

3-Terminal Positive Adjustable Regulator LM317L

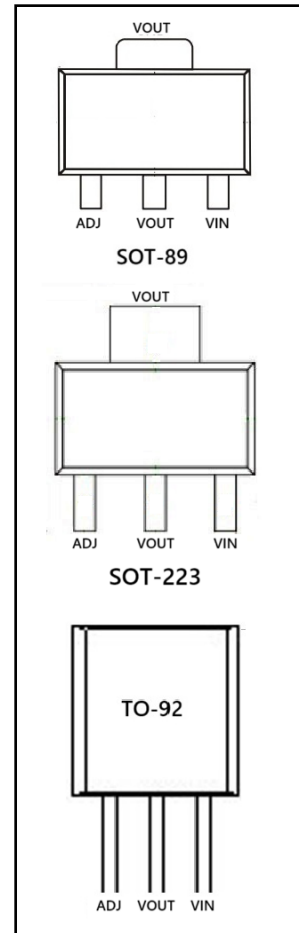
DESCRIPTION

The LM317L is an adjustable 3-terminal positive voltage regulator capable of supplying in excess of 100 mA over an output voltage range of 1.2 V to 37 V. This voltage regulator is exceptionally easy to use and requires only two external resistors to set the output voltage. Further, it employs internal current limiting, thermal shutdown and safe area compensation, making them essentially blow-out proof.

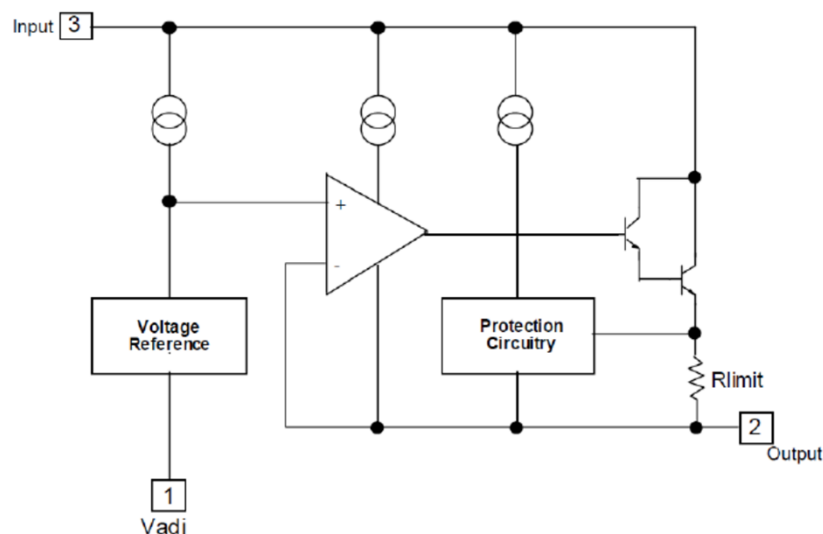
The LM317L serves a wide variety of applications including local, on card regulation. This device can also be used to make a programmable output regulator, or by connecting a fixed resistor between the adjustment and output, the LM317L can be used as a precision current regulator.

FEATURES

- Output Current in Excess of 100 mA
- Output Adjustable Between 1.2 V and 37 V
- Internal Thermal Overload Protection
- Internal Short Circuit Current Limiting
- Output Transistor Safe-Area Compensation
- Floating Operation for High Voltage Applications
- Standard 3-Lead Transistor Package
- Eliminates Stocking Many Fixed Voltages



INTERNAL BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Input-output differential voltage	$V_I - V_O$	40	V
Power dissipation	P_D	Internally Limited	W
Operating junction temperature range	T_j	0 ~ +125	°C
Storage temperature range	T_{STG}	-65 ~ +125	°C

