

DIGITAL SUPER MEGOHMMETER DSM-8104, DSM-8542

Super Megohm Testers



DSM-8104 (Single-Channel) HIOKI - CR **DSM-8542** 6 6 (Four-Channel) -Options Supporting Measurements such as Surface and Volume Resistivity

Power Supply Unit PSU-8541

Fast, Highly Accurate Measurement

 $3 \times 10^{16} \Omega$ and 0.1 fA Current Resolution

A High Insulator with the Capacitance (the Ingredient of a Condenser) can also be Measured. It is Accurately Test for Current with 0.1 fA Resolution

For practical measurement applications in semiconductor and electronic materials research, a broad range of voltage settings, high 0.1 fA resolution, automatic resistivity calculation, measurement data memory for large values and histogram display of selected measurement results are included as standard features.

Fast measurement for improved productivity

- Capacitive insulating materials are quickly charged by bulk charging terminals to 250 V (at 50 mA) or to 1,000 V (at 10 mA) using a high-capacity, low-noise power source.
- The 100 Ω input impedance remains constant regardless of measurement voltage.
- Measurement sampling time can be set from 2 to 300 ms to support high speed measurements.
- Measurement time is significantly shortened by a patented averaging method (optimization of average time of acceptance of measurement current).
- The installed charging terminals and handler interface make system support easy.
- Supports data collection on a PC.
- Model DSM-8542 provides high-speed simultaneous measurements on up to four channels when used together with the optional, specialpurpose PSU-8541 Power Supply Unit.
- Charging power supply PSU-8541 provides high- and low-voltage channels: 10 V at 600 mA for low-voltage channels, and 250 V at 600 mA to 1,000 V at 120 mA for high-voltage channels, with excellent stability during low-voltage output.
- The PSU-8541 includes charging terminals for up to 20 channels.

Measures ultra-low currents by applied voltage

• Measures current flow with 0.1 fA resolution using any specified applied voltage from 0.1 V to 1,000 V in 0.1 V steps.

2.	027	'8E-	-134	A
MES.V: SAMPL: DELAY:		S SE		FIØ
DISE M		SAVE	RCAL	RSEN

Data display with 0.1 fA resolution (10 pA range).

Provides highly reliable measurements

- Contact check function prevents false positive judgments due to poor contact with work.
- Measurement sequence program ensures measurements are taken under the same conditions every time.



• When measured voltage differs from a preset voltage by more than 3%, a voltage check error notification is issued.

Numerous functions enhance operating efficiency

• Use in combination with the optional SME-8310/8311 Flat Sample Test Fixtures, or with the optional SME-8330 Fluid Resistivity Cell to measure and automatically display surface resistivity or volume resistivity, respectively.



Combined with the optional SME-8310 Flat Sample Test Fixture

• Stores 1,000 measurement data points for searching and display.

MODE: A Role: Line/Brige	783:3.7901E+14 784:1.8688E+15 785:3.9960E+15 786:4.7678E+15 786:4.7678E+15 788:1.1569E+16
DOWN L	789:1.7172E+16 P TOP END

Store, search and display data for up to 1,000 measurements.

- Displays percentage and deviation from a reference value.
- Displays histogram of selected results.
- Select from up to ten types of measurement sequences according to the object to be measured.
- Displays the remaining time for each stage of a measurement sequence.
- Measurement settings are displayed together.

DSM-8104



DSM-8542



Shows the measurement results, conditions and time remaining for the measurement sequence.

Reduced IR Measurement Time for Capacitive Components

The time required to measure the insulation resistance of capacitors and capacitive cables has been a bottleneck to productivity improvement – until now. The DSM-8104/8542 eliminates this bottleneck with superb measurement efficiency provided by the combination of a high-current power source and a highly sensitive, low-input-impedance current meter.

Safety Considerations

- When using a covered measurement fixture (such as the optional SME-8360 Chip Capacitor Test Fixture or SME-8310/8311 Flat Sample Test Fixtures with the optional SME-8350 Shield Enclosure), connected to the instrument with the optional interlock cable, measurement voltage is disabled whenever the lid is opened.
- A red warning lamp indicates whenever measurement voltage of 30 volts or more is present.
- Measurement condition settings are stored even during power outages, although measurement voltage must be applied manually upon recovery.

