

# GL386

## LOW VOLTAGE AUDIO POWER AMP

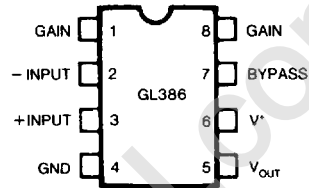
### Description

The GL386 is a power amplifier designed for use in low voltage consumer applications. The gain is internally set to 20 to keep external part count low, but the addition of an external resistor and capacitor between pins 1 and 8 will increase the gain to any value up to 200.

The inputs are ground referenced while the output is automatically biased to one half the supply voltage. The quiescent power drain is only 24 milliwatts when operating from a 6 volt supply, making the GL386 ideal for battery operation.

### Pin Configuration

(Top View)



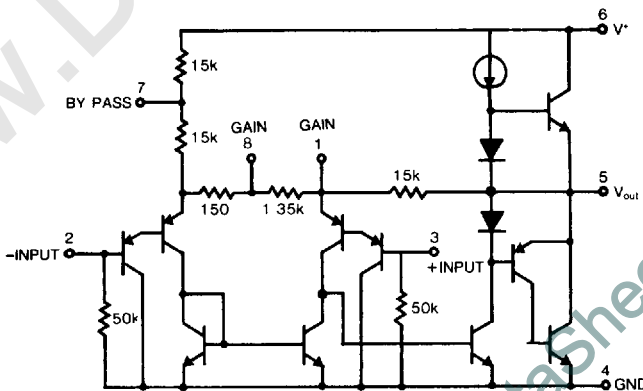
### Features

- Battery Operation
- Minimum External Parts
- Wide Supply Voltage Range: 4V-12V or 5V-18V
- Low Quiescent Current Drain: 4mA
- Voltage Gains from 20 to 200
- Ground Referenced Input
- Self-Centering Output Quiescent Voltage
- Low Distortion
- Eight Pin Dual-In-Line Package

### Absolute Maximum Ratings

Supply Voltage	15	V
Package Dissipation	1.25	mW
Input Voltage	$\pm 0.4$	V
Storage Temperature	$-65^{\circ}\text{C}$ to $+150$	$^{\circ}\text{C}$
Operating Temperature	$0$ to $+70$	$^{\circ}\text{C}$
Junction Temperature	$+150$	$^{\circ}\text{C}$
Lead Temperature	$+300$	$^{\circ}\text{C}$

### Schematic Diagram



Electrical Characteristics  $T_A=25^\circ\text{C}$ 

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Operating Supply Voltage	$V^*$		4		12	V
Quiescent Current	$I^*$	$V^*=6\text{V}$ , $V_{IN}=0$		4	8	mA
Output Power	$P_o$	$V^*=6\text{V}$ , $R_L=8\Omega$ , THD=10% $V^*=9\text{V}$ , $R_L=8\Omega$ , THD=10%	500	700 1000		mW mW
Voltage Gain	$A_V$	$V^*=6\text{V}$ , $f=1\text{kHz}$ $10\mu\text{F}$ from Pin 1 to 8		26 46		dB dB
Bandwidth	BW	$V^*=6\text{V}$ , Pins 1 and 8 Open		300		kHz
Total Harmonic Distortion	THD	$V^*=6\text{V}$ , $R_L=8\Omega$ , $P_{OUT}=125\text{mW}$ $f=1\text{kHz}$ , Pins 1 and 8 Open		0.2		%
Power Supply Rejection Ratio	PSRR	$V^*=6\text{V}$ , $f=1\text{kHz}$ , $C_{BYPASS}=10\mu\text{F}$ Pins 1 and 8 Open		50		dB
Input Resistance	$R_{IN}$			50		k $\Omega$
Input Bias Current	$I_B$	$V^*=6\text{V}$ , Pins 2 and 3 Open		250		nA

## Application Information

## GAIN CONTROL

To make the GL386 a more versatile amplifier, two pins (1 and 8) are provided for gain control. With pins 1 and 8 open the 1.35k $\Omega$  resistor sets the gain at 20 (26 dB). If a capacitor is put from pin 1 to 8, bypassing the 1.35 k $\Omega$  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 15k $\Omega$  resistor). For 6 dB effective bass boost:  $R \cong 15\text{k}\Omega$ , the lowest value for good stable operation is  $R = 10\text{k}\Omega$  if pin 8 is open. If pins 1 and 8 are bypassed then R as low as 2 k $\Omega$  can be used. This restriction is because the amplifier is only compensated for closed-loop gains greater the 9.

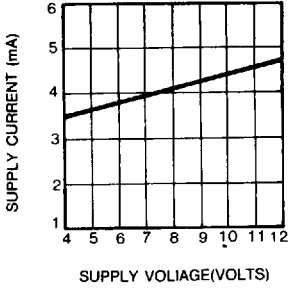
## INPUT BIASING

The schematic shows that both inputs are biased to ground with a 50 k $\Omega$  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 GL386 is higher than 250 k $\Omega$  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 k $\Omega$ , 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.

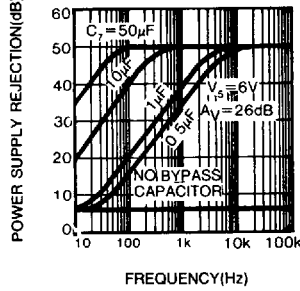
When using the GL386 with higher gains (by passing the 1.35 k $\Omega$  resistor between pins 1 and 8) it is necessary to bypass the unused input, preventing degradation of gain and possible instabilities. This is done with a 0.1  $\mu\text{F}$  capacitor or a short to ground depending on the dc source resistance on the driven input.

