
HA13159

37 W × 4-Channel BTL Power IC

HITACHI

ADE-207-264A (Z)

2nd Edition
Jul. 1999

Description

The HA13159 is four-channel BTL amplifier IC designed for car audio, featuring high output and low distortion, and applicable to digital audio equipment. It provides 37 W output per channel, with a 13.7 V power supply and at Max distortion.

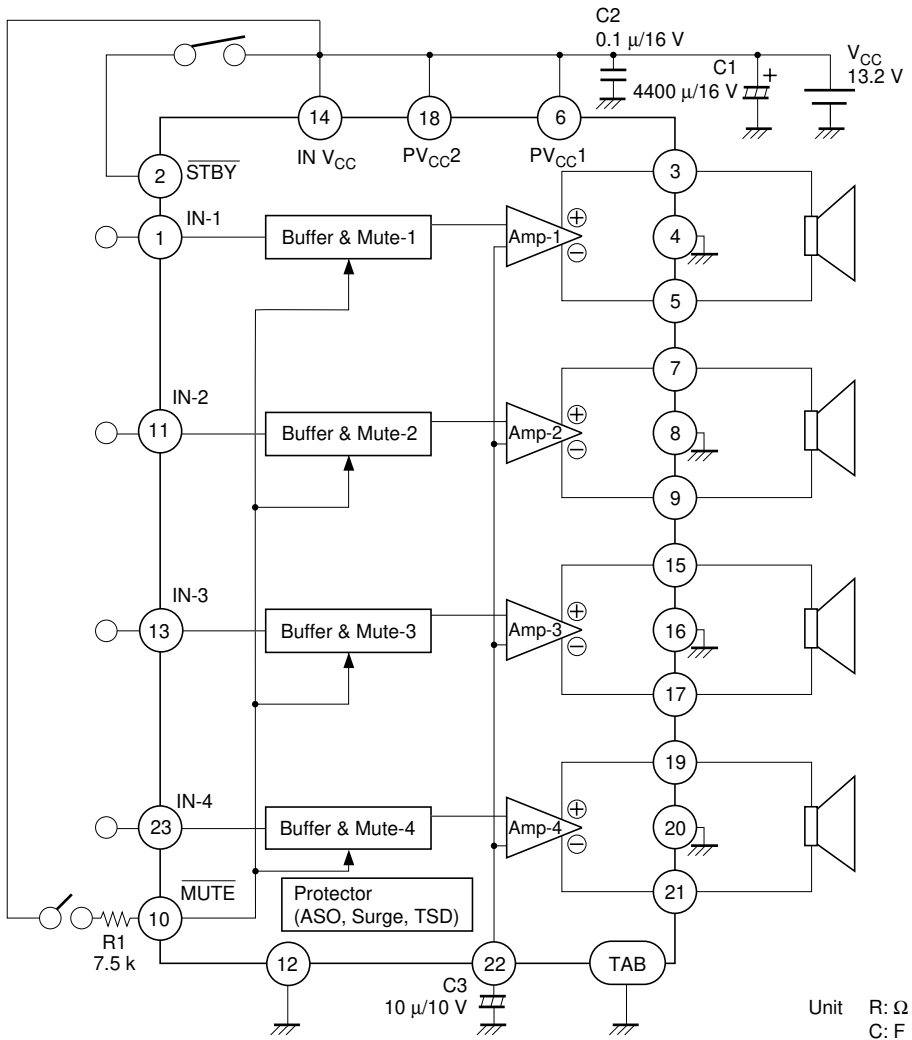
Functions

- 4 ch BTL power amplifiers
- Built-in standby circuit
- Built-in muting circuit
- Built-in protection circuit (surge, T.S.D and ASO)

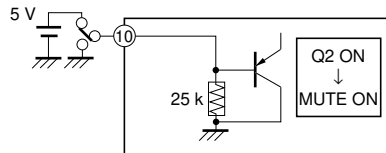
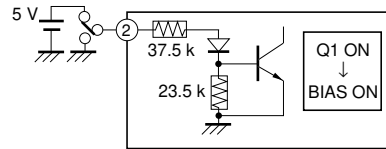
Features

