FAN2502, FAN2503

150 mA CMOS LDO Regulators

Features

- Ultra Low Power Consumption
- 150 mV dropout voltage at 150 mA
- 25 µA ground current at 150 mA
- Enable/Shutdown Control
- SOT23-5 package
- Thermal limiting
- 300 mA peak current

Applications

- Cellular Phones and accessories
- PDAs
- Portable cameras and video recorders
- Laptop, notebook and palmtop computers

Description

The FAN2502/03 family of micropower low-dropout voltage regulators utilize CMOS technology to offer a new level of cost-effective performance in GSM and TDMA cellular handsets, Laptop and Notebook portable computers, and other portable devices. Features include extremely low power consumption and low shutdown current, low dropout voltage, exceptional loop stability able to accommodate a wide variety of external capacitors, and the compact SOT23-5 surface-mount package. The FAN2502/03 family of products offer significant improvements over older BiCMOS designs and are pin-compatible with many popular devices. The output is thermally protected against overload.

The FAN2502 and FAN2503 devices are distinguished by the assignment of pin 4:

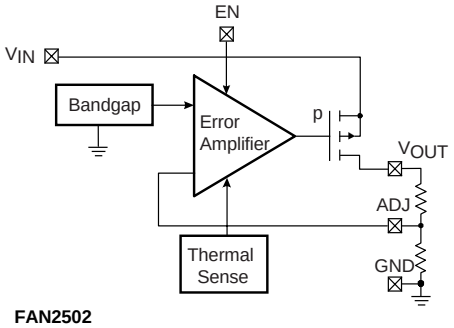
FAN2502: pin 4 – ADJ, allowing the user to adjust the output voltage over a wide range using an external voltage divider.

FAN2502-XX: pin 4 – BYP, to which a bypass capacitor may be connected for optimal noise performance. Output voltage is fixed, indicated by the suffix XX.

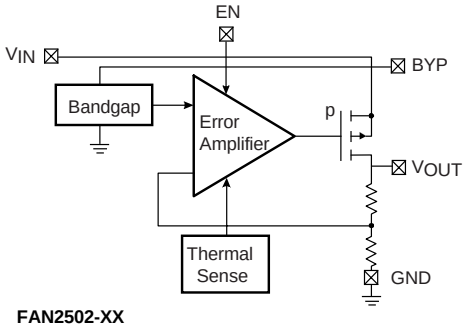
FAN2503-XX: pin 4 – $\overline{ERR}$, a flag which indicates that the output voltage has dropped below the specified minimum due to a fault condition.

The standard fixed output voltages available are 2.5V, 2.6V, 2.7V, 2.8V, 2.85V, 3.0V, and 3.3V. Custom output voltage are also available: please contact your local Fairchild Sales Office for information.

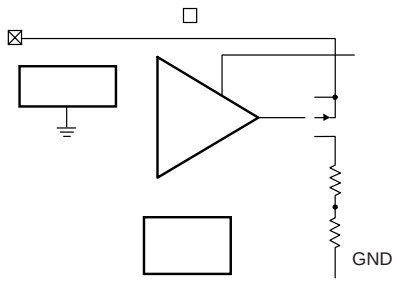
Block Diagrams



FAN2502

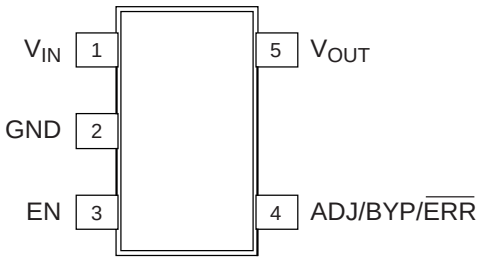


FAN2502-XX



FAN2503-XX

Pin Assignments



Pin No.	FAN2502	FAN2502-XX	FAN2503-XX
1.	V_{IN}	V_{IN}	V_{IN}
2.	GND	GND	GND
3.	EN	EN	EN
4.	ADJ	BYP	$\overline{ERR}$
5.	V_{OUT}	V_{OUT}	V_{OUT}

