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RF Communications	

# NE/SA5750

Audio processor – companding and amplifier section

*special components for cellular radio*

## DESCRIPTION

The NE/SA5750 is a high performance low power audio signal processing system. The NE/SA5750 subsystems include a low noise microphone preamplifier with adjustable gain, a noise cancellation switching amplifier with adjustable threshold, a voice operated transmitter (VOX) switch, VOX control, an audio compressor with buffered input, audio expander, a unity gain power amplifier to drive a speaker, a summing power amplifier for sidetone attenuation and headphone (earpiece) drive, and an internal bandgap voltage regulator with power down capability. When used with Signetics' NE/SA5751, the complete audio processing function of an AMPS or TACS cellular telephone is easily implemented. The NE/SA5750 can also be used without the NE/SA5751 in a wide variety of radio communications applications.

## FEATURES

- High performance
- 5V supply
- Adjustable VOX and noise cancellation threshold
- Adjustable gain preamplifier
- Audio companding
- ESD protected
- Open collector VOX output
- Logic inputs CMOS compatible
- Power down mode
- Built-in drivers for speaker and earpiece
- Few external components
- SOL and DIP packages

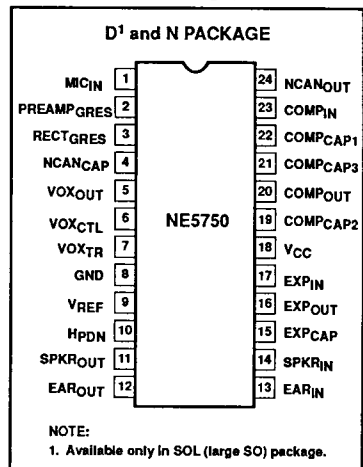
## BENEFITS

- Very compact applications
- Long battery life in portable equipment
- Complete cellular audio function with the SA5751

## APPLICATIONS

- Cellular radio
- Mobile communications
- High performance cordless telephones
- 2-way radio

## PIN CONFIGURATION



## ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE
24-Pin Plastic DIP	0 to +70°C	NE5750N
24-Pin Plastic SOL	0 to +70°C	NE5750D
24-Pin Plastic DIP	-40 to +85°C	SA5750N
24-Pin Plastic SOL	-40 to +85°C	SA5750D

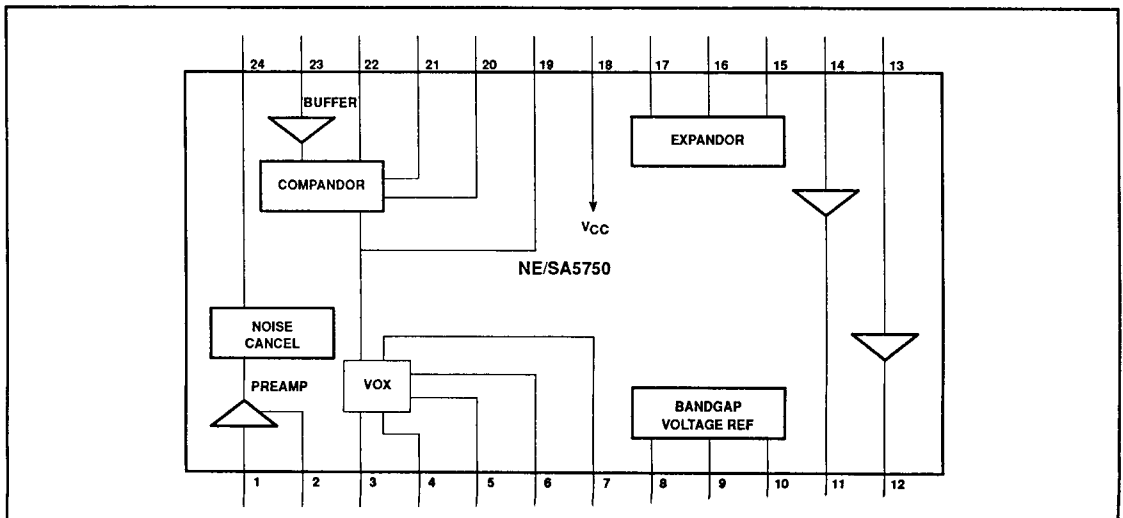
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## PIN DESCRIPTIONS

