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

ELP3990

General Description

The ELP3990 is designed for portable RF and wireless applications with demanding performance and space requirements. The ELP3990 performance is optimized for battery-powered systems to deliver ultra low noise and low quiescent current. The ELP3990 also works with low-ESR ceramic capacitors, reducing the amount of board space necessary for power applications critical in hand-held wireless devices. The ELP3990 consumes less than 0.01µA in shutdown mode and has fast turn-on time less than 50µs. The other features include ultra low dropout voltage, high output accuracy, current limiting protection, and high ripple rejection ratio. It is available in the DFN (1mm × 1mm) packages.

Features

◆Ultra-thin Package
◆2V- 5.5V Input Voltage Range
◆Low Dropout : 130mV @ 200mA
◆1.2V, 1.5V, 1.8V, 2.5V, 2.8V,3.0V,3.3V, 3.6Vand 5V Fixed
◆300mA Output Current, 450mA Peak Current
◆High PSSR:-75dB at 1KHz
◆< 0.01uA Standby Current When Shutdown
◆Available in DFN (1mm × 1mm) Package
◆TTL-Logic-Controlled Shutdown Input
◆Ultra-Fast Response in Line/Load transient
◆Current Limiting and Thermal Shutdown Protection
◆Quick start-up (typically 50uS)

Applications

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

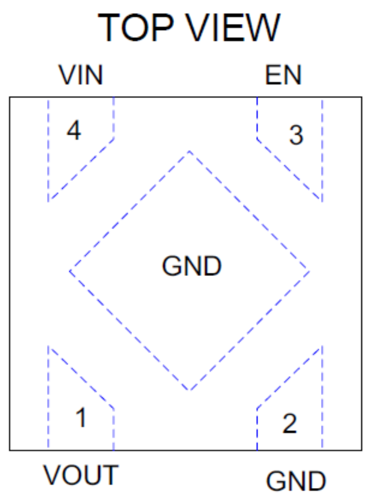
Ordering Information

ELP3990 XX XX X

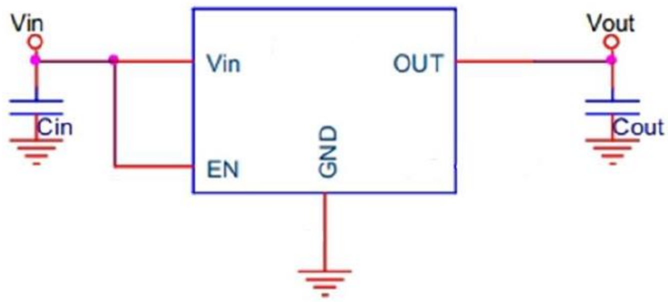
- X → R：Tape & Reel
- XX → F10：DFN1*1
- XX → Output Voltage Type：

