

**Proven  
Reliability**

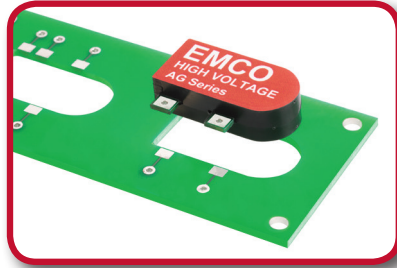
# AG SERIES

ISOLATED, PROPORTIONAL DC TO HV DC CONVERTERS

100V to 6000V @ 1.0 and 1.5 Watts

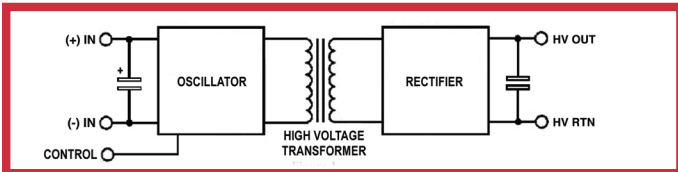
**Extremely Low Profile: 0.128 inches  
and volume of < 0.100 cubic inches<sup>5</sup>**

**NOW  
UL RECOGNIZED**



## PRODUCT DESCRIPTION

The AG Series is a new line of ultra-miniature DC to HV DC converters that set an industry standard in high voltage miniaturization. These component-sized converters are ideal for applications requiring minimal size and weight. Occupying less than one tenth of a cubic inch of volume<sup>5</sup>, this unique package features an extremely low profile of only 0.128 inches (3.25mm) when mounted in from the top, or 0.152 (3.86mm) when mounted in from the bottom of the PCB! The AG Series converter can also mount off the PCB with .030" diameter pins. See page 9 for illustrations. Controllable output voltages range from 100 volts to 6000 volts. Please refer to the A Series data sheet for PCB pin mounting.



## APPLICATIONS

- Avalanche Photodiodes
- Capacitor Charging
- Electrophoresis
- Photomultiplier Tubes
- Piezo Devices
- Mass Spectrometry
- Sustaining Ion Pumps

## OPTIONS

- 1 Watt and 1.5 Watt Versions Available (AG/AGH)
- Available in 3 Standard Input Voltage Ranges: 0 to 5, 12 or 24VDC (up to 3 kV)
- Polarity: Choose Positive or Negative Output (P/N)
- Extended Operating Temperature (AG Models / 1.0W) (T Suffix)
- Alternate Input / Output Voltages (Consult Factory)
- See Ordering Information (Page 12)

## PRODUCT SELECTION TABLE

VDC	STANDARD 1 WATT - AG MODEL		1.5 WATT OPTION - AGH MODEL	
	MODEL	MAXIMUM OUTPUT CURRENT*1	MODEL	MAXIMUM OUTPUT CURRENT*1
100 VDC	<b>AG01</b>	10 mA	<b>AGH01</b> <sup>7</sup>	15 mA
200 VDC	<b>AG02</b>	5 mA	<b>AGH02</b>	7.5 mA
250 VDC	<b>AG025</b>	4 mA	<b>AGH025</b>	6 mA
300 VDC	<b>AG03</b>	3.33 mA	<b>AGH03</b>	5mA
400 VDC	<b>AG04</b>	2.5 mA	<b>AGH04</b>	3.75 mA
500 VDC	<b>AG05</b>	2 mA	<b>AGH05</b>	3 mA
600 VDC	<b>AG06</b>	1.67 mA	<b>AGH06</b>	2.5 mA
700 VDC	<b>AG07</b>	1.43 mA	<b>AGH07</b>	2.15 mA
800 VDC	<b>AG08</b>	1.25 mA	<b>AGH08</b>	1.87 mA
900 VDC	<b>AG09</b>	1.1 mA	<b>AGH09</b>	1.67 mA
1000 VDC	<b>AG10</b>	1 mA	<b>AGH10</b>	1.5 mA
1200 VDC	<b>AG12</b>	0.83 mA	<b>AGH12</b>	1.25 mA
1500 VDC	<b>AG15</b>	0.66 mA	<b>AGH15</b>	1 mA
2000 VDC	<b>AG20</b>	0.5 mA	<b>AGH20</b>	0.75 mA
3000 VDC	<b>AG30</b>	0.32 mA	<b>AGH30</b>	0.5 mA
4000 VDC	<b>AG40</b>	0.24 mA	-	-
5000 VDC	<b>AG50</b>	0.2 mA	-	-
6000 VDC	<b>AG60</b>	0.167 mA	<b>AGH60</b>	0.25 mA

