45V,350mA,2.5uA,High PSRR, Low-Dropout Voltage Regulator With Enable

Features

- Low Quiescent Current : 2.5uA
- Shutdown Current : 130nA
- Wide Input Voltage Range : 3V to 45V
- High Output Current : 350mA
- High PSRR : 73dB at 1kHZ
- Low Dropout Voltage : 350mV@100mA
- Fixed Output Voltages : 1.8V, 3.0V, 3.3V and 5.0V
- Output Voltage Tolerance : ±2%
- Fast Transient Response
- Current Limit Protection
- Short Circuit Protection
- Thermal Shutdown Protection
- Available Packages : SOT23-3, SOT89-3, SOT23-5 and SOT223-3

Description

The ASPL54XXB series is an ultra-small, low dropout (LDO) linear regulator that can source 350mA of output current. The ASPL54XXB series is designed to provide high PSRR, high input voltage, and excellent load and line transient performance.

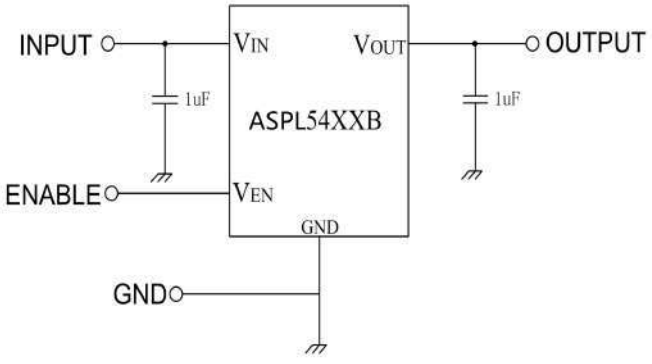
The ASPL54XXB series has thermal shutdown, current limit, and short Circuit protections for added safety. Shutdown mode is enabled by pulling the EN pin low.

The ASPL54XXB series contains four fixed output voltages of 1.8V, 3.0V, 3.3V and 5.0V.

