

MIX2007

3W Mono Class-D Audio Power Amplifier

Description

The MIX2007 is a high efficiency, filter-less 3W Mono class-D audio power amplifier. The high power output stage suitable for portable devices.

The filter-less architecture and the few external components for operation save the board space and cost.

The MIX2007 features shutdown and mute control functions. The Over temperature protection function and Low POP noise make system design more flexibility.

The MIX2007 is available in SOP8 package .

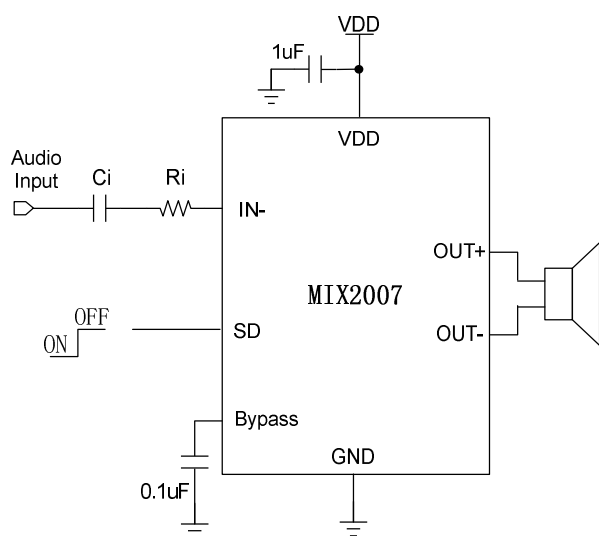
Features

- Output Power:
— 3W (VDD=5.0V, $R_L=4\Omega$, THD+N=10%)
- Supply Voltage : 2.5V to 5.5V
- Low Noise and Low distortion
- Low Pop noise
- Shutdown current less than 1uA
- Over temperature protection