Complete List of Models on page 2

## FEATURES

- Proportional Input/Output
- Low Noise Quasi-sinewave Oscillator
- Control Pin (can be used for on/off control)
- Low Leakage Current
- Low Input/Output Capacitance
- Input to Output Galvanic Isolation
- Short Circuit Protection, 1 Minute Minimum
- No Minimum Load Required<sup>2</sup>
- MTBF > 1,862,000 hours, per Bellcore TR 332
- Surface Mount Package
- No external components required
- RoHS Compliant
- UL Recognized



ELECTRICAL SPECIFICATIONS\*3

OUTPUT VOLTAGE*2 (To select polarity, see pg. 12 - How to Order)	STANDARD 1 WATT - AG MODEL			1.5 WATT OPTION - AGH MODEL		
	MODEL	MAXIMUM OUTPUT CURRENT*1	RIPPLE P-P*4	MODEL	MAXIMUM OUTPUT CURRENT*1	RIPPLE P-P*4
0 to 100 VDC	<b>AG01</b>	10 mA	5%	<b>AGH01</b> *7	15 mA	4%
0 to 200 VDC	<b>AG02</b>	5 mA	1%	<b>AGH02</b>	7.5 mA	3%
0 to 250 VDC	<b>AG025</b>	4 mA	0.90%	<b>AGH025</b>	6 mA	1.2%
0 to 300 VDC	<b>AG03</b>	3.33 mA	0.70%	<b>AGH03</b>	5 mA	0.70%
0 to 400 VDC	<b>AG04</b>	2.5mA	0.50%	<b>AGH04</b>	3.75 mA	0.75%
0 to 500 VDC	<b>AG05</b>	2 mA	0.50%	<b>AGH05</b>	3 mA	0.70%
0 to 600 VDC	<b>AG06</b>	1.67 mA	1%	<b>AGH06</b>	2.5 mA	2%
0 to 700 VDC	<b>AG07</b>	1.43 mA	0.50%	<b>AGH07</b>	2.15 mA	1.2%
0 to 800 VDC	<b>AG08</b>	1.25 mA	1%	<b>AGH08</b>	1.87 mA	1.2%
0 to 900 VDC	<b>AG09</b>	1.1 mA	1%	<b>AGH09</b>	1.67 mA	1.2%
0 to 1000 VDC	<b>AG10</b>	1 mA	0.79%	<b>AGH10</b>	1.5 mA	1%
0 to 1200 VDC	<b>AG12</b>	0.83 mA	0.50%	<b>AGH12</b>	1.25 mA	0.60%
0 to 1500 VDC	<b>AG15</b>	0.67 mA	0.40%	<b>AGH15</b>	1 mA	0.60%
0 to 2000 VDC	<b>AG20</b>	0.5 mA	0.30%	<b>AGH20</b>	0.75 mA	0.50%
0 to 3000 VDC	<b>AG30</b>	0.33 mA	0.30%	<b>AGH30</b>	0.5 mA	0.30%
0 to 4000 VDC	<b>AG40</b>	0.25 mA	0.30%	-	-	-
0 to 5000 VDC	<b>AG50</b>	0.2 mA	0.30%	-	-	-
0 to 6000 VDC	<b>AG60</b>	0.167 mA	0.30%	<b>AGH60</b>	0.25 mA	0.30%

	INPUT CURRENT			
	AG MODELS - 1 Watt		AGH MODELS - 1.5 Watt	
VIN	NO-LOAD	FULL-LOAD	NO-LOAD	FULL-LOAD
5 VDC	<200mA	<470mA	<300mA	<550mA
12 VDC	<100mA	<185mA	<125mA	<250mA
24 VDC	<25mA	<60mA	<40mA	<120mA

