300mA,Ultra-low noise, Small Package Ultra-Fast CMOS LDO Regulator

General Description

The LP3985 is designed for portable RF and wireless applications with demanding performance and space requirements. The LP3985 performance is optimized for battery-powered systems to deliver ultra low noise and low quiescent current. The LP3985 also works with low-ESR ceramic capacitors, reducing the amount of board space necessary for power applications, critical in hand-held wireless devices. The other features include ultra low dropout voltage, high output accuracy, current limiting protection, and high ripple rejection ratio. It is available in the 5-lead of SOT23-3 and SOT89-3 packages.

Features

- Ultra-Low-Noise for RF Application
- 2.5V- 5.5V Input Voltage Range
- Low Dropout : 300mV @ 300mA
- 300mA Output Current
- High PSSR:-68dB at 1KHz
- 1uA Standby Current When Shutdown
- Available in SOT23-3/SOT89-3 Package
- TTL-Logic-Controlled Shutdown Input
- Ultra-Fast Response in Line/Load transient
- Current Limiting and Thermal Shutdown Protection

Order Information

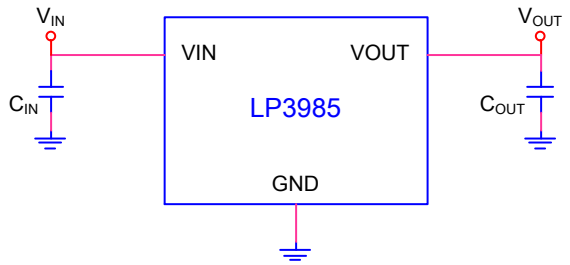
LP3985 □□ □□ □

- F: Pb-Free
- Package Type
  - B3: SOT23-3
  - X3: SOT89-3
- Output Type
  - 12 : 1.2V
  - 15 : 1.5V
  - 18 : 1.8V
  - 25 : 2.5V
  - 28 : 2.8V
  - 30 : 3.0V
  - 33 : 3.3V
  - 36 : 3.6V

Applications

- Portable Media Players/MP3 players
- Cellular and Smart mobile phone
- LCD
- DSC Sensor
- Wireless Card

Typical Application Circuit

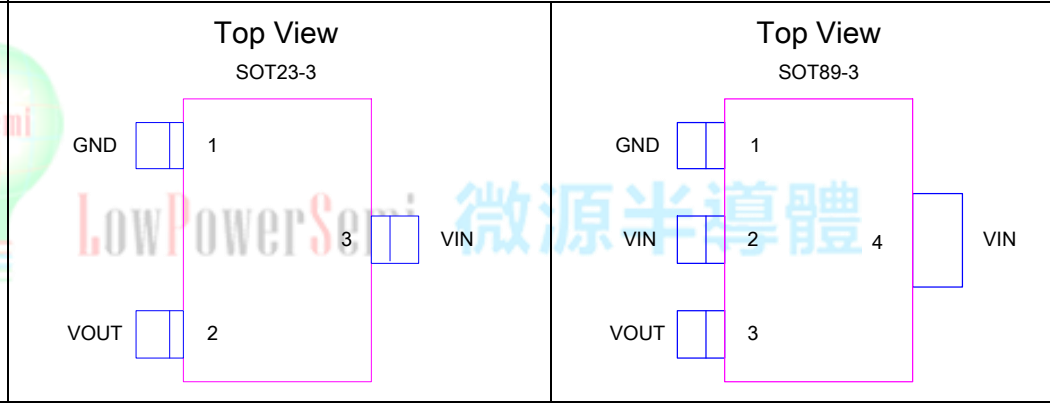


Marking Information

Device	Marking	Package	Shipping
LP3985-12B3F	LPS 5bYWX	SOT23-3	3K/REEL
LP3985-12X3F		SOT89-3	1K/REEL
LP3985-15B3F	LPS 6nYWX	SOT23-3	3K/REEL
LP3985-15X3F		SOT89-3	1K/REEL
LP3985-18B3F	LPS 6cYWX	SOT23-3	3K/REEL
LP3985-18X3F		SOT89-3	1K/REEL
LP3985-25B3F	LPS 6dYWX	SOT23-3	3K/REEL
LP3985-25X3F		SOT89-3	1K/REEL
LP3985-28B3F	LPS 6hYWX	SOT23-3	3K/REEL
LP3985-28X3F		SOT89-3	1K/REEL