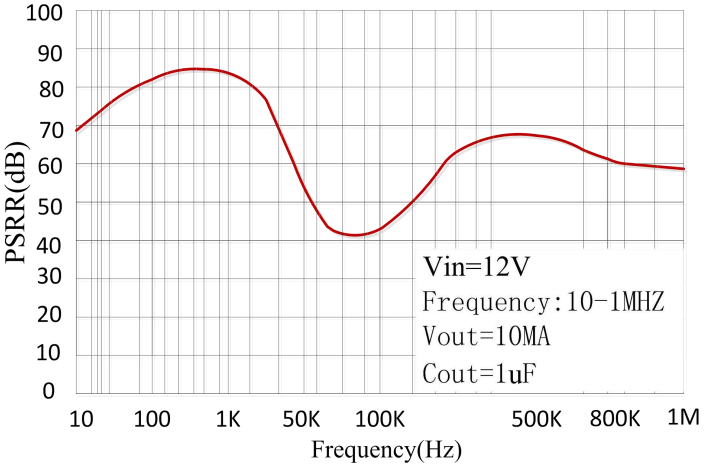
Application

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

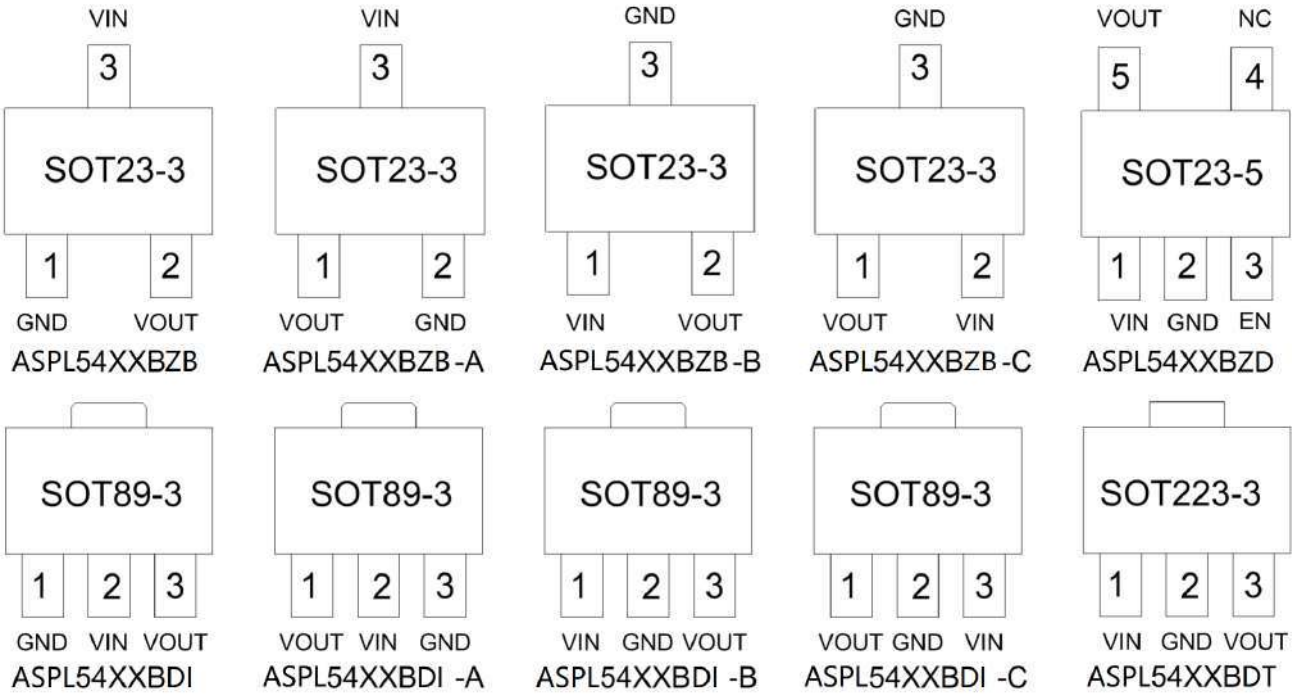
Typical Application Circuit



Power-Supply Rejection Ratio



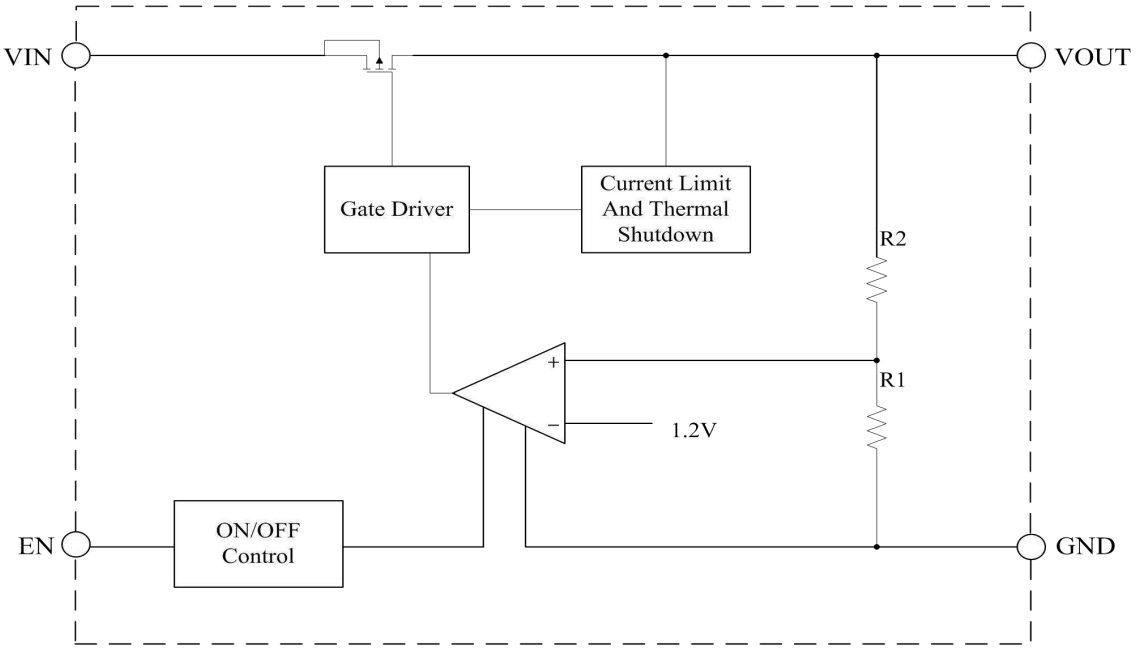
Marking Description



Pin Configuration

SOT23-3				Pin Name	Description
ASPL54XXBZB	ASPL54XXBZB-A	ASPL54XXBZB-B	ASPL54XXBZB-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**
ASPL54XXBDI	**ASPL54XXBDI-A**	**ASPL54XXBDI-B**	**ASPL54XXBDI-C**		
1	3	2	2	GND	Ground Pin
3	1	3	1	VOUT	Output Pin
2	2	1	3	VIN	Input Pin
SOT23-5		**SOT223-3**		**Pin Name**	**Description**
ASPL54XXBZD		**ASPL54XXBDT**			
1		1		VIN	Input Pin
2		2		GND	Ground Pin
3				EN	Enable pin
4				NC	No Connection
5		3		VOUT	Output Pin

Block Diagram



Absolute Maximum Ratings

Item	Description	Min	Max	Unit
Voltage	VIN to GND	-0.3	55	V
	VOUT to GND	-0.3	7	V
	VIN to VOUT	-0.3	50	V
	EN to GND	-0.3	55	V
Current	Peak output current	Internally limited		
Temperature	Operating Temperature Range	-40	125	℃
	Storage Temperature	-40	150	℃
Thermal Resistance (Junction to Ambient)	SOT89	130		℃/W
	SOT23	200		℃/W
	SOT223	120		℃/W
Power Dissipation	SOT89	900		mW
	SOT23	600		mW
	SOT223	1000		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.

