



LM317

LINEAR INTEGRATED CIRCUIT

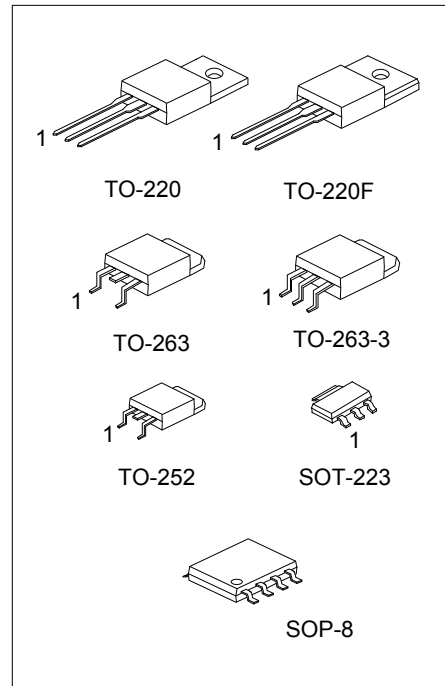
**HIGH CURRENT 1.3V TO 37V
ADJUSTABLE VOLTAGE
REGULATOR**

■ **DESCRIPTION**

The UTC **LM317** is an adjustable 3-terminal positive voltage regulator, designed to supply 1A of output current with voltage adjustable from 1.3V ~ 37V.

■ **FEATURES**

- *Output voltage adjustable from 1.3V ~ 37V
- *Output current in excess of 1A
- *Internal short circuit protection
- *Internal over temperature protection
- *Output transistor safe area compensation



■ **ORDERING INFORMATION**

| Ordering Number | | Package | Pin Assignment | | | | | | | | Packing |
|-----------------|--------------|----------|----------------|---|---|-----|----|---|---|----|-----------|
| Lead Free | Halogen Free | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| LM317K-AA3-R | LM317G-AA3-R | SOT-223 | ADJ | O | I | - | - | - | - | - | Tape Reel |
| LM317K-TA3-T | LM317G-TA3-T | TO-220 | ADJ | O | I | - | - | - | - | - | Tube |
| LM317K-TF3-T | LM317G-TF3-T | TO-220F | ADJ | O | I | - | - | - | - | - | Tube |
| LM317K-TN3-R | LM317G-TN3-R | TO-252 | ADJ | O | I | - | - | - | - | - | Tape Reel |
| LM317K-TQ2-T | LM317G-TQ2-T | TO-263 | ADJ | O | I | - | - | - | - | - | Tube |
| LM317K-TQ2-R | LM317G-TQ2-R | TO-263 | ADJ | O | I | - | - | - | - | - | Tape Reel |
| LM317K-TQ3-T | LM317G-TQ3-T | TO-263-3 | ADJ | O | I | - | - | - | - | - | Tube |
| LM317K-TQ3-R | LM317G-TQ3-R | TO-263-3 | ADJ | O | I | - | - | - | - | - | Tape Reel |
| LM317K-S08-R | LM317G-S08-R | SOP-8 | I | O | O | ADJ | NC | O | O | NC | Tape Reel |

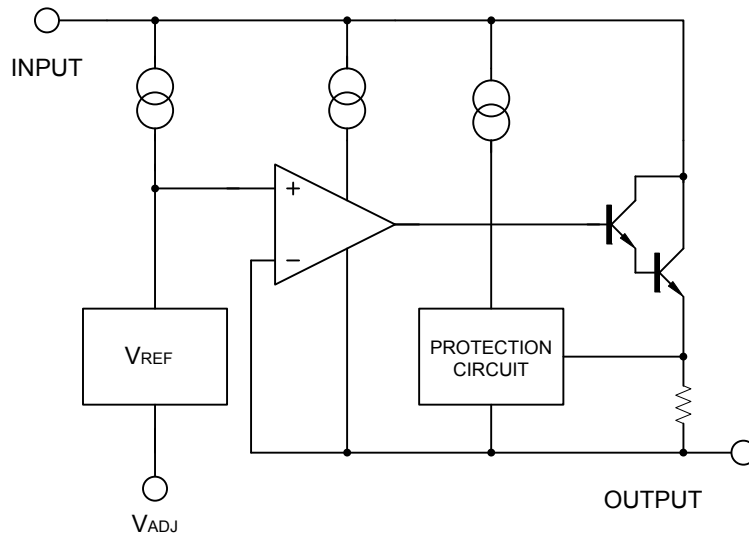
Note: Pin Assignment: I: V_{IN} O: V_{OUT}

