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 |

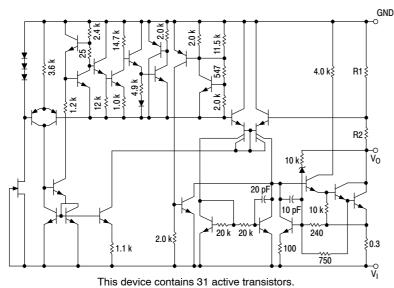


Figure 1. Representative Schematic Diagram

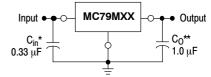


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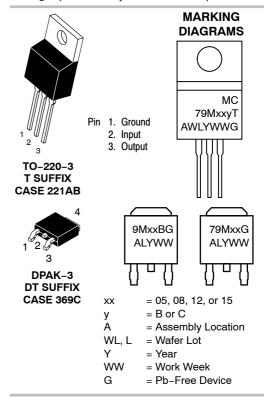
THREE-TERMINAL NEGATIVE FIXED VOLTAGE REGULATORS

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.



ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

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

| Rating | Symbol | Value | Unit |
|---|------------------|--------------------|------|
| Input Voltage | VI | -35 | Vdc |
| Power Dissipation | | | |
| Case 221A (TO-220-3) | | | |
| $T_A = 25^{\circ}C$ | PD | Internally Limited | W |
| Thermal Resistance, Junction-to-Ambient | θ_{JA} | 65 | °C/W |
| Thermal Resistance, Junction-to-Case | θ _{JC} | 5.0 | °C/W |
| Case 369C (DPAK-3) | | | |
| $T_A = 25^{\circ}C$ | P _D | Internally Limited | W |
| Thermal Resistance, Junction-to-Ambient | θ_{JA} | 92 | °C/W |
| Thermal Resistance, Junction-to-Case | θJC | 6.0 | °C/W |
| Storage Junction Temperature | T _{stg} | -65 to +150 | °C |
| Operating Junction Temperature Range | TJ | -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 | Тур | Max | Unit |
|--|--------------------------------|-------|------------|------------|-------|
| Output Voltage (T _J = 25° C) | V _O | -4.8 | -5.0 | -5.2 | Vdc |
| $ \begin{array}{l} \mbox{Line Regulation, } T_J = 25^\circ C \ (\mbox{Note 1}) \\ -7.0 \ \mbox{Vdc} \geq \mbox{V}_l \geq -25 \ \mbox{Vdc} \\ -8.0 \ \mbox{Vdc} \geq \mbox{V}_l \geq -18 \ \mbox{Vdc} \end{array} $ | Reg _{line} | | 7.0 2.0 | 50 30 | mV |
| Load Regulation, T_J = 25°C (Note 1) 5.0 mA $\leq I_O \leq$ 500 mA | Reg _{load} | - | 30 | 100 | mV |
| Output Voltage -7.0 Vdc \geq VI \geq -25 Vdc, 5.0 mA \leq IO \leq 350 mA | V _O | -4.75 | - | -5.25 | Vdc |
| Input Bias Current ($T_J = 25^{\circ}C$) | I _{IB} | - | 4.3 | 8.0 | mA |
| Input Bias Current Change -8.0 Vdc \geq V_l \geq -25 Vdc, I_O = 350 mA 5.0 mA \leq I_O \leq 350 mA, V_l = -10 V | ΔI _{IB} | | - | 0.4 0.4 | mA |
| Output Noise Voltage, T_A = 25°C, 10 Hz \leq f \leq 100 kHz | V _n | - | 40 | - | μV |
| Ripple Rejection (f = 120 Hz) | RR | 54 | 66 | - | dB |
| Dropout Voltage $I_{O} = 500 \text{ mA}, T_{J} = 25^{\circ}\text{C}$ | V _I –V _O | _ | 1.1 | _ | Vdc |
| Average Temperature Coefficient of Output Voltage I_{O} = 5.0 mA, 0°C \leq T_{J} \leq 125°C | $\Delta V_{O} / \Delta T$ | _ | 0.2 | _ | mV/°C |

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.
 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 (VI = -10 V, IO = 350 mA, Tlow to Thigh (Note 4), unless otherwise noted.)

