
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

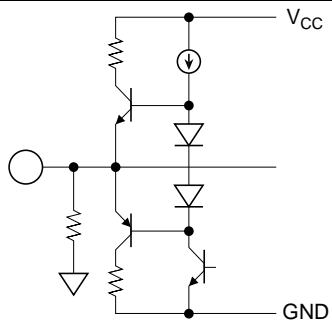
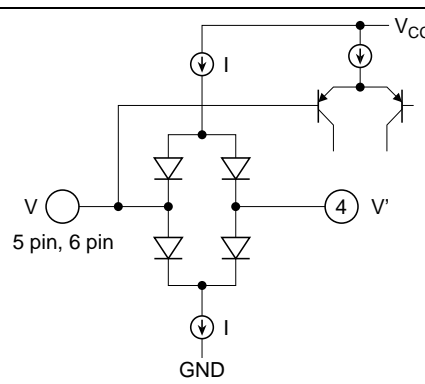
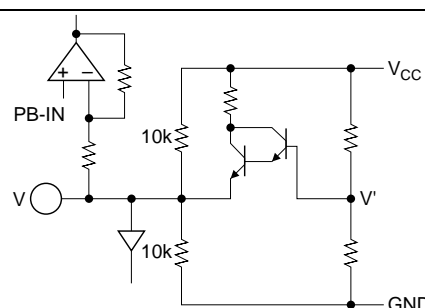
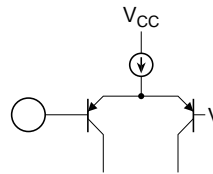
- PB equalizer × 2 channel
- REC equalizer × 2 channel
- Each electronic control switch to change REC/PB etc.
- REC MUTE
- REC head return switch

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.

HA12207NT

Pin Description, Equivalent Circuit ($V_{CC} = 10.5V$, $V_{ref} = 5.6V$, $T_a = 25^\circ C$, 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)	$V = V_{ref}$		REC-EQ output
3	RECOUT (R)			
4	REC-RETURN	$V = V_{ref}$ $V' = V_{ref}$		REC return
5	PB-IN B (L)			PB B Deck input
6	PB-IN B (R)			
7	VREF	$V = V_{ref}$ $V' = V_{CC} / 2$		Reference
8	PB-IN A (L)	$V = V_{ref}$		PB A deck input
9	PB-IN A (R)			

Pin Description, Equivalent Circuit ($V_{CC} = 10.5V$, $V_{ref} = 5.6V$, $T_a = 25^\circ C$, No signal, The value in the table show typical value.)

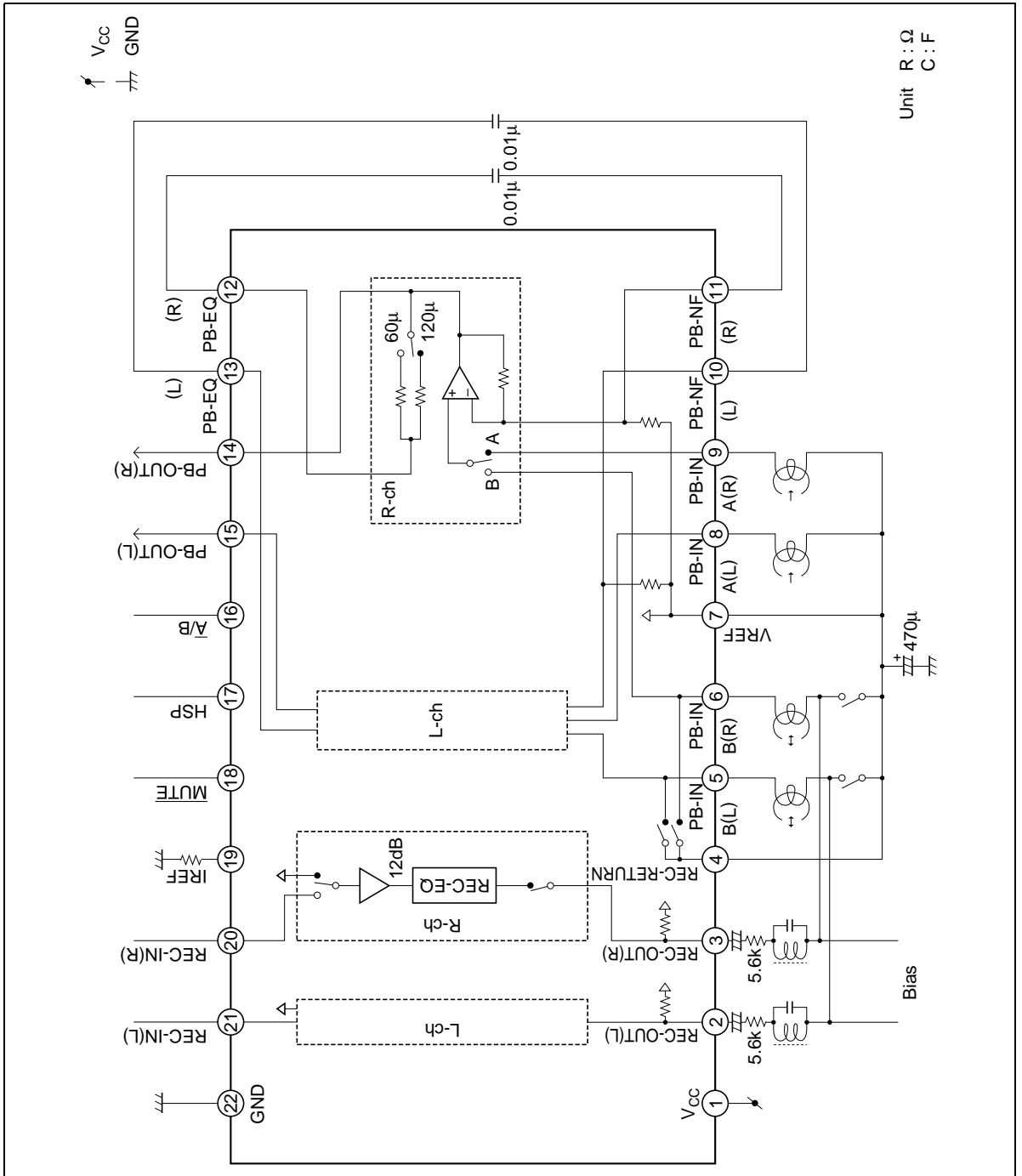
Pin No.	Pin Name	Note	Equivalent Circuit	Pin Description
10	PB-NF (L)	PB-IN = V_{ref}		PB EQ feed back
11	PB-NF (R)			
12	PB-EQ (L)	PBOUT = V_{ref}		NAB output
13	PB-EQ (R)			
20	REC IN (R)	$V = V_{ref}$		REC-EQ input
21	REC IN (L)			
14	PBOUT (R)	$V = V_{ref}$		PB output
15	PBOUT (L)			

HA12207NT

Pin Description, Equivalent Circuit ($V_{CC} = 10.5V$, $V_{ref} = 5.6V$, $T_a = 25^\circ C$, No signal, The value in the table show typical value.)

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

Block Diagram



HA12207NT

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 (V_{ref}) of this IC has not a current drivability, V_{ref} 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 V_{ref} , indicated to the pin interface circuit figure.

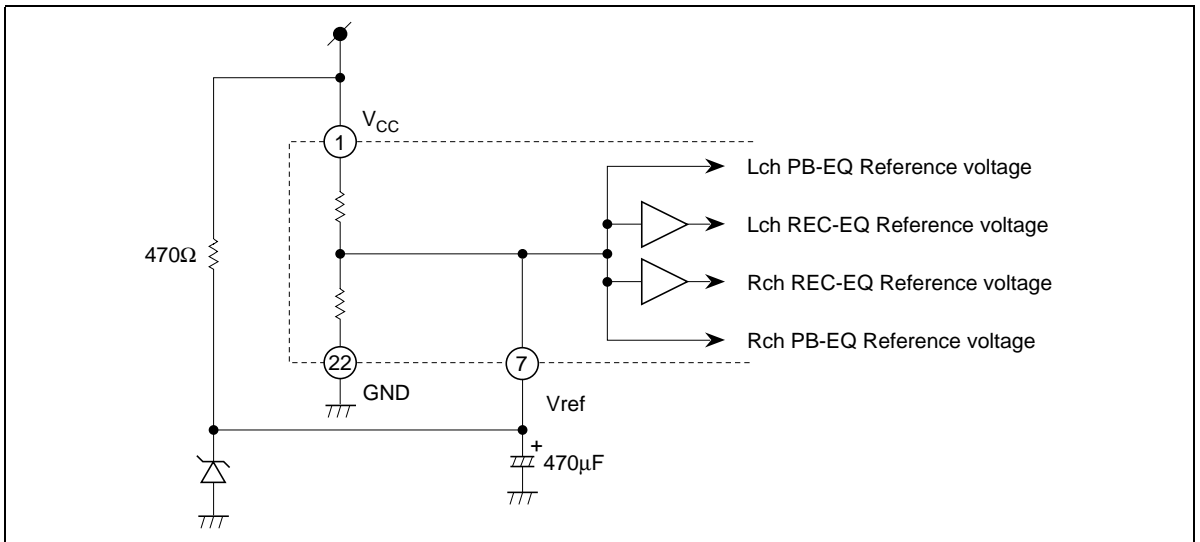


Figure 1 Reference Voltage Circuit

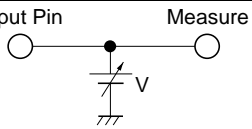
HA12207NT

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	Input Pin 
18	0.0 to 3.0	4.0 to V_{CC}	V	

- Note:
- Each pin is pulled down with 100kΩ internal resistor. 16 to 18 pins are low-level when each pin is open.
 - 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.

