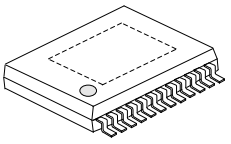
PA3011

CMOS IC

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



HTSSOP-24

■ 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

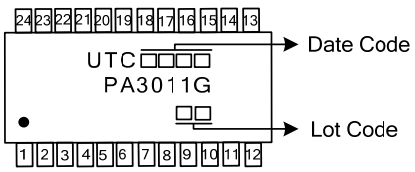
* DC volume control with 2-dB steps :-40 dB ~ 20 dB
* Fade mode
* Maximum volume setting for SE mode
* 3 W into 3Ω load
* MUX stereo input

■ ORDERING INFORMATION

Ordering Number	Package	Packing
PA3011G-N24-R	HTSSOP-24	Tape Reel

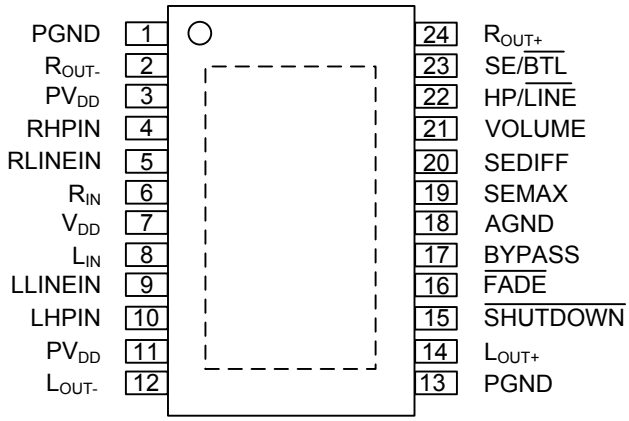
PA3011G-N24-R (1)Packing Type (2)Package Type (3)Green Package	(1) R: Tape Reel (2) N24: HTSSOP-24 (3) G: Halogen Free and Lead Free

■ MARKING



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■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN #	PIN NAME	I/O	DESCRIPTION
1,13	PGND		Ground, directly connected to thermal pad.
12	L_{OUT-}	O	negative output for left channel
3,11	PV_{DD}		Supply voltage
10	LHPIN	I	Left channel headphone input, selected when HP/ $\overline{LINE}$ pin is held high.
9	LLINEIN	I	Line input for left channel, selected when HP/ $\overline{LINE}$ pin is held low.
8	L_{IN}	I	Differential input for left channel. AC ground for single-ended inputs.
7	V_{DD}		Analog V_{DD} supply voltage
6	R_{IN}	I	Differential input for right channel. AC ground for single-ended inputs.
5	RLINEIN	I	Line input for Right channel, selected when HP/ $\overline{LINE}$ pin is held low.
4	RHPIN	I	Right channel headphone input, selected when HP/ $\overline{LINE}$ pin is held high.
2	R_{OUT-}	O	Negative output for right channel.
24	R_{OUT+}	O	Positive output for right channel.
15	$\overline{SHUTDOW}$	I	Circuit is in shutdown mode when this pin is held low.
16	$\overline{FADE}$	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_{DD}.
20	SEDIFF	I	This sets the difference between BTL volume and SE volume. The DC voltage range is 0 to V_{DD}.
21	VOLUME	I	DC volume control. The DC voltage range is 0 to V_{DD}.
22	HP/$\overline{LINE}$	I	MUX control input, hold high to select headphone inputs, hold low to select line inputs.
23	$\overline{SE}$/BTL	I	Hold low for BTL mode, hold high for SE mode.
14	L_{OUT+}	O	Positive output for left channel.

■ ABSUTE MAXIMUM RATINGS (T_A=25°C)