PIN NO.	SYMBOL	DESCRIPTION
1	MIC <sub>IN</sub>	Microphone input
2	PREAMP <sub>GRES</sub>	Preamplifier gain resistor
3	RECT <sub>GRES</sub>	Rectifier gain resistor
4	NCAN <sub>CAP</sub>	Noise cancellation timing capacitor
5	VOX <sub>OUT</sub>	Voice operated transmission output
6	VOX <sub>CTL</sub>	Voice operated transmission control
7	VOX <sub>TR</sub>	Voice operated transmission threshold resistor
8	GND	Ground
9	V <sub>REF</sub>	Reference voltage
10	H <sub>PDN</sub>	Hardware power down
11	SPKR <sub>OUT</sub>	Speaker output
12	EAR <sub>OUT</sub>	Earpiece output
13	EAR <sub>IN</sub>	Earpiece input, side tone input
14	SPKR <sub>IN</sub>	Speaker input
15	EXP <sub>CAP</sub>	Expander timing capacitor
16	EXP <sub>OUT</sub>	Expander output
17	EXP <sub>IN</sub>	Expander input
18	V <sub>CC</sub>	Positive supply
19	COMP <sub>CAP2</sub>	Compressor timing capacitor 2
20	COMP <sub>OUT</sub>	Compressor output
21	COMP <sub>CAP3</sub>	Compressor timing capacitor 3
22	COMP <sub>CAP1</sub>	Compressor timing capacitor 1
23	COMP <sub>IN</sub>	Compressor input
24	NCAN <sub>OUT</sub>	Noise cancellation output

## BLOCK DIAGRAM



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## ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNIT
V <sub>CC</sub>	Power supply voltage	6	V
	Voltage applied to any pin	-0.3 to (V <sub>CC</sub> + 0.3)	V
T <sub>STG</sub>	Storage temperature	-65 to +150	°C
T <sub>A</sub>	Ambient operating temperature	0 to 70	°C
	NE5750	-40 to +85	
	SA5750		

DC ELECTRICAL CHARACTERISTICS T<sub>A</sub> = 25°C, V<sub>CC</sub> = +5.0V, 0dB = 77.5mV<sub>RMS</sub>. See test circuit, Figure 4.

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX	
V <sub>CC</sub>	Supply voltage		4.75	5.0	5.25	V
I <sub>CC</sub>	Supply current	No signal Power down mode		8.4 1.8	12.0 3.0	mA mA
Z <sub>L</sub>	Load impedance pins NCAN <sub>OUT</sub> , EXP <sub>OUT</sub>		50			kΩ
	COMP <sub>OUT</sub> <sup>1</sup>		10			kΩ
Z <sub>IN</sub>	Input impedance COMP <sub>IN</sub> , MIC <sub>IN</sub> , SPKR <sub>IN</sub>		40	50	60	kΩ
	EXP <sub>IN</sub> <sup>2</sup>		2.0	2.5		kΩ
	Noise cancellation current	Pin 7, grounded	40	50	60	μA
V <sub>OS</sub>	DC offset NCAN <sub>OUT</sub> <sup>3</sup>		-50		50	mV

## NOTES:

- Compressor is tested in production with 50kΩ load.
- Not tested in production.
- Offset values are identical for both gain states of noise reduction circuit.

AC ELECTRICAL CHARACTERISTICS T<sub>A</sub> = 25°C, V<sub>CC</sub> = +5.0V, 0dB level = 77.5mV<sub>RMS</sub>. See test circuit, Figure 4.

