PREAMPLIFIER FOR INFRARED REMOTE CONTROL TRANSMISSION

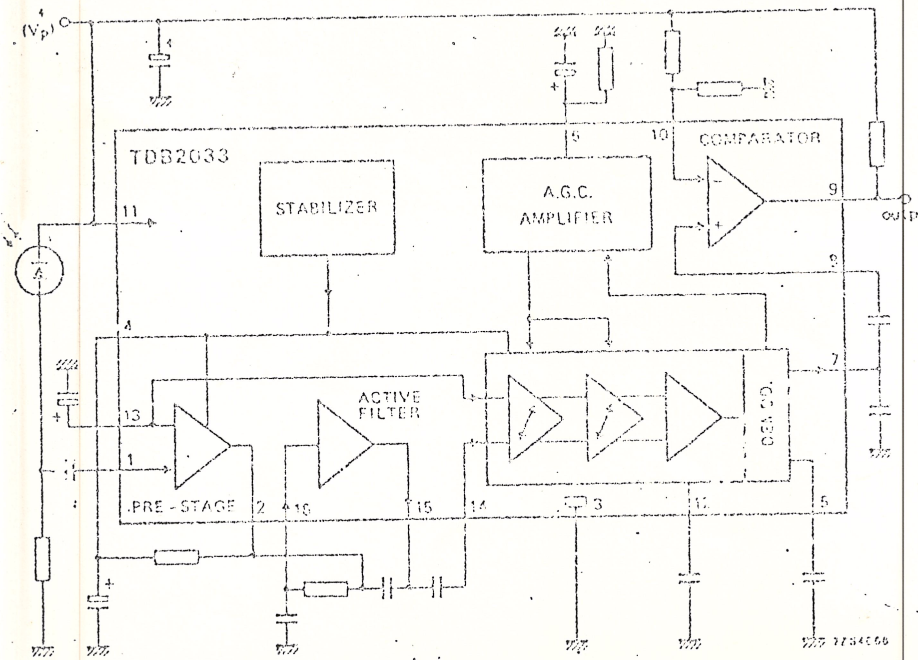

Fig. 1 Block diagram.

Features

- Three differential amplifier stages; two of which are gain controlled.
- The a.g.c. time-constant can be determined externally.
- Comparator for improving the noise performance, with adjustable threshold.
- Low current consumption.
- Active filter that obviates the use of a coil.
- Open collector output, TTL compatible.

QUICK REFERENCE DATA

Supply voltage	V_{CC}	typ.	12	V
Supply current	I_{CC}	typ.	17	mA
Voltage gain without comparator	G_v	typ.	100	dB
Operating ambient temperature range	T_{amb}		0 to + 70	°C

PACKAGE OUTLINE

16-lead DIL; plastic (SOT-38).

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GENERAL AND FUNCTIONAL DESCRIPTION

The TDB2033 comprises a preamplifier (impedance converter) and the operational amplifier for an active filter, of which the filter characteristic is determined by external components. This is followed by a 3-stage amplifier, of which the first and second stages are gain controlled. The control time-constant is determined by an external electrolytic capacitor. The time-constant of the demodulator is determined in the same way, by an external smoothing capacitor.
The demodulator output is externally connected to the input of a symmetrical comparator, with a threshold voltage matched to the available noise level by an external potential divider at pin 10.
The comparator output is an open-collector (n-p-n) which is made TTL compatible by connecting a collector load resistor to 5 V.
The output signal can easily be inverted by interchanging the comparator inputs at pins 8 and 10. These features allow a competitively priced preamplifier for infrared remote control to be constructed with the TDB2033. The outstanding feature is the active filter that obviates the use of a coil.

Caution

Due to the high gain of the TDB2033, special attention has to be given to grounding and shielding when mounting the device.

