



LR9211

CMOS IC

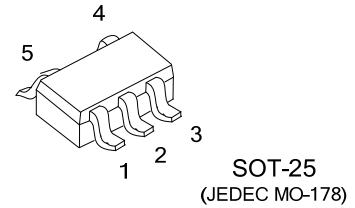
600mA LOW DROPOUT LINEAR REGULATOR

DESCRIPTION

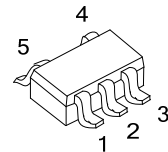
The UTC **LR9211** is a high speed LDO regulator that features high accurate, low noise, high ripple rejection, low dropout and low power consumption. Designed with a P-channel MOSFET series pass transistor, the UTC **LR9211** yields extremely low dropout voltage and maintains very low ground current (70µA).

The UTC **LR9211** does not require a bypass capacitor, hence achieving the smallest PCB area.

Other features include foldback overcurrent protection, quick soft start, and overtemperature protection. The UTC **LR9211** is available in fixed output voltage from 0.8V to 3.3V with 0.1V per step or as an adjustable device with a 0.8V reference voltage. The device comes in various packages.



SOT-25
(JEDEC MO-178)



SOT-23-5
(JEDEC TO-236)

FEATURES

- * Wide Input Voltage Range from 2.5V to 5.5V
- * Ultra Low Dropout Voltage: 200mV @ $V_{OUT}=3.3V$, 300mA
- * Ultra Fast Response in Line/Load Transient
- * Stable with 1µF Ceramic Output Capacitor
- * Low Ground Current: 70µA Typical
- * Low Shutdown Current: < 1µA
- * Foldback Output Current Limit
- * High Output Accuracy
 - 1.5% Initial Accuracy
 - Fixed Output Voltages: 0.8V~3.3V
 - Adjustable Output Voltage from 0.8V to 4.5V
- * Over-Temperature Protection

ORDERING INFORMATION

| Ordering Number | | Package | Packing |
|------------------|------------------|----------|-----------|
| Lead Free | Halogen Free | | |
| LR9211L-xx-AE5-R | LR9211G-xx-AE5-R | SOT-23-5 | Tape Reel |
| LR9211L-xx-AF5-R | LR9211G-xx-AF5-R | SOT-25 | Tape Reel |

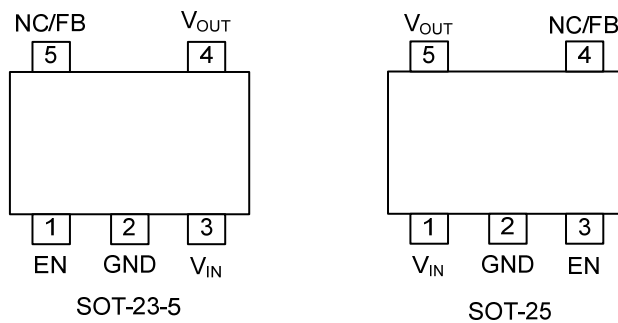
Note: xx: Output Voltage, refer to Marking Information.

| | |
|--|---|
| <p>LR9211G-xx-AE5-R</p> <p>(1)Packing Type (2)Package Type (3)Output Voltage Code (4)Green Package</p> | <p>(1) R: Tape Reel (2) AE5: SOT-23-5, AF5: SOT-25 (3) xx: refer to Marking Information (4) G: Halogen Free and Lead Free, L: Lead Free</p> |
|--|---|

MARKING

| PACKAGE | VOLTAGE CODE | MARKING |
|--------------------|---|---------|
| SOT-23-5 SOT-25 | 12: 1.2V 18: 1.8V 25: 2.5V 28: 2.8V 33: 3.3V AD: ADJ | |

