

# DATA SHEET

## **SA5752**

Audio processor – companding, VOX and amplifier section

Product Specification  
Replaces data of December 6, 1993  
IC17 Data Handbook

1997 Nov 07

**Philips Semiconductors**



**PHILIPS**

# Audio processor – companding, VOX and amplifier section

# SA5752

## DESCRIPTION

The 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 SA5752 subsystem includes 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, and an internal bandgap voltage regulator with power down capability. When used with Philips Semiconductors' 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 SA5752 can also be used without the SA5753 in a wide variety of radio communications applications.

## FEATURES

- Operating voltage range: 2V to 5.5V
- Miniature SSOP
- 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

## ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE	DWG #
20-Pin Plastic Shrink Small Outline Package (SSOP)	-40 to +85°C	SA5752DK	SOT266-1

## PIN CONFIGURATION

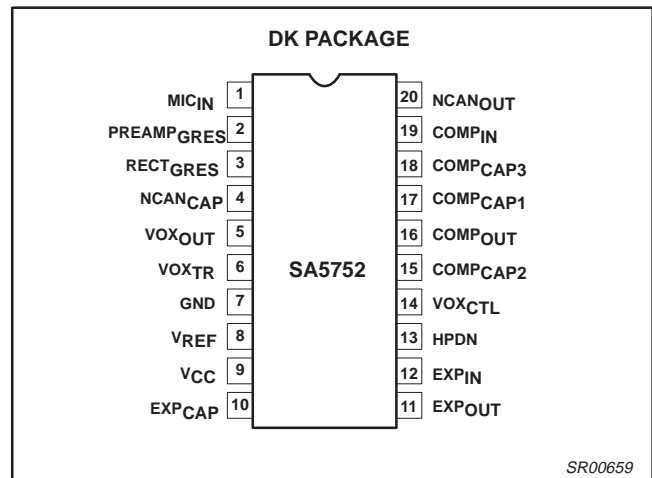


Figure 1. Pin Configuration

## 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

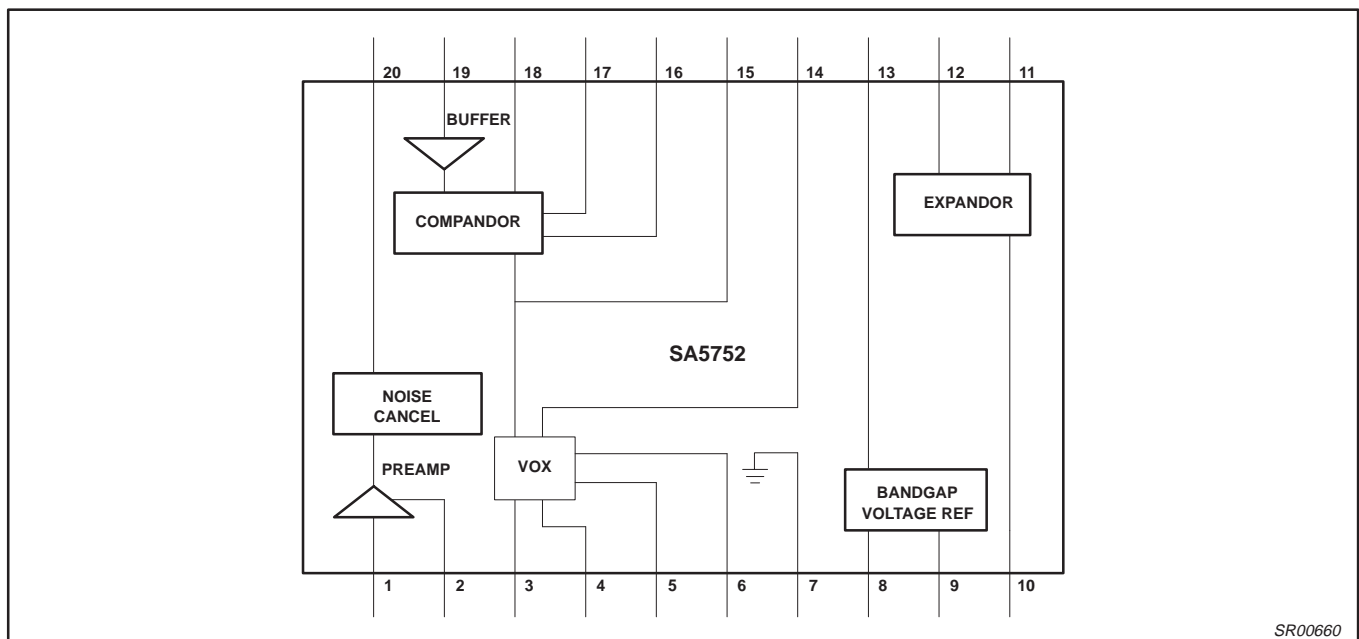
# Audio processor – companding, VOX and amplifier section

