



# TS1117

## 1 Amp Low Dropout Positive Voltage Regulator

TO-220



TO-263



TO-252



SOT-223



**Low dropout voltage 1.3 V max.**

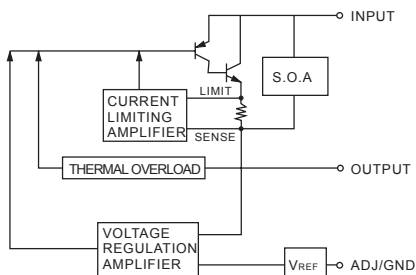
### General Description

The TS1117 Series of high performance positive voltage regulators are designed for use in applications requiring low dropout performance at full rated current. Additionally, the TS1117 Series provides excellent regulation over variations due to changes in line, load and temperature. Outstanding features include low dropout performance at rated current, fast transient response. The TS1117 Series are three terminal regulators with fixed and adjustable voltage options available in popular packages

### Features

- ✧ Low dropout voltage 1.3 V max.
- ✧ Full current rating over line and temperature
- ✧ Fast transient response
- ✧  $\pm 2\%$  Total output regulation over line, load and temperature
- ✧ Adjust pin current max 120  $\mu$  A over temperature
- ✧ Line regulation typical 0.015%.
- ✧ Load regulation typical 0.05%.
- ✧ Fixed / adjustable output voltage
- ✧ TO-220, TO-263, TO-252 & SOT-223 package

### Block Diagram



### Ordering Information

DEVICE	OPERATING TEMPERATURE (Ambient)	PACKAGE
TS1117CZ-adj / 1.8V	-20 to +85°C	TO-220
TS1117CZ-2.5V / 2.85V		
TS1117CZ-3.3V		
TS1117CZ-5.0V		
TS1117CM-adj / 1.8V		TO-263
TS1117CM-2.5V / 2.85V		
TS1117CM-3.3V		
TS1117CM-5.0V		
TS1117CW-adj / 1.8V		SOT-223
TS1117CW-2.5V / 2.85V		
TS1117CW-3.3V		
TS1117CW-5.0V		
TS1117CP-adj / 1.8V		TO-252
TS1117CP-2.5V / 2.85V		
TS1117CP-3.3V		
TS1117CP-5.0V		

### Absolute Maximum Rating

Input Voltage	$V_{IN}$	12	V
Power Dissipation	$P_D$	Internally Limited	W
Thermal Resistance Junction to Case	$\theta_{JC}$	2.5	°C / W
Thermal Resistance Junction to Ambient	$\theta_{JA}$	50	
Operating Junction Temperature Range	$T_J$	0 to +125	°C
Operating Ambient Temperature Range	$T_A$	-20 to +85	
Storage Temperature Range	$T_{STG}$	-25 to +150	
Lead Temperature (Soldering) 10 Sec	$T_{LEAD}$	260	

## Electrical Characteristics

Unless otherwise specified,  
 Adjust  $V_{IN}=2.75V$  to  $12V$  and Adjust  $I_O=10mA$  to  $1.0A$   
 Fixed  $V_{IN}=4.75V$  to  $12V$  and Fixed  $I_O=10mA$  to  $1.0A$   
 (For Fixed 5.0V Output Version,  $V_{IN}=7.5V$  to  $12V$ )

