HA13158

34 W × 4-Channel BTL Power IC

HITACHI

ADE-207-243
1st. Edition

Description

The HA13158 is four-channel BTL amplifier IC designed for car audio, featuring high output and low distortion, and applicable to digital audio equipment. It provides 34 W output per channel, with a 13.7 V power supply and at Max distortion.

Functions

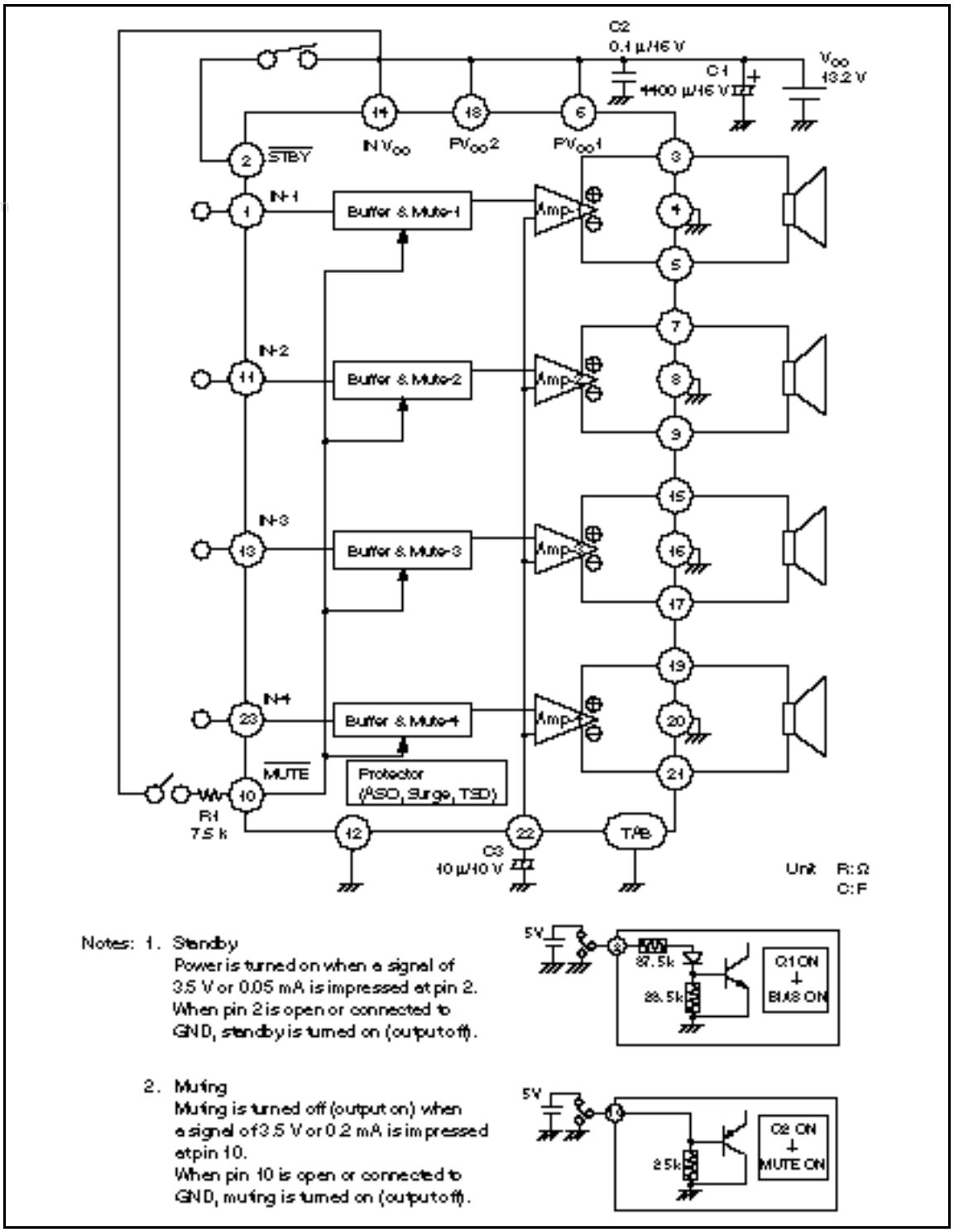
- 4 ch BTL power amplifiers
- Built-in standby circuit
- Built-in muting circuit
- Built-in protection circuit (surge, and ASO)

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 HA13150A/HA13151/HA13152/HA13153/HA13155/HA13157

