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# HA13150A

21 W × 4-Channel BTL Power IC

# HITACHI

ADE-207-107  
1st. Edition

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## Description

HA13150A is a four-channel BTL amplifier IC designed for car audio, featuring high output and low distortion, and applicable to digital audio equipment. It provides 21 W output per channel, with a 14.4 V power supply and at 10% distortion.

## Functions

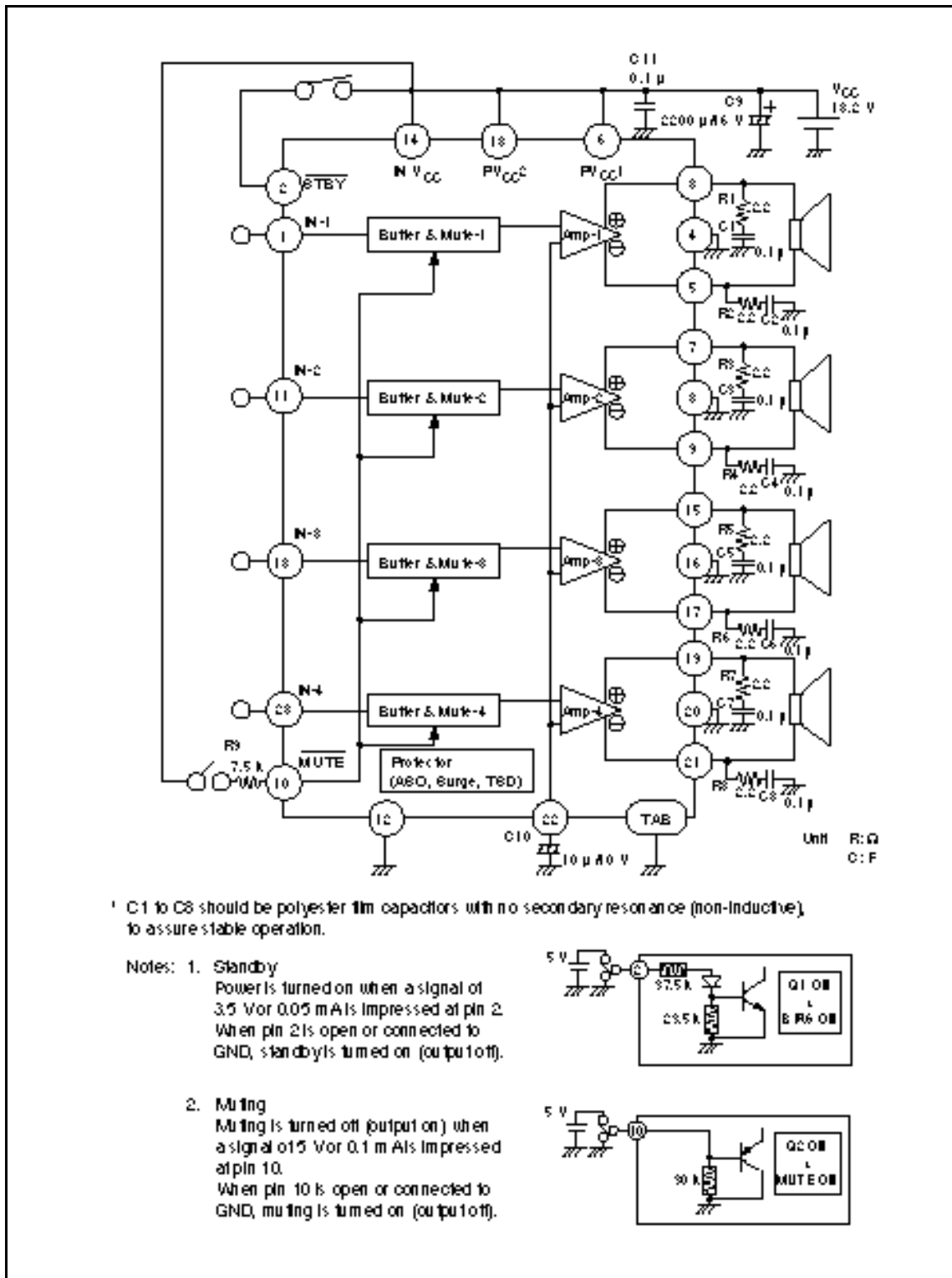
- Built-in standby circuit
- Built-in muting circuit
- Built-in protection circuits (surge, TSD, and ASO)

## Features

- Requires few external parts
- Low distortion (total harmonic distortion = 0.01% at 3 W)
- Low noise (at  $R_g = 620 \Omega$ , noise is 0.15 mV (muting off) or 0.1 mV (muting on))
- Popping noise minimized
- Highly reliable current-limiting ASO protector keeps speakers safe from all kinds of trouble. Reliability is further enhanced by a fast-acting thermal shutdown protection circuit with on/off hysteresis.

