

3817A/3817D

DIGITAL CLOCK RADIO OR DIGITAL ALARM CLOCK

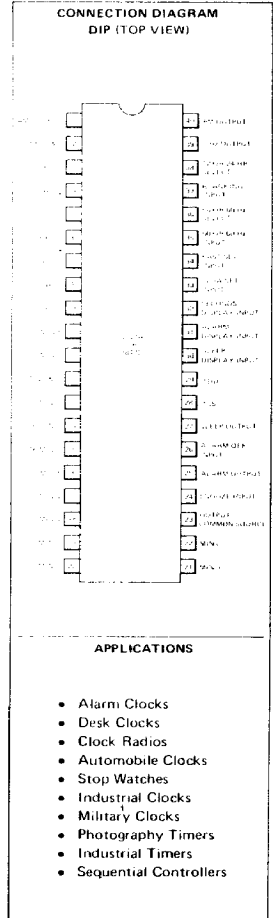
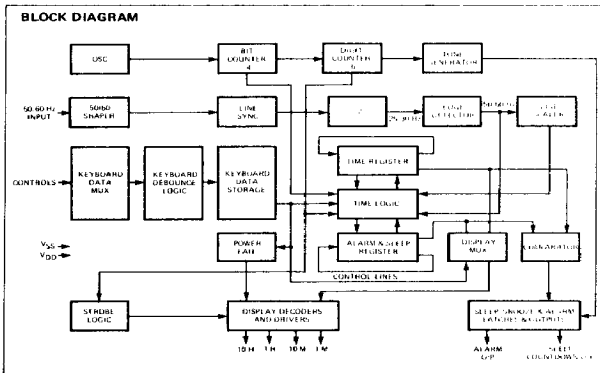
GENERAL DESCRIPTION – The 3817A and 3817D are 4 digit Alarm Clocks ^{MS109} utilizing the MOS P-channel Isoplanar, silicon gate process. The 3817A and 3817D contain all the logic required to build a variety of clocks and timers using 50 or 60 Hz line frequencies. Interfacing to LED, LCD, Gas Discharge and Vacuum Fluorescent displays is possible with a minimum number of external components.

Four different display modes may be selected:

- Time (unselected) - Hours and minutes
- Seconds - Minutes and seconds
- Alarm - Display the present setting of the alarm
- Sleep (countdown) - Displays time (minutes) to turn-off of radio

A display format of either 12 or 24 hours may be externally selected. These devices operate from a single unregulated power supply over a range of 8 to 22 volts with an indication to inform the viewer that a power failure has occurred. They are available in the 40-pin ceramic or plastic Dual In-line Package.

- 50 OR 60 Hz OPERATION
- SINGLE POWER SUPPLY
- 12 OR 24 HOUR DISPLAY FORMAT
- AM/PM OUTPUTS (12-HOUR DISPLAY FORMAT)
- LEADING ZERO BLANKING (12-HOUR DISPLAY FORMAT)
- FAST AND SLOW SET CONTROLS
- POWER FAILURE INDICATION
- BLANKING/BRIGHTNESS CONTROL CAPABILITY
- DIRECT INTERFACE TO LED, FLUORESCENT TUBES, OR LCD DISPLAYS
- 9 MINUTE SNOOZE ALARM
- PRESETTABLE 59 MINUTE SLEEP TIME



APPLICATIONS

- Alarm Clocks
- Desk Clocks
- Clock Radios
- Automobile Clocks
- Stop Watches
- Industrial Clocks
- Military Clocks
- Photography Timers
- Industrial Timers
- Sequential Controllers

ABSOLUTE MAXIMUM RATINGS (All voltages relative to V_{SS})

Supply Voltage Range, V_{DD}	-22 V to +0.3 V
Input Voltage Range	-22 V to +0.3 V
Output Voltage Range	-22 V to +0.3 V
Operating Temperature Range	0°C to +70°C
Storage Temperature Range	-55°C to +150°C

TABLE 1: OPERATING MODES FOR 3817A AND 3817D

DISPLAY MODE	DISPLAY CONTROL (PIN) CONNECTED TO V_{SS}	SET CONTROL CONNECTED TO V_{SS}			
		NONE	FAST SET (34)	SLOW SET (33)	BOTH
Time-of-Day	None	Time-of-Day Display	Time Set Advance (60 Hz)	Time Set Advance (1 Hz)	Same as FAST SET
Seconds	Seconds (32)	Seconds Display (1M, 10S, 1S)*	Seconds Reset to 00 (No Carry to Minutes)	Time Count Inhibited (Hold Mode)	Time Reset 12:00:00AM (12 hr) 00:00:00 (24 hr)
Alarm Time	Alarm Time (31)	Alarm Time Display (10H, 1H, 10M, 1M)	Alarm Set Advance (60 Hz)	Alarm Set Advance (1 Hz)	Alarm Reset 12:00AM (12 hr) 00:00 (24 hr)
Sleep Countdown	Sleep Countdown (30)	Sleep Countdown Display (10M, 1M)**	Sleep Countdown Set (Countback from 00 at 1 Hz)	Sleep Countdown Set (Countback from 00 at 1 Hz)	Same as FAST SET

* Leading digit is blanked.

