

# DATA SHEET

## **TDA1029** Signal-sources switch

Product specification  
File under Integrated Circuits, IC01

January 1980

**Signal-sources switch****TDA1029**

The TDA1029 is a dual operational amplifier (connected as an impedance converter) each amplifier having 4 mutually switchable inputs which are protected by clamping diodes. The input currents are independent of switch position and the outputs are short-circuit protected.

The device is intended as an electronic two-channel signal-source switch in a.f. amplifiers.

**QUICK REFERENCE DATA**

Supply voltage range (pin 14)	$V_P$		6 to 23 V
Operating ambient temperature	$T_{amb}$		-30 to + 80 °C
Supply voltage (pin 14)	$V_P$	typ.	20 V
Current consumption	$I_{14}$	typ.	3,5 mA
Maximum input signal handling (r.m.s. value)	$V_{i(rms)}$	typ.	6 V
Voltage gain	$G_V$	typ.	1
Total harmonic distortion	$d_{tot}$	typ.	0,01 %
Crosstalk	$\alpha$	typ.	70 dB
Signal-to-noise ratio	S/N	typ.	120 dB

**PACKAGE OUTLINE**

16-lead DIL; plastic (SOT38); SOT38-1; 1996 July 18.

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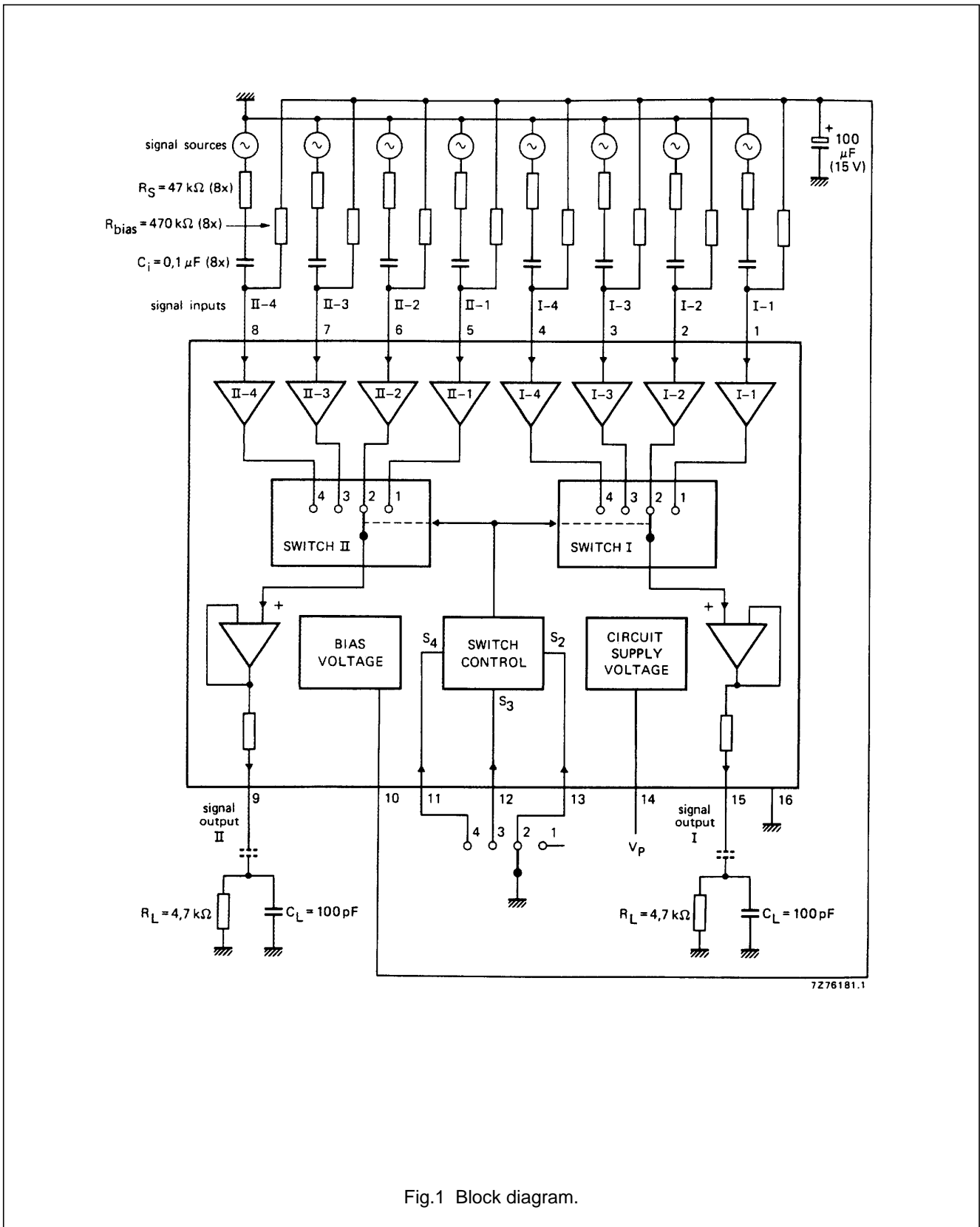


Fig.1 Block diagram.

