



Spellman's MM Series of high voltage power supplies are low cost, general purpose, dc to dc converters with output voltages up to 15kV.

They are designed for direct PCB mounting. High reliability is incorporated into these compact and lightweight modular blocks intended for customer designed products at power levels up to 2.5W. The modules are fully encapsulated in an ABS box and may be wave soldered.

The MM Series can be used with an external resistor feedback loop to provide regulated outputs. See the following pages for application diagrams illustrating a range of voltage regulated circuits using the MM high voltage power supplies.

#### TYPICAL APPLICATIONS

Photomultiplier Tubes  
Solid State Detectors  
Flow Sensors  
Analytical Instruments  
Spectral Source Lamps  
Ink Jet Printers  
Gas Chromatography

#### OPTIONS

##### 1.5W & 2.5W Modules

**I** Input to Output Isolation  
**S** Screened Box  
**C** Continuous Short Circuit protection

##### 1.5W Reversible Module

**S** Screened Box  
**C** Continuous Short Circuit protection

#### Customer Special Versions

- Other input and output voltage modules can be supplied.
- Mechanical dimensions to meet customer requirements are always considered where standard modules are not suitable.
- Please call us to discuss your custom design requirements.

- **OUTPUTS UP TO 15KV AT 1.5W OR 2.5W**
- **COMPACT SIZE**
- **LOW COST**
- **ARC AND SHORT-CIRCUIT PROTECTION**
- **POSITIVE OR NEGATIVE OUTPUTS**
- **OUTPUT VOLTAGE PROPORTIONAL TO INPUT VOLTAGE**
- **REVERSIBLE POLARITY MODULES AVAILABLE**
- **ARC FLASHOVER PROTECTION**
- **PCB MOUNTING**
- **OEM CUSTOMIZATION AVAILABLE**

#### SPECIFICATIONS

##### Input Voltage:

9Vdc, 12Vdc, or 24Vdc. Other input voltages (6Vdc to 28Vdc) available upon special order.

##### Input Current:

Typically less than 1A at full output.

##### Output Voltage:

Maximum voltages between 300V and 15kV are available (see tables). Output voltage is proportional to the input voltage over the range 10% to 100%. Optionally, multiple outputs can also be supplied.

##### Output Power:

1.5W continuous; 3W peak  
2.5W continuous; 5W peak

##### Output Ripple:

Less than 0.2% p-p

##### Load Regulation:

10% maximum.

##### Module Efficiency:

55% to 70%

##### Operating Frequency:

100kHz to 400kHz dependent on module type.

##### Dimensions:

Case Size A and E:  
0.79" H x 1.57" W x 1.57" D (20mm x 40mm x 40mm).  
Case Size B and F:  
1.18" H x 1.97" W x 1.97" D (30mm x 50mm x 50mm).  
Case Size C:  
1.38" H x 1.97" W x 2.99" D (35mm x 50mm x 76mm).  
Case Size D and G:  
1.65" H x 2.99" W x 3.98" D (42mm x 76mm x 101mm).

### MM 1.5W SELECTION TABLE

| Model Number | Output V Vdc Max | Full Load I mA Average | Ripple(max) Vp-p | Case Size |
|--------------|------------------|------------------------|------------------|-----------|
| MM0.3*1.5W   | 300              | 5.0                    | 0.6              | A         |
| MM0.5*1.5W   | 500              | 3.0                    | 1.0              | A         |
| MM1*1.5W     | 1,000            | 1.5                    | 2.0              | A         |
| MM1.5*1.5W   | 1,500            | 1.0                    | 3.0              | A         |
| MM2*1.5W     | 2,000            | 0.75                   | 4.0              | A         |
| MM3*1.5W     | 3,000            | 0.5                    | 6.0              | A         |
| MM5*1.5W     | 5,000            | 0.3                    | 10.0             | B         |
| MM10*1.5W    | 10,000           | 0.15                   | 20.0             | C         |

\*Specify "P" for positive polarity or "N" for negative polarity

### MM 2.5W SELECTION TABLE

| Model Number | Output V Vdc Max | Full Load I mA Average | Ripple(max) Vp-p | Case Size |
|--------------|------------------|------------------------|------------------|-----------|
| MM0.5*2.5W   | 500              | 5.0                    | 1.0              | B         |
| MM1*2.5W     | 1,000            | 2.5                    | 2.0              | B         |
| MM2*2.5W     | 2,000            | 1.25                   | 4.0              | B         |
| MM3*2.5W     | 3,000            | 0.83                   | 6.0              | B         |
| MM5*2.5W     | 5,000            | 0.5                    | 10.0             | C         |
| MM10*2.5W    | 10,000           | 0.25                   | 20.0             | D         |
| MM15*2.5W    | 15,000           | 0.17                   | 30.0             | D         |

