

# LM350

## 3-Terminal 3A Positive Adjustable Voltage Regulator

### Features

- Output adjustable between 1.2V and 33V
- Guaranteed 3A output current
- Internal thermal overload protection
- Load regulation (Typ: 0.1%)
- Line regulation (Typ: 0.015%/V)
- Internal short-circuit current limit
- Output transistor safe-area compensation

### Description

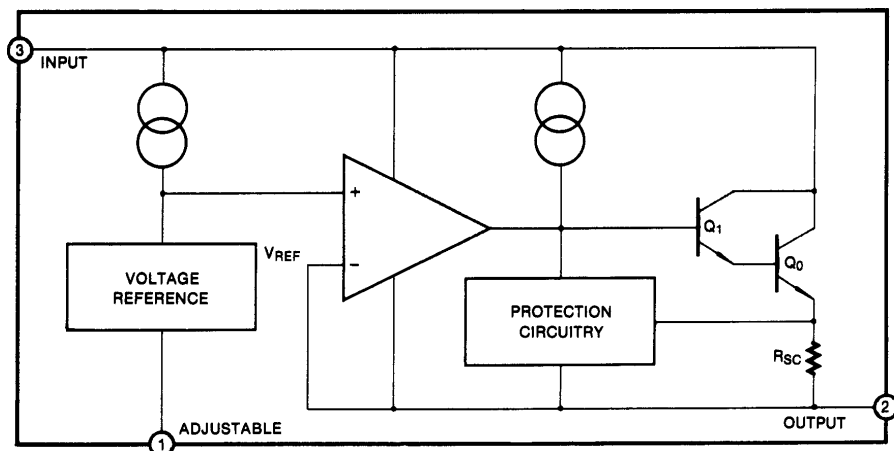
The LM350 is an adjustable 3-terminal positive voltage regulator capable of supplying in excess of 3.0 A over an output voltage range of 1.2V to 33 V

TO-220



1. Adj 2. Output 3. Input

### Internal Block Diagram



## Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Input-Output Voltage Differential	$V_I - V_O$	35	V <sub>DC</sub>
Lead Temperature (Soldering, 10sec)	T <sub>LEAD</sub>	300	°C
Power Dissipation	P <sub>D</sub>	Internally limited	-
Operating Temperature Range	T <sub>OPR</sub>	0 ~ +125	°C
Storage Temperature Range	T <sub>STG</sub>	-65 ~ +150	°C

## Electrical Characteristics

( $V_I - V_O = 5V$ ,  $I_O = 1.5A$ ,  $T_J = 0^\circ C$  to  $+125^\circ C$ ;  $P_D \leq P_{DMAX}$ , unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Line Regulation (Note1)	R <sub>line</sub>	$T_A = +25^\circ C$ , $3V \leq V_I - V_O \leq 35V$	-	0.015	0.03	%/V
Load Regulation (Note1)	R <sub>load</sub>	$T_A = +25^\circ C$ , $3V \leq V_I - V_O \leq 35V$ $V_O \leq 5V$ $V_O \geq 5V$	-	5 0.1	25 0.5	mV %
Adjustment Pin Current	I <sub>ADJ</sub>	-	-	50	100	μA
Adjustment Pin Current Change	ΔI <sub>ADJ</sub>	$3V \leq V_I - V_O \leq 35V$ , $10mA \leq I_O \leq 3A$ , $P_D \leq P_{MAX}$	-	0.2	5.0	μA
Thermal Regulation	REG <sub>T</sub>	Pulse = 20ms, $T_A = +25^\circ C$	-	0.002	-	%/W
Reference Voltage	V <sub>REF</sub>	$3V \leq V_I - V_O \leq 35V$ , $10mA \leq I_O \leq 3A$ , $P_D \leq 30W$	1.2	1.25	1.30	V
Line Regulation	R <sub>line</sub>	$3.0V \leq V_I - V_O \leq 35V$	-	0.02	0.07	%/V
Load Regulation	R <sub>load</sub>	$10mA \leq I_O \leq 3.0A$ $V_O \leq 5.0V$ $V_O \geq 5.0V$	-	20 0.3	70 1.5	mV %
Temperature Stability	ST <sub>T</sub>	$T_J = 0^\circ C$ to $+125^\circ C$	-	1.0	-	%
Maximum Output Current	I <sub>O(MAX)</sub>	$V_I - V_O \leq 10V$ , $P_D \leq P_{MAX}$	3.0	4.5	-	A
		$V_I - V_O = 30V$ , $P_D \leq P_{MAX}$ , $T_A = +25^\circ C$	0.25	1.0	-	A
Minimum Load Current	I <sub>L(MIN)</sub>	$V_I - V_O = 35V$	-	3.5	10	mA
RMS Noise, %of V <sub>OUT</sub>	V <sub>N</sub>	$10Hz \leq f \leq 10KHz$ , $T_A = +25^\circ C$	-	0.003	-	%/V <sub>O</sub>
Ripple Rejection	RR	$V_O = 10V$ , $f = 120Hz$ , C <sub>ADJ</sub> = 0 C <sub>ADJ</sub> = 10μF	66	65 80	-	dB dB
Long-Term Stability	ST	$T_J = +125^\circ C$	-	0.3	1	%/ 1000HR

