Features

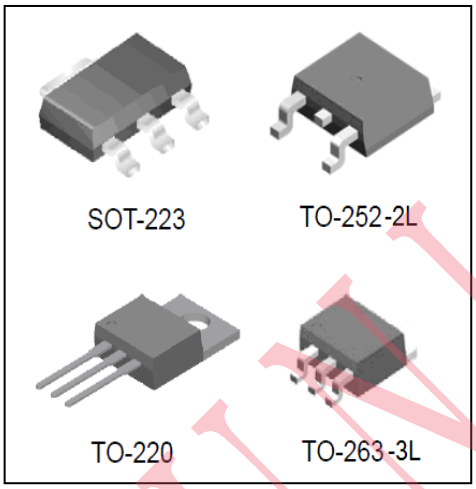
- Adjustable Output Voltage from 1.25 to 13.8V with Only Two External Resistors
- Fixed Output Voltage of 1.2V, 1.8V, 2.5V, 2.85V, 3.3V and 5.0V
- Output Current Capability of 1.0A
- Output Voltage Accuracy within±1.5%
- Operation Input Voltage up to 15V
- Less than 0.2 % Line Regulation
- Less than 0.4 % Load Regulation

General Description

The D1117 is a series of low-dropout positive voltage regulators with an output current capability of 1.0A .The series consists of fixed output voltage version and adjustable output voltage version with±1.5% accuracy.

D1117 offers thermal shutdown and current limit functions in order to ensure the stability of chip and power system, and it uses trimming technique to guarantee output voltage accuracy within±1.5%.

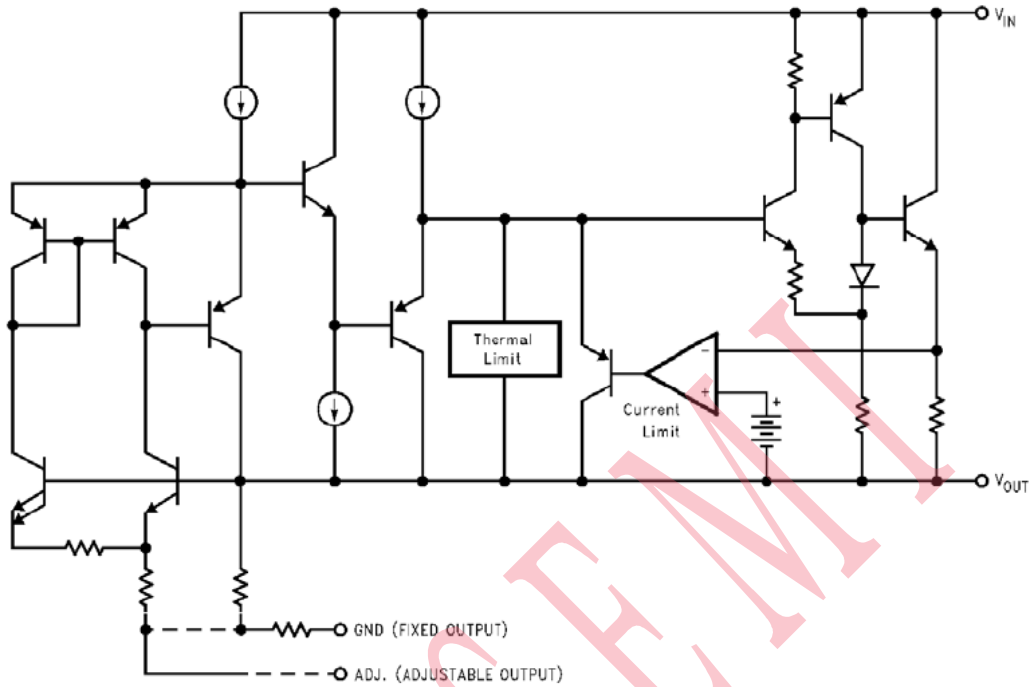
D1117 is available in SOT-223,TO-252-2L , TO-220 and TO-263-3L package.



