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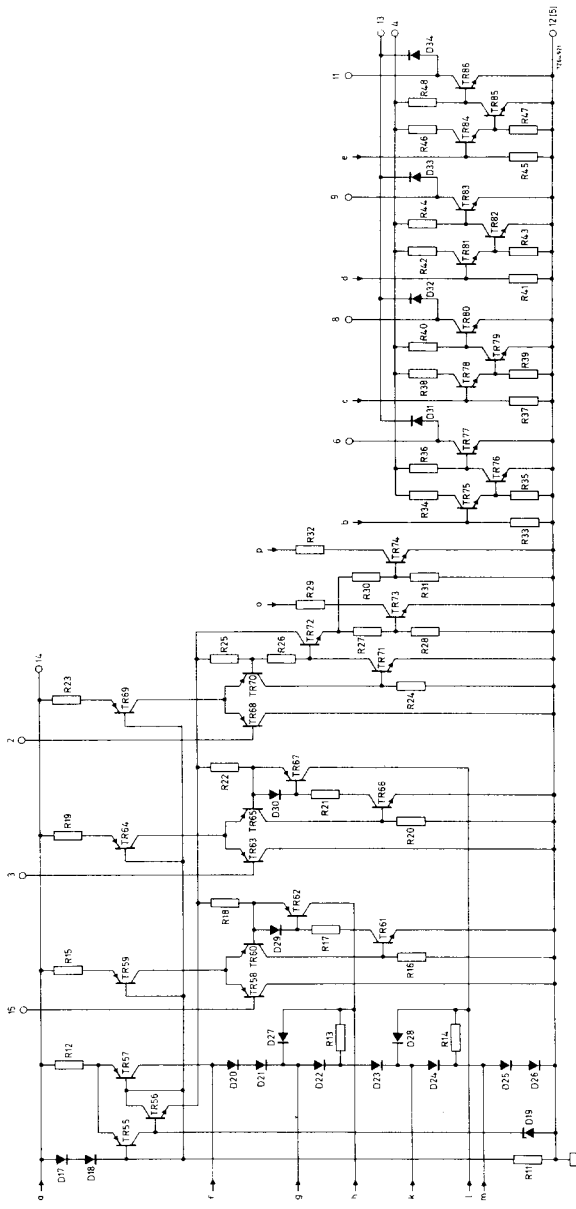
QUICK REFERENCE DATA				
Supply voltage	V_P		9,5 to 18	V
Load current (each output)	I_Q	max.	350	mA
Logic for CW and CCW operation				

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

CIRCUIT DIAGRAM
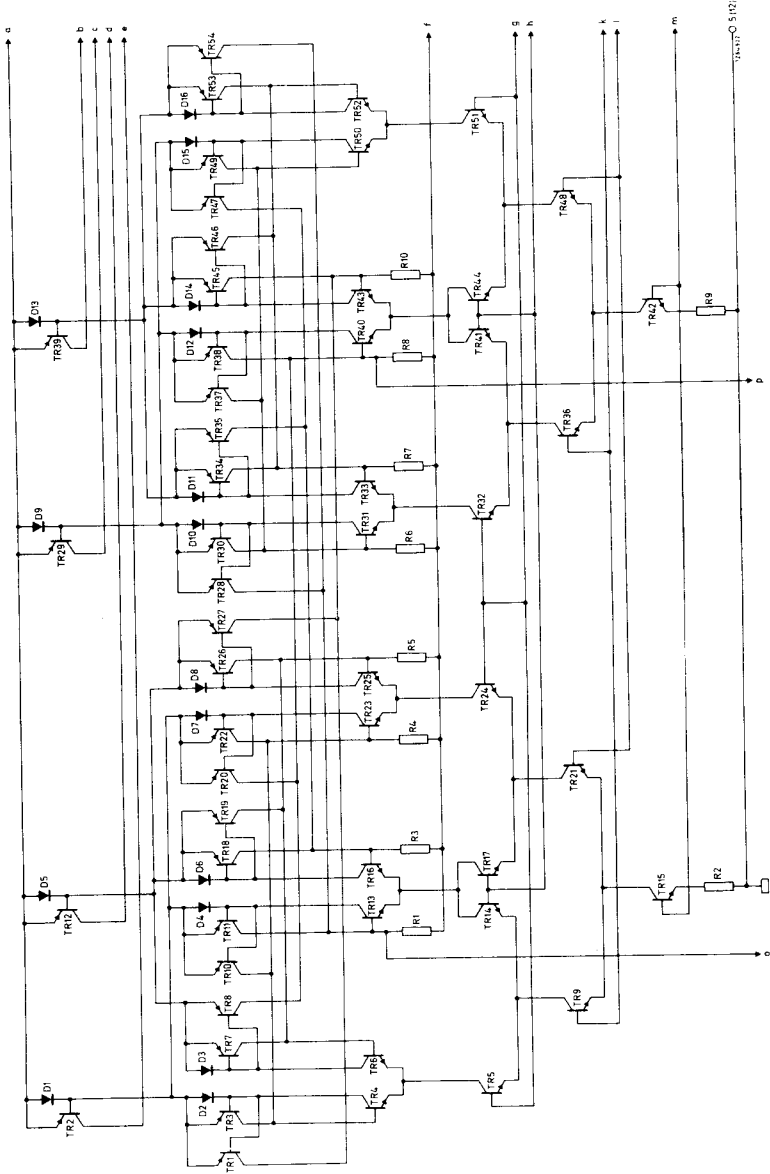
bi-directional, 4 position, synchronous counter

