DATA SHEET

NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

# μPC78L00 SERIES

## THREE TERMINAL POSITIVE VOLTAGE REGULATORS

### DESCRIPTION

The μPC78L00 series are monolithic three terminal positive regulators which employ internally current limiting, thermal shut down, output transistor safe area protection make them essentially indestructible.

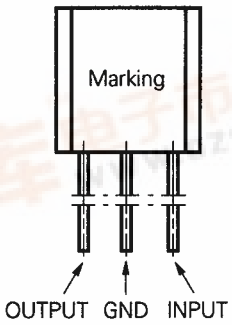
They are intended as fixed voltage regulators in a wide range of application including local on card regulation for elimination of distribution problems associated wide single point regulation.

### FEATURES

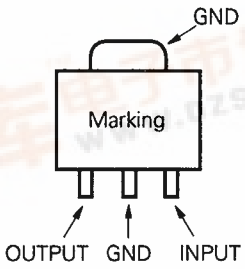
- Output current in excess of 100 mA.
- Low noise.
- High Ripple Rejection.
- Internal output transistor safe area protection.
- Internal thermal overload protection.
- Internal short circuit current limiting.

### CONNECTION DIAGRAM

μPC78L00J Series




μPC78L00T Series

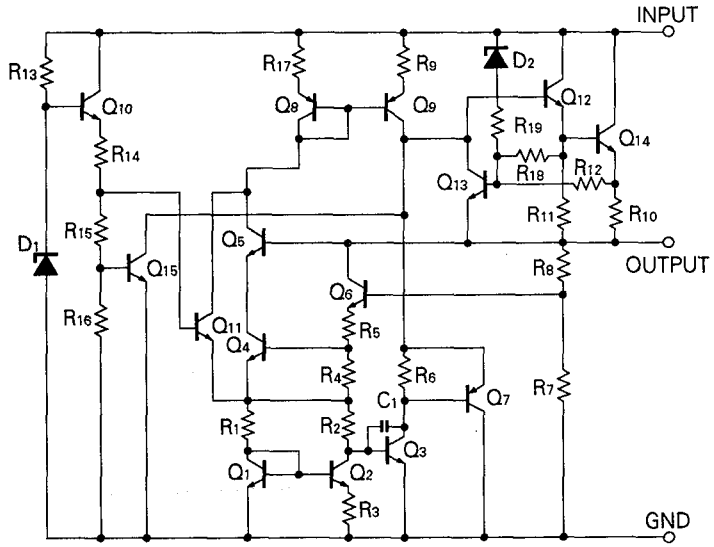



### ORDER INFORMATION

| Type Number | Output Voltage | Package | Quality Grade |
|---|---|---|---|
| μPC78L05J | 5 V | TO-92 | Standard |
| μPC78L05T | | SOT-89 | |
| μPC78L06J | 6 V | TO-92 | |
| μPC78L06T | | SOT-89 | |
| μPC78L07J | 7 V | TO-92 | |
| μPC78L07T | | SOT-89 | |
| μPC78L08J | 8 V | TO-92 | |
| μPC78L08T | | SOT-89 | |
| μPC78L10J | 10 V | TO-92 | |
| μPC78L10T | | SOT-89 | |
| μPC78L12J | 12 V | TO-92 | |
| μPC78L12T | | SOT-89 | |
| μPC78L15J | 15 V | TO-92 | |
| μPC78L15T | | SOT-89 | |

Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

## EQUIVALENT CIRCUIT



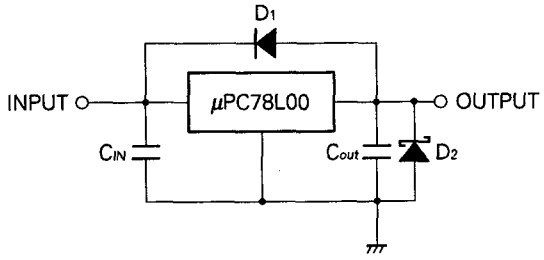

## ABSOLUTE MAXIMUM RATINGS ($T_a$ = 25 °C)

| PARAMETER | SYMBOL | RATINGS | | UNIT |
|---|---|---|---|---|
| | | μPC78L00J Series | μPC78L00T Series | |
| Input Voltage | $V_{IN}$ | 30/35 (Note1) | | V |
| Internal Power Dissipation | $P_T$ | 700 | 400/2000 (Note2) | mW |
| Operating Ambient Temperature Range | $T_{opt}$ | −20 to +85 | | °C |
| Operating Junction Temperature Range | $T_{opt\ (j)}$ | −20 to +150 | | °C |
| Storage Temperature Range | $T_{stg}$ | −55 to +150 | | °C |
| Thermal Resistance (junction to ambient) | $R_{th\ (j-a)}$ | 180 | 315/62.5 (Note2) | °C/W |

