■ Description

The MST56XXB series is a high input voltage (60V), low quiescent current, High PSRR linear regulator (LDO) able to provide 150mA load current.

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 3.0V, 3.3V, 3.6V and 5.0V, and available in SOT23 ,TO252 and SOT89 packages.

■ Features

- Low Quiescent Current：2uA
- High Input Voltage Rating：Up to 60V
- Output Current：150mA
- High PSRR：70dB at 1Khz
- Dropout Voltage：

  70mV@10mA

  700mV@100mA
- Fixed Output Voltages：

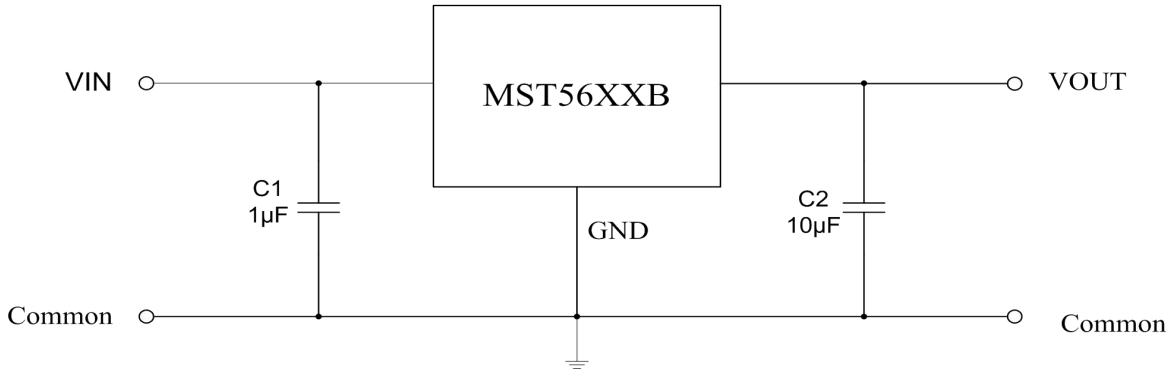
  3.0V, 3.3V, 3.6V and 5.0V
- High-accuracy Output Voltage: ±2%
- Good Transient Response
- Integrated Short-Circuit Protection
- Integrated Thermal Protection
- Available Packages：

■ Application

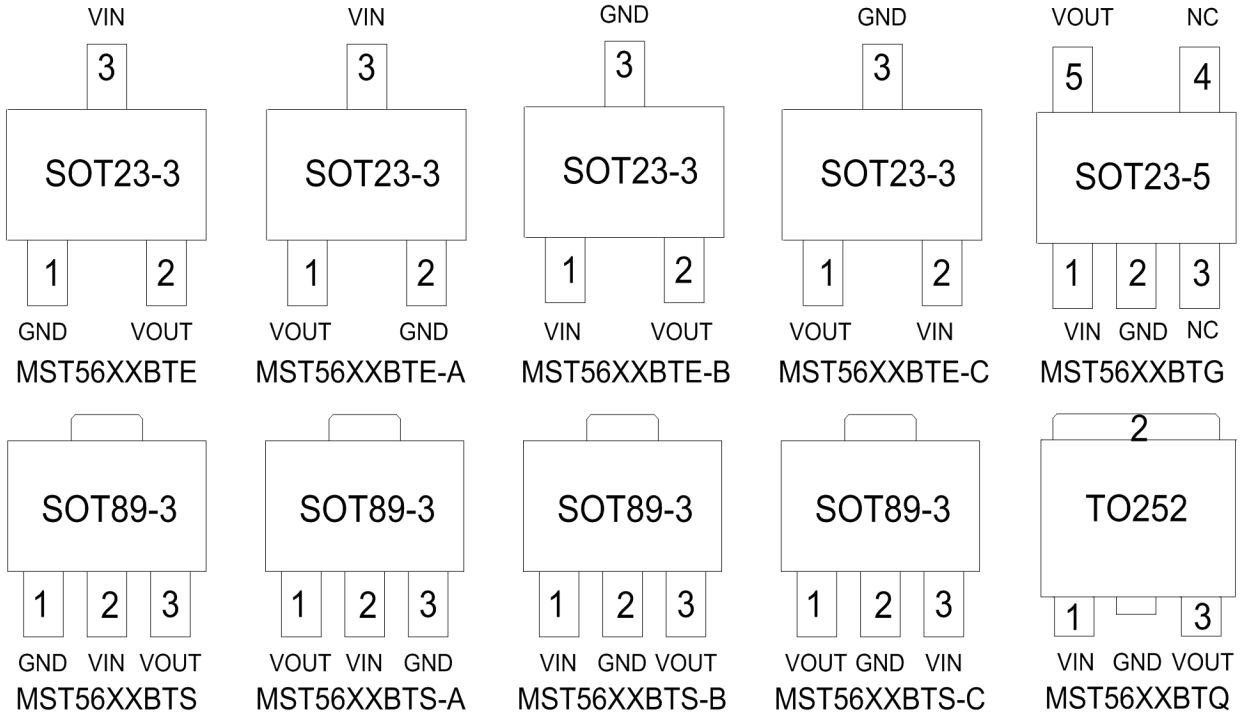
- Battery-powered equipment
- Smoke detector and sensor
- Micro controller Applications
- Home Appliance

