

# 2303, 2304A

## High Speed Power Supplies



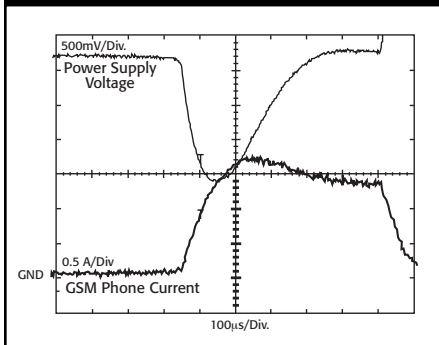
- Optimized for battery-powered device testing
- Ultra-fast transient response to load changes
- 5A continuous output
- Pulse peak, average, and baseline current measurements
- 100nA DC current sensitivity

### MODEL 2304A

- 100W output (20V @ 5A)
- Sinks up to 3A

### MODEL 2303

- 45W output (15V @ 3A, 9V @ 5A)
- Sinks up to 2A



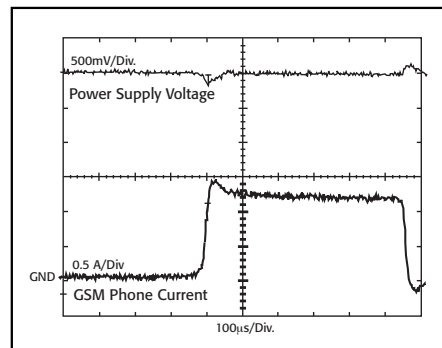
Typical Power Supply. Transient response with 4.5m (15 ft) of cable and 1Ω/lead between source and GSM phone load.



Model 2303 or 2304A rear panel

response during a large load change by minimizing the maximum drop in voltage and recovering to within 100mV of the original voltage in 40µs or less.

When a portable device such as a cellular phone switches from standby mode to the full power mode of operation, the current draw on the power supply can change by as much as 1000%. While a battery's voltage will decrease by the value of the voltage drop across the battery's low internal resistance, a conventional power supply will have a significant voltage drop (more than one volt) and take milliseconds to recover to the original voltage level. For portable devices that operate at full power only for short intervals, the full power event is over before a conventional power supply can recover. For example, cellular phones designed in accordance with the GSM cellular phone standard transmit and receive information in 576µs pulses.



Keithley's High Speed Power Supply. Transient response with 4.5m (15 ft) of cable and 1Ω/lead between source and GSM phone load.

The Model 2303/2304A Power Supplies provide both voltage control and power consumption monitoring for automated testing of portable, battery-operated devices. These power supplies are optimized for testing battery-operated, wireless communication devices such as cellular phones that undergo substantial load changes for very short time intervals. These power supplies exhibit outstanding voltage stability during pulse load changes and can simultaneously measure load currents, even if they are short pulses. In addition, this family of power supplies can sink current and, thus, take on the characteristics of a discharged, rechargeable battery for testing chargers and charger-control circuitry.

### 5A Output Capacity

Both the 100W Model 2304A and the 45W Model 2303 can supply 5A (at 20V for the Model 2304A and 9V for the Model 2303) to serve the peak pulse loading requirements of battery-operated devices. In both instruments, the maximum current of 5A can be delivered continuously. The Model 2304A can supply up to 20V DC while the Model 2303 can supply up to 15V.

### Fast Response to Load Changes

Keithley's High Speed Power Supplies are designed to simulate the current drive capacity of a battery. The power supplies simulate a battery's

performance of the device-under-test will be compromised by the power supply. If the power supply voltage drops below the threshold of the phone's low-battery detection circuitry for a sufficient amount of time, the phone will turn off during testing, giving a false indication of a failed device.

The Models 2303/2304A's fast transient response to large load changes will enable test engineers to test their portable products properly and eliminate false failures due to conventional power supplies with slow response times. In this way, the power supplies ensure maximum production throughput when testing portable devices.

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# 2303, 2304A

## Ordering Information

**2304A**  
High Speed Precision Readback Power Supply (100W)

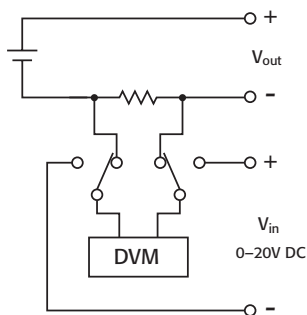
**2303**  
High Speed Precision Readback Power Supply (45W)

**2303-PJ**  
High Speed Precision Readback Power Supply (45W, 500mA range replaces 5mA range)

Extended warranty, service, and calibration contracts are available.

