AP1117

1A LOW DROPOUT POSITIVE ADJUSTABLE OR FIXED-MODE REGULATOR

Features

- 1.4V Maximum Dropout at Full Load Current
- Fast Transient Response
- Output Current Limiting
- Built-in Thermal Shutdown
- Good Noise Rejection
- 3-Terminal Adjustable or Fixed 1.5V, 1.8V, 2.5V, 3.3V, 5.0V
- SOT223-3L, TO252-3L, SOT89-3L, TO263-3L and TO220-3L Packages
- SOT223-3L and TO252-3L: Available in "Green" Molding Compound (No Br, Sb)
- Lead Free Finish/RoHS Compliant (Note 1)

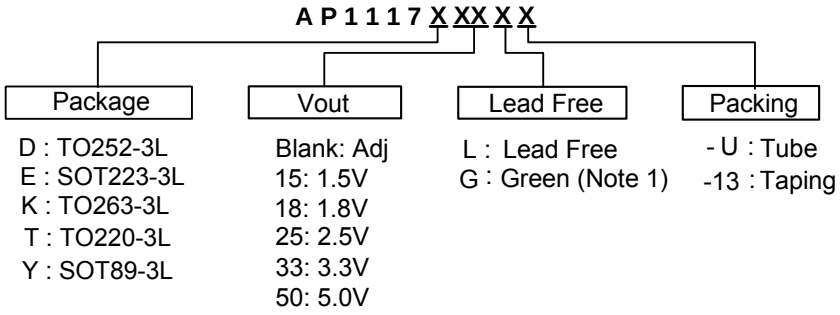
General Description

AP1117 is a low dropout positive adjustable or fixed-mode regulator with 1A output current capability. The product is voltage specifically designed to provide well-regulated supply for low IC applications such as high-speed bus termination and low current 3.3V logic supply. AP1117 is also well suited for other applications such as VGA cards. AP1117 is guaranteed to have lower than 1.4V dropout at full load current making it ideal to provide well-regulated outputs of 1.25 to 5.0 with 6.4V to 18V input supply. AP1117 is available in both commercial and industrial temperature grade.

Applications

- PC Peripheral
- Communication

Ordering Information



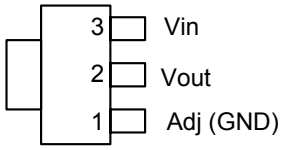
Note: 1. Green is only for SOT223-3L and TO252-3L.
2. RoHS revision 13.2.2003. Glass and High Temperature Solder Exemptions Applied, see *EU Directive Annex Notes 5 and 7.*

Device	Package Code	Packaging (Note 3)	Tube		13" Tape and Reel	
			Quantity	Part Number Suffix	Quantity	Part Number Suffix
AP1117D	D	TO252-3L	80	-U	2500/Tape & Reel	-13
AP1117E	E	SOT223-3L	75	-U	2500/Tape & Reel	-13
AP1117K	K	TO263-3L	50	-U	800/Tape & Reel	-13
AP1117T	T	TO220-3L	50	-U	NA	NA
AP1117Y	Y	SOT89-3L	NA	NA	2500/Tape & Reel	-13

Note: 3. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at http://www.diodes.com/datasheets/ap02001.pdf.

Pin Assignments

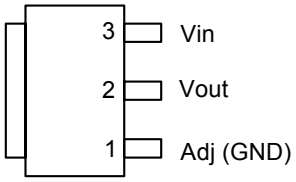
SOT89-3L



Tab is Vout

SOT223-3L

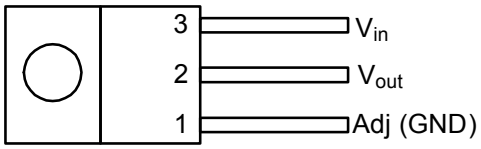
(Top View)



Tab is Vout

TO220-3L

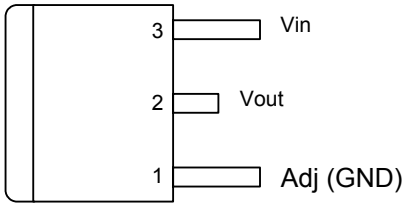
FRONT VIEW



Tab is V_{out}

TO252-3L / TO263-3L

(Top View)

