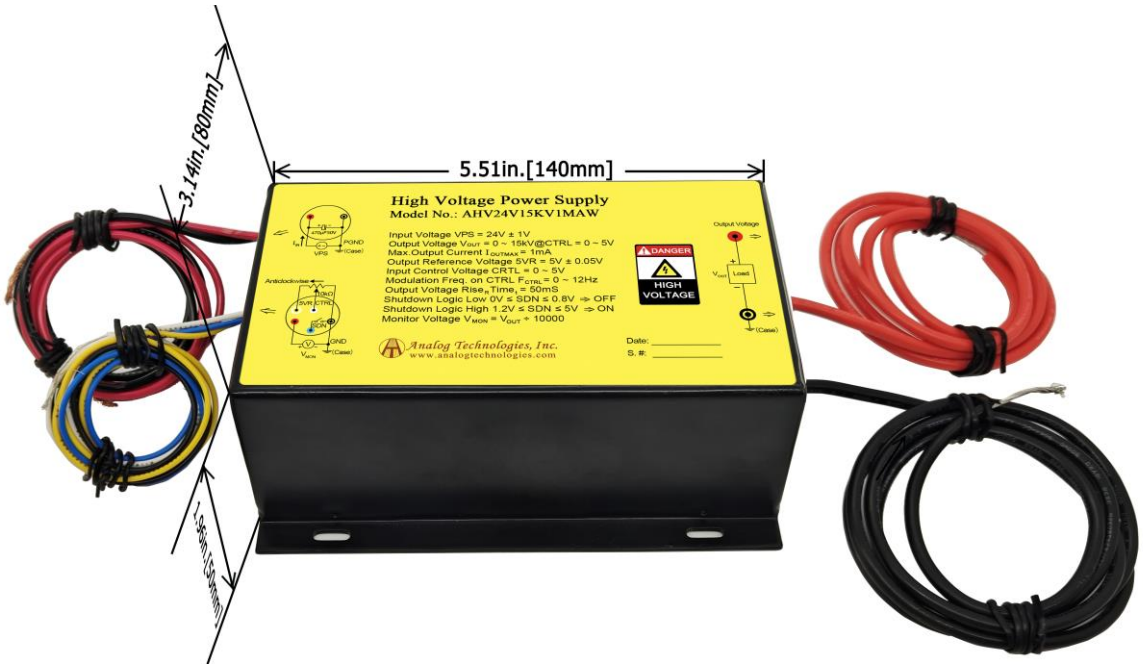


Figure 1.1. Top View of AHV24V15KV1MAW

Figure 1.2. Side View

Figure 1.3. Bottom View

Figure 1.4. Side View

Figure 1.5. Side View

FEATURES

- Input Power Voltage: 24V ± 1V
- Input Current Range: 140mA to 800mA
- Output Voltage: 0 to 15kV@CTRL = 0 to 5V
- Monitor Voltage: 0 to 1.5V
- Max. Output Current: 1mA
- Reference Voltage: 5V ± 0.05V
- Input Control Voltage: 0 to 5V
- Full Span Modulation on Output Voltage
- Electronic Shutdown Control

APPLICATIONS

This power module, AHV24V15KV1MAW, is designed for achieving DC-DC conversion from low voltage to high voltage as a power supply source which is widely used in scientific research and other fields including:

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

DESCRIPTION

Figure 2 shows the connecting wires of AHV24V15KV1MAW, of which their detail information given in Table 1. The output voltage can be set to a constant value by connecting the CTRL port to the central tap of a POT (Potentiometer) corresponding to 0V to 15kV proportionally at the output VOUT port as shown in Figure 3.

