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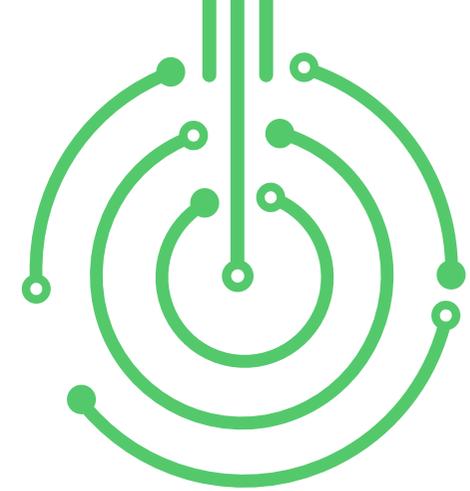
Open Source Hardware Electronics Projects

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Audio



Hi-Efficient 20W Mono Class-D Audio Amplifier



SKU: EL140915

Hi-Efficient 20W Mono Class-D Audio Amplifier



This is a Hi-Efficient 20W mono Class-D audio amplifier, designed to drive speakers as low as 4 ohms in a bridge-tied-load configuration. Due to the low power dissipation and high efficiency of up to 90%, the module doesn't require a heatsink. The project is built using PAM8320 chip which features short circuit protection, thermal shutdown, over-voltage protection and under-voltage lock-out. Ferrite-Bead is provided on the output of the speaker connection to eliminate EMI. Connect SD to a high and MUTE to a low for normal operation.

FEATURES

- Operates from 4.5V to 15V
- 20W into 4Ω BTL Load from 12V Supply
- Single-Ended Analog Input
- No Pop Noise for Start-up and Shut-down Sequences
- Output Power at 1% THD+N (1Khz) @ 15W Output
- Internal Oscillator (No External Components Required)
- Highly Efficient Class-D Operation Eliminates Need for Heat Sinks
- Thermal and Short-Circuit Protection with Auto Recovery
- Over Voltage Protection and Under Voltage Lock-out
- Screw Terminal for Speak and Power Connections
- On Board Trimmer Potentiometer for Volume Control
- On Board Jumpers for Shutdown and Mute Function
- On Board Power LED
- Header Connector for Audio Input
- PCB Dimensions 39.53 33.97MM
- 2 X 3MM PCB Mounting Holes



Shutdown Operation

The PAM8320 employs a shutdown operation mode to reduce supply current to the absolute minimum level during periods of non-use to save power. The SDN input terminal should be pull high during normal operation. Pulling SDN low causes the outputs to be muted and the amplifier enters a low-current state. SDN should never be left unconnected.

Anti-POP and Anti-Click Circuitry

The PAM8320 contains circuitry to minimize turn-on and turn-off transients or “click and pops”, where turn-on refers to either power supply turn-on or device recover from shutdown mode. When the device is turned on, the amplifiers are internally muted. An internal current source ramps up the internal reference voltage. The device will remain in mute mode until the reference voltage reaches half supply voltage. As soon as the reference voltage is stable, the device will begin full operation. For the best power-off pop performance, the amplifier should be set in shutdown mode prior to removing the power supply voltage.

Short-circuit Protection

The PAM8320 has short circuit protection circuitry on the outputs to prevent damage to the device when output-to-output shorts (BTL mode), output-to-GND shorts, or output-to-VCC shorts occur. Once a short-circuit is detected on the outputs, the output drive is immediately disabled. This is not a latched fault, if the short is removed the normal operation is restored.

