

## STEPPER MOTOR DRIVE CIRCUIT

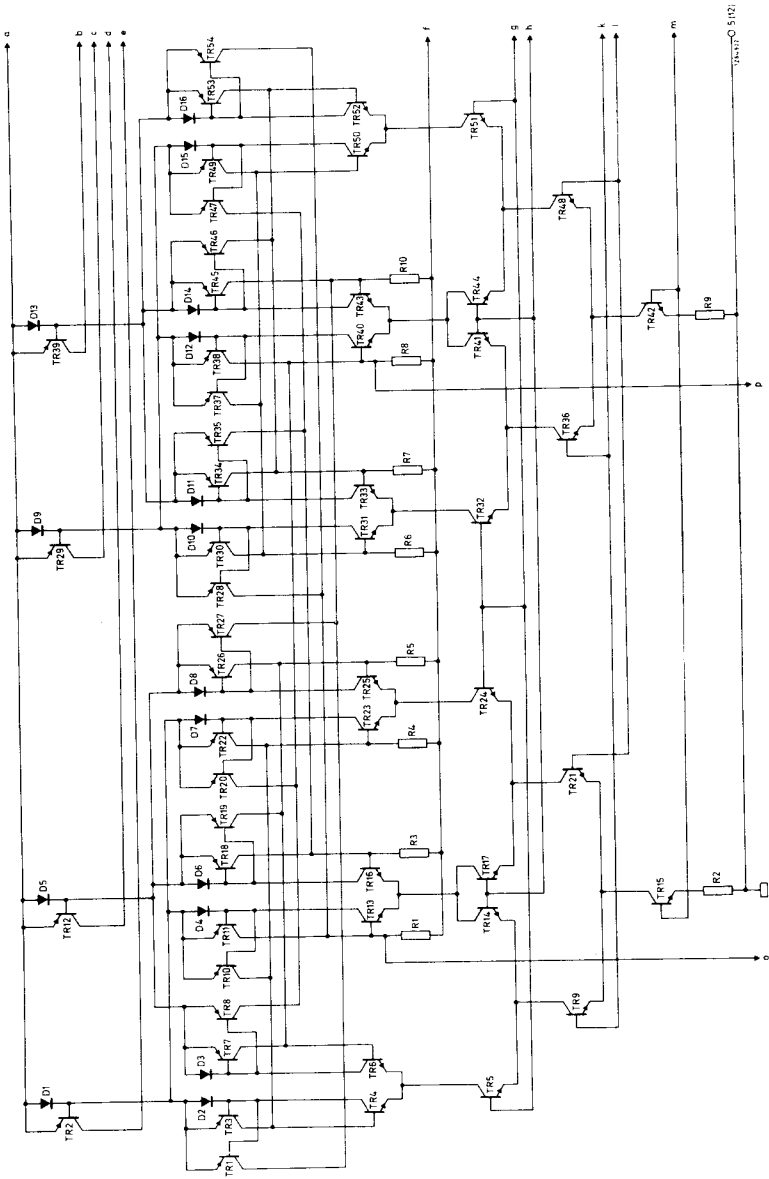
The SAA1027 is intended for driving a four phase two stator stepper motor. The circuit consists of four output stages, a logic part and three input stages. The logic part is driven by three input stages; a trigger input stage, an input stage which can change the switching sequence of the logic part so that the motor can rotate clock wise (CW) or counter clock wise (CCW) and a set input stage to set the four output stages. The three inputs are compatible with high noise immunity logic to ensure proper operation, even in noisy environments. The output can deliver 350 mA in each phase. The right switching sequence of the four phases is obtained from the logic part of the circuit. Integrated diodes protect the outputs against transient spikes.

