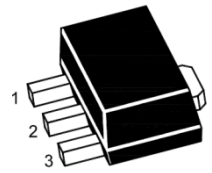
# 78L05K THRU 78L15K

## 3-Terminal Positive Voltage Regulator

### FEATURES

- Maximum Output Current $I_O$: 0.1 A
- Output Voltage $V_O$: 5V/6V/8V/9V/10V/12V/15V
- Continuous Total Dissipation
  $P_D$: 0.5 W ($T_a$ = 25 ℃)




1：OUT 2：GND 3：IN

SOT-89 PLASTIC PACKAGE

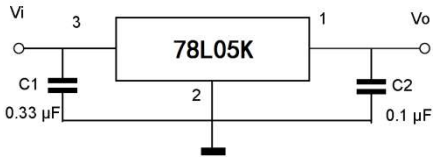
**Absolute Maximum Ratings ($T_a$ = 25 oC)**

| Parameter | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Input Voltage | 78L05K~78L08K | $V_I$ | 30 | V |
| | 78L09K~78L15K | | 35 | V |
| Power Dissipation | | $P_{tot}$ | 500 1) | mW |
| Operating Temperature | | $T_{opr}$ | - 20 to + 120 | ℃ |
| Storage Temperature Range | | $T_{stg}$ | - 55 to +150 | ℃ |

1) 15 mm X 25 mm X 0.7 mm alumina ceramic board, $T_a \leq 25$℃

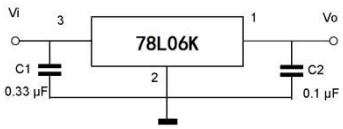
**Electrical Characteristics ($T_a$ = 25℃)** (Unless otherwise specified，0℃≤ TJ ≤ 125℃, VI = 10 V, IO = 40 mA, CI = 0.33 μF, C2 = 0.1 μF)

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | Tj = 25℃ | 4.8 | 5 | 5.2 | V |
| | | 7 V ≤ VI ≤ 20 V, 1 mA ≤ IO ≤ 40 mA | 4.75 | -- | 5.25 | V |
| | | VI = 10 V, 1 mA ≤ IO ≤ 70 mA | 4.75 | -- | 5.25 | V |
| Line Regulation | Regline | 7 V ≤ VI ≤ 20 V, Tj = 25℃ | -- | -- | 150 | mV |
| | | 8 V ≤ VI ≤ 20 V, Tj = 25℃ | -- | -- | 100 | |
| Load Regulation | Regload | 1 mA ≤ IO ≤ 100 mA, Tj = 25℃ | -- | -- | 60 | mV |
| | | 1 mA ≤ IO ≤ 40 mA, Tj = 25℃ | -- | -- | 30 | |
| Quiescent Current | $I_Q$ | Tj = 25℃ | -- | -- | 5.5 | mA |
| Quiescent Current Change | $\Delta I_Q$ | 8 V ≤ $V_I$ ≤ 20 V | -- | -- | 1.5 | mA |
| | | 1 mA ≤ $I_O$ ≤ 40 mA | -- | -- | 0.1 | |
| Output Noise Voltage | $V_N$ | 10 Hz ≤ f ≤ 100 KHz, Tj = 25℃ | -- | 40 | -- | μ V |
| Ripple Rejection | RR | f = 120 Hz, 8 V ≤ VI ≤ 18 V, Tj = 25℃ | 41 | -- | -- | dB |
| Dropout Voltage | $V_{Drop}$ | Tj = 25℃ | -- | 1.7 | -- | V |



**Electrical Characteristics ($T_a$ = 25℃)** (Unless otherwise specified，0℃≤ TJ ≤ 125℃, VI = 11 V, IO = 40 mA, CI = 0.33 μF, C2 = 0.1 μF)

