

## Ultra-low Dropout, 500mA, CMOS LDO

### General Description

The WR0512 series are ultra-low dropout, Low quiescent current, high PSRR CMOS LDO. The dropout voltage is 130mV (Typ.) at 500mA load current.

Using CMOS construction, the quiescent current consumed by the WR0512 is typically 60 $\mu$ A over the entire input voltage range, making it attractive for consumer, networking applications that demand high output current. The WR0512 series are available in wide output voltage range version from 1.2V to 3.3V with 0.1V step.

The WR0512 series offer thermal shutdown (OTP) and current limit functions, to assure the stability of chip and power system at wrong condition, and it uses trimming technique to guarantee output voltage accuracy within  $\pm 2\%$ .

The WR0512 regulators are available in SOT-23-3、SOT-23-5、SOT-89-3/L packages. Standard products are Pb-free and Halogen-free.

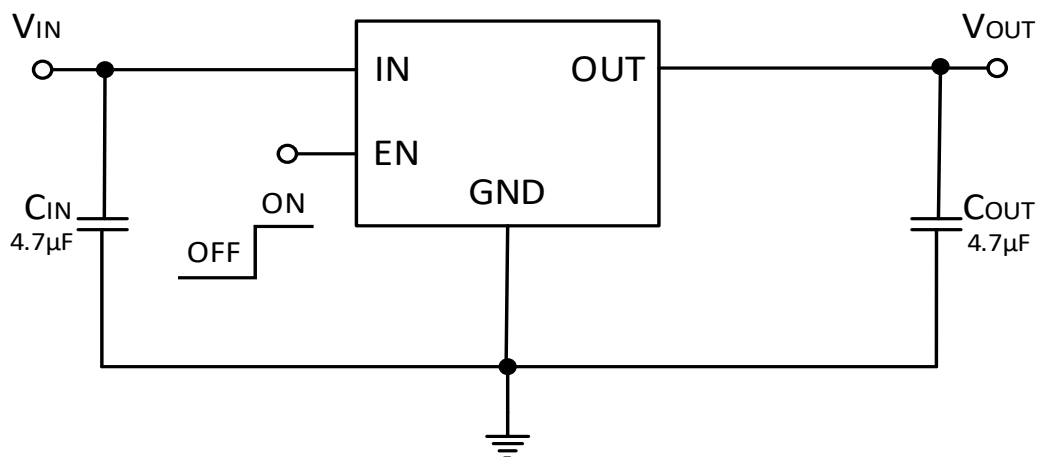
### Features

- Input Voltage: 2.5V to 5.5V
- Output Voltage: 1.2V to 3.3V
- Output Current: 500mA
- PSRR: 70dB @ 1KHz
- Dropout Voltage: 130mV @  $I_{OUT}=500mA$
- Operating Temperature: -40 to +85°C
- Output Noise: 120 $\mu$ VRMS
- Quiescent Current: 60 $\mu$ A Typ.

### Applications

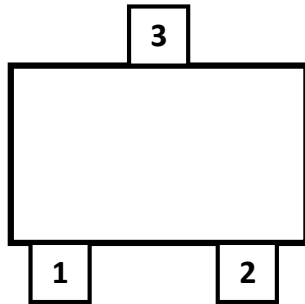
- LCD TV
- STB
- Computer, Graphic card
- Network communication equipments
- Others portable electronics devices

### Typical Application

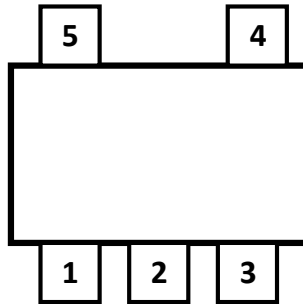


## Pin Configuration

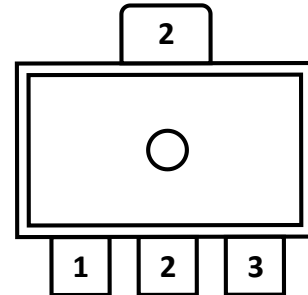
(Top View)



SOT 23-3



SOT 23-5



SOT89-3/L

## Pin Description

| Pin Number |         |         |          | Pin Name | Description         |
|------------|---------|---------|----------|----------|---------------------|
| SOT23-5    | SOT23-3 | SOT89-3 | SOT89-3L |          |                     |
| 1          | 3       | 2       | 3        | IN       | Input               |
| 2          | 1       | 1       | 2        | GND      | Ground              |
| 3          | -       | -       | -        | EN       | Enable, Active High |
| 4          | -       | -       | -        | NC       | Not connect         |
| 5          | 2       | 3       | 1        | OUT      | Output              |

**Absolute Maximum Ratings**

| Parameter                                                      |           | Rating          | Unit          |
|----------------------------------------------------------------|-----------|-----------------|---------------|
| Input voltage range                                            |           | -0.3 ~ 6.5      | V             |
| EN Input voltage range                                         |           | -0.3 ~ $V_{IN}$ | V             |
| Output voltage range                                           |           | -0.3 ~ $V_{IN}$ | V             |
| Power dissipation <sup>*1*3</sup><br>$P_D @ T_A = 25^{\circ}C$ | SOT89-3/L | 625             | mW            |
|                                                                | SOT23-5   | 500             | mW            |
|                                                                | SOT23-3   | 500             | mW            |
| Thermal resistance<br>$R_{\theta JA}^{*1*2}$                   | SOT89-3/L | 200             | $^{\circ}C/W$ |
|                                                                | SOT23-5   | 250             | $^{\circ}C/W$ |
|                                                                | SOT23-3   | 250             | $^{\circ}C/W$ |
| Top Thermal resistance<br>$R_{\theta JC}^{*1*2}$               | SOT23-5   | 120             | $^{\circ}C/W$ |
| Junction temperature                                           |           | 150             | $^{\circ}C$   |
| Lead temperature(10s)                                          |           | 260             | $^{\circ}C$   |
| Storage temperature                                            |           | -55 ~ 150       | $^{\circ}C$   |
| ESD Susceptibility                                             | HBM       | $\pm 4000$      | V             |

Note:

1. Measured on 2cm x 2cm 2-layer FR4 PCB board, 1 oz copper, no via holes on GND copper.
2. Measured according to JEDEC board specification. Detailed description of the board can be found JESD51-7.
3. Power dissipation is calculate by  $P_{D(MAX)} = (T_J - T_A) / R_{\theta JA}$ .

