



PA6204

Preliminary

CMOS IC

1.7-W MONO FULLY DIFFERENTIAL AUDIO POWER AMPLIFIER

DESCRIPTION

The UTC **PA6204** is a mono fully-differential audio amplifier, capable of delivering 1.7W of continuous average power to an 8-Ω BTL load with less than 10% distortion from a 5V power supply.

The UTC **PA6204** is ideal for PDA/smart phone applications due to features such as -80-dB supply voltage rejection from 20Hz to 2kHz, improved RF rectification immunity, small 20mm² total PCB area, and a fast startup with minimal pop. The device operates from 2.5V to 5.5V, drawing only 4mA of quiescent supply current.

The UTC **PA6204** is suitable for diverse applications, such as PDAs, Wireless or cellular handsets, Portable devices.

FEATURES

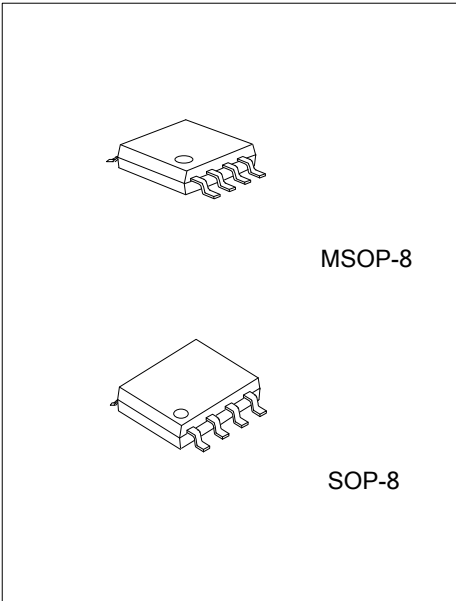
- * 1.7W into 8Ω from a 5-V supply at THD=10% (Typ.)
- * 2.5V-5.5V operation
- * Low supply current: 4mA typ at 5V
- * Ultra low current shutdown mode
- * Only three external components
 - Improved PSRR (-80dB) for direct battery operation
 - Fully differential design reduces RF rectification
 - -63dB CMRR eliminates two input coupling capacitors
- * Fast startup with minimal pop

ORDERING INFORMATION

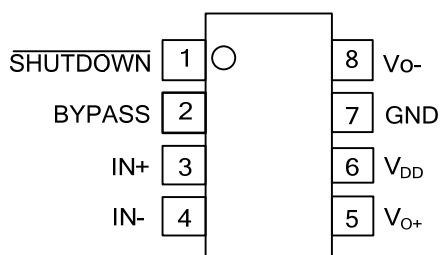
Ordering Number		Package	Packing
Lead Free	Halogen Free		
PA6204L-SM1-R	PA6204G-SM1-R	MSOP-8	Tape Reel
PA6204L-S08-R	PA6204G-S08-R	SOP-8	Tape Reel
PA6204L-S08-T	PA6204G-S08-T	SOP-8	Tube

Note: xx: Output Voltage, refer to Marking Information.

<p>PA6204G-xx-S08-R</p>	<p>(1) R: Tape Reel, T: Tube (2) S08: SOP-8 (3) xx: Refer to Marking Information (4) G: Halogen Free, L: Lead Free</p>
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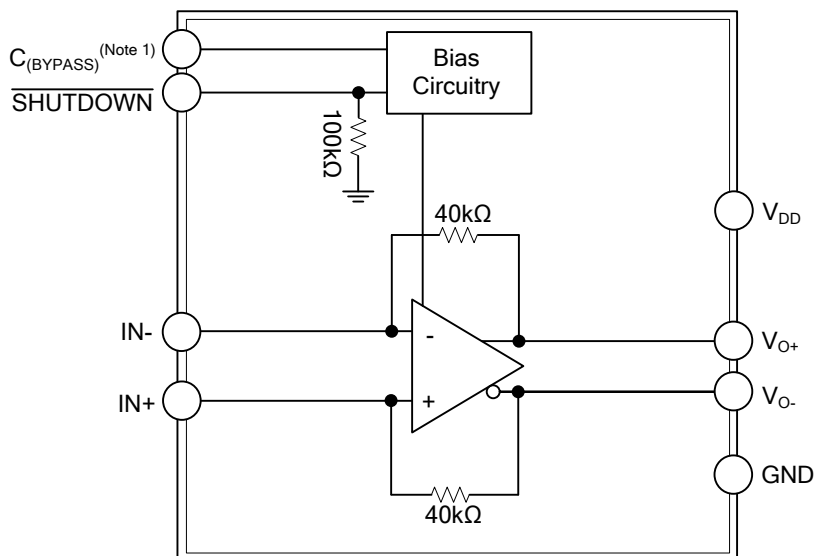
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	SHUTDOWN	Shutdown Terminal (Active Low Logic)
2	BYPASS	Mid-supply Voltage, Adding a Bypass Capacitor Improves PSRR
3	IN+	Positive Differential Input
4	IN-	Negative Differential Input
5	VO+	Positive BTL Output
6	V _{DD}	Power Supply
7	GND	High-current Ground
8	VO-	Negative BTL Output