| Characteristic | Symbol | Min | Тур | Max | Unit |
|---|--------------------------------|------|------------|------------|-------|
| Output Voltage (T _J = 25°C) | Vo | -7.7 | -8.0 | -8.3 | Vdc |
| $ \begin{array}{l} \mbox{Line Regulation, } T_J = 25^\circ C \ (\mbox{Note 3}) \\ -10.5 \ \mbox{Vdc} \geq V_I \geq -25 \ \mbox{Vdc} \\ -11 \ \ \mbox{Vdc} \geq V_I \geq -21 \ \ \mbox{Vdc} \\ \end{array} $ | Reg _{line} | | 5.0 3.0 | 80 50 | mV |
| Load Regulation, T _J = 25°C (Note 3) 5.0 mA \leq I _O \leq 500 mA | Reg _{load} | _ | 30 | 100 | mV |
| Output Voltage _10.5 Vdc \geq V _I \geq –25 Vdc, 5.0 mA \leq I _O \leq 350 mA | Vo | -7.6 | -8.0 | -8.4 | Vdc |
| Input Bias Current (T _J = 25°C) | I _{IB} | - | - | 8.0 | mA |
| Input Bias Current Change -10.5 Vdc \geq V _I \geq -25 Vdc, I _O = 350 mA 5.0 mA \leq I _O \leq 350 mA, V _I = -10 V | Δl _{IB} | | | 0.4 0.4 | mA |
| Output Noise Voltage, T_A = 25°C, 10 Hz \leq f \leq 100 kHz | V _n | - | 60 | - | μV |
| Ripple Rejection (f = 120 Hz) | RR | 54 | 63 | - | dB |
| Dropout Voltage $I_0 = 500 \text{ mA}, T_J = 25^{\circ}\text{C}$ | V _I –V _O | _ | 1.1 | _ | Vdc |
| Average Temperature Coefficient of Output Voltage I_{O} = 5.0 mA, 0°C \leq T_{J} \leq 125°C | $\Delta V_{O} / \Delta T$ | _ | 0.4 | _ | mV/°C |

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.
 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 | Тур | Max | Unit |
|--|--------------------------------|-------|------------|------------|-------|
| Output Voltage (T _J = 25°C) | Vo | -11.5 | -12 | -12.5 | Vdc |
| Line Regulation, $T_J = 25^{\circ}C$ (Note 5) -14.5 Vdc $\ge V_I \ge -30$ Vdc -15 Vdc $\ge V_I \ge -25$ Vdc | Reg _{line} | - | 5.0 3.0 | 80 50 | mV |
| Load Regulation, T _J = 25°C (Note 5) 5.0 mA \leq I _O \leq 500 mA | Reg _{load} | - | 30 | 240 | mV |
| Output Voltage $-14.5~Vdc \geq V_l \geq -30~Vdc,~5.0~mA \leq I_O \leq 350~mA$ | 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 -14.5 Vdc \geq V _I \geq -30 Vdc, I _O = 350 mA 5.0 mA \leq I _O \leq 350 mA, V _I = -19 V | Δl _{IB} | | | 0.4 0.4 | mA |
| Output Noise Voltage, T_A = 25°C, 10 Hz \leq f \leq 100 kHz | V _n | - | 75 | - | μV |
| Ripple Rejection (f = 120 Hz) | RR | 54 | 60 | - | dB |
| Dropout Voltage I _O = 500 mA, T _J = 25°C | V _I –V _O | - | 1.1 | - | Vdc |
| Average Temperature Coefficient of Output Voltage I_O = 5.0 mA, 0°C \leq T _J \leq 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

MC79M15B, C

ELECTRICAL CHARACTERISTICS (VI = -23 V, IO = 350 mA, Tlow to Thigh (Note 8), unless otherwise noted.)

