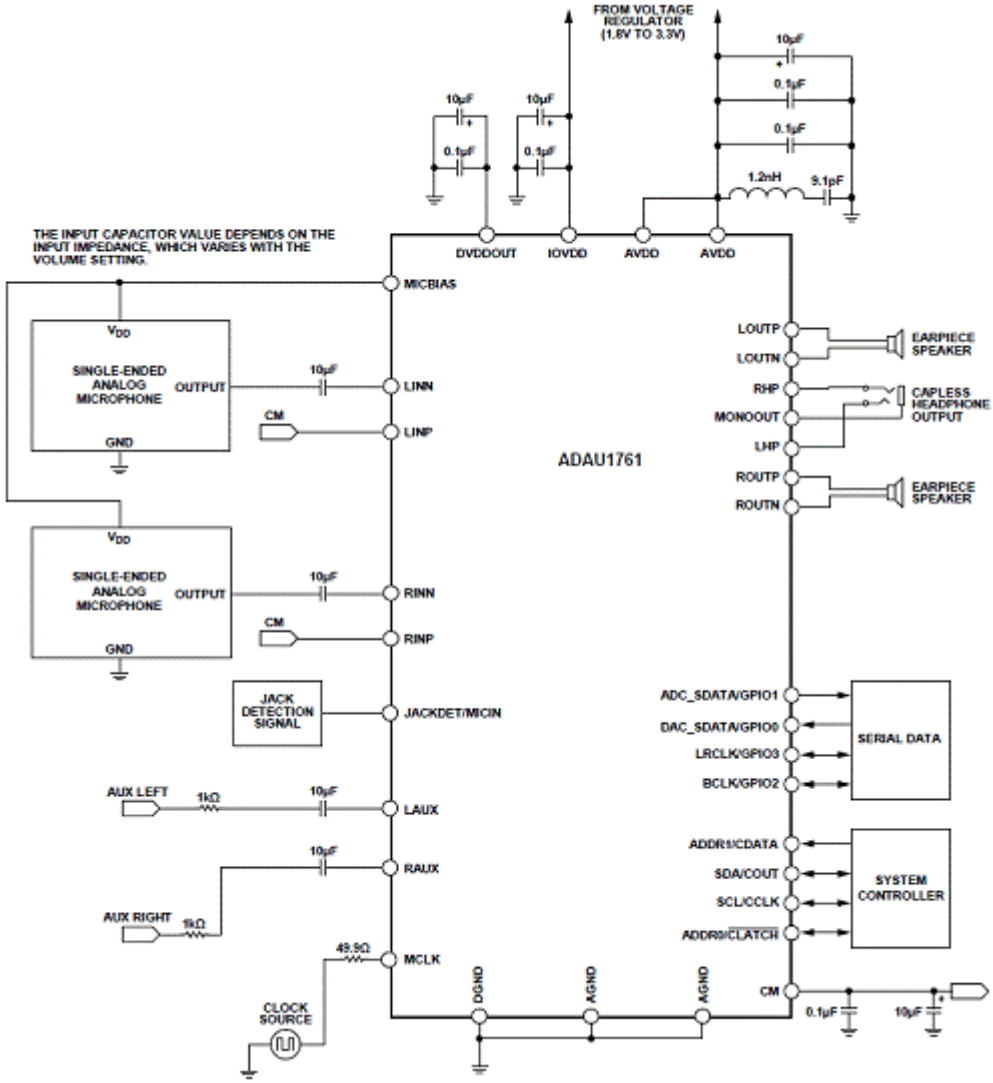

图 3.ADAU1761 采用模拟麦克风的系统方框图

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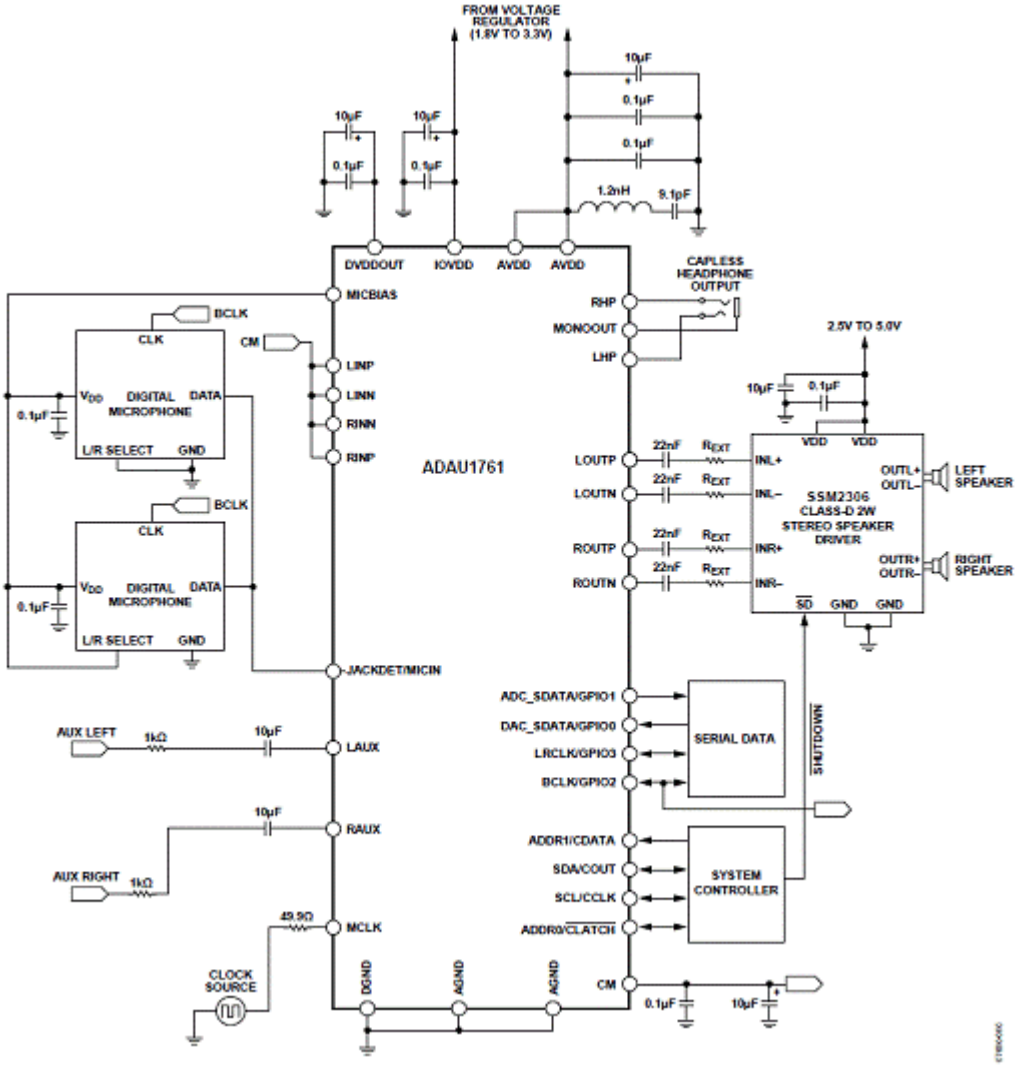

图 4.ADAU1761 带数字麦克风和 SSM2306 D 类扬声器驱动器的系统方框图

ADAU1761 评估板 EVAL-ADAU1761Z

The EVAL-ADAU1761Z includes both single-ended and differ-ential stereo line-level analog audio inputs as well as a digital audio interface. Single-ended and differential analog outputs are also provided, as well as a stereo capless headphone output.

The USBi provides power and the I2C communications interface to the evaluation board. A switch allows the ADAU1761 to operate at either 3.3 V or 1.8 V. The SigmaStudio™ programming software is used for all register controls and SigmaDSP® core programming.

A header is included for interfacing to stereo digital microphones. GPIO functions, such as push-buttons, LEDs, and switches, can be connected to the GPIO pins of the ADAU1761 for hardware control of the SigmaDSP.

