HA12207NT

Audio Signal Processor for Cassette Deck

HITACHI

ADE-207-197B (Z)

3rd Edition
Jun. 1999

Description

HA12207NT is silicon monolithic bipolar IC providing PB equalizer, REC equalizer system and each electronic control switch in one chip.

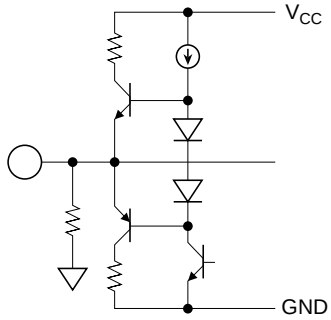
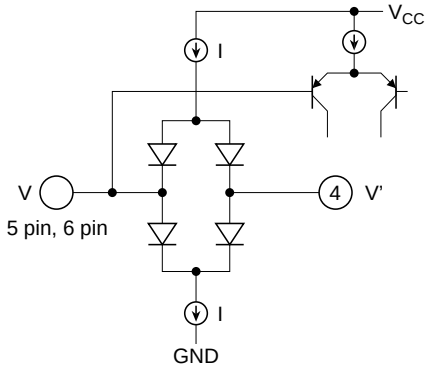
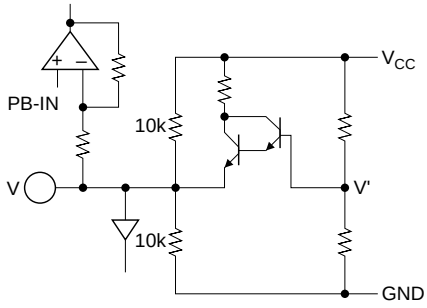
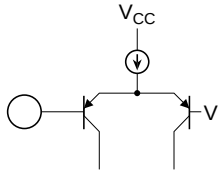
Functions

- PB equalizer × 2 channel
- REC equalizer × 2 channel
- Each electronic control switch to change REC/PB etc.
- REC MUTE
- REC head return switch

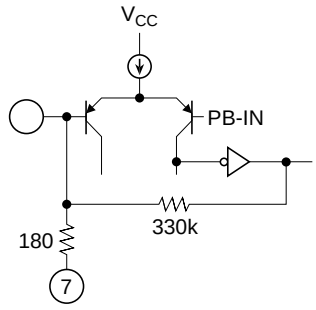
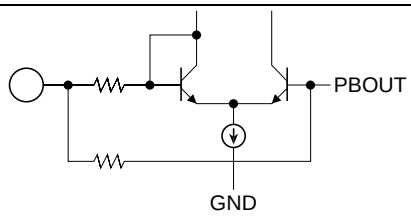
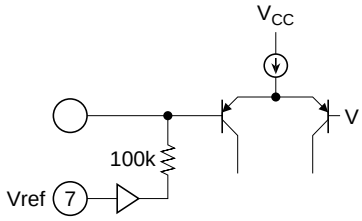
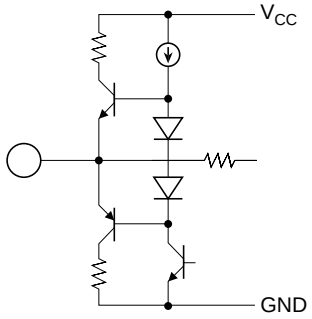
Features

- REC equalizer is very small number of external parts, built-in 2 types of frequency characteristics.
- PB equalizer circuit built-in.
- REC /PB of high speed mode are possible with TYPE 1(Normal tape).
- Controllable from direct micro-computer output.
- Available to reduce substrate-area because of high integration and small external parts.
- As the pins arrangement resembles HA12185NT, it can design the board that is replaced with HA12185NT.

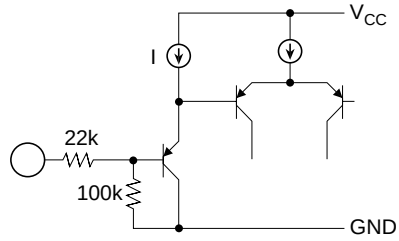
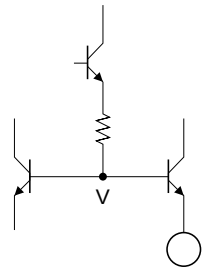
Pin Description, Equivalent Circuit (V_{CC} = 10.5V, Vref = 5.6V, Ta = 25°C, No signal, The value in the table show typical value.)

Pin No.	Pin Name	Note	Equivalent Circuit	Pin Description
1	V_{cc}	V = V_{cc}		V_{cc} pin
2	RECOUT (L)	V = Vref		REC-EQ output
3	RECOUT (R)			
4	REC-RETURN	V = Vref V '= Vref		REC return
5	PB-IN B (L)			PB B Deck input
6	PB-IN B (R)			
7	VREF	V = Vref V' = V_{cc} / 2		Reference
8	PB-IN A (L)	V = Vref		PB A deck input
9	PB-IN A (R)			

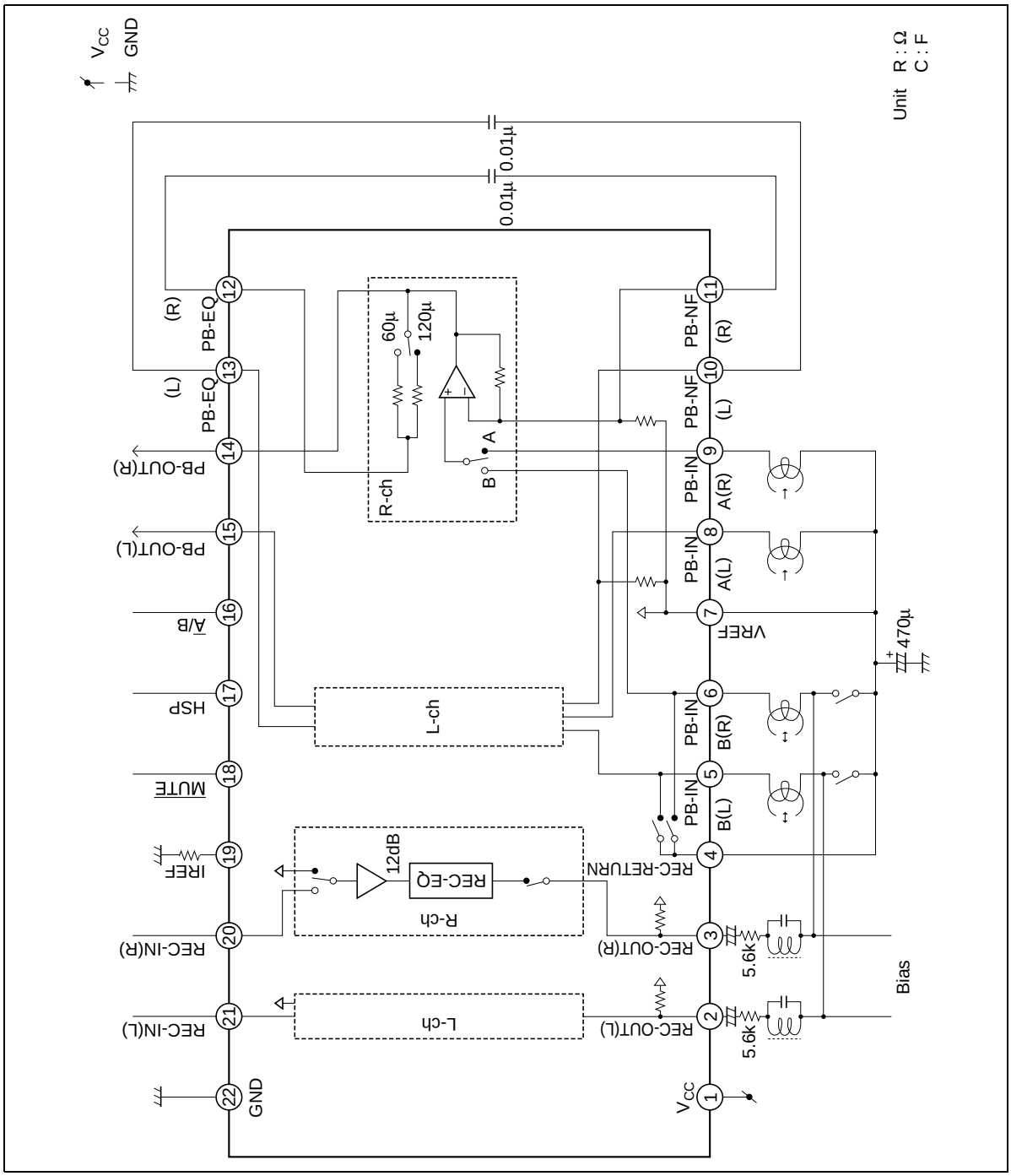
Pin Description, Equivalent Circuit (V_{CC} = 10.5V, Vref = 5.6V, Ta = 25°C, No signal, The value in the table show typical value.)

Pin No.	Pin Name	Note	Equivalent Circuit	Pin Description
10	PB-NF (L)	PB-IN = Vref		PB EQ feed back
11	PB-NF (R)			
12	PB-EQ (L)	PBOUT = Vref		NAB output
13	PB-EQ (R)			
20	REC IN (R)	V = Vref		REC-EQ input
21	REC IN (L)			
14	PBOUT (R)	V = Vref		PB output
15	PBOUT (L)			

Pin Description, Equivalent Circuit (V_{CC} = 10.5V, Vref = 5.6V, Ta = 25°C, No signal, The value in the table show typical value.)

Pin No.	Pin Name	Note	Equivalent Circuit	Pin Description
16	$\overline{A}$/B	I = 20μA		Mode control input
17	HSP			
18	$\overline{MUTE}$			
19	IREF	V = 1.9V		Equalizer reference current input
22	GND			GND pin

Block Diagram



Parallel Data Format

Pin No.	Pin Name	L	H
17	HSP	Normal *	Hi speed
16	$\overline{A}$/B	Ain active *	Bin active
		Return SW ON *	Return SW OFF
		REC OUT active *	REC OUT HIZ
18	$\overline{MUTE}$	MUTE ON *	MUTE OFF

Note: Unforced pin state

Functional Description

Power Supply Range

HA12207NT is designed to operate on single supply, shown by table 1.

