

## ET6H1XX - High Input Very-Low IQ 150mA LDO

### General Description

ET6H1XX series are the high input very low IQ 150mA LDO that operates from 1.8V~5V, is designed specifically for portable battery-powered applications which require ultra-low quiescent current. The very-low consumption of type 2.5uA ensures long battery life and dynamic transient boost feature improves device transient response for wireless communication applications.

ET6H1XX series are offered SOT89-3, SOT23-5, SOT23-3, DFN4(1x1) packages

### Features

- Wide input voltage range from 3V to 18V
- Up to 150mA Load Current
- Very low I<sub>Q</sub> is 2.5µA typical
- Fixed Output Voltage are 1.8V, 2.5V, 3.0V, 3.3V, 3.6V, 5V, etc
- Low dropout is 670mV at 150mA Load @V<sub>OUT</sub>=5.0V
- Low dropout is 820mV at 150mA Load @V<sub>OUT</sub>=3.3V
- Short current protection is 100mA
- Excellent load/line transient response
- Packages are SOT89-3, SOT23-5, SOT23-3, DFN4 (1x1)

### Device information

ET 6H1 XX X

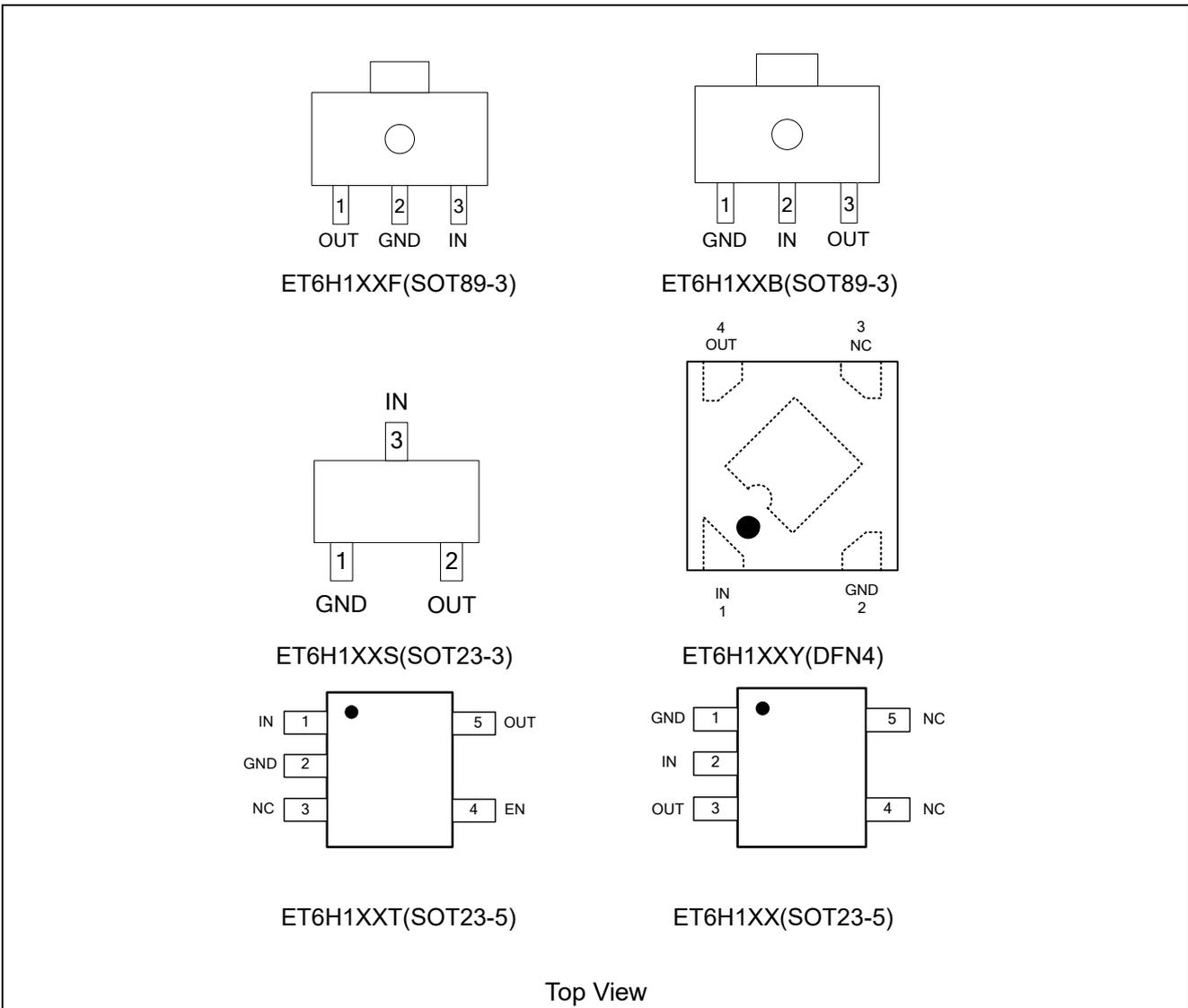
<u>XX</u> Output Voltage		<u>X</u> Package		
XX	Output X.X-V For example, 18 is 1.8V output	B	F	SOT89-3
		Y		DFN4(1×1)
		S		SOT23-3
		T		SOT23-5
		/		SOT23-5 (Default)

