45V high input voltage LDO

Features

Low Quiescent Current：2.1uA

High Input Voltage Rating：Up to 55V

High Output Current：350mA

High PSRR：80dB at 1Khz

Low Dropout Voltage：350mV@100mA

High-accuracy Output Voltage: ±2%

Fast Transient Response

Integrated Short-Circuit Protection

Integrated Thermal Protection

Application

Battery-powered equipment

Smoke detector and sensor

Micro controller Applications

Poduct information

• Package type

FS54XXSI	SOT23
FS54XXSK	SOT23-5
FS54XXSM	SOT89-3

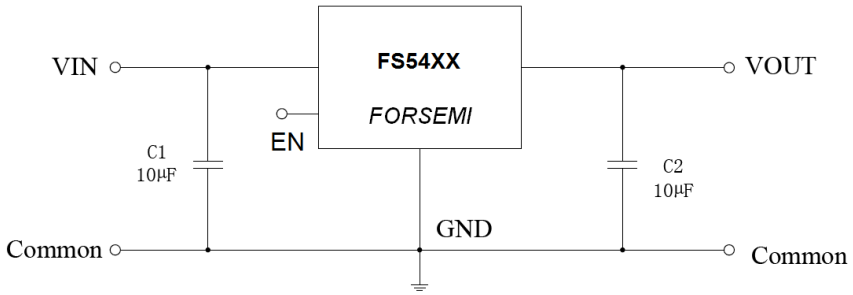
General Description

The FS54XX series is a high input voltage (45V),low quiescent current (2.1uA), low-dropout linear regulator (LDO) able to provide 300mA load current. The FS54XX family LDO offers EN pin to enable and disable the LDO output, EN pin can take 45V input voltage.

The LDO features very fast response against line voltage transient and load current transient, and ensures no overshoot voltage during the LDO start up and short circuit recovery. The device features integrated short-circuit and thermal shutdown protection.

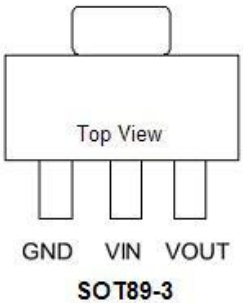
The device is available with fixed output voltages of 1.5V,1.8V, 2.8V,3.0V, 3.3V,3.6V,3.9V,4.2V and 5.0V, and available in SOT23/SOT23-3,SOT23-5 and SOT89 packages.

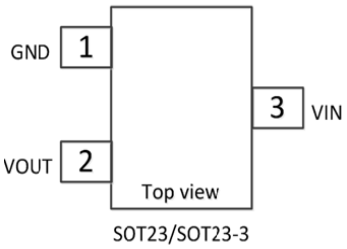
Typical Application Circuit

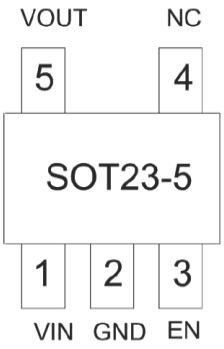


NOTE:, To ensure input stability, A minimum capacitor of C1=47μF Aluminum needed For ***HOT PLUG*** application

Package Information







Ordering information

FS54XX - □ □ □ □ □

Package type
SI=SOT23; SM=SOT89; SK=SOT23-5
Output Voltage Accuracy
2: ±2.0%
Output Voltage
…28=2.8V,30=3.0V 33=3.3V 36=3.6V 50=5.0V …
Indicates the product number

Absolute Maximum Ratings

Parameter	conditions	Min	Max	Units
Voltage	VIN to GND	-0.3	55	V
	VOUT to GND	-0.3	6	V
	VOUT to VIN	-55	0.3	V
	EN to GND	-0.3	55	V
Current	Peak Current	Innel		
Temperature.	Operating Temperature	-40	85	℃
	Storage Temperature	-40	150	℃
	Junction Temperature	-	150	℃
Thermal resistance	SOT23	350		℃/W
	SOT23-5	260		℃/W
	SOT89-3	165		℃/W
Power Consumption	SOT23-3	350		mW
	SOT23-5	480		mW
	SOT89-3	750		mW
ESD Rating	HBM	4	-	kV
	MM	100	-	V

