Sense and Drive the World

SYN NC4410

Low Power Ambient Noise-Cancelling Speaker Driver

Contents

1 General Description

The NC4410 is speaker driver with Background Noise Cancelling function for headsets, headphones or ear pieces. It is intended to improve quality of e.g. music listening, a phone conversation etc. by reducing background noise.

NC4410 is fully analog implementation, lowest power consumption, and lowest system BOM cost.

NC4410 can be used in different configurations for best trade-off of noise cancellation, required filtering functions and mechanical designs.

NC4410 is applicable to both feed-forward topology and feed-backward topology design, or apply both on a single chip.

2 Key Features

Microphone Input

Differential, low noise microphone amplifier
Single ended or differential mode
Improved supply for electrets microphone

High Efficiency Headphone Amplifier

2x105mW, 0.1% THD @ 16Ω, 5V supply, 100dB SNR
2x70mW, 0.1% THD @ 32Ω, 5V supply, 100dB SNR

Line Input

Single ended stereo or mono differential mode

ANC processing

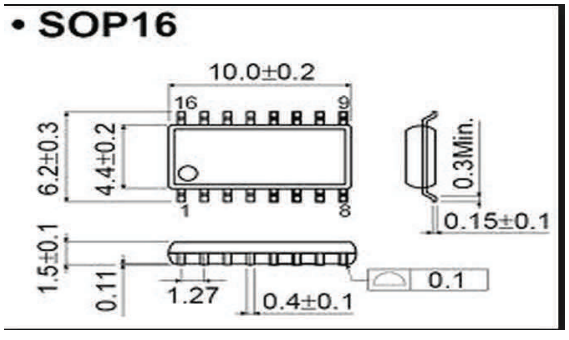
Feed-forward cancellation and Feed-back cancellation with filter loop transfer function definable via simple RC components
Simple in production VR adjustment
12-30dB noise reduction (headset dependent)
10-2000Hz wide frequency active noise attenuation (headset dependent)

