
HA12219NT

Audio Signal Processor for Cassette Deck

HITACHI

ADE-207-258A

2nd Edition
July 1998

Description

HA12219NT is silicon monolithic bipolar IC providing PB equalizer, REC equalizer system and each electronic control switch in one chip.

Functions

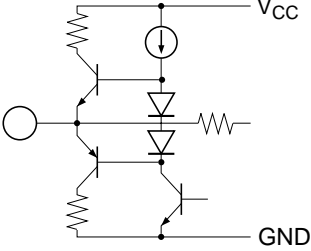
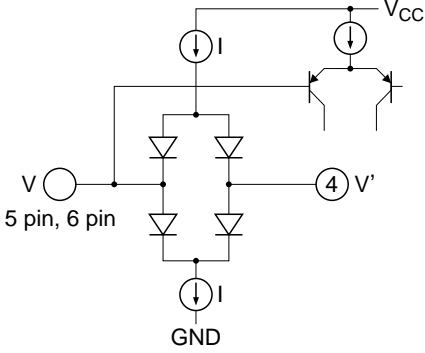
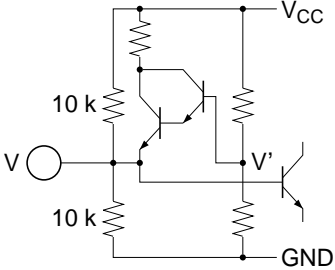
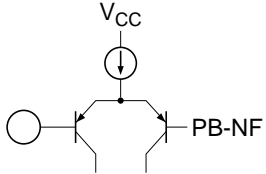
- PB equalizer × 2 channel
- REC equalizer × 2 channel
- Each electronic control switch to change REC/PB etc.
- REC MUTE
- REC head return switch

Features

- REC equalizer is very small number of external parts, built-in 2 types of frequency characteristics.
- PB equalizer circuit built-in.
- REC /PB are possible with TYPE I/II.
- Controllable from direct micro-computer output.
- Available to reduce substrate-area because of high integration and small external parts.

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Pin Description, Equivalent Circuit ($V_{CC} = 12\text{ V}$, $V_{ref} = 5.6\text{ V}$, $T_a = 25^\circ\text{C}$, No signal, The value in the table show typical value.)

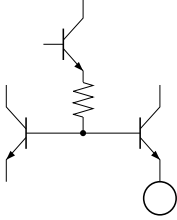
Pin No.	Pin Name	Note	Equivalent Circuit	Pin Description
1	V_{CC}	$V = V_{CC}$		V_{CC} pin
2	REC-OUT(L)	$V = V_{ref}$		REC-EQ output
3	REC-OUT(R)			
4	REC-RETURN	$V = V_{ref}$ $V' = V_{ref}$		REC return
5	PB-IN B(L)			PB B deck input
6	PB-IN B(R)			
7	VREF	$V = V_{ref}$ $V' = V_{CC} / 2$		Reference
8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

Pin Description, Equivalent Circuit ($V_{CC} = 12\text{ V}$, $V_{ref} = 5.6\text{ V}$, $T_a = 25^\circ\text{C}$, No signal, The value in the table show typical value.) (cont)

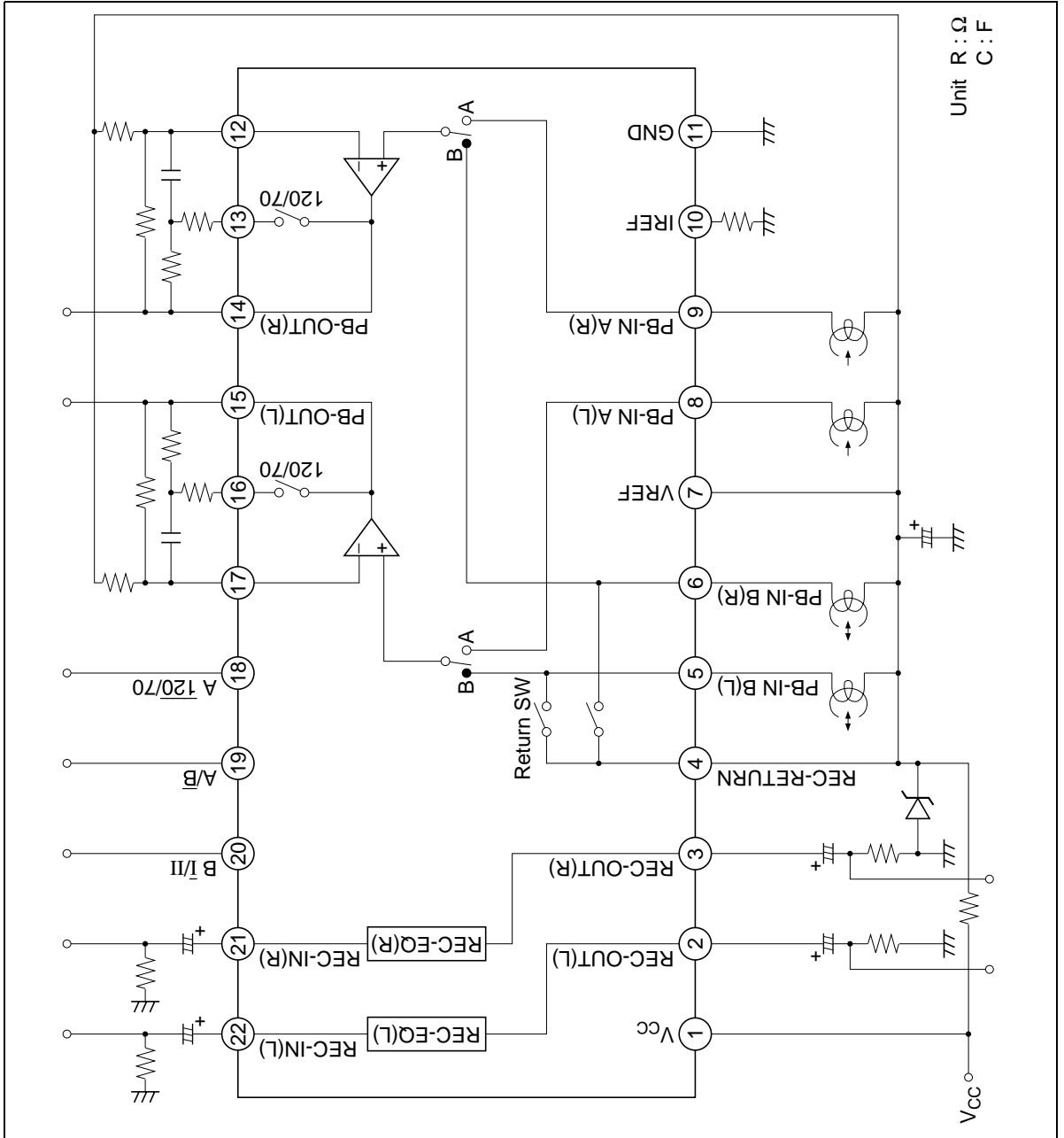
Pin No.	Pin Name	Note	Equivalent Circuit	Pin Description
12	PB-NF(R)	PB-IN = V_{ref}		PB-EQ feed back
17	PB-NF(L)			
13	PB-EQ(R)	PB-OUT = V_{ref}		NAB output
16	PB-EQ(L)			
21	REC-IN(R)	$V = V_{ref}$		REC-EQ input
22	REC-IN(L)			
14	PB-OUT(R)	$V = V_{ref}$		PB output
15	PB-OUT(L)			
18	A $\bar{I}0/70$	$I = 20\ \mu\text{A}$		Mode control input
19	A/B			
20	B \bar{I}/I			

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Pin Description, Equivalent Circuit ($V_{CC} = 12\text{ V}$, $V_{ref} = 5.6\text{ V}$, $T_a = 25^\circ\text{C}$, No signal, The value in the table show typical value.) (cont)

Pin No.	Pin Name	Note	Equivalent Circuit	Pin Description
10	IREF	$V = 1.2\text{ V}$		Equalizer reference current input
11	GND			GND pin

Block Diagram



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Parallel Data Format

Pin No.	Pin Name	Lo	Mid	Hi
18	A $\overline{120/70}$	*	—	*
19	A \overline{B}	B Return SW OFF REC Mute ON	A Return SW ON REC Mute ON	A Return SW ON REC Mute OFF
20	B $\overline{I/II}$	REC-EQ * TYPE I	—	REC-EQ * TYPE II

Note: PB-EQ 120/70 logic

A $\overline{120/70}$	B $\overline{I/II}$	A \overline{B}		
		Lo	Mid	Hi
Lo	Lo	120 μ	120 μ	120 μ
Lo	Hi	70 μ	120 μ	120 μ
Hi	Lo	120 μ	70 μ	70 μ
Hi	Hi	70 μ	70 μ	70 μ

Functional Description

Power Supply Range

HA12219NT is designed to operate on single supply, shown by table 1.

Table 1 Supply Voltage

Item	Power Supply Range
Single Supply	9.5 V to 15.0 V

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.

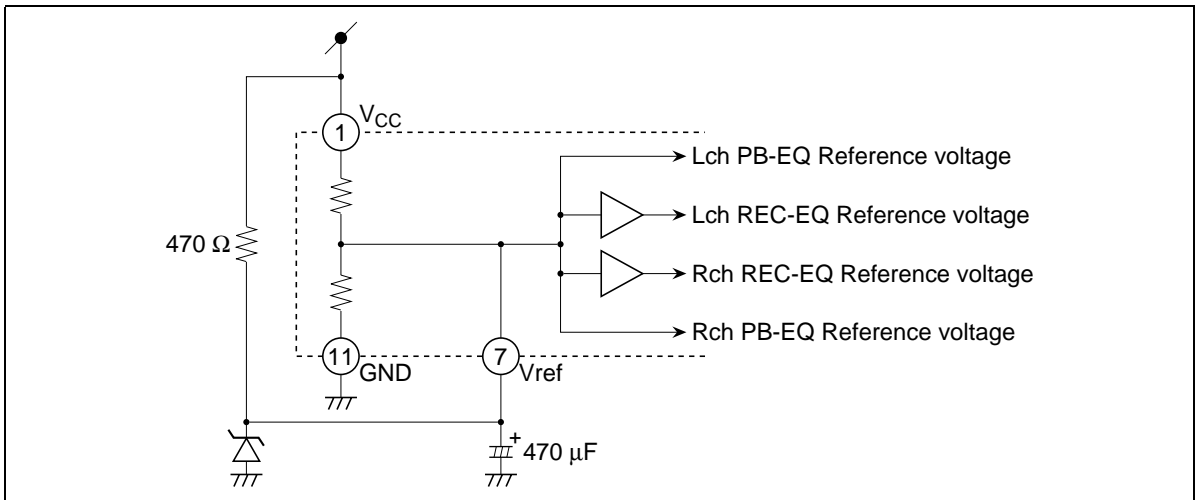


Figure 1 Reference Voltage Circuit

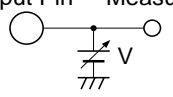
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Operating Mode Control

HA12219NT 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	Mid	Hi	Unit	Test Condition
18, 20	0.0 to 0.5	—	2.4 to V_{CC}	V	Input Pin Measure 
19	0.0 to 0.5	1.2 to 1.8	2.4 to V_{CC}	V	

- Note:
- Each pin is pulled down with 100 k Ω 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 -0.2 V)

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.

