DATA SHEET

TDA1029
Signal-sources switch

Product specification
File under Integrated Circuits, IC01

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Philips
Semiconductors

PHILIPS

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	α	typ.	70	dB
Signal-to-noise ratio	S/N	typ.	120	dB

PACKAGE OUTLINE

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

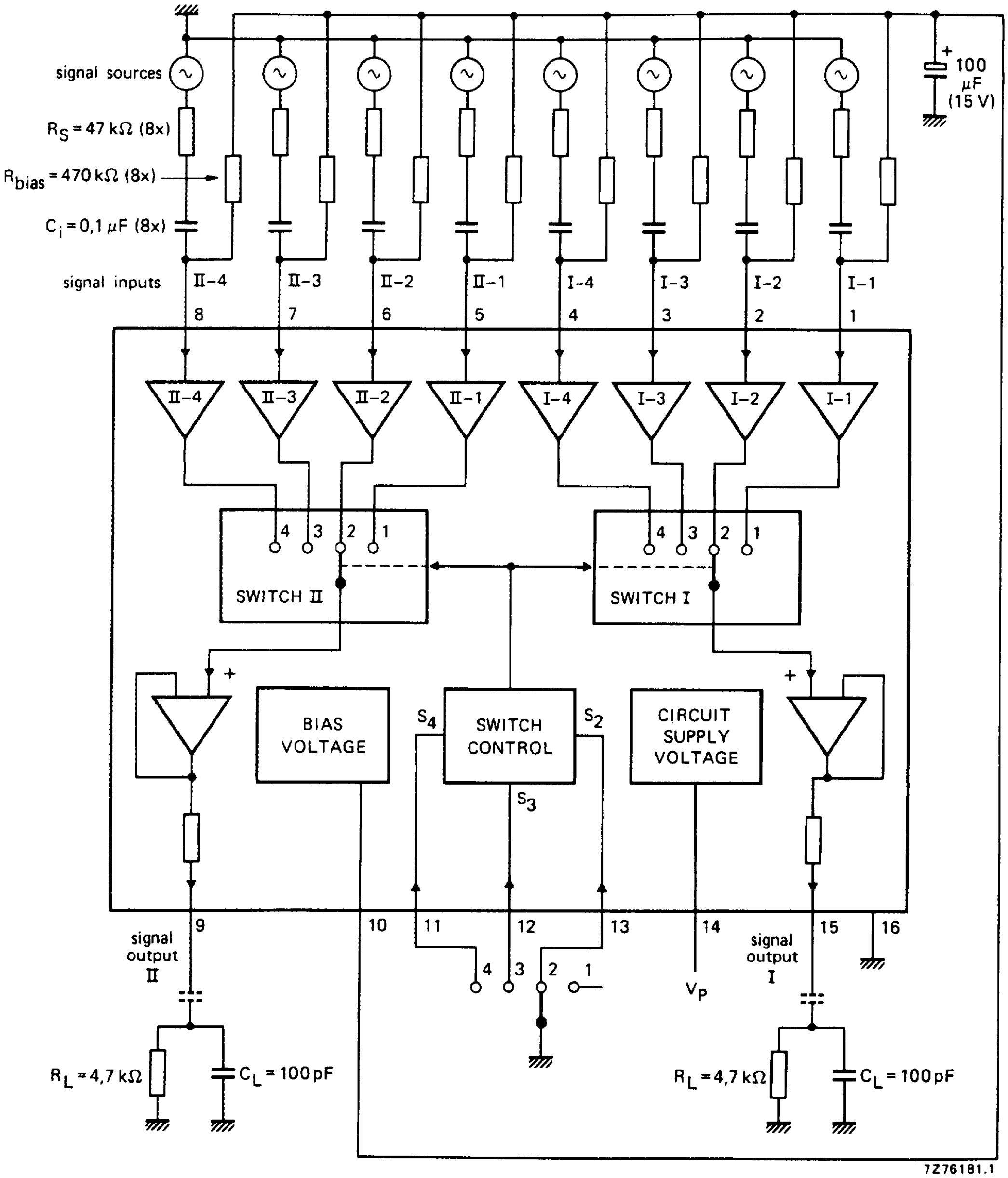

Fig.1 Block diagram.

