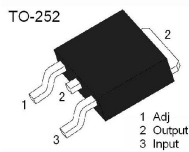


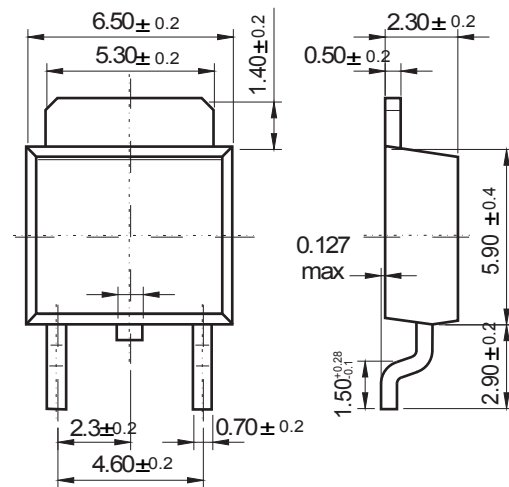
### Features

- Output Voltage Range : 1.2V to 37V
- Output Current in excess of 1.5A
- Internal Thermal Overload Protection
- Internal Short Circuit Current Limiting
- Output Transistor Safe Operating Area Compensation



### TO-252

Unit: mm

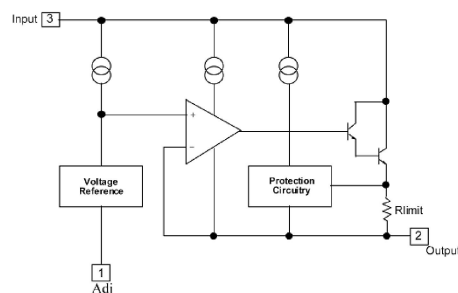


Dimensions in inches and (millimeters)

The LM317 are monolithic integrated circuit in TO-252 package intended for use as positive adjustable voltage regulators. They are designed to supply more than 1.5A of load current with an output voltage adjustable over a 1.2 to 37V range.

The nominal output voltage is selected by means of only a resistive divider, making the device exceptionally easy to use and eliminating the stocking of many fixed regulators.

### Internal Block Diagram



# LM317

## Electrical Characteristics

( $V_i - V_o = 5\text{ V}$ ,  $I_o = 0.5\text{ A}$ ,  $T_A = 25^\circ\text{C}$ , unless otherwise specified)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Line Regulation (Note2)	$\Delta V_{OUT}/V_{OUT}$	$3\text{ V} \leq V_i - V_o \leq 40\text{ V}$ , $T_A = 25^\circ\text{C}$		0.01	0.04	%V
		$3\text{ V} \leq V_i - V_o \leq 40\text{ V}$		0.002	0.07	
Load Regulation(Note2)	$\Delta V_{OUT}$	$10\text{ mA} \leq I_o \leq 1.5\text{ A}$				$\text{mV}\%/V_o$
		$V_o < 5\text{ V}$		18	25	
		$V_o \geq 5\text{ V}$		0.4	0.5	$\text{mV}\%/V_o$
		$10\text{ mA} \leq I_o \leq 1.5\text{ A}$				
		$V_o < 5\text{ V}$		40	70	$\text{mV}\%/V_o$
		$V_o \geq 5\text{ V}$		0.8	1.5	
Adjustment Pin Current	$I_{ADJ}$	$T_j = 25^\circ\text{C}$		50	100	$\mu\text{A}$
Adjustment Pin Current	$\Delta I_{ADJ}$	$3\text{ V} \leq V_i - V_o \leq 40\text{ V}$ $10\text{ mA} \leq I_o \leq 1.5\text{ A}$ $P_D \leq 20\text{ W}$		2.0	5.0	$\mu\text{A}$
Reference Voltage	$V_{REF}$	$3\text{ V} \leq V_i - V_o \leq 40\text{ V}$ $10\text{ mA} \leq I_o \leq 1.5\text{ A}$ , $P_D \leq 20\text{ W}$	1.20	1.25	1.30	V
Minimum Load Current	$I_{L(\text{Min})}$	$V_i - V_o = 40\text{ V}$		3.5	10	mA
Maximum Output Current	$I_{O(\text{Max})}$	$V_i - V_o = 40$ , $P_D \leq 20\text{ W}$	0.2	0.3		A
Maximum Load Current	eN	$10\text{ Hz} \leq f \leq 10\text{ kHz}$		0.003	0.01	% / $V_o$
RMS Noise,% of $V_{OUT}$	RR	$V_o = 10\text{ V}$ , $f = 120\text{ Hz}$ (Note3)				dB
		$C_{ADJ}$		65		
		$C_{ADJ} = 10\mu\text{F}$	66	80		