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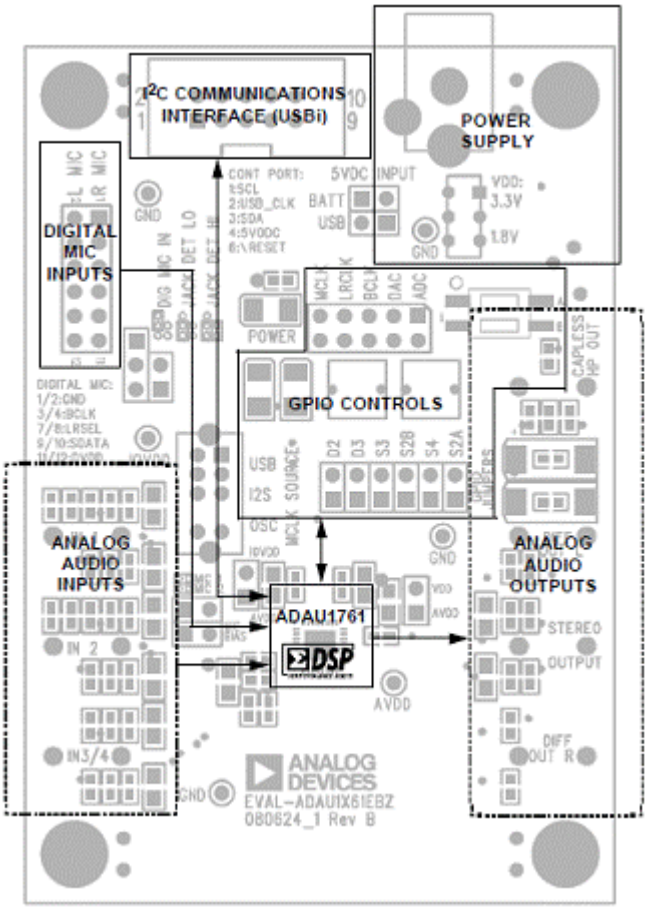

图 5.评估板 EVAL-ADAU1761Z 功能方框图

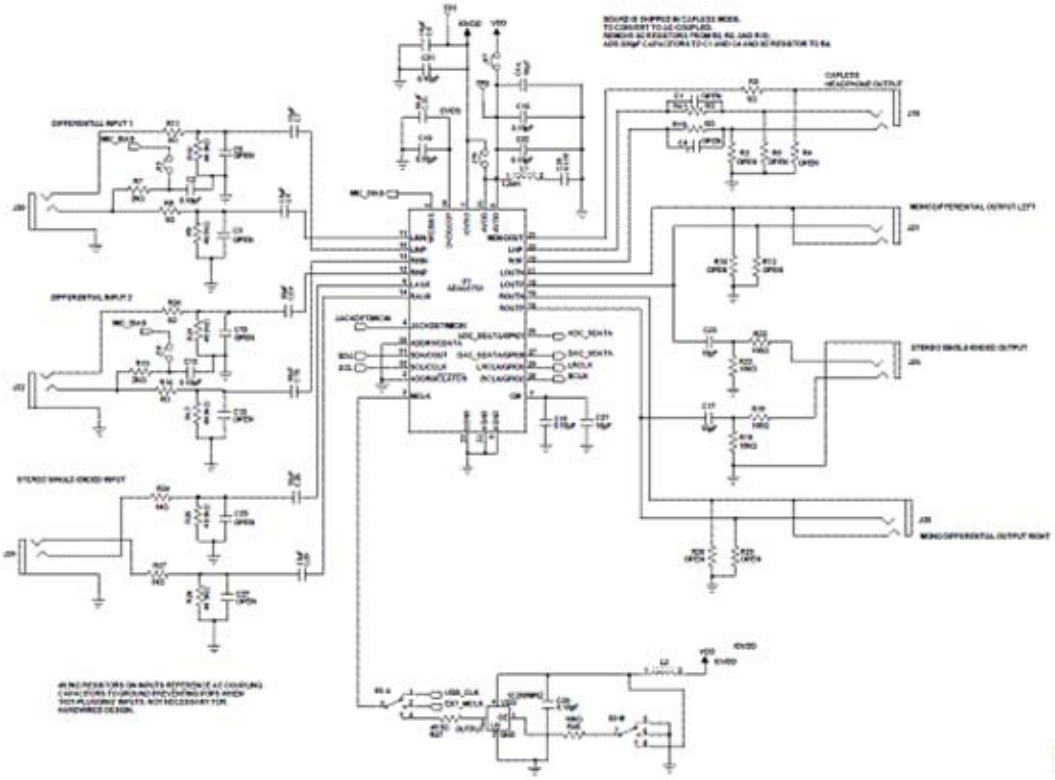

图 6.评估板 EVAL-ADAU1761Z 电路图(1)

