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.

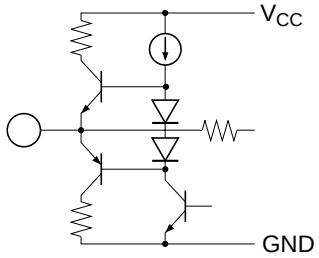
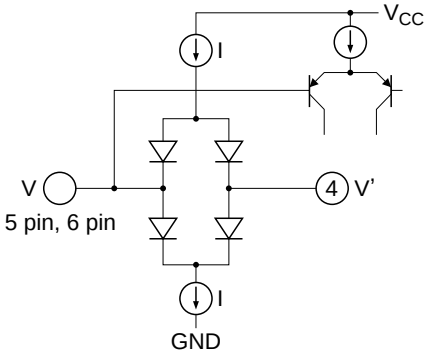
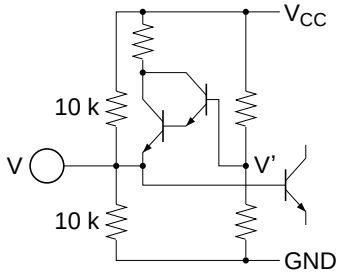
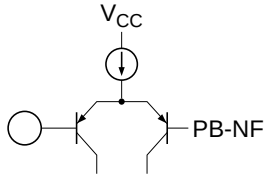
Functions

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

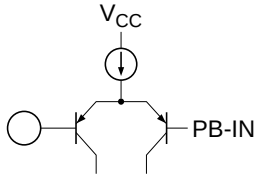
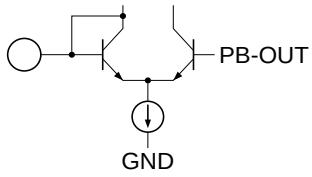
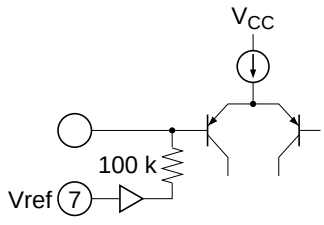
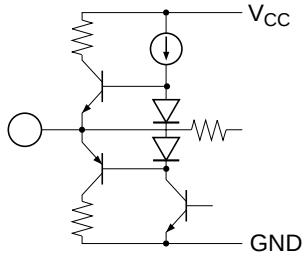
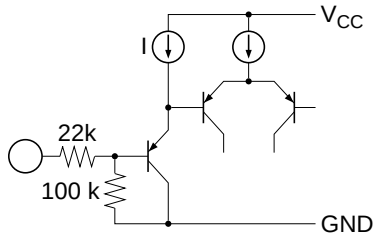
Features

- 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.

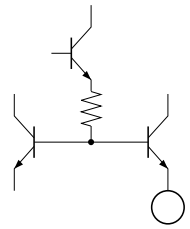
Pin Description, Equivalent Circuit (V_{CC} = 12 V, Vref = 5.6 V, Ta = 25°C, No signal, The value in the table show typical value.)

Pin No.	Pin Name	Note	Equivalent Circuit	Pin Description
1	V_{cc}	V = V_{cc}		V_{cc} pin
2	REC-OUT(L)	V = Vref		REC-EQ output
3	REC-OUT(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)			

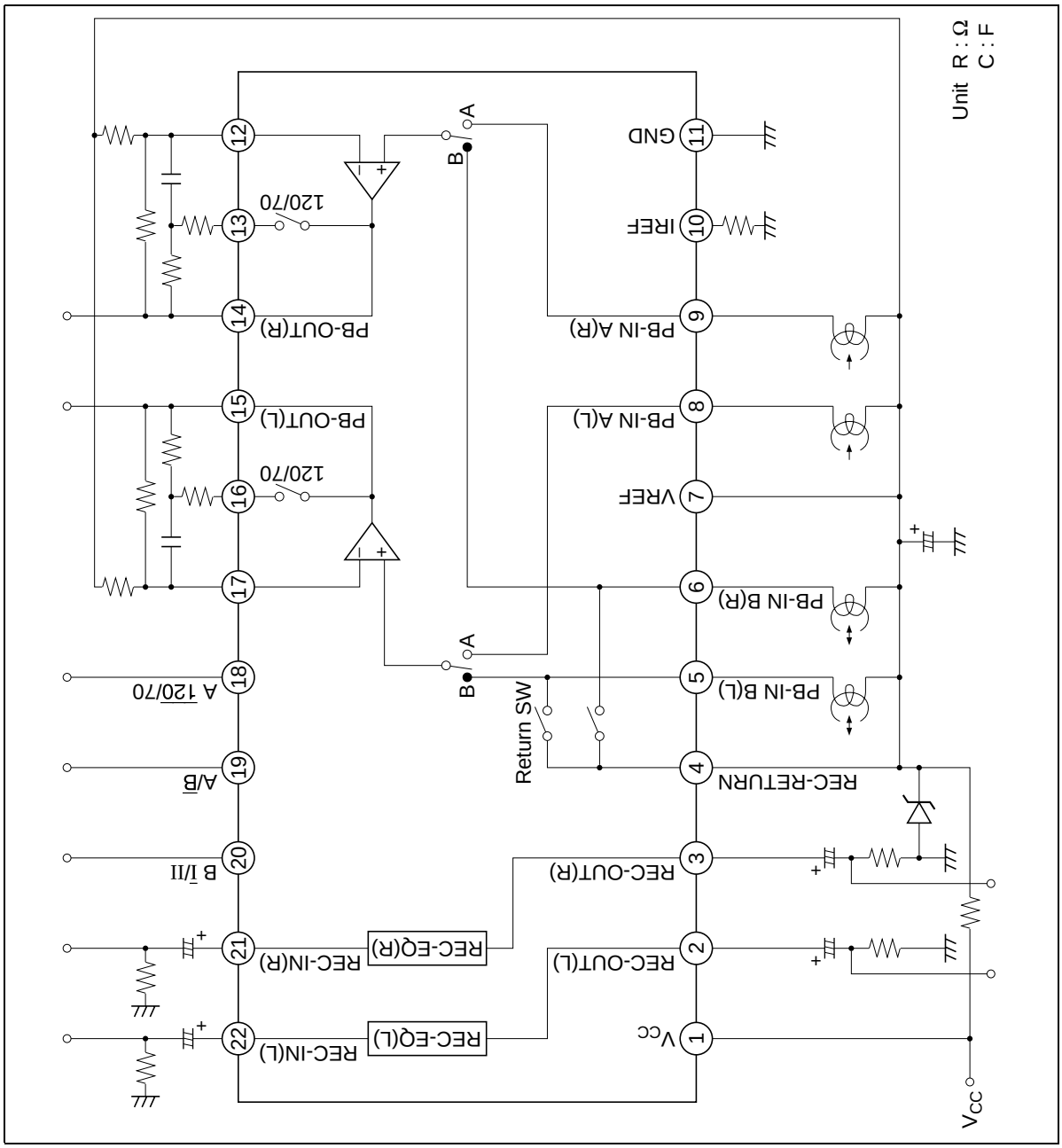
Pin Description, Equivalent Circuit (V_{CC} = 12 V, Vref = 5.6 V, Ta = 25°C, No signal, The value in the table show typical value.) (cont)

Pin No.	Pin Name	Note	Equivalent Circuit	Pin Description
12	PB-NF(R)	PB-IN = Vref		PB-EQ feed back
17	PB-NF(L)			
13	PB-EQ(R)	PB-OUT = Vref		NAB output
16	PB-EQ(L)			
21	REC-IN(R)	V = Vref		REC-EQ input
22	REC-IN(L)			
14	PB-OUT(R)	V = Vref		PB output
15	PB-OUT(L)			
18	A $\overline{120}$/70	I = 20 μA		Mode control input
19	A/$\overline{B}$			
20	B $\overline{I}$/II			

Pin Description, Equivalent Circuit (V_{CC} = 12 V, Vref = 5.6 V, Ta = 25°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 V		Equalizer reference current input
11	GND			GND pin

Block Diagram



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/$\overline{B}$		
A $\overline{120}$/70	**B $\overline{I}$/II**	**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 (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.

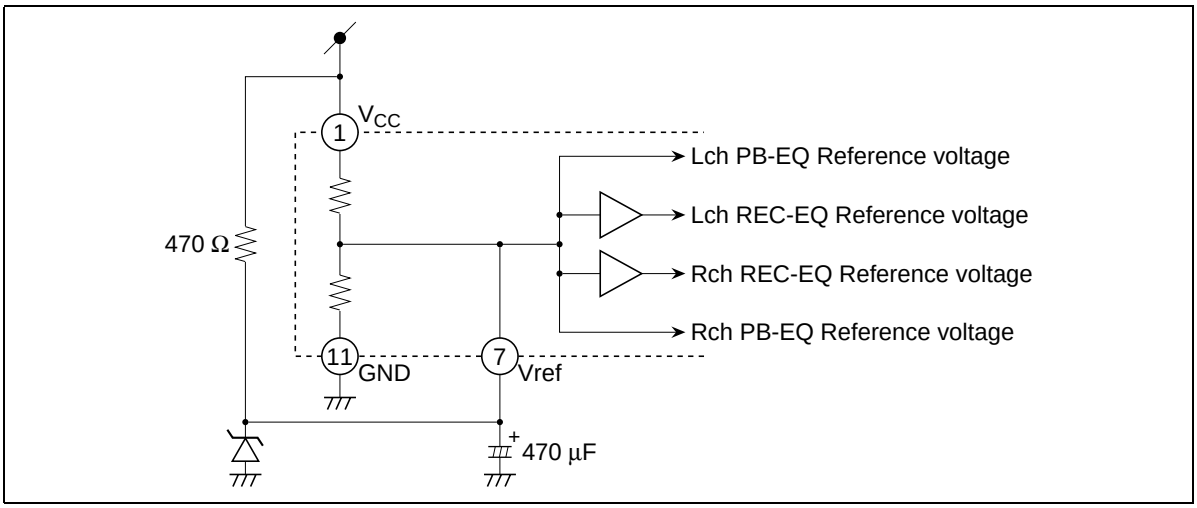


Figure 1 Reference Voltage Circuit

Operating Mode Control

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 V
19	0.0 to 0.5	1.2 to 1.8	2.4 to V_{cc}	V	

Note: 1. Each pin is pulled down with 100 kΩ 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 –0.2 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.

