

## IP Library: Power Supply Range 2.9V to 13V, Low Power, 50mA Low Dropout Voltage Regulator

### PRODUCT PREVIEW

- CHARGE CONTROL REGULATOR
- VERY LOW DROPOUT VOLTAGE : 60mV
- LARGE INPUT VOLTAGE RANGE
- OUTPUT CURRENT : 50mA
- LOW QUIESCENT CURRENT : 280 $\mu$ A
- HIGH PSRR : 60dB
- NO CURRENT IN POWER DOWN MODE
- SHORT CIRCUIT PROTECTION

### TYPICAL 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 Charge control devices of cellular phone

### APPLICATION NOTE

An external capacitor ( $C_{OUT} = 1\mu\text{F}$ ) with an equivalent serial resistance (ESR) in the range 0.02 to 0.6 $\Omega$  is used for regulator stability.

The regulator needs two separated power supplies, one ( $V_{5V}$ ) for the digital parts and programming inputs (Stand-by and Power-down mode) which cannot exceed 5V and one ( $V_{in}$ ) as the input voltage of the regulator.

Figure 1 : Block Diagram

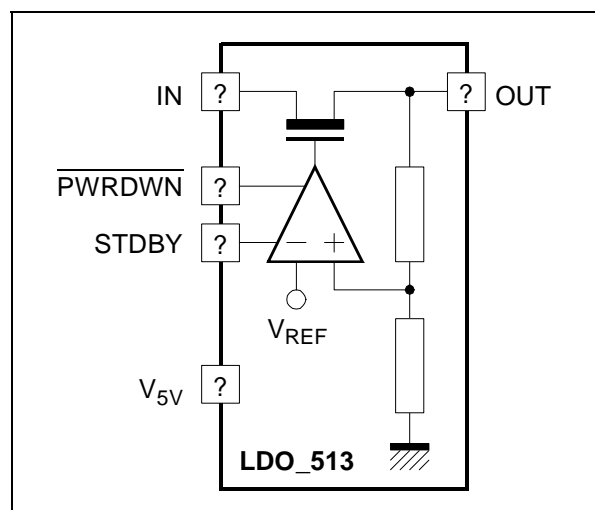
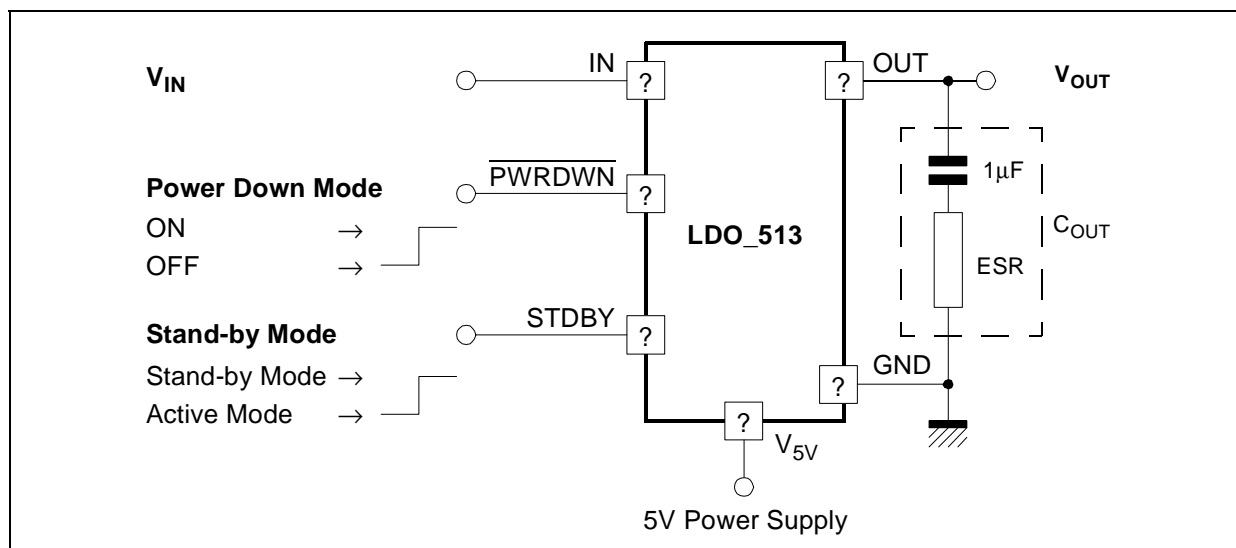


Figure 2 : Typical Application Circuit



**ELECTRICAL CHARACTERISTICS**

$2.9V < V_{IN} < 13V$ ,  $-30^{\circ}C < T_A < +85^{\circ}C$ ,  $C_{OUT} = 1\mu F \pm 20\%$ ,  $20m\Omega < ESR < 0.6\Omega$ ,  $I_{LOAD} = 50mA$ .

Typical case:  $V_{IN} = 4V$ ,  $T = 25^{\circ}C$ ,  $C_{OUT} = 1\mu F$ .

