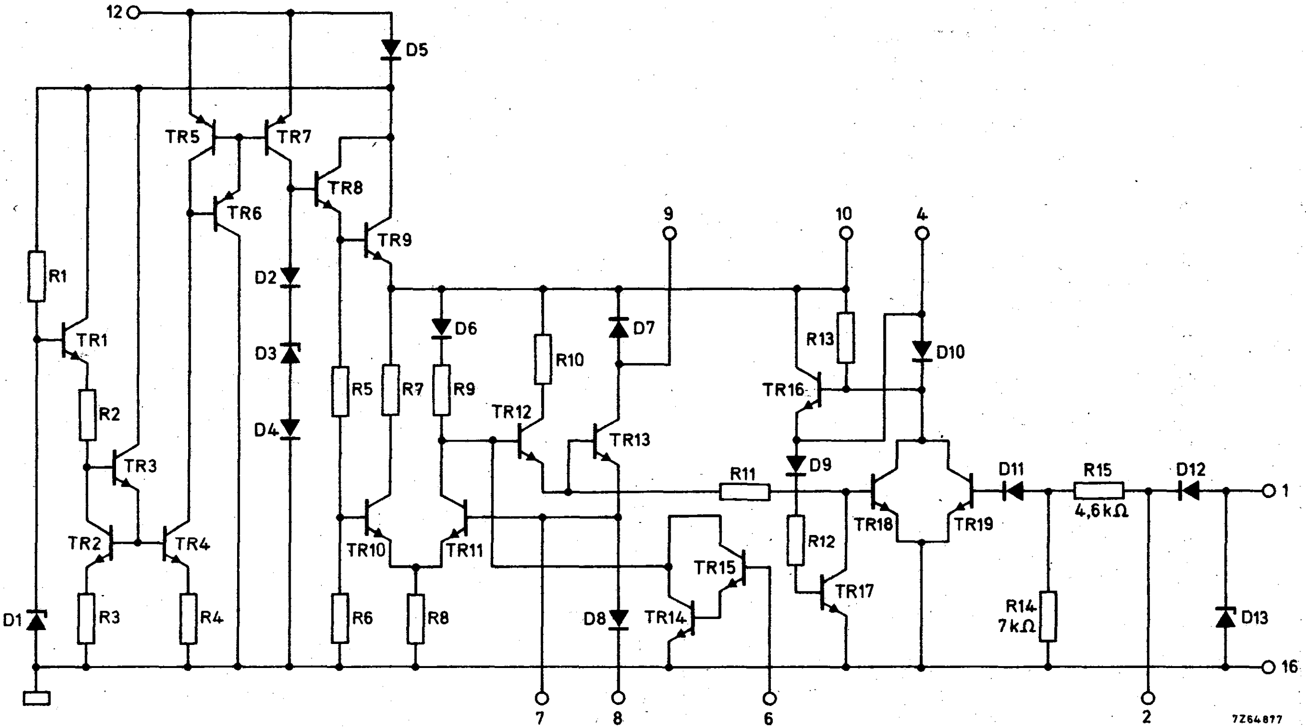
REVOLUTION COUNTER

The SAK140 is a monolithic integrated circuit intended for use as a revolution counter in motor cars.
It contains a stabilization circuit and a monostable multivibrator which converts the circuit input pulses into output current pulses of constant duration and amplitude.
This pulse duration is determined by an external R-C network; by proper choice of R and C, the circuit can be easily adapted to any milliammeter. Together with the internal stabilization circuitry this makes the indication almost independent of temperature changes and supply voltage variations.

QUICK REFERENCE DATA			
Supply voltage	V_P		10 to 18 V
Power dissipation at n = 6000 rpm; I_o = 12 mA; V_P = 12 V	P_{tot}	typ.	130 mW
Input pulse amplitude (pin 1)	V_i	>	3,5 V
Output current (pin 9)	I_o	<	50 mA

PACKAGE OUTLINE plastic 16-lead dual in-line (see general section).

