



## 800mA CMOS LDO

### DESCRIPTION

As UTC LDO, the features of the UTC **L1188** include low quiescent current and very low dropout voltage.

In order prevent form the bad operating conditions, there are internal thermal shutdown and current fold-back. For stably operation, the UTC **L1188** should be connected to an output capacitance of 2.2 $\mu$ F or larger.

The UTC **L1188** can be an ideal for battery applications, such as portable electronics, wireless devices, cordless phones, PC peripherals and battery powered widgets.

### FEATURES

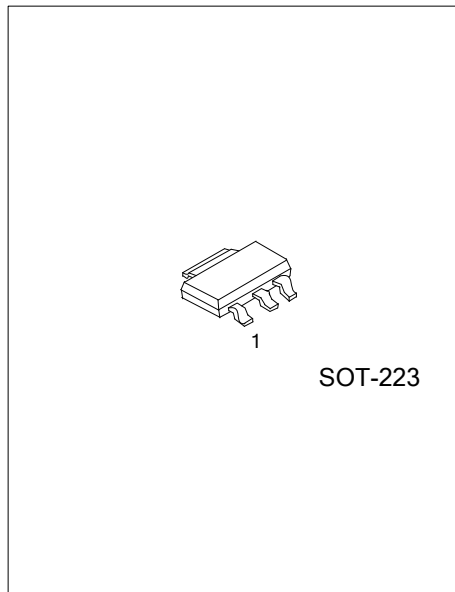
- \* Extra Low Dropout Voltage
- \* Output Current: 800mA (Guaranteed)
- \* Output Voltage Accuracy:  $\pm 1.5\%$
- \* Quiescent Current: 30 $\mu$ A
- \* Internal Over-Temperature Shutdown
- \* With Current limiting
- \* Internal Short Circuit Current Fold-Back
- \* Pre-set Output Voltages In Factory
- \* Very Low Temperature Coefficient

### ORDERING INFORMATION

| Ordering Number   |                   | Package | Pin Assignment |   |   | Packing   |
|-------------------|-------------------|---------|----------------|---|---|-----------|
| Lead Free         | Halogen Free      |         | 1              | 2 | 3 |           |
| L1188L-xx-AA3-A-R | L1188G-xx-AA3-A-R | SOT-223 | G              | O | I | Tape Reel |

Note: Pin Assignment: G:GND O:V<sub>OUT</sub> I:V<sub>IN</sub>  
xx: Output Voltage, refer to Marking Information.

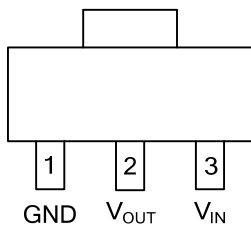
|                        |   |  |
|------------------------|---|--|
| <p>L1188L-xx-AA3-R</p> | <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Output Voltage Code</p> <p>(4) Lead Free</p> | <p>(1) R: Tape Reel</p> <p>(2) AA3: SOT-223</p> <p>(3) xx: Refer to Marking Information</p> <p>(4) G: Halogen Free, L: Lead Free</p> |
|------------------------|---|--|



MARKING INFORMATION

| PACKAGE | VOLTAGE CODE        | MARKING |
|---------|---------------------|---------|
| SOT-223 | 28 :2.8V<br>33:3.3V |         |