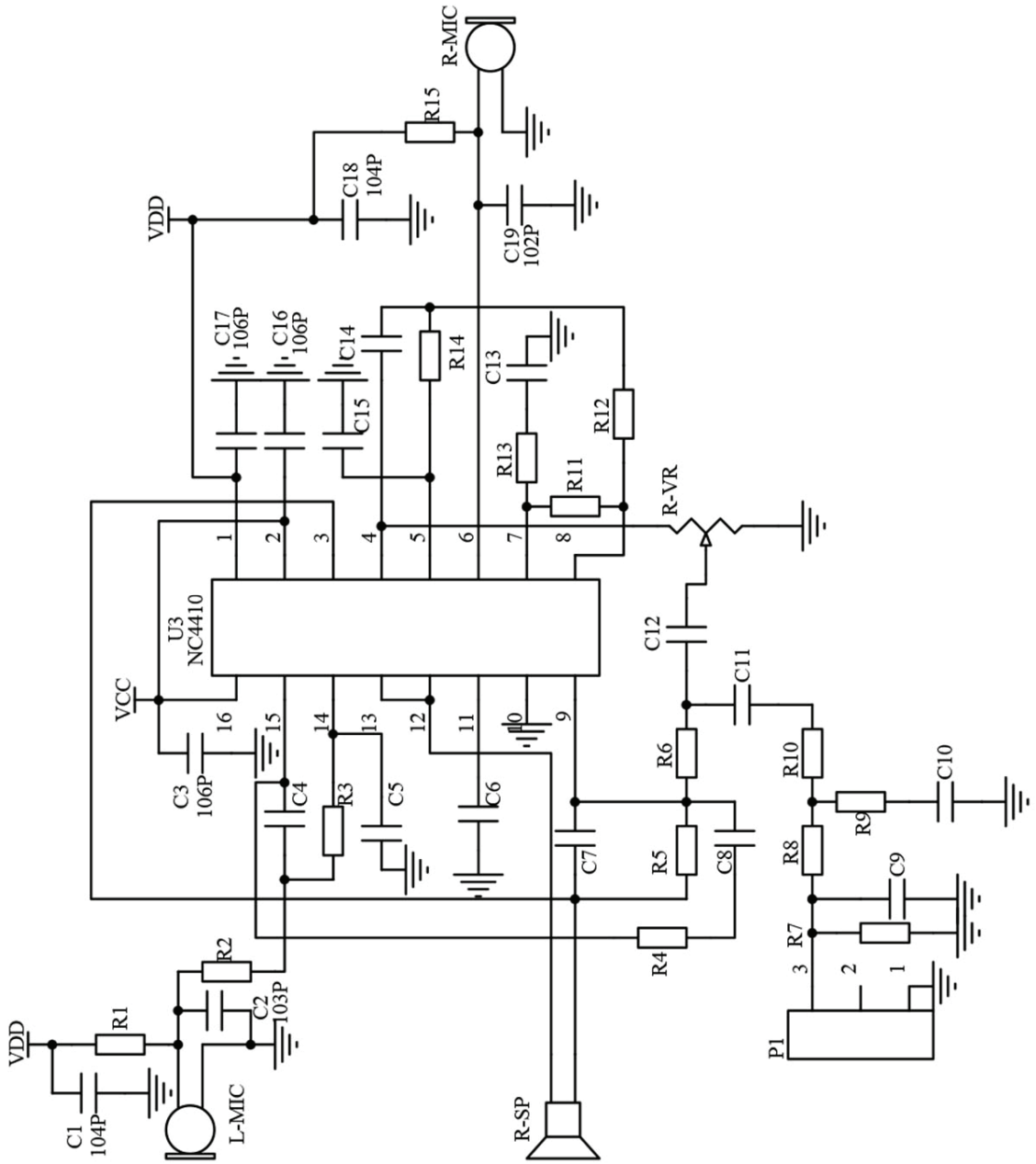
Performance Parameter

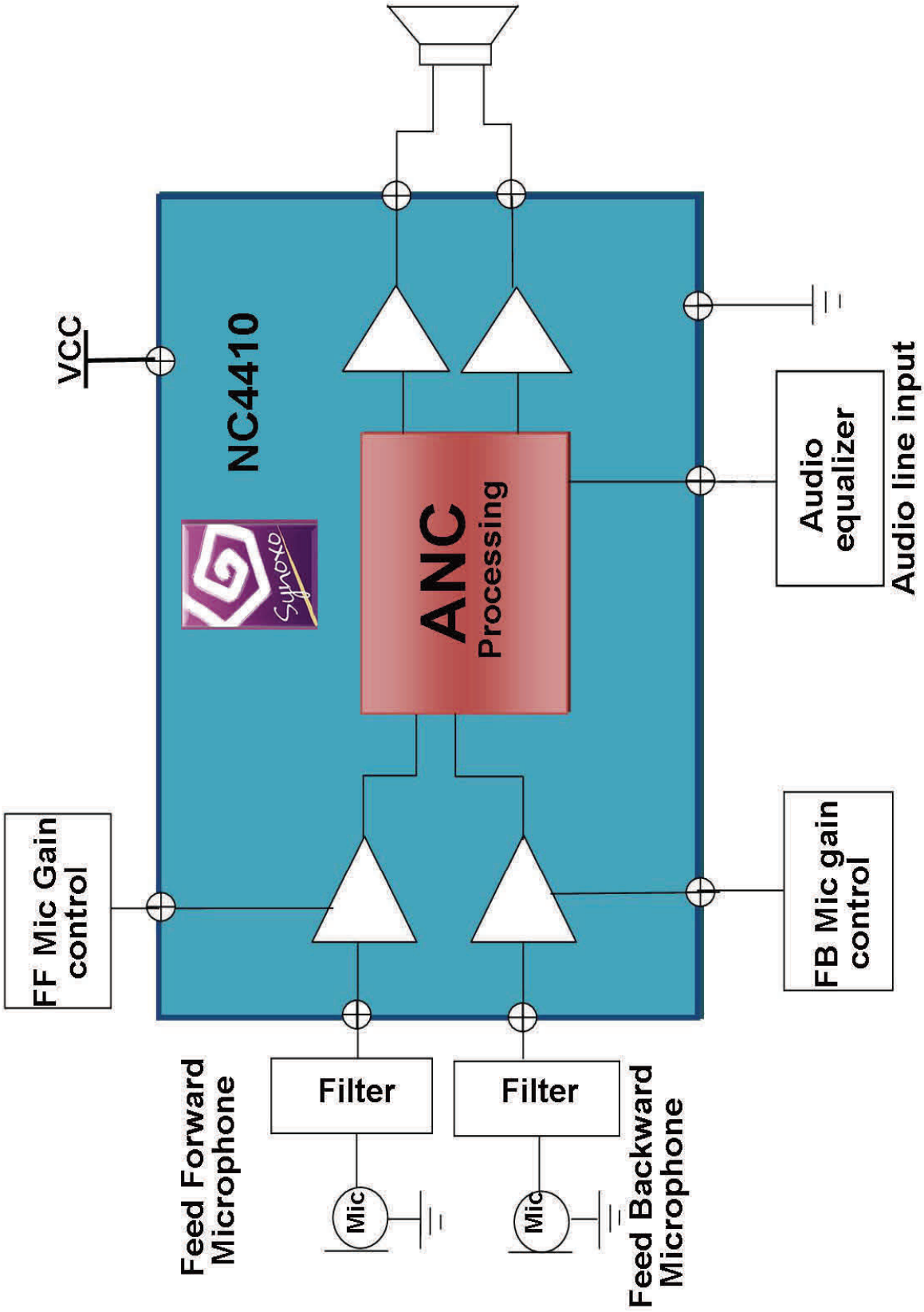
>10 mA @ 3V stereo/mono ANC

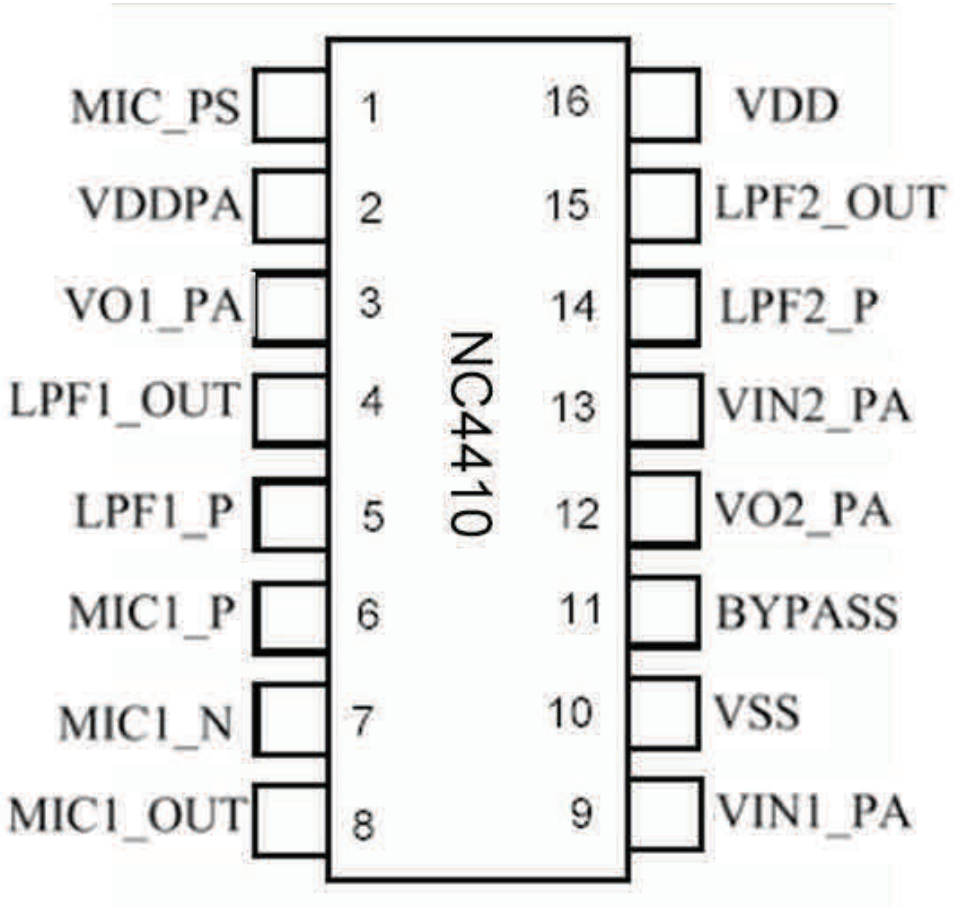
Package

SOP16




R-MIC
R15
C18
104P
VDD
C19
102P
C17
106P
C16
106P
C14
C15
R14
C13
R12
R13
R11
R-VR
U3
NC4410
C12
C11
VCC
C3
106P
C4
R3
C5
C6
C7
R6
R5
C8
R10