- Low power dissipation
- Soft thermal limiter
- Requires few external parts (C:3, R:1)
- Popping noise minimized
- Low output noise
- Built-in high reliability protection circuit
- Pin to pin with HA13153A/HA13154A/HA13155/HA13157/HA13158/HA13158A

Block Diagram



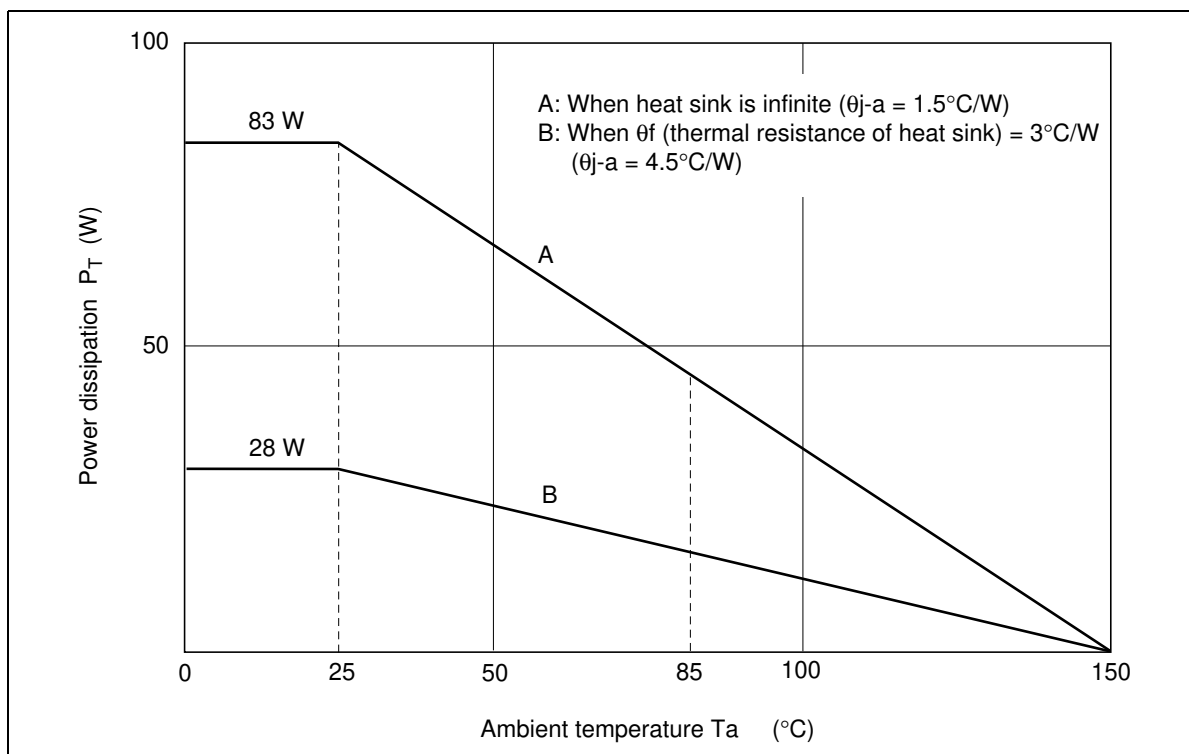
- Notes:
- Standby**
 Power is turned on when a signal of 3.5 V or 0.05 mA is impressed at pin 2. When pin 2 is open or connected to GND, standby is turned on (output off).
 - Muting**
 Muting is turned off (output on) when a signal of 3.5 V or 0.2 mA is impressed at pin 10. When pin 10 is open or connected to GND, muting is turned on (output off).
 - TAB** (header of IC) connected to GND.



Absolute Maximum Ratings

Item	Symbol	Rating	Unit
Operating supply voltage	V_{CC}	18	V
Supply voltage when no signal*1	V_{CC} (DC)	26	V
Peak supply voltage*2	V_{CC} (PEAK)	50	V
Output current*3	I_o (PEAK)	4	A
Power dissipation*4	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

- Note:
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 $T_a = 25\text{ °C}$.
The derating curve is as shown in the graph below.



