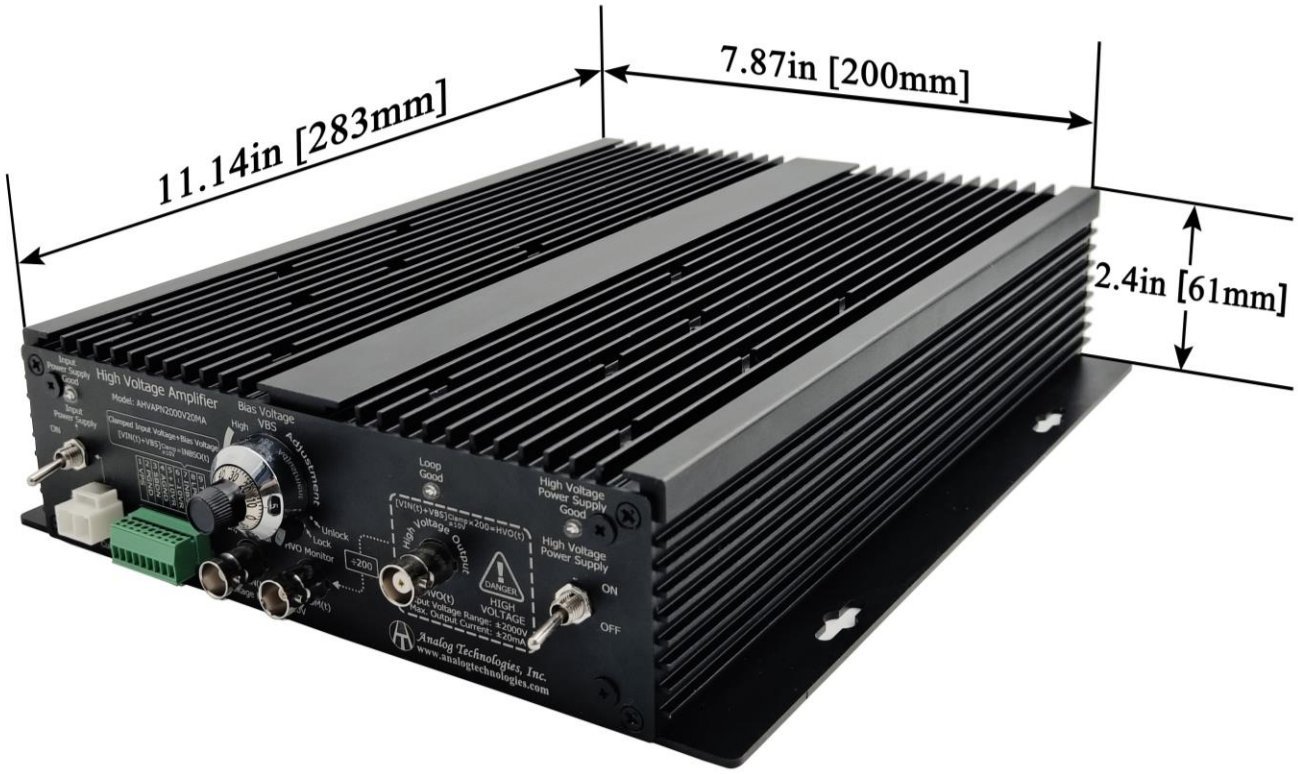

Figure 1A. 3D View

Figure 1B. Top and Front View

Figure 1D. Back View

Figure 1C. Top and Side View

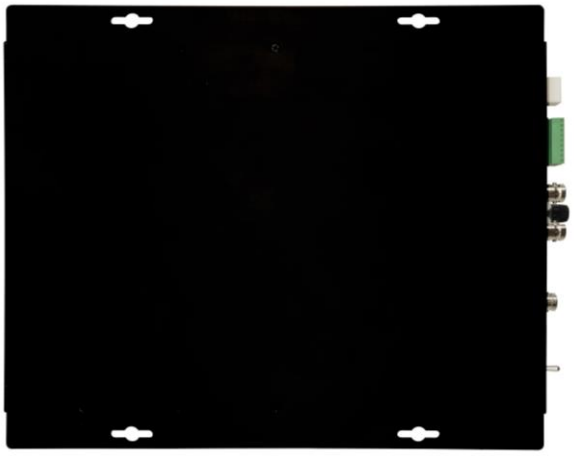

Figure 1E. Bottom View

FEATURES

- Built-in High Voltage Power Supply
- Compact Size: 9.15(L)×9.05(W)×2.4(H) inch
  232.5(L)×230(W)×61(H) mm
- Bi-directional Output: ±2000V
- High Current Capability: Up to 20mA
- High Slew Rate: 2000V/μs@open load
  540V/μs@250pF load
- Input Signal Voltage Range: ±10V
- Adjustable Bias Voltage Range: −10V ~ 10V
- Combined Control Voltage Range*: −10V ~ 10V
- Bandwidth: 15kHz @ Load = 100pF
  10kHz @ Load = 250pF
  8kHz @ Load = 500pF
  3kHz @ Load = 1nF

*: Input Signal + Bias voltage = Combined Control Voltage

CUSTOMIZATION

If a higher bandwidth is needed, we can customize high voltage amplifiers with larger size and larger heat sink.

APPLICATIONS

This high voltage amplifier can be used for driving high voltage loads, including: piezoelectric transducers, mass spectrometers, electrostatic precipitators, electrophoresis experiments, high voltage storage capacitors, etc.

WARNINGS

1. **Never touch the high voltage output by hand.**
2. **Do not place any foreign objects on the face plate.**
3. **Never connect the high voltage output to the low voltage side connectors. Keep them at least 2inch (50mm) apart.**
4. **Before connecting or disconnecting high voltage output, make sure to turn off the amplifier power.**

