Featured Product Recommendations

STE221 Series Power Device Analyzer

Performance Features

Standard Features of the STE221

- A wide operating range of up to 3.5 kV / 1800 A.
- Fully Automated Rapid Thermal Testing from -50°C to +250°C
- Technology for Automatically Generating Technical Documentation for Power Devices (Semiconductors and Components)
- The automatic recording function prevents data loss.
- AI-Assisted Python Test Script Writing

STE221 IV Kit Features

- Enables fully automated, high-speed IV measurements (Ron, BV, leakage Vth, Vsat, etc.) on packaged devices and wafers.
- A narrow IV pulse width (as narrow as 10 µs) prevents device self-heating, enabling more accurate testing of the device's actual performance.
- The Oscilloscope View (Time-Domain View) allows for the monitoring of actual voltage and current pulse waveforms, enabling accurate measurements.
- Configuration options are flexible (current ranges can be flexibly selected from 20 A up to 200 A, 600 A, or 1800 A), with CV and Qg available as optional features.

Complete Features of the STE221 Kit

- All Features of the IV Kit
- Measurement of transistor input, output, and reverse transfer capacitances (Ciss, Coss, Crss, Cies, Coes, Cres), as well as gate resistance (Rg), for packaged devices at 3.5 kV.
- Measuring the Gate Charge (Qg) Curve of Packaged Devices
- Calculate Power Loss (Conduction, Drive, and Switching Losses)

Application

- Semiconductor Power Devices

Parasitic capacitance testing and C-V characteristic analysis for diodes, transistors, MOSFETs, IGBTs, thyristors, integrated circuits, optoelectronic chips, etc.

- Semiconductor Materials

Wafer Dicing, C-V Characterization

- Liquid Crystal Materials

Elastic Constant Analysis, Liquid Crystal Cutting

- Capacitive Components

Capacitor C-V Characteristic Testing and Analysis;
Capacitive Sensor Testing and Analysis

Standard Configuration	RS232 √	USB HOST √	LAN √	GPIB √

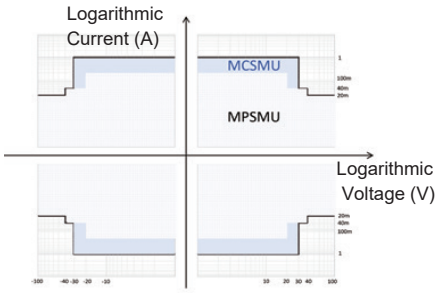
STE221 Series	
Host	volume（mm）： 430 (W) x 311 (H) x 600 (D)
	net weight：Approx. 34.5 kg / 35 kg
Extender	volume（mm）： 425 (W) x 365 (H) x 590 (D)
	net weight：Approx. 34.5 kg / 35 kg

Product Model

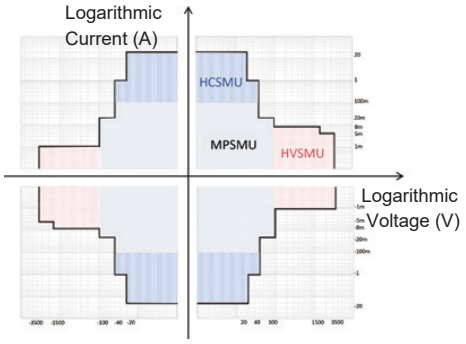
STE221-35-20	IV: 3500V/20A	STE221-35-600	IV: 3500V/600A
STE221-35-20C	IV: 3500V/20A, CV: 10MHz, Qg	STE221-35-600C	IV: 3500V/600A, CV: 10MHz, Qg
STE221-35-200	IV: 3500V/200A	STE221-35-1800	IV: 3500V/1800A
STE221-35-200C	IV: 3500V/200A, CV: 10MHz, Qg	STE221-35-1800C	IV: 3500V/1800A, CV: 10MHz, Qg

Featured Product Recommendations

STE221 Series Power Device Analyzer

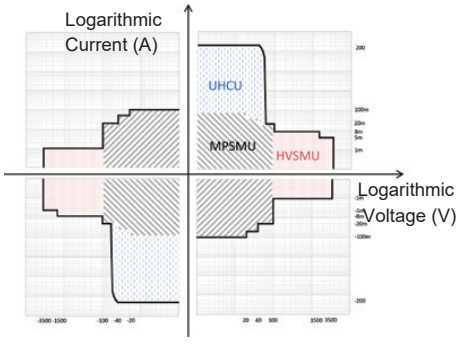


Measurement and Output Range of the Gate-Base Step Generator



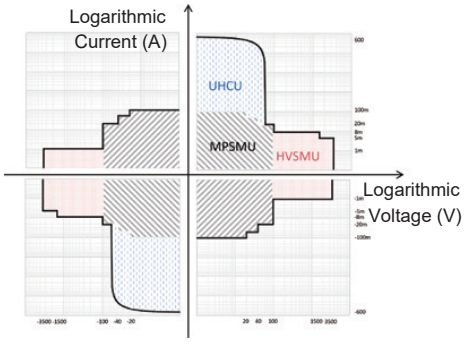
STE221-35-20
STE221-3520C
Drain/Collector Power Supply IV Operating Range