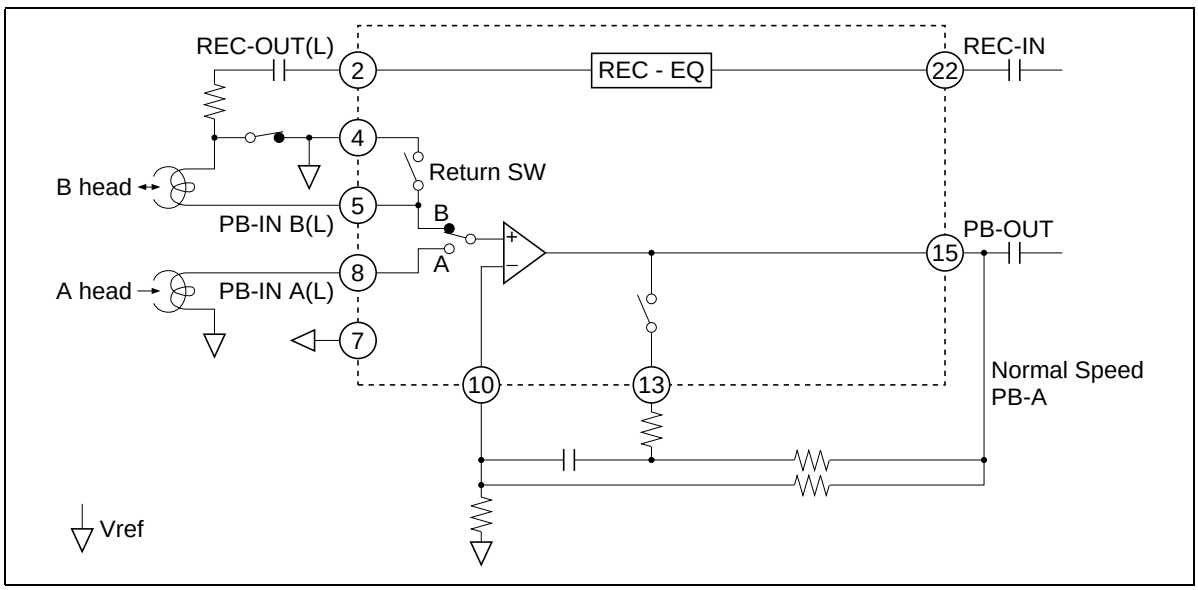


Figure 2 Block Diagram (Lch)

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.

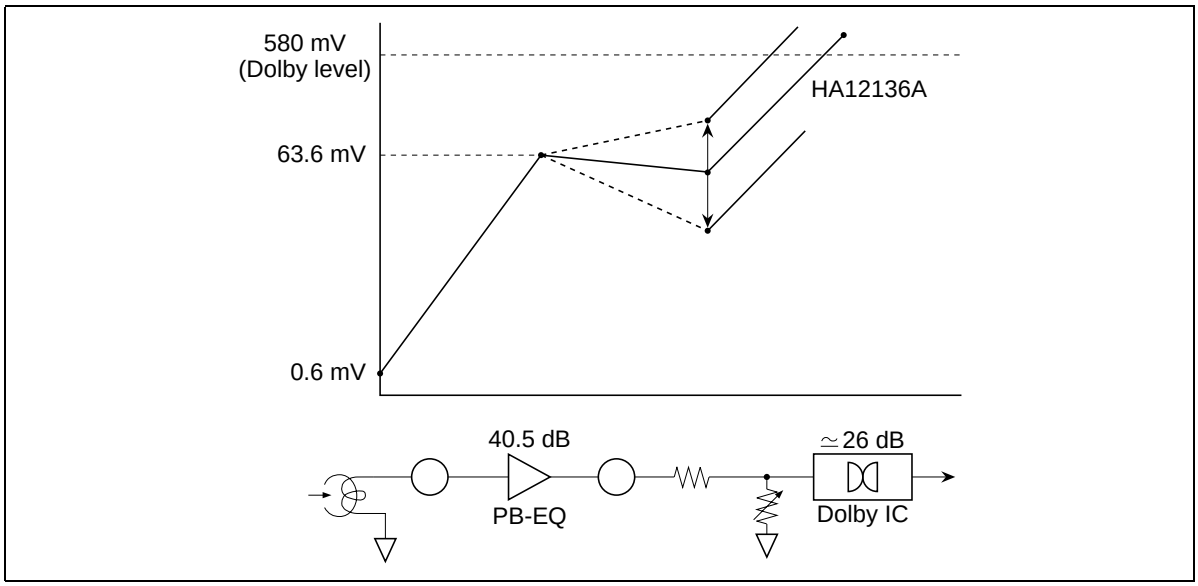


Figure 3 PB Level Block Diagram (120 μs, 1 kHz)

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	Topr	–40 to +75	°C	
Storage temperature	Tstg	–55 to +125	°C	
Operating voltage	Vopr	9.5 to 15	V	

Note: HA12219NT operates on single supply voltage.

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

Item	Symbol	Min	Typ	Max	Unit	Test Condition: IC Condition A/B	IC Condition B I/II	IC Condition A 120/70	fin (Hz)	Vin (mVrms)	Other	Application Terminal: Input R	Input L	Output R	Output L	COM
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)	50.0	60.0	—	dB	A/B	I	120	1k	*1	REC-EQ → PB-EQ	21	22	14	15	
	CT PB/REC(2)	60.0	70.0	—	dB	A	I	120	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	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	Vomax 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	VN PB	—	90.0	180.0	µVrms	A/B	I	120	—	—	Rg=820Ω, DIN-AUDIO	9/6	8/5	14	15	
PB-EQ 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	
						B						9	8			

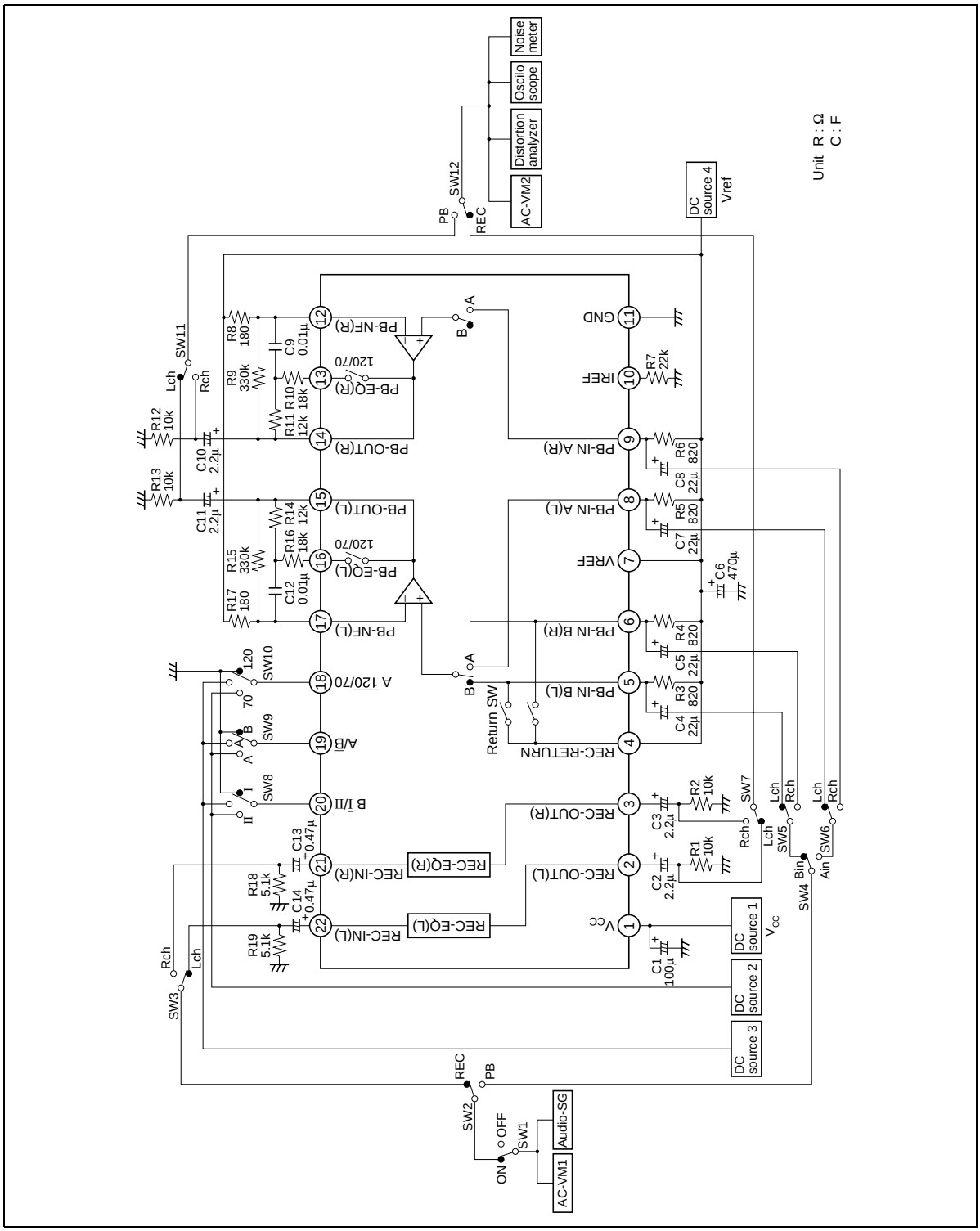
Note: 1. Large level without clipping
2. V_{CC} = 9.5 V, Vref = 4.75 V

Electrical Characteristics (Ta = 25°C, V_{CC} = 12 V, Vref = 5.6 V, EQIN standard level = 20 dBs = 77.5 mVrms = 0 dB) (cont)

