Agilent N9201A
Array Structure Parametric Test Option

Technical Overview

Introduction

The decreasing size of features on integrated circuits (45 nm and smaller) is driving the need for new parametric test capabilities. These capabilities must accommodate the advanced test structures developed for fast yield ramp up in process integration as well as process monitoring in semiconductor manufacturing.

High-throughput measurement of high-volume parametric data is required to shorten the time for ramping up the process yield. This is accomplished by statistically analyzing and correcting the cause of wide range of process performance variations across a 300 mm wafer. Advanced test structures, addressable array test structures that contain address decoder circuitry, and a large number of test array elements with fewer probing pads and silicon area have been developed by major semiconductor manufacturers for this purpose.

The Agilent N9201A Parametric Test Option offers high throughput parametric measurement capability for a variety of addressable array test structures (e.g. passive array, active array and clocked latched active array) with synchronized mixed operation of DC SMUs and digital outputs. Digital outputs (parallel, serial, or clock signals) are used for the address decoder that is built into addressable array test structures. This allows the selection of the specific array element to be measured. DC SMUs measure the DC voltage and current parameters of selected array elements.

The DC power source is used for applying the power supply voltage (Vdd) to the address decoder logic circuitry that is built-in the addressable array test structures.

The N9201A is able to provide a maximum of 48 signal lines using the extended path ports of the 4070/4080 test head. This can be any combination of available SMUs, digital outputs, and DC power source outputs. The signals pass through the 4070/4080 test head down to the probe card.

The N9201A is controlled by SPECS (Semiconductor Process Evaluation Core Software), a test shell environment for the 4070 Series and 4080 Series. The N9201A can be provided as an upgrade for existing 4070 Series and 4080 Series users.

Measurement functions

DC current, DC voltage, and digital output

DC measurement

Spot and sweep

Measurement unit:* High speed medium power SMU (MPSMU); 8 SMU minimum configuration; SMUs may be added in increments of one up to a maximum of 40 SMUs

*Note: High Speed MPSMU specification is specified at the connectors of the equipment's front panel

Range of operation: -42 V to 42 V; -200 mA to 200 mA

Minimum resolution: 100 µV; 5 pA

Maximum voltage between common and ground: ± 42 V

Ground unit (GNDU) specification

Output voltage: 0 V ± 100 µV

Maximum sink current: 0.5 A

Output terminal/connection: Triaxial connector, Kelvin (remote sensing)

Voltage range, resolution and accuracy

Voltage range	Force resolution	Measure resolution	Force accuracy[1]	Measure accuracy[2]	Maximum current
±2 V	100 µV	100 µV	±(0.03% + 900 µV)	±(0.03% + 700 µV)	200 mA
±20 V	1 mV	1 mV	±(0.03% + 4 mV)	±(0.03% + 4 mV)	200 mA
±40 V	2 mV	2 mV	±(0.03% + 7 mV)	±(0.03% + 8 mV)	[2]
±100 V	5 mV	5 mV	±(0.04% + 15 mV)	±(0.03% + 20 mV)	[3]

[1] ± (% of output/measurement value + offset voltage)

[2] 200 mA (Vout ≤ 20 V), 50 mA (20 V <Vout ≤40 V), Vout is the output voltage in volts.

[3] 200 mA (Vout ≤ 20 V), 50mA (20 V <Vout ≤40 V), 20 mA (40 V <Vout ≤42 V). Vout is the output voltage in volts.