**Recommended Operating Conditions**

| Parameter                   | Rating    | Unit        |
|-----------------------------|-----------|-------------|
| Operating Supply voltage    | 2.5 ~ 5.5 | V           |
| Operating Temperature Range | -40 ~ 85  | $^{\circ}C$ |

## Electrical Characteristics

( $T_a=25^{\circ}\text{C}$ ,  $V_{IN}=V_{OUT}+1\text{V}$ ,  $C_{IN}=C_{OUT}=4.7\mu\text{F}$ , unless otherwise noted)

| symbol          | Parameter                     | Test Condition                                                                                                     | Min               | Typ       | Max               | Unit                |
|-----------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------|-----------|-------------------|---------------------|
| $V_{OUT}$       | Output Voltage                | $V_{OUT}\leq 1.5\text{V}$ , $V_{IN}=2.5\text{V}$ ,<br>$I_{OUT}=1\text{mA}$                                         | 0.97<br>$V_{OUT}$ | $V_{OUT}$ | 1.03<br>$V_{OUT}$ | V                   |
|                 |                               | $V_{OUT} > 1.5\text{V}$ , $I_{OUT}=1\text{mA}$                                                                     | 0.98<br>$V_{OUT}$ | $V_{OUT}$ | 1.02<br>$V_{OUT}$ |                     |
| $V_{DO}$        | Dropout Voltage <sup>3</sup>  | $V_{OUT}=V_{OUT}\cdot 0.98$ ,<br>$I_{OUT}=500\text{mA}$                                                            |                   | 130       |                   | mV                  |
| $I_{LIMIT}$     | Current Limit                 | $V_{IN}=5\text{V}$                                                                                                 |                   | 0.8       |                   | A                   |
| LNR             | Line Regulation               | $V_{OUT}=3.3\text{V}$ , $V_{IN}=4.3\sim 5.5\text{V}$ ,<br>$I_{OUT}=1\text{mA}$                                     |                   | 0.1       |                   | %/V                 |
| LDR             | Load Regulation <sup>4</sup>  | $V_{OUT}=3.3\text{V}$ ,<br>$I_{OUT}=1\sim 500\text{mA}$                                                            |                   | 15        |                   | mV                  |
| $I_Q$           | Quiescent Current             | $V_{OUT}=3.3\text{V}$ , $I_{OUT}=0\text{mA}$                                                                       |                   | 60        | 90                | $\mu\text{A}$       |
| $I_{SHDN}$      | Shut-down Current             | $V_{EN} = 0\text{V}$                                                                                               |                   | 0.1       | 1.0               | $\mu\text{A}$       |
| PSRR            | Power Supply Ripple Rejection | $V_{IN}=(V_{OUT}+1\text{V})_{DC}+0.2V_{P-P}$<br>$F=1\text{KHz}$ , $I_{OUT}=10\text{mA}$<br>@ $V_{OUT}=3.3\text{V}$ |                   | 70        |                   | dB                  |
| $V_{NO}$        | Output noise voltage          | 10Hz to 100KHz,<br>$C_{OUT}=4.7\mu\text{F}$<br>$I_{OUT}=10\text{mA}$                                               |                   | 120       |                   | $\mu\text{V}_{RMS}$ |
| $V_{IH}$        | EN logic high voltage         | $V_{IN}=5.5\text{V}$ , $I_{OUT}=1\text{mA}$                                                                        | 1.2               |           |                   | V                   |
| $V_{IL}$        | EN logic low voltage          | $V_{IN}=5.5\text{V}$ , $I_{OUT}=1\text{mA}$                                                                        |                   |           | 0.4               | V                   |
| $T_{SD}$        | Thermal shutdown threshold    |                                                                                                                    |                   | 165       |                   | $^{\circ}\text{C}$  |
| $\Delta T_{SD}$ | Thermal shutdown hysteresis   |                                                                                                                    |                   | 30        |                   | $^{\circ}\text{C}$  |

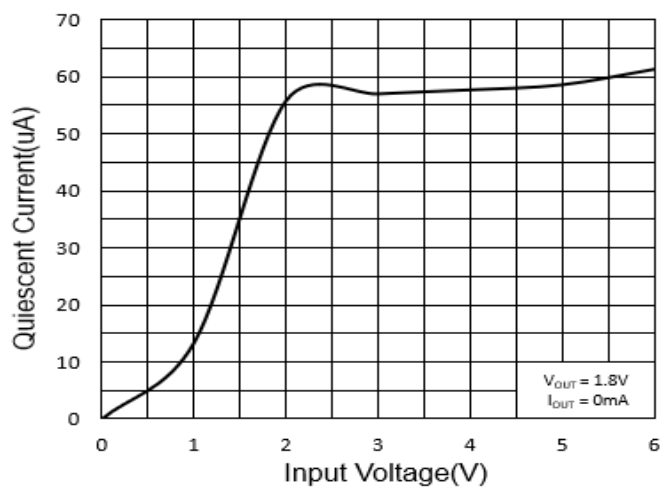
Note:

3. The dropout voltage is defined as ( $V_{IN}-V_{OUT}$ ) when  $V_{OUT}$  is 100mV below the target value of  $V_{OUT}$ .

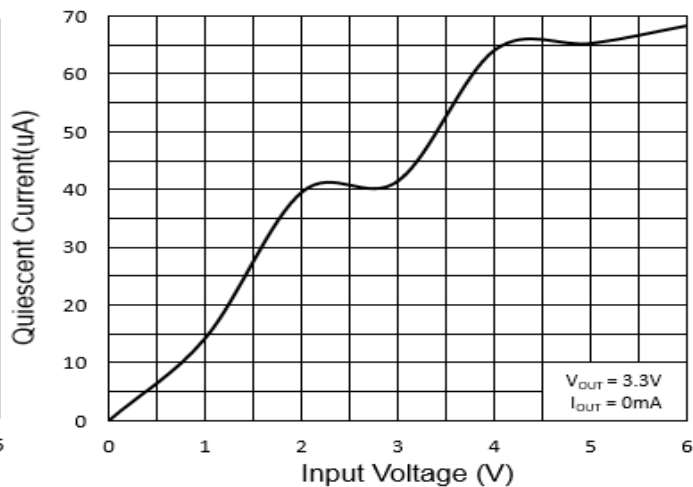
4. The Load regulation is measured using pulse techniques with duty cycle < 5%.