RATINGS

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

		min.	max.	
Supply voltage	$V_P = V_{11\text{-}3}$	0	+ 15	V
Voltages on:				
pin 1	$V_{1\text{-}3}$	0	$V_{2\text{-}3}$	V
pins 2, 13 and 14	$V_{2,13,14}$	0	$V_{4\text{-}3}$	V
pins 5, 6, 7, 12 and 16	V_n	0	V_P	V
pins 8 and 10	$V_{8,10}$	$V_P/4$	V_P	V
pin 9	V_9	0	+ 15	V
pin 16 with respect to pin 15	$V_{16\text{-}15}$	0	+ 6,5	V
Currents at:				
pin 4	$\lvert I_4 \rvert$	max.	15	mA
pins 8, 10 and 15	$\lvert I_{8,10,15} \rvert$	max.	5	mA
pins 6 and 9	$\lvert I_{6,9} \rvert$	max.	20	mA
Total power dissipation per package	P_{tot}	max.	330	mW
Operating ambient temperature range	T_{amb}		0 to + 70	°C
Storage temperature range	T_{stg}		−20 to + 125	°C

DEVELOPMENT SAMPLE DATA

CHARACTERISTICS

$V_P = 12$ V; $T_{amb} = 25$ °C; measured in Fig. 2; unless otherwise specified

		min.	typ.	max.	
Supply voltage	$V_P = V_{11\text{-}3}$	10	12	15	V
Supply current	$I_P = I_{11}$	–	17	–	mA
Total circuit					
Voltage gain ($V_{5\text{-}3}/V_{1\text{-}3}$)	G_v	–	100	–	dB
Required input voltage for obtaining comparator switching (peak-to-peak value) $I_{10\text{-}3} = 6,6$ V	$V_{1\text{-}3\,(p\text{-}p)}$	–	150	–	μV
Bandwidth without filter	B	–	2	–	MHz
Preamplifier					
Input resistance	$R_{1\text{-}3}$	–	25	–	kΩ
Output current	I_2	–	200	–	μA
Voltage gain	G_v	–	18	–	dB
Active filter					
Voltage gain ($V_{15\text{-}3}/V_{16\text{-}3}$)	G_v	–	0,98	1	
A.G.C. amplifier and demodulator					
Input resistance	$R_{14\text{-}3}$	–	8,5	–	kΩ
Output resistance					
pin 7	$R_{7\text{-}3}$	–	22	–	kΩ
pin 5	$R_{5\text{-}3}$	–	5	–	kΩ
Voltage gain at $V_{6\text{-}3} = 0$ V	G_v	–	84	–	dB
Noise voltage at the demodulator (r.m.s. value)	$V_{5\text{-}3\,(rms)}$	–	0,5	–	[illegible]
Control range of voltage gain	ΔG_v	–	60	–	dB
Comparator (open-collector output)					
Input resistance	$R_{8\text{-}3} = R_{10\text{-}3}$	–	500	–	kΩ
Input current	$I_8 = I_{10}$	–	3,5	5	μA
Output voltage LOW at $I_{9L} = 5$ mA	V_{9L}	–	0,22	0,4	V
Output leakage current HIGH at $V_{9H} = 15$ V	$\|I_{9H}\|$	–	–	1	μA