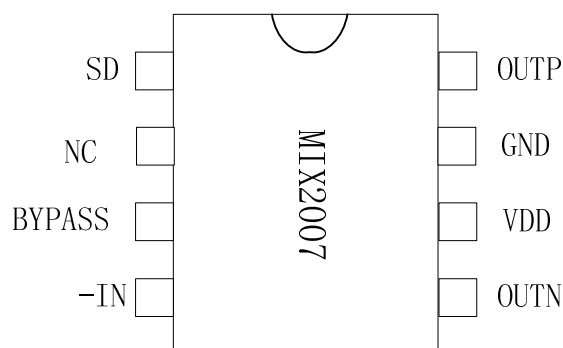
Application

- Bluetooth devices
- Mini-Speaker USB Speaker
- 2.0 / 2.1 Speaker

Typical Application



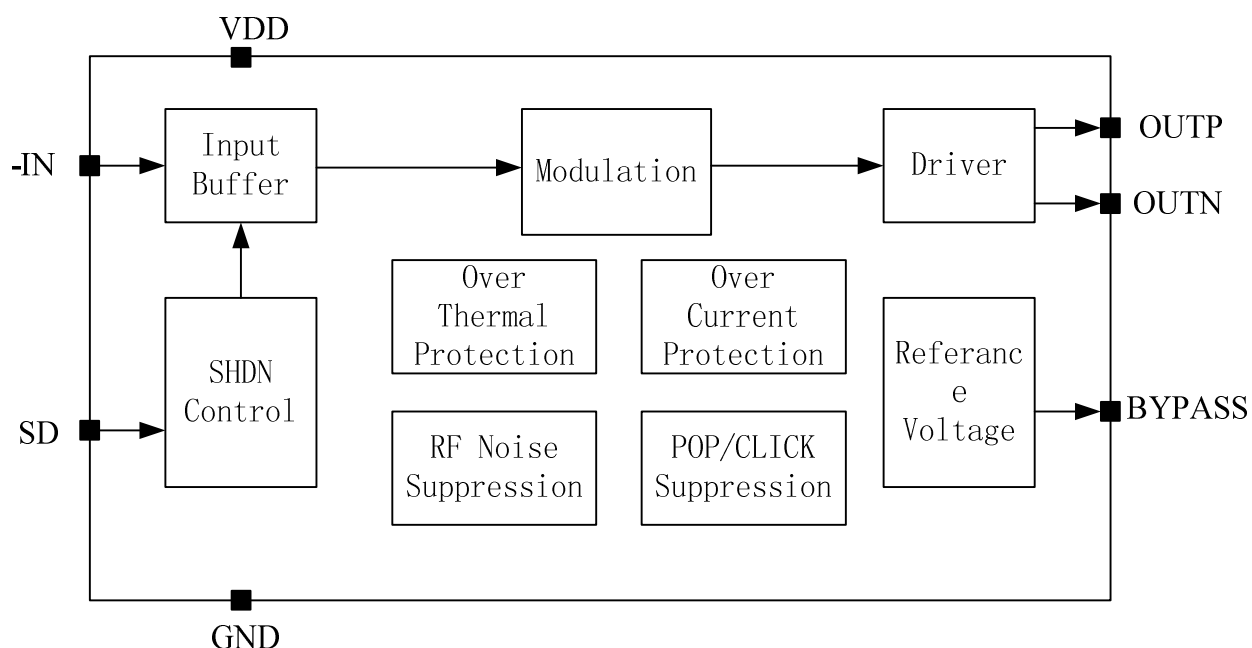
Pin Configuration



MIX2007

3W Mono Class-D Audio Power Amplifier

Block Diagram



Pin Descriptions

Pin	Symbol	I/O	Descriptions
1	SD	I	Shutdown Control Pin (low for active)
2	NC		No connection
3	BYPASS	I/O	Analog reference bypass capacitor
4	-IN	I	Negative Audio Input
5	OUTN	O	Audio Negative Output
6	VDD		VDD
7	GND		GND
8	OUTP	O	Audio Positive Output

MIX2007

3W Mono Class-D Audio Power Amplifier

Ordering Information

Order Number	Package	Marking	Packing
MIX2007	SOP8	MIX2007 XXXXXXX	2500pcs/reel 100pcs/tube

Absolute Maximum Ratings

V_{DD}	Supply voltage	-0.3V to 6V
V_I	Input voltage	-0.3V to $V_{DD}+0.3V$
T_A	Operation free-air temperate range	-40°C to 85°C
T_J	Operation free-air junction temperature	-40°C to 125°C
T_{STG}	Storage temperature range	-65°C to 150°C
T_{SLD}	Soldering temperature	300°C, 5sec

Recommended Operating Conditions

			MIN	MAX	UNIT
V_{DD}	Supply Voltage	VDD	2.5	5.5	V
V_{IH}	SD Input High Level	$V_{DD}=5.0V$	2		V
V_{IL}	SD Input Low Level	$V_{DD}=5.0V$		0.6	V

Thermal Information

Parameter	Symbol	Package	MAX	UNIT
Thermal Resistance(Junction to Ambient)	θ_{JA}	SOP8	115	°C/W

MIX2007

3W Mono Class-D Audio Power Amplifier

Electrical Characteristics

(V_{DD} =5V, Gain=20dB, R_L =8Ω, T =25°C, unless otherwise noted.)

Symbol	Parameter	Test Conditions		MIN	TYP	MAX	UNIT
V _{IN}	Supply Power			2.5	-	5.5	V
P _O	Output Power	THD+N=10%,f=1KHZ,R _L =4Ω	V _{DD} =5.0V		3		W
			V _{DD} =3.6V		1.55		
		THD+N=1%,f=1KHZ,R _L =4Ω	V _{DD} =5.0V		2.5		W
			V _{DD} =3.6V		1.28		
		THD+N=10%,f=1KHZ,R _L =8Ω	V _{DD} =5.0V		1.72		W
			V _{DD} =3.6V		0.9		
		THD+N=1%,f=1KHZ,R _L =8Ω	V _{DD} =5.0V		1.4		W
			V _{DD} =3.6V		0.75		
THD+N	Total Harmonic Distortion Plus Noise	V _{DD} =5.0V, P _O =1W, R _L =4Ω	f=1KHz		0.02		%
		V _{DD} =3.6V, P _O =0.5W, R _L =4Ω			0.02		
		V _{DD} =5.0V, P _O =0.5W, R _L =8Ω	f=1KHz		0.013		%
		V _{DD} =3.6V, P _O =0.25W, R _L =8Ω			0.013		
G _V	Gain		R _i =30K		20		dB
PSRR	Power-supply ripple rejection	V _{DD} =4.2V ±200mVp-p	f=1KHz		65		dB
SNR	Signal-to-Noise Ratio	V _{DD} =5.0V,Vo rms=1V, G _V =20dB	f=1KHz		-85		dB
V _n	Output Noise	V _{DD} =5.0V,Input floating with C _{IN} =0.1μF	A-weighting		60		μV
			NoA-weighting		80		
Dyn	Dynamic range	V _{DD} =5.0V,THD=1%	f=1KHz		-92		dB
η	Efficiency	R _L =8Ω, P _O =1.5W	f=1KHz		90		%
		R _L =4Ω, P _O =2.5W			85		
I _Q	Quiescent Current	V _{DD} =5.0V	No Load		4		mA
		V _{DD} =3.0V			2.7		
I _{SD}	Shutdown Current	V _{DD} =2.5V to 4.2V	V _{SD} =3.3V			1	μA
V _{OS}	Offset Voltage	V _{IN} =0V, V _{DD} =5V			10		mV
F _{osc}	Oscillator frequency				650		khz
T _{st}	Startup time	Bypass capacitor =10nF			15		mS
OTP	—	No Load, Junction Temperature	V _{DD} =5.0V		180		°C
OTH	—				40		

