COSINUS MESSTECHNIK GMBH

Datenblatt
NF-HSA-Serie

Inhalt:

COSINUS MESSTECHNIK GMBH

High Speed Bipolar Amplifier HSA series

DC - 1MHz
150 Vp-p

High Speed Bipolar Amplifier

3 Ap-p　　6 Ap-p　　12 Ap-p

Application

Stable output with both capacitive and inductive loads

Capacitor	Coil	Motor	Magnetic material
Piezoelectric element	Dielectrophoresis	Touch panel	Smartphone

Lineup

		HSA42011	HSA42012	HSA42014
Frequency Range		DC to 1MHz		
Maximum Output Voltage		150 Vp-p		
Output Current	AC	3 Ap-p, 1.06 Arms	6 Ap-p, 2.12 Arms	12 Ap-p, 4.24 Arms
	DC	±1 A	±2 A	±4 A
Slew Rate		475 V/μs		
Gain		Fixed: ×1, ×10, ×20, ×50　Variable: ×1 to ×3		

High Speed, Broad Bandwidth, High Voltage Output

In the test of electronic components and devices such as capacitors and coils,
it can stably drives the DUT that cannot be driven by other amplifiers.
Used in advanced research fields such as medicine and biotechnology.

HSA42011

HSA42012

HSA42014

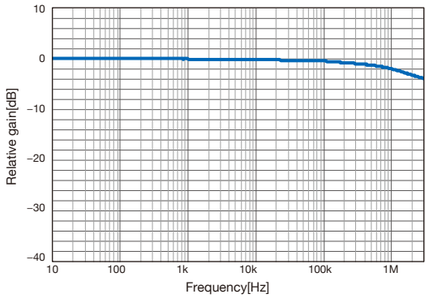
- **Frequency Range: DC to 1MHz**
- **Slew Rate: 475 V/μs**
- **Output Voltage: 150 Vp-p**
- **Output Current: 3 Ap-p / 6 Ap-p / 12 Ap-p**
- **Four-quadrant operation**
- **Low output impedance**

- Gain setting
- Output polarity switching
- Output DC Bias Voltage setting
- Output DC Offset adjustment
- Protection function(Overload, overvoltage, internal power supply error, internal temperature error, cooling fan error)

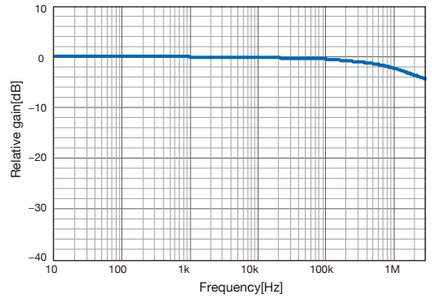
Frequency Response Data

●Small amplitude frequency response (10Vrms, 400Hz reference)

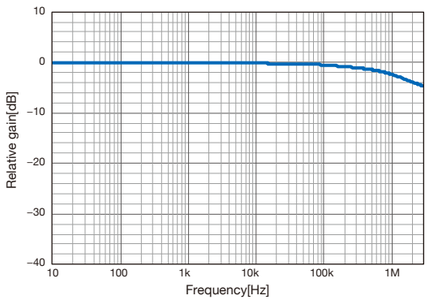
HSA42011
Rated Load (50Ω)



HSA42012
Rated Load (25Ω)



HSA42014
Rated Load (12.5Ω)



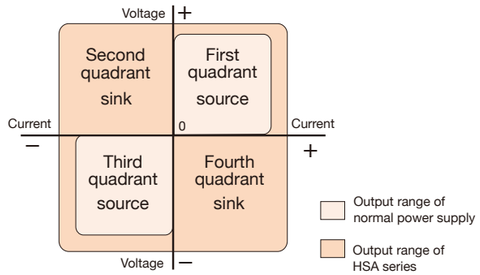
●Waveform at maximum output voltage HSA42011 x:200ns/div. y:20V/div.

1MHz, 53Vrms, Rated Load50Ω

Stable output under various load conditions

Four-quadrant operation

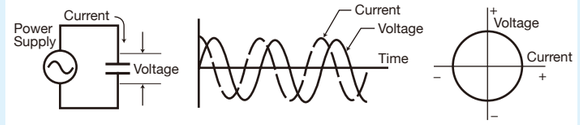
The operation range of the HSA series is four quadrants as shown in the figure on the right.
Current sources and sinks regardless of positive or negative output voltage.
When an AC voltage is applied to a load including capacitors and coils, current returns from the load.
In this case, a typical AC power supply or amplifier may not be able to drive the load.
The HSA series operates stably not only with capacitive loads such as a piezoelectric element or solenoid but also with inductive loads because of its 4-quadrant output.



4-quadrant operation and Capacitive · Inductive loads

When AC power is applied to a capacitor or inductor, the AC current of these loads create a 90°phase difference with the applied AC voltage, but when the instantaneous values of voltage and current are plotted on a 4-quadrant graph, they pass through all four quadrants.
When applying alternating current to capacitors and inductors in this way, a 4-quadrant operation is necessary.
On the other hand, a general DC power supply can only be driven in the first and third quadrants on the graph, therefore it is not suitable for driving anything but resistive loads.

