

MC79XX/LM79XX

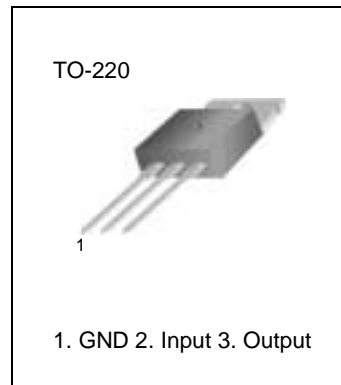
3-terminal 1A negative voltage regulator

Features

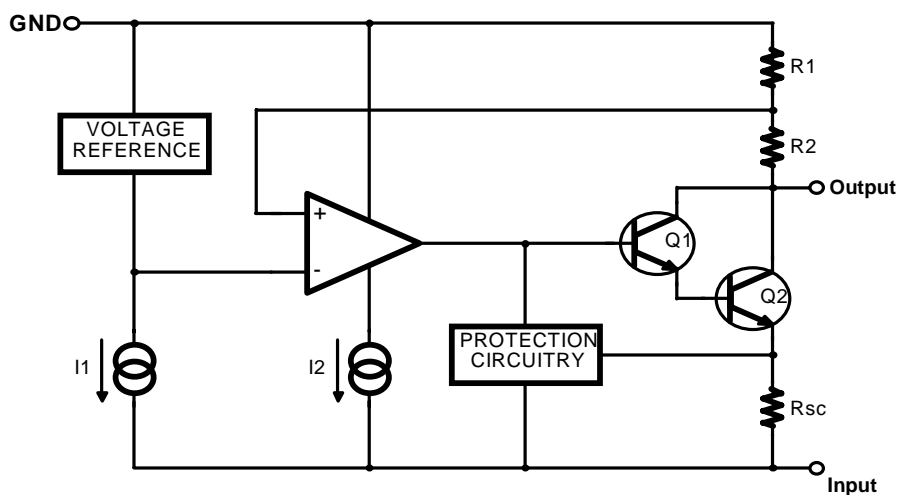
- Output Current in Excess of 1A
- Output Voltages of -5, -6, -8, -9, -12, -15, -18, -24V
- Internal Thermal Overload Protection
- Short Circuit Protection
- Output Transistor Safe Operating area Compensation

Description

The MC79XX/LM79XX series of three-terminal negative regulators are available in TO-220 package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut-down and safe operating area protection, making it essentially indestructible.



Internal Block Diagram



Absolute Maximum Ratings

| Parameter | Symbol | Value | Unit |
|--|------------------------------------|-------------|-----------------------------|
| Input Voltage | V_I | -35 | V |
| Thermal Resistance Junction-Cases Junction-Air | $R_{\theta JC}$ $R_{\theta JA}$ | 5 65 | $^{\circ}\text{C}/\text{W}$ |
| Operating Temperature Range | TOPR | 0 ~ +125 | $^{\circ}\text{C}$ |
| Storage Temperature Range | TSTG | - 65 ~ +150 | $^{\circ}\text{C}$ |

Electrical Characteristics (MC7905/LM7905)

