# Very-Low Dropout High PSRR 1A LDO

## General Description

ET5A0XXT is the fixed output 1A LDO , It uses an advanced CMOS process and a PMOSFET pass device to achieve high power supply rejection ratio (PSRR) ,low noise, very low dropout, fast start-up and excellent output accuracy.

ET5A0XXT is stable with a 1.0～10μF ceramic output capacitor, uses a precision voltage reference and feedback loop to achieve excellent Regulation and transient response.

ET5A0XXT is offered SOT-223 package.

## Features

- Wide input voltage range from 1.8V to 5.5V
- Output Voltage is 1.2V 1.8V 2.8V 3.0V 3.3V etc
- Low $I_Q$ is typical 110μA
- Excellent load/line transient response
- Low dropout voltage is 135mV@1A/3.3V output current
- Built-in over-current protection and thermal shutdown circuit
- Built-in inrush current suppression circuit and current limit circuit
- Reverse current protection

## Applications

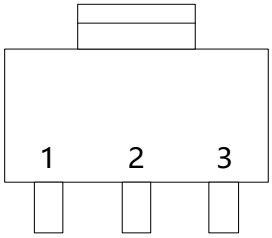
- Constant-voltage power supply for battery-powered device
- Constant-voltage power supply for TV, notebook PC and home electric appliance
- Constant-voltage power supply for portable equipment
- Label Information

## Device Information

**ET 5A0 XX T**

| Output Voltage | | Package | |
|---|---|---|---|
| **XX** | X.XV fixed output<br>18 is 1.8V fixed output | **T** | SOT223 |

## Pin Configuration

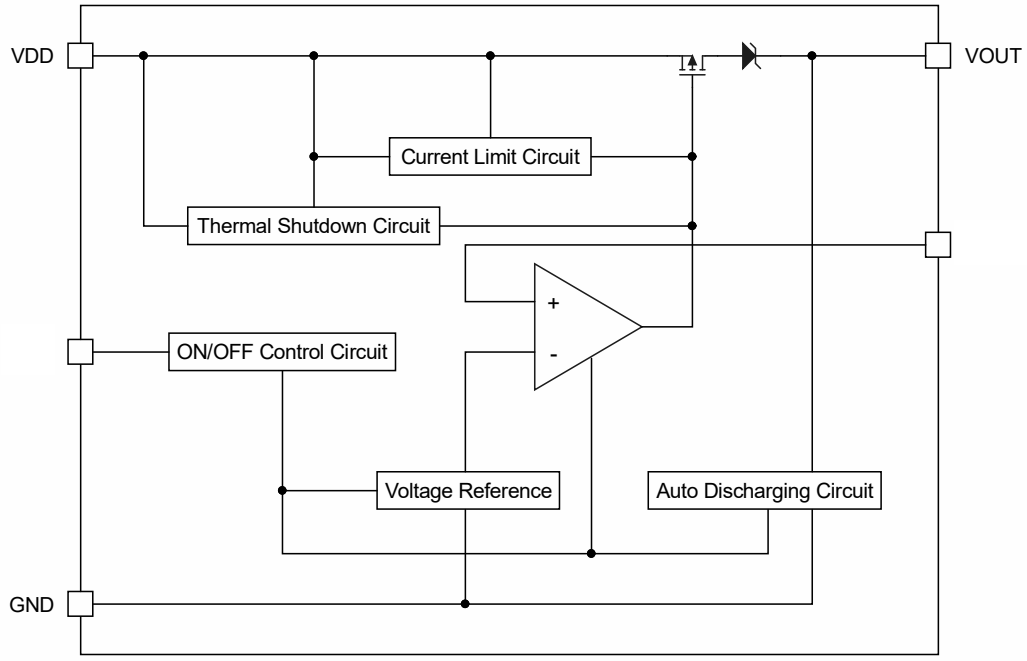



SOT223 Top View

## Pin Function

| Pin No. | Pin Name | Pin Function |
|---|---|---|
| 1 | GND | Ground Pin |
| 2 | VOUT | Output Pin |
| 3 | VDD | Input Pin |

## Block Diagram




## Functional Description

### Input Capacitor

A 1～10μF ceramic capacitor is recommended to connect between VDD 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 VDD and GND.

