

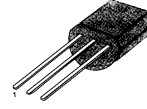
3-TERMINAL 0.1A POSITIVE VOLTAGE REGULATORS

The MC78LXX series of fixed voltage monolithic integrated circuit voltage regulators are suitable for application that required supply up to 100mA.

FEATURES

- Maximum Output Current of 100mA
- Output Voltage of 5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V and 24V
- Thermal Overload Protection
- Short Circuit Current Limiting
- Output Voltage Offered in $\pm 5\%$ Tolerance

TO-92



1: Output 2: GND 3: Input

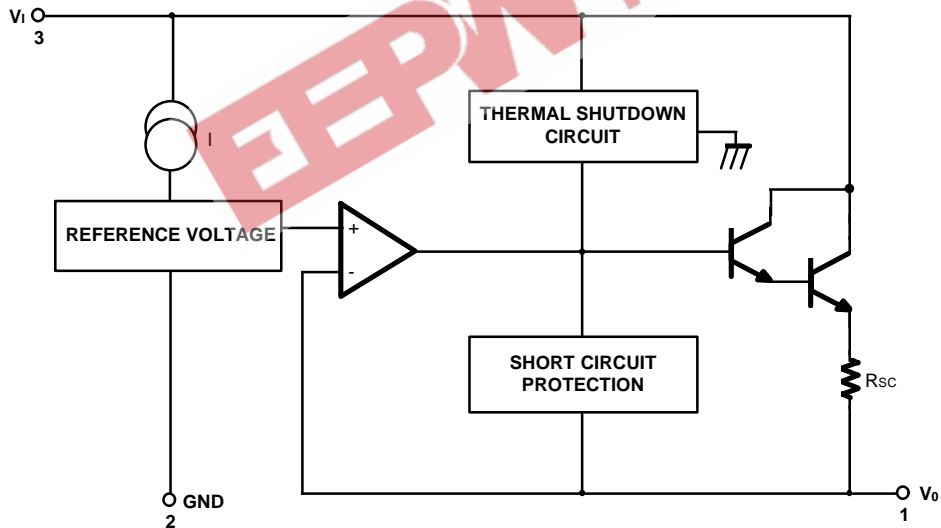
8 SOP



1: Output 2: GND 3: GND 4: NC
5: NC 6: GND 7: GND 8: Input

ORDERING INFORMATION

| Device | Package | Operating Temperature |
|-------------------------------------|---------|-----------------------|
| MC78LXXACP (LM78LXXACZ) (KA78LXXAZ) | TO-92 | - 45 ~ + 125°C |
| MC78LXXACD (KA78LXXAD) | 8 SOP | 0 ~ + 125°C |

BLOCK DIAGRAM

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$, unless otherwise specified)

| Characteristic | Symbol | Value | Unit |
|--|------------------|------------|------------------|
| Input Voltage (for $V_O = 5\text{V}, 8\text{V}$) (for $V_O = 12\text{V}, 15\text{V}$) | V_I | 30 | V |
| | | 35 | V |
| Operating Junction Temperature Range | T_J | 0 ~ +150 | $^\circ\text{C}$ |
| Storage Temperature Range | T_{STG} | -65 ~ +150 | $^\circ\text{C}$ |

LM78L05 ELECTRICAL CHARACTERISTICS

($V_I = 10\text{V}$, $I_O = 40\text{mA}$, $0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $C_I = 0.33\ \mu\text{F}$, $C_O = 0.1\ \mu\text{F}$, unless otherwise specified. (Note 1))

