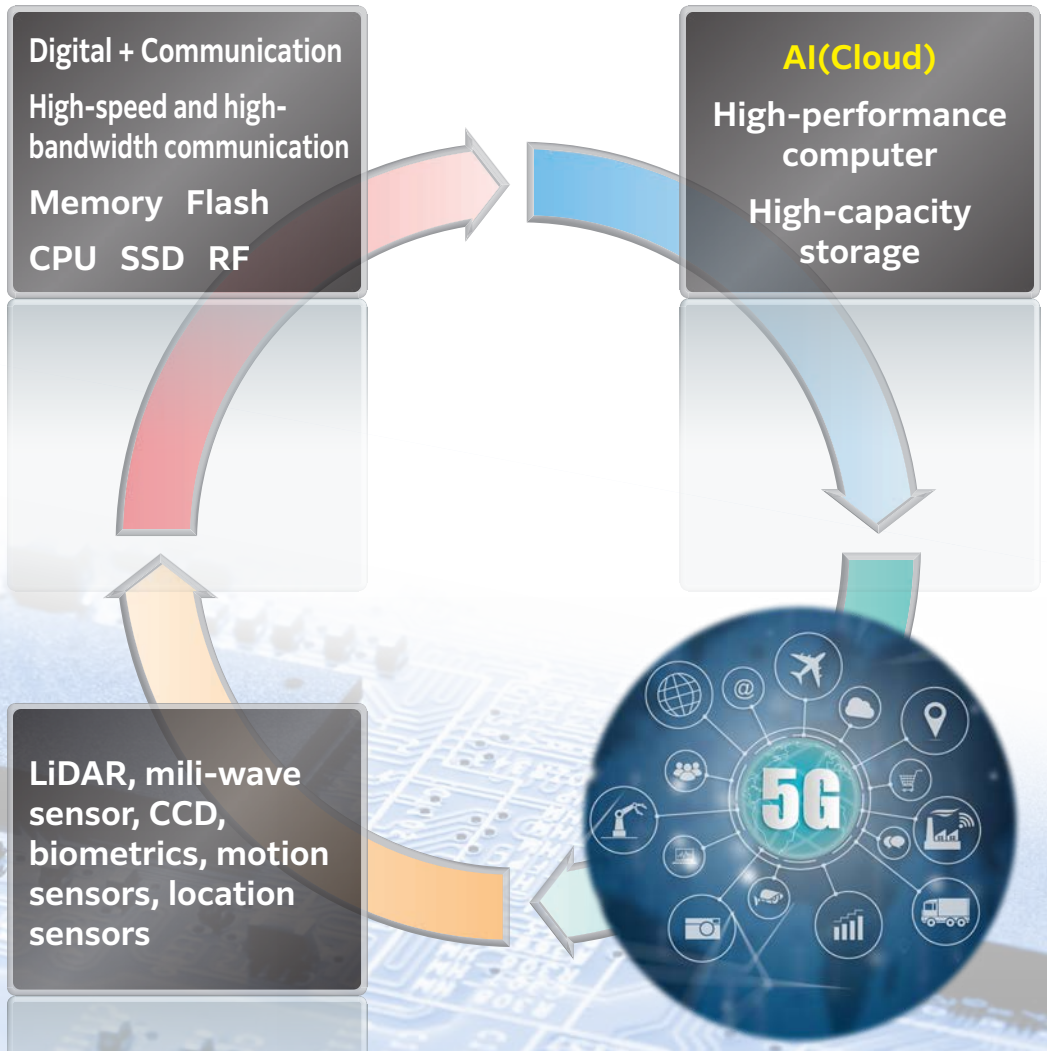
Quality is more than a word

ESPEC

Reliability Evaluation Supporting Electronic Devices



Key devices

Semiconductors
(Memory device, flash memory and power device, FPGA and RF device)

Sensor
(CMOS, LiDAR, current sensor and G3)

