# LM317EMPX-TP

**1.5A, ADJUSTABLE OUTPUT, NEGATIVE VOLTAGE REGULATOR**



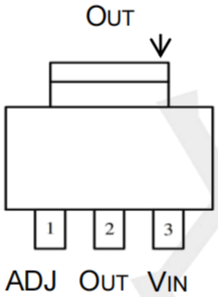
## Features

- Output Adjustable between 1.2V and 37V
- Output current up to 1.5A
- Internal Thermal Overload Protection
- internal thermal Overload protection
- Output transistor safe area compensation

## Applications

- HVAC Systems
- SMPS Post Regulation
- Test and Measurement Equipment
- Industrial Power Supplies

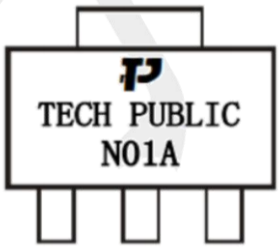
## PIN CONFIGURATION




**SOT-223-3**

**(TOP VIEW)**

**Marking:**




| Pin Number | Pin Name | Pin Function |
|---|---|---|
| SOT-223-3 | | |
| 1 | ADJ | Adjust pin |
| 2 | VOUT | Output of the Regulator |
| 3 | VIN | Input of Supply Voltage |

## Absolute Maximum Ratings

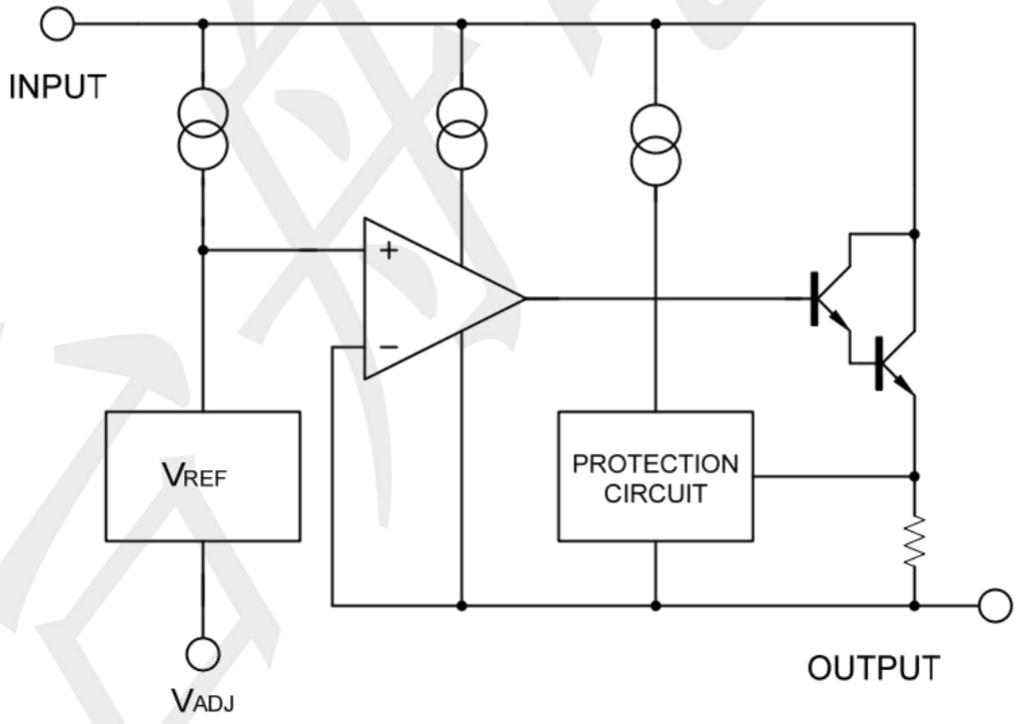
**over operating free-air temperature range (unless otherwise noted)**

| SYMBOL | PARAMETER | RATINGS | UNIT |
|---|---|---|---|
| $V_I - V_O$ | Input-Output Voltage Differential | 40 | V |
| $P_D$ | Power Dissipation | Internally Limited | W |
| $T_J$ | Operating Junction Temperature Range | +125 | ℃ |
| $T_{stg}$ | Storage temperature range | -65~ +150 | ℃ |
| $T_{OPR}$ | Operating Temperature | -40 ~ +85 | ℃ |

