



Figure 1. The Physical Photo of AHVAN2KV20MA

MAIN FEATURES

- **Built-in High Voltage Converter**
- **Compact Size: 181.5(L)×149.0(W)×38.3(H) mm**
- **High Current Capability: Up to 20mA**
- **High Slew Rate: 150V/μs**
- **Wide Output Voltage Range: $V_{OUT}=0\sim-2kV@Input=0V\sim10V$**
- **Offset Voltage Range: 10V**
- **Bandwidth: Up to 10kHz**

APPLICATIONS

High voltage amplifications for driving piezos and other high voltage loads.

DESCRIPTION

The AHVAN2KV20MA is an electronic module for amplifying an analog input voltage into a high voltage

output. Figure 1 shows its physical photo. It comes with a high voltage DC-DC converter, which converts the 24V input voltage into a 0 to -2kV output voltage. The analog output voltage can swing almost from 0 to -2kV when it is powered by a 24V power supply. There is three LEDs indicating if the amplifier works properly.

CAUTION

First, set up the AC power supply and fix it stably and firmly. Then make sure that the two switches of the high voltage amplifier are OFF. Connect the 24V DC power supply to the VPS and PGND of the high voltage amplifier. After the connection is complete, turn on the low voltage switch and set the input AC voltage or DC voltage. Then use the output monitor to check whether the input set voltage is correct. Finally turn on the high voltage switch.



Table 1. Descriptions of Terminal Block Pin Functions

Pin #	Name	Type	Description
1	VPS	Power Input	Power supply Input: 24VDC±1V.
2	PGND	Power Ground	Power ground pin.
3	LPGD	Analog Output	Loop Good indication.
4	SBDN	Digital Input	It sets the amplifier into Off, Standby or On mode.
5	AGND	Signal Ground	Signal ground pin. Connect ADC and DAC grounds to here.
6	10VR	Analog Output	10V voltage reference.
7	IHVMON	Analog Output	Output current indication, only available by special request.
8	HVMON	Analog Output	Output voltage indication. When being from 0 to 10V, it indicates the output voltage is from 0 to -2kV.
9	TMO	Analog Output	Temperature Output pin.
10	INPUT + BIAS	Analog Output	INPUT + BIAS is an analog voltage output pin, which is consisted of the signal voltage at the INPUT port + the bias voltage set by the built-in potentiometer with a dial on the front panel. This voltage is then used to control the output voltage directly. Its relationship with the output voltage is governed by this formula: $V_{VOUT} = (-200) \times V_{INPUT + BIAS}$
BNC 1	INPUT	Analog Input	Output voltage setting. When setting from 0 to 10V, the output voltage goes from 0 to -2kV, provided the bias setting voltage is 0.
BNC 2	INPUT + BIAS	Analog Output	INPUT + BIAS is an analog voltage output pin, which is consisted of the signal voltage at the INPUT port + the bias voltage set by the built-in potentiometer with a dial on the front panel. This voltage is then used to control the output voltage directly. Its relationship with the output voltage is governed by this formula: $V_{VOUT} = (-200) \times V_{INPUT + BIAS}$
BNC 3	VOUT	High Voltage Analog Output	Output voltage for driving the load.
	OGND	Output Ground	Connect this pin to the load return terminal.



SPECIFICATIONS

Table 2. Characteristics (Test ambient temperature $T_A = 25^\circ\text{C}$)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Power Supply Input VPS (Pin 1)						
Input Voltage Range	V_{VPS}		23	24	25	V
Input Current	I_{VPS}		0.1		4	A
High Voltage Output VOUT (BNC3)						
Output Voltage Range	V_{VOUT}		0		-2000	V
Output Current Range	I_{VOUT}		-20		20	mA
Maximum Slew Rate				150		V/ μs
Small Signal Bandwidth				20		kHz
Control Input SBDN (Pin 4)						
SBDN Voltage Range	V_{SBDN}		0		V_{VPS}	V
SBDN Threshold Voltages	$V_{SBDN-STANDBY}$		2.1		2.4	V
	$V_{SBDN-OFF}$		0		0.4	V
	$V_{SBDN-SB-ON}$	Going up from Standby to On threshold voltage			2.64	V
	$V_{SBDN-ON-SB}$	Going down from On to Standby threshold voltage	2.5			V
	$V_{SBDN-OFF-SB}$	Going up from Off to Standby threshold voltage			2.1	V
	$V_{SBDN-SB-OFF}$	Going down from Standby to Off threshold voltage	0.4			V
SBDN Current	I_{SBDN}	See input equivalent circuit in Figure 4. An internal 10M Ω resistor pulls up to VPS pin.	-24	-10	0	μA
Voltage Reference 10VR (Pin 6)						
Output Voltage	V_{10VR}		9.995	10	10.005	V
Output Current Range	I_{10VR}		-20		20	mA