output stages

set stage

CW/CCW
stage

trigger
stage

supply
voltages

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), $Q_?$ I_Q max.   500 mA

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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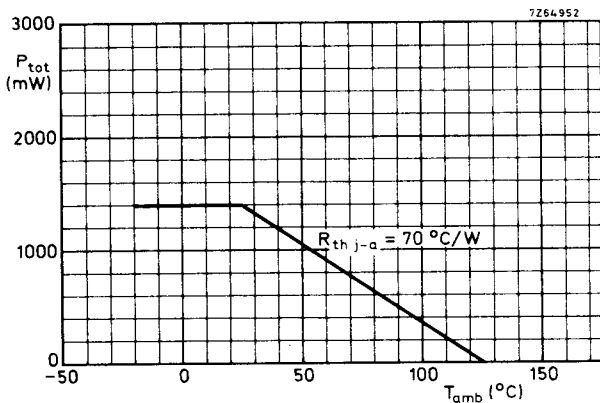
[1]) Additional power caused by the self-inductance of the motor-coils will be dissipated in the diodes (D31 to D34).
This extra dissipation has not been considered in the bottom graph on page 8.
If necessary external diodes must be used.

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: $Q_1 = L$, $Q_2 = H$, $Q_3 = L$, $Q_4 = H$.
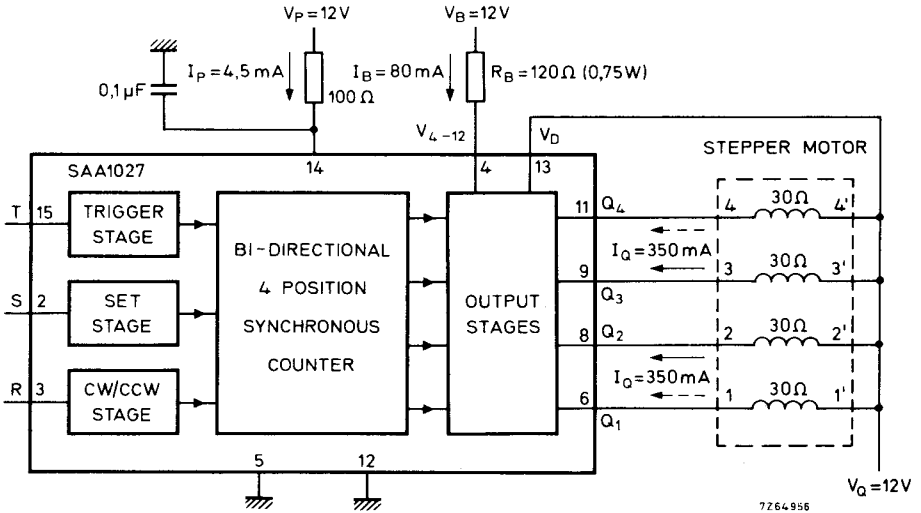
Trigger conditions (T)

S = H									
R = H					R = L				
T	Q_1	Q_2	Q_3	Q_4	T	Q_1	Q_2	Q_3	Q_4
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 $+65\ ^{o}C$; $V_P = 12$ 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			
HIGH	V_{IH}	>	7,5 V
	I_{IH}	typ.	1 µA
LOW	V_{IL}	<	4,5 V
	I_{IL}	typ.	30 µA
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