## Typical Characteristics

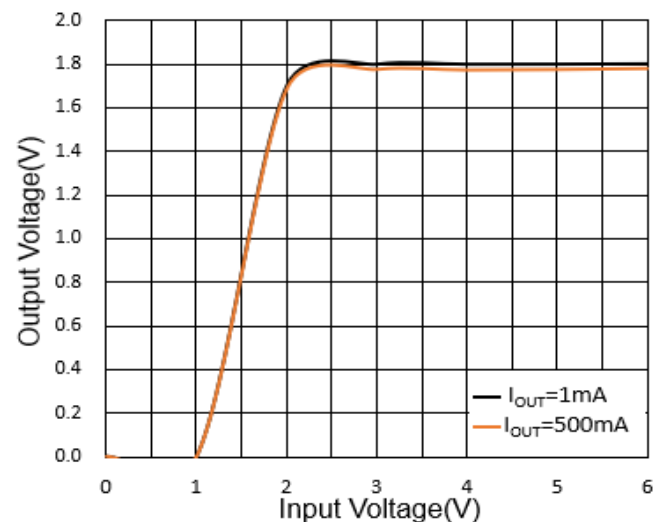
( $T_a=25^{\circ}\text{C}$ ,  $V_{IN}=V_{OUT}+1\text{V}$ ,  $C_{IN}=C_{OUT}=4.7\mu\text{F}$ , unless otherwise noted)