Table 1 Supply Voltage

Item	Power Supply Range
Single Supply	9.5V to 15.0V

Reference Voltage

As AC reference (Vref) of this IC has not a current drivability, Vref fluctuates by A/B switching of PB-EQ. Provided it causes you anxiety, please supply 7 pin with approximate 1/2 V_{CC} voltage.
For example, a suitable circuit is shown by figure 1.
This IC has a capacitor charger for the Vref, indicated to the pin interface circuit figure.

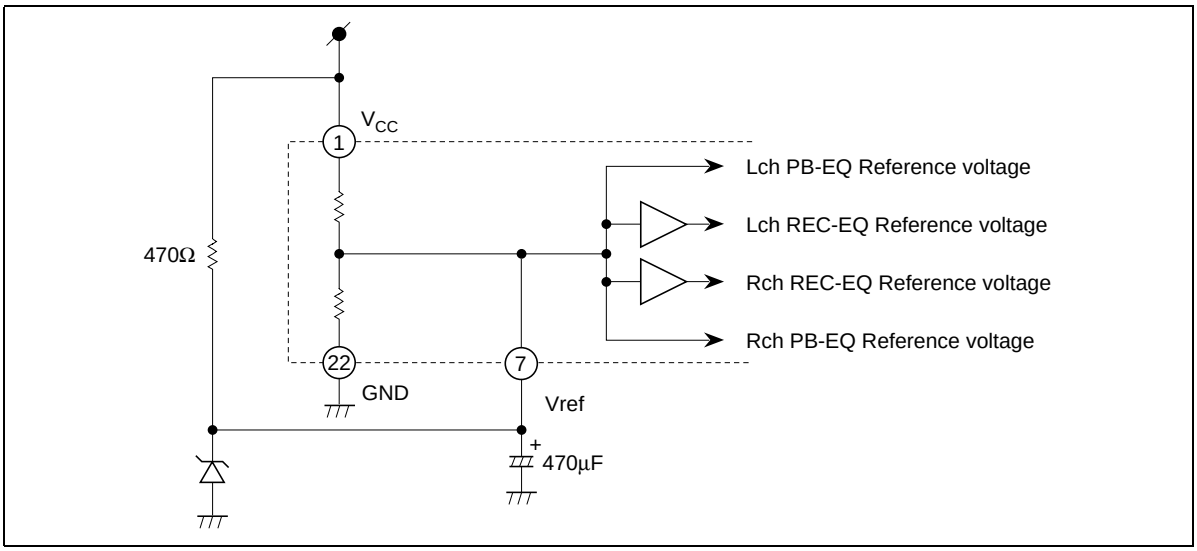


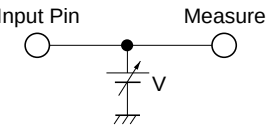
Figure 1 Reference Voltage Circuit

Operating Mode Control

HA12207NT provides fully electronic switching circuits. And each operating mode control is controlled by parallel data (DC voltage).

Table 2 shows the control voltage of each control input pin.

Table 2 Control Voltage (Vth)

Pin No.	Lo	Hi	Unit	Test Condition
16, 17	0.0 to 1.0	4.0 to V_{cc}	V	
18	0.0 to 3.0	4.0 to V_{cc}	V	

Note: 1. Each pin is pulled down with 100kΩ internal resistor. 16 to 18 pins are low-level when each pin is open.
2. Over shoot level and under shoot level of input signal must be the standardized. (High: Less than V_{cc}, Low: More than –0.2V)

Block Diagram

Figure 2 shows the block diagram.

As this IC is built-in REC return switch, the configuration system can be simple system using a few external component and the REC/PB head.

As this IC adopted Hi-z SW of REC-EQ output and the input mute system, it realizes REC mute attenuation and pop-noise reduction securing in REC mute.

About these logics, please look at the Parallel Data Format.

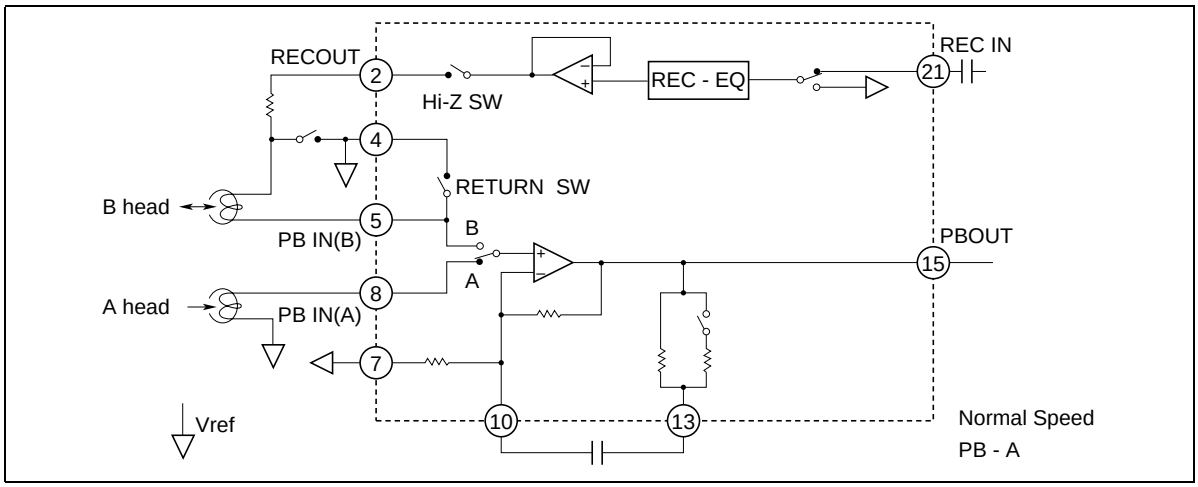


Figure 2 Block Diagram (Lch)

Level Block Diagram

The gain establishment of PB-EQ considers PB output level {(external AMP+PB AMP)=300mV(Dolby Level)} like figure 3 as the target.

Regarding REC-EQ adjust the gain in front of input to this IC.

The level diagram of 1kHz is shown figure 4. (Normal speed)

Similarly to PB, it consider Dolby level as a standard. And R1 needs the value more than 5.6kΩ.

Because mode establishment resistances are built-in, REC-EQ frequency characteristics are respectively fixed value.

In case the change of the frequency characteristics are necessary, please inquire the responsible agent because the adjustment of resistors is necessary.

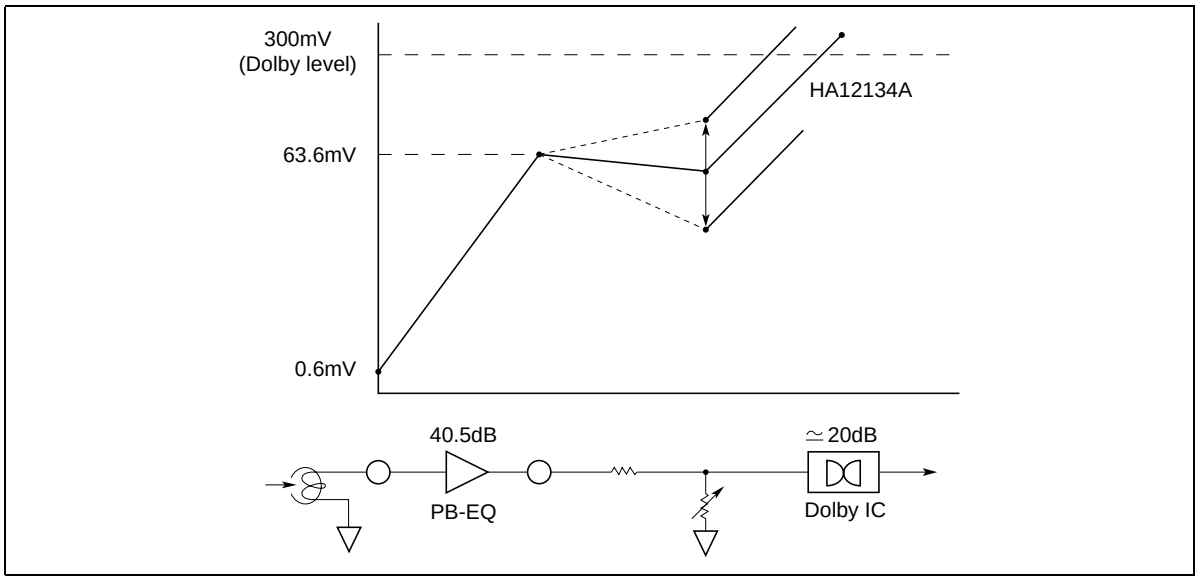


Figure 3 PB Level Block Diagram (Normal Speed, 1kHz)

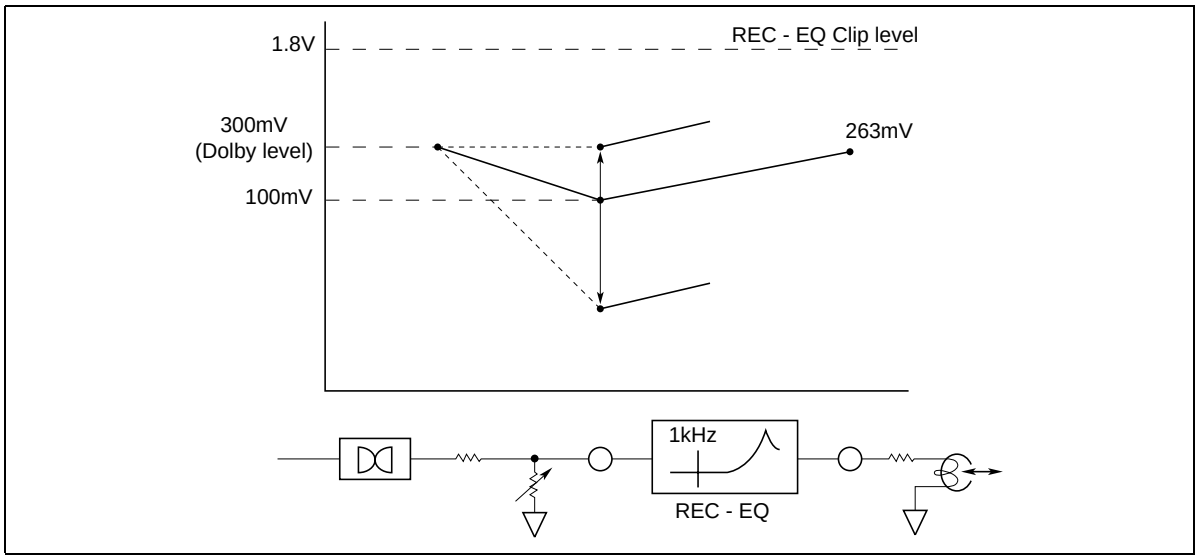


Figure 4 REC Level Block Diagram (Normal Speed, 1kHz)

Absolute Maximum Rating (Ta = 25°C)

Item	Symbol	Rating	Unit	Note
Max supply voltage	V_{CC} max	16	V	
Power dissipation	Pd	500	mW	Ta≤75°C
Operating temperature	Topr	–40 to +75	°C	
Storage temperature	Tstg	–55 to +125	°C	
Operating voltage	Vopr	9.5 to 15	V	

Note: HA12207NT operates on single supply voltage.