■ BLOCK DIAGRAM



Note 1. C_(BYPASS) is optional.

■ ABSOLUTE MAXIMUM RATING (Over operating free-air temperature range unless otherwise noted)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{DD}	-0.3~6	V
Input Voltage	V_I	-0.3~ $V_{DD}+0.3$	V
Power Dissipation($T_A=25^\circ\text{C}$)	P_D	0.5	W
Junction Temperature	T_J	-40~150	$^\circ\text{C}$
Operating Free-air Temperature	T_A	-40~85	$^\circ\text{C}$
Storage Temperature	T_{STG}	-65~150	$^\circ\text{C}$

Note: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. Derating factor based on high-k board layout.

■ RECOMMENDED OPERATING CONDITIONS

PACKAGE	SYMBOL	MIN	TYP	MAX	UNIT
Supply Voltage	V_{DD}	2.5		5.5	V
High-level Input Voltage	SHUTDOWN V_{IH}	1.55			V
Low-level Input Voltage	SHUTDOWN V_{IL}			0.5	V
Operating Free-air Temperature	T_A	-40		85	$^\circ\text{C}$

■ ELECTRICAL CHARACTERISTICS ($T_A=25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Offset Voltage (Measured Differentially)	V_{OS}	$V_I=0\text{V}$ differential, Gain=1V/V, $V_{DD}=5.5\text{V}$	-9	0.3	9	mV
Power Supply Rejection Ratio	PSRR	$V_{DD}=2.5\text{V}\sim 5.5\text{V}$		-85	-60	dB
Common Mode Input Range	V_{IC}	$V_{DD}=2.5\text{V}\sim 5.5\text{V}$	0.5		$V_{DD}-0.8$	V
Common Mode Rejection Ratio	CMRR	$V_{DD}=5.5\text{V}$, $V_{IC}=0.5\text{V}\sim 4.7\text{V}$		-63	-40	dB
		$V_{DD}=2.5\text{V}$, $V_{IC}=0.5\text{V}\sim 1.7\text{V}$		-63	-40	
Low-Output Swing		$R_L=8\Omega$, Gain=1V/V $V_{IN+}=0\text{V}$, $V_{IN-}=V_{DD}$	$V_{DD}=5.5\text{V}$	0.45		V
			$V_{DD}=3.6\text{V}$	0.37		
			$V_{DD}=2.5\text{V}$	0.26	0.4	
High-Output Swing		$R_L=8\Omega$, Gain=1V/V $V_{IN+}=V_{DD}$, $V_{IN-}=0\text{V}$	$V_{DD}=5.5\text{V}$	4.95		V
			$V_{DD}=3.6\text{V}$	3.18		
			$V_{DD}=2.5\text{V}$	2	2.13	
High-Level Input Current, SHUTDOWN	$ I_{IH} $	$V_{DD}=5.5\text{V}$, $V_I=5.8\text{V}$		58	100	μA
Low-Level Input Current, SHUTDOWN	$ I_{IL} $	$V_{DD}=5.5\text{V}$, $V_I=-0.3\text{V}$		3	100	μA
Quiescent Current	I_Q	$V_{DD}=2.5\text{V}\sim 5.5\text{V}$, No Load		4	6	mA
Supply Current	$I_{(SD)}$	$V_{I(\text{SHUTDOWN})}\leq 0.5\text{V}$, $V_{DD}=2.5\text{V}\sim 5.5\text{V}$, $R_L=8\Omega$		0.01	1	μA
Gain		$R_L=8\Omega$	$\frac{38\text{k}\Omega}{R_I}$	$\frac{40\text{k}\Omega}{R_I}$	$\frac{42\text{k}\Omega}{R_I}$	V/V
Resistance From Shutdown To GND				100		k Ω

