



## Providing Maximum Throughput for MLCC Testing

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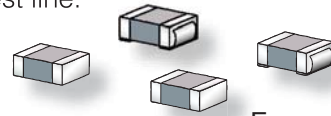
The Super MΩ HiTESTER SM7810 is a super megohm meter for testing leakage current in the Multilayer Ceramic Capacitor (MLCC) manufacturing process. The device can make high-speed measurements in as fast as 6.8ms over 8 channels simultaneously. The Power Source Unit SM7860 is a specially designed power source unit that supports multi-channel systems and provides functions required for the MLCC test line. An 8-channel or 16-channel dual-line voltage setting function enables up to 32-channel output. A test system combining the SM7810 and SM7860 is ideal for integration into automated equipment and can be used to build the fastest MLCC leakage current test line.

# 2 Test System Ideal for MLCC Leakage Current Measurement

## Features of MLCC Leakage Current Test System Combining the SM7810 and SM7860



- The Super MΩ HiTESTER SM7810 can be used to build an MLCC leakage current test line capable of performing 8-channel simultaneous measurement at the industry's fastest speed of up to 6.8 ms, which helps to reduce the tact time of automated equipment and thus MLCC manufacturing costs.
- Combined use of the Super MΩ HiTESTER SM7810 and the Power Source Unit SM7860 enables building a test system ideal for integration into automated equipment. The power source unit can be selected depending on the maximum applied voltage and functionality to suit various types of test line, including the charge-and-discharge test line.



Examples of MLCC

## ■ Features of the Super MΩ HiTESTER SM7810

- Test the leakage current of MLCCs at the fastest speed of 6.8ms simultaneously over 8 channels
- Conduct high-speed leakage current testing of large-capacity MLCCs in the high current range (1mA)
- Improve testing reliability using the contact check function
- Build a flexible system by making best use of the individual settings of each channel

### Performance Improvement

#### 6.8 ms measurement time (from the acceptance of the trigger to INDEX output)

Measurement finishes in just 6.8 ms, including the contact check and decision (when the measurement speed is FAST). The measurement time was reduced by 30% compared to HIOKI's conventional model, which helps to reduce the machine tact time.

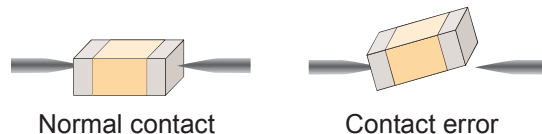
#### Make individual settings for each channel

The range, measurement voltage, and comparator can be set for each channel. Simultaneous measurement can be performed in a combination of 8-channel × 1-stage, 4-channel × 2-stage, or 2-channel × 4-stage according to the system configuration, which provides flexibility to adapt to the configuration of the automated equipment.

### Reliability Improvement

#### Improve reliability using contact check

Perform contact check despite the high-speed measurement. Elimination of judgment errors resulting from contact failure of the probe improves testing reliability.



## ■ SM7810 Specifications (Accuracy Specifications)

### ●Guaranteed accuracy conditions

Warm-up time	At least 1 hour
Guaranteed accuracy temperature and humidity ranges	23°C ±5°C (73°F ±9°F), 80% RH or less (No condensation)
Averaging function	OFF
Guaranteed accuracy period	1 year

### ●Measurement time INDEX [ms]

(from the acceptance of the trigger to the end of the analog measurement)

Power supply frequency	FAST	MED	SLOW	SLOW2
50Hz	6.8	26.0	100.0	320.0
60Hz	6.8	23.0	90.0	320.0

When measured value display mode is Current, current measurement range is Hold, comparison measurement is ON, and contact check is ON

