

KEYSIGHT TECHNOLOGIES (AGILENT HP)

4156A

The Keysight Technologies (formerly Agilent / HP) 4156A is a high-precision semiconductor parameter analyzer engineered for accurate device characterization. It comes equipped with four built-in High-Resolution Source/Monitor Units (HRSMUs), two Voltage Source Units (VSUs), two Voltage Monitor Units (VMUs), and a Ground Unit (GNDU), delivering sub-femtoampere current measurement and microvolt-level voltage control for precise parametric testing.

SPECIFICATIONS

General

Interfaces	GPIB (HP-IB), Parallel (Centronics), External I/O, Interlock, Analog Monitor Output
Display	9-inch color CRT

Physical

Power Supply	90 V to 264 V AC, 47 Hz to 63 Hz, 450 VA maximum power consumption
Operating Temperature	10°C to 40°C °C
Dimensions (W×H×D)	426 mm × 235 mm × 524 mm mm
Weight	21 kg kg

System Configuration & Architecture

Mainframe Module Capacity	4x HRSMU, 2x VSU, 2x VMU, 1x GNDU
Maximum Supported Source Monitor Units	6 (with 41501A/B expander)
Ground Unit Output	0 V ±100 µV

Source Monitor Unit Specs

Maximum Voltage Range (HRSMU)	±100 V
Maximum Current Range (HRSMU)	±100 mA
Voltage Programming Resolution (HRSMU)	100 µV (on 2 V range)
Current Programming Resolution (HRSMU)	10 fA (on 10 pA range)
Voltage Measurement Resolution (HRSMU)	2 µV (on 2 V range)
Current Measurement Resolution (HRSMU)	1 fA (on 10 pA range)
Maximum Output Power per Channel (HRSMU)	2 W
Sensing Configuration Type	Kelvin (4-wire connection)
Guarding and Shielding Method	Triaxial guarding

High-Resolution SMU Performance

Minimum Current Measurement Range	10 pA
Minimum Current Resolution	1 fA
Minimum Voltage Resolution	2 μV

Voltage Source Unit Specs

Voltage Source Unit (VSU) Channels	2
VSU Output Voltage Range	±20 V
VSU Voltage Resolution	20 mV
VSU Maximum Output Current	100 mA

Voltage Monitor Unit Specs

Voltage Monitor Unit (VMU) Channels	2
VMU Voltage Resolution	0.2 μV (on 0.2 V range)

Measurement Modes & Sweep Capabilities

Supported Sweep Modes	Linear, Logarithmic, Single, Double, Pulsed Sweep
Maximum Sweep Step Count	1001 points
Hold Time Range	0 to 655.35 s
Delay Time Range	0 to 65.535 s
Pulse Width Range	0.5 ms to 100 ms
Pulse Period Range	5 ms to 1 s
Minimum Sampling Interval	60 μs
Maximum Sampling Points	10001 points
Stress Force Time Range	1 ms to 65535 s

Inputs, Outputs & Interfacing

Triaxial Connector Count	8x HRSMU triaxial connectors (4x Force, 4x Sense), 1x GNDU triaxial connector
Ground Unit Connector Type	Triaxial
Safety Interlock Connector	6-pin connector
Analog Monitor Output Ports	2 channels (BNC connectors)
Trigger Input and Output Ports	BNC connectors

Software, Control & Data Analysis

Built-in Storage Media Type	3.5-inch Floppy Disk Drive (FDD)
Math Function Support	Built-in mathematical and automated parameter extraction analysis

Electrical, Physical & Environmental

Storage Temperature Range	-30°C to 60°C
---------------------------	---------------

SMU Specifications

Built-in HRSMU Channels	4
-------------------------	---

System Configuration

Total Mainframe Channels	8 (4 x HRSMU, 2 x VSU, 2 x VMU)
--------------------------	---------------------------------

System Expansion

Supported Expander Unit	HP / Agilent 41501A or 41501B
-------------------------	-------------------------------

Measurement Capabilities

Quasi-Static C-V (QSCV) Support	Yes
VMU Measurement Modes	Single-ended, Differential
Ranging Modes	Auto, Manual

Power Requirements

Line Power Frequency	47 Hz to 63 Hz
Line Power Voltage	90 V to 132 V, 198 V to 264 V (automatic selection)

Operating Specifications

Recommended Warm-up Time	40 minutes
--------------------------	------------

Measurement Settings

Integration Time Modes	Short, Medium, Long
------------------------	---------------------

Ground Unit (GNDU)

GNDU Maximum Sink Current	1.6 A
GNDU Output Voltage	0 V $\pm$ 100 μ V

Interfaces

External Keyboard Connector Type	Mini-DIN 6-pin (PS/2)
GP-IB Compliance Standards	IEEE 488.1, IEEE 488.2

Storage

Supported Floppy Disk Formats	3.5-inch (1.44 MB MS-DOS / 720 KB LIF)
-------------------------------	--

Compliance

Safety Compliance Standards	CSA C22.2 No. 1010.1, IEC 61010-1, EN 61010-1
EMC Compliance Standards	EN 55011 Group 1 Class A, EN 50082-1

TECHNOLOGY

Semiconductor Parameter Analysis

APPLICATIONS

Semiconductor Device Characterization and Parametric Testing

