HA12134A, HA12135A, HA12136A

Dolby B-Type Noise Reduction System

HITACHI

ADE-207-016B (Z)
3rd Edition
Jun. 1999

Description

The HA12134A, HA12135A, HA12136A are silicon monolithic bipolar IC series providing dual channel Dolby B-type noise reduction system* in one chip. The circuit is used primarily to reduce the level of background noise introduced during recording and playback of audio signals on magnetic tape.

HA12134A series provide the following functions and features.

Functions

- Dual Dolby B-type NR processor
- NR ON/OFF control switch.
- Record (encode)/playback (decode) control switch.

Features

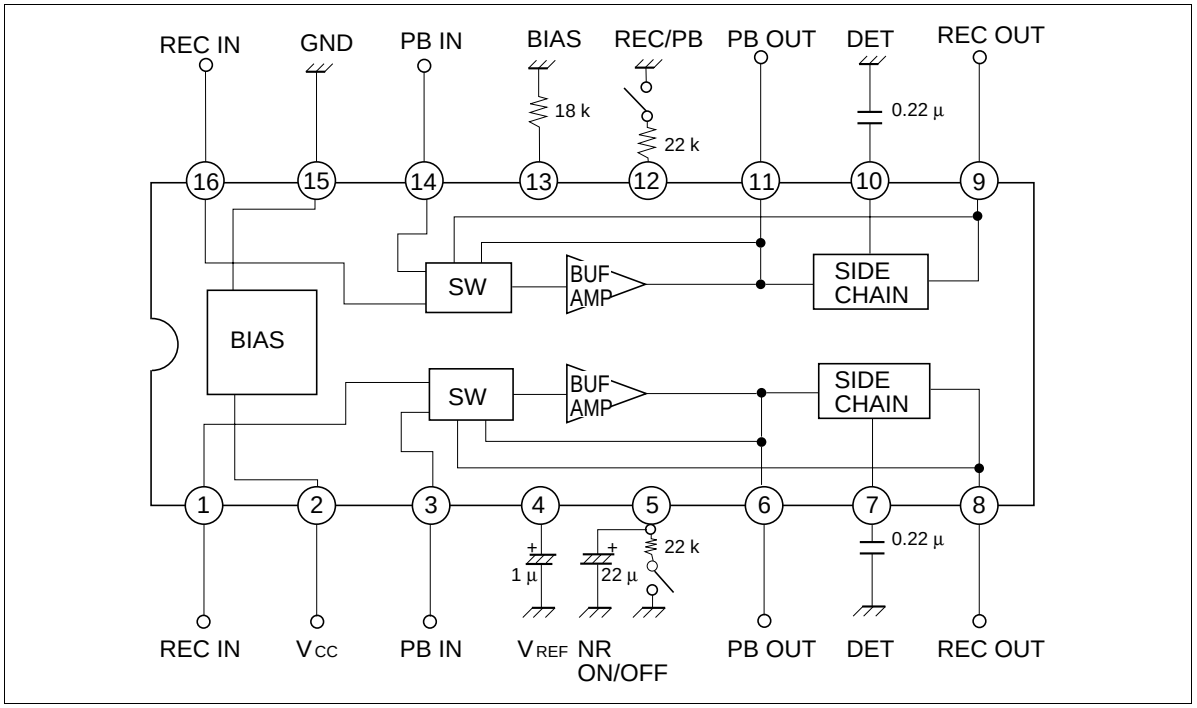
- Separate record/playback input and output.
  Unprocessed signal output available in the encode and decode modes.
- Reduction of external components count.
- Small capacitor value for the reference voltage.
- NR ON/OFF switching and REC/PB switching are provided internally.
- 2-type package (DP-16, FP-16DA)
- Wide range of operating supply voltage.

Hitachi semiconductor

Ordering Information

Type No	Dolby Level (mVrms)	Package
HA12134A	300	DP-16
HA12134AF		FP-16DA
HA12135A	450	DP-16
HA12135AF		FP-16DA
HA12136A	580	DP-16
HA12136AF		FP-16DA

Block Diagram

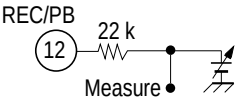
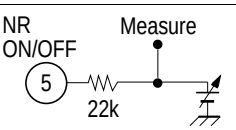


Absolute Maximum Ratings (Ta = 25°C, Unless otherwise specified.)

Item	Symbol	Rating	Unit	Note
Supply voltage	Vccmax	16	V	
Power dissipation	Pd	250	mW	Ta ≤ 85 °C
Operating temperature	Topr	–40 to +85	°C	
Storage temperature	Tstg	–55 to +125	°C	
Lead temperature	TI	260	°C	Note 1

Note: 1. Soldering 10 sec.

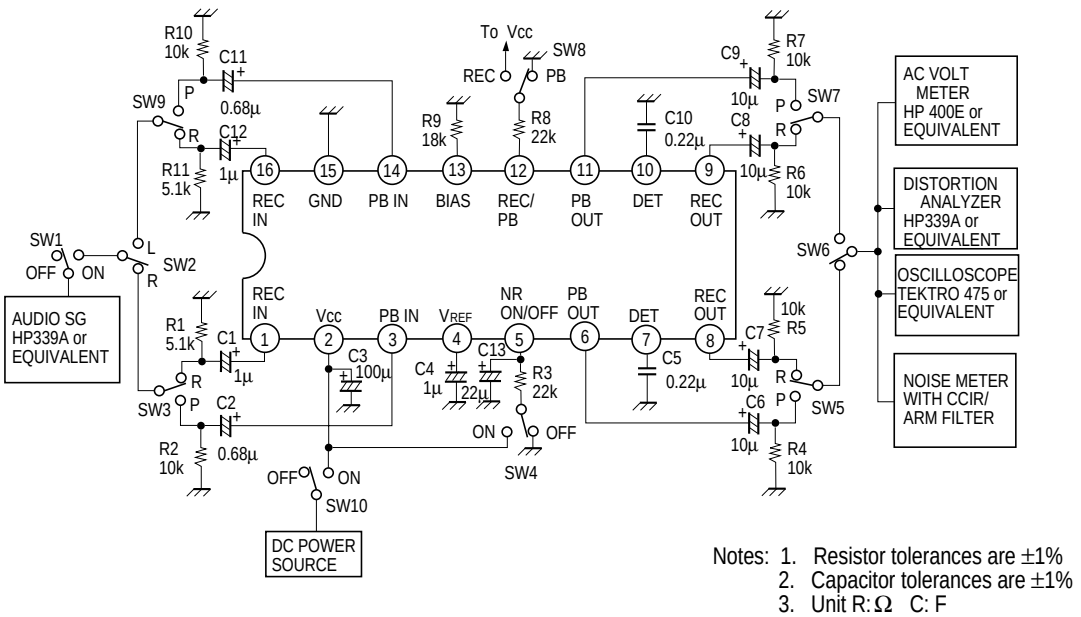
Electrical Characteristics (Ta = 25°C, V_{CC} = 12 V, Unless otherwise specified.)

Item		Symbol	Min	Typ	Max	Unit	Test conditions
Operating voltage	HA12134A	Vope	6.5	12.0	16.0	V	Enable functional operations
	HA12135A		8.0	12.0	16.0		
	HA12136A		9.5	12.0	16.0		
Quiescent current		I_Q	—	7	—	mA	No signal, REC NR-ON
Voltage gain of input amp	HA12134A	G_{VIA}	21.0	23.0	25.0	dB	Pin 1→Pin 6 (Pin 16→Pin 11) Vout = 0 dB, f = 1 kHz
	HA12135A		24.5	26.5	28.5		
	HA12136A		26.5	28.5	30.5		
NR encode boost V 8 (9) (NR ON)		ENC-1.4 k (1)	2.9	4.4	5.9	dB	f = 1.4 kHz V 8 (9) (NR OFF) = –20 dB
V 8 (9) (NR OFF)		ENC-1.4 k (2)	6.0	7.5	9.0	dB	f = 1.4 kHz V 8 (9) (NR OFF) = –30 dB
		ENC-5 k (1)	1.7	3.2	4.7	dB	f = 5 kHz V 8 (9) (NR OFF) = –20 dB
		ENC-5 k (2)	6.7	8.2	9.7	dB	f = 5 kHz V 8 (9) (NR OFF) = –30 dB
		ENC-10 k (1)	–1.1	0.4	1.9	dB	f = 10 kHz V 8 (9) (NR OFF) = 0 dB
		ENC-10 k (2)	9.8	10.4	11.8	dB	f = 10 kHz V 8 (9) (NR OFF) = –40 dB
T.H.D (REC)		T.H.D (REC)	—	0.05	0.3	%	f = 1 kHz V 8 (9) (NR ON) = 0 dB
Signal handling	HA12134A	Vomax (REC)	12.0	13.0	—	dB	f = 1 kHz, T.H.D = 1% V_{CC} = 6.5 V
	HA12135A						V_{CC} = 8.0 V
	HA12136A						V_{CC} = 9.5 V
Signal/noise ratio (REC)		S/N (REC)	62.0	68.0	—	dB	Rg = 5.1 kΩ weighted CCIR/ARM
Crosstalk (ENC) (Pin 8 – Pin 9)		CT R→L L→R	52.0	60.0	—	dB	f = 1 kHz NR OFF
Control voltage for REC/PB		REC	2.5	—	V_{CC}	V	
		PB	0.0	—	0.5		
Control voltage for NR ON/OFF		ON	2.5	—	V_{CC}	V	
		OFF	0.0	—	0.5		
Channel balance		ΔG_{VIA}	–1.0	0.0	1.0	dB	

Electrical Characteristics (Ta = 25°C, V_{CC} = 12 V, Unless otherwise specified.) (cont)