STE221-35-20	IV: 3500V/20A
STE221-35-20C	IV: 3500V/20A, CV: 10MHz, Qg



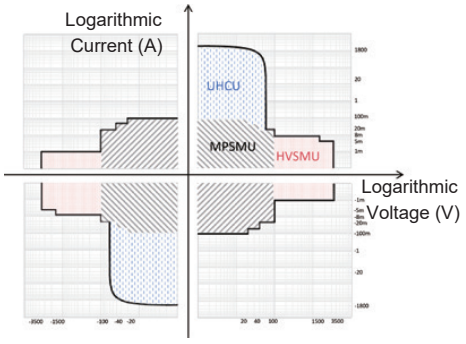
STE221-35-200,
STE221-35-200C
Drain/Collector Power Supply IV Operating Range

STE221-35-200	IV: 3500V/200A
STE221-35-200C	IV: 3500V/200A, CV: 10MHz, Qg



STE221-35-600,
STE221-35-600C
Drain/Collector Power Supply IV Operating Range

STE221-35-600	IV: 3500V/600A
STE221-35-600C	IV: 3500V/600A, CV: 10MHz, Qg



STE221-35-1800
STE221-35-1800C
Drain/Collector Power Supply IV Operating Range

STE221-35-1800	IV: 3500V/1800A
STE221-35-1800C	IV: 3500V/1800A, CV: 10MHz, Qg

Featured Product Recommendations

STE221 Series Power Device Analyzer

Measurable Parameters and Charts for MOSFETs

parameter	
BV_{DSS}	Drain-Source Breakdown Voltage
I_{DSS}	Drain Leakage Current
$I_{GSS(+)}$	Gate Leakage Current (Forward Bias)
$I_{GSS(-)}$	Gate Leakage Current (Reverse Bias)
$V_{GS(th)}$	Gate Threshold Voltage (VGS=VDS)
$V_{GS(th)}$	Gate Threshold Voltage (Constant VDS)
gfs*	Transconductance
$R_{DS(on)}$	Drain-Source On-Resistance
$V_{DS(on)}$	Drain-Source On-Voltage
V_{SD}	Body Diode Forward Voltage
Rg	Internal Gate Resistance
Ciss	Input Capacitance
Coss	Output Capacitance
Crss	Reverse Transfer Capacitance
Qg	Total Gate Charge
Qgs	Gate-Source Charge
Qgd	Gate-Drain Charge
Vgs（pl）	Gate-Source Plateau Voltage7

Cueve

I_D-V_{DS}	ID-VDS Curves with Varying VGS
I_D-V_{GS}	ID-VGS Curve at Constant VDS
G_{fs}-V_{Gs}*	Gfs-Vgs Curve at Constant VDS
$R_{DS(on)}$-I_D	RDS(on) vs. ID Curves with Varying VGS
$R_{DS(on)}$-V_{GS}	RDS(on) vs. VGS Curve under Varying ID Conditions
V_{DS}-V_{GS}	ID-VDS and ID-VGS Curves
I_S-V_S	Forward Current Characteristics of Built-in Diodes
C-V	Capacitance-VDS Curves (Including Ciss, Coss, and Crss)
Qg-Vgs	Gate Charge－VGS Curve

Measurable Parameters and Charts for IGBTs

parameter	
BV_{CES}	Collector-Emitter Breakdown Voltage
I_{CES}	Collector Leakage Current
$I_{GES(+)}$	Gate Leakage Current (Gate Forward Bias)
$I_{GES(-)}$	Gate Leakage Current (Gate Reverse Bias)
$V_{GE(th)}$	Gate Threshold Voltage (VGE = VCE)
$V_{GE(th)}$	Gate Threshold Voltage (Constant VCE)
gfs*	Transconductance
VF	Freewheeling Diode Forward Voltage
Rg	Internal Gate Resistance
Cies	Input Capacitance
Coes	Output Capacitance
Cres	Reverse Transfer Characteristics
Qg	Total Gate Charge
Qgs	Gate-Emitter Charge
Qgc	Gate-Collector Charge
Vge(pl)	Gate-Emitter Plateau Voltage

