MK 5017 P

MOS Clock Circuit

MOSTEK

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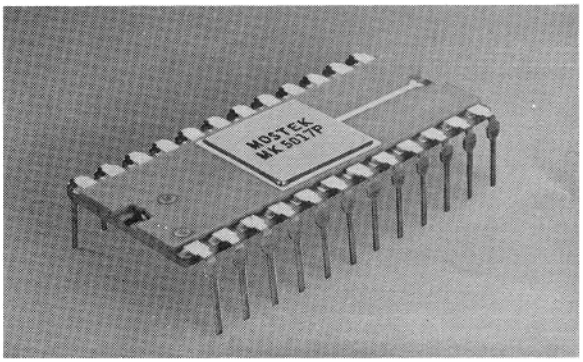

FEATURES

- 6-digit display
- 12/24 hour operation and display
- 50/60 Hz input
- Single power supply operation
- Easy to set
- Standard products available

Alarm Clock	MK 5017 P AA
Clock Radio Clock	MK 5017 P AN
Calendar Clock	MK 5017 P BB

CLOCK CIRCUIT TYPES

PIN DESIGNATION	CLOCK CIRCUIT AA	AN	BB	FUNCTION
V_{SS}	X	X	X	Supply Voltage
V_{DD}	X	X	X	Supply Voltage
D1	X	X	X	Digit Strobe, 1 Sec/Blank
D2	X	X	X	Digit Strobe, 10 Sec/Blank
D3	X	X	X	Digit Strobe, 1 Min/1 Day
D4	X	X	X	Digit Strobe, 10 Min/10 Day
D5	X	X	X	Digit Strobe, 1 Hr/1 Month
D6	X	X	X	Digit Strobe, 10 Hr/10 Month
SA	X	X	X	Segment A Data
SB	X	X	X	Segment B Data
SC	X	X	X	Segment C Data
SD	X	X	X	Segment D Data
SE	X	X	X	Segment E Data
SF	X	X	X	Segment F Data
SG	X	X	X	Segment G Data
Ø	X	X	X	Scan Oscillator Input
Ø Ref	X	X	X	Scan Oscillator Feedback
KA	X	X	X	Multiplexed Input
KB	X	X	X	Multiplexed Input
50/60 In	X	X	X	Input Count Frequency
50/60 Temp	X	X	X	Temporary Oscillator
AM	X	X		AM/PM Indication
1 Hz	X	X		Optional Output
Tone	X	X		Alarm Tone
INH		X	X	Inhibit
RS		X		Radio Sleep
RWS		X		Radio/Wake Sleep
ALT			X	Alternate

DESCRIPTION

The MK 5017 P is a versatile MOS/LSI clock circuit manufactured by MOSTEK using its depletion-load, ion-implantation process and P Channel technology. Intended for a wide range of timing applications, all of these clock circuits may be used with either four or six digit displays. These single chip clock circuits feature full 12 and 24 hour timekeeping operation. Either a 12 or 24 hour display may be selected without disturbing counter contents since only the display format circuitry is affected. Operation from either a 50 Hz or 60 Hz input frequency may be selected. (Another MOSTEK circuit, the MK 5009 P, is available to provide a 50 Hz signal from a 1 MHz crystal, where line frequency control is unavailable or inaccurate.) A 50/60 Hz oscillator on the chip provides a temporary time base during momentary line frequency interruptions so that timekeeping can continue if a backup battery is provided to maintain V_{DD}.

Only a single power supply is required for operation. All segments are turned on (pulled toward V_{SS}) causing an all "8's" display as a power failure indication when V_{DD} is below the operating range.

Data is multiplexed out of the clock in the form of six sequential seven-segment decoded digits.

A scanning technique is employed to sense control switch closures in order to minimize input pin connections. Using this method, only two pins, KA and KB, are required to sense up to 12 control switch closures.

Time setting is easy, a matter of depressing and holding pushbuttons which allow the internal counters to increment at a 2-Hz rate. Each of the minutes digits and the hours digits may be set individually with no "carrys" generated to the more significant digits. Thus, there is no "overrun" when setting the counter.