Hitachi semiconductor

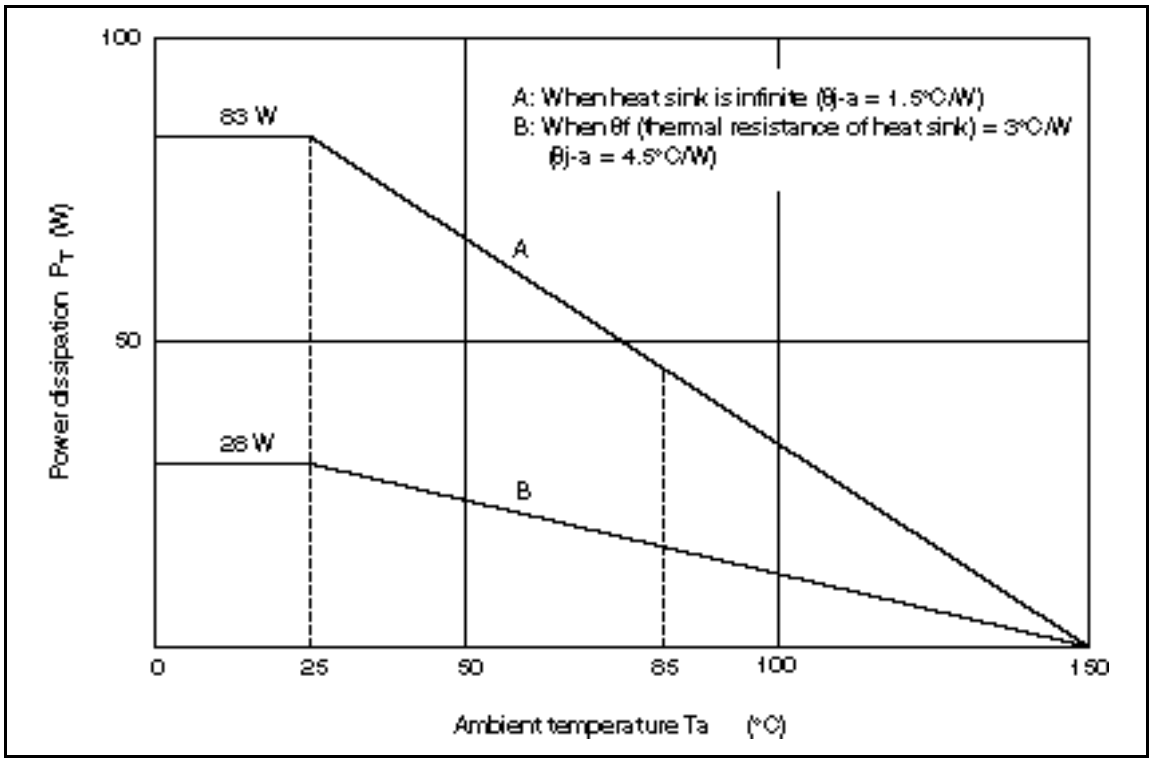
Block Diagram



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	Tj	150	°C
Operating temperature	Topr	–30 to +85	°C
Storage temperature	Tstg	–55 to +125	°C

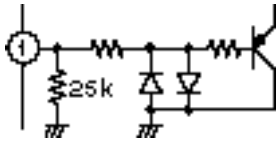
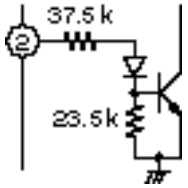
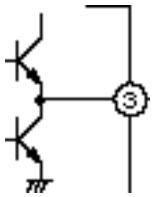
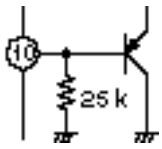
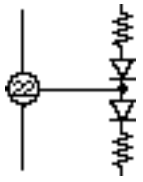
Note: 1. Tolerance within 30 seconds.
2. Tolerance in surge pulse waveform.
3. Value per 1 channel.
4. Value when attached on the infinite heat sink plate at Ta = 25 °C.
The derating carve is as shown in the graph below.



Electrical Characteristics (V_{CC} = 13.2 V, f = 1 kHz, R_L = 4 Ω, Rg = 600 Ω, Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Quiescent current	I_{Q1}	—	240	—	mA	Vin = 0
Output offset voltage	ΔV_Q	–180	0	180	mV	
Gain	G_V	30.5	32	33.5	dB	
Gain difference between channels	ΔG_V	–1.5	0	1.5	dB	
Rated output power	P_O	—	20	—	W	V_{CC} = 13.2 V, THD = 10%, R_L = 4 Ω
Max output power	P_{OMAX}	—	34	—	W	V_{CC} = 13.7 V, R_L = 4 Ω
Total harmonic distortion	T.H.D.	—	0.03	—	%	Po = 3 W
Output noise voltage	WBN	—	0.15	—	mVrms	Rg = 0 Ω, BW = 20 to 20 kHz
Ripple rejection	SVR	—	55	—	dB	f = 120 Hz
Channel cross talk	C.T.	—	70	—	dB	Vout = 0 dBm
Input impedance	Rin	—	25	—	kΩ	
Standby current	I_{Q2}	—	—	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	Vout = 0 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	

Pin Explanation (cont)

Pin No.	Symbol	Functions	Input Impedance	DC Voltage	Equivalence Circuit
6	$PV_{CC}1$	Power of output stage	—	V_{CC}	—
18	$PV_{CC}2$				
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 µF) close to IC.
- It is better to place the grounding of resistor (Rg), between input line and ground, close to INGND (Pin 12) because if OUTGND is connected to the line between Rg and INGND, THD will become worse due to current from OUTGND.

