

### 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
- Lead Free Packages: SOT223-3L, TO252-3L, SOT89-3L, TO263-3L and TO220-3L
- SOT223-3L, TO252-3L, SOT89-3L, TO263-3L and TO220-3L: Available in "Green" Molding Compound (No Br, Sb)
- Lead Free Finish/RoHS Compliant (Note 1)

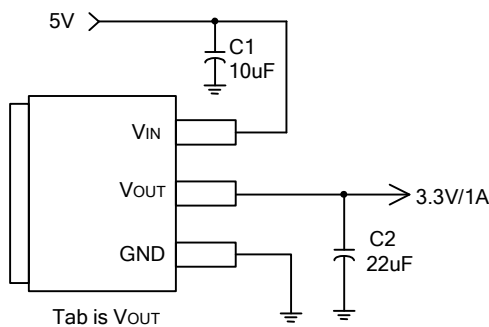
### General Description

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 commercial temperature grade.

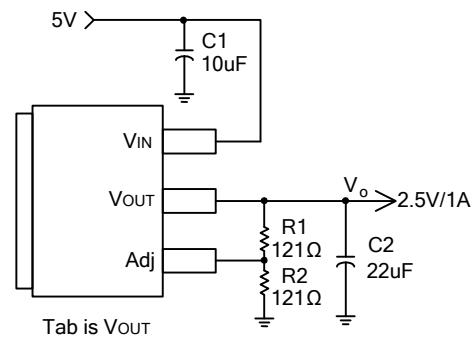
### Applications

- PC Peripheral
- Communication

### Typical Application Circuit



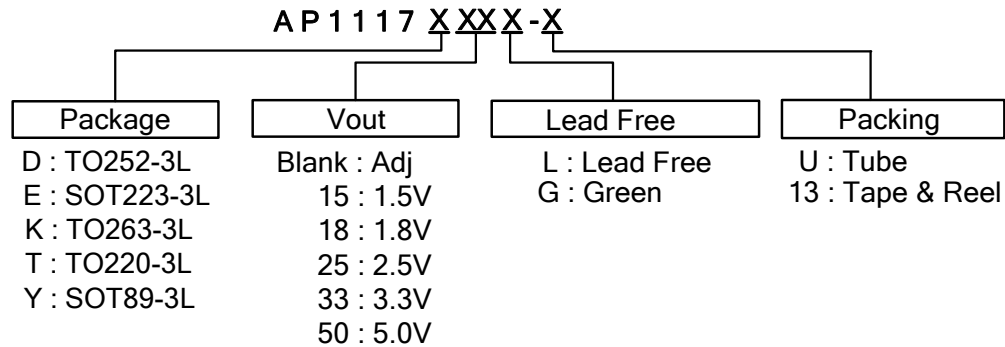
( 5V/3.3V fixed output )













( 5V/2.5V ADJ output )

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

### Ordering Information

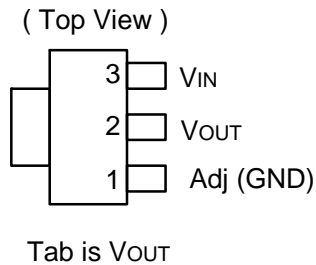


Device	Package Code	Packaging (Note 2)	Tube		13" Tape and Reel	
			Quantity	Part Number Suffix	Quantity	Part Number Suffix
 AP1117DXXL-13	D	TO252-3L	NA	NA	2500/Tape & Reel	-13
 AP1117DXXG-13	D	TO252-3L	NA	NA	2500/Tape & Reel	-13
 AP1117EXXL-13	E	SOT223-3L	NA	NA	2500/Tape & Reel	-13
 AP1117EXXG-13	E	SOT223-3L	NA	NA	2500/Tape & Reel	-13
 AP1117KXXL-13	K	TO263-3L	NA	NA	800/Tape & Reel	-13
 AP1117KXXG-13	K	TO263-3L	NA	NA	800/Tape & Reel	-13
 AP1117TXXL-U	T	TO220-3L	50	-U	NA	NA
 AP1117TXXG-U	T	TO220-3L	50	-U	NA	NA
 AP1117YXXL-13	Y	SOT89-3L	NA	NA	2500/Tape & Reel	-13
 AP1117YXXG-13	Y	SOT89-3L	NA	NA	2500/Tape & Reel	-13

