# FAN1117A

## 1A Adjustable/Fixed Low Dropout Linear Regulator

## Features

- Low dropout voltage
- Load regulation: 0.05% typical
- Trimmed current limit
- On-chip thermal limiting
- Standard SOT-223, TO-220, and TO-252 packages
- Three-terminal adjustable or fixed 1.8V, 2.5V, 2.85V, 3.3V, 5V

## Applications

- Active SCSI terminators
- High efficiency linear regulators
- Post regulators for switching supplies
- Battery chargers
- 12V to 5V linear regulators
- Motherboard clock supplies

## Description

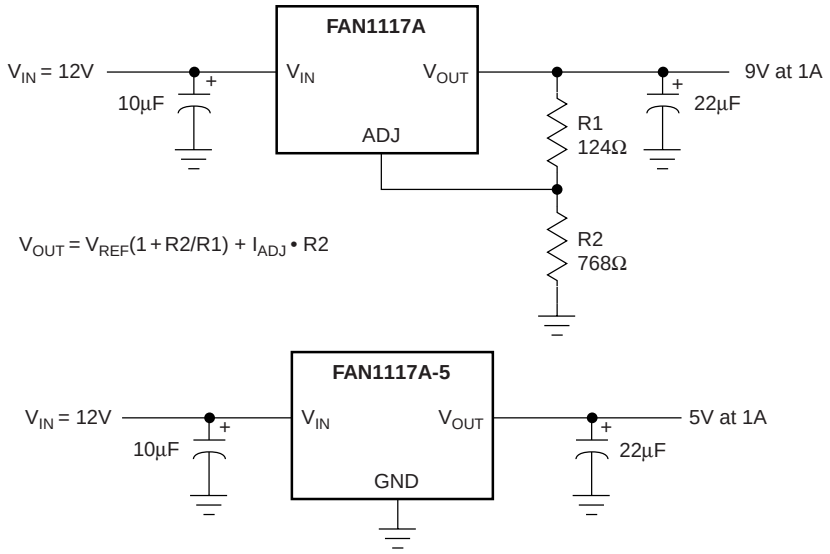
The FAN1117A and FAN1117A-1.8, -2.5, -2.85, -3.3 and -5 are low dropout three-terminal regulators with 1A output current capability. These devices have been optimized for low voltage where transient response and minimum input voltage are critical. The 2.85V version is designed specifically to be used in Active Terminators for SCSI bus.

Current limit is trimmed to ensure specified output current and controlled short-circuit current. On-chip thermal limiting provides protection against any combination of overload and ambient temperatures that would create excessive junction temperatures.

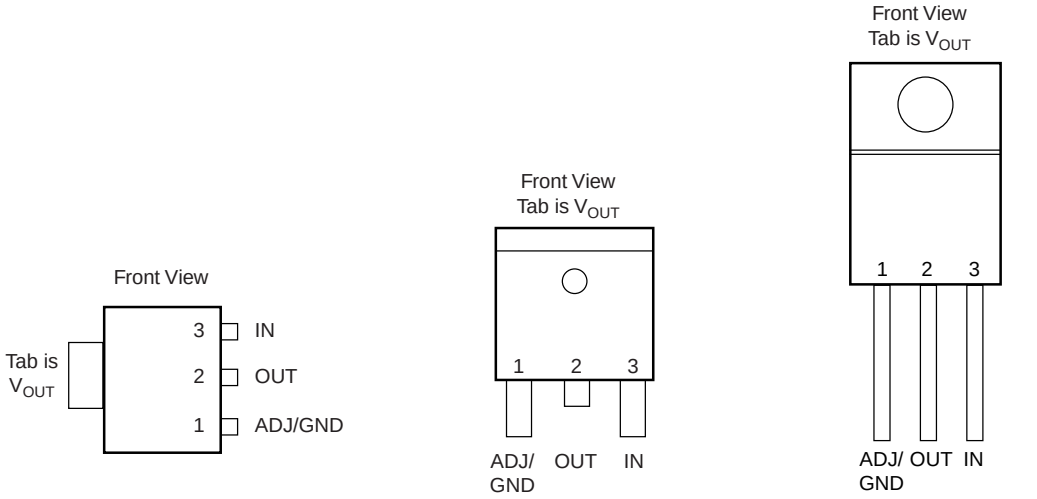
Unlike PNP type regulators where up to 10% of the output current is wasted as quiescent current, the quiescent current of the FAN1117A flows into the load, increasing efficiency.

