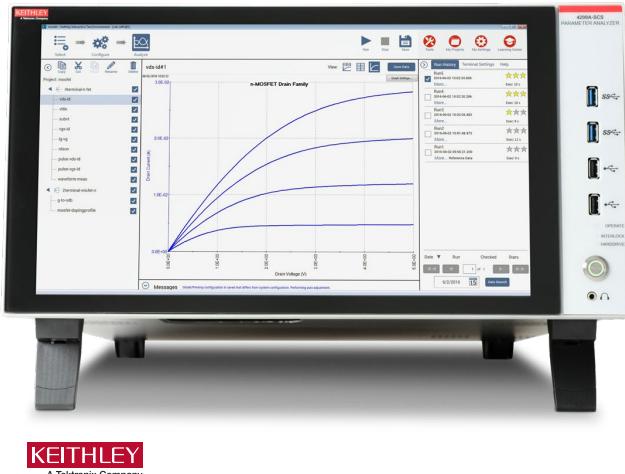


4200A-SCS Parameter Analyzer

Datasheet



KEITHLEY
A Tektronix Company

See your innovations come to life. The 4200A-SCS is a customizable and fully-integrated parameter analyzer that provides synchronized insight into current-voltage (I-V), capacitance-voltage (C-V), and ultra-fast pulsed I-V characterization. The highest performance parameter analyzer, the 4200A-SCS accelerates semiconductor, materials, and process development.

The 4200A-SCS Clarius™ GUI-based Software provides clear, uncompromised measurement and analysis capability. Furnished with embedded measurement expertise and hundreds of ready-to-use application tests, Clarius Software enables you to dig deeper into your research with speed and confidence.

The 4200A-SCS Parameter Analyzer is completely customizable and fully upgradable, so you can add the instruments you need now – or later. With the 4200A-SCS Parameter Analyzer, making connections to your bold discoveries has never been easier.

Key Performance Specifications

I-V Source Measure Units (SMUs)

- ± 210 V/100 mA or ± 210 V/1 A modules
- 100 fA measure resolution
- 10 aA measure resolution with optional preamp
- 10 mHz – 10 Hz very low frequency capacitance measurements
- 100 μ F load capacitance
- 4-quadrant operation
- 2 or 4-wire connections

C-V Multi-frequency Capacitance Units (CVUs)

- AC impedance measurements (C-V, C-f, C-t)
- 1 kHz – 10 MHz frequency range
- ± 30 V (60 V differential) built-in DC bias, expandable to ± 210 V (420 V differential)
- Simple switching between I-V and C-V measurements with the optional CVIV Multi-Switch

Pulsed I-V Ultra-fast Pulse Measure Unit (PMU)

- Two independent or synchronized channels of high-speed pulsed I-V source and measure
- 200 MS/s, 5 ns sampling rate
- ± 40 V (80 V_{p-p}), ± 800 mA
- Transient waveform capture mode
- Arbitrary waveform generator for multi-level pulse waveform with 10 ns programmable resolution

High Voltage Pulse Generator Unit (PGU)

- Two channels of high-speed pulsed V source
- ± 40 V (80 V_{p-p}), ± 800 mA
- Arbitrary waveform generator Segment ARB® mode for multi-level pulse waveform with 10 ns programmable resolution

I-V/C-V Multi-Switch Module (CVIV)

- Easily switch between I-V and C-V measurements without re-cabling or lifting prober needles
- Move the C-V measurement to any terminal without re-cabling or lifting prober needles
- ± 210 V DC bias capable

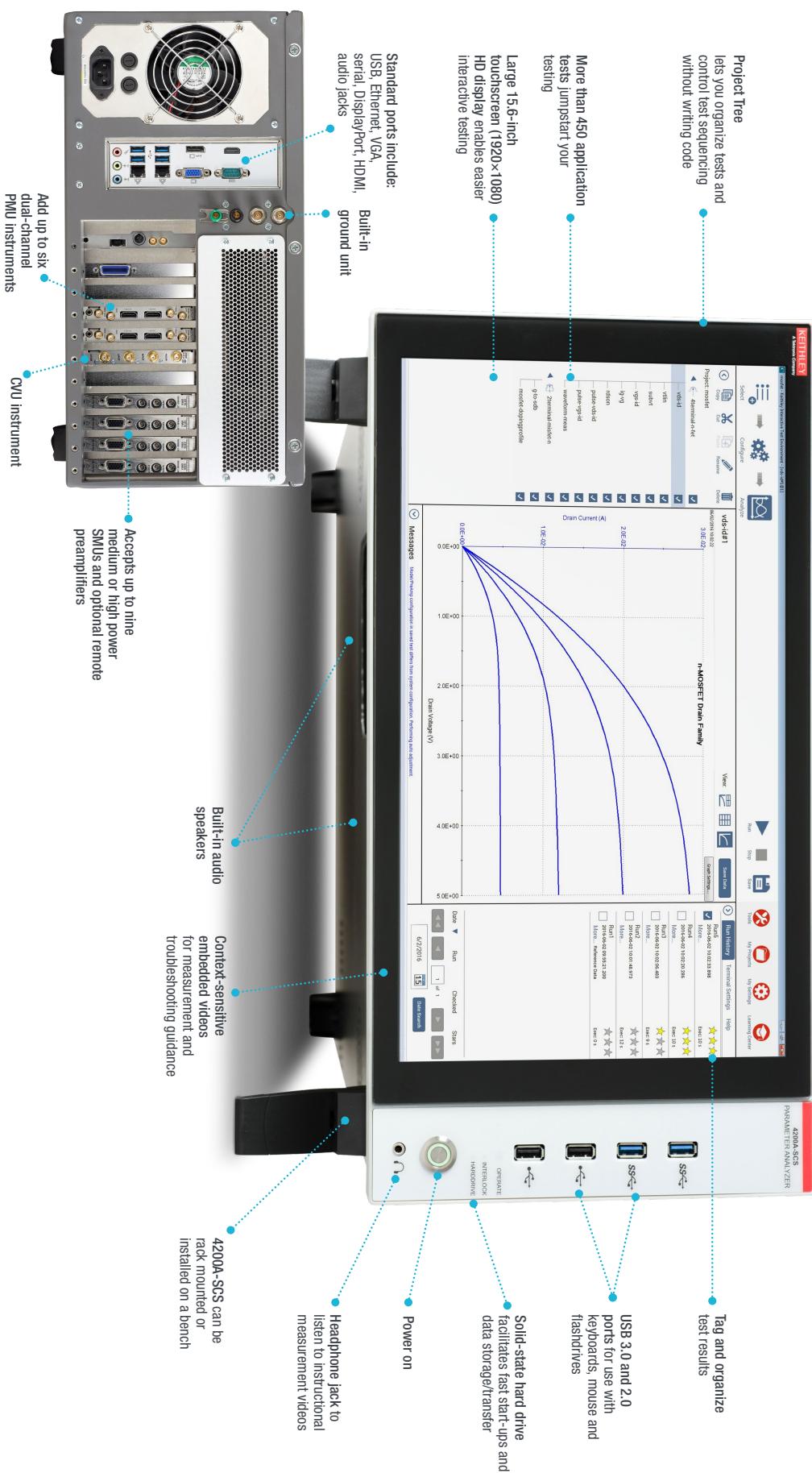
Remote Preamplifier/Switch Module (RPM)