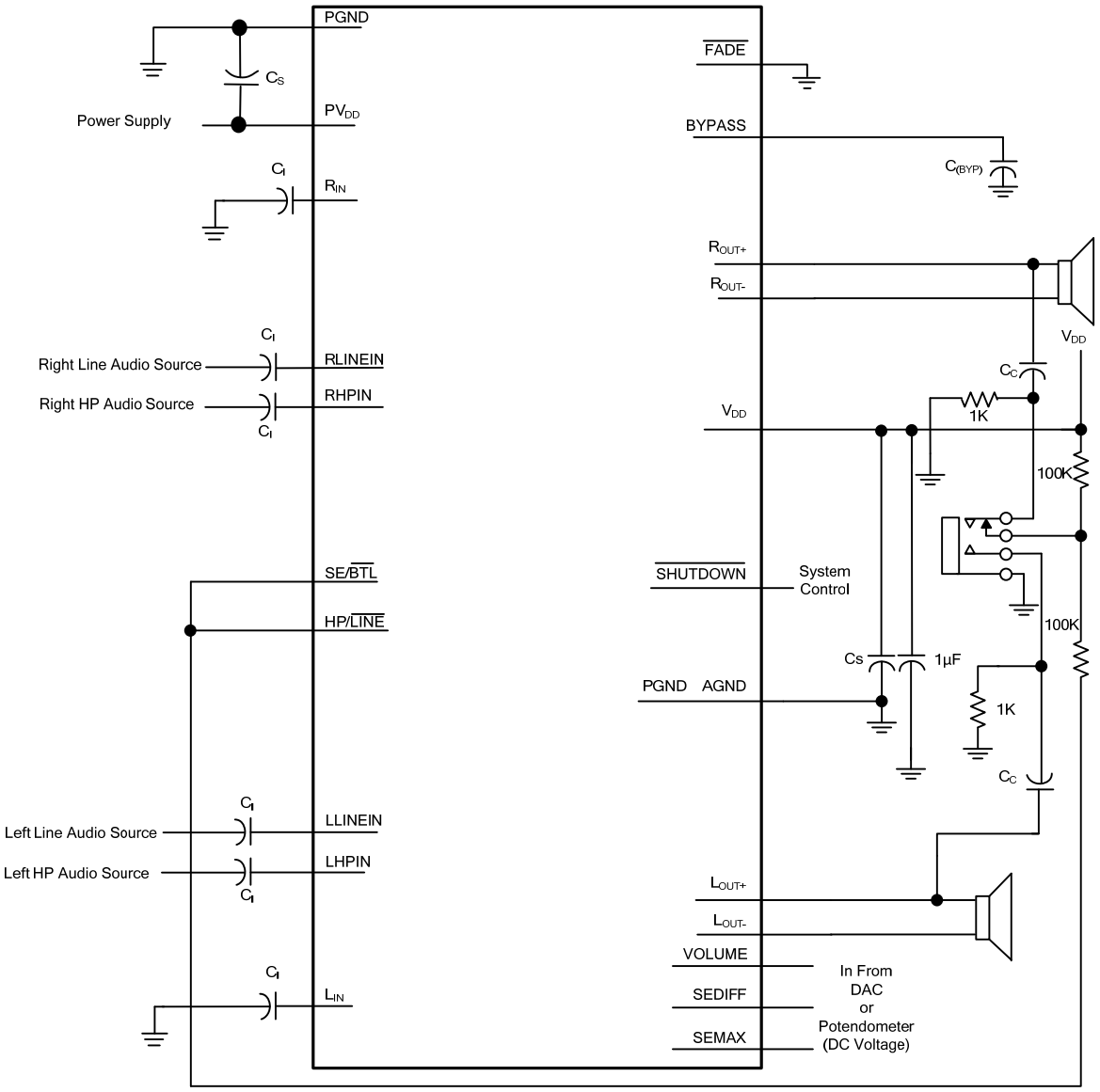
PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage, V_{DD}, PV_{DD}	V_{SS}	-0.3V ~ 6V	V
Input Voltage	V_{IN}	-0.3 V ~ V_{DD}+0.3V	V
Junction Temperature	T_J	-40 ~ +150	°C
Operating Temperature	T_{OPR}	-40 ~ +85	°C
Storage Temperature Range	T_{STG}	-65 ~ +150	°C

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.