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**RATINGS**

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Supply voltage (pin 14)	$V_P$	max.	23 V
Input voltage (pins 1 to 8)	$V_I$	max.	$V_P$
	$-V_I$	max.	0,5 V
Switch control voltage (pins 11, 12 and 13)	$V_S$		0 to 23 V
Input current	$\pm I_I$	max.	20 mA
Switch control current	$-I_S$	max.	50 mA
Total power dissipation	$P_{tot}$	max.	800 mW
Storage temperature	$T_{stg}$		-55 to + 150 °C
Operating ambient temperature	$T_{amb}$		-30 to + 80 °C

**CHARACTERISTICS** $V_P = 20$  V;  $T_{amb} = 25$  °C; unless otherwise specified

Current consumption		typ.	3,5 mA
without load; $I_9 = I_{15} = 0$	$I_{14}$		2 to 5 mA
Supply voltage range (pin 14)	$V_P$		6 to 23 V

**Signal inputs**

Input offset voltage			
of switched-on inputs		typ.	2 mV
$R_S \leq 1$ k $\Omega$	$V_{io}$	<	10 mV
Input offset current		typ.	20 nA
of switched-on inputs	$I_{io}$	<	200 nA
Input offset current			
of a switched-on input with respect to a non-switched-on input of a channel	$I_{io}$	typ.	20 nA
		<	200 nA
Input bias current		typ.	250 nA
independent of switch position	$I_i$	<	950 nA
Capacitance between adjacent inputs	C	typ.	0,5 pF
D.C. input voltage range	$V_I$		3 to 19 V
Supply voltage rejection ratio; $R_S \leq 10$ k $\Omega$	SVRR	typ.	100 $\mu$ V/V
Equivalent input noise voltage			
$R_S = 0$ ; $f = 20$ Hz to 20 kHz (r.m.s. value)	$V_{n(rms)}$	typ.	3,5 $\mu$ V
Equivalent input noise current			
$f = 20$ Hz to 20 kHz (r.m.s. value)	$I_{n(rms)}$	typ.	0,05 nA
Crosstalk between a switched-on input and a non-switched-on input; measured at the output at $R_S = 1$ k $\Omega$ ; $f = 1$ kHz	$\alpha$	typ.	100 dB

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**Signal amplifier**

Voltage gain of a switched-on input

at  $I_9 = I_{15} = 0$ ;  $R_L = \infty$  $G_V$  typ. 1

Current gain of a switched-on amplifier

 $G_i$  typ.  $10^5$ **Signal outputs**

Output resistance (pins 9 and 15)

 $R_o$  typ. 400  $\Omega$ Output current capability at  $V_P = 6$  to 23 V $\pm I_9$ ;  $\pm I_{15}$  typ. 5 mA

Frequency limit of the output voltage

 $V_{i(p-p)} = 1$  V;  $R_S = 1$  k $\Omega$ ;  $R_L = 10$  M $\Omega$ ;  $C_L = 10$  pF

f typ. 1,3 MHz

Slew rate (unity gain);  $\Delta V_{9-16}/\Delta t$ ;  $\Delta V_{15-16}/\Delta t$  $R_L = 10$  M $\Omega$ ;  $C_L = 10$  pFS typ. 2 V/ $\mu$ s**Bias voltage**

D.C. output voltage

 $V_{10-16}$  typ. 11 V<sup>(1)</sup>  
10,2 to 11,8 V

Output resistance

 $R_{10-16}$  typ. 8,2 k $\Omega$ **Switch control**

switched-on inputs	interconnected pins	control voltages		
		$V_{11-16}$	$V_{12-16}$	$V_{13-16}$
I-1, II-1	1-15, 5-9	H	H	H
I-2, II-2	2-15, 6-9	H	H	L
I-3, II-3	3-15, 7-9	H	L	H
I-4, II-4	4-15, 8-9	L	H	H
I-4, II-4	4-15, 8-9	L	L	H
I-4, II-4	4-15, 8-9	L	H	L
I-4, II-4	4-15, 8-9	L	L	L
I-3, II-3	3-15, 7-9	H	L	L

In the case of offset control, an internal blocking circuit of the switch control ensures that not more than one input will be switched on at a time. In that case safe switching-through is obtained at  $V_{SL} \leq 1,5$  V.

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**Control inputs (pins 11, 12 and 13)**

Required voltage

HIGH	$V_{SH}$	>	3,3 V <sup>(2)</sup>
LOW	$V_{SL}$	<	2,1 V

Input current

HIGH (leakage current)	$I_{SH}$	<	1 $\mu$ A
LOW (control current)	$-I_{SL}$	<	250 $\mu$ A

**Notes**

- $V_{10-16}$  is typically  $0,5 \cdot V_{14-16} + 1,5 \cdot V_{BE}$ .
- Or control inputs open ( $R_{11,12,13-16} > 33 \text{ M}\Omega$ ).

**APPLICATION INFORMATION**

$V_P = 20 \text{ V}$ ;  $T_{amb} = 25 \text{ }^\circ\text{C}$ ; measured in Fig.1;  $R_S = 47 \text{ k}\Omega$ ;  $C_i = 0,1 \text{ }\mu\text{F}$ ;  $R_{bias} = 470 \text{ k}\Omega$ ;  $R_L = 47 \text{ k}\Omega$ ;  
 $C_L = 100 \text{ pF}$  (unless otherwise specified)

Voltage gain	$G_V$	typ.	-1,5 dB
Output voltage variation when switching the inputs	$\Delta V_{9-16}; \Delta V_{15-16}$	typ. <	10 mV 100 mV
Total harmonic distortion over most of signal range (see Fig.4)	$d_{tot}$	typ.	0,01 %
$V_i = 5 \text{ V}$ ; $f = 1 \text{ kHz}$	$d_{tot}$	typ.	0,02 %
$V_i = 5 \text{ V}$ ; $f = 20 \text{ Hz to } 20 \text{ kHz}$	$d_{tot}$	typ.	0,03 %
Output signal handling			
$d_{tot} = 0,1\%$ ; $f = 1 \text{ kHz}$ (r.m.s. value)	$V_{o(rms)}$	> typ.	5,0 V 5,3 V
Noise output voltage (unweighted)			
$f = 20 \text{ Hz to } 20 \text{ kHz}$ (r.m.s. value)	$V_{n(rms)}$	typ.	5 $\mu$ V
Noise output voltage (weighted)			
$f = 20 \text{ Hz to } 20 \text{ kHz}$ (in accordance with DIN 45405)	$V_n$	typ.	12 $\mu$ V
Amplitude response			
$V_i = 5 \text{ V}$ ; $f = 20 \text{ Hz to } 20 \text{ kHz}$ ; $C_i = 0,22 \text{ }\mu\text{F}$	$\Delta V_{9-16}; \Delta V_{15-16}$	<	0,1 dB <sup>(1)</sup>
Crosswalk between a switched-on input and a non-switched-on input; measured at the output at $f = 1 \text{ kHz}$	$\alpha$	typ.	75 dB <sup>(2)</sup>
Crosswalk between switched-on inputs and the outputs of the other channels	$\alpha$	typ.	90 dB <sup>(2)</sup>

