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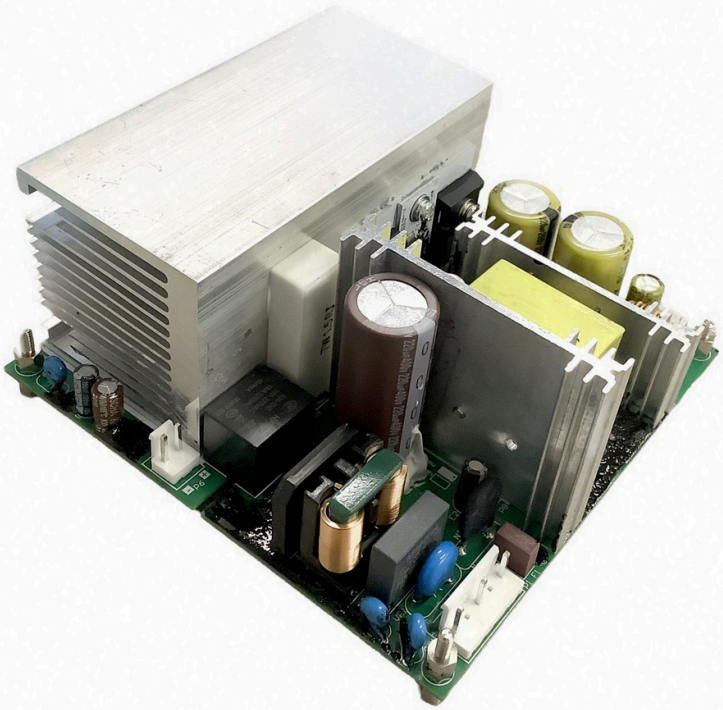
Ver. 1.02

HIGH-VOLTAGE PIEZO AMPLIFIER

MTAD600

High-Voltage Piezo Amplifier

User Manual



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1.02	2026-10-27	Added Sections 6.8–6.10 (output current calculation, power bandwidth, typical connection)		

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How to Contact Us

If the product has a defect in materials or workmanship, or fails to meet its specifications, contact us promptly within the warranty period by telephone (+81-3-5297-6088) or through our website (www.mechano-transformer.com), and return the product to Mechano Transformer Corporation. We are not responsible for damage that occurs during shipping. Products with a broken warranty seal may not be accepted for return.

When contacting technical support, please provide the following information so that our staff can assess the situation.

1. Your contact details (name, telephone number, e-mail address)
2. Product serial number or order number
3. Description of the problem, including drive conditions (load capacitance, waveform, voltage, frequency, etc.) and cooling conditions

We may also ask whether the system is used for production or for research and development, and about the state of the system before the problem occurred. If the same problem has occurred before, please tell us how often. Whether the system can still operate despite the problem, or does not work at all, is also important information. Finally, please let us know of any changes or events, such as modifications or changes in the environment, that may have caused the problem.

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1 Product Overview

The MTAD600 is a high-voltage piezo amplifier module that integrates an AC/DC switching power supply and a power amplifier on a single board. It amplifies a 0–3.33 V control signal with a fixed gain of 45 V/V and drives capacitive loads such as multilayer piezo actuators and piezo-driven stages from 0 to 150 V. Designed especially for high-speed repetitive trapezoidal-wave drive, it can deliver a peak output current of up to 10 A into loads of up to 7.5 µF.

It has built-in output short-circuit, overcurrent, output overvoltage and overheat protection. For system integration, it also provides an external shutdown input (SD), voltage/current monitor outputs and a +24 V auxiliary supply for cooling fans.

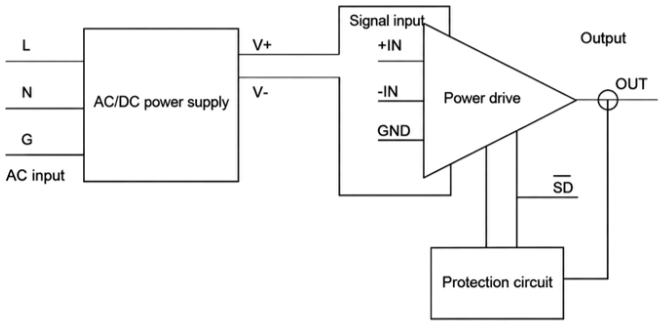


Fig. 1-1 MTAD600 block diagram

MTAD600 Features

- AC/DC power supply and high-voltage power amplifier in one unit (AC 100–120 V input)
- Output 0–150 V, fixed gain 45 V/V, differential signal input
- Peak output current 10 A; drives capacitive loads up to 7.5 µF
- Built-in output short-circuit, overcurrent (auto-recovery), overvoltage and overheat protection
- External shutdown input, output voltage/current monitor outputs
- Wide operating temperature range (−25 to +40 °C), high reliability

Main Applications

- Driving multilayer piezoelectric actuators and piezo-driven stages
- High-speed shutters, valves, dispensing pumps
- Precision positioning, active vibration control
- Mirror tilt, optical path adjustment
- Repetitive trapezoidal-wave drive in production equipment

Specifications are subject to change without notice.

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2 Safety Precautions

The following terms and symbols are used in this manual and on the MTAD600 to indicate safety-related information.