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX	
	Preampifier gain range	Pin 2 open Pin 2 AC ground	0	0	40	dB
	Preampifier voltage gain 0dB		-1.0		1.0	
	Preampifier voltage gain 40dB		39.0		41.0	
	Preampifier noise density	Pin 2 AC grounded RS = 0 – 50kΩ unweighted 20Hz–20kHz		7		nV/√Hz
		weighted CCIR DIN45405 20–20kHz		8		nV/√Hz
	Switch amplifier gain		9	10	11	dB
	Sidetone attenuation range				30	dB
<b>Compandor 1kHz, all tests<sup>1</sup></b>						
COMP <sub>OUT</sub>	Compressor error at -21dB output level	Input level = -42dB		0.38		dB
COMP <sub>OUT</sub>	Compressor error at -10dB output level	Input level = -20dB	-1.0		1.0	dB
COMP <sub>OUT</sub>	Compressor error at 0dB output level	Input level = 0dB	-1.5	0.12	1.5	dB
COMP <sub>OUT</sub>	Compressor error at +5dB output level	Input level = +10dB	-1.0		1.0	dB
COMP <sub>OUT</sub>	Compressor error at +12.3dB output level	Input level = +24.6dB	-1.0		1.0	dB
EXP <sub>OUT</sub>	Expander error at -42dB output level	Input level = -21dB		-0.41		dB
EXP <sub>OUT</sub>	Expander error at -21dB output level	Input level = -10.5dB	-1.0		1.0	dB

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**AC ELECTRICAL CHARACTERISTICS**  $T_A = 25^\circ\text{C}$ ,  $V_{CC} = +5.0\text{V}$ , 0dB level = 77.5mV<sub>RMS</sub>. See test circuit, Figure 4.