SA5752

## 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>TR</sub>	Voice operated transmission threshold resistor
7	GND	Ground
8	V <sub>REF</sub>	Reference voltage
9	V <sub>CC</sub>	Positive supply
10	EXP <sub>CAP</sub>	Expander timing capacitor
11	EXP <sub>OUT</sub>	Expander output
12	EXP <sub>IN</sub>	Expander input
13	HPDN	Hardware power-down
14	VOX <sub>CTL</sub>	Voice operated transmission control
15	COMP <sub>CAP2</sub>	Compressor capacitor 2 DC block
16	COMP <sub>OUT</sub>	Compressor output
17	COMP <sub>CAP1</sub>	Compressor timing capacitor 1
18	COMP <sub>CAP3</sub>	Compressor capacitor 3 DC block
19	COMP <sub>IN</sub>	Compressor input
20	NCAN <sub>OUT</sub>	Noise cancellation output

## BLOCK DIAGRAM



SR00660

Figure 2. Block Diagram

## Audio processor – companding, VOX and amplifier section

SA5752

## ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNIT
V <sub>CC</sub>	Power supply voltage range	-0.3 to 6	V
V <sub>IN</sub>	Voltage applied to any other 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	-40 to +85	°C

## DC ELECTRICAL CHARACTERISTICS

T<sub>A</sub> = 25°C, V<sub>CC</sub> = +3.0V, 0dB = 77.5mV<sub>RMS</sub>. See test circuit, Figure 6.

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX	
V <sub>CC</sub>	Supply voltage		2.7 <sup>4</sup>	3.0	5.5	V
I <sub>CC</sub>	Supply current	No signal Power down mode		3.1 125	4.0	mA µA
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>		40	50	60	kΩ
	EXP <sub>IN</sub> <sup>2</sup>		2.0			kΩ
	Noise cancellation current	Pin 6		25		µA
V <sub>OS</sub>	DC offset NCAN <sub>OUT</sub> <sup>3</sup>		-50	-3.0	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.
- Operational down to V<sub>CC</sub> = 2V.

## AC ELECTRICAL CHARACTERISTICS

T<sub>A</sub> = 25°C, V<sub>CC</sub> = +3.0V, 0dB level = 77.5mV<sub>RMS</sub>. See test circuit, Figure 6.

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX	
	Preamplifier gain range Preamplifier 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
<b>Compondor 1kHz, all tests<sup>1</sup></b>						
COMP <sub>OUT</sub>	Compressor error at -21dB output level	Input level = -42dB	-1.0	-0.16	1.0	dB
COMP <sub>OUT</sub>	Compressor error at -10dB output level	Input level = -20dB	-1.0	-0.11	1.0	dB
COMP <sub>OUT</sub>	Compressor error at 0dB output level	Input level = 0dB	-1.5	+0.1	1.5	dB
COMP <sub>OUT</sub>	Compressor error at +5dB output level	Input level = +10dB	-1.0	+0.04	1.0	dB
COMP <sub>OUT</sub>	Compressor error at +10dB output level	Input level = +20dB	-1.0	+0.02	1.0	dB
EXP <sub>OUT</sub>	Expander error at -42dB output level	Input level = -21dB	-1.0	-0.12	1.0	dB
EXP <sub>OUT</sub>	Expander error at -21dB output level	Input level = -10.5dB	-1.0	+0.1	1.0	dB
EXP <sub>OUT</sub>	Expander error at -10dB output level	Input level = -5dB	-1.0	+0.03	1.0	dB

## Audio processor – companding, VOX and amplifier section

SA5752

**AC ELECTRICAL CHARACTERISTICS** (Continued)

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX	
EXP <sub>OUT</sub>	Expander error at 0dB output level	Input level = 0dB	-1.5	-0.2	1.5	dB
EXP <sub>OUT</sub>	Expander error at +10dB output level	Input level = +5dB	-1.0	+0.03	1.0	dB
EXP <sub>OUT</sub>	Expander error at +20dB output level <sup>2</sup>	Input level = +10dB	-1.0	-0.1	1.0	dB
EXP <sub>OUT</sub>	Expander V <sub>OS</sub>	No signal	-50.0	+3.0	50.0	mV
EXP <sub>OUT</sub>	Expander output DC shift	No signal to 0dB	-100	+2.0	100	mV
	Timing capacitors compandor			2200		nF
THD	Total harmonic distortion					
	Compressor	1kHz, 0dB BW=300-3kHz		0.2	1	%
	Expander	1kHz, 0dB BW=300-3kHz		0.1	1	%
	NCAN <sub>OUT</sub>	1kHz, Pin 2 open output level = 0dB			0.02	1
1kHz, Pin 2 open output level = +20dB				0.06	1	%
VOX <sub>OUT</sub>	Sink current				0.5	mA
	Low level High level	Open collector I <sub>L</sub> = 0.5mA		V <sub>CC</sub>	0.4	V V
VOX <sub>CTL</sub>	Input current	Low	-50	-6.6	0	μA
		High	-10	-0.02	+10	μA
	Input level	Low High	0 0.7V <sub>CC</sub>		0.3V <sub>CC</sub> V <sub>CC</sub>	V V
H <sub>P</sub> DN	Input current	Low	-10	-4.1	+10	μA
		High	-10	-0.2	+10	μA
	Input level	Low High	0 0.7V <sub>CC</sub>		0.3V <sub>CC</sub> V <sub>CC</sub>	V V
	Reference filter capacitor			10		μF

