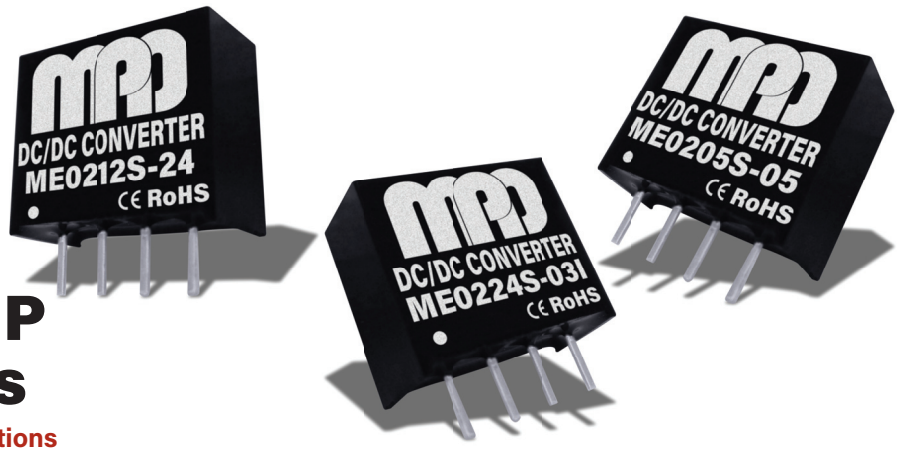
# ME02S

# Low Cost, 0.25W Ultra-Miniature SIP DC/DC Converters




## Key Features:

- 0.25W Output Power
- Ultra-Miniature SIP Case
- 40 Standard Models
- Up To 3,000 VDC Isolation
- >1.12 MHour MTBF
- Meets EN 55032 Class B
- -40°C to +85°C Operation

**Also Available In Ultra-Miniature Mini-DIP Case**


***MicroPower Direct***
292 Page Street
Suite D
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## Electrical Specifications

Specifications typical @ +25°C, nominal input voltage & rated output current, unless otherwise noted. Specifications subject to change without notice.

### Input

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Input Voltage Range | 3.3 VDC Input | 2.97 | 3.3 | 3.63 | VDC |
| | 5 VDC Input | 4.50 | 5.0 | 5.50 | |
| | 12 VDC Input | 10.80 | 12.0 | 13.20 | |
| | 15 VDC Input | 13.50 | 15.0 | 16.50 | |
| | 24 VDC Input | 21.60 | 24.0 | 26.40 | |
| Input Reflected Ripple Current | | | 20 | | mA P - P |
| Input Filter | Internal Capacitors | | | | |

### Output

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Output Voltage Accuracy | | | ±3.0 | | % |
| Line Regulation | For VIN Change of 1% | | ±1.2 | | % |
| Load Regulation, See Note 1 | See Model Selection Guide | | | | |
| Ripple & Noise (20 MHz) | | | 100 | | mV P - P |
| Temperature Coefficient | | | ±0.02 | | %/°C |
| Output Short Circuit | Momentary (0.5 Sec.) | | | | |

### General

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Isolation Voltage | 60 Seconds | 1,000 | | | VDC |
| | Units With "I" Suffix | 3,000 | | | |
| Isolation Resistance | | 1,000 | | | MΩ |
| Isolation Capacitance | | | 60 | | pF |
| Switching Frequency | See Note 2 | | 80 | | kHz |

### EMI Characteristics

| Parameter | | Standard | Criteria | Level |
|---|---|---|---|---|
| Radiated Emissions | | EN 55032 | | Class B |
| Conducted Emissions | See Note 4 | EN 55032 | | Class B |
| ESD | | EN 61000-4-2 | A | ±6 kV Contact |
| | | | A | ±8kV Air |
| RS | | EN 61000-4-3 | A | 20V/m |
| EFT | See Note 4 | EN 61000-4-4 | A | ±2 kV |
| Surge | See Note 4 | EN 61000-4-5 | A | ±0.5 kV |
| CS | | EN 61000-4-6 | A | 10 Vrms |
| PFMF | | EN 61000-4-8 | A | 1A/m |

### Environmental

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Operating Temperature Range | Ambient | -40 | | +85 | °C |
| | Case | | | +100 | |
| Storage Temperature Range | | -40 | | +125 | °C |
| Cooling | Free Air Convection | | | | |
| Humidity | RH, Non-condensing | | | 95 | % |

### Physical

| | |
|---|---|
| Case Size | See Mechanical Diagrams (Page 6) |
| Case Material | Non-Conductive Black Plastic (UL-94V0) |
| Weight | See Mechanical Diagrams (Page 6) |

### Reliability Specifications

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| MTBF | MIL HDBK 217F, 25°C, Gnd Benign | 1.121 | | | MHours |

### Absolute Maximum Ratings

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Input Voltage Surge (0.1 Sec) | 3.3 VDC Input | | | 5.0 | VDC |
| | 5 VDC Input | | | 7.0 | |
| | 12 VDC Input | | | 15.0 | |
| | 15 VDC Input | | | 18.0 | |
| | 24 VDC Input | | | 28.0 | |
| Lead Temperature | 1.5 mm From Case For 10 Sec | | | 260 | °C |

Caution: Exceeding Absolute Maximum Ratings may damage the module. These are not continuous operating ratings.

