DESCRIPTION

A1117A is a series of low dropout three-terminal regulators with a typical dropout of 1.3V at 1A load current.

Besides fixed voltage version (V_{OUT} = 1.2V, 1.8V, 2.5V, 3.3V, 5V), A1117A has an adjustable version that can provide an output voltage from 1.25 to 12V with two external resistors.

A1117A offers thermal shut down functions to assure stability of chip and power system. Trimming technique is used to guarantee output voltage accuracy within ±2%.

The A1117A is available in SOT-223, TO-252 and SOT89-3 packages.

FEATURES

- Maximum output current is 1A
- Range of operation input voltage: Max 15V
- Line regulation: 0.1%/V (typ.)
- Load regulation: 10mV (typ.)
- Environment Temperature: -20°C ~85°C
- Available in SOT-223 , TO-252 and SOT89-3 packages

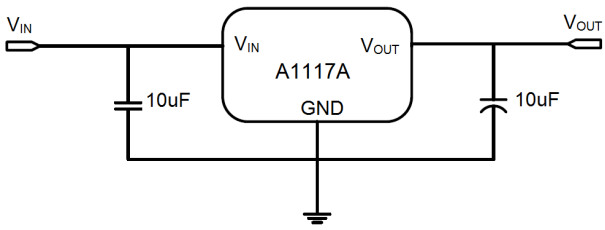
APPLICATION

- DVB
- Computer Mother Board, Graphic Card
- LCD Monitor and LCD TV
- DVD Decode Board
- ADSL Modem
- Post Regulators for Switching Supplies

ORDERING INFORMATION

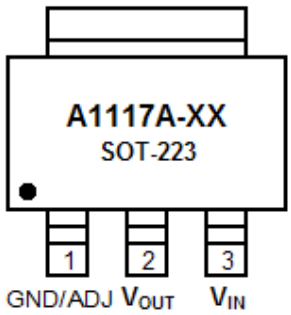
Package Type	Part Number	
SOT-223 SPQ: 2,500pcs/Reel	N	A1117ANR-XX
		A1117ANVR-XX
TO-252 SPQ: 2,500pcs/Reel	D	A1117ADR-XX
		A1117ADVR-XX
SOT89-3 SPQ: 1,000pcs/Reel	K3	A1117AK3R-XX
		A1117AK3VR-XX
Note	XX: Output Voltage, 12=1.2V, 18=1.8V, ADJ: Adjustable V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products		

TYPICAL APPLICATION

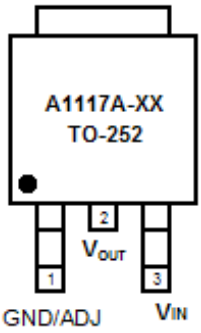


Application circuit of A1117A fixed version

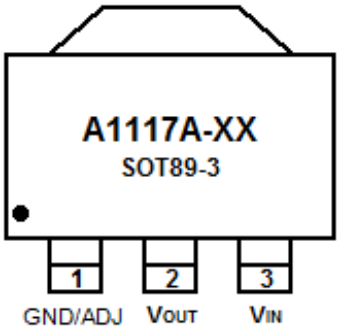
PIN DESCIPTION



Top View



Top View



Top View

Pin #	SOT-223		TO-252		SOT89-3	
	A1117A -XX	A1117A -ADJ	A1117A -XX	A1117A -ADJ	A1117A -XX	A1117A -ADJ
1	GND	ADJ	GND	ADJ	GND	ADJ
2	V_{OUT}	V_{OUT}	V_{OUT}	V_{OUT}	V_{OUT}	V_{OUT}
3	V_{IN}	V_{IN}	V_{IN}	V_{IN}	V_{IN}	V_{IN}

ABSOLUTE MAXIMUM RATINGS

Max Input Voltage		15V
T_J, Max Operating Junction Temperature		150°C
T_A, Ambient Temperature		-40°C ~ 85°C
Package Thermal Resistance	SOT-223	20°C/W
	TO-252	10°C/W
T_S, Storage Temperature		-40°C ~ 150°C
Lead Temperature & Time		260°C, 10s

