

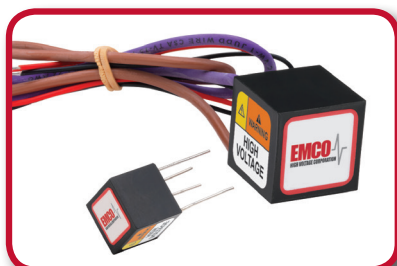
**Proven  
Reliability**

# Q SERIES

ISOLATED, PROPORTIONAL DC TO HV DC CONVERTERS

100V to 10,000V @ 0.5 Watts

**NOW  
UL RECOGNIZED**



## PRODUCT DESCRIPTION

The Q Series is a broad line of ultra-miniature, high reliability DC to HV DC converters supplying up to 5,000 volts in only 0.125 cubic inches and up to 10,000 volts in only 0.614 cubic inches. These component-sized converters are ideal for applications requiring minimal size and weight. The output is directly proportional to the input voltage and is linear from <0.7V input to maximum input voltage, allowing for an adjustable output voltage.

## OPTIONS

- Dual Output (Center Tap) option available (up to Q09)
- External Copper Shield (S suffix)
- Control Pin Option (Single output units, up to Q50) (C suffix)
- Extended Operating Temperature (up to Q50) (T suffix)
- Ordering Information (see Page 11)

## APPLICATIONS

- Avalanche Photodiodes
- Photomultiplier Tubes
- Light Sources
- Piezo Devices
- Sustaining Ion Pumps
- Electrophoresis
- Printers
- Igniters
- Capacitor Charging

## FEATURES

- Ultra-Miniature Case Size
- Proven Reliability
- No External Components Required
- Low Ripple and EMI/RFI
- Proportional Input/Output
- Input/Output Isolation
- Low Leakage Current <250nA
- Low input/output coupling capacitance, <50 pF typical
- MTBF: >3 million hrs. per Bellcore TR 332
- Short circuit protection, 1 minute minimum
- Control Pin can be used for ON/OFF control
- RoHS Compliant
- UL Recognized

## PRODUCT OVERVIEW

| OUTPUT VOLTAGE*2 | MODELS |
|------------------|--------|
| 100 VDC          | Q01    |
| 150 VDC          | Q015   |
| 200 VDC          | Q02    |
| 250 VDC          | Q025   |
| 300 VDC          | Q03    |
| 350 VDC          | Q035   |
| 400 VDC          | Q04    |
| 450 VDC          | Q045   |
| 500 VDC          | Q05    |
| 600 VDC          | Q06    |
| 700 VDC          | Q07    |
| 800 VDC          | Q08    |
| 900 VDC          | Q09    |
| 1,000 VDC        | Q10    |
| 1,200 VDC        | Q12    |
| 1,500 VDC        | Q15    |
| 2,000 VDC        | Q20    |
| 2,500 VDC        | Q25    |
| 3,000 VDC        | Q30    |
| 4,000 VDC        | Q40    |
| 5,000 VDC        | Q50    |
| 6,000 VDC        | Q60    |
| 8,000 VDC        | Q80    |
| 10,000 VDC       | Q101   |

Complete List of Models on pages 2-5

ISO 9001:2008  
CERTIFIED

ISO 14001:2004  
CERTIFIED

RoHS  
COMPLIANT

CAL US  
E139109

CE

IPC  
Certified J-STD-001  
Application Specialist

ELECTRICAL SPECIFICATIONS<sup>\*3</sup> (100V - 900V)