MST56XXBTE MST56XXBTE-A MST56XXBTE-B MST56XXBTE-C	SOT23-3
MST56XXBTS MST56XXBTS-A MST56XXBTS-B MST56XXBTS-C	SOT89-3
MST56XXBTG	SOT23-5
MST56XXBTQ	TO-252

■ Application Circuits



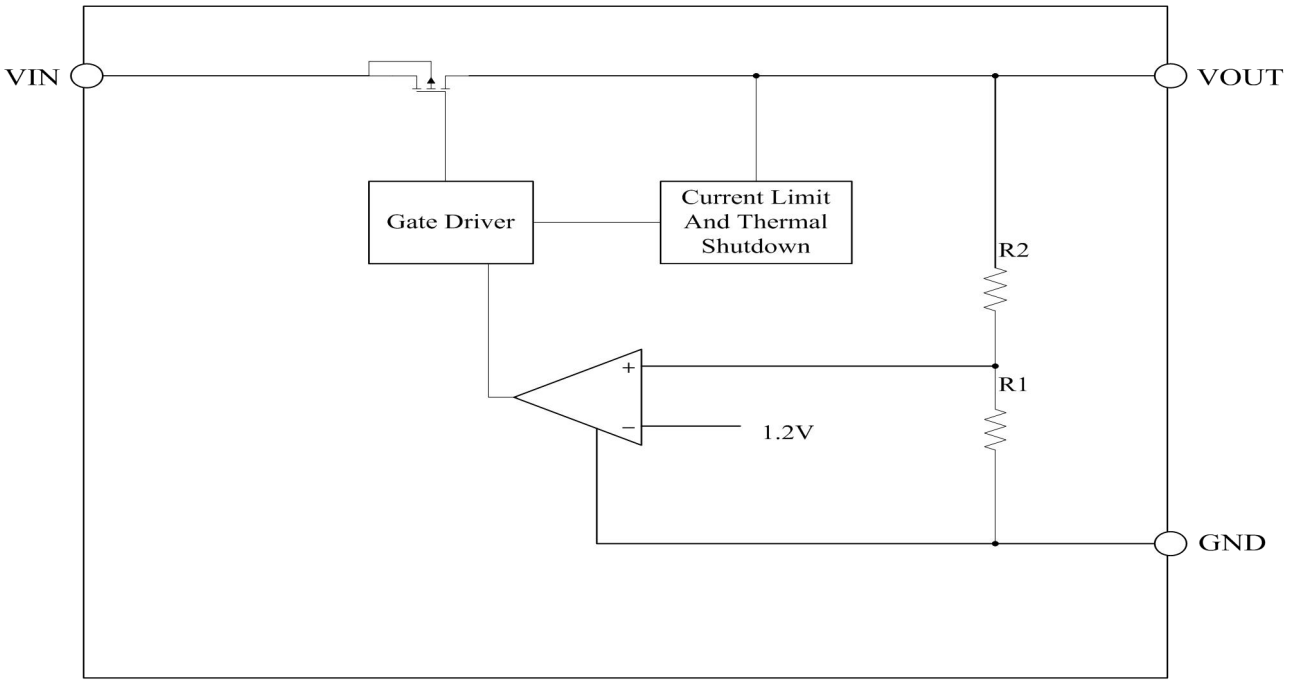
■ Packages And Pin Assignment



■ Pin Descriptions

SOT23-3				Pin Name	Description
MST56XXBTE	MST56XXBTE-A	MST56XXBTE-B	MST56XXBTE-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**
MST56XXBTS	**MST56XXBTS-A**	**MST56XXBTS-B**	**MST56XXBTS-C**		
1	3	2	2	GND	Ground Pin
3	1	3	1	VOUT	Output Pin
2	2	1	3	VIN	Input Pin
SOT23-5		**TO-252**		**Pin Name**	**Description**
MST56XXBTG		**MST56XXBTQ**			
1		1		VIN	Input Pin
2		2		GND	Ground Pin
3				NC	No Connection
4				NC	No Connection
5		3		VOUT	Output Pin

