800mA Low-Dropout Linear Regulator

1. General Description

1.1 Description

The AMS1117 is a low dropout voltage regulator with a dropout of 1.2 V at 800 mA of load current.

The AMS1117 is available in an adjustable version, which can set the output voltage from 1.25 V to 13.8V with only two external resistors. In addition, the device is available in five fixed voltages, 1.8 V, 2.5 V, 3.3 V, and 5 V.

The AMS1117 offers current limiting and thermal shutdown. The circuit includes a Zener trimmed bandgap reference to assure output voltage accuracy to within ±2%.

A minimum of 10-μF tantalum capacitor is required at the output to improve the transient response and stability.

1.2 Features

- Available in 1.8 V, 2.5 V, 3.3 V, 5 V, and adjustable versions
- Current limiting and thermal protection
- Output current: 800 mA
- Temperature range:

  –AMS1117: -40°C to +85°C

1.3 Device Information

PART NUMBER	PACKAGE
AMS1117	SOT223
	TO252
	TO220
	TO263
	SOT89

2. Connection Diagrams and Pin Description

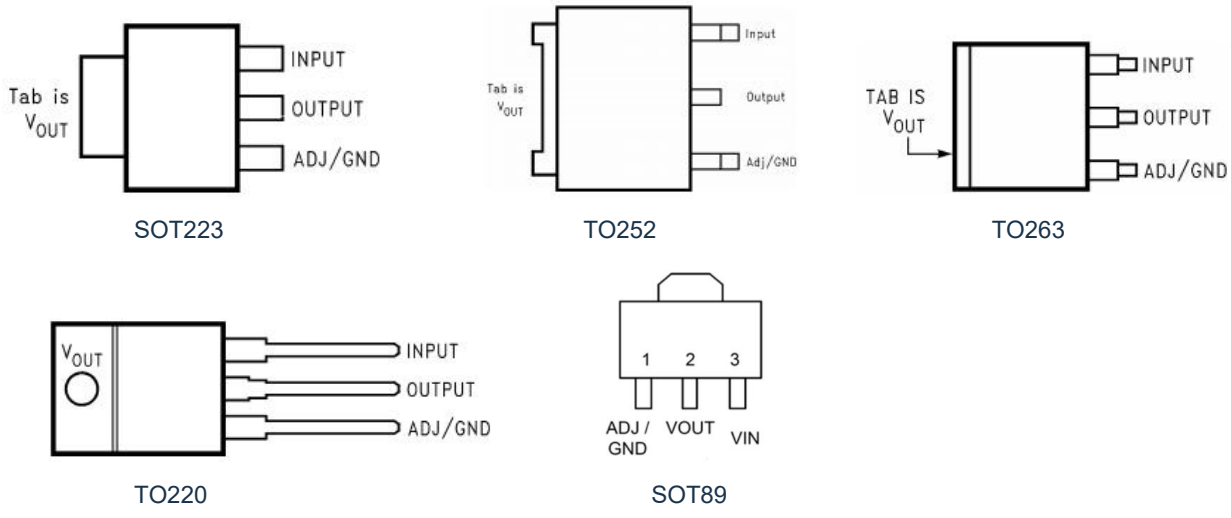


Figure 2.1: Top View

PIN No.					I/O	FUNCTION
NAME	TO252	SOT223	TO263	TO220		
GND/ADJ	1	1	1	1	-	Adjust pin for adjustable output option. Ground pin for fixed output option.
V_{IN}	3	3	3	3	I	Input voltage pin for the regulator
V_{OUT}	2,TAB	2,TAB	2,TAB	2,TAB	O	Output voltage pin for the regulator

