# MC79M00 Series

# 500 mA Negative Voltage Regulators

The MC79M00 series of fixed output negative voltage regulators are intended as complements to the popular MC78M00 series devices.

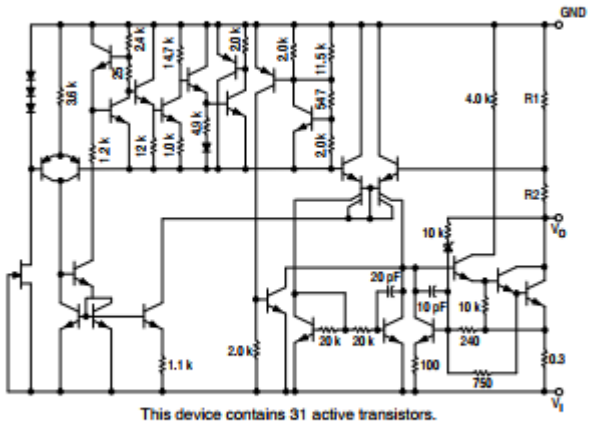
Available in fixed output voltage options of −5.0 V, −8.0 V, −12 V and −15 V, these regulators employ current limiting, thermal shutdown, and safe−area compensation, making them remarkably rugged under most operating conditions. With adequate heatsinking they can deliver output currents in excess of 0.5 A.

**Features**

- No External Components Required
- Internal Thermal Overload Protection
- Internal Short Circuit Current Limiting
- Output Transistor Safe−Area Compensation
- Also Available in Surface Mount DPAK (DT) Package
- Pb−Free Packages are Available

**DEVICE TYPE/NOMINAL OUTPUT VOLTAGE**

| Device | Nominal Output Voltage |
|---|---|
| MC79M05 | −5.0 V |
| MC79M08 | −8.0 V |
| MC79M12 | −12 V |
| MC79M15 | −15 V |




This device contains 31 active transistors.

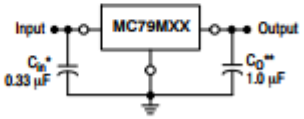
**Figure 1. Representative Schematic Diagram**

**ON Semiconductor®**

**http://onsemi.com**

## THREE−TERMINAL NEGATIVE FIXED VOLTAGE REGULATORS

**STANDARD APPLICATION**

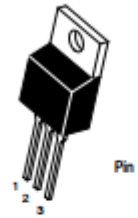



A common ground is required between the input and the output voltages. The input voltage must remain typically 1.1 V more negative even during the high point of the input ripple voltage.

XX These two digits of the type number indicate nominal voltage.

* $C_{in}$ is required if regulator is located an appreciable distance from power supply filter.

** $C_O$ improve stability and transient response.

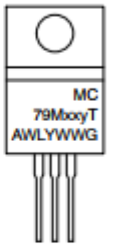



**TO−220−3**
**T SUFFIX**
**CASE 221AB**

Pin 1. Ground
2. Input
3. Output


**DPAK−3**
**DT SUFFIX**
**CASE 369C**

**MARKING DIAGRAMS**





xx = 05, 08, 12, or 15
y = B or C
A = Assembly Location
WL, L = Wafer Lot
Y = Year
WW = Work Week
G = Pb−Free Device

**MAXIMUM RATINGS** ($T_A$ = 25°C, unless otherwise noted.)

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Input Voltage | $V_I$ | −35 | Vdc |
| Power Dissipation | | | |
| Case 221A (TO−220−3) | | | |
| $T_A$ = 25°C | $P_D$ | Internally Limited | W |
| Thermal Resistance, Junction−to−Ambient | $\theta_{JA}$ | 65 | °C/W |
| Thermal Resistance, Junction−to−Case | $\theta_{JC}$ | 5.0 | °C/W |
| Case 369C (DPAK−3) | | | |
| $T_A$ = 25°C | $P_D$ | Internally Limited | W |
| Thermal Resistance, Junction−to−Ambient | $\theta_{JA}$ | 92 | °C/W |
| Thermal Resistance, Junction−to−Case | $\theta_{JC}$ | 6.0 | °C/W |
| Storage Junction Temperature | $T_{stg}$ | −65 to +150 | °C |
| Operating Junction Temperature Range | $T_J$ | −40 to +150 | °C |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