2.1 Explanation of Symbols

2.1.1 Electric Shock Hazard



The electric shock symbol indicates the presence of dangerous high voltage. The MTAD600 handles AC mains voltage at its input and outputs up to DC 150 V. Improper handling may result in serious damage, injury or death. Exercise great care and follow all safety instructions.

2.1.2 Hot Surface Hazard



The hot surface symbol indicates the presence of hot parts. The heatsinks of the MTAD600 become hot during operation (areas close to 100 °C were observed in testing; see Section 7.5). Touching them may cause burns or injury. Exercise great care and follow all safety instructions.

2.1.3 Ground



The ground symbol indicates the frame ground (FG) terminal. On the MTAD600, pin 1 of AC input connector P1 is FG. Always connect it to protective earth.

2.2 Warnings and Cautions

1. Read and understand this manual before use.
2. Installation and handling must be performed by qualified engineers experienced with high-voltage equipment.
3. The MTAD600 is an open-frame board. Install it inside an enclosure so that live parts cannot be touched.
4. Do not touch the board, output terminals or load wiring while power is applied. Even after power is turned off, confirm that the output voltage has dropped to a safe level before touching.
5. Always connect the FG terminal (P1 pin 1) to protective earth.
6. Always turn off the AC power before connecting or changing wiring.
7. Do not touch the heatsinks during operation or immediately after stopping.
8. Provide sufficient cooling. Forced-air cooling is recommended (see Section 6.6).
9. Do not disassemble or modify this product, and do not adjust components on the board.
10. Do not use near flammable materials, in humid locations or where condensation may form.
11. If you notice an unusual odor, noise, smoke or abnormal heat, turn off the power immediately.
12. If the product has been dropped or subjected to impact, do not turn on the power.
13. Do not operate with wet hands.
14. Connect a 0.1 µF multilayer ceramic capacitor (MLCC) and a 10 µF electrolytic capacitor in parallel to the output.
15. The output (−) of connector P6 is a separate signal from GND. Do not connect it to GND.

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2.3 Hazard Locations

The table below shows where the above hazards are located on the MTAD600. For item numbers, refer to Fig. 5-1 (Section 5.3).

Location	Hazard	Remarks
AC input connector P1 (item 1) and power supply section	Electric shock	AC mains voltage (AC 100–120 V)
Output connector P6 and load wiring	Electric shock	Up to DC 150 V. Piezo loads store charge
Power amplifier heatsink (item 7)	Hot surface	Overheat protection operates at 75–85 °C
Power supply heatsink (item 8)	Hot surface	
P1 pin 1 (FG)	Ground	Connect to protective earth

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3 Package Contents

3.1 Included Items

The standard package includes the following.

1. MTAD600 high-voltage piezo amplifier module (with mounting standoffs)

Mating connectors and cables are not included. Please prepare the JST housings and contacts listed in Section 5.4.

3.2 Options

1. DC 24 V cooling fan (connects to P3/P4)

For load capacitances above 7.5 µF, please contact Mechano Transformer Corporation.

4 Weight and Dimensions

Weight	580 g
Dimensions (L × W × H)	122 mm × 120 mm × 55 mm
Board outline	120.0 mm × 121.6 mm (see Fig. 4-1)
Mounting holes	4 × Ø3.5 mm (for M3 screws)

