CMOS Tester

A logical choice for testing the simpler CMOS ICS in up to 16-pin packages.

By Peter Dooley

WHEN FAULT-FINDING on equipment which uses CMOS devices, it is not always easy to isolate the fault to one IC. One method of elimination is to substitute the suspect device with a new one, but this has the disadvantage of possible damage or destruction of the replacement part, should the fault be elsewhere. A more positive method would be to have some device for testing a suspect IC. The unit to be described will test most CMOS ICs (up to 16 pins), and can also be used for evaluation of unfamiliar devices.

Construction And Testing

Fit and solder all links, followed by test pins, IC sockets, resistors, capacitors, diodes (except D2), LEDs, DIL switches and the power socket. The last item is mounted on the foil side of the PCB, and is held in position by two screws. Note carefully the orientation of the DIL switches, this is such that they are closed when the sliders on them are towards the test socket.

D2 is soldered between the +ve terminal on the power socket and the appropriate track on the PCB; the 0V connection should be made using a short length of wire. Two flying leads are required, and for this we suggest using the specially flexible wire that you can sometimes get for test leads, otherwise you'll have to replace these fairly regularly. Note that the sockets on the flying leads should match the test pins.

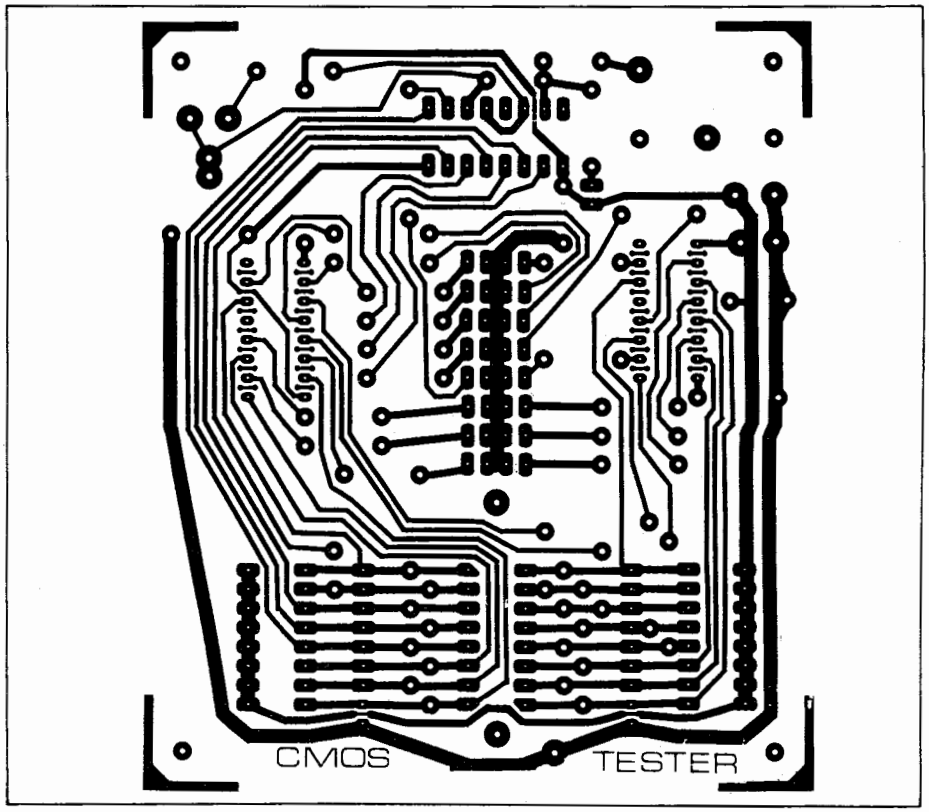
Six stand-off pillars are used to support the PCB, two of them being mounted close to the test socket to add strength where it's needed.