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Unit |
|----------------------------------|-----------------------|--|---|-------|------|----------------------------|
| Output Voltage | V_O | $T_J = 25^\circ\text{C}$ | 4.8 | 5.0 | 5.2 | V |
| Line Regulation | ΔV_O | $T_J = 25^\circ\text{C}$ | $7\text{V} \leq V_I \leq 20\text{V}$ | 8 | 150 | mV |
| | | | $8\text{V} \leq V_I \leq 20\text{V}$ | 6 | 100 | mV |
| Load Regulation | ΔV_O | $T_J = 25^\circ\text{C}$ | $1\text{mA} \leq I_O \leq 100\text{mA}$ | 11 | 60 | mV |
| | | | $1\text{mA} \leq I_O \leq 40\text{mA}$ | 5.0 | 30 | mV |
| Output Voltage | V_O | $7\text{V} \leq V_I \leq 0\text{V}$ | | | 5.25 | V |
| | | $7\text{V} \leq V_I \leq V_{\text{MAX}}$ (Note 2) | $1\text{mA} \leq I_O \leq 40\text{mA}$ | 4.75 | 5.25 | V |
| Quiescent Current | I_Q | $T_J = 25^\circ\text{C}$ | | 2.0 | 5.5 | mA |
| Quiescent Current Change | with line | $8\text{V} \leq V_I \leq 20\text{V}$ | | | 1.5 | mA |
| | with load | | | | | |
| Output Noise Voltage | V_N | $T_A = 25^\circ\text{C}$, $10\text{Hz} \leq f \leq 100\text{kHz}$ | | 40 | | $\mu\text{V}/V_O$ |
| Temperature Coefficient of V_O | $\Delta V_O/\Delta T$ | $I_O = 5\text{mA}$ | | -0.65 | | $\text{mV}/^\circ\text{C}$ |
| Ripple Rejection | RR | $f = 120\text{Hz}$, $8\text{V} \leq V_I \leq 18\text{V}$, $T_J = 25^\circ\text{C}$ | 41 | 80 | | dB |
| Dropout Voltage | V_D | $T_J = 25^\circ\text{C}$ | | 1.7 | | V |

LM78L06 ELECTRICAL CHARACTERISTICS(V_I = 12V, I_O = 40mA, 0°C ≤ T_J ≤ 125°C, C_I = 0.33μF, C_O = 0.1μF, unless otherwise specified. (Note 1))

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Unit | |
|---|---------------------|---|------------------------------|-----------------------------|------|-------------------|-----|
| Output Voltage | V _O | T _J = 25°C | 5.75 | 6.0 | 6.25 | V | |
| Line Regulation | ΔV _O | T _J = 25°C | 8.5V < V _I < 20V | | 64 | 175 | mV |
| | | | 9V ≥ V _I ≥ 20V | | 54 | 125 | mV |
| Load Regulation | ΔV _O | T _J = 25°C | 1mA < I _O < 100mA | | 12.8 | 80 | mV |
| | | | 1mA < I _O < 70mA | | 5.8 | 40 | mV |
| Output Voltage | V _O | 8.5 < V _I < 20V, 1mA < I _O < 40mA | 5.7 | | 6.3 | V | |
| | | 8.5 < V _I < V _{MAX} (Note), 1mA < I _O < 70mA | 5.7 | | 6.3 | | |
| Quiescent Current | I _Q | T _J = 25°C | | 3.9 | 6.0 | mA | |
| | | T _J = 125°C | | | 5.5 | | |
| Quiescent Current Change | with line | ΔI _Q | 9 < V _I < 20V | | 1.5 | mA | |
| | with load | | | 1mA < I _O < 40mA | | | 0.1 |
| Output Noise Voltage | V _N | T _A = 25°C, 10Hz < f < 100KHz | | 40 | | μV/V _O | |
| Temperature Coefficient of V _O | ΔV _O /ΔT | I _O = 5mA | | 0.75 | | mV/°C | |
| Ripple Rejection | RR | f = 120Hz, 10V < V _I < 20V, T _J = 25°C | 40 | 46 | | dB | |
| Dropout Voltage | V _D | T _J = 25°C | | 1.7 | | V | |

