

VERSATILE DIGITAL TIMER



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This digital timer can be easily constructed using readily available ICs and components. This timer can be used to automatically switch ON/OFF any electronic or electric equipment after a pre-programmed time period, variable between a few seconds to 24 hours, with high accuracy. This timer displays the timings on a digital readout display in the

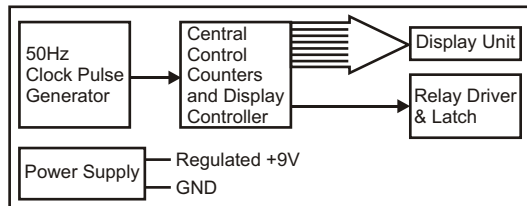


Fig. 1: Block Diagram of Digital Timer

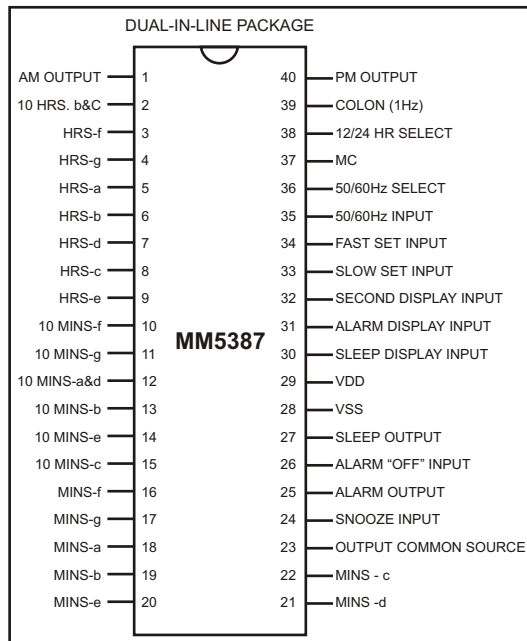


Fig. 2: Pin configuration of IC MM5387

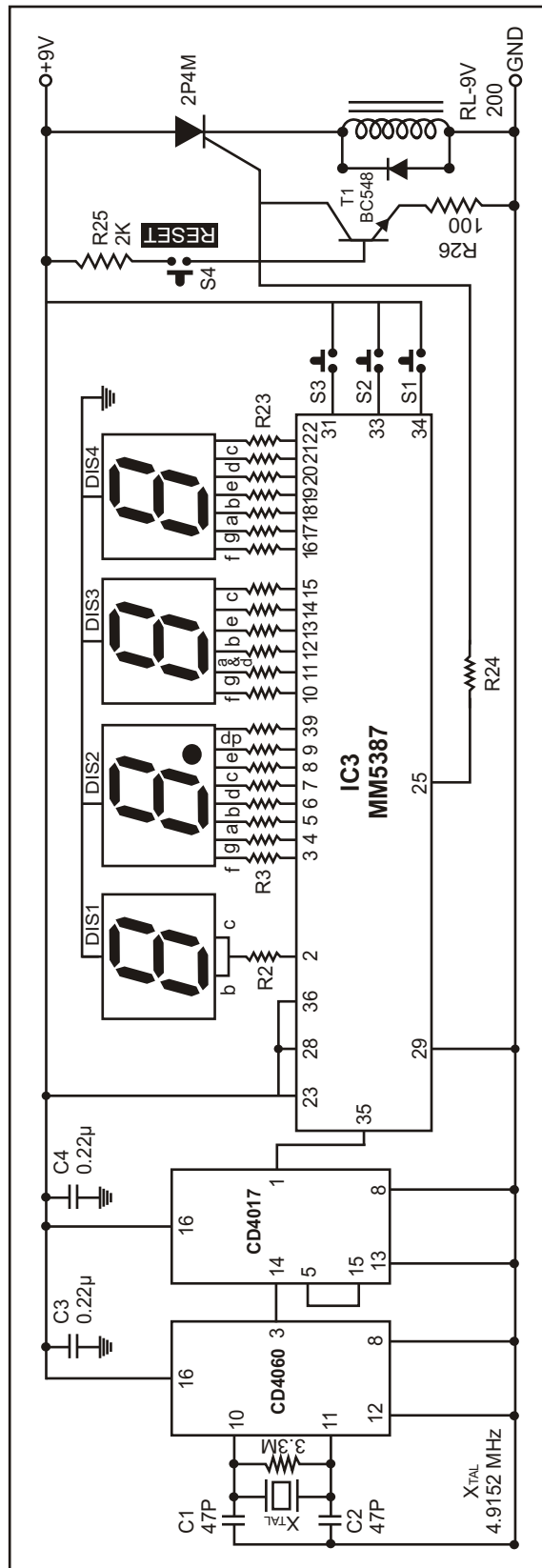


Fig. 3: Circuit Diagram of Digital Timer

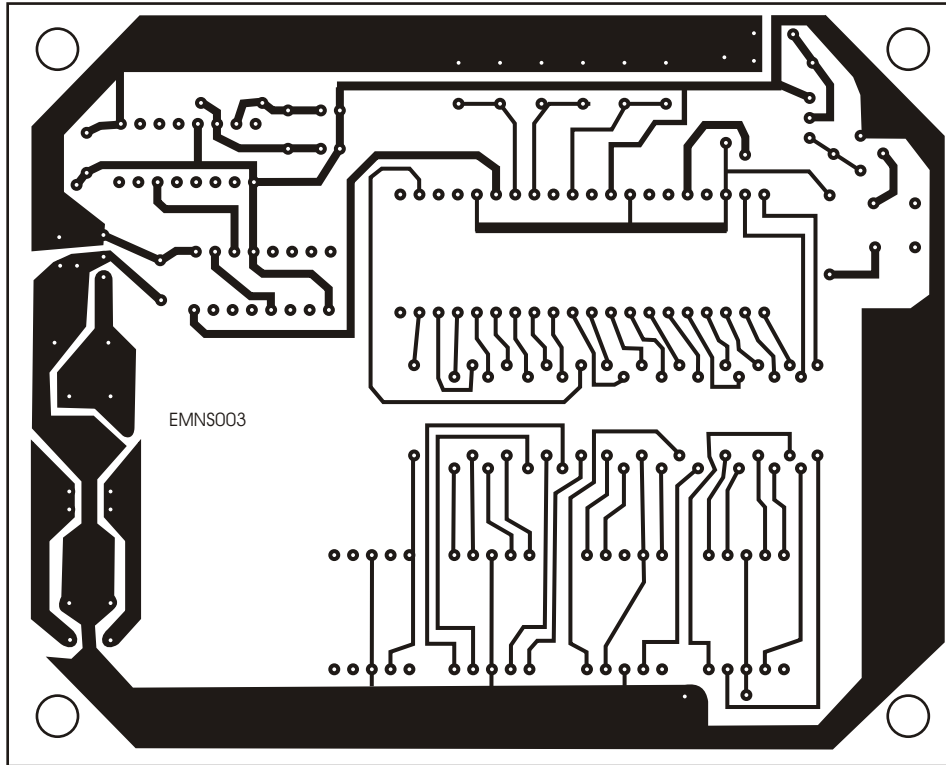


Fig. 4: Actual - size, solder-side PCB layout for the Digital Timer

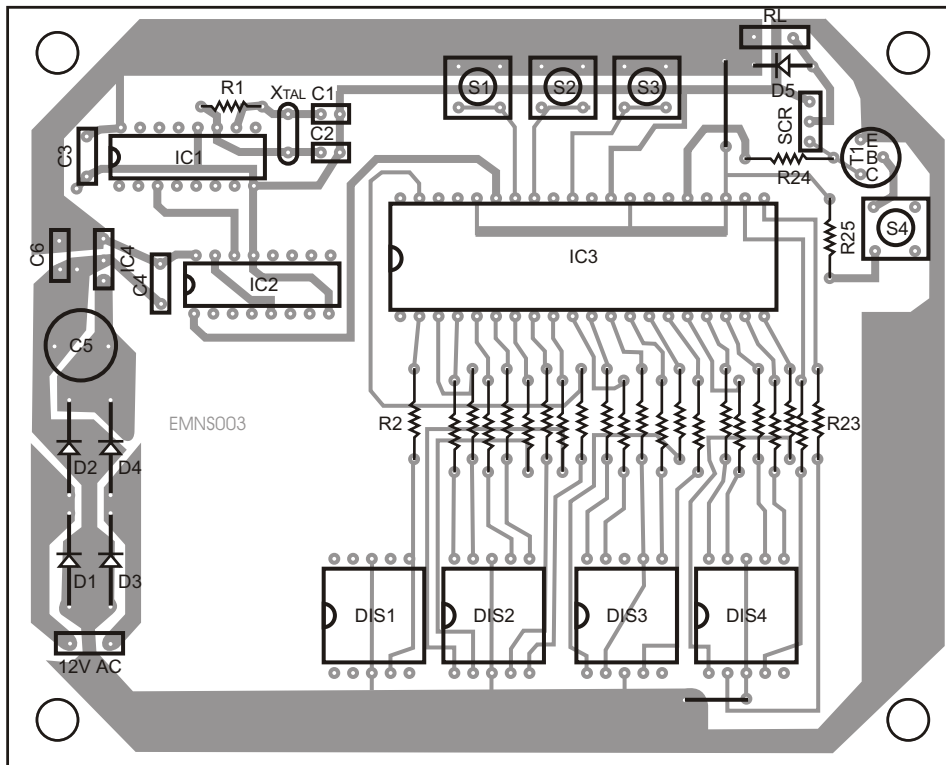


Fig. 5: Component layout for the PCB.

form of numeric characters and can be set using a pair of push-to-on switches.

The block diagram of the timer is shown in Fig.1. The clock chip, MM5387, forms the heart of the circuit. Pin details of IC MM5387 are shown in Fig.2. IC MM5387 is a 40-pin dual-in-line package IC operated on 8V to 26V DC. It gets the positive DC supply voltage at its pin 28. Pin 29 is grounded.

