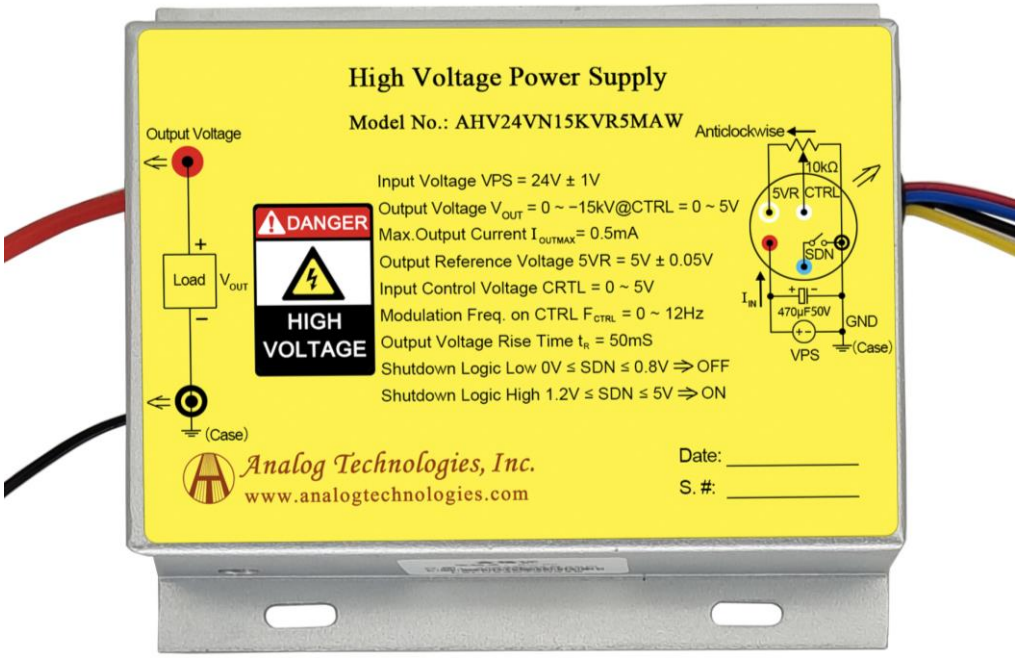


Figure 1.1. Top View of AHV24VN15KVR5MAW

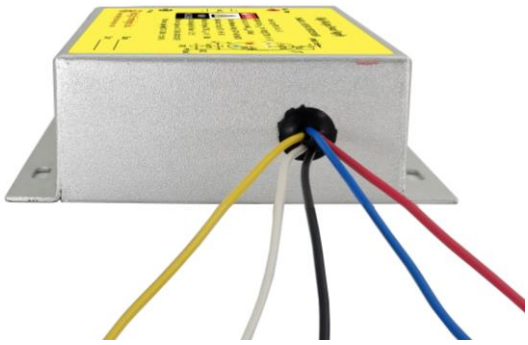


Figure 1.2. Side View

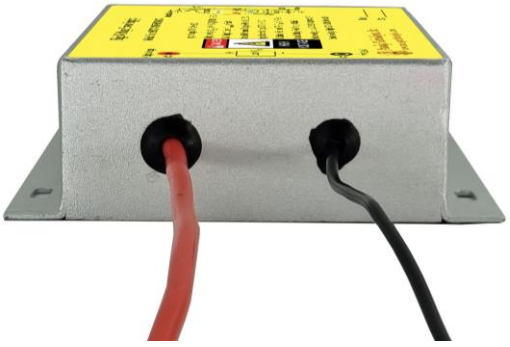


Figure 1.3. Side View

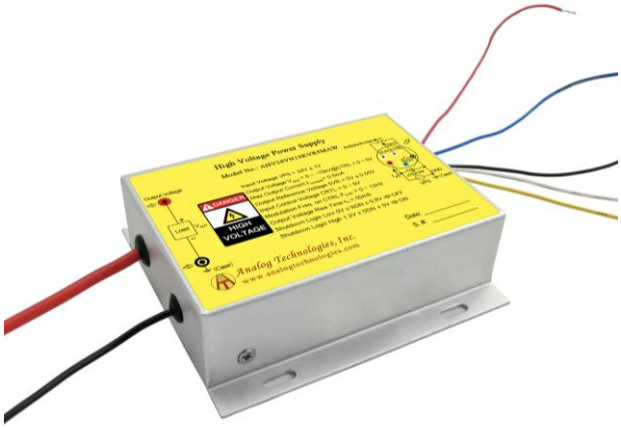


Figure 1.4. Side View



Figure 1.5. Bottom View

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FEATURES

- Input Power Voltage: 24V ± 1V
- Input Current Range: 100mA to 450mA
- Output Voltage: 0 to −15kV@CTRL = 0 to 5V
- Max. Output Current: 0.5mA
- Reference Voltage: 5V ± 0.05V
- Input Control Voltage: 0 to 5V
- Electronic Shutdown Control Available
- Zero EMIs and Good Heat Sinking by Metal Enclosure

APPLICATIONS

This power module, AHV24VN15KVR5MAW, 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