QUICK REFERENCE DATA			
Supply voltage	$V_P$	9, 5 to 18	V
Load current (each output)	$I_Q$	max.	350 mA
Logic for CW and CCW operation			

**PACKAGE OUTLINE** 16 lead plastic power dual in-line (see page 9)

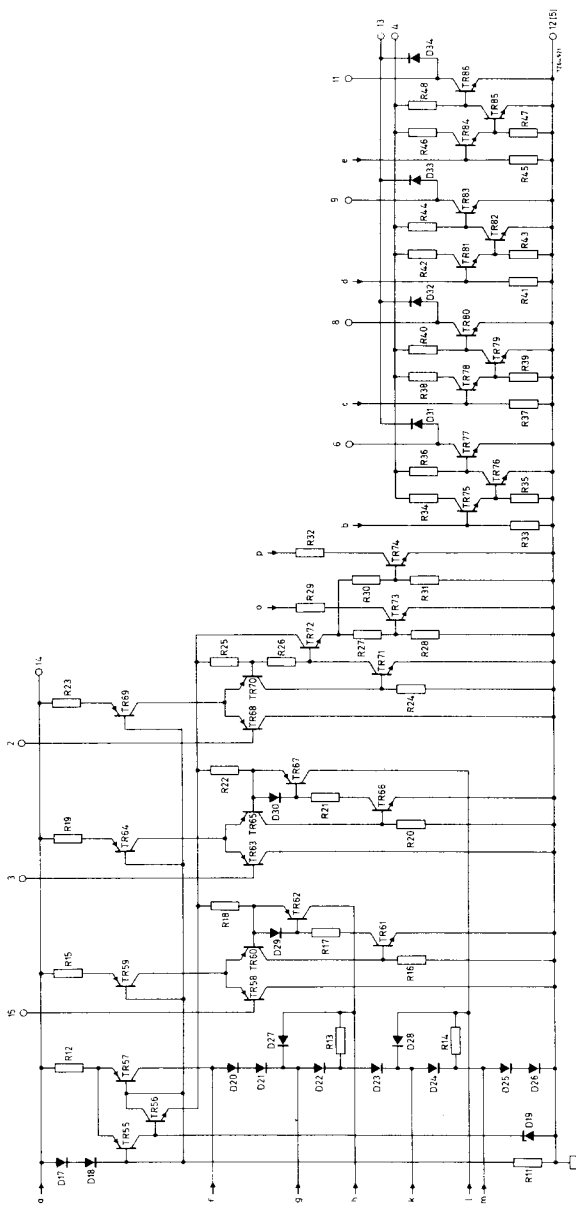


CIRCUIT DIAGRAM



bi-directional, 4 position, synchronous counter

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supply voltages      trigger stage      CW/CCW stage      set stage      output stages

December 1974

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

Voltages

Supply voltage (pins 4, 13, 14)	$V_P$	max.	20 V
Input voltage; R (pin 3), S (pin 2), T (pin 15)	$V_I$	max.	20 V

Current

Output current; $Q_1$ (pin 6), $Q_2$ (pin 8), $Q_3$	$I_Q$	max.	500 mA
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Power dissipation

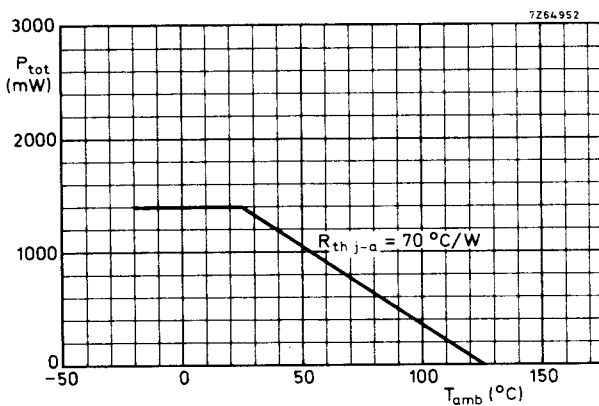
see derating curve below 1)

Temperatures

Storage temperature	$T_{stg}$	-40 to +125 °C
Operating ambient temperature	$T_{amb}$	-20 to +70 °C

**THERMAL RESISTANCE**

From junction to ambient	$R_{th\ j-a}$	=	70 °C/W
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1) Additional power caused by the self-inductance of the motor-coils will be dissipated in the diodes (D31 to D34). This extra dissipation has not been considered in the bottom graph on page 8. If necessary external diodes must be used.

**FUNCTION TABLE**Direction conditions (R)

The direction of rotation can be changed at any moment independent of the state of the T and S inputs.

Set conditions (S)

When T is HIGH and S LOW then the outputs are set:  $Q_1 = L$ ,  $Q_2 = H$ ,  $Q_3 = L$ ,  $Q_4 = H$ .