C10
R9
R8
C9
R7
R4
P1
R2
C2
103P
R1
C1
104P
L-MIC
R-SP


VCC
NC4410
ANC
Processing
Audio
equalizer
Audio line input
FF Mic Gain
control
FB Mic gain
control
Feed Forward
Microphone
Filter
Filter
Mic
Mic
Feed Backward
Microphone



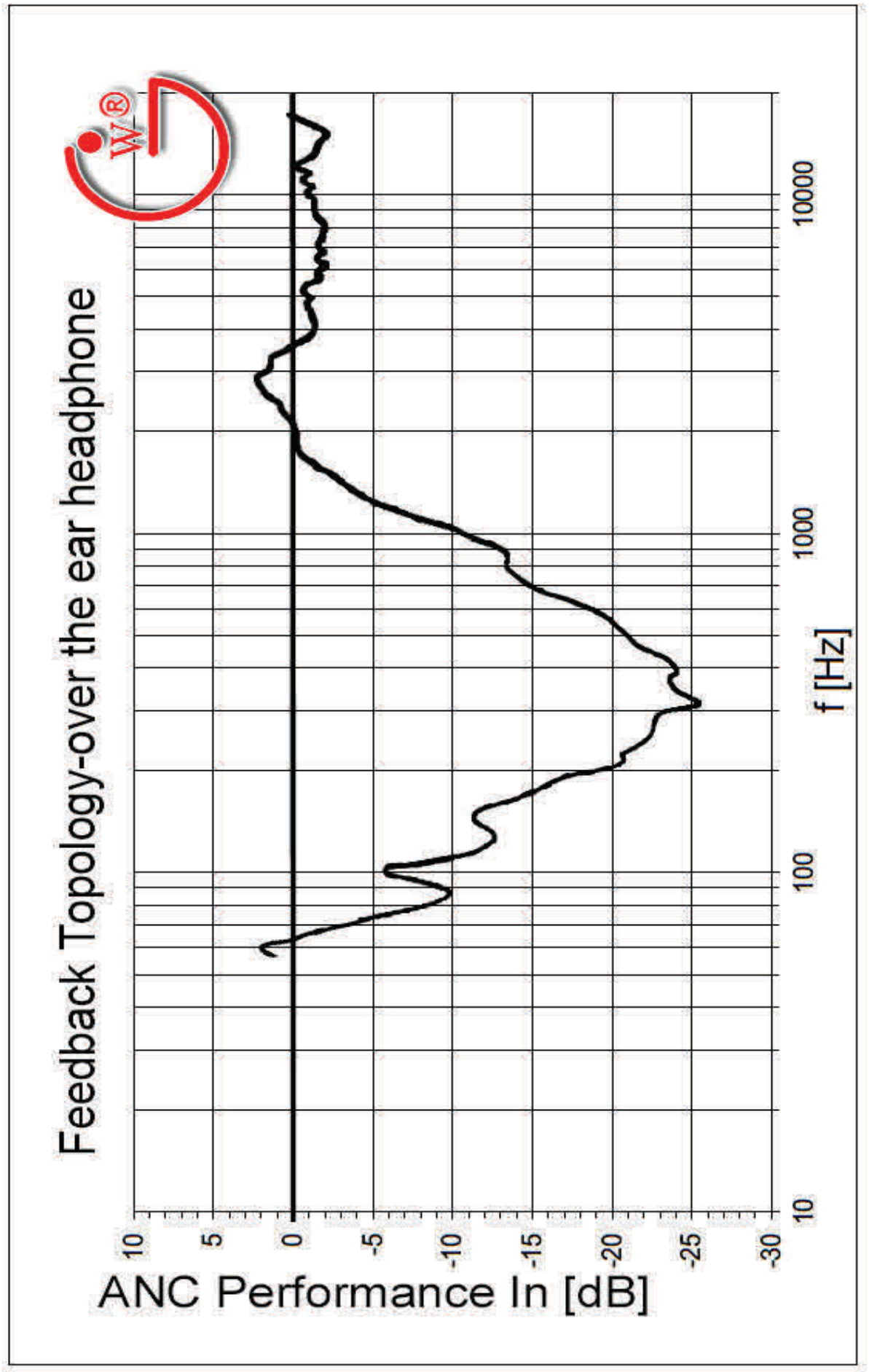
Pin Name	Pin Number	Function Description
MIC_PS	1	NC power source
VDDPA	2	Power for PA
VO1_PA	3	PA output 1
LPF1_OUT	4	Filter output
LPF1_P	5	Filter
MIC1_P	6	MIC input +
MIC1_N	7	MIC input -
MIC1_OUT	8	MIC output
VIN1_PA	9	PA input 1
VSS	10	ground connection
BYPASS	11	Connect the bypass capacitor
VO2_PA	12	PA output 2
VIN2_PA	13	PA input 2
LPF2_P	14	Filter
LPF2_OUT	15	Filter output
VDD	16	DC supply

