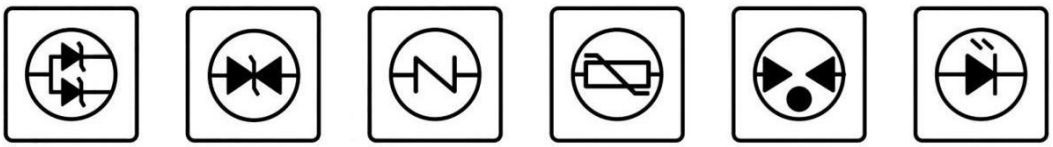
MSKSEMI 美森科
SEMICONDUCTOR




# MSP7118AUJZ-x.x

**Product specification**

## GENERAL DESCRIPTION

The MSP7118AUJZ-x.x series are a group of low-dropout ( LDO )voltage regulators offering the benefits of wide i nput voltage range, low dropout voltage, low power consumption, and miniaturized packaging.

Quiescent current of only 1.5μA makes these devices ideal for powering the battery-powered, always-on systems t hat require very little idle-state power dissipation to a longer service life.

The MSP7118AUJZ-x.x series of linear regulators are stable with the ceramic output capacitor over its wide input r ange from 2V to 24V and the entire range of output load current ( 0mA to 300mA ).

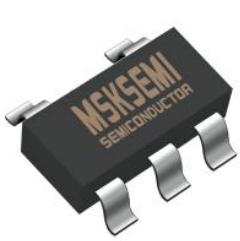
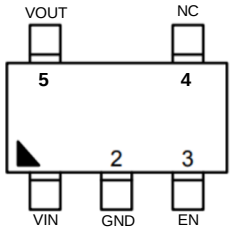
## FEATURES

- 1.5μA Ground Current at no Load
- ±2% Output Accuracy
- 300mA Output Current
- Wide Operating Input Voltage Range: 2V to 24V
- Dropout Voltage: 0.35V at 100mA / VOUT 5V
- Support Fixed Output Voltage 1.8V, 2.5V, 3.3V, 5V
- Stable with Ceramic or Tantalum Capacitor
- Current Limit Protection
- Over-Temperature Protection
- SOT-23-5 Packages Available

## APPLICATIONS

- Portable, Battery Powered Equipment
- Low Power Microcontrollers
- Laptop, Palmtops and PDAs
- Wireless Communication Equipment
- Audio/Video Equipment
- Car Navigation Systems
- Industrial Controls
- Weighting Scales
- Meters
- Home Automation

## Reference News

| SOT-23-5 | PIN CONFIGURATION |
|---|---|
|  | ( R-Type )  |



## Description of Functional Pins

| Pin No | Pin Name | Pin Function |
|---|---|---|
| SOT-23-5 | | |
| 2 | GND | Ground |
| 5 | VOUT | Output of the Regulator |
| 1 | VIN | Input of Supply Voltage. |
| 4 | NC | No Internal Connection. |
| 3 | EN | Enable Control Input. |

## MARKING

| MSP7118AUJZ-1.8 | MSP7118AUJZ-2.5 | MSP7118AUJZ-3.3 | MSP7118AUJZ-5.0 |
|---|---|---|---|
| LPA#MS | LPB#MS | LPC#MS | LPD#MS |

## ORDER INFORMATION

| P/N | Output Voltage | PKG | QTY |
|---|---|---|---|
| MSP7118AUJZ-1.8 | 1.8V | SOT-23-5 | 3000 |
| MSP7118AUJZ-2.5 | 2.5V | | |
| MSP7118AUJZ-3.3 | 3.3V | | |
| MSP7118AUJZ-5.0 | 5.5V | | |