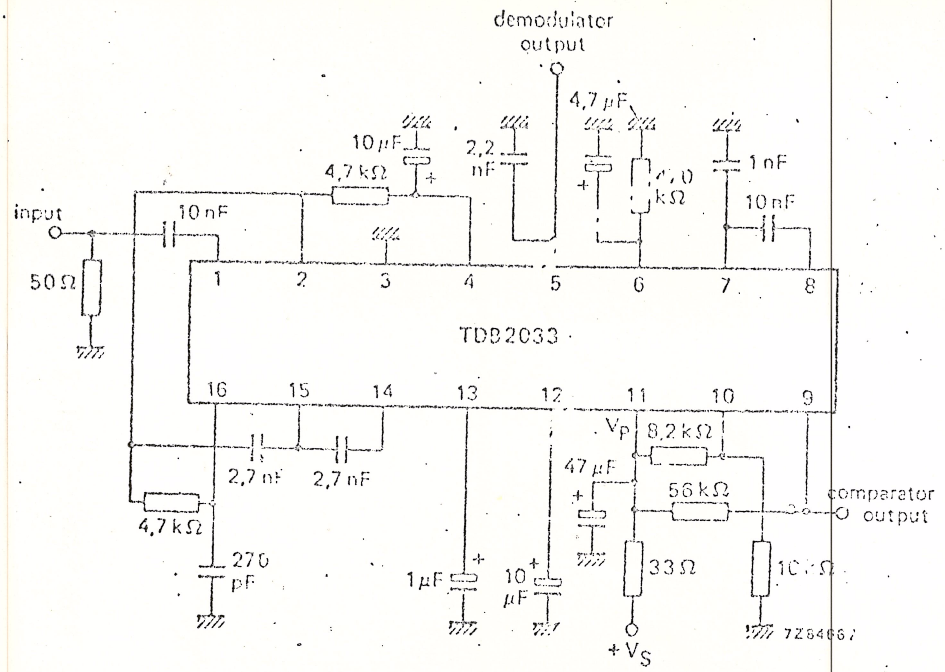

Fig. 2 Test circuit.

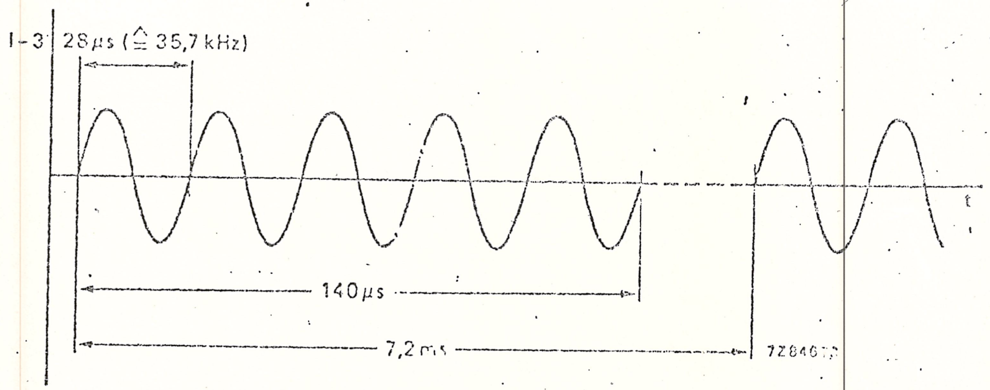

Fig. 3 Sine-wave test signal at input pin 1 for modulating input pulses.