Parts
(Capacitor, inductor and resistor)

Changes in environmental factors

DC high voltage and large current

Increased self-heat generation
(Device miniaturization, FOWLP and 3D mounting)

Guaranteed device performance under a wide range of temperatures

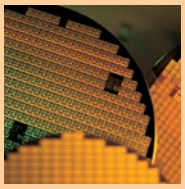
Semiconductor manufacturing processes and evaluation tests and peripheral electronic components/ materials evaluation tests

Wafer manufacturer

①-1 TDDB evaluation test (wafer evaluation) **AMM-TDDB-W**

Semiconductor manufacturer/foundry

Wafer manufacturing process (pre-processing)



Wiring process

Inspection process

FOWLP

①-1 TDDB evaluation test (wafer evaluation) **AMM-TDDB-W**

② Semiconductor parametric test **AMM-W**

Packaging (post-processing)

Assembly process

Screening process

② Semiconductor parametric test **AMM-C**

③ Burn-in test **RBC RBS RBM MBI**

Material manufacturer

Sealing material/substrate/insulation material/solder material/ multi-layer board

⑦ Insulation resistance evaluation test (electro-chemical migration) **AMI**

⑧ Conductor resistance evaluation test (joint reliability test) **AMR**

Reliability test

①-2 TDDB evaluation test (package evaluation) **AMM-TDDB-C AMI**

③ Burn-in test **RBC RBS RBM MBI**

④ Electromigration evaluation test **AEM**

⑤ Reverse bias test (power device) **HTRB HTGB H3TRB AMI**

⑥ Power cycle test (power device) **RBS-PST**

⑦ Insulation resistance evaluation test (electro-chemical migration) **AMI**

⑧ Conductor resistance evaluation test (joint reliability test) **AMR**

Product shipment

Assembly manufacturer

PC manufacturer/mobile phone manufacturer/in-vehicle component manufacturer/communication device manufacturer

⑦ Insulation resistance evaluation test (electro-chemical migration) **AMI**

⑧ Conductor resistance evaluation test (joint reliability test) **AMR**

Electronic component manufacturer

Capacitor/inductor/resistor/sensor

⑧ Conductor resistance evaluation test (joint reliability test) **AMR**

⑨ Leakage current measurement evaluation test **AMI**

⑩ Capacitor temperature characteristic evaluation test **AMQ**

⑪ Inductor evaluation test **AEM**

⑫ Sensor burn-in **RBS**

①-1 TDDB evaluation test

AMM-TDDB-W

AMM-TDDB performs process management by measuring the time-dependent breakdown of the insulating film of wafers and products.

Voltage/current application range	Voltage ±50 V/Current ±100 mA
Number of DUT processes	Max. 108 DUTs (package) Max. 324 DUTs (wafer)

①-2 ② TDDB evaluation test/semiconductor parametric test

AMM-TDDB-C／AMM／AMI

AMM-TDDB/AMM/AMI performs process management by measuring the time-dependent breakdown of the insulating film of wafers and products, and by evaluating electrical characteristics.

Voltage/current application range	Voltage ±50 V/Current ±100 mA
Number of DUT processes	Max. 54 DUTs (package) Max. 162 DUTs (wafer)

③ ⑫ Burn-in (memory/logic/in-vehicle device/sensor)

RBC RBS RBM MBI

Screening is conducted to prevent semiconductor products with initial failures from being sent to the market.

Stress voltage	Voltage specified for each device is supplied.
Chamber	Temperature chamber (150°C)/Temperature and humidity chamber

* We can make suggestions to meet your requirements.

④ Electromigration evaluation (Cu Al Bump Ball)

AEM

This system predicts the life of a product by measuring the time until wire breakage by supplying a current to the devices. The system can also be used for the reliability evaluation of C4 semiconductor packages.

