

# DATA SHEET

**SA576**

Low power compandor

Product specification

1997 Aug 14

IC17 Data Handbook

# Low power compandor

# SA576

## DESCRIPTION

The SA576 is a unity gain level programmable compandor designed for low power applications. The SA576 is internally configured as an expander and a compressor to minimize external component count.

The SA576 can operate at 1.8V. During normal operations, the SA576 can operate from at least a 2V battery. If the battery voltage drops to 1.8V, this part will still continue to function, however, turning on the part at a  $V_{CC}$  of 1.8V requires two external resistors to bring  $V_{REF}$  to half  $V_{CC}$ . One resistor connects between  $V_{CC}$  and  $V_{REF}$ ; the other connects from  $V_{REF}$  to ground. A typical value for these external resistors is approximately 20k. A lower value can be used, but the power consumption will go up.

The SA576 is available in a 14-pin plastic DIP and SO packages.

## FEATURES

- Operating voltage range: 1.8V to 7V
- Low power consumption (1.4mA @ 3.6V)
- Over 80dB of dynamic range
- Wide input/output swing capability (rail-to-rail)
- Low external component count
- ESD hardened

## PIN CONFIGURATION

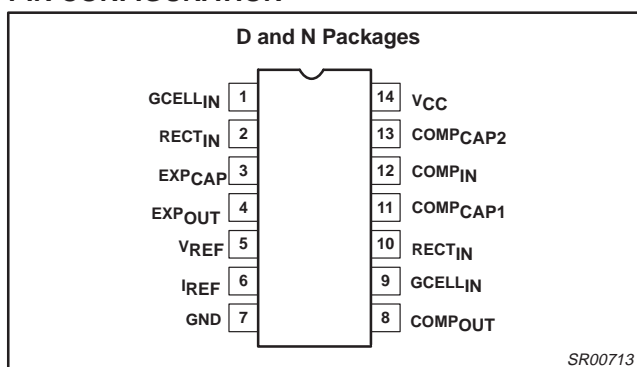


Figure 1. Pin Configuration

## APPLICATIONS

- Cordless telephone
- Consumer audio
- Wireless microphones
- Modems
- Electric organs
- Hearing aids
- Automatic level control

## ORDERING INFORMATION

| DESCRIPTION                               | TEMPERATURE RANGE | ORDER CODE | DWG #    |
|---|-------------------|------------|----------|
| 14-Pin Plastic Dual In-Line Package (DIP) | -40 to +85°C      | SA576N     | SOT27-1  |
| 14-Pin Plastic Small Outline (SO)         | -40 to +85°C      | SA576D     | SOT108-1 |

## ABSOLUTE MAXIMUM RATINGS

| SYMBOL        | PARAMETER                           | RATING      | UNITS    |
|---------------|-------------------------------------|-------------|----------|
|               |                                     | SA576       |          |
| $V_{CC}$      | Supply voltage                      | 8           | V        |
| $T_A$         | Operating ambient temperature range | -40 to +85  | °C       |
| $T_{STG}$     | Storage temperature range           | -65 to +150 | °C       |
| $\theta_{JA}$ | Thermal impedance                   | DIP         | 90 °C/W  |
|               |                                     | SO          | 125 °C/W |