The FAN1117A series regulators are available in the industry-standard SOT-223, TO-220, and TO-252 (DPAK) power packages.

## Typical Applications



## Pin Assignments




4-Lead Plastic SOT-223
$\Theta_{JC}$ = 15°C/W*

3-Lead Plastic TO-252
$\Theta_{JC}$ = 3°C/W*

3-Lead Plastic TO-220
$\Theta_{JC}$ = 3°C/W*

*With package soldered to 0.5 square inch copper area over backside ground plane or internal power plane, $\Theta_{JA}$ can vary from 30°C/W to more than 50°C/W. Other mounting techniques may provide better thermal resistance than 30°C/W.

## Absolute Maximum Ratings

| Parameter | Min. | Max. | Unit |
|---|---|---|---|
| $V_{IN}$ | | 18 | V |
| $(V_{IN} - V_{OUT}) * I_{OUT}$ | | See Figure 1 | |
| Operating Junction Temperature Range | 0 | 125 | °C |
| Storage Temperature Range | -65 | 150 | °C |
| Lead Temperature (Soldering, 10 sec.) | | 300 | °C |

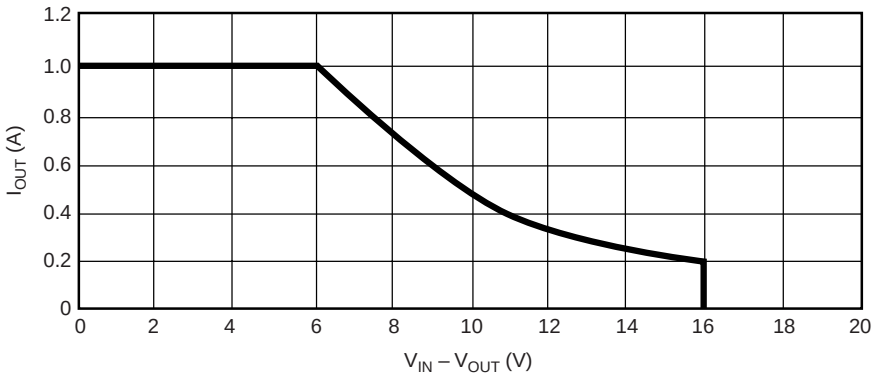



**Figure 1. Absolute Maximum Safe Operating Area**

## Electrical Characteristics

Operating Conditions: $V_{IN} \leq 7V$, $T_J = 25°C$ unless otherwise specified.

The • denotes specifications which apply over the specified operating temperature range.