Electrical Characteristics (Ta = 25°C, V_{CC} = 10.5V, Vref = 5.25V)

						Test Condition						Application Terminal				
						IC Condition						Input		Output		
Item	Symbol	Min	Typ	Max	Unit	A/B	HSP	MUTE	fin (Hz)	Vin (mVrms)	Other	R	L	R	L	COM
Quiescent current	I_Q	16.0	22.4	32.0	mA	A	Normal	MUTE	—	—	No signal					1
Logical threshold	V_{IL}(1)	-0.2	—	1.0	V	—	—	—	—	—						16, 17
	V_{IL}(2)	-0.2	—	3.0	V	—	—	—	—	—						18
	V_{IH}	4.0	—	V_{CC}	V	—	—	—	—	—						16, 17, 18
PB-REC crosstalk	CT PB/REC(1)	50	60	—	dB	A/B	Normal	Mute OFF	1k	*1	REC-EQ → PB-EQ	20	21	14	15	
	CT PB/REC(2)	60	70	—	dB	A	Normal	Mute OFF	1k	*1	PB-EQ → REC-EQ	9	8	3	2	
PB-EQ gain	G_V PB(1)	37.5	40.5	43.5	dB	A/B	Normal	Mute	1k	0.6		9/6	8/5	14	15	
	G_V PB(2)	33.2	36.2	39.2	dB	A/B	Normal	Mute	10k	0.6		9/6	8/5	14	15	
	G_V PB(3)	27.5	30.5	33.5	dB	A/B	High	Mute	20k	0.6		9/6	8/5	14	15	
PB-EQ maximum output	Vomax PB	0.3	0.6	—	Vrms	A/B	Normal	Mute	1k	—	THD=1%*2	9/6	8/5	14	15	
PB-EQ THD	THD PB	—	0.1	0.5	%	A/B	Normal	Mute	1k	0.6		9/6	8/5	14	15	
PB-EQ noise voltage	V_N PB	—	90	180	µVrms	A/B	Normal	Mute	—	—	Rg=820Ω, DIN-AUDIO	9/6	8/5	14	15	
PB-EQ channel separation	CT R/L(1)	50	60	—	dB	A/B	Normal	Mute	1k	*1		8/5	9/6	14	15	
PB-EQ crosstalk	CT A/B	60	70	—	dB	A	Normal	Mute	1k	*1		6	5	14	15	
						B						9	8			

Note: 1. Large level without clipping

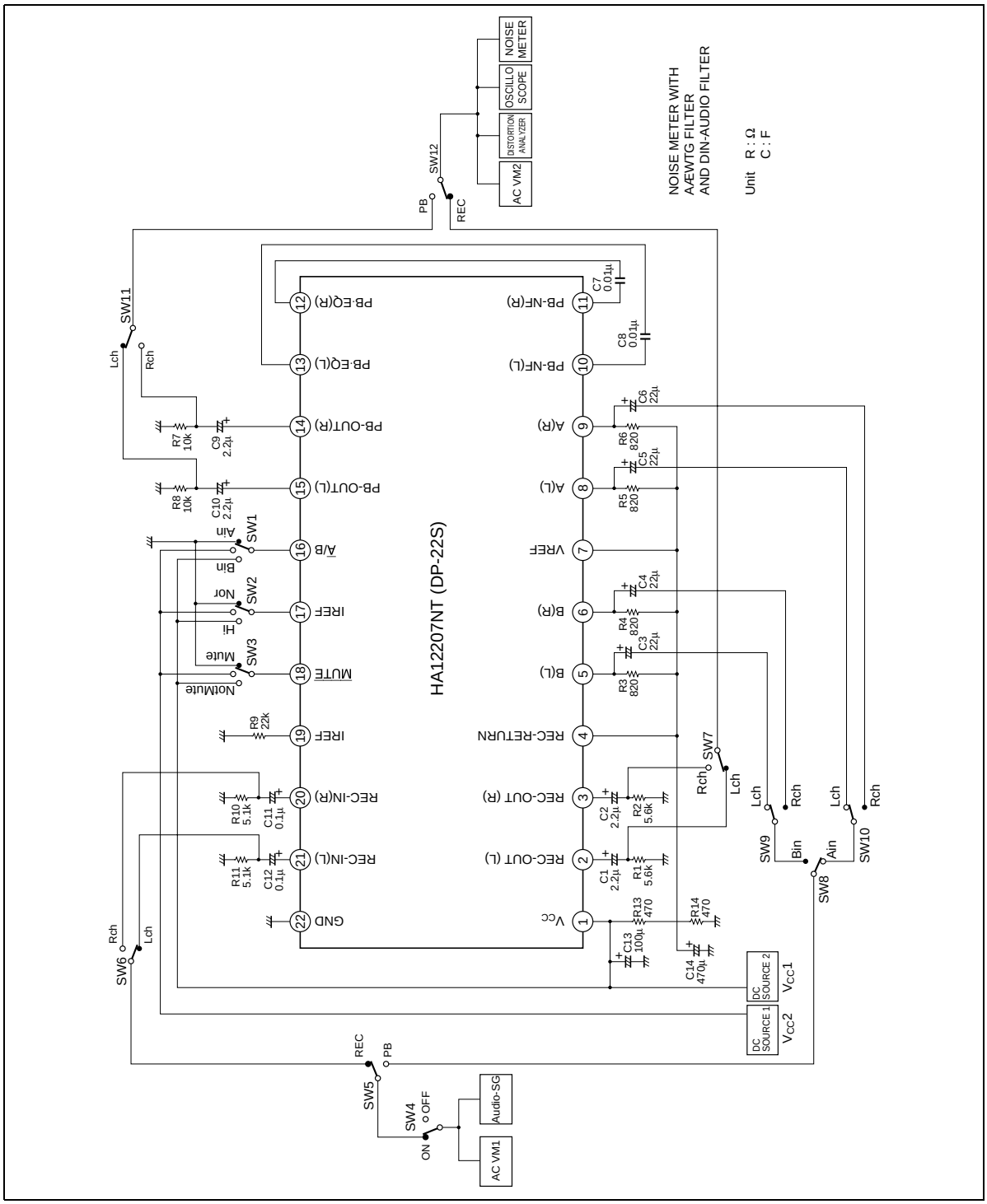
2. V_{CC}=9.5V, Vref=4.75V

Electrical Characteristics (Ta = 25°C, V_{CC} = 10.5V, Vref = 5.25V) (cont)

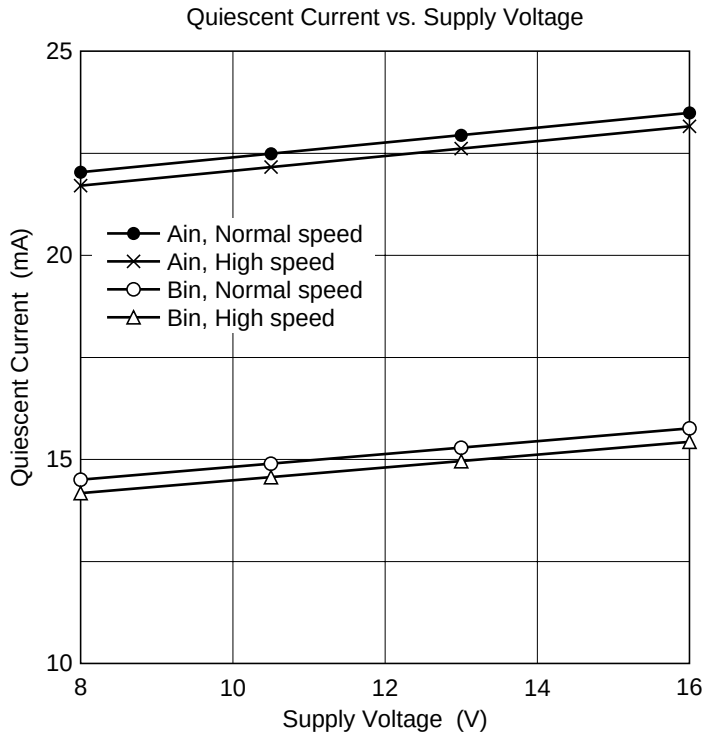
Item	Symbol	Min	Typ	Max	Unit	Test Condition: IC Condition: A/B	HSP	MUTE	fin (Hz)	Vin (mVrms)	Other	Application Terminal: Input: R	L	Output: R	L	COM
REC-EQ frequency response Normal speed	G_V REC-NN1	6.9	8.4	9.9	dB	A	Normal	Mute OFF	1k	10		20	21	3	2	
	G_V REC-NN2	10.3	12.3	14.3	dB	A	Normal	Mute OFF	5k	10		20	21	3	2	
	G_V REC-NN3	18.7	21.7	24.7	dB	A	Normal	Mute OFF	10k	10		20	21	3	2	
REC-EQ frequency response High speed	G_V REC-HN1	7.6	9.1	10.6	dB	A	High	Mute OFF	2k	10		20	21	3	2	
	G_V REC-HN2	12.1	14.1	16.1	dB	A	High	Mute OFF	10k	10		20	21	3	2	
	G_V REC-HN3	19.9	22.9	25.9	dB	A	High	Mute OFF	20k	10		20	21	3	2	
REC-EQ channel separation	CT R/L(2)	50	60	—	dB	A	Normal	Mute OFF	1k	*3		20	21	3	2	
REC-MUTE attenuation	R-MUTE ATT	70	80	—	%	A	Normal	Mute	1k	*3		20	21	3	2	
REC-EQ maximum output	Vomax REC	1.2	1.8	—	Vrms	A	Normal	Mute OFF	1k	—	THD=1%*4	20	21	3	2	
REC-EQ THD	THD REC	—	0.35	0.7	%	A	Normal	Mute OFF	1k	100		20	21	3	2	
REC-EQ S/N	S/N REC	52	56	—	dB	A	Normal	Mute OFF	—	—	Rg=5.1kΩ, A-WTG	20	21	3	2	