Figure 2. The Connecting Lead Wires of AHV24V15KV1MAW

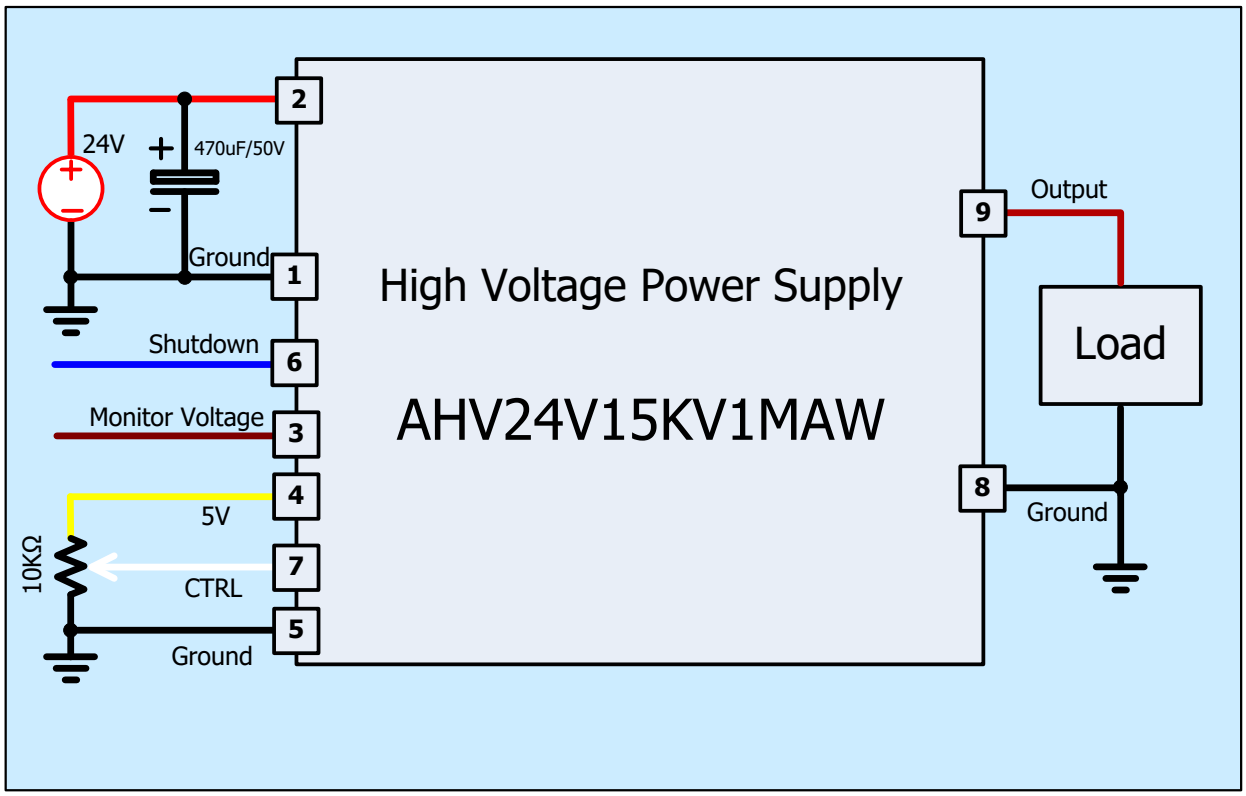


Figure 3. Setting Output to be a Constant Voltage

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

No.	Name	Color		Type	Description	Min.	Typ.	Max.
1	GND	Black	●	Ground for analog, digital and power signals.	Input GND		0V	
2	VPS	Red	●	Power input	Input voltage		24V	
3	MON	Red	●	Analog output	Monitor Voltage	0V		1.5V
4	5VR	Yellow	●	Analog output	Reference voltage		5V	
5	GND	Black	●	Ground for analog, digital and power signals.	Control GND Monitor GND		0V	
6	SDN	Blue	●	Digital input	Shutdown logic low	0V		0.8V
					Shutdown logic high	1.2V		5V
7	CTRL	White	○	Analog input	Regulation	0V		5V
8	GND	Black	●	Power output	Output GND		0V	
9	VOUT	Brown	●	Power output	Output high voltage	0V		15kV

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

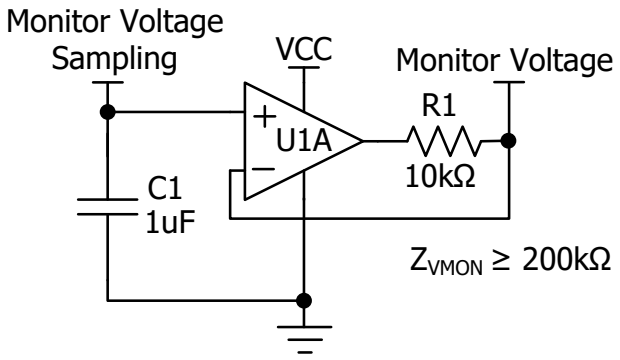


Figure 4. The Equivalent Circuit for MON Port

The equivalent input circuit for the CTRL is shown in Figure 5.

