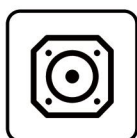


自主封測 品質把控 售後保障

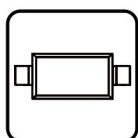
WEB | WWW.TDSEMIC.COM



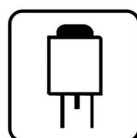
電源管理



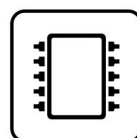
顯示驅動



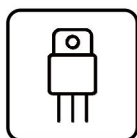
二三極管



LDO穩壓器



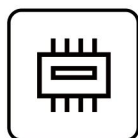
觸摸芯片



MOS管



運算放大器



存儲芯片



MCU



串口通信

LM317(SOP8)

產品規格說明書

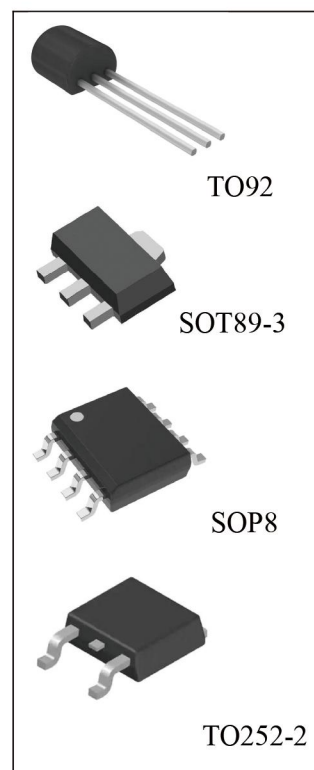
General Description

The LM317 is an adjustable 3-terminal positive voltage regulator capable of supplying 100mA over a 1.2V to 37V output range. It 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 it essentially blow-out proof. Also, the LM317 is available packaged in a standard TO92、SOP8、SOT89-3 transistor package which is easy to use.

The LM317 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 LM317 can be used as a precision current regulator.

Features

- Adjustable output down to 1.2V
- Guaranteed 100 mA output current
- Line regulation typically 0.01%V
- Load regulation typically 0.1%
- Current limit constant with temperature
- Eliminates the need to stock many voltages
- 80 dB ripple rejection
- Output is short circuit protected



Package Information

Part NO.	Package Description	Package Marking	Package Option
LM317	TO92	LM317 SXXXX	1000/Bag 2000/Tape
LM317	SOT89-3	LM317 SXXXX	1000/Reel
LM317	SOP8	LM317 SXXXX	100/Tube 2500/Reel

Part NO.	Package Description	Package Marking	Package Option
LM317	TO252-2	LM317 SXXXX	2500/Tape
LM317	TO92	LM317 XXXXL	1000/Bag 2000/Tape
LM317	SOT89-3	LM317 XXXX	1000/Reel
LM317	SOP8	LM317 SXXXX	100/Tube 2500/Reel
LM317	TO252-2	LM317 SXXXX	2500/Tape

:Trademark

LM317:Part NO.

SXXXX:Lot NO.

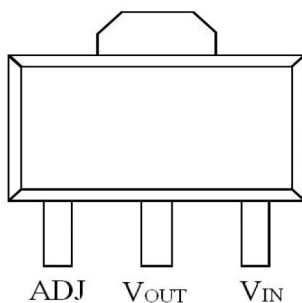
Pin Connection



ADJ V_{OUT} V_{IN}

LM317

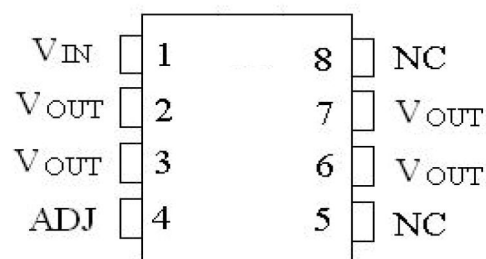
(TO92)



ADJ V_{OUT} V_{IN}

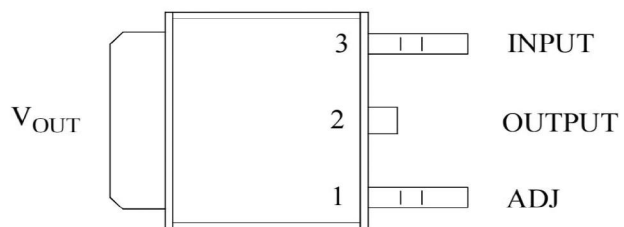
LM317

(SOT89-3)



LM317

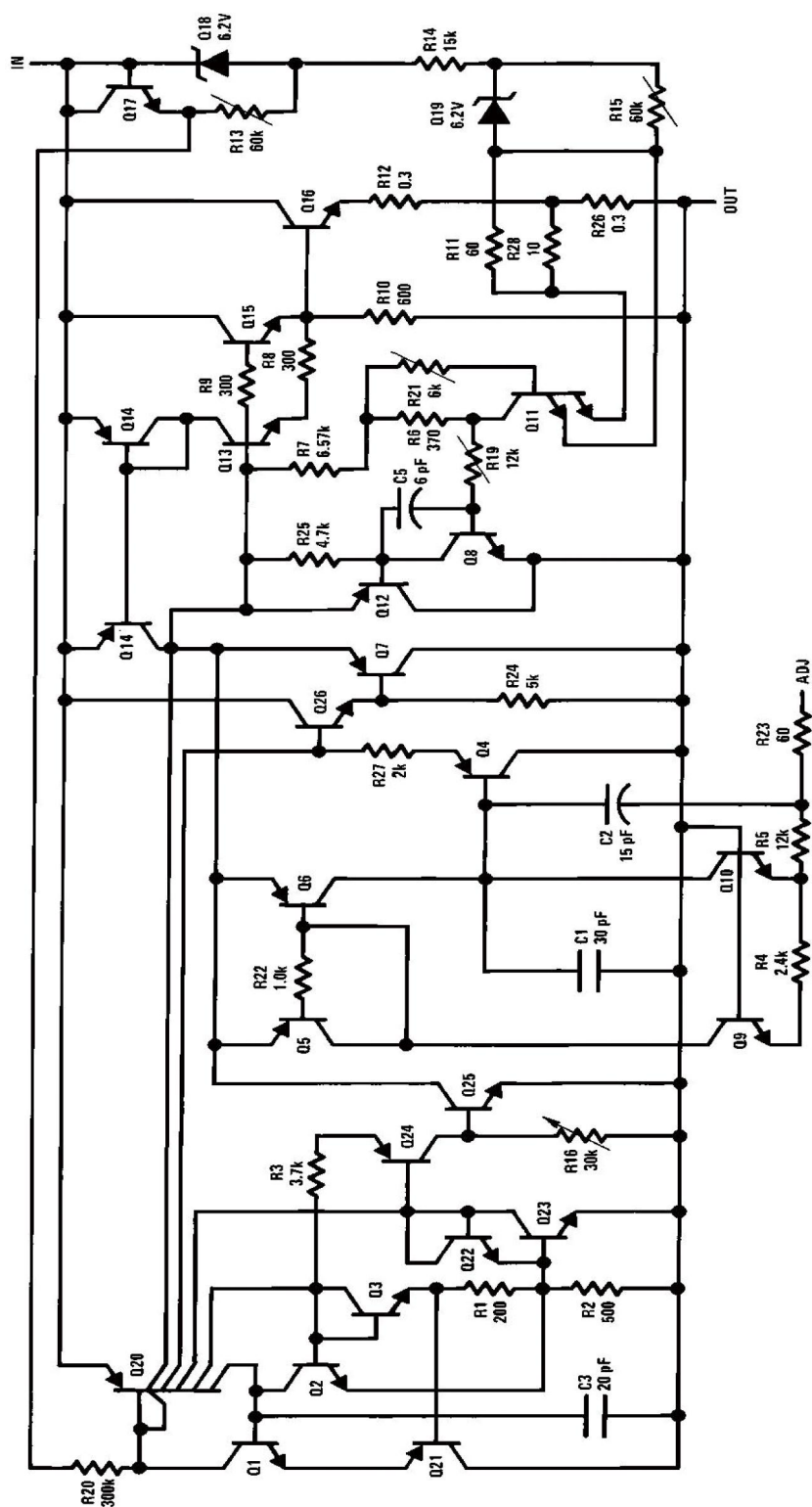
(SOP8)



