HA12211NT

Audio Signal Processor for Cassette Deck (Deck 1 Chip)

HITACHI

ADE-207-223A (Z)

2nd. Edition
June 1997

Description

HA12211NT is silicon monolithic bipolar IC providing REC equalizer system, PB equalizer system and each electronic control switch in one chip.

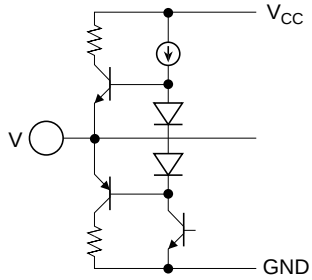
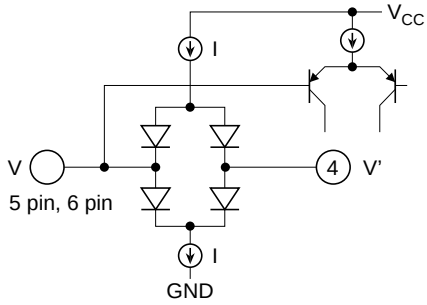
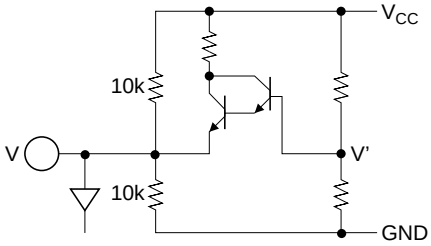
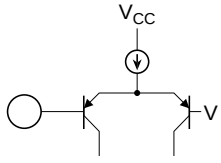
Functions

- PB equalizer $\times$ 2 channel
- REC equalizer $\times$ 2 channel
- Each electronical control switch to change equalizer characteristics
- REC mute
- REC head return switch

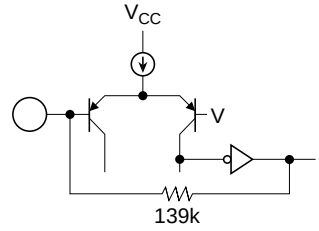
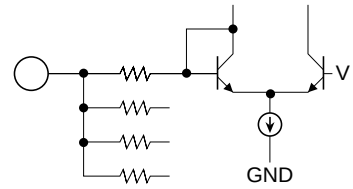
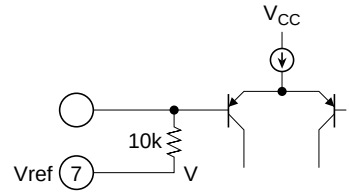
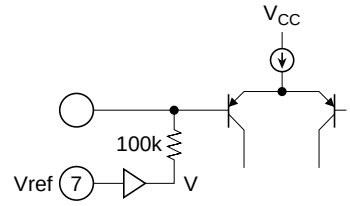
Features

- REC equalizer is very small number of external parts.(4 types of frequency characteristics built-in)
- PB equalizer built-in. (A/B input changing system, 4 types of frequency characteristics)
- Independent PB sensitivity for A deck, B deck.
- Normal-speed/high-speed, normal tape/chrome tape switching built-in.
- Controllable from direct micro-computer output.
- Available to reduce substrate-area because of high integration and small external parts.

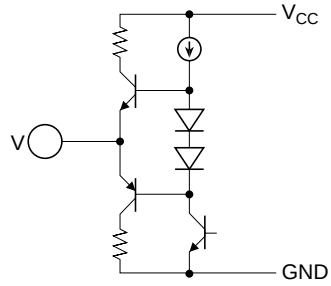
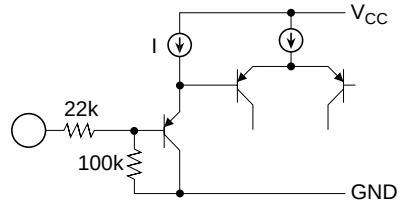
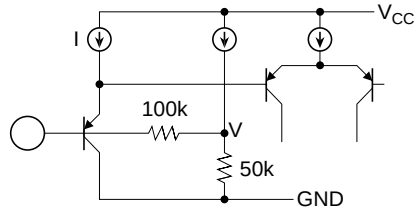
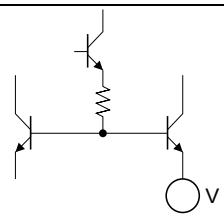
Pin Description, Equivalent Circuit (V_{CC} = 10.5V, Vref = 5.25V, Ta = 25°C, No signal, The value in the table show typical value.)

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)			

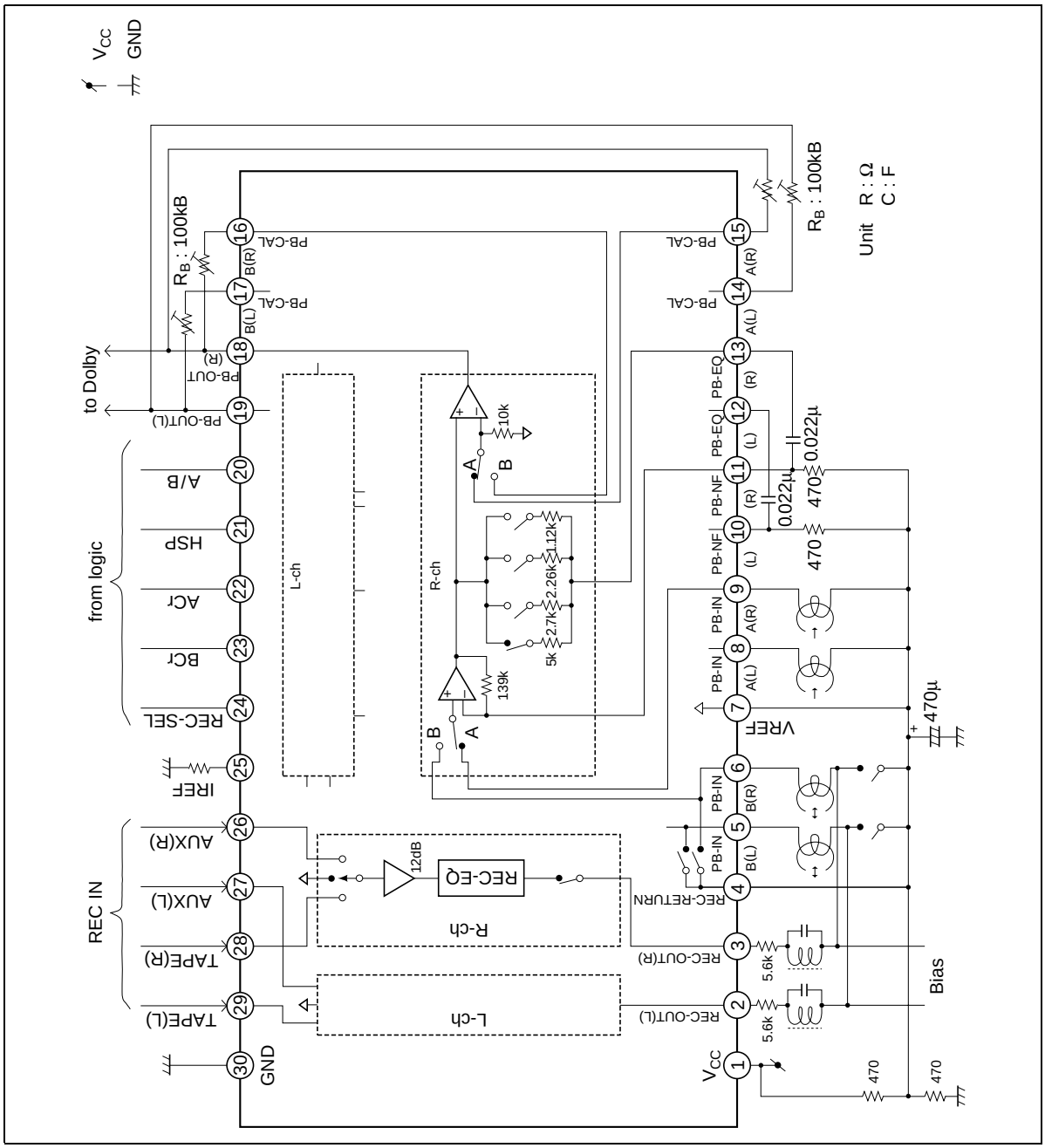
Pin Description, Equivalent Circuit (V_{CC} = 10.5V, Vref = 5.25V, Ta = 25°C, No signal, The value in the table show typical value.) (cont)

Pin No.	Pin Name	Note	Equivalent Circuit	Pin Description
10	PB-NF (L)	V = Vref		PB EQ Feed back
11	PB-NF (R)			
12	PB-EQ (L)	V = Vref		NAB Output
13	PB-EQ (R)			
14	PB-Cal A(L)	V = Vref		Feed back input for gain adjustment
15	PB-Cal A(R)			
16	PB-Cal B(R)			
17	PB-Cal B(L)			
26	AUX (R)	V = Vref		REC-EQ input
27	AUX (L)			
28	TAPE (R)			
29	TAPE (L)			

Pin Description, Equivalent Circuit (V_{CC} = 10.5V, Vref = 5.25V, Ta = 25°C, No signal, The value in the table show typical value.) (cont)

Pin No.	Pin Name	Note	Equivalent Circuit	Pin Description
18	PBOUT (R)	V = Vref		PB output
19	PBOUT (L)			
20	A/B	I = 20µA		Mode control input
21	HSP			
22	Acr			
23	Bcr			
24	REC-SEL	I = 20µA V = 2.5V		Mode control input
25	IREF	V = 1.2V		Equalizer reference current input
30	GND			GND Pin

Block Diagram



Parallel Data Format

Pin No.	Pin Name	L	M	H
22	A CrO2	*1, *3	—	*1
23	B CrO2	*1, *2, *3	—	*1, *2
21	HSP	Normal speed *3	—	Hi speed
20	A/B	Ain active *1, *3	—	Bin active *1
		Return SW ON *3	—	Return SW OFF
		REC OUT active *3	—	REC OUT Hiz
24	REC IN SEL	TAPE	MUTE *3	AUX

Note: 1. PB-EQ LOGIC

		HSP			
		L		H	
		A/B			
A CrO2	B CrO2	L	H	L	H
L	L	120µ	120µ	60µ	60µ
L	H	120µ	70µ	60µ	35µ
H	L	70µ	120µ	35µ	60µ
H	H	70µ	70µ	35µ	35µ

2. REC-EQ LOGIC

	HSP	
B CrO2	L	H
L	Normal speed TAPE I	High speed TAPE I
H	Normal speed TAPE II	High speed TAPE II

3. Unforced pin state

Functional Description

Power Supply Range

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

Table 1 Spply Voltage

Item	Power Supply Range
Single Supply	9.5V to 15.0V

Reference Voltage

So little is the current drivability of AC reference (Vref) that the Vref voltage may be altered by A/B switching of PB-EQ.

Provided it causes you anxiety, please use the constant 1/2 V_{CC} voltage circuit, for example, figure 1.

In addition, this IC has a capacitor charger for Vref pin.

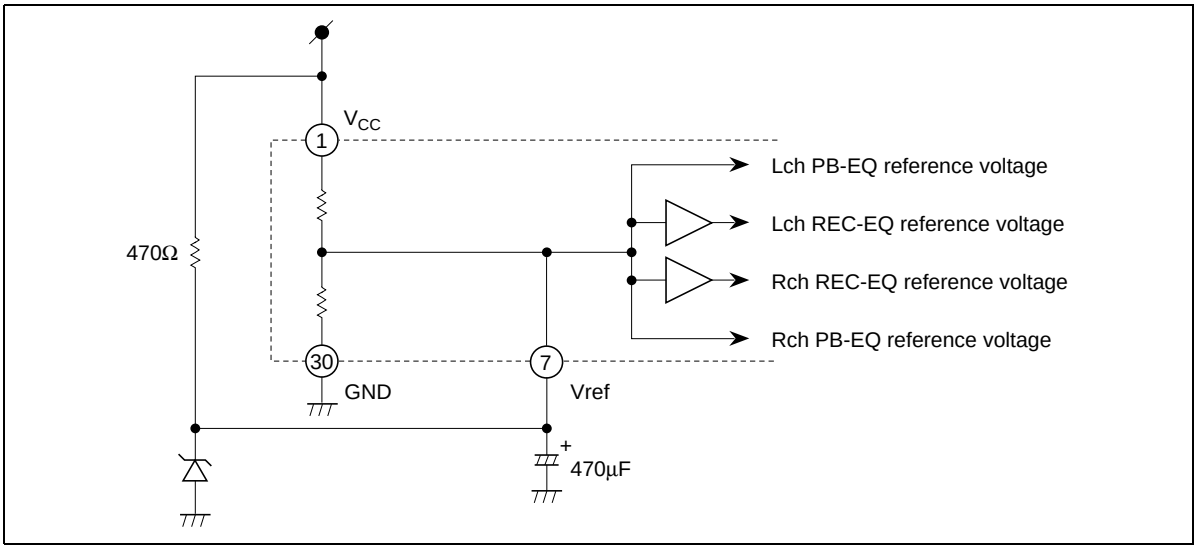


Figure 1 Reference Voltage Circuit

Operating Mode Control

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

Table 2 Threshold Voltage (Vth)

Pin No.	Lo	Mid	Hi	Unit	Test Condition
20, 21, 22, 23	0.0 to 2.5	—	4.0 to V_{CC}	V	Input Pin — Measure — V
24	0.0 to 1.0	2.0 to 3.0	4.0 to V_{CC}	V	

Note: 1. 20 to 23 pins are pulled down Lo level, and 24 pin is pulled to Mid level by the inside resistor 100kΩ.
2. Over shoot level and under shoot level of input signal must be the standardized. (High: V_{CC}, Low: –0.2V)

Block Diagram

This IC can be constructed for simple system which has little external parts by used the head serving both as Recording and Play back because of REC return SW built-in.