### ●Measurement accuracy (current accuracy): ± (% of reading)

Range	FAST	MED	SLOW	SLOW2
100 pA	--	5.0 + 15 × 10 <sup>-11</sup> /Im	3.0 + 15 × 10 <sup>-11</sup> /Im	1.5 + 6 × 10 <sup>-11</sup> /Im
1 nA	4.0 + 15 × 10 <sup>-10</sup> /Im	3.0 + 6 × 10 <sup>-10</sup> /Im	2.0 + 6 × 10 <sup>-10</sup> /Im	0.6 + 6 × 10 <sup>-10</sup> /Im
10 nA	2.0 + 8 × 10 <sup>-9</sup> /Im	1.0 + 6 × 10 <sup>-9</sup> /Im	0.6 + 6 × 10 <sup>-9</sup> /Im	0.4 + 5 × 10 <sup>-9</sup> /Im
100 nA	2.0 + 5 × 10 <sup>-8</sup> /Im	1.0 + 5 × 10 <sup>-8</sup> /Im	0.6 + 5 × 10 <sup>-8</sup> /Im	0.4 + 5 × 10 <sup>-8</sup> /Im
1 μA	2.0 + 5 × 10 <sup>-7</sup> /Im	1.0 + 5 × 10 <sup>-7</sup> /Im	0.6 + 5 × 10 <sup>-7</sup> /Im	0.4 + 5 × 10 <sup>-7</sup> /Im
10 μA	2.0 + 5 × 10 <sup>-6</sup> /Im	1.0 + 5 × 10 <sup>-6</sup> /Im	0.6 + 5 × 10 <sup>-6</sup> /Im	0.4 + 5 × 10 <sup>-6</sup> /Im
100 μA	2.0 + 5 × 10 <sup>-5</sup> /Im	1.0 + 5 × 10 <sup>-5</sup> /Im	0.6 + 5 × 10 <sup>-5</sup> /Im	--
1 mA	2.0 + 5 × 10 <sup>-4</sup> /Im	--	--	--

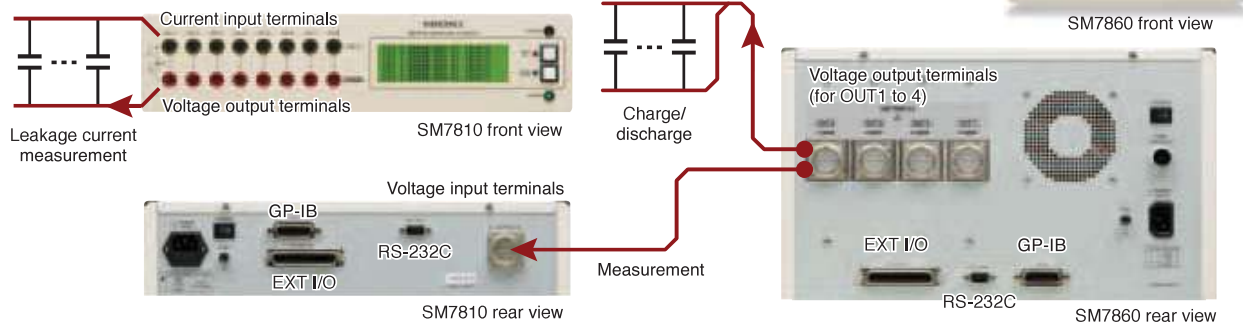
(Note) Im in the table: Measured current value [A]

### ●Measurement accuracy (resistance accuracy):

Current accuracy + Voltage generation accuracy of external power supply

## Interface and Input/Output Terminals

\*Rack mountable. For details on the dimensions and mounting method, please contact your local HIOKI representative.



## Features of the Power Source Unit SM7860

- Up to 32-channel output, 8-channel or 16-channel dual-line output voltage setting, and support for multi-channel systems
- Positive and negative polarities required for the MLCC test line included in a single unit
- Output ON/OFF and current limitation can be performed for each channel

- Large current output of 50 mA/channel<sup>\*1</sup> allows for reducing the number of backup charges
- Support for the discharge of the charge capacitor
- Output voltage of 1 kV is available<sup>\*1</sup>

\*1: Output voltage of 1 kV is limited to 10 mA/channel.

