

## Micropower 300mA Low-Noise Ultra-Low-Dropout Regulator

### Features

- Input Voltage Range: 2.5V to 20V
- Output Voltage Range:
  - Fixed: 2.5V to 5.0V
- Maximum output current: 300mA
- Low Dropout Voltage: 152mV at 300mA
- Low Noise When Using External Bypass Cap
- Output Voltage Accuracy: 2% over Line, Load and Temperature
- Excellent Load and Line Transient Responses
- Thermal Shutdown and Over-Current Protection
- Stable with 1 $\mu$ F or Larger Ceramic Capacitor
- Operating Junction Temperature: -40°C to +125°C
- Available packages: SOT23-5

### Description

The device is a fixed-output, wide-input, low-noise, low-dropout voltage regulator supporting an input voltage range from 2.5V to 20V and up to 300mA of load current. The device supports an output range of 2.5V to 5.0V.

Additionally the device has a 2% output accuracy across load, line and temperature that can meet the needs of low-voltage microcontrollers (MCUs) and processors.

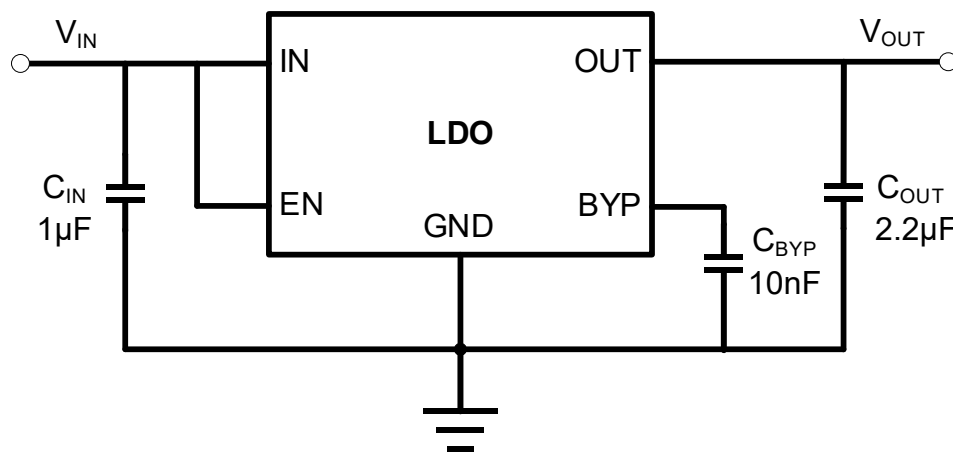
Low output noise (with 10nF bypass capacitor) and wide bandwidth PSRR help attenuate the switching noise of an upstream DC/DC converter and minimize post regulator filtering.

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

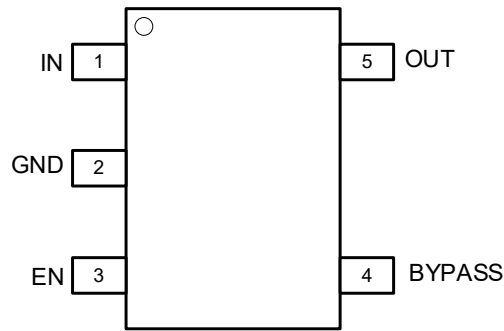
- Cellular Phones
- Laptop computers
- Portable Equipment
- Battery-Powered Systems
- High-Efficiency Linear Power Supplies

### Typical Application Circuits



Low Noise Fixed Output Voltage

## 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 1 $\mu$ F 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	BYPASS	I	Connect an external 10nF capacitor from this pin to ground can reduce the output to very low noise levels. This pin can be left open if low noise at the output is not required.
5	OUT	O	Regulator output voltage pin. A 1 $\mu$ F or larger ceramic capacitor from OUT to ground is required to ensure regulator stability.

