Audio processor – companding, VOX and amplifier section

NE/SA5752

PHILIPS INTERNATIONAL 60E D 7110826 0054582 62T PHIN

DESCRIPTION

The NE/SA5752 is a high performance low power audio signal processing system especially designed to meet the requirements for small size and low voltage operation of hand-held equipment. The NE/SA5752 subsystem includes a low noise microphone preamplifier with adustable gain, a noise cancellation switching amplifier with adjustable threshold, a voice operated transmitter (VOX) switch, VOX control, an audio compressor with buffered input, audio expandor, and an internal bandgap voltage regulator with power down capability. When used with Signetics' NE/SA5753, the complete audio processing function of an AMPS or TACS cellular telephone is easily implemented. The system also meets the requirements of the proposed NAMPS or NTACS specifications. The NE/SA5752 can also be used without the NE/SA5753 in a wide variety of radio communications applications.

FEATURES

- Low 3V supply
- Miniature SSOP and SO packages
- High performance
- Adjustable VOX and noise cancellation threshold
- Adjustable gain preamplifier
- Audio companding
- ESD protected
- Open collector VOX output
- Logic inputs CMOS compatible
- Power down mode
- Few external components
- Meets AMPS/TACS/NAMPS/NTACS requirements

BENEFITS

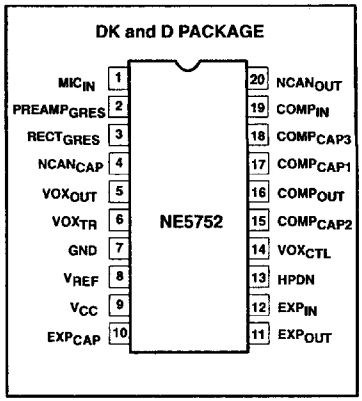
- Very compact applications
- Long battery life in portable equipment
- Complete cellular audio function with the SA5753

APPLICATIONS

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

PIN CONFIGURATION

DK and D PACKAGE



ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE
20-Pin Plastic SO	0 to +70°C	NE5752D
20-Pin Plastic SSOP	0 to +70°C	NE5752DK
20-Pin Plastic SO	-40 to +85°C	SA5752D
20-Pin Plastic SSOP	-40 to +85°C	SA5752DK

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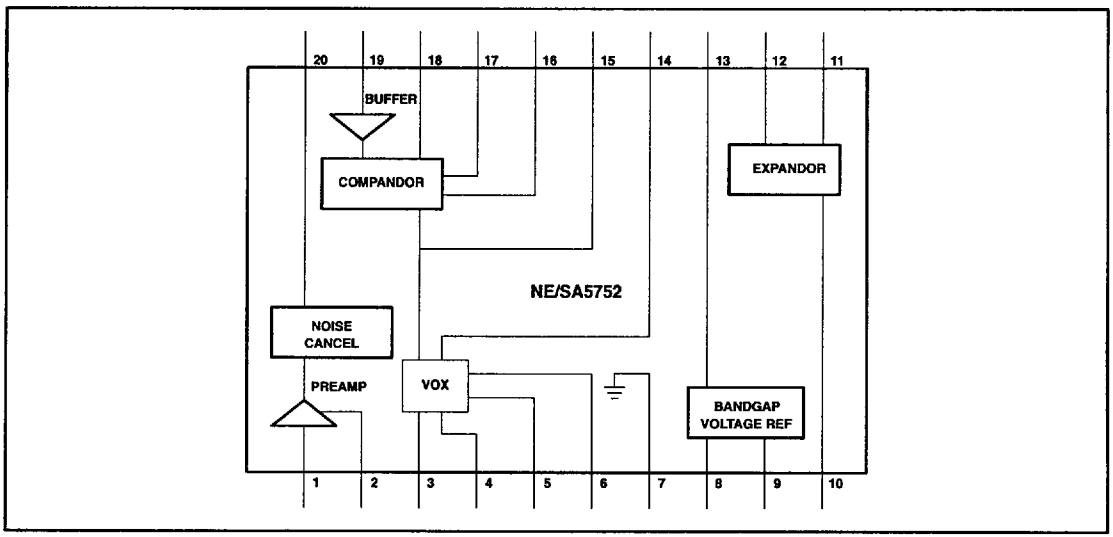
PIN DESCRIPTIONS