Typical Performance Curves

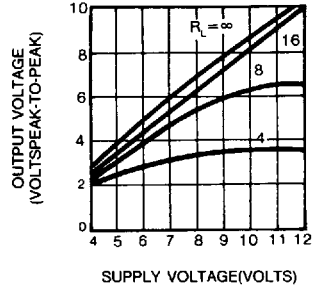
QUIESCENT SUPPLY CURRENT vs SUPPLY VOLTAGE



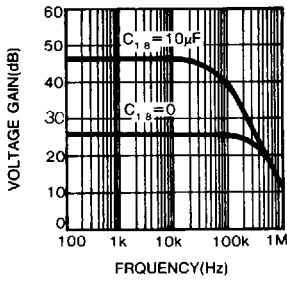
POWER SUPPLY REJECTION RATIO (REFERRED TO THE OUTPUT) vs FREQUENCY



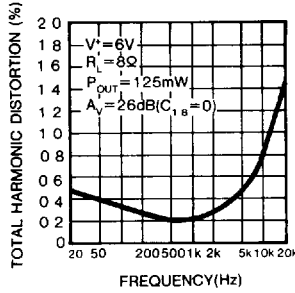
PEAK-TO-PEAK OUTPUT VOLTAGE SWING vs SUPPLY VOLTAGE



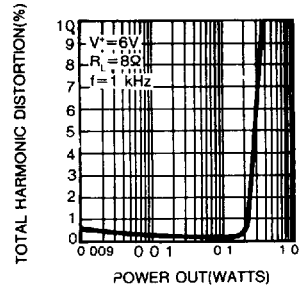
VOLTAGE GAIN vs FREQUENCY



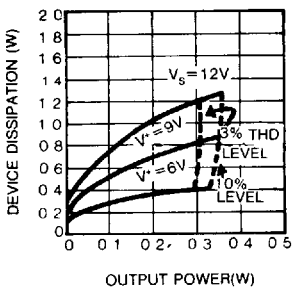
DISTORTION vs FREQUENCY



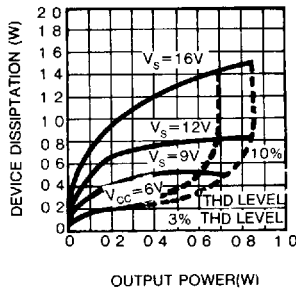
DISTORTION vs OUTPUT POWER



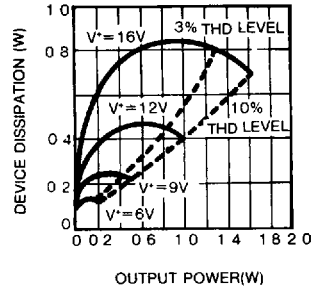
DEVICE DISSIPATION vs OUTPUT POWER-4Ω LOAD



DEVICE DISSIPATION vs OUTPUT POWER-8Ω LOAD

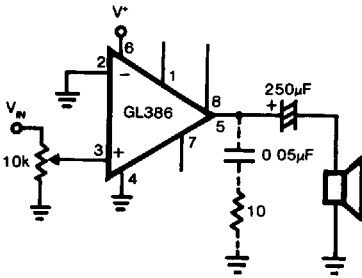


DEVICE DISSIPATION vs OUTPUT POWER-16Ω LOAD

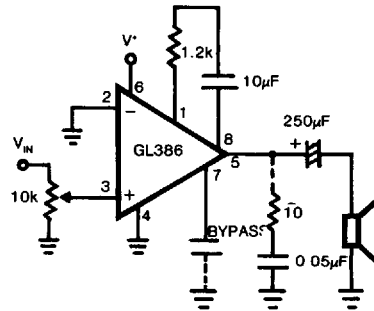


## Typical Application

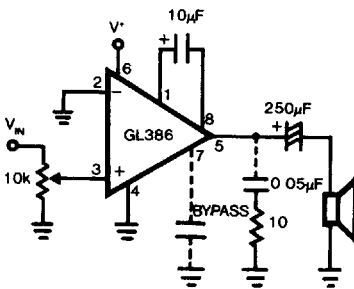
AMPLIFIER WITH GAIN = 20



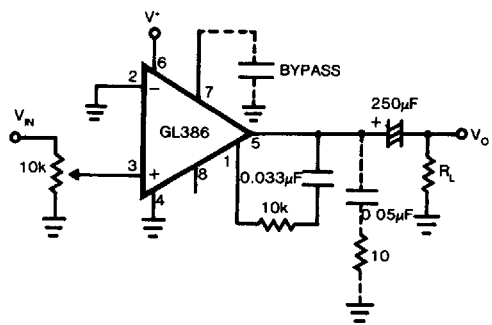
AMPLIFIER WITH GAIN = 50



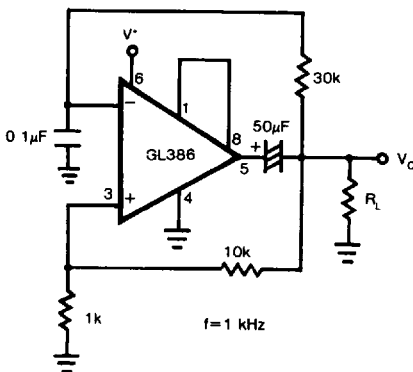
AMPLIFIER WITH GAIN = 200



AMPLIFIER WITH BASS BOOST



SQUARE WAVE OSCILLATOR



LOW DISTORTION POWER WIENBRIDGE OSCILLATOR