Electrical Characteristics

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

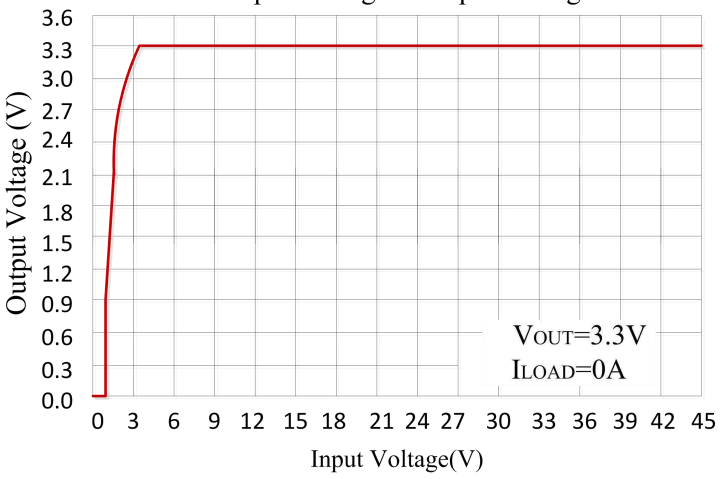
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage		3	—	45	V
I_{GND}	Quiescent Current	V_{IN}=12V, No load	—	2.5	—	uA
I_{SHUT}	Shutdown Current	V_{IN}=12V, EN=0V	—	130	—	nA
V_{OUT}	Output Voltage	V_{IN}=12V, I_{OUT}=10mA	V_{OUTNOM} * 0.98	V_{OUTNOM}	V_{OUTNOM} * 1.02	V
I_{OUT_MAX}	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	V_{IN}=7V, 1mA≤I_{OUT}≤100mA	—	0.1	—	mV/mA
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	I_{OUT}=1mA, V_{OUTNOM}+0.5V≤V_{IN}≤42V	—	0.1	—	mV/V
I_{LIMIT}	Current Limit		—	500	—	mA
T_{SHDN}	Thermal Shutdown Temperature	Shutdown, temperature increasing	—	144	—	℃
		Reset, temperature decreasing	—	126	—	
PSRR		V_{IN}=10V , I_{OUT}=10mA F=1Khz,V_{OUT}=3.3V	—	73	—	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.

