

Symphony

Compact, portable automated wafer-level reliability test system



DATA SHEET

The Symphony™ reliability test system provides true parallel testing for a wide variety of semiconductor wafer-level reliability (WLR) applications. Symphony leverages a unique and scalable architecture in which modular components are selected to configure system capabilities and capacities to exactly match customer requirements, and allow for easy system expansion and adaptation.

Application modules provide accurate source-measurement circuitry for testing a wide variety of reliability test applications and operating ranges. Application modules operate independently from one another and can be used in any combination within a system. Symphony's continuous monitoring system with high sampling rates provides excellent structure behavior detail for any system size or configuration.

When combined with the Conductor software package to coordinate probe station activities, Symphony enables a fully-automated test solution that moves test structures directly from the fab to the test lab for early analysis and lifetime predictions. Full-featured system software provides a flexible and powerful test environment. Statistical analysis software determines failure times based on various user-defined conditions, calculates acceleration model parameters, and predicts lifetimes with confidence intervals.

FEATURES / BENEFITS

Flexibility	Compact, configurable system provides full suite of test applications – EM, SM, BTS, TDDDB, SILC, MTTDDDB, HCI, and BTI Small size allows portability across multiple probe stations Full-featured software offers many experiment setup options Software and hardware interface with many models of probe stations and probe cards
Throughput	Parallel source and measurement unit (SMU) system simultaneously tests more DUTs when coupled with high-capacity multi-site probe card Parallel measurement system completes tests faster Conductor software provides automated, unattended WLR testing
Performance	Individual meters per DUT provide continuous monitoring and fast data sampling to characterize DUT behavior in detail and immediately capture breakdown Parallel measurement system minimizes device relaxation Precision SMUs provide accurate biases and measurements

RELIABILITY TEST APPLICATIONS

Test Algorithm	Devices Tested (Partial List)
EM (Electromigration)	Interconnects (lines, vias, bumps, TSVs, pillars)
SM (Stress Migration)	Interconnects (lines, vias, bumps, TSVs, pillars)
BTS (Bias Temperature Stress)	Dielectrics/barriers (ILDs, IMDs, MIMs, TSVs)
TDDDB (Time Dependent Dielectric Breakdown)	CMOS transistor gate oxides (NMOS, PMOS)
SILC (Stress Induced Leakage Current)	CMOS transistor gate oxides (NMOS, PMOS)
MTTDDDB (Multi Terminal TDDDB)	CMOS transistor gate oxides (NMOS, PMOS)
HCI (Hot Carrier Injection)	CMOS/bipolar transistors (NMOS, PMOS, NPN, PNP)
BTI (Bias Temperature Instability) – NBTI (Negative BTI) and PBTI (Positive BTI)	CMOS transistors (PMOS, NMOS)

OPERATING PLATFORM

Architecture	<p>Modular system, one or more compact 1Paks per system</p> <ul style="list-style-type: none">• Up to eight 1Paks in one system• Expand by adding 1Paks <p>Each 1Pak contains:</p> <ul style="list-style-type: none">• One independent application module – mix and match various types• One WLR interface (with cables to probe card) <p>System framework consisting of user interface PC, Test Control Unit(TCU), and accessories</p> <p>Simultaneously executes in a single system up to eight simultaneous, autonomous experiments of different types and biases</p> <p>Interfaces to single site or parallel multi-site probe cards</p> <p>Interfaces to and controls probe station with thermal chuck for automated, unattended, sequential testing</p>
Software	<p>Windows 7 operating system</p> <p>Included: Zeus system software to set up and monitor experiments; store, export and graph measurement data</p> <p>Included: Conductor software for WLR automation</p> <p>Optional: Statistical analysis software for modeling and lifetime prediction – multiple packages</p>

SYSTEM FRAMEWORK

Kit	Notes
Symphony System Base Kit	<p>One 1Pak (ready for application module and WLR Interface)</p> <p>One PC, two LCD monitors, keyboard, mouse</p> <p>TCU cabinet, communications cables</p> <p>Conductor and Zeus system software</p>
Symphony Rack	One 19-inch rack for PC, TCU cabinet, and up to eight 1Paks
Symphony 1Pak	<p>Ready for one application module and one WLR interface</p> <p>Supports all application module types</p>

APPLICATION MODULES

System test capabilities, operating ranges, and DUT capacities can be configured by selecting a mix of application module types from the list below.