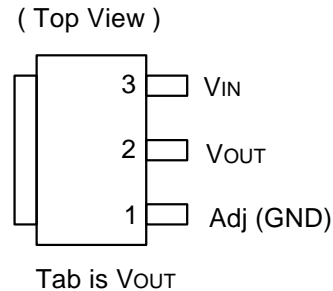
- Notes:
1. EU Directive 2002/95/EC (RoHS). All applicable RoHS exemptions applied. Please visit our website at [http://www.diodes.com/products/lead\\_free.html](http://www.diodes.com/products/lead_free.html).
  2. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.

### Pin Assignments

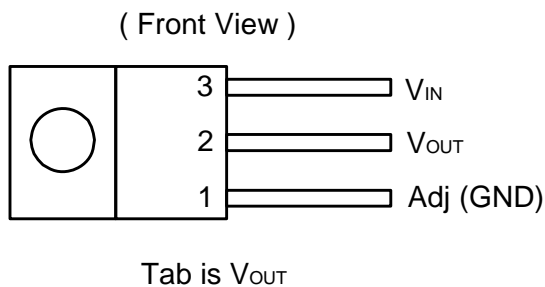
#### (1) SOT89-3L



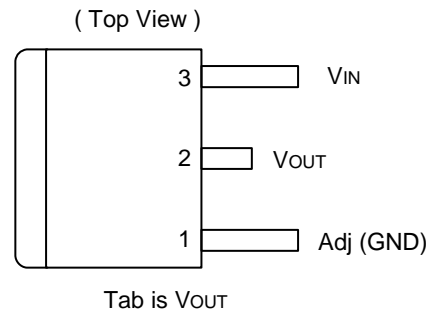
#### (2) SOT223-3L



#### (3) TO220-3L



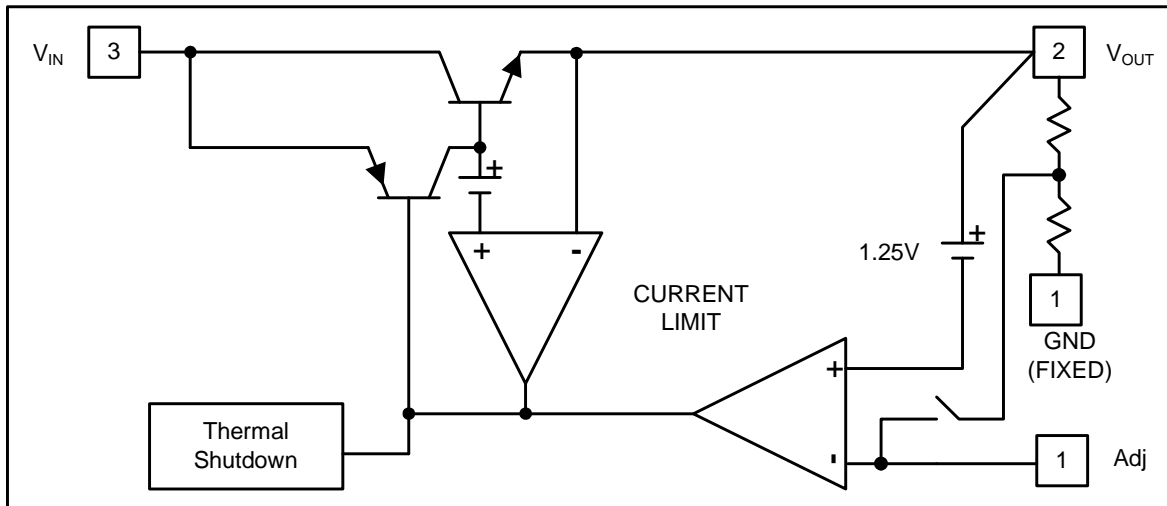
#### (4) TO252-3L and TO263-3L



### Pin Descriptions

Pin Name	I/O	PIN #	Description
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 ( $0.15\Omega \leq ESR \leq 20\Omega$ ) 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 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
$T_{MJ}$	Maximum Junction Temperature	150	$^{\circ}C$
$P_D$	Power Dissipation SOT89-3L SOT223-3L TO220-3L TO252-3L TO263-3L	Internally limited by maximum junction temperature of 150 $^{\circ}C$ (Note 3)	mW
$T_{ST}$	Storage Temperature	-65 to +150	$^{\circ}C$

Notes: 3. 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 $^{\circ}C$ , the regulator output switches off and then back on as the die cools.