**(Note 1)** μPC78L05, 06, 07, 08 : 30 V, μPC78L10, 12, 15 : 35 V

**(Note 2)** with 2.5 $cm^2$ × 0.7 mm ceramic substrate

## TYPICAL CONNECTION




$C_1$: Required if regulator is located an appreciable distance from power supply filter

$C_2$: More than 0.1 μF

$D_1$: Needed for $V_{IN} < V_O$

$D_2$: Needed for $V_O < GND$

## RECOMMENDED OPERATING CONDITIONS

| CHARACTERISTIC | SYMBOL | TYPE NUMBER | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Input Voltage | $V_{IN}$ | μPC78L05 | 7 | 10 | 20 | V |
| | | μPC78L06 | 8.5 | 11 | 21 | |
| | | μPC78L07 | 9.5 | 12 | 22 | |
| | | μPC78L08 | 10.5 | 14 | 23 | |
| | | μPC78L10 | 12.5 | 17 | 25 | |
| | | μPC78L12 | 14.5 | 19 | 27 | |
| | | μPC78L15 | 17.5 | 23 | 30 | |
| Output Current | $I_O$ | All | 0 | 40 | 70 | mA |
| Operating Temperature Range | $T_{opt}$ | All | −20 | | +85 | °C |
| Operating Junction Temperature Range | $T_{opt\ (j)}$ | All | −20 | | +125 | °C |

## ELECTRICAL CHARACTERISTICS μPC78L05

($V_{IN}$ = 10 V, $I_O$ = 40 mA, 0 °C ≦ $T_j$ ≦ + 125 °C, $C_{IN}$ = 0.33 μF, $C_{OUT}$ = 0.1 μF)

| CHARACTERISTIC | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | $T_j$ = 25 °C | 4.8 | 5.0 | 5.2 | V |
| | | 7 V ≦ $V_{IN}$ ≦ 20 V, 1 mA ≦ $I_O$ ≦ 40 mA | 4.75 | | 5.25 | |
| | | $V_{IN}$ = 10 V, 1 mA ≦ $I_O$ ≦ 70 mA | 4.75 | | 5.25 | |
| Line Regulation | $REG_{IN}$ | $T_j$ = 25 °C, 7 V ≦ $V_{IN}$ ≦ 20 V | | 6 | 150 | mV |
| | | $T_j$ = 25 °C, 8 V ≦ $V_{IN}$ ≦ 20 V | | 4 | 100 | |
| Load Regulation | $REG_L$ | $T_j$ = 25 °C, 1 mA ≦ $I_O$ ≦ 100 mA | | 9 | 60 | mV |
| | | $T_j$ = 25 °C, 1 mA ≦ $I_O$ ≦ 40 mA | | 4 | 30 | |
| Quiescent Current | $I_{BIAS}$ | $T_j$ = 25 °C | | 2.3 | 5.5 | mA |
| Quiescent Current Change | $\Delta I_{BIAS}$ | 8 V ≦ $V_{IN}$ ≦ 20 V, $I_O$ = 40 mA | | | 1.5 | mA |
| | | $V_{IN}$ = 10 V, 1 mA ≦ $I_O$ ≦ 40 mA | | | 0.1 | |
| Output Noise Voltage | $V_n$ | $T_j$ = 25 °C, 10 Hz ≦ f ≦ 100 kHz | | 45 | 120 | $\mu V_{r.m.s.}$ |
| Ripple Rejection | R · R | $T_j$ = 25 °C, f = 120 Hz, 8 V ≦ $V_{IN}$ ≦ 18 V | 55 | 75 | | dB |
| Dropout Voltage | $V_{DIF}$ | $T_j$ = 25 °C | | 1.7 | | V |
| Short Circuit Current | $I_{Oshort}$ | $T_j$ = 25 °C, $V_{IN}$ = 20 V | | 88 | | mA |
| Peak Output Current | $I_{Opeak}$ | $T_j$ = 25 °C | 125 | 160 | 205 | mA |
| Temperature coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $I_O$ = 5 mA | | 0.4 | | mV/°C |

## ELECTRICAL CHARACTERISTICS μPC78L06

($V_{IN}$ = 11 V, $I_O$ = 40 mA, 0 °C ≦ $T_j$ ≦ + 125 °C, $C_{IN}$ = 0.33 μF, $C_{OUT}$ = 0.1 μF)

