

Some of the advantages of ICs over conventional circuits are:

- Because all circuit parts are on the same substrate, performance and temperature conditions will not vary.
- Because of the microchip construction, more circuit operations can be mounted on smaller circuit boards.
- The IC is the main reason that electronic products are more reliable because so many external electrical connections have been eliminated.
- The IC has increased circuit performance and speed because of shorter lead interconnections. The invention of the IC caused the "great leap forward," which made possible the increased speed of computer computations and vast amounts of memory retention.
- With lower power consumption and less heat loss, the IC has made electronic devices much more efficient.

The circuit diagrams for two types of ICs are shown in Fig. 1-32 and are the way you will find chips drawn on schematic diagrams. A photo of the round 8-pin IC is seen in Fig. 1-33 and its circuit drawing is shown on the right side of Fig. 1-32. A photo of some common 16- and 18-pin in-line ICs are displayed in Fig. 1-34.

Solid-State Scope Sweep Checker

You can build this simple checker that tests transistor, diode, Zener diode, SCRs, and even some ICs. This device connects to an oscilloscope to make a fast "go-no-go" test unit. This little sweep checker can even be used to check resistors, capacitors, and find shorts and open cir-

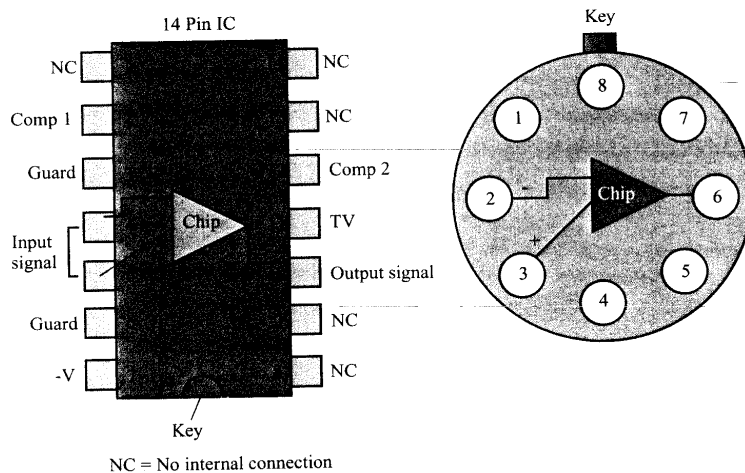


FIGURE 1-32 The circuit diagram and case layouts for two types of ICs.

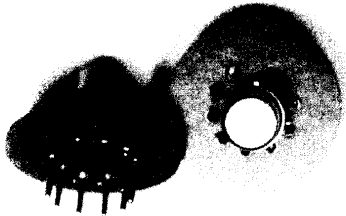


FIGURE 1-33 An 8-pin plug-in IC.

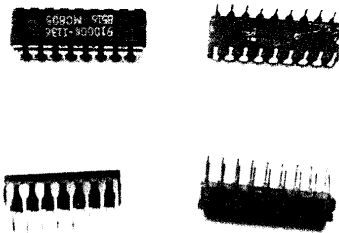


FIGURE 1-34 Some 16- and 18-pin in-line ICs.

cuits. I designed this "sweep junction" checker over 30 years ago; for some time, Texas Instruments (TI) used this device to sort out defective transistors and diodes on their production line.

This simple checker is easy to build-up and connect to your scope. You should find it to be a quick and easy, but reliable, test box for fast checking most solid-state devices. This tester, which connects to a scope, uses an ac sinewave to sweep the solid-state devices junction under test.

The simple circuit diagram for this checker is shown in Fig. 1-35 and also how to connect it to the scope's vertical and horizontal sweep inputs. Transformer T1 has a 120-Vac primary and either a 6.3-V or 12.6-Vac secondary. You can use red and black voltmeter leads with needle point tips for the test probes. The black lead is ground and the red lead is used for the positive test lead. The polarity of the leads will affect the scope waveforms by flipping the trace upside down when you reverse the leads to the component under test. The six scope pattern drawings shown in Fig. 1-36 are some typical traces you will find for the various components listed.

When checking a solid-state device out of the circuit, the main point of interest is the knee of the curve. A sharp bend usually indicates that the device is good. A straight horizontal line indicates an open junction and a straight vertical line on the scope pattern means a shorted component. If the supply voltage of the curve checker exceed the peak-inverse voltage (PIV) of the solid-state junction under test, Zener action might occur. This is indicated by a very short vertical line, see Fig. 1-37, at one end of the trace pattern and should be disregarded.

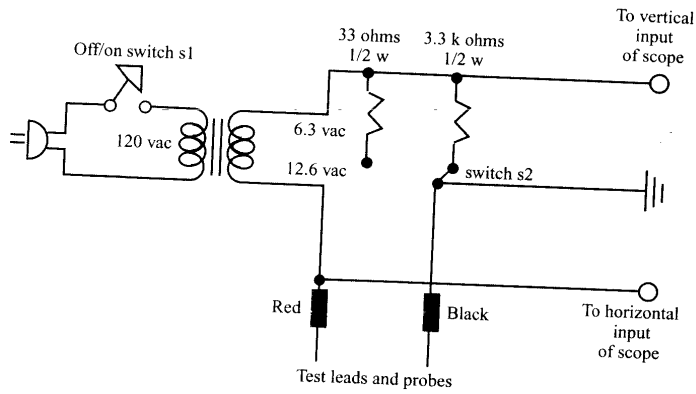


FIGURE 1-35 A circuit diagram for a solid-state sweep/junction checker.