## Package/Ordering Information

ORDERABLE DEVICE	PACKAGE TYPE	MARKING	OUTPUT VOLTAGE	PACKING OPTION
LP2985AIM5-2.5/NOPB	SOT23-5	LAUB	2.5V	Tape and Reel, 3000
LP2985AIM5-3.0/NOPB	SOT23-5	L0OB	3.0V	Tape and Reel, 3000
LP2985AIM5-3.3/NOPB	SOT23-5	L0RB	3.3V	Tape and Reel, 3000
LP2985AIM5-5.0/NOPB	SOT23-5	L0UA	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 22	V
Storage temperature range	T <sub>STG</sub>	-65 to +150	°C
Output current	I <sub>OUT</sub>	300	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 <sub>ESD</sub>	Electrostatic Discharge	HBM (Human Body Model)	3000
		CDM (Charge Device Model)	1000

### Recommended Operation Conditions

Over operating temperature range unless otherwise noted

Parameter	Symbol	Min	Max	Unit
Input Supply Voltage	V <sub>IN</sub>	2.5	20	V
Enable Input Voltage	EN	0	20	V
Output Voltage	V <sub>OUT</sub>	1.2	5.0	V
Output Capacitance	C <sub>OUT</sub>	2.2	47	μF
Output Current	I <sub>OUT</sub>	0	300	mA
Operating Junction Temperature	T <sub>J</sub>	-40	125	°C

### Thermal Information

Package	R <sub>θJA</sub>	Unit
SOT23-5	205	°C/W

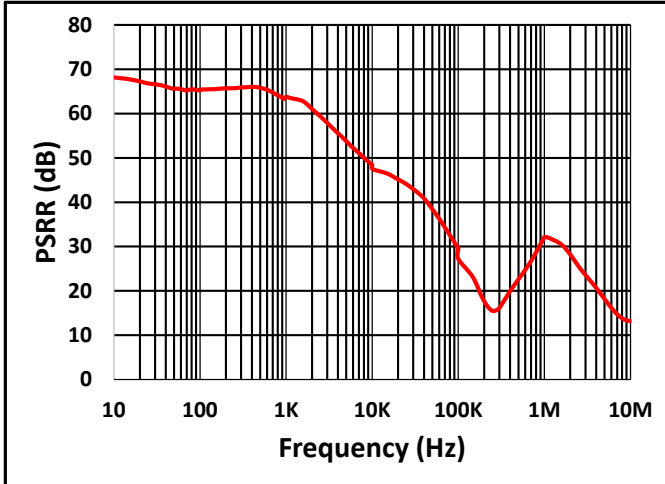
## Electrical Characteristics

$V_{IN} = 2.5V$  or  $V_{IN} = V_{OUT} + 1V$  (whichever is greater),  $I_{OUT} = 1mA$ ,  $C_{OUT} = 2.2\mu F$ , typical values are at  $T_A = 25^\circ C$  unless otherwise noted

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input Voltage	$V_{IN}$		2.5	-	20	V
Output Voltage Accuracy		$0.1mA \leq I_{OUT} \leq 300mA$	-2.0	0	2.0	%
GND Pin Current	$I_{GND}$	$V_{IN} = 2.5V$ , No Load		69		$\mu A$
		$V_{IN} = 2.5V$ , $I_{OUT} = 300mA$		156		$\mu A$
Shutdown Current	$I_{SHDN}$	$V_{IN} = 2.5V$ , $V_{EN} = 0V$		2.3		$\mu A$
Dropout Voltage	$V_{DO}$	$V_{OUT} = 3.3V$ , $I_{OUT} = 300mA$		152		mV
Output Current Limit	$I_{LIM}$	$V_{OUT} = 0$	300			mA
Line Regulation	$\Delta V_{OUT(LINE)}$	$V_{IN} = V_{OUT} + 1V$ to 20V		0.05		mV/V
Load Regulation	$\frac{\Delta V_{OUT}}{(V_{OUT} \Delta I_{OUT})}$	$V_{IN} = 6V$ , $I_{OUT} = 1mA$ to 300mA		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	$I_{EN}$	$V_{EN} = 20V$		0.8		$\mu A$
Power Supply Ripple Rejection	PSRR	$f = 1kHz$ , $V_{OUT} = 5V$ , $I_{OUT} = 300mA$		64		dB
Output Noise Voltage	$V_N$	BW = 300Hz to 50kHz, $C_{BYP} = 10nF$ , $C_{OUT} = 2.2\mu F$ , $V_{OUT} = 1.8V$ , $I_{OUT} = 300mA$		45		$\mu V$
Thermal Shutdown Temperature	TSD			160		$^\circ C$
Thermal Shutdown Hysteresis	$T_{HYS}$			20		$^\circ C$