\*Specify "P" for positive polarity or "N" for negative polarity

### MM 1.5W REVERSIBLE SELECTION TABLE

| Model Number | Output V Vdc Max | Full Load I mA Average | Ripple(max) Vp-p | Case Size |
|--------------|------------------|------------------------|------------------|-----------|
| MM0.5PN      | 500              | 3.0                    | 1.0              | E         |
| MM1PN        | 1,000            | 1.5                    | 2.0              | E         |
| MM1.5PN      | 1,500            | 1.0                    | 3.0              | E         |
| MM2PN        | 2,000            | 0.75                   | 4.0              | F         |
| MM3PN        | 3,000            | 0.5                    | 6.0              | F         |
| MM5PN        | 5,000            | 0.3                    | 10.0             | F         |
| MM10PN       | 10,000           | 0.1                    | 20.0             | G         |

Note: Polarity is achieved by grounding the opposite output pin.

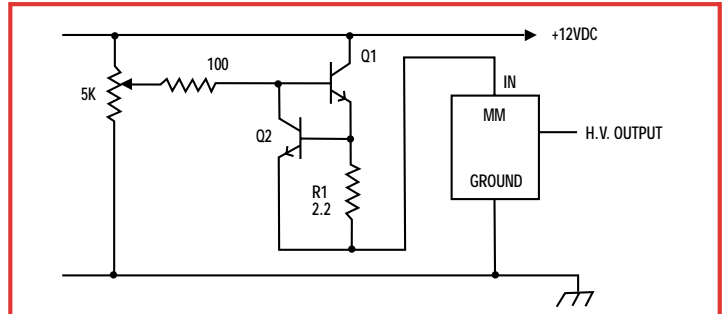
Shown here are some dc drive circuit ideas to regulate the high voltage output. It is always a good idea to incorporate current limiting as shown to allow for the occurrence of a continuous high voltage short circuit. This is sensed by R1 in the sample circuits.

#### NOTES

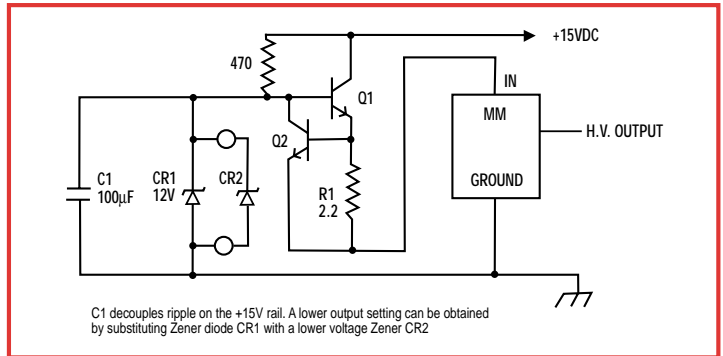
- The 1.5W MM module at full power draws a maximum of 250mA at 12V input (typically 180mA).
- The 2.5W MM module at full power draws a maximum of 380mA at 12V input (typically 340mA).
- Output voltage is approximately proportional to the dc input voltage—allow for 1 to 2 volts drop across Q1.
- Transistor Q1 may need a heatsink
- The circuit shown in Circuit 3 is for positive output. Negative can be achieved with minimal changes in the circuit configuration.
- Please note that these circuits are suggestions only

### APPLICATION NOTES

Circuit 1 This circuit allows control of the output voltage over its complete range and relies on a well regulated 12VDC Supply.

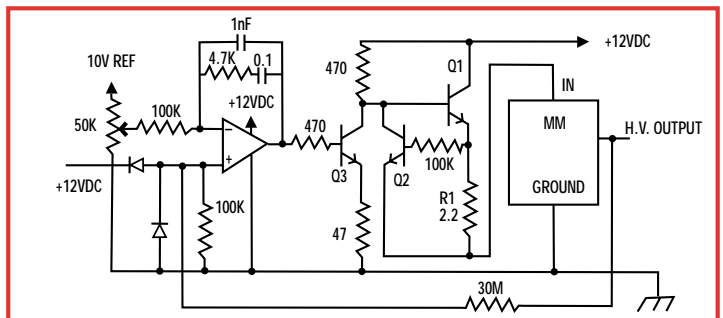


Circuit 2 This circuit is designed for fixed output voltages below the normal output voltage and has a line regulation of 5%/V (typical) change depending on the zener.