Device	Marking	Package	Shipping
LP3985-30B3F	LPS 6gYWX	SOT23-3	3K/REEL
LP3985-30X3F		SOT89-3	1K/REEL
LP3985-33B3F	LPS 6eYWX	SOT23-3	3K/REEL
LP3985-33X3F		SOT89-3	1K/REEL
LP3985-36B3F	LPS 6mYWX	SOT23-3	3K/REEL
LP3985-36X3F		SOT89-3	1K/REEL
Marking indication: Y: Y is year code. W: W is week code. X: X is series number.			

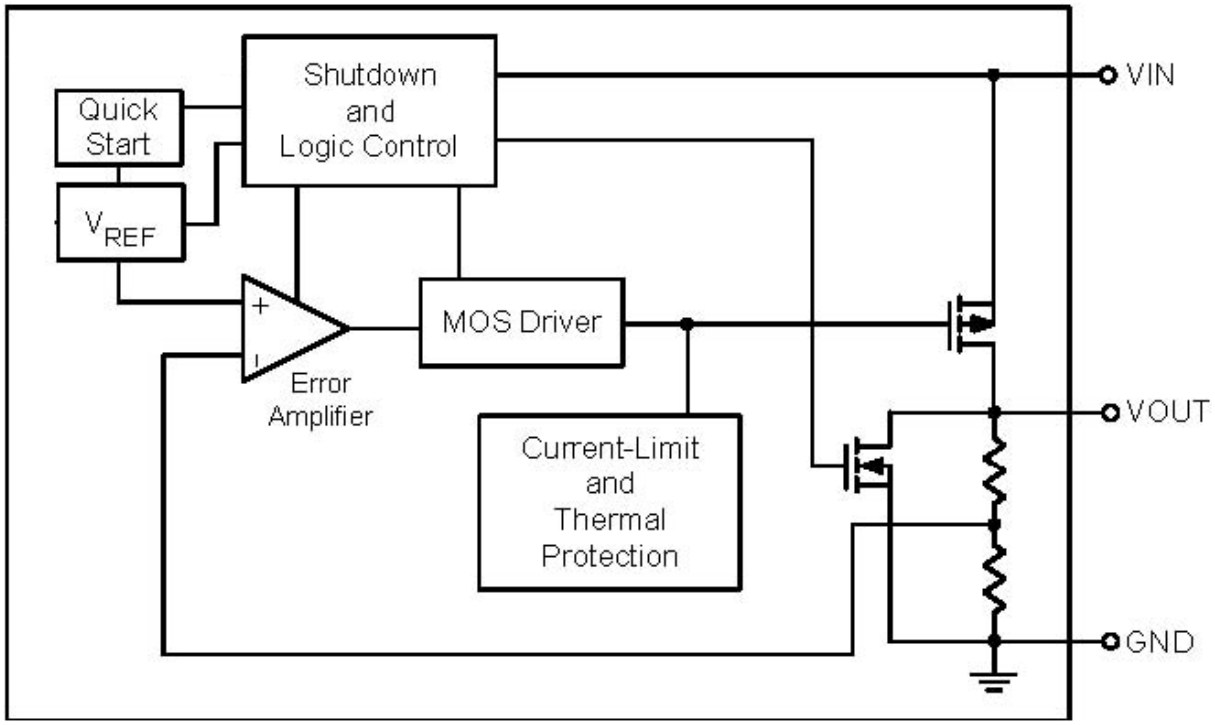
Functional Pin Description

Package Type	Pin Configurations
SOT23-3 / SOT89-3	

Pin Description

Pin		Name	Description
SOT23-3	SOT89-3		
3	2,4	VIN	Power Input Voltage.
2	3	VOUT	Output Voltage.
1	1	GND	Ground.