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## Block Diagram



## Absolute Maximum Ratings (Ta = 25°C)

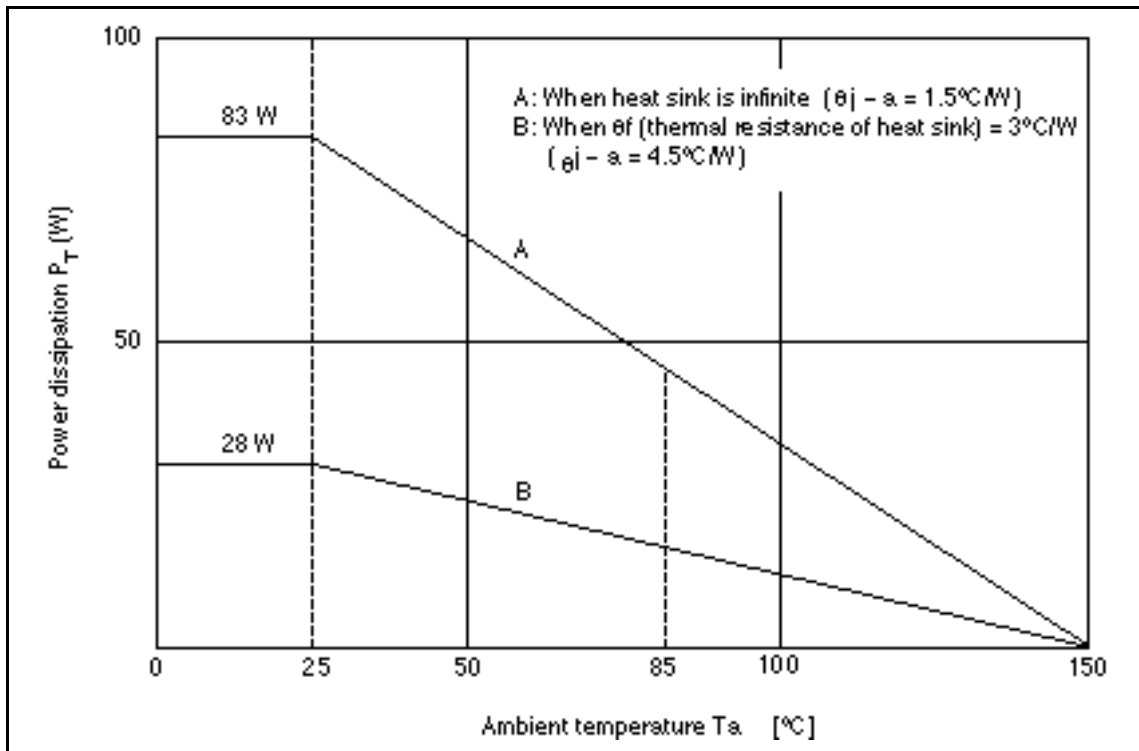
Item	Symbol	Rating	Unit	Remarks
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Operating supply voltage	$V_{CC}$	18	V
Supply voltage when no signal <sup>*1</sup>	$V_{CC}$ (DC)	26	V
Peak supply voltage <sup>*2</sup>	$V_{CC}$ (PEAK)	50	V
Output current <sup>*3</sup>	$I_O$ (PEAK)	4	A
Power dissipation <sup>*4</sup>	$P_T$	83	W
Junction temperature	$T_j$	150	°C
Operating temperature	$T_{opr}$	-30 to +85	°C
Storage temperature	$T_{stg}$	-55 to +125	°C

- Notes: 1. Tolerance within 30 seconds  
 2. Tolerance in surge pulse waveform  
 3. Value per 1 channel  
 4. Value when attached on the infinite heat sink plate at  $T_a = 25^\circ\text{C}$ .  
 The derating curve is as shown in the graph below.

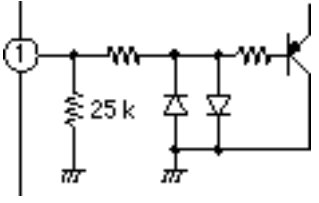
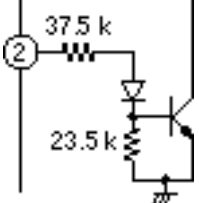
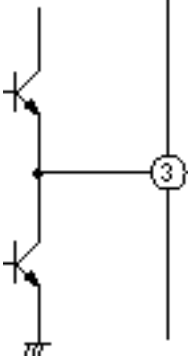
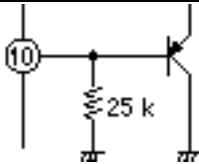


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**Electrical Characteristics** ( $V_{CC} = 13.2 \text{ V}$ ,  $f = 1 \text{ kHz}$ ,  $R_L = 4 \text{ } \Omega$ ,  $R_g = 620 \text{ } \Omega$ ,  $T_a = 25^\circ\text{C}$ )