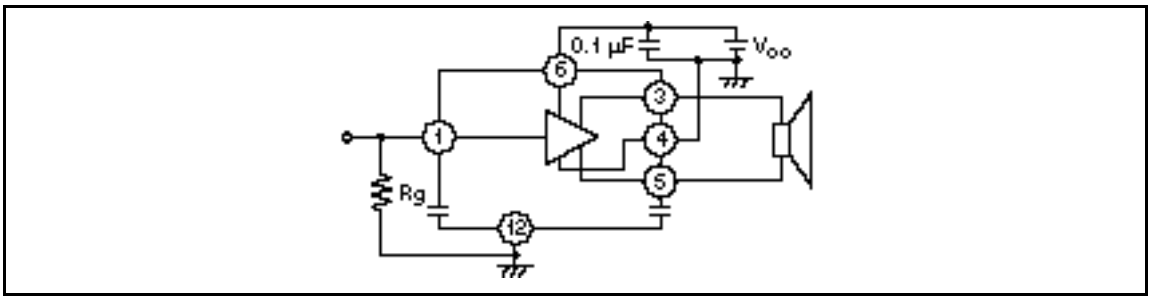


Figure 1 Notes on Application Board's Pattern Design

2. How to Reduce the Popping Noise by Muting Circuit

   At normal operating circuit, Muting circuit operates at high speed under 1 µs.

   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 then 1 µF.

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

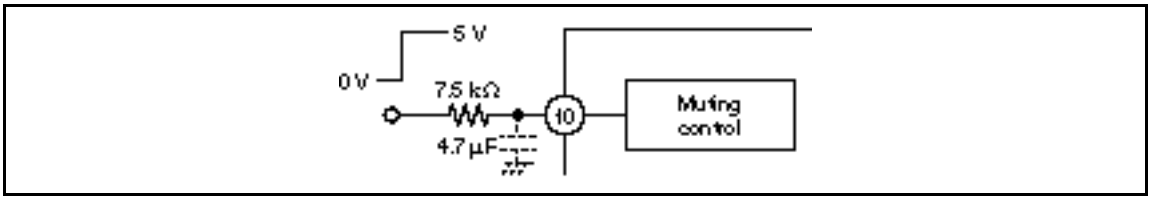
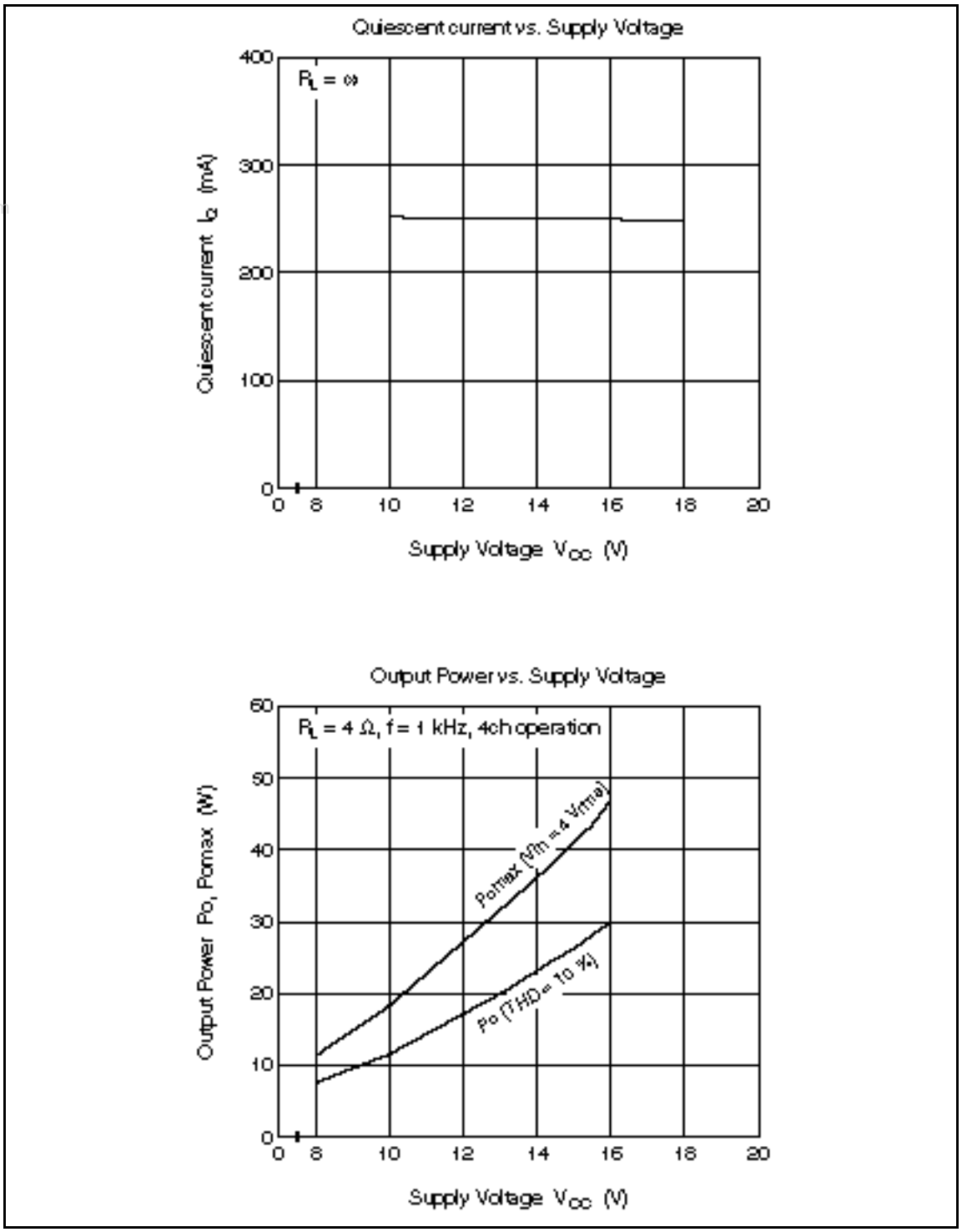