3. Function Block Diagram

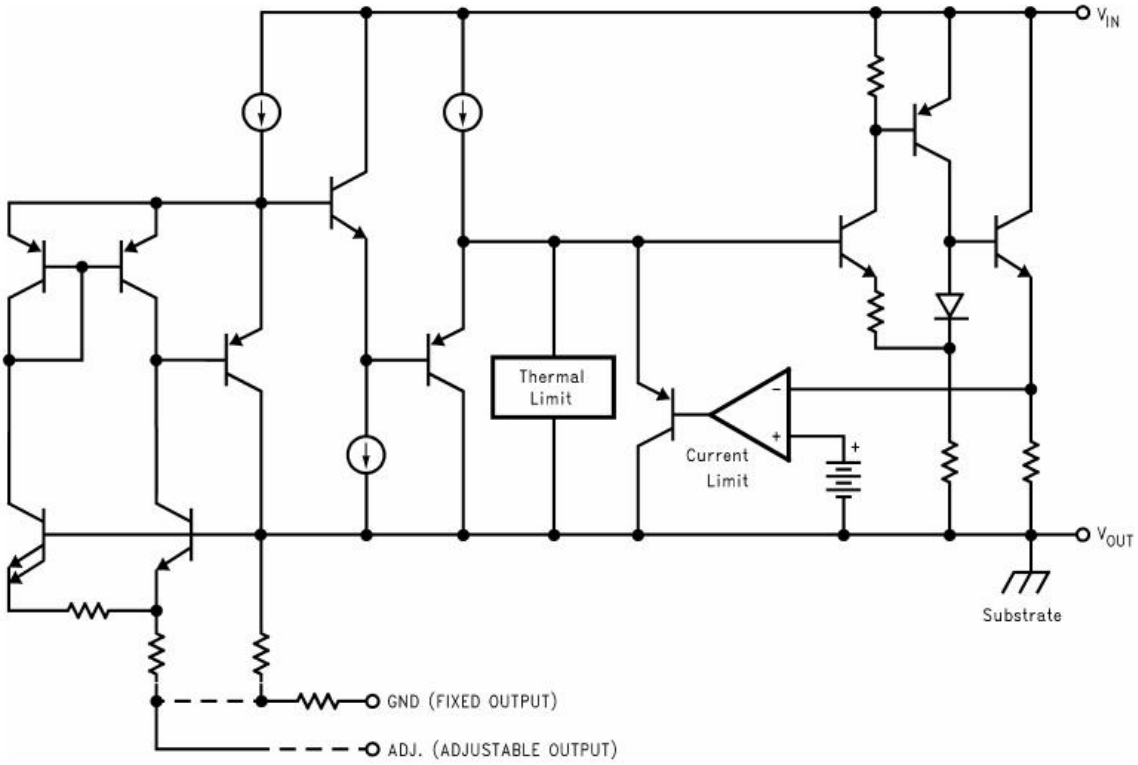


Figure 3.1：AMS1117 Functional Block Diagram

4. Specifications

4.1 Absolute Maximum Ratings

Symbol	Parameter	MIN	MAX	Unit
V_{IN}	Input Voltage		20	V
T_J	Junction Temperature		150	℃
T_{stg}	Storage Temperature	-65	150	℃

Absolute maximum ratings are those values beyond which the device could be permanently damaged,These are stress ratings only,which do not imply functional operation of the device at these or any other conditions beyond those indicated under normal operating conditions.

4.2 Recommended Operating Conditions

Symbol	Parameter	Range	Unit
V_{IN}	Input Voltage	15	V
T_J	Operating Temperature	-40~+85	℃

4.3 Electrical Characteristics

(Electrical Characteristics at IOUT = 0 mA, and T_J = +25°C unless otherwise specified.)

Parameter		Device	Test Condition	MIN	TYP	MAX	Units
V_{REF}	Reference Voltage	AMS1117-ADJ	IOUT = 10 mA, VIN - VOUT=2V	1.225	1.250	1.275	V
			10mA ≤ IOUT ≤800mA, 1.4V≤ (VIN - VOUT) ≤ 12V		1.25		V
V_{OUT}	Output Voltage	AMS1117-1.8	IOUT= 10mA , VIN =3.8V	1.764	1.8	1.836	V
		AMS1117-1.8	0 ≤ IOUT ≤ 800mA , 3.2V≤VIN ≤ 10V		1.8		V
		AMS1117-2.5	IOUT= 10mA , VIN =4.5V	2.45	2.5	2.55	V
		AMS1117-2.5	0 ≤ IOUT ≤ 800mA , 3.9V≤ VIN ≤10V		2.5		V
V_{OUT}	Output Voltage	AMS1117-3.3	IOUT = 10 mA, VIN = 5 V	3.234	3.3	3.366	V
		AMS1117-3.3	0≤ IOUT ≤ 800mA , 4.75V≤ VIN ≤10V		3.3		V
		AMS1117-5.0	IOUT = 10 mA, VIN = 7V	4.9	5	5.1	V
		AMS1117-5.0	0 ≤ IOUT≤ 800mA , 6.5V≤ VIN ≤ 12V		5		V