# Low power compandor

# SA576

## BLOCK DIAGRAM and TEST AND APPLICATION CIRCUIT

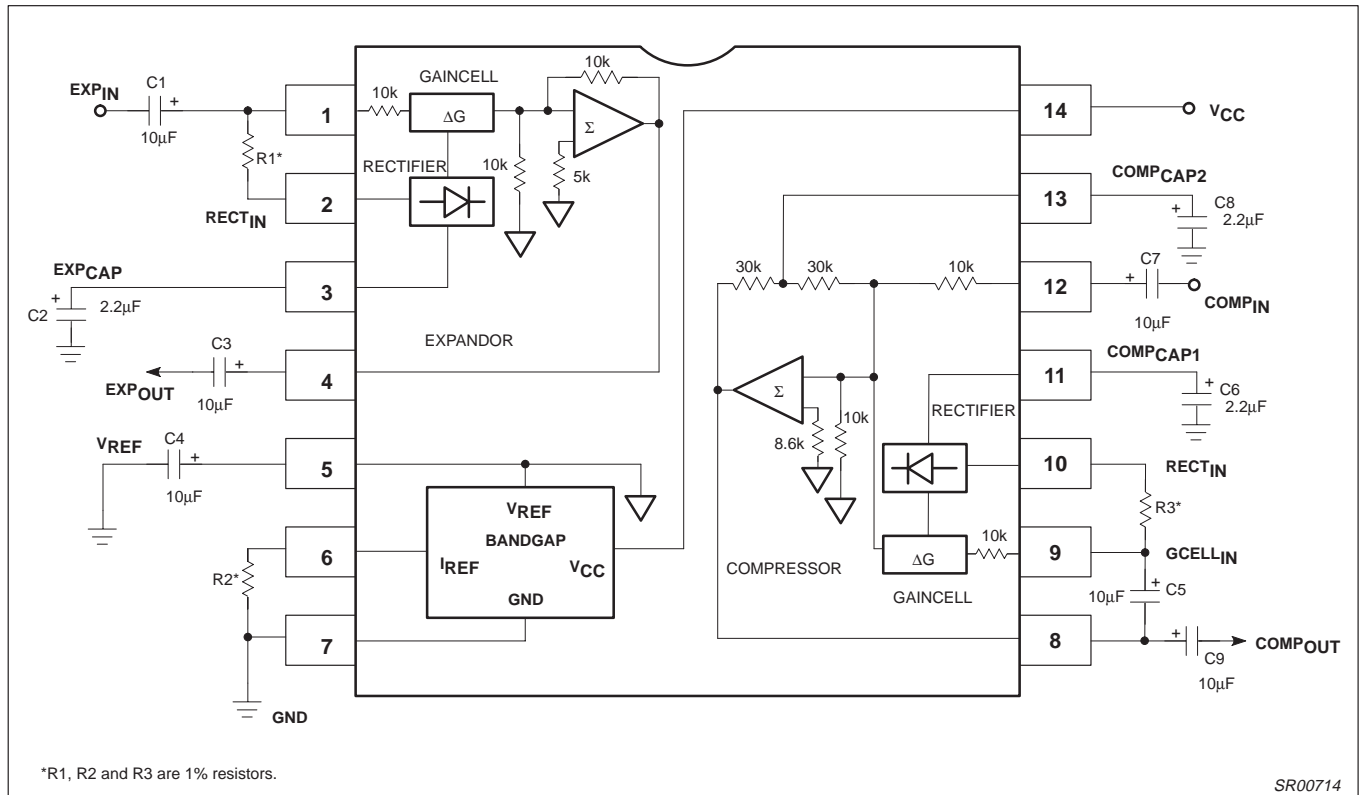


Figure 2. Block Diagram and Test and Application Circuit

## ELECTRICAL CHARACTERISTICS

T<sub>A</sub> = 25°C, V<sub>CC</sub> = 3.6VDC, compandor 0dB level = -20dBV = 100mV<sub>RMS</sub>, output load R<sub>L</sub> = 10kΩ, Freq = 1kHz, unless otherwise specified. R1, R2 and R3 are 1% resistors.

| SYMBOL           | PARAMETER                             | TEST CONDITIONS                     | LIMITS |                       |     | UNITS |
|------------------|---------------------------------------|-------------------------------------|--------|-----------------------|-----|-------|
|                  |                                       |                                     | SA576  |                       |     |       |
|                  |                                       |                                     | MIN    | TYP                   | MAX |       |
| V <sub>CC</sub>  | Supply voltage <sup>1</sup>           |                                     | 2      | 3.6                   | 7   | V     |
| I <sub>CC</sub>  | Supply current                        | No signal<br>R <sub>2</sub> = 100kΩ |        | 1.4                   | 3   | mA    |
| V <sub>REF</sub> | Reference voltage <sup>2</sup>        | V <sub>CC</sub> = 3.6V              |        | 1.8                   |     | V     |
| R <sub>L</sub>   | Summing amp output load               |                                     | 10     |                       |     | kΩ    |
| THD              | Total harmonic distortion             | 1kHz, 0dB, BW = 3.5kHz              |        | 0.25                  | 1.5 | %     |
| E <sub>NO</sub>  | Expander output noise voltage         | BW = 20kHz, R <sub>S</sub> = 0Ω     |        | 10                    | 30  | μV    |
| 0dB              | Unity gain level                      | 0dB at 1kHz                         | -1.5   | 0.18                  | 1.5 | dB    |
| V <sub>OS</sub>  | Output voltage offset                 | No signal                           | -150   | 1                     | 150 | mV    |
|                  | Expander output DC shift              | No signal to 0dB                    | -100   | 7                     | 100 | mV    |
|                  | Tracking error relative to 0dB output | -20dB expander                      | -1.0   | 0.3                   | 1.0 | dB    |
|                  | Crosstalk, COMP to EXP                | 1kHz, 0dB, C <sub>REF</sub> = 10μF  |        | -80                   |     | dB    |
| V <sub>O</sub>   | Output swing low                      |                                     |        | 0.2                   |     | V     |
|                  | Output swing high                     |                                     |        | V <sub>CC</sub> - 0.2 |     |       |