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Current when no signal	I <sub>q1</sub>	—	240	—	mA	V <sub>in</sub> = 0
Output offset voltage	V <sub>q</sub>	-250	0	+250	mV	
Gain	G <sub>v</sub>	30.5	32	33.5	dB	
Gain difference between channels	G <sub>v</sub>	-1.5	0	+1.5	dB	
Rated output power	P <sub>o</sub>	—	18	—	W	V <sub>CC</sub> = 13.2 V R <sub>L</sub> = 4 $\Omega$ , THD = 10%
Max output power	P <sub>omax</sub>	—	30	—		V <sub>CC</sub> = 13.7 V R <sub>L</sub> = 4 $\Omega$ , THD = Max
Total harmonic distortion	T.H.D	—	0.01	—	%	P <sub>o</sub> = 3 W
Output noise voltage	W <sub>BN</sub>	—	0.15	0.5	mV <sub>rms</sub>	R <sub>g</sub> = 0 BW = 20 to 20 kHz
Ripple rejection	SVR	—	55	—	dB	R <sub>g</sub> = 600 f = 120 Hz
Channel crosstalk	C.T	—	70	—	dB	R <sub>g</sub> = 600 V <sub>out</sub> = 0 dBm
Input impedance	R <sub>in</sub>	—	25	—	k	
Standby current	I <sub>q2</sub>	—	—	200	$\mu\text{A}$	
Standby control voltage (high)	V <sub>STH</sub>	3.5	—	V <sub>CC</sub>	V	
Standby control voltage (low)	V <sub>STL</sub>	0	—	1.5	V	
Muting control voltage (high)	V <sub>MH</sub>	3.5	—	V <sub>CC</sub>	V	
Muting control voltage (low)	V <sub>ML</sub>	0	—	1.5	V	
Muting attenuation	A <sub>TTM</sub>	—	70	—	dB	V <sub>out</sub> = 0 dBm

**Pin Explanation**

Pin No.	Symbol	Functions	Input Impedance	DC Voltage	Equivalence Circuit
1	IN1	CH1 INPUT	25 k (Typ)	0 V	
11	IN2	CH2 INPUT			
13	IN3	CH3 INPUT			
23	IN4	CH4 INPUT			
2	STBY	Standby control	90 k (at Trs. cutoff)	—	
3	OUT1 (+)	CH1 OUTPUT	—	$V_{cc}/2$	
5	OUT1 (-)				
7	OUT2 (+)	CH2 OUTPUT			
9	OUT2 (-)				
15	OUT3 (+)	CH3 OUTPUT			
17	OUT3 (-)				
19	OUT4 (+)	CH4 OUTPUT			
21	OUT4 (-)				
10	MUTE	Muting control	25 k (Typ)	—	

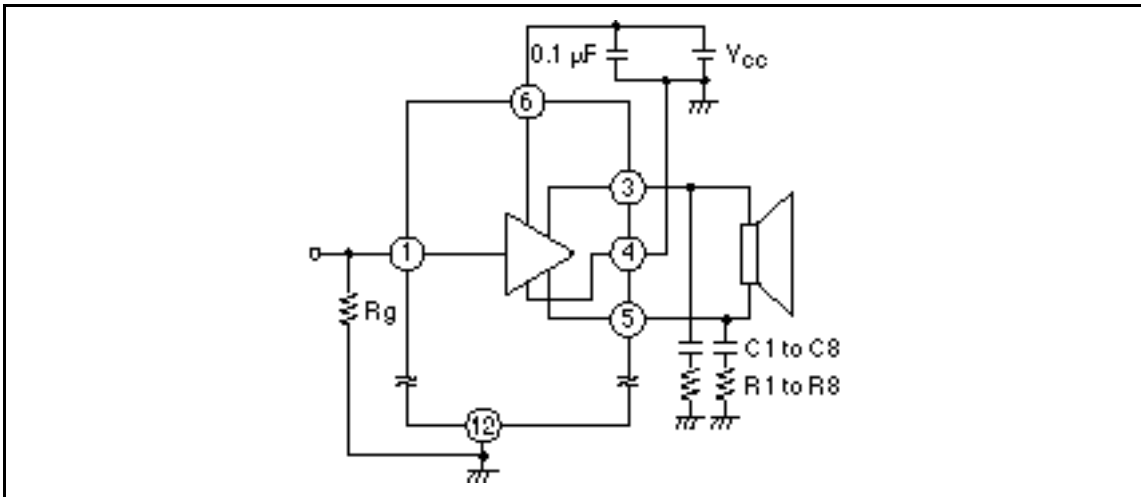
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### Pin Explanation (cont)

Pin No.	Symbol	Functions	Input Impedance	DC Voltage	Equivalence Circuit
22	RIPPLE	Bias stability	—	$V_{CC}/2$	
6	$PV_{CC1}$	Power of output stage	—	$V_{CC}$	—
18	$PV_{CC2}$				
14	$INV_{CC}$	Power of input stage	—	$V_{CC}$	—
4	CH1 GND	CH1 power GND	—	—	—
8	CH2 GND	CH2 power GND			
16	CH3 GND	CH3 power GND			
20	CH4 GND	CH4 power GND			
12	IN GND	Input signal GND	—	—	—

