

## FSP1117

### FEATURES

- Low Dropout Voltage: 1.15V at 1A Output Current
- Trimmed Current Limit
- On-chip Thermal Shutdown
- Three-terminal Adjustable or Fixed 1.2V, 1.5V, 1.8V, 2.5V, 3.3V, 5.0V

### APPLICATIONS

- PC Motherboard
- LCD Monitor
- Graphic Card
- DVD-video player
- NIC/Switch
- Telecom Equipment
- ADSL Modem
- Printer and other Peripheral Equipment

### GENERAL DESCRIPTION

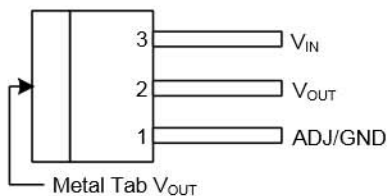
The FSP1117 is a series of low dropout three-terminal regulators with a dropout of 1.15V at 1A output current. The FSP1117 series provides current limiting and thermal shutdown. Its circuit includes a trimmed bandgap reference to assure output voltage accuracy to be within 1% for 1.5V, 1.8V, 2.5V, 3.3V, 5.0V and adjustable versions or 2% for 1.2V version. Current limit is trimmed to ensure specified output current and controlled short-circuit current. On-chip thermal shutdown provides protection against any combination of overload and ambient temperature that would create excessive junction temperature.

The FSP1117 has an adjustable version that can provide the output voltage from 1.25V to 12V with only two external resistors.

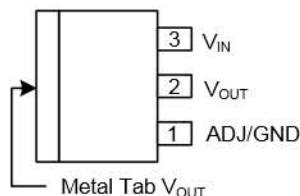
The FSP1117 series is available in the industry standard TO220-3L, TO263-3L, TO252-2L and SOT223 power packages.

### PIN CONFIGURATION

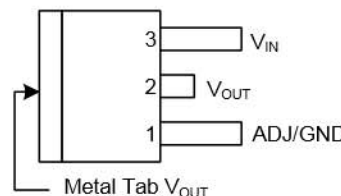
(1) TO220-3L



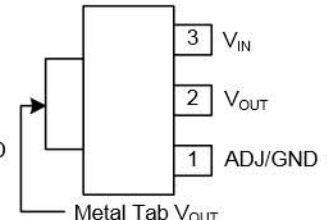
(2) TO263-3L



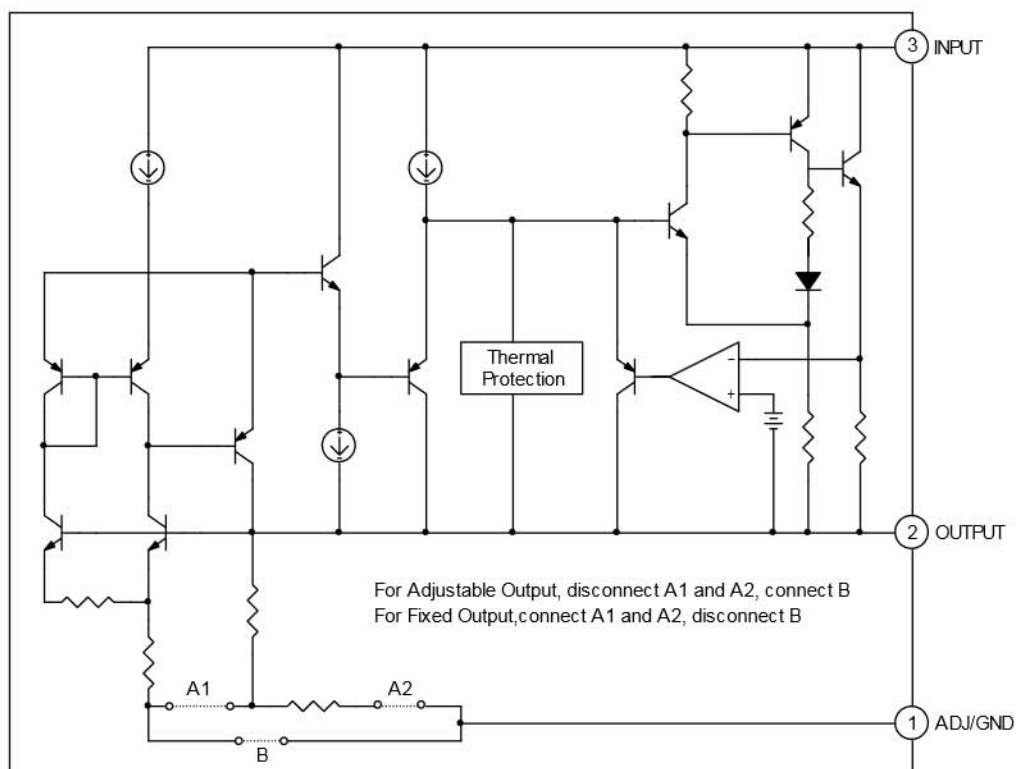
(3) TO252-2L



(4) SOT223



### BLOCK DIAGRAM



**■ ABSOLUTE MAXIMUM RATINGS (NOTE 1)**

Symbol	Parameter	Rating	Unit
$V_{IN}$	Input Voltage	20	V
$T_J$	Maximum Junction Temperature	150	°C
$T_S$	Storage Temperature	-65~150	°C
$T_{LEAD}$	Lead Temperature (10 sec.)	300	°C
ESD	ESD (Machine Model)	600	V

Note 1: Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress rating only, and functional operation of the device at these or any other conditions beyond those indicated under “Recommended Operating Conditions” is not implied. Exposure to “Absolute Maximum Ratings” for extended periods may affect device reliability.