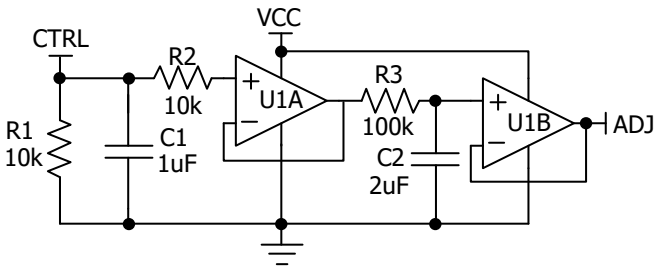


Figure 5. The Equivalent Circuit for CTRL Port

To shutdown AHV24V15KV1MAW, 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.

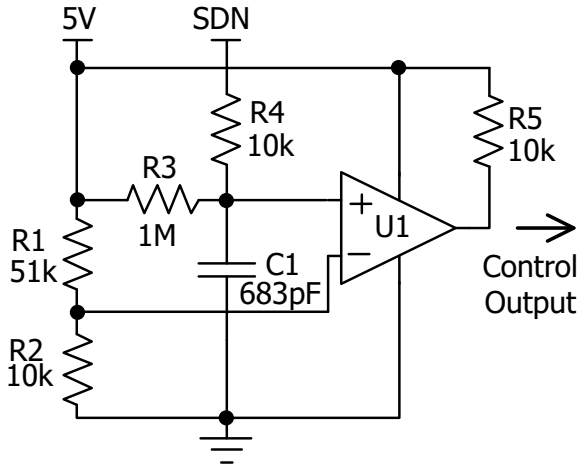


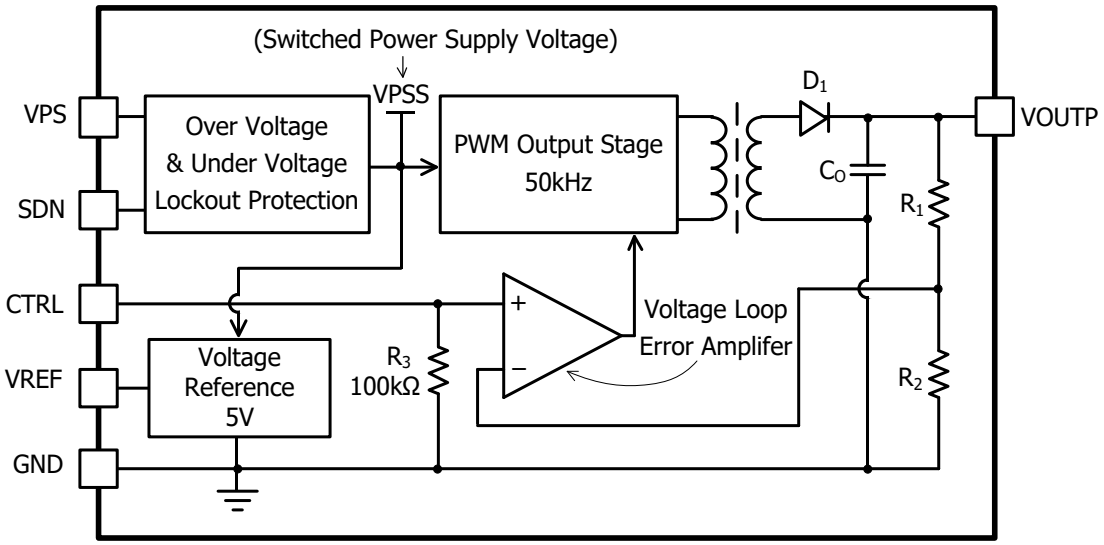
Figure 6. The Equivalent Circuit for SDN Port

USING AHV24V15KV1MAW

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 AHV24V15KV1MAW 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.	Typ.	Max.	Unit/Note
Input Power Voltage	V_{VPS}		23	24	25	V
Input Power Quiescent Current	I_{VPS_QC}	I_{VOUT} = 0mA	175	225	275	mA
Input Power Current at Full Load	I_{VPS_FL}	I_{VOUT} = 1mA	850	900	950	mA
Input Power Current at Shutdown	I_{VPS_SHDN}	T_A = −10°C ~ 55°C		16		mA
Modulation Voltage Range Frequency 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 ~ 1mA	0		15000	V
Output Current Range	$I_{VOUTMAX}$	V_{VPS} = 23V ~ 25V	0		1	mA
Reference Voltage Output Range	V_{5VR}	T_A = −10°C ~ 55°C I_{5VR} ≤ 5mA	4.95	5	5.05	V
Monitor Voltage Out Impedance	Z_{VMON}			1		MΩ
Monitor Voltage	V_{MON}	V_{OUT} = 0 ~ 15kV	0		1.5	V
Output Load Range			15		∞	MΩ