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

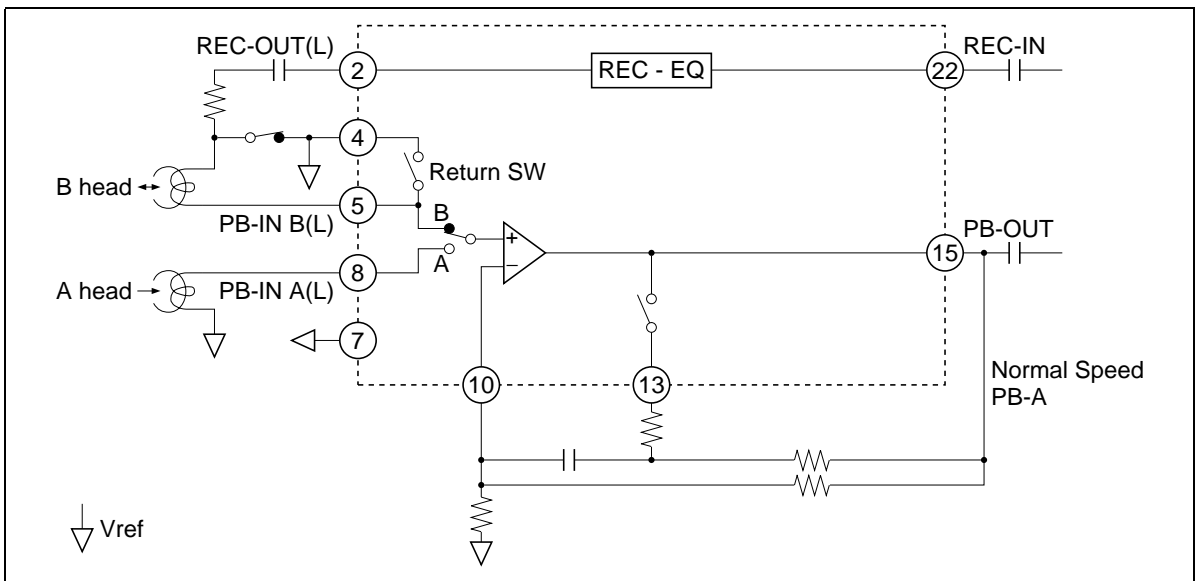


Figure 2 Block Diagram (Lch)

Level Block Diagram

The gain establishment of PB-EQ considers PB output level
 {(external AMP+PB AMP <HA12136A>) = 580 mV (Dolby Level)} like figure 3 as the target.

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

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

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.

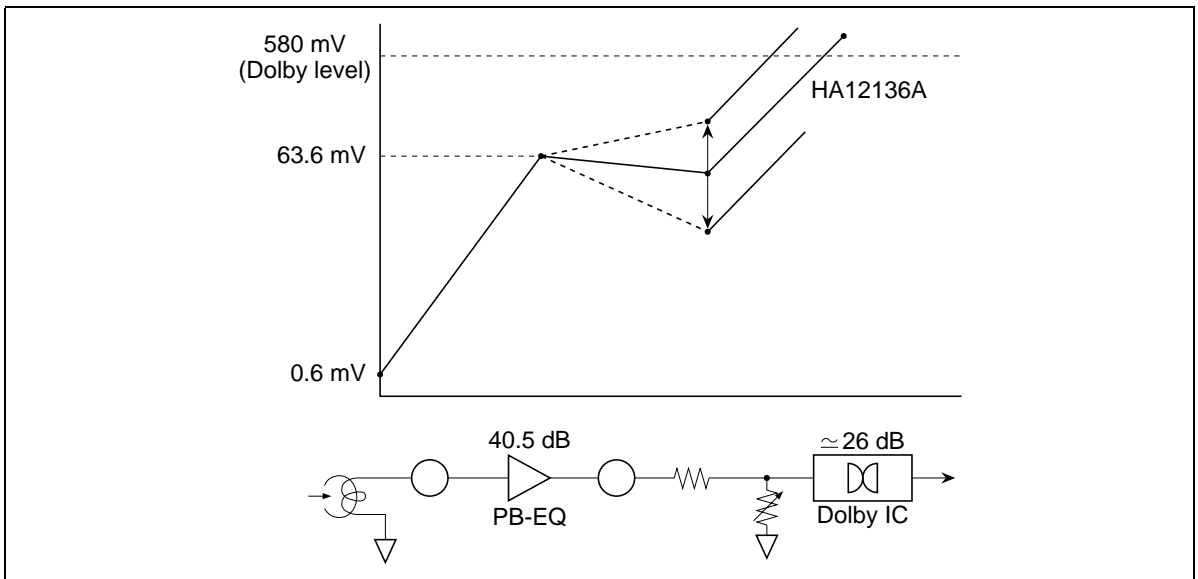


Figure 3 PB Level Block Diagram (120 μs, 1 kHz)

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Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Rating	Unit	Note
Maximum supply voltage	V _{CC} max	16	V	
Power dissipation	P _T	500	mW	Ta ≤ 75°C
Operating temperature	T _{opr}	-40 to +75	°C	
Storage temperature	T _{stg}	-55 to +125	°C	
Operating voltage	V _{opr}	9.5 to 15	V	

Note: HA12219NT operates on single supply voltage.

Electrical Characteristics (Ta = 25°C, V_{CC} = 12 V, V_{ref} = 5.6 V, PBIN standard level = 0.6 mVrms at 1 kHz)

Item	Symbol	Min	Typ	Max	Unit	Test Condition						Application Terminal			
						IC Condition			f _{in} (Hz)	V _{in} (mVrms)	Other	Input		Output	
						A/B	B //IIA	120/70				R	L	R	L
Quiescent current	I _Q	—	23.1	32.7	mA	A	I	70	—	—	No signal			1	
Logical threshold	V _{IL}	-0.2	—	0.5	V	—	—	—	—	—	—			18, 20	
	V _{IM}	1.2	—	1.8	V	—	—	—	—	—	—			19	
	V _{IH}	2.4	—	V _{CC}	V	—	—	—	—	—	—			18, 20	
	PB-REC crosstalk	CT PB/REC(1) CT PB/REC(2)	50.0 60.0	60.0 70.0	—	dB	A/B	I	120	1k	*1	REC-EQ → PB-EQ PB-EQ → REC-EQ	21	22	14
PB-EQ gain	G _V PB(1)	37.5	40.5	43.5	dB	A/B	I	120	1k	0.6	—	9/6	8/5	14	15
	G _V PB(2)	33.2	36.2	39.2	dB	A/B	I	120	10k	0.6	—	9/6	8/5	14	15
	G _V PB(3)	29.0	32.0	35.0	dB	A/B	II	70	10k	0.6	—	9/6	8/5	14	15
PB-EQ maximum output *2	V _{omax} PB	0.3	0.6	—	Vrms	A/B	I	120	1k	—	THD=1%	9/6	8/5	14	15
PB-EQ THD	THD PB	—	0.1	0.5	%	A/B	I	120	1k	0.6	—	9/6	8/5	14	15
PB-EQ noise voltage	V _N PB	—	90.0	180.0	μVrms	A/B	I	120	—	—	Rg=820Ω, DIN-AUDIO	9/6	8/5	14	15
	channel separation	CT R/L(1)	50.0	60.0	—	dB	A/B	I	120	1k	*1	8/5	9/6	14	15
PB-EQ crosstalk	CT A/B	60.0	70.0	—	dB	A	I	120	1k	*1	—	6	5	14	15
		—	—	—	dB	B	—	—	—	—	—	9	8	—	—

Note: 1. Large level without clipping.
2. V_{CC} = 9.5 V, V_{ref} = 4.75 V

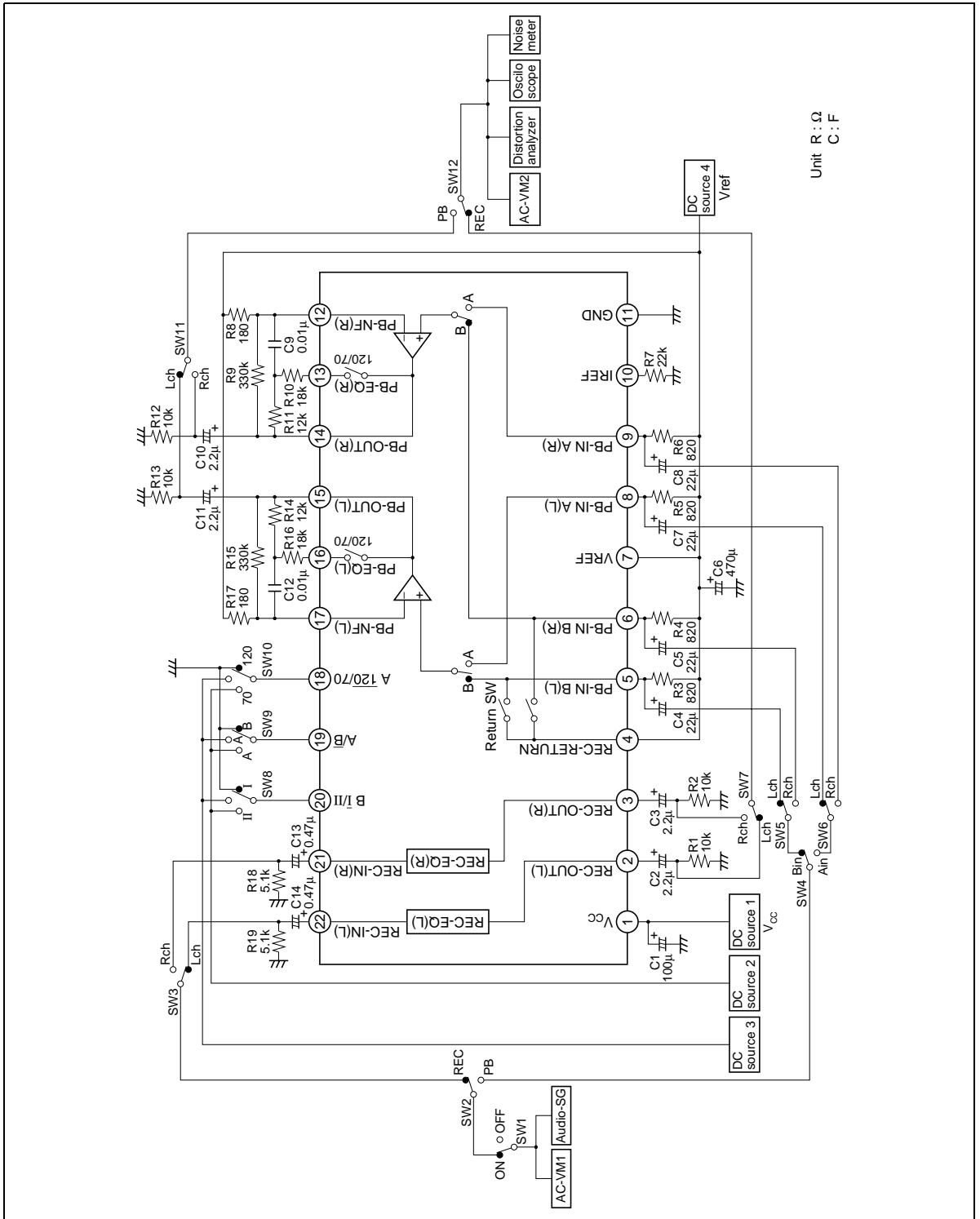
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Electrical Characteristics ($T_a = 25^\circ\text{C}$, $V_{CC} = 12\text{ V}$, $V_{ref} = 5.6\text{ V}$,
EQIN standard level = 20 dBs = 77.5 mVrms = 0 dB) (cont)