After checking the PCB and wiring for obvious faults, insert the three ICs. With the power still off and both flying leads disconnected, all switch positions on SW1-16 should be set to off. Apply power and observe LED17 flashing. Adjusting RV1 should alter the speed. Apply the pulse probe to each of the 16 test points in turn and check that the corresponding LED flashes. Operate SW1-16 in turn and check that the corresponding LEDs come on, and remain on until the switches are turned off. This concludes the test procedure.

In Use

Ensure that power is off before inserting the IC to be tested. Connect the 0V lead to the test point corresponding to the OV pin on the IC and select the +V on the appropriate switch of SW1-16. Apply power and observe the output status of the IC on the display.

Select the input using the appropriate section of SW1-16; care must be taken not to apply a high to any of the outputs of the IC, which will damage the IC under test, or to apply a high to the 0V power connection, which will risk damaging the PSU and D2. It should now be possible to work your way through the truth table of the IC under test, checking to see if all sections work.



PARTS LIST

RESISTORS (all ¼W 5%)	
R1-16	47k (16 off)
R17-32, 34	1k0 (17 off)
R33	100k
RV1	1M0
CAPACITORS	
C1	330n polyester
C2	100n polyester
C3	100 u 16V PCB electrolytic
SEMICONDUCTORS	
IC1-3	4049
D1	1N4148
D2	1N4001
LED1-17	0.1" red LEDs (17 off)
MISCELLANEOUS	
SW1-8, 9-16	8 pole SPST DIL switches (2)
SK1	16 pin ZIF socket

16 PCB test point connector pins, 2 test point sockets; 16 pin IC sockets (3); mounting pillars (6); 2.1 mm power socket; PCB. The ZIF socket can be obtained from Electro Sonic, 1100 Gordon Baker Rd., Willowdale, Ont. (416) 494-1555.

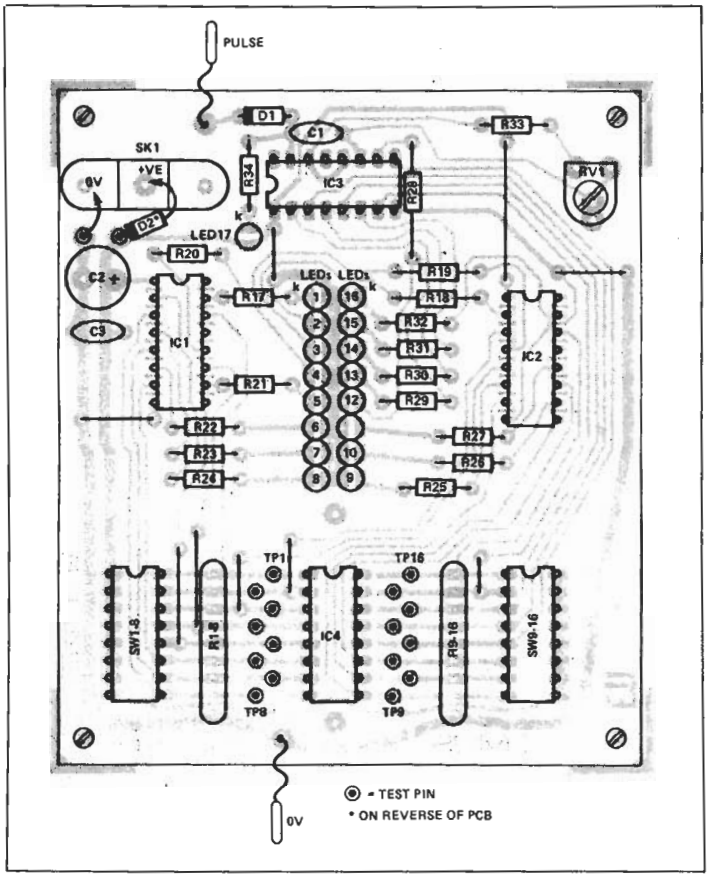


Fig 1. Overlay diagram of PCB.