■ Functional Block Diagram



■ Absolute Maximum Ratings

Item	Description	Min	Max	Unit
Voltage	VIN to GND	-0.3	60	V
	VOUT to GND	-0.3	6	V
	VOUT to VIN	-35	0.3	V
Current	Peak output current	Internally limited		
Temperature	Operating Ambient Temperature	-40	85	℃
	Storage Temperature	-40	150	℃
	Operating virtual junction Temperature	-	150	℃
Thermal Resistance (Junction to Ambient)	SOT89	180		℃/W
	SOT23	380		℃/W
	TO252	80		℃/W
Power Dissipation	SOT89	600		mW
	SOT23	300		mW
	TO252	2000		mW
Electrostatic discharge rating	Human Body Model (HBM)	4		kV
	Charged Device Model (MM)	100		V

■ Electrical Characteristics

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

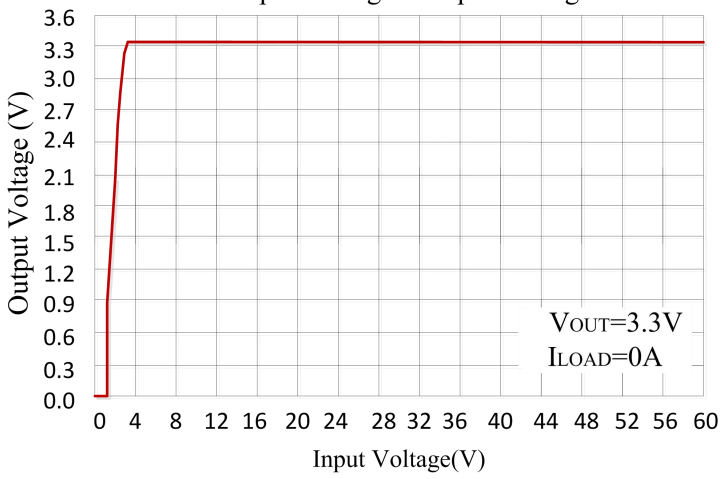
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
VIN	Input Voltage		5	—	60	V
I_{GND}	Quiescent Current	V_{IN}=12V, No load	—	2	—	uA
VOUT	Output Voltage	V_{IN}=12V, I_{OUT}=10mA	V_{OUTNOM} * 0.98	V_{OUTNOM}	V_{OUTNOM} * 1.02	V
I_{OUT_MAX}	Output Current		—	150	—	mA
V_{DROP}	Dropout Voltage(1)	I_{OUT}=10mA , V_{IN}=V_{OUTNOM}-0.1V	—	70	—	mV
		I_{OUT}=100mA , V_{IN}=V_{OUTNOM}-0.1V	—	700	—	mV
$\Delta V_{OUT(\Delta IOUT)}$	Load Regulation	VIN=12V, 1mA≤I_{OUT}≤100mA	—	0.02	—	%/mA
$\Delta V_{OUT(\Delta VIN)}$	Line Regulation	IOUT=1mA, V_{OUTNOM}+0.5V≤V_{IN}≤60 V	—	0.01	—	%/V
I_{LIMIT}	Current Limit		—	250	—	mA
T_{SHDN}	Thermal Shutdown Temperature	Shutdown, temperature increasing	—	150	—	℃
		Reset, temperature decreasing	—	140	—	
PSRR		Vin=12V , Iout=10mA F=1Khz,Vout=3.3V	—	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.

