



# LA4446

Monolithic Linear IC

## Two-Channel 5.5W AF Power Amplifier for Car Stereo Systems

### Overview

The LA4446 is a two-channel 5.5W AF power amplifier IC for car stereo systems.

### Features

- Two 5.5W channels ( $V_{CC} = 13.2V$ ,  $R_L = 4\Omega$ )
- Minimal impulse noise at power supply on/off and excellent starting balance
- Excellent ripple rejection ratio : 46dB (typical)
- Superlative channel separation
- Minimal residual noise :  $R_g = 0$
- Full complement of protection circuits
  - a. Thermal protection circuit, b. Overvoltage protection circuit, c. Shorting to adjacent pin protection circuits (pins 7/8 and 6/7).

### Specifications

#### Maximum Ratings at $T_a = 25^\circ C$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC\ max1}$	No signal, $t = 30s$	25	V
	$V_{CC\ max2}$	With signal	18	V
Surge supply voltage	$V_{CC\ surge}$	$t \leq 0.2s$ , single supply	50	V
Maximum output current	$I_O\ peak$	Per channel	3.5	A
Allowable power dissipation	$P_d\ max$	With an arbitrarily large heat sink	15	W
Operating temperature	$T_{opr}$		-20 to +75	$^\circ C$
Storage temperature	$T_{stg}$		-40 to +150	$^\circ C$

#### Operating Conditions at $T_a = 25^\circ C$

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	$V_{CC}$		13.2	V
Recommended load resistance	$R_L$	2 channels	4	$\Omega$
Operating supply voltage range	$V_{CC\ op}$		10 to 16	V

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# LA4446

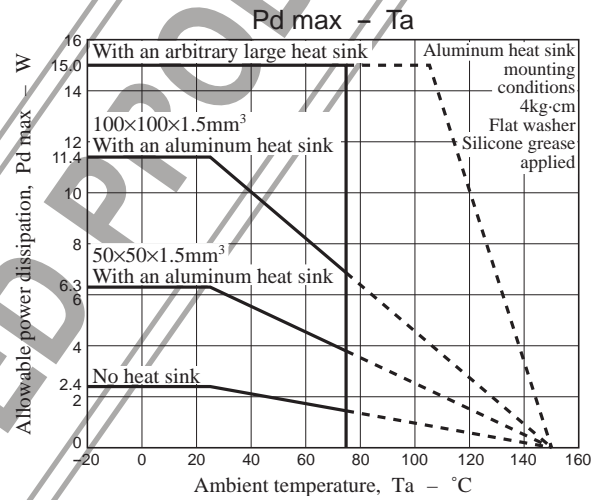
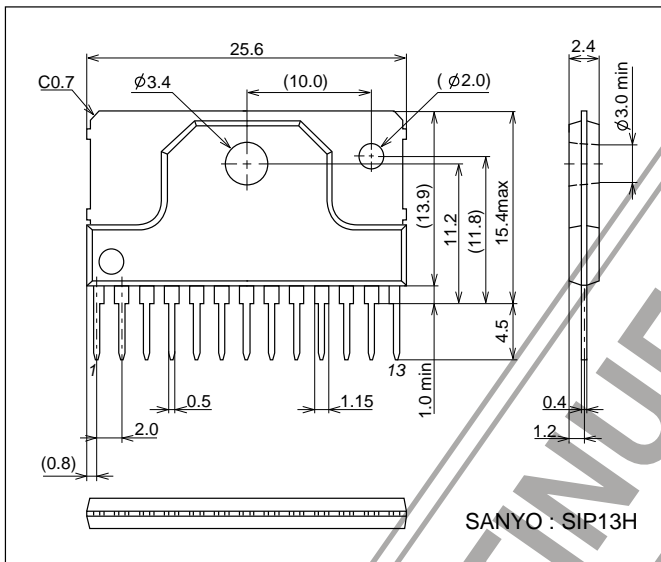
**Electrical Characteristics** at  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 13.2\text{V}$ ,  $R_L = 4\Omega$ ,  $f = 1\text{kHz}$ ,  $R_g = 600\Omega$ ,  $100 \times 100 \times 1.5\text{mm}^3$ , with an aluminum heat sink attached

