LM350

3-Terminal 3A Positive Adjustable Voltage Regulator

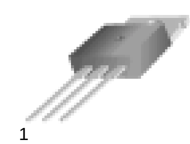
Features

- 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

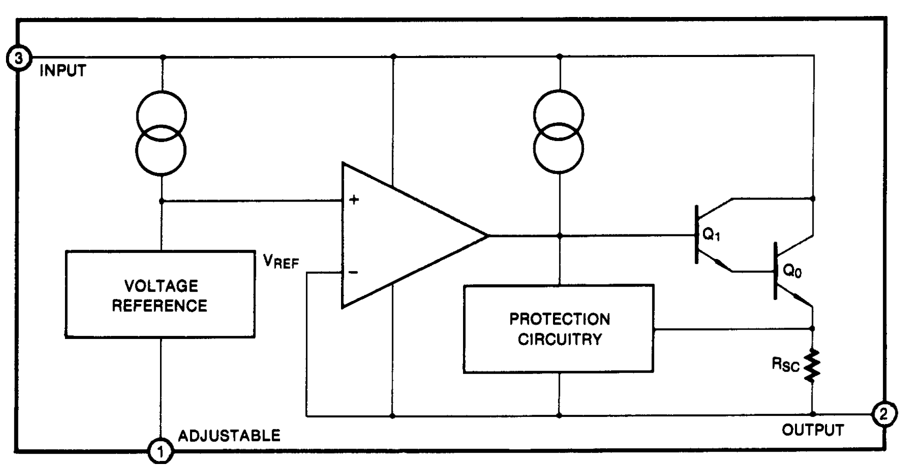
The LM350 is an adjustable 3-terminal positive voltage regulator capable of supplying in excess of 3.0 A over an output voltage range of 1.2V to 33 V

TO-220



1. Adj 2. Output 3. Input

Internal Block Diagram



Rev. 1.0.0

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Input-Output Voltage Differential	V_I - V_O	35	V_{DC}
Lead Temperature (Soldering, 10sec)	T_{LEAD}	300	°C
Power Dissipation	P_D	Internally limited	-
Operating Temperature Range	T_{OPR}	0 ~ +125	°C
Storage Temperature Range	T_{STG}	-65 ~ +150	°C

Electrical Characteristics

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Line Regulation (Note1)	Rline	T_A = +25°C, 3V ≤ V_I -V_O ≤ 35V	-	0.015	0.03	%/V
Load Regulation (Note1)	Rload	T_A = +25 °C, 3V ≤ V_I -V_O ≤ 35V V_O ≤ 5V V_O ≥ 5V	-	5 0.1	25 0.5	mV %
Adjustment Pin Current	I_{ADJ}	-	-	50	100	µA
Adjustment Pin Current Change	ΔI_{ADJ}	3V ≤ V_I -V_O ≤ 35V, 10mA ≤ I_o ≤ 3A, $P_D \leq P_{MAX}$	-	0.2	5.0	µA
Thermal Regulation	REG_T	Pulse = 20ms, T_A =+ 25°C	-	0.002	-	%/W
Reference Voltage	V_{REF}	3V ≤ V_I -V_O ≤ 35V, 10mA ≤ I_O ≤ 3A, P_D ≤ 30W	1.2	1.25	1.30	V
Line Regulation	Rline	3.0V ≤ V_I -V_O ≤ 35V	-	0.02	0.07	%/W
Load Regulation	Rload	10mA ≤ I_O ≤ 3.0A V_O ≤ 5.0V V_O ≥ 5.0V	-	20 0.3	70 1.5	mV %
Temperature Stability	ST_T	T_J = 0°C to + 125°C	-	1.0	-	%
Maximum Output Current	$I_{O(MAX)}$	V_I -V_O ≤ 10V, $P_D \leq P_{MAX}$	3.0	4.5	-	A
		V_I -V_O = 30V, $P_D \leq P_{MAX}$,T_A = +25°C	0.25	1.0	-	A
Minimum Load Current	$I_{L(MIN)}$	V_I -V_O = 35V	-	3.5	10	mA
RMS Noise, %of V_{OUT}	V_N	10Hz ≤ f ≤ 10KHz, T_A= +25 °C	-	0.003	-	%/V_O
Ripple Rejection	RR	V_O = 10V, f = 120Hz, C_{ADJ} = 0 C_{ADJ} = 10µF	 66	 65 80	-	 dB dB
Long-Term Stability	ST	T_J =+125 °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 Perfomance Characteristics