Cueve

I_C-V_{CE}	IC-VCE Curves at Constant VGE
I_C-V_{GE}	IC-VGE Curve at Constant VCE
gfs-V_{GE}*	Gfs-VGE Curve at Constant VCE
V_{CE}-V_{GE}	VCE(sat) Collector Saturation Voltage
IF-VF	Freewheeling Diode Forward Characteristics
V_{CE}-V_{GE}	VCE-VGE Curve with Varying IC
C-V	Capacitance-VCE Curves (Including Cies, Coes, and Cres)
Qg-Vge	Gate Charge－VGE Curve

Featured Product Recommendations

STE221 Series Power Device Analyzer

Measurable Parameters and Charts for BJTs

parameter

I_{CEO}	Collector Cutoff Current
I_{EBO}	Emitter Cutoff Current
hft*	DC Current Gain
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage
$V_{BE(sat)}$	Base-Emitter Saturation Voltage
$V_{BE(on)}$	Base-Emitter Turn-on Voltage
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage
$V_{(BR)EBO}$	Collector-Base Breakdown Voltage

graphics

I_C-V_{CE}	IC-VCE Curves with Varying IB
hfe-Ic*	hfcl Curve at Constant VCE
V_{CE}-I_C*	VBE-IC Curve at Constant VCE

Measurable Parameters and Charts for Diodes

parameter

V_{DC}	DC Blocking Voltage
VF	Forward Voltage
IR	Reverse Current
C	Total Capacitance

graphics

I_F-V_F	Forward Characteristics
I_R-V_R	Reverse Characteristics
C-V	Capacitance-Reverse Voltage Characteristics

Measurable Parameters and Images of Components

Inductor

L	Inductance at Zero Bias Current
RDC	DC Resistance

Resistor

R	Resistance at a Specified Voltage

Shunt Resistor

R	Resistance at a Specified Current

Capacitor

parameter

C	Capacitance at Zero Bias Voltage
$C_{(biased)}$	Voltage Coefficient of Capacitance
Leak	Leakage Current
$R_{(insulation)}$	Insulation Resistance

graphics

C_V	Capacitance-Voltage Characteristics

Connector

parameter

$R_{(contact)}$	Contact Resistance
BV	Withstanding Voltage
Leak	Leakage Current
$R_{(insulation)}$	Insulation Resistance
$C_{(insulation)}$	Insulation Capacitance

graphics

R-I	Contact Resistance and Conduction Current

Cable

parameter

C	Capacitance
$R_{(insulation)}$	Insulation Resistance
$R_{(conduction)}$	Conduction Resistance

graphics

R-I	Contact Resistance and Conduction Current

Featured Product Recommendations

STE221 Series Power Device Analyzer

Measurable Parameters and Images of Components

Relay

parameter

$R_{(contact)}$	Contact Resistance
$R_{(coil)}$	Coil Resistance
$R_{(open\ contacts)}$	Insulation Resistance Between Open Contacts
$R_{(coil\text{-}contact)}$	Insulation Resistance Between Coil and Contacts
$V_{(pick\text{-}up)}$	Pull-in / Set Voltage
$V_{(drop\text{-}out)}$	Drop-out / Reset Voltage
$I_{(operating)}$	Operating Current
$C_{(open\ contacts)}$	Capacitance Between Open Contacts
$C_{(coil\text{-}contact)}$	Capacitance Between Coil and Contacts

graphics

R-I	Conduction Resistance and Conduction Current

Optocoupler

parameter

VF	LED Forward Voltage
IR	LED Reverse Current
CT	Total LED Capacitance
BV_{CEO}	Detector Collector-Emitter Breakdown Voltage
BV_{ECO}	Detector Emitter-Collector Breakdown Voltage
I_{CEO}	Detector Collector Dark Current
Cce	Detector Collector-Emitter Capacitance
$V_{CE(sat)}$	Detector Collector-Emitter Saturation Voltage
CS	Input-Output Capacitance
RS	Insulation Resistance
B_{VS}	Insulation Voltage

graphics

I_F-V_F	Forward Current vs. Forward Voltage
I_{FP}-V_{FP}	Pulsed Forward Current vs. Pulsed Forward Voltage
I_C-V_{CE}	Collector Current vs. Collector-Emitter Voltage
I_C-I_F	Collector Current vs. Forward Current
C_{ce}-V_{CE}	Collector-Emitter Capacitance vs. Collector-Emitter Voltage