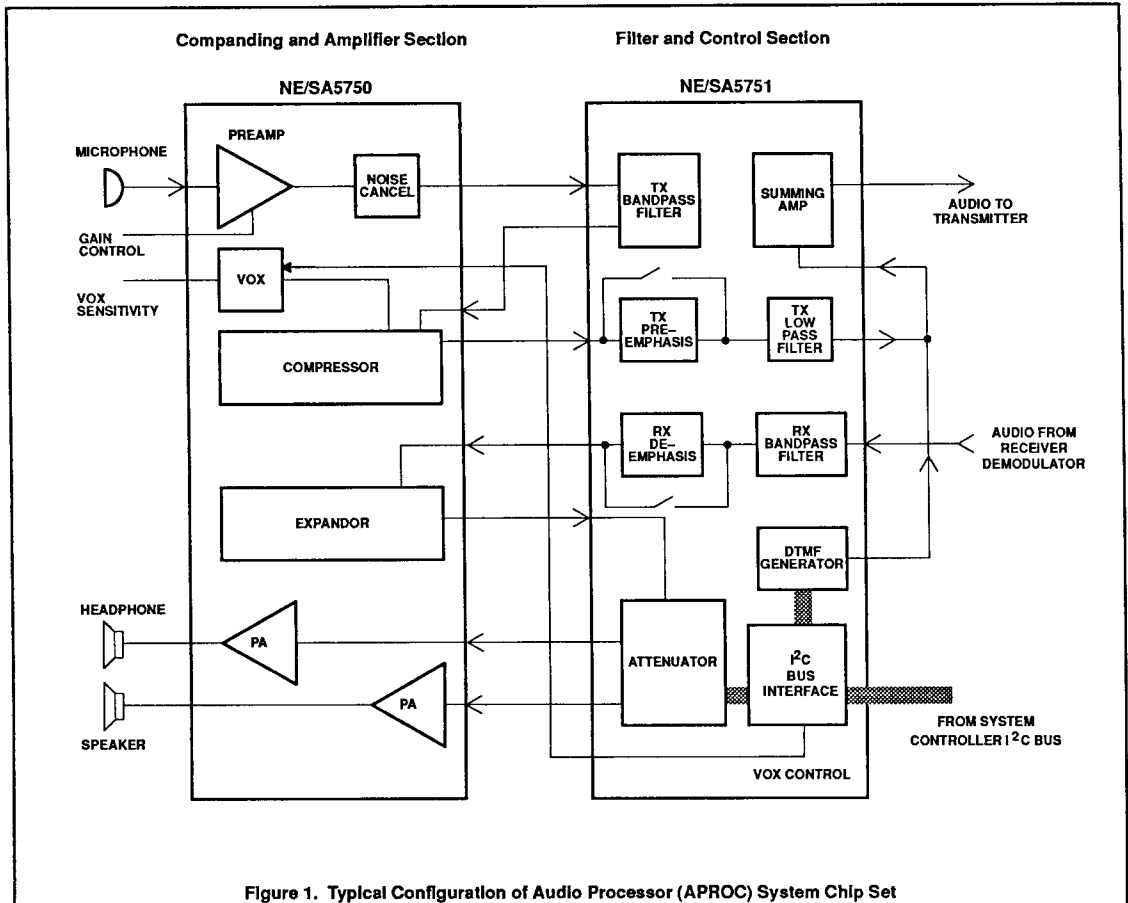
SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX	
EXP <sub>OUT</sub>	Expander error at -10dB output level	Input level = -5dB	-1.0		1.0	dB
EXP <sub>OUT</sub>	Expander error at 0dB output level	Input level = 0dB	-1.5	-0.18	1.5	dB
EXP <sub>OUT</sub>	Expander error at +10dB output level	Input level = +5dB	-1.0		1.0	dB
EXP <sub>OUT</sub>	Expander error at +24.6dB output level <sup>2</sup>	Input level = +12.3dB	-1.5		1.5	dB
EXP <sub>OUT</sub>	Expander V <sub>OS</sub>	No signal	-50.0		50.0	mV
EXP <sub>OUT</sub>	Expander output DC shift	No signal to 0dB	-100		100	mV
	Timing capacitors compandor			2.2		μF
THD	Total harmonic distortion					
	Compressor	1kHz, 0dB		0.09	1	%
	Expander	1kHz, 0dB		0.09	1	%
	NCAN <sub>OUT</sub>	1kHz, Pin 2 open output level = 0dB			0.18	1
1kHz, Pin 2 open output level = +25dB				0.13	1	%
	Speaker amplifier Drive capability				40	mA <sub>P-P</sub>
	Output swing (<1% THD)	50Ω load	2	3.2		V <sub>P-P</sub>
		100Ω load	3	4.1		V <sub>P-P</sub>
		No load	4	4.9		V <sub>P-P</sub>
	Ear amplifier Drive capability				10	mA <sub>P-P</sub>
	Output swing (<1% THD)	300Ω load	3	4.3		V <sub>P-P</sub>
		2000Ω load	4	4.9		V <sub>P-P</sub>
		No load	4	4.9		V <sub>P-P</sub>
VOX <sub>OUT</sub>	Sink current				0.5	mA
	Low level High level	Open collector I <sub>L</sub> = 0.5mA	4	0.07 5	0.4	V V
VOX <sub>CTL</sub>	Input current	Low	-50	-21	0	μA
		High	-10		+10	μA
	Input level	Low	0		1.5	V
		High	3.5		5	V
H <sub>PDN</sub>	Input current	Low	-10		+10	μA
		High	-10		+10	μA
	Input level	Low	0		1.5	V
		High	3.5		5	V
	Reference filter capacitor			10		μF

**NOTE:**

1. Measurements are relative to 0dB output.
2. Measurement is absolute and indicative of the output dynamic range capability.