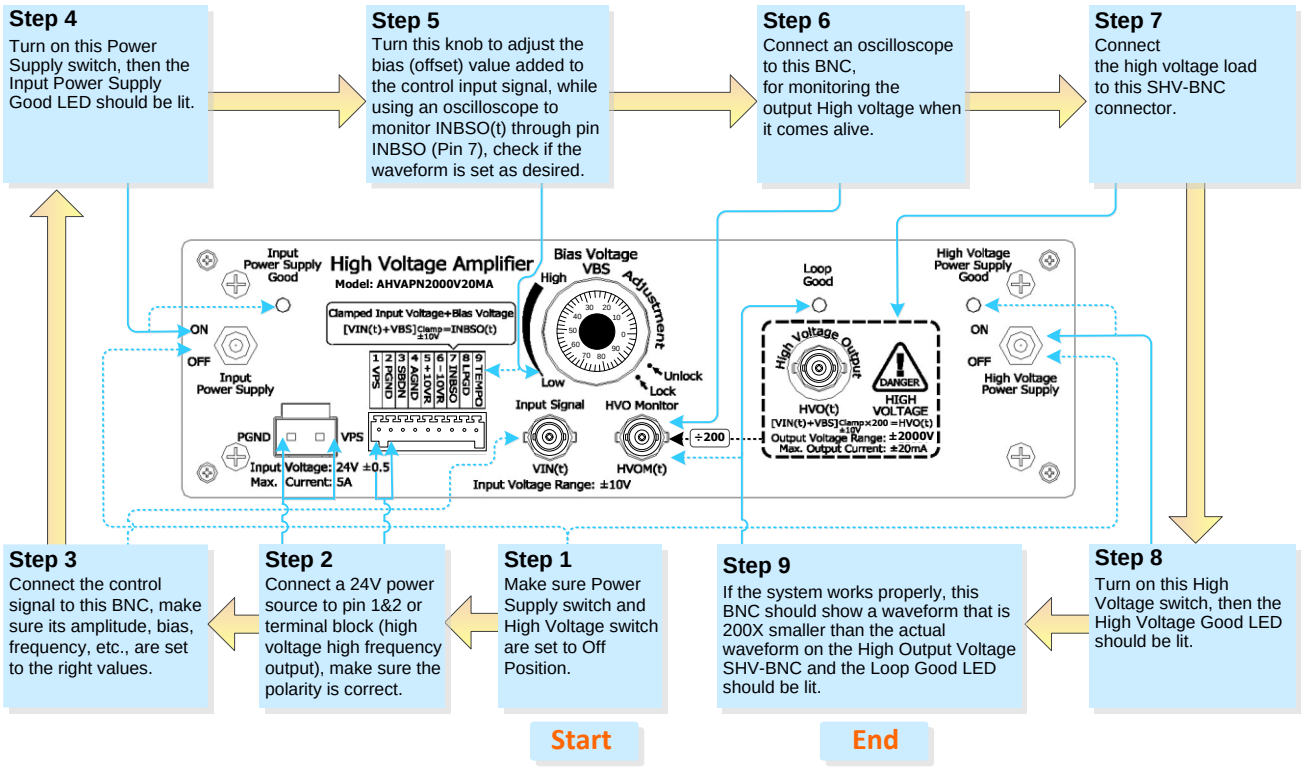

Figure 2. Operation Steps

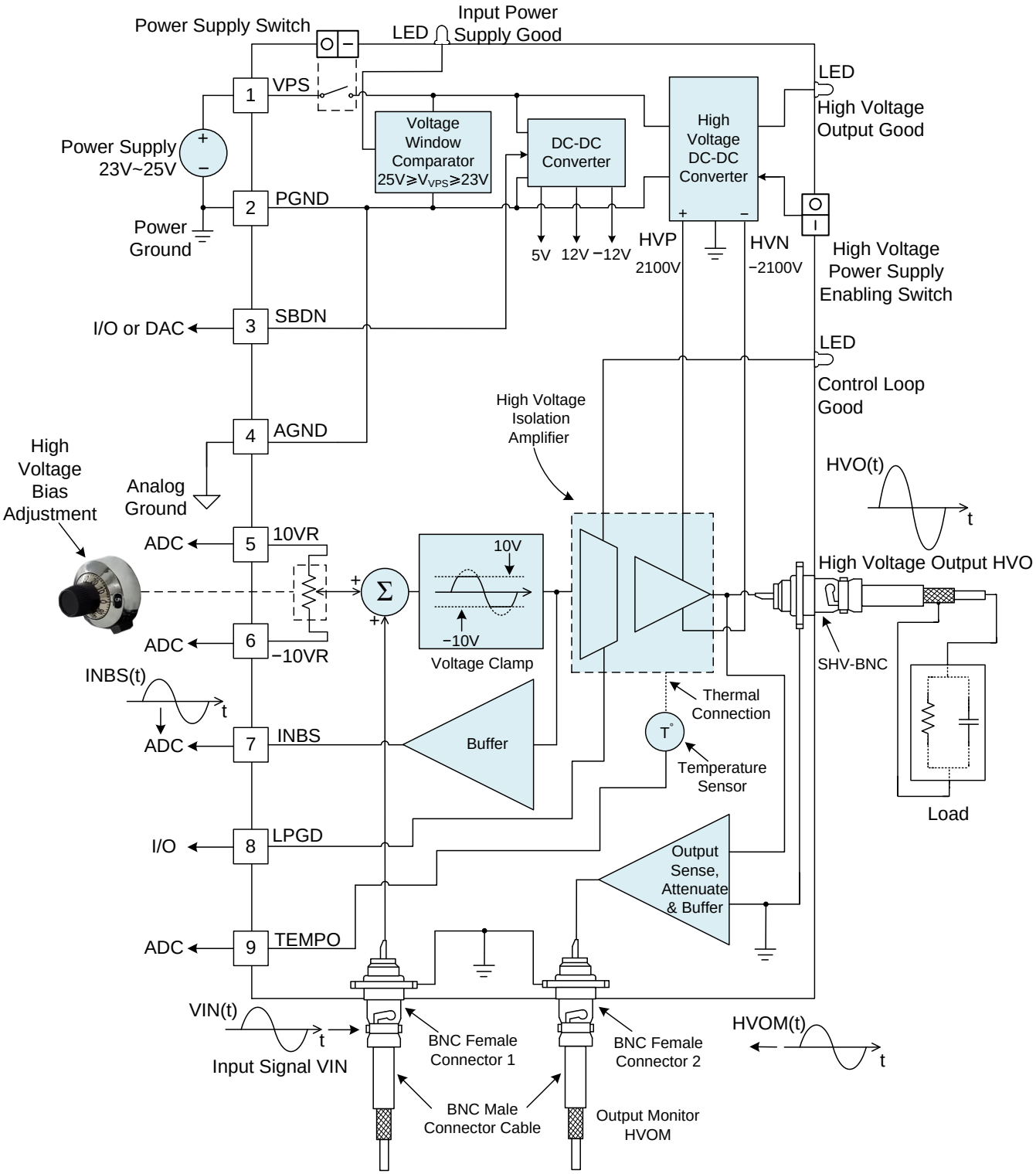

Figure 3. Block Diagram and Application Schematic

DESCRIPTION

The AHVAPN2000V20MA is an electronic module for amplifying an analog input voltage into a high voltage output. Figure 1 shows its photos. It comes with a high voltage DC-DC converter, which converts the 24V input voltage into two output voltages: −2100V and +2100V. The analog input voltage, VIN(t), can be from −10V to +10V, the corresponding output voltage, HVO(t), is from −2000V to +2000V. There are three LEDs indicating: 24V power supply is present and within an appropriate window: 23V to 25V, the high voltage power supply is outputting ±2100V outputs properly, and the control loop works properly, i.e. HVO(t) = 200×VIN(t).

Table 1. Terminal Block Pin Functions

Pin #	Name	Type	Description
1	VPS	Power Input	Power supply 24V±1V.
2	PGND	Power Ground	Ground pin for Power Supply Input.
3	SBDN	Digital Input	This is a duplex pin. It sets the amplifier into Off, Standby or On mode.
4	AGND	Signal Ground	Signal ground pin. Connect ADC and DAC grounds to here.