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Electrical Characteristics ($V_{CC} = 13.2 \text{ V}$, $f = 1 \text{ kHz}$, $R_L = 4 \Omega$, $R_g = 600 \Omega$, $T_a = 25^\circ\text{C}$)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Quiescent current	I_{O1}	—	220	—	mA	$V_{in} = 0$
Output offset voltage	ΔV_O	-180	0	+180	mV	
Gain	G_V	30.5	32	33.5	dB	
Gain difference between channels	ΔG_V	-1.0	0	+1.0	dB	
Rated output power	P_O	—	22	—	W	$V_{CC} = 13.2 \text{ V}$, THD = 10%, $R_L = 4 \Omega$
Max output power	P_{OMAX}	—	37	—	W	$V_{CC} = 13.7 \text{ V}$, $R_L = 4 \Omega$
Total harmonic distortion	T.H.D.	—	0.03	—	%	$P_o = 3 \text{ W}$
Output noise voltage	WBN	—	0.15	—	mVrms	$R_g = 0 \Omega$, BW = 20 to 20 kHz
Ripple rejection	SVR	—	55	—	dB	$f = 120 \text{ Hz}$
Channel cross talk	C.T.	—	70	—	dB	$V_{out} = 0 \text{ dBm}$
Input impedance	R_{in}	—	25	—	k Ω	
Standby current	I_{O2}	—	—	10	μA	
Standby control voltage (high)	V_{STH}	3.5	—	V_{CC}	V	
Standby control voltage (low)	V_{STL}	0	—	1.5	V	
Muting control voltage (high)	V_{MH}	3.5	—	V_{CC}	V	
Muting control voltage (low)	V_{ML}	0	—	1.5	V	
Muting attenuation	ATTM	—	70	—	dB	$V_{out} = 0 \text{ dBm}$

Pin Explanation

Pin No.	Symbol	Functions	Input Impedance	DC Voltage	Equivalence Circuit
1	IN1	CH1 INPUT	25 kΩ (Typ)	0 V	
11	IN2	CH2 INPUT			
13	IN3	CH3 INPUT			
23	IN4	CH4 INPUT			
2	STBY	Standby control	90 kΩ (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 kΩ (Typ)	—	
22	RIPPLE	Bias stability	—	V _{cc} /2	

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Pin Explanation (cont)

Pin No.	Symbol	Functions	Input Impedance	DC Voltage	Equivalence Circuit
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.
- 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.

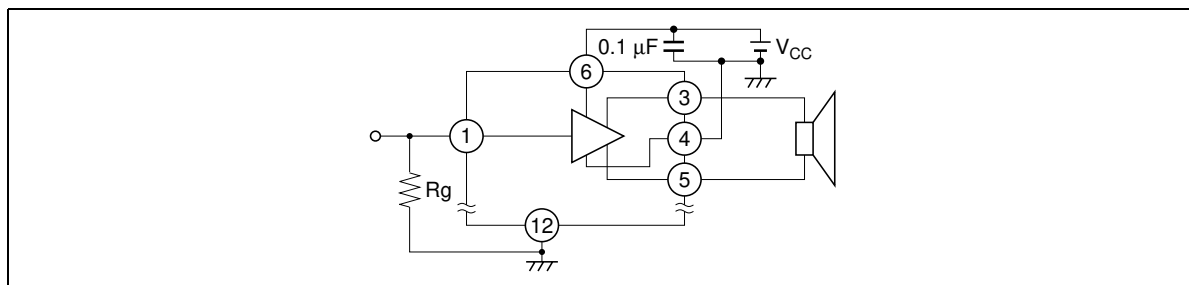


Figure 1 Notes on Application Board's Pattern Design

2. How to Reduce the Popping Noise by Muting Circuit

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

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 $1 \mu\text{F}$.

