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Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

FAN1950/FAN1951

1.5A Low-Voltage Low-Dropout Regulator

Features

- 1.5A minimum guaranteed output current
- 500mV maximum dropout at 1.5A
  Ideal for 2.5V to 1.8V or 1.65V conversion
  Ideal for 3.0V to 2.5V conversion
- Current Limiting and Thermal shutdown
- External Shut-down control (FAN1951 only)
- Error flag output (FAN1951 only)
- Fast transient response
- Low ground current

Applications

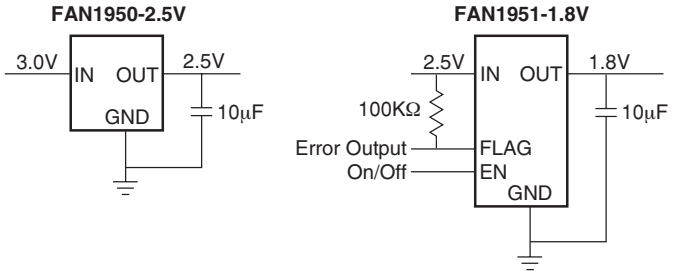
- General purpose conversion for low-voltage CPUs, DSP and FPGAs
- SMPS post regulator
- Cable/Satellite set-top boxes
- PCI Graphics adapter cards

General Description

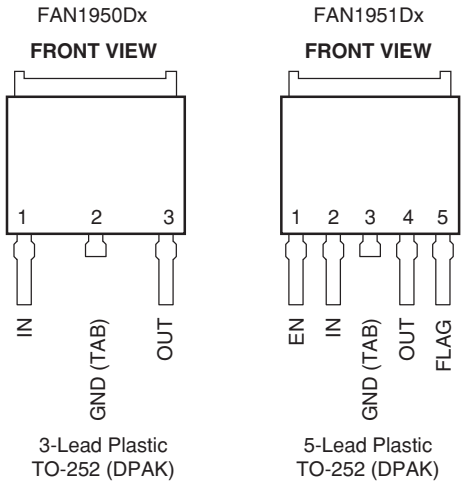
The FAN1950 and FAN1951 are 1.5A low-dropout linear regulators that provide a low voltage, high current output with a minimum of external components. Both of these devices use a PNP output pass element achieving a maximum 500mV dropout at 1.5A load current. In addition these devices offer overcurrent limit and thermal shutdown features to ensure full protection.

The FAN1951 offers a logic level enable pin and an error flag output to indicate undervoltage and over-current conditions. 1.8V and 2.5V fixed output versions are available. 3.3V, 1.65V and 1.5V options are available upon request.

Typical Application



Pin Assignments



Pin Descriptions

Pin Number		Pin Name	Pin Function Description
FAN1950	**FAN1951**		
NA	1	EN	**Enable (Input) – TTL/CMOS compatible input.** Logic HIGH enables the output
1	2	IN	**Input Supply Voltage**
2	3	GND	**Ground.** This pin and TAB are ground.
3	4	OUT	**Output Voltage**
NA	5	FLAG	**Error Flag (Output).** Open-collector output. Active-low indicates an output fault condition.

Absolute Maximum Ratings

Absolute maximum ratings are the values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

Parameter	Min.	Typ.	Max.	Units
Supply Voltage: IN	-0.2		15	V
Enable Voltage: EN	-0.2		15	V
FLAG voltage: FLAG	-0.2		15	V
Junction Temperature (T_J)	–55		150	°C
Storage Temperature	–65		150	°C
Lead Soldering Temperature, 10 seconds			300	°C
Power Dissipation (P_D)			Internally Limited	W

Recommended Operating Conditions

Parameter	Conditions	Min.	Typ.	Max.	Units
Supply Voltage		2.25		14	V
Package Thermal Resistance (θ_{JC})	TO-252		3		°C/W
Junction Operating Temperature		-40		125	°C

Electrical Specifications

($V_{IN} = V_{OUT} + 1V$, $V_{EN} = 2.5V$, $T_j = +25°C$ unless specified otherwise)
The • denotes specifications which apply over the full operating temperature range.