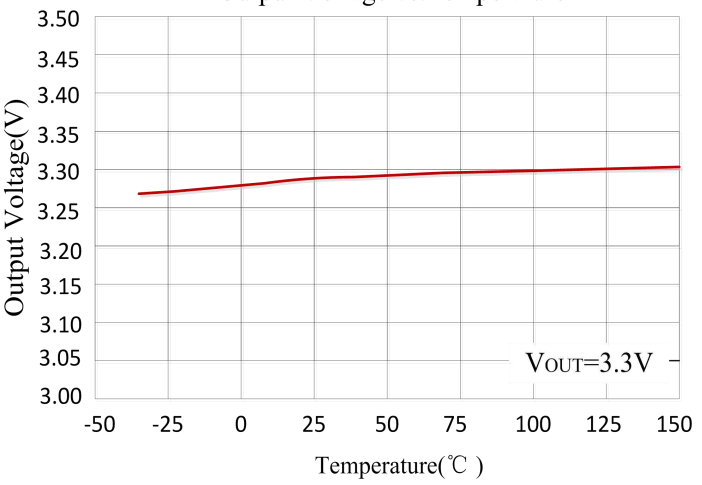
Typical Performance Characteristics

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

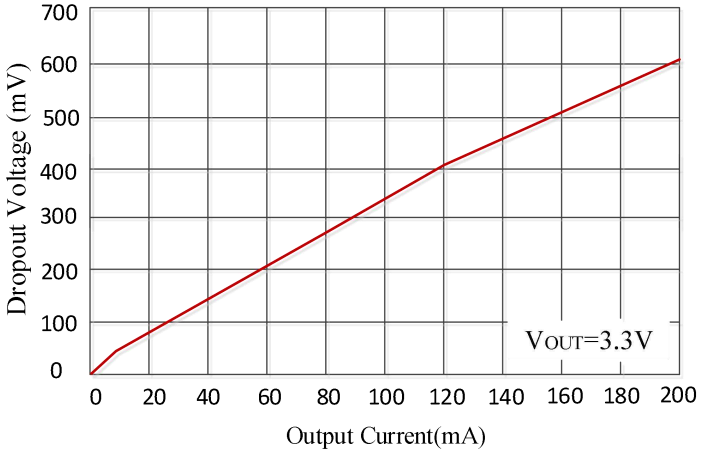
Output Voltage vs. Input Voltage



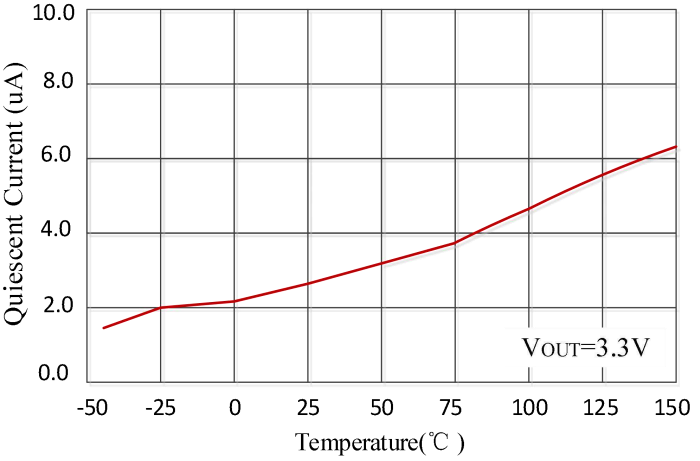
Output Voltage vs.Temperature



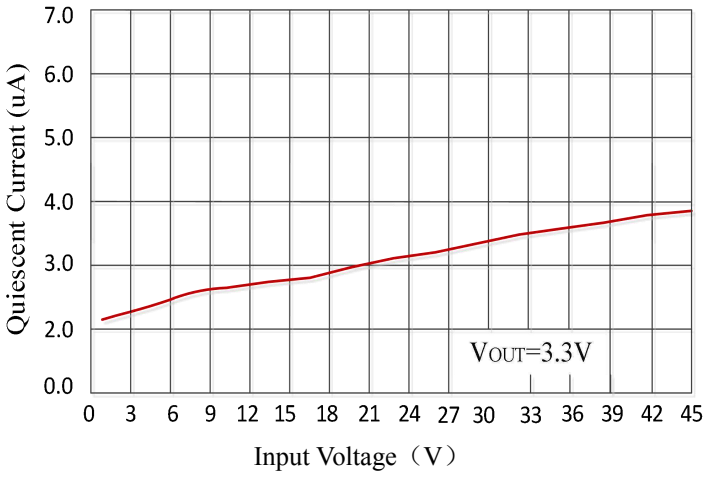
Dropout Voltage vs. Output Current



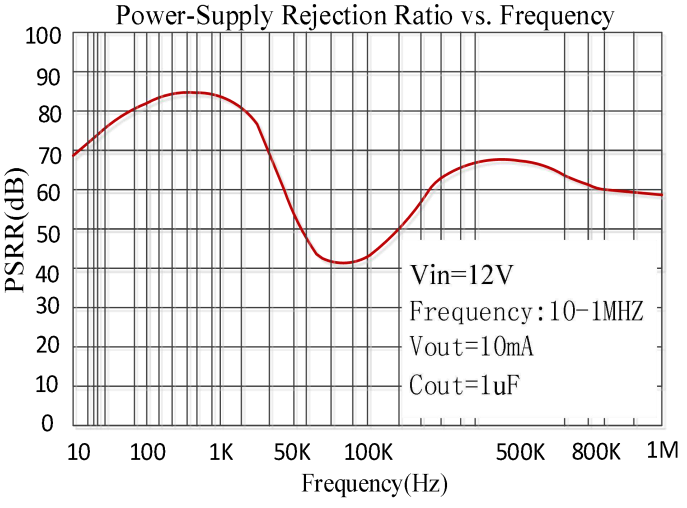
Quiescent Current vs.Temperature



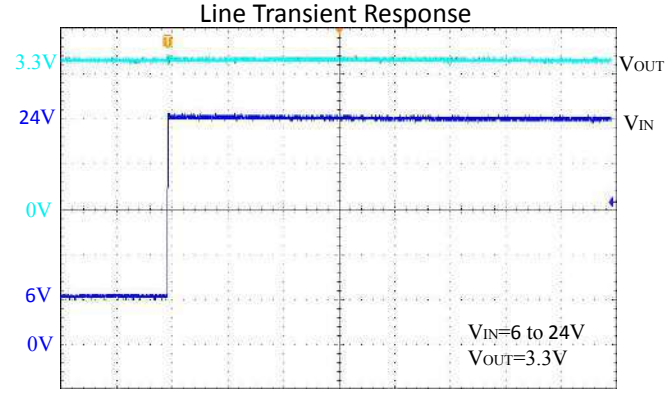