LM317

(TO252-2)

Block Diagram



Absolute Maximum Ratings (Tamb=25°C)

Characteristic	Symbol	Value	Unit
Input-Output Voltage Differential	V_i-V_o	40	V
Power Dissipation	P_D	Internally Limited	W
Operating Junction Temperature Range	T_j	-40~125	°C
Lead Temperature (Soldering, 4 seconds)	T_L	250	°C
Storage Temperature Range	T_{stg}	-55~150	°C

Electrical Characteristics

(unless otherwise specified: $V_i-V_o=5.0V$; $I_o=40mA$; $T_j=0\sim125^\circ C$; $I_{max}=100mA$ and $P_{max}=625mW$)

Characteristics	Test conditions	Symbol	Min.	Typ.	Max.	Unit
Line Regulation	$T_j=25^\circ C$, $I_L \leq 20mA$ $3V \leq (V_{IN}-V_{OUT}) \leq 40V$	Regline	-	0.01	0.05	% /V
Load Regulation	$T_j=25^\circ C$, $5mA \leq I_{OUT} \leq I_{MAX}$	Regload	-	0.1	0.5	%
Thermal Regulation	$T_j=25^\circ C$, 10ms Pulse	Regther	-	0.04	0.2	%/W
Adjustment Pin Current	-	I_{adj}	-	50	100	μA
Adjustment Pin Current Change	$5mA \leq I_L \leq 100mA$ $3V \leq (V_{IN}-V_{OUT}) \leq 40V$, $P \leq 625mW$	ΔI_{adj}	-	0.2	6	μA
Reference Voltage	$3V \leq (V_{IN}-V_{OUT}) \leq 40V$, $5mA \leq I_{OUT} \leq 100mA$, $P \leq 625mW$	V_{ref}	1.15	1.25	1.35	V
Line Regulation	$3V \leq (V_{IN}-V_{OUT}) \leq 40V$, $I \leq 20mA$	Regline	-	0.02	0.05	%/V
Load Regulation	$5mA \leq I_{OUT} \leq 100mA$	Regload	-	0.3	1.2	%
Temperature Stability	$T_{MIN} \leq T_j \leq T_{MAX}$	T_s	-	0.65	-	%
Minimum Load Current	$(V_{IN}-V_{OUT}) \leq 40V$	I_{Lmin}	-	3.5	17	mA
	$3V \leq (V_{IN}-V_{OUT}) \leq 15V$			1.5	6	
Current Limit	$3V \leq (V_{IN}-V_{OUT}) \leq 13V$	I_{max}	40	200	260	mA
	$(V_{IN}-V_{OUT}) = 40V$		25	50	70	mA
Rms Noise % of V_o	$T_j=25^\circ C$, $10Hz \leq f \leq 10KHz$	N	-	0.003	0.008	%
Ripple Rejection	$V_{OUT}=10V$, $f=120Hz$, $C_{ADJ}=0$	RR		65	80	dB
	$C_{ADJ}=10 \mu F$		66	80		
Long-Term Stability	$T_j=125^\circ C$, 1000Hours	S	-	0.3	1	%

Application Summary

1. Basic circuit operation

In operation, the LM317 develops a nominal 1.25V reference voltage, V_{ref} , between the output and adjustment terminal. The reference voltage is impressed across program resistor $R1$ and, since the voltage is constant, a constant current $I1$ then flows through the output set resistor $R2$, giving an output voltage of

$$V_{out} = V_{ref}(1 + R2/R1) + I_{adj} * (R2)$$

Since the 100 μ A current from the adjustment terminal represents an error term, the LM317 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 will rise.

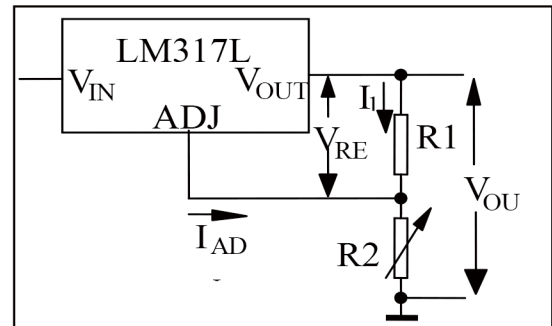
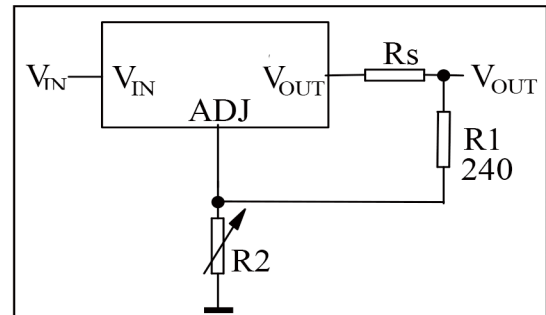


Figure: Basic circuit configuration

2. Load Regulation

The LM317 is capable of providing extremely good load regulation, but a few precautions are needed to obtain maximum performance. For best performance the programming resistor ($R1$) should be connected as close to the regulator as possible to minimize line drops which effectively appear in series with the reference, thereby degrading regulation. The ground end of $R2$ can be returned near the load ground to provide remote ground sensing and improve load regulation.



Regulator with line resistance in output lead

3. External capacitors

A 0.1 μ F disc or 1.0 μ F tantalum input bypass capacitor (C_{in}) is recommended to reduce the sensitivity to input line impedance.

The adjustment terminal may be bypassed to ground to improve ripple rejection.

This capacitor (C_{adj}) prevents ripple from being amplified as the output voltage is increased. A 10 μ F capacitor should improve ripple rejection about 15dB at 120Hz in a 10V application.

Although the LM317 is stable with no output capacitance, like any feedback circuit, certain values of external capacitance can cause excessive ringing. An output capacitance (C_o) in the form of a 1.0 μ F tantalum or 25 μ F aluminum electrolytic capacitor on the output swamps this effect and insures stability.

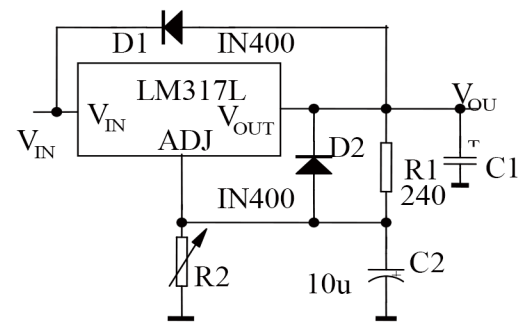
4. Protection Diodes

LM317/ 3-Terminal Adjustable Regulator Circuit

When external capacitors are used with any IC regulator it is sometimes necessary to add protection diodes to prevent the capacitors from discharging through low current points into the regulator. Most $10\mu\text{F}$ capacitors have low enough internal series resistance to deliver 20A spikes when shorted. Although the surge is short, there is enough energy to damage parts of the IC.