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | Tj = 25℃ | 5.76 | 6 | 6.24 | V |
| | | 8.5V ≤ VI ≤ 21V, 1 mA ≤ IO ≤ 40 mA | 5.7 | -- | 6.3 | V |
| | | VI = 11 V, 1 mA ≤ IO ≤ 70 mA | 5.7 | -- | 6.3 | V |
| Line Regulation | Regline | 8.5V ≤ VI ≤ 21V, Tj = 25℃ | -- | -- | 155 | mV |
| | | 9 V ≤ VI ≤ 21 V, Tj = 25℃ | -- | -- | 105 | |
| Load Regulation | Regload | 1 mA ≤ IO ≤ 100 mA, Tj = 25℃ | -- | -- | 65 | mV |
| | | 1 mA ≤ IO ≤ 40 mA, Tj = 25℃ | -- | -- | 35 | |
| Quiescent Current | $I_Q$ | Tj = 25℃ | -- | -- | 5.5 | mA |
| Quiescent Current Change | $\Delta I_Q$ | 9 V ≤ VI ≤ 21 V，IO = 40 mA | -- | -- | 1.5 | mA |
| | | VI = 11 V,1 mA ≤ IO ≤ 40 mA | -- | -- | 0.1 | |
| Output Noise Voltage | $V_N$ | 10 Hz ≤ f ≤ 100 KHz, Tj = 25℃ | -- | 49 | -- | μ V |
| Ripple Rejection | RR | f = 120 Hz, 9 V ≤ VI ≤ 19 V, Tj = 25℃ | 40 | -- | -- | dB |
| Dropout Voltage | $V_{Drop}$ | Tj = 25℃ | -- | 1.7 | -- | V |

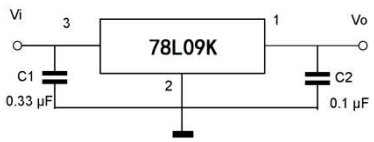



**Electrical Characteristics ($T_a$ = 25℃)** (Unless otherwise specified，0℃≤ TJ ≤ 125℃, VI = 14 V, IO = 40 mA, CI = 0.33 μF, C2 = 0.1 μF)

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | Tj = 25℃ | 7.7 | 8 | 8.3 | V |
| | | 10.5V ≤ VI ≤ 23V, 1 mA ≤ IO ≤ 40 mA | 7.6 | -- | 8.4 | V |
| | | VI = 14 V, 1 mA ≤ IO ≤ 70 mA | 7.6 | -- | 8.4 | V |
| Line Regulation | Regline | 10.5V ≤ VI ≤ 23V, Tj = 25℃ | -- | -- | 175 | mV |
| | | 11 V ≤ VI ≤ 23 V, Tj = 25℃ | -- | -- | 125 | |
| Load Regulation | Regload | 1 mA ≤ IO ≤ 100 mA, Tj = 25℃ | -- | -- | 80 | mV |
| | | 1 mA ≤ IO ≤ 40 mA, Tj = 25℃ | -- | -- | 40 | |
| Quiescent Current | $I_Q$ | Tj = 25℃ | -- | -- | 5.5 | mA |
| Quiescent Current Change | $\Delta I_Q$ | 12 V ≤ VI ≤ 23 V，IO = 40 mA | -- | -- | 1.5 | mA |
| | | VI = 14 V,1 mA ≤ IO ≤ 40 mA | -- | -- | 0.1 | |
| Output Noise Voltage | $V_N$ | 10 Hz ≤ f ≤ 100 KHz, Tj = 25℃ | -- | 60 | -- | μ V |
| Ripple Rejection | RR | f = 120 Hz, 12 V ≤ VI ≤ 22 V, Tj = 25℃ | 39 | -- | -- | dB |
| Dropout Voltage | $V_{Drop}$ | Tj = 25℃ | -- | 1.7 | -- | V |

**Electrical Characteristics ($T_a$ = 25℃)** (Unless otherwise specified，0℃≤ TJ ≤ 125℃, VI = 15 V, IO = 40 mA, CI = 0.33 μF, C2 = 0.1 μF)