**Recommended Operating Conditions**

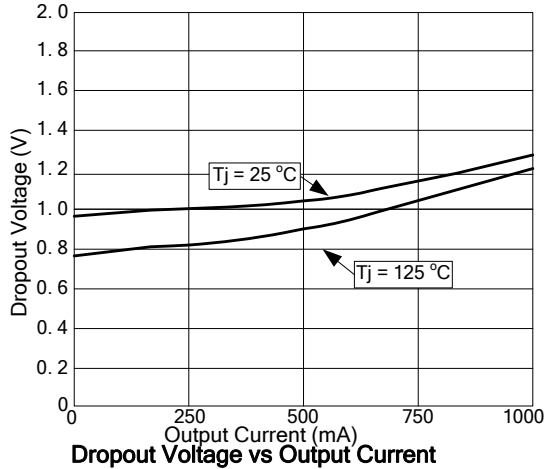
Symbol	Parameter	Min	Max	Unit
$T_{OP}$	Operating Junction Temperature Range	0	125	$^{\circ}C$

### Electrical Characteristics (Under Operating Conditions)

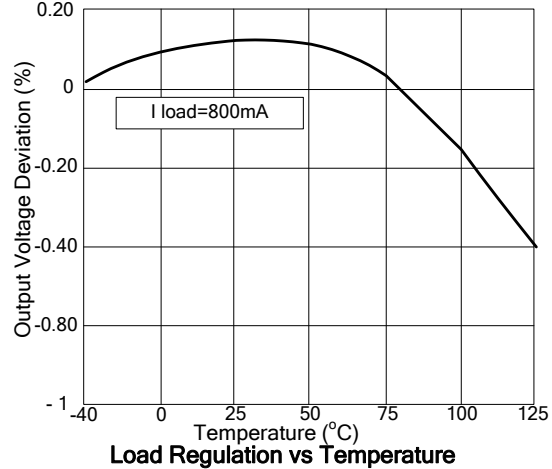
Parameter	Conditions	Min	Typ.	Max	Unit
Reference Voltage	AP1117-ADJ $T_A = 25^\circ\text{C}$ , $(V_{IN}-V_{OUT}) = 1.5\text{V}$ $I_O = 10\text{mA}$	1.225	1.250	1.275	V
Output Voltage	AP1117-1.5 $I_{OUT} = 10\text{mA}$ , $T_A = 25^\circ\text{C}$ , $3\text{V} \leq V_{IN} \leq 12\text{V}$	1.470	1.500	1.530	V
	AP1117-1.8 $I_{OUT} = 10\text{mA}$ , $T_A = 25^\circ\text{C}$ , $3.3\text{V} \leq V_{IN} \leq 12\text{V}$	1.764	1.800	1.836	V
	AP1117-2.5 $I_{OUT} = 10\text{mA}$ , $T_A = 25^\circ\text{C}$ , $4\text{V} \leq V_{IN} \leq 12\text{V}$	2.450	2.500	2.550	V
	AP1117-3.3 $I_{OUT} = 10\text{mA}$ , $T_A = 25^\circ\text{C}$ , $4.8\text{V} \leq V_{IN} \leq 12\text{V}$	3.235	3.300	3.365	V
	AP1117-5.0 $I_{OUT} = 10\text{mA}$ , $T_A = 25^\circ\text{C}$ , $6.5\text{V} \leq V_{IN} \leq 12\text{V}$	4.900	5.000	5.100	V
Line Regulation	AP1117-XXX $I_O = 10\text{mA}$ , $V_{OUT} + 1.5\text{V} < V_{IN} < 12\text{V}$ , $T_A = 25^\circ\text{C}$			0.2	%
Load Regulation	AP1117-ADJ $V_{IN} = 3.3\text{V}$ , $V_{adj} = 0$ , $0\text{mA} < I_O < 1\text{A}$ , $T_A = 25^\circ\text{C}$ (Note 4, 5)			1	%
	AP1117-1.5 $V_{IN} = 3\text{V}$ , $0\text{mA} < I_O < 1\text{A}$ , $T_A = 25^\circ\text{C}$ (Note 4, 5)		12	15	mV
	AP1117-1.8 $V_{IN} = 3.3\text{V}$ , $0\text{mA} < I_O < 1\text{A}$ , $T_A = 25^\circ\text{C}$ (Note 4, 5)		15	18	mV
	AP1117-2.5 $V_{IN} = 4\text{V}$ , $0\text{mA} < I_O < 1\text{A}$ , $T_A = 25^\circ\text{C}$ (Note 4, 5)		20	25	mV
	AP1117-3.3 $V_{IN} = 5\text{V}$ , $0 \leq I_{OUT} \leq 1\text{A}$ , $T_A = 25^\circ\text{C}$ (Note 4, 5)		26	33	mV
	AP1117-5.0 $V_{IN} = 8\text{V}$ , $0 \leq I_{OUT} \leq 1\text{A}$ , $T_A = 25^\circ\text{C}$ (Note 4, 5)		40	50	mV