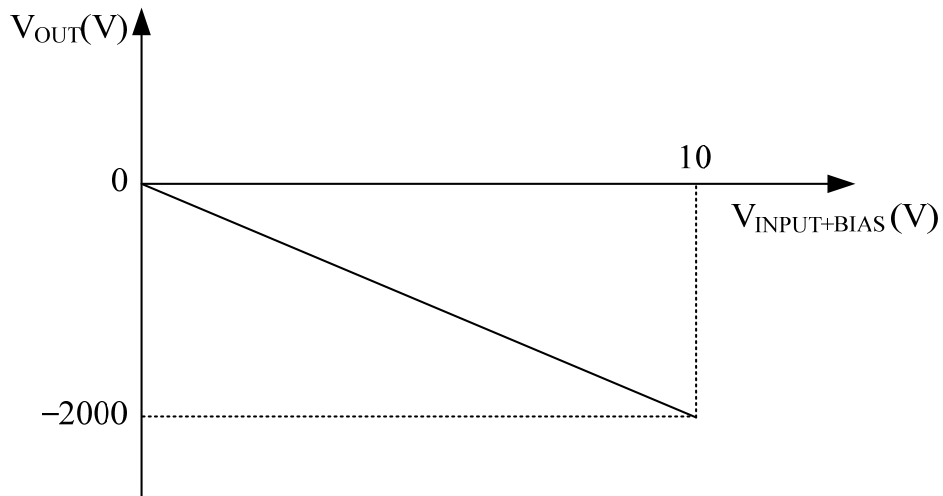


Figure 2. V_{OUT} vs. V_{VIN}

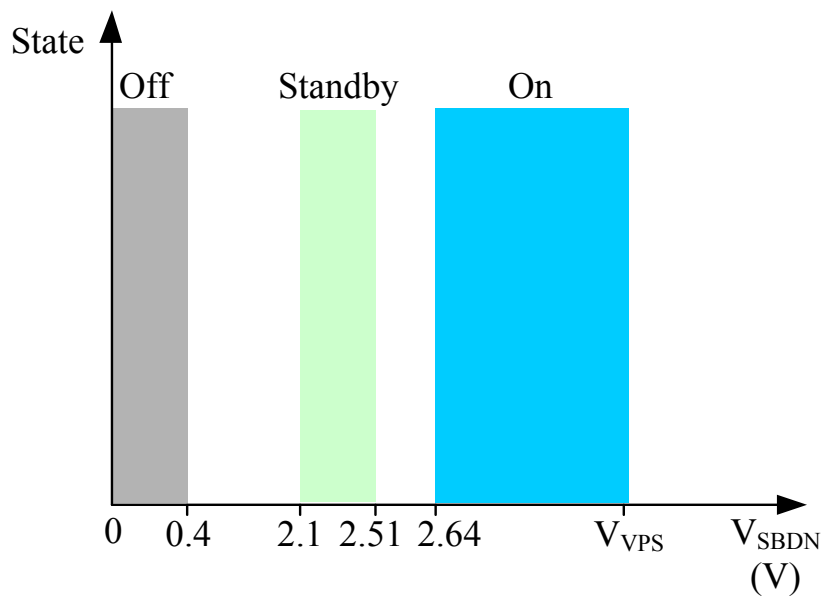
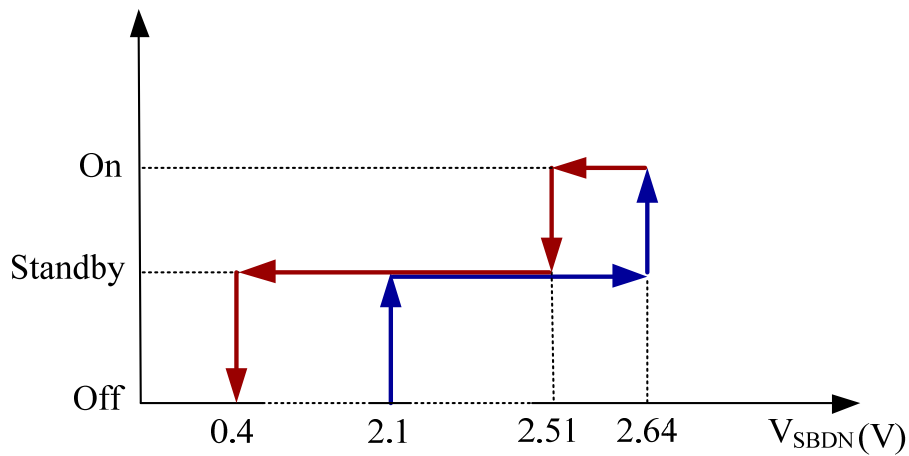