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | Tj = 25℃ | 8.64 | 9 | 9.36 | V |
| | | 11.4V ≤ VI ≤ 24V, 1 mA ≤ IO ≤ 40 mA | 8.55 | -- | 9.45 | V |
| | | VI = 15 V, 1 mA ≤ IO ≤ 70 mA | 8.55 | -- | 9.45 | V |
| Line Regulation | Regline | 11.4V ≤ VI ≤ 24V, Tj = 25℃ | -- | -- | 200 | mV |
| | | 12 V ≤ VI ≤ 24 V, Tj = 25℃ | -- | -- | 160 | |
| Load Regulation | Regload | 1 mA ≤ IO ≤ 100 mA, Tj = 25℃ | -- | -- | 90 | mV |
| | | 1 mA ≤ IO ≤ 40 mA, Tj = 25℃ | -- | -- | 45 | |
| Quiescent Current | $I_Q$ | Tj = 25℃ | -- | -- | 6 | mA |
| Quiescent Current Change | $\Delta I_Q$ | 12 V ≤ VI ≤ 24 V， IO = 40 mA | -- | -- | 1.5 | mA |
| | | VI = 15 V,1 mA ≤ IO ≤ 40 mA | -- | -- | 0.1 | |
| Output Noise Voltage | $V_N$ | 10 Hz ≤ f ≤ 100 KHz, Tj = 25℃ | -- | 70 | -- | μ V |
| Ripple Rejection | RR | f = 120 Hz, 12 V ≤ VI ≤ 24 V, Tj = 25℃ | 38 | -- | -- | dB |
| Dropout Voltage | $V_{Drop}$ | Tj = 25℃ | -- | 1.7 | -- | V |

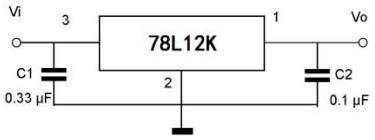



**Electrical Characteristics ($T_a$ = 25℃)** at specified virtual junction temperature, $V_I$= 17V, $I_O$= 40mA (unless otherwise noted)

| Parameter | Test Conditions* | | 78L10 | | | Units |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| Output voltage** | | 25°C | 9.6 | 10 | 10.4 | V |
| | $I_O$= 1mA to 40 mA, $V_I$= 13V to 25V | 0°C to 125°C | 9.5 | 10 | 10.5 | |
| | $I_O$= 1mA to 70mA, | | 9.5 | 10 | 10.5 | |
| Input regulation | $V_I$= 13V to 25V | 25°C | | 51 | 175 | mV |
| | $V_I$= 14V to 25V | | | 42 | 125 | |
| Ripple rejection | $V_I$= 15V to 25V, f= 120Hz | 0°C to 125°C | 37 | 44 | | dB |
| Output regulation | $I_O$= 1mA to 100mA | 25°C | | 20 | 90 | mV |
| | $I_O$= 1mA to 40mA | | | 11 | 40 | |
| Output noise voltage | f= 10Hz to 100 KHz | 25°C | | 62 | | μV |
| Dropout voltage | | 25°C | | 1.7 | | V |
| Bias current | | 25°C | | 4.2 | 6 | mA |
| | | 125°C | | | 5.5 | |
| Bias current change | $V_I$= 14V to 25V | 0°C to 125°C | | | 1.5 | |
| | $I_O$= 1mA to 40mA | | | | 0.1 | |

**Electrical Characteristics ($T_a$ = 25℃)** (Unless otherwise specified，0℃≤ TJ ≤ 125℃, VI = 19 V, IO = 40 mA, CI = 0.33 μF, C2 = 0.1 μF)