**NOTE:**

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

# Audio processor – companding, VOX and amplifier section

SA5752

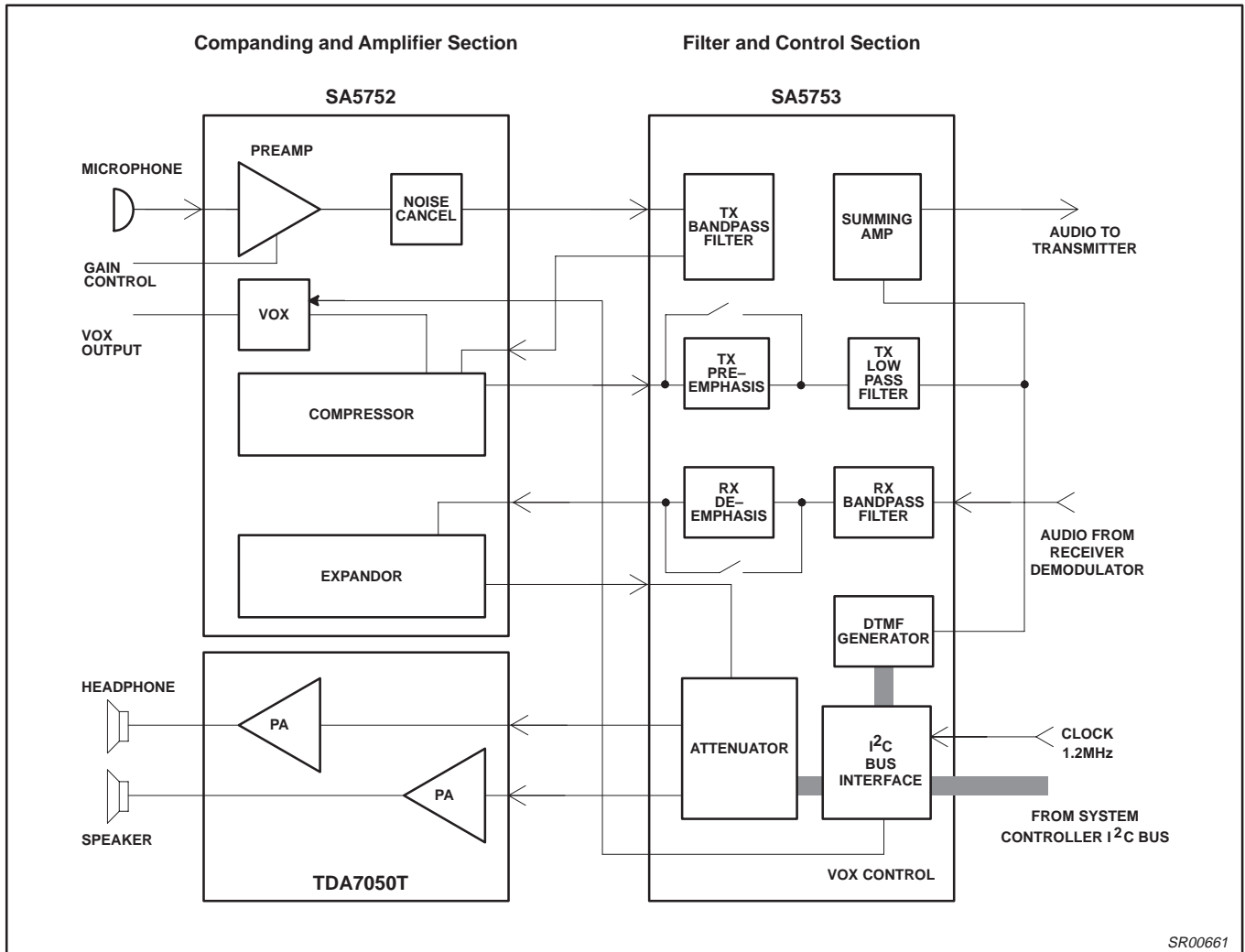