**■ RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Rating	Unit
$V_{IN}$	Input Voltage	15	V
$T_J$	Operating Junction Temperature Range	-40~125	°C

**■ ELECTRICAL CHARACTERISTICS**

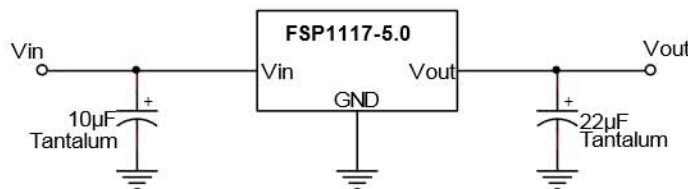
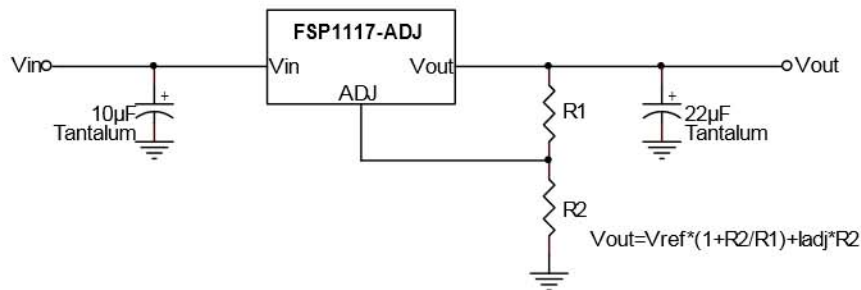
Operating Conditions:  $V_{IN} \leq 10V$ ,  $T_J = 25^\circ C$ , unless otherwise specified

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit	
Reference Voltage	$V_{REF}$	FSP1117 -adj $I_O = 10mA, V_{IN} - V_{OUT} = 2V$	1.238	1.250	1.262	V	
		$I_O = 10mA \sim 1A, 1.4V \leq V_{IN} - V_{OUT} \leq 8V$	1.225	1.250	1.270		
Output Voltage	$V_{OUT}$	FSP1117 -1.2 $I_O = 10mA, V_{IN} = 3.2V$	1.176	1.2	1.224	V	
		$I_O = 10mA \sim 1A, 3V \leq V_{IN} \leq 10V$	1.152	1.2	1.248		
		FSP1117 -1.5 $I_O = 10mA, V_{IN} = 3.5V$	1.485	1.5	1.515	V	
		$I_O = 10mA \sim 1A, 3V \leq V_{IN} \leq 10V$	1.470	1.5	1.530		
		FSP1117 -1.8 $I_O = 10mA, V_{IN} = 3.8V$	1.782	1.8	1.818	V	
		$I_O = 10mA \sim 1A, 3.2V \leq V_{IN} \leq 10V$	1.746	1.8	1.854		
		FSP1117 -2.5 $I_O = 10mA, V_{IN} = 4.5V$	2.475	2.5	2.525	V	
		$I_O = 10mA \sim 1A, 3.9V \leq V_{IN} \leq 10V$	2.450	2.5	2.550		
		FSP1117 -3.3 $I_O = 10mA, V_{IN} = 5.0V$	3.267	3.3	3.333	V	
		$I_O = 10mA \sim 1A, 4.75V \leq V_{IN} \leq 10V$	3.235	3.3	3.365		
FSP1117 -5.0 $I_O = 10mA, V_{IN} = 7.0V$	4.950	5.0	5.050	V			
$I_O = 10mA \sim 1A, 6.5V \leq V_{IN} \leq 12V$	4.900	5.0	5.100				
Line Regulation	$Reg_{LINE}$	FSP1117 -adj $I_O = 10mA, 1.5V \leq V_{IN} - V_{OUT} \leq 10V,$		0.035	0.2	%	
	$\Delta V_{OUT}$	FSP1117 -1.2/1.5/1.8/2.5/ 3.3	$I_O = 10mA, 1.5V \leq V_{IN} - V_{OUT} \leq 10V$		1	6	mV
		FSP1117 -5.0	$I_O = 10mA, 1.5V \leq V_{IN} - V_{OUT} \leq 10V$		1	10	mV
Load Regulation	$Reg_{Load}$	FSP1117 -adj $I_O = 10mA \sim 1A, V_{IN} - V_{OUT} = 2V$		0.2	0.4	%	
		$I_O = 10mA \sim 1A, V_{IN} - V_{OUT} = 2V$		0.1	0.3	%	
Dropout Voltage ( $V_{IN} - V_{OUT}$ )		FSP1117 -adj	$\Delta V_{REF} = 1\%, I_{OUT} = 0.1A$		1.00	1.1	V
			$\Delta V_{REF} = 1\%, I_{OUT} = 0.5A$		1.08	1.18	
			$\Delta V_{REF} = 1\%, I_{OUT} = 1.0A$		1.15	1.25	
			$\Delta V_{OUT} = 1\%, I_{OUT} = 0.1A$		1.00	1.1	
			$\Delta V_{OUT} = 1\%, I_{OUT} = 0.5A$		1.08	1.18	
			$\Delta V_{OUT} = 1\%, I_{OUT} = 1.0A$		1.15	1.25	
Current Limit	$I_{LIMIT}$	$V_{IN} - V_{OUT} = 2V$	1.25	1.35		A	