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

Signal inputs

Input offset voltage				
of switched-on inputs	V_{io}	typ.	2	mV
$R_S \leq 1$ kΩ		<	10	mV
Input offset current	I_{io}	typ.	20	nA
of switched-on inputs		<	200	nA
Input offset current				
of a switched-on input with respect to a	I_{io}	typ.	20	nA
non-switched-on input of a channel		<	200	nA
Input bias current	I_i	typ.	250	nA
independent of switch position		<	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; $R_S \leq 10$ kΩ	SVRR	typ.	100	µV/V
Equivalent input noise voltage				
R_S = 0; f = 20 Hz to 20 kHz (r.m.s. value)	$V_{n(rms)}$	typ.	3,5	µV
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 kΩ; f = 1 kHz	α	typ.	100	dB

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 Ω
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 $V_{i(p\text{-}p)}$ = 1 V; R_S = 1 kΩ; R_L = 10 MΩ; C_L = 10 pF	f	typ.	1,3 MHz
Slew rate (unity gain); $\Delta V_{9\text{-}16}/\Delta t$; $\Delta V_{15\text{-}16}/\Delta t$ R_L = 10 MΩ; C_L = 10 pF	S	typ.	2 V/μs

Bias voltage

D.C. output voltage	$V_{10\text{-}16}$	typ.	11 V(1)
			10,2 to 11,8 V
Output resistance	$R_{10\text{-}16}$	typ.	8,2 kΩ

Switch control

switched-on inputs	interconnected pins	control voltages $V_{11\text{-}16}$	$V_{12\text{-}16}$	$V_{13\text{-}16}$
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.

Control inputs (pins 11, 12 and 13)

Required voltage				
HIGH	V_{SH}	>	3,3	V(2)
LOW	VSL	<	2,1	V
Input current				
HIGH (leakage current)	I_{SH}	<	1	μA
LOW (control current)	$-I_{SL}$	<	250	μA

Notes

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

APPLICATION INFORMATION

V_P = 20 V; T_{amb} = 25 °C; measured in Fig.1; R_S = 47 kΩ; C_i = 0,1 μF; R_{bias} = 470 kΩ; R_L = 47 kΩ; C_L = 100 pF (unless otherwise specified)

Voltage gain	G_v	typ.	–1,5	dB
Output voltage variation when switching the inputs	ΔV_{9-16}; ΔV_{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 V; f = 1 kHz	d_{tot}	typ.	0,02	%
V_i = 5 V; f = 20 Hz to 20 kHz	d_{tot}	typ.	0,03	%
Output signal handling				
d_{tot} = 0,1%; f = 1 kHz (r.m.s. value)	$V_{o(rms)}$	>	5,0	V
		typ.	5,3	V
Noise output voltage (unweighted)				
f = 20 Hz to 20 kHz (r.m.s. value)	$V_{n(rms)}$	typ.	5	μV
Noise output voltage (weighted)				
f = 20 Hz to 20 kHz (in accordance with DIN 45405)	V_n	typ.	12	μV
Amplitude response				
V_i = 5 V; f = 20 Hz to 20 kHz; C_i = 0,22 μF	$\Delta V_{9\text{-}16}$; $\Delta V_{15\text{-}16}$	<	0,1	dB(1)
Crosswalk between a switched-on input and a non-switched-on input; measured at the output at f = 1 kHz	α	typ.	75	dB(2)
Crosswalk between switched-on inputs and the outputs of the other channels	α	typ.	90	dB(2)

