ACE1117C

1A Bipolar Linear Regulator

Description

ACE1117C is a series of low dropout three-terminal regulators with a dropout of 1.3V at 1A load current. ACE1117C features a very low standby current 2mA compared to 5mA of competitor.

Other than a fixed version Vout＝1.2V,1.8V,2.5V,2.85V,3.3V,5V and 12V, ACE1117C has an adjustable version, which can provide an output voltage from 1.25 to 12V with only two external resistors.

ACE1117C offers thermal shut down and current limit functions, to assure the stability of chip and power system. And it uses trimming technique to guarantee output voltage accuracy within ±2%.Other output voltage accuracy can be customized on command, such as ±1%.

Features

- Other than a fixed version and an adjustable version, output value can be customized on command.
- Maximum output current is 1A.
- Range of operation input voltage: Max 12V
- Standby current: 2mA (typ.)
- Line regulation: 0.1% (typ.)
- Load regulation: 10Mv (typ.)
- Environment Temperature: -20℃~85℃
- Compatible with tantalum capacitor, electrolytic capacitor

Application

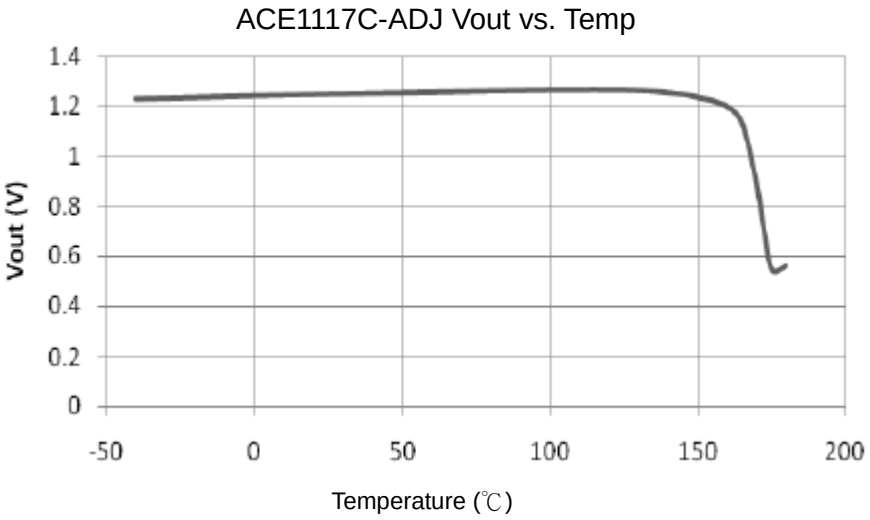
- Power Management for Computer Mother Board, Graphic Card
- LCD Monitor and LCD TV
- DVD Decode Board
- ADSL Modem
- Post Regulators for switching supplies

Absolute Maximum Ratings

Parameter		Symbol	Max	Unit
Input voltage		V_{IN}	15	V
Operating Junction Temperature		T_J	150	^{O}C
Ambient Temperature		T_A	-40~85	^{O}C
Package Thermal Resistance	SOT-223		20	^{O}C/W
	TO-252		12.5	
Storage temperature		T_S	- 40 to 150	^{O}C

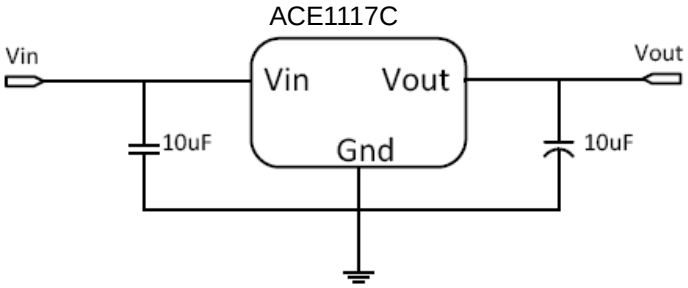
Note: Exceed these limits to damage to the device. Exposure to absolute maximum rating conditions may affect device reliability.