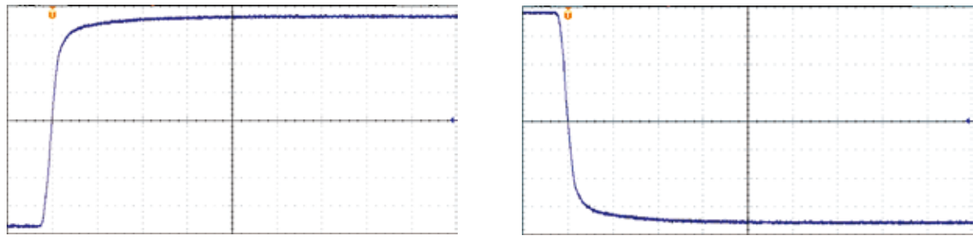
Driving capacitors



Fast response, wide frequency bandwidth, DC to 1MHz

High speed and high slew rate reproduce transient and repetitive operations with good step response.
HSA series outputs AC and DC. Therefore, it is possible to output positive/negative asymmetric signals or signals in which AC is superimposed on DC.

●Step Response HSA42011 x:800ns/div. y:20V/div.



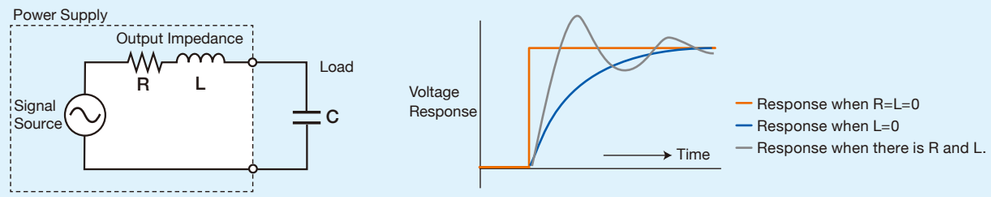
150Vp-p, Rated Load 50Ω

Low output impedance

Due to the output impedance of the power supply, the rise time of a capacitive or inductive load is delayed.
The HSA series maintains a low output impedance over the entire frequency band, suppresses voltage drop due to load, and operates at high speed.

Effect on Rise Time

In below figure, if the resistance of the output impedance of the power supply is R, the inductance is L, and the load capacitance is C, the rise will be slow because only R exists.
When L = 0, it takes C×R (seconds) to rise to about 60% of the final value.



Convenient functions for various purposes

●Gain setting

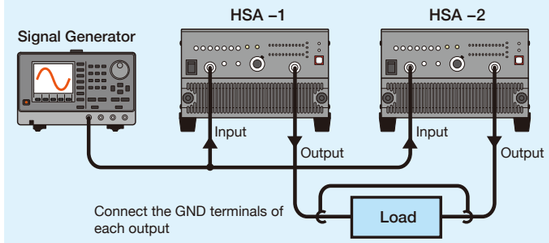
Set seamlessly by combining selectable fixed gain ×1,×10,×20,×50 and variable gain ×1–×3 (fine adjustment potentiometer)
With a gain ×1 setting, it is used as a buffer amplifier that outputs at the same voltage as the external signal generator setting.

●Output polarity switching

With the [INVT] switch on front panel, an amplification can be selected which the input and output phases are in the same or opposite polarity.
Balanced connection by two units of HSA series with output polarity set to opposite, the output voltage and power are doubled.

The output of the signal generator is divided and input to HSA –1 and. HSA –2 has a reverse phase output towards HSA –1. And the load must be isolated from ground potentials and signal sources. And it is also called BTL(Balanced Transformer Less) connection.

Double the output voltage and power

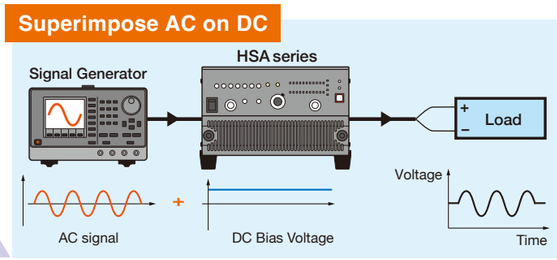


●Output DC bias voltage setting

Superimpose a DC bias voltage (up to ±75V) on the output voltage.(Setting by 10-turn indicating dial)
As a test in which the DC voltage of the load fluctuates, it is possible to superimpose the AC voltage on the DC voltage.

Set the rated DC voltage of the load with the DC bias of the HSA and superimpose the AC voltage output from the signal generator. It is also possible to sweep the frequency of the AC output from the signal generator or superimpose it on white noise.

Superimpose AC on DC



●Protection function

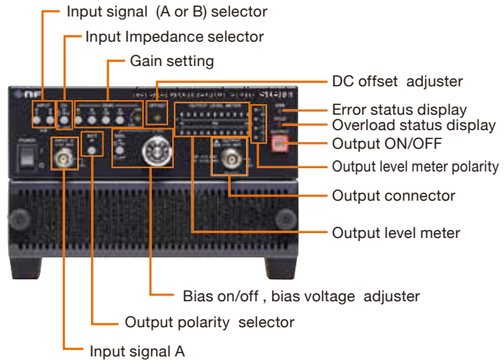
Function to protect the load from abnormal conditions.
Overload, overvoltage, internal power supply error, internal temperature error, cooling fan error. When an error is detected, the output is turned off or the overload protection function is activated and the error LED lights up. If the abnormal condition continues, the operation is disabled. (Only the power off switch is effective)

●Others

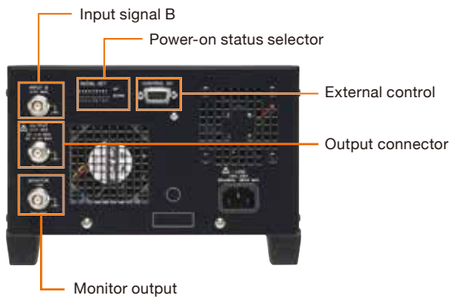
●External control ●Output voltage monitor
●Output on/off control ●Power-on status setting
●Input A, B, A+B
●Input Impedance 50Ω/10kΩ selectable

Functions HSA42011

■Front panel



■Rear panel



Capacitor MLCC

The demand for multi-layer ceramic capacitors (MLCCs) has been rapidly increasing for mobile devices, automotive devices and industrial devices. And their capacity has become larger and larger while they're downsizing at the same time.
The capacitance of the MLCC depends on the frequency and voltage, and the characteristics are evaluated with an impedance analyzer that applies voltage while sweeping the frequency.