### Reducing the Number of External Circuits of Automated Equipment Measurement Systems

#### ON/OFF and current limitation (charge/discharge) can be performed for all channels individually

An output ON/OFF switch is provided for each channel, allowing you to control the voltage without using an external circuit. Furthermore, the switches are semiconductor switching devices so they do not require maintenance. In addition, current limitation (50 mA/channel<sup>\*1</sup>) can be performed for each channel. A short-circuit in a workpiece does not affect measurements on other channels.

### Reducing the Number of MLCC Charges

#### Output current capacity of 50 mA/channel<sup>\*1</sup>

Current capacity of 50 mA/channel<sup>\*1</sup> allows for charging a large capacity MLCC quickly. The reduced number of total charges helps to minimize automated equipment costs.

### Up to 32-channel output and dual-line voltage setting

The SM7860 allows for setting the dual-line output voltage on 8 channels or 16 channels, and enables up to 32-channel output. Select a power source unit combining positive and negative power source (1 kV/500 V), discharge, and low-voltage power source (10 V) modules to build a power source ideal for the leakage current test system.

SM7860 output channel configuration

SM7860-XX*2		-01 / -21	-02 / -22	-03 / -23	-04 / -24	-05 / -25	-06 / -26	-07 / -27
OUT1 to 4 output content	OUT1	+500V	+1kV	+500V	+1kV	+500V	+1kV	+10V
	OUT2			+500V	+1kV	discharge	discharge	+10V
	OUT3	-500V	-1kV	-500V	-1kV	-500V	-1kV	discharge
	OUT4			-500V	-1kV	discharge	discharge	discharge
Overview (Total number of channels and output voltage)		16 ch ±500 V	16 ch ±1000 V	32 ch ±500 V	32 ch ±1000 V	32 ch ±500 V, discharge	32 ch ±1000 V, discharge	32 ch 10 V, discharge
Line A	Number of OUT1 channels	8 ch	8 ch	8 ch	8 ch	8 ch	8 ch	8 ch
	OUT1 output voltage range <sup>*3</sup>	1.0 V to 500.0 V	250.0 V to 1000.0 V	1.0 V to 500.0 V	250.0 V to 1000.0 V	1.0 V to 500.0 V	250.0 V to 1000.0 V	1.0 V to 10.0 V
	Number of OUT2 channels			8 ch	8 ch	8 ch	8 ch	8 ch
	OUT2 output voltage range <sup>*3</sup>	--	--	1.0 V to 500.0 V	250.0 V to 1000.0 V	discharge	discharge	1.0 V to 10.0 V
	Current limitation	±50 mA/ch	±10 mA/ch	±50 mA/ch	±10 mA/ch	±50 mA/ch	±10 mA/ch	±50 mA/ch
Maximum output current <sup>*4</sup>		430 mA (200 VA)	100 mA (100 VA)	430 mA (200 VA)	100 mA (100 VA)	430 mA (200 VA)	100 mA (100 VA)	430 mA (200 VA)
Line B	Number of OUT3 channels	8 ch	8 ch	8 ch	8 ch	8 ch	8 ch	8 ch
	OUT3 output voltage range <sup>*3</sup>	-1.0 V to -500.0 V	-250.0 V to -1000.0 V	-1.0 V to -500.0 V	-250.0 V to -1000.0 V	-1.0 V to -500.0 V	-250.0 V to -1000.0 V	1.0 V to 10.0 V
	Number of OUT4 channels			8 ch	8 ch	8 ch	8 ch	8 ch
	OUT4 output voltage range <sup>*3</sup>	--	--	-1.0 V to -500.0 V	-250.0 V to -1000.0 V	discharge	discharge	discharge
	Current limitation	±50 mA/ch	±10 mA/ch	±50 mA/ch	±10 mA/ch	±50 mA/ch	±10 mA/ch	±50 mA/ch
Maximum output current <sup>*4</sup>		430 mA (200 VA)	100 mA (100 VA)	430 mA (200 VA)	100 mA (100 VA)	430 mA (200 VA)	100 mA (100 VA)	430 mA (200 VA)

\*2 The power supply voltage for the SM7860-01 to -07 is 100 VAC, and that for the SM7860-21 to -27 is 220 VAC. \*3 The resolution of the output voltage range is 0.1 V.