Parameter		Device	Test Condition	MIN	TYP	MAX	Units
△ V_{OUT}	Line Regulation	AMS1117-ADJ	IOUT = 10 mA, 1.5V≤ VIN-VOUT ≤ 13.75V		0.035%		
		AMS1117-1.8	IOUT = 0mA, 3.2V≤VIN≤10V		1		mV
		AMS1117-2.5	IOUT = 0mA, 3.9V≤ VIN≤10V		1		mV
		AMS1117-3.3	IOUT = 0mA,4.75V≤VIN≤15V		1		mV
		AMS1117-5.0	IOUT = 0mA, 6.5V≤ VIN≤15V		1		mV
△ V_{OUT}	Load Regulation	AMS1117-ADJ	(VIN - VOUT) =3V, 10mA≤ IOUT ≤800mA		0.2		%
		AMS1117-1.8	VIN = 3.2V, 0 ≤ IOUT ≤800mA		1		mV
		AMS1117-2.5	VIN = 3.9V, 0 ≤ IOUT ≤ 800mA		1		mV
		AMS1117-3.3	VIN = 4.75V, 0 ≤IOUT ≤ 800mA		1		mV
		AMS1117-5.0	VIN =6.5V, 0 ≤ IOUT ≤ 800mA		1		mV

Parameter		Test Condition	MIN	TYP	MAX	Units
V_{IN}-V_{OUT}	Dropout Voltage(1)	I_{OUT}=100mA		1.1		V
		I_{OUT}=500mA		1.15		V
		I_{OUT}=800mA		1.2		V
I_{LIMIT}	Current Limit	V_{IN}-V_{OUT}=5v		1200		mA
	Minimum load current(2)	AMS1117-ADJ V_{IN}= 15 V		1		mA
	Quiescent Current	AMS1117-1.8/-2.5/-3.3/-5.0 V_{IN}≤ 15 V			10	mA
	Ripple regulation	F_{ripple}=120Hz,V_{IN}-V_{OUT}=3v V_{RIPPLE}=1V_{P-P}		60		db
	Adjust pin current			60		uA
	Adjust pin current change	10mA≤I_{OUT}≤800mA, 1.4V≤V_{IN}-V_{OUT}≤10V		0.2		uA
	Temperature stability			0.5		%
	Long term stability	T_A = 85°C, 1000 hours		0.3		
	RMS output noise	(% of V_{OUT}), 10 Hz ≤ f ≤ 10 kHz		0.003		

(1) . The dropout voltage is the input/output differential at which the circuit ceases to requlate against further reduction in input voltage. This voltage is measured when the output voltage has dropped 100 mV from the nominal value obtained at VIN = Vout + 1.5 V.

(2). The minimum output current required to maintain regulation.

5. Application and Implemention

5.1 Application Information

The AMS1117 is a versatile and high performance linear regulator with a wide temperature range and tight line/load regulation operation. An output capacitor is required to further improve transient response and stability. For the adjustable option, the ADJ pin can also be bypassed to achieve very high ripple-rejection ratios. The AMS1117 is versatile in its applications, including being used as a post regulator for DC/DC converters, battery chargers and microprocessor supplies.