Please pay attention, in the case of high impedance of the power supply, the input capacitance of the IC is small or the capacitor is not connected, the oscillation may occur. When the capacitance value of the output capacitor is greater than the capacitance value of the input capacitor, it is possible to generate oscillation.

### Output Capacitor

An output capacitor is required for the stability of the LDO. The recommended output capacitance is 1～10μF, 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 Protection

When output current of 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 predesigned level to prevent over-current and thermal damage.

### Thermal Shutdown Protection

Thermal protection disables the output when the junction temperature rises to approximately +155°C, allowing the device to cool down. When the junction temperature reduces to approximately +120°C the output circuit is enabled again. Depending on power dissipation, thermal resistance, and ambient temperature, the thermal protection circuit may cycle on and off. This cycling limits the heat dissipation of the regulator, protecting it from damage due to overheating.

### Reverse Current Protection Circuit

ET5A0XXT switches the mode to the reverse current protection mode before VIN becomes lower than VOUT by connecting the parasitic diode of Pch output transistor to the backward direction, and connecting the gate to VOUT pin. As a result, the Pch output transistor is turned off. However, from VOUT pin to GND pin, via the internal divider resistors, very small current IREV flows.

## Absolute Maximum Ratings

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

| Symbol | Parameter | Rating | Unit |
|---|---|---|---|
| $V_{IN}$ | Input Voltage | -0.3 to 6 | V |
| $V_{OUT}$ | Output Voltage | -0.3 to $V_{IN}$+0.3 | V |
| $I_{MAX}$ | Maximum Load Current | 1000 | mA |
| $P_D$ | Maximum Power Consumption | 1200 | mW |
| $T_J$ | Operating Junction Temperature | -40 to 150 | °C |
| $T_{STG}$ | Storage Temperature | -65 to 150 | °C |
| $T_{SOLD}$ | Lead Temperature (Soldering, 5sec) | 260 | °C |

## Recommended Operating Conditions

| Symbol | Item | Rating | Unit |
|---|---|---|---|
| $V_{IN}$ | Input Voltage | 1.8 to 5.5 | V |
| $I_{OUT}$ | Output Current | 0 to 1000 | mA |
| $T_A$ | Operating Ambient Temperature | -40 to 85 | °C |
| $C_{IN}$ | Effective Input Ceramic Capacitor Value | 1 to 10 | μF |
| $C_{OUT}$ | Effective Output Ceramic Capacitor Value | 1 to 10 | μF |
| ESR | Input and Output Capacitor Equivalent Series Resistance | 5 to 100 | mΩ |

## Electrical Characteristics

$V_{IN}=V_{OUT}+1.0V$, $I_{OUT}=1mA$, $C_{IN}=C_{OUT}=1uF$, unless otherwise noted, $T_A=25^oC$

