

3W Stereo Audio Power Amplifier With Advanced DC Volume Control

General Description

The XT4864 is a stereo audio power amplifier that drives 3 W/channel of continuous RMS power into a 3Ω load. Advanced DC volume control minimizes external components and allows BTL (speaker) volume control and SE (headphone) volume control. Notebook and pocket PCs benefit from the integrated feature set that minimizes external components without sacrificing functionality.

To simplify design, the speaker volume level is adjusted by applying a DC voltage to the VOLUME terminal. To avoid an unexpected high volume level through the headphones, a third terminal, SEMAX limits the headphone volume level when a DC voltage is applied. Finally, to ensure a smooth transition between active and shutdown modes, a fade mode ramps the volume up and down.

Features

- Advanced DC volume control with 2db steps, from -40 db to 20 db
 - Fade mode
 - Maximum volume setting for SE mode
 - Adjustable SE volume control
- Referenced to BTL volume control
- 3W into 3Ω Speakers
- Stereo input MUX
- Differential inputs

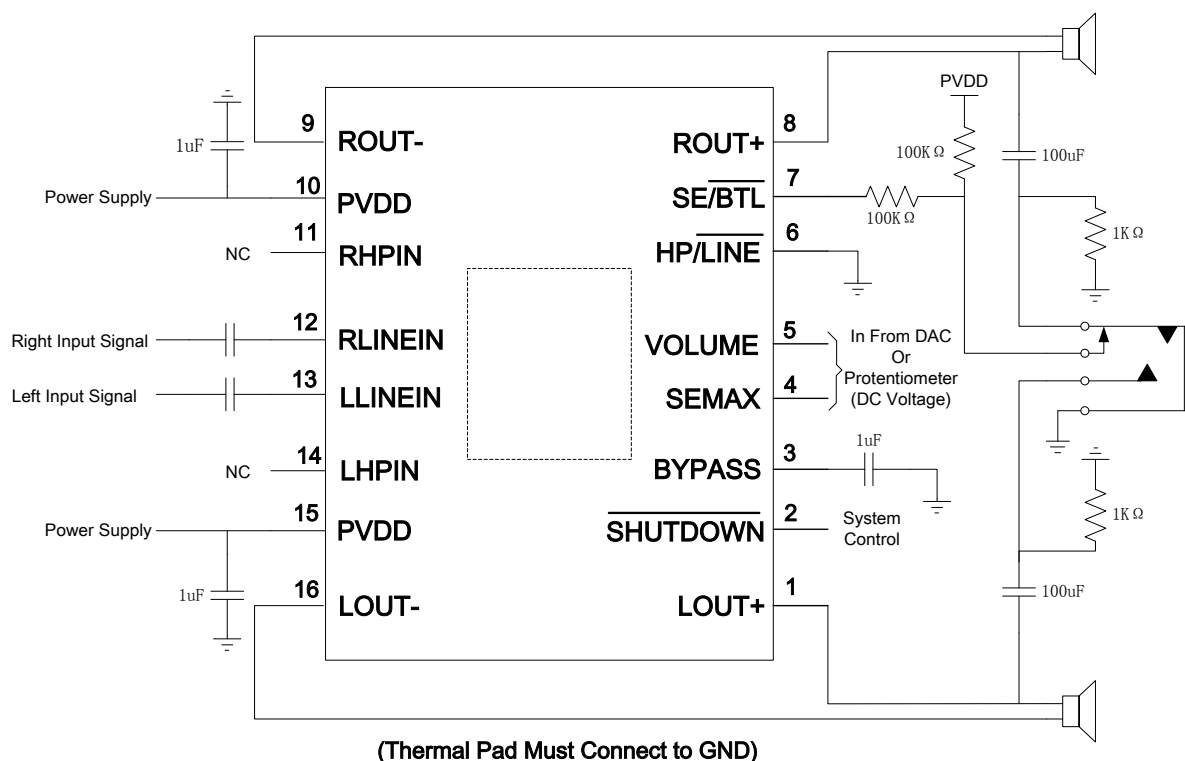
Applications

- Notebook PC
- LCD Monitors
- Pocket PC

Package

- SOP-16/PP

Typical Application Circuit



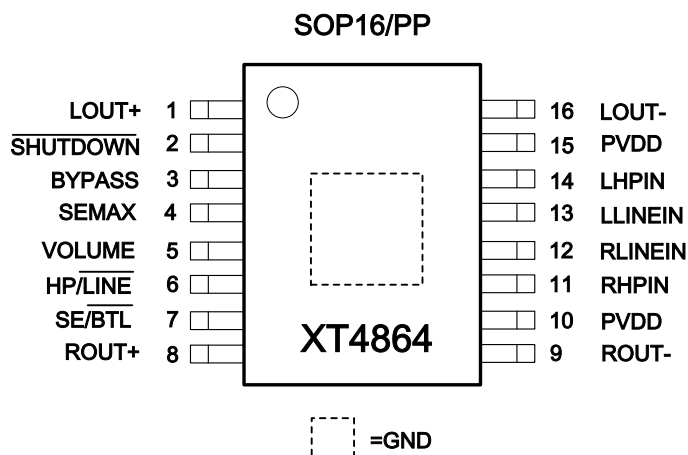
Note: 1, PVDD pin connect an external capacitor should near the chip

2, The thermal Pad should connect to the system GND.

Ordering Information

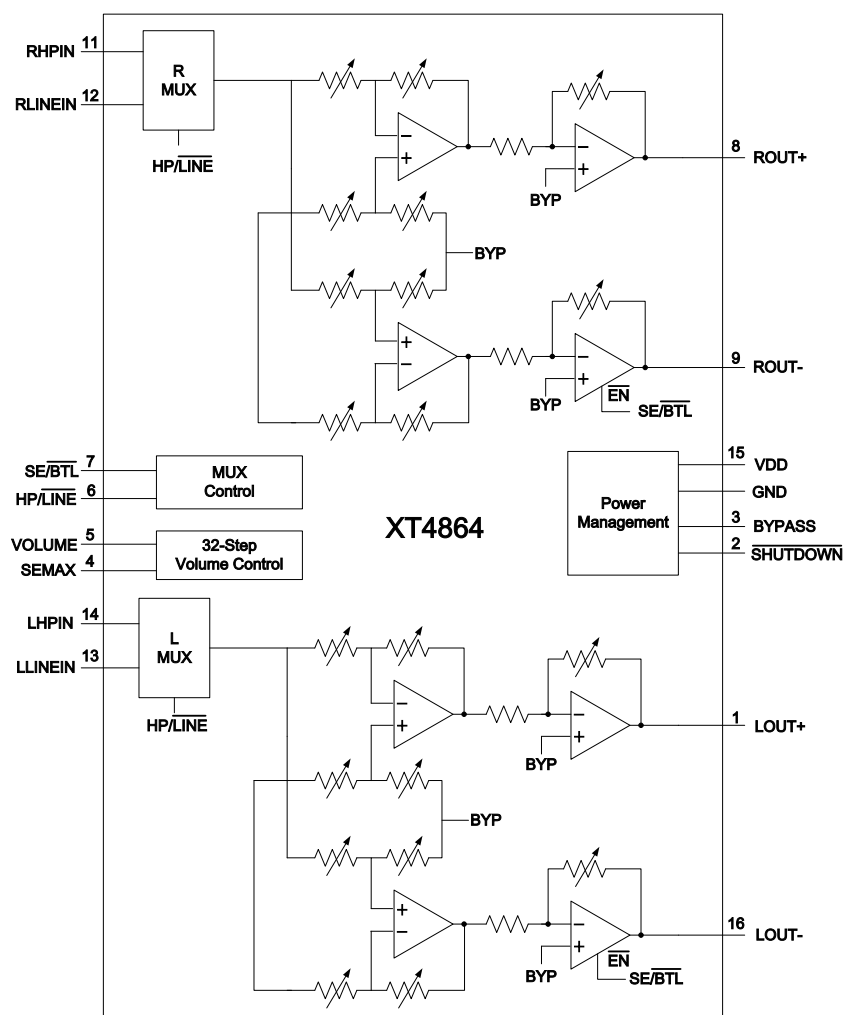
Ordering Number	Package Type
XT4864M	SOP-16/PP