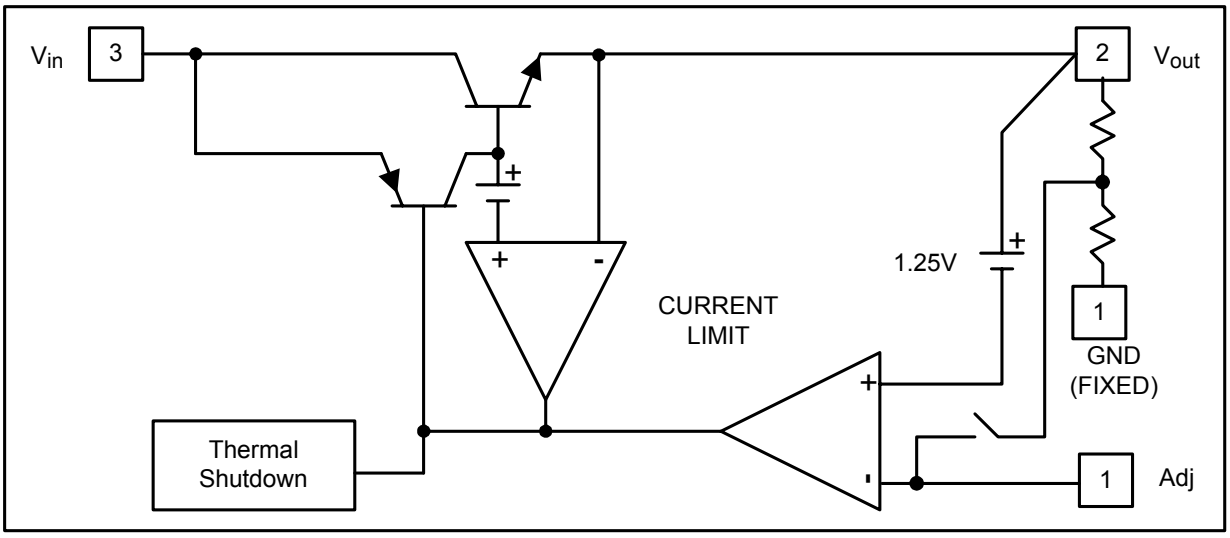


Tab is Vout

Pin Descriptions

NAME	I/O	PIN #	FUNCTION
Adj (GND)	I	1	A resistor divider from this pin to the V_{out} pin and ground sets the output voltage (Ground only for Fixed-Mode).
V_{out}	O	2	The output of the regulator. A minimum of 10uF capacitor (0.15Ω ≤ ESR ≤ 20Ω) must be connected from this pin to ground to insure stability.
V_{in}	I	3	The input pin of regulator. Typically a large storage capacitor (0.15Ω ≤ ESR ≤ 20Ω) is connected from this pin to ground to insure that the input voltage does not sag below the minimum dropout voltage during the load transient response. This pin must always be 1.3V higher than V_{out} in order for the device to regulate properly.

Block Diagram



Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
V_{in}	DC Supply Voltage	-0.3 to 18	V
T_{OP}	Operating Junction Temperature Range (Commercial Grade)	0 to +125	^{o}C
T_{MJ}	Maximum Junction Temperature	150	^{o}C
P_D	Power Dissipation SOT89-3L SOT223-3L TO220-3L TO252-3L TO263-3L	Internally limited by maximum junction temperature of 150 ^{o}C (Note 4)	mW
T_{ST}	Storage Temperature	-65 to +150	^{o}C

Note: 4. AP1117 contains an internal thermal limiting circuit that is designed to protect the regulator in the event that the maximum junction temperature exceeded. When activated, typically at 150°C, the regulator output switches off and then back on as the die cools.

Electrical Characteristics (Under Operating Conditions)