*This device series contains ESD protection and exceeds the following tests:
Human Body Model 2000 V per MIL_STD_883, Method 3015
Machine Model Method 200 V

**MC79M05B, C**
**ELECTRICAL CHARACTERISTICS** ($V_I$ = −10 V, $I_O$ = 350 mA, $T_{low}$ to $T_{high}$ (Note 2), unless otherwise noted.)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Output Voltage ($T_J$ = 25°C) | $V_O$ | −4.8 | −5.0 | −5.2 | Vdc |
| Line Regulation, $T_J$ = 25°C (Note 1)<br>−7.0 Vdc ≥ $V_I$ ≥ −25 Vdc<br>−8.0 Vdc ≥ $V_I$ ≥ −18 Vdc | $Reg_{line}$ | <br>−<br>− | <br>7.0<br>2.0 | <br>50<br>30 | mV |
| Load Regulation, $T_J$ = 25°C (Note 1)<br>5.0 mA ≤ $I_O$ ≤ 500 mA | $Reg_{load}$ | − | 30 | 100 | mV |
| Output Voltage<br>−7.0 Vdc ≥ $V_I$ ≥ −25 Vdc, 5.0 mA ≤ $I_O$ ≤ 350 mA | $V_O$ | −4.75 | − | −5.25 | Vdc |
| Input Bias Current ($T_J$ = 25°C) | $I_{IB}$ | − | 4.3 | 8.0 | mA |
| Input Bias Current Change<br>−8.0 Vdc ≥ $V_I$ ≥ −25 Vdc, $I_O$ = 350 mA<br>5.0 mA ≤ $I_O$ ≤ 350 mA, $V_I$ = −10 V | $\Delta I_{IB}$ | <br>−<br>− | <br>−<br>− | <br>0.4<br>0.4 | mA |
| Output Noise Voltage, $T_A$ = 25°C, 10 Hz ≤ f ≤ 100 kHz | $V_n$ | − | 40 | − | μV |
| Ripple Rejection (f = 120 Hz) | RR | 54 | 66 | − | dB |
| Dropout Voltage<br>$I_O$ = 500 mA, $T_J$ = 25°C | $V_I$−$V_O$ | − | 1.1 | − | Vdc |
| Average Temperature Coefficient of Output Voltage<br>$I_O$ = 5.0 mA, 0°C ≤ $T_J$ ≤ 125°C | $\Delta V_O/\Delta T$ | − | 0.2 | − | mV/°C |

1. Load and line regulation are specified at constant temperature. Change in $V_O$ due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.
2. B = $T_{low}$ to $T_{high}$, −40°C < $T_J$ < 125°C C = $T_{low}$ to $T_{high}$, 0°C < $T_J$ < 125°C.

**MC79M08B, C**
**ELECTRICAL CHARACTERISTICS** ($V_I$ = −10 V, $I_O$ = 350 mA, $T_{low}$ to $T_{high}$ (Note 4), unless otherwise noted.)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Output Voltage ($T_J$ = 25°C) | $V_O$ | −7.7 | −8.0 | −8.3 | Vdc |
| Line Regulation, $T_J$ = 25°C (Note 3)<br>−10.5 Vdc ≥ $V_I$ ≥ −25 Vdc<br>−11 Vdc ≥ $V_I$ ≥ −21 Vdc | $Reg_{line}$ | <br>–<br>– | <br>5.0<br>3.0 | <br>80<br>50 | mV |
| Load Regulation, $T_J$ = 25°C (Note 3)<br>5.0 mA ≤ $I_O$ ≤ 500 mA | $Reg_{load}$ | – | 30 | 100 | mV |
| Output Voltage<br>−10.5 Vdc ≥ $V_I$ ≥ −25 Vdc, 5.0 mA ≤ $I_O$ ≤ 350 mA | $V_O$ | −7.6 | −8.0 | −8.4 | Vdc |
| Input Bias Current ($T_J$ = 25°C) | $I_{IB}$ | – | – | 8.0 | mA |
| Input Bias Current Change<br>−10.5 Vdc ≥ $V_I$ ≥ −25 Vdc, $I_O$ = 350 mA<br>5.0 mA ≤ $I_O$ ≤ 350 mA, $V_I$ = −10 V | $\Delta I_{IB}$ | <br>–<br>– | <br>–<br>– | <br>0.4<br>0.4 | mA |
| Output Noise Voltage, $T_A$ = 25°C, 10 Hz ≤ f ≤ 100 kHz | $V_n$ | – | 60 | – | μV |
| Ripple Rejection (f = 120 Hz) | RR | 54 | 63 | – | dB |
| Dropout Voltage<br>$I_O$ = 500 mA, $T_J$ = 25°C | $V_I$–$V_O$ | – | 1.1 | – | Vdc |
| Average Temperature Coefficient of Output Voltage<br>$I_O$ = 5.0 mA, 0°C ≤ $T_J$ ≤ 125°C | $\Delta V_O/\Delta T$ | – | 0.4 | – | mV/°C |