### Point of Application Board Design

1. Notes on Application board's pattern design
  - For increasing stability, the connected line of  $V_{CC}$  and OUTGND is better to be made wider and lower impedance.
  - For increasing stability, it is better to place the capacitor between  $V_{CC}$  and GND ( $0.1 \mu\text{F}$ ) close to IC.
  - For increasing stability, it is better to place C1 to C8 and R1 to R8, which are for stopping oscillation, close to IC.
  - It is better to place the grounding of resistor ( $R_g$ ), between input line and ground, close to INGND (Pin 12) because if OUTGND is connected to the line between  $R_g$  and INGND, THD will become worse due to current from OUTGND.



**Figure 1** Notes on Application Board's Pattern Design

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### 2. How to reduce the popping noise by Muting circuit

At normal operating circuit, Muting circuit operates at high speed under 1  $\mu$ s.

In case popping noise becomes a problem, it is possible to reduce the popping noise by connecting capacitor, which determines the switching time constant, between pin 10 and GND. (Following figure 2)

We recommend value of capacitor greater than 1  $\mu$ F.

Also transitional popping noise can be reduced sharply by muting before  $V_{CC}$  and Standby are ON/OFF.

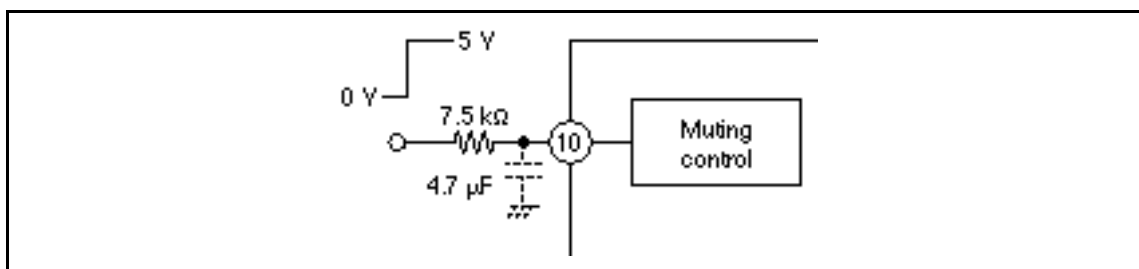
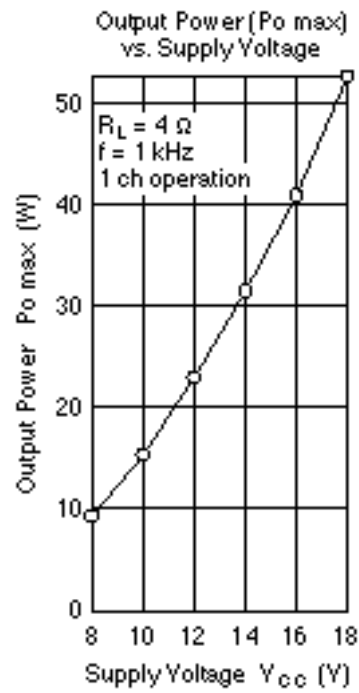
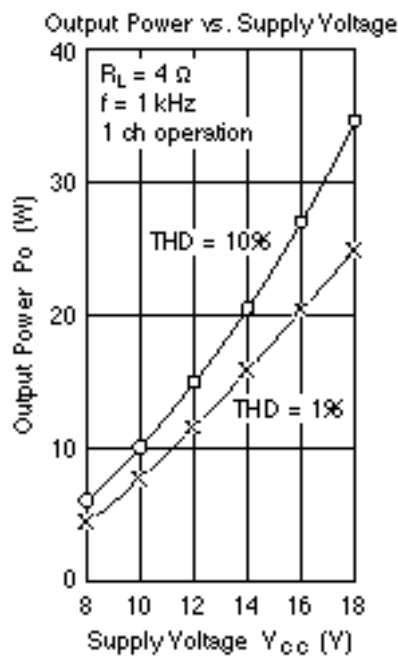
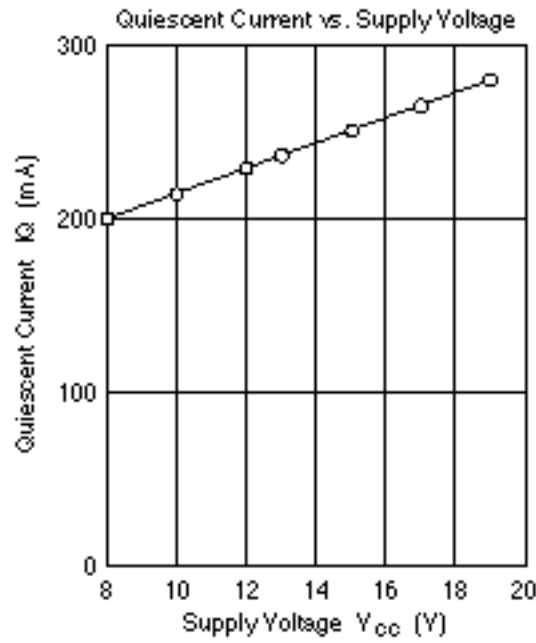
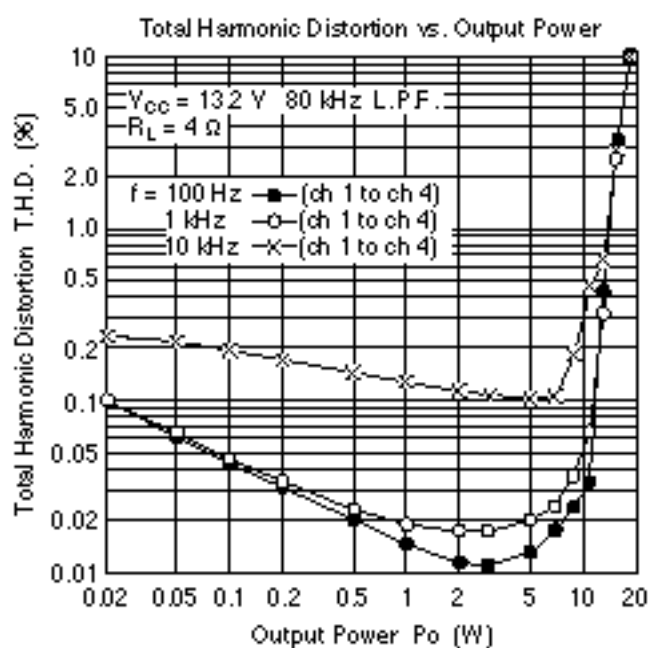
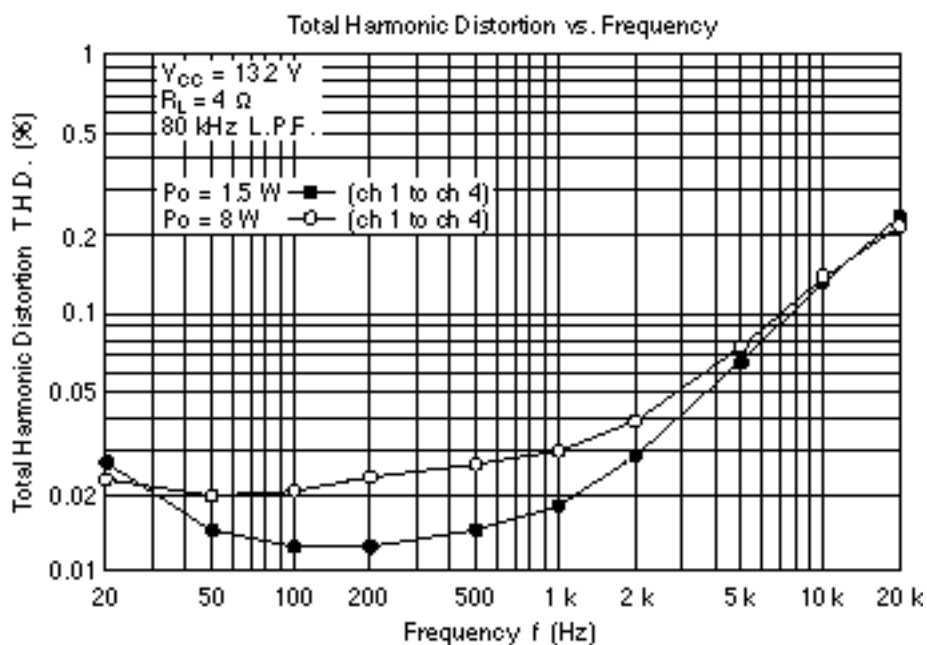


