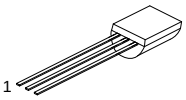
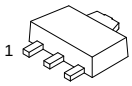
# 3-TERMINAL 0.1A POSITIVE VOLTAGE REGULATORS

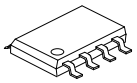



TO-92




SOT-89-3L

1. Output 2. GND 3. Input




SOP-8-225-1.27

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

## DESCRIPTION

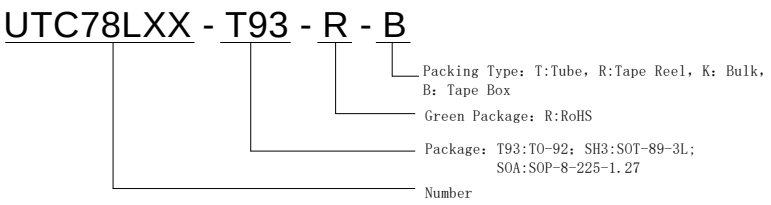
The UTC78LXX series of fixed voltage monolithic integrated circuit voltage regulators are suitable for applications that required supply up to 100mA.

## FEATURE

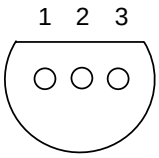
*Maximum output current of 100mA
*Output voltage of 3.3V,5V,6V,8V,9V,10V,12V,15V and 18V
*Thermal overload protection
*Short circuit current limiting

## ORDERING INFORMATION

| Ordering Number | Package | Print Number | Free | Packing |
|---|---|---|---|---|
| UTC78LXX-T93-R-K | TO-92 | 78LXX | RoHS | Bulk |
| UTC78LXX-T93-R-B | TO-92 | 78LXX | RoHS | Tape Box |
| UTC78LXX-SH3-R-R | SOT-89-3L | 78LXX | RoHS | Tape Reel |
| UTC78LXX-SOA-R-T | SOP-8-225-1.27 | UTC78LXX | RoHS | Tube |
| UTC78LXX -SOA-R-R | SOP-8-225-1.27 | UTC78LXX | RoHS | Tape Reel |

