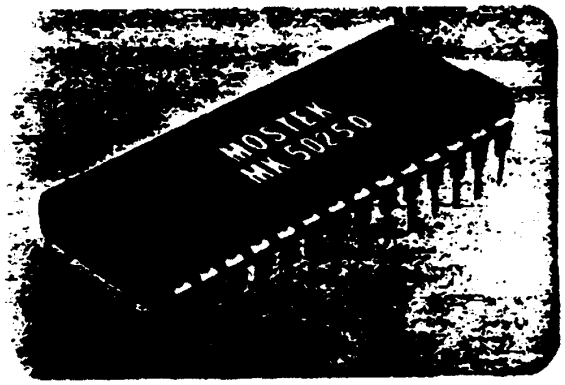
MOSTEK.

MOS DIGITAL ALARM CLOCK

MK 50250 N Series

FEATURES

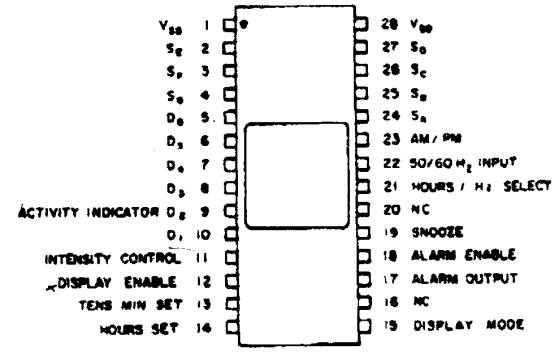
- Single Voltage Power Supply
- Intensity Control
- Simple Time Setting
- 4 or 6 Digit Display
- AM/PM and Activity Indicator
- Selectable Input Frequency and Output Mode
  - MK 50250 – 12 hr/60Hz or 24 hr/50Hz
  - MK 50253 – 12 hr/50Hz or 24 hr/50Hz
  - MK 50254 – 12 hr/60Hz or 24 hr/60Hz
- 24 hr. Alarm
- Snooze Alarm



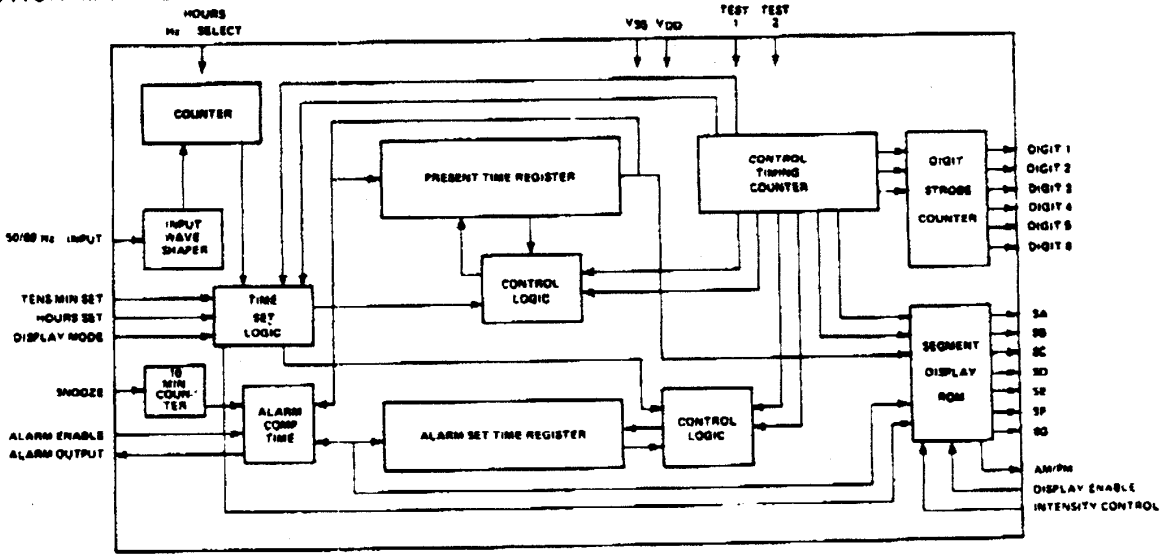
DESCRIPTION

The MK 50250 is a versatile MOS/LSI clock circuit manufactured by MOSTEK using its depletion-load, ion implantation process and P-channel technology. The circuit can be used to construct a digital alarm clock with the addition of only a simple power supply, display, and standard interfacing components. (See Typical Circuit Configuration). The circuit is compatible with 4- or 6- digit seven segment multiplexed displays.An AM/PM and circuit activity signal is generated by the chip. The alarm operates in a 24-hour mode, which allows the alarm to be disabled and immediately reenabled to activate 24 hours later. The snooze inhibits an activated alarm for 10 minutes.

