RS

Data Sheet

Stepper motor driver IC SAA 1027

The RS SAA1027 is a bipolar integrated circuit intended for driving a 4-phase two stator stepper motor. The circuit consists of a bidirectional 4-state counter and a code converter to drive the four outputs in the sequence required for driving a stepper motor.

It features high noise immunity inputs, clockwise and anticlockwise operation, a reset facility and high current outputs that are protected against damage by voltage overshoots.

For further details of **RS** stepper motors please see Data Sheet 7017.

Features
● High noise immunity inputs
● Clockwise and counter-clockwise rotation
● Reset facility
● High output current
● Outputs protected against damage by overshoots.

TOP VIEW

Absolute maximum ratings

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Supply voltage	18V DC
Input voltage, all inputs	18V
Current into pin 4	120mA
Output current	500mA
Storage temperature range	−40°C to +125°C
Operating temperature range	−20°C to +70°C
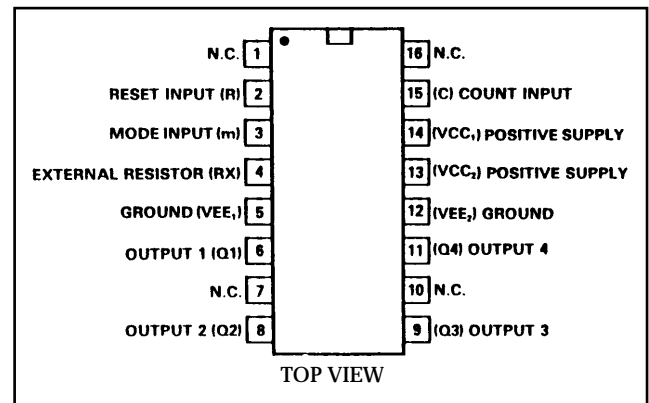
Electrical characteristics

$V_{CC} = 9,5$ to $18V$; $V_{EE} = 0V$; $T_{amb} = -20$ to $+70°C$ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply V_{CC1} and V_{CC2} (pins 14 and 13)					
Supply current $V_{CC1} = 12V$					
unloaded; all inputs HIGH; pin 4 open	I_{CC}	2	4,5	6,5	mA
Inputs C, M and R (pins 15, 3 and 2)					
Input voltage					
HIGH	V_{IH}	7,5	-	-	V
LOW	V_{IL}	-	-	4,5	V
Input current					
HIGH	I_{IH}	-	1	-	µA
LOW	$-I_{IL}$	-	30	-	µA
External resistor pin RX (pin 4)					
Voltage at RX at $V_{CC} = 12V \pm 15\%$;					
$R_X = 130\Omega \pm 5\%$	V_{RX}	3	-	4,5	V
Outputs Q1 to Q4					
Output voltage LOW					
at $I_{OL} = 350mA$	V_{OL}	-	500	1000	mV
at $I_{OL} = 500mA$	V_{OL}	-	700	-	mV
Output current					
LOW	I_{OL}	-	-	500*	mA
HIGH at $V_Q = 18V$	$-I_{OH}$	-	-	50	µA

* See Figures 3 and 4.

Figure 1 **Block diagram**

Figure 2 **Waveform diagram**
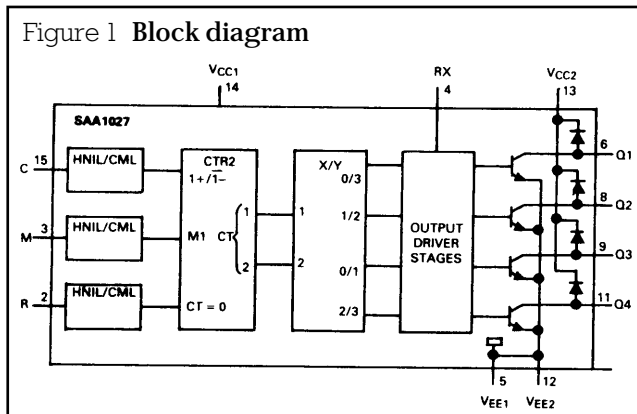
The blocks marked HNIL/CML are high noise immunity input stages, the block marked CTR2 is a bidirectional synchronous 2-bit (4-state) counter and the block marked X/Y is a code converter. C is the count input, M the mode input to select forward or reverse counting and R is the reset input which resets the counter to content zero.

Functional description

Count input C (pin 15)

The outputs change state after each L to H signal transition at the count input.

Mode input M (pin 3)

With the mode input the sequence of output signals, and hence the direction of rotation of the stepping motor, can be chosen, as shown in the following table.

