# LD2982
SERIES

VERY LOW DROP AND LOW NOISE VOLTAGE REGULATOR WITH INHIBIT FUNCTION, LOW ESR CAP. COMPATIBLE

- VERY LOW DROPOUT VOLTAGE (120mV AT 50mA AND 7mV AT 1mA LOAD)
- VERY LOW QUIESCENT CURRENT (375µA TYP. AT 50mA LOAD AND 75µA AT 1mA)
- OUTPUT CURRENT UP TO 50mA
- LOGIC CONTROLLED ELECTRONIC SHUTDOWN
- OUTPUT VOLTAGE OF 1.5,1.8, 2.5, 2.8, 2.85, 3, 3.1, 3.2, 3.3, 3.5, 3.6, 3.8, 4, 4.7, 5V
- INTERNAL CURRENT AND THERMAL LIMIT
- AVAILABLE IN ± 1% TOLLERANCE (AT 25°C, A VERSION)
- SUPPLY VOLTAGE REJECTION: 45dB (TYP)
- ONLY 1µF FOR STABILITY
- LOW OUTPUT NOISE VOLTAGE 30µVrms
- SMALLEST PACKAGE SOT23-5L
- TEMPERATURE RANGE: -40°C TO 125°C

SOT23-5L

DESCRIPTION

The LD2982 is a 50mA fixed output voltage regulator. The ultra low drop voltage and the low quiescent current make them particularly suitable for low noise, low power applications, and in battery powered systems. In sleep mode quiescent current is less than 1µA when INHIBIT
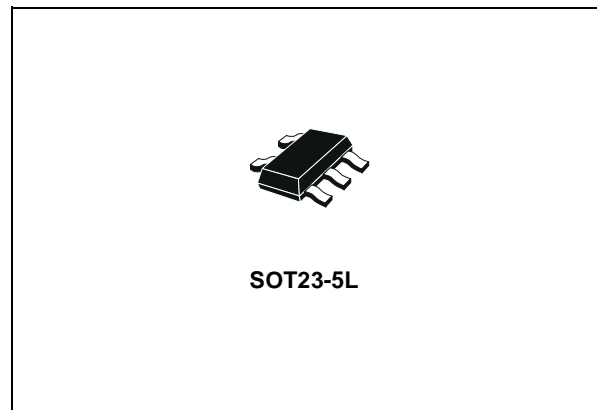
pin is pulled low. Shutdown Logic Control Function is available on pin 3 (TTL compatible). This means that when the device is used as local regulator, it is possible to put a part of the board in standby, decreasing the total power consumption.
An external capacitor C_{BYP}=10nF connected between bypass pin and GND reduce the noise to 30µVrms.
Typical application are in cellular phone, palmtop/ laptop computer, personal digital assistant (PDA), personal stereo, camcorder and camera.
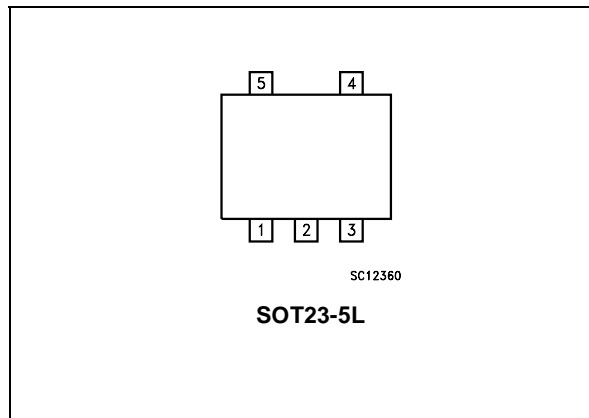
SCHEMATIC DIAGRAM
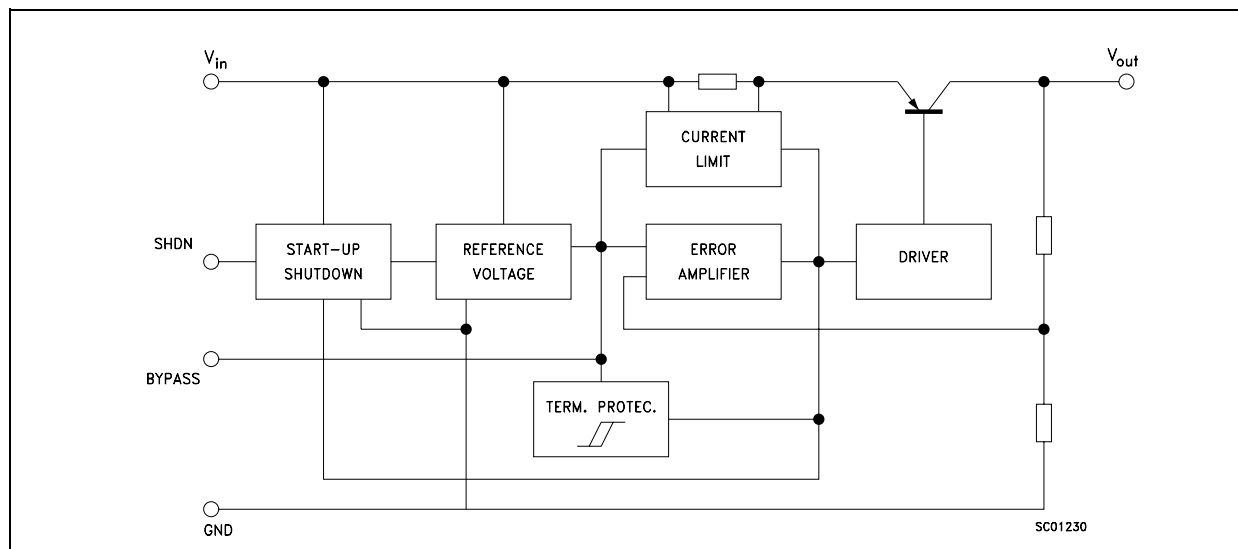
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_I	DC Input Voltage	16	V
V_{INH}	INHIBIT Input Voltage	16	V
I_O	Output Current	Internally limited	
P_{tot}	Power Dissipation	Internally limited	
T_{stg}	Storage Temperature Range	-65 to +150	°C
T_{op}	Operating Junction Temperature Range	-40 to +125	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