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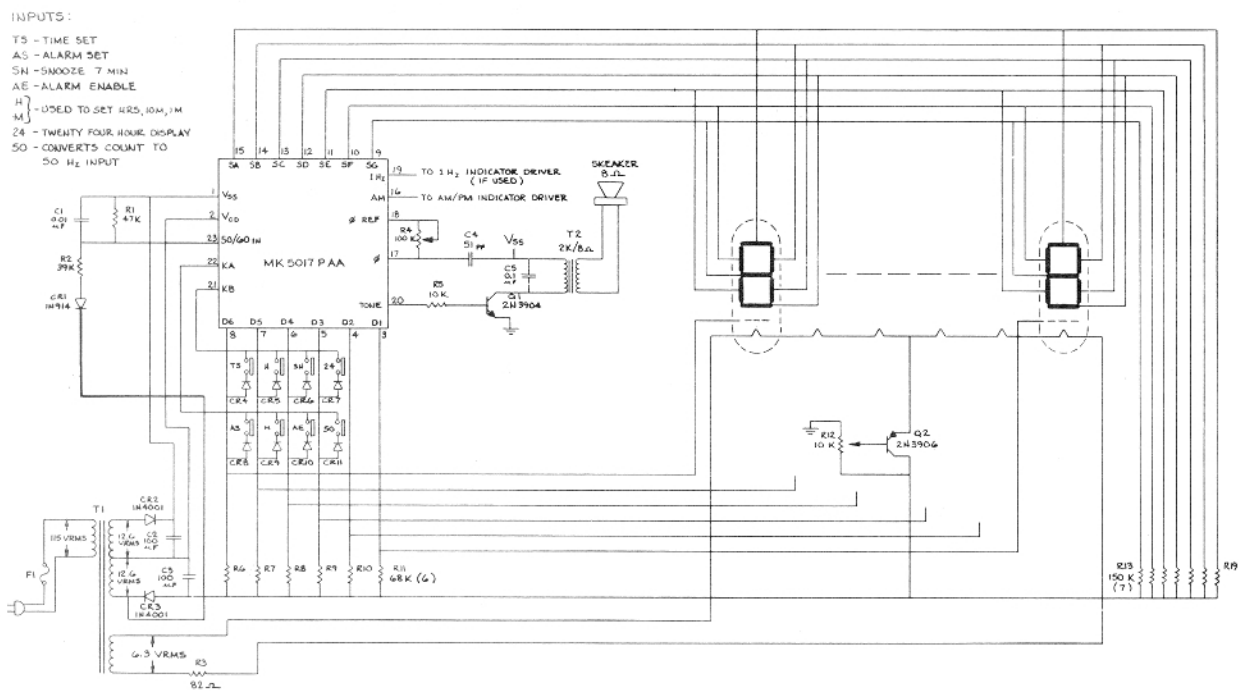

ALARM CLOCK

The MK 5017 P AA circuit may be used to construct an all-electronic digital alarm clock as shown above.

Timekeeping is accomplished by counting either a 50 Hz or a 60 Hz input reference frequency on the 50/60 IN pin. Voltage divider resistors R1 and R2 are selected so that the input reference frequency signal negative excursion is about one or two volts more negative than V_{DD}. Capacitor C2 serves as a filter to eliminate the effect of spurious impulses on the power line which could cause false counts to accumulate in the time counters.

Eight SPST switches located at the intersection of the six digit output lines and the two multiplexed input lines (KA and KB) provide control signals to the clock. Isolation diodes CR5 through CR12 prevent the digit strobe outputs from being connected together by multiple control switch closures in the same horizontal row of the input matrix. Similarly, the KA and KB multiplexed inputs are prevented from being shorted together by multiple switch closures in the same vertical column of the input matrix.

For applications requiring only an hours and minutes display, the 1 Hz output may be used to flash an indicator light to provide a visual indication that the clock is running.

An AM/PM signal is provided to distinguish between AM and PM for alarm setting on clocks using a 12 hour display. This output signal may be used to drive an AM indicator driver transistor. The AM output is at a logical one (near V_{SS}) to indicate AM and is at a logical zero (near V_{DD}) to indicate PM.

Each of the display digits is strobed sequentially from least significant to most significant digit at a rate determined by the frequency of the internal scan rate oscillator. Variable resistor R4, connected between the Ø and Ø REF pins, and capacitor C4 determine the scan rate oscillator frequency. At a nominal scan rate oscillator frequency of 100 KHz the digits are strobed or scanned for 1080 microseconds every 8.4 milliseconds.

Fluorescent anode tubes such as the ISE DG10A or the National Electronics NL-8051 may be driven from the MK 5017 P clock circuits. The segments or anodes are connected directly to the MK 5017 P segment outputs. The control grid for each tube is connected directly to the MK 5017 P digit output pins. The display tube filaments are all connected in a series string and through an 82 ohm current limiting resistor to the 6.3 volt winding on a filament transformer. This filament string is biased at about −25 volts (relative to V_{SS}) by transistor Q2 which may be used to provide brightness control for the display.

Tone pulses are generated within the clock circuit eliminating the requirement for an external alarm oscillator or a mechanical buzzer. The TONE output is a push-pull stage suitable for driving an NPN transistor that can be used to drive a speaker. Capacitor C5 across the primary of the speaker impedance matching transformer (T2) lowers the resonant frequency of the speaker circuit and eliminates the large turn-off voltage spike on the collector of transistor Q1.

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