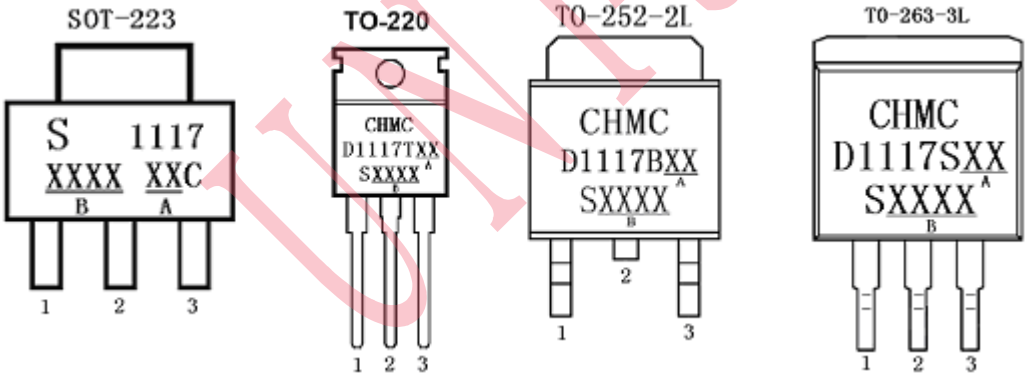
Applications

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

Functional Block Diagram



Pin Configuration



A: output voltage

B: data code

Pin Description

Pin Number	Pin Name	Function Description
1	GND	Ground
2	Vout	Output
3	Vin	Input

Fixed Version

Pin Number	Pin Name	Function Description
1	Adj.	Adjustable
2	Vout	Output
3	Vin	Input

Adjustable Version

Absolute Maximum Ratings (Ta=25°C)

Parameter Name	Symbol	Rating	Unit
Maximum Input Voltage	Vin	18	V
Junction Temperature	T_J	150	°C
Environment Temperature	T_A	140	°C
Storage Temperature	Ts	-65~ +150	°C
Lead Temperature and Time		300°C,10s	

Thermal Data

Parameter Name	Symbol	Condition	SOT-223	TO-252-2L	TO-220	TO-263-3L	Unit
Thermal Resistance Junction-ambient	θ-JA	No heat sink	120	100	60	60	°C/W

Recommended Operating Conditions (Ta=25°C)

Parameter Name	Min.	Max.	Unit
Input Voltage Range		15	V
Environment Temperature	-40	125	°C

Electrical Characteristics (Unless otherwise specified, Ta=25°C)

Parameter Name	Symbol	Test Conditions	Min	Typ	Max	Unit
Reference Voltage	Vref	Iout=10mA, Vin-Vout=2V 10mA≤Iout≤1A ,1.4V≤Vin-Vout≤12V	1.231 1.225	1.250 1.250	1.269 1.275	V
Output Voltage	Vout	D1117-1.20V Iout=10mA,Vin=3.2V 0≤Iout≤1.0A ,3.0V≤Vin≤12V	1.182 1.176	1.200 1.200	1.218 1.224	V
		D1117-1.50V Iout=10mA,Vin=3.5V 0≤Iout≤1.0A ,3.0V≤Vin≤12V	1.477 1.470	1.500 1.500	1.523 1.530	V
		D1117-1.80V Iout=10mA,Vin=3.8V 0≤Iout≤1.0A ,3.2V≤Vin≤12V	1.773 1.764	1.800 1.800	1.827 1.836	V
		D1117-2.5V Iout=10mA,Vin=4.5V 0≤Iout≤1.0A ,3.9V≤Vin≤12V	2.463 2.450	2.500 2.500	2.537 2.550	V
		D1117-2.85V Iout=10mA,Vin=4.85V 0≤Iout≤1.0A ,4.25V≤Vin≤12V	2.807 2.793	2.85 2.85	2.893 2.907	V
		D1117-3.3V Iout=10mA,Vin=5V 0≤Iout≤1.0A ,4.75V≤Vin≤12V	3.250 3.234	3.300 3.300	3.350 3.366	V
		D1117-5V Iout=10mA,Vin=7V 0≤Iout≤1.0A ,6.5V≤Vin≤12V	4.925 4.900	5.000 5.000	5.075 5.100	V