## ELECTRICAL SPECIFICATIONS\*3

PARAMETER	VALUE
INPUT VOLTAGE	0 TO 5, 12, OR 24V (FOR MODELS UP TO 3KV)
	0 TO 5V (FOR MODELS OVER 3KV)
TURN-ON VOLTAGE	<0.7 VDC
ISOLATION	< +/- 500V BIAS ON PIN 4
OUTPUT VOLTAGE TOLERANCE	+10%, -10% FULL LOAD, MAX. INPUT VOLTAGE
INPUT/OUTPUT COUPLING CAPACITANCE	<250 pf TYPICAL
INPUT/OUTPUT LEAKAGE CURRENT	<100 nA TYPICAL
CONTROL PIN	0 TO MAX INPUT VOLTAGE
INTERNAL OSCILLATOR FREQUENCY	50kHz - 350kHz
STANDARD TEMPERATURE RANGES	OPERATING: -25° TO +75°C*6 (CASE)
	STORAGE: -55° TO +105°C
EXTENDED TEMPERATURE RANGES (-T OPTION)	OPERATING: -55° TO +85°C*6 (CASE) (AG Models/1.0W)
	STORAGE: -55° TO +105°C

## DETAILED PRODUCT DESCRIPTION

The AG Series is a new line of ultra-miniature, DC to HV DC converters that set an industry standard in high voltage miniaturization. These component-sized converters are ideal for applications requiring minimal size and weight. Occupying less than one tenth of a cubic inch of volume<sup>5</sup>, this unique package features an extremely low profile of only 0.128 inches (3.25mm) when mounted in from the top, or 0.152 (3.86mm) when mounted in from the bottom of the PCB! The AG Series converter can also mount off the PCB with .030" diameter pins. See page 9 for illustrations. Controllable output voltages range from 100 volts to 6000 volts.

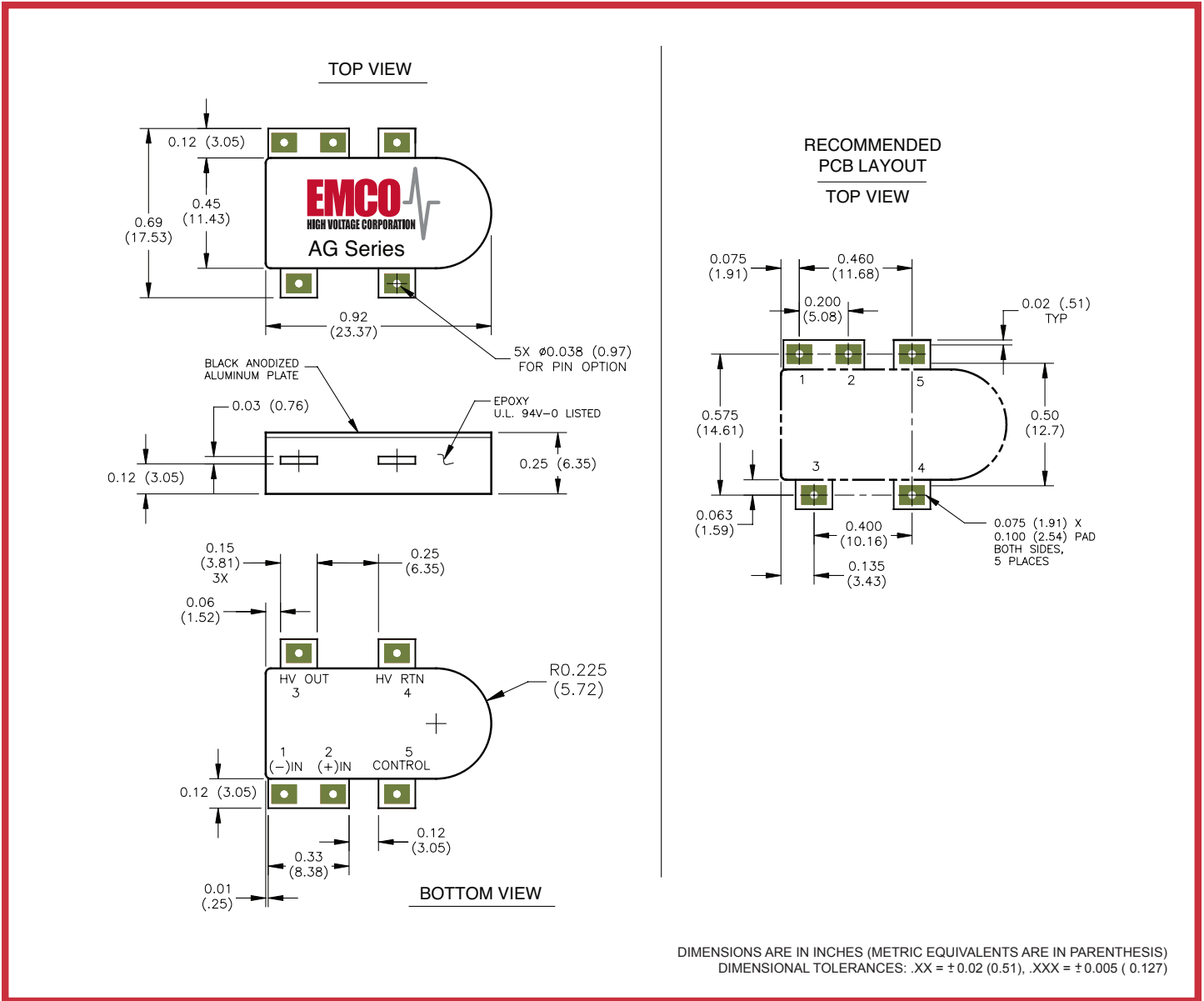
Turn-on voltage is very low at less than 0.7 volts, allowing for wide output voltage operating range. Use of a resonant, quasi-sinewave oscillator and fully shielded transformer result in clean, reliable high voltage conversion with inherently low ripple, EMI/RFI and input ripple current, making this product ideal for integration into noise sensitive equipment.