Note:

These are stress ratings only. Stresses exceeding the range specified under Absolute Maximum Ratings may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

■ Electrical Characteristics (TA=25°C , CIN=10uF , VIN=VOUTNOM+1V , COUT=10μF)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
VIN	Input Voltage		3		45	V
IGND	Current Consumption	VIN=12V No load		2.1		μA
VOUT	Output Voltage	VIN=12V / IOUT=10mA	-2%		2%	VOUT
$IOUT_{MAX}$	Output Current		300	350	—	mA
VDROP	Dropout* (FS5450)	IOUT=10mA ΔVOUT= - VOUTNOM*2%	—	35	50	mV
		IOUT=100mA ΔVOUT= - VOUTNOM*2%	—	350	400	mV
		IOUT=200mA ΔVOUT= - VOUTNOM*2%	—	600	750	mV
	Dropout (FS5433)	IOUT=10mA ΔVOUT= - VOUTNOM*2%	—	35	50	mV
		IOUT=100mA ΔVOUT= - VOUTNOM*2%	—	350	400	mV
		IOUT=200mA ΔVOUT= - VOUTNOM*2%	—	600	750	mV
ΔVOUT	Load Regulation	1mA≤IOUT≤100mA	—	20	50	mV
ΔVOUTx100/ ΔVINx VOUT	Line Regulation	IOUT=1mA, VIN=($VOUT_{NOM}$+1V) to 12V	—	—	0.2	%/V
ILIMIT	Current limited Protection			500		mA
TSHDN	Temperature Protection	Shutdown,temperature increasing		150		℃
		Reset,temperature decreasing		140		
TCVOUT	Temperature Coefficient	IOUT=10mA -40℃≤TAMB≤100℃		±100		ppm/℃
VENH	EN High level	Enabled	1	-	-	V
VENL	EN Low level	Shutdown	-	-	0.4	V

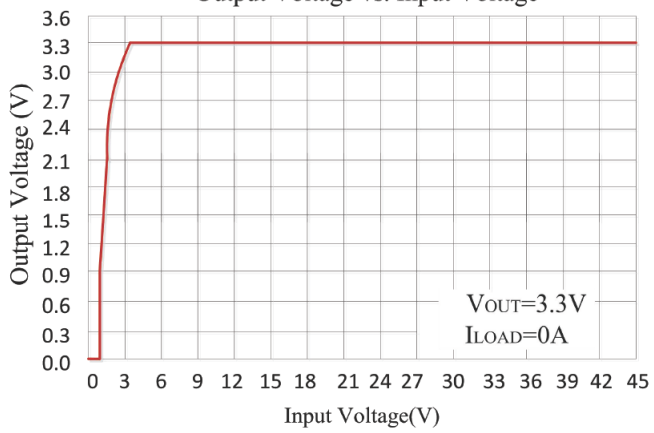
NOTE : *VDROP

1. V_{drop} = { V_{IN1} (note3) - V_{OUT1} (note2) }
2. V_{out}= A voltage equal to 98% of the output voltage whenever an amply stabilized I_{out} ($V_{out(T)}$ +1.0V) is input.
3. V_{IN1} = The input voltage when V_{out} = V_{OUT1}