| CHARACTERISTIC | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | $T_j$ = 25 °C | 5.76 | 6.0 | 6.24 | V |
| | | 8.5 V ≦ $V_{IN}$ ≦ 21 V, 1 mA ≦ $I_O$ ≦ 40 mA | 5.70 | | 6.30 | |
| | | $V_{IN}$ = 11 V, 1 mA ≦ $I_O$ ≦ 70 mA | 5.70 | | 6.30 | |
| Line Regulation | $REG_{IN}$ | $T_j$ = 25 °C, 8.5 V ≦ $V_{IN}$ ≦ 21 V | | 6 | 155 | mV |
| | | $T_j$ = 25 °C, 9 V ≦ $V_{IN}$ ≦ 21 V | | 4 | 105 | |
| Load Regulation | $REG_L$ | $T_j$ = 25 °C, 1 mA ≦ $I_O$ ≦ 100 mA | | 10 | 65 | mV |
| | | $T_j$ = 25 °C, 1 mA ≦ $I_O$ ≦ 40 mA | | 4 | 35 | |
| Quiescent Current | $I_{BIAS}$ | $T_j$ = 25 °C | | 2.3 | 5.5 | mA |
| Quiescent Current Change | $\Delta I_{BIAS}$ | 9 V ≦ $V_{IN}$ ≦ 21 V, $I_O$ = 40 mA | | | 1.5 | mA |
| | | $V_{IN}$ = 11 V, 1 mA ≦ $I_O$ ≦ 40 mA | | | 0.1 | |
| Output Noise Voltage | $V_n$ | $T_j$ = 25 °C, 10 Hz ≦ f ≦ 100 kHz | | 55 | 145 | $\mu V_{r.m.s.}$ |
| Ripple Rejection | R · R | $T_j$ = 25 °C, f = 120 Hz, 9 V ≦ $V_{IN}$ ≦ 19 V | 54 | 75 | | dB |
| Dropout Voltage | $V_{DIF}$ | $T_j$ = 25 °C | | 1.7 | | V |
| Short Circuit Current | $I_{Oshort}$ | $T_j$ = 25 °C, $V_{IN}$ = 21 V | | 85 | | mA |
| Peak Output Current | $I_{Opeak}$ | $T_j$ = 25 °C | 125 | 160 | 205 | mA |
| Temperature coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $I_O$ = 5 mA | | 0.5 | | mV/°C |

## ELECTRICAL CHARACTERISTICS μPC78L07

($V_{IN}$ = 12 V, $I_O$ = 40 mA, 0 °C ≦ $T_j$ ≦ + 125 °C, $C_{IN}$ = 0.33 μF, $C_{OUT}$ = 0.1 μF)

| CHARACTERISTIC | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | $T_j$ = 25 °C | 6.72 | 7.0 | 7.28 | V |
| | | 9.5 V ≦ $V_{IN}$ ≦ 22 V, 1 mA ≦ $I_O$ ≦ 40 mA | 6.65 | | 7.35 | |
| | | $V_{IN}$ = 12 V, 1 mA ≦ $I_O$ ≦ 70 mA | 6.65 | | 7.35 | |
| Line Regulation | $REG_{IN}$ | $T_j$ = 25 °C, 9.5 V ≦ $V_{IN}$ ≦ 22 V | | 8 | 165 | mV |
| | | $T_j$ = 25 °C, 10 V ≦ $V_{IN}$ ≦ 22 V | | 5 | 115 | |
| Load Regulation | $REG_L$ | $T_j$ = 25 °C, 1 mA ≦ $I_O$ ≦ 100 mA | | 12 | 75 | mV |
| | | $T_j$ = 25 °C, 1 mA ≦ $I_O$ ≦ 40 mA | | 5 | 35 | |
| Quiescent Current | $I_{BIAS}$ | $T_j$ = 25 °C | | 2.3 | 5.5 | mA |
| Quiescent Current Change | $\Delta I_{BIAS}$ | 10 V ≦ $V_{IN}$ ≦ 22 V, $I_O$ = 40 mA | | | 1.5 | mA |
| | | $V_{IN}$ = 12 V, 1 mA ≦ $I_O$ ≦ 40 mA | | | 0.1 | |
| Output Noise Voltage | $V_n$ | $T_j$ = 25 °C, 10 Hz ≦ f ≦ 100 kHz | | 70 | 180 | $\mu V_{r.m.s.}$ |
| Ripple Rejection | R · R | $T_j$ = 25 °C, f = 120 Hz, 10 V ≦ $V_{IN}$ ≦ 20 V | 52 | 74 | | dB |
| Dropout Voltage | $V_{DIF}$ | $T_j$ = 25 °C | | 1.7 | | V |
| Short Circuit Current | $I_{Oshort}$ | $T_j$ = 25 °C, $V_{IN}$ = 22 V | | 83 | | mA |
| Peak Output Current | $I_{Opeak}$ | $T_j$ = 25 °C | 125 | 160 | 205 | mA |
| Temperature coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $I_O$ = 5 mA | | 0.6 | | mV/°C |