Parameter		Symbol	Test Conditions	Min.	Typ.	Max.	Unit/Note
Output Voltage Ripple		V_{VOUT_RP}	Bandwidth = 1MHz R_{LOAD} = 15MΩ		≤7.5		V_{P-P}
Output Voltage Temperature Coefficient		TCV_{VOUT}	V_{VPS} = 24V V_{CTRL} = V_{5VR} = 5V V_{VOUT} = 15kV I_{VOUT} = 1mA T_A = −10°C ~ 55°C		≤0.1		%/°C
Output Voltage Range v.s. Temperature		$V_{VOUT}(T)$	V_{VPS} = 24V V_{CTRL} = V_{5VR} = 5V V_{VOUT} = 15kV I_{VOUT} = 1mA T_A = −10°C ~ 55°C	$0.99V_{VOUT}$	V_{VOUT}	$1.01V_{VOUT}$	V
Output Voltage Drift	Short Term Drift	$\frac{\lvert\Delta V_{VOUT}/V_{VOUT}\rvert}{\Delta t\ (min)}$	V_{VPS} = 24V V_{CTRL} = V_{5VR} = 5V V_{VOUT} = 15kV I_{VOUT} = 1mA T_A = −10°C ~ 55°C		≤0.3		%/min
	Long Term Drift	$\frac{\lvert\Delta V_{VOUT}/V_{VOUT}\rvert}{\Delta t\ (h)}$			≤0.5		%/h
Output Voltage Rise Time		t_r	V_{VOUT} (t_1) = 4.5kV V_{VOUT} (t_2) = 10.5kV No-Load		50		ms
Output Voltage Fall Time		t_f	V_{VOUT} (t_2) = 10.5kV V_{VOUT} (t_3) = 4.5kV No-Load		100		ms
Mean Time Between Failure		MTBF			1M		h
Instantaneous Short Circuit Current at the Output		I_{VOUT_SC}			≤150		mA
Load Regulation		$\frac{\lvert\Delta V_{VOUT}/V_{VOUT}\rvert}{\Delta I_{VOUT}}$	V_{VOUT} = 15kV I_{VOUT} = 1mA		≤0.05		%/mA
Full Load Efficiency		η (3)	V_{VPS} = 24V V_{VOUT} = 15kV I_{VOUT} = 1mA		≥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