| Characteristic | Symbol | Min | Тур | Max | Unit |
|---|--------------------------------|--------|------------|------------|-------|
| Output Voltage (T _J = 25° C) | Vo | -14.4 | -15 | -15.6 | Vdc |
| $ \begin{array}{l} \mbox{Line Regulation, } T_J = 25^\circ C \ (\mbox{Note 7}) \\ -17.5 \ \mbox{Vdc} \geq V_I \geq -30 \ \mbox{Vdc} \\ -18 \ \mbox{Vdc} \geq V_I \geq -28 \ \mbox{Vdc} \\ \end{array} $ | Reg _{line} | | 5.0 3.0 | 80 50 | mV |
| Load Regulation, T _J = 25°C (Note 7) 5.0 mA \leq I _O \leq 500 mA | Reg _{load} | _ | 30 | 240 | mV |
| Output Voltage _17.5 Vdc \geq V _I \geq –30 Vdc, 5.0 mA \leq I _O \leq 350 mA | Vo | -14.25 | - | -15.75 | Vdc |
| Input Bias Current ($T_J = 25^{\circ}C$) | I _{IB} | - | 4.4 | 8.0 | mA |
| Input Bias Current Change -17.5 Vdc \geq V _I \geq -30 Vdc, I _O = 350 mA 5.0 mA \leq I _O \leq 350 mA, V _I = -23 V | Δl _{IB} | | | 0.4 0.4 | mA |
| Output Noise Voltage, T_A = 25°C, 10 Hz \leq f \leq 100 kHz | V _n | - | 90 | - | μV |
| Ripple Rejection (f = 120 Hz) | RR | 54 | 60 | - | dB |
| Dropout Voltage $I_0 = 500 \text{ mA}, \text{ T}_J = 25^{\circ}\text{C}$ | V _I –V _O | _ | 1.1 | - | Vdc |
| Average Temperature Coefficient of Output Voltage I_{O} = 5.0 mA, 0°C \leq T_{J} \leq 125°C | $\Delta V_O / \Delta T$ | - | -1.0 | - | mV/°C |

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.
 B = T_{low} to T_{high}, -40°C < T_J < 125°C C = T_{low} to T_{high}, 0°C < T_J < 125°C

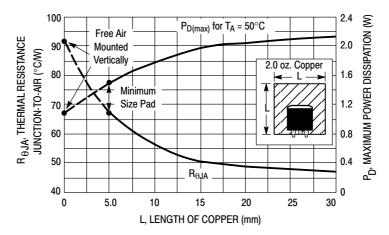


Figure 1. DPAK-3 Thermal Resistance and Maximum Power Dissipation versus P.C.B. Copper Length

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 10μ F. 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.

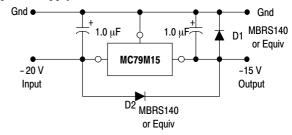


Figure 2. Protection Diodes

ORDERING INFORMATION

| Device | Output Voltage Tolerance | Operating Temperature Range | Package | Shipping [†] |
|---------------|-----------------------------|--|---------------------|-----------------------|
| MC79M05BDT | | | DPAK | 75 Units / Rail |
| MC79M05BDTG | | | DPAK (Pb-Free) | 75 Units / Rail |
| MC79M05BDTRK | | | DPAK | 2500 Units / Reel |
| MC79M05BDTRKG | | $T_J = -40^{\circ}C$ to $+125^{\circ}C$ | DPAK (Pb–Free) | 2500 Units / Reel |
| MC79M05BT | | | TO-220 | 50 Units / Rail |
| MC79M05BTG | | | TO-220 (Pb-Free) | 50 Units / Rail |
| MC79M05CDT | _ | | DPAK | 75 Units / Rail |
| MC79M05CDTG | | | DPAK (Pb-Free) | 75 Units / Rail |
| MC79M05CDTRK | | | DPAK | 2500 Units / Reel |
| MC79M05CDTRKG | | $T_J = 0^{\circ}C$ to +125°C | DPAK (Pb–Free) | 2500 Units / Reel |
| MC79M05CT | | | TO-220 | 50 Units / Rail |
| MC79M05CTG | | | TO-220 (Pb-Free) | 50 Units / Rail |
| MC79M08BDT | | | DPAK | 75 Units / Rail |
| MC79M08BDTRK | | | DPAK | 2500 Units / Reel |
| MC79M08BDTRKG | | $T_J = -40^{\circ}C$ to +125°C | DPAK (Pb–Free) | 2500 Units / Reel |
| MC79M08BT | | | TO-220 | 50 Units / Rail |
| MC79M08BTG | | | TO-220 (Pb-Free) | 50 Units / Rail |
| MC79M08CDT | 4.0% | | DPAK | 75 Units / Rail |
| MC79M08CDTG | 1.070 | | DPAK (Pb–Free) | 75 Units / Rail |
| MC79M08CDTRK | | | DPAK | 2500 Units / Reel |
| MC79M08CDTRKG | | $T_J = 0^{\circ}C \text{ to } +125^{\circ}C$ | DPAK (Pb–Free) | 2500 Units / Reel |
| MC79M08CT | | | TO-220 | 50 Units / Rail |
| MC79M08CTG | | | TO-220 (Pb-Free) | 50 Units / Rail |
| MC79M12BDT | | | DPAK | 75 Units / Rail |
| MC79M12BDTG | | | DPAK (Pb–Free) | 75 Units / Rail |
| MC79M12BDTRK | | | DPAK | 2500 Units / Reel |
| MC79M12BDTRKG | | $T_J = -40^{\circ}C$ to $+125^{\circ}C$ | DPAK (Pb–Free) | 2500 Units / Reel |
| MC79M12BT | | ľ | TO-220 | 50 Units / Rail |
| MC79M12BTG | | l l | TO-220 (Pb-Free) | 50 Units / Rail |
| MC79M12CDT | | | DPAK | 75 Units / Rail |
| MC79M12CDTG | | Ī | DPAK (Pb–Free) | 75 Units / Rail |
| MC79M12CDTRK | - | F | DPAK | 2500 Units / Reel |
| MC79M12CDTRKG | | $T_J = 0^{\circ}C$ to +125°C | DPAK (Pb-Free) | 2500 Units / Reel |
| MC79M12CT | | ľ | TO-220 | 50 Units / Rail |
| MC79M12CTG | | Ī | TO-220 (Pb-Free) | 50 Units / Rail |

