60V 350mA, 2.1μA Ultra Low Quiescent Current

Description

The AS54XXB series are highly accurate, LDO Voltage Regulators that are manufactured using CMOS technology and the input voltage of AS54XXB series is in Excess of 45 V.

The AS54XXB series contains four fixed output voltages of 1.8V,3.0V,3.3V,and 5.0V that have no minimum load requirement to maintain regulation.

When the EN input is low, a fast discharge path pulls the output voltage low via an internal pull-down resistor.

The AS54XXB features very fast response against line voltage transient and load current transient, and ensures no overshoot voltage during the AS54XXB start up and short circuit recovery.

The AS54XXB features integrated short-circuit and thermal shutdown protection.

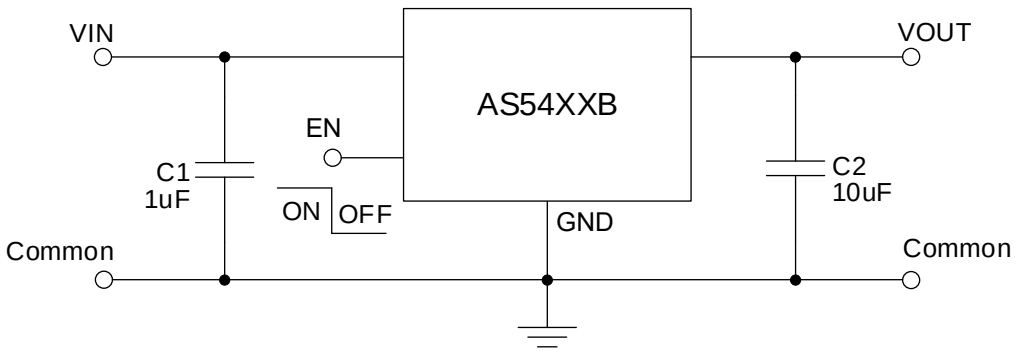
Features

- Low Quiescent Current: 2.1uA
- High Input Voltage Rating: Up to 60V
- High Output Current: 350mA
- High PSRR: 85dB at 1kHZ
- Low Dropout Voltage: 350mV@100mA
- Fixed Output Voltages: 1.8V, 3.0V, 3.3V and 5.0V
- High-accuracy Output Voltage: ±2%
- Fast Transient Response
- Enable pin is available
- Integrated Short-Circuit Protection
- Integrated Thermal Protection
- Available Packages: SOT23-3, SOT89-3, SOT23-5

