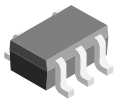
FEATURES

- Guaranteed Output Current of 150mA
- Highly Output Accuracy: ±1.0%
- Low Quiescent Current
- Very Low Dropout Voltage
- Ultra Low Noise Output
- Excellent Line and Load Regulation
- Fixed Output Voltage: 3.3V and 5.0V
- Logic Controlled Shutdown Option
- Stable with Low ESR MLCC
- Over Current Protection
- Over Temperature Protection
- Available in SOT-23-5L Package



SOT-23-5L

ORDERING INFORMATION

Device	Package
LP2985SF5-x.x	SOT-23-5L

xx: Output Voltage

APPLICATIONS

- Mobile Phones and Smart Phones
- Digital Cameras and Camcorders
- Portable Communication Devices
- GPS, PDAs and handhelds
- Battery-Powered Devices
- SMPS Post-regulator/DC to DC Modules
- High-efficiency Linear Power Supplies

DESCRIPTION

The LP2985 is an efficient linear voltage regulator with ultra-low noise output, very low dropout voltage, and very low ground current.

The LP2985 offers better than 1% initial accuracy. Designed especially for hand-held, battery-powered devices, the LP2985 includes a CMOS or TTL compatible enable/shutdown control input. When shutdown, power consumption drops nearly to zero.

Regulator ground current increases only slightly in dropout, further prolonging battery life.

Key LP2985 features include reversed-battery protection, current limiting, and over temperature shutdown.

The LP2985 is available in fixed output voltage versions in SOT-23-5 package.

ABSOLUTE MAXIMUM RATINGS (Note 1)

CHARACTERISTIC	SYMBOL	MIN	MAX	UNIT
Input Supply Voltage (Survival)	V_{IN}	−0.3	20	V
Enable Input Voltage (Survival)	V_{EN}	−0.3	20	V
Operating Junction Temperature Range	T_{JOPR}	−40	125	°C
Storage Temperature Range	T_{STG}	−65	150	°C

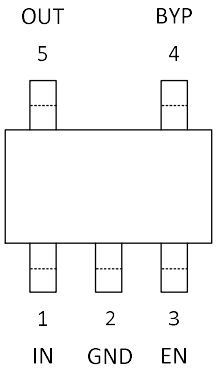
RECOMMENDED OPERATING RATINGS (Note 2)

CHARACTERISTIC	SYMBOL	MIN	MAX	UNIT
Input Supply Voltage	V_{IN}	2.0	16	V
Enable Input Voltage	V_{EN}	0	V_{IN}	V

ORDERING INFORMATION

VOUT	Package	Order No.	Description	Supplied As	Status
3.3V	SOT-23-5L	LP2985SF5-3.3	Enable, Bypass	Tape & Reel	Active
5.0V	SOT-23-5L	LP2985SF5-5.0	Enable, Bypass	Tape & Reel	Active

