

80V 150mA, 2.1 μ A Ultra Low Quiescent Current

Description

The AS56XXB series is an ultra-small, low dropout (LDO) linear regulator that can source 150mA of output current. The AS56XXB series is designed to provide high PSRR, high input voltage, and excellent load and line transient performance.

The AS56XXB series has thermal shutdown, current limit, and short Circuit protections for added safety.

The AS56XXB series contains four fixed output voltages of 3.0V, 3.3V, 3.6V and 5.0V.

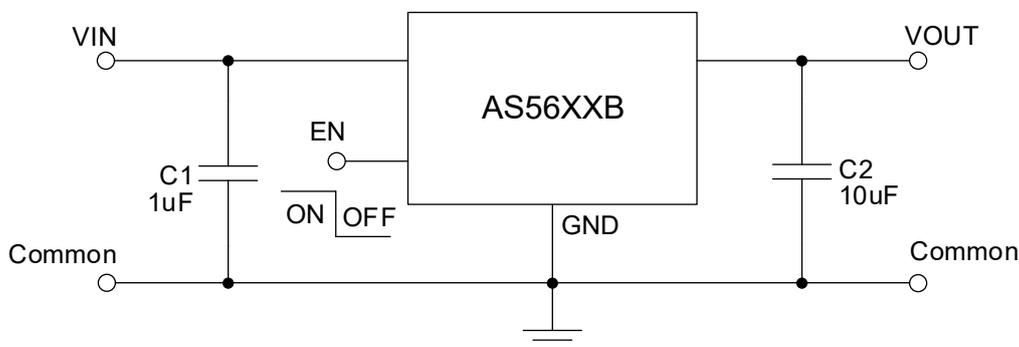
Features

- Low Quiescent Current: 2.1 μ A
- High Input Voltage Rating: Up to 80V
- High Output Current: 150mA
- High PSRR : 70dB at 1kHz
- Low Dropout Voltage: 700mV@100mA
- Fixed Output Voltages: 3.0V, 3.3V, 3.6V and 5.0V
- Output Voltage Tolerance: $\pm 2\%$
- Fast Transient Response
- Current Limit Protection
- Short Circuit Protection
- Thermal Shutdown Protection
- Available Packages: SOT23-3, SOT89-3, SOT23-5