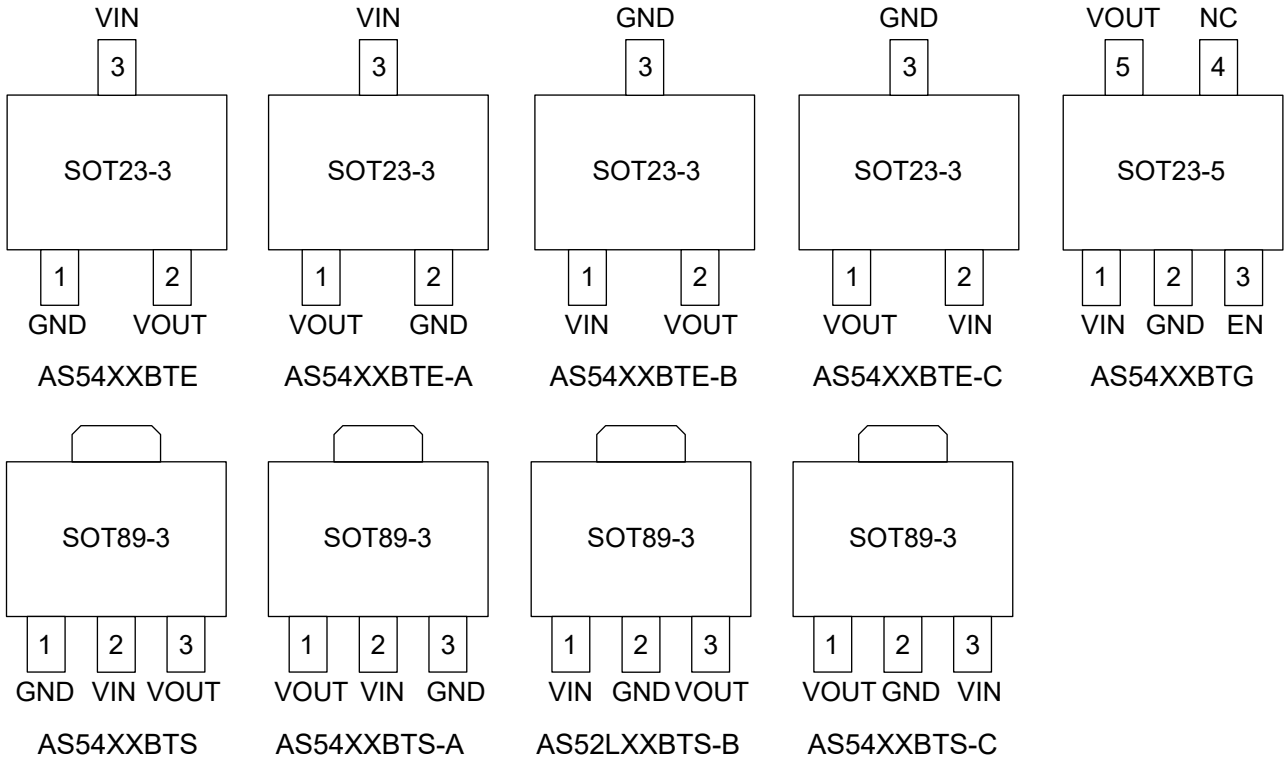
Application

- Battery-powered equipment
- Smoke detector and sensor
- Microcontroller Applications
- Home Appliance

Typical Application Circuit



Pin Configuration



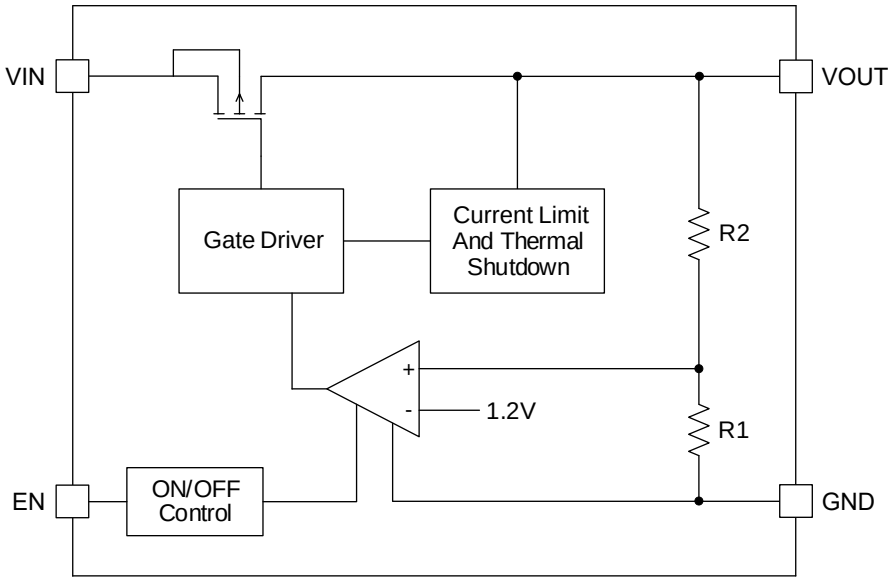
Pin Descriptions

SOT23-3				Pin Name	Description
AS54XXBTE	AS54XXBTE-A	AS54XXBTE-B	AS54XXBTE-C		
1	2	3	3	GND	Ground Pin
2	1	2	1	VOUT	Output Pin
3	3	1	2	VIN	Input Pin
SOT89-3				Pin Name	Description
AS54XXBTS	AS54XXBTS-A	AS54XXBTS-B	AS54XXBTS-C		
1	3	2	2	GND	Ground Pin
3	1	3	1	VOUT	Output Pin
2	2	1	3	VIN	Input Pin
SOT23-5				Pin Name	Description
AS54XXBTG					
1				VIN	Input Pin
2				GND	Ground Pin
3				EN	Enable pin
4				NC	No Connection
5				VOUT	Output Pin