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Input Voltage Range (Note 1)	$V_{IN}$		2.9		13	V
Output Voltage	$V_{out}$		1.8		5	V
Output Voltage Accuracy				3		%
Output current	$I_{OUT}$				50	mA
Dropout Voltage	$\Delta V_{DO}$	$\Delta V_{OUT} = 50mV$ , $I_{LOAD} = 50mA$			70	mV
		(Note 2)	200			
Quiescent current	$I_Q$	$I_{LOAD} = 100\mu A$		40		$\mu A$
		$I_{LOAD} = 10mA$		100		
		$I_{LOAD} = 50mA$		270	340	
Power down mode quiescent current	$I_{QPDM}$	Power down active		100		nA
Power Supply Rejection Ratio	PSRR	DC	45	60		dB
		$f = 10KHz$	40	60		
Line Regulation	$L_{IR}$	$I_{LOAD} = 50mA$ , $V_{IN} = 3V$ to $13V$			3	mV
Load Regulation	$L_{DR}$	$I_{LOAD} = 100\mu A - 50mA$			40	mV
Line Transient	$L_{IRT}$	$\Delta V_{IN} = 300mV$ $t_{RISE} = t_{FALL} = 10\mu s$			3	mV
Load Transient	$L_{DTR}$	$I_{LOAD} = 100\mu A - 50mA$ in $10\mu s$			6	mV
Output Noise Voltage	en	100Hz		1.2		$\frac{\mu V}{\sqrt{Hz}}$
		1KHz		400		$\frac{nV}{\sqrt{Hz}}$
		10KHz		150		$\frac{nV}{\sqrt{Hz}}$
		100KHz		70		$\frac{nV}{\sqrt{Hz}}$
	$en_{RMS}$	BW : 100Hz to 100KHz		35		$\mu V_{RMS}$
Output decoupling Capacitor	$C_{OUT}$			1		$\mu F$
Settling time		From power down to active mode			120	$\mu s$
Short Circuit Current Limit	$I_{SHORT}$			100	220	mA

Notes: 1. Above characteristics are given for 2.9V minimum input operating range voltage, but regulator is operational with 2.7V minimum input voltage.

2. All parameters are guaranteed with 200mV min Dropout voltage.

**ELECTRICAL CHARACTERISTICS : STAND-BY MODE**

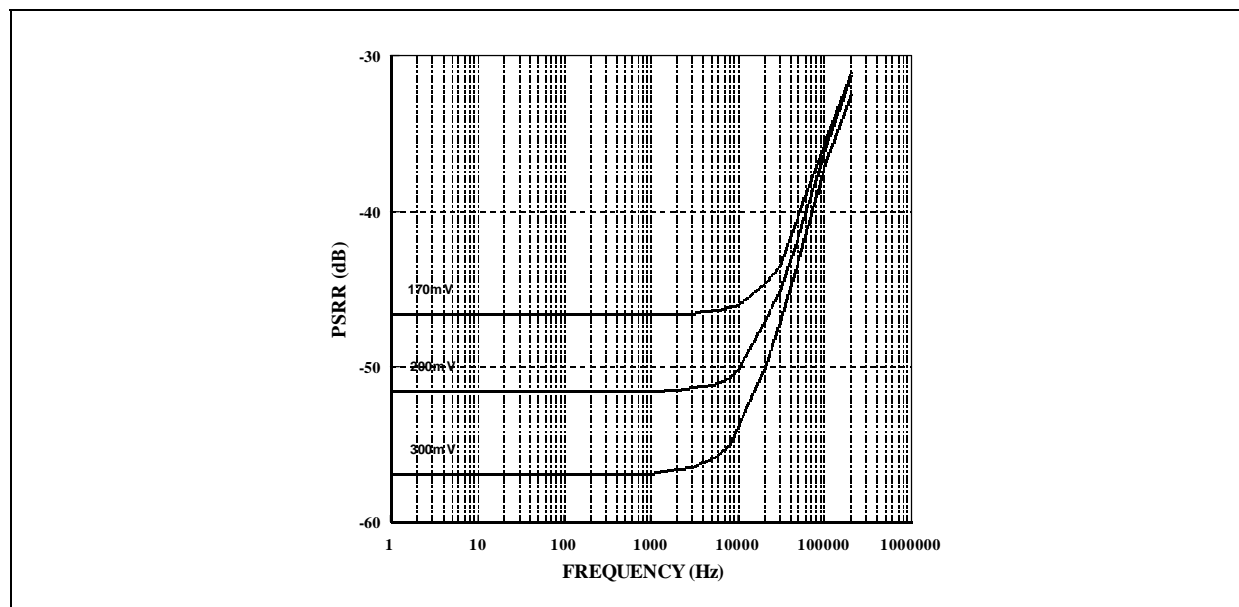
$3V < V_{IN} < 5.5V$ ,  $-30^{\circ}C < T_A < +85^{\circ}C$ ,  $V_{REF} = 2.8V$ ,  $C_{OUT} = 4.7\mu F \pm 20\%$ ,  $20m\Omega < ESR < 0.6\Omega$ .  
 $I_{LOAD} = 500\mu A$ .

Typical case :  $V_{IN} = 4V$ , Ambient temperature,  $I_{LOAD} = 500\mu A$ .

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Output current in stand-by mode	$I_{OUTSTDBY}$				500	$\mu A$
Quiescent Current in stand-by mode	$I_{STDBY}$	$I_{LOAD} = 500\mu A$		20	40	$\mu A$
Power Supply Rejection Ratio in stand-by mode	$PSRR_{STY}$	$f = 10KHz$		70		dB

**TYPICAL CHARACTERISTICS**

**Figure 3 : PSRR vs Frequency for Various Voltage Drop ( $I_{LOAD} = 50mA$ )**



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