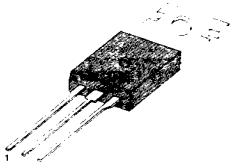
## 3-TERMINAL NEGATIVE VOLTAGE REGULATOR

The MC79XXC series of three-terminal negative regulators are available in TO-220 package and with several output voltages. They canprovides local on-card regulation, eliminating the distribution problems associated with single point regulation; furthermore, having the same voltage options as the MC78XXC positive standard series, they are particularly suited for split power supplies.

If adequate heat sinking is provided, the MC79XXC series can deliver an output current in excess of 1.5A. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

TO-220



1: GND 2: Input 3: Output



## FEATURES

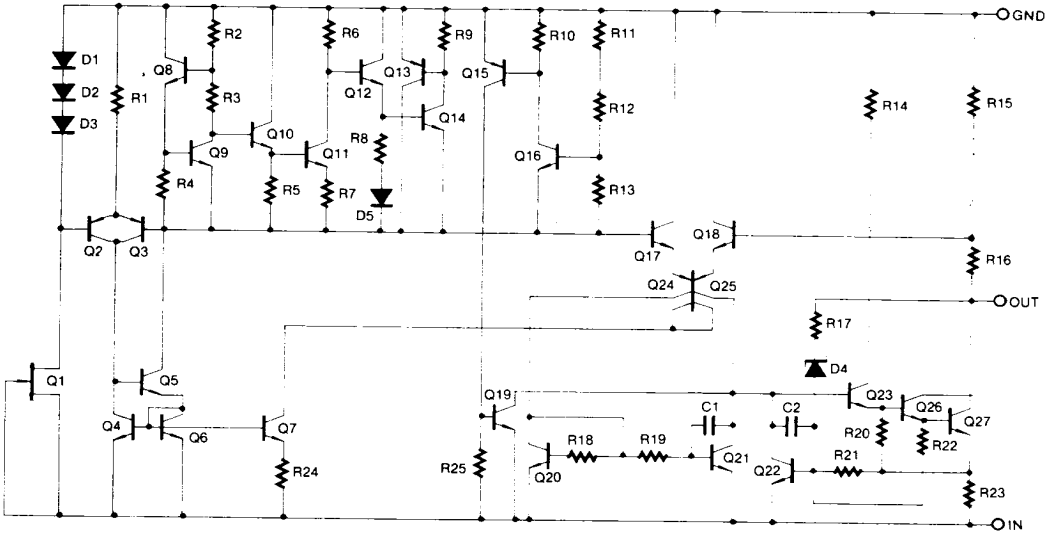
- **Output current in excess of 1A**
- **Output voltages of −2V, −5V, −6V, −8V, −12V, −15V, −18V, −24V**
- **Internal thermal overload protection**
- **Short circuit protection**
- **Output transistor safe-area compensation**

## ORDERING INFORMATION

| Device | Package | Operation Temperature |
|---|---|---|
| MC79XXCT | TO-220 | 0 ~ 125°C |
| **MC79XXIT | TO-220 | − 40 ~ 125°C |

** Under development

## SCHEMATIC DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Input Voltage (for $V_o$ = −2 to −18V)<br>(for $V_o$ = −24V) | $V_{IN}$ | −35<br>−40 | V<br>V |
| Thermal Resistance Junction-Case<br>Junction-Air | $\theta_{JC}$<br>$\theta_{JA}$ | 5<br>65 | °C/W<br>°C/W |
| Operating Temperature Range | $T_{opr}$ | 0 ~ +125 | °C |
| Storage Temperature Range | $T_{stg}$ | −65 ~ +150 | °C |

## ELECTRICAL CHARACTERISTICS MC7902C

($C_i$ = 2.2μF, $C_o$ = 1μF, $T_j$ = 0 to 125°C, $I_o$ = 500mA, $V_i$ = 10V, unless otherwise specified)