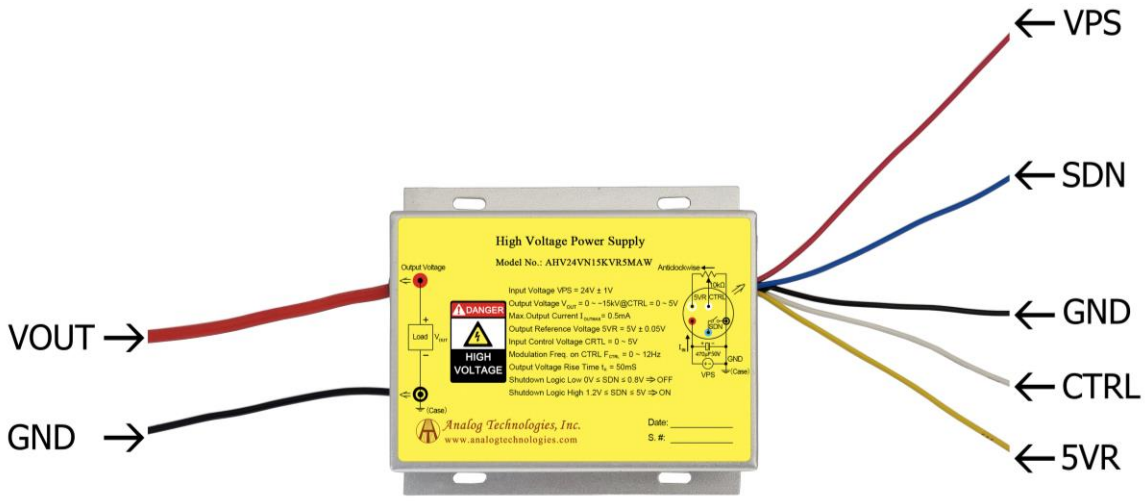


Figure 2. The Connecting Lead Wires of AHV24V15KVR5MAW

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

No.	Name	Description	Type	Color		Min.	Typ.	Max.
1	SDN	Shutdown logic low	Digital input		Blue	0V		0.8V
		Shutdown logic high				1.2V		5V
2	5VR	Reference voltage	Analog output		Yellow		5V	
3	CTRL	Regulation	Analog input		White	0V		5V
4	GND	Ground	Ground for power supply and analog & digital signals		Black		0V	
5	VPS	Input voltage	Power supply input		Red	23V	24V	25V
6	VOUT	Output high voltage	Power output		Brown	0V		−15kV
7	GND	Ground	Ground for power supply and analog & digital signals		Black		0V	

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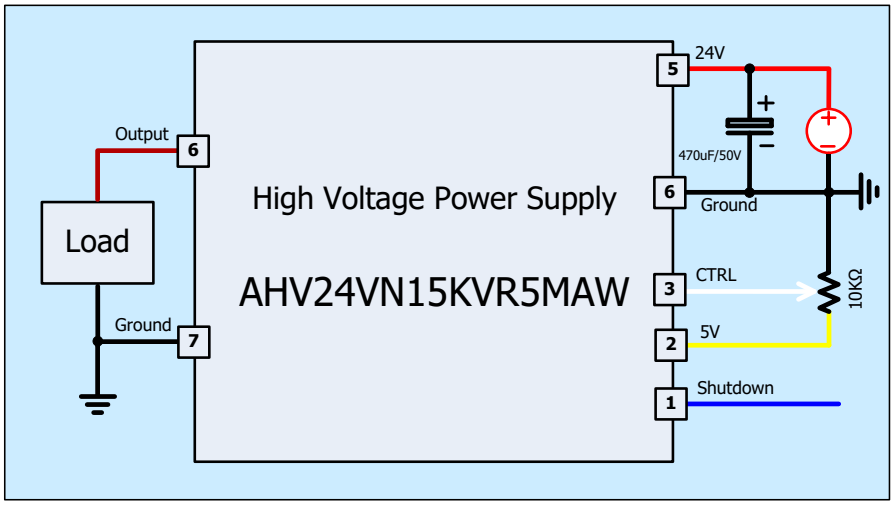


Figure 3. Setting Output to be a Constant Voltage

Please note that the modulation signal must have a low frequency ≤ 10Hz and the value range must be $0V \le V_{CTRL} \le 5V$. The equivalent input circuit for the CTRL is shown in Figure 4.

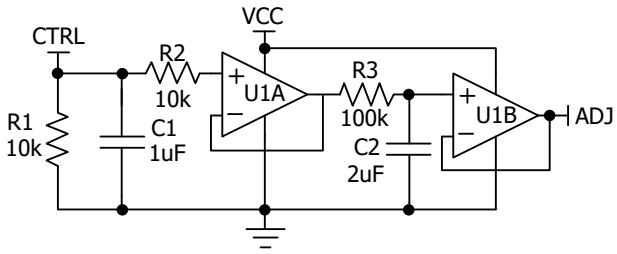


Figure 4. The Equivalent Circuit for CTRL Port

To shutdown AHV24VN15KVR5MAW, 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 5.