Absolute Maximum Rating

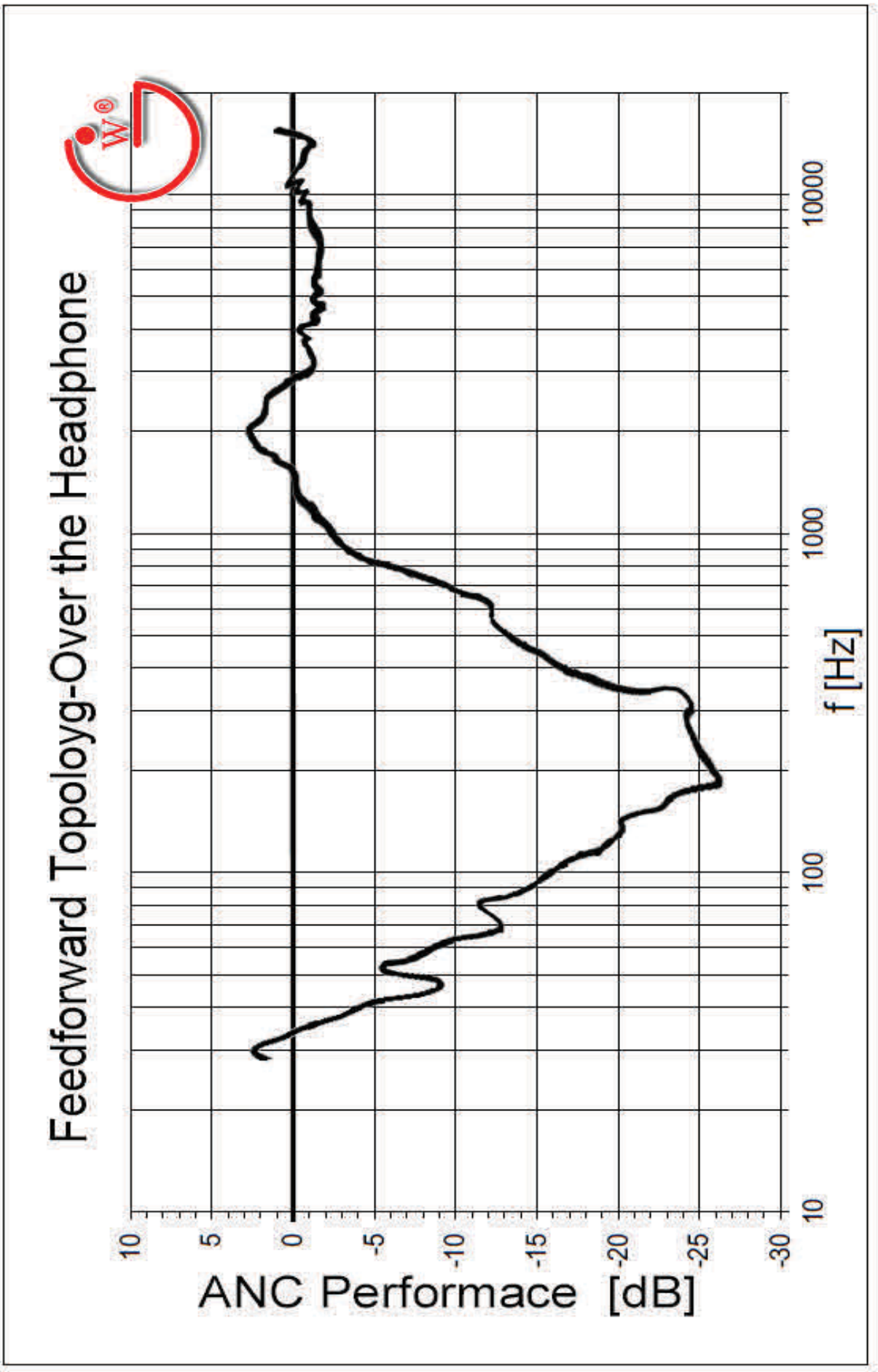
Supply Voltage (VDD)	+5V
Input / Output Voltage (VI/O)	VSS–0.3 to VDD+0.3
Storage Temperature Range (TS)	–65°C to +150°C
Lead Temperature (soldering	+300°C
Solder connection temperature	+150

