

### 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

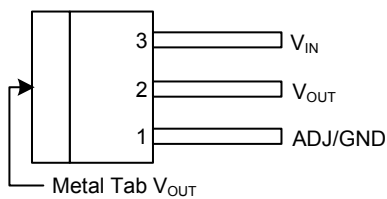
The FSP1117 is a series of low dropout three-terminal regulators with a dropout of 1.15V at 1A output current. The FSP1117 series provides current limiting and thermal shutdown. Its circuit includes a trimmed bandgap reference to assure output voltage accuracy to be within 1% for 1.5V, 1.8V, 2.5V, 3.3V, 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.

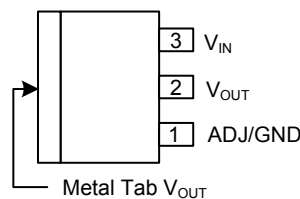
The FSP1117 series is available in the industry standard TO220-3L, TO263-3L, TO252-2L and SOT223 power packages.

### PIN CONFIGURATION

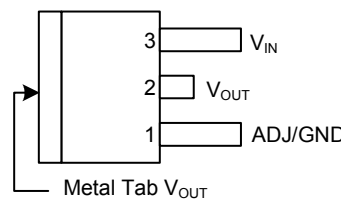
(1) TO220-3L



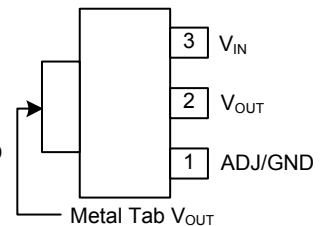
(2) TO263-3L



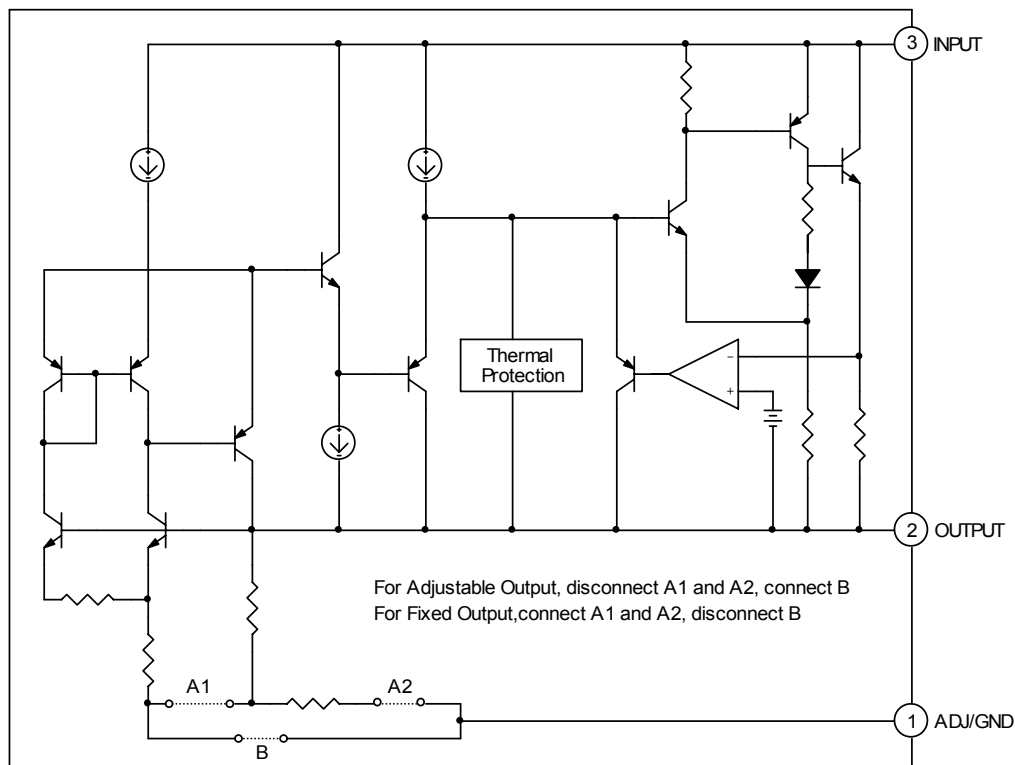
(3) TO252-2L



(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**

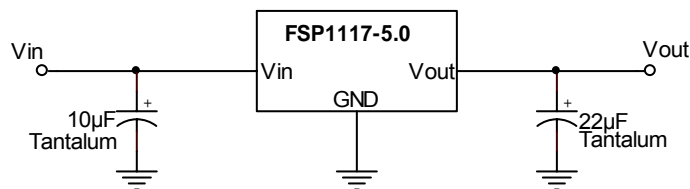
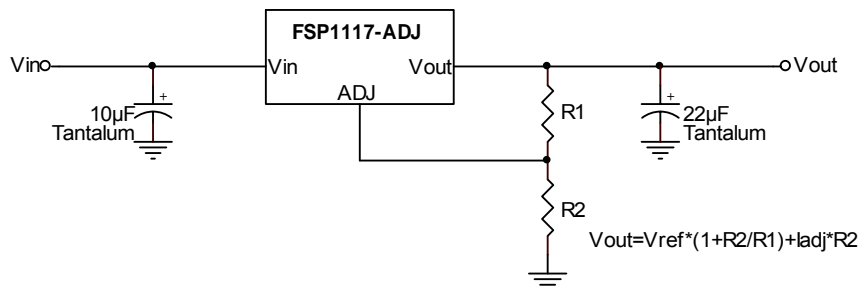
Operating Conditions:  $V_{IN} \leq 10V$ ,  $T_J = 25^\circ C$ , unless otherwise specified

| Parameter   | Symbol       | Test Condition  | Min.                                   | Typ.   | Max.  | Unit  |     |    |
|---|--------------|---|--|--|-------|-------|-----|----|