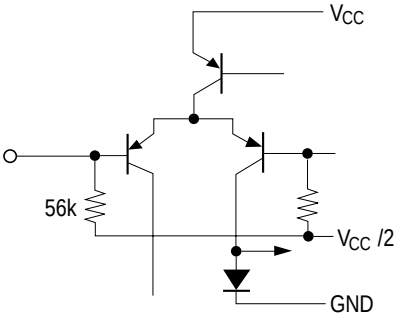
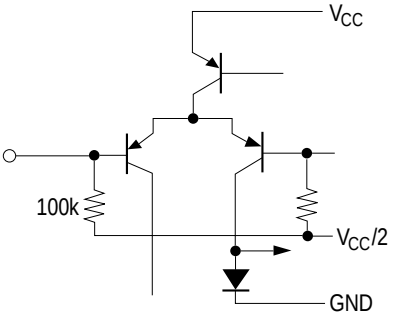
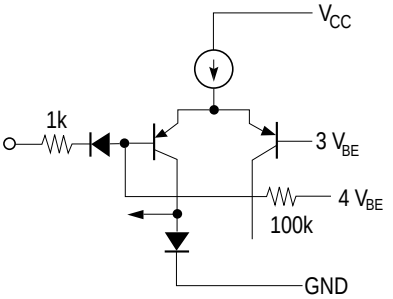
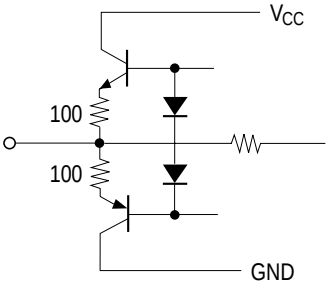
Item	Symbol	Min	Typ	Max	Unit	Test conditions
Offset voltage V 8 (9) (NR-ON) – V 8 (9) (NR-OFF)	ΔVorec	–50	0.0	50	mV	REC mode V_{CC} = 16.0 V

Test Circuit

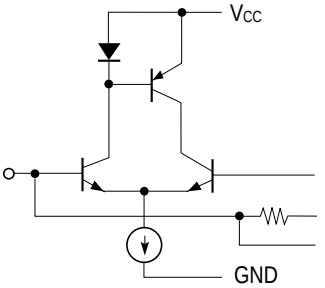
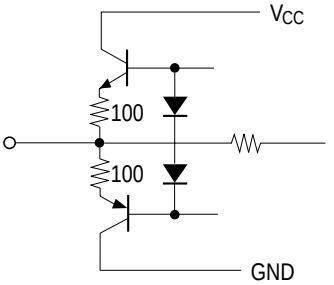
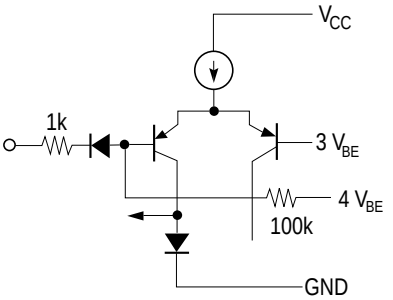
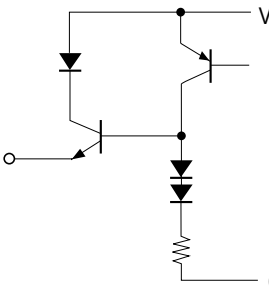


Notes: 1. Resistor tolerances are ±1%
2. Capacitor tolerances are ±1%
3. Unit R: Ω C: F

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

Pin No.	Symbol	R (in)	VDC	Equivalent circuit	Description
1, 16	REC IN	56 kΩ	6.0 V		Recording (encode) input
2	V_{CC}	—	12.0 V		Power supply
3, 14	PB IN	100 kΩ	6.0 V		Playback (decode) input
4	V_{REF}	—	6.0 V		Reference voltage
5	NR ON/OFF	—	—		Mode control pin for NR ON/OFF “H”→NR ON “L”→NR OFF
6, 11	PB OUT	—	6.0 V		Playback (decode) output

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

Pin No.	Symbol	R (in)	VDC	Equivalent circuit	Description
7, 10	DET	—	1.3 V		Time constant pin for the level detector
8, 9	REC OUT	—	6.0 V		Recording (encode) output
12	REC/PB	—	—		Mode control pin for REC/PB (encode/decode) "H" → REC (encode) "L" → PB (decode)
13	BIAS	—	1.0 V		Reference current input pin for the active filters
15	GND	—	0 V	—	Ground