Solid-State Relay

parameter

VE	LED Forward Voltage
VR	LED Reverse Voltage
$IF_{(on)}$	LED Operating Current
$IF_{(off)}$	LED Turn-off Current
$R_{(on)}$	On-resistance
$I_{(leak)}$	Off-state leakage current
$C_{(out)}$	Output capacitance
$C_{(iso)}$	I/O Capacitance
$R_{(iso)}$	I/O Isolation Resistance

graphics

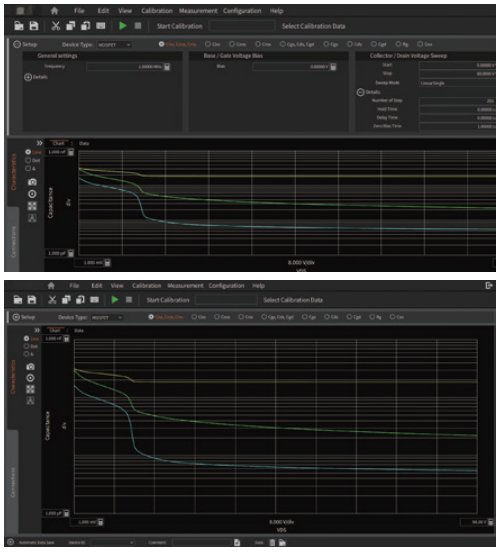
I_F-V_F	Forward Current vs. Forward Voltage
I_L-V	Output Current vs. Output Voltage
$I_{(off)}$-V_L	Off-State Leakage Current vs. Load Voltage
$C_{(out)}$-V_L	Output Capacitance vs. Load Voltage

