Diode/transistor/Mosfet tester

This simple tester was devised to check that components in my junk box are still OK before I use them, using a single test board.

The transistor/diode tester section is based around hex inverter IC3. The IC3b and IC3c sections form an astable oscillator/multivibrator which runs at around 2Hz, set by the 1MΩ resistor and 100nF capacitor.

The outputs at pins 4 and 6 are 180° out of phase, ie, opposite in polarity. These voltages are buffered by parallel pairs of inverters, IC3a/IC3f and IC3d/IC3e.

The output from the IC3d/IC3e pair is fed directly to the collector of the device under test (DUT) and via a 56kΩ resistor to the base.

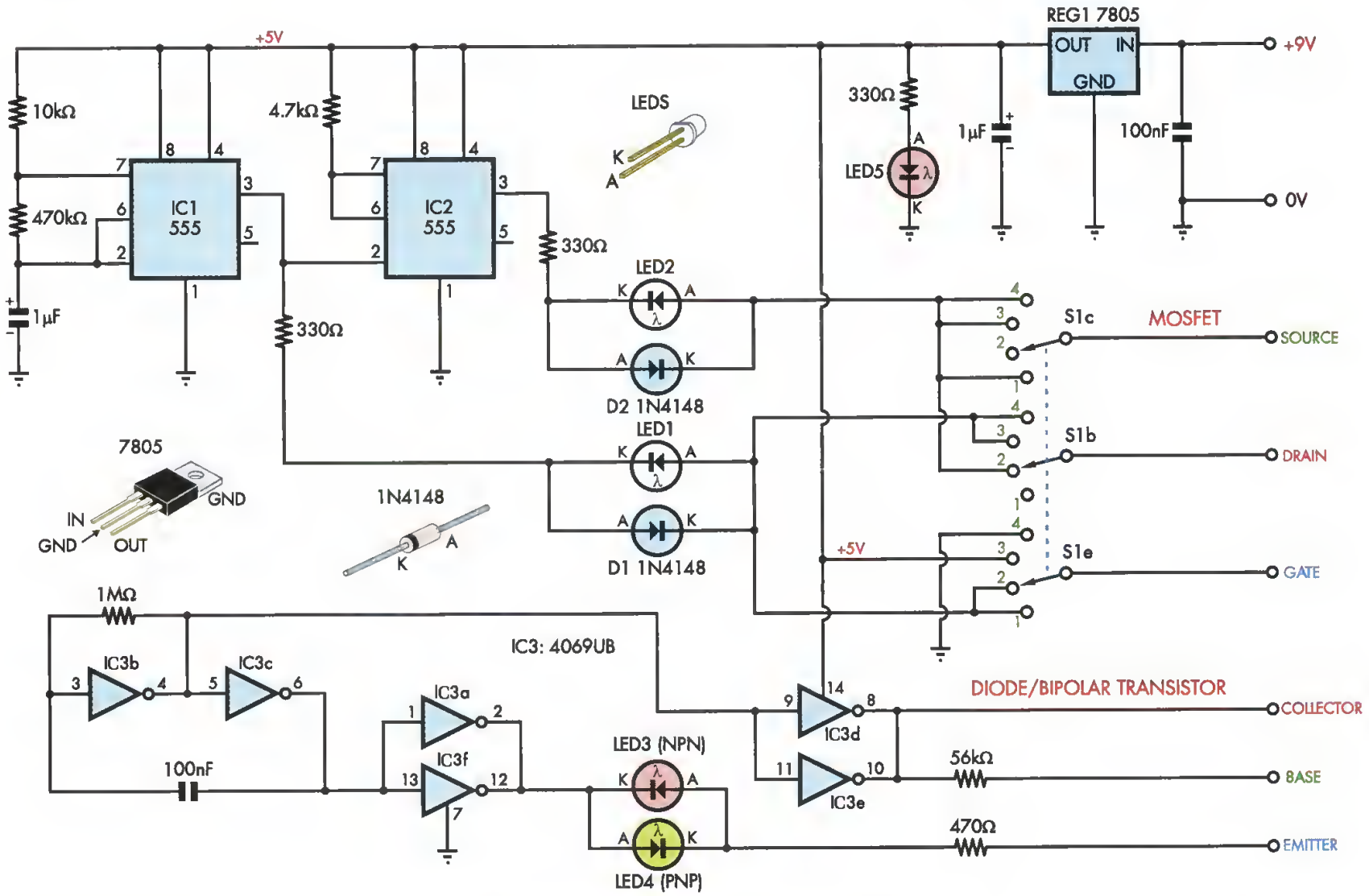
The emitter is driven with the opposite polarity signal from IC3a/IC3f via inverse parallel connected LEDs (LED3 & LED4) and a 470Ω current-limiting resistor.

If the DUT is working correctly then current will flow through either LED3 or LED4 during one of the output phases but it will cease during the other phase, when the base-emitter junction is reverse-biased.

So LED3 or LED4 will blink to indicate a good transistor, with the other LED remaining off. The colour indicates whether the transistor is a PNP or NPN device; red for NPN and green for PNP.

If the transistor has failed short-circuit then LED3 and LED4 will light alternately, whereas if it is open-circuit, neither LED will light.

Diodes can also be tested by connecting them between the COLLECTOR and EMITTER pin sockets. With a good diode, one of the two LEDs will blink while the other remains off. Reversing the diode will change which LED is blinking.



The Mosfet testing section is based on two 555 timer ICs; a single 556 could be used instead. IC1 operates as an oscillator, again at around 2Hz, while IC2 operates as an inverter, giving a square wave at its pin 3 output that's opposite in phase to that of output pin 3 of IC1.

These two ICs drive the Mosfet terminals via 330Ω current limiting-resistors, white LEDs with reverse-connected diodes and rotary switch S1. S1 allows four different testing modes.

In position 1, the drain is left disconnected while the gate and source are driven with opposite phase signals via LED1 and LED2.

Since there should be a very high resistance between the gate and the other two pins, neither LED should light up. If either does, that indicates a short circuit between gate and source.

Similarly, in position 2, the source is left disconnected and the drain and gate are driven via LED1 and LED2. Again, neither LED should light up. If either does, that indicates a short between the gate and drain.

In position 3, the gate is connected to the 5V supply while the drain and source are driven with opposite signals via LED1 and LED2. If LED1 and LED2 light up alternately, that indicates that the Mosfet is an N-channel type. If it's a P-channel type, LED1 will remain off and LED2 will blink.

In position 4, the gate is connected to 0V (GND) while the drain and source are driven with opposite signals via LED1 and LED2. If LED1 and LED2 light up alternately, that indicates that the Mosfet is a P-channel type. If it's an N-channel type, LED1 will blink while LED2 will remain off.

If LED1 and LED2 light up alternately in both positions 3 and 4, that indicates a short circuit between the drain and source.

All of the ICs in the circuit are powered from a 5V regulated supply, derived from a 9V battery or plugpack by linear regulator REG1. LED5 lights up to indicate when power is applied. If using a battery, an on/off switch should be connected in series between it and the input of REG1.

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Editor's note: most Mosfets will work at 5V but some might not. The circuit supply voltage could be increased above 5V to make the Mosfet tester more reliable.