12: 1.2V
15: 1.5V
18: 1.8V
25: 2.5V
28: 2.8V
30: 3.0V
33: 3.3V
50: 5.0V

Pin Configurations



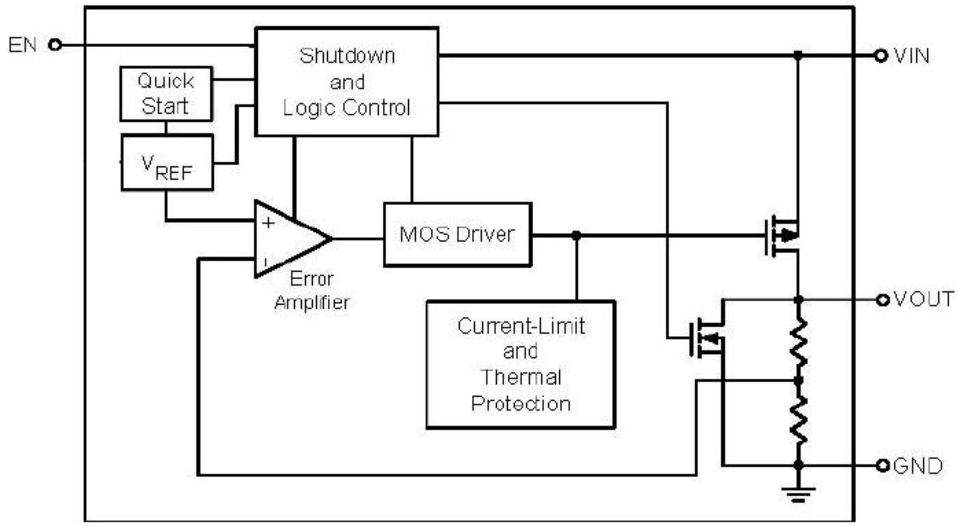
Typical Application Circuit



Functional Pin Description

PIN	Pin Name	Pin Function
1	VOUT	Output Voltage.
2	GND	Ground.
3	EN	Chip Enable (Active High). Note that this pin is high impedance. There is an integrated pull low 100kΩ resistor connected to GND when the control signal is floating.
4	VIN	Power Input Voltage.

Function Block Diagram



Absolute Maximum Ratings

◆Supply Input Voltage-- 6V
◆EN Voltage--- -0.3V to VIN+0.3V

Power Dissipation, PD @ TA = 25°C

DFN1*1 --- 390mW

Package Thermal Resistance

DFN1*1, θJA --- 256°C/W
Lead Temperature (Soldering, 10 sec.) --- 260°C
Storage Temperature Range -- −65°C to 150°C

ESD Susceptibility

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

Recommended Operating Conditions

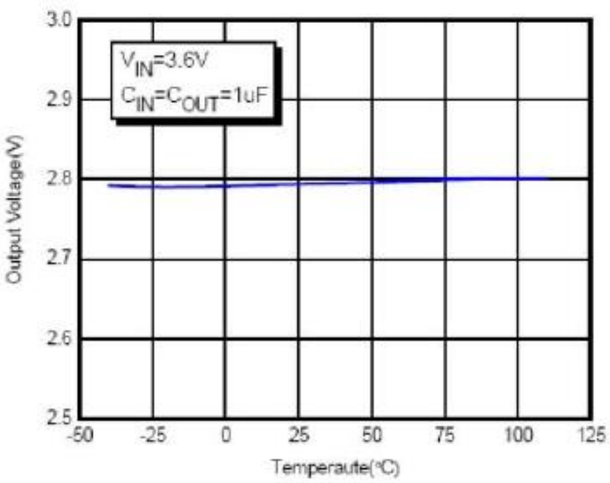
Supply Input Voltage--- 2.5V to 5.5V
EN Input Voltage -- 0V to5.5V
Operation Junction Temperature Range --- −40°C to 125°C
Operation Ambient Temperature Range--- −40°C to 85°C

Electrical Characteristics (VIN=VOUT+1V,CIN=COUT=1μF,TA=25°C,unless otherwise specified)