5.2 Typical Application

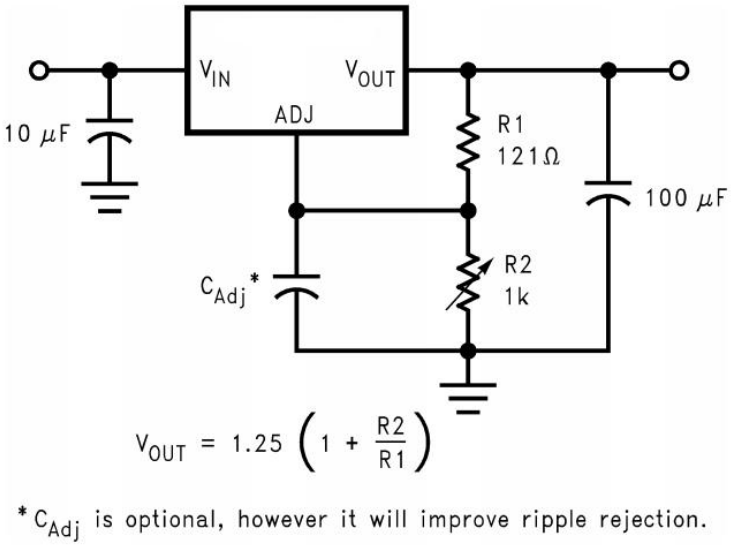


Figure 5.1. 1.25-V to 10-V Adjustable Regulator With Improved Ripple Rejection

5.3 Design Requirements

The device component count is very minimal, employing two resistors as part of a voltage divider circuit and an output capacitor for load regulation. A 10-μF tantalum on the input is a suitable input capacitor for almost all applications. An optional bypass capacitor across R2 can also be used to improve PSRR.

Detailed Design Procedure

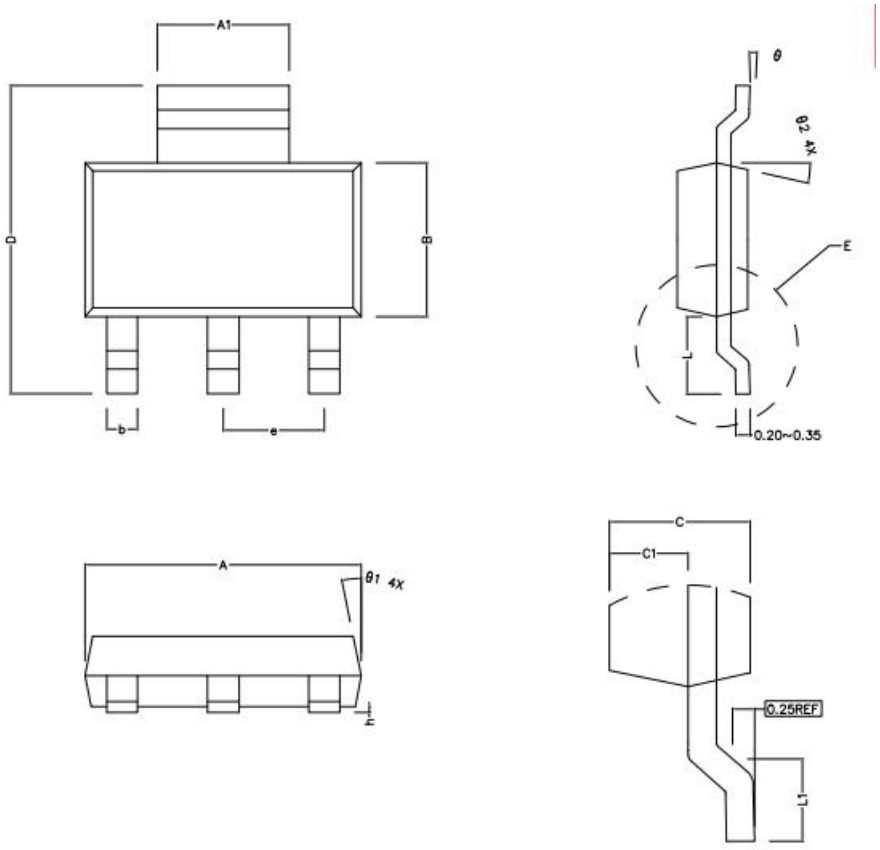
The output voltage is set based on the selection of the two resistors, R1 and R2, as shown in Figure 5.1. For details on capacitor selection, see the External Capacitors section.