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNIT
Reference Voltage	AP1117-ADJ	T_A = 25°C, (V_{IN}-$_{OUT}$) = 1.5V I_O = 10mA	1.225	1.250	1.275	V
Output Voltage	AP1117-1.5	I_{OUT} = 10mA, T_A = 25°C, 3V≦V_{IN}≦12V	1.470	1.500	1.530	V
	AP1117-1.8	I_{OUT} = 10mA, T_A = 25°C, 3.3V≦V_{IN}≦12V	1.764	1.800	1.836	V
	AP1117-2.5	I_{OUT} = 10mA, T_A = 25°C, 4V≦V_{IN}≦12V	2.450	2.500	2.550	V
	AP1117-3.3	I_{OUT} = 10mA, T_A = 25°C, 4.8V≦V_{IN}≦12V	3.235	3.300	3.365	V
	AP1117-5.0	I_{OUT} = 10mA, T_A = 25°C, 6.5V≦V_{IN}≦12V	4.900	5.000	5.100	V
Line Regulation	AP1117-XXX	I_O = 10mA,V_{OUT}+1.5V<V_{IN}<12V, T_A = 25°C			0.2	%
Load Regulation	AP1117-ADJ	V_{IN}=3.3V,Vadj=0,0mA<Io<1A, T_A = 25°C (Note 5, 6)			1	%
	AP1117-1.5	V_{IN} = 3V, 0mA<Io<1A, T_A = 25°C (Note 5, 6)		18	15	mV
	AP1117-1.8	V_{IN} = 3.3V, 0mA<Io<1A, T_A = 25°C (Note 5, 6)		15	18	mV
	AP1117-2.5	V_{IN} = 4V, 0mA<Io<1A, T_A = 25°C (Note 5, 6)		20	25	mV
	AP1117-3.3	V_{IN} = 5V, 0≦I_{OUT}≦1A, T_A = 25°C (Note 5, 6)		26	33	mV
	AP1117-5.0	V_{IN} = 8V, 0≦I_{OUT}≦1A, T_A = 25°C (Note 5, 6)		40	50	mV
Dropout Voltage (V_{IN}-V_{OUT})	AP1117-ADJ/1.5/1.8 /2.5/3.3/5.0	I_{OUT} = 1A, ΔV_{OUT} = 0.1%V_{OUT}		1.3	1.4	V
Current Limit	AP1117-ADJ/1.5/1.8 /2.5/3.3/5.0	(V_{IN}-V_{OUT}) = 5V	1. 1			A
Minimum Load Current (Note 7)	AP1117-XXX	0°C≦Tj≦125°C		5	10	mA
Thermal Regulation	T_A = 25°C, 30ms pulse			0.008	0.04	%/W
Ripple Rejection	F = 180Hz, C_{OUT} = 25uF Tantalum, I_{OUT} = 1A					
	AP1117-XXX	V_{IN} = V_{OUT}+3V		60	70	dB
Temperature Stability	I_O = 10mA			0.5		%
θ_{JA} Thermal Resistance Junction-to-Ambient	SOT223-3L: Control Circuitry/Power Transistor (Note 8) TO252-3L: Control Circuitry/Power Transistor (Note 9) SOT89-3L: Control Circuitry/Power Transistor (Note 10) TO220-3L: Control Circuitry/Power Transistor (Note 11) TO263-3L: Control Circuitry/Power Transistor (Note 12)			107 73 182 31.35 95		°C/W
θ_{JC} Thermal Resistance Junction-to-Case	SOT223-3L: Control Circuitry/Power Transistor (Note 8) TO252-3L: Control Circuitry/Power Transistor (Note 9) SOT89-3L: Control Circuitry/Power Transistor (Note 10) TO220-3L: Control Circuitry/Power Transistor (Note 11) TO263-3L: Control Circuitry/Power Transistor (Note 12)			12 16 42 5.25 19		°C/W

Notes: 5. See thermal regulation specifications for changes in output voltage due to heating effects. Line and load regulation are measured at a constant junction temperature by low duty cycle pulse testing. Load regulation is measured at the output lead = 1/18" from the package.

6. Line and load regulation are guaranteed up to the maximum power dissipation of 15W. Power dissipation is determined by the difference between input and output differential and the output current. Guaranteed maximum power dissipation will not be available over the full input/output range.

7. Quiescent current is defined as the minimum output current required in maintaining regulation. At 12V input/output differential the device is guaranteed to regulate if the output current is greater than 10mA.

