

IP Library: Wide Range ESR Capacitor, Low Noise, 100mA Low Dropout Voltage Regulator

PRODUCT PREVIEW

- AnyESR REGULATOR
- VERY COMMON OUTPUT DECOUPLING CERAMIC CAPACITOR
- LOW CONSUMPTION : 250 μ A FULL LOAD
- VERY LOW NOISE : 30 μ V
- VERY LOW DROPOUT VOLTAGE : 50mV
- HIGH PSRR : 60dB
- STANDBY AND POWER DOWN MODE
- 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 RF devices for cellular phone

APPLICATION NOTE

An external capacitor ($C_{OUT} = 1\mu\text{F}$) with an equivalent serial resistance (ESR) up to 1Ω is used for regulator stability.

Figure 1 : Block Diagram

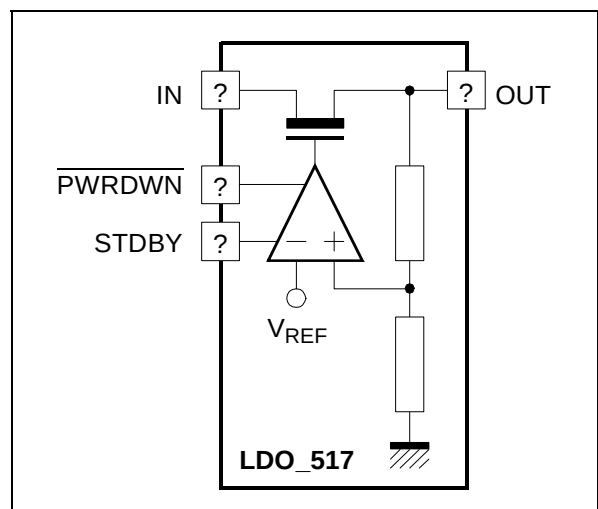
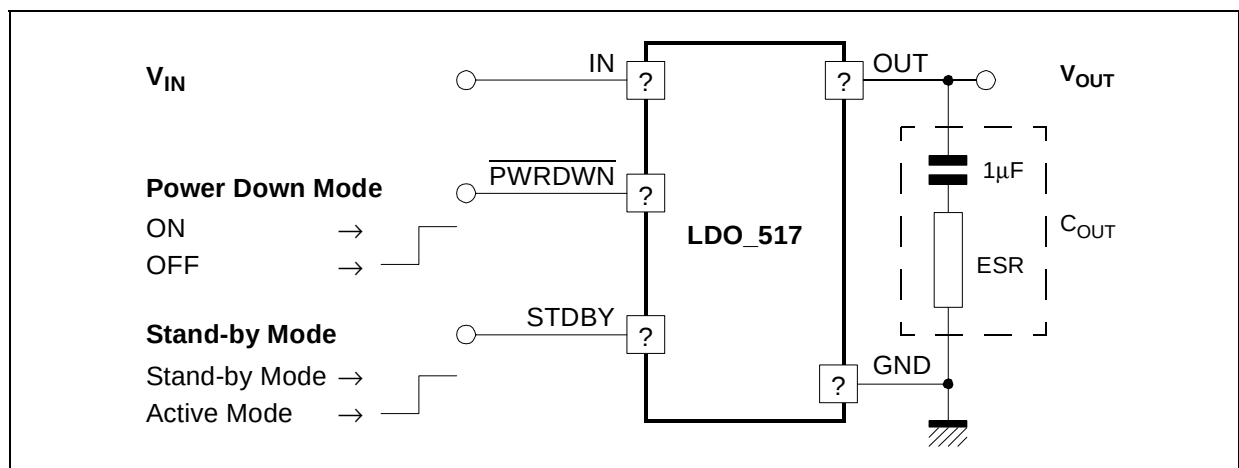


Figure 2 : Typical Application Circuit



ELECTRICAL CHARACTERISTICS

$3V < V_{IN} < 5.5V$, $-30^{\circ}C < T_A < +125^{\circ}C$, $C_{OUT} = 1\mu F \pm 20\%$, $ESR < 1\Omega$, $I_{LOAD} = 100mA$.