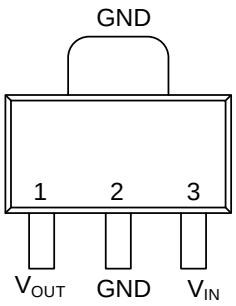


## PIN CONFIGURATION

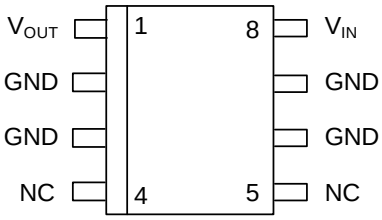



PIN1 = $V_{OUT}$
PIN2 = GND
PIN3 = $V_{IN}$

TO-92

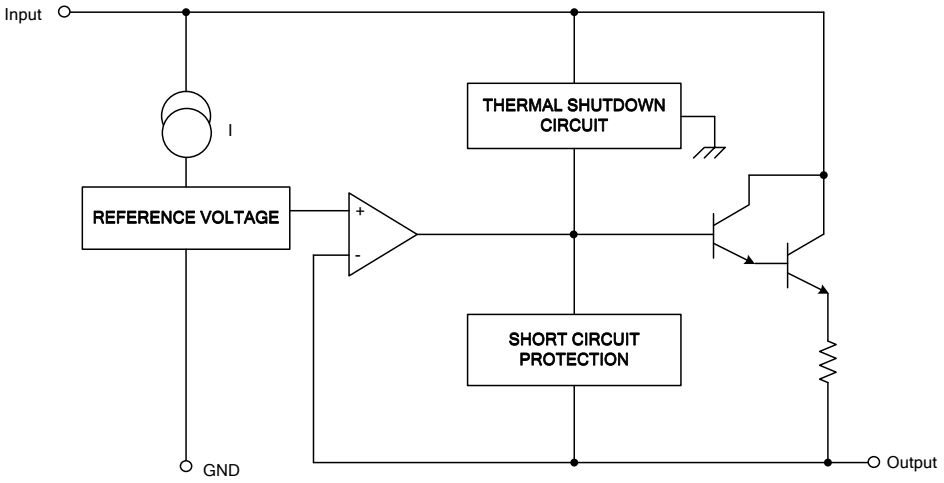



SOT-89-3L




SOP-8-225-1.27

## BLOCK DIAGRAM



**ABSOLUTE MAXIMUM RATINGS**(Operating temperature range applies unless otherwise specified)

| CHARACTERISTICS | | SYMBOL | VALUE | UNITS |
|---|---|---|---|---|
| Input voltage | $V_{OUT}$=3.3~10V | $V_{IN}$ | 30 | V |
| | $V_{OUT}$=12~18V | | 35 | |
| Output Current | | $I_{OUT}$ | 100 | mA |
| Power Dissipation | TO-92 | Pd | 625 | mW |
| | SOT-89-3L | | 350 | |
| | SOP-8-225-1.27 | | 300 | |
| Junction Temperature | | $T_J$ | +125 | °C |
| Operating Temperature | | $T_{OPR}$ | -20~+120 | °C |
| Storage Temperature Range | | $T_{STG}$ | -40~+150 | °C |

**UTC78L33 ELECTRICAL CHARACTERISTICS**

($V_I$=8.3V, $I_O$=40mA, 0<Tj<125°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)(Note 1)

| Characteristic | Symbol | Test conditions | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | Tj=25°C | 3.168 | 3.3 | 3.432 | V |
| | | 5.3V≤$V_I$≤20V,$I_O$=1mA~40mA | 3.135 | | 3.465 | V |
| | | $I_O$=1mA~70mA | 3.135 | | 3.465 | V (note 2) |
| Output Voltage(note 3) | $V_O$ | Tj=25°C | 3.234 | 3.3 | 3.366 | V |
| | | 5.3V≤$V_I$≤20V,$I_O$=1mA~40mA | 3.20 | | 3.40 | V |
| | | $I_O$=1mA~70mA | 3.20 | | 3.40 | V (note 2) |
| Load Regulation | ΔVo | Tj=25°C,$I_O$=1mA~100mA | | 10 | 60 | mV |
| | | Tj=25°C,$I_O$=1mA~40mA | | 7 | 30 | mV |
| Line regulation | ΔVo | 5.3V≤$V_I$≤20V,Tj=25°C | | 7 | 150 | mV |
| | | 6.3V≤$V_I$≤20V,Tj=25°C | | 4 | 100 | mV |
| Quiescent Current | Iq | Tj=25°C | | 2.0 | 5.5 | mA |
| Quiescent Current Change | ΔIq | 6.3V≤$V_I$≤20V | | | 1.5 | mA |
| | ΔIq | 1mA≤$V_I$≤40mA | | | 0.1 | mA |
| Output Noise Voltage | $V_N$ | 10Hz≤f≤100kHz, Tj=25°C | | 40 | | μV |
| Temperature coefficient of Vo | ΔVo/ΔT | Io=5mA | | 0.45 | | mV/°C |
| Ripple Rejection | RR | 6.3V≤$V_I$≤16.3V,f=120Hz,Tj=25°C | 40 | 49 | | dB |
| Dropout Voltage | Vd | | | 1.7 | | V |

## UTC78L05 ELECTRICAL CHARACTERISTICS

(VI=10V, Io=40mA, 0<Tj<125°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)(Note 1)

