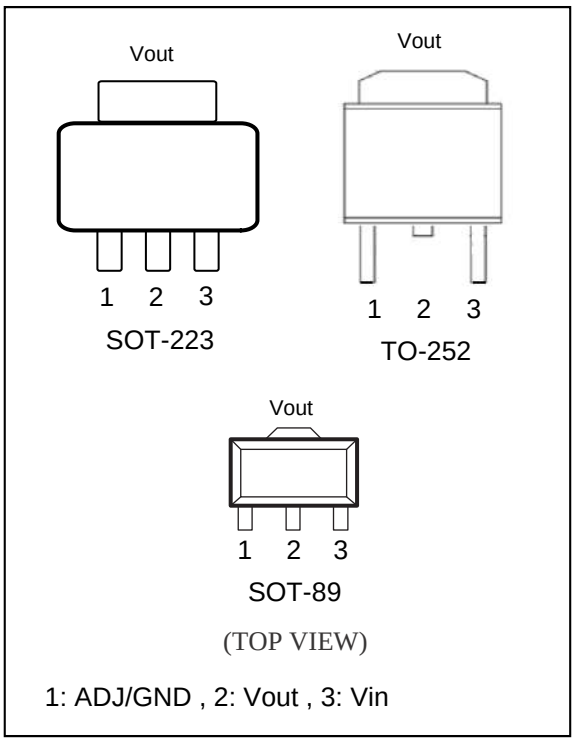
General Description

ASPL1117 is a series of low dropout three-terminal regulators with a dropout of 1.3V at 1 A load current. ASPL1117 features a very low standby current 2mA compared to 5mA of competitor.

Other than a fixed version, Vout = 1.2V, 1.5V, 1.8V, 2.5V, 3.3V and 5.0V, ASPL1117 has an adjustable version, which can provide an output voltage from 1.25 to 5.0V with only two external resistors.

ASPL1117 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 demand, such as 1%. ASPL1117 is available in SOT-223, TO-252, SOT-89 power package.



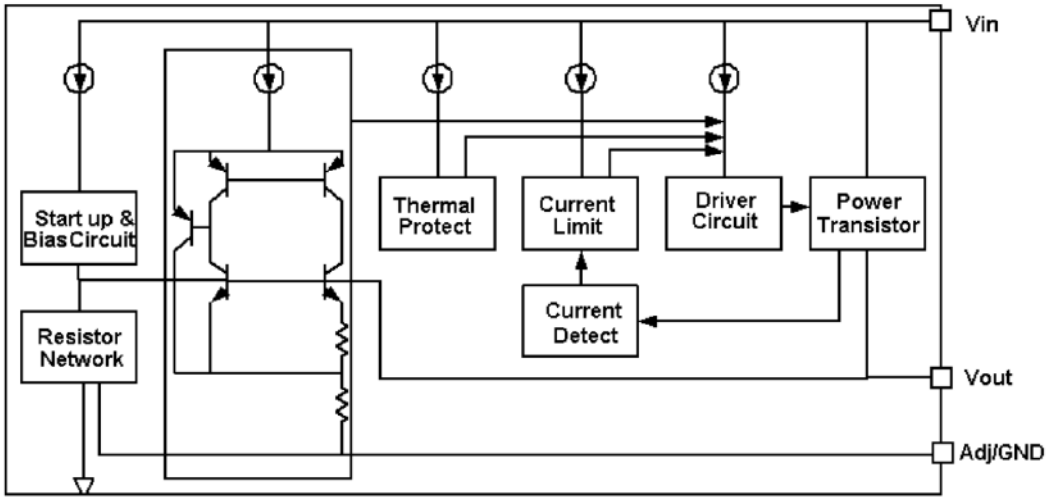
Features

- Maximum output current is 1000mA
- Range of operation input voltage: Max 20V
- Line regulation: 0.03%/V (typ.)
- Standby current: 2mA (typ.)
- Load regulation: 0.2%/A (typ.)
- Environment Temperature: -20℃~85℃

Applications

- Power Management for STB, Mother Board, Graphic Card
- LCD Monitor and LCD TV
- Appliances and White Goods
- ADSL Modem,WLAN
- Post Regulators For Switching Supplies

