

## INTEGRATED VOLTAGE STABILIZER

The TCA530 is an adjustable 30 V integrated circuit voltage stabilizer for use with variable capacitance diodes.

The circuit features: continuous short-circuit protected output, a.f.c. control voltage input, internal switch-on delay (can be adjusted externally), pre-stabilization and crystal temperature control (temperature sensor and heater).

### QUICK REFERENCE DATA

Input (supply) voltage range (for $R_i = 3,3 \text{ k}\Omega$ )	$V_i = V_p$	50 to 68 V
Output voltage	$V_O = V_{6-16}$	typ. 30 V
Amplitude range of output voltage for a.f.c.	$\Delta V_{6-16}$	typ. $\pm 0,75 \text{ V}$
Variation of output voltage as a function of:		
input (supply) voltage variations	$\Delta V_{6-12}/\Delta V_i$	typ. 0,2 mV/V
output current variations	$\Delta V_{6-12}/\Delta I_6$	typ. 0,5 mV/mA
temperature variations	$\Delta V_{6-12}/\Delta T_{amb}$	typ. 0,1 mV/K
heater voltage variations	$\Delta V_{6-12}/\Delta V_{1-16}$	typ. 0,2 mV/V
Output current	$I_6 - I_Q$	typ. 3,0 mA

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Allowable output voltage range	$V_O = V_{6-16}$	25 to 30 $\pm 0,75 \text{ V}$
Allowable output current range	$I_6$	0 to 4,6 mA

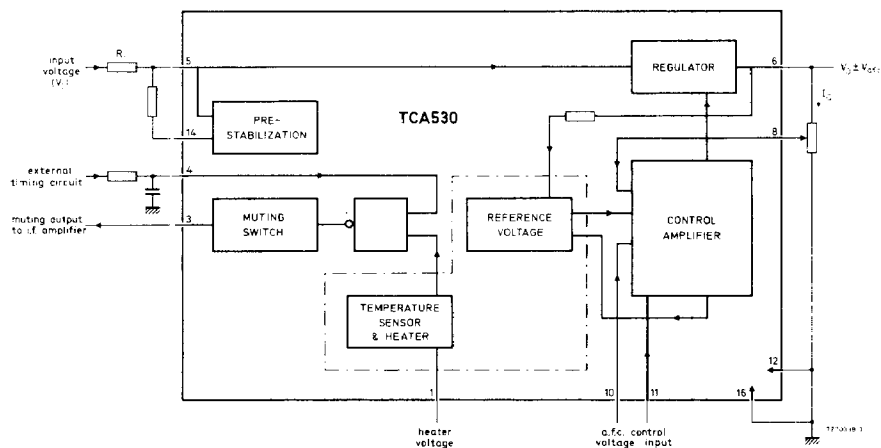


Fig. 1 Block diagram.

### PACKAGE OUTLINE

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

## RATINGS

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

Voltages: pin 1 (heater voltage)	$V_{1-16}$	0 to 20 V
pin 3 (muting switch supply)	$V_{3-16}$ max.	15 V
pins 10 and 11 (a.f.c. input control voltage)	$\pm V_{10-11}$ max.	6 V
Currents: pin 3	$\pm I_3$ max.	5 mA
pin 4	$I_4$ max.	500 $\mu$ A
pin 5	$I_5$ max.	25 mA
pin 6	$I_6$ max.	30 mA
pin 8	$I_8$ max.	500 $\mu$ A
pin 10	$I_{10}$ max.	500 $\mu$ A
pin 11	$I_{11}$ max.	500 $\mu$ A
pin 14	$I_{14}$ max.	15 mA
Total power dissipation (excluding heater power) at $T_{amb} = 60^\circ\text{C}$	$P_{tot}$ max.	500 mW
Storage temperature	$T_{stg}$	-55 to +150 $^\circ\text{C}$
Operating ambient temperature	$T_{amb}$	-20 to +80 $^\circ\text{C}$

## CHARACTERISTICS

 $V_{6-12} = 30\text{ V}$ ;  $V_{10-12} = V_{11-12} = 10\text{ V}$ ;  $V_{1-16} = 15\text{ V}$ ;  $T_{amb} = 25^\circ\text{C}$ ; measured in Fig. 3.

## Voltage control

Input (supply) voltage range\*

 $R_i = 3,3\text{ k}\Omega$ ;  $I_6 = 3,5\text{ mA}$  $V_I = V_P$  50 to 68 V

Current consumption

 $I_P$  typ. 8,1 mA  
5,2 to 11,0 mA $I_5$  typ.  $I_6 + (1,1 \pm 0,3)\text{ mA}$ 

Regulator voltage drop

within operating range of  
the pre-stabilizer $V_{5-6}$  typ. 2,7 V  
2 to 3,5 Voutside operating range of  
the pre-stabilizer\*\* $V_{5-6} <$  6 V

Output current (start of current limiting)

 $I_6 >$  8 mA

Internal reference voltage

 $V_{8-12}$  typ. 20 V  
18,2 to 21,8 V\* For other input (supply) voltage ranges and output currents, the series resistor  $R_i$  has to be altered (see also Fig. 2).