| | |
|-----------------------|--|
| <p>LM317G-T30-Y-R</p> | <p>(1) R: Tape Reel, T: Tube (2) refer to Pin Assignment (3) AA3: SOT-223, TA3: TO-220, TF3: TO-220F, TN3: TO-252, TQ2: TO-263, TQ3: TO-263-3 S08: SOP-8 (4) G: Halogen Free and Lead Free, K: Lead Free</p> |
|-----------------------|--|

MARKING

| PACKAGE | MARKING |
|---|--|
| SOT-223 | <p>K: Lead Free G: Halogen Free Date Code</p> <p>1</p> |
| TO-220 TO-220F TO-252 TO-263 TO-263-3 | <p>UTC LM317</p> <p>Lot Code</p> <p>K: Lead Free G: Halogen Free Date Code</p> <p>1</p> |
| SOP-8 | <p>8 7 6 5</p> <p>UTC LM317</p> <p>1 2 3 4</p> <p>Date Code K: Lead Free G: Halogen F Lot Code</p> |

BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS ($T_A=25^\circ\text{C}$, unless otherwise specified)

| PARAMETER | SYMBOL | RATINGS | UNIT |
|-----------------------------------|------------------|------------------|------------------|
| Input - Output Voltage Difference | $V_{IN}-V_{OUT}$ | 40 | V |
| Power Dissipation | P_D | Internal limited | |
| Junction Temperature | T_J | +125 | $^\circ\text{C}$ |
| Operating Temperature | T_{OPR} | -40 ~ +85 | $^\circ\text{C}$ |
| Storage Temperature | T_{STG} | -40 ~ +150 | $^\circ\text{C}$ |

Note: Absolute maximum ratings are stress ratings only and functional device operation is not implied. The device could be damaged beyond Absolute maximum ratings.

■ THERMAL DATA

| PARAMETER | SYMBOL | RATINGS | UNIT | |
|---------------------|---------------|-----------------|------|---------------------------|
| Junction-to-Ambient | θ_{JA} | TO-252 | 112 | $^\circ\text{C}/\text{W}$ |
| | | TO-220/TO-220F | 65 | |
| | | TO-263/TO-263-3 | | |
| | | SOT-223 | 165 | |
| | SOP-8 | 190 | | |
| Junction-to-Case | θ_{JC} | TO-252 | 12 | $^\circ\text{C}/\text{W}$ |
| | | TO-220/TO-263 | 5 | |
| | | TO-263-3 | | |
| | | TO-220F | 7.8 | |
| | | SOT-223 | 23 | |
| | | SOP-8 | 45 | |