Figure 2 How to use Muting Circuit

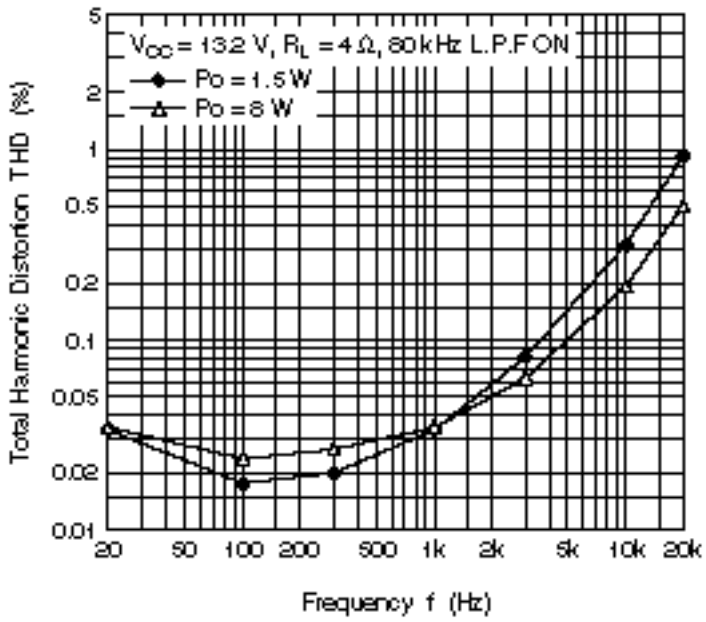
Table 1 Muting ON/OFF Time

C (µF)	ON Time	OFF Time
nothing	under 1 µs	under 1 µs
0.47	2 ms	2 ms
4.7	19 ms	19 ms

