



LR1801

Preliminary

CMOS IC

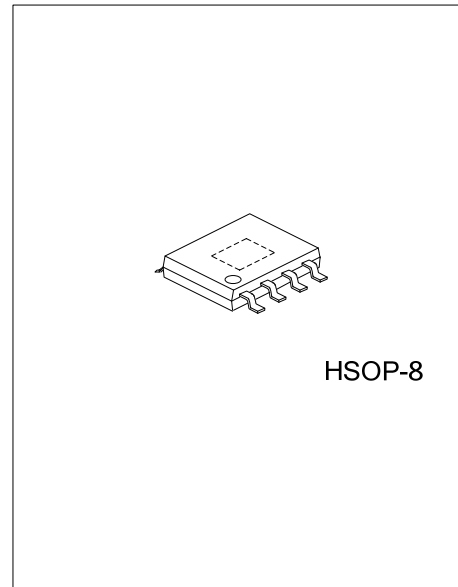
1A FAST ULTRA LOW DROPOUT LINEAR REGULATOR

DESCRIPTION

The UTC **LR1801** operate from a +2V ~ +6V input supply as fast ultra low-dropout linear regulators. Wide output voltage range options are available. The fast response characteristic to make UTC **LR1801** suitable for low voltage microprocessor application. The low quiescent current operation and low dropout quality caused by the CMOS process.

The UTC **LR1801** has ultra low dropout voltage 300mV at 1A load current typically. The ground pin current is typically 60uA at 1mA load current.

Output Voltage Precision: Multiple output voltage options are available and ranging from 1.2V ~ 3.5V at room temperature with a guaranteed accuracy of ±1.5%, and ±3.0% when varying line, load and temperature.



FEATURES

- * Ultra Low Dropout Voltage
- * Low Ground Pin Current
- * The Guaranteed Output Current is 1A DC
- * Output Voltage Accuracy ± 1.5%
- * Over temperature Protection And Over current Protection

ORDERING INFORMATION

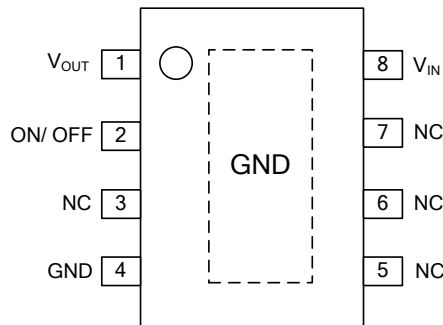
| Ordering Number | | Package | Packing |
|------------------|------------------|---------|-----------|
| Lead Free | Halogen Free | | |
| LR1801L-xx-SH2-T | LR1801G-xx-SH2-T | HSOP-8 | Tube |
| LR1801L-xx-SH2-R | LR1801G-xx-SH2-R | HSOP-8 | Tape Reel |

| | |
|--|---|
| <p>LR1801L-xx-AB3-T</p> <p>(1)Packing Type (2)Package Type (3)Output Voltage Code (4)Lead Free</p> | <p>(1) T: Tube, R: Tape Reel (2) SH2: HSOP-8 (3) xx: refer to Marking Information (4) L: Lead Free, G: Halogen Free</p> |
|--|---|

MARKING INFORMATION

| PACKAGE | VOLTAGE CODE | MARKING |
|---------|---|---------|
| HSOP-8 | 12: 1.2V 15 : 1.5V 18: 1.8V 25: 2.5V 33: 3.3V | |