\*\* The specified output voltage dependency of the input (supply) voltage is not guaranteed outside the operating range of the pre-stabilizer.

Input current of control amplifier	$I_8$	typ. <	0,5 $\mu\text{A}$ 1 $\mu\text{A}$
Variation of output voltage as a function of *			
input (supply) voltage variations	$\Delta V_{6-12}/\Delta V_1$	typ.	0,2 mV/V
output current variations	$\Delta V_{6-12}/\Delta I_6$	typ.	0,5 mV/mA
temperature variations	$\Delta V_{6-12}/\Delta T_{\text{amb}}$	typ.	0,1 mV/K
heater voltage variations	$\Delta V_{6-12}/\Delta V_{1-16}$	typ.	0,2 mV/V
Hum suppression at $f = 50 \text{ Hz}$			
between input (supply) voltage and pin 6		typ.	80 dB
between pins 5 and 6		typ.	60 dB
between pins 1 and 6		typ.	80 dB
Output noise voltage at $f = 10 \text{ Hz to } 15 \text{ kHz}$ (r.m.s. value)	$V_{n(\text{rms})}$	<	50 $\mu\text{V}$

**A.F.C. control amplifier**

Common mode input voltage range	$V_{10-12} = V_{11-12}$	6,0 to 18,0 V
Common mode rejection ratio	CMRR	typ. 60 dB
Input current	$I_{10} = I_{11}$	typ. 0,1 $\mu\text{A}$ < 0,5 $\mu\text{A}$
Input resistance	$R_{i(10-11)}$	> 1 M $\Omega$
Ratio between output voltage variation and a.f.c. input voltage variation	$\Delta V_{6-12}/\Delta V_{10-11}$	1,2 : 1
Amplitude range of output voltage	$\Delta V_{6-12}$	typ. $\pm 0,75 \text{ V}$ $\pm 0,5 \text{ to } \pm 1,0 \text{ V}$

**Muting switch**

When the crystal temperature has reached approximately its stationary final value, the output of the muting switch (pin 3) becomes high-ohmic. The switching of pin 3 can be delayed by an external RC-circuit at pin 4 or by a switching voltage.

Muting switch ON (pin 3 low-ohmic)

Input voltage	$V_{4-16}$	<	8 V
Input current	$I_4$	typ.	1 $\mu\text{A}$
Output saturation voltage at $I_3 = 1 \text{ mA}$	$V_{3-16 \text{ sat}}$	typ. <	0,45 V 0,6 V

Muting switch OFF (pin 3 high-ohmic)

Input voltage	$V_{4-16}$		8 to 11 V
Input current	$I_4$	>	0,1 $\mu\text{A}$
Output voltage	$V_{3-16}$	<	15 V
Output current	$I_3$	<	1 $\mu\text{A}$
Internal switch-on delay	$t_d$	<	3 s

\* External component value changes are not taken into account.

## CHARACTERISTICS (continued)

## Crystal temperature control

Heater voltage range

 $V_{1-16}$  8 to 20 V

Heater peak current at switching on

 $I_{1M}$  typ. 230 mA  
< 300 mAContinuous heater current at  $V_{1-16} = 15$  V $I_t$  typ. 40 mA  
< 55 mA