With output Hi-Z of REC-EQ and input muting, this IC is realized not only REC mute attenuation sufficiently but reducing pop noise in REC muting.

Note: Referring to Parallel Data Format also.

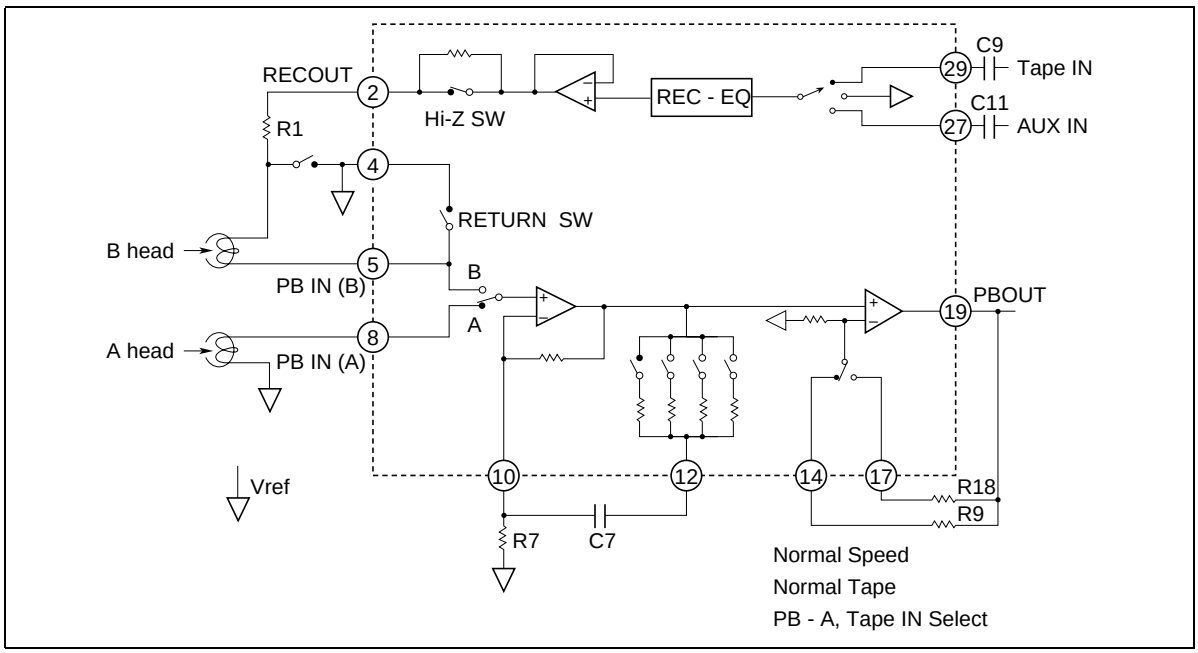


Figure 2 Block Diagram (Lch)

Level Diagram

It is the target that total play back output level is adjusted to 300mV; Dolby level, which the PB system gain in all is included of external amplifier's (Dolby IC etc.) as follows figure 3. Though A head adjustment is independent of B, select the value of R9, R18 adequately.

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

The level diagram at 1kHz is shown by figure 4.

Note: 1. R1 needs the value more than 1kHz.
2. Depending on the employed REC/PB head and test tape characteristics, there is rare case that the REC-EQ frequency characteristics of this IC can not be matched to the required characteristics because of built-in resistors which determined the REC-EQ parameters in this case, please inquire the responsible agent because of the adjustment of built-in resistors is necessary.

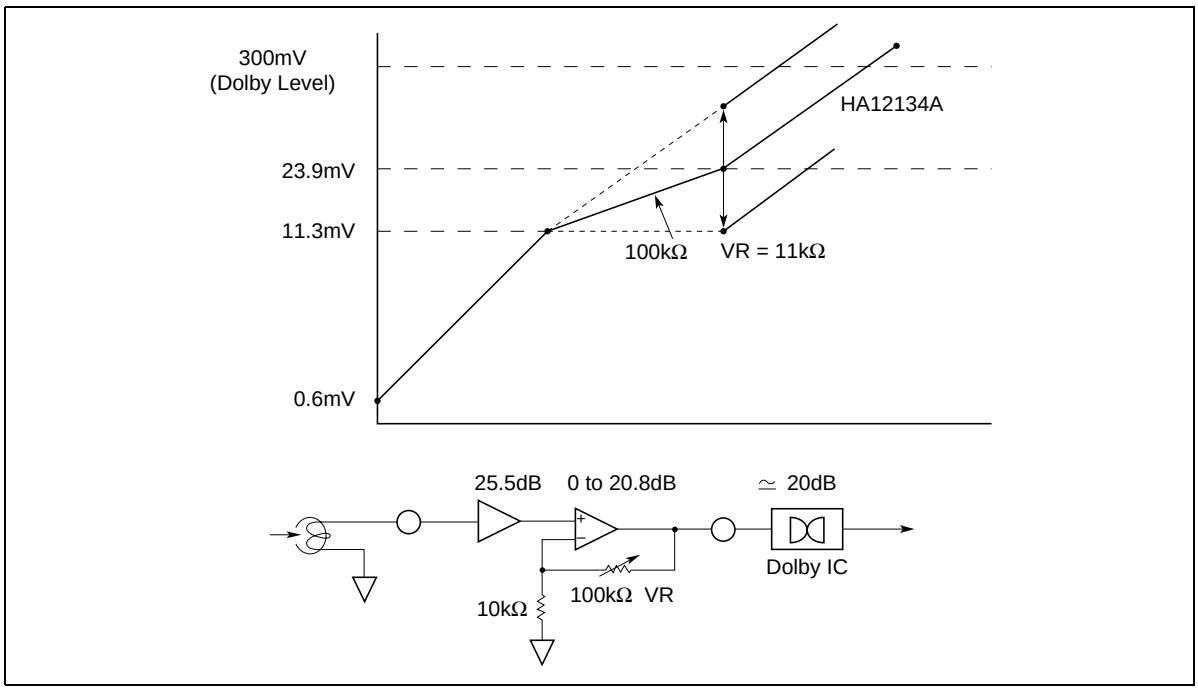


Figure 3 PB Level Diagram (Normal Speed, Normal Tape, 1kHz)

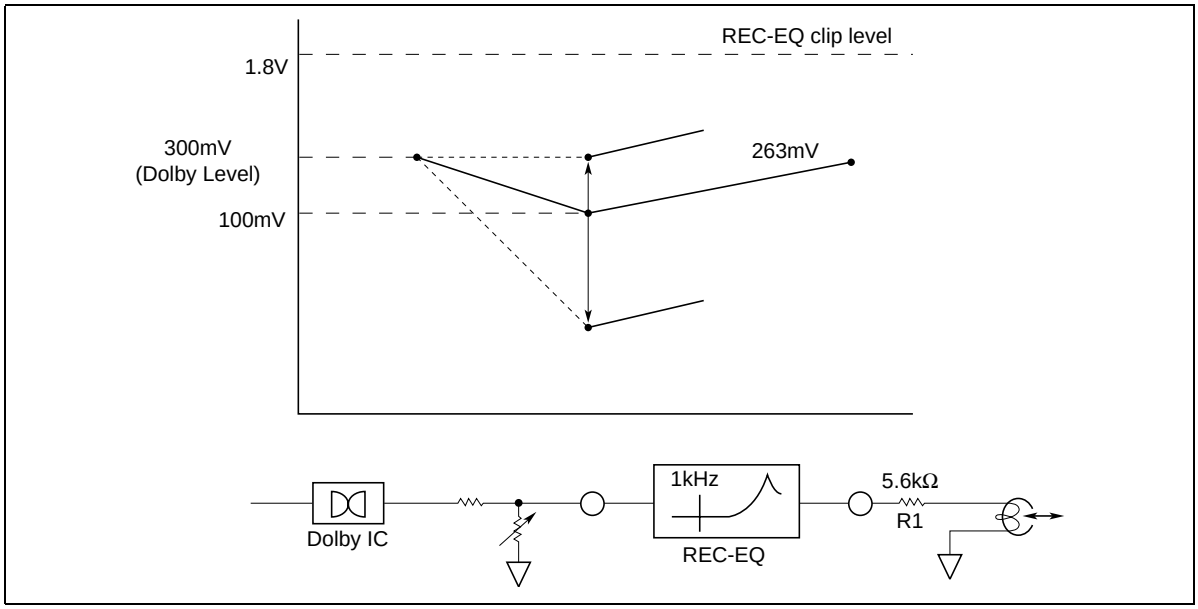


Figure 4 REC Level Diagram (Normal Speed, Normal Tape, 1kHz)

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	

Electrical Characteristics (Ta = 25°C, V_{CC} = 10.5V, Vref = 5.25V, PB-EQ standard DC gain 55.9dB (R9, R10, R18, R19 = 11.0kΩ))

						Test Condition								Application Terminal				
						IC Condition								Input		Output		
Item	Symbol	Min	Typ	Max	Unit	A/B	HSP	A CrO2	B CrO2	REC IN SEL	fin (Hz)	Vin (mVrms)	Other	R	L	R	L	COM
Quiescent current	I_Q	16.0	22.8	32.0	mA	A	Norm	TYPE I	TYPE I	Mute	—	—	No signal					1
Logical threshold	$V_{IL}1$	–0.2	—	2.5	V	—	—	—	—	—	—	—						20 to 23
	$V_{IL}2$	–0.2	—	1.0	V	—	—	—	—	—	—	—						24
	V_{IM}	2.0	—	3.0	V	—	—	—	—	—	—	—						24
	V_{IH}	4.0	—	V_{CC}	V	—	—	—	—	—	—	—						20 to 24
PB-REC Crosstalk	CT PB/REC(1)	50	60	—	dB	A/B	Norm	TYPE I	TYPE I	Tape/ AUX	1k	*1		27/ 29	26/ 28	18	19	
	CT PB/REC(2)	60	70	—	dB	A	Norm	TYPE I	TYPE I	Tape/ AUX	1k	*1		9	8	3	2	
PB-EQ Gain	G_V PB (1)	29.0	32.0	35.0	dB	A/B	Norm	TYPE I	TYPE I	Tape	1k	0.6		9/6	8/5	18	19	
	G_V PB (2)	25.0	28.0	31.0	dB	A/B	Norm	TYPE I	TYPE I	Tape	10k	0.6		9/6	8/5	18	19	
	G_V PB (3)	20.8	23.8	26.8	dB	A/B	Norm	TYPE II	TYPE II	Tape	10k	0.6		9/6	8/5	18	19	
	G_V PB (4)	19.4	22.4	25.4	dB	A/B	High	TYPE I	TYPE I	Tape	20k	0.6		9/6	8/5	18	19	
	G_V PB (5)	14.8	17.8	20.8	dB	A/B	High	TYPE II	TYPE II	Tape	20k	0.6		9/6	8/5	18	19	
PB-EQ Maximum output	Vomax PB	0.3	2.0	—	Vrms	A/B	Norm	TYPE I	TYPE I	Tape	1k	—	THD=1%*2	9/6	8/5	18	19	
PB-EQ THD	THD PB	—	0.1	0.5	%	A/B	Norm	TYPE I	TYPE I	Tape	1k	0.6		9/6	8/5	18	19	
PB-EQ Noise voltage	V_N PB	—	38	70	µVrms	A/B	Norm	TYPE I	TYPE I	Tape	—	—	Rg=820Ω, DIN-AUDIO	9/6	8/5	18	19	
PB-EQ Channel separation	CT R/L (1)	50	60	—	dB	A/B	Norm	TYPE I	TYPE I	Tape	1k	*1		8/5	9/6	18	19	
PB-EQ Crosstalk	CT A/B	60	70	—	dB	A	Norm	TYPE I	TYPE I	Tape	1k	*1		11	10	18	19	
						B								9	8			