THERMAL DATA

Symbol	Parameter	SOT23-5L	Unit
$R_{thj-case}$	Thermal Resistance Junction-case	81	°C/W

CONNECTION DIAGRAM (top view)

SC12360

SOT23-5L

PIN DESCRIPTION

Pin N°	Symbol	Name and Function
1	IN	Input Port
2	GND	Ground Pin
3	INHIBIT	Control switch ON/OFF. Inhibit is not internally pulled-up; it cannot be left floating. Disable the device when connected to GND or to a positive voltage less than 0.18V
4	Bypass	Bypass Pin: Capacitor to be connected to GND in order to improve the thermal noise performances.
5	OUT	Output Port

ORDERING CODES

A VERSION	B VERSION	OUTPUT VOLTAGES
LD2982AM15R	LD2982BM15R	1.5V
LD2982AM18R	LD2982BM18R	1.8V
LD2982AM25R	LD2982BM25R	2.5V
LD2982AM28R	LD2982BM28R	2.8V
LD2982AM285R	LD2982BM285R	2.85V
LD2982AM30R	LD2982BM30R	3.0V
LD2982AM31R	LD2982BM31R	3.1V
LD2982AM32R	LD2982BM32R	3.2V
LD2982AM33R	LD2982BM33R	3.3V
LD2982AM35R	LD2982BM35R	3.5V
LD2982AM36R	LD2982BM36R	3.6V
LD2982AM38R	LD2982BM38R	3.8V
LD2982AM40R	LD2982BM40R	4.0V
LD2982AM47R	LD2982BM47R	4.7V
LD2982AM50R	LD2982BM50R	5.0V

ELECTRICAL CHARACTERISTICS FOR LD2982A (T_J = 25°C, V_I=V_O+1V, I_O=1mA, V_{SHDN}=2V, C_I = 1μF, C_O = 1μF, unless otherwise specified)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
V_{Op}	Operating Input Voltage			2.5		16	V
V_O	Output Voltage	V_I = 2.5V		1.485	1.5	1.515	V
		I_O = 1 to 50mA		1.477		1.523	V
		I_O = 1 to 50mA	T_J= -40 to 125°C	1.470		1.530	V
V_O	Output Voltage	V_I = 2.8V		1.782	1.8	1.818	V
		I_O = 1 to 50mA		1.773		1.827	V
		I_O = 1 to 50mA	T_J= -40 to 125°C	1.764		1.836	V
V_O	Output Voltage	V_I = 3.5V		2.475	2.5	2.525	V
		I_O = 1 to 50mA		2.462		2.537	V
		I_O = 1 to 50mA	T_J= -40 to 125°C	2.45		2.55	V
V_O	Output Voltage	V_I = 3.8V		2.772	2.8	2.828	V
		I_O = 1 to 50mA		2.758		2.842	V
		I_O = 1 to 50mA	T_J= -40 to 125°C	2.744		2.856	V
V_O	Output Voltage	V_I = 3.85V		2.821	2.85	2.879	V
		I_O = 1 to 50mA		2.807		2.893	V
		I_O = 1 to 50mA	T_J= -40 to 125°C	2.793		2.907	V
V_O	Output Voltage	V_I = 4.0V		2.970	3.0	3.030	V
		I_O = 1 to 50mA		2.955		3.045	V
		I_O = 1 to 50mA	T_J= -40 to 125°C	2.94		3.06	V
V_O	Output Voltage	V_I = 4.1V		3.069	3.1	3.131	V
		I_O = 1 to 50mA		3.053		3.146	V
		I_O = 1 to 50mA	T_J= -40 to 125°C	3.038		3.162	V
V_O	Output Voltage	V_I = 4.2V		3.168	3.2	3.232	V
		I_O = 1 to 50mA		3.152		3.248	V
		I_O = 1 to 50mA	T_J= -40 to 125°C	3.136		3.264	V
V_O	Output Voltage	V_I = 4.3V		3.267	3.3	3.333	V
		I_O = 1 to 50mA		3.250		3.349	V
		I_O = 1 to 50mA	T_J= -40 to 125°C	3.234		3.366	V
V_O	Output Voltage	V_I = 4.5V		3.465	3.5	3.535	V
		I_O = 1 to 50mA		3.447		3.552	V
		I_O = 1 to 50mA	T_J= -40 to 125°C	3.43		3.57	V
V_O	Output Voltage	V_I = 4.6V		3.564	3.6	3.636	V
		I_O = 1 to 50mA		3.546		3.654	V
		I_O = 1 to 50mA	T_J= -40 to 125°C	3.528		3.672	V
V_O	Output Voltage	V_I = 4.8V		3.762	3.8	3.838	V
		I_O = 1 to 50mA		3.743		3.857	V
		I_O = 1 to 50mA	T_J= -40 to 125°C	3.724		3.876	V
V_O	Output Voltage	V_I = 5.0V		3.96	4	4.04	V
		I_O = 1 to 50mA		3.94		4.06	V
		I_O = 1 to 50mA	T_J= -40 to 125°C	3.92		4.08	V