Item	Symbol	Min	Typ	Max	Unit	Test Condition						Application Terminal					
						IC Condition			fin (Hz)	Vin (mVrms)	Other	Input			Output		
						A/B	B //IIA	120/70				R	L	R	L	R	L
REC-EQ frequency response TYPE I	G_V REC-NN1 G_V REC-NN2 G_V REC-NN3	18.5 19.4 29.1	20.0 21.4 32.1	21.5 23.4 35.1	dB dB dB	A	I	120	1k	7.75		21	22	3	2		
REC-EQ frequency response TYPE II	G_V REC-NC1 G_V REC-NC2 G_V REC-NC3	22.3 24.7 33.6	23.8 26.7 36.6	25.3 28.7 39.6	dB dB dB	A	II	120	1k	7.75		21	22	3	2		
REC-EQ channel separation	CT R/L(2)	61.0	70.0	—	dB	A	I	120	1k	*1		21	22	3	2		
REC-MUTE attenuation	R-MUTE ATT	66.0	76.0	—	dB	MID	I	120	1k	*1		21	22	3	2		
REC-EQ maximum output *2	Vomax REC	1.2	1.8	—	Vrms	A	I	120	1k	—	THD=1%	21	22	3	2		
REC-EQ THD	THD REC	—	0.2	0.5	%	A	I	120	1k	77.5		21	22	3	2		
REC-EQ S/N	S/N REC	61.0	64.0	—	dB	A	I	120	1k	—	Rg=5.1k Ω , A-WTG	21	22	3	2		

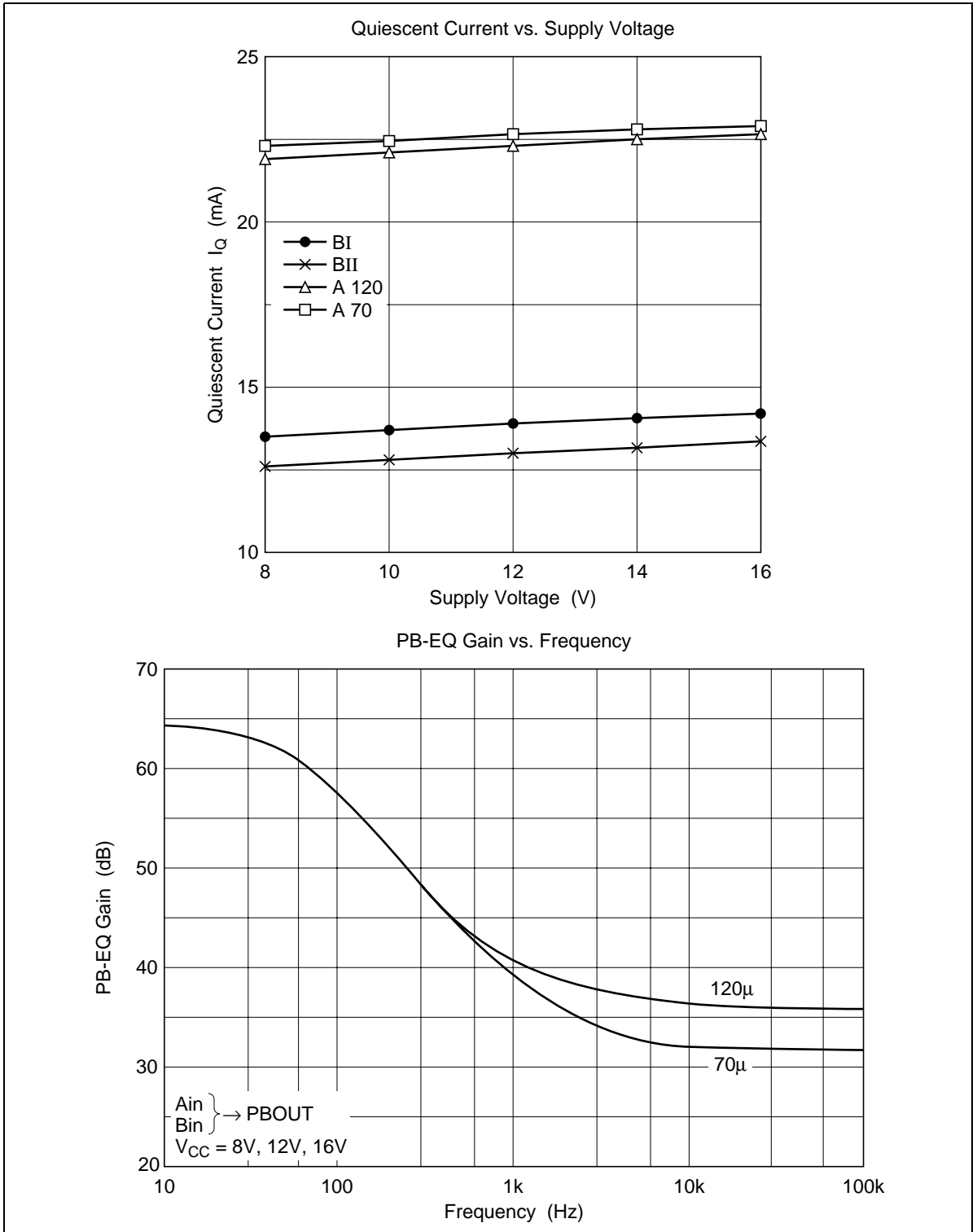
Note: 1. Large level without clipping
2. $V_{CC} = 9.5\text{ V}$, $V_{ref} = 4.75\text{ V}$

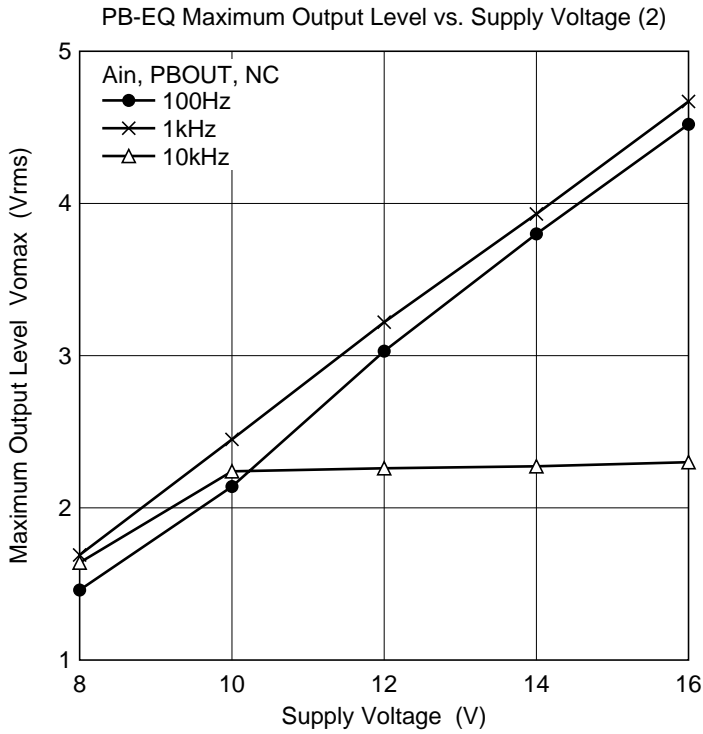
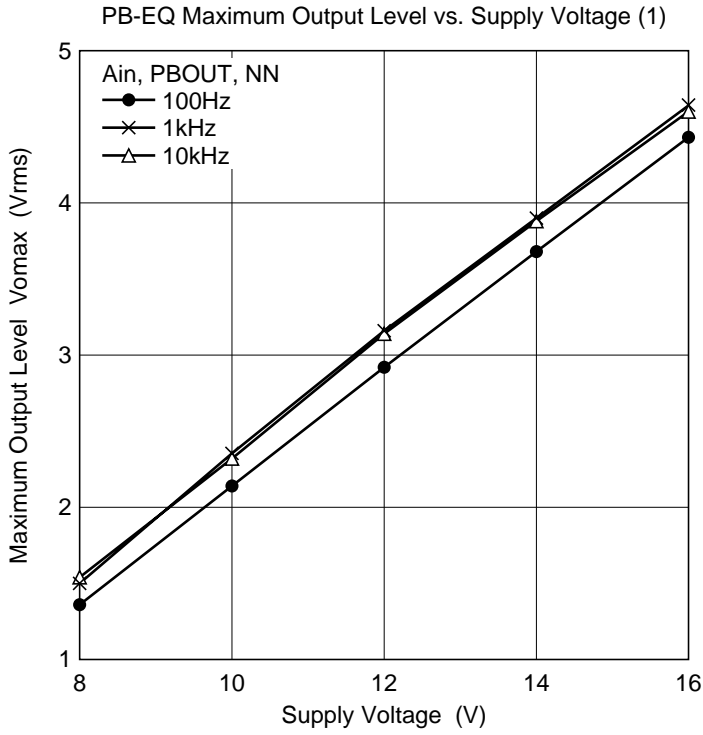
Test Circuit