A separate high impedance control pin is standard and is designed for external error amplifier and/or DAC control in closed or open loop systems, or simply connect the control pin to the + input for proportional input to output operation (see performance charts below).

Output power is 1 watt standard, with 1.5 watts available as an option. No minimum load is required. A proprietary vacuum encapsulation process and custom 94V-0 listed, high performance formula are used to achieve excellent high voltage and thermal properties. Isolation is +/- 500V bias on the output return. Input to output leakage current is very low at less than 100 nA and coupling capacitance is also low at <250 pF.

The AG Series leverages XP EMCO's Best-in-Class long-term reliability, utilizing proven DC to high voltage DC conversion technology, perfected by over four decades of high voltage design experience in the most demanding applications. Our extensive in-house capabilities enable us to meet specific customer requirements with standard, modified and custom solutions quickly, easily, and economically. Technical assistance is readily available.

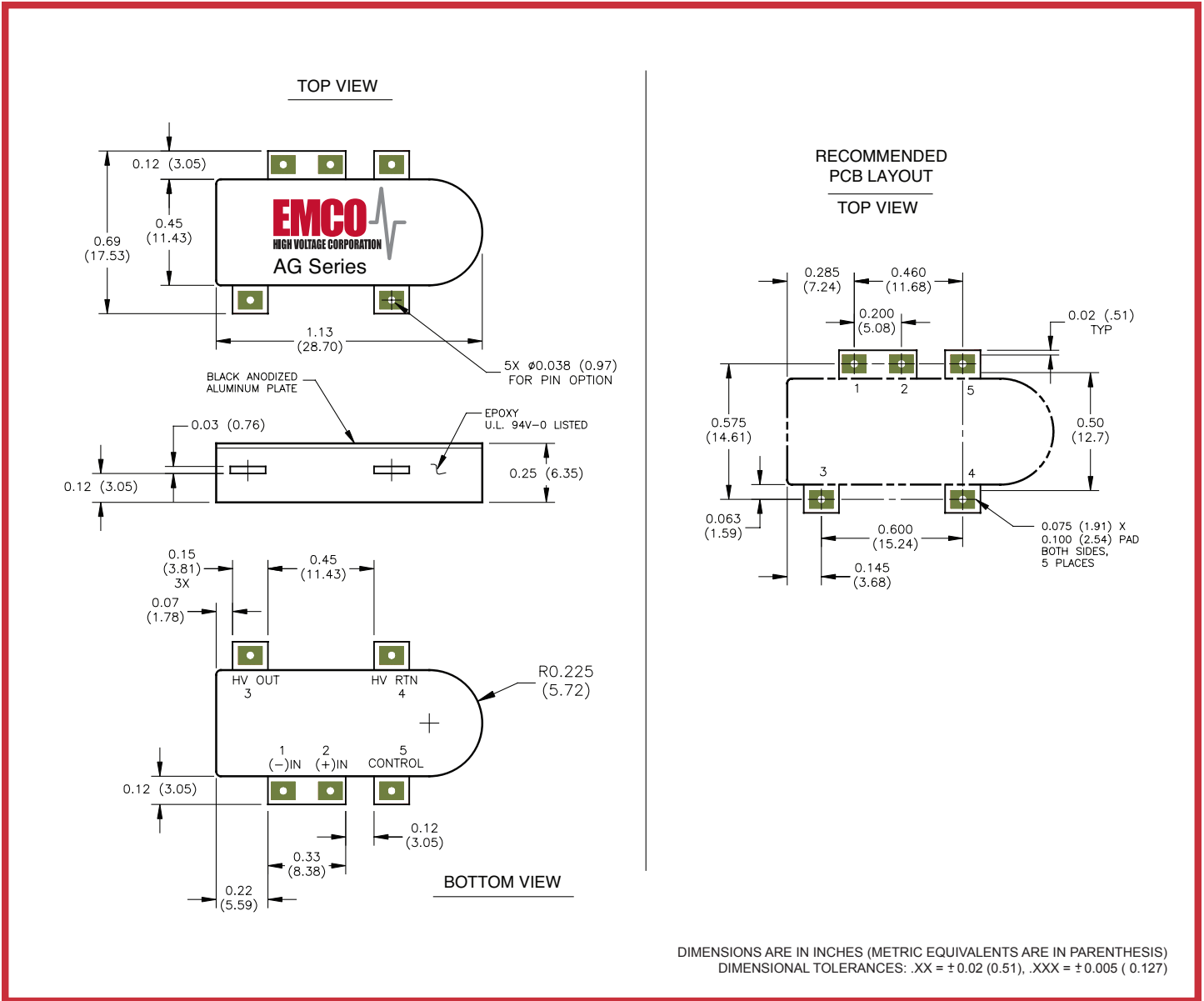
## MECHANICAL SPECIFICATIONS (100V - 2,000V)