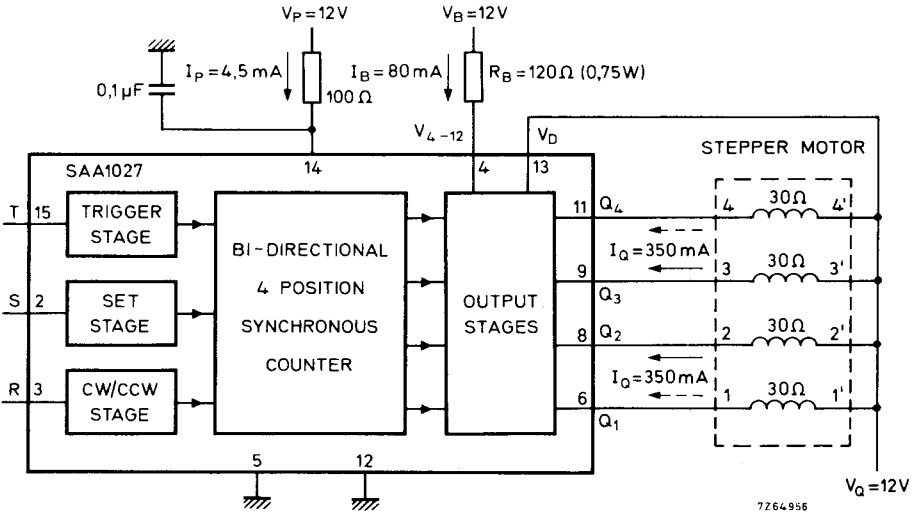
Trigger conditions (T)

S = H									
R = H					R = L				
T	Q <sub>1</sub>	Q <sub>2</sub>	Q <sub>3</sub>	Q <sub>4</sub>	T	Q <sub>1</sub>	Q <sub>2</sub>	Q <sub>3</sub>	Q <sub>4</sub>
0	L	H	L	H	0	L	H	L	H
1	H	L	L	H	1	L	H	H	L
2	H	L	H	L	2	H	L	H	L
3	L	H	H	L	3	H	L	L	H
4	L	H	L	H	4	L	H	L	H

**CHARACTERISTICS** at  $T_{amb} = -20$  to  $+65$  °C;  $V_P = 12$  V

Supply voltage (pin 14)	$V_P$	typ.	12 V 9,5 to 18 V
Supply current (without load, all inputs HIGH, pin 4 open)	$I_P$	typ.	4,5 mA 2,0 to 6,5 mA
Input logic voltage levels and currents for R, S and T	$V_{IH}$	>	7,5 V
		$I_{IH}$	typ. 1 $\mu$ A
LOW	$V_{IL}$	<	4,5 V
		$I_{IL}$	typ. 30 $\mu$ A
Supply voltage (each output stage)	$V_Q$	typ.	12 V 1,5 to 18 V
Supply current (each output stage)	$I_Q$	<	350 mA
Saturation voltage of output transistors at $I_Q = 350$ mA (pins 6, 8, 9, 11)	$V_{sat}$	<	1,0 V
Bias voltage and current (max. values: pin 4)	See top graph on page 7		
Bias resistor	See bottom graph on page 7		
Power dissipation in bias resistor	See top graph on page 8		
Total device power dissipation	See bottom graph on page 8		