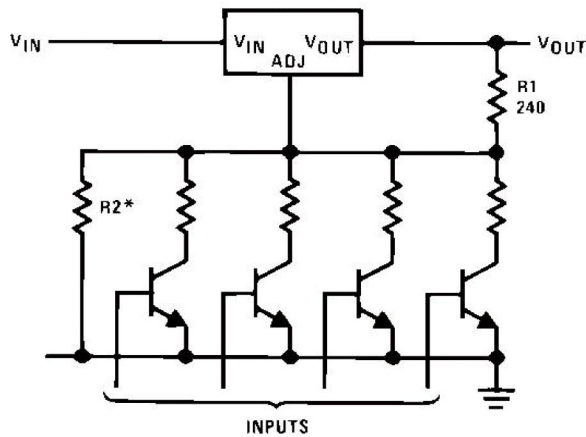
When an output capacitor is connected to a regulator and the input is shorted, the output capacitor will discharge into the output of the regulator. The discharge current depends on the value of the capacitor, the output voltage of the regulator, and the rate of decrease of V_{in} . In the LM317, this discharge path is through a large junction that is able to sustain a 2A surge with no problem. This is not true of other types of positive regulators. For output capacitors of $25\mu\text{F}$ or less, the LM317's ballast resistors and output structure limit the peak current to a low enough level so that there is no need to use a protection diode.

The bypass capacitor on the adjustment terminal can discharge through a low current junction. Discharge occurs when either the input or output is shorted. Internal to the LM317 is a 50Ω resistor which limits the peak discharge current. No protection is needed for output voltages of 25V or less and $10\mu\text{F}$ capacitance. Figure in right shows an LM317 with protection diodes included for use with outputs greater than 25V and high values of output capacitance.

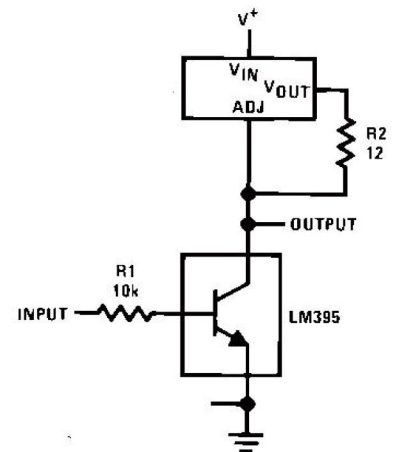


Regulator with protection diodes

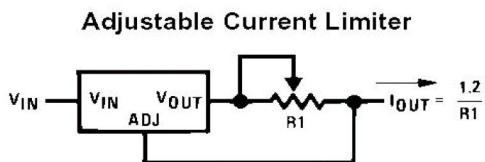
Application Circuit



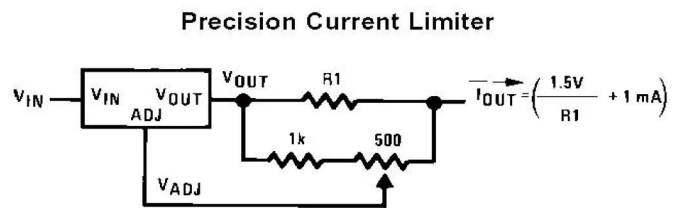
*Sets maximum Vout
Digitally Selected Outputs



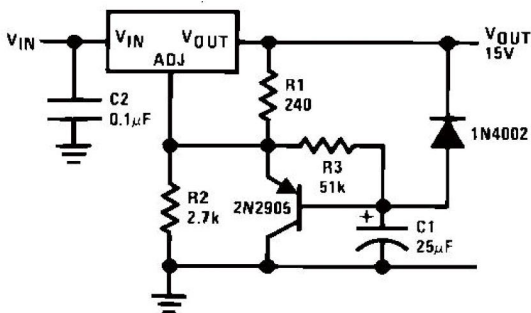
High Gain Amplifier



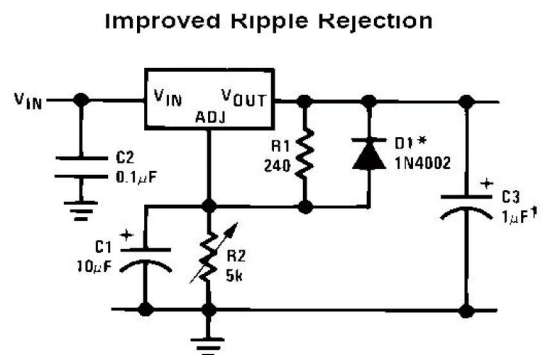
$12 \leq R1 \leq 240$
Adjustable Current Limiter



Precision Current Limiter

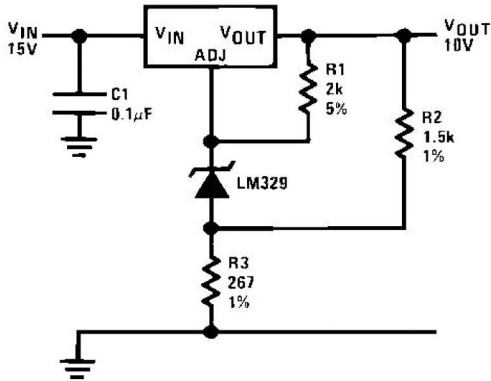


Slow Turn-on 15V Regulator
Improved Ripple Rejection

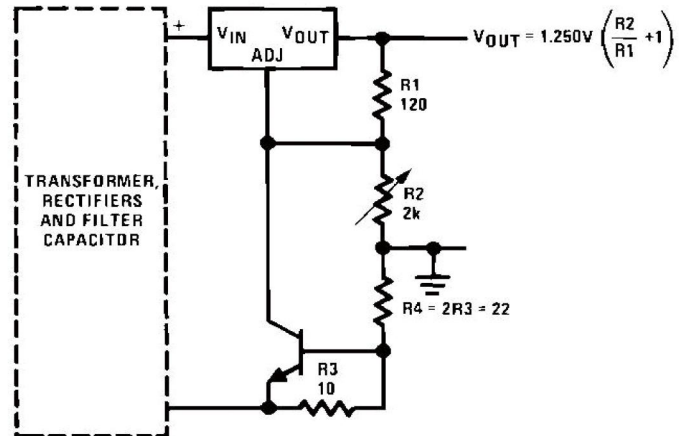


+Solder tantalum
*Discharges C1 if output is shorted to ground
Adjustable Regulator with

LM317/ 3-Terminal Adjustable Regulator Circuit



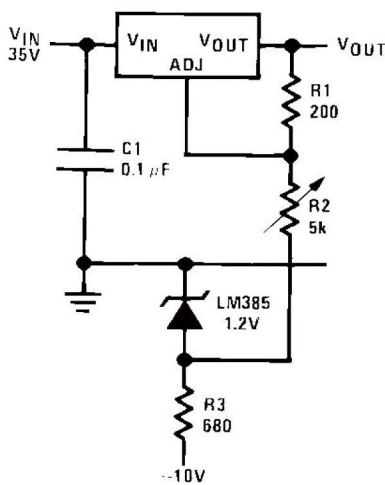
High Stability 10V Regulator



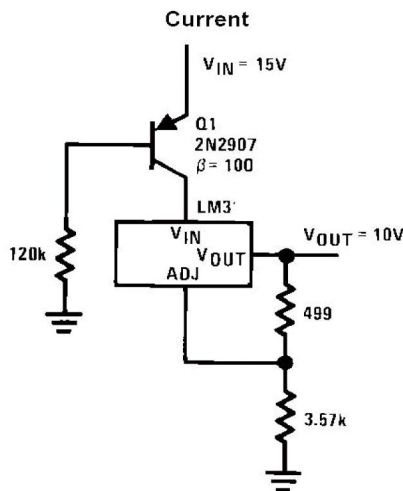
Short circuit current is approximately $600\text{mV}/R_3$,