### Note:

1. Regulation is measured at constant junction temperature. Changes in output voltage due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

## Typical Performance Characteristics

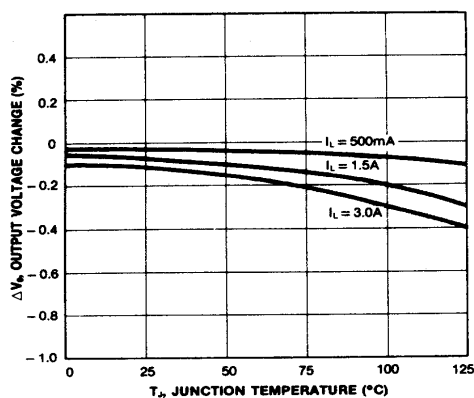


Figure 1. Load Regulation

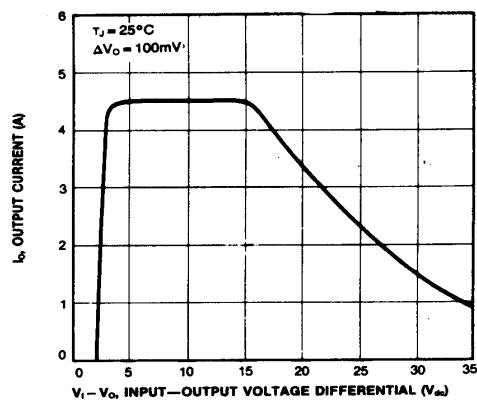


Figure 2. Current Limit

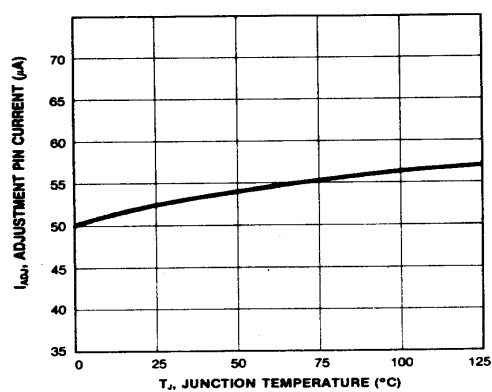


Figure 3. Adjustment Pin Current

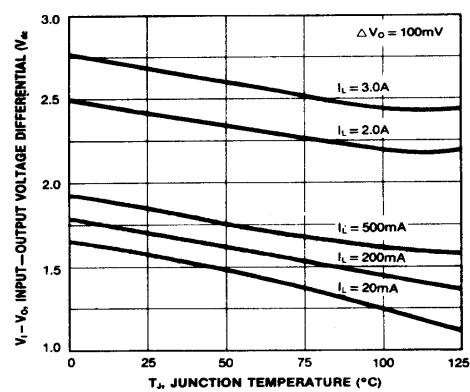