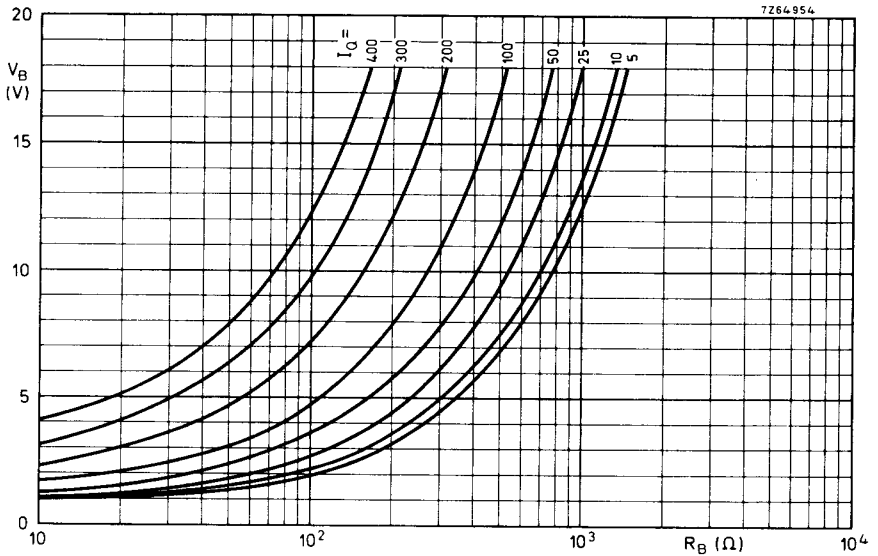
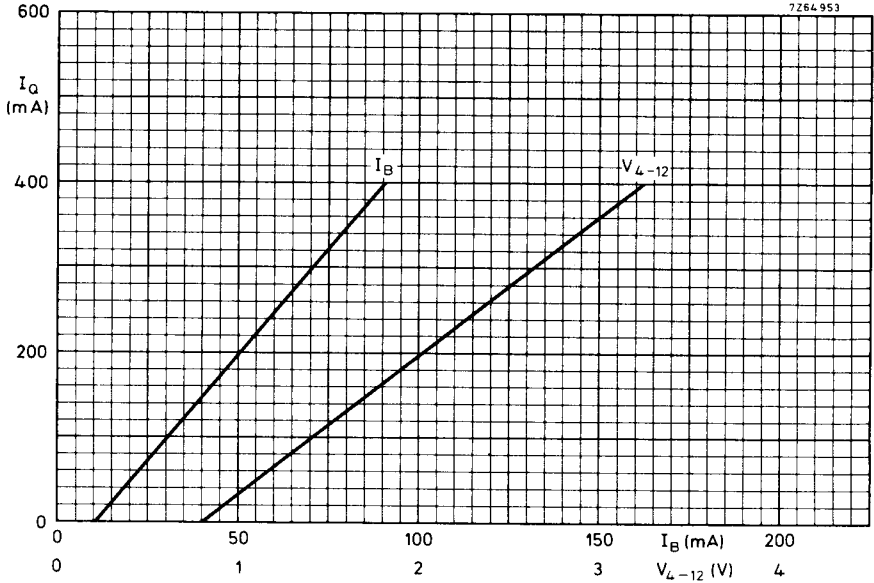
APPLICATION INFORMATION

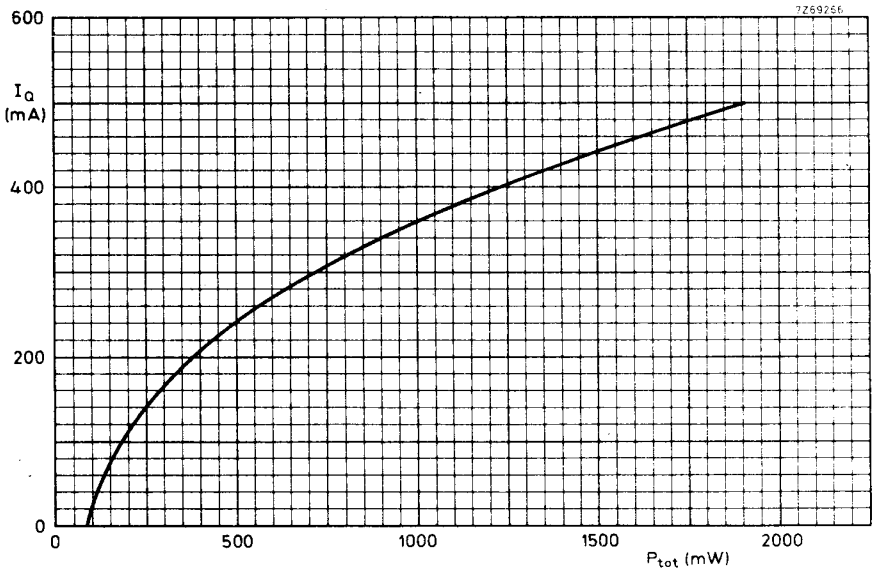
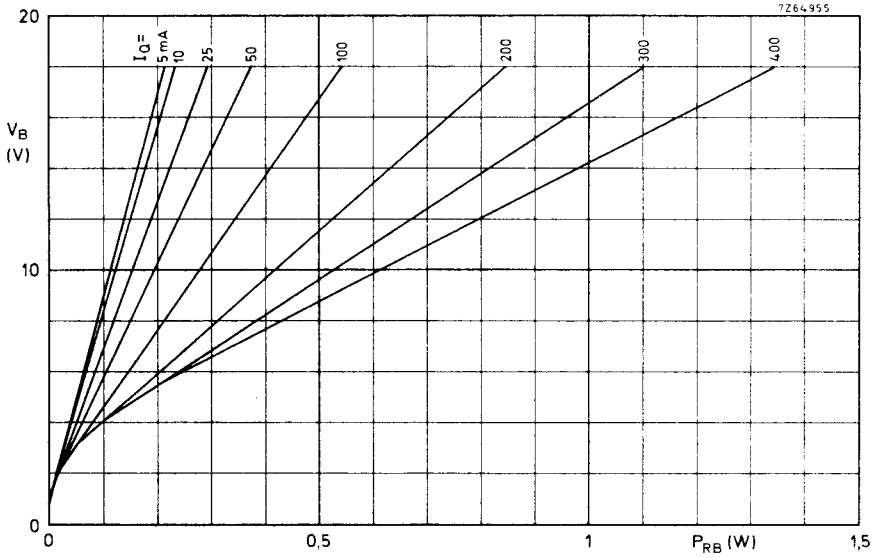