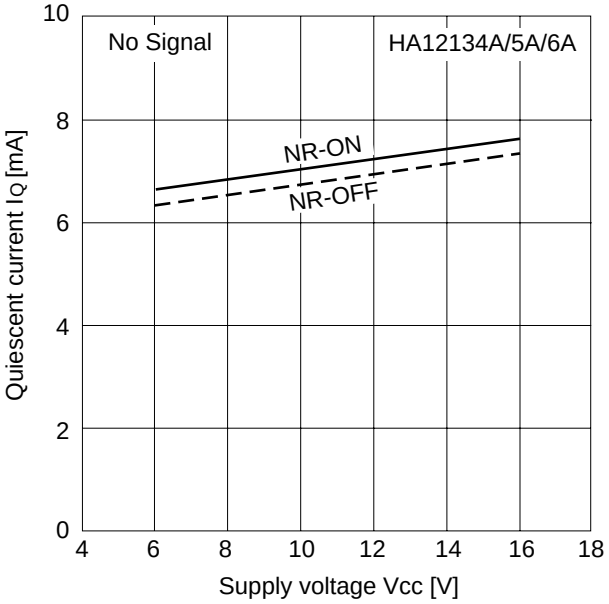


Figure 1 Quiescent Current vs. Supply Voltage

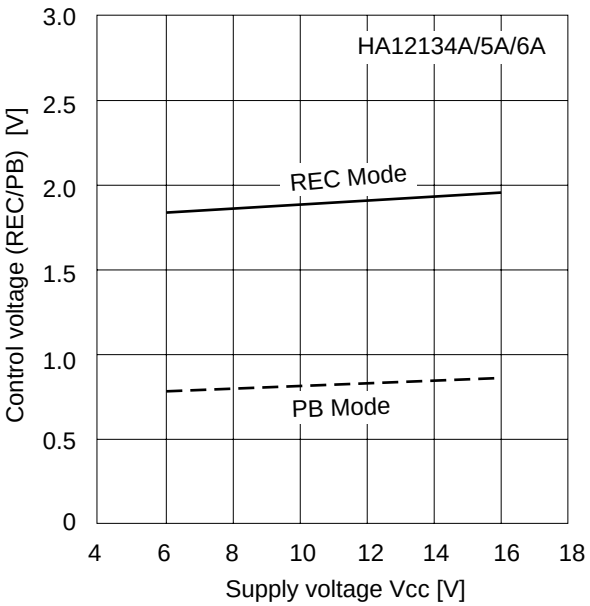


Figure 2 REC/PB Control Voltage vs. Supply Voltage

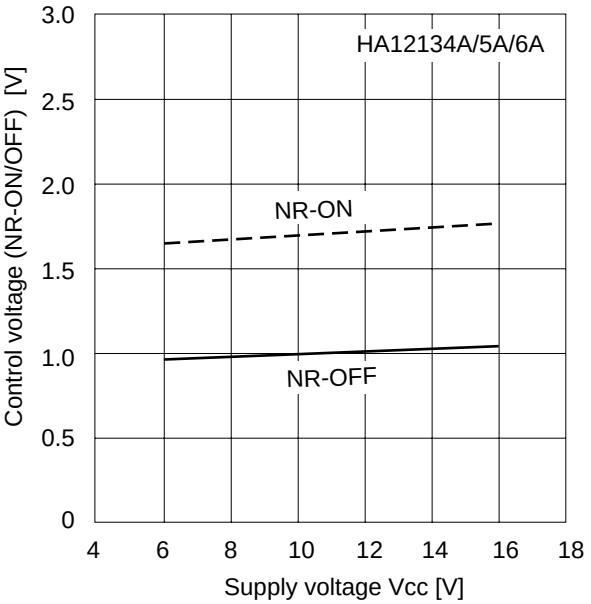


Figure 3 NR-ON/OFF Control Voltage vs. Supply Voltage

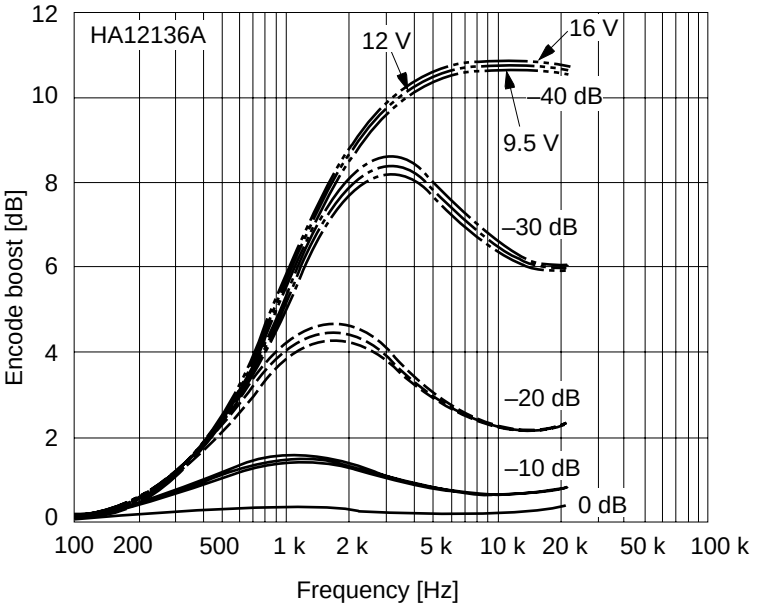


Figure 4 Encode Boost vs. Frequency

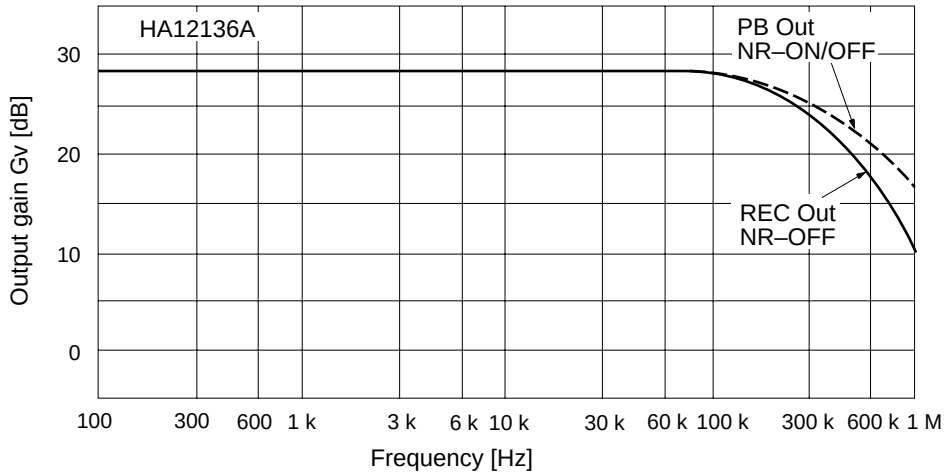


Figure 5 REC Mode Output Gain vs. Frequency

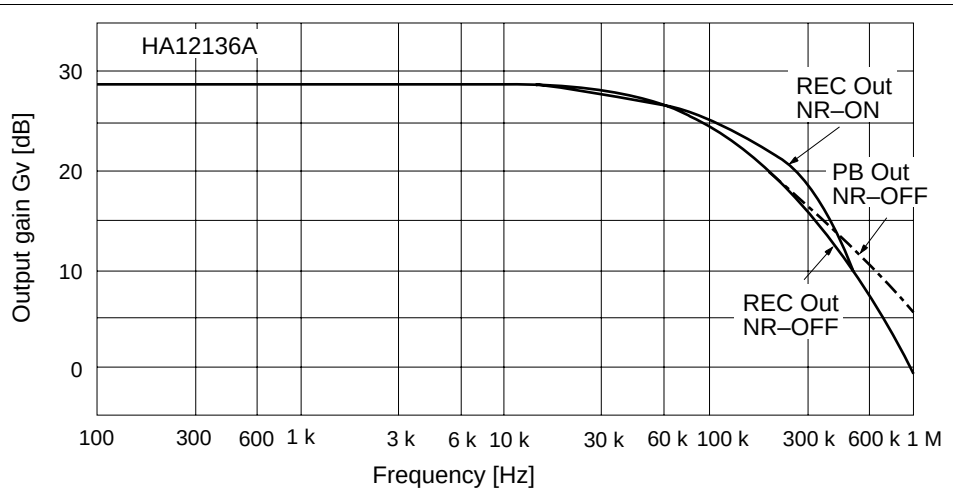


Figure 6 PB Mode Output Gain vs. Frequency

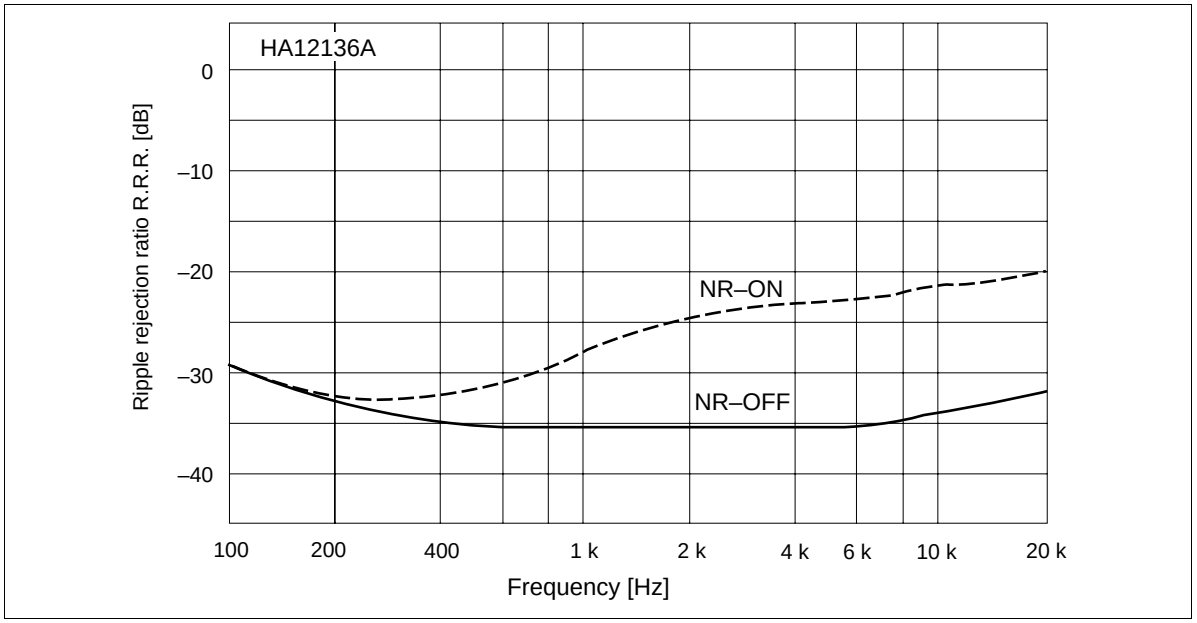


Figure 7 REC Mode Ripple Rejection Ratio vs. Frequency

