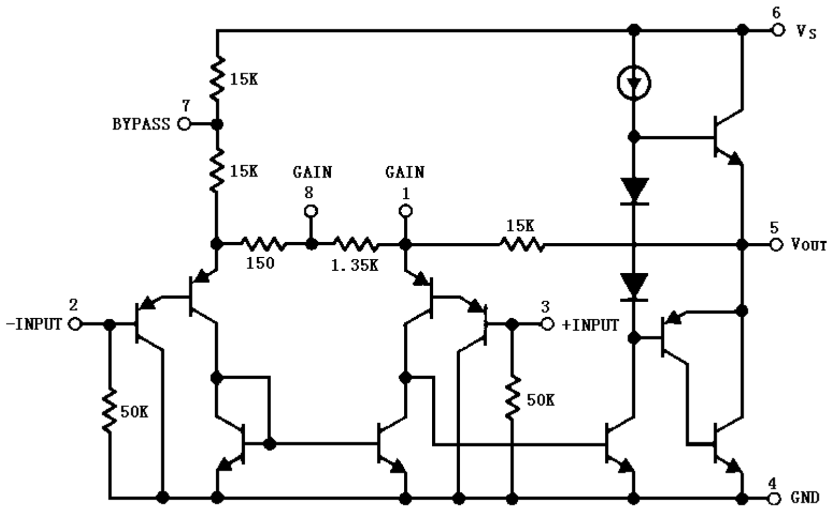
LM386

LM386

EQUIVALENT SCHEMATIC AND CONNECTION DIAGRAMS



ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Characteristic		Symbol	Value	Unit
Maximum Input Voltage		V_{IN}	±0.4	V
Supply Voltage		Vcc	15	V
Maximum Power Disspation	SOP8	P_D	660	mW
	DIP8		1200	
Soldering temperature(10 sec.)		Ts	260	°C
Junction Temperature		Tj	150	°C
Operating Temperature		Tamb	-10~+70	°C
Storage Temperature		Tstg	-40~125	°C

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified: Vcc=6V , R_L=8 Ω , f=1kHz , Tamb=25℃)

Characteristics	Test conditions	Symbol	Min	Typ	Max	Unit
Operating Supply Voltage		Vcc			12	V
Quiescent Current	Vcc=6V， V_{IN}=0	Icc	-	4	8	mA
Output Power	Vcc=6V, R_L=8Ω， THD=10%	Po	250	325		mW
	Vcc=9V, R_L=8Ω， THD=10%		500	700		
Voltage Gain	Vcc=6V, f=1kHz	Av	-	26	-	dB
	10μ Ffrom Pin 1 to 8		-	46	-	
Bandwidth	Vcc=6V， Pins 1 and 8 open	BW	-	300	-	kHz
Total Harmonic Distortion	Vcc=6V， R_L=8 Ω， Po=125mW， f=1kHz Pins 1 and 8 open	THD	-	0.2	-	%
Power Supply Rejection Ratio	Vcc=6V， f=1kHz， C_{BYPASS}=10μ Pins 1 and 8 open referred to Output	PSRR		50		dB
Input Resistance		R_{IN}	-	50	-	kΩ
Input Bias Current	Vcc=6V， Pins 2 and 3 open	I_B	-	250	-	nA

APPLICATION HINTS

GAIN CONTROL

To make the LM386 a more versatile amplifier, two pins (1and 8) are provided for gain control. With pins 1 and 8 open the 1.35 kW resistor sets the gain at 20 (26 dB). If a capacitoris put from pin 1 to 8, bypassing the 1.35 kW resistor, the gain will go up to 200 (46 dB). If a resistor is placed in series with the capacitor, the gain can be set to any value from 20 to 200. Gain control can also be done by capacitively coupling a resistor (or FET) from pin 1 to ground.

Additional external components can be placed in parallel with the internal feedback resistors to tailor the gain and frequency response for individual applications. For example, we can compensate poor speaker bass response by frequency shaping the feedback path. This is done with a series RC from pin 1 to 5 (paralleling the internal 15 kW resistor). For 6 dB effective bass boost: R . 15 kW, the lowest value for good stable operation is R = 10 kW if pin 8 is open. If pins 1 and 8 are bypassed then R as low as 2 kW can be used. This restriction is because the amplifier is only compensated for closed-loop gains greater than 9.