**NOTE:**

1. Operation down to V<sub>CC</sub> = 1.8V is possible, see description on front page of SA576 data sheet.
2. Reference voltage, V<sub>REF</sub>, is typically at 1/2 V<sub>CC</sub>.

# Low power compandor

SA576

## 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

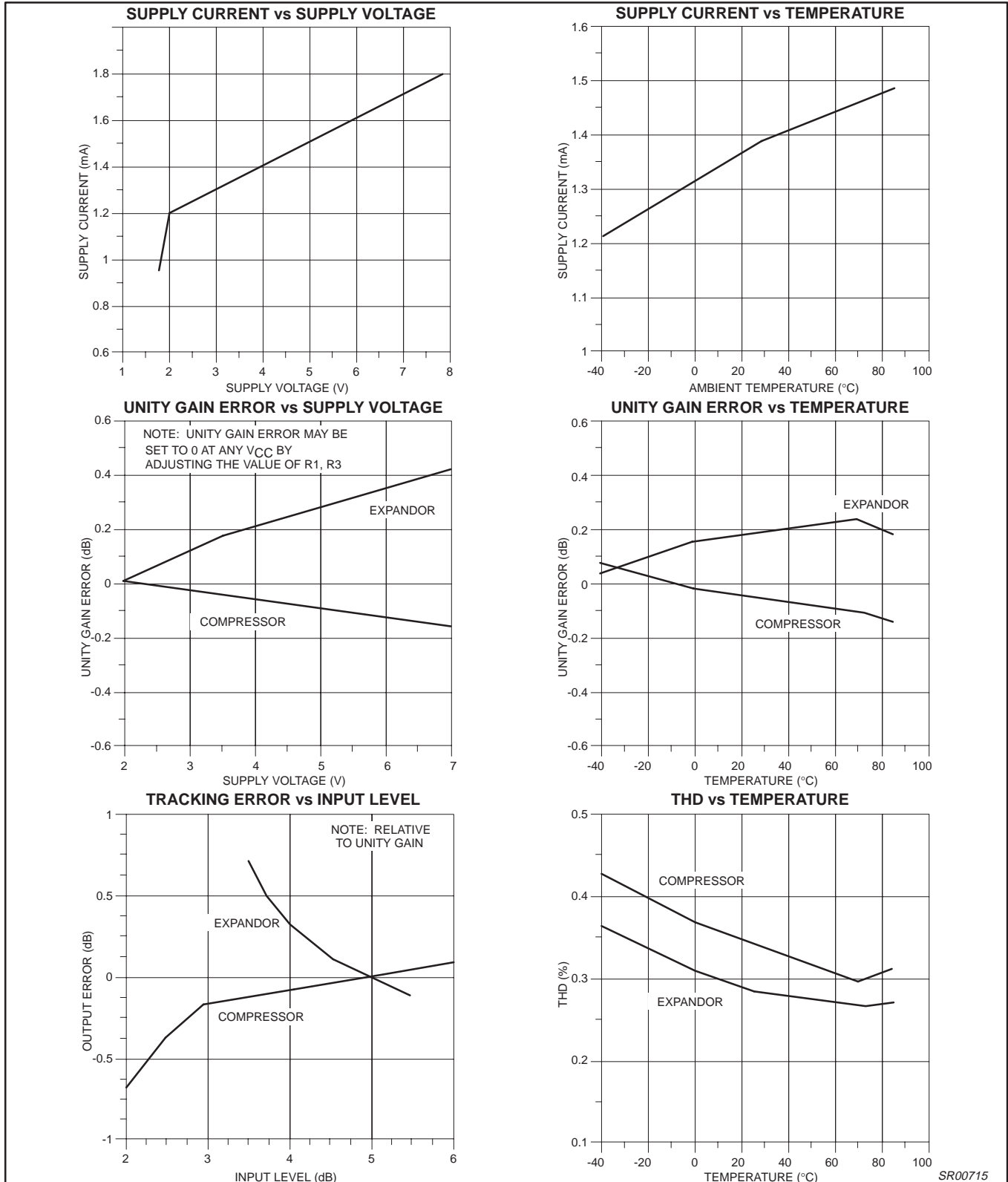


Figure 3. Typical Performance Characteristics

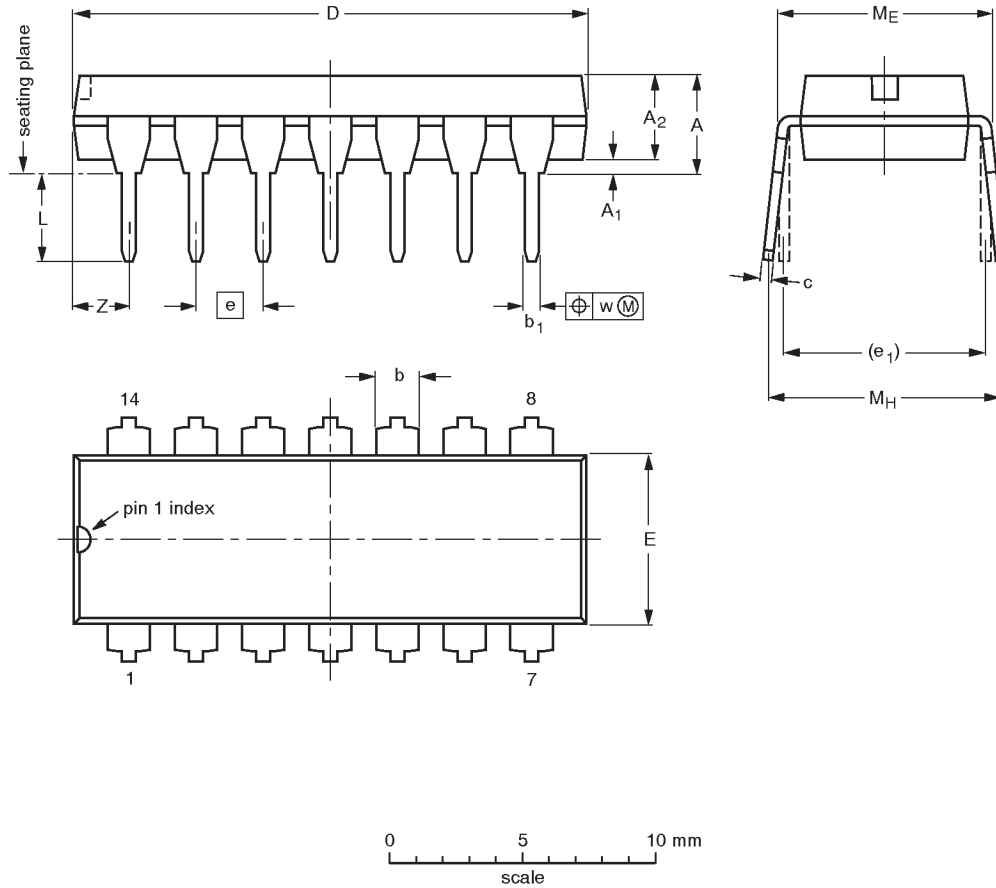
SR00715

Low power compandor

SA576

DIP14: plastic dual in-line package; 14 leads (300 mil)

SOT27-1



**DIMENSIONS (inch dimensions are derived from the original mm dimensions)**

| UNIT   | A max. | A <sub>1</sub> min. | A <sub>2</sub> max. | b              | b <sub>1</sub> | c              | D <sup>(1)</sup> | E <sup>(1)</sup> | e    | e <sub>1</sub> | L            | M <sub>E</sub> | M <sub>H</sub> | w     | Z <sup>(1)</sup> max. |
|--------|--------|---------------------|---------------------|----------------|----------------|----------------|------------------|------------------|------|----------------|--------------|----------------|----------------|-------|-----------------------|
| mm     | 4.2    | 0.51                | 3.2                 | 1.73<br>1.13   | 0.53<br>0.38   | 0.36<br>0.23   | 19.50<br>18.55   | 6.48<br>6.20     | 2.54 | 7.62           | 3.60<br>3.05 | 8.25<br>7.80   | 10.0<br>8.3    | 0.254 | 2.2                   |
| inches | 0.17   | 0.020               | 0.13                | 0.068<br>0.044 | 0.021<br>0.015 | 0.014<br>0.009 | 0.77<br>0.73     | 0.26<br>0.24     | 0.10 | 0.30           | 0.14<br>0.12 | 0.32<br>0.31   | 0.39<br>0.33   | 0.01  | 0.087                 |