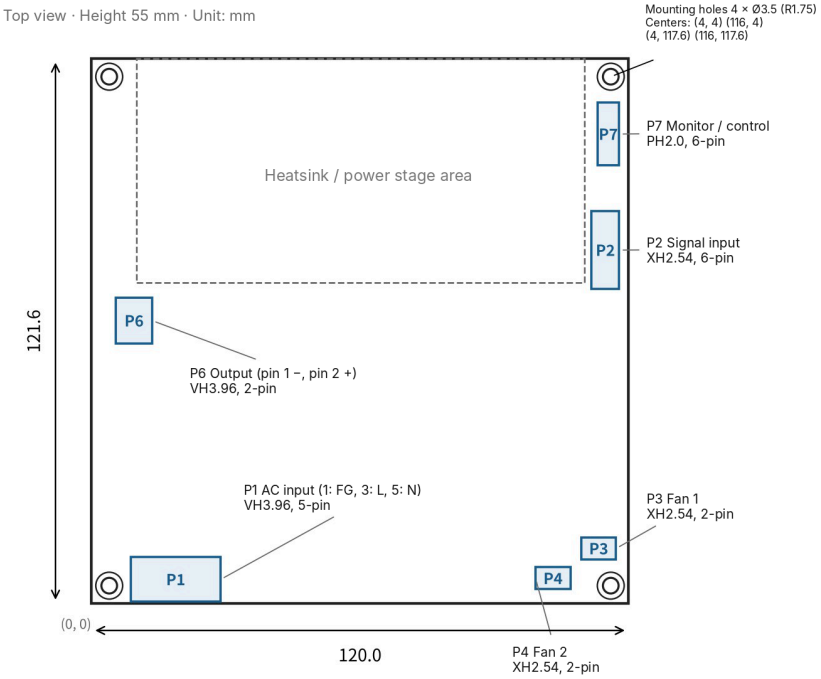


Fig. 4-1 Outline drawing and connector layout (top view). Unit: mm

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5 Specifications

5.1 Electrical Characteristics

Item	MTAD600
Type	High-voltage piezo amplifier with integrated switching power supply
AC input	AC 100–120 V (typ. 110 V), 47–63 Hz, max. 1.5 A
Output voltage range	0–150 V
Gain	45 V/V fixed (44–46 V/V)
Signal input	0–5 V differential (+IN/−IN); 150 V output at 3.33 V
Output current	Peak 10 A, RMS 3.16 A, average 1 A [1)]
Max. power dissipation	100 W
Load capacitance	Max. 7.5 µF [2)]
Slew rate	Typ. 10 V/µs (no load)
Output noise	Max. 20 mVRMS (bandwidth 300 kHz)
Protection	Output short circuit, overcurrent (auto-recovery), output overvoltage, overheat
External shutdown	SD pin: Low (connected to GND) = stop, High (+5 V) = normal operation
Auxiliary output	DC +24 V, 1 A total
Operating temperature	−25 to +40 °C, 20–90 %RH [3)]
Storage temperature	−25 to +80 °C, 10–90 %RH [3)]
Lifetime	10,000 hours

Notes: 1) Load capacitance 6.6 µF, Vo 0–150 V, Tr = Tf = 100 µs, 500 Hz trapezoidal wave. See Chapter 7 for measured data.
2) Please consult us for larger capacitances. 3) Non-condensing.

5.2 Detailed Specifications

Input (Power Supply Section)

Item	Min.	Typ.	Max.	Conditions	Unit
Input voltage	100	110	120		V
Input frequency	47	50	63		Hz
Power factor	0.4	0.5	–		–
Efficiency	85 %	90 %	–	100 W load connected to output V+	–
Input AC current	–	–	1.5		A
Inrush current	–	–	60	At 110 V input	A
No-load power consumption	–	–	6	At 110 V input	W
Power dissipation	–	–	100		W
Start-up delay	–	5	–		s
Start-up overshoot	–	10	–	At power on/off, relative to Vo	%

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24 V Auxiliary Supply

Item	Min.	Typ.	Max.	Conditions	Unit
Output voltage	21.6	24	26.4	Load 0.1–1 A	V
Total output current	–	–	1	Total of P2 (V+), P3 and P4	A

Power Amplifier Section

Item	Min.	Typ.	Max.	Conditions	Unit
Input voltage range	0	3	5		V
Input impedance	50	100	–		kΩ
Output error	−0.5	0	+0.5		V
Gain	44	45	46		V/V
Output noise	–	–	20	BW 300 kHz, all inputs to GND, no load	mVRMS
Output impedance	–	–	3		Ω
Slew rate	5	10	–	No load	V/µs
Output offset voltage	–	–	300	All inputs to GND, no load	mV
External shutdown (SD) current	–	–	1	SD connected to GND	mA
Output voltage range	0	–	150		V
Output overvoltage protection	151	–	155		V
Output current	–	10	12	Peak 10 A, RMS 3.16 A, average 1 A	A
Overcurrent protection	15	17	20		A
Overcurrent protection delay	–	–	2	2 Ω load	µs
Overheat protection	75	80	85		°C

Environment and Other

Operating temp./humidity	−25 to +40 °C, 20–90 %RH, non-condensing
Storage temp./humidity	−25 to +80 °C, 10–90 %RH, non-condensing
Withstand voltage	Input–output, input–input GND: AC 1500 V, 5 mA, 5 s
Lifetime	10,000 hours

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5.3 Part Names

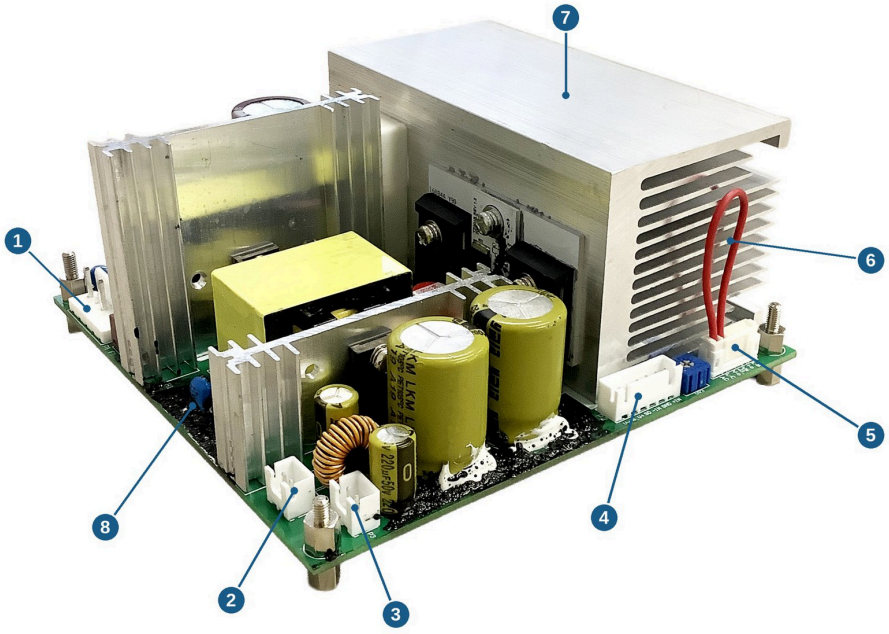


Fig. 5-1 MTAD600 part names (output connector P6 is on the far side; see Fig. 4-1)

Item No.	Name / Description
1	P1 AC input connector (VH3.96, 5-pin)
2	P4 Fan 2 connector (XH2.54, 2-pin, +24 V)
3	P3 Fan 1 connector (XH2.54, 2-pin, +24 V)
4	P2 Signal input connector (XH2.54, 6-pin)
5	P7 Monitor/control connector (PH2.0, 6-pin)
6	Jumper wire between AC and L-C on P7 (for direct output; see Section 6.1)
7	Heatsink (power amplifier section, hot surface)
8	Heatsink (power supply section, hot surface)

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5.4 Connector Pin Assignments

All connectors are made by JST. Use the following housings and crimp contacts for the mating side (datasheet MTAD600-DS-JA Rev.1).