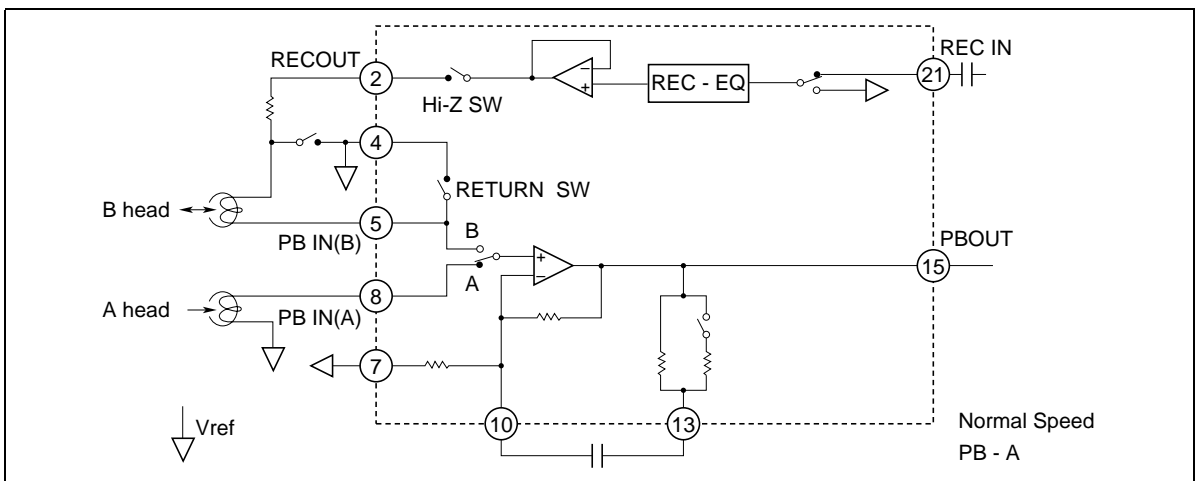


Figure 2 Block Diagram (Lch)

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.

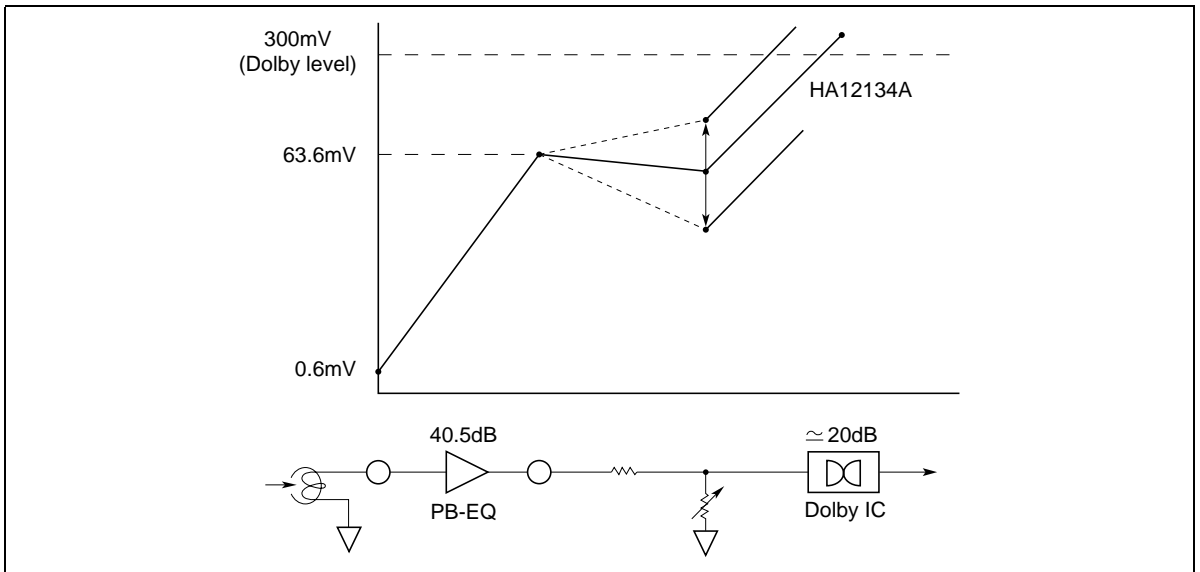


Figure 3 PB Level Block Diagram (Normal Speed, 1kHz)

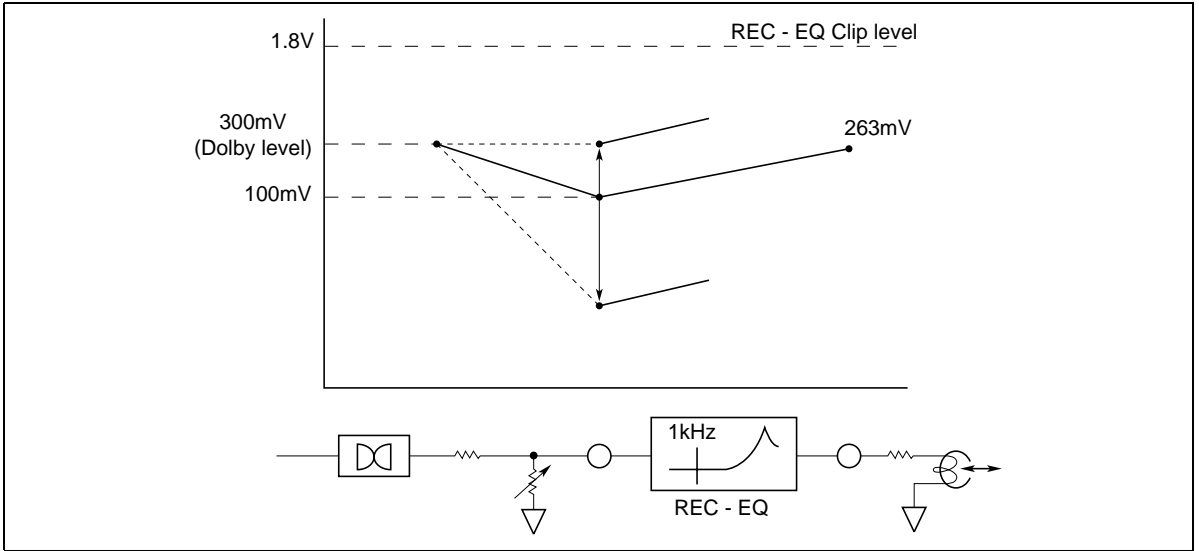


Figure 4 REC Level Block Diagram (Normal Speed, 1kHz)

Absolute Maximum Rating (Ta = 25°C)

Item	Symbol	Rating	Unit	Note
Max supply voltage	$V_{cc\ max}$	16	V	
Power dissipation	P_d	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, V_{ref} = 5.25V)

Item	Symbol	Min	Typ	Max	Unit	Test Condition				Application Terminal					
						IC Condition				Input Output					
						A/B	HSP	MUTE	fin (Hz)	Vin (mVrms)	Other	R	L	R	L
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	1k	*1	REC-EQ → PB-EQ	20	21	14	15
	CT PB/REC(2)	60	70	—	dB	A	Normal	Mute	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	V _{omax} 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, V_{ref}=4.75V