Quiescent Current vs. Input Voltage



Power-Supply Rejection Ratio vs. Frequency

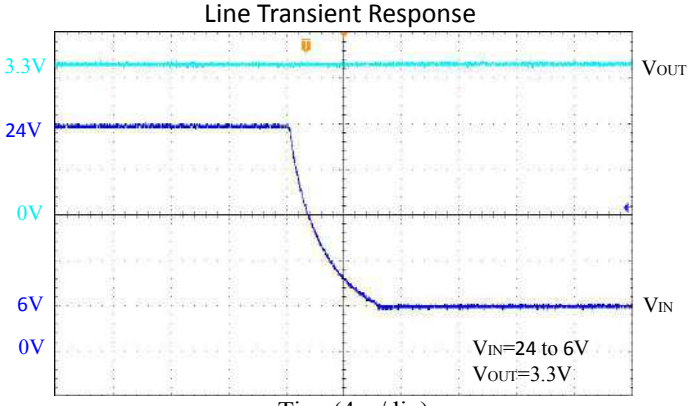


Line Transient Response



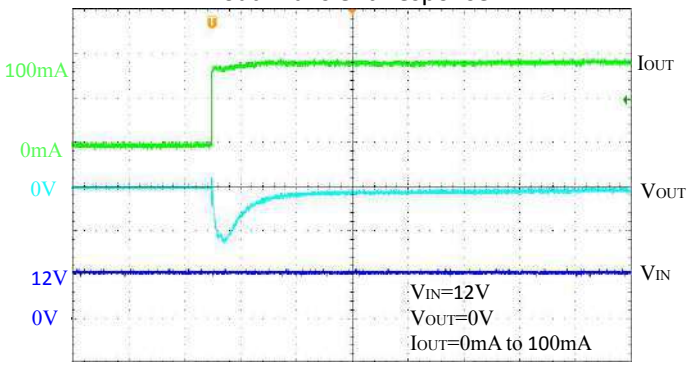
Time(4us/div)

Line Transient Response



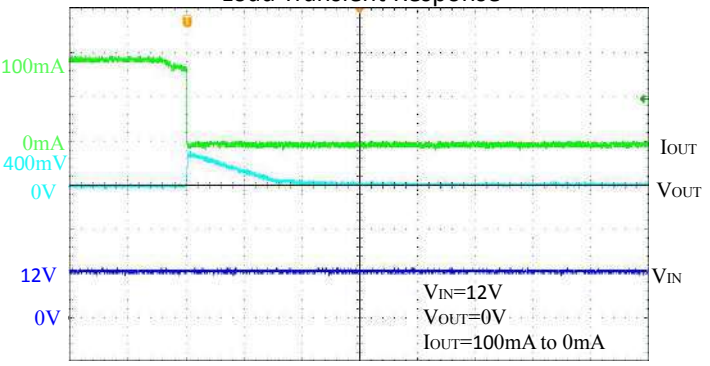
Time(4us/div)

Load Transient Response



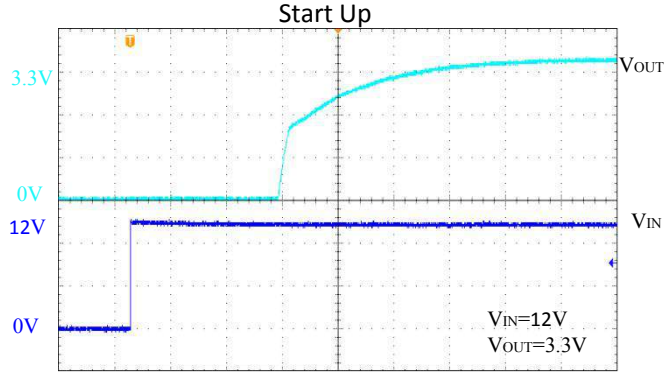
Time(200us/div)

Load Transient Response



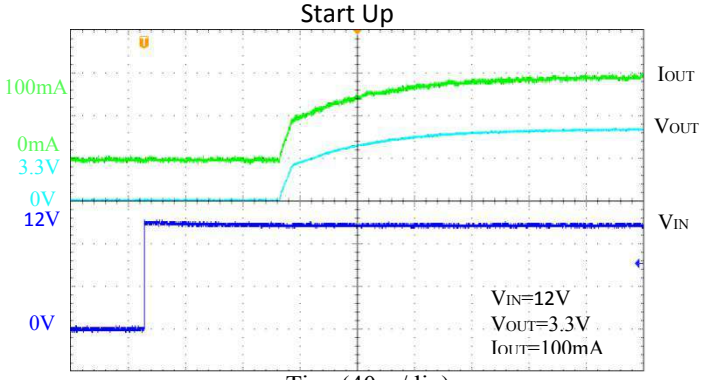
Time(200us/div)