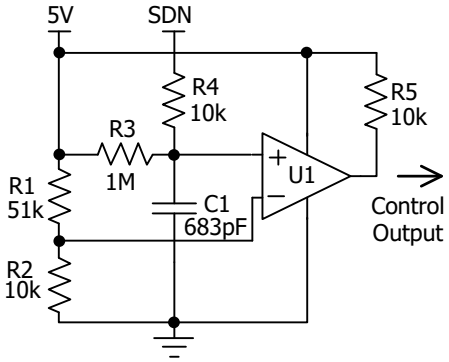


Figure 5. The Equivalent Circuit for SDN Port

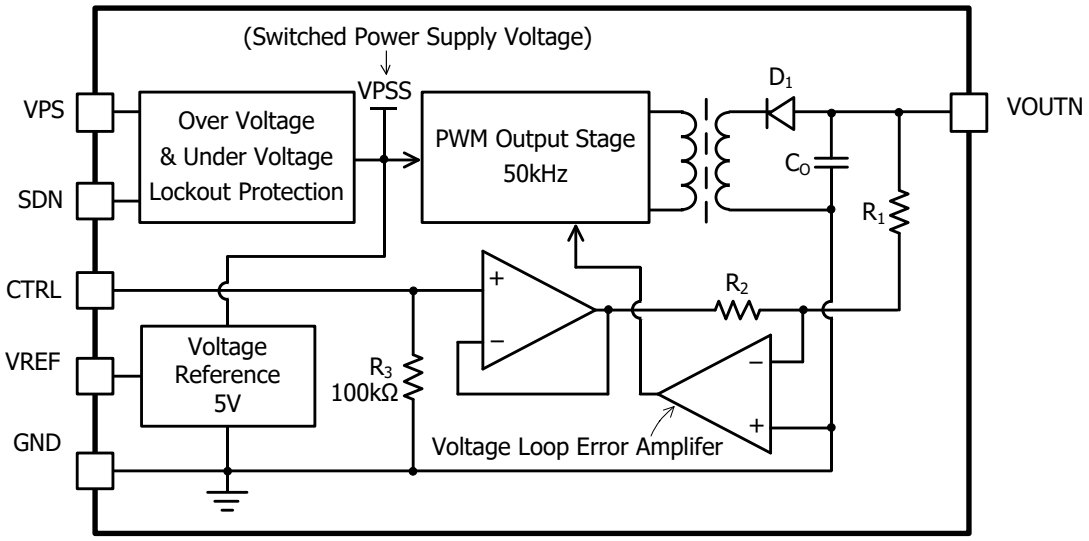
USING AHV24VN15KVR5MAW

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 AHV24VN15KVR5MAW 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.

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

Figure 6. High Voltage Power Supply Function Block Diagram

SPECIFICATIONS

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

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit/Note
Input Power Supply Voltage	V_{VPS}		23	24	25	V
Input Power Supply Quiescent Current	I_{VPS_QC}	I_{VOUT} = 0mA $V_{SDN} = V_{CTRL}$ = 5V	100	110	120	mA
Input Power Supply Current at Full Load	I_{VPS_FL}	I_{VOUT} = 0.5mA	400	450	500	mA
Input Power Supply Current at Shutdown	I_{VPS_SHDN}	T_A = −10°C ~ 55°C		16		mA
Modulation Voltage Range on CTRL	V_{CTRL}		0		5	V
Modulation Frequency Range on CTRL	f_{CTRL}		0		12	Hz
Shutdown Port Current	I_{SDNL}	V_{SDNL} < 0.8V	−5		−4.2	μA
	I_{SDNH}	1.2V < V_{SDNL} < 5V	0		3.8	μA
Shutdown Voltage Logic Low	V_{SDNL}		0		0.8	V
Shutdown Voltage Logic High	V_{SDNH}		1.2		5	V
Output Voltage	V_{VOUT}	I_{VOUT} = 0 ~ 0.5mA	0		−15000	V
Output Current Range	$I_{VOUTMAX}$	V_{VPS} = 23V ~ 25V	0		0.5	mA
Reference Voltage Output Range	V_{5VR}	T_A = −10°C ~ 55°C $I_{5VR} \le$ 1mA	4.95	5	5.05	V
Reference Output Current Range	I_{5VR}	T_A = −10°C ~ 55°C V_{5VR} = 0 ~ 5V	0		1	mA

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Parameter		Symbol	Test Conditions	Min.	Typ.	Max.	Unit/Note
Output Load Resistance Range				$\frac{V_{VOUT}}{I_{VOUT}}$		∞	MΩ
Output Voltage Ripple		V_{VOUT_RP}	Bandwidth = 1MHz R_{LOAD} = 30MΩ V_{VOUT} = −15kV		≤7.5		V_{P-P}
Output Voltage Temperature Coefficient		TCV_{VOUT}	V_{VPS} = 24V V_{CTRL} = V_{5VR} = 5V V_{VOUT} = −15kV I_{VOUT} = 0.5mA T_A = −10°C ~ 55°C		≤0.01		%/°C
Output Voltage Range v.s. Temperature		$V_{VOUT}(T)$	V_{VPS} = 24V V_{CTRL} = V_{5VR} = 5V V_{VOUT} = −15kV I_{VOUT} = 0.5mA T_A = −10°C ~ 55°C	$0.99V_{VOUT}$	V_{VOUT}	$1.01V_{VOUT}$	V
Output Voltage Drift	Short Term Drift	$\frlvert\Delta V_{VOUT}/V_{VOUT}\frrvert$ / Δt (min)	V_{VPS} = 24V V_{CTRL} = V_{5VR} = 5V V_{VOUT} = −15kV I_{VOUT} = 0.5mA T_A = −10°C ~ 55°C		≤0.5		%/min
	Long Term Drift	$\frlvert\Delta V_{VOUT}/V_{VOUT}\frrvert$ / Δt (h)			≤1		%/h
Output Voltage Rise Time		t_r	V_{VOUT} (t_1) = −1500V V_{VOUT} (t_2) = −13500V R_{LOAD} = 30MΩ		50		ms
Output Voltage Fall Time		t_f	V_{VOUT} (t_2) = −13500V V_{VOUT} (t_3) = −1500V R_{LOAD} = 30MΩ		100		ms
Mean Time Between Failure		MTBF			1M		h
Instantaneous Short Circuit Current at the Output		I_{VOUT_SC}			≤50		mA
Load Regulation		$\frlvert\Delta V_{VOUT}/V_{VOUT}\frrvert$ / ΔI_{VOUT}	V_{VOUT} = −3kV I_{VOUT} = 10mA		≤0.05		%/mA
Full Load Efficiency		η	V_{VPS} = 24V V_{VOUT} = −3kV I_{VOUT} = 10mA		≥70		%
Operating Temperature Range		T_{opr}		−10		55	°C
Storage Temperature Range		T_{stg}		−20		85	°C
External Dimensions				140×100×55			mm
				5.51×3.94×2.17			inch
Weight					1000		g
					2.21		lbs
					35.27		Oz