| Parameter | Conditions | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Reference Voltage[3] | $1.5V \leq (V_{IN} - V_{OUT}) \leq 7V$, $10mA \leq I_{OUT} \leq 1A$ | • | 1.225 (-2%) | 1.250 | 1.275 (+2%) | V |
| Output Voltage[4] | $10mA \leq I_{OUT} \leq 1A$ | | | | | |
| | FAN1117A-1.8, $3.3V \leq V_{IN} \leq 8.8V$ | • | 1.764 | 1.8 | 1.836 | V |
| | FAN1117A-2.5, $4V \leq V_{IN} \leq 9.5V$ | • | 2.450 | 2.5 | 2.550 | V |
| | FAN1117A-2.85, $4.35V \leq V_{IN} \leq 9.85V$ | • | 2.793 | 2.85 | 2.907 | V |
| | FAN1117A-3.3, $4.8V \leq V_{IN} \leq 10.3V$ | • | 3.234 | 3.3 | 3.366 | V |
| | FAN1117A-5, $6.5V \leq V_{IN} \leq 12V$ | • | 4.900 | 5.0 | 5.100 | V |
| Line Regulation[1,2] | $(V_{OUT} + 1.5V) \leq V_{IN} \leq 12V$, $I_{OUT} = 10mA$ | • | | 0.005 | 0.2 | % |
| Load Regulation[1,2] | $(V_{IN} - V_{OUT}) = 2V$, $10mA \leq I_{OUT} \leq 1A$ | • | | 0.05 | 0.5 | % |
| Dropout Voltage | $\Delta V_{REF} = 1\%$, $I_{OUT} = 1A$ | • | | 1.100 | 1.200 | V |
| Current Limit | $(V_{IN} - V_{OUT}) = 2V$ | • | 1.1 | 1.5 | | A |
| Adjust Pin Current[3] | | • | | 35 | 120 | µA |
| Adjust Pin Current Change[3,4] | $1.5V \leq (V_{IN} - V_{OUT}) \leq 7V$, $10mA \leq I_{OUT} \leq 1A$ | • | | 0.2 | 5 | µA |
| Minimum Load Current | $1.5V \leq (V_{IN} - V_{OUT}) \leq 15V$ | • | 10 | | | mA |
| Quiescent Current | $V_{IN} = V_{OUT} + 1.25V$ | • | | 4 | 13 | mA |
| Ripple Rejection | f = 120Hz, $C_{OUT}$ = 22µF Tantalum, $(V_{IN} - V_{OUT}) = 3V$, $I_{OUT} = 1A$ | | 60 | 72 | | dB |
| Thermal Regulation | $T_A = 25°C$, 30ms pulse | | | 0.004 | 0.02 | %/W |
| Temperature Stability | | • | | 0.5 | | % |
| Long-Term Stability | $T_A = 125°C$, 1000hrs. | | | 0.03 | 1.0 | % |
| RMS Output Noise (% of $V_{OUT}$) | $T_A = 25°C$, $10Hz \leq f \leq 10kHz$ | | | 0.003 | | % |
| Thermal Resistance, Junction to Case | SOT-223 | | | 15 | | °C/W |
| | TO-252, TO-220 | | | 3 | | °C/W |
| Thermal Shutdown | Junction Temperature | | | 155 | | °C |
| Thermal Shutdown Hysteresis | | | | 10 | | °C |

**Notes:**

1. See thermal regulation specifications for changes in output voltage due to heating effects. Load and line regulation are measured at a constant junction temperature by low duty cycle pulse testing.
2. Line and load regulation are guaranteed up to the maximum power dissipation (18W). Power dissipation is determined by input/output differential and the output current. Guaranteed maximum output power will not be available over the full input/output voltage range.
3. FAN1117A only.
4. Output current must be limited to meet the absolute maximum ratings of the part.