6. Ordering Information

Orderable Device	Package Type	Pins	Packing	Package Qty
AMS1117-5.0BT03ARCQ	SOT223	3	Tape & Reel	3000
AMS1117-3.3BT03ARCQ	SOT223	3	Tape & Reel	3000
AMS1117-1.8BT03ARCQ	SOT223	3	Tape & Reel	3000
AMS1117-ADJBT03ARCQ	SOT223	3	Tape & Reel	3000
AMS1117-5.0DW03ATEQ	TO220	3	Tube	50
AMS1117-3.3DW03ATEQ	TO220	3	Tube	50
AMS1117-1.8DW03ATEQ	TO220	3	Tube	50
AMS1117-ADJDW03ATEQ	TO220	3	Tube	50
AMS1117-5.0EW03ARBE	TO252	3	Tape & Reel	2500
AMS1117-3.3EW03ARBE	TO252	3	Tape & Reel	2500
AMS1117-1.8EW03ARBE	TO252	3	Tape & Reel	2500
AMS1117-ADJEW03ARBE	TO252	3	Tape & Reel	2500
AMS1117-5.0FW03ARHQ	TO263	3	Tape & Reel	800
AMS1117-3.3FW03ARHQ	TO263	3	Tape & Reel	800
AMS1117-1.8FW03ARHQ	TO263	3	Tape & Reel	800
AMS1117-ADJFW03ARHQ	TO263	3	Tape & Reel	800
AMS1117-5.0GT03ARAQ	SOT89	3	Tape & Reel	1000
AMS1117-3.3GT03ARAQ	SOT89	3	Tape & Reel	1000
AMS1117-1.8GT03ARAQ	SOT89	3	Tape & Reel	1000