Dropout Voltage ( $V_{IN}-V_{OUT}$ )	AP1117-ADJ/1.5/1.8 /2.5/3.3/5.0 $I_{OUT} = 1\text{A}$ , $\Delta V_{OUT} = 1\%V_{OUT}$		1.3	1.4	V
Current Limit	AP1117-ADJ/1.5/1.8 /2.5/3.3/5.0 $(V_{IN}-V_{OUT}) = 5\text{V}$	1.1			A
Minimum Load Current (Note 6)	AP1117-XXX $0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$		5	10	mA
Thermal Regulation	$T_A = 25^\circ\text{C}$ , 30ms pulse		0.008	0.04	%/W
Ripple Rejection	$F = 180\text{Hz}$ , $C_{OUT} = 25\mu\text{F}$ Tantalum, $I_{OUT} = 1\text{A}$				
	AP1117-XXX   $V_{IN} = V_{OUT} + 3\text{V}$		60	70	dB
Temperature Stability	$I_O = 10\text{mA}$		0.5		%
$\theta_{JA}$ Thermal Resistance Junction-to-Ambient	SOT89-3L: Control Circuitry/Power Transistor (Note 7)		164		$^\circ\text{C/W}$
	SOT223-3L: Control Circuitry/Power Transistor (Note 8)		107		
	TO252-3L: Control Circuitry/Power Transistor (Note 7)		73		
	TO220-3L: Control Circuitry/Power Transistor (Note 7)		78		
	TO263-3L: Control Circuitry/Power Transistor (Note 7)		60		
$\theta_{JC}$ Thermal Resistance Junction-to-Case	SOT89-3L: Control Circuitry/Power Transistor (Note 7)		42		$^\circ\text{C/W}$
	SOT223-3L: Control Circuitry/Power Transistor (Note 8)		15		
	TO252-3L: Control Circuitry/Power Transistor (Note 7)		12		
	TO220-3L: Control Circuitry/Power Transistor (Note 7)		3.5		
	TO263-3L: Control Circuitry/Power Transistor (Note 7)		3.5		

- Notes:
- 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.
  - 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.
  - 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.
  - Test conditions for SOT89-3L, TO220-3L, TO252-3L and TO263-3L: Devices mounted on FR-4 substrate, single sided PC board, 2oz copper, with minimum recommended pad layout, no air flow. The case point of  $\theta_{JC}$  is located on the thermal tab.
  - Test conditions for SOT223-3L: Devices mounted on FR-4 substrate, single sided PC board, 2oz copper, with 5mmx5mm thermal pad layout, no air flow. The case point of  $\theta_{JC}$  is located on the thermal tab.