Stress beyond above listed “Absolute Maximum Ratings” may lead permanent damage to the device. These are stress ratings only and operations of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

RECOMMENDED WORKING CONDITIONS

Parameter	Symbol	Value	Units
Input Voltage Range		Max. 12	V
Operating Junction Temperature	T_J	-20 ~ 125	°C

ELECTRICAL CHARACTERISTICS

T_J = 25°C

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Reference Voltage	V_{REF}	10mA≤I_{OUT}≤1A , V_{IN}=3.25V	ADJ	1.225	1.25	1.275	V
Output Voltage	V_{OUT}	0≤I_{OUT}≤1A , V_{IN}=3.2V	1.2V	1.176	1.2	1.224	V
		0≤I_{OUT}≤1A , V_{IN}=3.8V	1.8V	1.764	1.8	1.836	
		0≤I_{OUT}≤1A , V_{IN}=4.5V	2.5V	2.45	2.5	2.55	
		0≤I_{OUT}≤1A , V_{IN}=5.3V	3.3V	3.234	3.3	3.366	
		0≤I_{OUT}≤1A , V_{IN}=7.0V	5.0V	4.9	5	5.1	
Line Regulation	ΔV_{OUT}	I_{OUT}=10mA, 2.75V≤V_{IN}≤12V	ADJ	-	0.1	0.2	%/V
		I_{OUT}=10mA, 2.7V≤V_{IN}≤10V	1.2V				
		I_{OUT}=10mA, 3.3V≤V_{IN}≤12V	1.8V				
		I_{OUT}=10mA, 4.0V≤V_{IN}≤12V	2.5V				
		I_{OUT}=10mA, 4.8V≤V_{IN}≤12V	3.3V				
		I_{OUT}=10mA, 6.5V≤V_{IN}≤12V	5.0V				
Load Regulation	ΔV_{OUT}	V_{IN} =2.75V, 10mA≤I_{OUT}≤1A	ADJ	-	10	30	mV
		V_{IN} =2.7V, 10mA≤I_{OUT}≤1A	1.2V				
		V_{IN}=3.3V, 10mA≤I_{OUT}≤1A	1.8V				
		V_{IN}=4.0V, 10mA≤I_{OUT}≤1A	2.5V				
		V_{IN}=4.8V, 10mA≤I_{OUT}≤1A	3.3V				
		V_{IN}=6.5V, 10mA≤I_{OUT}≤1A	5.0V				
Dropout Voltage	V_{DROP}	I_{OUT}=100mA		-	1.23	1.3	V
		I_{OUT}=1A		-	1.3	1.5	
Current Limit	Ilimit	V_{IN}-V_{OUT}=2V, T_J=25°C		1	-	-	A
Minimum Load Current	Imin		ADJ	-	2	10	mA
Quiescent Current	I_q	V_{IN} =10V	1.2V	-	2	3.5	mA
		V_{IN} =12V	1.8V				
		V_{IN} =12V	2.5V				
		V_{IN} =12V	3.3V				
		V_{IN} =12V	5.0V				
Adjust Pin Current	I_{ADJ}	V_{IN} =5V, 10mA≤I_{OUT}≤1A	ADJ	-	55	120	μA
I_{ADJ} change	I_{CHANGE}	V_{IN} =5V, 10mA≤I_{OUT}≤1A	ADJ	-	0.2	10	μA
Temperature Coefficient	ΔV/ΔT			-	±100	-	ppm
Thermal Resistor	θ_{JC}	SOT-223		-	20	-	°C/W
		TO-252		-	10	-	
		SOT-89-3		-	40	-	

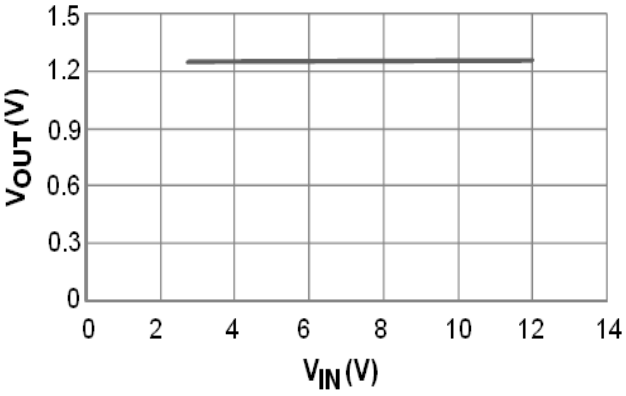
NOTE1: All test are conducted under ambient temperature 25°C and within a short period of time 20ms

NOTE2: Load current smaller than minimum load current of A1117A-ADJ will lead to unstable or oscillation output.

