

Figure 1.1. Top View of AHV24V8KV2R5MAW



Figure 1.2. Side View



Figure 1.4. Side View



Figure 1.3. Side View



Figure 1.5. Bottom View



#### **FEATURES**

• Input Power Voltage: 24V ± 1V

• Input Current Range: 250mA to 1.2A

Output Voltage: 0 to 8kV@CTRL = 0 to 5V

Max. Output Current: 2.5mA
Reference Voltage: 5V ± 0.05V
Input Control Voltage: 0 to 5V

Electronic Shutdown Control Available

Zero EMIs and Good Heat Sinking by Metal Enclosure

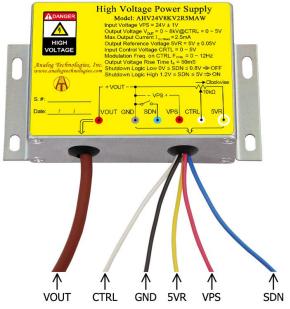


Figure 2. The Connecting Lead Wires of AHV24V8KV2R5MAW

#### **APPLICATIONS**

This power module, AHV24V8KV2R5MAW, is designed for achieving DC-DC conversion from low voltage to high voltage as a power supply source. It can be used for:

- X-ray Machine
- Spectral Analysis
- Nondestructive Inspection
- Semiconductor Manufacturing Equipment
- Particle Accelerator
- Capillary Electrophoresis
- Particles Injection
- Physical Vapor Phase Deposition
- Electrospinning Preparation of Nanofiber
- Glass/ Fabric Coating
- DC Reactive Magnetron Sputtering

Table 1. Pin Names, Colors, Functions and Specifications.

No.	Name	Description	Type Color		Min.	Тур.	Max.	
1	SDN	Shutdown logic low	Digital input		Blue	0V		0.8V
1	SDN	Shutdown logic high	Digital input		Diue	1.2V		5V
2	5VR	Reference voltage	Analog output		Yellow		5V	
3	CTRL	Regulation	Analog input		White	0V		5V
4	VPS	Input voltage	Power supply input		Red	23V	24V	25V
5	GND	Ground	Ground for power supply and analog & digital signals  Black			0V		
6	VOUT	Output high voltage	Power output		Brown	0V		8kV

#### **DESCRIPTION**

Figure 1 shows the actual pictures of AHV24V8KV2R5MAW. Figure 2 shows its connecting wires. More detail information is given in Table 1. The high voltage output can be set to a constant value between 0V to 8kV by connecting the CTRL port to the central tap of a POT (Potentiometer) or modulated by an AC signal ranging from 0V to 5V, as see Figure 3 and Figure 4 respectively. The output voltage equals to 1600 times the input control voltage: VVOUT=1600×VCTRL.

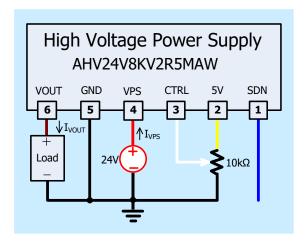


Figure 3. Setting Output to be a Constant Voltage

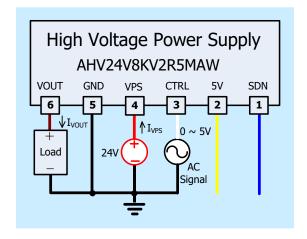


Figure 4. Modulating Output by an AC Signal Source

Please note that the modulation signal must have a low frequency  $\leq$  12Hz and the value range must be  $0V \leq V_{CTRL} \leq 5V$ . The equivalent input circuit for the CTRL is shown in Figure 5.

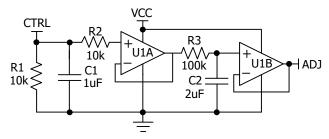


Figure 5. The Equivalent Circuit for CTRL Port

To shutdown AHV24V8KV2R5MAW, pull down SDN pin to <0.8V; to turn it on, leave SDN pin unconnected or pull it >1.2V. The maximum voltage allowed on the SDN pin is 5V. The equivalent circuit for SDN port is shown in Figure 6.