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	V_I = 5.7V	4.653	4.7	4.747	V
		I_O = 1 to 50mA	4.629		4.77	V
		I_O = 1 to 50mA $\quad$ T_J= -40 to 125°C	4.606		4.794	V
V_O	Output Voltage	V_I = 6.0V	4.95	5	5.05	V
		I_O = 1 to 50mA	4.925		5.075	V
		I_O = 1 to 50mA $\quad$ T_J= -40 to 125°C	4.9		5.1	V
I_{SC}	Short Circuit Current	R_L = 0		150		mA
$\Delta V_O/\Delta V_I$	Line Regulation	V_I = V_O+1V to 16V, I_O = 1mA		0.003	0.014	%/V_I
		V_I = V_O+1V to 16V, I_O = 1mA T_J= -40 to 125°C			0.032	%/V_I
V_d	Dropout Voltage	I_O = 0		1	3	mV
		I_O = 0 $\quad$ T_J= -40 to 125°C			5	mV
		I_O = 1mA		7	10	mV
		I_O = 1mA $\quad$ T_J= -40 to 125°C			15	mV
		I_O = 10mA		40	60	mV
		I_O = 10mA $\quad$ T_J= -40 to 125°C			90	mV
		I_O = 50mA		120	150	mV
		I_O = 50mA $\quad$ T_J= -40 to 125°C			225	mV
I_d	Quiescent Current	I_O = 0		80	100	µA
		I_O = 0 $\quad$ T_J= -40 to 125°C			150	µA
		I_O = 1mA		100	150	µA
		I_O = 1mA $\quad$ T_J= -40 to 125°C			200	µA
		I_O = 10mA		200	300	µA
		I_O = 10mA $\quad$ T_J= -40 to 125°C			400	µA
		I_O = 50mA		600	900	µA
		I_O = 50mA $\quad$ T_J= -40 to 125°C			1200	µA
		OFF MODE $\quad$ V_{INH}<0.18V		0		µA
		OFF MODE $\quad$ V_{INH}<0.18V T_J= -40 to 125°C			1	µA
SVR	Supply Voltage Rejection	C_{BYP} = 0.01µF $\quad$ C_O = 10µF $\quad$ f = 1KHz		45		dB
V_{IL}	Control Input Logic Low	T_J= -40 to 125°C			0.15	V
V_{IH}	Control Input Logic High	T_J= -40 to 125°C	2			V
I_{iNH}	Control Input Current	T_J= -40 to 125°C $\quad$ V_{SHDN} = 5V		5	15	µA
		T_J= -40 to 125°C $\quad$ V_{SHDN} = 0V		0	-1	µA
eN	Output Noise Voltage	B= 300Hz to 50KHz C_{BYP} = 0.01µF $\quad$ C_O = 10µF		30		µV

ELECTRICAL CHARACTERISTICS FOR LD2982B (T_J = 25°C, V_I=V_O+1V, I_O=1mA, V_{SHDN}=2V, C_I = 1µF, C_O = 1µF, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{Op}	Operating Input Voltage		2.5		16	V
V_O	Output Voltage	V_I = 2.5V	1.477	1.5	1.523	V
		I_O = 1 to 50mA	1.470		1.530	V
		I_O = 1 to 50mA $\quad$ T_J= -40 to 125°C	1.447		1.553	V
V_O	Output Voltage	V_I = 2.8V	1.773	1.8	1.827	V
		I_O = 1 to 50mA	1.764		1.836	V
		I_O = 1 to 50mA $\quad$ T_J= -40 to 125°C	1.737		1.863	V
V_O	Output Voltage	V_I = 3.5V	2.462	2.5	2.537	V
		I_O = 1 to 50mA	2.45		2.55	V
		I_O = 1 to 50mA $\quad$ T_J= -40 to 125°C	2.412		2.587	V
V_O	Output Voltage	V_I = 3.8V	2.758	2.8	2.842	V
		I_O = 1 to 50mA	2.744		2.856	V
		I_O = 1 to 50mA $\quad$ T_J= -40 to 125°C	2.702		2.898	V
V_O	Output Voltage	V_I = 3.85V	2.807	2.85	2.893	V
		I_O = 1 to 50mA	2.793		2.907	V
		I_O = 1 to 50mA $\quad$ T_J= -40 to 125°C	2.750		2.950	V
V_O	Output Voltage	V_I = 4.0V	2.955	3.0	3.045	V
		I_O = 1 to 50mA	2.94		3.06	V
		I_O = 1 to 50mA $\quad$ T_J= -40 to 125°C	2.895		3.105	V
V_O	Output Voltage	V_I = 4.1V	3.053	3.1	3.146	V
		I_O = 1 to 50mA	3.038		3.162	V
		I_O = 1 to 50mA $\quad$ T_J= -40 to 125°C	2.991		3.208	V
V_O	Output Voltage	V_I = 4.2V	3.152	3.2	3.248	V
		I_O = 1 to 50mA	3.136		3.264	V
		I_O = 1 to 50mA $\quad$ T_J= -40 to 125°C	3.088		3.312	V
V_O	Output Voltage	V_I = 4.3V	3.250	3.3	3.349	V
		I_O = 1 to 50mA	3.234		3.366	V
		I_O = 1 to 50mA $\quad$ T_J= -40 to 125°C	3.184		3.415	V
V_O	Output Voltage	V_I = 4.5V	3.447	3.5	3.552	V
		I_O = 1 to 50mA	3.430		3.370	V
		I_O = 1 to 50mA $\quad$ T_J= -40 to 125°C	3.377		3.662	V
V_O	Output Voltage	V_I = 4.6V	3.546	3.6	3.654	V
		I_O = 1 to 50mA	3.528		3.672	V
		I_O = 1 to 50mA $\quad$ T_J= -40 to 125°C	3.474		3.726	V
V_O	Output Voltage	V_I = 4.8V	3.743	3.8	3.857	V
		I_O = 1 to 50mA	3.724		3.876	V
		I_O = 1 to 50mA $\quad$ T_J= -40 to 125°C	3.667		3.933	V
V_O	Output Voltage	V_I = 5.0V	3.94	4	4.06	V
		I_O = 1 to 50mA	3.92		4.08	V
		I_O = 1 to 50mA $\quad$ T_J= -40 to 125°C	3.86		4.14	V