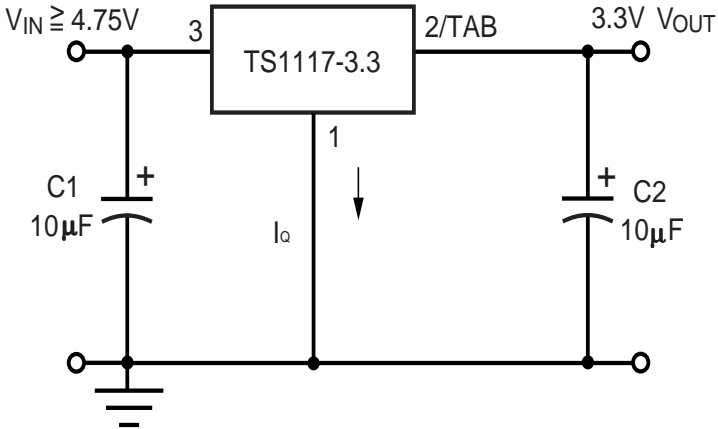
PARAMETER	SYMBOL	TEST CONDITIONS			TEST LIMITS			UNITS
		$V_{IN} - V_{OUT}$	$I_O$	$T_J^{(4)}$	MIN	TYP	MAX	
Output Voltage <sup>(1)</sup> Fixed Voltage	$V_O$	5V	10mA	25	0.99   $V_O$	$V_O$	1.01   $V_O$	V
				Over Temp.	0.98   $V_O$		1.02   $V_O$	
Reference Voltage <sup>(1)</sup> Adj Voltage	$V_{REF}$	5V	10mA	25	1.238	1.250	1.262	
				Over Temp.	1.225		1.275	
Line Regulation <sup>(1)</sup> ( $V_{in}-V_{out}=3V$ )	$REG_{(LINE)}$		10mA	25		0.015	0.2	%
				Over Temp.		0.035		
Load Regulation <sup>(1)</sup> ( $V_{in}-V_{out}=3V$ )	$REG_{(LOAD)}$			25		0.05	0.3	
				Over Temp.		0.2	0.4	
Dropout Voltage $\Delta V_{REF}=1\%$	$V_D$			25		1		V
				Over Temp.		1.1	1.3	
Current Limit ( $V_{in}-V_{out}=5V$ )	$I_{CL}$				1.0	1.1		A
Quiescent Current Fixed Model	$I_Q$	5V		Over Temp.		12	14	mA
Temperature Coefficient	$T_C$					0.005		%/°C
Adjust Pin Current	$I_{ADJ}$			25		55		$\mu A$
				Over Temp.			120	
Adjust Pin Current Change	$\Delta I_{ADJ}$					0.2	5	
Temperature Stability	$T_S$	5V	500mA	Over Temp.		0.5		%
Minimum Load Current Adjust Model	$I_O$	5V				5	10	mA
RMS Output Noise <sup>(2)</sup>	$V_N$			25		0.003		% $V_O$
Ripple Rejection Ratio <sup>(3)</sup>	$R_A$	5V	1.0A	Over Temp.	60	72		dB

- (1) Low duty cycle pulse testing with Kelvin connections required.  
 (2) Bandwidth of 10Hz to 10KHz.  
 (3) 120Hz input ripple( $C_{ADJ}$  for ADJ)=25  $\mu F$ .  
 (4) Over Temp. - over specified operating junction temperature range.



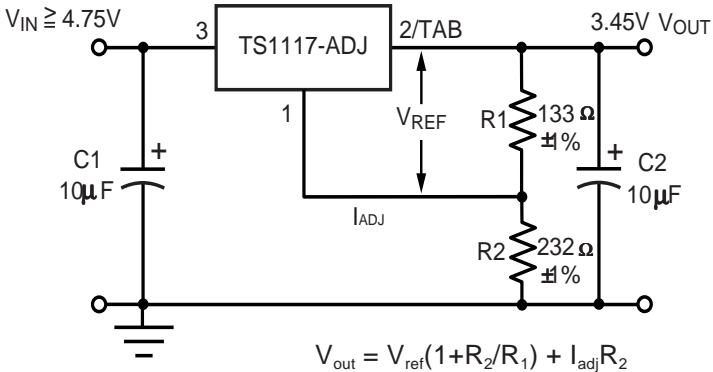
**Typical Application Circuit**

**Fixed Voltage Regulator(1)(2)**



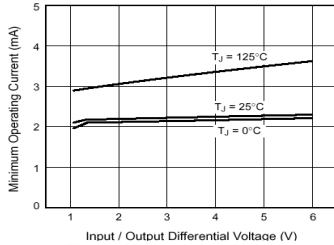
- (1) C1 NEEDED IF DEVICE IS FAR FROM FILTER CAPACITORS
- (2) C2 REQUIRED FOR STABILITY