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TESTING DATA

Test conditions: V_{VPS} = 24V, T_A = 25°C, R_{LOAD} = 30MΩ

DC Testing

The measured output voltage, V_{VOUT}, corresponding to the control port input voltage, V_{CTRL}, is shown in Figure 7.

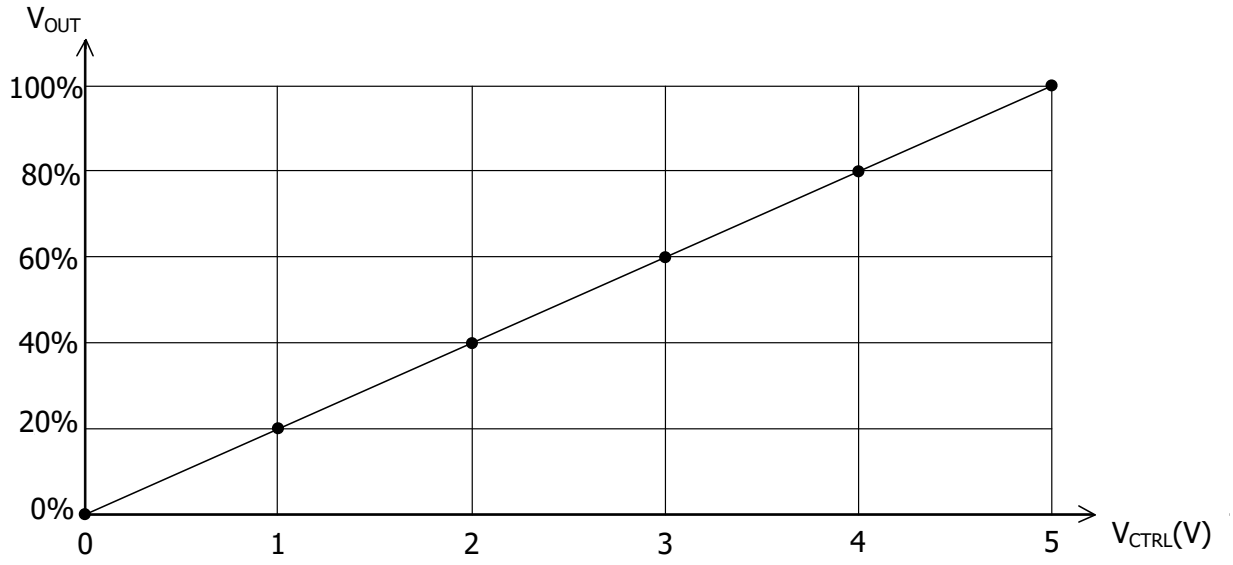


Figure 7. V_{CTRL} vs. V_{VOUT}

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.

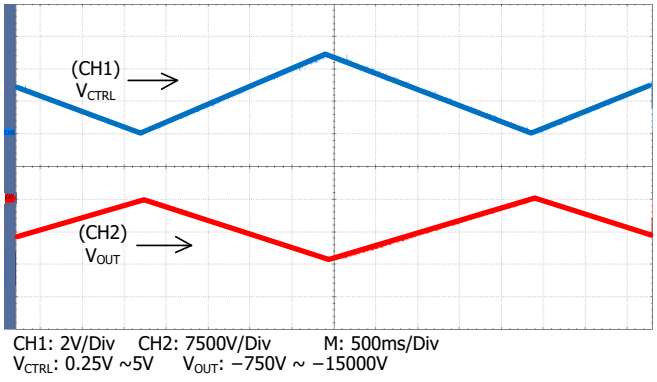


Figure 8. Triangle Wave Modulation

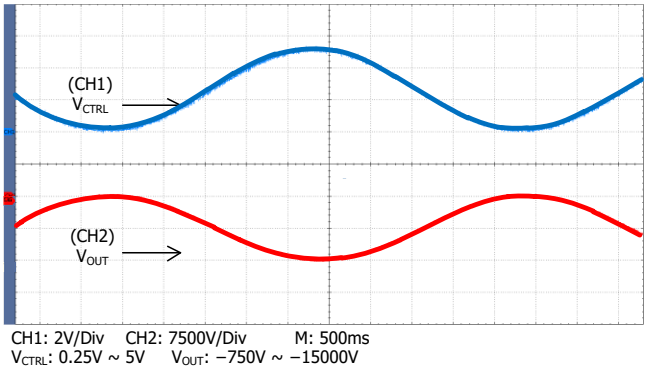


Figure 9. Sine Wave Modulation

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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 ~ 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.