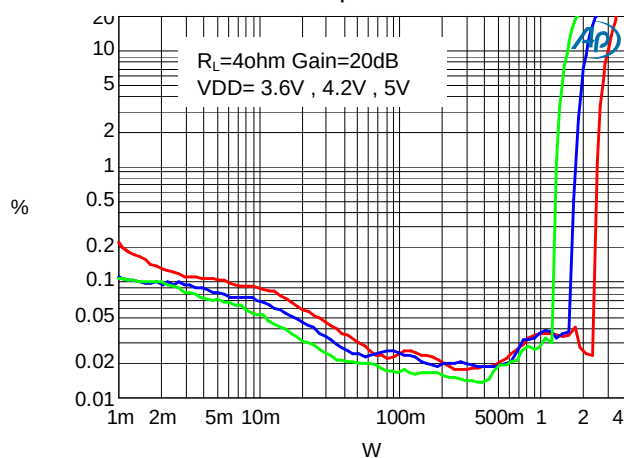
MIX2007

3W Mono Class-D Audio Power Amplifier

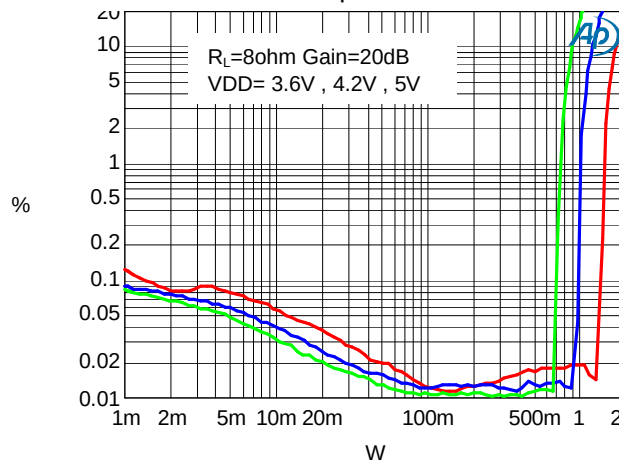
Typical Operating Characteristics

(VDD =5V, Gain=20dB, R_L =8 Ω , T =25°C, unless otherwise noted.)

