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# HA12211NT

Audio Signal Processor for Cassette Deck (Deck 1 Chip)

## HITACHI

ADE-207-223A (Z)

2nd. Edition  
June 1997

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### Description

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

### Functions

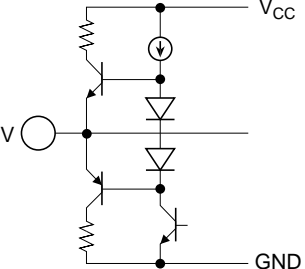
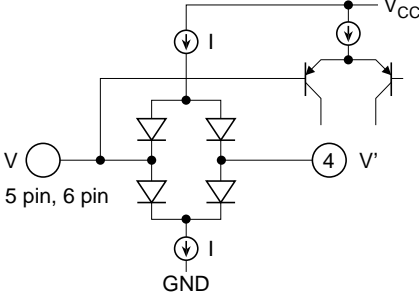
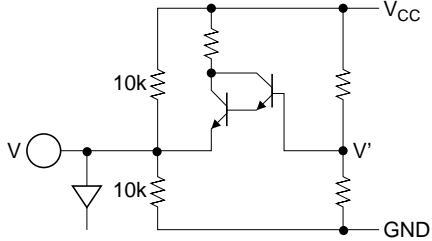
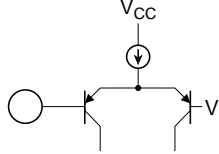
- PB equalizer × 2 channel
- REC equalizer × 2 channel
- Each electrical control switch to change equalizer characteristics
- REC mute
- REC head return switch

### 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.

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**Pin Description, Equivalent Circuit** ( $V_{CC} = 10.5V$ ,  $V_{ref} = 5.25V$ ,  $T_a = 25^\circ C$ , 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** ( $V_{CC} = 10.5V$ ,  $V_{ref} = 5.25V$ ,  $T_a = 25^\circ C$ , No signal, The value in the table show typical value.) (cont)

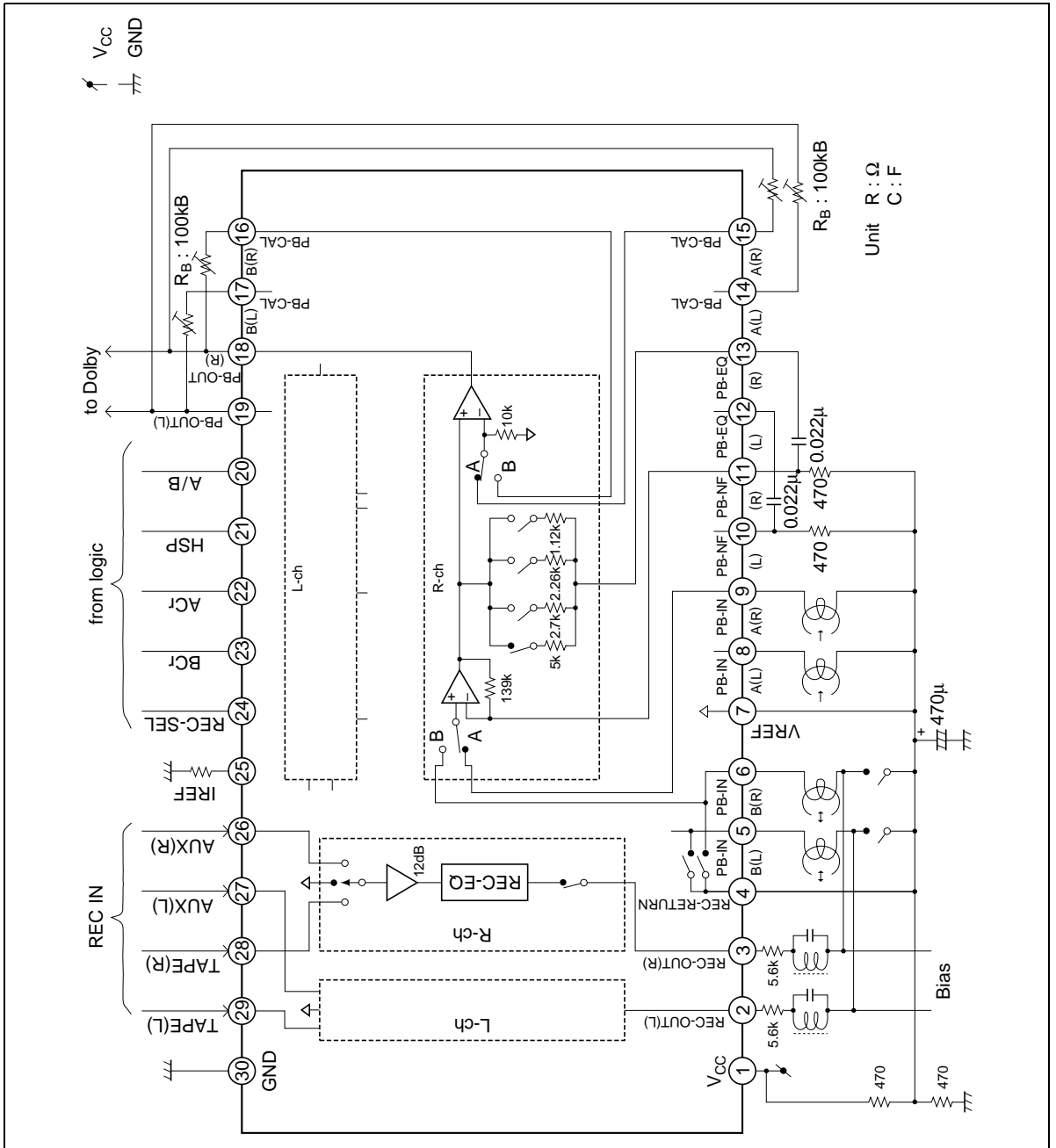
Pin No.	Pin Name	Note	Equivalent Circuit	Pin Description
10	PB-NF (L)	$V = V_{ref}$		PB EQ Feed back
11	PB-NF (R)			
12	PB-EQ (L)	$V = V_{ref}$		NAB Output
13	PB-EQ (R)			
14	PB-Cal A(L)	$V = V_{ref}$		Feed back input for gain adjustment
15	PB-Cal A(R)			
16	PB-Cal B(R)			
17	PB-Cal B(L)			
26	AUX (R)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

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**Pin Description, Equivalent Circuit** ( $V_{CC} = 10.5V$ ,  $V_{ref} = 5.25V$ ,  $T_a = 25^\circ C$ , No signal, The value in the table show typical value.) (cont)

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

Block Diagram



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## 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 Sply Voltage**

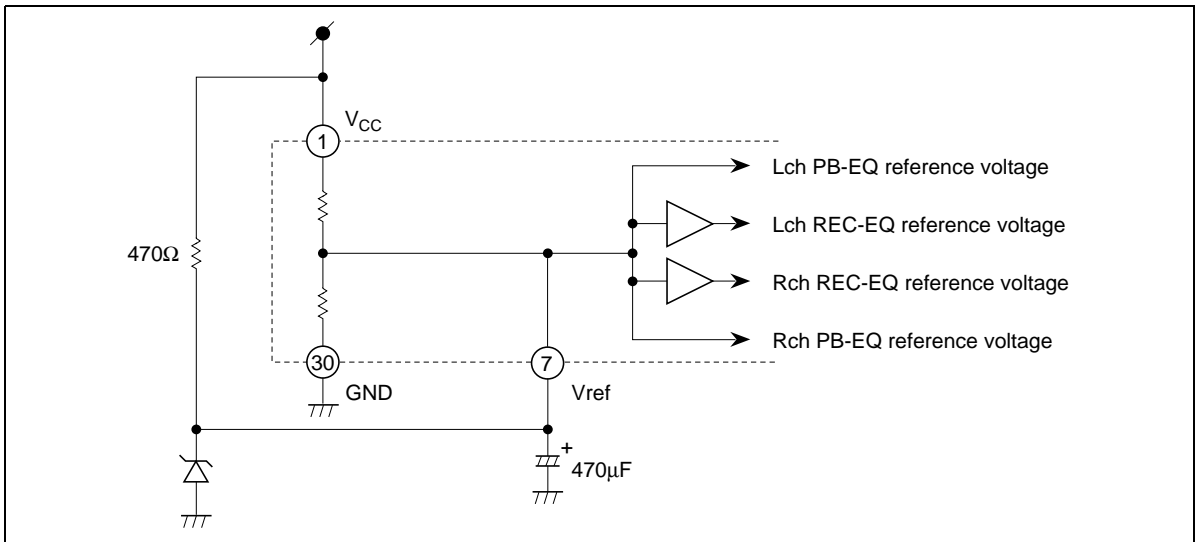
Item	Power Supply Range
Single Supply	9.5V to 15.0V

**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<sub>cc</sub> voltage circuit, for example, figure 1.

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



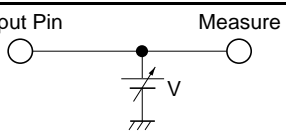
**Figure 1 Reference Voltage Circuit**

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## 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 ( $V_{th}$ )**

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 
24	0.0 to 1.0	2.0 to 3.0	4.0 to $V_{cc}$	V	

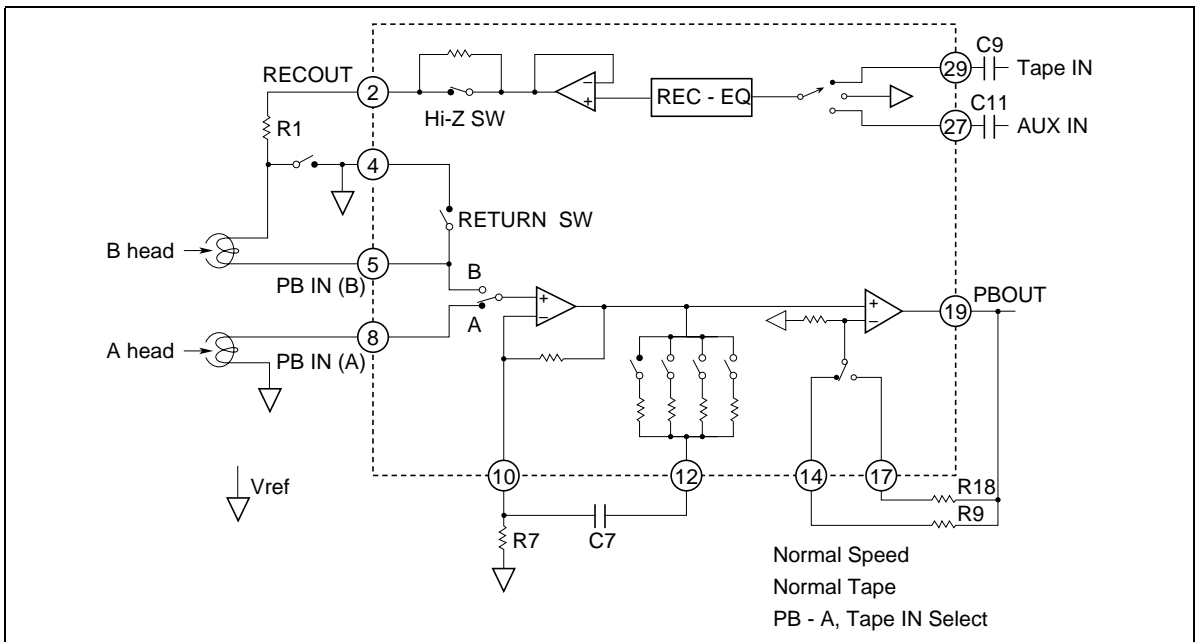
- Note:
- 20 to 23 pins are pulled down Lo level, and 24 pin is pulled to Mid level by the inside resistor 100k $\Omega$ .
  - Over shoot level and under shoot level of input signal must be the standardized.  
(High:  $V_{cc}$ , Low:  $-0.2V$ )