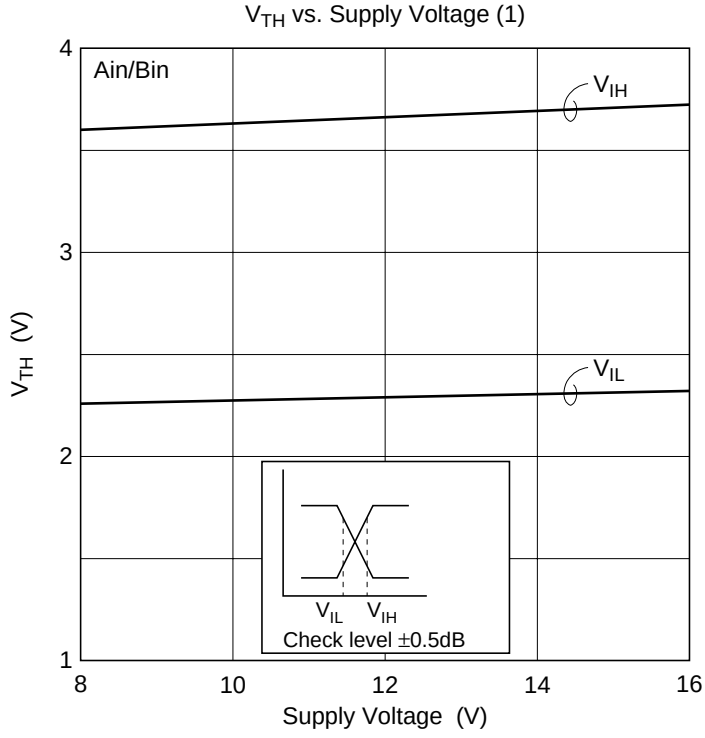
Note: 3. Large level without clipping
4. V_{CC}=9.5V, Vref=4.75V

Test Circuit

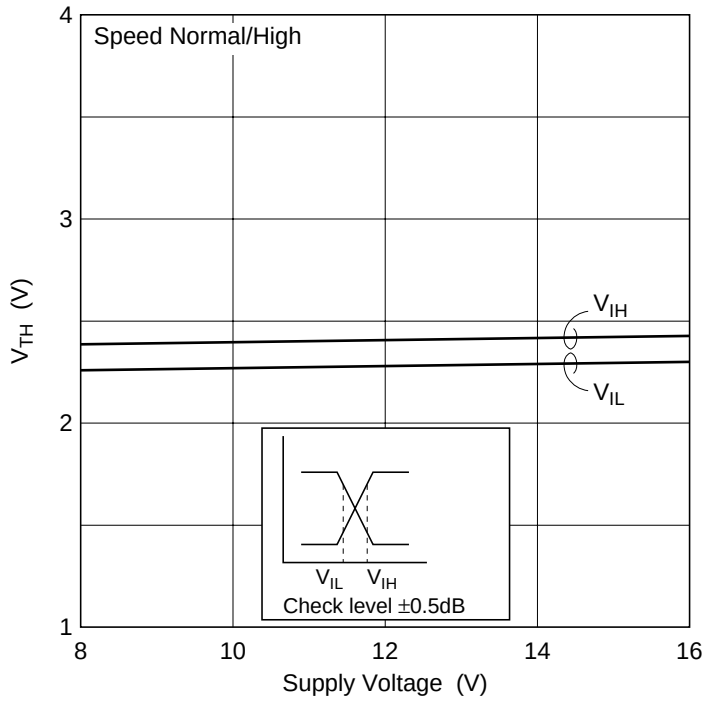


Characteristic Curves

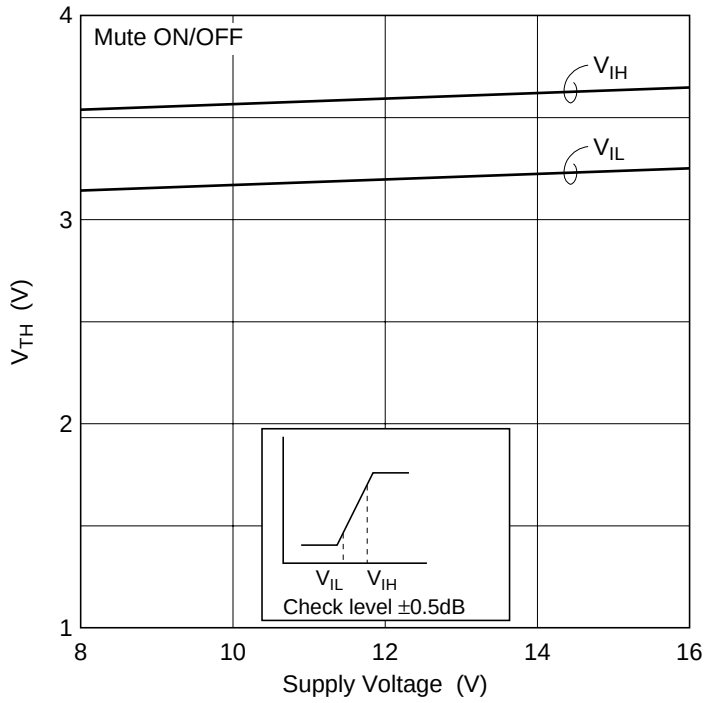




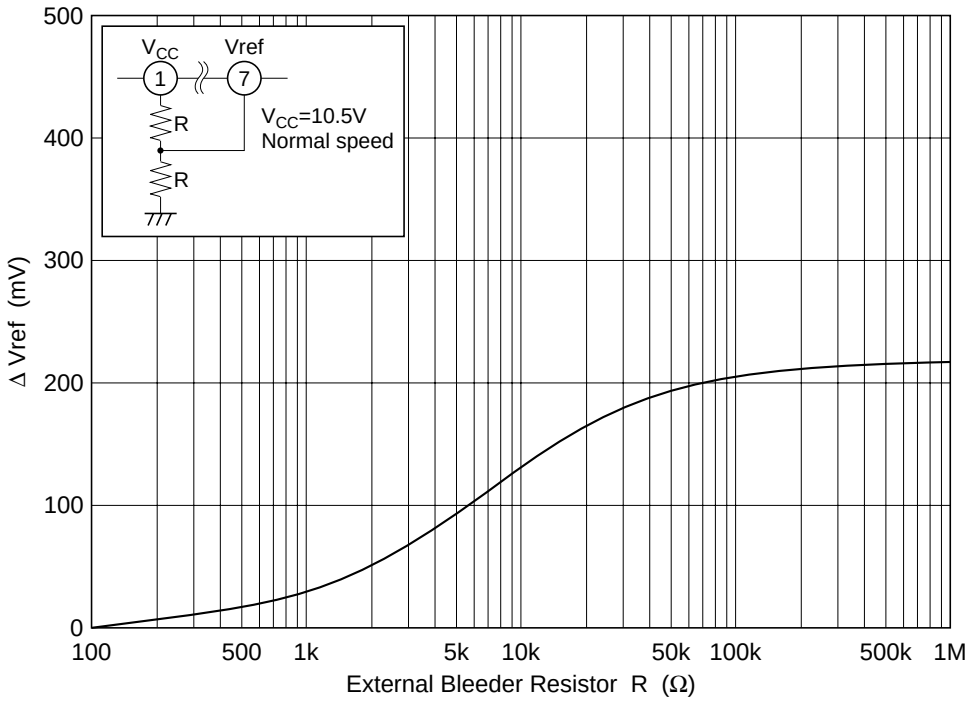
V_{TH} vs. Supply Voltage (2)



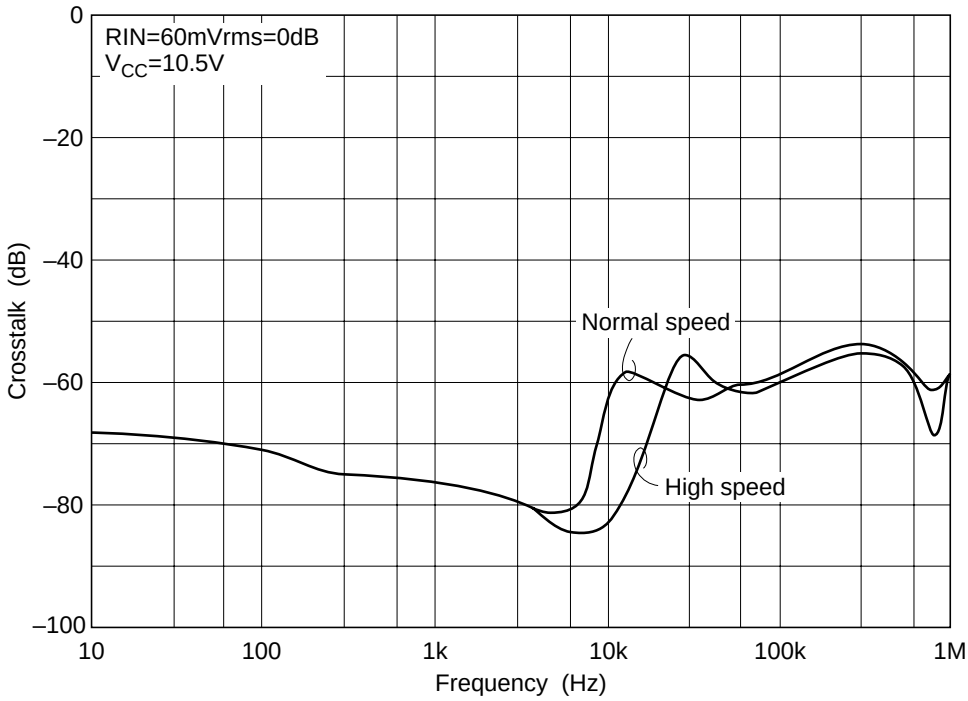
V_{TH} vs. Supply Voltage (3)



