ES660 ESD and Latch-UP Test System

(Default configuration, other options may look different without notice.)

1. Description

The ES660 series ESD and LU Test system is a state-of-the-art, multi-pin automated testing equipment designed to meet the rigorous demands of modern semiconductor testing. This versatile device is engineered to seamlessly support Human Body Model (HBM), Machine Model (MM), Latch-Up (LU) and Transient Latch-Up (TLU) testing, offering a comprehensive solution for assessing the reliability and robustness of integrated circuits (ICs) and electronic components. The ES660 has a higher specification compared to the previous solution of ES612A + RE64 & RE128 relay expansion module.

With the capability to support from 128 pins up to 1280 pins and 10 buses, the ES660-P1 configuration is an ideal hardware solution for testing various ICs and electronic components that have numerous connections.

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For higher pin count test demands, the ES660-P1 can be upgraded to the ES660-P2 configuration, which features a higher density base unit motherboard supporting up to 2560 pins and 12 buses.

The highly modular design ensures upgrade possibilities to future designs with higher pin counts and specialized test capabilities. The excellent capacity of the ES660 guarantees the efficient evaluation of large-scale devices, reducing testing time and enhancing productivity.

2. Features

- Highly Flexible System Configuration, expandable from 128 pin to 2560 pin, 1 bus to 12 buses.
- High stress specifications, including 10 kV HBM, 300 V/1A LU Stress
- Compatibility with Multiple ESD/LU/TLU Testing Methods & Standards
- Software defined multi-zone feature allowing multiple devices testing in parallel
- IV waveforms during ESD/LU setup can be software captured with probes
- Optional Integration of Thermal Forcing Module
- Multi-Protocol Preconditioning Module with API allowing interactive behaviors during LU tests
- A 14-inch touch screen enables visualization of test progress and conditions.

3. Applications

- Semiconductor ESD/EOS/LU testing
- HBM setup complies with ANSI/ESDA/JEDEC JS-001, MIL-STD-883E, and AEC Q100-002
- MM setup complies with ANSI/ESDA SP5.2
- Latch up setup complies with JEDEC JESD78
- Transient latch up setup complies with ANSI/ESD SP5.4.1

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4. Specifications

ES660 Base Unit

Parameters	ES660-P1/P2	Unit	Comments
Touch Screen	14	inch	
Dimensions	(ESDEMC Rack System)	cm	
Weight	(Depends on configuration) 50 - 200	kg	
ESD and LU Waveform	Optional Passive voltage and current probes		
Supported Oscilloscope	Majority models from Keysight, Tektronix, LeCroy, Rigol		**Customizable**
Supported SMU	Selected models from Keysight, Tektronix, LeCroy, Rigol		**Customizable**
Supported PSU	Selected models from Keysight, Tektronix, LeCroy, Rigol		**Customizable**

HBM Human Body Model Option

(ANSI/ESDA/JEDEC JS-001)

Parameters	ES660-Px-HBM8	ES660-Px-HBM10	Unit	Comments
Output voltage	±10 ~ 8000	±10 ~ 10000	V	
Discharge RC Value	C: 100 pF ± 10%, R: 1.5kΩ ± 1%			
Short Load Peak Current I_{ps}	0.67 ± 10 % per kV		A	
Short Load Rise Time t_{rs}	$2 < t_{rs} < 10$		ns	
Short Load Decay Time t_{ds}	$130 < t_{ds} < 170$		ns	
Short Load Ringing t_{rs}	< 15% of I_{ps}			
500 Ω Load Peak Current I_{pr}	$I_{pr}/I_{ps} \geq 63\%$			
500 Ω Load Rise Time t_{rr}	$5 < t_{rr} < 25$		ns	
Max Pulse Rate /Pulse Module	10		P/S	
Number of simultaneous pulses	>=8			>512pin

MM Machine Model Option

(ANSI/ESD SP5.2)

Parameters	ES660-Px-MM2	ES660-Px-MM4	Unit	Comments
Output Voltage	±10 ~ 2000	±10 ~ 4000	V	
Discharge RC Value	C: 200 pF, R: 0 Ω			
Short Load Peak Current I_{p1}	1.75±10% per 100V		A	
Short Load I_{p2}	67% ~ 90% of I_{p1}		A	
Short Load Pulse Period t_{pm}	$66 < t_{pm} < 90$		ns	
500 Ω Load Peak Current I_{pr}	0.85 – 1.2		A	@400V condition per standard
500 Ω Load I_{100}	0.23 – 0.4		A	@400V condition per standard
Max Pulse Rate /Pulse Module	10		P/S	
Number of simultaneous pulses	>=8			>512pin

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DC & Latch-Up Option

(JEDEC JESD78)

Parameters	ES660-P1 BU	ES660-P2 BU	Comments
Preconditioning Vectors	Up to ≥ 20 MHz, 256K/1M Depth	Up to ≥ 20 MHz, 256K/1M Depth	Both Internal & External Options
Preconditioning Logic Levels	0.5 – 5V	0.5 – 5V	
V/I 4-wire Kelvin Measurements	Y	Y	
DUT V/I Bus Supplies	3+1, 5+1, 7+1	3+1, 5+1, 7+1, 9+1	Additional DC Sources Expansion available
LU Waveform Capture	Y	Y	
Relay Matrix Max V DC (V)	400	400	
SSR Matrix Max V DC (V)	100	100	
Max I DC (A) Per Pin	2	2	
Max I DC (A) Per DC Bus	15	15	
Default LU Source Vmax (V)	>= 300	>= 300	Limited to 1 A
Default LU Source Imax (A)	>= 10	>= 10	Limited to 10 V

Note:
The ES660 system has an additional DC path from the back panel to the TermA connection of each Pogopin. This path allows additional DC characterization of the device with up to 1200V DC voltage.

