

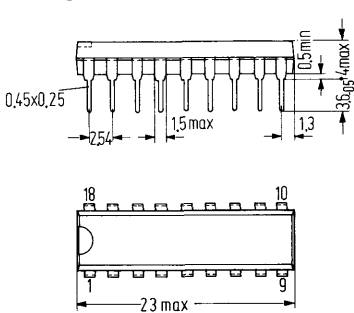
The monolithic integrated circuits SAS 580 and SAS 590 have been developed from SAS 560 S/570 S which are being further produced. SAS 580 is the basic component for the first 4 channels. By adding any number of SAS 590, the number of channels can be extended by 4 channels each one.

The new ICs offer with even less external circuitry higher operating comfort:

- Integrated ring counter for remote control saves external components and permits higher frequency
- Potentiometers are switched by sliders. External diodes are unnecessary
- The outputs are able of directly driving filamental lamps, LED's, neon lamps or nixie tubes
- Complete function for supply voltage between 10 and 36 V, i.e. the supply voltage can be strongly reduced during stand-by operation, a selected channel remains switched without any additional circuitry

Type	Ordering codes
SAS 580	Q67000-S28
SAS 590	Q67000-S29

Package outlines



Plastic plug-in package  
20 A 18 DIN 41866  
18 pins, dual-in-line  
Weight approx. 1.3 g  
Dimensions in mm

Absolute maximum ratings

Supply voltage	$V_{16}$	36	V
Current consumption (for operation with higher voltage than 36 V, a series resistor is required)	$I_{16}$	15	mA
Driver current for $t_{max} \leq 2s$	$I_3, I_5, I_7, I_9$	55	mA
Junction temperature	$I_3, I_5, I_7, I_{9max}$	100	mA
Thermal resistance (system-air)	$T_j$	150	°C
Storage temperature	$R_{thsa}$	120	°K/W
	$T_s$	-40 to +125	°C

Range of operation

Supply voltage	$V_{16}$	10 to 36	V
Ambient temperature in operation	$T_{amb}$	0 to +70	°C

**Electrical characteristics** (see test circuit,  $V_{16} = 30\text{ V}$ ,  $T_{\text{amb}} = 25\text{ }^\circ\text{C}$ )

		min	typ	max	
Internal current consumption					
channel switched	$I_1$	4.5	7.0	9.5	mA
channel not switched	$I_{16}$	3.0	5.0	8.5	mA
Voltage at pin 18 ( $R_C = 3\text{ k}\Omega$ )					
during touching	$V_{18s}$	3.4	3.8	4.2	V
after touching	$V_{18h}$	2.6	3.0	3.4	V
Saturation voltage of driver outputs					
$R_L = 1\text{ k}\Omega$	$V_3, V_5, V_7, V_9$		.8	1.5	V
$R_L = 30\text{ k}\Omega$	$V_3, V_5, V_7, V_9$		30	60	mV
Reverse voltage of driver outputs					
$I_{\text{rev}} = 100\text{ }\mu\text{A}$	$V_3, V_5, V_7, V_9$	60			V
$I_{\text{rev}} = 5\text{ }\mu\text{A}$	$V_3, V_5, V_7, V_9$	50			V
Tuning voltage	$V_{12}, V_{13}, V_{14}, V_{15}$	.5		$V_{16}-2$	V
Input current of tuning voltage inputs	$I_{12}, I_{13}, I_{14}, I_{15}$		150	300	nA
Offset voltage of tuning switches <sup>1)</sup>	$V_{12-11}, V_{13-11}$			$\pm 100$	mV
	$V_{14-11}, V_{15-11}$			$\pm 100$	mV
Temperature drift of tuning voltage switches ( $T_{\text{amb}} 20 \dots 50\text{ }^\circ\text{C}$ ) <sup>1)</sup>	$V_T$			5	mV
Impedance of tuning output ( $I_{11} < \pm 30\text{ }\mu\text{A}$ )	$R_{q11}$		3		k $\Omega$
Trigger current for channel switching	$I_2, I_4, I_6, I_8$	20	80	200	nA
Input threshold voltage of switch amplifiers ( $I_2, I_4, I_6, I_8 = 80\text{ nA}$ )	$V_2, V_4, V_6, V_8$		5.5		V
Switch frequency of ring counter	$f_{rc}$		10		kHz

<sup>1)</sup> measured between switched input and pin 11.