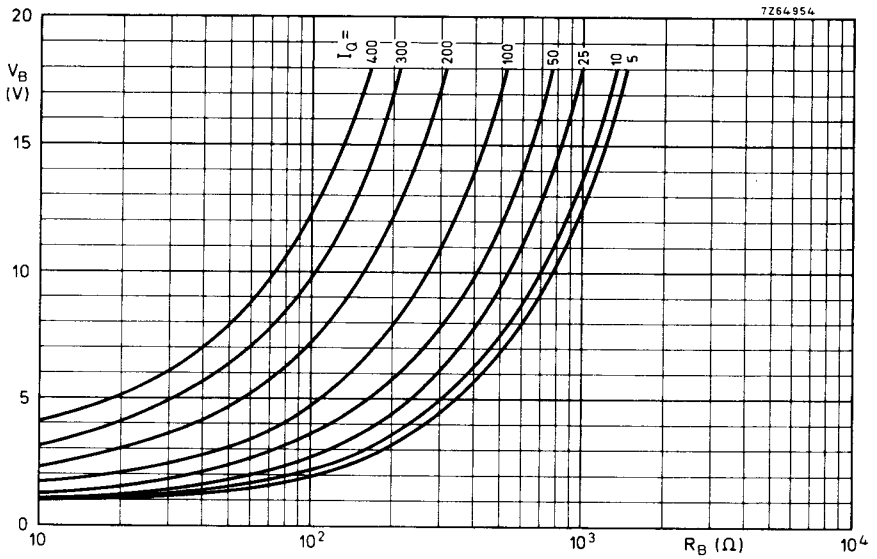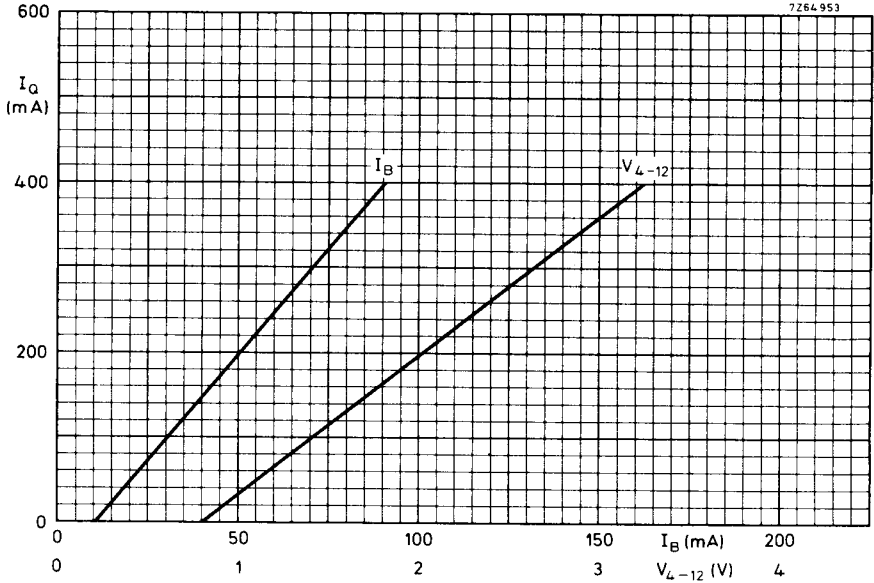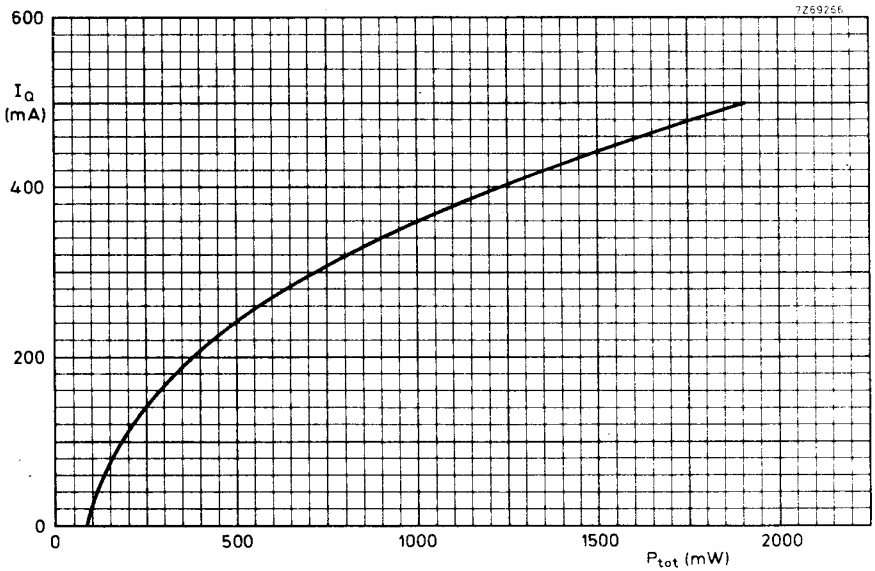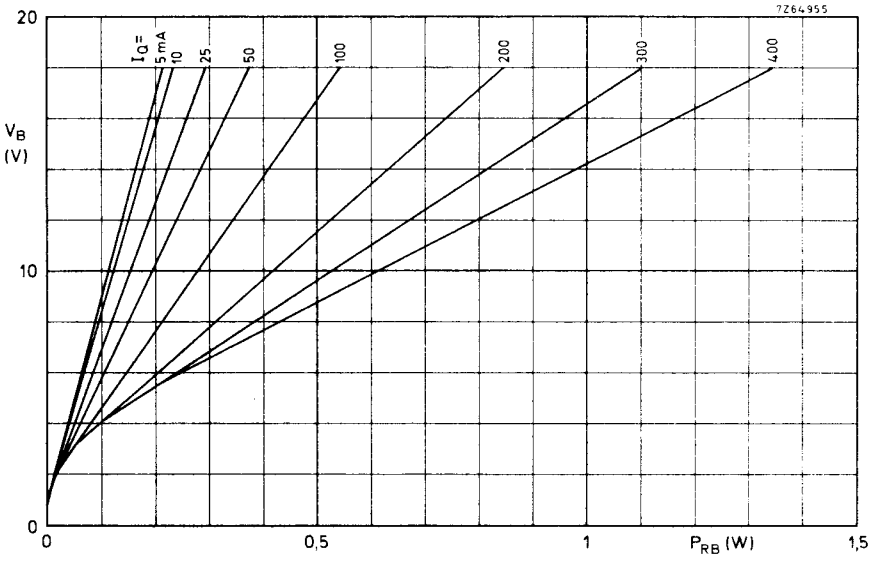Total device power dissipation   See bottom graph on page 8