Absolute Maximum Ratings

Item	Description	Min	Max	Unit
Voltage	VIN to GND	-0.3	55	V
	VOUT to GND	-0.3	7	V
	VOUT to VIN	-55	0.3	V
	EN to GND	-0.3	55	V
Current	Peak output current	Internally limited		
Temperature	Operating Temperature Range	-40	125	°C
	Storage Temperature	-40	150	°C
Thermal Resistance (Junction to Ambient)	SOT89	180		°C/W
	SOT23	360		°C/W
Power Dissipation	SOT89	600		mW
	SOT23	300		mW
Electrostatic discharge rating	Human Body Model (HBM)	4		kV
	Charged Device Model (CDM)	200		V

Block Diagram



Electrical Characteristics

(At T_A=25°C, C_{IN}=1uF, V_{IN}=V_{OUTNOM}+1.0V, C_{OUT}=10uF, unless otherwise noted)

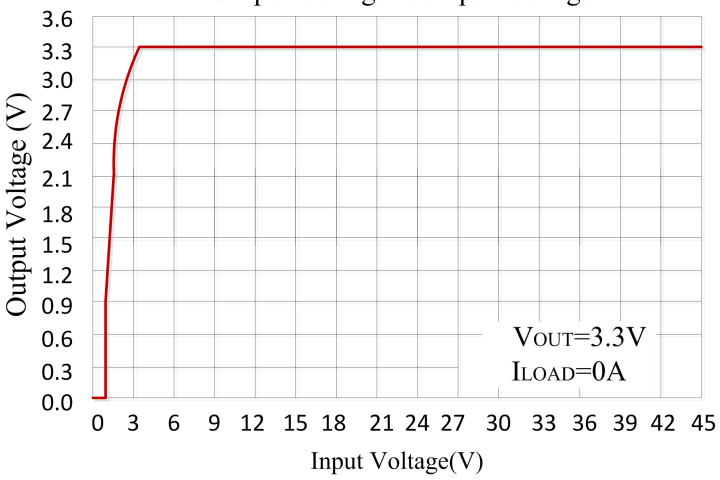
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage		3	—	45	V
I_{GND}	Quiescent Current	V_{IN}=12V, No load	—	2.1	—	uA
V_{OUT}	Output Voltage	V_{IN}=12V, I_{OUT}=10mA	V_{OUTNOM} * 0.98	V_{OUTNOM}	V_{OUTNOM} * 1.02	V
I_{OUT_MAX}	Output Current		300	350	—	mA
V_{DROP}	Dropout Voltage(1)	I_{OUT}=10mA , V_{IN}=V_{OUTNOM}-0.1V	—	35	—	mV
		I_{OUT}=100mA , V_{IN}=V_{OUTNOM}-0.1V	—	350	—	mV
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation	VIN=7V, 1mA≤I_{OUT}≤100mA	—	0.2	—	mV/mA
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	IOUT=1mA, V_{OUTNOM} +0.5V≤V_{IN}≤40 V	—	0.1	—	mV/V
I_{LIMIT}	Current Limit		—	500	—	mA
T_{SHDN}	Thermal Shutdown Temperature	Shutdown, temperature increasing	—	150	—	°C
		Reset, temperature decreasing	—	130	—	
PSRR		Vin=12V , Iout=10mA F=1Khz,Vout=3.3V	—	85	—	dB
V_{ENH}	EN High level	Enabled	1	—	—	V
V_{ENL}	EN Low level	Shutdown	—	—	0.4	V

Note: (1) Dropout Voltage is the voltage difference between the input and the output at which the output voltage drops 2% below its nominal value.