Function Diagram



Absolute Maximum Ratings

- ✧ Supply Input Voltage ---------- 6.5V
- ✧ Other Pin Voltage ---------- -0.3V to V_{IN}+0.3V

Power Dissipation, PD @ TA = 25℃

- ✧ SOT23-3 ---------- 350mW
- ✧ SOT89-3---------- 700mW

Package Thermal Resistance

- ✧ Thermal Resistance (SOT23-3) (J_A) ---------- 350℃/W
- ✧ Thermal Resistance (SOT89-3) (J_A) ---------- 165℃/W
- ✧ Maximum Junction Temperature ---------- 150℃
- ✧ Maximum Soldering Temperature (at leads, 10 sec) ---------- 260℃
- ✧ Storage Temperature Range ---------- −65℃ to 150℃

ESD Susceptibility

- ✧ HBM (Human Body Mode) ---------- 2kV
- ✧ MM (Machine-Mode) ---------- 200V

Recommended Operating Conditions

- ✧ Supply Input Voltage ---------- 2.5V to 5.5V
- ✧ EN Input Voltage ---------- 0V toV_{IN}+0.3V
- ✧ Operation Junction Temperature Range ---------- −40℃ to 125℃
- ✧ Operation Ambient Temperature Range ---------- −40℃ to 85℃

Electrical Characteristics

(V_{IN} = V_{OUT} + 1V, C_{IN} = C_{OUT} = 1μF, T_A = 25° C, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ.	Max	Units
Output Voltage Accuracy	ΔV_{OUT}	I_{OUT}=1mA	−2	--	+2	%
Output Loading Current	I_{LOAD}	V_{IN} >2.8V		300		mA
Current Limit	I_{LIM}	R_{LOAD}=1Ω		500		mA
Quiescent Current	I_Q	IOUT=0mA		50	130	μA
Dropout Voltage	V_{DROP}	IOUT=200mA, V_{OUT}>2.5V		200	240	mV
		IOUT=300mA, V_{OUT}>2.5V		300	360	
Line Regulation	ΔV_{LINE}	V_{IN}=(V_{OUT}+1V) to 5.5V, I_{OUT}=50mA			0.2	%/V
Load Regulation	ΔL_{OAD}	1mA<I_{OUT}<300mA			2	%/A
Output Noise Voltage		10Hz to 100kHz, I_{OUT}=200mA, C_{OUT}=1μF		300		uVRMS
Power Supply Rejection Rate	PSRR	C_{OUT}=1μF, f = 1kHz, I_{OUT}=100mA		-68		dB
		C_{OUT}=1μF, f = 10kHz, I_{OUT}=100mA		-60		dB
Thermal Shutdown Temperature	T_{SD}			150		℃

Applications Information

Like any low-dropout regulator, the external capacitors used with the LP3985 must be carefully selected for regulator stability and performance. Using a capacitor whose value is > 1μF on the LP3985 input and the amount of capacitance can be increased without limit. The input capacitor must be located a distance of not more than 0.5 inch from the input pin of the IC and returned to a clean analog ground. Any good quality ceramic or tantalum can be used for this capacitor. The capacitor with larger value and lower ESR (equivalent series resistance) provides better PSRR and line-transient response. The output capacitor must meet both requirements for minimum amount of capacitance and ESR in all LDOs application. The LP3985 is designed specifically to work with low ESR ceramic output capacitor in space-saving and performance consideration. Using a ceramic capacitor whose value is at least 1μF with ESR is > 25mΩ on the LP3985 output ensures stability. The LP3985 still works well with output capacitor of other types due to the wide stable ESR range. Output capacitor of larger capacitance can reduce noise and improve load transient response, stability, and PSRR. The output capacitor should be located not more than 0.5 inch from the VOUT pin of the LP3985 and returned to a clean analog ground.

Thermal Considerations

Thermal protection limits power dissipation in LP3985. When the operation junction temperature exceeds 150℃, the OTP circuit starts the thermal shutdown function turn the pass element off. The pass element turns on again after the junction temperature cools by 20℃. For continue operation, do not exceed absolute maximum operation junction temperature 125℃.

The power dissipation definition in device is:

$$P_D = (V_{IN}-V_{OUT}) \times I_{OUT} + V_{IN} \times I_Q$$

The maximum power dissipation depends on the thermal resistance of IC package, PCB layout, the rate of surroundings airflow and temperature difference between junction to ambient.