## Model Selection Guide



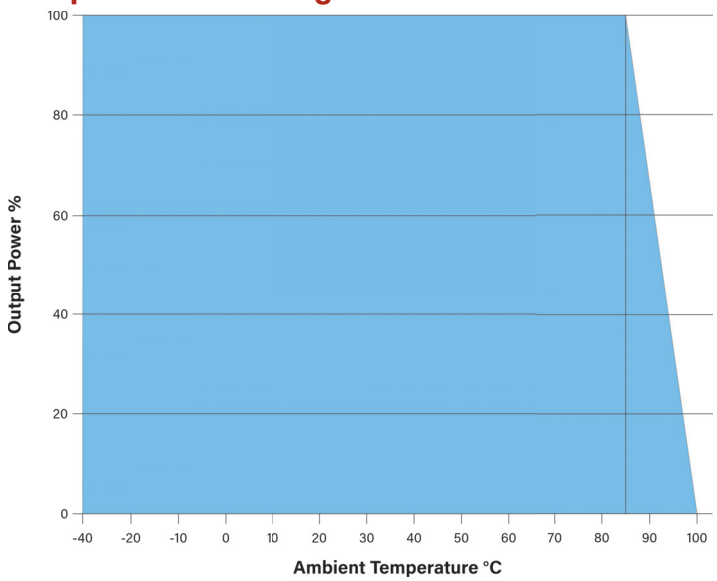
| Model Number | Input | | | | Output | | Load Regulation (% Typ) | Efficiency (%, Typ) | Capacitive Load (μF, Max) | Fuse Rating Slow-Blow (mA) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Voltage (VDC) | | Current (mA) | | Voltage (VDC) | Current (mA, Max) | | | | |
| | Nominal | Range | Full-Load | No-Load | | | | | | |
| ME0203S-03(I) | 3.3 | 2.97 - 3.63 | 120 | 30 | 3.3 | 75.7 | ±20 | 63 | 100 | 250 |
| ME0203S-05(I) | 3.3 | 2.97 - 3.63 | 115 | 25 | 5.0 | 50.0 | ±10 | 66 | 100 | 250 |
| ME0203S-07(I) | 3.3 | 2.97 - 3.63 | 118 | 25 | 7.2 | 34.7 | ±10 | 64 | 100 | 250 |
| ME0203S-09(I) | 3.3 | 2.97 - 3.63 | 118 | 25 | 9.0 | 27.7 | ±10 | 64 | 100 | 250 |
| ME0203S-12(I) | 3.3 | 2.97 - 3.63 | 113 | 32 | 12.0 | 20.8 | ±10 | 67 | 100 | 250 |
| ME0203S-15(I) | 3.3 | 2.97 - 3.63 | 118 | 25 | 15.0 | 16.6 | ±10 | 64 | 100 | 250 |
| ME0203S-18(I) | 3.3 | 2.97 - 3.63 | 115 | 25 | 18.0 | 13.8 | ±10 | 66 | 100 | 250 |
| ME0203S-24(I) | 3.3 | 2.97 - 3.63 | 115 | 20 | 24.0 | 10.4 | ±10 | 66 | 100 | 250 |
| ME0205S-03(I) | 5.0 | 4.5 - 5.5 | 78 | 20 | 3.3 | 75.7 | ±20 | 64 | 100 | 150 |
| ME0205S-05(I) | 5.0 | 4.5 - 5.5 | 70 | 17 | 5.0 | 50.0 | ±10 | 71 | 100 | 150 |
| ME0205S-07(I) | 5.0 | 4.5 - 5.5 | 74 | 18 | 7.2 | 34.7 | ±10 | 68 | 100 | 150 |
| ME0205S-09(I) | 5.0 | 4.5 - 5.5 | 68 | 15 | 9.0 | 27.7 | ±10 | 73 | 100 | 150 |
| ME0205S-12(I) | 5.0 | 4.5 - 5.5 | 66 | 14 | 12.0 | 20.8 | ±10 | 76 | 100 | 150 |
| ME0205S-15(I) | 5.0 | 4.5 - 5.5 | 70 | 20 | 15.0 | 16.6 | ±10 | 71 | 100 | 150 |
| ME0205S-18(I) | 5.0 | 4.5 - 5.5 | 69 | 17 | 18.0 | 13.8 | ±10 | 72 | 100 | 150 |
| ME0205S-24(I) | 5.0 | 4.5 - 5.5 | 65 | 18 | 24.0 | 10.4 | ±10 | 77 | 100 | 150 |
| ME0212S-03(I) | 12 | 10.8 - 13.2 | 32 | 10 | 3.3 | 75.7 | ±20 | 65 | 100 | 75 |
| ME0212S-05(I) | 12 | 10.8 - 13.2 | 31 | 12 | 5.0 | 50.0 | ±10 | 67 | 100 | 75 |
| ME0212S-07(I) | 12 | 10.8 - 13.2 | 31 | 10 | 7.2 | 34.7 | ±10 | 67 | 100 | 75 |
| ME0212S-09(I) | 12 | 10.8 - 13.2 | 33 | 12 | 9.0 | 27.7 | ±10 | 64 | 100 | 75 |
| ME0212S-12(I) | 12 | 10.8 - 13.2 | 33 | 15 | 12.0 | 20.8 | ±10 | 63 | 100 | 75 |
| ME0212S-15(I) | 12 | 10.8 - 13.2 | 31 | 13 | 15.0 | 16.6 | ±10 | 67 | 100 | 75 |
| ME0212S-18(I) | 12 | 10.8 - 13.2 | 32 | 13 | 18.0 | 13.8 | ±10 | 65 | 100 | 75 |
| ME0212S-24(I) | 12 | 10.8 - 13.2 | 38 | 18 | 24.0 | 10.4 | ±10 | 55 | 100 | 75 |
| ME0215S-03(I) | 15 | 13.5 - 16.5 | 26 | 12 | 3.3 | 75.7 | ±20 | 63 | 100 | 50 |
| ME0215S-05(I) | 15 | 13.5 - 16.5 | 27 | 8 | 5.0 | 50.0 | ±10 | 62 | 100 | 50 |
| ME0215S-07(I) | 15 | 13.5 - 16.5 | 28 | 12 | 7.2 | 34.7 | ±10 | 60 | 100 | 50 |
| ME0215S-09(I) | 15 | 13.5 - 16.5 | 28 | 12 | 9.0 | 27.7 | ±10 | 60 | 100 | 50 |
| ME0215S-12(I) | 15 | 13.5 - 16.5 | 27 | 12 | 12.0 | 20.8 | ±10 | 62 | 100 | 50 |
| ME0215S-15(I) | 15 | 13.5 - 16.5 | 27 | 10 | 15.0 | 16.6 | ±10 | 61 | 100 | 50 |
| ME0215S-18(I) | 15 | 13.5 - 16.5 | 29 | 12 | 18.0 | 13.8 | ±10 | 57 | 100 | 50 |
| ME0215S-24(I) | 15 | 13.5 - 16.5 | 29 | 12 | 24.0 | 10.4 | ±10 | 57 | 100 | 50 |
| ME0224S-03(I) | 24 | 21.6 - 26.4 | 17 | 8 | 3.3 | 75.7 | ±20 | 60 | 100 | 40 |
| ME0224S-05(I) | 24 | 21.6 - 26.4 | 18 | 7 | 5.0 | 50.0 | ±10 | 58 | 100 | 40 |
| ME0224S-07(I) | 24 | 21.6 - 26.4 | 18 | 8 | 7.2 | 34.7 | ±10 | 57 | 100 | 40 |
| ME0224S-09(I) | 24 | 21.6 - 26.4 | 17 | 8 | 9.0 | 27.7 | ±10 | 62 | 100 | 40 |
| ME0224S-12(I) | 24 | 21.6 - 26.4 | 19 | 10 | 12.0 | 20.8 | ±10 | 56 | 100 | 40 |
| ME0224S-15(I) | 24 | 21.6 - 26.4 | 19 | 7 | 15.0 | 16.6 | ±10 | 55 | 100 | 40 |
| ME0224S-18(I) | 24 | 21.6 - 26.4 | 18 | 10 | 18.0 | 13.8 | ±10 | 57 | 100 | 40 |
| ME0224S-24(I) | 24 | 21.6 - 26.4 | 18 | 10 | 24.0 | 10.4 | ±10 | 59 | 100 | 40 |