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	$V_I = 5.7V$	4.629	4.7	4.77	V
		$I_O = 1$ to 50mA	4.606		4.794	V
		$I_O = 1$ to 50mA $\quad T_J = -40$ to $125°C$	4.535		4.864	V
V_O	Output Voltage	$V_I = 6.0V$	4.925	5	5.075	V
		$I_O = 1$ to 50mA	4.9		5.1	V
		$I_O = 1$ to 50mA $\quad T_J = -40$ to $125°C$	4.825		5.175	V
I_{SC}	Short Circuit Current	$R_L = 0$		400		mA
$\Delta V_O/\Delta V_I$	Line Regulation	$V_I = V_O + 1V$ to 16V, $I_O = 1mA$		0.003	0.014	$\%/V_I$
		$V_I = V_O + 1V$ to 16V, $I_O = 1mA$ $T_J = -40$ to $125°C$			0.032	$\%/V_I$
V_d	Dropout Voltage	$I_O = 0$		1	3	mV
		$I_O = 0 \quad\quad T_J = -40$ to $125°C$			5	mV
		$I_O = 1mA$		7	10	mV
		$I_O = 1mA \quad T_J = -40$ to $125°C$			15	mV
		$I_O = 10mA$		40	60	mV
		$I_O = 10mA \quad T_J = -40$ to $125°C$			90	mV
		$I_O = 50mA$		120	150	mV
		$I_O = 50mA \quad T_J = -40$ to $125°C$			225	mV
I_d	Quiescent Current	$I_O = 0$		80	100	µA
		$I_O = 0 \quad\quad T_J = -40$ to $125°C$			150	µA
		$I_O = 1mA$		100	150	µA
		$I_O = 1mA \quad T_J = -40$ to $125°C$			200	µA
		$I_O = 10mA$		200	300	µA
		$I_O = 10mA \quad T_J = -40$ to $125°C$			400	µA
		$I_O = 50mA$		600	900	µA
		$I_O = 50mA \quad T_J = -40$ to $125°C$			1200	µA
		OFF MODE $\quad V_{INH} < 0.18V$		0		µA
		OFF MODE $\quad V_{INH} < 0.18V$ $T_J = -40$ to $125°C$			1	µA
SVR	Supply Voltage Rejection	$C_{BYP} = 0.01µF \quad C_O = 10µF \quad\quad f = 1KHz$		45		dB
V_{IL}	Control Input Logic Low	$T_J = -40$ to $125°C$			0.15	V
V_{IH}	Control Input Logic High	$T_J = -40$ to $125°C$	2			V
I_{iNH}	Control Input Current	$T_J = -40$ to $125°C \quad V_{SHDN} = 5V$		5	15	µA
		$T_J = -40$ to $125°C \quad V_{SHDN} = 0V$		0	-1	µA
eN	Output Noise Voltage	B= 300Hz to 50KHz $C_{BYP} = 0.01µF \quad C_O = 10µF$		30		µV

TYPICAL CHARACTERISTICS (unless otherwise specified $T_J = 25°C$, $C_I=1\mu F$, $C_O=2.2\mu F$, $C_{BYP}=100nF$)