- **Block Diagram**



- **Absolute Maximum Rating**

Parameter	Value
Max Input Voltage	20V
Max Power Dissipation(Pd)	1.0W
Max Output Current	1A
Recommended operating junction temperature(Tj)	-20~125℃
Max Operating Junction Temperature(Tj)	150℃
Ambient Temperature(Ta)	-20℃~85℃
Storage Temperature(Ts)	-40℃~150℃
Lead Temperature & Time	260℃, 10S

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

- **Electrical Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Vref	Reference voltage	ASPL1117-ADJ 10mA≤Iout≤0.9A,Vin=3.25V	1.225	1.25	1.275	V
Vout	Output voltage	ASPL1117-1.2 0≤Iout≤0.9A , Vin=3.2V	1.176	1.2	1.224	V
		ASPL1117-1.5 0≤Iout≤0.9A , Vin=3.5V	1.470	1.5	1.530	V
		ASPL1117-1.8 0≤Iout≤0.9A , Vin=3.8V	1.764	1.8	1.836	V
		ASPL1117-2.5 0≤Iout≤0.9A , Vin=4.5V	2.45	2.5	2.55	V
		ASPL1117-3.3 0≤Iout≤0.9A , Vin=5.3V	3.234	3.3	3.366	V
		ASPL1117-5.0 0≤Iout≤0.9A , Vin=7.0V	4.9	5.0	5.1	V
ΔVout	Line Regulation	ASPL1117-1.2 Iout=10mA, 2.7V≤Vin≤10V		0.03	0.2	%/V
		ASPL1117-ADJ Iout=10mA, 2.75V≤Vin≤12V		0.03	0.2	%/V
		ASPL1117-1.5 Iout=10mA, 3.0V≤Vin≤12V		0.03	0.2	%/V
		ASPL1117-1.8 Iout=10mA, 3.3V≤Vin≤12V		0.03	0.2	%/V
		ASPL1117-2.5 Iout=10mA, 4.0V≤Vin≤12V		0.03	0.2	%/V
		ASPL1117-3.3 Iout=10mA, 4.8V≤Vin≤12V		0.03	0.2	%/V
		ASPL1117-5.0 Iout=10mA, 6.5V≤Vin≤12V		0.03	0.2	%/V
ΔVout	Load regulation	ASPL1117-1.2 Vin =2.7V, 10mA≤Iout≤0.9A		2	8	mV
		ASPL1117-ADJ Vin =2.75V, 10mA≤Iout≤0.9A		2	8	mV
		ASPL1117-1.5 Vin =3.0V, 10mA≤Iout≤0.9A		2.5	10	mV
		ASPL1117-1.8 Vin =3.3V, 10mA≤Iout≤0.9A		3	12	mV
		ASPL1117-2.5 Vin =4.0V, 10mA≤Iout≤0.9A		4	16	mV
		ASPL1117-3.3 Vin =4.8V, 10mA≤Iout≤0.9A		6	24	mV
		ASPL1117-5.0 Vin =6.5V, 10mA≤Iout≤0.9A		9	36	mV

Vdrop	Dropout voltage	Iout =100mA		1.23	1.3	V
		Iout=0.9A		1.3	1.5	V
Ilimit	Current limit	Vin-Vout=2V;Tj =25℃	0.8	0.9		A
Imin	Minimum load current	ASPL1117-ADJ		2	10	mA
Iq	Quiescent Current	ASPL1117-1.2,Vin=10V		2	5	mA
		ASPL1117-1.5,Vin=12V		2	5	mA
		ASPL1117-1.8,Vin=12V		2	5	mA
		ASPL1117-2.5,Vin=12V		2	5	mA
		ASPL1117-3.3,Vin=12V		2	5	mA
		ASPL1117-5.0,Vin=12V		2	5	mA
IAdj	Adjust pin current	ASPL1117-ADJ Vin =5.0V, 10mA≤Iout≤0.9A		55	120	uA
PSRR	Ripple Regulation	f=100Hz, Cout=104		65		dB
		f=1KHz, Cout=104		65		dB
		f=10KHz, Cout=104		60		dB
		f=22KHz, Cout=104		57		dB
Ichange	Iadj change	ASPL1117-ADJ Vin =5.0V, 10mA≤Iout≤0.9A		0.2	10	uA
ΔV/ΔT	Temperature coefficien			±100		ppm
θ_{JC}	Thermal resistance	SOT-223 TO-252 SOT89-3		20 10 8		℃/W

Note1: All test are conducted under ambient temperature 25 °Cand within a short period of time 20ms

Note2: Load current smaller than minimum load current of ASPL1117-ADJ will lead to unstable or oscillation output.