Note: 1. Large level without clipping

2. V_{CC} = 9.5V, Vref = 4.75V, R9, R10, R18, R19 = 56kΩ

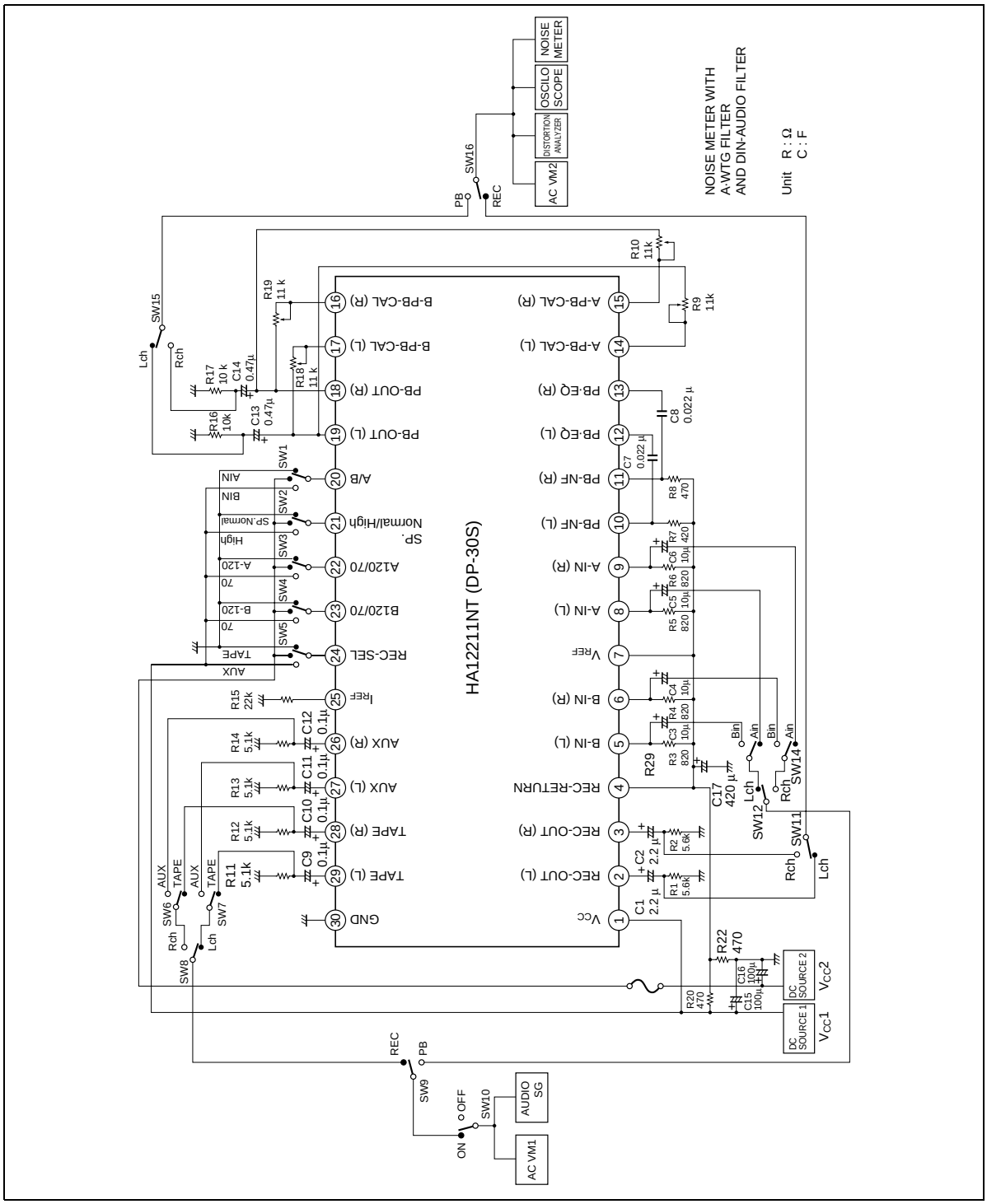
Electrical Characteristics (Ta = 25°C, V_{CC} = 10.5V, Vref = 5.25V, EQIN standard level = 100mV = 0dB) (cont)

Item	Symbol	Min	Typ	Max	Unit	Test Condition: IC Condition A/B	HSP	A CrO2	B CrO2	REC IN SEL	fin (Hz)	Vin (mVrms)	Other	Application Terminal: Input R	Input L	Output R	Output L	COM
REC-EQ Frequency response Normal speed TYPE I	G_V REC-NN 1	6.7	8.2	9.7	dB	A	Norm	TYPE I	TYPE I	Tape/AUX	1k	10		26/28	27/29	3	2	
	G_V REC-NN 2	9.3	11.3	13.3	dB	A	Norm	TYPE I	TYPE I	Tape/AUX	5k	10		26/28	27/29	3	2	
	G_V REC-NN 3	17.3	20.3	23.3	dB	A	Norm	TYPE I	TYPE I	Tape/AUX	10k	10		26/28	27/29	3	2	
REC-EQ Frequency response Normal speed TYPE II	G_V REC-NC 1	9.8	11.3	12.8	dB	A	Norm	TYPE I	TYPE II	Tape/AUX	1k	10		26/28	27/29	3	2	
	G_V REC-NC 2	14.2	16.2	18.2	dB	A	Norm	TYPE I	TYPE II	Tape/AUX	5k	10		26/28	27/29	3	2	
	G_V REC-NC 3	20.5	23.5	26.5	dB	A	Norm	TYPE I	TYPE II	Tape/AUX	10k	10		26/28	27/29	3	2	
REC-EQ Frequency response High speed TYPE I	G_V REC-HN 1	7.0	8.5	10.0	dB	A	High	TYPE I	TYPE I	Tape/AUX	2k	10		26/28	27/29	3	2	
	G_V REC-HN 2	10.9	12.9	14.9	dB	A	High	TYPE I	TYPE I	Tape/AUX	10k	10		26/28	27/29	3	2	
	G_V REC-HN 3	18.7	21.7	24.7	dB	A	High	TYPE I	TYPE I	Tape/AUX	20k	10		26/28	27/29	3	2	
REC-EQ Frequency response High speed TYPE II	G_V REC-HC 1	11.0	12.5	14.0	dB	A	High	TYPE I	TYPE II	Tape/AUX	2k	10		26/28	27/29	3	2	
	G_V REC-HC 2	16.2	18.2	20.2	dB	A	High	TYPE I	TYPE II	Tape/AUX	10k	10		26/28	27/29	3	2	
	G_V REC-HC 3	23.7	26.7	29.7	dB	A	High	TYPE I	TYPE II	Tape/AUX	20k	10		26/28	27/29	3	2	
REC-EQ Channel separation	CT R/L (2)	50	60	—	dB	A	Norm	TYPE I	TYPE I	Tape/AUX	1k	*1		26/28	27/29	3	2	
REC-EQ Crosstalk	CT Tape/AUX	50	60	—	dB	A	Norm	TYPE I	TYPE I	Tape AUX	1k	*1		26/28	27/29	3	2	
REC-EQ Attenuation	R-MUTE ATT	70	80	—	dB	A	Norm	TYPE I	TYPE I	Mute	1k	*1		26/28	27/29	3	2	
REC-EQ Maximum output	Vomax REC	1.2	1.8	—	Vrms	A	Norm	TYPE I	TYPE I	Tape/AUX	1k	—	THD=1%*2	26/28	27/29	3	2	
REC-EQ THD	THD REC	—	0.35	0.7	%	A	Norm	TYPE I	TYPE I	Tape/AUX	1k	100		26/28	27/29	3	2	
REC-EQ S/N	S/N REC	52	56	—	dB	A	Norm	TYPE I	TYPE I	Tape/AUX	—	—	Rg=5.1kΩ, A-WTG	26/28	27/29	3	2	