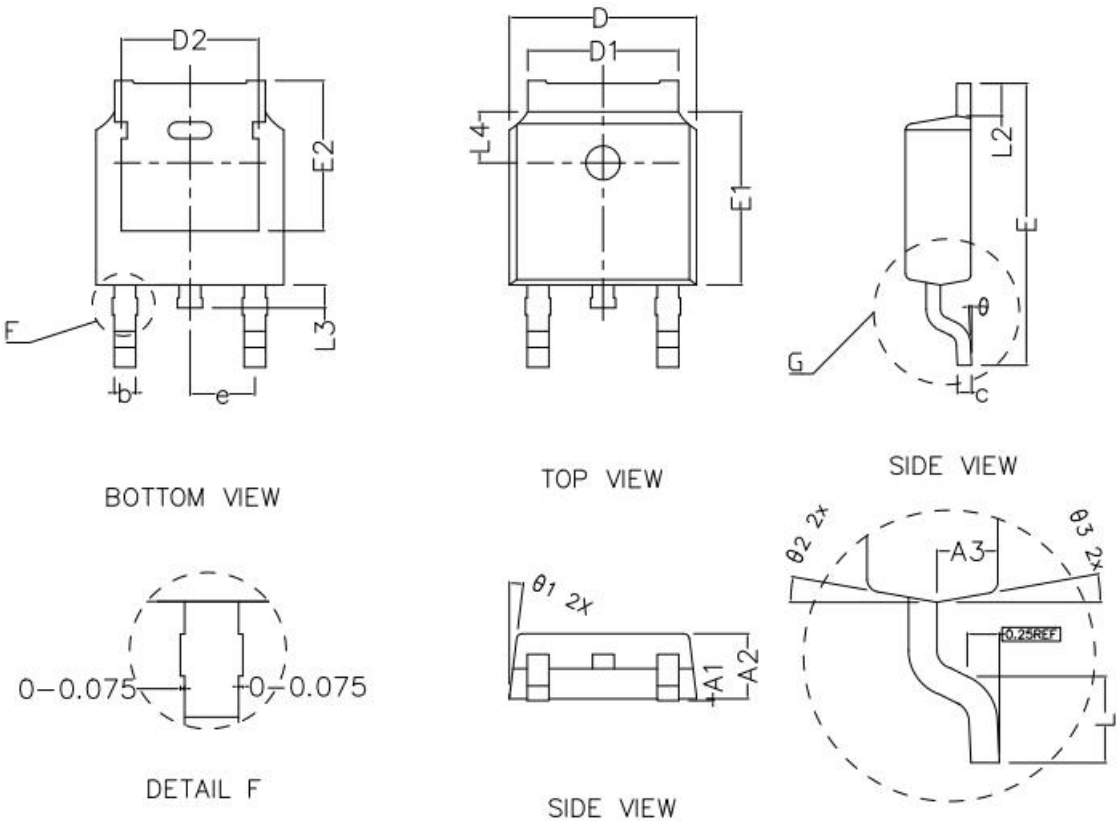
7. Package Information

7.1 SOT-223



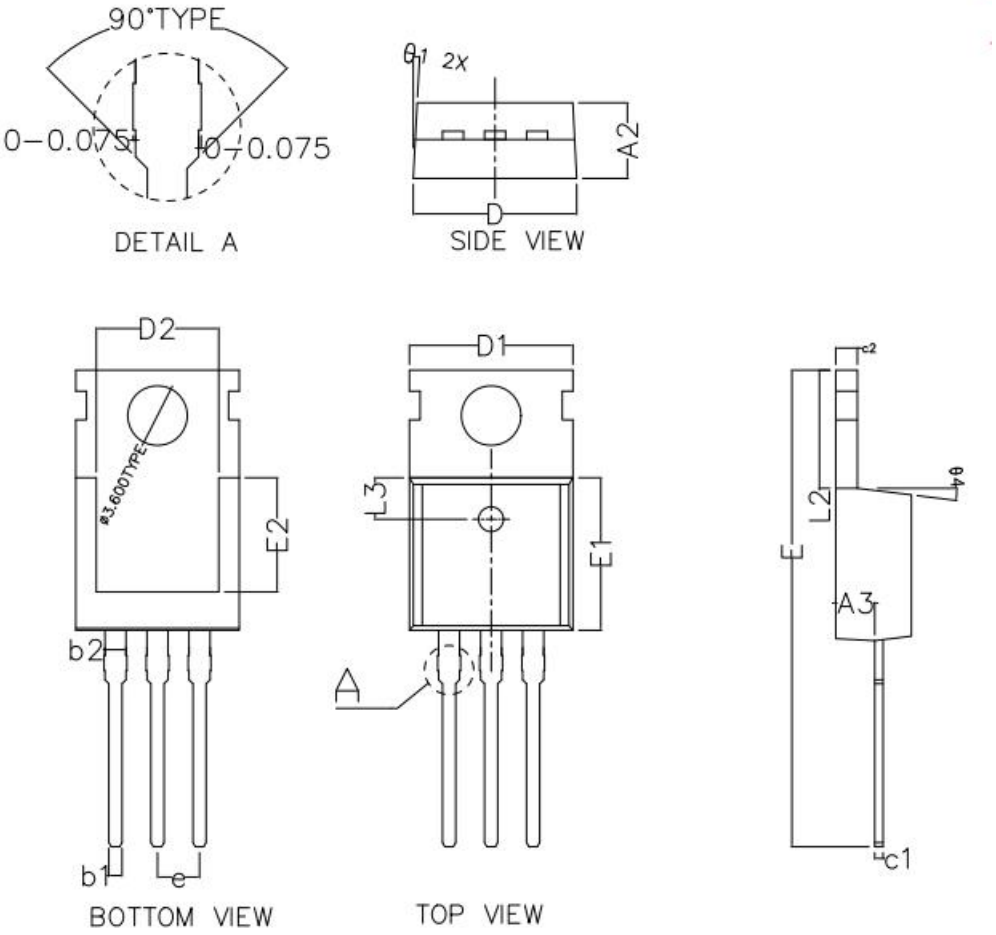
COMMON DIMENSIONS (UNITS OF MEASURE IS mm)			
	MIN	NORMAL	MAX
A	6.400	6.500	6.600
⚠A1	2.900	3.000	3.100
B	3.400	3.500	3.600
C	1.550	1.600	1.650
C1	0.850	0.900	0.950
D	6.800	7.000	7.200
L	1.650	1.750	1.850
⚠L1	0.900	1.000	1.150
b	0.660	0.740	0.820
h	0.020	0.050	0.100
e	2.300TYPE		
θ_1	13° TYPE		
θ_2	13° TYPE		
θ	0° ~ 8°		