Functional Pin Description



Pin Name	Pin Number	I/O	Function Description
GND		-	Power ground
LOUT-	16	O	Left channel negative audio output
PV _{DD}	15,10	-	Supply voltage terminal for power stage
LHPIN	14	I	Left channel headphone input,selected when HP/ $\overline{\text{LINE}}$ is held high
LLINEIN	13	I	Left channel line input,selected when HP/ $\overline{\text{LINE}}$ is held low
RLINEIN	12	I	Right channel line input, selected when HP/ $\overline{\text{LINE}}$ is held low
RHPIN	11	I	Right channel headphone input, selected when HP/ $\overline{\text{LINE}}$ is held high
ROUT-	9	O	Right channel negative audio output
ROUT+	8	O	Right channel positive audio output
$\overline{\text{SHUTDOWN}}$	2	I	Places the amplifier in shutdown mode if a TTL logic low is placed on this terminal
BYPASS	3	I	Tap to voltage divider for internal midsupply, bias generator used for analog reference
SEMAX	4	I	Sets the maximum volume for single ended operation. DC voltage range is 0 to VDD .
VOLUME	5	I	Terminal for dc volume control. DC voltage range is 0 to VDD .
HP/ $\overline{\text{LINE}}$	6	I	Input MUX control. When logic high, RHPIN and LHPIN inputs are selected. When logic low, RLINEIN and LLINEIN inputs are selected.
SE/ $\overline{\text{BTL}}$	7	I	Output MUX control. When this terminal is high, SE outputs are selected. When this terminal is low, BTL outputs are selected
LOUT+	1	O	Left channel positive audio output.

■ Function Block Diagram



Note: Block Diagram of a variable resistance determined by a 32 volume control, GND pin heat sink for the chip package.

■ Absolute Maximum Ratings

Parameter	Symbol	Ratings	Units
Power Supply Voltage	V_{DD}	-0.3~6.0	V
Input Supply Voltage	V_{IN}	-0.3~ $V_{DD}+0.3$	
Operating Temperature Range	T_{opr}	-40~85	°C
Storage Temperature Range	T_{stg}	-55~125	°C
Junction Temperature	T_j	-45~150	°C
ESD	—	2000	V

Note: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

■ Electrical Characteristics

(Ta=25°C, V_{DD}=PV_{DD}=5.5V, unless otherwise noted)

Symbol	Parameters	Test Conditions	Min.	Typ.	Max.	Unit
V _{OO}	Output Offset Voltage	V _{DD} =5.5V, Gain=0dB, SE/BTL =0V			30	mV
		V _{DD} =5.5V, Gain=20dB, SE/BTL =0V			50	
PSRR	Power Supply Rejection Ratio	V _{DD} =PV _{DD} =4.0V to 5.5V	-42	-70		dB
I _{IH}	High-level input current	V _{DD} =PV _{DD} =5.5V, V _I =V _{DD} =PV _{DD}			1	μA
I _{IL}	Low-level input current	V _{DD} =PV _{DD} =5.5V, V _I =0V			1	μA
I _(SD)	Shutdown Current	SHUTDOWN =0V		1	20	μA
I _{DD}	Supply current, no load	V _{DD} =PV _{DD} =5.5V, SE/BTL =0V, SHUTDOWN =2V	6.0	7.5	9.0	mA
		V _{DD} =PV _{DD} =5.5V, SE/BTL =5.5V, SHUTDOWN =2V	3.0	5	6	mA
I _{DD}	Supply current, max power into a 3Ω load	V _{DD} =PV _{DD} =5.5V, SE/BTL =0V, V _{SHUTDOWN} =2V, R _L =3Ω		1.5		Arms

■ Operating Characteristics

(V_{DD}=5V, GAIN=2V/V, R_L=8Ω, Unless otherwise specified. Limits apply for TA = 25°C.)

