# LDO_59

## IP Library: Ultra Low Noise, High PSRR, Low Power, 20mA Low Dropout Voltage Regulator

**PRODUCT PREVIEW**

- RF REGULATOR
- VERY LOW DROPOUT VOLTAGE : 60mV
- ULTRA LOW OUTPUT VOLTAGE NOISE
- HIGH PSRR : 70dB
- LOW QUIESCENT CURRENT : 70µA FULL LOAD
- NO CURRENT IN POWER DOWN MODE
- SHORT CIRCUIT PROTECTION
- SMALL DECOUPLING CERAMIC CAPACITOR
- MOS INPUT STAGE

### APPLICATIONS

– Cellular and Cordless phones supplied by 1 cell Lithium-ion battery / 3 cells Ni-MH or Ni-Cd battery.

– PDA (Personal Digital Assistant), Smart phone.

– Portable equipment.

– Supply for RF devices for cellular phone.

### APPLICATION NOTE

An external capacitor ($C_{OUT}$ = 1µF typical) with an equivalent serial resistance (ESR) in the range 0.02 to 0.6Ω is used to ensure stability.

**Figure 1 :** Block Diagram

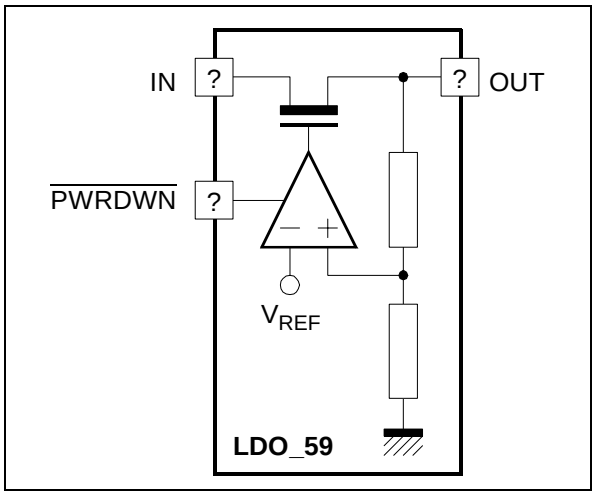
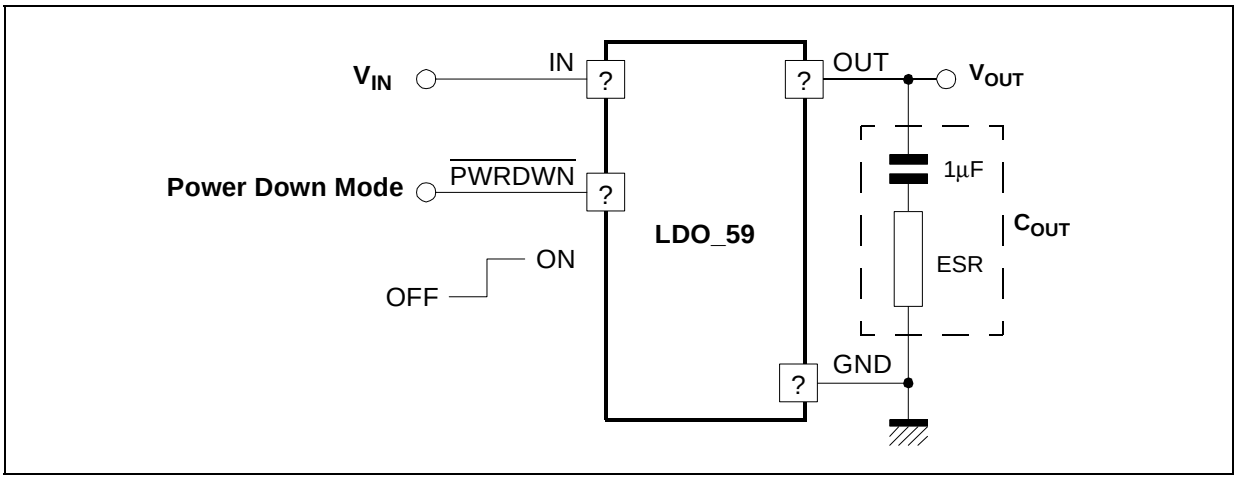



**Figure 2 :** Typical Application Circuit



## ELECTRICAL CHARACTERISTICS

$3V < V_{IN} < 5.5V$, $-30°C < T < 125°C$, $0.8\mu F < C_{OUT} < 1.2\mu F$, $20m\Omega < ESR < 0.6\Omega$, $100\mu A < I_{LOAD} < 20mA$.