| OUTPUT VOLTAGE <sup>*2</sup>                   | MODEL <sup>*6</sup> | MAXIMUM OUTPUT CURRENT <sup>*1</sup> | RIPPLE P-P | OUTPUT VOLTAGE <sup>*2</sup>                    | MODEL <sup>*6</sup> | MAXIMUM OUTPUT CURRENT <sup>*1</sup> | RIPPLE P-P |
|------------------------------------------------|---------------------|--------------------------------------|------------|-------------------------------------------------|---------------------|--------------------------------------|------------|
| REVERSIBLE: 0 TO (+) OR (-) Vout <sup>*7</sup> |                     |                                      |            | DUAL OUTPUT (CENTER TAP): 0 TO (+) AND (-) Vout |                     |                                      |            |
| 0 to 100VDC                                    | Q01                 | 5.000 mA                             | <1.000 %   | 0 to +/- 50 VDC                                 | Q01CT               | 5.000 mA                             | <1.000 %   |
| 0 to 150VDC                                    | Q015                | 3.333 mA                             | <0.500 %   | 0 to +/- 75 VDC                                 | Q015CT              | 3.333 mA                             | <0.500 %   |
| 0 to 200VDC                                    | Q02                 | 2.500 mA                             | <0.250 %   | 0 to +/-100 VDC                                 | Q02CT               | 2.500 mA                             | <0.250 %   |
| 0 to 250VDC                                    | Q025                | 2.000 mA                             | <0.250 %   | 0 to +/-125 VDC                                 | Q025CT              | 2.000 mA                             | <0.250 %   |
| 0 to 300VDC                                    | Q03                 | 1.667 mA                             | <0.250 %   | 0 to +/-150 VDC                                 | Q03CT               | 1.667 mA                             | <0.250 %   |
| 0 to 350VDC                                    | Q035                | 1.429 mA                             | <0.250 %   | 0 to +/-175 VDC                                 | Q035CT              | 1.429 mA                             | <0.250 %   |
| 0 to 400VDC                                    | Q04                 | 1.250 mA                             | <0.100 %   | 0 to +/-200 VDC                                 | Q04CT               | 1.250 mA                             | <0.100 %   |
| 0 to 450VDC                                    | Q045                | 1.111 mA                             | <0.150 %   | 0 to +/-225 VDC                                 | Q045CT              | 1.111 mA                             | <0.150 %   |
| 0 to 500VDC                                    | Q05                 | 1.000 mA                             | <0.150 %   | 0 to +/-250 VDC                                 | Q05CT               | 1.000 mA                             | <0.150 %   |
| 0 to 600VDC                                    | Q06                 | 0.833 mA                             | <0.100 %   | 0 to +/-300 VDC                                 | Q06CT               | 0.833 mA                             | <0.100 %   |
| 0 to 700VDC                                    | Q07                 | 0.714 mA                             | <0.250 %   | 0 to +/-350 VDC                                 | Q07CT               | 0.714 mA                             | <0.250 %   |
| 0 to 800VDC                                    | Q08                 | 0.625 mA                             | <0.300 %   | 0 to +/-400 VDC                                 | Q08CT               | 0.625 mA                             | <0.300 %   |
| 0 to 900VDC                                    | Q09                 | 0.556 mA                             | <0.250 %   | 0 to +/-450 VDC                                 | Q09CT               | 0.556 mA                             | <0.250 %   |

| PARAMETER                      | VALUE                                                         |
|--------------------------------|---------------------------------------------------------------|
| INPUT VOLTAGE                  | 0 to 5, 12, 15 or 24 VOLTS                                    |
| TYPICAL TURN-ON VOLTAGE        | <0.7 VOLTS                                                    |
| ISOLATION                      | < +/- 500 VDC BIAS ON OUTPUT RETURN (PIN4)                    |
| OUTPUT VOLTAGE TOLERANCE       | +10%, -10% (AT 100% OUTPUT, FULL LOAD)                        |
| FREQUENCY                      | 75-500KHZ (TYPICAL)                                           |
| CONTROL PIN                    | 0 to VIN (SEE PAGE 10 FOR DETAILS) (SINGLE OUTPUT UNITS ONLY) |
| STORAGE TEMPERATURE            | -55 to +105°C                                                 |
| STANDARD OPERATING TEMPERATURE | -25 to +70°C <sup>*4</sup> (CASE)                             |
| EXTENDED OPERATING TEMPERATURE | -55 to +75°C <sup>*4</sup> (CASE)                             |

| INPUT CURRENT |         |           |
|---------------|---------|-----------|
| VIN           | NO-LOAD | FULL-LOAD |
| 5 VDC         | <100 mA | <250 mA   |
| 12 VDC        | <40 mA  | <100 mA   |
| 15 VDC        | <32 mA  | <80 mA    |
| 24 VDC        | <20 mA  | <50 mA    |

ELECTRICAL SPECIFICATIONS<sup>3</sup> (1,000V - 2,000V)

| OUTPUT VOLTAGE <sup>*2</sup> | MODEL | MAXIMUM OUTPUT CURRENT <sup>*1</sup> | RIPPLE P-P |
|------------------------------|-------|--------------------------------------|------------|
| POSITIVE                     |       |                                      |            |
| 0 to +1000 VDC               | Q10   | 0.500 mA                             | <0.250 %   |
| 0 to +1200 VDC               | Q12   | 0.417 mA                             | <0.250 %   |
| 0 to +1500 VDC               | Q15   | 0.333 mA                             | <0.250 %   |
| 0 to +2000 VDC               | Q20   | 0.250 mA                             | <0.250 %   |
| NEGATIVE                     |       |                                      |            |
| 0 to -1000 VDC               | Q10N  | 0.500 mA                             | <0.250 %   |
| 0 to -1200 VDC               | Q12N  | 0.417 mA                             | <0.250 %   |
| 0 to -1500 VDC               | Q15N  | 0.333 mA                             | <0.250 %   |
| 0 to -2000 VDC               | Q20N  | 0.250 mA                             | <0.250 %   |