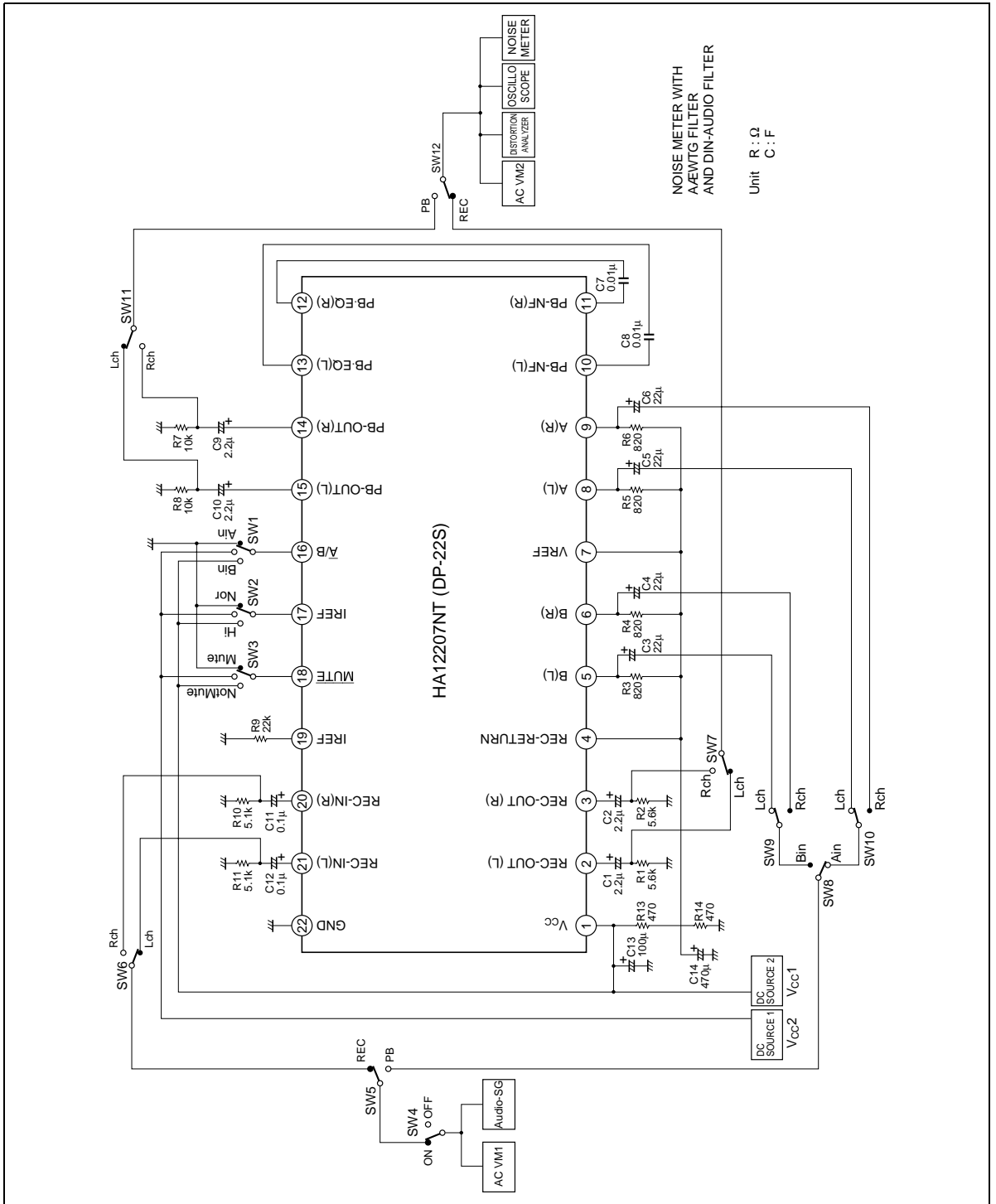
Electrical Characteristics (Ta = 25°C, V_{CC} = 10.5V, V_{ref} = 5.25V) (cont)

Item	Symbol	Test Condition						Application Terminal							
		IC Condition						Input			Output				
		A/B	HSP	MUTE	fin (Hz)	Vin (mVrms)	Other	R	L	R	L	R	L	COM	
	Min	Typ	Max	Unit											
REC-EQ frequency response Normal speed	G _V REC-NN1	6.9	8.4	9.9	dB	A	Normal	Mute	1k	10		20	21	3	2
	G _V REC-NN2	10.3	12.3	14.3	dB	A	Normal	Mute	5k	10		20	21	3	2
	G _V REC-NN3	18.7	21.7	24.7	dB	A	Normal	Mute	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	2k	10		20	21	3	2
	G _V REC-HN2	12.1	14.1	16.1	dB	A	High	Mute	10k	10		20	21	3	2
	G _V REC-HN3	19.9	22.9	25.9	dB	A	High	Mute	20k	10		20	21	3	2
REC-EQ channel separation	CT R/L(2)	50	60	—	dB	A	Normal	Mute	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	V _{omax} REC	1.2	1.8	—	V _{rms}	A	Normal	Mute	1k	—	THD=1%*4	20	21	3	2
REC-EQ THD	THD REC	—	0.35	0.7	%	A	Normal	Mute	1k	100		20	21	3	2
REC-EQ S/N	S/N REC	52	56	—	dB	A	Normal	Mute	—	—	Rg=5.1kΩ, A-WTG	20	21	3	2

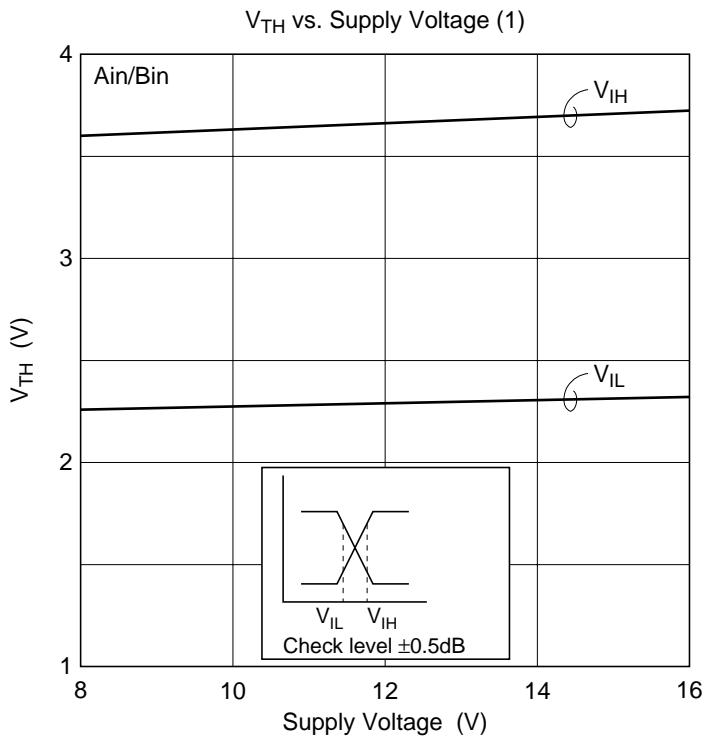
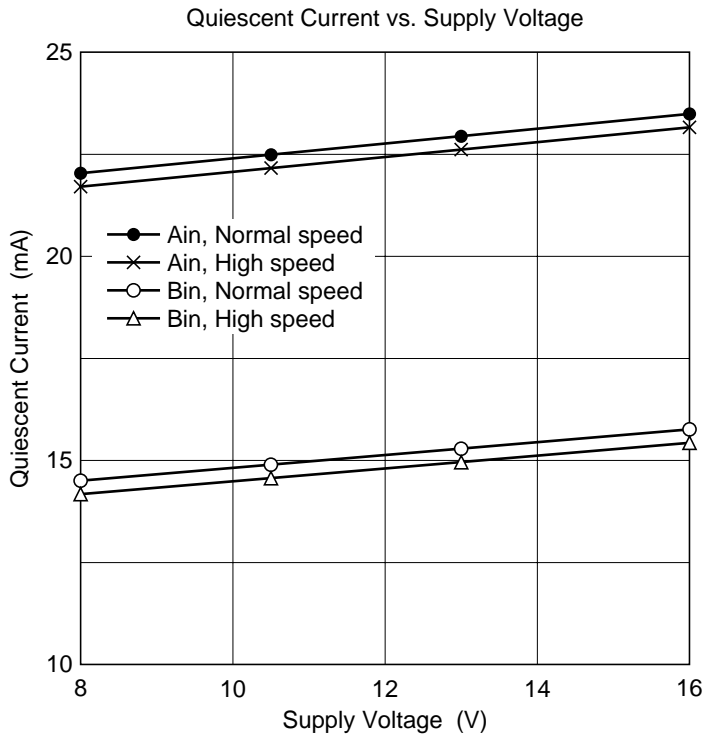
Note: 3. Large level without clipping