## Summary

The integrated circuits SAS 580/590 have been developed for electronic channel selection in radio and TV sets with varicap diodes. The selection can be carried out by merely touching the sensor plates. By selecting a stage, a pre-set tuning voltage is switched and a driver stage operated which are controlling the band selection and the channel indication. For the indication, it can be chosen between neon lamps, nixie tubes, LED's or filamental lamps. Each integrated circuit contains 4 channel memories. An internal ring counter allows continued switching from channel to channel. The IC's can be lined up in any number.

## Concept

The concept is that already the first IC SAS 580 is a fully functioning unit which can be extended by adding further IC's. The number of channel memories per package resulted from the necessary functional extent and the number of pins at disposal. The DIL 18 package houses 4 channel memories. Picture 1 shows the block diagram of the SAS 580.

Each stage consists of a RS flipflop which is set either from input by input amplifier  $A_1$  or in the ring counter function by amplifier  $A_2$ . At the same time, a previously selected stage is reset via the coupling resistance  $R_c$  which is common to all stages.

The RS flipflop controls two switches. Switch  $S_1$  switches the tuning voltage preselected with the potentiometer to the tuning output pin 11, switch  $S_2$  sends a signal to the output for channel indication and band selection.

Instead of the ring counter amplifier  $A_2$ , the SAS 580 contains in the first stage a switching stage which sets the IC automatically at the first stage after application of the supply voltage. The SAS 580 also contains an auxiliary circuit SB by means of which all inputs can be blocked (stand-by operation), and a current generator CG as common operating resistance for the separator amplifier OP's of all stages.

## Realisation of switching functions

Picture 2 shows the circuit of one stage. The amplifiers  $A_1$  and  $A_2$  have two stages each ( $T_3, T_4$  and  $T_1, T_2$ ). The gain of  $A_1$  is designed so that the memories can also be selected by bridging the key Ta with the finger. The RS flipflop is set by  $T_6$ . This is maintained by  $T_7$ . Since the voltage at the coupling resistance  $R_c$  is during the switching procedure higher than the holding voltage at  $T_7$ , each switching procedure annuls an existing holding state.

The tuning switch  $S_1$  and the indication switch  $S_2$  are controlled by the holding circuit ( $T_8, T_9, R_7, R_8$ ). The switch  $S_2$  can supply a maximum current of 55 mA. By short-circuit between base and emitter ( $T_{11}$ ),  $S_2$  obtains a reverse voltage  $V_{CES} \approx 60$  V.

## Switching through of the tuning voltage

The switching through of the tuning voltage was subject to particular care during development.

For adjusting the tuners, voltages between .5 V and 28.5 V with low temperature drift are necessary. As shown in block diagram, picture 1, switching through is carried out by means of operational amplifiers as impedance transformer circuit. A small input current and a low output impedance are the advantages of this circuit. The current source CG serves as operating resistance for the amplifiers of all stages, even for those of further components.

By selecting a memory, the respective operational amplifier is connected to the operating resistance. Operational amplifier and current source are adapted to each other so that the operational amplifier works with almost symmetrical currents. Differing  $V_{BE}$ -voltages and a resulting temperature drift are thus avoided.

Figure 3 shows the dimensions of the operational amplifier and the current source as well as the test circuit used for the drift tests carried out.

The resistance  $R_p$  corresponds to the potentiometer resistance. Tests were carried out with  $R_p = 25$  k $\Omega$ , which corresponds to a 100 k $\Omega$  potentiometer in its most unfavourable position.