## 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)**



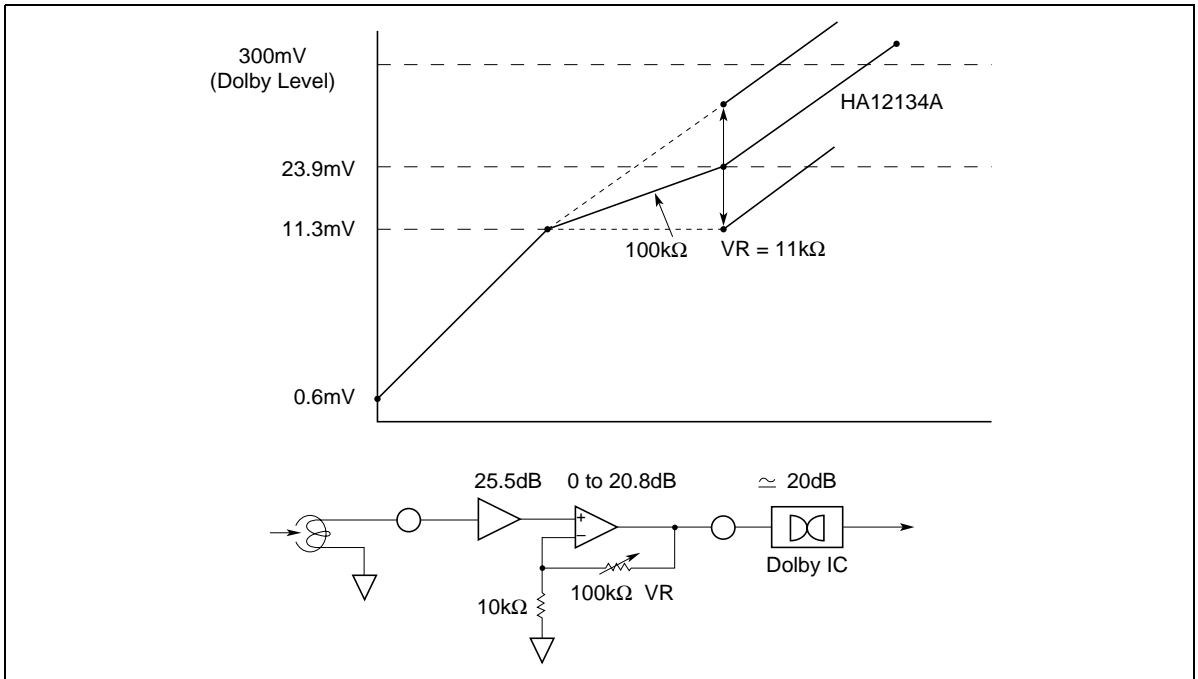
**Level Diagram**

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.

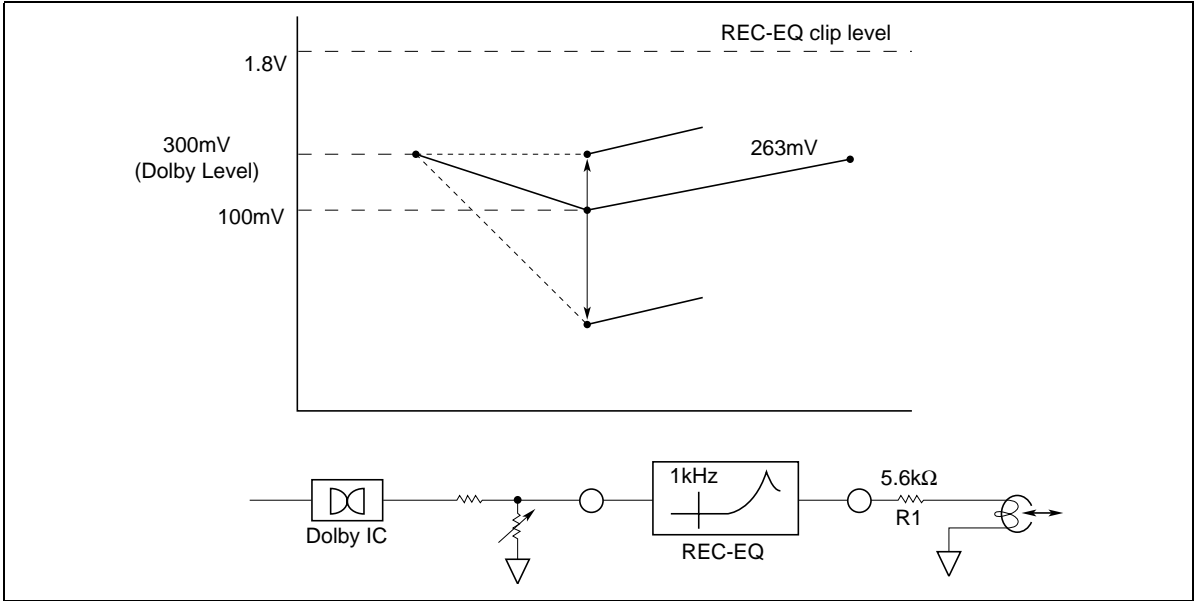
Regarding REC-EQ adjust the gain in front of input to this IC.

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** ( $T_a = 25^\circ\text{C}$ )

<b>Item</b>	<b>Symbol</b>	<b>Rating</b>	<b>Unit</b>	<b>Note</b>
Max supply voltage	$V_{cc\ max}$	16	V	
Power dissipation	$P_d$	500	mW	$T_a \leq 75^\circ\text{C}$
Operating temperature	$T_{opr}$	-40 to +75	$^\circ\text{C}$	
Storage temperature	$T_{stg}$	-55 to +125	$^\circ\text{C}$	
Operating voltage	$V_{opr}$	9.5 to 15	V	

## Electrical Characteristics (Ta = 25°C, V<sub>CC</sub> = 10.5V, V<sub>ref</sub> = 5.25V, PB-EQ standard DC gain 55.9dB (R9, R10, R18, R19 = 11.0kΩ))

Item	Symbol	Min	Typ	Max	Unit	A/B	HSP	A CrO2 B CrO2 IN SEL (Hz)	REC fin	Vin	Application Terminal				
											Other	Input	Output	COM	
											R	L	R	L	
Quiescent current	I <sub>Q</sub>	16.0	22.8	32.0	mA	A	Norm	TYPE I	TYPE I	Mute	—	—	—	—	1
Logical threshold	V <sub>IL1</sub>	-0.2	—	2.5	V	—	—	—	—	—	—	—	—	—	20 to 23
	V <sub>IL2</sub>	-0.2	—	1.0	V	—	—	—	—	—	—	—	—	—	24
	V <sub>IM</sub>	2.0	—	3.0	V	—	—	—	—	—	—	—	—	—	24
	V <sub>IH</sub>	4.0	—	V <sub>CC</sub>	V	—	—	—	—	—	—	—	—	—	20 to 24
PB-REC Crosstalk	CT PB/REC(1)	50	60	—	dB	A/B	Norm	TYPE I	TYPE I	Tape/ AUX	1k	1k	27/ 29	26/ 28	18 19
	CT PB/REC(2)	60	70	—	dB	A	Norm	TYPE I	TYPE I	Tape/ AUX	1k	1k	9	8 3	2
PB-EQ Gain	G <sub>V</sub> 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 <sub>V</sub> 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 <sub>V</sub> 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 <sub>V</sub> 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 <sub>V</sub> 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	V <sub>omax</sub> PB	0.3	2.0	—	V <sub>rms</sub>	A/B	Norm	TYPE I	TYPE I	Tape	1k	—	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 <sub>N</sub> PB	—	38	70	μV <sub>rms</sub>	A/B	Norm	TYPE I	TYPE I	Tape	—	—	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	1k	8/5	9/6	18 19
PB-EQ Crosstalk	CT A/B	60	70	—	dB	A	Norm	TYPE I	TYPE I	Tape	1k	1k	11	10 18	19
						B							9	8	

Note: 1. Large level without clipping

2. V<sub>CC</sub> = 9.5V, V<sub>ref</sub> = 4.75V, R9, R10, R18, R19 = 56kΩ

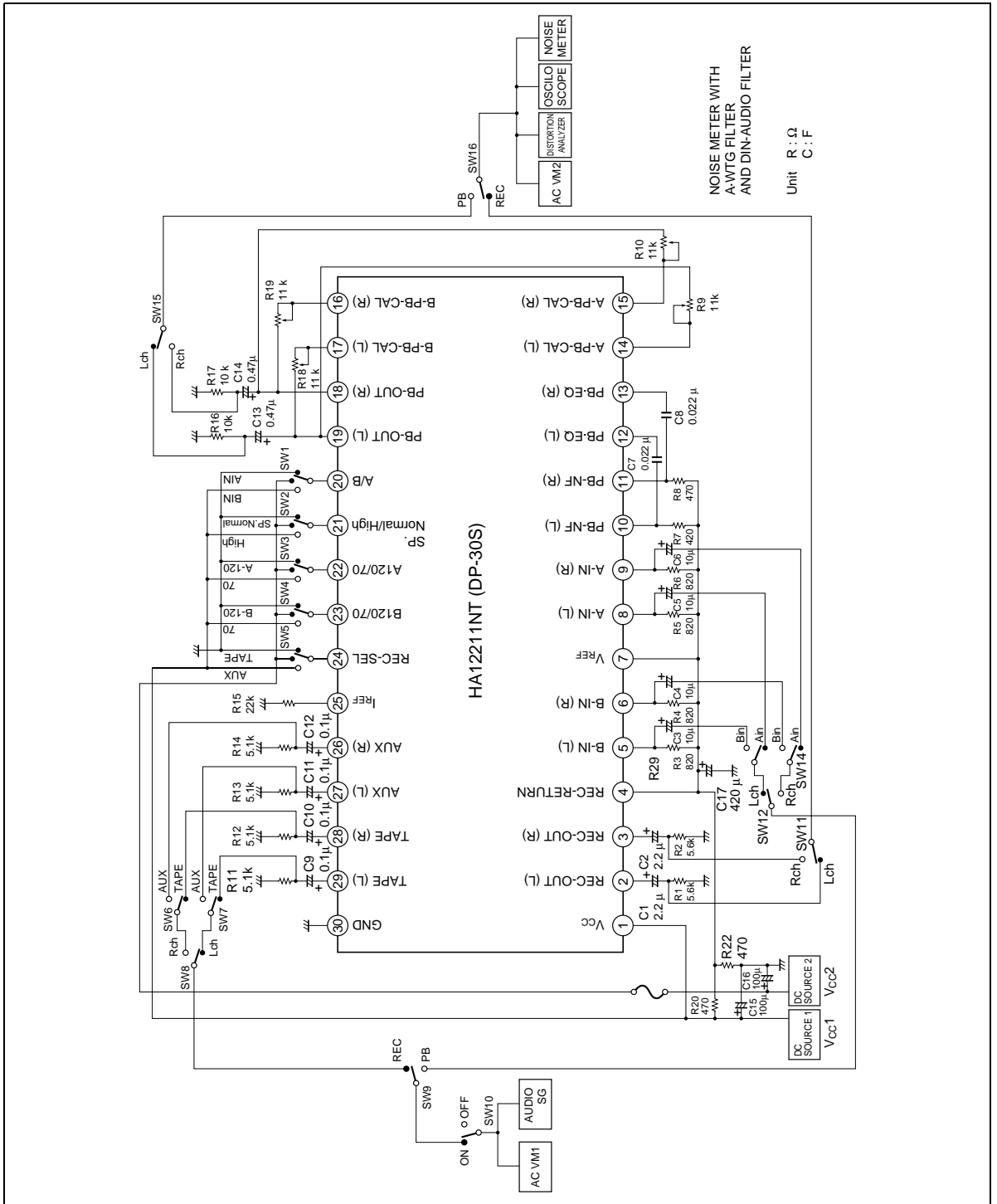
Electrical Characteristics (Ta = 25°C, V<sub>CC</sub> = 10.5V, V<sub>ref</sub> = 5.25V, EQIN standard level = 100mV = 0dB) (cont)