**Notes**

- The lower cut-off frequency depends on values of  $R_{bias}$  and  $C_i$ .
- Depends on external circuitry and  $R_S$ . The value will be fixed mostly by capacitive crosstalk of the external components.

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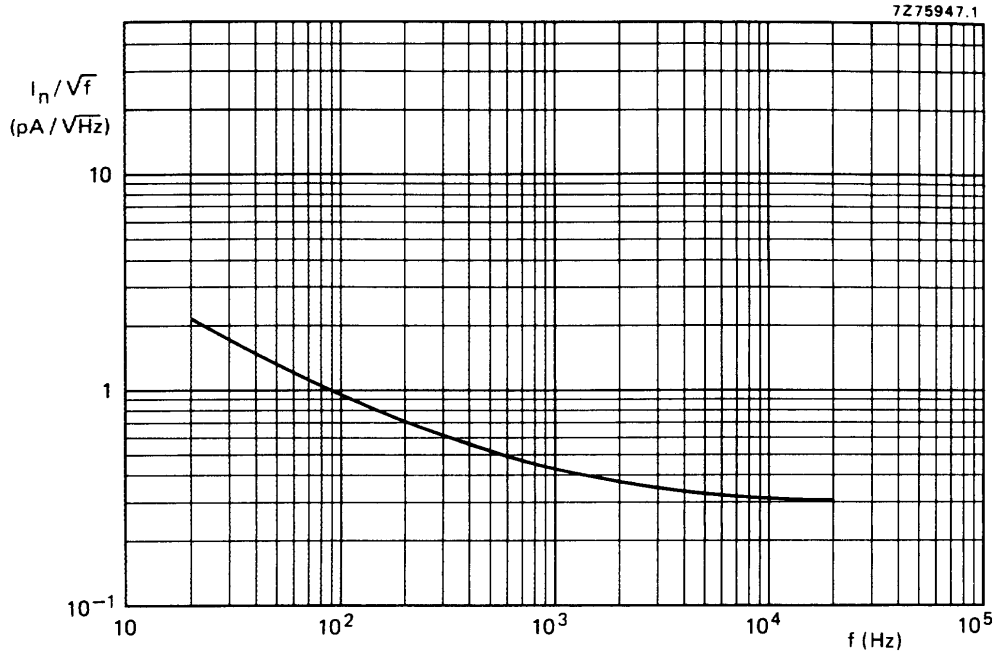


Fig.2 Equivalent input noise current.

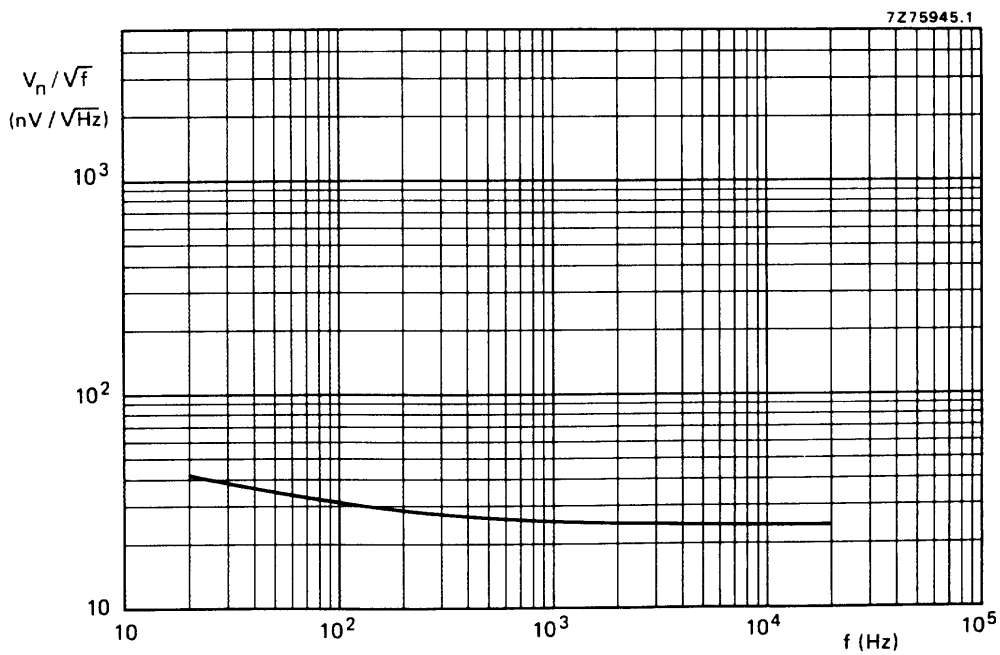


Fig.3 Equivalent input noise voltage.