**Note 2:** Load and line regulation are specified at constant junction temperature. Change in  $V_o$  due to heating effects must be taken into account separately. Pulse testing with low duty is used. ( $P_{MAX} = 20\text{ S}$ )

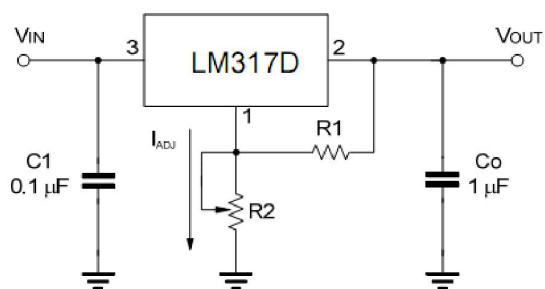
**Note 3:**  $C_{ADJ}$ , when used, is connected between the adjustment pin and ground.

## Thermal resistances

Parameter	Symbol	Conditions	Value	Unit
Junction to ambient	$R\theta_{JA}$		112	$^\circ\text{C/W}$
Junction to case	$R\theta_{JC}$		12	$^\circ\text{C/W}$

# LM317

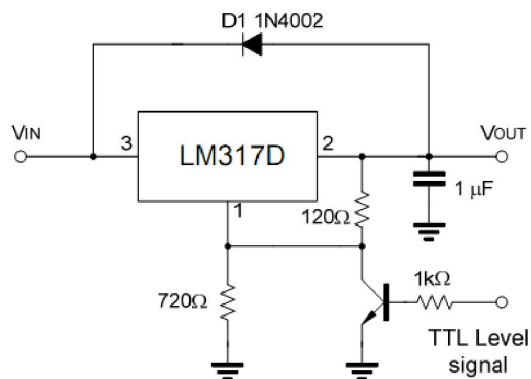
## Typical Application



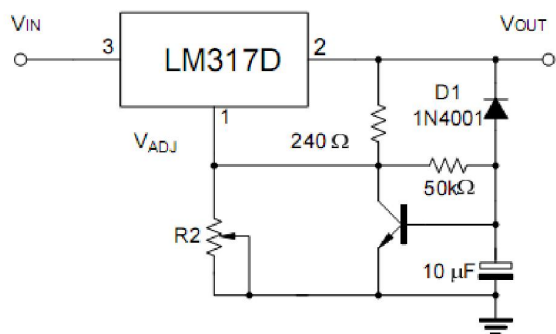
**Fig.1 Programmable voltage regulator**

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

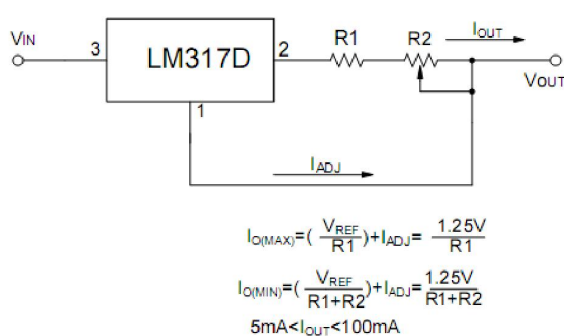
Ci is required when regulator is located an appreciable distance from power supply filter. Co is not needed for stability, however, it does improve transient response.