Pin Descriptions

Pin Name	Pin No.	Type	Pin Function Description
ADJ	4	Input	**FAN2502 Adjust.** Ratio of potential divider from VOUT to ADJ determines output voltage.
BYP	4	Passive	**FAN2502-XX Bypass.** Connect 470 pF capacitor for noise reduction.
$\overline{ERR}$	4	Open drain	**FAN2503-XX Error.** Error flag output. **0:** Output voltage < 95% of nominal. **1:** Output voltage > 95% of nominal.
EN	3	Digital Input	**Enable.** **0:** Shutdown V_{OUT}. **1:** Enable V_{OUT}.
V_{IN}	1	Power in	**Voltage Input.** Supply voltage input.
V_{OUT}	5	Power out	**Voltage Output.** Regulated output voltage.
GND	2	Power	**Ground.**

Functional Description

Designed utilizing CMOS process technology, the FAN2502/03 family of products are carefully optimized for use in compact battery-powered devices, offering a unique combination of low power consumption, extremely low dropout voltages, high tolerance for a variety of output capacitors, and the ability to disable the output to less than 1µA under user control. In the circuit, a difference amplifier controls the current through a series-pass P-Channel MOSFET, comparing the load voltage at the output with an onboard low-drift bandgap reference. The series resistance of the pass P-Channel MOSFET is approximately 1Ω, resulting in an unusually low dropout voltage under load when compared to older bipolar pass-transistor designs.

Protection circuitry is provided onboard for overload conditions. In conditions where the device reaches temperatures exceeding the specified maximums, an onboard circuit shuts down the output, where it remains suspended until it has cooled before re-enabling. The user is also free to shut down the device using the Enable control pin at any time.

Careful design of the output regulator amplifier assures loop stability over a wide range of ESR values in the external output capacitor. A wide range of values and types can be accomodated, allowing the user to select a capacitor meeting his space, cost, and performance requirements, and enjoy reliable operation over temperature, load, and tolerance variations.

Depending on the model selected, a number of control and status functions are available to enhance the operation of the LDO regulator. An Enable pin, available on all devices, allows the user to shut down the regulator output to conserve power, reducing supply current to less than 1µA. The adjustable-voltage versions of the device utilize pin 4 to connect to an external voltage divider which feeds back to the regulator error amplifier, thereby setting the voltage as desired. Two other functions are available at pin 4 in the fixed-voltage versions: in noise-sensitive applications, an external Bypass capacitor connection is provided that allows the user to achieve optimal noise performance at the output, while the Error output functions as a diagnostic flag to indicate that the output voltage has dropped more than 5% below the nominal fixed voltage.

Applications Information

External Capacitors – Selection

The FAN2502/03 allows the user to utilize a wide variety of capacitors compared to other LDO products. An innovative design approach offers significantly reduced sensitivity to ESR (Effective Series Resistance), which degrades regulator loop stability in older designs. While the improvements featured in the FAN2502/03 family greatly simplify the design task, capacitor quality still must be considered if the designer is to achieve optimal circuit performance. In general, ceramic capacitors offer superior ESR performance, at a lower cost and a smaller case size than tantalums. Those with X7R or Y5Vdielectric offer the best temperature coefficient characteristics. The combination of tolerance and variation over temperature in some capacitor types can result in significant variations, resulting in unstable performance over rated conditions.

Input Capacitor

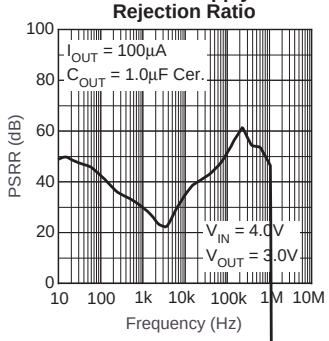
Absolute Maximum Ratings (beyond which the device may be damaged)[1]

Notes:

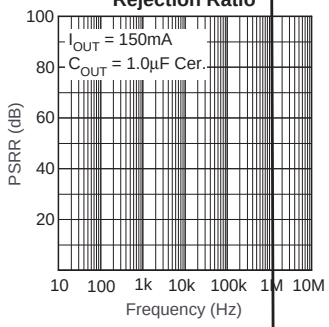
1. Functional operation under any of these conditions is NOT implied. Performance and reliability are guaranteed only if Operating Conditions are not exceeded.
2. Applied voltage must be current limited to specified range.