■ OPERATING CHARACTERISTICS ($T_A=25^\circ\text{C}$, Gain=1V/V, unless otherwise specified)

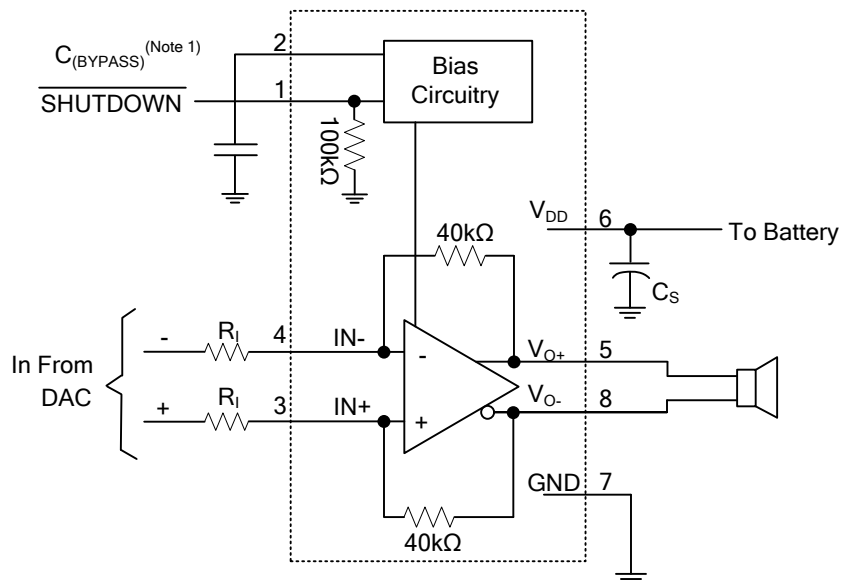
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
Output Power	P_O	THD+N=1%, f=1kHz, $R_L=8\Omega$	$V_{DD}=5V$		1.36		W
			$V_{DD}=3.6V$		0.72		
			$V_{DD}=2.5V$		0.33		
		THD+N=10%, f=1kHz, $R_L=8\Omega$	$V_{DD}=5V$		1.7		W
			$V_{DD}=3.6V$		0.85		
			$V_{DD}=2.5V$		0.4		
Total Harmonic Distortion Plus Noise	THD+N	$V_{DD}=5V, P_O=1W, R_L=8\Omega, f=1kHz$		0.02		%	
		$V_{DD}=3.6V, P_O=0.5W, R_L=8\Omega, f=1kHz$		0.02			
		$V_{DD}=2.5V, P_O=200mW, R_L=8\Omega, f=1kHz$		0.03			
Supply Ripple Rejection Ratio	K_{SVR}	$V_{DD}=3.6V$, Inputs Ac-grounded With $C_I=2\mu F$, $V_{(RIPPLE)}=200mV_{DD}$	f=217Hz		-80	dB	
			f=20Hz~20kHz		-70		
Signal-To-Noise Ratio	SNR	$V_{DD}=5V, P_O=1W, R_L=8\Omega$		105		dB	
Output Voltage Noise	V_N	$V_{DD}=3.6V$, f=20Hz~20kHz, Inputs Ac-grounded With $C_I=2\mu F$	No Weighting		15	μV_{RMS}	
			A Weighting		12		
Common Mode Rejection Ratio	CMRR	$V_{DD}=3.6V, V_{IC}=1V_{PP}$	f=217Hz		-65	dB	
Feedback Resistance	R_F		38	40	44	k Ω	
Start-up Time From Shutdown		$V_{DD}=3.6V, C_{BYPASS}=0.1\mu F$		27		ms	

