

# RingDown™

## InstaBIST™ Library



### Features

- Non-invasive diagnostic and health monitor for switching power supplies.
- Detects wear-out signatures prior to any noticeable reduction in performance.
- Topology-independent approach can be applied to a range of supplies, with equivalent diagnostic performance on each.
- Testing is fast — data are collected within the recovery time of the power supply.
- Testing can be performed in either online or offline scenarios

### Product Description

RingDown™ is a non-invasive, stand-alone early warning approach to detecting the onset of component aging in most switch-mode power supplies. It snaps onto an existing supply and communicates health status through a test bus. It provides an important capability that supports any electronic health management strategy for high-reliability systems.

This patented approach relies on an understanding of the behavior of the power stage as a system with feedback. Switching supplies generally employ closed-loop feedback to keep voltage or current under tight regulation.

RingDown exploits this feature by using a special technique to extract eigenvalues that characterize the control loop. Changes to these values indicate early degradation in electronic components within the supply, long before there is any performance change in the regulated output. The built-in self-test (BIST) relies on an external sensor only, so there is no modification to the power supply circuit.

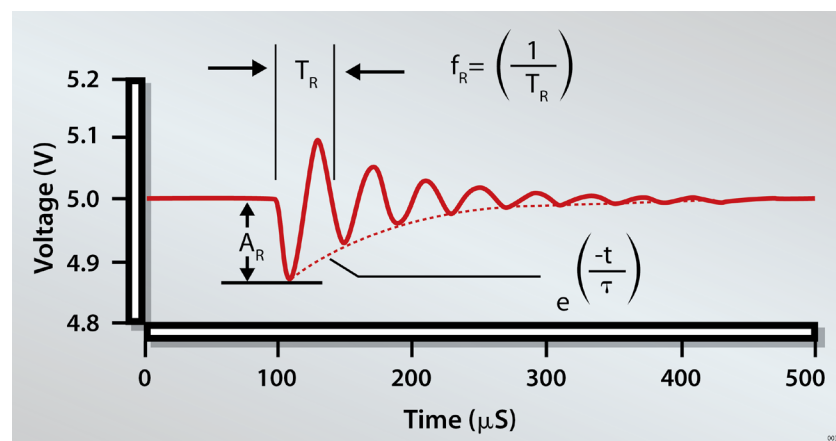


Figure 1: Damped sinusoid response showing results of a momentary load change

The phase margin plays an important role in the stability of a SMPS. A large phase margin will tend to cause greater damping and less oscillation. A low phase margin will allow the circuit to “ring” for an extended time for small input perturbations. This can result in a marginal system. Phase margins of 0 or less result in uncontrolled oscillations and instability, which is undesirable in a closed control system. We use an impulse input to cause the output voltage to ring as shown in Figure 1.

This observation suggests the use of resonance as a measurement indicator in a regulated SMPS. This relative response can be tracked as a function of time using the calculation for the oscillation frequency, and signal-averaging or least-squares regression can be used to determine whether measurements show a trend toward failure. Data representing shifts in the characteristic response can thus be obtained with a non-invasive approach.

In any electronic system, power supplies are among the top degraders. Ridgetop's RingDown sensor provides an advanced diagnostic capability that is far superior to the current method of static load testing, thus adding an important core technology for automated test equipment.

Analyzing a supply's RingDown response is a fast and easy way to compare and "baseline" one supply against another, and to compare expected operating life on one supply versus another under various load conditions. RingDown can be used on power supplies at the factory to support product testing, or in the field to support degraded-condition prognostics as well as pro-active maintenance.

## Additional Information

Ridgetop offers IC integration technical support to assist customers at every step in the process.

Our design and support team has extensive experience in CMOS and SiGe bipolar IC design semiconductor process technologies, and practical, results-oriented engineering.

## About Ridgetop

Ridgetop Group Inc. is a leader in providing advanced electronic solutions for critical applications. Ridgetop was founded in 2000 with the purpose of introducing revolutionary tools to improve performance of mission-critical electronic systems.

With a strong management team and world-class technical staff, Ridgetop has established a stellar reputation serving its government and commercial customers with effective and practical "best of class" solutions.

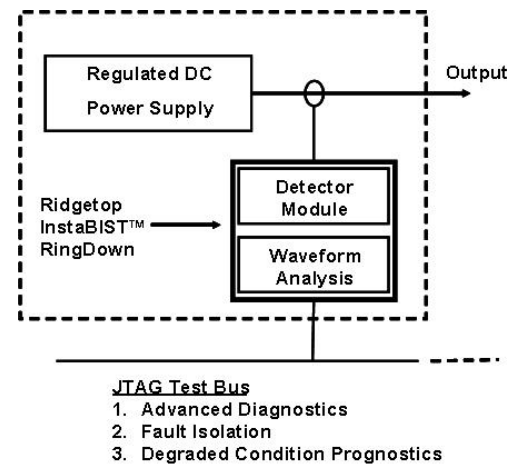


Figure 2: Ridgetop RingDown sensor added to SMPS communicating with JTAG test bus

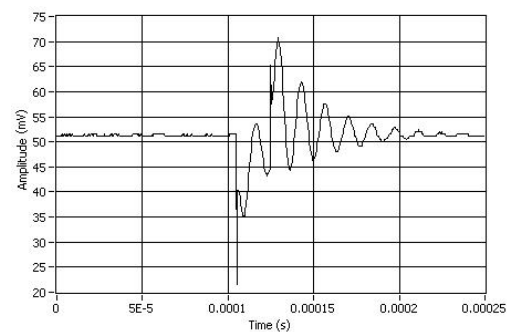


Figure 3: Properly functioning power supply

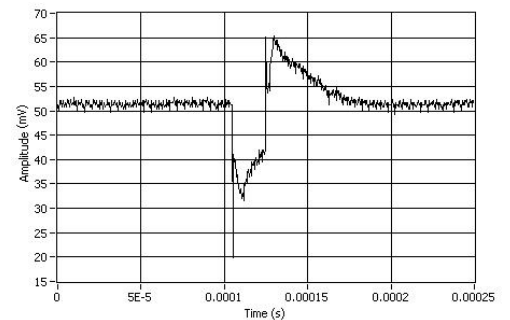


Figure 4: Degraded power supply

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