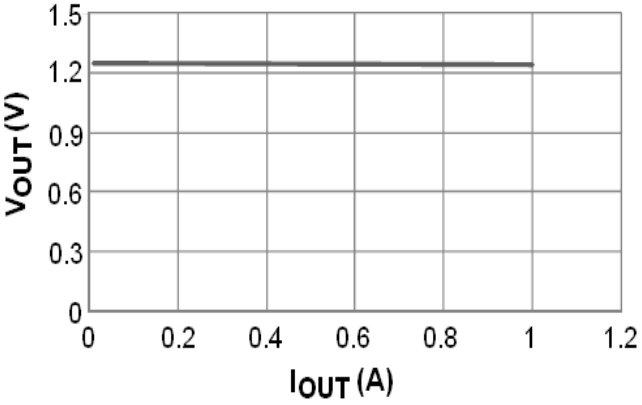
TYPICAL PERFORMANCE CHARACTERISTICS

T=25°C, unless specified.

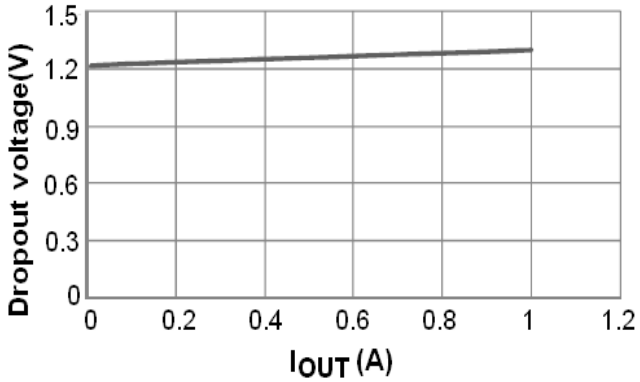
1. Line Regulation
   A1117A-ADJ V_{OUT} Vs. V_{IN}



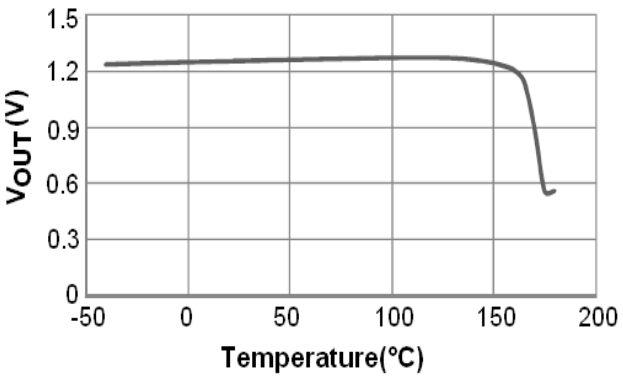
2. Load Regulation
   A1117A-ADJ V_{OUT} Vs. I_{OUT}