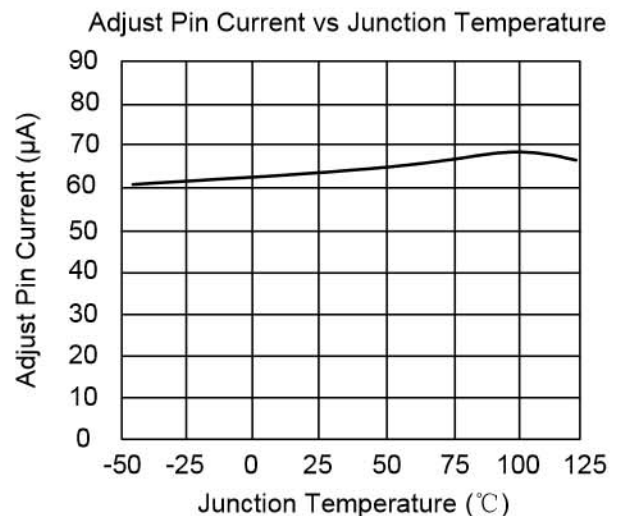
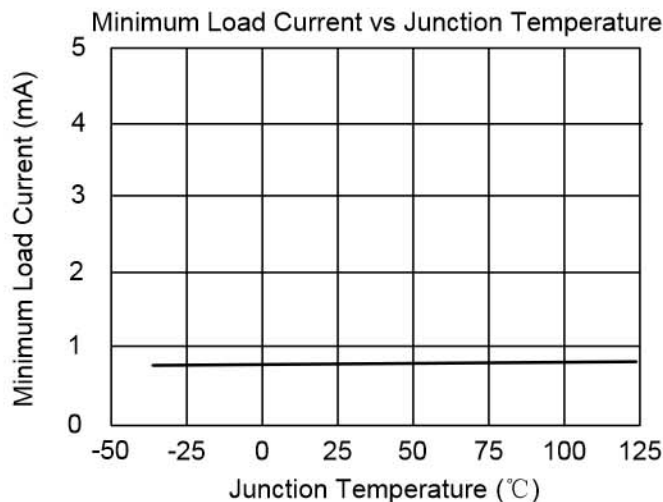
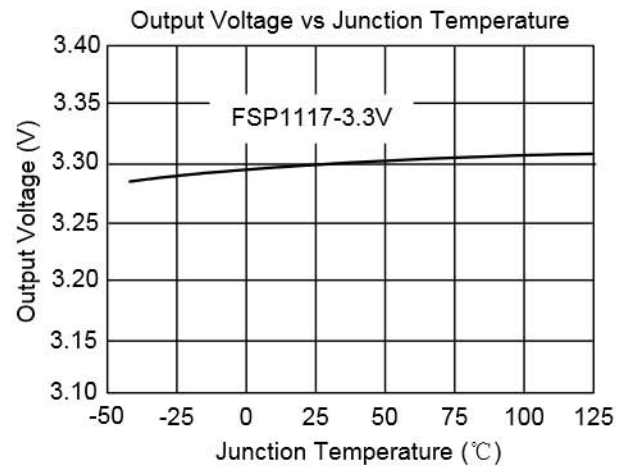
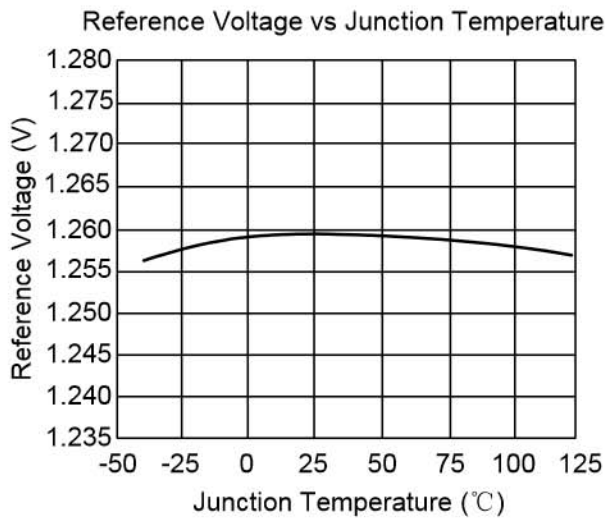
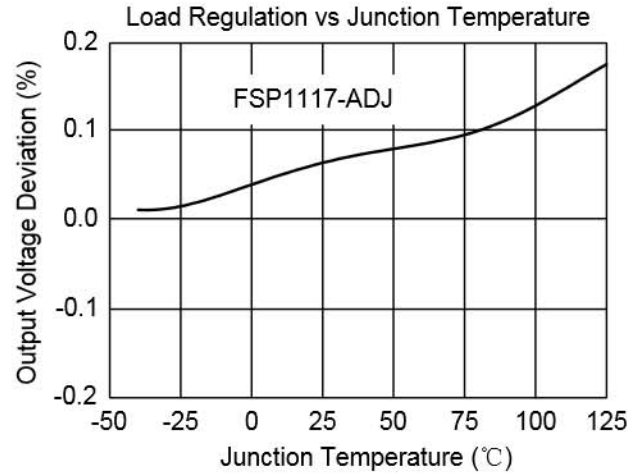
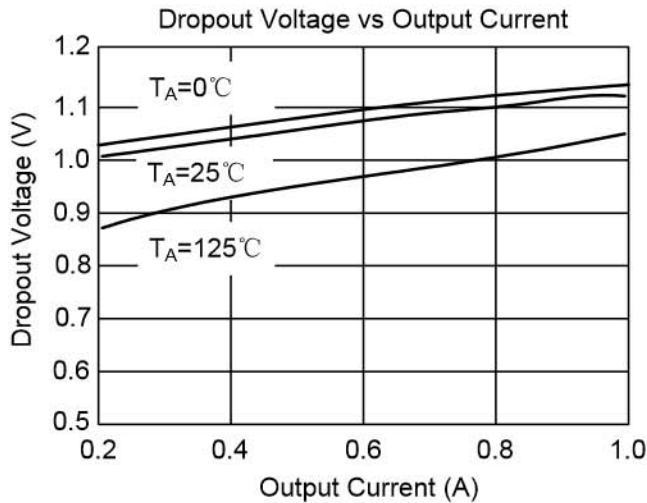
**ELECTRICAL CHARACTERISTICS (CONTINUED)**