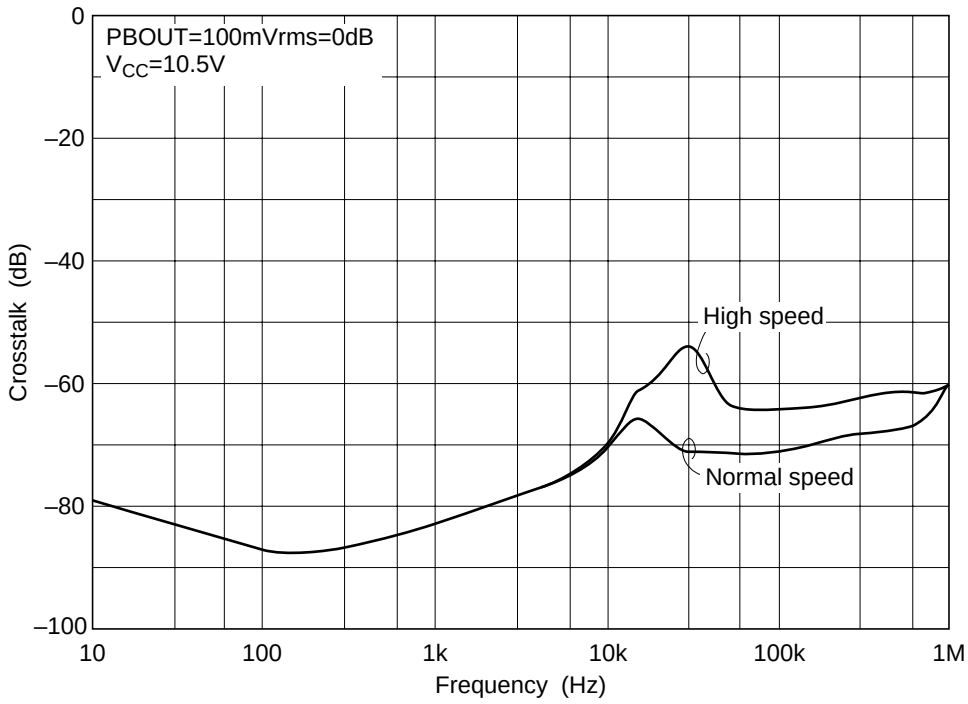
Altered Reference Voltage vs. External Impedance



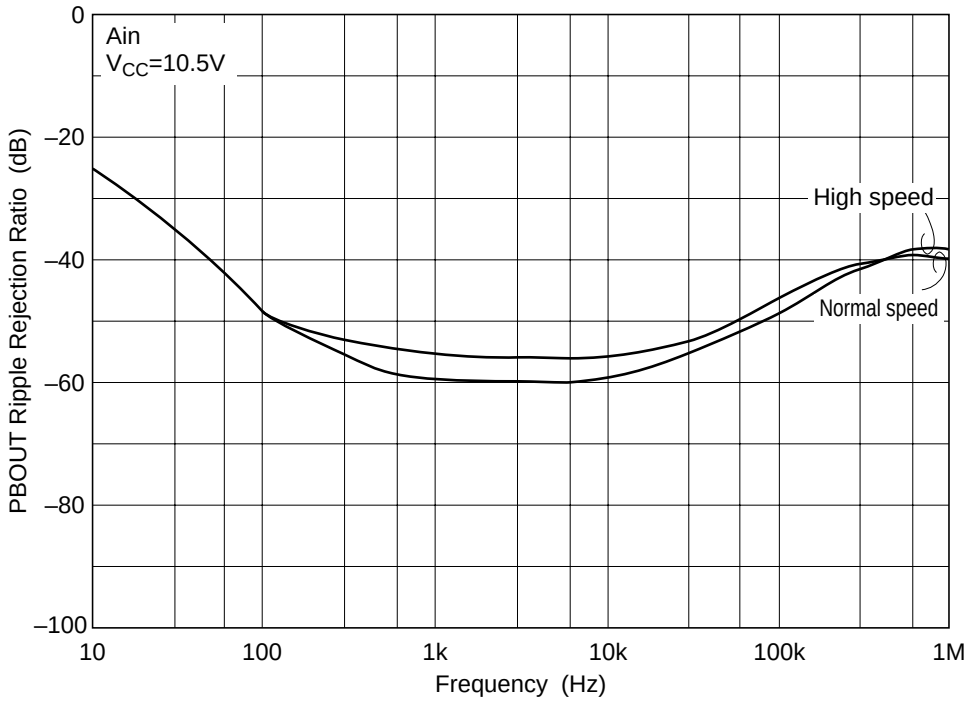
REC-EQ→PB-EQ Mode Crosstalk vs. Frequency



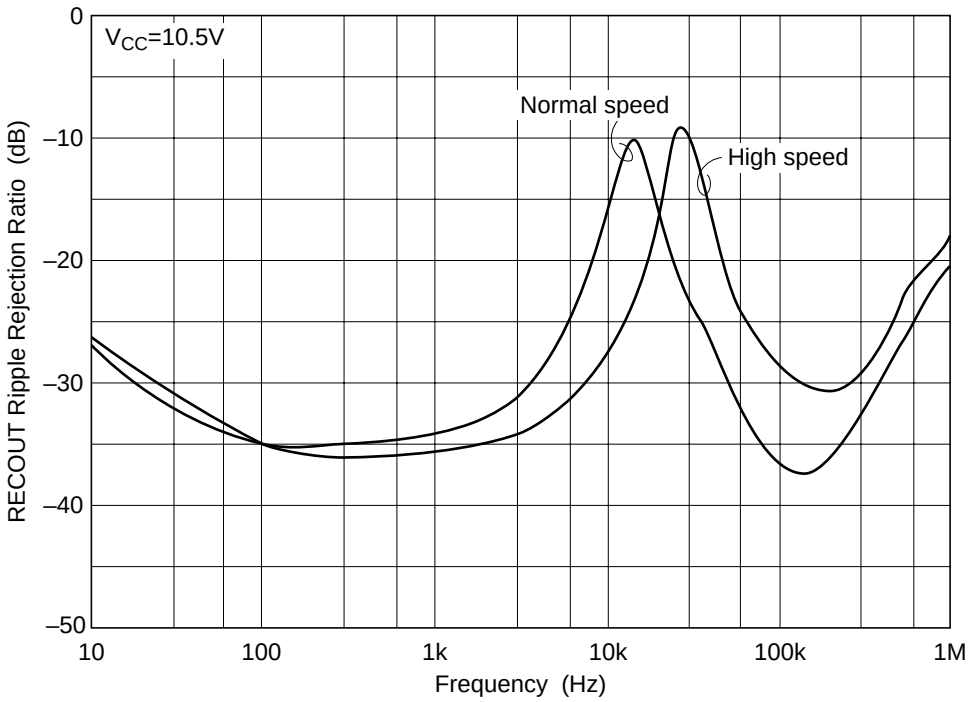
PB-EQ→REC-EQ Mode Crosstalk vs. Frequency



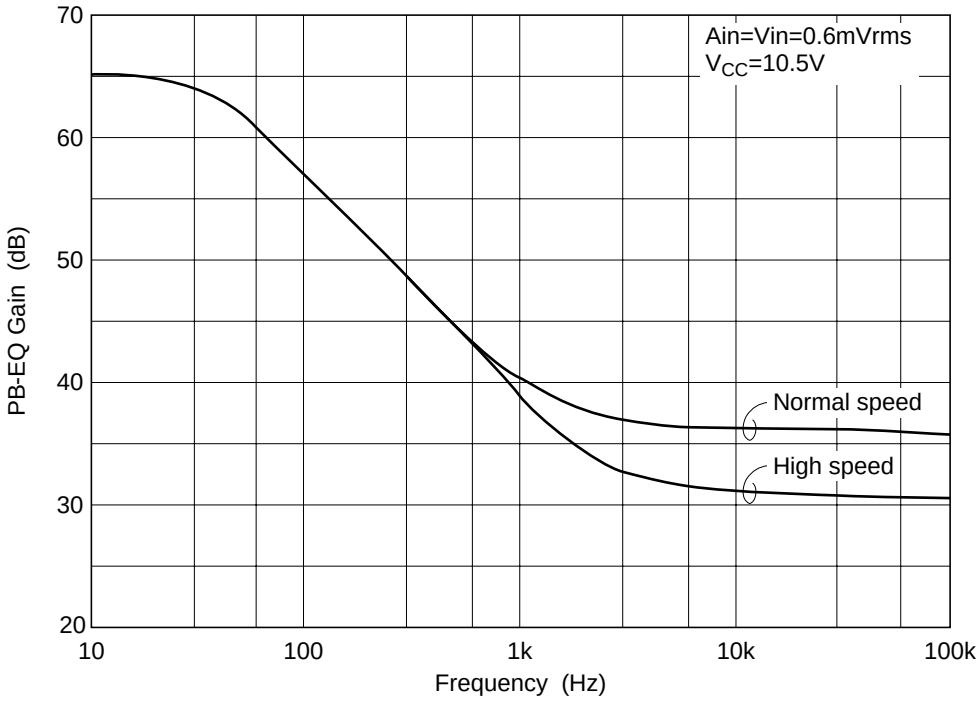
Ripple Rejection Ratio vs. Frequency (1)



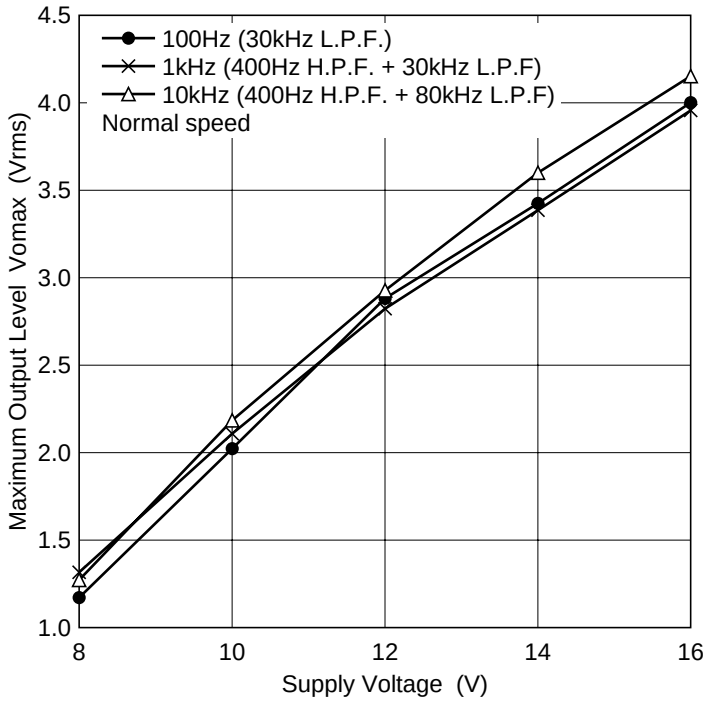
Ripple Rejection Ratio vs. Frequency (2)