DEVELOPMENT SAMPLE DATA

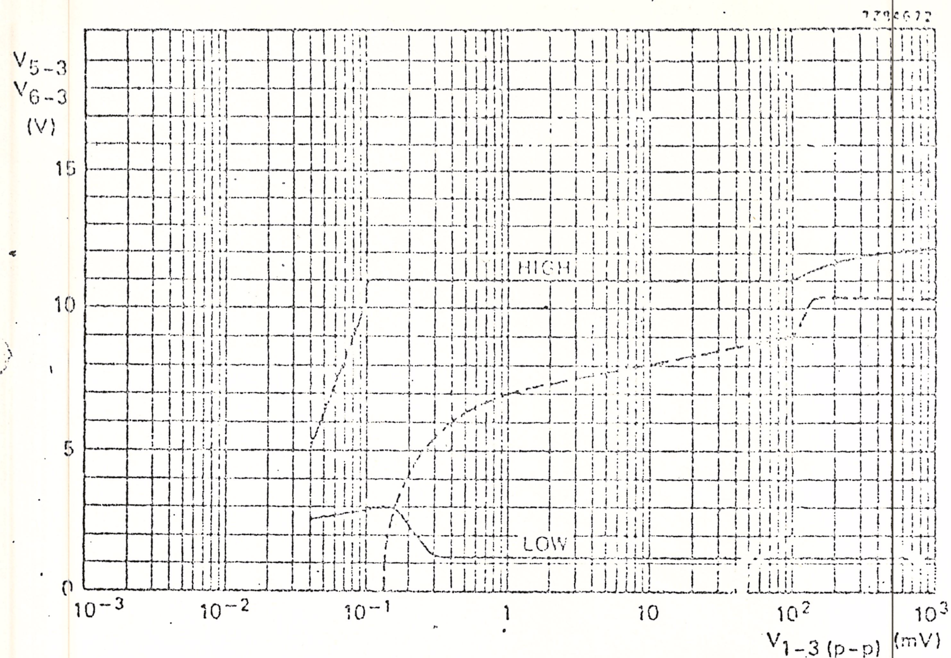

Fig. 4 Voltage $V_{5\text{-}3}$ at the demodulator output (pin 5) and the control voltage $V_{6\text{-}3}$ (pin 6) as a function of the peak-to-peak input voltage $V_{1\text{-}3\,(p\text{-}p)}$ (pin 1).
——— $V_{5\text{-}3}$; – – – $V_{6\text{-}3}$.

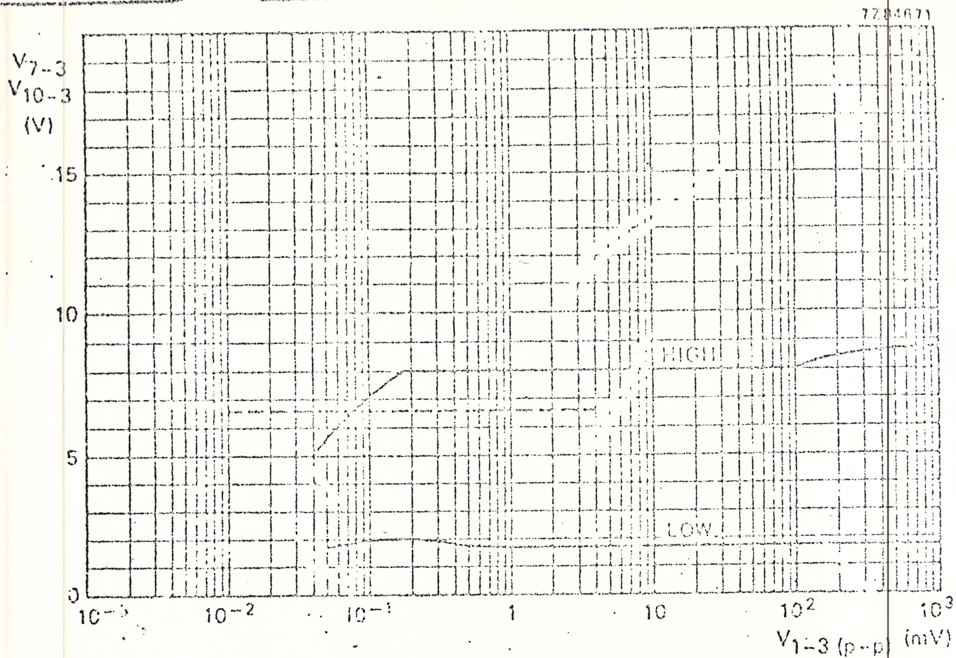

Fig. 5 Voltage $V_{7\text{-}3}$ at the demodulator output (pin 7) and the comparator threshold voltage $V_{10\text{-}3}$ (pin 10) as a function of the peak-to-peak input voltage $V_{1\text{-}3\ (p\text{-}p)}$ (pin 1).