## Typical Application Circuits

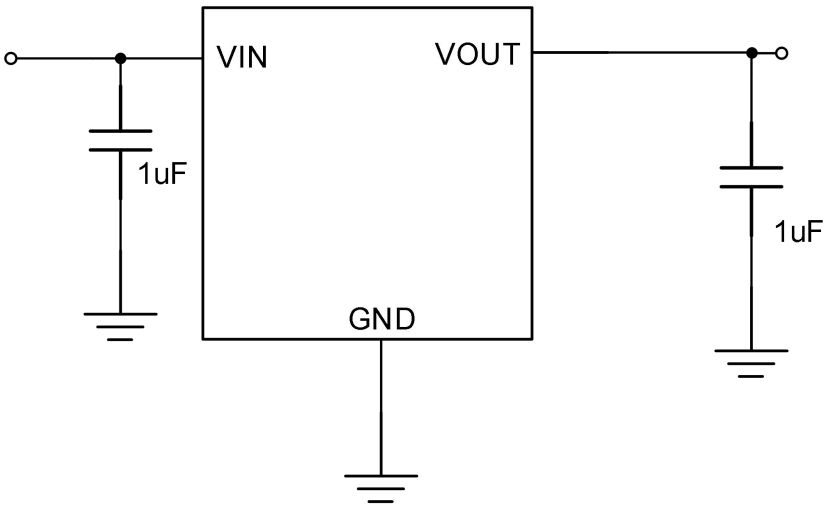
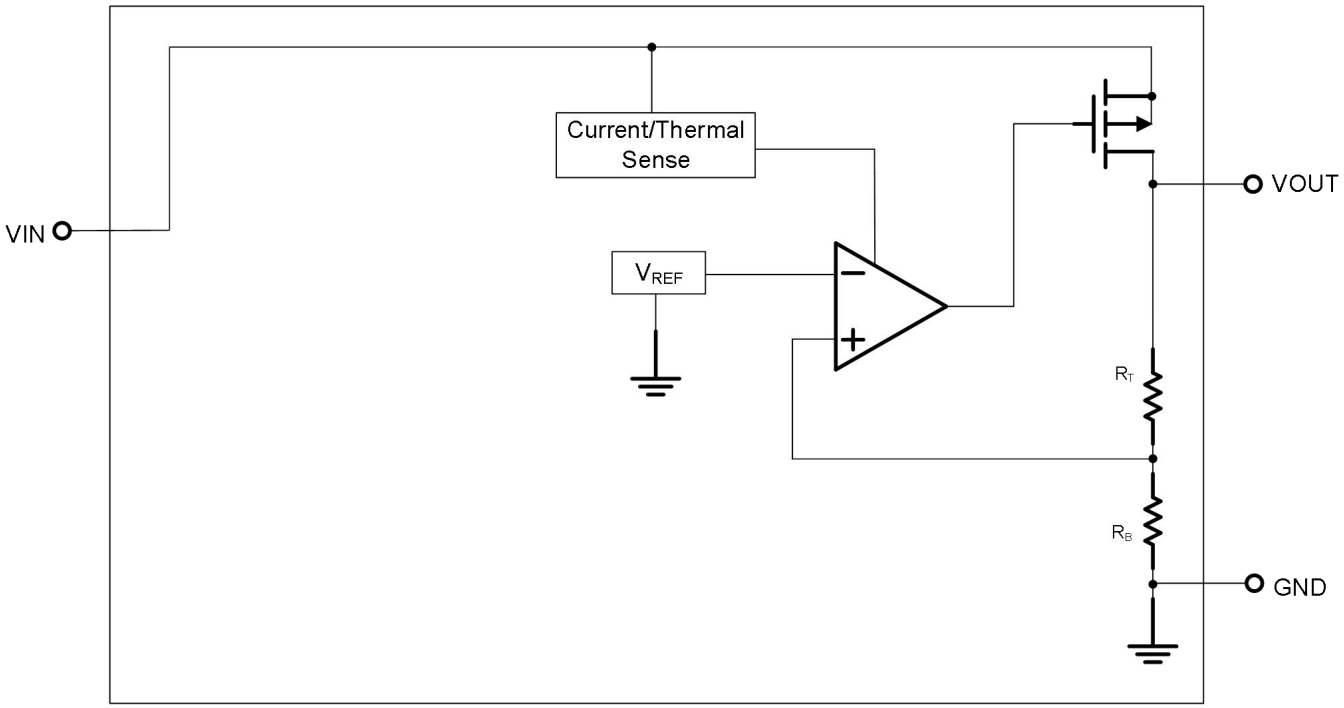



Figure 1: Application circuit of Fixed $V_{OUT}$ LDO

## Function Block Diagram



## Absolute Maximum Ratings (Note 1)

VIN to GND ---------- -0.3V to 28V

VOUT to GND

1.8V,2.5V,3.3V,5.0V---------- -0.3V to 6.0V

VOUT to VIN ---------- -28V to 0.3V

Package Thermal Resistance (Note 2)