| PARAMETER                      | VALUE                                      |
|--------------------------------|--------------------------------------------|
| INPUT VOLTAGE                  | 0 to 5, 12, 15 or 24 VOLTS                 |
| TYPICAL TURN-ON VOLTAGE        | <0.7 VOLTS                                 |
| ISOLATION                      | < +/- 500 VDC BIAS ON OUTPUT RETURN (PIN4) |
| OUTPUT VOLTAGE TOLERANCE       | +10%, -10% (AT 100% OUTPUT, FULL LOAD)     |
| FREQUENCY                      | 75-500KHZ (TYPICAL)                        |
| CONTROL PIN                    | 0 to VIN (SEE PAGE 10 FOR DETAILS)         |
| STORAGE TEMPERATURE            | -55 to +105°C                              |
| STANDARD OPERATING TEMPERATURE | -25 to +70°C <sup>*4</sup> (CASE)          |
| EXTENDED OPERATING TEMPERATURE | -55 to +75°C <sup>*4</sup> (CASE)          |

| INPUT CURRENT |         |           |
|---------------|---------|-----------|
| VIN           | NO-LOAD | FULL-LOAD |
| 5 VDC         | <100 mA | <250 mA   |
| 12 VDC        | <40 mA  | <100 mA   |
| 15 VDC        | <32 mA  | <80 mA    |
| 24 VDC        | <20 mA  | <50 mA    |

ELECTRICAL SPECIFICATIONS<sup>3</sup> (2,500V - 5,000V)

| OUTPUT VOLTAGE*2 | MODEL | MAXIMUM OUTPUT CURRENT*1 | RIPPLE P-P |
|------------------|-------|--------------------------|------------|
| POSITIVE         |       |                          |            |
| 0 to +2,500 VDC  | Q25   | 0.200 mA                 | <0.500 %   |
| 0 to +3,000 VDC  | Q30   | 0.167mA                  | <0.500 %   |
| 0 to +4,000 VDC  | Q40   | 0.125 mA                 | <0.500 %   |
| 0 to +5,000 VDC  | Q50   | 0.100 mA                 | <0.500 %   |
| NEGATIVE         |       |                          |            |
| 0 to -2,500 VDC  | Q25N  | 0.200 mA                 | <0.500 %   |
| 0 to -3,000 VDC  | Q30N  | 0.167 mA                 | <0.500 %   |
| 0 to -4,000 VDC  | Q40N  | 0.125 mA                 | <0.500 %   |
| 0 to -5,000 VDC  | Q50N  | 0.100 mA                 | <0.500 %   |

| PARAMETER                      | VALUE                                                       |
|--------------------------------|-------------------------------------------------------------|
| INPUT VOLTAGE                  | 0 to 5, 12, 15 or 24 VOLTS<br>0 TO 5V (FOR MODELS OVER 3KV) |
| TYPICAL TURN-ON VOLTAGE        | <0.7 VOLTS                                                  |
| ISOLATION                      | < +/- 500 VDC BIAS ON OUTPUT RETURN (PIN4)                  |
| OUTPUT VOLTAGE TOLERANCE       | +10%, -10% (AT 100% OUTPUT, FULL LOAD)                      |
| FREQUENCY                      | 75-500KHZ (TYPICAL)                                         |
| CONTROL PIN                    | 0 to VIN (SEE PAGE 10 FOR DETAILS)                          |
| STORAGE TEMPERATURE            | -55 to +105°C                                               |
| STANDARD OPERATING TEMPERATURE | -25 to +60°C*4 (CASE)                                       |
| EXTENDED OPERATING TEMPERATURE | -55 to +70°C*4 (CASE)                                       |

| INPUT CURRENT |         |           |
|---------------|---------|-----------|
| VIN           | NO-LOAD | FULL-LOAD |
| 5 VDC         | <250 mA | <400 mA   |
| 12 VDC        | <100 mA | <250 mA   |
| 15 VDC        | <75 mA  | <125 mA   |
| 24 VDC        | <35 mA  | <75 mA    |

0 TO 5V ONLY (FOR MODELS OVER 3kV)

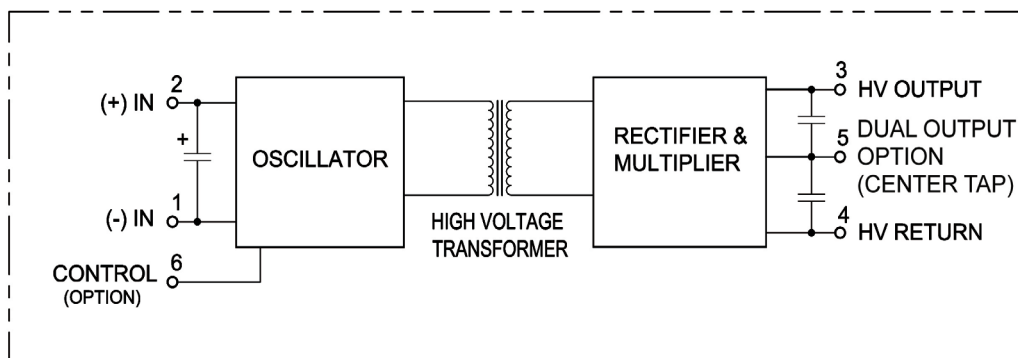
ELECTRICAL SPECIFICATIONS<sup>\*3</sup> (6,000V - 10,000V)