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}		3		5.5	V
Output Voltage	V_{OUT}			2.8		V
Output Voltage Accuracy				3		%
Output current	I_{OUT}				100	mA
Dropout Voltage	ΔV_{DO}	$\Delta V_{OUT} = 50mV$, $I_{LOAD} = 100mA$			50	mV
		(Note 2)	170			
Quiescent current	I_Q	$I_{LOAD} = 100\mu A$		50	65	μA
		$I_{LOAD} = 100mA$		250	450	
Power down mode quiescent current	I_{QPDM}	Power down active		100		nA
Power Supply Rejection Ratio	PSRR	DC ; Dropout = 170mV	45	55		dB
		10KHz < f < 100KHz	45	55		
		DC ; Dropout = 200mV	55	60		
		10KHz < f < 100KHz	50	60		
Line Regulation	L_{IR}	$I_{LOAD} = 100mA$, $V_{IN} = 3V$ to $5.5V$		5	15	mV
Load Regulation	L_{DR}	$I_{LOAD} = 100\mu A - 100mA$		15	20	mV
Line Transient	L_{IRT}	$\Delta V_{IN} = 300mV$ $t_{RISE} = t_{FALL} = 10\mu s$			3	mV
Load Transient	L_{DTR}	$I_{LOAD} = 100\mu A - 100mA$ in $10\mu s$			3	mV
Output Noise Voltage (Note 3)	en	100Hz		80		$\frac{nV}{\sqrt{Hz}}$
		1KHz - 10KHz		70		
		100KHz		85		
	en_{RMS}	BW : 100Hz to 100KHz			30	μV_{RMS}
Output decoupling Capacitor	C_{OUT}			1		μF
Settling time		$I_{LOAD} = 100mA$		20		μs
Short Circuit Current Limit	I_{SHORT}		200	400	800	mA

Notes: 1. Above characteristics are given for 3V minimum input operating range voltage, but regulator is operational with 2.5V minimum input voltage.

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

3. Output Noise density reaches its maximum at 1MHz ($300nV / \sqrt{Hz}$ typical).

ELECTRICAL CHARACTERISTICS : (STAND-BY MODE)

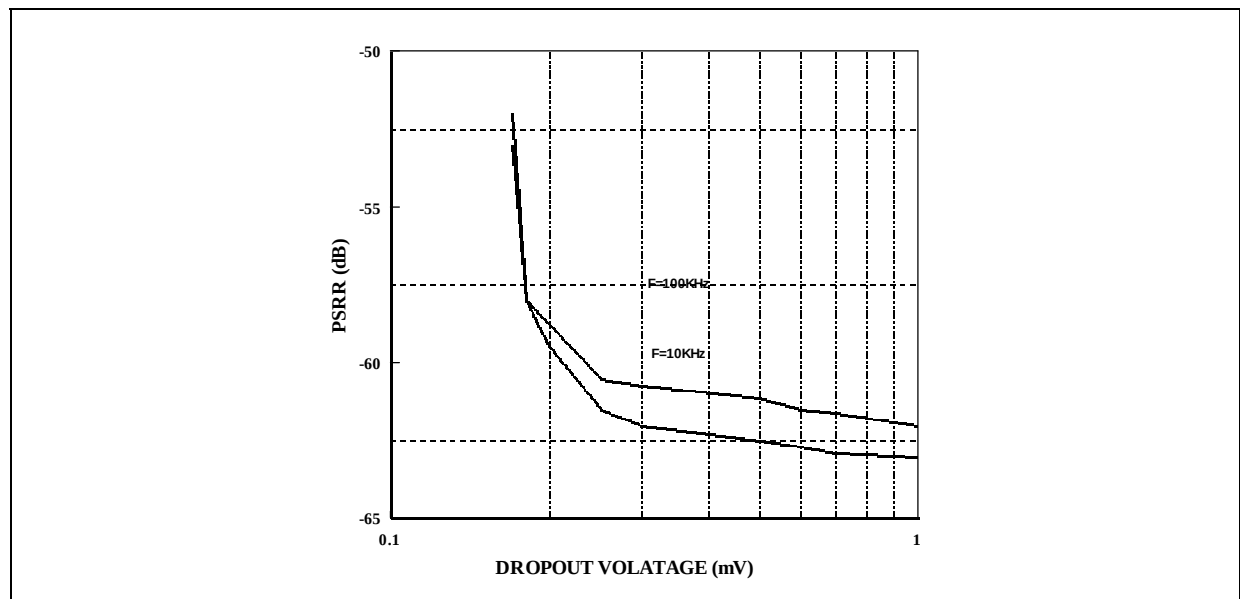
$3V < V_{IN} < 5.5V$, $-30^{\circ}C < T_A < +125^{\circ}C$, $C_{OUT} = 1\mu F \pm 20\%$, $ESR < 1\Omega$, $I_{LOAD} = 500\mu A$.

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}	$I_{LOAD} = 500\mu A$		15	20	μA
Power Supply Rejection Ratio in stand-by mode	$PSRR_{STY}$	DC ; Dropout > 1V		65		dB
		f = 10KHz		65		
		f = 100KHz		45		
Line Regulation in stand-by mode	L_{IRSTBY}	$V_{IN} = 3V$ to $5.5V$		2		mV
Load Regulation in stand-by mode	L_{DRSTBY}	$I_{LOAD} = 100\mu A - 500\mu A$		1		mV

TYPICAL CHARACTERISTICS

Figure 3 : PSRR vs Dropout for Various Frequency ($V_{OUT} = 2.8V$, Full Load)



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