



# LM317

## LINEAR INTEGRATED CIRCUIT

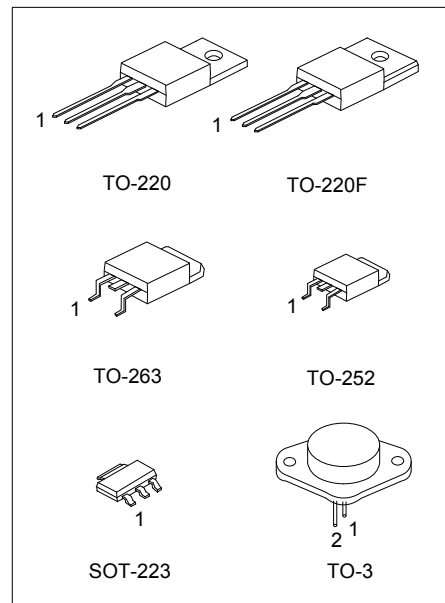
### HIGH CURRENT 1.3V TO 37V ADJUSTABLE VOLTAGE REGULATOR

#### 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



Lead-free: LM317K  
Halogen-free: LM317G

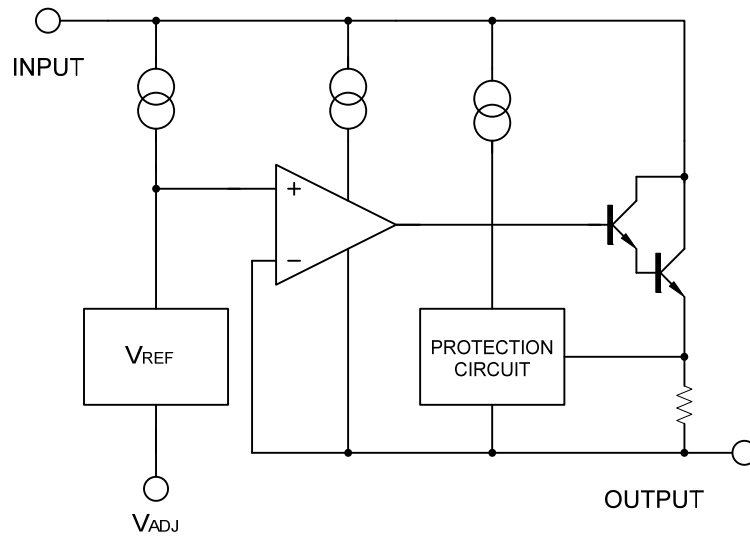
#### ORDERING INFORMATION

Ordering Number			Package	Pin Assignment			Packing
Normal	Lead Free	Halogen Free		1	2	3	
LM317-AA3-R	LM317K-AA3-R	LM317G-AA3-R	SOT-223	ADJ	O	I	Tape Reel
LM317-TA3-T	LM317K-TA3-T	LM317G-TA3-T	TO-220	ADJ	O	I	Tube
LM317-TF3-T	LM317K-TF3-T	LM317G-TF3-T	TO-220F	ADJ	O	I	Tube
LM317-TN3-R	LM317K-TN3-R	LM317G-TN3-R	TO-252	ADJ	O	I	Tape Reel
LM317-TN3-T	LM317K-TN3-T	LM317G-TN3-T	TO-252	ADJ	O	I	Tube
LM317-TQ2-R	LM317K-TQ2-R	LM317G-TQ2-R	TO-263	ADJ	O	I	Tape Reel
LM317-TQ2-T	LM317K-TQ2-T	LM317G-TQ2-T	TO-263	ADJ	O	I	Tube
LM317-T30-Y	LM317K-T30-Y	LM317G-T30-Y	TO-3	I	ADJ	O	Tray

Note: 1. Pin Assignment: I:V<sub>IN</sub> O:V<sub>OUT</sub>  
2. Pin 3 on TO-3 is case

<p>LM317K-AA3-R</p>	<p>(1) R: Tape Reel, T: Tube, Y: Tray  (2) AA3: SOT-223, TA3: TO-220, TF3: TO-220F, TN3: TO-252, TQ2: TO-263, T30: TO-3  (3) G: Halogen Free, K: Lead Free, Blank: Pb/Sn</p>
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### ■ BLOCK DIAGRAM



### ■ ABSOLUTE MAXIMUM RATINGS (Ta=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:1. 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	TO-252	112	°C/W
	TO-220/TO-220F	54	
	TO-263	64	
	SOT-223	165	
	TO-3	35	
Junction-to-Case	TO-252	12	°C/W
	TO-220/TO-220F	5	
	TO-263	5	
	SOT-223	23	
	TO-3	3	

