



LR1107/E

CMOS IC

600mA FAST ULTRA LOW DROPOUT LINEAR REGULATOR

DESCRIPTION

The UTC LR1107/E operate from a +2.5V ~ +7.0V input supply as fast ultra low-dropout linear regulators. Wide output voltage range options are available. The fast response characteristic to make UTC LR1107/E suitable for low voltage microprocessor application. The low quiescent current operation and low dropout quality caused by the CMOS process.

The UTC LR1107/E has ultra low dropout voltage; 300mV at 600mA load current typically.

The ground pin current is typically 200uA at 1mA load current.

SET/ADJ Mode (for LR1107): Connect an external resistive voltage-divider from V_{OUT} to this pin to set the output voltage from 1.145V to 5V.

$\overline{\text{ERROR}}$ Flag (for LR1107E): When the output voltage drops 10% below nominal value Error flag goes low.

Output Voltage Precision: Multiple output voltage options are available and ranging from 1.2V ~ 5.0V at room temperature with a guaranteed accuracy of $\pm 1.5\%$, and $\pm 3.0\%$ when varying line, load and temperature.

FEATURES

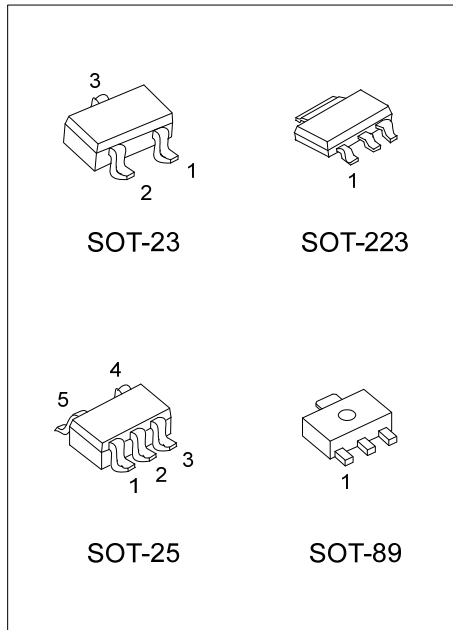
- * Ultra Low Dropout Voltage
- * Low Ground Pin Current
- * 0.68% Load Regulation
- * The Guaranteed Output Current is 600mA DC
- * Output Voltage Accuracy $\pm 1.5\%$
- * $\overline{\text{ERROR}}$ Flag Indicates Output Status
- * V_{OUT} can be Adjusted From 1.145V to 5V.
- * Low Output Capacitor Required
- * Overtemperature Protection and Overcurrent Protection

ORDERING INFORMATION

| Ordering Number | | Package | Pin Assignment | | | | | Packing |
|--------------------|--------------------|---------|----------------|---|----|---|---|-----------|
| Lead Free | Halogen Free | | 1 | 2 | 3 | 4 | 5 | |
| LR1107L-xx-AA3-A-R | LR1107G-xx-AA3-A-R | SOT-223 | G | O | I | - | - | Tape Reel |
| LR1107L-xx-AE3-3-R | LR1107G-xx-AE3-3-R | SOT-23 | O | G | I | - | - | Tape Reel |
| LR1107L-xx-AB3-C-R | LR1107G-xx-AB3-C-R | SOT-89 | G | I | O | - | - | Tape Reel |
| LR1107L-xx-AB3-D-R | LR1107G-xx-AB3-D-R | SOT-89 | I | G | O | - | - | Tape Reel |
| LR1107L-xx-AF5-R | LR1107G-xx-AF5-R | SOT-25 | I | G | SD | S | O | Tape Reel |
| LR1107EL-xx-AF5-R | LR1107EG-xx-AF5-R | SOT-25 | I | G | SD | E | O | Tape Reel |

Note: Pin Assignment: I:V_{IN} O:V_{OUT} G:GND SD:SD E: ERROR S: SET/ADJ

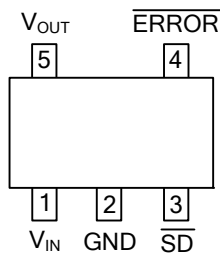
| | | |
|---------------------|--|---|
| LR1107EL-xx-AA3-A-R | (1) Packing Type (2) Pin Assignment (3) Package Type (4) Voltage Code (5) Lead Free (6) Pin Situation | (1) R: Tape Reel (2) refer to Pin Assignment (3) AA3: SOT-223, AB3:SOT-89, AE3:SOT-23, AF5:SOT-25 (4) xx: reference to Marking Information (5) G: Halogen Free, L: Lead Free (6) Refer to PIN CONFIGURATION |
|---------------------|--|---|



