500mA Low Noise High PSRR LDO Regulator

Features

- Input Voltage Range: 2.5V to 6.5V
- Output Voltage Range:
  - Fixed: 1.8V, 2.5V, 3.0V, 3.3V, 5.0V
- Maximum output current: 500mA
- Low Dropout Voltage: 275mV at 500mA
- Output Voltage Accuracy: 2% over Line, Load and Temperature
- Low Quiescent Current
- Low Noise with Bypass Cap
- Excellent Load and Line Transient Responses
- Thermal Shutdown and Over-Current Protection
- Stable with 1µF or Larger Ceramic Capacitor
- Operating Junction Temperature: -40°C to +125°C
- Available packages: SOT23-5

Description

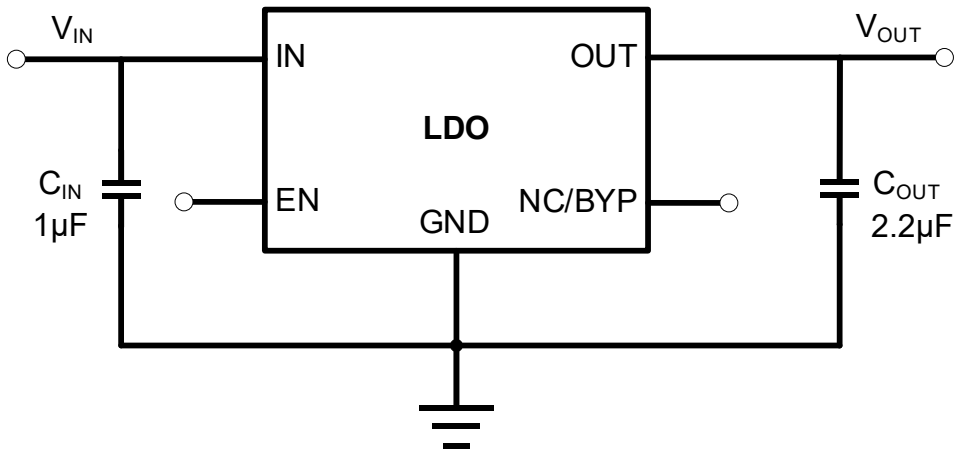
The device is an ultra-small, low quiescent current, low-dropout regulator that sources 500mA with good line and load transient performance. The output voltage is fixed and spans from 1.8V to 5V.

The device also features short-circuit current limit and thermal shutdown protection, as well as automatic discharge function to quickly discharge V_{OUT} in the disabled states.

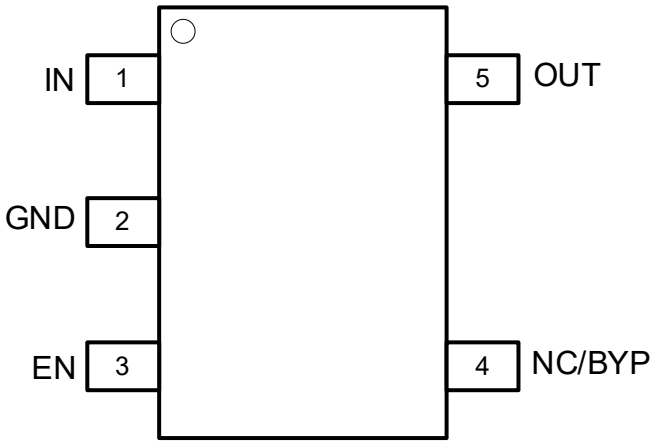
Applications

- Set-Top Boxes, TV, and Gaming Consoles
- Portable and Battery-Powered Equipment
- Desktops, Notebooks, and Ultrabooks
- Tablets and Remote Controls
- White Goods and Appliances
- Grid Infrastructure and Protection Relays
- Camera Modules and Image Sensors

Typical Application Circuits



Pin Configuration and Functions



5-Pin SOT-23 (Top View)

