ESPEC

TDDB Evaluation System
AMM−1000

Precise data acquisition
Endless pursuit for reliability
The Oxide Film Property Evaluation System

As wafer size is enlarged for mass production of high-density, high-function LSIs,
reliability evaluation of oxide film is on increasing demand, which is key for LSI reliability.
ESPEC'S TDDB Evaluation System will play an indispensable role for analyzing failure
caused by pressure resistivity of thin insulation oxide film
and characteristics and flattening of oxide film, at wafer, glass substrate, and package level.

Prober for LCD

MEASUREMENT EVALUATION SYSTEMS

CONDUCTOR RESISTANCE EVALUATION SYSTEM

THROUGH-HOLE CONDUCTOR EVALUATION SYSTEM
SOLDER-JOINT CONTACT EVALUATION SYSTEM
BGA, CSP SOLDER JOINT CONTACT EVALUATION SYSTEM
CONNECTOR CONTACT RESISTANCE EVALUATION SYSTEM
FPC LIFE EVALUATION SYSTEM
OTHER INTERCONNECTION MATERIAL CONTACT EVALUATION SYSTEM

ION MIGRATION EVALUATION SYSTEM

INSULATION RESISTANCE EVALUATION SYSTEM

CAPACITOR INSULATION RESISTANCE EVALUATION SYSTEM
PCB, PWB INSULATION RESISTANCE EVALUATION SYSTEM
INSULATION RESISTANCE EVALUATION SYSTEM FOR OTHER INSULATION MATERIAL

LOW-K INSULATION CHARACTERISTIC EVALUATION SYSTEM

LEAK CURRENT MEASUREMENT SYSTEM

CAPACITOR LEAK CURRENT MEASUREMENT SYSTEM
FET LEAK CURRENT MEASUREMENT SYSTEM
SEMICONDUCTOR REVERSE BIAS LEAK CURRENT MEASUREMENT SYSTEM

CAPACITOR TEMPERATURE PROPERTY EVALUATION SYSTEM

LASER DIODE AGING SYSTEM

INTERCONNECTION MEASUREMENT EVALUATION SYSTEM

CONNECTOR DISCONNECTION EVALUATION SYSTEM
SOLDER-JOINT DISCONNECTION EVALUATION SYSTEM
HARNESS CONTINUITY EVALUATION SYSTEM

ELECTRONICS PARTS ELECTRIC PROPERTY AUTOMATIC EVALUATION SYSTEM

TEMPERATURE COMPENSATED CRYSTAL OSCILLATOR TEMPERATURE PROPERTY TEST SYSTEM

OPTICAL COMPONENT ENVIRONENTAL TEST SYSTEM

ELECTRO-MIGRATION EVALUATION SYSTEM

LSI ELECTRO-MIGRATION EVALUATION SYSTEM
GMR HEAD ELECTRO-MIGRATION EVALUATION SYSTEM
GMR HEAD ELECTRO-MIGRATION RH EVALUATION SYSTEM
HIGH FREQUENCY ELECTRO-MIGRATION EVALUATION SYSTEM
WAFER LEVEL
PACKAGE LEVEL

TDDB EVALUATION SYSTEM

SEMICONDUCTOR PARAMETER AUTOMATIC EVALUATION SYSTEM

FET(HOT-CARRIER) PROPERTY EVALUATION SYSTEM
TRANSISTOR PROPERTY EVALUATION SYSTEM

COMBINED ENVIRONMENTAL TESTING, MEASUREMENT & EVALUATION SYSTEM

AUTOMATED RESONANCE POINT
SEARCH & MEASUREMENT SYSTEM

Performance

Prober for LCD

APPLICATIONS

TDDB evaluation system

Package level
Wafer level (for 8 inch wafer, 12 inch wafer)

FET(Individual transistor) property evaluation system

Package level
Wafer level (for 8 inch wafer, 12 inch wafer)

Semiconductor, Liquid crystal glass substrate, etc..

Connection

System configuration to fit number of measurement

Equipped with DC Multi Source Measurement (MSM) on each channel, which enable monitoring and output of voltage and current. MSM consists of 4 channels per board. The basic 40-channel configuration stores up to 10 boards. The system can be upgraded according to measurement volume and condition up to 5 units (200 MSMs).