LM78L08 ELECTRICAL CHARACTERISTICS(V_I = 14V, I_O = 40mA, 0°C ≤ T_J ≤ 125°C, C_I = 0.33 μF, C_O = 0.1μF, unless otherwise specified. (Note 1))

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Unit | |
|---|---------------------|---|------------------------------|-----------------------------|-----|-------------------|-----|
| Output Voltage | V _O | T _J = 25°C | 7.7 | 8.0 | 8.3 | V | |
| Line Regulation | ΔV _O | T _J = 25°C | 10.5V ≤ V _I ≤ 23V | | 10 | 175 | mV |
| | | | 11V ≤ V _I ≤ 23V | | 8 | 125 | mV |
| Load Regulation | ΔV _O | T _J = 25°C | 1mA ≤ I _O ≤ 100mA | | 15 | 80 | mV |
| | | | 1mA ≤ I _O ≤ 40mA | | 8.0 | 40 | mV |
| Output Voltage | V _O | 10.5V ≤ V _I ≤ 23V 10.5V ≤ V _I ≤ V _{MAX} (Note 2) | 1mA ≤ I _O ≤ 40mA | 7.6 | | 8.4 | V |
| | | | 1mA ≤ I _O ≤ 70mA | 7.6 | | 8.4 | V |
| Quiescent Current | I _Q | T _J = 25°C | | 2.0 | 5.5 | mA | |
| Quiescent Current Change | with line | ΔI _Q | 11V ≤ V _I ≤ 23V | | 1.5 | mA | |
| | with load | | | 1mA ≤ I _O ≤ 40mA | | | 0.1 |
| Output Noise Voltage | V _N | T _A = 25°C, 10Hz ≤ f ≤ 100KHz | | 60 | | μV/V _O | |
| Temperature Coefficient of V _O | ΔV _O /ΔT | I _O = 5mA | | -0.8 | | mV/°C | |
| Ripple Rejection | RR | f = 120Hz, 11V ≤ V _I ≤ 21V, T _J = 25°C | 39 | 70 | | dB | |
| Dropout Voltage | V _D | T _J = 25°C | | 1.7 | | V | |

LM78L09 ELECTRICAL CHARACTERISTICS(V_I = 15V, I_O = 40mA, 0°C ≤ T_J ≤ 125°C, C_I = 0.33 μF, C_O = 0.1 μF, unless otherwise specified. (Note 1))

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Unit | |
|---|---------------------|--|------------------------------|-----------------------------|------|-------------------|----|
| Output Voltage | V _O | T _J = 25°C | 8.64 | 9.0 | 9.36 | V | |
| Line Regulation | ΔV _O | T _J = 25°C | 11.5V ≤ V _I ≤ 24V | | 90 | 200 | mV |
| | | | 13V ≤ V _I ≤ 24V | | 100 | 150 | mV |
| Load Regulation | ΔV _O | T _J = 25°C | 1mA ≤ I _O ≤ 100mA | | 20 | 90 | mV |
| | | | 1mA ≤ I _O ≤ 40mA | | 10 | 45 | mV |
| Output Voltage | V _O | 11.5V ≤ V _I ≤ 24V | 1mA ≤ I _O ≤ 40mA | 8.55 | | 9.45 | V |
| | | 11.5V ≤ V _I ≤ V _{MAX} (Note 2) | 1mA ≤ I _O ≤ 70mA | 8.55 | | 9.45 | V |
| Quiescent Current | I _Q | T _J = 25°C | | 2.1 | 6.0 | mA | |
| Quiescent Current Change | with line | ΔI _Q | 13V ≤ V _I ≤ 24V | | 1.5 | mA | |
| | with load | | | 1mA ≤ I _O ≤ 40mA | | 0.1 | mA |
| Output Noise Voltage | V _N | T _A = 25°C, 10Hz ≤ f ≤ 100KHz | | 70 | | μV/V _O | |
| Temperature Coefficient of V _O | ΔV _O /ΔT | I _O = 5mA | | -0.9 | | mV/°C | |
| Ripple Rejection | RR | f = 120Hz, 12V ≤ V _I ≤ 22V, T _J = 25°C | 38 | 44 | | dB | |
| Dropout Voltage | V _D | T _J = 25°C | | 1.7 | | V | |