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

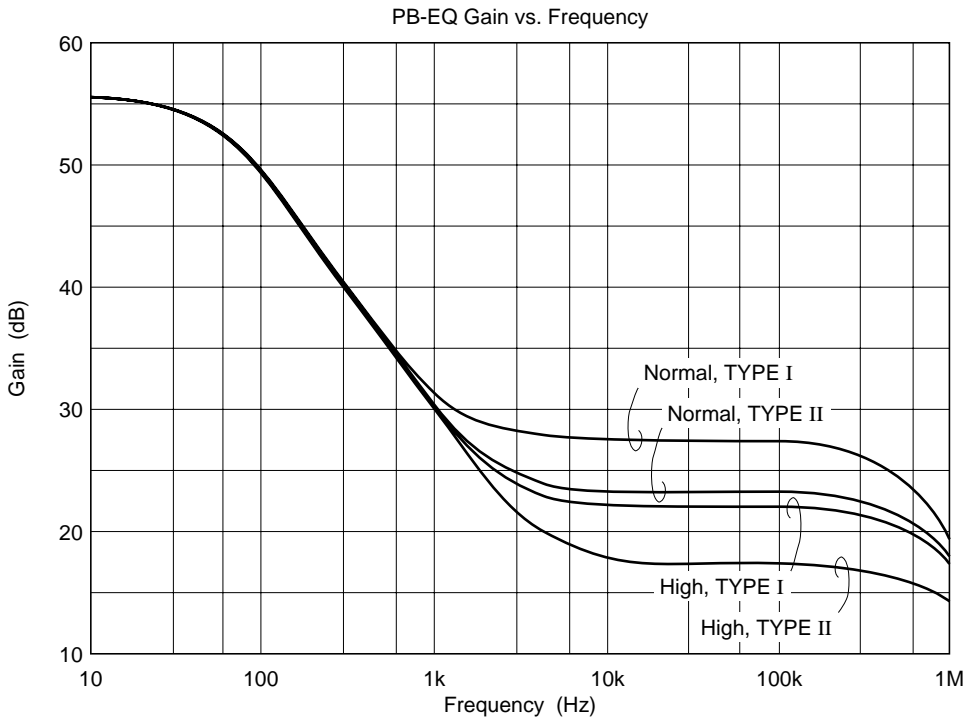
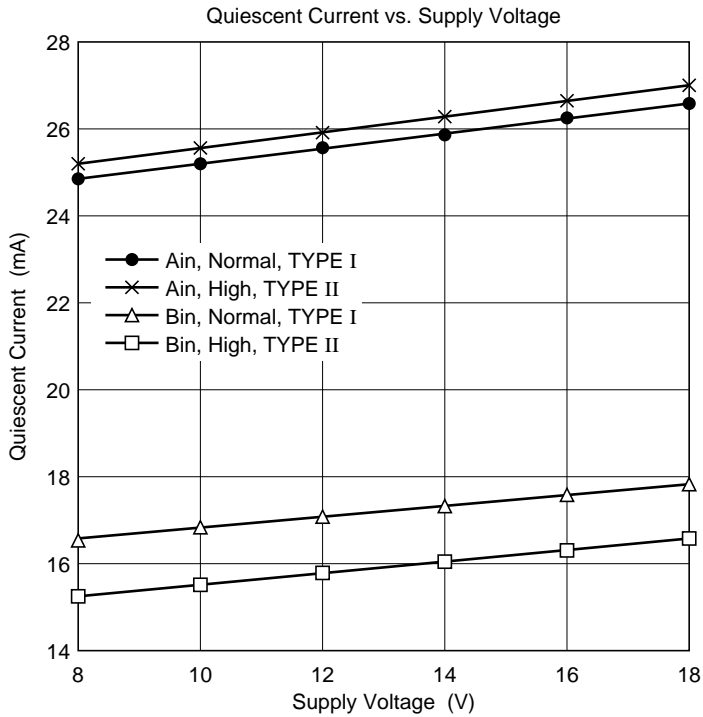
Note: 1. Large level without clipping  
 2. V<sub>CC</sub> = 9.5V, V<sub>ref</sub> = 4.75V

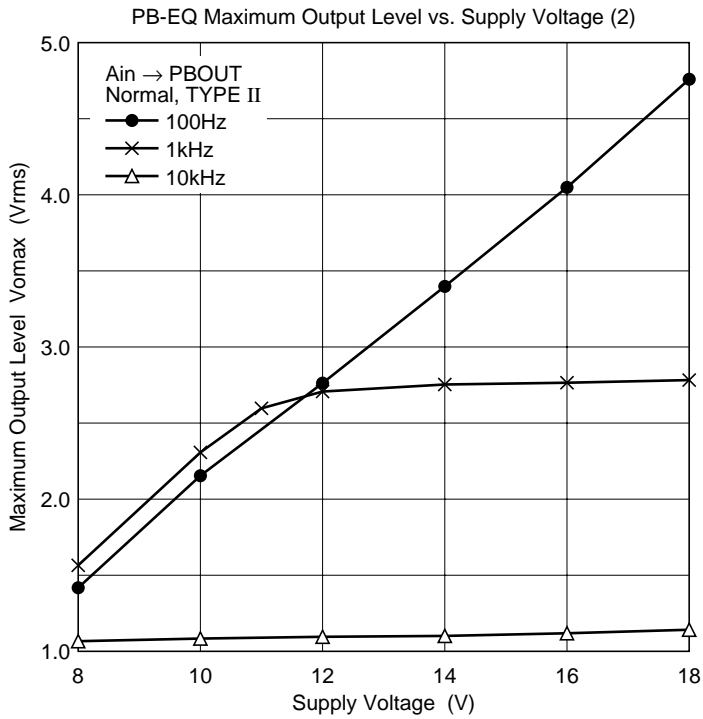
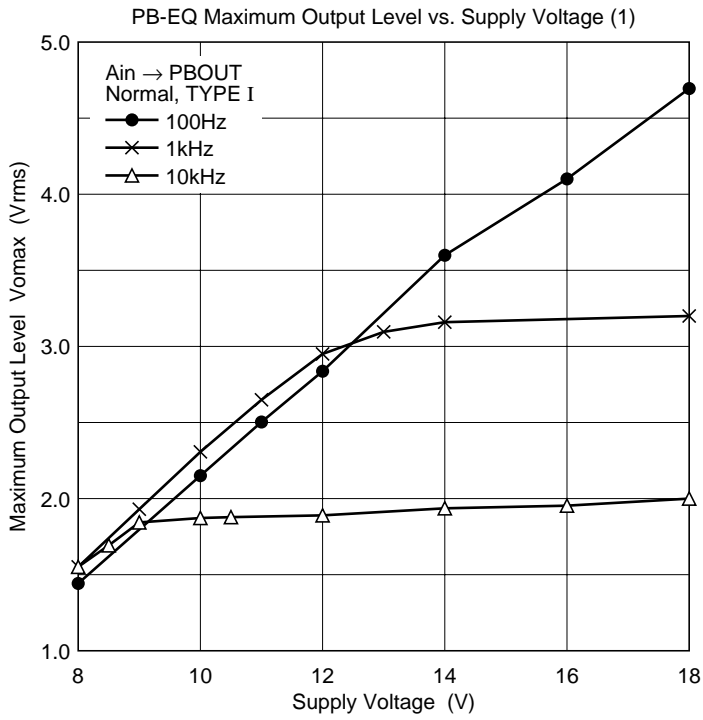
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## Test Circuit

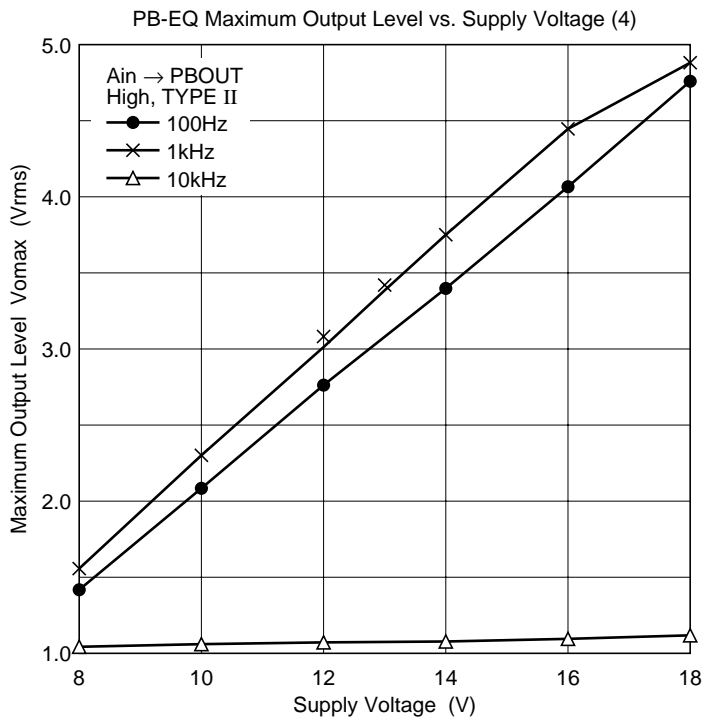
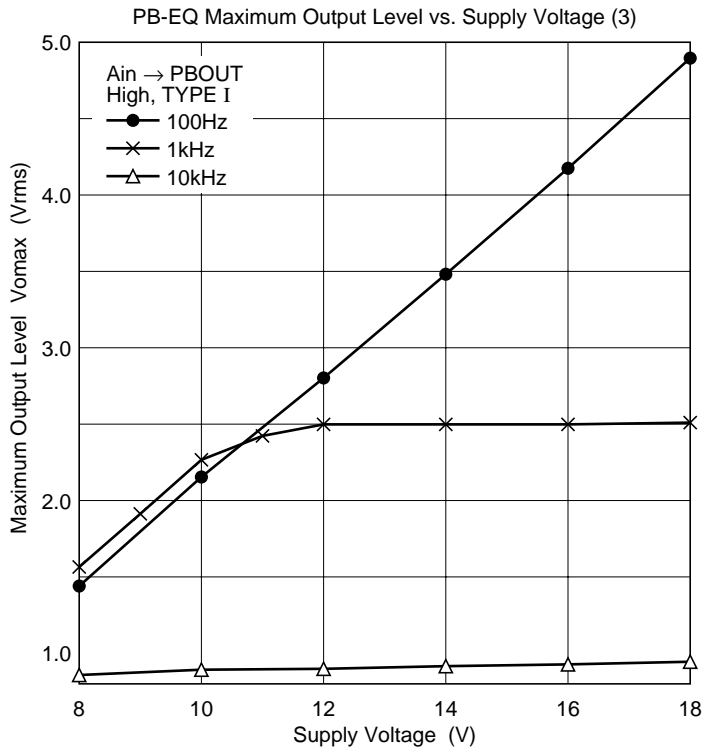