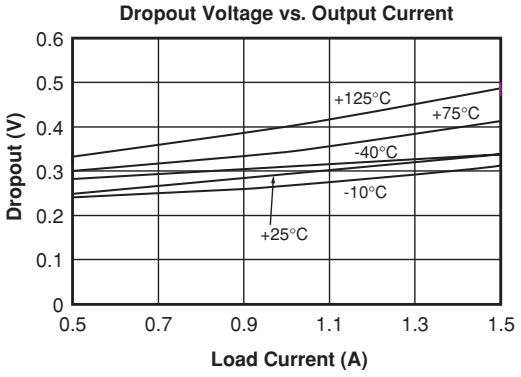
Parameter	Conditions		Min.	Typ.	Max.	Units
Output Voltage (V_{OUT}) Tolerance	$10mA \le I_{OUT} \le 1.0A$, $10mA \le I_{OUT} \le 1.5A$, $V_{OUT} + 1V \le V_{IN} \le 8V$	• •	-2 -2.5		2 2.5	%
Line Regulation[1,2]	$I_{OUT} = 10mA$, $V_{OUT} + 1V \le V_{IN} \le 14V$			.06	0.5	%
Load Regulation[1,2]	$V_{IN} = V_{OUT} + 1V$, $10mA \le I_{OUT} \le 1.5A$			0.2	1	%
Dropout Voltage[3]	$I_{OUT} = 1.5A$, $\Delta V_{OUT} = -1\%$	 •		350	 500	mV
Ground Current	$I_{OUT} = 750mA$ $I_{OUT} = 1.5A$	•		10 20	20	mA mA
Minimum Load Current	$V_{OUT} + 1V \le V_{IN} \le 8V$	•		5	10	mA
Current Limit	$V_{OUT} = 0V$, $V_{IN} = V_{OUT} + 1V$	•		2.5		A
EN Input Voltage (FAN1951 only)	V_{IH} (On) V_{IL} (Off)	• •	2.25		 0.8	V V
EN Input Current (FAN1951 only)	I_{IH}, $V_{EN} = 2.25V$ I_{IL}, $V_{EN} = 0.8V$	• •			30 4	µA µA
FLAG Threshold Voltage (FAN1951 only)	Low threshold, % V_{OUT} High threshold, % V_{OUT} Hysteresis			93 1	 99.2	% % %
FLAG Output Leakage Current[4] (FAN1951 only)	$V_{FLAG} = 14V$	•			2	µA
FLAG Output-Low Voltage (FAN1951 only)	$I_{OL} = 250µA$	•			400	mV

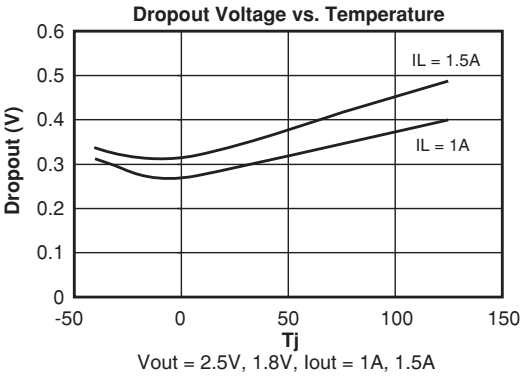
Parameter	Conditions		Min.	Typ.	Max.	Units
Thermal Shutdown Temperature				150		°C
Thermal Shutdown Hysteresis				10		°C
Shutdown output current	$V_{EN} \leq 0.8V$, $V_{IN} \leq 8V$, $V_{OUT} = 0V$	•			20	µA

Notes:

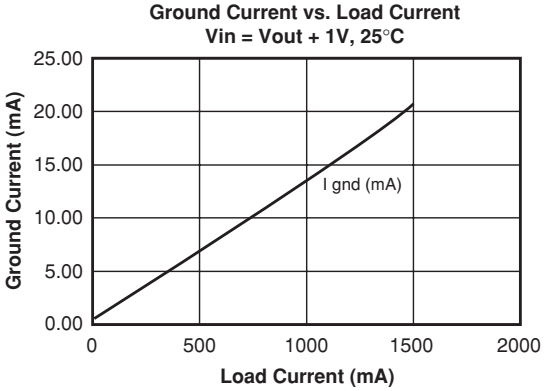
1. See thermal regulation specifications for changes in output voltage due to heating effects. Load and line regulation are measured at a constant junction temperature by low duty cycle pulse testing.
2. Line and load regulation are guaranteed up to the maximum power dissipation. Power dissipation is 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. Dropout voltage = $V_{IN} – V_{OUT}$ when V_{OUT} decreases to 98% of its nominal output voltage with $V_{IN} = V_{OUT} + 1V$. For output voltages below 2.25V, dropout voltage is the input-to-output voltage differential with the minimum input voltage being 2.25V. Minimum input operating voltage is 2.25V.
4. Flag output cannot be pulled to a voltage higher than V_{IN}.

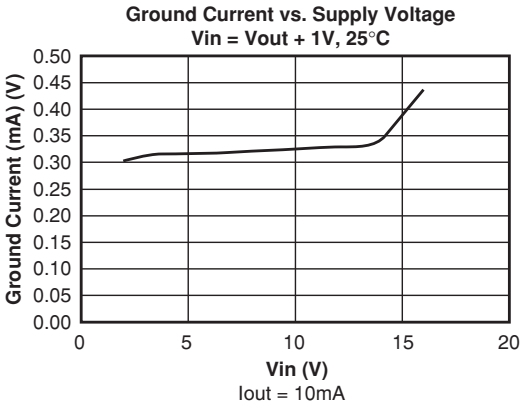
Typical Performance Characteristics





Vout = 2.5V, 1.8V, Iout = 1A, 1.5A

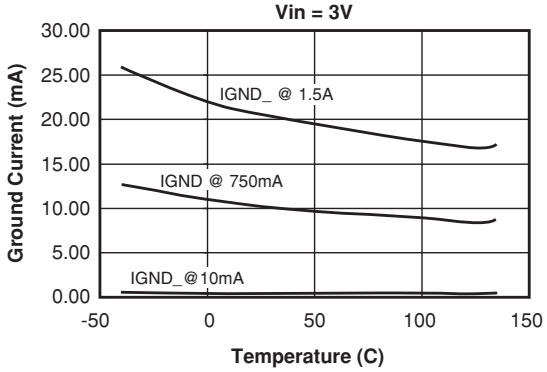




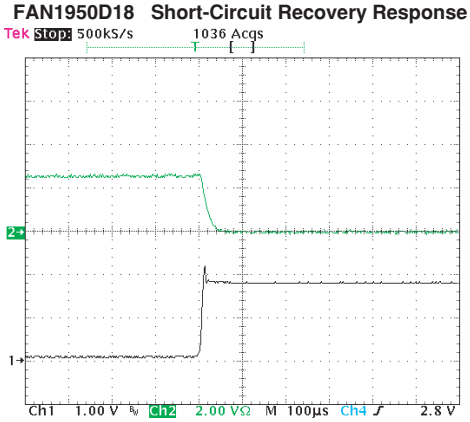
Iout = 10mA

Typical Performance Characteristics (continued)