3. Load and line regulation are specified at constant temperature. Change in $V_O$ due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.
4. B = $T_{low}$ to $T_{high}$, −40°C < $T_J$ < 125°C
   C = $T_{low}$ to $T_{high}$, 0°C < $T_J$ < 125°C

**MC79M12B, C**
**ELECTRICAL CHARACTERISTICS** ($V_I$ = −19 V, $I_O$ = 350 mA, $T_{low}$ to $T_{high}$ (Note 6), unless otherwise noted.)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Output Voltage ($T_J$ = 25°C) | $V_O$ | −11.5 | −12 | −12.5 | Vdc |
| Line Regulation, $T_J$ = 25°C (Note 5)<br>−14.5 Vdc ≥ $V_I$ ≥ −30 Vdc<br>−15 Vdc ≥ $V_I$ ≥ −25 Vdc | $Reg_{line}$ | <br>–<br>– | <br>5.0<br>3.0 | <br>80<br>50 | mV |
| Load Regulation, $T_J$ = 25°C (Note 5)<br>5.0 mA ≤ $I_O$ ≤ 500 mA | $Reg_{load}$ | – | 30 | 240 | mV |
| Output Voltage<br>−14.5 Vdc ≥ $V_I$ ≥ −30 Vdc, 5.0 mA ≤ $I_O$ ≤ 350 mA | $V_O$ | −11.4 | – | −12.6 | Vdc |
| Input Bias Current ($T_J$ = 25°C) | $I_{IB}$ | – | 4.4 | 8.0 | mA |
| Input Bias Current Change<br>−14.5 Vdc ≥ $V_I$ ≥ −30 Vdc, $I_O$ = 350 mA<br>5.0 mA ≤ $I_O$ ≤ 350 mA, $V_I$ = −19 V | $\Delta I_{IB}$ | <br>–<br>– | <br>–<br>– | <br>0.4<br>0.4 | mA |
| Output Noise Voltage, $T_A$ = 25°C, 10 Hz ≤ f ≤ 100 kHz | $V_n$ | – | 75 | – | μV |
| Ripple Rejection (f = 120 Hz) | RR | 54 | 60 | – | dB |
| Dropout Voltage<br>$I_O$ = 500 mA, $T_J$ = 25°C | $V_I$–$V_O$ | – | 1.1 | – | Vdc |
| Average Temperature Coefficient of Output Voltage<br>$I_O$ = 5.0 mA, 0°C ≤ $T_J$ ≤ 125°C | $\Delta V_O/\Delta T$ | – | –0.8 | – | mV/°C |

5. Load and line regulation are specified at constant temperature. Change in $V_O$ due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.
6. B = $T_{low}$ to $T_{high}$, −40°C < $T_J$ < 125°C
   C = $T_{low}$ to $T_{high}$, 0°C < $T_J$ < 125°C

