ES622 Series TLP Pulsed IV-Curve System

(External Modules Available for HMM, HBM, MM)

(Enclosure and Software maybe updated without notice)

1. Description

The model ES622 Series TLP Pulsed IV-Curve System is an advanced IV-curve characterization system designed to simulate ESD events (TLP/ VF-TLP/ HMM/ HBM/MM pulse) and monitor a device (semiconductors, discrete, circuit modules, etc.) in high power time domain. The ES622 has a higher specification, more functionality, greater expansion capability and better software experience compared to the previous model ES620 and ES621.

The TLP (transmission line pulse) test function is designed to meet the latest ANSI/ESD STM5.5.1 test standard and applies high quality rectangular pulses to devices and records both the voltage across and current through the device. This gives pulsed IV curves, allowing users to characterize a device's transient response over ns time windows. Advanced automatic device failure detection methods are incorporated, such as DC Spot Check (V or I), Static IV curve, Fuse, Breakdown, and Bias Source Fluctuation.

The VF-TLP test is designed to simulate the CDM speed ESD event and captures the voltage across the DUT and current through the DUT under a high speed (such as <100 ps rise-time) ESD transient. This allows the user to study the response speed and peak clamping voltage of a device.

The HMM (Human Metal Model) test function is an alternative test method to IEC61000-4-2 system level ESD. It gives the equivalent waveform to an ideal standard waveform for low ohm devices and eliminates many IEC gun test problems for components or wafer level tests, such as repeatability, imprecision gun tip, impedance mismatches, EMI interferences from unshielded relays and special setup with large ground plane and coupling plane etc.

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2. Features

- Most configurable TLP Pulsed IV-Curve System
- Ultra-Compact Design System
- Fast test speed with multi-thread processing
- 20 A, 40A, 50 A, 100 A, 125A, 150 A models are available (Customization available)
- Advanced system and accessory monitor and control in software available
  (switch lifespan monitor, E-Cal module, oscilloscope attenuation adjustment)
- Test Function Expandable with vf-TLP, HMM, HBM, MM options
- Multiple automatic failure detection methods
  (DC spot check (V or I) or IV sweep, fuse, breakdown, and bias current change)
- Software controlled pulsing: Burst, Continuous, IV-Curve Characterization
- Rise-Time options from 40 ps to 1200 ns *(depends on model, customization available)
- Pulse-Width options from 1 ns to 2000 ns *(depends on model, customization available)

Note*: Longer pulse applications are supported by EOS series with pulse width from few hundred of ns to few ms.

3. Applications

- ESD performance characterization
- Wafer/ package level ESD test
- System / circuit module ESD test
- Safe operation area (SOA) test
- Charge recovery time test
- Solar panel diode characterization
- Touchscreen ITO trace fuse and breakdown test

Related Standards:

✓ TLP / VF-TLP option meets ANSI/ESD STM 5.5.1-2016
✓ HMM option meets ANSI/ESD SP5.6-2009
✓ HBM option meets ANSI/ESDA/JEDEC JS-001-2017
✓ MM option meets ANSI/ESDA SP5.2-2019

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4. Specifications

ES622 Series TLP Unit Specifications

Typical Models	ES622-20	ES622-50	ES622-125	ES622-150	Unit	*Special models such as 40, 100, 200+ A are available per request
Output voltage @ Open load	± 0.5 ~ 1000	± 0.5 ~ 2500	± 0.5 ~ 6250	± 0.5 ~ 7500	V	
Min Voltage step @ Open load	0.1	0.1	0.1	0.1	V	
Output current @ Short load	± 0.01 ~ 20	± 0.01 ~ 50	± 0.01 ~ 125	± 0.01 ~ 150	A	
Voltage precision	Accuracy adjustable between 1 - 10 %				%	Speed / accuracy software adjustable
Fastest rise-time* (default 20-80%)	≤ 50	≤ 200	≤ 300	≤ 300	ps	Fastest 10-90% 40 ps risetime is available with special configuration
Rise-time range	0.05 ~ 1200	0.2 ~ 1200	5 ~ 1200	5 ~ 1200	ns	
Rise-time options	Unlimited programable or manual options					per customization
Pulse-width (default 50-50%)	100 ± 1				ns	Default
Min Pulse-width	0.5	1	5	5	ns	
Max Pulse-width	2000	2000	1500	1000	ns	
Pulse-width options	Unlimited programable or manual options					per customization
Test Speed	Typical 0.2 ~ 2				Sec	Varies between hardware setups
Dimensions	347 W X 300 D X 145 H				mm	May change per customization
Weight	8	8	10	12	kg	
Supported Oscilloscopes	Major Series from Tektronix, Agilent, LeCroy, Rigol.					Others supported on request
Supported SMU	Keithley 24xx/26xx series SMU					Others supported on request

ES62X-HMM2 External Human Metal Model Module

(short circuit DUT, 100 Ω HMM per ANSI/ESD SP5.6-2009)