PIN CONFIGURATION

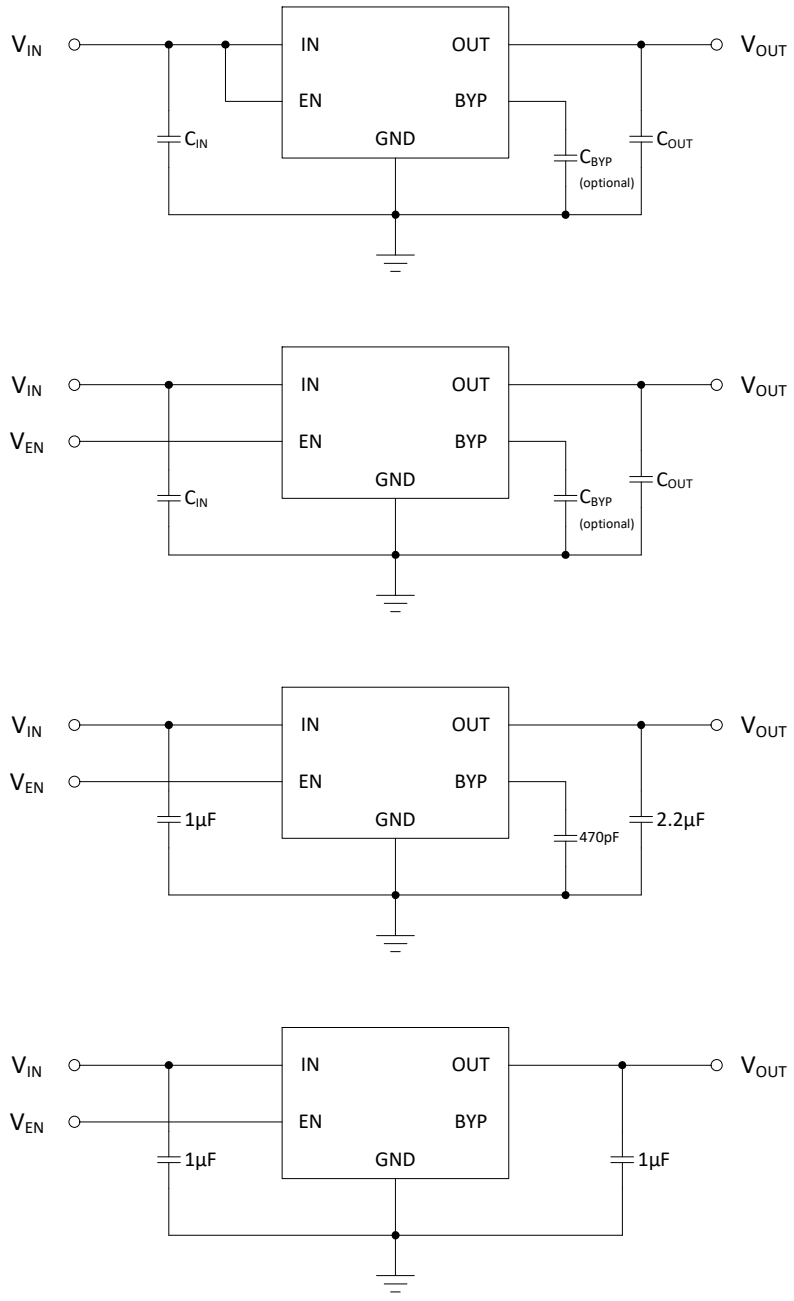


SOT-23-5L

PIN DESCRIPTION

Pin No.	Pin Name	Pin Function
1	IN	Supply Input.
2	GND	Ground.
3	EN	Enable Voltage. Active-High Enable (Active-Low Shutdown) Pin. Do Not Float. Tie to V_{IN} if unused.
4	BYP	Reference Bypass. Attach a 470 pF capacitor to improve low-noise performance. Can be left open if unused.
5	OUT	Regulator Output.

TYPICAL APPLICATION CIRCUIT



* For the details, see Application Information.

** LP2985 can deliver a continuous current of 150 mA over the full operating temperature. However, the output current is limited by the restriction of power dissipation which differs from packages. A heat sink may be required depending on the maximum power dissipation and maximum ambient temperature of application. With respect to the applied package, the maximum output current of 150 mA may be still undeliverable.

ELECTRICAL CHARACTERISTICS

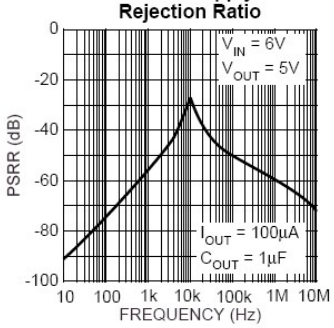
Limits in standard typeface are for T_J = 25ºC, and limits in **boldface type** apply over the **full operating temperature range**. V_{IN} = $V_{OUT(NOM)}$ + 1.0 V or V_{IN} = 2.0 V, whichever is greater; I_{OUT} = 100 µA, C_{IN} = C_{OUT} = 1.0 µF, unless otherwise specified.