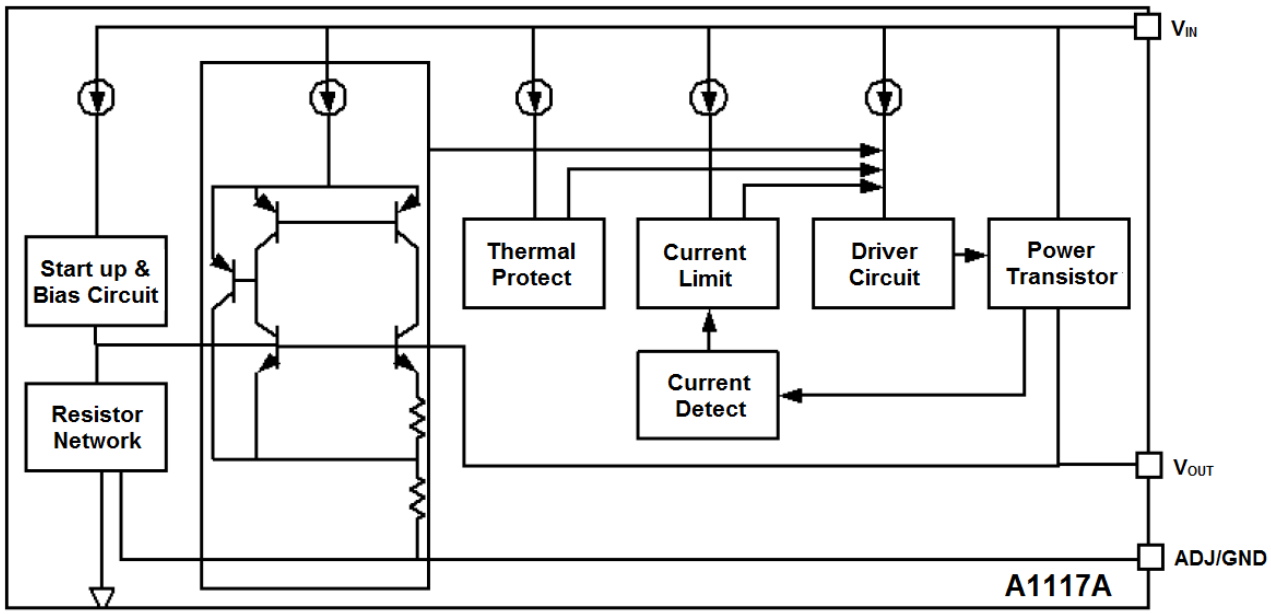
3. Dropout Voltage
   A1117A-ADJ Dropout Vs. I_{OUT}



4. Thermal performance with OTP
   A1117A-ADJ V_{OUT} Vs. Temp



BLOCK DIAGRAM



DETAILED DESCRIPTION

A1117A is a series of low dropout voltage, three terminal regulators. Its application circuit is very simple: the fixed version only needs two capacitors and the adjustable version only needs two resistors and two capacitors to work. It is composed of some modules including start-up circuit, bias circuit, bandgap, thermal shutdown, current limit, power transistors and its driver circuit and so on.

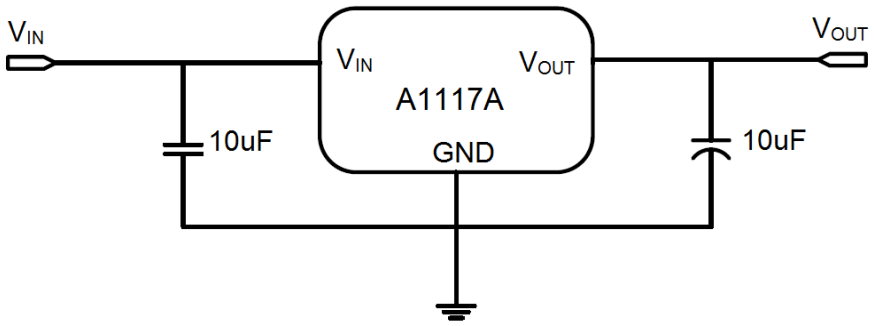
The thermal shut down modules can assure chip and its application system working safety when the junction temperature is larger than 140°C.

The bandgap module provides stable reference voltage, whose temperature coefficient is compensated by careful design considerations. The temperature coefficient is under 100 ppm/°C. And the accuracy of output voltage is guaranteed by trimming technique.

TYPICAL APPLICATION

A1117A has an adjustable version and fixed versions (1.2V, 1.8V, 2.5V, 3.3V and 5V)