Figure 3 **Total power dissipation P_{tot} as a function of output current I_{OL}**

Counting	M = L				M = H			
sequence	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
0	L	H	L	H	L	H	L	H
1	H	L	L	H	L	H	H	L
2	H	L	H	L	H	L	H	L
3	L	H	H	L	H	L	L	H
0	L	H	L	H	L	H	L	H

Reset input R (pin 2)

A LOW level at the R input resets the counter to content zero. The outputs take on the levels shown in the upper and lower line of the table above.

If this facility is not used the R pin should be connected to the supply.

External resistor pin RX (pin 4)

The external resistor R4 connected to RX sets the base current of the output transistors. Its value has to be chosen in accordance with the required output current (Figure 5).

Outputs Q1 to Q4 (pins 6, 8, 9 and 11)

The circuit has open-collector outputs. To prevent damage by an overshooting output voltage the outputs are protected by diodes connected to V_{CC2}, pin 13. High output currents mainly determine the total dissipation, (Figure 3).
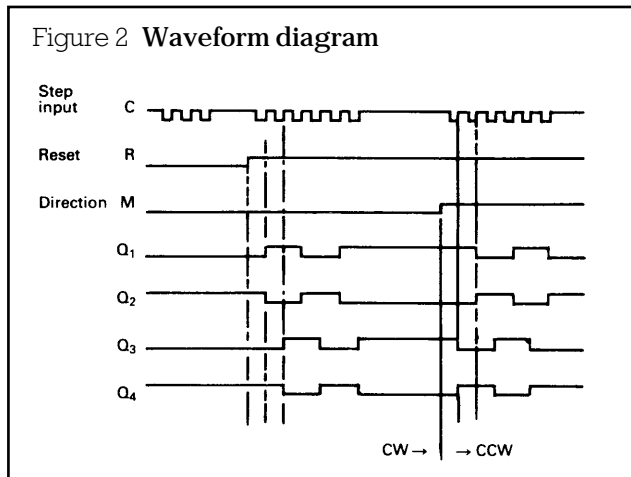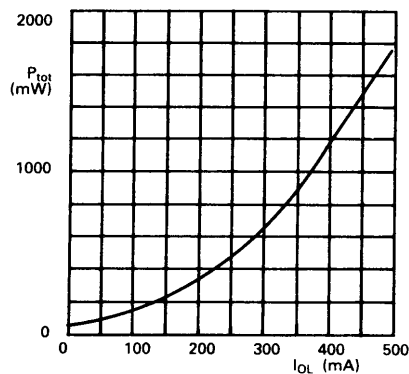
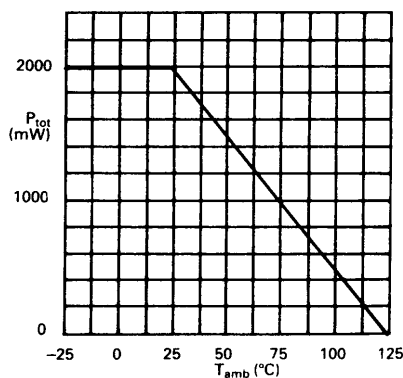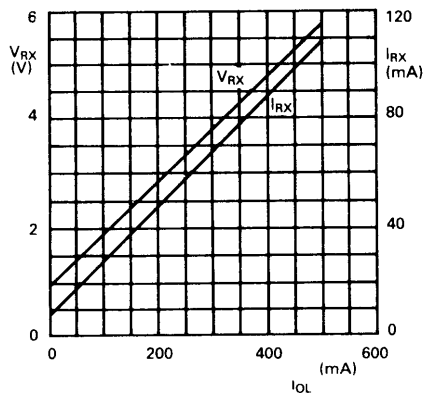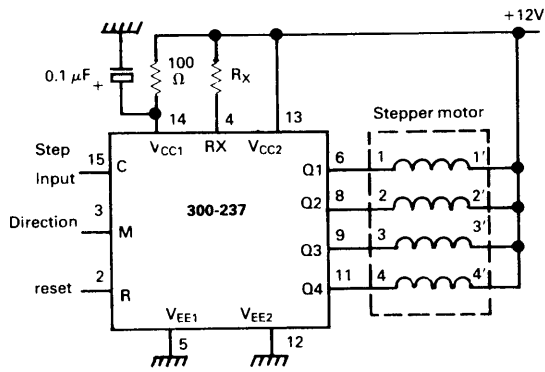Figure 4 **Power derating curve**

Figure 5 Current I_{RX} into RX and voltage VRX on RX as a function of required output current I_{OL}

Applications

Figure 6 Typical application of the SAA 1027 as a stepper motor driver

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