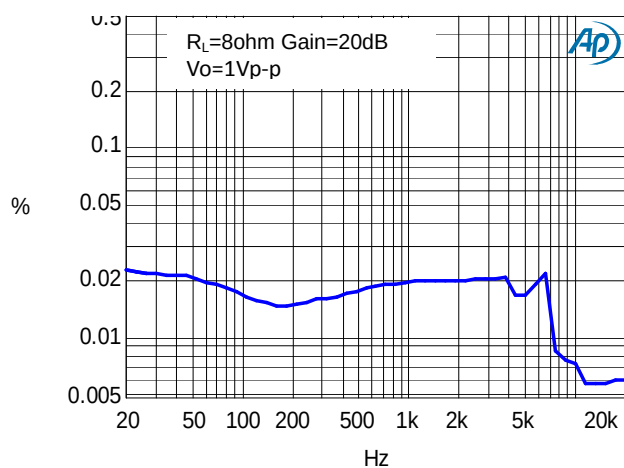
THD+N vs Output Power



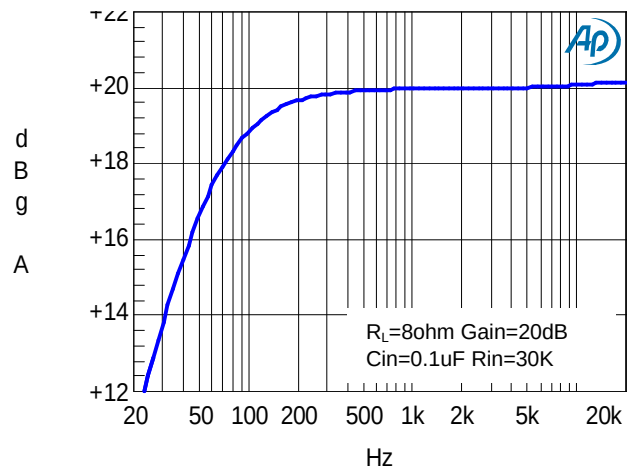
THD+N vs Output Power



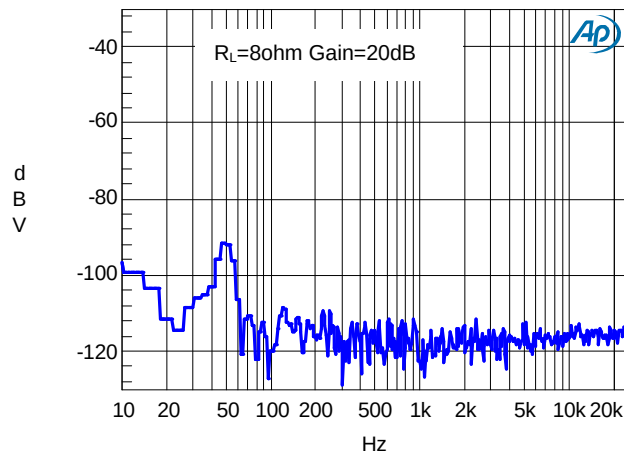
THD+N VS FREQUENCY



Frequency Response



NOISE FLOOR FFT



Application Information

Input Resistors (R_i)

The input resistors (R_i) set the gain of amplifier according to the below equation:

$$\text{Gain} = 2 \times \frac{R_f}{R_i} \left(\frac{V}{V} \right)$$

R_f is 150KΩ and the R_i is the external input resistor. For example, if you put a 30KΩ resistor at the input stage. The gain is below:

$$\text{Gain} = \frac{2 \times 150\text{K}\Omega}{30\text{K}\Omega} = 10 \left(\frac{V}{V} \right) = 20\text{dB}$$

Please place the input resistor very close to the MIX2007 for better noise performance.

Input Capacitors (C_i)

The input capacitor and input resistor form a high-pass filter with the corner frequency, f_c, determined in below equation:

$$f_c = \frac{1}{(2\pi R_i C_i)}$$

The value of input capacitor is important to consider as it directly affects the bass (low frequency) performance of the circuit.

Below equation is used to solve the input coupling capacitance.

$$C_i = \frac{1}{(2\pi R_i f_c)}$$

The capacitors should have tolerance of ±10% or better, because any mismatch in capacitance causes an impedance mismatch at the corner frequency.

Analog Reference Bypass Capacitor (C_{BYP})

The Analog Reference Bypass Capacitor (C_{BYP}) is the most critical capacitor and serves several important functions. During start-up or recovery from shutdown mode, C determines the rate at which the amplifier starts up. The second function is to reduce noise caused by the power supply coupling into the output drive signal. This noise is from the internal analog reference to the amplifier, which appears as degraded PSRR and THD+N.

A ceramic bypass capacitor (C_{BYP}) with values of 0.47 μF to 1.0 μF is recommended for the best noise performance. Increasing the bypass capacitor reduces clicking and popping noise from power on/off and entering and leaving shutdown.