PINNING

- |                                     |                                      |
|-------------------------------------|--------------------------------------|
| 1. not connected                    | 9. Q <sub>3</sub> (output)           |
| 2. S (set input)                    | 10. not connected                    |
| 3. R (CW/CCW input)                 | 11. Q <sub>4</sub> (output)          |
| 4. V <sub>B</sub> (positive supply) | 12. Earth (negative supply)          |
| 5. Earth (negative supply)          | 13. V <sub>D</sub> (positive supply) |
| 6. Q <sub>1</sub> (output)          | 14. V <sub>p</sub> (positive supply) |
| 7. not connected                    | 15. T (trigger input)                |
| 8. Q <sub>2</sub> (output)          | 16. not connected                    |

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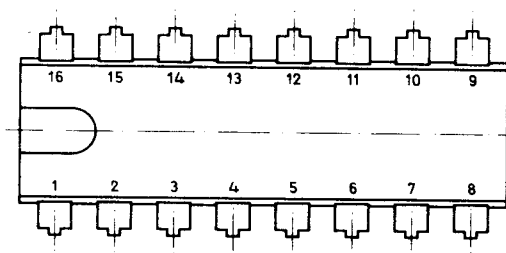
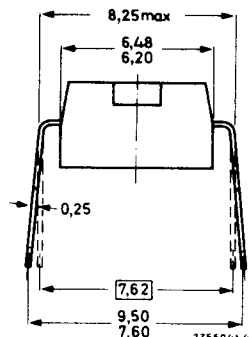
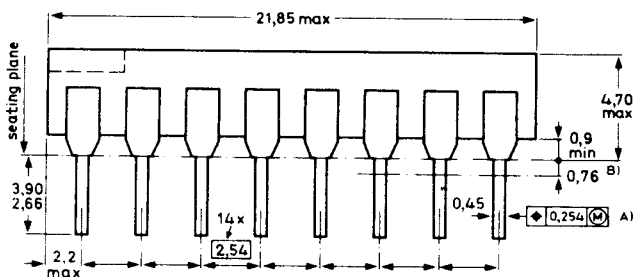


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# 16 LEAD PLASTIC POWER DUAL IN-LINE

Dimensions in mm



top view

A) Centre-lines of all leads are within  $\pm 0,127$  mm of the nominal positions shown; in the worst case, the spacing between any two leads may deviate from nominal by  $\pm 0,254$  mm.

B) Lead spacing tolerances apply from seating plane to the line indicated

## SOLDERING

### 1. By hand

Apply the soldering iron below the seating plane (or not more than 2 mm above it). If its temperature is below 300 °C it must not be in contact for more than 10 seconds; if between 300 °C and 400 °C, for not more than 5 seconds.

### 2. By dip or wave

260 °C is the maximum allowable temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.

The device may be mounted up to the seating plane, but the temperature of the plastic body must not exceed the specified storage maximum. If the printed circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature within the allowable limit.

### 3. Repairing soldered joints

The same precautions and limits apply as in (1) above.



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Datasheets for electronics components.