| Characteristic | Symbol | Test conditions | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | Vo | Tj=25°C | 4.8 | 5.0 | 5.2 | V |
| | | 7V≤VI≤20V,IO=1mA~40mA | 4.75 | | 5.25 | V |
| | | IO=1mA~70mA | 4.75 | | 5.25 | V (note 2) |
| Output Voltage(note 3) | Vo | Tj=25°C | 4.9 | 5.0 | 5.1 | V |
| | | 7V≤VI≤20V,IO=1mA~40mA | 4.85 | | 5.15 | V |
| | | IO=1mA~70mA | 4.85 | | 5.15 | V (note 2) |
| Load Regulation | ΔVo | Tj=25°C, IO=1mA~100mA | | 15 | 60 | mV |
| | | Tj=25°C, IO=1mA~40mA | | 10 | 30 | mV |
| Line regulation | ΔVo | 7V≤VI≤20V,Tj=25°C | | 10 | 150 | mV |
| | | 8V≤VI≤20V,Tj=25°C | | 5 | 100 | mV |
| Quiescent Current | Iq | Tj=25°C | | 2.0 | 5.5 | mA |
| Quiescent Current Change | ΔIq | 8V≤VI≤20V | | | 1.5 | mA |
| | ΔIq | 1mA≤VI≤40mA | | | 0.1 | mA |
| Output Noise Voltage | VN | 10Hz≤f≤100kHz, Tj=25°C | | 40 | | μV |
| Temperature coefficient of Vo | ΔVo/ΔT | Io=5mA | | 0.65 | | mV/°C |
| Ripple Rejection | RR | 8V≤VI≤18V,f=120Hz,Tj=25°C | 40 | 49 | | dB |
| Dropout Voltage | Vd | | | 1.7 | | V |

## UTC78L06 ELECTRICAL CHARACTERISTICS

(VI=12V, Io=40mA, 0<Tj<125°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)(Note 1)

| Characteristic | Symbol | Test conditions | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | VO | Tj=25°C | 5.75 | 6.0 | 6.25 | V |
| | | 8.5V≤VI≤20V,IO=1mA~40mA | 5.7 | | 6.3 | V |
| | | IO=1mA~70mA | 5.7 | | 6.3 | V (note 2) |
| Output Voltage(note 3) | VO | Tj=25°C | 5.88 | 6.0 | 6.12 | V |
| | | 8.5V≤VI≤20V,IO=1mA~40mA | 5.82 | | 6.18 | V |
| | | IO=1mA~70mA | 5.82 | | 6.18 | V (note 2) |
| Load Regulation | ΔVo | Tj=25°C,IO=1mA~100mA | | 18 | 60 | mV |
| | | Tj=25°C,IO=1mA~40mA | | 12 | 30 | mV |
| Line regulation | ΔVo | 8.5V≤VI≤20V,Tj=25°C | | 12 | 150 | mV |
| | | 9V≤VI≤20V,Tj=25°C | | 6 | 100 | mV |
| Quiescent Current | Iq | Tj=25°C | | 2.0 | 5.5 | mA |
| Quiescent Current Change | ΔIq | 9V≤VI≤20V | | | 1.5 | mA |
| | ΔIq | 1mA≤VI≤40mA | | | 0.1 | mA |
| Output Noise Voltage | VN | 10Hz≤f≤100kHz, Tj=25°C | | 50 | | μV |
| Temperature coefficient of Vo | ΔVo/ΔT | Io=5mA | | 0.75 | | mV/°C |
| Ripple Rejection | RR | 9V≤VI≤20V,f=120Hz,Tj=25°C | 38 | 46 | | dB |
| Dropout Voltage | Vd | | | 1.7 | | V |

**UTC78L08 ELECTRICAL CHARACTERISTICS**

(VI=14V, Io=40mA, 0<Tj<125°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)(Note 1)