## ELECTRICAL CHARACTERISTICS μPC78L08

($V_{IN}$ = 14 V, $I_O$ = 40 mA, 0 °C ≦ $T_j$ ≦ + 125 °C, $C_{IN}$ = 0.33 μF, $C_{OUT}$ = 0.1 μF)

| CHARACTERISTIC | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | $T_j$ = 25 °C | 7.7 | 8.0 | 8.3 | V |
| | | 10.5 V ≦ $V_{IN}$ ≦ 23 V, 1 mA ≦ $I_O$ ≦ 40 mA | 7.6 | | 8.4 | |
| | | $V_{IN}$ = 14 V, 1 mA ≦ $I_O$ ≦ 70 mA | 7.6 | | 8.4 | |
| Line Regulation | $REG_{IN}$ | $T_j$ = 25 °C, 10.5 V ≦ $V_{IN}$ ≦ 23 V | | 10 | 175 | mV |
| | | $T_j$ = 25 °C, 11 V ≦ $V_{IN}$ ≦ 23 V | | 6 | 125 | |
| Load Regulation | $REG_L$ | $T_j$ = 25 °C, 1 mA ≦ $I_O$ ≦ 100 mA | | 14 | 80 | mV |
| | | $T_j$ = 25 °C, 1 mA ≦ $I_O$ ≦ 40 mA | | 6 | 40 | |
| Quiescent Current | $I_{BIAS}$ | $T_j$ = 25 °C | | 2.4 | 5.5 | mA |
| Quiescent Current Change | $\Delta I_{BIAS}$ | 12 V ≦ $V_{IN}$ ≦ 23 V, $I_O$ = 40 mA | | | 1.5 | mA |
| | | $V_{IN}$ = 14 V, 1 mA ≦ $I_O$ ≦ 40 mA | | | 0.1 | |
| Output Noise Voltage | $V_n$ | $T_j$ = 25 °C, 10 Hz ≦ f ≦ 100 kHz | | 85 | 190 | $\mu V_{r.m.s.}$ |
| Ripple Rejection | R · R | $T_j$ = 25 °C, f = 120 Hz, 12 V ≦ $V_{IN}$ ≦ 22 V | 51 | 73 | | dB |
| Dropout Voltage | $V_{DIF}$ | $T_j$ = 25 °C | | 1.7 | | V |
| Short Circuit Current | $I_{Oshort}$ | $T_j$ = 25 °C, $V_{IN}$ = 23 V | | 80 | | mA |
| Peak Output Current | $I_{Opeak}$ | $T_j$ = 25 °C | 125 | 160 | 205 | mA |
| Temperature coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $I_O$ = 5 mA | | 0.6 | | mV/°C |

## ELECTRICAL CHARACTERISTICS μPC78L10

($V_{IN}$ = 17 V, $I_O$ = 40 mA, 0 °C ≦ $T_j$ ≦ + 125 °C, $C_{IN}$ = 0.33 μF, $C_{OUT}$ = 0.1 μF)

| CHARACTERISTIC | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | $T_j$ = 25 °C | 9.6 | 10 | 10.4 | V |
| | | 12.5 V ≦ $V_{IN}$ ≦ 25 V, 1 mA ≦ $I_O$ ≦ 40 mA | 9.5 | | 10.5 | |
| | | $V_{IN}$ = 17 V, 1 mA ≦ $I_O$ ≦ 70 mA | 9.5 | | 10.5 | |
| Line Regulation | $REG_{IN}$ | $T_j$ = 25 °C, 12.5 V ≦ $V_{IN}$ ≦ 25 V | | 12 | 200 | mV |
| | | $T_j$ = 25 °C, 13 V ≦ $V_{IN}$ ≦ 25 V | | 8 | 150 | |
| Load Regulation | $REG_L$ | $T_j$ = 25 °C, 1 mA ≦ $I_O$ ≦ 100 mA | | 18 | 90 | mV |
| | | $T_j$ = 25 °C, 1 mA ≦ $I_O$ ≦ 40 mA | | 8 | 45 | |
| Quiescent Current | $I_{BIAS}$ | $T_j$ = 25 °C | | 2.5 | 5.5 | mA |
| Quiescent Current Change | $\Delta I_{BIAS}$ | 13 V ≦ $V_{IN}$ ≦ 25 V, $I_O$ = 40 mA | | | 1.5 | mA |
| | | $V_{IN}$ = 17 V, 1 mA ≦ $I_O$ ≦ 40 mA | | | 0.1 | |
| Output Noise Voltage | $V_n$ | $T_j$ = 25 °C, 10 Hz ≦ f ≦ 100 kHz | | 100 | 230 | $\mu V_{r.m.s.}$ |
| Ripple Rejection | R · R | $T_j$ = 25 °C, f = 120 Hz, 14 V ≦ $V_{IN}$ ≦ 24 V | 49 | 69 | | dB |
| Dropout Voltage | $V_{DIF}$ | $T_j$ = 25 °C | | 1.7 | | V |
| Short Circuit Current | $I_{Oshort}$ | $T_j$ = 25 °C, $V_{IN}$ = 25 V | | 70 | | mA |
| Peak Output Current | $I_{Opeak}$ | $T_j$ = 25 °C | 125 | 160 | 205 | mA |
| Temperature coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $I_O$ = 5 mA | | 0.8 | | mV/°C |