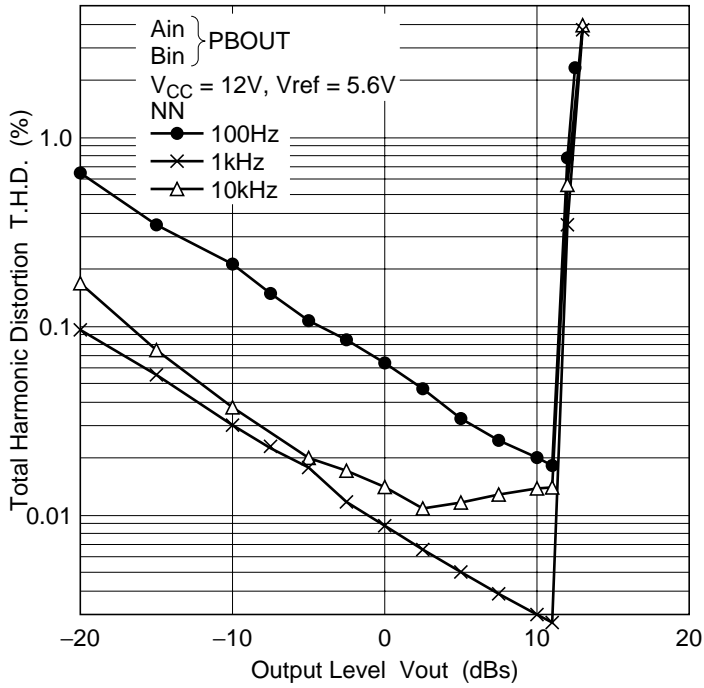
Unit R : Ω
C : F

Characteristic Curves

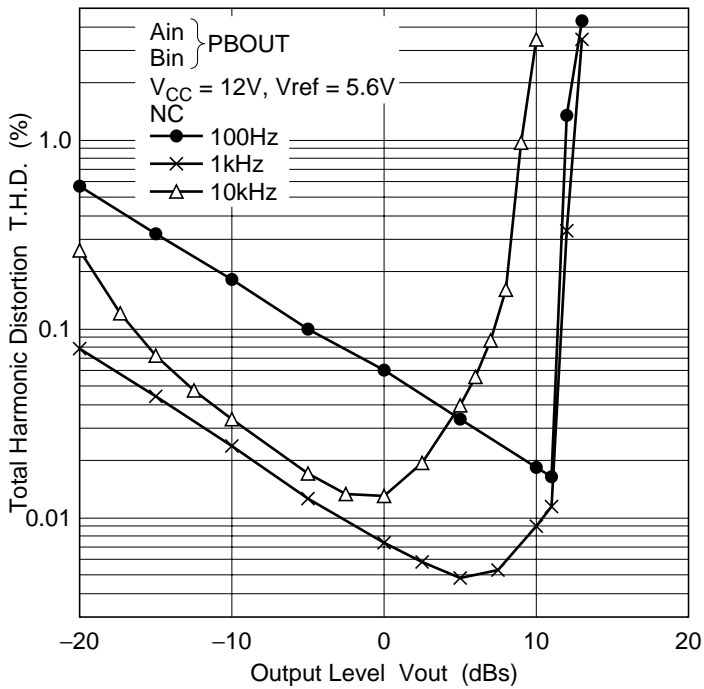




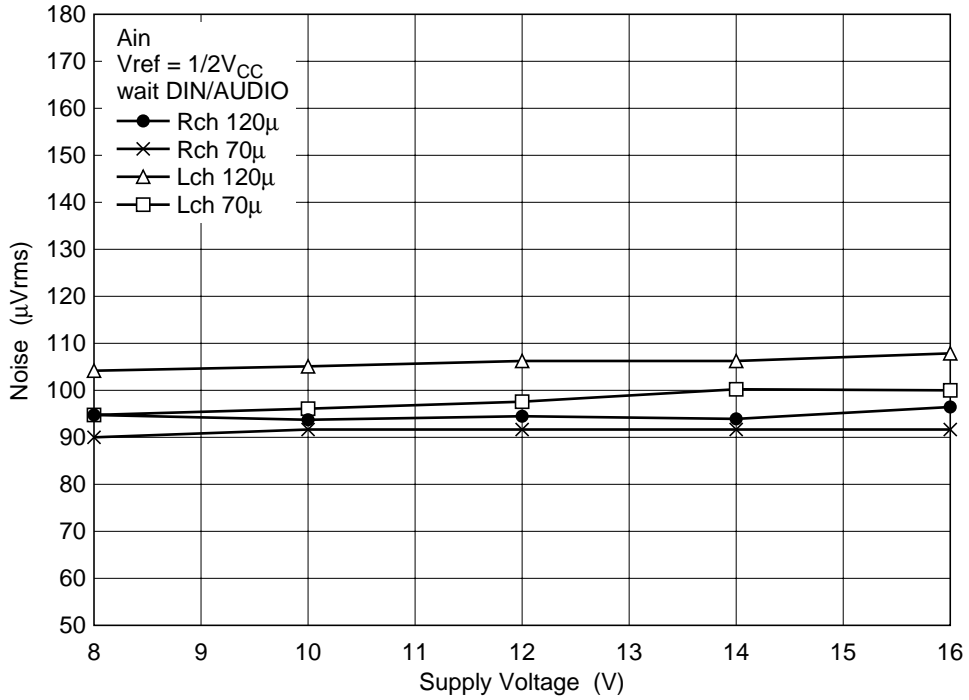
PB-EQ Total Harmonic Distortion vs. Output Level (1)



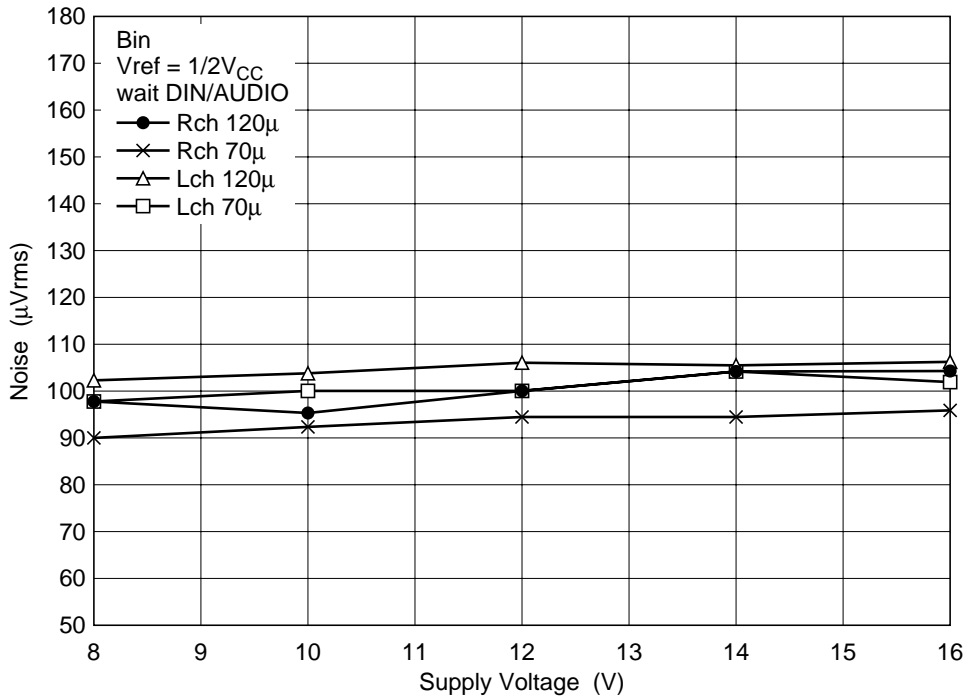
PB-EQ Total Harmonic Distortion vs. Output Level (2)



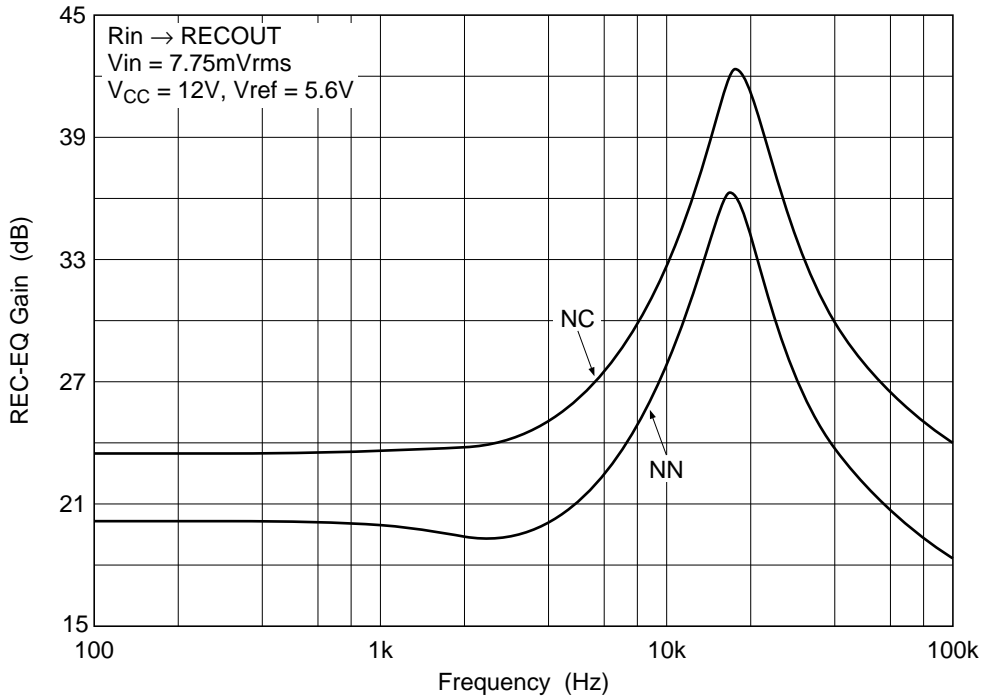
PB-EQ Noise Level vs. Supply Voltage (1)