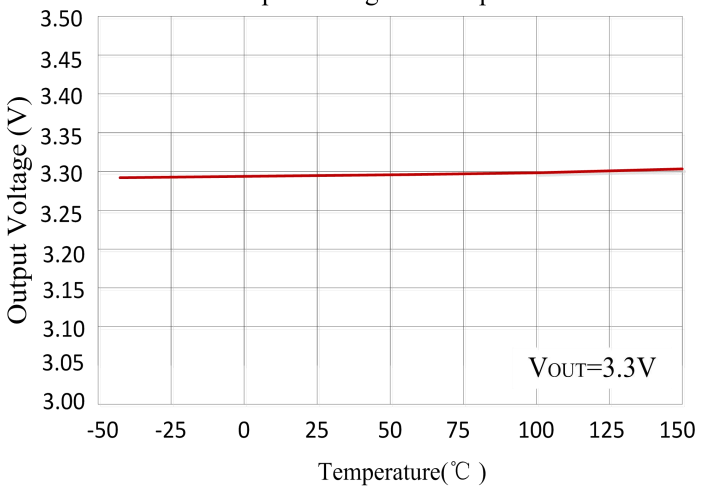
■ Typical Performance Characteristics

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

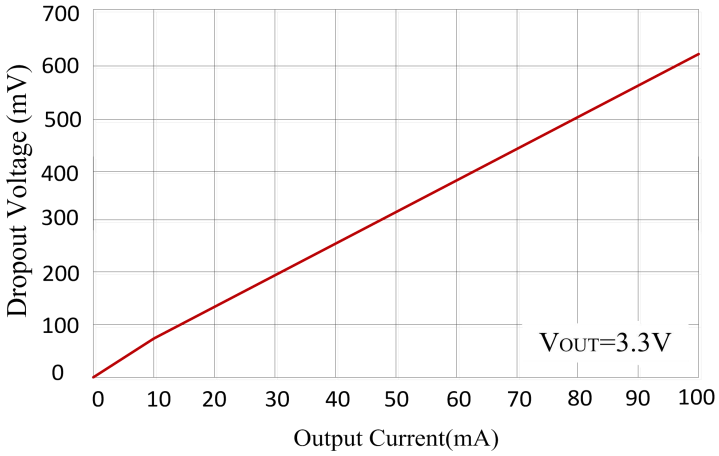
Output Voltage vs.Input Voltage



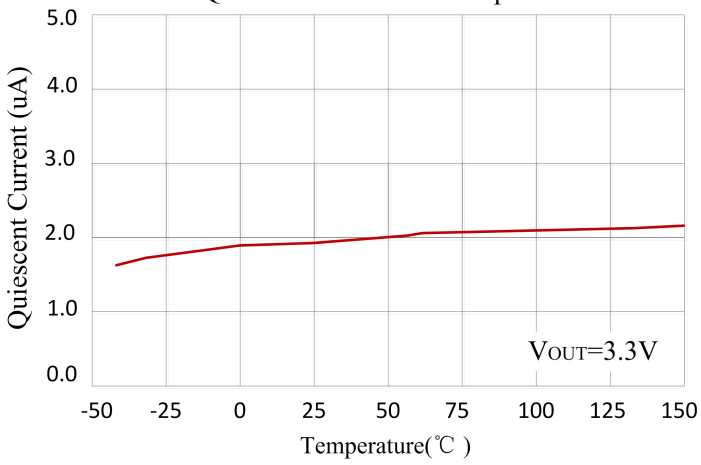
Output Voltage vs.Temperature



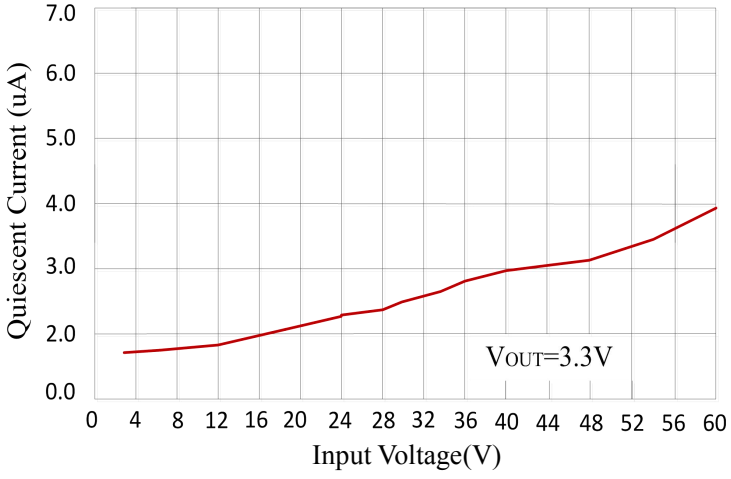
Dropout Voltage vs. Output Current



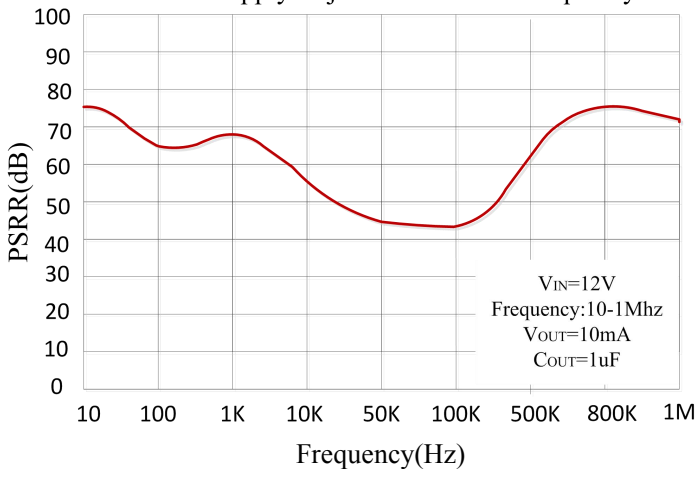