INPUT BIASING

The schematic shows that both inputs are biased to ground with a 50 kW resistor. The base current of the input transistors is about 250 nA, so the inputs are at about 12.5 mV when left open. If the dc source resistance driving the D386 is higher than 250 kW it will contribute very little additional offset (about 2.5 mV at the input, 50 mV at the output). If the dc source resistance is less than 10 kW, then shorting the unused input to ground will keep the offset low (about 2.5 mV at the input, 50 mV at the output). For dc source resistances between these values we can eliminate excess offset by putting a resistor from the unused input to ground, equal in value to the dc source resistance. Of course all offset problems are eliminated if the input is capacitively coupled.

When using the LM386 with higher gains (bypassing the 1.35 kW resistor between pins 1 and 8) it is necessary to bypass the unused input, preventing degradation of gain and possible instabilities. This is done with a 0.1 µF capacitor or a short to ground depending on the dc source resistance on the driven input.

APPLICATION CIRCUIT

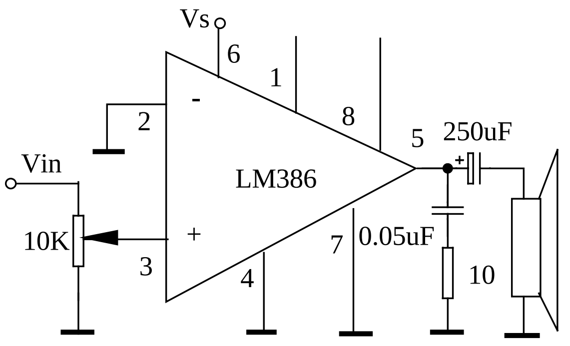


Fig1 Amplifier with Gain = 20
(Minimum Parts)

