RC4861
1/2W Audio Power Amplifier with Shutdown

<div style="float:right">**Preliminary Information**</div>

Features

- Low VOS, typically 2mV
- THD 0.3% typically at 0.5W output power
- Drives 8Ω and 4Ω non-powered speakers
- User programmable gain
- Internal thermal limiting circuitry
- 8 pin SOIC package

Applications

- Multimedia PC motherboards and add-in sound cards
- Companion chip to sigma-delta sound codecs
- Low power portable systems
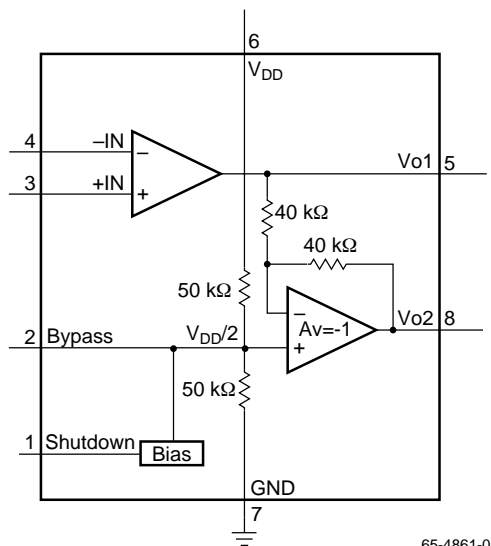- Toys and games
- Cellular phones

Description

The RC4861 sound driver is an audio device that can be used on PC motherboards and add-in sound cards. It consists of H-bridge connected output drivers for headphones or speakers.

The output drivers can deliver up to 0.5 Watt of continuous average output power into 8Ω speaker from a 5V source. The drivers use class AB amplifiers and maintain a low bias current. A shut down function disables the device for power savings when not in use.
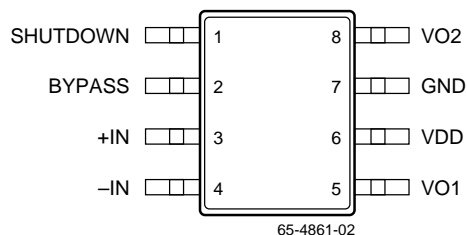
The thermal limiting circuitry becomes active if the chip temperature exceeds 150°C.

Block Diagram

65-4861-01

Rev. 0.9.3

Pin Assignments

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SHUTDOWN  ⊏□⊐ 1      8 ⊏□⊐  VO2
  BYPASS  ⊏□⊐ 2      7 ⊏□⊐  GND
     +IN  ⊏□⊐ 3      6 ⊏□⊐  VDD
     −IN  ⊏□⊐ 4      5 ⊏□⊐  VO1
                65-4861-02
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Absolute Maximum Ratings

Supply Voltage, V_{DD}	6.0V
Junction Temperature, T_J	150°C
Storage Temperature, T_S	−65 to +150°C
Lead Soldering Temperature, 10 seconds	300°C
ESD Threshold, ESD (Human Body Model)	2000V

Note:

1. Functional operation under any of these conditions is not implied. Performance is guaranteed only if Operating Conditions are not exceeded

Operating Conditions

Parameter	Conditions	Min.	Typ.	Max.	Units
Power Supply, V_{DD}		2.7	5.0	5.5	V
Input Voltage Logic High, V_{IH}		V_{DD}−0.8		V_{DD}	V
Input Voltage Logic Low, V_{IL}				0.8	V
Ambient Operating Temperature, T_A		0		70	°C

Electrical Characteristics

V_{DD} = 5V, f = 1kHz, R_L = 8Ω, unless otherwise specified.