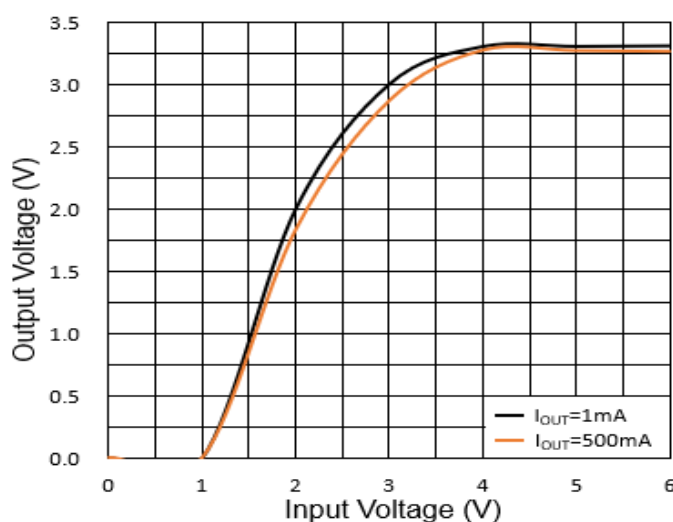
Quiescent Current vs. Supply Voltage



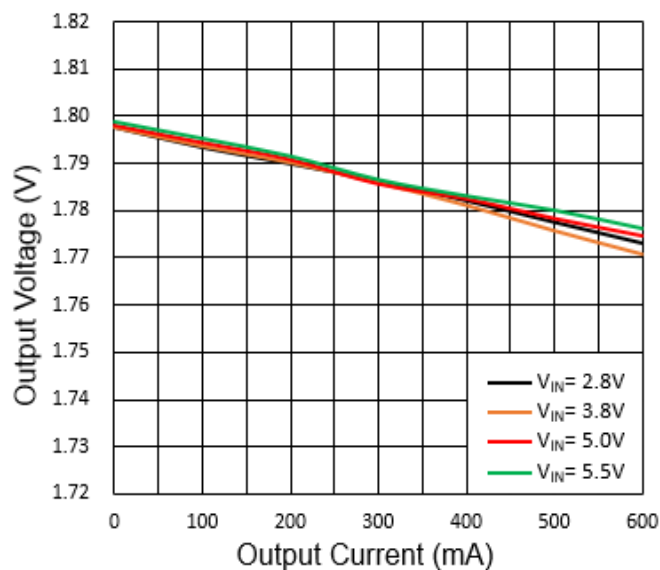
Quiescent Current vs. Supply Voltage



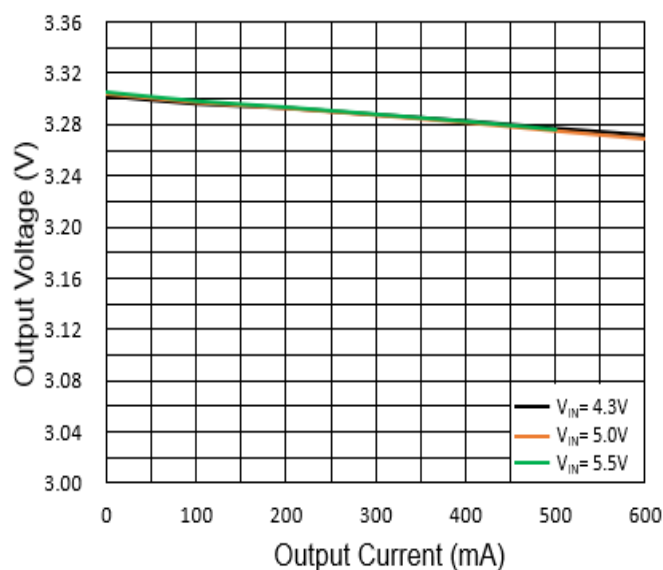
Output Voltage vs. Supply Voltage



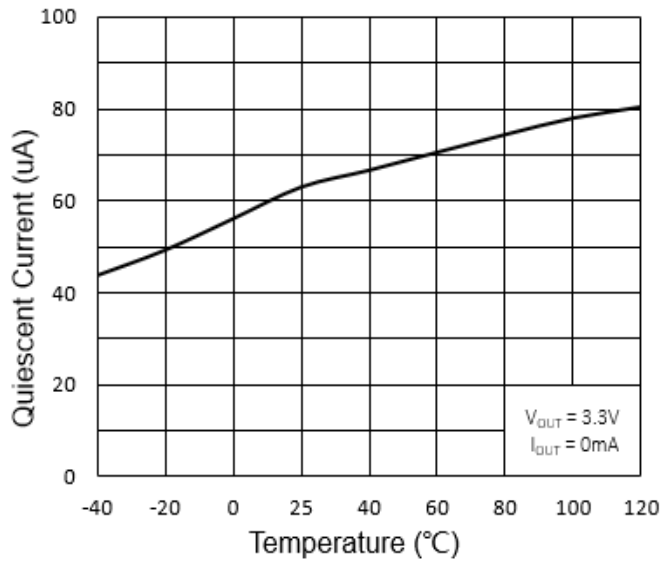
Output Voltage vs. Supply Voltage



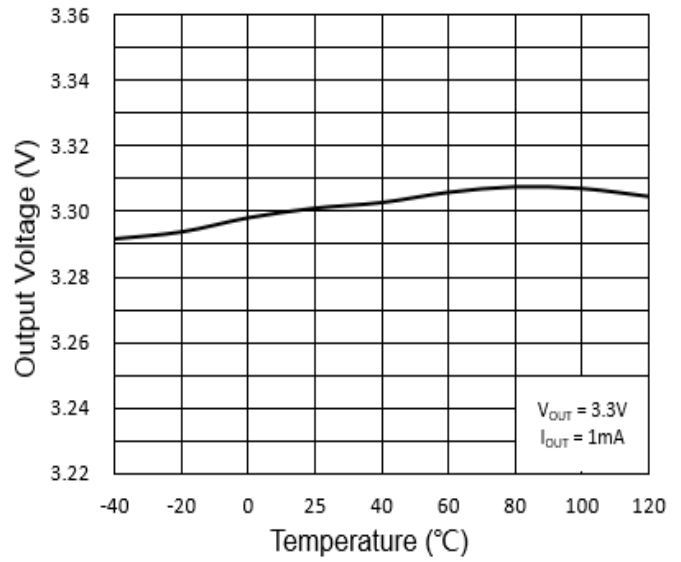
Output Voltage vs. Output Current



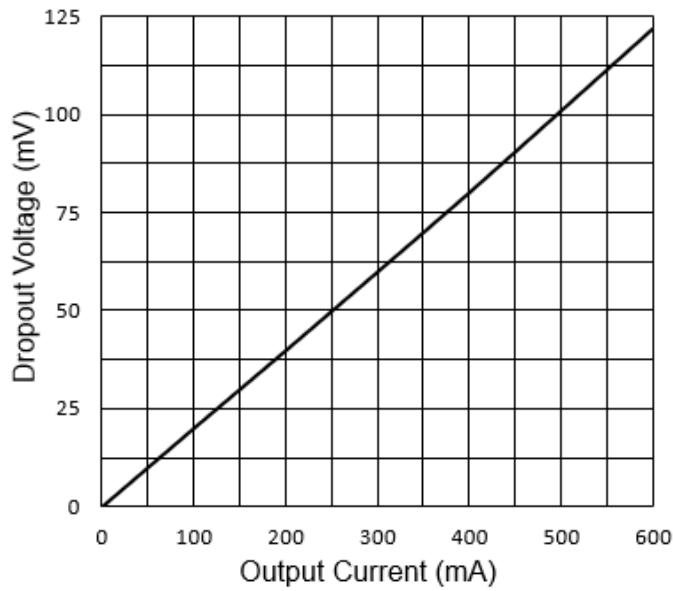
Output Voltage vs. Output Current