PIN CONNECTIONS



FUNCTIONAL DIAGRAM



*ABSOLUTE MAXIMUM RATING OVER OPERATING FREE-AIR TEMPERATURE RANGE

Voltage on any pin relative to V_{SS} ..... +0.3 to −18.0V

Output Voltage Breakdown on any output relative to V_{SS} ..... −18.0V @ 10 μA

Operating Free-Air Temperature Range ..... 0°C to 55°C

Storage Temperature Range ..... −40°C to + 100°C

*Operation above absolute maximum ratings may damage the device.

RECOMMENDED OPERATING CONDITIONS ($0°C \leq T_A \leq 55°C$)

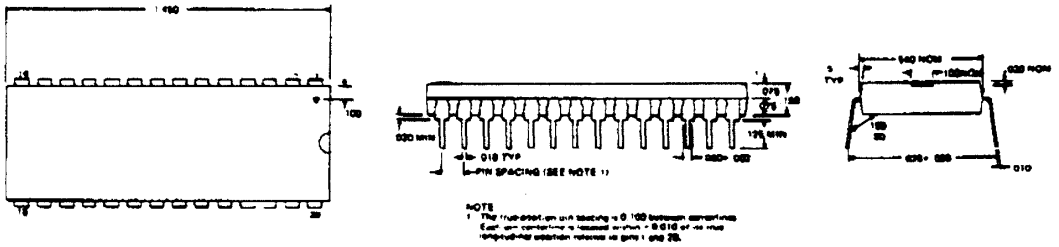
PARAMETER	MIN	MAX	UNITS	NOTES
Operating Voltage V_{DD} Relative to V_{SS}	−18.0	−9.0	volts	9
Input Logic Levels				1, 2
"1" Logic Level	V_{SS}−0.3	V_{SS} +0.3	volts	
"0" Logic Level	−18.0	V_{DD}+0.5	volts	

ELECTRICAL CHARACTERISTICS ($9V \leq V_{SS} - V_{DD} \leq 18V, 0°C \leq T_A \leq 55°C$)

PARAMETER	MIN	MAX	UNITS	NOTES
Output Current S_A–S_G, D_6 –D_1, AM/PM				
"1" Logic Level	0.5		mA	3
"0" Logic Level				4
Alarm Output Current				
"1" Logic Level	0.5		mA	3
"0" Logic Level	−5.0		μA	5
Supply Current, I_{DD}		10	mA	8
Input Current				
Tens Min Set, Hours Set	50	1000	μA	6
Hours/Hz Select	5	100	μA	
Alarm Enable,Snooze	5	100	μA	
50/60 Hz Input, Display Enable	−15	−200	μA	7

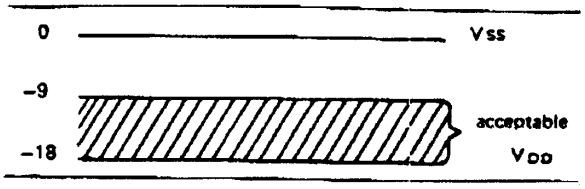
Notes:
1. 50/60 Hz Input has 3 volts of hysteresis for noise protection
2. "Display Mode" and "Intensity" are three state inputs which will self seek third state if left open.
3. Output voltage equal to V_{SS}−2.0 volts.
4. Open drain output.
5. Output voltage equal to V_{DD} +4.0 volts.
6. For power up clear, capacitance to V_{SS} must not exceed 20pF.
7. Pull-up device provided on 50/60 Hz input.
8. Outputs open
9. Pins 18 and 20 may be tied to V_{SS} or left floating.

PACKAGE DESCRIPTION 28-lead dual in-line plastic package



OPERATION

The MK 50250 requires a single power supply with a voltage range from $9V \leq V_{SS} - V_{DD} \leq 18$.



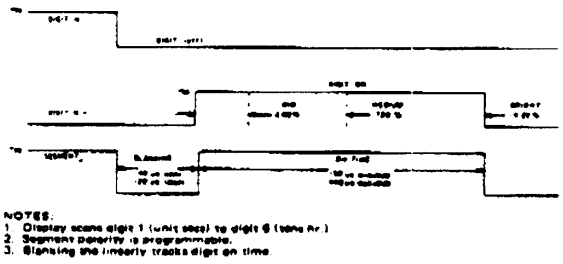
A Three State Input is one of the features which MOSTEK has employed on the MK 50250 to reduce system expense and simplify operation for the consumer. By switching Display Mode to one of three possible states the mode of operation is as follows:

Display Mode Input	Mode
V_{SS}	Alarm Set
Open	Real Time
V_{DD}	Count Inhibit

When in alarm set mode the alarm time is displayed and may be altered using the time set procedure (see setting). In the real time mode the real time is displayed and may also be altered using the same procedure. Count inhibit halts the counting of the clock. The display shows the halted time and may be altered by the time set procedure.