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Quiescent current	$I_{CCO}$			75	150	mA
Voltage gain	VG		49.5	51.5	53.5	dB
Output power	$P_O$	THD = 10%, 2 channels	5.0	5.5		W
Total harmonic distortion	THD	$P_O = 1\text{W}$		0.2	1.0	%
Input resistance	$R_i$			30		$k\Omega$
Output noise voltage	$V_{NO1}$	$R_g = 0$		0.6	1.0	mV
	$V_{NO2}$	$R_g = 10k\Omega$		1.0	2.0	mV
Ripple rejection ratio	SVRR	$R_g = 0$ , $V_{CCR} = 200\text{mV}$ , $f_r = 100\text{Hz}$		46		dB
Channel separation	CHsep	$R_g = 10k\Omega$ , $V_O = 0\text{dBm}$	45	55		dB

## Package Dimensions

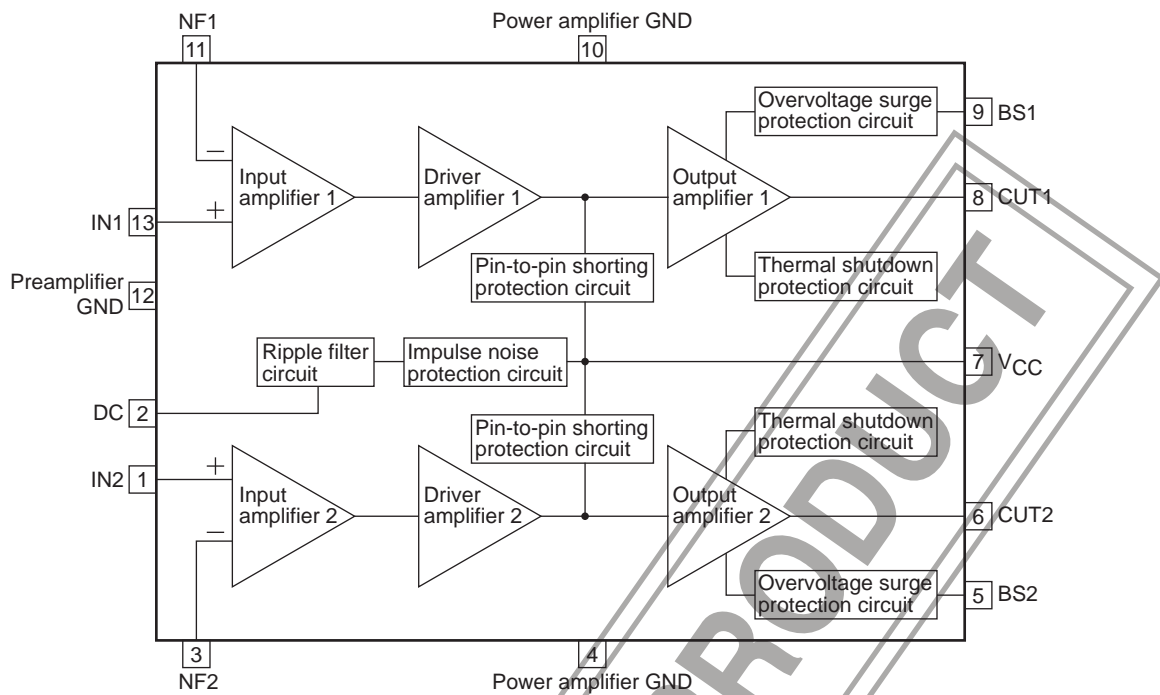
unit : mm (typ)