Figure 3. Typical Configuration of Audio Processor (APROC) System Chip Set

# Audio processor – companding, VOX and amplifier section

SA5752

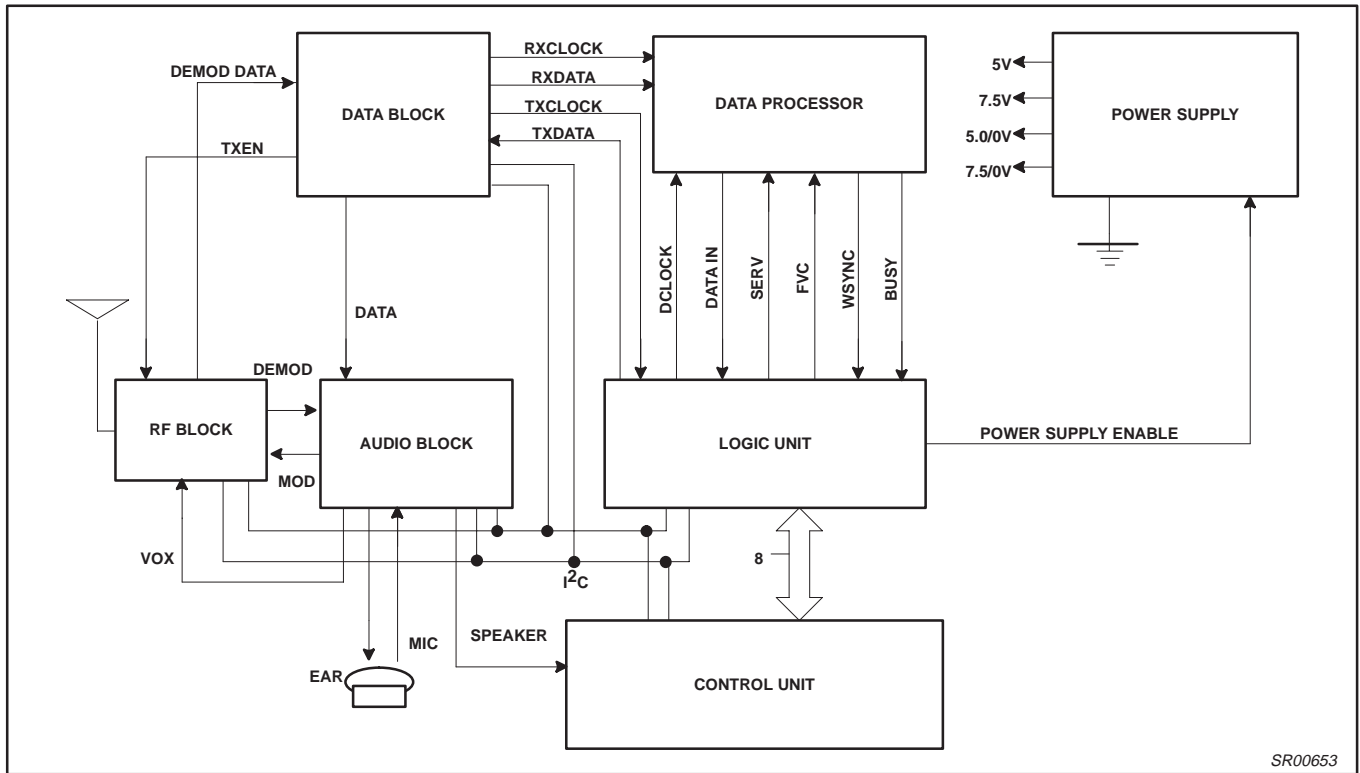


Figure 4. Cellular Radio System

SR00653