Connector	Function	Board side	Mating housing	Contact
P1	AC input	VH3.96, 5-pin	VHR-5N	SVH-41T-P1.1
P2	Signal input	XH2.54, 6-pin	XHP-6	SXH-001T-P0.6
P3/P4	Fan 1/Fan 2	XH2.54, 2-pin	XHP-2	SXH-001T-P0.6
P6	Output	VH3.96, 2-pin	VHR-2N	SVH-41T-P1.1
P7	Monitor/control	PH2.0, 6-pin	PHR-6	SPH-002T-P0.5L

P1 (VH3.96, 5-pin) – AC Input

Mating connector (JST): housing VHR-5N, contact SVH-41T-P1.1

Pin	Name	Description
1	F.G	Frame ground. Connect to protective earth
2	–	Not used
3	AC IN	AC input L
4	–	Not used
5	AC IN	AC input N

P2 (XH2.54, 6-pin) – Signal Input

Mating connector (JST): housing XHP-6, contact SXH-001T-P0.6

Pin	Name	Description
1	+IN	Signal input +
2	GND	Signal GND
3	−IN	Signal input −
4	SD	External shutdown. Pulling Low stops the output stage
5	G_V+	+24 V auxiliary supply GND
6	V+	+24 V auxiliary supply +

P3/P4 (XH2.54, 2-pin) – Fan 1/Fan 2

Mating connector (JST): housing XHP-2, contact SXH-001T-P0.6

Pin	Name	Description
1	–	+24 V auxiliary supply GND
2	+	+24 V auxiliary supply +

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P6 (VH3.96, 2-pin) – Output

Mating connector (JST): housing VHR-2N, contact SVH-41T-P1.1

Pin	Name	Description
1	–	Output – (to the – side of the piezo load). Separate signal from GND
2	+	Output + (to the + side of the piezo load)

P7 (PH2.0, 6-pin) – Signal Control and Sampling Outputs

Mating connector (JST): housing PHR-6, contact SPH-002T-P0.5L

Pin	Name	Description
1	L-B	Load discharge. A 3.3 V High discharges the load (approx. 6.8 mA). Disabled when open or Low. Do not continue discharging for more than 10 seconds.
2	I-o	Output current sampling output. 1.65 V at 0 A. V = Iout × 0.01 × 20 + 1.65 V
3	Va-G	GND of the sampling section
4	Vo	Output voltage sampling output. Vo = Vout / 50
5	L-C	Load switch. Enabled when High. AND logic with the AC signal: the load conducts only when both are High.
6	AC	AC input power-good signal. High = AC input normal; 0 V = no AC input or AC voltage too low

CAUTION

- P6 pin 1 (output –) is a separate signal from GND. Do not connect it to GND.
- Connect a 0.1 µF multilayer ceramic capacitor (MLCC) and a 10 µF electrolytic capacitor in parallel to the output.

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6 Operation

6.1 Before Use

1. **Mounting** – Using the standoffs, secure the MTAD600 inside the enclosure with M3 screws through the four Ø3.5 mm mounting holes. Do not obstruct airflow through the heatsink fins.
2. **Cooling** – Provide forced-air cooling. DC 24 V fans can be powered from P3 and P4. The +24 V auxiliary supply provides up to 1 A in total across P2 (V+), P3 and P4.
3. **P7 jumper** – For direct output, AC (P7-6) and L-C (P7-5) must be shorted. On the unit shown in Fig. 5-1, they are shorted with a jumper wire (item 6). To control the load switch externally, remove the jumper and drive L-C with a High/Low signal.
4. **Signal cable** – Use shielded cable for the signal input (UL2547 recommended).
5. **Load** – Keep the total load capacitance within 7.5 µF and check the peak current for the waveform used (see Section 7.4).

6.2 Setup

1. Confirm that the AC power is off.
2. Install the MTAD600 and the cooling fans, and connect the fans to P3/P4.
3. Connect the piezo load to P6 (pin 1 = output –, pin 2 = output +). Observe the polarity of the piezo actuator.
4. Connect the signal source to P2 (pin 1 = +IN, pin 2 = GND, pin 3 = −IN). For a single-ended signal, connect −IN to GND at the signal source side.
5. When using external shutdown, connect the control circuit to SD (P2-4) as shown in Fig. 6-1.
6. Check the AC–L-C jumper on P7 (or the external L-C control).
7. Connect AC power to P1 (pin 1 = FG (protective earth), pin 3 = L, pin 5 = N). Input is AC 100–120 V, 47–63 Hz.
8. Set the input signal to 0 V, then turn on the AC power. The output is enabled after the start-up delay (approx. 5 seconds).
9. Apply the drive signal.
10. To stop, set the input signal to 0 V, then turn off the AC power. If necessary, discharge the load with L-B (P7-1) (within 10 seconds).