| Characteristic | Symbol | Test conditions | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | Tj=25°C | 7.7 | 8.0 | 8.3 | V |
| | | 10.5V≤$V_I$≤23V,$I_O$=1mA~40mA | 7.6 | | 8.4 | V |
| | | $I_O$=1mA~70mA | 7.6 | | 8.4 | V (note2) |
| Output Voltage(note3) | $V_O$ | Tj=25°C | 7.84 | 8.0 | 8.16 | V |
| | | 10.5V≤$V_I$≤23V,$I_O$=1mA~40mA | 7.76 | | 8.24 | V |
| | | $I_O$=1mA~70mA | 7.76 | | 8.24 | V (note2) |
| Load Regulation | ΔVo | Tj=25°C, $I_O$=1mA~100mA | | 24 | 80 | mV |
| | | Tj=25°C, $I_O$=1mA~40mA | | 16 | 40 | mV |
| Line regulation | ΔVo | 10.5V≤$V_I$≤23V,Tj=25°C | | 16 | 175 | mV |
| | | 11V≤$V_I$≤23V,Tj=25°C | | 8 | 125 | mV |
| Quiescent Current | Iq | Tj=25°C | | 2.0 | 5.5 | mA |
| Quiescent Current Change | ΔIq | 11V≤$V_I$≤23V | | | 1.5 | mA |
| | ΔIq | 1mA≤$V_I$≤40mA | | | 0.1 | mA |
| Output Noise Voltage | $V_N$ | 10Hz≤f≤100kHz, Tj=25°C | | 60 | | μV |
| Temperature coefficient of Vo | ΔVo/ΔT | Io=5mA | | 0.8 | | mV/°C |
| Ripple Rejection | RR | 12V≤$V_I$≤23V,f=120Hz,Tj=25°C | 36 | 45 | | dB |
| Dropout Voltage | Vd | | | 1.7 | | V |

**UTC78L09 ELECTRICAL CHARACTERISTICS**

(VI=15V, Io=40mA, 0<Tj<125°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)(Note 1)

| Characteristic | Symbol | Test conditions | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | Tj=25°C | 8.64 | 9.0 | 9.36 | V |
| | | 11.5V≤$V_I$≤23V,$I_O$=1mA~40mA | 8.55 | | 9.45 | V |
| | | $I_O$=1mA~70mA | 8.55 | | 9.45 | V (note 2) |
| Output Voltage(note 3) | $V_O$ | Tj=25°C | 8.82 | 9.0 | 9.18 | V |
| | | 11.5V≤$V_I$≤23V,$I_O$=1mA~40mA | 8.73 | | 9.27 | V |
| | | $I_O$=1mA~70mA | 8.73 | | 9.27 | V (note 2) |
| Load Regulation | ΔVo | Tj=25°C, $I_O$=1mA~100mA | | 27 | 80 | mV |
| | | Tj=25°C, $I_O$=1mA~40mA | | 18 | 40 | mV |
| Line regulation | ΔVo | 11.5V≤$V_I$≤23V,Tj=25°C | | 18 | 225 | mV |
| | | 12V≤$V_I$≤23V,Tj=25°C | | 9 | 150 | mV |
| Quiescent Current | Iq | Tj=25°C | | 2.0 | 5.5 | mA |
| Quiescent Current Change | ΔIq | 12V≤$V_I$≤23V | | | 1.5 | mA |
| | ΔIq | 1mA≤$V_I$≤40mA | | | 0.1 | mA |
| Output Noise Voltage | $V_N$ | 10Hz≤f≤100kHz, Tj=25°C | | 70 | | μV |
| Temperature coefficient of Vo | ΔVo/ΔT | Io=5mA | | 0.85 | | mV/°C |
| Ripple Rejection | RR | 12V≤$V_I$≤23V,f=120Hz,Tj=25°C | 36 | 44 | | dB |
| Dropout Voltage | Vd | | | 1.7 | | V |

## UTC78L10 ELECTRICAL CHARACTERISTICS

(VI=16V,Io=40mA,0<Tj<125°C,C1=0.33μF,Co=0.1μF,unless otherwise specified)(Note 1)