Motor Ultrasonic motor

In combination with a signal generator, the frequency, phase and amplitude can all be adjusted to test drive the motor.
The voltage output is stable over a wide frequency band, and the best drive conditions for the motor are verified. Recently, an ultrasonic motor driven at 100kHz or higher is also developed.

●Applications

Autofocus of single-lens reflex camera, scanning electron microscope(SEM), semiconductor manufacturing equipment, Micromachine manufacturing equipment, etc.

Piezoelectric element Piezoelectric actuator

Piezoelectric transformer
The low output impedance of the HSA series provides good step response even when driving a piezoelectric element with a large capacitance.
Combined with an impedance analyzer to measure the resonance characteristics under actual driving conditions.

●Applications

Ultrasonic cleaning (parts, semiconductors)
Ultrasonic processing (wire bonders, plastic wells, atomizers, etc.)
Medical equipment (ultrasound diagnostic equipment, catheters, electric scalpels, etc.)
Underwater oscillator
Ultrasonic sensor
Small fine movement actuator (cantilever), etc.

Magnetic material Magnetic powder core Ferrite core

For magnetic materials, new materials that do not contain rare earth elements are being actively developed.
Particularly, the magnetic powder core has good magnetic characteristics in the high frequency bandwidth of 1 kHz or higher.
Magnetic powder cores are manufactured by processing and molding powder with characteristics such as excellent flexibility in shape and high manufacturing yield, and their applications to various types of components are being considered.
HSA series is used for B-H curve measurement to evaluate magnetic materials.

Vehicle Electrical Components

High voltage of EV power supplies

The shifting to electric vehicles worldwide had made EV development more active. Vehicle power supply tend to be higher in voltage, and vehicle electrical components are also required to have power fluctuation a higher voltage.
In some cases, a high-speed bipolar power supply is required for high-frequency voltage fluctuation tests.

Smartphone Touch Panel

Verification of device malfunction due to external noise

Mobile devices such as smartphones may malfunction due to common mode noise or noise from the AC adapter.
Also, capacitive touch panels that are widely used in factories use weak changes in capacitance as signals, but they may malfunction due to ambient noise. To verify these malfunctions, a test is performed in which alternating current is superimposed on direct current.
The HSA series superimposes a broadband harmonic noise simulation signal up to 1MHz.

■Example of test waveform

The voltage level set by the signal generator can be output by setting the gain to 1x. Output noise is 3.68 Vrms or less, and low noise digital circuits can be tested.

Dielectrophoresis (DEP)

Cell separation, detection of microorganisms and viruses

Dielectrophoresis is a phenomenon in which dielectric particles migrate due to the particles and surrounding medium in a non-uniform electric field.
They're usually applied to biomolecule measurement. In many cases, a high AC voltage is applied at a frequency around 1MHz.
A bacterial detection method that combines dielectrophoresis and impedance measurement has been studied.

Specifications

Unless otherwise noted, below setting and conditions are specified after a 30 minute warm up period.
•Output Waveform: sine wave •Output Polarity: In-phase
•Load: (Power Factor 1, nominal value)
50Ω (HSA42011), 25Ω (HSA42012), 12.5Ω (HSA42014)
•Input Impedance: 50Ω •Gain Setting: ×50 (CAL)

The following values with accuracy represents warranted performance, values without accuracy are not warranted, they are typical values(typ.) or reference values.
Reference values are only supplementary data to use for reference, they do not guarantee performance.

Input

Input Format	Input A, Input B or addition of input A and input B (When two inputs are on, the maximum input voltage is within ±10 V in total)
Input Impedance	50 Ω±5%,10 kΩ±5% switchable (Unbalanced, switch between two inputs A and B at once)
Maximum input voltage	±10 V
Non-destructive maximum input voltage	±11 V
Input Terminals	BNC connector Input A: Front panel, Input B: Rea panel Lo side is connected to the chassis.

Output

	HSA42011	HSA42012	HSA42014
Output Mode	Constant Voltage (CV)		
Output Polarity	In-phase or reversed phase (switchable with switch on front panel)		
Gain setting Function	Fixed: ×1, ×10, ×20, ×50 Variable: 1(CAL) to ×3 consecutive Gain Setting is (Fixed)×(Variable).		
Gain Accuracy	±5% (Fixed Gain:×1, ×10,×20, and ×50, Variable Gain: CAL, at 400 Hz)		
Maximum Output Voltage R_L: Load of resistance	R_L: 50 Ω 53 Vrms (40 Hz to 1 MHz) 45 Vrms (20 Hz to 40 Hz) R_L: 75 Ω ±75 V (DC to 1 MHz)	R_L: 25 Ω 53 Vrms (40 Hz to 1 MHz) 45 Vrms (20 Hz to 40 Hz) R_L: 37.5 Ω ±75 V (DC to 1 MHz)	R_L: 12.5 Ω 53 Vrms (40 Hz to 1 MHz) 45 Vrms (20 Hz to 40 Hz) R_L: 18.8 Ω ±75 V (DC to 1 MHz)
Maximum Output Current(AC)	1.06 Arms, 3 Ap-p (40 Hz to 1 MHz)	2.12 Arms, 6 Ap-p (40 Hz to 1 MHz)	4.24 Arms, 12 Ap-p (40 Hz to 1 MHz)
Maximum Output Current(DC)	±1 A	± 2 A	±4 A
Low Amplitude Frequency response	DC to 100 kHz −1 dB to +1 dB 100 kHz to 1 MHz −3 dB to +1 dB (Output Amplitude 10 Vrms, reference 400 Hz)		
Slew Rate	475 V/μs or above		
Output DC Offset	Adjustment Range: ±0.5 V or above (Input Terminal Short circuit) Temperature Drift: within ±(1+0.1×G) mV/°C(typ.) *G is gain (DC bias off)		
Output DC Bias	±75 V or above ON/OFF with switch on front panel		
Harmonic Distortion Rate	0.1% or less (40 Hz to 1 kHz, output 40 Vrms) 0.5% or less (1 kHz to 100 kHz, output 40 Vrms)		
Spurious	−30 dBc or less (100 kHz to 1 MHz, output 40 Vrms)		
Output Noise	(3.6+0.08×G) mVrms or less		
Output Impedance	[0.19+0.0155 $\sqrt{f}$×(1+j)] Ω or less (typ.)	[0.19+0.00803 $\sqrt{f}$×(1+j)] Ω or less (typ.)	[0.19+0.00460 $\sqrt{f}$×(1+j)] Ω or less (typ.)
Output Terminals	BNC connector, two terminals (1 for front panel and 1 for rear panel) Lo side is connect to chassis. Terminals on front panel and rear panel are connected in parallel.		

