

FAN1654

1.5A LDO, DDR Bus Termination Regulator

Features

- Sinks and sources 1A continuous, 1.5A peak
- -40°C to +125°C Operating Range
- Load regulation: $(VDDQ/2) \pm 40mV$
- 5mA VREF buffer tracks VTT
- On-chip thermal limiting
- Power-enhanced eTSSOP™-16 package
- Low Current Shutdown Mode
- Output Short Circuit Protection

Applications

- DDR terminators

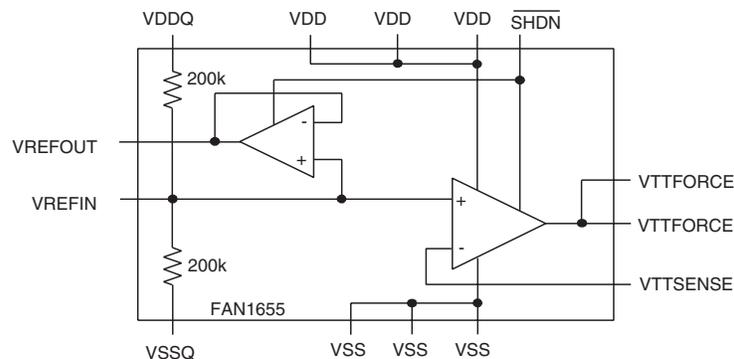
Description

The FAN1654 is a low-cost bi-directional LDO specifically designed for terminating DDR memory bus. It can both sink and source up to 1A continuous, 1.5A peak, providing enough current for most DDR applications. Load regulation meets the JEDEC spec, $VTT = (VDDQ/2) \pm 40mV$.

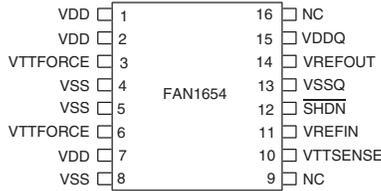
The FAN1654 includes a buffered reference voltage capable of supplying up to 5mA current. On-chip thermal limiting provides protection against a combination of power overload and ambient temperature that would create an excessive junction temperature. A shutdown input puts the FAN1654 into a low power mode for laptop computer applications.

The FAN1654 regulator is available in a power-enhanced eTSSOP™-16 package, and the standard SOIC-14

Block Diagram



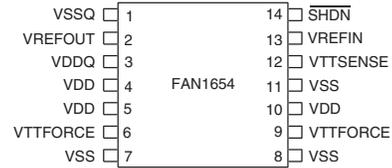
Pin Assignments



16-Lead Plastic eTSSOP-16

$$\theta_{JC} = 4^{\circ}\text{C/W}^*$$

*With package power slug soldered to 0.5 square inch copper area over backside ground plane of internal power plane



14-Lead Plastic SOIC

$$\theta_{JC} = 37^{\circ}\text{C/W}, \theta_{JA} = 88^{\circ}\text{C/W}$$

Pin Definitions

Pin Number*	Pin Name	Pin Function Description
1, 2, 7 (4, 5, 10)	VDD	VDD. Input power for the LDO.
3, 6 (6, 9)	VTTFORCE	VTT Force Output.
4, 5, 8 (7, 8, 11)	VSS	Power Ground.
10 (12)	VTTSENSE	VTT Sense. Feedback for remote sense of the VTT voltage.
11 (13)	VREFIN	VREFIN. Alternative input for direct control of VTTOUT and VREFOUT.
12 (14)	SHDN	Shutdown. This active low shutdown turns off both VTT and VREFOUT. This pin has an internal pull-down, and must be externally driven high for the IC to be on.
13 (1)	VSSQ	Signal Ground.
14 (2)	VREFOUT	Buffered Voltage Reference Output.
15 (3)	VDDQ	VDDQ Input. Attach this pin to the VDDQ supply to generate VTT and VREFOUT.
9,16	NC	No Internal Connection

* Pin Numbers in brackets are for the SOIC-14 package

Typical Application

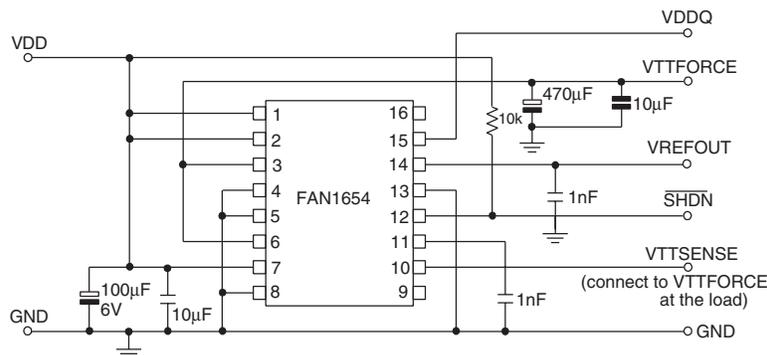


Figure 1. (eTSSOP pinout shown)