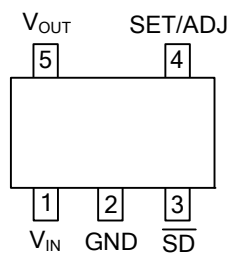
MARKING INFORMATION

| PACKAGE | VOLTAGE CODE | MARKING |
|---------|--|---------|
| SOT-223 | 15 :1.5V 18:1.8V 25:2.5V 28:2.8V 2J:2.85V 33:3.3V | |
| SOT-23 | | |
| SOT-25 | | |
| SOT-89 | | |

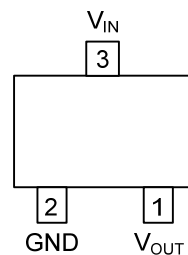
PIN CONFIGURATION



SOT-25 (for LR1107E)



SOT-25 (for LR1107)

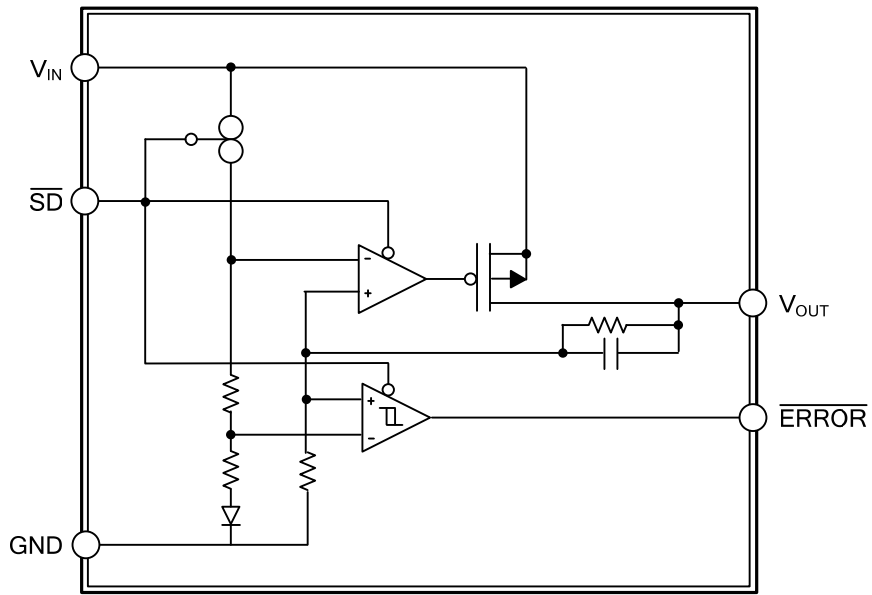


SOT-23

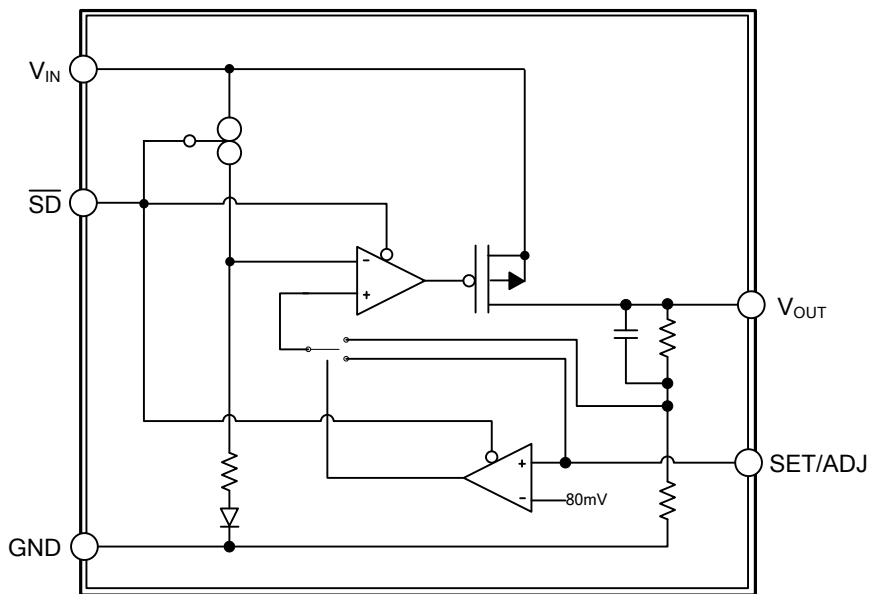
PIN DESCRIPTION

| PIN NAME | I/O | DESCRIPTION |
|-------------------------------------|-----|---|
| V _{IN} | | Input supply |
| GND | | Ground |
| \overline{SD} | I | Shutdown LR1107/E enable; when the \overline{SD} pin connects to GND will shutdown the LR1107/E ; At normal operation, \overline{SD} must be tied to V _{DD} through a 10K Ω pull up resistor. |
| \overline{ERROR} (for LR1107E) | O | Error flag, active low; when the output dropout of regulation due to low input voltage, the LR1107E produces a logic low signal at the \overline{ERROR} pin. |
| SET/ADJ (for LR1107) | O | Voltage-Setting Input. Connect an external resistive voltage-divider from V _{OUT} to this pin to set the output voltage. |
| V _{OUT} | O | Output voltage |

■ BLOCK DIAGRAM



LR1107E



LR1107

■ ABSOLUTE MAXIMUM RATINGS (Note 1)

| PARAMETER | SYMBOL | RATINGS | UNIT |
|--|---------------|-------------------------|------|
| Input Voltage (Operating), (Note 10) | V_{IN} | 2.5~7.0 | V |
| Input Voltage (Survival) | | -0.3~+7.5 | V |
| Shutdown Input Voltage | $V_{I(SHDN)}$ | -0.3~ $V_{IN}+0.3$ | V |
| Output Voltage (Survival), (Note 4, 5) | V_{OUT} | -0.3~+7.5 | V |
| I_{OUT} (Survival) | | Short Circuit Protected | |
| Maximum Voltage for \overline{ERROR} , SET/ADJ Pin | | $V_{IN}+0.3$ | V |
| Maximum Operating Current (DC) | | 600 | mA |
| Power Dissipation (Note 2) | P_D | Internally Limited | |
| Junction Temperature | T_J | 150 | °C |
| Operating Temperature | T_{OPR} | -40~+125 | °C |
| Storage Temperature | T_{STG} | -65~+150 | °C |

