



LM317

LINEAR INTEGRATED CIRCUIT

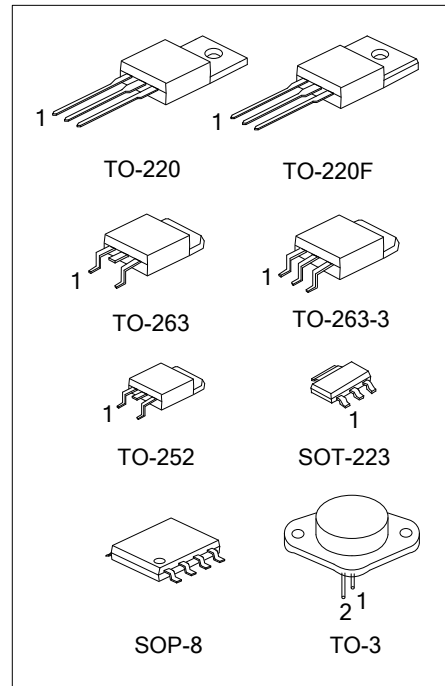
**HIGH CURRENT 1.3V TO 37V
ADJUSTABLE VOLTAGE
REGULATOR**

■ **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 | | |
| - | 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-R | LM317G-TQ2-R | TO-263 | ADJ | O | I | - | - | - | - | - | - | Tape Reel |
| LM317K-TQ2-T | LM317G-TQ2-T | TO-263 | ADJ | O | I | - | - | - | - | - | - | Tube |
| LM317K-TQ3-R | LM317G-TQ3-R | TO-263-3 | ADJ | O | I | - | - | - | - | - | - | Tape Reel |
| LM317K-TQ3-T | LM317G-TQ3-T | TO-263-3 | ADJ | O | I | - | - | - | - | - | - | Tube |
| LM317K-T30-Y | LM317G-T30-Y | TO-3 | I | ADJ | O | - | - | - | - | - | - | Tray |
| LM317K-T30-A-Y | LM317G-T30-A-Y | TO-3 | ADJ | I | O | - | - | - | - | - | - | Tray |
| - | LM317G-S08-R | SOP-8 | I | O | O | ADJ | NC | O | O | NC | NC | Tape Reel |

Note: 1. Pin Assignment: I: V_{IN} O: V_{OUT}
2. Pin 3 on TO-3 is case

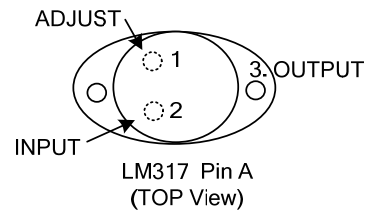
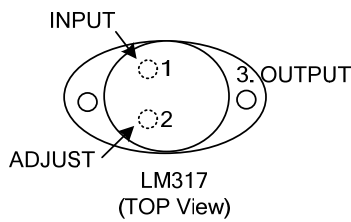
| | |
|-----------------------|--|
| <p>LM317L-T30-Y-R</p> | <p>(1) R: Tape Reel, T: Tube, Y: Tray (2) refer to Pin Assignment (3) AA3: SOT-223, TA3: TO-220, TF3: TO-220F, TN3: TO-252, TQ2: TO-263, TQ3: TO-263-3 T30: TO-3, S08: SOP-8 (4) G: Halogen Free and Lead Free, K: Lead Free</p> |
|-----------------------|--|

MARKING

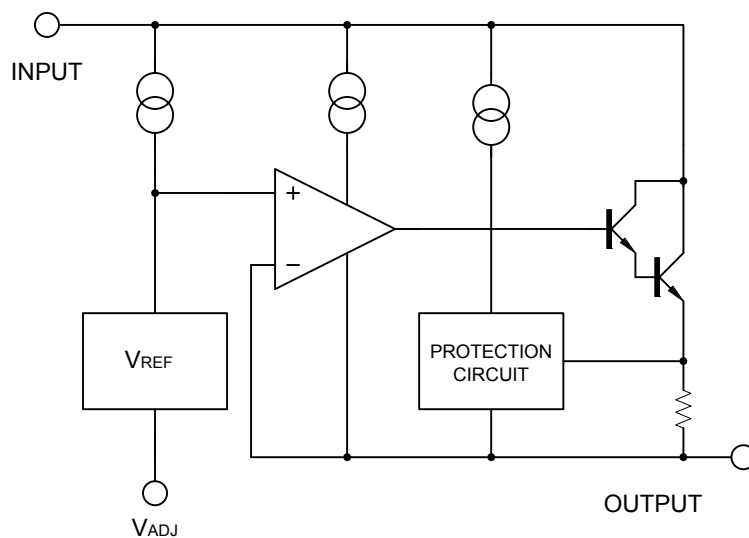
| PACKAGE | MARKING |
|---|---|
| SOT-223 | <p>LM317G □□□□ → Data Code 1</p> |
| TO-220 TO-220F TO-252 TO-263 TO-263-3 | <p>UTC LM317 □□□□ □□ → Data Code Lot Code ← □□□□ □□ → 1</p> <p>K: Lead Free G: Halogen Free</p> |
| TO-3 | <p>UTC LM317 □□□□ □□ → Data Code Pin Code ← □□□□ □□ →</p> <p>K: Lead Free G: Halogen Free</p> |
| SOP-8 | <p>UTC □□□□ → Date Code LM317G □□ □□ → Lot Code 8 7 6 5 1 2 3 4</p> |