** Leading two digits are blanked.

FUNCTIONAL DESCRIPTION

50/60 Hz Input (Pin 35) and Select (Pin 36) – The timing for the Clock is obtained from the 50 Hz or 60 Hz ac line. Internal circuitry allows interfacing with the ac line through a high-value resistor. Internal limiting is provided, and hysteresis is designed in to minimize noise response. A series resistor is always necessary to limit the current at this input.

The input frequency may be 50 or 60 Hz. To select a frequency of 50 Hz connect pin 36 to V_{SS} ; to select a 60 Hz frequency leave pin 36 disconnected. An internal pull-down resistor provides the logic level.

Display Modes/Time Settings (Pins 30 to 32) – There are four display modes:

- 1) **Time-of-day** – This is the normal mode of operation where tens and unit hours (10 H, 1 H) and tens and unit minutes (10 M, 1 M) are displayed. It is obtained by leaving all Display Controls unconnected. To set any desired time, the Fast Set and/or Slow Set inputs must be connected to V_{SS} . Fast Set advances the time at a 60 Hz rate; Slow Set advances the time at a 1 Hz rate (see Table 1).
- 2) **Seconds Display Input (Pin 32)** – If a more accurate time display is desired, the Seconds Display mode may be activated by connecting the Seconds Display input to V_{SS} . The Output will display unit minutes (1 M) and tens and unit seconds (10 S, 1 S). If, during a Seconds Display, Fast Set is connected to V_{SS} , seconds will reset to 00 with no effect on the minutes display. If Slow Set is connected to V_{SS} , the entire counter will stop (Hold mode) until Slow Set is disconnected. Activating both Fast Set and Slow Set simultaneously will reset the time-of-day to 12:00 AM (12-hour format). (See Table 1)
- 3) **Alarm Display Input (Pin 31)** – The contents of the alarm register may be displayed by connecting pin 31 to V_{SS} causing 10 H, 1 H, 10 M, 1 M to be displayed. The Alarm is set in the same manner as "time-of-day". Activating both Fast Set and Slow Set simultaneously will reset the Alarm Time to 12:00 AM (12-hour format) or 00:00 (24-hour format). (See Table 1)

FUNCTIONAL DESCRIPTION (Cont'd)

- 4) **Sleep Display Input (Pin 30)** - The Sleep Countdown is generally used to turn off a radio after falling asleep. It displays in minutes (10 M, 1 M) and counts down the time remaining from a maximum of 59 minutes until any external circuitry is turned off. The Sleep Time is set by using the Fast Set and/or Slow Set inputs which decrement the counter from 00 (00, 59, 58, etc.) to the desired Countdown time. Once set, the counter will count down to 00. For times other than 00, the Sleep Countdown output (open-drain device) is pulled toward V_{SS} . A 00 display will cause a high impedance at the Sleep Countdown output. The countdown may be terminated at any time by momentarily connecting the Snooze input to V_{SS} .

Time Setting Inputs - Fast (Pin 34) and Slow (Pin 33) - Two inputs are provided to set time, where the Fast Set is 50 or 60 Hz and the Slow Set is 1 Hz. Their function varies for each of the four display modes. Time, Seconds, Alarm and Sleep Countdown (see Table 1).

Alarm Output (Pin 25), Snooze (Alarm) Input (Pin 24) and Alarm Off (Pin 26) - The Alarm has the option to output either a dc level (3817D) or a 700 Hz frequency (3817A) for a variety of industrial or commercial applications. The level or tone output will be active for 60 minutes after the Alarm setting.

Connecting the Snooze input to V_{SS} during the 60-minute period while the alarm is active will inhibit the Alarm Output for about 9 minutes. The Alarm is turned off by momentarily connecting Pin 26 to V_{SS} . The alarm is inhibited as long as Pin 26 is left at V_{SS} .

A Power Failure is caused when the V_{SS} -to- V_{DD} voltage difference drops below 8 volts and is indicated by a 1 Hz flashing of the AM or PM segments in the 12-hour mode and the C/F, C, or G segments in the 24-hour mode. The failure indicator is reset by connecting either the Fast or Slow Set Inputs to V_{SS} (Pins 33 or 34).

Blanking Input (Pin 37) - The displays will be enabled or be blanked by connecting Pin 37 to V_{SS} (HIGH) or V_{DD} (LOW), respectively. This is the only control pin where the input must be connected to a voltage.

Common Source Connection (Pin 23) - All segments including AM and PM are open drain devices with all sources connected in common to Pin 23. Connecting all sources in common permits these devices to be used with a multitude of display devices, even those which have different power supply requirements.

Segment Outputs (Pins 1, 3 to 11, 13 to 22, and 40) - Each of these segment outputs may source a maximum of 8 millamps of direct current. The maximum power is 25 milliwatts per output device (see Figure 1), at an ambient temperature of 50°C.