| OUTPUT VOLTAGE <sup>*2</sup> | MODEL | MAXIMUM OUTPUT CURRENT <sup>*1</sup> | RIPPLE P-P |
|------------------------------|-------|--------------------------------------|------------|
| POSITIVE                     |       |                                      |            |
| 0 to +6,000 VDC              | Q60   | 83 $\mu$ A                           | <1.000 %   |
| 0 to +8,000 VDC              | Q80   | 62.5 $\mu$ A                         | <1.000 %   |
| 0 to +10,000 VDC             | Q101  | 50 $\mu$ A                           | <1.000 %   |
| NEGATIVE                     |       |                                      |            |
| 0 to -6,000 VDC              | Q60N  | 83 $\mu$ A                           | <1.000 %   |
| 0 to -8,000 VDC              | Q80N  | 62.5 $\mu$ A                         | <1.000 %   |
| 0 to -10,000 VDC             | Q101N | 50 $\mu$ A                           | <1.000 %   |

| PARAMETER                      | VALUE                                    |
|--------------------------------|------------------------------------------|
| INPUT VOLTAGE                  | 0 to 5 VOLTS                             |
| TYPICAL TURN-ON VOLTAGE        | <0.7 VOLTS                               |
| ISOLATION                      | < +/- 500 VDC BIAS ON OUTPUT RETURN (W4) |
| OUTPUT VOLTAGE TOLERANCE       | +10%, -10% (AT 100% OUTPUT, FULL LOAD)   |
| FREQUENCY                      | 75-500KHZ (TYPICAL)                      |
| STORAGE TEMPERATURE            | -20° TO +105°C                           |
| STANDARD OPERATING TEMPERATURE | -10 TO +60°C <sup>*4</sup> (CASE)        |

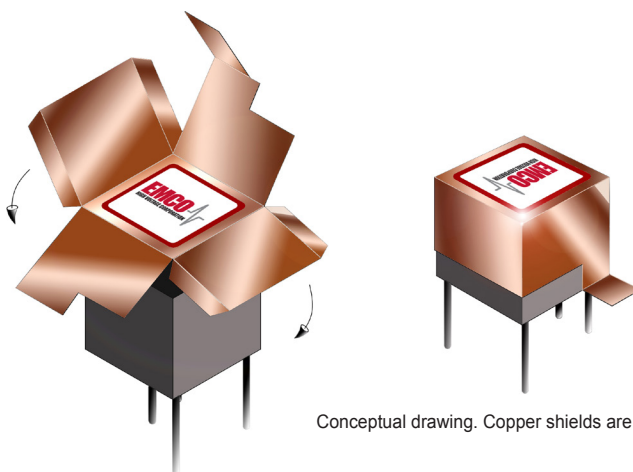
| VIN   | INPUT CURRENT |           |
|-------|---------------|-----------|
|       | NO-LOAD       | FULL-LOAD |
| 5 VDC | <175 mA       | <250 mA   |

## BLOCK DIAGRAM



NOTE: Pin designators for pin out models up to 5KV.

## COPPER SHIELD PLACEMENT



Conceptual drawing. Copper shields are factory installed.

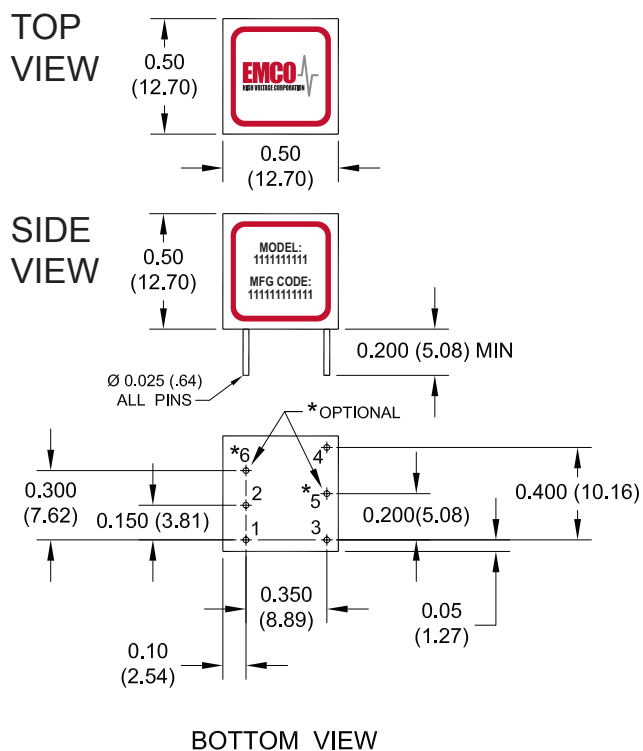
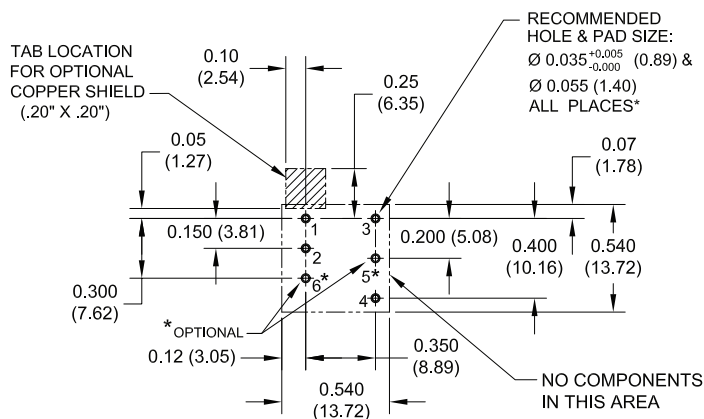
## DETAILED PRODUCT DESCRIPTION

