Low power consumption, high performance 150mA LDO

General Description

The ET75XXX-X is low power consumption very low 1.5uA ground current, high performance 150mA LDO. The family uses an advanced CMOS process and a PMOSFET pass device to achieve fast start-up, with high output voltage accuracy. The ET75XXX-X is stable with a 1.0μF~10uF ceramic output capacitor, and uses a precision voltage reference and feedback loop to achieve a worst-case accuracy of 2% over all load, line, process, and temperature variations.

ET75XXX-X series are offered in a SOT89-3, SOT23-5, SOT23-3, TO-92 package.

Features

- Wide input voltage range: 3V to 30V
- Up to 150mA Load Current
- Very low I_Q: 1.5μA @Typ
- Ultra low Dropout: 720mV at 150mA Load @V_{OUT}=5V
  820mV at 150mA Load @V_{OUT}=3.3V
  840mV at 150mA Load @V_{OUT}=3V
- Dropout is 700mV at 200mA Load @V_{OUT}=1.8V
- Short current protection: 100mA
- Excellent load/line transient response
- Line regulation is 0.01%/V typical
- Packages: SOT89-3, SOT23-5, SOT23-3, TO-92

Device information

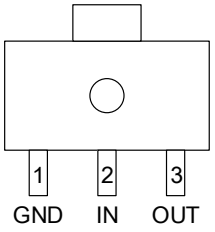
ET 75 XX X -X

XX Output Voltage		X Package		X Accuracy
XX	Output X.XV For example, 50 is 5.0V output voltage	B / F	SOT89-3	1: output accuracy is 1% 2: output accuracy is 2%
		S	SOT23-3	
		/	SOT23-5	

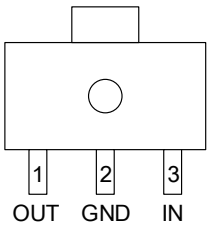
Mark Specification Label

Part No.	Marking				V_{OUT}
	SOT89-3 (B Type)	SOT89-3 (F Type)	SOT23-3 (S)	SOT23-5	
ET75XXX-X	18B	18F	18S	18	1.8V
	25B	25F	25S	25	2.5V
	30B	30F	30S	30	3.0V
	33B	33F	33S	33	3.3V
	36B	36F	36S	36	3.6V
	50B	50F	50S	50	5.0V

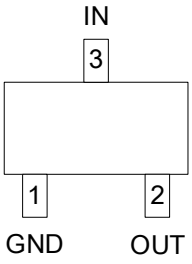
Pin Configuration



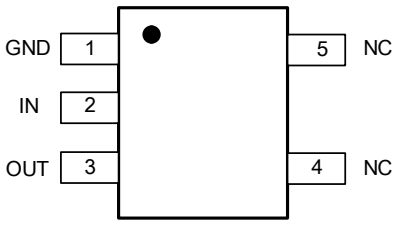
ET75XXB-X(SOT89-3)



ET75XXF-X(SOT89-3)



ET75XXS-X(SOT23-3)



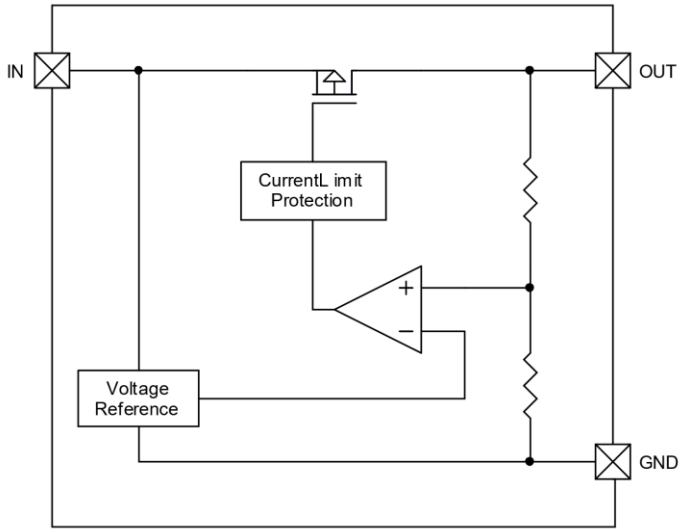
ET75XX-X(SOT23-5)

Top View

Pin Function

Pin No.				Pin Name	Pin Function
SOT89-3		SOT23-3	SOT23-5		
XXB	XXF	XXS	XX		
1	2	1	1	GND	Ground.
2	3	3	2	IN	Supply input pin.
3	1	2	3	OUT	Output pin.
			4,5	NC	No connection.

Block Diagram



Functional Description

Input Capacitor

A 1μF-10uF 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 output capacitance is from 1μF to 10μF, Equivalent Series Resistance (ESR) is from 5mΩ to 100mΩ, 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 OUT and GND pins.

Low Quiescent Current

The ET75XXX-X, consuming only around 1.5μA for all input range and output loading, provides great power saving in portable and low power applications.