Typical Performance Characteristics

Quiescent Current vs. Temperature

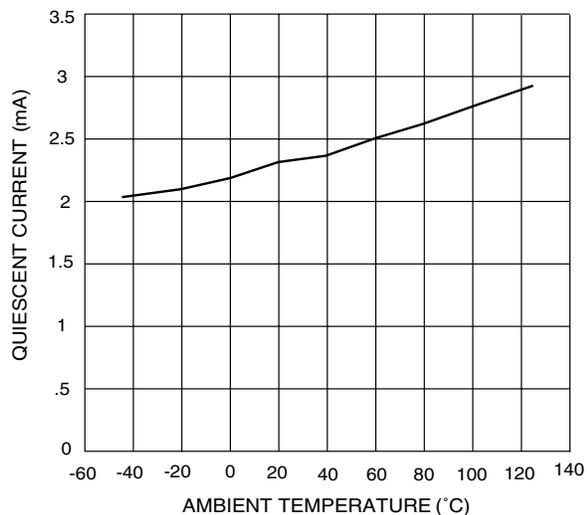


Figure 2

VREF Output Change vs. IREF

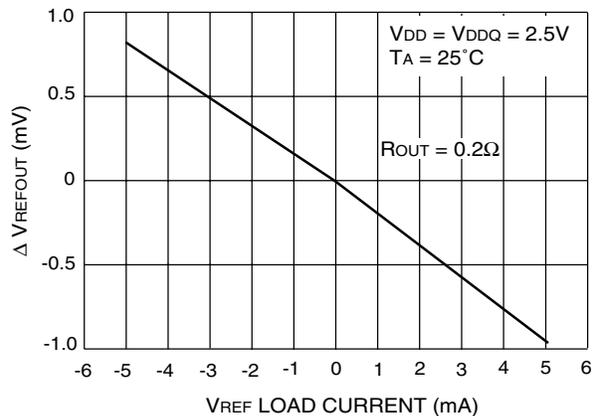


Figure 3

VTT Load Current

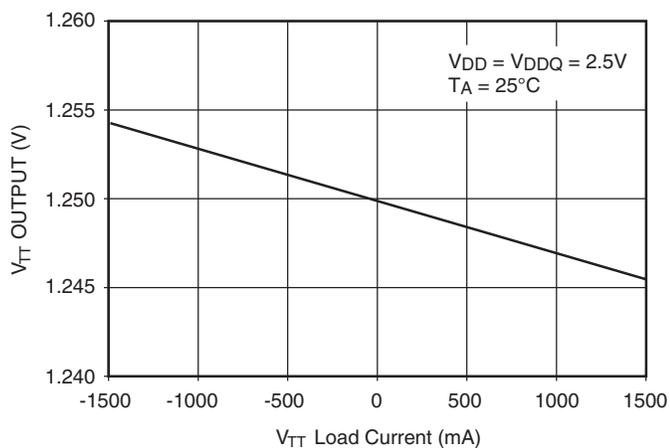


Figure 4

Absolute Maximum Ratings

Supply Voltage VDD, VDDQ	6V
Junction Temperature, T _J	150°C
Storage Temperature	-65 to 150°C
Lead Soldering Temperature, 10 seconds	300°C
Power Dissipation, P _D	1.4W

Recommended Operating Conditions

Parameter	Conditions	Min.	Typ.	Max.	Units
Supply Voltage VDD		2.3	2.5	3.6	V
Supply Voltage VDDQ		2.2	2.5	3.0	V
Ambient Operating Temperature		-40		125	°C
VREFIN		1.1	1.25	1.5	V