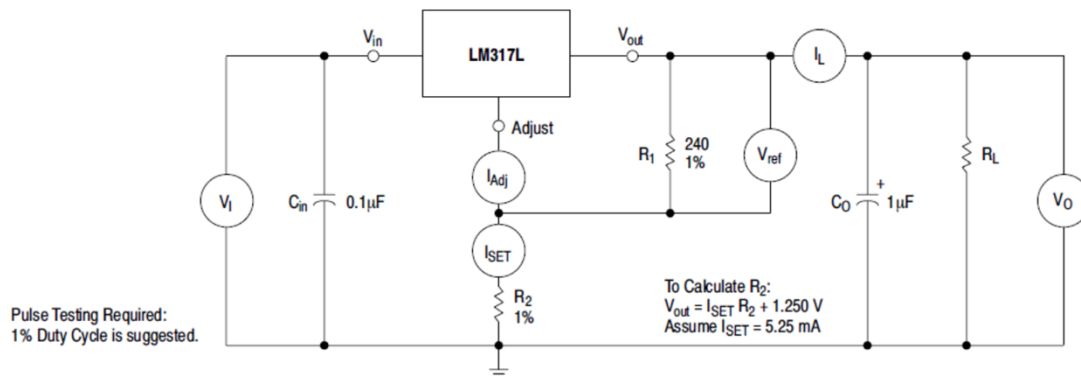
ELECTRICAL CHARACTERISTICS

($V_I - V_O = 5V$, $I_O = 40mA$, $T_J = 0$ to $125^{\circ}C$, unless otherwise specified)

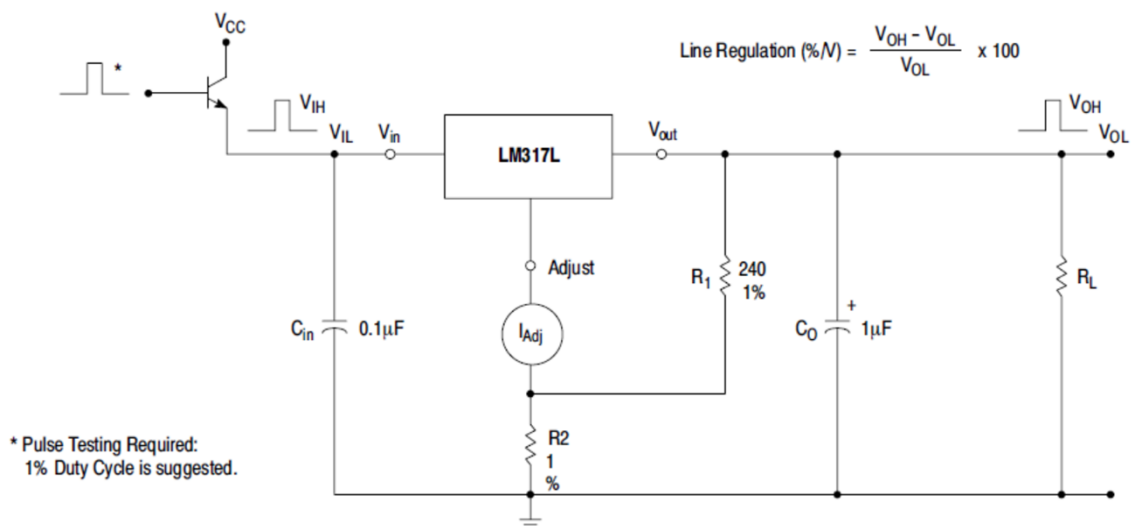
Parameter	Symbol	Test conditions		Min	Typ	Max	Unit
Reference Voltage	V_{REF}	$3.0V \leq V_I - V_O \leq 40V$ $10mA \leq I_O \leq 100mA$, $P_D \leq P_{max}$		1.2	1.25	1.3	V
Line Regulation	Regline	$3.0V \leq V_I - V_O \leq 40V$, $I_L \leq 10mA$		$T_A = 25^{\circ}C$	0.01	0.04	% / V
					0.02	0.07	
Load Regulation	Regload	$10mA \leq I_O \leq 100mA$	$V_O \leq 5.0V$	$T_A = 25^{\circ}C$	5.0	25	mV
			$V_O \geq 5.0V$		0.1	0.5	% / V
			$V_O \leq 5.0V$		20	70	mV
			$V_O \geq 5.0V$		0.3	1.5	% / V
Adjustment Pin Current	I_{Adj}				50	100	μA
Adjustment Pin Current Change	ΔI_{Adj}	$3.0V \leq V_I - V_O \leq 40V$ $10mA \leq I_O \leq 100mA$, $P_D \leq P_{max}$			0.2	5.0	μA
Maximum Output Current	$I_O MAX$	$V_I - V_O \leq 6.25V$, $P_D \leq P_{max}$		100	200		mA
		$V_I - V_O \leq 40V$, $P_D \leq P_{max}$		$T_A = 25^{\circ}C$	20		
Minimum Load Current to Maintain Regulation	$I_L MIN$	$V_I - V_O = 40V$			3.5	10	mA
RMS Noise, % of V_O	N	$T_A = 25^{\circ}C$, 10 Hz 3 f 3 10 kHz			0.003		% V
Ripple Rejection	RR	$V_O = 1.2V$, $f = 120Hz$	$C_{Adj} = 0mF$	60	80		dB
			$C_{Adj} = 10mF$		80		