Figure 3. The States of Amplifier vs. V_{SBDN}

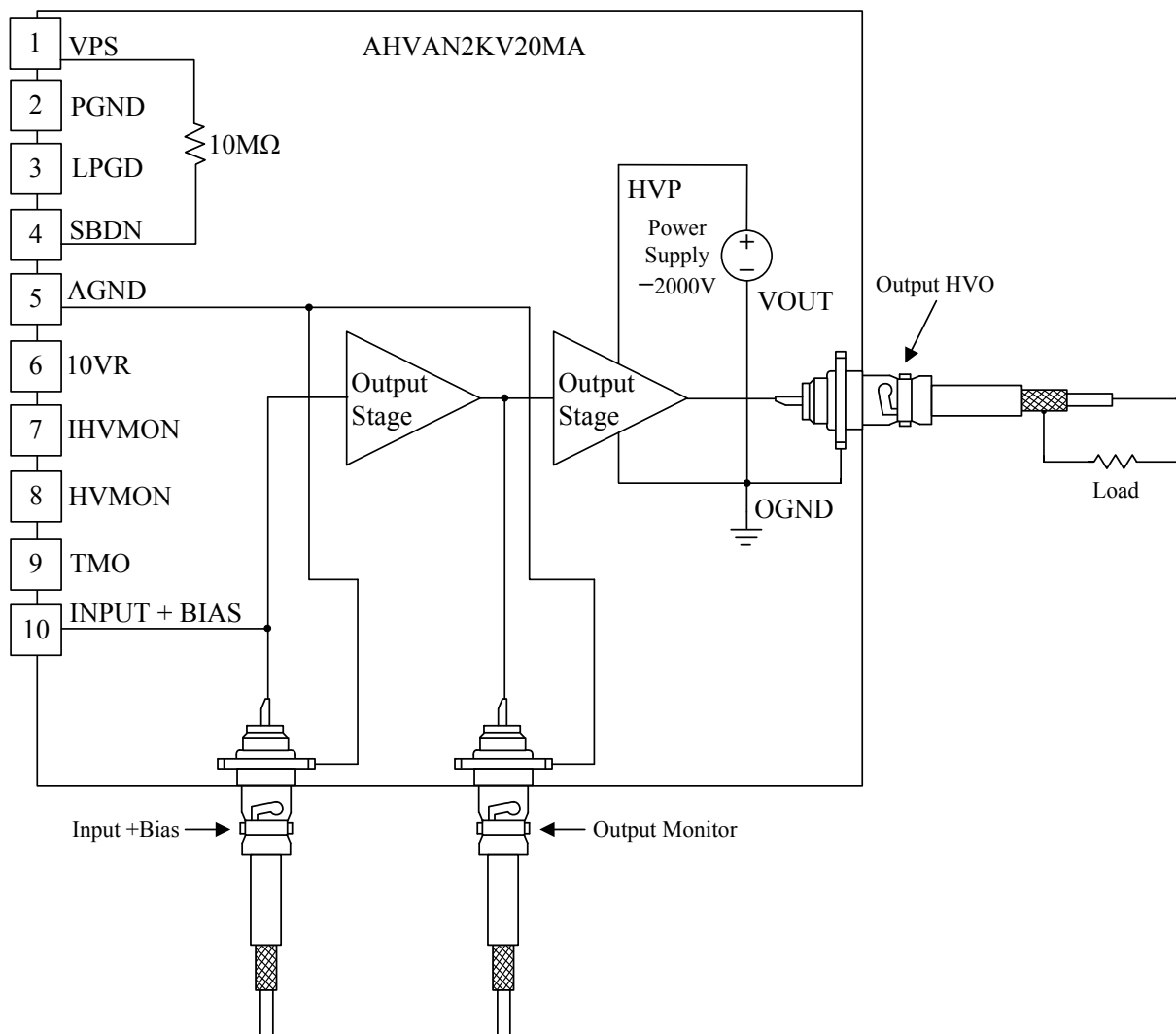


Figure 4. Schematic for Driving the Load



As shown in Figure 5 and Figure 6, when a square wave of 0V ~ 10V, f=100Hz, is applied to AC input pin, measure the waveform of HVO. The rise time should be about 10μs, and the fall time should be about 11μs.