Output voltage monitor

Monitor ratio	1/100 of output voltage (1 V /100 V), same polarity as output voltage
Monitor accuracy	±5.0%(DC to 1 MHz) (Error between output voltage and monitor output conversion voltage, load impedance 1 MΩ)
Output Impedance	50 Ω±5%
Output Terminal	BNC connector (rear panel)

Output level LED meter

	HSA42011	HSA42012	HSA42014
Display item	Output voltage and Output current Level display from 0% to 100% with 11 LEDs.		
Detection method	Average value detection (AC+DC). Calibrated with sine wave.		
Full scale (100%)	Voltage: 75 V Current: 1.06 A	Voltage: 75 V Current: 2.12 A	Voltage: 75 V Current: 4.24 A

Protection function

Overload	By detecting excessive output current or excessive internal power loss, the output current is clipped and the front panel overload LED lights up. Output turns off if the overload condition continues for 10 seconds or longer. If the overload continues for 60 seconds or longer, the mode switches to disabled mode.
Output overvoltage	Output turns off when an error is detected. If the error continues for 60 seconds or longer, the mode switches to disable mode.
Internal power supply error	The internal power error LED on the front panel flashes when an error is detected. Then output off ,the mode changes to disable mode.
Internal temperature error	The front panel overload LED lights up when an error is detected. Output turns off if the temperature error continues for 10 seconds or longer. If the overload continues for 60 seconds or longer, the mode changes to disable mode.
Cooling fan error	Output turns off when an error is detected. The mode switches to disable mode.

Disable mode: All operations except power off are disabled.

External control input/output

Control input	Control item	Output on/off
	Control input valid/invalid	Setting with the DIP switch on the rear panel
	Input level	Hi: +4.0 V or more Lo: +1.0 V or less
	Maximum Input Voltage(Non-destructive)	+6 V/−5 V
	Input circuit format	Photocoupler LED input (series resistance 150 Ω)
	Signal detection cycle	50 ms
Status output	Output circuit format	Open collector output
	Range of voltage and current	15 V or less, 10 mA or less
	Status item	Output on/off (output on is short-circuited), Overload (output overload is short-circuited)
	State update cycle	10 ms
Terminals		D-sub 9-pin multi connector (rear panel)

Output on/off control

Output on/off	Controlled by front panel switch or external control input (When the external control input is valid, only output off is valid for front panel operation)

Power-on status setting

Setting method	The DIP switch on the rear panel
Setting items (8 items)	Output (on/off), Gain, External control (on/off), Output polarity, input A (on/off), input B (on/off), Input impedance (50 Ω/10 kΩ), DC bias (on/off)

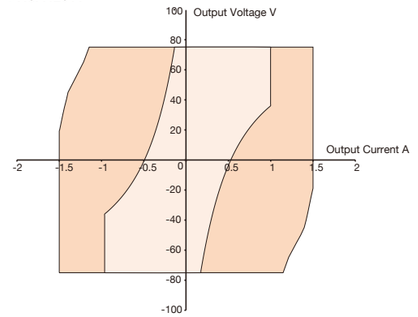
General Information

	HSA42011	HSA42012	HSA42014
Power Input	AC100 V to 230 V±10% (Maximum voltage 250 V), Overvoltage category II 50 Hz ±2 Hz or 60 Hz ±2 Hz (Single-phase), Power factor 0.95 or more		
Power Consumption	290 VA or less	580 VA or less	1050 VA or less
Withstanding voltage*	AC1500 V		
Insulation resistance*	10 MΩ or higher (DC 500 V)		
Operating environment	Indoor use Pollution degree 2		
Altitude	2000 m or lower		
Operation Conditions	0°C to +40°C 5% to 85% RH, (Absolute humidity 1 to 25 g/m³, no condensation)		
Performance Conditions	+5°C to +35°C 5% to 85% RH, (Absolute humidity 1 to 25 g/m³, no condensation)		
Storage conditions	−10°C to +50°C 5% to 95% RH, (Absolute humidity 1 to 29 g/m³, no condensation)		
Dimensions (W×H×D) mm (no protrusions)	220×132.5×450	290×132.5×450	350×177×450
Weight (approx.)	9 kg	11 kg	16 kg