TEST CIRCUIT

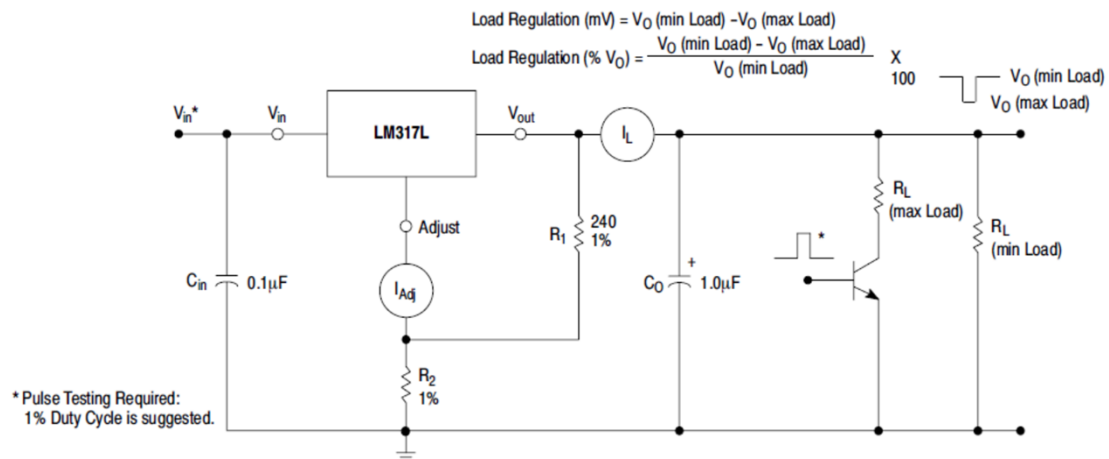
Standard Test Circuit

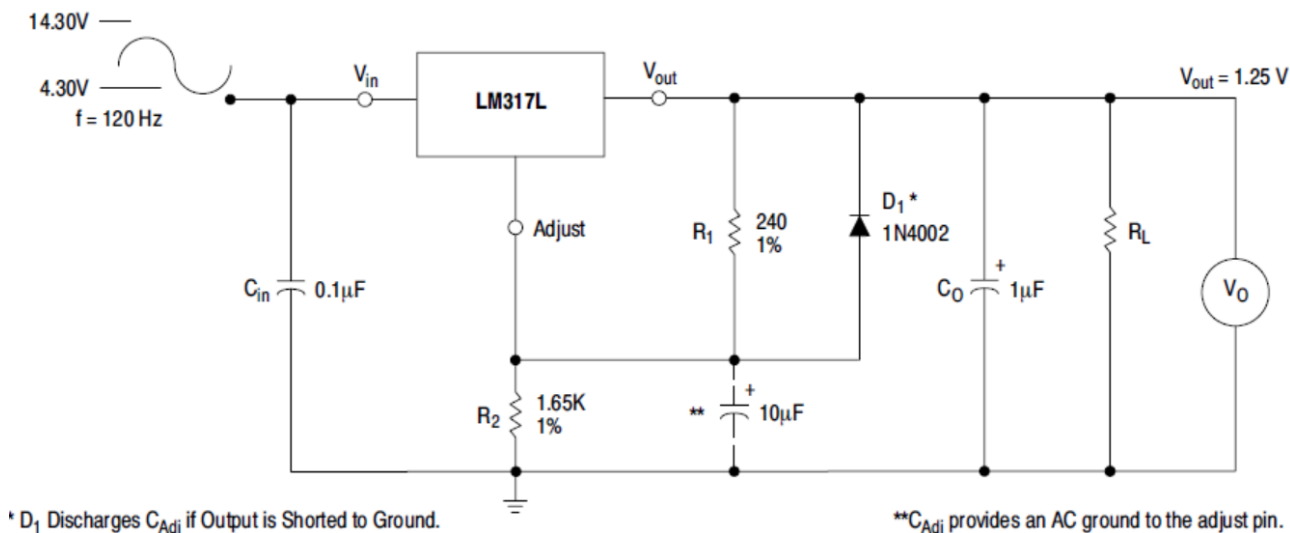
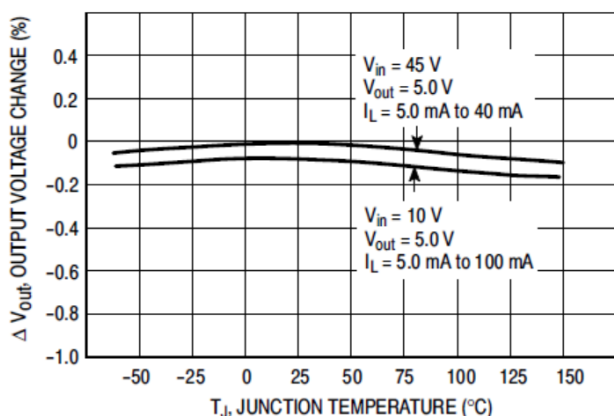