Shutdown operation

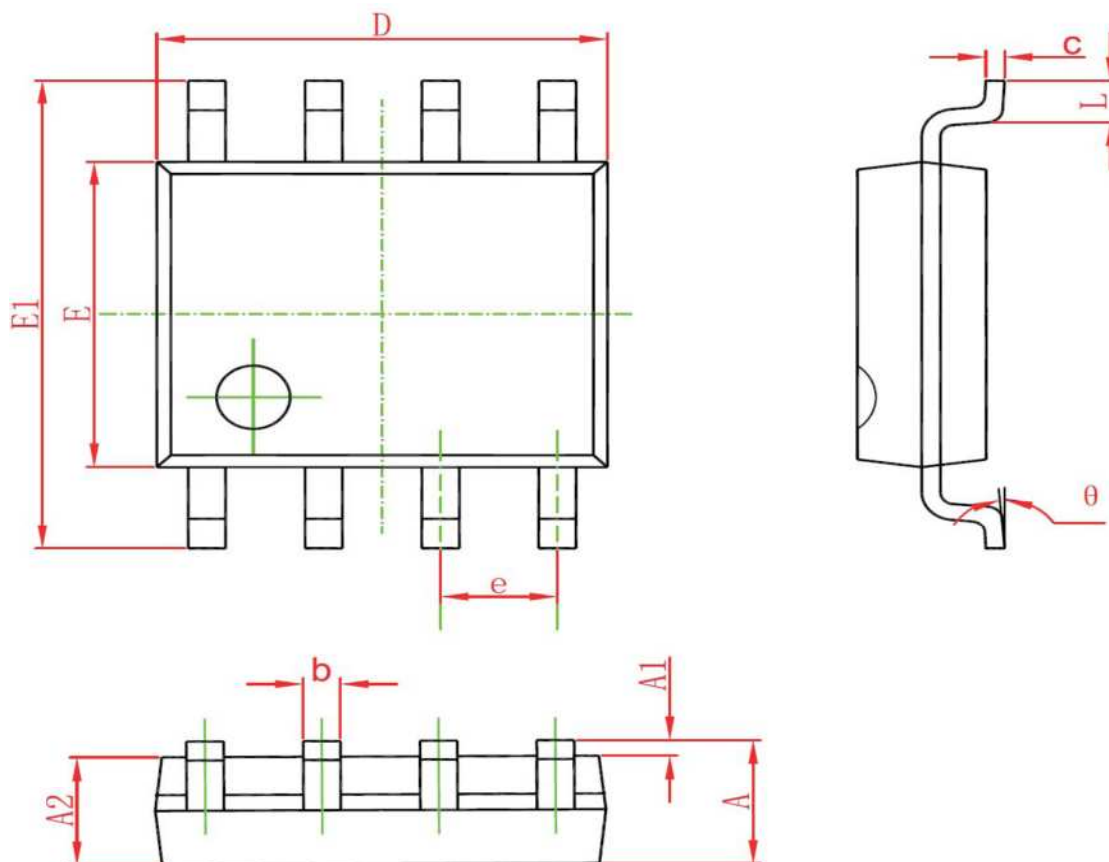
The MIX2007 employs a shutdown function which consumption less than 1uA current to save the standby time. The $\overline{\text{SHDN}}$ input terminal should be pull low during normal operation when the amplifier is in use.

Thermal Protection

Thermal protection on the MIX2007 prevents damage to the device when the internal die temperature exceeds 180°C. There is a ±30°C tolerance on this trip point from device to device. Once the die temperature exceeds the thermal set point, the device enters into the shutdown state and the outputs are disabled. This is not a latched fault. The thermal fault is cleared once the temperature of the die is reduced by 30°C. The device begins normal operation at this point with no external system intervention.

MIX2007
3W Mono Class-D Audio Power Amplifier

封装图 (SOP8)



Symbol	Millimeter(mm)		Inch	
	min	max	min	max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	1.550	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050

IMPORTANT NOTICE

We reserve the right to make corrections, modifications, enhancements, improvements, and other changes to our products and this document without prior notice. We believe that the information contained in this document has been carefully examined. However, our company assumes no responsibility for any inaccuracies and does not promise to update or retain the information contained in this document.

Our products are only suitable for commercial and general industrial applications. And it is not authorized to be used for life support equipment that may cause death, personal injury, or environmental or property damage. The risks and costs of using the product in such applications are borne by the customer themselves. Our company is not responsible for any incidental incidents caused by misuse or improper use or operation of the product.

Resale of our company's products or services with statements that differ from or exceed the parameters set by our company for that product or service is an unfair and deceptive business practice. Our company is not responsible for any such statements.

There is a possibility of product failure. However, our company makes every effort to improve the quality and reliability of our products.