Current range, resolution and accuracy

Current range	Force resolution	Measure resolution	Force accuracy[1]	Measure accuracy[2]	Maximum voltage
±100 nA	5 pA	5 pA	±(0.12% + 50 pA + 200 fA x Vo)	±(0.1% + 30 pA + 200 fA x Vo)	42 V
±1 µA	50 pA	50 pA	±(0.12% + 400 pA + 2 pA x Vo)	±(0.1% + 200 pA + 2 pA x Vo)	42 V
±10 µA	500 pA	500 pA	±(0.12% + 5 nA + 20 pA x Vo)	±(0.1% + 3 nA + 20 pA x Vo)	42 V
±100 µA	5 nA	5 nA	±(0.12% + 40 nA + 200 pA x Vo)	±(0.1% + 20 nA + 200 pA x Vo)	42 V
±1 mA	50 nA	50 nA	±(0.12% + 500 nA + 2 nA x Vo)	±(0.1% + 300 nA + 2 nA x Vo)	42 V
±10 mA	500 nA	500 nA	±(0.12% + 4 µA + 20 nA x Vo)	±(0.1% + 2 µA + 20 nA x Vo)	42 V
±100 mA	5 µA	5 µA	±(0.12% + 50 µA + 200 nA x Vo)	±(0.1% + 30 µA + 200 nA x Vo)	[2]
±200 mA	10 µA	10 µA	±(0.12% +100 µA + 400 nA x Vo)	±(0.1% + 60 µA + 400 nA x Vo)	[3]

[1] ±(% of output/measurement value + offset current A (fixed part determined by the output/measurement range + the proportional part that is multiplied by Vo))

[2] 42 V (Io ≤ 20 mA), 40 V (20 mA <Io ≤50 mA), 20 V (50 mA <Io ≤100 mA), Io is the output current in Amps.

[3] 42 V (Io ≤20 mA), 40 V (20 mA <Io ≤50 mA), 20 V (50 mA <Io ≤200 mA), Io is the output current in Amps.

Digital output

Digital output characteristics: 16 digital output lines maximum when the N9201A has 8 or less SMUs; 32 digital output lines maximum when the N9201A has more than 8 SMUs

Output voltage: High voltage: 0.3 V to 8.0 V Low voltage: 0.0 V

Maximum output current: ± 64 mA

Minimum state transition time: 20 µs

DC power source**

1 channel and GND

Output rating: 0.03 V to + 10.25 V

Programming accuracy: Voltage: 0.1% ± 20 mV

Current limit: 0.15% ± 20 mA

**Note: DC power source specification is specified at the connectors of the equipment's front panel

General specifications

Accuracy is specified at
Temperature: 23°C ± 5°C

Humidity: 5% to 70% RH

Warm up time: at least 40 minutes.

Self-calibration: Within one hour after calibration

Integration time: Medium or long

Operation and storage
Operating temperature range: 5°C to 30°C

Operating humidity range: 5% to 70% (noncondensing)

Storage temperature -20°C to 50°C (< 80% RH, noncondensing)

Power requirements
Allowable voltage range at maximum current:
100 Vac – 120 Vac @ 20 A
200 Vac – 240 Vac @10 A

Regulatory and standards compliance
EMC:
EMC Directive 89/336/EEC, 93/68/EEC

IEC/EN61326-1

ICES-001

AS/NZS 2064.1

Safety:
Low voltage directive
73/23/EEC, 93/68/EEC

IEC/EN61010-1

CSA C22.2 No. 61010-1

Certification marking:
CW, c CSA us, C-tick, ICES/NMB-001

Dimensions
System cabinet: 600 mm (W) by 1050 mm (D) by 1818 mm (H)

Weight
System cabinet: Approximately 360 kg (including 40 SMUs, 32 digital outputs, 1 DC power source, and required cables)