| Reference Voltage   | $V_{REF}$    | FSP1117 -adj<br>$I_O = 10mA, V_{IN} - V_{OUT} = 2V$         | 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<br>$I_O = 10mA, V_{IN} = 3.2V$                 | 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<br>$I_O = 10mA, V_{IN} = 3.5V$                 | 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<br>$I_O = 10mA, V_{IN} = 3.8V$                 | 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<br>$I_O = 10mA, V_{IN} = 4.5V$                 | 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<br>$I_O = 10mA, V_{IN} = 5.0V$                 | 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<br>$I_O = 10mA, V_{IN} = 7.0V$                 | 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<br>$I_O = 10mA, 1.5V \leq V_{IN} - V_{OUT} \leq 10V,$                       |       | 0.035 | 0.2 | %  |
|   |              |   | $\Delta V_{OUT}$                       | FSP1117<br>-1.2/1.5/1.8/2.5/<br>3.3<br>$I_O = 10mA, 1.5V \leq V_{IN} - V_{OUT} \leq 10V$ |       | 1     | 6   | mV |
| FSP1117 -5.0<br>$I_O = 10mA, 1.5V \leq V_{IN} - V_{OUT} \leq 10V$ |              |   |  | 1  | 10    | mV    |     |    |
| Load Regulation   | $Reg_{Load}$ | FSP1117 -adj<br>$I_O = 10mA \sim 1A, V_{IN} - V_{OUT} = 2V$ |  | 0.2  | 0.4   | %     |     |    |
|   |              | $I_O = 10mA \sim 1A, V_{IN} - V_{OUT} = 2V$                 |  | 0.1  | 0.3   | %     |     |    |
| Dropout Voltage<br>( $V_{IN} - V_{OUT}$ )                         |              | 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     |     |    |