LM78L10 ELECTRICAL CHARACTERISTICS(V_I = 16V, I_O = 40mA, 0°C < T_J < 125°C, C_I = 0.33 μF, C_O = 0.1 μF, unless otherwise specified. (Note 1))

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Unit | |
|---|---------------------|--|------------------------------|-----------------------------|------|-------------------|-----|
| Output Voltage | V _O | T _J = 25°C | 9.6 | 10.0 | 10.4 | V | |
| Line Regulation | ΔV _O | T _J = 25°C | 12.5 < V _I < 25V | | 100 | 220 | mV |
| | | | 14V ≥ V _I ≥ 25V | | 100 | 170 | mV |
| Load Regulation | ΔV _O | T _J = 25°C | 1mA < I _O < 100mA | | 20 | 94 | mV |
| | | | 1mA < I _O < 70mA | | 10 | 47 | mV |
| Output Voltage | V _O | 12.5 < V _I < 25V, 1mA < I _O < 40mA | 9.5 | | 10.5 | V | |
| | | 12.5 < V _I < V _{MAX} (Note), 1mA < I _O < 70mA | 9.5 | | 10.5 | | |
| Quiescent Current | I _Q | T _J = 25°C | | 4.2 | 6.5 | mA | |
| | | T _J = 125°C | | | 6.0 | | |
| Quiescent Current Change | with line | ΔI _Q | 12.5 < V _I < 25V | | 1.5 | mA | |
| | with load | | | 1mA < I _O < 40mA | | | 0.1 |
| Output Noise Voltage | V _N | T _A = 25°C, 10Hz < f < 100KHz | | 74 | | μV/V _O | |
| Temperature Coefficient of V _O | ΔV _O /ΔT | I _O = 5mA | | 0.95 | | mV/°C | |
| Ripple Rejection | RR | f = 120Hz, 15V < V _I < 25V, T _J = 25°C | 38 | 43 | | dB | |
| Dropout Voltage | V _D | T _J = 25°C | | 1.7 | | V | |

LM78L12 ELECTRICAL CHARACTERISTICS(V_I = 19V, I_O = 40mA, 0°C ≤ T_J ≤ 125°C, C_I = 0.33 μF, C_O = 0.1 μF, unless otherwise specified. (Note 1))

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Unit | |
|---|---------------------|---|------------------------------|------|------|-------------------|-----------------------------|
| Output Voltage | V _O | T _J = 25 °C | 11.5 | 12 | 12.5 | V | |
| Line Regulation | ΔV _O | T _J = 25 °C | 14.5V ≤ V _I ≤ 27V | | 20 | 250 | mV |
| | | | 16V ≤ V _I ≤ 27V | | 15 | 200 | mV |
| Load Regulation | ΔV _O | T _J = 25 °C | 1mA ≤ I _O ≤ 100mA | | 20 | 100 | mV |
| | | | 1mA ≤ I _O ≤ 40mA | | 10 | 50 | mV |
| Output Voltage | V _O | 14.5V ≤ V _I ≤ 27V | 1mA ≤ I _O ≤ 40mA | 11.4 | | 12.6 | V |
| | | 14.5V ≤ V _I ≤ V _{MAX} (Note 2) | 1mA ≤ I _O ≤ 70mA | 11.4 | | 12.6 | V |
| Quiescent Current | I _Q | T _J = 25 °C | | 2.1 | 6.0 | mA | |
| Quiescent Current Change | with line | 16V ≤ V _I ≤ 27V | | | 1.5 | mA | |
| | with load | | | | | | 1mA ≤ I _O ≤ 40mA |
| Output Noise Voltage | V _N | T _A = 25 °C, 10Hz ≤ f ≤ 100KHz | | 80 | | μV/V _O | |
| Temperature Coefficient of V _O | ΔV _O /ΔT | I _O = 5mA | | -1.0 | | mV/°C | |
| Ripple Rejection | RR | f = 120Hz, 15V ≤ V _I ≤ 25V, T _J = 25 °C | 37 | 65 | | dB | |
| Dropout Voltage | V _D | T _J = 25 °C | | 1.7 | | V | |