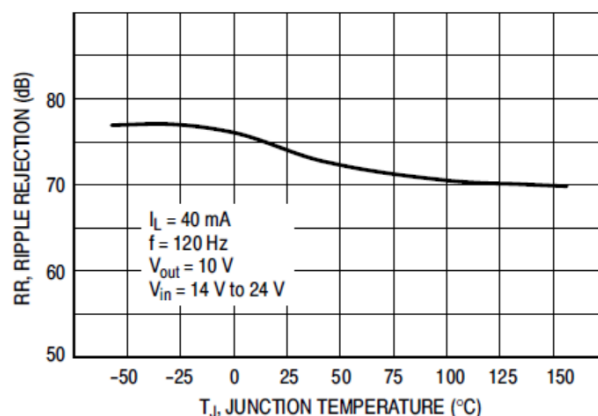
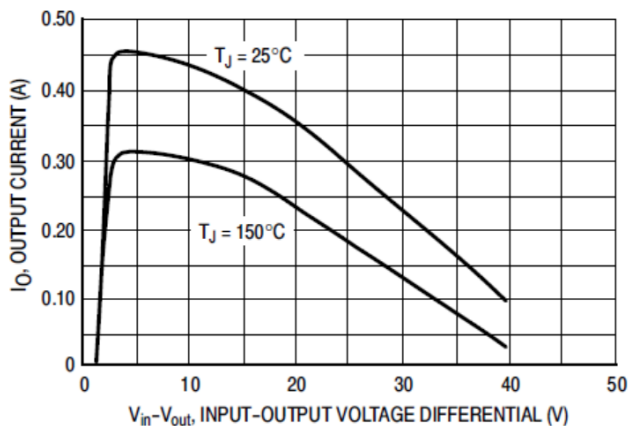
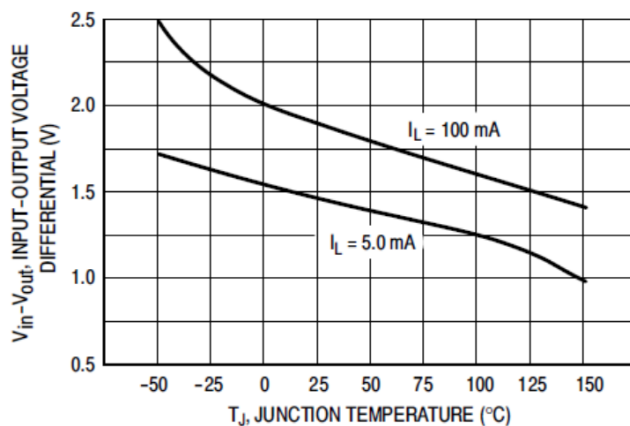