■ TYPICAL APPLICATION CIRCUIT

Table 1. Typical Component Values

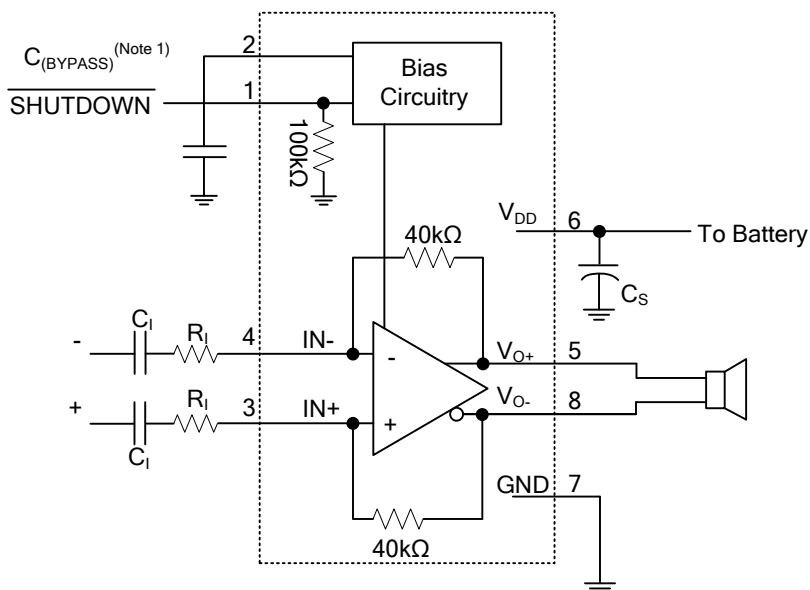
COMPONENT	VALUE	UNIT
R_I	40	$k\Omega$
$C_{(BYPASS)}$ (Note 1)	0.22	μF
C_S	1	μF
C_I	0.22	μF

Note: 1. $C_{(BYPASS)}$ is optional



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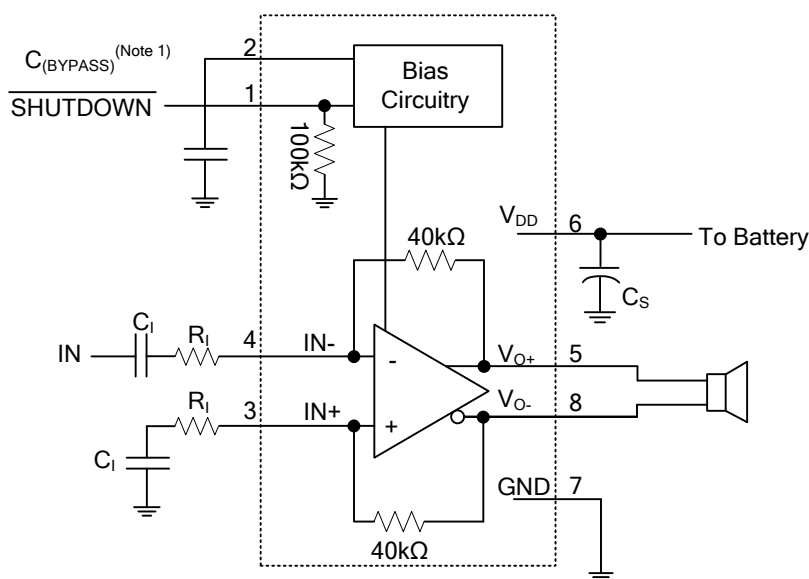
Figure 1. Typical Differential Input Application Schematic



Note 1. $C_{(BYPASS)}$ is optional.

Figure 2. Differential Input Application Schematic Optimized With Input Capacitors

■ TYPICAL APPLICATION CIRCUIT(Cont.)



Note 1. C_(BYPASS) is optional.

Figure 3. Single-Ended Input Application Schematic

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