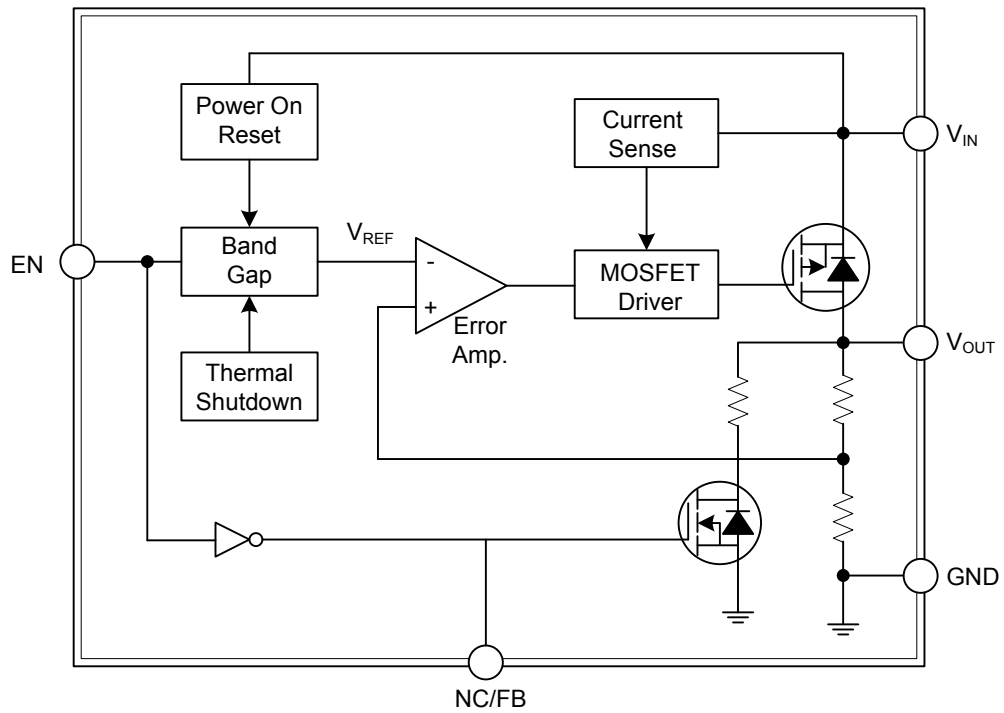
PIN CONFIGURATION



PIN DESCRIPTION

| PIN NO. | | PIN NAME | DESCRIPTION |
|----------|--------|------------------|---|
| SOT-23-5 | SOT-25 | | |
| 1 | 3 | EN | Enable Input. Pulling this pin below 0.35V turns the regulator off, reducing the quiescent current to a fraction of its operating value. This pin is not available for 3-pin packages. |
| 2 | 2 | GND | Ground |
| 3 | 1 | V _{IN} | Input Voltage. This pin connects to the source of the internal pass transistor that supplies current to the output pin. Bypass V _{IN} to GND with a minimum 1μF ceramic capacitor. Place the decoupling capacitor physically as close as possible to the device. |
| 4 | 5 | V _{OUT} | Output Voltage. This pin is power output of the device. A pull low resistance exists when the device is disabled by pulling low the EN pin. To maintain adequate transient response to large load change, a minimum 1uF ceramic capacitor is required to reduce the effects of current transients on V _{OUT} . |
| 5 | 4 | FB/NC | Feedback Pin (ADJ Version). this pin is connected to an external resistor divider, turns to adjustable output voltage; V _{OUT} =0.8×(R1+R2)/R2(V); NC Pin (fixed version) |

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

| PARAMETER | SYMBOL | RATINGS | UNIT |
|--|-----------|-------------------------|--------------------|
| Supply Input Voltage (Note 1) | V_{IN} | -0.3 ~ +6 | V |
| Other Pins | | -0.3 ~ ($V_{IN}+0.3$) | V |
| Power Dissipation ($T_A=25^{\circ}\text{C}$) | P_D | 0.4 | W |
| Junction Temperature | T_J | +150 | $^{\circ}\text{C}$ |
| Storage Temperature Range | T_{STG} | -65 ~ +150 | $^{\circ}\text{C}$ |