PARAMETER	VALUE
WEIGHT	< 0.20 OZ. (5.66 GRAMS)
VOLUME	< 0.10 CUBIC INCHES (1.639 CUBIC CENTIMETERS)
BODY DIMENSIONS	0.92L (23.37L) x 0.45W (11.43W) x 0.25H (6.35H)
BODY + WING DIMENSIONS	0.92L (23.37L) x 0.69W (17.53W) x 0.25H (6.35H)

PIN #	FUNCTION
1	(-) INPUT
2	(+) INPUT
3	HV OUT
4	HV RTN
5	CONTROL

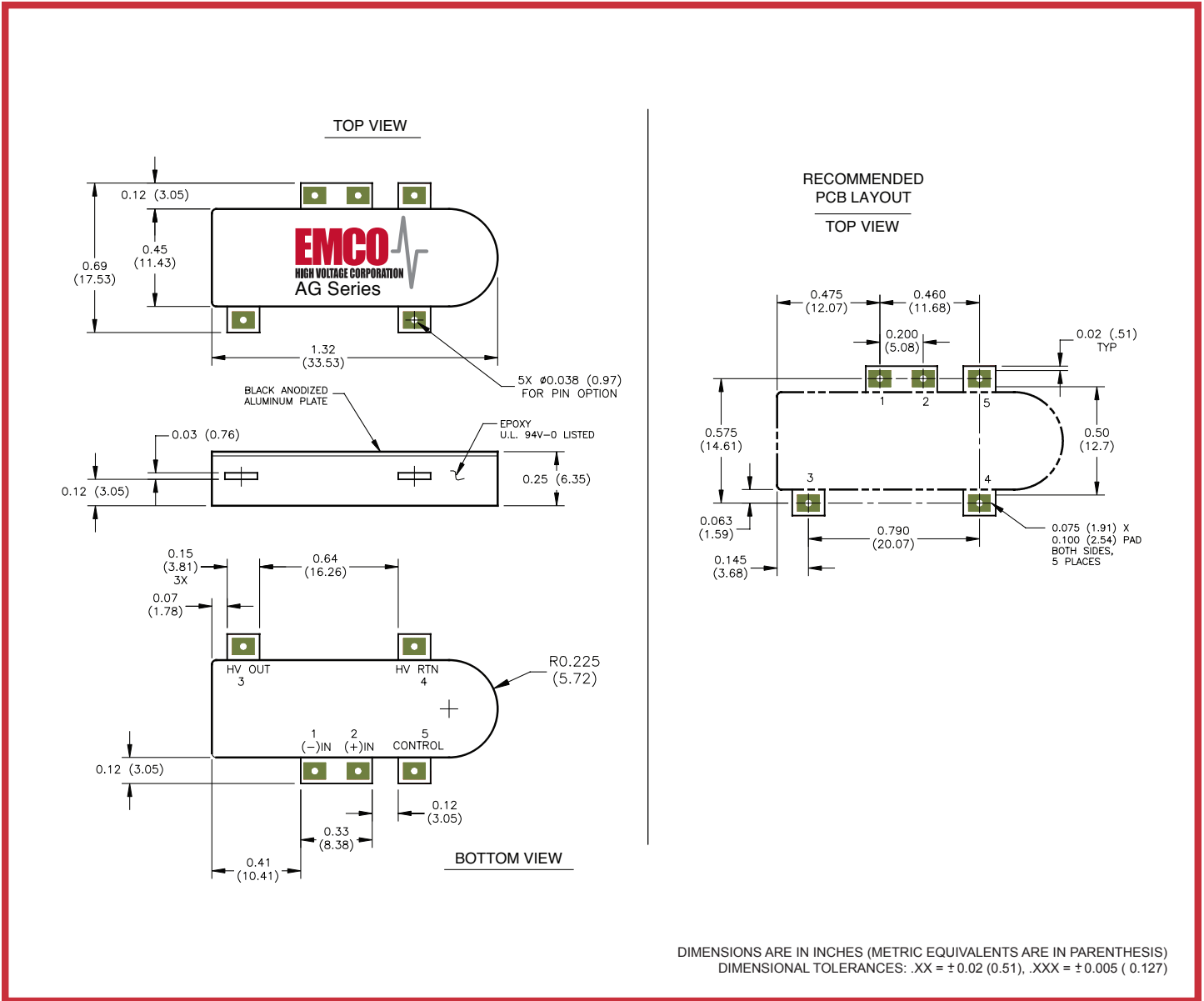
## MECHANICAL SPECIFICATIONS (3,000V – 5,000V)



PARAMETER	VALUE
WEIGHT	0.25 OZ. (7.09 GRAMS)
VOLUME	<0.125 CUBIC INCHES (2.048 CUBIC CENTIMETERS)