| Characteristic | Symbol | Test conditions | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | Vo | Tj=25°C | 9.6 | 10.0 | 10.4 | V |
| | | 12.5V≤VI≤23V,IO=1mA~40mA | 9.5 | | 10.5 | V |
| | | IO=1mA~70mA | 9.5 | | 10.5 | V (note 2) |
| Output Voltage(note 3) | Vo | Tj=25°C | 9.8 | 10.0 | 10.2 | V |
| | | 12.5V≤VI≤23V,IO=1mA~40mA | 9.7 | | 10.3 | V |
| | | IO=1mA~70mA | 9.7 | | 10.3 | V (note 2) |
| Load Regulation | ΔVo | Tj=25°C, IO=1mA~100mA | | 30 | 90 | mV |
| | | Tj=25°C, IO=1mA~40mA | | 20 | 45 | mV |
| Line regulation | ΔVo | 12.5V≤VI≤23V,Tj=25°C | | 20 | 230 | mV |
| | | 13V≤VI≤23V,Tj=25°C | | 10 | 170 | mV |
| Quiescent Current | Iq | Tj=25°C | | 2.0 | 5.5 | mA |
| Quiescent Current Change | ΔIq | 13V≤VI≤23V | | | 1.5 | mA |
| | ΔIq | 1mA≤VI≤40mA | | | 0.1 | mA |
| Output Noise Voltage | VN | 10Hz≤f≤100kHz, Tj=25°C | | 60 | | μV |
| Temperature coefficient of Vo | ΔVo/ΔT | Io=5mA | | 0.9 | | mV/°C |
| Ripple Rejection | RR | 14V≤VI≤23V,f=120Hz,Tj=25°C | 36 | 45 | | dB |
| Dropout Voltage | Vd | | | 1.7 | | V |

## UTC78L12 ELECTRICAL CHARACTERISTICS

(VI=19V, Io=40mA, 0<Tj<125°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)(Note 1)

| Characteristic | Symbol | Test conditions | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | VO | Tj=25°C | 11.5 | 12 | 12.6 | V |
| | | 14.5V≤VI≤27V,IO=1mA~40mA | 11.4 | | 12.6 | V |
| | | IO=1mA~70mA | 11.4 | | 12.6 | V (note 2) |
| Output Voltage(note 3) | VO | Tj=25°C | 11.76 | 12.0 | 12.24 | V |
| | | 14.5V≤VI≤27V,IO=1mA~40mA | 11.64 | | 12.36 | V |
| | | IO=1mA~70mA | 11.64 | | 12.36 | V (note 2) |
| Load Regulation | ΔVo | Tj=25°C, IO=1mA~100mA | | 36 | 100 | mV |
| | | Tj=25°C, IO=1mA~40mA | | 24 | 50 | mV |
| Line regulation | ΔVo | 14.5V≤VI≤27V,Tj=25°C | | 24 | 250 | mV |
| | | 16V≤VI≤27V,Tj=25°C | | 12 | 200 | mV |
| Quiescent Current | Iq | Tj=25°C | | 2.0 | 5.5 | mA |
| Quiescent Current Change | ΔIq | 16V≤VI≤27V | | | 1.5 | mA |
| | ΔIq | 1mA≤VI≤40mA | | | 0.1 | mA |
| Output Noise Voltage | VN | 10Hz≤f≤100kHz, Tj=25°C | | 80 | | μV |
| Temperature coefficient of Vo | ΔVo/ΔT | Io=5mA | | 1.0 | | mV/°C |
| Ripple Rejection | RR | 15V≤VI≤25V,f=120Hz,Tj=25°C | 36 | 42 | | dB |
| Dropout Voltage | Vd | | | 1.7 | | V |

## UTC78L15 ELECTRICAL CHARACTERISTICS

(VI=23V, Io=40mA, 0<Tj<125°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)(Note 1)

