

## IP Library: High PSRR, Very Low Power, 40mA Low Dropout Voltage Regulator

PRODUCT PREVIEW

- DIGITAL BASEBAND REGULATOR
- VERY LOW DROPOUT VOLTAGE : 50mV
- HIGH PSRR : 55dB
- VERY LOW QUIESCENT CURRENT : 100µA FULL LOAD
- NO CURRENT IN POWER DOWN MODE
- SHORT CIRCUIT PROTECTION
- SMALL DECOUPLING CERAMIC CAPACITOR

### 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 Digital (DSP/Microcontroller) devices.

### APPLICATION NOTE

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

Figure 1 : Block Diagram

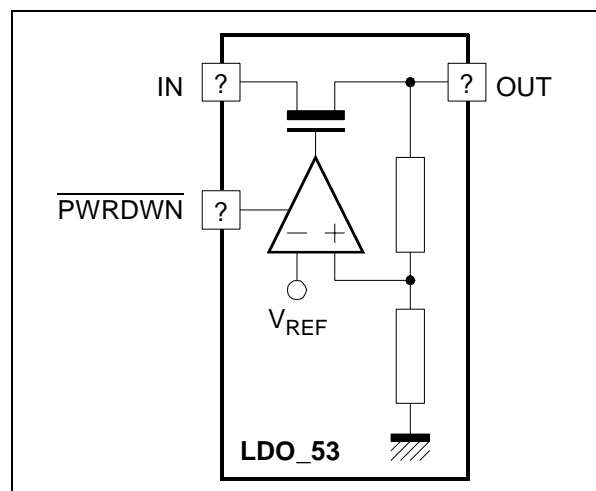
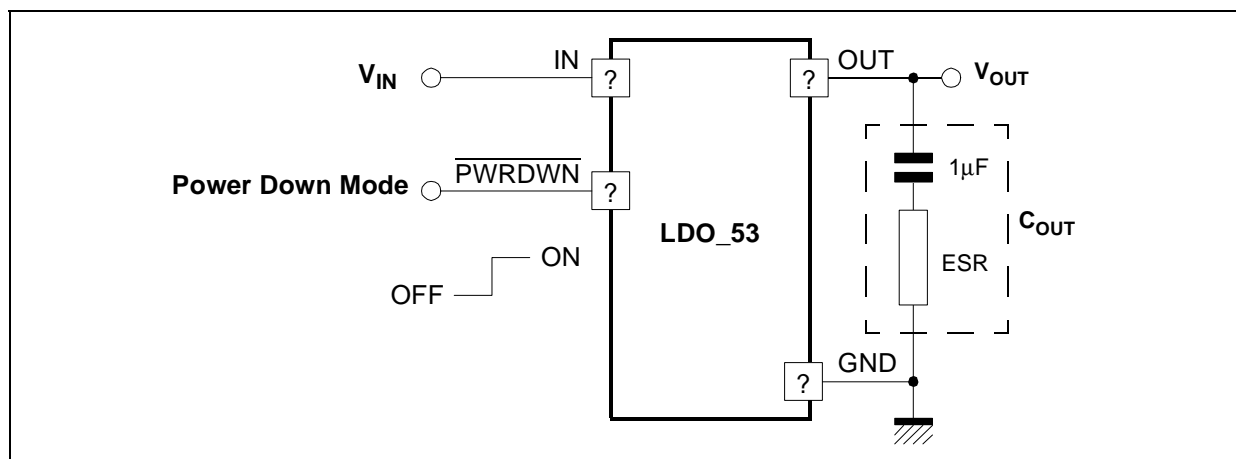


Figure 2 : Typical Application Circuit



**ELECTRICAL CHARACTERISTICS**

$3V < V_{IN} < 5.5V$ ,  $-30^{\circ}C < T < +85^{\circ}C$ ,  $V_{REF} = 2.8V$ ,  $0.8\mu F < C_{OUT} < 1.2\mu F$ ,  $20m\Omega < ESR < 0.6\Omega$   
 $100\mu A < I_{LOAD} < 40mA$ .