Electrical Characteristics (T_A =25℃)

Parameter	Symbol	Conditions			NC4410 Min	NC4410 TYP	NC4410 MAX	Unit
Supply Voltage	VDD				2		5.5	V
Shut Down Current	ISD	VIN=0V, VSHDN=GND,V+=5.0				0.6	4	μA
		VIN=0V, VSHDN=GND,V+=3.3				0.18		
		VIN=0V, VSHDN=GND,V+=2.6				0.1		
Output Offset Voltage	VOS	VIN=0V, VSHDN=GND,V+=5.0			-50	5.3	50	mV
		VIN=0V, VSHDN=GND,V+=3.3			-50	4.7	50	
		VIN=0V, VSHDN=GND,V+=2.6			-50	4.4	50	
Quiescent Power Supply Current	IQ	VIN=0V, VSHDN=V+	V+=5V, no load			4	5	mA
			V+=3V, no load			3.4		
			V+=2.2V, no load			3.1		
Output Power (per channel)	PO	F=1Khz THD+N=0.1 %	V+=5	RL=16Ω		105		mW
				RL=32Ω		70		
			V+=3.6	RL=16Ω		40		
				RL=32Ω		28		
			V+=2.6	RL=16Ω		28		
				RL=32Ω		16		
Total Harmonic Distortion + Noise	THD + N	PO=70mW rms, V+=5V RL=32Ω F=20Hz to 20KHz				0.3		%
Cross Talk	Xtalk	RL=32, PO=70mA V==5V, f=1K				-90		dB
Power Supply Reject Ratio	PSRR	f=217Hz	V+=5			-62		dB
			V+=3.6			-62		dB
			V+=3			-62		dB
			V+=2.6			-62		dB
		F=1KHz	V+=5			-71		dB
			V+=3.6			-71		dB
			V+=3			-71		dB
			V+=2.6			-71		dB


Feedback Topology-over the ear headphone
ANC Performance In [dB]
10
5
0
-5
-10
-15
-20
-25
-30
10
100
1000
10000
f [Hz]

NC


Feedforward Topoloyg-Over the Headphone
ANC Performace [dB]
10
5
0
-5
-10
-15
-20
-25
-30
10
100
1000
10000
f [Hz]