 Operating Conditions:  $V_{IN} \leq 10V$ ,  $T_J = 25^\circ C$ , unless otherwise specified

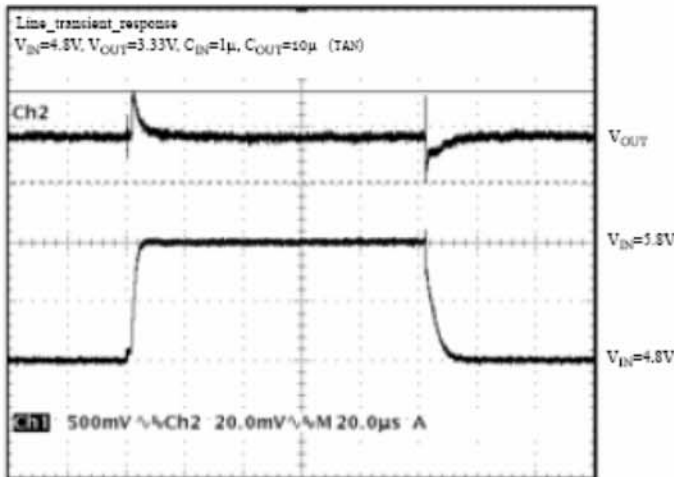
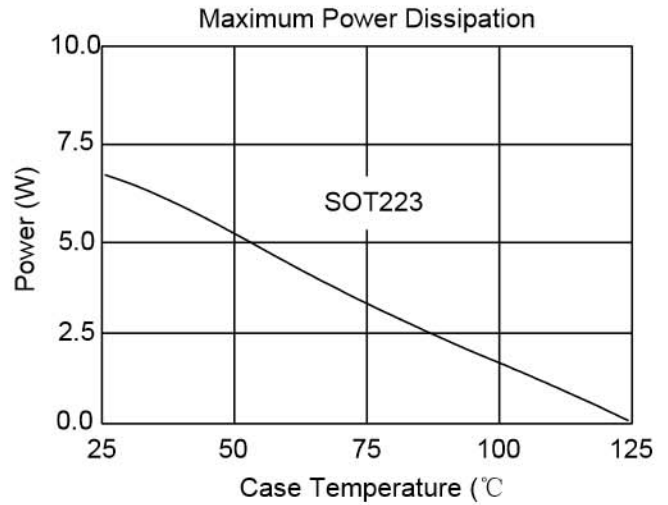
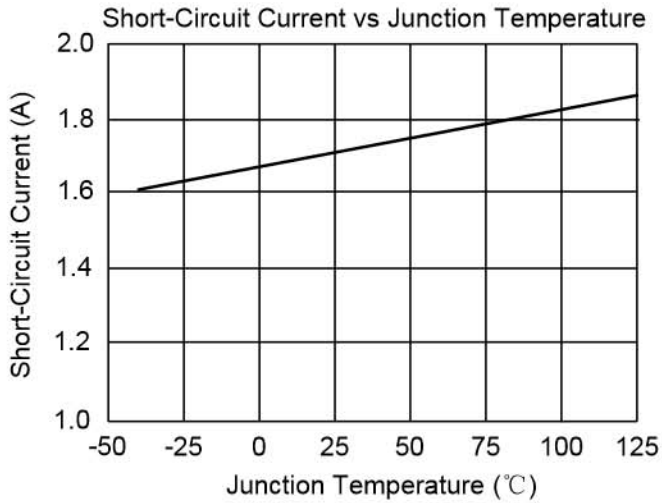
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Adjust Pin Current		$I_O = 10mA \sim 1A$ , $1.5V \leq V_{IN} - V_{OUT} \leq 10V$		60	120	$\mu A$
Adjust Pin Current Change		$I_O = 10mA \sim 1A$ , $1.4V \leq V_{IN} - V_{OUT} \leq 10V$		0.2	5	$\mu A$
Minimum Load Current(ADJ)		FSP1117 E		1.7	5	mA
		FSP1117		5	10	mA
Quiescent Current		$V_{IN} = V_{OUT} + 1.25V$		5	10	mA
Ripple Rejection		$f = 120Hz$ , $C_{OUT} = 22\mu F$ Tantalum, $V_{IN} - V_{OUT} = 3V$ , $I_{OUT} = 1A$	60	75		dB
Temperature Stability				0.5		%
Long-term Stability		$T_A = 125^\circ C$ , 1000hrs		0.3		%
RMS Output Noise (% of $V_{OUT}$ )		$T_A = 25^\circ C$ , $10Hz \leq f \leq 10kHz$		0.003		%
Thermal Resistance, Junction to case	$\theta_{JC}$	SOT223		15		$^\circ C/W$
		TO252-2L		10		
		TO220-3L		4.5		
		TO263-3L		4		
Thermal Shutdown		Junction Temperature		150		$^\circ C$
Thermal Shutdown Hysteresis				25		$^\circ C$