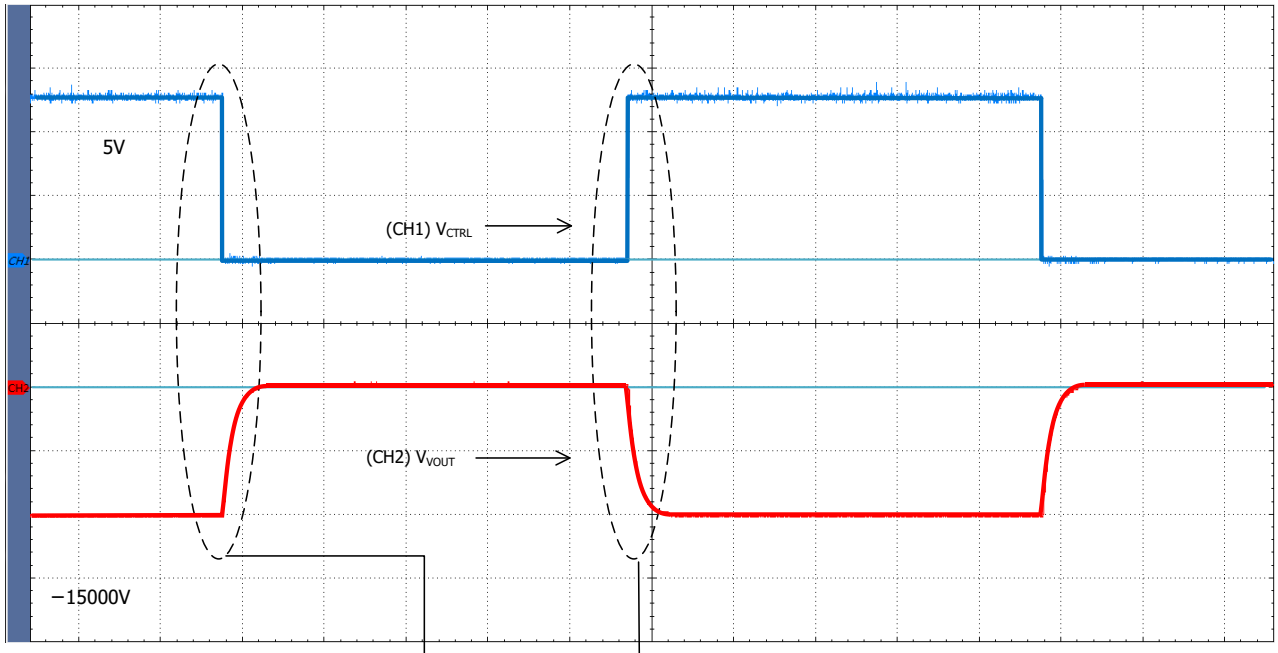


Figure 10. Input vs. Output Waveforms for Square Wave Control

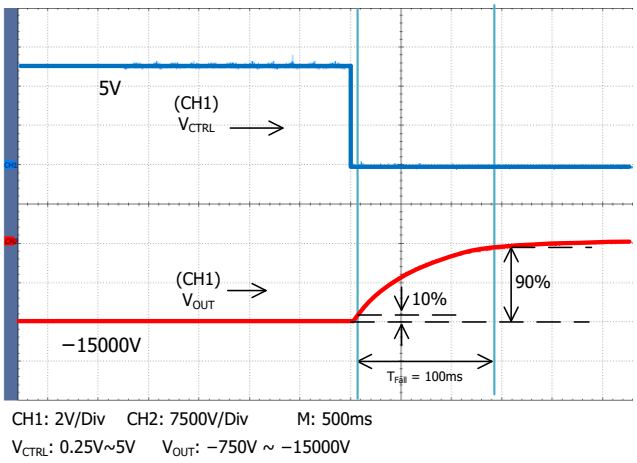


Figure 11. Falling Trail for Large Signal Response

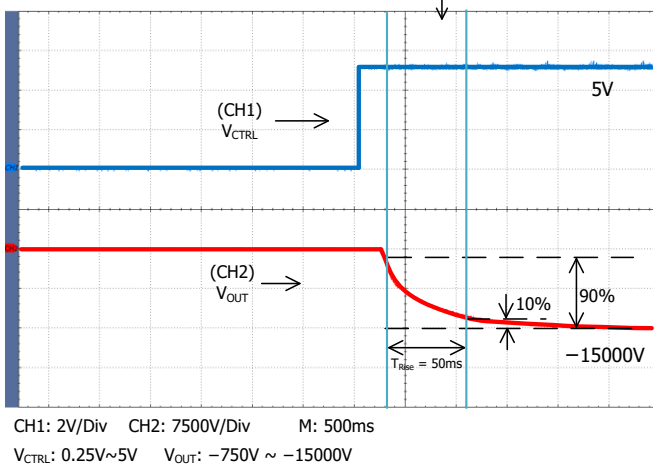
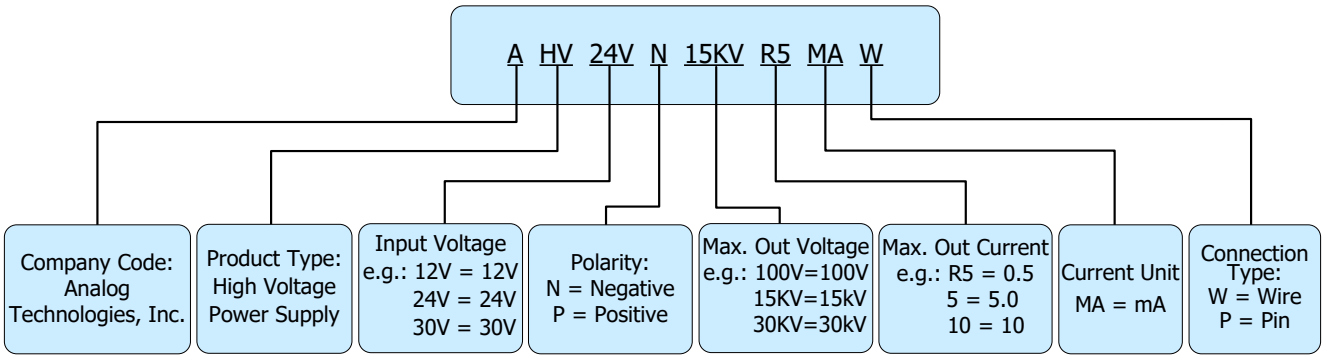