For the 3 kV isolation models, add suffix "I" to model number (i.e. **ME0224S-05I**)

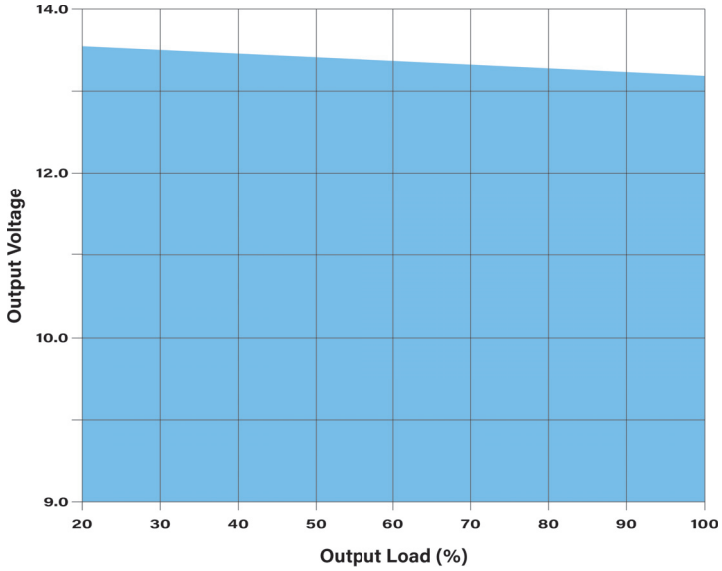
**Notes:**

1. Output load regulation is specified for a load change of 20% to 100%.
2. Switching frequency is typically 80 kHz, but may vary with differing operating conditions.
3. Operation at no-load will not damage these units. However, they may not meet all specifications.
4. These converters will operate without external components. However, to meet the specified EMI limits, a simple external input filter is required. See page 5 for more information.
5. All units are rated for operation at full output power to +85°C. Operation over +85°C without airflow is not recommended. Output power should be derated linearly from 100% at 85°C to 0% at 100°C.
6. It is recommended that a fuse be used on the input of a power supply for protection. See the Model Selection table above for the correct rating.