4. V_{CC}=9.5V, V_{ref}=4.75V

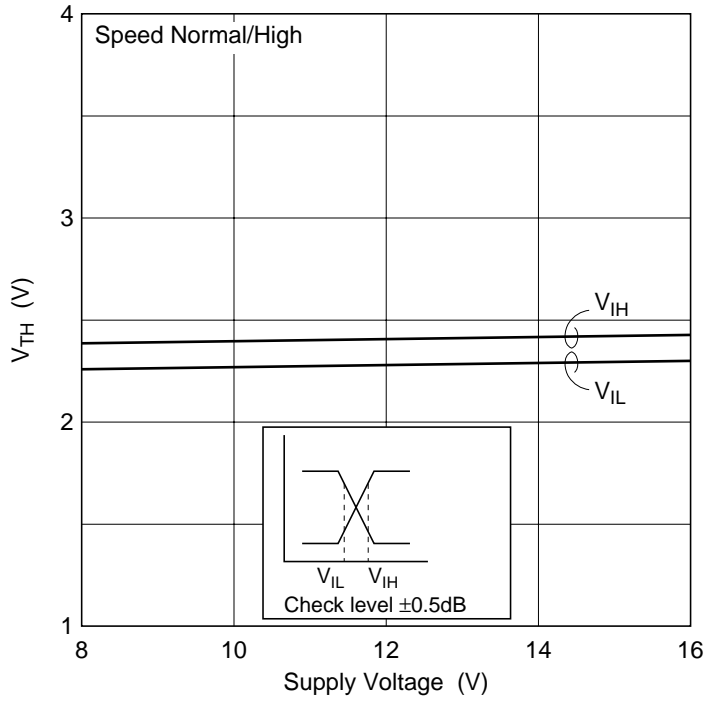
Test Circuit



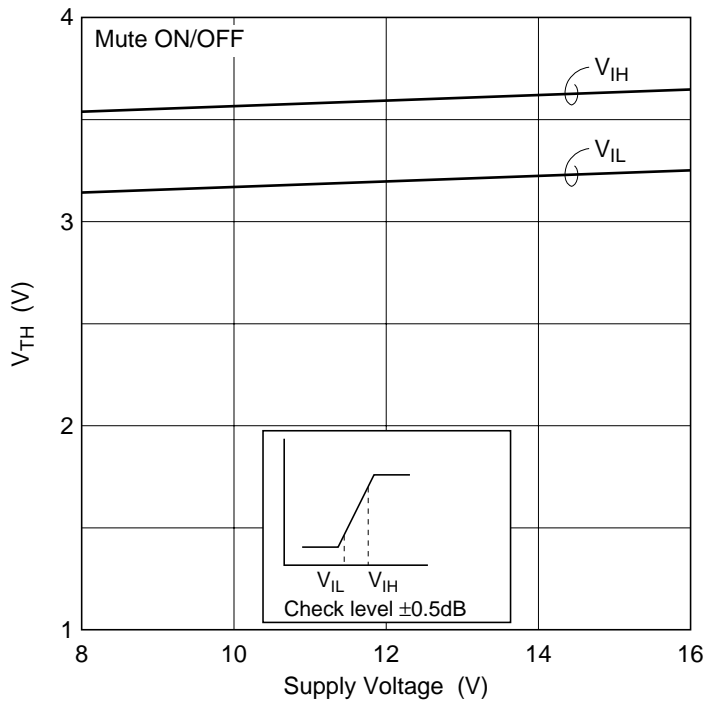
Characteristic Curves



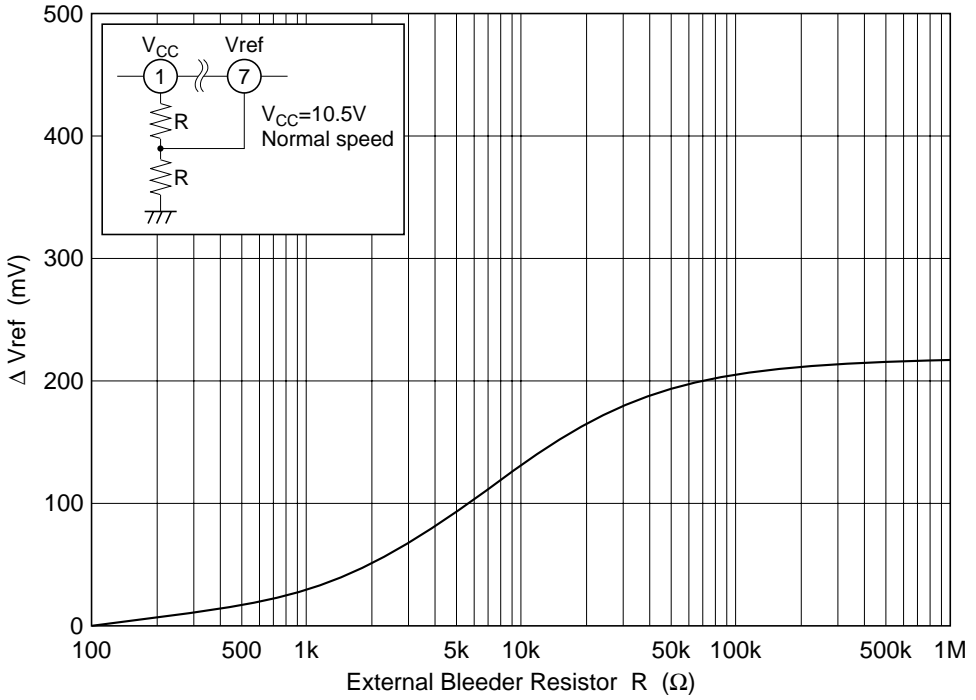
V_{TH} vs. Supply Voltage (2)



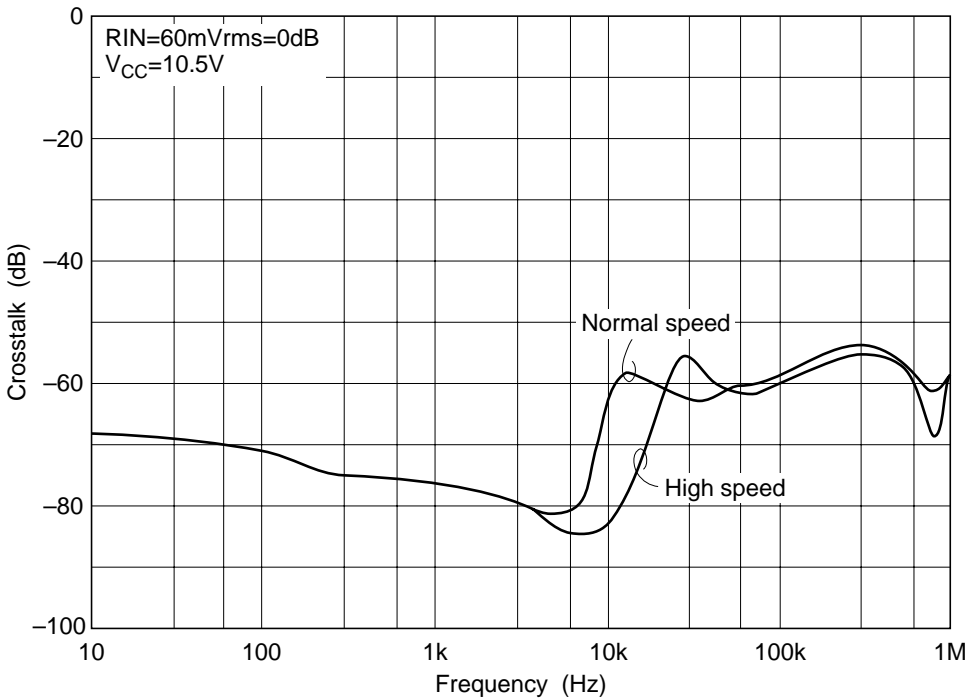
V_{TH} vs. Supply Voltage (3)

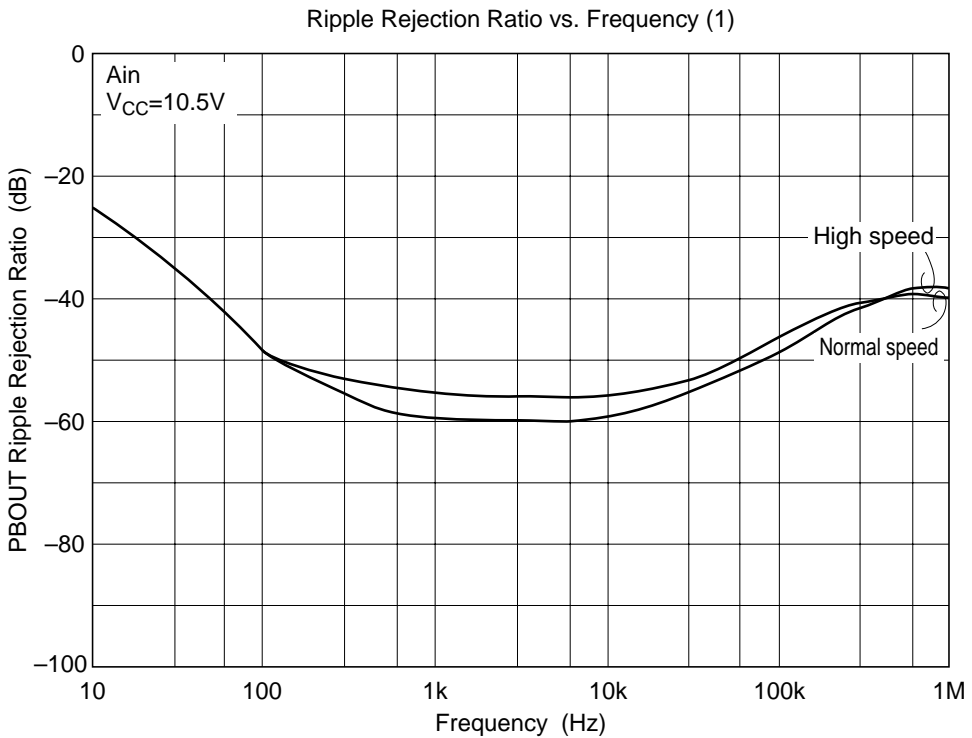
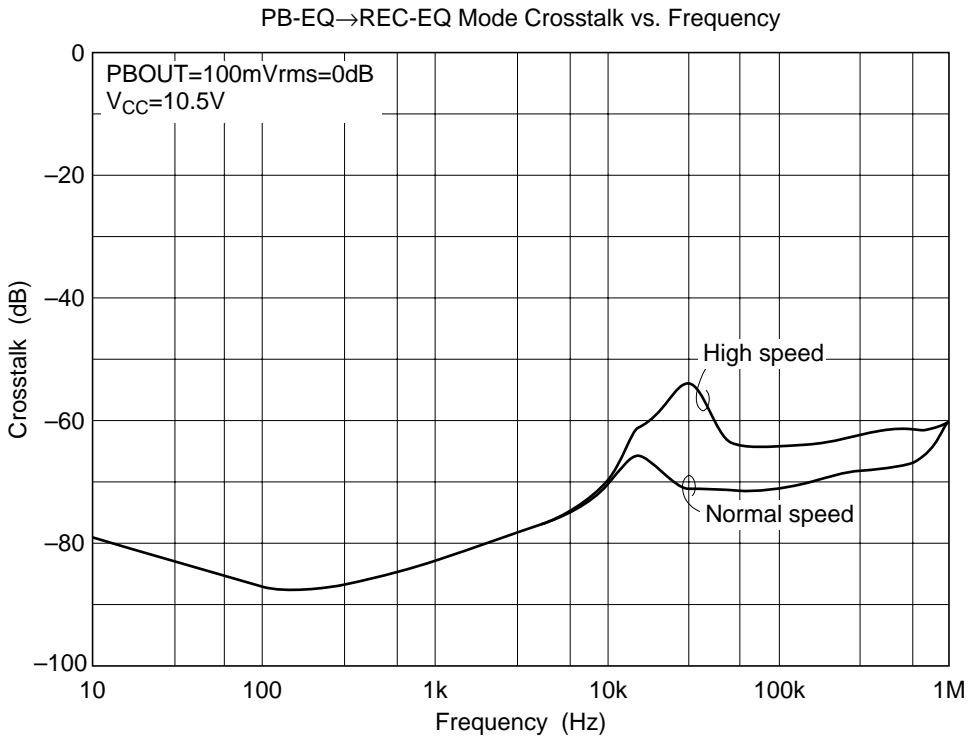