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

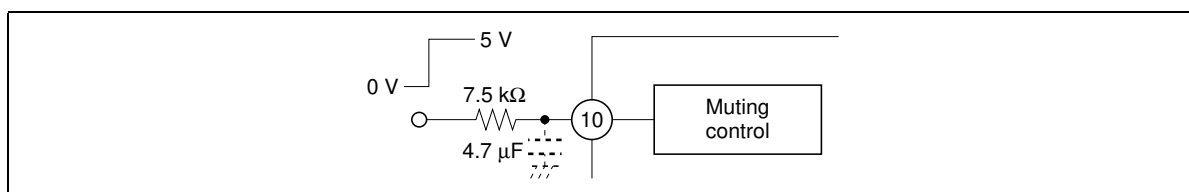
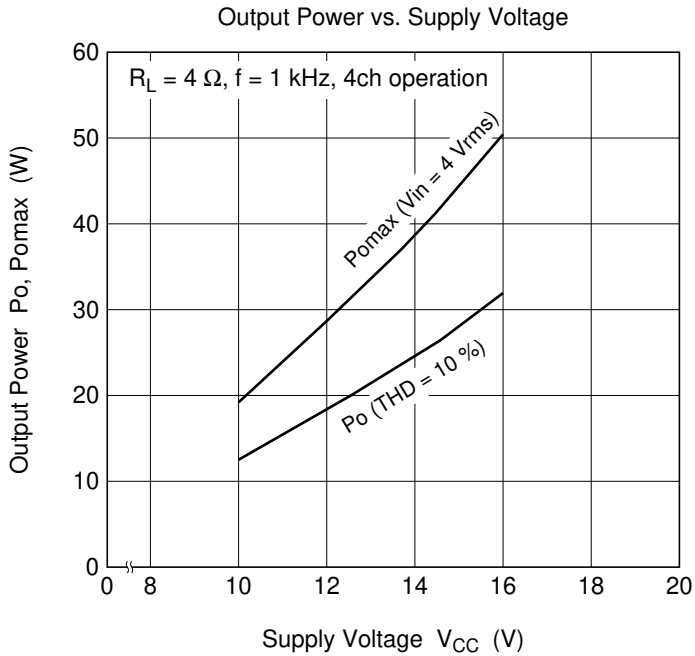
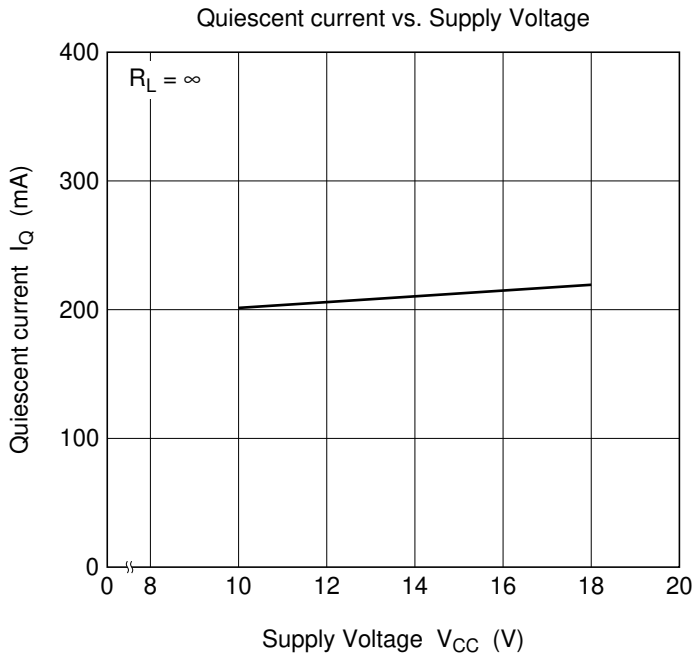