($V_I = -10\text{V}$, $I_O = 500\text{mA}$, $0^{\circ}\text{C} \leq T_J \leq +125^{\circ}\text{C}$, $C_I = 2.2\mu\text{F}$, $C_O = 1\mu\text{F}$, unless otherwise specified.)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit | |
|----------------------------------|-------------------------|---|---|-------|--------|------------------------|----|
| Output Voltage | V_O | $T_J = +25^{\circ}\text{C}$ | - 4.8 | - 5.0 | - 5.2 | V | |
| | | $I_O = 5\text{mA}$ to 1A, $P_{O} \leq 15\text{W}$ $V_I = -7$ to -20V | - 4.75 | -5.0 | - 5.25 | | |
| Line Regulation | ΔV_O | $T_J = +25^{\circ}\text{C}$ | $V_I = -7$ to -20V $I_O = 1\text{A}$ | - | 5 | 50 | mV |
| | | | $V_I = -8$ to -12V $I_O = 1\text{A}$ | - | 2 | 25 | |
| | | $V_I = -7.5$ to -25V | - | 7 | 50 | | |
| | | $V_I = -8$ to -12V $I_O = 1\text{A}$ | - | 7 | 50 | | |
| Load Regulation | ΔV_O | $T_J = +25^{\circ}\text{C}$ $I_O = 5\text{mA}$ to 1.5A | - | 10 | 100 | mV | |
| | | $T_J = +25^{\circ}\text{C}$ $I_O = 250$ to 750mA | - | 3 | 50 | | |
| Quiescent Current | I_Q | $T_J = +25^{\circ}\text{C}$ | - | 3 | 6 | mA | |
| Quiescent Current Change | ΔI_Q | $I_O = 5\text{mA}$ to 1A | - | 0.05 | 0.5 | mA | |
| | | $V_I = -8$ to -25V | - | 0.1 | 0.8 | | |
| Temperature Coefficient of V_D | $\Delta V_O / \Delta T$ | $I_O = 5\text{mA}$ | - | - 0.4 | - | mV/ $^{\circ}\text{C}$ | |
| Output Noise Voltage | V_N | $f = 10\text{Hz}$ to 100KHz $T_A = +25^{\circ}\text{C}$ | - | 40 | - | μV | |
| Ripple Rejection | RR | $f = 120\text{Hz}$ $\Delta V_I = 10\text{V}$ | 54 | 60 | - | dB | |
| Dropout Voltage | V_D | $T_J = +25^{\circ}\text{C}$ $I_O = 1\text{A}$ | - | 2 | - | V | |
| Short Circuit Current | I_{SC} | $T_J = +25^{\circ}\text{C}$, $V_I = -35\text{V}$ | - | 300 | - | mA | |
| Peak Current | I_{PK} | $T_J = +25^{\circ}\text{C}$ | - | 2.2 | - | A | |

- Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Electrical Characteristics (MC7906)

($V_I = -11V$, $I_O = 500mA$, $0^\circ C \leq T_J \leq +125^\circ C$, $C_I = 2.2\mu F$, $C_O = 1\mu F$, unless otherwise specified.)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit | |
|----------------------------------|-------------------------|---|--------------------|------|--------|----------------|----|
| Output Voltage | V_O | $T_J = +25^\circ C$ | - 5.75 | - 6 | - 6.25 | V | |
| | | $I_O = 5mA$ to 1A, $P_O \leq 15W$ $V_I = -9$ to -21V | - 5.7 | - 6 | - 6.3 | | |
| Line Regulation | ΔV_O | $T_J = +25^\circ C$ | $V_I = -8$ to -25V | - | 10 | 120 | mV |
| | | | $V_I = -9$ to -12V | - | 5 | 60 | |
| Load Regulation | ΔV_O | $T_J = +25^\circ C$ $I_O = 5mA$ to 1.5A | - | 10 | 120 | mV | |
| | | $T_J = +25^\circ C$ $I_O = 250$ to 750mA | - | 3 | 60 | | |
| Quiescent Current | I_Q | $T_J = +25^\circ C$ | - | 3 | 6 | mA | |
| Quiescent Current Change | ΔI_Q | $I_O = 5mA$ to 1A | - | - | 0.5 | mA | |
| | | $V_I = -9$ to -25V | - | - | 1.3 | | |
| Temperature Coefficient of V_D | $\Delta V_O / \Delta T$ | $I_O = 5mA$ | - | -0.5 | - | mV/ $^\circ C$ | |
| Output Noise Voltage | V_N | $f = 10Hz$ to 100KHz $T_A = +25^\circ C$ | - | 130 | - | μV | |
| Ripple Rejection | RR | $f = 120Hz$ $\Delta V_I = 10V$ | 54 | 60 | - | dB | |
| Dropout Voltage | V_D | $T_J = +25^\circ C$ $I_O = 1A$ | - | 2 | - | V | |
| Short Circuit Current | I_{SC} | $T_J = +25^\circ C$, $V_I = -35V$ | - | 300 | - | mA | |
| Peak Current | I_{PK} | $T_J = +25^\circ C$ | - | 2.2 | - | A | |

- Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Electrical Characteristics (MC7908)

($V_I = -14V$, $I_O = 500mA$, $0^\circ C \leq T_J \leq +125^\circ C$, $C_I = 2.2\mu F$, $C_O = 1\mu F$, unless otherwise specified.)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit | |
|----------------------------------|-------------------------|--|-----------------------|------|-------|----------------|----|
| Output Voltage | V_O | $T_J = +25^\circ C$ | - 7.7 | - 8 | - 8.3 | V | |
| | | $I_O = 5mA$ to 1A, $P_O \leq 15W$ $V_I = -10$ to -23V | - 7.6 | - 8 | - 8.4 | | |
| Line Regulation | ΔV_O | $T_J = +25^\circ C$ | $V_I = -10.5$ to -25V | - | 10 | 100 | mV |
| | | | $V_I = -11$ to -17V | - | 5 | 80 | |
| Load Regulation | ΔV_O | $T_J = +25^\circ C$ $I_O = 5mA$ to 1.5A | - | 12 | 160 | mV | |
| | | $T_J = +25^\circ C$ $I_O = 250$ to 750mA | - | 4 | 80 | | |
| Quiescent Current | I_Q | $T_J = +25^\circ C$ | - | 3 | 6 | mA | |
| Quiescent Current Change | ΔI_Q | $I_O = 5mA$ to 1A | - | 0.05 | 0.5 | mA | |
| | | $V_I = -11.5$ to -25V | - | 0.1 | 1 | | |
| Temperature Coefficient of V_D | $\Delta V_O / \Delta T$ | $I_O = 5mA$ | - | -0.6 | - | mV/ $^\circ C$ | |
| Output Noise Voltage | V_N | $f = 10Hz$ to 100KHz $T_A = +25^\circ C$ | - | 175 | - | μV | |
| Ripple Rejection | RR | $f = 120Hz$ $\Delta V_I = 10V$ | 54 | 60 | - | dB | |
| Dropout Voltage | V_D | $T_J = +25^\circ C$ $I_O = 1A$ | - | 2 | - | V | |
| Short Circuit Current | I_{SC} | $T_J = +25^\circ C$, $V_I = -35V$ | - | 300 | - | mA | |
| Peak Current | I_{PK} | $T_J = +25^\circ C$ | - | 2.2 | - | A | |

- Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Electrical Characteristics (MC7912)

($V_I = -18V, I_O = 500mA, 0^\circ C \leq T_J \leq +125^\circ C, C_I = 2.2\mu F, C_O = 1\mu F$, unless otherwise specified.)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit | |
|----------------------------------|-------------------------|--|-----------------------|------|-------|----------------|----|
| Output Voltage | V_O | $T_J = +25^\circ C$ | -11.5 | -12 | -12.5 | V | |
| | | $I_O = 5mA$ to 1A, $P_O \leq 15W$ $V_I = -15.5$ to -27V | -11.4 | -12 | -12.6 | | |
| Line Regulation | ΔV_O | $T_J = +25^\circ C$ | $V_I = -14.5$ to -30V | - | 12 | 240 | mV |
| | | | $V_I = -16$ to -22V | - | 6 | 120 | |
| Load Regulation | ΔV_O | $T_J = +25^\circ C$ $I_O = 5mA$ to 1.5A | - | 12 | 240 | mV | |
| | | $T_J = +25^\circ C$ $I_O = 250$ to 750mA | - | 4 | 120 | | |
| Quiescent Current | I_Q | $T_J = +25^\circ C$ | - | 3 | 6 | mA | |
| Quiescent Current Change | ΔI_Q | $I_O = 5mA$ to 1A | - | 0.05 | 0.5 | mA | |
| | | $V_I = -15$ to -30V | - | 0.1 | 1 | | |
| Temperature Coefficient of V_D | $\Delta V_O / \Delta T$ | $I_O = 5mA$ | - | -0.8 | - | mV/ $^\circ C$ | |
| Output Noise Voltage | V_N | $f = 10Hz$ to 100KHz $T_A = +25^\circ C$ | - | 200 | - | μV | |
| Ripple Rejection | RR | $f = 120Hz$ $\Delta V_I = 10V$ | 54 | 60 | - | dB | |
| Dropout Voltage | V_D | $T_J = +25^\circ C$ $I_O = 1A$ | - | 2 | - | V | |
| Short Circuit Current | I_{SC} | $T_J = +25^\circ C, V_I = -35V$ | - | 300 | - | mA | |
| Peak Current | I_{PK} | $T_J = +25^\circ C$ | - | 2.2 | - | A | |

- Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Electrical Characteristics (MC7915)

($V_I = -23V$, $I_O = 500mA$, $0^\circ C \leq T_J \leq +125^\circ C$, $C_I = 2.2\mu F$, $C_O = 1\mu F$, unless otherwise specified.)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit | |
|----------------------------------|-------------------------|--|-----------------------|------|--------|----------------|----|
| Output Voltage | V_O | $T_J = +25^\circ C$ | -14.4 | -15 | -15.6 | V | |
| | | $I_O = 5mA$ to 1A, $P_O \leq 15W$ $V_I = -18$ to -30V | -14.25 | -15 | -15.75 | | |
| Line Regulation | ΔV_O | $T_J = +25^\circ C$ | $V_I = -17.5$ to -30V | - | 12 | 300 | mV |
| | | | $V_I = -20$ to -26V | - | 6 | 150 | |
| Load Regulation | ΔV_O | $T_J = +25^\circ C$ $I_O = 5mA$ to 1.5A | - | 12 | 300 | mV | |
| | | $T_J = +25^\circ C$ $I_O = 250$ to 750mA | - | 4 | 150 | | |
| Quiescent Current | I_Q | $T_J = +25^\circ C$ | - | 3 | 6 | mA | |
| Quiescent Current Change | ΔI_Q | $I_O = 5mA$ to 1A | - | 0.05 | 0.5 | mA | |
| | | $V_I = -18.5$ to -30V | - | 0.1 | 1 | | |
| Temperature Coefficient of V_D | $\Delta V_O / \Delta T$ | $I_O = 5mA$ | - | -0.9 | - | mV/ $^\circ C$ | |
| Output Noise Voltage | V_N | $f = 10Hz$ to 100KHz $T_A = +25^\circ C$ | - | 250 | - | μV | |
| Ripple Rejection | RR | $f = 120Hz$ $\Delta V_I = 10V$ | 54 | 60 | - | dB | |
| Dropout Voltage | V_D | $T_J = +25^\circ C$ $I_O = 1A$ | - | 2 | - | V | |
| Short Circuit Current | I_{SC} | $T_J = +25^\circ C$, $V_I = -35V$ | - | 300 | - | mA | |
| Peak Current | I_{PK} | $T_J = +25^\circ C$ | - | 2.2 | - | A | |

- Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Electrical Characteristics (MC7918)