Pin Descriptions

PIN Number	PIN Name	I/O	Function
1	IN	I	Input supply voltage pin. It is recommended to use a 1μF or larger ceramic capacitor from IN pin to ground to get a good power supply decoupling.
2	GND	-	Ground.
3	EN	I	Enable Pin. Drive EN high to turn on the regulator. Drive EN low to turn off the regulator.
4	NC/BYP	-	Do not connect (NC) or Connect a 10nF to ground to reduce output noise (BYP).
5	OUT	O	Regulator output voltage pin. A 2.2μF or larger ceramic capacitor from OUT to ground is required to ensure regulator stability.

Package/Ordering Information

DEVICE	PACKAGE TYPE	MARKING	OUTPUT VOLTAGE	PACKING OPTION
NCP161ASN180T1G	SOT23-5	JAF	1.8V	Tape and Reel, 3000
NCP161ASN250T1G	SOT23-5	JAA	2.5V	Tape and Reel, 3000
NCP161ASN300T1G	SOT23-5	JAD	3.0V	Tape and Reel, 3000
NCP161ASN330T1G	SOT23-5	JAG	3.3V	Tape and Reel, 3000
NCP161ASN500T1G	SOT23-5	JAE	5.0V	Tape and Reel, 3000

Electrical Specifications

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
IN, OUT and EN Pins	IN, OUT and EN	−0.3 to 7	V
Storage temperature range	T_{STG}	−65 to +150	°C
Output current	I_{OUT}	500	mA

Notes:

1. Exposure of the device under conditions beyond the limits specified by Maximum Ratings for extended periods may cause permanent damage to the device and affect product reliability. These conditions represent a stress rating only, and functional operations of the device at these or any other conditions above the operational limits noted in this specification is not implied.

ESD Ratings

			Value	Unit
V_{ESD}	Electrostatic Discharge	HBM (Human Body Model)	3000	V
		CDM (Charge Device Model)	1000	

Recommended Operation Conditions

Over operating temperature range unless otherwise noted

Parameter	Symbol	Min	Max	Unit
Input Supply Voltage	V_{IN}	2.5	6.5	V
Enable Input Voltage	EN	0	V_{IN}	V
Output Voltage	V_{OUT}	1.2	5.0	V
Output Capacitance	C_{OUT}	1	47	μF
Output Current	I_{OUT}	0	500	mA
Operating Junction Temperature	T_J	-40	125	°C

Thermal Information

Package	$R_{\theta JA}$	Unit
SOT23-5	205	°C/W

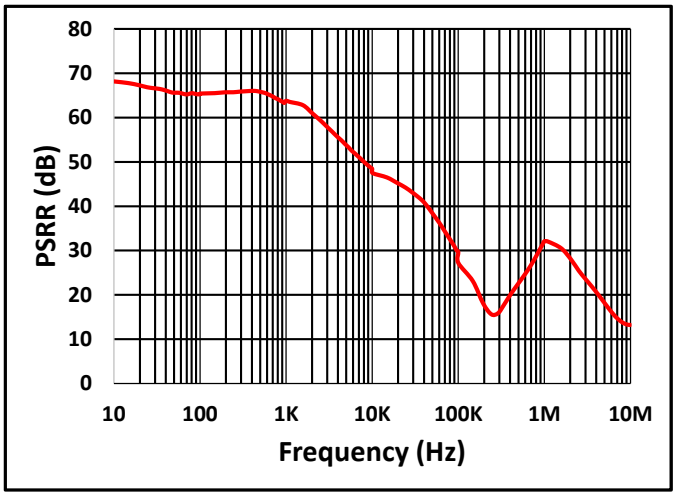
Electrical Characteristics

V_{IN} = 2.5V or V_{IN} = V_{OUT} + 1V (whichever is greater), I_{OUT} = 1mA, C_{OUT} = 2.2μF, typical values are at T_A = 25°C unless otherwise noted