# ET6H1XX

## Mark Specification Label

Part No.	Marking						V <sub>OUT</sub>
	SOT89-3		SOT23-3	DFN4	SOT23-5		
	XXB	XXF	XXS	XXY	XX	XXT	
ET6H118	18B	18F	18S	CX	18	18T	1.8V
ET6H125	25B	25F	25S	FX	25	25T	2.5V
ET6H130	30B	30F	30S	GX	30	30T	3.0V
ET6H133	33B	33F	33S	EX	33	33T	3.3V
ET6H136	36B	36F	36S	OX	36	36T	3.6V
ET6H150	50B	50F	50S	5X	50	50T	5.0V

## Pin Configuration

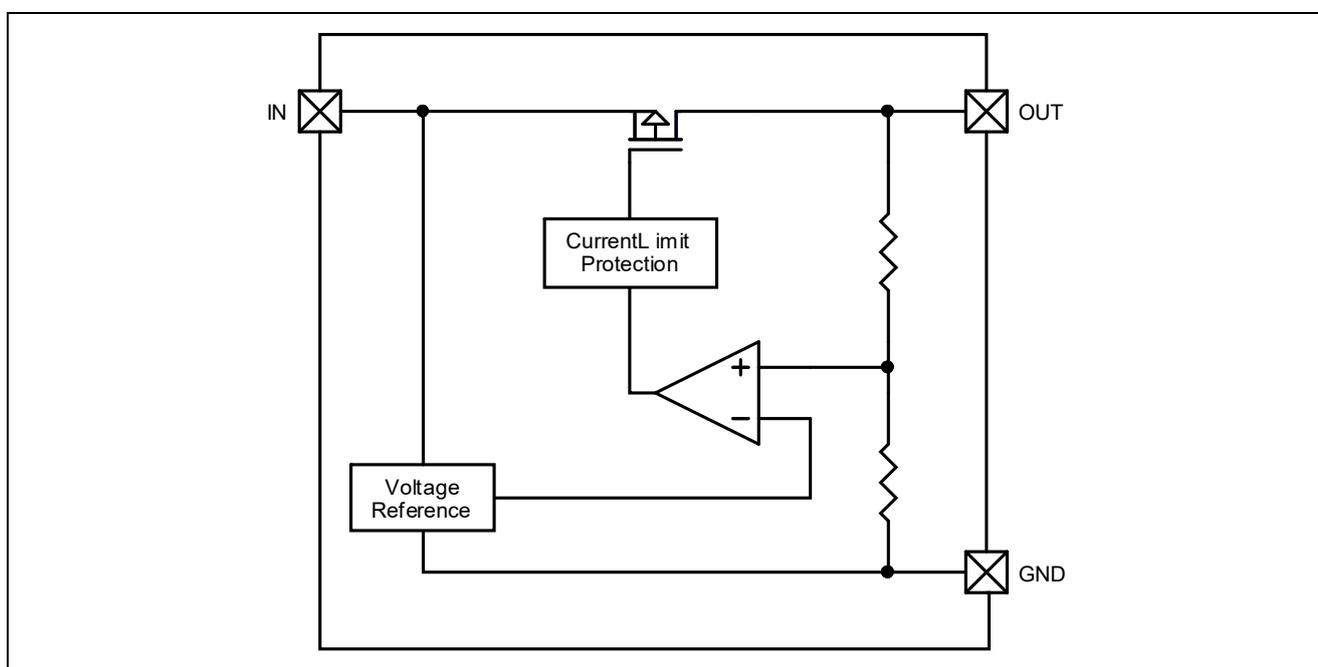


# ET6H1XX

## Pin Function

Pin No.						Pin Name	Pin Function
SOT89-3		SOT23-3	DFN4	SOT23-5			
XXB	XXF	XXS	XXY	XX	XXT		
2	1	1	2	1	2	GND	Ground.
3	2	3	1	2	1	IN	Supply input pin.
1	3	2	4	3	5	OUT	Output pin.
			3	4,5	3,4	NC	No connection.

