

Requirements and Specifications

1. Mechanical

The PC based SDRAM tester hardware must be compact and portable. The tester must communicate with the PC through a peripheral port. All control hardware will be contained inside a black box where it will be protected from its environment. The matched specifications for each requirement are also listed below.

- The black box will have dimensions of 6"X4"X3".
- The weight of the black box will be less than 5 lbs.
- The black box will connect to the PC via the serial port.

2. Electrical

The PC based tester must be powered externally from the PC. The user will also have the option of powering the SDRAM tester from two types of sources, each option will allow the user to transport the test unit to its desired location. The user must be able to control the voltage input to the SDRAM and monitor the input current to the device. The matched specifications for each requirement are also listed below.

- The V_{DD} voltage will have a range of 1-5V.
- A potentiometer will be used to vary the voltage into the SDRAM chip.
- The SDRAM tester will have the capability of being powered via battery and/or ac adapter.
- Measurements of V_{DD} and I_{DD} will be taken by a PIC (Personal Intelligent Communicator) micro controller and displayed by the Graphical User Interface.
- A PIC micro controller will be used to communicate with the PC and SDRAM.
- A serial port driver will be used to drive the signal to and from the PC and PIC micro controller.
- The serial port driver will handle any isolation circuitry anomalies.
- A multiplexer will be used to decrease the number of I/O lines used by PIC micro controller.

3. Graphical User Interface

The GUI design must be user friendly and display the test failure analysis information. The GUI will display the SDRAM refresh rate, address locations of failures, and voltage levels. The GUI must also be designed to accept input from a set of user options. The user options will include voltage settings, address locations for test analysis, and test patterns for memory array failure analysis. The matched specifications for each requirement are also listed below.

- The GUI software will display exact memory cell locations of the SDRAM being tested.
- The GUI will display the I_{DD} current and V_{DD} voltage of the SDRAM.
- Along with a visual display, the GUI will provide a text output, which will display the row and column addresses, selected input, and corresponding output.
- The GUI will call a program function that will tell the PIC micro controller to test the SDRAM by toggling bits in the memory array and verifying the correct corresponding output.
- The GUI will be designed to operate on a Microsoft Windows NT based platform.
- The GUI will be programmed using Microsoft's Visual C++.

4. Environment

The PC SDRAM tester must be able to operate within a normal lab environment. The hardware must be durable and be functional under a commercial temperature range. The matched specifications for each requirement are also listed below.

- The hardware will be functional under the commercial operating temperature range of 0°C to $+70^{\circ}\text{C}$.

5. Documentation

Documentation will be provided for the functionality and use of hardware and software interfaces. The documentation must include design documentation, test procedures, and instruction manual. All documentation must be easily accessible and professional. The matched specifications for each requirement are also listed below.

- The SDRAM test program will be installed from a CDROM.
- All code and instruction manuals will be saved onto the CDROM.
- Instruction manuals will contain procedure steps for operation and maintenance of the test unit.

6. Testing

Testing of the memory device will involve following a constructed list of procedure steps. Testing the SDRAM will consist of writing and reading data while stressing the device under various voltages. The SDRAM will be tested through various test patterns specified by the user. The matched specifications for each requirement are also listed below.

- The following procedures will be followed in testing the SDRAM:
 - 1.) Install the testing software
 - 2.) Connect black box to PC
 - 3.) Turn power on
 - 4.) Set VDD voltage
 - 5.) Configure test sequence
 - 6.) Run test sequence
 - 7.) Observe results
- The SDRAM will be tested by writing to the memory array in the following patterns: All ones, all zeros, and checkerboard layout
- The user will be able to select a pattern to write to the memory array.

7. Reliability

The hardware reliability of the PC based SDRAM will be guaranteed to function under normal working conditions for as long as the individual devices are guaranteed to operate. The software will have an indefinite lifetime for as long as the specified operating system is in use. The voltage and current displays will be accurate up to 3 decimal places. The matched specifications for each requirement are also listed below.

- Hardware should last a minimum of 5 years.
- Hardware should withstand normal wear and tear.
- Calibration of the device will be performed at the user's discretion.
- VDD will be accurate to the nearest 100mV
- I_{DD} will be accurate to the nearest 100μA