Item	Symbol	Min	Typ	Max	Unit	Test Condition						Application Terminal				
						IC Condition						Input		Output		
						A/B	B I/II	A 120/70	fin (Hz)	Vin (mVrms)	Other	R	L	R	L	COM
REC-EQ frequency response TYPE I	G_V REC-NN1	18.5	20.0	21.5	dB	A	I	120	1k	7.75		21	22	3	2	
	G_V REC-NN2	19.4	21.4	23.4	dB	A	I	120	5k	7.75		21	22	3	2	
	G_V REC-NN3	29.1	32.1	35.1	dB	A	I	120	12.5k	7.75		21	22	3	2	
REC-EQ frequency response TYPE II	G_V REC-NC1	22.3	23.8	25.3	dB	A	II	120	1k	7.75		21	22	3	2	
	G_V REC-NC2	24.7	26.7	28.7	dB	A	II	120	5k	7.75		21	22	3	2	
	G_V REC-NC3	33.6	36.6	39.6	dB	A	II	120	12.5k	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=5.1kΩ, A-WTG	21	22	3	2	

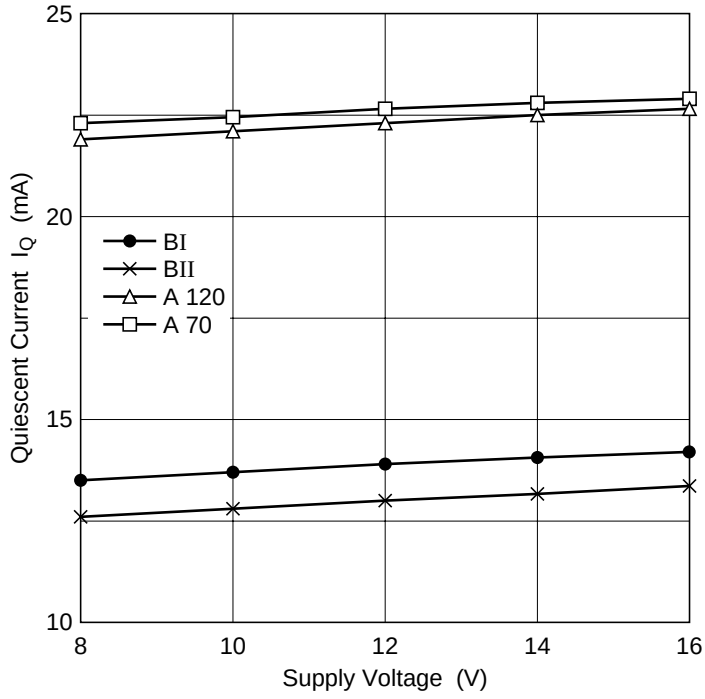
Note: 1. Large level without clipping
2. V_{CC} = 9.5 V, Vref = 4.75 V

Test Circuit

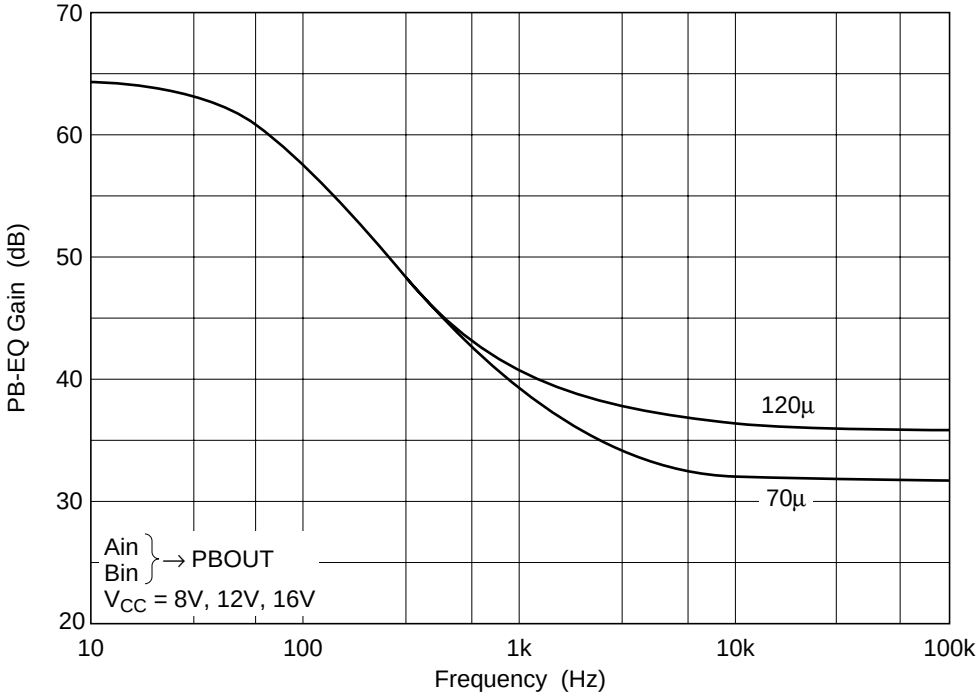


Characteristic Curves

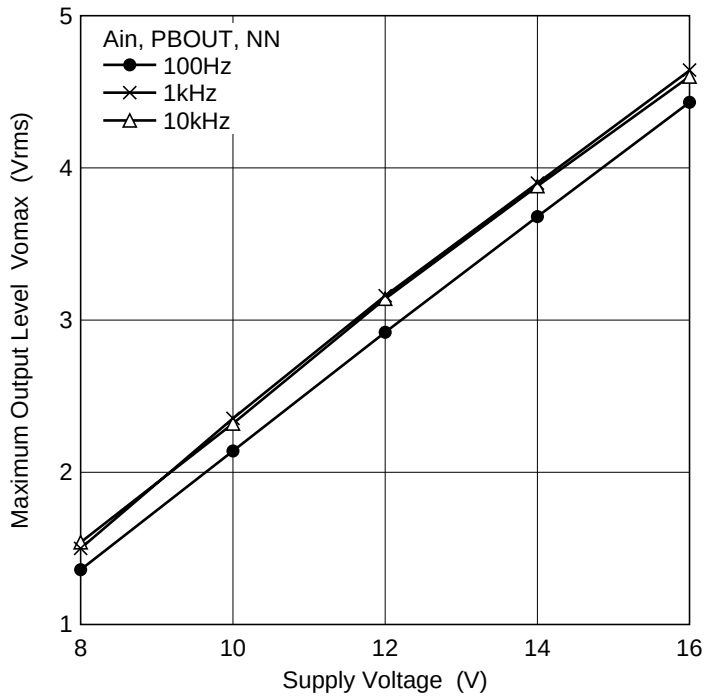
Quiescent Current vs. Supply Voltage



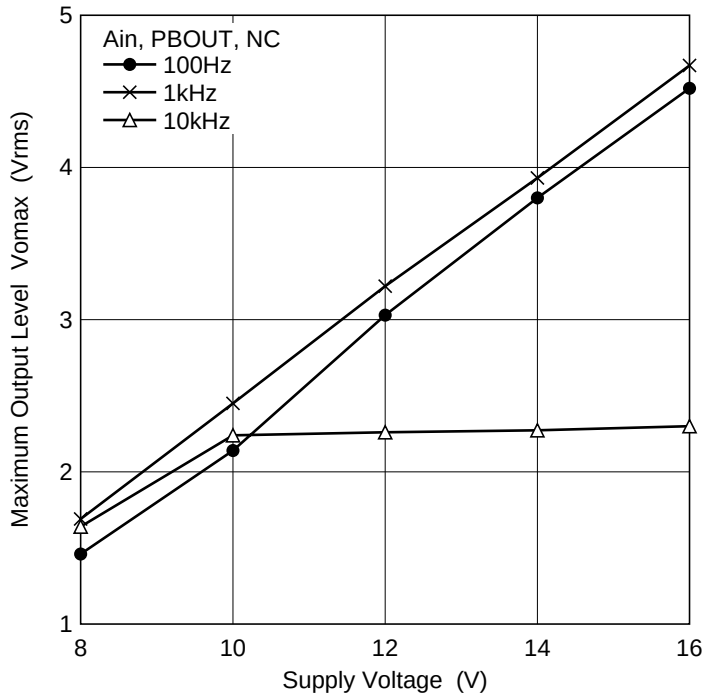
PB-EQ Gain vs. Frequency



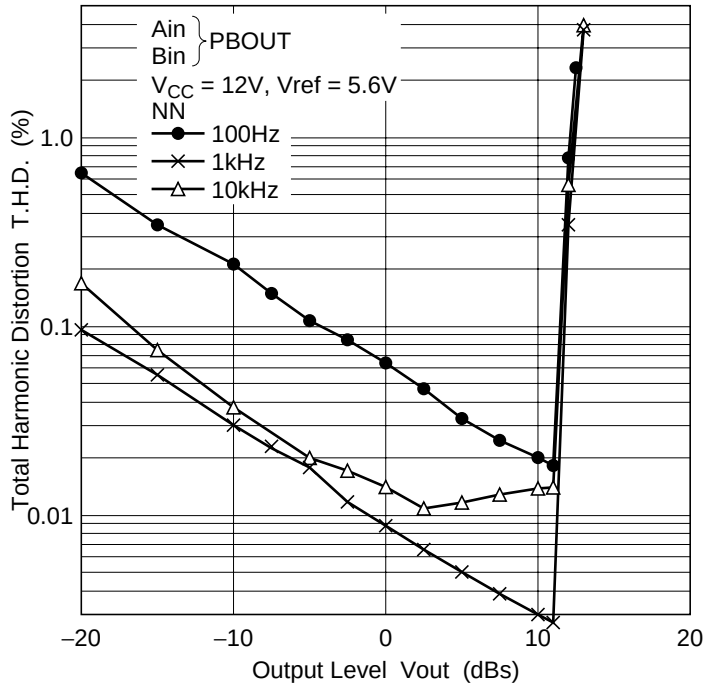
PB-EQ Maximum Output Level vs. Supply Voltage (1)