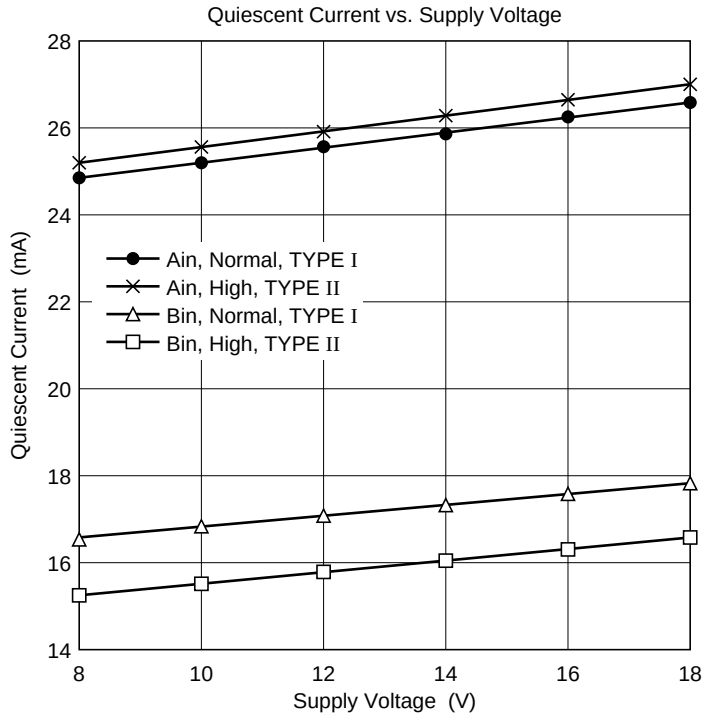
Note: 1. Large level without clipping

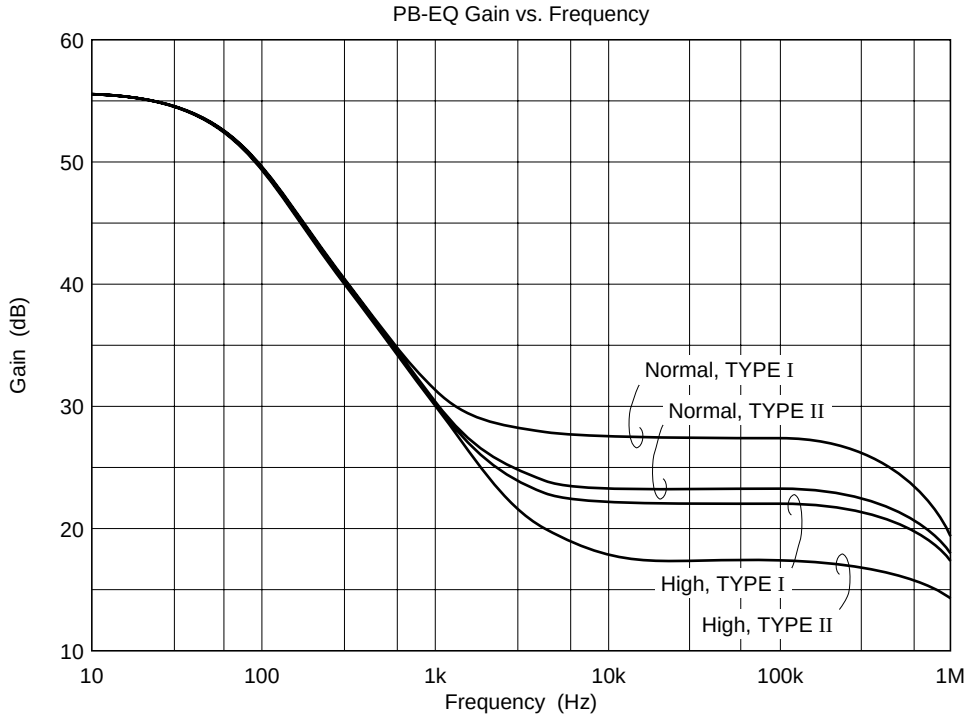
2. V_{CC} = 9.5V, Vref = 4.75V

Test Circuit

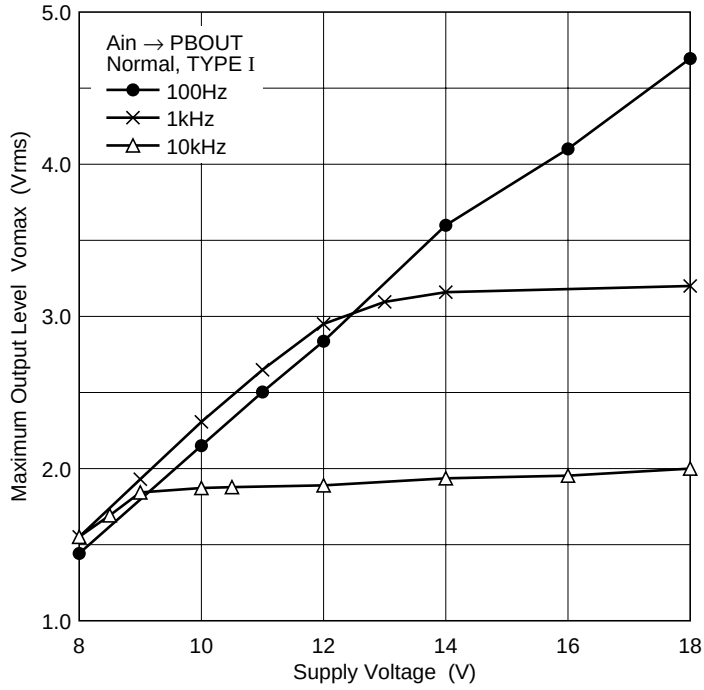


Characteristics Curve

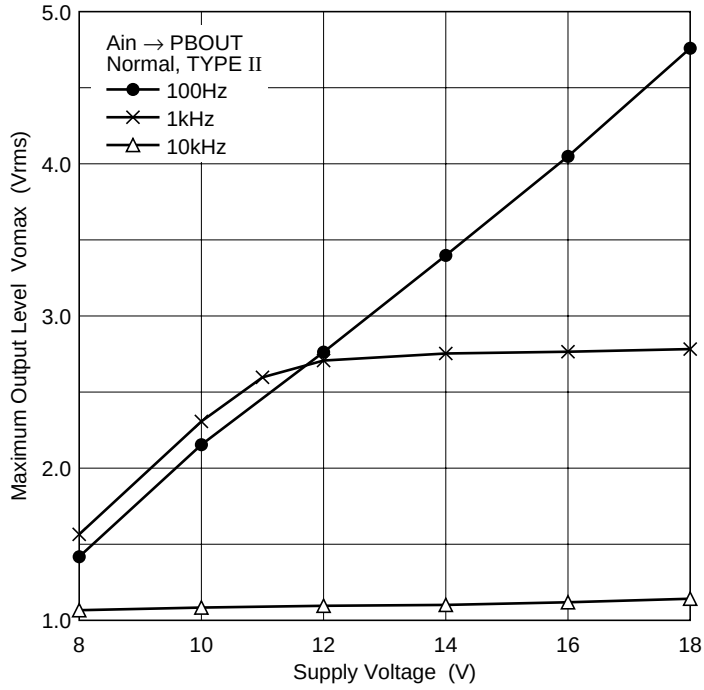




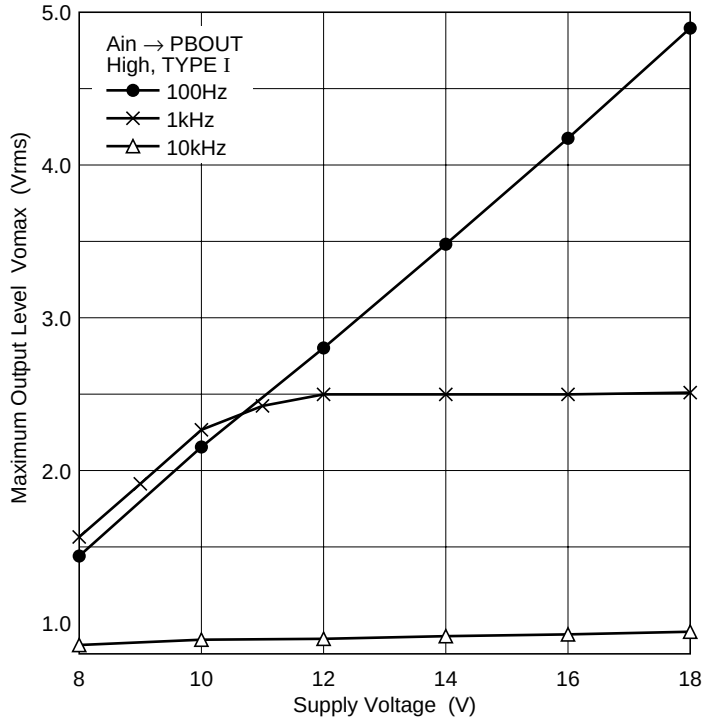
PB-EQ Maximum Output Level vs. Supply Voltage (1)



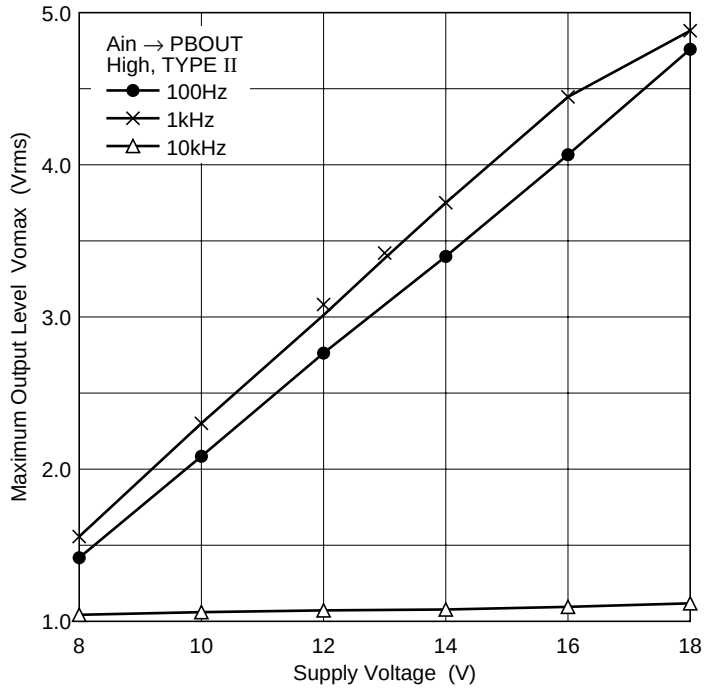
PB-EQ Maximum Output Level vs. Supply Voltage (2)



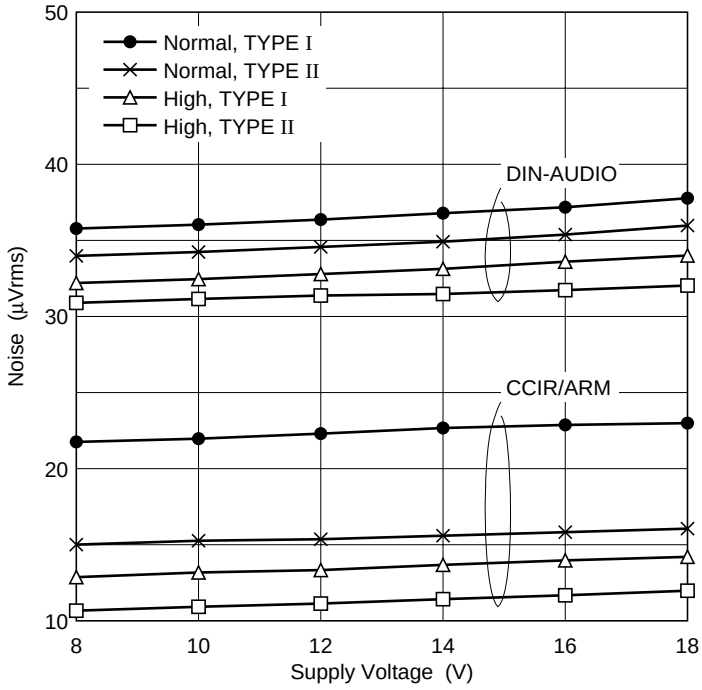
PB-EQ Maximum Output Level vs. Supply Voltage (3)



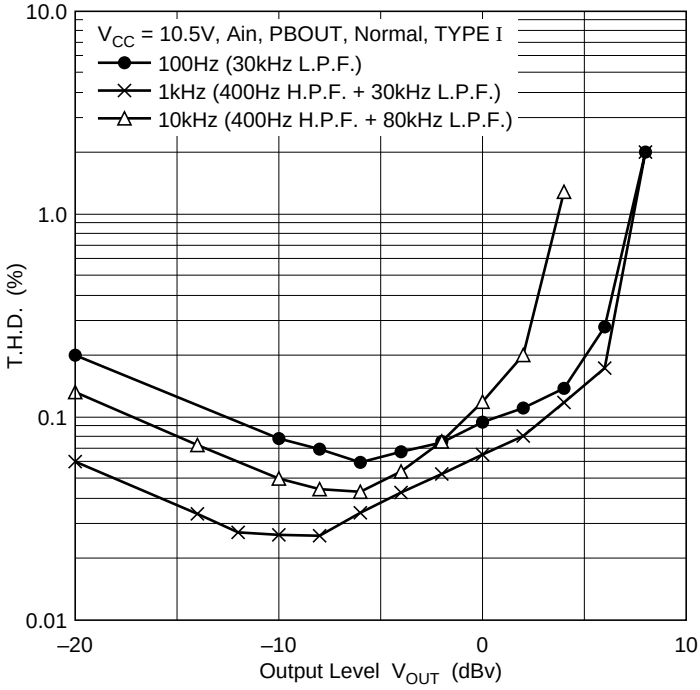
PB-EQ Maximum Output Level vs. Supply Voltage (4)



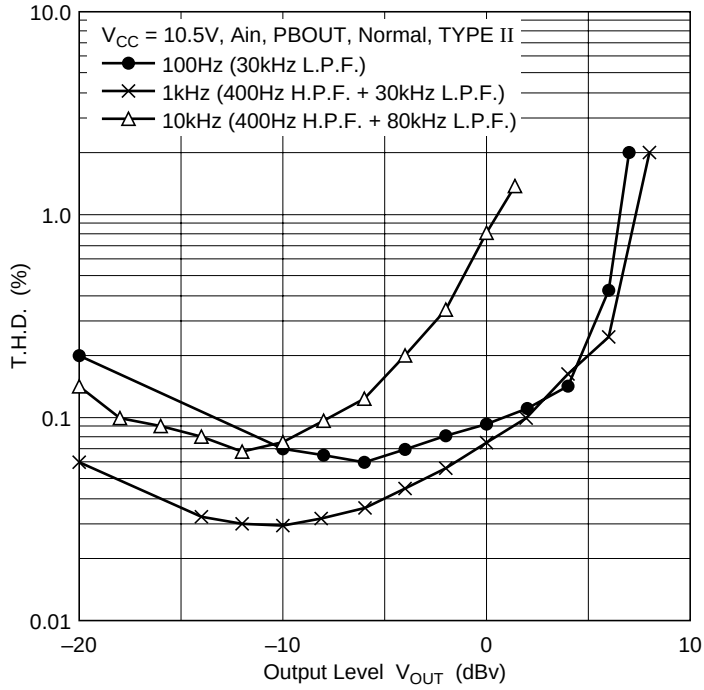
PB-EQ Noise vs. Supply Voltage



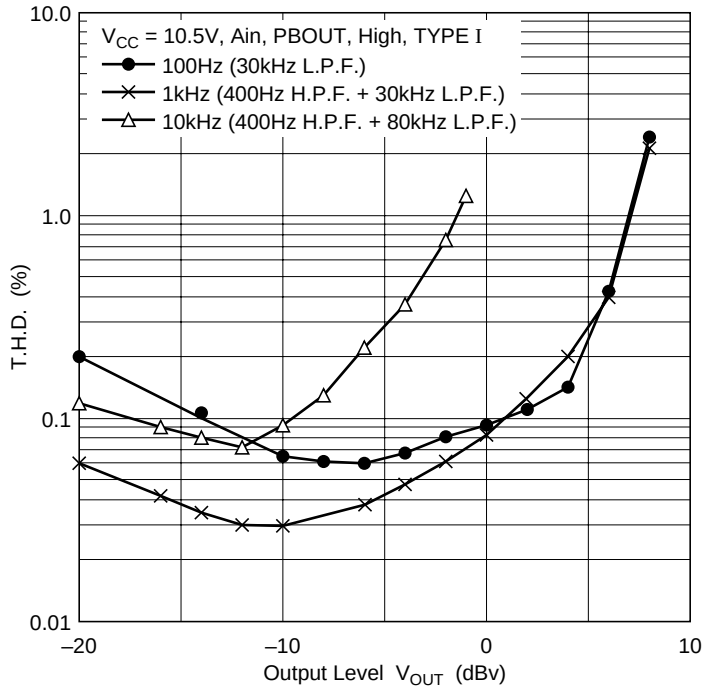
PB-EQ Total Harmonic Distortion vs. Output Level (1)