Electrical Characteristics

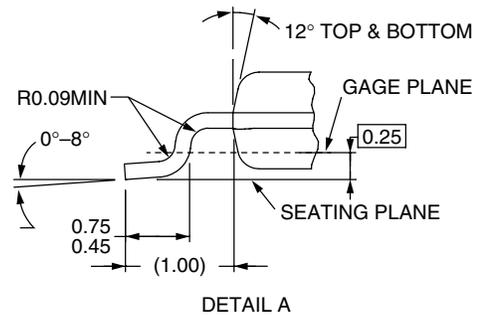
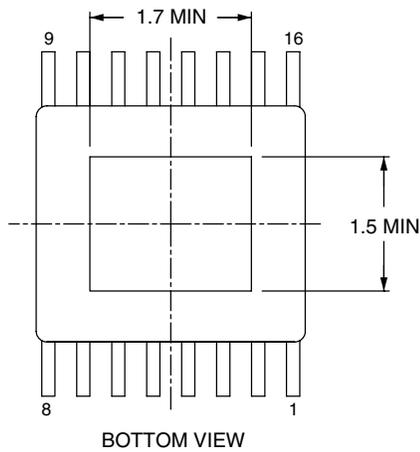
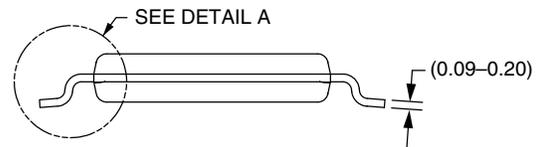
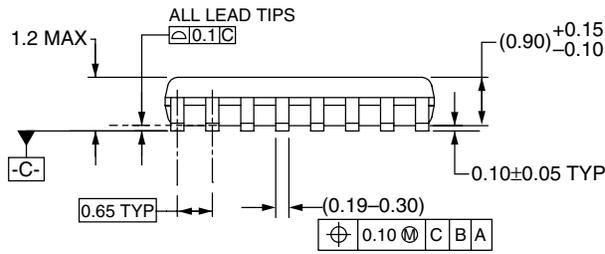
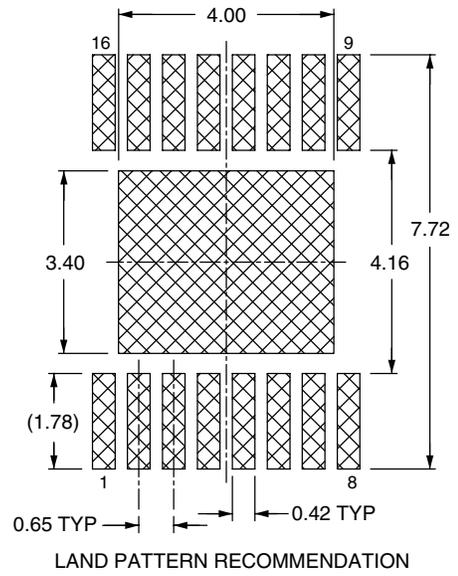
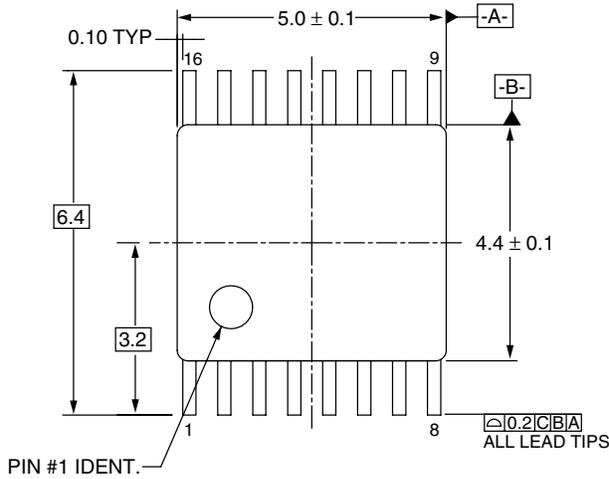
(VDD = VDDQ = 2.5V ± 0.2V, and T_A = 25°C using circuit in Figure 1, unless otherwise noted.)