SOT-23-5, $\theta_{JA}$ ---------- 200 °C /W

Lead Temperature (Soldering, 10 sec.) ---------- 260 °C

Junction Temperature ---------- 150 °C

Storage Temperature Range ---------- -40 °C to 150 °C

ESD Susceptibility

HBM ---------- 2KV

MM ---------- 200V

## Recommended Operating Conditions

Input Voltage VIN ---------- 2.0V to 24V

Junction Temperature Range ---------- -40 °C to 125 °C

Ambient Temperature Range ---------- -40 °C to 85 °C

## Electrical Characteristics

($V_{IN}$ =15V, $V_{EN}$ =5V, $T_A$=25°C unless otherwise specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Supply Voltage | $V_{IN}$ | | 2 | -- | 24 | V |
| DC Output Voltage Accuracy | | $I_{LOAD}$ =0.1mA | -2 | | 2 | % |
| Dropout Voltage ($I_{LOAD}$ =100mA) | $V_{DROP}$ | $V_{OUT}$ ≥ 5V | -- | 0.35 | | V |
| | $V_{DROP\_3.3V}$ | $V_{OUT}$ = 3.3V | | 0.42 | | |
| | $V_{DROP\_1.8V}$ | $V_{OUT}$ = 1.8V | | 0.5 | | |
| Ground Current ($I_{LOAD}$ = 0mA) | $I_Q$ | $V_{OUT}$ = 5V | | 2.2 | | μA |
| Line Regulation | ΔLINE | $I_{LOAD}$ =1mA, 5 ≤ $V_{IN}$ ≤ 30V | -- | 0.3 | | % |
| Load Regulation | ΔLOAD | 1mA≤ $I_{LOAD}$ ≤ 0.2A | | 0.1 | | % |
| Output Current Limit | $I_{LIM}$ | $V_{OUT}$ =0 | | 300 | 500 | mA |
| Power Supply Rejection Ratio | PSRR | $V_{OUT}$ =5V, $I_{LOAD}$ =1mA, $V_{IN}$ = 12V, f = 100Hz | | 70 | | dB |
| Thermal Shutdown Temperature | $T_{SD}$ | $I_{LOAD}$ =10mA | -- | 160 | -- | °C |
| Thermal Shutdown Hysteresis | $\Delta T_{SD}$ | | | 15 | | °C |

**Note 1.** Stresses beyond those listed "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 conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions may affect device reliability.

## Application Guideline

### *Input and Output Capacitor Requirements*

The external input and output capacitors of MSP7118AUJZ-x.x series must be properly selected for stability and performance. Use a 1μF or larger input capacitor and place it close to the IC's VIN and GND pins. Any output capacitor meeting the minimum 1mΩ ESR ( Equivalent Series Resistance ) and effective capacitance between 1μF and 22μF requirement may be used. Place the output capacitor close to the IC's VOUT and GND pins. Increasing capacitance and decreasing ESR can improve the circuit's PSRR and line transient response.

### *Current Limit*

The MSP7118AUJZ-x.x series contain the current limiter of output power transistor, which monitors and controls the transistor, limiting the output current to 500mA ( typical ).

The output can be shorted to ground indefinitely without damaging the part.

### *Dropout Voltage*

The MSP7118AUJZ-x.x series use a PMOS pass transistor to achieve low dropout. When ( VIN – VOUT ) is less than the dropout voltage ( $V_{DROP}$ the PMOS pass device is in the linear region of operation and the input- to-output resistance is the $RDS_{(ON)}$ of the PMOS pass element. $V_{DROP}$ scales approximately with the output current because the PMOS device behaves as a resistor in dropout condition.

As any linear regulator, PSRR and transient response are degraded as ( VIN – VOUT ) approaches dropout condition.

### *OTP (Over Temperature Protection)*

The over temperature protection function of MSP7118AUJZ-x.x series will turn off the PMOSFET when the junction temperature exceeds 160°C (typ.). Once the junction temperature cools down by approximately 15°C, the regulator will automatically resume operation.