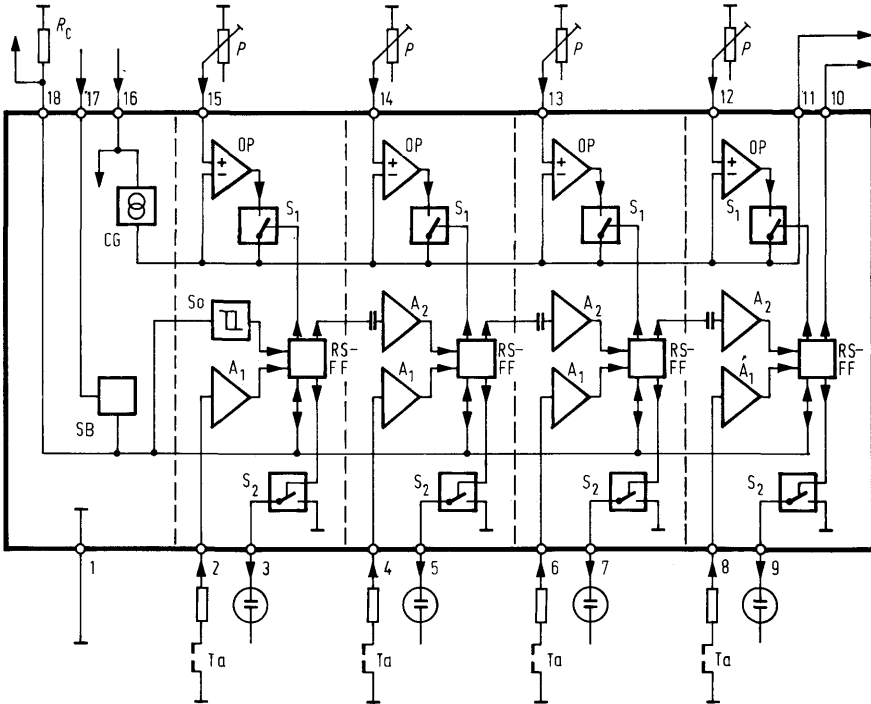
Figure 4 shows the test results in the interesting temperature range, represented as voltage difference between input and output. The test was carried out for different tuning voltages. As can be seen, the temperature drift is inferior.

### **The application**

The described Integrated Circuits can be used in all cases where a channel selection 1-out of -n shall be carried out. They have been developed in consideration of the particular requirements of radio and TV sets. Figure 5, therefore, shows, as example of a typical application, a circuit for the selection of 8 channels in a TV sets. Each channel may, with the pre-selection switches, be assigned to all transmitting bands. The selected channel is indicated by a nixie tube. Continued switching from channel to channel is obtained by positive pulses to pin 18.