Continuous heater power

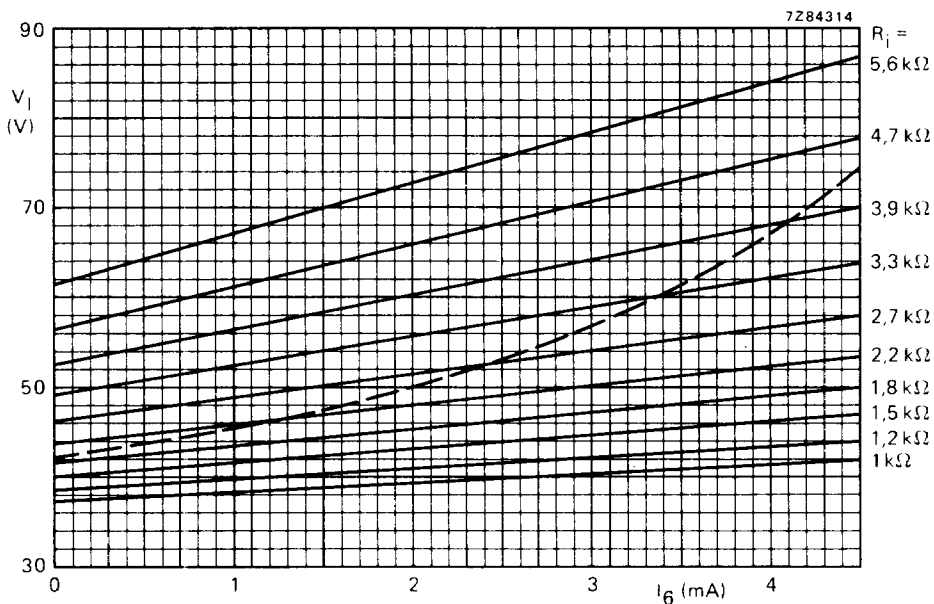
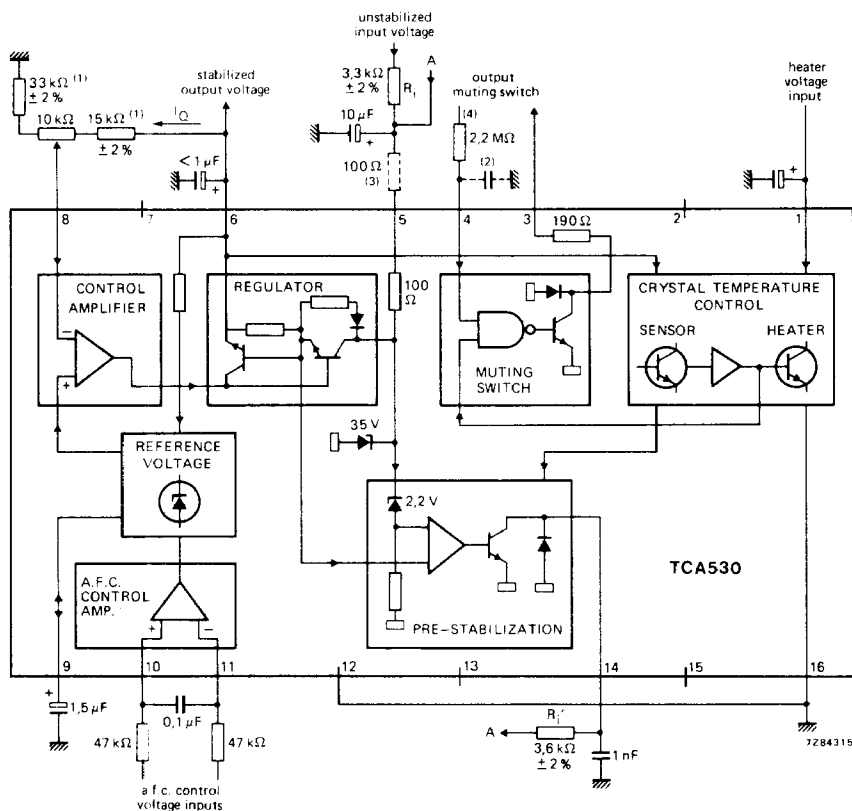
 $P_h$  typ. 600 mW

Fig. 2 Curves to obtain  $R_i$ -values for various input (supply) voltages and/or output currents. Conditions:  $V_{6-12} = 30$  V; tolerance of  $I_6 = \pm 20\%$ ;  $R_{5-14} = 3,6$  k $\Omega$ ; tolerance of  $R_i = \pm 2\%$ . Above the dotted curve a tolerance of  $V_i$  ( $V_p$ ) of  $\pm 15\%$  is allowed.



(1) It is recommended that fixed resistors of the same kind be used for the voltage divider.

The voltage divider of Fig. 4 can be used when a narrow temperature dependency is required.

(2) This capacitor can be applied to increase the internal delay.

(3) This resistor is recommended when the IC is not soldered on a printed-circuit board.

(4) Can be connected to pin 6, for example.

Fig. 3 Test circuit.

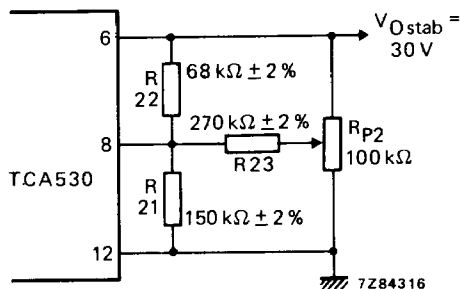


Fig. 4 Voltage divider for the narrowest possible temperature dependency.

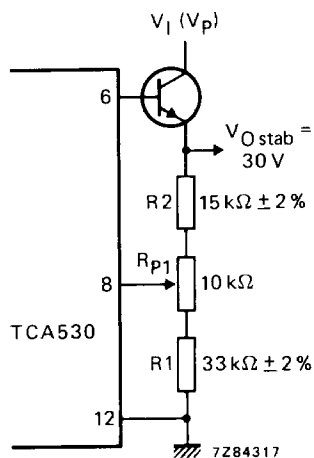


Fig. 5 Circuit extension by means of a series transistor at the output, for output currents  $> 4,6$  mA.