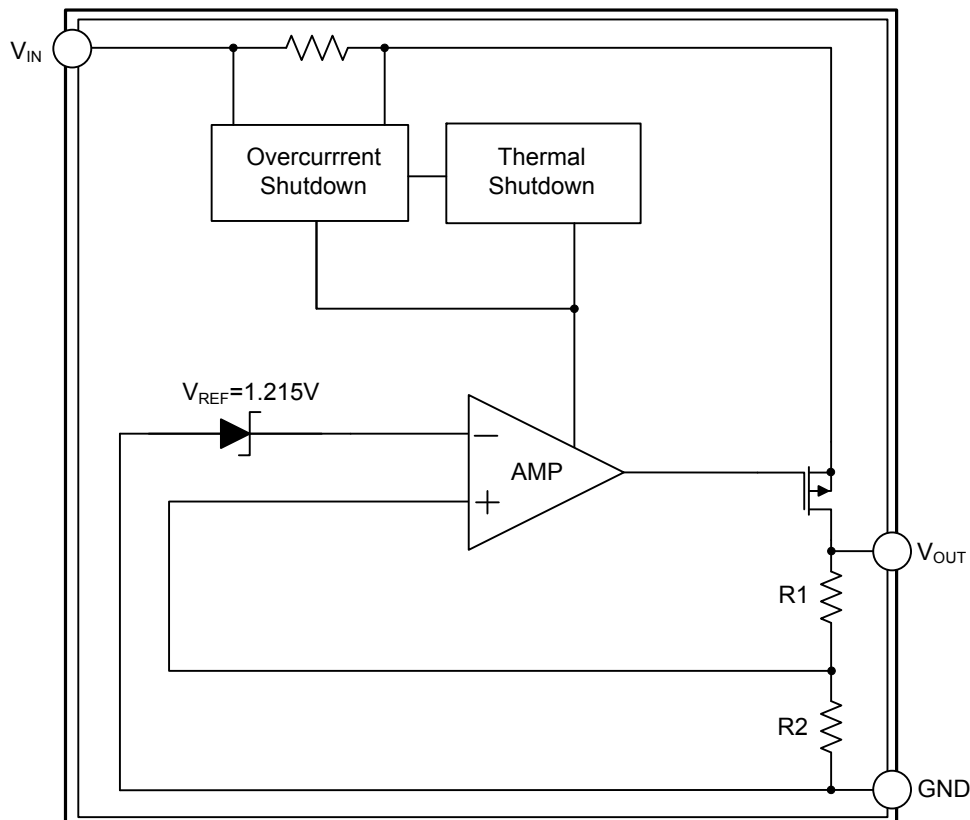
PIN CONFIGURATION



PIN DESCRIPTION

| PIN NO. | PIN NAME         | DESCRIPTION   |
|---------|------------------|---|
| 1       | GND              | Ground.   |
| 2       | V <sub>OUT</sub> | Output voltage pin which should be decoupled with a ceramic capacitor (Value: 2.2μF or larger and low ESR). |
| 3       | V <sub>IN</sub>  | Input voltage pin which should be decoupled with 1μF or greater capacitor.                                  |

BLOCK DIAGRAM



### ■ ABSOLUTE MAXIMUM RATING

| PARAMETER                     | SYMBOL    | RATINGS                    | UNIT |
|-------------------------------|-----------|----------------------------|------|
| Input, Output Voltage         |           | GND - 0.3 ~ $V_{IN} + 0.3$ | V    |
| Input Voltage                 | $V_{IN}$  | 8                          | V    |
| Output Current                | $I_{OUT}$ | 1                          | A    |
| Power Dissipation             | $P_D$     | 800                        | mW   |
| Junction Temperature          | $T_J$     | 125                        | °C   |
| Ambient Operating Temperature | $T_{OPR}$ | - 40 ~ +85                 | °C   |
| Storage Temperature           | $T_{STG}$ | - 65 ~ +150                | °C   |

Notes: Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

### ■ THERMAL DATA

| PARAMETER               | SYMBOL        | RATINGS | UNIT |
|-------------------------|---------------|---------|------|
| Junction to Ambient     | $\theta_{JA}$ | 135     | °C/W |
| Junction to Case (Note) | $\theta_{JC}$ | 31      | °C/W |

Note: Measure  $\theta_{JC}$  on backside center of tab.

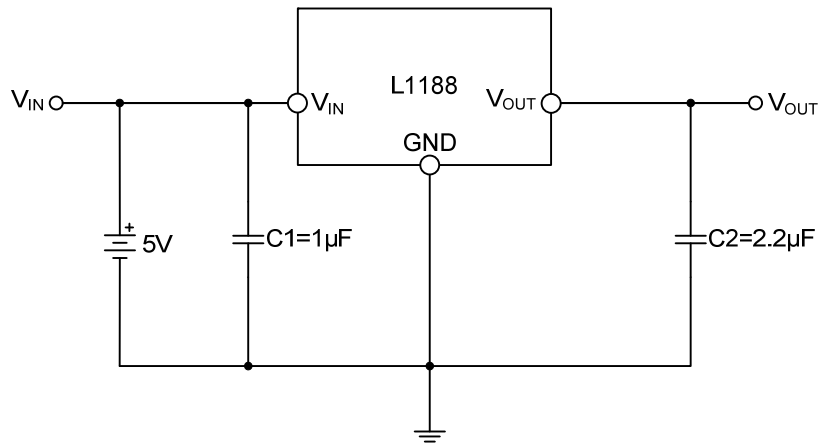
### ■ ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , unless otherwise specified.)