# Typical Performance Characteristics

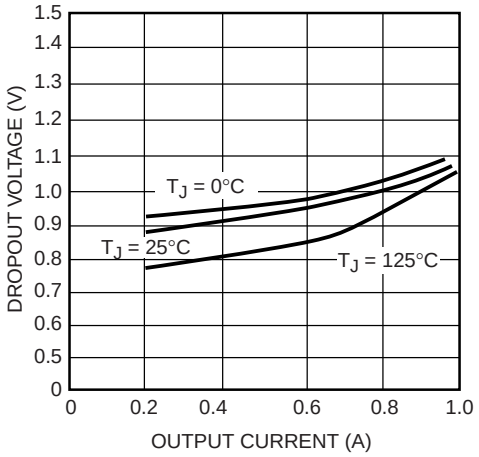



**Figure 2. Dropout Voltage vs. Output Current**

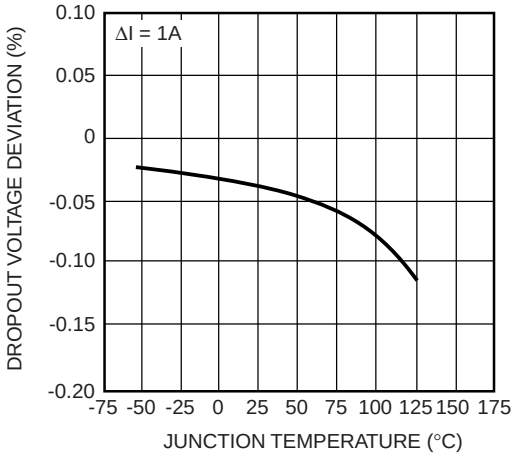



**Figure 3. Load Regulation vs. Temperature**

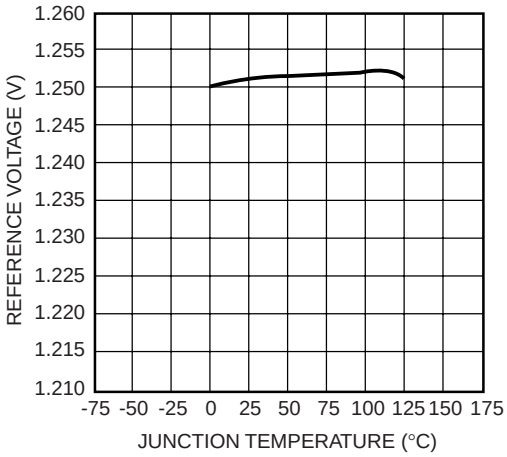



**Figure 4. Reference Voltage vs. Temperature**

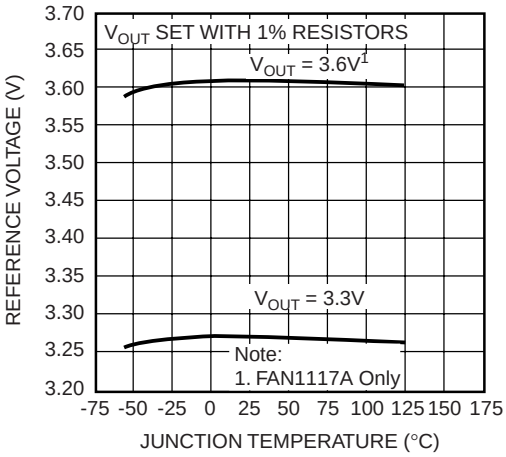



**Figure 5. Output Voltage vs. Temperature**

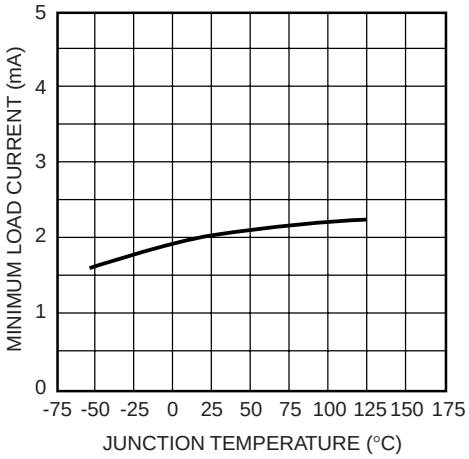



**Figure 6. Minimum Load Current vs. Temperature**

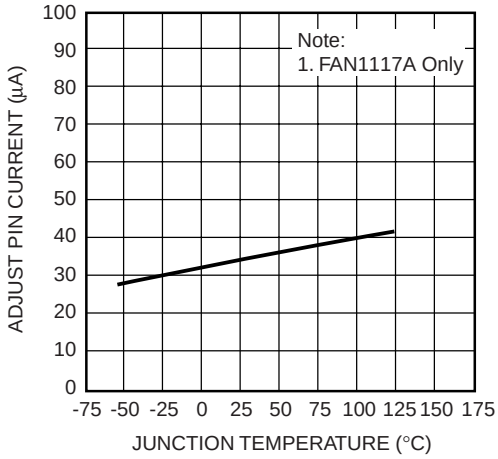