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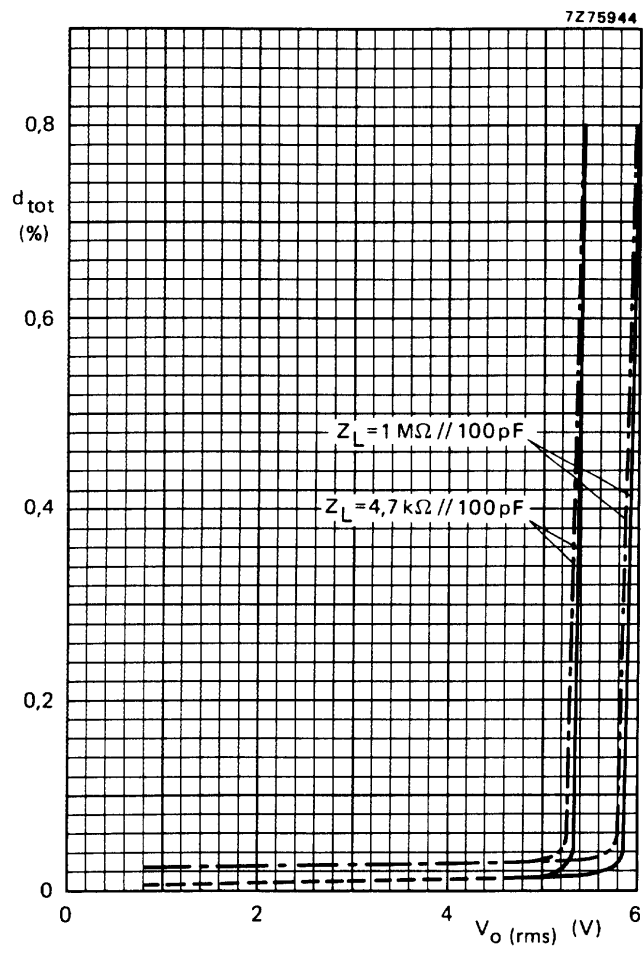


Fig.4 Total harmonic distortion as a function of r.m.s output voltage. —  $f = 1\text{ kHz}$ ; - - -  $f = 20\text{ kHz}$ .



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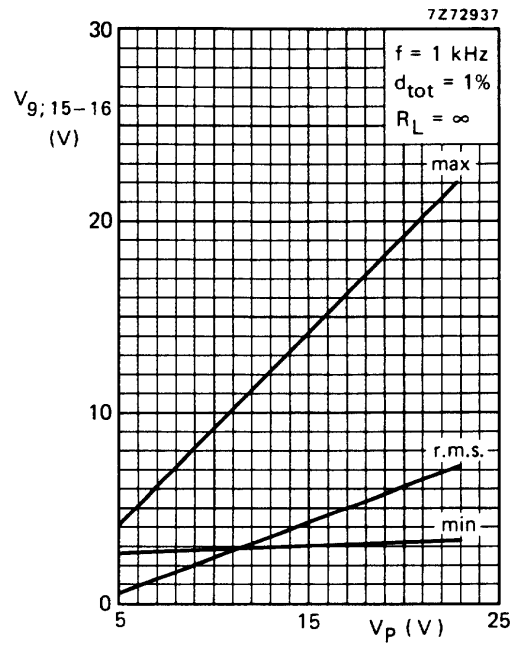


Fig.5 Output voltage as a function of supply voltage.

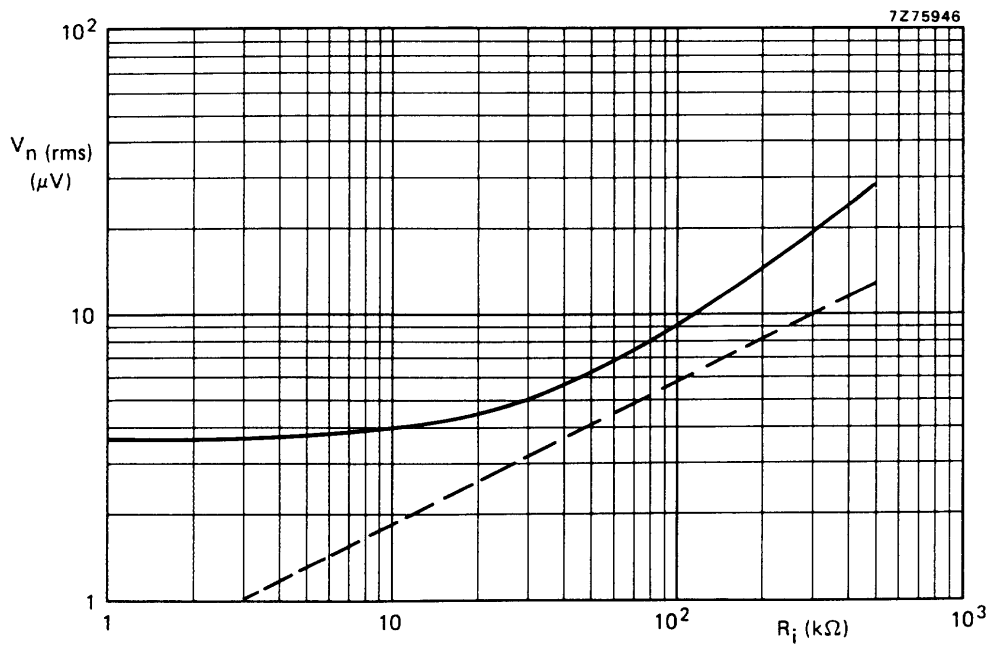


Fig.6 Noise output voltage as a function of input resistance;  $G_V = 1$ ;  $f = 20 \text{ Hz to } 20 \text{ kHz}$ .  
 —  $V_n \text{ (output)}$ ; - - -  $V_n \text{ (}R_S\text{)}$ .