**Note**

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

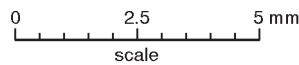
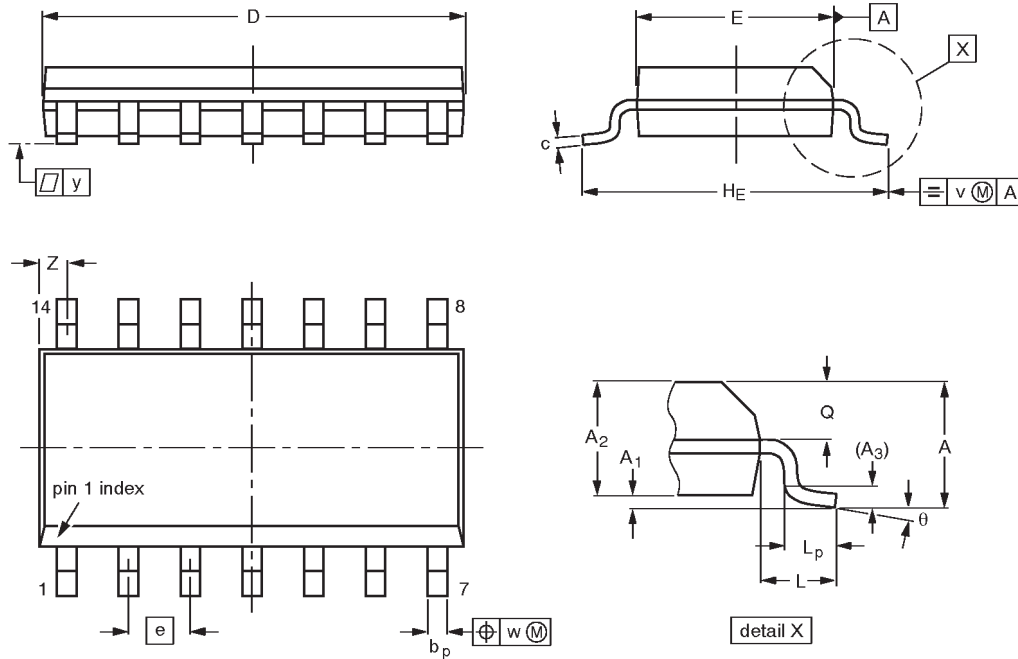
| OUTLINE VERSION | REFERENCES |          |      |  | EUROPEAN PROJECTION | ISSUE DATE           |
|-----------------|------------|----------|------|--|---------------------|----------------------|
|                 | IEC        | JEDEC    | EIAJ |  |                     |                      |
| SOT27-1         | 050G04     | MO-001AA |      |  |                     | 92-11-17<br>95-03-11 |

# Low power compandor

# SA576

**SO14: plastic small outline package; 14 leads; body width 3.9 mm**

**SOT108-1**



**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<br>0.10     | 1.45<br>1.25   | 0.25           | 0.49<br>0.36   | 0.25<br>0.19     | 8.75<br>8.55     | 4.0<br>3.8       | 1.27  | 6.2<br>5.8     | 1.05  | 1.0<br>0.4     | 0.7<br>0.6     | 0.25 | 0.25 | 0.1   | 0.7<br>0.3       | 8°<br>0° |
| inches | 0.069  | 0.0098<br>0.0039 | 0.057<br>0.049 | 0.01           | 0.019<br>0.014 | 0.0098<br>0.0075 | 0.35<br>0.34     | 0.16<br>0.15     | 0.050 | 0.24<br>0.23   | 0.041 | 0.039<br>0.016 | 0.028<br>0.024 | 0.01 | 0.01 | 0.004 | 0.028<br>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 |  |                     |                      |
| SOT108-1        | 076E06S    | MS-012AB |      |  |                     | 91-08-13<br>95-01-23 |

## Low power compandor

SA576

## 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. |
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