



LDO_513

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 μ 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 Ω 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

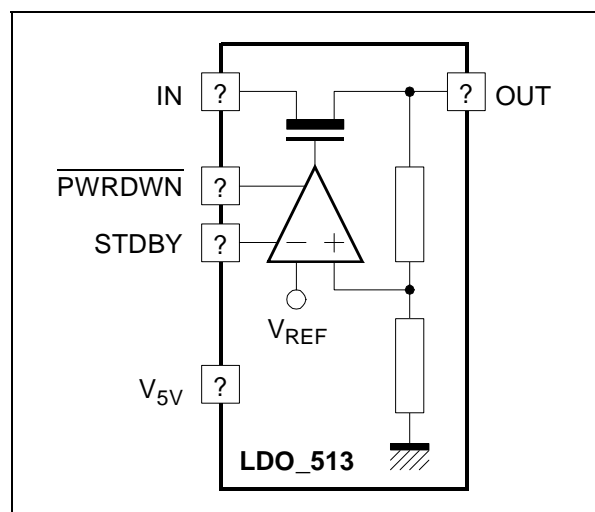
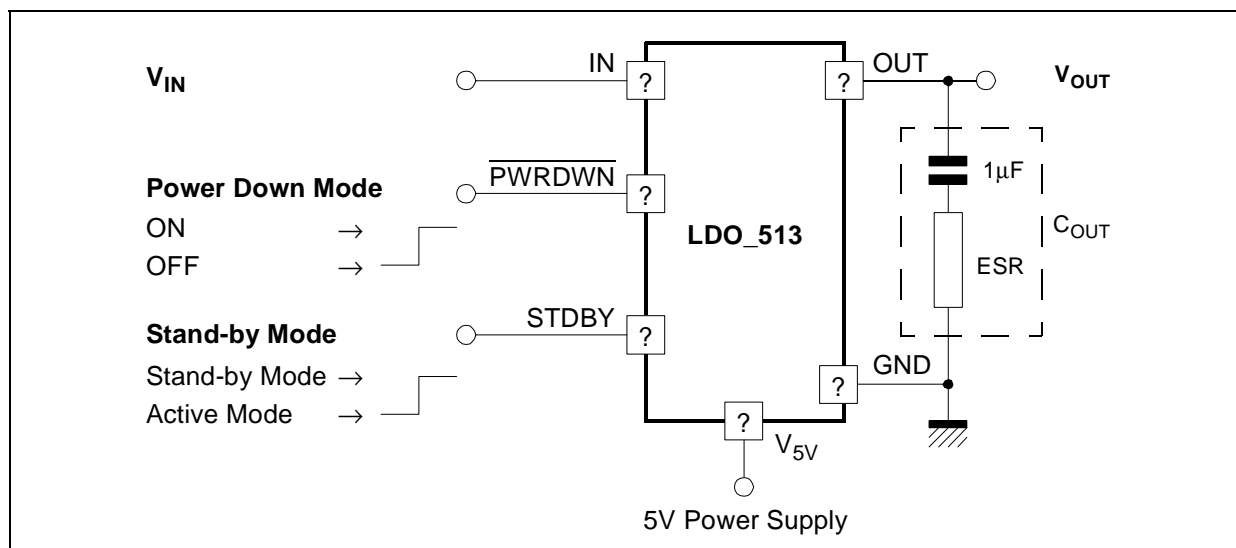


Figure 2 : Typical Application Circuit



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	ΔV_{DO}	$\Delta V_{OUT} = 50mV$, $I_{LOAD} = 50mA$			70	mV
		(Note 2)	200			
Quiescent current	I_Q	$I_{LOAD} = 100\mu A$		40		μA
		$I_{LOAD} = 10mA$		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		μV_{RMS}
Output decoupling Capacitor	C_{OUT}			1		μF
Settling time		From power down to active mode			120	μs
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

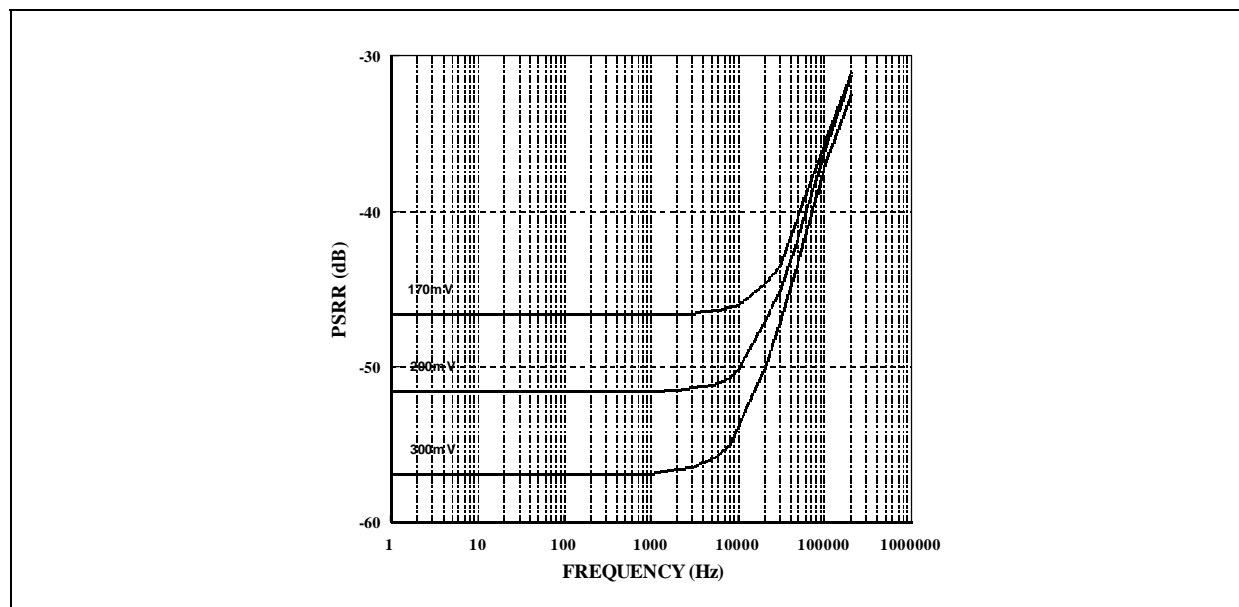
$3V < V_{IN} < 5.5V$, $-30^{\circ}C < T_A < +85^{\circ}C$, $V_{REF} = 2.8V$, $C_{OUT} = 4.7\mu F \pm 20\%$, $20m\Omega < ESR < 0.6\Omega$.
 $I_{LOAD} = 500\mu A$.

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	μA
Quiescent Current in stand-by mode	I_{STDBY}	$I_{LOAD} = 500\mu A$		20	40	μA
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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