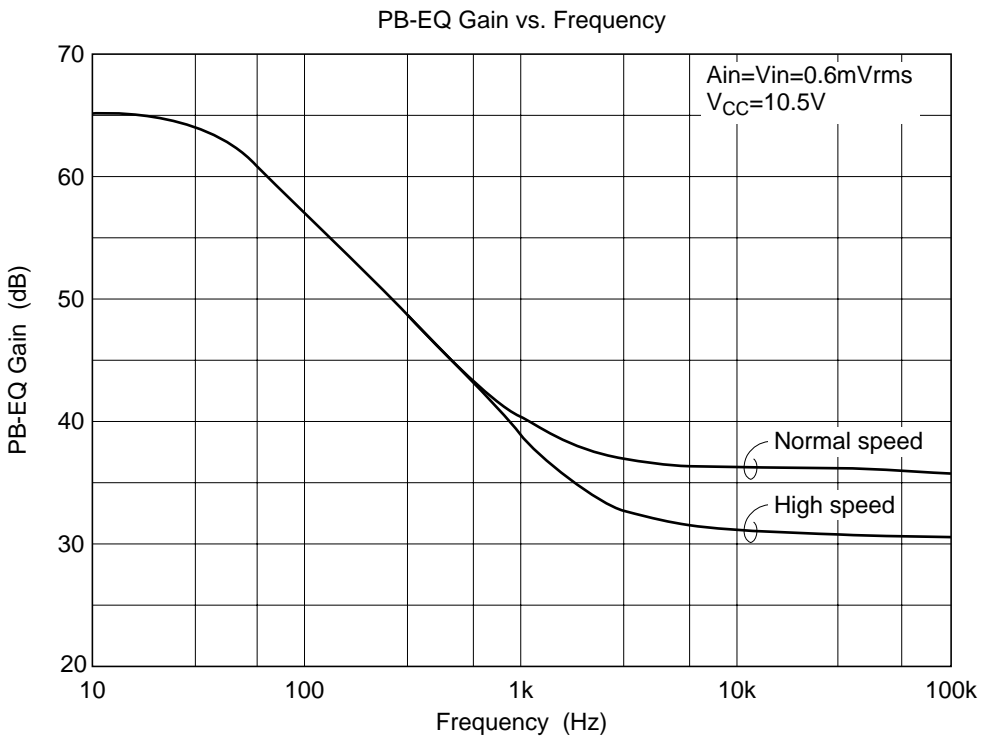
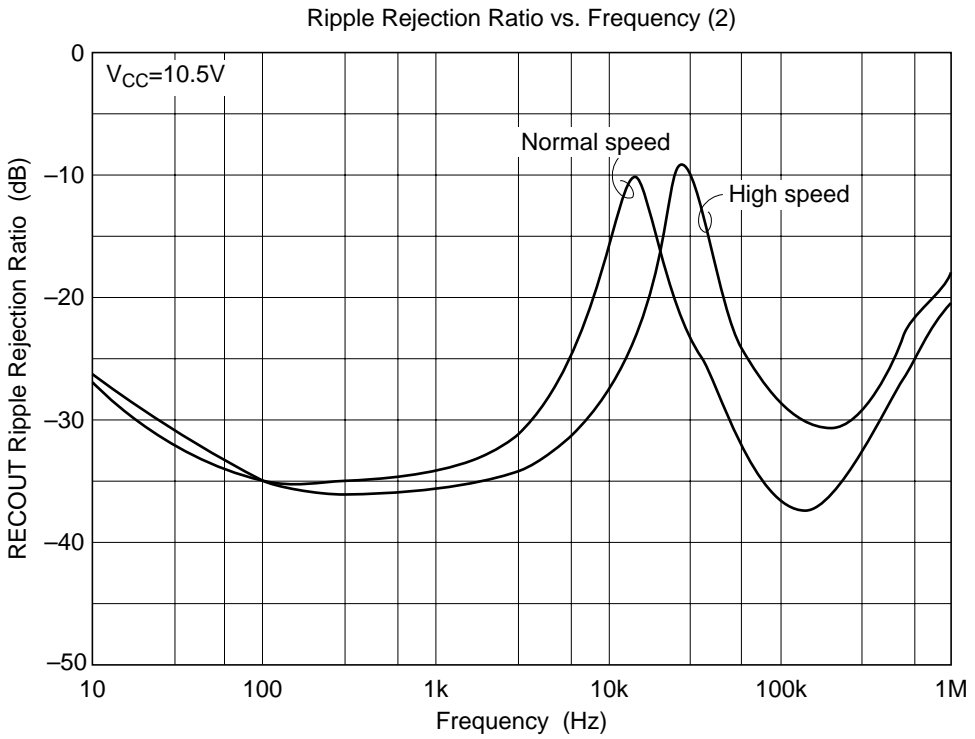
Altered Reference Voltage vs. External Impedance

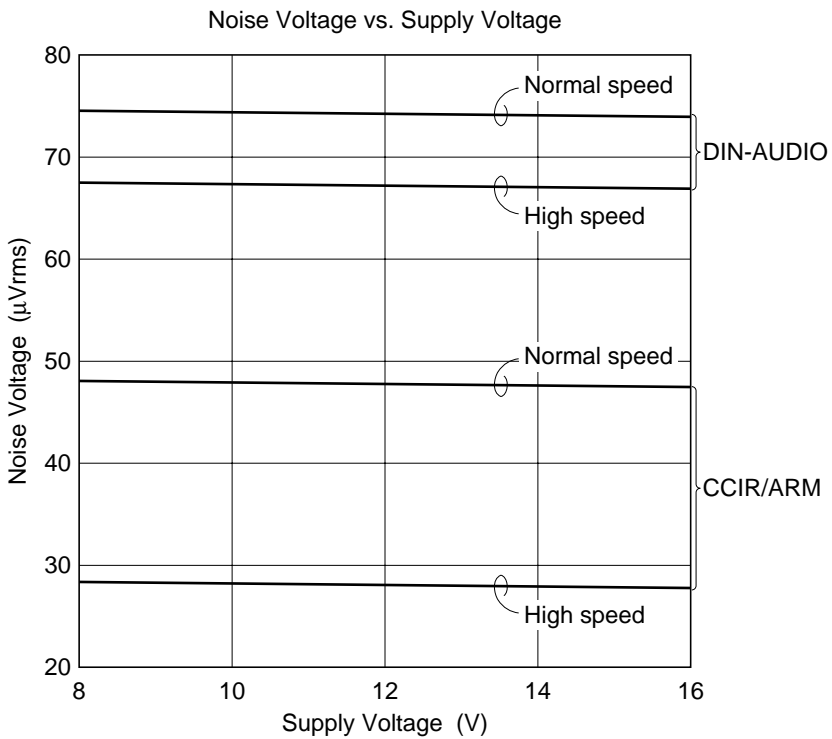
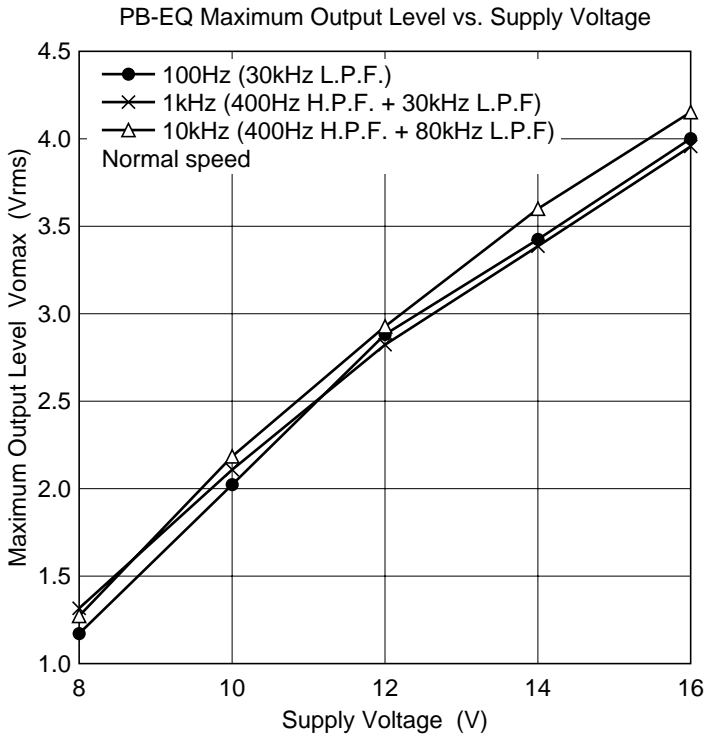


