PREAMPLIFIER FOR INFRARED REMOTE CONTROL TRANSMISSION

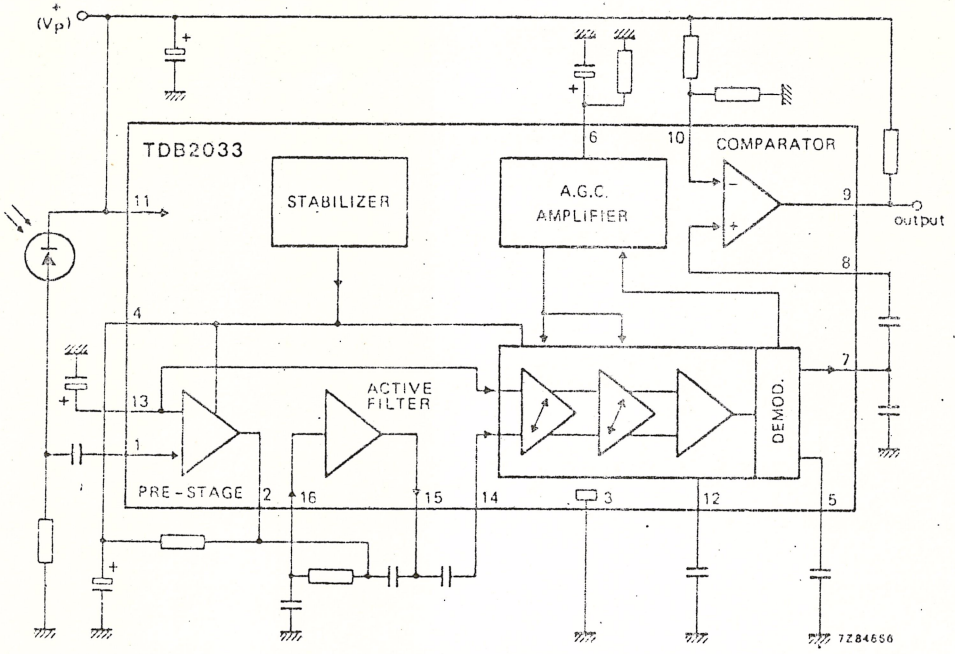

Fig. 1 Block diagram.

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).

TDB2033

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	$V_P = V_{11-3}$	0	+ 15	V
Voltages on:				
pin 1	V_{1-3}	0	V_{2-3}	V
pins 2, 13 and 14	$V_{2,13,14}$	0	V_{4-3}	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_{16-15}	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

TDB2033

DEVELOPMENT SAMPLE DATA

CHARACTERISTICS

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

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

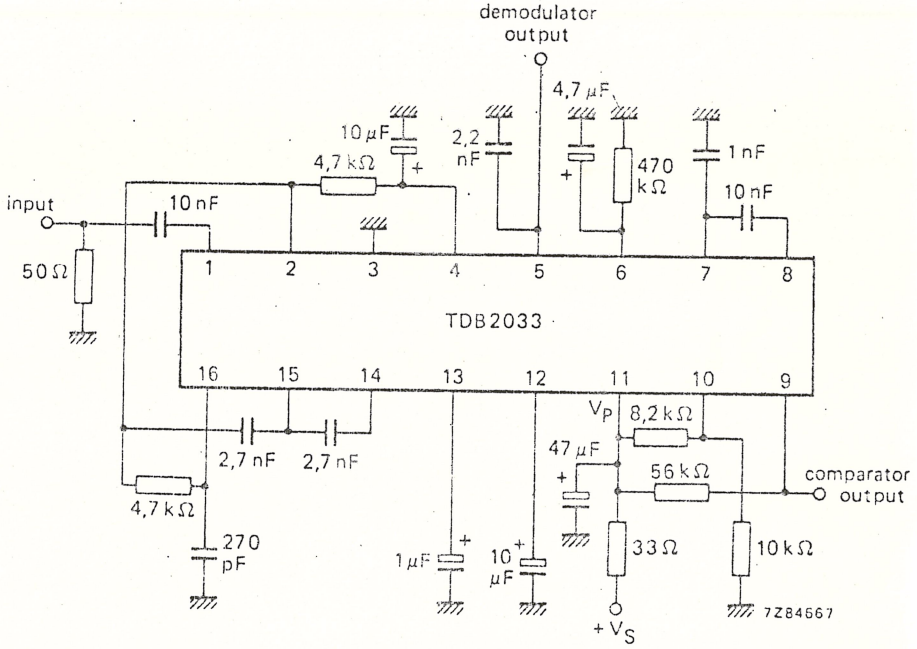

Fig. 2 Test circuit.