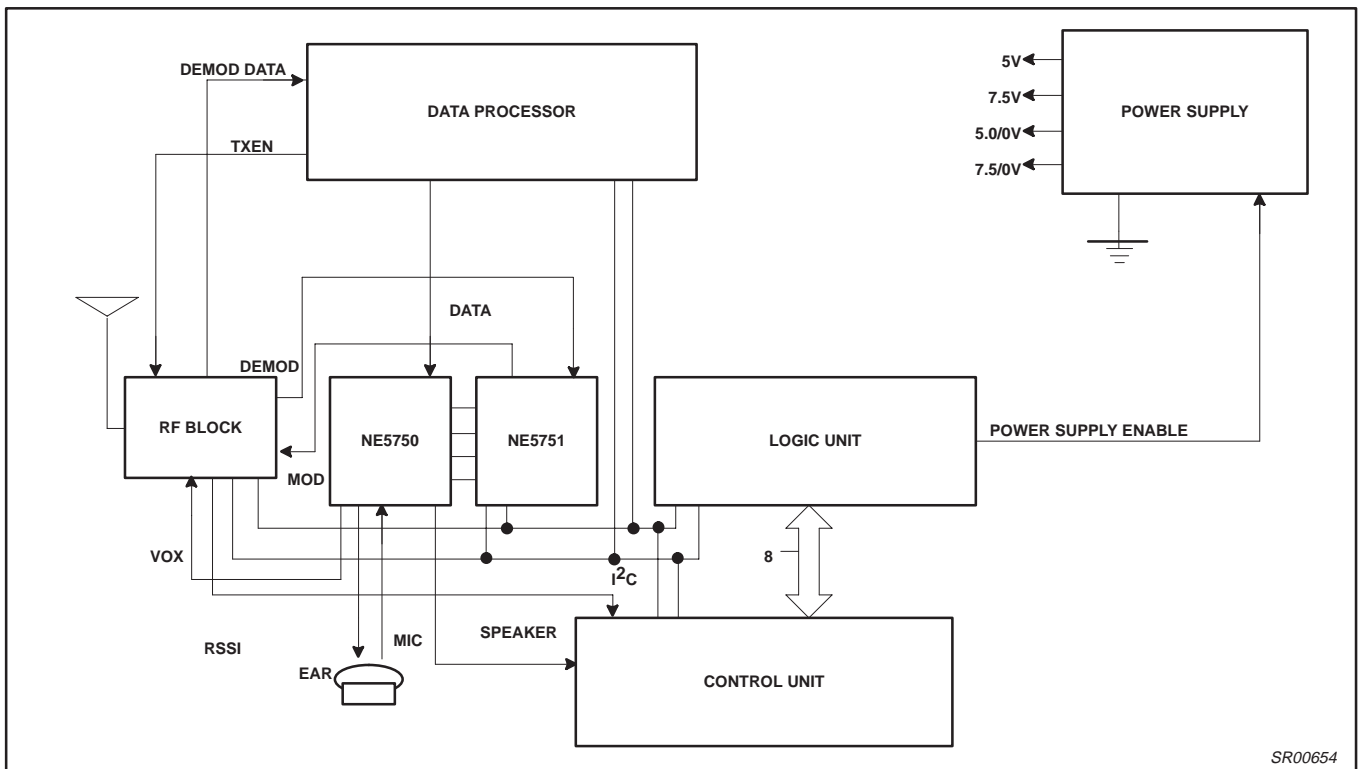


Figure 5. APROC Application Diagram

SR00654

Audio processor – companding, VOX and amplifier section

SA5752

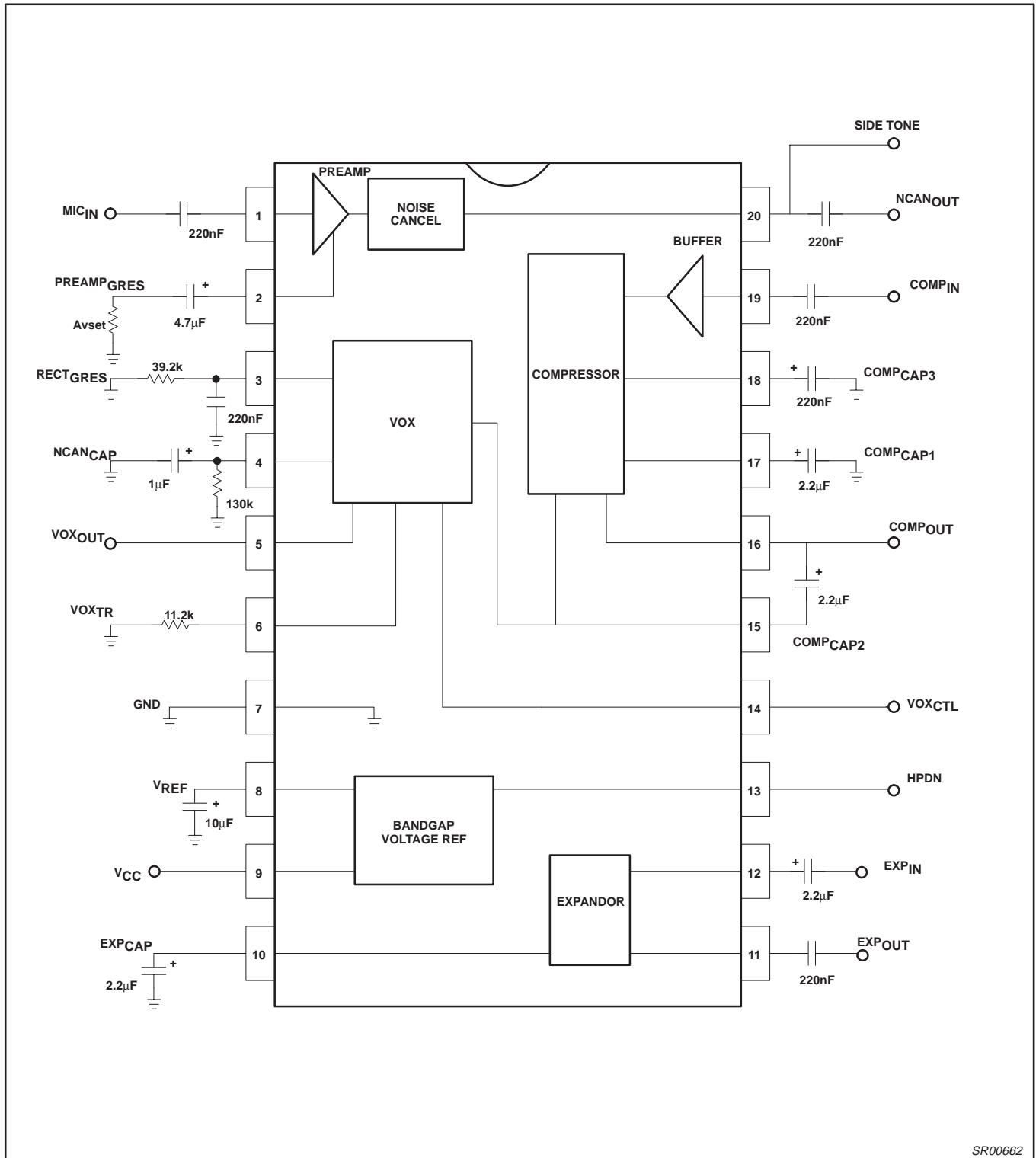