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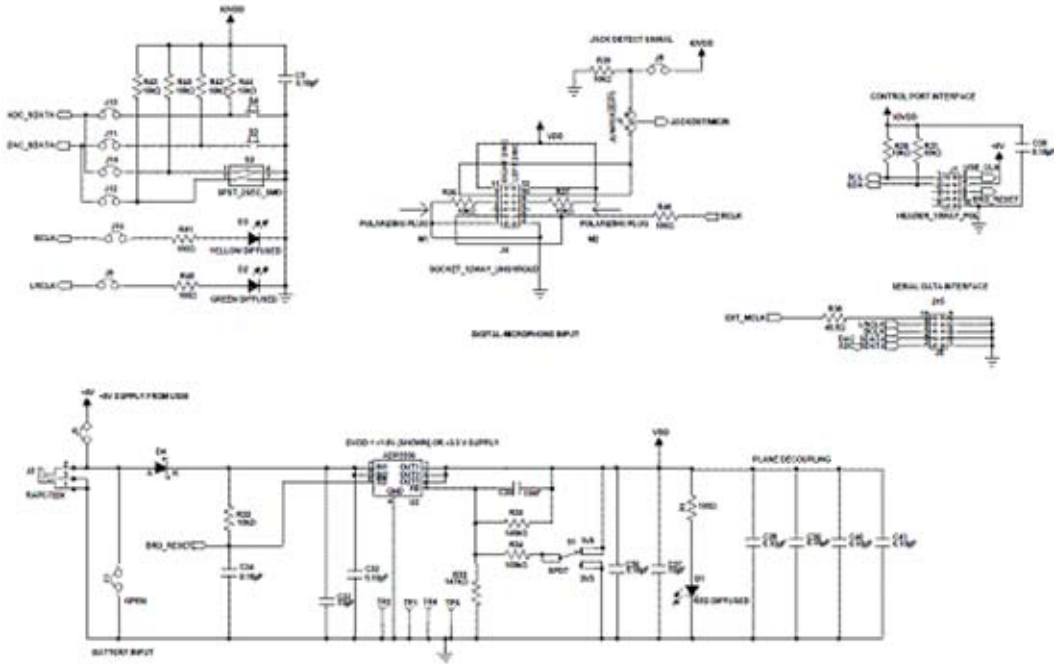

图 7.评估板 EVAL-ADAU1761Z 电路图(2)

评估板 EVAL-ADAU1761Z 材料清单(BOM):