At 25mA output only 3/4V of drop occurs in R_3 and R_4

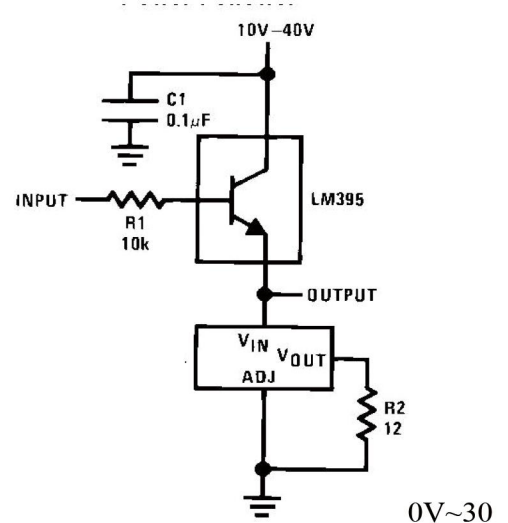
Adjustable Regulator with Current Limiter



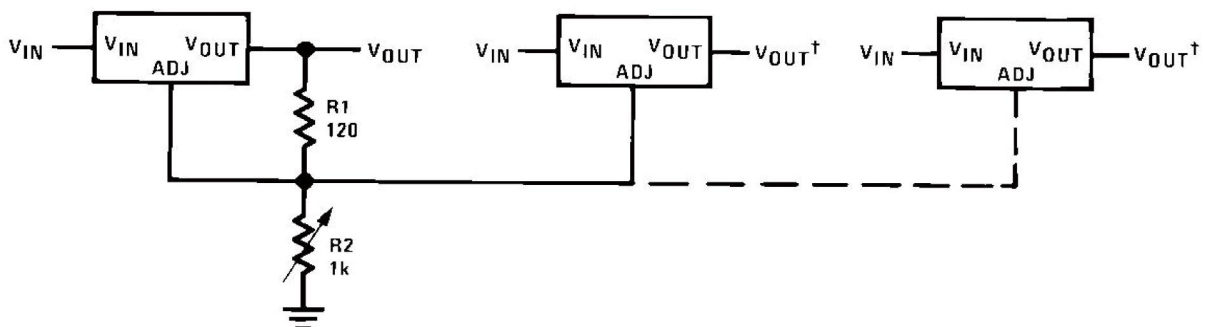
V Regulator



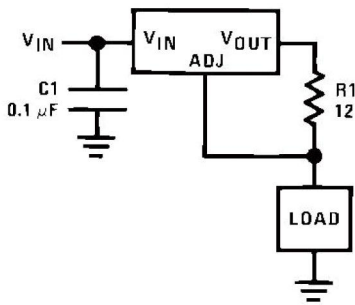
Current



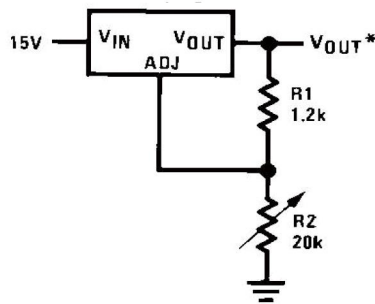
Power Follower



Adjusting Multiple on-Card Regulators with Single Control

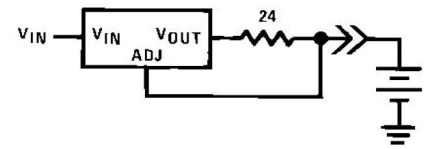


100mA Current Regulator

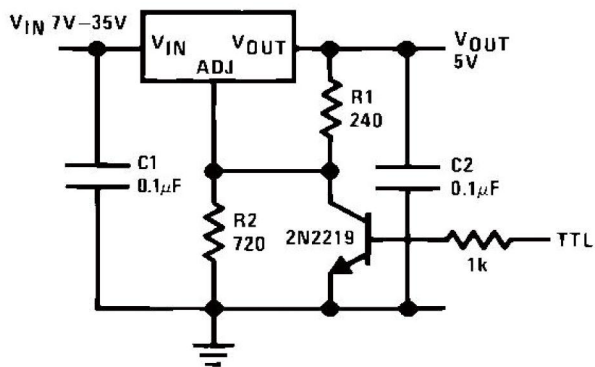


*Minimum load current=2mA

1.2V~12V Regulator with
Minimum Program Current

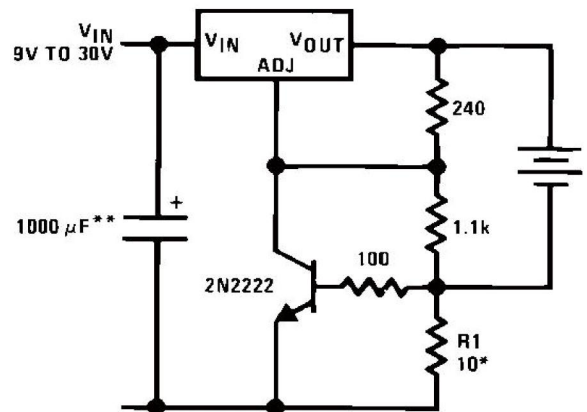


50mA constant Current
Battery Charger for
Nickel-Cadmium Batteries



*Minimum output=1.2V