Many Interfaces

• GP-IB, RS-232C and handler interfaces are included as standard.



Use the DSM-8104 in Manufacturing, Tesngand Research

DSM-8104 (Single-Channel) Application Examples



High-Speed Measurement by Charging with the Charge Terminal



Capacitors are charged before measuring

Research insulation Material using an Electrode Combination

• Evaluate insulating materials using the SME-8310 Flat Sample Test Fixture.



Collect Manual Measurement Data un a Notebook Computer

- A measurement system can be constructed using RS-232C or optional LAN interface. Use your PC to take measurements and process test reuslts.
- The GP-IB and handler interfaces provided in the instrument support measurement systems that include jigs (handlers).



Results of manual measurements are accumulated on the notebook computer.

- Test Withstand Voltage of Semiconductor Thin Film (Insulation Breakdown)
- High-sensitivity current measurement is used for withstand voltage testing of semiconductor thin film. (A strong electric field is applied even at low voltage .)
- Insulation breakdown voltage is determined by measuring current flow while gradually increasing the applied voltage.



Test Withstand Voltage of Semiconductor Thin Film (Insulation Breakdown)

• Measured values can be categorized and displayed in a bar graph indicating the number of occurrences of each value. The display scale is adjusted automatically so the maximum count always appears at the full display width. Category threshold values can be set as needed.

	MODE:Ω	+
C101.00E+ C201.00E+ C301.00E+ C401.00E+ C501.00E+	15 73 14 12 13 0	

Application Examples

- Measuring insulation resistance of electronic components Capacitors, connectors, switches, cables and etc.
- Evaluating insulating materials
 - Coatings, washing fluids, some types of oil and etc.
- Testing anti-static products Plastics, paint, paper, tile, etc.
- Measuring migration coefficients

Use the DSM-8542 to Enhance Electronic Component Automated Production Lines

DSM-8542 (Four-Channel) Application Examples

High-Speed Measurement of Capacitors by Charging with the Charge Terminal

• Twenty channels are used to charge (with current limiting) in parallel using the same voltage as used for measurement. Each terminal is independently current limited.

DSM-8542





PSU-8541

Charging Output Terminals

Capacitor Measurement Example



- * Each capacitor is charged for the specified time before connection to a measurement terminal for leakage current measurement.
- * Because there are 20 charging channels and four measurement channels, the time required for charging prior to leakage current measurement can be shorted to one fifth of the time required when using measurement terminals only, increasing measurement throughput by a factor of five.

- Evaluate of Insulating Materials by Four-Point Simultaneous High-Speed Measurement
- For reliability testing of insulation deterioration due to migration of metallic ions in printed circuit boards, measurements are taken simultaneously on four channels, and short intermittent peak current is detected by high-speed measurement (repeated maxima).

Insulating Material Measurement Example



Comb-shaped pattern on measurement sample



Voltage Application Time

Automatic Testing System Connection Example



* The description applies to one of the four channels.

DSM-8104 (Single-Channel), DSM-8542 (Four-Channel)

Specifications (Accuracy guaranteed for 1 year, Post-adjustment accuracy guaranteed for 1 year)

Measurement Ranges

DC Measurement Capabilities

Current Measurement			
Measurement Range Name	Maximum Display	Resolution	Accuracy
10 pA	9.9999 pA	0.1 fA	±(3.0% of rdg +1.2% of range)
100 pA	99.999 pA	1.0 fA	±(1.5% of rdg +0.6% of range)
1 nA	999.99 pA	10 fA	±(0.6% of rdg +0.6% of range)
10 nA	9.9999 nA	100 fA	±(0.4% of rdg +0.5% of range)
100 nA	99.999 nA	1 pA	±(0.4% of rdg +0.5% of range)
1 µA	999.99 nA	10 pA	±(0.4% of rdg +0.5% of range)
10 µA	9.9999 µA	100 pA	±(0.4% of rdg +0.5% of range)
100 µA	99.999 µA	1 nA	±(0.4% of rdg +0.5% of range)

* Measurement time is 300 ms, with Average Processing enabled * Within 23 ±5°C, 85% rh or less, with self-calibration (@1 min. intervals)