PIN CONFIGURATION

For TO-3P



BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS (T_A=25°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 | °C |
| Operating Temperature | T _{OPR} | -40 ~ +85 | °C |
| Storage Temperature | T _{STG} | -40 ~ +150 | °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 | °C/W |
| | | TO-220/TO-220F | 65 | |
| | | TO-263/TO-263-3 | | |
| | | SOT-223 | 165 | |
| | | TO-3 | 35 | |
| | | SOP-8 | 190 | |
| Junction-to-Case | θ _{JC} | TO-252 | 12 | °C/W |
| | | TO-220/TO-263 | 5 | |
| | | TO-263-3 | | |
| | | TO-220F | 7.8 | |
| | | SOT-223 | 23 | |
| | | TO-3 | 3 | |
| | | SOP-8 | 4.5 | |

■ ELECTRICAL CHARACTERISTICS

(V_{IN}-V_{OUT}=5V, I_{OUT}=10mA, T_A=25°C, unless otherwise specified.)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT | |
|-------------------------------------|-------------------------------------|---|------|------------------------|------|--------------------|----|
| Line Regulation | ΔV _{OUT} /V _{OUT} | 3V ≅ V _{IN} -V _{OUT} ≅ 40V | | 0.01 | 0.04 | %/V | |
| Load Regulation | ΔV _{OUT} | 10mA ≅ I _{OUT} ≅ 1A | | V _{OUT} ≅ 5V | 5 | 25 | mV |
| | | | | V _{OUT} ≅ 5V | 0.1 | 0.5 | % |
| Adjustable Pin Current | I _{ADJ} | | | 50 | 100 | μA | |
| Adjustable Pin Current Change | ΔI _{ADJ} | 3V ≅ V _{IN} -V _{OUT} ≅ 40V, 10mA ≅ I _{OUT} ≅ 1A, P _D ≅ 20W | | 0.2 | 5 | μA | |
| Reference Voltage | V _{REF} | 3V ≅ V _{IN} -V _{OUT} ≅ 40V, 10mA ≅ I _{OUT} ≅ 1A, P _D ≅ 20W | 1.20 | 1.25 | 1.30 | V | |
| Temperature Stability | | T _{MIN} ≅ T _J ≅ T _{MAX} | | 0.7 | | %/V _{OUT} | |
| Minimum Load Current for Regulation | I _{L(MIN)} | V _{IN} -V _{OUT} =40V | | 3.5 | 10 | mA | |
| Maximum Output Current | I _{O(MAX)} | V _{IN} -V _{OUT} =40V, P _D ≅ 20W | 0.2 | 0.3 | | A | |
| RMS Noise vs. % of V _{OUT} | eN | 10Hz ≅ f ≅ 10KHz | | 0.003 | | %/V _{OUT} | |
| Ripple Rejection | RR | V _{OUT} =10V, f=120Hz | | C _{ADJ} =0 | 65 | dB | |
| | | | | C _{ADJ} =10μF | 66 | | 80 |