Figure 1 : Output Voltage vs Temperature
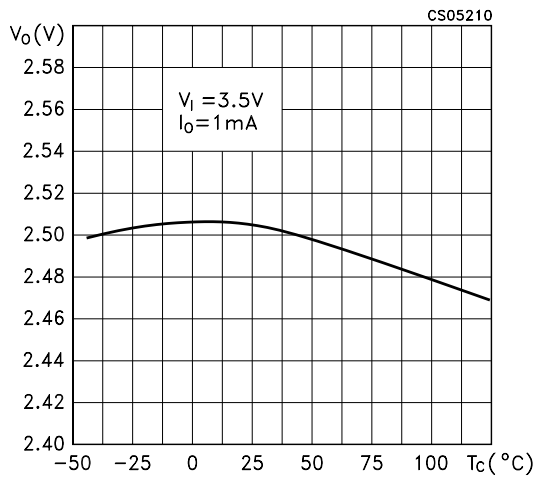
Figure 2 : Dropout Voltage vs Temperature
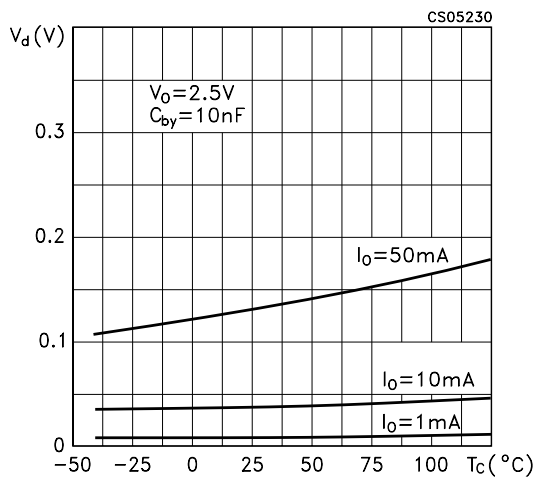
Figure 3 : Dropout Voltage vs Output Current
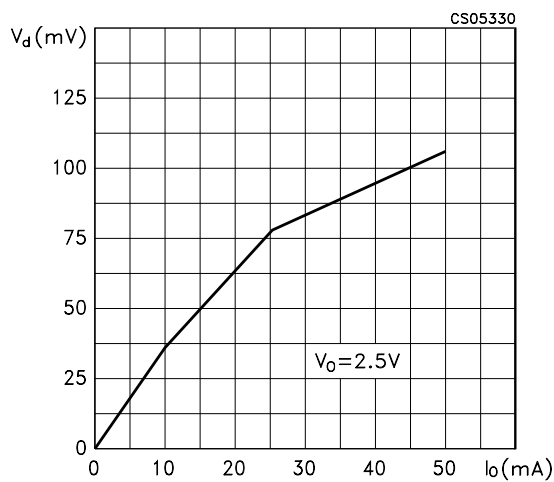
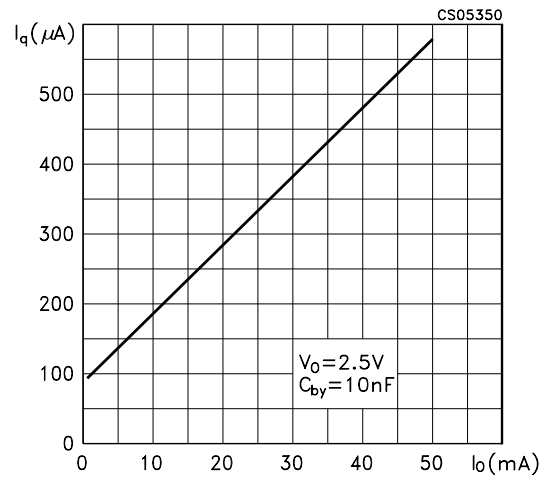
Figure 4 : Quiescent Current vs Load Current

Figure 5 : Quiescent Current vs Temperature

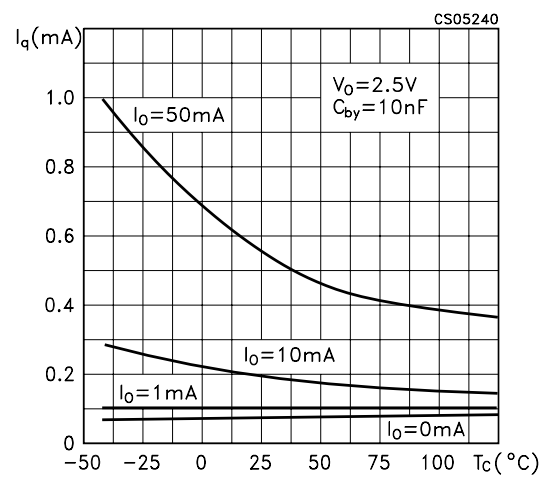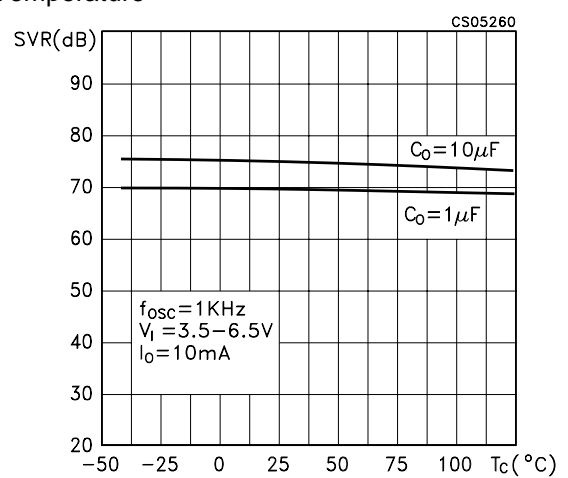

Figure 6 : Supply Voltage Rejection vs Temperature
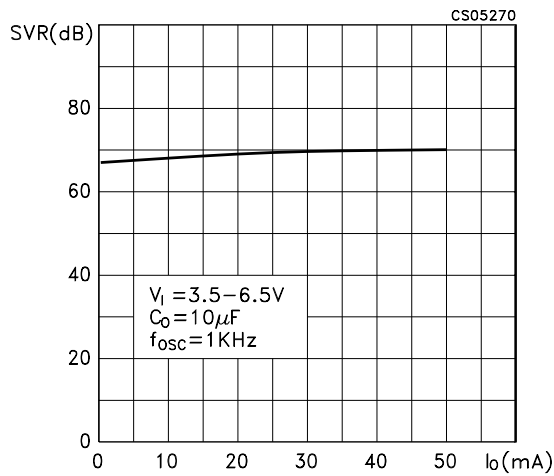
Figure 7 : Supply Voltage Rejection vs Output Current