——— $V_{7\text{-}3}$; – – – $V_{10\text{-}3}$ (externally adjustable)

DEVELOPMENT SAMPLE DATA

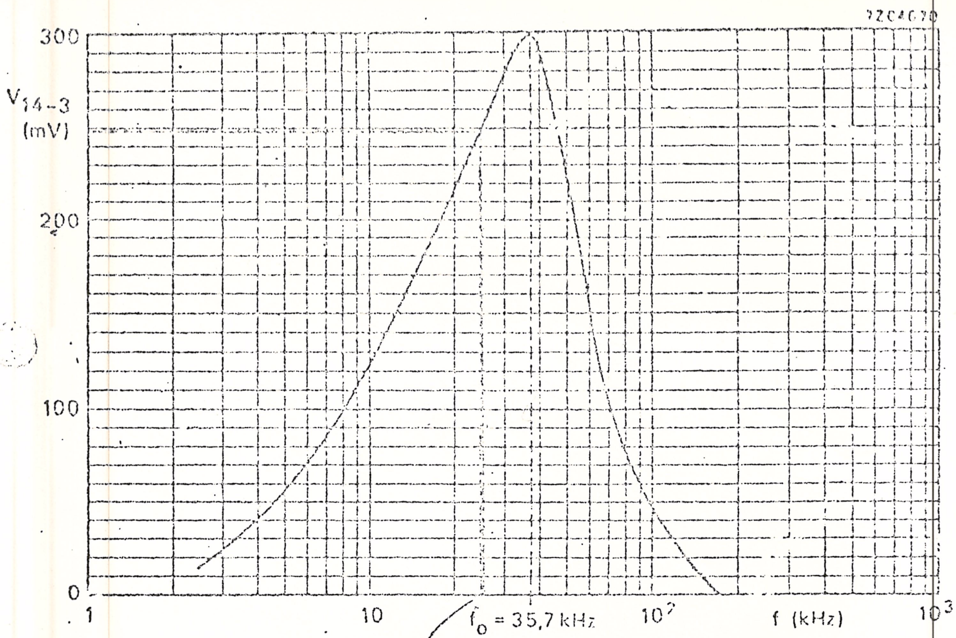

Fig. 6 Frequency response of the active filter using the peripheral circuitry shown in Fig. 2.

APPLICATION INFORMATION

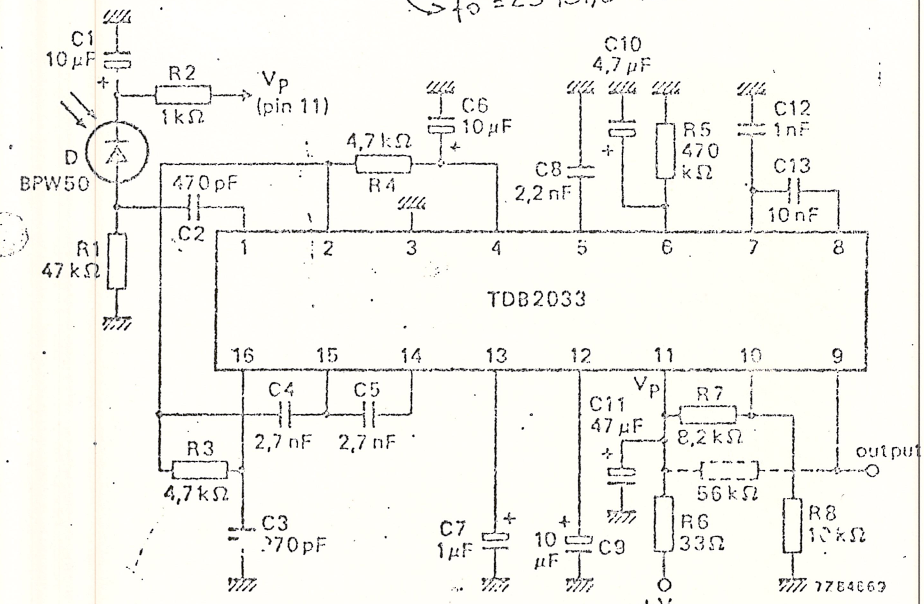

Fig. 7 The TDB2033 used as preamplifier for infrared remote control signals from the SAB3021 transmitter.