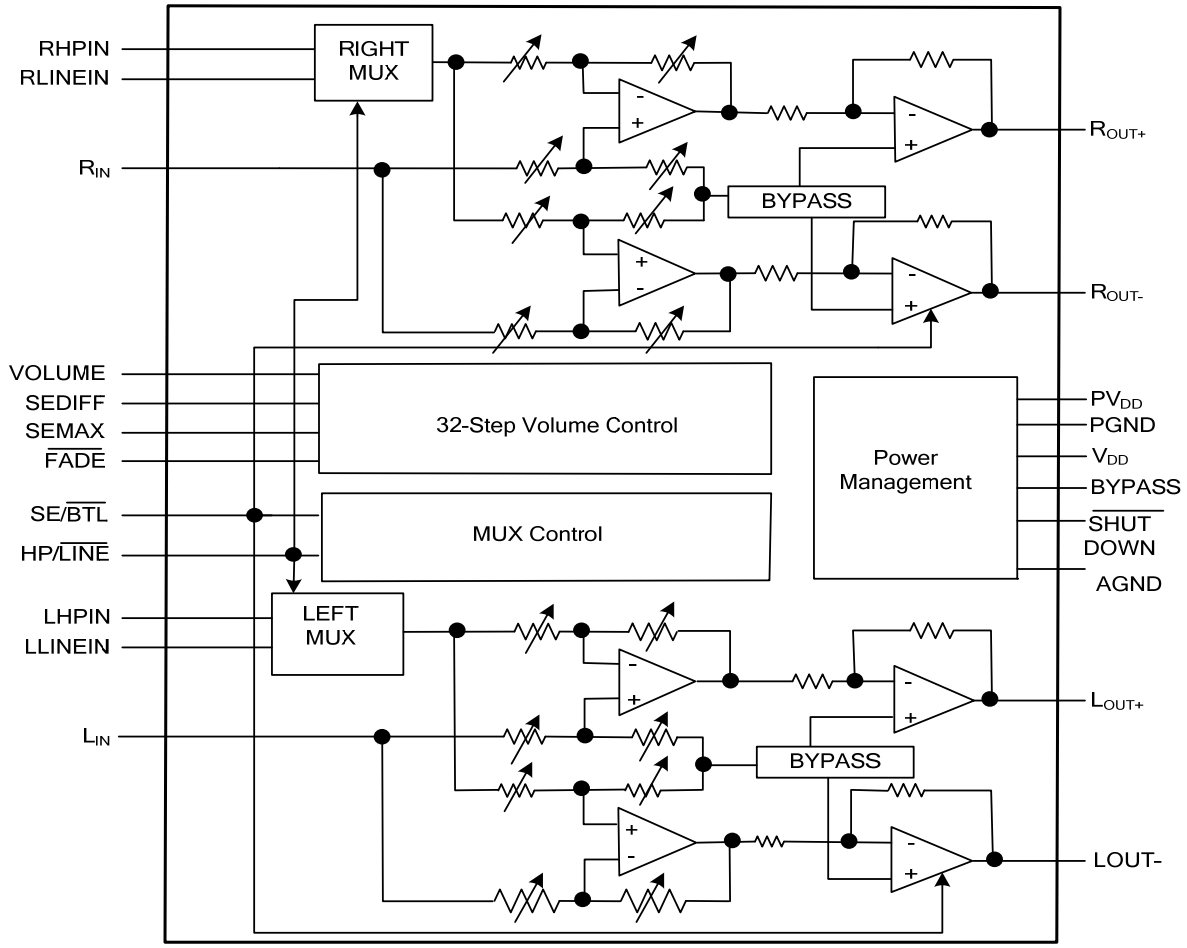
■ ELECTRICAL CHARACTERISTICS (T_A=25°C, unless otherwise specified)

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

■ TYPICAL APPLICATION CIRCUIT



■ BLOCK APPLICATION



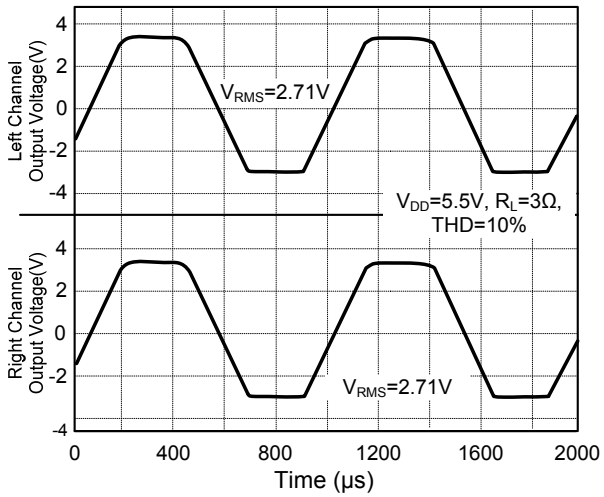
■ VOLUME CONTROL TABLE

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

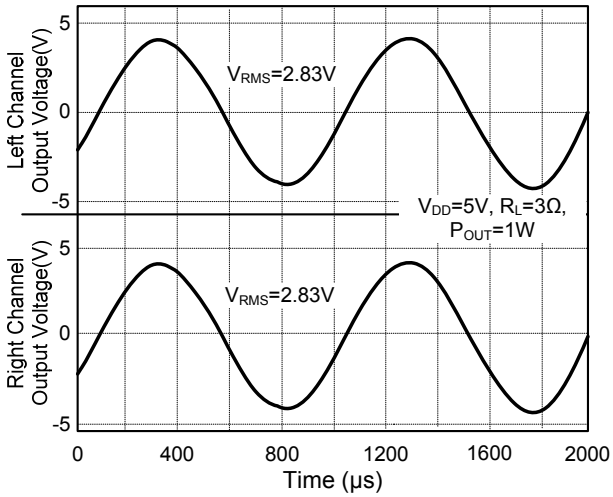
Note: 1. For other values of V_{DD}, scale the voltage values in the table by a factor of V_{DD}/5.
2. Tested in production. Remaining gain steps are specified by design.

■ TYPICAL CHARACTERISTICS

Output Waveform



Output Waveform



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