Symbol	Parameters	Test Conditions	Min.	Typ.	Max.	Unit
P _O	Output Power	THD = 1%, f = 1 kHz		2		W
		THD = 10%, f = 1 kHz, V _{DD} = 5.5 V		3		
THD+N	Total Harmonic Distortion+Noise	P _O =1W, R _L =8Ω, f =20Hz to 20kHz		<0.4%		
V _{OH}	High-level output voltage	R _L =8Ω, Measured between output and V _{DD}			700	mV
V _{OL}	Low-level Output voltage	R _L =8Ω, Measured between output and GND			400	mV

● Table 1: DC volume control corresponding to the table (BTL output mode $V_{DD} = 5V$)

VOLUME (PIN5)		GAIN OF AMPLIFIER (Typ)
FROM (V)	TO (V)	
0.00	0.26	-85
0.33	0.37	-40
0.44	0.48	-38
0.56	0.59	-36
0.67	0.70	-34
0.78	0.82	-32
0.89	0.93	-30
1.01	1.04	-28
1.12	1.16	-26
1.23	1.27	-24
1.35	1.38	-22
1.46	1.49	-20
1.57	1.60	-18
1.68	1.72	-16
1.79	1.83	-14
1.91	1.94	-12
2.02	2.06	-10
2.13	2.17	-8
2.25	2.28	-6
2.36	2.39	-4
2.47	2.50	-2
2.58	2.61	0
2.70	2.73	2
2.81	2.83	4
2.92	2.95	6
3.04	3.06	8
3.15	3.17	10
3.26	3.29	12
3.38	3.40	14
3.49	3.51	16
3.60	3.63	18
3.71	5.00	20

- Table 2 :DC volume control corresponding to the table (SE output mode $V_{DD} = 5V$)

SE_VOLUME=VOLUME or SEMAX		GAIN OF AMPLIFIER (Typ)
FROM (V)	TO (V)	
0.00	0.26	-85
0.33	0.37	-40
0.44	0.48	-38
0.56	0.59	-36
0.67	0.70	-34
0.78	0.82	-32
0.89	0.93	-30
1.01	1.04	-28
1.12	1.16	-26
1.23	1.27	-24
1.35	1.38	-22
1.46	1.49	-20
1.57	1.60	-18
1.68	1.72	-16
1.79	1.83	-14
1.91	1.94	-12
2.02	2.06	-10
2.13	2.17	-8
2.25	2.28	-6
2.36	2.39	-4
2.47	2.50	-2
2.58	2.61	0
2.70	2.73	2
2.81	2.83	4
2.92	2.95	6
3.04	3.06	8
3.15	3.17	10
3.26	3.29	12
3.38	3.40	14
3.49	3.51	16
3.60	3.63	18
3.71	5.00	20

Typical Performance Characteristics

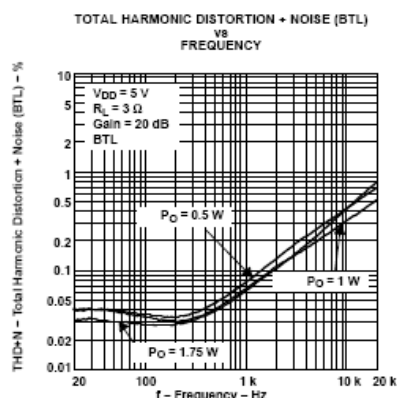


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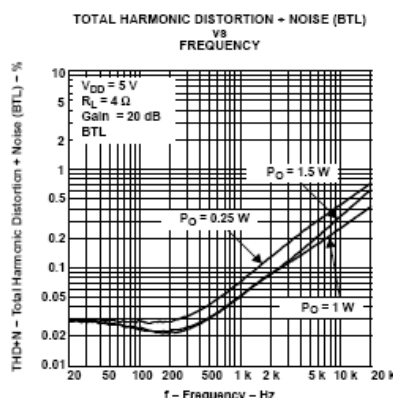


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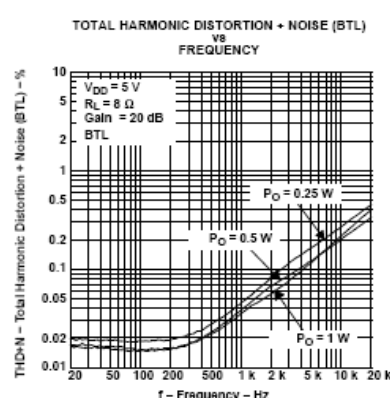