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | Tj = 25℃ | 11.5 | 12 | 12.5 | V |
| | | 14.5V ≤ VI ≤ 27V, 1 mA ≤ IO ≤ 40 mA | 11.4 | -- | 12.6 | V |
| | | VI = 19 V, 1 mA ≤ IO ≤ 70 mA | 11.4 | -- | 12.6 | V |
| Line Regulation | Regline | 14.5V ≤ VI ≤ 27V, Tj = 25℃ | -- | -- | 250 | mV |
| | | 16 V ≤ VI ≤ 27 V, Tj = 25℃ | -- | -- | 200 | |
| Load Regulation | Regload | 1 mA ≤ IO ≤ 100 mA, Tj = 25℃ | -- | -- | 100 | mV |
| | | 1 mA ≤ IO ≤ 40 mA, Tj = 25℃ | -- | -- | 50 | |
| Quiescent Current | $I_Q$ | Tj = 25℃ | -- | -- | 6 | mA |
| Quiescent Current Change | $\Delta I_Q$ | 16 V ≤ VI ≤ 27 V | -- | -- | 1.5 | mA |
| | | 1 mA ≤ IO ≤ 40 mA | -- | -- | 0.1 | |
| Output Noise Voltage | $V_N$ | 10 Hz ≤ f ≤ 100 KHz, Tj = 25℃ | -- | 80 | -- | μ V |
| Ripple Rejection | RR | f = 120 Hz, 15 V ≤ VI ≤ 25 V, Tj = 25℃ | 37 | -- | -- | dB |
| Dropout Voltage | $V_{Drop}$ | Tj = 25℃ | -- | 1.7 | -- | V |

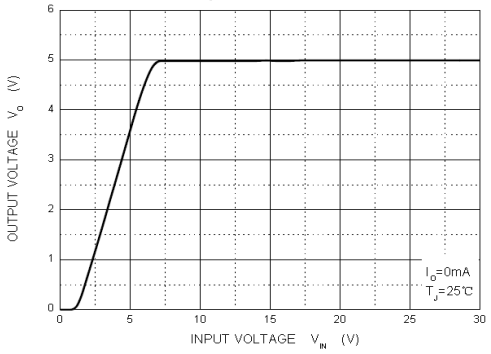



**Electrical Characteristics** (Unless otherwise specified, $V_{IN}$ = 23 V, $I_{OUT}$ = 40 mA, $C_{IN}$ = 0.33 μF, $C_{OUT}$ = 0.1 μF, $T_j$ = 25 °C)

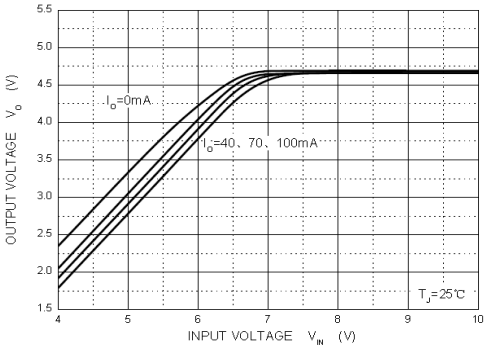
| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Output Voltage | $V_{OUT}$ | 14.4 | 15 | 15.6 | V |
| Output Voltage<br>17.5 V ≤ $V_{IN}$ ≤ 30 V, 1 mA ≤ $I_{OUT}$ ≤ 40 mA | $V_{OUT}$ | 14.25 | - | 15.75 | V |
| Output Voltage<br>$V_{IN}$ = 23 V, 1 mA ≤ $I_{OUT}$ ≤ 70 mA | $V_{OUT}$ | 14.25 | - | 15.75 | V |
| Input Regulation<br>17.5 V ≤ $V_{IN}$ ≤ 30 V<br>19 V ≤ $V_{IN}$ ≤ 30 V | Reg. line | -<br>- | -<br>- | 300<br>250 | mV |
| Load Regulation<br>1 mA ≤ $I_{OUT}$ ≤ 100 mA<br>1 mA ≤ $I_{OUT}$ ≤ 40 mA | Reg. load | -<br>- | -<br>- | 150<br>75 | mV |
| Quiescent Current | $I_Q$ | - | - | 6.5 | mA |
| Quiescent Current Change<br>19 V ≤ $V_{IN}$ ≤ 30 V With line<br>1 mA ≤ $I_{OUT}$ ≤ 40 mA With load | $\Delta I_Q$ | -<br>- | -<br>- | 1.5<br>0.1 | mA |
| Output Noise Voltage<br>at $T_a$ = 25 °C, 10 Hz ≤ f ≤ 100 KHz | $V_{NO}$ | - | 90 | - | μV |
| Ripple Rejection<br>at f = 120 Hz, 18.5 V ≤ $V_{IN}$ ≤ 28.5 V, $T_j$ = 25 °C | RR | 34 | - | - | dB |
| Dropout Voltage<br>at $T_j$ = 25 °C | $\lvert V_{IN}-V_{OUT}\rvert$ | - | 1.7 | - | V |