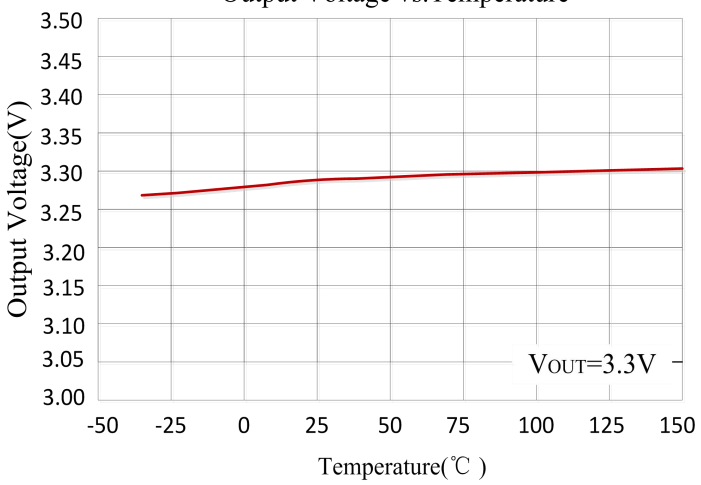
Typical Performance Characteristics

Test Condition: T_A=25°C, Vin=12V, Iout=1mA, C_{OUT}=10uF, unless otherwise note

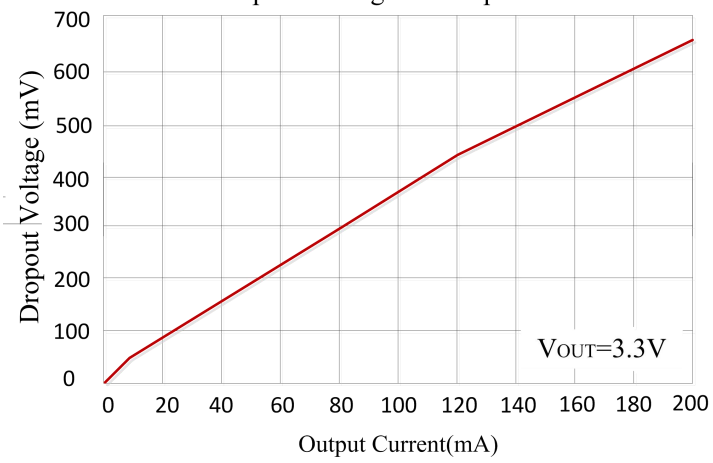
Output Voltage vs. Input Voltage



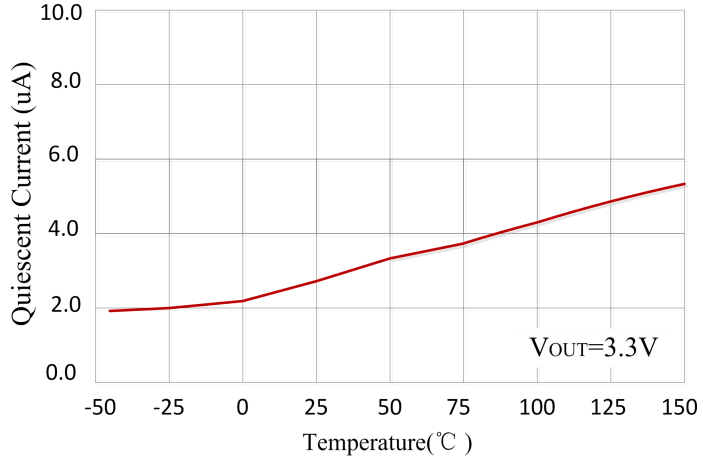
Output Voltage vs.Temperature



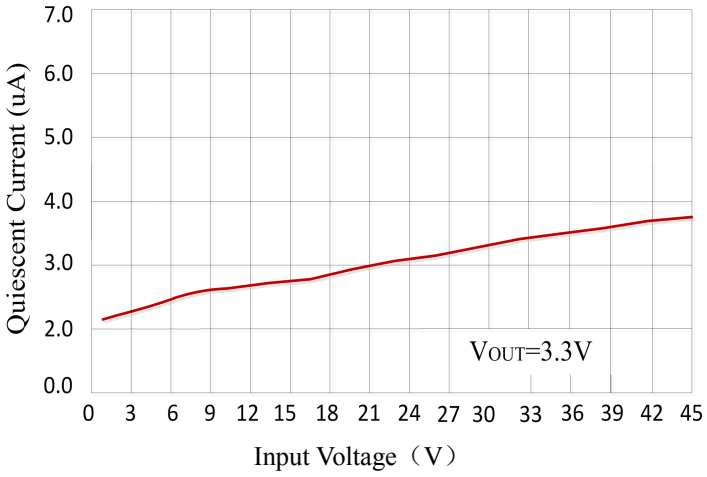
Dropout Voltage vs. Output Current