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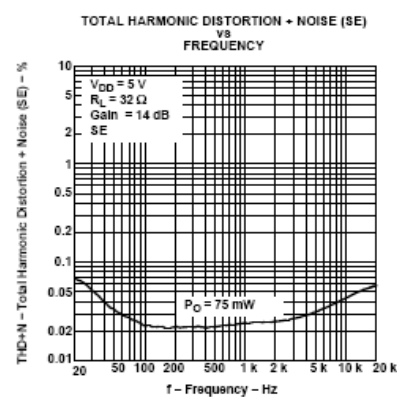


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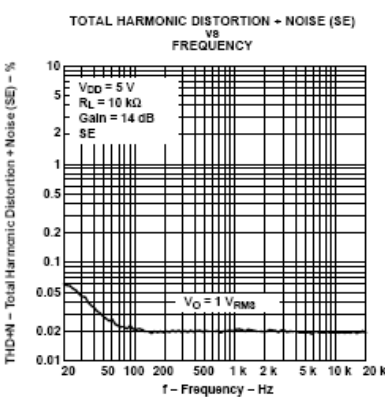


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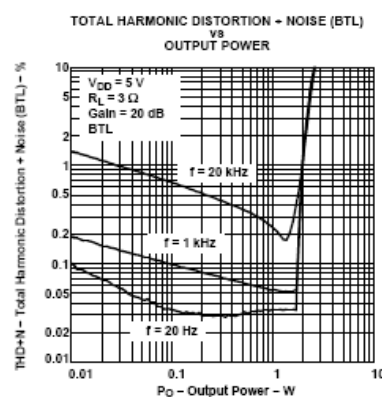


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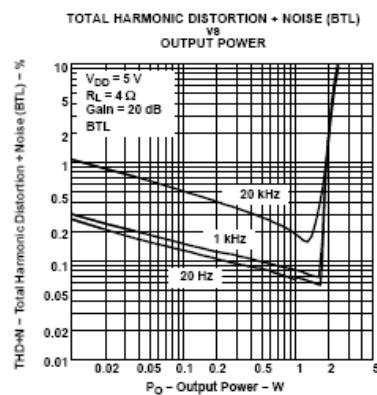


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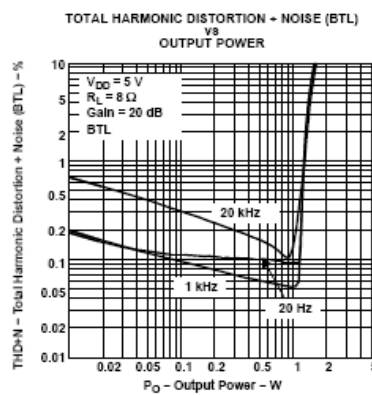


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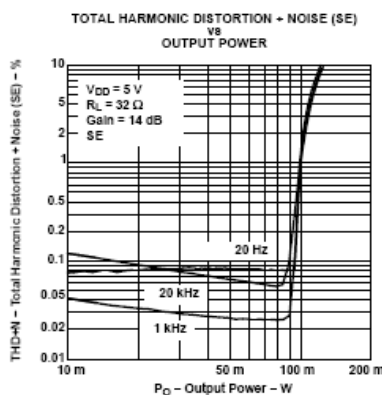


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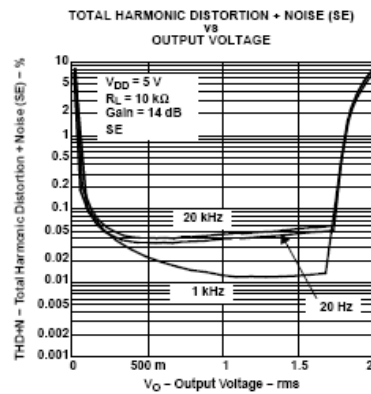


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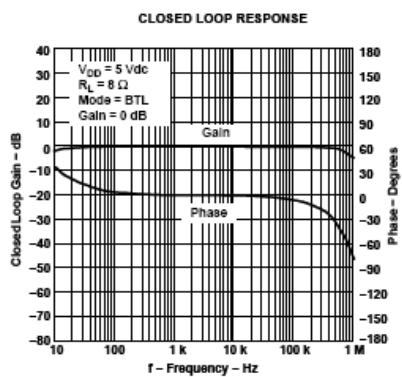