REC-EQ \rightarrow PB-EQ Mode Crosstalk vs. Frequency

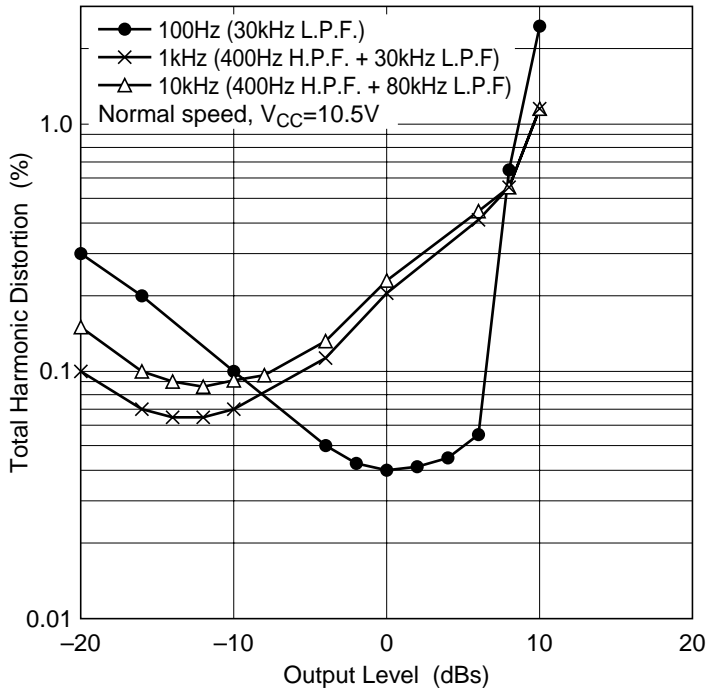




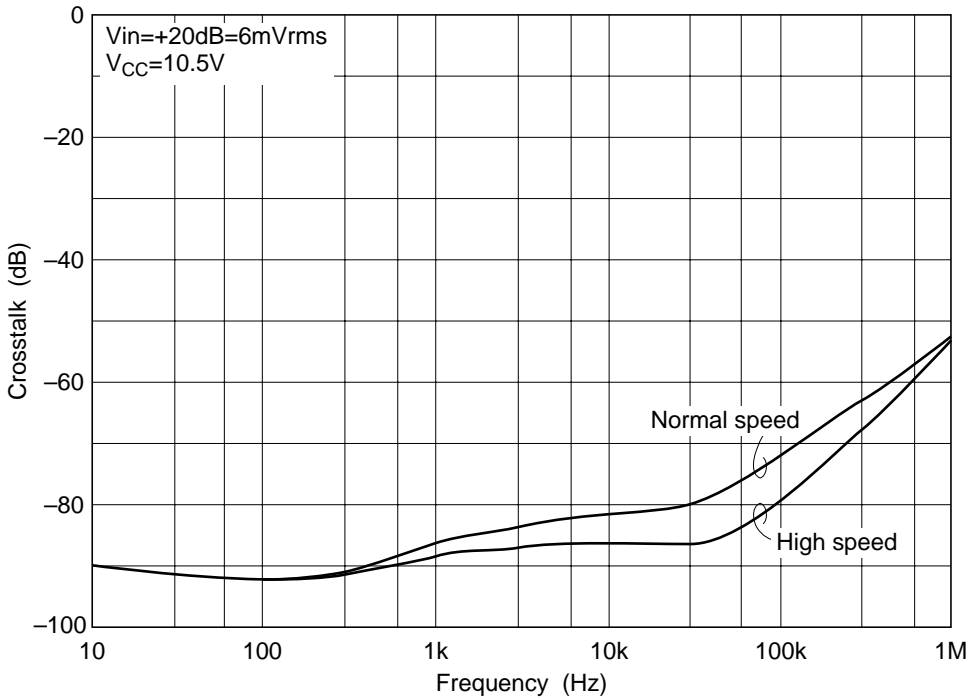


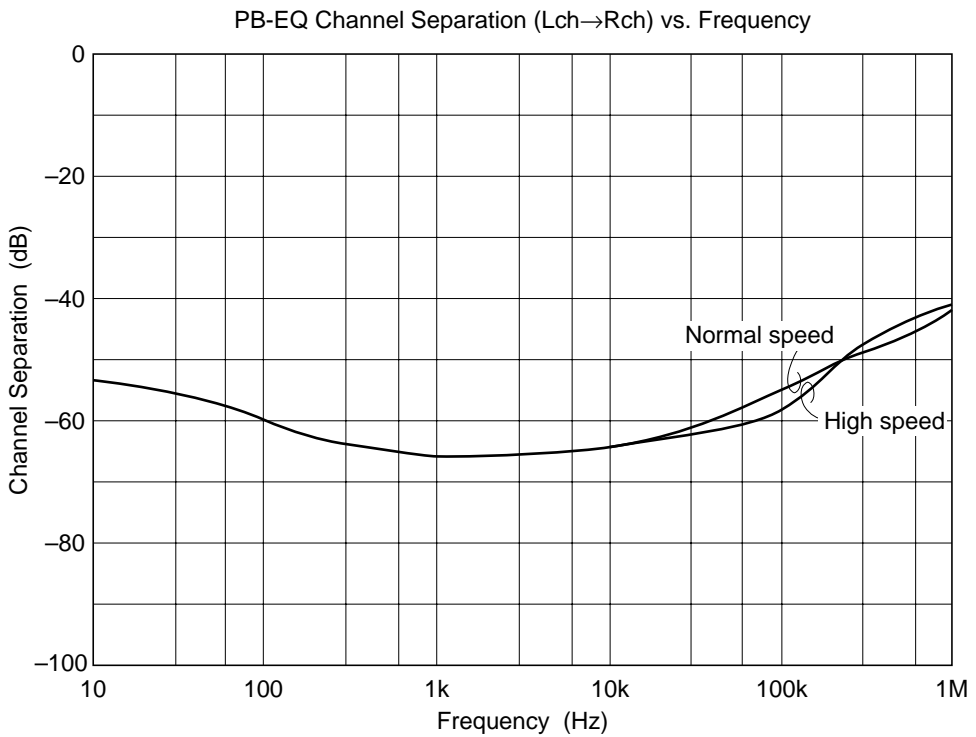
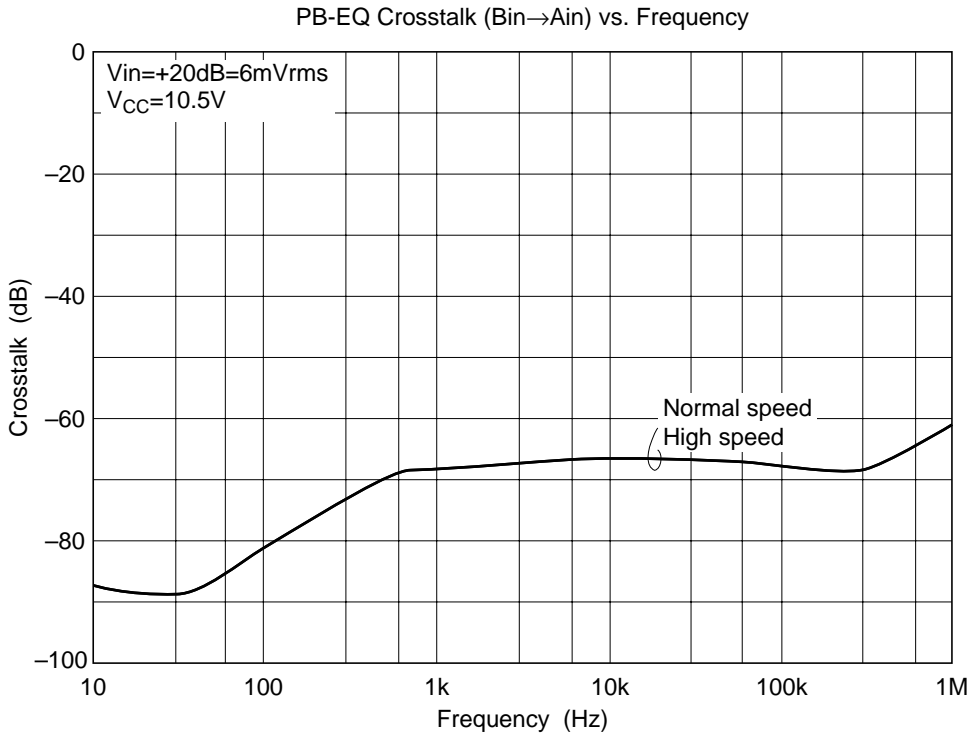