Figure 10 : Supply Voltage Rejection vs Frequency
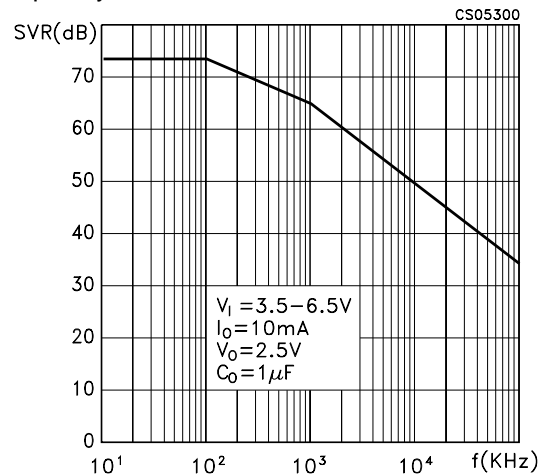
Figure 8 : Supply Voltage Rejection vs Output Current
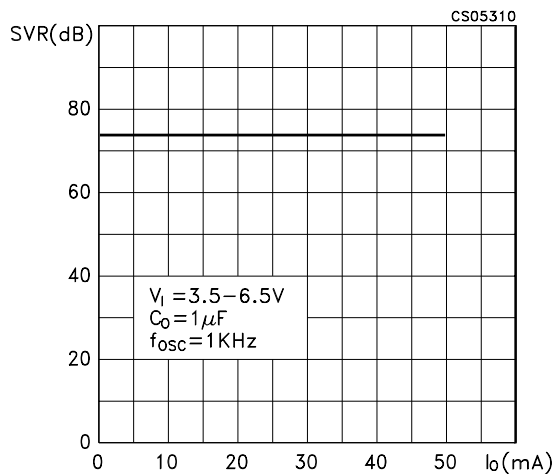
Figure 11 : Line Transient

V_O=2.5V, I_O= 50mA, no C_I, C_O=4.7μF, t_r=t_f=2ns
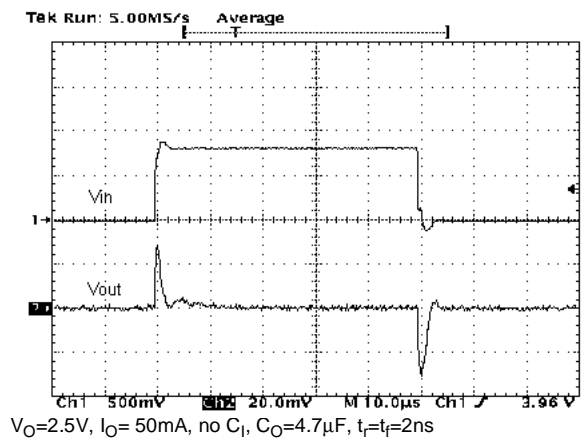
Figure 9 : Supply Voltage Rejection vs Frequency
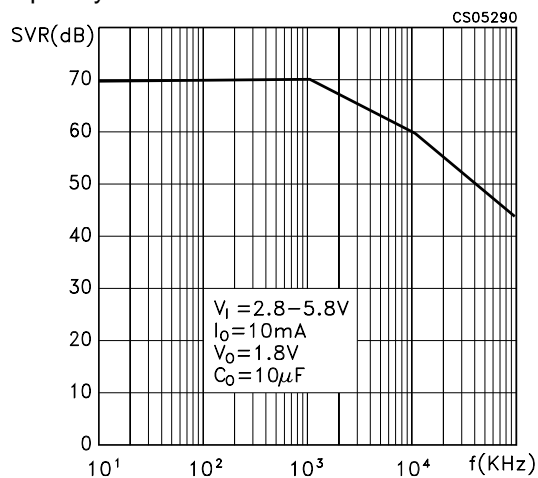
Figure 12 : Line Transient

V_O=2.5V, I_O= 50mA, no C_I, C_O=4.7μF, t_r=t_f=1μs
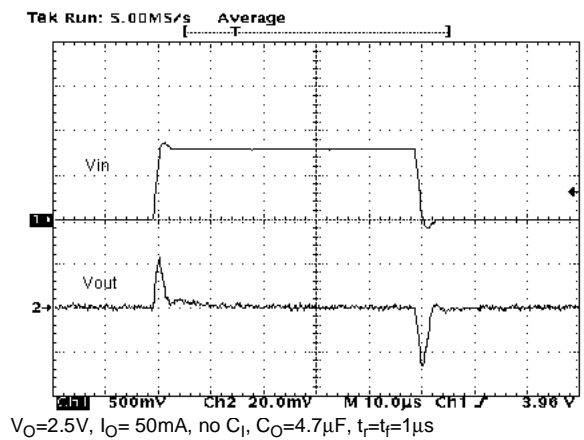
Figure 13 : Load Transient