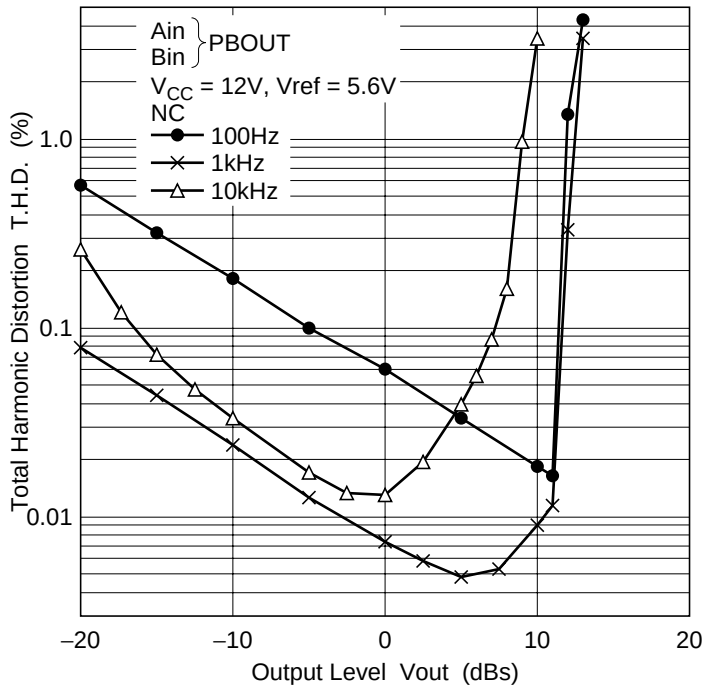
PB-EQ Maximum Output Level vs. Supply Voltage (2)



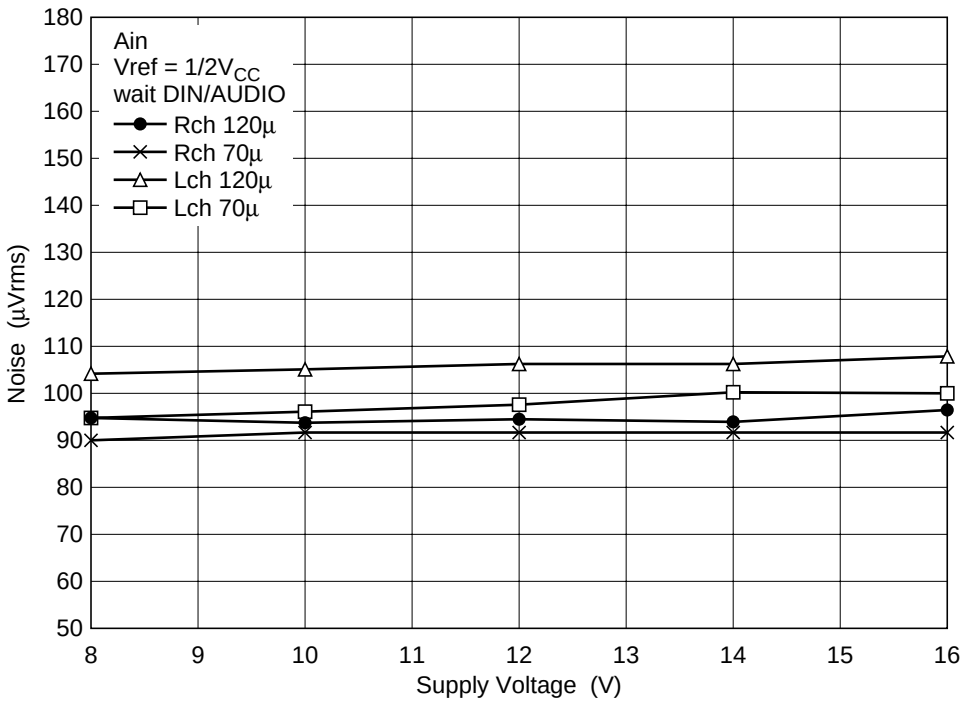
PB-EQ Total Harmonic Distortion vs. Output Level (1)



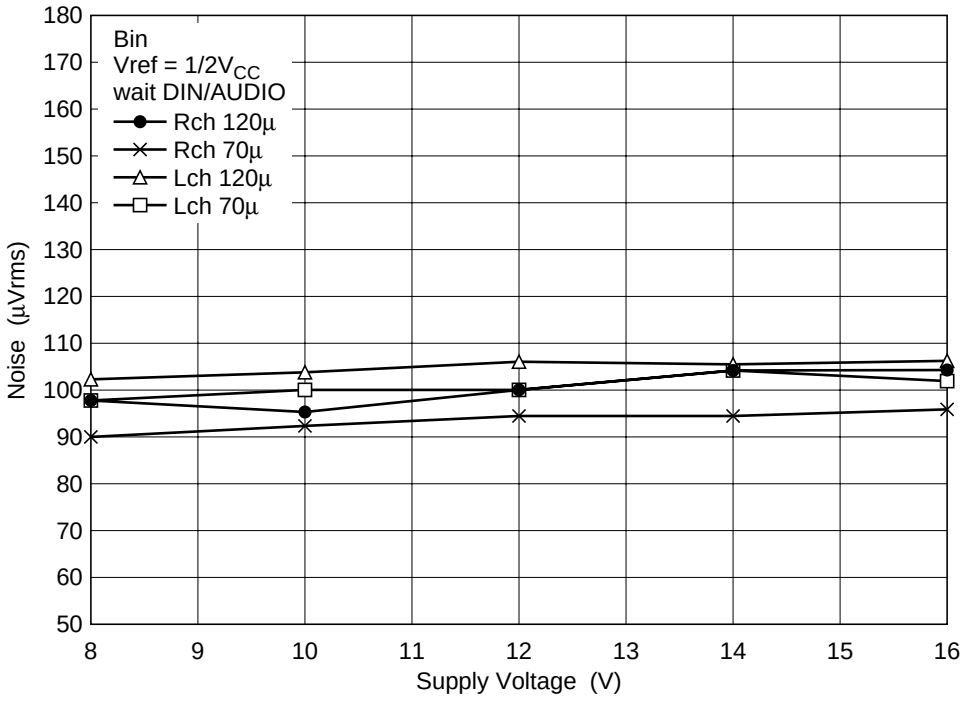
PB-EQ Total Harmonic Distortion vs. Output Level (2)



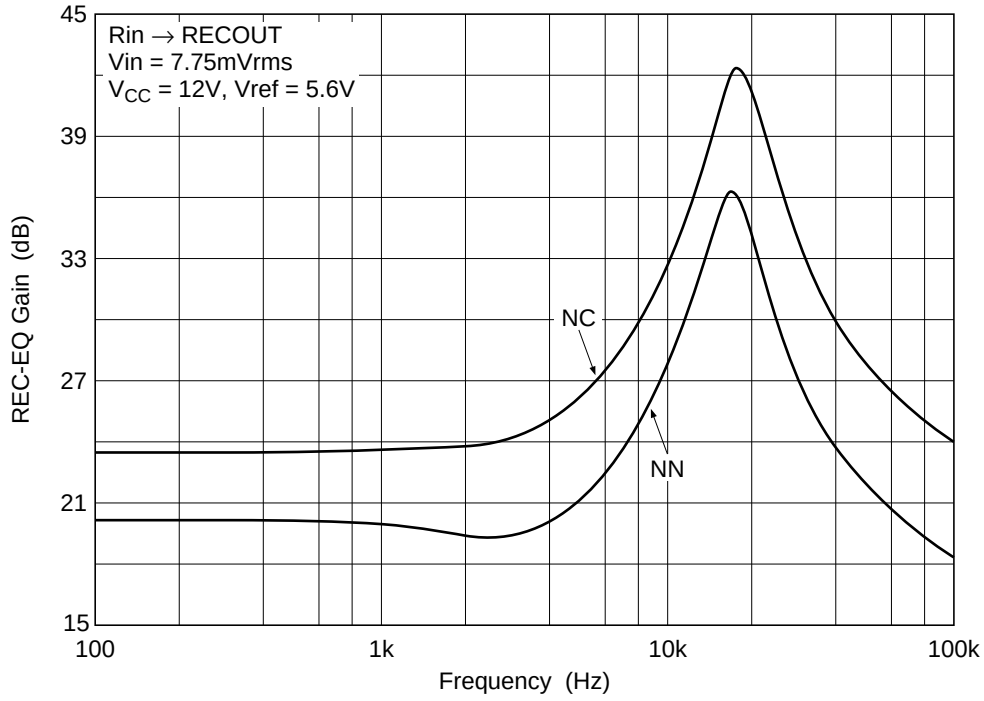
PB-EQ Noise Level vs. Supply Voltage (1)



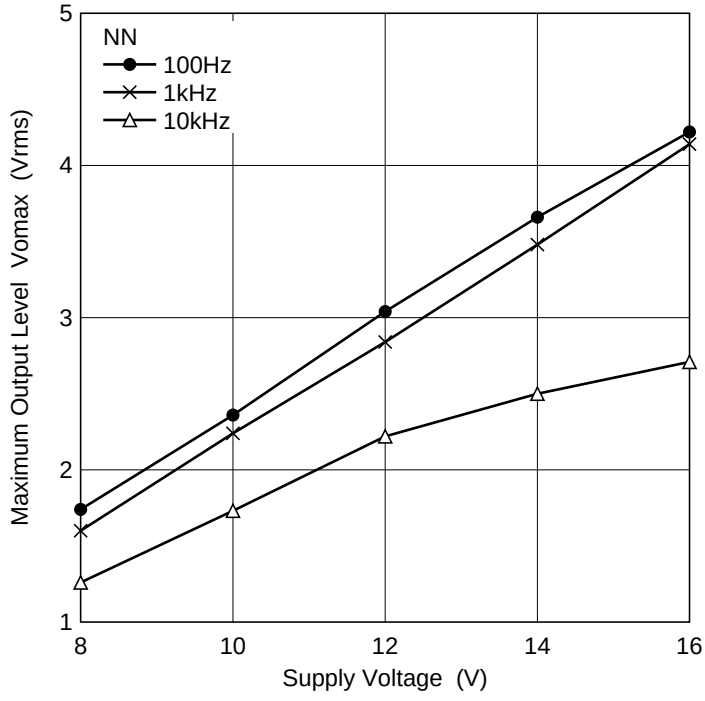
PB-EQ Noise Level vs. Supply Voltage (2)