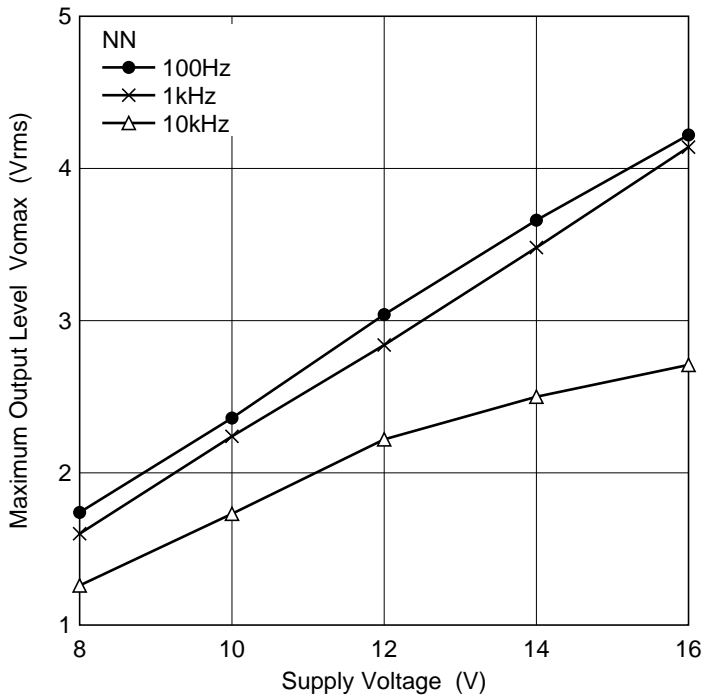
PB-EQ Noise Level vs. Supply Voltage (2)

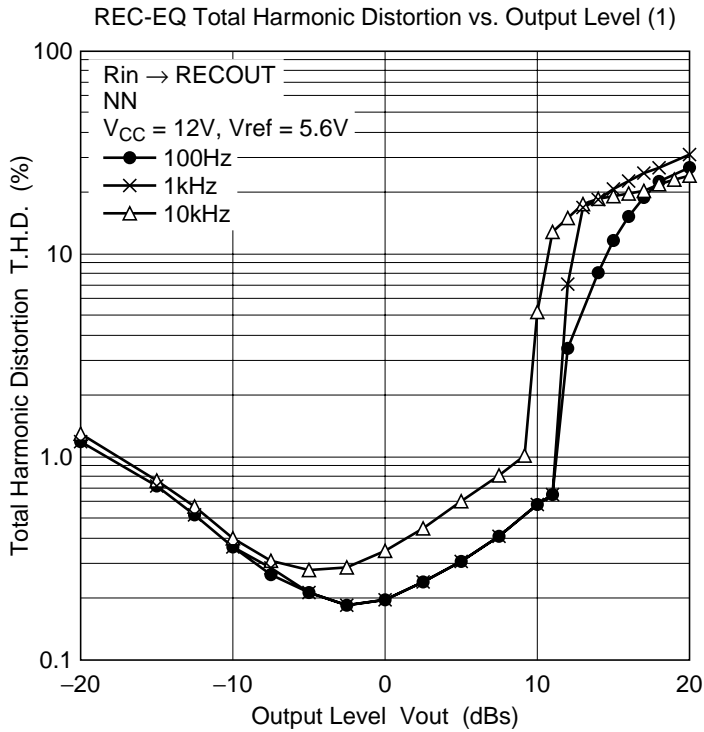
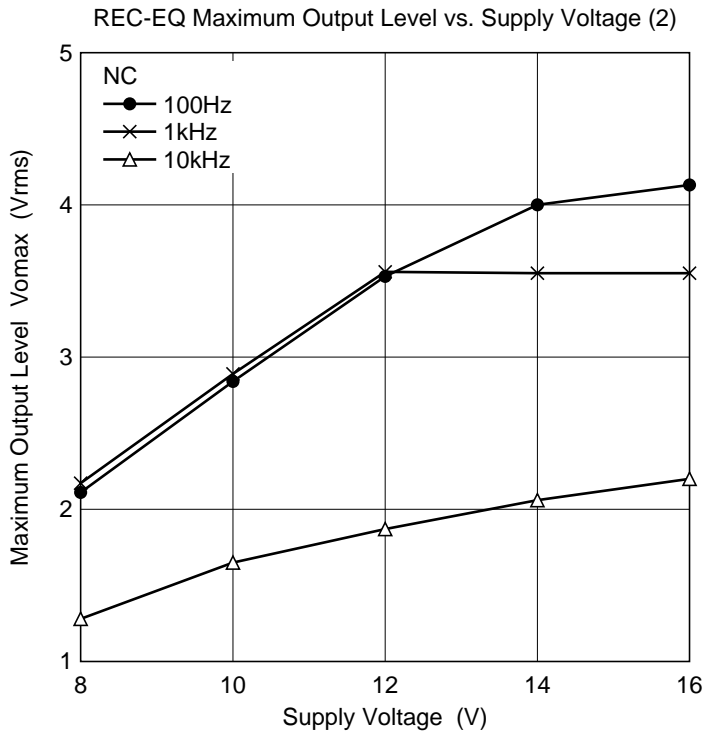


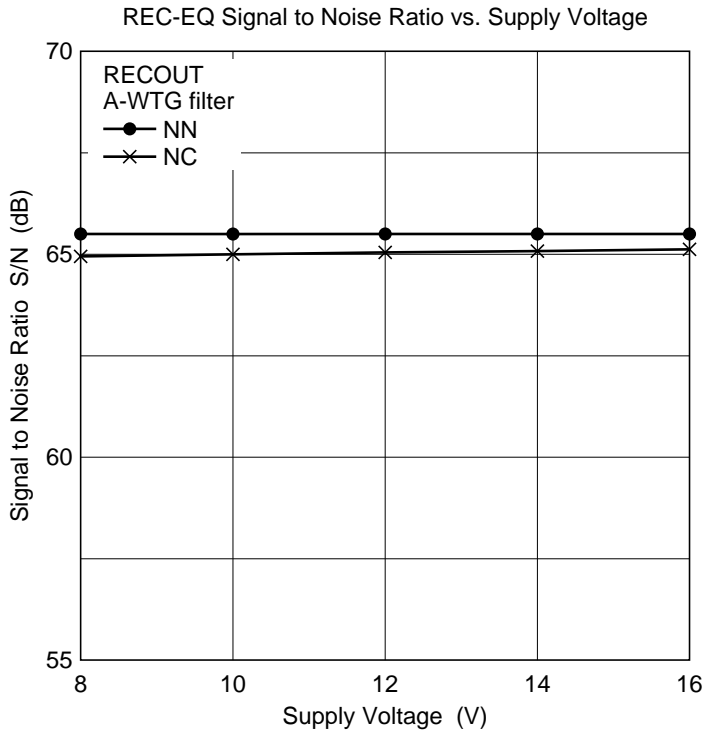
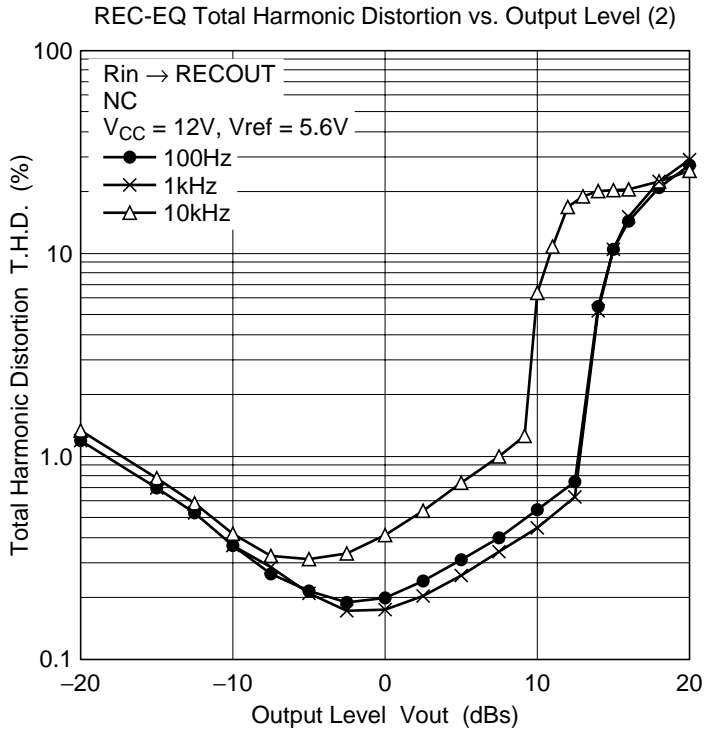
REC-EQ Gain vs. Frequency



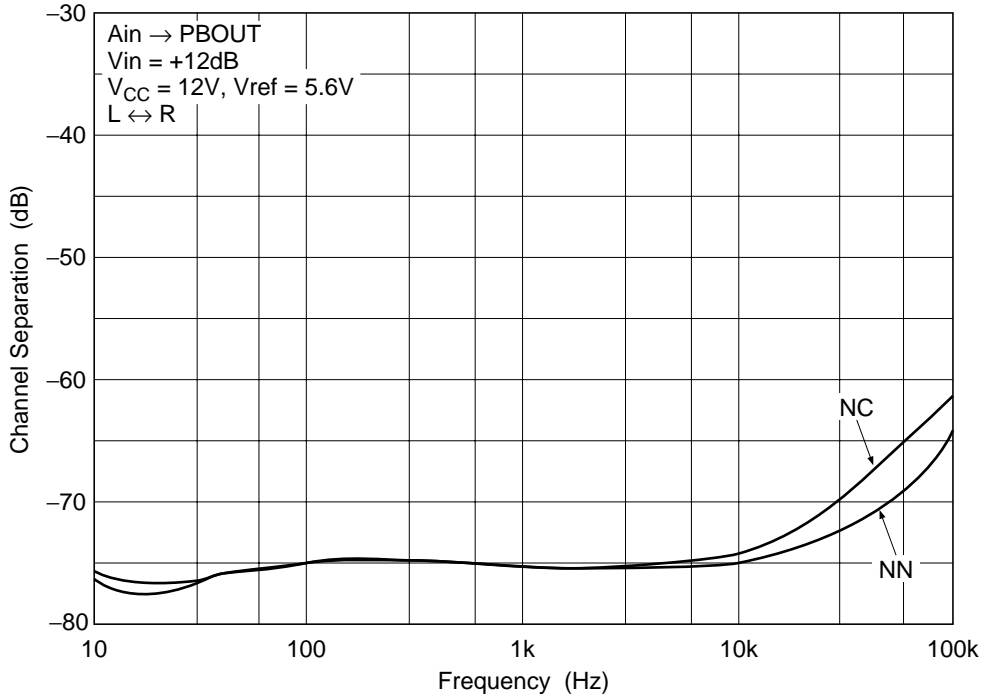
REC-EQ Maximum Output Level vs. Supply Voltage (1)