* Input impedance is constant at 100Ω

Resistance Measurement Capabilities (1,000 V measurement voltage)

Resistance Measurement		
Range of Measurement	Measurement Range Name	Fundamental Accuracy
1 × 10 ¹⁴ ~3 × 10 ¹⁶ (Open-circuit)	10 pA	±4.0% of rdg
1 × 10 ¹³ ~1 × 10 ¹⁴	100 pA	±4.0% of rdg
1 × 10 ¹² ~1 × 10 ¹³	1 nA	±2.0% of rdg
1 × 10 ¹¹ ~1 × 10 ¹²	10 nA	±0.8% of rdg
1 × 10 ¹⁰ ~1 × 10 ¹¹	100 nA	±0.6% of rdg
$1 \times 10^{9} \sim 1 \times 10^{10}$	1 μA	±0.6% of rdg
1 × 10 ⁸ ~1 × 10 ⁹	10 µA	±0.6% of rdg
1 × 10 ⁷ ~1 × 10 ⁸	100 µA	±0.6% of rdg

* Measurement time is 300 ms, with Average Processing enabled * Within 23 ±5°C, 85% rh or less, with self-calibration (@1 min. intervals) * Measured values in each measurement range are derived by dividing the measurement voltage by the measured current. Fundamental accuracy applies to the fundamental portion of the measurement accuracy, and depends on the voltage and resistance values.

Measurement Time Setting

Delay	0~9,999 ms
Sampling Time Time Setting	2~300 ms
Power Supply (Line) Frequency Setting	1~15 PLC

* PLC denotes the period of one cycle on the commercial power line.

Voltage Generator

Setting Voltage Accuracy and Resolution

Setting Voltage Range	Resolution	Accuracy
0.1~250.0 V	100 mV	±(0.1% of setting +150 mV)
251~1,000 V	1 V	±(0.1% of setting +400 mV)

Current Limiter

Setting Voltage Range	Current Limit Value
0.1~250.0 V	50 mA
	10 mA
	5 mA
251~1,000 V	10 mA
	5 mA

* Current for the voltage sources provided for measuring and charging is as follows

Current limit value = measurement current + charging power The charging power supply can be set on or off.

* The current setting error is ±10% of setting

Measurement Check Function

Voltage Monitor	Monitors output voltage and checks that it is within 3% of the
	specified voltage.
	When the output voltage is more than 3% from the specified voltage,
	the V.CHK ON indicator blinks on the display, and a beep sounds.
Contact Check Function	When no contact is detected, the C.CHK ON indicator blinks on the display, and a beep sounds.
Capacitance Range for Contact Detection	Minimum: 0.5 pF, or at least 1/10th of the fixture value
Offset Range for Fixture Capacitance	Maximum: 100 pF (with 0.1 pF resolution)

Measurement Sequence Program Function

Ten types of discharge, charge, measure and measurement sequence discharge patterns can be programmed.
Setting Time: 0 to 999.9 s with 0.1 s resolution

Measurement Data Storage/Display Functions

Measurement Data	Up to 1,000 measurement values can be stored and scrolled
	sequentially on the display.
Histogram	Measurement values can be categorized and displayed with their sample counts
	in an on-screen bar graph. Up to ten category thresholds can be set as needed.

Auto-Resume, Calibration and Diagnostic Functions

	Settings and measured values are stored for automatic recovery
	after a power outage (except for auto voltage application).
Self-Calibration Function	Self-calibration of the A/D converter and current range is performed at specified intervals.
Self-Diagnostic Function	Self-diagnosis of the A/D converter, current range and internal
	microcontroller memory is performed.