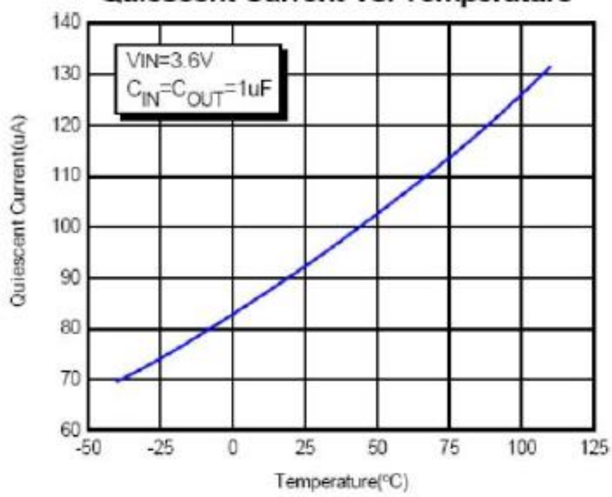
Parameter		Symbol	Test Conditions	Min	Typ.	Max	Units
Output Voltage Accuracy		ΔVOUT	IOUT = 1mA	−2	--	+2	%
Output Loading Current		I_{LOAD}	VEN=VIN,VIN>2.5V		300		mA
Current Limit		ILIM	RLOAD = 1Ω	350	450		mA
Quiescent Current		IQ	VEN ≥ 1.2V, IOUT = 0mA		75	130	μA
Dropout Voltage		VDROP	IOUT=200mA, VOUT>2.8V		130	200	mV
			IOUT=300mA, VOUT>2.8V		220	300	
Line Regulation		ΔVLINE	VIN = (VOUT + 1V) to 5.5V, IOUT = 1mA			0.2	%/V
Load Regulation		ΔLOAD	1mA < IOUT < 200mA			2	%/A
Standby Current		ISTBY	VEN = GND, Shutdown		0.01	1	μA
EN Input Bias Current		IIBSD	VEN = GND or VIN		2	1500	nA
EN Threshold	Logic-Low Voltage	VIL	VIN = 3V to 5.5V,Shutdown			0.4	V
	Logic-High Voltage	VIH	VIN = 3V to 5.5V,Start-Up	1.4			
Output Noise Voltage			10Hz to 100kHz, IOUT = 200mA, COUT = 1μF		100		uVRMS
Power Supply Rejection Rate	f = 1kHz		COUT = 1μF, IOUT = 10mA		-75		dB
	f = 10kHz				−68		
Thermal Shutdown Temperature		TSD			165		°C