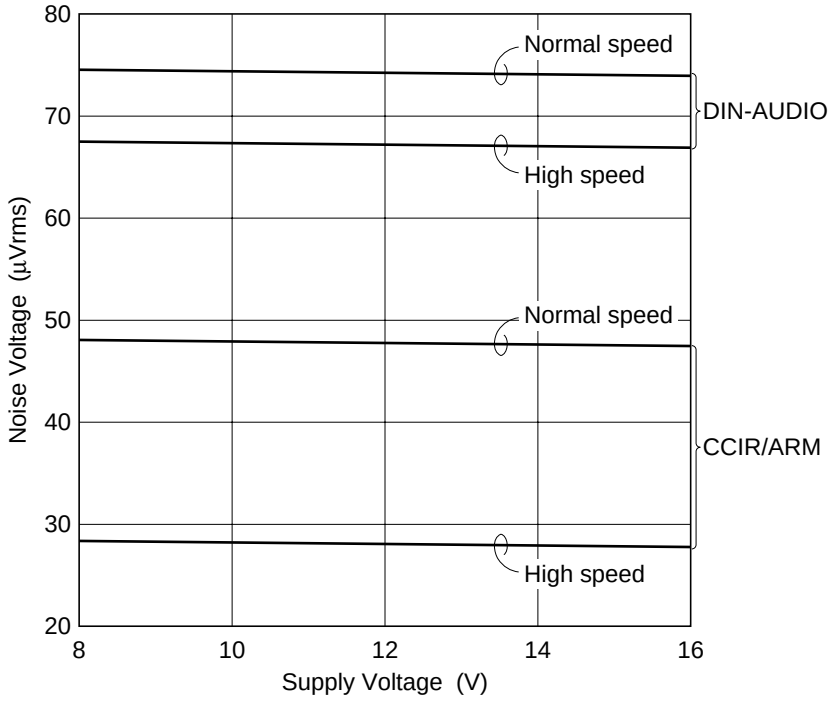
PB-EQ Gain vs. Frequency



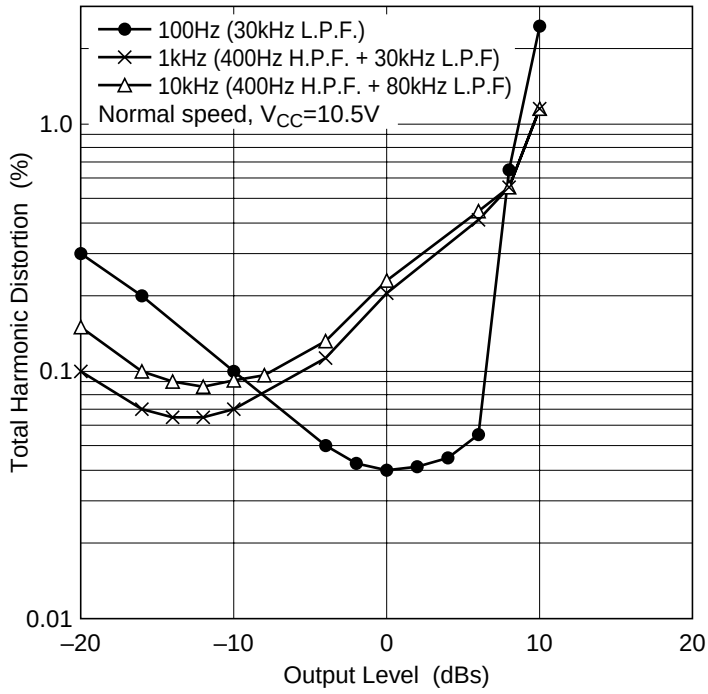
PB-EQ Maximum Output Level vs. Supply Voltage



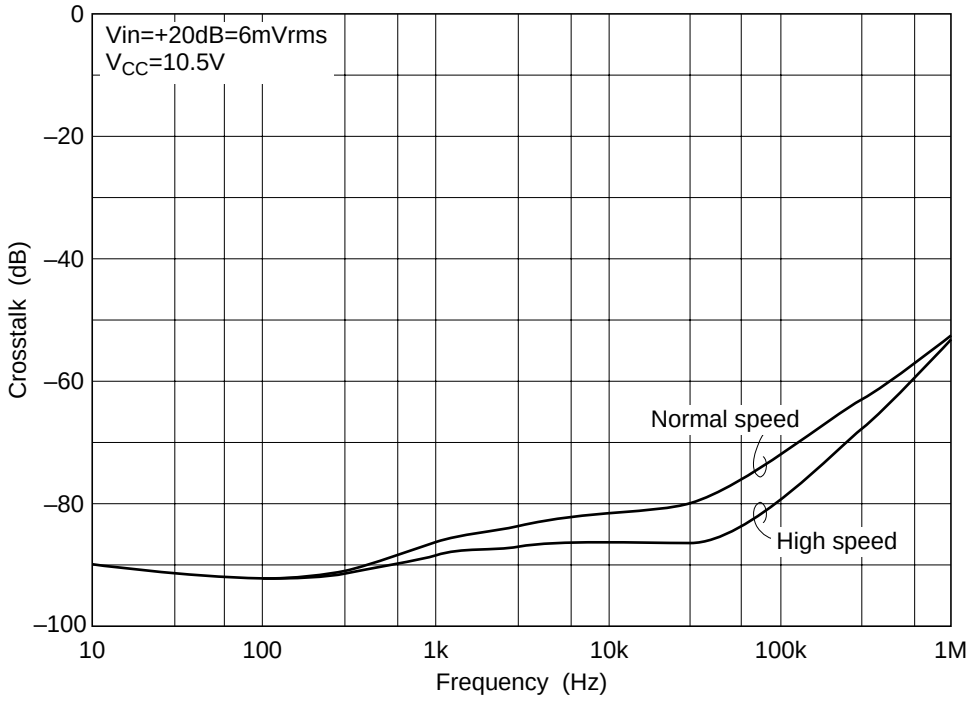
Noise Voltage vs. Supply Voltage



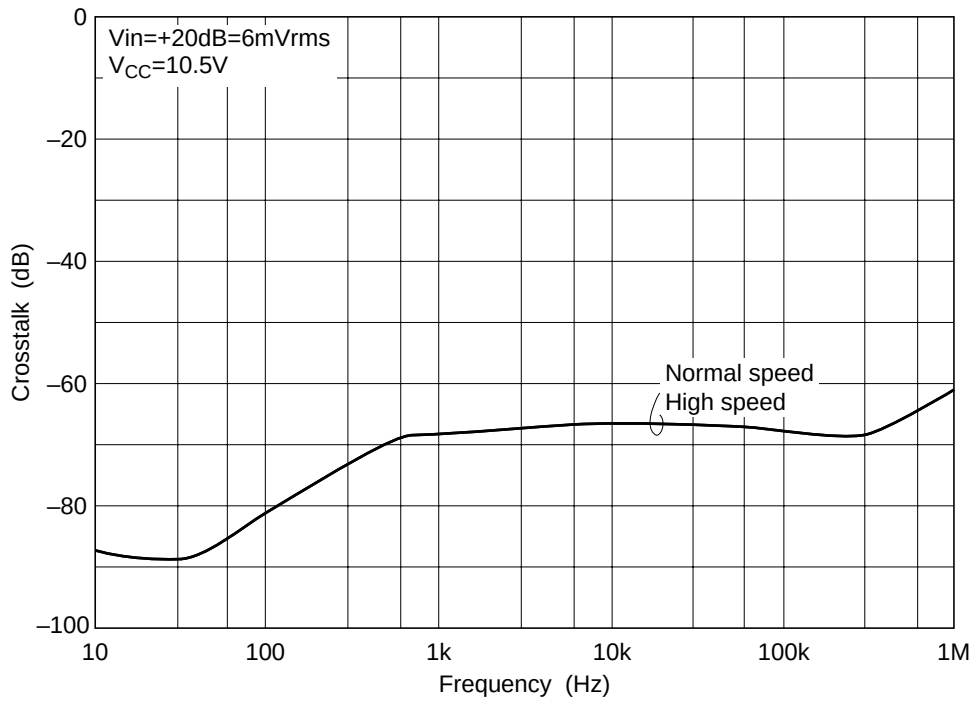
PB-EQ Total Harmonic Distortion vs. Output Level