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output Voltage | $V_o$ | $T_j$ = 25°C | −1.92 | −2 | −2.08 | V |
| | | $I_o$ = 5mA to 1A $P_D \leq$ 15W<br>$V_i$ = −7 to −20V | −1.9 | −2 | −2.1 | |
| Line Regulation | $\triangle V_o$ | $T_j$ = 25°C, $V_i$ = −7 to −25V | | 10 | 40 | mV |
| | | $T_j$ = 25°C, $V_i$ = −8 to −12V | | 5 | 20 | |
| Load Regulation | $\triangle V_o$ | $T_j$ = 25°C<br>$I_o$ = 5mA to 1.5A | | 10 | 120 | mV |
| | | $T_j$ = 25°C<br>$I_o$ = 250 to 750mA | | 3 | 60 | |
| Quiescent Current | $I_d$ | $T_j$ = 25°C | | 3 | 6 | mA |
| Quiescent Current Change | $\triangle I_d$ | $I_o$ = 5mA to 1A | | | 0.5 | mA |
| | | $V_i$ = −7 to −25V | | | 1.3 | |
| Output Voltage Drift | $\frac{\triangle V_o}{\triangle T}$ | $I_o$ = 5mA | | −0.4 | | mV/°C |
| Output Noise Voltage | $V_N$ | f = 10Hz to 100KHz<br>$T_j$ = 25°C | | 40 | | μV |
| Ripple Rejection | RR | f = 120Hz<br>$\triangle V_i$ = 10V | 54 | 60 | | dB |
| Dropout Voltage | $V_D$ | $T_j$ = 25°C<br>$I_o$ = 1A | | 3.5 | | V |
| Short Circuit Current | $I_{sc}$ | $T_j$ = 25°C, $V_i$ = −35V | | 300 | | mA |
| Peak Current | $I_{peak}$ | $T_j$ = 25°C | | 2.2 | | A |

## ELECTRICAL CHARACTERISTICS MC7905C

($C_i = 2.2\mu F$, $C_o = 1\mu F$, $T_j = 0$ to $125°C$, $I_o = 500mA$, $V_i = 10V$, unless otherwise specified)

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output Voltage | $V_o$ | $T_j = 25°C$ | −4.8 | −5 | −5.2 | V |
| | | $I_o = 5mA$ to $1A$, $P_o \leq 15W$<br>$V_i = -8$ to $-20V$ | −4.75 | −5 | −5.25 | |
| Line Regulation | $\triangle V_o$ | $T_j = 25°C$, $V_i = -7$ to $-25V$ | | 10 | 100 | mV |
| | | $T_j = 25°C$, $V_i = -8$ to $-12V$ | | 5 | 50 | |
| Load Regulation | $\triangle V_o$ | $T_j = 25°C$<br>$I_o = 5mA$ to $1.5A$ | | 10 | 100 | mV |
| | | $T_j = 25°C$<br>$I_o = 250$ to $750mA$ | | 3 | 50 | |
| Quiescent Current | $I_d$ | $T_j = 25°C$ | | 3 | 6 | mA |
| Quiescent Current Change | $\triangle I_d$ | $I_o = 5mA$ to $1A$ | | | 0.5 | mA |
| | | $V_i = -8$ to $-25V$ | | | 1.3 | |
| Output Voltage Drift | $\frac{\triangle V_o}{\triangle T}$ | $I_o = 5mA$ | | −0.4 | | mV/°C |
| Output Noise Voltage | $V_N$ | $f = 10Hz$ to $100KHz$<br>$T_j = 25°C$ | | 100 | | μV |
| Ripple Rejection | RR | $f = 120Hz$<br>$\triangle V_i = 10V$ | 54 | 60 | | dB |
| Dropout Voltage | $V_D$ | $T_j = 25°C$<br>$I_o = 1A$ | | 2 | | V |
| Short Circuit Current | $I_{sc}$ | $T_j = 25°C$, $V_i = -35V$ | | 300 | | mA |
| Peak Current | $I_{peak}$ | $T_j = 25°C$ | | 2.2 | | A |