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Voltage	V_{IN}		2.5	-	6.5	V
Output Voltage Accuracy		0.1mA ≤ I_{OUT} ≤ 500mA	-2.0	0	2.0	%
GND Pin Current	I_{GND}	V_{IN} = 2.5V, No Load		69		μA
		V_{IN} = 2.5V, I_{OUT} = 500mA		158		μA
Shutdown Current	I_{SHDN}	V_{IN} = 2.5V, V_{EN} = 0V		2.3		μA
Dropout Voltage	V_{DO}	V_{OUT} = 3.3V, I_{OUT} = 500mA		152		mV
Output Current Limit	I_{LIM}	V_{OUT} = 0V	500			mA
Line Regulation	$\Delta V_{OUT(LINE)}$	V_{IN} = V_{OUT} +1V to 6.5V		0.03		mV/V
Load Regulation	ΔV_{OUT} /($V_{OUT}\Delta I_{OUT}$)	V_{IN} = 6V, I_{OUT} = 1mA to 500mA		0.3		%/A
EN pin low-level input voltage (device disabled)	$V_{IL(EN)}$				0.5	V
EN pin high-level input voltage (device enabled)	$V_{IH(EN)}$		1.6			V
EN PIN Leakage Current	I_{EN}	V_{EN} = 6.5V		0.8		μA
Power Supply Ripple Rejection	PSRR	f = 1kHz, V_{OUT} = 3.3V, I_{OUT} = 500mA		64		dB
Output Noise Voltage	V_N	BW = 300Hz to 50kHz, C_{BYP} = 10nF, C_{OUT} = 2.2μF, V_{OUT} = 1.8V, I_{OUT} = 500mA		45		μV
Thermal Shutdown Temperature	TSD			160		°C
Thermal Shutdown Hysteresis	T_{HYS}			20		°C

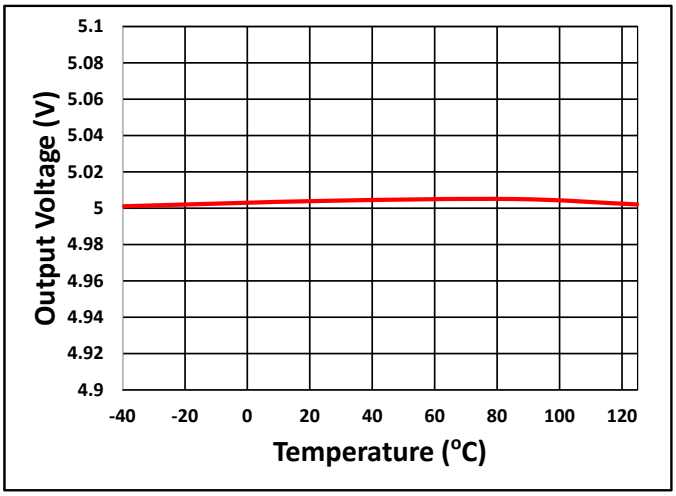
Typical Characteristics

C_{IN} = 1μF, C_{OUT} = 2.2μF, I_{OUT} = 500mA, T_A = 25°C unless otherwise noted



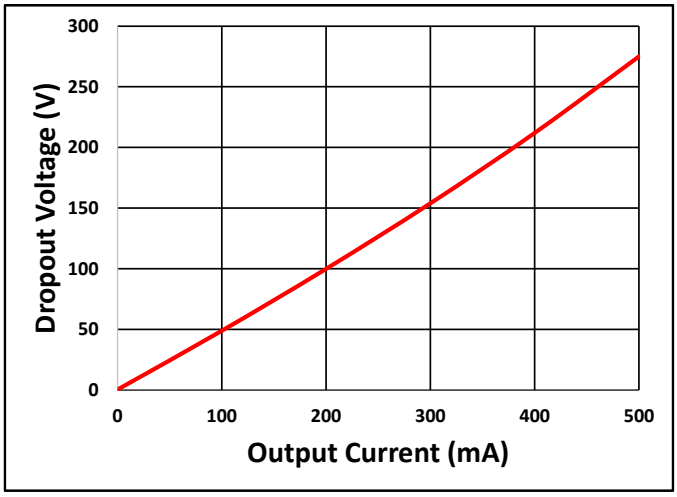
V_{IN} = 6V, V_{OUT} = 3.3V, I_{OUT} = 500mA, C_{OUT} = 2.2μF