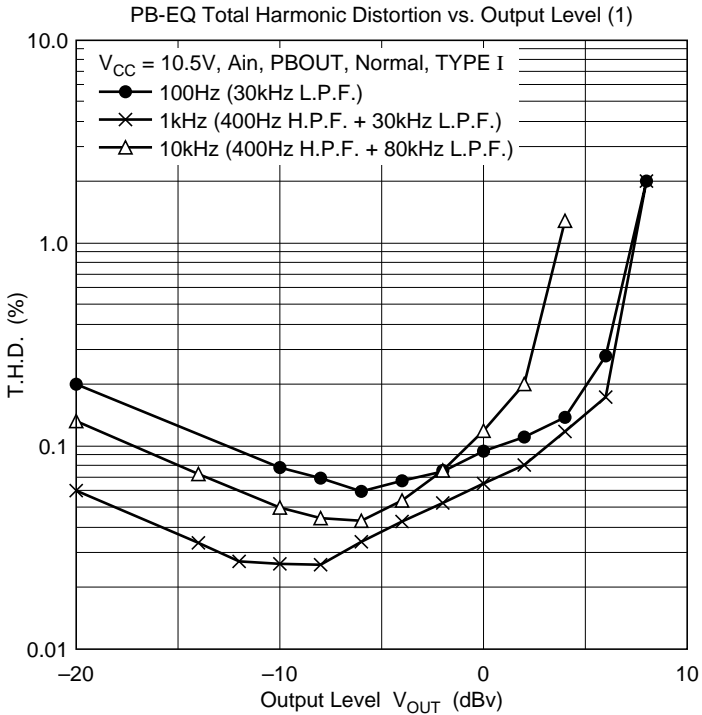
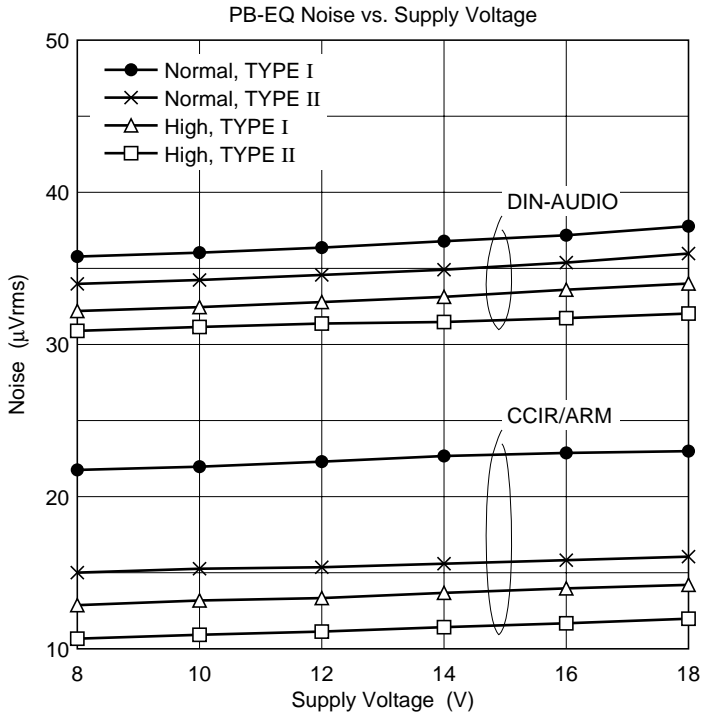
Characteristics Curve

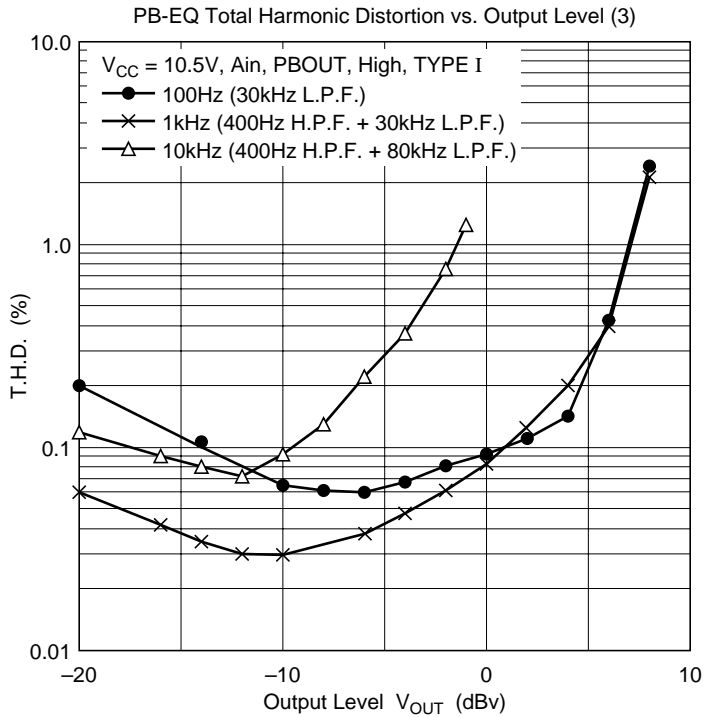
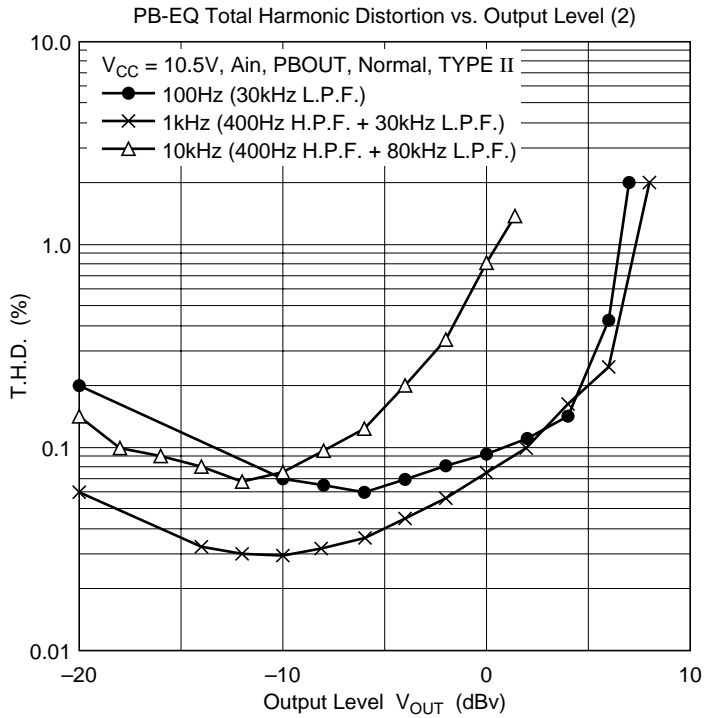


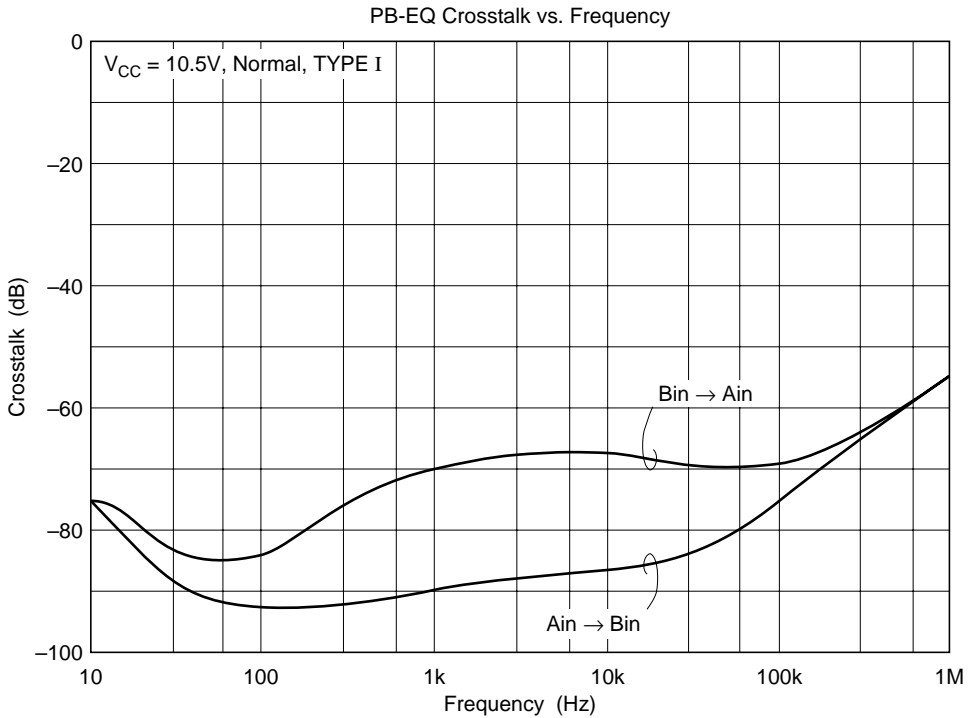
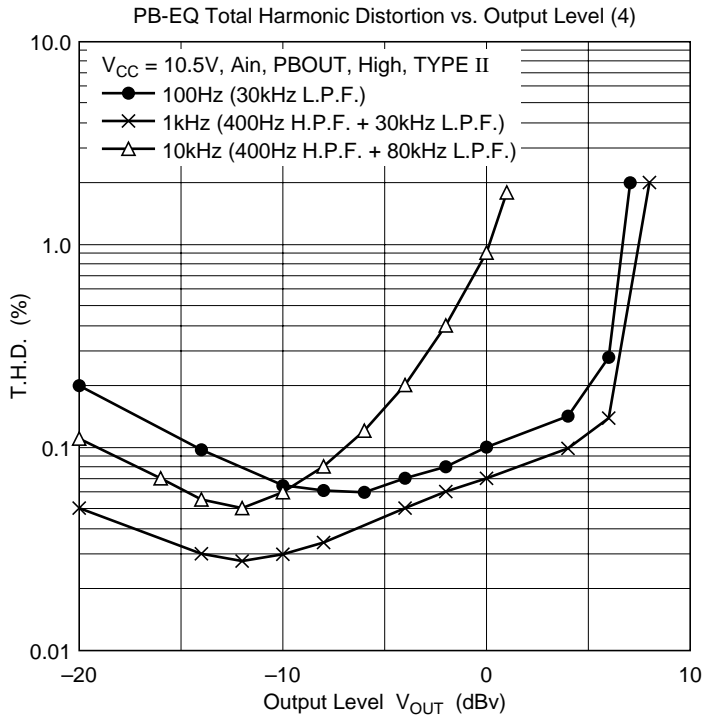