CAUTION

- Always turn off the AC power to the MTAD600 before connecting or disconnecting cables.
- An overshoot of up to 10 % of Vo may occur at power-on and power-off. Make sure that the load and mechanism can withstand it.

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6.3 Signal Input and Gain

The power drive section of the MTAD600 is a low-noise differential amplifier with a fixed gain of 45 V/V. The relationship between input and output voltage is as follows.

$$Vout = (V_{+IN} - V_{-IN}) \times 45$$

Differential input (V)	0	1.00	2.00	3.00	3.33
Output voltage (V)	0	45	90	135	150

To reduce differential amplifier error, choose a signal source with low internal resistance or use a small-signal op-amp as a buffer stage. To reduce noise, use shielded cable for the signal input. For single-ended input, the −IN terminal may be connected to GND. To reduce common-mode noise, ground at the output side of the signal source, not at the amplifier input terminals.

Use the differential input within 0–3.33 V. Exceeding this range exceeds the output voltage range (0–150 V) and may trigger the output overvoltage protection (151–155 V).

6.4 External Shutdown (SD)

When SD (P2-4) goes Low (GND), the output stage stops and remains stopped while SD is Low. SD High (+5 V) indicates that the power amplifier is within its normal range; Low indicates the shutdown state. By monitoring SD with a high-impedance circuit, it can also be used as a flag indicating that the amplifier has stopped. The SD sink current is 1 mA max.



Fig. 6-1 External shutdown circuits (left: open-collector transistor, right: logic inverter)

6.5 Monitor and Control Signals (P7)

P7 provides monitor outputs referenced to Va-G (P7-3).

Signal	Conversion	Example
Vo (P7-4) – Output voltage	Vmon = Vout / 50	0 V → 0 V, 75 V → 1.5 V, 150 V → 3.0 V
I-o (P7-2) – Output current	Vmon = Iout × 0.2 + 1.65 V	−5 A → 0.65 V, 0 A → 1.65 V, +5 A → 2.65 V
AC (P7-6) – AC power status	High = AC normal	0 V = no AC input or AC voltage too low

L-C (P7-5) enables the load switch; the load conducts only when both L-C and AC are High. Applying 3.3 V to L-B (P7-1) discharges the load at approx. 6.8 mA. Do not keep it enabled for more than 10 seconds.

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6.6 Power Dissipation and Cooling

A piezo load is a capacitive (reactive) load. Only a small part of the energy is converted into mechanical work or heat in the actuator; most of the loss occurs in the amplifier. When a load of capacitance C is driven full swing from 0 to V at frequency f, the amplifier loss can be estimated as $P \approx C \times V^2 \times f$.

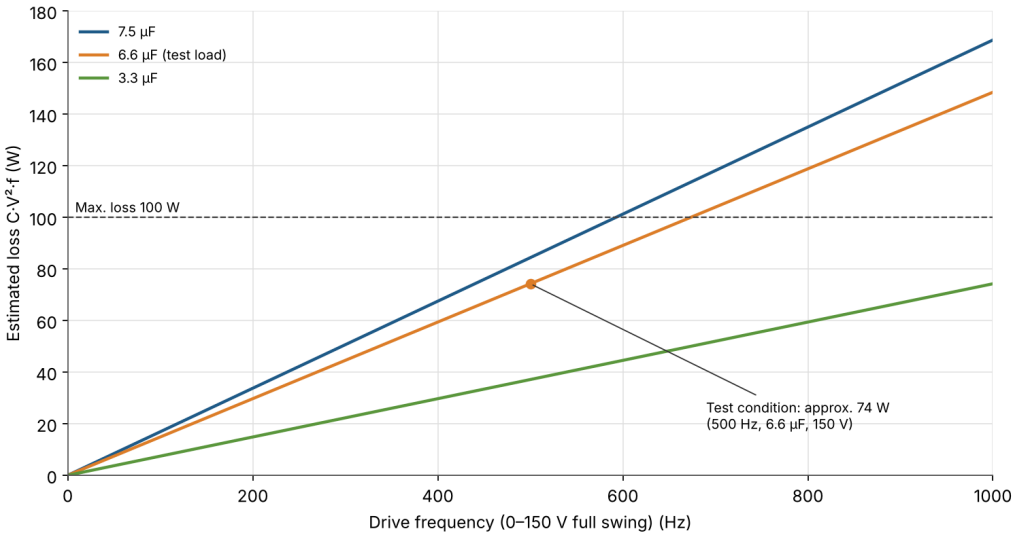


Fig. 6-2 Drive frequency vs. estimated amplifier loss (calculated, 0–150 V full swing)

Under the verification test conditions (6.6 µF, 150 V, 500 Hz), the estimated loss is approx. 74 W, close to the maximum dissipation of 100 W. In this test, the overheat protection operated after approx. 30 seconds (Section 7.5). Forced-air cooling is required for continuous operation near these conditions. Evaluate the operating temperature under the final drive conditions. Loss decreases in proportion to frequency and load capacitance, and with the square of the amplitude.