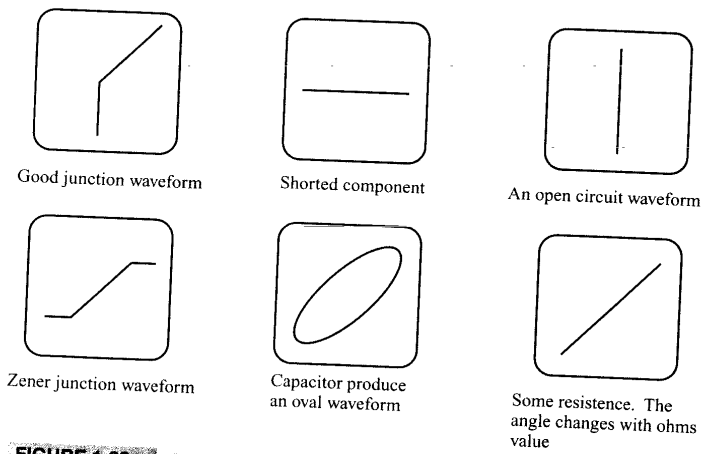
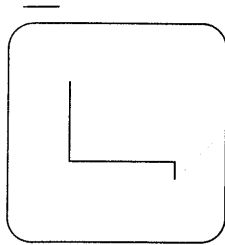


FIGURE 1-36 Some typical scope waveforms that you will find when using the junction sweep checker.

Note:

Connect test probes across solid-state device to be checked with no power applied to circuit under test.



Zener action

FIGURE 1-37 The short line at end of the trace will occur when curve tracer voltage exceeds the PIV of the solid-state junction under test. Just disregard this line.

When solid-state devices are checked in circuit, the ideal out-of-circuit scope traces might not appear because other resistors, coils, and capacitors in the circuit might cause the trace patterns to vary. Thus, when checking in-circuit components, a comparative method must be used. Also, for a positive test, the component can be removed from the circuit.

When checking transistors, disconnect power from the device under test and connect the test probes. Always connect the test probes to the transistor terminals by the color code shown:

- Base-emitter junction: Base red, emitter black.
- Base-collector junction: Base red, collector black.
- Collector-emitter junction: Collector red, emitter black.

The shape of the pattern shown in Fig. 1-38 is for a transistor with a high junction leakage. The pattern in Fig. 1-39 was obtained when the circuit under test had a very low resistance value.

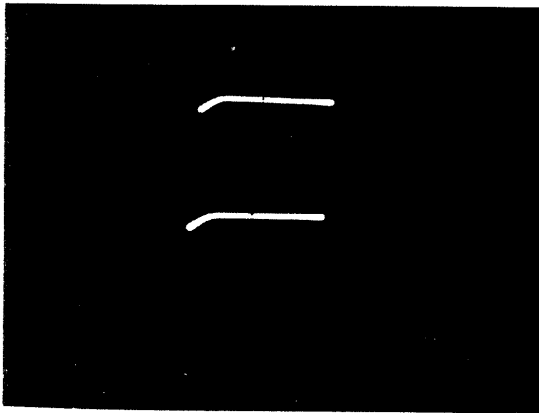


FIGURE 1-38 A scope pattern for a very leaky transistor.

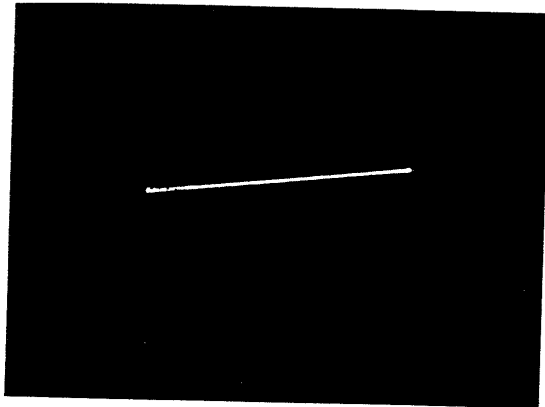


FIGURE 1-39 This scope pattern shows a circuit with a very low resistance.

Electronic Power Supplies

All electronic devices must have some type of power supply or source voltage to operate. Most draw power from an ac power line and use rectifiers and filters to produce a dc voltage. Some equipment operates from batteries and the power supply is used to recharge the batteries. Most electronic circuits require a dc or direct current in order to operate.

HALF-WAVE POWER SUPPLY

The circuit drawing in Fig. 1-40 is of a half-wave rectifier power supply. Notice at the top right, the negative going part of the sine-wave is missing and only the positive-going part is now available. The bottom waveform portion is removed by the diode rectifier because it only lets current pass in one direction. The pulsating dc is 60 times per second and is now smoothed out with a filter capacitor.

FULL-WAVE POWER SUPPLY

The full-wave power supply circuit shown in Fig. 1-41 lets both halves of the ac sine-wave be used, with an output ripple of 120 times per second, rather than 60 times, as with the half-wave power supply. The two diodes are connected so that one diode conducts on the other half of the cycle. Thus, the diodes are conducting on each half cycle. This 120-cycle ripple now must be smoothed out with a resistor or iron-core choke and two filter capacitors. The choke helps prevent sudden changes of current through it and a second electrolytic capacitor (C2) provides even more filtering.