Figure 6. SA5752 Test and Application Circuit

SR00662



# Audio processor – companding, VOX and amplifier section

SA5752

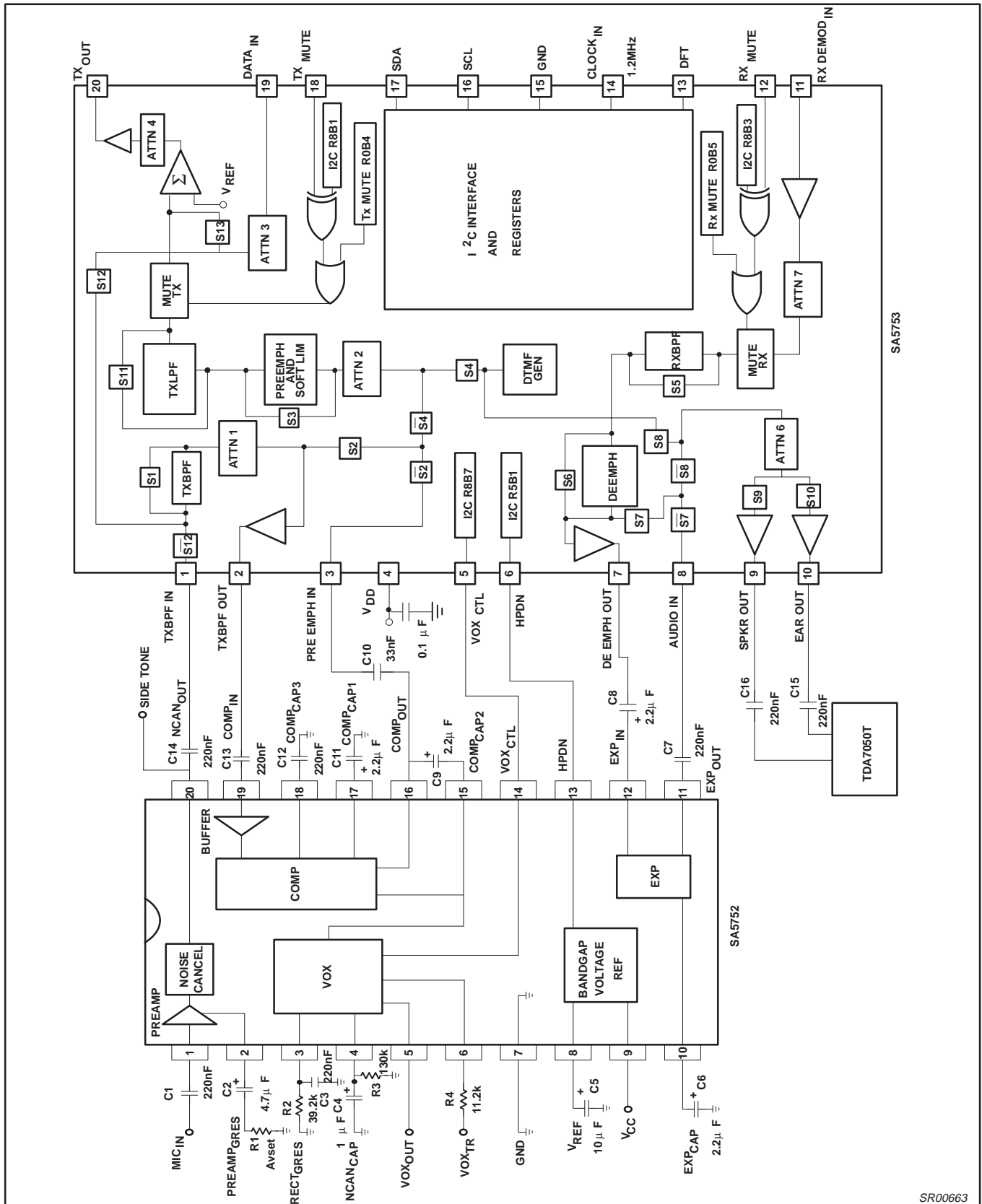
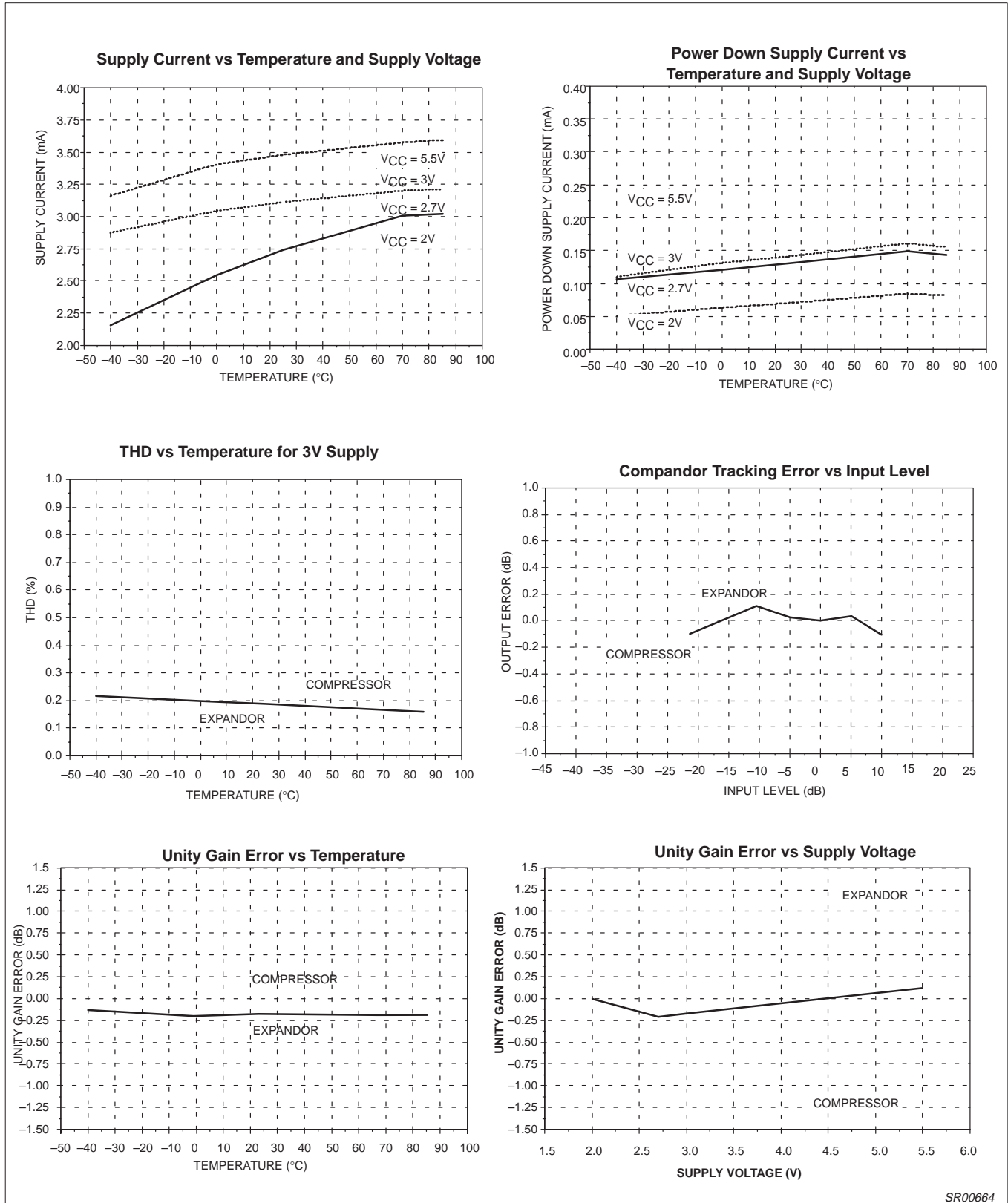