6.7 Protection Functions

Protection	Trip point	Action
Output short circuit / overcurrent	Min. 15 A, typ. 17 A, max. 20 A Delay max. 2 µs	Limits the output current to approx. ±3 mA. Recovers automatically when the fault is cleared.
Output overvoltage	151–155 V	Protects the load from excessive output voltage.
Overheat	75–85 °C (typ. 80 °C)	Stops the output. Recovers automatically when the temperature drops (within 1 minute in the verification test).
External shutdown	SD = Low	Stops the output stage while SD is Low.

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6.8 Output Current Calculation

With a capacitive (piezo) load, the output current is set by the load capacitance and the rate of change of the output voltage ($i = C \times dV/dt$). Use the expressions below to estimate the current for your drive waveform, and compare the results with the specifications in Section 5.2.

Waveform	Peak current	Average current (absolute)	RMS current
Trapezoidal (edge time tr)	$I_{pk} = C \times V_{pp} / t_r$	$I_{avg} = 2 \times C \times V_{pp} \times f$	$I_{rms} = I_{pk} \times \sqrt{(2 \times t_r \times f)}$
Sine	$I_{pk} = \pi \times f \times C \times V_{pp}$	$I_{avg} = 2 \times C \times V_{pp} \times f$	$I_{rms} = I_{pk} / \sqrt{2}$

C: load capacitance, Vpp: peak-to-peak output voltage, f: drive frequency, tr: rise/fall time. The trapezoidal RMS expression assumes rectangular current pulses.

Example – verification test conditions (Chapter 7)

C = 6.6 µF, Vpp = 150 V, tr = 100 µs, f = 500 Hz → Ipk = 9.9 A, Iavg = 0.99 A, Irms ≈ 3.13 A. These values agree with the measured results in Section 7.3.

Keep the peak current at or below the maximum output current of 12 A (below the overcurrent protection trip point of min. 15 A). Also check that the estimated power dissipation $P \approx C \times V_{pp}^2 \times f$ stays within the maximum of 100 W (Section 6.6).

6.9 Power Bandwidth

The maximum sine-wave frequency at a given output amplitude is limited by the slew rate, the maximum output current and the maximum power dissipation. The achievable frequency is the lowest of the following three values.

$$f_{SR} = SR / (\pi \times V_{pp}) \qquad f_I = I_{pk(max)} / (\pi \times C \times V_{pp}) \qquad f_P = P_{max} / (C \times V_{pp}^2)$$

SR: slew rate (typ. 10 V/µs, min. 5 V/µs), $I_{pk(max)}$: 12 A, P_{max}: 100 W.

Load	f_{SR} (slew rate)	f_I (current)	f_P (dissipation)	Max. frequency	Limited by
No load	21.2 kHz	–	–	**21.2 kHz**	Slew rate
0.1 µF	21.2 kHz	255 kHz	44.4 kHz	**21.2 kHz**	Slew rate
0.3 µF	21.2 kHz	84.9 kHz	14.8 kHz	**14.8 kHz**	Dissipation
1 µF	21.2 kHz	25.5 kHz	4.44 kHz	**4.44 kHz**	Dissipation
3 µF	21.2 kHz	8.49 kHz	1.48 kHz	**1.48 kHz**	Dissipation
6.6 µF	21.2 kHz	3.86 kHz	673 Hz	**673 Hz**	Dissipation
7.5 µF	21.2 kHz	3.40 kHz	593 Hz	**593 Hz**	Dissipation

Calculated values for a 150 Vp-p sine wave using the typical slew rate. With the minimum slew rate (5 V/µs), f_{SR} is 10.6 kHz.

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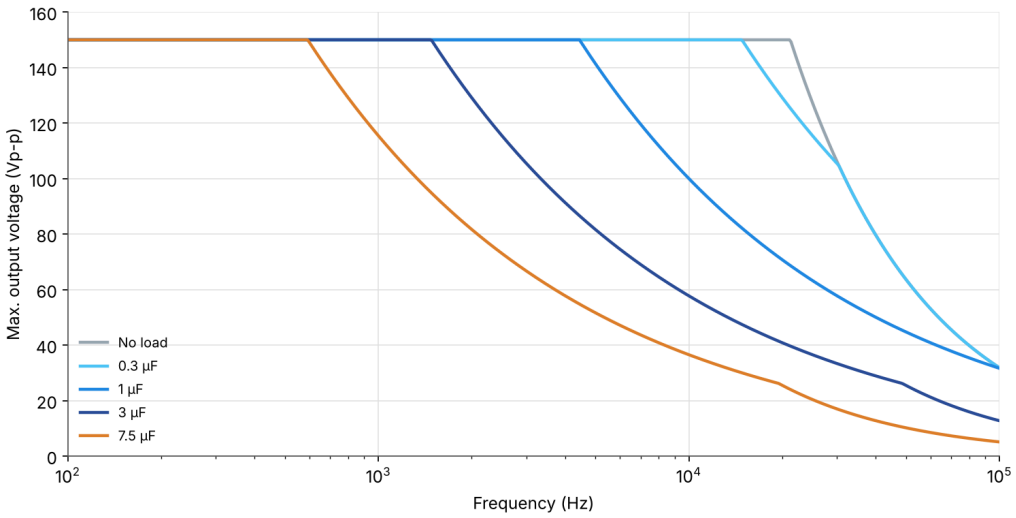


Fig. 6-3 Maximum sine-wave output voltage vs. frequency (calculated; slew rate, 12 A peak current and 100 W dissipation limits)

> **CAUTION**
>
> The dissipation limit f_P assumes the full 100 W maximum dissipation with sufficient forced-air cooling. In the verification test (approx. 74 W), the overheat protection operated after approx. 30 seconds (Section 7.5). For continuous operation, allow margin and confirm the temperature under the actual drive and cooling conditions.