Line Regulation and I_{Adj} /Line Test Circuit

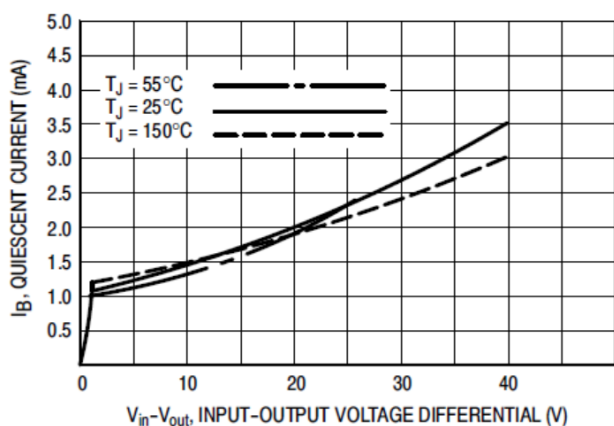


Load Regulation and I_{Adj} /Load Test Circuit

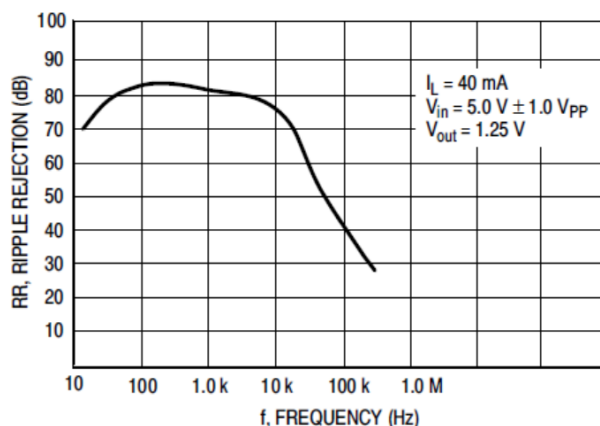


Ripple Rejection Test Circuit

TYPICAL PERFORMANCE CHARACTERISTICS
Load Regulation

Ripple Rejection

Current Limit

Dropout Voltage


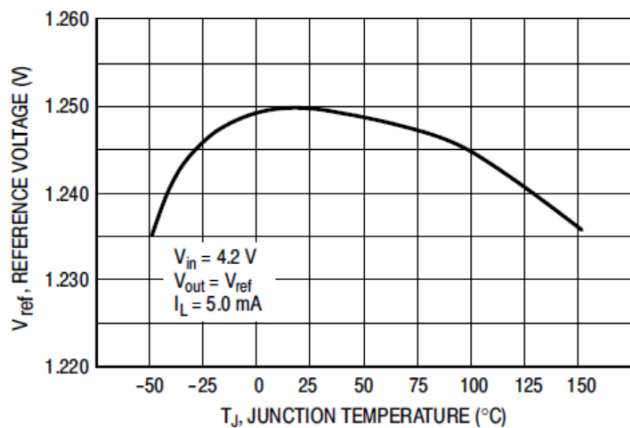
Minimum Operating Current



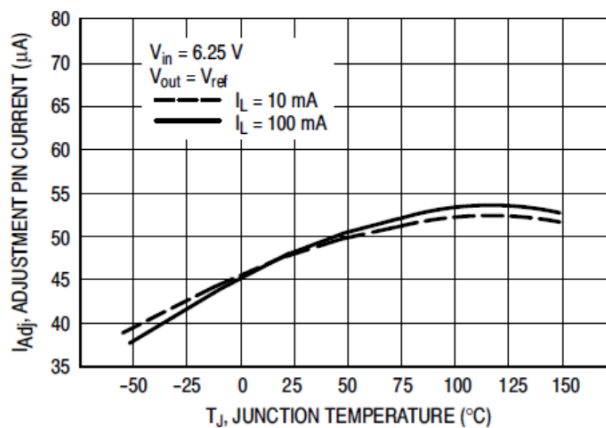
Ripple Rejection versus Frequency



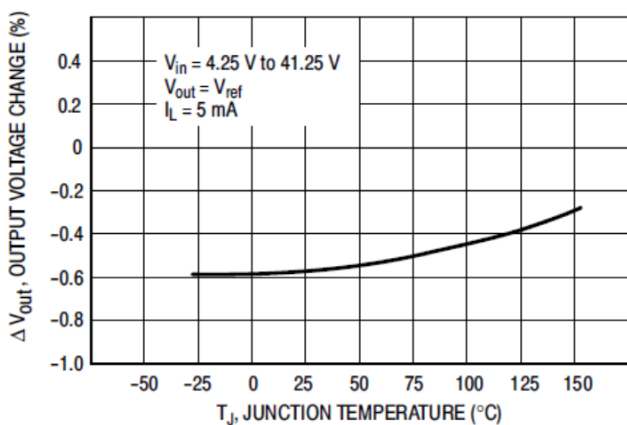
Temperature Stability



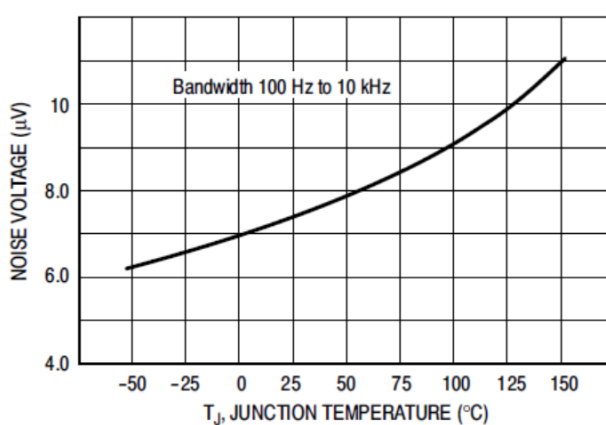
Adjustment Pin Current