● Detailed Description

ASPL1117 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.

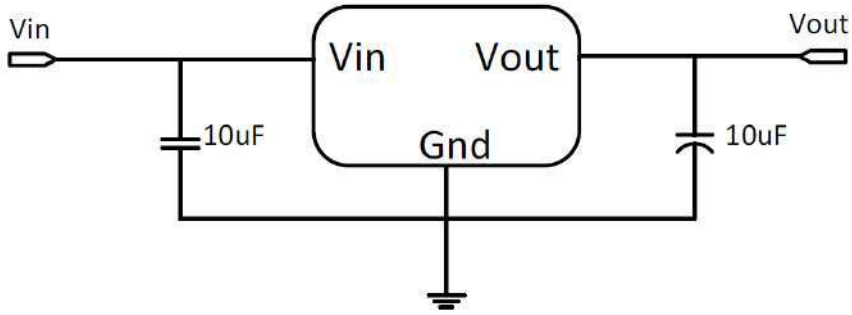
The thermal shut down modules can assure chip and its application system working safety when the junction temperature is larger than 140 °C.

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

Typical Application

ASPL1117 has an adjustable version and six fixed versions (1.2V, 1.5V, 1.8V, 2.5V, 3.3V and 5.0V)

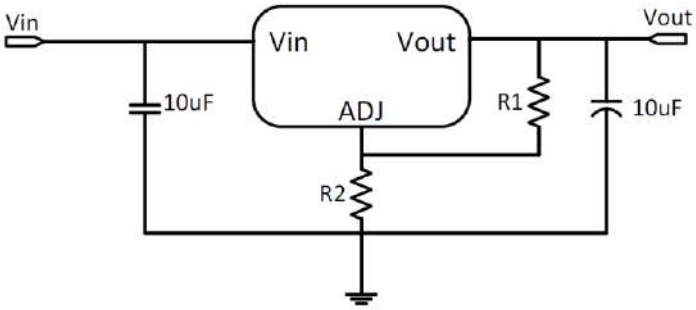
Fixed Output Voltage Version



Application circuit of ASPL1117 fixed version

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

Adjustable Output Voltage Version



Application Circuit of ASPL1117-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 ASPL1117-ADJ can keep itself stable at load current about 2mA, R1 is not allowed to be higher than 625ohm.

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: $1/(2\pi \times fripple \times C_{ADJ}) < R1$.

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 ASPL1117 is very large. ASPL1117 series uses SOT-223 package type and its thermal resistance is about 20 °C/W. And the copper area

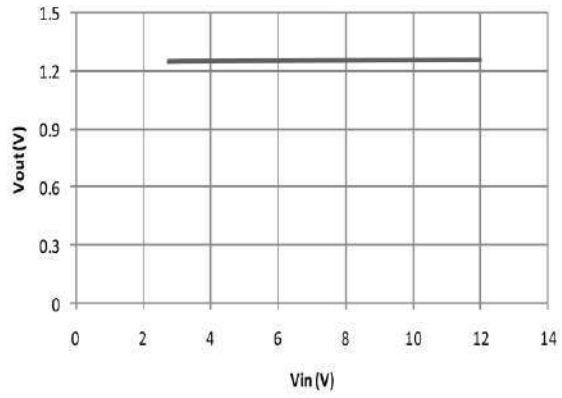
of application board can affect the total thermal resistance. If copper area is 5cm*5cm (two sides), the resistance is about 30 °C/W.So the total thermal resistance is about 20 °C/W + 30 °C/W.We can decrease total thermal resistance by increasing copper area in application board. When there is no good heat dissipation copper are in PCB, the total thermal resistance will be as high as 120 °C/W,then the power dissipation of ASPL1117 could allow on itself is less than 1W. And furthermore, ASPL1117 will work at junction temperature higher than 125 °C under such condition and no lifetime is guaranteed.