BODY DIMENSIONS	1.13L (28.70L) x 0.45W (11.43W) x 0.25H (6.35H)
BODY + WING DIMENSIONS	1.13L (28.70L) x 0.69W (17.53W) x 0.25H (6.35H)

PIN #	FUNCTION
1	(-) INPUT
2	(+) INPUT
3	HV OUT
4	HV RTN
5	CONTROL

## MECHANICAL SPECIFICATIONS (6,000V)

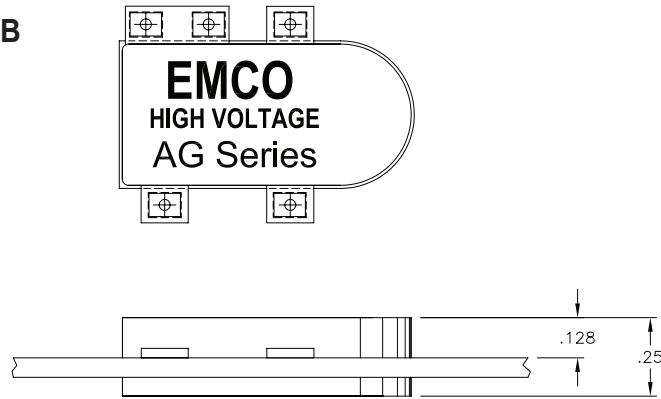


PARAMETER	VALUE
WEIGHT	0.3 OZ (8.51 GRAMS)
VOLUME	<0.156 CUBIC INCHES (2.556 CUBIC CENTIMETERS)
BODY DIMENSIONS	1.32L (33.53L) x 0.45W (11.43W) x 0.25H (6.35H)
BODY + WING DIMENSIONS	1.32L (33.53L) x 0.69W (17.53W) x 0.25H (6.35H)