**Adjustable Voltage Regulator(1)(2)**

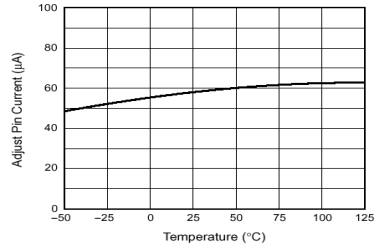


$$V_{out} = V_{ref}(1+R_2/R_1) + I_{adj}R_2$$

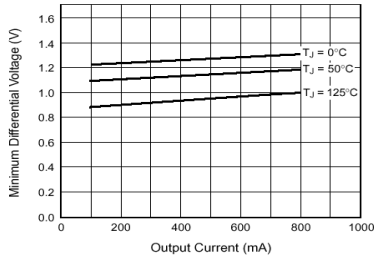
- (1) C1 NEEDED IF DEVICE IS FAR FROM FILTER CAPACITORS
- (2) C2 REQUIRED FOR STABILITY



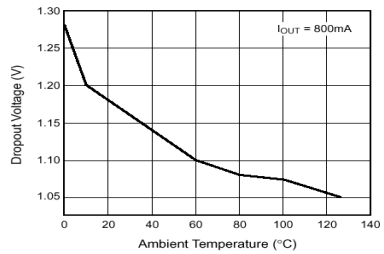
**Fig. 1 – Minimum Load Current (Adjustable Version)**



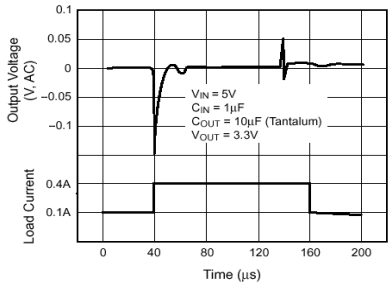
**Fig. 2 – Adjust Pin Current**



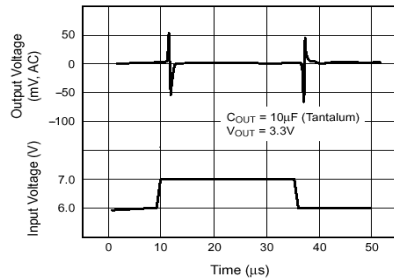
**Fig. 3 – Dropout Voltage**



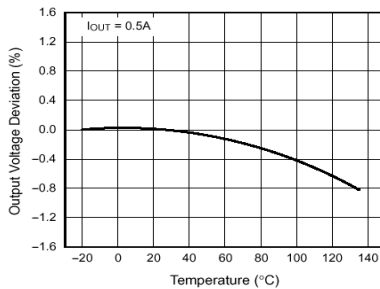
**Fig. 4 – Dropout Voltage v.s. Temperature**