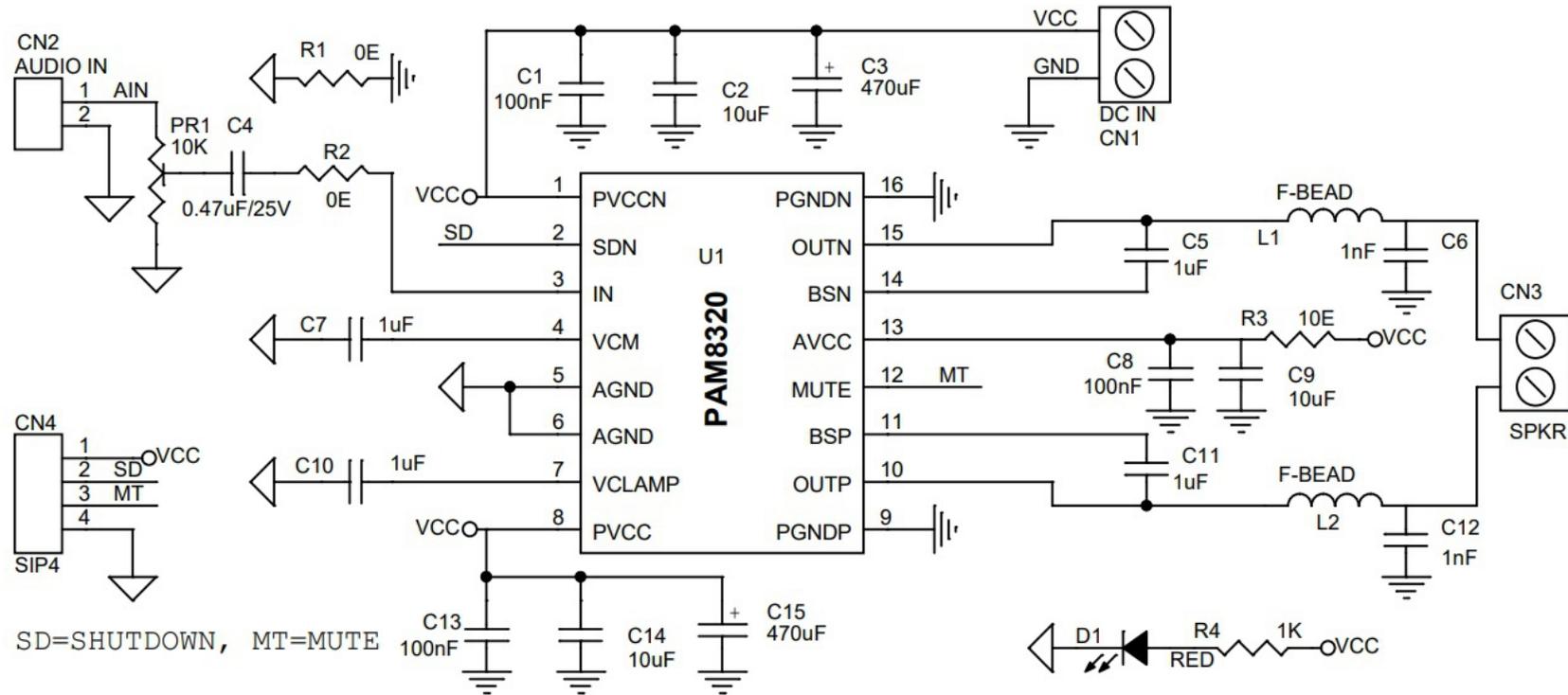
Thermal Protection

Thermal protection prevents the device from damage. When the internal die temperature exceeds a typical of 160°C the device will enter a shutdown state and the outputs are disabled. This is not a latched fault, once the thermal fault is cleared and the temperature of the die decreased by 40°C the device will restart with no external system interaction.

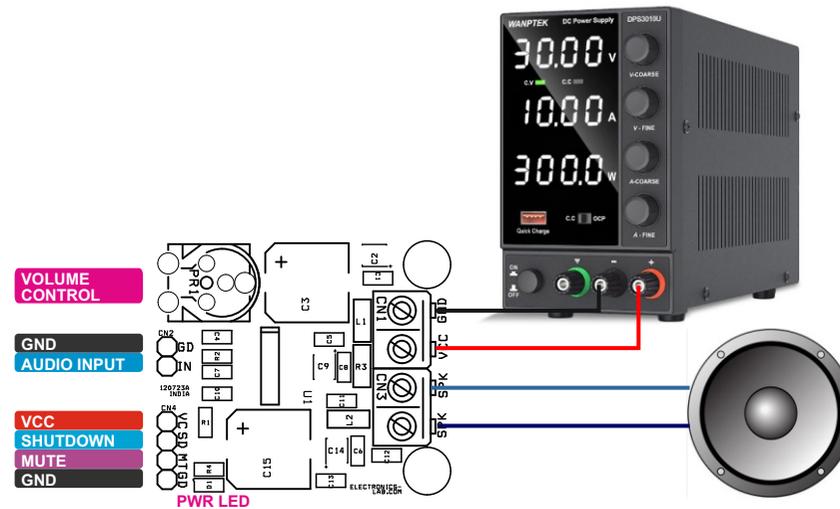
Over Voltage Protection and Under Voltage Lock-out (OVP and UVLO)

An over-voltage protection (OVP) circuit is integrated in PAM8320, when the supply voltage is over 18V the OVP is active and then the output stage is disabled. The PAM8320 will auto recovery when the supply voltage is lower than the OVP threshold. The PAM8320 incorporates circuitry designed to detect low supply voltage. When the supply voltage drops to 4.4V or below, the PAM8320 goes into a state of shutdown. When the supply voltage is higher than 4.5V normal operation is resumed.