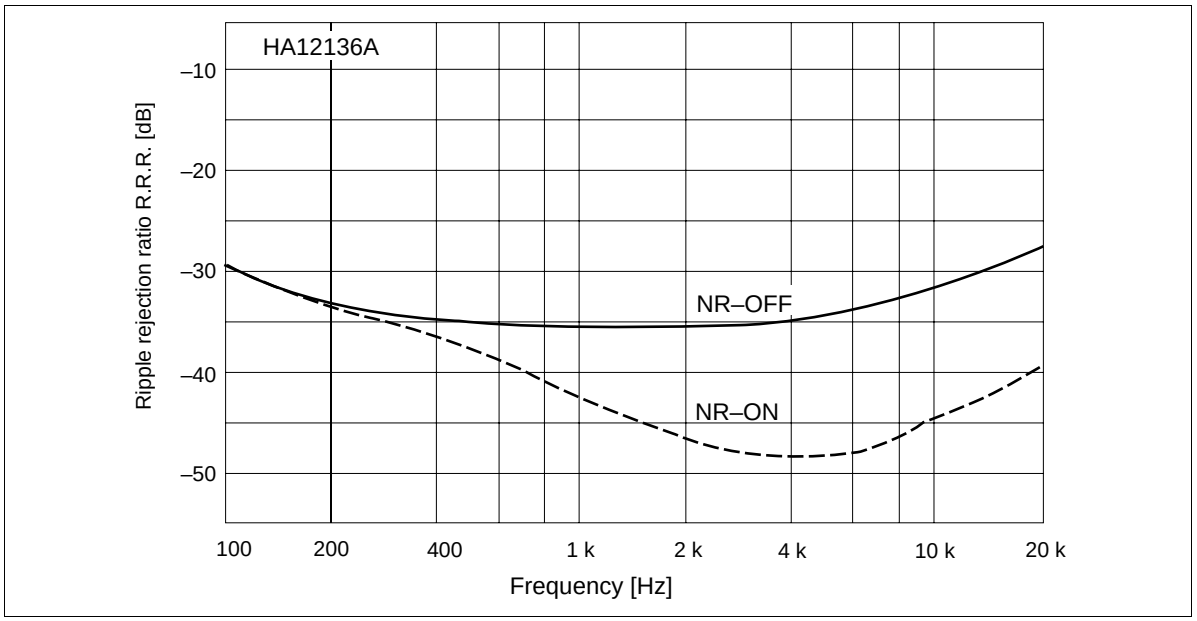


Figure 8 PB Mode Ripple Rejection Ratio vs. Frequency

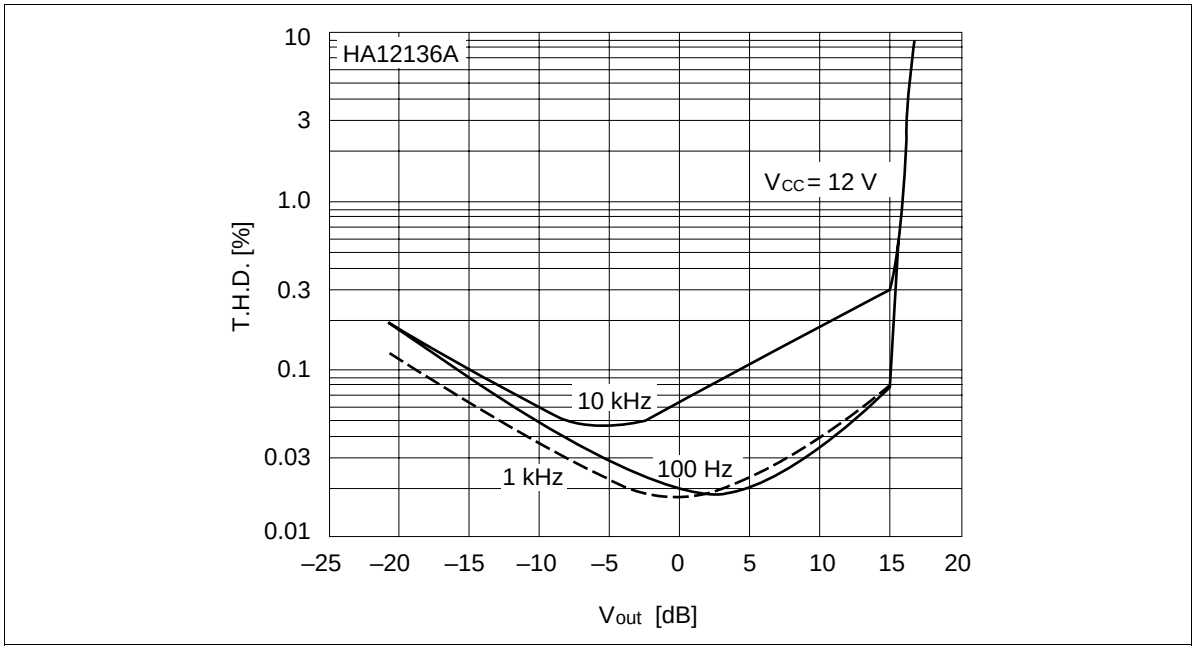


Figure 9 REC NR-OFF Total Harmonic Distortion vs. Output Level

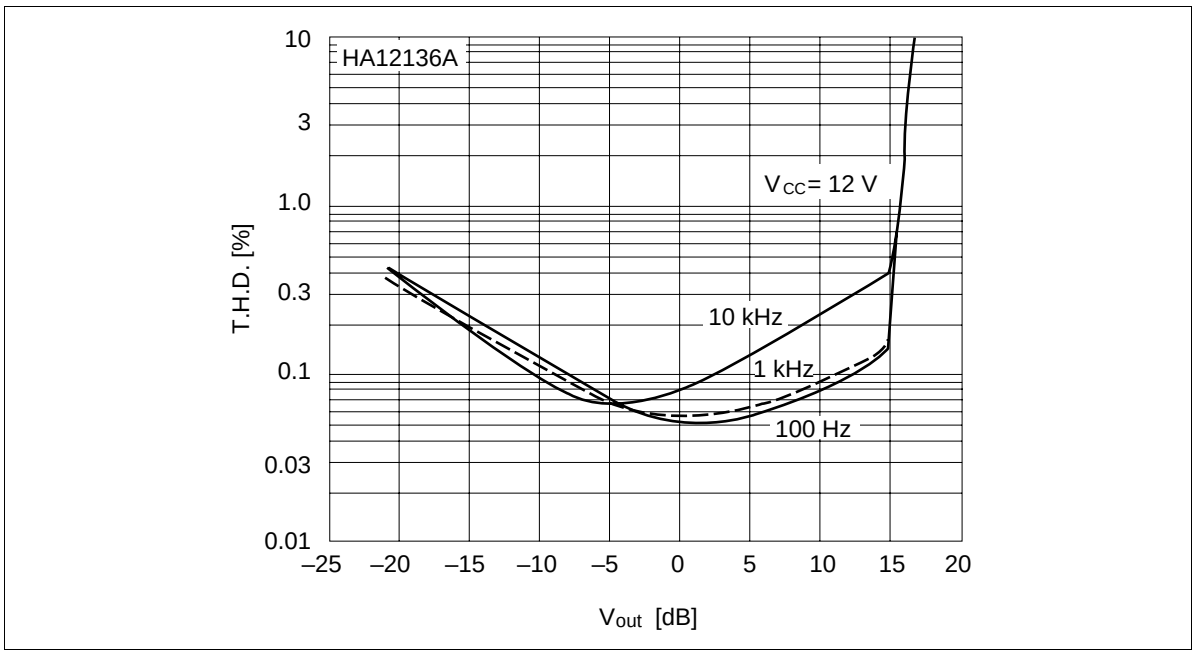


Figure 10 REC NR-ON Total Harmonic Distortion vs. Output Level

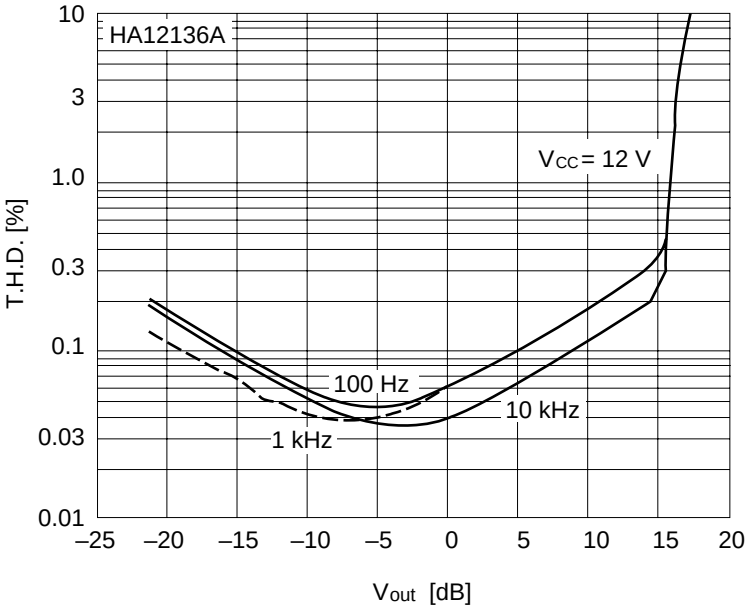


Figure 11 PB NR-OFF Total Harmonic Distortion vs. Output Level

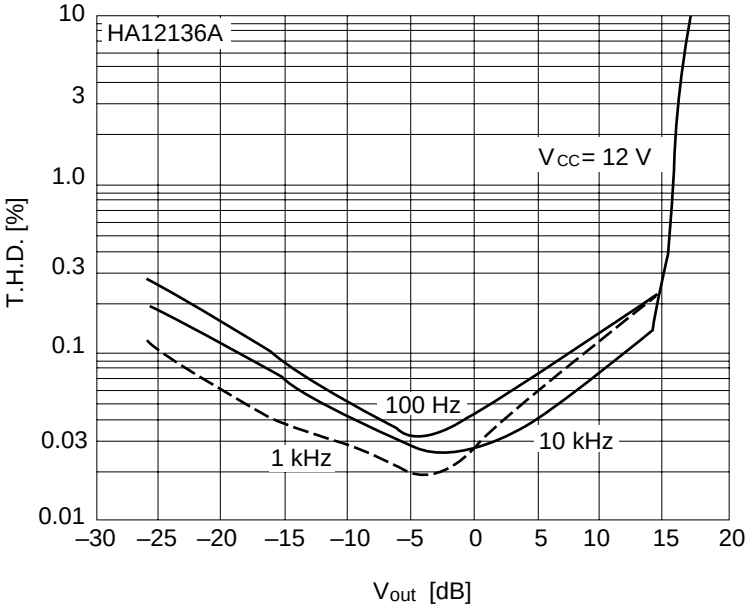


Figure 12 PB NR-ON Total Harmonic Distortion vs. Output Level

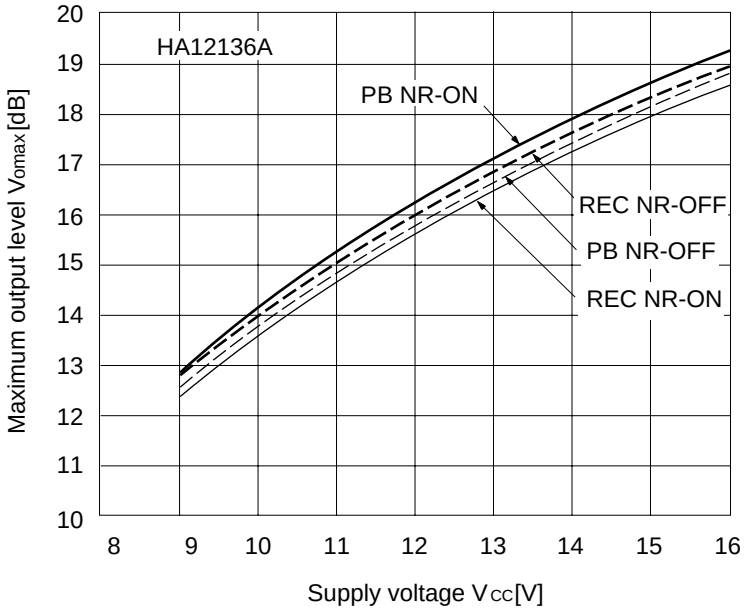


Figure 13 Maximum Output Level vs. Supply Voltage

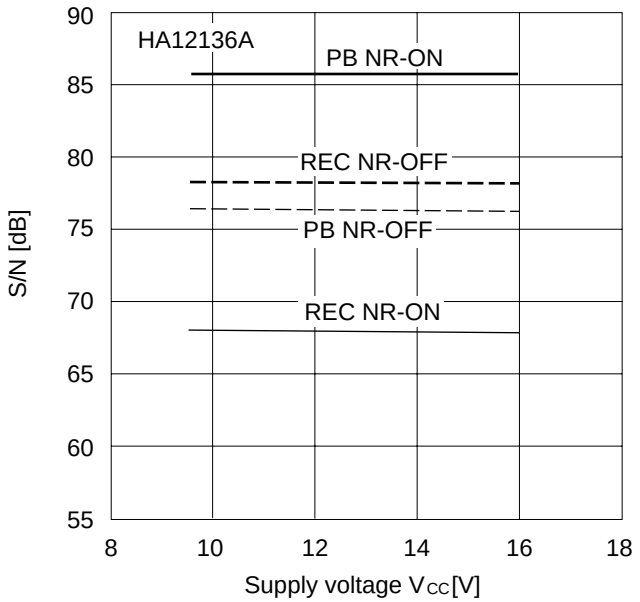


