

LCD/LED WATCH CIRCUIT

GENERAL DESCRIPTION

The MMC 353 A is a low threshold voltage metal gate CMOS integrated circuit that provides or controls all signals needed for a 3 1/2 digit LCD or LED watch. The circuit time-base is a crystal controlled oscillator. The selection input SEL is set to 0 for a 32768 Hz oscillator or to 1 for a 4194304 Hz oscillator. This time base frequency is counted down to provide proper signals to display Hours-Minutes information continuously and Month-Date, Seconds, Alarm Hours-Minutes, Sleep information upon demand. Time is displayed in 12 hours format, with an AM/PM indicator. When displaying Hours-Minutes information, the circuit provides an alarm "on" indicator and a seconds indicator blinking colon. The circuit operates from a single 2.5 V to 5 V supply. It is available in a 40-lead dual-in-line package.

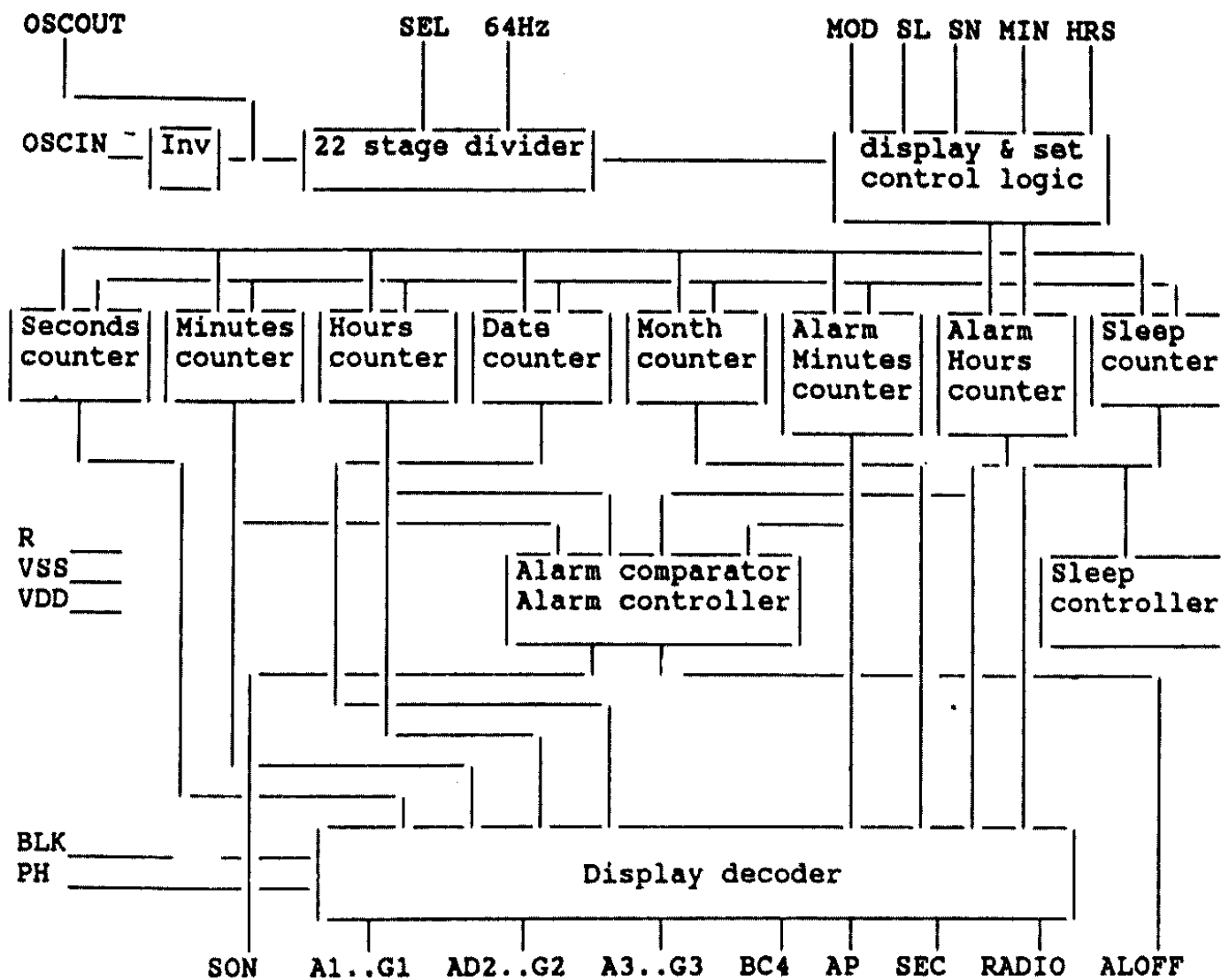
FEATURES

- 32768 Hz or 4194304 Hz crystal controlled operation
- Single 2.5 V to 5 V power supply
- Drive outputs for LED's and LCD's
- 12 hour display format with AM/PM indicator
- Seconds indicator blinking colon
- Date counters (Month — Day)
- Alarm counters (Alarm Hours — Alarm Minutes)
- 7 minutes snooze alarm function
- Presetable 59 minutes sleep downcounter
- 2 setting buttons (Minutes/Days — Hours/Months)

CONNECTION DIAGRAM

VSS	1	40	MIN
ALOFF	2	39	HRS
SEL	3	38	MOD
OSCOUT	4	37	SL
OSCIN	5	36	SN
SON	6	35	RESET
RADIO	7	34	64Hz
G1	8	33	PH
F1	9	32	SEC
E1	10	31	AP
D1	11	30	A3
C1	12	29	B3
B1	13	28	C3
A1	14	27	D3
G2	15	26	E3
F2	16	25	F3
E2	17	24	G3
C2	18	23	BC4
B2	19	22	BLK
AD2	20	21	VDD