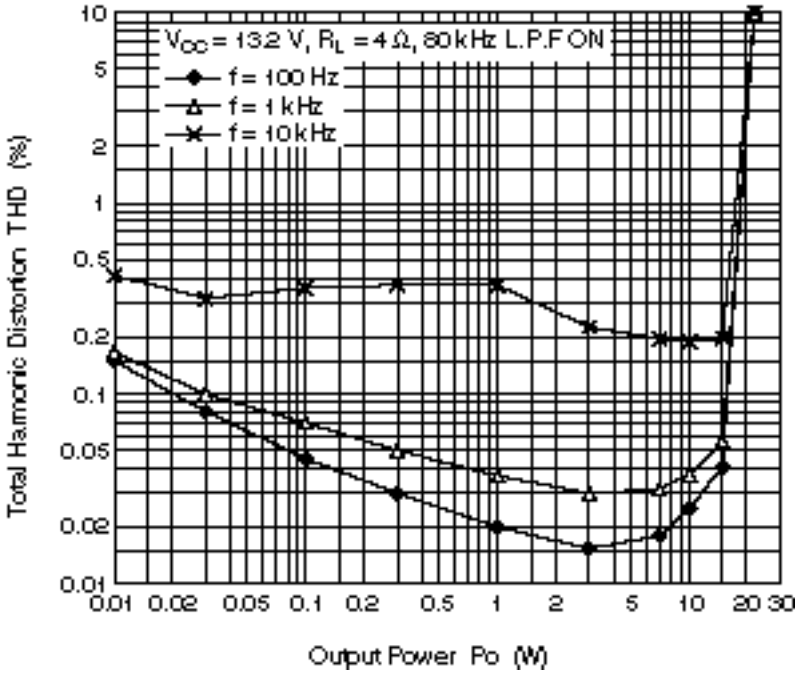
Characteristic Curves



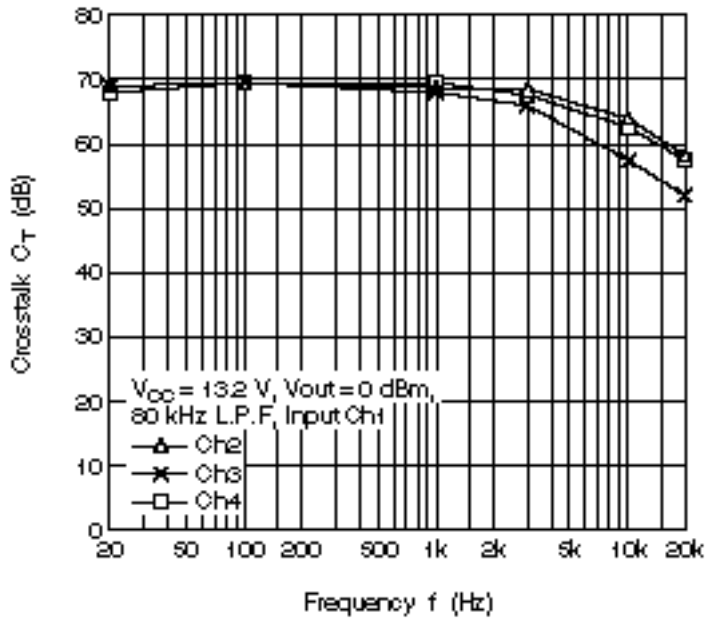
Total Harmonic Distortion vs. Frequency



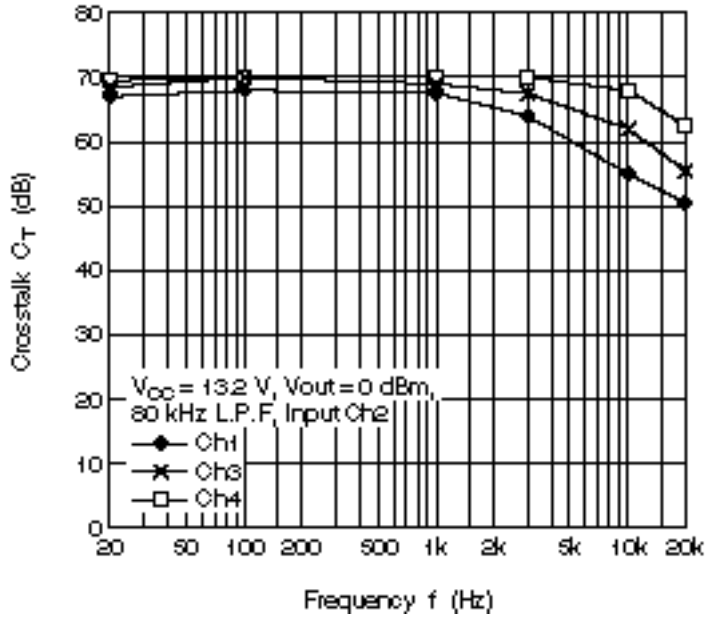
Total Harmonic Distortion vs. Output Power



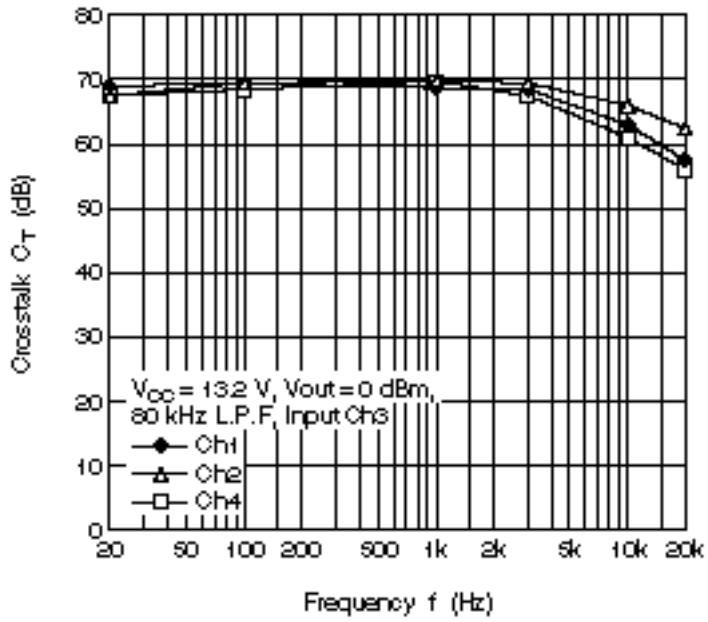
Crosstalk vs. Frequency (1)