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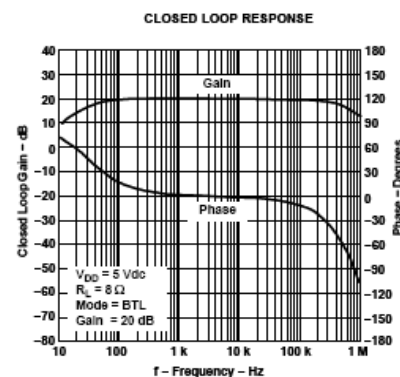


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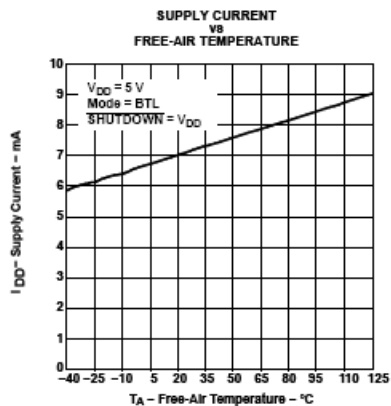


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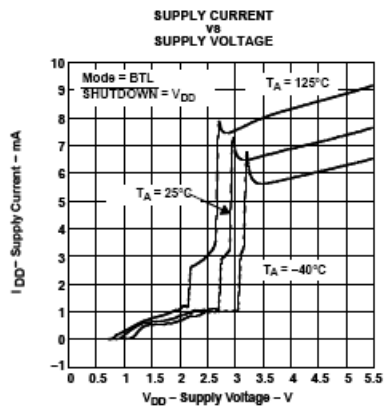


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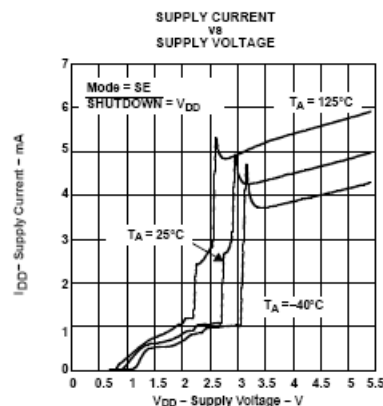


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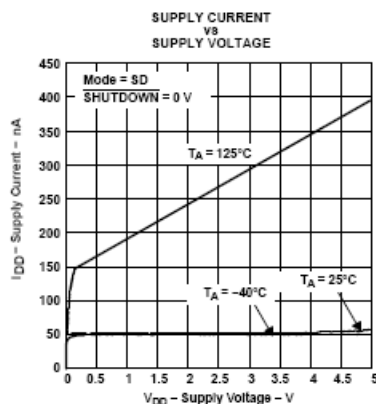


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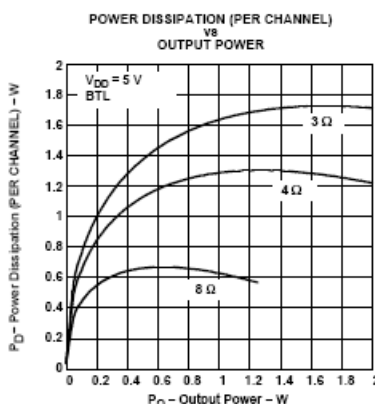


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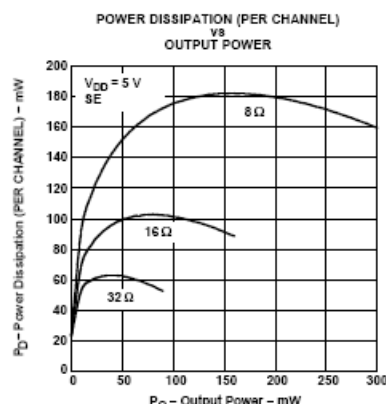


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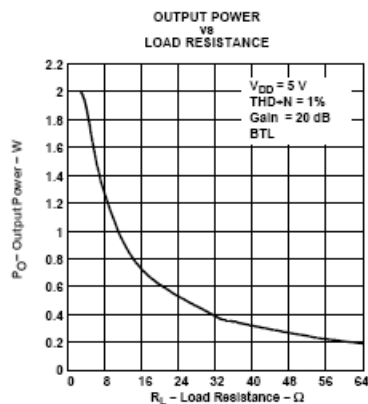