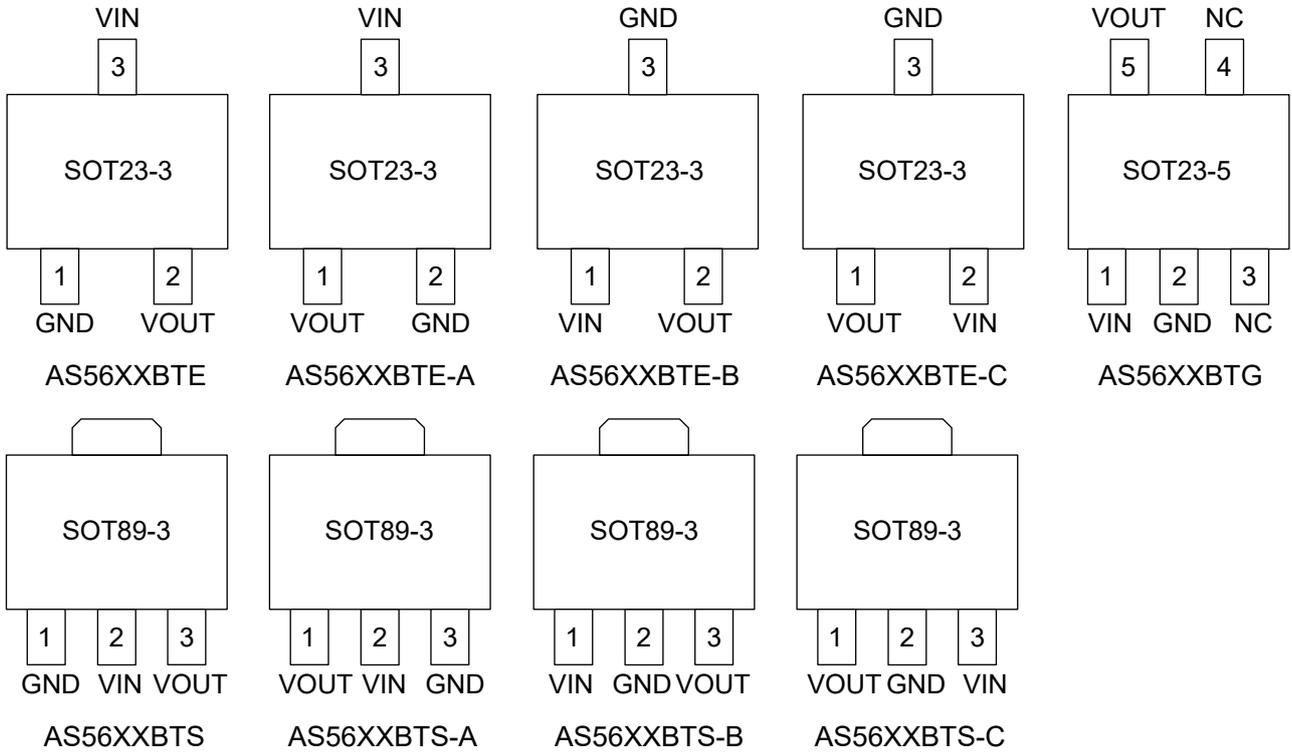
Application

- Battery-powered Equipment
- Smoke Detector and Sensor
- Micro Controller Applications
- Home Appliance

Typical Application Circuit



Pin Configuration



Pin Descriptions

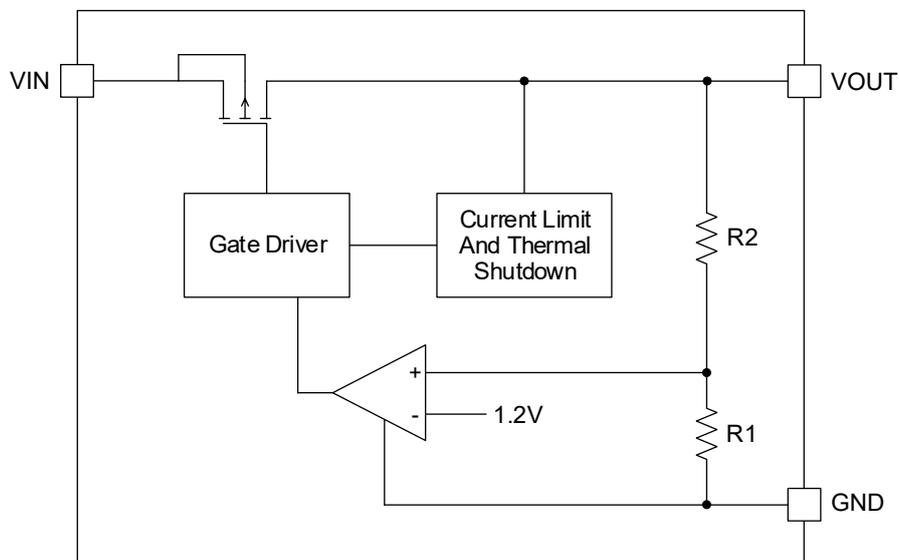
SOT23-3				Pin Name	Description
AS56XXBTE	AS56XXBTE-A	AS56XXBTE-B	AS56XXBTE-C		
1	2	3	3	GND	Ground Pin
2	1	2	1	VOUT	Output Pin
3	3	1	2	VIN	Input Pin
SOT89-3				Pin Name	Description
AS56XXBTS	AS56XXBTS-A	AS56XXBTS-B	AS56XXBTS-C		
1	3	2	2	GND	Ground Pin
3	1	3	1	VOUT	Output Pin
2	2	1	3	VIN	Input Pin
SOT23-5				Pin Name	Description
AS56XXBTG					
1				VIN	Input Pin
2				GND	Ground Pin
3				NC	No Connection
4				NC	No Connection
5				VOUT	Output Pin

Absolute Maximum Ratings

Item	Description	Min	Max	Unit
Voltage	VIN to GND	-0.3	80	V
	VOUT to GND	-0.3	7	V
	VIN to VOUT	-0.3	75	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	130		°C/W
	SOT23	200		°C/W
	TO252	80		°C/W
Power Dissipation	SOT89	900		mW
	SOT23	600		mW
	TO252	1700		mW
Electrostatic discharge rating	Human Body Model (HBM)	4		kV
	Charged Device Model (CDM)	200		V

Note: exceeding the range specified by the rated parameters will cause damage to the chip, and the working state of the chip beyond the range of rated parameters cannot be guaranteed. Exposure outside the rated parameter range will affect the reliability of the chip.