The Q Series is a broad line of ultra-miniature, high reliability DC to HV DC converters supplying up to 5,000 volts in only 0.125 cubic inches and up to 10,000 volts in only 0.614 cubic inches. These component-sized converters are ideal for applications requiring minimal size and weight. The output is directly proportional to the input voltage and is linear from <0.7V input to maximum input voltage, allowing for an adjustable output voltage. Output is load dependent. A control pin option allows full control of the output via a high impedance input, ideal for error-amplifier control in closed-loop systems. Isolation is  $\pm 500V$  bias on output return and output power is 0.5 watt. No external components or minimum load are required. The output

ripple is extremely low for this package size, as low as .1%. Light weight and wide temperature range make these units ideal for portable, battery-powered equipment. Many models feature a dual output (center tap) option, which creates both a positive and a negative output from miniature, one low cost unit. An alternate pin pattern is available for users wishing to upgrade without modifying their board design. Output is load dependent.

Application notes are available on this series, and technical assistance is readily available.

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

PCB LAYOUT  
COMPONENT SIDE

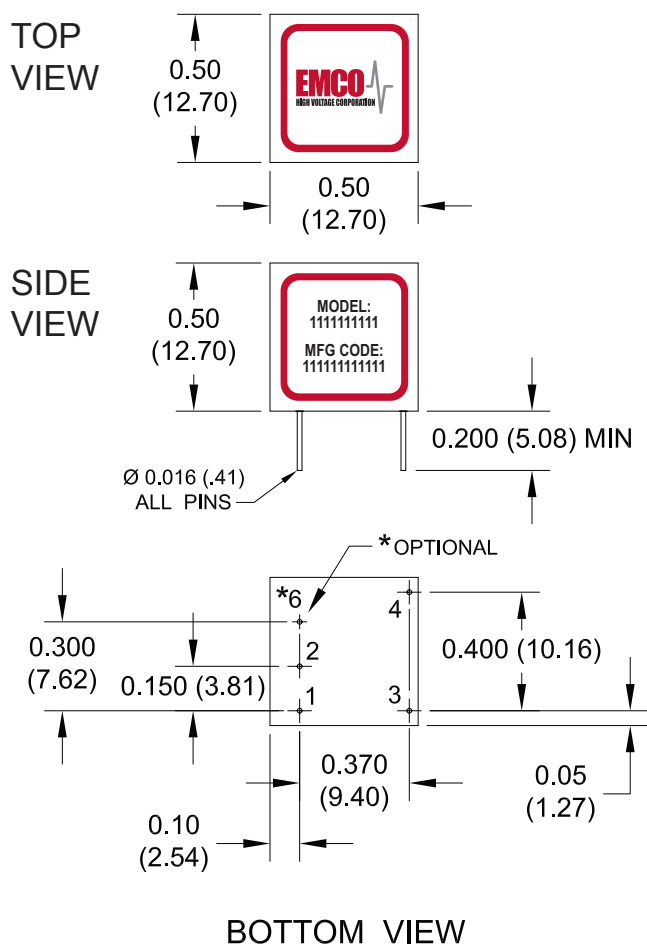
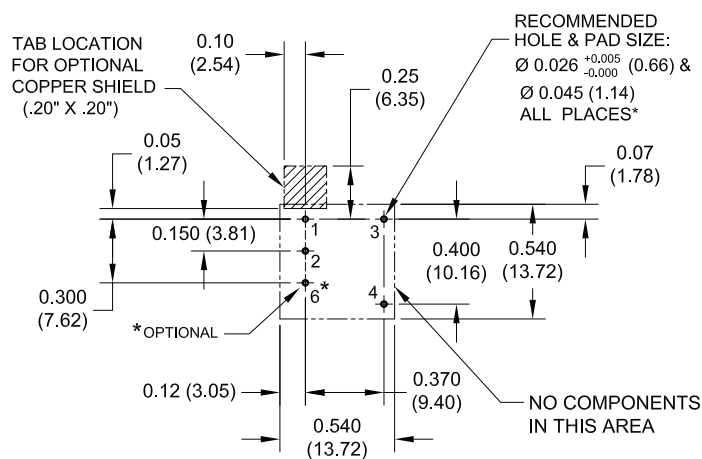
\*OPTIONAL