5V Logic Regulator with Electronic Shutdown

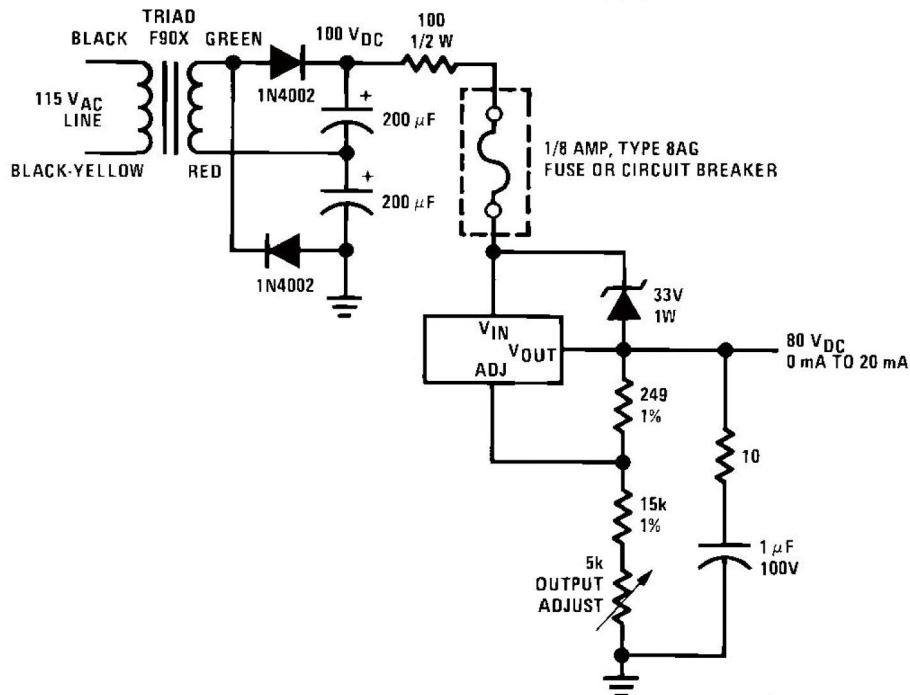


*Sets peak current, $I_{peak} = 0.6V/R1$

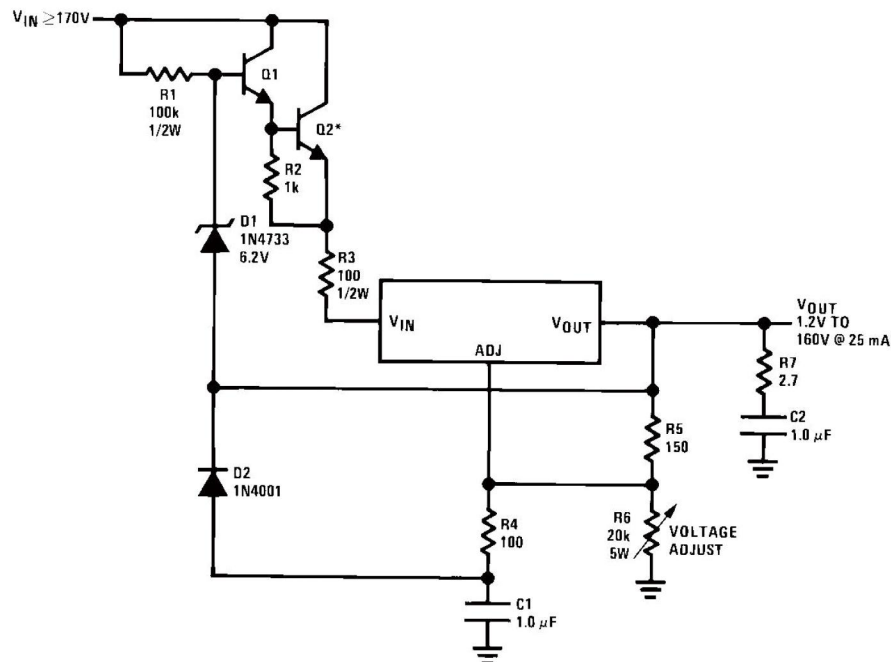
**1000µF is recommended to filter out any input transients

Current Limited 6V Charger

LM317/ 3-Terminal Adjustable Regulator Circuit



Short Circuit Protected 80V Supply



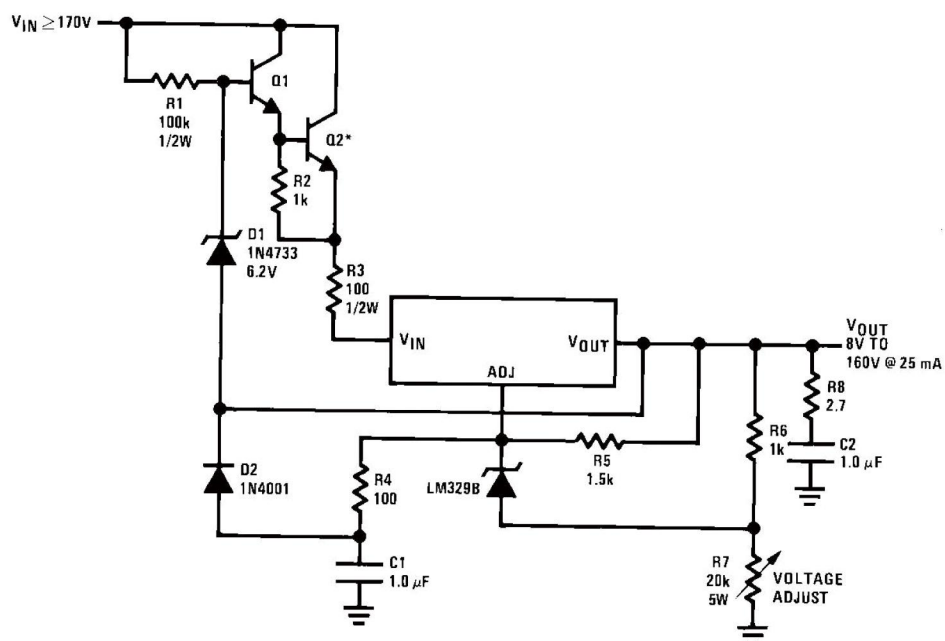
Q1,Q2: NSD134 or similar

C1,C2: 1μF, 200V mylar**

*Heat sink

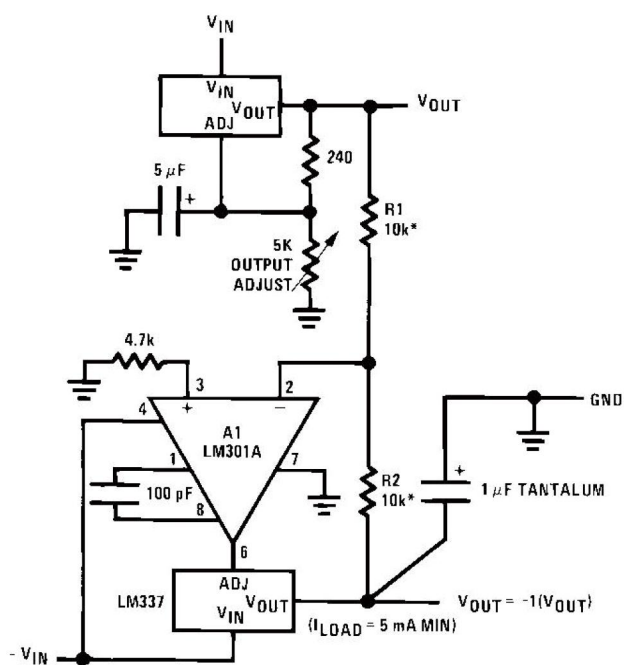
Basic High Voltage Regulator

LM317/ 3-Terminal Adjustable Regulator Circuit

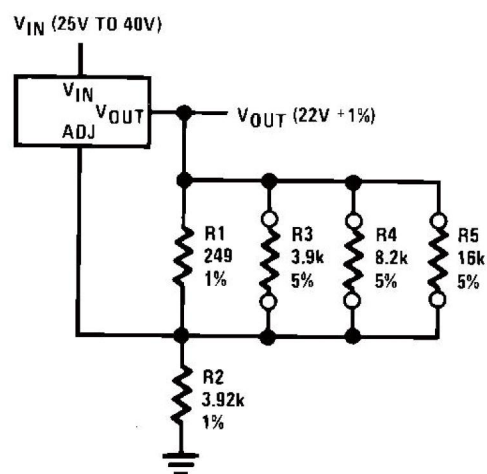


Q1,Q2: NSD134 or similar C1,C2: 1μF, 200V mylar** *Heat sink ** Mylar is a registered trademark of DuPont Co.