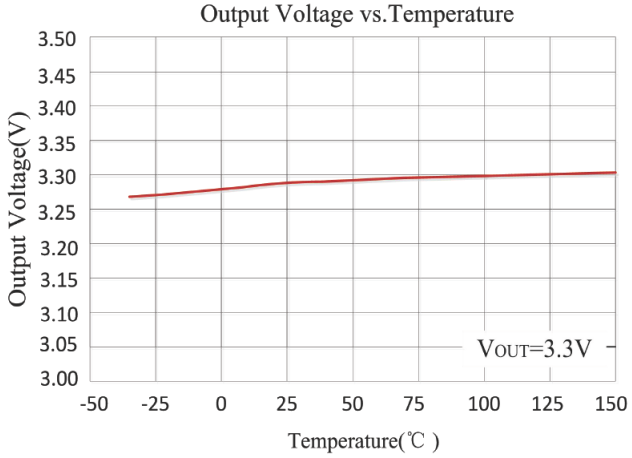
Typical Performance Characteristics

Condition: TA=25℃, Vin=12V, Iout=1mA, COUT=10uF, unless otherwise noted

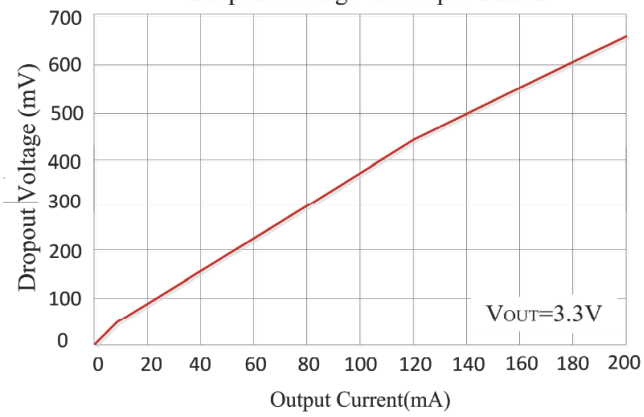
Output Voltage vs. Input Voltage



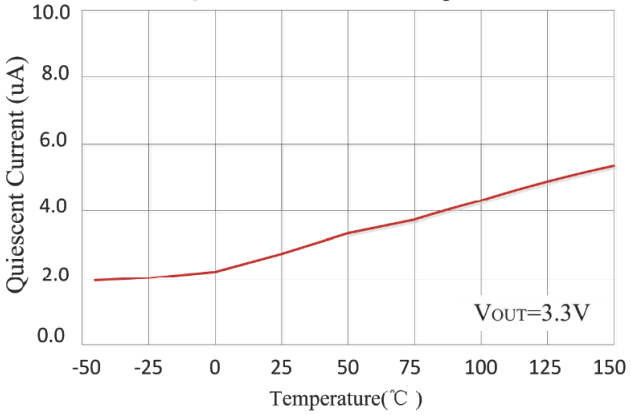
Output Voltage vs.Temperature



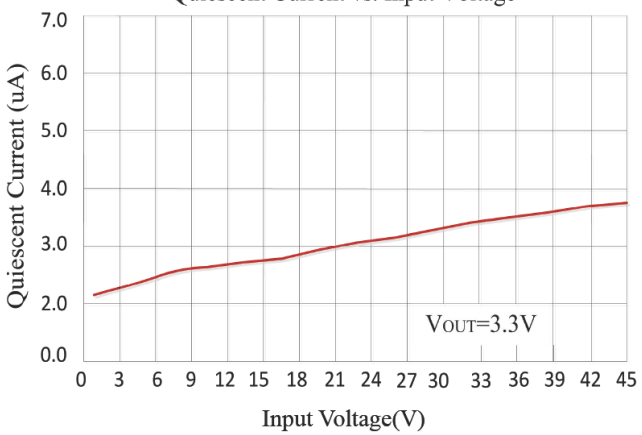
Dropout Voltage vs. Output Current



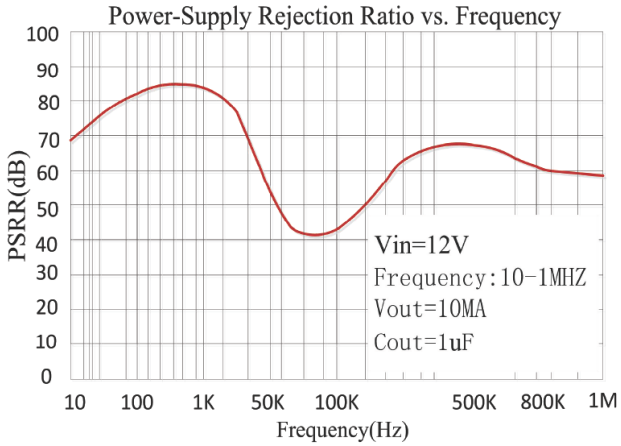
Quiescent Current vs.Temperature



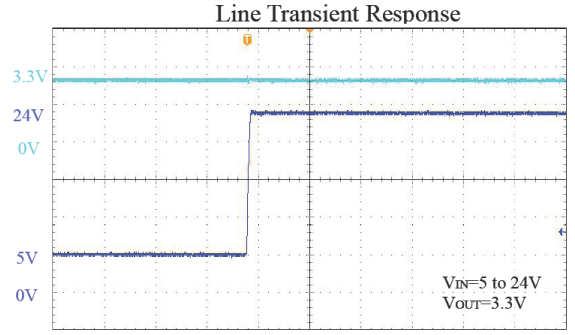