Figure 4. Dropout Voltage

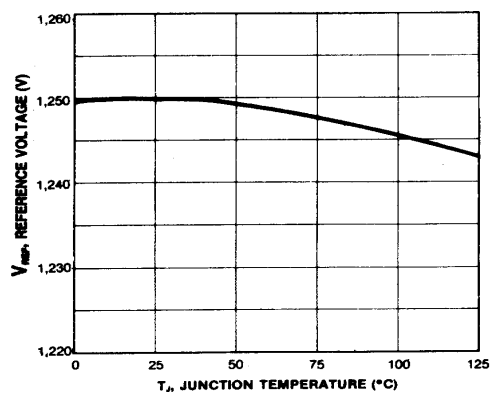


Figure 5. Temperature Stability

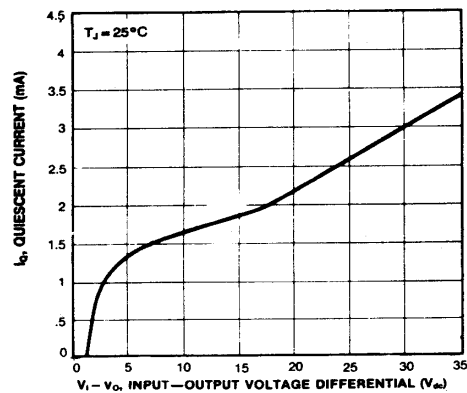


Figure 6. Minimum Load Current

## Typical Performance Characteristics (continued)

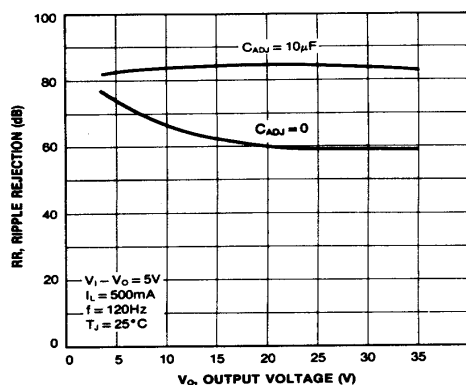
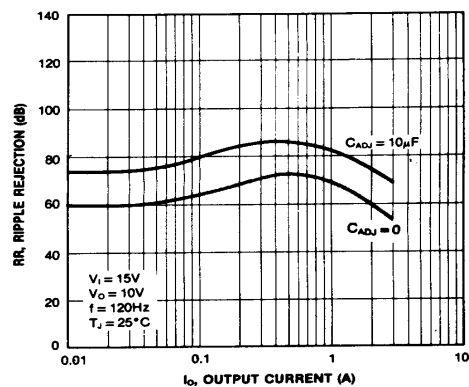
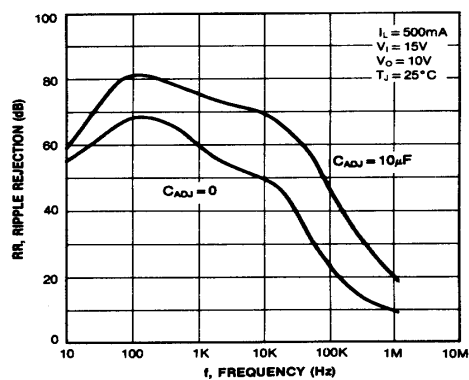
Figure 7. Ripple Rejection vs  $V_O$ Figure 8. Ripple Rejection vs  $I_O$ 

