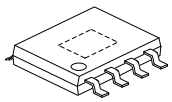
# 1.5A ULTRA LOW DROPOUT LINEAR REGULATOR WITH PROGRAMMABLE SOFT-START



HSOP-8


DFN3030-10

## ■ DESCRIPTION

The UTC **L1803** is a typical LDO that features a user-programmable soft-start, very low dropout voltage as low as 0.15V at output current 1.5A, an enable input and a power-good output.

The soft-start reduces inrush current of the load capacitors and minimizes stress on the input power source during start-up. An enable pin to further reduce power dissipation while shutdown. And power-good output indicates the output voltage status.

The UTC **L1803** is stable with any type of output capacitor of 2.2μF or more. A precision reference and feedback control deliver 2% accuracy over load, line, and operating temperature ranges.

## ■ FEATURES

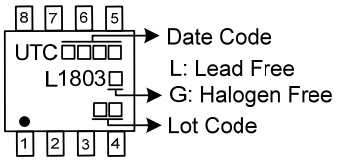
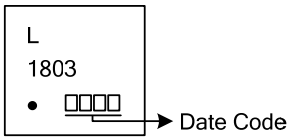
* Low $V_{IN}$ and wide $V_{IN}$ range: 1.0V~5.5V
* Bias voltage ($V_{VCC}$) range: 2.7V~5.5V
* Low $V_{OUT}$ range: 0.8V~3.3V
* 150mV dropout @1.5A, $V_{VCC}$=5V
* 2% output Voltage
* Power-Good (PG) output
* Programmable soft-start provides linear voltage startup
* Stable with any output capacitor≥2.2μF

## ■ ORDERING INFORMATION

| Ordering Number | | Package | Packing |
|---|---|---|---|
| Lead Free | Halogen Free | | |
| L1803L-SH2-R | L1803G-SH2-R | HSOP-8 | Tape Reel |
| L1803L-K10-3030-R | L1803G-K10-3030-R | DFN3030-10 | Tape Reel |

| | |
|---|---|
| L1803G-SH2-R<br>(1)Packing Type<br>(2)Package Type<br>(3)Green Package | (1) R: Tape Reel<br>(2) SH2: HSOP-8, K10-3030: DFN-10(3×3)<br>(3) G: Halogen Free and Lead Free, L: Lead Free |

