

# DATA SHEET

## **SA578**

Unity gain level programmable low power  
compandor

Product specification  
Replaces data of 1993 December 15  
IC17 Data Handbook

1997 Nov 07

**Philips Semiconductors**



**PHILIPS**

# Unity gain level programmable low power compandor

# SA578

## DESCRIPTION

The SA578 is a unity gain level programmable compandor designed for low power applications. The SA578 is internally configured as an expander and a compressor to minimize external component count.

The summing amplifiers of the SA578 have 600Ω drive capability and the inverting input of the compressor amplifier is accessible through Pin 9 for summing multiple external signals. Power Down/Mute function is active low and requires an open collector output logic configuration at Pin 8. If Power Down/Mute is not needed, Pin 8 should be left open. When the part is muted, supply current drops to 170mA at 3.6V.

## FEATURES

- Operating voltage range: 1.8V to 7V
- Low power consumption (1.4mA @ 3.6V)
- 0dB level programmable (10mV<sub>RMS</sub> to 1.0V<sub>RMS</sub>)
- Over 90dB of dynamic range
- Wide input/output swing capability
- Low external component count
- SA578 meets cellular radio specifications
- ESD hardened
- Power Down mode (I<sub>CC</sub> = 170μA @ 3.6V)
- Mute function
- Multiple external summing capability
- 600Ω drive capability

## PIN CONFIGURATION

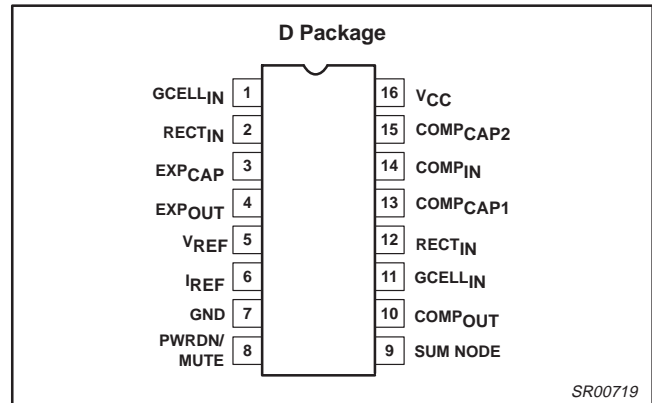


Figure 1. Pin Configuration

## APPLICATIONS

- High performance portable communications
- Cellular radio
- Cordless telephone
- Consumer audio
- Wireless microphones
- Modems
- Electric organs
- Hearing aids
- Automatic level control (ALC)

## ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE	DWG #
16-Pin Plastic Small Outline (SO)	-40 to +85°C	SA578D	SOT109-1

## ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNITS
		SA578	
V <sub>CC</sub>	Supply voltage	8	V
T <sub>A</sub>	Operating ambient temperature range	-40 to +85	°C
T <sub>STG</sub>	Storage temperature range	-65 to +150	°C
θ <sub>JA</sub>	Thermal impedance SO	125	°C/W

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## BLOCK DIAGRAM and TEST AND APPLICATION CIRCUIT