**TYPICAL APPLICATIONS**


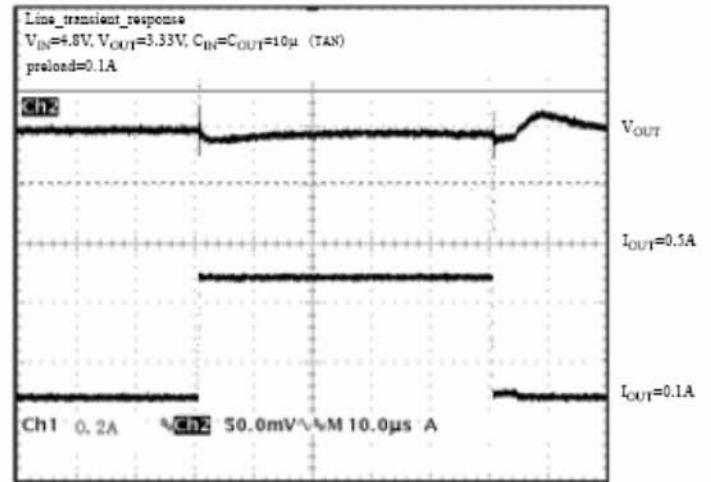
■ TYPICAL PERFORMANCE CHARACTERISTICS



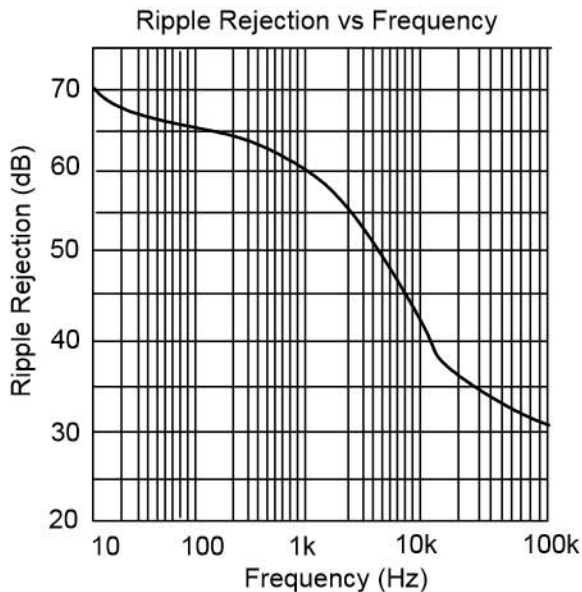
■ TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)



