SAK215

Pulse Shaper Circuit for Revolution Counters

The monolithic integrated circuit SAK215 is designed for use in revolution counters of cars and for other applications like frequency to current converters. By use of suitable external circuitry the revolution counter can be adapted to engines with two to eight cylinders. It is designed for a nominal 12 V DC supply.

Fig. 2 shows the operating circuit of a revolution counter with FSD = 6000 RPM (two ignition pulses per turn of the crank-shaft) at a nominal battery voltage of 12 V.

Dimensioning Hints

Coil resistance R_M of the indicating instrument:
The output transistor must operate in the active range. This is ensured if

$$V_{5/6} = V_7 - V_6 - (I_{5p} \cdot R_M)$$

is above 1 V. The additional inductive voltage drop at the beginning of a current pulse due to the inductance of the moving coil is ignored in this equation.

Adjustment resistor $R_{6/1}$ for the instrument current:
The peak current through the moving coil is given at a pulse duty factor of 0.7 by

$$I_{5p} = \frac{I_M}{0.7}$$

where I_M is the DC current for full scale deflection. Since the current flowing into pin 5 is equal to the sink current of pin 6 the adjustment resistor $R_{6/1}$ can be calculated as

$$R_{6/1} = \frac{V_6}{I_{5p}}$$

Series resistor R_V:
Between pin 7 and pin 1 the circuit behaves like a zener diode. The resistor R_V therefore has to be chosen so that adequate current for the IC and the moving coil is available even at the lowest battery voltage:

$$R_V \leqslant \frac{V_{B\,min} - 8.2\,V}{12\,mA + I_{5p}}$$

By-pass resistor $R_{7/8}$:
In order to ensure proper function of the stabilizing circuit the voltage drop across the by-pass resistor $R_{7/8}$ must be limited to 7 V at the highest battery voltage.

$$R_{7/8} < \frac{7\,V \cdot R_V}{V_{B\,max} - 7.4\,V}$$
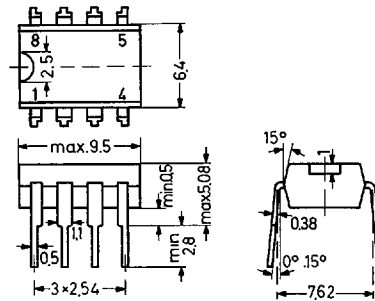

Fig. 1:
SAK215 in mini Dip
plastic package similar to TO-116
20A8 according to DIN 41866

Weight approximately 0.5 g
Dimensions in mm

Pin connections

1   Ground, 0
2   Input
3   Feedback output
4   Feedback input
5   Output
6   Adjustment pin for output current
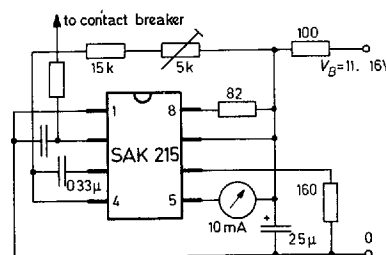7   Stabilized supply voltage pin
8   Supply voltage V_B

Fig. 2:
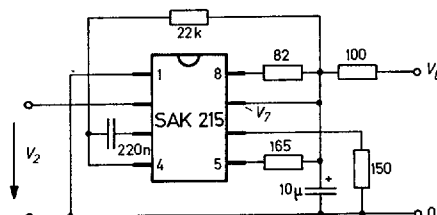Block diagram and operating circuit of the SAK215

Fig. 3:
Test circuit for the characteristics

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All voltages are referred to pin 1.

Absolute Maximum Ratings

	Symbol	Value	Unit
Supply Voltage	V_B	see dimensioning hints for R_V and $R_{7/8}$	–
Input Voltage	V_2	±20	V
Current through Instrument Coil	I_5	40	mA
	$-I_6$	40	mA
Power Dissipation at $T_A = 65\,°C$	P_{tot}	500	mW
Ambient Operating Temperature Range	T_A	-25 to $+65$	°C
Storage Temperature Range	T_S	-25 to $+125$	°C

Recommended Operating Conditions

	Symbol	Min.	Typ.	Max.	Unit
Frequency of the Input Pulses	f_I	–	–	10	kHz
Pulse Duty Factor of the Output Current	t_{p5}/T_5	–	–	0.9	–
Timing Resistor	$R_{7/4}$	15	–	100	kΩ
Resistor for adjusting the Current through the Instrument Coil	$R_{6/1}$	100	–	–	Ω
Voltage Drop across Bypass Resistor	$V_{7/8}$	–	–	7	V
Voltage Drop between Pins 5 and 6	$V_{5/6}$	1	–	–	V

Test Conditions for the Characteristics (see test circuit Fig. 3)

	Symbol	Value	Unit
Supply Voltage	V_B	14	V
Ambient Operating Temperature	T_A	25	°C
Input Pulse Amplitude	V_2	1.6	V
Input Pulse Duration	t_I	0.5	ms
Input Pulse Repetition Frequency	f_I	250	Hz

Characteristics in the Test Circuit Fig. 3

	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage (stabilized)	V_7	7.4	–	8.2	V
Current Consumption	I_7	–	–	12	mA
Input Voltage Range without triggering the Circuit	V_2	-20	–	$+0.5$	V
Trigger Range	V_2	1.5	–	20	V
Trigger Slope	dV_2/dt	positive going			
Input Impedance	$r_{2/1}$	–	7	–	kΩ
Pulse Amplitude at Pin 6	V_6	2	–	2.5	V
Output Pulse Duration	t_5	$0.64 \cdot R_{7/4} \cdot C_{3/4}$			
Output Current	I_5	–	$-I_6$	–	–