3107B

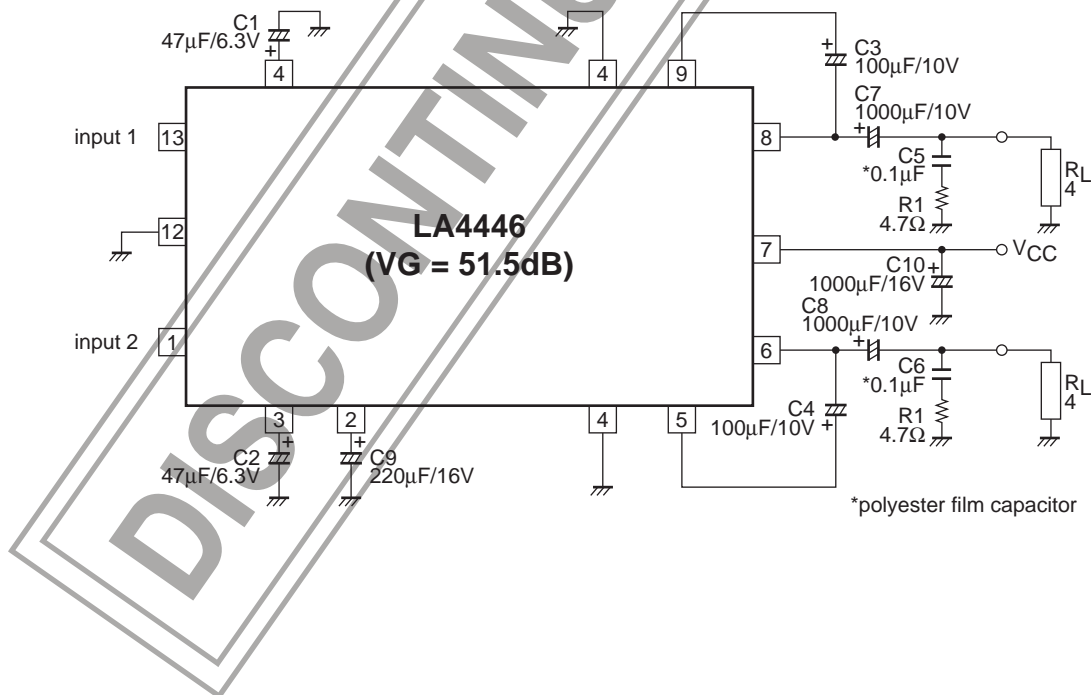


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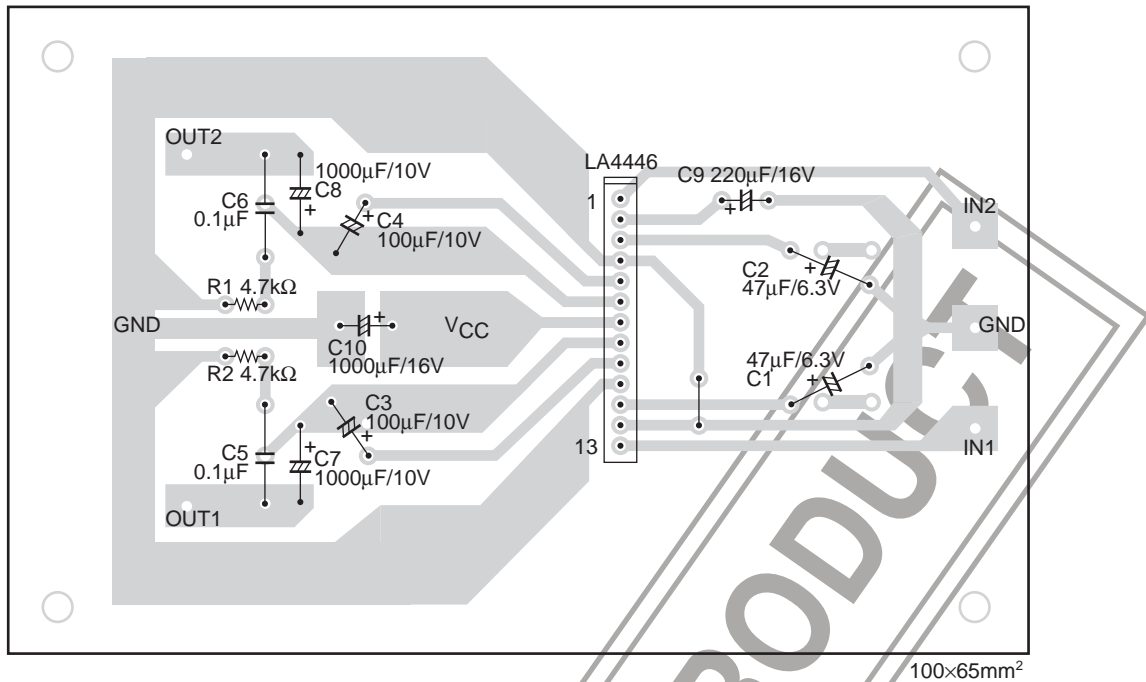
## Block Diagram



## Sample Application Circuit



## Printed Pattern Side (copper foil surface)



\* : Flat washers and a torque of 4 to 6kg-cm must be used when mounting the heat sink.