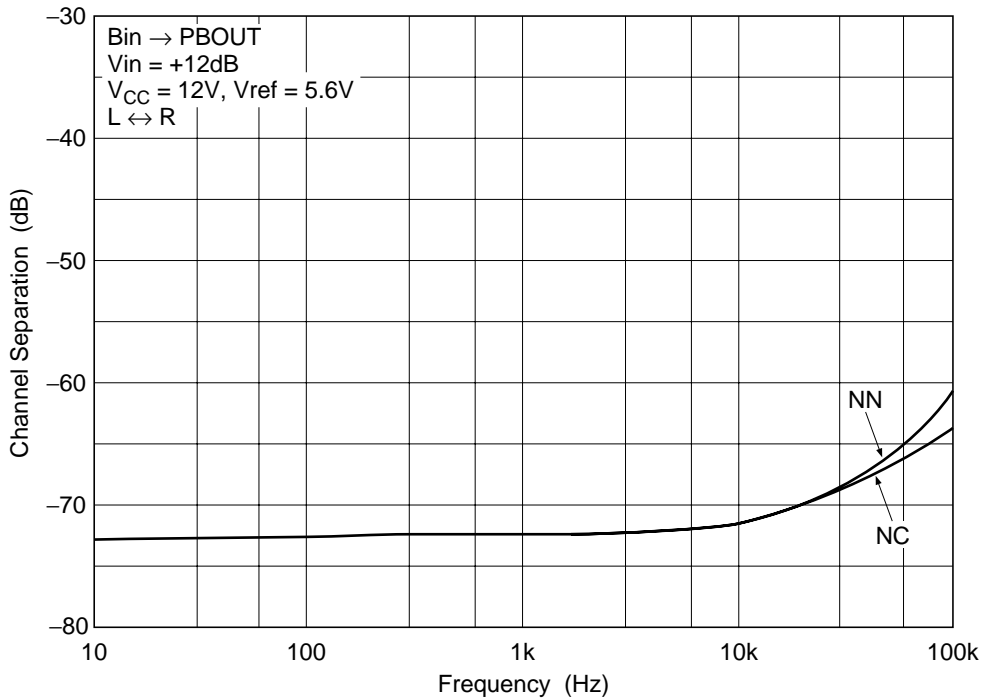


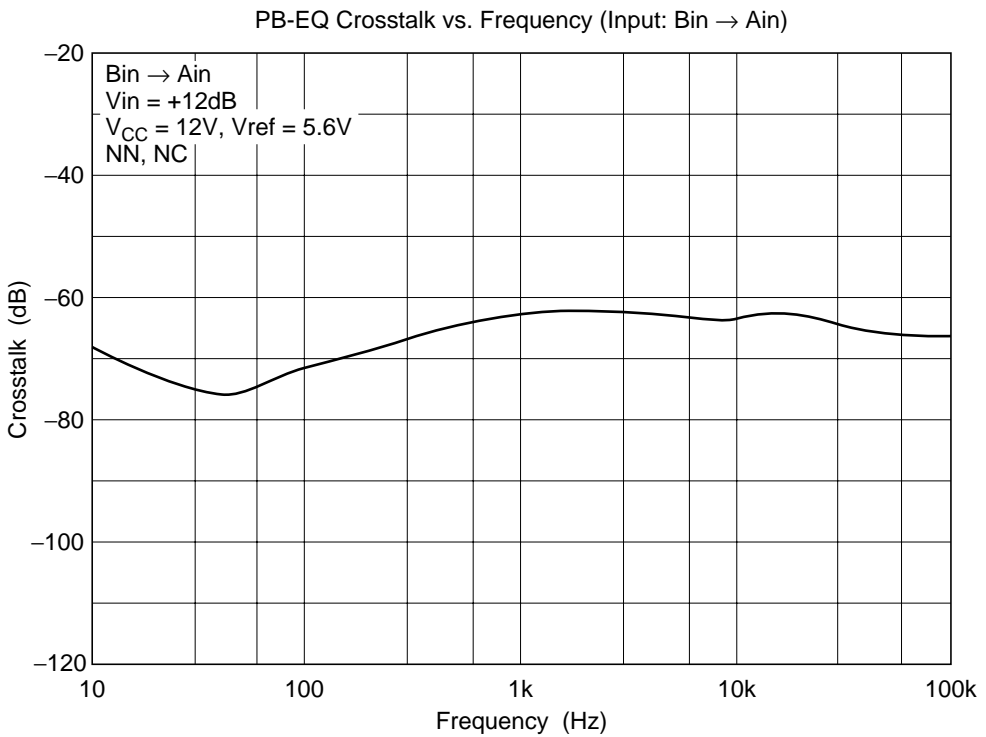
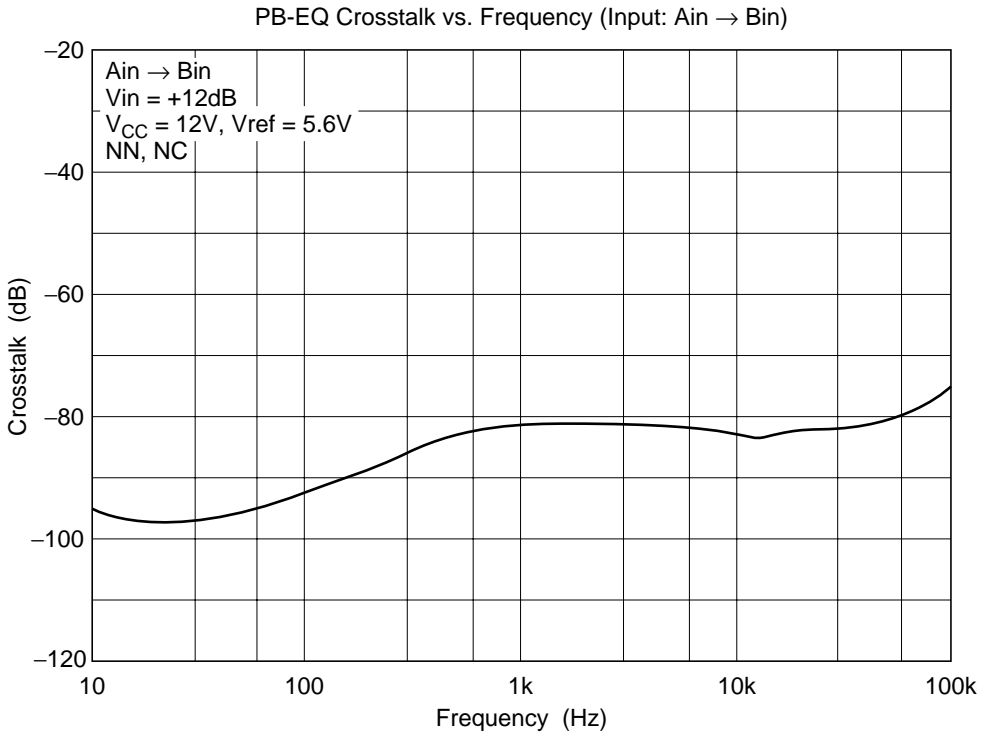


PB-EQ Channel Separation vs. Frequency (L ↔ R) (1)

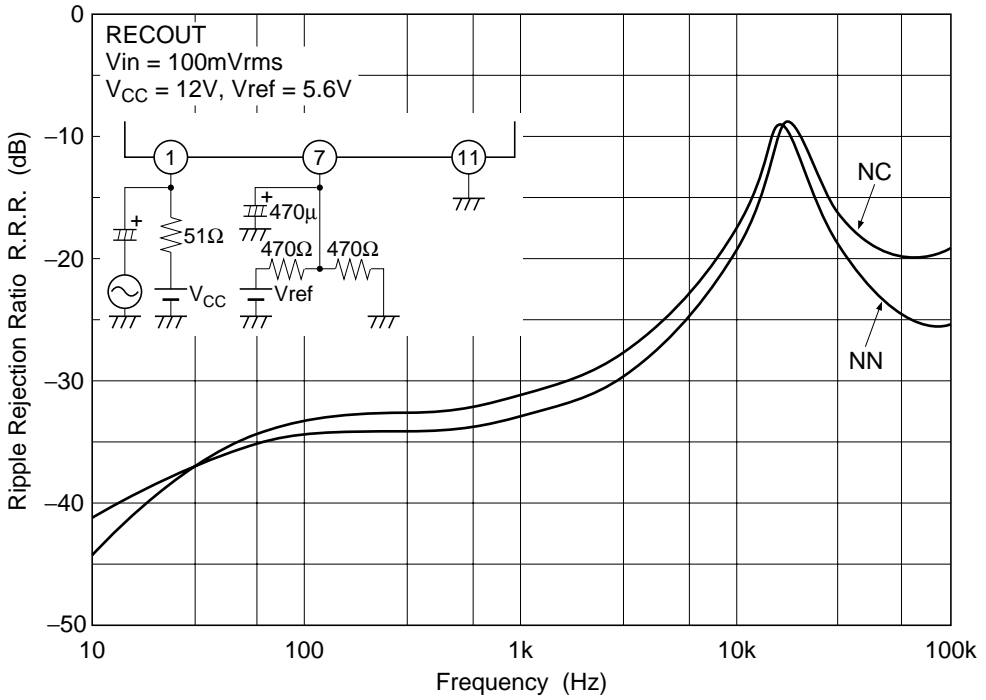


PB-EQ Channel Separation vs. Frequency (L ↔ R) (2)