PIN NO.	SYMBOL	DESCRIPTION
1	MIC_{IN}	Microphone input
2	$PREAMP_{GRES}$	Preamplifier gain resistor
3	$RECT_{GRES}$	Reactifier gain resistor
4	$NCAN_{CAP}$	Noise cancellation timing capacitor
5	VOX_{OUT}	Voice operated transmission output
6	VOX_{TR}	Voice operated transmission threshold resistor
7	GND	Ground
8	V_{REF}	Reference voltage
9	V_{CC}	Positive supply
10	EXP_{CAP}	Expandor timing capacitor
11	EXP_{OUT}	Expandor output
12	EXP_{IN}	Expandor input
13	HPDN	Hardware power-down
14	VOX_{CTL}	Voice operated transmission control
15	$COMP_{CAP2}$	Compressor timing capacitor 2
16	$COMP_{OUT}$	Compressor output
17	$COMP_{CAP1}$	Compressor timing capacitor 1
18	$COMP_{CAP3}$	Compressor timing capacitor 3
19	$COMP_{IN}$	Compressor input
20	$NCAN_{OUT}$	Noise cancellation output

BLOCK DIAGRAM



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ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNIT
V_{CC}	Power supply voltage range	-0.3 to 6	V
V_{IN}	Voltage applied to any other pin	-0.3 to (V_{CC}+0.3)	V
T_{STG}	Storage temperature	-65 to +150	°C
T_A	Ambient operating temperature NE5752 SA5752	0 to 70 -40 to +85	°C

DC ELECTRICAL CHARACTERISTICS

T_A = 25°C, V_{CC} = +3.0V, 0dB = 77.5mV_{RMS}. See test circuit, Figure 4.

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX	
V_{CC}	Supply voltage		2.7	3.0	5.5	V
I_{CC}	Supply current	No signal Power down mode		5.0 200		mA µA
Z_L	Load impedance pins $NCAN_{OUT}$, EXP_{OUT}		50			kΩ
	$COMP_{OUT}$[1]		10			kΩ
Z_{IN}	Input impedance $COMP_{IN}$, MIC_{IN}		40	50	60	kΩ
	EXP_{IN}[2]		2.0			kΩ
	Noise cancellation current	Pin 6		25		µA
V_{OS}	DC offset $NCAN_{OUT}$[3]		-50		50	mV

NOTES:
1. Compressor is tested in production with 50kΩ load.
2. Not tested in production.
3. Offset values are identical for both gain states of noise reduction circuit.

AC ELECTRICAL CHARACTERISTICS

T_A = 25°C, V_{CC} = +3.0V, 0dB level = 77.5mV_{RMS}. See test circuit, Figure 4.

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX	
	Preamplifier gain range Preamplifoer voltage gain 0dB Preamplifier voltage gain 40dB	 Pin 2 open Pin 2 AC ground	0 -1.0 39.0	 0 40	40 1.0 41.0	dB dB dB
	Preamplifier noise density	Pin 2 AC grounded RS = 50kΩ unweighted 20Hz-20kHz		7		nV/√Hz
		weighted CCIR DIN45405 20-20kHz		8		nV/√Hz
	Switch amplifier gain		9	10	11	dB
Compandor 1kHz, all tests[1]						
$COMP_{OUT}$	Compressor error at -21dB output level	Input level = -42dB	-1.0		1.0	dB
$COMP_{OUT}$	Compressor error at -10dB output level	Input level = -20dB	-1.0		1.0	dB
$COMP_{OUT}$	Compressor error at 0dB output level	Input level = 0dB	-1.5		1.5	dB
$COMP_{OUT}$	Compressor error at +5dB output level	Input level = +10dB	-1.0		1.0	dB
$COMP_{OUT}$	Compressor error at +12.3dB output level	Input level = +24.6dB	-1.0		1.0	dB
EXP_{OUT}	Expandor error at -42dB output level	Input level = -21dB	-1.0		1.0	dB

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EXP_{OUT}	Expandor error at -21dB output level	Input level = -10.5dB	-1.0		1.0	dB
EXP_{OUT}	Expandor error at -10dB output level	Input level = -5dB	-1.0		1.0	dB

AC ELECTRICAL CHARACTERISTICS

T_A = 25°C, V_{CC} = +3.0V, 0dB level = 77.5mV_{RMS}. See test circuit, Figure 4.