LM78L15 ELECTRICAL CHARACTERISTICS(V_I = 23V, I_O = 40mA, 0°C ≤ T_J ≤ 125°C, C_I = 0.33 μF, C_O = 0.1 μF, unless otherwise specified. (Note 1))

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Unit | |
|---|---------------------|---|------------------------------|-------|------|-------------------|-----------------------------|
| Output Voltage | V _O | T _J = 25 °C | 14.4 | 15 | 15.6 | V | |
| Line Regulation | ΔV _O | T _J = 25 °C | 17.5V ≤ V _I ≤ 30V | | 25 | 300 | mV |
| | | | 20V ≤ V _I ≤ 30V | | 20 | 250 | mV |
| Load Regulation | ΔV _O | T _J = 25 °C | 1mA ≤ I _O ≤ 100mA | | 25 | 150 | mV |
| | | | 1mA ≤ I _O ≤ 40mA | | 12 | 75 | mV |
| Output Voltage | V _O | 17.5V ≤ V _I ≤ 30V | 1mA ≤ I _O ≤ 40mA | 14.25 | | 15.75 | V |
| | | 17.5V ≤ V _I ≤ V _{MAX} (Note 2) | 1mA ≤ I _O ≤ 70mA | 14.25 | | 15.75 | V |
| Quiescent Current | I _Q | T _J = 25 °C | | 2.1 | 6.0 | mA | |
| Quiescent Current Change | with line | 20V ≤ V _I ≤ 30V | | | 1.5 | mA | |
| | with load | | | | | | 1mA ≤ I _O ≤ 40mA |
| Output Noise Voltage | V _N | T _A = 25 °C, 10Hz ≤ f ≤ 100KHz | | 90 | | μV/V _O | |
| Temperature Coefficient of V _O | ΔV _O /ΔT | I _O = 5mA | | -1.3 | | mV/°C | |
| Ripple Rejection | RR | f = 120Hz, 18.5V ≤ V _I ≤ 28.5V, T _J = 25 °C | 34 | 60 | | dB | |
| Dropout Voltage | V _D | T _J = 25 °C | | 1.7 | | V | |

LM78L18 ELECTRICAL CHARACTERISTICS(V_I = 27V, I_O = 40mA, 0°C ≤ T_J ≤ 125°C, C_I = 0.33 μF, C_O = 0.1 μF, unless otherwise specified. (Note 1))

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Unit | |
|---|---------------------|---|------------------------------|------|------|-------------------|-----------------------------|
| Output Voltage | V _O | T _J = 25 °C | 17.3 | 18 | 18.7 | V | |
| Line Regulation | ΔV _O | T _J = 25 °C | 21V ≤ V _I ≤ 33V | | 145 | 300 | mV |
| | | | 22V ≤ V _I ≤ 33V | | 135 | 250 | mV |
| Load Regulation | ΔV _O | T _J = 25 °C | 1mA ≤ I _O ≤ 100mA | | 30 | 170 | mV |
| | | | 1mA ≤ I _O ≤ 40mA | | 15 | 85 | mV |
| Output Voltage | V _O | 21V ≤ V _I ≤ 33V | 1mA ≤ I _O ≤ 40mA | 17.1 | | 18.9 | V |
| | | 21V ≤ V _I ≤ V _{MAX} (Note 2) | 1mA ≤ I _O ≤ 70mA | 17.1 | | 18.9 | V |
| Quiescent Current | I _Q | T _J = 25 °C | | 2.2 | 6.0 | mA | |
| Quiescent Current Change | with line | 21V ≤ V _I ≤ 33V | | | 1.5 | mA | |
| | with load | | | | | | 1mA ≤ I _O ≤ 40mA |
| Output Noise Voltage | V _N | T _A = 25 °C, 10Hz ≤ f ≤ 100KHz | | 150 | | μV/V _O | |
| Temperature Coefficient of V _O | ΔV _O /ΔT | I _O = 5mA | | -1.8 | | mV/°C | |
| Ripple Rejection | RR | f = 120Hz, 23V ≤ V _I ≤ 33V, T _J = 25 °C | 34 | 48 | | dB | |
| Dropout Voltage | V _D | T _J = 25 °C | | 1.7 | | V | |