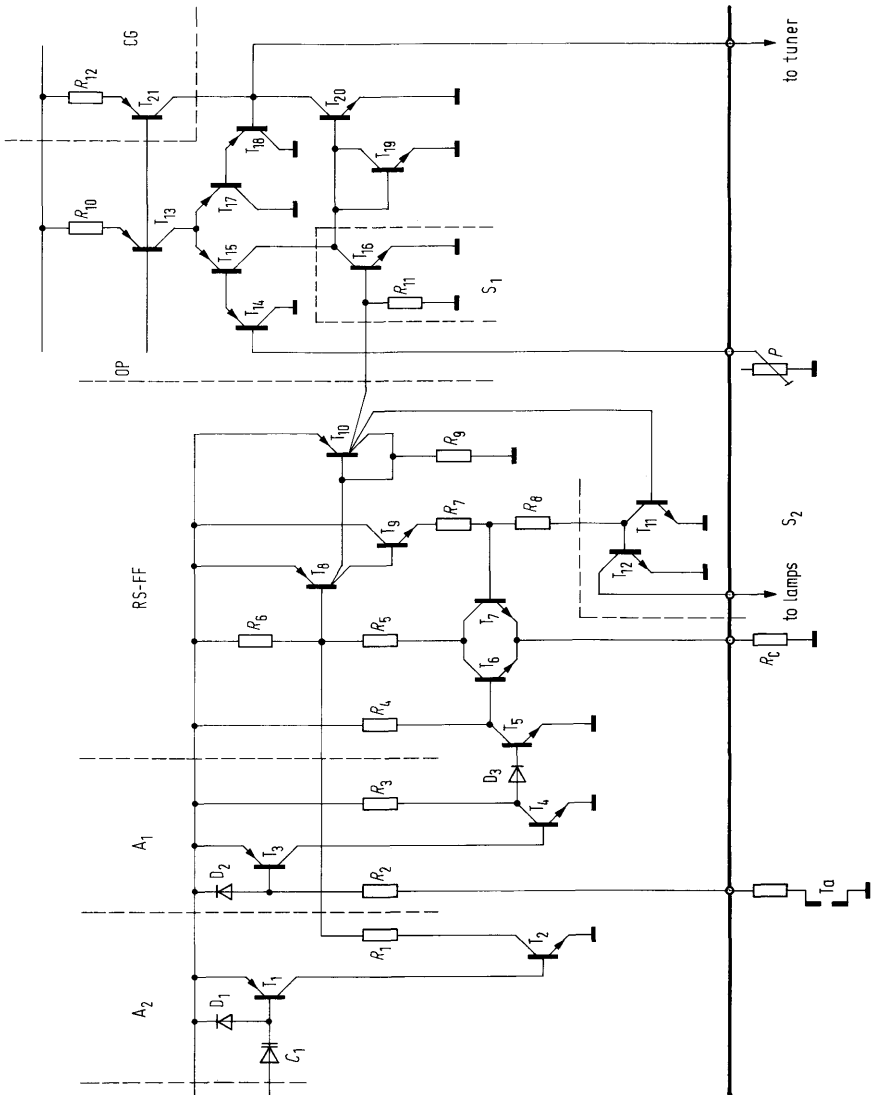
Figure 6 shows an application circuit for filamental lamps or LED's as indicating elements. The displays are in series to the band switches so that the diodes from application, figure 5, are not needed.