Featured Product Recommendations

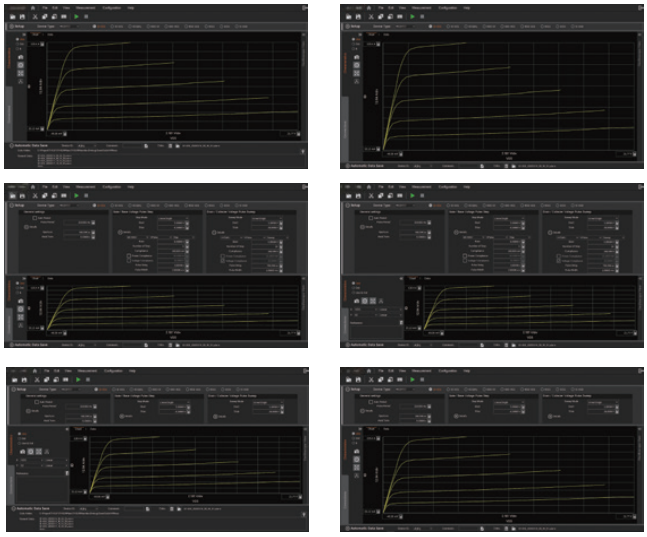
STE221 Series Power Device Analyzer

Product Feature Interface

CV

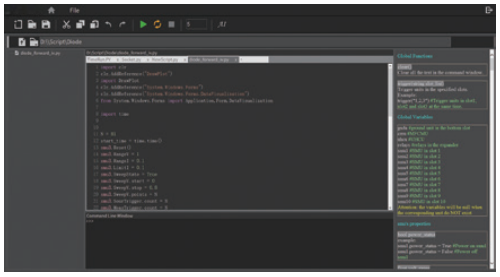


IV



QG

TSB

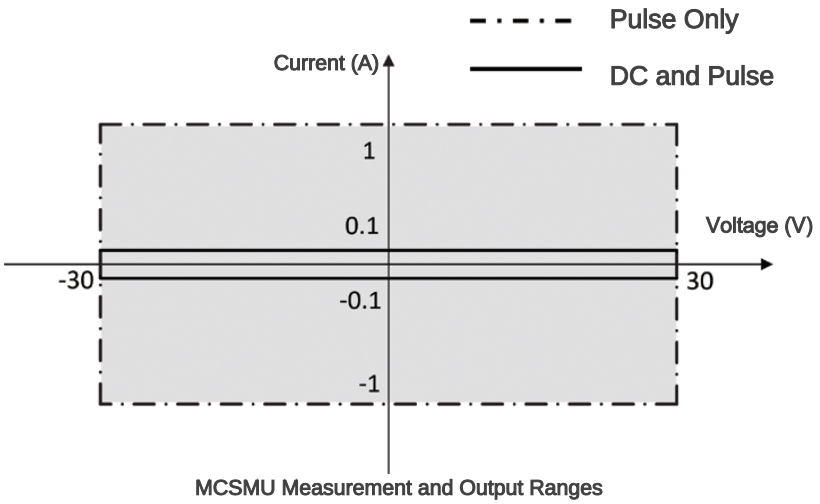


Featured Product Recommendations

STE221 Series Power Device Analyzer

Technical Parameters

MCSMU			
Voltage Range, Resolution, and Accuracy			
Voltage Range	Output/Measurement Resolution	Output/Measurement Accuracy (% + mV + mV)	Maximum Current
200mV	200nV	±(0.06 + 0.14 + Io x 0.05)	1A
2V	2μV	±(0.06 + 0.6 + Io x 0.5)	1A
20V	20μV	±(0.06 + 3 + Io x 5)	1A
40V	40μV	±(0.06 + 3 + Io x 10)	1A
Current Range, Resolution, and Accuracy	Output/Measurement Resolution	Output/Measurement Accuracy (% + A + A)	Maximum Voltage
10μA	10pA	±(0.06+ 1E-8 + Vo x 1E-10)	30V
100μA	100pA	±(0.06 + 2E-8 + Vo x 1E-9)	30V
1mA	1nA	±(0.06 + 2E-7 + Vo x 1E-8)	30V
10mA	10nA	±(0.06 + 2E-6 + Vo x 1E-7)	30V
100mA	100nA	±(0.06 + 2E-5 + Vo x 1E-6)	30V
1A	1uA	±(0.4 + 2E-4 + Vo x 1E-5)	30V
Typical Resolution	6½位		
Maximum Voltage	±30V		
Minimum Current	10pA		
Maximum Pulse Duty Cycle	5% (When the peak exceeds 100 mA)		
Minimum Pulse Width	10μs		
Maximum Pulse Width	100ms (When the peak exceeds 100 mA)		
Maximum DC Current	±100mA		
Maximum Pulse Peak Value	±1A		
Maximum Pulse Base Value	±50mA (When the peak exceeds 100 mA)		

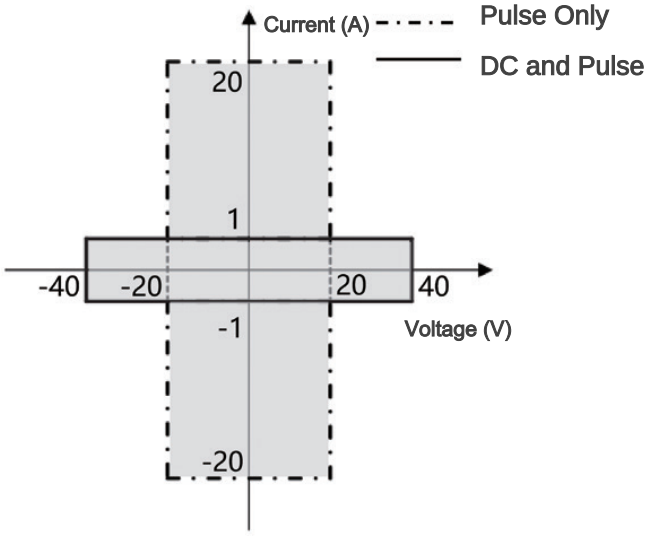


MCSMU Measurement and Output Ranges

Featured Product Recommendations

STE221 Series Power Device Analyzer

HCSMU			
Voltage Range, Resolution, and Accuracy			
Voltage Range	Output/Measurement Resolution	Output/Measurement Accuracy (% + mV + mV)	Maximum Current
200mV	200nV	±(0.06 + 0.6 + Io x 0.05)	20A
2V	2μV	±(0.06 + 0.6 + Io x 0.5)	20A
20V	20μV	±(0.06 + 3 + Io x 5)	20A
40V	40μV	±(0.06 + 3 + Io x 10)	1A
Current Range, Resolution, and Accuracy	Output/Measurement Resolution	Output/Measurement Accuracy (% + A + A)	Maximum Voltage
10μA	10pA	±(0.06+ 1E-8 + Vo x 1E-10)	40V
100μA	100pA	±(0.06 + 2E-8 + Vo x 1E-9)	40V
1mA	1nA	±(0.06 + 2E-7 + Vo x 1E-8)	40V
10mA	10nA	±(0.06 + 2E-6 + Vo x 1E-7)	40V
100mA	100nA	±(0.06 + 2E-5 + Vo x 1E-6)	40V
1A	1μA	±(0.4 + 2E-4 + Vo x 1E-5)	40V
20A	20μA	±(0.4 + 2E-3+Vo x 1E-4)	20V
Typical Resolution	6½ digits		
Maximum Voltage	±40V		
Minimum Current	10pA		
Maximum Pulse Duty Cycle	1% (When the peak exceeds 1A)		
Minimum Pulse Width	50μs		
Maximum Pulse Width	1ms (When the peak exceeds 1A)		
Maximum DC Current	±1A		
Maximum Pulse Peak Value	±20A		
Maximum Pulse Base Value	±100mA (When the peak exceeds 1A)		