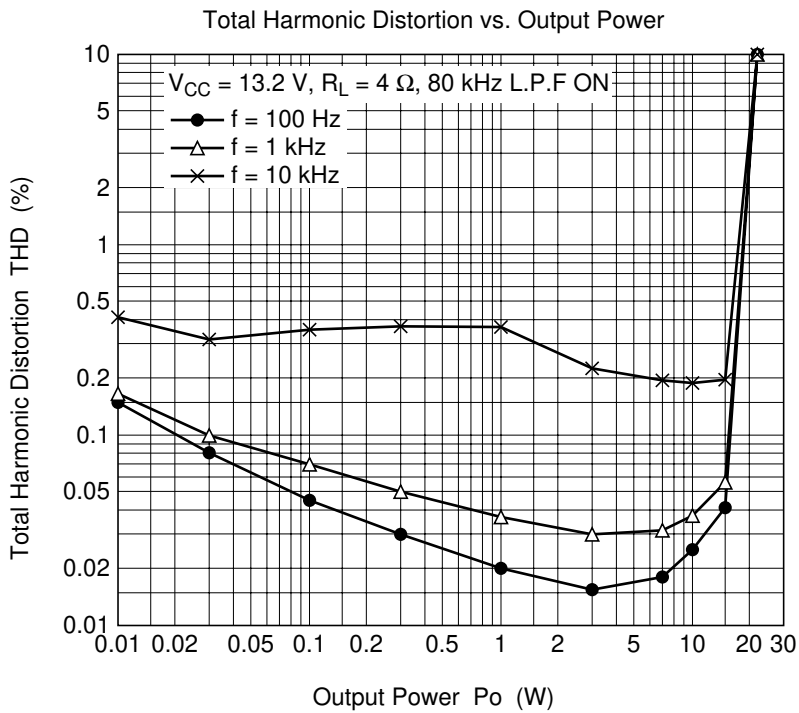
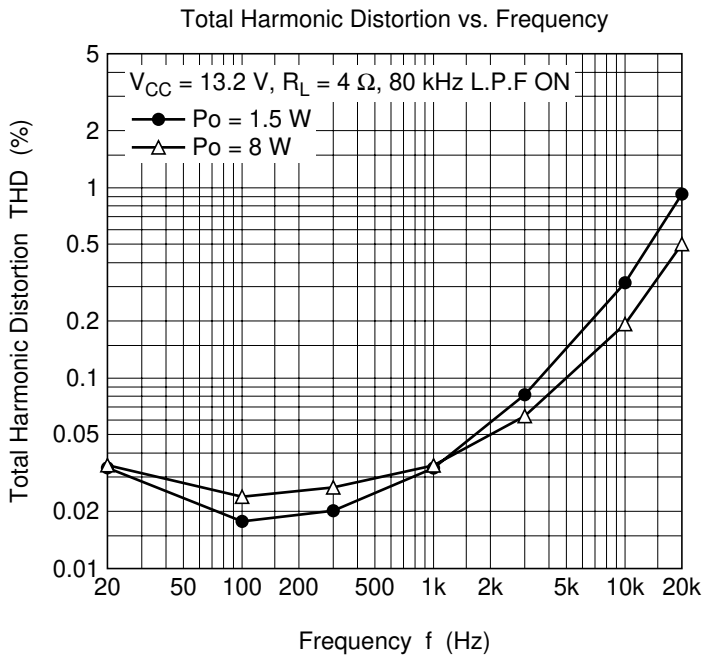
Figure 2 How to use Muting Circuit