**Typical case :** $V_{IN} = 4V$, $T = 25°C$, $I_{OUT} = 10mA$.

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Input Voltage Range (Note 1) | $V_{IN}$ | | 3 | | 5,5 | V |
| Output Voltage | $V_{OUT}$ | | | 2,8 | | V |
| Output Voltage Accuracy | | | | 3 | | % |
| Output current | $I_{LOAD}$ | | | | 20 | mA |
| $P_{MOS}$ Output Resistance | $R_{ON}$ | | | | 0,6 | Ω |
| Dropout Voltage | $\Delta V_{DO}$ | $\Delta V_{OUT}$ = 50mV, $I_{LOAD}$ = 20mA | | | 60 | mV |
| | | (Note 2) | 170 | | | |
| Quiescent current | $I_Q$ | $I_{LOAD}$ = 100µA | | 50 | 70 | µA |
| | | $I_{LOAD}$ = 20mA | | 70 | 150 | µA |
| Power down mode quiescent current | $I_{QPRWDWN}$ | Power down active | | 100 | | nA |
| Power Supply Rejection Ratio | PSRR | DC to 10KHz | 55 | 70 | | dB |
| | | f < 100KHz | 40 | 50 | | |
| Load Regulation | Ldr | | | 6 | 9 | mV |
| Line Regulation | Lir | $I_{LOAD}$ = 20mA, $V_{OUT}$ = 2.8V | | 0,5 | 1 | mV |
| Line Transient | Lirt | $V_{OUT}$ = 2.8V, $I_{LOAD}$ = 20mA, $\Delta V_{IN}$ = 300mV $t_{RISE} = t_{FALL}$ = 10µs | | 0,5 | 1 | mV |
| Load Transient | Ldtr | $V_{OUT}$ = 2.8V $t_{FALL} = t_{RISE}$ = 10µs | | 0,3 | 1 | mV |
| | | Recovery time | | 4 | 6 | µs |
| Output Noise Voltage | en | $V_{OUT}$ = 2.8V 100Hz < f < 1KHz | | 160 | 200 | $\frac{nV}{\sqrt{Hz}}$ |
| | | 1KHz < f < 100KHz | | | 60 | |
| Output decoupling capacitor | $C_{OUT}$ | | | 1 | | µF |
| Settling time (from power down to active mode) | | $V_{OUT}$ = 2.8V, $C_{OUT}$ = 1.2µF | | 20 | 50 | µs |
| Short Circuit Current Limit | $I_{SHORT}$ | | | | 200 | mA |

Notes: 1. Above characteristics are given for 3V minimum input operating range voltage, but regulator is operational with 2.7V minimum input voltage.

