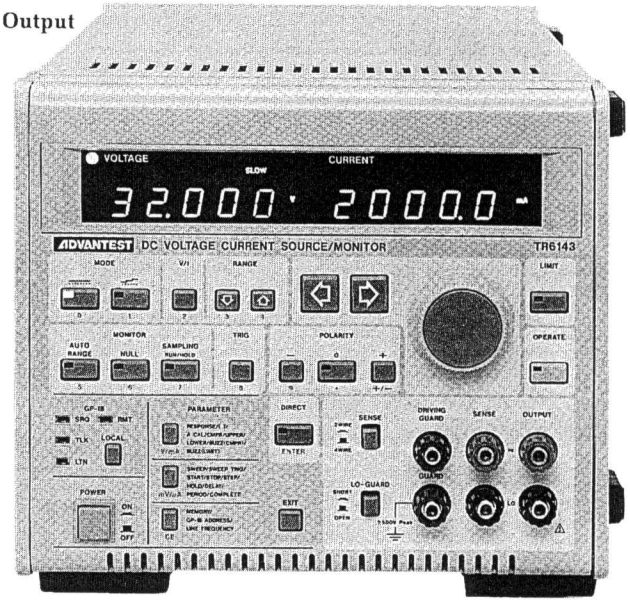
Basic Electrical Quantity Measurement

Ideal for Evaluation of Semiconductors or Electronic Components

TR6143

- Built-In VSIM and ISVM Functions
- 10 μV/1 nA Step DC Voltage/Current Output
- Sink-Enabled Bipolar Output



TR6143
DC Voltage/Current Source/Monitor

The TR6143 programmable DC voltage/current source/monitor enables measurement at high current and is ideal for power supply to a semiconductor or electronic component or for evaluation of DC characteristic test.
This equipment can generate and measure DC voltage of 10 μV to 110 V and
DC current of 1 nA to 2 A. In addition, the setting for the limit values can be made in the same way as for voltage/current generation to protect from load caused by overvoltage or overcurrent.
The TR6143 has a linear/log sweep function for generated voltage or current, a memory function to store generated data, a backup function to hold panel settings, and an oscillation detection function for DC characteristic tests.
It also has the GPIB interface as a standard function. A synchronous trigger function, required when more than one unit of this equipment is connected is also provided.

■ Built-In VSIM and ISVM Functions for Current/Voltage Characteristic Tests

■ 10 μV/1 nA Step DC Voltage/Current Output

■ Sink-Enabled Bipolar Output

■ Output of Up to 2 A

■ Built-In Linear/Log Sweep Function Ideal for Characteristic Tests

■ 4A Parallel Operation with Two Units

● Semiconductor characteristic tests
A semiconductor DC evaluation system can be configured easily with the TR6143 and a personal computer. For evaluation tests for diodes, transistors, FET, and ICs, the TR6143 is equipped with VSIM and ISVM functions at 10 μV and 1 nA resolution, an automatic sweep function to program step time, delay time, and step voltage, and a synchronous signal input/output to synchronize with external equipment. The R12701 test fixture is useful for measuring 8-, 10-, 12-pin ICs for transistors, diodes, or TO packages, and 300 mil (28 pins maximum) or 600 mil (28 pins maximum) ICs for DIP packages.

● Battery charge/discharge tests
The TR6143 can charge or discharge constant current by I function, or constant voltage by V function. With the source/sink capability of ±110 V (0.5 A) and ±2 A (32 V) maximum, charge or discharge can be evaluated by connecting many batteries serially or in parallel. Voltage or current generation can be increased by serial or parallel operation of more than one TR6143.

Basic Electrical Quantity Measurement

Ideal for Evaluation of Semiconductors or Electronic Components

TR6143

Specifications

Voltage generation/current measurement (VSIM)

Voltage generation range:

Range	Sourcing range	Minimum step
320 mV	0 to ±320.00 mV	10 µV
3.2 V	0 to ±3.2000 V	100 µV
32 V	0 to ±32.000 V	1 mV
110 V	0 to ±110.00 V	10 mV

Current measurement range:

Range	Measurement range	Resolution
32 µA	0 to ±32.000 µA	1 nA
320 µA	0 to ±320.00 µA	10 nA
3.2 mA	0 to ±3.2000 mA	100 nA
32 mA	0 to ±32.000 mA	1 µA
320 mA	0 to ±320.00 mA	10 µA
2 A	0 to ±2000.0 mA	100 µA

Integral accuracy: Correction tolerance, stability for one day, temperature coefficient, linearity included at 23°C+5°C and 85% RH or less (six-month guarantee)

Voltage generation range	Generation tolerance ±(% of setting +V)
320 mV	0.05 ±160 µV
3.2 V	0.05 ±960 µV
32 V	0.05 ±9.6 mV
110 V	0.05 ±64 mV

Current measurement range	Integrated time (T)	Measurement tolerance ±(% of rdg. + digit + digit × Vo/1 V)
32 µA	10 ms 1 PLC 10 PLC 100 PLC	0.05 + 7 d + 0.5 d × Vo/1 V
320 µA		
3.2 mA		
32 mA		
320 mA		
2 A		0.07 + 7 d + 0.5 d × Vo/1 V