Parameter Name	Symbol	Test Conditions	Min	Typ	Max	Unit
Line Regulation (Note1)	LNR	D1117-ADJ Iout=10mA,1.4V≤Vin-Vout≤10.75V		0.035	0.2	%
		D1117 Fixed Version Iout=10mA, Vout+1.4V≤Vin≤12V		4	12	mV
Load Regulation (Note1,2)	LDR	D1117-ADJ Vin-Vout=3V, 10mA≤Iout≤1.0A		0.2	0.4	%
		D1117 Fixed Version Vin=Vout+1.4V, 0≤Iout≤1.0A		6	12	mV
Dropout Voltage (Note3)	Vin-Vout	ΔVout, ΔVref =1%,Iout=100mA		1.0	1.2	V
		ΔVout, ΔVref=1%,Iout=500mA		1.05	1.25	V
		ΔVout, ΔVref=1%,Iout=1.0A		1.1	1.3	V
Current Limit	Ilimit	Vin-Vout=2V, Tj=25℃	1.0	1.4		A
Minimum Load Current (Note4)				5	10	mA
Quiescent Current	Iq	D1117 Fixed Version , Vin-Vout=1.25V		4	8	mA
Adjust Pin Current	I_{adj}	Adjustable Version		55	120	μA
Adjust Pin Current Change	Ichange			0.2	5	μA
Temperature Stability	Ts				0.5	%

Note1: The Parameters of Line Regulation and Load Regulation in Table are tested under constant junction temperature. The Curve of Load Regulation vs. Temperature is shown in typical parameter curve that follows.

Note2: When Iout varies from 0 to 1.0A, Vin-Vout varies from 1.4V to 12V under constant junction temperature, the parameter is satisfied the criterion in table. If temperature varies between -40℃ and 125℃, it needs output current to be larger than 10mA to satisfy the criterion.

Note3: Dropout Voltage is specified over the full output current range of the device, and it is tested under following testing conditions: First step is to find out the Vout value(Vout1) when Vin1=Vout+1.3 V, second step is to decrease Vin(Vin2) until Vout value is equal to 99%*Vout1(Vout2).Vdrop_out=Vin2-Vout2.

Note4: Minimum Load Current is defined as the minimum output current required to maintain regulation. When Vin-Vout value between 1.4V and 12V,the device is guaranteed to regulate if the output current is greater than 10mA.

Application Information

D1117 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 and current limit modules can assure chip and its application system working safety when the junction temperature is larger than 125℃ or output current is larger than 1.5A.

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

D1117 has fixed versions and an adjustable version.

Output Voltage of Fixed Version

Chart 1 is its fixed version typical application.

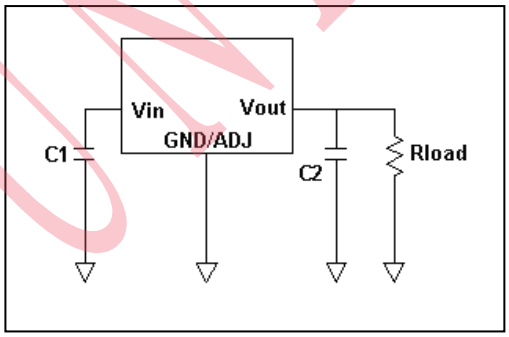


Chart 1: Application circuit of D1117 fixed version

Output Voltage of Adjustable Version

The D1117 adjustable version provides 1.25V Reference Voltage. Any output voltage between 1.25V and 13.8V can be available by choosing two external resistors, connection method of R1 and R2 two external resistors is shown in chart 2.