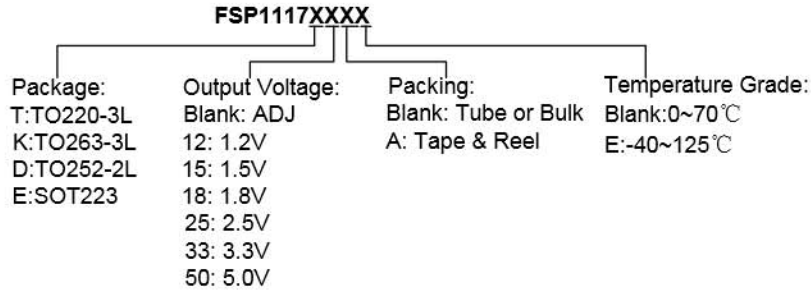
Line Transient Response



Load Transient Response

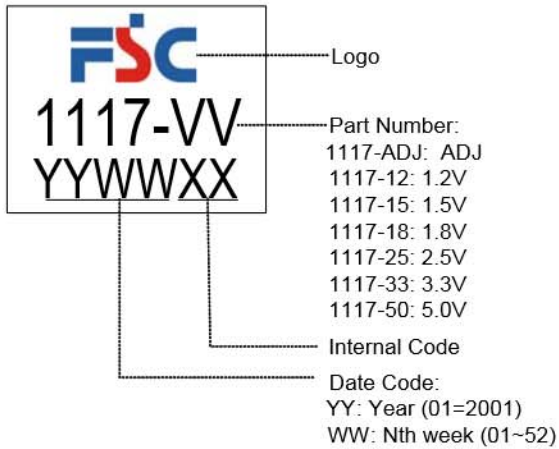


ORDERING INFORMATION

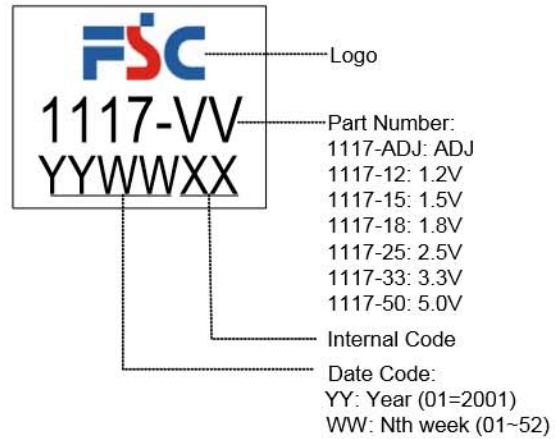


MARKING INFORMATION

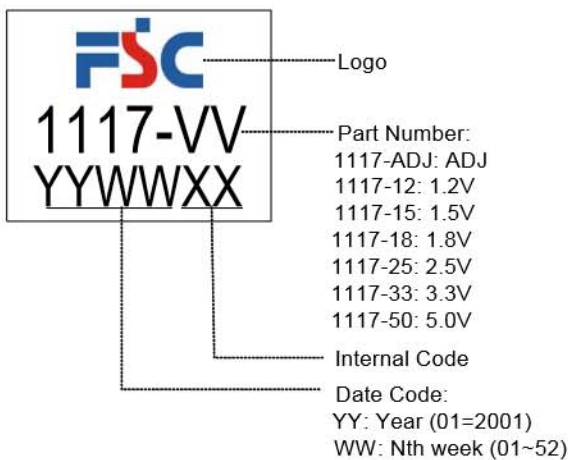
(1)TO220-3L



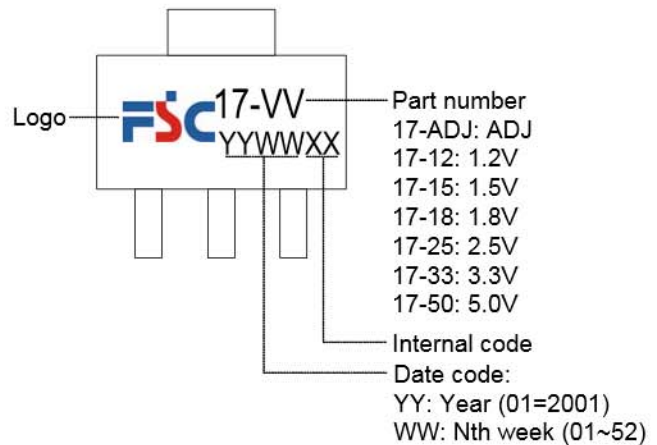
(2) TO263-3L



(3) TO252-2L

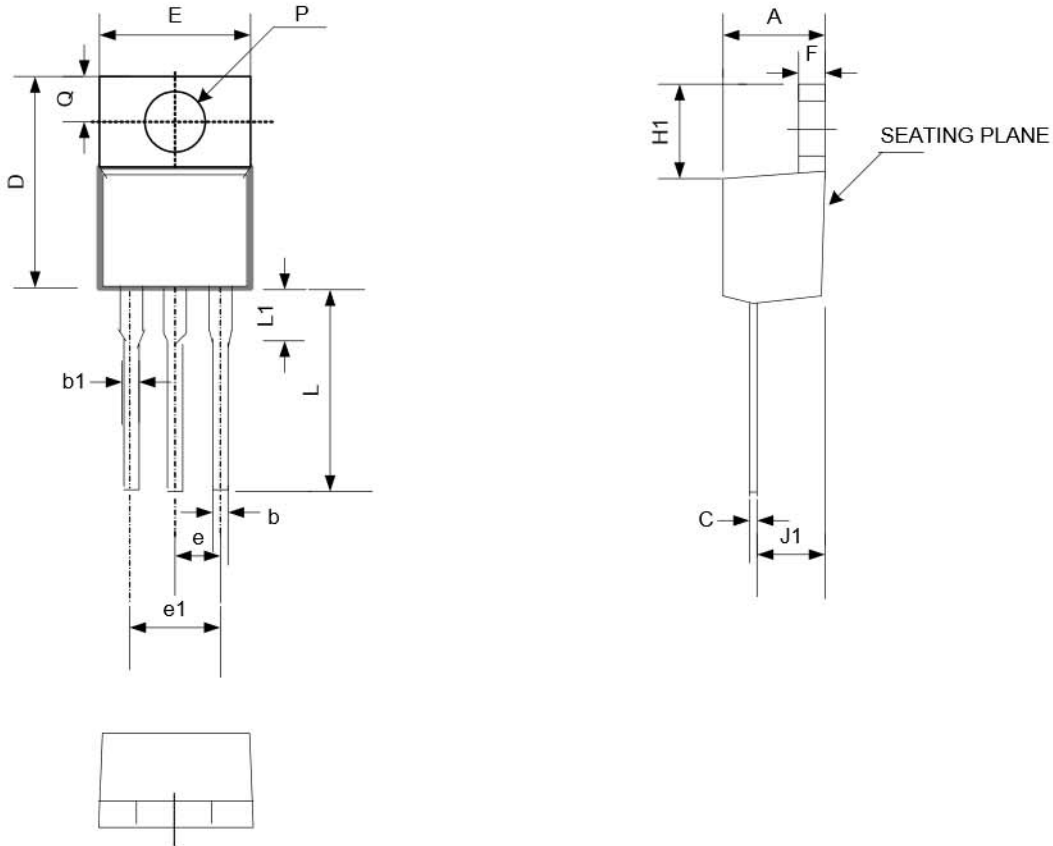


(4) SOT223



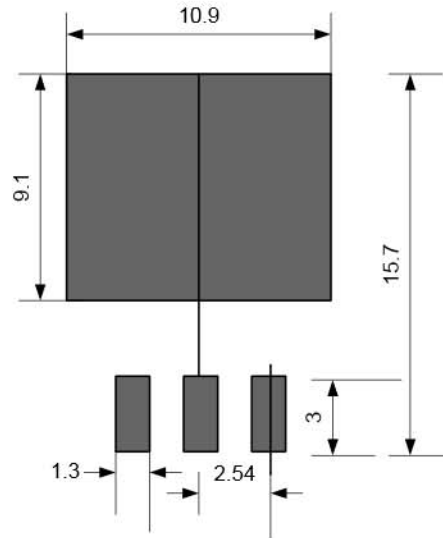
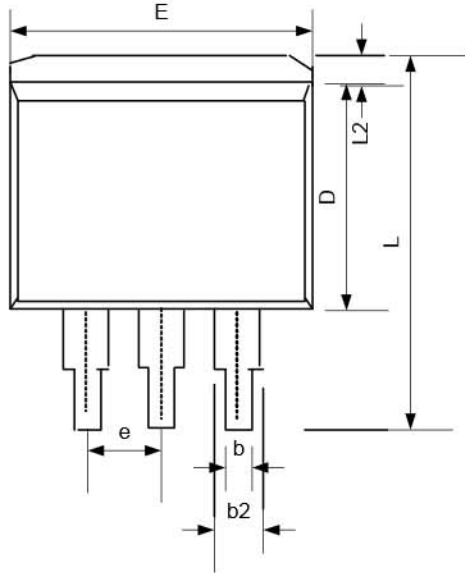
■ PACKAGE INFORMATION

(1) TO220-3L

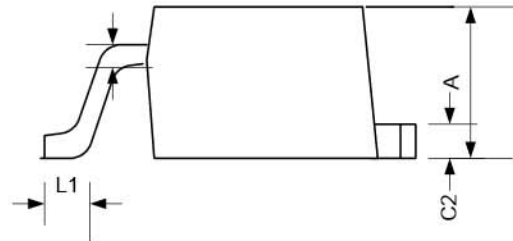
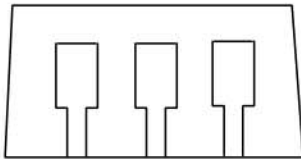


Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	3.55	4.20	4.85	0.140	0.165	0.191