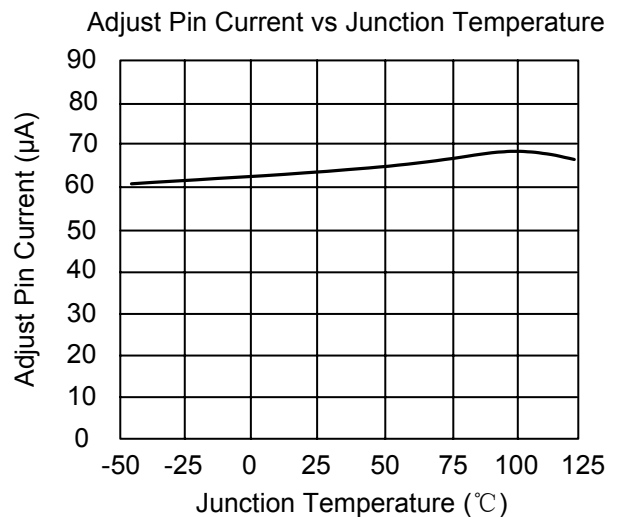
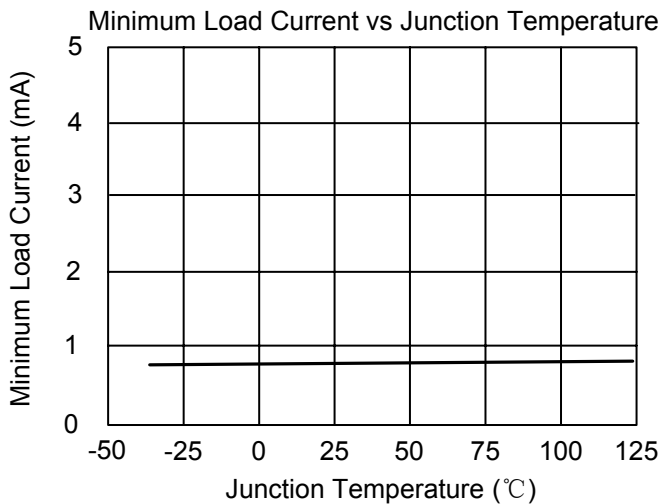
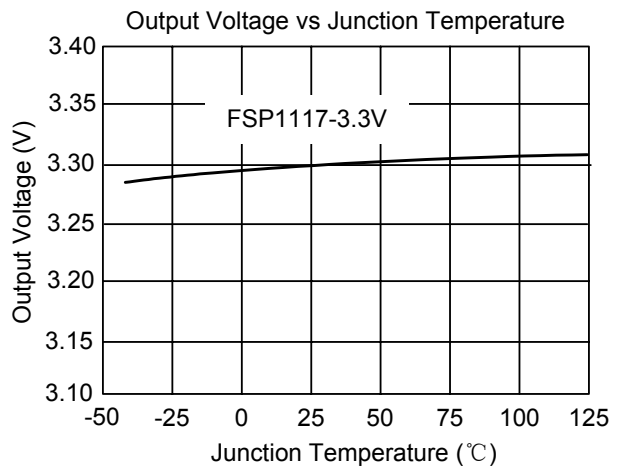
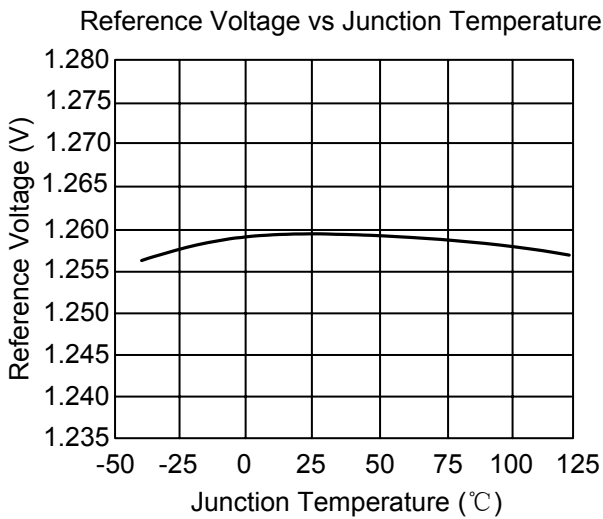
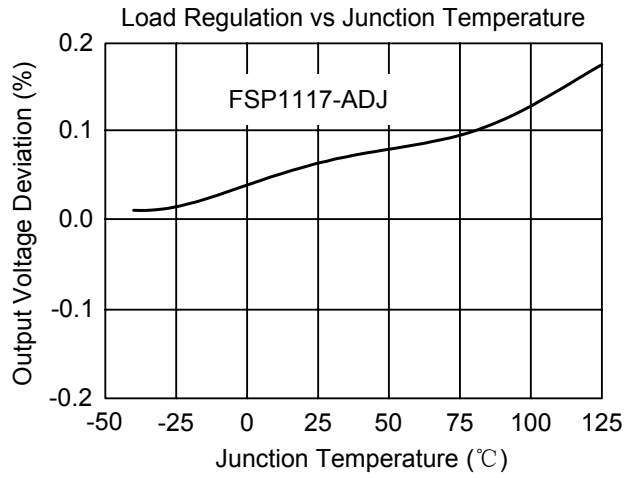
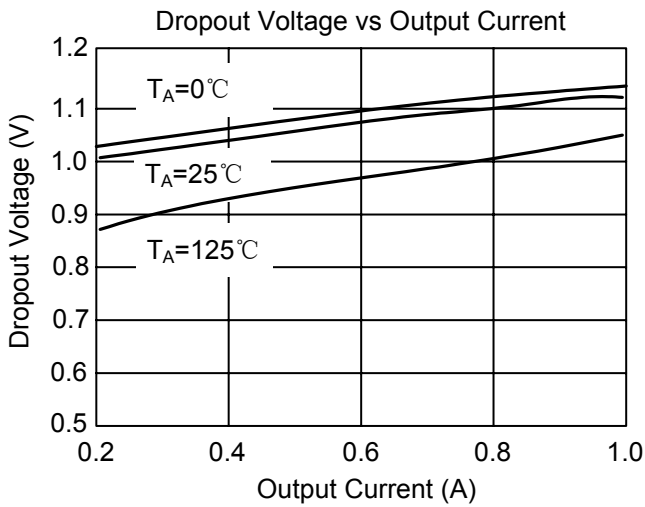
**■ ELECTRICAL CHARACTERISTICS (CONTINUED)**