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS MIN	LIMITS TYP	LIMITS MAX	UNIT
EXP_{OUT}	Expandor error at 0dB output level	Input level = 0dB	-1.5		1.5	dB
EXP_{OUT}	Expandor error at +10dB output level	Input level = +5dB	-1.0		1.0	dB
EXP_{OUT}	Expandor error at +24.6dB output level[2]	Input level = +12.3dB	-1.0		1.0	dB
EXP_{OUT}	Expandor V_{OS}	No signal	-50.0		50.0	mV
EXP_{OUT}	Expandor output DC shift	No signal to 0dB	-100		100	mV
	Timing capacitors compandor			2200		nF
THD	Total harmonic distortion					
	Compressor	1kHz, 0dB			1	%
	Expandor	1kHz, 0dB			1	%
	$NCAN_{OUT}$	1kHz. Pin 2 open output level = 0dB			1	%
		1kHz, Pin 2 open output level = +25dB			1	%
VOX_{OUT}	Sink current				0.5	mA
	Low level High level	Open collector I_L = 0.5mA		 V_{CC}	0.4	V V
VOX_{CTL}	Input current Low		-50		0	µA
	High		-10		+10	µA
	Input level Low High		0 0.7V_{CC}		0.3V_{CC} V_{CC}	V V
H_{PDN}	Input current Low		-10		+10	µA
	High		-10		+10	µA
	Input level Low High		0 0.7V_{CC}		0.3V_{CC} V_{CC}	V 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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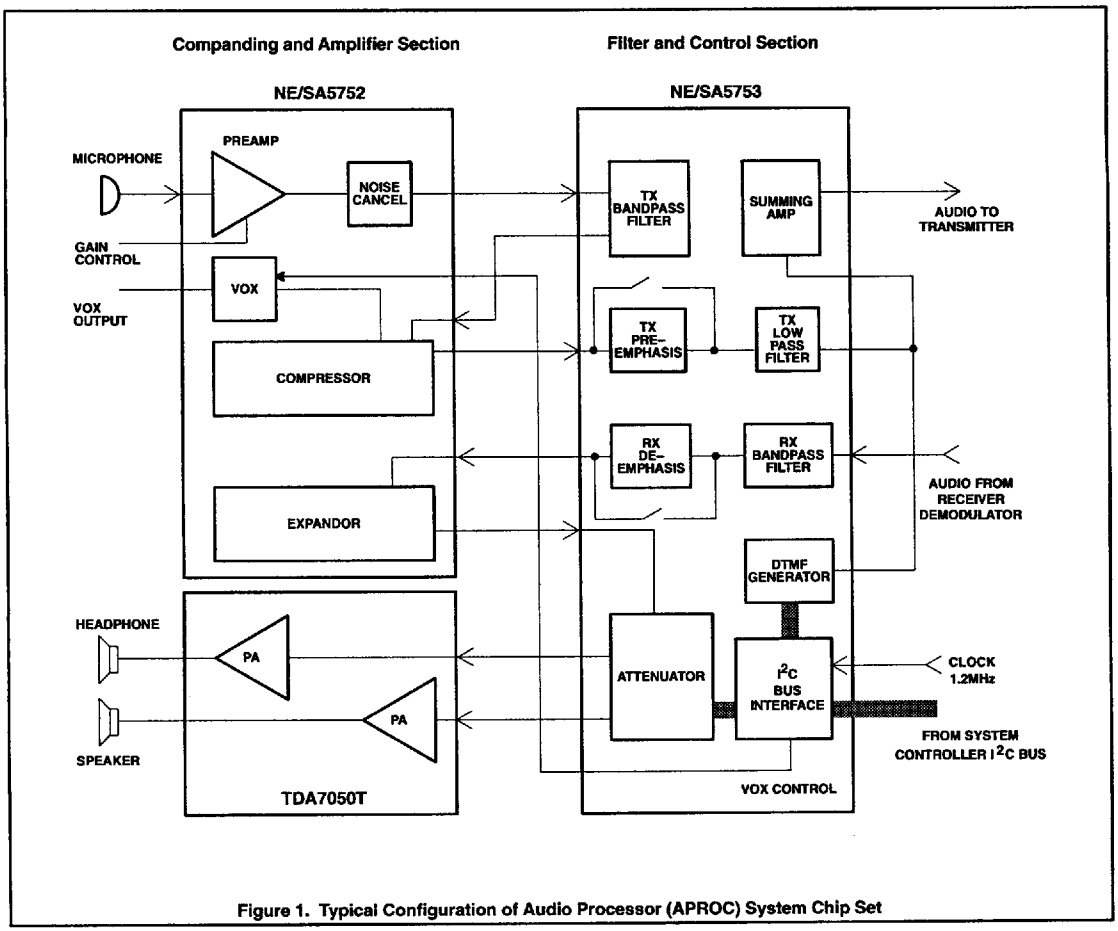