b1	1.14	1.46	1.78	0.045	0.057	0.070
b	0.51	0.83	1.14	0.020	0.033	0.045
C	0.31	0.72	1.14	0.012	0.028	0.045
D	14.20	15.35	16.50	0.559	0.604	0.650
E	9.70	10.20	10.70	0.382	0.402	0.421
e	2.29	2.54	2.79	0.090	0.100	0.110
e1	4.83	5.08	5.33	0.190	0.200	0.210
F	0.51	0.95	1.40	0.020	0.037	0.055
H1	5.84	6.35	6.86	0.230	0.250	0.270
J1	2.03	2.48	2.92	0.080	0.098	0.115
L	12.72	13.72	14.72	0.501	0.540	0.580
L1	3.66	5.00	6.35	0.144	0.197	0.250
P	3.53	3.81	4.09	0.139	0.150	0.161
Q	2.54	2.98	3.43	0.100	1.117	0.135

(2) TO263-3L



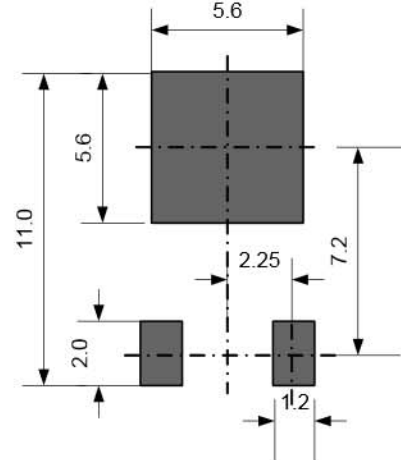
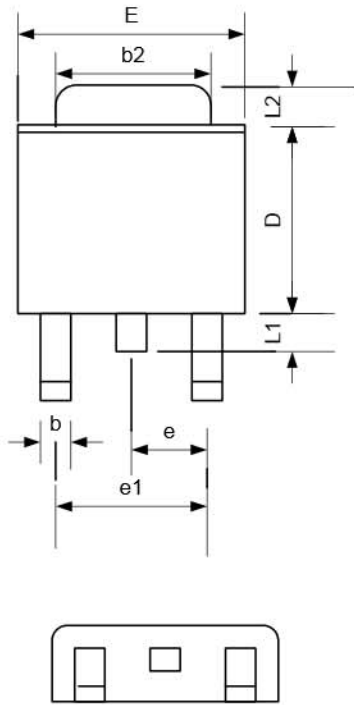
Land Pattern Recommendation (Unit : mm)