Figure 14 REC/PB Signal To Noise Ratio vs. Supply Voltage

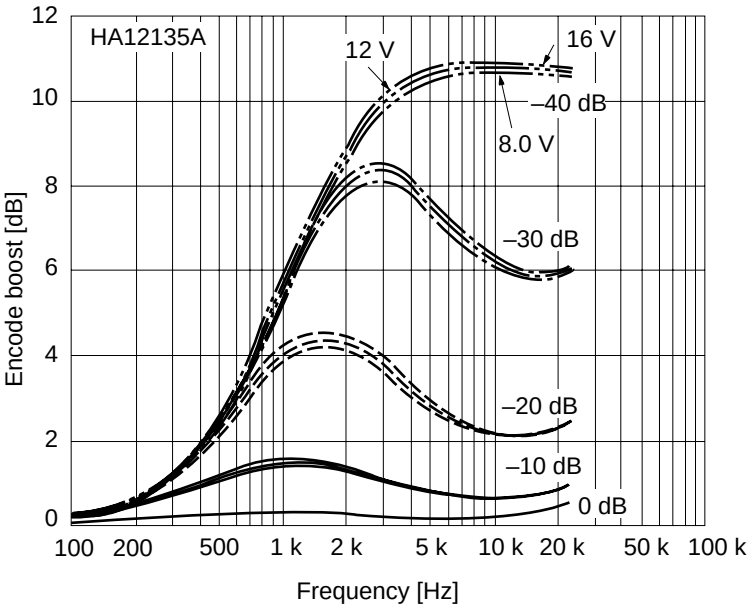


Figure 15 Encode Boost vs. Frequency

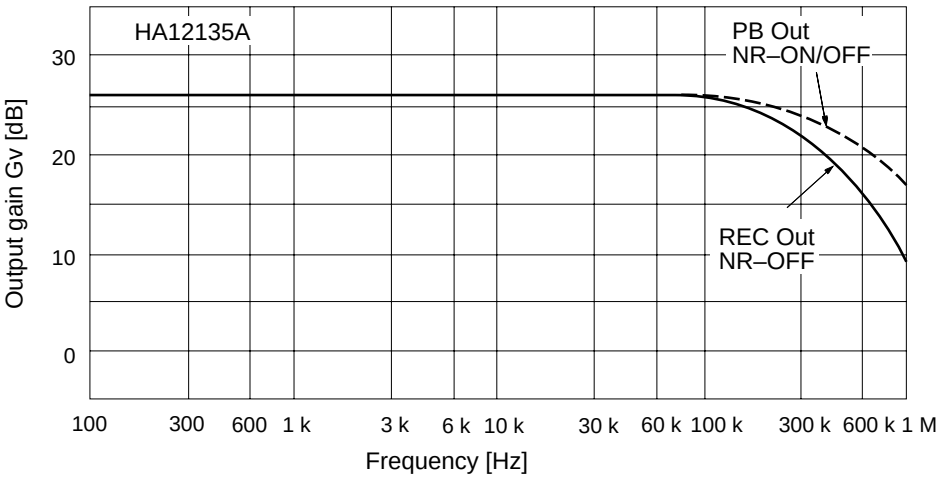


Figure 16 REC Mode Output Gain vs. Frequency

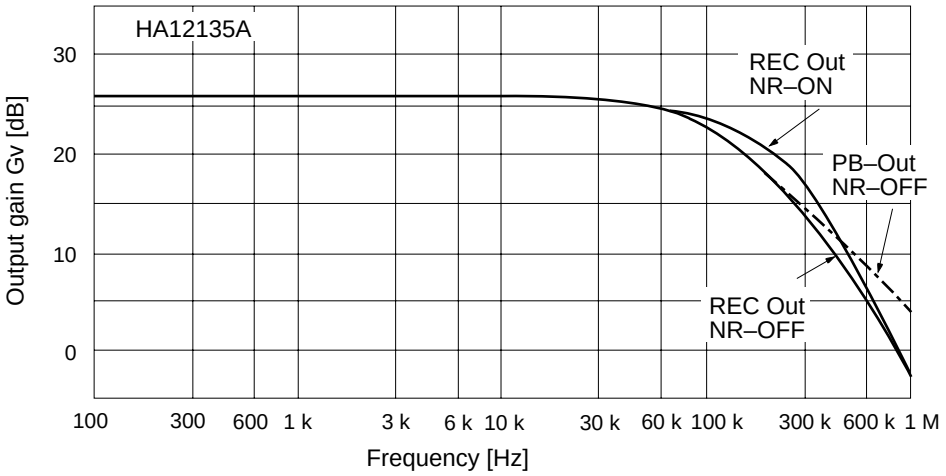


Figure 17 PB Mode Output Gain vs. Frequency

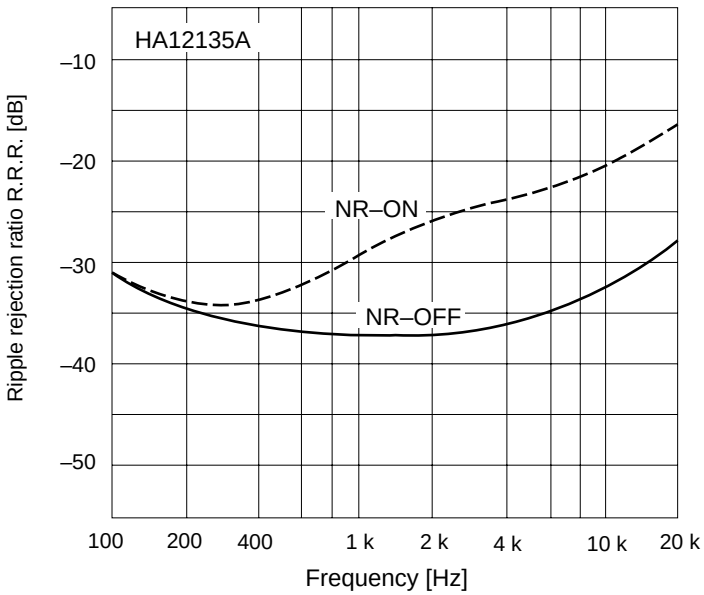


Figure 18 REC Mode Ripple Rejection Ratio vs. Frequency

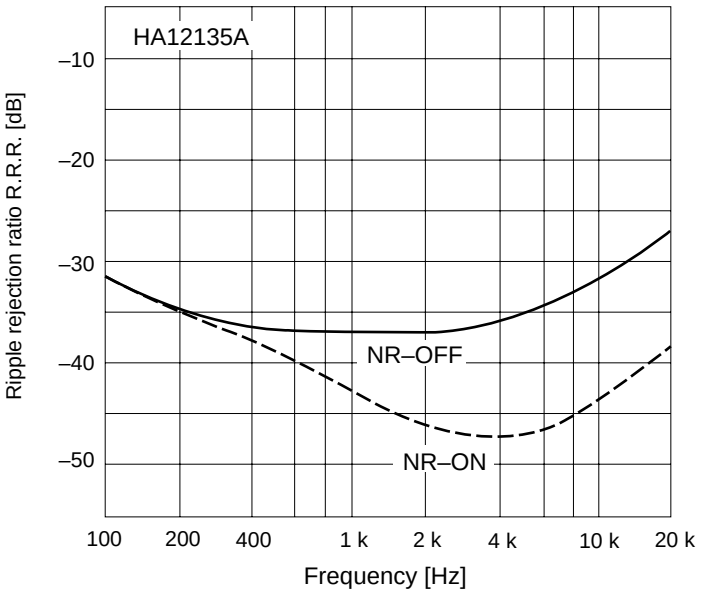


Figure 19 PB Mode Ripple Rejection Ratio vs. Frequency

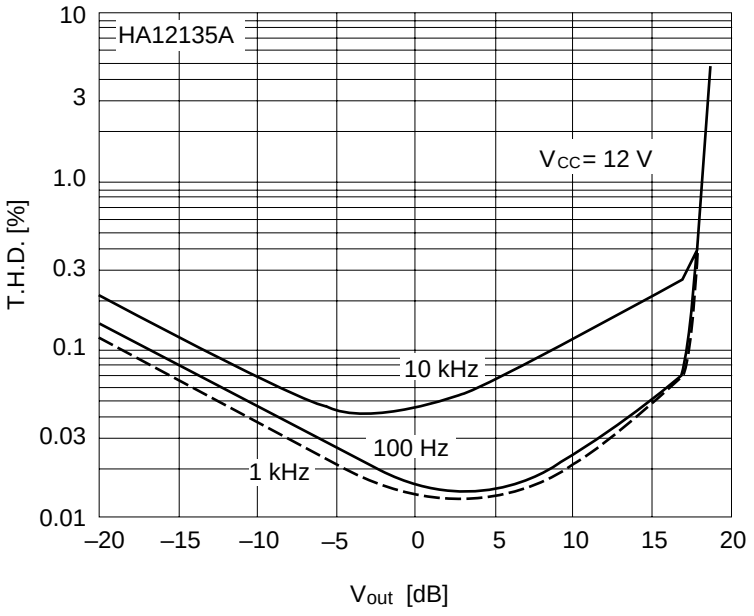


Figure 20 REC NR-OFF Total Harmonic Distortion vs. Output Level

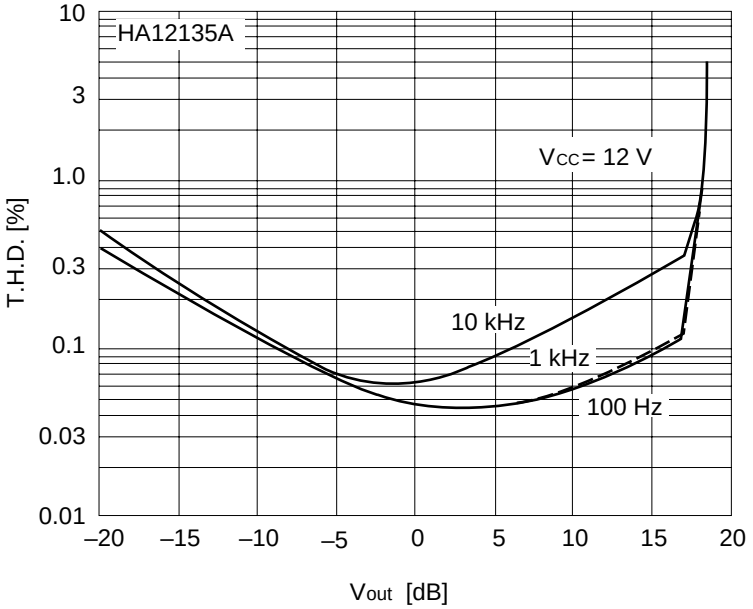