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage Tolerance	V_{OUT}	(V_{OUT} + 1.0 V) < V_{IN} < 6.5 V	−1 **−2**	0	1 **2**	%
Line Regulation	LNR	(V_{OUT} + 1.0 V) < V_{IN} < 6.5 V	-	0.004	0.012 **0.05**	%/V
Load Regulation (Note 3)	LDR	100 µA ≤ I_{OUT} ≤ 150 mA	-	0.02	0.2 **0.5**	%
Dropout Voltage	V_{DROP}	I_{OUT} = 100 µA	-	10	50 **70**	mV
		I_{OUT} = 50 mA	-	110	150 **230**	
		I_{OUT} = 100 mA	-	140	250 **300**	
		I_{OUT} = 150 mA	-	165	275 **350**	
Current Limit	I_{CL}	V_{OUT} = 0 V	-	320	600	mA
Ground Current	I_{GND}	I_{OUT} = 100 µA	-	120	160 **180**	µA
		I_{OUT} = 50 mA	-	350	600 **800**	
		I_{OUT} = 100 mA	-	600	1000 **1500**	
		I_{OUT} = 150 mA	-	1300	1900 **2500**	
Shutdown Current	I_{SD}	V_{EN} ≤ 0.4 V	-	0.01	1.0 **5.0**	µA
EN Threshold Logic Low	V_{ENL}	Output = Low	-	-	0.4	V
EN Threshold Logic High	V_{ENH}	Output = High	2.0	-	-	V
EN Input Current Low	I_{ENL}	V_{EN} ≤ 0.4 V	-	0.01	1.0 **2.0**	µA
EN Input Current High	I_{ENH}	V_{EN} ≥ 2.0 V	2.0	5.0	35 **40**	µA
V_{OUT} Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	(Note 4)	-	40	-	ppm/°C
Power Supply Ripple Rejection	PSRR	I_{OUT} = 100 µA, f = 100Hz	-	75	-	dB

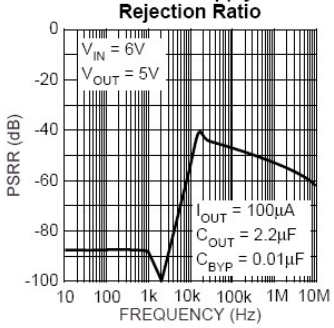
Note 1. Exceeding the absolute maximum ratings may damage the device.
Note 2. The device is not guaranteed to function outside its operating ratings.
Note 3. Regulation is measured at constant junction temperature using low duty cycle pulse testing.
Note 4. Output voltage temperature coefficient is defined as the worst case voltage change divided by the total temperature range.

TYPICAL OPERATING CHARACTERISTICS

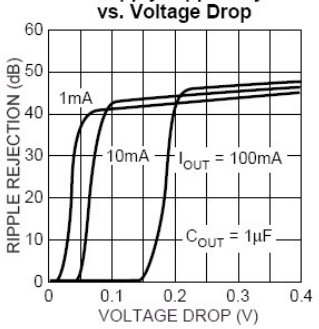
Power Supply Rejection Ratio



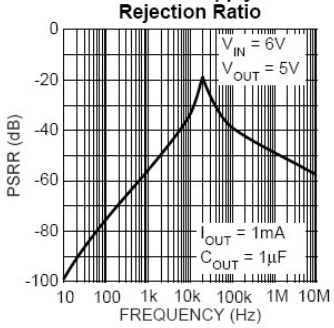
Power Supply Rejection Ratio



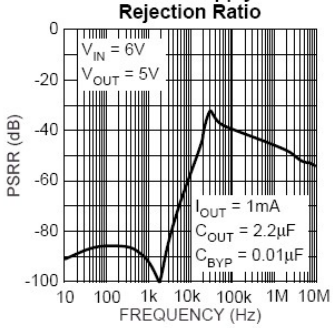
Power Supply Ripple Rejection vs. Voltage Drop