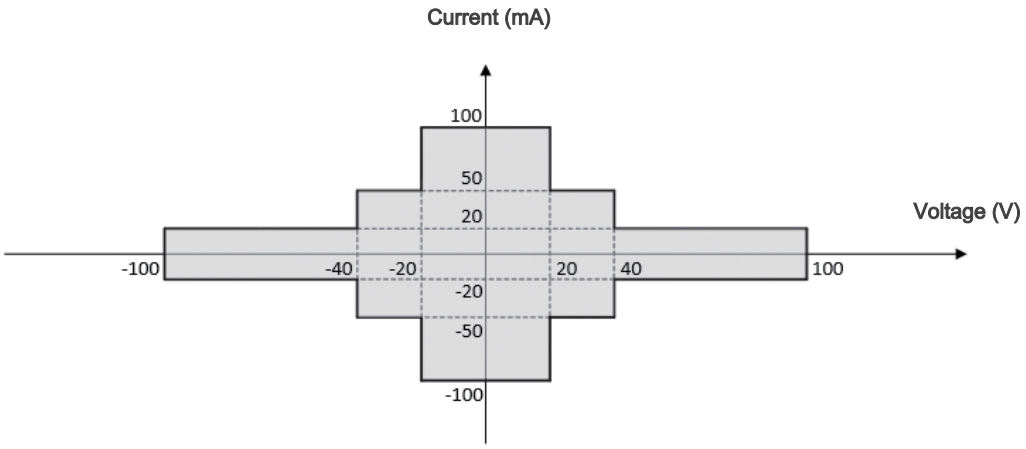


HCSMU Measurement and Output Ranges

Featured Product Recommendations

STE221 Series Power Device Analyzer

MPSMU			
Voltage Range, Resolution, and Accuracy			
Voltage Range	Output/Measurement Resolution	Output/Measurement Accuracy (% + mV + mV)	Maximum Current
100mV	100nV	±(0.06 + 0.14 + Io x 0.05)	100mA
1V	1μV	±(0.06 + 0.6 + Io x 0.5)	100mA
10V	10μV	±(0.06 + 3 + Io x 5)	100mA
100V	100μV	±(0.012 + 2.5 + Io x 10)	20mA(≥40V) 50mA(≤40V) 100mA(≤20V)
Current Range, Resolution, and Accuracy	Output/Measurement Resolution	Output/Measurement Accuracy (% + A + A)	Maximum Voltage
10nA	10fA	±(0.1 + 1E-12 + Vo x 1E-14)	100V
100nA	100fA	±(0.05 + 2E-11 + Vo x 1E-13)	100V
1μA	1pA	±(0.05 + 1E-10 + Vo x 1E-12)	100V
10μA	10pA	±(0.04 + 2E-9 + Vo x 1E-11)	100V
100μA	100pA	±(0.03 + 3E-9 + Vo x 1E-10)	100V
1mA	1nA	±(0.03 + 6E-8 + Vo x 1E-9)	100V
10mA	10nA	±(0.03 + 2E-7 + Vo x 1E-8)	100V
100mA	100nA	±(0.04 + 6E-6 + Vo x 1E-7)	100V(≤20mA) 40V(≤50mA) 20V(≤100mA)
Typical Resolution	6½ digits		
Maximum Voltage	±100V		
Minimum Current	10fA		