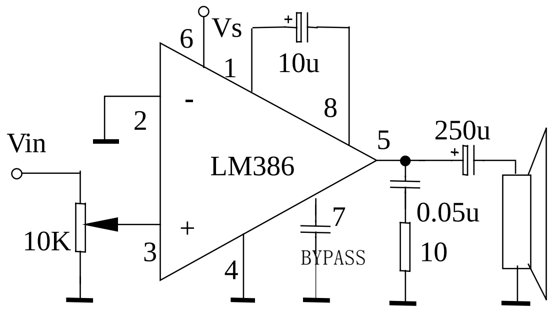


Fig2 Amplifier with Gain = 200

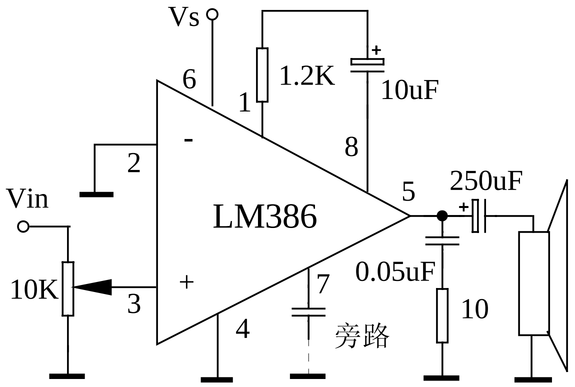


Fig3 Amplifier with Gain = 50

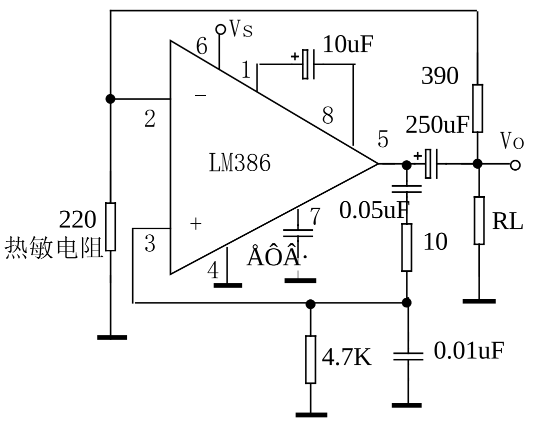


Fig4 Low Distortion Power
Wienbridge Oscillator

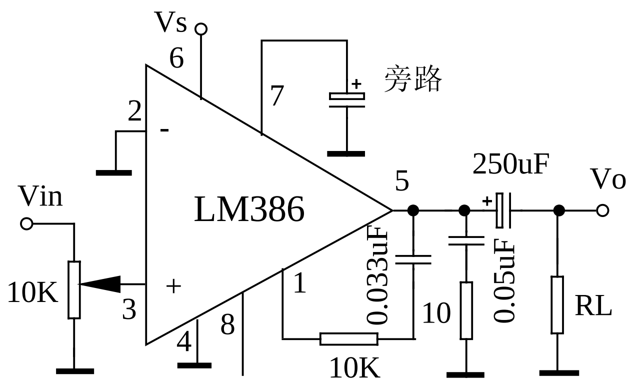


Fig5 Amplifier with Bass Boost

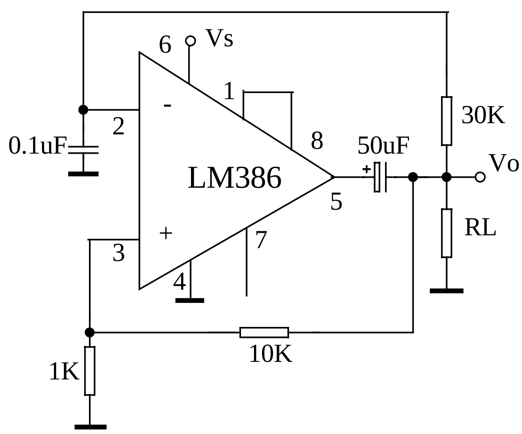


Fig6 Square Wave Oscillator

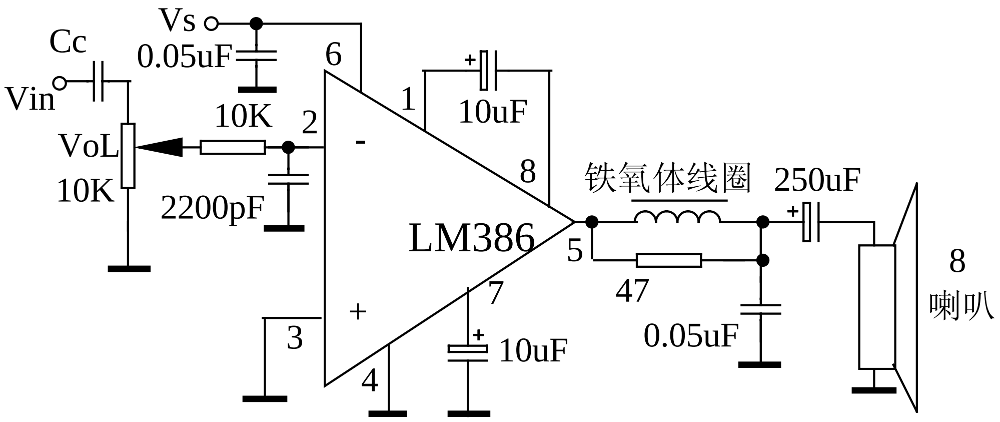
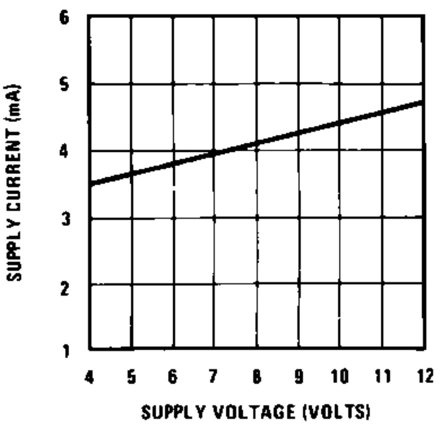


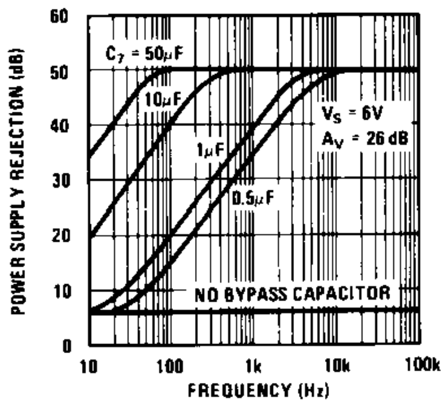
Fig7 AM Radio Power Amplifier

TYPICAL PERFORMANCE CHARACTERISTICS

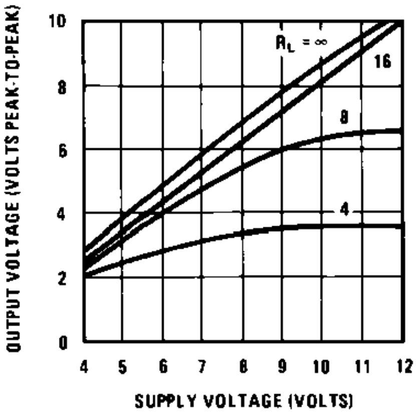
Quiescent Supply Current vs Supply Voltage