Figure 7. Application Diagram for the Audio Processor

Audio processor – companding, VOX and amplifier section

SA5752

TYPICAL PERFORMANCE CHARACTERISTICS



SR00664

Figure 8. Typical Performance Characteristics

Audio processor – companding, VOX and amplifier section

SA5752

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

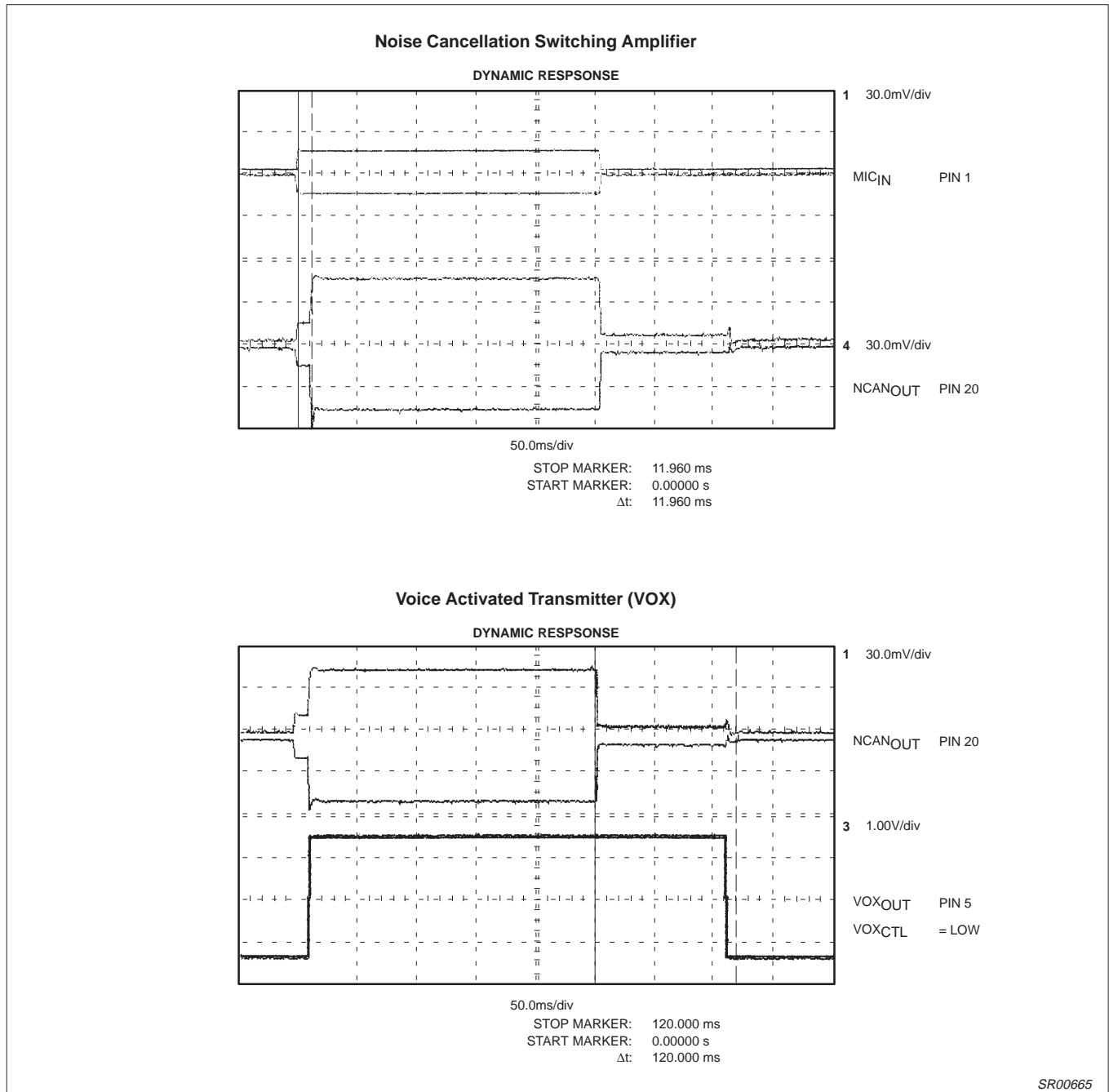


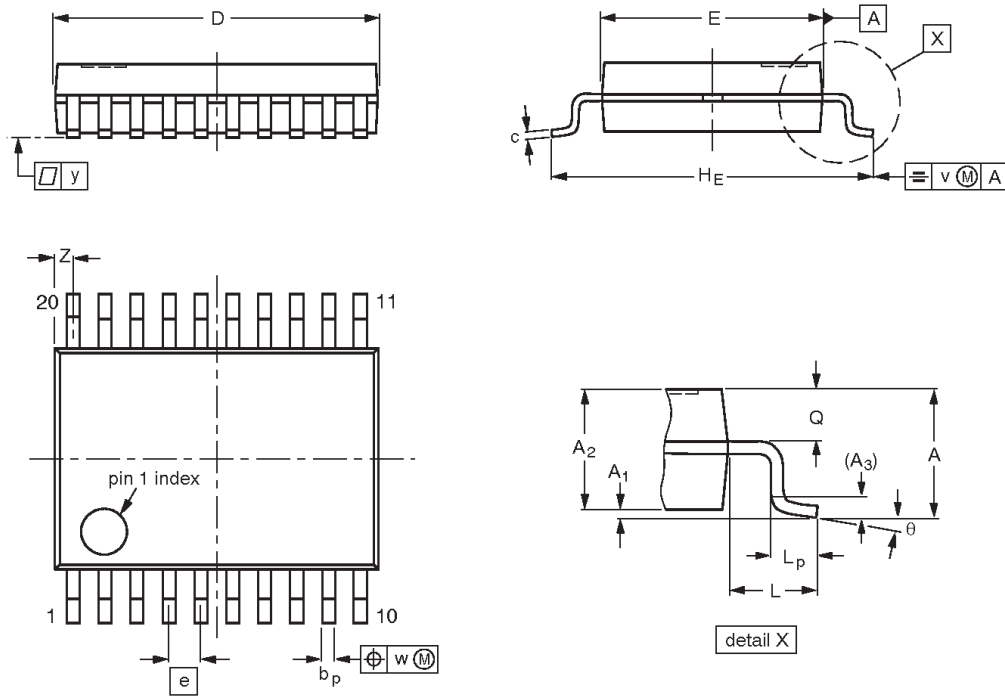
Figure 9. Typical Performance Characteristics (cont.)

Audio processor — companding, VOX and amplifier section

SA5752

SSOP20: plastic shrink small outline package; 20 leads; body width 4.4 mm

SOT266-1



**DIMENSIONS (mm are the original dimensions)**

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	1.5	0.15 0	1.4 1.2	0.25	0.32 0.20	0.20 0.13	6.6 6.4	4.5 4.3	0.65	6.6 6.2	1.0	0.75 0.45	0.65 0.45	0.2	0.13	0.1	0.48 0.18	10° 0°

**Note**

1. Plastic or metal protrusions of 0.20 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT266-1						90-04-05 95-02-25

## Audio processor — companding, VOX and amplifier section

SA5752

## DEFINITIONS

Data Sheet Identification	Product Status	Definition
<i>Objective Specification</i>	<b>Formative or in Design</b>	This data sheet contains the design target or goal specifications for product development. Specifications may change in any manner without notice.
<i>Preliminary Specification</i>	<b>Preproduction Product</b>	This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
<i>Product Specification</i>	<b>Full Production</b>	This data sheet contains Final Specifications. Philips Semiconductors reserves the right to make changes at any time without notice, in order to improve design and supply the best possible product.

Philips Semiconductors and Philips Electronics North America Corporation reserve the right to make changes, without notice, in the products, including circuits, standard cells, and/or software, described or contained herein in order to improve design and/or performance. Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no license or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified. Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

## LIFE SUPPORT APPLICATIONS

Philips Semiconductors and Philips Electronics North America Corporation Products are not designed for use in life support appliances, devices, or systems where malfunction of a Philips Semiconductors and Philips Electronics North America Corporation Product can reasonably be expected to result in a personal injury. Philips Semiconductors and Philips Electronics North America Corporation customers using or selling Philips Semiconductors and Philips Electronics North America Corporation Products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors and Philips Electronics North America Corporation for any damages resulting from such improper use or sale.

**Philips Semiconductors**  
**811 East Arques Avenue**  
**P.O. Box 3409**  
**Sunnyvale, California 94088-3409**  
**Telephone 800-234-7381**

© Copyright Philips Electronics North America Corporation 1997  
 All rights reserved. Printed in U.S.A.

*Let's make things better.*

**Philips**  
**Semiconductors**



**PHILIPS**