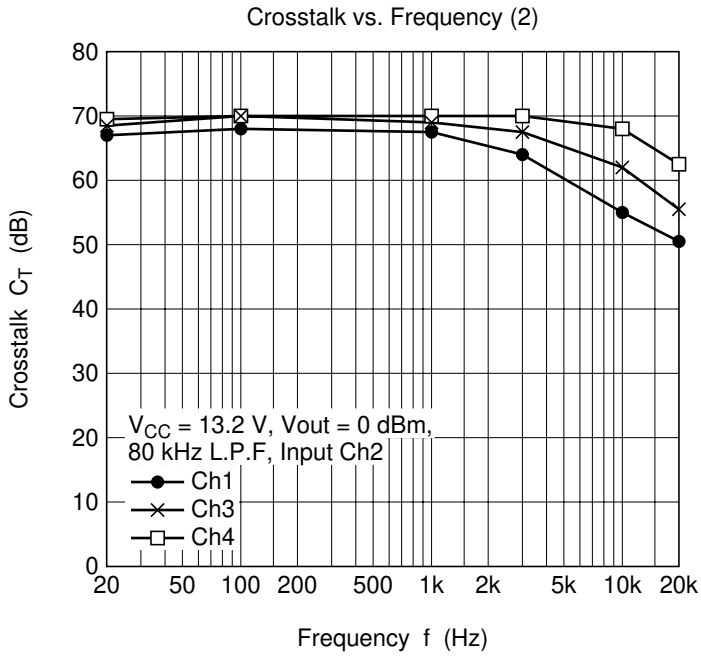
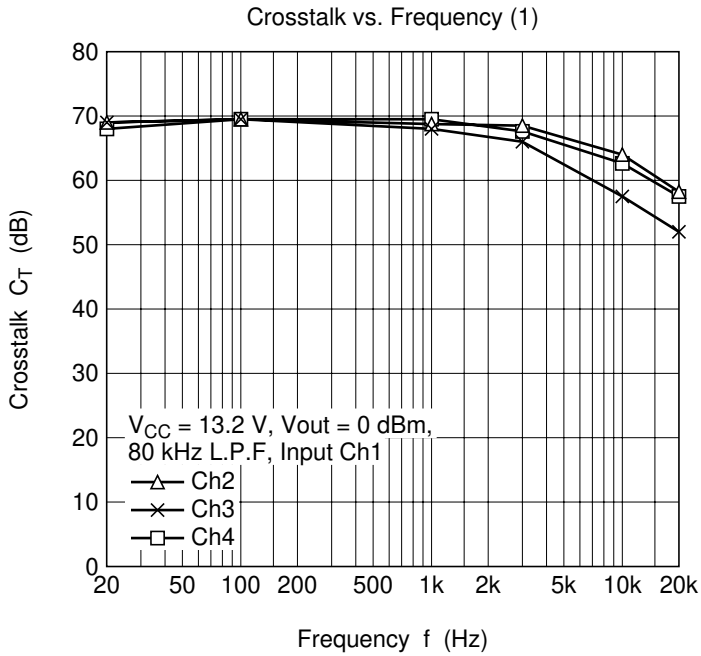
Table 1 Muting ON/OFF Time

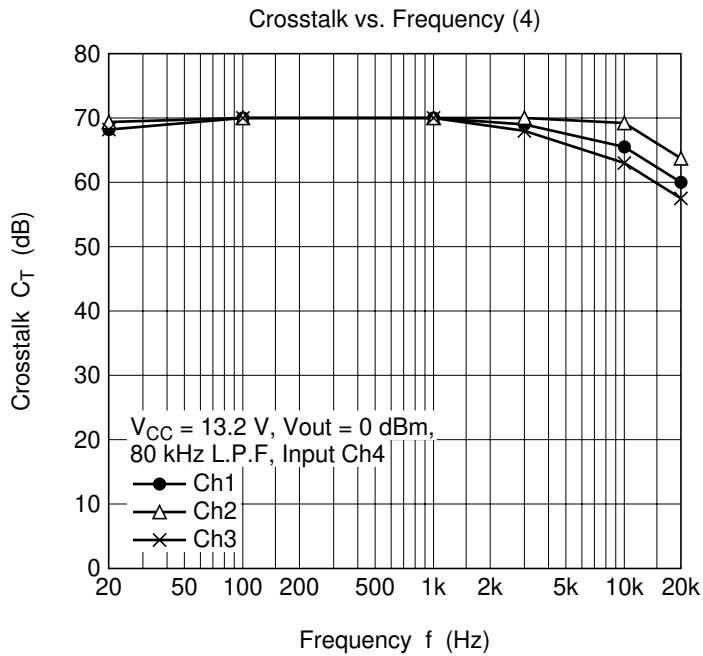
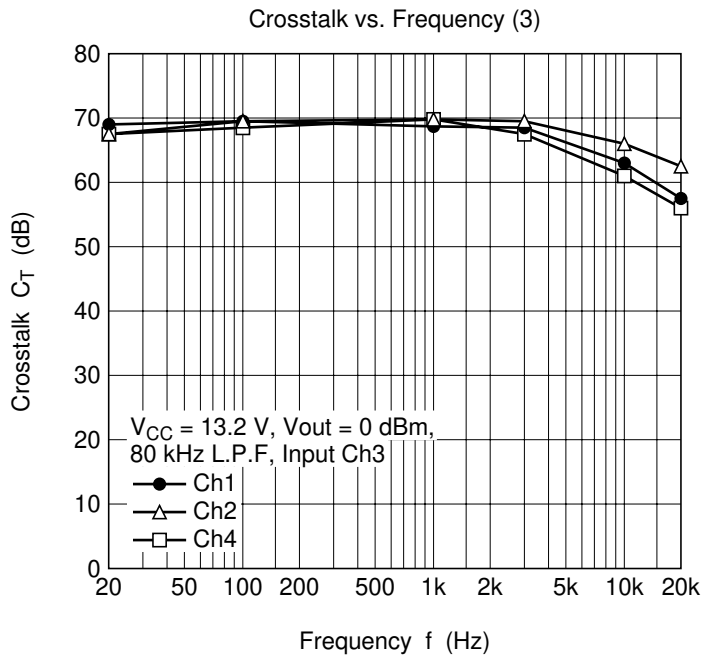
C (μF)	ON Time	OFF Time
nothing	under $1 \mu\text{s}$	under $1 \mu\text{s}$
0.47	2 ms	2 ms
4.7	19 ms	19 ms