PIN CONFIGURATION

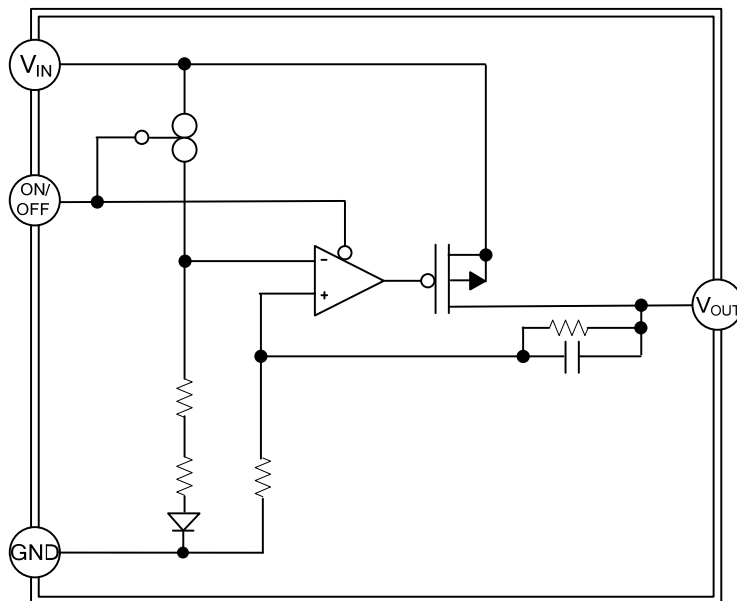


PIN DESCRIPTION

| PIN NO. | PIN NAME | PIN DESCRIPTION |
|------------|---------------------|---|
| 1 | V_{OUT} | Output voltage |
| 2 | $\overline{ON/OFF}$ | ON/OFF select pin, when connected to the ground the chip in operating normally. |
| 3, 5, 6, 7 | NC | No connection |
| 4 | GND | GND |
| 8 | V_{IN} | Input voltage |

Note: The NC pin is electrically open.
The NC pin can be connected to V_{IN} or GND.

BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | RATINGS | UNIT |
|--------------------------------|----------------|--------------------|------|
| Input Voltage | V_{IN} | 7 | V |
| Shutdown Input Voltage | $V_{IN(SHDN)}$ | -0.3~ V_{IN} | V |
| Maximum Operating Current (DC) | | 1 | A |
| Power Dissipation (Note 3) | P_D | Internally Limited | |
| Junction Temperature | T_J | +125 | °C |
| Storage Temperature | T_{STG} | -65 ~ +150 | °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 |
|---------------------|---------------|---------|------|
| Junction to Ambient | θ_{JA} | 143 | °C/W |
| Junction to Case | θ_{JC} | 45 | °C/W |

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

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT | |
|--|--|--|----------------------------------|--------------------------|--------------------------|--------|---|
| Input Voltage | V_{IN} | | 2 | | 6 | V | |
| Output Voltage (Note 4) | $V_{OUT(E)}$ | $V_{IN}=V_{OUT(S)}+1V$ $I_{OUT}=100mA$ | $1.0V \leq V_{OUT(S)} < 1.5V$ | $V_{OUT(S)} - 0.015$ | $V_{OUT(S)} + 0.015$ | V | |
| | | | $1.5V \leq V_{OUT(S)} \leq 3.5V$ | $V_{OUT(S)} \times 0.99$ | $V_{OUT(S)} \times 1.01$ | V | |
| Output Voltage Line Regulation | $\frac{\Delta V_{OUT1}}{(\Delta V_{IN} \times V_{OUT})}$ | $V_{OUT(S)}+0.5V \leq V_{IN} \leq 5.5V, I_{OUT}=100mA$ | | 0.05 | 0.2 | %/V | |
| Output Voltage Load Regulation | ΔV_{OUT2} | $V_{IN}=V_{OUT(S)}+1V, 1mA \leq I_{OUT} \leq 300mA$ | -20 | -3 | 20 | mV | |
| Dropout Voltage(Note 5) | V_{drop} | $I_{OUT}=300mA$ | $1.2V \leq V_{OUT(S)} < 1.5V$ | | 0.34 | 0.38 | V |
| | | | $1.5V \leq V_{OUT(S)} < 2.6V$ | | 0.10 | 0.15 | |
| | | | $2.6V \leq V_{OUT(S)} \leq 3.5V$ | | 0.07 | 0.10 | |
| | | $I_{OUT}=1000mA$ | $1.2V \leq V_{OUT(S)} < 1.5V$ | | 0.70 | | |
| | | | $1.5V \leq V_{OUT(S)} < 2.0V$ | | 0.40 | | |
| | | | $2.0V \leq V_{OUT(S)} < 2.6V$ | | 0.32 | | |
| Output Current(Note 6) | I_{OUT} | $V_{IN} \geq V_{OUT(S)}+1V$ | 1000 | | | mA | |
| | | | (Note 8) | | | | |
| Ground Pin Current In Normal Operation Mode | I_{SS1} | $V_{IN}=V_{OUT(S)}+1V, ON/OFF \text{ pin}=ON, \text{ No Load}$ | | 60 | 90 | uA | |
| Ground Pin Current In Power-off Mode | I_{SS2} | $V_{IN}=V_{OUT(S)}+1V, ON/OFF \text{ pin}=OFF, \text{ No Load}$ | | 0.1 | 1.0 | uA | |
| Short Circuit Current | I_{SC} | $V_{IN}=V_{OUT(S)}+1V, ON/OFF \text{ pin}=ON, V_{OUT}=0V$ | | 200 | | mA | |
| Output Voltage Temperature Coefficient(Note 7) | $\frac{\Delta V_{OUT}}{(\Delta T_A \times V_{OUT})}$ | $V_{IN}=V_{OUT(S)}+1V, I_{OUT}=100mA, -40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ | | ±100 | | ppm/°C | |
| ON/OFF Pin Input Voltage "H" | V_{SH} | $V_{IN}=V_{OUT(S)}+1V, R_L=1.0K\Omega$ | 1.0 | | | V | |
| ON/OFF Pin Input Voltage "L" | V_{SL} | Determined by V_{OUT} output level | | | 0.3 | | |

