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 kΩ)	$V_I = V_P$	50 to 68	V
Output voltage	$V_O = V_{6\text{-}16}$	typ. 30	V
Amplitude range of output voltage for a.f.c.	$\Delta V_{6\text{-}16}$	typ. ± 0,75	V
Variation of output voltage as a function of:			
input (supply) voltage variations	$\Delta V_{6\text{-}12}/\Delta V_I$	typ. 0,2	mV/V
output current variations	$\Delta V_{6\text{-}12}/\Delta I_6$	typ. 0,5	mV/mA
temperature variations	$\Delta V_{6\text{-}12}/\Delta T_{amb}$	typ. 0,1	mV/K
heater voltage variations	$\Delta V_{6\text{-}12}/\Delta V_{1\text{-}16}$	typ. 0,2	mV/V
Output current	$I_6 - I_Q$	typ. 3,0	mA
Allowable output voltage range	$V_O = V_{6\text{-}16}$	25 to 30 ± 0,75	V
Allowable output current range	I_6	0 to 4,6	mA

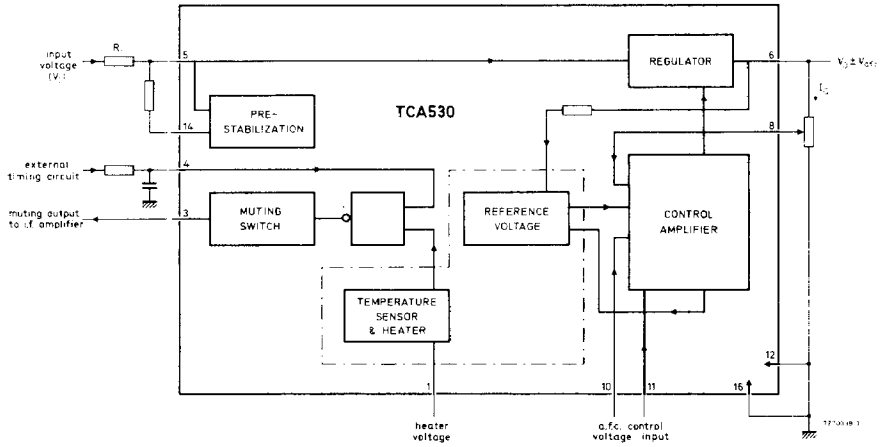


Fig. 1 Block diagram.

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 μA
pin 5	I_5	max.	25 mA
pin 6	I_6	max.	30 mA
pin 8	I_8	max.	500 μA
pin 10	I_{10}	max.	500 μA
pin 11	I_{11}	max.	500 μA
pin 14	I_{14}	max.	15 mA
Total power dissipation (excluding heater power) at T_{amb} = 60 °C	P_{tot}	max.	500 mW
Storage temperature	T_{stg}		−55 to + 150 °C
Operating ambient temperature	T_{amb}		−20 to + 80 °C

CHARACTERISTICS

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

Voltage control

Input (supply) voltage range* R_i = 3,3 kΩ; I_6 = 3,5 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.	$I_6 + (1,1 \pm 0,3)$ mA
Regulator voltage drop within operating range of the pre-stabilizer	V_{5-6}	typ.	2,7 V 2 to 3,5 V
outside 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 µA 1 µA
Variation of output voltage as a function of *			
input (supply) voltage variations	$\Delta V_{6\text{-}12}/\Delta V_I$	typ.	0,2 mV/V
output current variations	$\Delta V_{6\text{-}12}/\Delta I_6$	typ.	0,5 mV/mA
temperature variations	$\Delta V_{6\text{-}12}/\Delta T_{amb}$	typ.	0,1 mV/K
heater voltage variations	$\Delta V_{6\text{-}12}/\Delta V_{1\text{-}16}$	typ.	0,2 mV/V
Hum suppression at f = 50 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 Hz to 15 kHz (r.m.s. value)	$V_{n(rms)}$	<	50 µV

A.F.C. control amplifier

Common mode input voltage range	$V_{10\text{-}12} = V_{11\text{-}12}$	6,0 to 18,0	V
Common mode rejection ratio	CMRR	typ.	60 dB
Input current	$I_{10} = I_{11}$	typ. <	0,1 µA 0,5 µA
Input resistance	$R_{i(10\text{-}11)}$	>	1 MΩ
Ratio between output voltage variation and a.f.c. input voltage variation	$\Delta V_{6\text{-}12}/\Delta V_{10\text{-}11}$	1,2 : 1	
Amplitude range of output voltage	$\Delta V_{6\text{-}12}$	typ. ± 0,5 to ± 1,0	± 0,75 V 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	$V_{4\text{-}16}$	<	8 V
Input current	I_4	typ.	1 µA
Output saturation voltage at I_3 = 1 mA	$V_{3\text{-}16\,sat}$	typ. <	0,45 V 0,6 V
Muting switch OFF (pin 3 high-ohmic)			
Input voltage	$V_{4\text{-}16}$	8 to 11	V
Input current	I_4	>	0,1 µA
Output voltage	$V_{3\text{-}16}$	<	15 V
Output current	I_3	<	1 µA
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 < 300	mA mA
Continuous heater current at V_{1-16} = 15 V	I_1	typ. 40 < 55	mA mA
Continuous heater power	P_h	typ. 600	mW