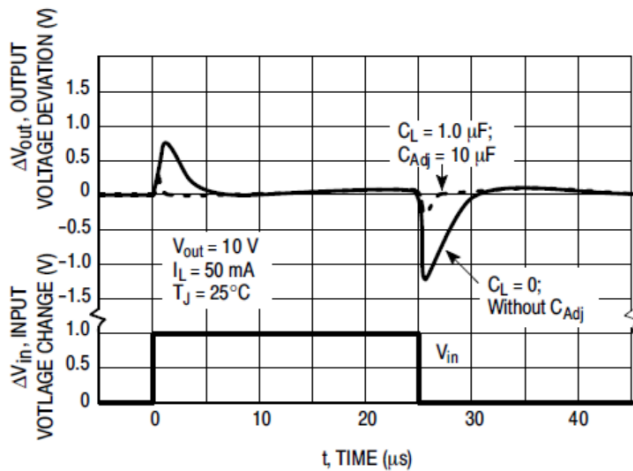
Line Regulation



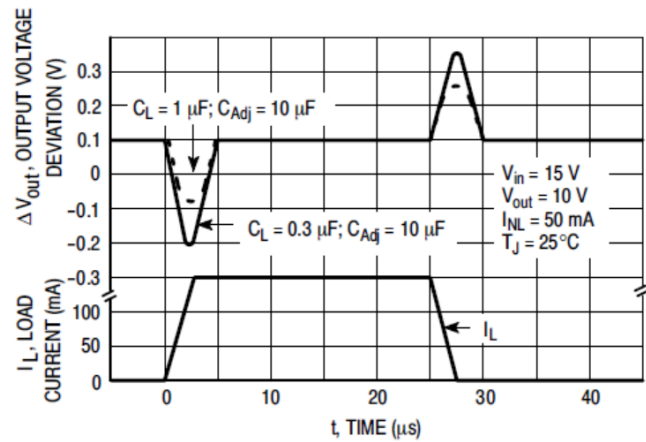
Output Noise



Line Transient Response

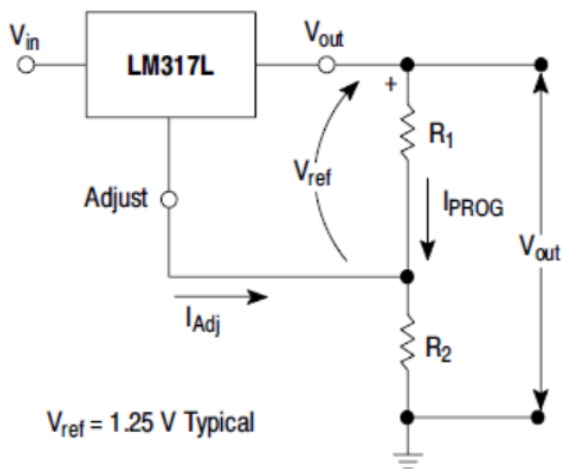


Load Transient Response

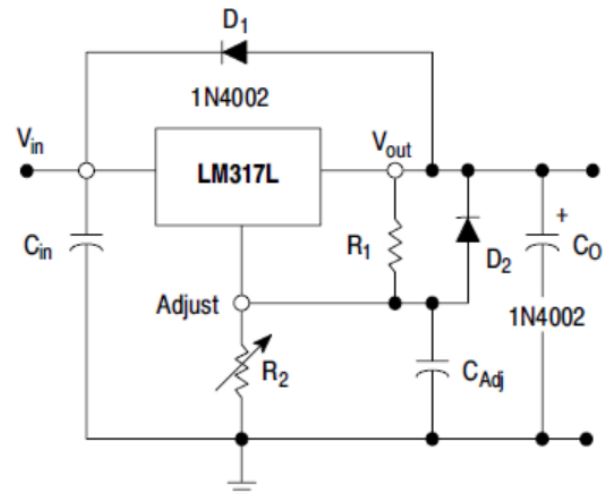


APPLICATION CIRCUIT

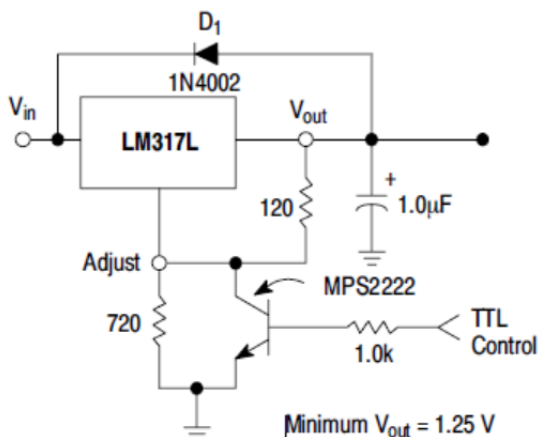
Basic Circuit Configuration



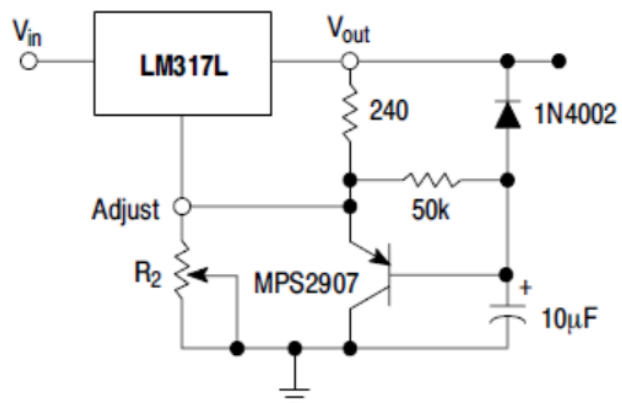
Voltage Regulator with Protection Diodes



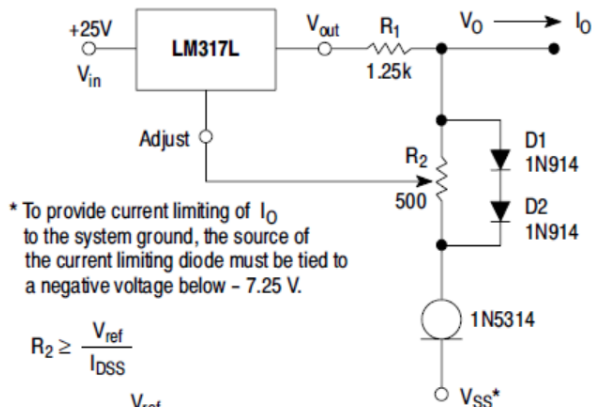
5.0 V Electronic Shutdown Regulator



Slow Turn-On Regulator



Adjustable Current Limiter



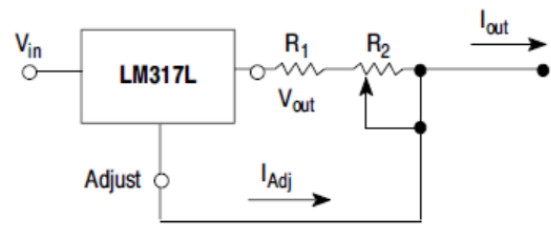
* To provide current limiting of I_O to the system ground, the source of the current limiting diode must be tied to a negative voltage below -7.25 V .

$$R_2 \geq \frac{V_{ref}}{I_{DSS}}$$

$$R_1 = \frac{V_{ref}}{I_{Omax} + I_{DSS}}$$

$V_O < P_{OV} + 1.25\text{ V} + V_{SS}$
 $I_{Lmin} - I_P < I_O < 100\text{ mA} - I_P$
 As shown $0 < I_O < 95\text{ mA}$

Current Regulator



$$I_{outmax} = \left(\frac{V_{ref}}{R_1} \right) + I_{Adj} \cong \frac{1.25\text{ V}}{R_1}$$

$$I_{outmax} = \left(\frac{V_{ref}}{R_1 + R_2} \right) + I_{Adj} \cong \frac{1.25\text{ V}}{R_1 + R_2}$$

$$5.0\text{ mA} < I_{out} < 100\text{ mA}$$