■ ELECTRICAL CHARACTERISTICS

Limits in standard typeface are for $T_J = 25^\circ\text{C}$, and limits in **boldface type** apply over the full operating temperature range. ($T_J = 25^\circ\text{C}$, $V_{IN} = V_{O(NOM)} + 1\text{V}$, $I_L = 10\text{mA}$, $C_{OUT} = 22\mu\text{F}$, $V_{SD} = V_{IN}-0.3\text{V}$, unless otherwise specified.)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP (Note 3) | MAX | UNIT |
|---|----------------------------------|---|--------------|-----------------|------------|---------------|
| Output Voltage Tolerance (Note 6) | V_{OUT} | $0\text{mA} \leq I_L \leq 600\text{mA}$ $V_{OUT} + 1 \leq V_{IN} \leq 7.0\text{V}$ | -1.5 -3 | 0 | +1.5 +3 | % |
| Output Voltage Line Regulation (Note 6) | $\frac{\Delta V_{OUT}}{V_{OUT}}$ | $V_{OUT} + 1\text{V} < V_{IN} < 7.0\text{V}$ | | 0.725 | | % |
| Output Voltage Load Regulation (Note 6) | V_{OUT} | $10\text{mA} < I_L < 600\text{mA}$ | | 0.68 | | % |
| Dropout Voltage (Note 8) | V_D | $I_L = 600\text{mA}$ | | 300 | 500 | mV |
| Ground Pin Current In Normal Operation Mode | I_{GND1} | $I_L = 0\text{mA}$ | | 200 | | μA |
| | | $I_L = 600\text{mA}$ | | 300 | | |
| Ground Pin Current In Shutdown Mode | I_{GND2} | $V_{SD} \leq 0.2\text{V}$ (Note 9) | | 0.02 | 5 | μA |
| Peak Output Current | $I_{O(PEAK)}$ | (Note 2) | 600 | 800 | | mA |
| SHORT CIRCUIT PROTECTION | | | | | | |
| Short Circuit Current | I_{SC} | | | 2 | | A |
| OVER TEMPERATURE PROTECTION | | | | | | |
| Shutdown Threshold | $T_{SHDN(THR)}$ | | | 165 | | °C |
| Thermal Shutdown Hysteresis | $T_{SHDN(HYS)}$ | | | 10 | | °C |
| SHUTDOWN INPUT | | | | | | |
| Shutdown Threshold | V_{SHDN} | Output = High | $V_{IN}-0.3$ | V_{IN} | | V |
| | | Output = Low | | 0 | 0.2 | V |
| Turn-off Delay | $t_{D(OFF)}$ | $I_L = 600\text{mA}$ | | 20 | | μs |
| Turn-on Delay | $t_{D(ON)}$ | $I_L = 600\text{mA}$ | | 60 | | μs |
| \overline{SD} Input Current | I_{SD} | $V_{SD} = V_{IN}$ | | 1 | | nA |