8. Test condition for SOT223: Ta=27°C, no air flow, 2 oz copper, 5mmx5mm pad.

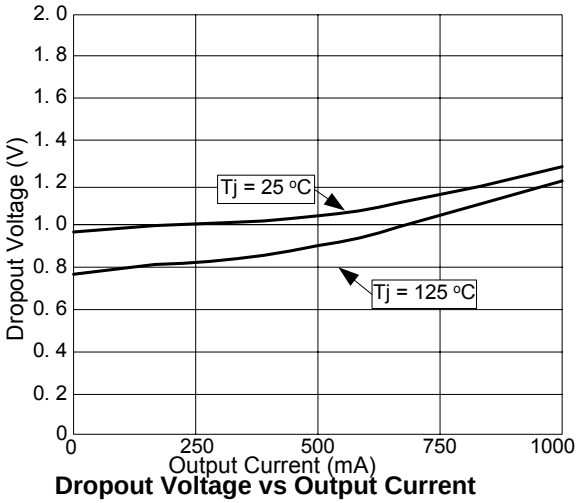
9. Test condition for TO252: Ta=27°C, no air flow, 2 oz copper, 5mmx5mm pad.

10. Test condition for SOT89-3L: no air flow, no heat sink.

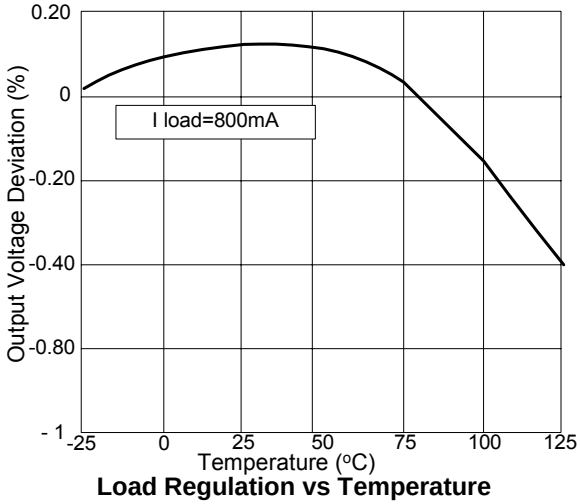
11. Test condition for TO220-3L: with copper area of approximately 3in^2, 1 oz, no air flow.

