



## PA3011

CMOS IC

### 3-W STEREO AUDIO POWER AMPLIFIER WITH ADVANCED DC VOLUME CONTROL

#### DESCRIPTION

As a stereo audio speaker which is operating on a single 5.5V supply, the UTC **PA3011** is capable of delivering 3W of output power per channel into 3Ω loads with less than 10% THD+N.

The speaker volume level is adjusted by applying a dc voltage to the VOLUME terminal. When a dc voltage is applied, to avoid an unexpected high volume level through the headphones, a third terminal, SEMAX, limits the headphone volume level. And also a fade mode ramps the volume up and down to ensure a smooth transition between active and shutdown modes..

The UTC **PA3011** can be applicatated in notebook, LCD monitors and pocket PC.

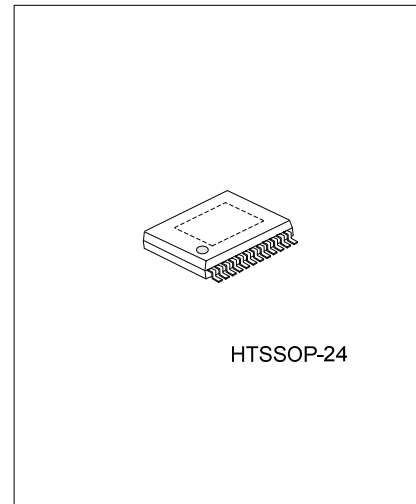
#### FEATURES

- \* DC volume control with 2-dB steps :-40 dB ~ 20 dB
- \* Fade mode
- \* Maximum volume setting for SE mode
- \* 3 W into 3Ω load
- \* MUX stereo input

#### ORDERING INFORMATION

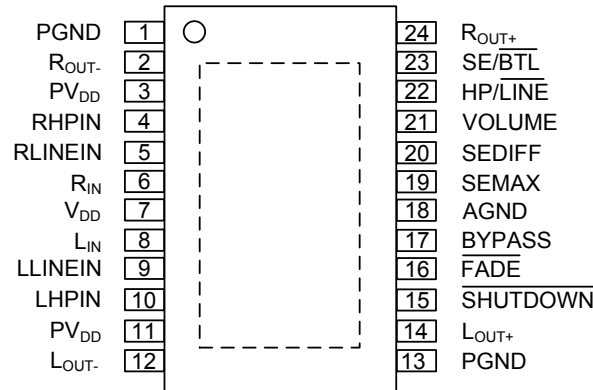
Ordering Number			Package	Packing
Normal	Lead Free Plating	Halogen Free		
PA3011-N24-R	PA3011L-N24-R	PA3011G-N24-R	HTSSOP-24	Tape Reel
PA3011-N24-T	PA3011L-N24-T	PA3011G-N24-T	HTSSOP-24	Tube

<p>PA3011L-N24-R</p>	<p>(1) Packing Type (2) Package Type (3) Lead Plating</p>	<p>(1) R: Tape Reel, T: Tube (2) N24: HTSSOP-24 (3) G: Halogen Free, L: Lead Free, Blank: Pb/Sn</p>
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Lead-free: PA3011L  
Halogen-free: PA3011G