Module Type	Test Algorithms	DUT Capacity per Module (Max per Symphony System)	Application Notes
5 mA 10 V Ultra High Accuracy EM (UHAEM)	EM, SM	16 (128)	For 32 nm and beyond (excellent accuracy for very low currents, high sampling rate)
25 mA 10 V High Accuracy EM (HAEM)	EM, SM	16 (128)	For general purpose EM
200 mA 40 V Standard EM (SEM)	EM, SM	16 (128)	For general purpose EM
4 A 10 V High Current EM (HIEM)	EM, SM	12 (96)	For 3D IC (high accuracy Wheatstone Bridges for low resistance bumps and TSVs)
40 V 350 mA High Accuracy TDDB (HATDDB)	BTS, TDDB, SILC	48 (384)	For thin oxides including HKMG and FinFET (high sampling rate for soft breakdown)
40 V 1 mA Standard TDDB (STDDB)	BTS, TDDB, SILC	64 (512)	For general purpose BTS and TDDB
150 V 10 mA High Voltage TDDB (HVTDDB)	BTS, TDDB, SILC	32 (256)	For higher-voltage processes
200 V 10 mA Extended Voltage TDDB (EVTDDB)	BTS, TDDB, SILC	32 (256)	For higher-voltage processes
12 V 50 mA Multi-Terminal TDDB (MTDDB)	MTDDB	24 (192)	For thin oxides including HKMG and FinFET (more detail than 2-terminal TDDB)
15 V 100 mA Advanced HCI (AHCI)	HCI, BTI	12 (96)	For general purpose HCI and conventional BTI, including HKMG and FinFET
150 V 100 mA High Voltage HCI (HVHCI)	HCI	6 (48)	For higher-voltage processes

WLR INTERFACES

WLR Interfaces can be configured with multiple cable options to match various single site and multi-site probe cards, and support the full Module capacity. WLR Interfaces are manufactured by Celadon Systems. WLR Interfaces must match application module types according to this table.

WLR Interface Type	Supported Module Types
EM	UHAEM, HAEM, SEM
HIEM	HIEM
HATDDB	HATDDB
STDDB	STDDB
HVTDDB	HVTDDB, EVTDB
AHCI	AHCI
HVHCI	HVHCI

PHYSICAL DIMENSIONS

	Approx. Dimensions (H x W x D)	Approx. Weight
1Pak	5.5 in x 17.5 in x 18 in (14 cm x 44.5 cm x 45.7 cm)	25 lb (11.3 kg)
User Interface PC (not including LCD monitors, keyboard and mouse)	16.8 in x 5.1 in x 17.5 in (42.7 cm x 13 cm x 44.5 cm)	40.7 lb (18.5 kg)
TCU Cabinet	1.75 in x 17.25 in x 14.5 in (4.4 cm x 43.8 cm x 36.8 cm)	5 lb (2.3 kg)

FACILITY REQUIREMENTS

The Symphony system is connected to a single AC service; the PC and individual 1Paks are connected to power through the TCU cabinet.

AC Service Requirements	100-240 VAC, 10 A, 50/60 Hz Single phase, three wire with safety ground NEMA 5-15 receptacle to match provided removable power cord– exchange power cord outside USA Line conditioner or uninterruptible power system (UPS) is recommended to ensure clean AC power
Operating Humidity	30% - 50% relative humidity
HVAC Requirement per 1Pak	2,050 BTU/hr

REGULATORY COMPLIANCE

CE, SEMI S2

WARRANTY

Warranty*	One year
Service contracts	Single- and multi-year programs available to suit your needs

*See Cascade Microtech's Terms and Conditions of Sale for more details.

ORDERING INFORMATION

Consult factory for more detailed specifications, additional options, suitability of configuration for intended usage, part numbers, pricing, and delivery.

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