| Characteristic | Symbol | Test conditions | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | Tj=25°C | 14.4 | 15 | 15.6 | V |
| | | 17.5V≤$V_I$≤30V,$I_O$=1mA~40mA | 14.25 | | 15.75 | V |
| | | $I_O$=1mA~70mA | 14.25 | | 15.75 | V (note 2) |
| Output Voltage(note 3) | $V_O$ | Tj=25°C | 14.7 | 15.0 | 15.3 | V |
| | | 17.5V≤$V_I$≤30V,$I_O$=1mA~40mA | 14.55 | | 15.45 | V |
| | | $I_O$=1mA~70mA | 14.55 | | 15.45 | V (note 2) |
| Load Regulation | ΔVo | Tj=25°C,$I_O$=1mA~100mA | | 45 | 150 | mV |
| | | Tj=25°C,$I_O$=1mA~40mA | | 30 | 75 | mV |
| Line regulation | ΔVo | 17.5V≤$V_I$≤30V,Tj=25°C | | 30 | 300 | mV |
| | | 20V≤$V_I$≤30V,Tj=25°C | | 15 | 250 | mV |
| Quiescent Current | Iq | Tj=25°C | | 2.2 | 6.0 | mA |
| Quiescent Current Change | ΔIq | 20V≤$V_I$≤30V | | | 1.5 | mA |
| | ΔIq | 1mA≤$V_I$≤40mA | | | 0.1 | mA |
| Output Noise Voltage | $V_N$ | 10Hz≤f≤100kHz, Tj=25°C | | 90 | | μV |
| Temperature coefficient of Vo | ΔVo/ΔT | Io=5mA | | 1.3 | | mV/°C |
| Ripple Rejection | RR | 18.5V≤$V_I$≤28.5V,f=120Hz,Tj=25°C | 33 | 39 | | dB |
| Dropout Voltage | Vd | | | 1.7 | | V |

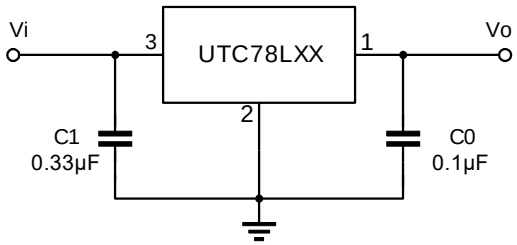
## UTC78L18 ELECTRICAL CHARACTERISTICS

(VI=27V, Io=40mA, 0<Tj<125°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)(Note 1)

| Characteristic | Symbol | Test conditions | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | Tj=25°C | 17.3 | 18 | 18.7 | V |
| | | 22V≤$V_I$≤33V,$I_O$=1mA~40mA | 17.1 | | 18.9 | V |
| | | $I_O$=1mA~70mA | 17.1 | | 18.9 | V (note 2) |
| Output Voltage(note 3) | $V_O$ | Tj=25°C | 17.64 | 18.0 | 18.36 | V |
| | | 22V≤$V_I$≤33V,$I_O$=1mA~40mA | 17.46 | | 18.54 | V |
| | | $I_O$=1mA~70mA | 17.46 | | 18.54 | V (note 2) |
| Load Regulation | ΔVo | Tj=25°C,$I_O$=1mA~100mA | | 54 | 170 | mV |
| | | Tj=25°C,$I_O$=1mA~40mA | | 36 | 85 | mV |
| Line regulation | ΔVo | 20.5V≤$V_I$≤33V,Tj=25°C | | 36 | 320 | mV |
| | | 22V≤$V_I$≤33V,Tj=25°C | | 18 | 270 | mV |
| Quiescent Current | Iq | Tj=25°C | | 2.2 | 6.0 | mA |
| Quiescent Current Change | ΔIq | 23V≤$V_I$≤33V | | | 1.5 | mA |
| | ΔIq | 1mA≤$V_I$≤40mA | | | 0.1 | mA |
| Output Noise Voltage | $V_N$ | 10Hz≤f≤100kHz, Tj=25°C | | 120 | | μV |
| Temperature coefficient of Vo | ΔVo/ΔT | Io=5mA | | 1.5 | | mV/°C |
| Ripple Rejection | RR | 23V≤$V_I$≤33V,f=120Hz,Tj=25°C | 32 | 38 | | dB |
| Dropout Voltage | Vd | | | 1.7 | | V |

Note 1: The Maximum steady state usable output current and input voltage are very dependent on the heating sinking and/or lead temperature length of the package.The date above respresent pulse test conditions with junction temperatures as indicated at the initiation of test.
Note 2:Power dissipation<$P_D$.
Note 3:Output voltage of 78LXXA.