Fixed Output Voltage Version

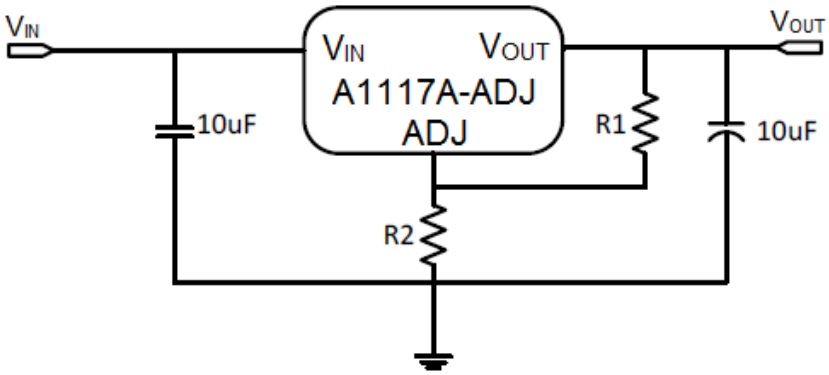


Application circuit of A1117A fixed version

1. Recommend using 10uF tan capacitor as bypass capacitor for all application circuit.
2. Recommend using 10uF tan capacitor to assure circuit stability.

Adjustable Output Voltage Version

A1117A-ADJ provides a 1.25V reference voltage. Any output voltage between 1.25V~12V can be achievable by choosing two external resistors (schematic is shown below), R1 and R2



Application Circuit of A1117A-ADJ

The output voltage of adjustable version follows the equation: V_{OUT} =1.25 x (1+R2/R1) + I_{ADJ} x R2. We can ignore I_{ADJ} because I_{ADJ} (about 50uA) is much less than the current of R1 (about 2~10mA).

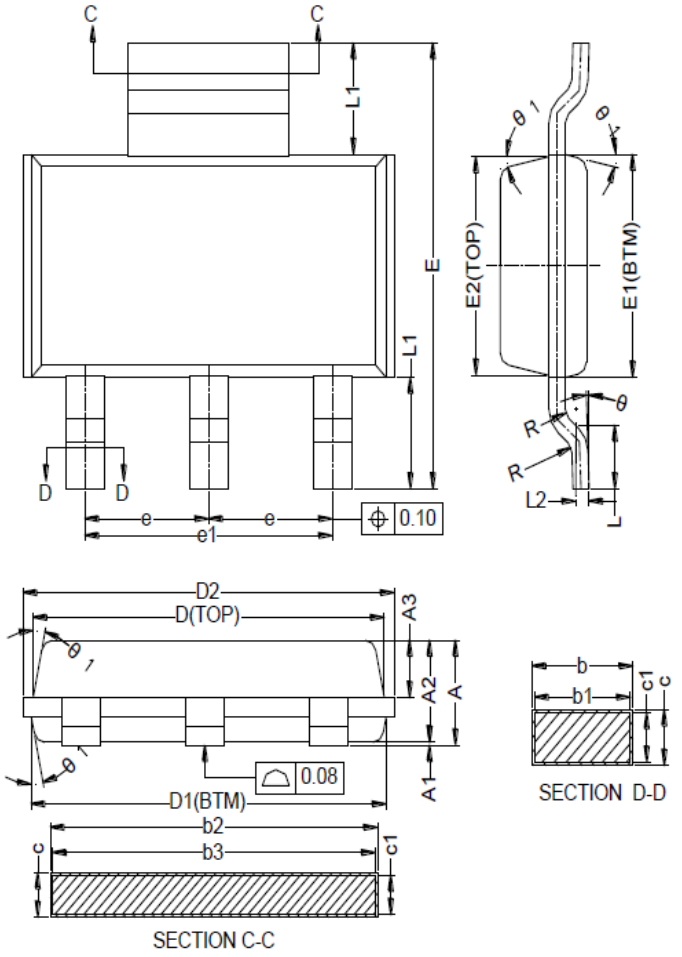
1. To meet the minimum load current (>10mA) requirement, R1 is recommended to be 125Ω or lower. As A1117A-ADJ can keep itself stable at load current about 2mA, R1 is not allowed to be higher than 625Ω.
2. Using a bypass capacitor (C_{ADJ}) between the ADJ pin and ground can improve ripple rejection. This bypass capacitor prevents ripple from being amplified as the output voltage is increased. The impedance of C_{ADJ} should be less than R1 to prevent ripple from being amplified. As R1 is normally in the range of 100Ω~500Ω, the value of C_{ADJ} should satisfy this equation: $1/(2\pi \times f_{ripple} \times C_{ADJ})<R1$.