12. Test condition for TO263-3L: with copper area of approximately 2cmX2cm, 1 oz, no air flow.

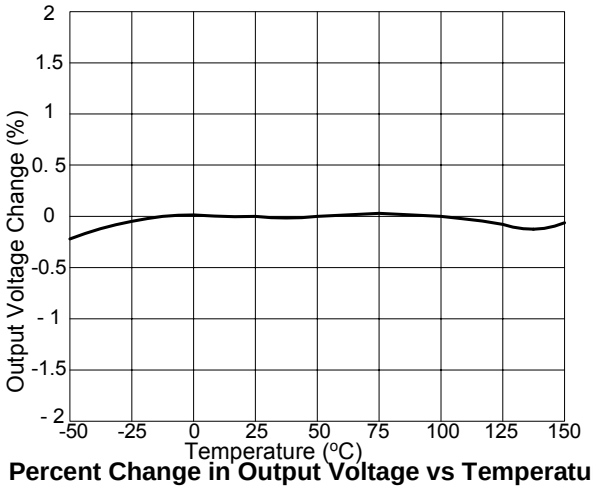
Typical Performance Characteristics



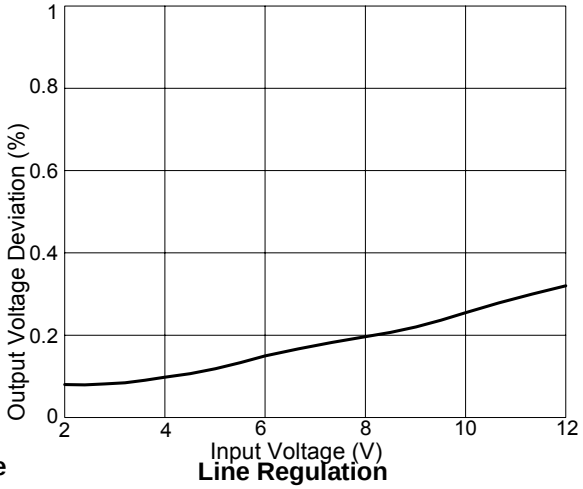
Dropout Voltage vs Output Current



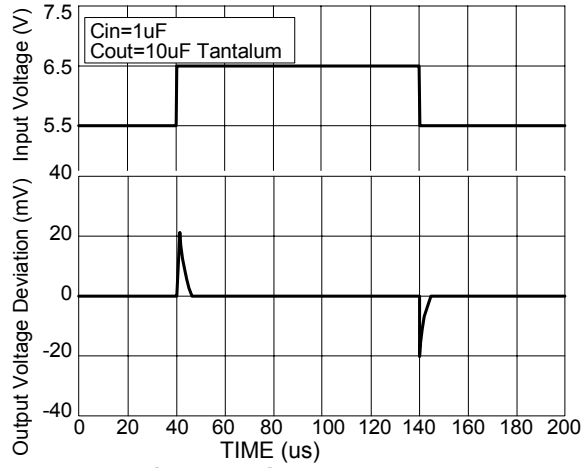
Load Regulation vs Temperature



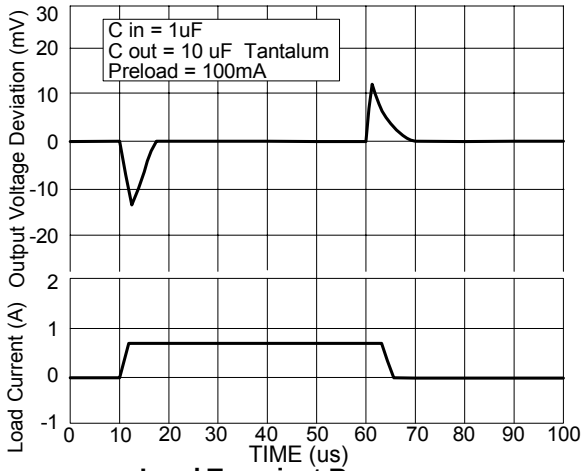
Percent Change in Output Voltage vs Temperature



Line Regulation

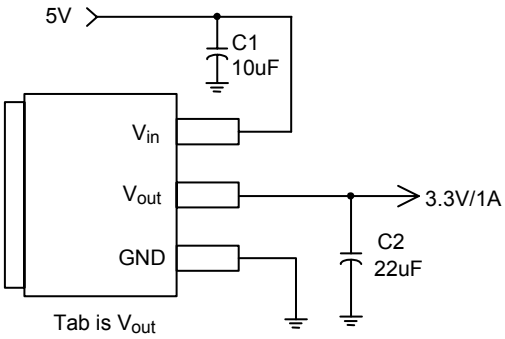


Line Transient Response

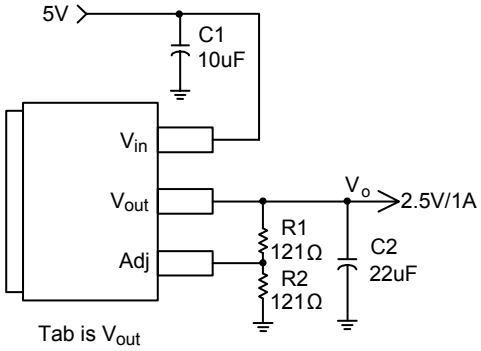


Load Transient Response

Typical Application Circuit



(5V/3.3V fixed output)

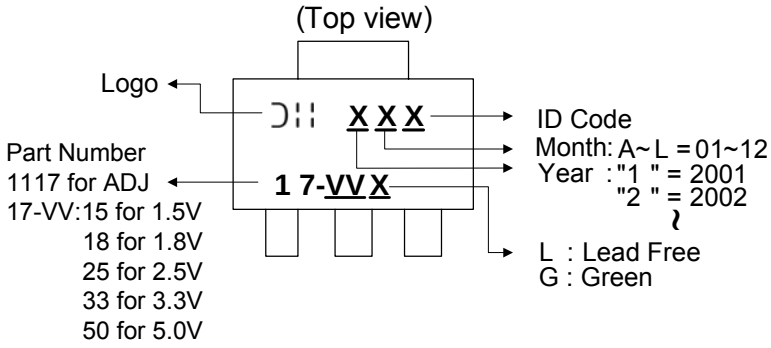


(5V/2.5V ADJ output)

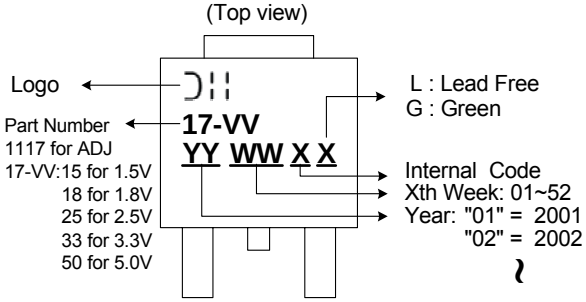
Note: $V_o = V_{REF} * (1 + \frac{R_2}{R_1})$