Notes

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

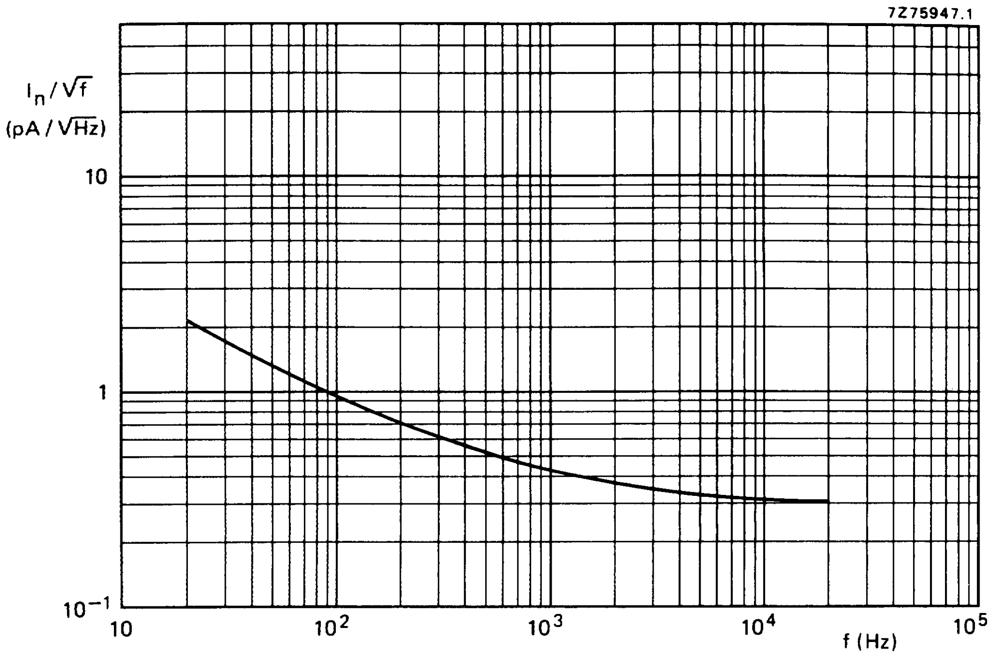

Fig.2 Equivalent input noise current.

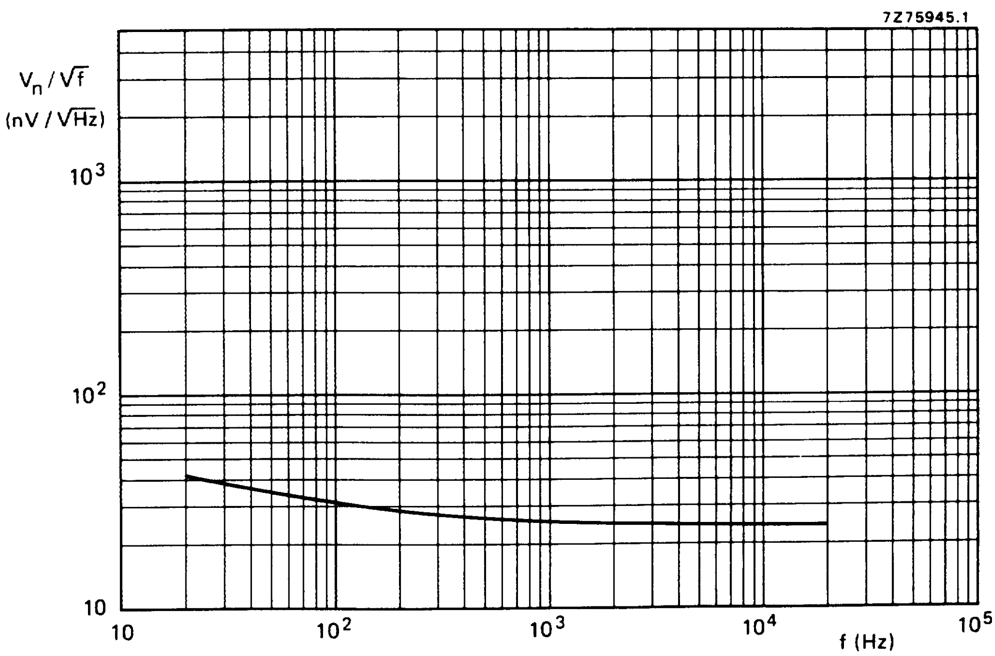

Fig.3 Equivalent input noise voltage.