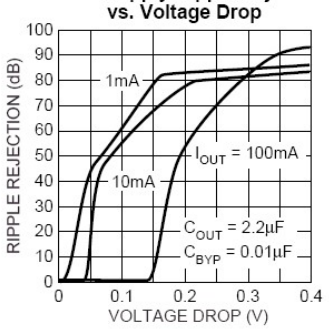
Power Supply Rejection Ratio



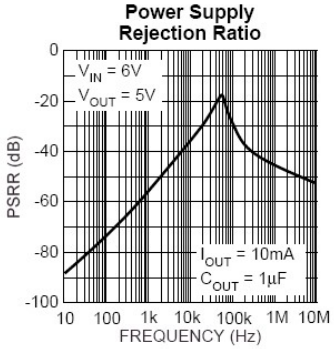
Power Supply Rejection Ratio



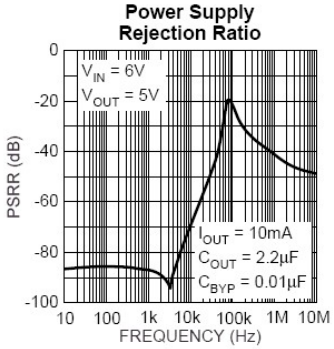
Power Supply Ripple Rejection vs. Voltage Drop



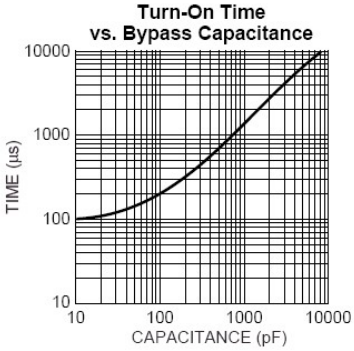
Power Supply Rejection Ratio



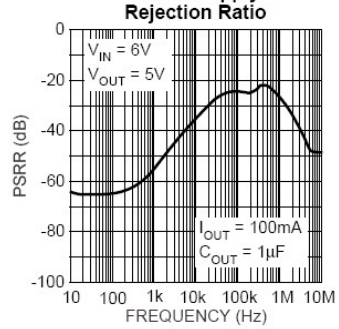
Power Supply Rejection Ratio



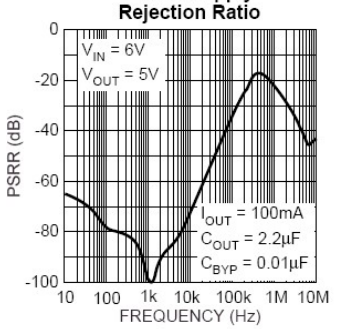
Turn-On Time vs. Bypass Capacitance



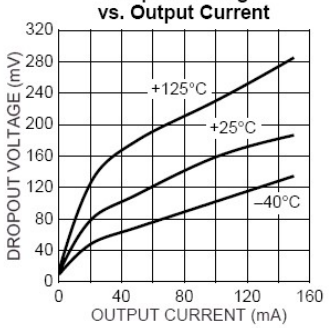
Power Supply Rejection Ratio



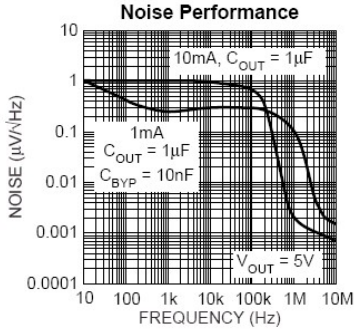
Power Supply Rejection Ratio



Dropout Voltage vs. Output Current



Noise Performance



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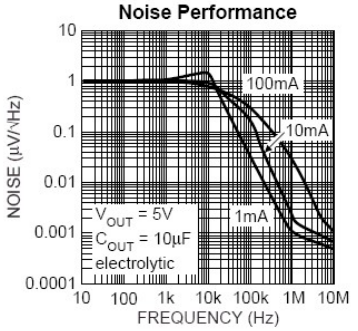

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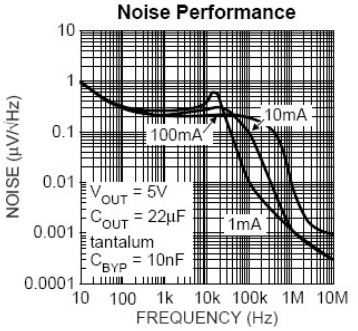