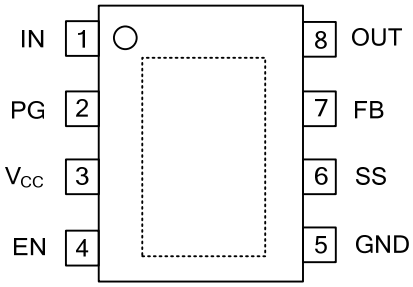
## ■ MARKING

| HSOP-8 | DFN3030-10 |
|---|---|
|  |  |



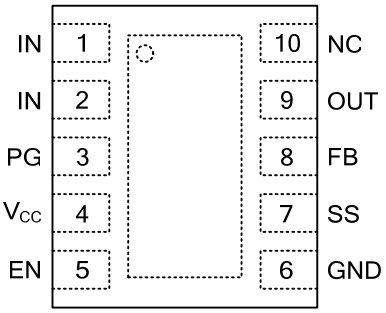


## ■ PIN CONFIGURATION





HSOP-8



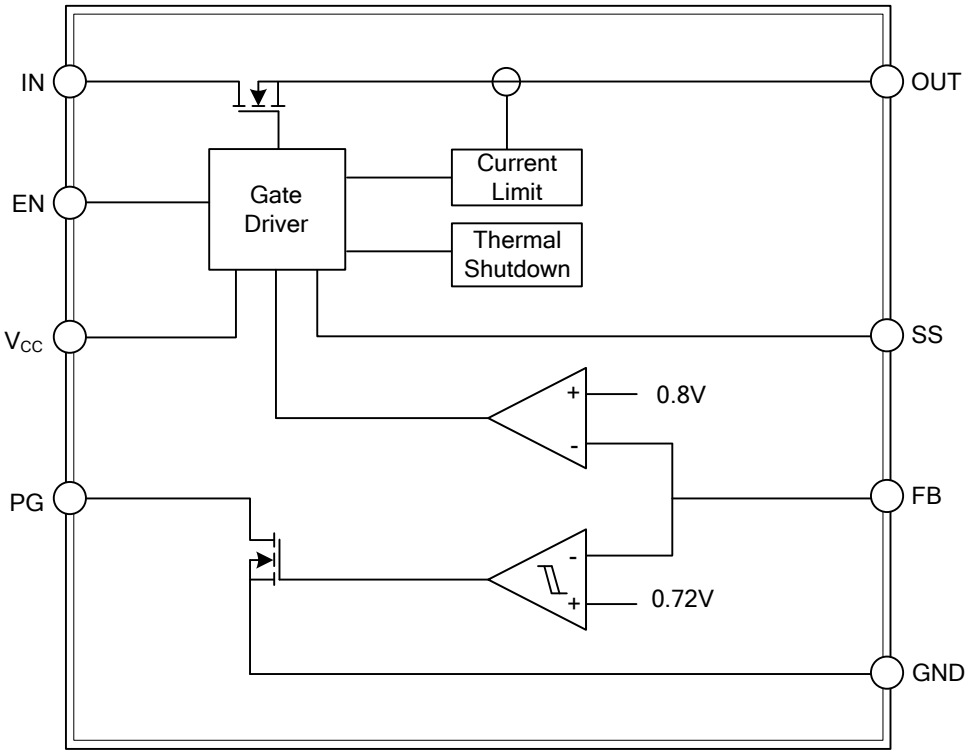


Top View
DFN3030-10

## ■ PIN DESCRIPTION

| PIN NO. | | PIN NAME | DESCRIPTION |
|---|---|---|---|
| HSOP-8 | DFN3030-10 | | |
| 1 | 1, 2 | IN | The main power Input pin. |
| 2 | 3 | PG | Power-good pin, open-drain output. |
| 3 | 4 | $V_{CC}$ | Bias input pin of the control circuitry |
| 4 | 5 | EN | Enable pin. |
| 5 | 6 | GND | Ground. |
| 6 | 7 | SS | Soft-start pin. |
| 7 | 8 | FB | Feedback pin. |
| 8 | 9 | OUT | Regulated output pin. |
| - | 10 | NC | NO Connection. |

## ■ BLOCK DIAGRAM



## ■ ABSOLUTE MAXIMUM RATING

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Input Voltage Range | $V_{IN}$, $V_{VCC}$ | -0.3~+6 | V |
| Enable Voltage Range | $V_{EN}$ | -0.3~+6 | V |
| Power-Good Voltage Range | $V_{PG}$ | -0.3~+6 | V |
| Soft-Start Voltage Range | $V_{SS}$ | -0.3~+6 | V |
| Feedback Voltage Range | $V_{FB}$ | -0.3~+6 | V |
| Output Voltage Range | $V_{OUT}$ | -0.3~$V_{IN}$ +0.3 | V |
| Maximum Output Current | $I_{OUT}$ | Internally Limited | |
| Junction Temperature | $T_J$ | -40~+150 | °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.

## ■ RECOMMENDED OPERATING CONDITIONS

| PARAMETER | SYMBOL | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| Input Voltage (Note) | $V_{IN}$ | 1.0 | | 5.5 | V |
| Bias Voltage | $V_{VCC}$ | 2.7 | | 5.5 | V |
| Output Current | $I_{OUT}$ | 0 | | 1.5 | A |
| Operating Ambient Temperature | $T_A$ | -40 | | 85 | °C |

Note: At $V_{IN}$ =1V, the maximum load currents may be lower than 1.5A.