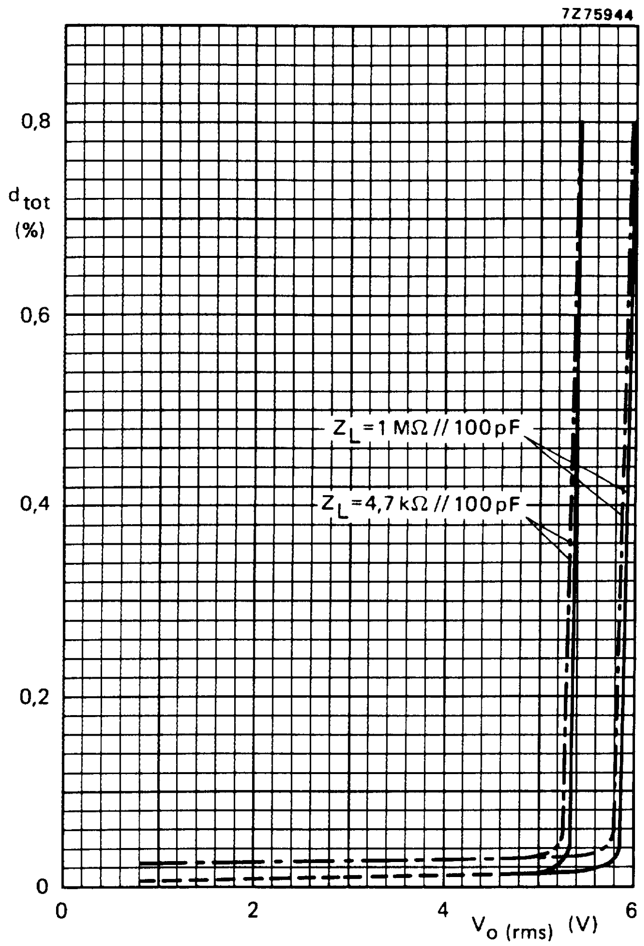

Fig.4 Total harmonic distortion as a function of r.m.s output voltage. — f = 1 kHz; — - — - f = 20 kHz.

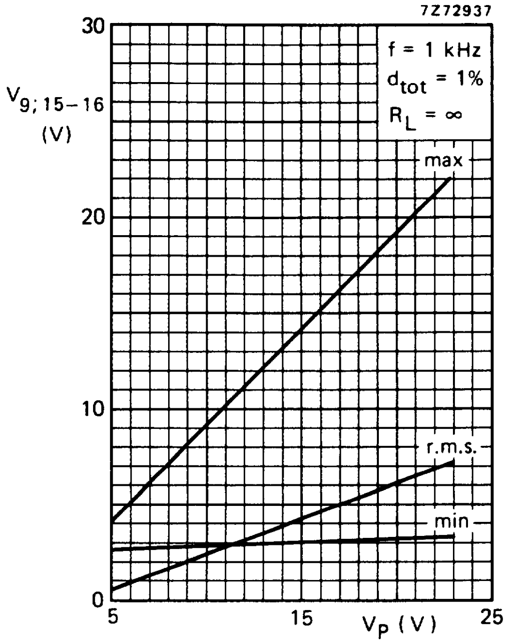

Fig.5 Output voltage as a function of supply voltage.

