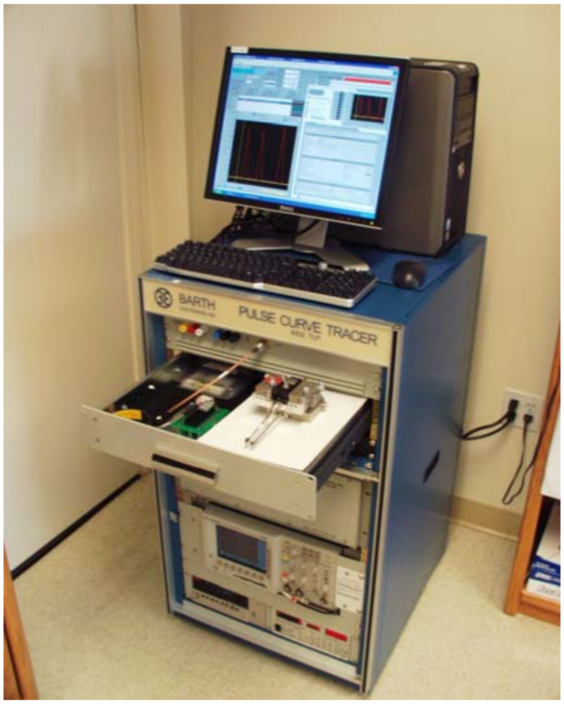
PULSE CURVE TRACER

BARTH Model 4002 TLP

The Barth Model 4002 TLP test system is the first commercial TLP (Transmission Line Pulse) tester to be produced since this method of testing was developed in 1985. The TLP tester is used as a pulse type curve tracer to measure the current-voltage characteristics designed into ESD (Electro-Static Discharge) protection circuitry.

This "classical" TLP tester has been produced by test equipment engineers who have been designing state-of-the-art fast-pulse high voltage measurement hardware since 1964.

Special Barth wide bandwidth pulse current and voltage sensors provide a new standard of measurement capability for ESD test equipment. The complete system has been built with special attention toward minimizing the losses in the test circuitry and the coaxial cable connections. This provides low internal resistance at the Device Under Test (DUT), for high accuracy measurements (+/- 1.5% measurement errors).



Printer and probe station not shown; front door removed

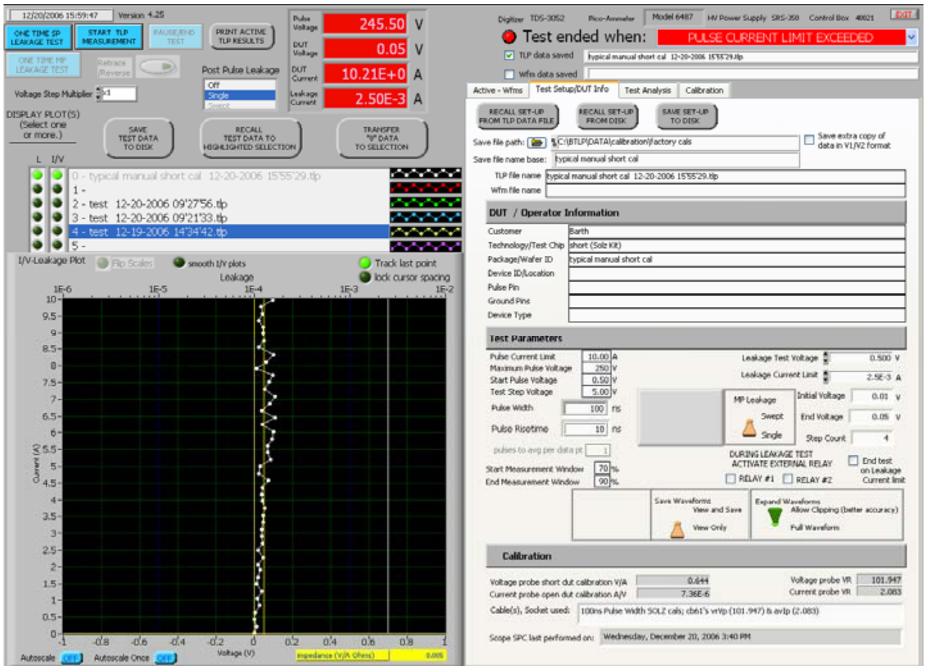
Clean pulse generation and precision measurements, combined with computer control, provides repeatable and fast data collection with minimal operator intervention. The operator chooses the test parameters and then selects the start button to run the test to completion.

Barth Electronics has combined these capabilities into one complete system that is now available for your TLP testing. This test system can be relied upon to produce consistent TLP data on a day to day basis. Because of the built-in accuracy, TLP measurements can now be standardized throughout the semiconductor industry.

Components of the Barth Model 4002 TLP consist of a Tektronix 500 MHz digitizing oscilloscope, the Barth Model 40021 pulse generator/control box, a Stanford Research Systems high voltage power supply, a Keithley picoammeter/voltage source, and a PC running Windows with a high-resolution monitor. Barth Application Software, written with National Instruments Labview software, controls all instruments, processes, and displays the test results. A color inkjet printer provides paper copies of the test data in a presentation ready format.