Block Diagram



Electrical Characteristics

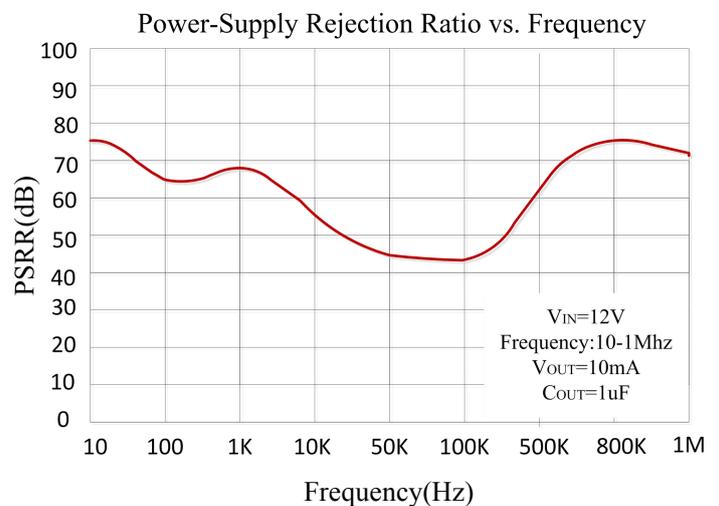
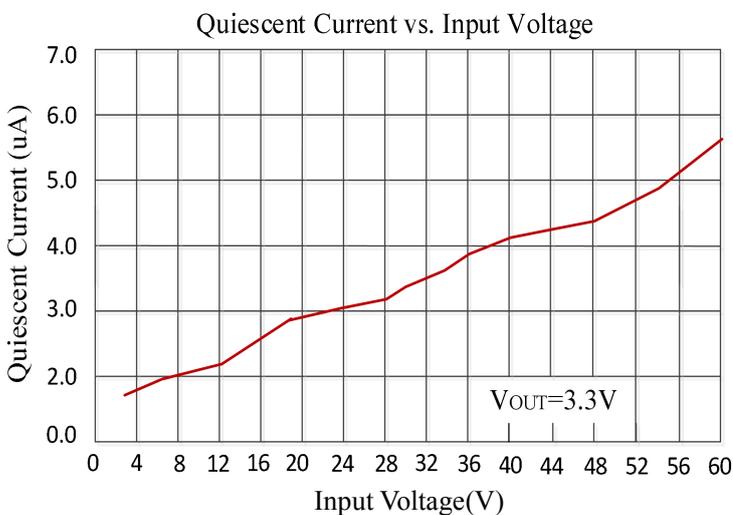
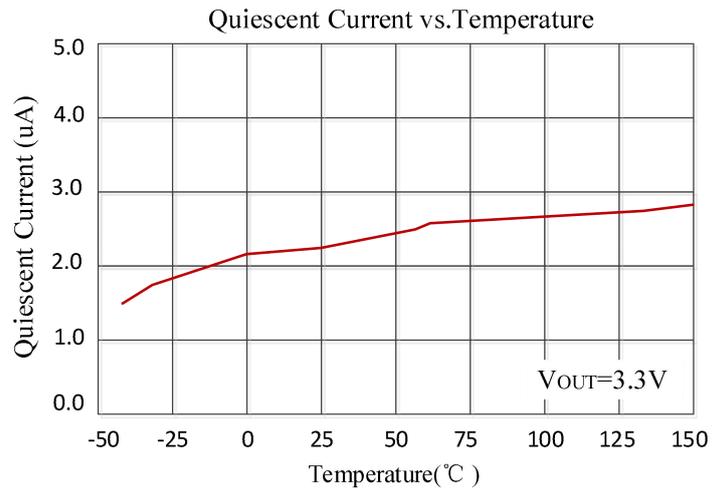
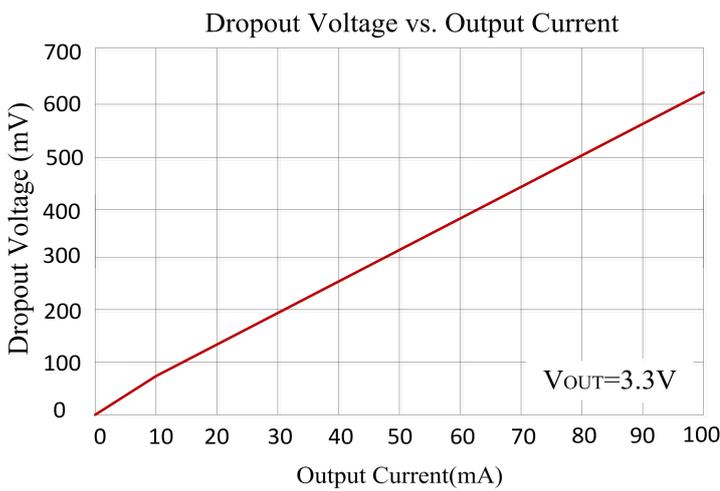