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APPLICATION NOTES

Input protection circuit and indication

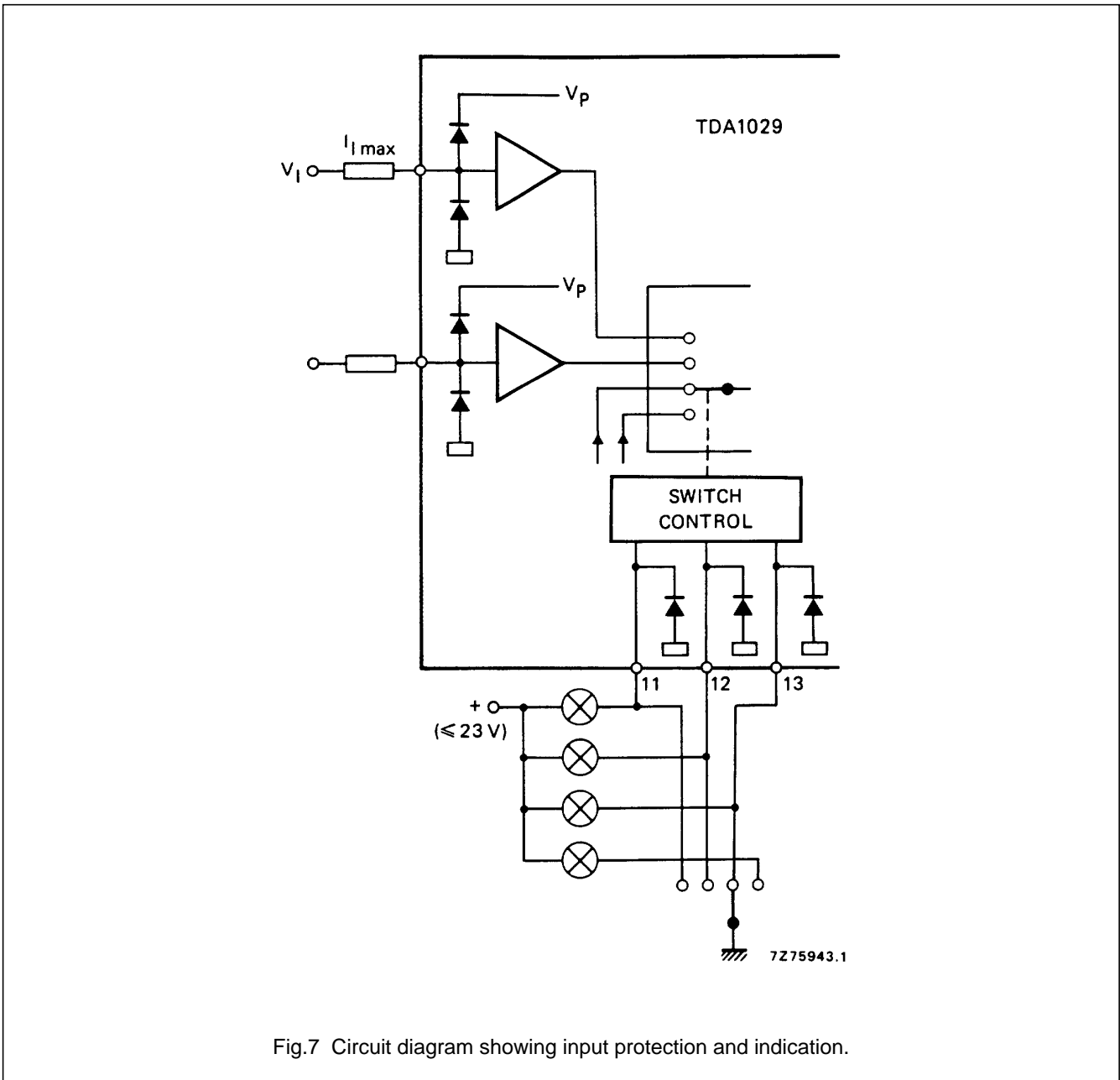


Fig.7 Circuit diagram showing input protection and indication.

Unused signal inputs

Any unused inputs must be connected to a d.c. (bias) voltage, which is within the d.c. input voltage range; e.g. unused inputs can be connected directly to pin 10.

Circuits with standby operation

The control inputs (pins 11, 12 and 13) are high-ohmic at  $V_{SH} \le 20\text{ V}$  ( $I_{SH} \le 1\ \mu\text{A}$ ), as well as, when the supply voltage (pin 14) is switched off.