Figure 21 REC NR-ON total Harmonic Distortion vs. Output Level

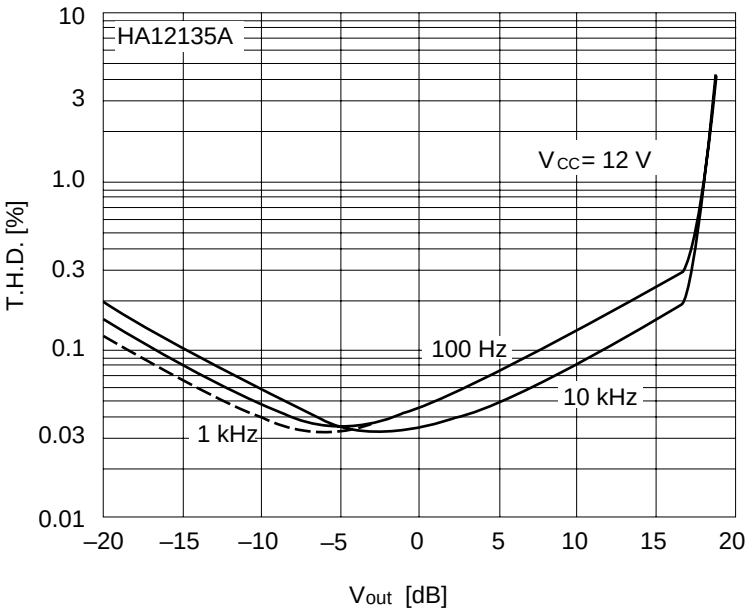


Figure 22 PB NR-OFF Total Harmonic Distortion vs. Output Level

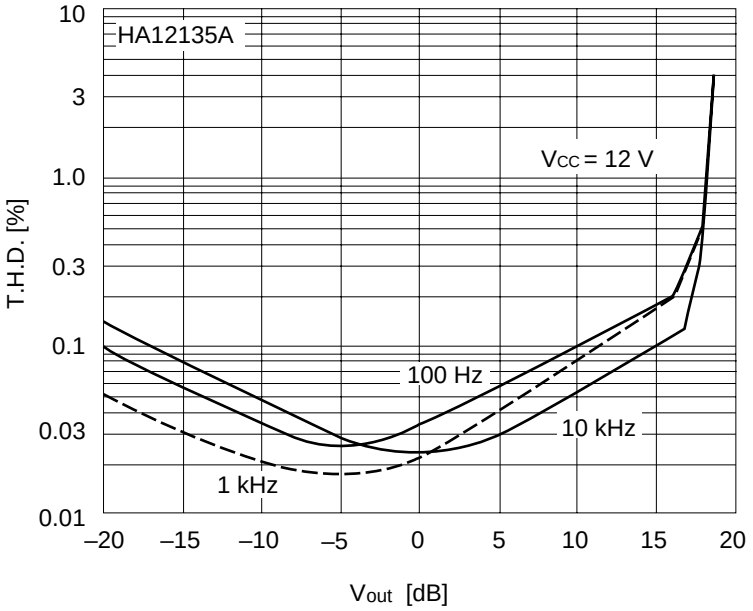


Figure 23 PB NR-ON Total Harmonic Distortion vs. Output Level

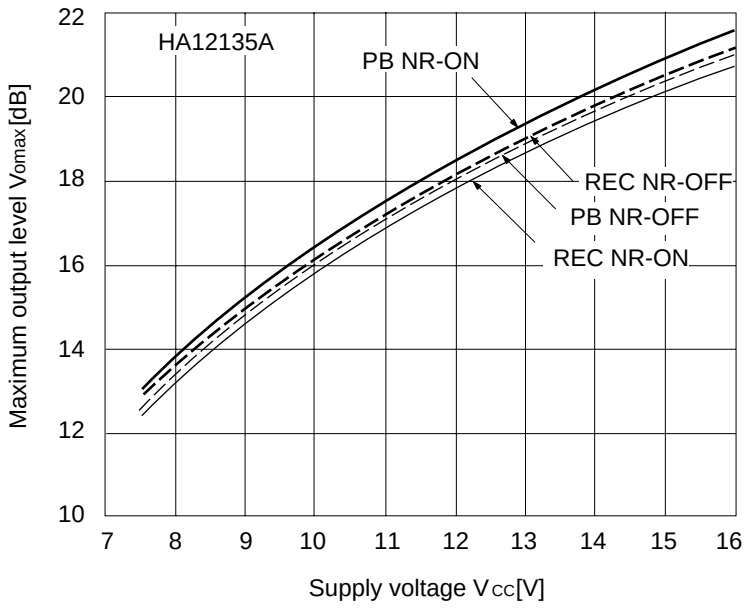


Figure 24 Maximum Output Level vs. Supply Voltage

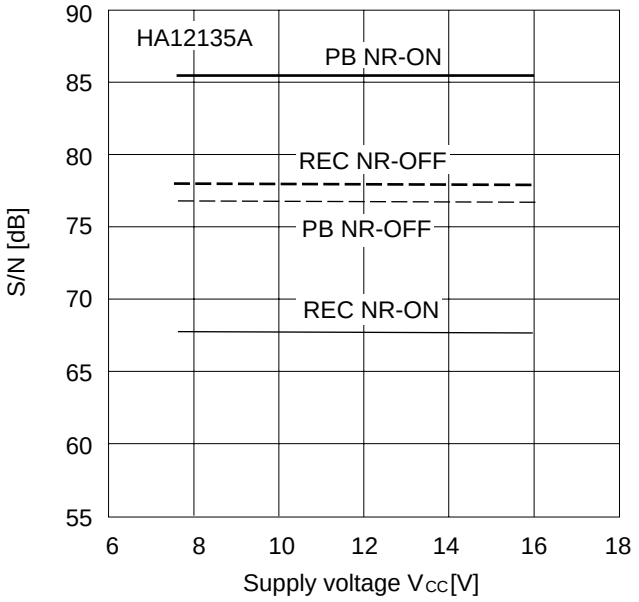


Figure 25 REC/PB Signal to Noise Ratio vs. Supply Voltage

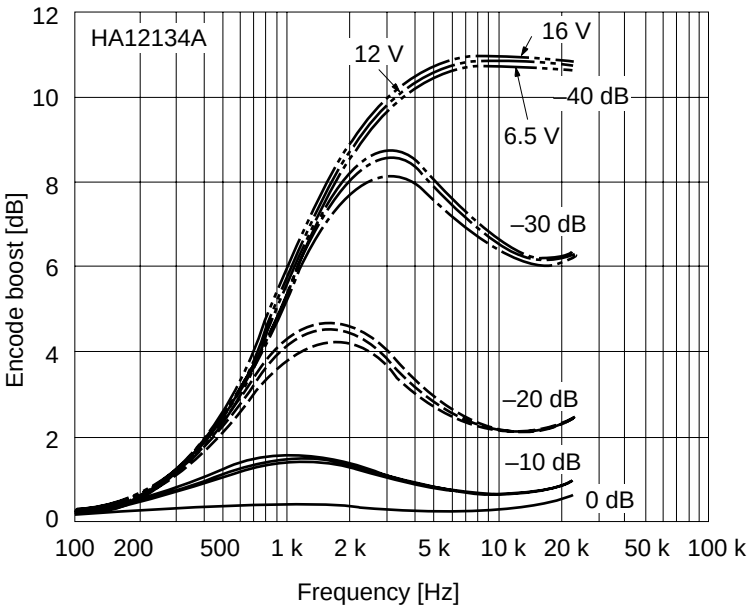


Figure 26 Encode Boost vs. Frequency

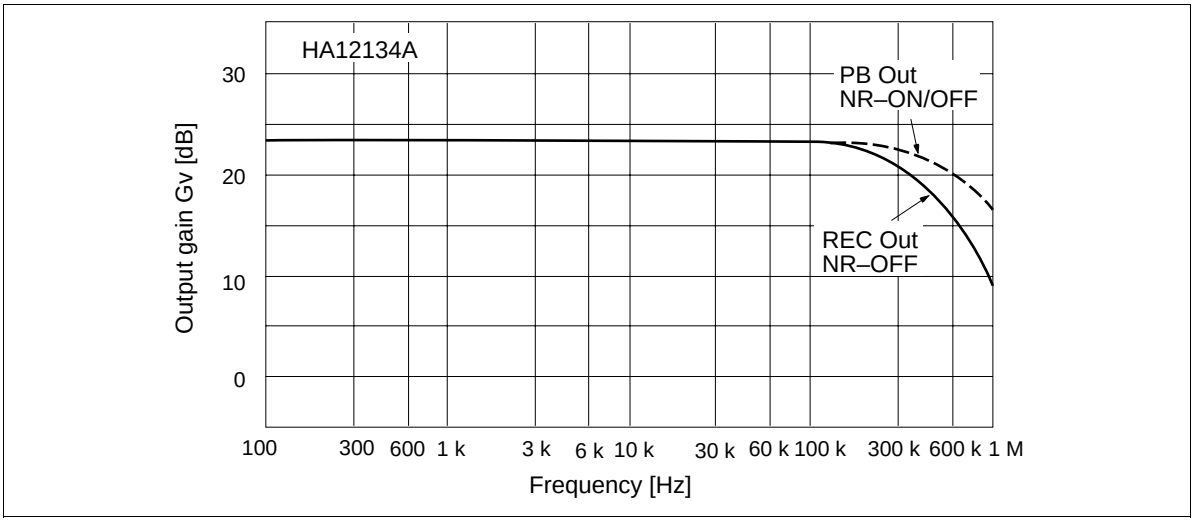


Figure 27 REC Mode Output Gain vs. Frequency