Start Up



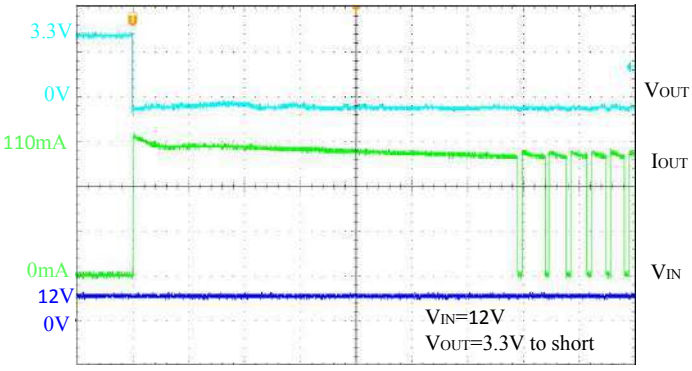
Time(40us/div)

Start Up



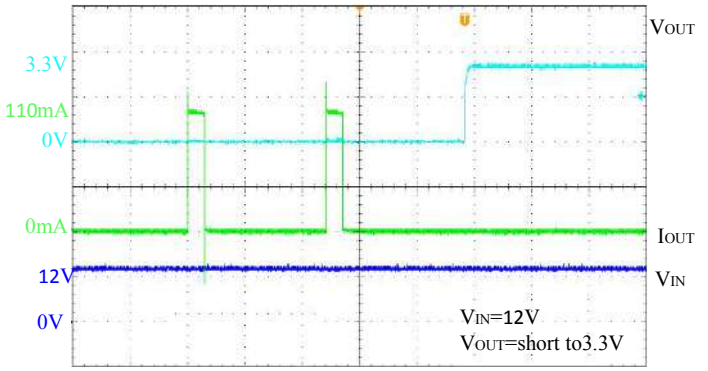
Time(40us/div)

Short Circuit Protection



Time(2ms/div)

Short Circuit Protection

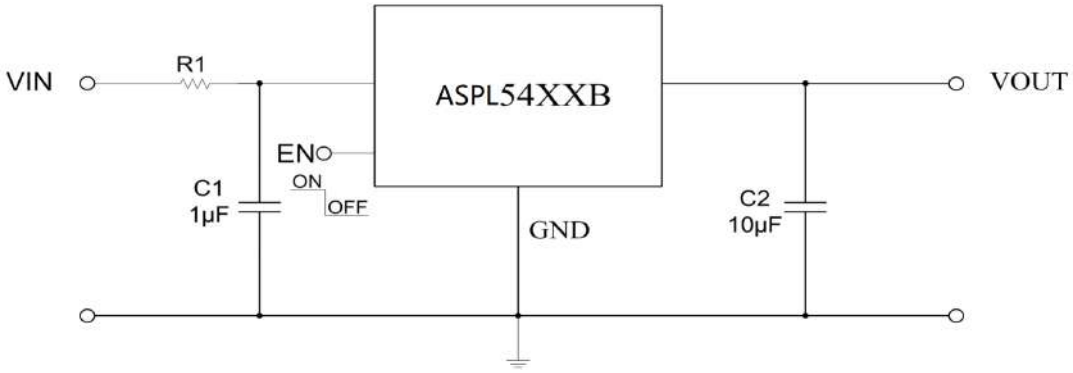


Time(2ms/div)

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 ASPL54XXB 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 ASPL54XXB 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.