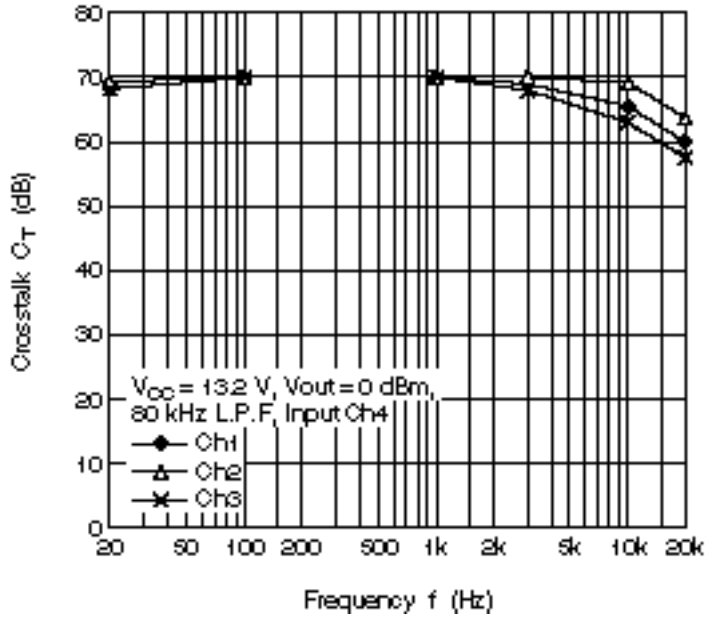
Crosstalk vs. Frequency (2)



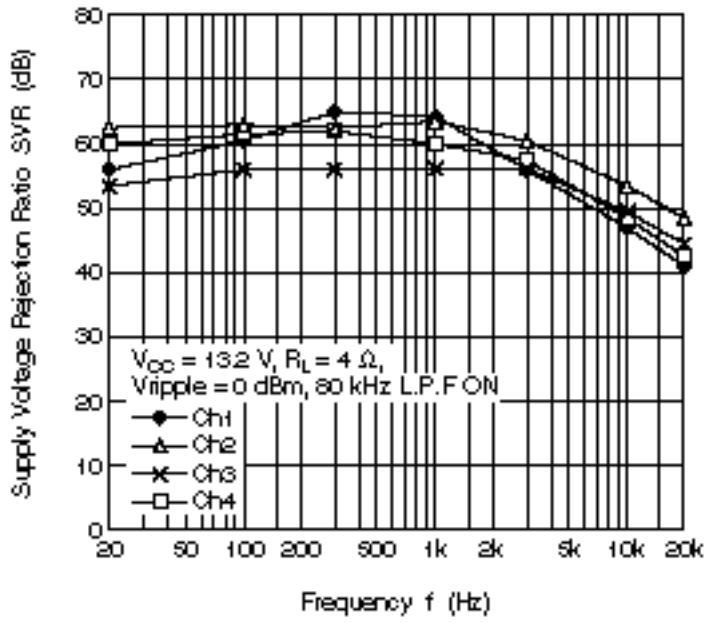
Crosstalk vs. Frequency (3)



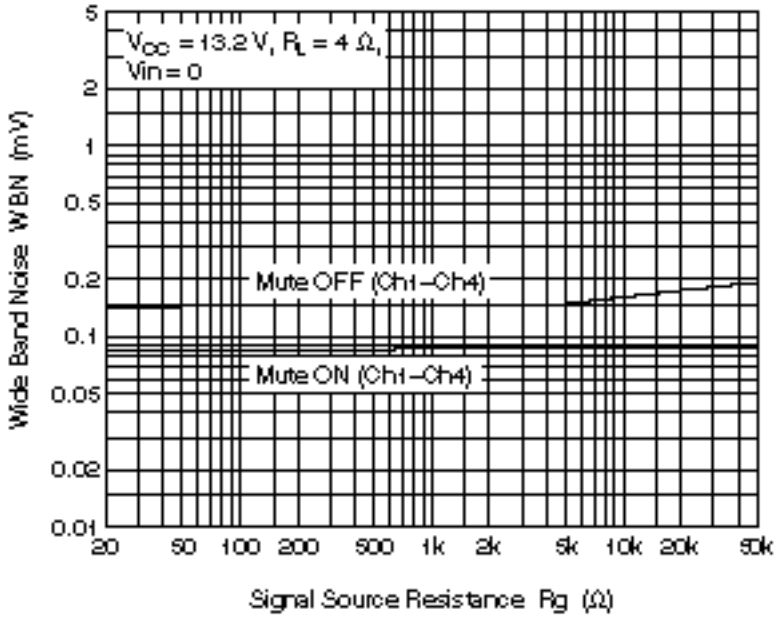
Crosstalk vs. Frequency (4)