5	10VR	Analog Output	10V voltage reference.
6	−10VR	Analog Output	−10V voltage reference.
7	INBS	Analog Output	Combined control voltage. It is derived from input signal, INPUT, plus the bias voltage set by the potentiometer (see Figure 2), and **clipped** to ±10V. When going from −10V to 10V, the output voltage will be from −2000V to 2000V.
8	LPGD	Digital Output	Loop Good indication. It means the output voltage is correctly proportional to the combined control voltage at pin 7.
9	TEMPO	Analog Output	A voltage represents the actual amplifier internal temperature.
BNC 1	INPUT	Analog Input	A signal voltage to be amplified into high voltage swing at the output. When going from −10V to 10V, the output voltage should change from −2000V to 2000V.
BNC 2	Output Monitor	Analog Output	Output voltage indication. When going from −10V to 10V, it indicates the output voltage is from −2000V to 2000V.
BNC 3	VOUT	Analog Output	Output voltage for driving the load.

SPECIFICATIONS

Table 2. Characteristics (Test ambient temperature T_A = 25°C)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Power Supply Input (Pin 1&2)						
Input Range	V_{VPS}		23	24	25	V
Input Current	I_{IN}		0		4	A
Maximum Input Power				100		W
Voltage Output (BNC3)						
Output Voltage	V_{OUT}		−2000		2000	V
Output Current	I_{OUT}		0		20	mA
Maximum Slew Rate		open load		2000		V/µs
		250pF load		540		V/µs
SBDN Pin (Pin 4)						
Off State	$V_{SBDN-OFF}$		0		0.4	V
	$V_{SBDN-OFF-HI}$ Going up from Off to Standby threshold				2.1	V
	$V_{SBDN-OFF-LOW}$ Going down from Standby to Off threshold		0.4			V
SBDN State	$V_{SBDN-STANDBY}$		2.1		2.51	V
	$V_{SBDN-SB-HI}$ Going up from Standby to On threshold				2.64	V
	$V_{SBDN-SB-LOW}$ Going down from On to Standby threshold		2.51			V
On State	$V_{SBDN-ON}$		2.64		V_{VPS}	V
SBDN Current	I_{SBDN}			10	20	µA
LPGD Pin (Pin 3)						
LPGD Voltage	$V_{LPGD-LOW}$	V_{DD} = 5V Sinking current = 8mA			0.6	V
	$V_{LPGD-HI}$	V_{DD} = 5V Sourcing current = 3.5mA	V_{DD} − 0.7			V
Voltage Reference	V_{REF}			−10/+10		V
Voltage Reference Current Range	I_{REF}		−20		20	mA
Voltage Noise	e_np-p	0.1Hz to 10Hz		117		nVp-p
Voltage Noise Density	e_n	f = 1kHz		9		nV/√Hz