Ground Current vs. Temperature
Vin = 3V

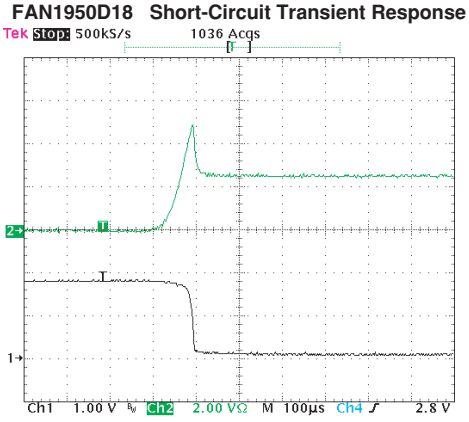


FAN1950D18 Short-Circuit Recovery Response



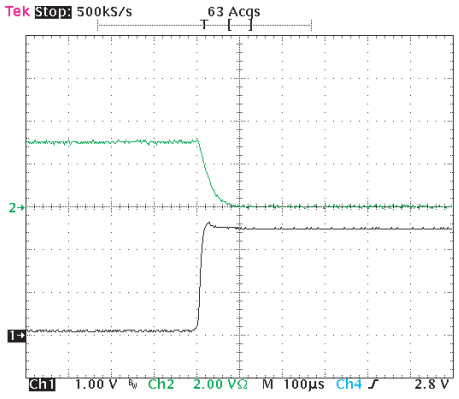
Vin = 3V, Vout = 1.8V
Ch.1 – Vout (1V/div) Ch.2 – Load Current (2A/div)

FAN1950D18 Short-Circuit Transient Response



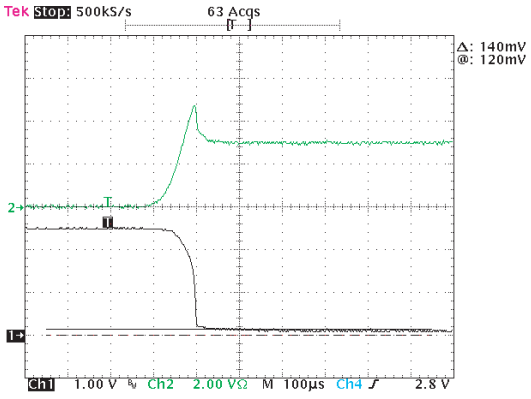
Vin = 3V, Vout = 1.8V
Ch.1 – Vout (1V/div) Ch.2 – Load Current (2A/div)

FAN1950D25 Short-Circuit Recovery Response



Vin = 3V, Vout = 2.5V
Ch.1 – Vout (1V/div) Ch.2 – Load Current (2A/div)

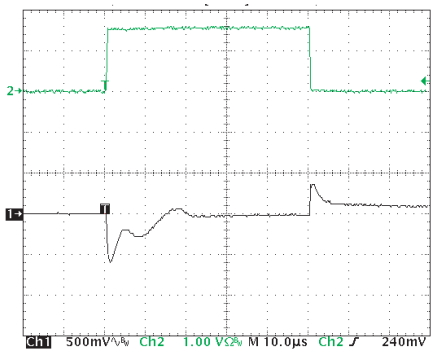
FAN1950D25 Short-Circuit Transient Response



Vin = 3V, Vout = 2.5V
Ch.1 – Vout (1V/div) Ch.2 – Load Current (2A/div)

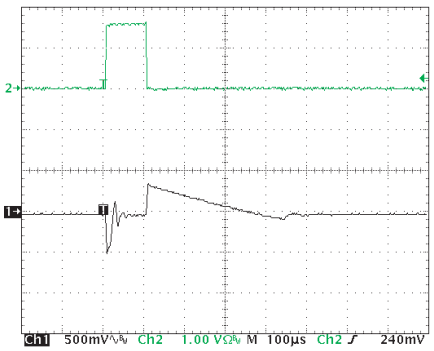
Typical Performance Characteristics (continued)

Load Transient Response
Vin=2.5V, Vout=1.8V, Cin=10μF Ceramic



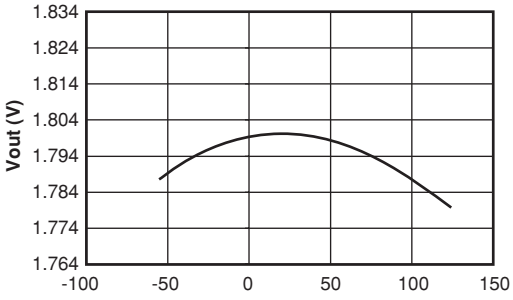
Cout = 10μF Tantalum (ESR~700mΩ)
Ch1 – Vout (AC, 0.5V/div) Ch2 – Load Current (1A/div.)