Figure 12. Rising Trail for Large Signal Response

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NAMING PRINCIPLE



Naming Principle of AHV24VN15KVR5MAW

DIMENSIONS

Connecting Lead Wire Sizes and Lengths



Figure 13. Connecting Lead Wires of AHV24VN15KVR5MAW

Lead Wires	Diameter		Length	
	mm	inch	mm	inch
Thick brown lead wire	4.5	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

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Outline Dimensions

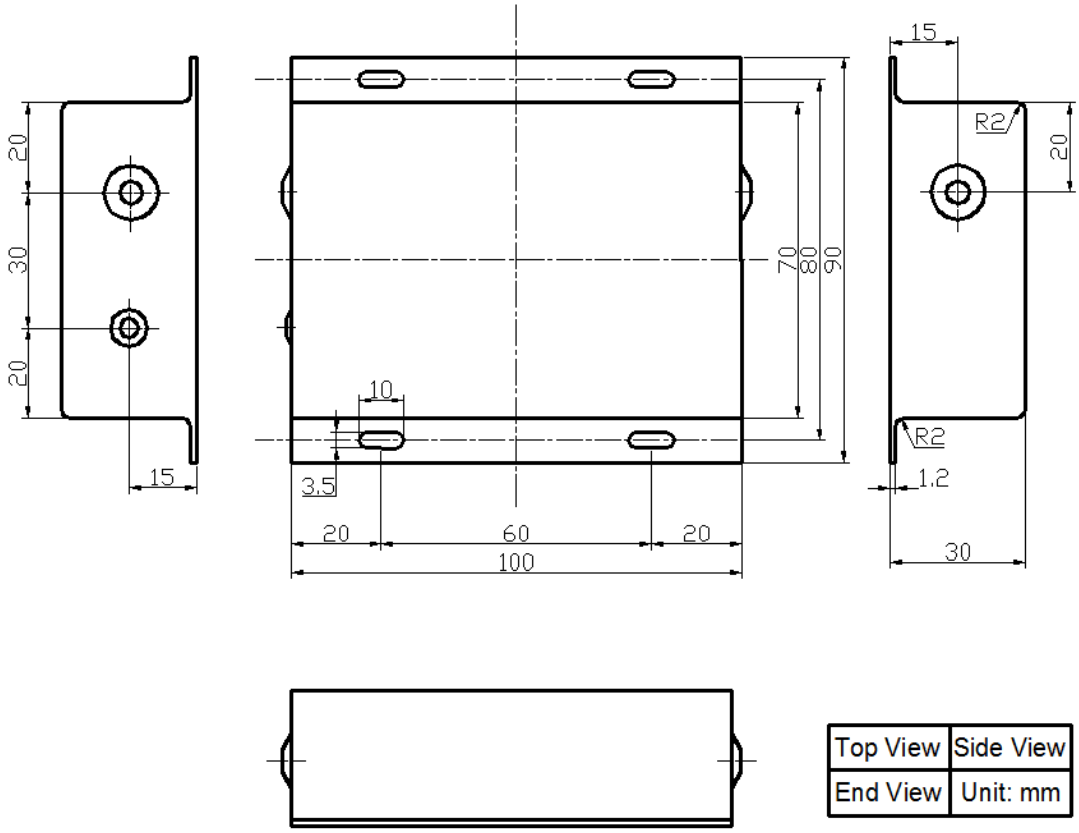


Figure 14. Outline Dimensions

ORDERING INFORMATION

Part Number	Buy Now
AHV24VN15KVR5MAW	

RELATED PRODUCTS

Input Voltage: 24V, Input Control Voltage: 0 to 5V, Efficiency: 70%.