## ELECTRICAL CHARACTERISTICS μPC78L12

($V_{IN}$ = 19 V, $I_O$ = 40 mA, 0 °C ≦ $T_j$ ≦ + 125 °C, $C_{IN}$ = 0.33 μF, $C_{OUT}$ = 0.1 μF)

| CHARACTERISTIC | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | $T_j$ = 25 °C | 11.5 | 12 | 12.5 | V |
| | | 14 V ≦ $V_{IN}$ ≦ 27 V, 1 mA ≦ $I_O$ ≦ 40 mA | 11.4 | | 12.6 | |
| | | $V_{IN}$ = 19 V, 1 mA ≦ $I_O$ ≦ 70 mA | 11.4 | | 12.6 | |
| Line Regulation | $REG_{IN}$ | $T_j$ = 25 °C, 14.5 V ≦ $V_{IN}$ ≦ 27 V | | 14 | 250 | mV |
| | | $T_j$ = 25 °C, 16 V ≦ $V_{IN}$ ≦ 27 V | | 10 | 200 | |
| Load Regulation | $REG_L$ | $T_j$ = 25 °C, 1 mA ≦ $I_O$ ≦ 100 mA | | 20 | 100 | mV |
| | | $T_j$ = 25 °C, 1 mA ≦ $I_O$ ≦ 40 mA | | 10 | 50 | |
| Quiescent Current | $I_{BIAS}$ | $T_j$ = 25 °C | | 2.6 | 5.5 | mA |
| Quiescent Current Change | $\Delta I_{BIAS}$ | 16 V ≦ $V_{IN}$ ≦ 27 V, $I_O$ = 40 mA | | | 1.5 | mA |
| | | $V_{IN}$ = 19 V, 1 mA ≦ $I_O$ ≦ 40 mA | | | 0.1 | |
| Output Noise Voltage | $V_n$ | $T_j$ = 25 °C, 10 Hz ≦ f ≦ 100 kHz | | 115 | 280 | $\mu V_{r.m.s.}$ |
| Ripple Rejection | R · R | $T_j$ = 25 °C, f = 120 Hz, 15 V ≦ $V_{IN}$ ≦ 25 V | 47 | 66 | | dB |
| Dropout Voltage | $V_{DIF}$ | $T_j$ = 25 °C | | 1.7 | | V |
| Short Circuit Current | $I_{Oshort}$ | $T_j$ = 25 °C, $V_{IN}$ = 27 V | | 64 | | mA |
| Peak Output Current | $I_{Opeak}$ | $T_j$ = 25 °C | 125 | 160 | 205 | mA |
| Temperature coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $I_O$ = 5 mA | | 1.1 | | mV/°C |

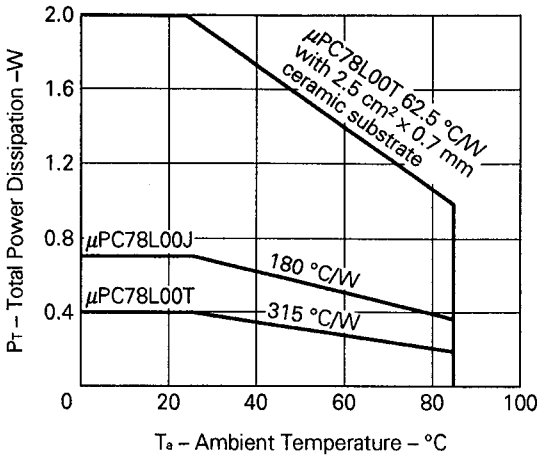
## ELECTRICAL CHARACTERISTICS μPC78L15

($V_{IN}$ = 23 V, $I_O$ = 40 mA, 0 °C ≦ $T_j$ ≦ + 125 °C, $C_{IN}$ = 0.33 μF, $C_{OUT}$ = 0.1 μF)