Short Current Limit Protection

When output current at the OUT pin is higher than current limit threshold or the OUT pin is short-circuit to GND, the short current limit protection will be triggered and clamp the output current to approximately 100mA to prevent over-current and to protect the regulator from damage due to overheating.

Absolute Maximum Ratings

Parameter	Rating		Unit
IN pin to GND pin	-0.3 to 36		V
OUT pin to GND pin	-0.3 to 6.0		V
Thermal Resistance (Junction to Ambient)	SOT89-3	135	°C /W
	SOT23-5	250	
	SOT23-3	360	
Power Dissipation @25°C	SOT89-3	950	mW
	SOT23-5	500	
	SOT23-3	350	
Operating Junction Temperature	-40 to 150		°C
Storage Temperature	-65 to 150		°C
Lead Temperature (Soldering, 10 sec)	300		°C
ESD (HBM mode) ESDA/JEDEC JS-001-2017	±2000		V

Recommended Operating Conditions

Symbol	Items	Rating	Unit
V_{IN}	Input Voltage	3.0 to 30	V
I_{OUT}	Output Current	0 to 150	mA
T_A	Operating Ambient Temperature	-40 to 85	°C
C_{IN}	Effective Input Ceramic Capacitor Value	1 to 10	uF
C_{OUT}	Effective Output Ceramic Capacitor Value	1 to 10	uF
ESR	Input and Output Capacitor Equivalent Series Resistance (ESR)	5 to 100	mΩ

Electrical Characteristics

V_{OUT}=5V

(V_{IN} = 7V, T_A = +25°C, C_{IN} = C_{OUT} = 10μF, unless otherwise noted.)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Input Voltage Operation Range	V_{IN}			3		30	V
Dropout Voltage	V_{DROP}	V_{OUT}= 5V, I_{OUT} = 150mA			720	900	mV
		V_{OUT}= 5V, I_{OUT} = 100mA			420	600	
DC Supply Quiescent Current	I_Q				1.5	3	μA
Regulated Output Voltage	V_{OUT}	I_{OUT}=1mA	7550-1	4.95	5.0	5.05	V
			7550-2	4.90	5.0	5.10	
Output Voltage Line Regulation	Reg_{LINE}	V_{IN} = V_{OUT} +1V to 30V, I_{OUT} = 10mA （$\Delta V_{OUT}/\Delta V_{IN}/V_{OUT}$）			0.01	0.04	%/V
Output Voltage Load Regulation	Reg_{LOAD}	I_{OUT} from 1mA to 150mA V_{IN}=V_{OUT}+2V			5	20	mv
		I_{OUT} from 1mA to 150mA V_{IN}=10V			25	60	mv
Maximum Output Current	I_{OUT}	V_{IN} = V_{OUT} +1V		150			mA
Short Current Protection	I_{SHORT}	OUT short to GND			100		mA
Output Noise	e_N	10Hz to 100kHz, I_{OUT} =30mA,			90		μV_{RMS}

V_{OUT}=3.6V

(V_{IN} = 5.6V, T_A = +25°C, C_{IN} = C_{OUT} = 10μF, unless otherwise noted.)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Input Voltage Operation Range	V_{IN}			3		30	V
Dropout Voltage	V_{DROP}	V_{OUT}= 3.6V, I_{OUT} = 150mA			800	930	mV
		V_{OUT}= 3.6V, I_{OUT} = 100mA			500	660	
DC Supply Quiescent Current	I_Q				1.5	3	μA
Regulated Output Voltage	V_{OUT}	I_{OUT}=1mA	7536-1	3.564	3.60	3.636	V
			7536-2	3.528	3.60	3.672	V
Output Voltage Line Regulation	Reg_{LINE}	V_{IN} = V_{OUT} +1V to 30V, I_{OUT} = 10mA （$\Delta V_{OUT}/\Delta V_{IN}/V_{OUT}$）			0.01	0.04	%/V
Output Voltage Load Regulation	Reg_{LOAD}	I_{OUT} from 1mA to 150mA V_{IN}=V_{OUT}+2V			5	20	mv
		I_{OUT} from 1mA to 150mA V_{IN}=8V			25	60	mv
Maximum Output Current	I_{OUT}	V_{IN} = V_{OUT} +1V		150			mA
Short Current Protection	I_{SHORT}	OUT short to GND			100		mA
Output Noise	e_N	10Hz to 100kHz, I_{OUT} =30mA,			90		μV_{RMS}