## THERMAL DATA

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---|---|---|---|---|
| Junction to Ambient | SOT-223-3 | $\theta_{JA}$ | 140 | ℃/W |
| Junction to Case | SOT-223-3 | $\theta_{JC}$ | 23.5 | ℃/W |

## BLOCK DIAGRAM



## Electrical Characteristics ( TA=25℃, unless otherwise specified)

Notes: 1. Load and line regulation are specified at constant junction temperature. Change in $V_O$ because of heating

| PARAMETER | SYMBOL | TEST Conditions | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| Line Regulation (Note 1) | $\Delta V_{OUT} / V_{OUT}$ | $T_A$ = +25°C, 3.0V ≤ \|$V_I$−$V_O$\|≤ 40V | | -- | 0.01 | 0.04 | %/V |
| Load Regulation (Note 1) | $\Delta V_{OUT}$ | TA= +25°C, 10mA ≤ IO ≤ 1.5A | \|$V_O$\| ≤ 5.0V | -- | 5 | 25 | mV |
| | | | \|$V_O$\| ≥5.0V | -- | 0.1 | 0.5 | % |
| Adjustment Pin Current | $I_{ADJ}$ | | | -- | 50 | 100 | μA |
| Adjustment Pin Current Change | $\Delta I_{ADJ}$ | 3.0V ≤ \|VI-VO\|≤ 40V, 10mA≤ IL ≤ 1.5A, PD ≤PMAX, TA = +25°C | | -- | 2.0 | 5.0 | μA |
| Reference Voltage | $V_{REF}$ | $T_A$ = +25°C, 3.0V ≤ \|$V_I$-$V_O$\| ≤ 40V | | 1.215 | 1.250 | 1.285 | V |
| | | 10mA ≤ $I_O$ ≤ 1.5A, $P_D$ ≤ $P_{MAX}$, $T_J$ = $T_{LOW}$ to $T_{HIGH}$ | | 1.20 | 1.25 | 1.30 | V |
| Temperature Stability | $T_S$ | $T_{LOW}$ ≤$T_J$ ≤ $T_{HIGH}$ | | -- | 0.7 | -- | %$V_O$ |
| Minimum Load Current to Maintain Regulation | $I_{LMIN}$ | \|$V_I$-$V_O$\| ≤ 10V | | -- | 1.5 | 6.0 | mA |
| | | \|$V_I$-$V_O$\| ≤ 40V | | -- | 2.5 | 10 | mA |
| Maximum Output Current | $I_{MAX}$ | \|$V_I$-$V_O$\| ≤ 15V, $P_D$ ≤ $P_{MAX}$ | | 1.5 | 2.2 | -- | A |
| | | \|$V_I$-$V_O$\| ≤40V, $P_D$ ≤ $P_{MAX}$, $T_J$ =+25°C | | 0.3 | 0.4 | -- | A |
| RMS Noise | N | % of $V_O$, $T_A$ = +25°C, 10Hz ≤ f ≤ 10kHz | | -- | 0.003 | -- | %$V_O$ |
| Ripple Rejection | RR | $V_O$ = -10V, f = 120Hz (Note 2) | Without $C_{ADJ}$ | -- | 65 | -- | dB |
| | | | $C_{ADJ}$=10μF | 66 | 80 | -- | dB |
| Long-Term Stability | S | $T_J$ = $T_{HIGH}$ (Note 4), $T_A$ = +25°C for Endpoint Measurements | | | 0.3 | 1.0 | %/1.0k Hrs. |
| Thermal Regulation | | $T_A$ = +25°C (Note 3), 10ms Pulse | | | 0.003 | 0.4 | %VO/W |