Load Transient Response
Vin=2.5V, Vout=1.8V, Cin=10μF Ceramic



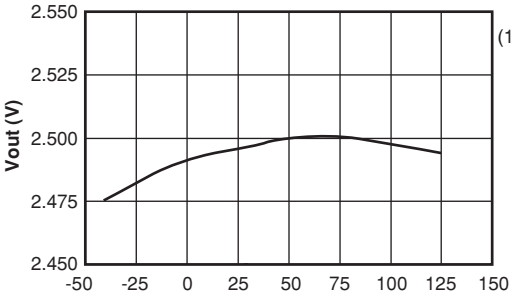
Cout = 10μF Ceramic
Ch1 – Vout (AC, 0.5V/div.) Ch2 – Load Current (1A/div.)

Vout vs. Temperature



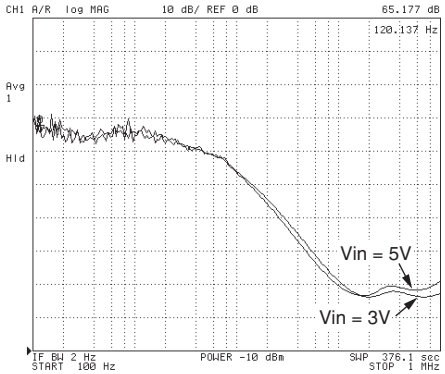
Iout = 10 mA; Vout = 1.8V

Vout vs. Temperature (°C)



Iout = 10 mA; Vout = 2.5V

FAN1950D18 Ripple Rejection (PSRR)



Vin = 3V and 5V Vout = 1.8V Iload = 1A
Cin = Cout = 10μF/ 6.3V Tantalum
PSRR – 10dB/div

FAN1950D25 Ripple Rejection (PSRR)

Vin = 5V Vout = 2.5V Iload = 1A
Cin = Cout = 10μF/ 6.3V Tantalum
PSRR – 10dB/div

Input and Output Capacitor Requirements

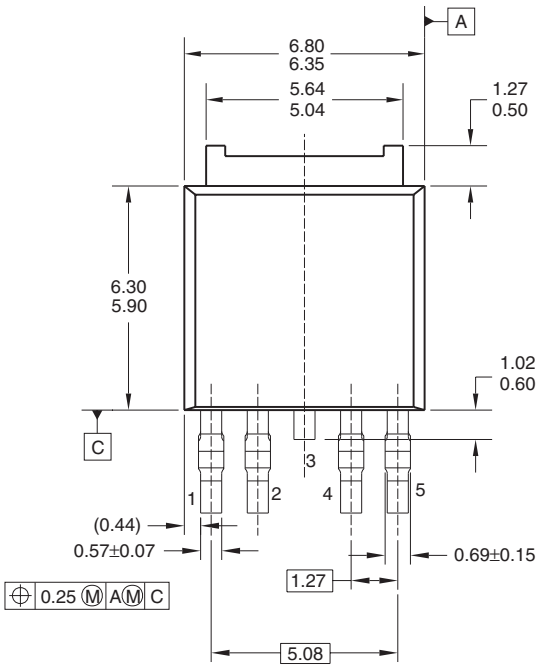
A 4.7µF or greater Input Capacitor (Ceramic or Tantalum), installed closely between V_{IN} and GND leads of the part, is required for stability, better transient response, noise and ripple rejection. A higher value of electrolytic input capacitor can be recommended if the bulk capacitor of the power supply is located more than 3– 4 inches from the device or a large and fast-rise-time load is a requirement.