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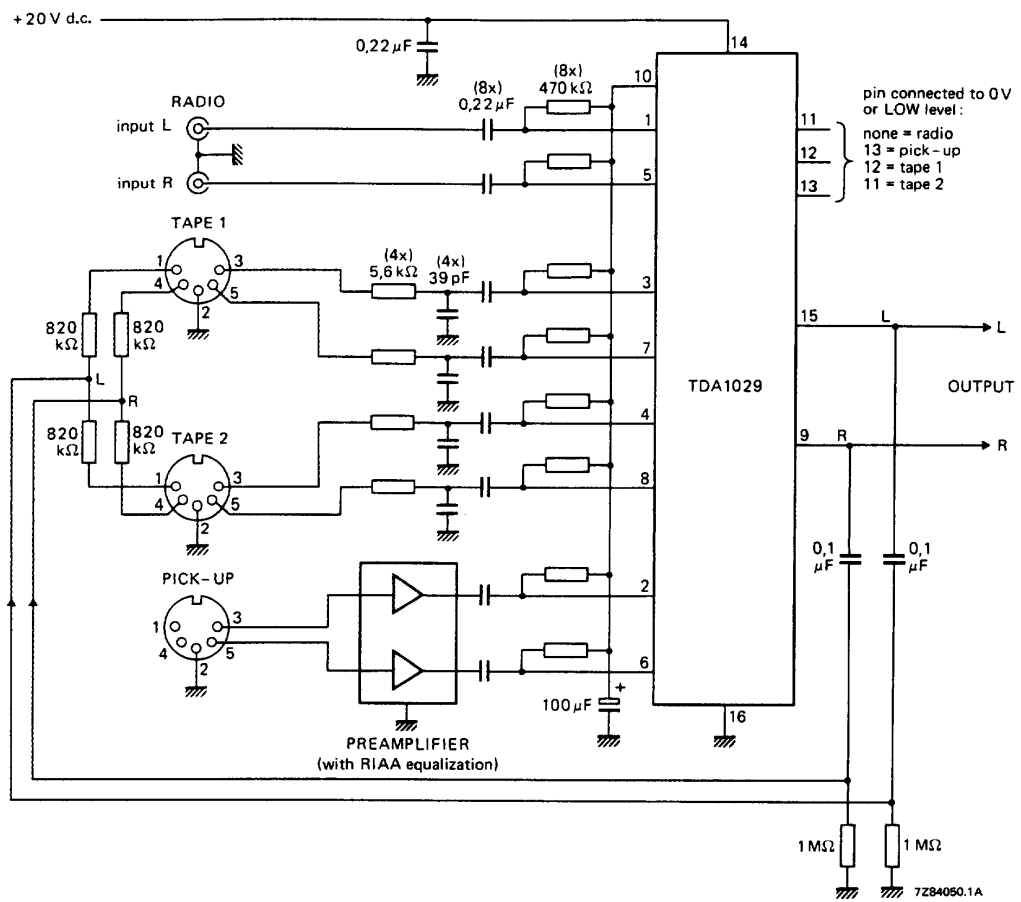


Fig.8 TDA1029 connected as a four input stereo source selector.

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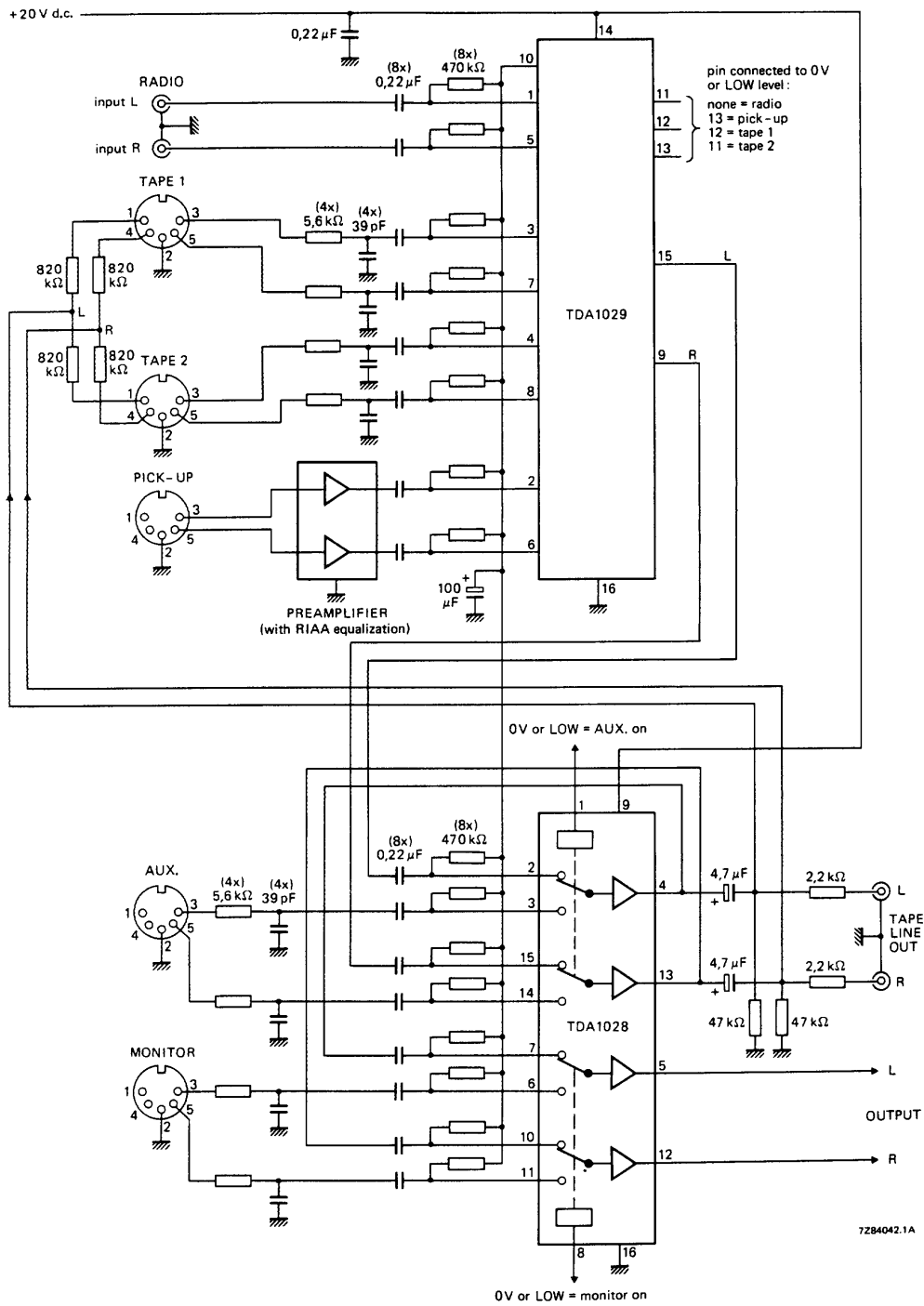


Fig.9 TDA1029 and TDA1028 connected as a five input stereo source selector with monitoring facilities.