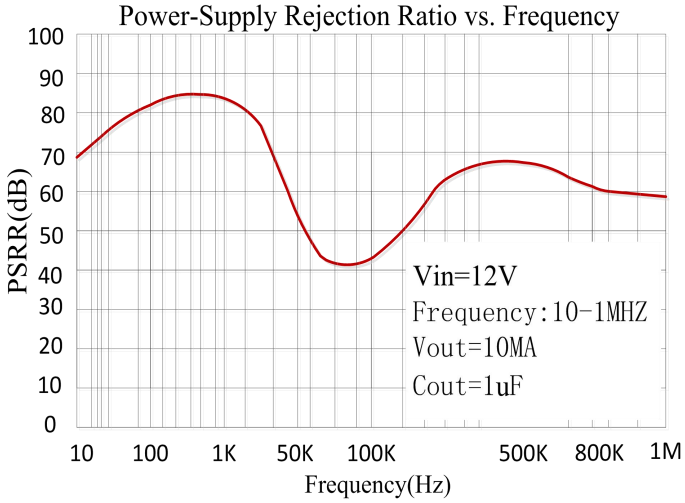
Quiescent Current vs.Temperature



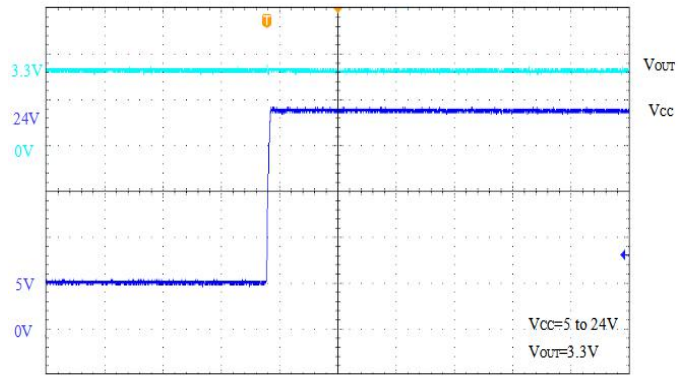
Quiescent Current vs. Input Voltage



Power-Supply Rejection Ratio vs. Frequency

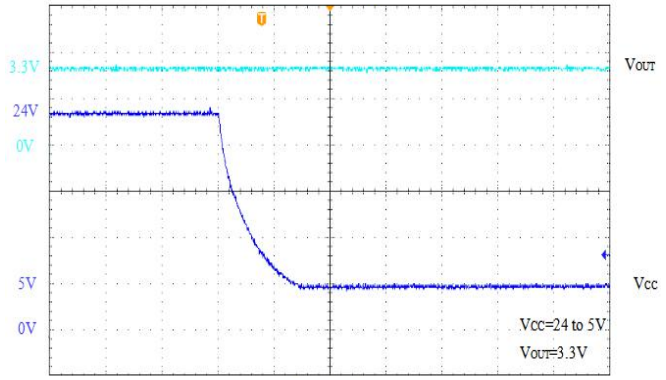


Line Transient Response



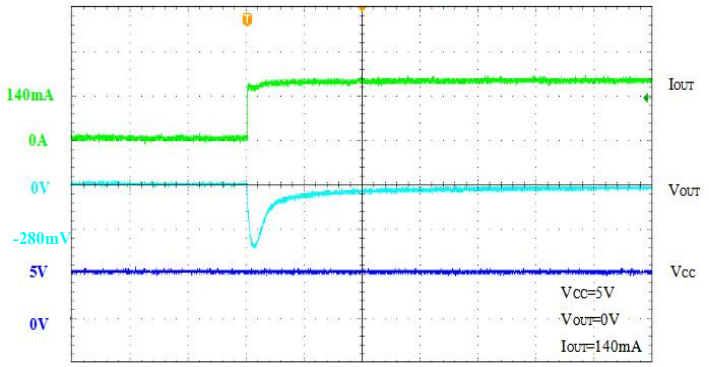
Time(4us/div)

Line Transient Response



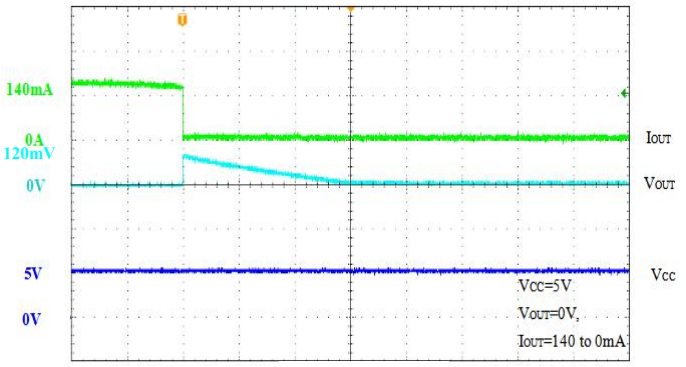
Time(4us/div)

