

## Advanced reliability qualification and monitoring equipment assessment



MIDAS® 5000

### Objectives:

- Evaluation and enhancement of the MIDAS 5000 series reliability test equipment.
- Demonstrate benefits of system for applications involving:
  - High power, high voltage
  - High speed, low voltage
  - Mixed signal
  - High current & analogue signal, switching
  - High speed switching with long pattern depth
  - Concurrent operation at different temperatures
  - Testing of advanced packaging for high performance components.
- Promotion of high temperature dynamic life testing for a range of new IC technologies.

### Evaluation Site:

**AMI Semiconductor (AMIS), (Dries Myny, Product Reliability Group)**

The trend towards System-On-Chip design has created the need for advanced burn-in methods. Typical SOC designs often include microcontroller cores, interface cores and non-volatile memories such as EEPROM, Flash and other embedded features. The MIDAS equipment features both mixed-signal and high-speed digital capabilities that can address such requirements.

### Partner:

**Philips, (Eddy van Zoest, Life Test Department)**

Decreasing sizes in CMOS technology and related lower voltage levels as well as higher frequencies, require state of the art burn-in equipment. The highly modular MIDAS system will provide the solutions for testing the reliability aspects of next generation chips, be they analogue, digital or mixed signal devices.

### Equipment Supplier:

**Reltech UK, (Mark A. Ashley, Marketing & Sales Director)**

Working together with our partners AMIS and Philips Semiconductors has resulted in a very advanced reliability test system which, through its modular concept and multi tasking features, allows Reltech to tackle the challenges set by today's leading semiconductor manufacturers. The MIDAS system provides semiconductor reliability test solutions covering a very wide range of technologies such as digital, mixed signal, low voltage, high power, high speed, high frequency, embedded memory, all from one system. It is no longer necessary for users to specify and purchase a new system every time a new product is introduced. This results in dramatic cost savings, reduces the Cost of Ownership and speeds up new product qualification and hence reduces "time to market".

### MIDAS placements / activities at AMIS and Philips

The Flexitray® MIDAS® system concept and modules are being assessed at AMIS Oudenaarde within a Reltech model 4548 mainframe equipment with two independently controlled temperature zones and individual power and signal zones for every burn-in board position.

Concurrently, a MIDAS development/pre-screen station installed at Philips Semiconductor, Nijmegen, is being used for thorough evaluation of the system without the need to install the complete equipment. This pre-screen station has a number of beneficial uses for off-line set up and evaluation.

AMI Semiconductor, Oudenaarde, is focusing on the system's application to both automotive and telecom integrated circuits, requiring mixed signals, especially during high temperature lifetest. It is also assessing the equipment usability and cost-effectiveness.

Philips Semiconductors is assessing the evaluation of the signal generation of the analogue audio and digital driver boards, with focus on low voltage and high frequency, at room temperature.



Individual DUT tray

EQUIPMENT EVALUATION SITE



EQUIPMENT SUPPLIER



PARTNER



PHILIPS

### Evaluation Period

1 March 2002 -  
31 March 2004

## Site Acceptance Tests (SAT)

The SAT results for the MIDAS I system have been assessed both at AMIS and Philips. The SAT results can be compared with initial target (at project outset) and MIDAS II (Final target specifications) in Fig.1.

The VOH level is currently 9 volts, however the modular approach allows higher voltages (e.g. 15v) using higher rated components in the output driver card. The sub vector frequency has already been extended (post SAT) to 20MHz.

## Evaluation of MIDAS at AMIS

AMIS has made an initial assessment resulting in recommendations for improvements and revised final target specifications for the new MIDAS driver cards (MIDAS II). The initial assessment included an evaluation of the first phase specifications using an evaluation board and real-life products.

Both automotive and telecom products were used to demonstrate the equipment capabilities. Whilst the automotive product required high voltage (mixed-signal), the telecom product put higher demands on the digital capability of the equipment. Telecom products required wider and deeper vector patterns (e.g. JTAG scan chain). Automotive products combine both digital and analogue circuitry that created the need for analogue stimuli in the burn-in equipment. Whilst improvements were recommended, the equipment performed effectively and indicated its potential to address the diverse set of product requirements.

## Evaluation of MIDAS at Philips

Using the development station, Philips has extensively evaluated the parametric performance. Again, suggestions have also been made to further enhance MIDAS hardware /software performance. Reltech has subsequently implemented these modifications within their MIDAS II driver board that is now being assessed by Philips using their pre-screen station. During this phase, the analogue driver board will also be checked according to the specification for the final targets of the MIDAS project.

Digital Parameters		MIDAS II	SAT	Initial
Clock frequency	MHz	100	40	40
Vector channels	#	176	128	64
Vector depth	K	2000	512	128
Maximum vector frequency	MHz	25	10	10
Voh minimum	v	0.5	0.9	0.9
Voh maximum	v	15	9	15
Sub vector frequency	MHz	50	10	20
Operational temperature	C	175	175	150
Analogue Parameters				
Output voltage range low frequency	v	0-60v 20kHz	-	-
Output voltage range high frequency	v	0-6v 20MHz	-	0-6v 20MHz (manual)
Maximum Current @10kHz	A	10	-	5
DC Offset	v	20	-	20
Minimum Load	Ω	2	-	50
Other features to be added during project				
Vector channels		Bi-directional (memory testing)		
Memory test module		Embedded flash capability		
Functional monitor/test DUT		To be available		
Multi Voh levels		Groups of 32		
Pattern creation		ATE vector conversion and graphical editing capability		
Reset "on the fly"		Subroutines/Looping/ Vector address to be available		
Dynamic Memory Allocation		To be available		
Output Tri-state control		To be available		

Fig. 1

## Other Features Added

Fig.1 also lists other features added to the MIDAS capability during the project. MIDAS I had 128 vector lines. 176 vector lines have now been achieved. Also, the vector lines have been designed for bi-directional use, thus allowing the usage of MIDAS II for testing memory devices. Reltech recognises a great opportunity in the Flash memory market, particularly for testing system on chip (SOC) devices where embedded Flash memory is included. MIDAS II can be configured to achieve this function by changing only one memory test module on the main motherboard. As a background project in conjunction with other customer requirements, MIDAS II is also configured with a module to perform functional monitoring and testing of the DUT during life test. This involves sending test patterns to the DUT and checking the data returned matches an expected test pattern exactly.

## Board compatibility

The MIDAS system has been further enhanced by the ability to utilise or simultaneously mix in other manufacturers burn-in boards via a MIDAS adaptor frame that acts as a conversion interface.

This facility has been used at AMIS and has resulted in considerable cost saving as existing hardware, previously purchased for use with an older system, has been used.

## Cost saving features

The MIDAS system has many features that impact Cost Of Ownership, including:

- Modularity
- Flexibility
- High board capacity
- Small footprint per board function
- Multiple temperature zones
- Energy cost saving
- Use of other manufacturers burn-in boards
- Digital/analogue/mixed signal capability
- Use with existing ATE programmes via rapid software conversion to MIDAS format.
- Digital/analogue/mixed signal/memory capability within a single equipment

These factors are being quantified and will be reported in the forthcoming SEA Results Bulletin along with final digital, analogue and mixed function performance results from MIDAS II.

## Further information on Project MIDAS

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