Fig. 1 PSRR



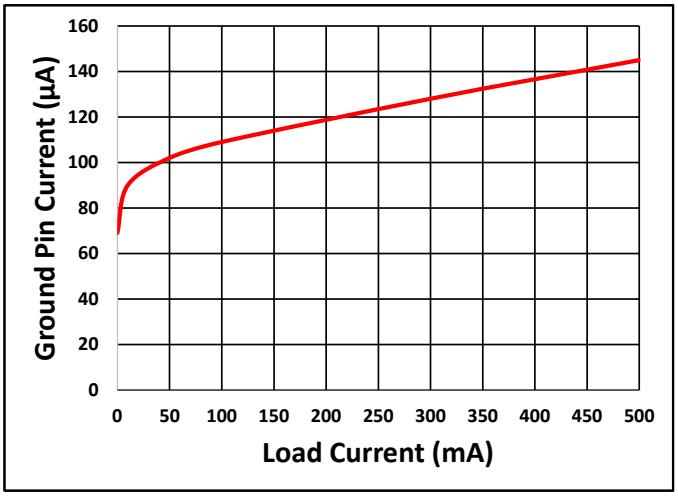
V_{IN} = 6V, V_{OUT} = 3.3V, I_{OUT} = 0.1mA

Fig. 2 Output Voltage vs Temperature



V_{IN} = 6V

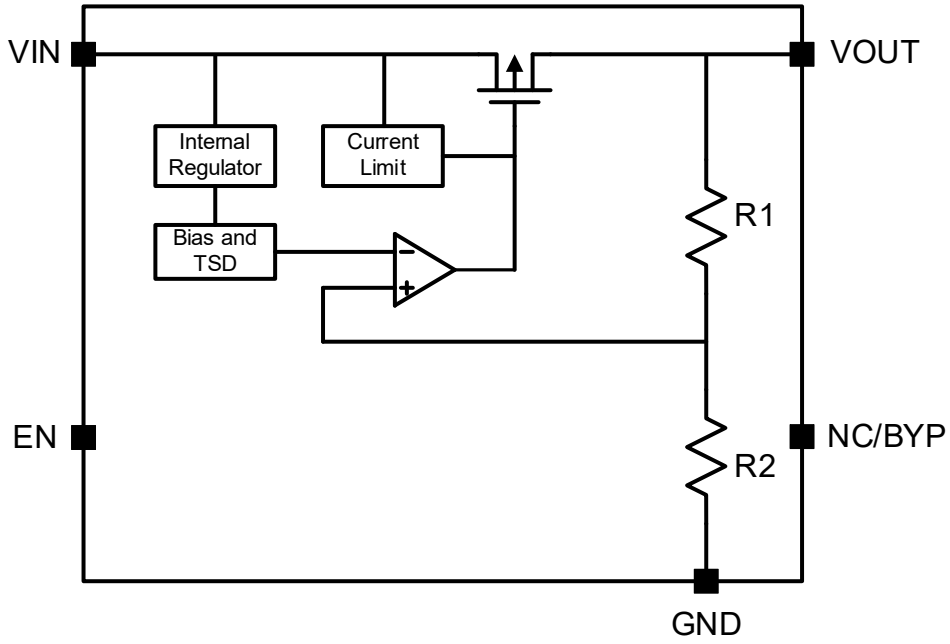
Fig. 3 Dropout Voltage



V_{IN} = 2.5V

Fig. 4 Ground Current vs Load Current

Functional Block Diagram



Feature Description

Enable

The enable pin for the LDO is active high. The device is enabled when the enable pin voltage is greater than $V_{IH(EN)}$ and disabled with the enable pin voltage less than $V_{IL(EN)}$. If independent control of chip enable is not needed, then connect the enable pin to the input. The LDO has an internal pulldown MOSFET that connects a discharge resistor from V_{OUT} to ground when the device is disabled to actively discharge the output voltage.