Parameter		Conditions	Min.	Typ.	Max.	Units
A_V	Voltage Gain, Open Loop			90		dB
I_{SS}	Shutdown current	Shutdown pin HIGH, V_{DD} = 5V		0.6	10	μA
I_{total}	Power Supply Current,	No load		6.5	10	mA
V_{OS}	Output Offset Voltage	V_{IN} = 0V		2	20	mV
P_O	RMS Output Power	R_L = 8Ω, V_{DD} = 5V	0.5			W
THD	Total Harmonic Distortion	f_O = 1kHz, P_O = 0.5W		0.3	1	%
PSRR	Power Supply Rejection Ratio Input Referenced	f_O = 1kHz, ΔV_{DD} = 0.2Vp-p 0.1 μF bypass cap	65	75		dB

Typical Application Circuit

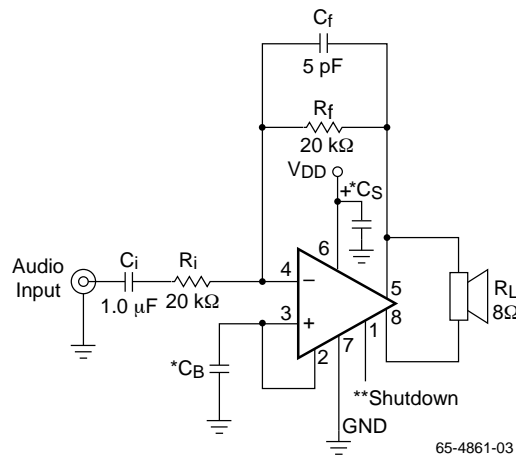(Demo board is available for circuit in Figure 1).

Figure 1. Audio Amplifier with A_{VD} = 2

* C_S and C_B size depend on specific application requirements and constraints. Typical values of C_S and C_B are 0.1 μF
**Pin 1 should be connected to V_{DD} to disable the amplifier or to GND to enable the amplifier. This pin should not be left floating.

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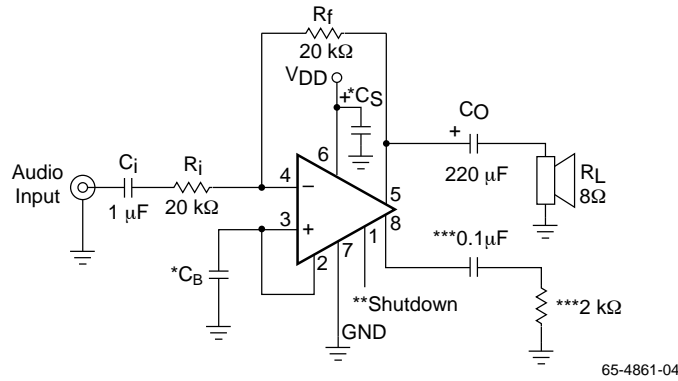
Single Ended Application Circuit