Marking Information

(1) SOT223-3L

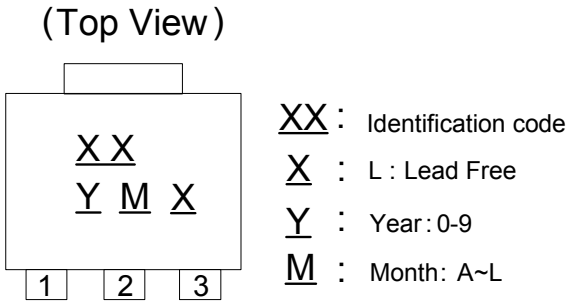


(2) TO252-3L



Marking Information (Continued)

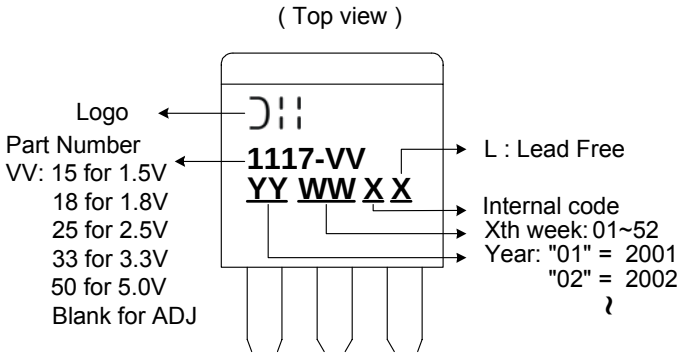
(3) SOT89-3L



Marking Code Table

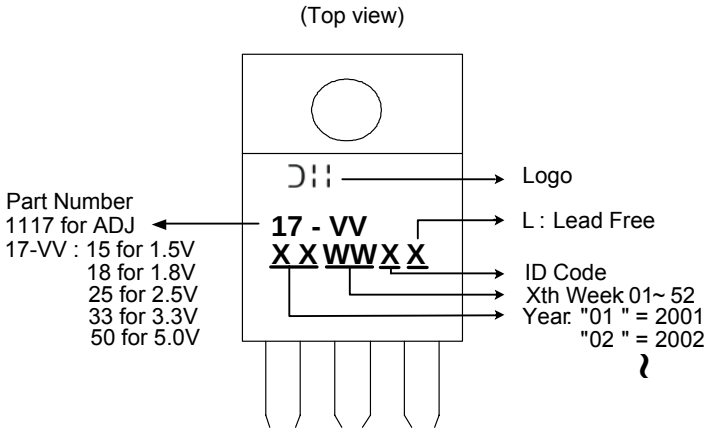
Identification Code	Output Version
DA	AP1117-ADJ
DB	AP1117-1.5V
DC	AP1117-1.8V
DD	AP1117-2.5V
DE	AP1117-3.3V
DF	AP1117-5.0V

(4) TO263-3L



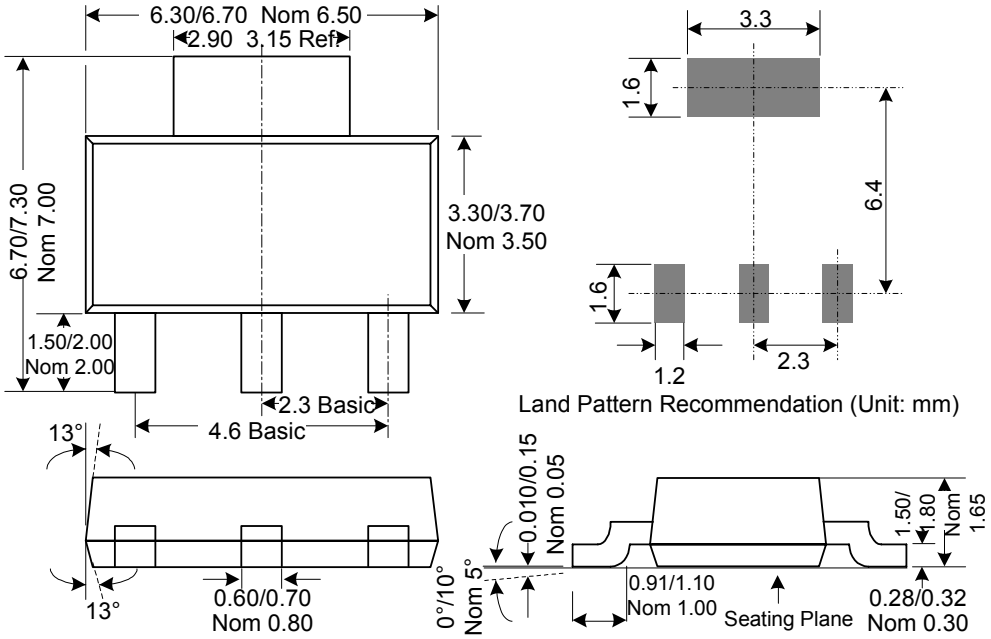
Marking Information (Continued)