Quiescent Current vs.Temperature



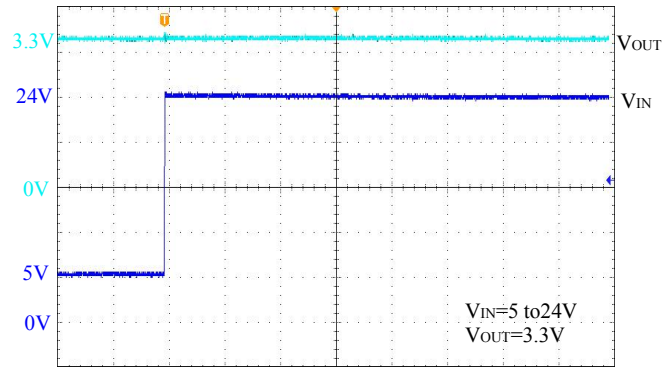
Quiescent Current vs. Input Voltage



Power-Supply Rejection Ratio vs. Frequency

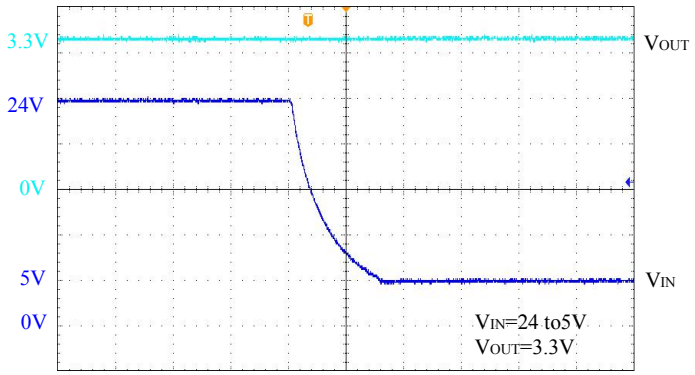


Line Transient Response



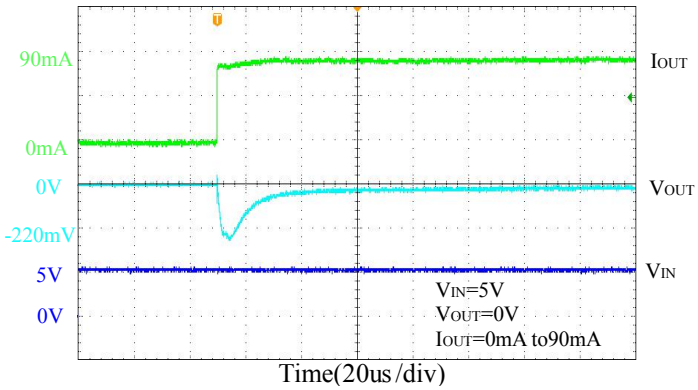
Time(10us/div)

Line Transient Response



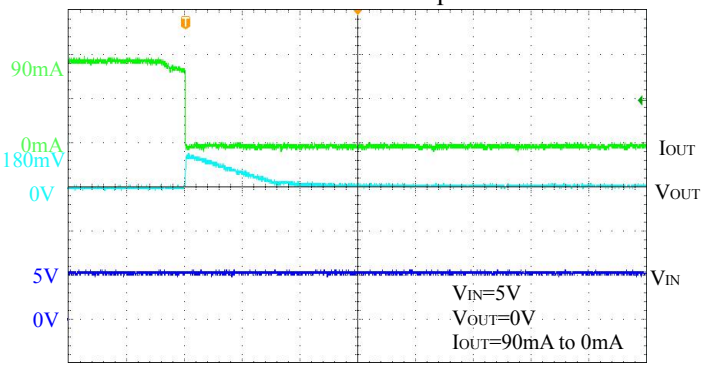
Time(4us/div)