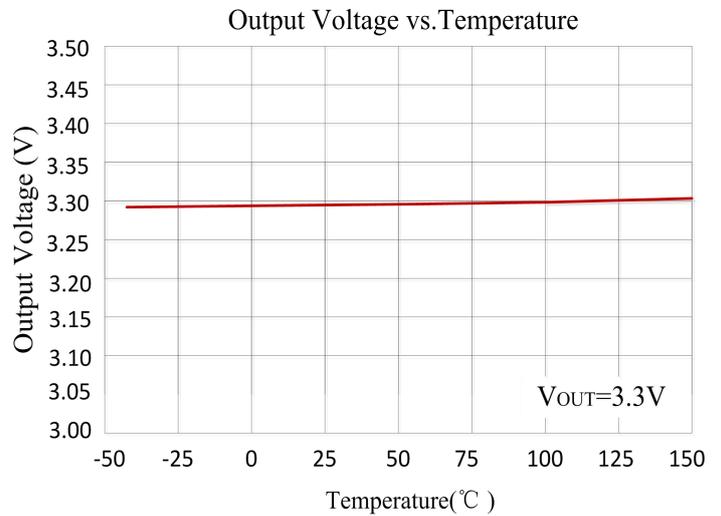
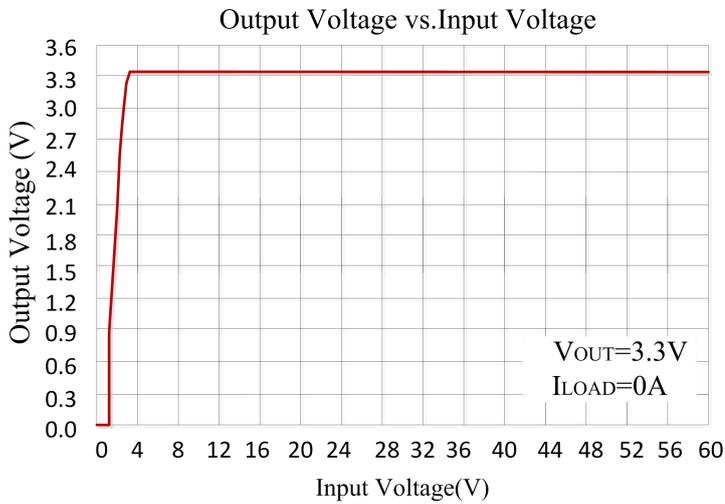
(At $T_A=25^\circ\text{C}$, $C_{IN}=1\mu\text{F}$, $V_{IN}=V_{OUTNOM}+1.0\text{V}$, $C_{OUT}=10\mu\text{F}$, unless otherwise noted)