TESTING DATA

Test conditions: V_{VPS} = 24V, T_A = 25°C, R_{LOAD} = 15MΩ

DC Testing

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

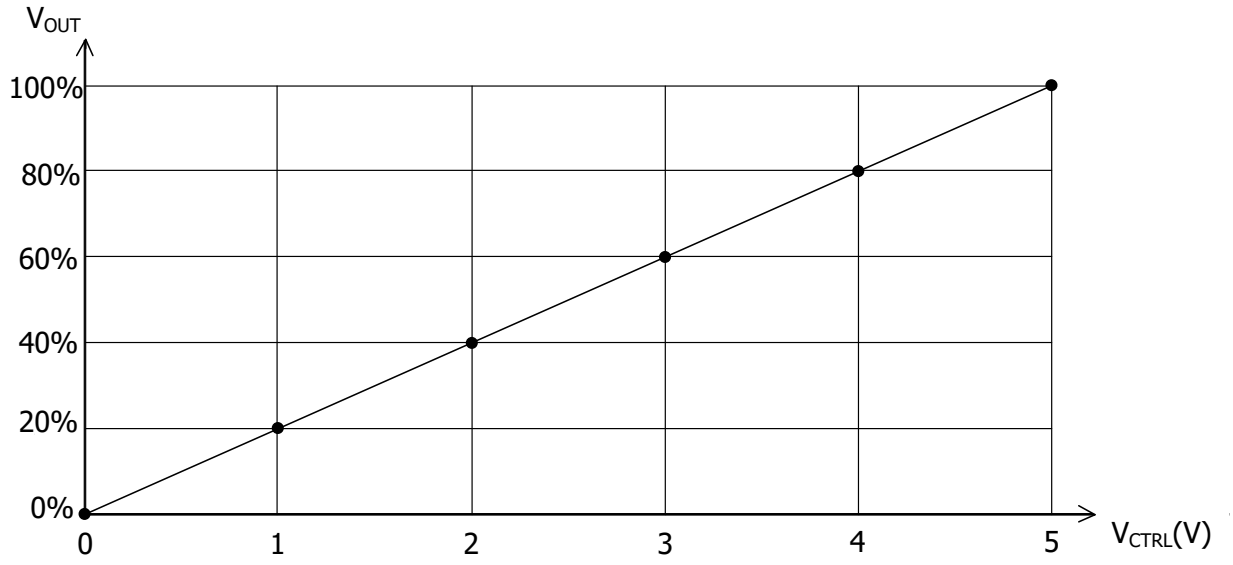


Figure 7. V_{CTRL} vs. V_{VOUT}

AC Testing

To test the analog modulation function, a triangle and sine-wave voltage signals of 0.25V ~ 5V, f = 0.10Hz, 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.

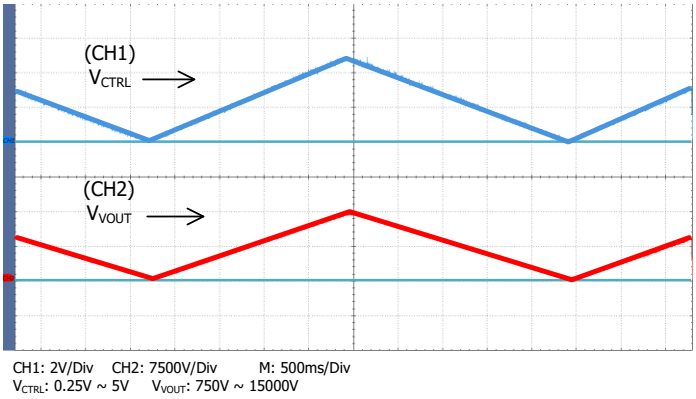


Figure 8. Triangle Wave Modulation

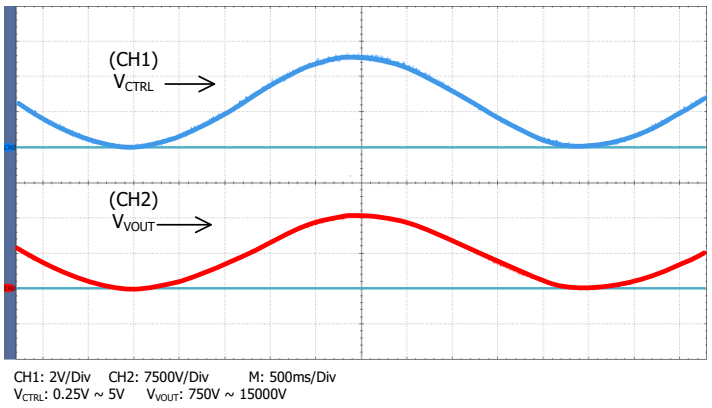


Figure 9. Sine Wave Modulation

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 ~ 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 30ms. 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.