Display Method	When a NO-G display, and a		ition is detected, the COMP.ON indicator blinks on the ounds.				
Comparison Method	Upper Limit Comparison: Measured Value > Upper Limit (GO decision = HI) Intermediate Comparison: Upper Limit ≥ Measured Value ≥ Lower Limit (GO decision = IN)						
	Lower Limit C	omparis	son: Measured Value < Lower Limit (GO decision = LO)				
Deviation/I	Percentage	e Mea	surement				
Percentage Measu	rement method	(Measu	ired Value – Reference Value) / Reference Value × 100				
Deviation Measurement Measure			red Value – Reference Value				
Surface/Volume	olume Resi	stivity	/ Measurement				
Surface/Vo	olume Resi	stivity	/ Measurement Settings				
Surface/Vo Surface Resistivit			, I				

rnal Control Interfac

I/O Functions	GP-IB Interface
	Handler Interface
	RS-232C Interface
	I

Measurement Channel Configuration (DSM-8542)

Number of Measurement Channels	Four Channels
Measurement Input Terminals Measurement Input [INPUT] Voltage Output [OUTPUT] Voltage Input [A (-), B (-)] Voltage Input [Ch1 (+), Ch2 (+), Ch3 (+), Ch4 (+)]	Four channels on the front panel (Hioki megohmmeter input connector) Four channels on the front panel (binding posts) Two channels on the rear panel (Round socket) Four channels on the rear panel (Round socket)
Channels, Separation	Channels 1 and 2 share connections Channels 3 and 4 share connections Channels 1 and 2 are separate from channels 3 and 4

General Specifications

Model	DSM-8104 (Single-Channel)	DSM-8542 (Four-Channel)						
Display	LCD (8 lines of 30 characters), with backlight (yellow-green LEDs)							
	High voltage warning indicator: Red LED I	ights at 30 V or more						
Input/Output	Hioki megohmmeter input connector	Hioki megohmmeter input connector						
Terminals	(INPUT)	$(INPUT \times 4)$						
	Binding posts	Binding posts						
	(GND, CHARGE, OUTPUT, GUARD)	(OUTPUT × 4)						
Operating Environment	Temperature 0 to 40°C, Humidity 85% RH or less							
Supply Voltage	100 V AC ±10% (standard), 115, 220 or 240 V AC ±10% (factory option), at 50/60 Hz							
Power Consumption	Approx. 55 VA							
Dimensions	Approx. 332 mm (13.07 in) W × 89 mm (3.50 in) H × 450 mm (17.72 in) D							
Mass	Approx. 6.7 kg (236.3 oz)	Approx. 7.0 kg (246.9 oz)						

Supplied Accessories

Power Cord	• •	• • •	• •	• •	•	• • •	• •	• •	• •	• •	•	••	• •	• •	1	
Instruction Ma	anual	• •	• •	• •	• •	• •	• •	••	••	• •	•	••	• •	••	1	

* Measurement leads are optional.

* Unless measurement leads are one meter long, the contact check function requires calibration.

Options

1 m (3.28 ft) long, red	0GE00002
1 m (3.28 ft) long, black	0GE00001
1 m (3.28 ft) long, red	0GA00007
1 m (3.28 ft) long, black	0GA00008
0.1 m (0.33 ft) long	DSM8104F
	1 m (3.28 ft) long, black 1 m (3.28 ft) long, red 1 m (3.28 ft) long, black

* Please inquire if you need measurement leads other than 1 m (3.28 ft) long.



DIGITAL SUPER MEGOHMMETER Order Code: DSM-8104 (1 ch) DSM-8542 (4 ch)

Note: RS-232C connection cable: The optional RS-232C Cable 9637 cannot be used with this product. Use a cross cable for connections as described in the instruction manual.

lectrodes/Shielded Enclosures

Options for Super megohm meters (for surface resistance or volume resistance measurement)

SURFACE/VOLUME RESISTANCE MEASUREMENT ELECTRODE SM9001



(8.78in), Mass: 2.5 kg (88.2oz) Cable length: 1 m (3.28 ft)

SM9002



Surface resistance can be easily measured by simply pushing the electrode against the specimen. It measures surface resistance Not CE Marked of anti-static related goods in combination of mainly Model SM-8213. Measure resistance up to $10^{11} \Omega$.

> Dimensions: φ 60mm (2.36in) × 50mm (1.97in) Lead length 1m (3.28ft)

> > Order Code: SME-8301

Electrode for plate samples SME-8310

Electrode for surface resistance SME-8301



Not CE Marked Sample of 100mm square by up to 8mm in thickness is measurable. The main electrode dia. is 50mm and inner & outer dia. of ring electrode are 70mm & 80mm respectively. Measurement voltage becomes "OFF" while the lid is open to ensure safety. A selector switch allows selection of voltage or surface resistivity.