## Block Diagram



## Functional Description

### Input Capacitor

A 1 $\mu$ F~10 $\mu$ 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.

### Output Capacitor

An output capacitor is required for the stability of the LDO. The recommended output capacitance is from 1 $\mu$ F to 10 $\mu$ F, Equivalent Series Resistance (ESR) is from 5m $\Omega$  to 100m $\Omega$ , 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.

# ET6H1XX

---

## Dropout Voltage

The ET6H1XX uses a PMOS pass transistor to achieve low dropout. When  $(V_{IN} - V_{OUT})$  is less than the dropout voltage (VDO), the PMOS pass device is in the linear region of operation and the input-to-output resistance is the  $R_{DS(ON)}$  of the PMOS pass element. VDO scales approximately with output current because the PMOS device behaves like a resistor in dropout mode. As with any linear regulator, PSRR and transient response degrade as  $(V_{IN} - V_{OUT})$  approaches dropout operation.

## Low Quiescent Current

The ET6H1XX consuming only around 2.5 $\mu$ A 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.

## Layout Guidelines

- Place input and output capacitors as close to the device as possible.
- Use copper planes for device connections in order to optimize thermal performance.
- Place thermal vias around the device to distribute heat.
- Do not place a thermal via directly beneath the thermal pad. A via can wick solder or solder paste away from the thermal pad joint during the soldering process, leading to a compromised solder joint on the thermal pad.

# ET6H1XX

## Absolute Maximum Ratings

Symbol	Rating	Value	Unit
$V_{IN}$	Input Voltage <sup>(1)</sup>	-0.3~30	V
$V_{OUT}$	Output Voltage	-0.3~6.0	V
$T_J$	Maximum Junction Temperature	-40~150	°C
$T_{STG}$	Storage Temperature	-65~150	°C
$T_{SOLD}$	Lead Temperature (Soldering, 10 sec)	300	°C
$V_{ESD}$	Human Body Model Capability <sup>(2)</sup>	±2000	V

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

**Note1.** Refer to Electrical Characteristics and Application Information for Safe Operating Area.

**Note2.** This device series incorporates ESD protection and is tested by the following methods:

ESD Human Body Model tested per ESDA/JEDEC JS-001-2017

## Thermal Characteristics

Symbol	Package	Ratings	Value	Unit
$R_{\theta JA}$	SOT89-3	Thermal Characteristics, Thermal Resistance, Junction-to-Air	135	°C/W
	SOT23-5		250	
	SOT23-3		360	
	DFN4		250	
$P_D$	SOT89-3	Power Dissipation @25°C PCB Board Dimension : 40mm x 40mm (2layer) Copper :1OZ	750	mW
	SOT23-5		400	
	SOT23-3		280	
	DFN4		400	