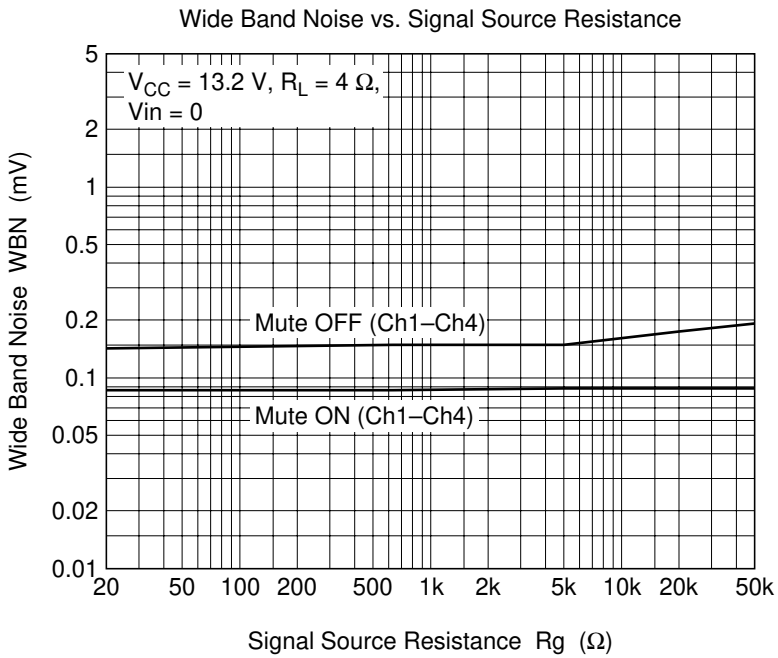
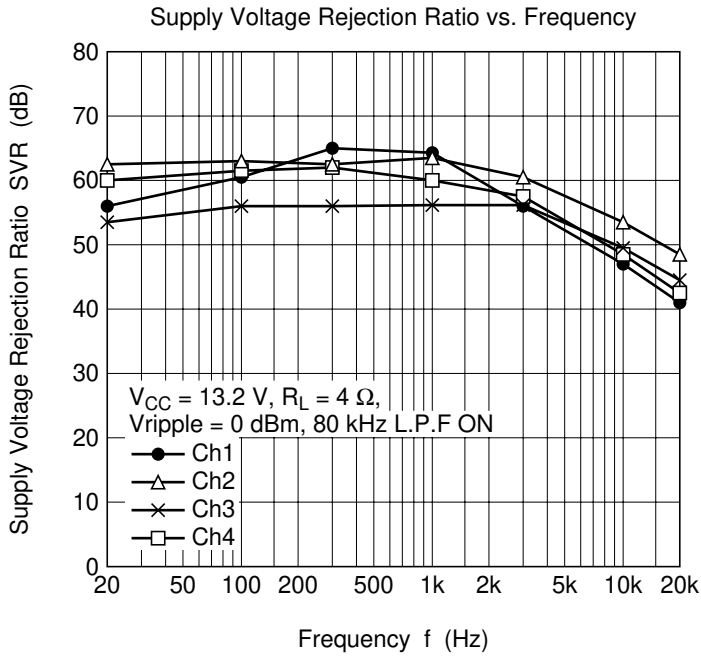
Characteristic Curves