V_{OUT}=3.3V

(V_{IN} = 5.3V, T_A = +25°C, C_{IN} = C_{OUT} = 10μF, unless otherwise noted.)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Input Voltage Operation Range	V_{IN}			3		30	V
Dropout Voltage	V_{DROP}	V_{OUT}= 3.3V, I_{OUT} = 150mA			820	950	mV
		V_{OUT}= 3.3V, I_{OUT} = 100mA			520	680	
DC Supply Quiescent Current	I_Q				1.5	3	μA
Regulated Output Voltage	V_{OUT}	I_{OUT}=1mA	7533-1	3.267	3.30	3.333	V
			7533-2	3.234	3.30	3.366	
Output Voltage Line Regulation	Reg_{LINE}	V_{IN} = V_{OUT} +1V to 30V, I_{OUT} = 10mA （$\Delta V_{OUT}/\Delta V_{IN}/V_{OUT}$）			0.01	0.04	%/V
Output Voltage Load Regulation	Reg_{LOAD}	I_{OUT} from 1mA to 150mA V_{IN}=V_{OUT}+2V			5	20	mv
		I_{OUT} from 1mA to 150mA V_{IN}=8V			25	60	mv
Maximum Output Current	I_{OUT}	V_{IN} = V_{OUT} +1V		150			mA
Short Current Protection	I_{SHORT}	OUT short to GND			100		mA
Output Noise	e_N	10Hz to 100kHz, I_{OUT} =30mA			90		μV_{RMS}

V_{OUT}=3.0V

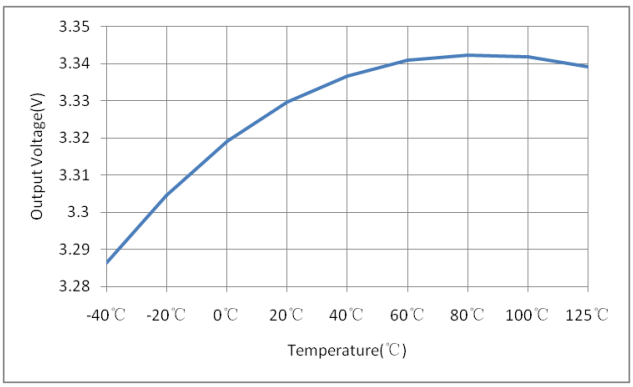
(V_{IN} = 5.6V, T_A = +25°C, C_{IN} = C_{OUT} = 10μF, unless otherwise noted.)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Input Voltage Operation Range	V_{IN}			3		30	V
Dropout Voltage	V_{DROP}	V_{OUT}=3V, I_{OUT} = 150mA			840	960	mV
		V_{OUT}= 3V, I_{OUT} = 100mA			530	700	
DC Supply Quiescent Current	I_Q				1.5	3	μA
Regulated Output Voltage	V_{OUT}	I_{OUT}=1mA	7530-1	2.97	3.0	3.03	V
			7530-2	2.94	3.0	3.06	
Output Voltage Line Regulation	Reg_{LINE}	V_{IN} = V_{OUT} +1V to 30V, I_{OUT} = 10mA （$\Delta V_{OUT}/\Delta V_{IN}/V_{OUT}$）			0.01	0.04	%/V
Output Voltage Load Regulation	Reg_{LOAD}	I_{OUT} from 1mA to 150mA V_{IN}=V_{OUT}+2V			5	20	mv
		I_{OUT} from 1mA to 150mA V_{IN}=8V			25	60	mv
Maximum Output Current	I_{OUT}	V_{IN} = V_{OUT} +1V		150			mA
Short Current Protection	I_{SHORT}	OUT short to GND			100		mA
Output Noise	e_N	10Hz to 100kHz, I_{OUT} =30mA,			90		μV_{RMS}

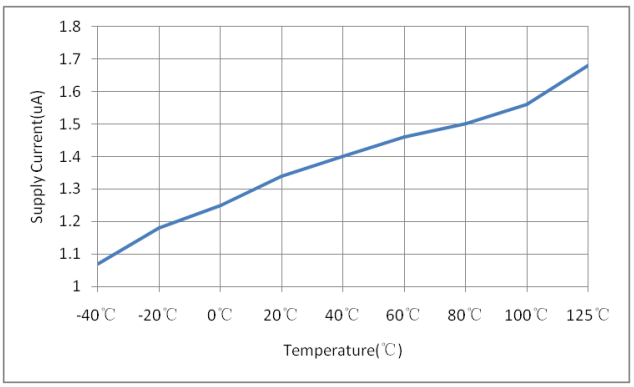
Typical Performance Characteristics

VOLTAGE VERSION 3.3V

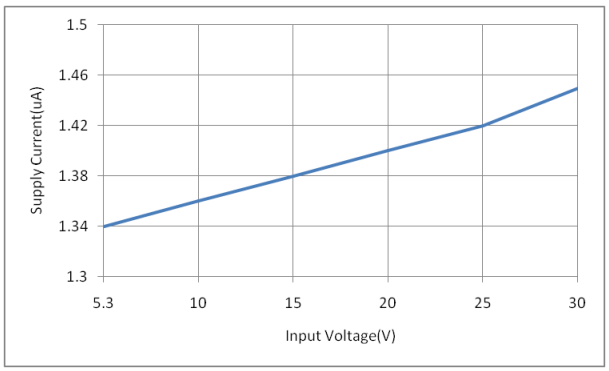
(V_{IN} = 5.3V; I_{OUT} = 1mA, C_{IN} = C_{OUT} = 1.0μF, unless otherwise noted. Typical values are at T_A = +25℃.)