Load Transient Response



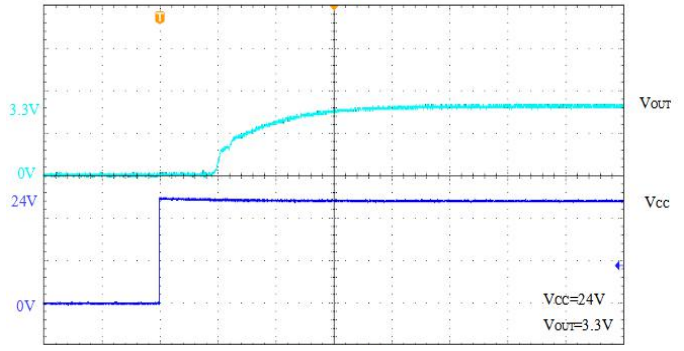
Time(20us/div)

Load Transient Response



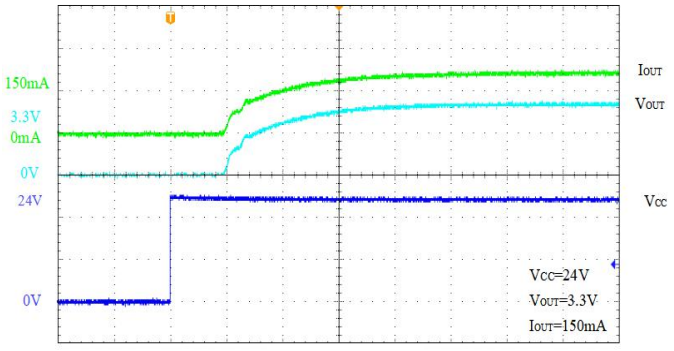
Time(200us/div)

Start Up



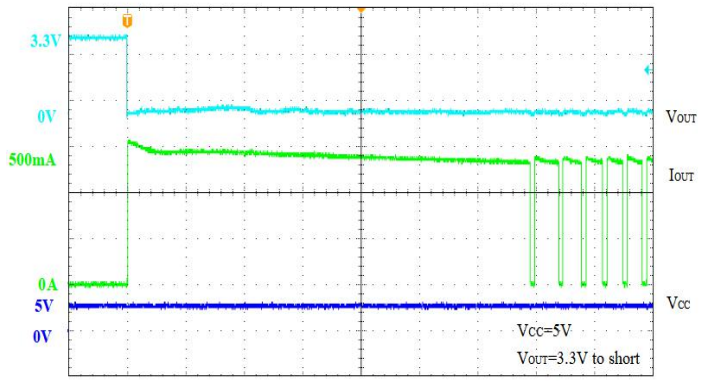
Time(100us/div)

Start Up



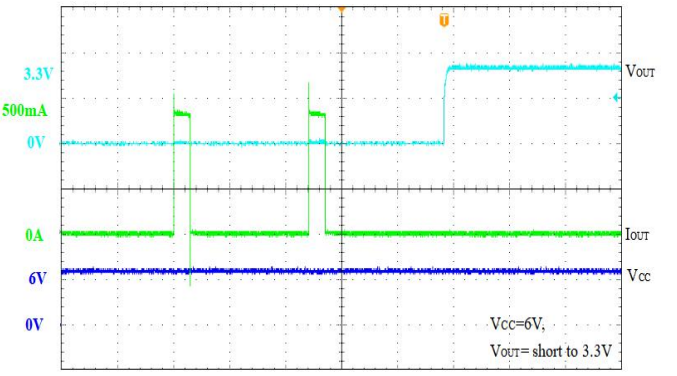
Time(100us/div)

Short Circuit Protection



Time(20ms/div)