APPLICATION INFORMATION

$V_P = 12V$ $V_B = 12V$

$I_P = 4,5\,mA$ $I_B = 80\,mA$ $R_B = 120\,\Omega\ (0,75W)$

$0,1\,\mu F$ $100\,\Omega$

V_{4-12} V_D

STEPPER MOTOR

SAA1027   14   4   13

T 15 | TRIGGER STAGE

S 2 | SET STAGE

R 3 | CW/CCW STAGE

BI-DIRECTIONAL 4 POSITION SYNCHRONOUS COUNTER

OUTPUT STAGES

11 Q_4 4 $30\,\Omega$ $4'$

$I_Q = 350\,mA$ 3 $30\,\Omega$ $3'$

9 Q_3

8 Q_2 2 $30\,\Omega$ $2'$

$I_Q = 350\,mA$ 1 $30\,\Omega$ $1'$

6 Q_1

5   12

$V_Q = 12V$

7Z64956

PINNING

1. not connected
2. S (set input)
3. R (CW/CCW input)
4. V_B (positive supply)
5. Earth (negative supply)
6. Q_1 (output)
7. not connected
8. Q_2 (output)
9. Q_3 (output)
10. not connected
11. Q_4 (output)
12. Earth (negative supply)
13. V_D (positive supply)
14. V_P (positive supply)
15. T (trigger input)
16. not connected

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7Z64954

(7)

16 LEAD PLASTIC POWER DUAL IN-LINE

Dimensions in mm

8,25max

6,48
6,20

21,85 max

4,70
max

0,9
min

0,76 B)

3,90
2,66

14x

0,45

◆ 0,254 Ⓜ A)

2,2
max

2,54

0,25

7,62

9,50
7,60

7255041.4
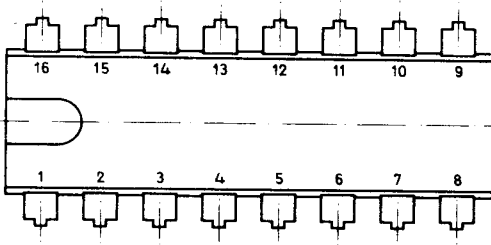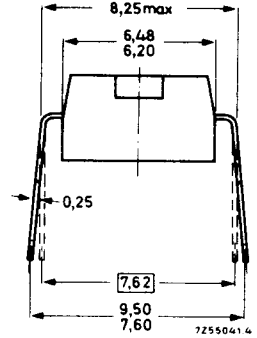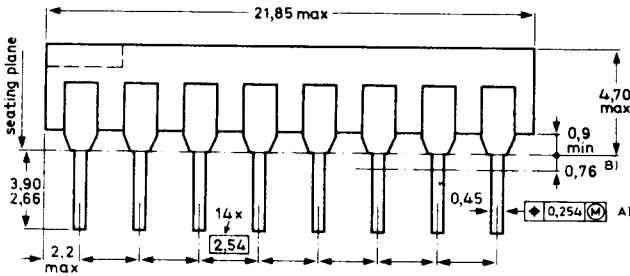
top view

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

B) Lead spacing tolerances ap-
ply 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 con-
    tact 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 plas-
    tic 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.