Typical Electrical Characteristics



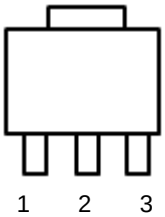
Typical Application

Application circuit of ACE1117C fixed version

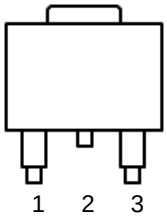


Packaging Type

SOT-223



TO-252



SOT-223 / TO-252	Description
1	ADJ/GND
2	Vout
3	Vin

Ordering information

ACE1117C XX XX + H

- H: Halogen - free
- +: Pb - free
- XX: XM : SOT-223, YM : TO-252
- XX: Output Voltage : 1.2 / 1.8V ….. / Default: Adjustable Version

Electrical Characteristics

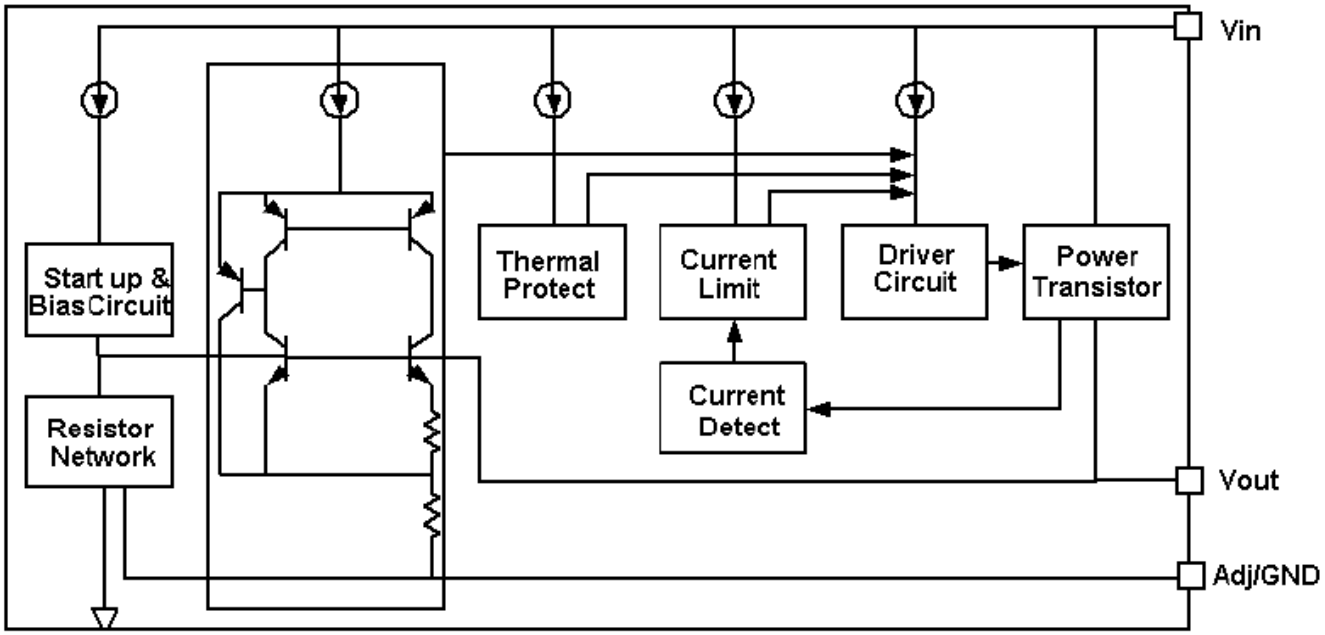
Parameter	Symbol	Test Conditions	Min	Typ	Mum	Unit
Output Voltage	Vout	ACE1117C-1.2V 0≦Iout≦1A, Vin=3.2V	1.176	1.20	1.224	V
		ACE1117C-1.8V 0≦Iout≦1A, Vin=3.8V	1.764	1.80	1.836	
		ACE1117C-2.5V 0≦Iout≦1A, Vin=4.5V	2.45	2.5	2.55	
		ACE1117C-3.3V 0≦Iout≦1A, Vin=5.3V	3.234	3.3	3.366	
		ACE1117C-5.0V 0≦Iout≦1A, Vin=7.0V	4.9	5	5.1	
		ACE1117C-12.0V 0≦Iout≦1A, Vin=14V	11.76	12	12.24	
Reference Voltage	V_{REF}	ACE1117C-ADJ 10mA≦Iout≦1A, Vin=3.25V	1.225	1.25	1.275	V
Line Regulation	ΔVout	ACE1117C-ADJ Iout=10mA, 2.75V≦Vin≦12V		0.1	0.2	%/V
		ACE1117C-1.2V Iout=10mA, 2.7V≦Vin≦10V		0.1	0.2	
		ACE1117C-1.8V Iout=10mA, 3.3V≦Vin≦12V		0.1	0.2	
		ACE1117C-2.5V Iout=10mA, 4.0V≦Vin≦12V		0.1	0.2	
		ACE1117C-3.3V Iout=10mA, 4.8V≦Vin≦12V		0.1	0.2	
		ACE1117C-5.0V Iout=10mA, 6.5V≦Vin≦12V		0.1	0.2	
		ACE1117C-12.0V Iout=10mA, 13.5V≦Vin≦20V		0.1	0.2	