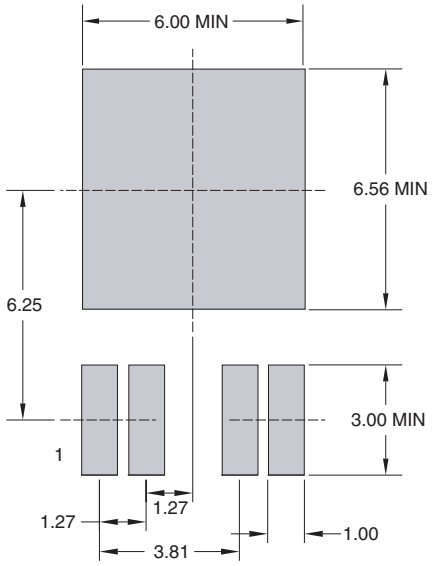
FAN1950 and FAN1951, as most of LDO regulators, require an Output Capacitor. The recommended value of this capacitor is 10µF. The larger capacitor will additionally improve the Transient Response, Ripple Rejection and output noise. The low-ESR Tantalum capacitors are the best for this application: they provide stable work and good transient response over the temperature range. Using the Ceramic capacitors as the Output capacitor can provoke instability (oscillation in the Output Voltage).

Aluminum electrolytic capacitors also can be used if their ESR is below 3Ω.