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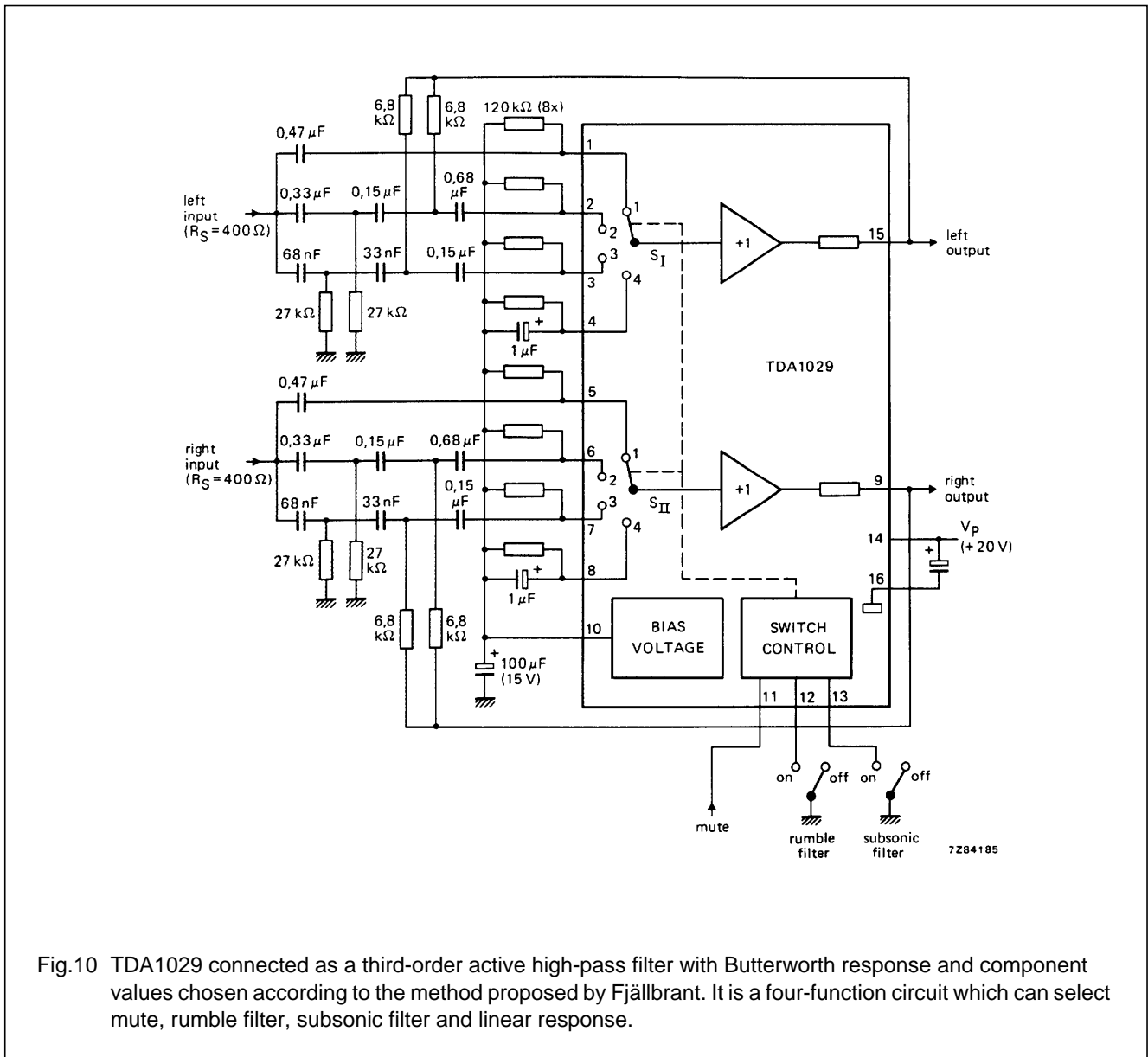


Fig.10 TDA1029 connected as a third-order active high-pass filter with Butterworth response and component values chosen according to the method proposed by Fjällbrant. It is a four-function circuit which can select mute, rumble filter, subsonic filter and linear response.

Switch control

function	V <sub>11-16</sub>	V <sub>12-16</sub>	V <sub>13-16</sub>
linear	H	H	H
subsonic filter 'on'	H	H	L
rumble filter 'on'	H	L	X
mute 'on'	L	X	X

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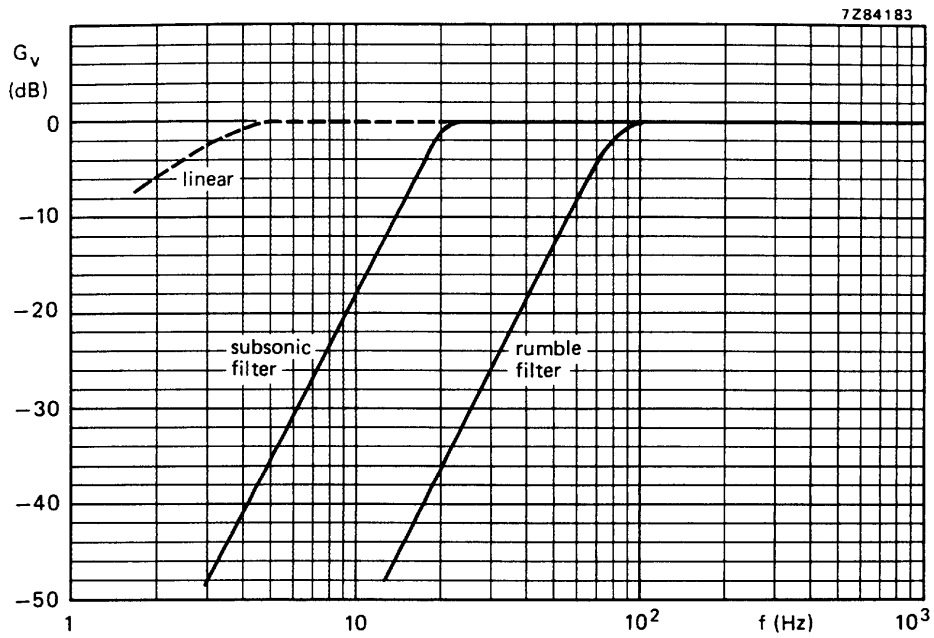


Fig.11 Frequency response curves for the circuit of Fig.10.