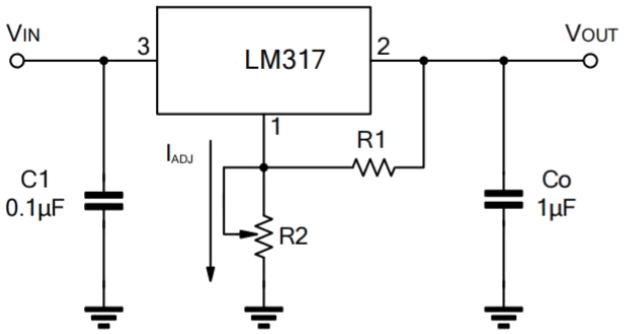
effects is covered under the Thermal Regulation specification. Pulse testing with a low duty cycle is used.

2. $C_{ADJ}$, when used, is connected between the adjustment pin and ground.

3. Power dissipation within an IC voltage regulator produces a temperature gradient on the die, affecting individual IC components on the die. These effects can be minimized by proper integrated circuit design and layout techniques. Thermal Regulation is the effect of these temperature gradients on the output voltage and is expressed in percentage of output change per watt of power change in a specified time.

4. Since Long Term Stability cannot be measured on each device before shipment, this specification is an engineering estimate of average stability from lot to lot.

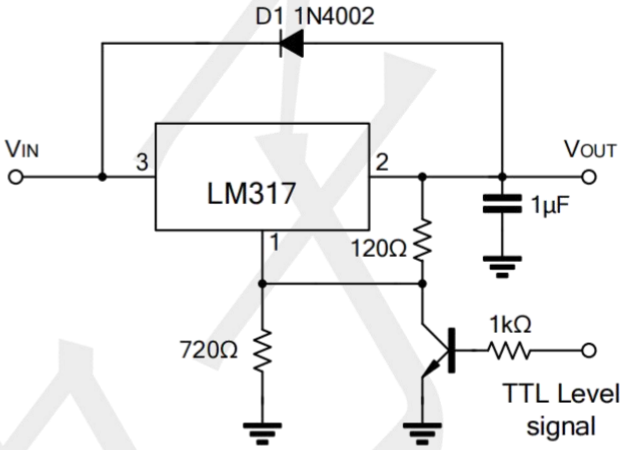
## Typical Application Circuit



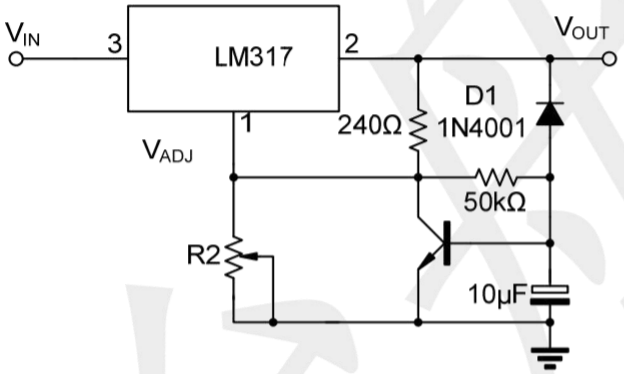

$V_{OUT}=1.25V\times(1+R2/R1)+I_{ADJ}\times R2$

C1 is required when regulator is located an appreciated distance from power supply. Co is needed to improve transient response.