Ordering Information

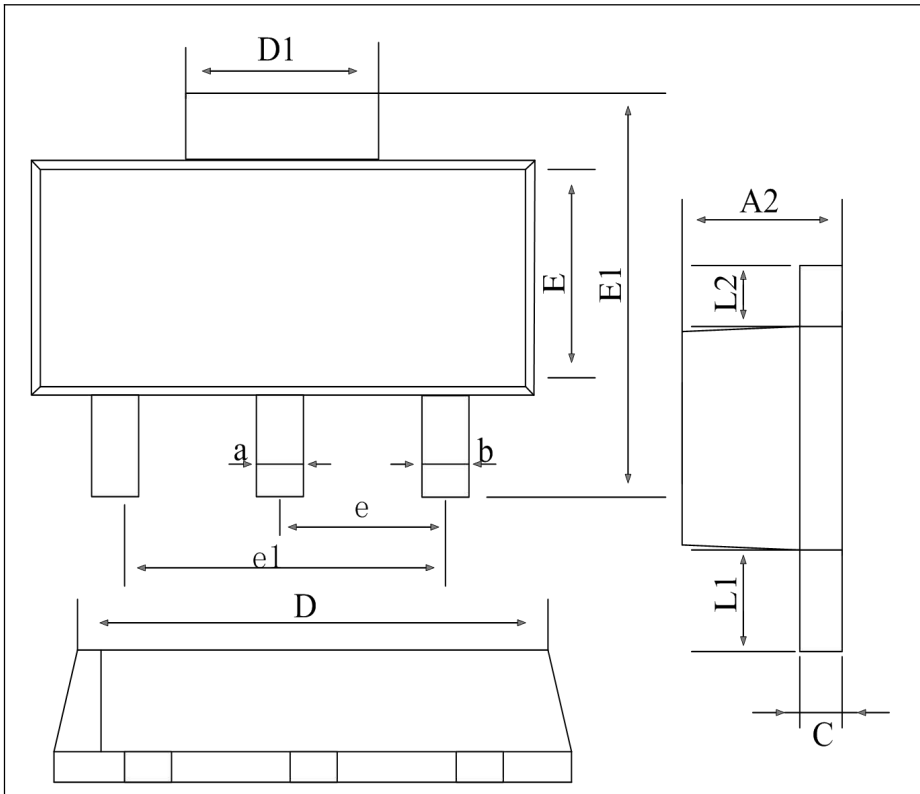
Ordering Number	Package	Packing	Quantity	Pin Definition
ASPL54XXBZB-R	SOT23-3	Tape&Reel	3000/Reel	pin1:GND,pin2:VOUT,pin3:VIN
ASPL54XXBZB-A-R	SOT23-3	Tape&Reel	3000/Reel	pin1:VOUT,pin2:GND,pin3:VIN
ASPL54XXBZB-B-R	SOT23-3	Tape&Reel	3000/Reel	pin1:VIN,pin2:VOUT,pin3:GND
ASPL54XXBZB-C-R	SOT23-3	Tape&Reel	3000/Reel	pin1:VOUT,pin2:VIN,pin3:GND
ASPL54XXBDI-R	SOT89-3	Tape&Reel	3000/Reel	pin1:GND,pin2:VIN,pin3:VOUT
ASPL54XXBDI-A-R	SOT89-3	Tape&Reel	3000/Reel	pin1:VOUT,pin2:VIN,pin3:GND
ASPL54XXBDI-B-R	SOT89-3	Tape&Reel	3000/Reel	pin1:VIN,pin2:GND,pin3:VOUT
ASPL54XXBDI-C-R	SOT89-3	Tape&Reel	3000/Reel	pin1:VOUT,pin2:GND,pin3:VIN
ASPL54XXBZD-R	SOT23-5	Tape&Reel	3000/Reel	pin1:VIN,pin2:GND,pin3:EN,Pin4:NC,Pin5:VOUT
ASPL54XXBDT-R	SOT-223	Tape&Reel	2500/Reel	pin1:VIN,pin2:GND,pin3:VOUT

Note: ”XX” stands for Output Voltage. "18": 1.8V, "30": 3.0V, "33": 3.3V, "50": 5.0V.
Note: ”B” stands for Voltage accuracy. "B": ±2%
Note: ”ZB, ZD, DI, DT” stands for package. "ZB": SOT23-3, "ZD": SOT23-5, "DI": SOT89-3, "DT": SOT-223.
Note: ”A, B, C” stands for pin definition, Please refer to page 2 of the specification.
Note: ”R” stands for Packing, Tape&Reel.
P/N example: ASPL5418BZD-R, ASPL5430BZB-R, ASPL5433BDI-C-R, etc.