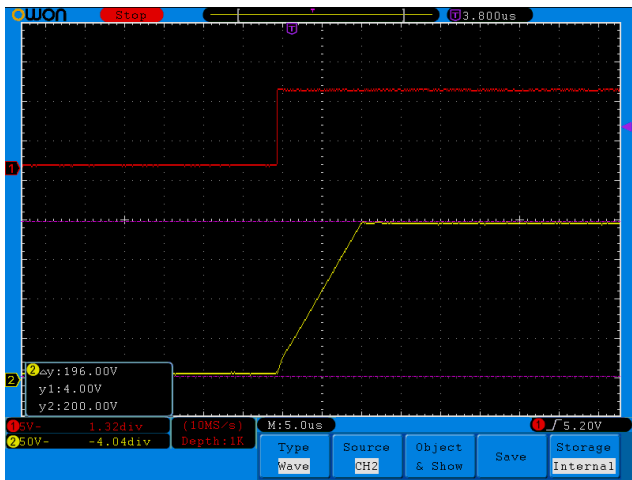


Figure 5. Rise Time

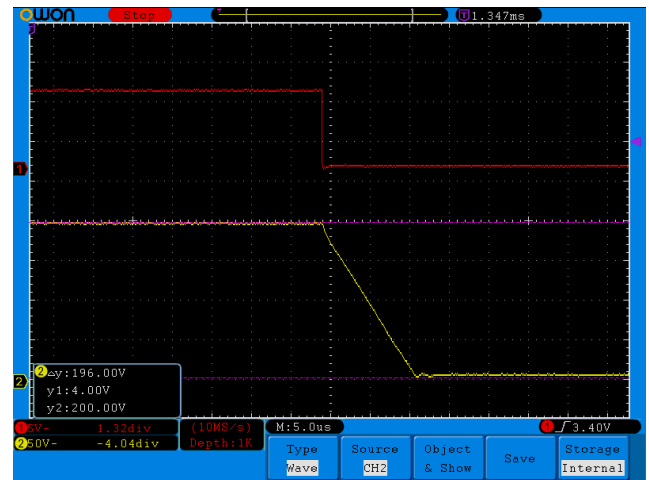


Figure 6. Fall Time

As shown in Figure 7 ~ Figure 10, when a sine wave of 0V ~ 10V, f = 100Hz/10kHz/20kHz/35kHz, is applied to AC input pin, measure the waveform of HVO. Gain=200.