Load Regulation	ΔVout	ACE1117C-ADJ Vin=2.75V, 10mA≦Iout≦1A		10	30	mV
		ACE1117C-1.2V Vin=2.7V, 10mA≦Iout≦1A		10	30	
		ACE1117C-1.8V Vin=3.3V, 10mA≦Iout≦1A		10	30	
		ACE1117C-2.5V Vin=4.0V, 10mA≦Iout≦1A		10	30	
		ACE1117C-3.3V Vin=4.8V, 10mA≦Iout≦1A		10	30	
		ACE1117C-5.0V Vin=6.5V, 10mA≦Iout≦1A		10	30	
		ACE1117C-12.0V Vin=13.5V, 10mA≦Iout≦1A		10	30	
Quiescent Current	I_Q	ACE1117C-1.2V, Vin=10V		2	5	mA
		ACE1117C-1.8V, Vin=12V		2	5	
		ACE1117C-2.5V, Vin=12V		2	5	
		ACE1117C-3.3V, Vin=12V		2	5	
		ACE1117C-5.0V, Vin=12V		2	5	
		ACE1117C-12.0V, Vin=20V		2	5	
Adjust Pin Current	I_{ADJ}	ACE1117C-ADJ Vin=5V, 10mA≦Iout≦1A		55	120	uA
Iadj change	Ichange	ACE1117C-ADJ Vin=5V, 10mA≦Iout≦1A		0.2	10	uA
Current Limit	Ilimit	Vin-Vout=2V, T_J=25℃	1			A
Minimum load Current	Imin	ACE1117C-ADJ		2	10	mA
Temperature coefficient	ΔV/ΔT			±100		ppm
Vdrop	Dropout voltage	Iout=100mA		1.23	1.3	V
		Iout=1A		1.3	1.5	V
Thermal Resistance	ΘJC	SOT-223		20		℃/W
		TO-252		10		

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 ACE1117C-ADJ will lead to unstable or oscillation output.

Block Diagram



Detailed Description

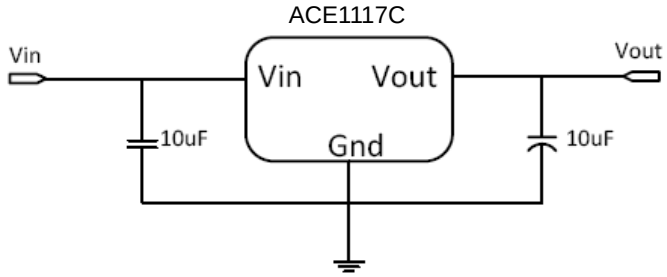
ACE1117C is a series of low dropout voltage, three terminal regulators. Its application circuit is very simple: the fixed version only needs two capacitors and the adjustable version only needs two resistors and two capacitors to work. It is composed of some modules including start-up circuit, bias circuit, 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℃.