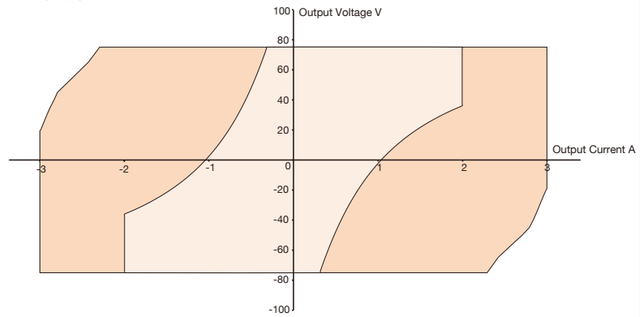
*Between power input vs. others and chassis in total

Output Voltage · Current Range (Reference Values)

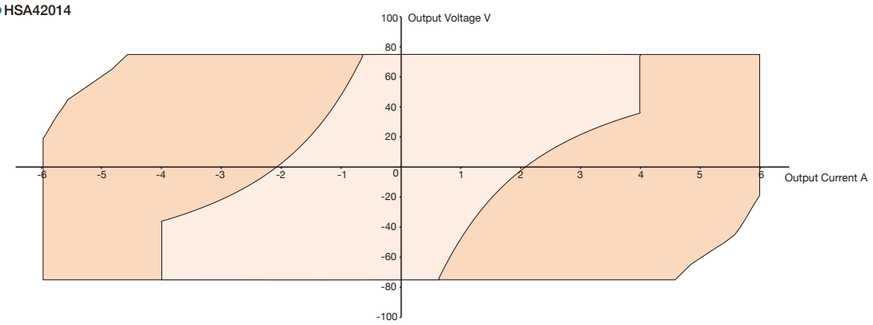
● HSA42011



● HSA42012



● HSA42014



Lineup Power Amplifier

Selection Guide

Model	Frequency Range	Output Voltage	Output Current	Slew Rate
HSA42011	DC to 1 MHz	150 Vp-p	3 Ap-p	475 V/μs
HSA42012	DC to 1 MHz	150 Vp-p	6 Ap-p	475 V/μs
HSA42014	DC to 1 MHz	150 Vp-p	12 Ap-p	475 V/μs
HSA42051	DC to 500 kHz	300 Vp-p	2.83 Ap-p	450 V/μs
HSA42052	DC to 500 kHz	300 Vp-p	5.66 Ap-p	450 V/μs
BA4825	DC to 2 MHz	300 Vp-p	0.5 Arms	500 V/μs

High Speed Bipolar Amplifier HSA series / BA4825

HSA42052

BA4825

Bipolar DC Power Supply BP series

Current output up to 100A

- ±60 V, 120 Vp-p
  ±10A to ±100A
  10 models with different output current
- DC to 150 kHz
- Constant voltage / Constant current (selectable)

BP4610 (±10 A)

BP4650 (±50 A)

Precision Power Amplifier 4500 series

For various power immunity tests

- DC to 20kHz, ±200V
- DC / AC (selectable)
  Constant voltage / Constant current (selectable)
- Output power up to 10kVA
  (power booster required)

4510

Custom & System

Supports the provision of external equipment and customization of equipment for specific applications.

Customization Examples

- **Increase the current of the HSA series**
  Providing external equipment that combines the outputs of multiple units
- **Constant current control of HSA series**
  Providing equipment that constantly controls the current with the AGC (Automatic Gain Control) function

Equipment for specific applications

Test equipment for applying high frequency ripple current

Aging tests of multilayer ceramic capacitors (MLCC)

The HSA series is combined with an output coupled equipment and a constant current controller (AGC) to output high frequency ripple current.
Aging tests that can simulate the actual usage state of MLCC is possible.

Related products used in combination

Impedance analyzer ZA57630

Combined with a high speed bipolar power supply to measure the frequency response of electronic components

- Measurement frequency: 10 μHz to 36 MHz
- Basic accuracy: ±0.08%
- Measurement Impedance range: 10 μΩ to 100 GΩ (Mode: IMPD-EXT)
- Output AC signal level 0.01 mVrmsto 3 Vrms / 0.1 μArms to 60 mArms
  Can be amplified by an external power amplifier
- Measurement time 0.5 ms / point

Multifunction Generator WF1981(1ch) / WF1982(2ch)

Suitable as an input signal source for high-speed bipolar power amplifier

WF1982

- Maximum frequency: 30 MHz (sine wave)
- Maximum output voltage: 21 Vp-p/open
- Low jitter 40 ps rms or less
- Low distortion rate 0.03% or less
- Sine wave, square wave, pulse wave, ramp wave, noise, DC, variable parameter waveform, arbitrary waveform
- Various oscillation modes: Continuous, burst/trigger/gate, internal/external modulation, sweep, burst and modulation, sweep and modulation

*Note: The contents of this catalog are current as of November 6th, 2024.
Product appearance and specifications are subject to change without notice.
Before purchase, contact us to confirm the latest specifications, price and delivery date.

COSINUS MESSTECHNIK GMBH

High Speed Bipolar Amplifier HSA42051/HSA42052

DC - 500 kHz
300 Vp-p

5.66 Ap-p

HSA42052

2.83 Ap-p

HSA42051

Stable output with both capacitive and inductive loads

Piezoelectric element | **Coil** | **Magnetic material** | **Mobile Phone** | **Automotive** | **Motor**

- Frequency range : DC to 500 kHz
- Slew rate : 450 V/µs
- Output Voltage : 300 Vp-p
- Output Current : 2.83 Ap-p (HSA42051) 5.66 Ap-p (HSA42052)
- Four-quadrant operation
- Low output impedance

- Gain setting
- Output polarity switching
- Output DC offset voltage adjustment
- Output DC bias voltage setting
- Output DC offset canceling
- Protection function

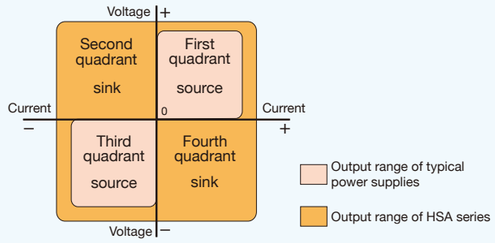
High Speed, Broad Bandwidth, High Voltage Output

In the test of electronic components and devices such as piezoelectric elements and coils,it can stably drives the DUT that cannot be driven by other amplifiers.
Used in advanced research fields such as medical and MEMS.