HOW IT WORKS

IC1, 2, 3 are 4049 CMOS hex inverting buffers, one buffer being connected to each of a 16-pin test socket. An LED monitors the output of each buffer. With all poles in DIL switches SW1-16 open, the pins and test points on the test socket are held low by resistors R1-16 and the LEDs, which are displayed in DIL formation, are off. If one or more switches are closed, applying the positive supply to the IC pins, or an output on the test IC goes high level, then the corresponding LED lights to indicate a high level. The 0V connection to the test IC is made using a flying lead which is connected directly to OV.

IC3e and f together with C1, form a variable speed oscillator, with a frequency of approximately 1Hz to 20Hz. The output can be connected to any of the test points TP1-16, using a flying lead. Diode D1 is used to protect the oscillator components, should the output be inadvertently connected to a high level point. The output is monitored by LED 17, which can be seen flashing at low speeds. The 9 volt DC supply can be obtained from a standard AC adaptor or a 9V battery could be used. Diode D2 serves as a reverse polarity protector.

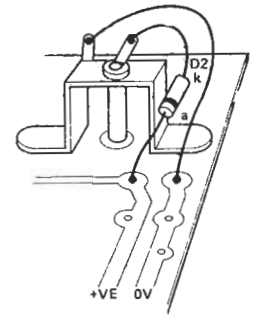


Fig. 3 Wiring of the power socket.

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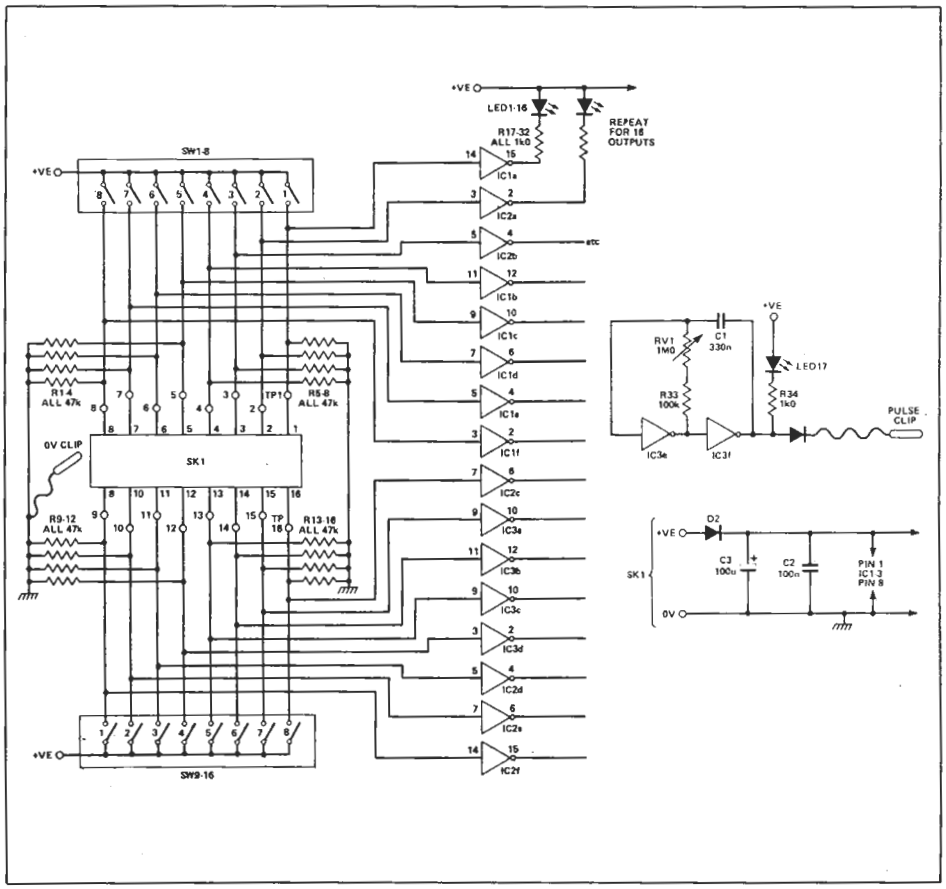

Fig. 2 Circuit Diagram of the CMOS tester.