THERMAL CONSIDERATIONS

We have to take heat dissipation into great consideration when output current or differential voltage of input and output voltage is large. Because in such cases, the power dissipation consumed by A1117A is very large. A1117A series uses SOT-223 package type and its thermal resistance is about 20°C/W. And the copper area of application board can affect the total thermal resistance. If copper area is 5cm*5cm (two sides), the resistance is about 30°C/W. So the total thermal resistance is about 20°C/W + 30°C/W. We can decrease total thermal resistance by increasing copper area in application board. When there is no good heat dissipation copper are in PCB, the total thermal resistance will be as high as 120°C/W, then the power dissipation of A1117A could allow on itself is less than 1W. And furthermore, A1117A will work at junction temperature higher than 125°C under such condition and no lifetime is guaranteed.

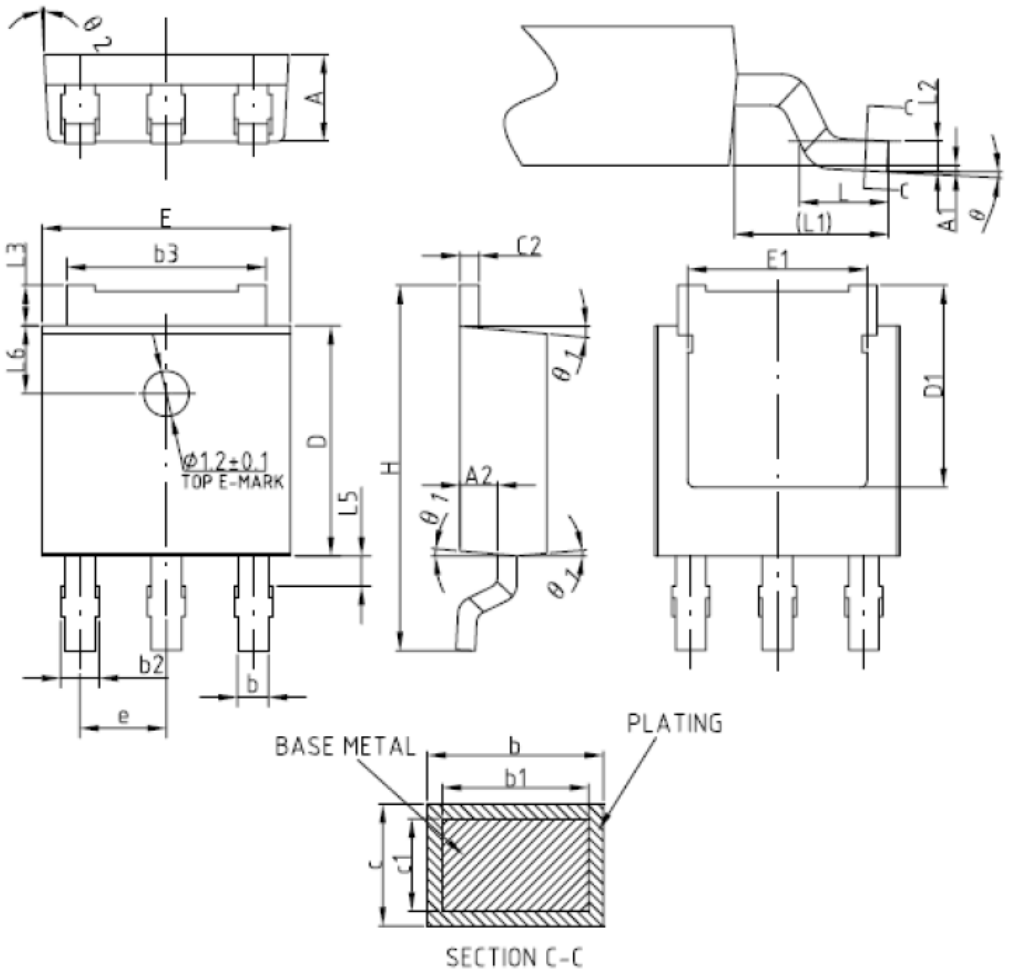
PACKAGE INFORMATION

Dimension in SOT-223 (Unit: mm)