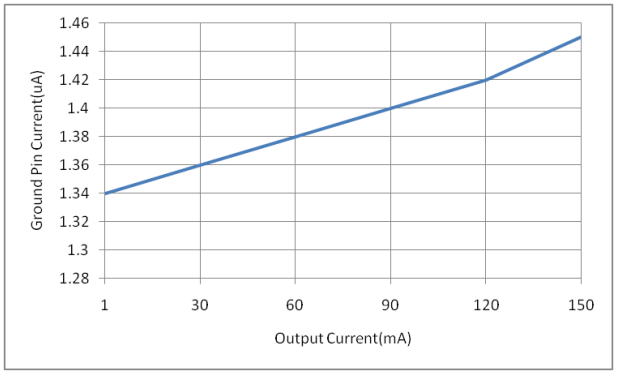
Output Voltage VS Temperature



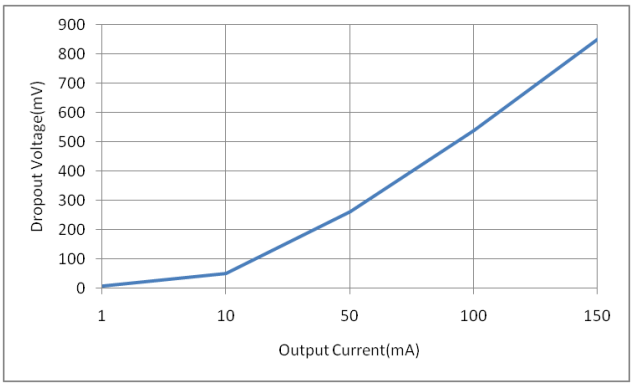
Supply Current VS Temperature



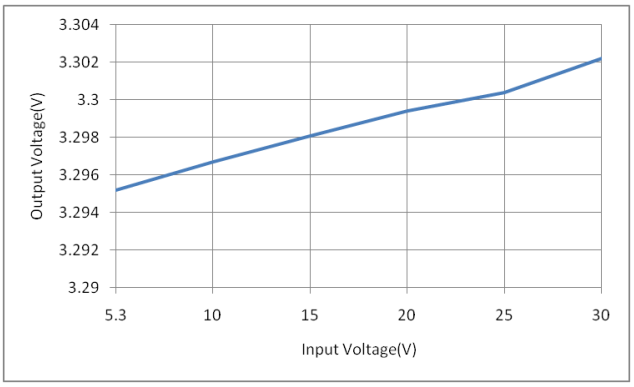
Supply Current VS Input Voltage



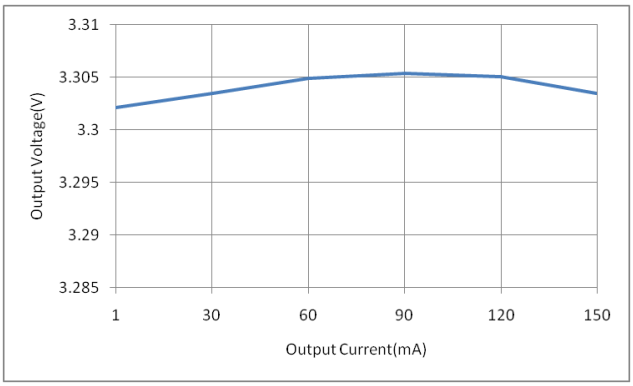
Ground Pin Current VS Output Current



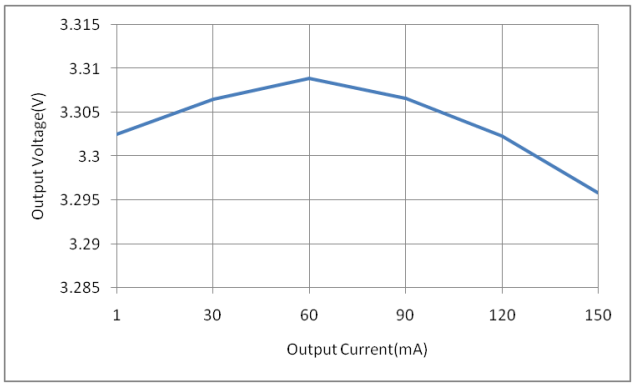
Dropout Voltage VS Output Current



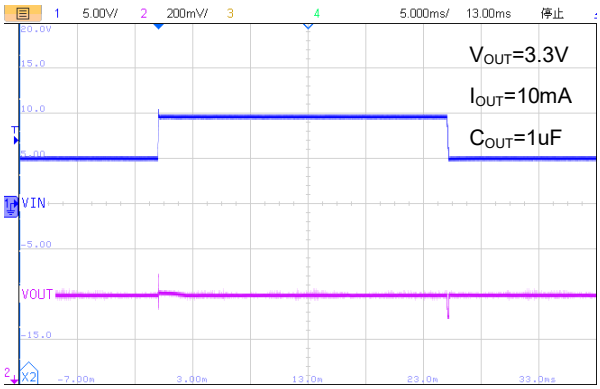
Output Voltage VS Input Voltage