Precision High Voltage Regulator

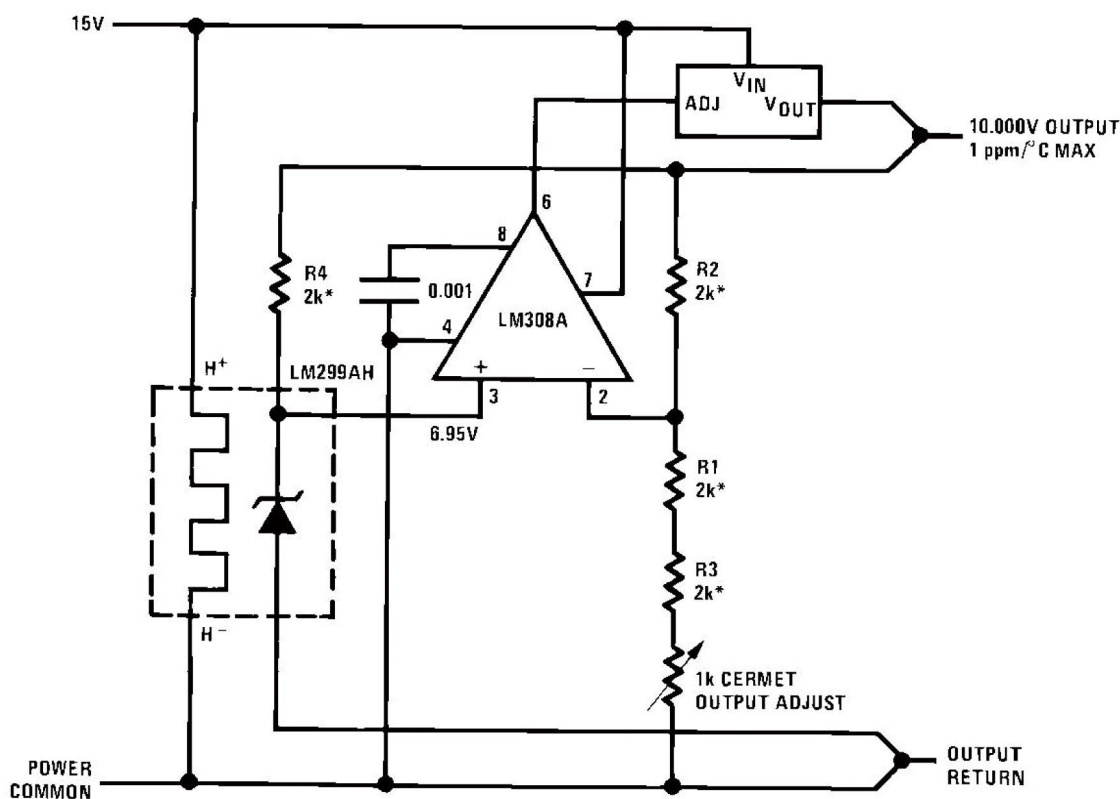


Tracking Regulator

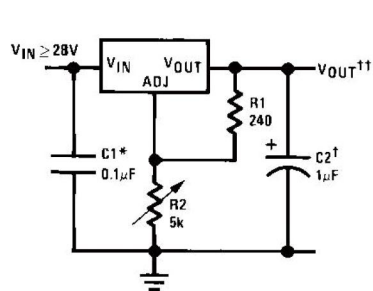


Regulator with Trimmable output Voltage

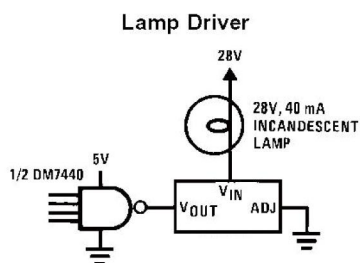
LM317/ 3-Terminal Adjustable Regulator Circuit



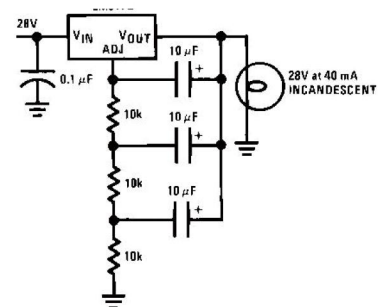
Precision Reference with Short-Circuit Proof Output