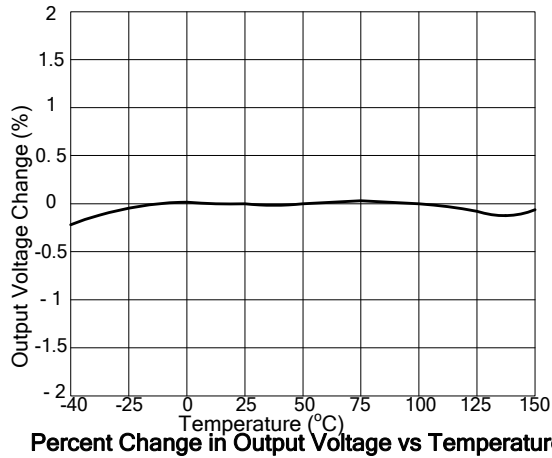
**Typical Performance Characteristics**



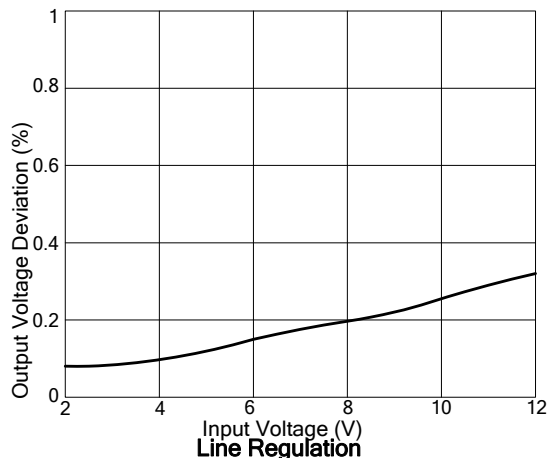
**Dropout Voltage vs Output Current**



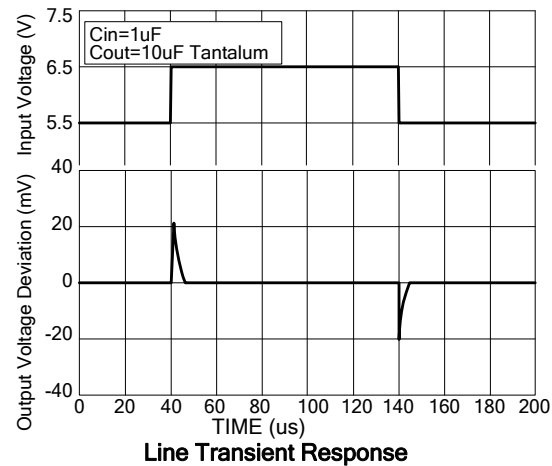
**Load Regulation vs Temperature**



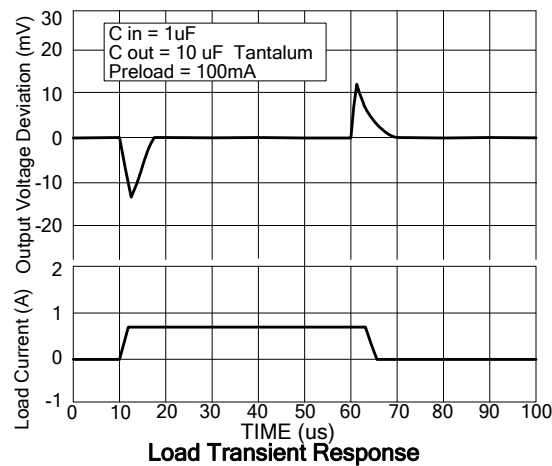
**Percent Change in Output Voltage vs Temperature**