**Figure 7. Adjust Pin Current vs. Temperature**

## Typical Performance Characteristics (continued)

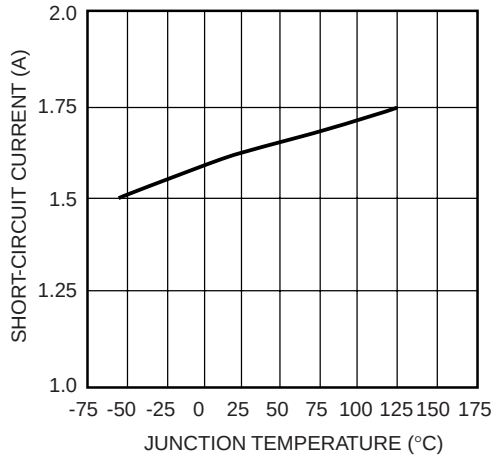



**Figure 8. Short-Circuit Current vs. Temperature**

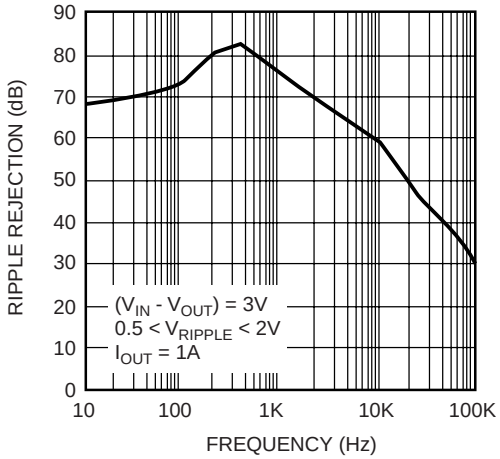



**Figure 9. Ripple Rejection vs. Frequency**

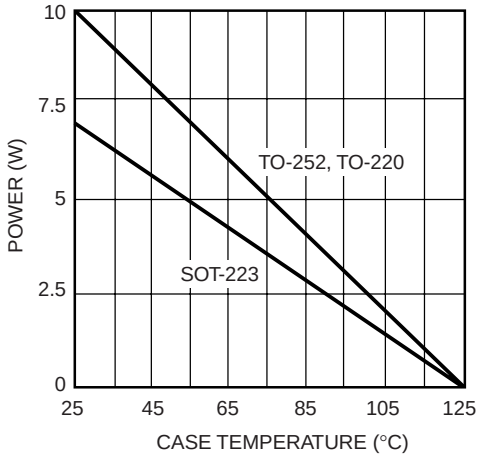



**Figure 10. Maximum Power Dissipation**

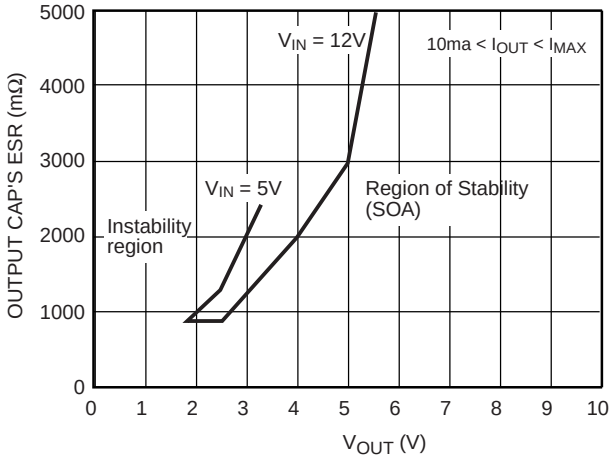
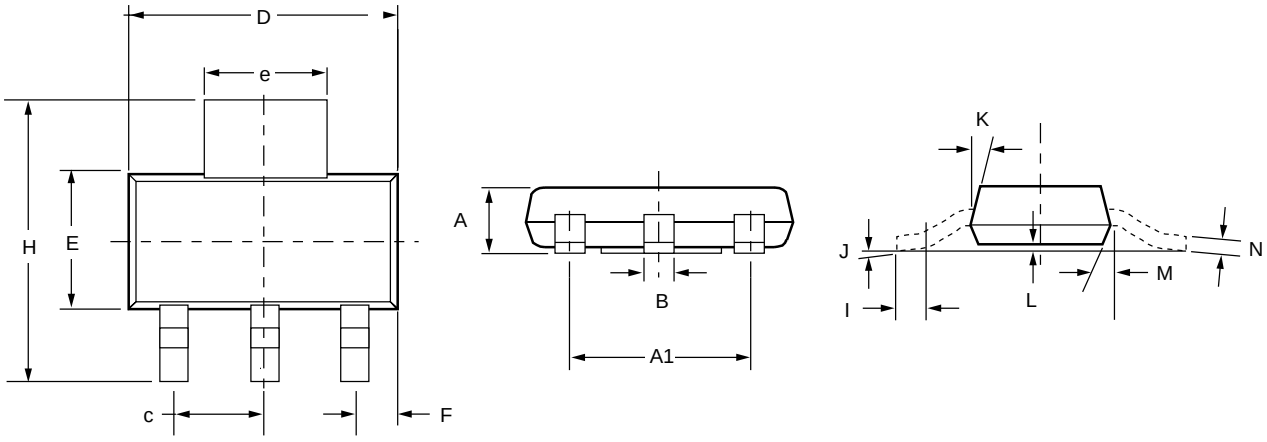



**Figure 11. Stability Region (SOA) vs. ESR of the $C_{OUT}$**

# Mechanical Dimensions

## 4-Lead SOT-223 Package

| Symbol | Inches | | Millimeters | | Notes |
|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | |
| A | — | .071 | — | 1.80 | |
| A1 | — | .181 | — | 4.80 | |
| B | .025 | .033 | .640 | .840 | |
| c | — | .090 | — | 2.29 | |
| D | .248 | .264 | 6.30 | 6.71 | |
| E | .130 | .148 | 3.30 | 3.71 | |
| e | .115 | .124 | 2.95 | 3.15 | |
| F | .033 | .041 | .840 | 1.04 | |
| H | .264 | .287 | 6.71 | 7.29 | |
| I | .012 | — | .310 | — | |
| J | — | 10° | — | 10° | |
| K | 10° | 16° | 10° | 16° | |
| L | .0008 | .0040 | .0203 | .1018 | |
| M | 10° | 16° | 10° | 16° | |
| N | .010 | .014 | .250 | .360 | |