DIMENSIONS ARE IN INCHES (METRIC EQUIVALENTS ARE IN PARENTHESIS)  
DIMENSIONAL TOLERANCES: .XX = ± 0.02 (0.51), .XXX = ± 0.005 (0.127)

| PARAMETER  | VALUE                                     |
|------------|-------------------------------------------|
| WEIGHT     | 0.15 OUNCES APPROX. (4.25 GRAMS)          |
| VOLUME     | 0.125 CUBIC INCHES (2.05CM <sup>3</sup> ) |
| DIMENSIONS | 0.50L (12.7) X 0.50W (12.7) 0.50H (12.7)  |

| PIN # | 100V TO 900V           | 1,000V TO 2,000V |
|-------|------------------------|------------------|
| 1     | INPUT (-)              | INPUT (-)        |
| 2     | INPUT (+)              | INPUT (+)        |
| 3     | OUTPUT (+)             | HV OUTPUT        |
| 4     | OUTPUT (-)             | OUTPUT RETURN    |
| 5*    | DUAL OUTPUT/CENTER TAP |                  |
| 6*    | CONTROL PIN            |                  |

## MECHANICAL SPECIFICATIONS (2,500V - 5,000V)

PCB LAYOUT  
COMPONENT SIDE

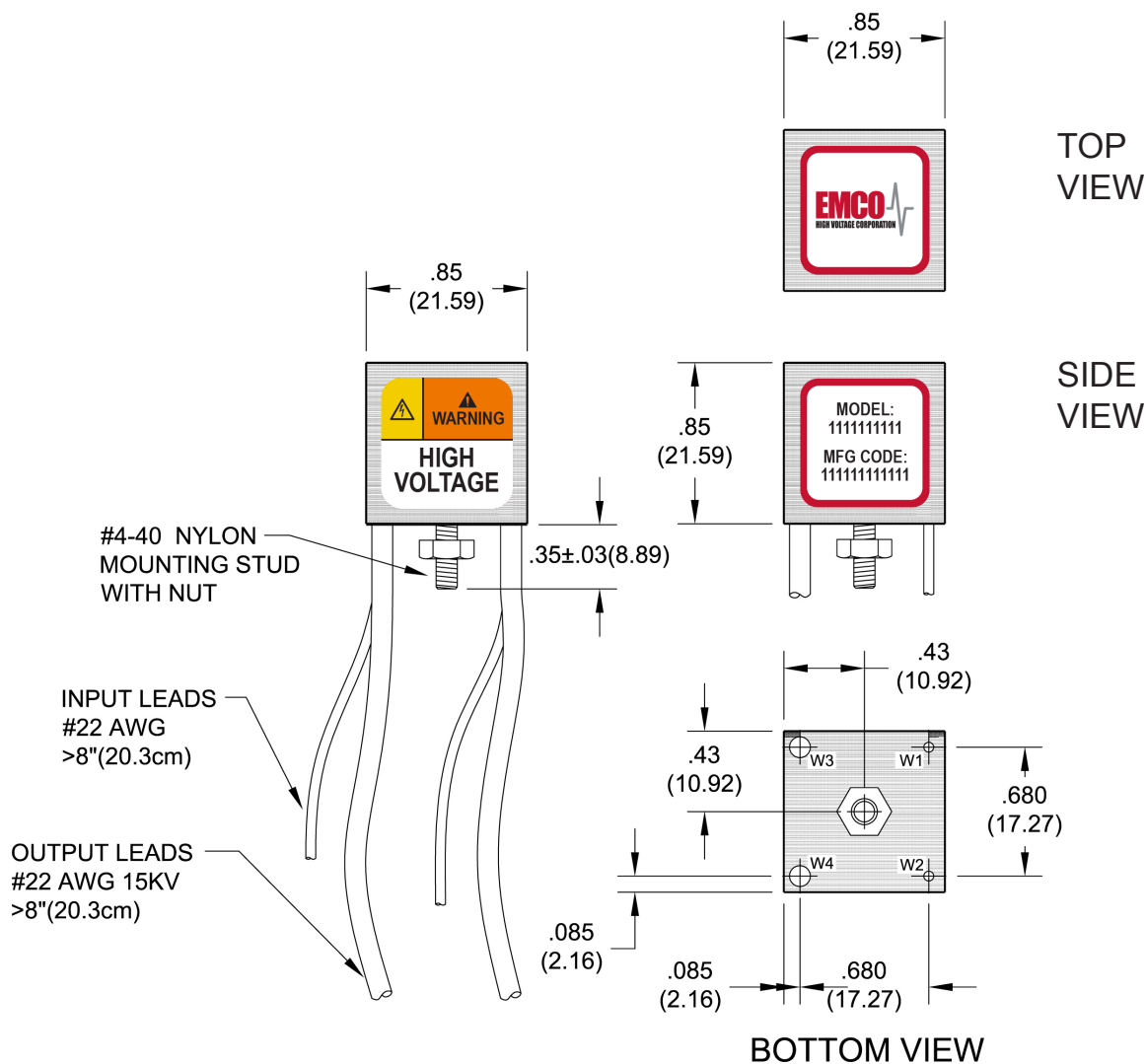
\*OPTIONAL

DIMENSIONS ARE IN INCHES (METRIC EQUIVALENTS ARE IN PARENTHESIS)  