CIRCUIT DIAGRAM



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

Voltage

Supply voltage (pin 12)	V_P	max.	18 V

Currents

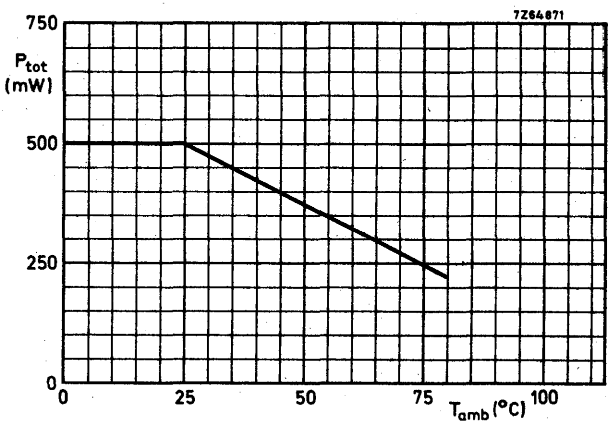
Current at pin 9 (peak value)	$-I_{9M}$	max.	50 mA
at pin 7 (peak value)	$-I_{7M}$	max.	50 mA
at pin 8 (peak value)	$-I_{8M}$	max.	50 mA
at pin 1	$\pm I_1$	max.	10 mA

Dissipation

Total power dissipation — see derating curve below

Temperatures

Storage temperature	T_{stg}	−40 to +80 °C
Ambient temperature	T_{amb}	−40 to +80 °C



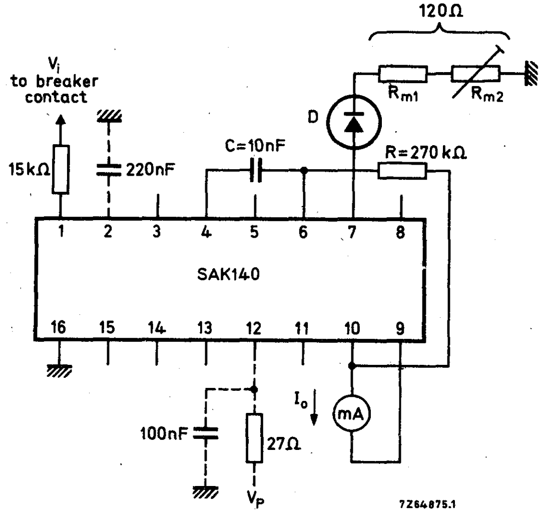
CHARACTERISTICS

Supply voltage range (pin 12)	V_P	10 to 18 V [1]
Supply current (on-state) at V_P = 12 V	I_{12}	typ. 5 mA
Power dissipation at n = 6000 rpm;		
I_o = 12 mA; V_P = 12 V	P_{tot}	typ. 130 mW
Voltage at pin 7 (on-state)	V_{7-16}	typ. 2,5 V
Temperature coefficient		
of output pulse (pin 9)		typ. 200 ppm/°C
Adjustable output current		
resistor between pins 7 and 16 or 8 and 16		< 50 mA
Resistor for peak output current adjustment	R_m	> 50 Ω
Resistor for output pulse duration adjustment	R	typ. 270 kΩ 0,01 to 500 kΩ
Capacitor for output pulse duration adjustment	C	> 220 pF typ. 10 nF < 30 µF
Input pulse frequency (for circuits on page 5)	f	< 400 Hz
Input pulse frequency (pin 2 not connected)	f	< 30 kHz
Influence of supply voltage on output amplitude		
Vp from 10 to 16 V; top circuit on page 5		typ. 0,6 %
bottom circuit on page 5		typ. 1,6 %
Input triggering voltage		
at which level good triggering is achieved	V_{1-16}	> 3,5 V [2]
Duty cycle of output pulse	δ	typ. 0,75 < 0,90