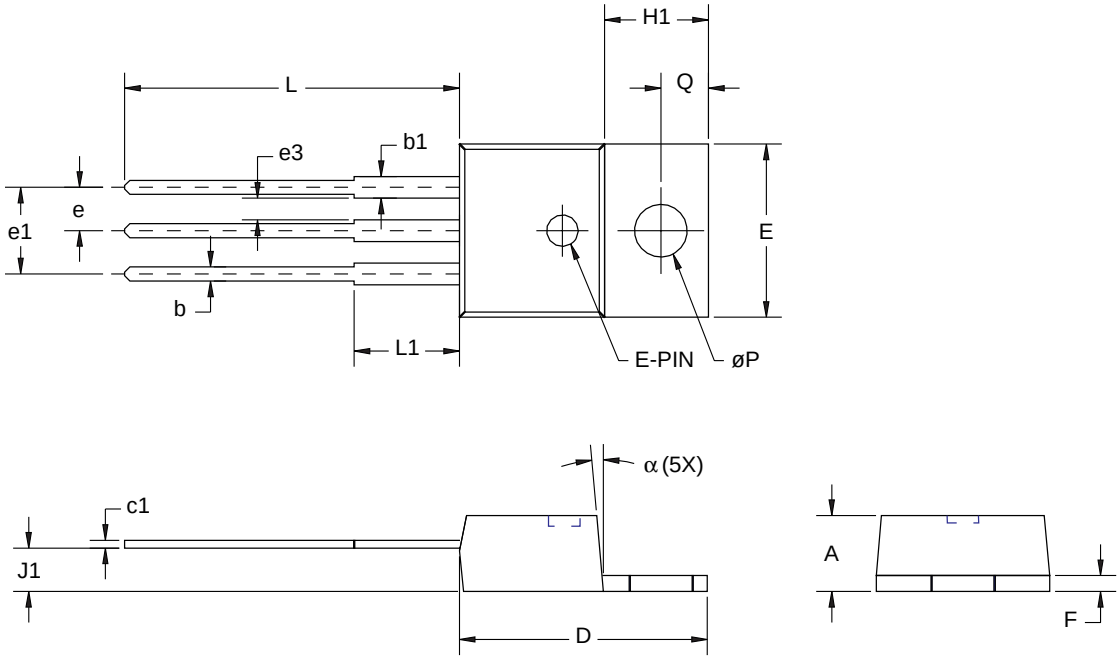


# Mechanical Dimensions (continued)

## 3-Lead TO-220 Package

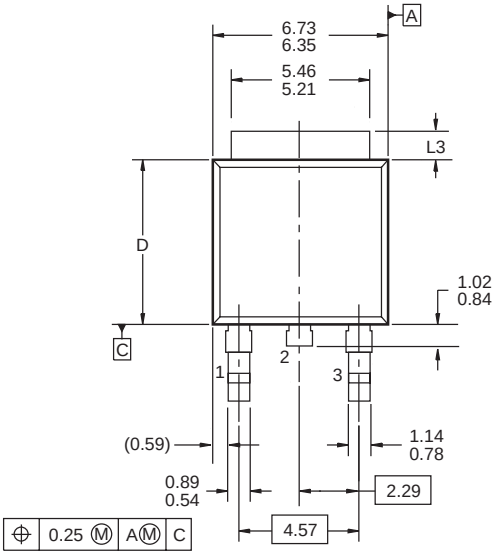
| Symbol | Inches | | Millimeters | | Notes |
|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | |
| A | .140 | .190 | 3.56 | 4.83 | |
| b | .015 | .040 | .38 | 1.02 | |
| b1 | .045 | .070 | 1.14 | 1.78 | |
| c1 | .014 | .022 | .36 | .56 | |
| øP | .139 | .161 | 3.53 | 4.09 | |
| D | .560 | .650 | 14.22 | 16.51 | |
| E | .380 | .420 | 9.65 | 10.67 | |
| e | .090 | .110 | 2.29 | 2.79 | |
| e1 | .190 | .210 | 4.83 | 5.33 | |
| e3 | .045 | — | 1.14 | — | |
| F | .020 | .055 | .51 | 1.40 | |
| H1 | .230 | .270 | 5.94 | 6.87 | |
| J1 | .080 | .115 | 2.04 | 2.92 | |
| L | .500 | .580 | 12.70 | 14.73 | |
| L1 | .250 BSC | | 6.35 BSC | | |
| Q | .100 | .135 | 2.54 | 3.43 | |
| α | 3° | 7° | 3° | 7° | |

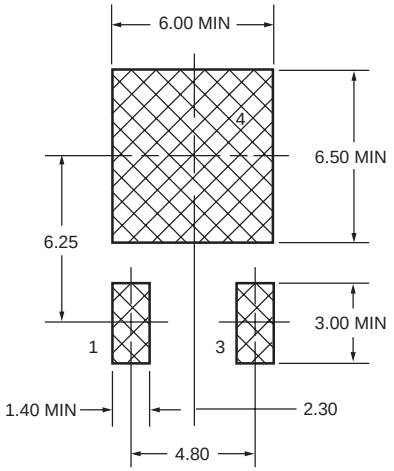
**Notes:**
1. Dimension c1 apply for lead finish.