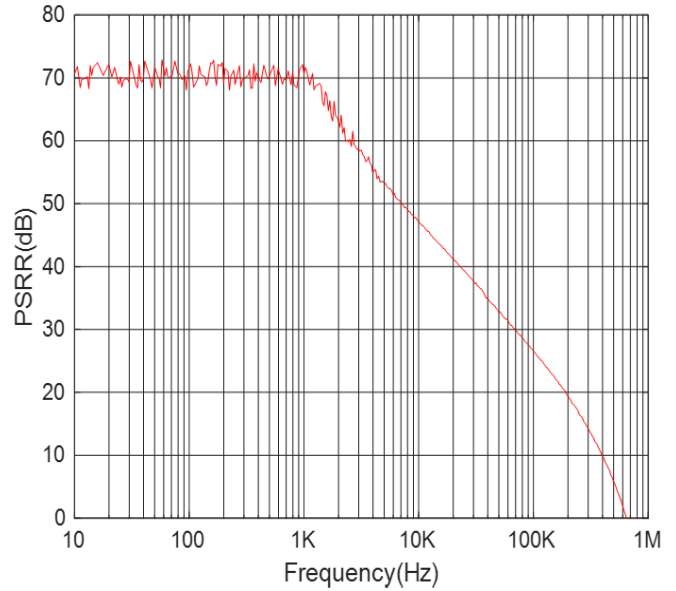
Quiescent Current vs. Temperature



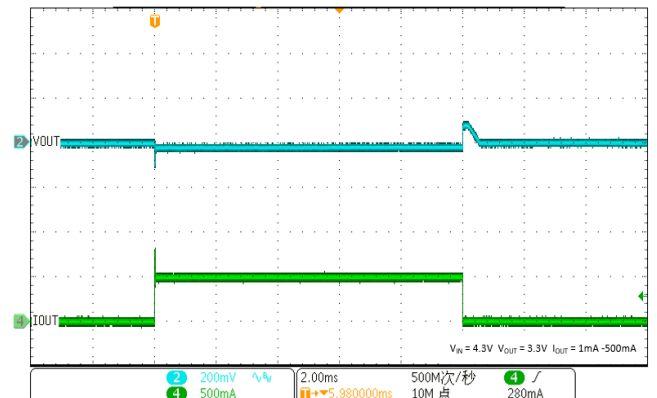
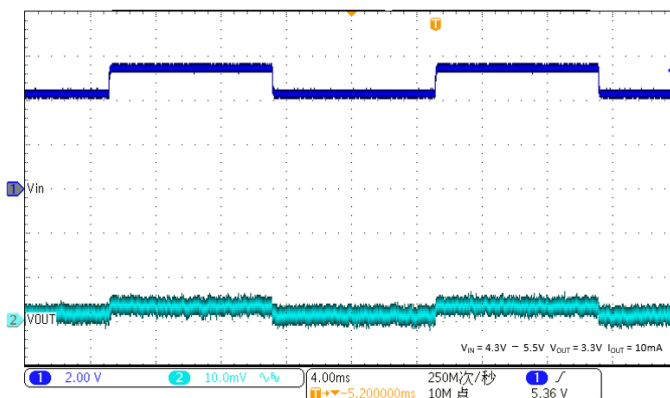
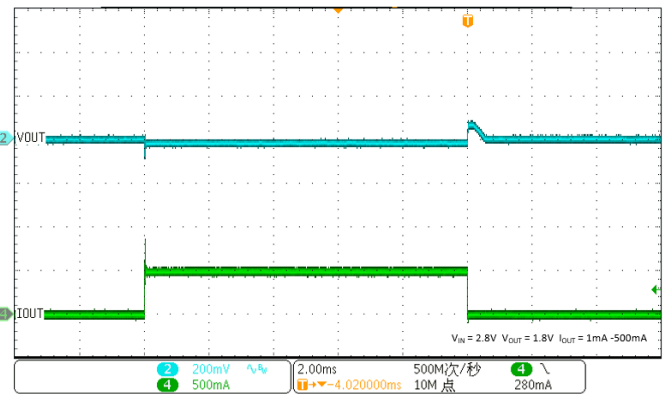
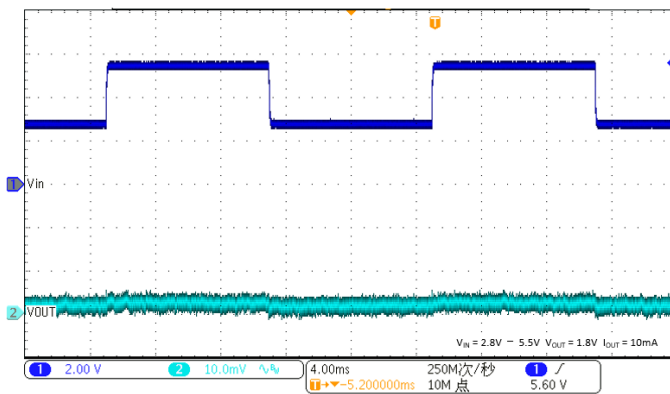
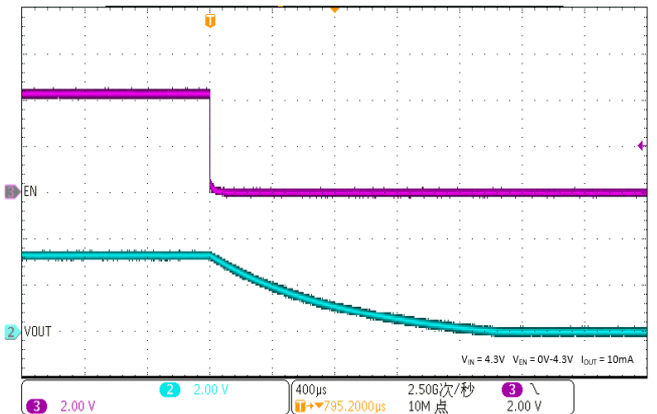
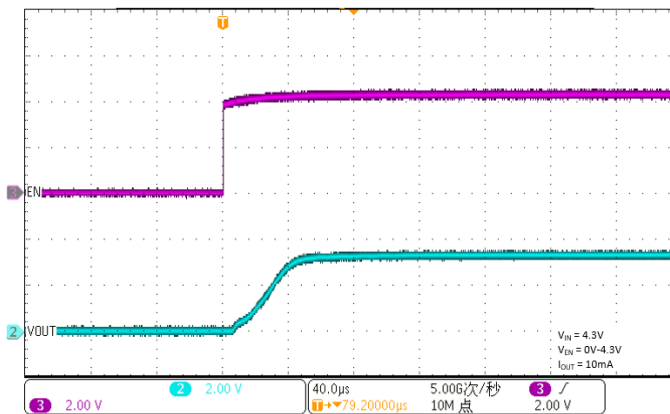
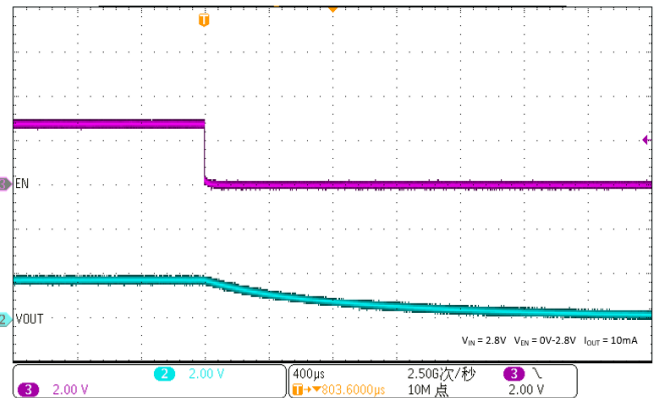
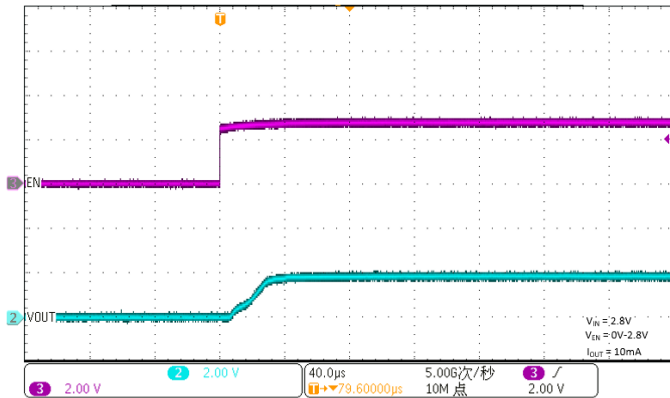
Output Voltage vs. Temperature