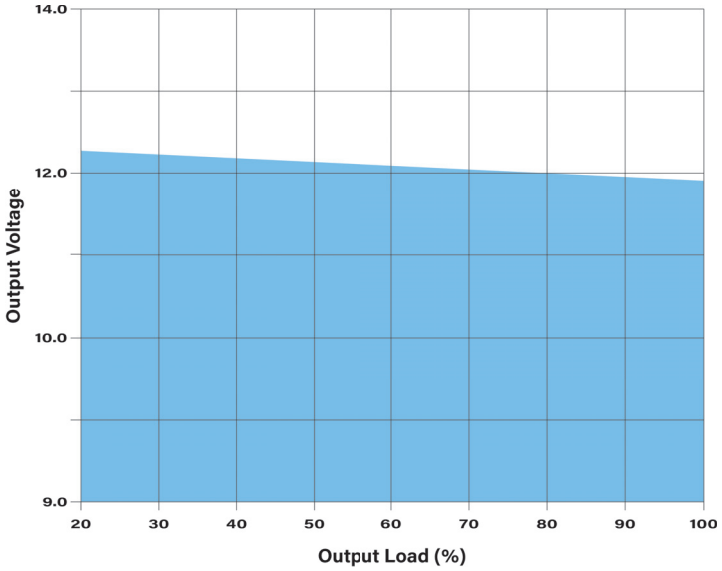
## Temperature Derating Curve



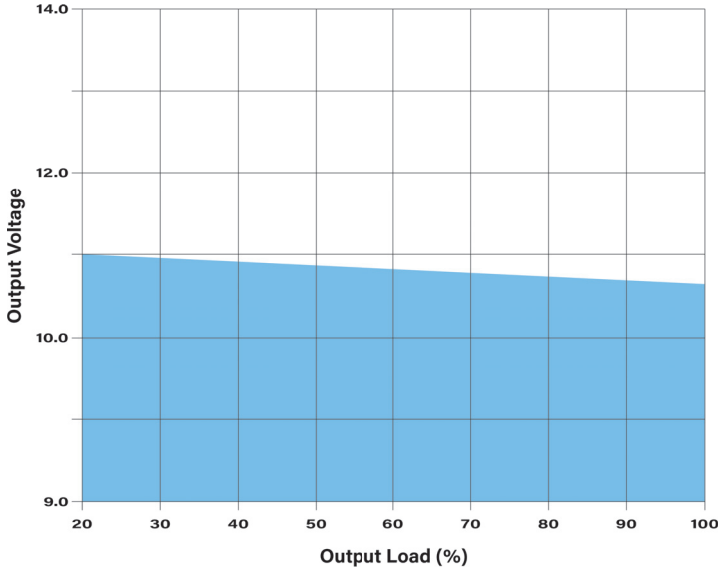
## Output Load vs Output Voltage: ME0203, High Line