Adjustable Regulator



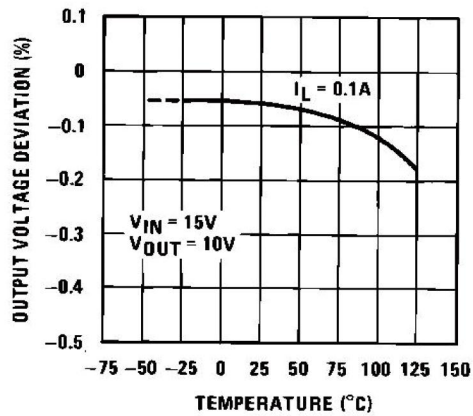
Protected (Bulletproof)
Lamp Driver



Lamp Flasher

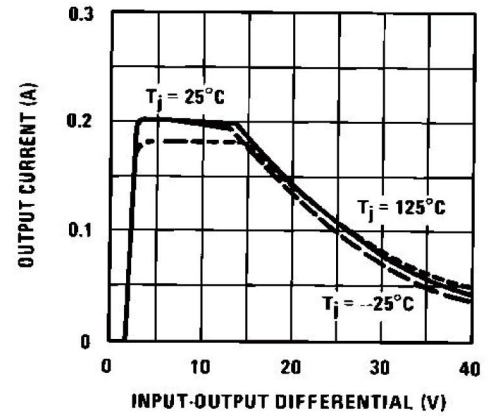
Characteristics Curves

Load Regulation



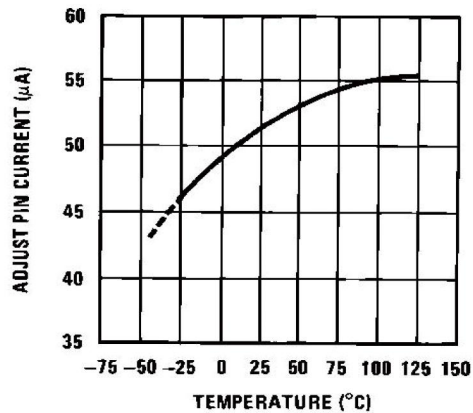
DS009064-34

Current Limit



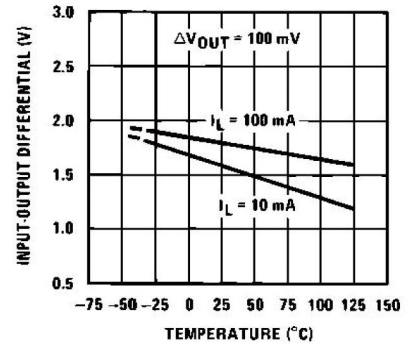
DS009064-35

Adjustment Current



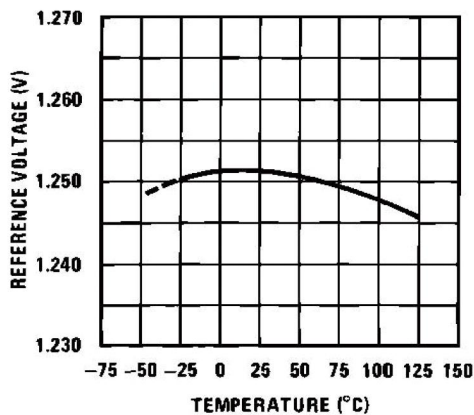
DS009064-36

Dropout Voltage



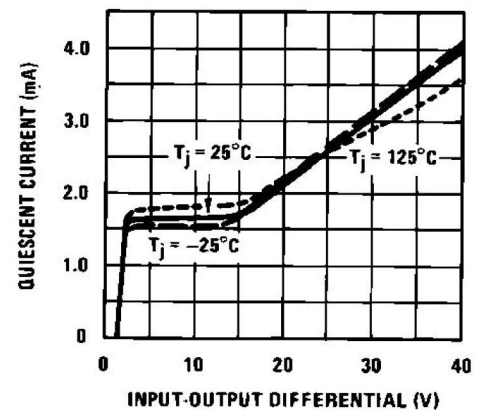
DS009064-37

Reference Voltage
Temperature Stability



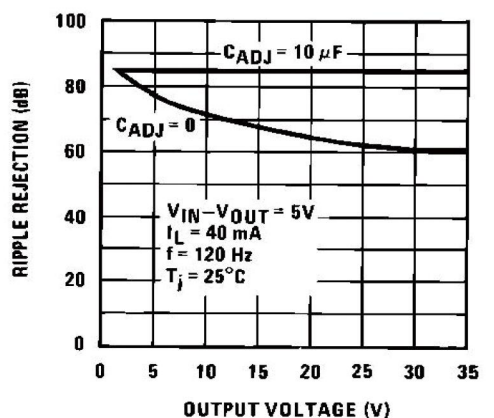
DS009064-38

Minimum Operating Current



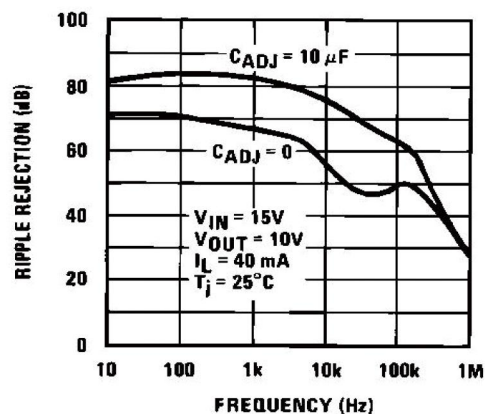
DS009064-39

Ripple Rejection



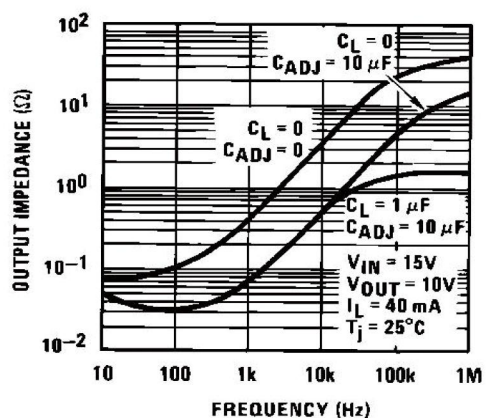
DS009064-40

Ripple Rejection



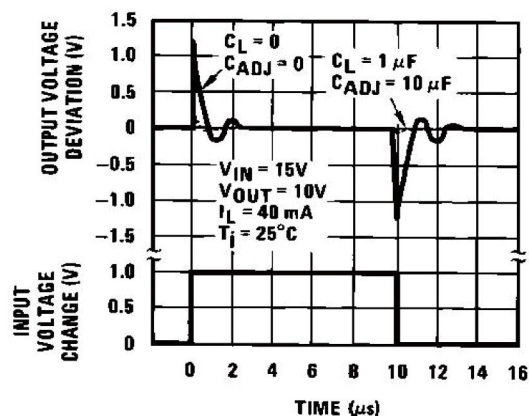
DS009064-41

Output Impedance



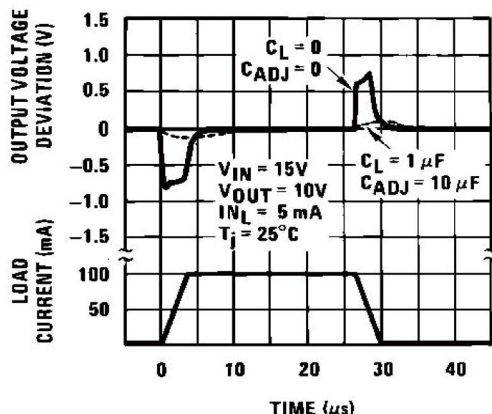
DS009064-42

Line Transient Response



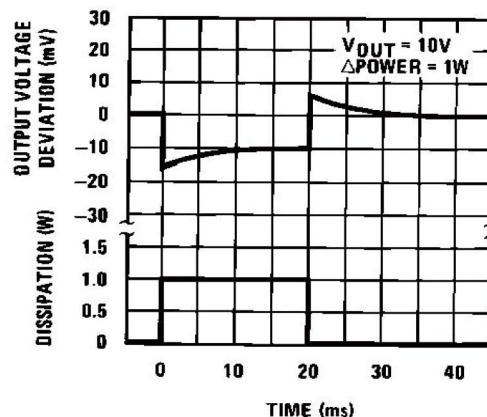
DS009064-43

Load Transient Response



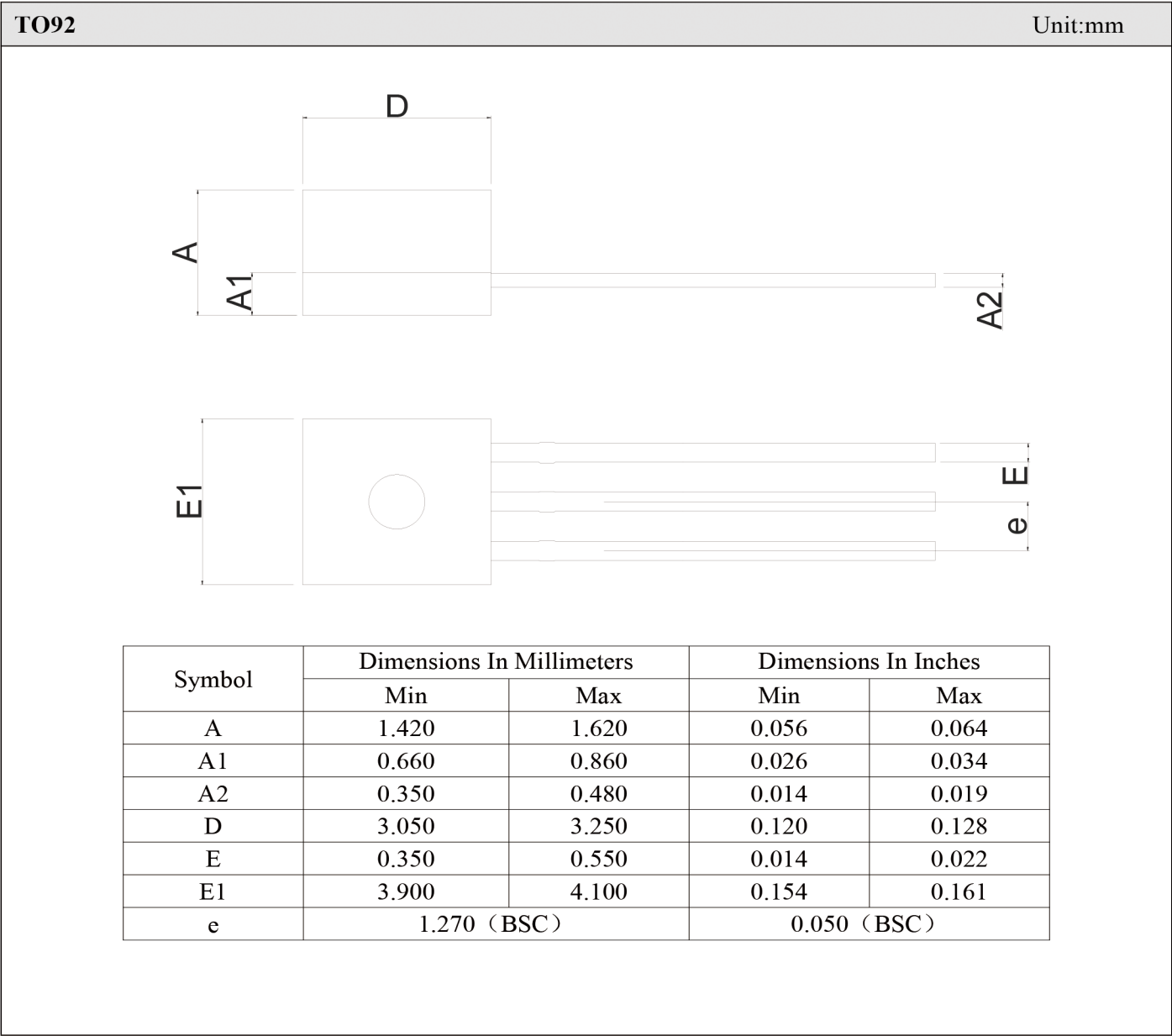
DS009064-44

Thermal Regulation