APPLICATION INFORMATION (continued)

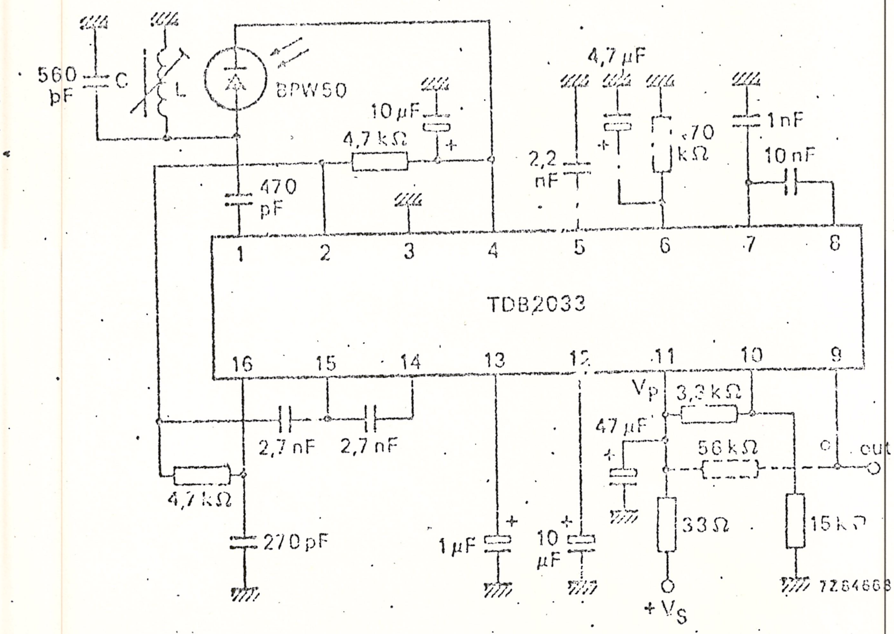

Fig. 8 Similar circuit to that given in Fig. 7, but with LC-input circuit to permit increased operating range and greater immunity to ambient light.

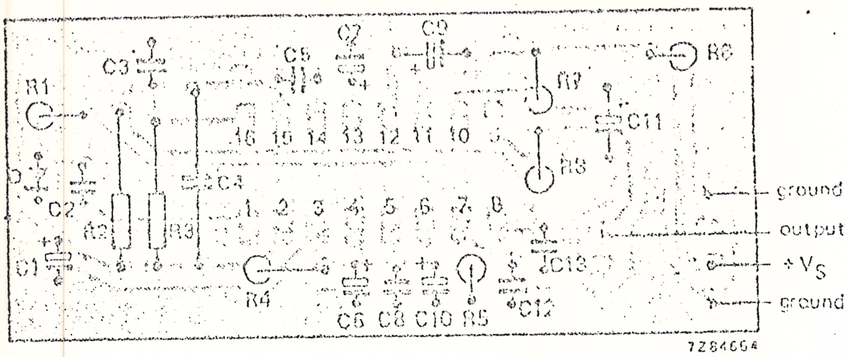

Fig. 9 Component side of printed-circuit board showing component layout used for the circuit of Fig. 7.

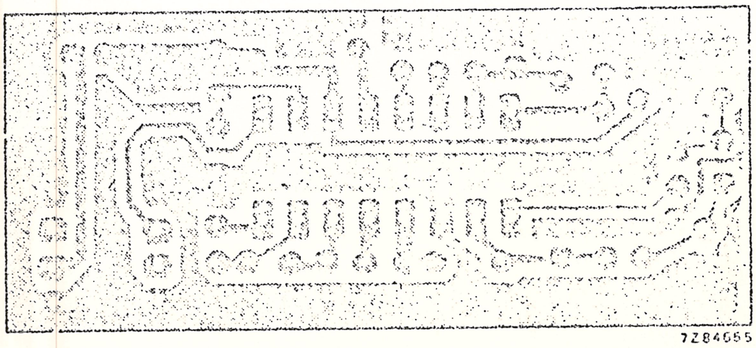

Fig. 10 Track side of printed-circuit board used for the circuit of Fig. 7; p.c. board dimensions 53 mm x 23 mm.