@ Typical Models	ES620-25	ES620-50	ES620-125	ES620-150	Unit	Comments
IEC equivalent level	6	12	30	36	kV	
HMM peak current	22.5	45	112.5	135	A	3.75 A per 1 kV ≤ ± 10 % IEC 61000-4-2 (R=330Ω, C=150pF)
HMM current @ 30 ns	12	24	60	72	A	≤ ± 10 % (better than ±30% IEC)
HMM current @ 60 ns	6	12	30	36	A	≤ ± 10 % (better than ±30% IEC)

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ES62X-HBM2 External Human Body Model Module
(ANSI/ESDA/JEDEC JS-001-2017 R=1.5 kΩ, C=100 pF)

@ Typical Models	ES620-25	ES620-50	ES620-125	ES620-150	Unit	Comments
Maximum HBM Test Level	± 2	± 4	± 10	± 12	kV	
Minimum HBM Test Level		± 50			V	
Minimum Test Level Step		1			V	PCB controlled via USB
Charge Removal Resistance		10 K			Ohm	
Voltage Output Sensitivity		1/201			V/V	± 3% into 50 Ohm
Current Sensor Sensitivity		1			V/A	± 3% into 50 Ohm
Test Speed		>= 1			S	Per Standard 1P/S
Physical Dimensions		90 X 90 X 130			mm	

5. Ordering Information

Line	Part # or Option #	Description
TLP IV-Curve System Basic Configuration		
1.1	ES622-20	ES622 TLP Pulsed IV-Curve System, 20 A Base Unit
1.2	ES622-25	ES622 TLP Pulsed IV-Curve System, 25 A Base Unit
1.3	ES622-40	ES622 TLP Pulsed IV-Curve System, 40 A Base Unit
1.4	ES622-50	ES622 TLP Pulsed IV-Curve System, 50 A Base Unit
1.5	ES622-100	ES622 TLP Pulsed IV-Curve System, 100 A Base Unit
1.6	ES622-125	ES622 TLP Pulsed IV-Curve System, 125 A Base Unit
1.7	ES622-150	ES622 TLP Pulsed IV-Curve System, 150 A Base Unit
Rise-time Options (example configuration only, customizable option available)		
2.1	ES62x-PRT4	Programmable pulse rise-time filter X4 module (Default: Intrinsic, 1 ns, 5 ns, 10 ns, customization available)
2.2	ES62x-PRT10	Programmable pulse rise-time filter X10 module (Default: Intrinsic, 0.5ns, 1 ns, 2ns, 5 ns, 10 ns, 20ns, customization available)
2.3	ES62x-ERTF	Manual External Rise-time Filter
Pulse-width Options (example configuration only, customizable option available)		
3.1	ES620-PPL4	Programmable Internal pulse length X4 module
3.2	ES620-PPL10	Programmable Internal pulse length X10 module
3.3	ES620-MPLEx	Manual Pulse Width Extremal Change Option

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External Pulse Module Options		
4.1	ES62X-HBM2	Human Body Model (HBM) ESD Pulse Module and Measurement Setup Option (ANSI/ESDA/JEDEC JS-001-2014 Pulse Test with IV Measurement)
4.2	ES62X-HMM2	Human Metal Model (HMM) ESD Pulse Module and Measurement Setup Option (IEC61000-4-2 Pulse Test with IV Measurement)
4.3	ES62X-MM2	Machine Model (MM) ESD Pulse Module and Measurement Setup Option (ANSI/ESDA SP5.2-2019 Pulse Test with IV Measurement)
Leakage or DC IV Measurement Options		
5.1	ES62X-SSM	System Switch Module (switching between Pulse and DC test)
5.2	ES62X-STP1	SMU Transient Protector
DC Bias Measurement Options		
6.1	BT-100V2A6G	TLP Test Bias Tee, 10 kHz – 6 GHz, 100V, 2 A DC/10 A Pulse Current
6.2	BT-100V4A3G	TLP Test Bias Tee, 10 kHz – 3 GHz, 100V, 4 A DC/20 A Pulse Current
6.3	BT-450V2A5G	TLP Test Bias Tee, 10 kHz – 5 GHz, 450V, 2 A DC/10 A Pulse Current
ESD Injection and IV-Curve Measurement Options		
7.1	ES62X-PSTT	TDR-O Measurement Setup for package level standard TLP test
7.2	ES62X-PVFTT	TDR-S Measurement Setup for package level VF-TLP test
7.3	ES62X-CMPS	Compact Manual Probe Station with flexible moving vacuum chuck and microscope
7.4	ES62X-WSTT	TDR-O Measurement Setup for wafer level TLP test includes micro-positioners
7.5	ES62X-WVFTT	TDR-S Measurement Setup for wafer level VF-TLP test includes micro-positioners
Oscilloscope Paired with TLP System		
8.1	MISC-OSC1	Digital Oscilloscope (1 GHz, 5 Gs, 4 Ch) (Recommended for standard TLP test)
8.2	MISC-OSC6	Digital Oscilloscope (6 GHz, 20 Gs, 4 Ch) (Recommended for VF-TLP test)

Many customized specifications are available upon request.

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