**Typical case** :  $V_{IN} = 4V$ ,  $T = 25^{\circ}C$ ,  $I_{OUT} = 20mA$ .

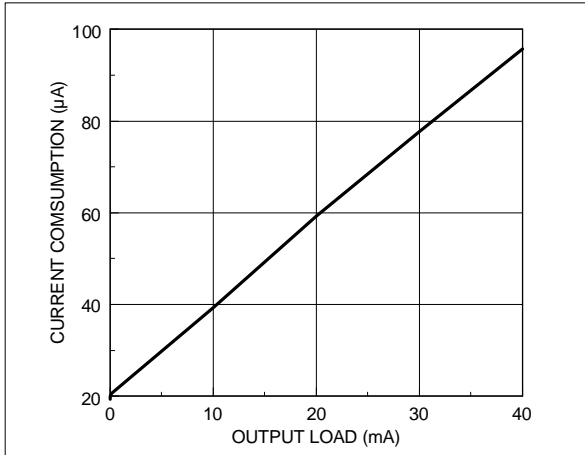
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Input Voltage Range (Note 1)	$V_{IN}$		3		5,5	V
Output Voltage	$V_{OUT}$			2,8		V
Output Voltage Accuracy			-3		3	%
Output current	$I_{OUT}$		0,1		40	mA
$P_{MOS}$ Output Resistance	$R_{ON}$				0,4	$\Omega$
Dropout Voltage	$\Delta V_{DO}$	$\Delta V_{OUT} = 50mV$ , $I_{LOAD} = 40mA$			50	mV
		(Note 2)	170			
Quiescent current	$I_Q$	$I_{LOAD} = 100\mu A$		20	30	$\mu A$
		$I_{LOAD} = 40mA$		100	120	
Power down mode quiescent current	$I_{QPND}$	Power down active			1	$\mu A$
Power Supply Rejection Ratio	PSRR	DC	50	55		dB
		$f < 10KHz$	45	50		
Load Regulation	Ldr			15	25	mV
Line Regulation	Lir	$I_{LOAD} = 40mA$ , $V_{IN} = 3V$ to $5.1V$ , $V_{OUT} = 2.8V$		2	3	mV
Line Transient	Lirt	$V_{OUT} = 2.8V$ , $I_{OUT} = 40mA$ , $\Delta V_{IN} = 300mV$ $t_{RISE} = t_{FALL} = 10\mu s$			3	mV
Load Transient	Ldtr	$V_{OUT} = 2.8V$ , $t_{RISE} = t_{FALL} = 10\mu s$ $100\mu A < I_{LOAD} < 40mA$			3	mV
		Recovery time		5	6	$\mu s$
Output decoupling capacitor	$C_{OUT}$			1		$\mu F$
Settling time (from power down to active mode)		$V_{OUT} = 2.8V$ , $C_{OUT} = 1\mu F$		20	50	$\mu s$
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.

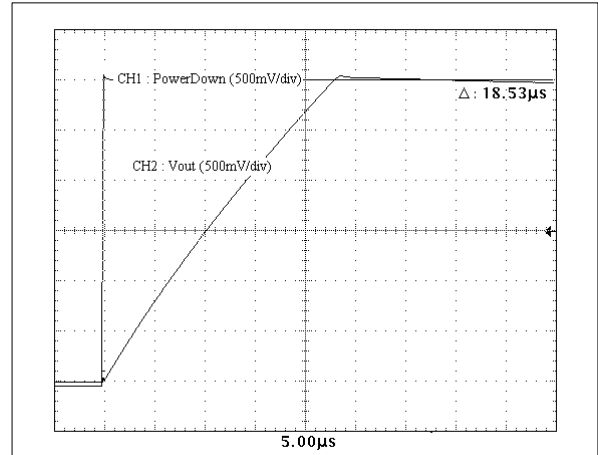
2. All parameters are guaranteed with 170mV Dropout voltage.

**TYPICAL CHARACTERISTICS**

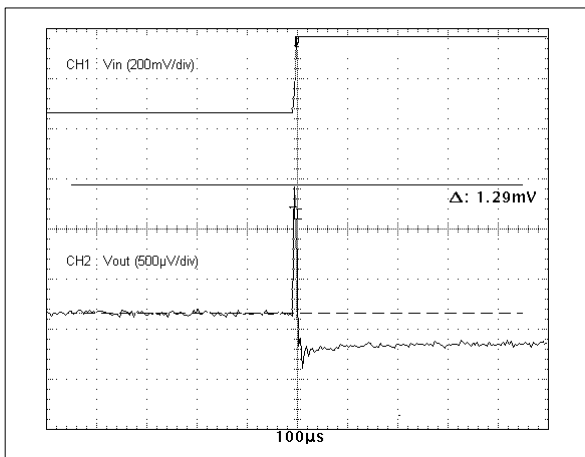
**Figure 3 : Quiescent Current vs Output Current**  
 ( $I_L = 0$  to  $40\text{mA}$  -  $V_{IN} = 4\text{V}$ )