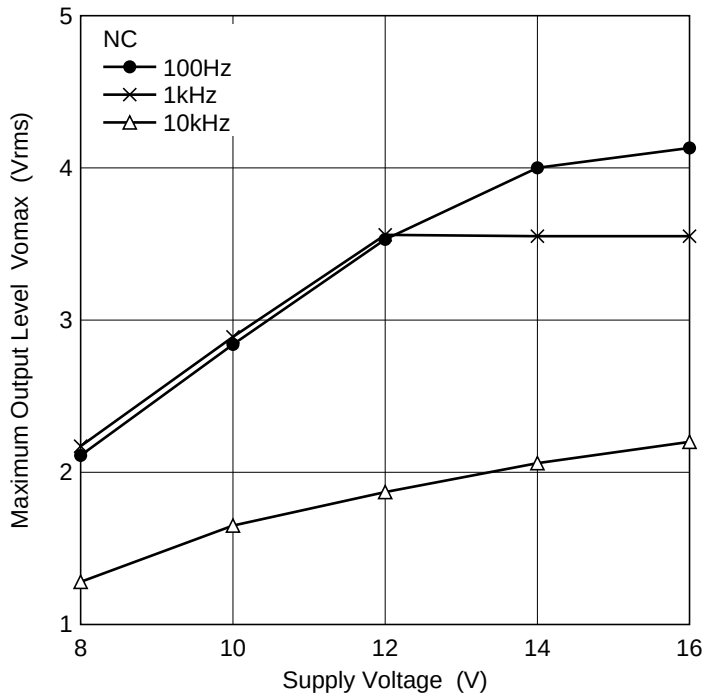
REC-EQ Gain vs. Frequency



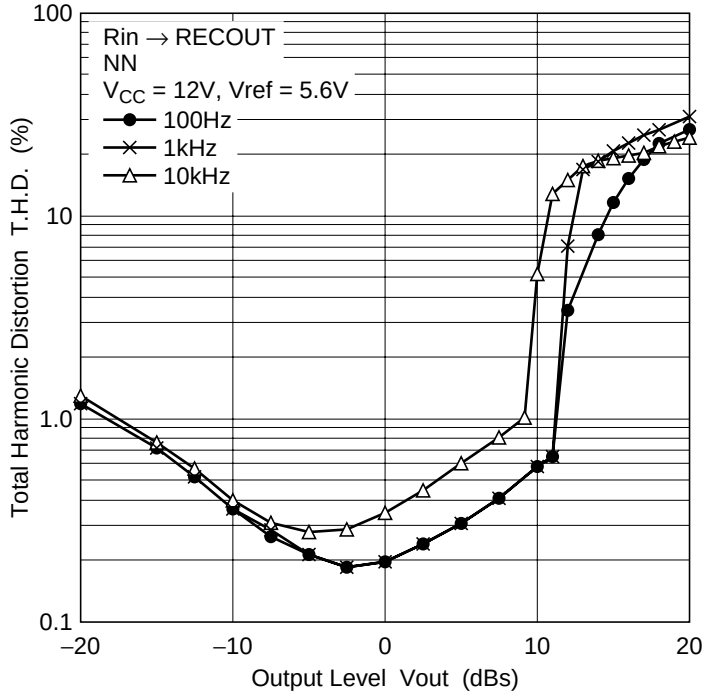
REC-EQ Maximum Output Level vs. Supply Voltage (1)



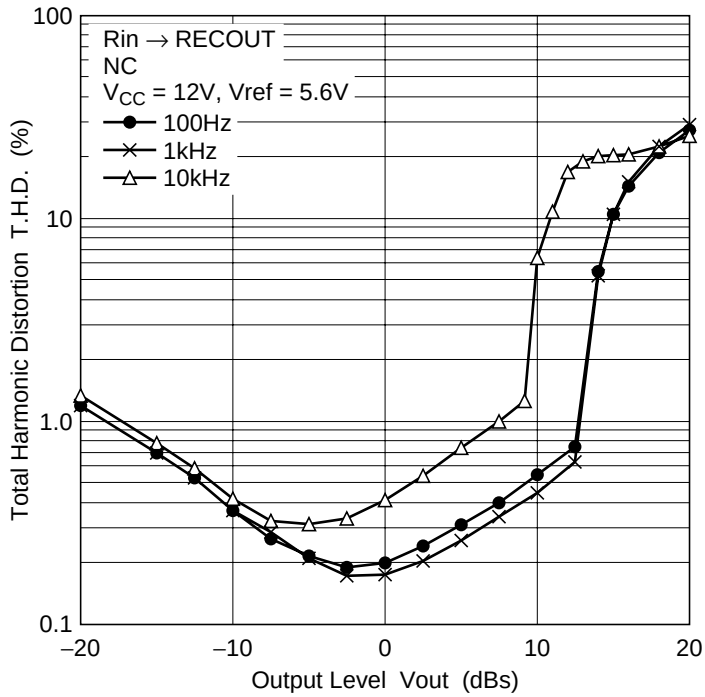
REC-EQ Maximum Output Level vs. Supply Voltage (2)



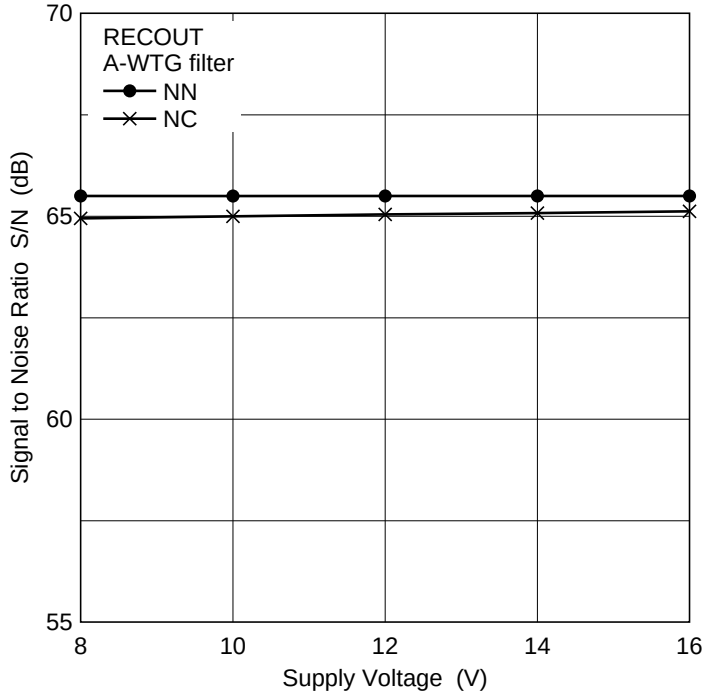
REC-EQ Total Harmonic Distortion vs. Output Level (1)



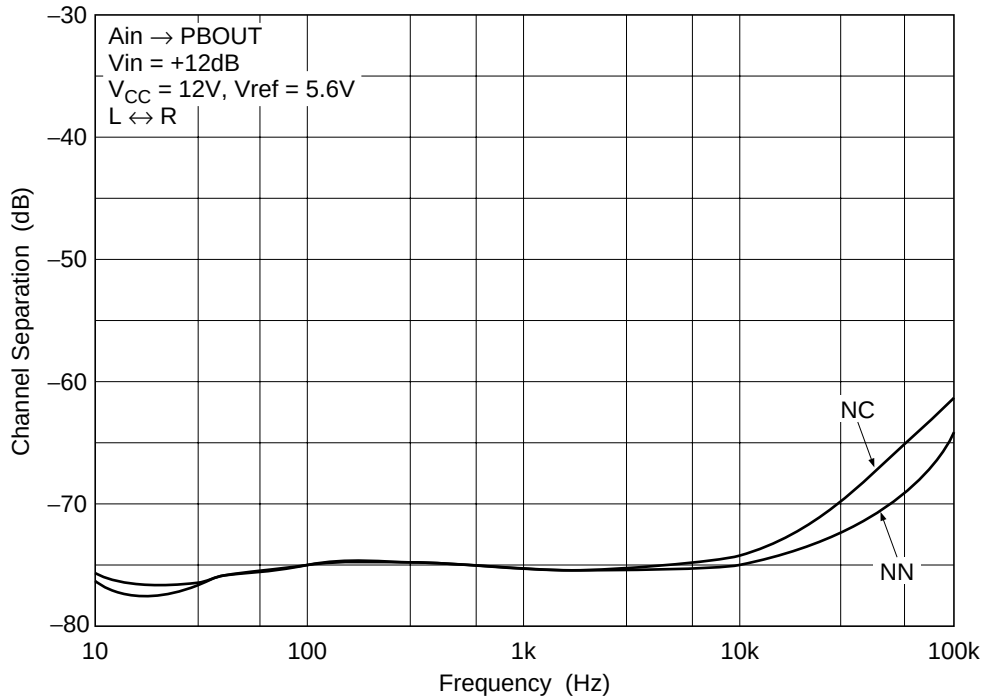
REC-EQ Total Harmonic Distortion vs. Output Level (2)



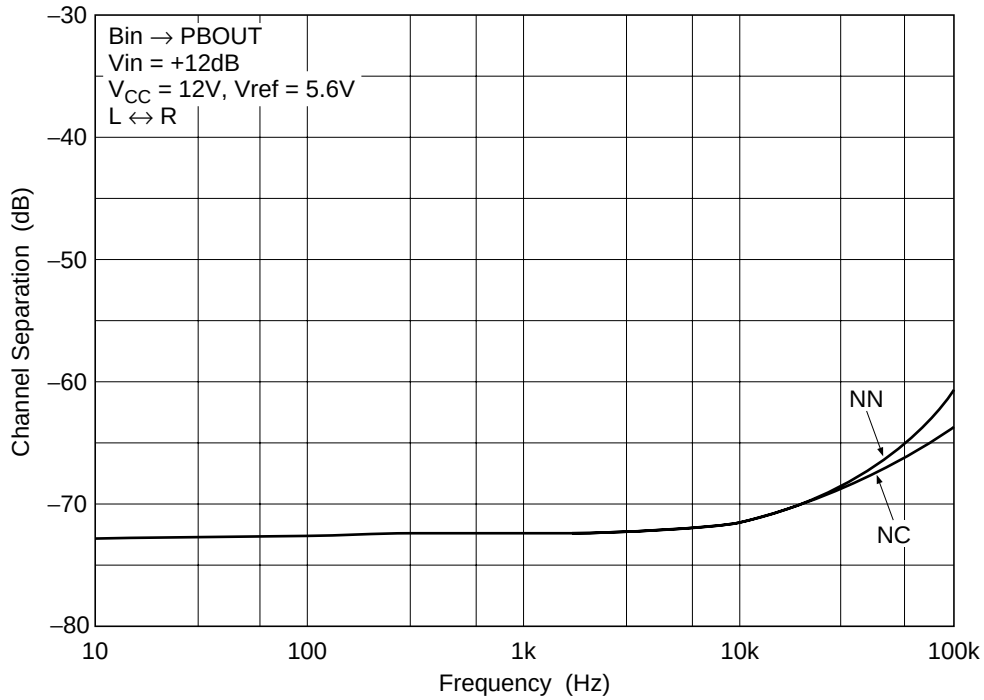
REC-EQ Signal to Noise Ratio vs. Supply Voltage