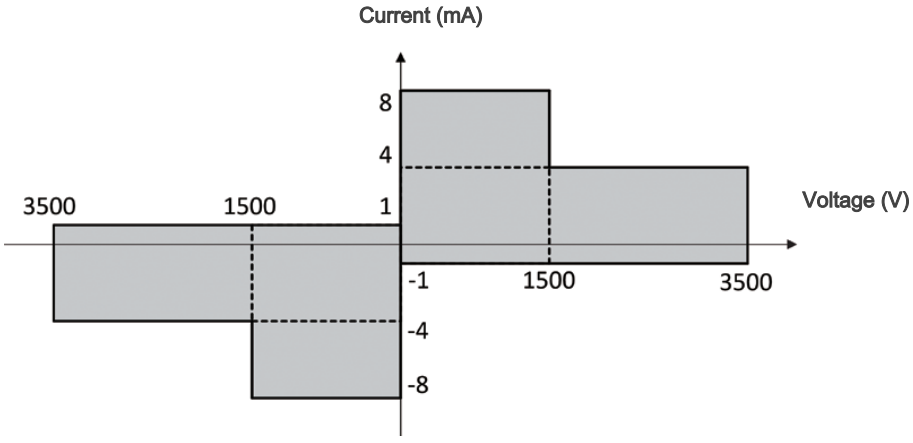


MPSMU Measurement and Output Ranges

Featured Product Recommendations

STE221 Series Power Device Analyzer

HVSMU			
Voltage Range, Resolution, and Accuracy			
Voltage Range	Output/Measurement Resolution	Output/Measurement Accuracy ±(% + mV)	Maximum Current
200V	200uV	±(0.03+40)	8mA
500V	500uV	±(0.03+100)	8mA
1500V	1.5mV	±(0.03+300)	8mA
3500V	3.5mV	±(0.03+600)	4mA
Current Range, Resolution, and Accuracy	Output/Measurement Resolution	Output/Measurement Accuracy (% + A + A)	Maximum Voltage
10nA	10fA	±(0.1 + 1E-9 + Vo x 8E-12)	3500V
1μA	1pA	±(0.05 + 1E-9 + Vo x 8E-12)	3500V
100μA	100pA	±(0.03 + 3E-9 + Vo x 1E-11)	3500V
10mA	10nA	±(0.03 + 2E-7+ Vo x 1E-9)	1500V
Typical Resolution	6½ digits		
Maximum Voltage	±3500V		
Minimum Current	10fA		



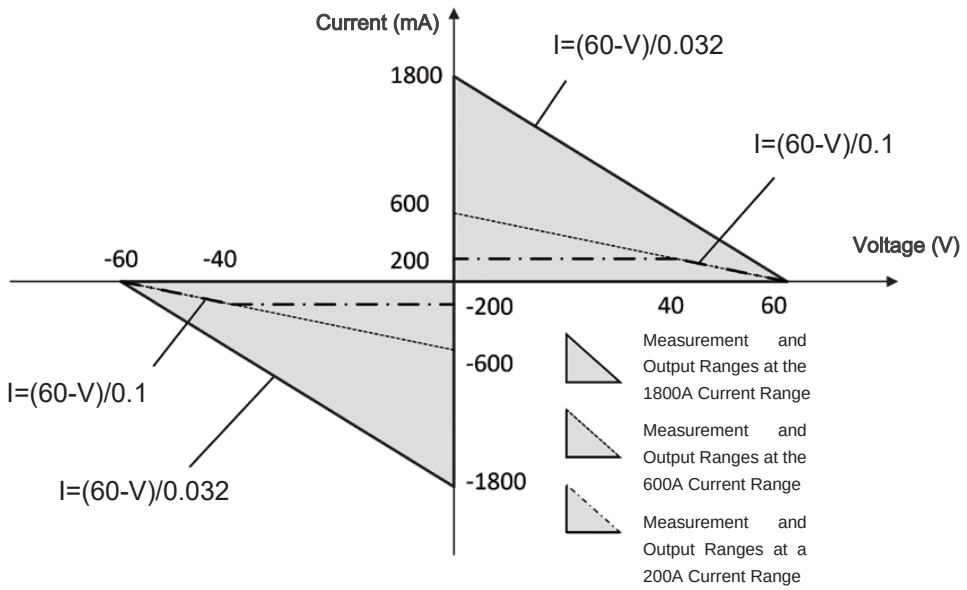
HVSMU Measurement and Output Ranges

Featured Product Recommendations

STE221 Series Power Device Analyzer

MFCMU		
Frequency	Frequency Range	1kHz-10MHz
	Minimum Frequency Resolution	1mHz
	Frequency Accuracy	±0.008%
AC Level	Level Range	0-1V
	Resolution	0.1mVrms
	Precision	±(10%*Set Voltage+2mV)
DC Bias	Scope	0-±25V
	Resolution	1mV
	Accuracy	1%* Set Voltage+8mV
Output Impedance		100Ω
Test Client Configuration		The Four Beginnings (Paired)
Test Time		0.05plc-100plc(1plc=20ms)
Capacitance	Display Range	0.00001pF-9.99999F
	Maximum Accuracy	0.1%

UHCU			
Voltage Range, Resolution, and Accuracy			
Voltage Range	Measurement Resolution	Output Resolution	Output/Measurement Accuracy ±(% + mV)
60V	100μV	200μV	±(0.2+10)
6V(Measurement Only)	10μV	------	------
Current Range, Resolution, and Accuracy	Measurement Resolution	Output Resolution	Output/Measurement Accuracy (% + A + A)
200A	500μA	1mA	±(0.6 + 0.3 + 0.01*Vo)
600A	500μA	1mA	±(0.6 + 0.3 + 0.01*Vo)
1800A	2mA	4mA	±(0.8 + 0.9 + 0.02*Vo)
Maximum Pulse Duty Cycle	0.4% (600A Measurement Range)；0.1% (1800A Measurement Range)		
Minimum Pulse Width	10μs		
Maximum Pulse Width	1ms (600A Measurement Range)；500μs (1800A Measurement Range)		
Maximum Pulse Peak Value	200A、600A、1800A		
Pulse Resolution	2μs		