### IC Internal Features

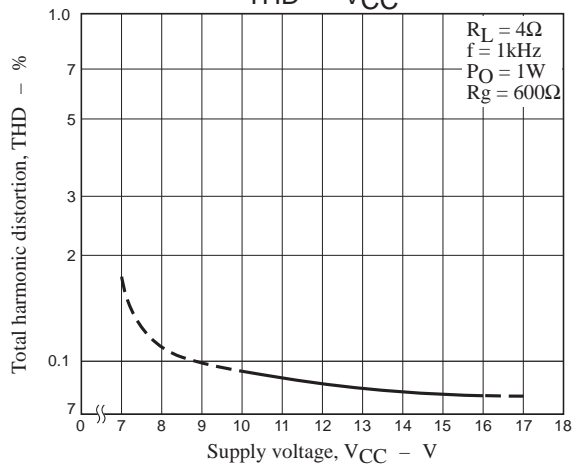
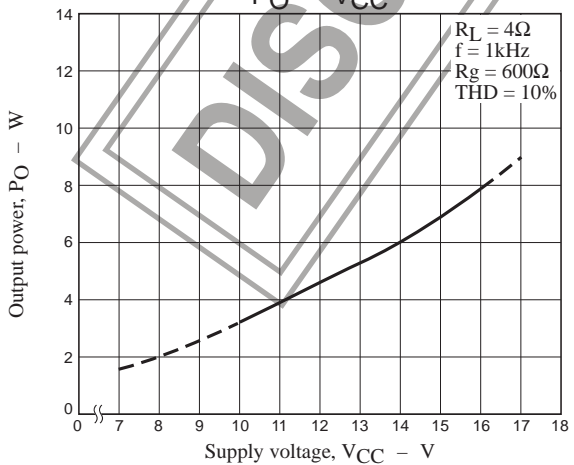
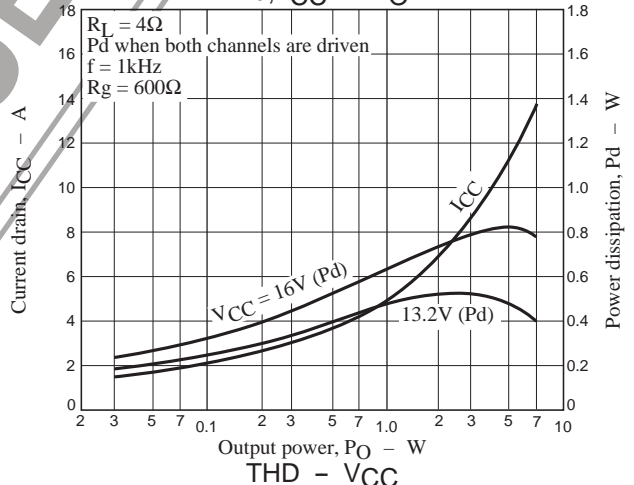
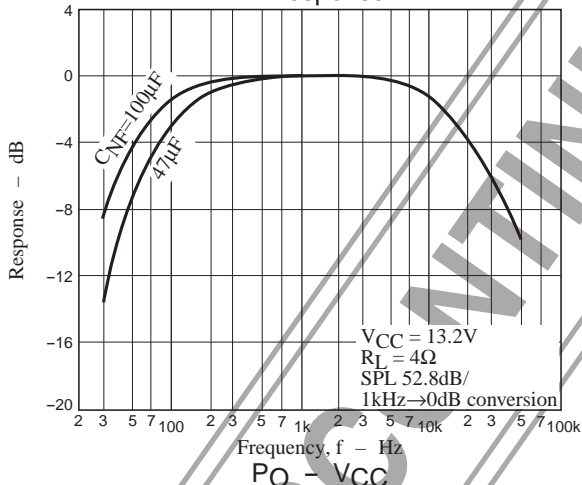
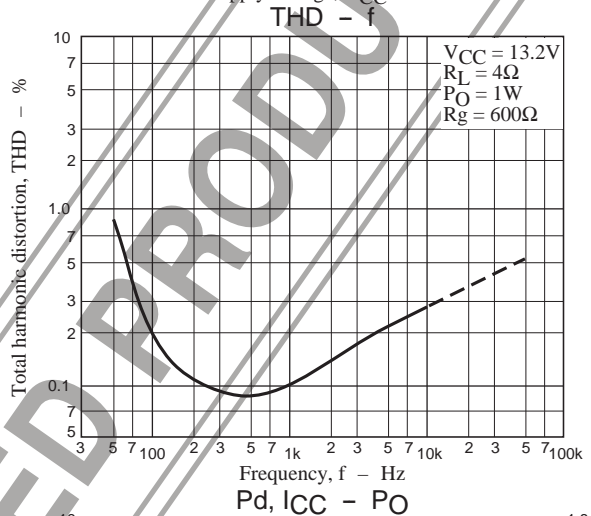
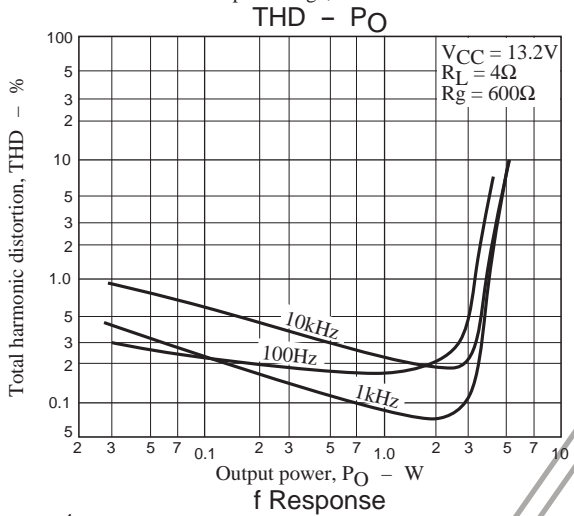
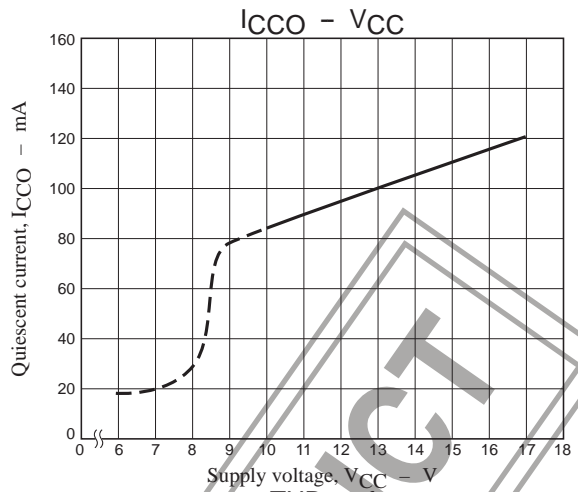
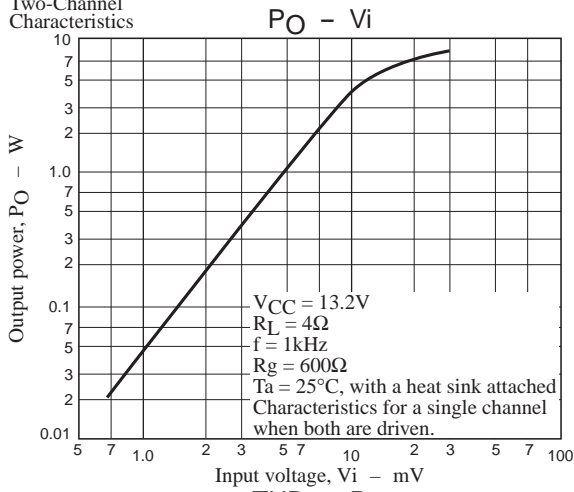
- Provides two channels
- The purpose of the decoupling capacitor C9 (220μF) is both to provide a ripple rejection effect and to set the power on delay time.
- The NF capacitor has a causal relationship with the low-band roll-off frequency. See the graph. Note that if it is desirable to extend  $f_L$  even further, the output capacitor is also involved.
- If it is desirable to reduce impulse noise even further, lowering the gain by adding  $R_{NF}'$  to the NF capacitors C1 and C2 will have an effect.