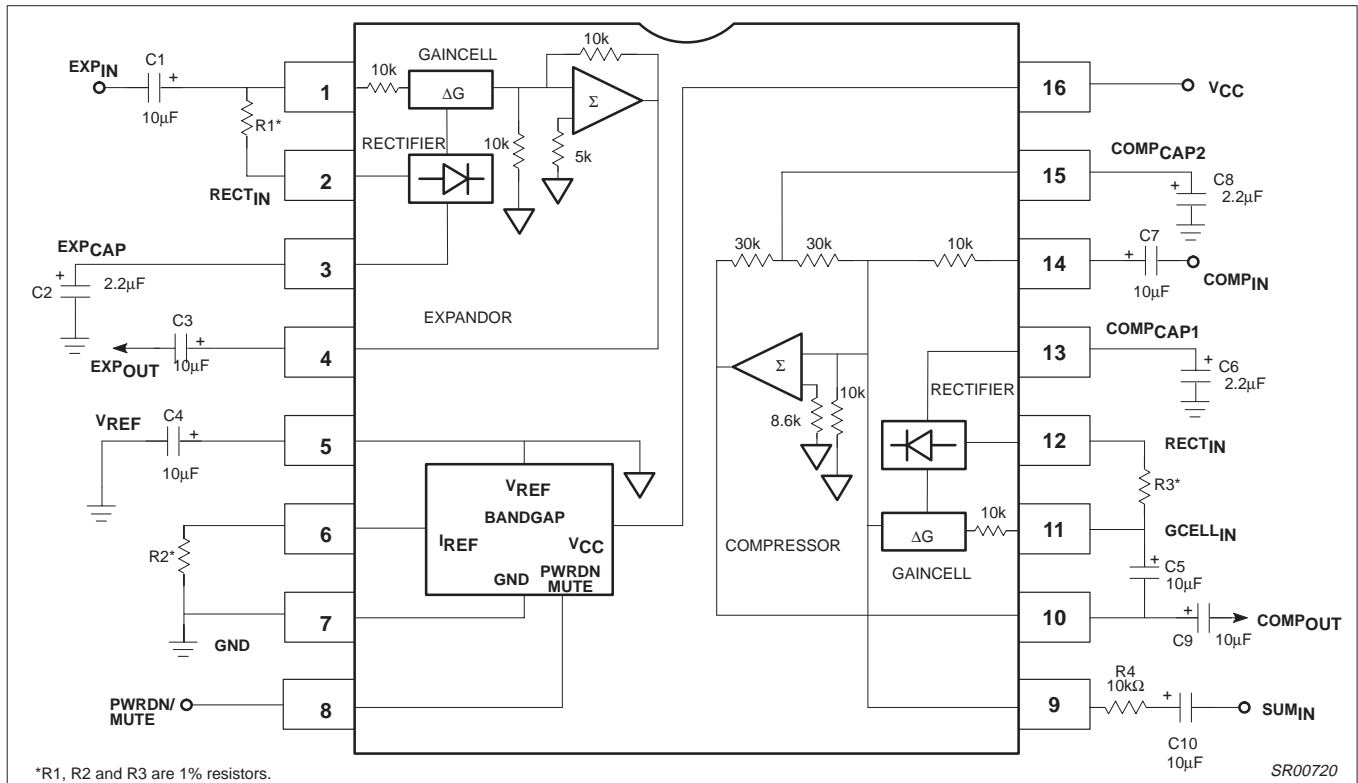


Figure 2. Block Diagram and Test and Application Circuit

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**ELECTRICAL CHARACTERISTICS**

$T_A = 25^\circ\text{C}$ ,  $V_{CC} = 3.6\text{VDC}$ , compandor 0dB level =  $-20\text{dBV} = 100\text{mV}_{\text{RMS}}$ , output load  $R_L = 10\text{k}\Omega$ , Freq = 1kHz, unless otherwise specified. R1, R2 and R3 are 1% resistors.

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNITS
			SA578			
			MIN	TYP	MAX	
$V_{CC}$	Supply voltage <sup>1</sup>		2	3.6	7	V
$I_{CC}$	Supply current operating power down	No signal, $R_2 = 100\text{k}\Omega$		1.4 170	2	mA $\mu\text{A}$
$V_{REF}$	Reference voltage <sup>2</sup>	$V_{CC} = 3.6\text{V}$	1.7	1.8	1.9	V
$R_L$	Summing amp minimum output load			600		$\Omega$
THD	Total harmonic distortion	1kHz, 0dB, BW = 3.5kHz		0.25	1.0	%
$E_{NO}$	Expandor output noise voltage	BW = 20kHz, $R_S = 0\Omega$		10	20	$\mu\text{V}$
0dB	Unity gain level	0dB at 1kHz	-1.0	0.18	1.0	dB
	Programmable range <sup>3</sup>	$R_1 = R_3 = 18.7\text{k}\Omega$ , $R_2 = 24.3\text{k}\Omega$		0		dBV
		$R_1 = R_3 = 22.6\text{k}\Omega$ , $R_2 = 100\text{k}\Omega$		-10		
		$R_1 = R_3 = 7.15\text{k}\Omega$ , $R_2 = 100\text{k}\Omega$		-20		
		$R_1 = R_3 = 1.33\text{k}\Omega$ , $R_2 = 200\text{k}\Omega$		-40		
$V_{OS}$	Output voltage offset	No signal	-150	1	150	mV
	Expandor output DC shift	No signal to 0dB	-100	7	100	mV
	Tracking error relative to 0dB output	-20dB expandor	-1.0	0.3	1.0	dB
	Crosstalk, COMP to EXP	1kHz, 0dB, $C_{REF} = 10\mu\text{F}$		-80	-65	dB
$V_O$	Output swing low			0.2		V
	Output swing high			$V_{CC} - 0.2$		
	Power Down/Mute low level		0		0.4	V
	Power Down/Mute input current	Pin 8 grounded		-65		$\mu\text{A}$