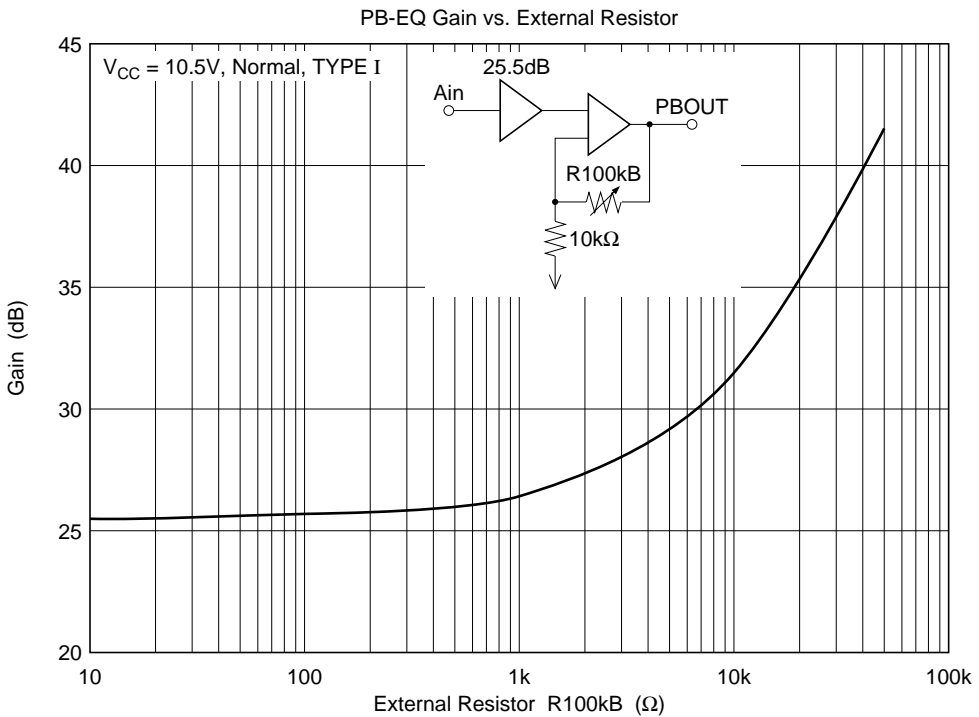
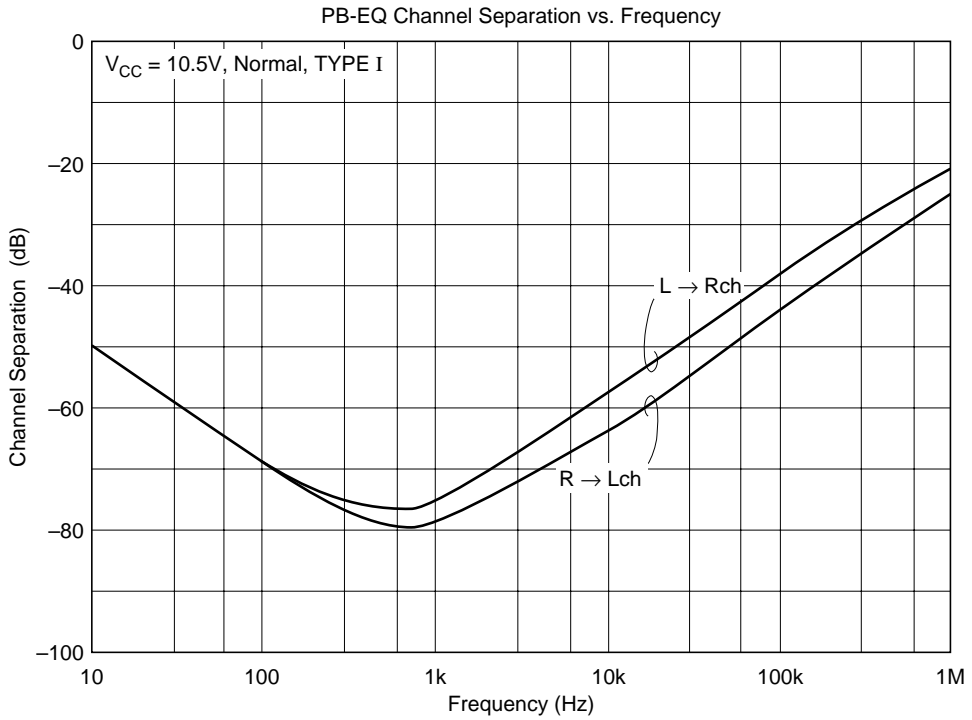




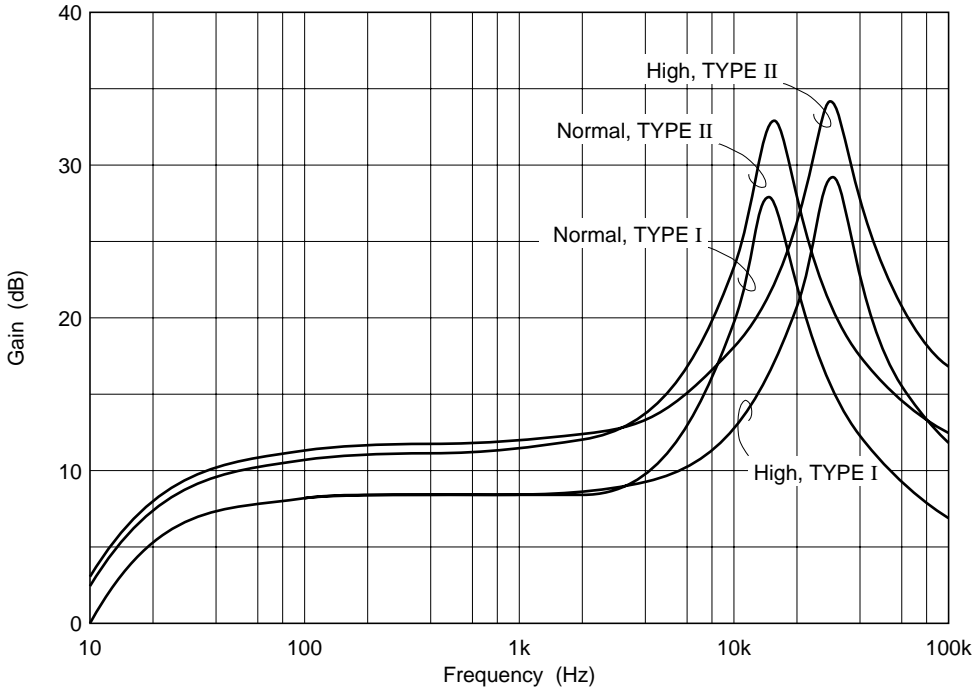




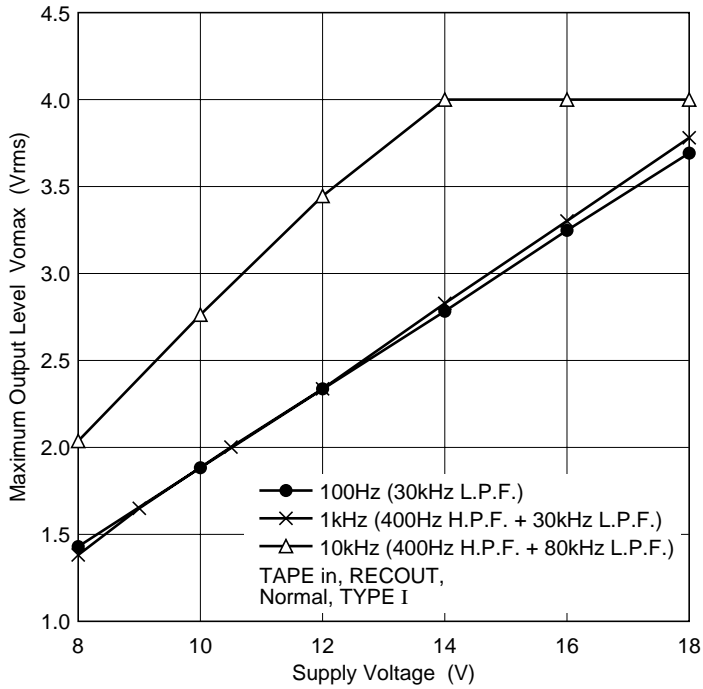


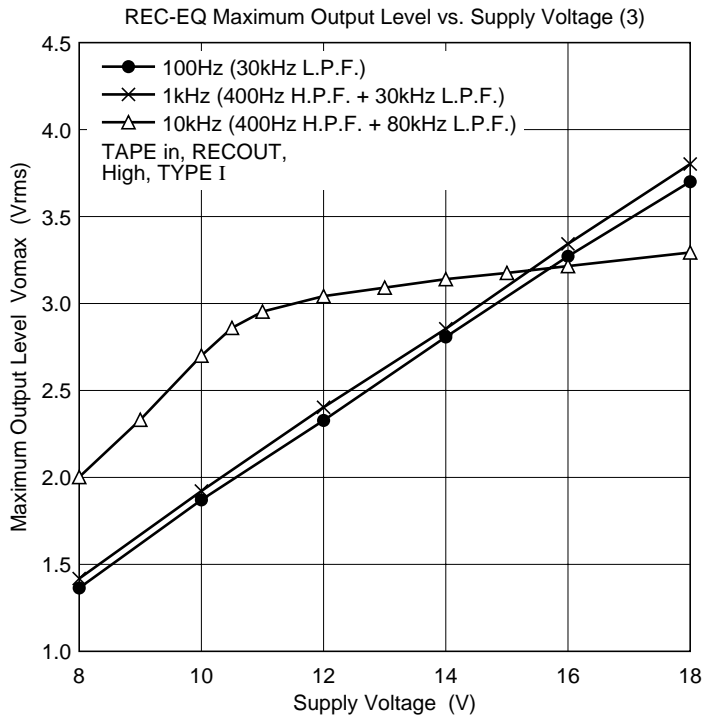
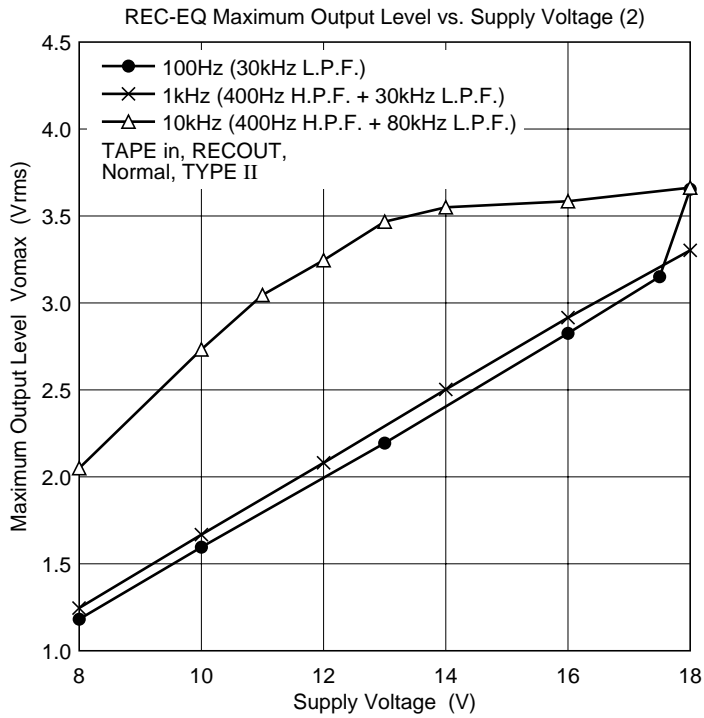