## 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

# ET6H1XX

## Electrical Characteristics

( $V_{IN} = V_{OUT} + 2V$ ;  $I_{OUT} = 10mA$ ,  $C_{IN} = C_{OUT} = 1.0\mu F$ , unless otherwise noted. Typical values are at  $T_A = +25^\circ C$ .)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$V_{IN}$	Operating Input Voltage <sup>(3)</sup>		3.0		18	V
$V_{OUT}$	Output Voltage	$I_{OUT} = 1mA$	-2%		+2%	V
$I_Q$	Quiescent Current	$I_{OUT} = 0mA$		2.5	4.0	$\mu A$
$Line_{REG}$	Line Regulation	$V_{IN} = V_{OUT} + 1V$ to 18V, $I_{OUT} = 10mA$ ( $\Delta V_{OUT} / \Delta V_{IN} / V_{OUT}$ )		0.01	0.04	%/V
$V_{DROP}$	Dropout Voltage $I_{OUT} = 150mA$ <sup>(4)</sup>	$V_{OUT} = 1.8V$		1250	1450	mV
		$V_{OUT} = 2.5V$		1150	1350	
		$V_{OUT} = 3.0V$		820	960	
		$V_{OUT} = 3.3V$		800	950	
		$V_{OUT} = 3.6V$		750	930	
		$V_{OUT} = 5V$		670	900	
$V_{DROP}$	Dropout Voltage $I_{OUT} = 100mA$ <sup>(4)</sup>	$V_{OUT} = 1.8V$		880	1050	mV
		$V_{OUT} = 2.5V$		800	1000	
		$V_{OUT} = 3.0V$		530	700	
		$V_{OUT} = 3.3V$		520	680	
		$V_{OUT} = 3.6V$		500	660	
		$V_{OUT} = 5V$		420	600	
$Load_{REG}$	Load Regulation	$1mA \leq I_{OUT} \leq 150mA$ , $V_{IN} = V_{OUT} + 2V$		5	20	mV
		$1mA \leq I_{OUT} \leq 150mA$ , $V_{IN} = 10V$		25	60	mv
$I_{OUT}$	Current Limit	$V_{IN} = V_{OUT} + 2V$	150			mA
$I_{SHORT}$	Short Current Protection	OUT short to GND		100		mA
$e_N$	Output Noise Voltage <sup>(5)</sup>	$V_{IN} = V_{OUT} + 2V$ , $I_{OUT} = 1mA$ , $f = 10Hz$ to 100KHz, $V_{OUT} = 3V$ , $C_{OUT} = 1\mu F$		120		$\mu V_{rms}$

**Note3.** Here  $V_{IN}$  means internal circuit can work normal. If  $V_{IN} < V_{OUT}$ , Output voltage follow  $V_{IN}(I_{OUT} = 1mA)$ , circuit is safety.

**Note4.**  $V_{DROP}$  FT test method: test the  $V_{OUT}$  voltage at  $V_{SET} + V_{DROP_{MAX}}$  with 150mA output current.

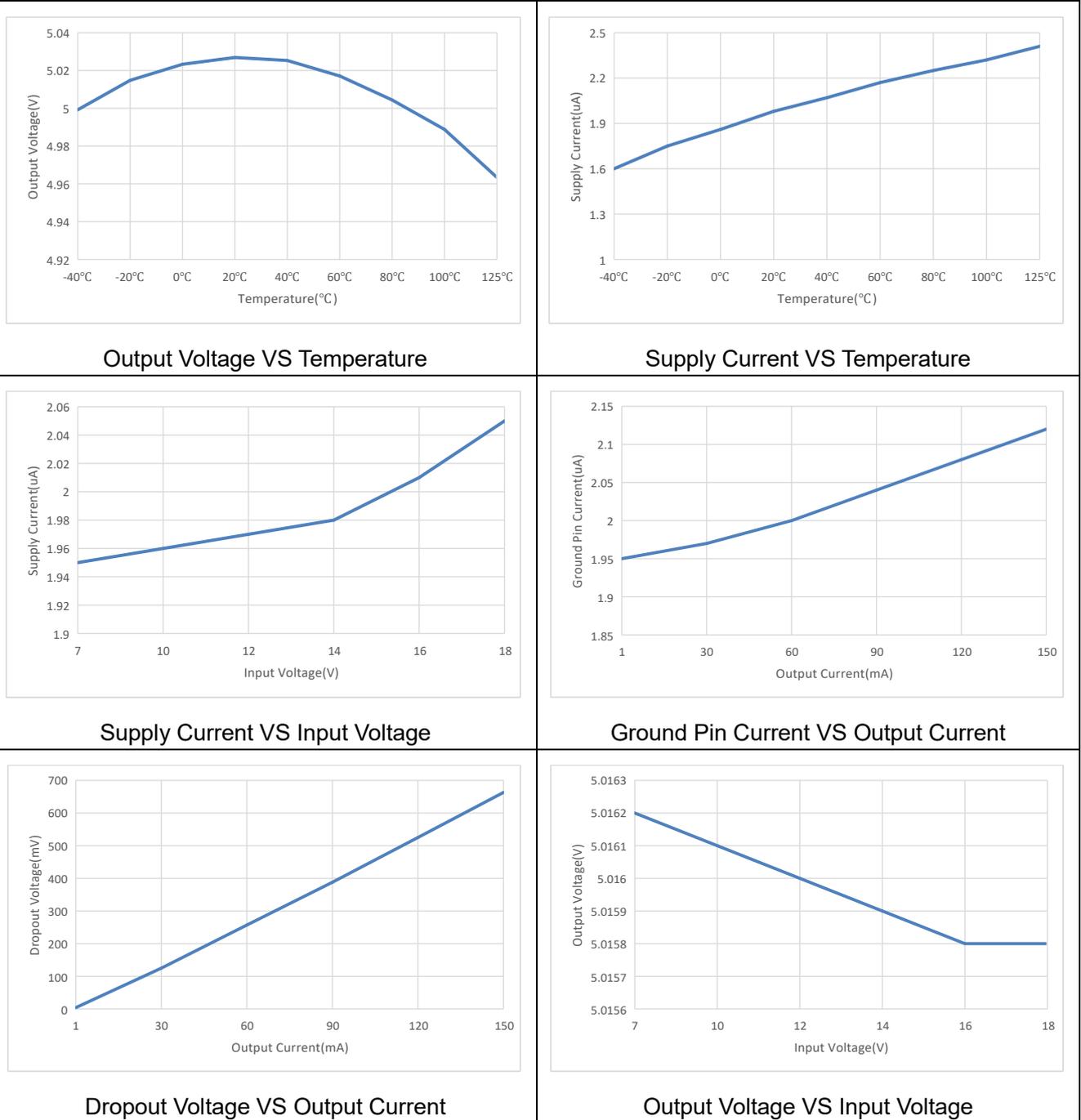
**Note5.** Guaranteed by design and characterization. not a FT item.