- Automatically switches between I-V, C-V, and ultra-fast pulsed I-V measurements
- Extends current sensitivity of the 4225-PMU to tens of picoamps
- Reduces cable capacitance effects

Tektronix®

The Ultimate Parameter Analyzer for Materials, Semiconductor Devices and Process Development

Perform I-V, C-V and pulsed I-V characterization with speed, clarity and confidence with the powerful Clarius software.



4200A-SCS Instruments and Modules

Model	Description	Key Measurements	Range	Measure Resolution
4200-SMU	Medium Power Source-Measure Unit	<ul style="list-style-type: none"> • DC I-V • Very Low Frequency C-V • QSCV 	±100 mA, ±210 V	0.2 µV, 100 fA
4201-SMU	Medium Power SMU with increased low I stability		±1 A, ±210 V	
4210-SMU	High Power Source-Measure Unit		Extends current ranges for all SMUs	0.2 µV, 10 aA
4211-SMU	High Power SMU with increased low I stability			
4200-PA	Remote Preamplifier Module			
4210-CVU	Capacitance-Voltage Unit	<ul style="list-style-type: none"> • AC Impedance • C-V, C-f, C-t 	<ul style="list-style-type: none"> • 1 kHz – 10 MHz • ±30 V built-in DC bias (60 V differential) • ±210 V DC bias with SMUs • 100 mV AC drive 	1 aF, 1 nS, 0.001 degree
4215-CVU	High Resolution Capacitance-Voltage Unit	<ul style="list-style-type: none"> • AC Impedance • C-V, C-f, C-t 	<ul style="list-style-type: none"> • 1 kHz – 10 MHz • ±30 V built in DC bias (60 V differential) • ±210 V DC bias with SMUs • 1 V AC drive 	1 kHz 1 aF, 1 nS, 0.001 degree
4200A-CVIV	I-V/C-V Multi-Switch Module	DC I-V and C-V with Automatic Switching	—	—
4225-PMU	Ultra-Fast Pulse Measure Unit	<ul style="list-style-type: none"> • Pulsed I-V • SegmentARB® Multi-level Pulsing • Transient Waveform Capture 	<ul style="list-style-type: none"> • ±40 V (80 V_{p-p}), ±800 mA • 200 MS/s simultaneous I and V measure • 2048 unique segments • 20 ns PW source only • 60 ns PW source/measure 	75 nA
4225-RPM	Remote Preamplifier/Switch Module	<ul style="list-style-type: none"> • Enables automatic switching between SMU, CVU and PMU 	Extends current range of 4225-PMU unit	200 pA
4220-PGU	High Voltage Pulse Generator Unit	<ul style="list-style-type: none"> • Pulsed Voltage Source • SegmentARB® Multi-level Pulsing 	<ul style="list-style-type: none"> • ±40 V (80 V_{p-p}) • 2048 unique segments 	—
Ground Unit	Built-in, Low Noise Ground Unit	—	<ul style="list-style-type: none"> • Triaxial connection: 2.6 A • Binding post: 9.5 A 	—

Example List of Extracted or Measured Parameters

CMOS transistor	Id-Vg, Id-Vd, Ig-Vg, Vth, Vtlin, Sub-Vt, Rds-on, breakdown, capacitance, QSCV, Low-frequency CV, self-heating reduction and more
BJT	Ic-Vc, Vcsat, Gummel plot, capacitance, βF, αF
Non-volatile Memory	Vth, endurance test, capacitance
Nanoscale	Resistance, Id-Vg, Id-Vd, Ic-Vc
Discrete components	Id-Vg, Id-Vd, Ic-Vc, V _{fdiode} , V _{rdiode} , capacitance
Materials	Van der Pauw, 4-point collinear resistivity, Hall Effect
Photovoltaics	I _{forward} , I _{reverse} , HiR, LoR
Power device	Pulsed Id-Vg, pulsed Id-Vd, breakdown
Reliability	NBTI/PBTI, charge pumping, hot carrier injection, V-Ramp, J-Ramp, TDDB