PACKAGE	MARKING
SOT23-3 SOT89-3 SOT23-5 SOT-223	正面丝印

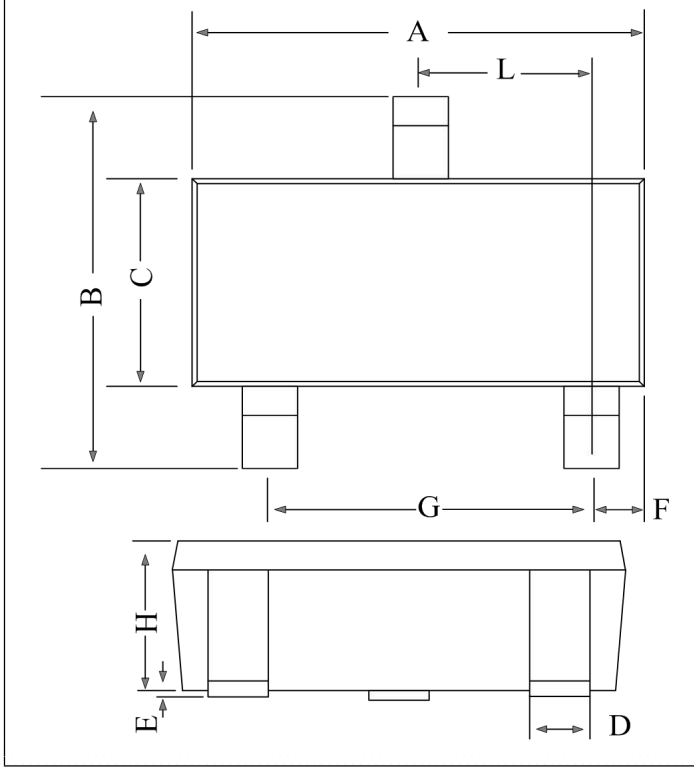
Package Outline

SOT-223



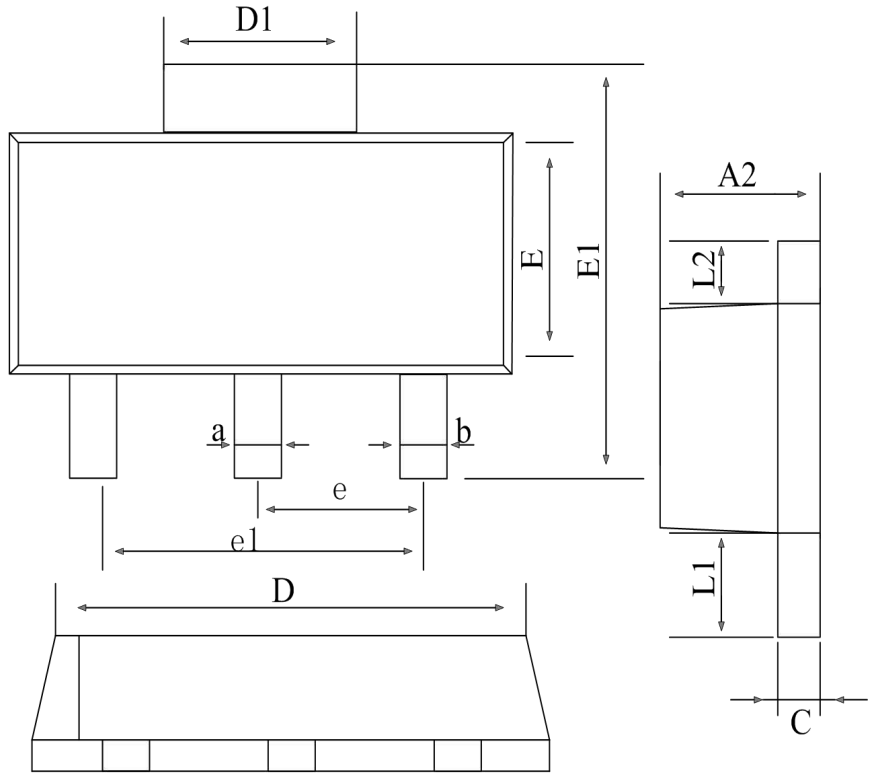
REF.	Millimeter	
	Min.	Max.
A2	1.5	1.7
a	0.45	0.55
b	0.66	0.84
c	0.23	0.35
D	6.30	6.70
D1	2.90	3.10
E	2.40	2.60
E1	3.30	3.70
e	2.20	2.30
e1	4.40	4.60
L1	0.80	1.00
L2	0.65	0.75

SOT23-3



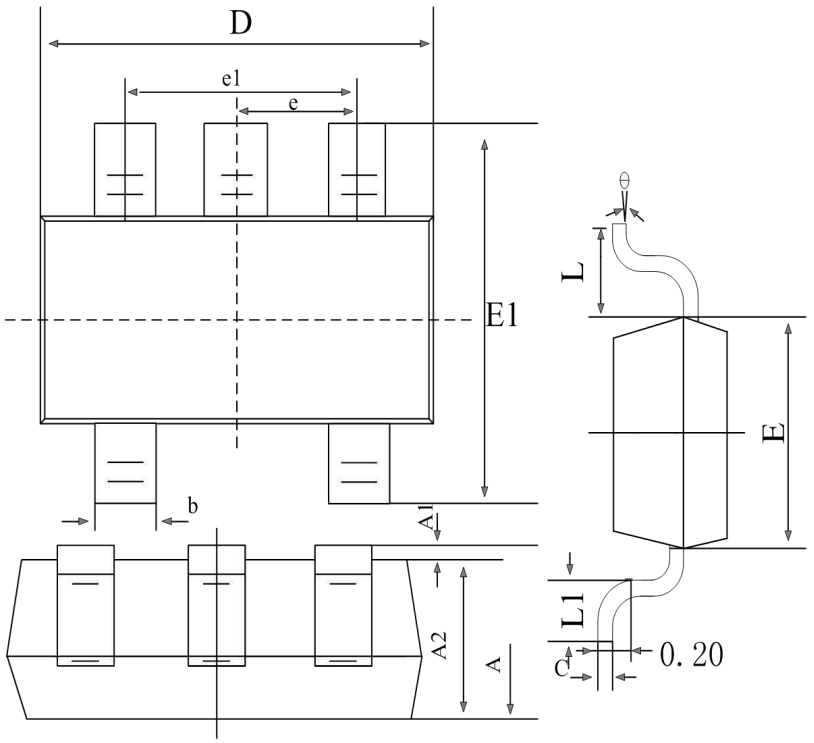
REF.	Millimeter	
	Min.	Max.
A	2.82	2.92
B	2.65	2.95
C	1.56	1.60
D	0.35	0.55
E	0	0.1
F	0.45	0.55
G	1.90	REF.
H	1.0	1.3
K	0.10	0.20
J	0.40	_
L	0.85	1.15
M	0°	10°

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°

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