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

Typical Application

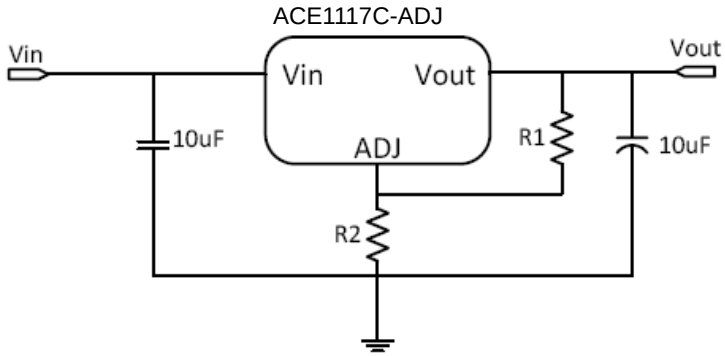
ACE1117C has an adjustable version and six fixed versions (1.2V, 1.8V, 2.5V, 3.3V, 5.0V and 12V)
Fixed output voltage version



Application circuit of ACE1117C fixed version

1. Recommend using 10uF tan capacitor as bypass capacitor (C1) for all application circuit.
2. Recommend using 10uF tan capacitor to assure circuit stability.

Adjustable Output Voltage Version
ACE1117C 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 ACE1117C -ADJ

The output voltage of adjustable version follows the equation: Vout=1.25*(1+R2/R1)+IAdj*R2. We can ignore IAdj because IAdj (about 50uA) is much less than the current of R1 (about 2~10mA).

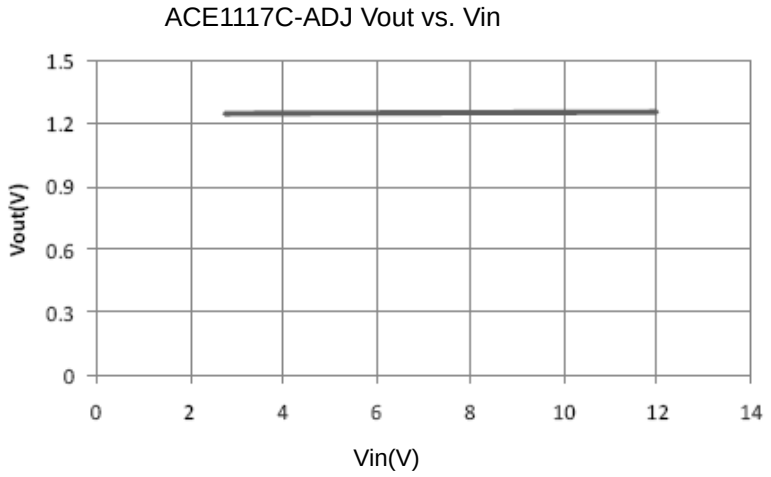
1. To meet the minimum load current (>10mA) requirement, R1 is recommended to be 125ohm or lower. As ACE1117C-ADJ can keep itself stable at load current about 2mA, R1 is not allowed to be higher than 625Ω.
2. Using a bypass capacitor (C_{ADJ}) between the ADJ pin and ground can improve ripple rejection. 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:$1/(2\ \pi\ * f_{ripple}*C_{ADJ})<R1$.