The TLP test system is supplied with a 48-pin DIP socket that can accommodate .300" and .600" width packages. It can be used for smaller pin count DIP packages with the use of pin renumbering overlays. Sockets for packaged devices are conveniently located in a pullout drawer in the instrument cabinet, and have clearly numbered pins with easily connected test leads.

An optional Barth Model 45002 Dual Wafer Probe enables wafer testing.



12/20/2006 15:59:47 Version 4.25

Pulse Voltage 245.50 V
DUT Voltage 0.05 V
DUT Current 10.21E+0 A
Leakage Current 2.50E-3 A

Voltage Step Multiplier x1

Post Pulse Leakage: Off / Single (selected) / Swept

0 - typical manual short cal 12-20-2006 15'55'29.tlp
1 -
2 - test 12-20-2006 09'27'56.tlp
3 - test 12-20-2006 09'21'33.tlp
4 - test 12-19-2006 14'34'42.tlp
5 -

Digitizer TDS-3052 Pico-Ammeter Model 6487 HV Power Supply SRS-350 Control Box 40021

Test ended when: PULSE CURRENT LIMIT EXCEEDED

☑ TLP data saved typical manual short cal 12-20-2006 15'55'29.tlp
☐ Wfm data saved

Save file path: C:\BTLP\DATA\calibration\factory cals
☐ Save extra copy of data in V1/V2 format
Save file name base: typical manual short cal
TLP file name typical manual short cal 12-20-2006 15'55'29.tlp
Wfm file name

DUT / Operator Information

Customer Barth
Technology/Test Chip short (Solz Kit)
Package/Wafer ID typical manual short cal
Device ID/Location
Pulse Pin
Ground Pins
Device Type

Test Parameters

Pulse Current Limit 10.00 A
Maximum Pulse Voltage 250 V
Start Pulse Voltage 0.50 V
Test Step Voltage 5.00 V
Pulse Width 100 ns
Pulse Risetime 10 ns
pulses to avg per data pt 1
Start Measurement Window 70 %
End Measurement Window 90 %
Leakage Test Voltage 0.500 V
Leakage Current Limit 2.5E-3 A
Initial Voltage 0.01 V
End Voltage 0.05 V
Step Count 4
DURING LEAKAGE TEST ACTIVATE EXTERNAL RELAY ☐ RELAY #1 ☐ RELAY #2
☐ End test on Leakage Current limit

Calibration

Voltage probe short dut calibration V/A 0.644
Current probe open dut calibration A/V 7.36E-6
Voltage probe VR 101.947
Current probe VR 2.083
Cable(s), Socket used: 100ns Pulse Width SOLZ cals; cb61's vrVp (101.947) & avIp (2.083)
Scope SPC last performed on: Wednesday, December 20, 2006 3:40 PM

Screen Displays (Barth Software)

The display screen shown is the "Test Setup / DUT Information" screen , which includes the I/V curve and the leakage evolution plot.

Seven other screens will <u>all</u> display the active test and up to 5 recalled tests on the <u>left</u> half of the screen. The left display includes the I/V curve and leakage evolution.

The <u>right</u> side of the displays can be any <u>one</u> of the following:

1. **V & I waveforms <u>plus</u> leakage evolution (single &/or multi-point) from the <u>active</u> test.**
2. **Operator info plus test parameters from the <u>active</u> test (shown above).**
3. **Operator info plus test parameters plus I/V plot from the active test <u>or</u> any <u>one</u> previous test.**
4. **V waveforms plus I/V plot from the active test <u>or</u> any <u>one</u> previous test.**
5. **I waveforms plus I/V plot from the active test <u>or</u> any <u>one</u> previous test.**
6. **Multi-point leakage evolution plot plus I/V plot from the active test <u>or</u> any <u>one</u> previous test.**
7. **Numerical data from the active test <u>or</u> any <u>one</u> previous test.**
8. **Calibration data from the active test.**

The I/V plot configuration created by Koen Verhaege, Sarnoff Europe, displays both the voltage versus current and the leakage current after each TLP pulse. Both characteristics are clearly displayed to identify the pulse current amplitude that causes an increase in leakage current. The leakage current scale is the logarithmic scale at the top of the IV plot. The voltage scale for each test pulse is displayed at the bottom of the plot. These scales along with the pulse current scale can be manually selected or auto-scaled during the testing.

The software automatically stores all data to hard disk after the completion of each test. Hard copy prints are immediately available on the provided printer. This includes both the <u>active I/V plus leakage plot</u>, and/or the "print window" print which will print <u>all</u> information in that "window". Previously stored data can be recovered, displayed, and the plot re-scaled as desired if data review or additional hard copies from previous tests are needed.

Favorite test set-ups including DUT information and test parameters can be stored for easy recall, to minimize operator input and to speed up testing.

The Labview runtime software can easily be changed to fit different applications, and upgrades will be provided for one year. Software upgrades can be downloaded, e-mailed or provided on disks.

A Barth Model 45002WP wafer probe with dual balanced needles, specifically designed with minimum parasitics for TLP testing, is available as an accessory. The wafer probe or sockets for packaged devices can be quickly interchanged.

Please call or e-mail for pricing and delivery information.