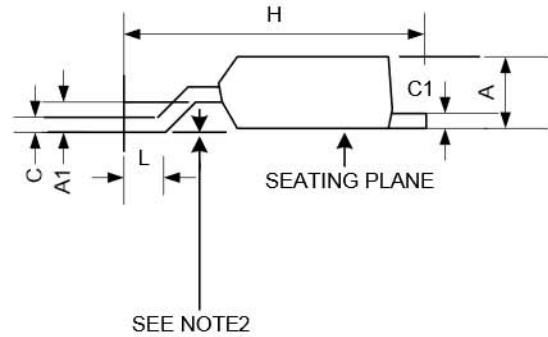
Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	4.06	4.45	4.83	0.160	0.175	0.190
b	0.51	0.75	0.99	0.020	0.030	0.039
b2	1.14	1.27	1.40	0.045	0.050	0.055
C	0.38TYP.			0.015TYP.		
C2	1.14	1.27	1.40	0.045	0.050	0.055
D	8.65	9.15	9.65	0.341	0.360	0.380
E	9.65	9.97	10.29	0.380	0.393	0.405
e	2.54BSC.			0.100BSC.		
L	14.61	15.24	15.88	0.575	0.600	0.625
L1	2.28	2.54	2.80	0.090	0.100	0.110
L2		1.30	2.92		0.051	0.115



(3) TO252-2L



Land Pattern Recommendation (Unit : mm)



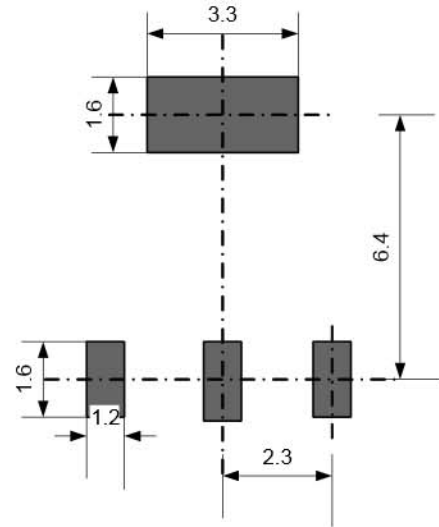
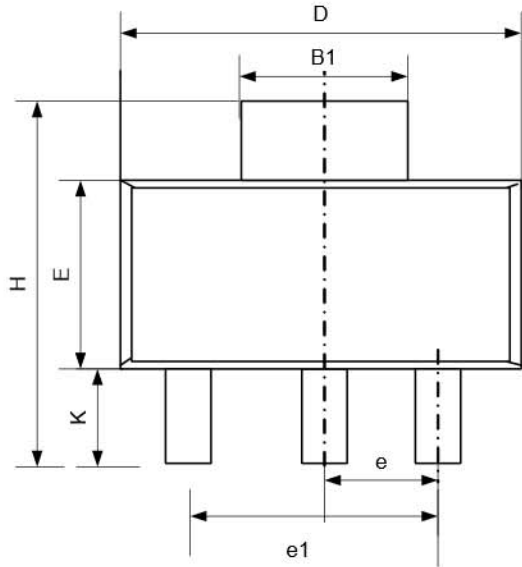
SEE NOTE2

**Notes:**

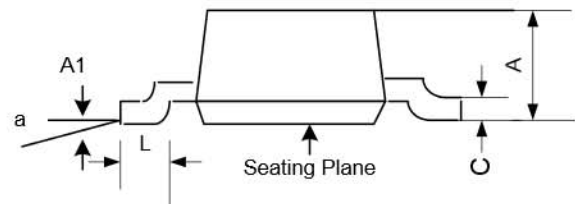
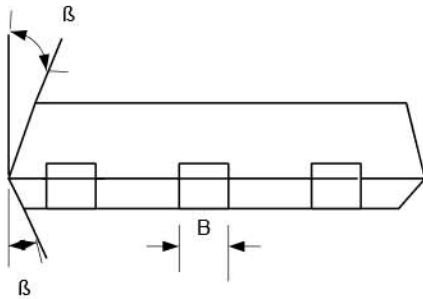
1. JEDEC Outline: TO-252 AB
2. Mils suggested for positive contact at mounting

Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	2.18	2.29	2.39	0.086	0.090	0.094
A1	1.02	1.15	1.27	0.040	0.045	0.050
b	0.61TYP.			0.024TYP.		
b2	5.20	5.35	5.50	0.205	0.211	0.217
C	0.46	0.52	0.58	0.018	0.020	0.023
C1	0.46	0.52	0.58	0.018	0.020	0.023
D	5.33	5.57	5.80	0.210	0.219	0.228
E	6.35	6.58	6.80	0.250	0.259	0.268
e	2.25BSC.			0.089BSC.		
e1	4.50BSC.			0.177BSC.		
H	9.00	9.70	10.40	0.354	0.382	0.409
L	0.51			0.020		
L1	0.64	0.83	1.02	0.025	0.033	0.040
L2	1.52	1.78	2.03	0.060	0.070	0.080

(4) SOT223



Land Pattern Recommendation (Unit :mm)



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	1.50	1.65	1.80	0.059	0.065	0.071
A1	0.02	0.05	0.08	0.001	0.002	0.003
B	0.60	0.70	0.80	0.024	0.028	0.031
B1	2.90		3.15(Ref.)	0.114		0.124(Ref.)
c	0.28	0.30	0.32	0.011	0.012	0.013
D	6.30	6.50	6.70	0.248	0.256	0.264
E	3.30	3.50	3.70	0.130	0.138	0.146
e	2.3Basic			0.091Basic		
e1	4.6Basic			0.181Basic		
H	6.70	7.00	7.30	0.264	0.276	0.287
L	0.91	1.00	1.10	0.036	0.039	0.043
K	1.50	1.75	2.00	0.059	0.069	0.079
$\alpha$	0°	5°	10°	0°	5°	10°
$\beta$		13°			13°	