Note: 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 |
|----------------------------|---------------|---------|-----------------------------|
| Package Thermal Resistance | θ_{JA} | 250 | $^{\circ}\text{C}/\text{W}$ |

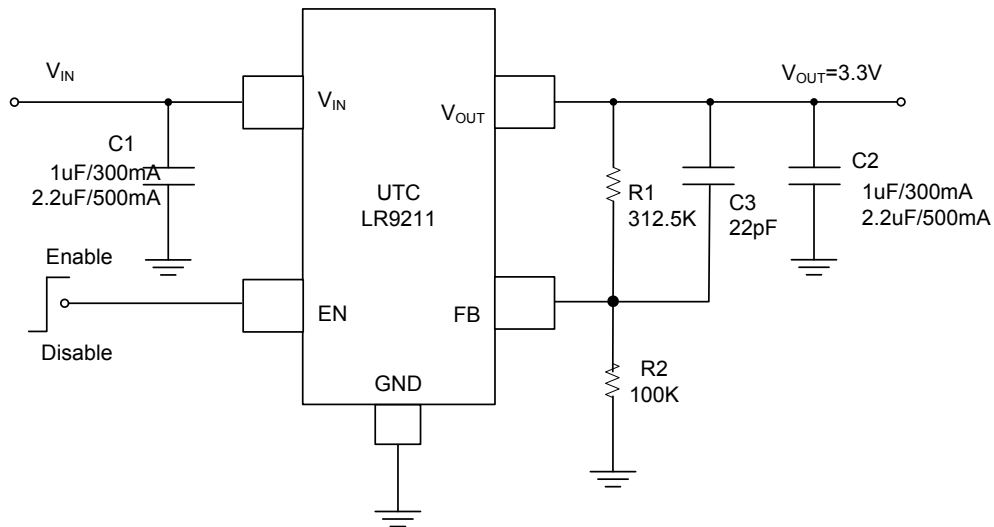
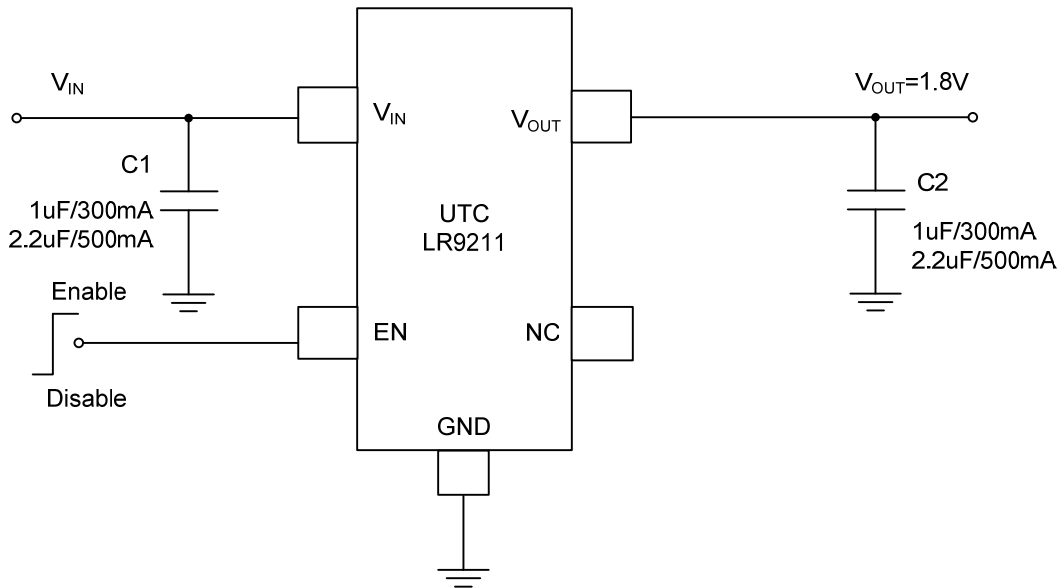
■ RECOMMENDED OPERATION CONDITIONS

| PARAMETER | SYMBOL | RATINGS | UNIT |
|--------------------------------------|----------|------------|--------------------|
| Supply Input Voltage | V_{IN} | 2.5 ~ +5.5 | V |
| Operating Ambient Temperature Range | T_A | -40 ~ +85 | $^{\circ}\text{C}$ |
| Operating Junction Temperature Range | T_J | -40 ~ +125 | $^{\circ}\text{C}$ |