DIMENSIONAL TOLERANCES: .XX = ± 0.02 (0.51), .XXX = ± 0.005 (0.127)

| PARAMETER  | VALUE                                     |
|------------|-------------------------------------------|
| WEIGHT     | 0.15 OUNCES APPROX. (4.25 GRAMS)          |
| VOLUME     | 0.125 CUBIC INCHES (2.05CM <sup>3</sup> ) |
| DIMENSIONS | 0.50L (12.7) X 0.50W (12.7) 0.50H (12.7)  |

| PIN # | FUNCTION    |
|-------|-------------|
| 1     | INPUT (-)   |
| 2     | INPUT (+)   |
| 3     | HV OUTPUT   |
| 4     | HV RETURN   |
| 5*    |             |
| 6*    | CONTROL PIN |

## MECHANICAL SPECIFICATIONS (6,000V - 10,000V)



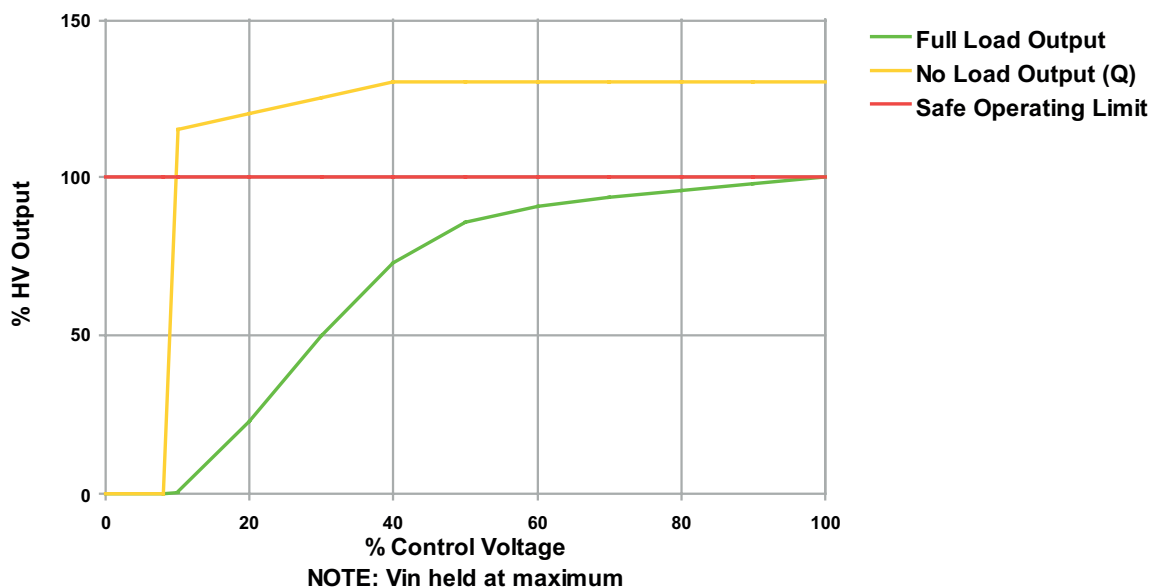
DIMENSIONS ARE IN INCHES (METRIC EQUIVALENTS ARE IN PARENTHESIS)  
 DIMENSIONAL TOLERANCES: .XX =  $\pm 0.02$  (0.51), .XXX =  $\pm 0.005$  (0.127)

| PARAMETER  | VALUE                                         |
|------------|-----------------------------------------------|
| WEIGHT     | 1 OUNCE (28.3 GRAMS)                          |
| VOLUME     | 0.614 CU INCHES (10.06 CU CM)                 |
| DIMENSIONS | 0.85L (21.59) X 0.85W (21.59) X 0.85H (21.59) |