V_O=2.5V, I_O=0 to 50mA, no C_I, C_O=10µF, t_s=t_f=2ns
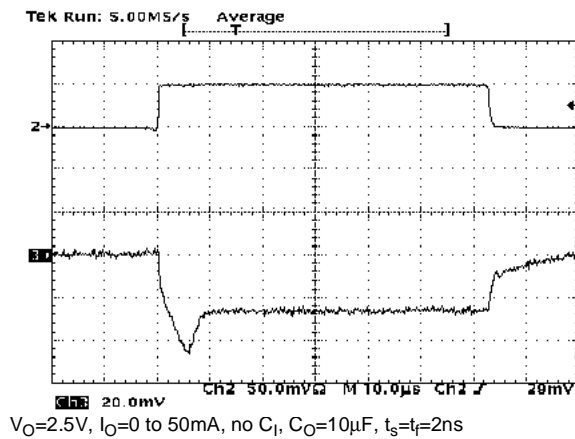
Figure 14 : Load Transient

V_O=2.5V, I_O=0 to 50mA, no C_I, C_O=4.7µF, t_s=t_f=2ns
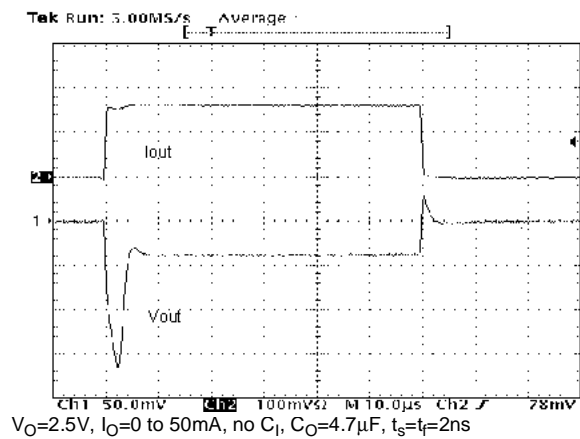
EXTERNAL CAPACITORS

Like any low-dropout regulator, the LD2982 requires external capacitors for regulator stability. This capacitor must be selected to meet the requirements of minimum capacitance and equivalent series resistance. We suggest to solder input and output capacitors as close as possible to the relative pins.

INPUT CAPACITOR

An input capacitor whose value is 1µF is required with the LD2982 (amount of capacitance can be increased without limit). This capacitor must be located a distance of not more than 0.5" from the input pin of the device and returned to a clean analog ground. Any good quality ceramic, tantalum or film capacitors can be used for this capacitor.

OUTPUT CAPACITOR

The LD2982 is designed specifically to work with ceramic output capacitors. It may also be possible to use Tantalum capacitors, but these are not as attractive for reasons of size and cost. By the way, the output capacitor must meet both the requirement for minimum amount of capacitance and E.S.R. (equivalent series resistance) value. Due to the different loop gain, the stability improves for higher output versions and so the suggested minimum output capacitor value, if low E.S.R. ceramic type is used, is 1µF for output voltages equal or major than 3.8V, 2.2µF for V_O going from 1.8 to 3.3V, and 3.3µF for the other versions. However, if an output capacitor lower than the suggested one is used, it's possible to make stable the regulator adding a resistor in series to the capacitor.

IMPORTANT:

The output capacitor must maintain its ESR in the stable region over the full operating temperature to assure stability. Also, capacitor tolerance and variation with temperature must be considered to assure the minimum amount of capacitance is provided at all times. This capacitor should be located not more than 0.5" from the output pin of the device and returned to a clean analog ground.

INHIBIT INPUT OPERATION

The inhibit pin can be used to turn OFF the regulator when pulled low, so drastically reducing the current consumption down to less than 1µA. When the inhibit feature is not used, this pin must be tied to V_I to keep the regulator output ON at all times. To assure proper operation, the signal source used to drive the inhibit pin must be able to swing above and below the specified thresholds listed in the electrical characteristics section under V_{IH} V_{IL}. Any slew rate can be used to drive the inhibit.

REVERSE CURRENT

The power transistor used in the LD2982 has not an inherent diode connected between the regulator input and output. If the output is forced above the input, no current will flow from the output to the input across the series pass transistor. When a V_{REV} voltage is applied on the output, the reverse current measured flows to the GND across the two feedback resistors. This current typical value is 160µA. R_1 and R_2 resistors are implanted type; typical values are, respectively, 42.6 KΩ and 51.150 KΩ.

Figure 15 : Reverse Current Test Circuit
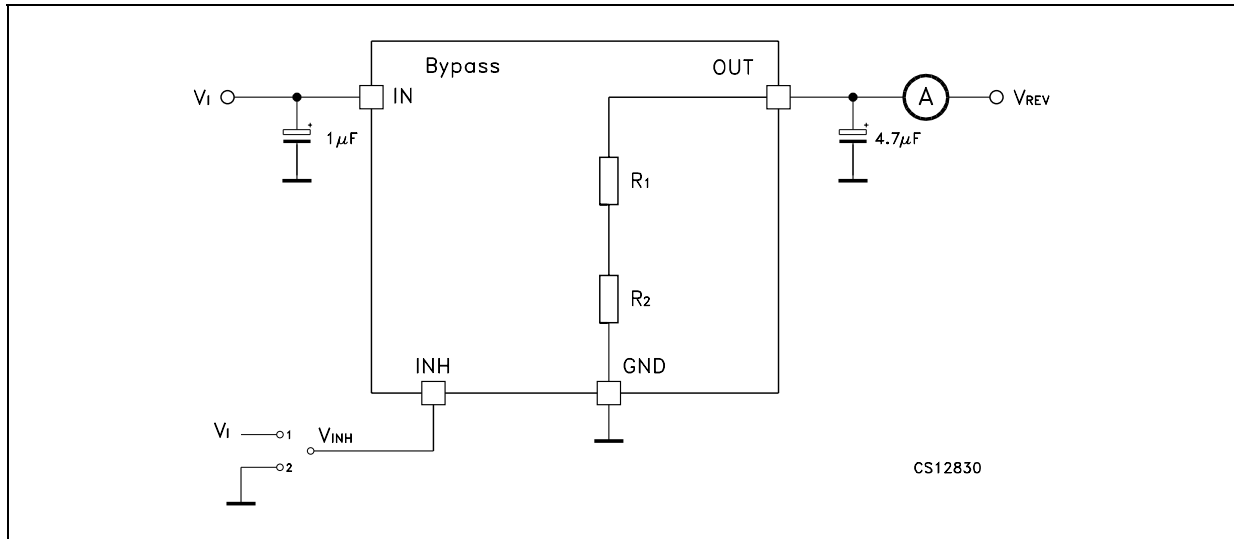
SOT23-5L MECHANICAL DATA