$$VG \approx 20 \log \frac{R_f}{R_{NF}} \text{ [dB]} \quad \text{the internal } R_{NF} \approx 50\Omega, R_f = 20k\Omega$$

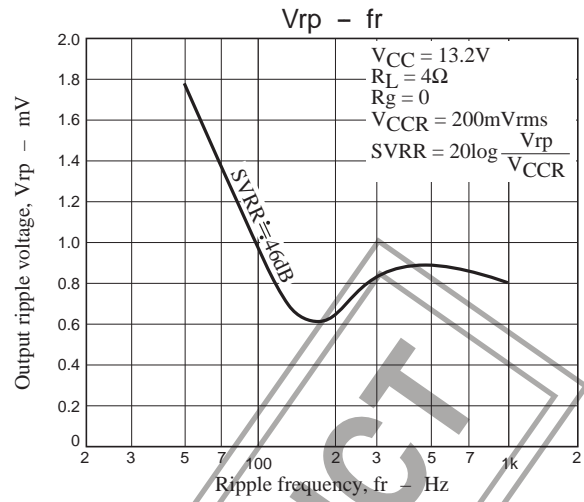
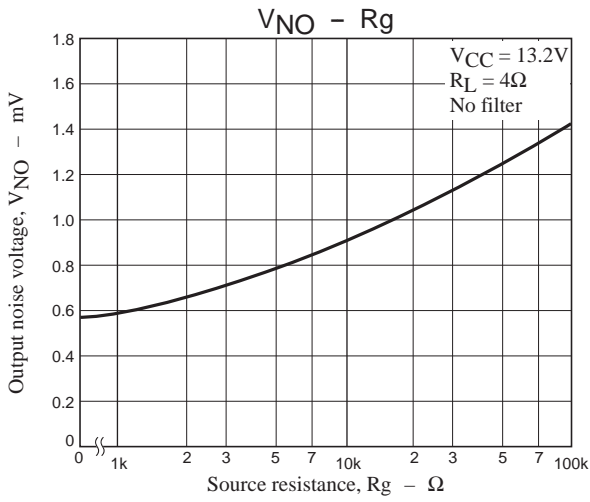
The gain will be about 46dB if individual resistors  $R_{NF}'$  of 50Ω are added externally, and the gain will be about 40dB if 150Ω resistors are used for  $R_{NF}'$ .

- The SVRR, THD, and OSC parameters change depending on the printed circuit board pattern layout. The handling of the large signal ground and the small signal ground, and grounding points for the external components required special care.
- When external audio muting is to be applied intentionally, the IC can be cut off by dropping the decoupling pin (pin 2) to ground through a 50 to 100Ω limit resistor.
- Protection circuits  
Since, the most dangerous of the adjacent pins,  $V_{CCout}$ , appears at an inter-pin pitch of 2mm, this IC can easily be destroyed by solder bridges created during end product manufacturing. For this reason, this IC includes DC short protection circuits for pins 7 and 8 and for pins 7 and 6. This circuit is designed to operate within the range of voltage fluctuations common in automotive systems, namely 10.5 to 15.6V.
- Overvoltage and surge protection circuit  
This circuit is provided to protect against giant pulses of positive surge up to 50V/200ms. Testing must be performed according to the JASO standards. Note that the overvoltage protection circuit is set up to operate at  $V_{CCX}$  = about 24.5V.
- Built-in thermal protection circuit  
This circuit is provided to protect the IC in abnormal states, such as when cooling has become inadequate or when an AC load short occurs. The thermal shutdown temperature is set to be  $T_j = 160^\circ\text{C}$ .