■ ELECTRICAL CHARACTERISTICS

($V_{IN}-V_{OUT}=5\text{V}$, $I_{OUT}=10\text{mA}$, $T_A=25^\circ\text{C}$, unless otherwise specified.)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|-------------------------------------|--------------------------|--|--------------------------|-------|------|---------------|
| Line Regulation | $\Delta V_{OUT}/V_{OUT}$ | $3\text{V} \leq V_{IN}-V_{OUT} \leq 40\text{V}$ | | 0.01 | 0.04 | %/V |
| Load Regulation | ΔV_{OUT} | $10\text{mA} \leq I_{OUT} \leq 1\text{A}$ | $V_{OUT} \leq 5\text{V}$ | 5 | 25 | mV |
| | | | $V_{OUT} \geq 5\text{V}$ | 0.1 | 0.5 | % |
| Adjustable Pin Current | I_{ADJ} | | | 50 | 100 | μA |
| Adjustable Pin Current Change | ΔI_{ADJ} | $3\text{V} \leq V_{IN}-V_{OUT} \leq 40\text{V}$, $10\text{mA} \leq I_{OUT} \leq 1\text{A}$, $P_D \leq 20\text{W}$ | | 0.2 | 5 | μA |
| Reference Voltage | V_{REF} | $3\text{V} \leq V_{IN}-V_{OUT} \leq 40\text{V}$, $10\text{mA} \leq I_{OUT} \leq 1\text{A}$, $P_D \leq 20\text{W}$ | 1.20 | 1.25 | 1.30 | V |
| Temperature Stability | | $T_{MIN} \leq T_J \leq T_{MAX}$ | | 0.7 | | %/ V_{OUT} |
| Minimum Load Current for Regulation | $I_{L(MIN)}$ | $V_{IN}-V_{OUT}=40\text{V}$ | | 3.5 | 10 | mA |
| Maximum Output Current | $I_{O(MAX)}$ | $V_{IN}-V_{OUT}=40\text{V}$, $P_D \leq 20\text{W}$ | 0.2 | 0.3 | | A |
| RMS Noise vs. % of V_{OUT} | eN | $10\text{Hz} \leq f \leq 10\text{KHz}$ | | 0.003 | | %/ V_{OUT} |
| Ripple Rejection | RR | $V_{OUT}=10\text{V}$, $f=120\text{Hz}$ | $C_{ADJ}=0$ | 65 | | dB |
| | | | $C_{ADJ}=10\mu\text{F}$ | 66 | 80 | |

Note: C_{ADJ} is connected between Adjust pin and Ground.

APPLICATION CIRCUITS

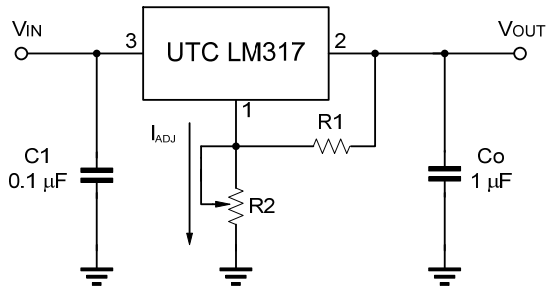


Fig.1 Programmable voltage regulator

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

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

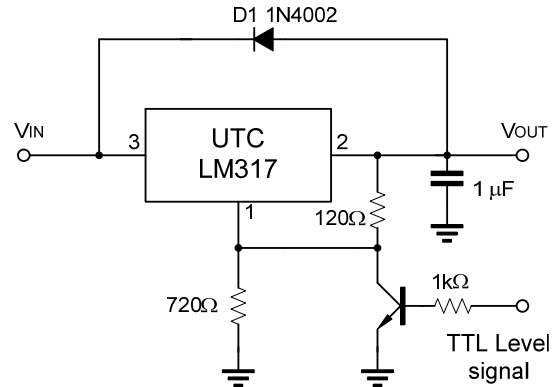


Fig.2 Regulator with On-off control

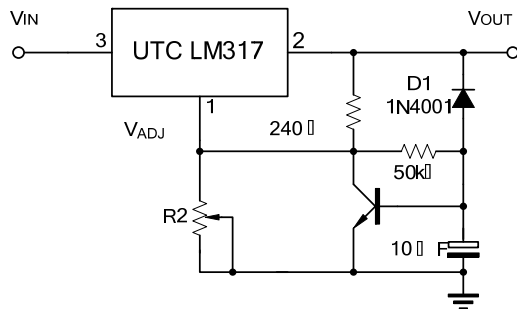
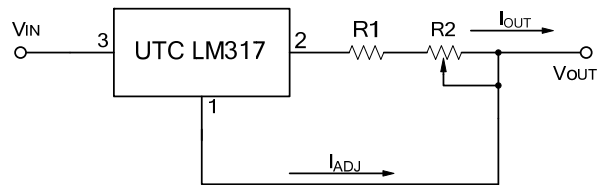