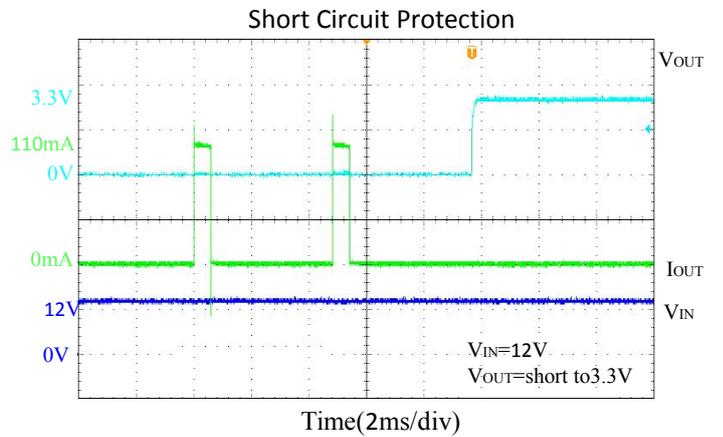
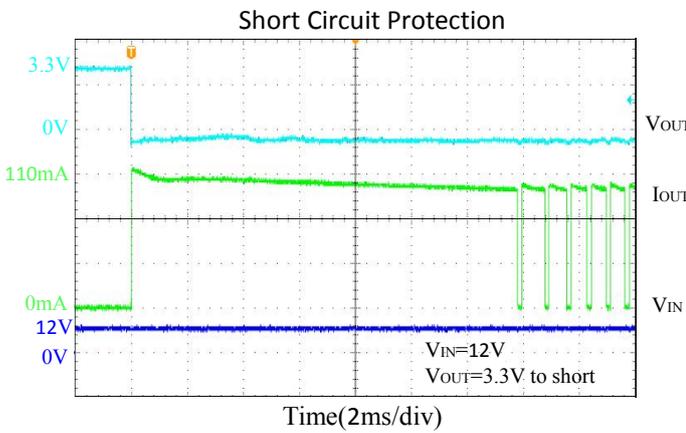
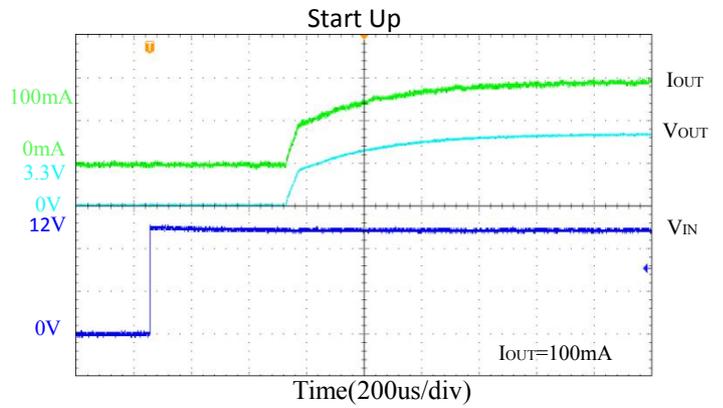
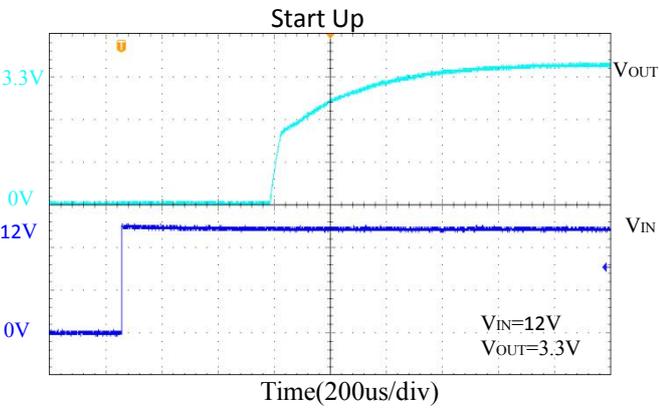
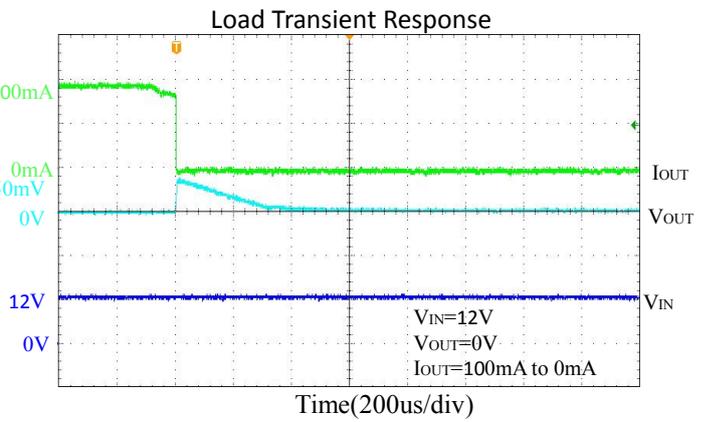
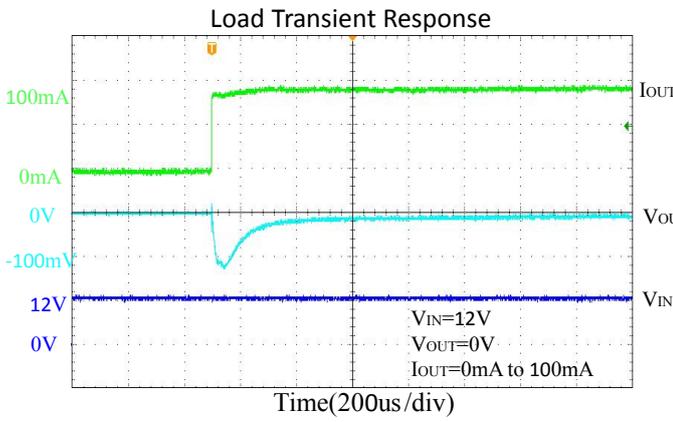
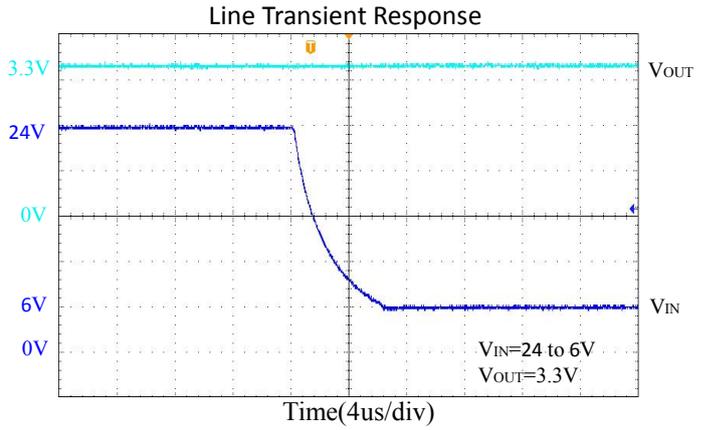
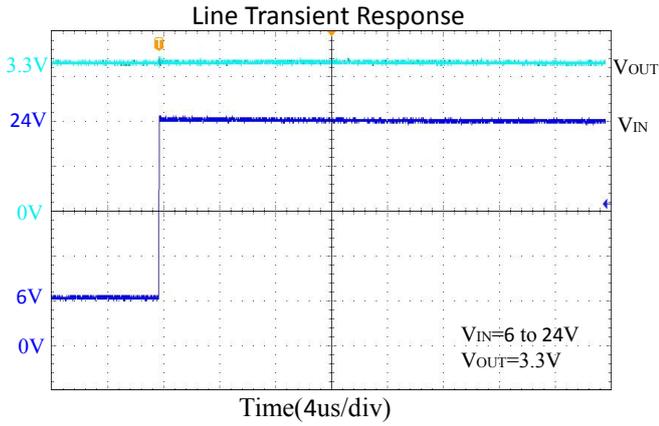
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage		5	—	60	V
I_{GND}	Quiescent Current	$V_{IN}=12\text{V}$, No load	—	2.1	—	μA
V_{OUT}	Output Voltage	$V_{IN}=12\text{V}$, $I_{OUT}=10\text{mA}$	$V_{OUTNOM} * 0.98$	V_{OUTNOM}	$V_{OUTNOM} * 1.02$	V
I_{OUT_MAX}	Output Current	$V_{IN}=V_{OUTNOM}+1\text{V}$	—	150	—	mA
V_{DROP}	Dropout Voltage ⁽¹⁾	$I_{OUT}=10\text{mA}$, $V_{IN}=V_{OUTNOM}-0.1\text{V}$	—	65	—	mV
		$I_{OUT}=100\text{mA}$, $V_{IN}=V_{OUTNOM}-0.1\text{V}$	—	650	—	mV
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation	$V_{IN}=7\text{V}$, $1\text{mA} \leq I_{OUT} \leq 100\text{mA}$	—	0.2	—	mV/mA
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	$I_{OUT}=1\text{mA}$, $V_{OUTNOM}+0.5\text{V} \leq V_{IN} \leq 60\text{V}$	—	0.1	—	mV/V
I_{LIMIT}	Current Limit	$V_{IN}=V_{OUTNOM}+2\text{V}$	—	250	—	mA
I_{SHORT}	Short Current	$V_{IN}=12\text{V}$	—	80	—	mA
T_{SHDN}	Thermal Shutdown Temperature	Shutdown, temperature increasing	—	150	—	°C
		Reset, temperature decreasing	—	115	—	
PSRR		$V_{IN}=10\text{V}$, $I_{OUT}=10\text{mA}$ $F=1\text{KHz}$, $V_{OUT}=3.3\text{V}$	—	70	—	dB