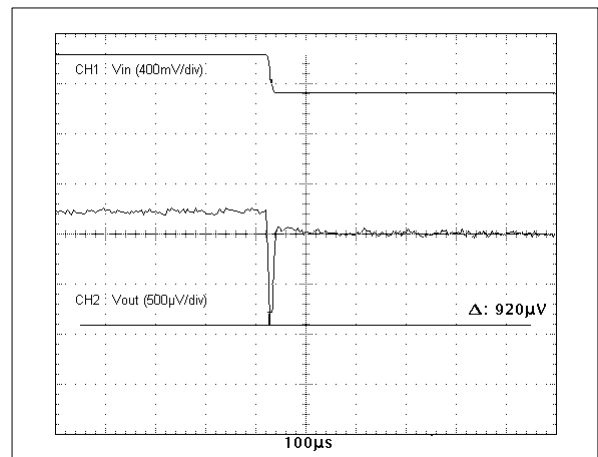
**Figure 4 : Settling time**  
 ( $V_{IN} = 4\text{V}$  ;  $I_{LOAD} = 20\text{mA}$ )



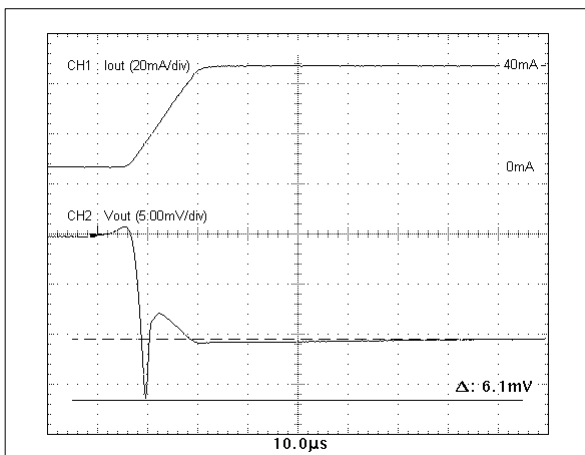
**Figure 5 : Line Transient - rising edge**  
 ( $V_{IN} = 4\text{V} + 300\text{mV}$  with  $10\mu\text{s}$ )



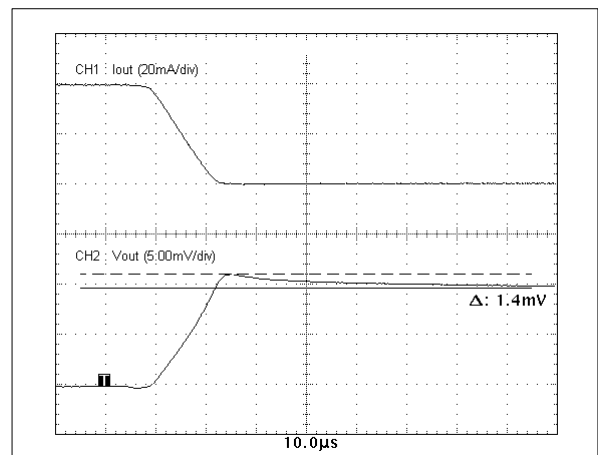
**Figure 6 : Line Transient - falling edge**  
 ( $V_{IN} = 4\text{V} + 300\text{mV}$  with  $10\mu\text{s}$ )



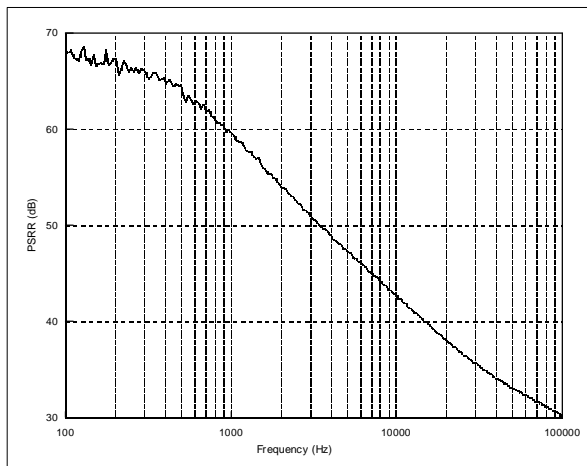
**Figure 7 : Load Transient - rising edge**  
 ( $I_L = 0$  to  $40\text{mA}$  -  $V_{IN} = 4\text{V}$ )



**Figure 8 : Load Transient - falling edge**  
 ( $I_L = 40$  to  $0\text{mA}$  -  $V_{IN} = 4\text{V}$ )



**Figure 9 : PSRR vs Frequency**  
( $I_{LOAD\ max} - V_{INmin}$ )



Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a registered trademark of STMicroelectronics

© 2002 STMicroelectronics - All Rights Reserved

STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - Canada - China - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco  
Singapore - Spain - Sweden - Switzerland - United Kingdom - United States

<http://www.st.com>