Figure 1. Typical Configuration of Audio Processor (APROC) System Chip Set

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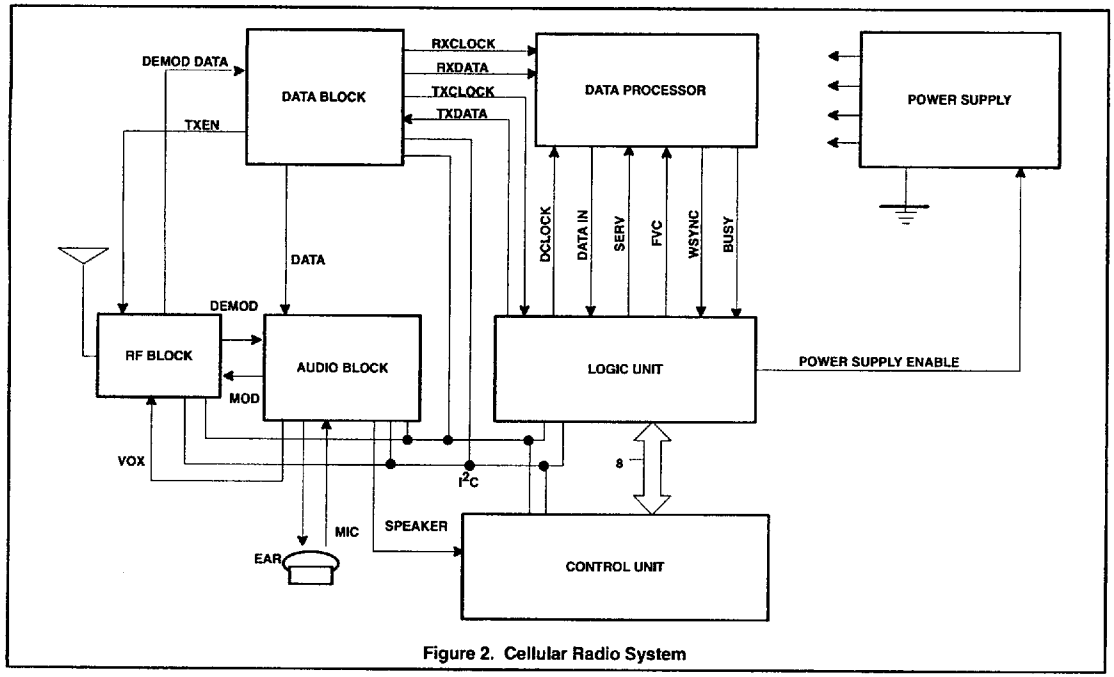