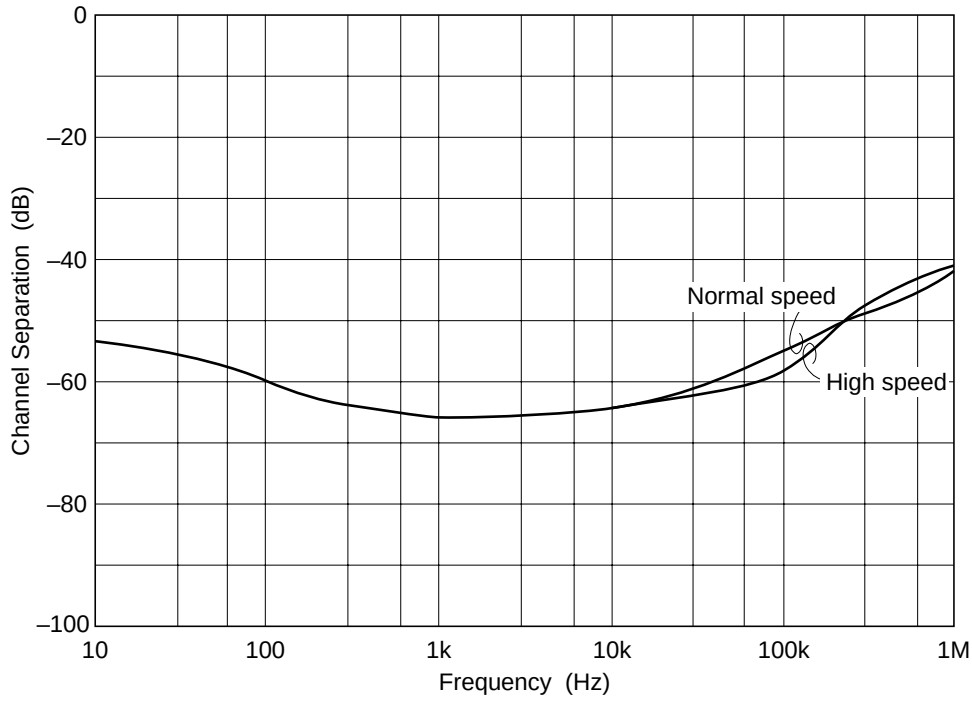
PB-EQ Crosstalk (Ain→Bin) vs. Frequency



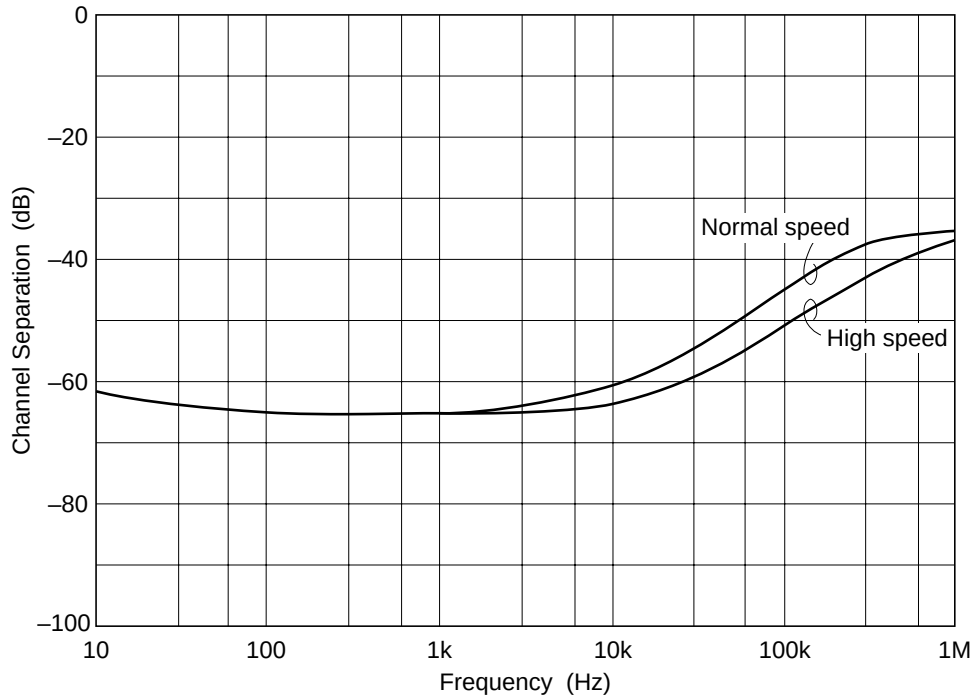
PB-EQ Crosstalk (Bin→Ain) vs. Frequency



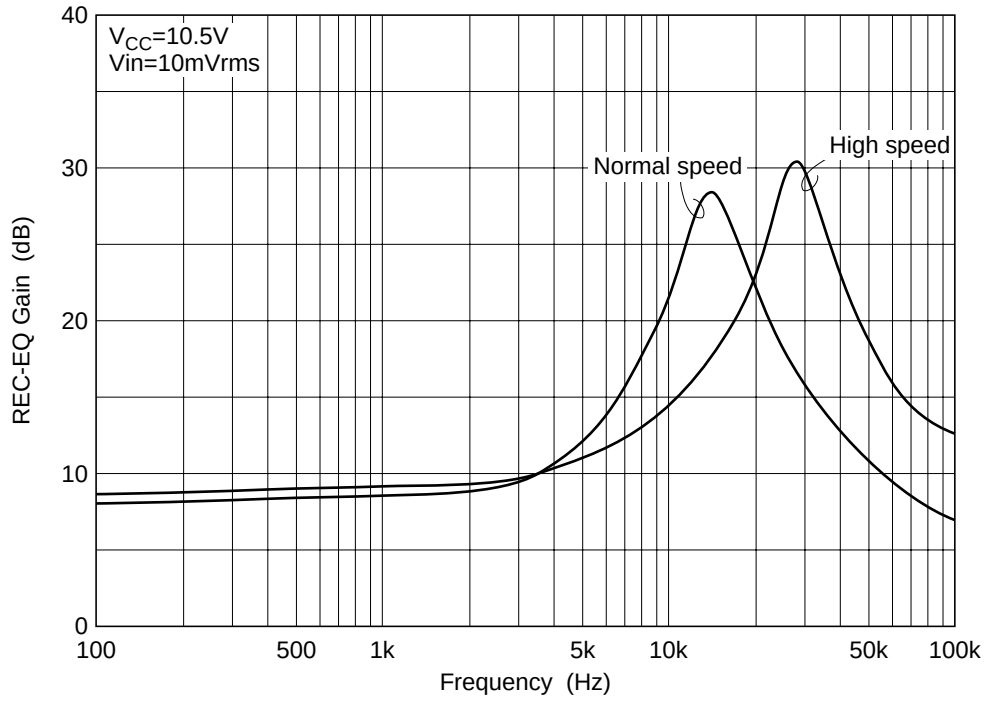
PB-EQ Channel Separation (Lch→Rch) vs. Frequency



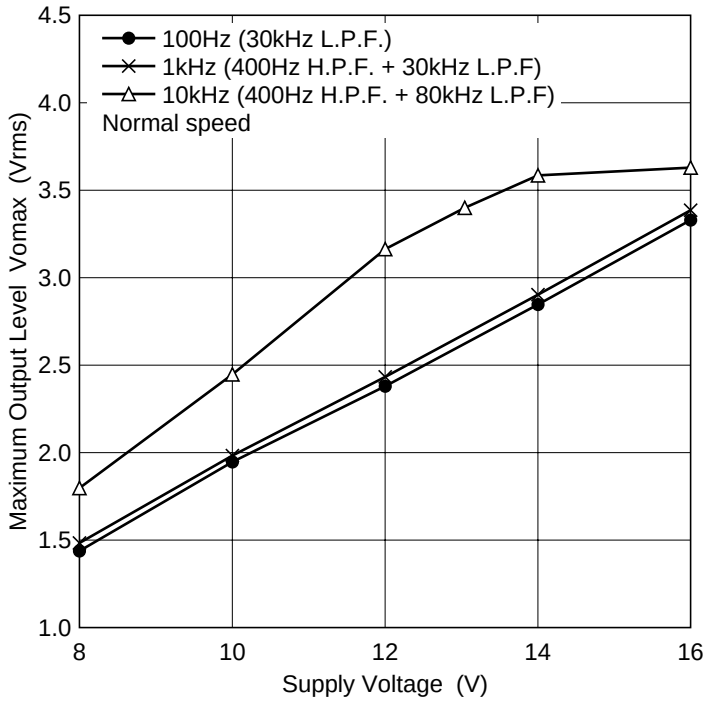
PB-EQ Channel Separation (Rch→Lch) vs. Frequency



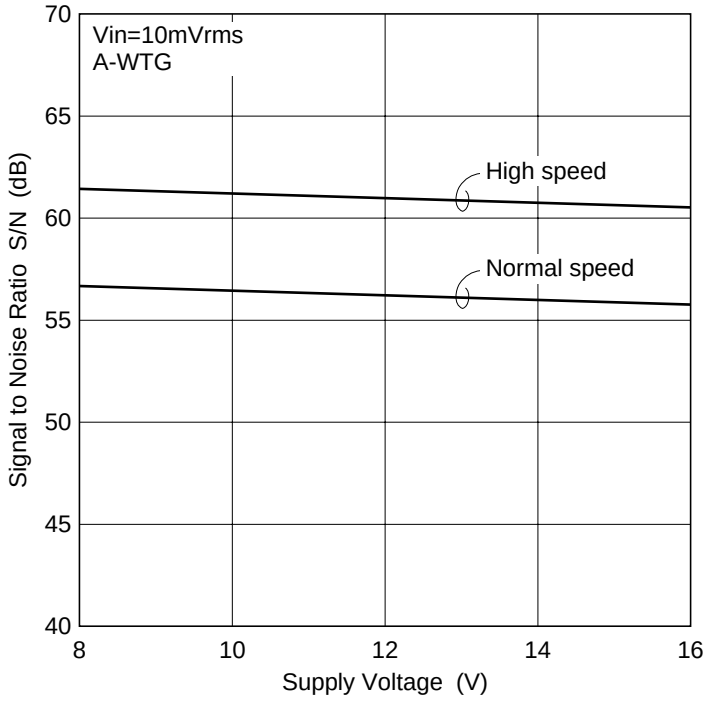
REC-EQ Gain vs. Frequency



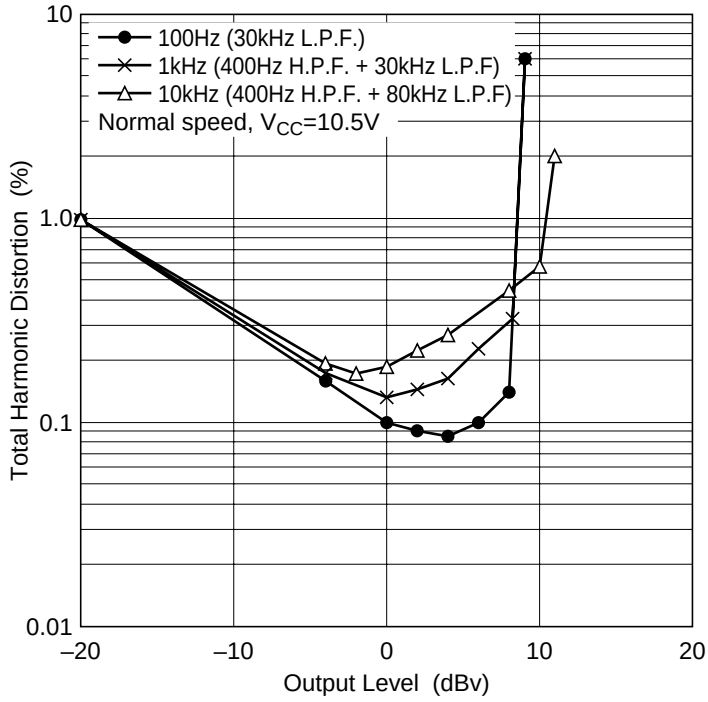
REC-EQ Maximum Output Level vs. Supply Voltage