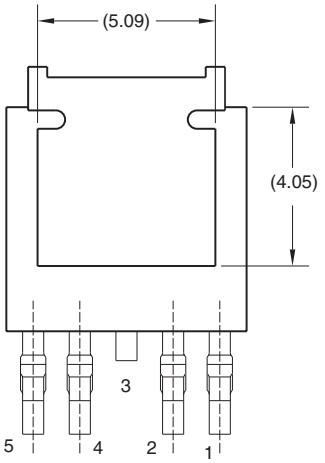
Mechanical Dimensions

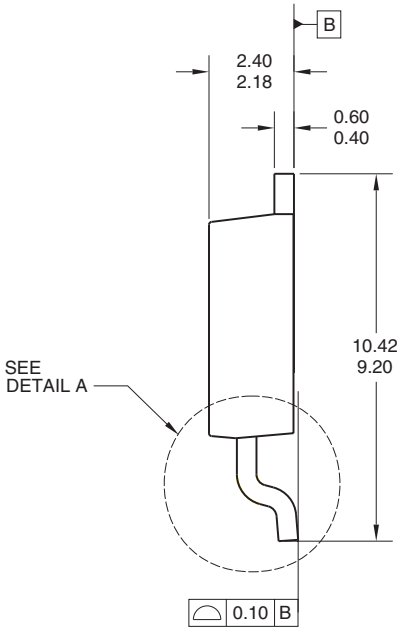
5-Lead TO-252 DPAK Package

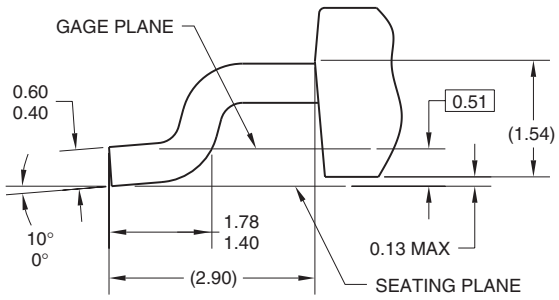




LAND PATTERN RECOMMENDATION







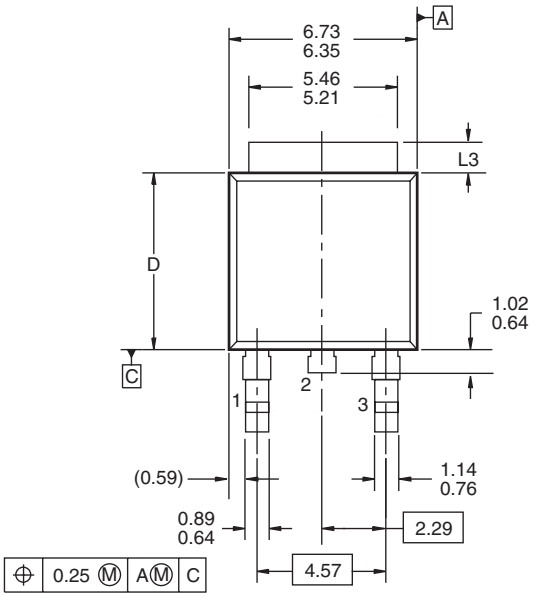
DETAIL A
(ROTATED 90°)
SCALE: 2X

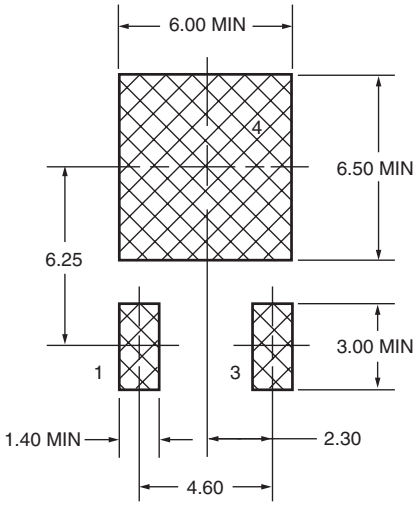
NOTES: UNLESS OTHERWISE SPECIFIED

A) ALL DIMENSIONS ARE IN MILLIMETERS.
B) THIS PACKAGE CONFORMS TO JEDEC, TO-252, ISSUE C, VARIATION AA, DATED NOV. 1999.

Mechanical Dimensions

3-Lead TO-252 DPAK Package





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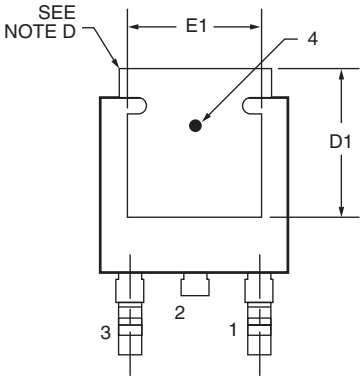

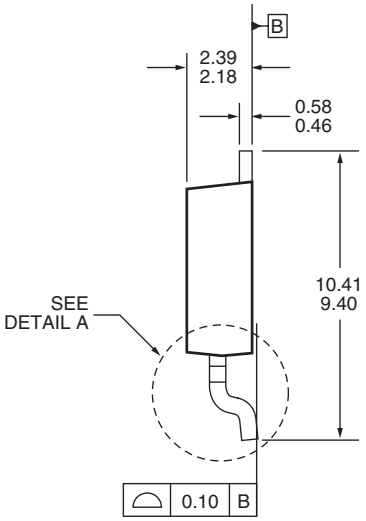

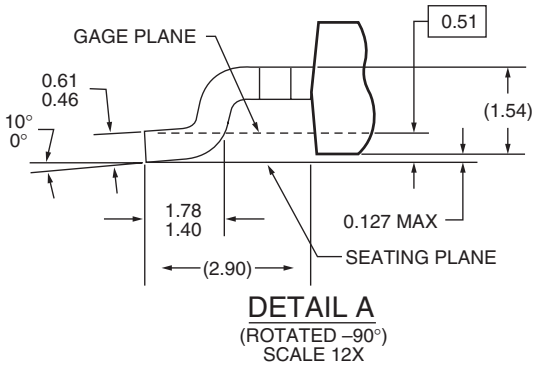

DETAIL A
(ROTATED –90°)
SCALE 12X

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

Part Number	Output Voltage	Package
FAN1951D18X	1.8V	5 Lead TO-252 DPAK in Tape and Reel
FAN1951D25X	2.5V	5 Lead TO-252 DPAK in Tape and Reel
FAN1950D25X	2.5V	3 Lead TO-252 DPAK in Tape and Reel

Note: Please contact sales for other voltage and package options.

8/30/04 0.0m 005
Stock#DS30001950