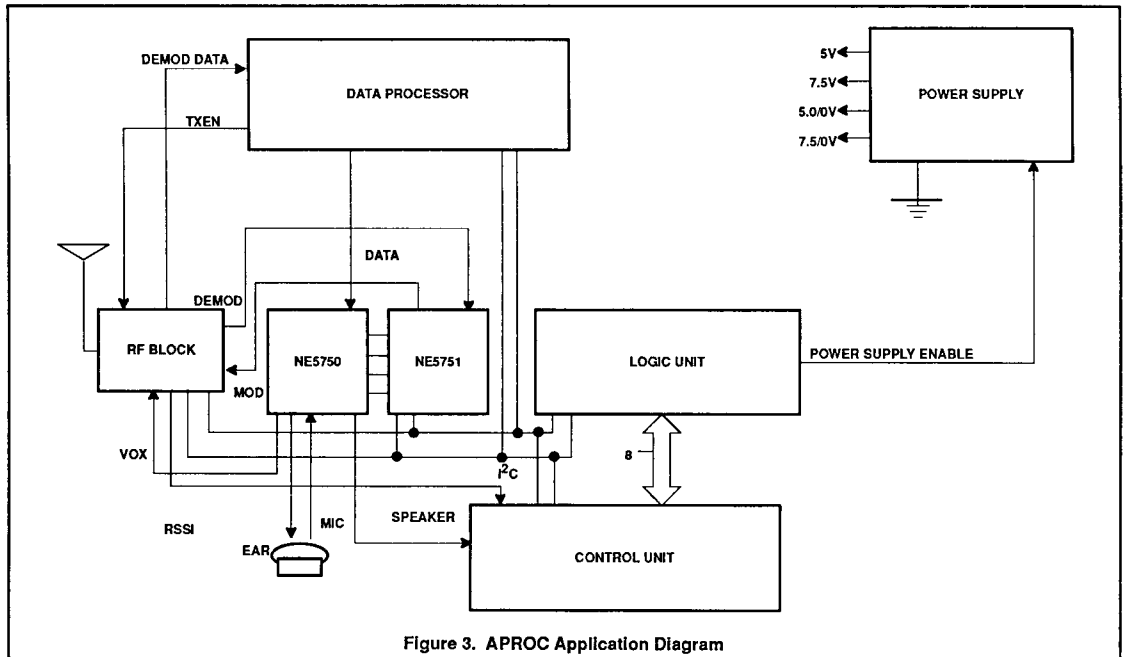
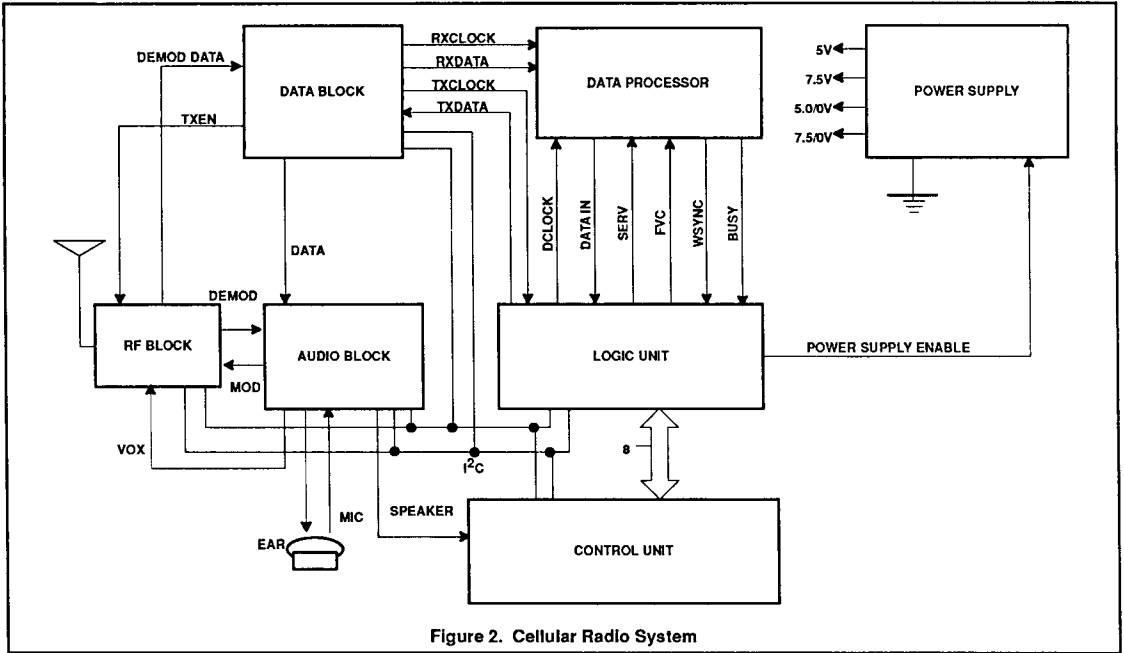
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