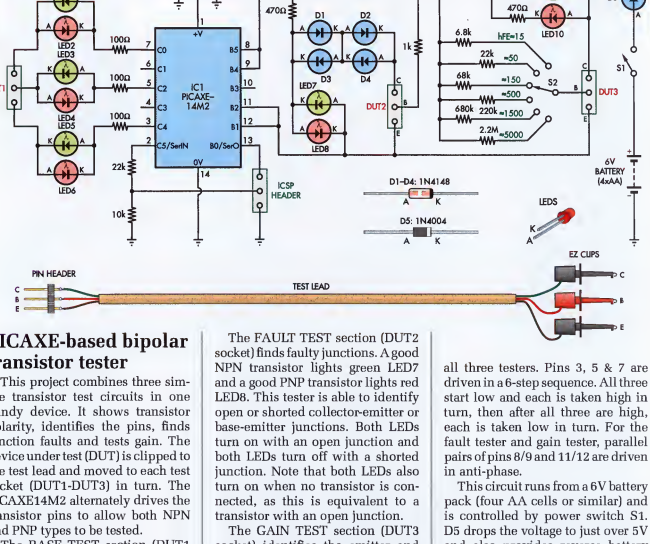
CIRCUIT NOTEBOOK

Interesting circuit ideas which we have checked but not built and tested. Contributions will be paid for at standard rates. All submissions should include full name, address & phone number.



PICAXE-based bipolar transistor tester

This project combines three simple transistor test circuits in one handy device. It shows transistor polarity, identifies the pins, finds junction faults and tests gain. The device under test (DUT) is clipped to the test lead and moved to each test socket (DUT1-DUT3) in turn. The PICAXE14M2 alternately drives the transistor pins to allow both NPN and PNP types to be tested.

The BASE TEST section (DUT1 socket) identifies the base pin and shows if the transistor is an NPN or PNP type. The circuit includes a red and green LED for each pin of the transistor and both LEDs will turn on for the emitter and collector pins, while a single LED will turn on for the base pin. The base lights the green LED for an NPN transistor or the red LED for a PNP transistor. If the base is not indicated for the centre pin, the clips can then be re-arranged to give the correct connections for the remaining tests.

The FAULT TEST section (DUT2 socket) finds faulty junctions. A good NPN transistor lights green LED7 and a good PNP transistor lights red LED8. This tester is able to identify open or shorted collector-emitter or base-emitter junctions. Both LEDs turn on with an open junction and both LEDs turn off with a shorted junction. Note that both LEDs also turn on when no transistor is connected, as this is equivalent to a transistor with an open junction.

The GAIN TEST section (DUT3 socket) identifies the emitter and collector pins and gives an idea of the gain of the transistor. The gain is tested by rotating S2 to the highest position that will fully illuminate green LED9 (NPN) or red LED10 (PNP). The higher the resistance selected, the higher the transistor gain; approximate gain values are indicated on the circuit diagram. Reverse the collector and emitter pins if the transistor exhibits very low gain. If this fails, the device may not be a transistor or could be faulty.

A simple BASIC program controls all three testers. Pins 3, 5 & 7 are driven in a 6-step sequence. All three start low and each is taken high in turn, then after all three are high, each is taken low in turn. For the fault tester and gain tester, parallel pairs of pins 8/9 and 11/12 are driven in anti-phase.

This circuit runs from a 6V battery pack (four AA cells or similar) and is controlled by power switch S1. D5 drops the voltage to just over 5V and also provides reverse battery protection.

The prototype used 3mm clear-lens LEDs as these provide a more concentrated beam. Headers for the test sockets were cut from Arduino shield strips (Jaycar HM-3207) These headers have extended pins, allowing the test sockets to be level with the LEDs.

The circuit also includes an ICSP header to download software into microcontroller IC1, with pin 2 as the serial input and pin 13 as the serial output signals. A PICAXE serial or

USB cable can be used to upload the **tran_tester14m2.bas** BASIC program, which is available from the SILICON CHIP website (free for subscribers).

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