## 78L05K Typical Characteristics

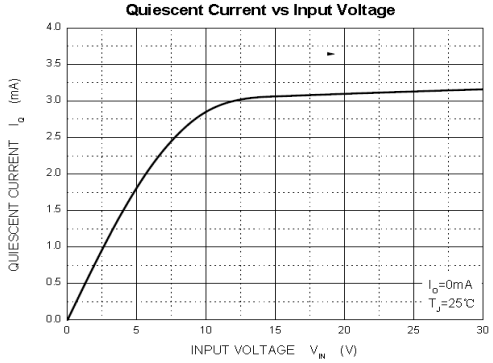
Output Characteristics



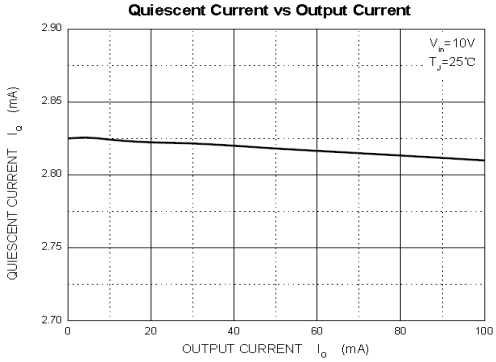

Dropout Characteristics



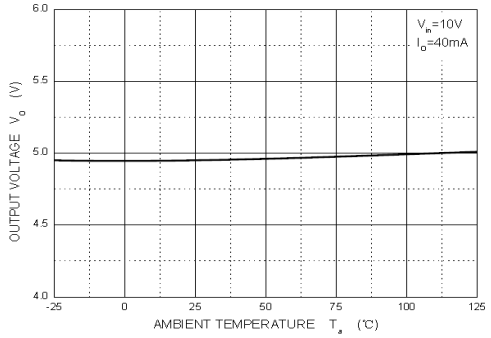

Quiescent Current vs Input Voltage



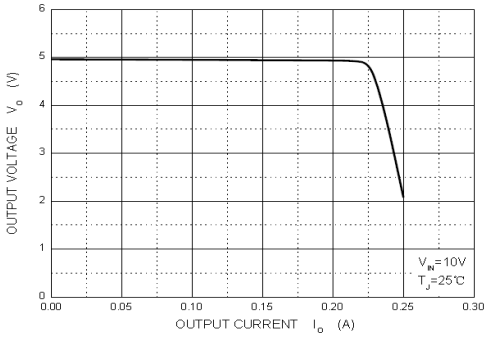

Quiescent Current vs Output Current



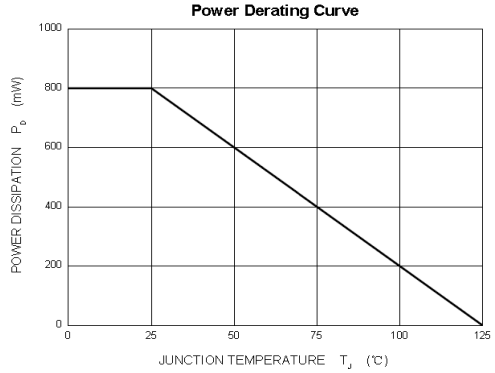

Output Voltage vs Ambient Temperature




Current Cut-off Grid Voltage

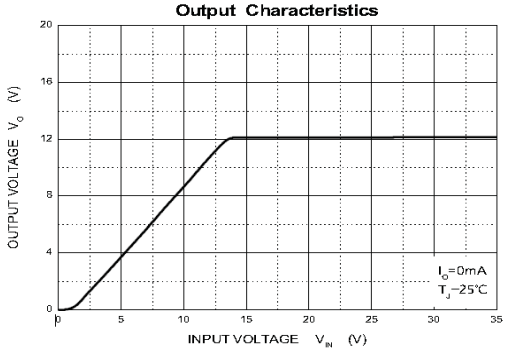



Power Derating Curve