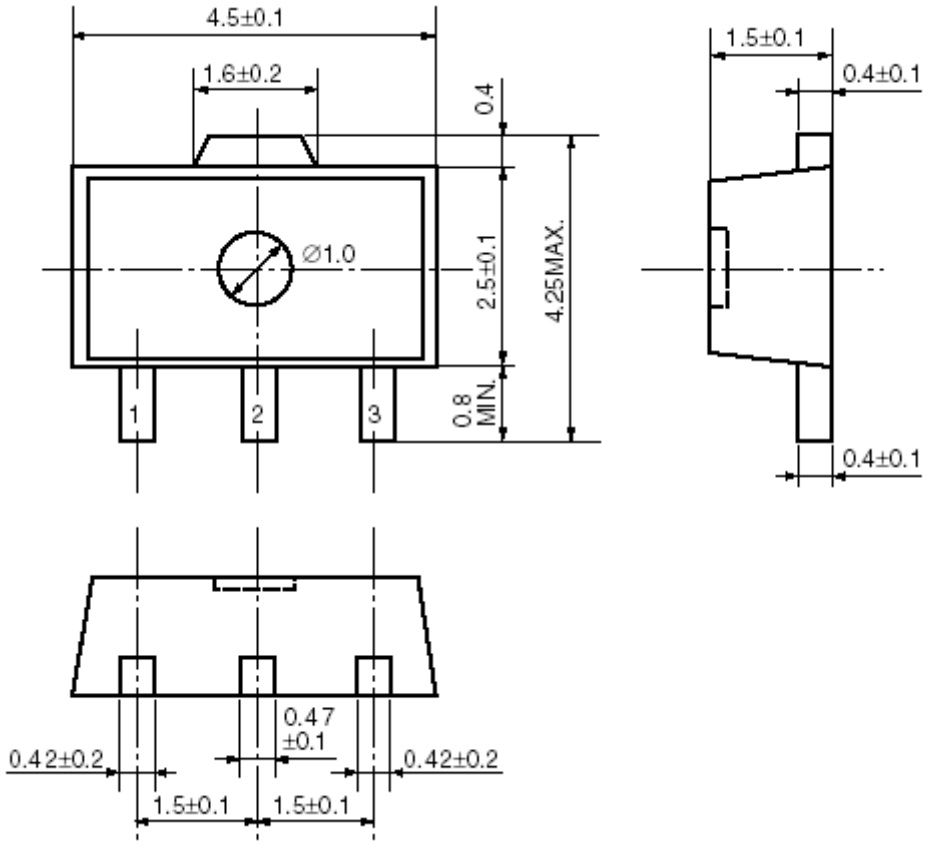
Symbol	Min	Max	Symbol	Min	Max
A	-	1.80	E	6.80	7.20
A1	0.02	0.10	E1	3.40	3.60
A2	1.50	1.70	E2	3.33	3.53
A3	0.80	1.00	e	2.30BSC	
b	0.67	0.80	e1	4.60BSC	
b1	0.66	0.76	L	0.80	1.20
b2	2.96	3.09	L1	1.75REF	
b3	2.95	3.05	L2	0.25BSC	
c	0.30	0.35	R	0.10	-
c1	0.29	0.31	R1	0.10	-
D	6.48	6.58	θ	0°	8°
D1	6.55	6.65	θ1	10°	14°
D2	-	7.05			

Dimension in TO-252 Package (Unit: mm)



Symbol	Min	Max	Symbol	Min	Max
A	2.20	2.38	E	6.50	6.70
A1	0.00	0.10	E1	4.70	-
A2	0.90	1.10	e	2.28BSC	
b	0.77	0.89	H	9.80	10.40
b1	0.76	0.86	L	1.40	1.70
b2	0.77	1.10	L1	2.90REF	
b3	5.23	5.43	L2	0.51BSC	
c	0.47	0.60	L3	0.90	1.25
c1	0.46	0.56	L5	0.90	1.50
c2	0.47	0.60	L6	1.80REF	
D	6.00	6.20	θ	0°	8°
D1	5.25	-	θ1	3°	7°
			θ2	1°	5°

Dimension in SOT89-3 (Unit: mm)



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