| PARAMETER                                 | SYMBOL                           | TEST CONDITIONS  | MIN  | TYP   | MAX  | UNIT                |    |
|---|----------------------------------|--|--|-------|------|---------------------|----|
| Input Voltage                             | $V_{IN}$                         |  | Note1  |       | 7    | V                   |    |
| Output Voltage Accuracy                   | $V_{OUT}$                        | $I_{OUT} = 1\text{mA}$   | -1.5   |       | 1.5  | %                   |    |
| Line Regulation                           | $\frac{\Delta V_{OUT}}{V_{OUT}}$ | $I_{OUT}=1\text{mA}$<br>$V_{IN}=V_{OUT}+1\sim V_{OUT}+2$                       | $1.8\text{V}\leq V_{OUT}\leq 2.0\text{V}$      | -0.15 |      | 0.15                | %  |
|   |                                  |  | $2.0\text{V}<V_{OUT}<4.0\text{V}$              | -0.1  | 0.02 | 0.1                 | %  |
|   |                                  |  | $V_{OUT}\geq 4.0\text{V}$                      | -0.4  | 0.2  | 0.4                 | %  |
| Load Regulation                           | $\frac{\Delta V_{OUT}}{V_{OUT}}$ | $I_{OUT} = 1\text{mA}\sim 800\text{mA}$  |  | 0.2   | 1    | %                   |    |
| Output Current                            | $I_{OUT}$                        | $V_{OUT}\geq 1.8\text{V}$  | 800  |       |      | mA                  |    |
| Current Limit                             | $I_{LIMIT}$                      | $V_{OUT}\geq 1.8\text{V}$  | 900  |       |      | mA                  |    |
| Short Circuit Current                     | $I_{SC}$                         | $V_{OUT}<0.8\text{V}$  |  | 400   | 800  | mA                  |    |
| Quiescent Current                         | $I_Q$                            | $I_{OUT}=0\text{mA}$   |  | 30    | 50   | $\mu\text{A}$       |    |
| Ground Pin Current                        | $I_{GND}$                        | $I_{OUT}=1\text{mA} \sim 800\text{mA}$   |  | 35    |      | $\mu\text{A}$       |    |
| Dropout Voltage                           | $V_D$                            | $I_{OUT}=800\text{mA}$<br>$V_{OUT}=V_{OUT(NOM)}-2.0\%$                         | $1.8\text{V}\leq V_{OUT(NOM)}\leq 2.0\text{V}$ |       |      | 1400                | mV |
|   |                                  |  | $2.0\text{V}<V_{OUT(NOM)}\leq 2.8\text{V}$     |       |      | 1000                | mV |
|   |                                  |  | $2.8\text{V}<V_{OUT(NOM)}$                     |       |      | 800                 | mV |
| Over Temperature Shutdown                 | OTS                              |  |  | 150   |      | °C                  |    |
| Over Temperature Hysteresis               | OTH                              |  |  | 30    |      | °C                  |    |
| Temperature Coefficient of Output Voltage | $T_C V_O$                        |  |  | 30    |      | ppm/°C              |    |
| Power Supply Ripple Rejection             | PSRR                             | $I_{OUT}=100\text{mA}$<br>$C_O=2.2\mu\text{F}$                                 | $f=100\text{Hz}$                               |       | 60   |                     | dB |
|   |                                  |  | $f=1\text{kHz}$                                |       | 50   |                     | dB |
|   |                                  |  | $f=10\text{kHz}$                               |       | 20   |                     | dB |
| Output Voltage Noise                      | $e_N$                            | $I_{OUT}=10\text{mA}, C_{OUT}=2.2\mu\text{F}, f=10\text{Hz}\sim 100\text{kHz}$ |  | 30    |      | $\mu\text{V}_{RMS}$ |    |

Notes: 1.  $V_{IN(MIN)}=V_{OUT}+V_D$

2. To prevent the Short Circuit Current protection feature from being prematurely activated, the input voltage must be applied before a current source load is applied.

## ■ TYPICAL APPLICATION CIRCUIT



## ■ APPLICATION INFORMATION

### 1. Detailed Description

Internal circuits include: a PMOS pass transistor, voltage reference, error amplifier, over-current protection, and thermal shutdown.

The data through the error amplifier, over-current shutdown, and thermal protection circuits, then to the P-channel pass transistor.

As soon as the junction temperature exceeds 150°C or the current exceeds 900mA, over-current and thermal shutdown circuits start working. When the junction temperature drops below 120°C, normal operation is restored.

When the load exceeds the rated output current, for preventing the over stress, the chip switches from voltage mode to current mode.

### 2. External Information

When considering the external capacitors, the L1188 is stable with an output capacitor to ground of 2.2µF or greater. As we know, the ceramic capacitors have the lowest ESR but can offer the best AC performance; the aluminum electrolytic capacitors exhibit the highest ESR but offer the poorest AC response. And also large value ceramic capacitors are expensive. Consider all the situation, the best way is to parallel a 0.1µF ceramic capacitor with a 10µF Aluminum Electrolytic (low ESR, high capacitance, and low overall cost).

For better beneficial effecting, the input capacitor should be at least 0.1µF.

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