Stable output under various load conditions

Four-quadrant operation

The operation range of the HSA series is four quadrants as shown in the figure below.
Current sources and sinks regardless of positive or negative output voltage.



Stable output with both capacitive and inductive loads

When an AC voltage is applied to a load including capacitors and coils, current returns from the load. In this case, a typical AC power supply or amplifier may not be able to drive the load. The HSA series operates in the sink state in which the directions of voltage and current are opposite due to the 4-quadrant output function. Therefore, not only a capacitive load such as a piezoelectric element but also an inductive load such as a solenoid can both be driven stably.

Fast response, wide frequency bandwidth from DC to 500 MHz

High speed and high slew rate reproduce transient and repetitive operation with sharp step response.
HSA series outputs AC and DC. Therefore, it is possible to output positive/negative asymmetric signals or signals in which AC is superimposed on DC.

Low output impedance

Due to the output impedance of the power supply, the rise time of a capacitive or inductive load is delayed.
The HSA series maintains a low output impedance over the entire frequency band, suppresses voltage drop due to load, and operates at high speed.

Convenient functions for various purposes

Gain setting

Set seamlessly by combining selectable fixed gain ×1,×20,×40,×100 and variable gain ×1 to ×3 (fine adjustment potentiometer)
With a gain ×1 setting, it is used as a buffer amplifier that outputs at the same voltage as the external signal generator setting (when input impedance : 10 kΩ).

Output polarity switching

With the [INVT] switch on front panel, an amplification can be selected which the input and output phases are in the same or opposite polarity.
BTL connection by two HSA units with output polarity set to opposite, the output voltage and power are doubled.

BTL : Balanced Transformer Less

Output DC offset voltage adjustment

Adjust the output DC offset voltage to zero volts.

Output DC bias voltage setting

Superimpose a DC bias voltage (up to ±150 V) on the output voltage. (Setting by 10-turn potentiometer)

Output DC offset cancellation function

When set to AC mode, the DC offset is automatically removed and only AC voltage is output.
This function is effective when a transformer or coil is magnetically saturated due to the DC component of the applied voltage.

Protection function

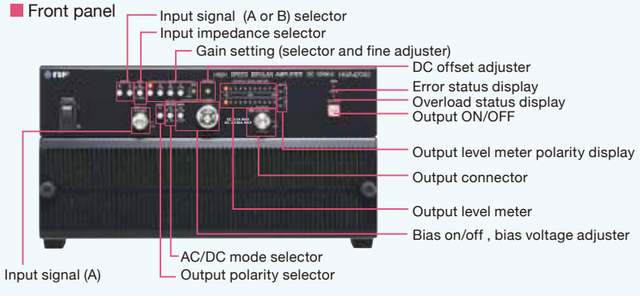
This instrument is equipped with protection functions against overload, overvoltage, internal error, internal temperature error, and cooling fan failure.

Others

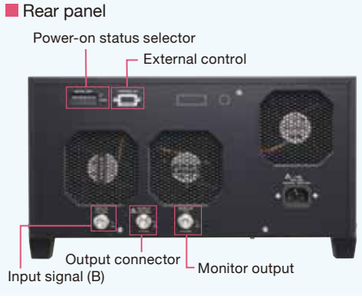
●External control input/output ●Output voltage monitor
●Output on/off control ●Power-on status setting

HSA42052

■ Front panel



■ Rear panel



Coils and Transformers

Magnetic powder core
Ferrite core

Researchers in magnetic materials are developing new materials to achieve rare-earth-free materials.
Powder magnetic cores have good magnetic properties in the frequency band of 1 kHz or higher, and their production yields are good, so they are being applied to various parts.
The HSA42051/HSA42052 have an output DC offset cancellation function that suppresses magnetic saturation, and with a maximum output of 300Vp-p, it is suitable for testing and measuring power inductors.

Piezoelectric element

Actuator
Transformer

Piezoelectric elements are also being used in new fields such as haptics and underwater communication, and fine displacement control and high power output are required.
The HSA42051/HSA42052 have low output impedance, high speed, good step response, and maximum output of 300 Vp-p (600 Vp-p with BTL connection), supporting device evaluation in new fields.

Mobile Phone

Touch Panel

Verification of device malfunction due to external noise

Mobile devices such as mobile phones may malfunction due to common mode noise or noise from the AC adapter. The malfunction is verified by conducting a test that superimposes the AC voltage on the DC voltage.
With the output DC bias setting and wide frequency response, it is also possible to test with a sine wave superimposed on the DC voltage.

Vehicle Electrical Components

Battery charger

High voltage of EV power supplies

The shifting to electric vehicles worldwide had made EV development more active. Vehicle power supply tend to be higher in voltage, and vehicle electrical components are also required to have power fluctuation a higher voltage.
In some cases, a high-speed bipolar power supply is required for high-frequency voltage fluctuation tests.

Moreover...