Short Circuit Protection

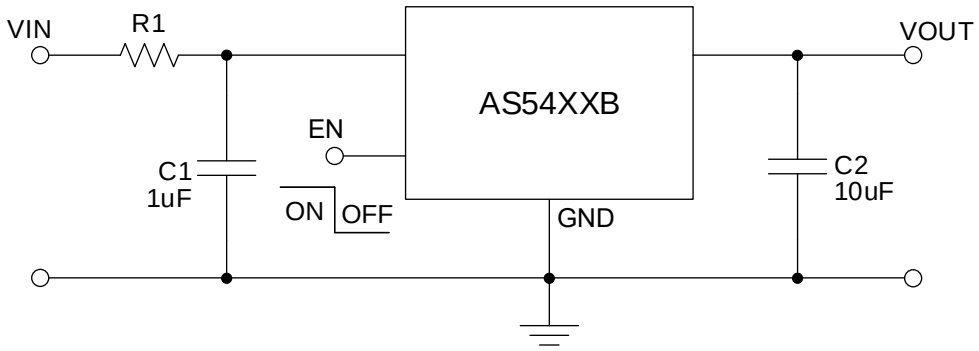


Time(2ms/div)

Detailed Description

Input Capacitor

A 1μF 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. When VIN ≥18V, it is recommended to add R1(R1>1Ω, The resistance shall be adjusted according to the actual application) at the input end.



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 AS54XXB 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

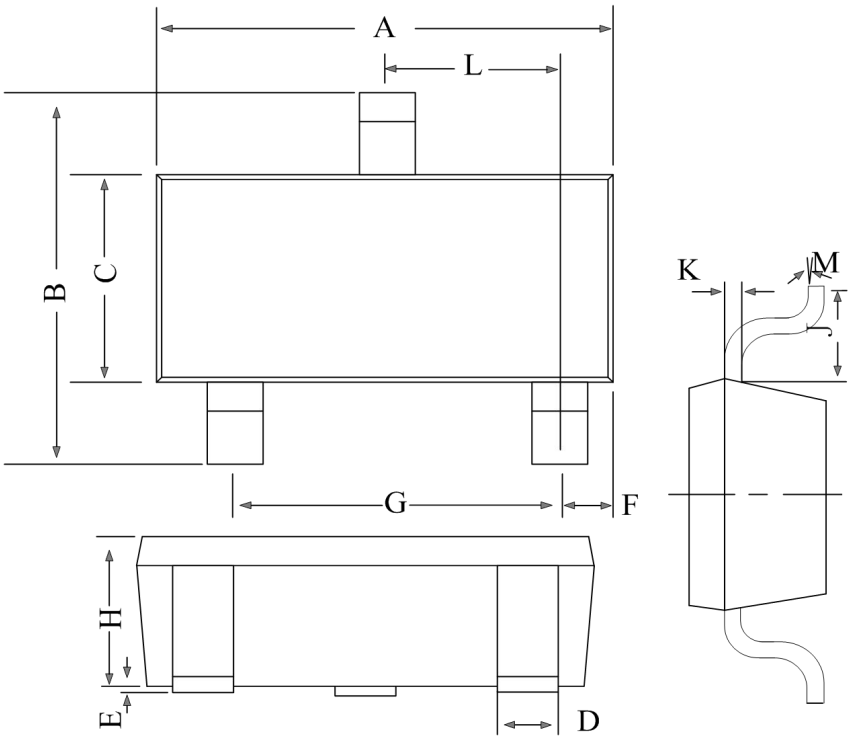
When output current at VOUT pin is higher than current limit threshold or the VOUT pin is direct short to GND, the current limit protection will be triggered and clamp the output current at a pre-designed level to prevent over-current and thermal damage.

Thermal Protection

The AS54XXB 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.