The display outputs of the MK 50250 requires the use of seven segment displays which can be multiplexed. The scaning oscillator is completely internal and requires no external components. As can be seen in the timing diagram each digit is on 14.29% of the time required to scan all 6 possible digits when the intensity mode switch is on bright.

DISPLAY TIMING



NOTES:
1. Display scans digit 1 (units sec) to digit 6 (tens hr.)
2. Segment polarity is programmable.
3. Blanking one linearly tracks digit on time.

The Intensity Control Input provides the following degrees of display intensity:

Intensity Control Input	Mode	Duty Cycle
V_{SS}	Bright	14.29%
Open	Medium	7.20%
V_{DD}	Dim	2.60%

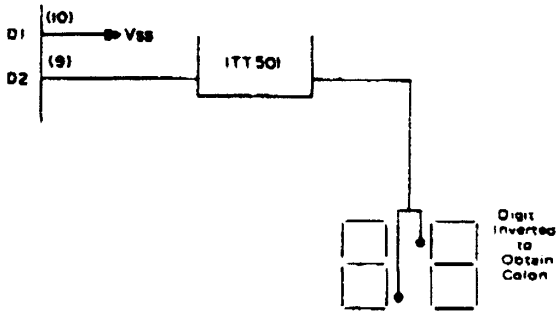
The intensity can be controlled either manually or automatically (see "Automatic Intensity Control diagram").

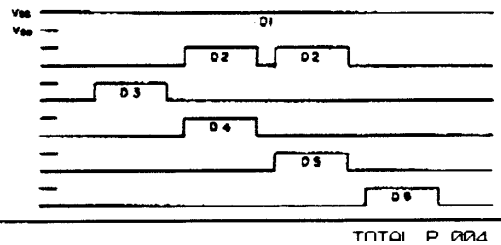
The display can be blanked by connecting the Display Enable input to V_{DD}. Leaving this pin open allows internal pull-up to V_{SS} which enables the display. This feature allows the display to be time shared with other information.

When power is initially applied both real time and alarm time will be at 12:00:00 midnight in the 12 hr. mode and 00:00:00 in the 24 hr. mode. Time keeping begins when hrs. set and tens min. set are simultaneously taken to V_{SS}. The units minutes digit can be advanced at a 2 Hz rate by connecting both the hours set pin and the tens minute set pin to V_{SS}, this also resets seconds to zero. The tens minute digit will advance at a 2 Hz rate when the tens minute set pin is connected to V_{SS}. The hours digit will be advanced by connecting the hr. set pin to V_{SS}. The carry from one digit to the next more significant digit does occur so setting should be performed from the least significant digit to the most significant. Both pins have internal pull-down resistors and can be either left open or tied to V_{DD} when not being used.

The chip can be used with either a 4 or 6 digit display. If digits D_1 and D_2 are not used to display seconds and tens of seconds, the user is unable to tell if the circuit is active until the minutes digit changes. In order to more quickly determine clock activity, a colon or other indicator can be flashed at a 1 Hz rate by connecting D_1 to V_{ss}. D_2 can then be used to drive the colon or activity indicator. The D_2 output used in this mode occurs during D_4 and D_5 time so that the decimal point for digits D_4 and D_5 can be used as a colon.

OPTIONAL ACTIVITY INDICATOR AND TIMING





The AM/PM output operates with an 85% duty cycle at full intensity and conducts to V_{SS} for PM indication.

If a "brown out" occurs, the AM/PM indicator will flash at a 1 Hz rate to signify an incorrect display time. This low power indication continues until proper power is restored and the clock is reset.

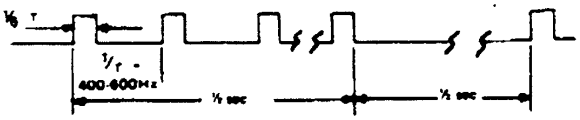
The Hours/Hz select input is provided with an internal pulldown resistor to VDD. The options available are as follows:

Part	Hours/Hz	Mode
50250	Open to V_{DD}	60Hz - 12 Hrs.
	V_{SS}	50Hz - 24 Hrs.
50253	Open or V_{DD}	50Hz - 12 Hrs.
	V_{SS}	50Hz - 24 Hrs.
50254	Open to V_{DD}	60Hz - 12 Hrs.
	V_{SS}	60Hz - 24 Hrs.