7.2 TO-252



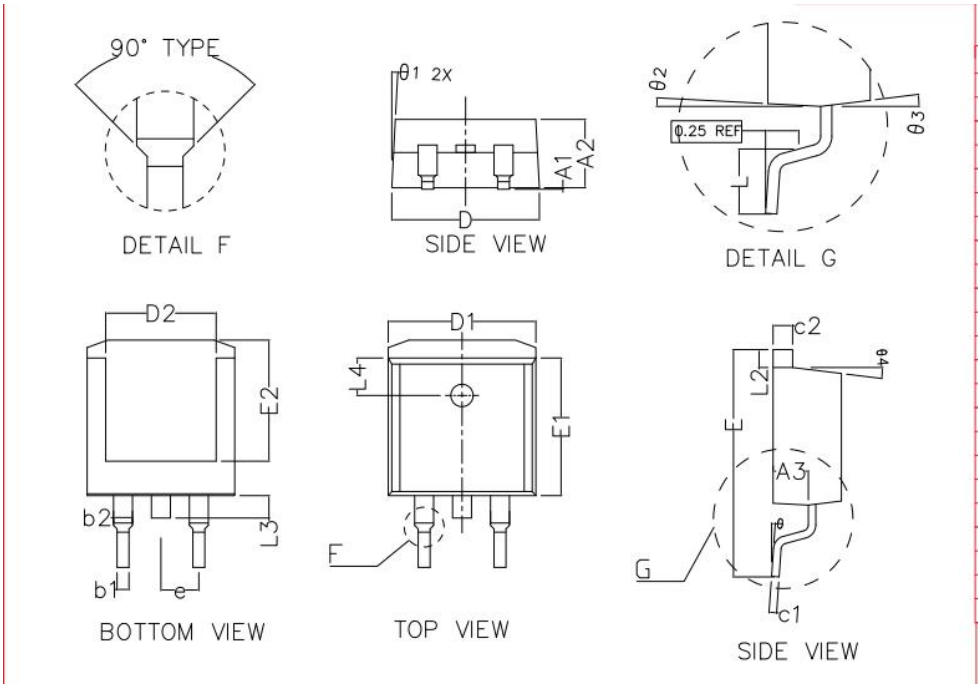
COMMON DIMENSIONS (UNITS OF MEASURE IS mm)			
	MIN	NORMAL	MAX
A1	0.000	0.100	0.150
A2	2.200	2.300	2.400
A3	1.020	1.070	1.120
b	0.710	0.760	0.810
c	0.460	0.508	0.550
D	6.500	6.600	6.700
D1	5.330REF		
D2	4.830REF		
E	9.900	10.100	10.300
E1	6.000	6.100	6.200
⚠E2	5.600REF		
e	2.286TYPE		
L	1.400	1.550	1.700
L2	1.10REF		
L3	0.80REF		
L4	1.80REF		
θ	0~8°		
θ1	7° TYPE		
θ2	10° TYPE		
θ3	10° TYPE		