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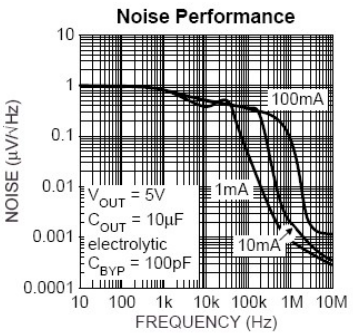

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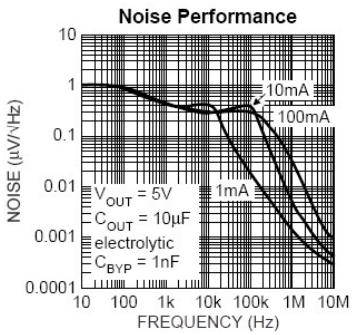
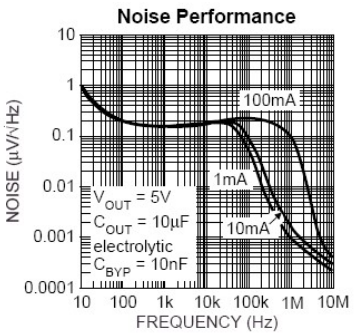


Noise Performance



APPLICATION INFORMATION

The LP2985 consists of a high-precision voltage reference, an error correction circuit, and a current limited output driver. With good transient responses, output remains stable even during load changes. The EN input enables the output to be turned off, resulting in reduced power consumption. The LP2985 incorporates both over-temperature and over-current protection.

INPUT CAPACITOR

An input capacitor of minimum 1.0 μF of MLCC is recommended. Larger values will help to improve ripple rejection by bypassing the input to the regulator, further improving the integrity of the output voltage. X7R or X5R dielectrics are recommended and it should be placed as close as to the IN pin as possible.

OUTPUT CAPACITOR

The LP2985 requires a minimum output capacitance maintain stability. The LP2985 is designed to be stable with a MLCC with very low equivalent series resistance (ESR). A 2.2 μF of MLCC would satisfy most applications. If a bypass capacitor is not used, minimum 1.0 μF of MLCC is also acceptable. Larger values and lower ESR improves dynamic performance. X7R or X5R dielectrics are recommended to maintain sufficient capacitance over its full operating temperature. It should be placed as close as OUT pin as possible.

BYPASS CAPACITOR

Attach a 470 pF capacitor to reduce output noise. May be left open if not used.

MAXIMUM OUPUT CURRENT CAPABILITY

The LP2985 can deliver a continuous current of 150mA over the full operating junction temperature range. However, the output current is limited by the restriction of power dissipation of package. With respect to the applied package, the maximum output current of 150mA may be still undeliverable due to the restriction of the power dissipation of LP2985. Under all possible conditions, the junction temperature must be within the range specified under operating conditions.
The temperatures over the device are given by:

$$T_C = T_A + P_D \times \theta_{CA}$$
$$T_J = T_C + P_D \times \theta_{JC}$$
$$T_J = T_A + P_D \times \theta_{JA}$$

where T_J is the junction temperature, T_C is the case temperature, T_A is the ambient temperature, P_D is the total power dissipation of the device, θ_{CA} is the thermal resistance of case-to-ambient, θ_{JC} is the thermal resistance of junction-to-case, and θ_{JA} is the thermal resistance of junction to ambient.
The total power dissipation of the device is given by:

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

where I_{GND} is the operating ground current of the device which is specified at the Electrical Characteristics. The maximum allowable temperature rise (T_{Rmax}) depends on the maximum ambient temperature (T_{Amax}) of the application, and the maximum allowable junction temperature (T_{Jmax}):

$T_{Rmax} = T_{Jmax} – T_{Amax}$

The maximum allowable value for junction-to-ambient thermal resistance, θ_{JA}, can be calculated using the formula:

$\theta_{JA} = T_{Rmax} / P_D$

If proper cooling solution such as copper plane area or air flow is applied, the maximum allowable power dissipation could be increased. However, if the ambient temperature is increased, the allowable power dissipation would be decreased.

REVISION NOTICE

The description in this datasheet is subject to change without any notice to describe its electrical characteristics properly.