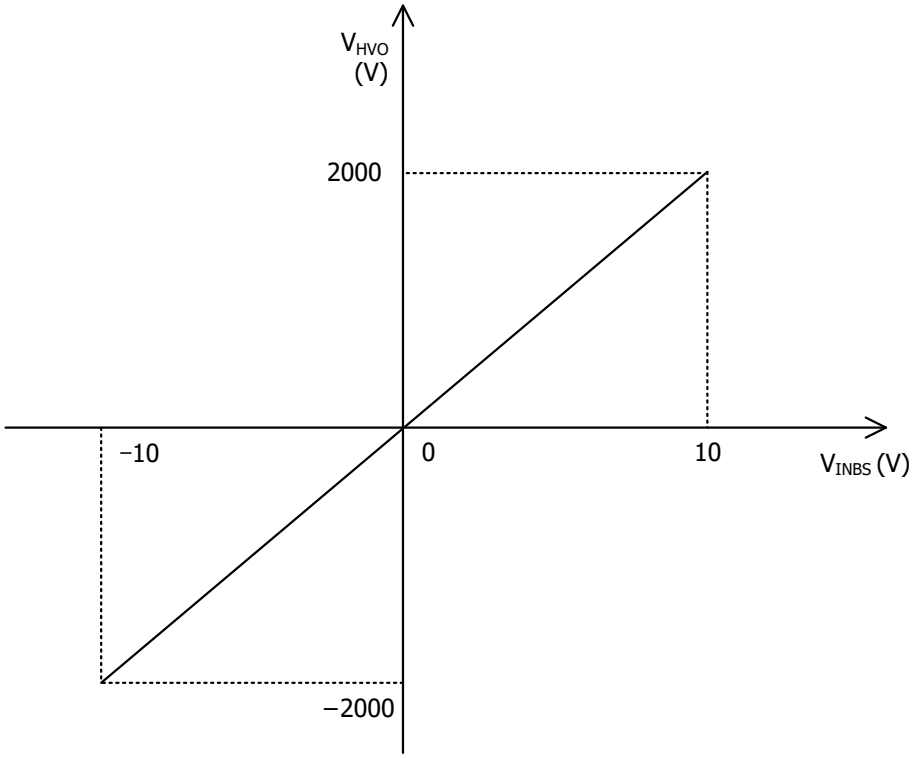

Figure 4. V_{INBS} vs. V_{HVO}

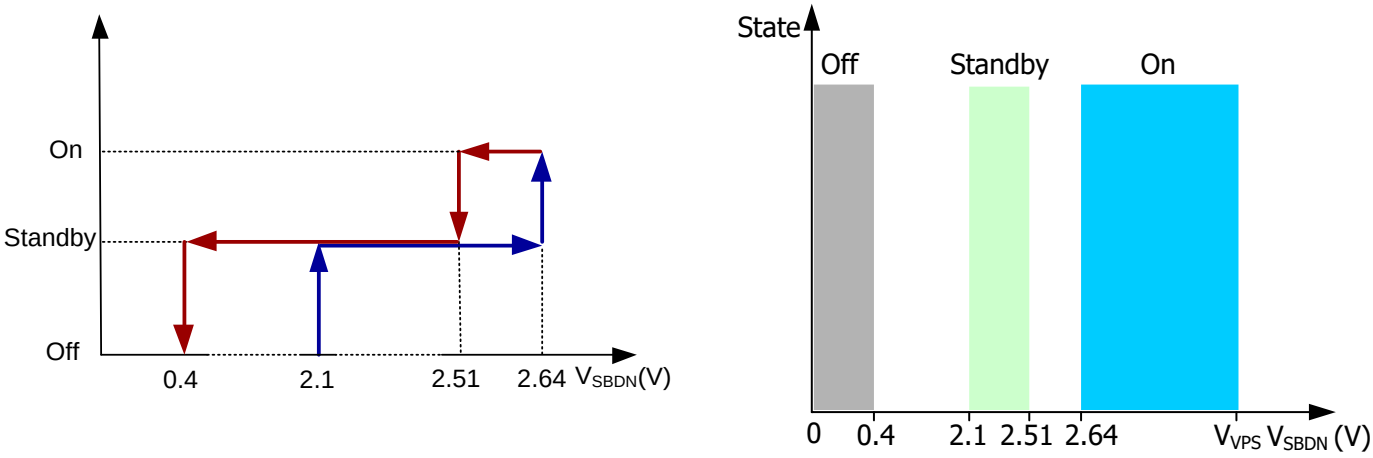

Figure 5. V_{SBDN} vs. Amplifier States

APPLICATIONS

A. Waveforms @ Load = 100pF, V_{OUT} = ±1500V

Figure 6. f = 1kHz

Figure 7. f = 5kHz

Figure 8. f = 10kHz

Figure 9. f = 15kHz

Figure 10. Rise time

Figure 11. Fall time

B. Waveforms @ Load = 250pF, V_{OUT} = ±1500V

Figure 12. f = 1kHz

Figure 13. f = 5kHz