## TYPICAL APPLICATION




Note 1: To specify an output voltage,substitue voltage value for "XX".
Note 2: Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulators.

## TYPICAL PERFORMANCE CHARACTERISTICS

Fig.1 78L05/09 Output Voltage vs Junction Temperature

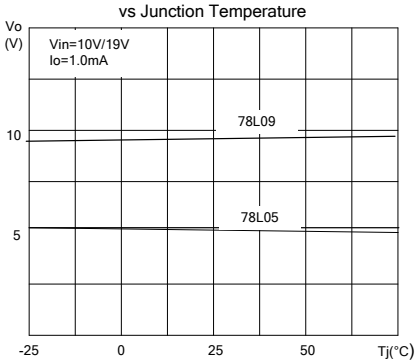



Fig.2 78L05/09 Quiescent Current vs Output Current

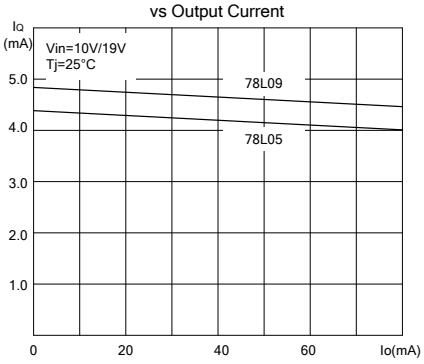



Fig.3 78L05 Quiescent Current vs Input

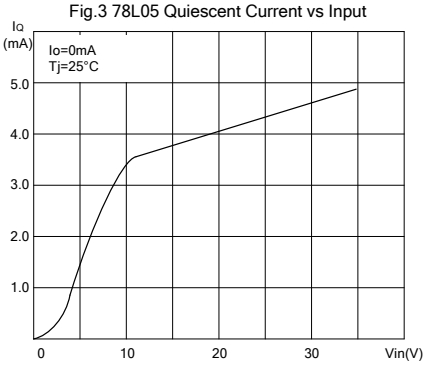



Fig.4 78L05/09 Thermal Shutdown

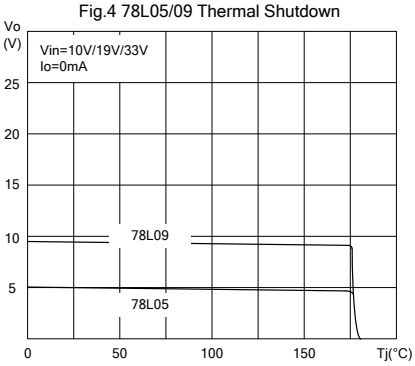



Fig.5 78L05/09 Output Characteristics

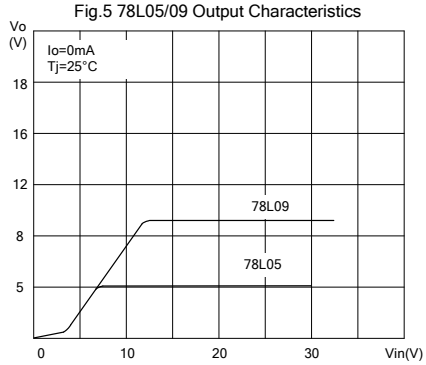
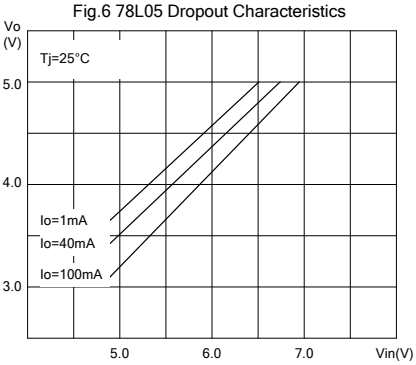
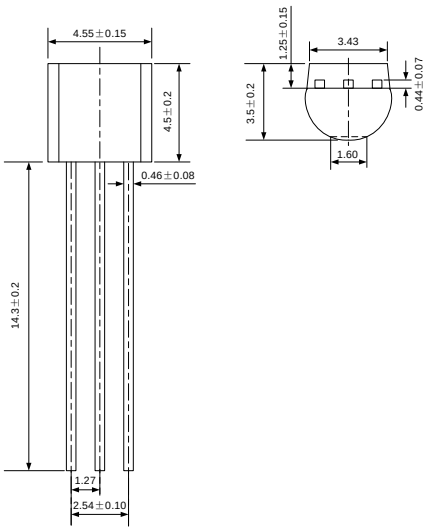