Typical Operating Characteristics

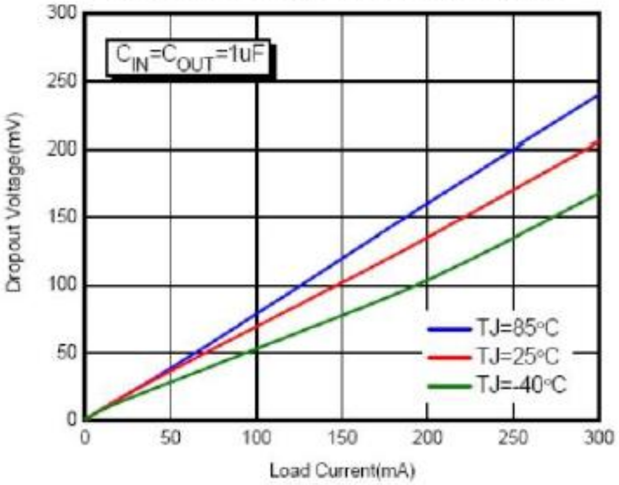
Output Voltage Vs. Temperature



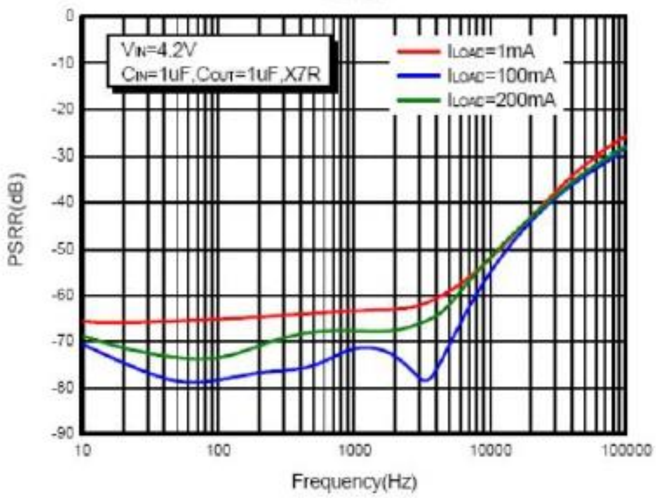
Quiescent Current Vs. Temperature



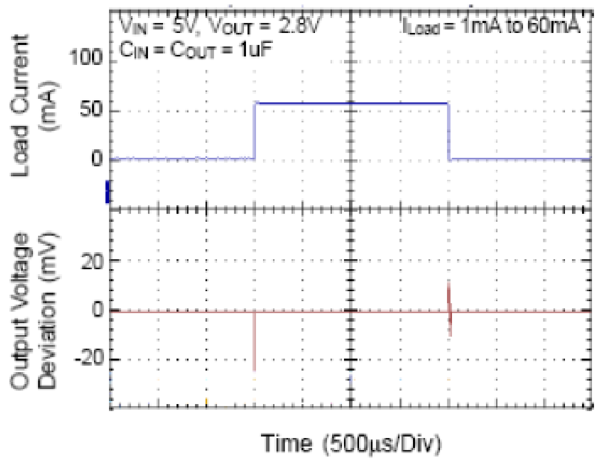
Dropout Voltage Vs. Load Current



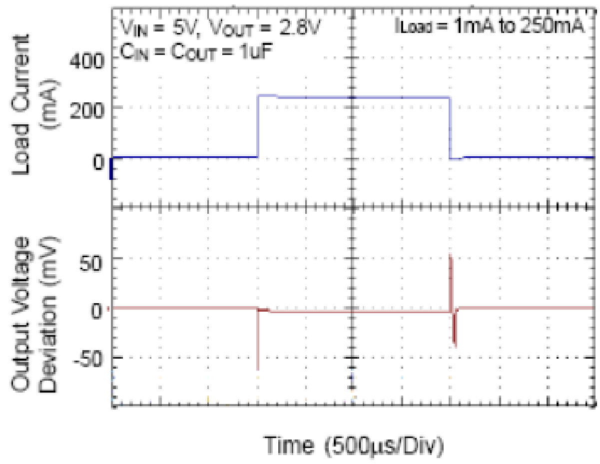
PSRR



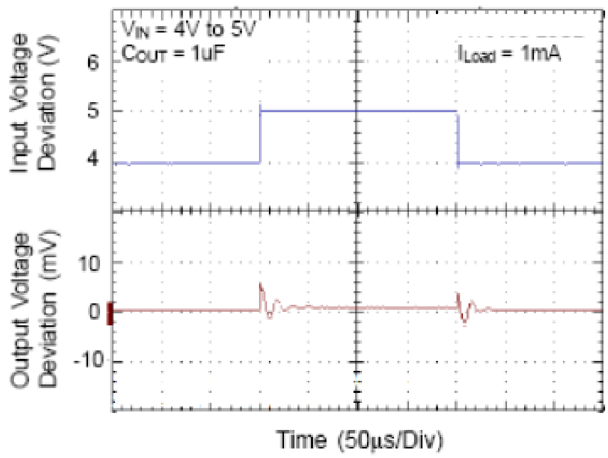
Load Transient Response



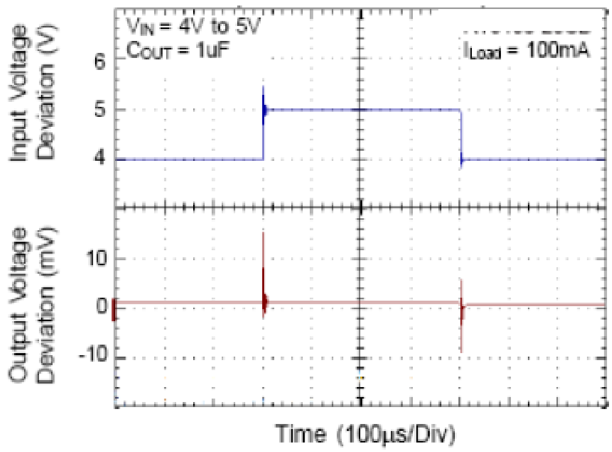
Load Transient Response



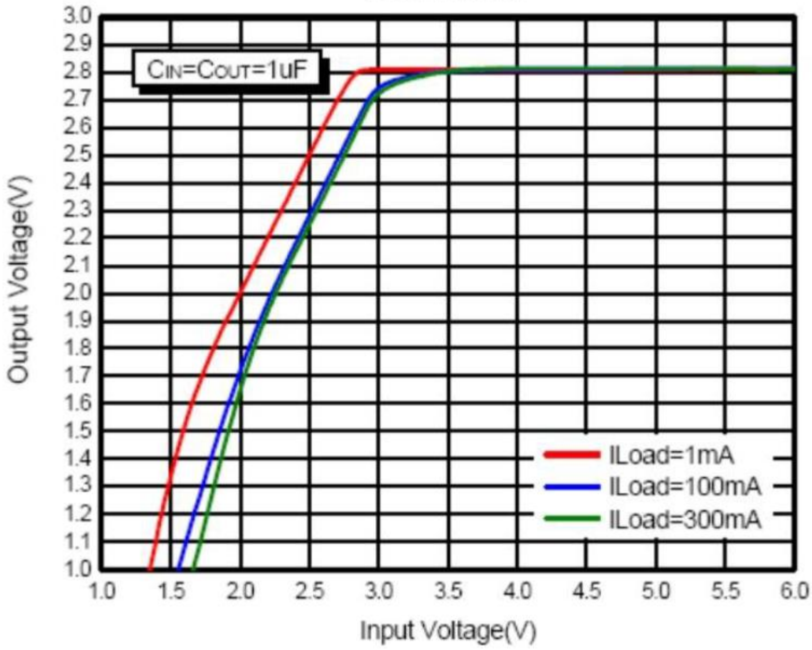
Line Transient Response



Line Transient Response



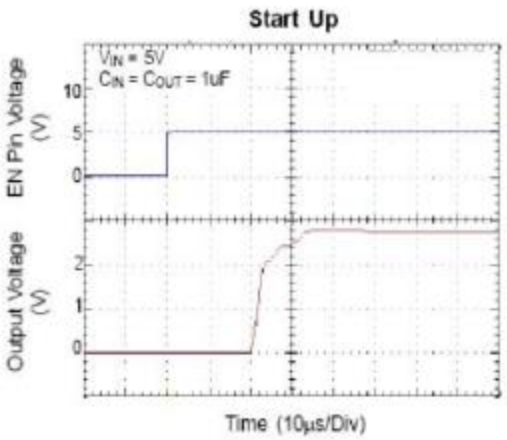
V_{OUT} Vs. V_{IN}



Applications Information

Like any low-dropout regulator, the external capacitors used with the ELP3990 must be carefully selected for regulator stability and performance. Using a capacitor whose value is > 1µF on the ELP3990 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 ELP3990 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 ELP3990 output ensures stability. The ELP3990 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 ELP3990 and returned to a clean analog ground.

Start-up Function Enable Function



The ELP3990 features an LDO regulator enable/disable function. To assure the LDO regulator will switch on, the EN turn on control level must be greater than 1.4 volts. The LDO regulator will go into the shutdown mode when the voltage on the EN pin falls below 0.4 volts. For to protecting the system, the ELP3990 have a quick-discharge function. If the enable function is not needed in a specific application, it may be tied to VIN to keep the LDO regulator in a continuously on state.

Thermal Considerations

Thermal protection limits power dissipation in ELP3990. When the operation junction temperature exceeds 165°C, 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 30°C. For continue operation, do not exceed absolute maximum operation junction temperature 125°C. The power dissipation definition in device is: **PD = (VIN−VOUT) x IOUT + VIN x IQ**