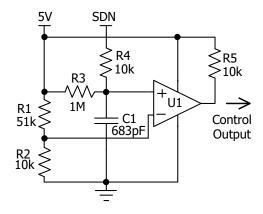


Figure 6. The Equivalent Circuit for SDN Port

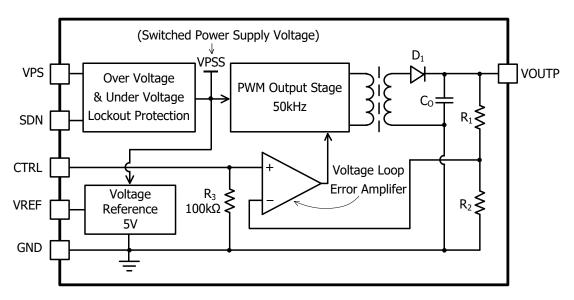
#### **USING AHV24V8KV2R5MAW**

This high voltage power supply must be mounted tightly onto a metal plate, ideally, thus expanding its heating sinking capacity of the metal enclosure. Sufficient ventilation must be provided to keep the power supply surface temperature under 55°C.

#### SAFETY PRECAUTIONS

Although AHV24V8KV2R5MAW high voltage power supply comes with an over current protection circuit, a short circuit at the output should always be avoided. Make sure the high voltage wire for connecting VOUT node has sufficient insulation capability with its surrounding objects.





VOUTP =  $N \times V_{CTRL}$ , where N is the amplification factor:  $N = R_1/R_2$ .

High Voltage Power Supply Function Block Diagram

## **SPECIFICATIONS**

Table 2. Characteristics.  $T_A = 25$ °C, unless otherwise noted.

Parameter	Symbol	Test Conditions	Min.	Тур.	Max.	Unit/Note
Input Power Supply Voltage	V <sub>VPS</sub>		23	24	25	V
Input Power Supply Quiescent Current	Ivps_qc	$I_{VOUT} = 0mA$ $V_{SDN} = V_{CTRL} = 5V$	250	300	350	mA
Input Power Supply Current at Full Load	Ivps_fl	I <sub>VOUT</sub> = 2.5mA	1.1	1.2	1.3	А
Input Power Supply Current at Shutdown	Ivps_shdn	$T_A = -10^{\circ}C \sim 55^{\circ}C$		16		mA
Modulation Voltage Range on CTRL	V <sub>CTRL</sub>		0		5	V
Modulation Frequency Range on CTRL	<b>f</b> CTRL		0		12	Hz
Shutdown Port Current	$I_{SDNL}$	$0 \le V_{SDNL} < 0.8V$	4		4.8	μΑ
Silutuowii Fort Current	${ m I}_{\sf SDNH}$	$1.2V < V_{SDNL} < 5V$	0		3.6	μΑ
Shutdown Voltage Logic Low	$V_{SDNL}$		0		0.8	V
Shutdown Voltage Logic High	$V_{SDNH}$		1.2		5	V
Output Voltage Range	V <sub>VOUT</sub>	$I_{VOUT} = 0 \sim 2.5 \text{mA}$	0		8000	V
Output Current Range	Ivoutmax	V <sub>VPS</sub> = 23V ~ 25V	0		2.5	mA
Reference Output Voltage Range	V <sub>5VR</sub>	$T_{\text{A}} = -10^{\circ}\text{C} \sim 55^{\circ}\text{C}$ $I_{\text{5VR}} \leq 1\text{mA}$	4.95	5	5.05	V
Reference Output Current Range	${ m I}_{\sf 5VR}$	$T_A = -10^{\circ}\text{C} \sim 55^{\circ}\text{C}$ $V_{5VR} = 0 \sim 5V$	0		1	mA