Fig.6 78L05 Dropout Characteristics

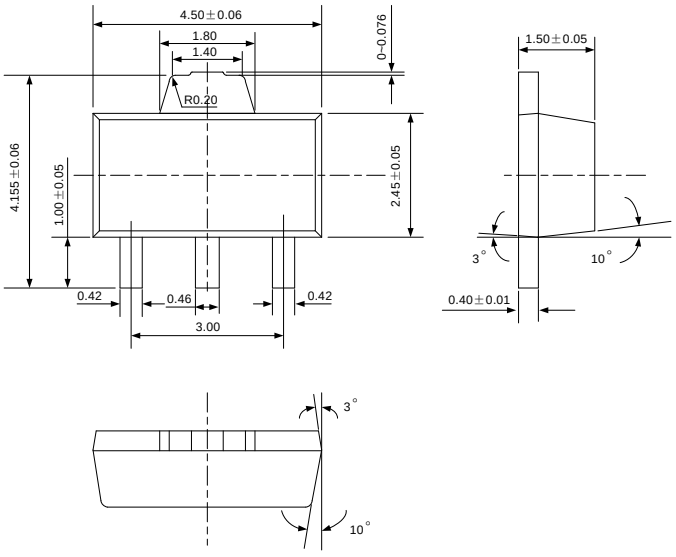


## PACKAGE OTLINE

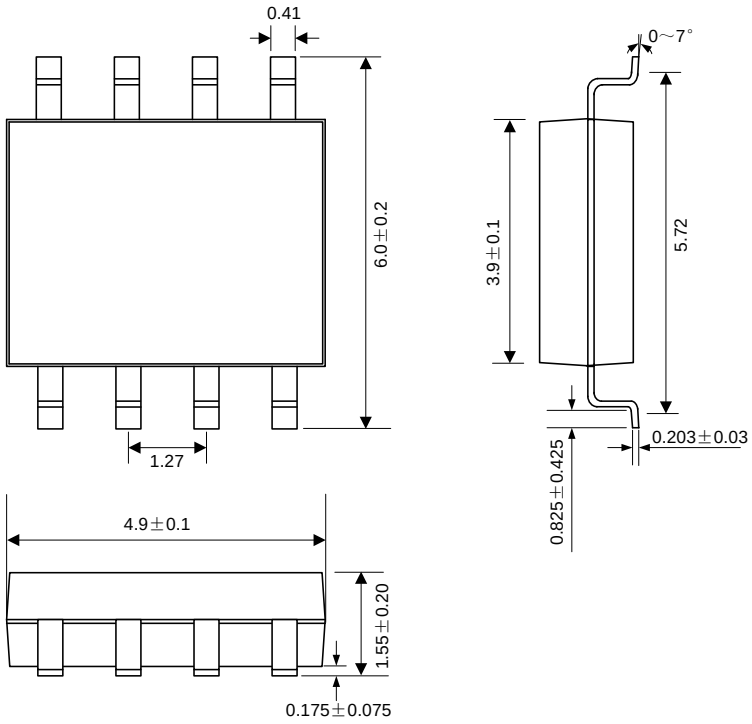
**TO-92** UNIT：mm




**SOT-89-3L** UNIT：mm



| SOP-8-225-1.27 | UNIT：mm |
|---|---|



## ELECTROSTATIC DISCHARGE CAUTION

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage handing to prevent electrostatic damage to the device.