Measured with auto calibration set to on

Voltage generation linearity: +0.012% of range at 23°C +5°C and 85% RH or less

Voltage generation noise, ripple:

	No load			Maximum load		
Response	DC to 100 Hz	DC to 10 kHz	20 Hz to 20 MHz	DC to 100 Hz	DC to 10 kHz	20 Hz to 20 MHz
FAST	50 µVpp±1 d	1 mVpp±1 d	10 mVpp±1 d	50 µVpp±1 d	1 mVpp±1 d	10 mVpp±1 d
SLOW	50 µVpp±1 d	1 mVpp±1 d	5 mVpp±1 d	50 µVpp±1 d	1 mVpp±1 d	5 mVpp±1 d

Range switching noise:

Range switching	Condition	Noise
Voltage generation range switching	—	50 mVp-p±1 d
Current measurement range switching	When current limiter does not operate	50 mVp-p
	When current limiter operates	±300 d±50 mV
Current limiter range switching	—	±300 d±50 mV

d indicates voltage generation or current limiter display resolution.

Response time: Time within ±0.05% of full scale in all ranges. The limiter setting value is a value when a limiter range is at full scale.

Fast 3 ms or less

Slow 20 ms or less

Line reguration: At 100 VAC ±10%
±0.003% of range or less

Load regulation: At maximum load in each range at 4 WIRE connection
±0.003% of setting or less

Maximum output current:

Source, sink 2 A up to ±32 V, 1 A up to ±64 V, 0.5 A up to ±110 V

Maximum load capacity:

Current measurement range	Maximum load capacity	
	FAST	SLOW
32 µA	0.01 µF	1 µF
320 µA		
3.2 mA	0.1 µF	100 µF
32 mA		
320 mA	100 µF	2000 µF
2 A	1000 µF	

Common mode noise removal ratio: 80 dB or more at DC, 50/60 Hz ±1% at 1 kΩ unbalanced impedance between Lo and guard terminal

Current measurement NMR: At 50/60 Hz ±0.09%

Integrated time (IT)	NMR
10 ms	0 dB
1 PLC to 100 PLC	60 dB or more

Current limiter

Setting range:

Range	Setting range	Minimum step
32 µA	±0.300 µA to ±32.000 µA	1 nA
320 µA	±3.00 µA to ±320.00 µA	10 nA
3.2 mA	±0.0300 mA to ±3.2000 mA	100 nA
32 mA	±0.300 mA to ±32.000 mA	1 µA
320 mA	±3.00 mA to ±320.000 mA	10 µA
2 A	±30.0 mA to ±2000.0 mA	100 µA

Integral accuracy: ±0.07% of setting ±(0.1%+0.003%×Vo/1 V of range at 23°C ±5°C and 85%RH or less in all ranges

Current generation/voltage measurement (ISVM)

Current generation range:

Range	Generation range	Minimum step
32 µA	0 to ±32.000 µA	1 nA
320 µA	0 to ±320.00 µA	10 nA
3.2 mA	0 to ±3.2000 mA	100 nA
32 mA	0 to ±32.000 mA	1 µA
320 mA	0 to ±320.00 mA	10 µA
2 A	0 to ±2000.0 mA	100 µA

Voltage measurement range:

Range	Measurement range	Minimum step
320 mV	0 to ±320.00 mV	10 µV
3.2 V	0 to ±3.2000 V	100 µV
32 V	0 to ±32.000 V	1 mV
110 V	0 to ±110.00 V	10 mV

Integral accuracy: Correction tolerance, stability for one day, temperature coefficient, linearity included at 23°C ±5°C and 85% RH or less (six-month guarantee)

Current generation range	Setting tolerance ±(% of setting +A+A+Vo/1 V)
32 µA	0.05 + 9.6 nA + 480 pA × Vo/1 V
320 µA	0.05 + 64 nA+ 4.8 nA × Vo/1 V
3.2 mA	0.05 + 960 nA + 48 nA × Vo/1 V
32 mA	0.05 + 6.4 µA + 480 nA × Vo/1 V
320 mA	0.05 + 96 µA + 4.8 µA × Vo/1 V
2 A	0.07 + 960 µA + 48 µA × Vo/1 V

Voltage measurement range	Integrated time (T)	Measurement tolerance ±(% of rdg. + digit)
320 mA	10 ms	0.05 +7 d
3.2 V	1 PLC	
32 V	10 PLC	
110 V	100 PLC	0.05 + 3 d

Measured with auto calibration set to on

TR6143

Current generation linearity: ±0.012% of range at 23°C ±5°C and 85% RH or less

Current generation noise, ripple: At 1 k load resistance

Current	Response	DC to 100 Hz	DC to 10 kHz	DC to 200 MHz
2 A, 320 mA	SLOW	±1 d	±1 d	1 mApp
	FAST	±2 d	±2 d	2 mApp
32 mA to 32 µA	SLOW	20 nApp±1 d	200 nApp±20 d	—
	FAST	20 nApp±2 d	200 nApp±50 d	—

Range switching noise:

Range switching	Noise
Current generation range switching	±300 ±50 mV
Voltage measurement range switching	50 mVpp
Voltage limiter range switching	50 mVpp±1 d

1 d indicates current generation or voltage limiter display resolution.