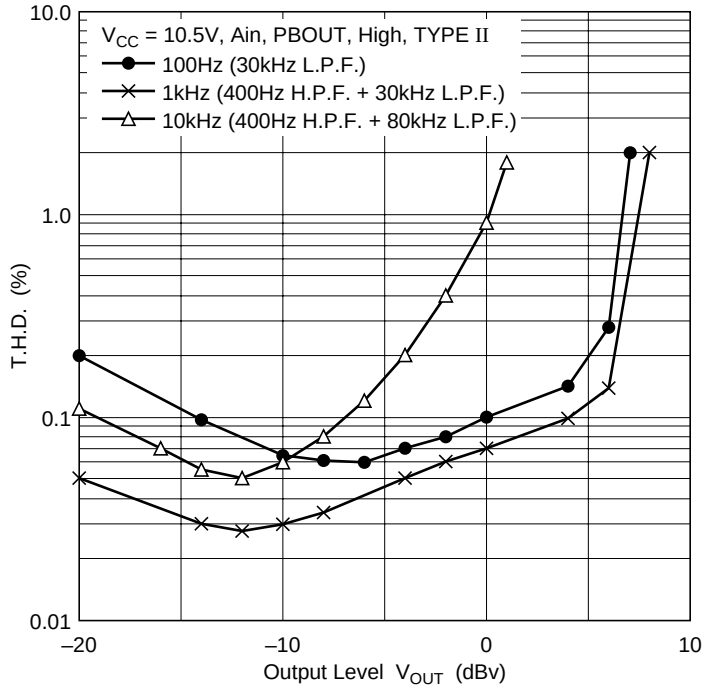
PB-EQ Total Harmonic Distortion vs. Output Level (2)



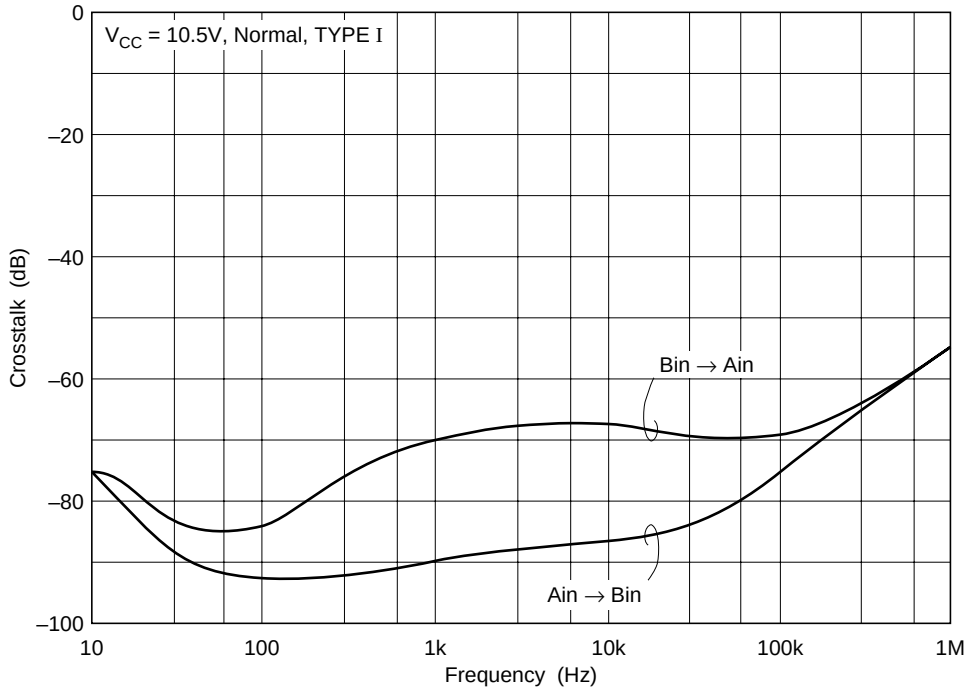
PB-EQ Total Harmonic Distortion vs. Output Level (3)



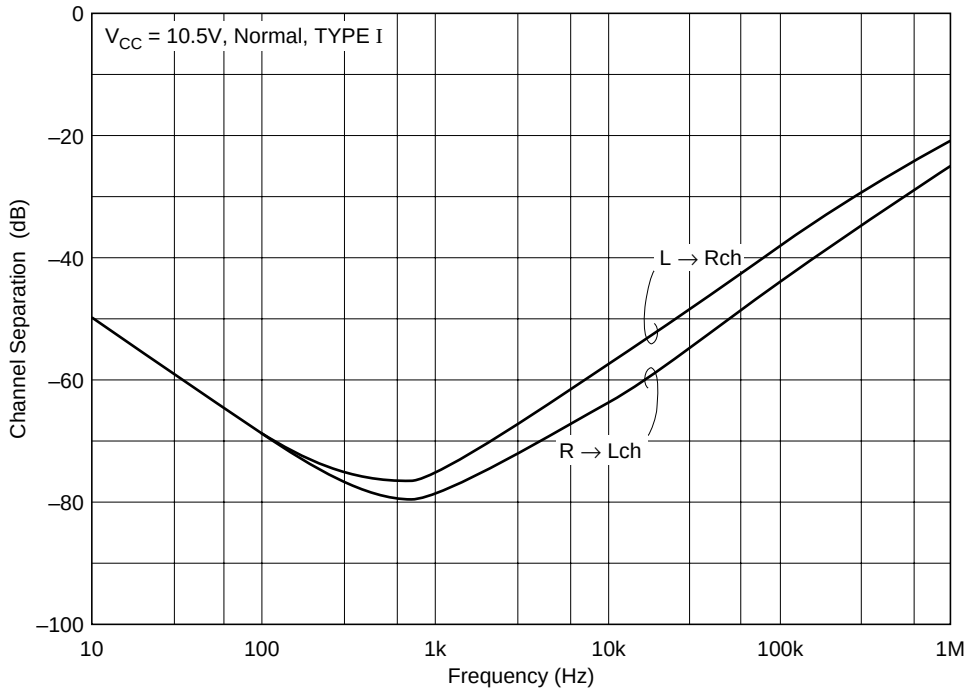
PB-EQ Total Harmonic Distortion vs. Output Level (4)