## ■ PIN CONFIGURATION



## ■ PIN DESCRIPTION

PIN #	PIN NAME	I/O	DESCRIPTION
1,13	PGND		Ground, directly connected to thermal pad.
12	L <sub>OUT-</sub>	O	negative output for left channel
3,11	PV <sub>DD</sub>		Supply voltage
10	LHPIN	I	Left channel headphone input, selected when $\overline{\text{HP/LINE}}$ pin is held high.
9	LLINEIN	I	Line input for left channel, selected when $\overline{\text{HP/LINE}}$ pin is held low.
8	L <sub>IN</sub>	I	Differential input for left channel. AC ground for single-ended inputs.
7	V <sub>DD</sub>		Analog V <sub>DD</sub> supply voltage
6	R <sub>IN</sub>	I	Differential input for right channel. AC ground for single-ended inputs.
5	RLINEIN	I	Line input for Right channel, selected when $\overline{\text{HP/LINE}}$ pin is held low.
4	RHPIN	I	Right channel headphone input, selected when $\overline{\text{HP/LINE}}$ pin is held high.
2	R <sub>OUT-</sub>	O	Negative output for right channel.
24	R <sub>OUT+</sub>	O	Positive output for right channel.
15	$\overline{\text{SHUTDOWN}}$	I	Circuit is in shutdown mode when this pin is held low.
16	$\overline{\text{FADE}}$	I	If a logic low is placed on this terminal places the amplifier in fade mode; if a logic high is placed on this terminal normal operation
17	BYPASS	I	Tap to voltage divider for internal midsupply bias generator
18	AGND		Analog ground
19	SEMAX	I	This sets the maximum volume for single ended operation. The DC voltage range is 0 to V <sub>DD</sub> .
20	SEDIFF	I	This sets the difference between BTL volume and SE volume. The DC voltage range is 0 to V <sub>DD</sub> .
21	VOLUME	I	DC volume control. The DC voltage range is 0 to V <sub>DD</sub> .
22	HP/ $\overline{\text{LINE}}$	I	MUX control input, hold high to select headphone inputs, hold low to select line inputs.
23	SE/ $\overline{\text{BTL}}$	I	Hold low for BTL mode, hold high for SE mode.
14	L <sub>OUT+</sub>	O	Positive output for left channel.

■ ABSOLUTE MAXIMUM RATINGS (T<sub>a</sub>=25°C)

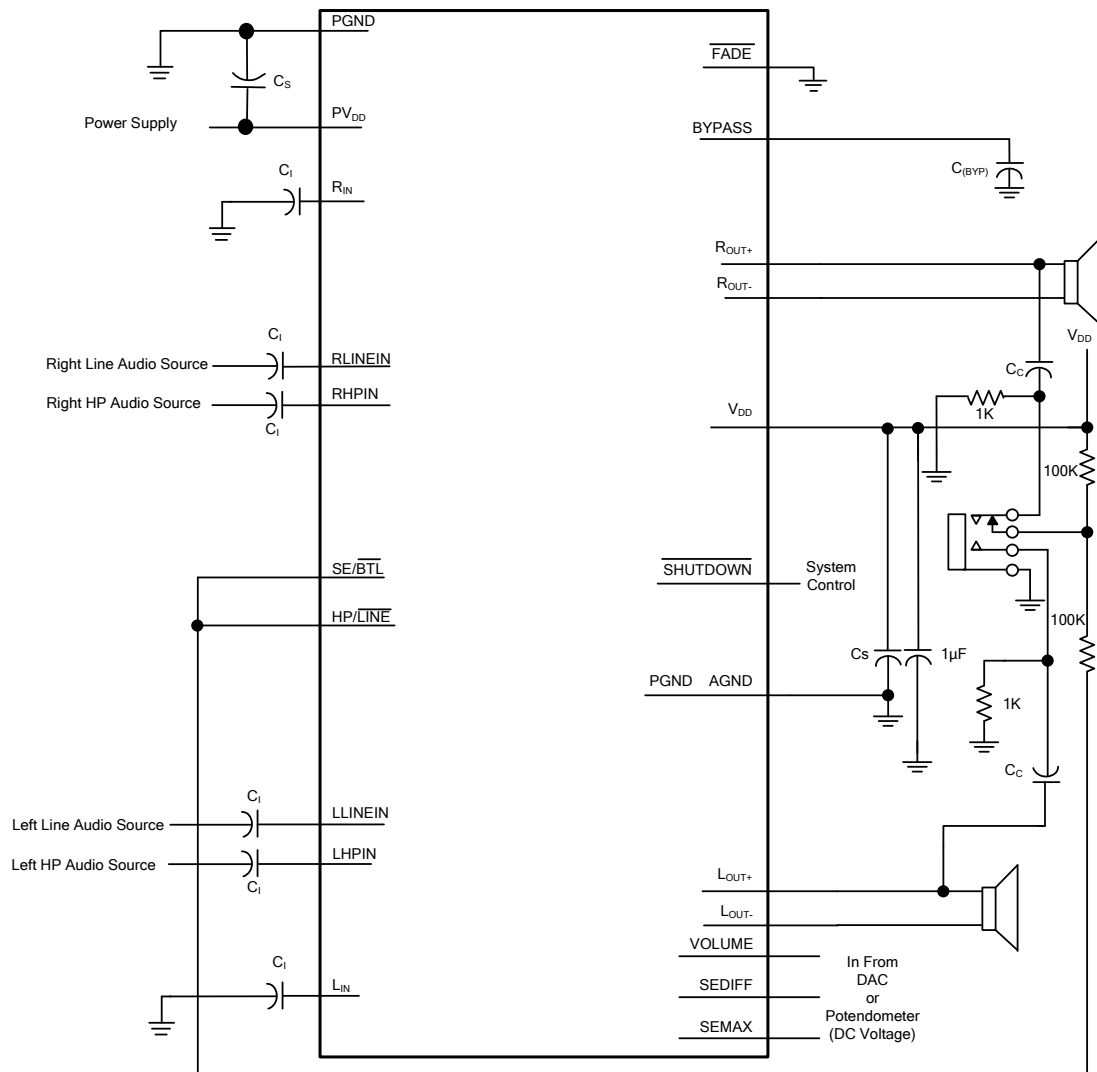
PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage, V <sub>DD</sub> , PV <sub>DD</sub>	V <sub>SS</sub>	-0.3V ~ 6V	V
Input Voltage	V <sub>IN</sub>	-0.3V ~ V <sub>DD</sub> +0.3V	V
Junction Temperature	T <sub>J</sub>	-40 ~ +150	°C
Operating Temperature	T <sub>OPR</sub>	-40 ~ +85	°C
Storage Temperature Range	T <sub>STG</sub>	-65 ~ +150	°C

