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Standard Test Method for Measuring Unsaturated TTL Sink Current[1]

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1. Scope

1.1 This test method covers the measurement of the unsaturated sink current of transistor-transistor logic (TTL) devices under specified conditions.

1.2 *Units*—The values stated in the International System of Units (SI) are to be regarded as standard. No other units of measurement are included in this standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E178 Practice for Dealing With Outlying Observations

3. Summary of Test Method

3.1 Input and bias voltage levels and any required input signals are applied to the device under test to put the output to be tested in the low-level state. Voltage pulses of sufficient magnitude to pull the output transistor out of saturation are applied to the output pin under test. The corresponding current pulses are measured.

3.2 The following test conditions are not specified by the test method and shall be agreed upon by the parties to the test:

3.2.1 The output pin(s) to be tested,

3.2.2 Ambient temperature range,

3.2.3 Supply voltage(s) to be used,

3.2.4 Input sequence to be applied before the device output is pulsed,

3.2.5 Pulse voltage to be applied to the output pin under test,

3.2.6 Duty cycle and duration of the applied pulses, and

3.2.7 Accuracy and tolerances required for supply voltage(s), input voltages, pulse voltage, current measurement, duty cycle, and pulse-width.

4. Significance and Use

4.1 Unsaturated sink current is a special parameter that is closely related to the gain of the output transistor of TTL circuits. This parameter is particularly useful in evaluating neutron degradation in TTL devices because it changes smoothly as the device degrades, and exhibits larger changes at moderate radiation levels than the standard electrical parameters.

5. Interferences

5.1 Long pulses will cause many current probes to saturate. The current-time rating of the probe must not be exceeded.

5.2 Valid measurements will not be obtained unless the voltage applied to the output is sufficient to bring the output transistor out of saturation.

5.3 If the voltage applied to the output exceeds 1.5 V, errors may result. Some devices may change state. Some devices have internal diode connections which will conduct if the output exceeds 1.5 V.

5.4 High contact resistance will cause the voltage at the device to differ from the applied voltage. Kelvin contacts may be required.

5.5 Device temperature will affect this measurement. Pulse width and duty cycle must be maintained low enough that the test does not cause heating of the device.

6. Apparatus

6.1 *Pulse Generator*, capable of supplying the current required by the output pin under test at the agreed-upon voltage.

6.2 *Oscilloscope, or Digital Recorder*, dual-beam or dual-trace, meeting the following requirements:

6.2.1 Bandwidth of 30 MHz or greater.

6.2.2 Deflection factor range of 5 mV per division to 1 V per division.

6.3 *Termination R_T*, suitable for the current probe used.

6.4 *Current Probe*, meeting the following requirements:

6.4.1 Rise time less than 10 % of the agreed-upon pulse width.

[1] This test method is under the jurisdiction of ASTM Committee F01 on Electronics and is the direct responsibility of Subcommittee F01.11 on Quality and Hardness Assurance.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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