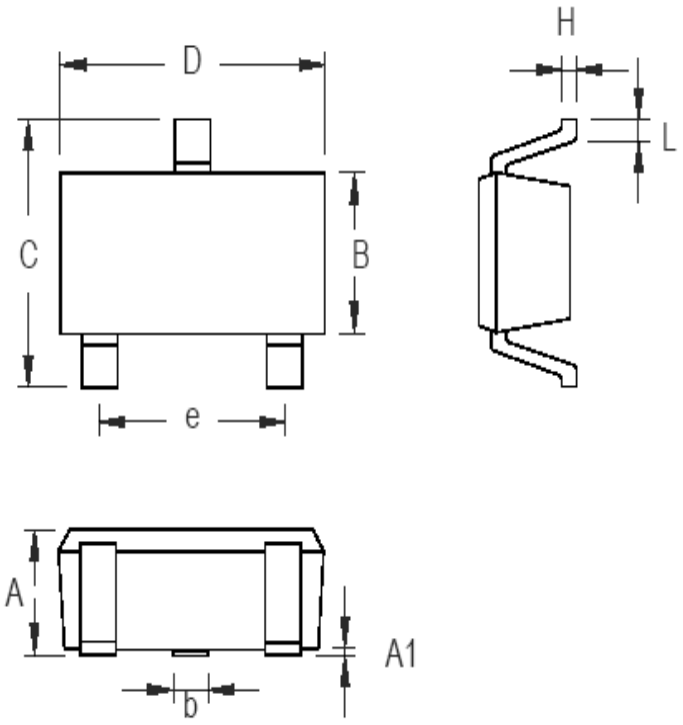
The maximum power dissipation can be calculated by following formula:

$$P_{D(MAX)} = (T_{J(MAX)} - T_A) / \theta_{JA}$$

Where $T_{J(MAX)}$ is the maximum operation junction temperature 125℃, T_A is the ambient temperature and the θ_{JA} is the junction to ambient thermal resistance.

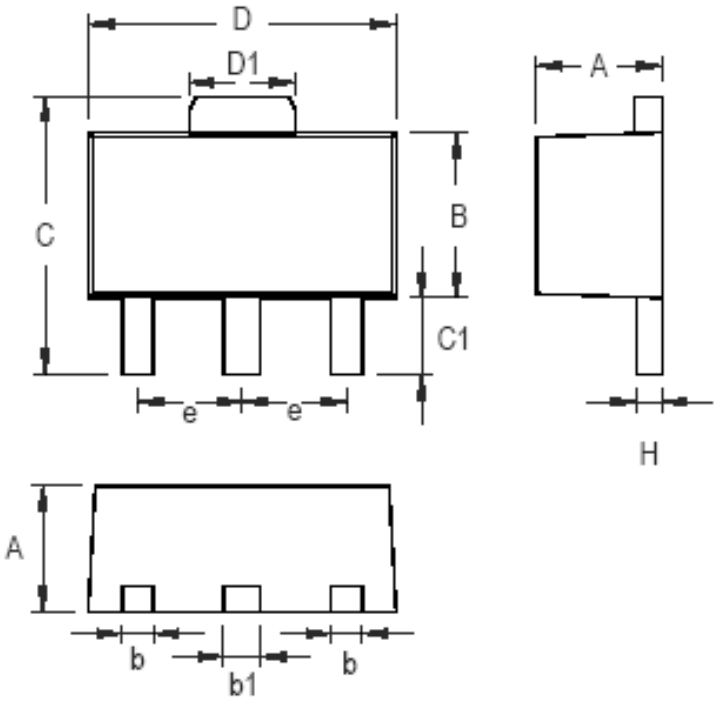
Packaging Information

SOT23-3



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	0.889	1.295	0.035	0.051
A1	0.000	0.152	0.000	0.006
B	1.200	1.450	0.047	0.057
b	0.340	0.510	0.013	0.020
C	2.200	2.600	0.087	0.102
D	2.692	3.099	0.106	0.122
e	1.803	2.007	0.071	0.079
H	0.070	0.254	0.003	0.010
L	0.160	0.500	0.006	0.020

SOT89-3



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.397	1.600	0.055	0.063
b	0.356	0.483	0.014	0.019
B	2.388	2.591	0.094	0.102
B1	0.406	0.533	0.016	0.021
C	3.937	4.242	0.155	0.167
C1	0.787	1.194	0.031	0.047
D	4.394	4.597	0.173	0.181
D1	1.397	1.753	0.055	0.069
e	1.448	1.549	0.057	0.061
H	0.356	0.432	0.014	0.017