



# LK112 SERIES

## LOW NOISE LOW DROPT VOLTAGE REGULATOR WITH SHUTDOWN FUNCTION

- OUTPUT CURRENT UP TO 150mA
- LOW DROPT VOLTAGE (350mV AT  $I_{OUT}=150mA$ )
- VERY LOW QUIESCENT CURRENT: 0.1 $\mu A$  IN OFF MODE AND MAX 250 $\mu A$  IN ON MODE AT  $I_{OUT}=0mA$
- LOW OUTPUT NOISE: TYP 30 $\mu V$  AT  $I_{OUT}=60mA$  AND  $10Hz < f < 80KHz$
- WIDE RANGE OF OUTPUT VOLTAGES
- INTERNAL CURRENT AND THERMAL LIMIT

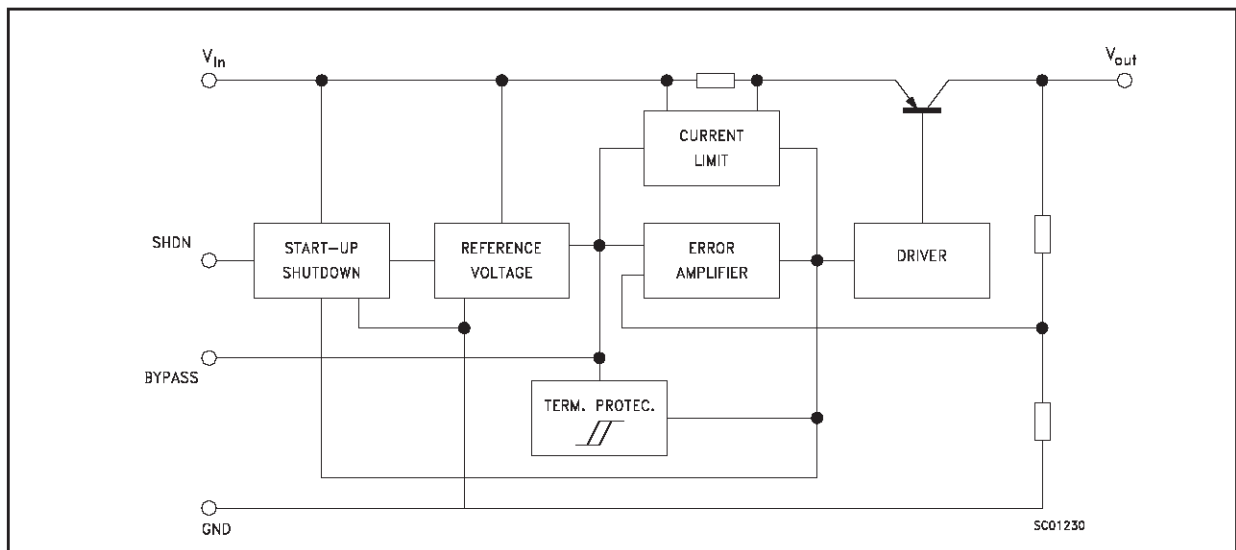
### DESCRIPTION

The LK112 is a low dropout linear regulator with a built in electronic switch. The internal switch can be controlled by TTL or CMOS logic levels. The device is ON state when the control pin is pulled to a logic high level. An external capacitor can be used connected to the noise bypass pin to lower the output noise level to 30 $\mu V_{rms}$ . An internal PNP pass transistor is used to achieve a low dropout voltage.



The LK112 has a very low quiescent current in ON MODE while in OFF MODE the  $I_q$  is reduced down to 100nA max. The internal thermal shutdown circuitry limits the junction temperature to below 150°C. The load current is internally monitored and the device will shutdown in the presence of a short circuit or overcurrent condition at the output.