Load Transient Response



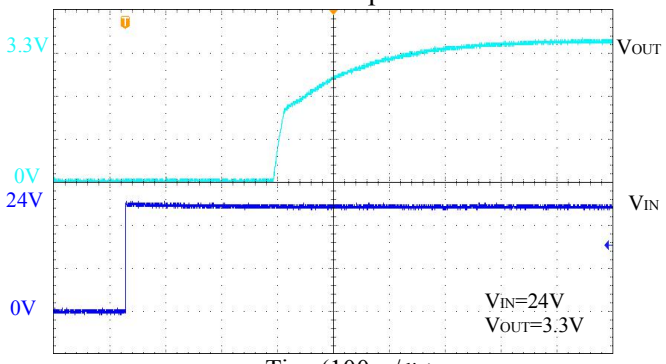
Time(20us /div)

Load Transient Response



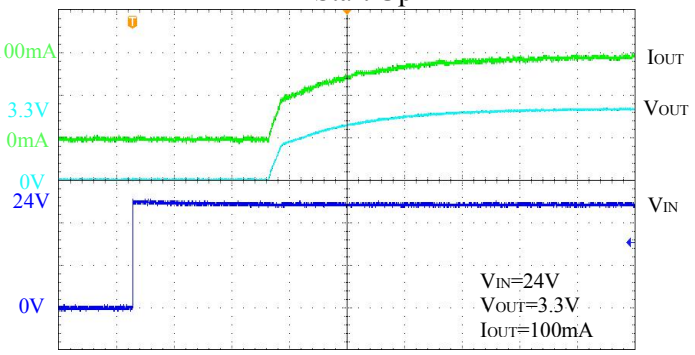
Time(200us/div)

Start Up



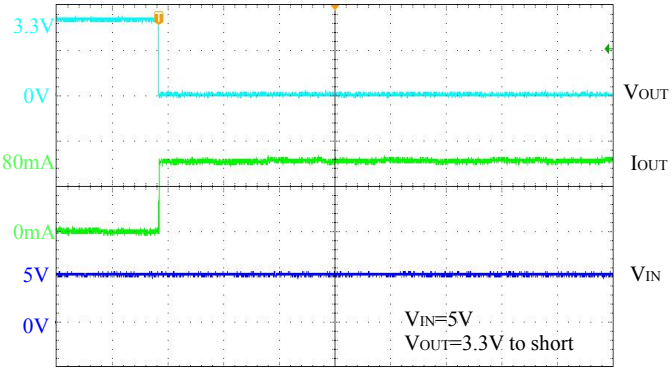
Time(100us/div)

Start Up



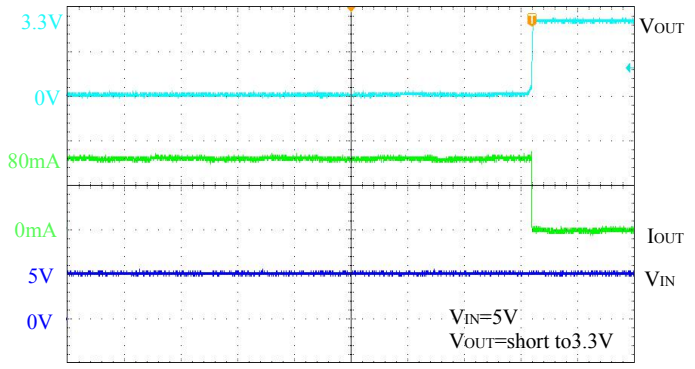
Time(100us/div)

Short Circuit Protection



Time(10ms/div)

Short Circuit Protection



Time(10ms/div)

■ Functional 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.

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.