6.10 Typical Connection

Fig. 6-4 shows a typical connection for driving a piezo stack actuator with a single-ended 0–3.33 V signal.

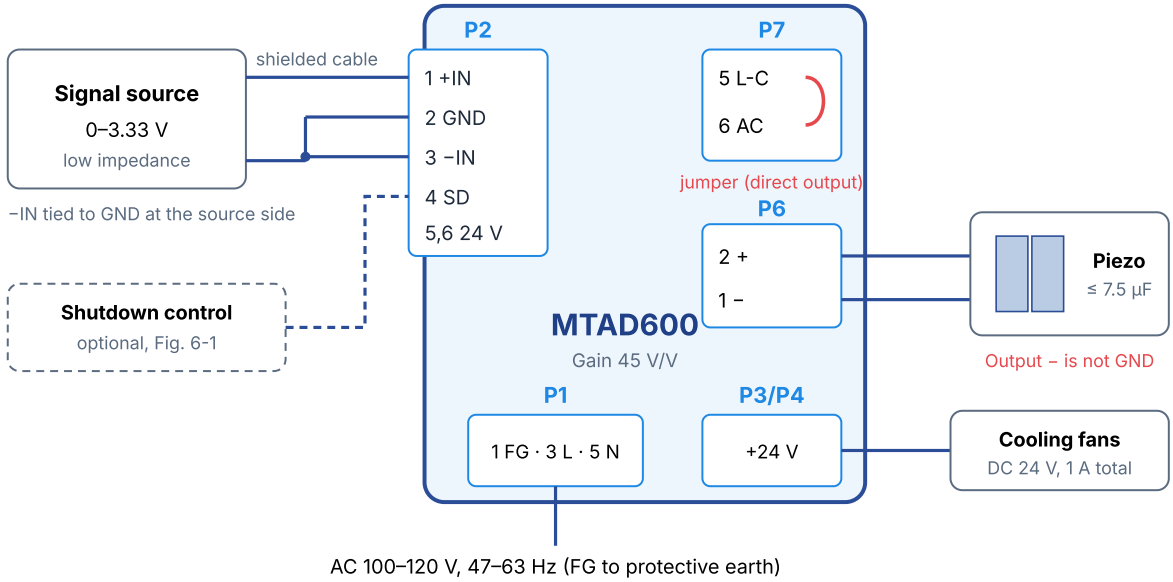


Fig. 6-4 Typical connection (single-ended input, direct output). See also Section 2.2 for the output capacitor requirement.

> **Note**
>
> Bipolar (AC-coupled) and bridged output configurations are not covered in this manual. Contact Mechano Transformer Corporation before using the MTAD600 in such configurations.

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7 Performance Data

This chapter presents the results of the output current verification test performed on the MTAD600 by Mechano Transformer Corporation on October 9, 2026.

7.1 Test Conditions

Test date	October 9, 2026
Input signal	Square wave, 0–3.3 V, 500 Hz, rise 100 µs, fall 100 µs
Output load	6.6 µF capacitor in series with a 1 Ω/5 W resistor (for current measurement)
Measurement	CH1: Vin (2 V/div) CH2: Vout (100 V/div) CH3: Iout = voltage across 1 Ω (5 V/div = 5 A/div) Time base 500 µs/div

7.2 Output Waveforms



Fig. 7-1 Oscilloscope waveforms – CH1 (yellow) Vin, CH2 (green) Vout, CH3 (magenta) Iout

The output (CH2) follows the trapezoidal input with an amplitude of 149.67 Vp-p. The output current (CH3) flows as pulses of approx. ±10 A at each rising and falling edge as the load capacitance is charged and discharged, and is nearly zero on the flat portions of the waveform.

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7.3 Test Results

Item	Specification	Measured	Result
Output voltage amplitude	0–150 V	149.67 Vp-p	OK
Gain	44–46 V/V	45.2 V/V (149.67 V ÷ 3.312 V)	OK
Output current (peak)	Typ. 10 A, max. 12 A	±10 A (cursor +9.95 A, 20.9 Ap-p)	OK
Output current (average)	Typ. 1 A	1 A (10 A × 200 µs ÷ 2 ms)	OK
Output current (RMS)	Typ. 3.16 A	2.88 A (scope RMS of CH3)	See note

Note on RMS current

The specified 3.16 A is a calculated value that treats the 10 A current pulses as rectangular (duty D = 0.1): Irms = √D × Ip = √0.1 × 10 A ≈ 3.16 A. Because the actual current pulses are not perfectly rectangular, the measured RMS value (2.88 A) is lower than this calculation.

Comparison with theory

The charging current of a capacitive load is i = C × dV/dt. Driving a 150 V edge in 100 µs into a 6.6 µF load gives i = 6.6 µF × 150 V ÷ 100 µs = 9.9 A, which agrees with the measured peak of 9.95 A.