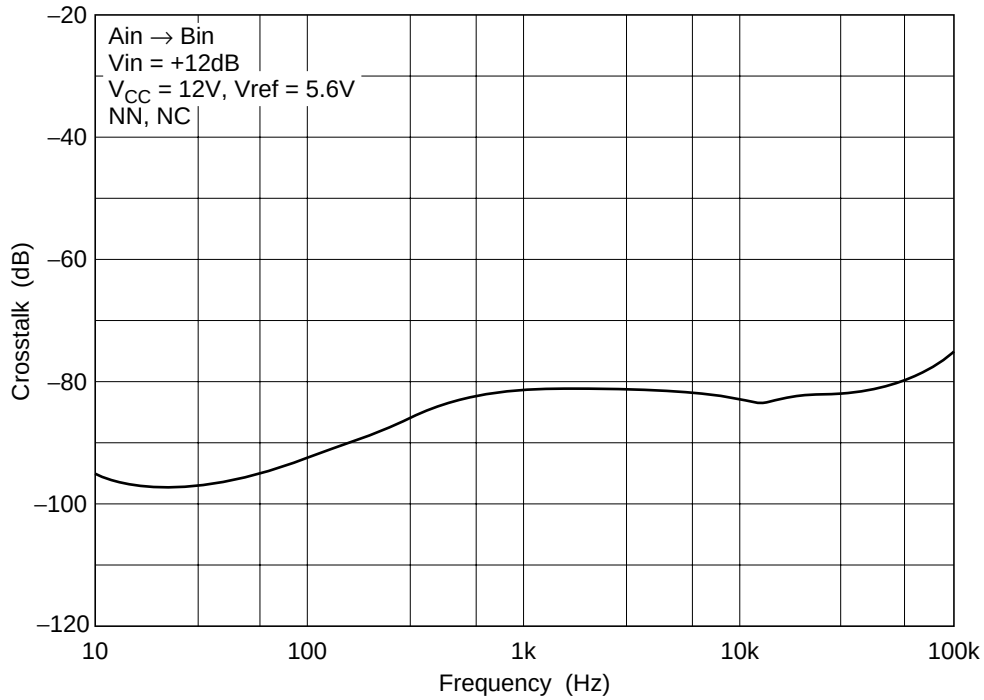
PB-EQ Channel Separation vs. Frequency (L ↔ R) (1)



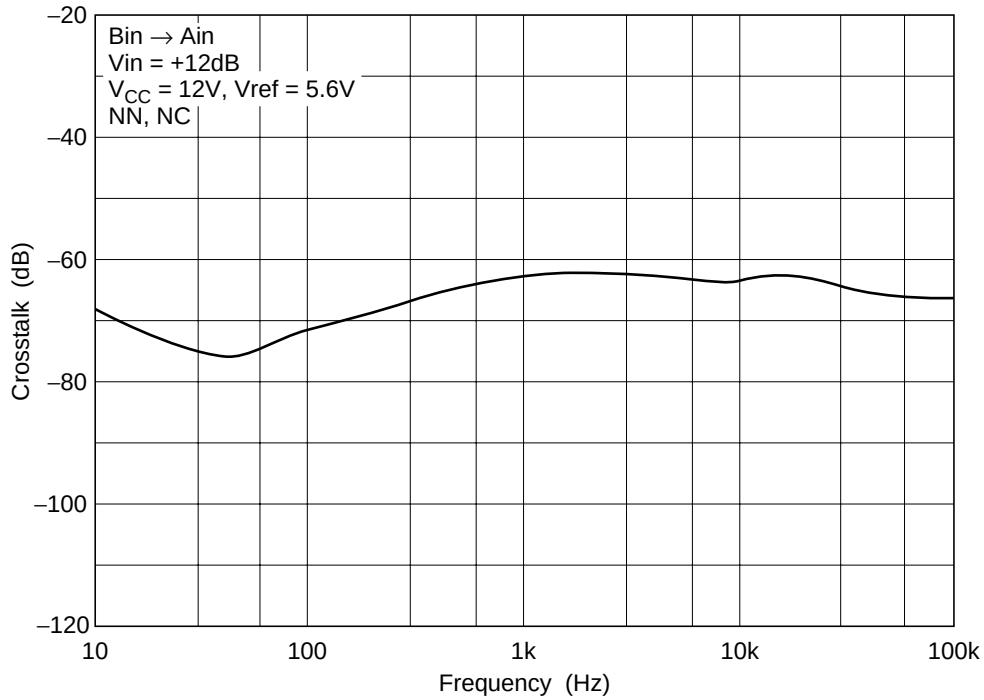
PB-EQ Channel Separation vs. Frequency (L ↔ R) (2)



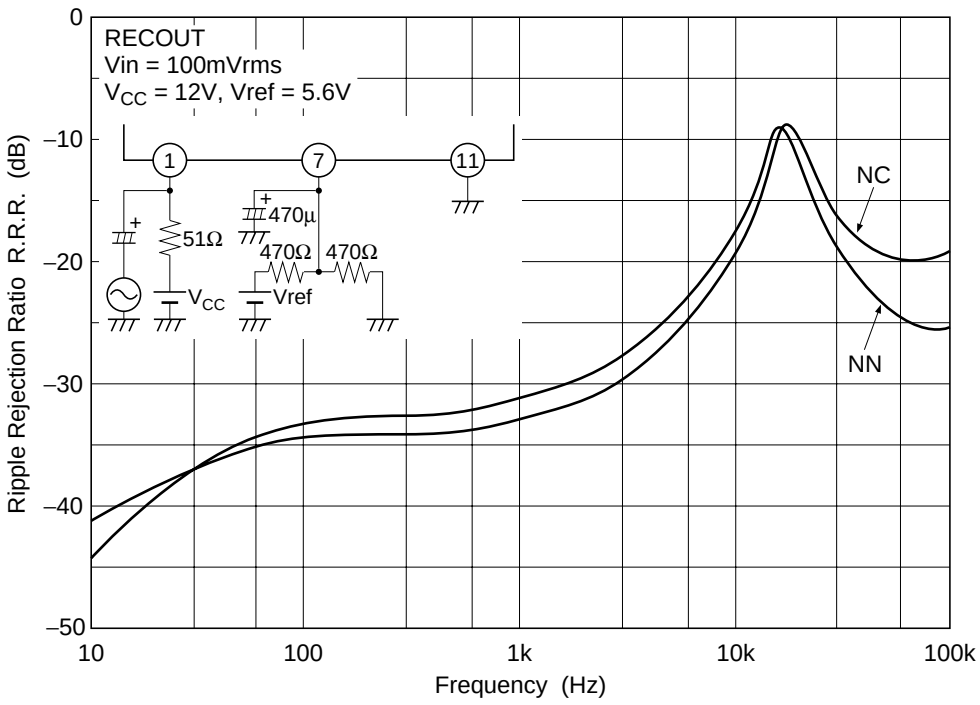
PB-EQ Crosstalk vs. Frequency (Input: Ain → Bin)



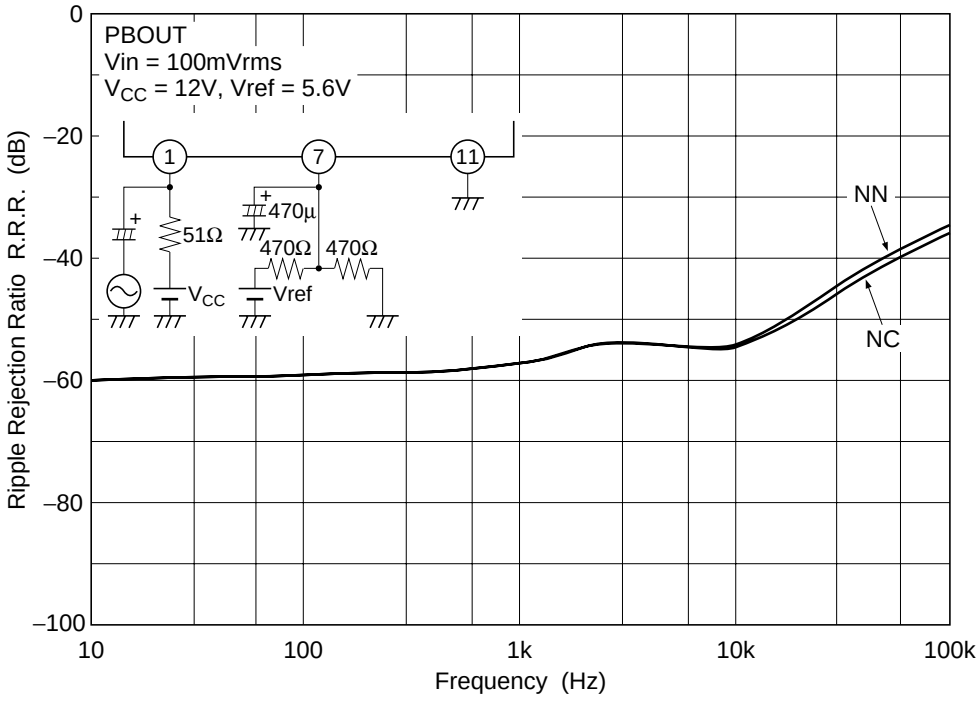
PB-EQ Crosstalk vs. Frequency (Input: Bin → Ain)