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

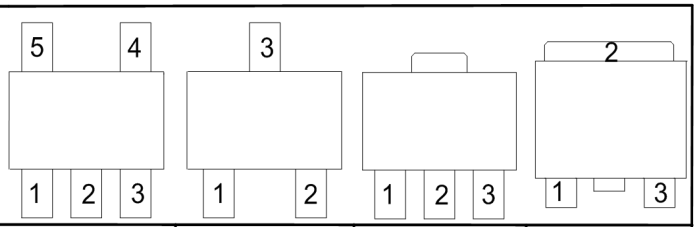
The MST56XXB has internal thermal sense and protection circuits. When excessive power dissipation happens on the device, such as short circuit at the output pin or very heavy load current with a large voltage drop across the device, the internal thermal protection circuit will be triggered, and it will 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 And Marking Information

Part Number

MST5633BTE-A
- Pin definition
- Package definition
- Voltage accuracy
- Product Name
- Company Name

Package Outline



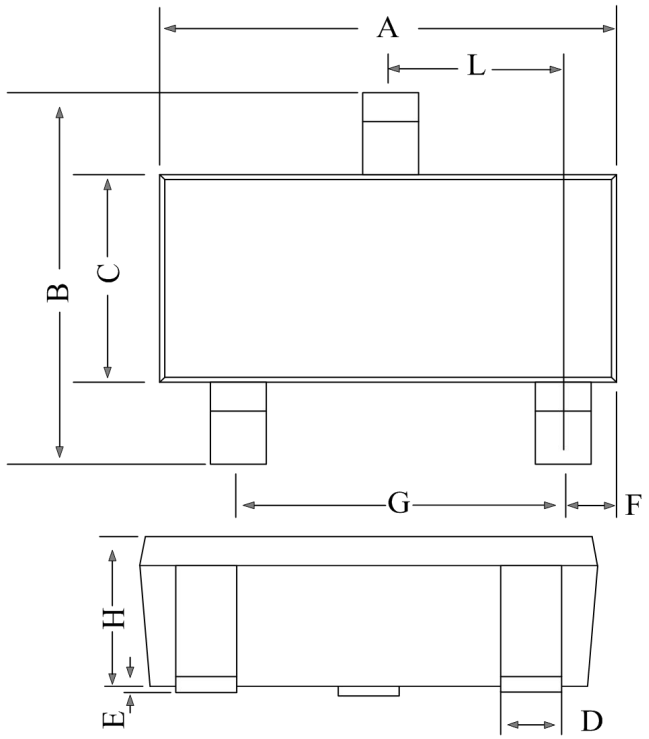
Minimum Package	SOT23-5	SOT23-3	SOT89-3	TO252
	3000pcs/Reel	3000pcs/Reel	1000pcs/Reel	2500pcs/Reel

Marking

M5633BA
1918R
- A:Pin definition
- B:B(±2%) A(±1%) C(±3%)
- 5633:5633(3.3V) 5636(3.6V) 5630(3.0V) 5650(5.0V)
- R:Internal Code.Variable.
- 1918:19-2019;18-the 18th week of this year
- M:M(SOT89-3) blank(SOT23) Q(TO252)