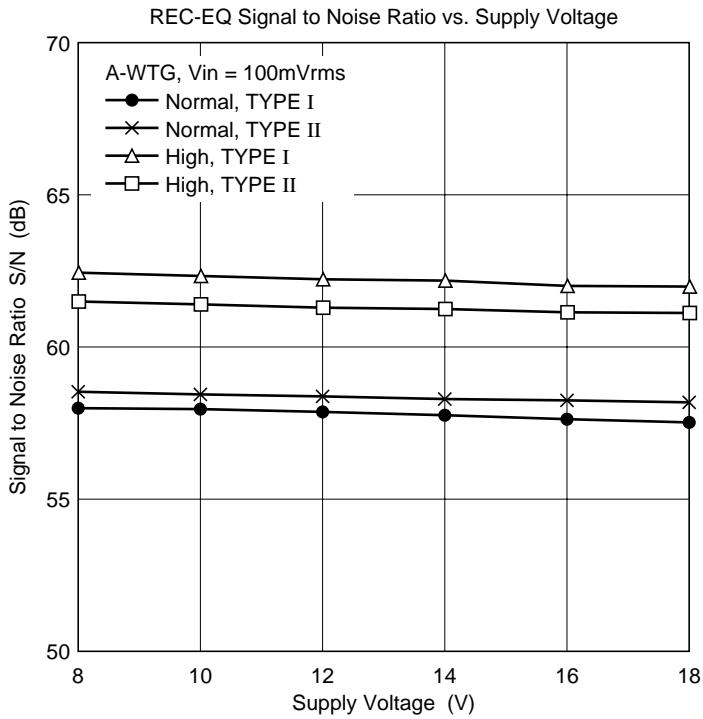
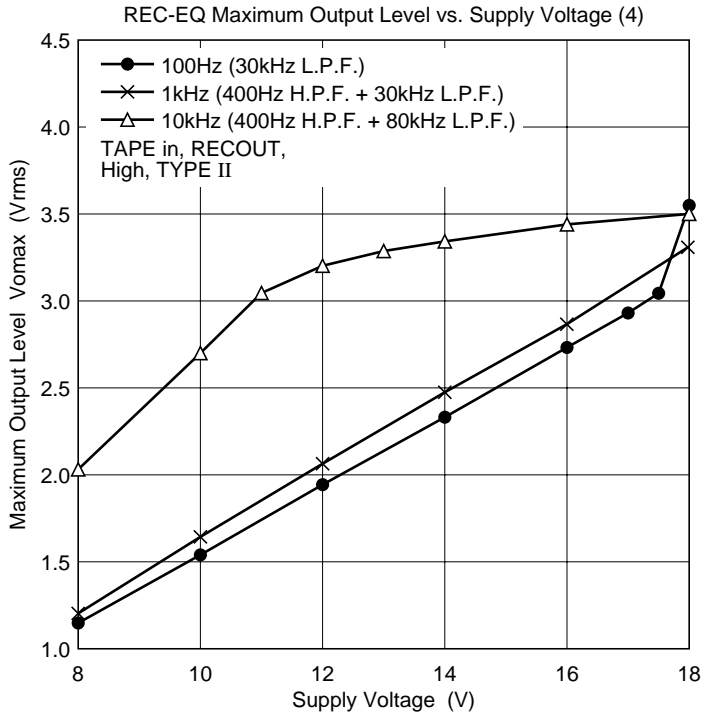
PB-EQ Gain vs. Frequency



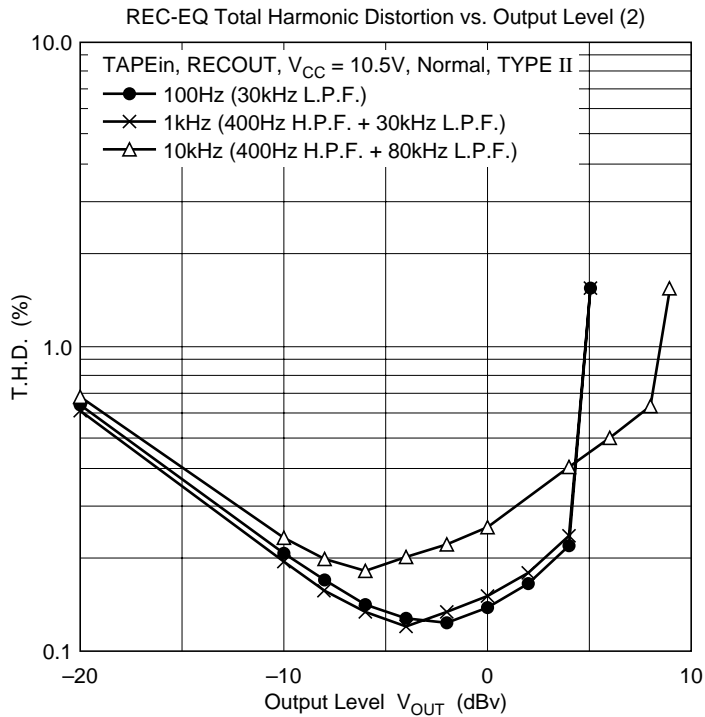
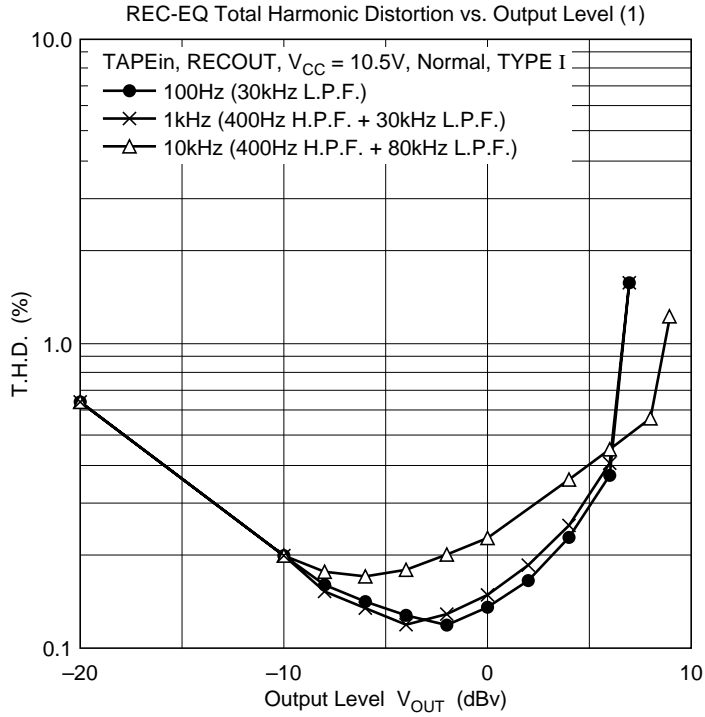
REC-EQ Maximum Output Level vs. Supply Voltage (1)

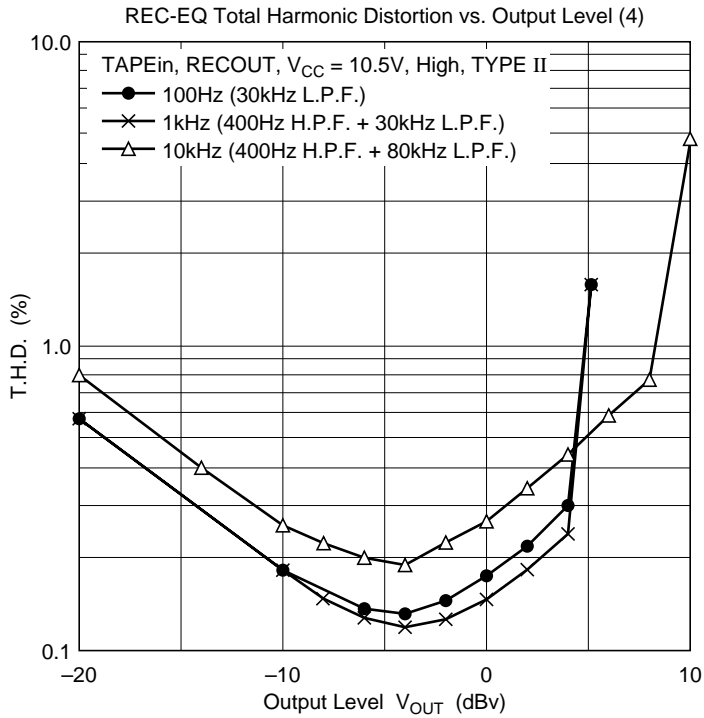
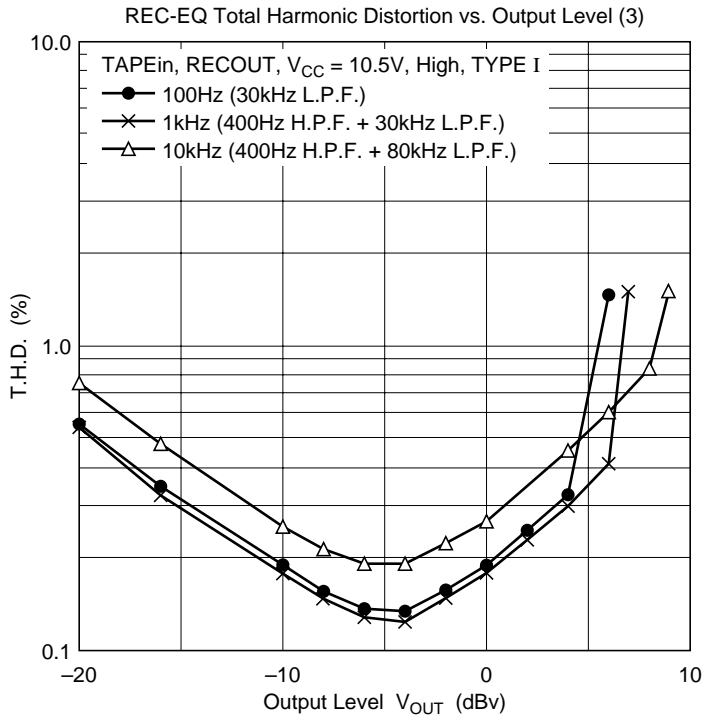