Part #	Datasheet	Output Voltage (V)	Output Current (mA)	Description	Buy Now*
AHV24V500V1MAW		500	1	Positive 500V 1mA module with lead wires	
AHV24V500V2MAW		500	2	Positive 500V 2mA module with lead wires	
AHV24V500V5MAW		500	5	Positive 500V 5mA module with lead wires	
AHV24V500V10MAW		500	10	Positive 500V 10mA module with lead wires	
AHV24V500V20MAW		500	20	Positive 500V 20mA module with lead wires	

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Part #	Datasheet	Output Voltage (V)	Output Current (mA)	Description	Buy Now*
AHV24V500V50MAW		500	50	Positive 500V 50mA module with lead wires	
AHV24V600V30MAW		600	30	Positive 600V 30mA module with lead wires	
AHV24V1KV1MAW		1000	1	Positive 1kV 1mA module with lead wires	
AHV24V1KV2MAW		1000	2	Positive 1kV 2mA module with lead wires	
AHV24V1KV3MAW		1000	3	Positive 1kV 3mA module with lead wires	
AHV24V1KV5MAW		1000	5	Positive 1kV 5mA module with lead wires	
AHV24V1KV10MAW		1000	10	Positive 1kV 10mA module with lead wires	
AHV24V1KV20MAW		1000	20	Positive 1kV 20mA module with lead wires	
AHV24V1500V1MAW		1500	1	Positive 1.5kV 1mA module with lead wires	
AHV24V1500V2MAW		1500	2	Positive 1.5kV 2mA module with lead wires	
AHV24V1500V3MAW		1500	3	Positive 1.5kV 3mA module with lead wires	
AHV24V1500V5MAW		1500	5	Positive 1.5kV 5mA module with lead wires	
AHV24V1500V10MAW		1500	10	Positive 1.5kV 10mA module with lead wires	
AHV24V2KV1MAW		2000	1	Positive 2kV 1mA module with lead wires	
AHV24V2KV2MAW		2000	2	Positive 2kV 2mA module with lead wires	
AHV24V2KV3MAW		2000	3	Positive 2kV 3mA module with lead wires	
AHV24V2KV5MAW		2000	5	Positive 2kV 5mA module with lead wires	
AHV24V2KV10MAW		2000	10	Positive 2kV 10mA module with lead wires	
AHV24V2500V1MAW		2500	1	Positive 2.5kV 1mA module with lead wires	
AHV24V2500V3MAW		2500	3	Positive 2.5kV 3mA module with lead wires	
AHV24V2500V5MAW		2500	5	Positive 2.5kV 5mA module with lead wires	
AHV24V3KV1MAW		3000	1	Positive 3kV 1mA module with lead wires	
AHV24V3KV2MAW		3000	2	Positive 3kV 2mA module with lead wires	
AHV24V3KV3MAW		3000	3	Positive 3kV 3mA module with lead wires	
AHV24V3KV5MAW		3000	5	Positive 3kV 5mA module with lead wires	
AHV24V3KV10MAW		3000	10	Positive 3kV 10mA module with lead wires	
AHV24V4KV1MAW		4000	1	Positive 4kV 1mA module with lead wires	
AHV24V4KV2R5MAW		4000	2.5	Positive 4kV 2.5mA module with lead wires	
AHV24V4KV5MAW		4000	5	Positive 4kV 5mA module with lead wires	
AHV24V5KV1MAW		5000	1	Positive 5kV 1mA module with lead wires	

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Part #	Datasheet	Output Voltage (V)	Output Current (mA)	Description	Buy Now*
AHV24V5KV2MAW		5000	2	Positive 5kV 2mA module with lead wires	
AHV24V5KV4MAW		5000	4	Positive 5kV 4mA module with lead wires	
AHV24V5KV10MAW		5000	10	Positive 5kV 10mA module with lead wires	
AHV24V6KV1MAW		6000	1	Positive 6kV 1mA module with lead wires	
AHV24V6KV3MAW		6000	3	Positive 6kV 3mA module with lead wires	
AHV24V7KV1MAW		7000	1	Positive 7kV 1mA module with lead wires	
AHV24V7KV2MAW		7000	2	Positive 7kV 2mA module with lead wires	
AHV24V8KV1MAW		8000	1	Positive 8kV 1mA module with lead wires	
AHV24V8KV2R5MAW		8000	2.5	Positive 8kV 2.5mA module with lead wires	
AHV24V9KV1MAW		9000	1	Positive 9kV 1mA module with lead wires	
AHV24V10KVR6MAW		10,000	0.6	Positive 10kV 0.6mA module with lead wires	
AHV24V10KV1MAW		10,000	1	Positive 10kV 1mA module with lead wires	
AHV24V10KV2MAW		10,000	2	Positive 10kV 2mA module with lead wires	
AHV24V10KV5MAW		10,000	5	Positive 10kV 5mA module with lead wires	
AHV24V15KVR5MAW		15,000	0.5	Positive 15kV 0.5mA module with lead wires	
AHV24V15KV1MAW		15,000	1	Positive 15kV 5mA module with lead wires	
AHV24V20KV1MAW		20,000	1	Positive 20kV 1mA module with lead wires	
AHV24V25KV1MAW		25,000	1	Positive 25kV 1mA module with lead wires	
AHV24V30KVR5MAW		30,000	0.5	Positive 30kV 0.5mA module with lead wires	
AHV24V30KV1MAW		30,000	1	Positive 30kV 1mA module with lead wires	
AHV24V30KV2R5MAW		30,000	2.5	Positive 30kV 2.5mA module with lead wires	
AHV24V40KV1MAW		40,000	1	Positive 40kV 1mA module with lead wires	
AHV24V60KV1MAW		60,000	1	Positive 60kV 1mA module with lead wires	
AHV24VN500V1MAW		−500	1	Negative 500V 1mA module with lead wires	
AHV24VN500V2MAW		−500	2	Negative 500V 2mA module with lead wires	
AHV24VN500V5MAW		−500	5	Negative 500V 5mA module with lead wires	
AHV24VN500V10MAW		−500	10	Negative 500V 10mA module with lead wires	
AHV24VN500V20MAW		−500	20	Negative 500V 20mA module with lead wires	
AHV24VN500V50MAW		−500	50	Negative 500V 50mA module with lead wires	
AHV24VN1KV1MAW		−1000	1	Negative 1kV 1mA module with lead wires	