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

APPLICATION CIRCUITS

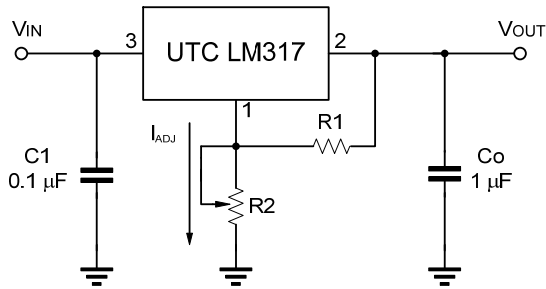


Fig.1 Programmable voltage regulator

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

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

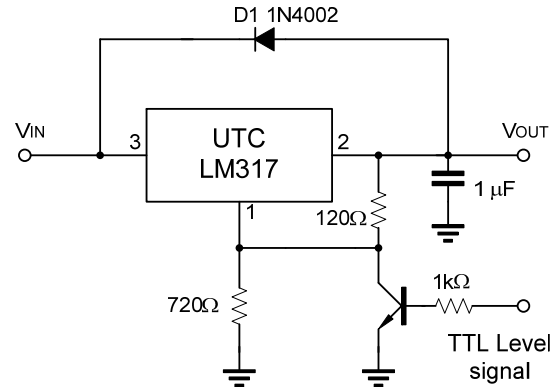


Fig.2 Regulator with On-off control

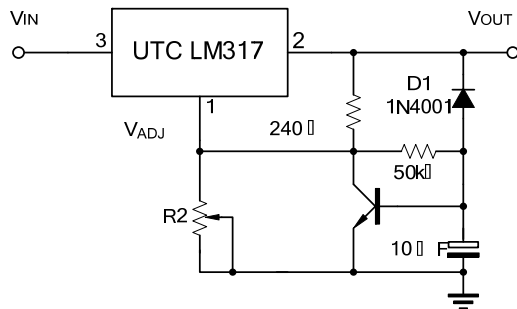
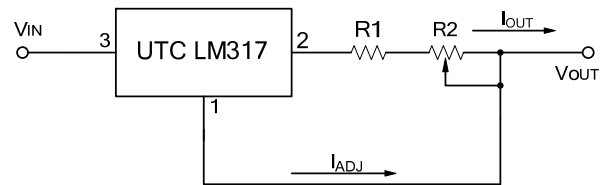


Fig.3 Soft Start Application



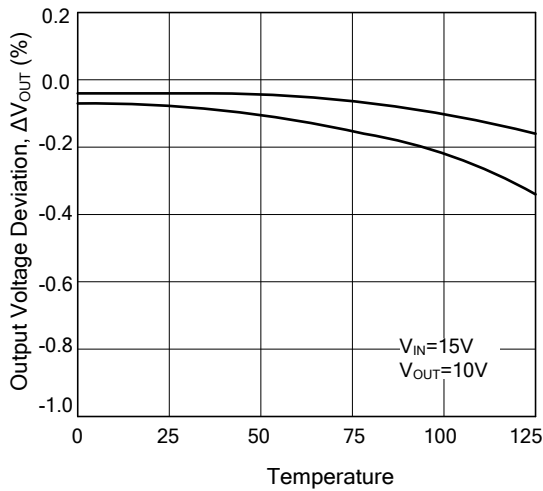
$$I_{O(MAX)} = \left(\frac{V_{REF}}{R1} \right) + I_{ADJ} = \frac{1.25V}{R1}$$

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

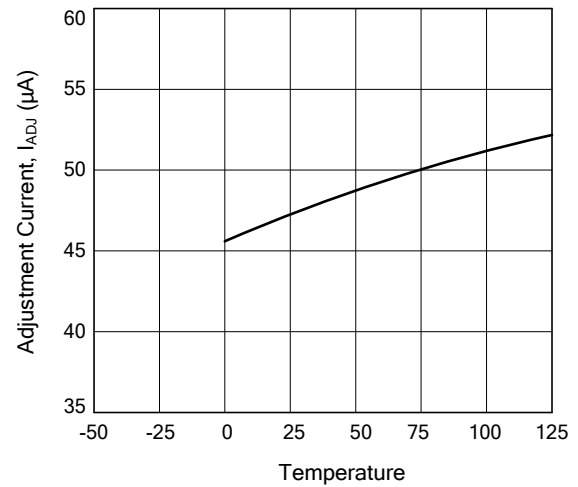
Fig.4 Constant Current Application

TYPICAL CHARACTERISTICS

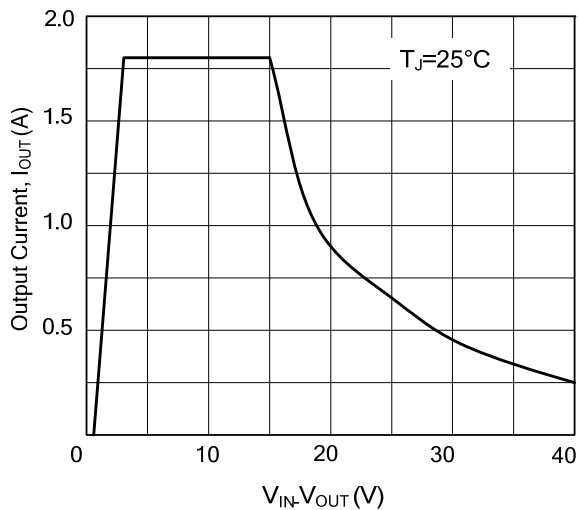
Load Regulation vs. temperature



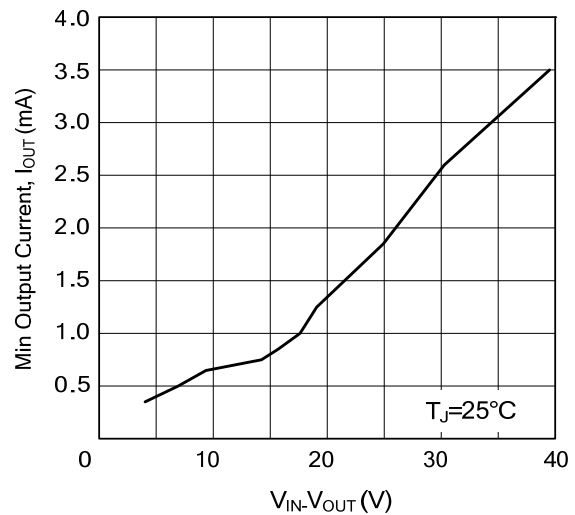
Adjustment Current vs. Temperature



Current Limit



Minimum Operating Current



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