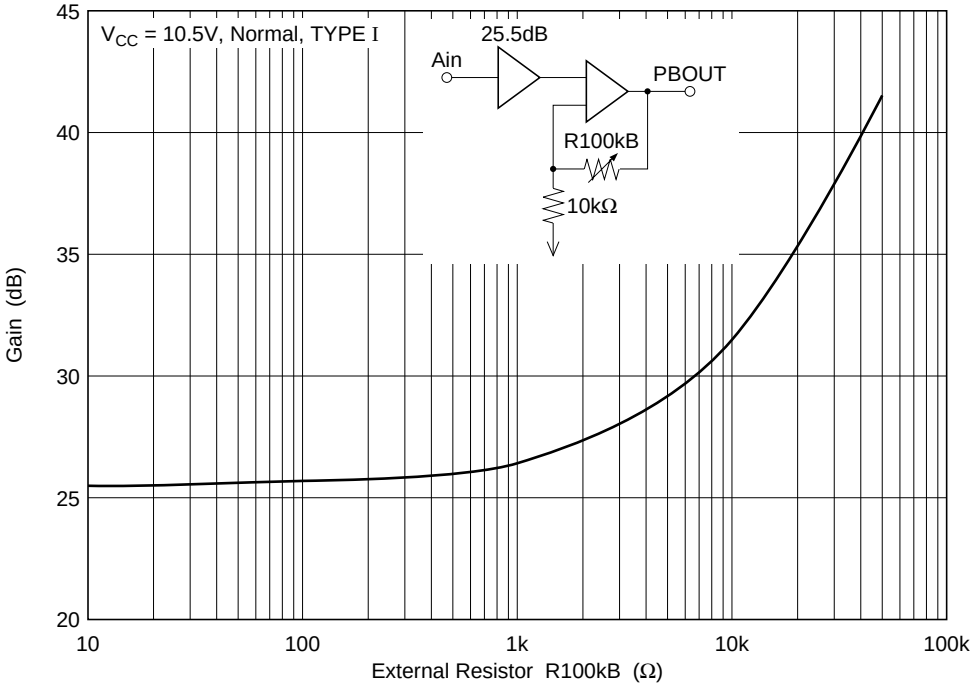
PB-EQ Crosstalk vs. Frequency



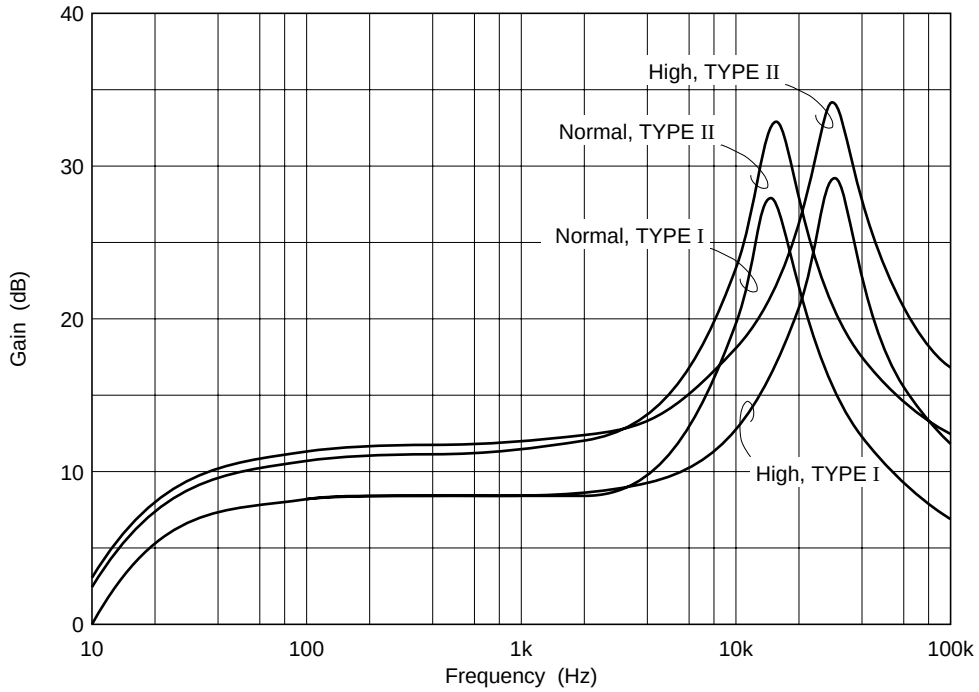
PB-EQ Channel Separation vs. Frequency



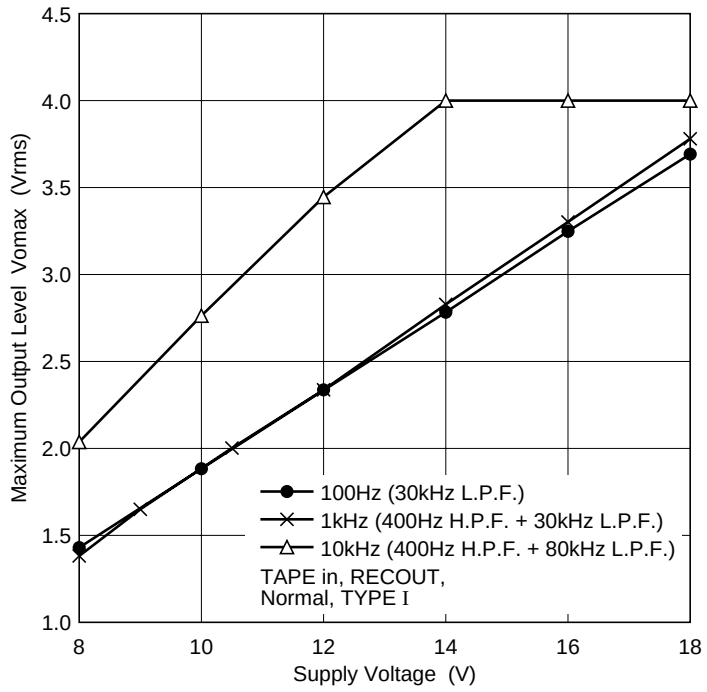
PB-EQ Gain vs. External Resistor



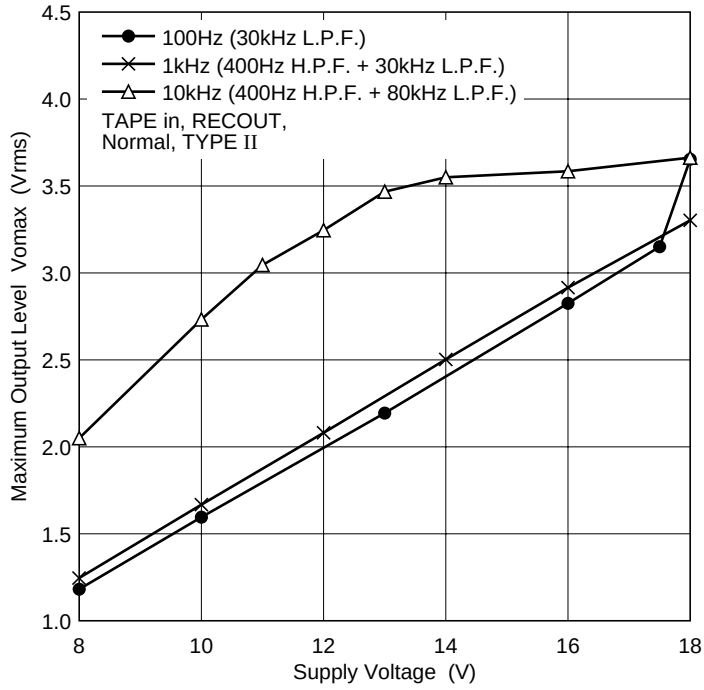
PB-EQ Gain vs. Frequency



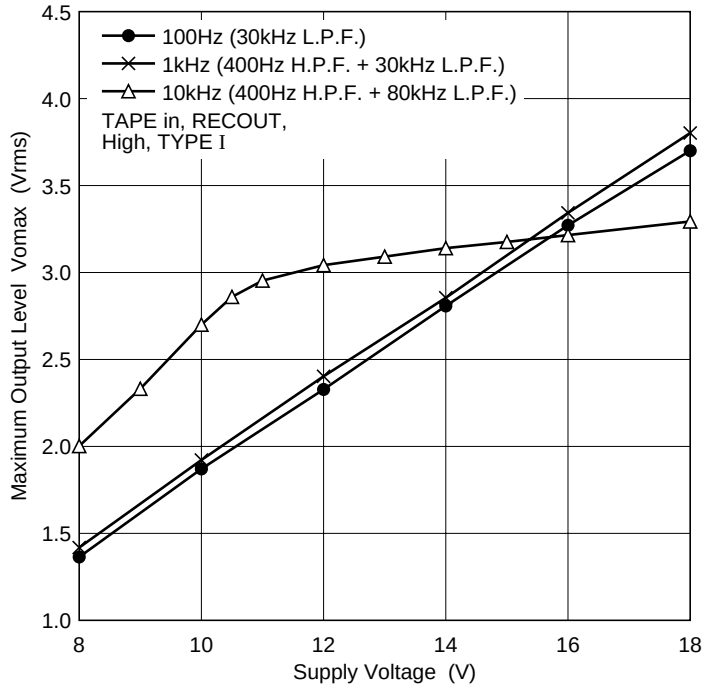
REC-EQ Maximum Output Level vs. Supply Voltage (1)



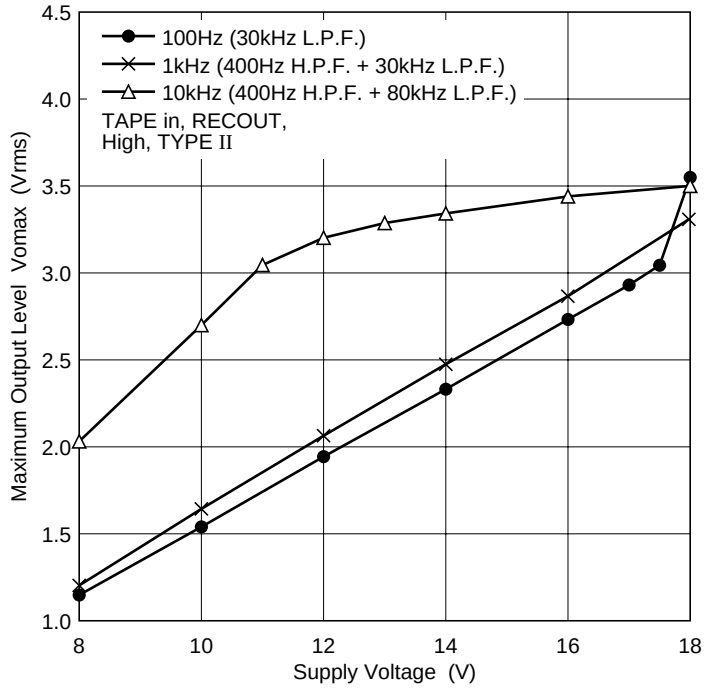
REC-EQ Maximum Output Level vs. Supply Voltage (2)



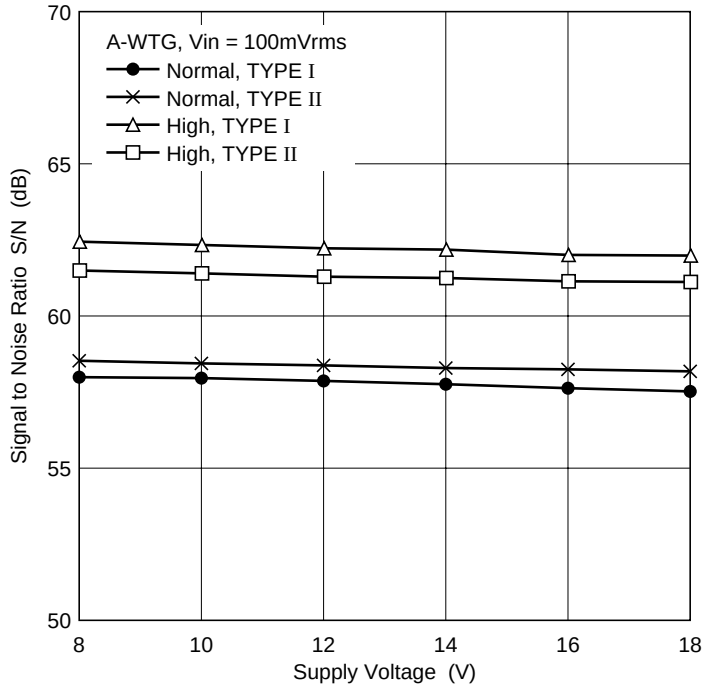
REC-EQ Maximum Output Level vs. Supply Voltage (3)



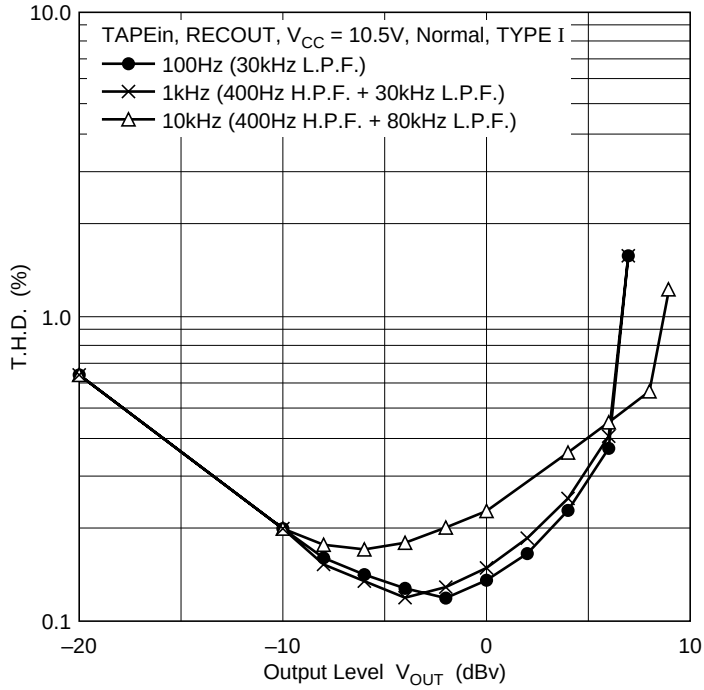
REC-EQ Maximum Output Level vs. Supply Voltage (4)



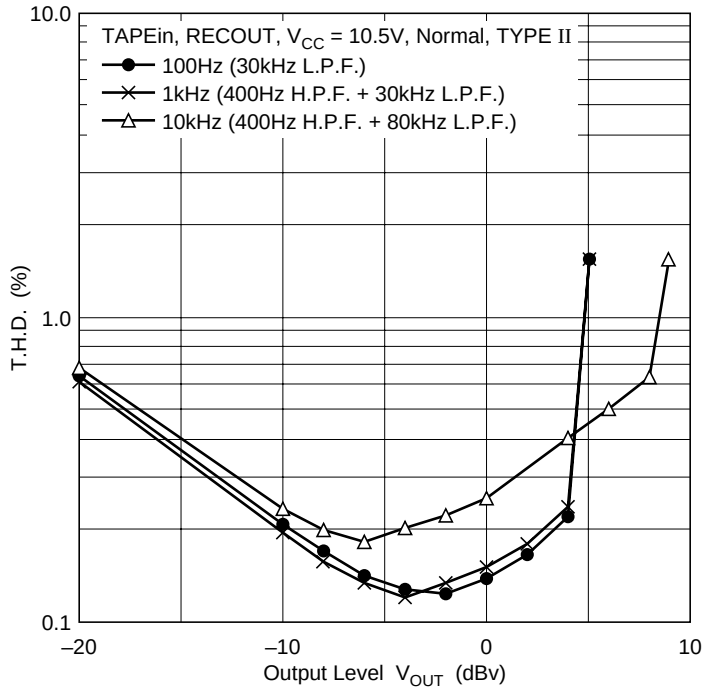
REC-EQ Signal to Noise Ratio vs. Supply Voltage



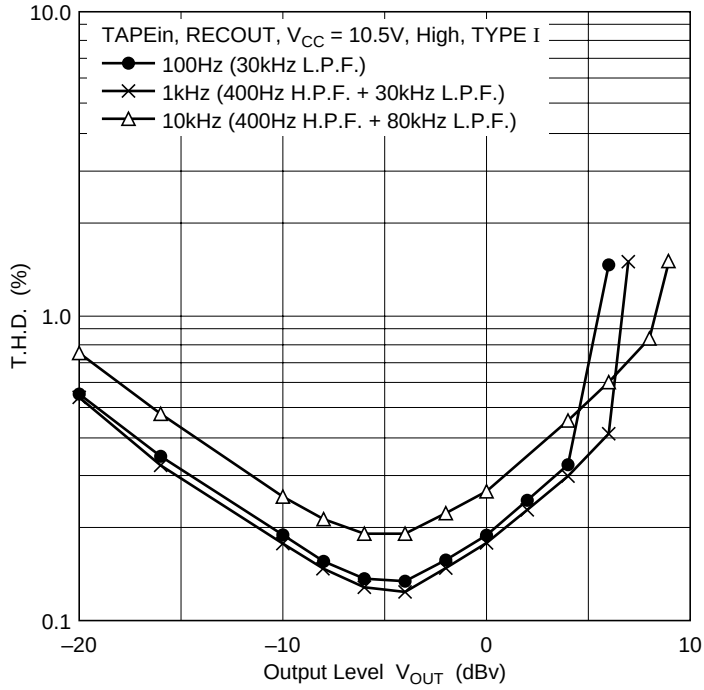
REC-EQ Total Harmonic Distortion vs. Output Level (1)



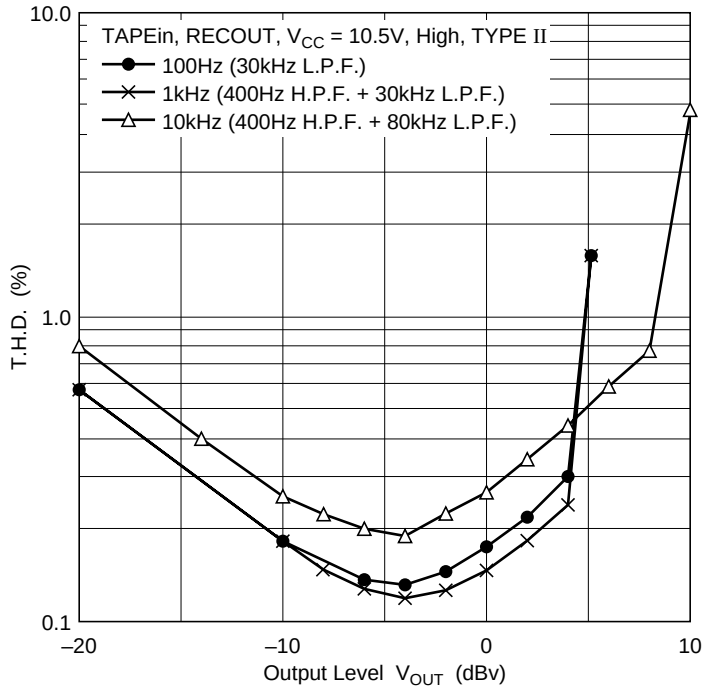
REC-EQ Total Harmonic Distortion vs. Output Level (2)