Figure 14. f = 10kHz

Figure 15. Rise Time

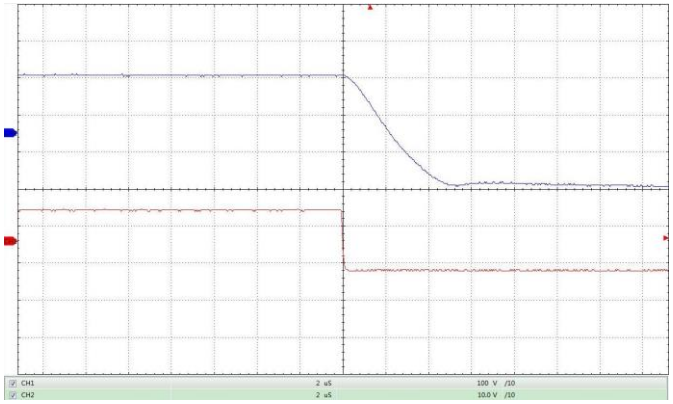

Figure 16. Fall Time

C. Waveforms @ Load = 500pF, V_{OUT} = ±1500V

Figure 17. f = 1kHz

Figure 18. f = 5kHz

Figure 19. f = 8kHz

Figure 20. Rise Time

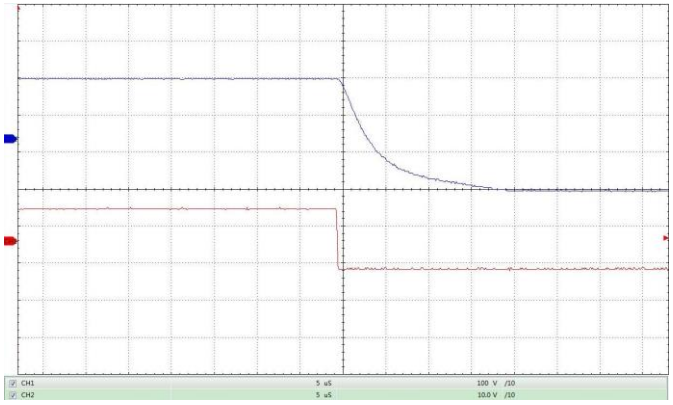

Figure 21. Fall Time

D. Waveforms @ Load = 1nF, V_{OUT} = ±1500V

Figure 22. f = 1kHz

Figure 24. Rise Time

Figure 23. f = 3kHz

Figure 25. Fall Time