## ■ THERMAL RESISTANCES CHARACTERISTICS

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---|---|---|---|---|
| Junction to Ambient | HSOP-8 | $\theta_{JA}$ | 150 | °C/W |
| | DFN3030-10 | | 72 (Note) | °C/W |

Note: The PCB area is 4 times larger than that of IC's

## ■ ELECTRICAL CHARACTERISTICS

At $V_{EN}$=1.1V, $V_{IN}$=$V_{OUT}$+0.5V, $C_{VCC}$=0.1uF, $C_{IN}$=$C_{OUT}$=10uF, $I_{OUT}$=50mA, $V_{VCC}$=5.0V, and $T_A$=-40°C~+85°C, unless otherwise noted. Typical values are at $T_A$=+25°C.

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Input Voltage Range | $V_{IN}$ | | $V_{OUT}$+$V_{DO}$ | | 5.5 | V |
| Bias Pin Voltage Range (Note 2) | $V_{VCC}$ | | 2.7 | | 5.5 | V |
| Internal Reference (Adj.) | $V_{REF}$ | $T_A$=+25°C | 0.792 | 0.8 | 0.808 | V |
| Output Voltage Range | $V_{OUT}$ | $V_{IN}$=5V, $I_{OUT}$=1.5A | 0.8 | | 3.3 | V |
| Accuracy (Note 2) | | 3V≤$V_{VCC}$≤5.5V, 50mA≤$I_{OUT}$≤1.5A | -2 | ±0.5 | 2 | % |
| Line Regulation | $\Delta V_{OUT}$ / $\Delta V_{IN}$ / $V_{OUT}$ | $V_{OUT\ (NOM)}$+0.5≤$V_{IN}$, 5.5V | | 0.02 | | %/V |
| Load Regulation | $\Delta V_{OUT}$ / $V_{OUT}$ / $\Delta I_{OUT}$ | 50mA≤$I_{OUT}$≤1.5A | | 0.08 | | %/V |
| Dropout Voltage (Note 3) | $V_{DO}$ | $I_{OUT}$=1.5A, $V_{VCC}$-$V_{OUT(NOM)}$≥3.25V | | 150 | 270 | mV |
| | | $I_{OUT}$=1.5A, $V_{IN}$=$V_{VCC}$ | | 1.5 | 1.7 | V |
| Current Limit | $I_{CL}$ | $V_{OUT}$=80%x$V_{OUT\ (NOM)}$ | 2 | 3 | 4 | A |
| Short-Circuit Current | $I_{SHORT}$ | $V_{OUT}$<0.2V | 0.6 | 1.1 | | A |
| Bias Pin Current | $I_{VCC}$ | | | 1 | 2 | mA |
| Shutdown Supply Current ($I_{GND}$) | $I_{SHDN}$ | $V_{EN}$≤0.4V | | 70 | 100 | μA |
| Feedback Pin Current | $I_{FB}$ | | -1 | 0.1 | 1 | μA |