Figure 9. Ripple Rejection vs Frequency

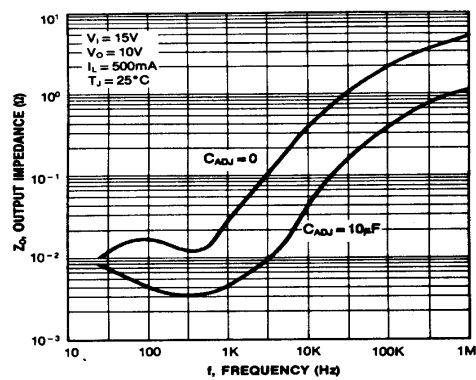


Figure 10. Output Impedance

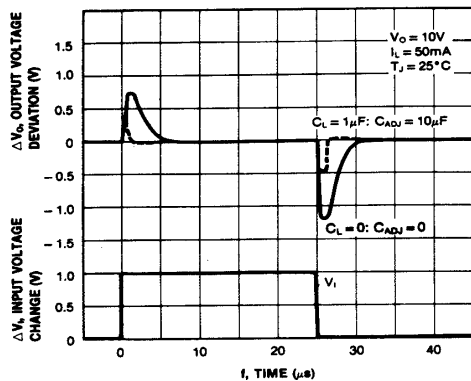


Figure 11. Line Transient Response

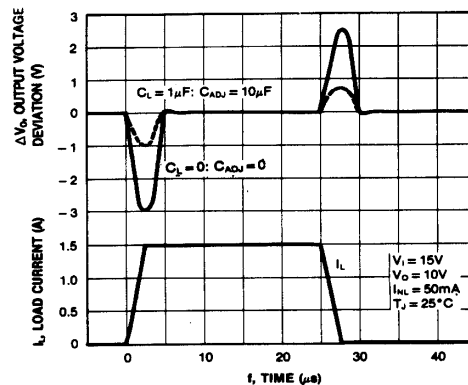


Figure 12. Load Transient Response

## Typical Application

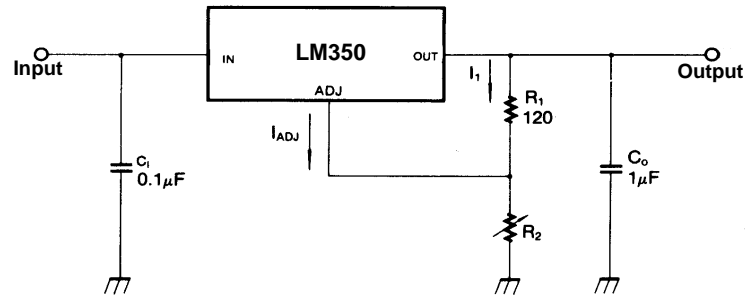


Figure 13.

$C_I$  :  $C_I$  is required if the regulator is located an appreciable distance from power supply filter.

$C_O$  : Output capacitors in the range of  $1\mu\text{F}$  to  $100\mu\text{F}$  of aluminum or tantalum electronic are commonly used to provide improved output impedance and rejection of transients.

In operation, the LM350 develops a nominal 1.25V reference voltage,  $V_{REF}$ , between the output and adjustment terminal. The reference voltage is impressed across program resistor  $R_1$  and, since the voltage is constant, a constant current  $I_1$  then flows through the output set resistor  $R_2$ , giving an output voltage of

$$V_O = 1.25V(1 + R_2/R_1) + I_{ADJ} R_2$$

Since  $I_{ADJ}$  current (less than  $100\mu\text{A}$ ) from the adjustment terminal represents an error term, the LM350 was designed to minimize  $I_{ADJ}$  and make it very constant with line and load changes. To do this, all quiescent operating current is returned to the output establishing a minimum load current requirement. If there is insufficient load on the output, the output voltage will rise.

Since the LM350 is a floating regulator, it is only the voltage differential across the circuit which is important to performance, and operation at high voltage with respect to ground is possible.

Since  $I_{ADJ}$  is controlled to less than  $100\mu\text{A}$ , the error associated with this term is negligible in most applications.



## Ordering Information

Product Number	Package	Operating Temperature
LM350T	TO-220	0°C to + 125°C

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