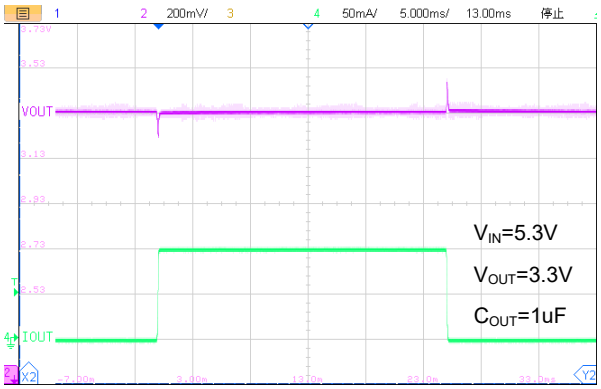
Output Voltage VS Output Current(V_{IN}=5.3V)



Output Voltage VS Output Current(V_{IN}=8V)



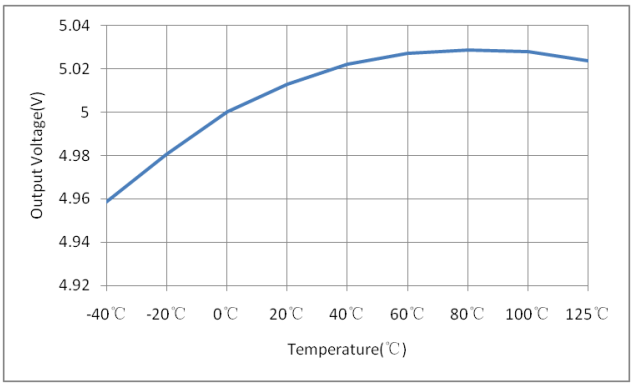
Line Transient Response



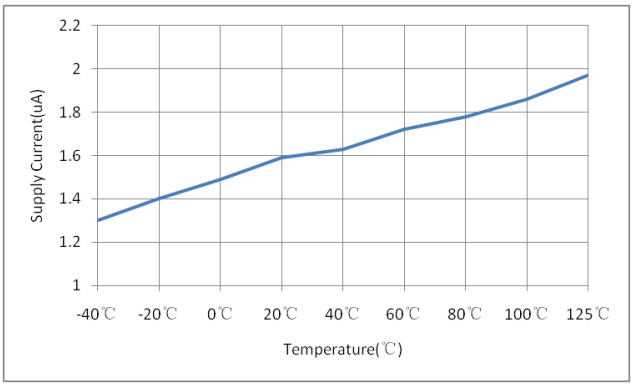
Load Transient Response

VOLTAGE VERSION 5.0V

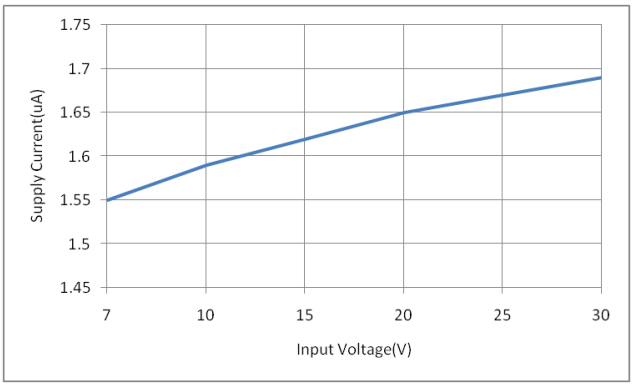
(V_{IN} = 7V; I_{OUT} = 1mA, C_{IN} = C_{OUT} = 1.0μF, unless otherwise noted. Typical values are at T_A = +25℃.)