\*4 Only when the operating conditions as stated in the restriction warnings of the specifications are met.

## SM7860 Specifications (Accuracy Specifications)

### Guaranteed accuracy conditions

Warm-up time	At least 1 hour
Guaranteed accuracy temperature and humidity ranges	23°C ±5°C (73°F ±9°F), 80% RH or less (No condensation)
Temperature coefficient	Add 0.1%/°C for 0 to 18°C and 28 to 40°C
Guaranteed accuracy period	1 year

### Accuracy

Generation accuracy	Output voltage accuracy: ±2% of set value ± 0.5 V (with no load) Inter-channel error: ± 0.01 V or less (between outputs on the same line with no load)
Voltage monitoring accuracy	±2% of output voltage ± 0.5 V



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## SM7810 Specifications

Number of channels	8
Measurement method	Apply voltage to object under test and measure current
Applied voltage	Supply voltage from external power source (voltage input terminal on the rear panel)
Ammeter input resistance	1 k $\Omega$
Input/output terminals	Current input terminal (front): HIOKI M $\Omega$ HiTESTER input connector Voltage output terminal (front): Plug-in terminal (safety terminal) Voltage input terminal (rear): Circular connector
External interface (Condition setting and operation)	GP-IB, RS-232C, EXT I/O (Condition setting and operation except for GP-IB address setting are all performed from external interface)
Applicable power source	SM7860 series
Measured value display mode	Resistance/current
Measurement speed	FAST, MED, SLOW, SLOW2
Measurement range	Current: 1 pA to 1 mA, Resistance: $1 \times 10^3 \Omega$ to $1 \times 10^{15} \Omega$
Range switching	HOLD / AUTO
Trigger delay	0 ms to 9999 ms (Resolution: 1 ms)
Averaging function	Averaging method: Moving average, OFF / ON (1 to 255) / AUTO
Power supply frequency setting	50 Hz / 60 Hz (Affects the measurement time)
Measurement voltage setting	0.1 V to 1000.0 V (Resolution: 0.1 V)
Measured value comparison and judgment	Compare measured value and reference value Judgment: HI, IN, LO Judgment criterion setting range: -9.9999E30 to 9.9999E30
Functionality	Contact check, jig capacity open correction, jig resistance open correction functions
Operating temperature and humidity ranges	0°C (32°F) to 40°C (104°F), 80% RH or less (No condensation)
Storage temperature and humidity ranges	-10°C (14°F) to 55°C (131°F), 80% RH or less (No condensation)
Operating location	Indoors, Contamination class: 2, Altitude: 2,000 m (6,562 ft) or less
Rated power supply voltage	SM7810: 100 VAC, 110 V $\pm$ 10%, SM7810-20: 220 VAC $\pm$ 10%
Rated power supply frequency	50 / 60 Hz
Maximum rated power	30 VA
Withstand voltage	1.69 kVAC, 15 s, cutoff current 10 mA Between all power supply terminals and the protective ground, interface, and measurement terminals
External dimensions	Approx. 425 mm (16.73 in) W $\times$ 99 mm (3.90 in) H $\times$ 488 mm (19.21 in) D
Mass	Approx. 10.5 kg (370.4 oz)
Accessories	Power cable $\times$ 1, voltage input connector $\times$ 1, rubber leg $\times$ 4
Safety standard	EN61010



Model : SUPER M $\Omega$  HiTESTER SM7810

Model No. (Order Code)	(Note)
SM7810	(100/110V AC power supply)
SM7810-20	(220V AC power supply)

The Super M $\Omega$  HiTESTER SM7810 is produced to order. An input/output terminal connection cable\*1 is required separately. Please contact your local HIOKI representative.