### SCHEMATIC DIAGRAM

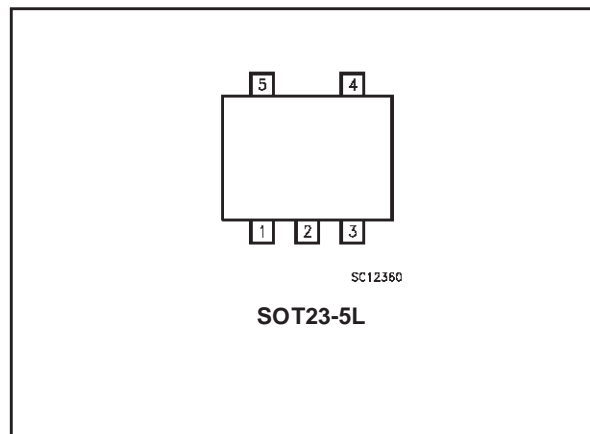


## LK112 SERIES

### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_I$	DC Input Voltage	16	V
$V_{SHDN}$	Shutdown Input Voltage	16	V
$I_O$	Output Current	Internally limited	
$T_{stg}$	Storage Temperature Range	-55 to +150	°C
$T_{op}$	Operating Junction Temperature Range	-30 to +80	°C

### CONNECTION DIAGRAM (top view)



### PIN DESCRIPTION

Pin N°	Symbol	Name and Function
1	SHDN	Shutdown Input: Disables the regulator when is connected to GND or to positive voltage less than 0.6V
2	GND	Ground Pin: Internally connected to the die attach flag to decrease the total thermal resistance and increase the package ability to dissipate power.
3	Bypass	Bypass Pin: Bypass with 0.1 $\mu$ F to improve the Vref thermal noise performances.
4	OUT	Output Port
5	IN	Input Port

### ELECTRICAL CHARACTERISTICS FOR LK112 ( $T_j = 25^\circ\text{C}$ , $V_{IN}=V_{OUT}+1\text{V}$ (see Note 1), $I_{OUT}=0\text{mA}$ , $V_{SHDN}=1.8\text{V}$ , $C_I = 1\ \mu\text{F}$ , $C_O = 2.2\ \mu\text{F}$ , $C_{BYPASS} = 0.1\ \mu\text{F}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_d$	Quiescent Current	ON MODE (except $I_{SHDN}$ )		175	250	$\mu\text{A}$
		OFF MODE $V_I = 8\text{V}$ $V_{SHDN} = 0\text{V}$		0	0.1	$\mu\text{A}$
$V_O$	Output Voltage	$I_O = 30\text{mA}$	(see table)			
$\Delta V_O$	Line Regulation	$V_I = V_O+1\text{V}$ to $V_O+6\text{V}$ , $V_O \leq 5.6\text{V}$		0.7	20	mV
		$V_I = V_O+1\text{V}$ to $V_O+6\text{V}$ , $V_O > 5.6\text{V}$		0.8	40	mV
$\Delta V_O$	Load Regulation	$I_O = 1$ to $60\text{mA}$		15	30	mV
		$I_O = 1$ to $150\text{mA}$		25	90	mV
$V_d$	Dropout Voltage	$I_O = 60\text{mA}$ (see Note 2)		0.17	0.24	V
		$I_O = 150\text{mA}$ (see Note 2)		0.29	0.35	V
$I_O$	Output Current Limit		150			mA
SVR	Supply Voltage Rejection	$V_I = V_O+1.5\text{V}$ $C_{BYP} = 0.1\ \mu\text{F}$ $C_O = 10\ \mu\text{F}$ $f = 400\text{Hz}$ $I_O = 30\text{mA}$		55		dB
eN	Output Noise Voltage	$B = 10\text{Hz}$ to $80\text{KHz}$ $C_{BYP} = 0.1\ \mu\text{F}$ $C_O = 10\ \mu\text{F}$ $V_I = V_O+1.5\text{V}$ , $I_O = 60\text{mA}$		30		$\mu\text{V}_{rms}$
$I_{SHDN}$	Shutdown Input Current	$V_{SHDN} = 1.8\text{V}$ Output ON		12	35	$\mu\text{A}$
$V_{SHDN}$	Shutdown Input Logic	Output ON	1.8			V
		Output OFF			0.6	V
$\Delta V_O/T_j$	Output Voltage Temperature Coefficient	$I_O = 10\text{mA}$		0.09		$\text{mV}/^\circ\text{C}$