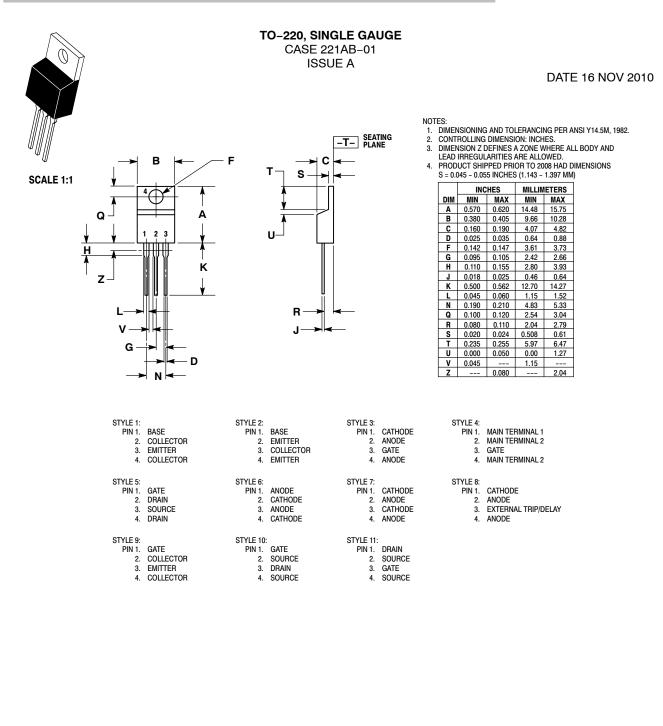
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

ORDERING INFORMATION

| Device | Output Voltage Tolerance | Operating Temperature Range | Package | Shipping† |
|---------------|-----------------------------|--|---------------------|-------------------|
| MC79M15BDT | | | DPAK | 75 Units / Rail |
| MC79M15BDTG | | | DPAK (Pb-Free) | 75 Units / Rail |
| MC79M15BDTRK | | | DPAK | 2500 Units / Reel |
| MC79M15BDTRKG | | $T_J = -40^{\circ}C$ to $+125^{\circ}C$ | DPAK (Pb–Free) | 2500 Units / Reel |
| MC79M15BT | | | TO-220 | 50 Units / Rail |
| MC79M15BTG | 1.00/ | | TO-220 (Pb-Free) | 50 Units / Rail |
| MC79M15CDT | 4.0% | | DPAK | 75 Units / Rail |
| MC79M15CDTG | | | DPAK (Pb–Free) | 75 Units / Rail |
| MC79M15CDTRK | | | DPAK | 2500 Units / Reel |
| MC79M15CDTRKG | | $T_J = 0^{\circ}C \text{ to } +125^{\circ}C$ | DPAK (Pb-Free) | 2500 Units / Reel |
| MC79M15CT | 1 | | 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.





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