**Line Regulation**



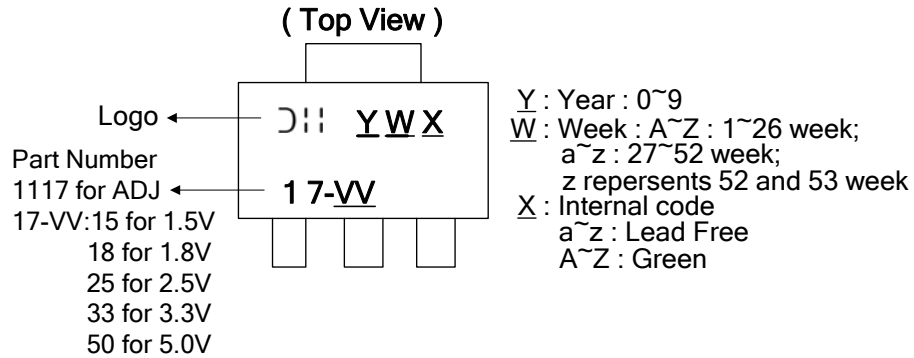
**Line Transient Response**



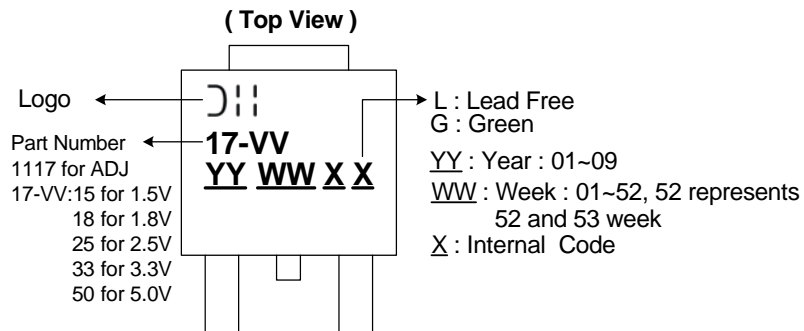
**Load Transient Response**

**Marking Information**

**(1) SOT223-3L**



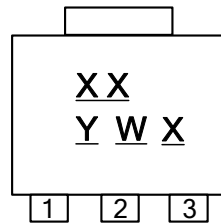
**(2) TO252-3L**



**Marking Information (Continued)**

(3) SOT89-3L

( Top View )



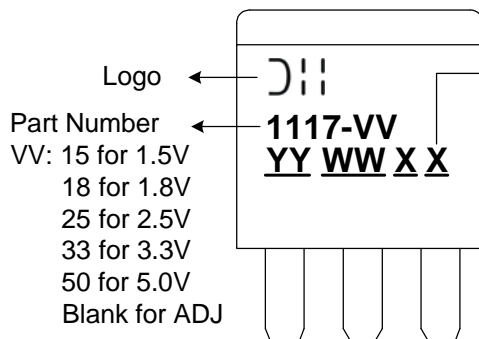
XX : Identification code  
Y : Year : 0~9  
W : Week : A~Z : 1~26 week;  
           a~z : 27~52 week;  
           z represents 52 and 53 week  
X : Internal code  
       a~z : Lead Free  
       A~Z : Green

**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

( Top View )

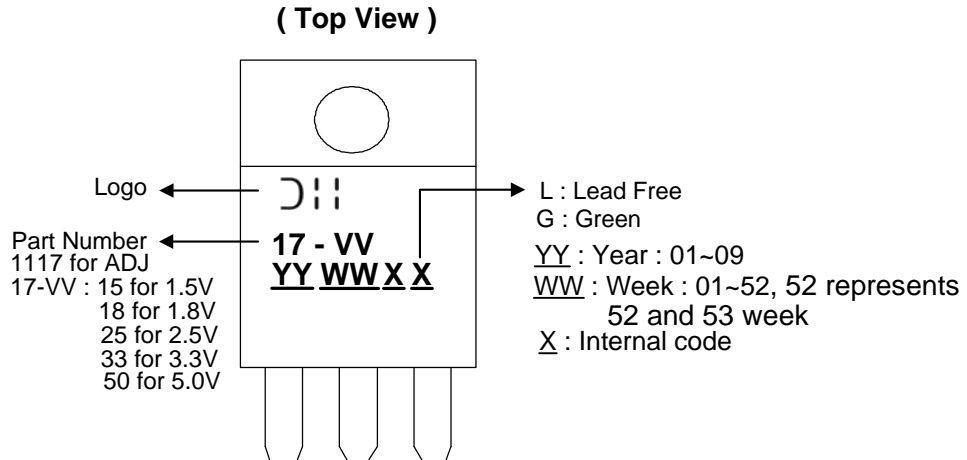


L : Lead Free  
 G : Green  
YY : Year : 01~09  
WW : Week : 01~52, 52 represents  
           52 and 53 week  
X : Internal code