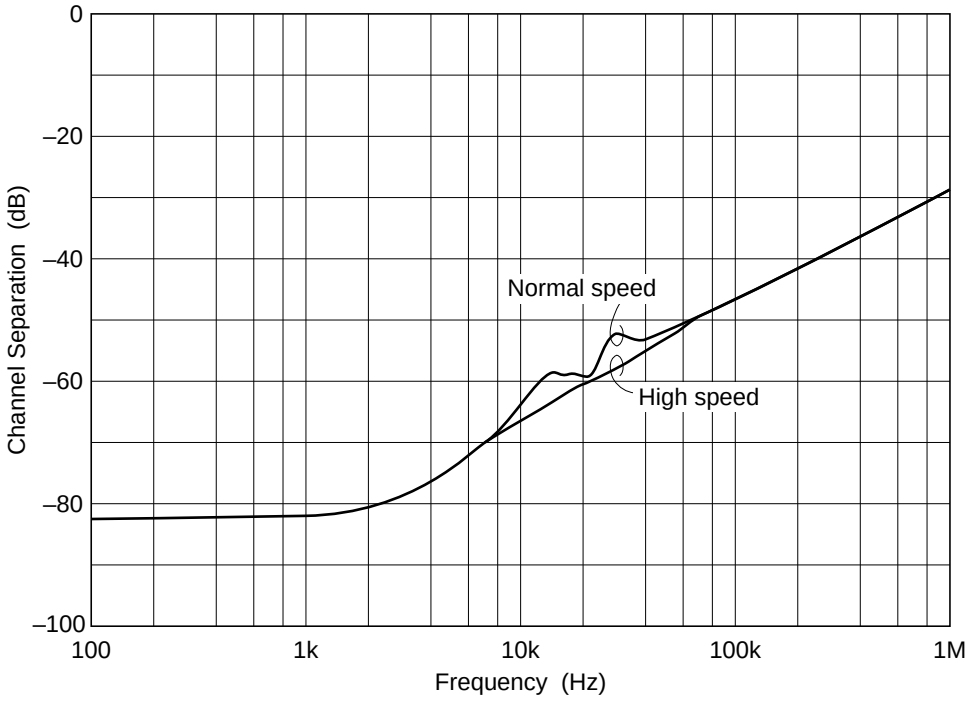
Signal to Noise Ratio vs. Supply Voltage



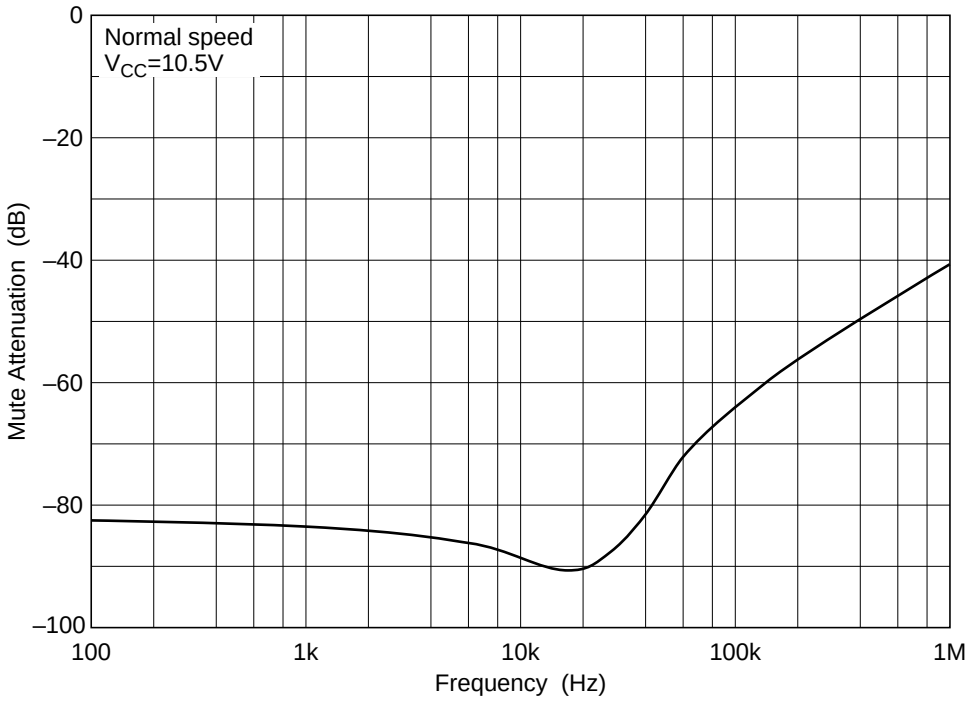
REC-EQ Total Harmonic Distortion vs. Output Level



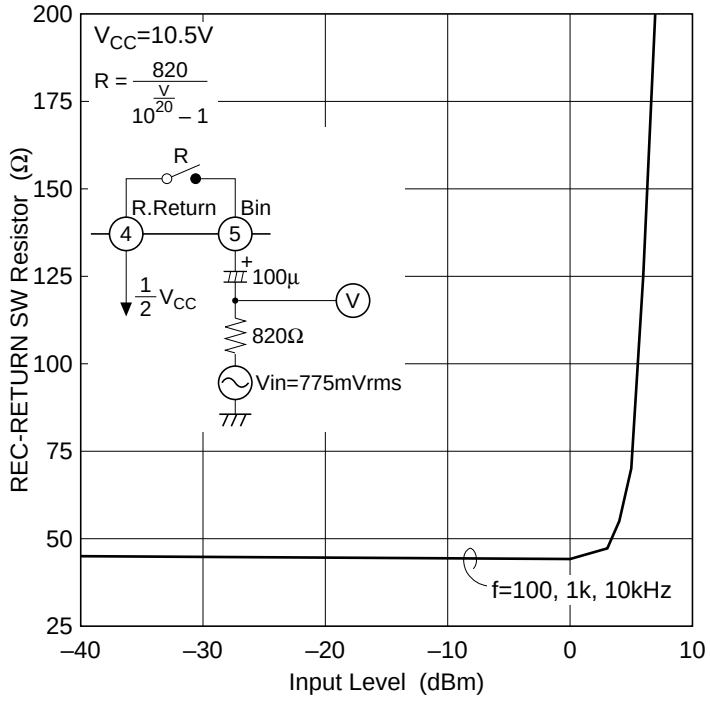
REC-EQ Channel Separation (Lch→Rch) vs. Frequency



Mute Attenuation vs. Frequency

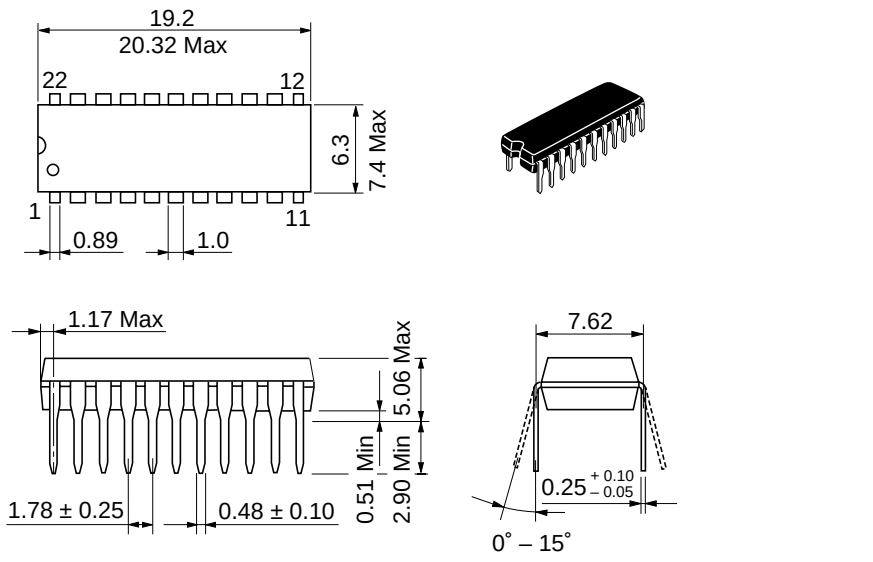


REC-RETURN SW Resistor vs. Input Level



Package Dimensions

Unit: mm



Hitachi Code	DP-22NS
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.90 g

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Hitachi, Ltd.
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Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

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Hitachi Semiconductor
(America) Inc.
179 East Tasman Drive,
San Jose,CA 95134
Tel: <1> (408) 433-1990
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Hitachi Europe GmbH
Electronic Components Group
Dornacher Straße 3
D-85622 Feldkirchen, Munich
Germany
Tel: <49> (89) 9 9180-0
Fax: <49> (89) 9 29 30 00

Hitachi Europe Ltd.
Electronic Components Group.
Whitebrook Park
Lower Cookham Road
Maidenhead
Berkshire SL6 8YA, United Kingdom
Tel: <44> (1628) 585000
Fax: <44> (1628) 585160

Hitachi Asia Ltd.
Hitachi Tower
16 Collyer Quay #20-00,
Singapore 049318
Tel : <65>-538-6533/538-8577
Fax : <65>-538-6933/538-3877
URL : http://www.hitachi.com.sg

Hitachi Asia Ltd.
(Taipei Branch Office)
4/F, No. 167, Tun Hwa North Road,
Hung-Kuo Building,
Taipei (105), Taiwan
Tel : <886>-(2)-2718-3666
Fax : <886>-(2)-2718-8180
Telex : 23222 HAS-TP
URL : http://www.hitachi.com.tw

Hitachi Asia (Hong Kong) Ltd.
Group III (Electronic Components)
7/F., North Tower,
World Finance Centre,
Harbour City, Canton Road
Tsim Sha Tsui, Kowloon,
Hong Kong
Tel : <852>-(2)-735-9218
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