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

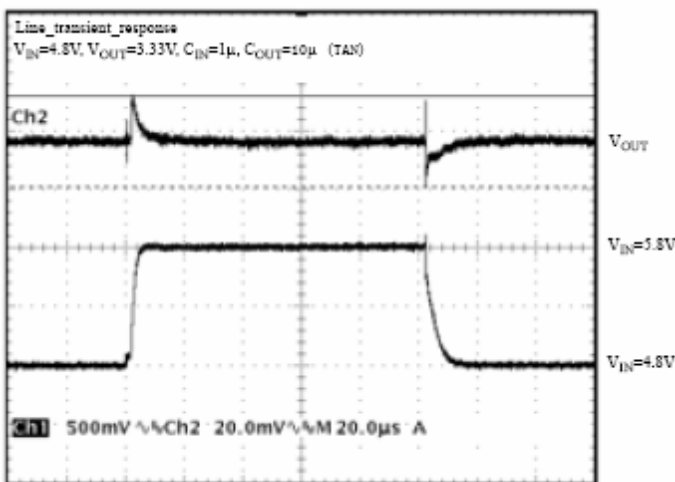
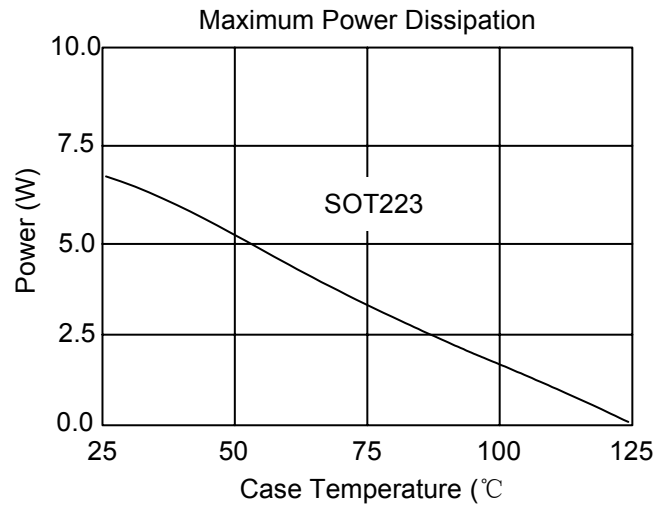
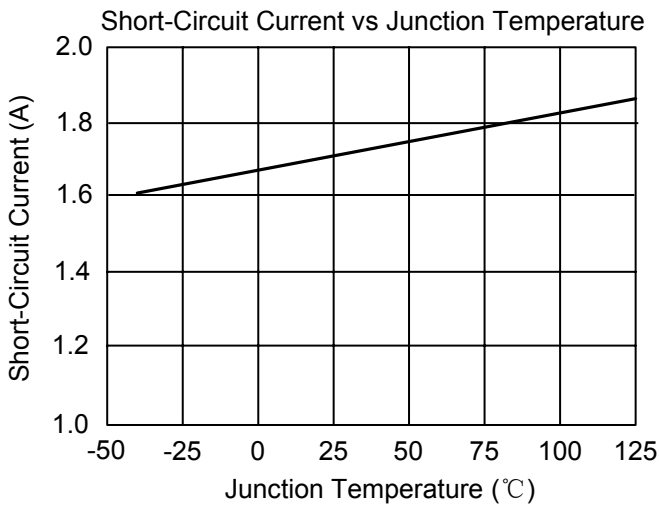
| Parameter                               | Symbol        | Test Condition  | Min.                                  | Typ.  | Max. | Unit           |
|---|---------------|---|---------------------------------------|-------|------|----------------|
| Adjust Pin Current                      |               | $I_O = 10mA \sim 1A$ , $1.5V \leq V_{IN} - V_{OUT} \leq 10V$                            |                                       | 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   | $1.5V \leq V_{IN} - V_{OUT} \leq 10V$ | 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,<br>$V_{IN} - V_{OUT} = 3V$ , $I_{OUT} = 1A$ | 60                                    | 75    |      | dB             |
| Temperature Stability                   |               |   |                                       | 0.5   |      | %              |
| Long-term Stability                     |               | $T_A = 125^\circ C$ , 1000hrs   |                                       | 0.3   |      | %              |
| RMS Output Noise<br>(% of $V_{OUT}$ )   |               | $T_A = 25^\circ C$ , $10Hz \leq f \leq 10kHz$   |                                       | 0.003 |      | %              |
| Thermal Resistance,<br>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<br>Hysteresis          |               |   |                                       | 25    |      | $^\circ C$     |