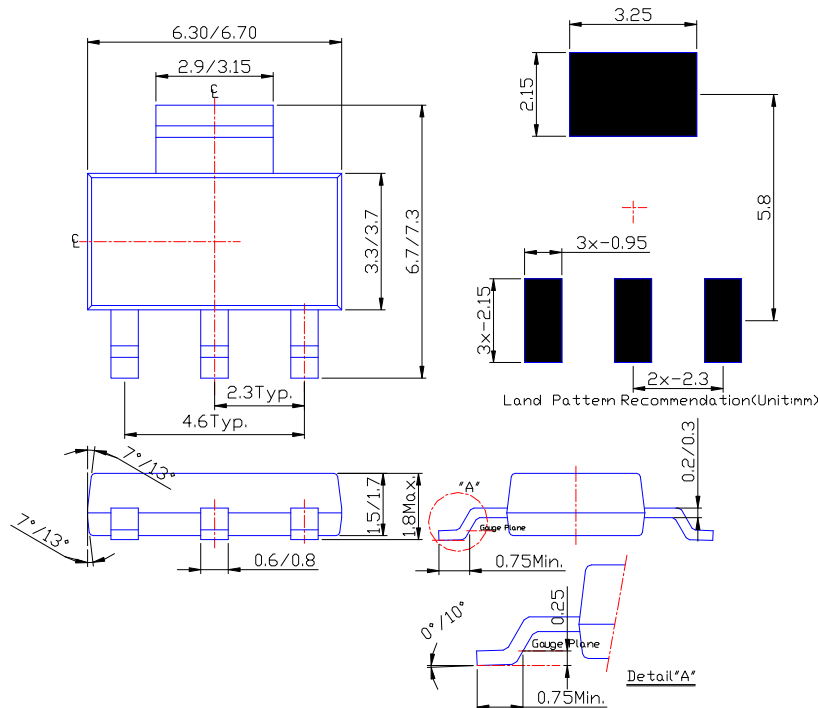
**Marking Information (Continued)**

(5) TO220-3L



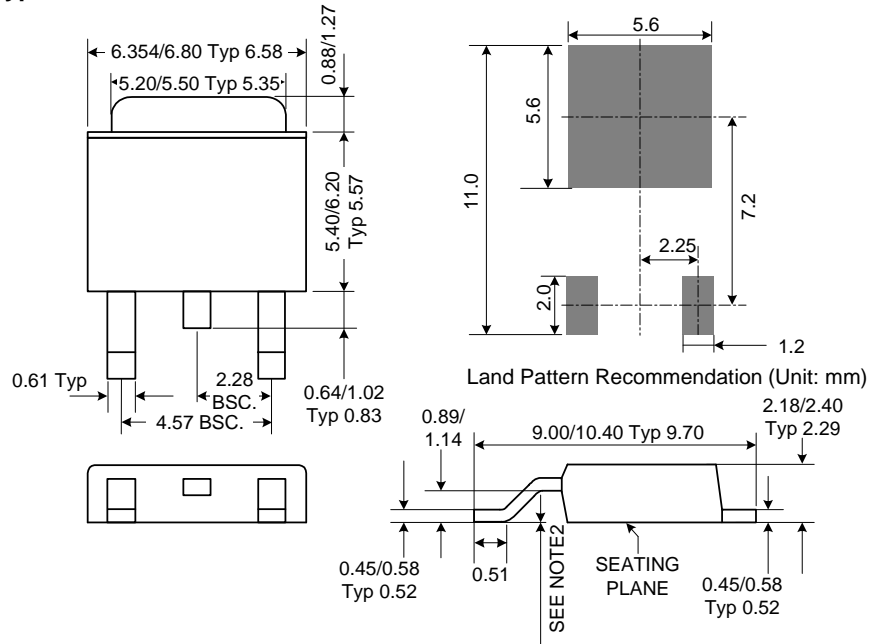
**Package Information (All Dimensions in mm)**