The following table gives some resistor value examples for various output voltages with  $\Delta R/R \leq \pm 2\%$  and  $\Delta R_p/R_p \leq \pm 20\%$ .

$V_{Ostab}$ V	$R_{p2}$ k $\Omega$	$R_{21}$ k $\Omega$	$R_{22}$ k $\Omega$	$R_{23}$ k $\Omega$	$R_{p1}$ k $\Omega$	$R_1$ k $\Omega$	$R_2$ k $\Omega$
30	100	200	82	300	10	20	10
30	47	180	82	300	47	100	47
29					22	39	18
28 <sup>+</sup>	100	220	75	300	22	39	15
28	47	300	100	430			
27					47	68	24
26					22	27	8,2
25	100	560	91	390	47	47	12
25	47	620	100	430			

The series resistors  $R_i$  and  $R_i'$  (see Fig. 3), as well as the input (supply) voltage  $V_i$  ( $V_P$ ), have to be adapted to the chosen output voltages  $V_{Ostab}$ .

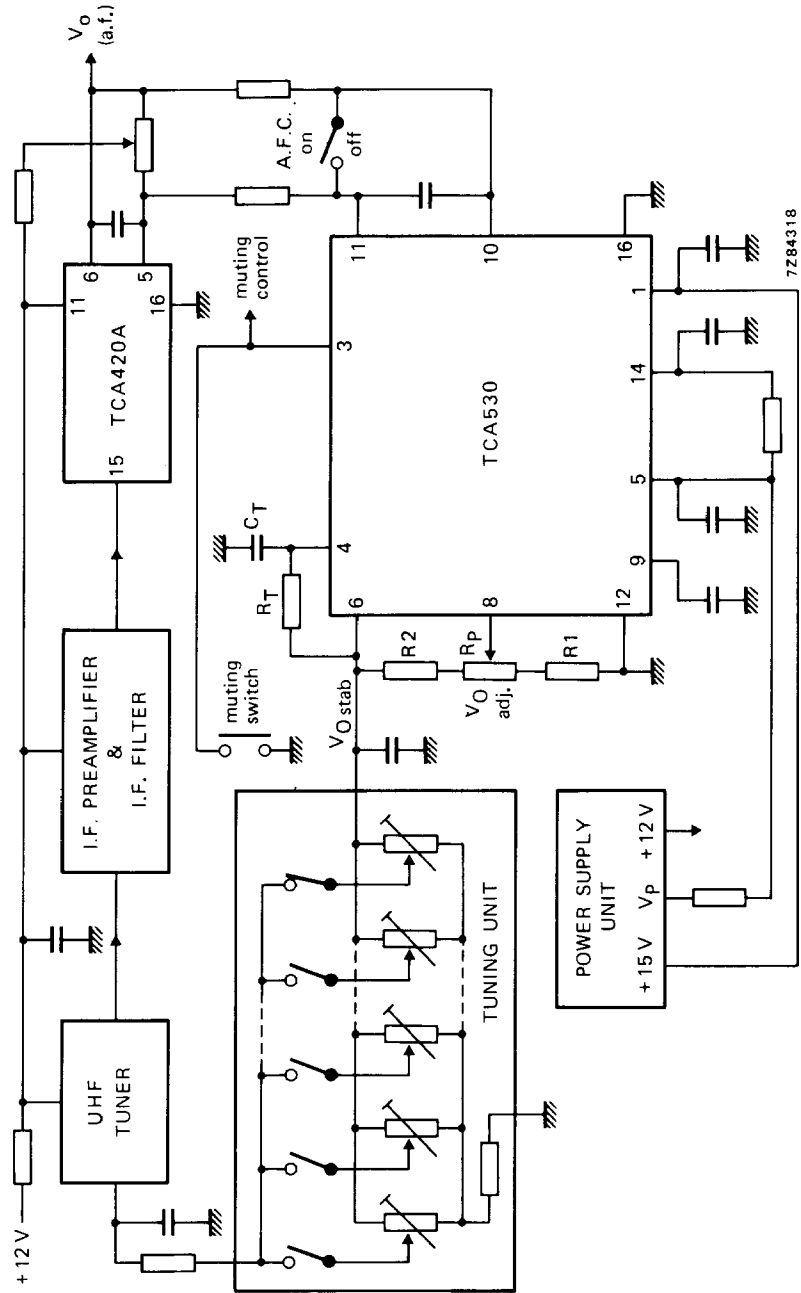


Fig. 6 Application example; f.m. receiver with TCA530 and TCA420A.