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: $T_A=25^{\circ}\text{C}$, $V_{in}=12\text{V}$, $I_{out}=1\text{mA}$, $C_{OUT}=10\mu\text{F}$, unless otherwise note

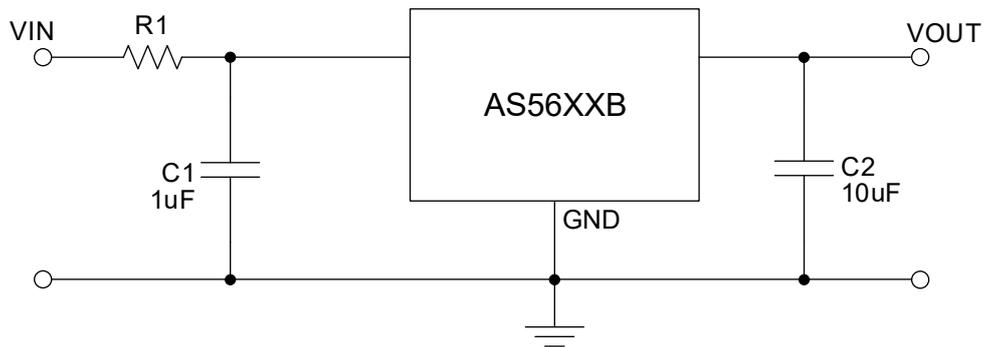




Detailed Description

Input Capacitor

A 1 μ F 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 \geq 18V, it is recommended to add R1(R1 $>$ 1 Ω , 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 1 μ F, 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.

Current Limit and Short Circuit Protection

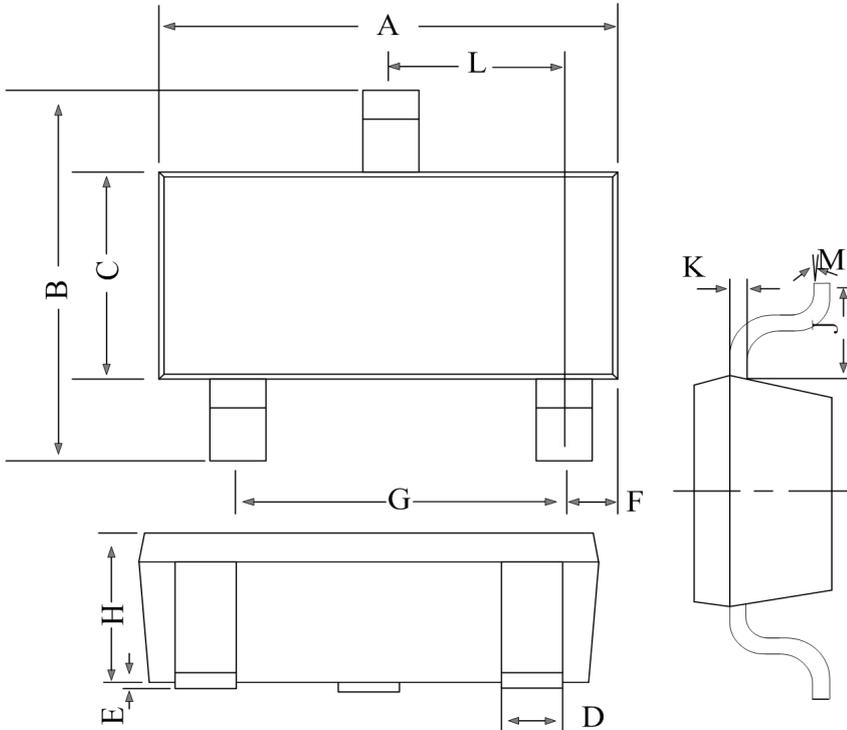
When output current at VOUT pin is higher than current limit threshold or the VOUT pin is direct short to GND, the current limit protection will be triggered and clamp the output current at a pre-designed level to prevent over-current and thermal damage.