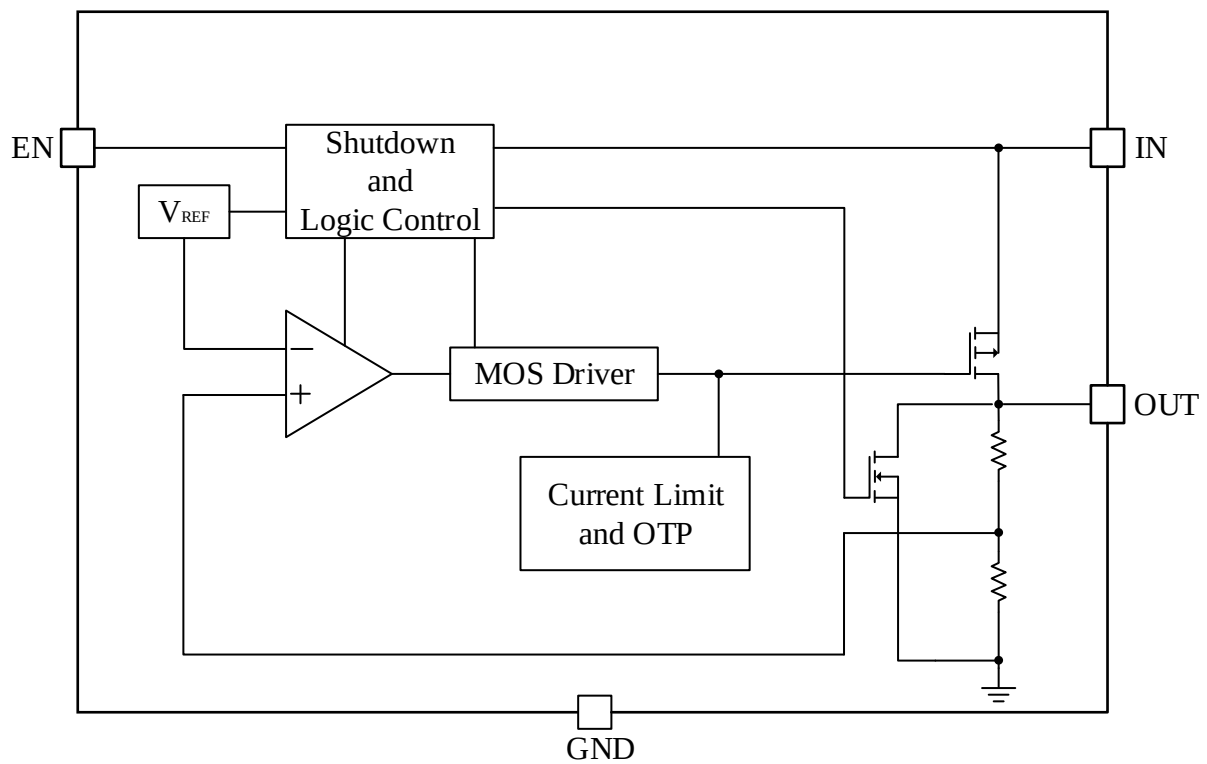
Dropout Voltage vs. Output Current



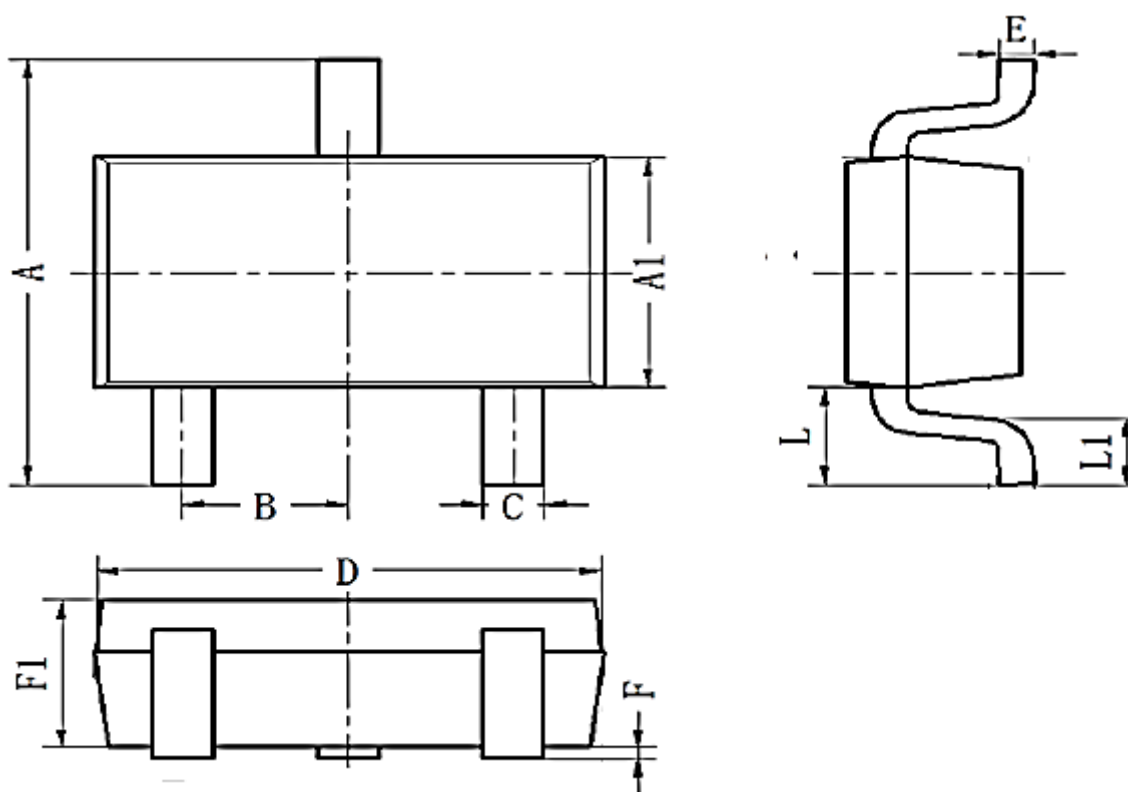
Power Supply Rejection Ratio vs. Frequency