Figure 2. Cellular Radio System

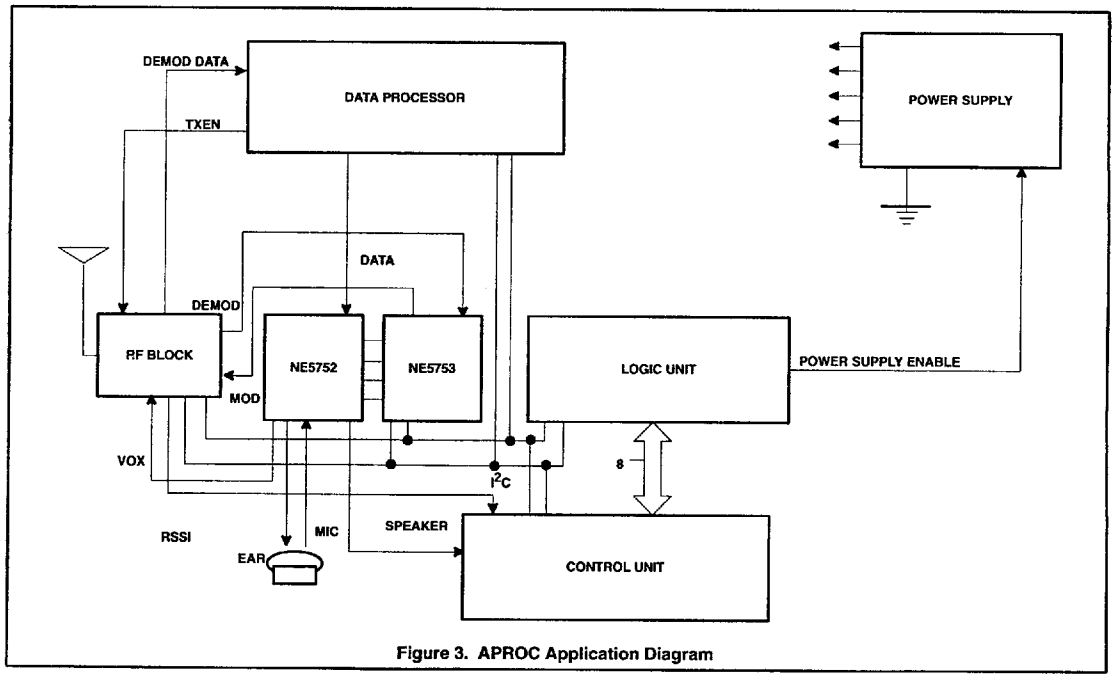

Figure 3. APROC Application Diagram

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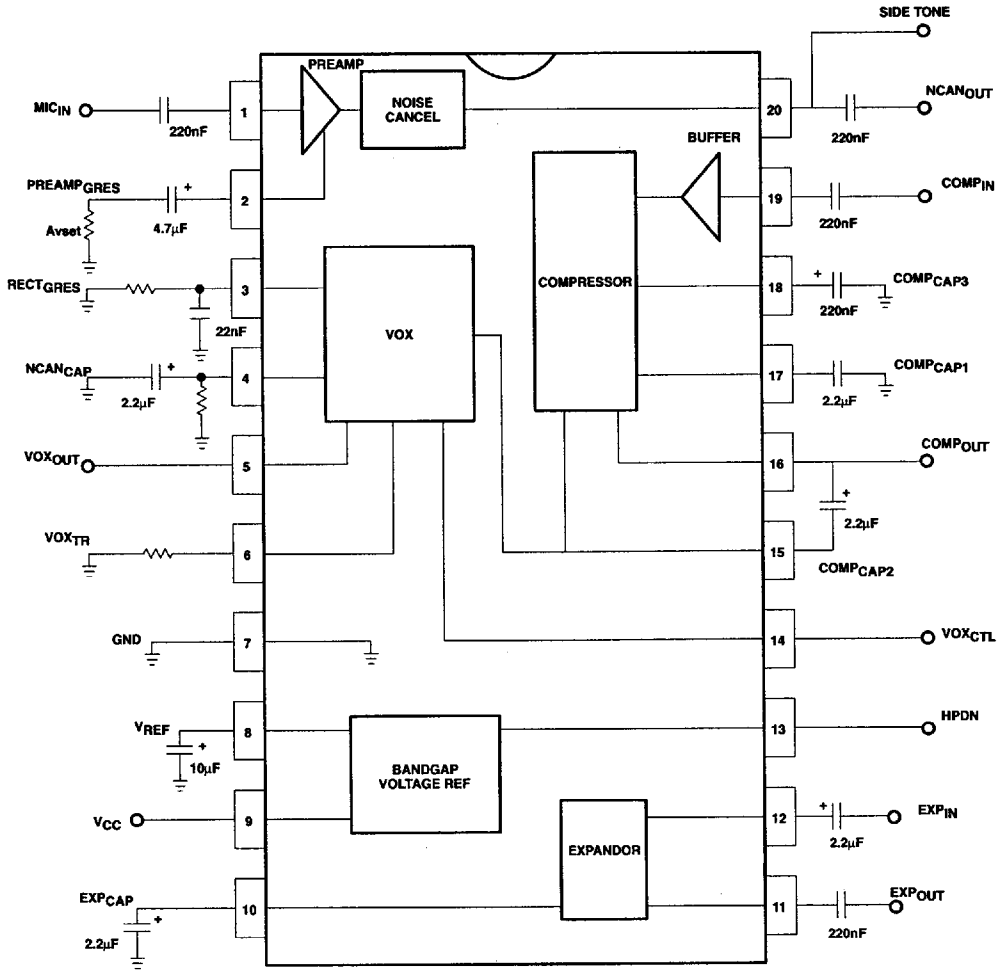