Parameter		Symbol	Test Conditions	Min.	Тур.	Max.	Unit/Note
Output Load Resistance Range				$\frac{V_{VOUT}}{I_{VOUT}}$		∞	МΩ
Output Voltage Ripple		Vvout_rp	$\begin{aligned} \text{Bandwidth} &= 1 \text{MHz} \\ \text{R}_{\text{LOAD}} &= 3.2 \text{M}\Omega \\ \text{V}_{\text{VOUT}} &= 8000 \text{V} \end{aligned}$		≤4		V <sub>P-P</sub>
Output Voltage Temperature Coefficient		TCV <sub>VOUT</sub>	$V_{VPS} = 24V$ $V_{CTRL} = V_{5VR} = 5V$ $V_{VOUT} = 8000V$ $I_{VOUT} = 2.5\text{mA}$ $T_A = -10^{\circ}\text{C} \sim 55^{\circ}\text{C}$		≤0.01		%/°C
Output Voltage Range v.s. Temperature		V <sub>vouт</sub> (Т)	$V_{VPS} = 24V$ $V_{CTRL} = V_{5VR} = 5V$ $V_{VOUT} = 8000V$ $I_{VOUT} = 2.5\text{mA}$ $T_A = -10^{\circ}\text{C} \sim 55^{\circ}\text{C}$	0.99V <sub>VOUT</sub>	Vvout	1.01V <sub>V</sub> оит	V
Output	Short Term Drift	$\frac{\left \Delta V_{VOUT}/V_{VOUT}\right }{\Delta t \text{ (min)}}$	$V_{VPS} = 24V$ $V_{CTRL} = V_{5VR} = 5V$		≤0.5		%/min
Voltage Drift	Long Term Drift	$\frac{\left \Delta V_{VOUT}/V_{VOUT}\right }{\Delta t (h)}$	$V_{VOUT} = 8000V$ $I_{VOUT} = 2.5 mA$ $T_A = -10^{\circ} C \sim 55^{\circ} C$		≤1		%/h
Output Volt	Output Voltage Rise Time		$V_{VOUT}(t_1) = 800V$ $V_{VOUT}(t_2) = 7200V$ $R_{Load} = 3.2M\Omega$		50		ms
Output Vol	Output Voltage Fall Time		$V_{VOUT}(t_2) = 7200V$ $V_{VOUT}(t_3) = 800V$ $R_{Load} = 3.2M\Omega$		100		ms
Mean Time I	Mean Time Between Failure				1M		h
	Instantaneous Short Circuit Current at the Output				≤250		mA
Load Regulation		$\frac{\left \Delta V_{\text{VOUT}}/V_{\text{VOUT}}\right }{\Delta I_{\text{VOUT}}}$	$V_{VOUT} = 8000V$ $I_{VOUT} = 2.5mA$		≤0.05		%/mA
Full Load Efficiency		η	$V_{VPS} = 24V$ $V_{VOUT} = 8000V$ $I_{VOUT} = 2.5 mA$		≥70		%
Operating Temperature Range		T <sub>opr</sub>		-10		55	°C
Storage Temperature Range		T <sub>stg</sub>		-20		85	°C
External Dimensions				82×55×28 3.23×2.17×1.10		mm	
						inch	
Weight					210		g
					0.46		lbs
					7.4		Oz

#### **TESTING DATA**

Test conditions:  $V_{VPS} = 24V$ ,  $T_A = 25$ °C,  $R_{LOAD} = 3.2M\Omega$ 

#### **DC Testing**

The measured output voltage, V<sub>VOUT</sub>, corresponding to the control port input voltage, V<sub>CTRL</sub>, is shown in Figure 7.

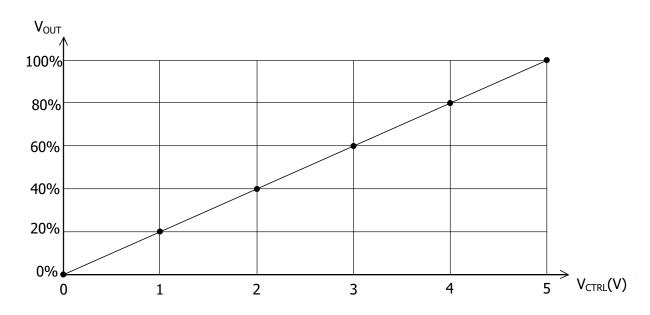


Figure 7. V<sub>CTRL</sub> vs. V<sub>VOUT</sub>

#### **AC Testing**

To test the analog modulation function, a triangle and sine-wave voltage signals are applied to the CTRL port as the input source signal respectively. Figure 8 and 9 show both the input signal and the output signal waveforms when using the triangle and sine-wave signals at the CTRL port respectively.

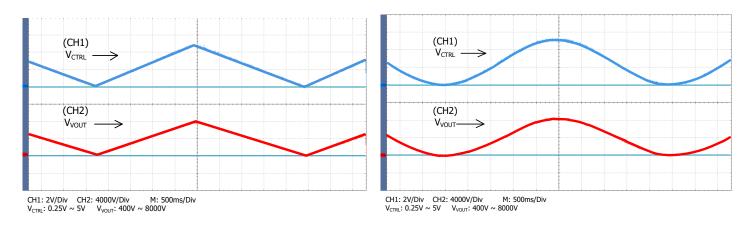


Figure 8. Triangle Wave Modulation

Figure 9. Sine Wave Modulation

To test the rise and fall times at the output, a step function signal is applied to the CTRL port. The testing results are shown in Figure 10, Figure 11, and Figure 12. As shown in Figure 11 and Figure 12, a square wave of  $0.25V \sim 5V$ , f = 0.10Hz, is applied to CTRL port, the output waveform fall time is measured to be about 100ms and the rise time is about 50ms. These two values are not the same, that is because on the rising trail, the power supply injects a current to the load; while on the falling trail, the best the power supply can do is to stop its output current and let the load resistor drain the output filtering capacitor to a lower voltage, and the draining current is much smaller than the injection current.