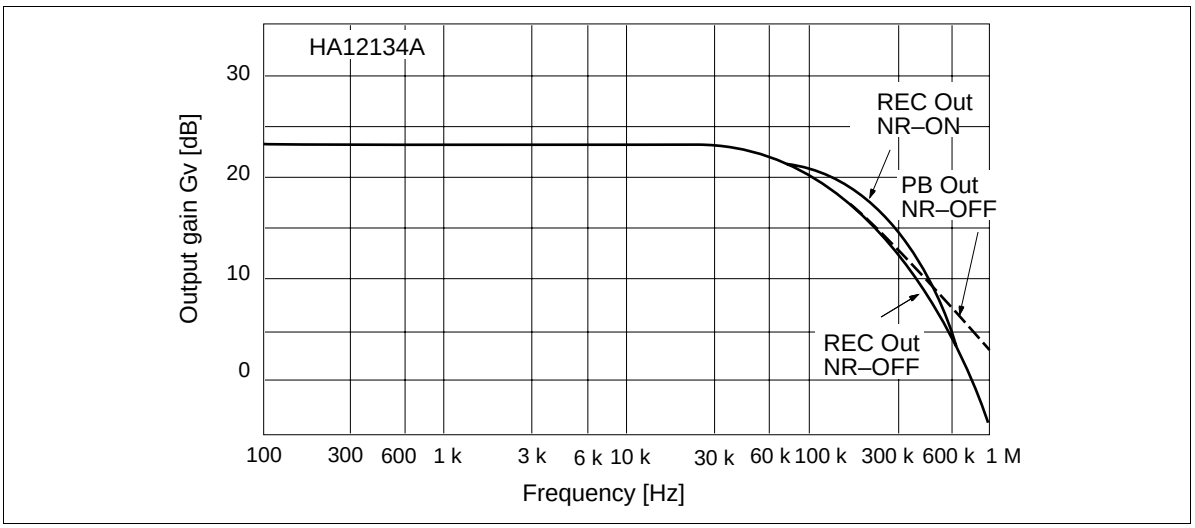


Figure 28 PB Mode Output Gain vs. Frequency

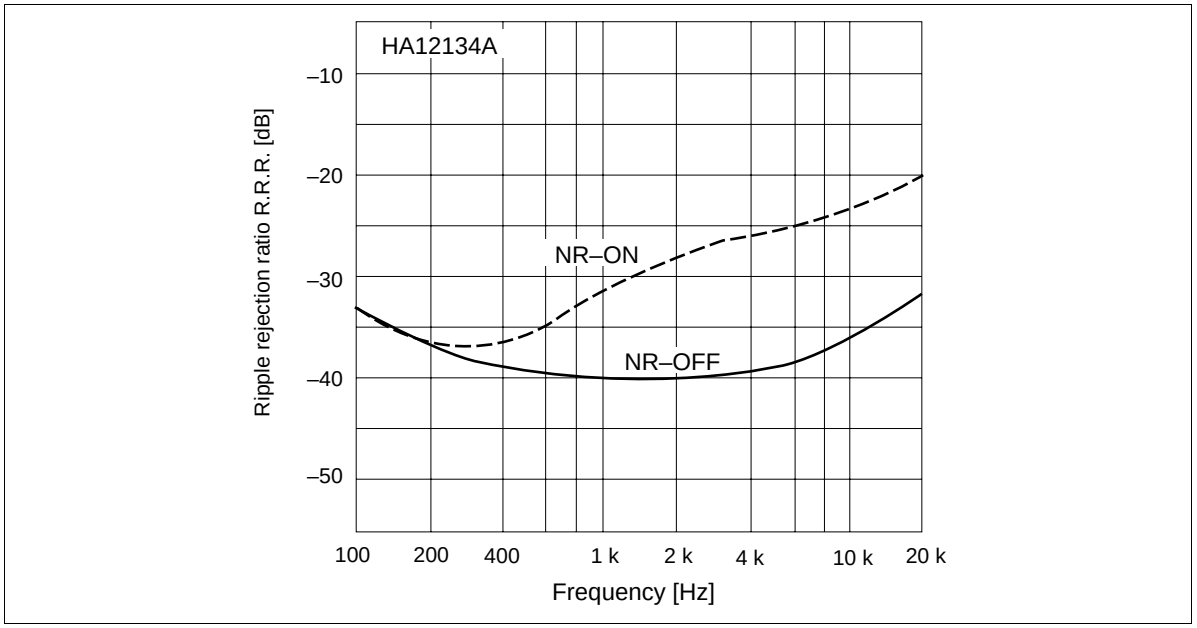


Figure 29 REC Mode Ripple Rejection Ratio vs. Frequency

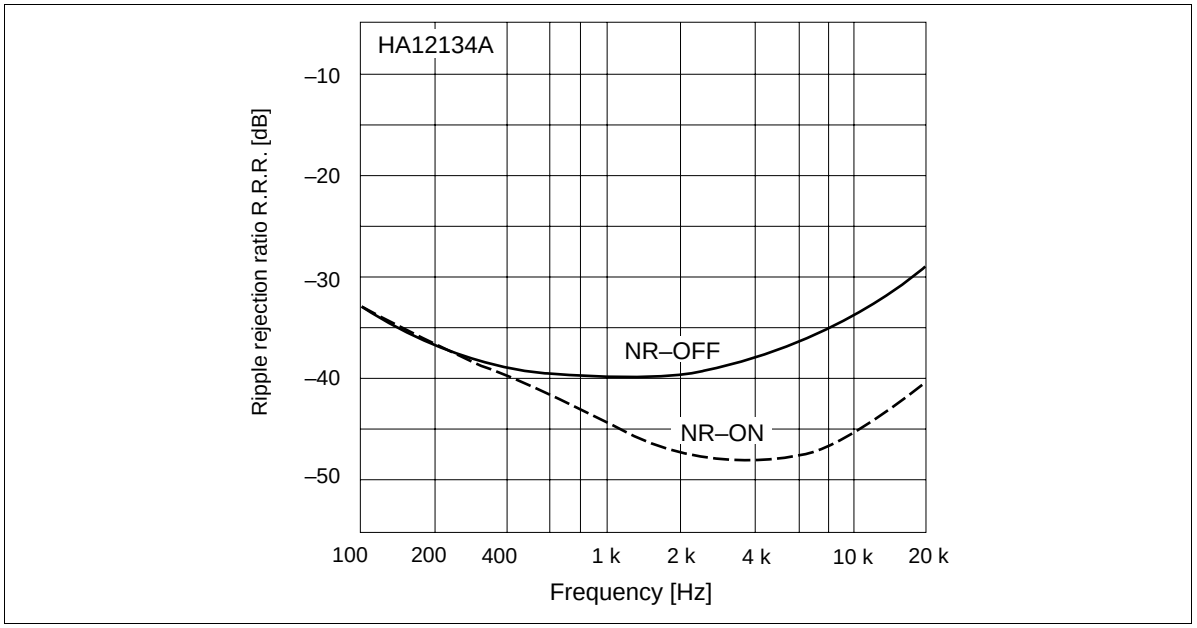


Figure 30 PB Mode Ripple Rejection Ratio vs. Frequency

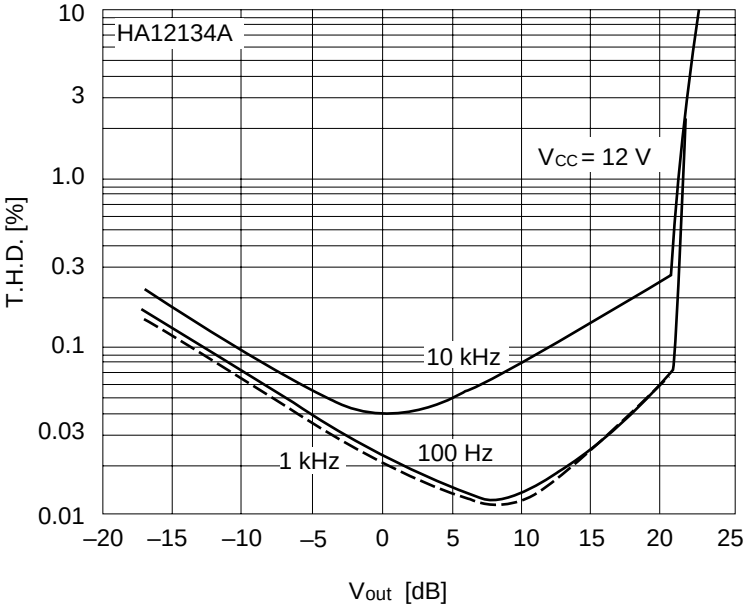


Figure 31 REC NR-OFF Total Harmonic Distortion vs. Output Level

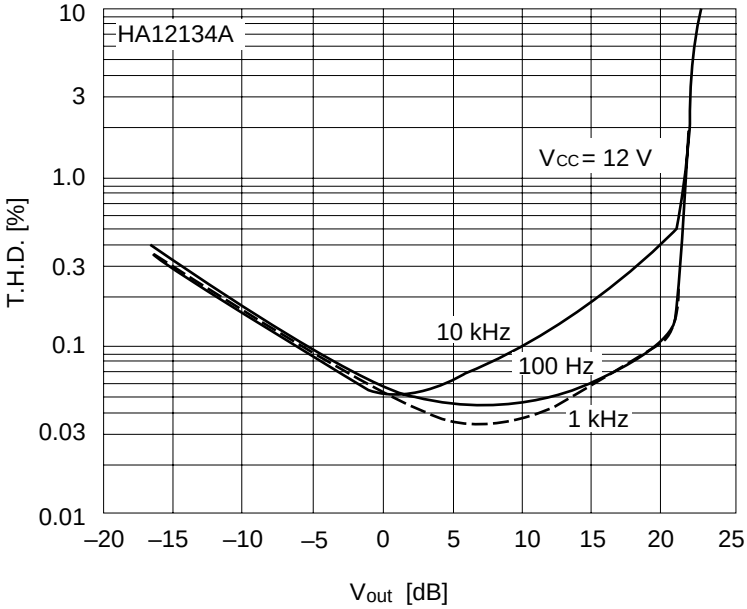


Figure 32 REC NR-ON Total Harmonic Distortion vs. Output Level

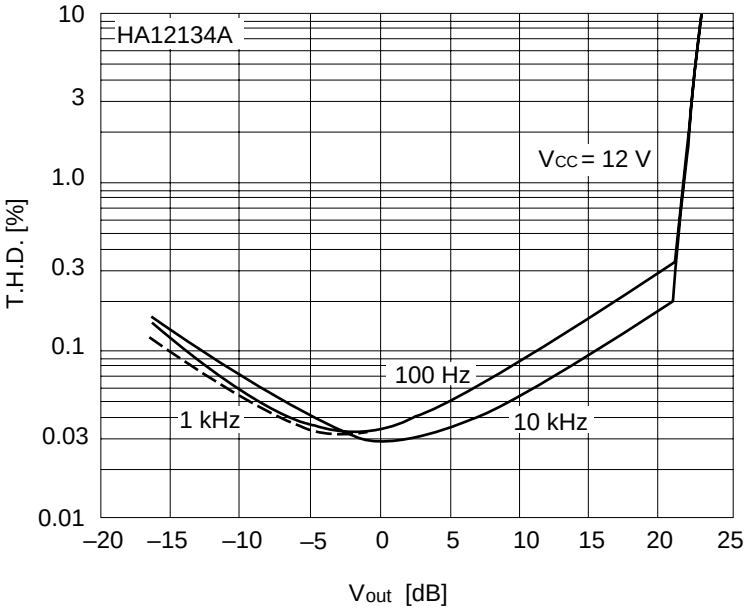


Figure 33 PB NR-OFF Total Harmonic Distortion vs. Output Level

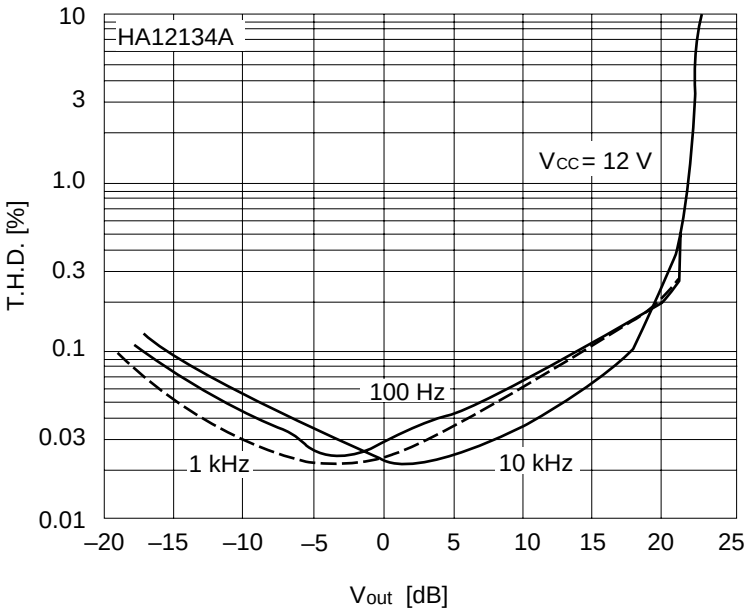