Precise current and voltage application measurement

Current at 9 ranges, measurement resolution of maximum current ± 100mA, and minimum current ± 1pA. Voltage at 2 ranges, resolution of maximum voltage ± 50V and minimum voltage 1mV. Enables a wide range and precise application and measurement.

Measurement at minimum 10msec

Delivers high-speed measurement for multiple channels. Measures at top speed of 10msec per 40 channels, while acquiring data.

Various evaluation items

The TDDB Evaluation System is configured for wafer level and liquid crystal glass substrate level, by effectively systemizing MSM. It also applies for requirements of QDB evaluation and TZDB evaluation, while FET property evaluation can also be realized by exchanging software.
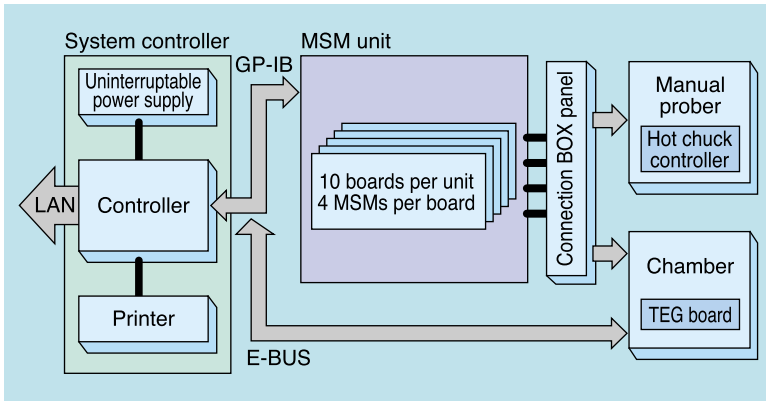
Output by CSV file

Automatic compilation of CSV file enable output by normal plotting. (Spread sheet software Microsoft EXCEL data can also be converted)

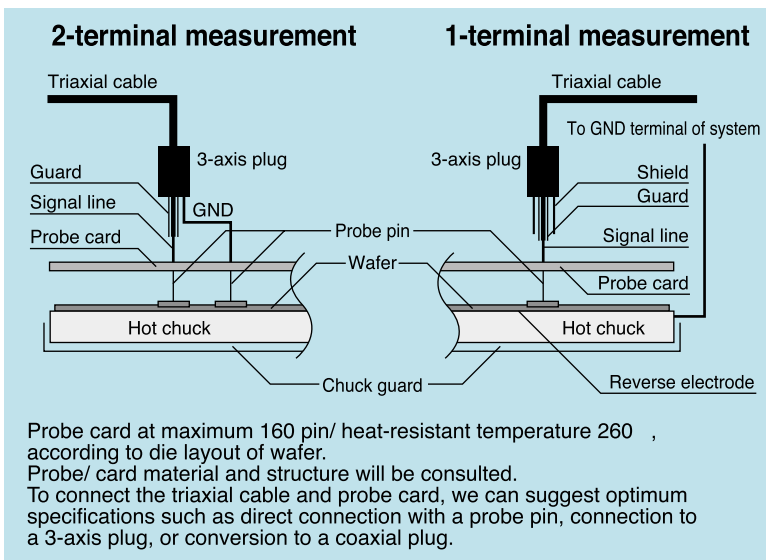### LAN compatible

Expansion to high-voltage load

To upgrade the system, we provide MSM boards designed specifically for a maximum 100V high-voltage load.

SYSTEM BLOCK DIAGRAM

Uninterruptable power supply
Backup power supply for controller (Does not reset automatically when power restored)

MSM unit
Incorporates 40ch MSMs per unit (maximum 5 units)

Connection BOX panel
Can be set as panel for prober shield BOX.

Triaxial cable
Connects specimen and MSM to reduce noise level.

Chamber
Evaluation at package level of specimen, under high temperature, using the TEG board.

E-BUS
Temperature control, monitor, alarm control of chamber with a GP-IB adapter.

CONNECTION TO A PROBER

Probe card at maximum 160 pin/ heat-resistant temperature 260 ,
according to die layout of wafer.
Probe/ card material and structure will be consulted.
To connect the triaxial cable and probe card, we can suggest optimum specifications such as direct connection with a probe pin, connection to a 3-axis plug, or conversion to a coaxial plug.