- **Typical Performance Characteristics**

T=25℃ unless specified.

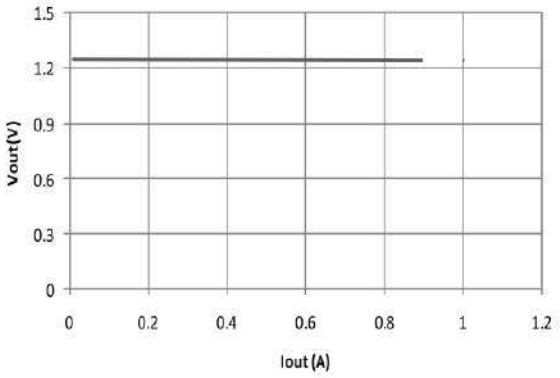
Line Regulation

ASPL1117-ADJ Vout Vs. Vin



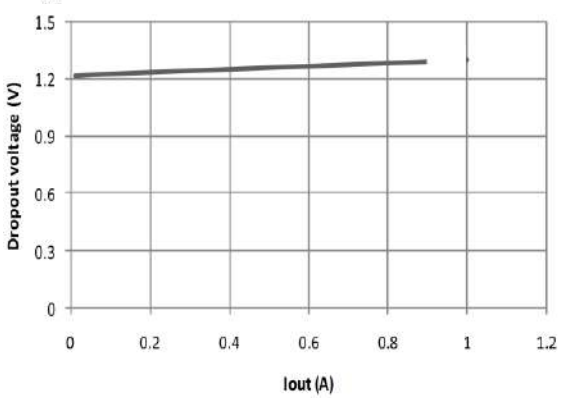
Load Regulation

ASPL1117-ADJ Vout Vs. Iout



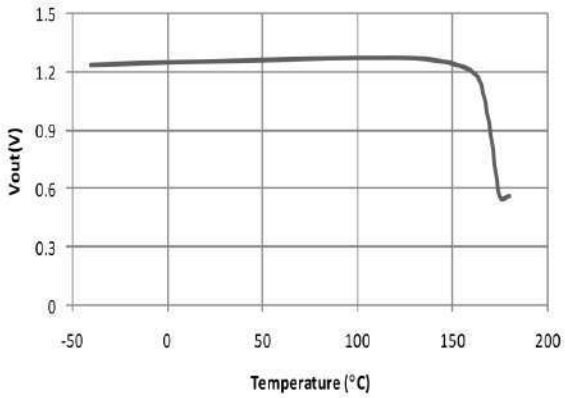
Dropout Voltage

ASPL1117-ADJ Dropout Vs. Iout



Thermal performance with OTP

ASPL1117-ADJ Vout Vs. Temp



Ordering Information

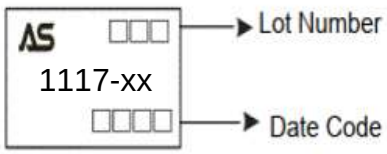
Ordering Device No.	Package	Packing	Quantity
ASPL1117-XX-DT-R	SOT-223	Tape&Reel	2500/Reel
ASPL1117-XX-KQ-R	TO-252	Tape&Reel	2500/Reel
ASPL1117-XX-DI-R	SOT-89	Tape&Reel	1000/Reel

Note: ”xx” stands for output voltages. Example: "1.8"=1.8V, "3.3"=3.3V, "5.0"=5.0V, "ADJ"=Adjustable version, etc.

Note: "DT"=SOT-223, "KQ"=TO-252, "DI"=SOT-89.

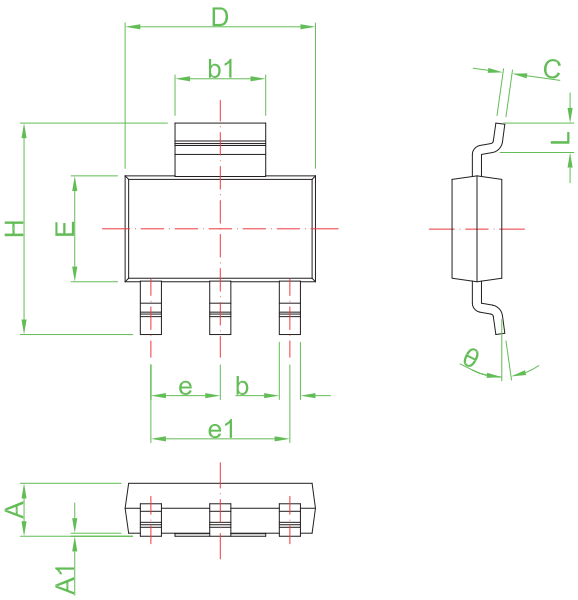
Note: ”R” stands for Packing, Tape&Reel.