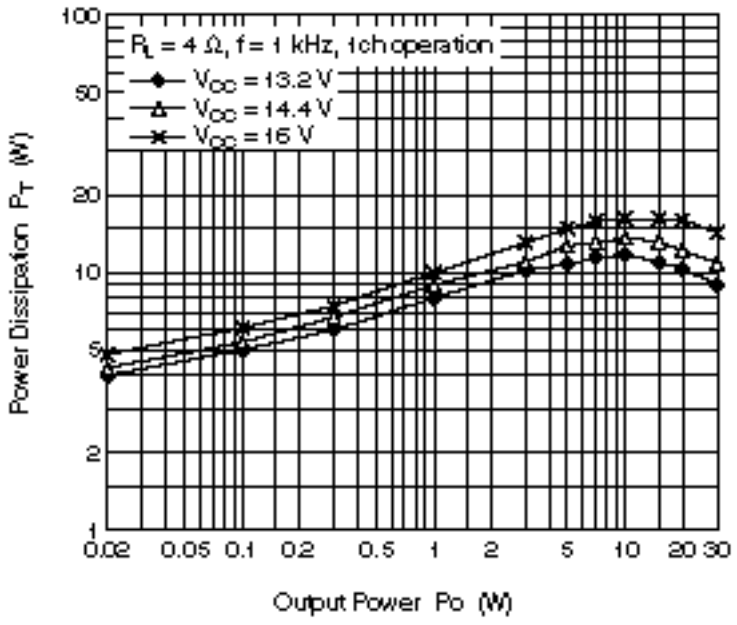
Supply Voltage Rejection Ratio vs. Frequency



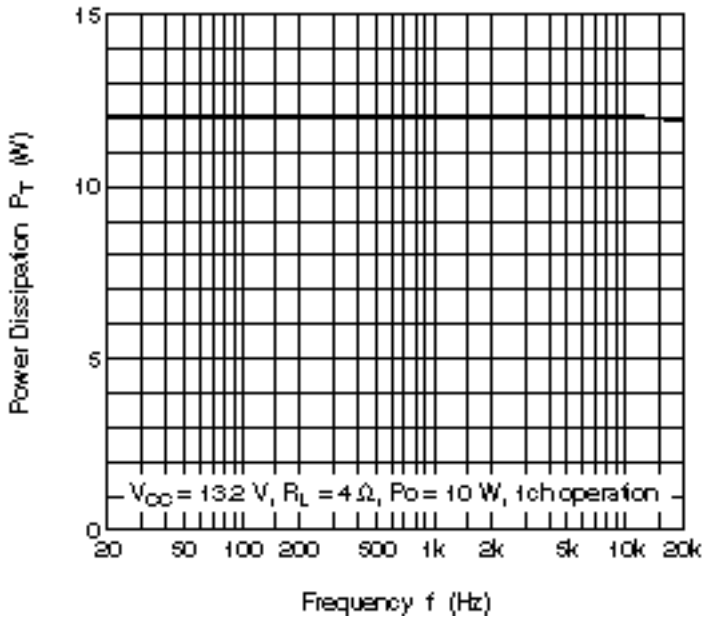
Wide Band Noise vs. Signal Source Resistance