Prober

Type1
Wafer level prober
For both 5 inch type and 8 inch type
Compatible with 300mm wafer type full automatic prober

Type2
Liquid crystal glass substrate (maximum 500× 400mm)

Hot chuck
Compatible prober :
maximum 300   for wafer level
maximum 150   for liquid crystal glass substrate.

Probe card
We offer optimum probe card to meet required specification and layout such as number of channels, pins and wafer size. Enables whole contact with a single shot.

Model	AMM-1000
Software	Windows® 2000
Voltage/current application range	50V to 50V/ 100mA to 100mA
Resolution	1mV step/ 1pA step
Voltage/current measurement range	50V to 50V/ 100mA to 100mA
No. of measurement channels	Standard 40ch. Max. installment 200ch
Measurement sampling speed	Short mode: 0 to 100msec 10msec interval 100msec to 10sec 100msec interval Over 10sec according to time table below Data acquisition without averaging Medium mode: 0 to 100msec 20msec interval 100msec to 10sec 100msec interval Over 10sec according to time table below Averaging per 1 cycle Long mode: 0 to 10sec 100msec interval Over 10sec according to time table below Averaging per 5 cycle Time table / Measurement interval: 10 sec / 100 sec : 1 sec × multiply by 1, 2, 5 or 10 100 sec / 1000 sec : 10 sec × multiply by 1, 2, 5 or 10 1000 sec / 10000 sec : 100 sec × multiply by 1, 2, 5 or 10 10000 sec / 100000 sec : 1000 sec × multiply by 1, 2, 5 or 10 100000 sec / 1000000 sec : 10000 sec × multiply by 1, 2, 5 or 10

External dimension	MSM unit	650W× 1300H× 800Dmm
	System controller	570W× 1100H× 900Dmm

Required utility	100V AC± 10% 50/60Hz 15A
	100V AC± 10% 50/60Hz 50A

● MSM Simplex Performance

Voltage range	Resolution	Accuracy	Max. current
± 10V	1mV	± (0.2% 10mV)	100mA
± 50V	10mV	± (0.2% 50mV)	

Voltage range	Resolution	Accuracy	Max. current
± 100mA	100µ A	± (0.5% 100µ A 2µ A× Vo)	50V
± 10mA	10µ A	± (0.5% 10µ A 200nA× Vo)	
± 1mA	1µ A	± (0.5% 1µ A 20nA× Vo)	
± 100µ A	100nA	± (0.5% 100nA 2nA× Vo)	
± 10µ A	10nA	± (1.0% 10nA 200pA× Vo)	
± 1µ A	1nA	± (1.0% 1nA 20pA× Vo)	
± 100nA	100pA	± (10% 100pA 2pA× Vo)	
± 10nA	10pA	± (2.0% 10pA 200fA× Vo)	
± 1nA	1pA	± (2.0% 1pA 20fA× Vo)	

Accuracy: ± (set value or % of specified value) ± (offset), Vo: output voltage (V)

Option

Wafer prober (8 inch, 12 inch)

8 inch

Prober external dimension	Manual prober	750W× 1500H× 800Dmm
	Semi auto prober	1100W× 1600H× 900Dmm
	Full auto prober	1000W× 1200H× 1000Dmm
Temperature range	MAX 300 Resolution 1 step	
Required utility	200V AC± 10% 50/60Hz 30A× 1	

*Please contact us for details of 12 inch prober.

Prober for liquid crystal

Prober card

*Utility for prober differs according to type of prober.
 We can coordinate your system accordingly.

Chamber

| Chamber external dimension	750W× 1500H× 800Dmm
Temperature range	MAX 250 Resolution 1 step
Required utility	200V AC± 10% 50/60Hz 20A× 1

Applied voltage,   100V Specification

EVALUATION PROCEDURES

Execute test by selecting from the following measurement mode library.