(1) Package Type: SOT223-3L

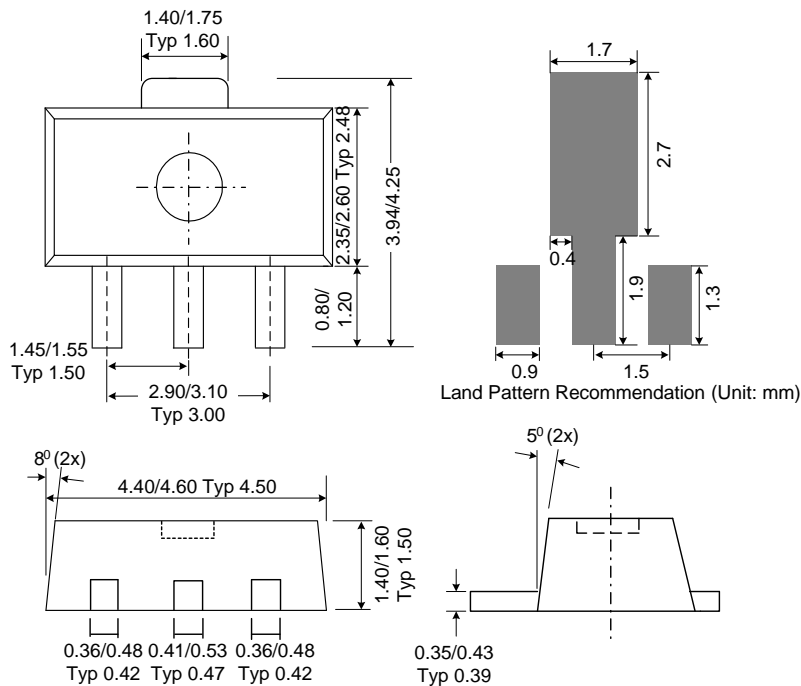


**Package Information (Continued)**

**(2) Package Type: TO252-3L**

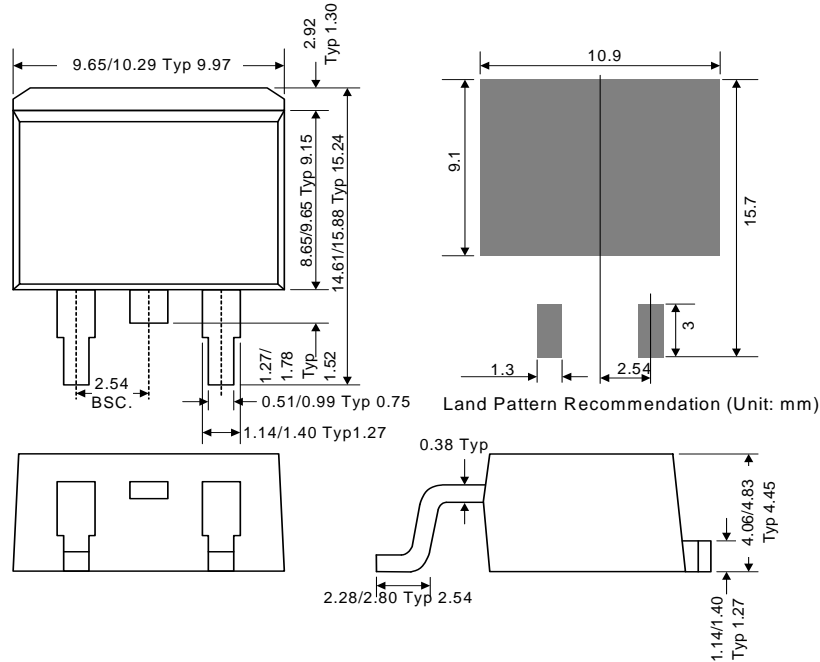


**(3) Package Type: SOT89-3L**

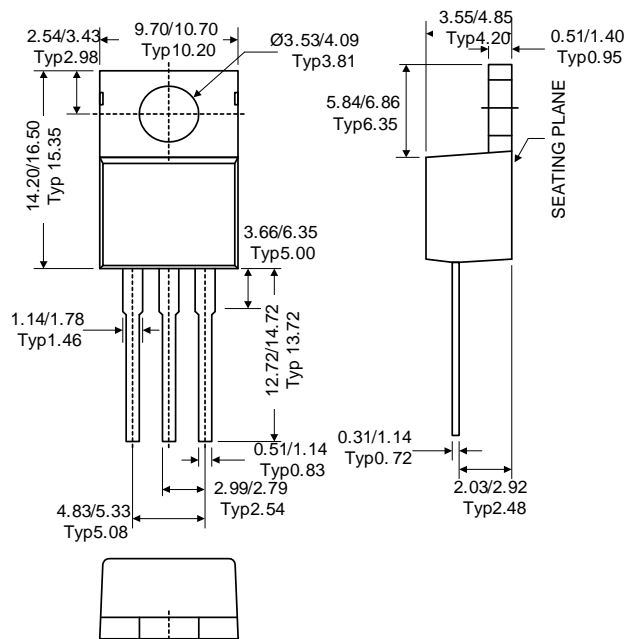


**Package Information (Continued)**

**(4) Package Type: TO263-3L**



**(5) Package Type: TO220-3L**



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