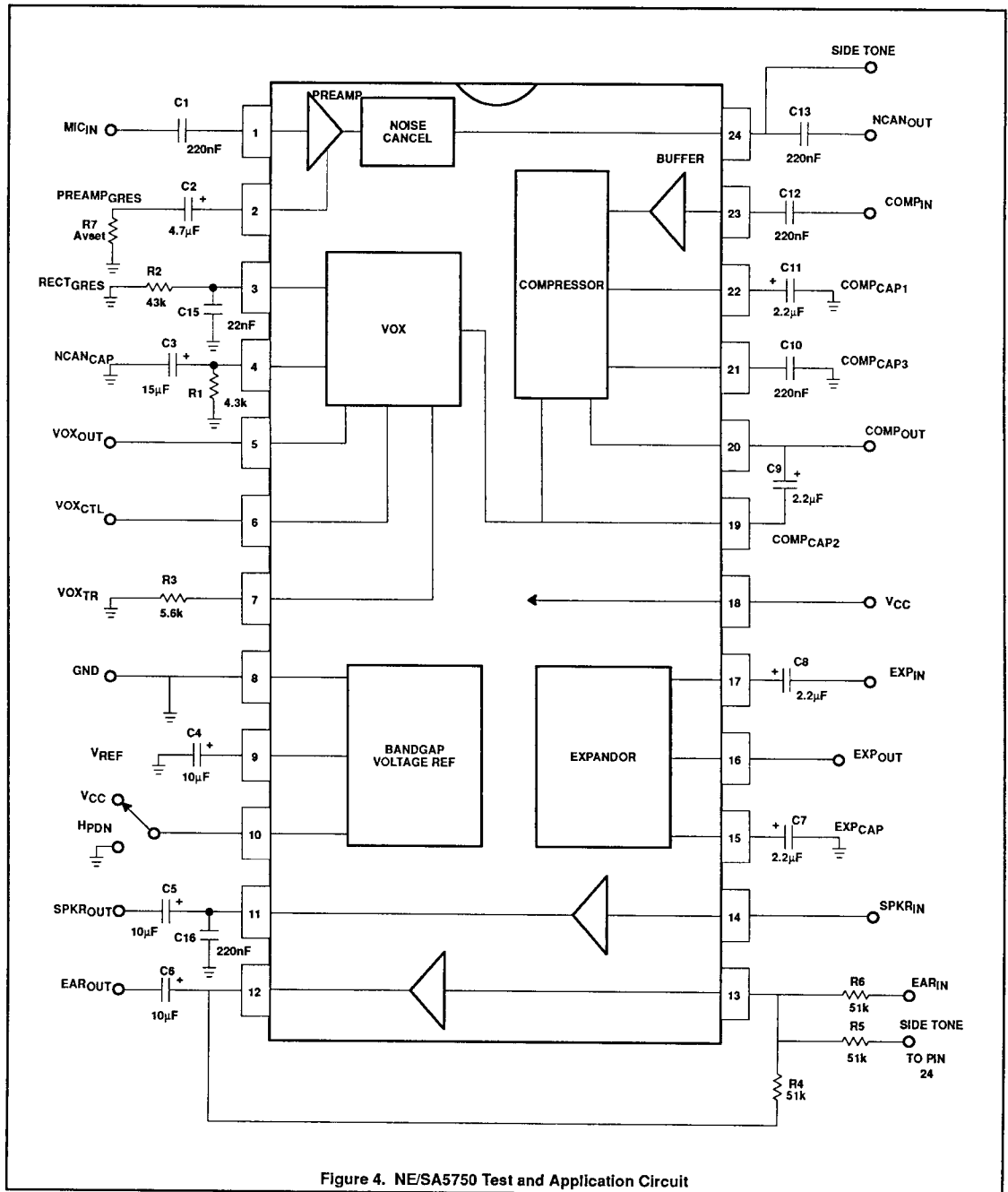


Figure 4. NE/SA5750 Test and Application Circuit