REEDHOLM

DATA SHEET

DS-11065

Voltage Stress Module [VSM]

- **Output Voltage: ±10V/100V**
- **Output Current: ±1A/100mA**
- **Programmable Bipolar Voltage**
- **Three or Six Voltage Ranges**
- **Indefinite Short Circuit Protection**
- **Kelvin Sensing**

Voltage Stress Modules are used in the RI-51 Oxide Reliability Analyzer and RI-53 Device Degradation Reliability Analyzers as stress supplies. Each VSM is factory configured to have ±100mA or ±1A current output and the corresponding voltage span (±100V for ±100mA and ±10V for ±1A).

Critical elements of the VSM are a high-gain, JFET-input operational amplifier followed by a MOSFET power output stage.

Specifications

Range	Source Error		Resolution
	Offset	% of Value	
2.5V	250µV	0.03	78.125µV
5V	500µV	0.03	156.25µV
10V	1mV	0.03	312.5µV
High Voltage Configuration Only			
25V	2.5mV	0.03	781.25µV
50V	5mV	0.03	1.5625mV
100V	10mV	0.03	3.125mV

Comments:

1. Specifications apply for 24 hours and ±1C° after manual calibration.
2. Voltage accuracy on a given range has uncertainty of ± (offset error + % of value error). For example, forcing 1V on the 2.5V range results in:

   1V ± (250µV + 0.03% of 1V) = 1V ± 550µV

   Forcing 40V on the 50V range results in:

   40V ± (5mV + 0.03% of 40V) = 40V ± 17mV
3. Current limits at approximately 1.2A for the low voltage configuration and 120mA for the high voltage configuration.

Output Voltage

Referring to the block diagram of Figure 1, the voltage reference for the VSM is a 16-bit precision DAC that outputs a bipolar 10 volts at full scale. The Range Divider Buffer output is 10V, 5V, or 2.5V at full scale, depending on the VSM range.

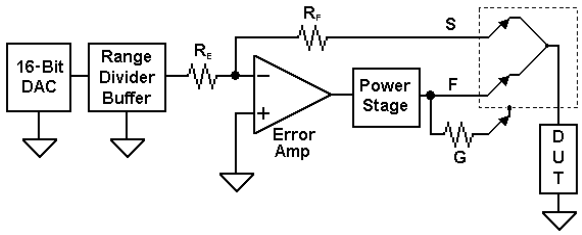

Figure 1 - Block Diagram

This voltage is applied to the inverting input of a power amplifier consisting of a precision, high voltage Error Amp and a power output stage. The output voltage at the sense line (S) is the product of the ratio R_F/R_E and the Range Divider Buffer output voltage. For the 10V range, the ratio is 1. At 100V, the ratio is 10. The composite amplifier loop gain is greater than 100dB, so gain-related errors are virtually zero.

Stress Supply Card Files

Depending on system configuration, card file(s) for the VSM modules may be located inside the instrumentation cabinet or in an external stress one. Up to twelve VSM modules can be installed in a single card file.

RI-51 Systems

There is a single VSM module per experiment in the RI-51, so the basic RI-51 only requires a single card cage. For dual-stress RI-51's, two VSM modules are used per experiment so at least two card files are needed.

RI-53 Systems

Four VSM modules are assigned per RI-53 experiment, one for each of four possible DUT stress nodes. A dual stress RI-53 uses two VSM modules on each possible stress node.

Since the RI-53 supports up to six experiments, as many as four stress supply card files may be required.

Stress Supply Delivery

Kelvin Sensing

Regardless of stress supply location, force and sense lines are separately routed to thermal chambers and connected together on the load boards. This configuration assures accurate voltage delivery for whatever stress current might flow.

RI-51 Systems

When the stress supply card file is located inside the RI-51 instrument cabinet, the output of each stress supply is routed, together with the matrix cabling, to the bracket on the thermal chamber door. When an external stress supply cabinet is used, the analog cable from the external cabinet terminates to a connector on the thermal chamber door.

RI-53 Systems

Outputs from VSM modules are wired to the nodal backplane of each bank via a stress NTM module. Stress voltage is then delivered to DUT's through CPM modules and cables that attach directly to connectors on thermal chamber doors.

For the first VSM module in each bank (the first two VSM modules for a dual stress system), a second output connection delivers stress through analog cabling to designated load board connections for TDDB testing.

Short Circuit Protection

The VSM is protected against output short circuits. When in a current limit condition, the maximum output current is approximately 1.2A when set up for 10V and 120mA when set up for 100V. Heat dissipaters on the output stage transistors allow indefinitely long shorts to ground.

Voltage Step Response

Bandwidth, and thus step response time, is virtually independent of load. Referring to Figure 2, the VSM step response shows rapid settling to specified accuracy without overshoot.

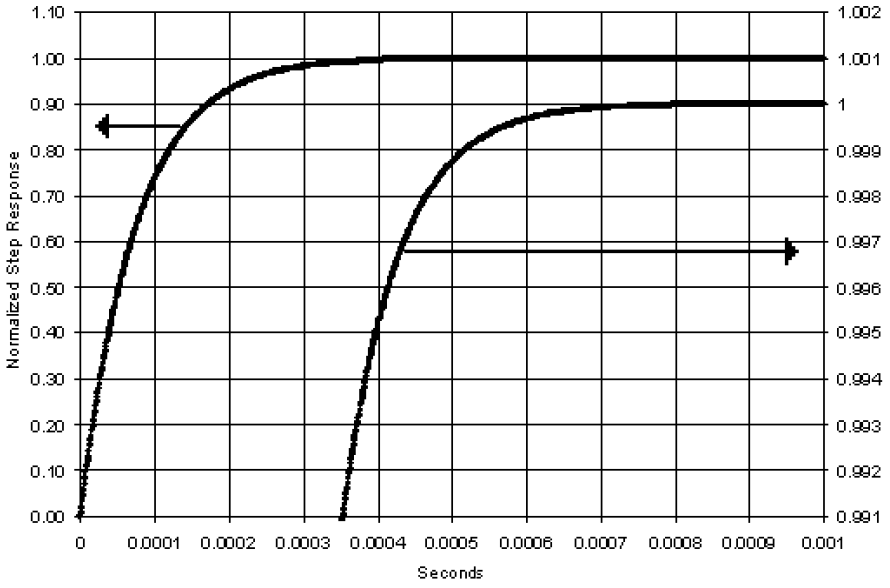

Figure 2 - Normalized Step Response