> Dimensions: 215mm (8.46in) W × 78mm (3.07in)H × 165mm (6.50in)D Lead length 75cm (2.46ft)

Order Code: SME-8310

Weight electrode SME-8320 Not CF Marked

Photo is Combination with Shield box SME-8350

Shield box SME-8350



This is an electrode for plate sample for use together with SME-8350 shield box. This electrode enables extremely easy measurement of surface resistivity and volume of sample with coarse surface such as carpets, etc. The main electrode dia. is 50mm, and the ring electrode innerdia. and outer-dia. are 70mm and 80mm respectively.

Order Code: SME-8320 Note: Included: Banana clips ×2

This is used as a sample accommodation box during measurement of a high-insulation resistance samples, or inductive or capacitive samples to perform electromagnetic shielding.

Dimensions: 250mm (9.84in) W × 100mm (3.94in)H × 200mm (7.87in)D

Lead length 80cm (2.62ft) Order Code: SME-8350

Note: Includes rubber sheet

Standard resistor box SR-2

Not CE Marked This is a resistor box for calibration of the super megohmmeters

Max. voltage is 1,000 V DC and resistor value covers from 10 M Ω to 10,000 M Ω in 24 points.

Dimensions: 270mm (10.63in) W × 90mm (3.54in)H < 195mm (7.68in)D

Order Code: SR-2

Note: Includes inspection data sheet

Measurement (option) allows you to check the operation of the

Electrode for surface resistance SME-8302



An electrode distance: 4mm (0.16in) Dimensions: ϕ 40mm (1.57in) × 115mm (4.53in), Lead length 1m (3.28ft)

Electrode for plates SME-8311



small samples. Surface resistance can be measured by pressing the rubber tips at the tip onto the sample. Measure electrodes up to $10^{11} \Omega$ at 10mm intervals or greater. Order Code: SME-8302

Electrode for surface resistance of

curved samples such as resin and rubber

processed goods, TV cathode tubes or

Sample of 40~100mm square by up to 8mm in thickness is measurable. The main electrode dia. is 19.6mm and inner & outer dia. of ring electrode are 24.1mm & 28.8mm respectively. Measurement voltage becomes "OFF" while the lid is open to ensure safety.

The fundamental specifications are the same as SME-8310.

Dimensions: 215mm (8.46in) W × 78mm (3.07in)H (165mm (6.50in)D Lead length 75cm (2.46ft)

Order Code: SME-8311

Electrode for liquid samples SME-8330



Included: Connection cable 60cm (1.97ft) length (Red) 0GA00029 ×1 (Black) 0GA00030 ×1

Dimensions: ω 36mm (1 42in) × 140mm (5 51in)

Electrode for liquid samples which is electrically guarded. Total volume is 25ml. Capacitance between main and counter electrode is approx. 45pF. Electrode constant is approx. 500cm. Distance between both electrodes is 1mm. Outer dia. is 36mm, height is approx. 140mm. Measure resistance up to 1019 Ω (at 1000V) when used together with Model SM-8216.

Order Code: SME-8330

Note: Includes inspection data sheet

Electrode for chip capacitor SME-8360



For measuring the resistance of tip capacitors, with adjustable jig from 0mm to 11mm. When connected to the meter by an interlock cable, measurement voltage becomes "OFF" while the lid is open to ensure safety.

Dimensions: 200mm (7.87in) W \times 520mm (2.05in)H < 150mm (5.91in)D

Order Code: SME-8360



electrode to increase the reliability of measurement results.

PSU-8541

Low-Noise, High-Capacity Power Supply for Stable Charging Output

Specifications

Configuration

Constituents	No. of	Configuration	Remarks [Continuous
	Circuits		ratings in parentheses ()]
Voltage Generator A	-1		150.0 W (50 W) / 250 V
(HIGH)			120.0 W (50 W) /1,000 V
Voltage Generator B			6.0 W /10 V
(LO)	1		0.0 00 / 10 0
Current Control Circuit	4	Two circuits shared by	
(Measurement System)		two pairs	
(Charge System)	20	Five circuits shared by	
		four groups	

* High and low voltage amplifiers and current limiter connections are by internal terminal block (when external control not used).