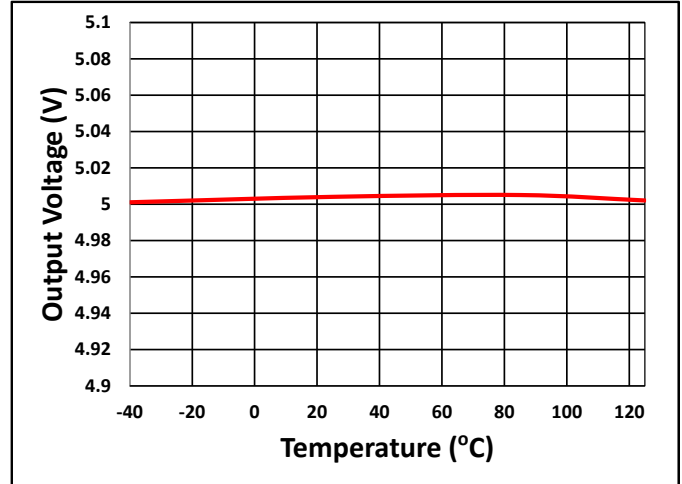
## Typical Characteristics

$C_{IN} = 1\mu F$ ,  $C_{OUT} = 2.2\mu F$ ,  $I_{OUT} = 300mA$ ,  $T_A = 25^\circ C$  unless otherwise noted



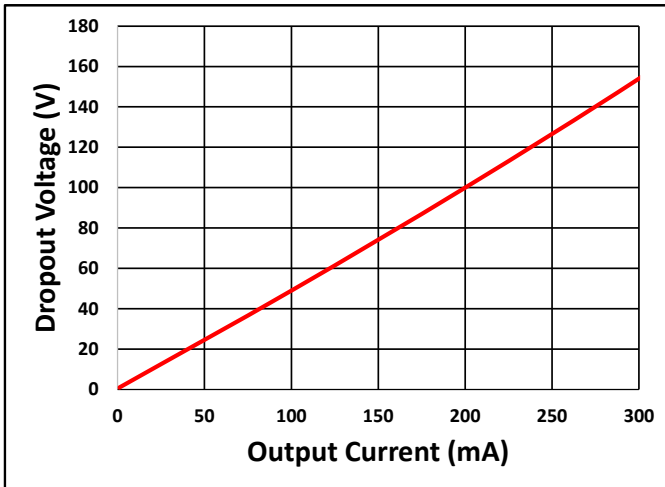
$V_{IN} = 6V$ ,  $V_{OUT} = 5V$ ,  $I_{OUT} = 300mA$ ,  $C_{OUT} = 2.2\mu F$

**Fig. 1 PSRR**



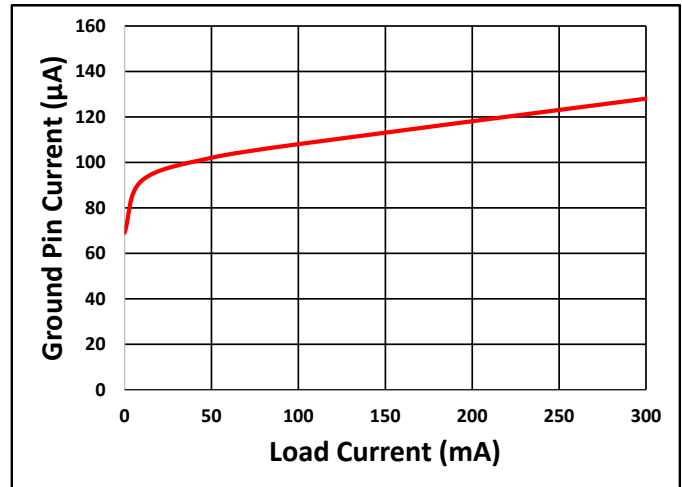
$V_{IN} = 6V$ ,  $V_{OUT} = 5V$ ,  $I_{OUT} = 0.1mA$