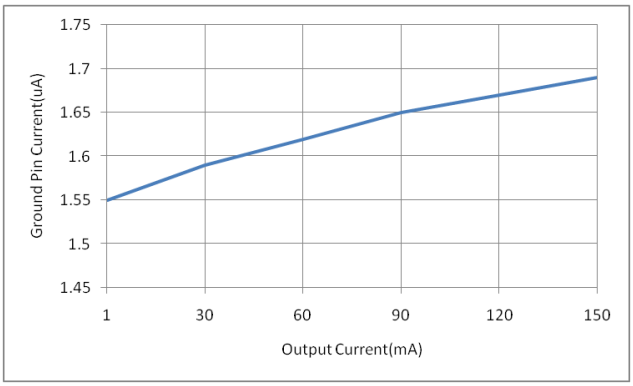
Output Voltage VS Temperature



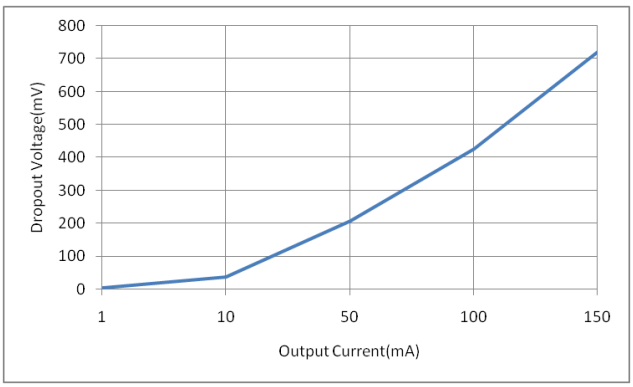
Supply Current VS Temperature



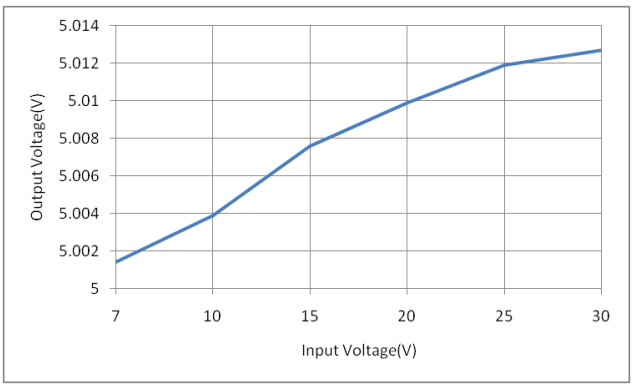
Supply Current VS Input Voltage



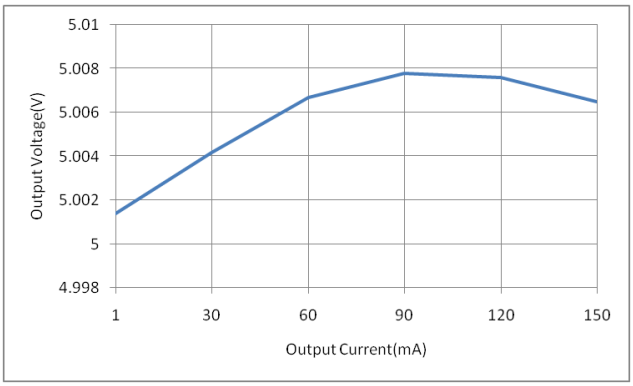
Ground Pin Current VS Output Current



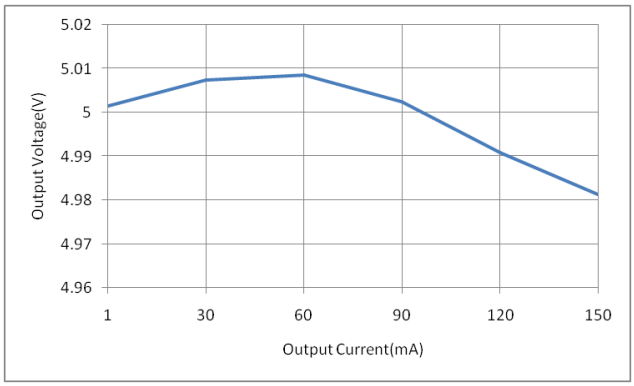
Dropout Voltage VS Output Current



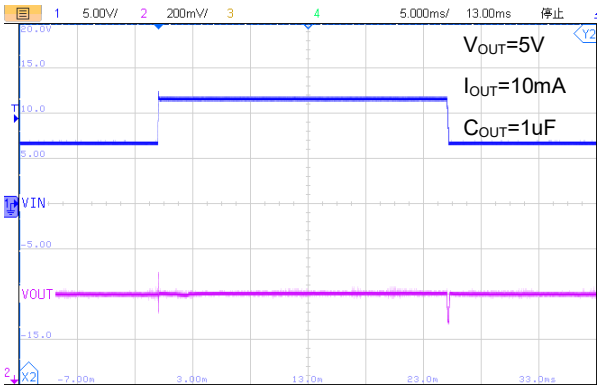
Output Voltage VS Input Voltage



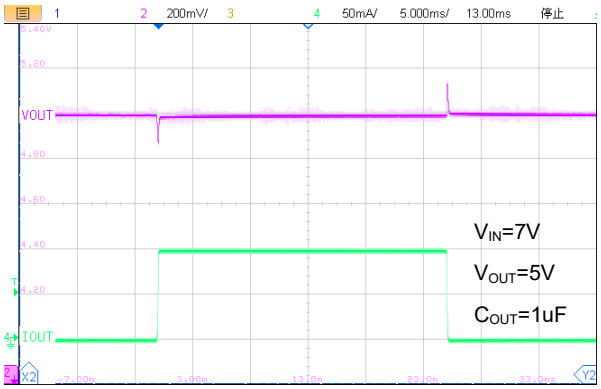
Output Voltage VS Output Current(V_{IN}=7V)



Output Voltage VS Output Current(V_{IN}=10V)