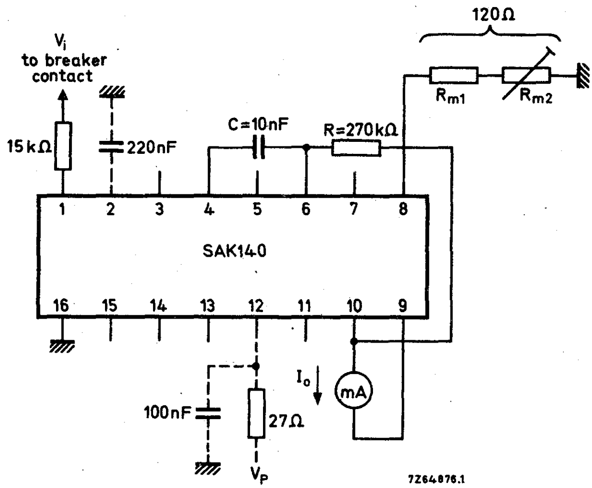
[1]) The circuit is internally protected against reverse connected supply voltage.

[2]) To prevent the input circuit from overloading by large input pulses a voltage regulator diode (D13) has been connected at the input terminal.
This diode also functions as a protection against negative trigger pulses.
A resistor has to be connected in series with the input terminal, having such a value that the input current does not exceed 10 mA.

APPLICATION INFORMATION



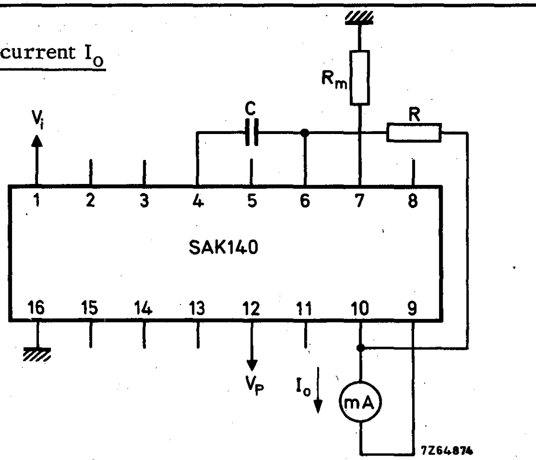
Temperature coefficient of I_0 is 800 ppm/^oC determined by diode D. [1])



Temperature coefficient of I_0 is 800 ppm/^oC determined by an internal diode between pins 7 and 8. [1])

[1]) The influence of supply voltage variations is very small when using the top circuit. When using the bottom circuit the influence will be greater.
The influence of the temperature coefficients of R, C and R_m are in this case negligible.

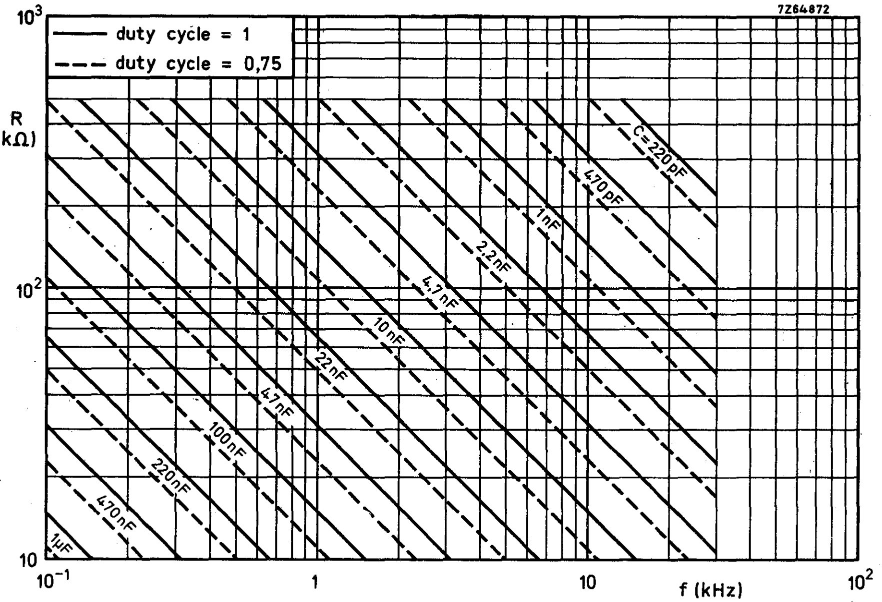
Temperature coefficient of output current I_o