Capacitor

Multilayer ceramic capacitors (MLCCs), which are becoming smaller in size and larger in capacity, have a capacitance that depends on frequency and voltage.The impedance frequency response can be evaluated by applying a voltage while sweeping the frequency.

Motor

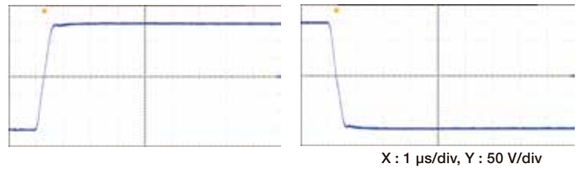
In an ultrasonic motor, it can be driven by changing the frequency, phase, and amplitude in combination with a signal generator.

Advanced research

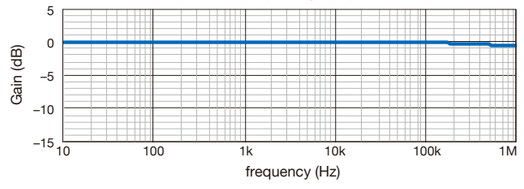
It can be used as an experimental drive amplifier in medical devices, nanotechnology and MEMS.

Performance data HSA42052

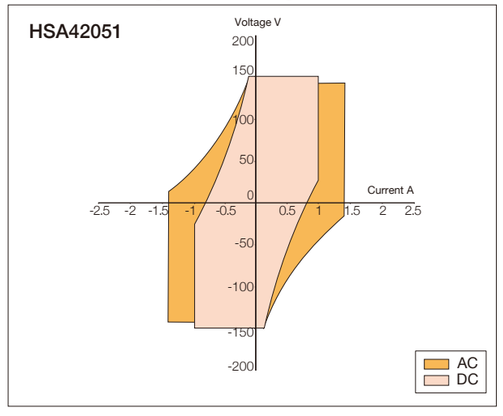
Step Response (300 Vp-p, rated Load 50 Ω)

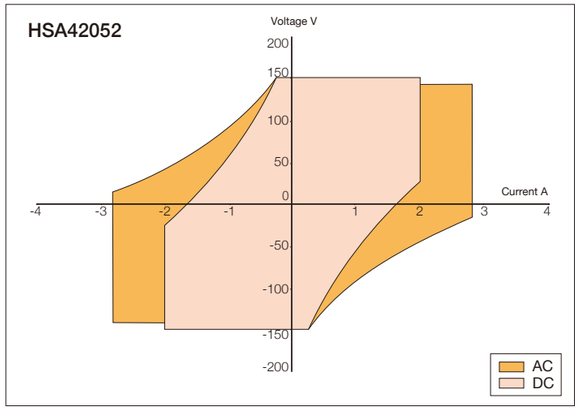


Small amplitude frequency response



Output voltage/current range





Specifications

Settings and Conditions · 30 minute warm-up · Waveform : sine wave · Polarity : In-phase · DC mode · Gain Setting : ×100 (CAL)
· Load (PF 1, nominal value) : 100 Ω (HSA42051) , 50 Ω (HSA42052) · Input Impedance : 50 Ω

The following values with accuracy represents warranted performance, values without accuracy are not warranted, they are typical values(typ.) or reference values. Reference values are only supplementary data to use for reference, they do not guarantee performance.

Input

Input type	Input A, Input B or addition of input A and input B (When two inputs are on, the maximum input voltage is within ±10 V in total)
Input impedance	50 Ω±5%,10 kΩ±5% switchable (Unbalanced, switch between two inputs A and B at once)
Maximum input voltage	±10 V
Non-destructive input voltage	±11 V
Input terminals	BNC connector Input A : Front panel, Input B : Rea panel Lo side is connected to the chassis.

Output

Output mode	Constant Voltage (CV)	
AC/DC mode	DC or AC	
Output polarity	In-phase or reversed phase (switchable with switch on front panel)	
Gain setting function	Fixed : ×1, ×20, ×40, ×100 Variable: ×1(CAL) to ×3 consecutive Gain Setting is (Fixed)×(Variable).	
Gain error	±5% (Fixed Gain : ×1, ×20, ×40, and ×100, Variable Gain: CAL, Input voltage 0.1Vrms or more, at 400 Hz)	
Maximum output voltage		
DC mode	Load of Resistance 100 Ω*1	100 Vrms (40 Hz to 200 kHz) 40 Vrms (20 Hz to 500 kHz)
	Load of Resistance 150 Ω*2	±150 V (DC to 50 kHz) ±140 V (50 kHz to 200 kHz) ±55 V (200 kHz to 500 kHz)
AC mode	Load of Resistance 100 Ω*1	100 Vrms (40 Hz to 200 kHz) 40 Vrms (20 Hz to 500 kHz)
	Load of Resistance 150Ω*2	±150 V (10 Hz to 50 kHz) ±140 V (50 kHz to 200 kHz) ±55 V (200 kHz to 500 kHz)
Maximum current (AC)	**HSA42051** : 1Arms, 2.83Ap-p(40Hz to 200kHz) **HSA42052** : 2Arms, 5.66Ap-p(40Hz to 200kHz)	
Maximum current (DC)	**HSA42051** : ±1 A **HSA42052** : ±2 A	
Low amplitude frequency response		
DC mode	DC to 100 kHz : -0.3 dB to +0.3 dB 100 kHz to 300 kHz : -1 dB to +0.5 dB 300 kHz to 500 kHz : -3 dB to +0.5 dB (Output Amplitude 20 Vrms, reference 400 Hz)	
AC mode	10 Hz to 100 kHz : -0.3 dB to +0.3 dB 100 kHz to 300 kHz : -1 dB to +0.5 dB 300 kHz to 500 kHz : -3 dB to +0.5 dB (Output Amplitude 20 Vrms, reference 400 Hz)	
Slew rate	450 V/μs or above	
Output DC offset*3		
DC mode	Adjustment Range : ±1 V or above (Input Terminal Short circuit)	
AC mode	Adjustment Range : ±1 mV or above	
Output DC bias	±150 V or above on/off with switch on front panel	
Harmonic distortion factor	0.1% or less (40 Hz to 1 kHz, output 80 Vrms) 0.5% or less (1 kHz to 20 kHz, output 80 Vrms)	
Spurious	-46 dBc or less (20 kHz to 50 kHz, output 80 Vrms) -30 dBc or less (50 kHz to 500 kHz, output 30 Vrms)	
Output noise*3	(7.2+0.16×G) mVrms or less (G=1 to 3) (1+0.4×G) mVrms or less (G=20 to 300) (Input terminal short circuit, bandwidth 10 Hz to 1 MHz)	
Output impedance*4	**HSA42051** : [0.19+0.016 $\sqrt{f}$ (1+j)] Ω or less (typ.) **HSA42052** : [0.19+0.0084 $\sqrt{f}$ (1+j)] Ω or less (typ.)	
Output terminals	BNC connector Number of terminals: 2 (One each on the front and rear panels) Lo side is connect to chassis. Terminals on front panel and rear panel are connected in parallel.	