($V_I = -27V$, $I_O = 500mA$, $0^\circ C \leq T_J \leq +125^\circ C$, $C_I = 2.2\mu F$, $C_O = 1\mu F$, unless otherwise specified.)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit | |
|----------------------------------|-------------------------|--|---------------------|------|-------|----------------|----|
| Output Voltage | V_O | $T_J = +25^\circ C$ | -17.3 | -18 | -18.7 | V | |
| | | $I_O = 5mA$ to 1A, $P_O \leq 15W$ $V_I = -22.5$ to -33V | -17.1 | -18 | -18.9 | | |
| Line Regulation | ΔV_O | $T_J = +25^\circ C$ | $V_I = -21$ to -33V | - | 15 | 360 | mV |
| | | | $V_I = -24$ to -30V | - | 8 | 180 | |
| Load Regulation | ΔV_O | $T_J = +25^\circ C$ $I_O = 5mA$ to 1.5A | - | 15 | 360 | mV | |
| | | $T_J = +25^\circ C$ $I_O = 250$ to 750mA | - | 5 | 180 | | |
| Quiescent Current | I_Q | $T_J = +25^\circ C$ | - | 3 | 6 | mA | |
| Quiescent Current Change | ΔI_Q | $I_O = 5mA$ to 1A | - | - | 0.5 | mA | |
| | | $V_I = -22$ to -33V | - | - | 1 | | |
| Temperature Coefficient of V_D | $\Delta V_O / \Delta T$ | $I_O = 5mA$ | - | -1 | - | mV/ $^\circ C$ | |
| Output Noise Voltage | V_N | $f = 10Hz$ to 100KHz $T_A = +25^\circ C$ | - | 300 | - | μV | |
| Ripple Rejection | RR | $f = 120Hz$ $\Delta V_I = 10V$ | 54 | 60 | - | dB | |
| Dropout Voltage | V_D | $T_J = +25^\circ C$ $I_O = 1A$ | - | 2 | - | V | |
| Short Circuit Current | I_{SC} | $T_J = +25^\circ C$, $V_I = -35V$ | - | 300 | - | mA | |
| Peak Current | I_{PK} | $T_J = +25^\circ C$ | - | 2.2 | - | A | |

- Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Electrical Characteristics (MC7924)

($V_I = -33V$, $I_O = 500mA$, $0^\circ C \leq T_J \leq +125^\circ C$, $C_I = 2.2\mu F$, $C_O = 1\mu F$, unless otherwise specified.)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit | |
|----------------------------------|-------------------------|--|---------------------|------|--------|----------------|----|
| Output Voltage | V_O | $T_J = +25^\circ C$ | - 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 | ΔV_O | $T_J = +25^\circ C$ | $V_I = -27$ to -38V | - | 15 | 480 | mV |
| | | | $V_I = -30$ to -36V | - | 8 | 180 | |
| Load Regulation | ΔV_O | $T_J = +25^\circ C$ $I_O = 5mA$ to 1.5A | - | 15 | 480 | mV | |
| | | $T_J = +25^\circ C$ $I_O = 250$ to 750mA | - | 5 | 240 | | |
| Quiescent Current | I_Q | $T_J = +25^\circ C$ | - | 3 | 6 | mA | |
| Quiescent Current Change | ΔI_Q | $I_O = 5mA$ to 1A | - | - | 0.5 | mA | |
| | | $V_I = -27$ to -38V | - | - | 1 | | |
| Temperature Coefficient of V_D | $\Delta V_O / \Delta T$ | $I_O = 5mA$ | - | -1 | - | mV/ $^\circ C$ | |
| Output Noise Voltage | V_N | $f = 10Hz$ to 100KHz $T_A = +25^\circ C$ | - | 400 | - | μV | |
| Ripple Rejection | RR | $f = 120Hz$ $\Delta V_I = 10V$ | 54 | 60 | - | dB | |
| Dropout Voltage | V_D | $T_J = +25^\circ C$ $I_O = 1A$ | - | 2 | - | V | |
| Short Circuit Current | I_{SC} | $T_J = +25^\circ C$, $V_I = -35V$ | - | 300 | - | mA | |
| Peak Current | I_{PK} | $T_J = +25^\circ C$ | - | 2.2 | - | A | |

- Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Typical Performance Characteristics