UHCU Measurement and Output Ranges

Featured Product Recommendations

STE221 Series Power Device Analyzer

HVMCU	
Maximum Output Specifications	
+ 3500V/4mA	+ 1500V/8mA

Peak Output Specifications	
Voltage Range	**Peak Power**
±2200V	600W
±1500V	900W

Voltage Range, Resolution, Accuracy				
Voltage Range	**Set Resolution**	**Measurement Resolution**	**Set Precision[1,2,3]± (%+V)**	**Measurement Accuracy[1,2]± (%+V)**
±2200V	3mV	3mV	± (5+20)	± (0.8+1.8)
±1500V	1.5mV	3mV	± (5+20)	± (0.8+1.8)

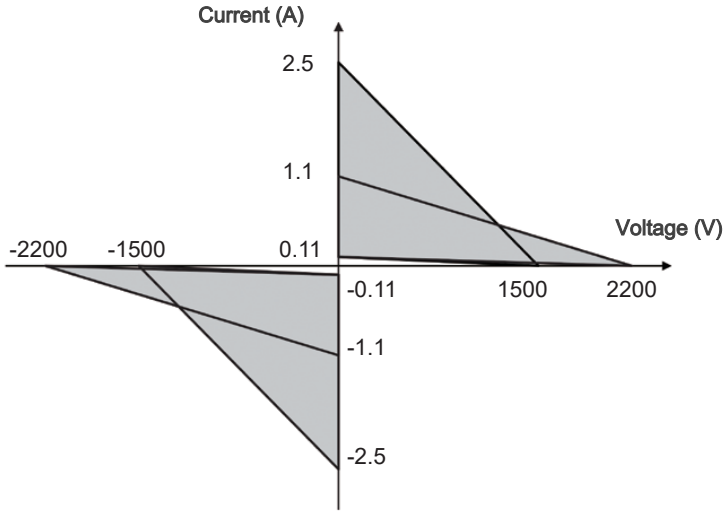
1: Measurement Accuracy: ± (6% of reading + fixed voltage offset)
2: Accuracy Definition Conditions: Tested using a 100 µs pulse in the 1.1 A and 2.5 A ranges; tested using a 1 ms pulse in the 100 mA range.
3: Setting Accuracy: Defined under open-circuit conditions.

Current Range, Resolution, Accuracy[1,2]		
Current Range	**Measurement Resolution**	**Measurement Accuracy: ±(% + A + A)**
±2.5A	4µA	± (0.9+4E-3+Vo×3E-7)
±1.1A	4µA	± (0.9+4E-3+Vo×3E-7)
±110mA	200nA	± (0.9+2E-4+Vo×3E-7)

1: When the current exceeds 1.1 A, the manufacturer provides additional performance specifications or parameter limits.
2: The relevant accuracy or characteristics are valid under the condition that an average is taken across 20 sampling points.

Pulse Width and Resolution		
Output Range	**Pulse Width**	**Resolution**
1500V/2.5A	10µs-100µs	2µs
2200V/1.1A	10µs-100µs	2µs
2200V/110mA	10µs-1ms	2µs

Supplementary Characteristics (HVMCU Charging Capacitor: 0.22 µF)	
Output Resistance Range	**Nominal Value**
1500V/2.5A	600Ω
2200V/1.1A	2000Ω
2200V/110mA	20000Ω



HVMCU Measurement and Output Ranges

Featured Product Recommendations

STE221 Series Power Device Analyzer

Model Module Configuration

Slot Number	STE221-35-20	STE221-35-20C	STE221-35-200	STE221-35-200C	STE221-35-600	STE221-35-600C	STE221-35-1800	STE221-35-1800C
0	GNDU	GNDU	GNDU	GNDU	GNDU	GNDU	GNDU	GNDU
1	MPSMU	MPSMU	MPSMU	MPSMU	MPSMU	MPSMU	MPSMU	MPSMU
2	Empty	MFCMU	Empty	MFCMU	Empty	MFCMU	Empty	MFCMU
3	MCSMU	MCSMU	MCSMU	MCSMU	MCSMU	MCSMU	MCSMU	MCSMU
4	Empty	MCSMU	Empty	MCSMU	Empty	MCSMU	Empty	MCSMU
5	HCSMU	HCSMU	MCSMU	MCSMU	MCSMU	MCSMU	MCSMU	MCSMU
6			MCSMU	MCSMU	MCSMU	MCSMU	MCSMU	MCSMU
7	HVSMU	HVSMU	HVSMU	HVSMU	HVSMU	HVSMU	HVSMU	HVSMU
8								
9	Empty / MCSMU (Optional Features HVMCU)							
10	Empty / MCSMU (Optional Features HVMCU)							