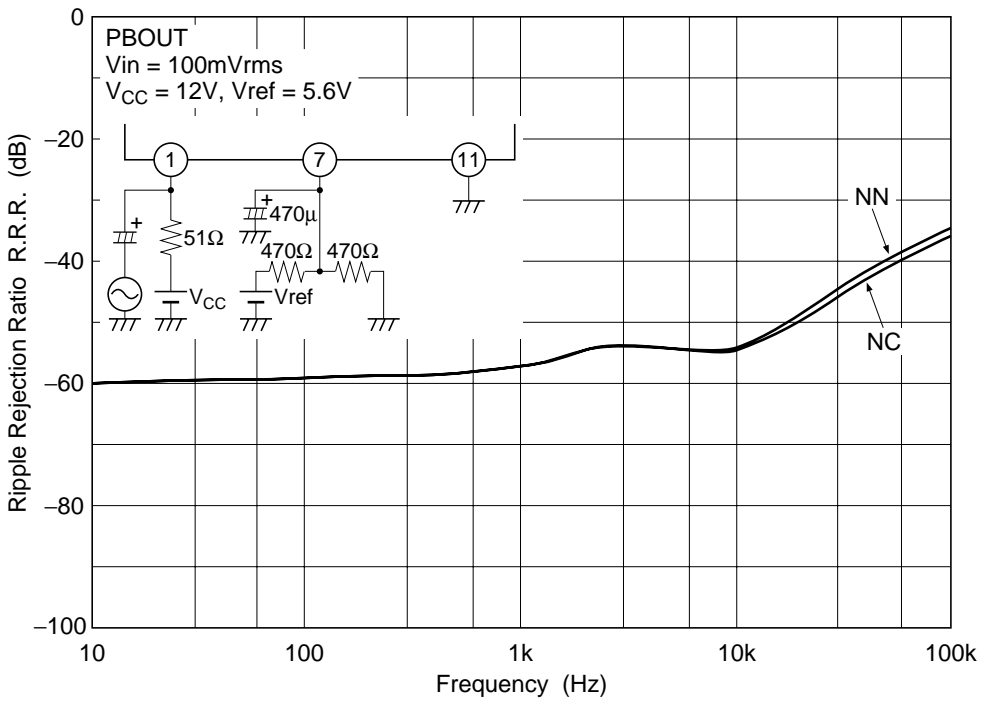




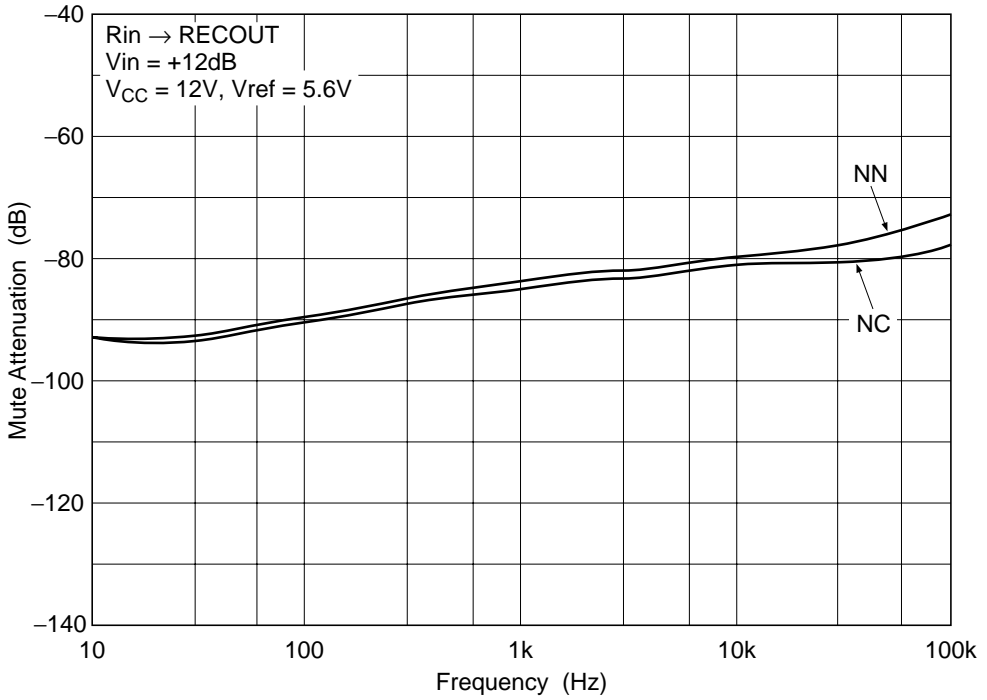
Ripple Rejection Ratio vs. Frequency (REC)



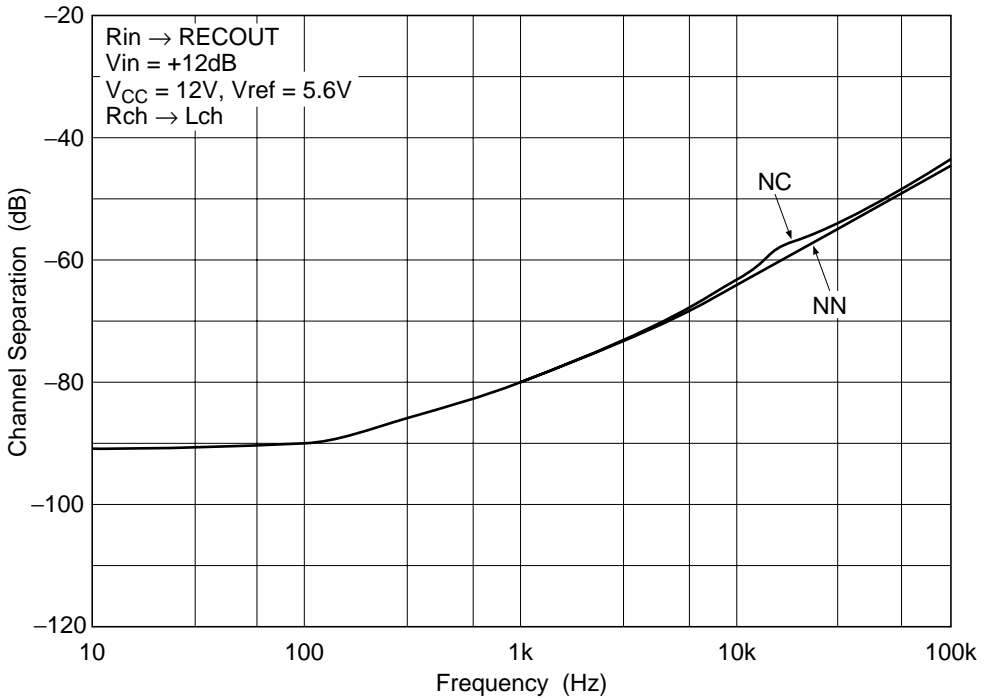
Ripple Rejection Ratio vs. Frequency (PB)

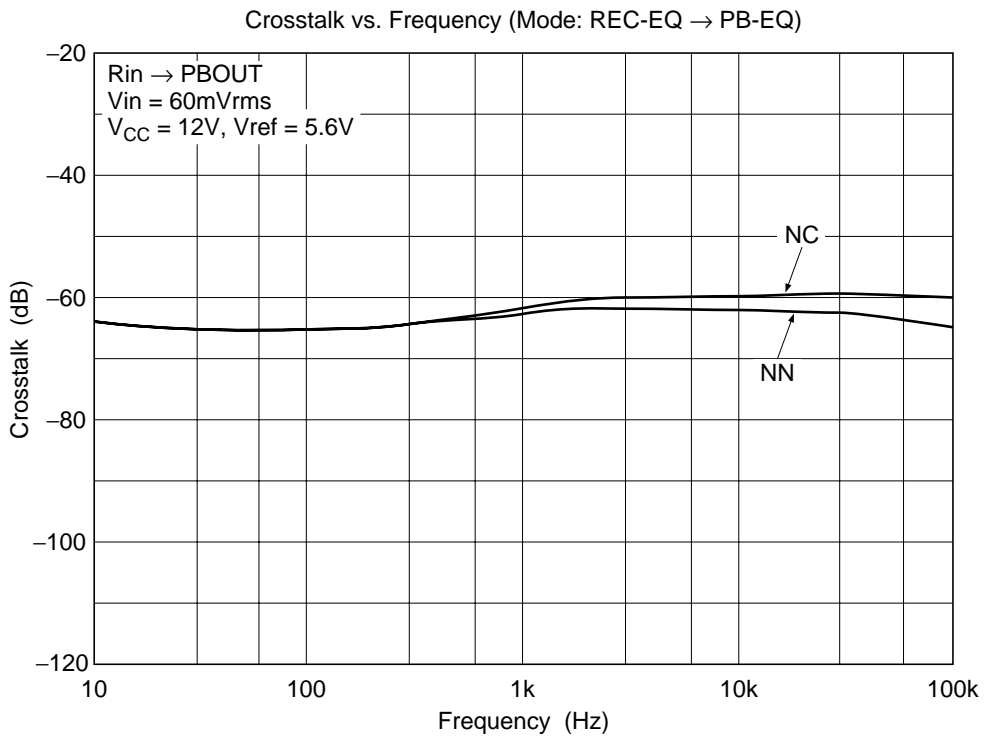
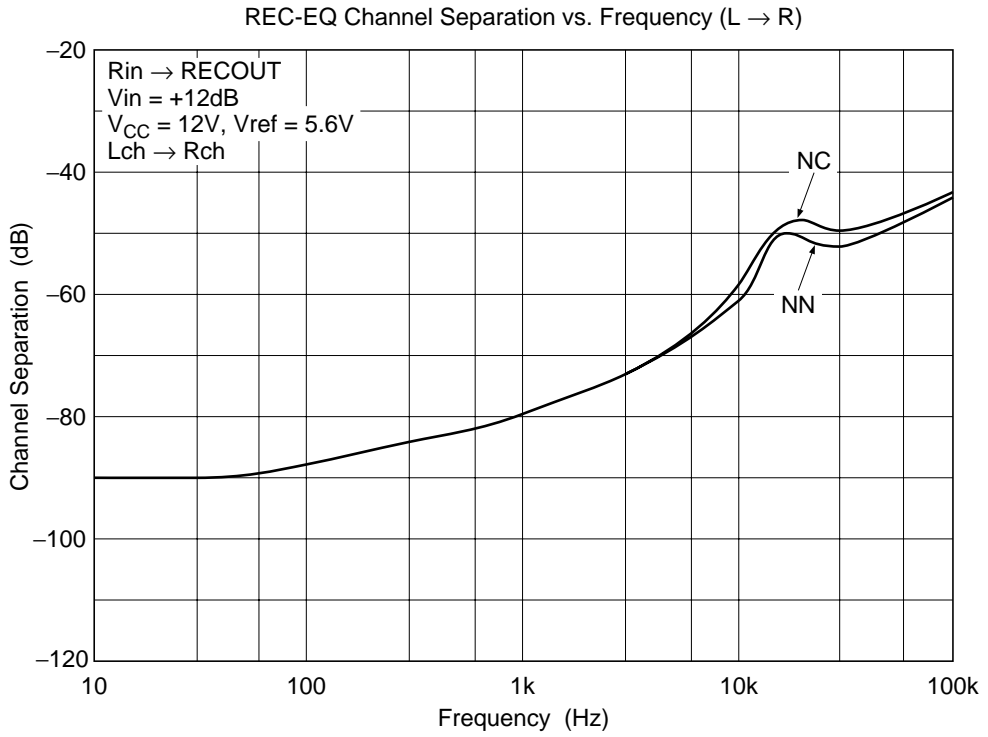