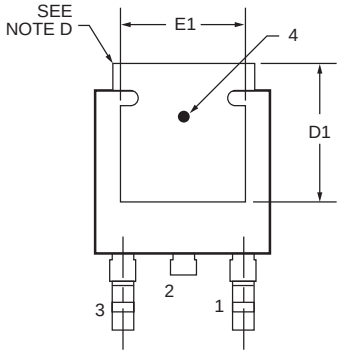
# Mechanical Dimensions (continued)

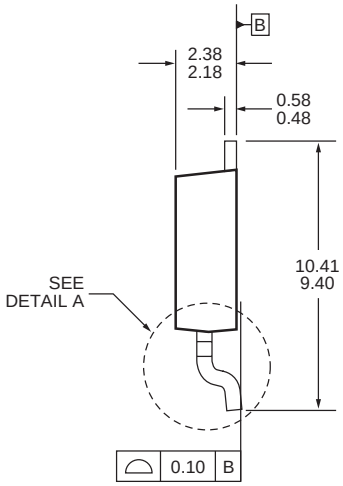
## 3-Lead TO-252 Package

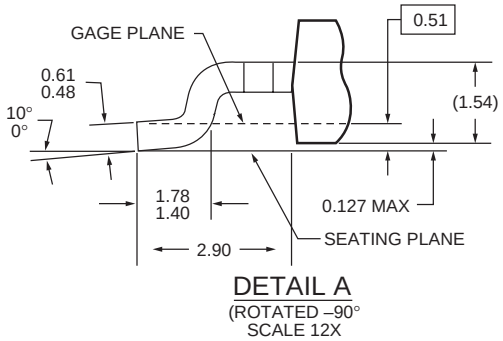



LAND PATTERN RECOMMENDATION




DETAIL A
(ROTATED –90°
SCALE 12X

NOTES: UNLESS OTHERWISE SPECIFIED

A) ALL DIMENSIONS ARE IN MILLIMETERS.

B) THIS PACKAGE CONFORMS TO JEDEC, TO-252, ISSUE C. VARIATION AA & AB, DATED NOV. 1999.

C) DIMENSIONING AND TOLERANCING PER ASME Y14.5–1994.

D) HEAT SINK TOP EDGE COULD BE IN CHAMFERED CORNERS OR EDGE PROTRUSION.

E) DIMENSIONS L3, D, E1 & D1 TABLE:

| | OPTION AA | OPTION AB |
|---|---|---|
| L3 | 0.89 – 1.27 | 1.52 – 2.03 |
| D | 5.97 – 6.22 | 5.33 – 5.59 |
| E1 | 4.32 MIN | 3.81 MIN |
| D1 | 5.21 MIN | 4.57 MIN |

## Ordering Information

| Product Number | Package |
|---|---|
| FAN1117ADX | TO-252 in tape and reel |
| FAN1117ASX | SOT-223 in tape and reel |
| FAN1117AD18X | TO-252 in tape and reel |
| FAN1117AS18X | SOT-223 in tape and reel |
| FAN1117AD25X | TO-252 in tape and reel |
| FAN1117AS25X | SOT-223 in tape and reel |
| FAN1117AD285 | TO-252 |
| FAN1117AS285 | SOT-223 |
| FAN1117AD33X | TO-252 in tape and reel |
| FAN1117AS33X | SOT-223 in tape and reel |
| FAN1117AT | TO-220 |
| FAN1117AT18 | TO-220 |
| FAN1117AT25 | TO-220 |
| FAN1117AT33 | TO-220 |
| FAN1117AD5X | TO-252 in tape and reel |
| FAN1117AS5X | SOT-223 in tape and reel |

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