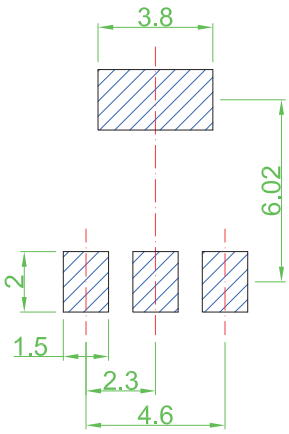
P/N example: ASPL1117-1.8-DT-R, ASPL1117-3.3-DT-R, ASPL1117-ADJ-DT-R, etc.

PACKAGE	MARKING
SOT-223 TO-252 SOT-89	

- **Package Information**

SOT-223

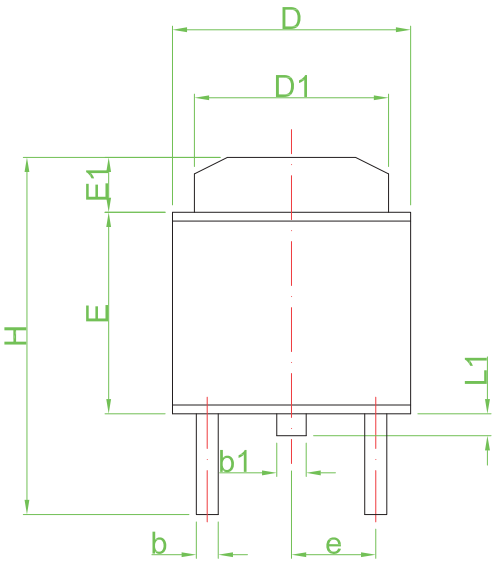


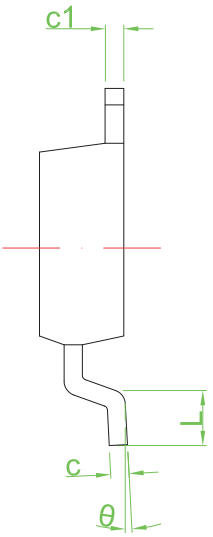


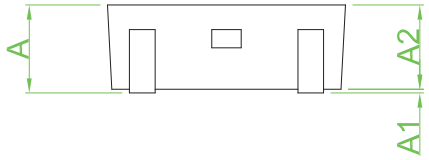
Recommended Land Pattern

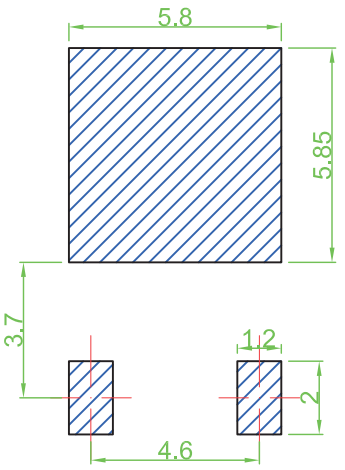
Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.50	1.70	0.059	0.067
A1	---	0.10	---	0.004
b	0.60	0.82	0.024	0.032
b1	2.90	3.10	0.114	0.122
C	0.24	0.35	0.009	0.014
D	6.15	6.65	0.242	0.262
E	3.30	3.70	0.130	0.146
e	2.30 TYP		0.091 TYP	
e1	4.50	4.70	0.177	0.185
H	6.70	7.30	0.264	0.287
L	0.80	1.15	0.031	0.045
θ	0°	10°	0 n	10°