| Symbol | Item | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{OUT}$ | Output Voltage | Output accuracy | -2 | | 2 | % |
| $V_{IN}$ | Input Voltage (1) | | 1.8 | | 5.5 | V |
| $I_{LIM}$ | Output Current Limit | $V_{IN}=V_{OUT}+0.5V$ | 1000 | | | mA |
| $\Delta V_{LINE}$ | Line Regulation | $V_{OUT}+0.5V \le V_{IN} \le 5.5V$ | | 0.02 | | %/V |
| $\Delta V_{LOAD}$ | Load Regulation | $V_{IN}=V_{OUT}+0.5V$, $1mA \le I_{OUT} \le 1A$ | | 5 | 40 | mV |
| $V_{DIF}$ | Dropout Voltage (2) | $1.2V \le V_{OUT} < 2.6V$, $I_{OUT}=1A$, $V_{OUT}$ dropping to $0.98 \times V_{OUT}$ | | 170 | 220 | mV |
| | | $2.6V \le V_{OUT} < 3.3V$, $I_{OUT}=1A$, $V_{OUT}$ dropping to $0.98 \times V_{OUT}$ | | 150 | 185 | mV |
| | | $3.3V \le V_{OUT} \le 4.3V$, $I_{OUT}=1A$, $V_{OUT}$ dropping to $0.98 \times V_{OUT}$ | | 135 | 170 | mV |
| $I_{Q_ON}$ | Supply Current | $I_{OUT}$ = 0mA | | 110 | | μA |
| PSRR | Ripple Rejection (3) | f=1kHz, Ripple 0.2Vp-p, $V_{IN}=V_{OUT}+1.0V$, $I_{OUT}=30mA$ | | 70 | | dB |
| $e_N$ | Output Noise (3) | 10Hz to 100kHz, $I_{OUT}$ =30mA | | 50 | 80 | $\mu V_{RMS}$ |
| $T_{TSD}$ | Thermal Shutdown Temperature | | | 155 | | °C |
| $T_{TSR}$ | Thermal Shutdown Released Temperature | | | 120 | | °C |

***Note (1)***: Here $V_{IN}$ means internal circuit can work normal. If $V_{IN} < V_{OUT}$, Reverse current protection circuit will work .

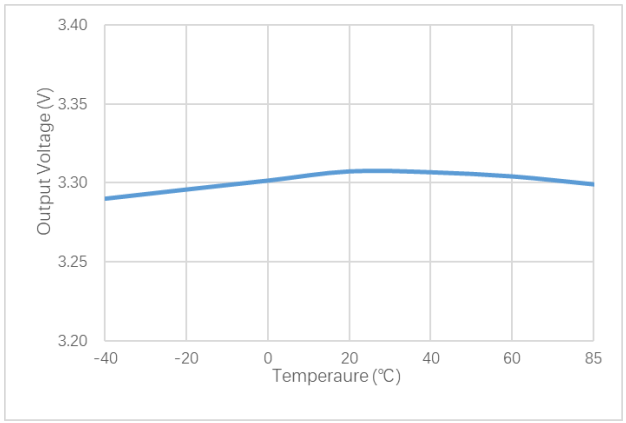
***Note (2)***: $V_{DROP}$ FT test method: test the $V_{OUT}$ voltage at $V_{SET}$ +$V_{DROPMAX}$ with output current.

***Note (3)***: Guaranteed by design and characterization. not a FT item.

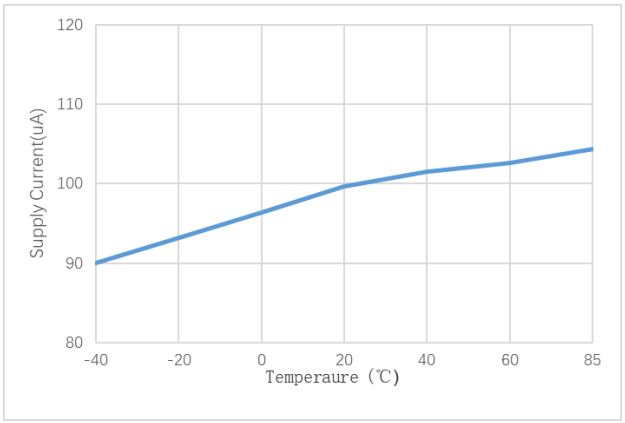
## Typical Characteristics

Note: Typical Characteristics are intended to be used as reference data; they are not guaranteed.