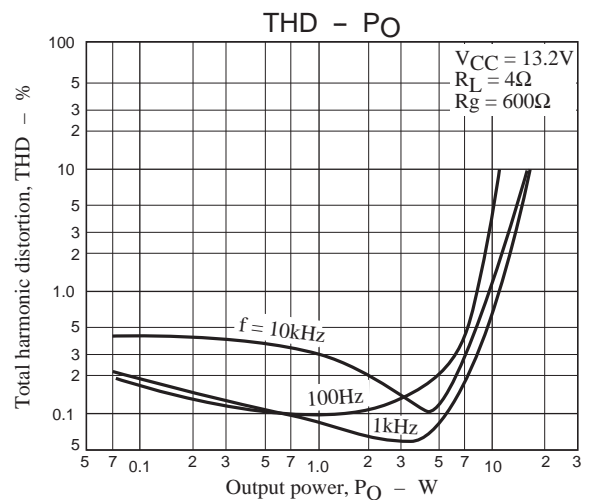
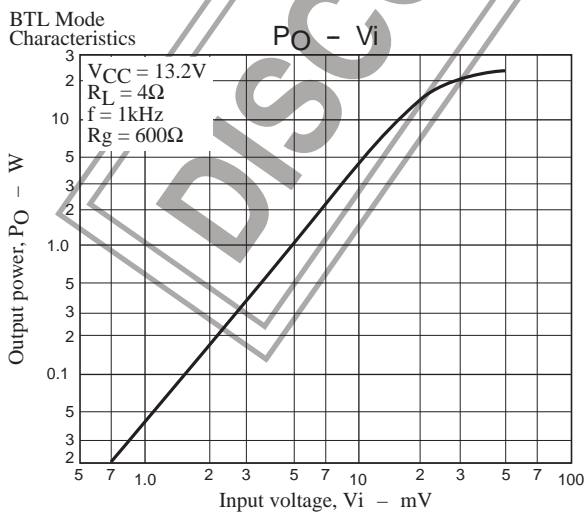
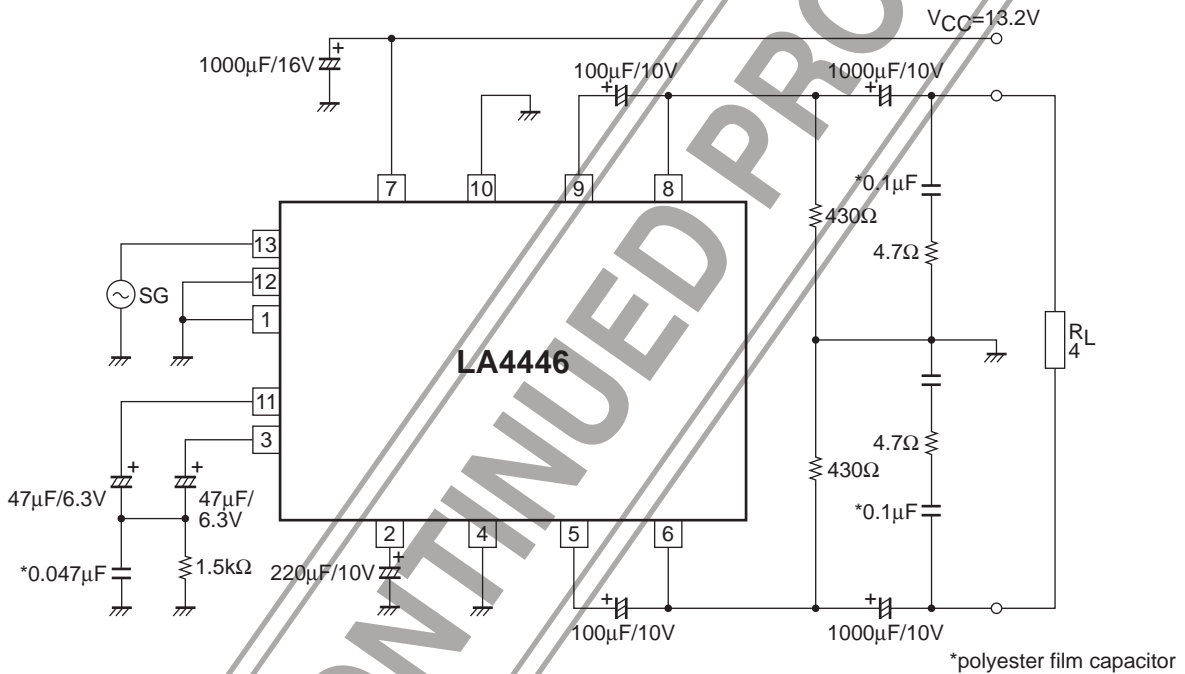
Two-Channel Characteristics