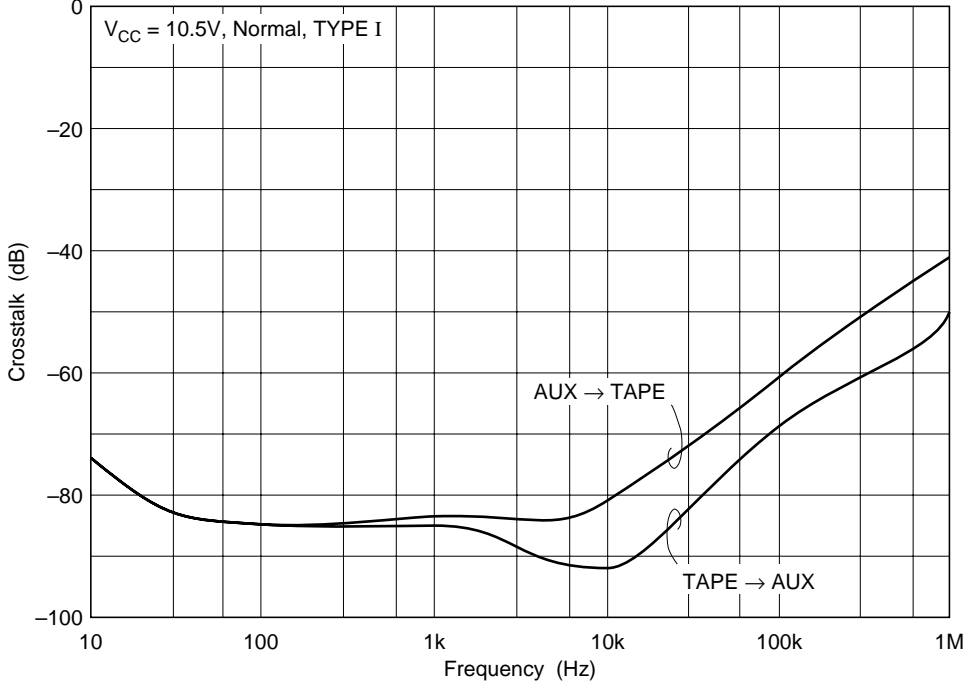




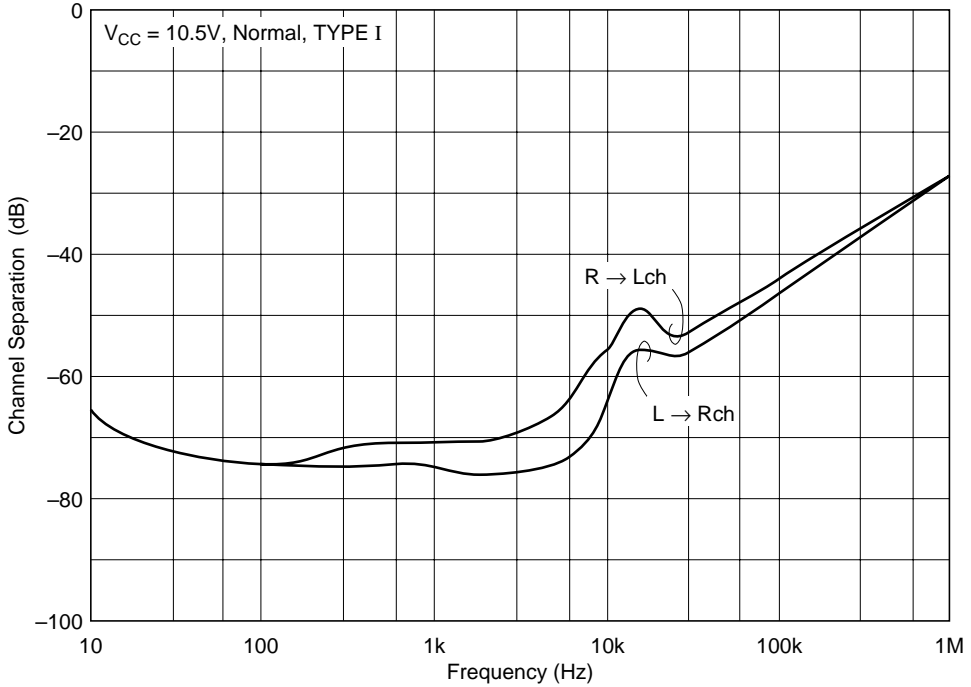


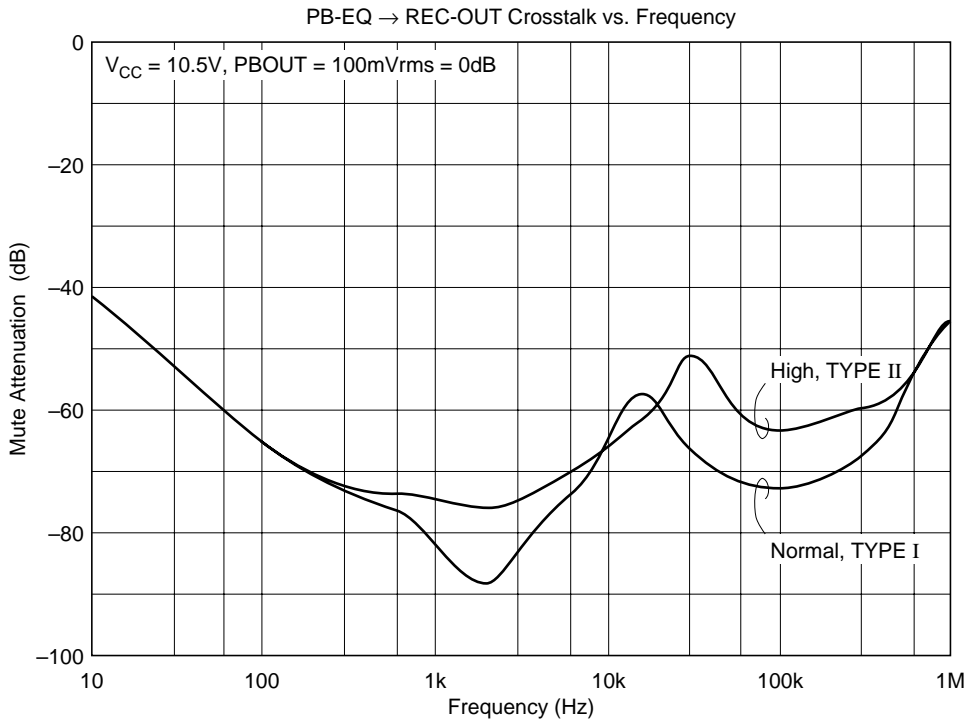
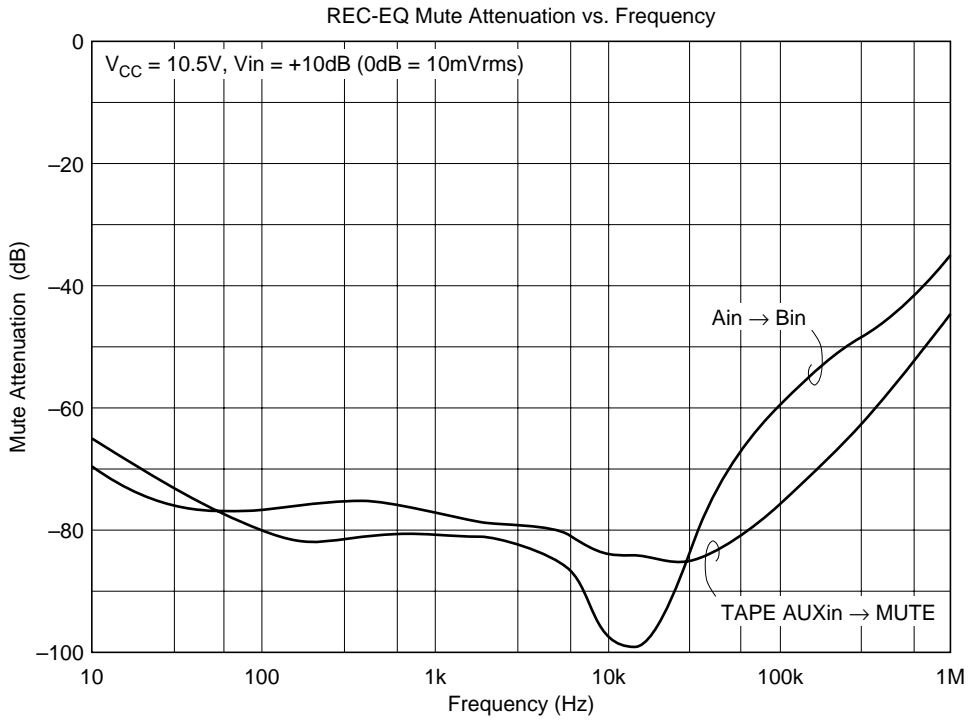


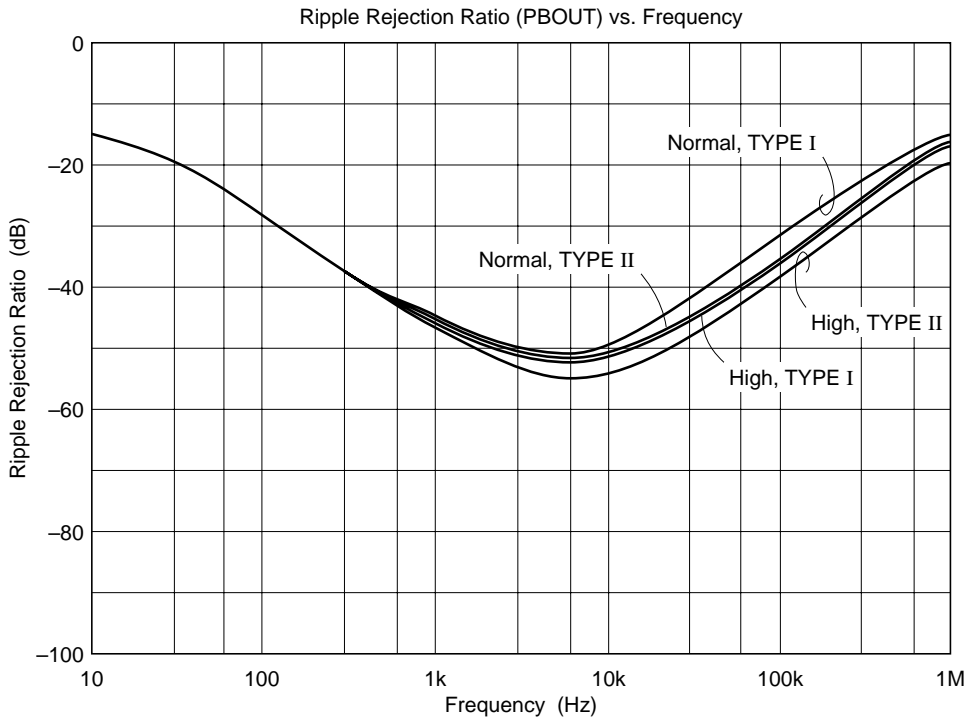
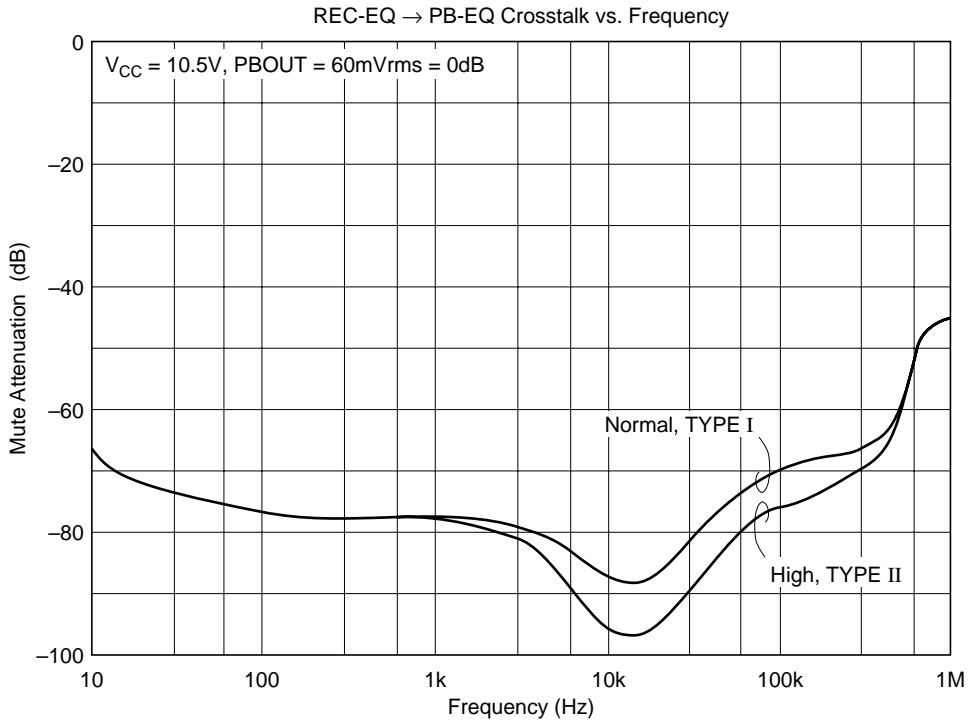
REC-EQ Crosstalk vs. Frequency