Quiescent Current vs. Input Voltage



Power-Supply Rejection Ratio vs. Frequency

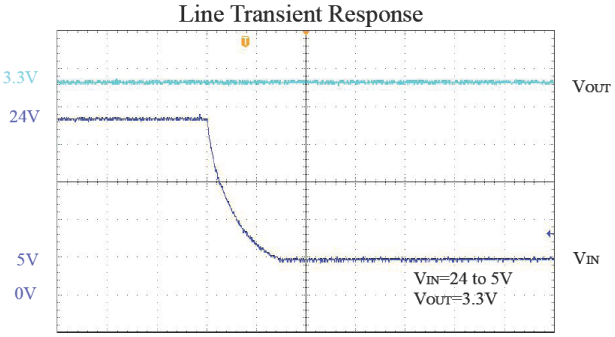


Line Transient Response



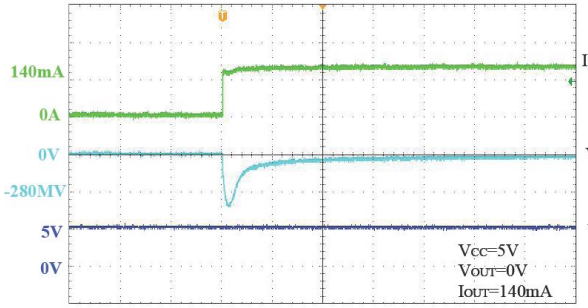
Time(4us/div)

Line Transient Response



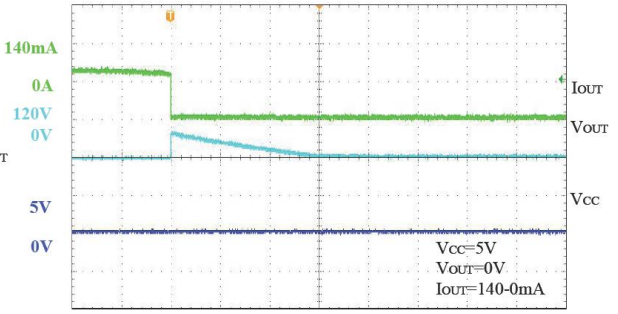
Time(4us/div)

Load Transient Response



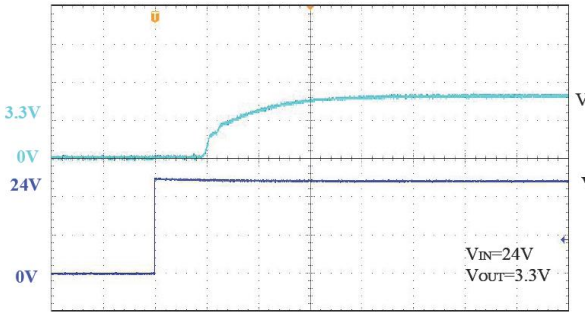
Time(20us/div)

Load Transient Response



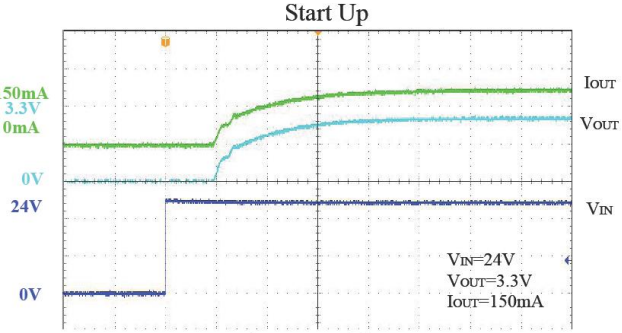
Time(200us/div)