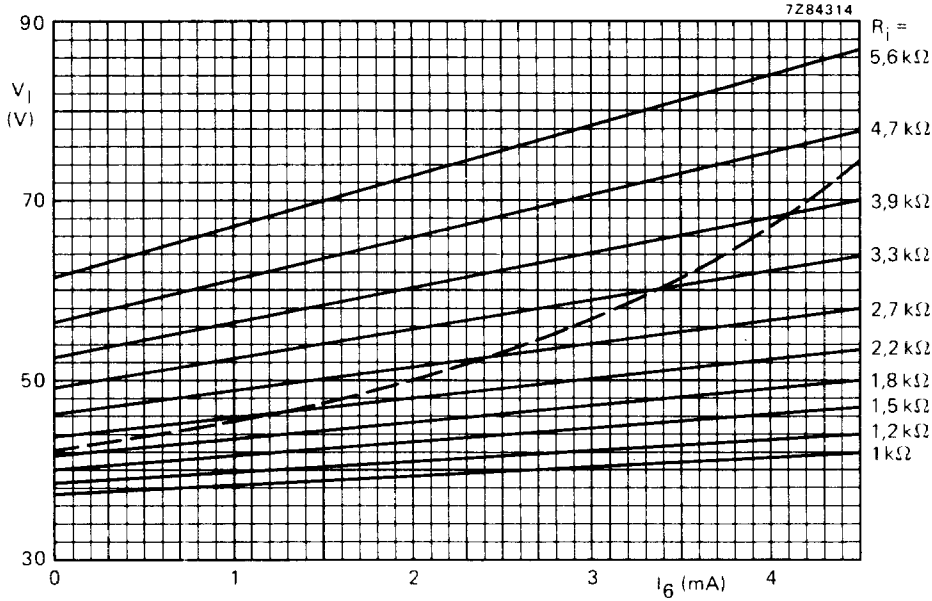
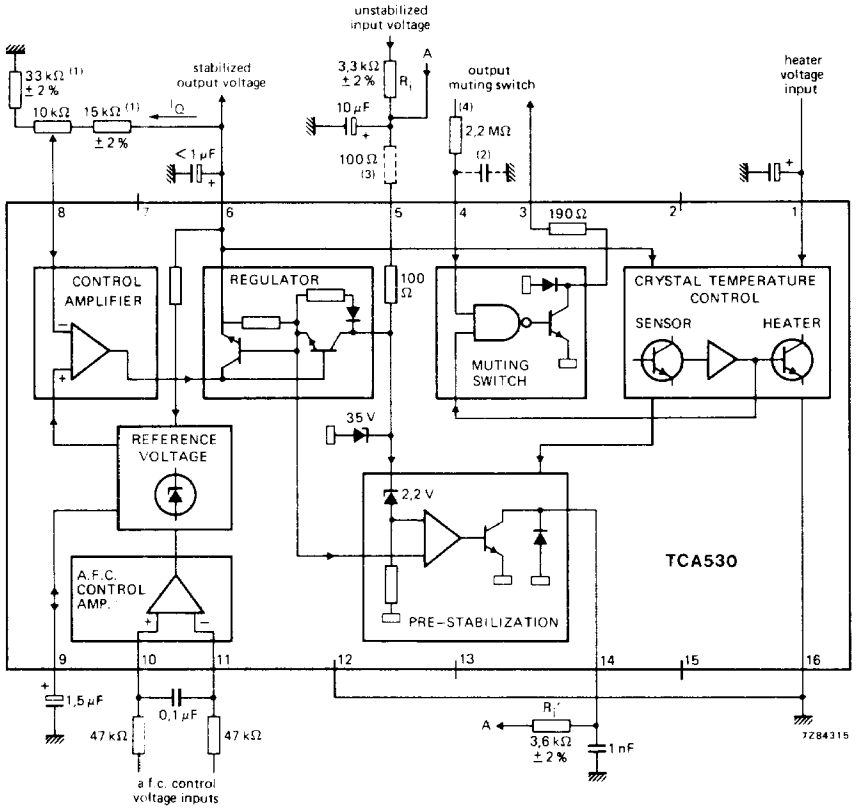


Fig. 2 Curves to obtain R_i-values for various input (supply) voltages and/or output currents. Conditions: V_{6-12} = 30 V; tolerance of I_6 = ± 20%; R_{5-14} = 3,6 kΩ; tolerance of R_i = ± 2%. Above the dotted curve a tolerance of V_I (V_P) of ± 15% is allowed.



(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.