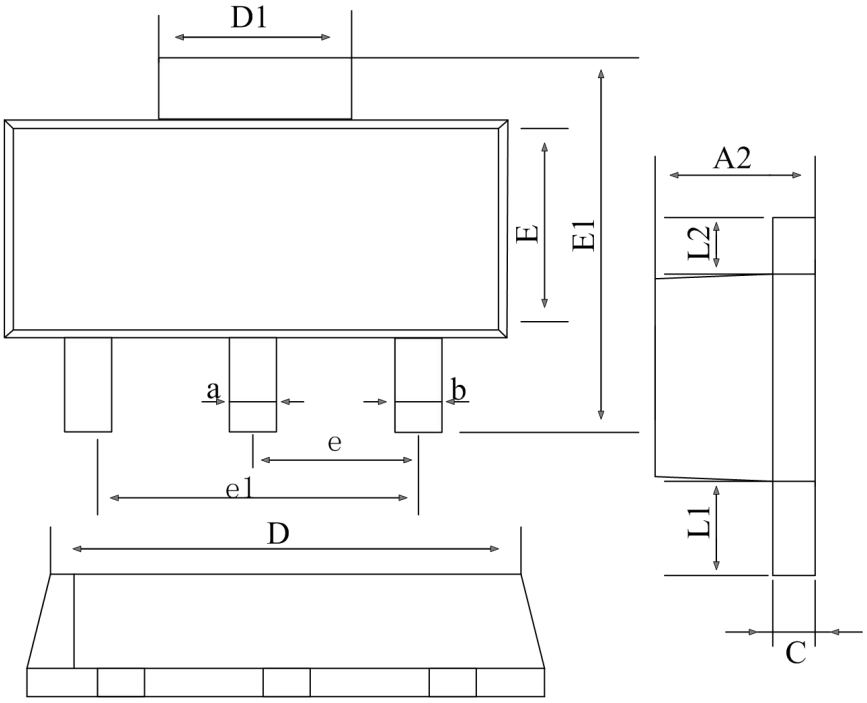
Package Description

SOT23-3



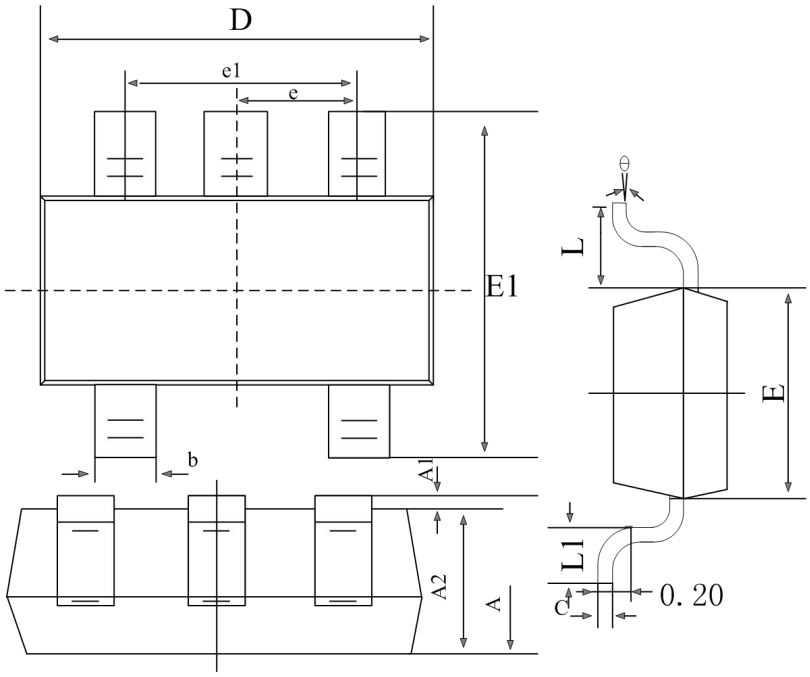
REF.	Millimeter	
	Min.	Max.
A	2.82	2.92
B	2.65	2.95
C	1.56	1.60
D	0.35	0.55
E	0	0.1
F	0.45	0.55
G	1.90	REF.
H	1.0	1.3
K	0.10	0.20
J	0.40	_
L	0.85	1.15
M	0°	10°

SOT89-3



REF.	Millimeter	
	Min.	Max.
A2	1.4	1.6
a	0.45	0.55
b	0.38	0.48
c	0.36	0.46
D	4.40	4.60
D1	1.60	1.80
E	2.40	2.60
E1	4.00	4.30
e	1.00	2.00
e1	2.95	3.05
L1	0.80	1.00
L2	0.65	0.75

SOT23-5



REF.	Millimeter	
	Min.	Max.
A	1.05	1.25
A1	0	0.1
A2	1.05	1.15
b	0.3	0.5
c	0.1	0.2
D	2.85	3.05
E	1.5	1.7
E1	2.65	2.95
e	0.95(BSC)	
e1	1.8	2.0
L	0.3	0.6
θ	0°	8°