Only the timer section of this chip is used here. The time-keeping function of the clock chip (IC3) operates off a 50 Hz or 60 Hz input. Operation at 50 Hz is set by connecting pin 36 (50/60 Hz SELECT) of the clock IC to Vss. To get a 50 Hz clock pulse, we use the decade counter/divider CD4017 BE (IC2) and the 14-stage binary counter CD4060 (IC1) together with a 4.9152 MHz crystal (XTAL). The IC CD4060 divides the crystal frequency of 4.9152 MHz by 16,384 and produces a 300 Hz clock pulse, which is further divided by 6 using the CD4017 BE (IC2) to get the required 50 Hz pulse. These pulses are fed to the central control counter built around IC3. The timer output is fed to the gate of the SCR that is used to drive the relay. IC3

displays the timing on the 7-segment displays DIS1 to DIS4.

The IC3 has the option to select 24-hour format, we have designed it to display hours in 12-hour format only. By leaving pin 38 (12/24 HR SELECT) unconnected, the tens digit of the hours display can be set to provide a 12-hour display format.

The 1Hz output from pin 39 of IC3 is used to blink colon. The circuit diagram is shown in Fig. 3.

Setting Up The Clock:

After soldering is done, place the ICs in the respective bases. Now set the clock to display the real time using switches S2 and S3. Now depress the S1; displays will now show the

timer settings with reference to the preset actual time. S3 should be used to make fast settings. S2 should be used to make fine settings.

Press S4 to reset the relay, if energized.

Construction:

The circuit can be assembled on a Vero board or single sided PCB. Sockets should be used for all ICs. The displays may be soldered directly on to the PCB. The complete circuit may be housed in a suitable cabinet with S1, S2, S3 and S4 on the front panel along with displays.

This timer would be found indispensable in many industrial or domestic field of application.

Components List

Semiconductors:

IC1	CD4060 14-Stage binary counter
IC2	CD4017 Decade counter/divider
IC3	MM5387 Clock chip
IC4	7809, regulator
T1	BC548 npn transistor
SCR	2P4M
D1	1N4001 rectifier diode
D2-D5	1N4001, rectifier

Resistors:

R1	3.3M
R2-R24	560
R25	2K
R26	100

Capacitors:

C1-C2	47pF
C3-C4	0.22µF ceramic disk
C5	1000µF / 25V Electrolytic
C6	0.1µF ceramic disk

Miscellaneous:

XTAL	4.9152MHz Crystal
DIS1- DIS4	LT543 Common Cathode 7-segment display
X1	230V AC primary 0-12V, 500 mA Transformer
RL	Relay 9V, 200
S1-S4	push-to-on tactile switch
IC bases	