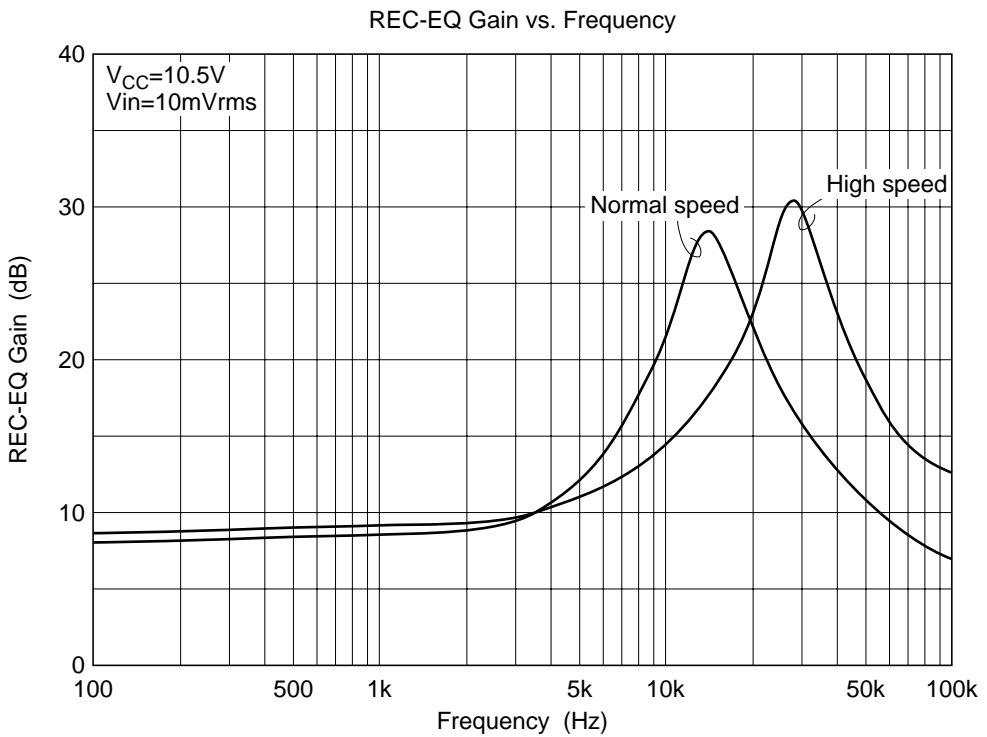
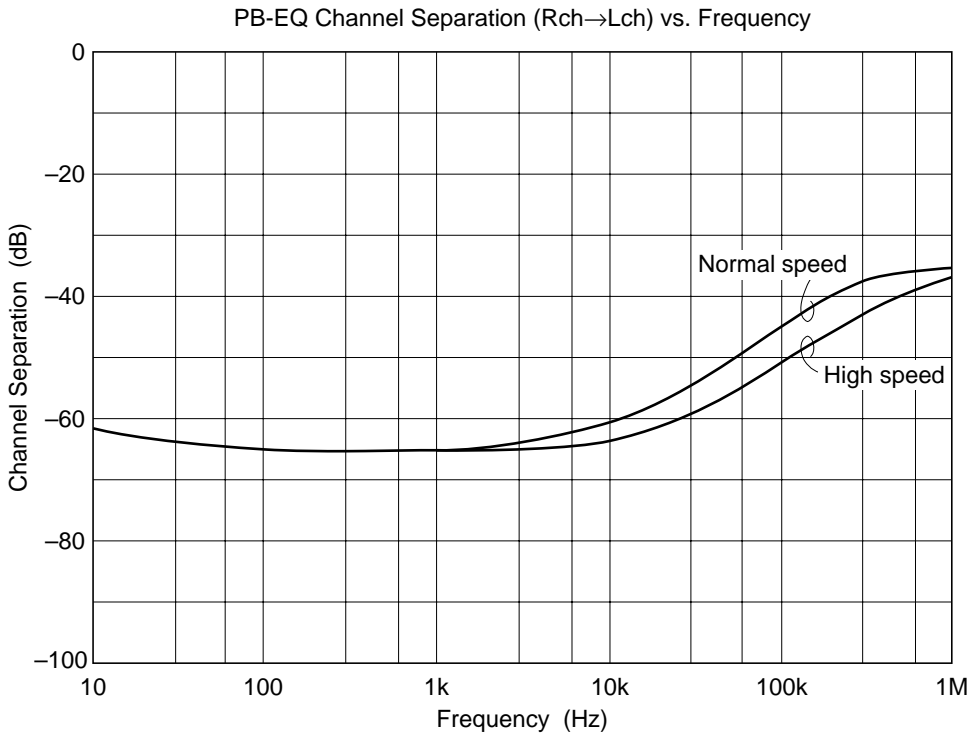
PB-EQ Total Harmonic Distortion vs. Output Level

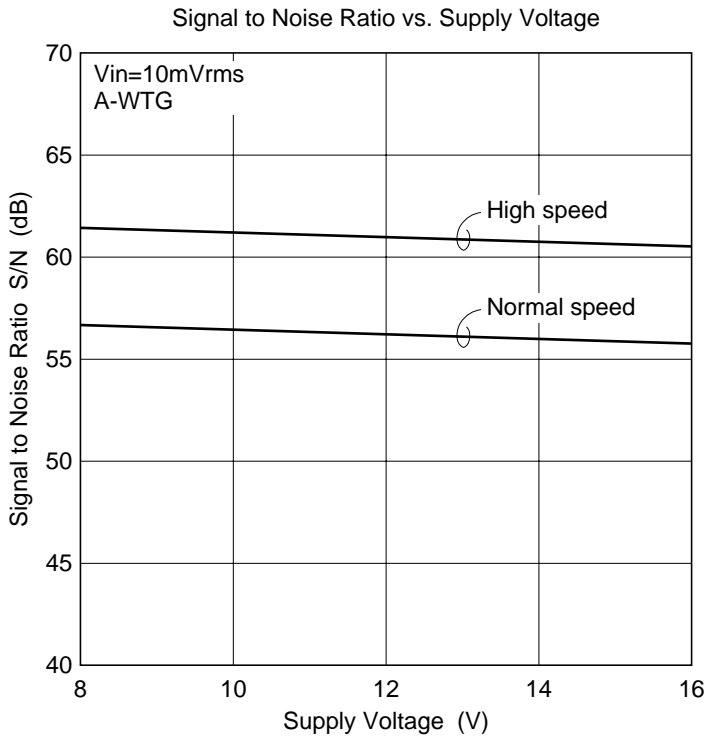
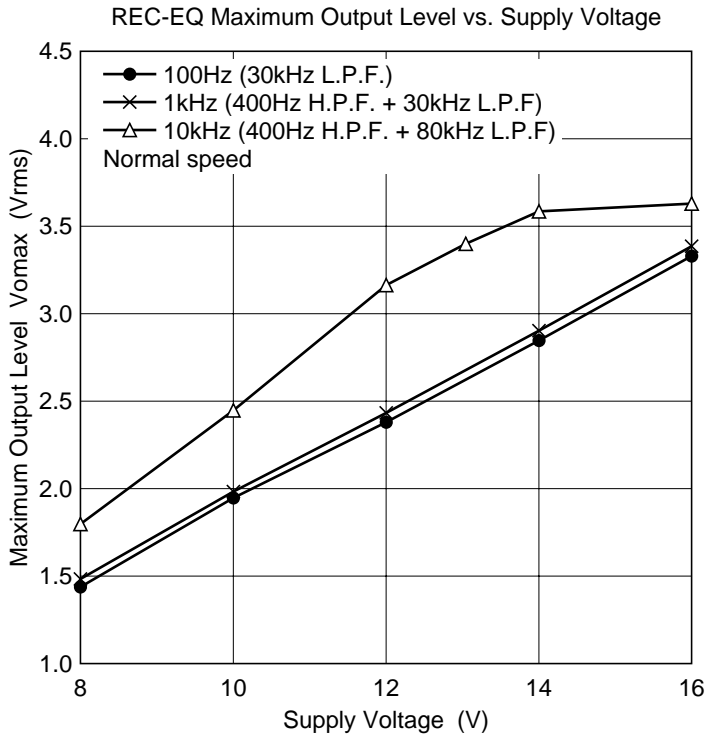