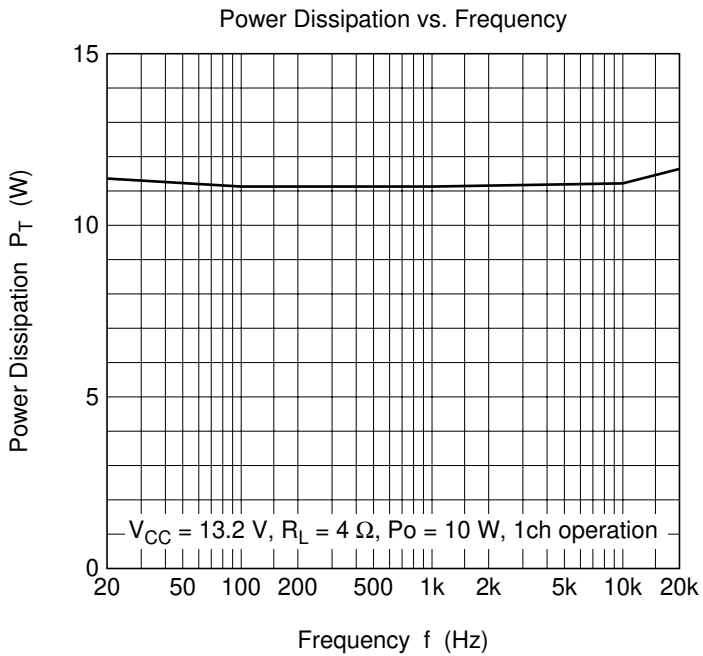
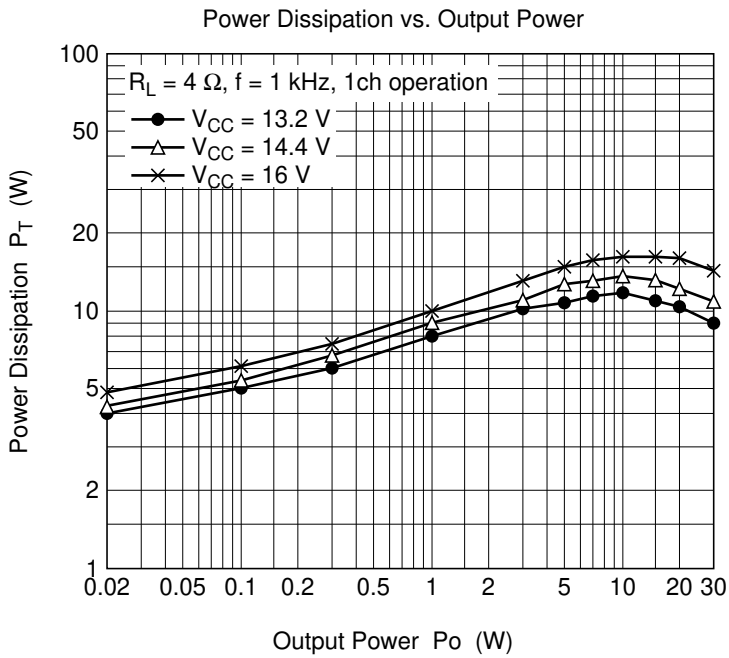












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