**Fig.2 Regulator with On-off control**



**Fig.3 Soft Start Application**



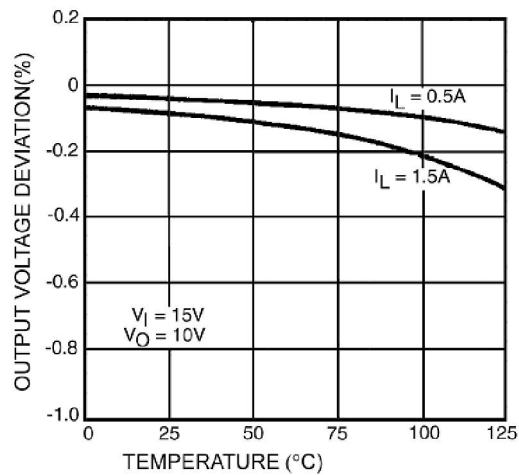
$$I_{O(MAX)} = \left( \frac{V_{REF}}{R1} \right) + I_{ADJ} = \frac{1.25V}{R1}$$

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

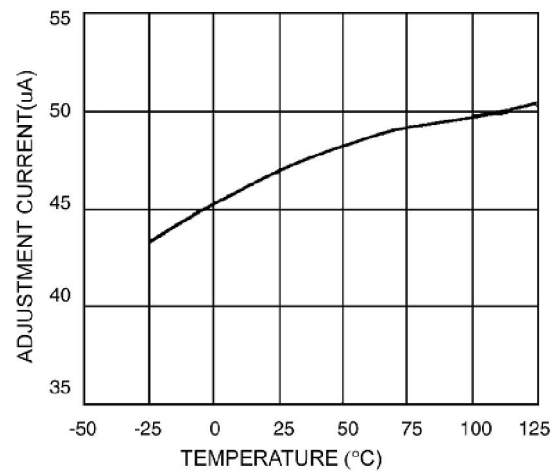
$$5mA < I_{OUT} < 100mA$$

**Fig.4 Constant Current Application**

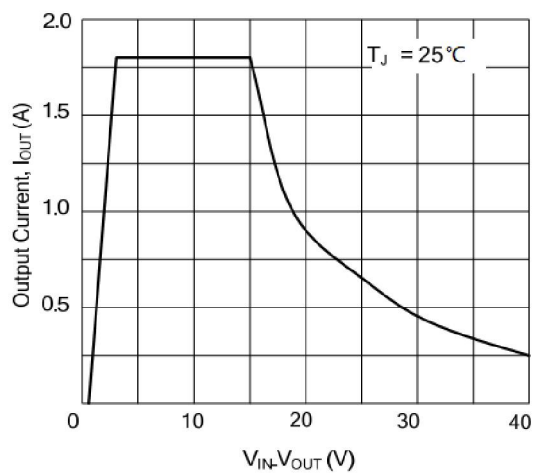
## RATING AND CHARACTERISTIC CURVES (LM317)



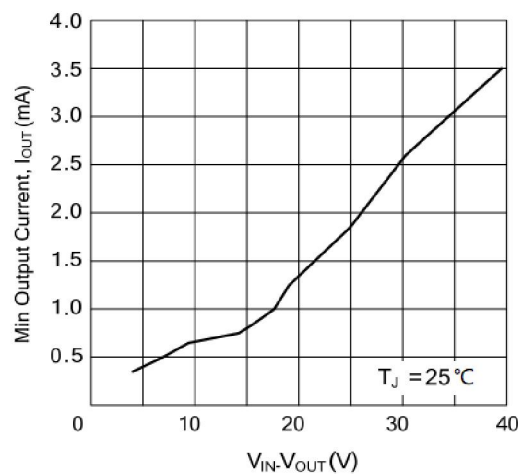
**Fig.5 Load Regulation vs. temperature**



**Fig.6 Adjustment Current vs. Temperature**



**Fig.7 Current limit**



**Fig.8 Minimum Operating Current**