Schematic



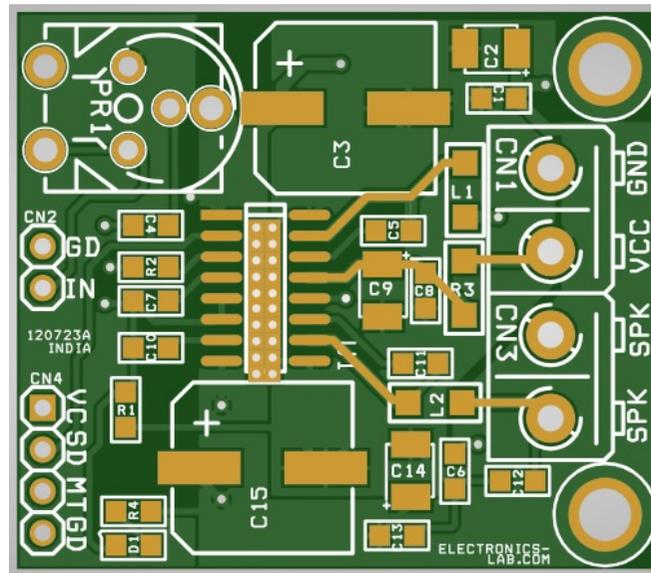
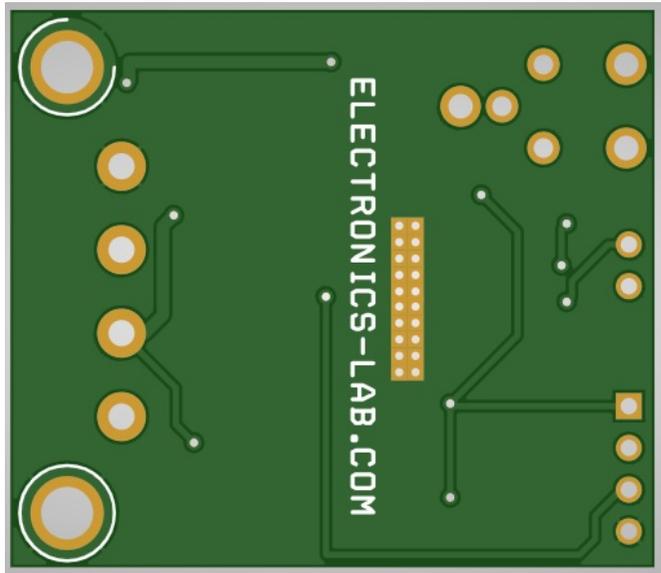
Connections



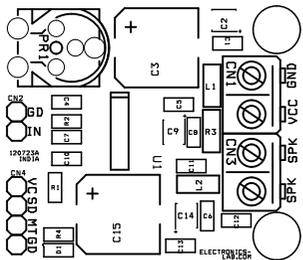
Connections and other details:

- CN1 Power Supply: Pin 1 = VCC, Pin 2 = GND
- CN2 Audio Input: Pin 1 Audio Input, Pin 2 = GND
- CN3 Speaker: Pin 1 = Speaker 1, Pin 2 Speaker 2
- CN4 Mute and Shutdown: Pin 1 = VCC, Pin 2 Shutdown, Pin 3 = Mute, Pin 4 = GND
- D1: Power LED
- Pr1: Volume Control

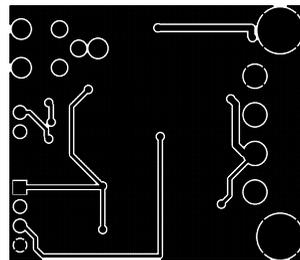
PCB



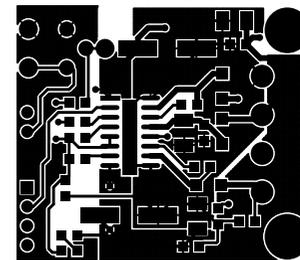
PCB GERBER
FILES
AVAILABLE



SILK SCREEN TOP



BOTTOM LAYER



TOP LAYER

PCB DIMENSIONS 39.53 33.97MM

Parts List

BOM						
NO	QNTY.	REF	DESC	MANUFACTURER	SUPPLIER	SUPPLIER PART NO
1	1	CN1	2 PIN SCREW TERMINAL PITCH 5.08MM	PHOENIX	DIGIKEY	277-1247-ND
2	1	CN2	2 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5315-ND
3	1	CN3	2 PIN SCREW TERMINAL PITCH 5.08MM	PHOENIX	DIGIKEY	277-1247-ND
4	1	CN4	4 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5317-ND
5	3	C1,C8,C13	100nF/50V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
6	3	C2,C9,C14	10uF/25V CERMIC SMD SIZE 1210	YAGEO/MURATA	DIGIKEY	
7	2	C3,C15	470uF/25V ELECTROLYTIC	NICHICON	DIGIKEY	493-2194-1-ND
8	1	C4	0.47uF/25V CERAMIC SMD SIZE 0804	YAGEO/MURATA	DIGIKEY	
9	4	C5,C7,C10,C11	1uF/25V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
10	2	C6,C12	1nF/25V CERMAIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
11	1	D1	RED LED SMD SIZE 0805	OSRAM	DIGIKEY	475-1278-1-ND
12	2	L1,L2	FERRITE-BEAD 600-OHMS SMD SIZE 1206	LAIRD	DIGIKEY	240-2405-1-ND
13	1	PR1	10K TRIMMER POTENTIOMETER	PIHER	DIGIKEY	PT10LV10-103A2020-S
14	2	R1,R2	0E SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
15	1	R3	10E 5% SMD SIZE 1206	YAGEO/MURATA	DIGIKEY	
16	1	R4	1K 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
17	1	U1	PAM8320 SOIC	DIODE INC	DIGIKEY	PAM8320RDRDICT-ND



Keep
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