Typical Performance Characteristics

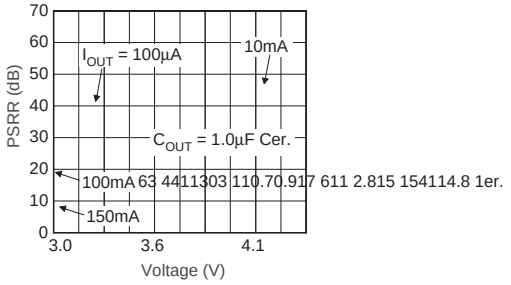
Power Supply Rejection Ratio



Power Supply Rejection Ratio



Power Supply Rejection Ratio vs. Voltage Drop



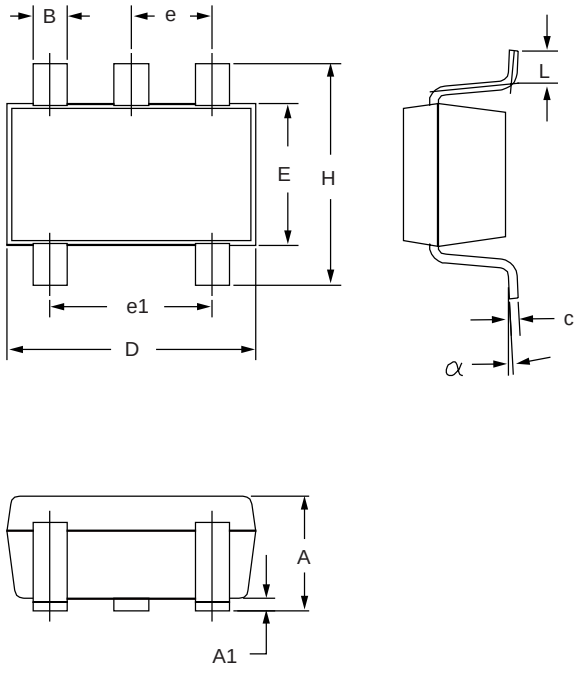
Mechanical Dimensions

5-Lead SOT-23-5 (S) Package

Symbol	Inches		Millimeters		Notes
	Min.	Max.	Min.	Max.	
A	.035	.057	.90	1.45	
A1	.000	.006	.00	.15	
B	.008	.020	.20	.50	
c	.003	.010	.08	.25	
D	.106	.122	2.70	3.10	
E	.059	.071	1.50	1.80	
e	.037 BSC		.95 BSC		
e1	.075 BSC		1.90 BSC		
H	.087	.126	2.20	3.20	
L	.004	.024	.10	.60	
α	0°	10°	0°	10°	

Notes:

1. Package outline exclusive of mold flash & metal burr.
2. Package outline exclusive of solder plating.
3. EIAJ Ref Number SC-74A.



Ordering Information

Product Number	V_{OUT}	Pin 4 Function	Package Marking
FAN2502SX	Adj.	Adjust	AEA
FAN2502S25X	2.5	Bypass	AEE
FAN2502S26X	2.6	Bypass	AEG
FAN2502S27X	2.7	Bypass	AEJ
FAN2502S28X	2.8	Bypass	AEM
FAN2502S285X	2.85	Bypass	AEN
FAN2502S30X	3.0	Bypass	AEW
FAN2502S33X	3.3	Bypass	AE3
FAN2503S25X	2.5	Error output	AFE
FAN2503S26X	2.6	Error output	AFG
FAN2503S27X	2.7	Error output	AFJ
FAN2503S28X	2.8	Error output	AFM
FAN2503S285X	2.85	Error output	AFN
FAN2503S30X	3.0	Error output	AFW
FAN2503S33X	3.3	Error output	AF3

Tape and Reel Information

Quantity	Reel Size	Width
3000	7"	8mm

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