Figure 4. NE/SA5752 Test and Application Circuit

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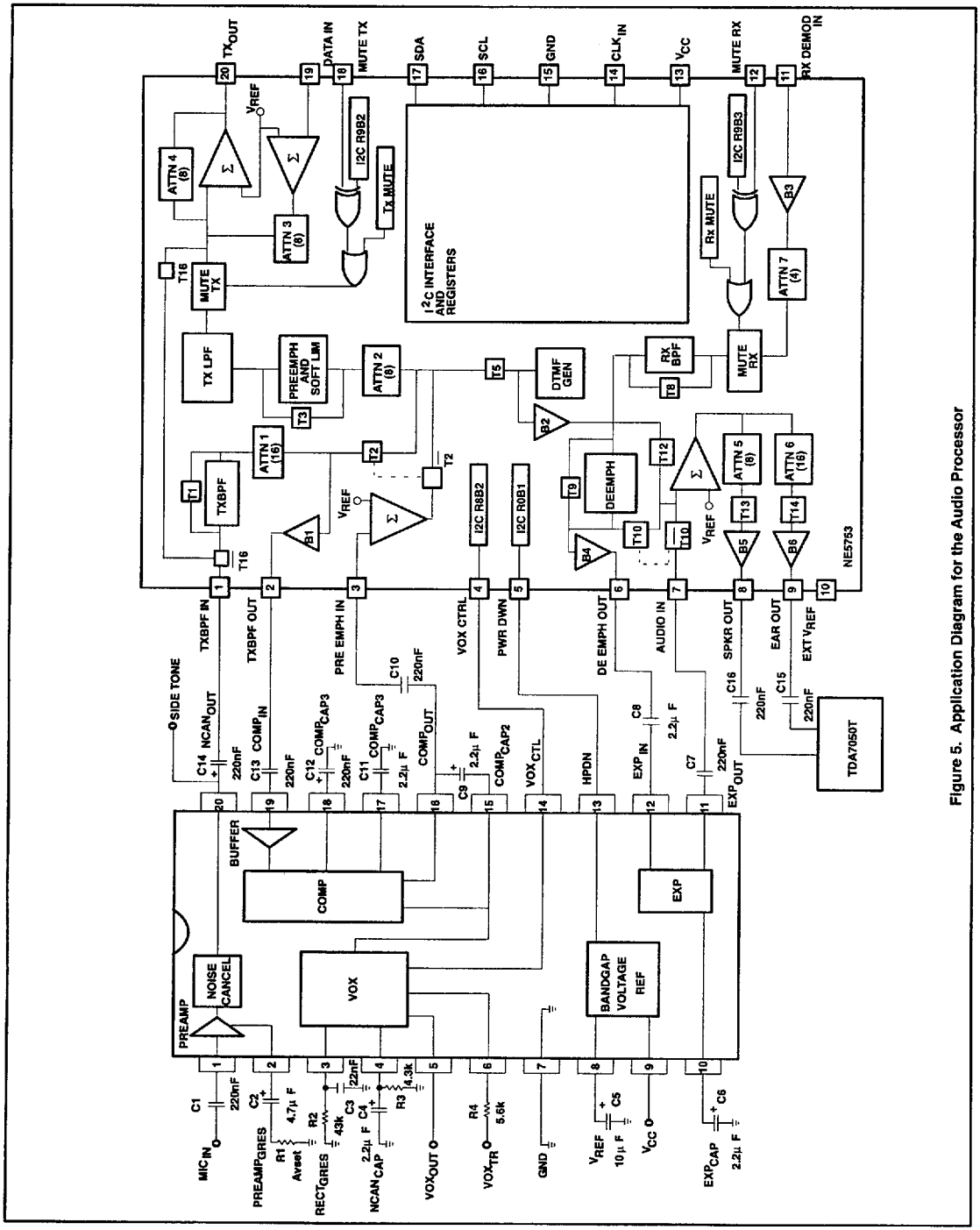

Figure 5. Application Diagram for the Audio Processor