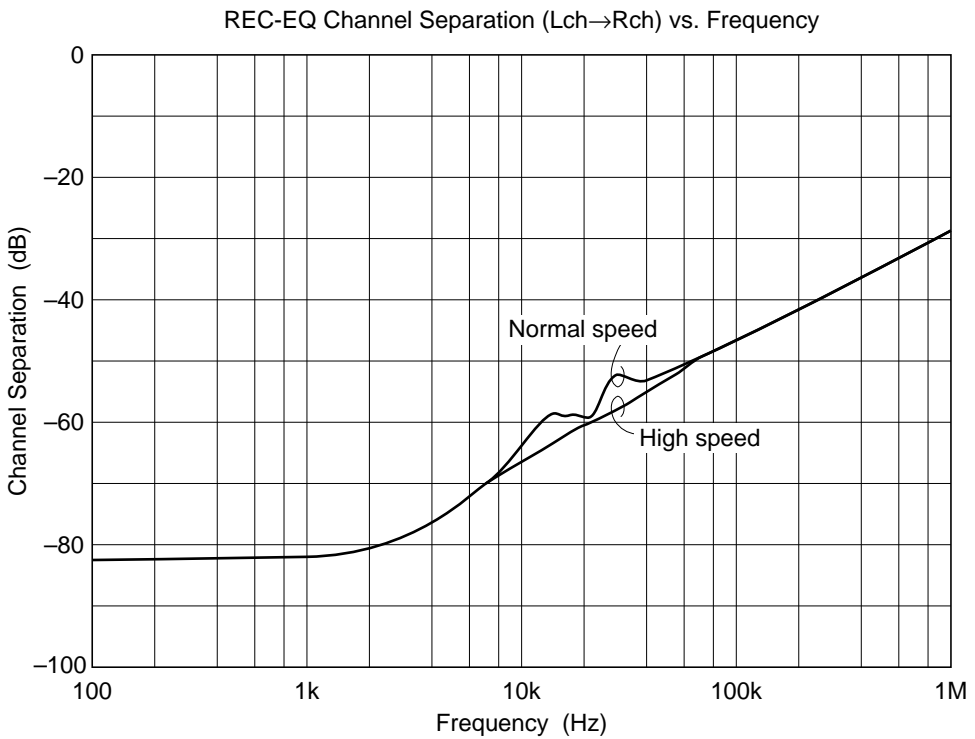
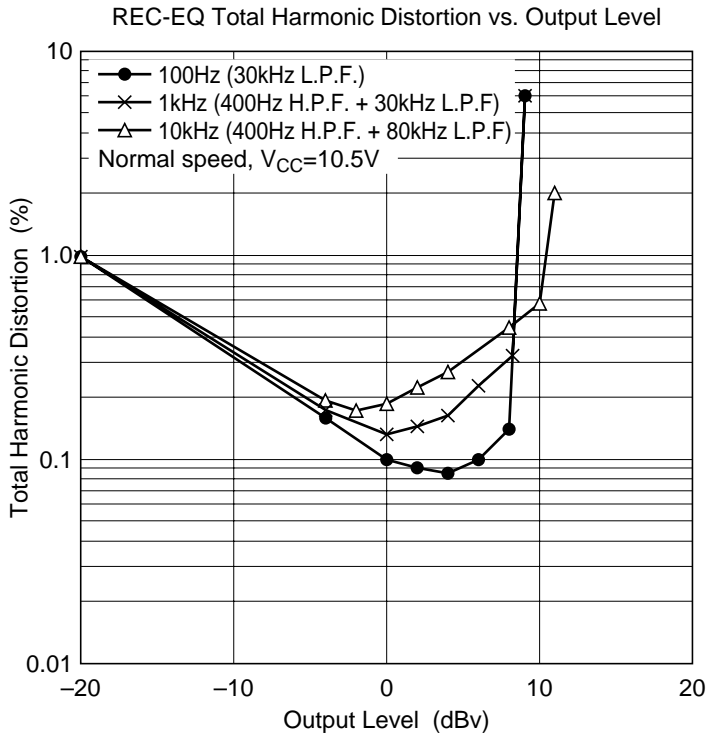
PB-EQ Crosstalk (Ain→Bin) vs. Frequency



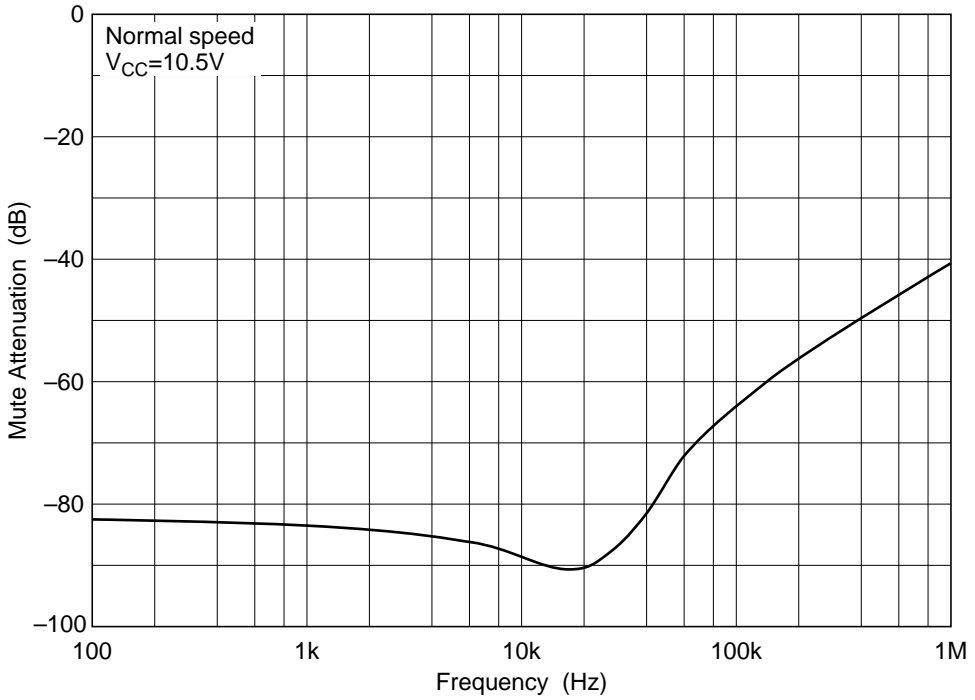




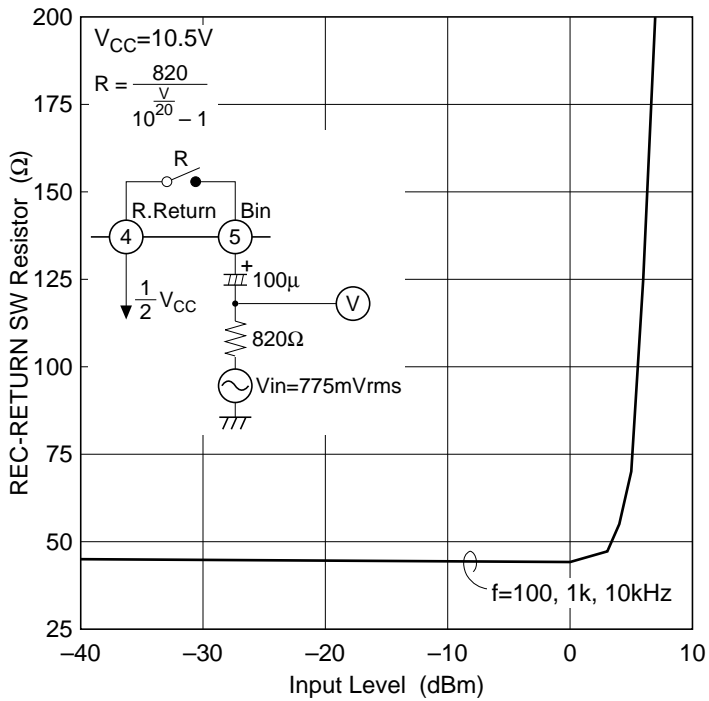




Mute Attenuation vs. Frequency



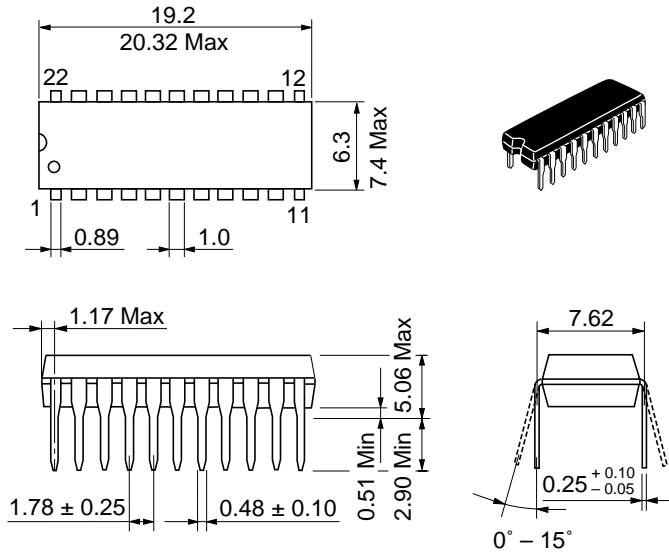
REC-RETURN SW Resistor vs. Input Level



HA12207NT

Package Dimensions

Unit: mm



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

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