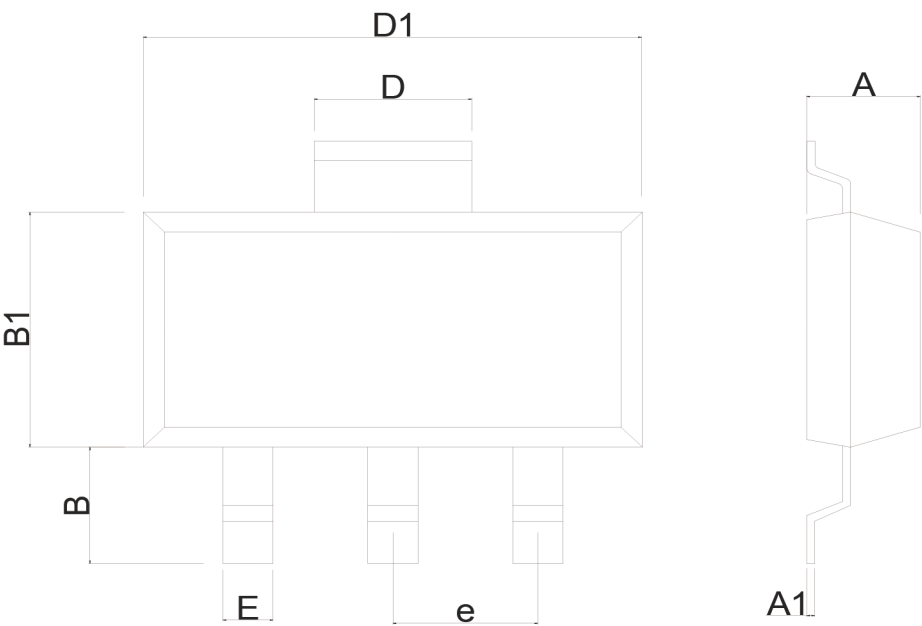
DS009064-45

Outline Dimensions



SOT89-3

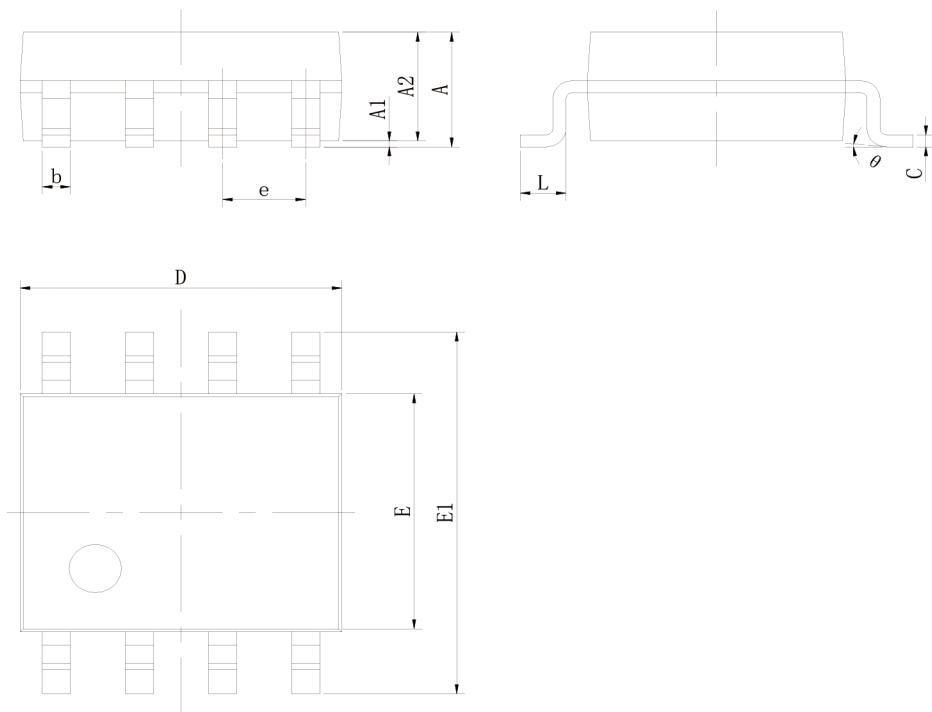
Unit:mm



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.450	1.550	0.057	0.061
A1	0.390	0.410	0.015	0.016
B	0.950	1.050	0.037	0.041
B1	2.350	2.550	0.092	0.100
E	0.350	0.450	0.013	0.017
D1	4.400	4.600	0.173	0.181
D	1.550 REF		0.061 REF	
e	1.500 (BSC)		0.059 (BSC)	

SOP8

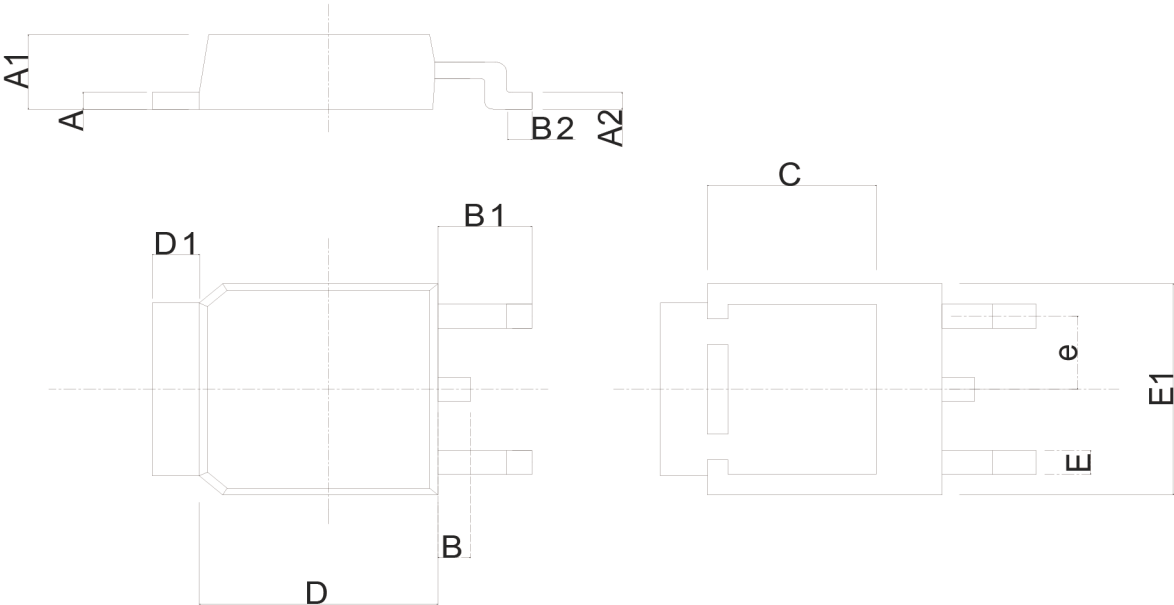
Unit:mm



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.800	0.053	0.071
A1	0.000	0.250	0.000	0.010
A2	1.250	1.550	0.053	0.061
b	0.300	0.510	0.011	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.201
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

TO252-2

Unit:mm



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.470	0.570	0.018	0.023
A1	2.220	2.380	0.087	0.094
A2	0.470	0.570	0.018	0.023
B	0.820	0.840	0.032	0.033
B1	2.380	2.480	0.093	0.098
B2	0.500	0.520	0.019	0.021
C	4.250	4.450	0.167	0.176
D	6.000	6.200	0.236	0.245
D1	1.150	1.250	0.045	0.050
E	0.650	0.850	0.025	0.034
E1	6.450	6.750	0.253	0.266
e	2.285 (BSC)		0.090 (BSC)	