

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 nA 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 probe needles
- Move the C-V measurement to any terminal without re-cabling or lifting probe 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.

Project Tree
lets you organize tests and control test sequencing without writing code

More than 450 application tests jumpstart your testing

Large 15.6-inch touchscreen (1920x1080) HD display enables easier interactive testing

Standard ports include: USB, Ethernet, VGA, serial, DisplayPort, HDMI, audio jacks

Built-in ground unit

Add up to six dual-channel PMU instruments

CWU instrument

Accepts up to nine medium or high power SMUs and optional remote preamplifiers

Built-in audio speakers

Context-sensitive embedded videos for troubleshooting guidance

4200A-SCS can be rack mounted or installed on a bench

Headphone jack to listen to instructional measurement videos

Power on

Solid-state hard drive facilitates fast start-ups and data storage/transfer

USB 3.0 and 2.0 ports for use with keyboards, mouse and flashdrives

Tag and organize test results

Run ID	Run Name	Run Status	Run Date	Run Time	Run Location	Run User	Run Comment
10000000000000000000	10000000000000000000	Completed	10/10/2016	10:10:10	10000000000000000000	10000000000000000000	10000000000000000000
10000000000000000000	10000000000000000000	Completed	10/10/2016	10:10:10	10000000000000000000	10000000000000000000	10000000000000000000
10000000000000000000	10000000000000000000	Completed	10/10/2016	10:10:10	10000000000000000000	10000000000000000000	10000000000000000000
10000000000000000000	10000000000000000000	Completed	10/10/2016	10:10:10	10000000000000000000	10000000000000000000	10000000000000000000
10000000000000000000	10000000000000000000	Completed	10/10/2016	10:10:10	10000000000000000000	10000000000000000000	10000000000000000000

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			
4210-SMU	High Power Source-Measure Unit		±1 A, ±210 V	
4211-SMU	High Power SMU with increased low I stability			
4200-PA	Remote Preamplifier Module		Extends current ranges for all SMUs	
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	• 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