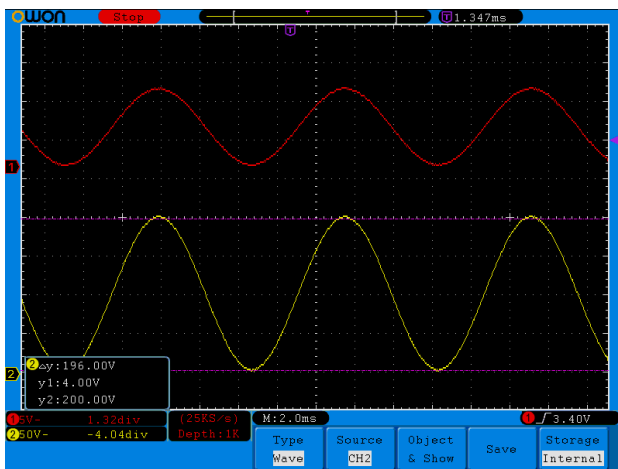


Figure 7. f=100Hz

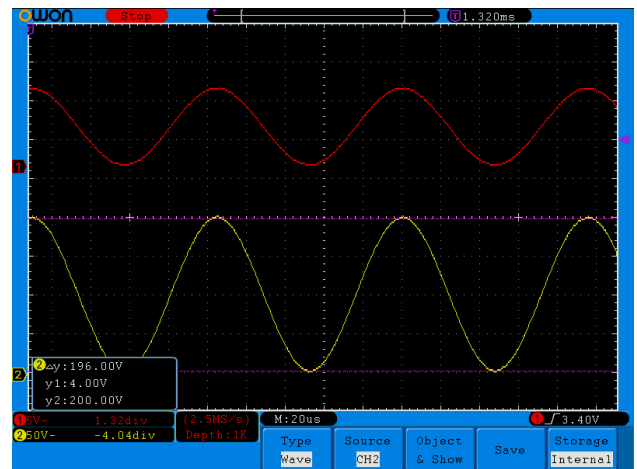


Figure 8. f=10kHz

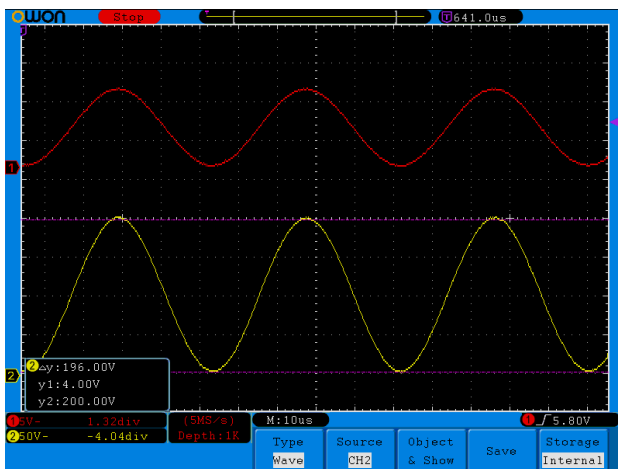


Figure 9. f=20kHz

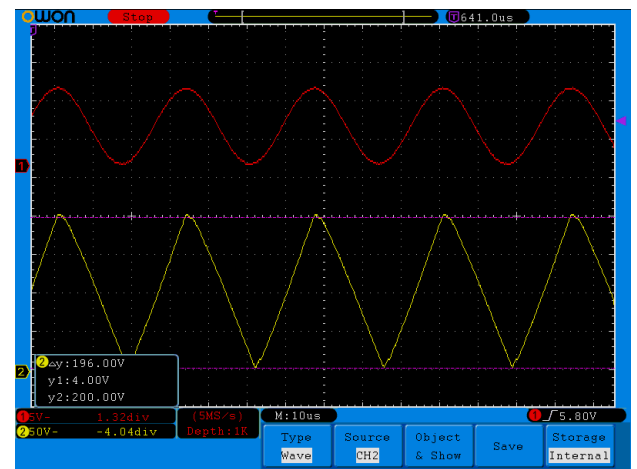


Figure 10. f=35kHz

As shown in Figure 11, when a sine wave of 0V ~ 10V, $f=50\text{kHz}$, is applied to AC input pin, measure the waveform of HVO. Gain = 140.