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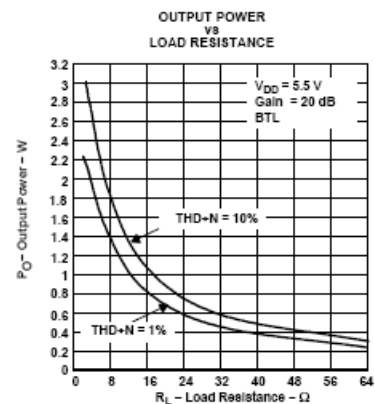


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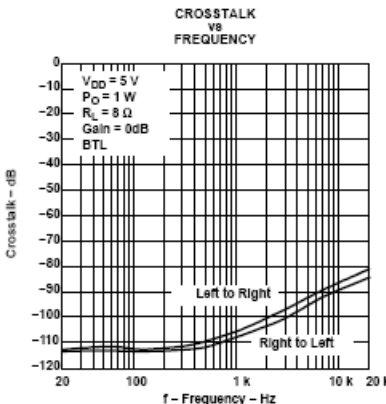


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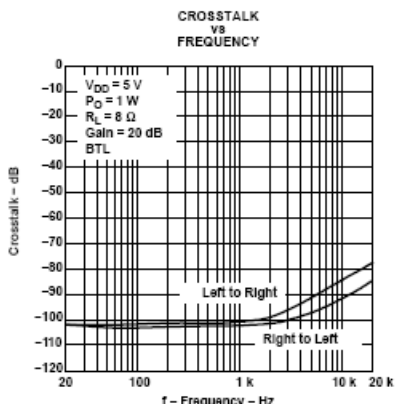


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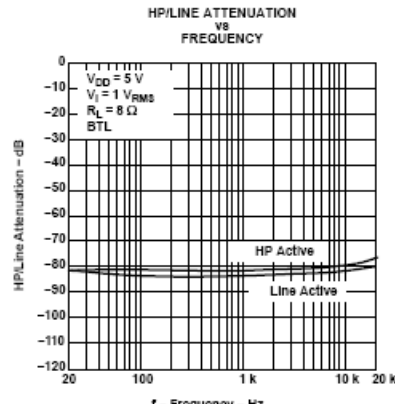


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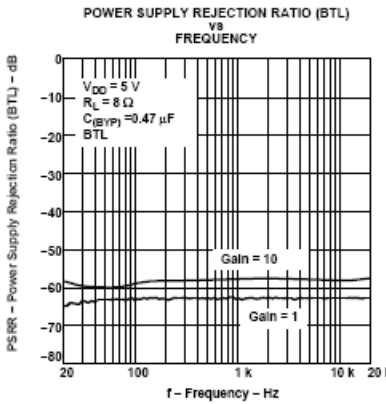


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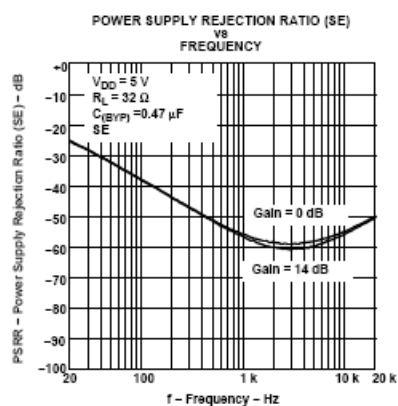


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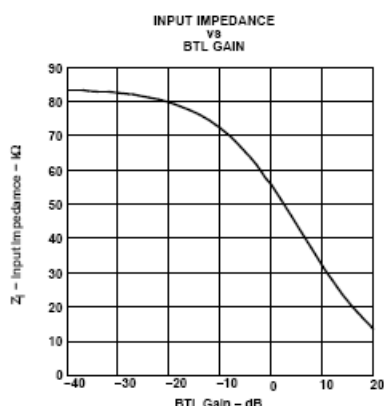