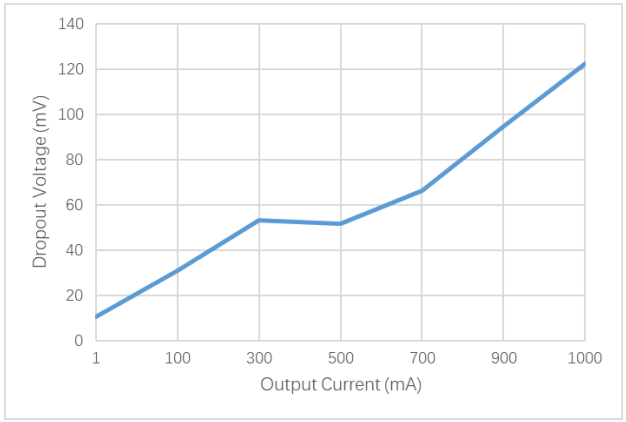
( $V_{IN}$ = 4.3V, $V_{OUT}$ =3.3V, $I_{OUT}$ = 1mA ,$C_{IN}$ = $C_{OUT}$ = Ceramic 1.0μF)



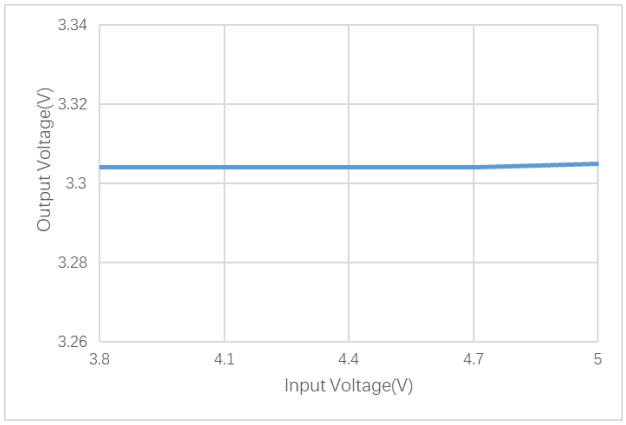

Output Voltage vs. Temperature



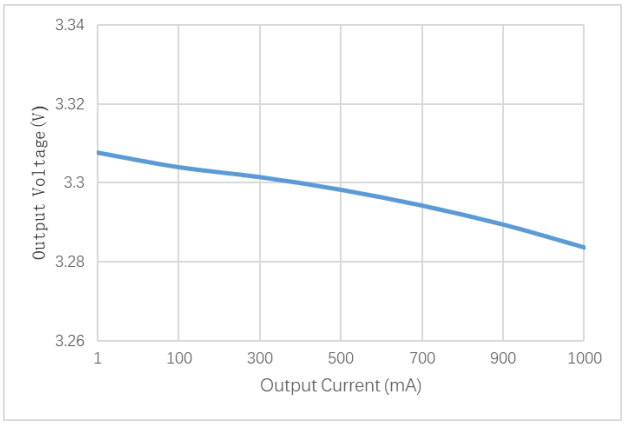

Supply Current vs. Temperature




Dropout Voltage vs. Output Current

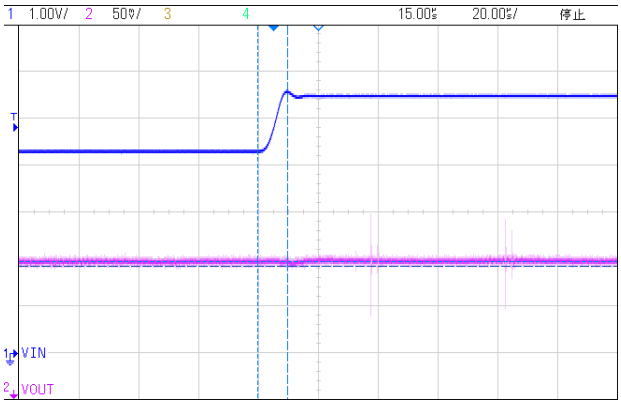



Output Voltage VS Input Voltage

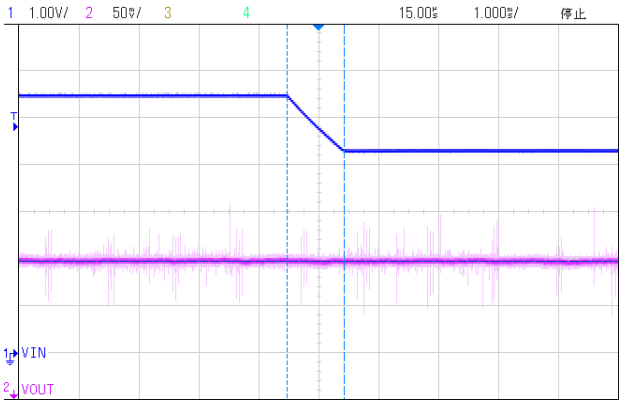



Output Voltage VS Output Current

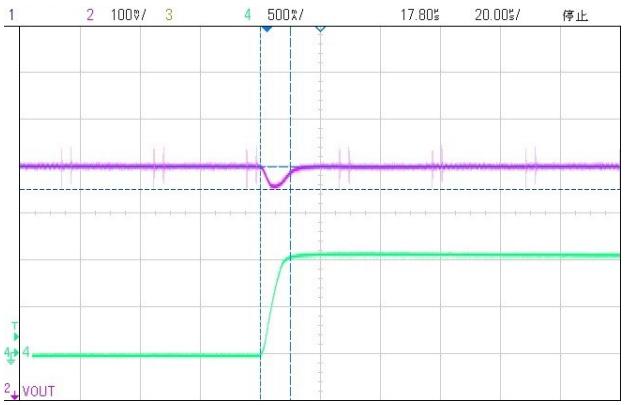
## Typical Characteristics (Continued)