**■ TYPICAL APPLICATIONS**


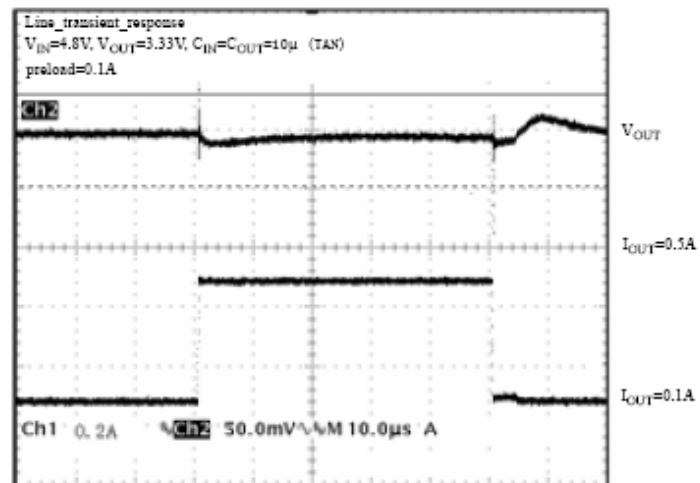
■ TYPICAL PERFORMANCE CHARACTERISTICS



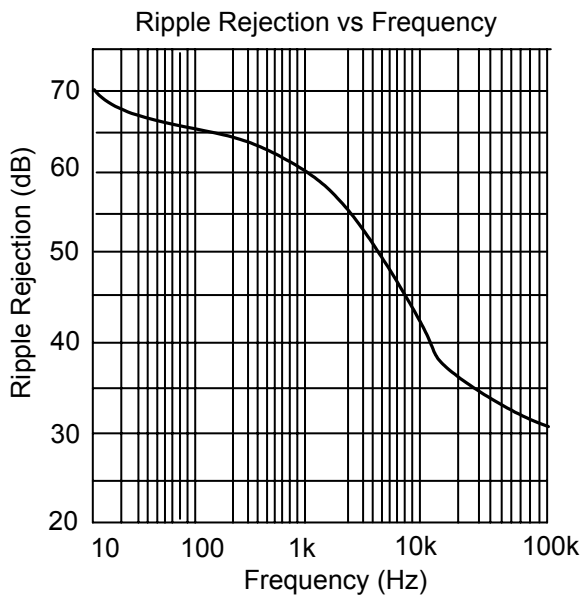
■ TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)



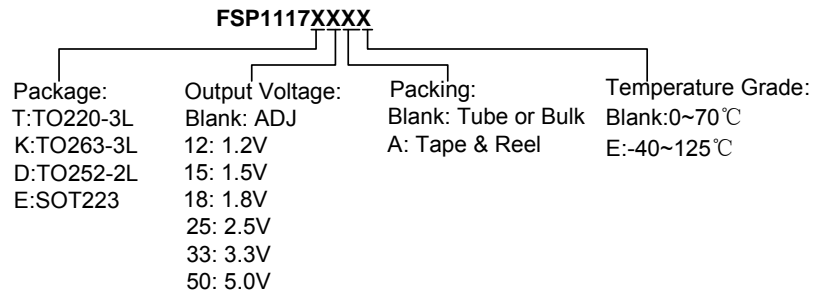
Line Transient Response



Load Transient Response



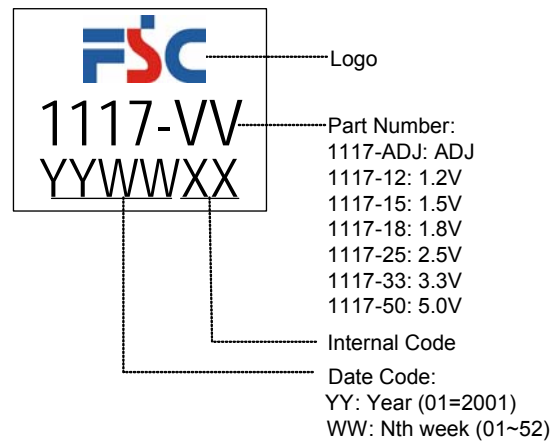
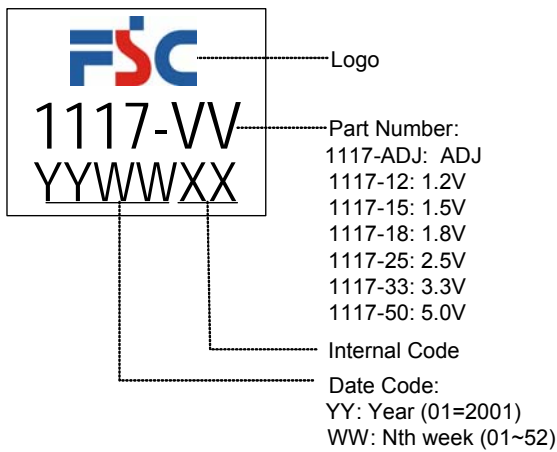
■ ORDERING INFORMATION