## Accessories Supplied

User and service manuals, CS-846 output connectors mating terminal



# High Speed Power Supplies

## Fast Measurements for Power Consumption Analysis

As manufacturers of portable devices strive to extend battery life and the length of time between recharges, power consumption has become an important performance indicator. Therefore, in production testing, accurate peak power and average power measurements are critical. These measurements are complicated by the fact that wireless telecommunication devices draw full load current in short pulses. The Models 2303/2304A's pulse readback measurement mode makes it possible to capture peak and average values on pulses as short as 60µs. This allows the power supply to power a device-under-test and determine its current consumption to qualify the device for its specified power consumption.

In addition to making measurements on short pulses, the 2303/2304A power supplies can measure a current pulse peak or a current pulse train that is as long as 833ms. For random pulse trains that have periods longer than 833ms, the power supplies have a special long integration mode that can make an average current measurement on up to 60s of data. To capture low current pulses from very low power devices, the Model 2303-PJ provides pulse measurement on both the 5A and 500mA ranges.

## Accurate Low Current Measurements

The Models 2303/2304A are well-suited for making fast, accurate measurements of sleep and standby mode currents because they are based on Keithley's expertise in low current measure-

## Model 2303/2304A Block Diagram showing DC DVM measurement capability

ment technologies. With 100nA resolution, the power supplies offer the precision needed to monitor the low sleep mode currents in today's products and future products. They can also measure these low currents with 0.2% basic accuracy.

## High Current Sinking Capacity

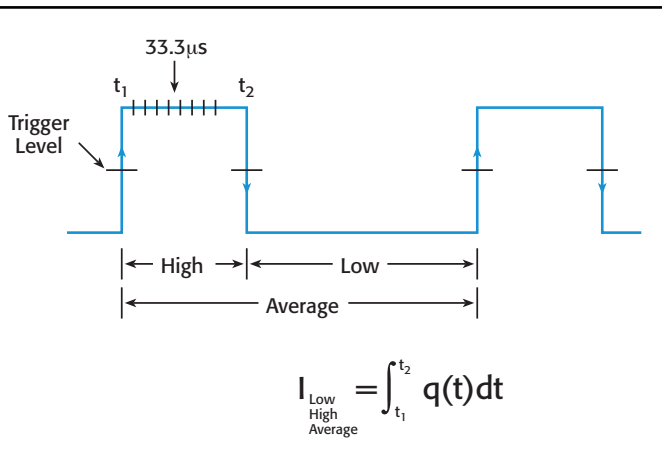
Keithley's power supplies can act as an electronic load and sink as much as 3A (Model 2304A) and 2A (Model 2303), so they can simulate a discharged rechargeable battery. Therefore, they can be used to verify the performance of a portable device's charger. The power supplies' current dissipation capacity allows them to test even high-current fast chargers.

## Independent Digital Voltmeter Inputs

While many programmable power supplies offer output readback capabilities, Keithley's power supplies are the only instruments available that also offer a set of DVM inputs. These inputs allow the Model 2304A to measure signals from 0 to +20V (0 to +15V for the Model 2303) anywhere in the test system with the same rated accuracy as the voltage readback. The DVM and the power source can operate simultaneously. For many applications, the power supplies' built-in DVM eliminates the expense and space that a separate voltage measurement instrument would require.

## Remote Display Option

If the Model 2303 or 2304A must be mounted in a location in which the display is not readily visible, an optional Model 2304-DISP Display Module can be mounted at a more convenient point, then plugged into the power supply unit. The display module also includes all instrument controls, so that the power supply can be operated remotely from the more accessible location.



The Models 2303/2304A perform a continuous integration to make peak, average, and baseline measurements on complex load current waveforms. Integration times can be programmed with 33.3µs resolution.

## ACCESSORIES AVAILABLE

2304-DISP	Remote Display
<b>CABLES</b>	
7007-1	Shielded IEEE-488 Cable, 1m (3.3 ft)
7007-2	Shielded IEEE-488 Cable, 2m (6.6 ft)
SC-182	Low-Inductance Coaxial Cable (42nH/ft)
<b>RACK MOUNT KITS</b>	
4288-1	Single Fixed Rack Mount Kit
4288-2	Dual Fixed Rack Mount Kit
<b>OTHER</b>	
2303-EW	1 Year Warranty Extension
2304-EW	1 Year Warranty Extension
2304A-EW	1 Year Warranty Extension
KPC-488.2	IEEE-488.2 Interface Card for the ISA Bus
KPCI-488	IEEE-488 Interface/Controller for the PCI Bus
KUSB-488	IEEE-488.2 USB-to-GPIB Interface Adapter
TestPoint	Test Development Software

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