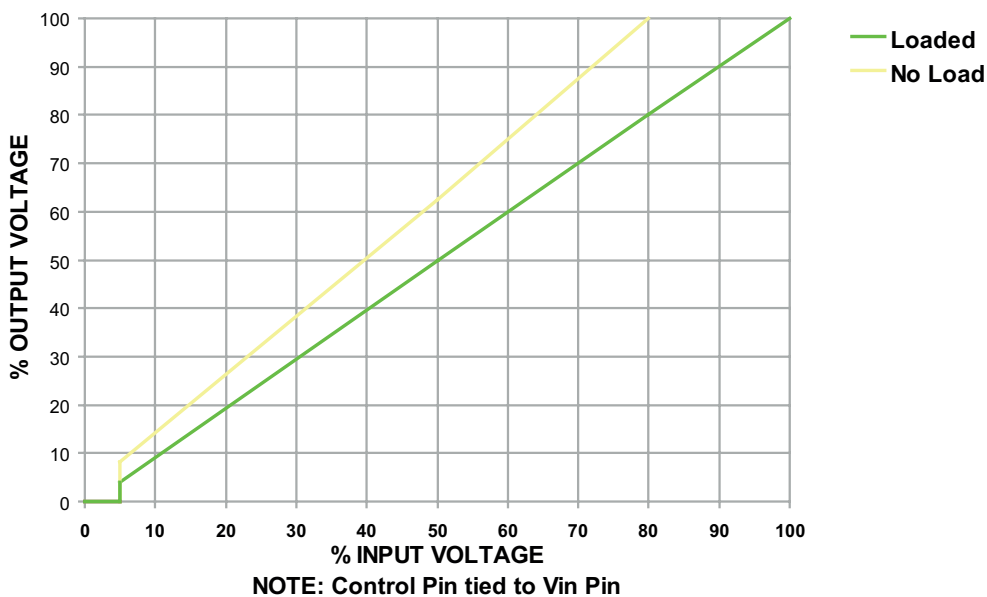
| WIRE | COLOR  | FUNCTION  |
|------|--------|-----------|
| 1    | RED    | INPUT (+) |
| 2    | BLACK  | INPUT (-) |
| 3    | BROWN  | HV OUTPUT |
| 4    | VIOLET | HV RETURN |

## APPLICATION NOTES

## Typical HV Output vs. Control Voltage



## TYPICAL INPUT vs. OUTPUT VOLTAGE

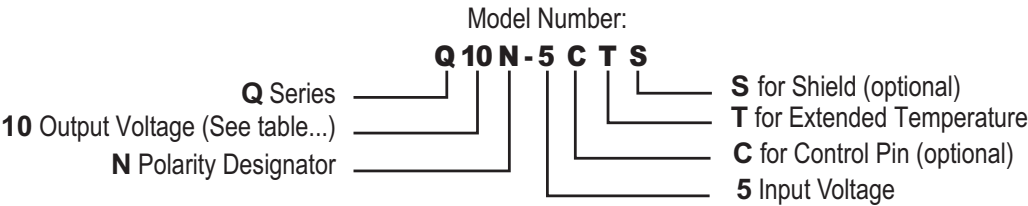


OPTION CODES

| ORDERING INFORMATION |                                 | ORDER CODE | AVAILABILITY |
|----------------------|---------------------------------|------------|--------------|
| SERIES               | 0.5 WATT                        | Q          | ALL MODELS   |
| OUTPUT VOLTAGE       | SEE TABLES                      |            |              |
| POLARITY DESIGNATOR  | POSITIVE OUTPUT                 | BLANK      | ALL MODELS   |
|                      | NEGATIVE OUTPUT*7               | N          | Q10 AND UP   |
|                      | DUAL OUTPUT (CENTER TAP) OPTION | CT         | UP TO 900V   |
| INPUT VOLTAGE        | 5 VDC                           | 5          | ALL MODELS   |
|                      | 12 VDC                          | 12         | UP TO 3KV    |
|                      | 15 VDC                          | 15         | UP TO 3KV    |
|                      | 24 VDC                          | 24         | UP TO 3KV    |
| OPTIONS              | CONTROL PIN                     | C          | UP TO 5KV    |
|                      | EXTENDED TEMP                   | T          | UP TO 5KV    |
|                      | External Copper Shield          | S          | ALL MODELS   |

HOW TO ORDER

PART NUMBER SELECTOR:



EXAMPLE

**Q10N-5CTS:** Q Series 0.5W, **1000** VDC, **N** negative, **5** VDC input, **C** for Control Pin, **T** for Extended Temperature, **S** for Shield.

\*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 are after 30 minute warm-up, full-load at 25°C, unless otherwise noted.
4. Proper thermal management techniques are required to maintain safe case temperature at maximum power output.
5. Ripple specification for dual output units applies to the voltage between the positive and negative output terminals.
6. For dual output units [CT option], the negative output voltage will be 10% larger than the positive output voltage with respect to the center tap pin.
7. For models Q01 thru Q09, one unit is used for positive or negative by reversing the output leads. See App Notes.

XP-EMCO reserves the right to make changes on products and literature, including specifications, without notice. XP-EMCO standard product models are not recommended for "copy-exact" applications or any other application restricting product changes. "Copy-exact" options are available. Please contact an XP-EMCO sales representative for more details.



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.