■ MARKING INFORMATION

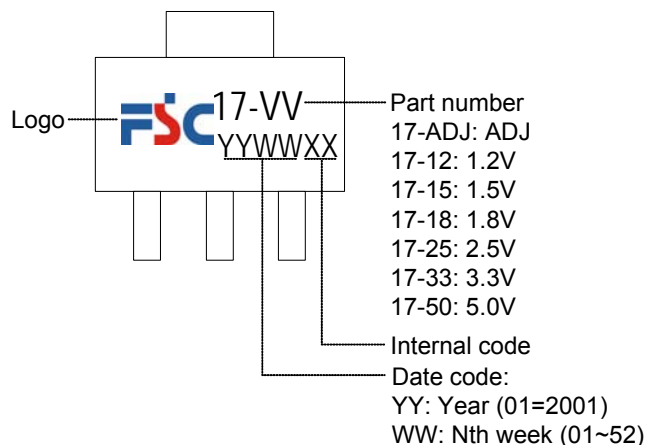
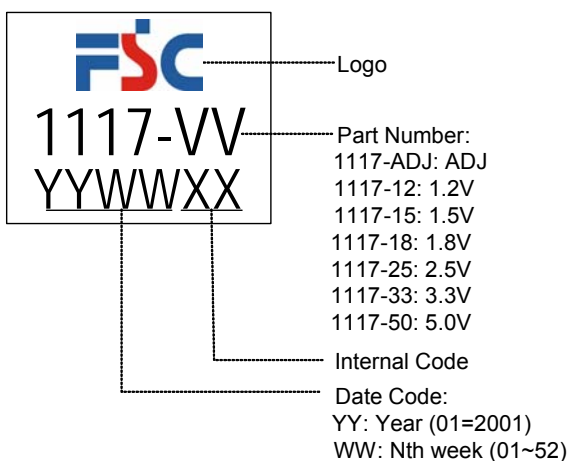
(1)TO220-3L

