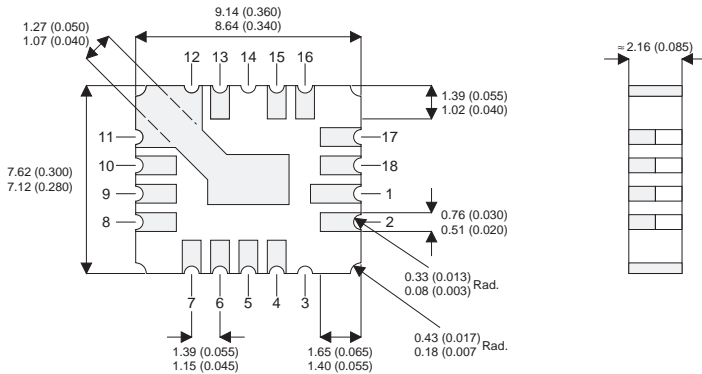


**0.5 AMP
 POSITIVE
 VOLTAGE REGULATOR
 IN A CERAMIC SURFACE
 MOUNT PACKAGE**



Pins 4,5 – V_{IN}
 6,7,8,9,10,11,12,13 – V_{OUT}
 Pins 15,16,17,18,1,2 – GND

FEATURES

- OUTPUT CURRENT UP TO 0.5A
- OUTPUT VOLTAGES OF 5, 12, 15V
- 0.01% / V LINE REGULATION
- 0.3% / A LOAD REGULATION
- THERMAL OVERLOAD PROTECTION
- SHORT CIRCUIT PROTECTION
- OUTPUT TRANSISTOR SOA PROTECTION
- 1% VOLTAGE TOLERANCE (–A VERSIONS)

DESCRIPTION

The IP78M00A series of voltage regulators are fixed output regulators intended for local, on-card voltage regulation. These devices are available in 5, 12, and 15 volt options and are capable of delivering in excess of 500mA over temperature.

The A-suffix devices are fully specified at 0.5A, provide 0.01% / V line regulation, 0.3% / A load regulation, and $\pm 1\%$ output voltage tolerance at room temperature. Protection features include safe operating area, current limiting and thermal shutdown.

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ unless otherwise stated)

| | | | |
|-----------|--------------------------------------|----------------------------------|--------------------|
| V_I | DC Input Voltage | (for $V_O = 5, 12, 15\text{V}$) | 35V |
| I_O | Output Current | | Internally limited |
| P_D | Power Dissipation | | Internally limited |
| T_J | Operating Junction Temperature Range | | –55 to 150°C |
| T_{stg} | Storage Temperature | | –65 to 150°C |

ELECTRICAL CHARACTERISTICS

| Parameter | Test Conditions | IP78M05A-LCC4 | | | IP78M05-LCC4 | | | Units |
|---|--|--|------|------|--------------|------|------|------------------------------------|
| | | Min. | Typ. | Max. | Min. | Typ. | Max. | |
| V_O Output Voltage | $I_O = 100\text{mA}$ $V_{IN} = 10\text{V}$ | 4.95 | 5 | 5.05 | 4.8 | 5 | 5.2 | V |
| | $I_O = 5\text{mA to } 350\text{mA}$ $P_D \leq P_{MAX}$ $V_{IN} = 7.5\text{V to } 20\text{V}$ $T_J = -55\text{ to } 150^\circ\text{C}$ | 4.85 | | 5.15 | 4.75 | | 5.25 | |
| ΔV_O Line Regulation | $I_O = 200\text{mA}$ $V_{IN} = 7\text{V to } 25\text{V}$ $V_{IN} = 8\text{V to } 25\text{V}$ $T_J = -55\text{ to } 150^\circ\text{C}$ | 3 | 10 | | 50 | mV | | |
| | | 3 | 10 | | 25 | | | |
| | $I_O = 500\text{mA}$ $V_{IN} = 8\text{V to } 12\text{V}$ | 3 | 10 | | 50 | | | |
| ΔV_O Load Regulation | $I_O = 5\text{mA to } 500\text{mA}$ $V_{IN} = 10\text{V}$ $T_J = -55\text{ to } 150^\circ\text{C}$ | | 5 | 50 | | 50 | mV | |
| I_Q Quiescent Current | $V_{IN} = 10\text{V}$ $I_O = 350\text{mA}$ $T_J = -55\text{ to } 150^\circ\text{C}$ | | 4 | 6 | | 4 | 6 | mA |
| ΔI_Q Quiescent Current Change | $I_O = 5\text{mA to } 500\text{mA}$ $V_{IN} = 10\text{V}$ $T_J = -55\text{ to } 150^\circ\text{C}$ | | 0.1 | 0.5 | | | 0.5 | mA |
| | $I_O = 200\text{mA}$ $V_{IN} = 8\text{V to } 25\text{V}$ $T_J = -55\text{ to } 150^\circ\text{C}$ | | 0.2 | 0.8 | | | 0.8 | |
| V_N Output Noise Voltage | $f = 10\text{Hz to } 100\text{kHz}$ | | 40 | 200 | | 40 | 200 | μV |
| $\frac{\Delta V_{IN}}{\Delta V_O}$ Ripple Rejection | $f = 120\text{Hz}$ $V_{IN} = 8\text{V to } 18\text{V}$ | $I_O = 300\text{mA}$ | 65 | 80 | 62 | | | dB |
| | | $I_O = 100\text{mA}$ $T_J = -55\text{ to } 150^\circ\text{C}$ | 65 | 80 | 62 | | | |
| Dropout Voltage | $I_O = 350\text{mA}$ | | 2 | 2.5 | | | 2.5 | V |
| I_{SC} Short Circuit Current | $V_{IN} = 35\text{V}$ | | 300 | 600 | | 300 | 600 | mA |
| I_{pk} Peak Output Current | $V_{IN} = 10\text{V}$ | 0.7 | 1.0 | 1.4 | 0.7 | 1.0 | 1.6 | A |
| Average Temperature Coefficient of V_O | $I_O = 5\text{mA}$ | | 0.5 | 2.0 | | 0.5 | | $\frac{\text{mV}}{^\circ\text{C}}$ |
| $R_{\theta JC}$ Thermal Resistance Junction to Case | | | | 13 | | | 13 | $^\circ\text{C/W}$ |