Fixed Voltage Measurement Mode

Measured with fixed voltage stress. The measurement current and breakdown time are stored.
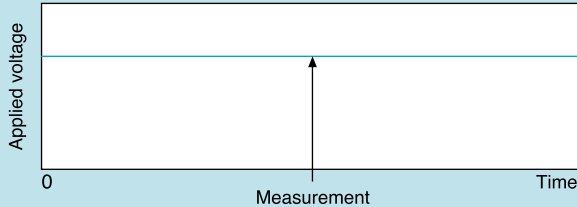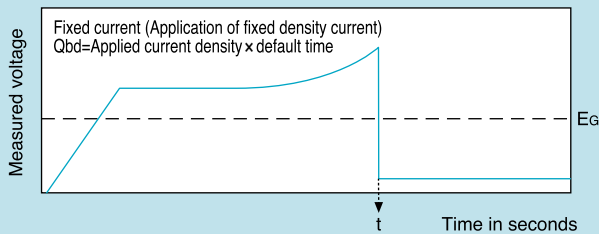

Soft Breakdown Mode

Measured by changing stress voltage and measurement voltage. The voltage measurement can be adjusted in 5 steps.
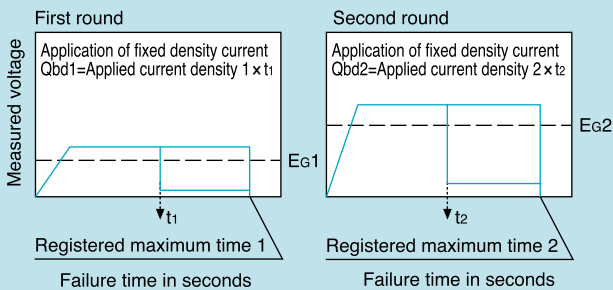

Current Stress Measurement

Voltage is measured by applying fixed current.
The default time is recorded and stored.

Fixed current (Application of fixed density current)
Q_{bd}=Applied current density× default time

Considered as breakdown when ratio of two continuous measure-ment value is above ∠EG electric field strength ratio.

## Two-Step Current Stress Measurement

Different fixed current is applied two times (When breakdown does not occur the first time, the second test round is started)

First round

Application of fixed density current
Q_{bd1}=Applied current density 1× t_1

Second round

Application of fixed density current
Q_{bd2}=Applied current density 2× t_2

Registered maximum time 1
Failure time in seconds

Registered maximum time 2
Failure time in seconds

Considered as breakdown when ratio of two continuous measure-ment value at both rounds is above ∠EG electric field strength ratio for both the first and second rounds.

Step Voltage Measurement
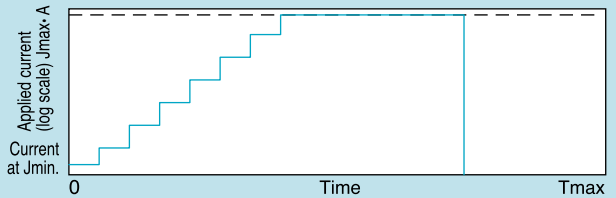### (I-V characteristics measurement, TZDB method)

Measures the current at each voltage level while increasing voltage application stepwise.

Voltage that reached Emax
Tox or Jmax
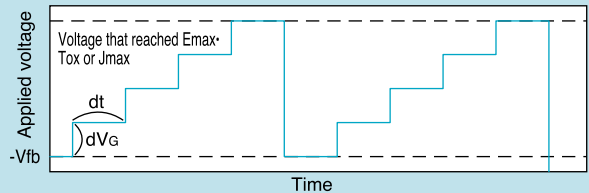
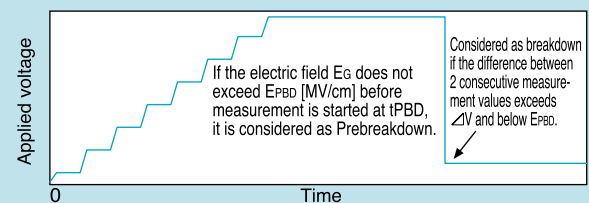## Step Current Measurement (TZDB)

Measures time dependent change of voltage while increasing current application stepwise.
Test is terminated if a failure is detected.

Measurement is terminated if no breakdown is detected within Tmax.

Sample Measurement Data

If the electric field E_G does not exceed E_{PBD} [MV/cm] before measurement is started at tPBD, it is considered as Prebreakdown.

Considered as breakdown if the difference between 2 consecutive measure-ment values exceeds ∠V and below E_{PBD}.

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Registration Number
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JAB Certificate Number
R001

ISO 9001/JIS Z 9901
Quality Management System Assessed and Registered

The Quality Management System of ESPEC CORP. has been assessed and registered based upon the International Standard ISO9001:1994 (JIS Z 9901-1998), by the Japanese Standards Association (JSA).

EMS Accreditation
RE 009

051

ISO 14001 (JIS Q 14001)
Environmental Management System Assessed and Registered

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