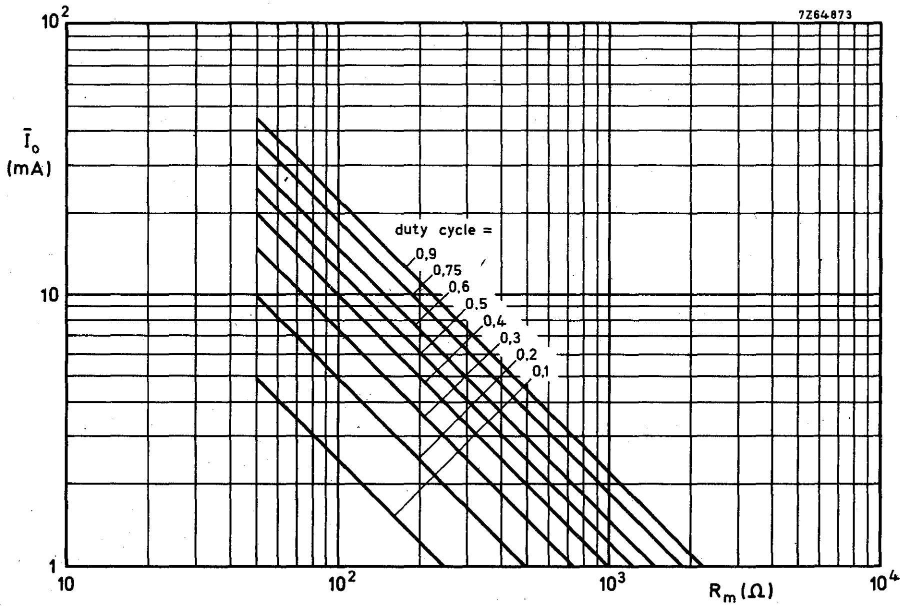
The temperature coefficient of I_o depends on the temperature coefficients of R, C, R_m and the voltage on pin 7.
The temperature coefficient of R = 270 kΩ (carbon resistor, catalogue number 2322 101 33274) is −330 ppm/°C and of V_{7-16} is 200 ppm/°C.
The temperature coefficients of R_m and C depend on the kind of components chosen. Their influence on the temperature coefficient of I_o are given below.

C = 10 nF	R_m = 160 Ω	t.c. I_o = 12 mA
metallized polyester capacitor (flat film type) t.c. = 350 ppm/°C catalogue number: 2222 342 25103	carbon resistor t.c. = −220 ppm/°C catalogue number: 2322 101 33161	440 ppm/°C
	moulded metal film resistor t.c. = 25 ppm/°C catalogue number: 2322 163 11601	190 ppm/°C
tubular moulded polystyrene capacitor t.c. = −100 ppm/°C catalogue number: 2222 435 21003	carbon resistor t.c. = −220 ppm/°C catalogue number: 2322 101 33161	−10 ppm/°C
	moulded metal film resistor t.c. = 25 ppm/°C catalogue number: 2322 163 11601	−250 ppm/°C

In general: $$\text{t.c.} = \frac{\Delta I_o}{I_o} = \frac{1 + \frac{\Delta C}{C} + \frac{\Delta R}{R} + \frac{\Delta V_{7-16}}{V_{7-16}}}{1 + \frac{\Delta R_m}{R_m}} - 1$$



For other duty cycles at f. s. d. than 0, 75, the value of R or C derived from the graph at a duty cycle of 1 must be multiplied by the duty cycle required.



If a diode is connected in series with R_m, the value of R_m derived from the graph must be lowered with 25 %.