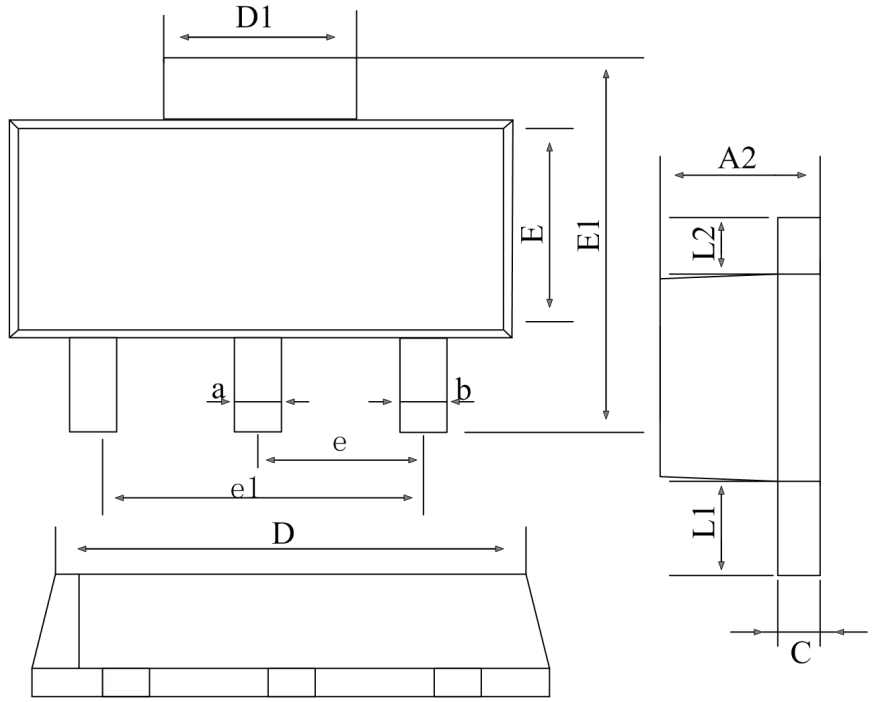
■ Package Outline Dimensions

SOT23-3



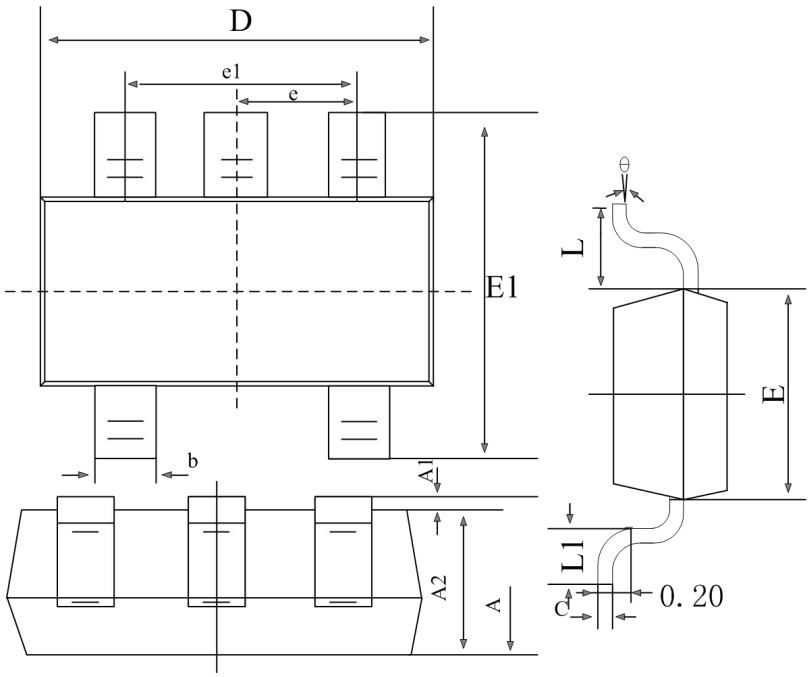
REF.	Millimeter	
	Min.	Max.
A	2.82	2.92
B	2.65	2.95
C	1.56	1.60
D	0.35	0.55
E	0	0.1
F	0.45	0.55
G	1.90	REF.
H	1.0	1.3
K	0.10	0.20
J	0.40	_
L	0.85	1.15
M	0^0	10^0

SOT89-3



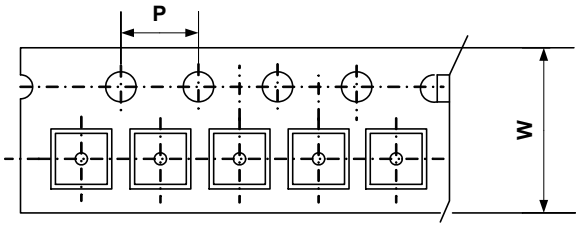
REF.	Millimeter	
	Min.	Max.
A2	1.4	1.6
a	0.45	0.55
b	0.38	0.48
c	0.36	0.46
D	4.40	4.60
D1	1.60	1.80
E	2.40	2.60
E1	4.00	4.30
e	1.00	2.00
e1	2.95	3.05
L1	0.80	1.00
L2	0.65	0.75

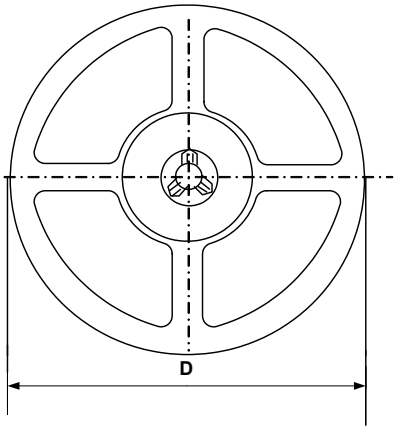
SOT23-5



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°

■ Packing Information





Type	W(mm)	P(mm)	D(mm)	Qty (pcs)
SOT23-3	8.0±0.1 mm	4.0±0.1 mm	180±1 mm	3000pcs
SOT23-5	8.0±0.1 mm	4.0±0.1 mm	180±1 mm	3000pcs
SOT89-3	12.0±0.1 mm	4.0±0.1 mm	180±1 mm	1000pcs

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