*1 50Ω for HSA42052 *2 75Ω for HSA42052
*3 G means gain. *4 f means frequency, unit is Hz.

Output voltage monitor

Monitor ratio	1/100 of output voltage (1 V / 100 V), same polarity as output voltage
Monitor accuracy	±5.0% (DC to 500 kHz) (Error between output voltage and monitor output conversion voltage, load impedance 1 MΩ)
Output impedance	50 Ω±5%
Output terminal	BNC connector (rear panel)

Output level LED meter

Display item	Output voltage and Output current Level display from 0% to 100% with 11 LEDs.
Detection method	Average value detection (AC+DC). Calibrated with sine wave.
Full scale (100%)	**HSA42051** : Voltage : 150 V Current : 1 A **HSA42052** : Voltage : 150 V Current : 2 A

Protection function

Overload	By detecting excessive output current or excessive internal power loss, the output current is clipped and the front panel overload LED lights up. Output turns off if the overload condition continues for 10 seconds or longer.
Output overvoltage	Output turns off when an error is detected.
Internal power supply error	The internal power error LED on the front panel flashes when an error is detected.Then output off.
Internal temperature error	The front panel overload LED lights up when an error is detected.Output turns off if the temperature error continues for 10 seconds or longer.
Cooling fan error	Output turns off when an error is detected.

External control input/output

Control input	Control item	Output on/off
	Control input valid/invalid	Setting with the DIP switch on the rear panel
	Input level	Hi : +4.0 V or more Lo : +1.0 V or less
	Non-destructive input	+6 V/−5 V
	Input type	Photocoupler LED input (series resistance 150 Ω)
	Signal detection cycle	50 ms
Status output	Output type	Open collector output
	Range of voltage and current	15 V or less, 10 mA or less
	Status item	Output on/off (output on is short-circuited), Overload (output overload is short-circuited)
	State update cycle	10 ms
Terminals		D-sub 9-pin multi connector (rear panel)

Output on/off control

Output on/off	Controlled by front panel switch or external control input (When the external control input is valid, only output off is valid for front panel operation)

Power-on status setting

Setting method	The DIP switch on the rear panel
Setting items (9 items)	Output (on/off), Gain, External control (on/off), Output polarity, input A (on/off), input B (on/off), Input impedance (50Ω/10kΩ), DC bias (on/off) AC/DC mode (AC/DC)

General Information

Power input	AC100 V to 230 V±10% (Maximum voltage 250 V), Overvoltage category II 50 Hz ±2 Hz or 60 Hz ±2 Hz (Single-phase), Power consumption (Maximum) 1050 VA Power factor 0.95 or more (AC 100V, 50Hz)
Consumption Power	**HSA42051** : 580 VA or more **HSA42052** : 1050 VA or more
Withstanding voltage*	AC1500 V
Insulation resistance*	10 MΩ or higher (DC 500 V)
Operating environment	Indoor use, Pollution degree 2
Guaranteed performance	+5°C to + 35°C 5% RH to 85% RH, (Absolute humidity 1 to 25g/m3, no condensation)
Storage conditions	−10°to + 50°C 5% RH to 85% RH, (Absolute humidity 1 to 29g/m3, no condensation)
Dimensions (W×H×D) mm	**HSA42051** : 290(W)×132.5(H)×450(D) mm **HSA42052** : 350(W)×177(H)×450(D) mm
Weight (approx.)	**HSA42051** : 11kg **HSA42052** : 16kg

*Between power input vs. others and chassis in total

High Speed Bipolar Amplifier lineup

Model name	Frequency characteristics	Output voltage	Output current	Slew rate
HSA42011	DC to 1 MHz	150 Vp-p	3 Ap-p	475 V/μs
HSA42012	DC to 1 MHz	150 Vp-p	6 Ap-p	475 V/μs
HSA42014	DC to 1 MHz	150 Vp-p	12 Ap-p	475 V/μs
HSA42051	DC to 500 kHz	300 Vp-p	2.83 Ap-p	450 V/μs
HSA42052	DC to 500 kHz	300 Vp-p	5.66 Ap-p	450 V/μs
BA4825	DC to 2 MHz	300 Vp-p	0.5 Arms	500 V/μs

*Note: The contents of this catalog are current as of June 23th, 2023.
Product appearance and specifications are subject to change without notice.
Before purchase, contact us to confirm the latest specifications, price and delivery date.

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