BLOCK DIAGRAM

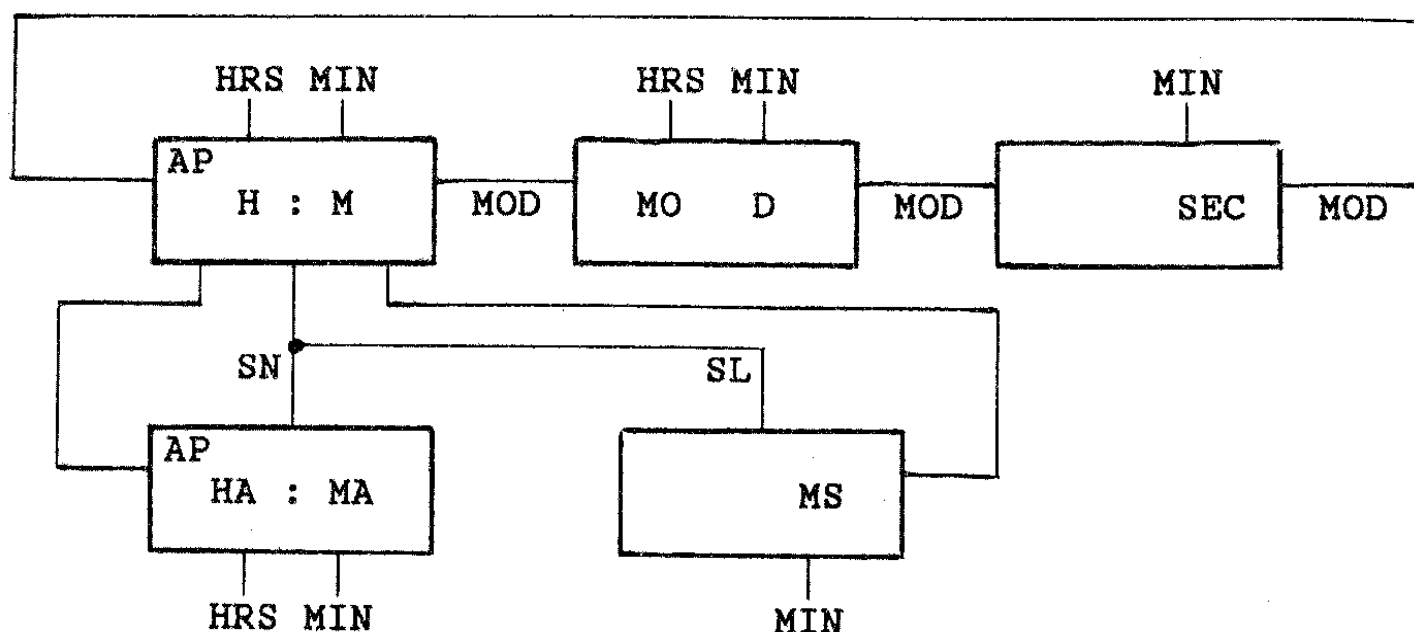


FUNCTIONAL DESCRIPTION

The reset input RESET allows resetting all the counters. The Seconds, Minutes and Alarm Minutes counters are reset to 00, the Hours, Alarm Hours, Month and Date counters are reset to 01 and the Sleep counter is reset to 59. The mode input MOD allows displaying date or seconds information. The MIN and HRS inputs are used for setting the counters (Time Counters, Date Counters, Seconds Counter, Alarm Time Counters, Sleep Counter). The mode input MOD, the programming inputs HRS, MIN, the snooze input SN, the alarm-off input ALOFF, the sleep input SL and the reset input RESET are internally connected to 1; for making them active push buttons are used that establish a temporarily connection to 0. 24 phase-controlled outputs are available for direct drive of a 3 1/2 digit liquid crystall output display. A 64 Hz output serves as the backplane drive for the LCD and as phase input PH for the circuit when used with LCD display. When used with LED display, the PH input is set to 0 for common cathode LED and to 1 for common anode LED. The blanking input BLK set to 0 blanks the display.

The SON output is kept high for an hour after the coincidence between the time counters (real time) and the alarm counters (alarm time). The SON output may be temporarily inhibited for a time interval of 7 minutes using the "snooze" input SN or cancelled using the ALOFF input. The „snooze" input SN is also used for Alarm Time displaying. In order to turn off a radio after a desired time interval of up to 59 minutes, the circuit contains a sleep downcounter with the serial output RADIO. The sleep input SL is used for Sleep Time displaying.