(5) TO220-3L



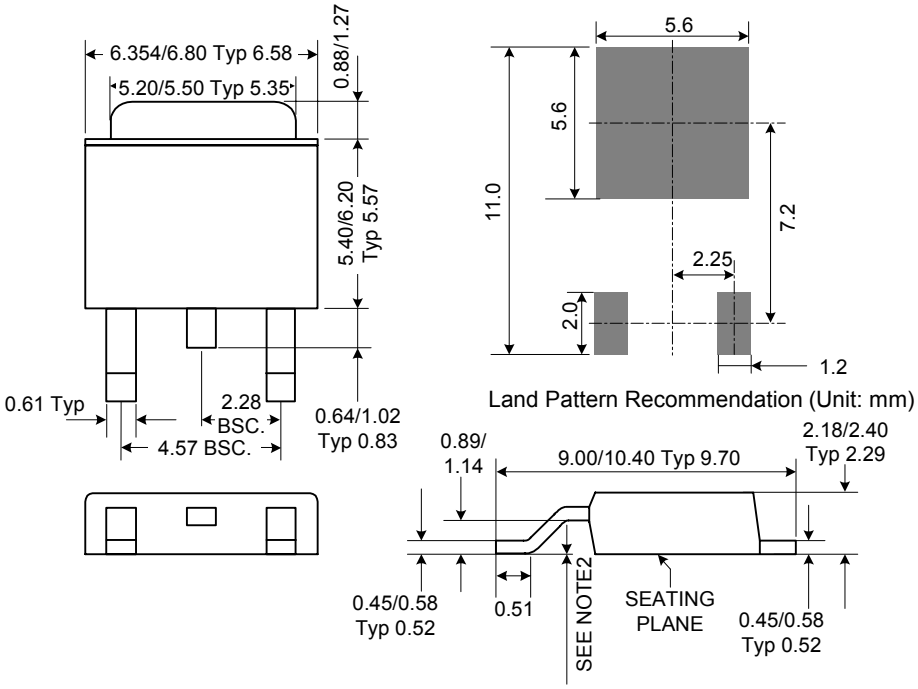
Package Information (All Dimensions in mm)

(1) SOT223-3L

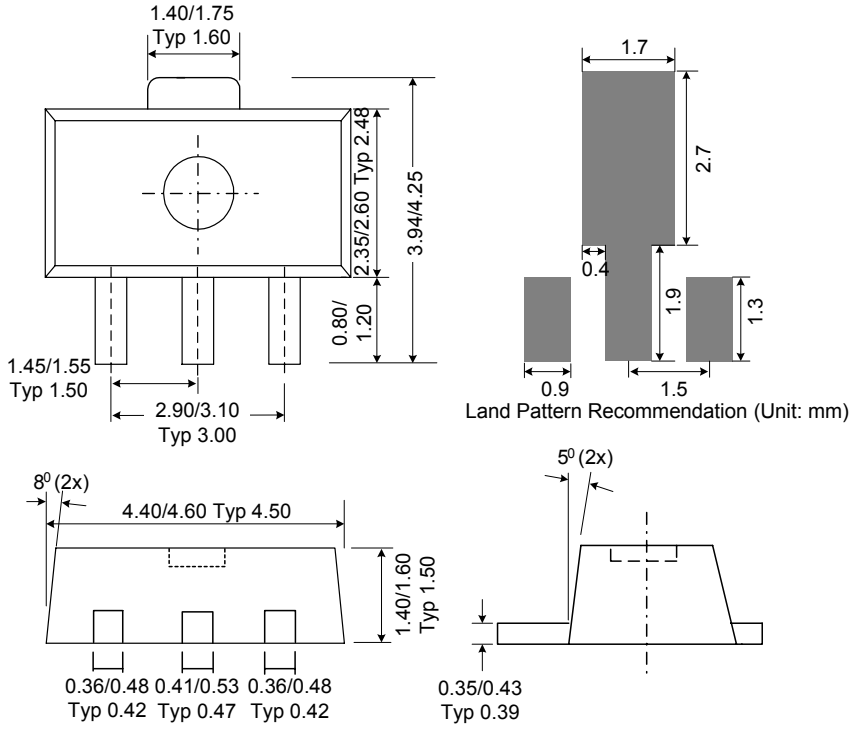


Package Information (Continued) (All Dimensions in mm)