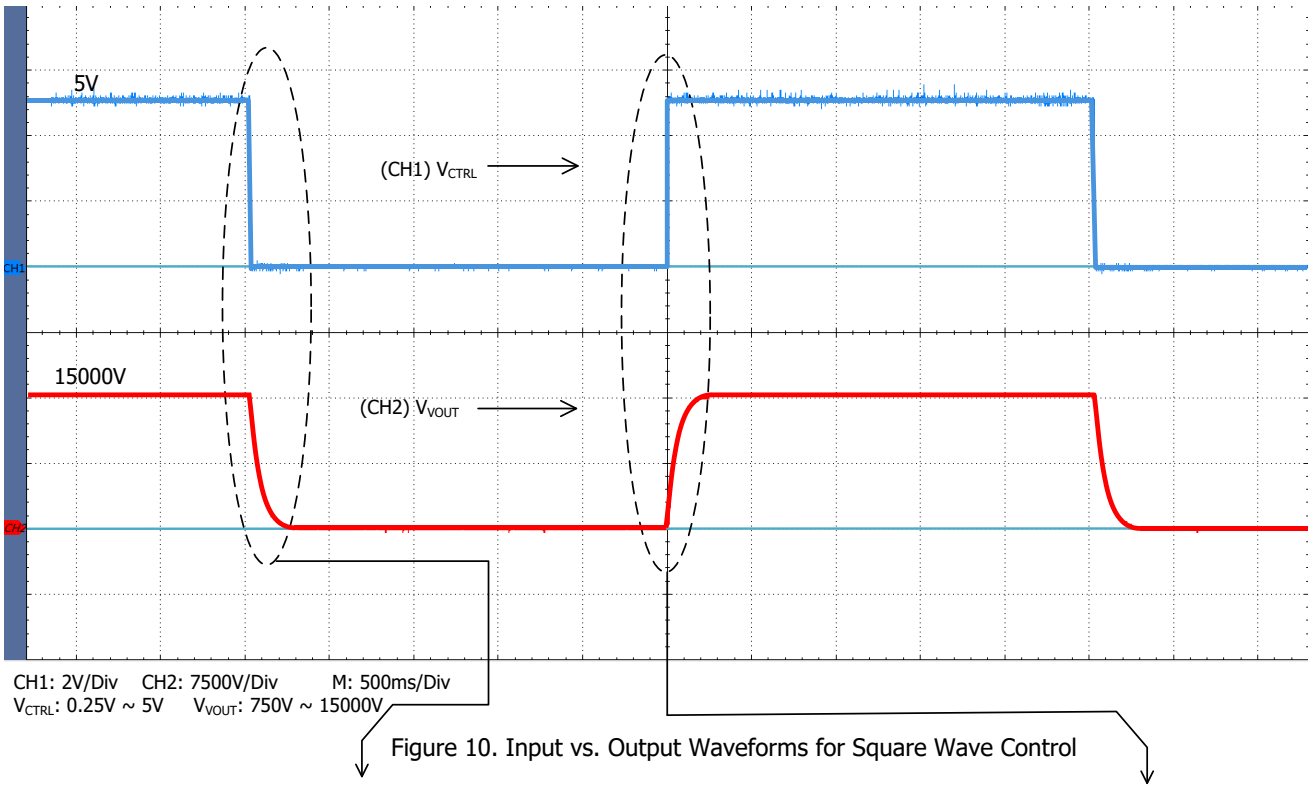


Figure 10. Input vs. Output Waveforms for Square Wave Control

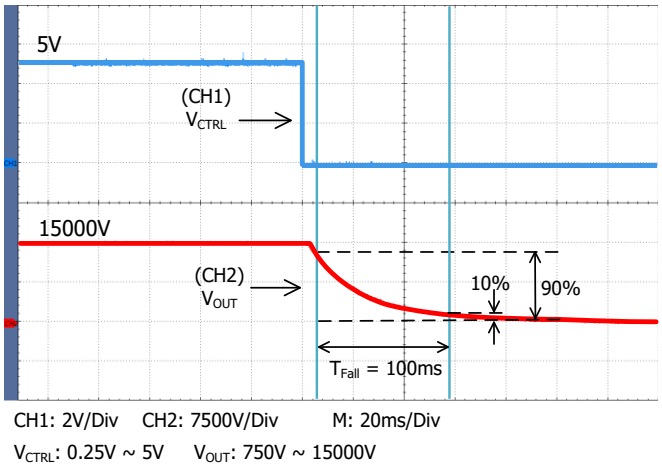


Figure 11. Falling Trail for Large Signal Response

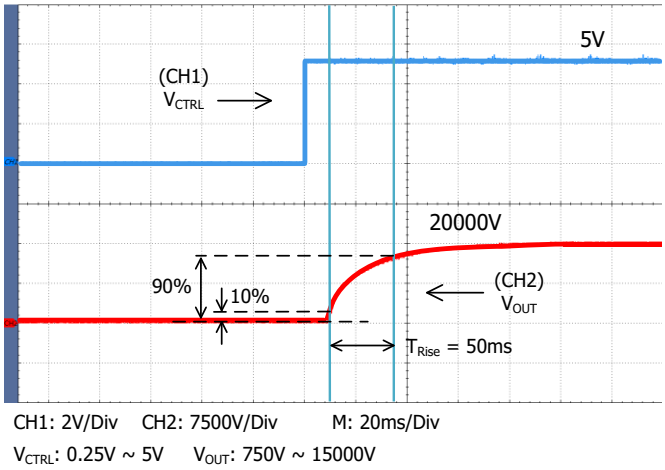
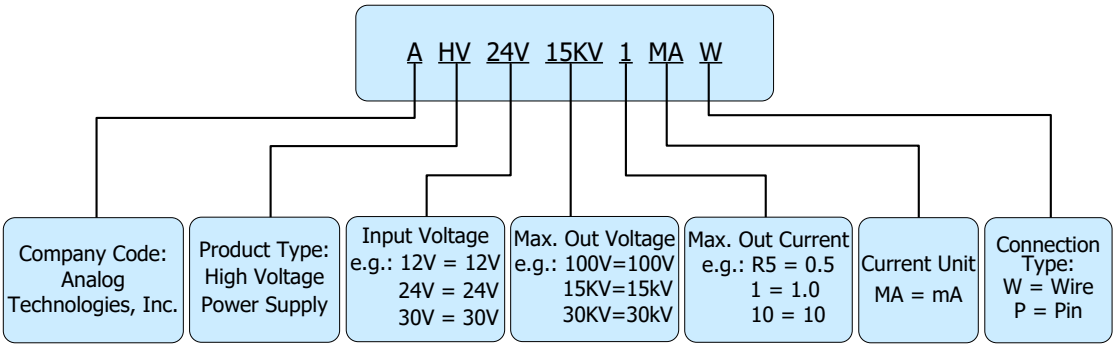