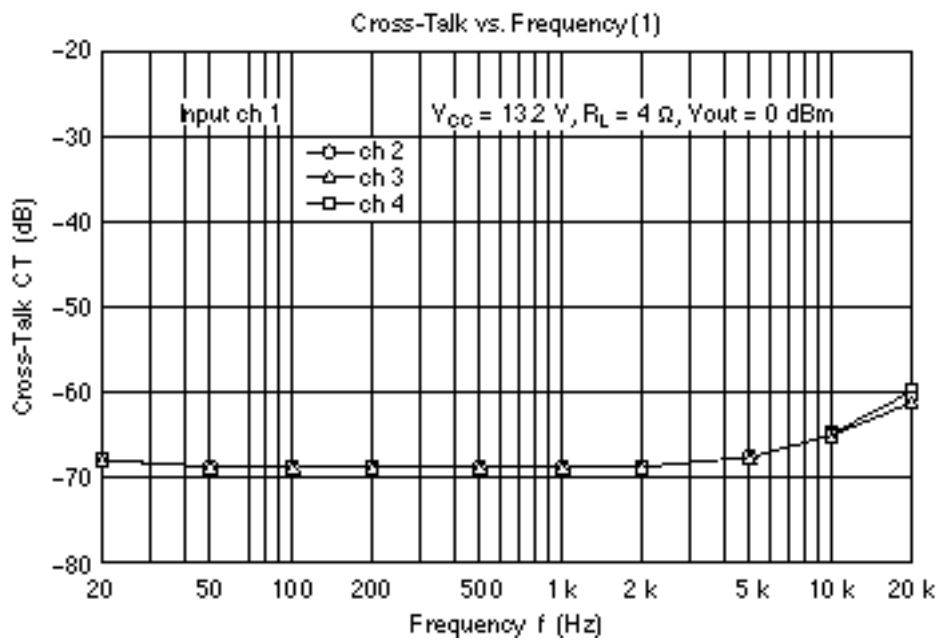
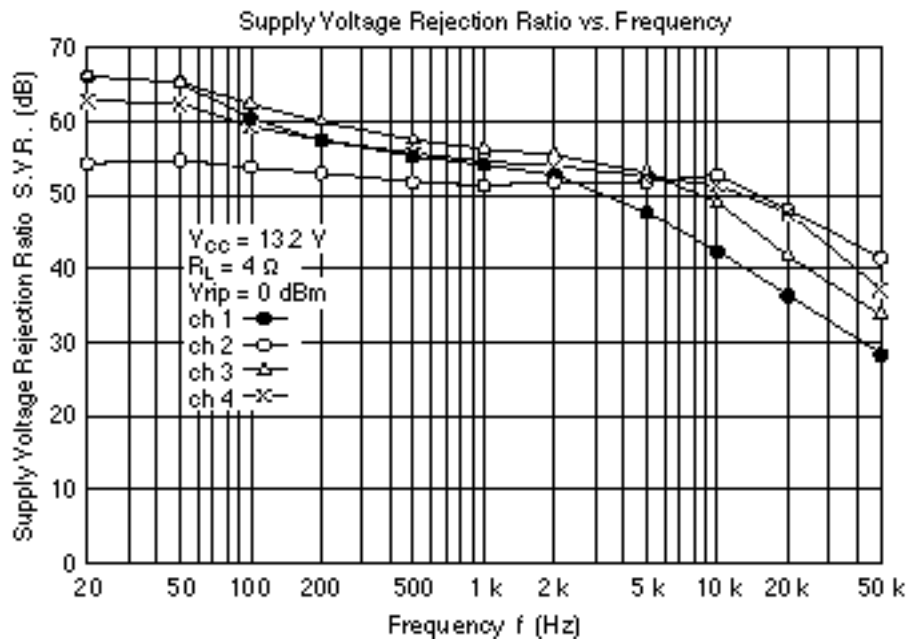
Figure 2 How to use Muting Circuit

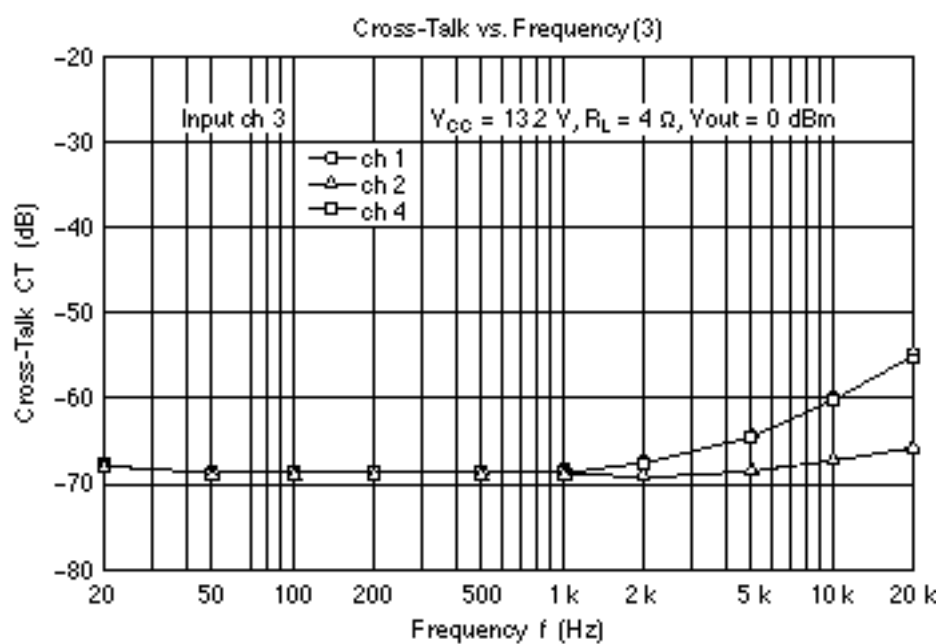
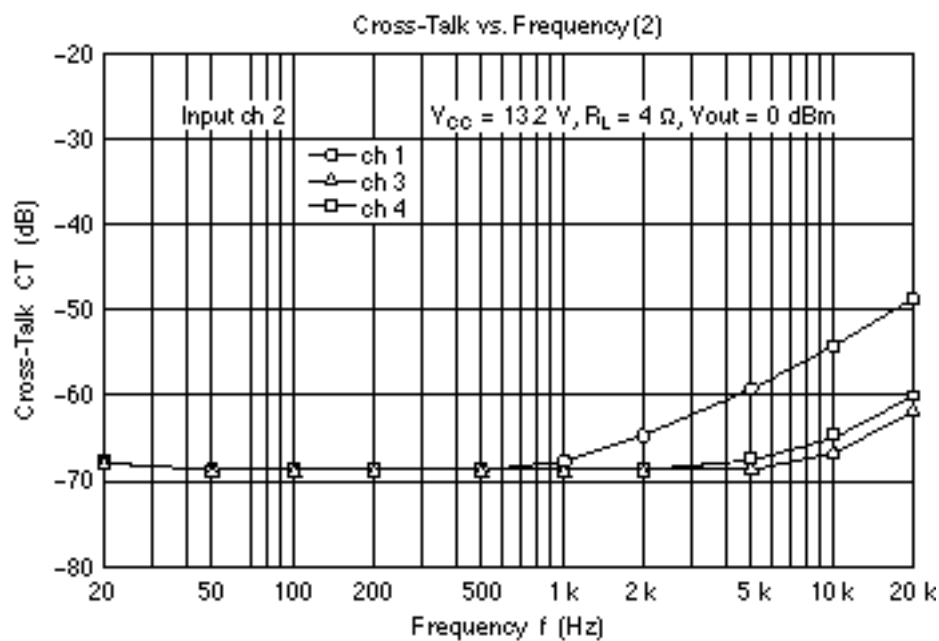
Table 1 Muting ON/OFF Time