Note: 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.

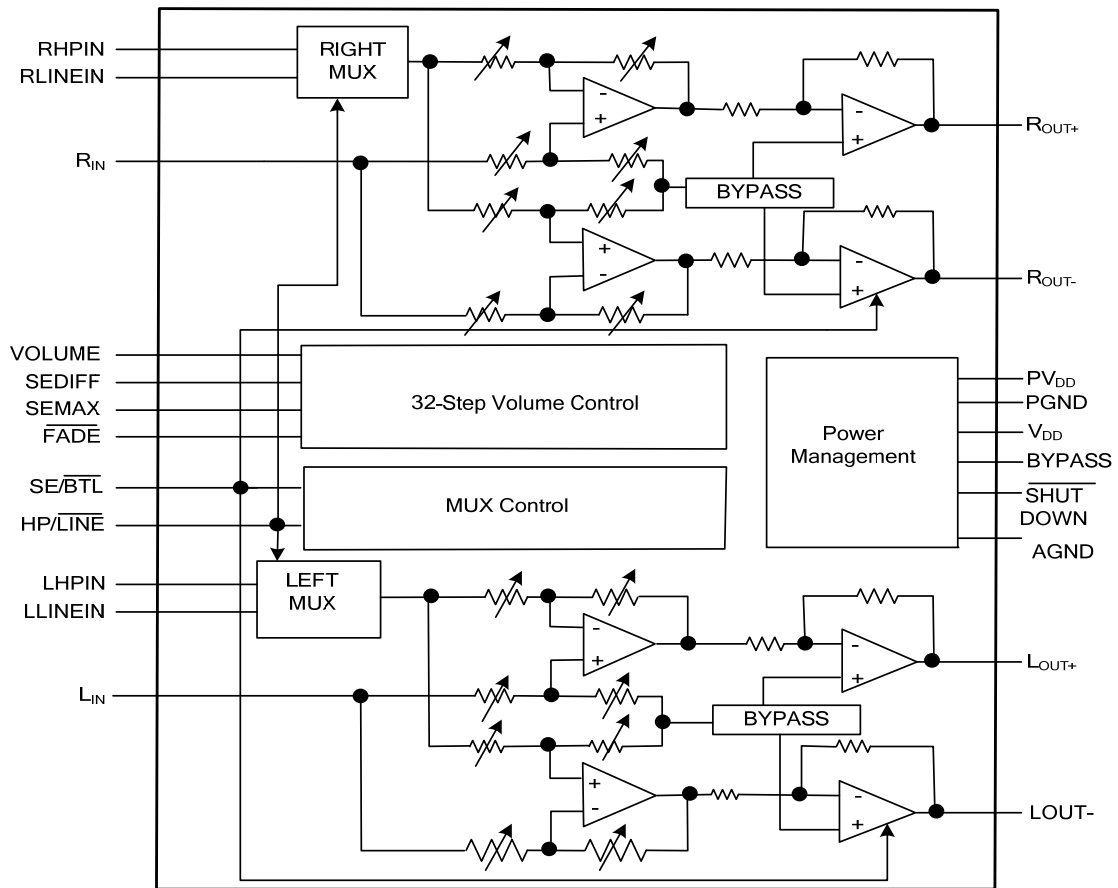
■ ELECTRICAL CHARACTERISTICS (T<sub>a</sub>=25°C, unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
<b>DC CHARACTERISTICS (V<sub>DD</sub>=PV<sub>DD</sub>=5.5V)</b>						
Supply voltage	V <sub>DD</sub>		4.0		5.5	V
High-level Input Voltage	V <sub>IH</sub>	SE/BTL, HP/LINE, FADE	0.8×V <sub>DD</sub>			V
		SHUTDOWN	2			
Low-level Input Voltage	V <sub>IL</sub>	SE/BTL, HP/LINE, FADE			0.6×V <sub>DD</sub>	V
		SHUTDOWN			0.8	
High-level Input Current (SE/BTL, FADE, HP/LINE, SHUTDOWN, SEDIFF, SEMAX, VOLUME)	I <sub>IH</sub>	V <sub>IN</sub> =V <sub>DD</sub> =PV <sub>DD</sub>			1	μA
Low-level Input Current (SE/BTL, FADE, HP/LINE, SHUTDOWN, SEDIFF, SEMAX, VOLUME)	I <sub>IL</sub>	V <sub>IN</sub> =0V			1	μA
Supply Current, No Load	I <sub>DD</sub>	SE/BTL=0V, SHUTDOWN=2V	6.0	7.5	9.0	mA
		SE/BTL=5.5V, SHUTDOWN=2V	3.0	5	6	
Supply Current, Shutdown Mode	I <sub>DD(SD)</sub>	SHUTDOWN=0V		1	20	μA
DC Differential Output Voltage	V <sub>OUT(DIFF)</sub>	Gain=0dB, SE/BTL=0V			30	mV
		Gain=20dB, SE/BTL=0V			50	