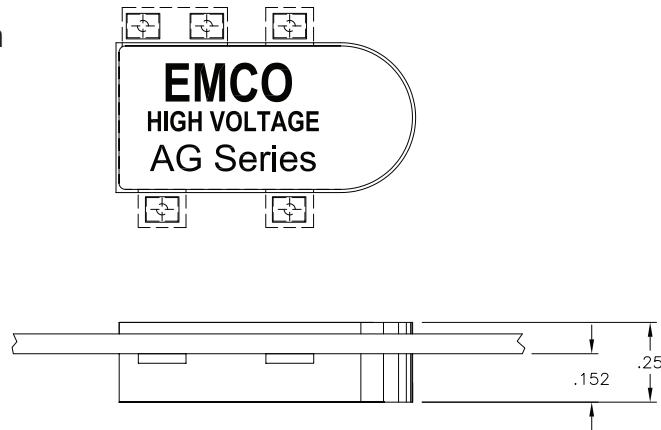
PIN #	FUNCTION
1	(-) INPUT
2	(+) INPUT
3	HV OUT
4	HV RTN
5	CONTROL

AG INSTALLATION

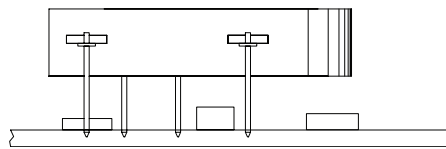
AG Mounted  
on Top of PCB



AG Mounted  
From Bottom  
of PCB



AG Mounted Off  
PCB With .030"  
DIA Pins



\*Height of pin can vary depending upon application

AG RoHS REFLOW PROFILE

Probe	Reflow Results						
	Positive Slope (°C/sec)	Positive Slope Time (mm:ss.tt)	Rise Time (120.0 - 180.0°C) (mm:ss.tt)	Mean Slope to Peak (°C/sec)	Time Above Liquidus (217.0°C) (mm:ss.tt)	Peak Temperature (°C)	Negative Slope (°C/sec)
(°C) Module Lead Top	2.62	03:43.50	01:17.00	0.77	00:44.00	237.5	-2.59

Probe	Maximum / Minimum						
	Maximum (°C)	Max. Reached (mm:ss.tt)	Mean (°C)	Deviation from 255.0°C	Standard deviation	Minimum (°C)	Min. Reached (mm:ss.tt)
(°C) Module Lead Top	237.5	04:18.00	139.8	-17.5	56.5	38.5	00:00.00

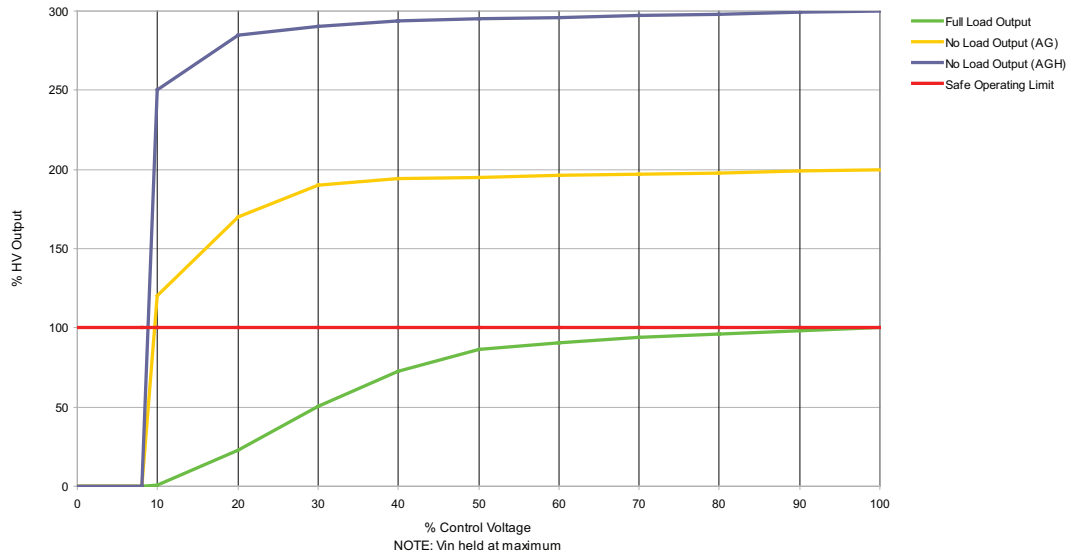
Probe	Time at Temperature		Slopes	
	Time Above 230.0°C (mm:ss.tt)	Time to Reach 230.0°C (mm:ss.tt)	Positive Slope (°C/sec)	Mean Slope (°C/sec)
(°C) Module Lead Top	00:16.00	04:09.50	2.62	0.38