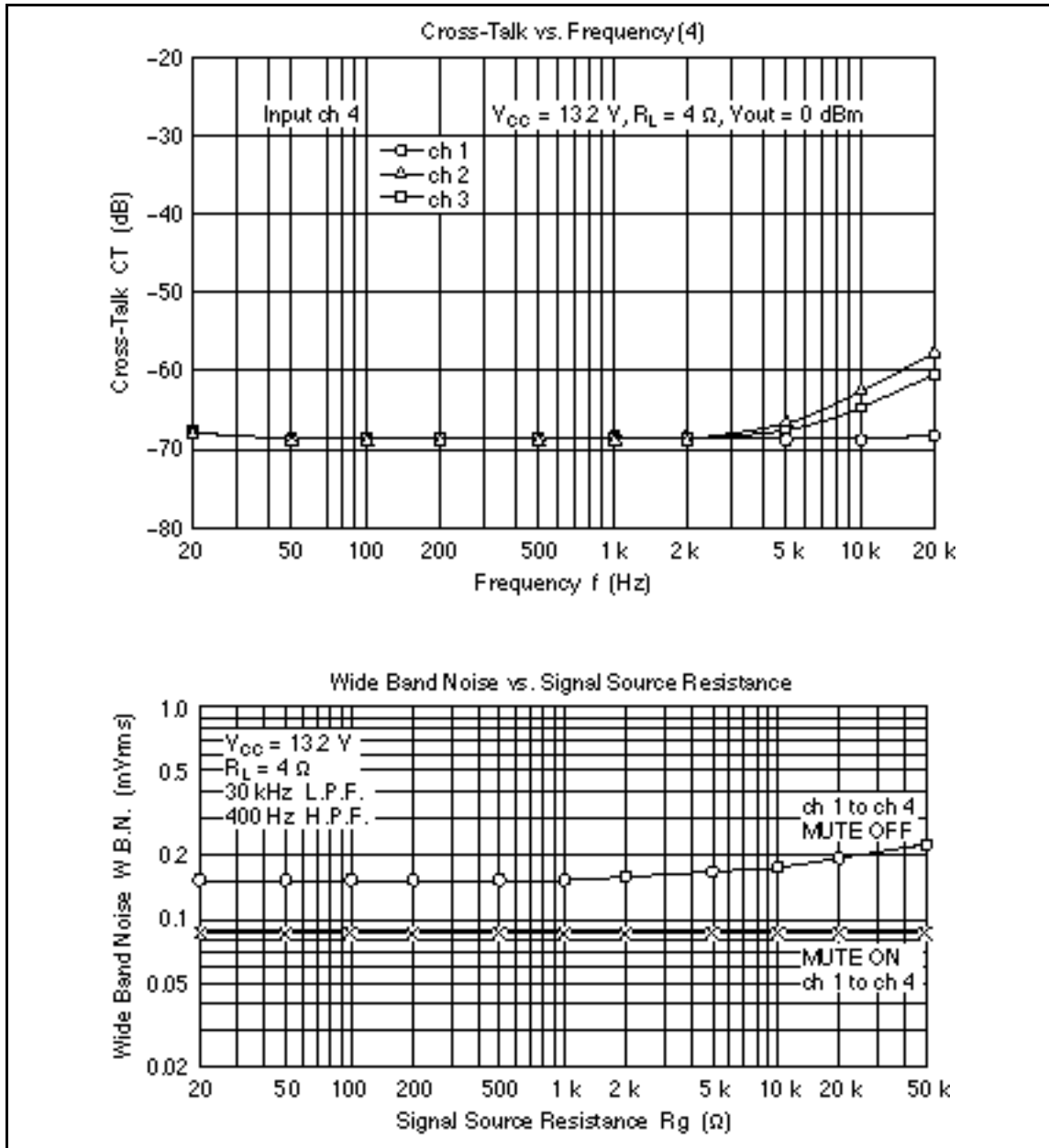
C ( $\mu$ F)	ON Time	OFF Time
nothing	under 1 $\mu$ s	under 1 $\mu$ s
0.47	2 ms	2 ms
4.7	19 ms	19 ms