■ ELECTRICAL CHARACTERISTICS (Cont.)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|--|-----------------|--|--------------------------------|-----|-----|------|
| ON/OFF Pin Input Current "H" | I _{SH} | V _{IN} =V _{OUT(S)} +1V, V _{ON/OFF} =5.5V | -0.1 | | 0.1 | μA |
| ON/OFF Pin Input Current "L" | I _{SL} | V _{IN} =V _{OUT(S)} +1V, V _{ON/OFF} =0V | -0.1 | | 0.1 | μA |
| Ripple Rejection | RR | V _{IN} =V _{OUT(S)} +1V, f=1kHz, ΔV _{rip} =0.5Vrms, I _{OUT} =100mA | 1.2V≤V _{OUT(S)} <3.0V | 65 | | dB |
| | | 3.0V≤V _{OUT(S)} ≤3.5V | 60 | | | |
| Thermal Shutdown detection temperature | T _{SD} | Junction temperature | | 150 | | °C |
| Thermal Shutdown release temperature | T _{SR} | Junction temperature | | 120 | | °C |

Notes: 1. The **LR1801** output must be diode-clamped to ground. If used in a dual-supply system where the regulator load is returned to a negative supply.

2. 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 1Amp of peak current and 200mA of DC current typically.

3. Devices must be derated based on package thermal resistance at elevated temperatures.

4. V_{OUT(S)}: Specified output voltage

V_{OUT(E)}: Actual output voltage

Output voltage when fixing I_{OUT}(=100ma) and inputting V_{OUT(S)}+1.0V

5. V_{drop}=V_{IN1}-(V_{OUT3}×0.98)

V_{OUT3} is the output voltage when V_{IN}=V_{OUT(S)}+1.0V and I_{OUT}=300mA, 1000mA.

6. The output current at which the output voltage becomes 95% of V_{OUT(E)} after gradually increasing the output current.

7. The change in temperature [mV/°C] is calculated using the following equation.

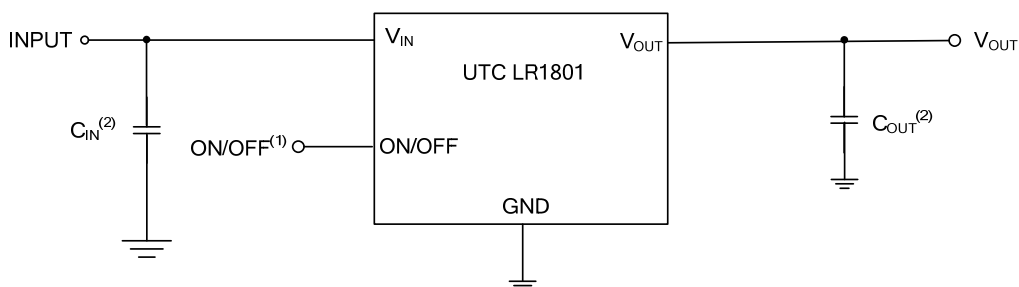
$$\frac{\Delta V_{OUT}}{\Delta T_A} [mV/^\circ C] = V_{OUT(S)} [V] \times \frac{\Delta V_{OUT}}{\Delta T_A \times V_{OUT}} [ppm/^\circ C] \div 1000$$

8. The output current can be at least this value.

Due to restrictions on the package power dissipation, this value may not be satisfied. Attention should be paid to the power dissipation of the package when the output current is large.

This specification is guaranteed by design.

■ TYPICAL APPLICATION CIRCUIT



(1) ON/OFF pins must be pulled high through a 10k Ω pull-up resistor.

(2) Generally a series regulator may cause oscillation, depending on the selection of external parts. The following conditions are recommended for this IC. However, be sure to perform sufficient evaluation under the actual usage conditions for selection, including evaluation of temperature characteristics.

Input capacitor (C_{IN}): 2.2 μ F or more

Output capacitor (C_L): 2.2 μ F or more

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