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Qty	Designator	Description	Manufacturer	Part Number
2	C1, C4	Capacitor (open)		
13	C2, C9, C10, C12, C16, C18, C22, C31, C33, C34, C36, C38, C39	Capacitor, multilayer ceramic, 0.10 µF, 50 V, X7R, 0603	Panasonic	ECJ-1VB1H104K
6	C3, C6, C13, C19, C25, C27	Capacitor (open)		
14	C5, C7, C8, C11, C14, C15, C17, C20, C21, C23, C26, C28, C32, C37	Capacitor, multilayer ceramic, 10 µF, 10 V, X7R, 0805	Murata	GRM21BR71A106KE51L
1	C24	Capacitor, multilayer ceramic, 9.1 pF, 50 V, NP0, 0603	Murata	GQM1885C1H9R1CB01D
4	C29, C30, C40, C41	Capacitor, multilayer ceramic, 0.10 µF, 16 V, X7R, 0402	Panasonic	ECJ-0EX1C104K
1	C35	Capacitor, multilayer ceramic, 10 nF, 25 V, NP0, 0603	TDK	C1608C0G1E103J
1	D1	LED, red diffused, 6 millicandela, 635 nm, 1206	Lumex	SML-LX1206IW-TR
1	D2	LED, green diffused, 10 millicandela, 565 nm, 1206	Lumex	SML-LX1206GW-TR
1	D3	LED, yellow diffused, 4 millicandela, 585 nm, 1206	CML Innovative Technologies	CMD15-21VYD/TR8
1	D4	Schottky diode, 30 V, 0.5 A, SOD-123	ON Semiconductor	MBR0530T1G
1	J1	Header, 10-way (2 × 5), shrouded, polarized	3M	N2510-6002RB
1	J2	Mini power jack, 0.08", R/A T/H	Switchcraft, Inc.	RAPC722X
1	J3	Open		
1	J4	Header, 12-way (2 × 6), socket, unshrouded	Sullins Connector Solutions	PPPC062LFBN-RC
12	J5, J8 to J18	Header, 2-pin, unshrouded, 2-jumper, 0.10" (use Tyco shunt, 881545-2)	Sullins Connector Solutions	PBC02SAAN
1	J6	Header, 10-way (2 × 5), unshrouded	Sullins Connector Solutions	PBC05DAAN
1	J7	Header, 3-position, SIP	Sullins Connector Solutions	PBC03SAAN
7	J19 to J25	Stereo mini jack, SMT	CUI Inc.	SJ-3523-SMT
1	L1	Inductor, 1.2 nH	Jaro Components, Inc.	HFI-160808-1N2S
1	L2	Chip ferrite bead, 600 Ω @ 100 MHz	TDK	MPZ1608S601A
6	R1, R19, R23, R40, R41, R48	Chip resistor, 100 Ω, 1%, 100 mW, thick film, 0603	Panasonic	ERJ-3EKF1000V
7	R2 to R4, R13, R14, R26, R29	Resistor, open		
7	R5, R6, R8, R10, R11, R16, R20	Chip resistor, 0 Ω, 5%, 100 mW, thick film, 0603	Panasonic	ERJ-3GEY0R00V
2	R7, R15	Chip resistor, 2 kΩ, 1%, 100 mW, thick film, 0603	Panasonic	ERJ-3EKF2001V
6	R9, R12, R17, R21, R25, R28	Chip resistor, 49.9 kΩ, 1%, 100 mW, thick film, 0603	Panasonic	ERJ-3EKF4992V
13	R18, R22, R30 to R32, R36, R37, R39, R42 to R46	Chip resistor, 10 kΩ, 1%, 100 mW, thick film, 0603	Panasonic	ERJ-3EKF1002V
2	R24, R27	Chip resistor, 1 kΩ, 1%, 100 mW, thick film, 0603	Panasonic	ERJ-3EKF1001V
1	R33	Chip resistor, 147 kΩ, 1%, 100 mW, thick film, 0603	Panasonic	ERJ-3EKF1473V
1	R34	Chip resistor, 169 kΩ, 1%, 100 mW, thick film, 0603	Panasonic	ERJ-3EKF1693V
1	R35	Chip resistor, 140 kΩ, 1%, 100 mW, thick film, 0603	Panasonic	ERJ-3EKF1403V
2	R38, R47	Chip resistor, 49.9 Ω, 1%, 100 mW, thick film, 0603	Panasonic	ERJ-3EKF49R9V

Qty	Designator	Description	Manufacturer	Part Number
1	S1	Slide switch, SPDT, PC mount, L = 2 mm	E-Switch	EG1271
1	S2	SMD dip switch, 2-section SPST, raised actuator	CTS Corporation	219-2LPST
2	S3, S4	Tact switch, long stroke (normally open)	Omron Electronics	B3M-6009
1	S5	Slide switch, DP3T, PC mount, L = 4 mm	E-Switch	EG2305
6	TP1 to TP6	Mini test point, white, 0.1" OD	Keystone Electronics	5002
1	U1	SigmaDSP codec	Analog Devices	ADAU1761BCPZ
1	U2	Adjustable low dropout voltage regulator	Analog Devices	ADP3336ARMZ
1	U3	SMD oscillator, 12.288 MHz, fixed, 1.8 VDC to 3.3 VDC	Abracon Corporation	AP3S-12.288MHz-F-J-B