## ELECTRICAL CHARACTERISTICS MC7906C

($C_i = 2.2\mu F$, $C_o = 1\mu F$, $T_j = 0$ to 125°C, $I_o = 500mA$, $V_i = 11V$, unless otherwise specified)

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output Voltage | $V_o$ | $T_j = 25°C$ | −5.75 | −6 | −6.25 | V |
| | | $I_o = 5mA$ to 1A, $P_o \leq 15W$<br>$V_i = -9$ to $-21V$ | −5.7 | −6 | −6.3 | |
| Line Regulation | $\triangle V_o$ | $T_j = 25°C$, $V_i = -8$ to $-25V$ | | 10 | 120 | mV |
| | | $T_j = 25°C$, $V_i = -9$ to $-13V$ | | 5 | 60 | |
| Load Regulation | $\triangle V_o$ | $T_j = 25°C$<br>$I_o = 5mA$ to 1.5A | | 10 | 120 | mV |
| | | $T_j = 25°C$<br>$I_o = 250$ to 750mA | | 3 | 60 | |
| Quiescent Current | $I_d$ | $T_j = 25°C$ | | 3 | 6 | mA |
| Quiescent Current Change | $\triangle I_d$ | $I_o = 5mA$ to 1A | | | 0.5 | mA |
| | | $V_i = -9$ to $-25V$ | | | 1.3 | |
| Output Voltage Drift | $\frac{\triangle V_o}{\triangle T}$ | $I_o = 5mA$ | | −0.5 | | mV/°C |
| Output Noise Voltage | $V_N$ | $f = 10Hz$ to 100KHz<br>$T_j = 25°C$ | | 130 | | μV |
| Ripple Rejection | RR | $f = 120Hz$<br>$\triangle V_i = 10V$ | 54 | 60 | | dB |
| Dropout Voltage | $V_D$ | $T_j = 25°C$<br>$I_o = 1A$ | | 2 | | V |
| Short Circuit Current | $I_{sc}$ | $T_j = 25°C$, $V_i = -35V$ | | 300 | | mA |
| Peak Current | $I_{peak}$ | $T_j = 25°C$ | | 2.2 | | A |

## ELECTRICAL CHARACTERISTICS MC7908C

($C_i = 2.2\mu F$, $C_o = 1\mu F$, $T_j = 0$ to $125°C$, $I_o = 500mA$, $V_i = 14V$, unless otherwise specified)

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output Voltage | $V_o$ | $T_j = 25°C$ | -7.7 | -8 | -8.3 | V |
| | | $I_o = 5mA$ to $1A$, $P_o \leq 15W$<br>$V_i = -11.5$ to $-23V$ | -7.6 | -8 | -8.4 | |
| Line Regulation | $\triangle V_o$ | $T_j = 25°C$, $V_i = -10.5$ to $-25V$ | | 10 | 160 | mV |
| | | $T_j = 25°C$, $V_i = -11$ to $-17V$ | | 5 | 80 | |
| Load Regulation | $\triangle V_o$ | $T_j = 25°C$<br>$I_o = 5mA$ to $1.5A$ | | 12 | 160 | mV |
| | | $T_j = 25°C$<br>$I_o = 250$ to $750mA$ | | 4 | 80 | |
| Quiescent Current | $I_d$ | $T_j = 25°C$ | | 3 | 6 | mA |
| Quiescent Current Change | $\triangle I_d$ | $I_o = 5mA$ to $1A$ | | | 0.5 | mA |
| | | $V_i = -11.5$ to $-25V$ | | | 1 | |
| Output Voltage Drift | $\frac{\triangle V_o}{\triangle T}$ | $I_o = 5mA$ | | -0.6 | | mV/°C |
| Output Noise Voltage | $V_N$ | $f = 10Hz$ to $100KHz$<br>$T_j = 25°C$ | | 175 | | $\mu V$ |
| Ripple Rejection | RR | $f = 120Hz$<br>$\triangle V_i = 10V$ | 54 | 60 | | dB |
| Dropout Voltage | $V_D$ | $T_j = 25°C$<br>$I_o = 1A$ | | 2 | | V |
| Short Circuit Current | $I_{sc}$ | $T_j = 25°C$, $V_i = -35V$ | | 300 | | mA |
| Peak Current | $I_{peak}$ | $T_j = 25°C$ | | 2.2 | | A |