Note 1: for version with output voltage less than 2V  $V_{IN}=2.4\text{V}$

Note 2: only for version with output voltage more than 2.1V

## ORDERING NUMBERS AND OUTPUT VOLTAGE

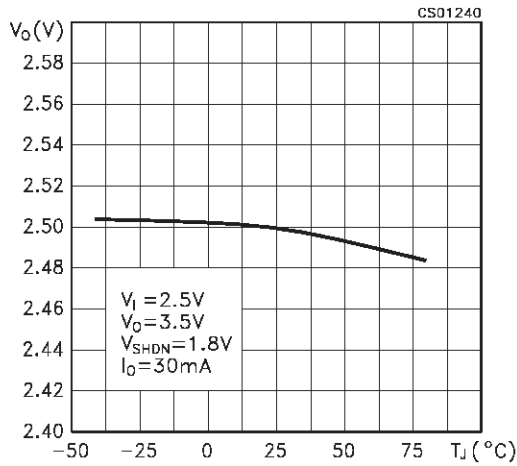
Part Number	Output Voltage	V <sub>OUT</sub> Min	V <sub>OUT</sub> Max	Test Voltage
LK112M13TR	1.3V	1.24V	1.36V	2.4V
LK112M14TR (*)	1.4V	1.34V	1.46V	2.4V
LK112M15TR	1.5V	1.44V	1.56V	2.4V
LK112M16TR	1.6V	1.54V	1.66V	2.4V
LK112M17TR (*)	1.7V	1.64V	1.76V	2.4V
LK112M18TR	1.8V	1.74V	1.86V	2.4V
LK112M19TR (*)	1.9V	1.84V	1.96V	2.4V
LK112M20TR (*)	2.0V	1.94V	2.06V	3.0V
LK112M21TR	2.1V	2.04V	2.16V	3.1V
LK112M22TR (*)	2.2V	2.14V	2.26V	3.2V
LK112M23TR (*)	2.3V	2.24V	2.36V	3.3V
LK112M24TR (*)	2.4V	2.34V	2.46V	3.4V
LK112M25TR	2.5V	2.44V	2.56V	3.5V
LK112M26TR (*)	2.6V	2.54V	2.66V	3.6V
LK112M27TR (*)	2.7V	2.64V	2.76V	3.7V
LK112M28TR	2.8V	2.74V	2.86V	3.8V
LK112M29TR (*)	2.9V	2.84V	2.96V	3.9V
LK112M30TR	3.0V	2.94V	3.06V	4.0V
LK112M31TR (*)	3.1V	3.04V	3.16V	4.1V
LK112M32TR	3.2V	3.14V	3.26V	4.2V
LK112M33TR	3.3V	3.24V	3.36V	4.3V
LK112M34TR (*)	3.4V	3.335V	3.465V	4.4V
LK112M35TR (*)	3.5V	3.435V	3.565V	4.5V
LK112M36TR	3.6V	3.535V	3.655V	4.6V
LK112M37TR (*)	3.7V	3.630V	3.770V	4.7V
LK112M38TR	3.8V	3.725V	3.875V	4.8V
LK112M39TR (*)	3.9V	3.825V	3.975V	4.9V
LK112M40TR	4.0V	3.920V	4.080V	5.0V
LK112M41TR (*)	4.1V	4.020V	4.180V	5.1V
LK112M42TR (*)	4.2V	4.120V	4.280V	5.2V
LK112M43TR (*)	4.3V	4.215V	4.385V	5.3V
LK112M44TR (*)	4.4V	4.315V	4.485V	5.4V
LK112M45TR (*)	4.5V	4.410V	4.590V	5.5V
LK112M46TR (*)	4.6V	4.510V	4.690V	5.6V
LK112M47TR	4.7V	4.605V	4.795V	5.7V
LK112M48TR (*)	4.8V	4.705V	4.895V	5.8V
LK112M49TR (*)	4.9V	4.800V	5.000V	5.9V
LK112M50TR	5.0V	4.900V	5.100V	6.0V
LK112M55TR (*)	5.5V	5.390V	5.610V	6.5V
LK112M80TR	8.0V	7.840V	8.160V	9.0V