Thermal Protection

The AS56XXB 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.

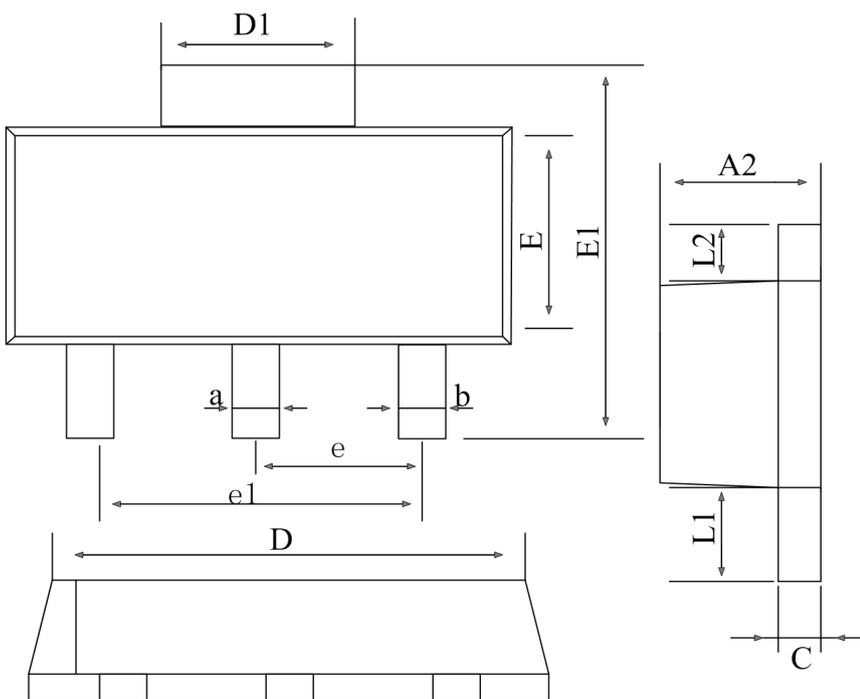
Package Description

SOT23-3

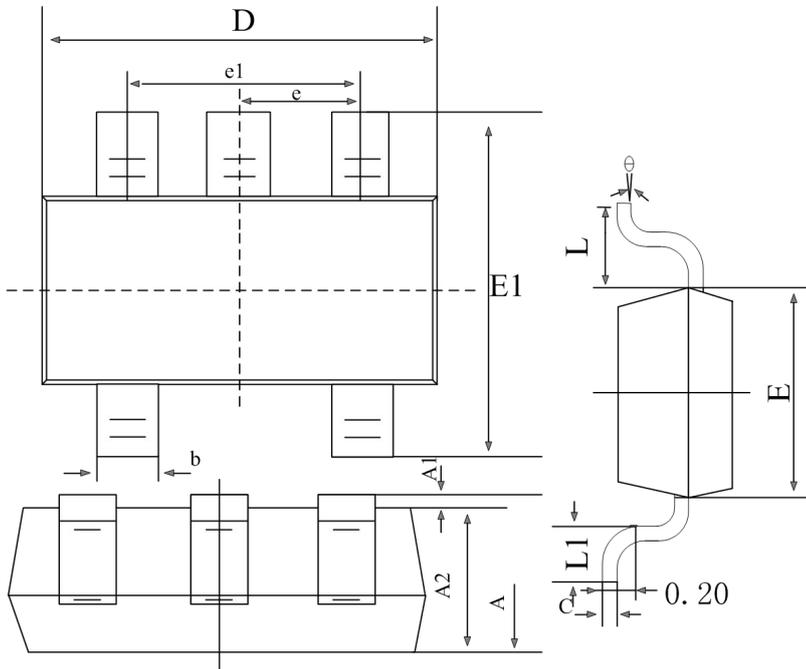


REF.	Millimeter	
	Min.	Max.
A	2.82	2.92
B	2.65	2.95
C	1.56	1.60
D	0.35	0.55
E	0	0.1
F	0.45	0.55
G	1.90 REF.	
H	1.0	1.3
K	0.10	0.20
J	0.40	-
L	0.85	1.15
M	0°	10°

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
E1	1.5	1.7
e	0.95 (BSC)	
e1	1.8	2.0
L	0.3	0.6
θ	0°	8°