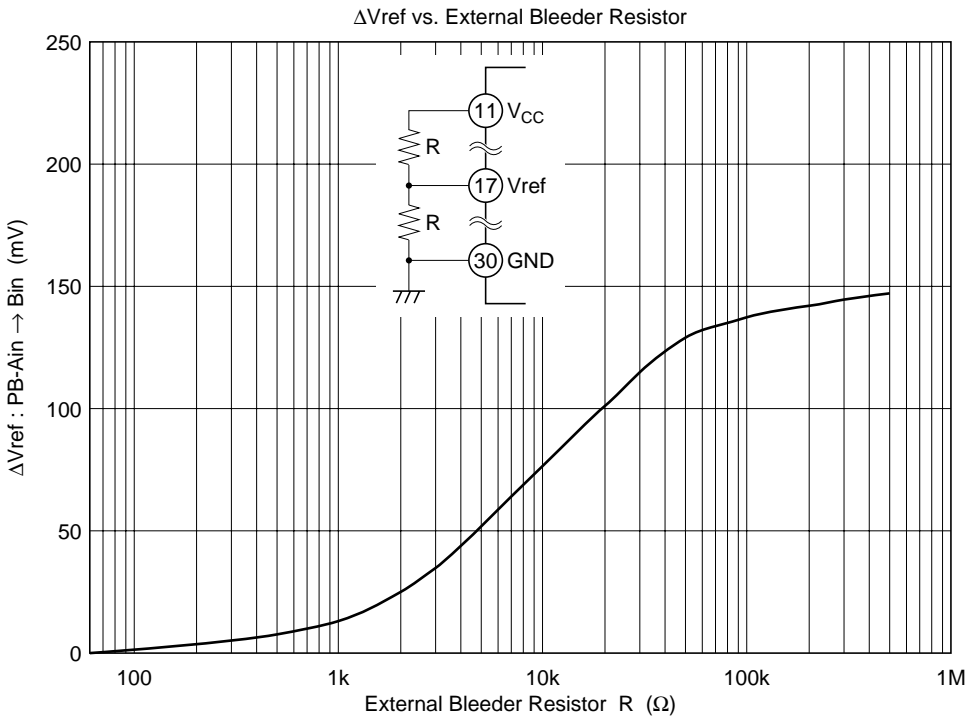
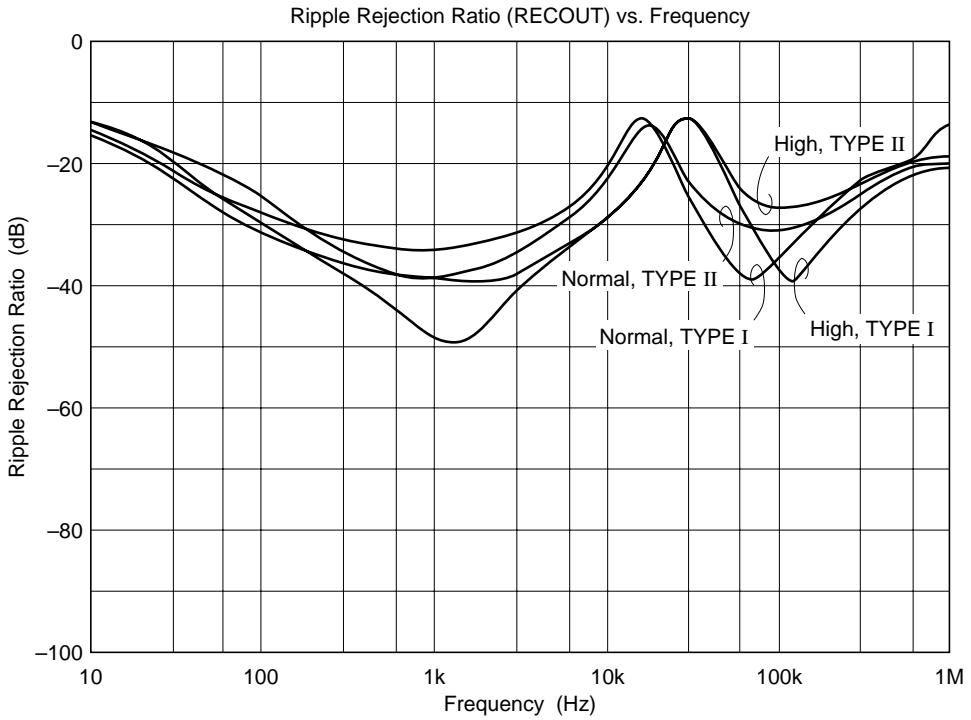


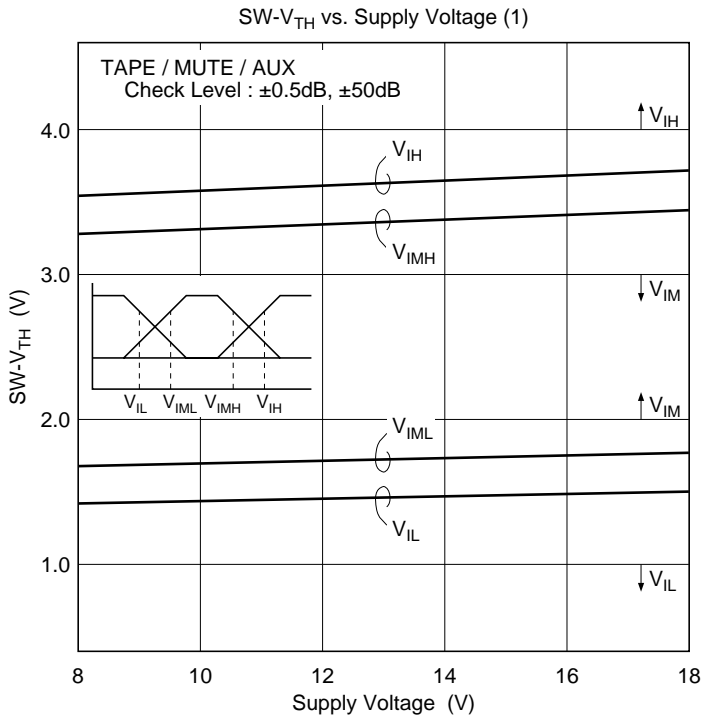
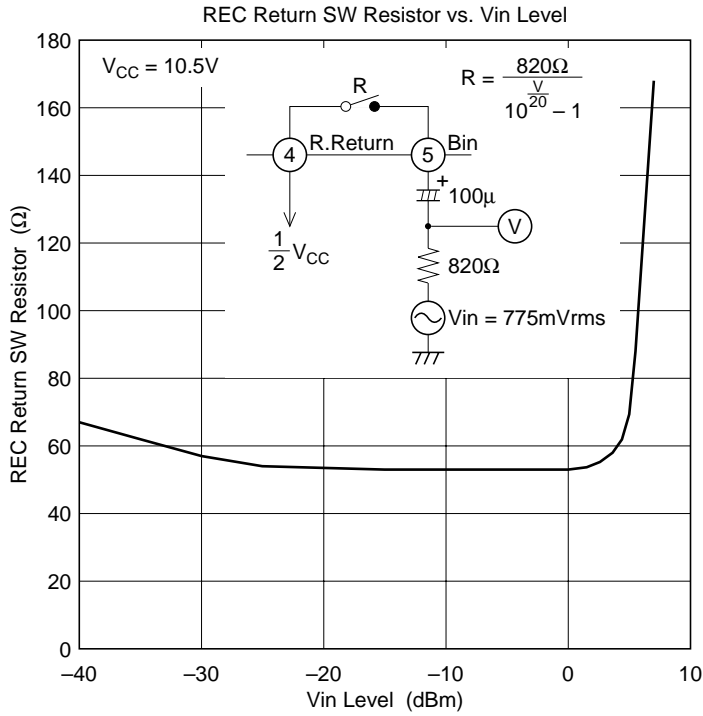
REC-EQ Channel Separation vs. Frequency

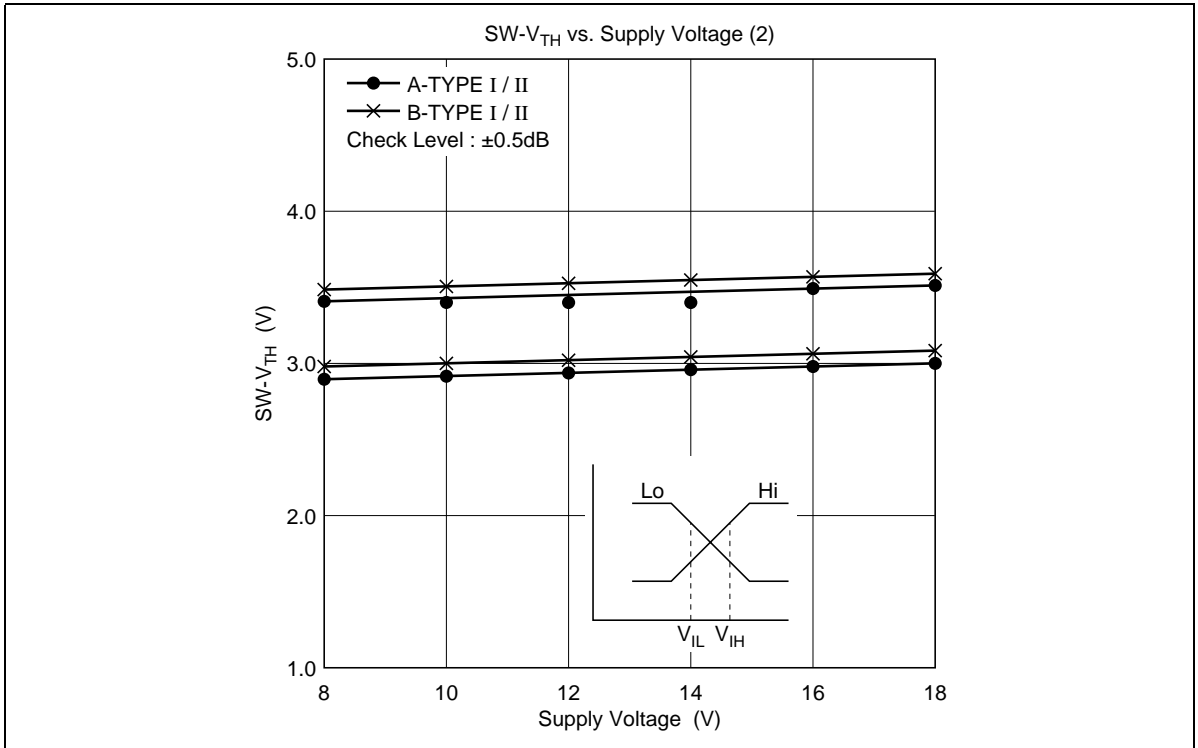








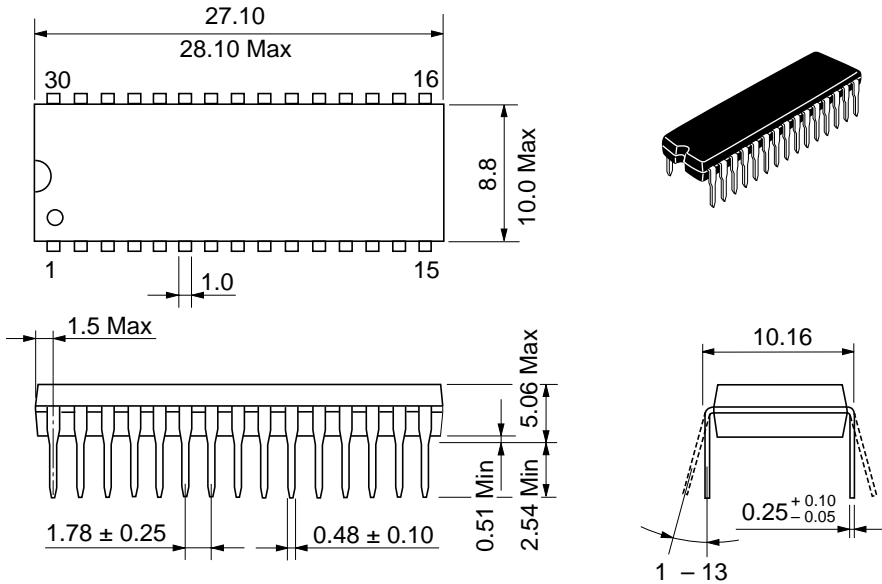






Package Dimensions

Unit: mm



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

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