Power Dissipation vs. Output Power

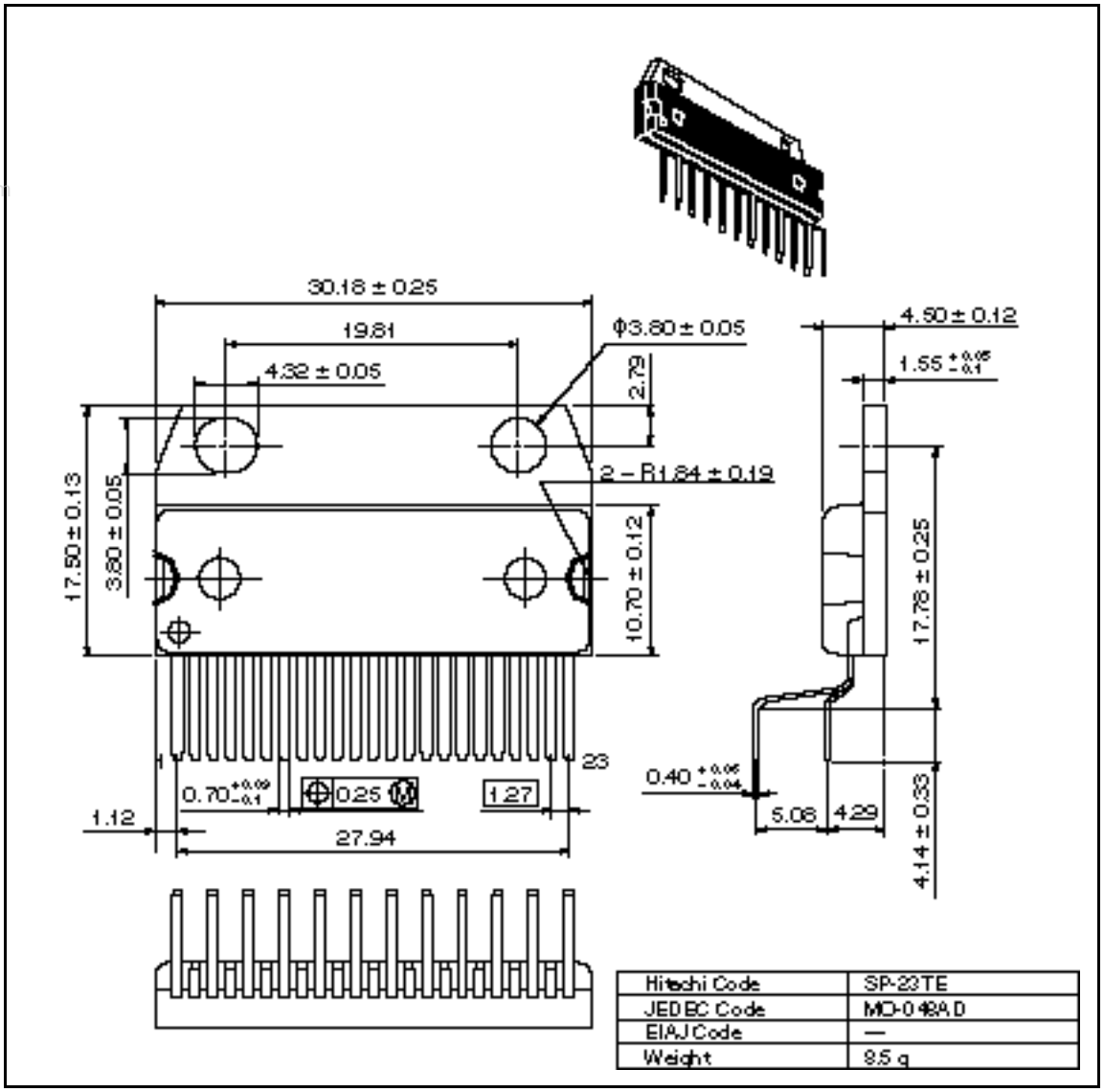


Power Dissipation vs. Frequency



Package Dimensions

Unit: mm



Hitachi Code	SP-23TE
JEDEC Code	MO-048AD
EIAJ Code	—
Weight	9.5 g

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HITACHI

Hitachi, Ltd.
Semiconductor & IC Div.
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100, Japan
Tel: Tokyo (03) 3270-2111
Fax: (03) 3270-5109

For further information write to:

Hitachi America, Ltd.
Semiconductor & IC Div.
2000 Sierra Point Parkway
Brisbane, CA. 94005-1835
U.S.A.
Tel: 415-589-8300
Fax: 415-583-4207

Hitachi Europe GmbH
Electronic Components Group
Continental Europe
Dornacher Straße 3
D-85622 Feldkirchen
München
Tel: 089-9 91 80-0
Fax: 089-9 29 30 00

Hitachi Europe Ltd.
Electronic Components Div.
Northern Europe Headquarters
Whitebrook Park
Lower Cookham Road
Maidenhead
Berkshire SL6 8YA
United Kingdom
Tel: 0628-585000
Fax: 0628-778322

Hitachi Asia Pte. Ltd.
16 Collyer Quay #20-00
Hitachi Tower
Singapore 0104
Tel: 535-2100
Fax: 535-1533

Hitachi Asia (Hong Kong) Ltd.
Unit 706, North Tower,
World Finance Centre,
Harbour City, Canton Road
Tsim Sha Tsui, Kowloon
Hong Kong
Tel: 27359218
Fax: 27306071