<b>AC CHARACTERISTICS (V<sub>DD</sub>=PV<sub>DD</sub>=5V, R<sub>L</sub>=3Ω, Gain=6dB)</b>						
Bypass Voltage (Nominally V <sub>DD</sub> /2)	V <sub>(BYPASS)</sub>	Measured At Pin17, No Load	2.65	2.75	2.85	V
High-Level Output Voltage	V <sub>OH</sub>	R <sub>L</sub> =8Ω, Measured Between Output And V <sub>DD</sub>			700	mV
Low-Level Output Voltage	V <sub>OL</sub>	R <sub>L</sub> =8Ω, Measured Between Output And GND			400	mV
Output Power	P <sub>OUT</sub>	THD=1%, f=1kHz		2		W
		THD=10%, f=1kHz, V <sub>DD</sub> =5.5V		3		
Total Harmonic Distortion + Noise	THD+N	P <sub>OUT</sub> =1W, R <sub>L</sub> =8Ω, f=20Hz~20kHz		<0.4%		
Maximum Output Power Bandwidth	B <sub>OM</sub>	THD=5%		>20		kHz
Power Supply Rejection Ratio	PSRR	V <sub>DD</sub> =PV <sub>DD</sub> =4.0V~5.5V	-42	-70		dB
Supply Ripple Rejection Ratio	RR	f=1kHz, Gain=0dB, C <sub>(BYP)</sub> =0.4μF	BTL		-63	dB
			SE		-57	
Noise Output Voltage	eN	Gain=0dB, C <sub>(BYP)</sub> =0.47μF, f=20Hz~20kHz		36		μV <sub>RMS</sub>
Supply Current, Max Power Into a 3-Ω Load	I <sub>DD</sub>	SHUTDOWN=2V, R <sub>L</sub> =3Ω, SE/BTL=0V, P <sub>OUT</sub> =2W		1.5		A <sub>RMS</sub>