(\*) Available on request

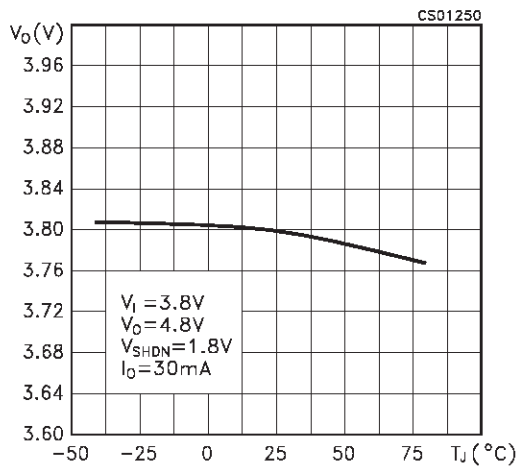
# LK112 SERIES

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

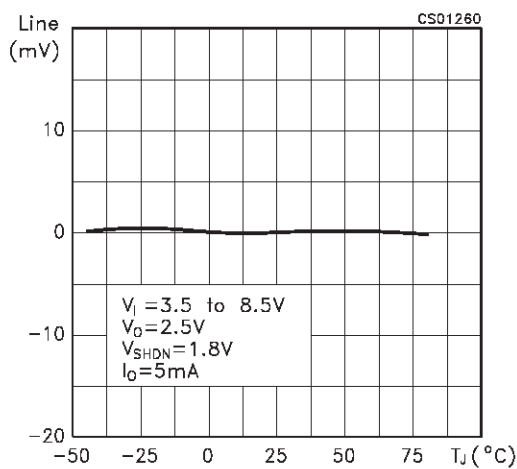
**Figure 1 : Output Voltage vs Temperature**



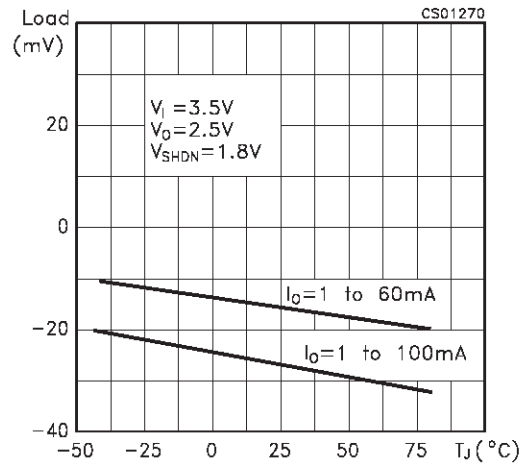
**Figure 2 : Output Voltage vs Temperature**



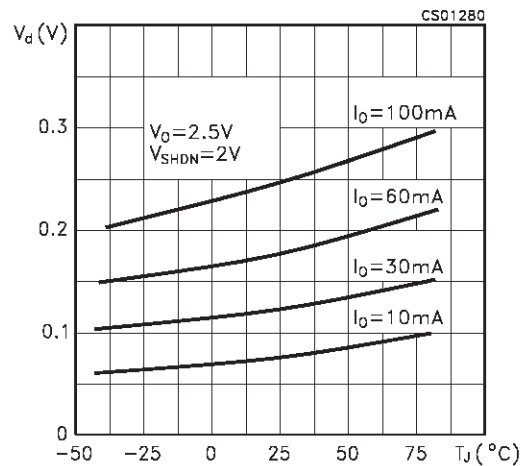
**Figure 3 : Line Regulation vs Temperature**



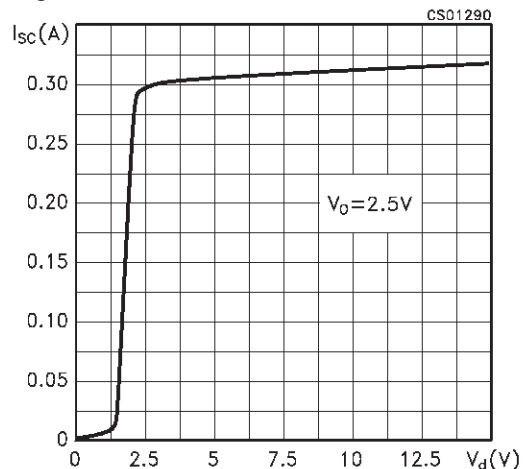
**Figure 4 : Load Regulation vs Temperature**