### ■ ELECTRICAL CHARACTERISTICS

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

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

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

## APPLICATION CIRCUITS

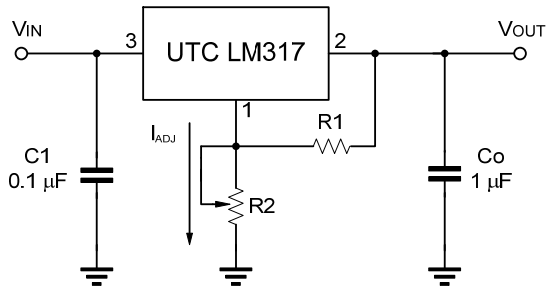


Fig.1 Programmable voltage regulator

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

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

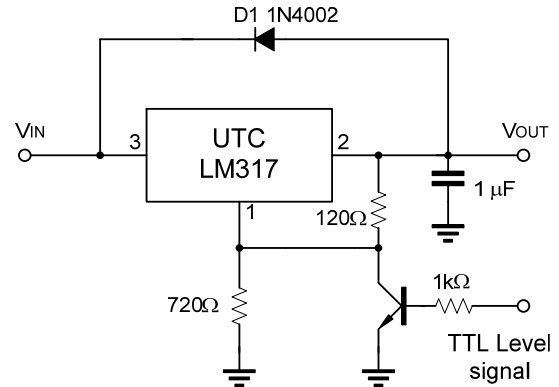


Fig.2 Regulator with On-off control

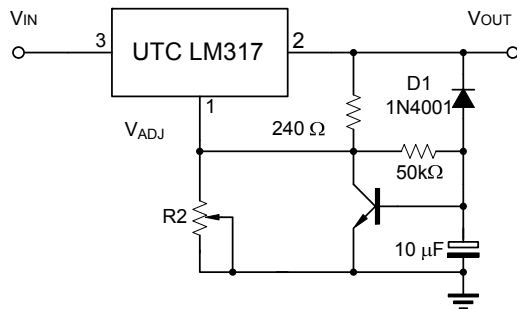
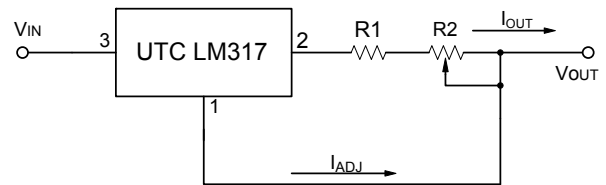


Fig.3 Soft Start Application



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

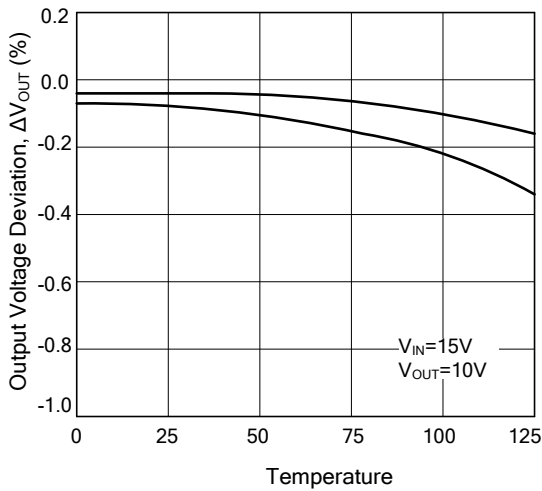
$$I_{O(MIN)} = \left( \frac{V_{REF}}{R1+R2} \right) + I_{ADJ} = \frac{1.25V}{R1+R2}$$

$$5mA < I_{OUT} < 100mA$$

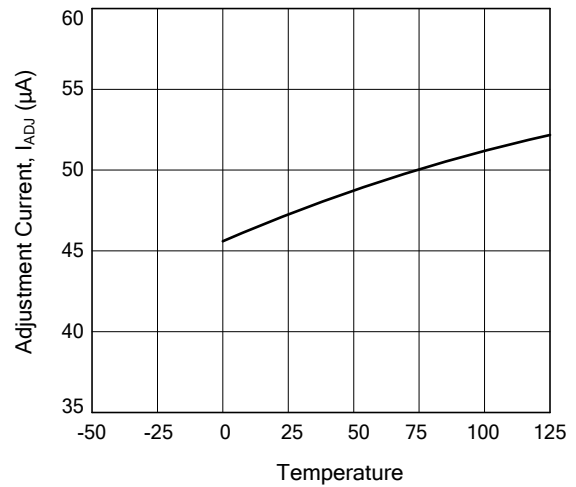
Fig.4 Constant Current Application

## TYPICAL CHARACTERISTICS

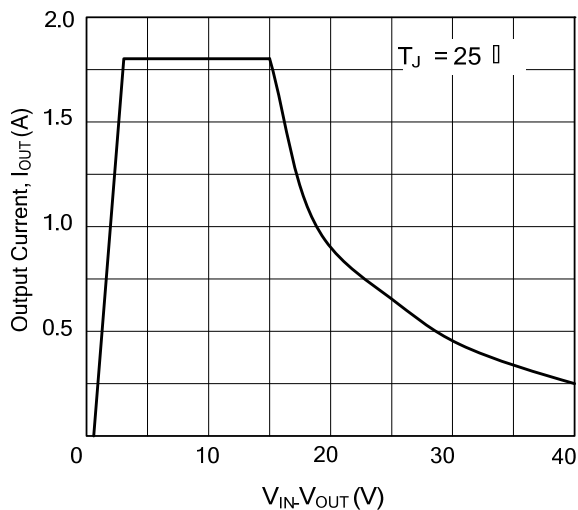
Load Regulation vs. temperature



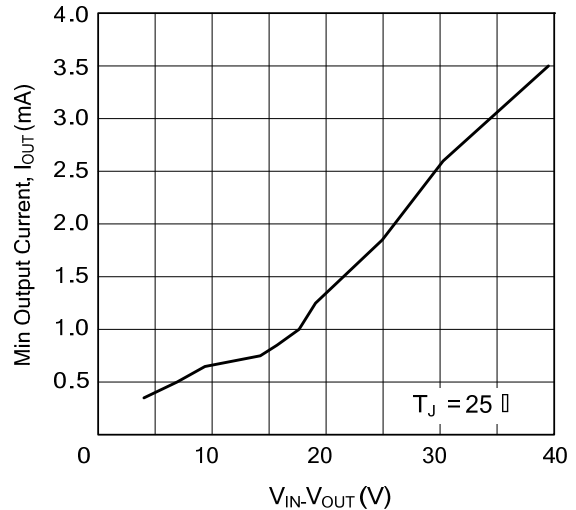
Adjustment Current vs. Temperature



Current Limit



Minimum Operating Current



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