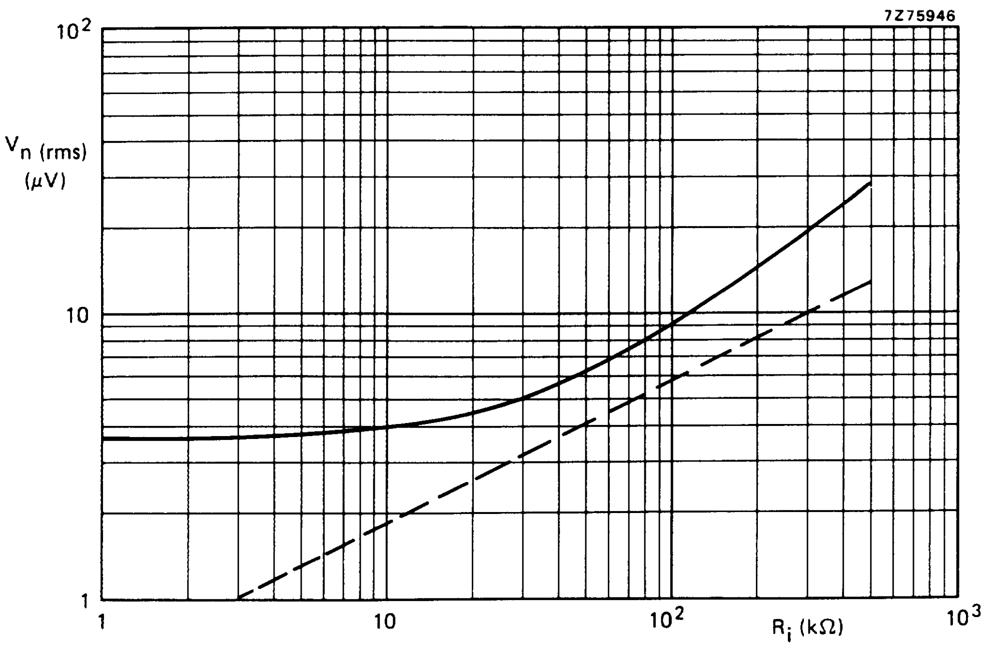

Fig.6 Noise output voltage as a function of input resistance; G_V = 1; f = 20 Hz to 20 kHz.
— V_n (output); – – – V_n (R_S).

APPLICATION NOTES

Input protection circuit and indication

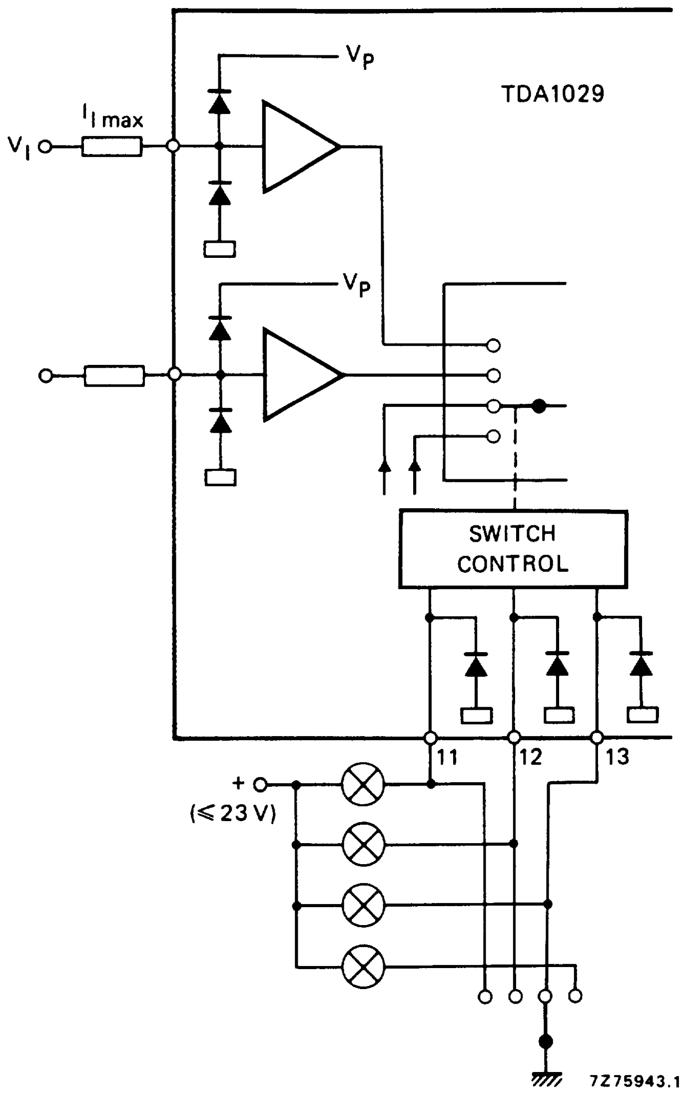

Fig.7 Circuit diagram showing input protection and indication.

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 $V_{SH} \leq 20$ V ($I_{SH} \leq 1$ µA), as well as, when the supply voltage (pin 14) is switched off.