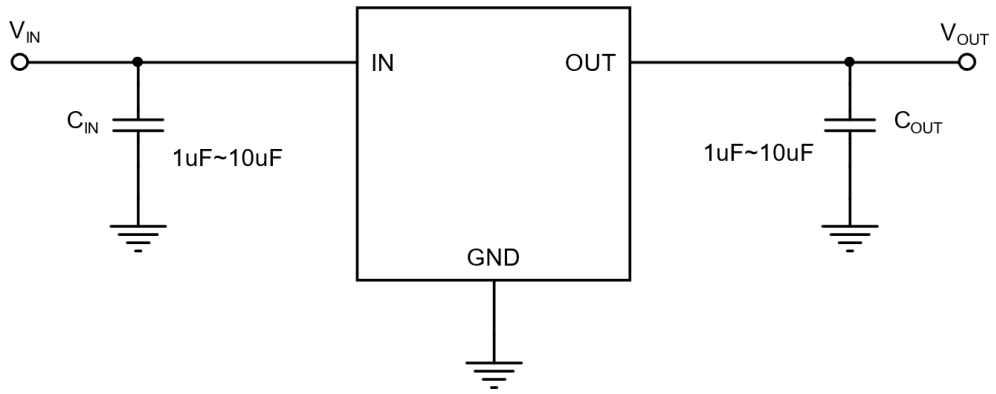


Line Transient Response



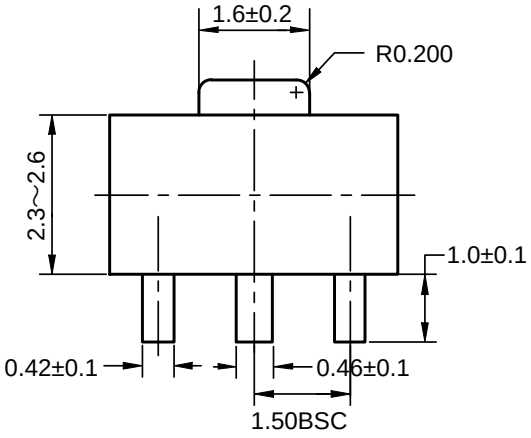
Load Transient Response

Application Circuits

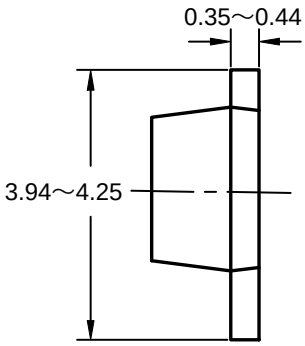


Package Dimension

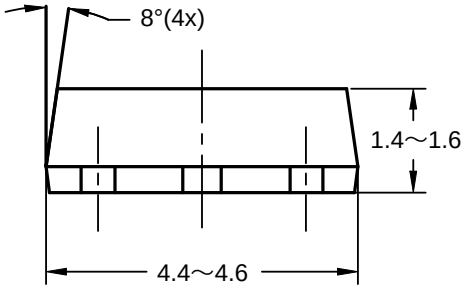
SOT89-3



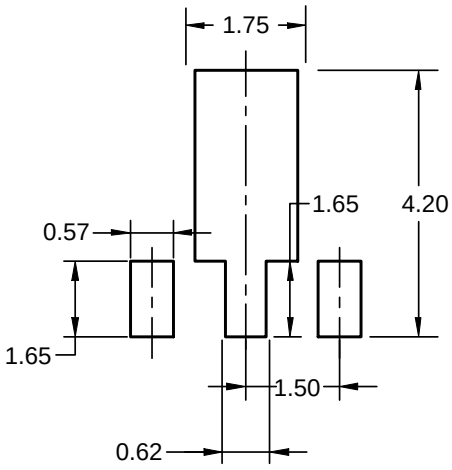
Top View



Side View



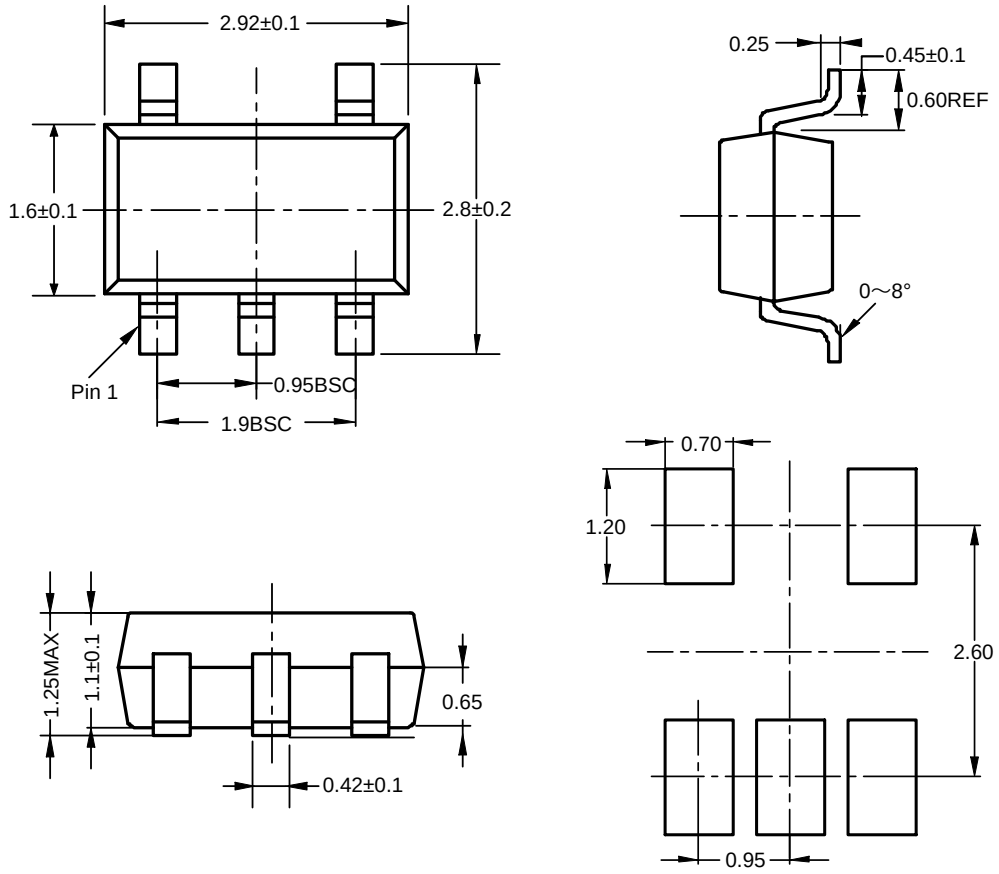
Side View



Recommended Land Pattern

Unit: mm

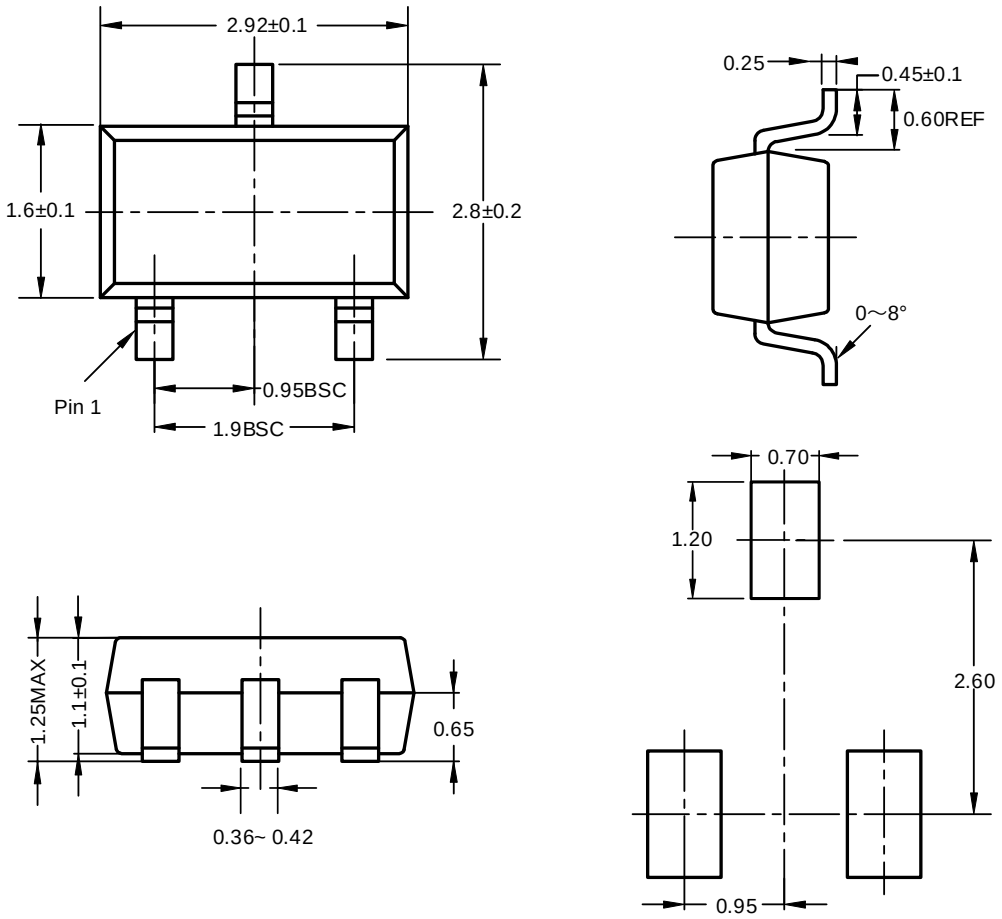
SOT23-5



Recommended Land Pattern

Unit: mm

SOT23-3



Recommended Land Pattern

Unit: mm

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2019-04-04	Original Version	Liuxm	Liuxm	Zhujl
1.1	2019-06-18	Add V_{OUT}=3.6V	Liuxm	Liuxm	Liujy
1.2	2019-10-09	Update package size	Liuxm	Liuxm	Liujy
1.3	2022.08.18	Update format	Wuh	Liuxm	Liujy
1.4	2023-6-21	Update marking	Shibo	Liuxm	Liujy
1.5	2023-10-7	Packaging adjustment	Shibo	Liuxm	Liujy
1.6	2023-10-7	Packaging adjustment	Shibo	Liuxm	Liujy