Thermal Considerations

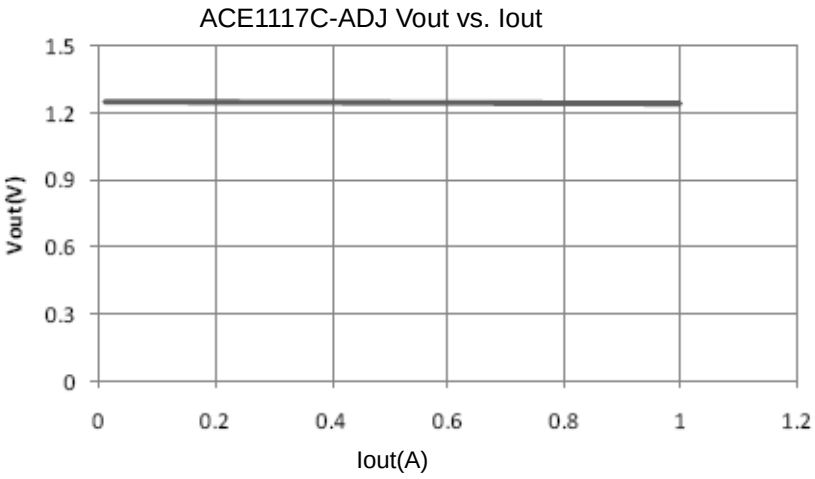
We have to take heat dissipation into great consideration when output current or differential voltage of input and output voltage is large. Because in such cases, the power dissipation consumed by ACE1117C is very large. ACE1117C series uses SOT-223 package type and its thermal resistance is about 20°C/W. 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 ACE1117C could allow on itself is less than 1W. And furthermore, ACE1117C will work at junction temperature higher than 125°C under such condition and no lifetime is guaranteed.