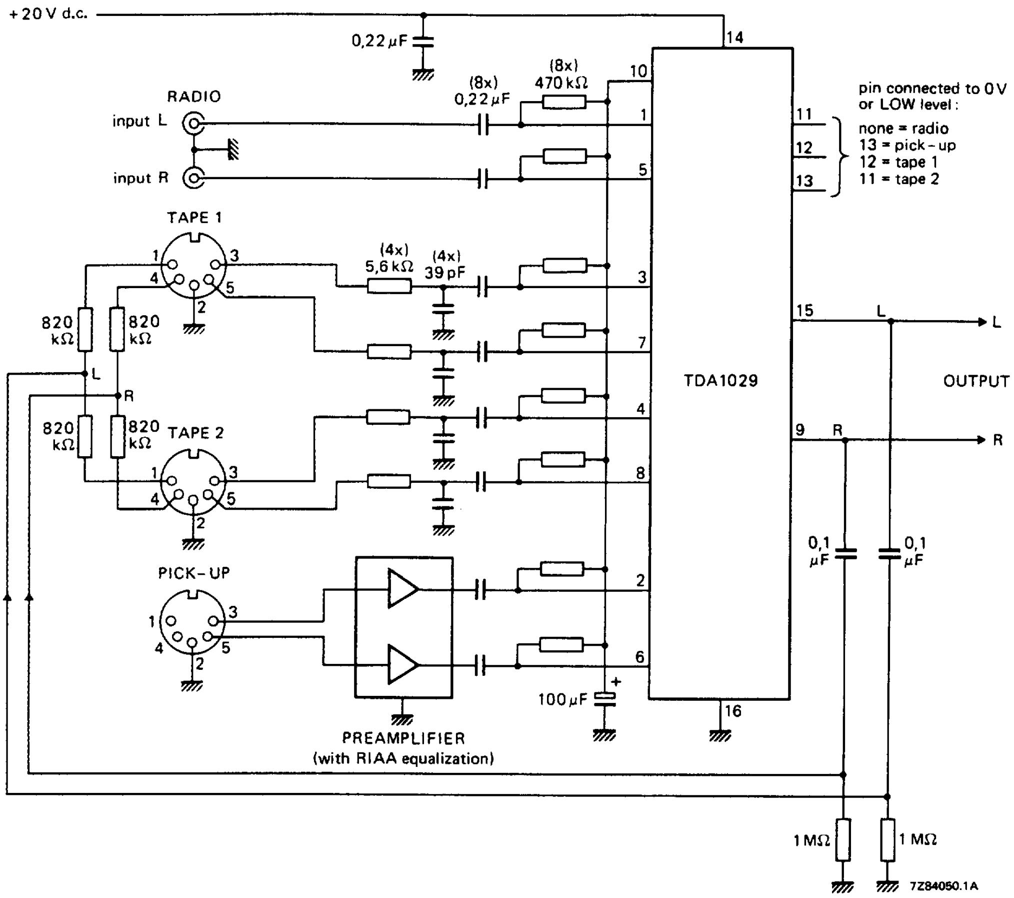

Fig.8 TDA1029 connected as a four input stereo source selector.