Figure 2. Single Ended Amplifier with $A_V = -1$

* C_S and C_B size depend on specific application requirements and constraints. Typical values of C_S and C_B are 0.1 μF
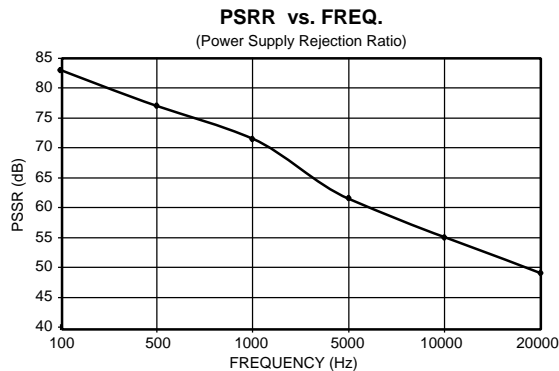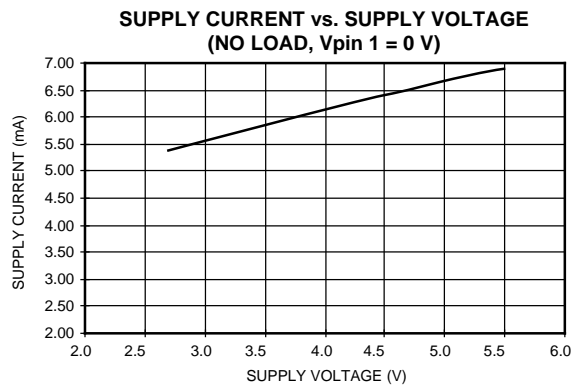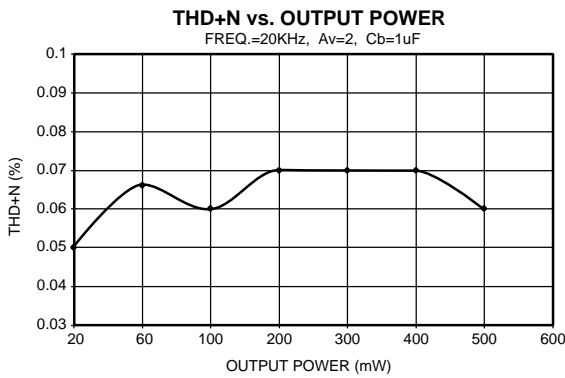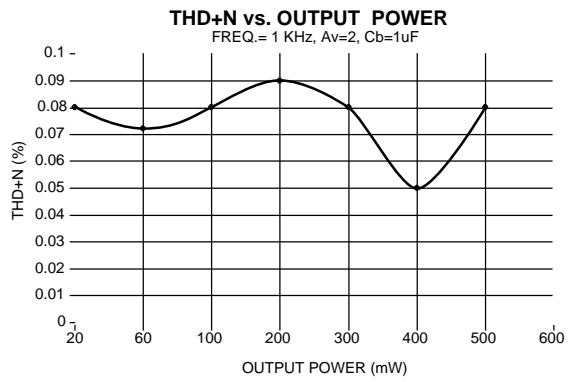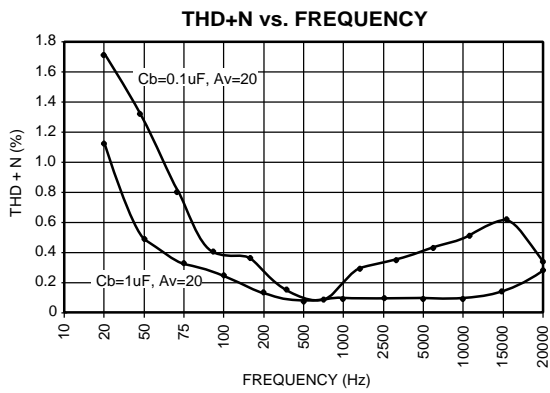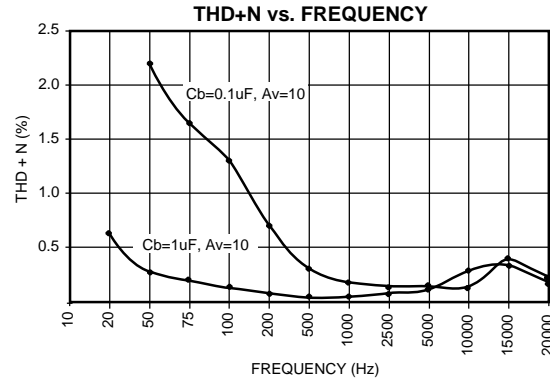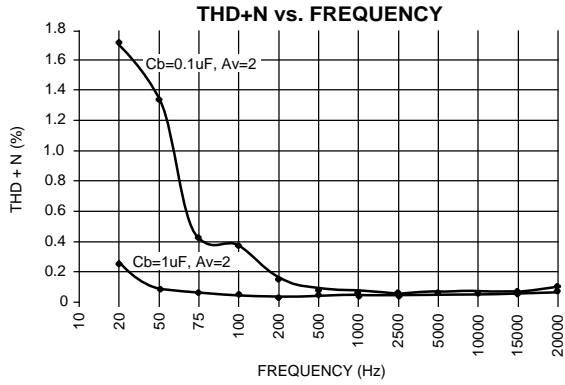
**Pin 1 should be connected to V_{DD} to disable the amplifier or to GND to enable the amplifier. This pin should not be left floating.