DIM.	mm.			mils		
	MIN.	**TYP**	**MAX.**	**MIN.**	**TYP.**	**MAX.**
A	0.90		1.45	35.4		57.1
A1	0.00		0.10	0.0		3.9
A2	0.90		1.30	35.4		51.2
b	0.35		0.50	13.7		19.7
C	0.09		0.20	3.5		7.8
D	2.80		3.00	110.2		118.1
E	1.50		1.75	59.0		68.8
e		0.95			37.4	
H	2.60		3.00	102.3		118.1
L	0.10		0.60	3.9		23.6

7049676C
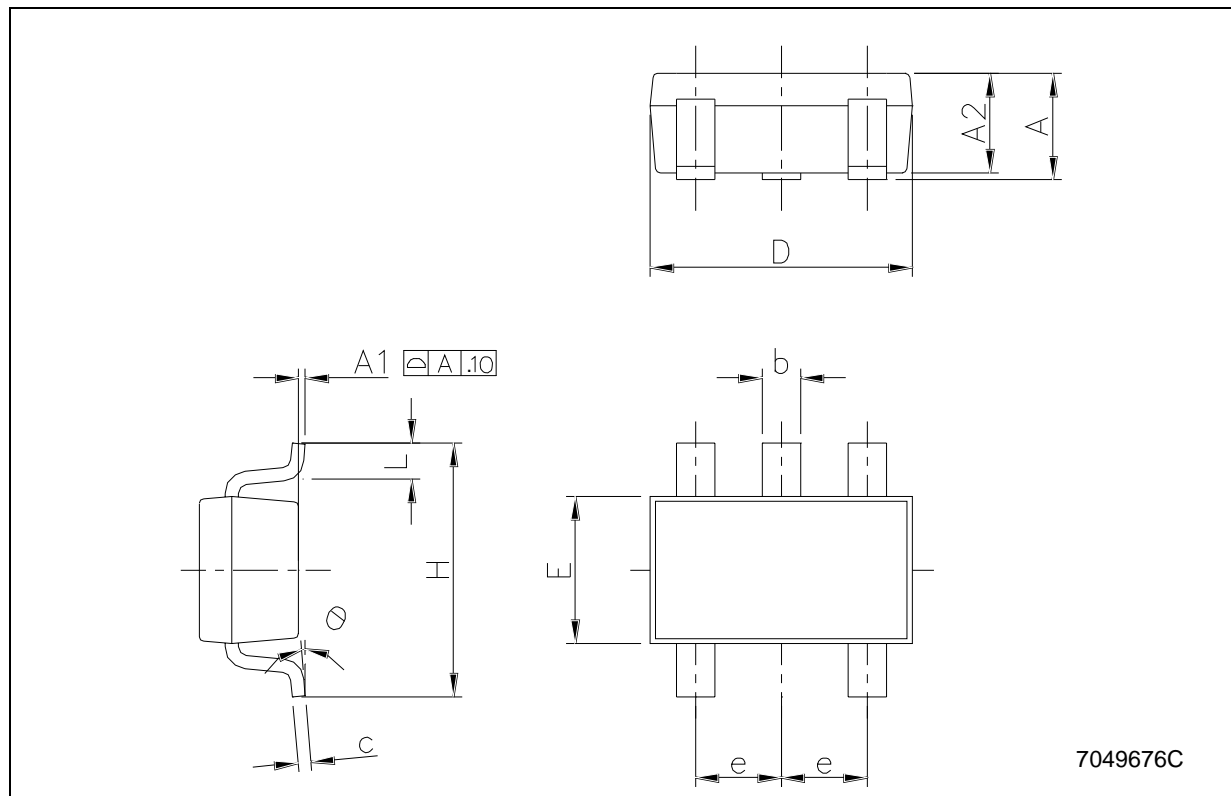
Tape & Reel SOT23-xL MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	**TYP**	**MAX.**	**MIN.**	**TYP.**	**MAX.**
A			180			7.086
C	12.8	13.0	13.2	0.504	0.512	0.519
D	20.2			0.795		
N	60			2.362		
T			14.4			0.567
Ao	3.13	3.23	3.33	0.123	0.127	0.131
Bo	3.07	3.17	3.27	0.120	0.124	0.128
Ko	1.27	1.37	1.47	0.050	0.054	0.0.58
Po	3.9	4.0	4.1	0.153	0.157	0.161
P	3.9	4.0	4.1	0.153	0.157	0.161

Note: Drawing not in scale