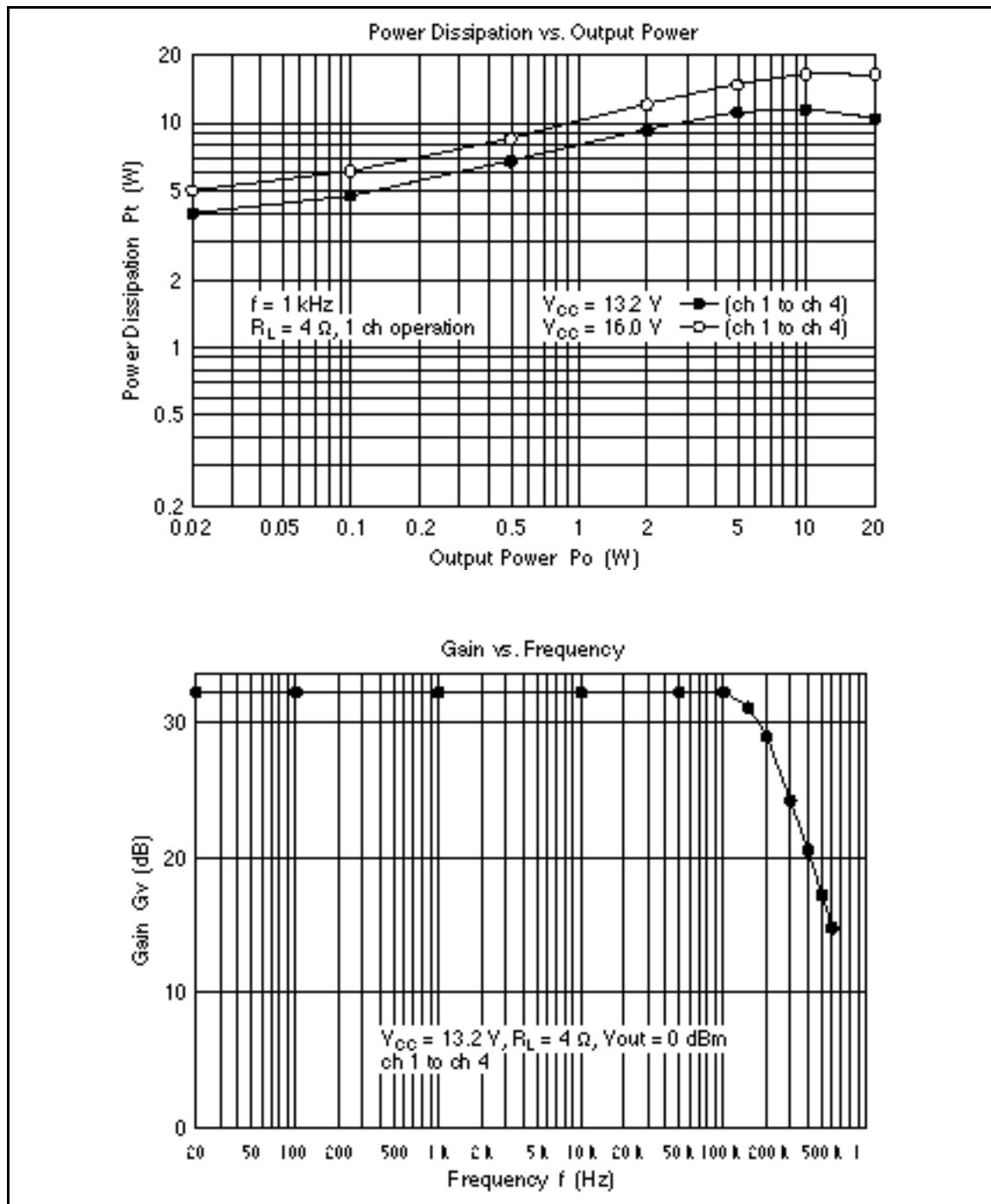








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