E. Waveforms @ Load = 10nF, V_{OUT} = ±1500V

Figure 26. f = 1kHz

Figure 27. f = 500Hz

Figure 28. f = 100Hz

Figure 30. Fall Time

Figure 29. Rise Time

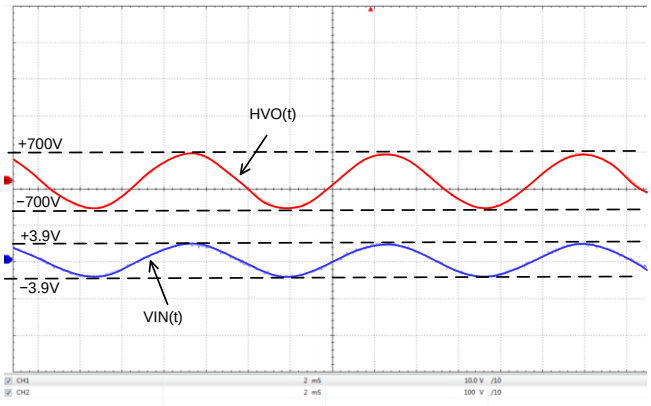

Figure 31. Input vs. Output with Sine Wave

PART NUMBER CONVENTION

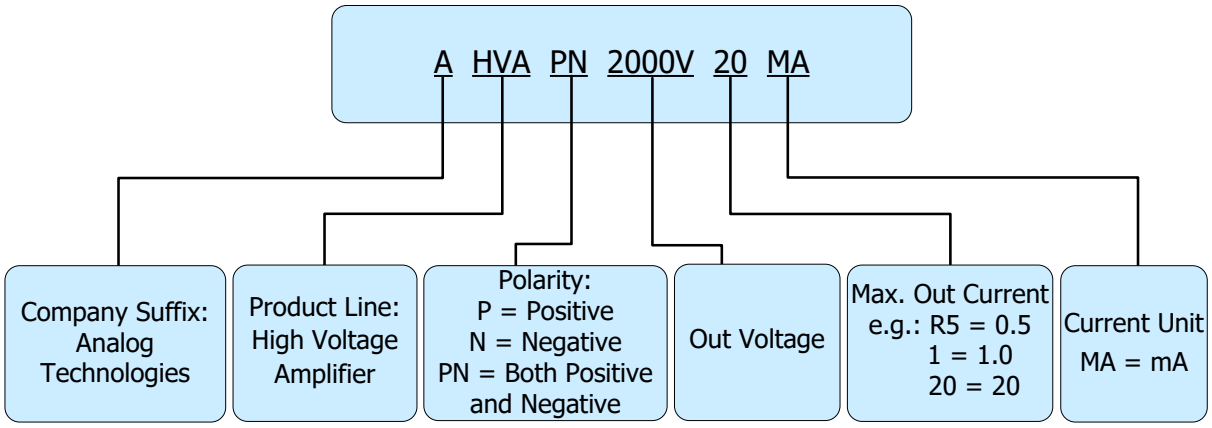

Figure 32. Part Number Convention

MECHANICAL DIMENSIONS

Figure 33 shows the dimensions of this high voltage amplifier.