(2) TO263-3L



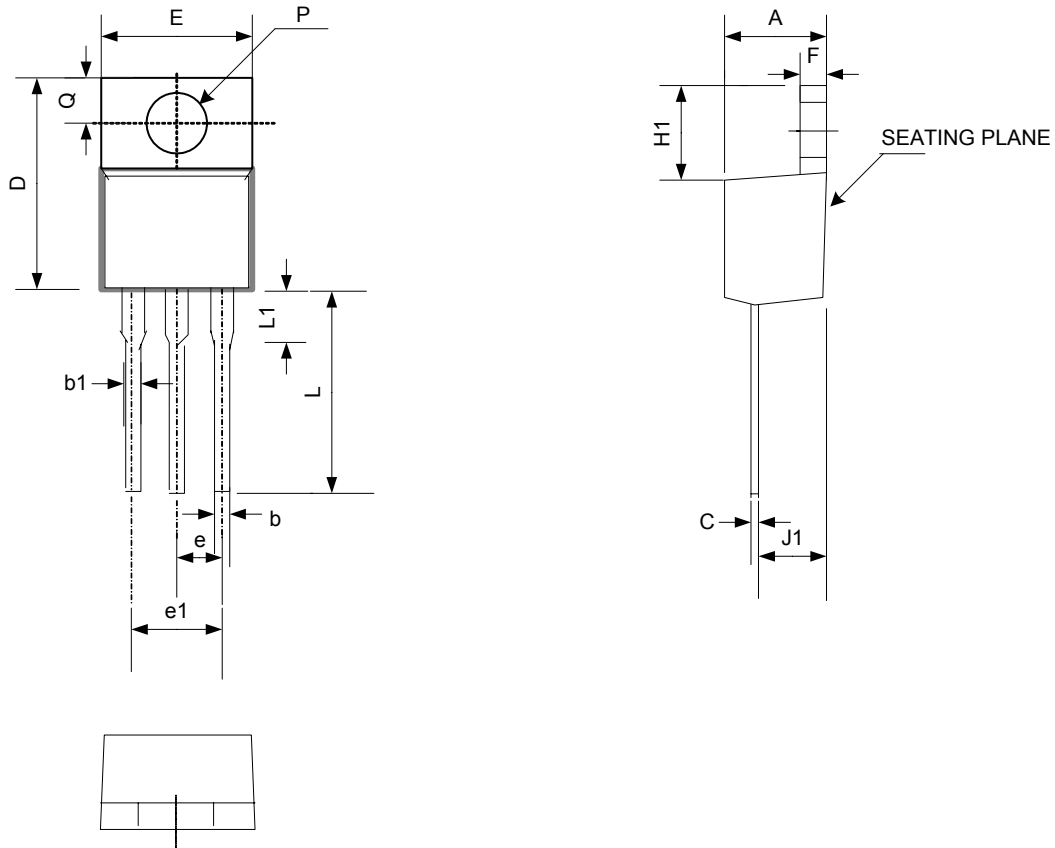
(3) TO252-2L

(4) SOT223



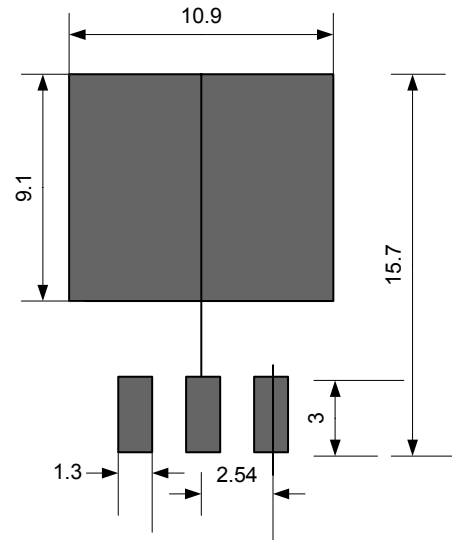
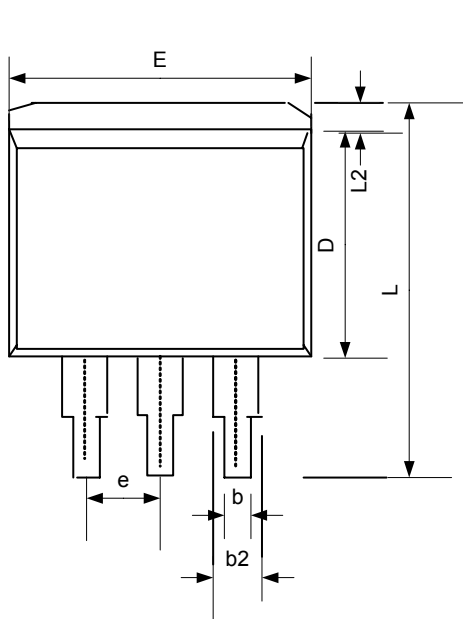
■ PACKAGE INFORMATION

(1) TO220-3L

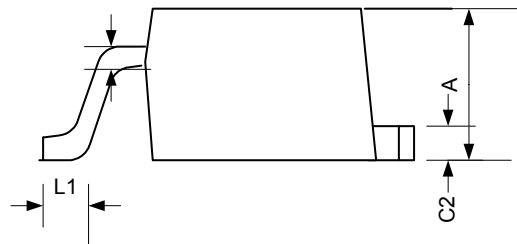
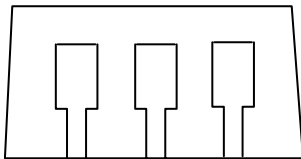


| Symbol | Dimensions In Millimeters |       |       | Dimensions In Inches |       |       |
|--------|---------------------------|-------|-------|----------------------|-------|-------|
|        | Min.                      | Nom.  | Max.  | Min.                 | Nom.  | Max.  |
| A      | 3.55                      | 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