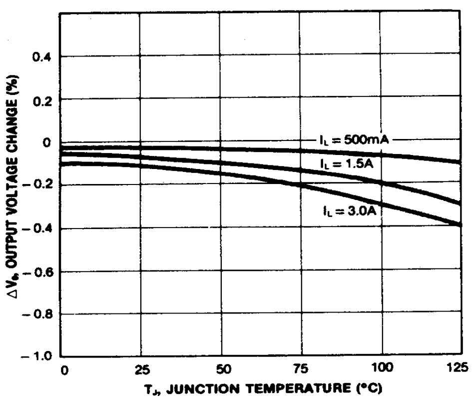


Figure 1. Load Regulation

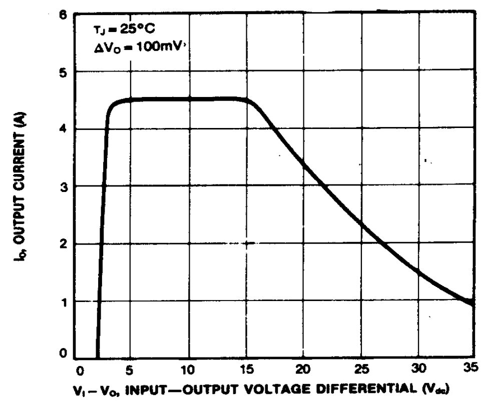


Figure 2. Current Limit

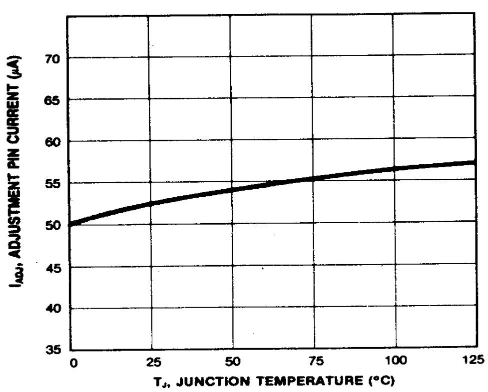


Figure 3. Adjustment Pin Current

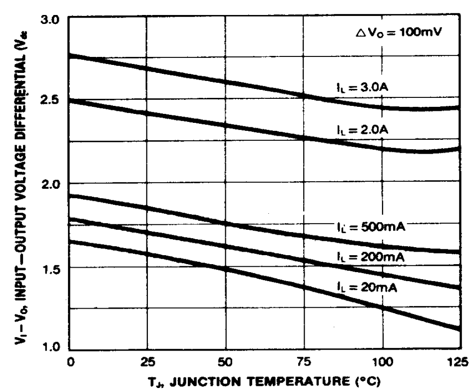


Figure 4. Dropout Voltage

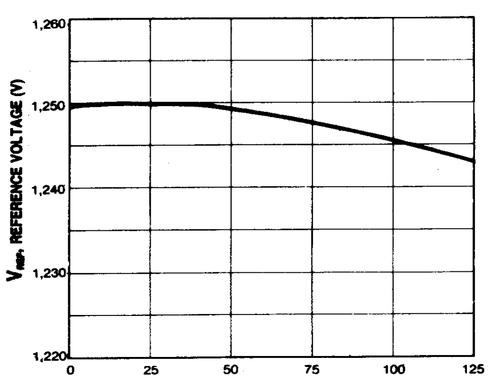


Figure 5. Temperature Stability

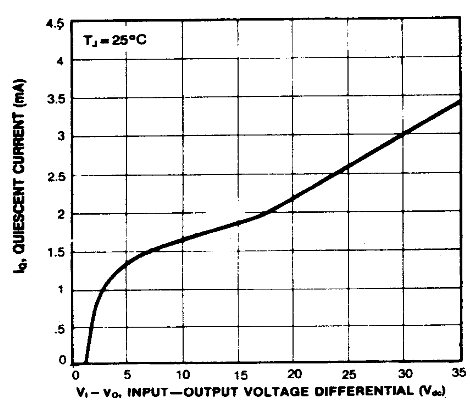


Figure 6. Minimum Load Current

Typical Perfomance Characteristics (continued)