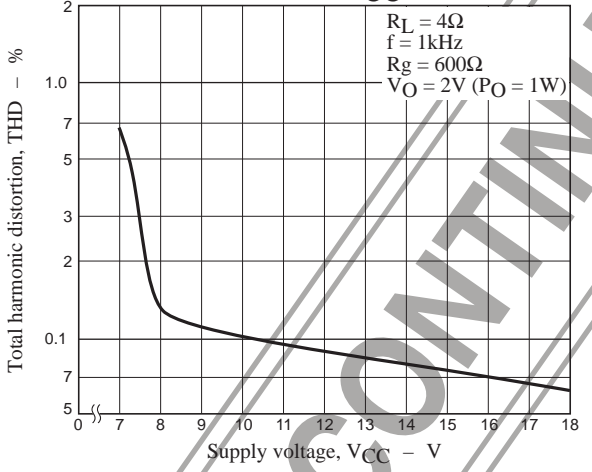
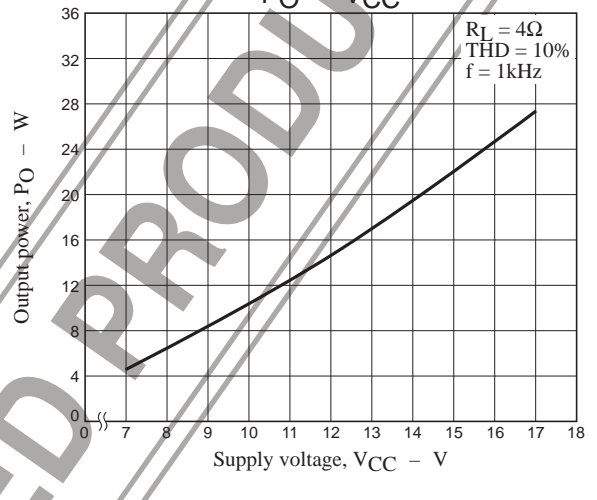
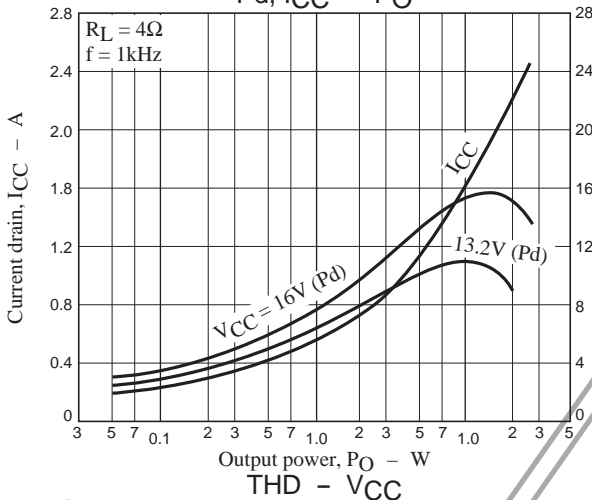
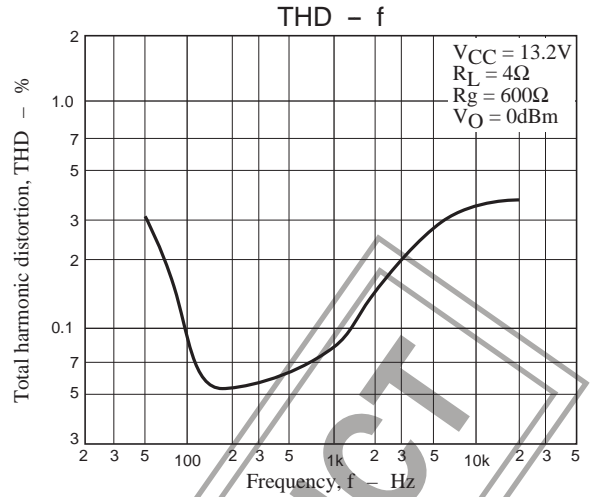
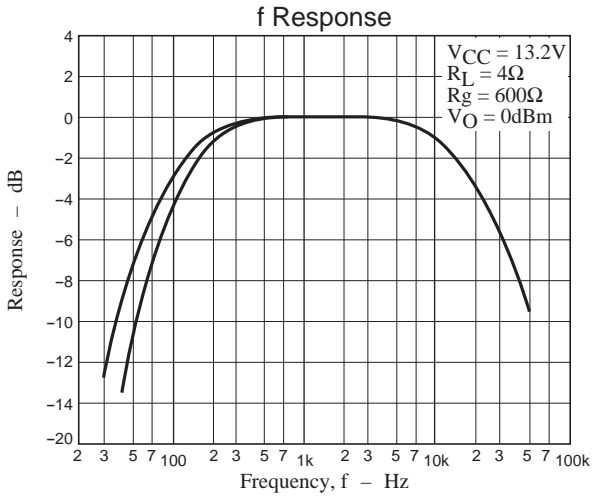


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## BTL Sample Application Circuit





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