# ET6H1XX

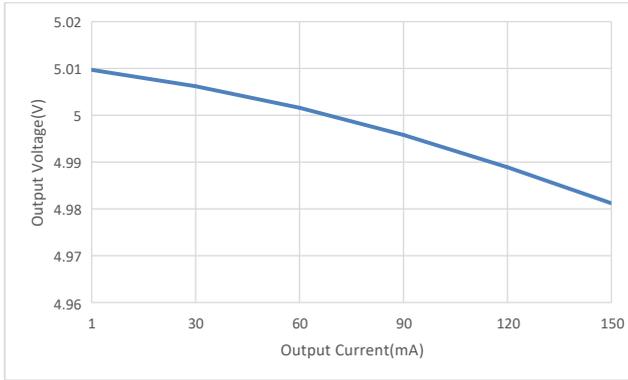
## Typical Characteristics

### VOLTAGE VERSION 5.0V

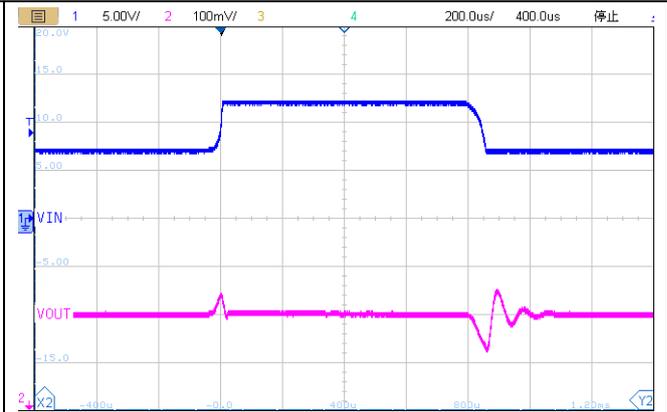
( $V_{IN} = 7V$ ;  $I_{OUT} = 1mA$ ,  $C_{IN} = C_{OUT} = 1.0\mu F$ , unless otherwise noted. Typical values are at  $T_A = +25^\circ C$ .)