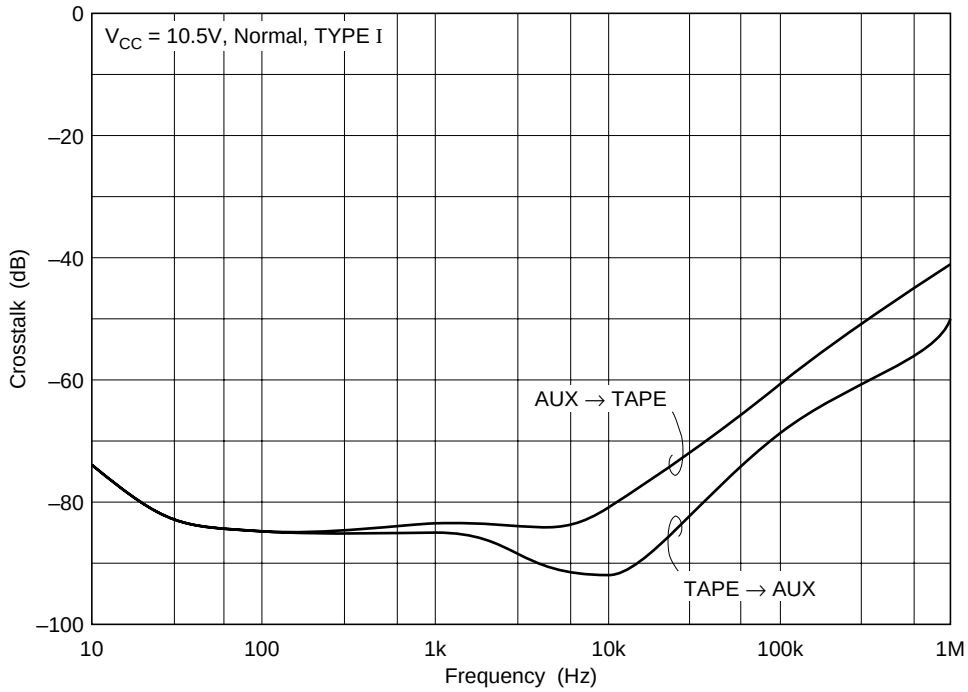
REC-EQ Total Harmonic Distortion vs. Output Level (3)



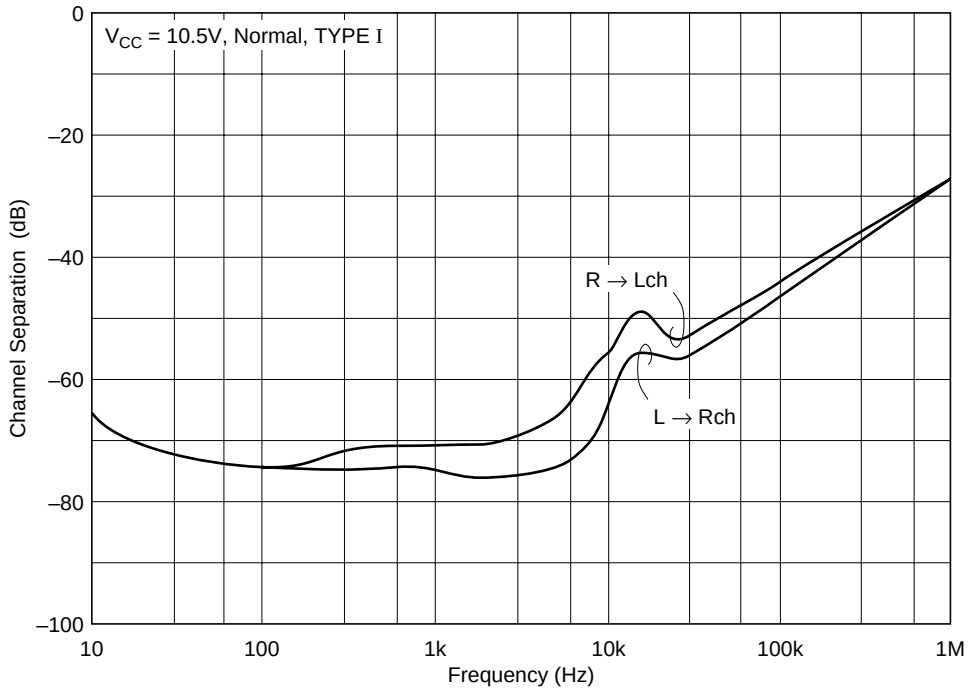
REC-EQ Total Harmonic Distortion vs. Output Level (4)