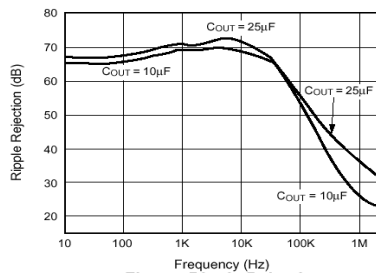
**Fig. 5 – Load Transient Response**



**Fig. 6 – Line Transient Response**



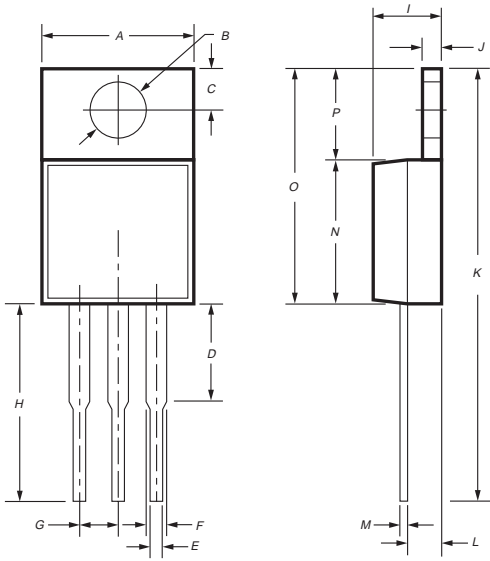
**Fig. 7 – Temperature Stability**



**Fig. 8 – Ripple Rejection (with  $C_{adj}$  25µF)**

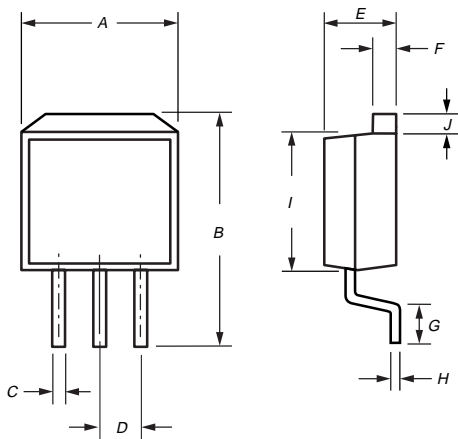


### TO-220 Mechanical drawing



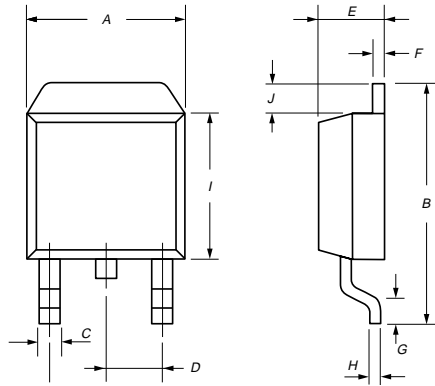
TO-220 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.00	10.50	0.394	0.413
B	3.24	4.44	0.128	0.175
C	2.44	2.94	0.096	0.116
D	3.565	4.315	0.140	0.170
E	0.68	0.92	0.027	0.036
F	1.115	1.485	0.044	0.058
G	2.345	2.715	0.092	0.107
H	13.49	14.31	0.531	0.563
I	4.475	5.225	0.176	0.206
J	1.15	1.39	0.045	0.055
K	27.78	29.62	1.094	1.166
L	2.175	2.925	0.086	0.115
M	0.297	0.477	0.012	0.019
N	8.28	8.80	0.326	0.346
O	14.29	15.31	0.563	0.603
P	6.01	6.51	0.273	0.256

### TO-263 Mechanical drawing



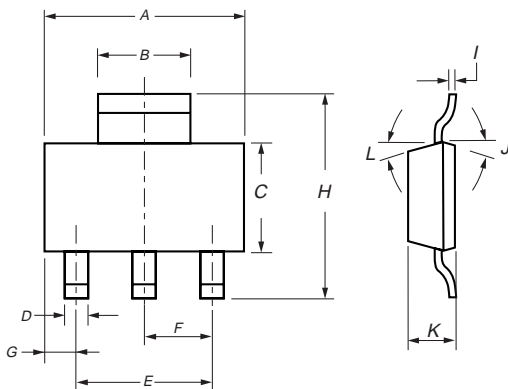
TO-263 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.00	10.50	0.394	0.413
B	14.60	15.87	0.575	0.625
C	0.68	0.92	0.027	0.036
D	2.42	2.66	0.095	0.105
E	4.31	4.83	0.170	0.190
F	1.14	1.40	0.045	0.055
G	2.28	2.79	0.090	0.110
H	0.45	0.73	0.018	0.029
I	8.28	8.80	0.326	0.346
J	1.14	1.40	0.045	0.055

### TO-252 Mechanical drawing



TO-252 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.23	10.28	0.403	0.405
B	9.92	9.96	0.391	0.392
C	0.50	0.54	0.020	0.021
D	1.83	1.96	0.072	0.077
E	4.59	4.61	0.180	0.181
F	0.49	0.51	0.019	0.020
G	1.15	1.22	0.045	0.048
H	0.43	0.47	0.017	0.019
I	5.37	5.40	0.211	0.213
J	1.33	1.39	0.052	0.055

### SOT-223 Mechanical drawing



SOT-223 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	6.30	6.80	0.248	0.268
B	2.90	3.10	0.114	0.122
C	3.30	3.70	0.130	0.146
D	0.63	0.83	0.025	0.033
E	4.60	4.60	0.181	0.181
F	2.30	2.30	0.091	0.091
G	0.83	1.04	0.033	0.041
H	6.70	7.30	0.264	0.287
I	0.255	0.355	0.010	0.014
J	16°	16°	16°	16°
K	1.55	1.80	0.061	0.070
L	10°	10°	10°	10°