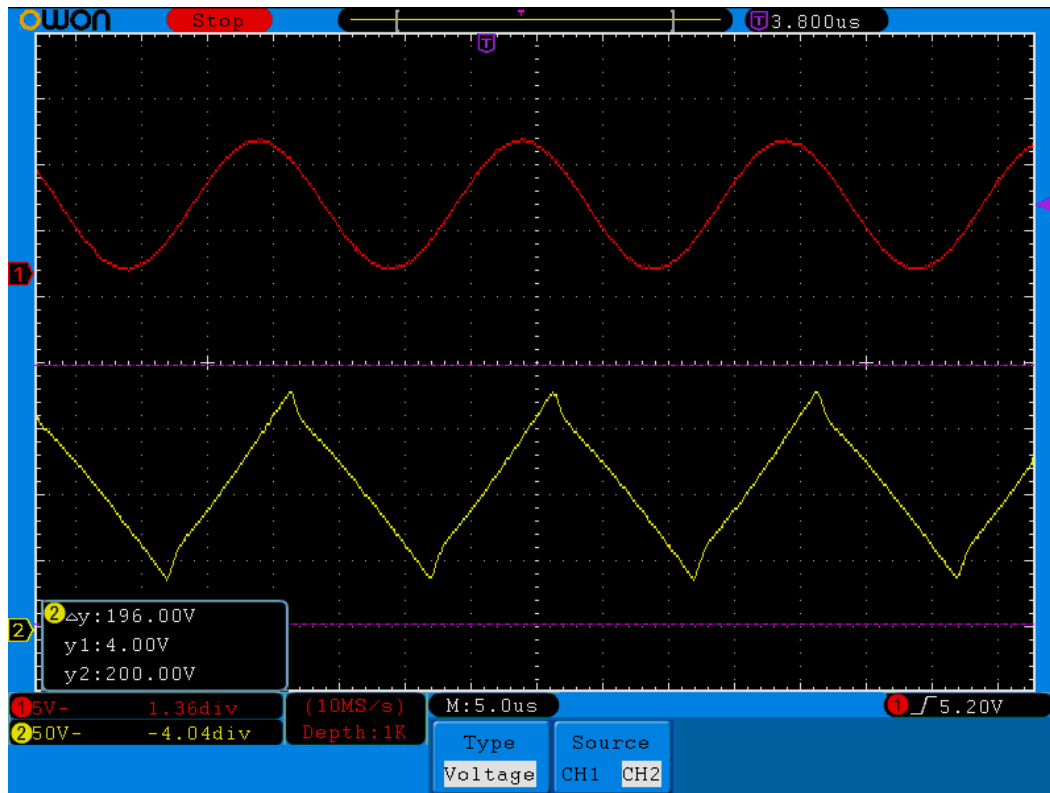


Figure 11. $f=50\text{kHz}$

BLOCK DIAGRAM

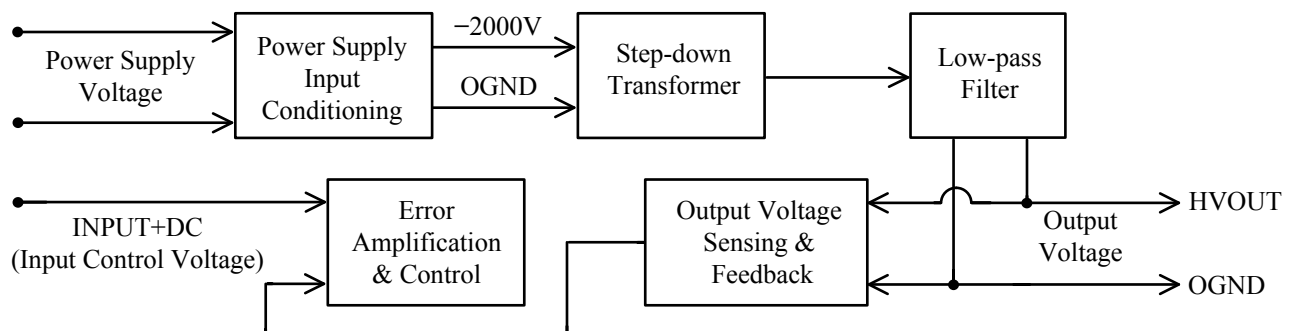
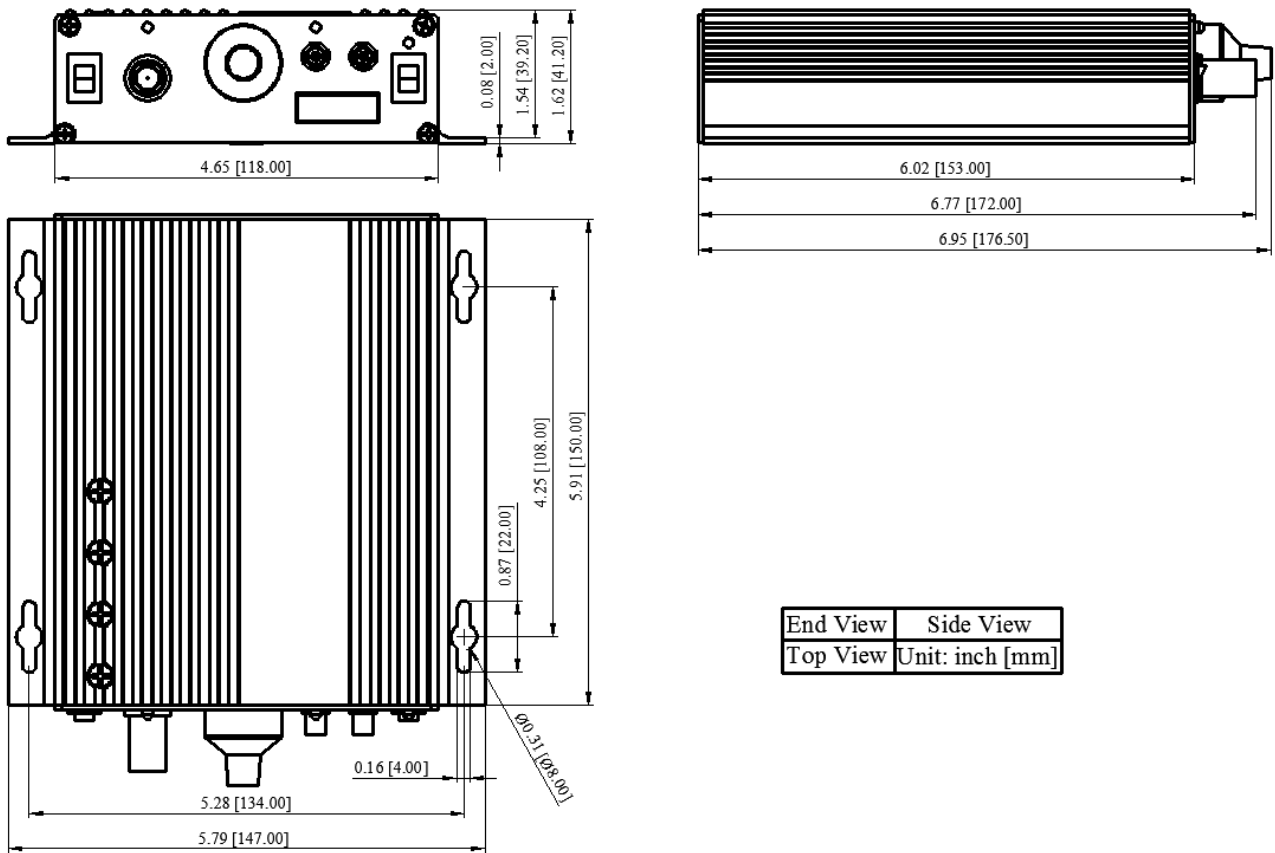


Figure 12. Block Diagram



End View	Side View
Top View	Unit: inch [mm]

Figure 13. Dimensions of AHVAN2KV20MA

ORDERING INFORMATION

Table 3. Part Number

Part Number	Description
AHVAN2KV20MA	-2kV high voltage amplifier, with 20mA output current and 20kHz bandwidth



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