1) All characteristics are measured with a capacitor across the input of $0.22\mu\text{F}$ and a capacitor across the output of $0.1\mu\text{F}$.

All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ($t_p \leq 10\text{ms}$, $\delta \leq 5\%$). Output voltage changes due to changes in internal temperature must be taken into account separately.

ELECTRICAL CHARACTERISTICS

| Parameter | Test Conditions | IP78M12A-LCC4 | | | IP78M12-LCC4 | | | Unit |
|--|--|---|------|-------|--------------|------|-------|---------|
| | | Min. | Typ. | Max. | Min. | Typ. | Max. | |
| V _O Output Voltage | I _O = 100mA V _{IN} = 19V | 11.88 | 12 | 12.12 | 11.50 | 12 | 12.50 | V |
| | I _O = 5mA to 350mA P _D ≤ P _{MAX} V _{IN} = 14.8V to 27V T _J = -55 to 150°C | 11.64 | | 12.36 | 11.40 | | 12.60 | |
| ΔV _O Line Regulation | I _O = 200mA V _{IN} = 14.5V to 30V V _{IN} = 16V to 30V T _J = -55 to 150°C | | 4 | 18 | | | 60 | mV |
| | | | 4 | 18 | | | 30 | |
| | I _O = 500mA V _{IN} = 16V to 22V | | 4 | 18 | | | 120 | |
| ΔV _O Load Regulation | I _O = 5mA to 500mA V _{IN} = 19V T _J = -55 to 150°C | | 10 | 60 | | | 120 | mV |
| I _Q Quiescent Current | V _{IN} = 19V I _O = 350mA T _J = -55 to 150°C | | 4 | 6 | | 4 | 6 | mA |
| ΔI _Q Quiescent Current Change | I _O = 5mA to 500mA V _{IN} = 19V T _J = -55 to 150°C | | 0.1 | 0.5 | | | 0.5 | mA |
| | I _O = 200mA V _{IN} = 14.8V to 30V T _J = -55 to 150°C | | 0.2 | 0.8 | | | 0.8 | |
| V _N Output Noise Voltage | f = 10Hz to 100kHz | | 75 | 480 | | 75 | 480 | μV |
| ΔV _{IN} / ΔV _O Ripple Rejection | f = 120Hz V _{IN} = 15V to 25V | I _O = 300mA | 58 | 72 | | | 55 | dB |
| | | I _O = 100mA T _J = -55 to 150°C | 58 | 72 | | | 55 | |
| Dropout Voltage | I _O = 350mA | | 2 | 2.5 | | | 2.5 | V |
| I _{sc} Short Circuit Current | V _{IN} = 35V | | 300 | 600 | | 300 | 600 | mA |
| I _{pk} Peak Output Current | V _{IN} = 19V | 0.7 | 1.0 | 1.4 | 0.7 | 1.0 | 1.6 | A |
| Average Temperature Coefficient of V _O | I _O = 5mA | | 1.2 | 4.8 | | 1.2 | | mV / °C |
| R _{θJC} Thermal Resistance Junction to Case | | | | 13 | | | 13 | °C/W |

1) All characteristics are measured with a capacitor across the input of 0.22μF and a capacitor across the output of 0.1μF.