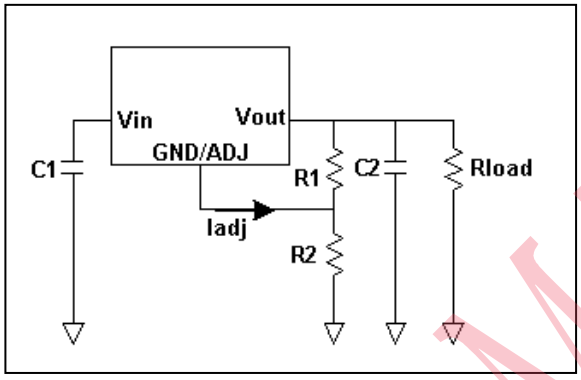


Chart 2. Application Circuit of D1117 adjustable version

Application Hints

1. Recommend using 10μF tan capacitor of C1 as bypass capacitor for all application circuit.

2. Recommend using 22μF tan capacitor of C2 to assure circuit stability.

3. Using a Cadj bypass capacitor between the adjust terminal and ground can improve ripple rejection ratio, This bypass capacitor prevents ripple from being amplified as the output voltage is increased. The impedance of Cadj should be less than R1 resistor which is between output and adjust pins to prevent ripple from being amplified at any ripple frequency. As R1 is normally in the range 200Ω from 350Ω, the value of Cadj should satisfy this equation: 2*Fripple*Cadj<R1.Recommend using 10μF tan capacitor.

Explanation

The output voltage of adjustable version satisfies this followed equation:

Vout=Vref*(1+R2/R1) + Iadj*R2. We can ignore Iadj because Iadj(about 50μA) is much less than the current of R1(about 4mA).

How to choose R1：

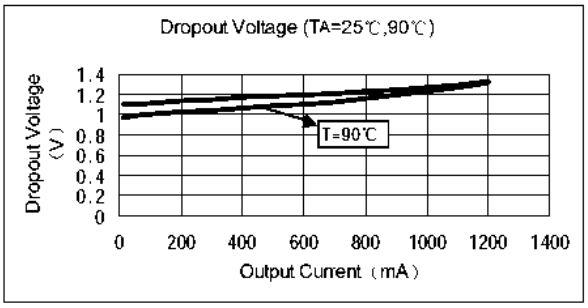
The value of R1 should be in the range 200Ω from 350Ω to assure chip working normally without any load. To assure the electrical performance showed in table, the output current should be larger than 5mA. If R1 is too large, the minimum output current should be larger than 4mA, The best working condition is to assure that the output current exceeds 10mA.

Thermal Considerations

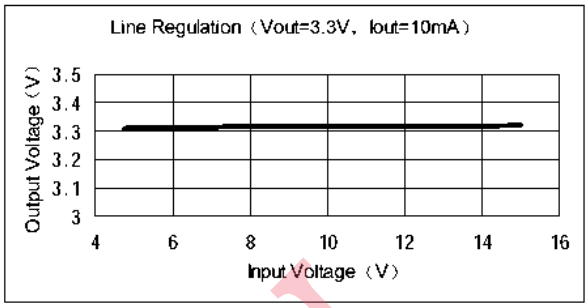
We have to take heat dissipation into consideration when output current or differential voltage of input and output voltage is large. Because in such cases, the power dissipation consumed by D1117 is very large. D1117 series uses SOT-223 package type and its thermal resistance is about 120℃/W. And the copper area of application board can affect the total thermal resistance. If copper area is 5cm*5cm(two sides), the resistance is about 30℃/W. So total thermal resistance is about 30℃/W to 120℃/W. We can decrease total thermal resistance by increasing copper area in application board.