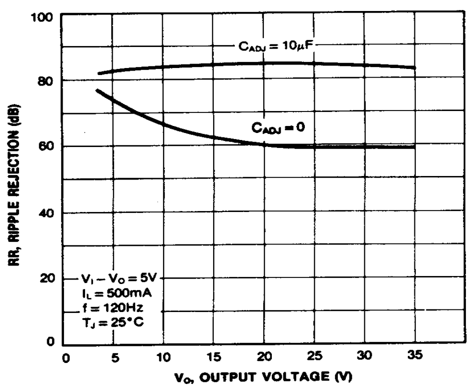


Figure 7. Ripple Rejection vs Vo

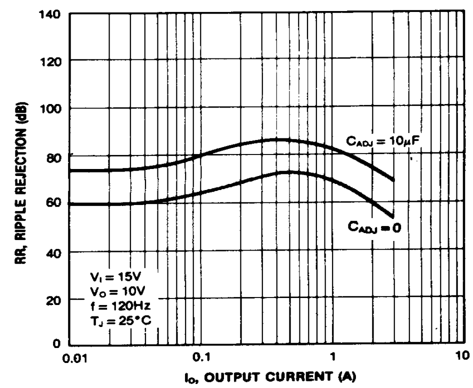


Figure 8. Ripple Rejection vs Io

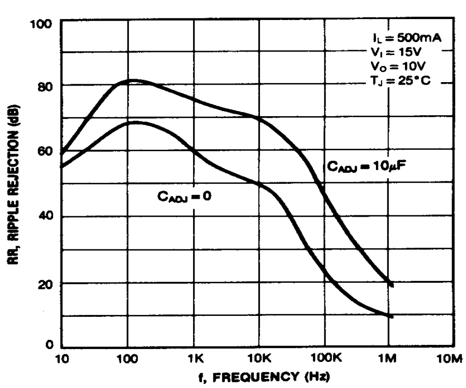


Figure 9. Ripple Rejection vs Frequency

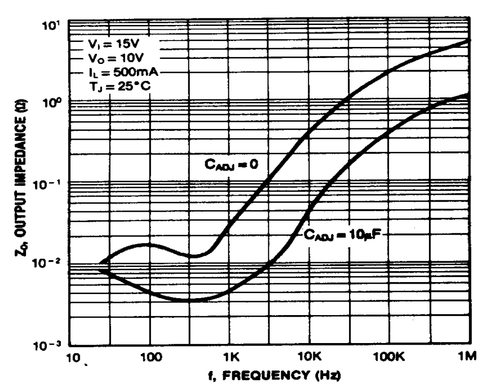


Figure 10. Output Impedance

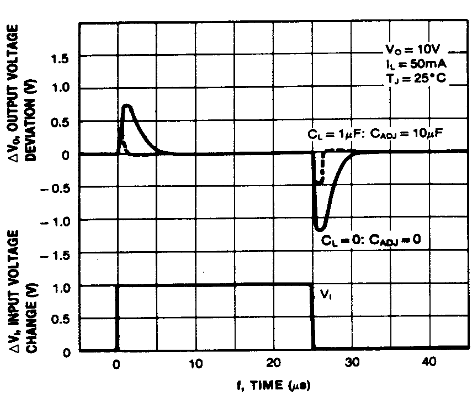


Figure 11. Line Transient Response

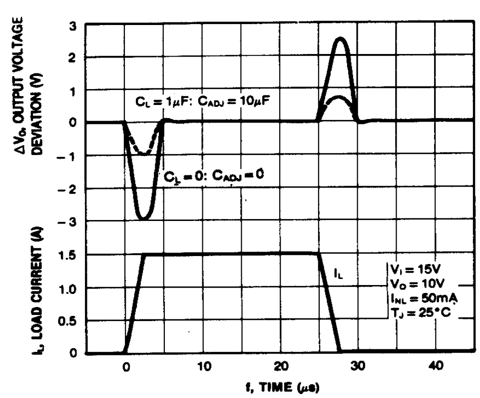


Figure 12. Load Transient Response

Typical Application

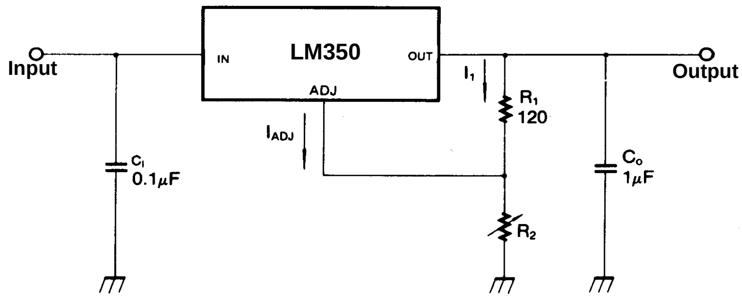


Figure 13.

