HA51U Series
±500V TO 6000VPP, 15W – 20W
PROGRAMMABLE HIGH SPEED HIGH VOLTAGE AMPLIFIERS

• FEATURES
  - ±500V to 6000VPP
  - Bipolar, Unipolar and Unsymmetrical
  - High Precision, High Speed
  - Fully User Programmable:
    - Compatible with Arduino IDE
    - Modular / 3U Cassette
    - Arbitrary Signal Generation
    - Control - Feedback Applications

• APPLICATIONS
  - EAP
  - Piezo
  - ER Fluids
  - Mirror Deflection / Deforming
  - Electrophoresis
  - Ion Beam Deflection
  - Electro Optics
  - MEMS
  - Mass Spectrometry
  - High Voltage Testing

The HA51U series is a family of single channel, bipolar, unipolar and unsymmetrical high voltage amplifiers. They feature high speed, high precision and high stability as well as very low ripple and noise. They are designed to drive capacitive and resistive loads. High peak output current facilitates easy driving of capacitive loads.

Each amplifier of the HA51U series is equipped with voltage and current monitor outputs, a TTL-compatible INHIBIT input and further monitoring outputs. The output stage is fed by internal high voltage sources. The amplifier output is protected against overcurrent, short circuit, overvoltage, overtemperature and high voltage flashover. A safety interlock feature is provided to integrate the unit into a safety circuit.

An isolated USB interface is provided to control the amplifier by means of a simple command interface [setting of the output voltage, monitoring of output voltage, current, temperature and further operational parameters, configuring the amplifier]. Alternatively, the internal microcontroller can be used to run the user’s own application code. This can be simple arbitrary waveform generation or direct control of the output voltage via USB. More complex applications are possible too. General Purpose I/O lines and a separate analog input are provided to connect additional components to the amplifier that can be controlled.

Programming of the controller is possible e.g. by means of the free Arduino IDE.

The amplifiers are available in a robust modular metal case or as 3U cassette versions. The modular units can be used as a table-top device or built into an appliance. Up to four 3U cassette version units can be plugged into a 19” subrack – see HAR-51-4M.

<table>
<thead>
<tr>
<th>Output Voltage</th>
<th>Maximum Output Current</th>
<th>Model</th>
<th>Signal Gain</th>
<th>Slew Rate (typ.)</th>
<th>Full Power Bandwidth</th>
<th>Small Signal Bandwidth</th>
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</thead>
<tbody>
<tr>
<td>±500V – +500V</td>
<td>±20mA / 40mA</td>
<td>HA51U-0.5B20</td>
<td>50 ±1%</td>
<td>100V/μs</td>
<td>0 – 30kHz</td>
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<td>-200V – +800V</td>
<td>±20mA / 40mA</td>
<td>HA51U-0.8P20</td>
<td>80 ±1%</td>
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<td>±10mA / 20mA</td>
<td>HA51U-2P10</td>
<td>200 ±1%</td>
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<td>-2000V – +2000V</td>
<td>±4mA / 8mA</td>
<td>HA51U-2B4</td>
<td>200 ±1%</td>
<td>25V/μs</td>
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<td>±5mA / 10mA</td>
<td>HA51U-1.5B5</td>
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<td>300 ±1%</td>
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<td>0 – +6000V</td>
<td>±2.5mA / 5mA</td>
<td>HA51U-6P2</td>
<td>600 ±1%</td>
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**SPECIFICATIONS**

- Control Input: ±10V (10V ≜ max. output voltage), differential
- Monitor Output (V): ±10V (10V ≜ max. output voltage)
- Monitor Output (I): ±10V
- Input Connector: SMB, D-Sub
- Output Connector: SHV
- Supply Voltage: 24Vdc ±10% / <1.6A at maximum output power
- Dimensions: Modular Case: ca. 105 x 59 x 230mm³
- Ambient Temperature: -20 - +50°C
- Safety: EN61010-1, CE

Model HA51U-6P2: status PRELIMINARY

**DIMENSIONS**

**Modular Case**

- Dimensions: 105.0 x 59.3 x 225 mm³

**3U Cassette**

- Dimensions: 81.0 x 128.4 x 225 mm³

**REMARKS**

- Slew rate and bandwidth measured at CL = 100pF
- Full power bandwidth: 1% distortion
- Small signal bandwidth: -3dB
**MAINFRAME HAR-51-4M**

The HAR-51-4M is a 19”/3U subrack for up to 4 high voltage amplifier modules HA51...-3. It features internal power supplies, cooling fans, a common Interlock input for all channels and a HV OFF button.
Customized and full custom models are available on request.

**SPECIFICATIONS HAR-51-4M**

- **Line Voltage**: 100 - 240VAC ±10% 50/60Hz
- **Input Current**: 1.9A RMS at VLine=115VAC, nominal load
  0.95A RMS at VLine=230VAC, nominal load
- **Line Fuses F1, F2**: T6.3A, 250V, IEC127-2/V
- **External Fuse**: 16A
- **Protection Class**: I
- **Dimensions (d x w x h)**: 376 x 447 x 140mm³ (housing)
  419 x 482 x 140mm³ (overall, without cable)
- **Weight**: ca. 5.1kg without amplifier modules

**Disclaimer**

The information given in this data sheet is technical data, not assured product characteristics. It has been carefully checked and is believed to be accurate; however, no responsibility is assumed for inaccuracies. The user has to ensure by adequate tests that the product is suitable for his application regarding safety and technical aspects.

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**Safety Advice**

Design, installation and inspection of machinery and devices carrying high voltage require accordingly trained and qualified personnel. Appropriate safety rules and directives must be complied with.

Improper handling of high voltage can mean severe injuries or death and may cause serious collateral damage!

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