***These components create a "dummy" load for pin 8 for stability purposes.

External Components Description (for Figure 1)

Components	Functional Description
R_i	Inverting input resistance which sets the closed-loop gain in conjunction with R_f . This resistor also forms a high pass filter with C_i at $f_C = 1/(2\pi\, R_i\, C_i\,)$.
C_i	Input coupling capacitor which blocks DC voltage at the amplifier's input terminals. Also creates a highpass filter with R_i at $f_C = 1/(2\pi\, R_i\, C_i\,)$.
R_f	Feedback resistance which sets closed-loop gain in conjuncticn with R_i. $A_V = -R_f/R_i$
C_S	Supply bypass capacitor which provides power supply filtering.
C_B	Bypass pin capacitor which provides half supply filtering.
C_f	Used when a differential gain of over 10 is desired. C_f in conjunction with R_f creates a low-pass filter which bandwidth limits the amplifier and prevents high frequency oscillation bursts. $f_C = 1/(2\pi\, R_f\, C_f\,)$

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Typical Performance Characteristics

THD+N vs. FREQUENCY

Cb=0.1uF, Av=2

Cb=1uF, Av=2

THD + N (%)

FREQUENCY (Hz)

THD+N vs. FREQUENCY

Cb=0.1uF, Av=10

Cb=1uF, Av=10

THD + N (%)

FREQUENCY (Hz)

THD+N vs. FREQUENCY

Cb=0.1uF, Av=20

Cb=1uF, Av=20

THD + N (%)

FREQUENCY (Hz)

THD+N vs. OUTPUT POWER
FREQ.= 1 KHz, Av=2, Cb=1uF

THD+N (%)

OUTPUT POWER (mW)

THD+N vs. OUTPUT POWER
FREQ.=20KHz, Av=2, Cb=1uF

THD+N (%)

OUTPUT POWER (mW)

SUPPLY CURRENT vs. SUPPLY VOLTAGE
(NO LOAD, Vpin 1 = 0 V)

SUPPLY CURRENT (mA)

SUPPLY VOLTAGE (V)

PSRR vs. FREQ.
(Power Supply Rejection Ratio)

PSSR (dB)

FREQUENCY (Hz)

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Notes:

Mechanical Dimensions – 8-Lead SOIC Package

Symbol	Inches		Millimeters		Notes
	Min.	Max.	Min.	Max.	
A	.053	.069	1.35	1.75	
A1	.004	.010	0.10	0.25	
B	.013	.020	0.33	0.51	
C	.008	.010	0.20	0.25	5
D	.189	.197	4.80	5.00	2
E	.150	.158	3.81	4.01	2
e	.050 BSC		1.27 BSC		
H	.228	.244	5.79	6.20	
h	.010	.020	0.25	0.50	
L	.016	.050	0.40	1.27	3
N	8		8		6
α	0°	8°	0°	8°	
ccc	—	.004	—	0.10	

Notes:

1. Dimensioning and tolerancing per ANSI Y14.5M-1982.
2. "D" and "E" do not include mold flash. Mold flash or protrusions shall not exceed .010 inch (0.25mm).
3. "L" is the length of terminal for soldering to a substrate.
4. Terminal numbers are shown for reference only.
5. "C" dimension does not include solder finish thickness.
6. Symbol "N" is the maximum number of terminals.
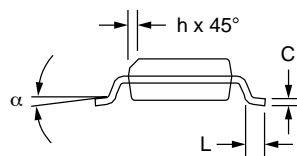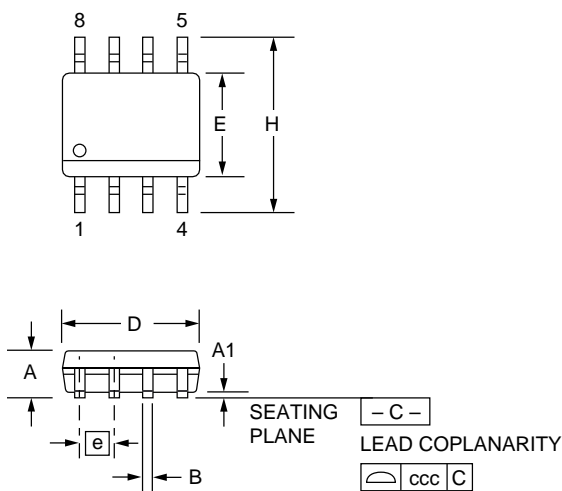
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Ordering Information

Product Number	Package
RC4861M	8 pin SOIC

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