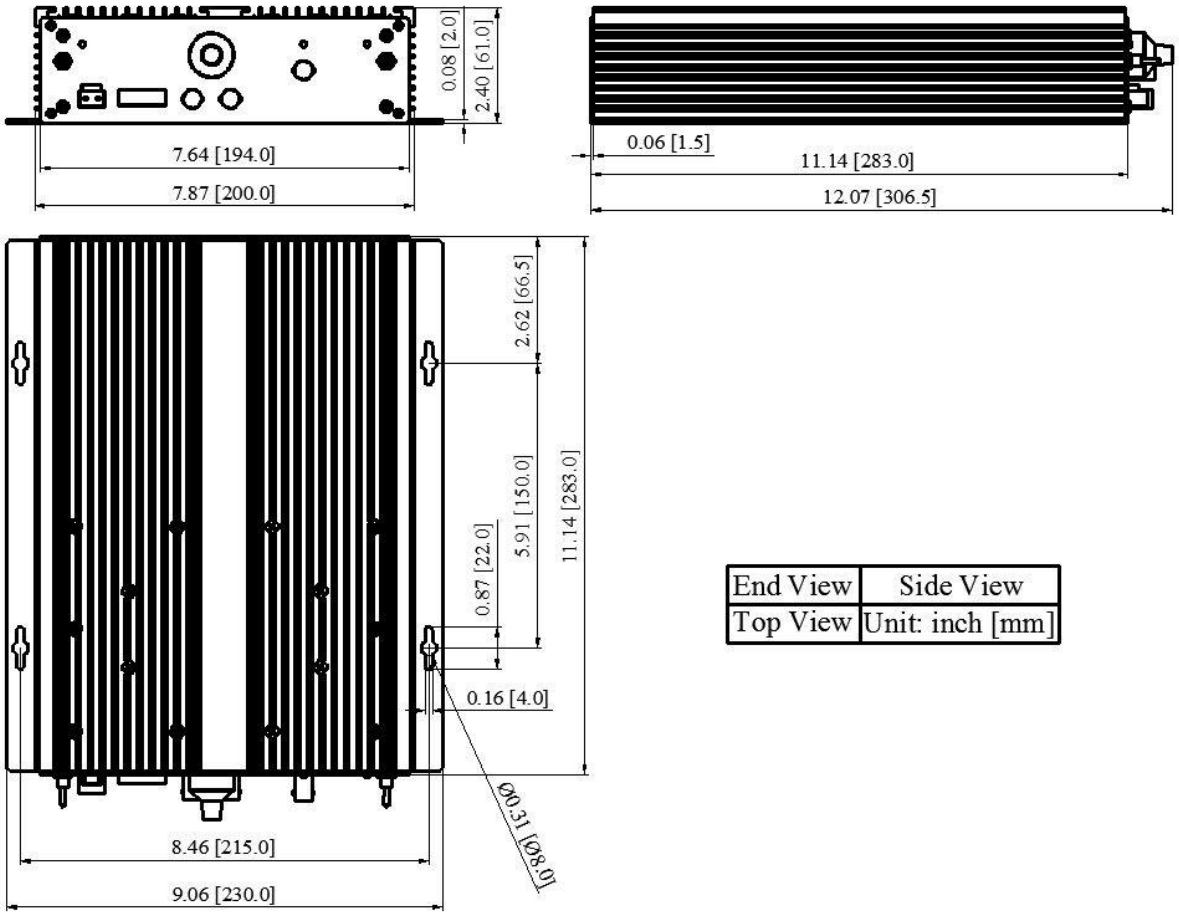

Figure 33. Dimensions of AHVAPN2000V20MA

ORDERING INFORMATION

Table 3. Ordering Information

Part Number	Buy Now
AHVAPN2000V20MA	* *

*: both and are our online store icons. Our products can be ordered from either one of them with the same pricing and delivery time.

RELATED PRODUCTS

Table 4. Related Products

Part Number	Description
AHVAPN1800V10MA	±1800V 10mA high voltage amplifier
AHVAPN1000V10MA	±1000V 10mA high voltage amplifier
AHVAPN1000V20MA	±1000V 20mA high voltage amplifier
AHVAPN500V10MA	±500V 10mA high voltage amplifier
AHVAPN500V20MA	±500V 20mA high voltage amplifier

NOTICE

1. ATI warrants its products to perform according to specifications for one year from the date of sale, except when damaged due to excessive abuse. If a product fails to meet specifications within one year of the sale, it can be exchanged free of charge.
2. ATI reserves the right to make changes or discontinue products or services without notice. Customers are advised to obtain the latest information before placing orders.
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