Curve Tracer- Retro Rangers

Functionality

A curve tracer is an electronic test equipment used to analyze the characteristics of discrete electronic components, such as diodes, transistors, resistors, and capacitors. The device contains voltage and current sources that can be used to stimulate the device under test and plot its characteristic I-V curve (Current vs voltage curve).

Functions:

1. IV Curve Generation: The curve tracer can generate and display IV curves, illustrating how the device responds to varying voltage and current levels.

2. Component Matching and Sorting: This can be used to sort components and identify components.

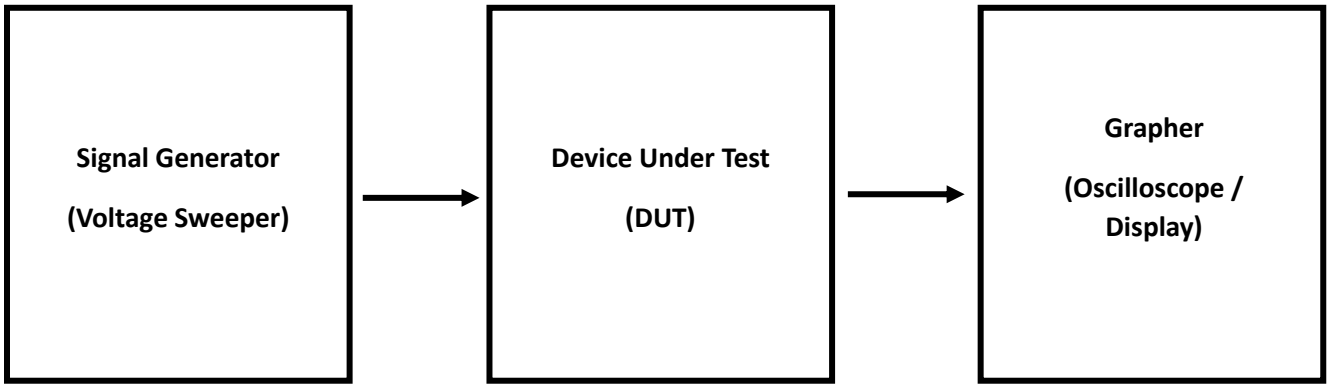
3. Failure Analysis: A curve tracer can help identify the root cause when devices fail by comparing the measured characteristics to the expected specifications.

4. Diode and Transistor Analysis: Curve tracers can analyze diode characteristics like forward and reverse bias behavior, as well as transistor parameters like gain, threshold voltage, and leakage current.

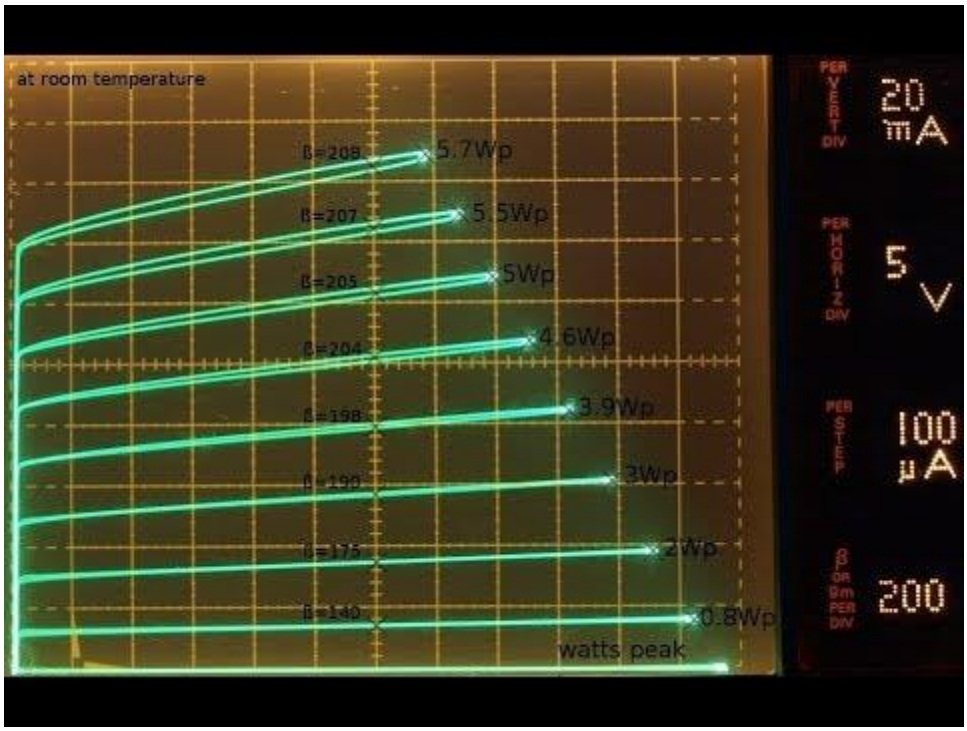
5. Educational Tool: helps students understand the behavior of semiconductor devices through hands-on experimentation. They can provide valuable insights into electronic principles and device physics.

To operate the device the discrete component needs to be connected to the device and the I-V characteristic curve can be seen by connecting the output to an oscilloscope and using the XY function in the oscilloscope to view the graph.

Block Diagram of the System



Methodology



This curve tracing component tester's main purpose is to draw the I – V characteristics of the device under test. Which can be for example a resistor, diode, transistor, or capacitor. Testing/ Graphing of two-terminal components is done by applying a changing voltage across them while recording the current through them. For devices like the transistor, the signal generator/sweeper circuit would also change a third parameter such as the base current while changing the collector-emitter voltage and measuring the collector current. This is done by running a clock that will reset the collector-emitter voltage for every clock cycle while applying a stair-step current through the base junction.

The collected values can be fed into an oscilloscope working in the XY mode or to a microcontroller which can display the data on a screen.

So, the main parts would be to generate the required signals to do a sweep (Square wave, Ramp, Stair step), measure the proper values, and process them to give a graph.

Micro products

1. **Signal Generation and Biasing:** This section involves creating precise voltage levels using op-amps to bias the components. The op-amp configurations and voltage divider networks will be designed to generate appropriate biasing conditions.
2. **Current Measurement and Amplification:** Op-amps will be utilized to amplify the small current signals from the components. The amplified current signals will be directed to the display interface through analog connections.

3. **Data Acquisition and Processing**: This section will involve analog multiplexers to switch between different test conditions and filters to condition the signals before data is sent to the display interface.
4. **Display Interface:** The display interface could be an oscilloscope, an XY plotter, or any analog display capable of showing the I-V curves. The amplified current signals will be connected to the display to generate the curves in real time.

Micro Product allocation

- Signal Generation and Biasing: Tharoosha
- Current Measurement and Amplification: Jazooli
- Data Acquisition and Processing: Thisara
- Display Interface: Nidula

References

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