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Part #	Datasheet	Output Voltage (V)	Output Current (mA)	Description	Buy Now*
AHV24VN1KV2MAW		−1000	2	Negative 1kV 2mA module with lead wires	
AHV24VN1KV3MAW		−1000	3	Negative 1kV 3mA module with lead wires	
AHV24VN1KV5MAW		−1000	5	Negative 1kV 5mA module with lead wires	
AHV24VN1KV10MAW		−1000	10	Negative 1kV 10mA module with lead wires	
AHV24VN1KV20MAW		−1000	20	Negative 1kV 20mA module with lead wires	
AHV24VN1500V1MAW		−1500	1	Negative 1.5kV 1mA module with lead wires	
AHV24VN1500V2MAW		−1500	2	Negative 1.5kV 2mA module with lead wires	
AHV24VN1500V3MAW		−1500	3	Negative 1.5kV 3mA module with lead wires	
AHV24VN1500V5MAW		−1500	5	Negative 1.5kV 5mA module with lead wires	
AHV24VN1500V10MAW		−1500	10	Negative 1.5kV 10mA module with lead wires	
AHV24VN2KV1MAW		−2000	1	Negative 2kV 1mA module with lead wires	
AHV24VN2KV2MAW		−2000	2	Negative 2kV 2mA module with lead wires	
AHV24VN2KV3MAW		−2000	3	Negative 2kV 3mA module with lead wires	
AHV24VN2KV5MAW		−2000	5	Negative 2kV 5mA module with lead wires	
AHV24VN2KV10MAW		−2000	10	Negative 2kV 10mA module with lead wires	
AHV24VN2500V1MAW		−2500	1	Negative 2.5kV 1mA module with lead wires	
AHV24VN2500V3MAW		−2500	3	Negative 2.5kV 3mA module with lead wires	
AHV24VN2500V5MAW		−2500	5	Negative 2.5kV 5mA module with lead wires	
AHV24VN3KV1MAW		−3000	1	Negative 3kV 1mA module with lead wires	
AHV24VN3KV2MAW		−3000	2	Negative 3kV 2mA module with lead wires	
AHV24VN3KV3MAW		−3000	3	Negative 3kV 3mA module with lead wires	
AHV24VN3KV5MAW		−3000	5	Negative 3kV 5mA module with lead wires	
AHV24VN3KV10MAW		−3000	10	Negative 3kV 10mA module with lead wires	
AHV24VN4KV1MAW		−4000	1	Negative 4kV 1mA module with lead wires	
AHV24VN4KV2R5MAW		−4000	2.5	Negative 4kV 2.5mA module with lead wires	
AHV24VN4KV5MAW		−4000	5	Negative 4kV 5mA module with lead wires	
AHV24VN5KV1MAW		−5000	1	Negative 5kV 1mA module with lead wires	
AHV24VN5KV2MAW		−5000	2	Negative 5kV 2mA module with lead wires	
AHV24VN5KV4MAW		−5000	4	Negative 5kV 4mA module with lead wires	
AHV24VN5KV10MAW		−5000	10	Negative 5kV 10mA module with lead wires	

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Part #	Datasheet	Output Voltage (V)	Output Current (mA)	Description	Buy Now*
AHV24VN6KV1MAW		−6000	1	Negative 6kV 1mA module with lead wires	
AHV24VN6KV3MAW		−6000	3	Negative 6kV 3mA module with lead wires	
AHV24VN7KV1MAW		−7000	1	Negative 7kV 1mA module with lead wires	
AHV24VN7KV2MAW		−7000	2	Negative 7kV 2mA module with lead wires	
AHV24VN8KV1MAW		−8000	1	Negative 8kV 1mA module with lead wires	
AHV24VN8KV2R5MAW		−8000	2.5	Negative 8kV 2.5mA module with lead wires	
AHV24VN9KV1MAW		−9000	1	Negative 9kV 1mA module with lead wires	
AHV24VN10KVR6MAW		−10000	0.6	Negative 10kV 0.6mA module with lead wires	
AHV24VN10KV1MAW		−10000	1	Negative 10kV 1mA module with lead wires	
AHV24VN10KV2MAW		−10000	2	Negative 10kV 2mA module with lead wires	
AHV24VN10KV5MAW		−10000	5	Negative 10kV 5mA module with lead wires	
AHV24VN15KVR5MAW		−15000	0.5	Negative 15kV 0.5mA module with lead wires	
AHV24VN15KV1MAW		−15000	1	Negative 15kV 1mA module with lead wires	
AHV24VN20KV1MAW		−20000	1	Negative 20kV 1mA module with lead wires	
AHV24VN25KV1MAW		−25000	1	Negative 25kV 1mA module with lead wires	
AHV24VN30KVR5MAW		−30000	0.5	Negative 30kV 0.5mA module with lead wires	
AHV24VN30KV1MAW		−30000	1	Negative 30kV 1mA module with lead wires	
AHV24VN30KV2R5MAW		−30000	2.5	Negative 30kV 2.5mA module with lead wires	
AHV24VN40KV1MAW		−40000	1	Negative 40kV 1mA module with lead wires	

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

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