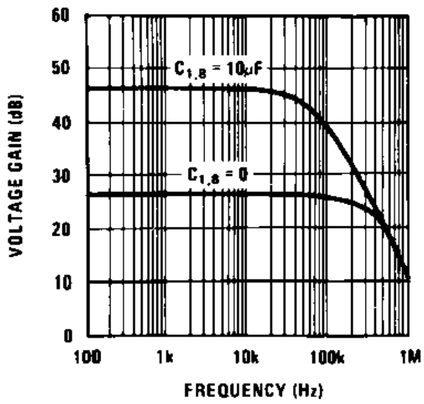
Power Supply Rejection Ratio (Referred to the Output) vs Frequency



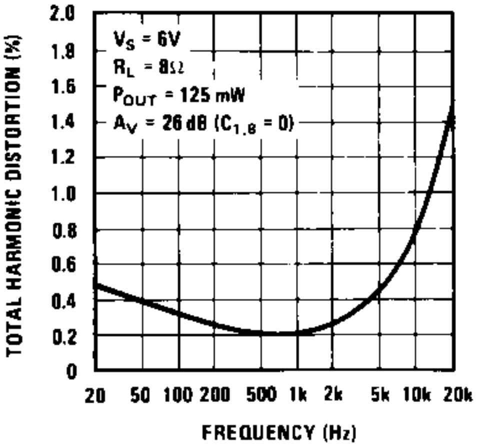
Peak-to-Peak Output Voltage Swing vs Supply Voltage



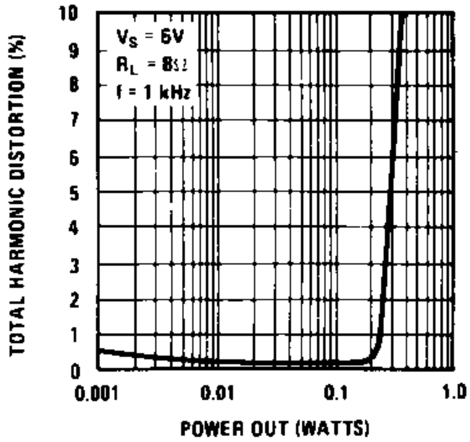
Voltage Gain vs Frequency



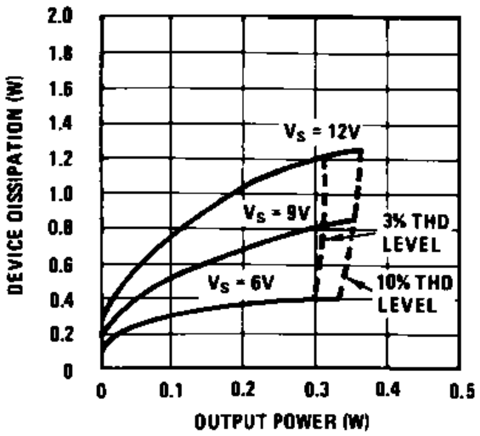
Distortion vs Frequency



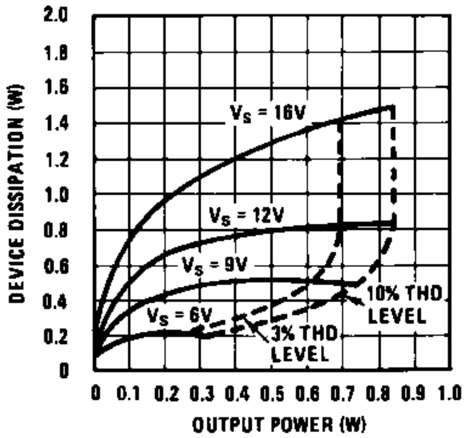
Distortion vs Output Power



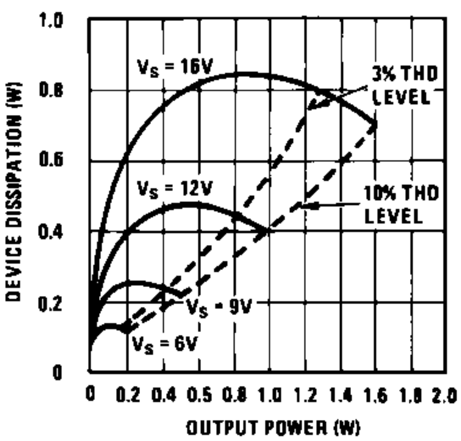
Device Dissipation vs Output Power—4Ω Load



Device Dissipation vs Output Power—8Ω Load



Device Dissipation vs Output Power—16Ω Load



Frequency Response with Bass Boost