7.4 Peak Current and Edge Time

Since the peak current is determined by the load capacitance and the edge time, the minimum rise/fall time for a 150 V full swing follows from the maximum output current of 12 A: **tr(min) = C × 150 V ÷ 12 A ≈ 12.5 µs per 1 µF of load**. This is approx. 83 µs for 6.6 µF and approx. 94 µs for 7.5 µF. Faster edges approach the overcurrent protection trip point (min. 15 A).

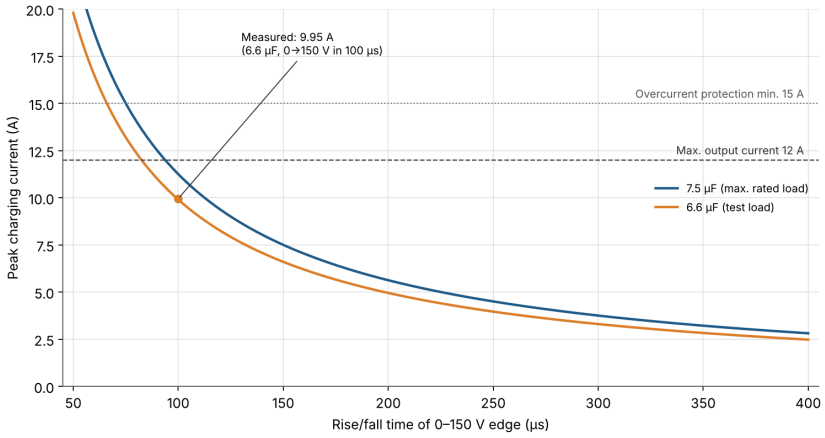


Fig. 7-2 Edge time vs. peak charging current (calculated) with measured point

7.5 Thermal Characteristics

Approx. 30 seconds after starting the above operation, the Vout output stopped. The thermal image of the top of the module at that time (Fig. 7-3) showed areas approaching 100 °C, confirming that the overheat protection had operated. The output recovered within 1 minute.

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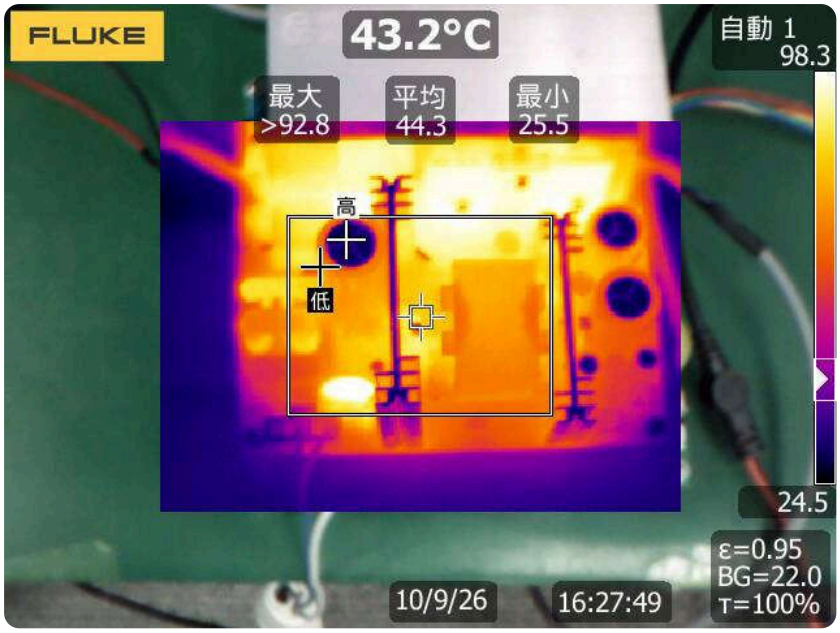


Fig. 7-3 Thermal image of the module top (max. > 92.8 °C; on-screen readings from left: max./avg./min.)

This result is consistent with the estimated loss of approx. 74 W under these conditions (Section 6.6). The overheat protection operates as designed. For continuous operation under similar conditions, provide forced-air cooling and check the temperature under the final drive conditions.

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8 Troubleshooting

If the MTAD600 does not operate correctly, use the table below to identify the cause.

Symptom	Possible cause	Remedy
No output	1) No AC input, or voltage too low (P7-6 AC = 0 V) 2) Start-up delay has not elapsed 3) L-C is not High (AC–L-C jumper removed) 4) SD is Low 5) Signal not connected / −IN open	1) Check the AC power and P1 wiring 2) Wait approx. 5 seconds after power-on 3) Install the jumper or set L-C High 4) Release the external shutdown 5) Check the P2 wiring. For single-ended input, connect −IN to GND
Output stops during operation and recovers after a while	Overheat protection operated	Improve cooling, or reduce frequency, amplitude or load capacitance (Section 6.6)
Output waveform distorts at the edges	Overcurrent protection operated (edges too fast or load too large)	Lengthen the rise/fall time (Section 7.4), reduce the load capacitance, check the load wiring for shorts
Output does not reach 150 V	Differential input below 3.33 V, or high signal source impedance	Check the input level. Use a low-impedance source or a buffer
Noise or offset on the output	Ground loop, unshielded signal cable	Use shielded cable and ground at the signal source side
Fan does not run	P3/P4 wiring, or overload of the 24 V auxiliary supply (over 1 A total)	Check the wiring and the total load on the auxiliary supply

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