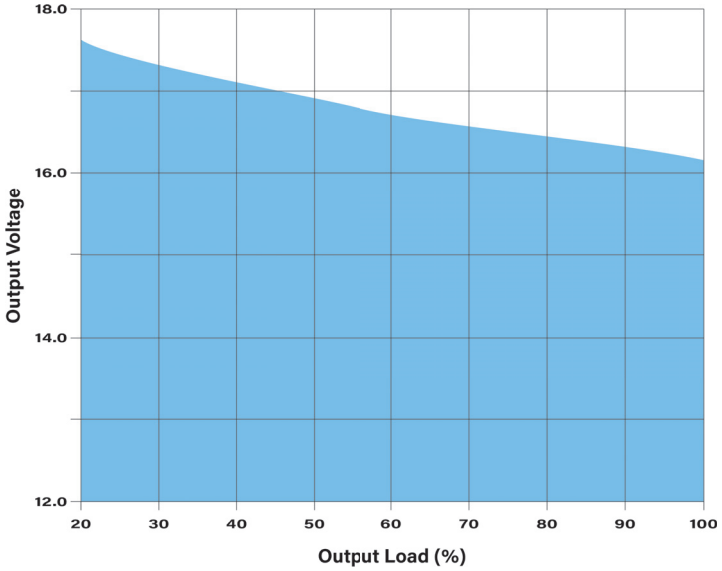

## Output Load vs Output Voltage: ME0203, Nom Line



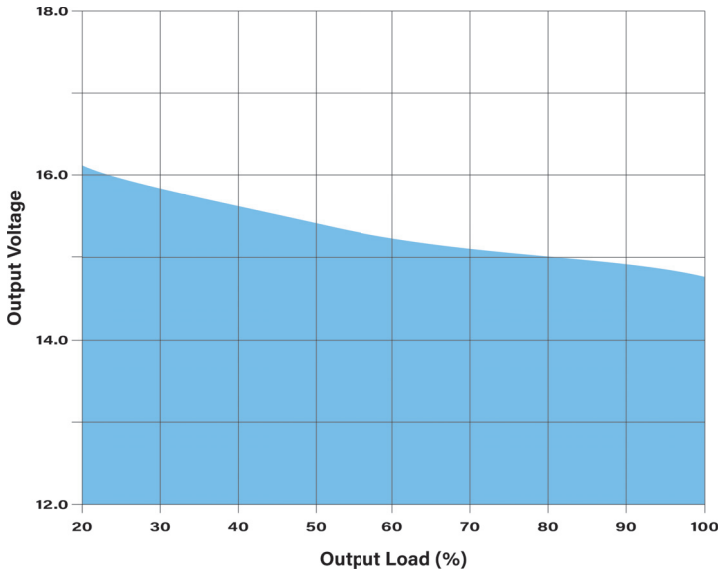

## Output Load vs Output Voltage: ME0203, Low Line



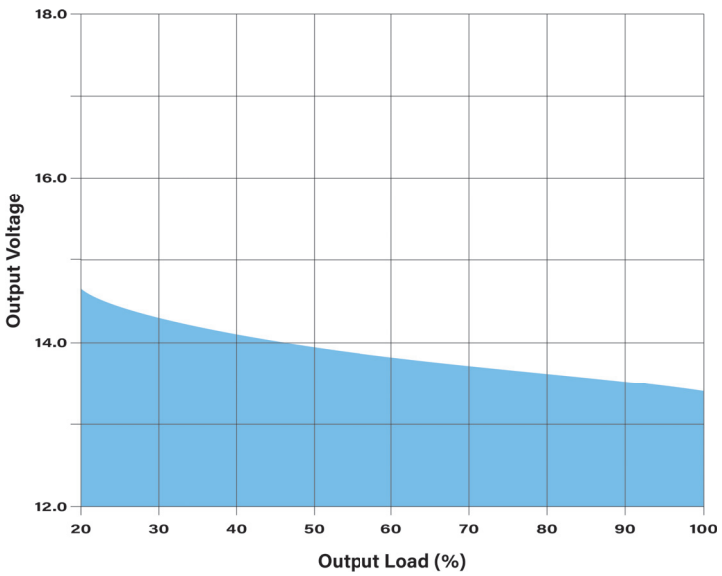

## Output Load vs Output Voltage: ME0205, High Line



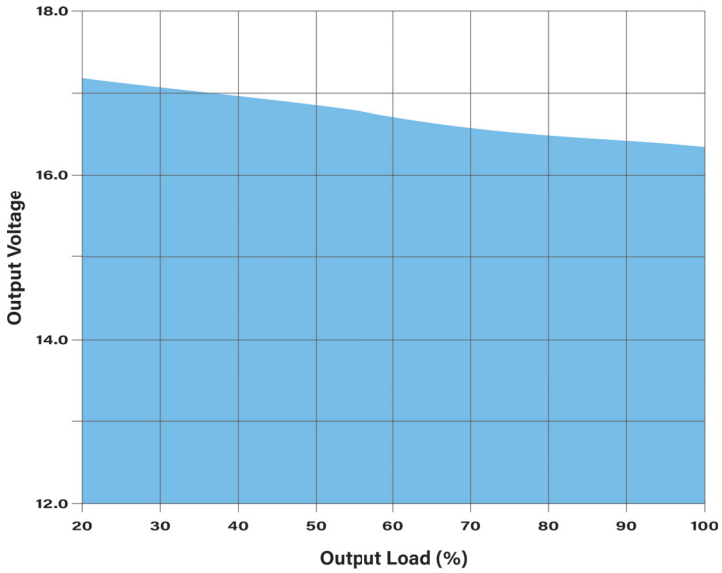

## Output Load vs Output Voltage: ME0205, Nom Line



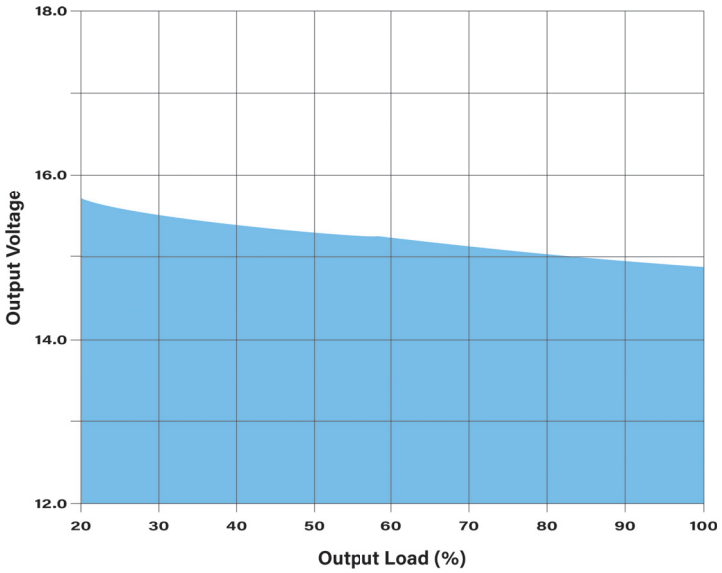

## Output Load vs Output Voltage: ME0205, Low Line



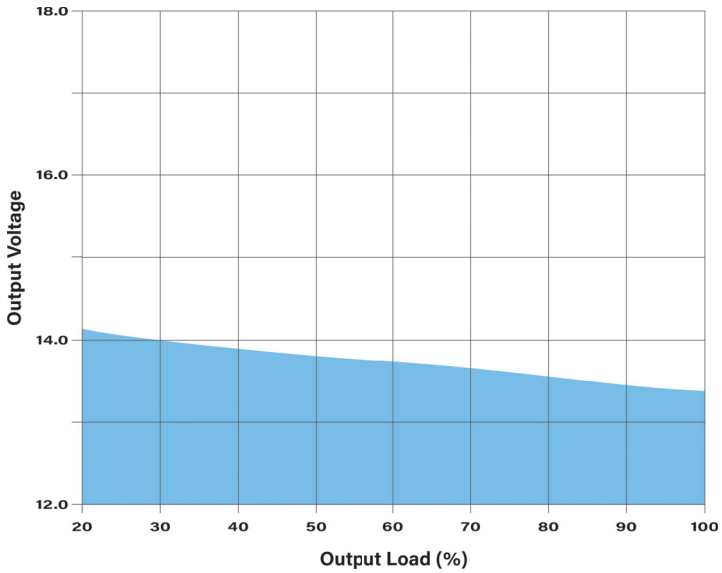
## Output Load vs Output Voltage: ME0212, High Line