**Fig. 2 Output Voltage vs Temperature**



$V_{IN} = 6V$

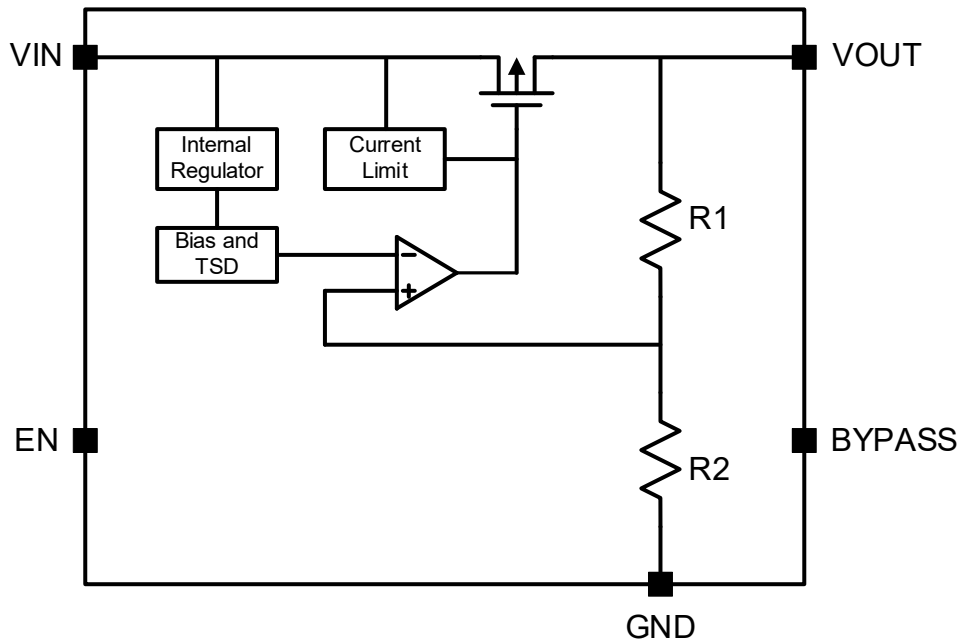
**Fig. 3 Dropout Voltage**



$V_{IN} = 6V$

**Fig. 4 Ground Current vs Load Current**

## Functional Block Diagram



Block Diagram of Fixed Output Voltage

## 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 VOUT 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)**

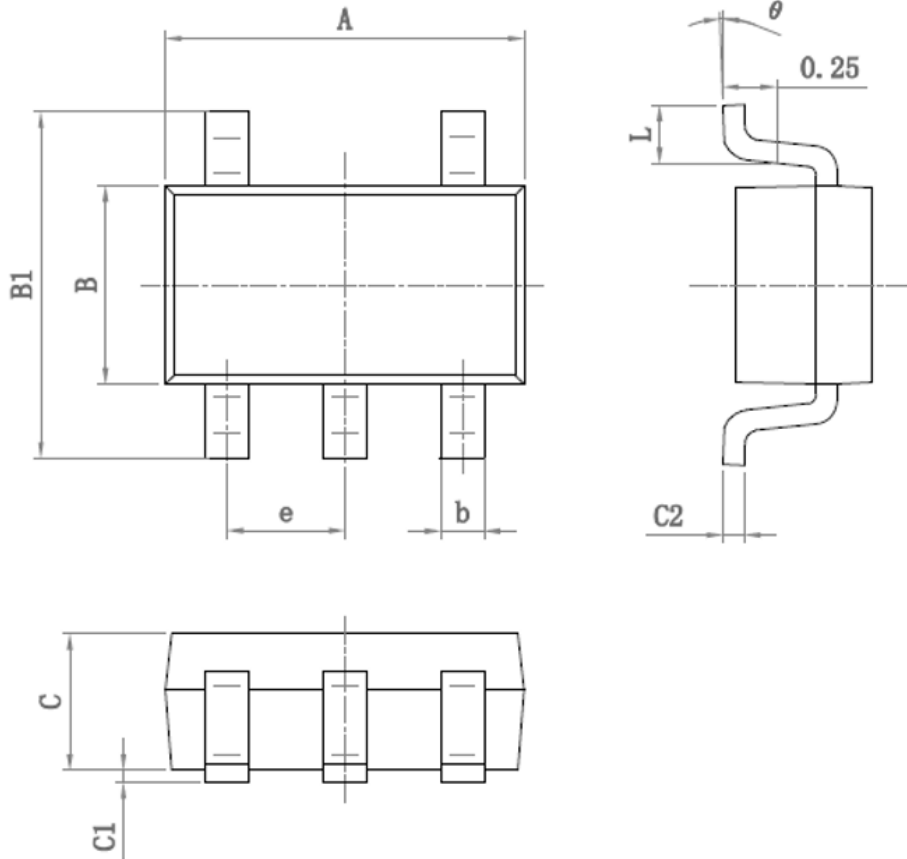
The LDO uses an undervoltage lockout circuit to keep the output shut off until the internal circuitry is operating properly.

**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°