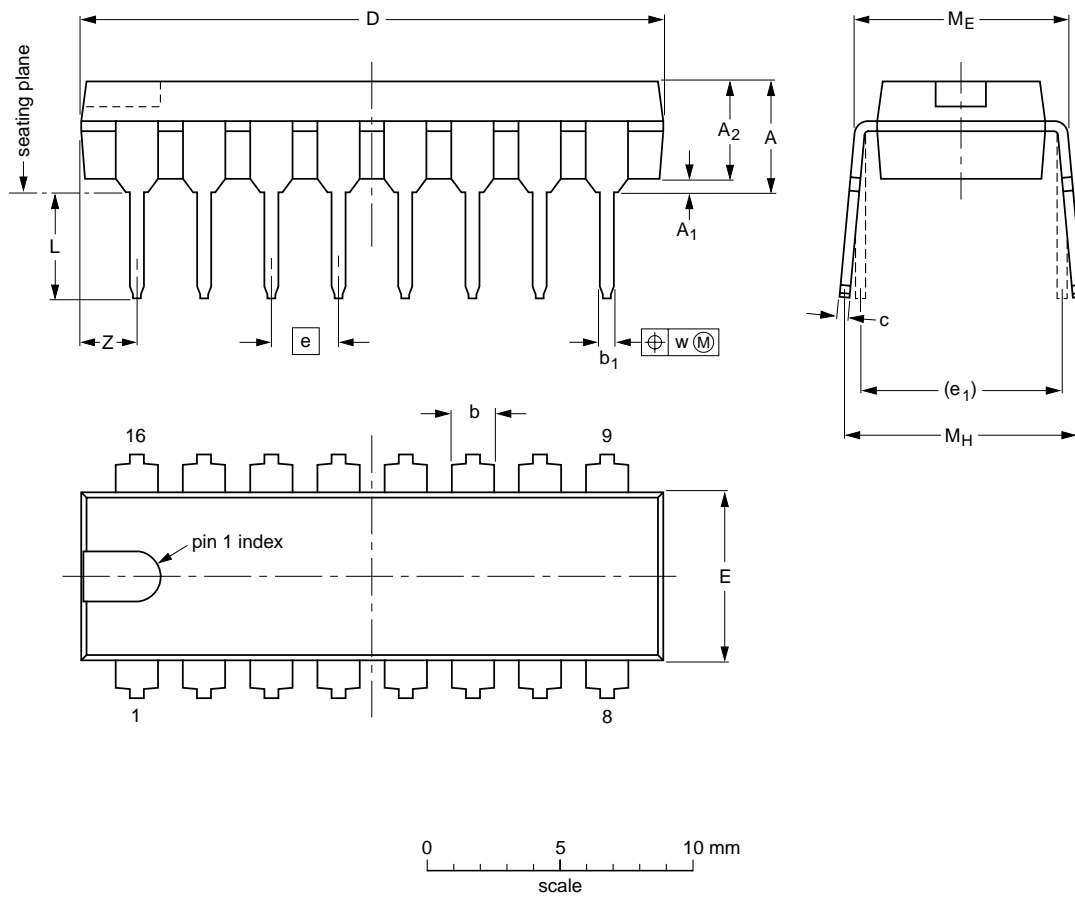
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PACKAGE OUTLINE

DIP16: plastic dual in-line package; 16 leads (300 mil); long body

SOT38-1



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	4.7	0.51	3.7	1.40 1.14	0.53 0.38	0.32 0.23	21.8 21.4	6.48 6.20	2.54	7.62	3.9 3.4	8.25 7.80	9.5 8.3	0.254	2.2
inches	0.19	0.020	0.15	0.055 0.045	0.021 0.015	0.013 0.009	0.86 0.84	0.26 0.24	0.10	0.30	0.15 0.13	0.32 0.31	0.37 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			
SOT38-1	050G09	MO-001AE				92-10-02 95-01-19

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### SOLDERING

#### Introduction

There is no soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and surface mounted components are mixed on one printed-circuit board. However, wave soldering is not always suitable for surface mounted ICs, or for printed-circuits with high population densities. In these situations reflow soldering is often used.

This text gives a very brief insight to a complex technology. A more in-depth account of soldering ICs can be found in our "IC Package Databook" (order code 9398 652 90011).

#### Soldering by dipping or by wave

The maximum permissible temperature of the solder is 260 °C; solder at this temperature must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.

The device may be mounted up to the seating plane, but the temperature of the plastic body must not exceed the specified maximum storage temperature ( $T_{stg\ max}$ ). If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature within the permissible limit.

#### Repairing soldered joints

Apply a low voltage soldering iron (less than 24 V) to the lead(s) of the package, below the seating plane or not more than 2 mm above it. If the temperature of the soldering iron bit is less than 300 °C it may remain in contact for up to 10 seconds. If the bit temperature is between 300 and 400 °C, contact may be up to 5 seconds.

### DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

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