## ■ ELECTRICAL CHARACTERISTICS (Cont.)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Power-Supply Rejection ($V_{IN}$~$V_{OUT}$) | PSRR | 1KHz, $I_{OUT}$=1A, $V_{IN}$=1.8V, $V_{OUT}$=1.5V | | 60 | | dB |
| | | 300KHz, $I_{OUT}$=1A, $V_{IN}$=1.8V, $V_{OUT}$=1.5V | | 30 | | dB |
| Power-Supply Rejection ($V_{VCC}$~$V_{OUT}$) | | 1KHz, $I_{OUT}$=1A, $V_{IN}$=1.8V, $V_{OUT}$=1.5V | | 50 | | dB |
| | | 300KHz, $I_{OUT}$=1A, $V_{IN}$=1.8V, $V_{OUT}$=1.5V | | 30 | | dB |
| Startup Time | $T_{ST}$ | RLOAD for $I_{OUT}$=1.0A, $C_{SS}$ =OPEN | | 100 | | μS |
| Soft-Start Charging Current | $I_{SS}$ | $V_{SS}$=0.4V | | 440 | | nA |
| Enable Input High Level | $V_{EN}$, $H_I$ | | 1.1 | | 5.5 | V |
| Enable Input Low Level | $V_{EN}$, $L_O$ | | 0 | | 0.4 | V |
| Enable Pin Hysteresis | $V_{EN}$, $H_{YS}$ | | | 50 | | mV |
| Enable Pin Current | $I_{EN}$ | $V_{EN}$=5V | | 0.1 | 1 | μA |
| PG Trip Threshold | $V_{PG}$, $T_H$ | $V_{OUT}$ Decreasing | 85 | 90 | 94 | %$V_{OUT}$ |
| PG Trip Hysteresis | $V_{PG}$, $H_{YS}$ | | | 7 | | %$V_{OUT}$ |
| PG Output Low Voltage | $V_{PG}$, $L_O$ | $I_{PG}$=1mA (Sinking), $V_{OUT}$<$V_{PG}$, $T_H$ | | | 0.3 | V |
| PG Leakage Current | $I_{PG}$, $L_{KG}$ | VPG=5.25V, $V_{OUT}$>$V_{PG}$, $T_H$ | | 0.1 | 1 | μA |
| Thermal Shutdown Temperature | $T_{SD}$ | Shutdown, Temperature Increasing | | +150 | | °C |
| | | Reset, Temperature Decreasing | | +130 | | °C |

Notes: 1. $V_{VCC}$ should be higher or equal to $V_{IN}$ in this chip.
2. Tested at 0.8V; resistor tolerance is not taken into account.
3. Dropout is defined as the voltage from $V_{IN}$ to $V_{OUT}$ when $V_{OUT}$ is 3% below nominal.

## ■ TYPICAL APPLICATION CIRCUIT

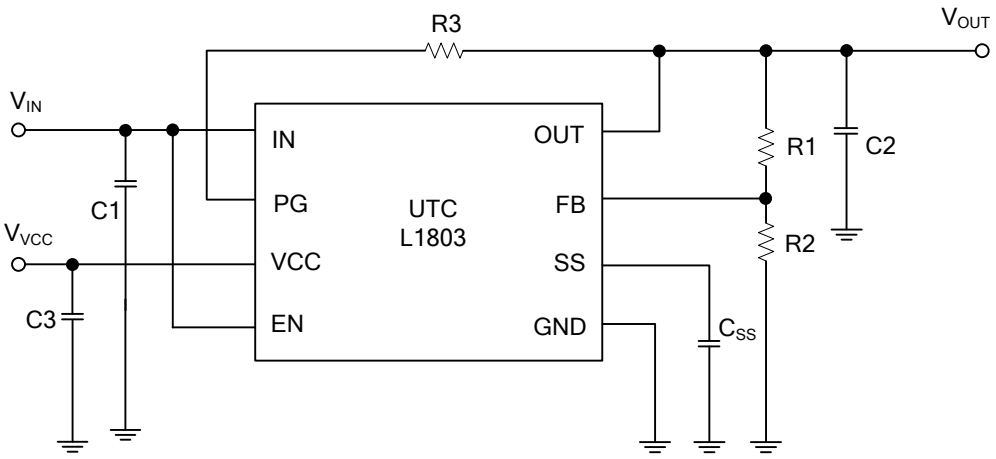



Table 1. Capacitor Values for Programming the Soft-Start Time (Note)

| CSS | SOFT-START TIME |
|---|---|
| Open | 0.1ms |
| 270pF | 0.5ms |
| 560pF | 1ms |
| 2.7nF | 5ms |
| 5.6nF | 10ms |

Note: $t_{SS}$ (s) = 0.8 x $C_{SS}$ (F) / ($4.4x10^{-7}$)