All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques (t_p ≤ 10ms, δ ≤ 5%). Output voltage changes due to changes in internal temperature must be taken into account separately.

ELECTRICAL CHARACTERISTICS

| Parameter | Test Conditions | IP78M15A-LCC4 | | | IP78M15-LCC4 | | | Units |
|---|--|--|------|-------|--------------|------|-------|------------------------------------|
| | | Min. | Typ. | Max. | Min. | Typ. | Max. | |
| V_O Output Voltage | $I_O = 100\text{mA}$ $V_{IN} = 23\text{V}$ | 14.85 | 15 | 15.15 | 14.40 | 15 | 15.60 | V |
| | $I_O = 5\text{mA to } 350\text{mA}$ $P_D \leq P_{MAX}$ $V_{IN} = 18\text{V to } 30\text{V}$ $T_J = -55\text{ to } 150^\circ\text{C}$ | 14.55 | | 15.45 | 14.25 | | 15.75 | |
| ΔV_O Line Regulation | $I_O = 200\text{mA}$ $V_{IN} = 17.5\text{V to } 30\text{V}$ $V_{IN} = 20\text{V to } 30\text{V}$ $T_J = -55\text{ to } 150^\circ\text{C}$ | 4 | | 22 | | | 60 | mV |
| | | 4 | | 22 | | | 30 | |
| | $I_O = 500\text{mA}$ $V_{IN} = 20\text{V to } 26\text{V}$ | 4 | | 22 | | | 150 | |
| ΔV_O Load Regulation | $I_O = 5\text{mA to } 500\text{mA}$ $V_{IN} = 23\text{V}$ $T_J = -55\text{ to } 150^\circ\text{C}$ | | 12 | 75 | | | 150 | mV |
| I_Q Quiescent Current | $V_{IN} = 23\text{V}$ $I_O = 350\text{mA}$ $T_J = -55\text{ to } 150^\circ\text{C}$ | | 4 | 6 | | 4 | 6 | mA |
| ΔI_Q Quiescent Current Change | $I_O = 5\text{mA to } 500\text{mA}$ $V_{IN} = 23\text{V}$ $T_J = -55\text{ to } 150^\circ\text{C}$ | | 0.1 | 0.5 | | | 0.5 | mA |
| | $I_O = 200\text{mA}$ $V_{IN} = 18\text{V to } 30\text{V}$ $T_J = -55\text{ to } 150^\circ\text{C}$ | | 0.2 | 0.8 | | | 0.8 | |
| V_N Output Noise Voltage | $f = 10\text{Hz to } 100\text{kHz}$ | | 90 | 600 | | 90 | 600 | μV |
| $\frac{\Delta V_{IN}}{\Delta V_O}$ Ripple Rejection | $f = 120\text{Hz}$ $V_{IN} = 18.5\text{V to } 28.5\text{V}$ | $I_O = 300\text{mA}$ | 57 | 70 | 54 | | | dB |
| | | $I_O = 100\text{mA}$ $T_J = -55\text{ to } 150^\circ\text{C}$ | 57 | 70 | 54 | | | |
| Dropout Voltage | $I_O = 350\text{mA}$ | | 2 | 2.5 | | | 2.5 | V |
| I_{sc} Short Circuit Current | $V_{IN} = 35\text{V}$ | | 300 | 600 | | 300 | 600 | mA |
| I_{pk} Peak Output Current | $V_{IN} = 23\text{V}$ | 0.7 | 1.0 | 1.4 | 0.7 | 1.0 | 1.6 | A |
| Average Temperature Coefficient of V_O | $I_O = 5\text{mA}$ | | 1.5 | 6.0 | | 1.5 | | $\frac{\text{mV}}{^\circ\text{C}}$ |
| $R_{\theta JC}$ Thermal Resistance Junction to Case | | | | 13 | | | 13 | $^\circ\text{C/W}$ |

- 1) All characteristics are measured with a capacitor across the input of $0.22\mu\text{F}$ and a capacitor across the output of $0.1\mu\text{F}$.
All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ($t_p \leq 10\text{ms}$, $\delta \leq 5\%$). Output voltage changes due to changes in internal temperature must be taken into account separately.