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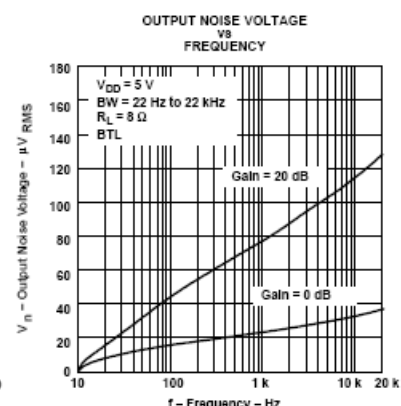
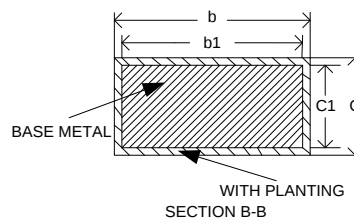
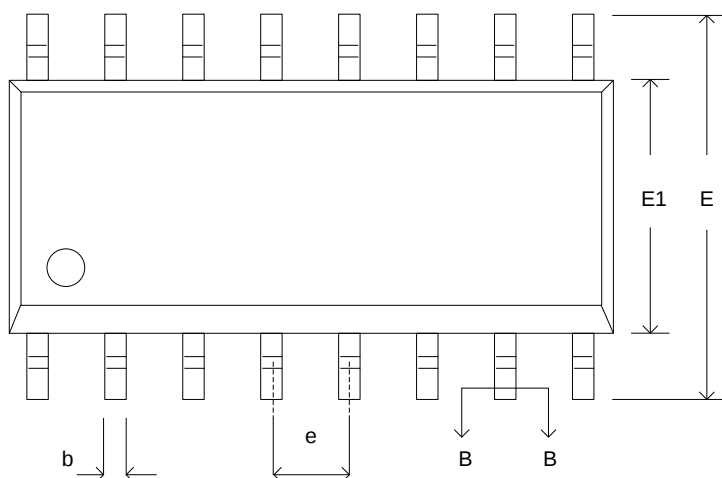
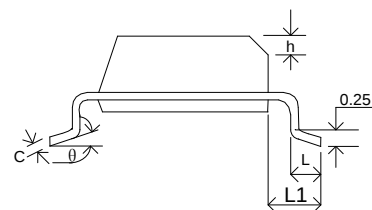
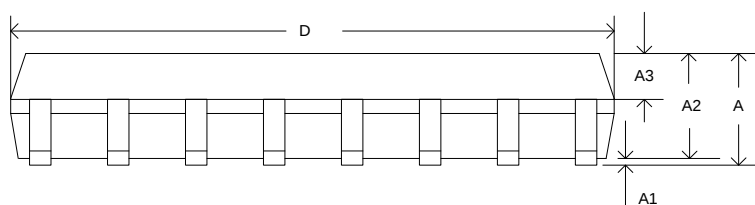
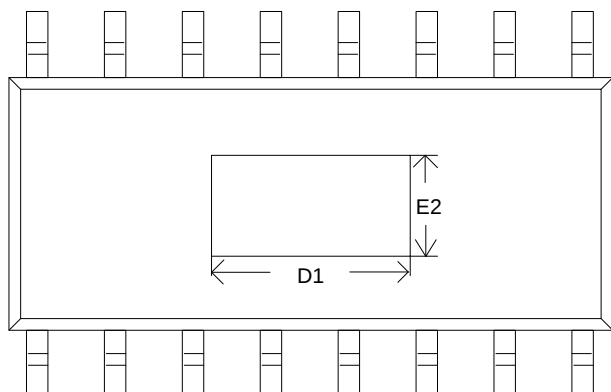


Figure 27.

Package Information

SOP-16/PP



Symbol	Millimeter			Symbol	Millimeter			Symbol	Millimeter		
	Min	Nom	Max		Min	Nom	Max		Min	Nom	Max
A	—	—	1.75	C1	0.19	0.20	0.21	L1	1.05BSC		
A1	0.05	—	0.225	D	9.70	9.90	10.10	θ	0		8
A2	1.30	1.40	1.50	E	5.80	6.00	6.20	D1	3.96REF		
A3	0.60	0.65	0.70	E1	3.70	3.90	4.10	E2	1.67REF		
b	0.39	—	0.48	e	1.27BSC			L/下载体尺寸 (mil)	95*180		
b1	0.38	0.41	0.43	h	0.25	—	0.50				
c	0.21	—	0.26	L	0.50	—	0.80				