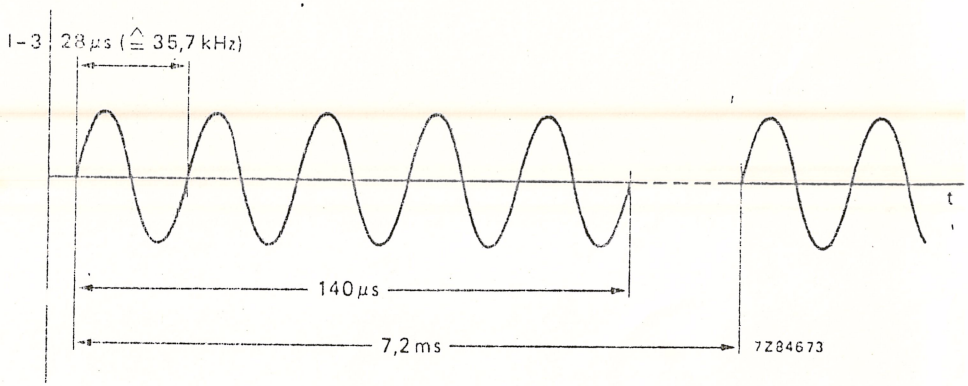

Fig. 3 Sine-wave test signal at input pin 1 for modulating input pulses.

TDB2033

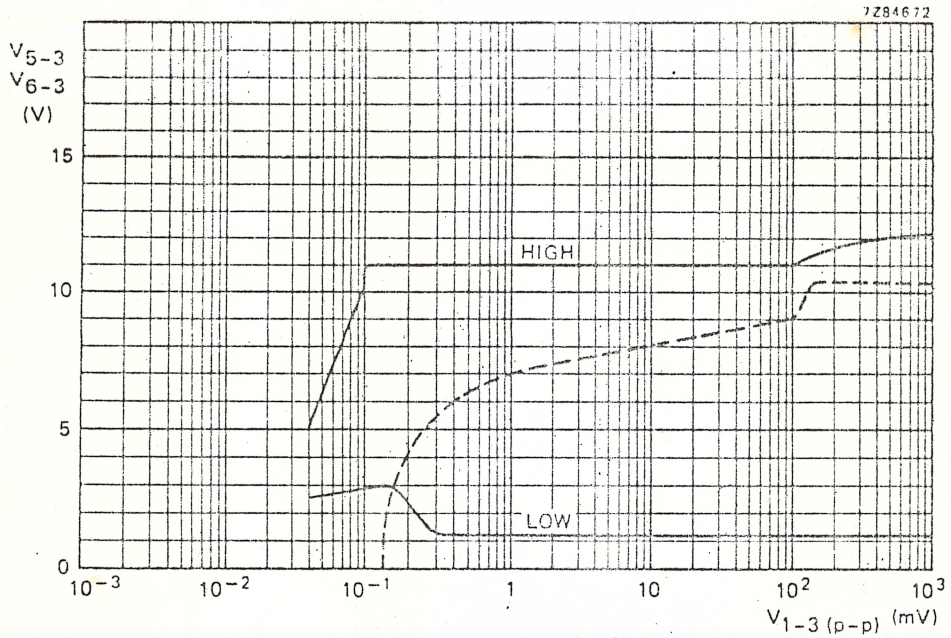

Fig. 4 Voltage V_{5-3} at the demodulator output (pin 5) and the control voltage V_{6-3} (pin 6) as a function of the peak-to-peak input voltage $V_{1-3\,(p-p)}$ (pin 1).

——— V_{5-3}; – – – V_{6-3}.

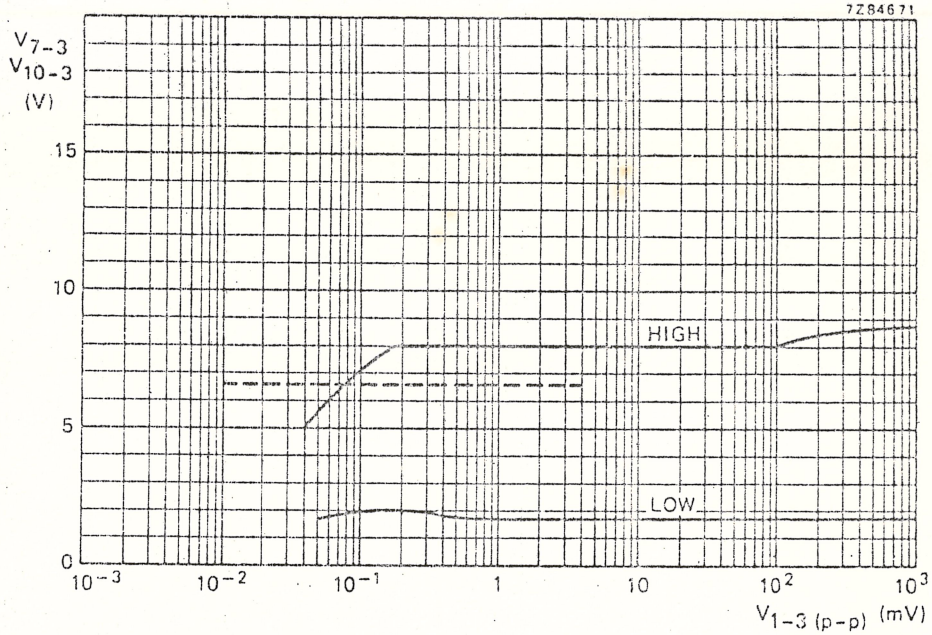

Fig. 5 Voltage V_{7-3} at the demodulator output (pin 7) and the comparator threshold voltage V_{10-3} (pin 10) as a function of the peak-to-peak input voltage $V_{1-3\,(p-p)}$ (pin 1).

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