SAF0300 **Car Clock IC with Digital Adjustment, 0.5 Hz Output and Additional 64 Hz Signal** (16-Pin Plastic Package)

CMOS circuit for crystal-controlled analog car clocks with 12 V (6... 16.5 V) supply voltage having an additional 64 Hz push-pull output supplying a time base signal e. g. for recording speedometers. The SAF0300 consists of an oscillator circuit, a fixed 4 : 1 frequency divider, an adjustable frequency divider which is variable in 127 steps and covering the range from 2^{14} : 1 to $(2^{14} + 2^2)$: 1, a motor driver stage in bridge configuration and the 64 Hz push-pull output.

Apart from the crystal the oscillator does not require any additional components. The correct output frequency may be set by seven adjustment terminals with an accuracy of 10^{-6}. At 4.194812 MHz oscillator frequency the bridge output (pins 12/13) supplies a squarewave signal of 0.5 s pulse duration and 0.5 Hz frequency if the adjustable frequency divider is set to the center position. Every second a current pulse of alternate direction flows in the motor coil. Output 1 (pin 1) supplies the additional 64 Hz squarewave signal with a pulse duty factor of 0.5.

The adjustable frequency divider has been designed so that the maximum output frequency is set when all adjustment terminals are either open-circuit or connected to pin 16. If one or more adjustment terminals are grounded (taken to pin 14), the output frequency decreases. Pin 8 gives the smallest adjustment step of 1.9 ppm. Pin 7 offers the nextlarger step of 3.8 ppm and so forth, up to pin 2 which enables an adjustment step of 122 ppm to be obtained. If all adjustment terminals are grounded, the output frequency is reduced by 242 ppm.

SAJ300R **Car Clock IC with Digital Adjustment and 0.5 Hz Output** (14-Pin Plastic Package TO-116)

CMOS circuit for use in crystal-controlled analog car clocks operating on 12 V (6...16,5 V) supply voltage. The SAJ300R contains an oscillator circuit, a fixed 4 : 1 frequency divider, an adjustable frequency divider and a motor driver stage. The adjustable frequency divider of the SAJ300R has an adjustment range from 2^{21} : 1 to $(2^{21} + 2^9)$: 1.

Except for the crystal, the oscillator requires no additional components. The trimmer capacitor previously needed for frequency adjustment has been taken over by the variable frequency divider. Seven adjustment pins are provided. They are used to set the divider ratio to the required value with an accuracy of 10^{-6}. With an oscillator frequency of 4.194812 MHz the series-connected push-pull output stage supplies a symmetrical squarewave signal with a pulse duty factor of 0.5. The frequency of this output signal is 0.5 Hz if the variable frequency divider is set to the center. Due to the differentiating effect of the motor capacitors pulses of alternate direction occur in the motor coil.

The adjustable frequency divider has been designed so that the maximum output frequency is set when all adjustment pins are either open circuit or connected to pin 14. If one or more adjustment pins are grounded (taken to pin 13) the output frequency decreases. Pin 7 gives the smallest adjustment of 1.9 ppm. Pin 6 affords the nextlarger step of 3.8 ppm and so forth, up to pin 1 which enables an adjustment step of 122 ppm to be obtained.

CLK5010 **CMOS Car Clock IC with Electrical Forward Setting** (16-Pin Plastic Package)

The CLK5010 is designed for driving analog clocks that advance at either second or minute intervals. With minute-controlled mechanisms, forward setting is done electrically by pressing a pushbutton switch. With second-controlled mechanisms, the minute and second hands must be set mechanically.

The IC contains an oscillator circuit for a 4.194812 MHz crystal and a switchable frequency divider whose output frequency in the normal mode is 0.5 Hz for clocks with a seconds' hand or 1/120 Hz for minute-
controlled mechanisms. Change-over takes place at the min/$\overline{\text{sec}}$ input. With seven tuning pins of the frequency divider, the output frequency can be adjusted to 0.5 Hz or 1/120 Hz to an accuracy of ±0.95 ppm. In the normal mode, the conduction phase of the alternating current through the motor winding is 125 ms. The motor makes a step every time the current direction changes.

Electrical forward setting is actuated with a pushbutton switch at the setting input. Each time the button is briefly pressed, a motor step takes place in forward direction. If the button is pressed for more than approx. 1.2 s, fast electrical setting takes place with 21 steps per second. When the button is released, the second counter is reset so that the clock is synchronized to the full minute.

CLK5011 **CMOS Car Clock IC with Electrical Setting** (16-Pin Plastic Package)

The CLK5011 is designed for driving analog clocks that advance at either second or minute intervals. With minute-controlled mechanisms, settings are done electrically either forward or backward by actuating a change-over switch. With second-controlled mechanisms, the minute and second hands must be set mechanically.

The IC contains an oscillator circuit for a 4.194812 MHz crystal and a switchable frequency divider whose output frequency in the normal forward mode is 0.5 Hz for clocks with a seconds' hand or 1/120 Hz for minute-controlled mechanisms. Change-over takes place at the min/sec input. With six tuning pins of the frequency divider, the output frequency can be adjusted to 0.5 Hz or 1/120 Hz to an accuracy of ±1.90 ppm.

The step motor is operated by a main winding L1 at the motor outputs MO1 and MO2 and an auxiliary winding L2 at the motor outputs MO2 and MO3. L2 is only provided for minute movements and allows the direction of rotation of the step motor to be changed. In the normal mode, the conduction phase of the alternating current through the motor winding(s) is 125 ms. The motor makes a step every time the current direction changes. In the normal mode of a clock with a second movement, the connections MO1 and MO2 are controlled in phase opposition wit the 0.5 Hz frequency.

In the minute mode, MO3 is controlled in the normal mode (with a frequency of 1/120 Hz) and in phase with MO1 for forward setting (L1 and L2 parallel). MO1 and MO3 are controlled in phase opposition (L1 and L2 in series) for backward setting (MO2 disabled).

When the change-over switch is open, the clock is in the normal mode. Each time the switch is briefly actuated (to R or L), a motor step takes place forwards or backwards. If the switch is pressed to R or L for more than approx. 1.2 s, fast electrical setting takes place in the corresponding direction with 21 steps per second. When the switch is released, the second counter is reset so that the clock is synchronized to the full minute.