## Block Diagram

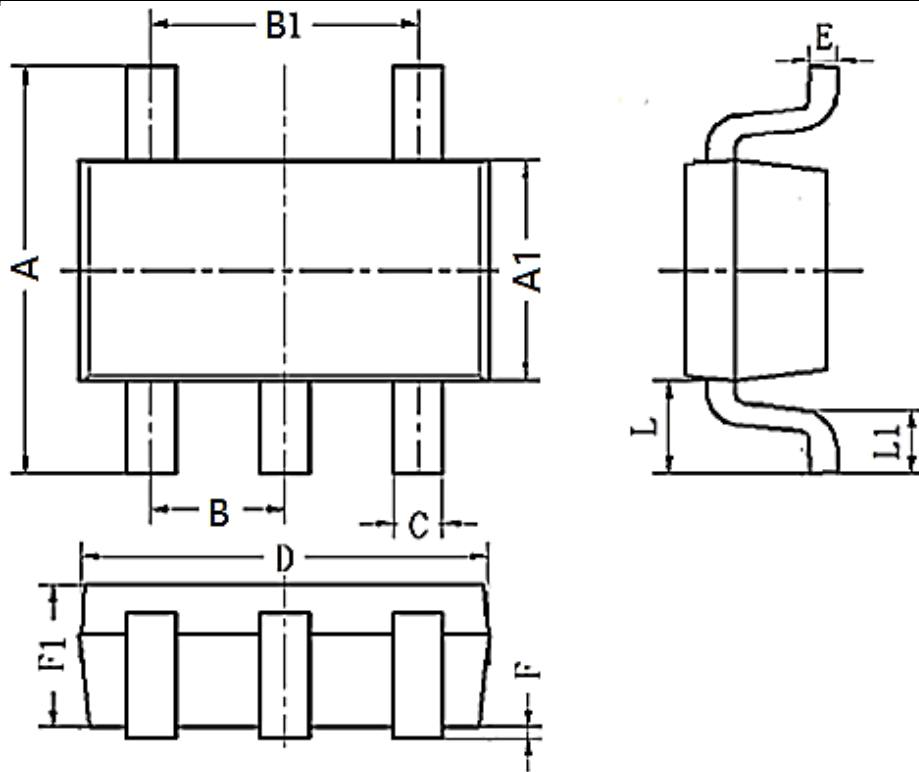


# Package Information



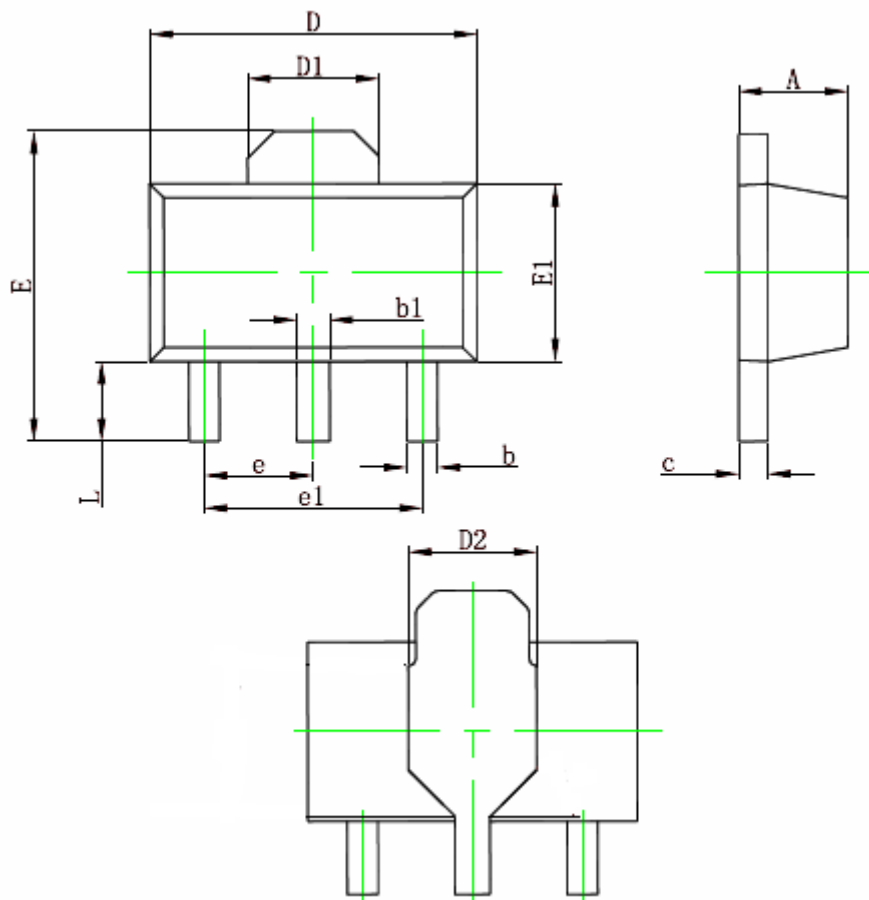
SOT 23-3

| SYMBOL | DIMENSIONS IN MILLIMETERS |      |      |
|--------|---------------------------|------|------|
|        | MIN                       | NOM  | MAX  |
| A      | 2.60                      | 2.80 | 3.00 |
| A1     | 1.50                      | 1.60 | 1.70 |
| B      | 0.95BSC                   |      |      |
| C      | 0.25                      | 0.40 | 0.50 |
| D      | 2.82                      | 2.92 | 3.02 |
| E      | 0.10                      | 0.15 | 0.20 |
| L      | 0.59REF                   |      |      |
| L1     | 0.30                      | 0.45 | 0.60 |
| F1     | 0.90                      | 1.10 | 1.30 |
| F      | 0.00                      | 0.08 | 0.15 |



SOT 23-5

| SYMBOL | DIMENSIONS IN MILLIMETERS |      |      |
|--------|---------------------------|------|------|
|        | MIN                       | NOM  | MAX  |
| A      | 2.60                      | 2.80 | 3.00 |
| A1     | 1.50                      | 1.60 | 1.70 |
| B      | 0.95BSC                   |      |      |
| B1     | 1.90BSC                   |      |      |
| C      | 0.25                      | 0.40 | 0.50 |
| D      | 2.82                      | 2.92 | 3.02 |
| E      | 0.10                      | 0.15 | 0.20 |
| F      | 0.00                      | 0.08 | 0.15 |
| L      | 0.59REF                   |      |      |
| F1     | 0.90                      | 1.10 | 1.30 |
| L1     | 0.30                      | 0.45 | 0.60 |