Segment Outputs (Pins 2 and 12) - Each of these segment outputs may source a maximum of 16 millamps of direct current or a maximum power of 50 milliwatts per output device at an ambient temperature of 50°C.

DC REQUIREMENTS: $T_A = 0^\circ\text{C}$ to $+70^\circ\text{C}$, $V_{SS} = +15\text{ V} \pm 7\text{ V}$, $V_{DD} = 0\text{ V}$

SYMBOL	PARAMETER	MIN	MAX	UNITS	CONDITIONS
V_{FIH}	50/60 Hz Input HIGH Voltage	$V_{SS}-1$		V	External Series Resistor to limit current to $-10\ \mu\text{A} \leq I_{FIL} \leq -350\ \mu\text{A}$ and $10\ \mu\text{A} \leq I_{FIH} \leq 150\ \mu\text{A}$
V_{FIL}	50/60 Hz Input LOW Voltage		$V_{SS}-6$	V	
V_{IH}	Control Input HIGH Voltage	$V_{SS}-1$	V_{SS}	V	Internal R, typically 2.5 M Ω to V_{DD}
V_{IL}	Control Input LOW Voltage	V_{DD}	$V_{DD}+2$	V	
V_{BIH}	Blanking Input HIGH Voltage	$V_{SS}-2$	V_{SS}	V	
V_{BIL}	Blanking Input LOW Voltage		$V_{SS}-4$	V	

DC CHARACTERISTICS: $T_A = 0^\circ\text{C}$ to $+70^\circ\text{C}$, $V_{SS} = +15\text{ V} \pm 7\text{ V}$, $V_{DD} = 0\text{ V}$

SYMBOL	PARAMETER	MIN	MAX	UNITS	CONDITIONS
V_{PF}	Power Failure Detect Voltage	8		V	
I_{IN}	Input Leakage Current		1	μA	$V_{IN} = 20\text{ V}$, Pin 37 only
I_{DD}	Power Supply Current		6	mA	No output loading
I_{OH}	Output HIGH Current	1.5		mA	$V_{OH} = V_{SS} - 2$
I_{OL}	Output LOW Current		1.0	μA	
$*I_{OH2}$	Output HIGH Current	3.0		mA	$V_{COMMON} = V_{SS}$
$*I_{OL2}$	Output LOW Current		1.0	μA	$V_{OL} = V_{DD}$
I_{IOH}	1 Hz Output HIGH Current	4.5		mA	See Fig. 1

*Pins 2 and 12

AC REQUIREMENT: $T_A = 0^\circ\text{C}$ to $+70^\circ\text{C}$, $V_{SS} = +15\text{ V} \pm 7\text{ V}$, $V_{DD} = 0\text{ V}$

SYMBOL	PARAMETER	MIN	MAX	UNITS	CONDITIONS
f_{IN}	50/60 Hz Input Frequency	0	400	Hz	

AC CHARACTERISTIC: $T_A = 0^\circ\text{C}$ to $+70^\circ\text{C}$, $V_{SS} = +15\text{ V} \pm 7\text{ V}$, $V_{DD} = 0\text{ V}$

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	CONDITIONS
f_N	3817A Alarm Output	350	700	1200	Hz	Fundamental Harmonic

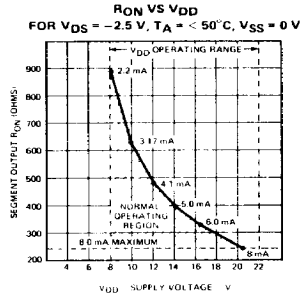


Fig. 1

TYPICAL ALARM CLOCK SCHEMATIC

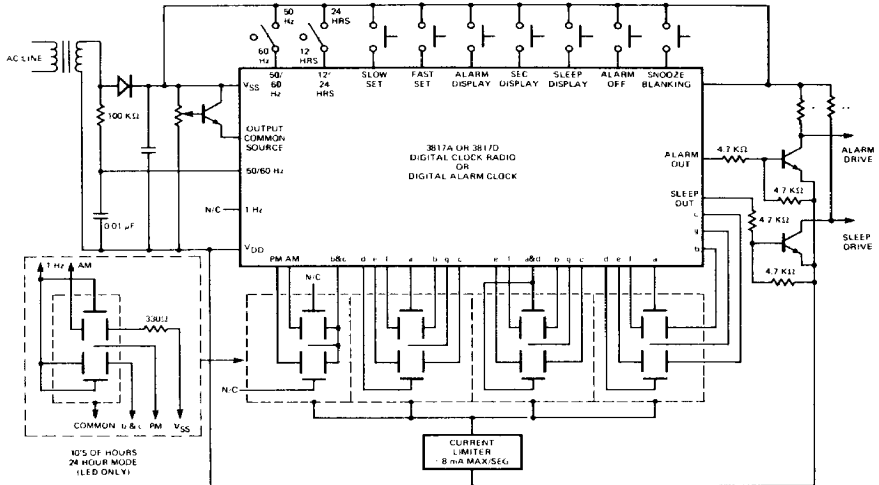


Fig. 2

* May be replaced with alarm speaker coil.
** May be replaced with solenoid or relay coil.