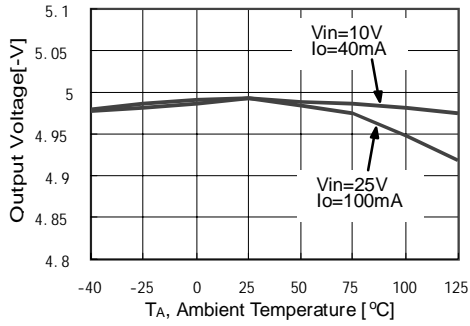


Figure 1. Output Voltage

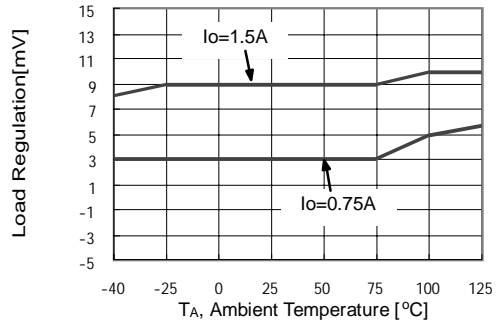


Figure 2. Load Regulation

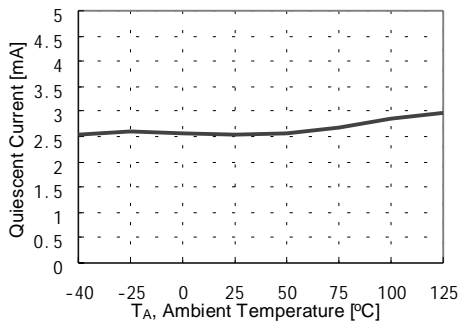


Figure 3. Quiescent Current

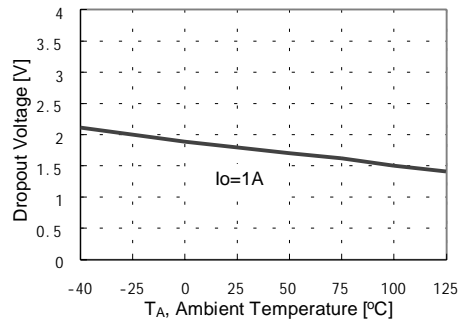


Figure 4. Dropout Voltage

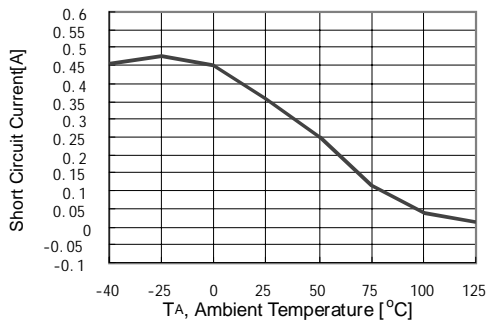


Figure 5. Short Circuit Current

Typical Applications

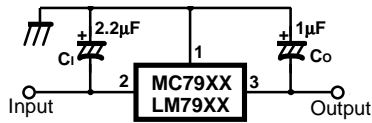


Figure 6. Negative Fixed output regulator

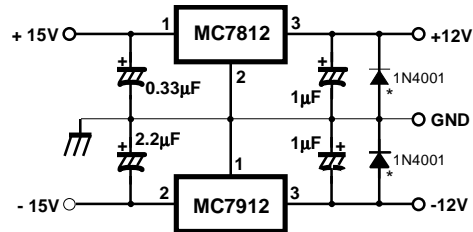


Figure 7. Split power supply ($\pm 12V/1A$)†

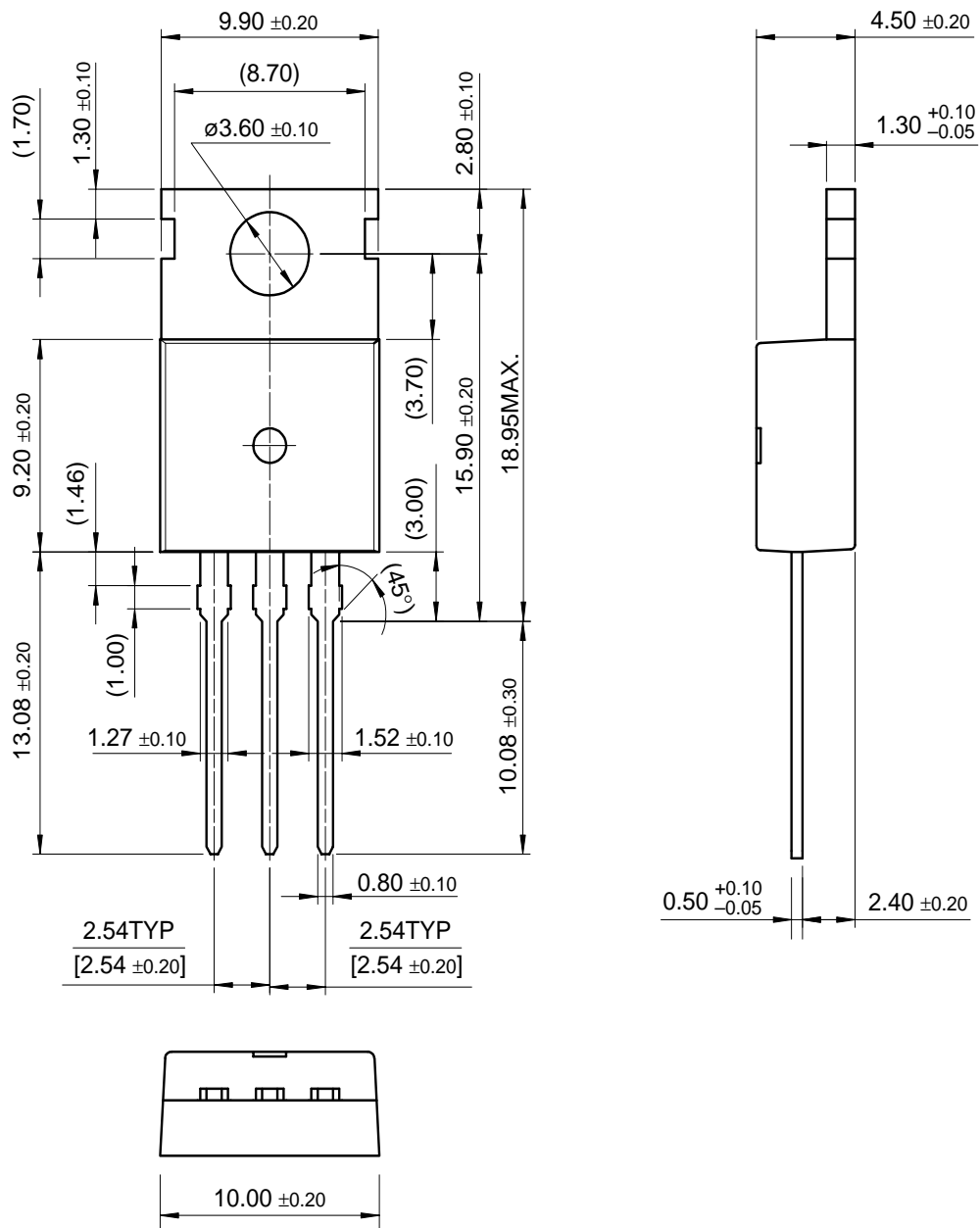
Notes:

- (1) To specify an output voltage, substitute voltage value for "XX "
- (2) Required for stability. For value given, capacitor must be solid tantalum. If aluminium electronics 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.

Mechanical Dimensions

Package

TO-220



Ordering Information

| Product Number | Output Voltage Tolerance | Package | Operating Temperature |
|----------------|--------------------------|---------|-----------------------|
| LM7905CT | ±4% | TO-220 | 0 ~ + 125°C |

| Product Number | Output Voltage Tolerance | Package | Operating Temperature |
|----------------|--------------------------|---------|-----------------------|
| MC7905CT | ±4% | TO-220 | 0 ~ + 125°C |
| MC7906CT | | | |
| MC7908CT | | | |
| MC7912CT | | | |
| MC7915CT | | | |
| MC7918CT | | | |
| MC7924CT | | | |

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