Stress current source	Output range +DC0.1mA～200mA, 5A
Oven temperature control range	+65～+400°C

⑤ Reverse bias test (power device)

HTRB HTGB H3TRB AMI

When the voltage of a power device is shut off, the inductors in the circuit generate surge voltage, which may damage the device. A reverse bias test is conducted to improve the reliability of the product.

Drain power supply	0 to 2 kV or 0 to 3 kV
Gate power supply	0 to ±30 V or 0 to ±35 V
Temperature control	In-chamber DUT board connection type: 200°C or 350°C

* Temperature/humidity type is also available.

⑥ Power cycle test (power device)

RBS-PST

The self-heat generation cycle that occurs when a power device is turned ON or OFF can cause disconnection of wiring and damage to heat dissipation circuits. Power cycle tests are conducted to improve the reliability of products.

■Major test modes

Continuous mode	Control the temperature and amount of cooling water to achieve the device temperature setting while Ice is constant.
Vf cycle mode	Repeat the control of turning Ice ON/OFF to make the device temperature reach the set temperature.
Cycle mode	Turn Ice ON/OFF repeatedly for the setting time.

⑦ ⑨ Insulation resistance evaluation test (Electro-chemical migration)

AMI

AMI improves the reliability of products by measuring insulation deterioration and leakage current in a voltage resistance test or under various voltage conditions and environments such as insulation deterioration due to moisture absorption.

Channel configuration	Standard 25 channels (maximum 150 channels per rack)
Test control unit	5ch 25ch
Resistance measurement range	$2 \times 10^5\ \Omega$ to $1 \times 10^{13}\ \Omega$ (when applying 100 V) $2 \times 10^3\ \Omega$ to $1 \times 10^{11}\ \Omega$ (when applying 1 V)
Voltage application range	100V/ 500V /1000V /2500V

* Contact us for the test voltage.

⑧ Conductor resistance evaluation test (joint reliability test)

AMR

AMR improves reliability of products by measuring the disconnection caused by the deformation in substrates due to changes in the ambient environment or by the strain between self-heat generation and the ambient environment.

Application system	Direct electric current measurement system
Channel configuration	Standard 40 channels (maximum 280 channels per rack)
Resistance measurement range	1×10^{-3}～$1\times10^{6}\Omega$

⑩ Capacitor temperature characteristic evaluation test

AMQ

IoT, 5G and automotive electronics carry many electronic components such as capacitors and resistors. These device performances are temperature-dependent, which makes temperature reliability test a must.

Measurement method	AC four-terminal pair measurement (end of measurement cable)
Measurement interval	Min. 1 minute to 1500 minutes (Variable in 1 minute increments)
Measurement range	Measured frequency 20Hz～1MHz Dielectric loss angle 0.0001～10.0000 tanδ Impedance 10mΩ～100M

⑫ Sensor burn-in

RBS

Sensors are used in various places. Screening is conducted to prevent products with initial failures from being sent to the market.
* In-vehicle sensors, in particular, require screening because they may affect human life.

Stress voltage	Voltage specified for each device is supplied.
Chamber	Temperature chamber (150°C)/Temperature and humidity chamber

* We can make suggestions to meet your requirements.

⑪ Inductor evaluation/electromigration evaluation

AEM

Multi-layer chip inductors used for IoT, 5G and in-vehicle applications are subject to damage due to wire breakage caused by electric currents and heat generated over long-term use. Supplying a constant current to the conductor coil at a high temperature allows service life evaluation.

Output current (10 A system)

Number of ranges	3 ranges		
	100 mA range	1,000 mA range	10,000 mA range
Setting range	0～100.000mA	0～1,000.000mA	0～10,000mA
Setting resolution	0.001mA		1mA
Accuracy-guaranteed output range	10～100mA	100～1,000mA	1,000～10,000mA
Output accuracy	±0.1% F.S (F.S=100mA)	±0.1% F.S (F.S=1,000mA)	±0.1% F.S (F.S=10,000mA)

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