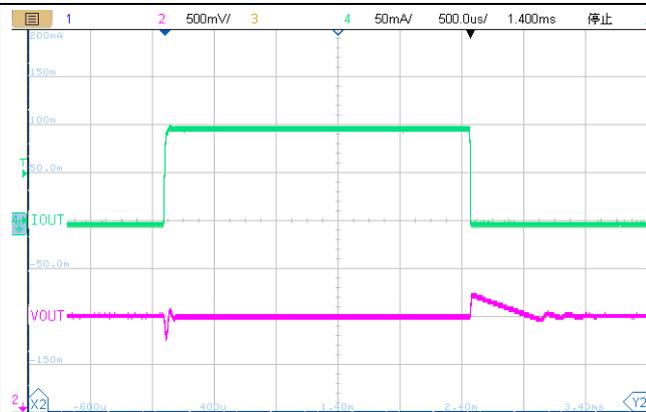
# ET6H1XX



Output Voltage VS Output Current

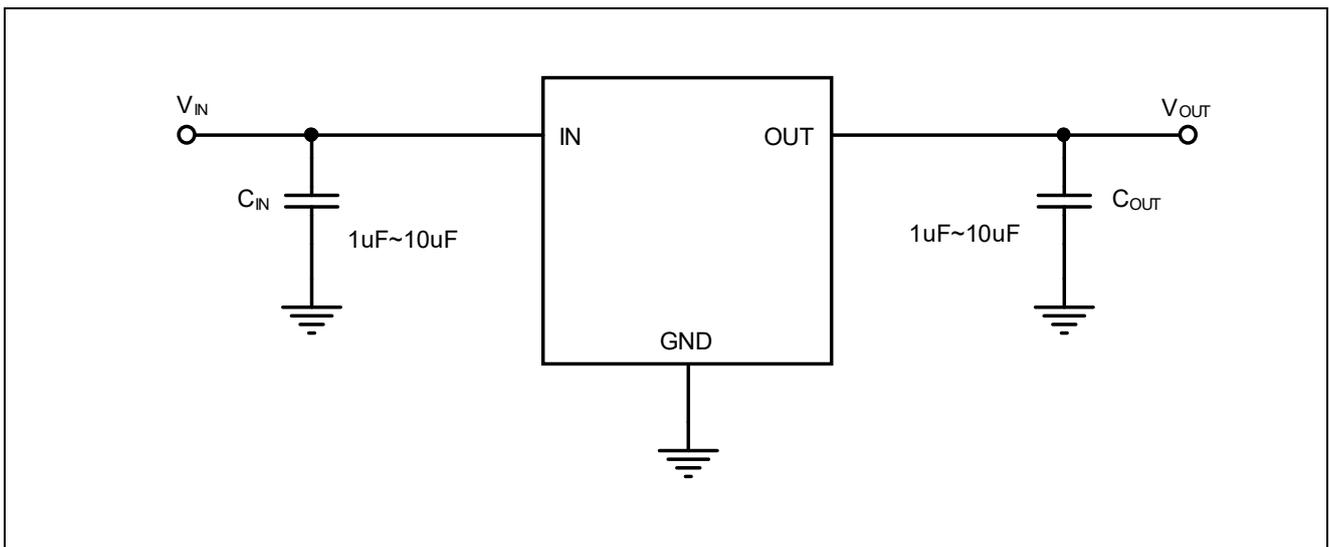


Line Transient Response  
 $V_{IN}=7V\sim 12V$ ,  $V_{OUT}=5V$ ,  $I_{OUT}=10mA$



Load Transient Response  
 $V_{IN}=7V$ ,  $V_{OUT}=5V$ ,  $I_{OUT}=1mA\sim 100mA$