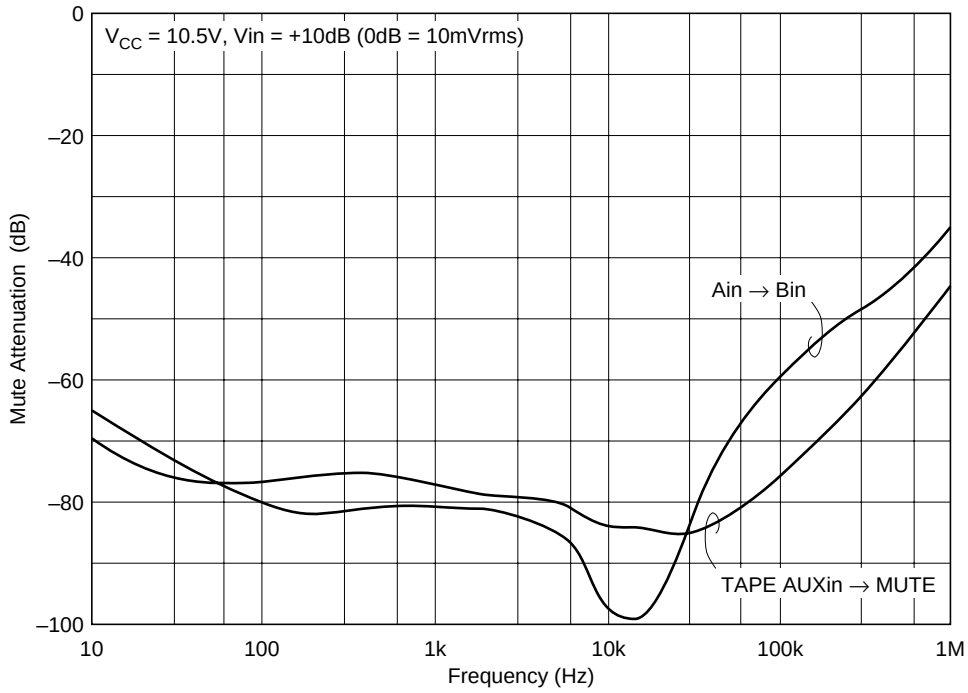
REC-EQ Crosstalk vs. Frequency



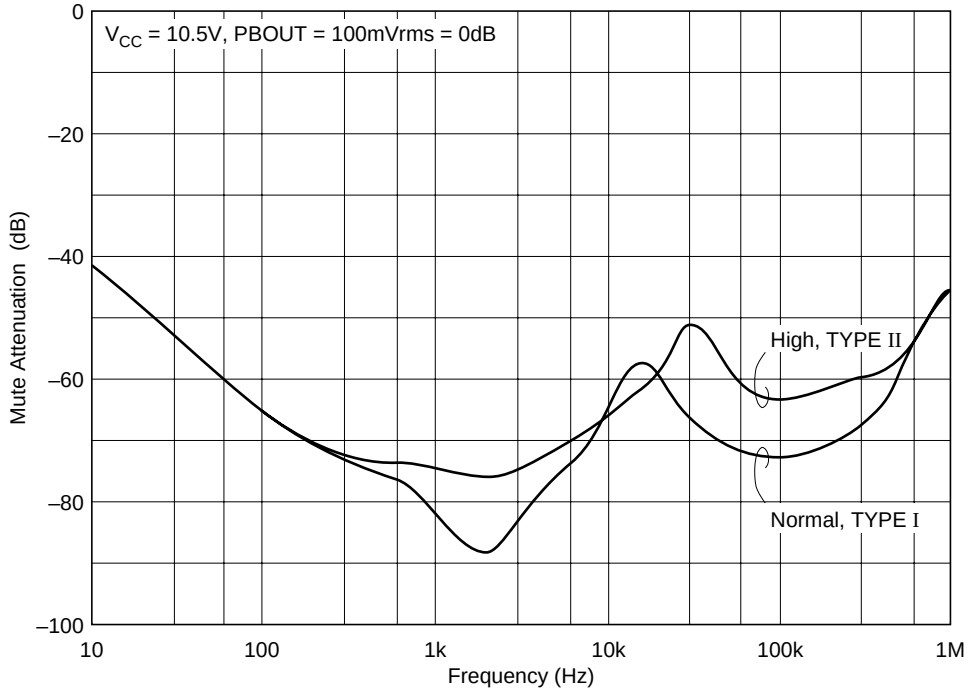
REC-EQ Channel Separation vs. Frequency



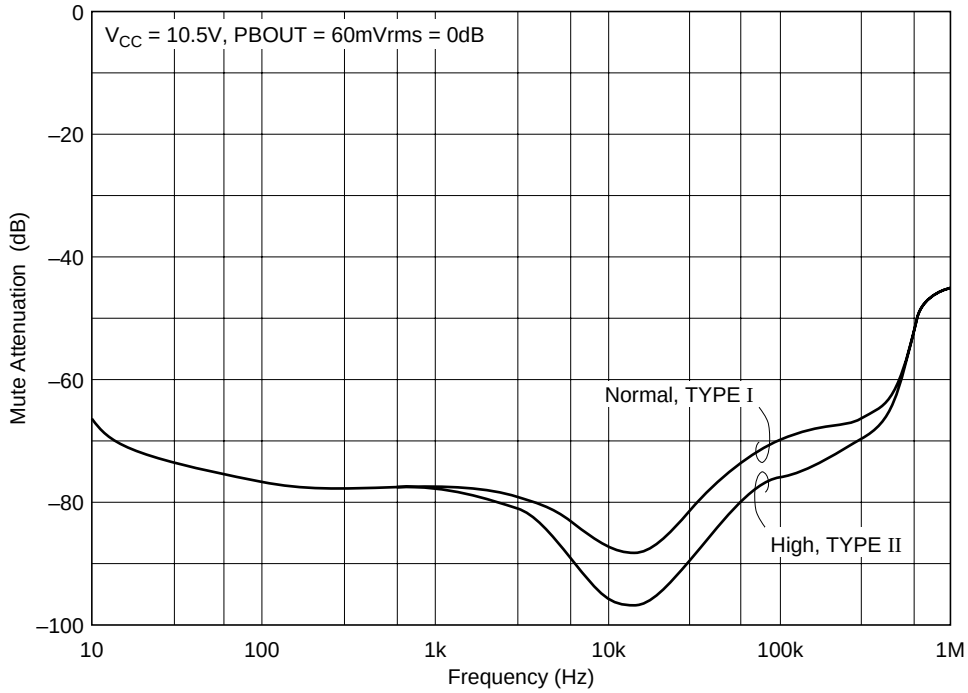
REC-EQ Mute Attenuation vs. Frequency



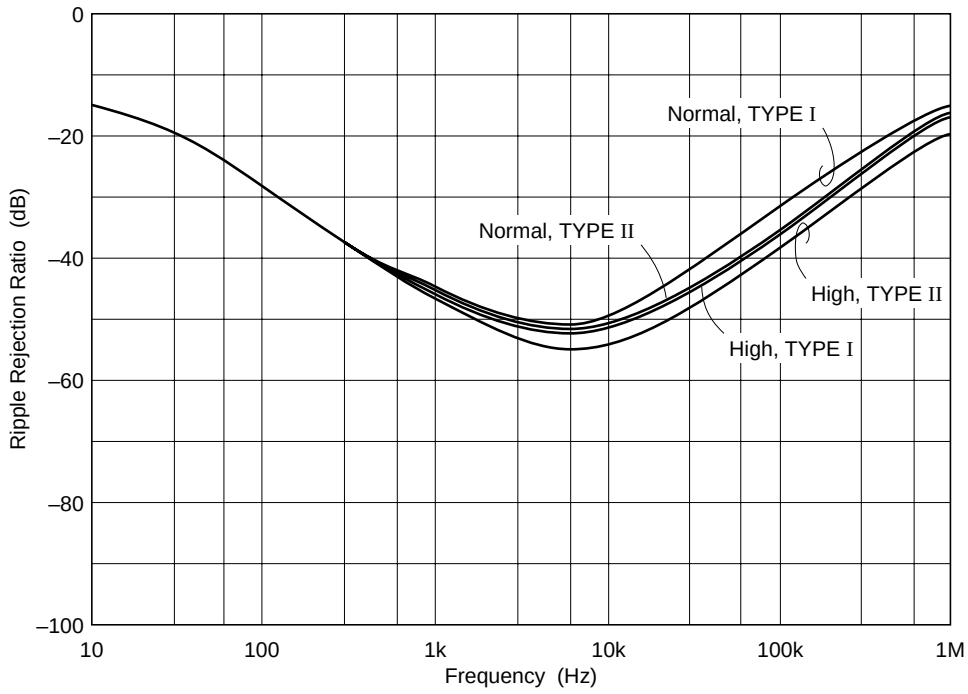
PB-EQ → REC-OUT Crosstalk vs. Frequency



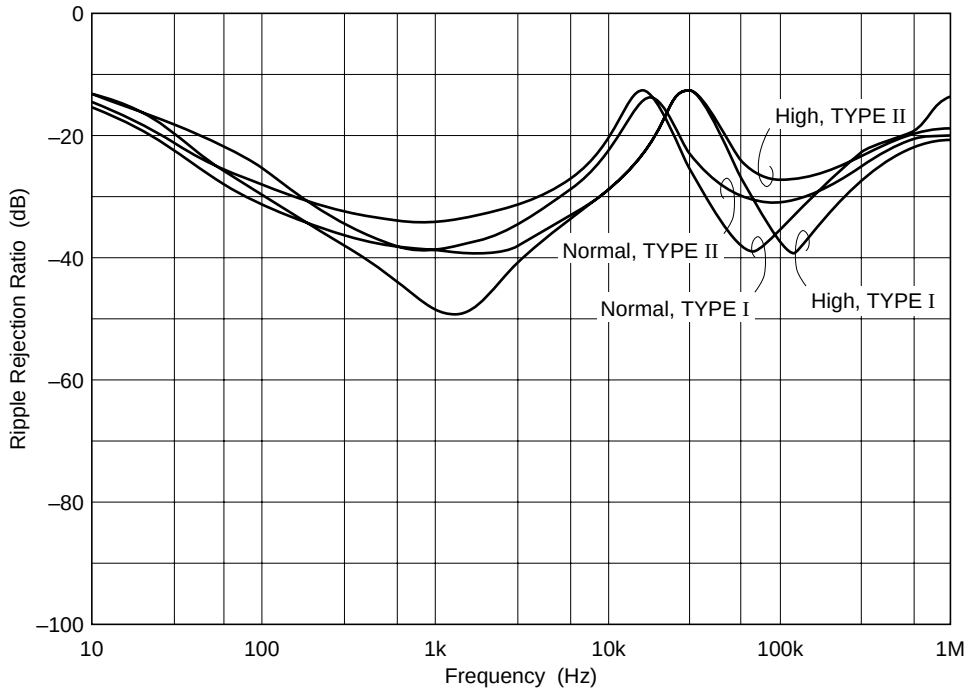
REC-EQ → PB-EQ Crosstalk vs. Frequency



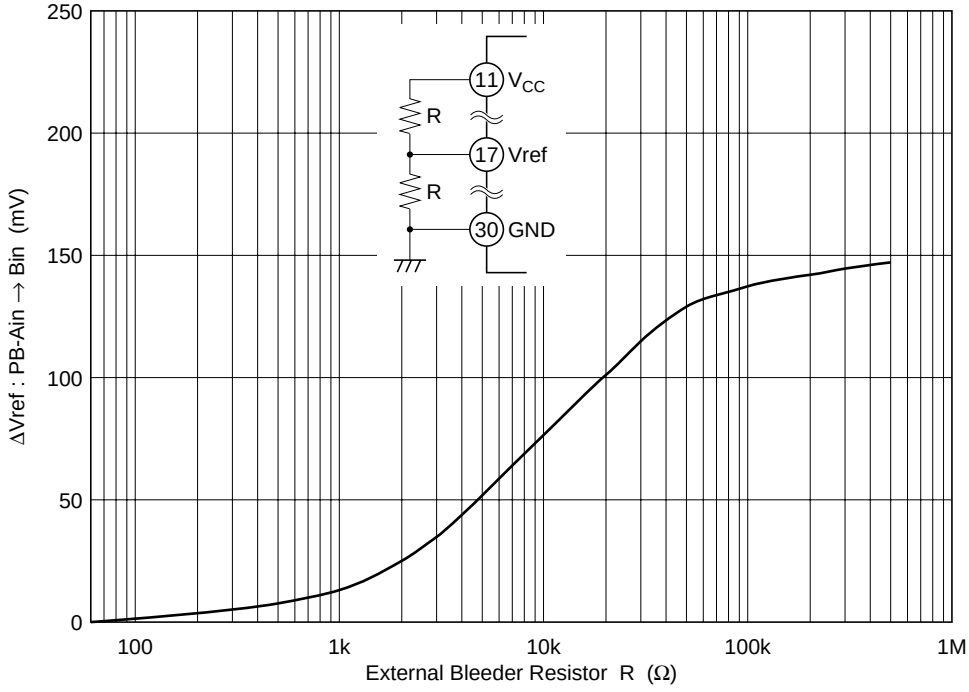
Ripple Rejection Ratio (PBOUT) vs. Frequency



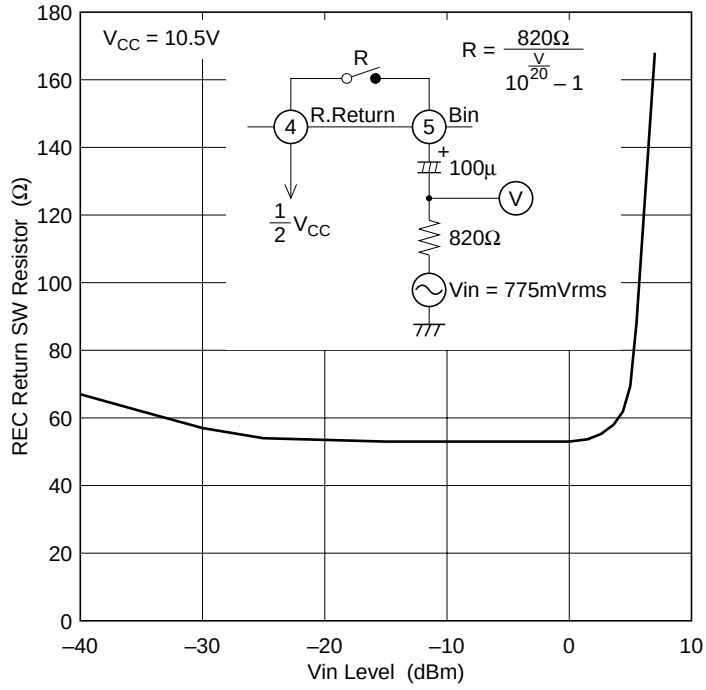
Ripple Rejection Ratio (RECOUT) vs. Frequency



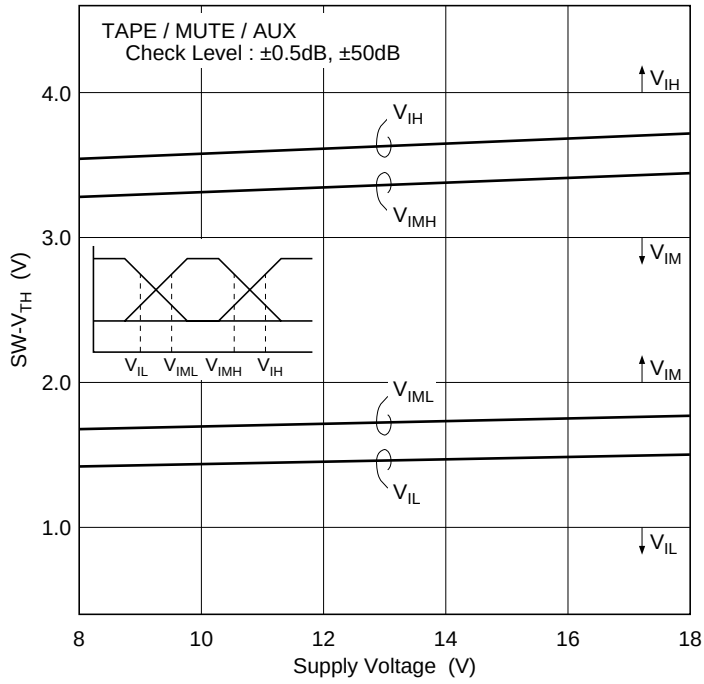
ΔVref vs. External Bleeder Resistor

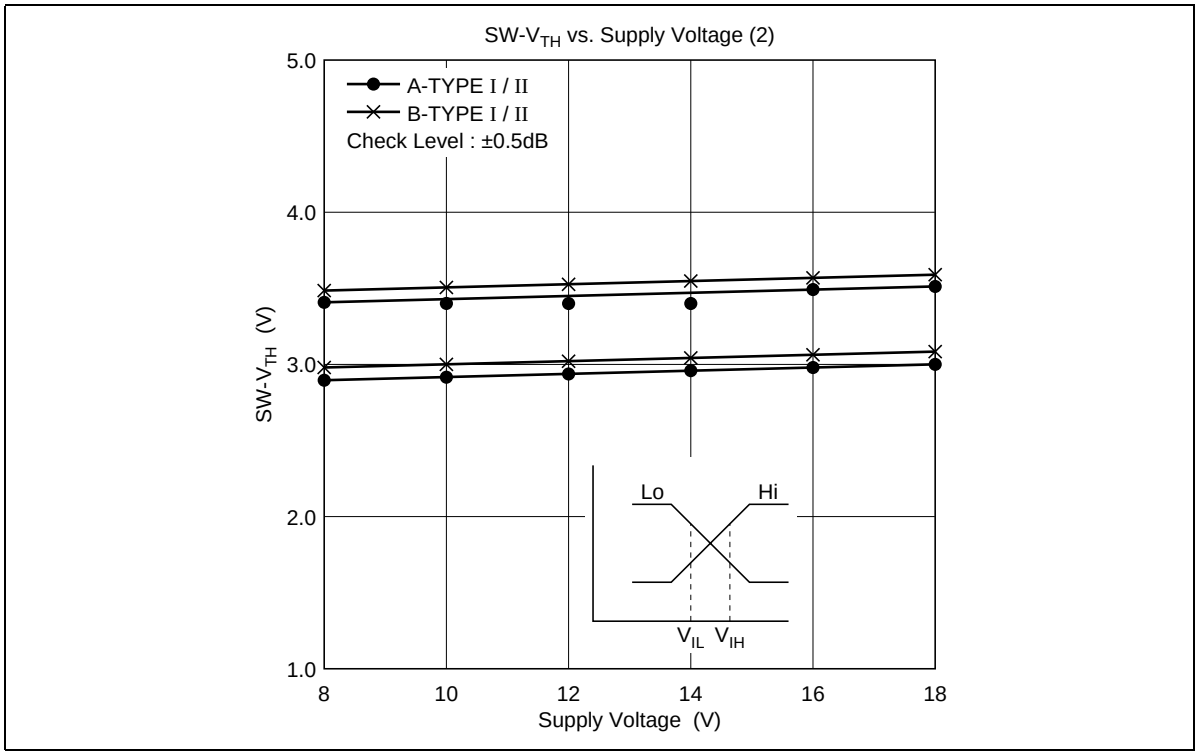


REC Return SW Resistor vs. Vin Level



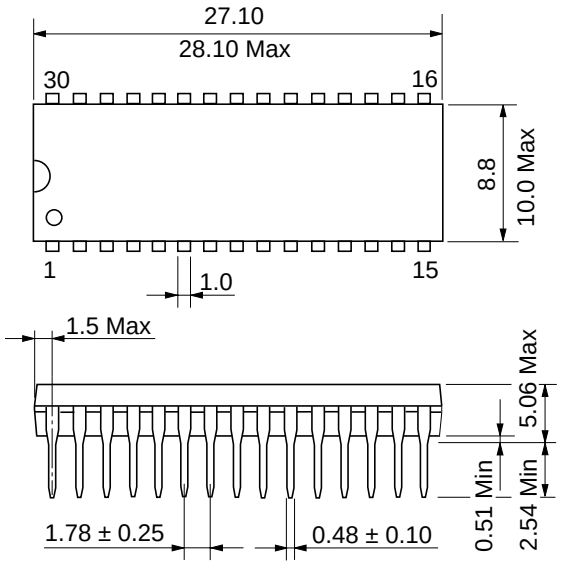
SW-V_{TH} vs. Supply Voltage (1)

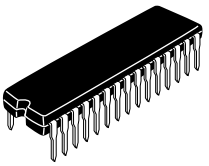


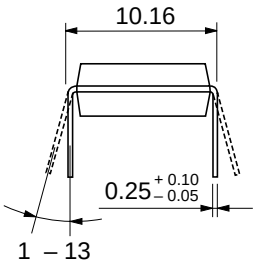

SW-V_{TH} vs. Supply Voltage (2)
A-TYPE I / II
B-TYPE I / II
Check Level : ±0.5dB
SW-V_{TH} (V)
5.0
4.0
3.0
2.0
1.0
8
10
12
14
16
18
Supply Voltage (V)
Lo
Hi
V_{IL} V_{IH}

Package Dimensions

Unit: mm







Hitachi Code	DP-30S
JEDEC Code	—
EIAJ Code	SC-549-30
Weight	1.98 g

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