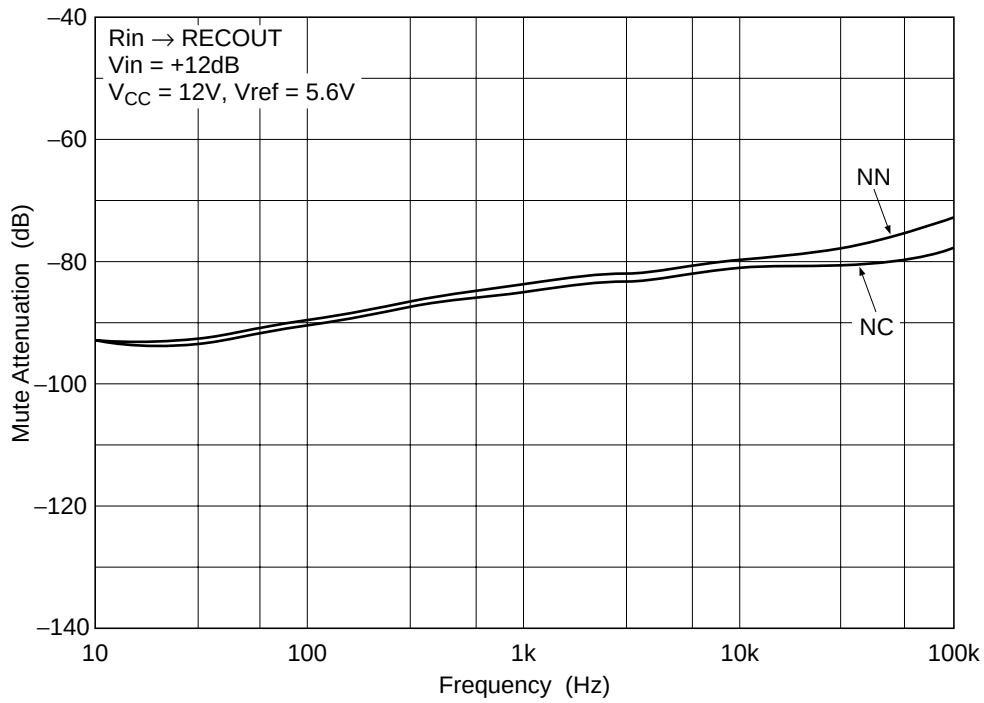
Ripple Rejection Ratio vs. Frequency (REC)



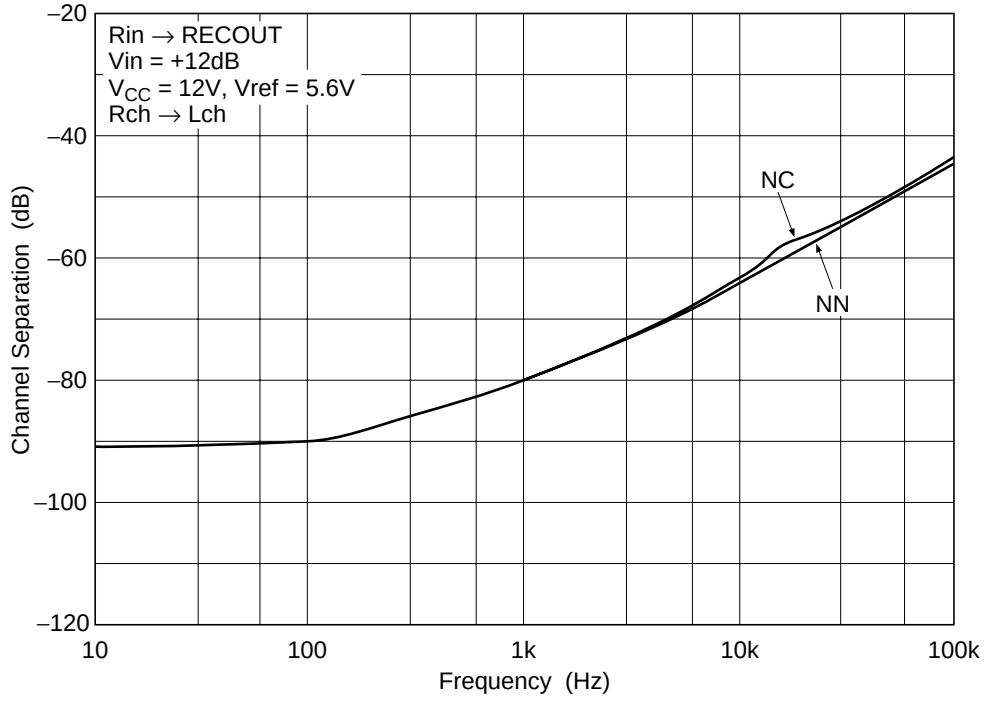
Ripple Rejection Ratio vs. Frequency (PB)



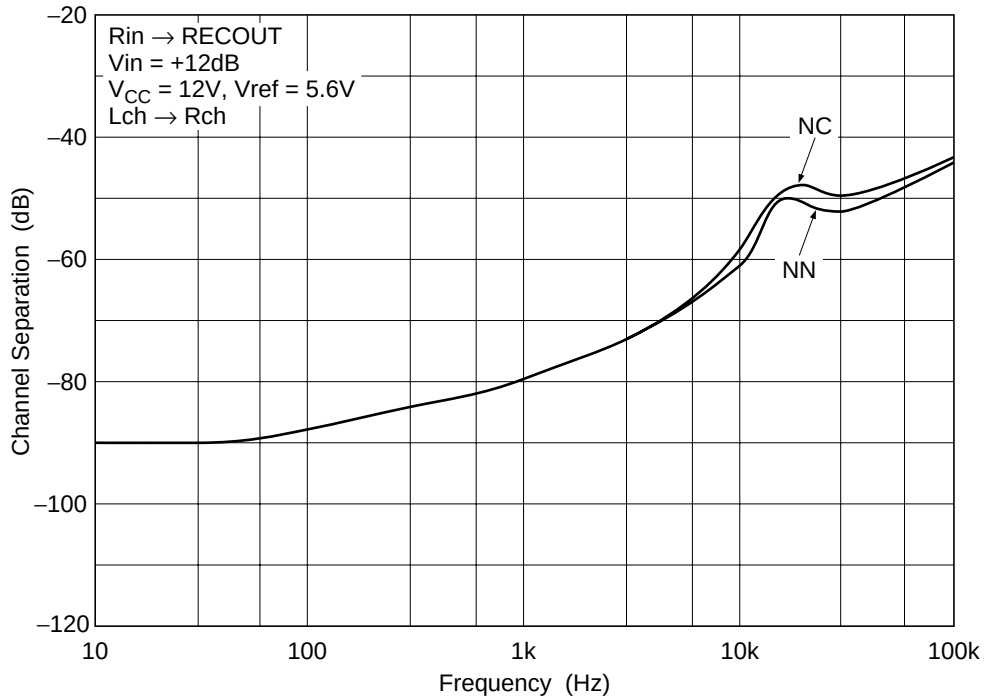
Mute Attenuation vs. Frequency



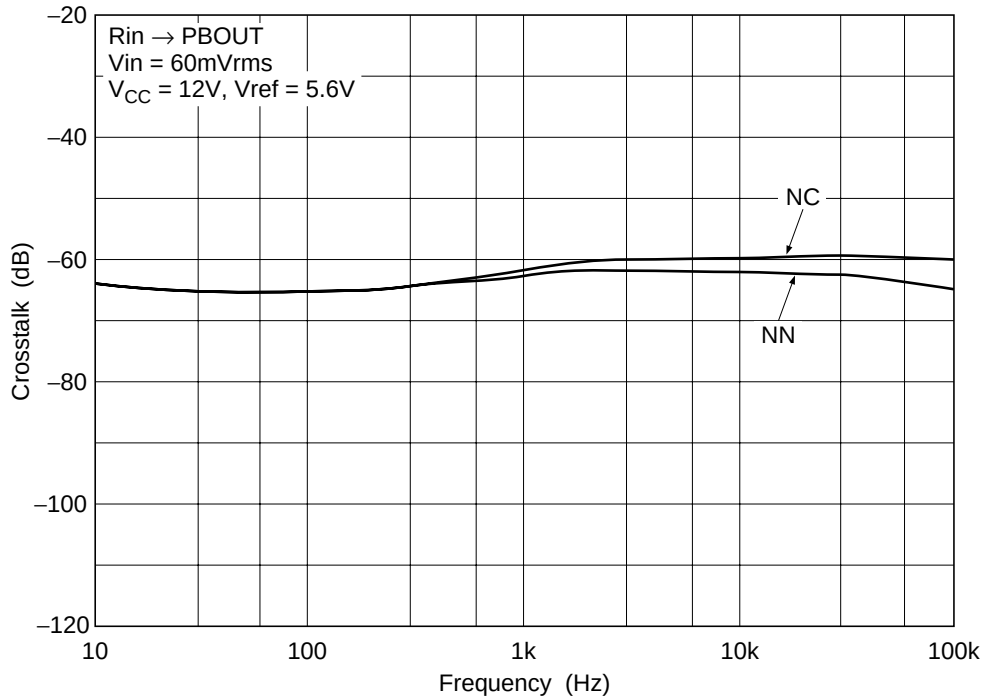
REC-EQ Channel Separation vs. Frequency (R → L)