Characteristics Curves

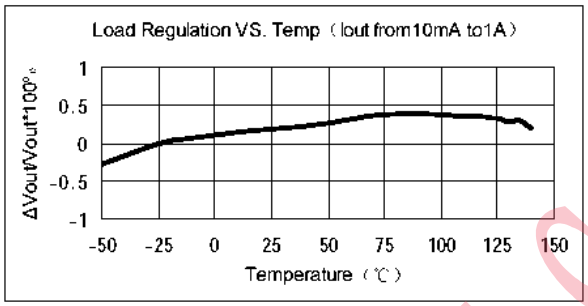
1. Dropout Voltage

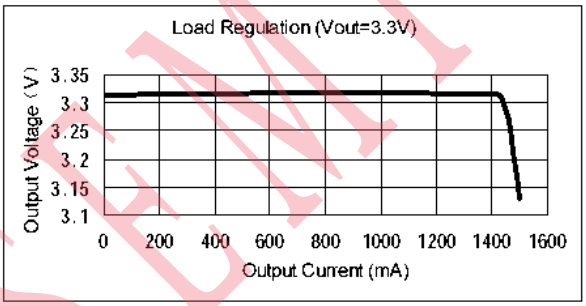


2. Line Regulation

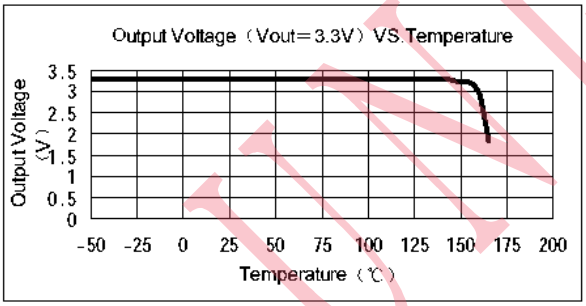


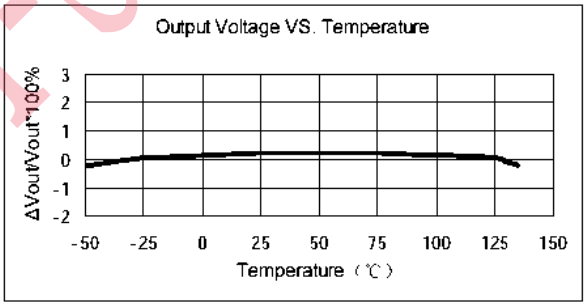
3. Load Regulation



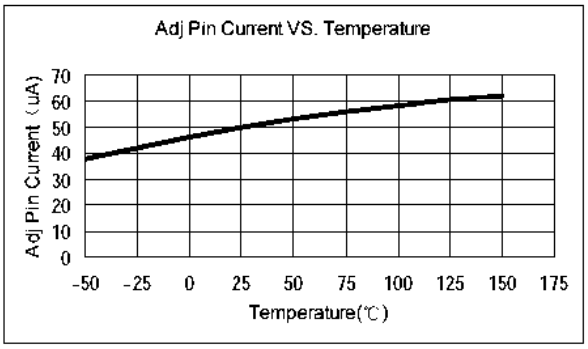


4. Temperature Stability





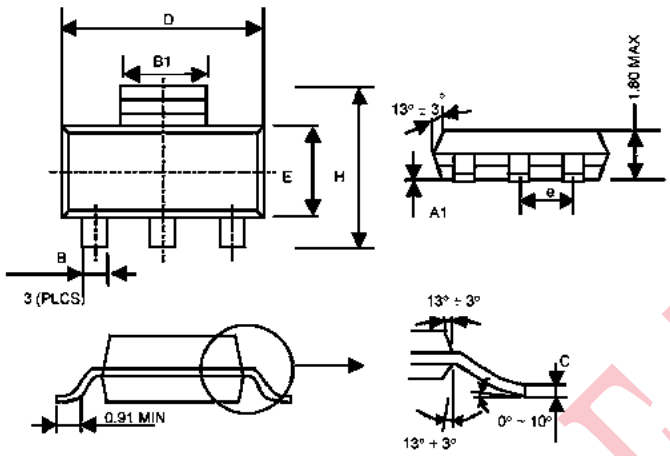