Start Up



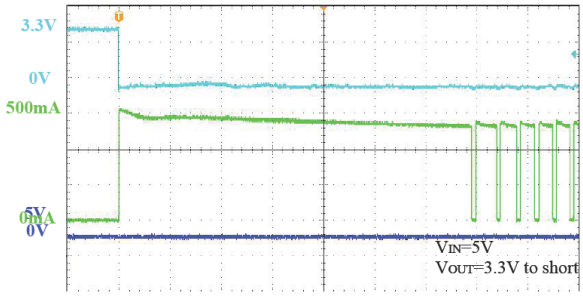
Time(100us/div)

Start Up



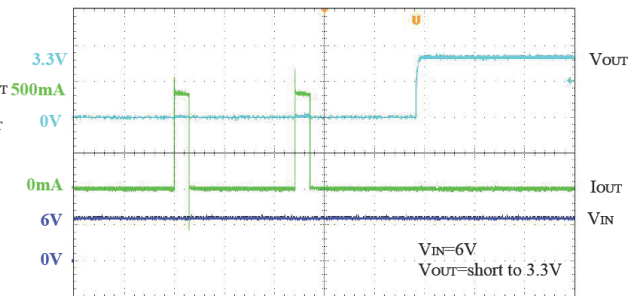
Time(100us/div)

Short Circuit Protection



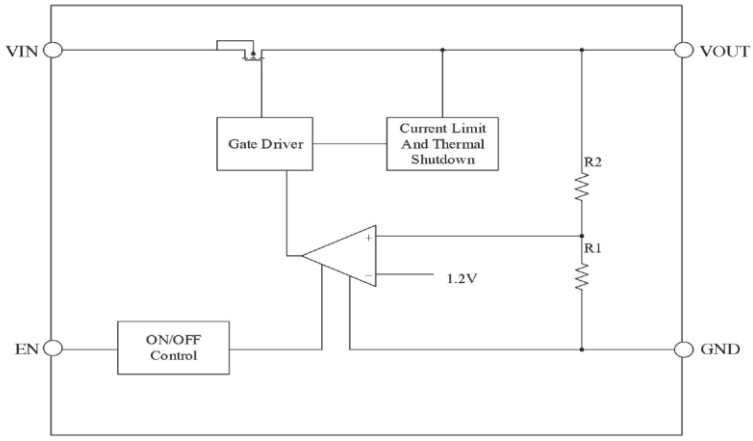
Time(20ms/div)

Short Circuit Protection



Time(2ms/div)

■ Functional Block Diagram



Input Capacitor

A 10μF ceramic capacitor is recommended to connect between VIN and GND pins to decouple input power supply glitch and noise. The amount of the capacitance may be increased without limit. This input capacitor must be located as close as possible to the device to assure input stability and less noise. For PCB layout, a wide copper trace is required for both VIN and GND. To ensure input stability, A minimum capacitor of C1=47μF Aluminum needed For ***HOT PLUG*** application

Output Capacitor

An output capacitor is required for the stability of the LDO. The recommended minimum output capacitance is 1μF, ceramic capacitor is recommended, and temperature characteristics are X7R or X5R. Higher capacitance values help to improve load/line transient response. The output capacitance may be increased to keep low undershoot/overshoot. Place output capacitor as close as possible to VOUT and GND pins.

EN Pin Operation

The FS54XX is turned on by setting the EN pin to “H”. Since the EN pin is neither pulled down nor pulled up internally, do not set it in floating status. When the EN pin is not used, connect the EN pin with VIN to keep the LDO in operating mode.

Current Limit and Short Circuit Protection

When output current at VOUT pin is higher than current limit threshold or the VOUT pin is direct short to GND, the current limit protection will be triggered and clamp the output current at a pre-designed level to prevent over-current and thermal damage.

Thermal Protection

The FS54XX has internal thermal sense and protection circuits. When excessive power dissipation happens on the device, such as short circuit at the output pin or very heavy load current with a large voltage drop across the device, the internal thermal protection circuit will be triggered, and it will shut down the power MOSFET to prevent the LDO from damage. As soon as excessive thermal condition is removed and the temperature of the device drops down, the thermal protection circuit will lease the control of the power MOSFET, and the LDO device goes to normal operation.