WATCH PROGRAMMING DIAGRAM



The circuit normally displays Hours-Minutes information with the colon flashing at a 1 Hz rate. The Hours and Minutes counters may be set using the setting buttons MIN and HRS. Depressing once the mode button MOD causes Months-Days information to be displayed with no colon. The display will automatically return to Hours-Minutes information 2 ± 0.25 seconds after the MOD button has been released. While MOD button depressed, the Months and Days counters may be set using the setting buttons MIN and HRS. Depressing twice the mode button MOD causes Seconds information to be displayed. Depressing MIN button while Seconds are displayed, the Second counter is reset. Depressing MOD button once more causes display to return to Hours-Minutes information. Depressing the "snooze" button SN causes Alarm Hours-Minutes information to be displayed with the colon lighting. The display will automatically return to Hours-Minutes information 2 ± 0.25 seconds after the SN button has been released. While SN button depressed, the Alarm Hours and Alarm Minutes counters may be set using the setting buttons MIN and HRS. Depressing the "sleep" button SL causes Sleep information to be displayed. The display will automatically return to Hours-Minutes information 2 ± 0.25 seconds after the SL button has been released. While SL button depressed, the Sleep counter may be set using the setting button MIN. Setting of Time, Date, Seconds, Alarm Time and Sleep counters is realised by pressing the setting buttons MIN and HRS, that will advance the counters at a 4 Hz rate.