Figure 12. Rising Trail for Large Signal Response

NAMING PRINCIPLE



Naming Principle of AHV24V15KV1MAW

DIMENSIONS

Connecting Lead Wire Sizes and Lengths

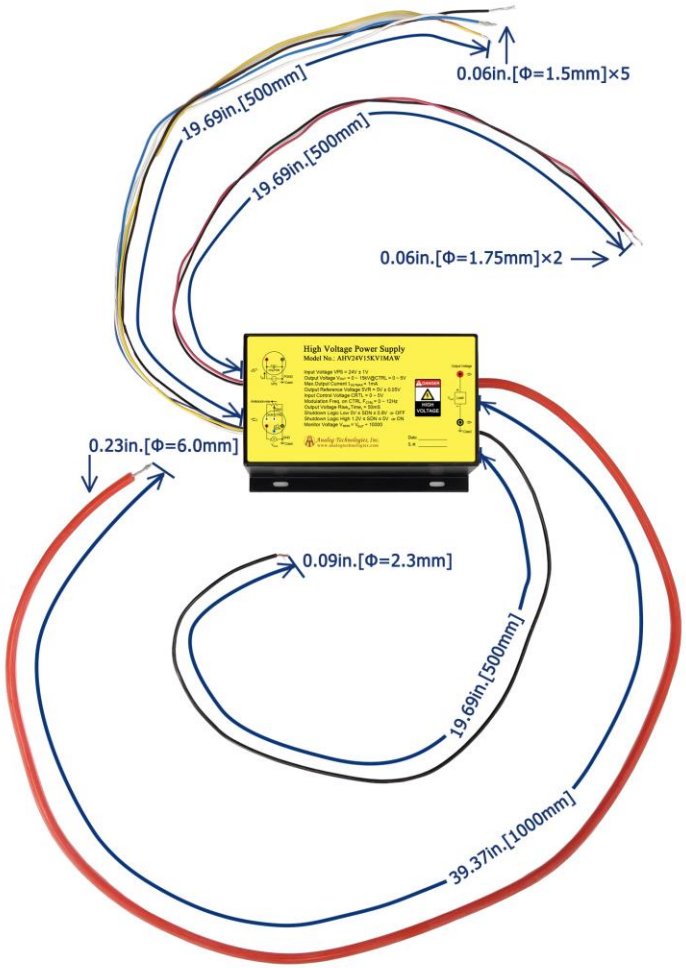


Figure 13. Connecting Lead Wires of AHV24V15KV1MAW

Outline Dimensions

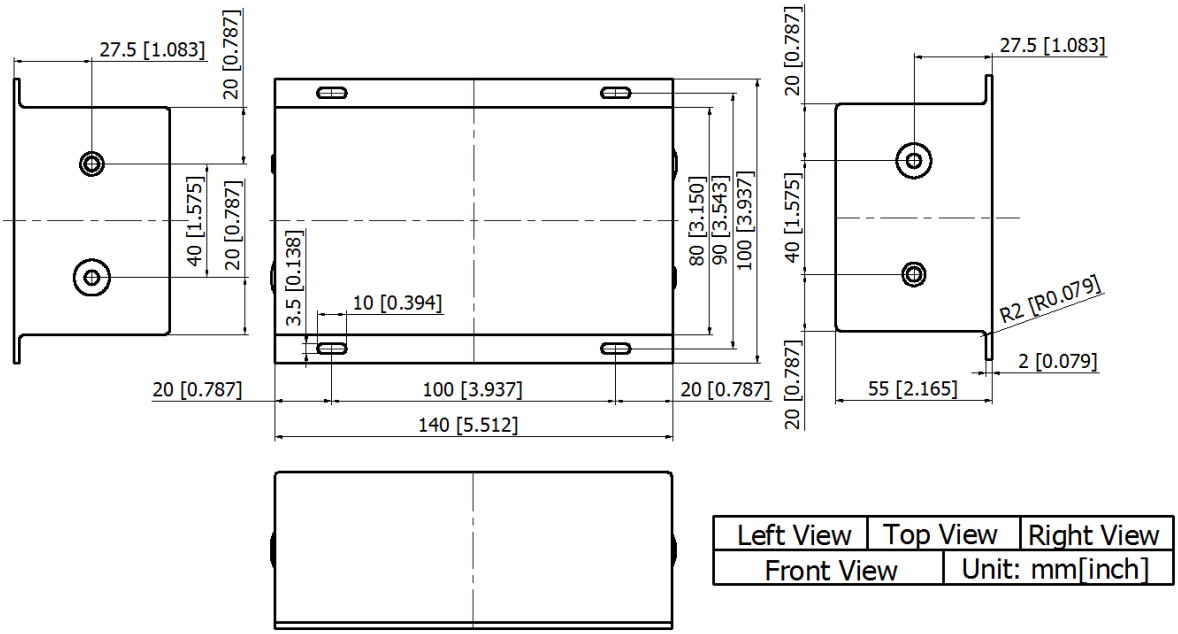


Figure 14. Outline Dimensions

ORDERING INFORMATION

Part Number	Buy Now
AHV24V15KV1MAW	

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	
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	

Part #	Datasheet	Output Voltage (V)	Output Current (mA)	Description	Buy Now*
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	
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	

Part #	Datasheet	Output Voltage (V)	Output Current (mA)	Description	Buy Now*
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	
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	

Part #	Datasheet	Output Voltage (V)	Output Current (mA)	Description	Buy Now*
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	
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	

Part #	Datasheet	Output Voltage (V)	Output Current (mA)	Description	Buy Now*
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.

NOTICE

1. It is important to carefully read and follow the warnings, cautions, and product-specific notes provided with electronic components. These instructions are designed to ensure the safe and proper use of the component and to prevent damage to the component or surrounding equipment. Failure to follow these instructions could result in malfunction or failure of the component, damage to surrounding equipment, or even injury or harm to individuals. Always take the necessary precautions and seek professional assistance if unsure about proper use or handling of electronic components.
2. Please note that the products and specifications described in this publication are subject to change without prior notice as we continuously improve our products. Therefore, we recommend checking the product descriptions and specifications before placing an order to ensure that they are still applicable. We also reserve the right to discontinue the production and delivery of certain products, which means that not all products named in this publication may always be available.

3. This means that while ATI may provide information about the typical requirements and applications of their products, they cannot guarantee that their products will be suitable for all customer applications. It is the responsibility of the customer to evaluate whether an ATI product with the specified properties is appropriate for their particular application.
4. 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.
5. 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.
6. All products are sold subject to terms and conditions of sale, including those pertaining to warranty, patent infringement, and limitation of liability. Customers are responsible for their applications using ATI products, and ATI assumes no liability for applications assistance or customer product design.
7. ATI does not grant any license, either express or implied, under any patent right, copyright, mask work right, or other intellectual property right of ATI.
8. ATI's publication of information regarding third-party products or services does not constitute approval, warranty, or endorsement.
9. ATI retains ownership of all rights for special technologies, techniques, and designs for its products and projects, as well as any modifications, improvements, and inventions made by ATI.
10. Despite operating the electronic modules as specified, malfunctions or failures may occur before the end of their usual service life due to the current state of technology. Therefore, it is crucial for customer applications that require a high level of operational safety, especially in accident prevention or life-saving systems where the malfunction or failure of electronic modules could pose a risk to human life or health, to ensure that suitable measures are taken. The customer should design their application or implement protective circuitry or redundancy to prevent injury or damage to third parties in the event of an electronic module malfunction or failure.