Output Current Limit

When overload events happen, the output current is internally limited.

Undervoltage Lockout (UVLO)

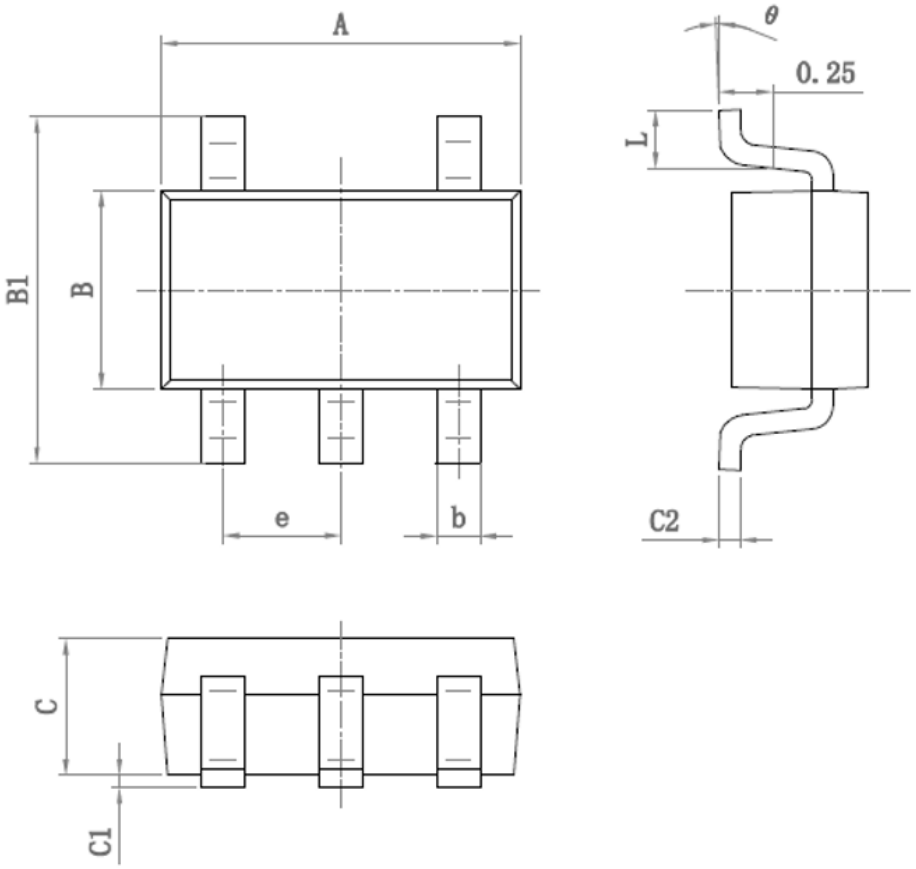
The LDO uses an undervoltage lockout circuit to keep the output shut off until the internal circuitry is operating properly.

Thermal Protection

The LDO contains a thermal shutdown protection circuit to turn off the output current when excessive heat is dissipated in the LDO.

PACKAGE OUTLINE DIMENSIONS

SOT23-5



Symbol	Dimensions (mm)		Symbol	Dimensions (mm)	
	Min	Max		Min	Max
A	2.82	3.02	C	1.05	1.15
e	0.95 (BSC)		C1	0.03	0.15
b	0.28	0.45	C2	0.12	0.23
B	1.50	1.70	L	0.35	0.55
B1	2.60	3.00	θ	0°	8°