Block circuit diagram

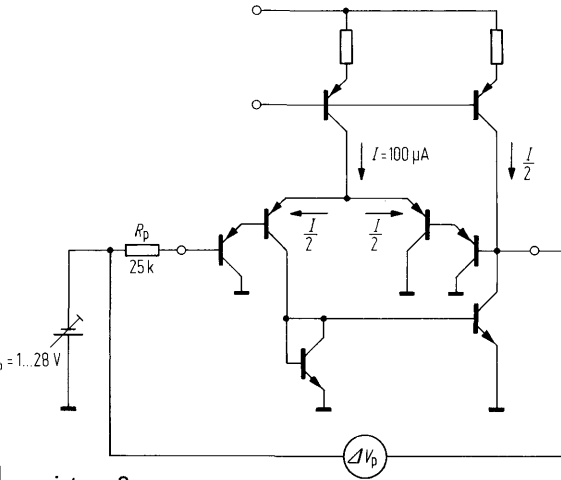


picture 1

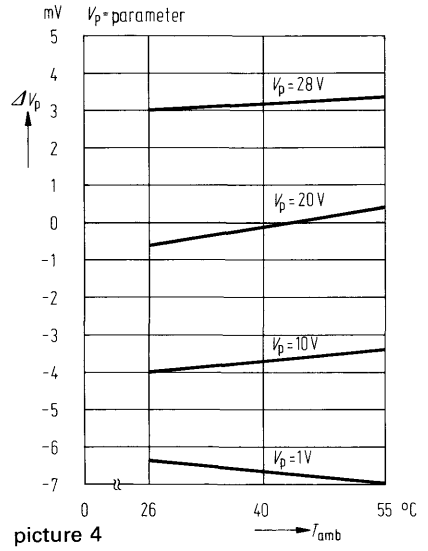
Circuit: one channel



picture 2

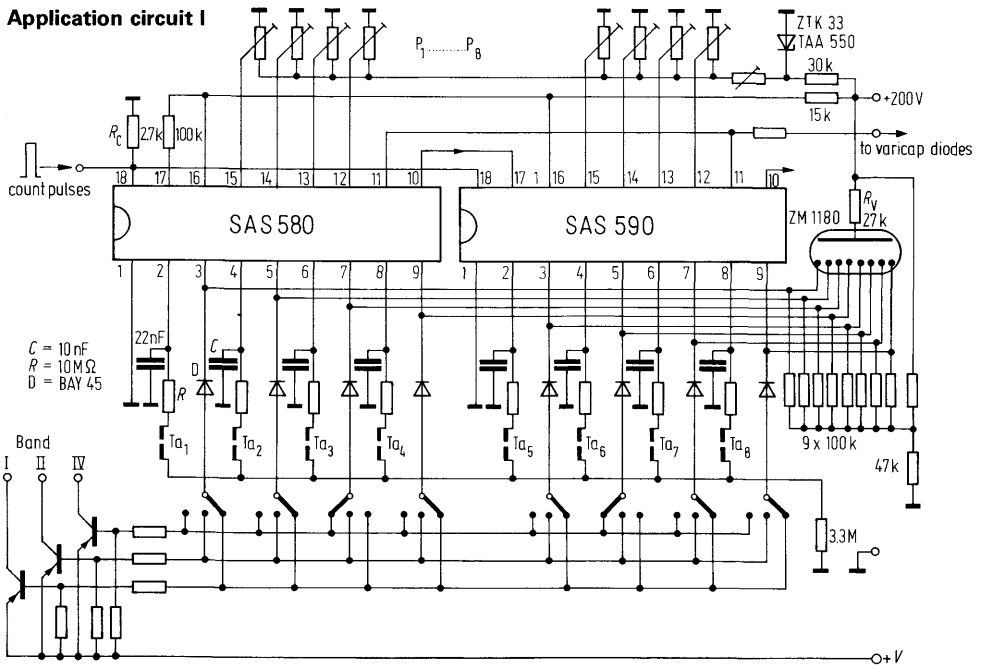


picture 3



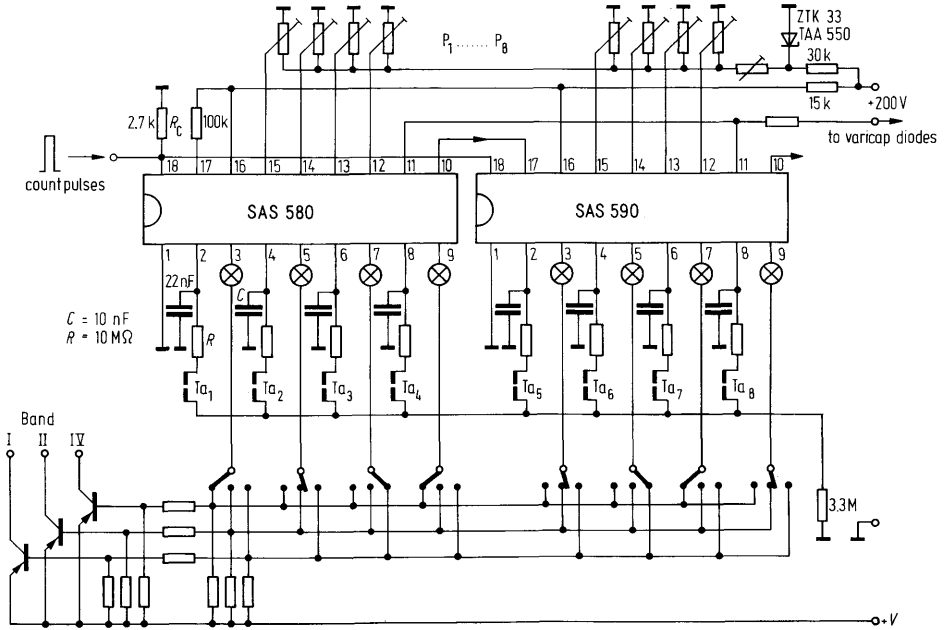
picture 4

**Application circuit I**



picture 5

**Application circuit II**



picture 6