- \*1 Input/output terminal connector/plug and connection cable
- Current input terminal connector and voltage output terminal plug are not included. Voltage input terminal connector is included.
- Input/output terminal connection cables are available in various lengths to suit HIOKI measurement systems. Please consult with your HIOKI representative.

PC communication	RS-232C CABLE 9637	RS-232C CABLE 9638	GP-IB CONNECTOR CABLE 9151-02	Bundle Accessories
	For the PC, 9pin - 9pin, cross, 1.8m (5.91 ft) length	For the PC, 9pin - 25pin, cross, 1.8m (5.91 ft) length	2 m (6.56 ft) length	CONNECTOR L2220 Voltage input connector for SM7810

## SM7860 Specifications

Input/output terminal	Voltage output terminal (rear): Circular connector (for 8 channels)
External interface (Condition setting and operation)	GP-IB, RS-232C, EXT I/O (Condition setting and operation except for GP-IB address setting are all performed from external interface)
Applicable model	Super M $\Omega$ HiTESTER SM7810
Functionality	Voltage output
Operation method	Support sink/source and charge/discharge systems
Generation control	Output when OUTPUT signals of EXT I/O are ON
Output ON/OFF	Settable for each channel
Voltage error alarm	Alarm is generated when the monitoring voltage is outside the set range Settable range: $\pm 2$ to $\pm 19\%$ (Resolution 1%)
Current limitation	Method: Limiting for each channel Current limiting direction: Current can be limited in two ways
Voltage monitoring	Measure and display output voltage for each line
Restrictions	Object to which voltage is applied: MLCC Number of channels for charging: 8 or less/line Operating conditions: There are restrictions on the charging interval. For details, please contact your HIOKI representative.
Operating temperature and humidity ranges	0°C (32°F) to 40°C (104°F), 80% RH or less (No condensation)
Storage temperature and humidity ranges	-10°C (14°F) to 55°C (131°F), 80% RH or less (No condensation)
Operating location	Indoors, Contamination class 2, Altitude: 2,000 m (6,562 ft) or less
Rated power supply voltage	SM7860-01, 02, 03, 04, 05, 06, 07: 100 VAC $\pm$ 10% SM7860-21, 22, 23, 24, 25, 26, 27: 220 VAC $\pm$ 10%
Rated power supply frequency	50 / 60 Hz
Maximum rated power	860 VA
Withstand voltage	1.62 kVAC, 60 s, cutoff current 10 mA Between all power supply terminals and the protective ground, and between the power line and the neutral line
External dimensions	Approx. 425 mm (16.73 in) W $\times$ 249 mm (9.80 in) H $\times$ 581 mm (22.87 in) D
Mass	Approx. 45 kg (1587.3 oz) (SM7860-07 / -27: Approx. 32 kg (1128.7 oz))
Accessories	Power cable $\times$ 1 Voltage output connector $\times$ 4 (SM7860-01, 02, 21, 22 $\times$ 2)
Safety standard	EN61010



Model : POWER SOURCE UNIT SM7860

Model No. (Order Code)	(Note)
SM7860-01	(100V AC power supply)
SM7860-02	(100V AC power supply)
SM7860-03	(100V AC power supply)
SM7860-04	(100V AC power supply)
SM7860-05	(100V AC power supply)
SM7860-06	(100V AC power supply)
SM7860-07	(100V AC power supply)
SM7860-21	(220V AC power supply)
SM7860-22	(220V AC power supply)
SM7860-23	(220V AC power supply)
SM7860-24	(220V AC power supply)
SM7860-25	(220V AC power supply)
SM7860-26	(220V AC power supply)
SM7860-27	(220V AC power supply)

The Power Source Unit SM7860 is produced to order. An output terminal connection cable\*2 is required separately. Please contact your local HIOKI representative, or if you need to use a power supply voltage other than 100VAC or 220VAC.

- \*2 Output terminal cable
- Voltage output terminal connection cables are available in various lengths to suit HIOKI measurement systems. Please consult with your HIOKI representative.

Bundle Accessories	CONNECTOR L2221
	Voltage output connector for SM7860

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