**NOTE:**

1. Operation down to  $V_{CC} = 1.8\text{V}$  is possible.
2. Reference voltage,  $V_{REF}$ , is typically at  $1/2 V_{CC}$ .
3. Unity gain level can be adjusted CONTINUOUSLY between  $-40\text{dBV} = 10\text{mV}_{\text{RMS}}$  and  $0\text{dBV} = 1.0\text{V}_{\text{RMS}}$ . For details see application note AN1762.

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## TYPICAL PERFORMANCE CHARACTERISTICS

$V_{CC} = 3.6V$ ,  $T_A = 25^\circ C$ ,  $R_1=R_3=7.15k\Omega$ ,  $R_2=100k\Omega$ , 0dB level = 100mV, Freq. = 1kHz

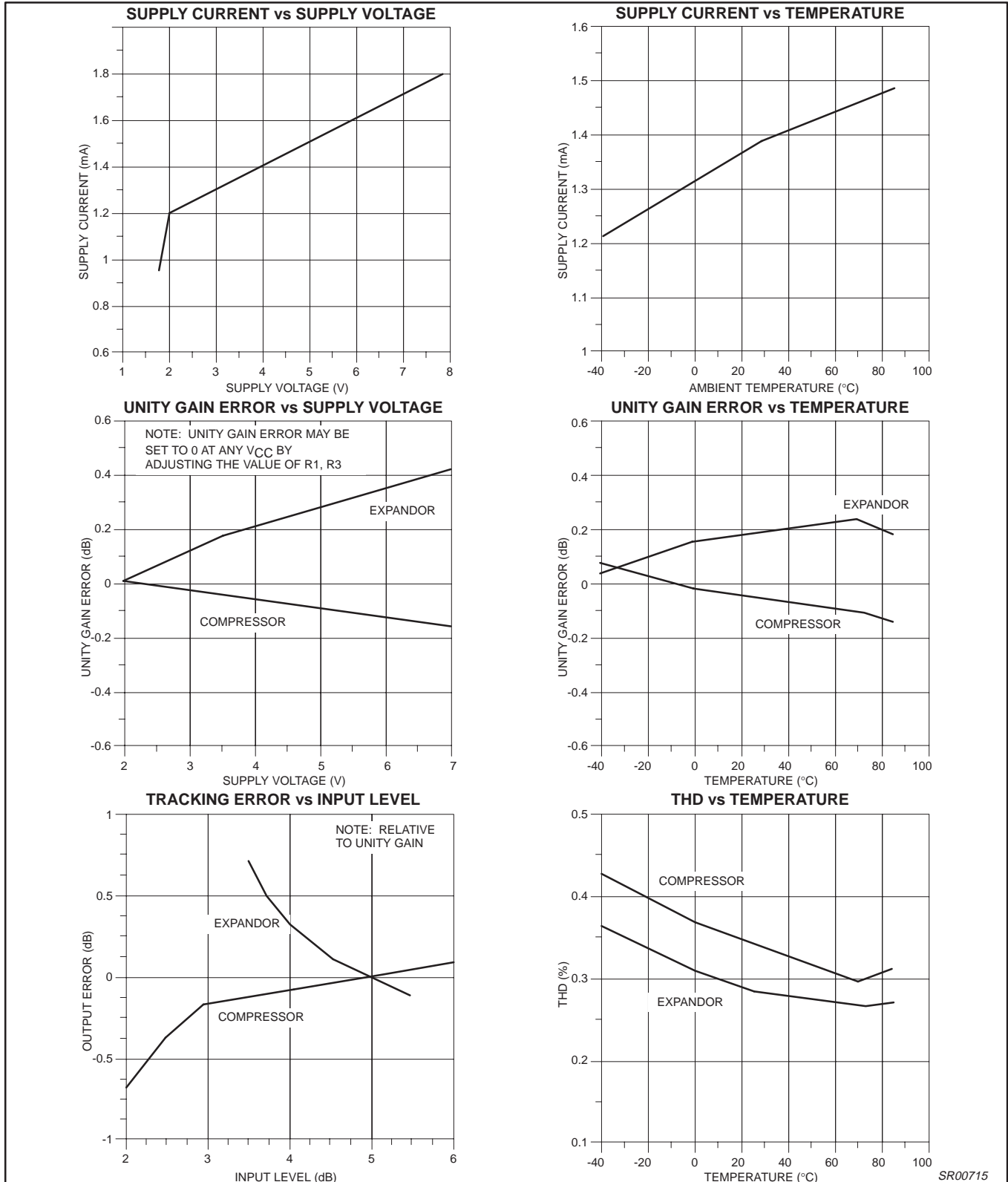


Figure 3. Typical Performance Characteristics

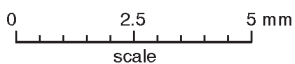
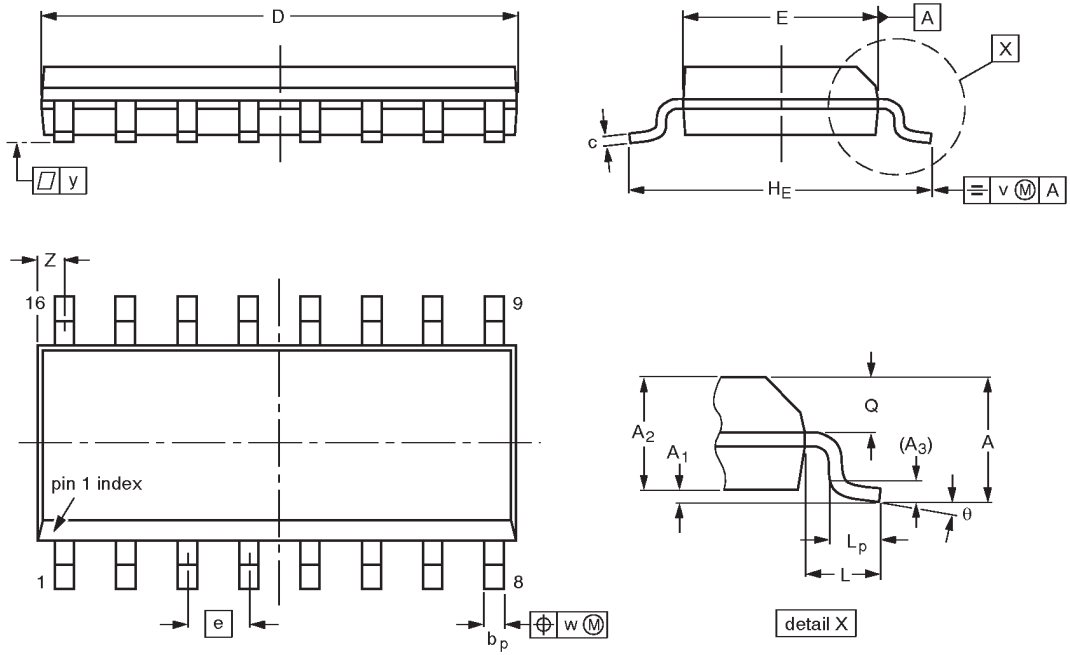
SR00715

# Unity gain level programmable low power compandor

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SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1



**DIMENSIONS (inch dimensions are derived from the original mm 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	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	10.0 9.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.0098 0.0039	0.057 0.049	0.01	0.019 0.014	0.0098 0.0075	0.39 0.38	0.16 0.15	0.050	0.24 0.23	0.041	0.039 0.016	0.028 0.020	0.01	0.01	0.004	0.028 0.012	

**Note**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT109-1	076E07S	MS-012AC				91-08-13 95-01-23

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## 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.

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