Response time: Time within ±0.05% of full scale in all ranges. At no capacity load

Fast 3 ms or less

Slow 20 ms or less

Line regulation: At 100 VAC ±10%
±0.003% of range or less

Load regulation: Following voltage 0 to ±110 V
Same as in item "integral accuracy ±(A × Vo/1 V)" (Vo: following voltage)

Maximum following voltage:

Source, sink 110 V up to ±0.5 A, 64 V up to ±1 A, 32 V up to ±2 A

Voltage measurement input resistance: $1 \times 10^{10}\Omega$ more

Voltage measurement leak current: ±2 nA or less (at 0 V)

Maximum load capacity: At voltage limit operation

Current generation range	Maximum load capacity	
	FAST	SLOW
32 µA	0.01 µF	1 µF
320 µA		
3.2 mA	0.1 µF	100 µF
32 mA		
320 mA	100 µF	2000 µF
2 A	1000 µF	

Common mode noise removal ratio: 80 dB or more at DC, 50/60 Hz ±1% at 1 kΩ unbalanced impedance between Lo and guard terminal

Voltage measurement NMR: At 50/60 Hz ±0.09%

Integrated time (IT)	NMR
10 ms	0 dB
1 PLC to 100 PLC	60 dB or more

Voltage limiter

Setting range:

Range	Setting range	Minimum step
320 mV	±3.00 mV to ±320.00 mV	10 µV
3.2 V	±0.0300 V to ±3.2000 V	100 µV
32 V	±0.300 V to ±32.000 V	1 mV
110 V	±3.00 V to ±110.00 V	10 mV

Integral accuracy: ±0.05% of setting and ±0.1% of range at 23°C ±5°C and 85% RH or less in all ranges

VSIM and ISVM Common Specifications

Maximum allowable guard capacity: 2000 pF between Hi (output or sense) and DG (including cable capacity)

Maximum allowable shield capacity: 5000 pF between DG and Lo (output, sense) (including cable capacity)

Measurement speed: Trigger input to complete output (end mode) at HOLD

Power frequency \ Integrated time (IT)	10 ms	1 PLC	10 PLC	100 PLC
50 Hz	25.0 ms	35.0 ms	215.0 ms	2.015 s
60 Hz		31.7 ms	181.7 ms	1.682 s

Output method: Floating bipolar output

Output: Hi force, Hi sense, Lo force, Lo sense, driving guard, guard

Output terminals:

Front Binding post

Rear Triaxial connector

Voltage/current setting mode: Continuous setting, direct setting, GPIB

Sweep mode: Linear, log, random

Maximum number of sweep steps: 1023

Random sweep maximum memory: 500 data items

Measurement mode: Sampling (RUN or HOLD)

Measurement parameters: Integrated time (IT): 10 ms, 1 PLC, 10 PLC, 100 PLC

Measured data buffer memory: 1024 data items

Measured data output format: ASCII or binary

Hold time: 9999 ms maximum

Resolution 1 ms, **Setting tolerance** 5% + 10 ms

Delay time: 9999 ms maximum

Resolution 1 ms, **Setting tolerance** 5% + 10 ms

Period time: 9999 ms maximum

Resolution 1 ms, **Setting tolerance** 5% + 5 ms (at 25 ms or more)

Protection functions: Overload, overheat, oscillation detection

GPIB interface: Conforms to IEEE STD 488-1978.

Single line signals:

Input Trigger, Operate

Output Complete, Operate, Syn Out

General Specifications

Display functions:

Voltage display and current display: Polarity + 5-digit, 7-segment + unit

Maximum application voltage between terminals:

Terminals	Maximum applied voltage
Between Hi and Lo	110 V peak
Between Lo and Guard	50 V peak
Between Guard and cabinet	500 V peak

Preheating time: 30 minutes or more (within specified tolerance)

Operational environment: 0°C to 40°C, 85% RH or less

Storage ambient temperature range: –25°C to +70°C

Option No.	Standard	Opt. 31	Opt. 32	Opt. 42	Opt. 43	Opt. 44
Line voltage (V)	90 to 110	103 to 127	108 to 132	198 to 242	207 to 250	216 to 264

Specify options at time of order. The price does not include the options.

Power frequency: 48 Hz to 66 Hz

Power consumption: 340 VA or less

Outside dimensions: About 212(W) × 177(H) × 450 (D) mm

Weight: 17 kg or less

Accessories (Sold separately)

R12701 Test fixture

A02631 Rack mount set (EIA standard, single)

A02631-J Rack mount set (JIS, single)

A02603 Rack mount set (EIA standard, twin)

A02603-J Rack mount set (JIS, twin)

A02611 Front handle set

A02605 Side joint set

*A02603 or A02603-J needs A02605.