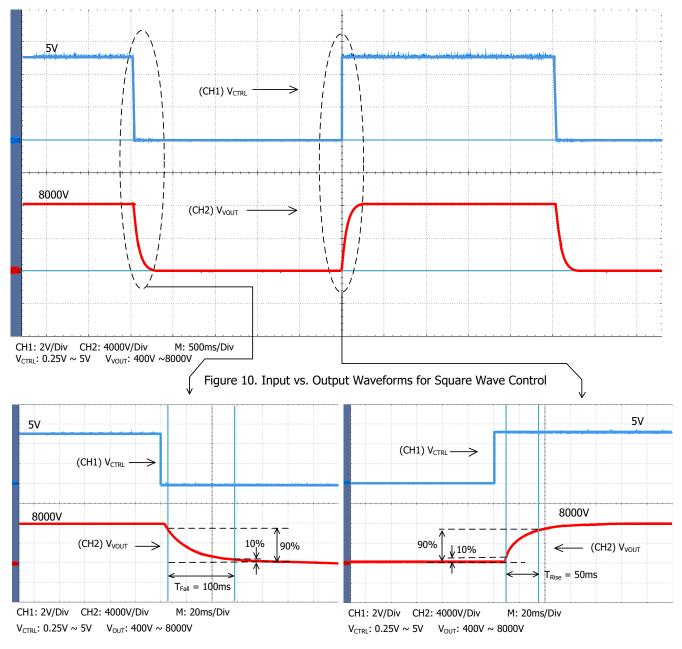
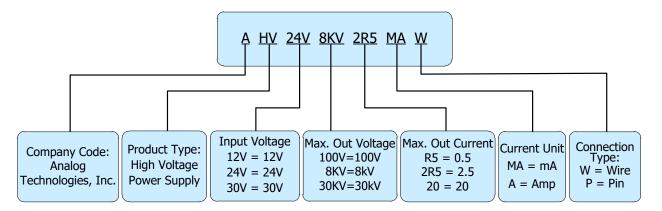


Figure 11. Falling Trail for Large Signal Response

Figure 12. Rising Trail for Large Signal Response

## **NAMING PRINCIPLE**



Naming Principle of AHV24V8KV2R5MAW

#### **DIMENSIONS**

#### **Connecting Lead Wire Sizes and Lengths**

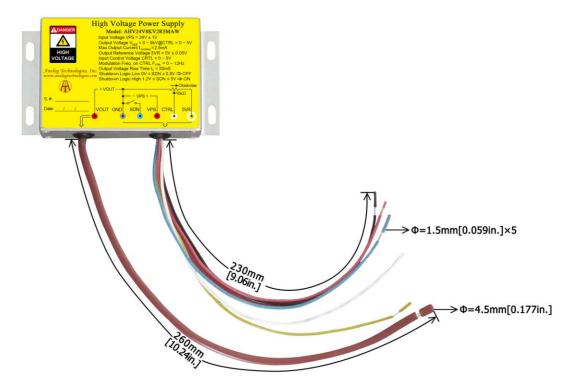


Figure 13. Connecting Lead Wires of AHV24V8KV2R5MAW

Lead Wires	Diameter		Length		
Lead Wires	mm	inch	mm	inch	
Thick brown lead wire		0.177	260 ± 1	10.24 ± 0.039	
Yellow, red, blue, black and white lead wires	1.5	0.059	230 ± 1	9.06 ± 0.039	

#### **Outline Dimensions**

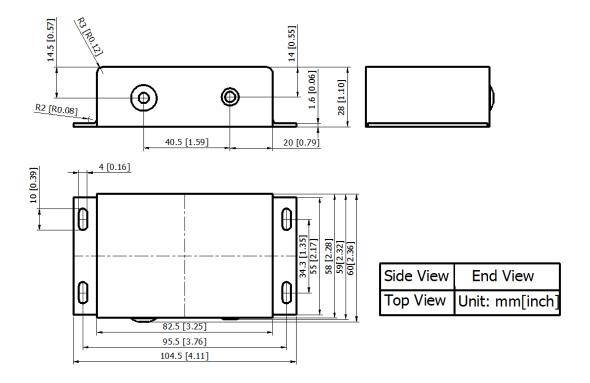


Figure 14. Outline Dimensions

#### ORDERING INFORMATION

Part Number	Buy Now			
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# **High Voltage Power Supply**



AHV24V8KV2R5MAW

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