## ELECTRICAL CHARACTERISTICS MC7912C

($C_i = 2.2\mu F$, $C_o = 1\mu F$, $T_j = 0$ to $125°C$, $I_o = 500mA$, $V_i = 18V$, unless otherwise specified)

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output Voltage | $V_o$ | $T_j = 25°C$ | −11.5 | −12 | −12.5 | V |
| | | $I_o = 5mA$ to $1A$, $P_o \leq 15W$<br>$V_i = -15.5$ to $-27V$ | −11.4 | −12 | −12.6 | |
| Line Regulation | $\triangle V_o$ | $T_j = 25°C$, $V_i = -14.5$ to $-30V$ | | 12 | 240 | mV |
| | | $T_j = 25°C$, $V_i = -16$ to $-22V$ | | 6 | 120 | |
| Load Regulation | $\triangle V_o$ | $T_j = 25°C$<br>$I_o = 5mA$ to $1.5A$ | | 12 | 240 | mV |
| | | $T_j = 25°C$<br>$I_o = 250$ to $750mA$ | | 4 | 120 | |
| Quiescent Current | $I_d$ | $T_j = 25°C$ | | 3 | 6 | mA |
| Quiescent Current Change | $\triangle I_d$ | $I_o = 5mA$ to $1A$ | | | 0.5 | mA |
| | | $V_i = -15$ to $-30V$ | | | 1 | |
| Output Voltage Drift | $\frac{\triangle V_o}{\triangle T}$ | $I_o = 5mA$ | | −0.8 | | mV/°C |
| Output Noise Voltage | $V_N$ | $f = 10Hz$ to $100KHz$<br>$T_j = 25°C$ | | 200 | | $\mu V$ |
| Ripple Rejection | RR | $f = 120Hz$<br>$\triangle V_i = 10V$ | 54 | 60 | | dB |
| Dropout Voltage | $V_D$ | $T_j = 25°C$<br>$I_o = 1A$ | | 2 | | V |
| Short Circuit Current | $I_{sc}$ | $T_j = 25°C$, $V_i = -35V$ | | 300 | | mA |
| Peak Current | $I_{peak}$ | $T_j = 25°C$ | | 2.2 | | A |

## ELECTRICAL CHARACTERISTICS MC7915C

($C_i = 2.2\mu F$, $C_o = 1\mu F$, $T_j = 0$ to $125°C$, $I_o = 500mA$, $V_i = 23V$, unless otherwise specified)