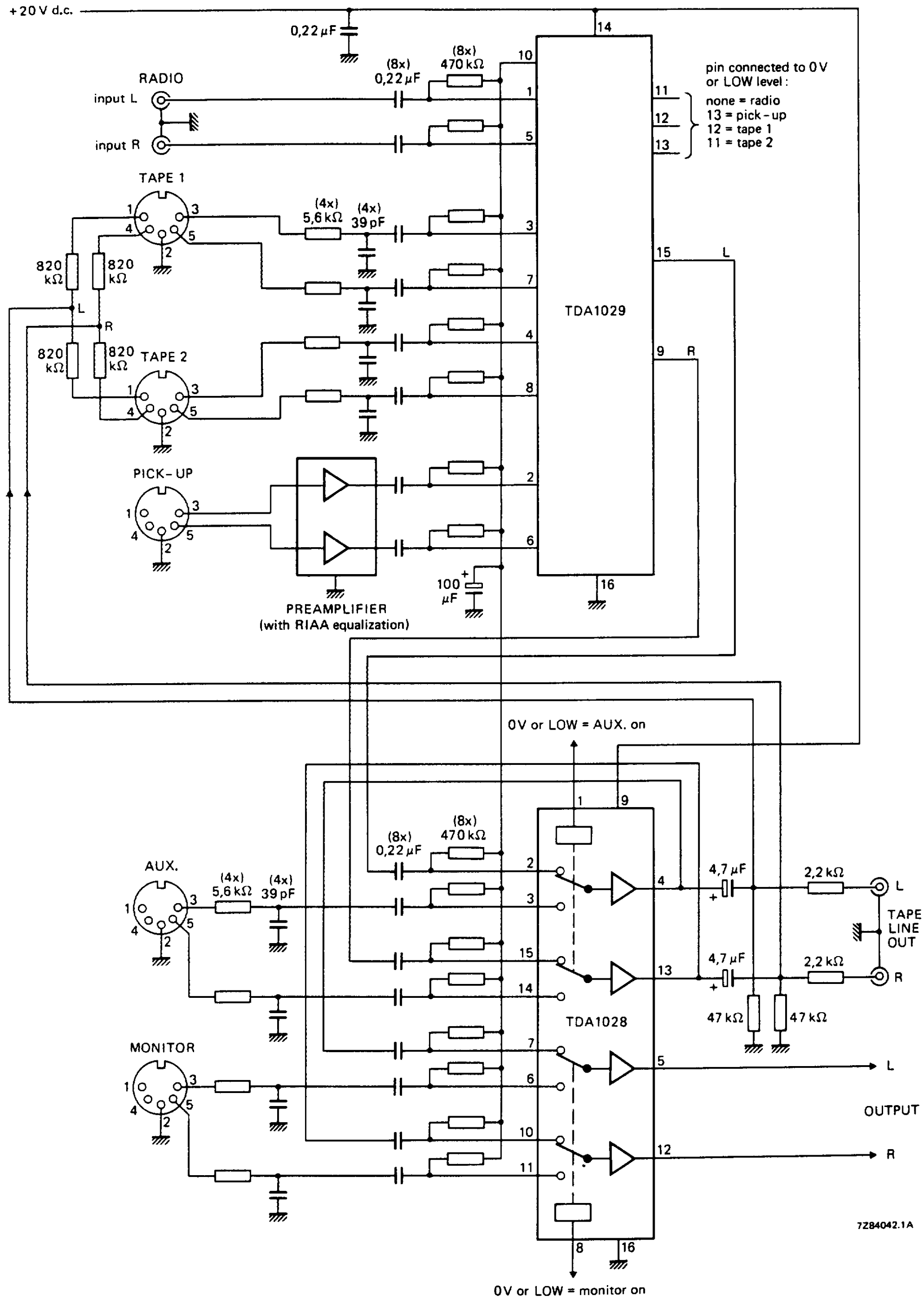

Fig.9 TDA1029 and TDA1028 connected as a five input stereo source selector with monitoring facilities.