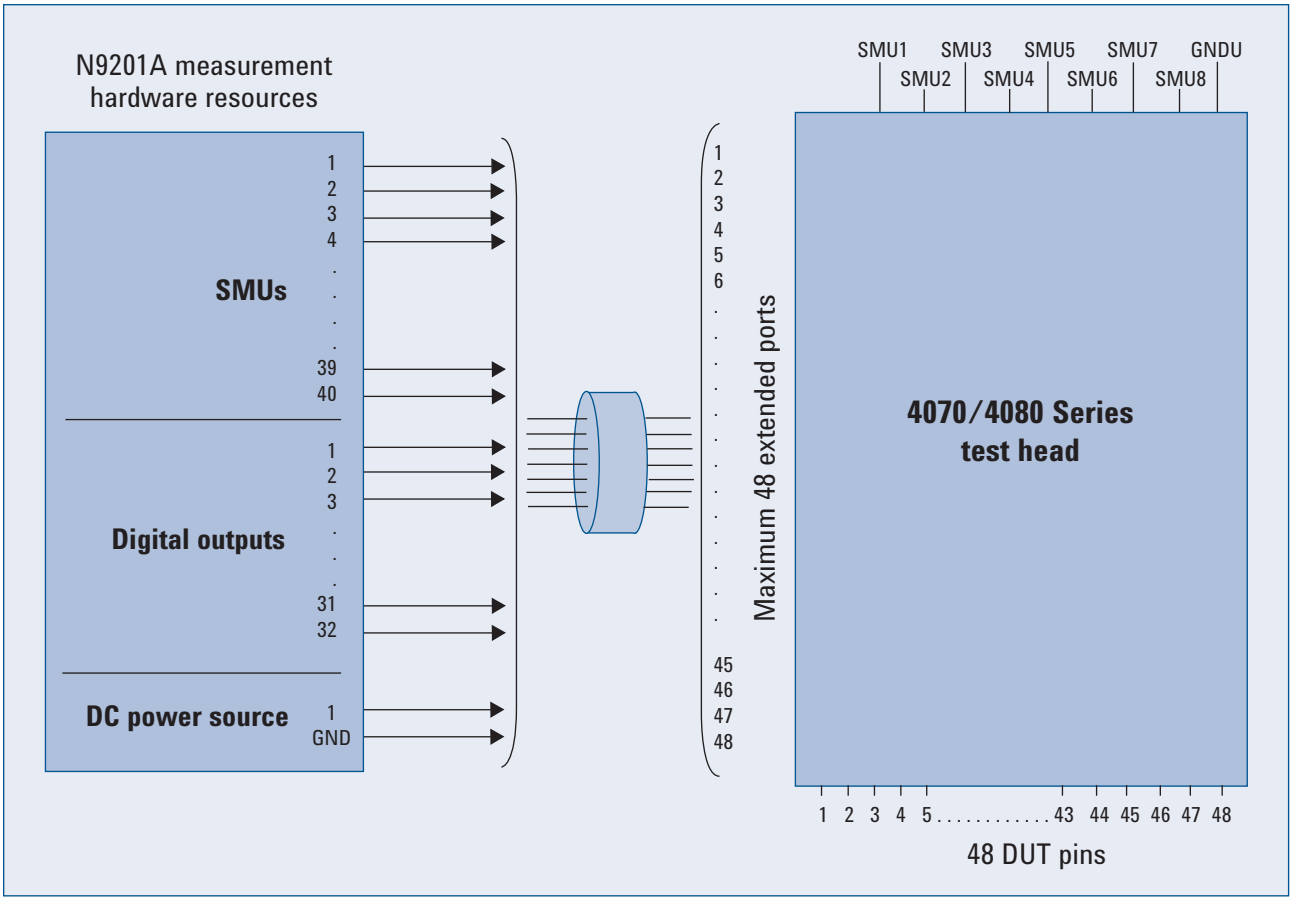
Recommended probers and probe cards*

Probers:
- ACCRETECH UF3000
- TEL P12XL

Probe cards:
- JEM (Japan electronic materials Co.)
- MJC (Micronics Japan Co.)
- K&S (Kulicke & Soffa Industries Inc.)
- FormFactor

* Please contact your local sales representative regarding the latest information on recommended probers and probe cards.

N9201A-to-4070/4080 Series connection capabilities



Web Resources

N9201A Web Site

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