**SOT89-3/L**

| SYMBOL    | DIMENSIONS IN MILLIMETERS |       |       |
|-----------|---------------------------|-------|-------|
|           | MIN                       | NOM   | MAX   |
| <b>A</b>  | 1.4                       | 1.5   | 1.6   |
| <b>b</b>  | 0.320                     | 0.420 | 0.520 |
| <b>b1</b> | 0.380                     | 0.480 | 0.580 |
| <b>c</b>  | 0.350                     | 0.405 | 0.460 |
| <b>D</b>  | 4.400                     | 4.500 | 4.600 |
| <b>D1</b> | 1.65REF                   |       |       |
| <b>D2</b> | 1.700                     | 1.950 | 2.200 |
| <b>E</b>  | 3.940                     | 4.120 | 4.300 |
| <b>E1</b> | 2.300                     | 2.450 | 2.600 |
| <b>e</b>  | 1.5BSC                    |       |       |
| <b>e1</b> | 3.00BSC                   |       |       |
| <b>L</b>  | 0.800                     | 1.000 | 1.200 |

## Ordering Information

| Part Number   | Output Voltage | Package  | Packing Quantity | Marking*        |
|---------------|----------------|----------|------------------|-----------------|
| WR0512-12A50R | 1.2V           | SOT23-5  | 3k/Reel          | WR0512 12 XXXX  |
| WR0512-15A50R | 1.5V           | SOT23-5  | 3k/Reel          | WR0512 15 XXXX  |
| WR0512-18A50R | 1.8V           | SOT23-5  | 3k/Reel          | WR0512 18 XXXX  |
| WR0512-20A50R | 2.0V           | SOT23-5  | 3k/Reel          | WR0512 20 XXXX  |
| WR0512-22A50R | 2.2V           | SOT23-5  | 3k/Reel          | WR0512 22 XXXX  |
| WR0512-25A50R | 2.5V           | SOT23-5  | 3k/Reel          | WR0512 25 XXXX  |
| WR0512-28A50R | 2.8V           | SOT23-5  | 3k/Reel          | WR0512 28 XXXX  |
| WR0512-30A50R | 3.0V           | SOT23-5  | 3k/Reel          | WR0512 30 JXXXX |
| WR0512-33A50R | 3.3V           | SOT23-5  | 3k/Reel          | WR0512 33 JXXXX |
| WR0512-12A20R | 1.2V           | SOT89-3  | 1k/Reel          | WR0512 12 XXXX  |
| WR0512-15A20R | 1.5V           | SOT89-3  | 1k/Reel          | WR0512 15 JXXXX |
| WR0512-18A20R | 1.8V           | SOT89-3  | 1k/Reel          | WR0512 18 XXXX  |
| WR0512-20A20R | 2.0V           | SOT89-3  | 1k/Reel          | WR0512 20 XXXX  |
| WR0512-22A20R | 2.2V           | SOT89-3  | 1k/Reel          | WR0512 22 XXXX  |
| WR0512-25A20R | 2.5V           | SOT89-3  | 1k/Reel          | WR0512 25 XXXX  |
| WR0512-28A20R | 2.8V           | SOT89-3  | 1k/Reel          | WR0512 28 XXXX  |
| WR0512-30A20R | 3.0V           | SOT89-3  | 1k/Reel          | WR0512 30 JXXXX |
| WR0512-33A20R | 3.3V           | SOT89-3  | 1k/Reel          | WR0512 33 JXXXX |
| WR0512-12A21R | 1.2V           | SOT89-3L | 1k/Reel          | WR0512 12 XXXX  |
| WR0512-15A21R | 1.5V           | SOT89-3L | 1k/Reel          | WR0512 15 XXXX  |
| WR0512-18A21R | 1.8V           | SOT89-3L | 1k/Reel          | WR0512 18 XXXX  |
| WR0512-20A21R | 2.0V           | SOT89-3L | 1k/Reel          | WR0512 20 XXXX  |
| WR0512-22A21R | 2.2V           | SOT89-3L | 1k/Reel          | WR0512 22 XXXX  |
| WR0512-25A21R | 2.5V           | SOT89-3L | 1k/Reel          | WR0512 25 XXXX  |
| WR0512-28A21R | 2.8V           | SOT89-3L | 1k/Reel          | WR0512 28 XXXX  |
| WR0512-30A21R | 3.0V           | SOT89-3L | 1k/Reel          | WR0512 30 XXXX  |
| WR0512-33A21R | 3.3V           | SOT89-3L | 1k/Reel          | WR0512 33 XXXX  |
| WR0512-12A30R | 1.2V           | SOT23-3  | 3k/Reel          | WR0512 12 XXXX  |
| WR0512-15A30R | 1.5V           | SOT23-3  | 3k/Reel          | WR0512 15 XXXX  |
| WR0512-18A30R | 1.8V           | SOT23-3  | 3k/Reel          | WR0512 18 XXXX  |
| WR0512-20A30R | 2.0V           | SOT23-3  | 3k/Reel          | WR0512 20 XXXX  |
| WR0512-22A30R | 2.2V           | SOT23-3  | 3k/Reel          | WR0512 22 XXXX  |
| WR0512-25A30R | 2.5V           | SOT23-3  | 3k/Reel          | WR0512 25 XXXX  |
| WR0512-28A30R | 2.8V           | SOT23-3  | 3k/Reel          | WR0512 28 XXXX  |

| Part Number   | Output Voltage | Package | Packing Quantity | Marking*        |
|---------------|----------------|---------|------------------|-----------------|
| WR0512-30A30R | 3.0V           | SOT23-3 | 3k/Reel          | WR0512 30 JXXXX |
| WR0512-33A30R | 3.3V           | SOT23-3 | 3k/Reel          | WR0512 33 XXXX  |

\* XXXX is variable.

## Contact Information

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WAYON website: <http://www.way-on.com>

For additional information, please contact your local Sales Representative.

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*Specifications are subject to change without notice.*

*The device characteristics and parameters in this data sheet can and do vary in different applications and actual device performance may vary over time.*

*Users should verify actual device performance in their specific applications.*