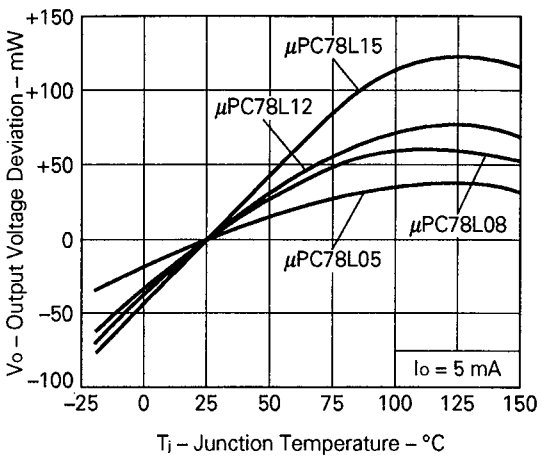
| CHARACTERISTIC | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | $T_j$ = 25 °C | 14.4 | 15 | 15.6 | V |
| | | 17.5 V ≦ $V_{IN}$ ≦ 30 V, 1 mA ≦ $I_O$ ≦ 40 mA | 14.25 | | 15.75 | |
| | | $V_{IN}$ = 23 V, 1 mA ≦ $I_O$ ≦ 70 mA | 14.25 | | 15.75 | |
| Line Regulation | $REG_{IN}$ | $T_j$ = 25 °C, 17.5 V ≦ $V_{IN}$ ≦ 30 V | | 18 | 300 | mV |
| | | $T_j$ = 25 °C, 20 V ≦ $V_{IN}$ ≦ 30 V | | 13 | 250 | |
| Load Regulation | $REG_L$ | $T_j$ = 25 °C, 1 mA ≦ $I_O$ ≦ 100 mA | | 25 | 150 | mV |
| | | $T_j$ = 25 °C, 1 mA ≦ $I_O$ ≦ 40 mA | | 12 | 75 | |
| Quiescent Current | $I_{BIAS}$ | $T_j$ = 25 °C | | 2.7 | 5.5 | mA |
| Quiescent Current Change | $\Delta I_{BIAS}$ | 20 V ≦ $V_{IN}$ ≦ 30 V, $I_O$ = 40 mA | | | 1.5 | mA |
| | | $V_{IN}$ = 23 V, 1 mA ≦ $I_O$ ≦ 40 mA | | | 0.1 | |
| Output Noise Voltage | $V_n$ | $T_j$ = 25 °C, 10 Hz ≦ f ≦ 100 kHz | | 135 | 350 | $\mu V_{r.m.s.}$ |
| Ripple Rejection | R · R | $T_j$ = 25 °C, f = 120 Hz, 18.5 V ≦ $V_{IN}$ ≦ 28.5 V | 45 | 61 | | dB |
| Dropout Voltage | $V_{DIF}$ | $T_j$ = 25 °C | | 1.7 | | V |
| Short Circuit Current | $I_{Oshort}$ | $T_j$ = 25 °C, $V_{IN}$ = 30 V | | 53 | | mA |
| Peak Output Current | $I_{Opeak}$ | $T_j$ = 25 °C | 125 | 160 | 205 | mA |
| Temperature coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $I_O$ = 5 mA | | 1.4 | | mV/°C |