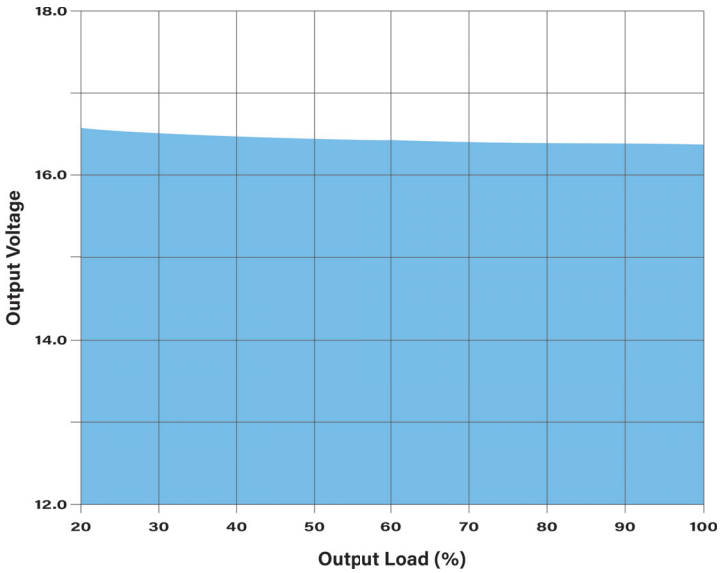

## Output Load vs Output Voltage: ME0212, Nom Line



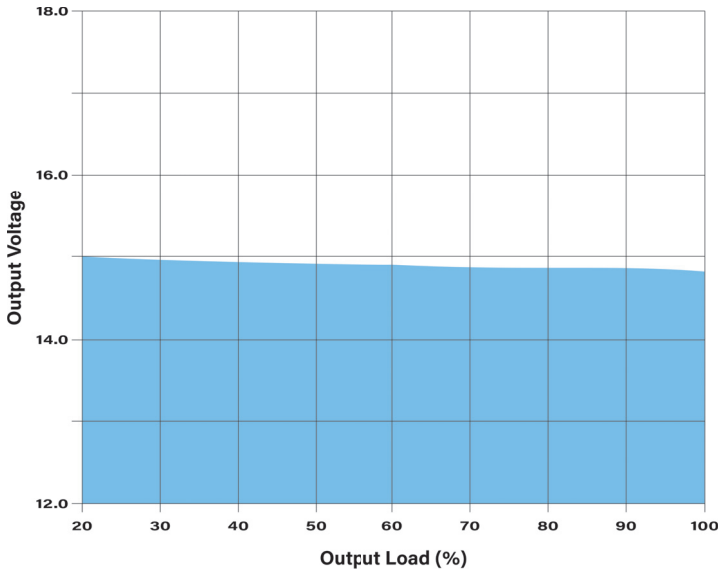

## Output Load vs Output Voltage: ME0212, Low Line



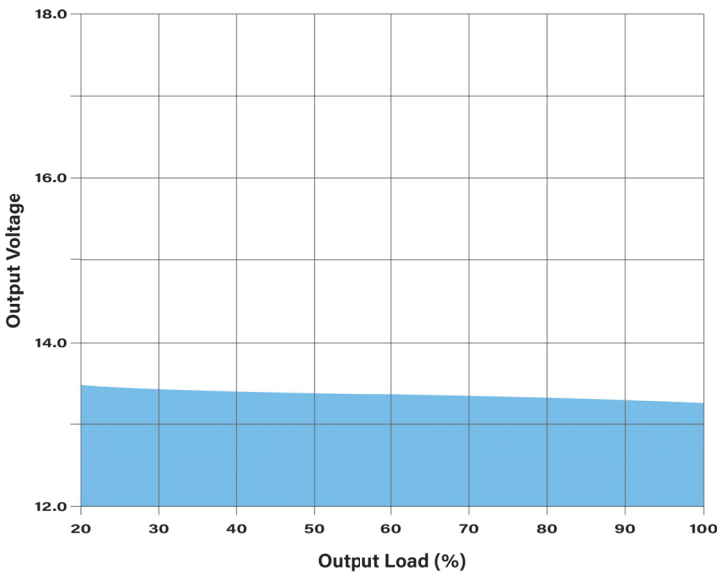

## Output Load vs Output Voltage: ME0224, High Line



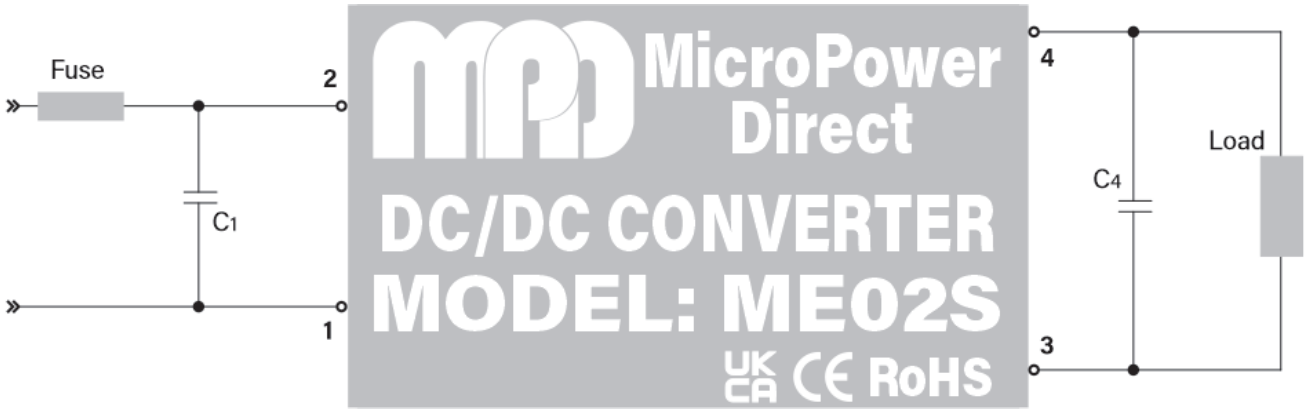

## Output Load vs Output Voltage: ME0224, Nom Line




## Output Load vs Output Voltage: ME0224, Low Line



## Typical Connection

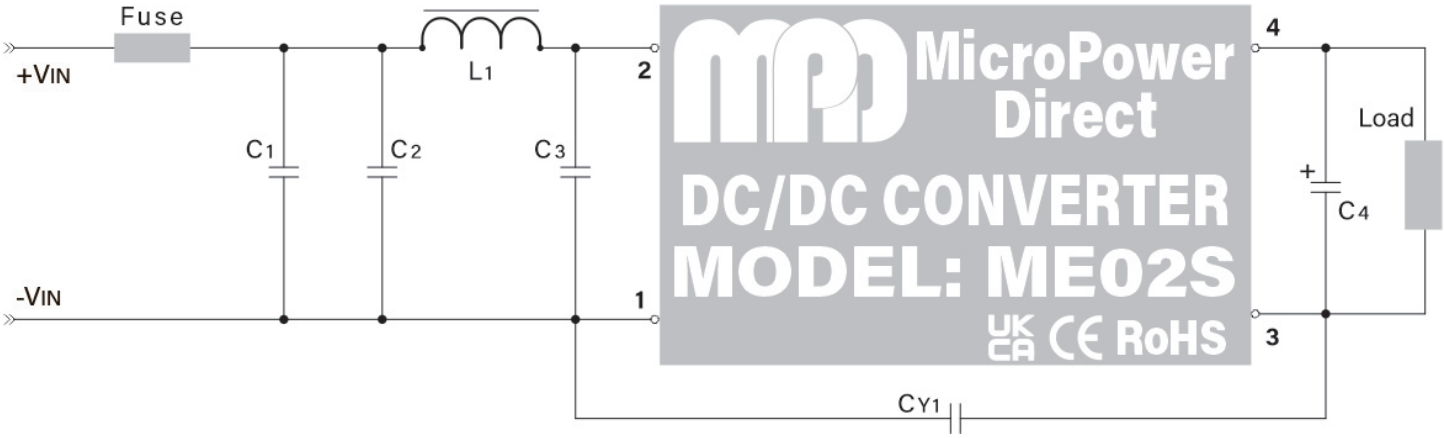



The diagram above illustrates a typical connection of the **ME02S**. For applications that do not require the circuit to meet EMI/EMC specifications, the capacitors C1 and C4 will reduce input/output ripple and improve the converter stability over time and temperature. The recommended component values are given in the table at right.

| VIN | C1 |
|---|---|
| 3.3 VDC | 5.0 µF/25V |
| 5 VDC | 5.0 µF/25V |
| 12 VDC | 7.5 µF/25V |
| 15 VDC | 7.5 µF/50V |
| 24 VDC | 10 µF/50V |

| VOUT | C4 |
|---|---|
| 3.3 VDC | 10 µF/16V |
| 5 VDC | 10 µF/16V |
| 7.2 VDC | 10 µF/16V |
| 9 VDC | 10 µF/16V |
| 12 VDC | 10 µF/25V |
| 15 VDC | 10 µF/25V |
| 18 VDC | 10 µF/35V |
| 24 VDC | 10 µF/50V |

## EMI Connection




The diagram above illustrates a connection of the **ME02S** for an application that requires compliance to EMI/EMC standards EN 55032 and EN 61000-4 (as specified on page 1). Some notes on these components are:

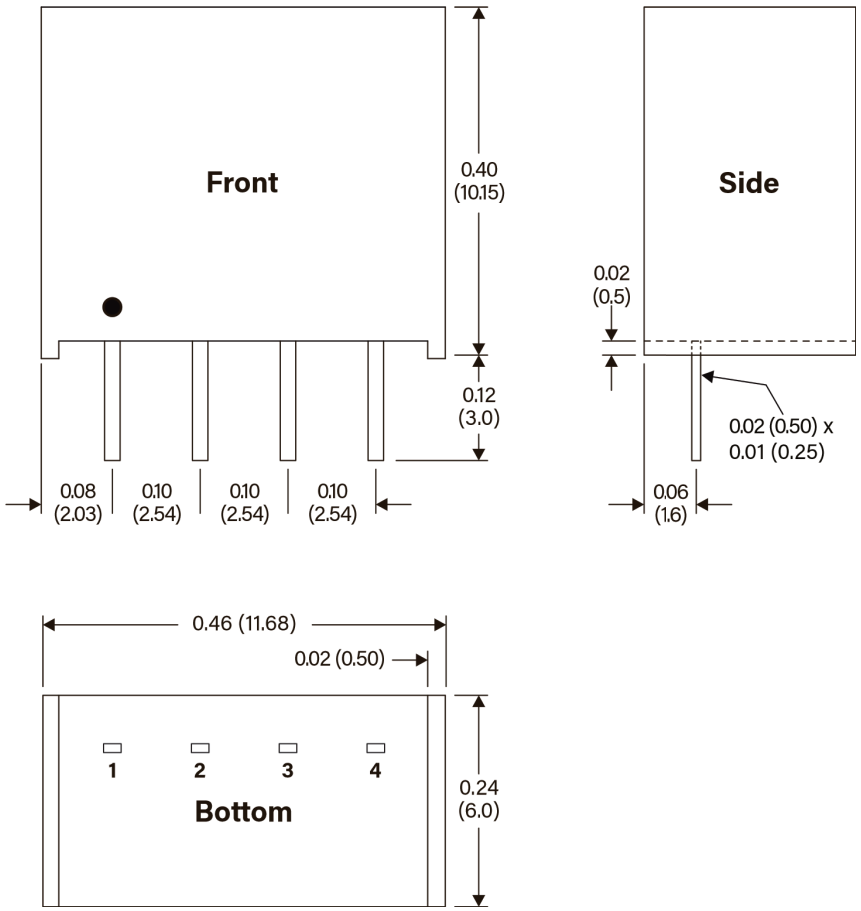
1. An external fuse is recommended to protect the unit in the event a fault occurs on the input line. A recommended value is given in the model selection table on page 2.
2. The output filtering capacitor (C4) is a high frequency, low resistance electrolytic capacitor. Care must be taken in choosing this capacitor not to exceed the capacitive load specification for the unit. Voltage derating of capacitors should be 80% or above.
3. Recommended component values for all external components are given in the table below.
4. In many applications, simply adding input/output capacitors will enhance the input surge protection & and reduce output ripple sufficiently. In this case, capacitors could be connected as shown in the typical connection at the top of the page, without the other filter components.

Suggested component values are:

| VIN | C1 | C2 | L1 | C3 | CY1 |
|---|---|---|---|---|---|
| 3.3 VDC | Nippon Chemi-Con KY Series 470 µF/100V | MLCC 2.2 µF/100V | 18 µH | Not Required | Not Required |
| 5 VDC | | | | | |
| 12 VDC | | | | | |
| 15 VDC | | | | | |
| 24 VDC | | | | MLCC 2.2 µF/100V | MLCC 470 pF/3 kV |

## Mechanical Dimensions






## Pin Connections

| Pin | Description |
|---|---|
| 1 | -VIN |
| 2 | +VIN |
| 3 | -VOUT |
| 4 | +VOUT |

**Notes:**

- All dimensions are typical in inches (mm)
- Pin 1 is marked by a "dot" or indentation on the unit
- General Tolerance = ±0.02 (±0.50)
- Pin Tolerance = ±0.002 (±0.05)
- Recommended pin hole size (on the application PC Board) is Ø 0.039 (Ø1.00)
- Weight (Typ) = 0.05 Oz (1.5g)

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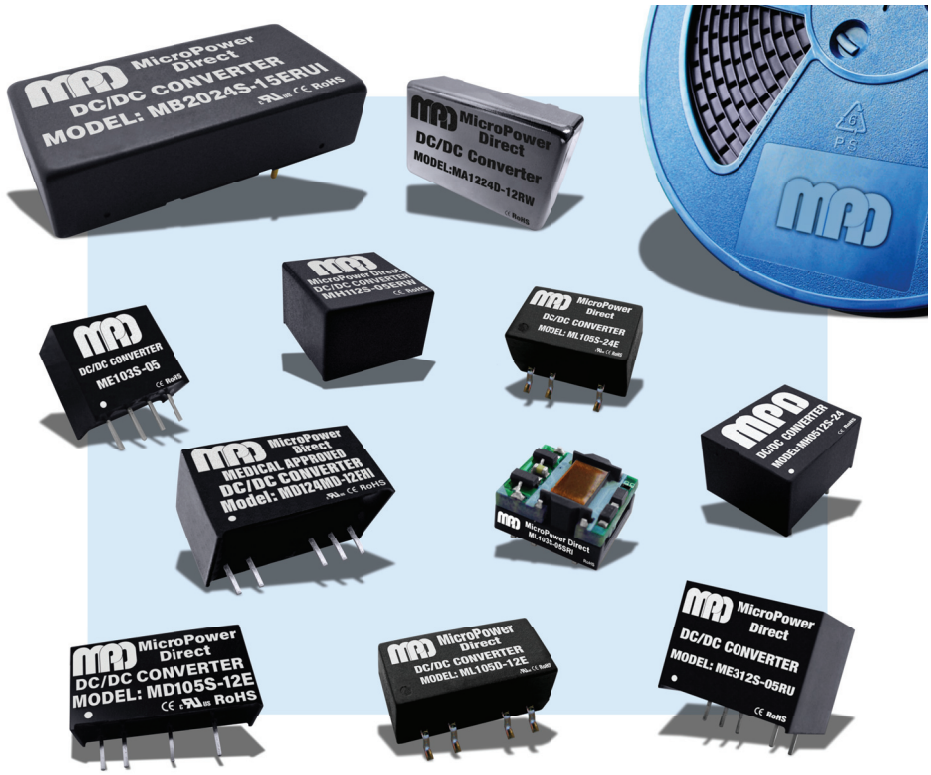


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