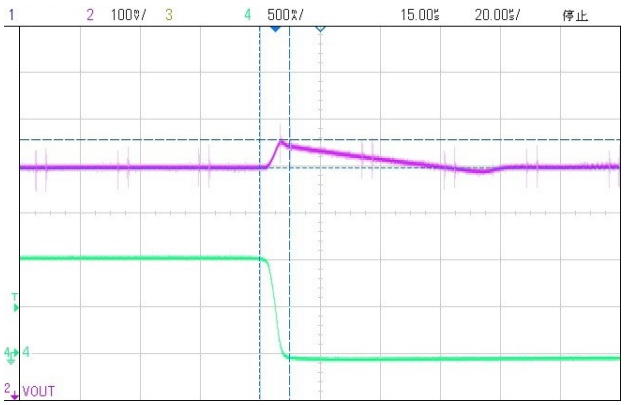

Input Transient Response



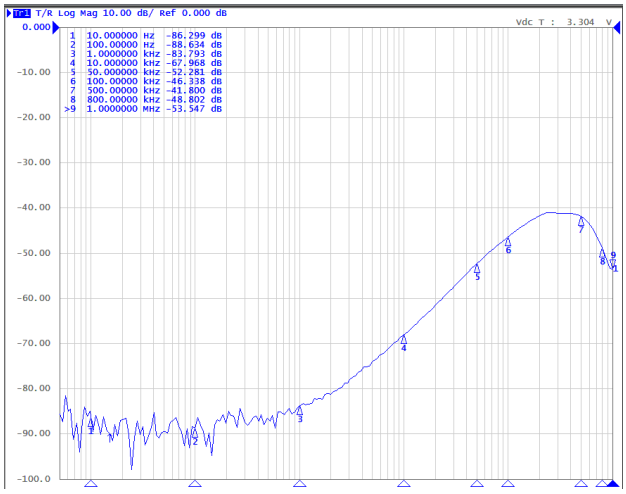

Input Transient Response




Load Transient Response

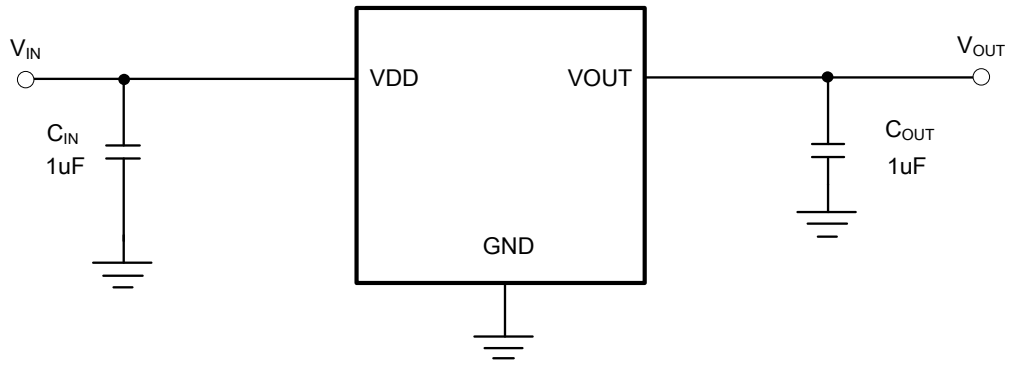



Load Transient Response



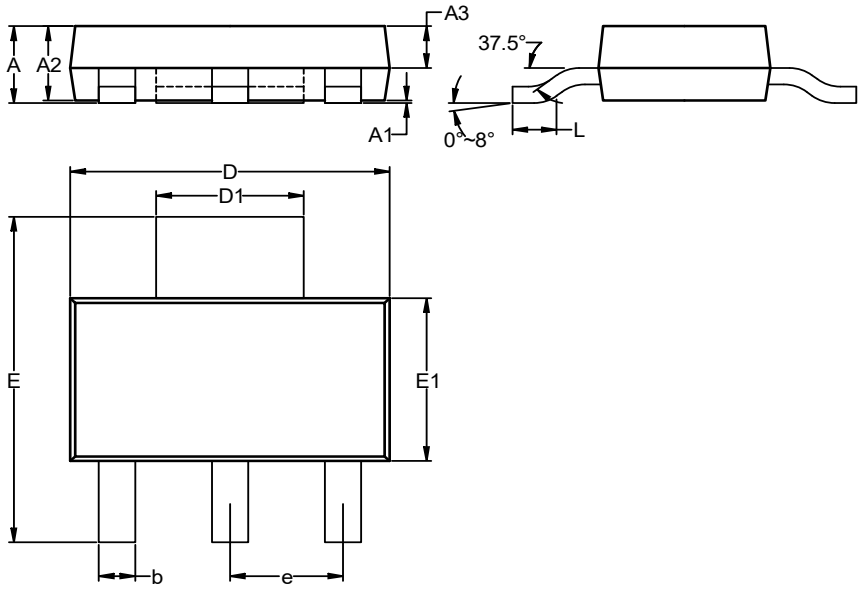

PSRR

## Application Circuits




*:This application ADJ Output circuit only supplies for reference.

## Package Dimension




COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

| SYMBOL | MIN | NOM | MAX |
|---|---|---|---|
| A | 1.5 | 1.65 | 1.8 |
| A1 | 0.03 | 0.06 | 0.09 |
| A2 | 1.45 | 1.60 | 1.75 |
| A3 | 0.8 | 0.9 | 1 |
| b | 0.69 | - | 0.78 |
| D | 6.3 | 6.5 | 6.7 |
| D1 | 3.00REF | | |
| e | 2.30BSC | | |
| E | 6.8 | 7 | 7.2 |
| E1 | 3.4 | 3.5 | 3.6 |
| L | 0.9 | - | - |

SOT223 Package

## Revision History and Checking Table

| Version | Date | Revision Item | Modifier | Function & Spec Checking | Package & Tape Checking |
|---|---|---|---|---|---|
| 1.0 | 2017-07-28 | Original Version | Liu Yi Guo | Liu Yi Guo | Zhu Jun Li |
| 1.1 | 2024-3-29 | Update form | Shibo | Liuyg | Liujy |