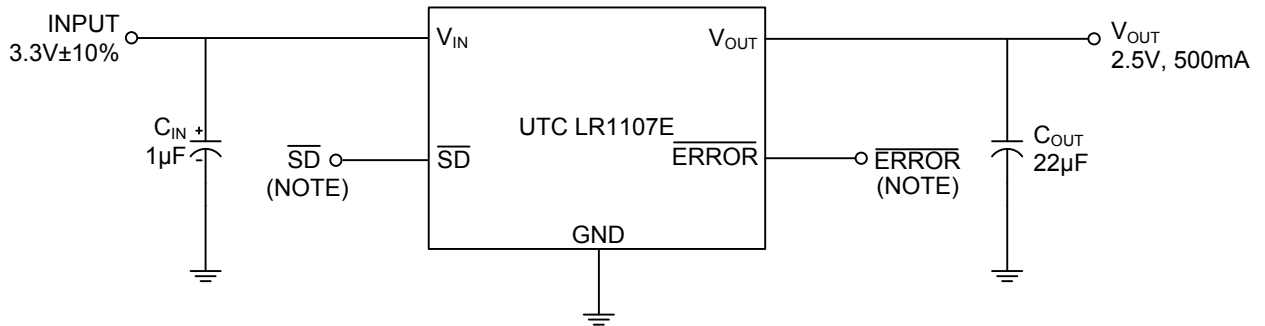
■ ELECTRICAL CHARACTERISTICS(Cont.)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP (Note 3) | MAX | UNIT |
|--|-----------------------|---|-------|-----------------|-------|------------------|
| ERROR FLAG COMPARATOR (for LR1107E) | | | | | | |
| $\overline{\text{ERROR}}$ Flag Saturation | $V_{\text{EF(SAT)}}$ | $I_{\text{SINK}} = 100\mu\text{A}$ | | 0.02 | 0.1 | V |
| $\overline{\text{ERROR}}$ Flag Pin Leakage Current | $I_{\text{I(LEAK)}}$ | | | 1 | | nA |
| Threshold | V_{T} | (Note 7) | 5 | 7 | 16 | % |
| Threshold Hysteresis | V_{THR} | (Note 7) | 2 | 4.2 | 8 | % |
| Flag Reset Delay | t_{D} | | | 17 | | μs |
| SET/ADJ Mode (for LR1107 5pins) | | | | | | |
| SET Voltage | V_{SET} | Measured on ADJ, $I_{\text{OUT}} = 10\text{mA}$ | 1.110 | 1.145 | 1.188 | V |
| AC PARAMETERS | | | | | | |
| Ripple Rejection | PSRR | $V_{\text{IN}} = V_{\text{OUT}} + 1.5\text{V}$ $C_{\text{OUT}} = 100\mu\text{F}, V_{\text{OUT}} = 3.3\text{V}$ | | 60 | | dB |
| | | $V_{\text{IN}} = V_{\text{OUT}} + 0.3\text{V}$ $C_{\text{OUT}} = 100\mu\text{F}, V_{\text{OUT}} = 3.3\text{V}$ | | 40 | | dB |
| Output Noise Density | $\rho_{\text{n(lf)}}$ | $f = 120\text{Hz}$ | | 0.8 | | μV |
| Output Noise Voltage | eN | $\text{BW} = 10\text{Hz} - 100\text{kHz}$ | | 150 | | μVrms |