\*Reflow profile is subject to change based on your application

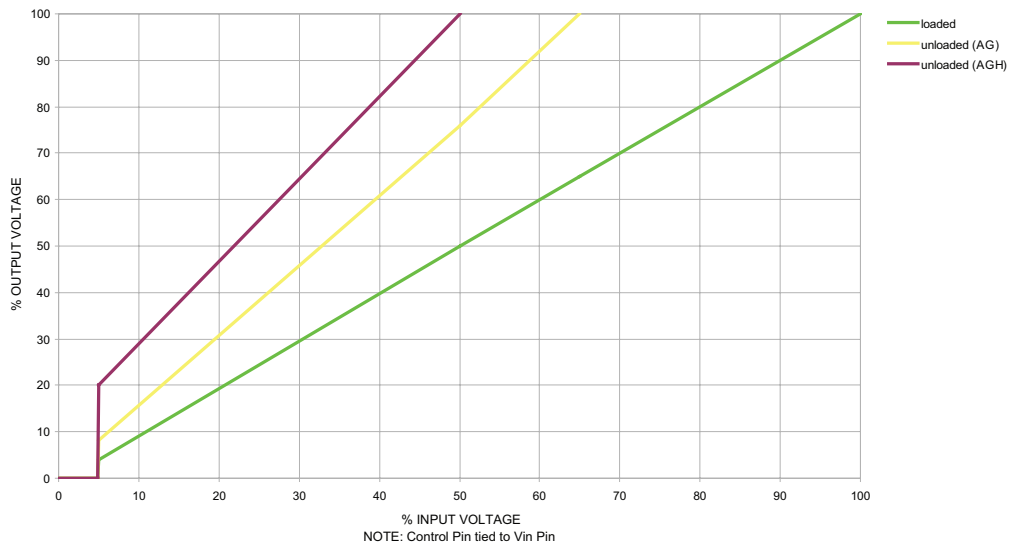


APPLICATION NOTES

Typical HV Output vs. Control Voltage



TYPICAL INPUT vs. OUTPUT VOLTAGE



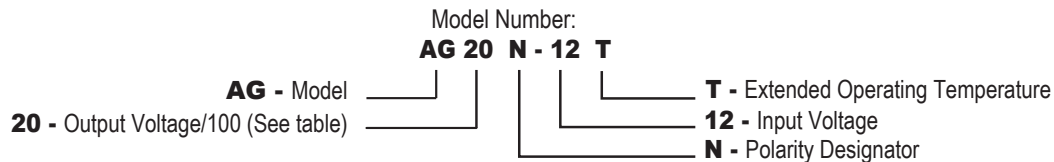
Output Voltage is load dependent. Under light or no-load conditions, reduce the Input Voltage so maximum rated Output Voltage is not exceeded.

OPTION CODES

ORDERING INFORMATION		ORDER CODE	AVAILABILITY
OUTPUT VOLTAGE	1 WATT	AG	ALL
	1.5 WATT	AGH	ALL
POLARITY DESIGNATOR	POSITIVE OUTPUT	P	ALL
	NEGATIVE OUTPUT	N	ALL
INPUT VOLTAGE	5 VDC	5	ALL/Except AGH01 Model
	12 VDC	12	UP TO 3KV
	24 VDC	24	UP TO 3KV
OPTIONS	EXTENDED TEMP	T	AG MODELS/1W

HOW TO ORDER

PART NUMBER SELECTOR:



EXAMPLE: **AG20N-12T** (**AG** - Model, **20** - Output Voltage, **N** - Negative, **12** - Input Voltage, **T** - Extended Operating Temperature)

- \*Note:
1. At maximum rated output voltage.
  2. Output Voltage is load dependent. Under light or no-load conditions, reduce the Input Voltage so maximum rated Output Voltage is not exceeded.
  3. Specifications after 30 minute warm-up, full-load, at 25°C, unless otherwise noted.
  4. Ripple may be reduced substantially by the addition of an external RC filter.
  5. Volume will vary depending on package size.
  6. Proper thermal management techniques are required to maintain safe case temperature at maximum power output.
  7. The AGH01 is only available in 12V or 24V.

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