■ ELECTRICAL CHARACTERISTICS (T_A=25°C, unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|------------------------------|-------------------------|--|-------|------|-------|-------------------|
| Supply Input Voltage | | | | | | |
| Supply Input Voltage | V _{IN} | | 2.5 | | 5.5 | V |
| Quiescent Current | I _Q | V _{EN} =5V, I _{OUT} =0mA | 40 | 70 | 115 | μA |
| Shutdown Current | I _{SHDN} | V _{EN} =0V | | 0.1 | 1 | μA |
| Output Voltage | | | | | | |
| Output Voltage Accuracy | V _{OUT} | V _{IN} =V _{NOM} +1.0V, I _{OUT} =1mA, fixed output voltage version | -1.5 | | 1.5 | %V _{NOM} |
| Reference Voltage Accuracy | V _{FB} | V _{IN} =3.3V, I _{OUT} =1mA, V _{OUT} =FB ADJ output voltage version | 0.788 | 0.80 | 0.812 | V |
| Output Line Regulation | ΔV _{REF(LINE)} | 2.5V<V _{IN} <5.5V, and V _{IN} >V _{OUT} +1.0V, I _{OUT} =1mA | | 0.01 | 0.2 | %/V |
| Output Load Regulation | ΔV _{REF(LOAD)} | 1mA<I _{OUT} <500mA, V _{IN} =V _{NOM} +1.0V | | 0.5 | 2.0 | %/A |
| Dropout Voltage | V _{DROP} | I _{OUT} =300mA, V _{OUT} =1.2V | | 800 | 1200 | mV |
| | | I _{OUT} =300mA, V _{OUT} =1.8V | | 350 | 600 | mV |
| | | I _{OUT} =300mA, V _{OUT} =2.5V | | 250 | 450 | mV |
| | | I _{OUT} =300mA, V _{OUT} =3.3V | | 200 | 400 | mV |
| | | I _{OUT} =600mA, V _{OUT} =1.2V | | | 1800 | mV |
| | | I _{OUT} =600mA, V _{OUT} =1.8V | | | 1200 | mV |
| | | I _{OUT} =600mA, V _{OUT} =2.5V | | | 900 | mV |
| Power Supply Rejection Ratio | PSRR | Frequency=1kHz, I _{OUT} =10mA | | 65 | | dB |
| | | Frequency=1kHz, I _{OUT} =300mA | | 60 | | dB |
| Enable | | | | | | |
| Enable High Level | V _{EN} | | 1.2 | | | V |
| Disable Low Level | V _{SD} | | | | 0.35 | V |
| EN Input Current | I _{EN} | V _{IN} =5.5V, V _{EN} =5.5V or 0V | -1 | | 1 | μA |
| Enable Delay Time | T _{DELAY} | from V _{EN} >1.2V to V _{OUT} >10%V _{NOM} , by design | | 35 | | us |
| Output Ramp Up Time | T _{SS} | from V _{OUT} =10% to 90% of V _{NOM} , by design | | 45 | | us |
| Protection | | | | | | |
| Current Limit Threshold | I _{LIM} | | 0.9 | 1.2 | | A |
| Short Circuit Current | | | 0.6 | | | A |
| Thermal Shutdown Temperature | T _{SD} | I _{OUT} =0mA, V _{IN} =V _{EN} =5.5V | | 170 | | °C |
| Thermal Shutdown Hysteresis | T _{SDHYS} | I _{OUT} =0mA, V _{IN} =V _{EN} =5.5V | | 10 | | °C |

■ TYPICAL APPLICATION CIRCUIT



UTC 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 specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. UTC reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.