TO-252





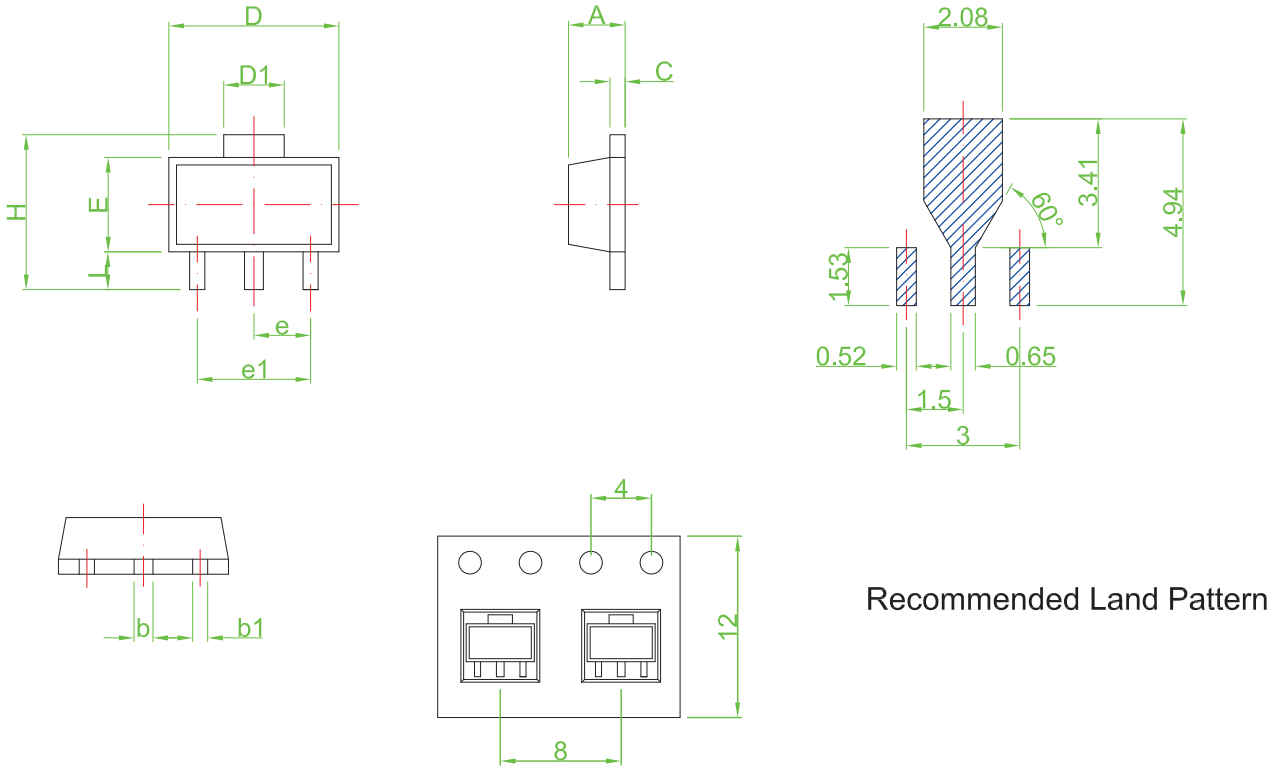




Recommended Land Pattern

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	2.25	2.65	0.089	0.104
A1	0.00	0.15	0.000	0.006
A2	2.20	2.40	0.087	0.094
b	0.50	0.70	0.020	0.028
b1	0.70	0.90	0.028	0.035
c	0.46	0.66	0.018	0.026
c1	0.46	0.66	0.018	0.026
D	6.30	6.70	0.248	0.264
D1	5.20	5.40	0.205	0.213
E	5.30	5.70	0.209	0.224
E1	1.40	1.60	0.055	0.063
H	9.40	9.90	0.370	0.390
e	2.30 TYP		0.09 TYP	
L	1.40	1.77	0.055	0.070
L1	0.50	0.70	0.020	0.028
θ	0°	8°	0°	8°

SOT-89



Recommended Land Pattern

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.30	1.70	0.051	0.067
b	0.40	0.60	0.016	0.024
b1	0.25	0.55	0.010	0.022
C	0.30	0.50	0.012	0.020
D	4.30	4.70	0.169	0.185
D1	1.40	1.80	0.055	0.071
E	2.30	2.70	0.091	0.106
e	1.5TYP		0.059TYP	
e1	2.90	3.10	0.114	0.122
H	3.90	4.40	0.154	0.173
L	0.80	1.20	0.031	0.047

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