Typical Performance Characteristic

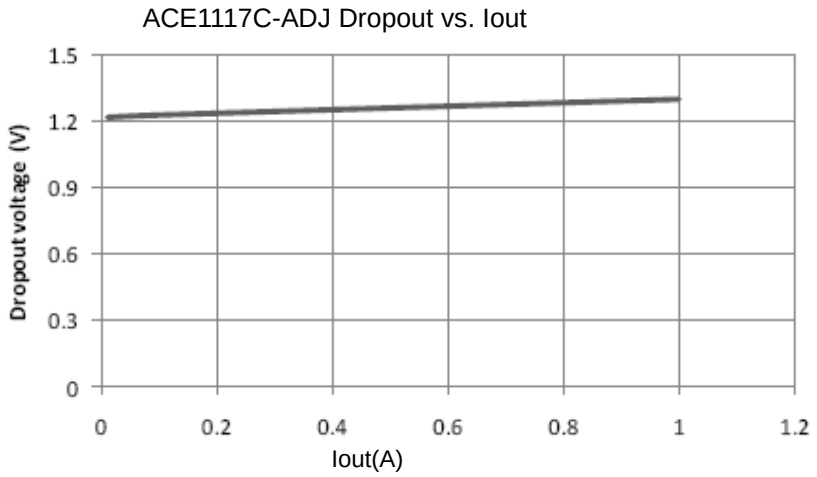
Line Regulation



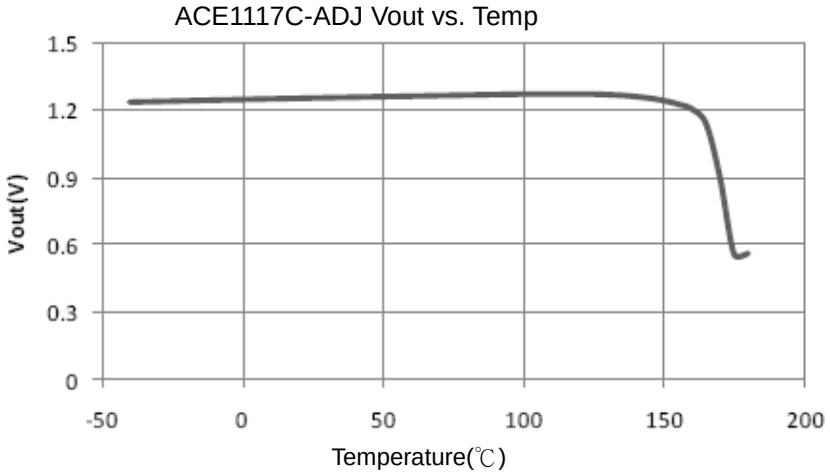
Load Regulation



Dropout Voltage

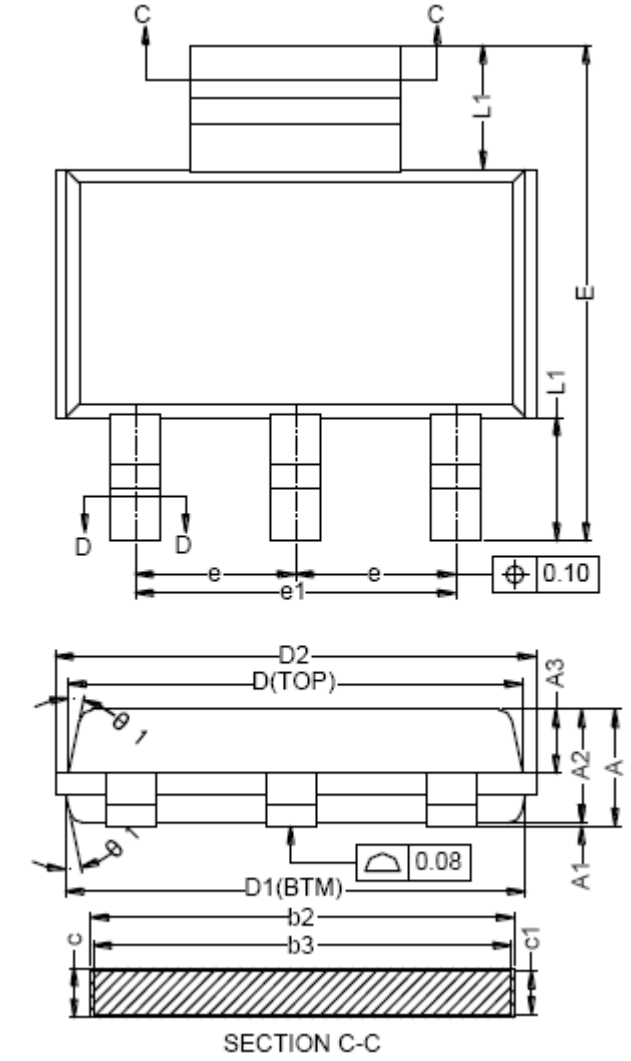


Thermal performance with OTP



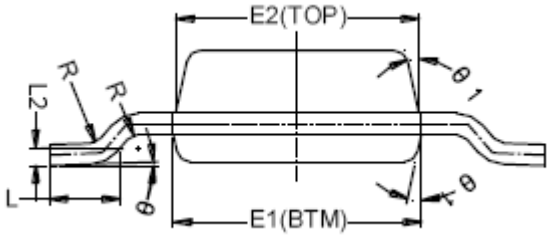
Packing Information

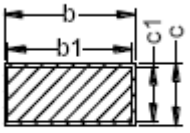
SOT-223



Symbol	Min	Nom	Max
A	-	-	1.80
A1	0.02	-	0.10
A2	1.50	1.60	1.70
A3	0.80	0.90	1.00
b	0.67	-	0.80
b1	0.66	0.71	0.76
b2	2.96	-	3.09
b3	2.95	3.00	3.05
c	0.30	-	0.35
c1	0.29	0.30	0.31
D	6.48	6.53	6.58
D1	6.55	6.60	6.65
D2	-	-	7.05
E	6.80	-	7.20
E1	3.40	3.50	3.60
E2	3.33	3.43	3.53
e	2.30BSC		
e1	4.60BSC		
L	0.8	1.00	1.20
L1	1.75REF		
L2	0.25BSC		
R	0.10	-	-
R1	0.10	-	-
Θ	0°	-	8°
Θ1	10°	12°	14°