(2) TO252-3L

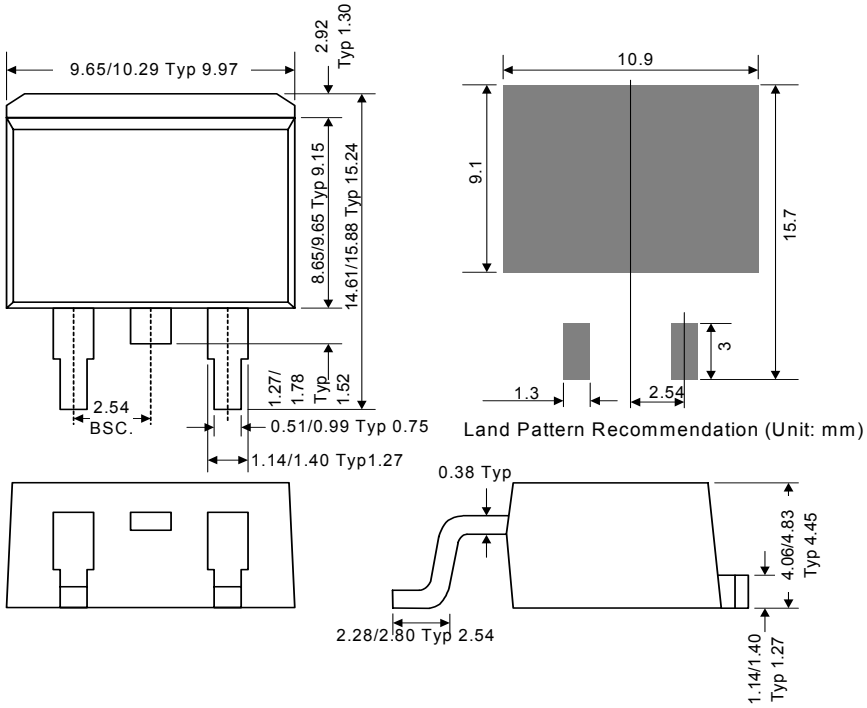


(3) SOT89-3L

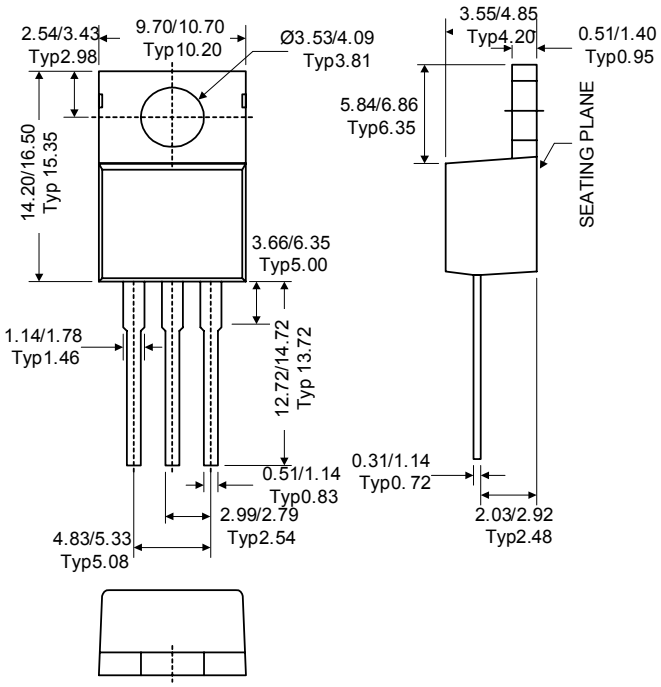


Package Information (Continued) (All Dimensions in mm)

(4) TO263-3L



(5) TO220-3L



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