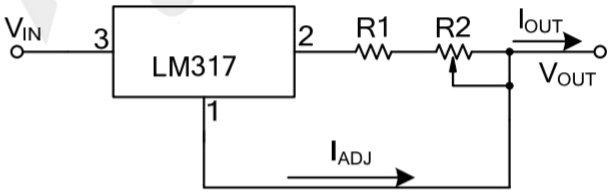
**Programmable voltage regulator**




**Regulator with On-off control**




**Soft Start Application**



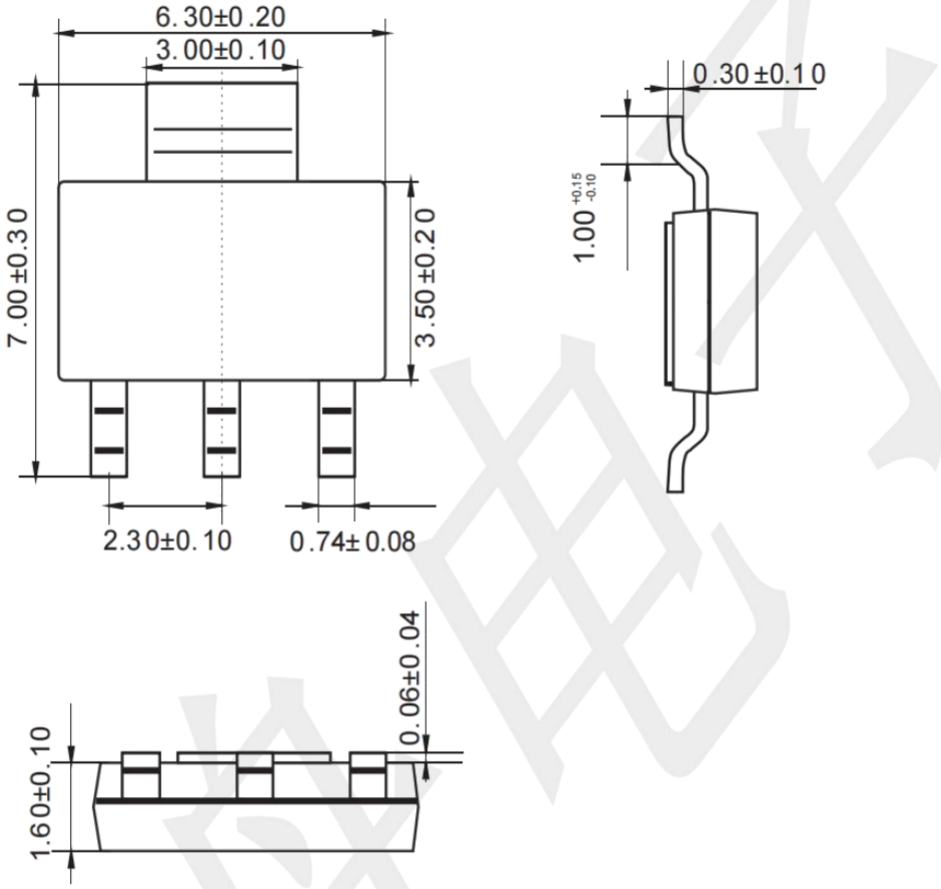

$$I_{O(MAX)} = \left(\frac{V_{REF}}{R1}\right) + I_{ADJ} = \frac{1.25V}{R1}$$

$$I_{O(MIN)} = \left(\frac{V_{REF}}{R1+R2}\right) + I_{ADJ} = \frac{1.25V}{R1+R2}$$

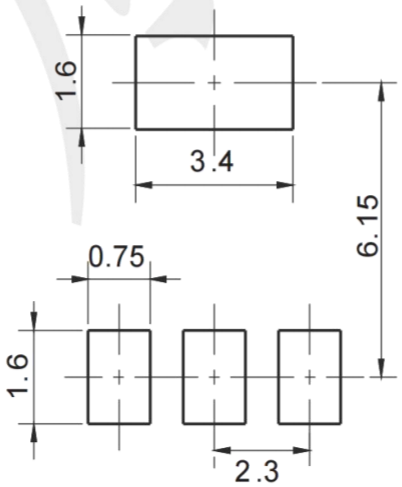
**Constant Current Application**

## Package Outline Dimensions (unit: mm)

**SOT-223-3**




## Mounting Pad Layout (unit: mm)



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