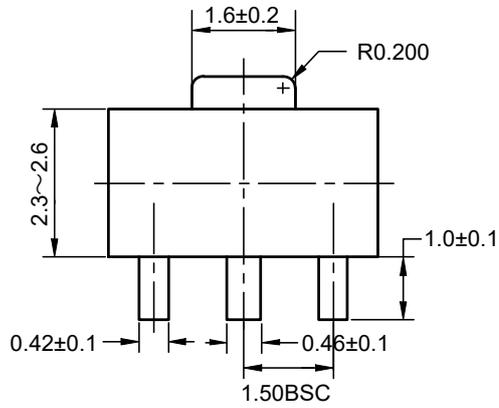
## Application Circuits



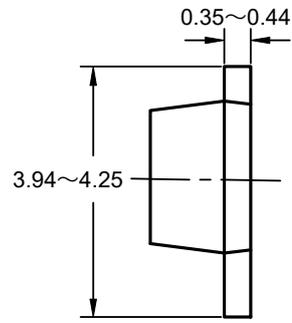
# ET6H1XX

## Package Dimension

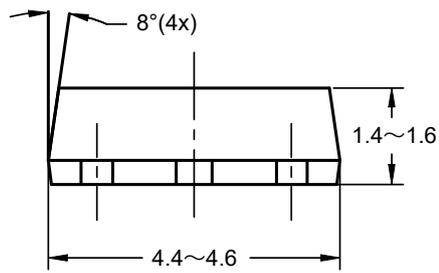
SOT89-3



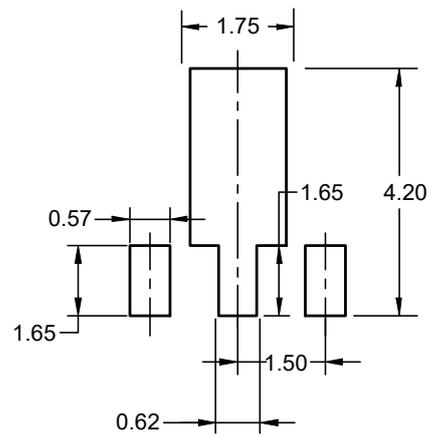
Top View



Side View



Side View

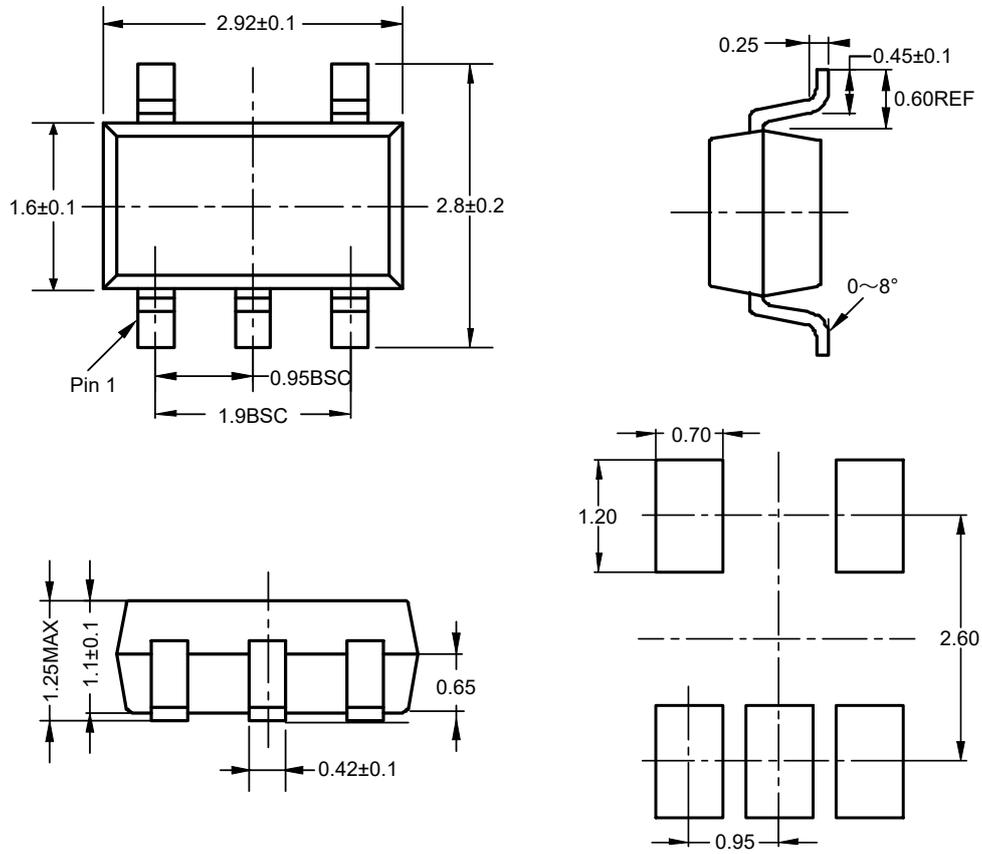


Recommended Land Pattern

Unit: mm

# ET6H1XX

SOT23-5

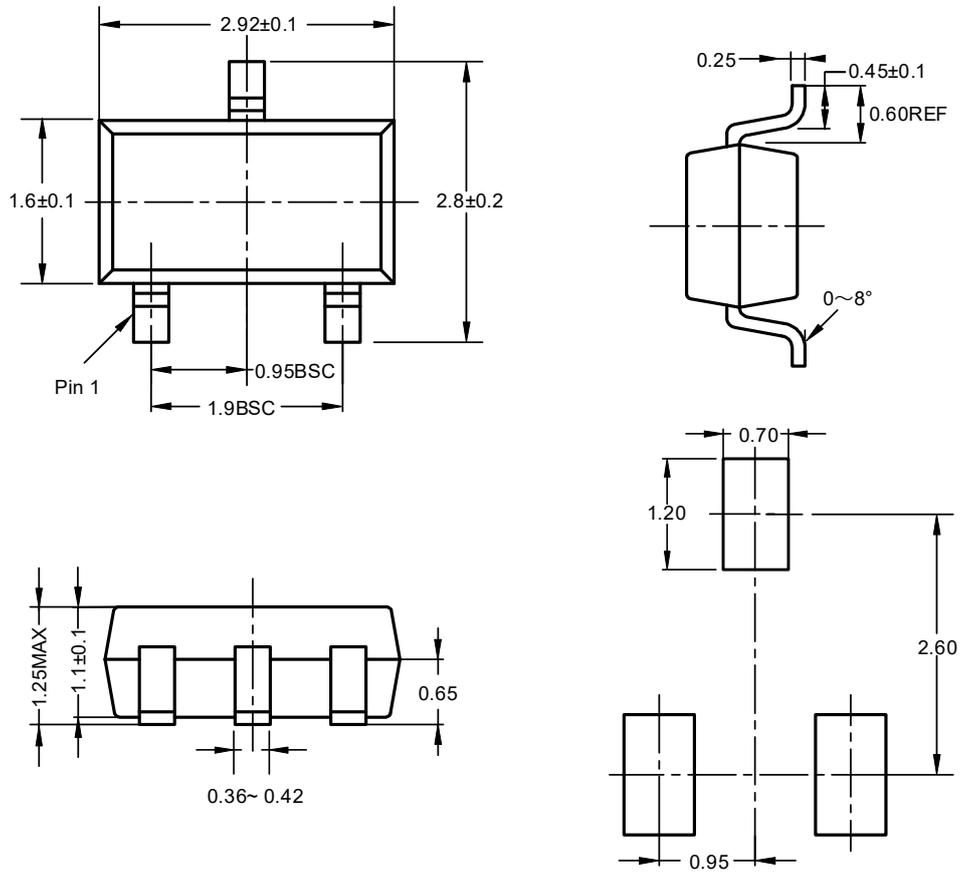


**Recommended Land Pattern**

Unit: mm

# ET6H1XX

SOT23-3

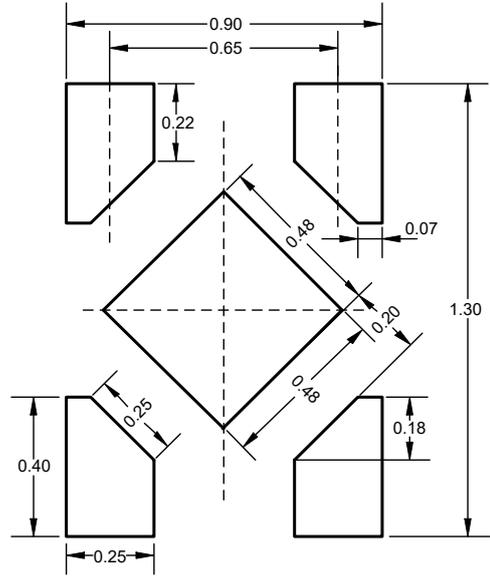