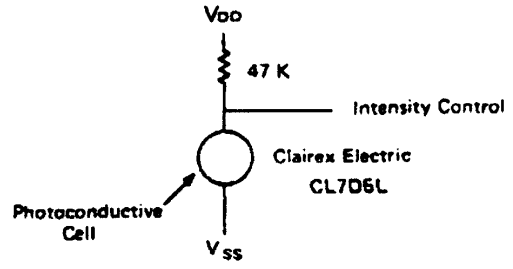
The Alarm Enable pin enables the alarm when connected to V_{SS}. If it is left open it will disable the alarm due to an internal pull down resistor to V_{DD}. When alarm occurs it may be disabled and immediately re-enabled and will activate 24 hours later at the alarm time. The output tone will be in the range of 400-600 Hz, and has a 1/6 duty cycle which conducts to V_{SS} 50% of the time at a 1 Hz rate.

The Snooze feature will temporarily turn off an activated alarm signal to allow an additional 10 minutes sleep Momentarily connecting snooze to V_{SS} will activate the snooze. If left open an internal pull down resistor to V_{DD} will maintain the snooze feature inoperative.

ALARM OUTPUT



AUTOMATIC INTENSITY CONTROL



TYPICAL CIRCUIT CONFIGURATION

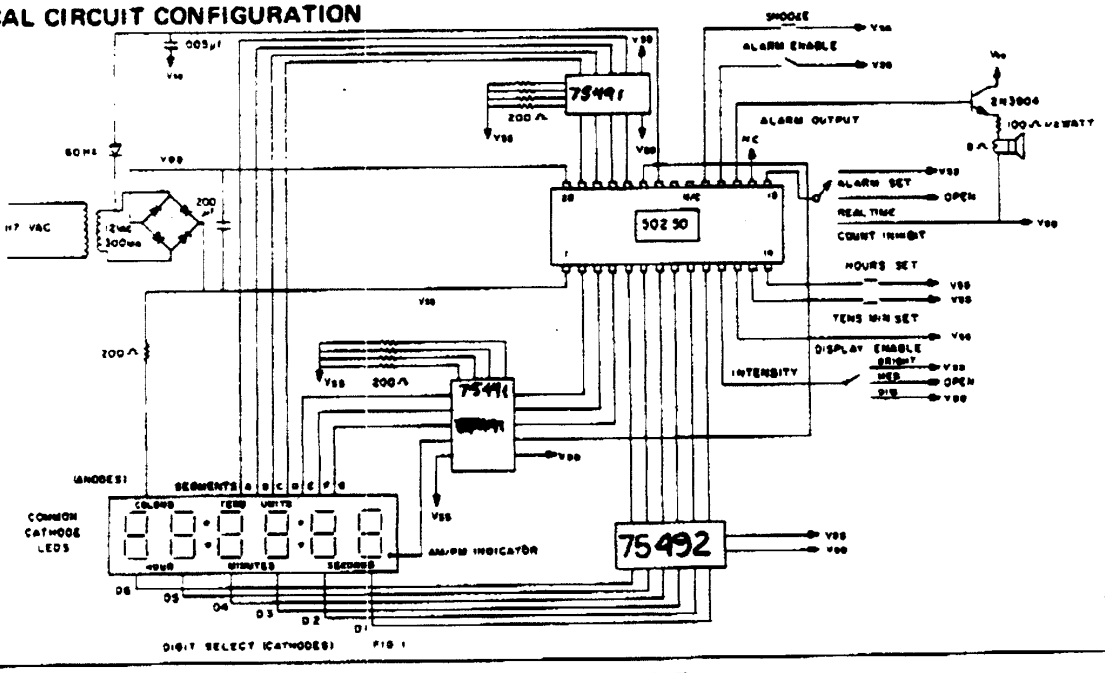


FIG 1

MOSTEK.

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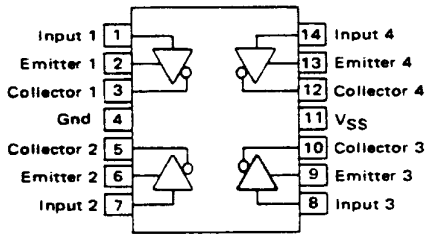
NUMERIC DISPLAY INTERFACE

. . . for mating multiplexed LED or gas discharge numeric displays to MOS or TTL logic systems.

LED Drivers for Common-Cathode Displays

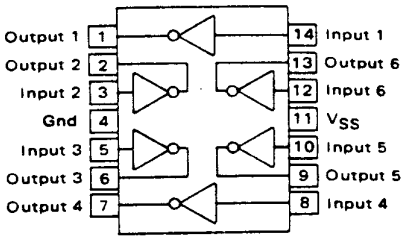
MC75491 – Quad segment driver



Both Devices:
T_A = 0 to 70°C

Packages:
L Suffix – Case 632
P Suffix – Case 646

MC75492 – Hex digit driver



Device Number	I_I @ V_I = 10 V mA Max	V_{OL} Volts Max	@ I_{OL} mA	V_{SS} Volts Max
MC75491	3.3	1.2	250	10
MC75492	3.3	1.2	50	10