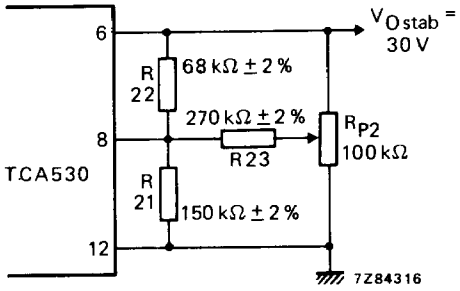


Fig. 4 Voltage divider for the narrowest possible temperature dependency.

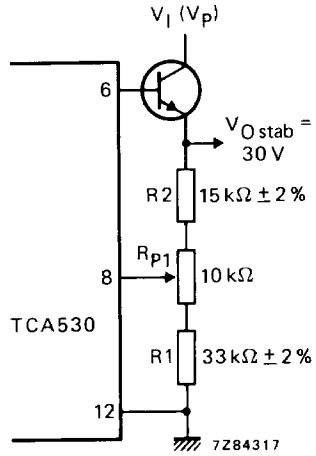


Fig. 5 Circuit extension by means of a series transistor at the output, for output currents > 4,6 mA.

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

V_{Ostab} V	R_{P2} kΩ	R21 kΩ	R22 kΩ	R23 kΩ	R_{P1} kΩ	R1 kΩ	R2 kΩ
30	100	200	82	300	10	20	10
30	47	180	82	300	47	100	47
29					22	39	18
28	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}.

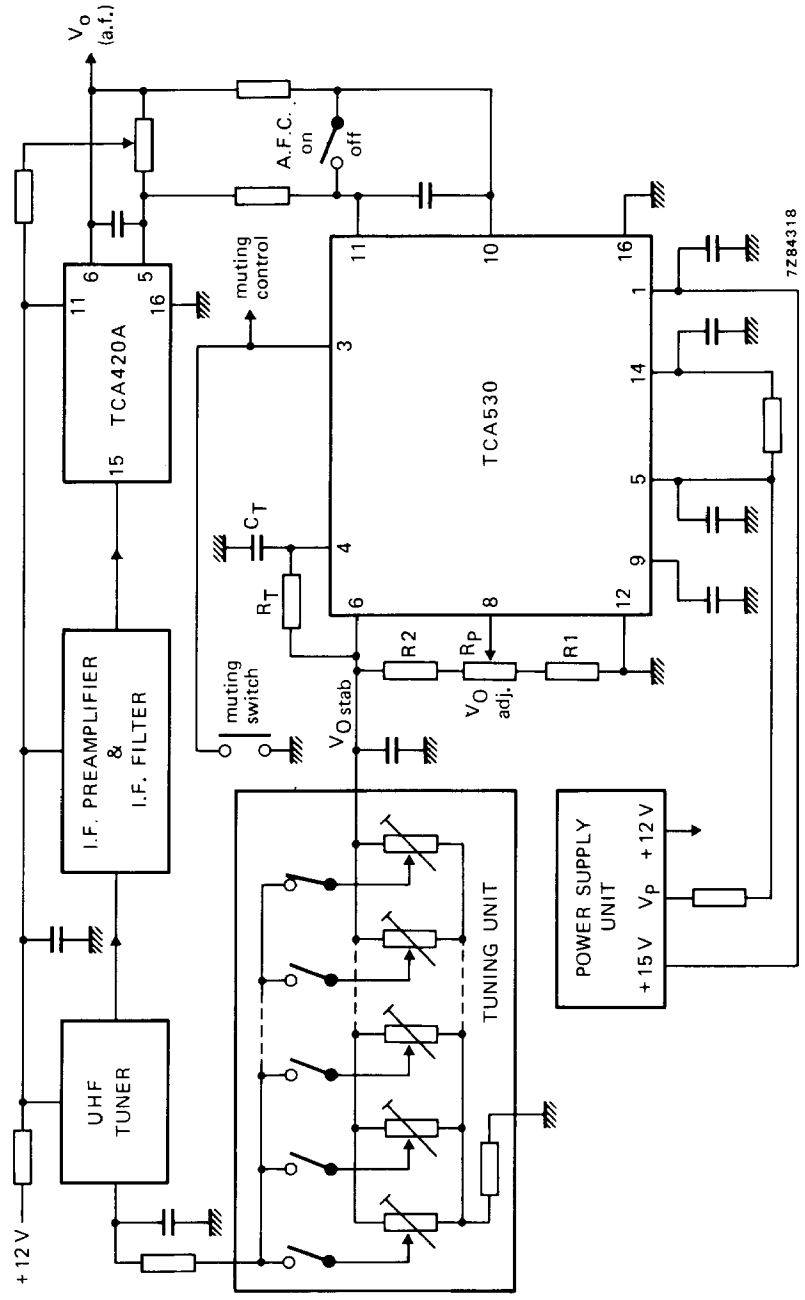


Fig. 6 Application example; f.m. receiver with TCA530 and TCA420A.