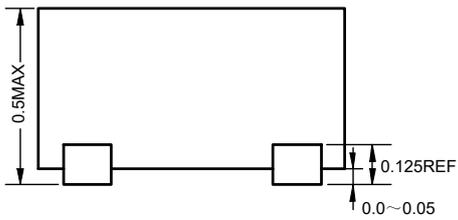
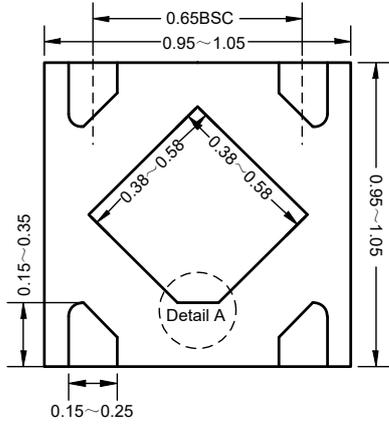


**Recommended Land Pattern**

Unit: mm

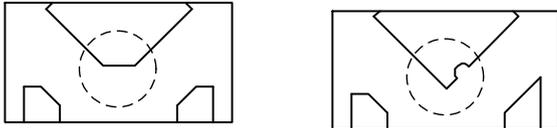
# ET6H1XX

DFN4(1x1)



**Recommended Land Pattern**

**Detail A: (PIN1 shape)**



Unit: mm

# ET6H1XX

---

## Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2021-12-01	Initial Version	Yuangr	Yuangr	Zhuji
1.1	2022-3-11	Update test condition	Yuangr	Yuangr	Liuji
1.2	2022-8-4	Update Typeset	Shibo	Liuxm	Liuji
1.3	2025-4-28	Update package dimension	Shibo	Liuxm	Liuji