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output Voltage | $V_o$ | $T_j = 25°C$ | −14.4 | −15 | −15.6 | V |
| | | $I_o = 5mA$ to $1A$, $P_o \leq 15W$<br>$V_i = -18$ to $-30V$ | −14.25 | −15 | −15.75 | |
| Line Regulation | $\triangle V_o$ | $T_j = 25°C$, $V_i = -17.5$ to $-30V$ | | 12 | 300 | mV |
| | | $T_j = 25°C$, $V_i = -20$ to $-26V$ | | 6 | 150 | |
| Load Regulation | $\triangle V_o$ | $T_j = 25°C$<br>$I_o = 5mA$ to $1.5A$ | | 12 | 300 | mV |
| | | $T_j = 25°C$<br>$I_o = 250$ to $750mA$ | | 4 | 150 | |
| Quiescent Current | $I_d$ | $T_j = 25°C$ | | 3 | 6 | mA |
| Quiescent Current Change | $\triangle I_d$ | $I_o = 5mA$ to $1A$ | | | 0.5 | mA |
| | | $V_i = -18.5$ to $-30V$ | | | 1 | |
| Output Voltage Drift | $\frac{\triangle V_o}{\triangle T}$ | $I_o = 5mA$ | | −0.9 | | mV/°C |
| Output Noise Voltage | $V_N$ | $f = 10Hz$ to $100KHz$<br>$T_j = 25°C$ | | 250 | | μV |
| Ripple Rejection | RR | $f = 120Hz$<br>$\triangle V_i = 10V$ | 54 | 60 | | dB |
| Dropout Voltage | $V_D$ | $T_j = 25°C$<br>$I_o = 1A$ | | 2 | | V |
| Short Circuit Current | $I_{sc}$ | $T_j = 25°C$, $V_i = -35V$ | | 300 | | mA |
| Peak Current | $I_{peak}$ | $T_j = 25°C$ | | 2.2 | | A |

## ELECTRICAL CHARACTERISTICS MC7918C

($C_i = 2.2\mu F$, $C_o = 1\mu F$, $T_j = 0$ to $125°C$, $I_o = 500mA$, $V_i = 27V$, unless otherwise specified)

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output Voltage | $V_o$ | $T_j = 25°C$ | −17.3 | −18 | −18.7 | V |
| | | $I_o = 5mA$ to $1A$, $P_o \leq 15W$<br>$V_i = -22.5$ to $-33V$ | −17.1 | −18 | −18.9 | |
| Line Regulation | $\triangle V_o$ | $T_j = 25°C$, $V_i = -21$ to $-33V$ | | 15 | 360 | mV |
| | | $T_j = 25°C$, $V_i = -24$ to $-30V$ | | 8 | 180 | |
| Load Regulation | $\triangle V_o$ | $T_j = 25°C$<br>$I_o = 5mA$ to $1.5A$ | | 15 | 360 | mV |
| | | $T_j = 25°C$<br>$I_o = 250$ to $750mA$ | | 5 | 180 | |
| Quiescent Current | $I_d$ | $T_j = 25°C$ | | 3 | 6 | mA |
| Quiescent Current Change | $\triangle I_d$ | $I_o = 5mA$ to $1A$ | | | 0.5 | mA |
| | | $V_i = -22$ to $-33V$ | | | 1 | |
| Output Voltage Drift | $\frac{\triangle V_o}{\triangle T}$ | $I_o = 5mA$ | | −1 | | mV/°C |
| Output Noise Voltage | $V_N$ | $f = 10Hz$ to $100KHz$<br>$T_j = 25°C$ | | 300 | | μV |
| Ripple Rejection | RR | $f = 120Hz$<br>$\triangle V_i = 10V$ | 54 | 60 | | dB |
| Dropout Voltage | $V_D$ | $T_j = 25°C$<br>$I_o = 1A$ | | 2 | | V |
| Short Circuit Current | $I_{sc}$ | $T_j = 25°C$, $V_i = -35V$ | | 300 | | mA |
| Peak Current | $I_{peak}$ | $T_j = 25°C$ | | 2.2 | | A |

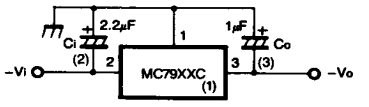
## ELECTRICAL CHARACTERISTICS MC7924C

($C_i = 2.2\mu F$, $C_o = 1\mu F$, $T_j = 0$ to $125°C$, $I_o = 500mA$, $V_i = 33V$, unless otherwise specified)