Figure 34 PB NR-ON Total Harmonic Distortion vs. Output Level

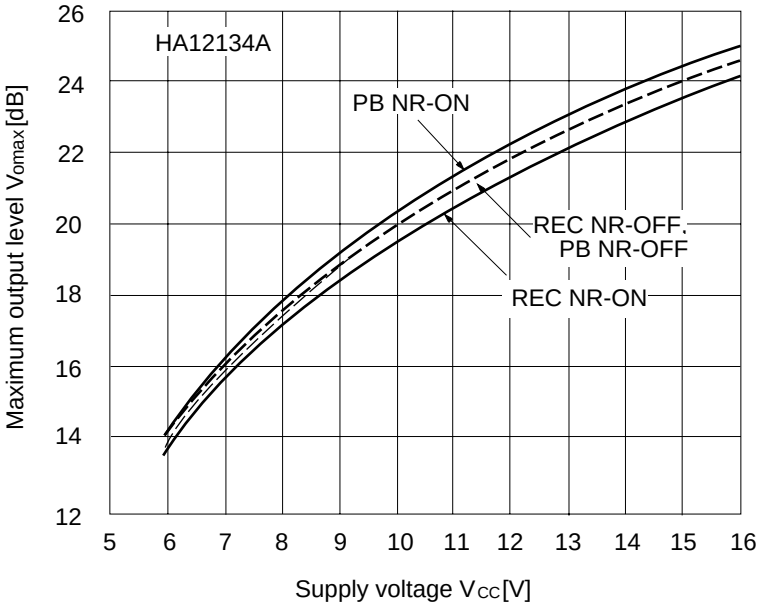


Figure 35 Maximum Output Level vs. Supply Voltage

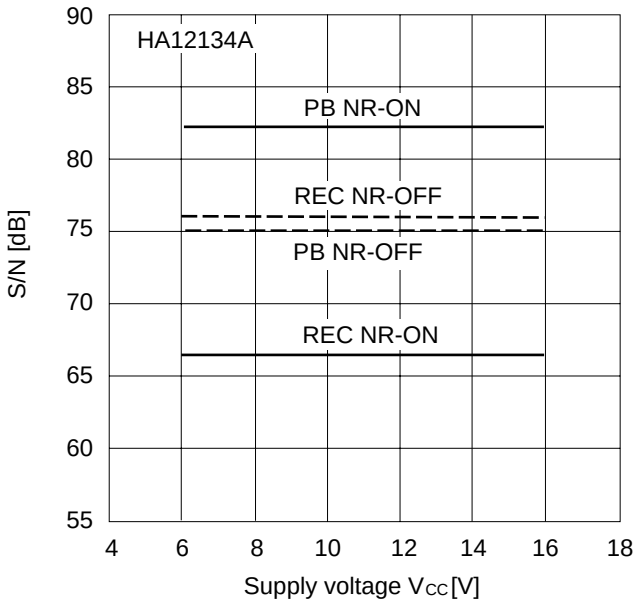
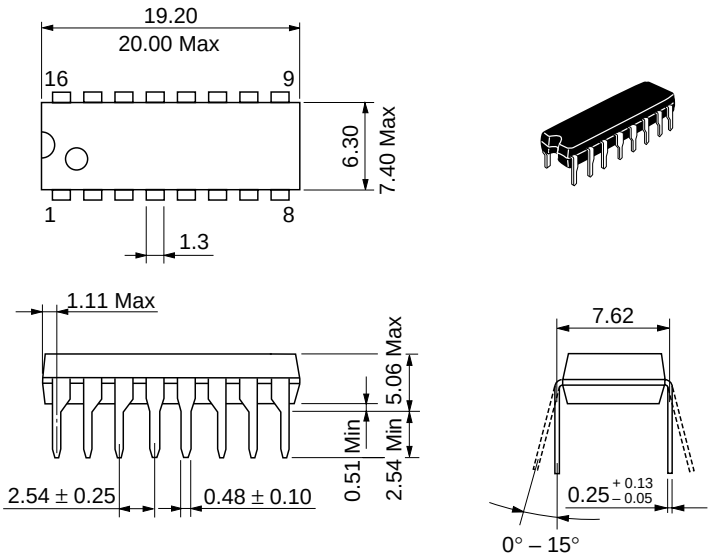


Figure 36 REC/PB Signal To Noise Ratio vs. Supply Voltage

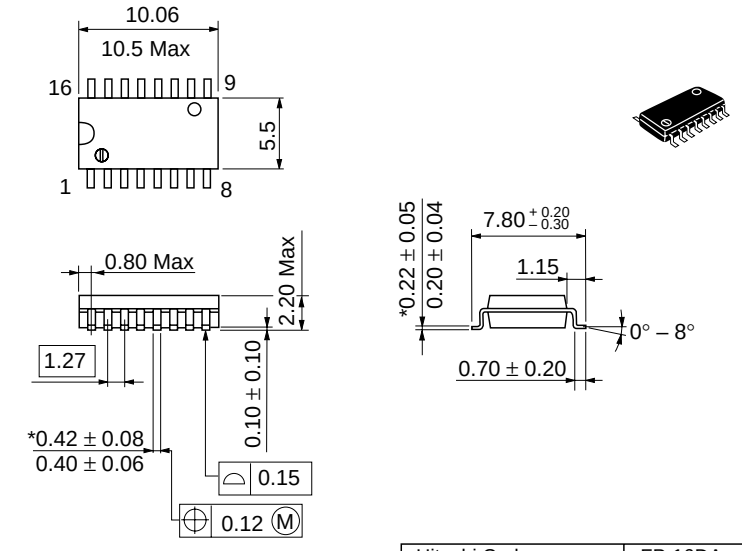
Package Dimensions

Unit: mm



Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g

Unit: mm



Hitachi Code	FP-16DA
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.24 g

*Dimension including the plating thickness
Base material dimension

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