2. All parameters are guaranteed with 170mV min dropout voltage.

## TYPCIAL CHARACTERISTICS

**Figure 3 :** Line transient (rising edge)

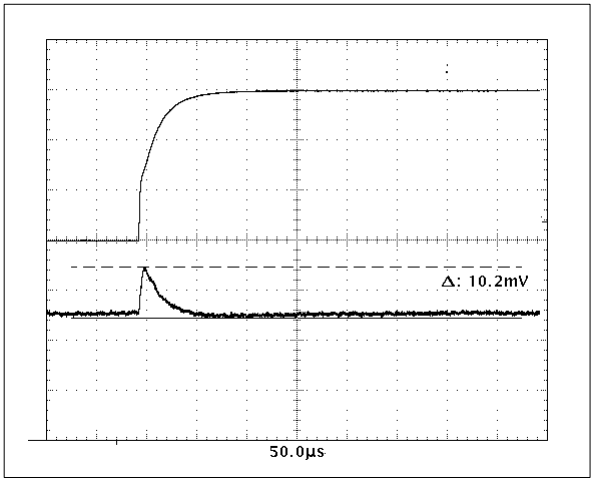



**Figure 4 :** Line transient (falling edge)

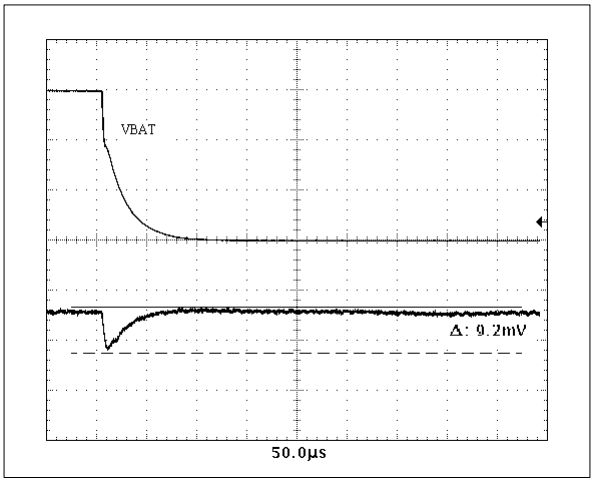



**Figure 5 :** Load transient (rising edge)

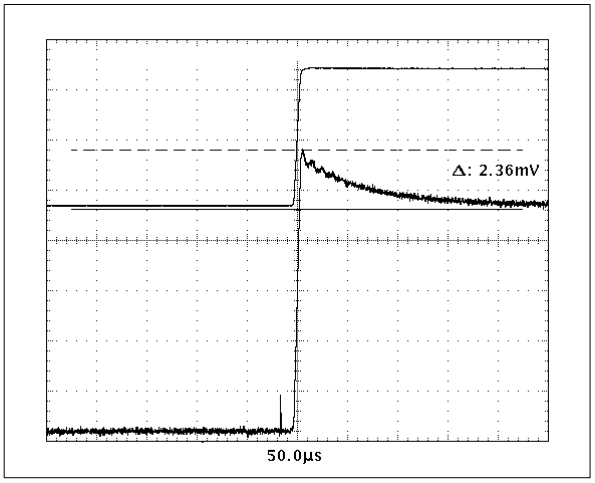



**Figure 6 :** Load transient (falling edge)

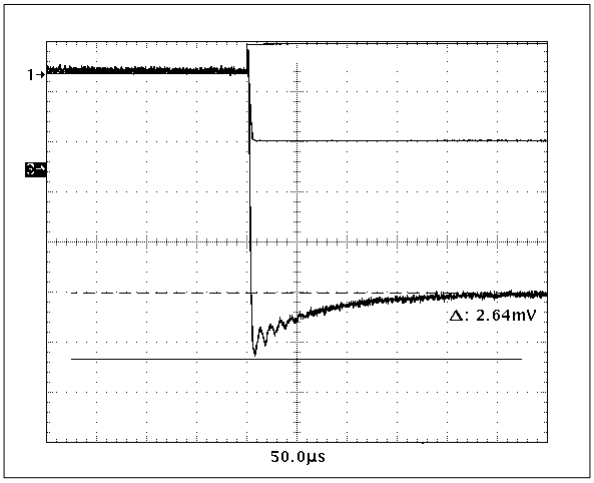



**Figure 7 :** Settling time

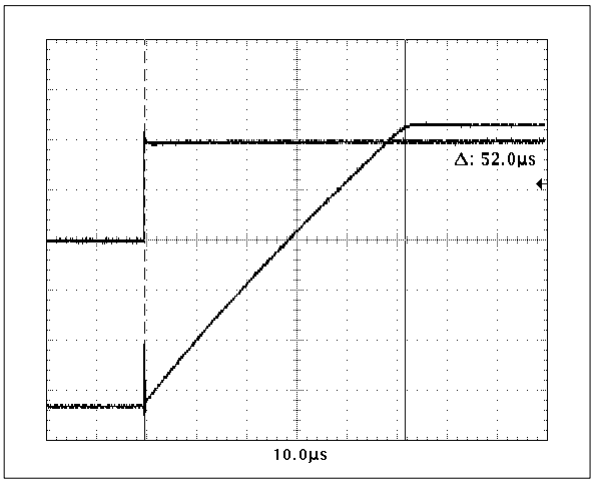



**Figure 8 :** PSRR vs Frequency ($I_{LOAD}$ = 20mA ; $V_{IN}$min)