5. Adj Pin Current VS. Temperature



Outline Dimensions

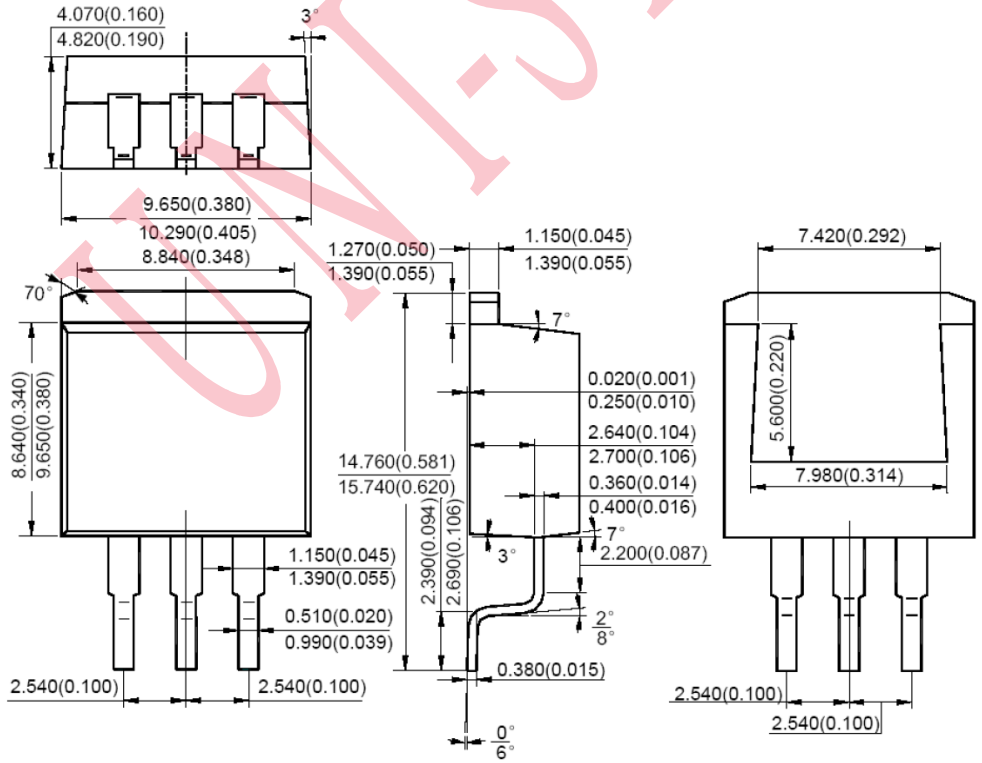
SOT-223 Unit:mm

- **SOT-223**

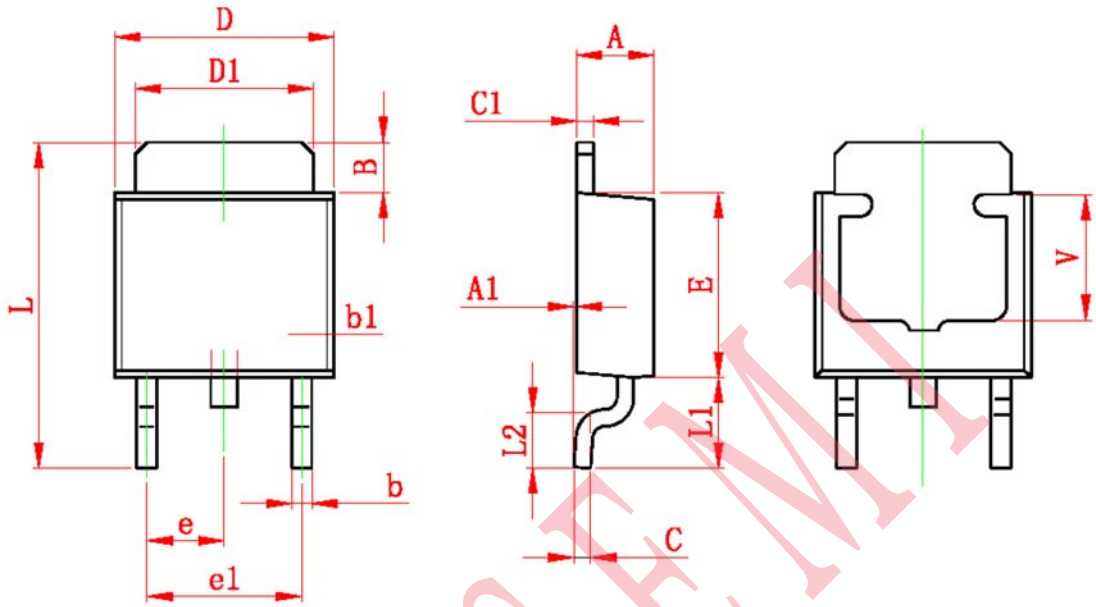


SYMBOL	MIN	MAX
A1	0.02	0.12
B	0.60	0.80
B1	2.90	3.15
C	0.24	0.35
D	6.30	6.80
E	3.30	3.70
e	2.30 (TYP.)	
H	6.70	7.30

TO-263-3L Unit:mm

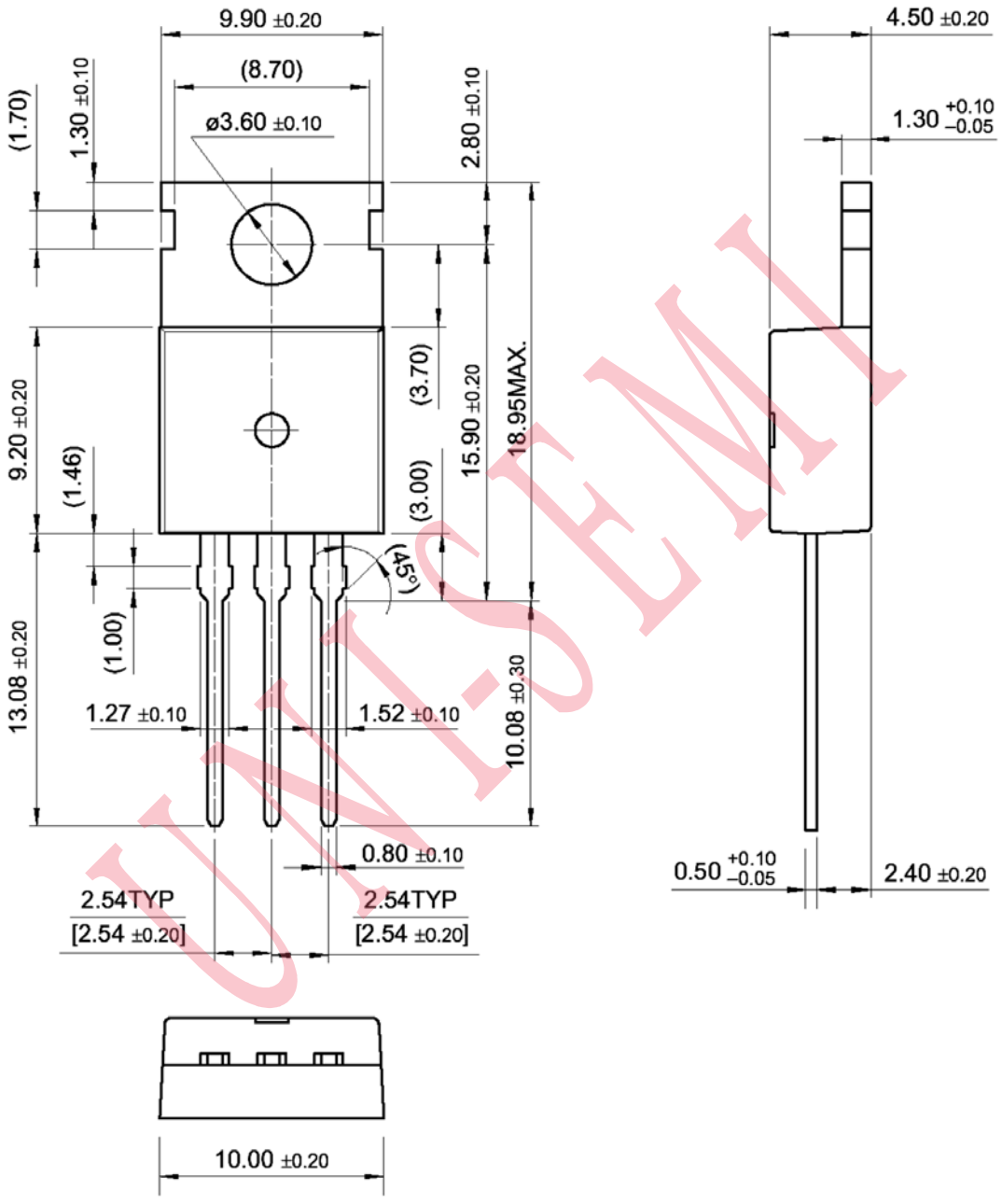


TO-252-2L Unit:mm



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
B	1.350	1.650	0.053	0.065
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	5.700	0.213	0.224
e	2.300 TYP		0.091 TYP	
e1	4.500	4.700	0.177	0.185
L	9.500	9.900	0.374	0.390
L1	2.550	2.900	0.100	0.114
L2	1.400	1.780	0.055	0.070
V	3.80 REF		0.150 REF	

TO-220 Unit:mm



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