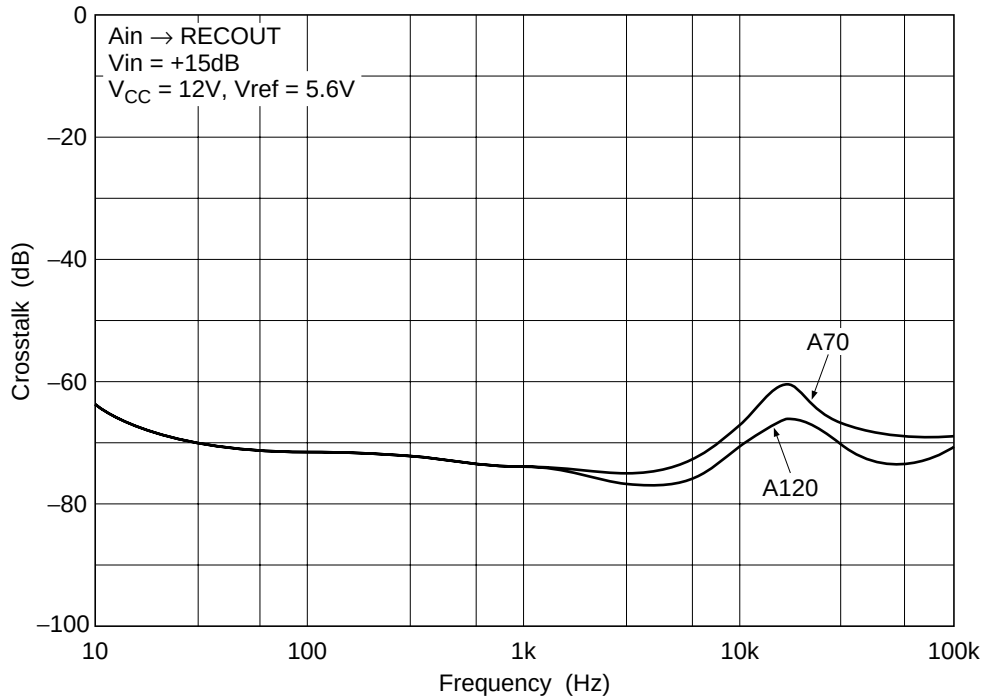
REC-EQ Channel Separation vs. Frequency (L → R)



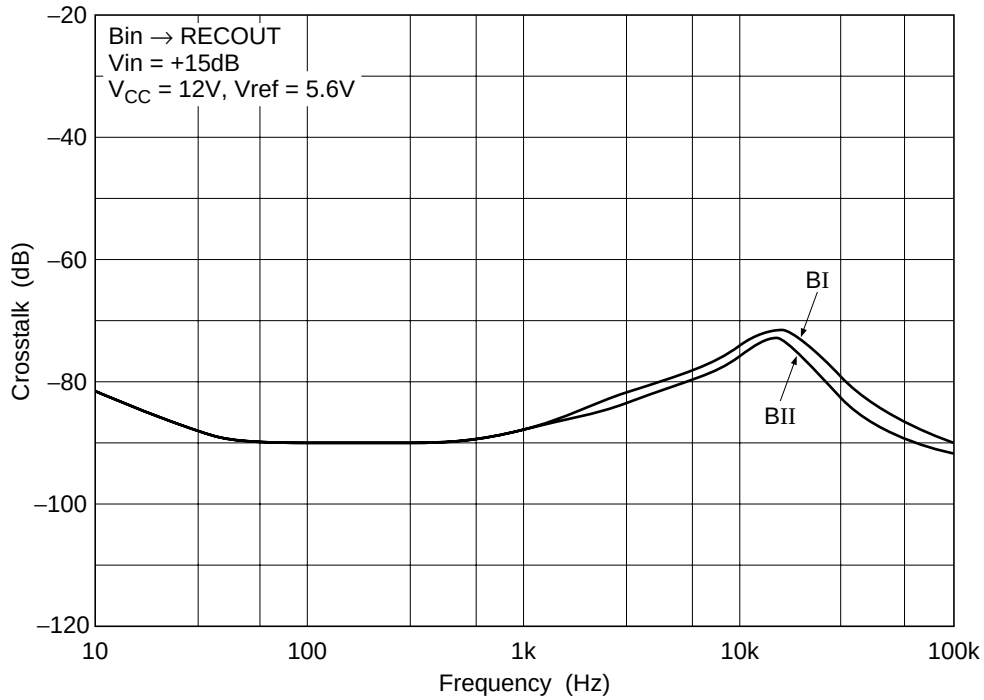
Crosstalk vs. Frequency (Mode: REC-EQ → PB-EQ)



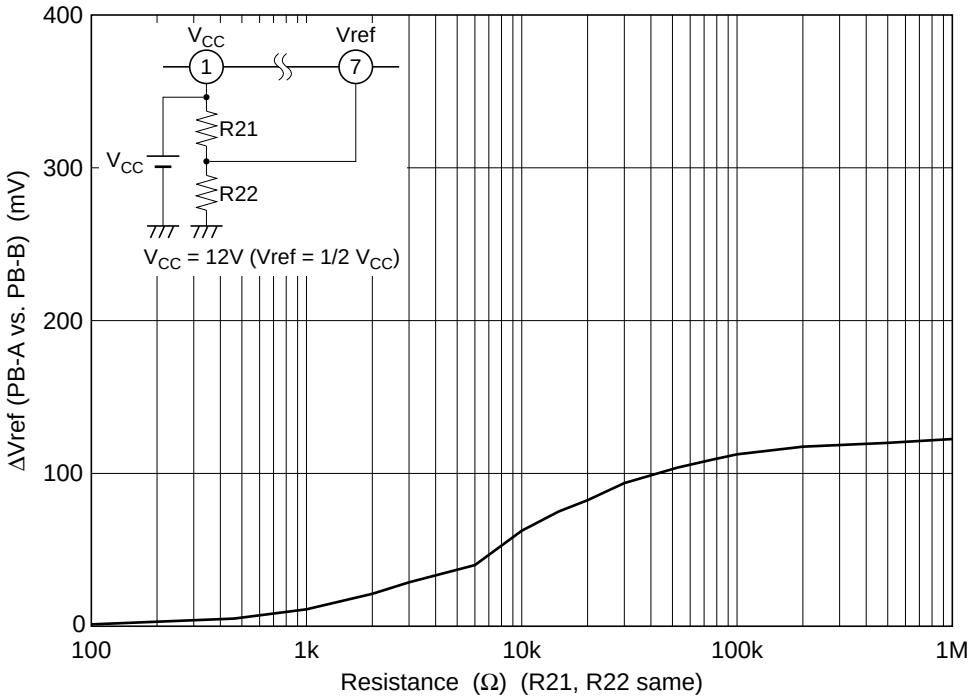
Crosstalk vs. Frequency (Mode: PB-EQ → REC-EQ) (1)



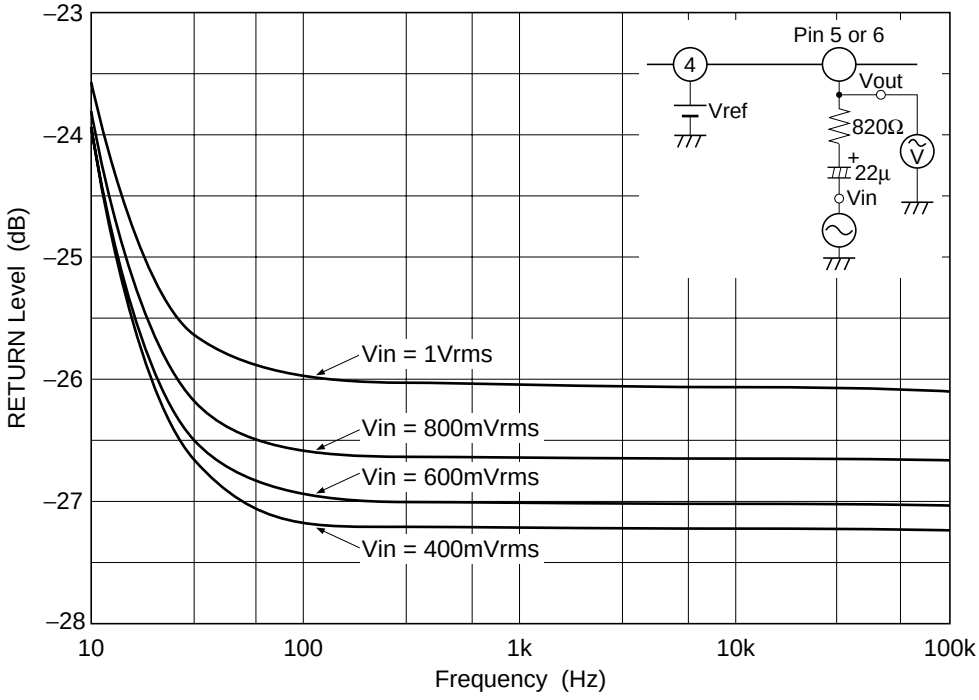
Crosstalk vs. Frequency (Mode: PB-EQ → REC-EQ) (2)



Altered Reference Voltage vs. External Resistance

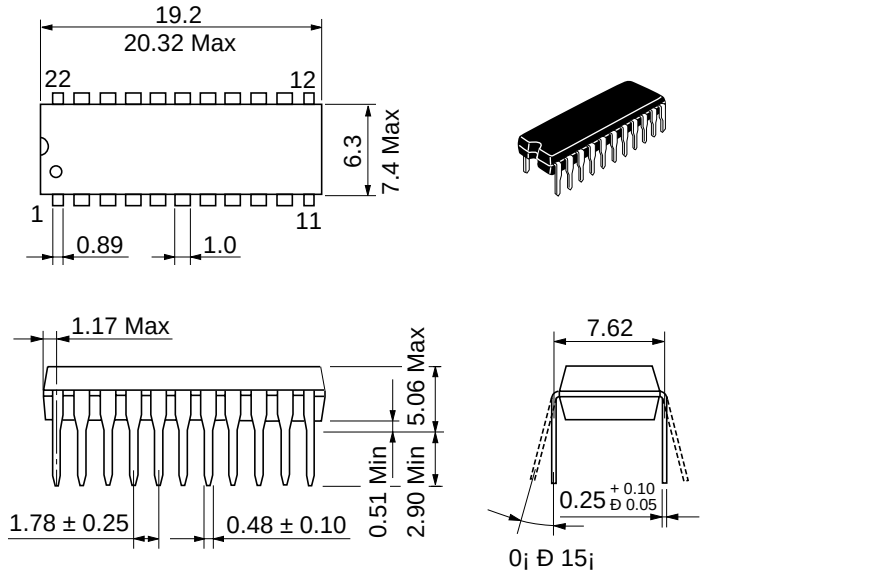


RETURN Level vs. Frequency



Package Dimensions

Unit: mm



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

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