Fig.3 Soft Start Application



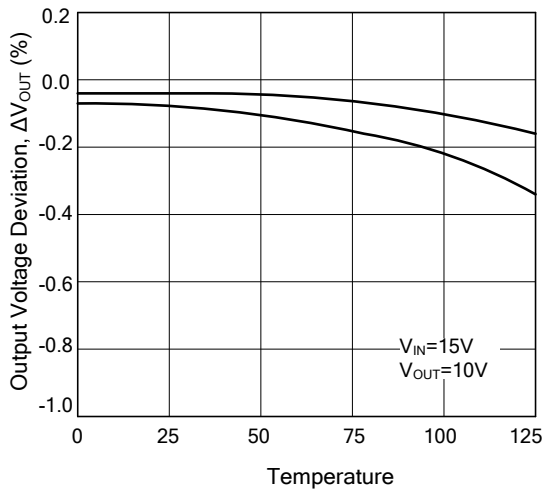
$$I_{O(MAX)} = \left(\frac{V_{REF}}{R1} \right) + I_{ADJ} = \frac{1.25V}{R1}$$

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

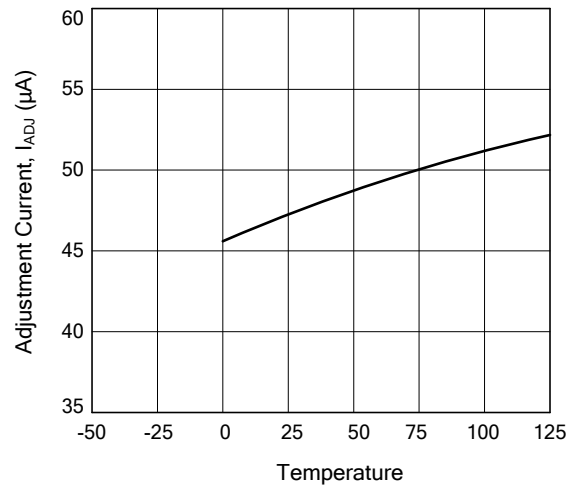
Fig.4 Constant Current Application

TYPICAL CHARACTERISTICS

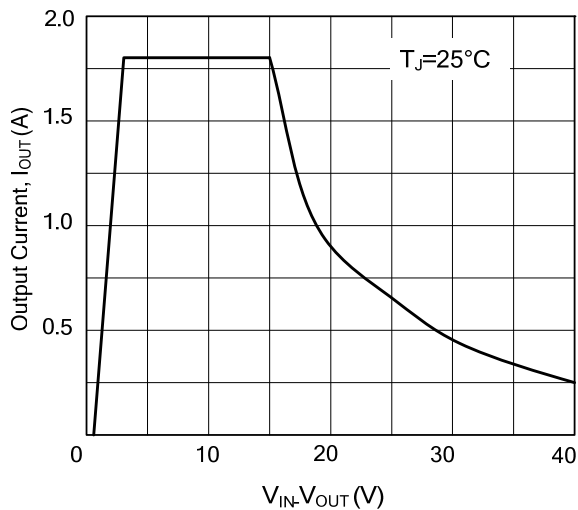
Load Regulation vs. temperature



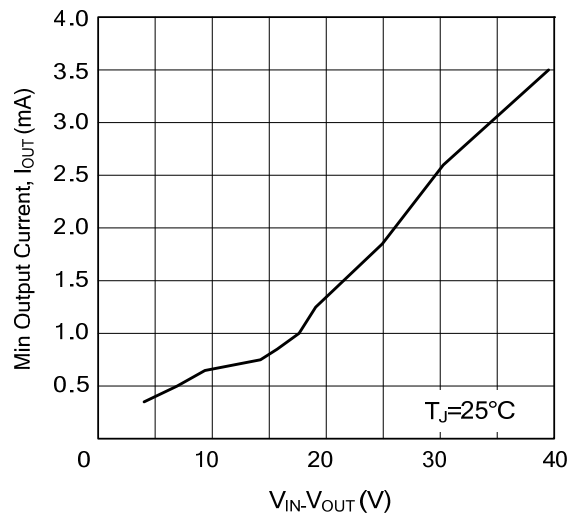
Adjustment Current vs. Temperature



Current Limit



Minimum Operating Current



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