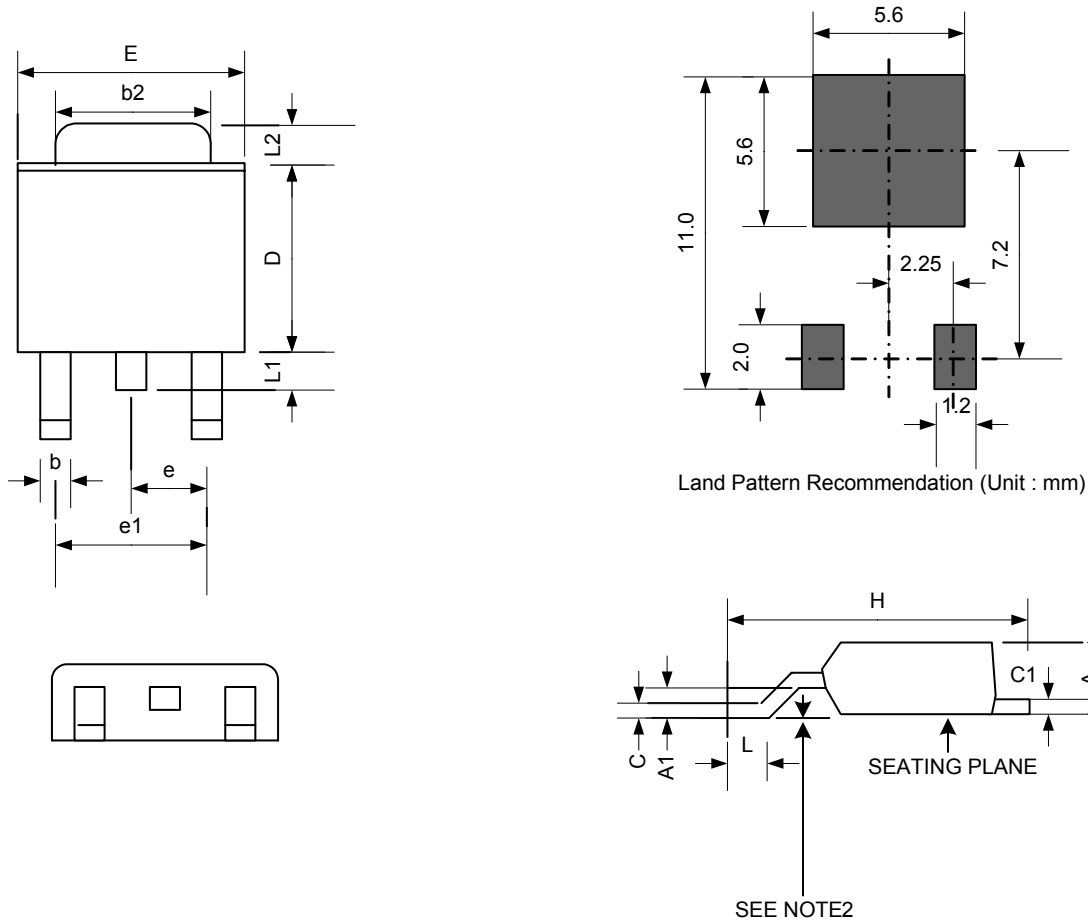
Land Pattern Recommendation (Unit : mm)



| 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

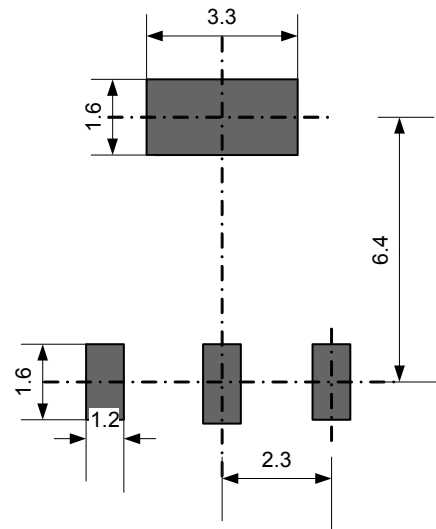
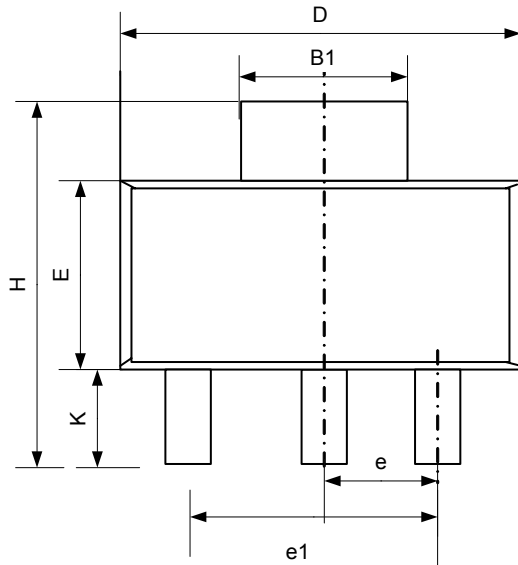


Notes:

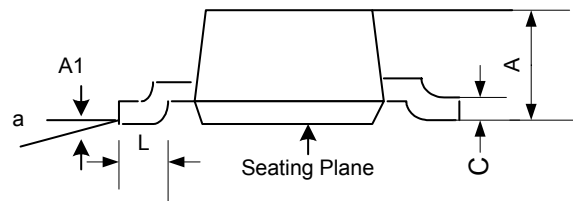
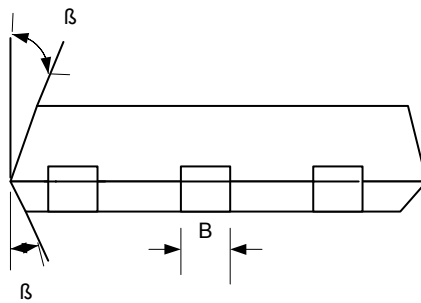
1. JEDEC Outline:TO-252 AB
2. Mils suggested for positive contact at mounting

| 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°   |             |