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 1μF to 100μF 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

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

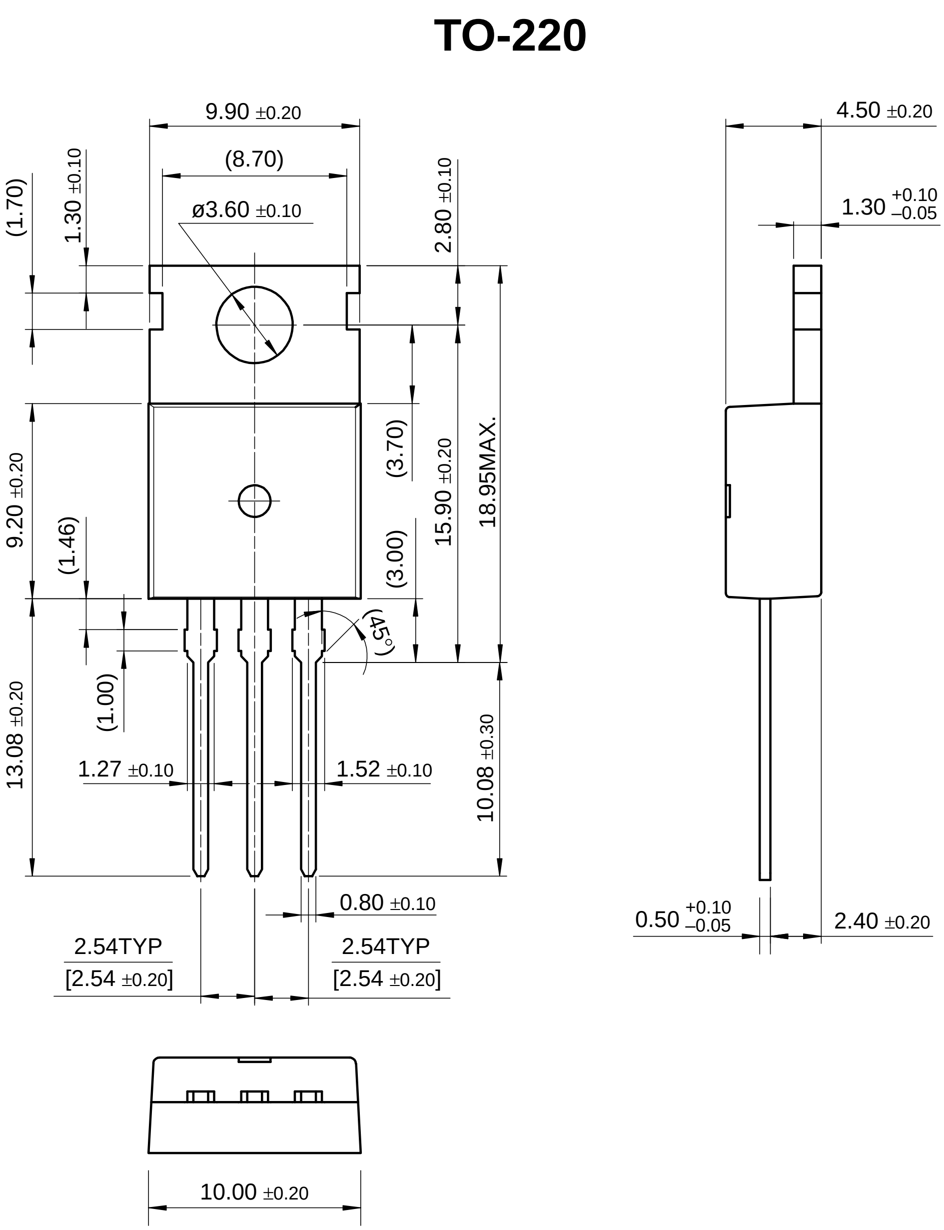
Since I_{ADJ} current (less than 100μF) from the adjustment terminal represents an error term, the LM350 was designed to minimize I_{ADJ} and make it very constant with line and load changes. To do this, all quiescent operating current is returned to the output establishing a minimum load current requirement. 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 100μA, the error associated with this term is negligible in most applications.

Mechanical Dimensions (Continued)

Package



Ordering Information

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

6/1/01 0.0m 001
Stock#DSxxxxxxxx