* Either one or both of systems A and B may be earthed systems.

Voltage Generator – Setting Voltage Accuracy and Resolution

Setting Voltage Range	Current Capacity (continuous rating)	Setting Resolution	Accuracy
	(continuous rating)	Resolution	
Voltage Generator A			
(HIGH)			
0.1 to 250.0 V	Max. 600 mA	100 mV	±(0.1% of setting +150 mV)
	(200 mA)		
251 to 1,000 V	Max. 120 mA	1 V	±(0.1% of setting +400 mV)
	(50 mA)		,
Voltage Generator B			
(LO)			
0.1 to 10.0 V	Max. 600 mA	100 mV	±(0.1% of setting +150 mV)

* Values in parentheses () are continuous ratings of current capacity

• Current Limiter Configuration

Current Limit Value, Voltage Range	Voltage Range, Current Capacity, Current Limit Setting			Voltage Source, Current		
	Measurement	Charge	Measurement	Charge	All	Capacity
	System	System	System	System	Loads	
251~1,000 V	5 mA	5 mA	5 mA × 4	5 mA × 5 × 4	120 mA	120 mA (50 mA)
0.1~250.0 V	5 mA	5 mA	5 mA × 4	5 mA × 5 × 4	120 mA	600 mA
	5 mA	10 mA	5 mA × 4	10 mA × 5 × 4	220 mA	(200 mA)
	5 mA	25 mA	5 mA × 4	25 mA × 5 × 4	520 mA	
	5 mA	50 mA	5 mA × 4	50 mA × 2 × 4	420 mA	
	10 mA	5 mA	10 mA × 4	5 mA × 5 × 4	140 mA	
	10 mA	10 mA	10 mA × 4	10 mA × 5 × 4	240 mA	
	10 mA	25 mA	10 mA × 4	25 mA × 5 × 4	540 mA	
	10 mA	50 mA	10 mA × 4	50 mA × 2 × 4	440 mA	
	25 mA	5 mA	25 mA × 4	5 mA × 5 × 4	200 mA	
	25 mA	10 mA	25 mA × 4	10 mA × 5 × 4	300 mA	
	25 mA	25 mA	25 mA × 4	25 mA × 5 × 4	600 mA	
	25 mA	50 mA	25 mA × 4	50 mA × 2 × 4	500 mA	
	50 mA	5 mA	50 mA × 4	5 mA × 5 × 4	300 mA	
	50 mA	10 mA		10 mA × 5 × 4	400 mA	
	50 mA	25 mA	50 mA × 4	25 mA × 5 × 4	600 mA	
	50 mA	50 mA	50 mA × 4	50 mA × 2 × 4	600 mA	

* When overall load current exceeds the current capacity of the voltage source, its voltage drops. * Values in parentheses () are continuous ratings of current capacity.

* When the continuous load rating is exceeded, voltage of the voltage source drops.



Control

Controller	Controlled by the DSM-8542					
	Voltage Setting, Current Limit for Measurement, Current Value Setting (common for all channels) Current Limit for Charging, Current Value Setting (common for all channels) Voltage Output On/Off Voltage Generator Filter On/Off					
Control Method	Special-Purpose Cable and Interface					
* Values in parentheses () are continuous ratings of current capacity						

General Specifications

Operating Environment	Temperature 5 to 35°C, Humidity 85% RH or less
Supply Voltage	100 V AC ±10% at 50/60 Hz
Power Consumption	Max. Approx. 350 VA
Dimensions	Approx. 332mm (13.07in) W × 178mm (7.01in) H × 450mm (17.72in) D
Mass	Approx. 28 kg (987.7 oz)

Supplied Accessories

Power cable x1, 3P-2P Conversion adapter x1, Connection cable for voltage control x1, Connection cable for high voltage x1, Operational manual x1

Options

PSU8541A	Charge connector
LMA-PSU	Rack mount adapter for dedicated power supply unit

POWER SUPPLY UNIT

Order Code: PSU-8541 (for the DSM-8542)

Note: RS-232C connection cable: The optional RS-232C Cable 9637 cannot be used with this product. Use a cross cable for connections as described in the instruction manual.



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