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output Voltage | $V_o$ | $T_j = 25°C$ | −23 | −24 | −25 | V |
| | | $I_o = 5mA$ to $1A$, $P_o \leq 15W$, $V_i = -27$ to $-38V$ | −22.8 | −24 | −25.2 | |
| Line Regulation | $\triangle V_o$ | $T_j = 25°C$, $V_i = -27$ to $-38V$ | | 15 | 480 | mV |
| | | $T_j = 25°C$, $V_i = -30$ to $-36V$ | | 8 | 240 | |
| Load Regulation | $\triangle V_o$ | $T_j = 25°C$, $I_o = 5mA$ to $1.5A$ | | 15 | 480 | mV |
| | | $T_j = 25°C$, $I_o = 250$ to $750mA$ | | 5 | 240 | |
| Quiescent Current | $I_d$ | $T_j = 25°C$ | | 3 | 6 | mA |
| Quiescent Current Change | $\triangle I_d$ | $I_o = 5mA$ to $1A$ | | | 0.5 | mA |
| | | $V_i = -27$ to $-38V$ | | | 1 | |
| Output Voltage Drift | $\frac{\triangle V_o}{\triangle T}$ | $I_o = 5mA$ | | −1 | | mV/°C |
| Output Noise Voltage | $V_N$ | $f = 10Hz$ to $100KHz$, $T_j = 25°C$ | | 400 | | μV |
| Ripple Rejection | RR | $f = 120Hz$, $\triangle V_i = 10V$ | 54 | 60 | | dB |
| Dropout Voltage | $V_D$ | $T_j = 25°C$, $I_o = 1A$ | | 2 | | V |
| Short Circuit Current | $I_{sc}$ | $T_j = 25°C$, $V_i = -35V$ | | 300 | | mA |
| Peak Current | $I_{peak}$ | $T_j = 25°C$ | | 2.2 | | A |

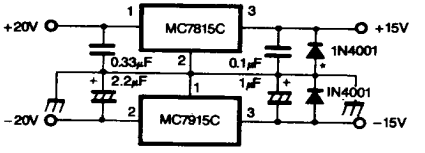
## APPLICATION INFORMATION

Fig. 1 — Fixed output regulator



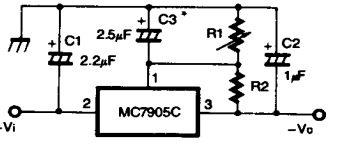

**Notes:**
(1) To specify an output voltage, substitute voltage value for "XXC".
(2) Required for stability. For value given, capacitor must be solid tantalum. If aluminium electrolitics are used, at least ten times value shown should be selected. Ci is required if regulator is located an appreciable distance from power supply filter.
(3) To improve transient response. If large capacitors are used, a high current diode from input to output (1N4001 or similar) should be introduced to protect the device from momentary input short circuit.

Fig. 2 — Split power supply (±15V/1A)




* Against potential latch-up problems.

Fig. 3 — Circuit for increasing output voltage




$$V_o = V_{XX} \cdot \frac{R1 + R2}{R2}$$

$V_{XX}/R2 > 3\ I_d$

* C3 optional for improved transient response and ripple rejection.

Fig. 4 — High current negative regulator (−5V/4A with 5A current limiting)

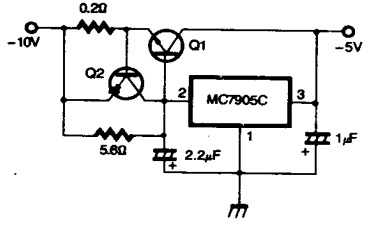
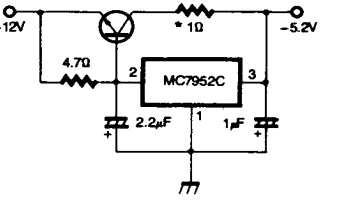



Fig. 5 — Typical ECL system power supply (−5.2V/4A)




* Optional dropping resistor to reduce the power dissipated in the boost transistor.