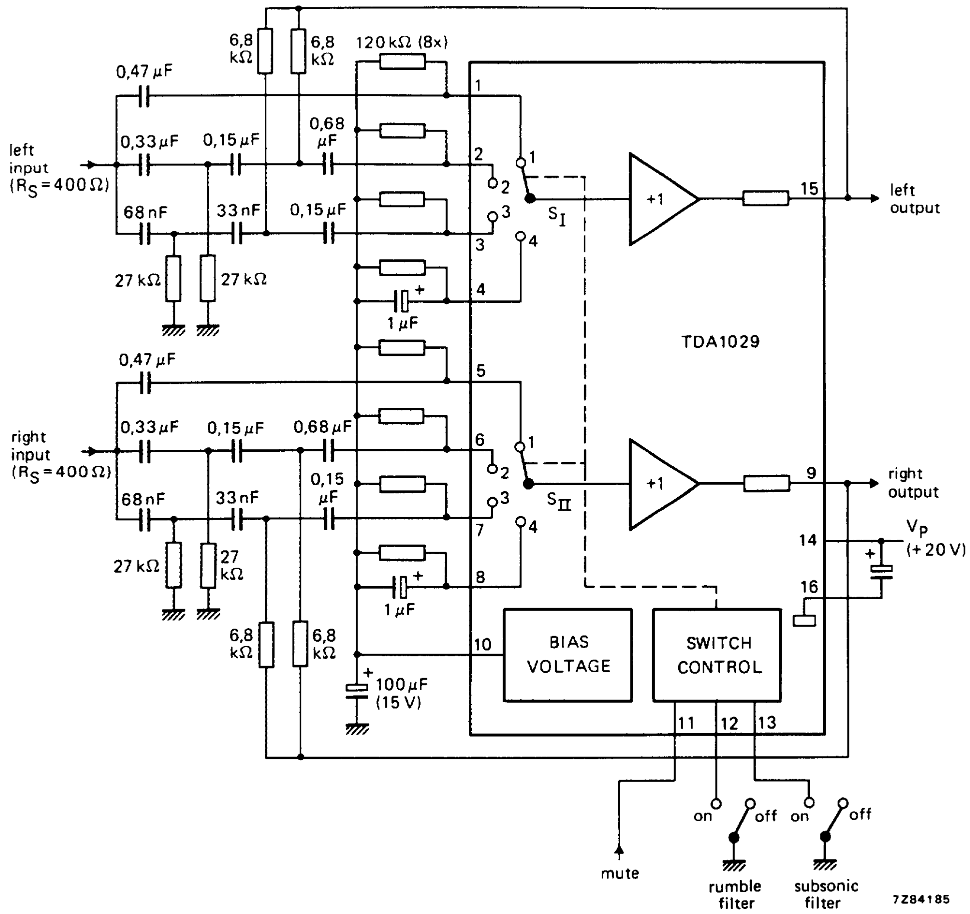

Fig.10 TDA1029 connected as a third-order active high-pass filter with Butterworth response and component values chosen according to the method proposed by Fjällbrant. It is a four-function circuit which can select mute, rumble filter, subsonic filter and linear response.

Switch control

function	V_{11-16}	V_{12-16}	V_{13-16}
linear	H	H	H
subsonic filter ‘on’	H	H	L
rumble filter ‘on’	H	L	X
mute ‘on’	L	X	X

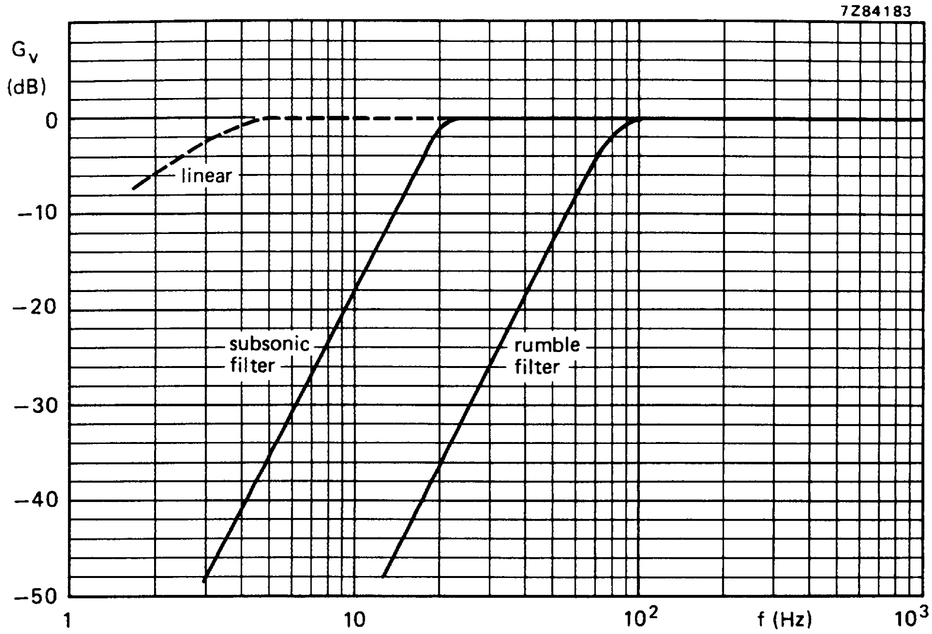

Fig.11 Frequency response curves for the circuit of Fig.10.