MC79M00 Series

**MC79M15B, C**
**ELECTRICAL CHARACTERISTICS** ($V_I$ = −23 V, $I_O$ = 350 mA, $T_{low}$ to $T_{high}$ (Note 8), unless otherwise noted.)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Output Voltage ($T_J$ = 25°C) | $V_O$ | −14.4 | −15 | −15.6 | Vdc |
| Line Regulation, $T_J$ = 25°C (Note 7)<br>−17.5 Vdc ≥ $V_I$ ≥ −30 Vdc<br>−18 Vdc ≥ $V_I$ ≥ −28 Vdc | $Reg_{line}$ | <br>–<br>– | <br>5.0<br>3.0 | <br>80<br>50 | mV |
| Load Regulation, $T_J$ = 25°C (Note 7)<br>5.0 mA ≤ $I_O$ ≤ 500 mA | $Reg_{load}$ | – | 30 | 240 | mV |
| Output Voltage<br>−17.5 Vdc ≥ $V_I$ ≥ −30 Vdc, 5.0 mA ≤ $I_O$ ≤ 350 mA | $V_O$ | −14.25 | – | −15.75 | Vdc |
| Input Bias Current ($T_J$ = 25°C) | $I_{IB}$ | – | 4.4 | 8.0 | mA |
| Input Bias Current Change<br>−17.5 Vdc ≥ $V_I$ ≥ −30 Vdc, $I_O$ = 350 mA<br>5.0 mA ≤ $I_O$ ≤ 350 mA, $V_I$ = −23 V | $\Delta I_{IB}$ | <br>–<br>– | <br>–<br>– | <br>0.4<br>0.4 | mA |
| Output Noise Voltage, $T_A$ = 25°C, 10 Hz ≤ f ≤ 100 kHz | $V_n$ | – | 90 | – | μV |
| Ripple Rejection (f = 120 Hz) | RR | 54 | 60 | – | dB |
| Dropout Voltage<br>$I_O$ = 500 mA, $T_J$ = 25°C | $V_I$–$V_O$ | – | 1.1 | – | Vdc |
| Average Temperature Coefficient of Output Voltage<br>$I_O$ = 5.0 mA, 0°C ≤ $T_J$ ≤ 125°C | $\Delta V_O/\Delta T$ | – | −1.0 | – | mV/°C |

7. Load and line regulation are specified at constant temperature. Change in $V_O$ due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.
8. B = $T_{low}$ to $T_{high}$, −40°C < $T_J$ < 125°C
   C = $T_{low}$ to $T_{high}$, 0°C < $T_J$ < 125°C

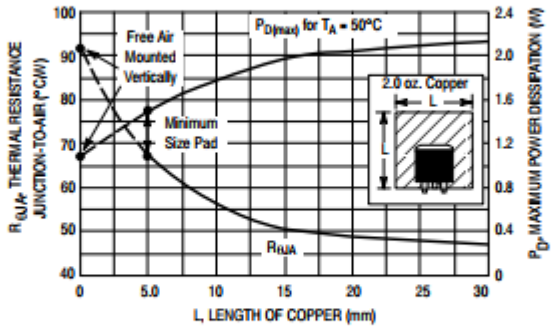



**Figure 1. DPAK−3 Thermal Resistance and Maximum Power Dissipation versus P.C.B. Copper Length**

### Protection Diodes

When external capacitors are used with MC79M00 series regulator it is sometimes necessary to add protection diodes to prevent the capacitors from discharging through low current points into the regulator or from output polarity reversals. Generally, no protection diode is required for values of output capacitance less then 10μF. Figure 2 shows the MC79M15 with the recommended protection diodes.

- Opposite Polarity Protection

Diode D1 protects the regulator from output polarity reversals during startup, power off and short-circuit operation.

- Reverse-bias Protection

Diode D2 prevents output capacitor from discharging thru the MC79M15 during an input short circuit or fast switch off of power supply.