## TYPICAL CHARACTERISTICS ($T_a$ = 25 °C)

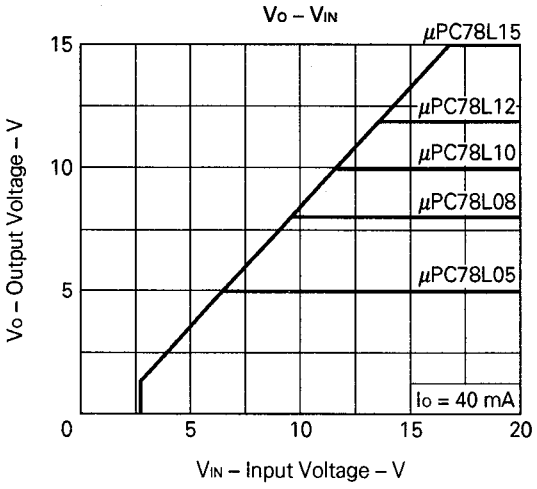
$P_T$ – $T_a$



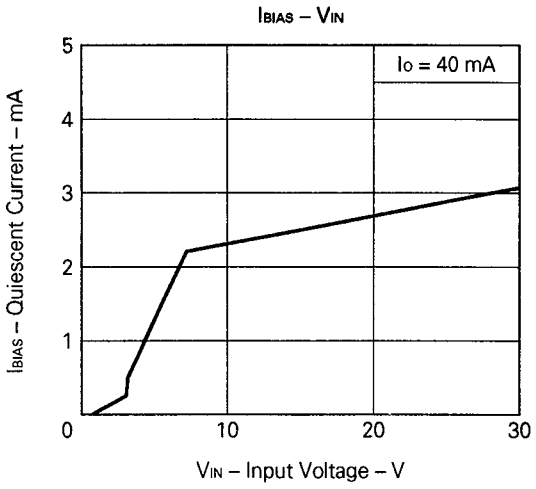

ΔVo – Ta



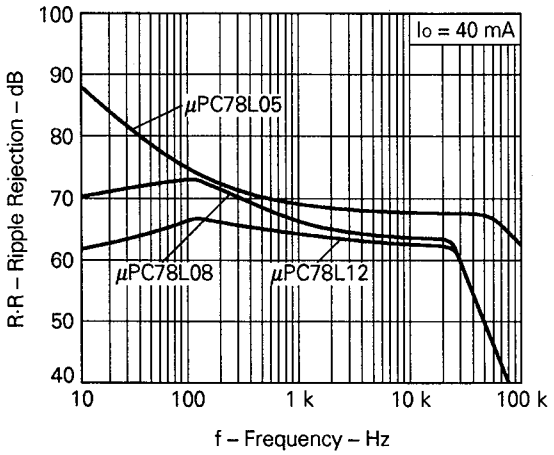

Vo – VIN



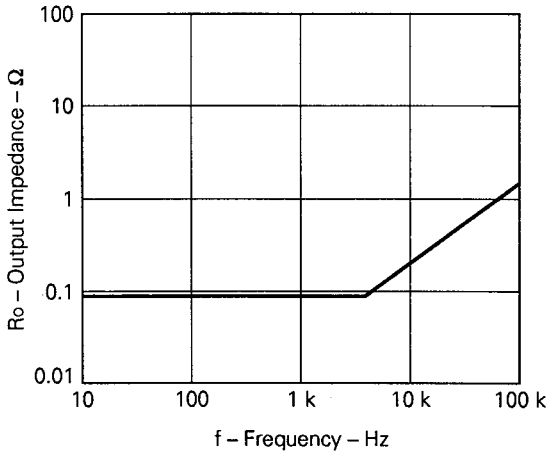

IBIAS – VIN



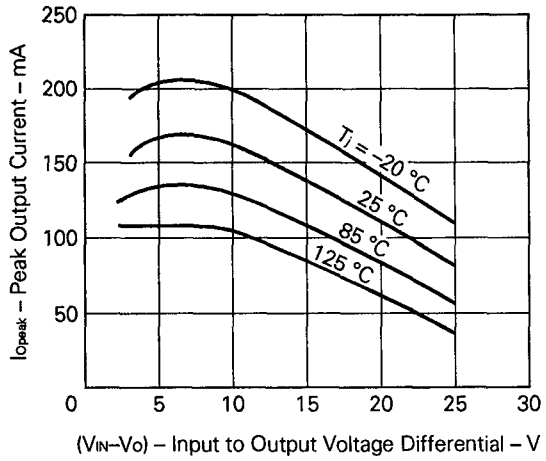

R·R – f



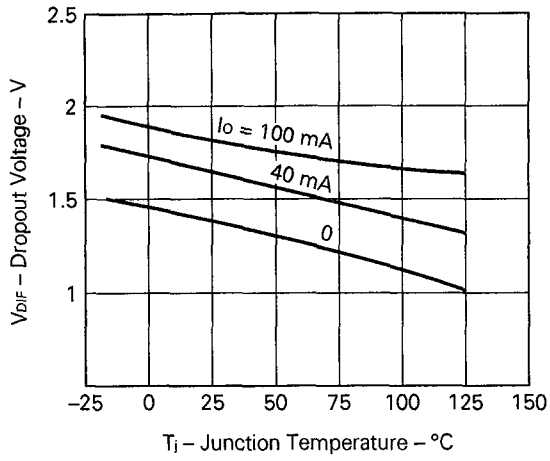

Ro – f (μPC78L05)



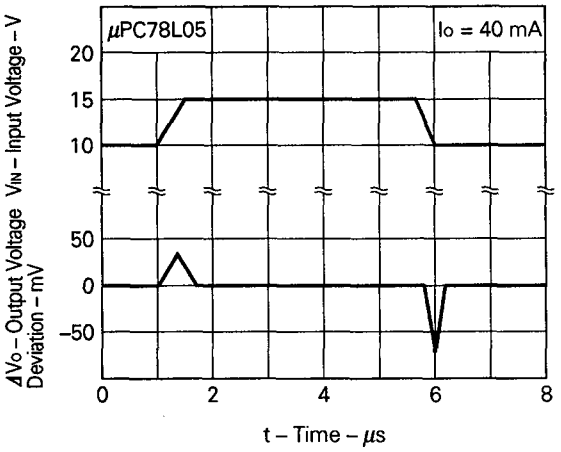
$I_{opeak}$ – ($V_{IN}$–$V_O$)