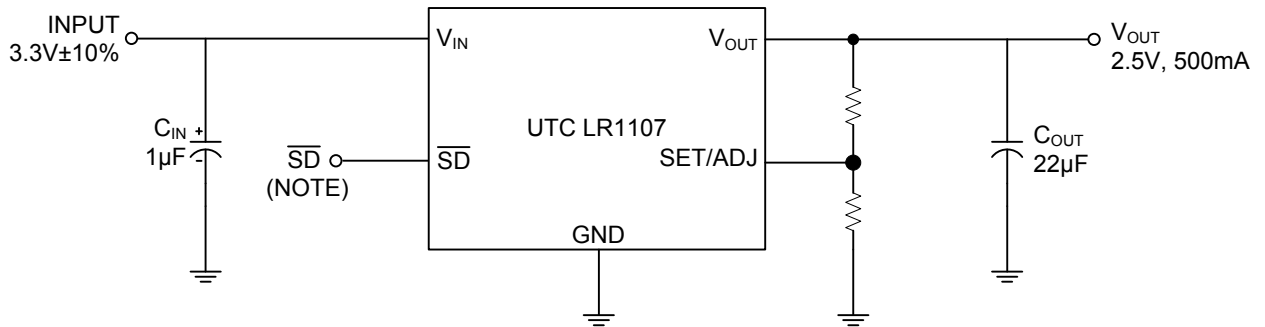
Note 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied. Conditions for which the device is intended to be functional is indicated by operating ratings, but specific performance limits isn't be guaranteed. To make sure of specifications and test conditions, read Electrical Characteristics. Only for the test conditions listed the guaranteed specifications can be applied. When the device is not operated under the listed test conditions some performance characteristics may degrade.

2. Devices must be derated based on package thermal resistance at elevated temperatures.
3. The most likely parametric norm represents at 25°C.
4. The LR1107/E output must be diode-clamped to ground. If used in a dual-supply system where the regulator load is returned to a negative supply.
5. Between the V_{IN} and V_{OUT} terminals the output PMOS structure contains a diode. This diode is reverse biased normally. If the voltage at the output terminal is forced to be higher than the voltage at the input terminal this diode will get forward biased. This diode can withstand 650mA of peak current and 120mA of DC current typically.
6. Output voltage line regulation is the change in output voltage from the nominal value which is due to change in the input line voltage. Which is defined as the change in output voltage from the nominal value due to change in load current is output voltage load regulation. The load regulation and line regulation specification include the typical number only. But, the limits for load and line regulation are included in the output voltage tolerance specification.
7. $\overline{\text{ERROR}}$ Flag hysteresis and threshold are specified as regulated output voltage's percentage.
8. At which the output drops 2% below the normal value dropout voltage is defined as the minimum input to output differential voltage. Only to output voltages of 2.5V and above dropout voltage specification applies. For output voltages below 2.5V, since the minimum input voltage is 2.5V, the drop-out voltage is nothing but the input to output differential.
9. Specification has been tested at $-40^{\circ}\text{C} \leq T_{\text{J}} \leq 85^{\circ}\text{C}$ cause under shutdown conditions the temperature rise of the device is negligible.
10. The minimum operating V_{IN} value is equal to $V_{\text{OUT(NOM)}} + V_{\text{DROPOUT}}$ or 2.5V, just the greater.

■ TYPICAL APPLICATION CIRCUIT



Note: \overline{SD} and \overline{ERROR} pins must be pulled high through a $10k\Omega$ pull-up resistor. Connect the \overline{ERROR} pin to ground if this function is not used.



Note: \overline{SD} pins must be pulled high through a $10k\Omega$ pull-up resistor. Connect the SET/ADJ pin to ground if this function is not used.

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