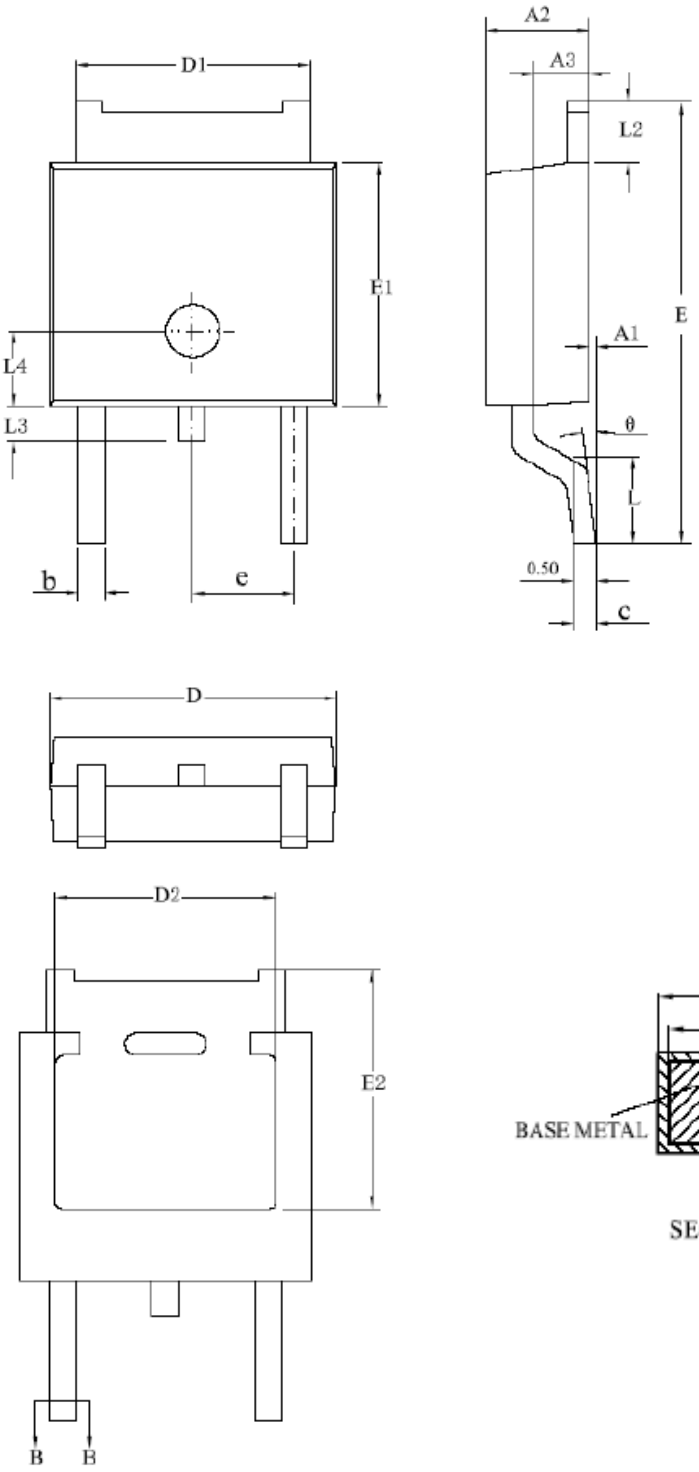
UNITS OF MEASURE=MILLIMETER





Packing Information

TO-252



Symbol	Min	Nom	Max
A1	0	-	0.10
A2	2.2	2.30	2.40
A3	1.02	1.067	1.12
b	0.75	-	0.84
b1	0.74	0.76	0.79
c	0.49	-	0.57
c1	0.48	0.508	0.52
D	6.50	6.60	6.70
D1	5.3REF		
D2	4.70	-	-
E	9.90	10.10	10.30
E1	6.00	6.10	6.20
E2	5.3REF		
e	2.286BSC		
L	1.40	1.50	1.60
L2	0.90	-	1.25
L3	0.60	0.80	1.00
L4	1.60	1.70	1.80
Θ	0	-	8°

Notes

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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