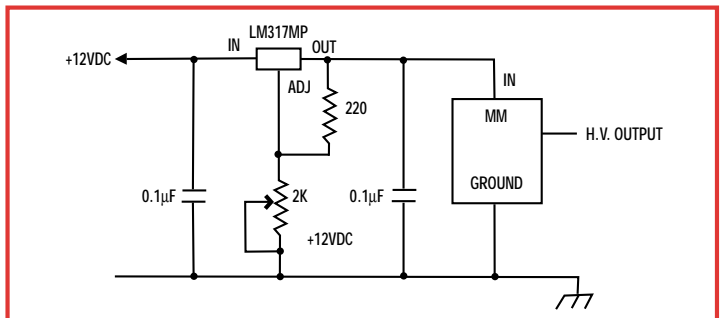


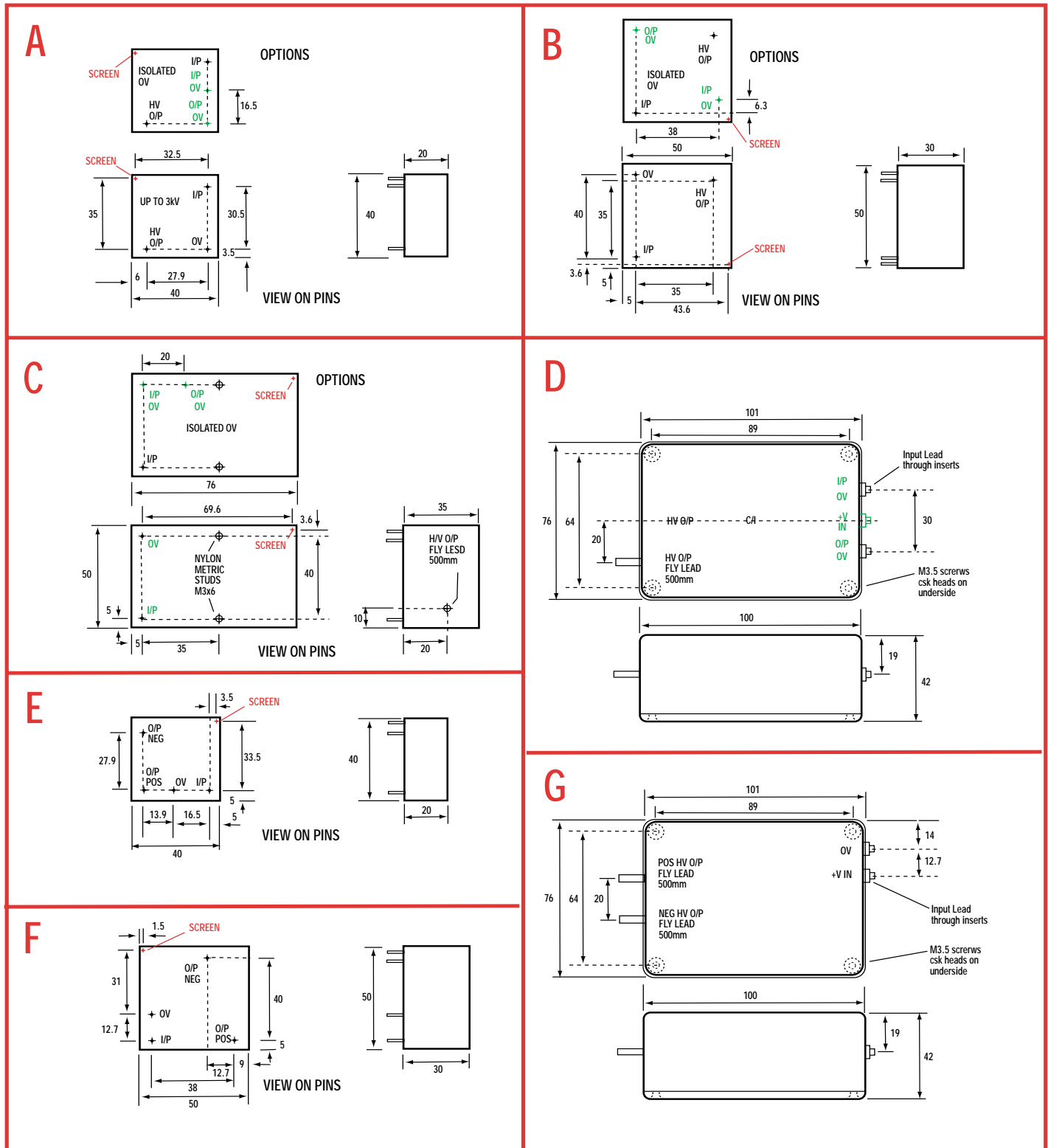
C1 decouples ripple on the +15V rail. A lower output setting can be obtained by substituting Zener diode CR1 with a lower voltage Zener CR2

Circuit 3 This circuit achieves a load regulation of 0.01% (typical) and a line regulation of 0.01% (typical) controlled over the complete range. (N.E. -positive output shown -see notes)



Circuit 4 This circuit allows for a full variable output voltage with a built-in current limit and achieves a line regulation of 0.05% (typical)





Standard configurations of housings for the MM Series modules.  
 Refer to case size reference in specifications on page 1.  
 Available options are shown in color; RED= Screen GREEN= Isolated I/P to O/P  
 Recommended hole size for pins- 1mm (case size A, B, E, F) 1.4mm (case size C.)