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

Parameter	Conditions	Min.	Typ.	Max.	Units	
VTT Output Voltage	I _{OUT} = 0A, VREFIN = open	VDDQ = 2.3V •	1.135	1.150	1.165	V
		VDDQ = 2.5V •	1.235	1.250	1.265	V
		VDDQ = 2.7V •	1.335	1.350	1.365	V
	I _{OUT} = ±1A, VREFIN = open	VDDQ = 2.3V	1.110	1.150	1.190	V
		VDDQ = 2.5V	1.210	1.250	1.290	V
		VDDQ = 2.7V	1.310	1.350	1.390	V
VTT Output Slew Rate	Cload = 10μF		0.1		V/μsec	
VTT Leakage Current	SHDN = 0V	• -50		50	μA	
VTT Current Limit			±2		A	
VREFIN Input Impedance			100		KΩ	
VREFOUT Output Voltage	No load	VREFIN = 1.150V •	1.145	1.150	1.155	V
		VREFIN = 1.250V •	1.245	1.250	1.255	V
		VREFIN = 1.350V •	1.345	1.350	1.355	V
		VDDQ = 2.3V	• -5		5	mA
VREFOUT Output Current	VDDQ = 2.3V	• -5		5	mA	
VREFOUT Leakage Current	SHDN = 0V	• -10		10	μA	
SHDN Logic High		• 1.667			V	
SHDN Logic Low		•		0.800	V	
IDD Supply Current	No load, SHDN = 2.7V	•	3	10	mA	
VDDQ Leakage Current	SHDN = 0V	•	6	10	μA	
VDD Leakage Current	SHDN = 0V	•	3	50	μA	
SHDN Input Current	SHDN = 2.7V	•	50	75	μA	
Over-Temperature Shutdown			155		°C	
Over-Temperature Hysteresis			30		°C	

Mechanical Dimensions

16 Lead eTSSOP



NOTES:

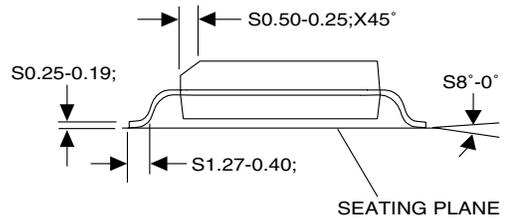
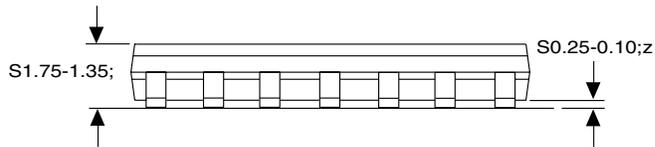
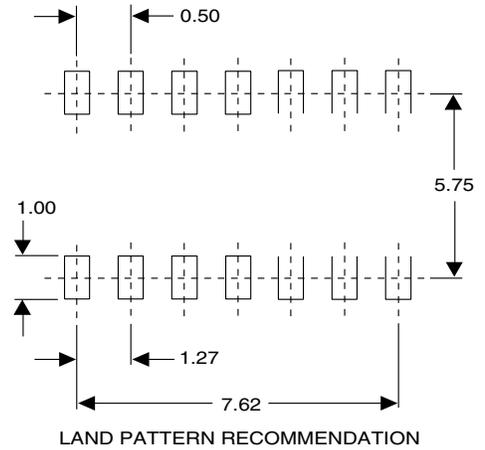
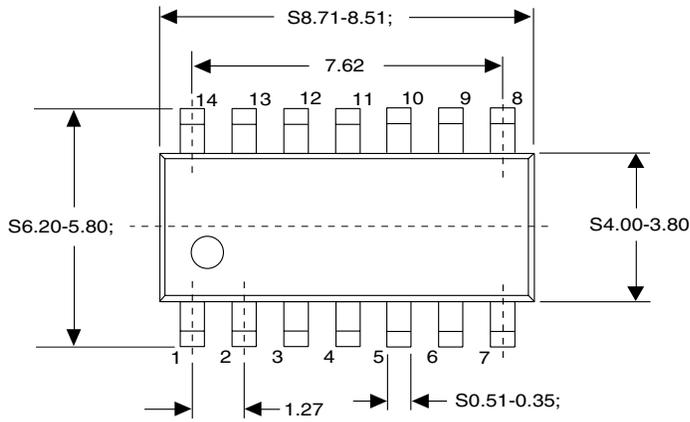
- A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION ABT, DATED 10/97.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND THE BAR EXTENSIONS.
- D. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.

Mechanical Dimensions

14-Lead SOIC

NOTES:

- 1. This package conforms to JEDEC MS-012, variation AB, ISSUEC dated May, 1990.
- 2. All dimensions are in millimeters
- 3. Standard lead finished
 - 200 microinches / 5.08 microns min.
 - Lead/Tin (solder) on copper



Ordering Information

Product Number	Package
FAN1654MTF	eTSSOP-16
FAN1654MTFX	eTSSOP-16 in tape and reel
FAN1654M	SOIC-14
FAN1654MX	SOIC-14 in tape and reel

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