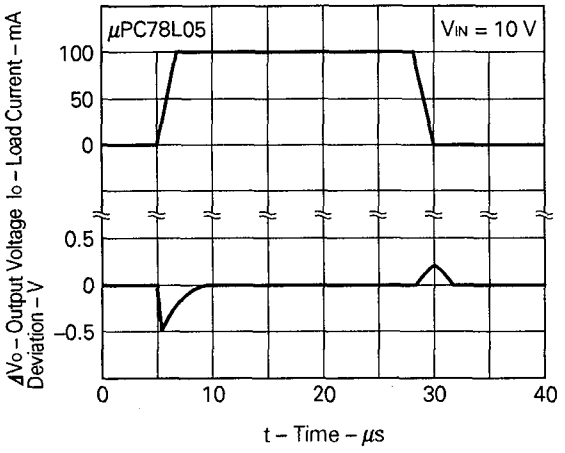

$V_{DIF}$ – $T_j$




LINE TRANSIENT RESPONSE



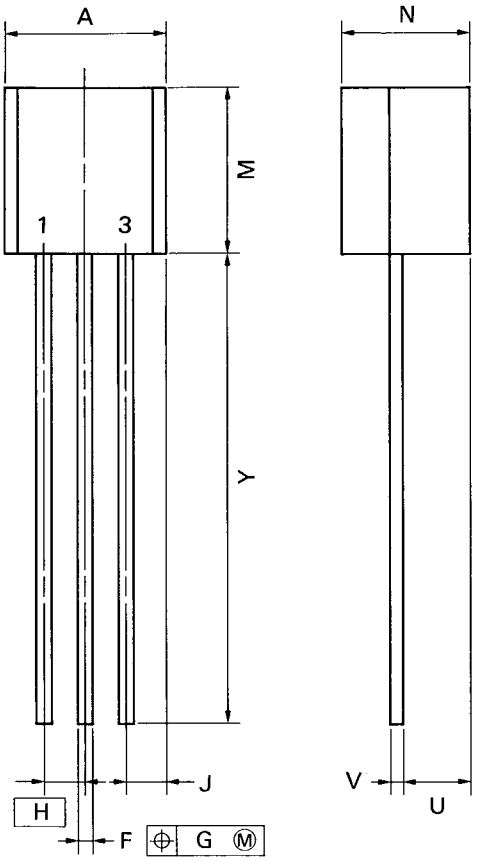

LOAD TRANSIENT RESPONSE



**PACKAGE DIMENSIONS** (Unit: mm)

μPC78L00J Series

3 PIN PLASTIC SIP (TO-92)



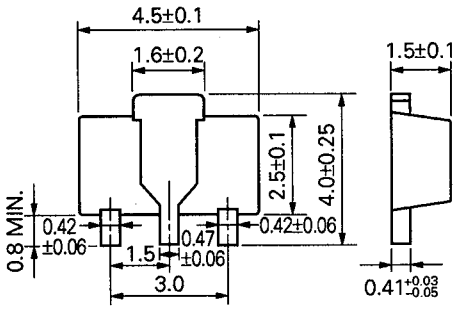

P3J-127B

**NOTE**

Each lead centerline is located within 0.12 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

| ITEM | MILLIMETERS | INCHES |
|---|---|---|
| A | 5.2 MAX. | 0.205 MAX. |
| F | $0.5^{+0.3}_{-0.1}$ | $0.02^{+0.012}_{-0.005}$ |
| G | 0.12 | 0.005 |
| H | 1.27 | 0.05 |
| J | 1.33 MAX. | 0.053 MAX. |
| M | 5.5 MAX. | 0.217 MAX. |
| N | 4.2 MAX. | 0.166 MAX. |
| U | 2.8 MAX. | 0.111 MAX. |
| V | $0.5^{\pm0.1}$ | $0.02^{+0.004}_{-0.005}$ |
| Y | $15.0^{\pm0.7}$ | $0.591^{+0.028}_{-0.029}$ |

μPC78L00T Series



## RECOMMENDED SOLDERING CONDITIONS

The following conditions (see table below) must be met when soldering this product.

Please consult with our sales offices in case other soldering process is used, or in case soldering is done under different conditions.

### <TYPES OF SURFACE MOUNT DEVICE>

For more details, refer to our document "SMT MANUAL" (IEI-1207).

[μPC78L00T Series]

| Soldering process | Soldering condition | Symbol |
|---|---|---|
| Infrared ray reflow | Peak package's surface temperature: 230 °C or below,<br>Reflow time: 30 seconds or below (210 °C or higher),<br>Number of reflow process: 1, Exposure limit*: None | IR30-00 |
| VPS | Peak package's surface temperature: 215 °C or below,<br>Reflow time: 40 seconds or below (200 °C or higher),<br>Number of reflow process: 1, Exposure limit*: None | VP15-00 |

*: Exposure limit before soldering after dry-pack package is opened. Storage conditions: 25 °C and relative humidity at 65% or less.

**Note:** Do not apply more than a single process at once, except for "Partial heating method".

### <TYPES OF THROUGH HOLE MOUNT DEVICE>

[μPC78L00J Series]

| Soldering process | Soldering condition | Symbol |
|---|---|---|
| Wave soldering | Solder temperature: 260 °C or below,<br>Flow time: 10 seconds or below | |

**Reference**

| Application note name | No. |
|---|---|
| Quality control of NEC semiconductor devices | TEI-1202 |
| Quality control guide of semiconductor devices | MEI-1202 |
| Assembly manual of semiconductor devices | IEI-1207 |
| NEC semiconductor device reliability/quality control system | IEI-1212 |



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