### *Thermal Application*

For continuous operation, do not exceed the absolute maximum junction temperature. The maximum power dissipation depends on the thermal resistance of the IC package, PCB layout, rate of surrounding airflow, and difference between junction and ambient temperature. The maximum power dissipation can be calculated as below:

The max PD (Max)= (125°C − 25°C) / (200°C/W) = 0.5W for SOT-23-3 / SOT-23-5 packages.

The max PD (Max)= (125°C − 25°C) / (120°C/W) = 0.83W for SOT-89-3 package

Power dissipation (PD) is equal to the product of the output current and the voltage drop across the output pass element, as shown in the equation below:

PD = ( VIN – VOUT ) × IOUT

## Layout Consideration

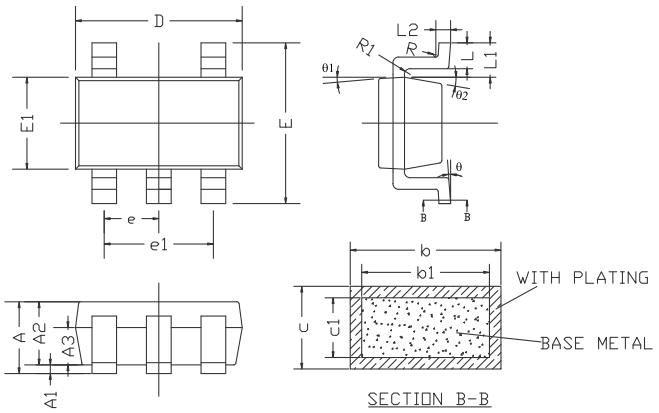
By placing input and output capacitors on the same side of the PCB as the LDO, and placing them as close as is practical to the package can achieve the best performance. The ground connections for input and output capacitors must be back to the MSP7118AUJZ-x.x ground pin using as wide and as short of a copper trace as is practical. Connections using long trace lengths, narrow trace widths, and/or connections through via must be avoided. These add parasitic inductances and resistance that results in worse performance especially during transient conditions.

## Package Outline

Package SOT-23-5

Devices per reel

Package dimension (mm):




| Symbol | MIN | NORM | MAX |
|---|---|---|---|
| A | - | - | 1.25 |
| A1 | 0.00 | - | 0.15 |
| A2 | 1.00 | 1.10 | 1.20 |
| A3 | 0.60 | 0.65 | 0.70 |
| b | 0.36 | - | 0.50 |
| b1 | 0.36 | 0.38 | 0.45 |
| c | 0.14 | - | 0.20 |
| c1 | 0.14 | 0.15 | 0.16 |
| D | 2.826 | 2.926 | 3.026 |
| E | 2.60 | 2.80 | 3.00 |
| E1 | 1.526 | 1.626 | 1.726 |
| e | 0.90 | 0.95 | 1.00 |
| e1 | 1.80 | 1.90 | 2.00 |
| L | 0.35 | 0.45 | 0.60 |
| L1 | 0.59 REF | | |
| L2 | 0.25 BSC | | |
| R | 0.05 | - | - |
| R1 | 0.05 | - | 0.20 |
| Θ | 0° | - | 8° |
| Θ1 | 3° | 5° | 7° |
| Θ2 | 6° | - | 14° |

# Attention

■ Any and all MSKSEMI Semiconductor products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your MSKSEMI Semiconductor representative nearest you before using any MSKSEMI Semiconductor products described or contained herein in such applications.

■ MSKSEMI Semiconductor assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specificationsof any andall MSKSEMI Semiconductor products described orcontained herein.

■ Specifications of any and all MSKSEMI Semiconductor products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer'sproducts orequipment.

■ MSKSEMI Semiconductor. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with someprobability. It is possiblethat these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits anderror prevention circuitsfor safedesign, redundant design, and structural design.

■ In the event that any or all MSKSEMI Semiconductor products(including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from theauthorities concerned in accordance with the above law.

■ No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of MSKSEMI Semiconductor.

■ Information (including circuit diagrams and circuit parameters) herein is for example only ; it is not guaranteed for volume production. MSKSEMI Semiconductor believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringementsof intellectual property rights or other rightsof third parties.

■ Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. Whendesigning equipment, referto the "Delivery Specification" for the MSKSEMI Semiconductor productthat you intend to use.