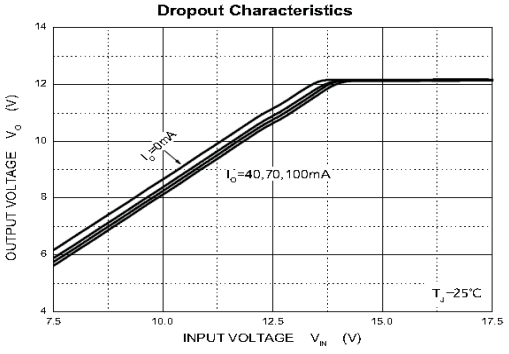


## 78L12K Typical Characteristics

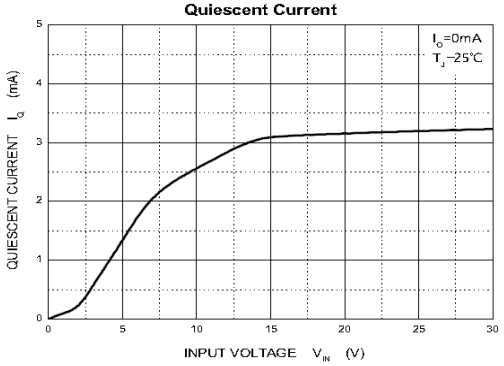
Output Characteristics



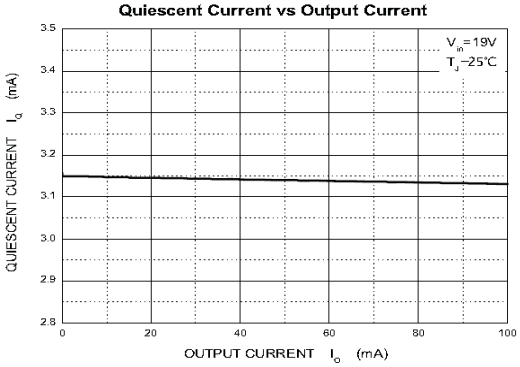

Dropout Characteristics



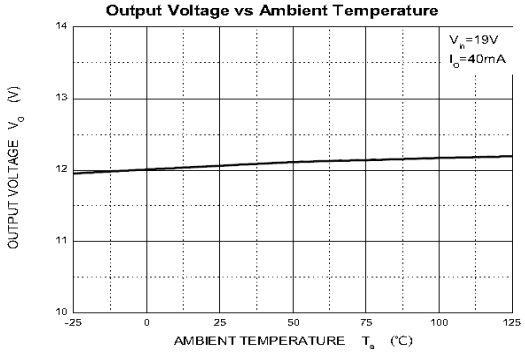

Quiescent Current



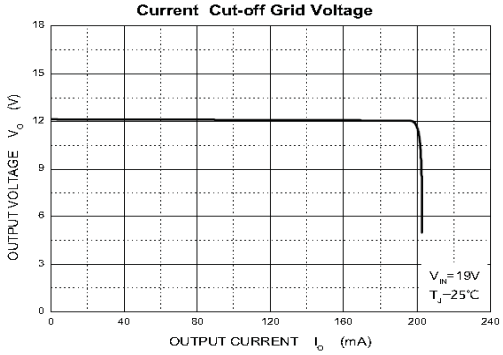

Quiescent Current vs Output Current



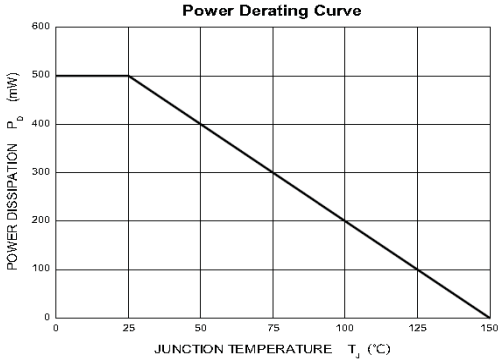

Output Voltage vs Ambient Temperature




Current Cut-off Grid Voltage




Power Derating Curve



**SOT-89 PACKAGE OUTLINE** **Unit：mm**