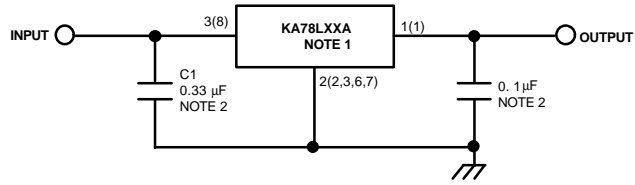
LM78L24 ELECTRICAL CHARACTERISTICS(V_I = 33V, I_O = 40mA, 0°C ≤ T_J ≤ 125°C, C_I = 0.33 μF, C_O = 0.1 μF, unless otherwise specified. (Note 1))

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Unit | |
|---|---------------------|---|------------------------------|------|-----|-------------------|-----------------------------|
| Output Voltage | V _O | T _J = 25 °C | 23 | 24 | 25 | V | |
| Line Regulation | ΔV _O | T _J = 25 °C | 27V ≤ V _I ≤ 38V | | 160 | 300 | mV |
| | | | 28V ≤ V _I ≤ 38V | | 150 | 250 | mV |
| Load Regulation | ΔV _O | T _J = 25 °C | 1mA ≤ I _O ≤ 100mA | | 40 | 200 | mV |
| | | | 1mA ≤ I _O ≤ 40mA | | 20 | 100 | mV |
| Output Voltage | V _O | 27V ≤ V _I ≤ 38V | 1mA ≤ I _O ≤ 40mA | 22.8 | | 25.2 | V |
| | | 27V ≤ V _I ≤ V _{MAX} (Note 2) | 1mA ≤ I _O ≤ 70mA | 22.8 | | 25.2 | V |
| Quiescent Current | I _Q | T _J = 25 °C | | 2.2 | 6.0 | mA | |
| Quiescent Current Change | with line | 28V ≤ V _I ≤ 38V | | | 1.5 | mA | |
| | with load | | | | | | 1mA ≤ I _O ≤ 40mA |
| Output Noise Voltage | V _N | T _A = 25 °C, 10Hz ≤ f ≤ 100KHz | | 200 | | μV/V _O | |
| Temperature Coefficient of V _O | ΔV _O /ΔT | I _O = 5mA | | -2.0 | | mV/°C | |
| Ripple Rejection | RR | f = 120Hz, 28V ≤ V _I ≤ 38V, T _J = 25 °C | 34 | 45 | | dB | |
| Dropout Voltage | V _D | T _J = 25 °C | | 1.7 | | V | |

Notes

- The maximum steady state usable output current and input voltage are very dependent on the heat sinking and/or lead length of the package. The data above represent pulse test conditions with junction temperature as indicated at the initiation of tests.
- Power dissipation ≤ 0.75W.

TYPICAL APPLICATION



'(') : 8SOP Type

Notes

1. To specify an output voltage, substitute voltage value for "XX".
2. Bypass Capacitors are recommend for optimum stability and transient response and should be located as close as possible to the regulator

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