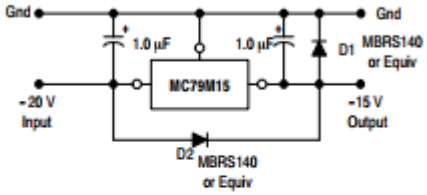



**Figure 2. Protection Diodes**

MC79M00 Series

**ORDERING INFORMATION**

| Device | Output Voltage Tolerance | Operating Temperature Range | Package | Shipping† |
|---|---|---|---|---|
| MC79M05BDT | 4.0% | $T_J$ = −40°C to +125°C | DPAK | 75 Units / Rail |
| MC79M05BDTG | | | DPAK (Pb−Free) | 75 Units / Rail |
| MC79M05BDTRK | | | DPAK | 2500 Units / Reel |
| MC79M05BDTRKG | | | DPAK (Pb−Free) | 2500 Units / Reel |
| MC79M05BT | | | TO−220 | 50 Units / Rail |
| MC79M05BTG | | | TO−220 (Pb−Free) | 50 Units / Rail |
| MC79M05CDT | | $T_J$ = 0°C to +125°C | DPAK | 75 Units / Rail |
| MC79M05CDTG | | | DPAK (Pb−Free) | 75 Units / Rail |
| MC79M05CDTRK | | | DPAK | 2500 Units / Reel |
| MC79M05CDTRKG | | | DPAK (Pb−Free) | 2500 Units / Reel |
| MC79M05CT | | | TO−220 | 50 Units / Rail |
| MC79M05CTG | | | TO−220 (Pb−Free) | 50 Units / Rail |
| MC79M08BDT | | $T_J$ = −40°C to +125°C | DPAK | 75 Units / Rail |
| MC79M08BDTRK | | | DPAK | 2500 Units / Reel |
| MC79M08BDTRKG | | | DPAK (Pb−Free) | 2500 Units / Reel |
| MC79M08BT | | | TO−220 | 50 Units / Rail |
| MC79M08BTG | | | TO−220 (Pb−Free) | 50 Units / Rail |
| MC79M08CDT | | $T_J$ = 0°C to +125°C | DPAK | 75 Units / Rail |
| MC79M08CDTG | | | DPAK (Pb−Free) | 75 Units / Rail |
| MC79M08CDTRK | | | DPAK | 2500 Units / Reel |
| MC79M08CDTRKG | | | DPAK (Pb−Free) | 2500 Units / Reel |
| MC79M08CT | | | TO−220 | 50 Units / Rail |
| MC79M08CTG | | | TO−220 (Pb−Free) | 50 Units / Rail |
| MC79M12BDT | | $T_J$ = −40°C to +125°C | DPAK | 75 Units / Rail |
| MC79M12BDTG | | | DPAK (Pb−Free) | 75 Units / Rail |
| MC79M12BDTRK | | | DPAK | 2500 Units / Reel |
| MC79M12BDTRKG | | | DPAK (Pb−Free) | 2500 Units / Reel |
| MC79M12BT | | | TO−220 | 50 Units / Rail |
| MC79M12BTG | | | TO−220 (Pb−Free) | 50 Units / Rail |
| MC79M12CDT | | $T_J$ = 0°C to +125°C | DPAK | 75 Units / Rail |
| MC79M12CDTG | | | DPAK (Pb−Free) | 75 Units / Rail |
| MC79M12CDTRK | | | DPAK | 2500 Units / Reel |
| MC79M12CDTRKG | | | DPAK (Pb−Free) | 2500 Units / Reel |
| MC79M12CT | | | TO−220 | 50 Units / Rail |
| MC79M12CTG | | | TO−220 (Pb−Free) | 50 Units / Rail |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

**ORDERING INFORMATION**

| Device | Output Voltage Tolerance | Operating Temperature Range | Package | Shipping† |
|---|---|---|---|---|
| MC79M15BDT | 4.0% | $T_J$ = −40°C to +125°C | DPAK | 75 Units / Rail |
| MC79M15BDTG | | | DPAK (Pb−Free) | 75 Units / Rail |
| MC79M15BDTRK | | | DPAK | 2500 Units / Reel |
| MC79M15BDTRKG | | | DPAK (Pb−Free) | 2500 Units / Reel |
| MC79M15BT | | | TO−220 | 50 Units / Rail |
| MC79M15BTG | | | TO−220 (Pb−Free) | 50 Units / Rail |
| MC79M15CDT | | $T_J$ = 0°C to +125°C | DPAK | 75 Units / Rail |
| MC79M15CDTG | | | DPAK (Pb−Free) | 75 Units / Rail |
| MC79M15CDTRK | | | DPAK | 2500 Units / Reel |
| MC79M15CDTRKG | | | DPAK (Pb−Free) | 2500 Units / Reel |
| MC79M15CT | | | TO−220 | 50 Units / Rail |
| MC79M15CTG | | | TO−220 (Pb−Free) | 50 Units / Rail |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.