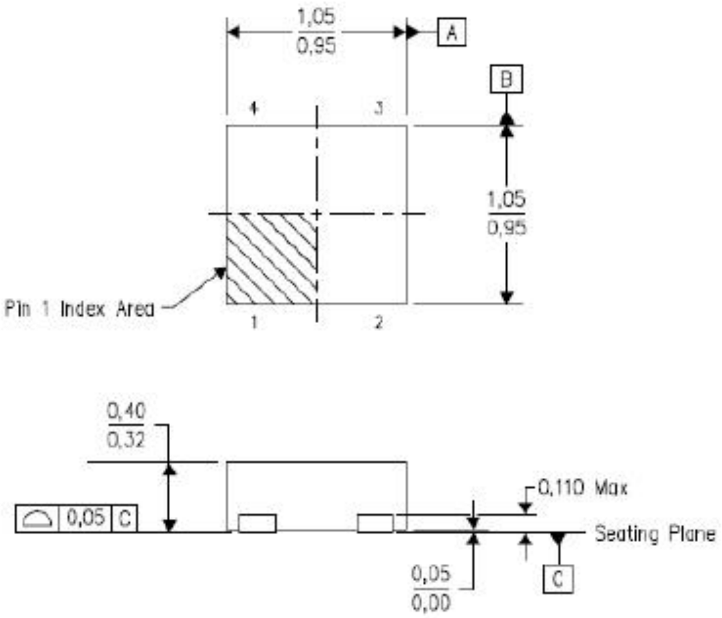
The maximum power dissipation depends on the thermal resistance of IC package, PCB layout, the rate of surroundings airflow and temperature difference between junction to ambient. The maximum power dissipation can be calculated by following formula: **PD(MAX) = (TJ(MAX) − TA) /θJA**

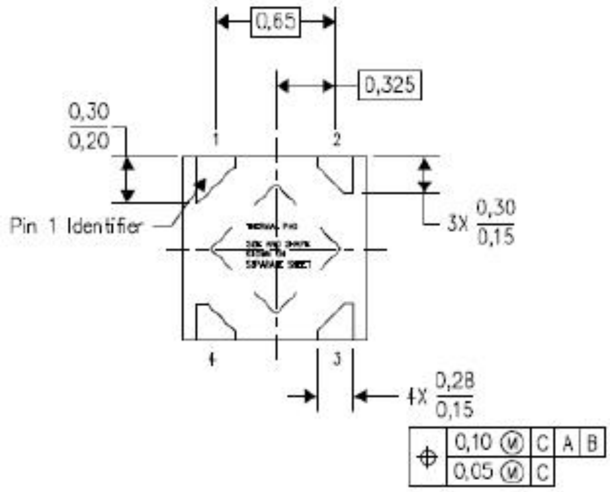
Where TJ(MAX) is the maximum operation junction temperature 125°C, TA is the ambient temperature and the θJA is the junction to ambient thermal resistance. For recommended operating conditions specification of ELP3990, where TJ(MAX) is the maximum junction temperature of the die (125°C) and TA is the maximum ambient temperature. The junction to ambient thermal resistance (θJA is layout dependent) for SOT23-5 package is 256°C/W.

PD(MAX) = (125°C−25°C) / 256 = 390mW (DFN1*1) The maximum power dissipation depends on operating ambient temperature for fixed TJ(MAX) and thermal resistance θJA.

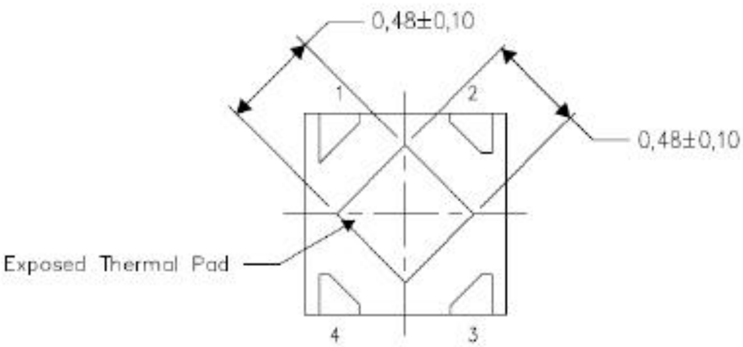
Package Information

DFN1*1





Bottom View



Bottom View

Exposed Thermal Pad Dimensions