7.3 TO220



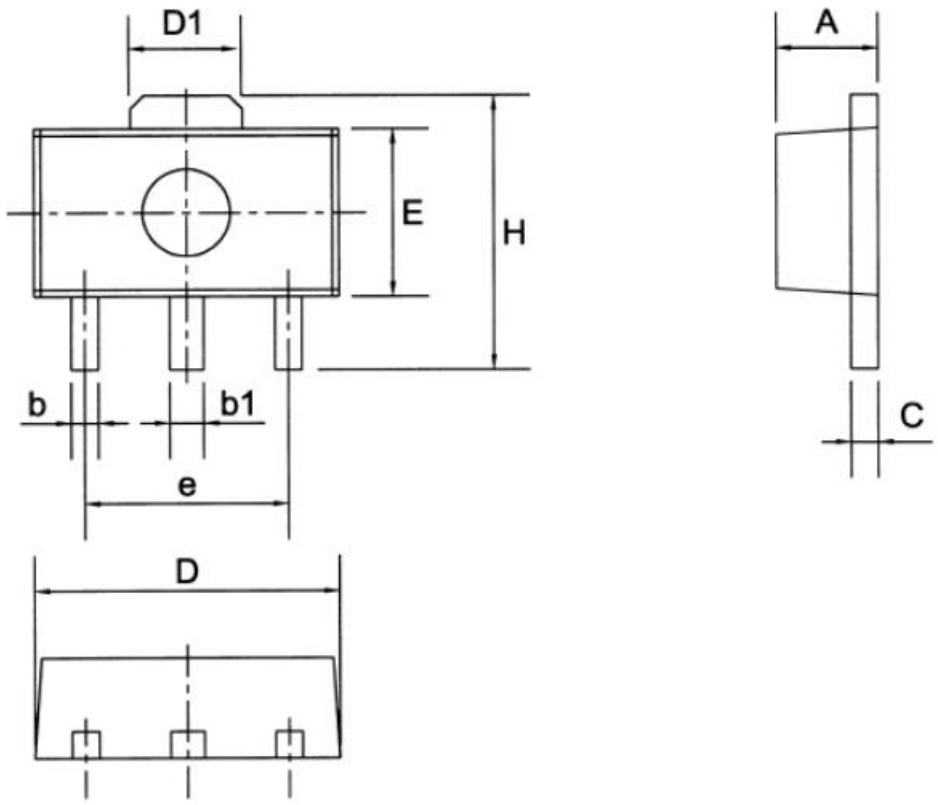
COMMON DIMENSIONS (UNITS OF MEASURE IS mm)			
	MIN	NORMAL	MAX
A2	4.470	4.570	4.670
A3	2.300	2.350	2.400
b1	0.750	0.800	0.850
b2		1.27 TYPE	
c1	0.450	0.500	0.550
c2	1.250	1.300	1.380
▲ D	9.900	10.000	10.100
▲ D1		10.000TYPE	
▲ D2		8.000TYPE	
▲ E	28.660	28.860	29.060
▲ E1	9.000	9.100	9.200
▲ E2		7.000TYPE	
e		2.540TYPE	
L2	6.350	6.500	6.650
L3		2.50TYPE	
θ1		3° TYPE	
θ2		3° TYPE	
θ3		7° TYPE	
θ4		7° TYPE	

7.4 TO263



COMMON DIMENSIONS (UNITS OF MEASURE IS mm)			
	MIN	NORMAL	MAX
A1	0.020	0.100	0.200
A2	4.470	4.570	4.670
A3	2.300	2.350	2.400
b1	0.750	0.800	0.850
b2	1.220	1.270	1.320
c1	0.450	0.500	0.550
c2	1.250	1.300	1.350
D	9.900	10.000	10.100
D1		9.880REF	
D2		7.400REF	
E	14.900	15.100	15.300
▲E1	9.000	9.100	9.200
E2		8.100REF	
e		2.540TYPE	
L	2.100	2.300	2.500
L2	1.100	1.200	1.300
L3	1.300	1.500	1.700
▲L4		2.50 TYPE	
θ1		3° TYPE	
θ2		3° TYPE	
θ3		7° TYPE	
θ4		7° TYPE	
θ		0 ~ 8°	

7.5 SOT89



Symbol	Dimensions In Millmeters			Dimensions In Inches		
	Min	Nom	Max	Min	Nom	Max
A	1.30	1.50	1.70	0.051	0.059	0.067
b	0.25	0.40	0.55	0.010	0.016	0.022
b1	0.40	0.50	0.60	0.016	0.020	0.024
C	0.30	0.40	0.50	0.012	0.016	0.020
D	4.30	4.50	4.70	0.169	0.177	0.185
D1	1.45	1.65	1.85	0.057	0.065	0.073
E	2.30	2.50	2.70	0.091	0.098	0.106
e	2.90	3.00	3.10	0.114	0.118	0.122
H	3.90	4.10	4.30	0.154	0.161	0.169

Flow (wave) soldering (solder dipping)

Product	Peak Temperature	Dipping Time
Pb device	245℃±5℃	5sec±1sec
Pb-Free device	260℃+0/-5℃	5sec±1sec

This integrated circuit can be damaged by ESD BYSEMI Corporation recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedure can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.