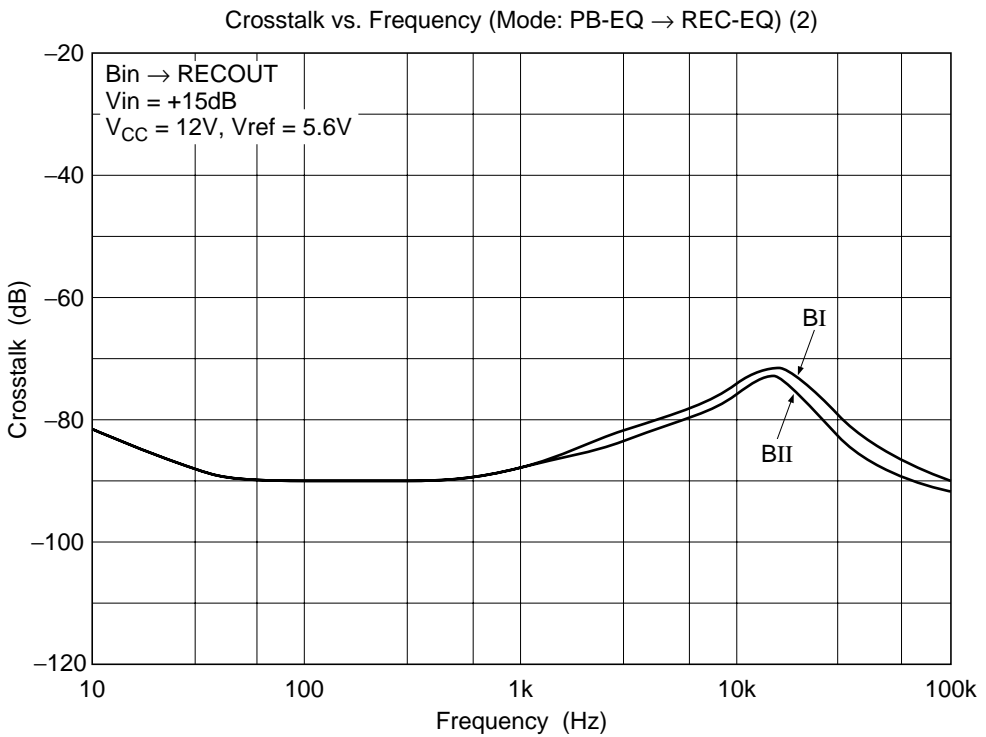
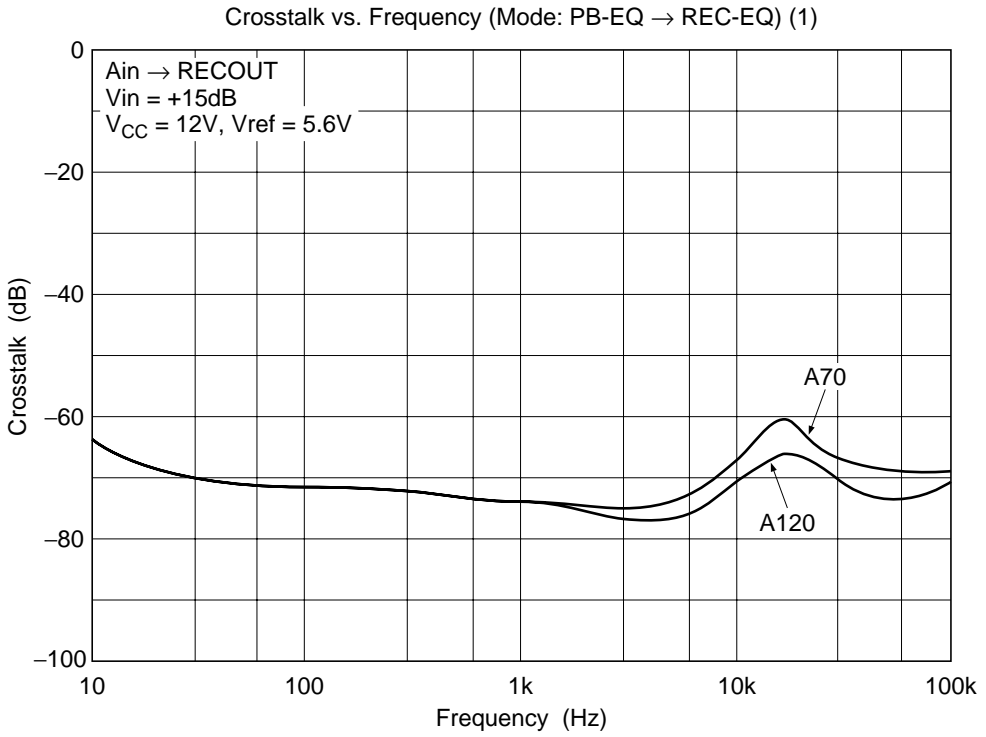
Mute Attenuation vs. Frequency



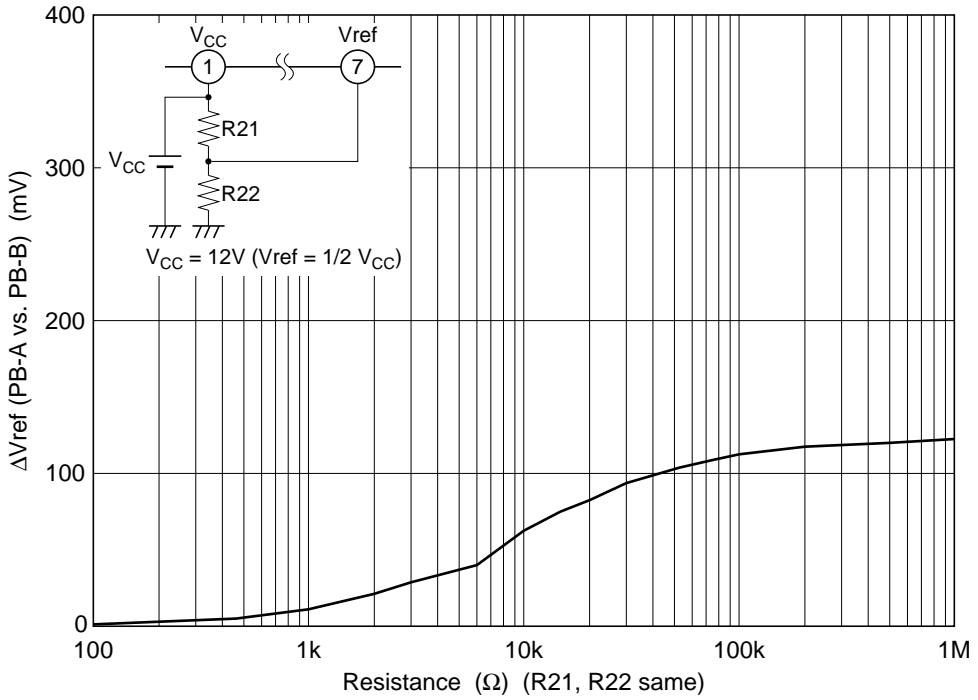
REC-EQ Channel Separation vs. Frequency (R → L)



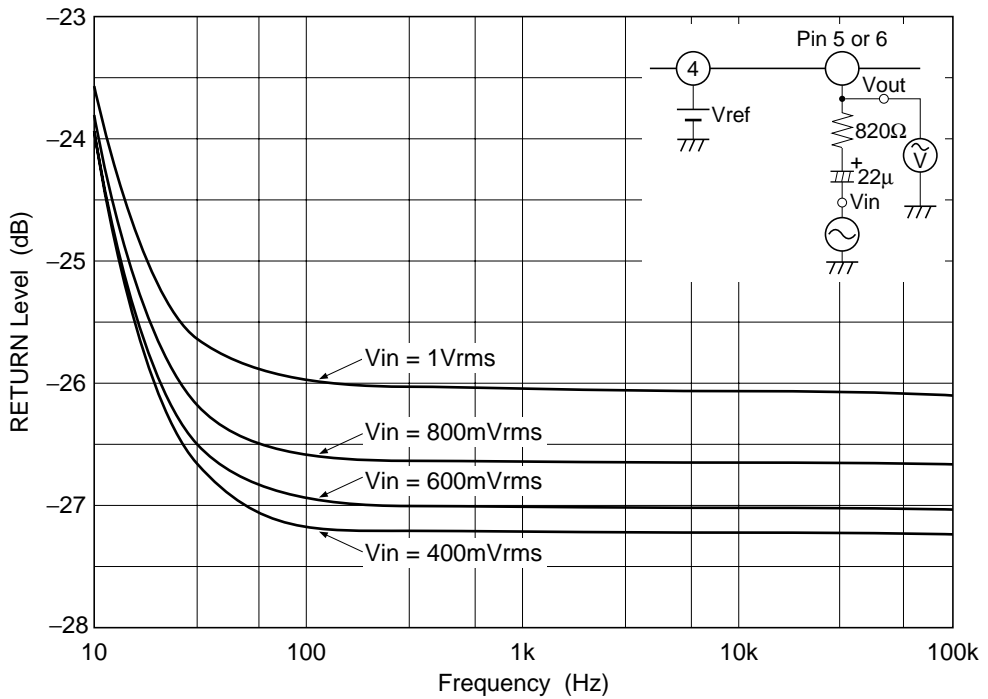




Altered Reference Voltage vs. External Resistance



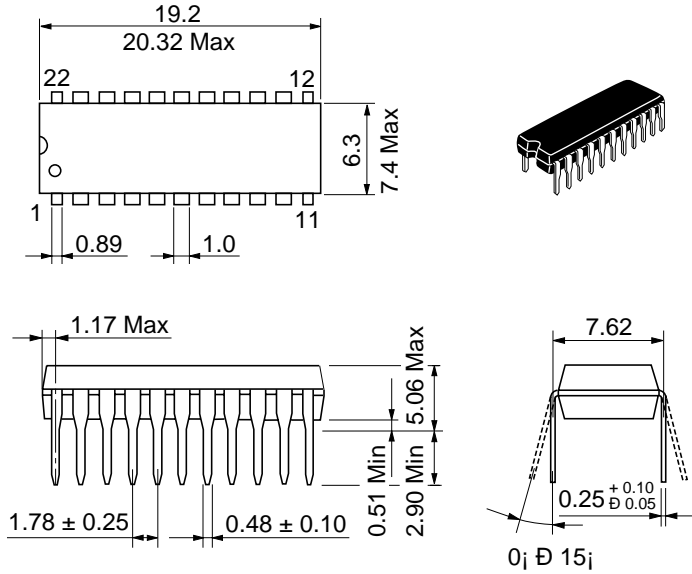
RETURN Level vs. Frequency



HA12219NT

Package Dimensions

Unit: mm



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

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