## ■ TYPICAL APPLICATION CIRCUIT



■ BLOCK APPLICATION



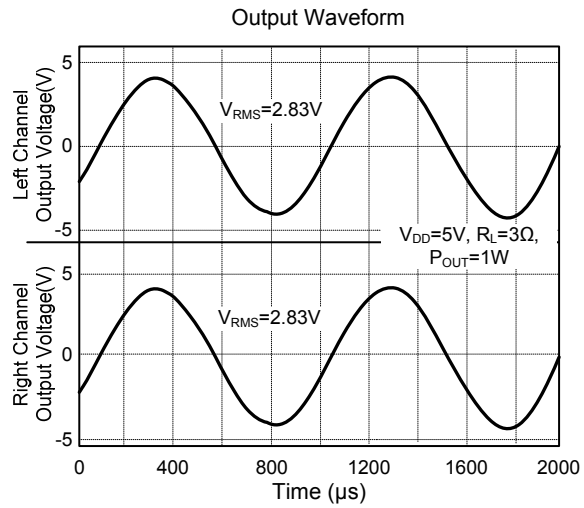
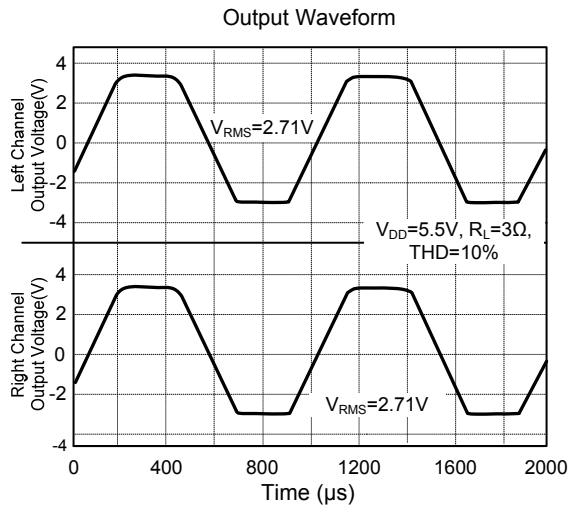
■ VOLUME CONTROL TABLE

BTL Mode, $V_{DD}=5V$ (Note 1)			SE Mode $V_{DD}=5V$ (Note 1)		
VOLUME (PIN21)		GAIN OF AMPLIFIER (TYP)	SE_VOLUME=VOLUME – SEDIFF or SEMAX		GAIN OF AMPLIFIER (TYP)
FROM(V)	TO(V)		FROM(V)	TO(V)	
0.00	0.26	-85(Note 2)	0.00	0.26	-85(Note 2)
0.33	0.37	-40	0.33	0.37	-46
0.44	0.48	-38	0.44	0.48	-44
0.58	0.59	-36	0.56	0.59	-42
0.67	0.70	-34	0.67	0.70	-40
0.78	0.82	-32	0.78	0.82	-38
0.89	0.93	-30	0.89	0.93	-36
1.01	1.04	-28	1.01	1.04	-34
1.12	1.06	-26	1.12	1.16	-32
1.23	1.27	-24	1.23	1.27	-30
1.35	1.38	-22	1.35	1.38	-28
1.48	1.49	-20	1.48	1.49	-26
1.57	1.60	-18	1.57	1.60	-24
1.68	1.72	-16	1.68	1.72	-22
1.79	1.83	-14	1.79	1.83	-20
1.91	1.94	-12	1.91	1.94	-18
2.02	2.06	-10	2.02	2.06	-16
2.13	2.17	-8	2.13	2.17	-14
2.25	2.28	-6(Note 2)	2.25	2.28	-12
2.38	2.39	-4	2.36	2.39	-10
2.47	2.50	-2	2.47	2.50	-8
2.58	2.61	0	2.58	2.61	-6(Note 2)
2.70	2.73	2	2.70	2.73	-4
2.81	2.83	4	2.81	2.83	-2
2.92	2.95	6	2.92	2.95	0(Note 2)
3.04	3.06	8	3.04	3.06	2
3.15	3.17	10	3.15	3.17	4
3.28	3.29	12	3.26	3.29	6(Note 2)
3.38	3.40	14	3.38	3.40	8
3.49	3.51	16	3.49	3.51	10
3.60	3.63	18	3.60	3.63	12
3.71	5.00	20(Note 2)	3.71	5.00	14

Note: 1. For other values of  $V_{DD}$ , scale the voltage values in the table by a factor of  $V_{DD}/5$ .

2. Tested in production. Remaining gain steps are specified by design.

■ TYPICAL CHARACTERISTICS



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