TLU Transient Latch-Up Option

(ANSI/ESD SP5.4.1)

[Specifications pending finalization]

Scheduled Hardware-support for Latch-Up Transient Pulse Source (hardware specification maybe defined in those product documents):

ES622 (TLP/ VF-TLP)
EOS-500 (EOS)
LVS-500 (LVS)
HBM
MM

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5. Order Information

Line	Part # or Option #	Description	Note
		Base Unit Options	
1.1	ES660-P1-BU	Relay Based HBM/MM/LU ATE System Base unit, up to 1024 pin	
1.2	ES660-P2-BU	Relay Based HBM/MM/LU ATE System Base unit, up to 2560 pin	
1.3	ES660-HBM8-1	Add Human Body Model capability up to 8 kV	
1.4	ES660-HBM10-1	Add Human Body Model capability up to 10 kV	
1.5	ES660-HBM12-1	Add Human Body Model capability up to 12 kV	
1.6	ES660-MM2	Add Machine Model capability up to 2 kV	
1.7	ES660-MM4	Add Machine Model capability up to 4 kV	
1.8	ES660-LU	Latch-up capability (Software, require PSU, PSMU, etc.)	
1.9	ES660-TLU	Transient Latch-up capability (Software, require TLP/EOS)	
1.10	ES660-MPPM-1	Multi-Protocol Precondition Module (External Module)	
1.11	ES660-RC64VP1-256K	Vectoring & Clock Pre-Conditioning Module of Relay Card. One module to one Relay Card, ⩾20MHz, 256K Depth	
1.12	ES660-RC64VP1-1M	Vectoring & Clock Pre-Conditioning Module of Relay Card. One module to one Relay Card, ⩾20MHz, 1M Depth	
1.13	ES660-TFM1	Temperature Forcing Module (RT – 200 degree C)	
		Relay Card Options (**Special** specification design is **available** per request)	
2.1	ES660-P1-R64R1	Expansion Relay Card for additional 64 Pin, 1 Bias	ESD Only
2.2	ES660-P1-R64R4	Expansion Relay Card for additional 64 Pin, 3+1 Bias	
2.3	ES660-P1-R64R6	Expansion Relay Card for additional 64 Pin, 5+1 Bias	
2.4	ES660-P1-R64B6-HV	Expansion Relay Card for additional 64 Pin, 5+1 Bias (DC & Stress >100V)	
2.5	ES660-P1-R64R8	Expansion Relay Card for additional 64 Pin, 7+1 Bias	
2.6	ES660-P1-R64B8-HV	Expansion Relay Card for additional 64 Pin, 7+1 Bias (DC & Stress >100V)	
2.7	ES660-P2-R64R1	Expansion Relay Card for additional 64 Pin, 1 Bias	ESD Only
2.8	ES660-P2-R64R4	Expansion Relay Card for additional 64 Pin, 3+1 Bias	
2.9	ES660-P2-R64B8	Expansion Relay Card for additional 64 Pin, 7+1 Bias	
2.10	ES660-P2-R64B8-HV	Expansion Relay Card for additional 64 Pin, 7+1 Bias, HV Version	
2.11	ES660-P2-R64B10	Expansion Relay Card for additional 64 Pin, 9+1 Bias	
2.12	ES660-P2-R64B12	Expansion Relay Card for additional 64 Pin, 11+1 Bias	
		DC & Leakage & LU Pulse Source Options	
3.1	ES660-SMU1	Leakage\DC Source: Single Channel SMU (±200V/1A)	
3.2	ES660-SMU2	Leakage\DC Source: Single Channel SMU (±1100V/1A)	
3.3	ES660-PSMU2	Leakage\DC\LU Source: Dual Channels Pulsed SMU (±210V/1.5A)	

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3.4	ES660-PSU1	DC Source: 3 Channels PSU with Internal Bridge (32V/3A X 2 Ch + 6V/5A X 1 Ch)	
3.5	ES660-PSU2	DC Source: 3-Channels PSU (60V/3A X 2 Ch, 5V/3A X 1 Ch)	
3.6	ES660-PSU3	DC Source: High Current PSU (20V/20A X 1 Ch)	
3.7	ES660-PSU6	DC Source: High Power PSU (±350V/2A 1ch)	
3.8	ES660-PSU7	DC Source: High Power PSU (±100V/7.5A 1ch)	
3.9	ES660-PSU-C2	Specialized HV HP DC Bias and Stress Source, ±300V/1A or ±100V/4A, IV Monitor Build-In	
Test Socket Options			
4.1	ES660-P1-DS512	DUT Socket PCB 512 Pin	
4.2	ES660-P1-DS1024	DUT Socket PCB 1024 Pin	
4.3	ES660-P1-DSC1	DUT Socket PCB Customized Pin Count	
Oscilloscope Options			
5.1	MISC-OSC350	Digital Oscilloscope (350 MHz, 4 Ch)	
5.3	CT-T03-1p0	Broadband Current Probe, 1V/A, 2kHz – 2GHz	

Note:
1. Motherboards, matrix cards, waveform boards, and self-diagnostic boards are the standard configurations of the system, which are not mentioned in the order information.
2. ES660-P1 configuration system can be smoothly upgraded to ES660-P2 configuration with modules upgrades. The ES660 system is a modular design that further upgrade to higher pin count than 2560 should also be possible.

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