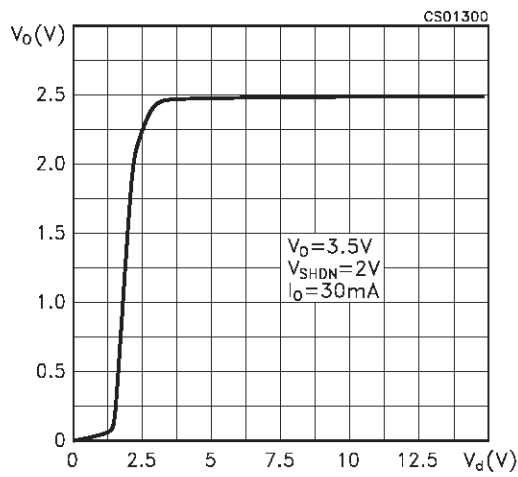
**Figure 5 : Dropout Voltage vs Temperature**



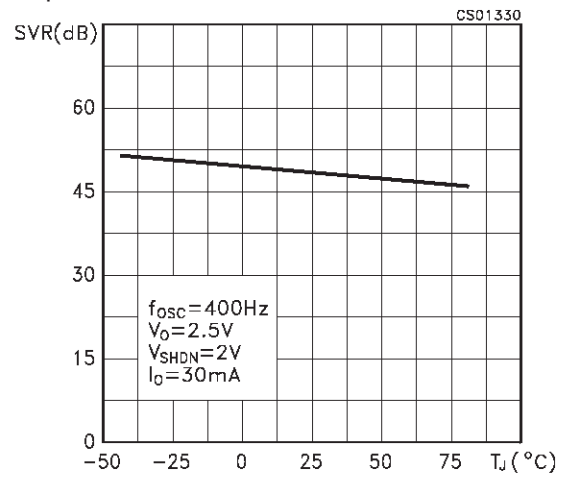
**Figure 6 : Short Circuit Current vs Dropout Voltage**



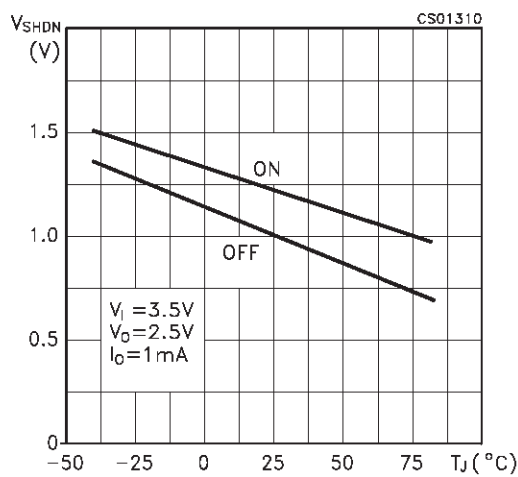
**Figure 7 : Output Voltage vs Input Voltage**



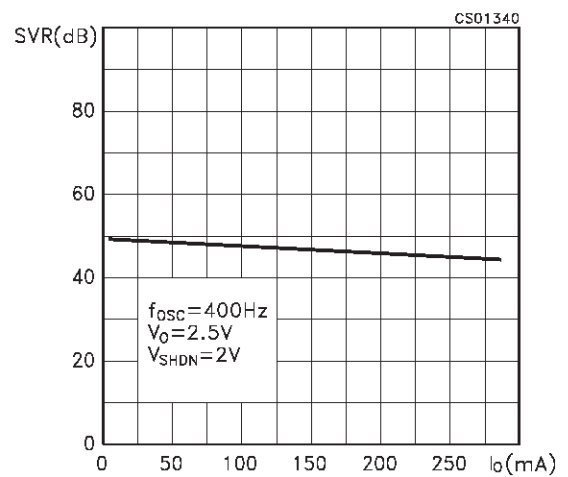
**Figure 10 : Supply Voltage Rejection vs Temperature**



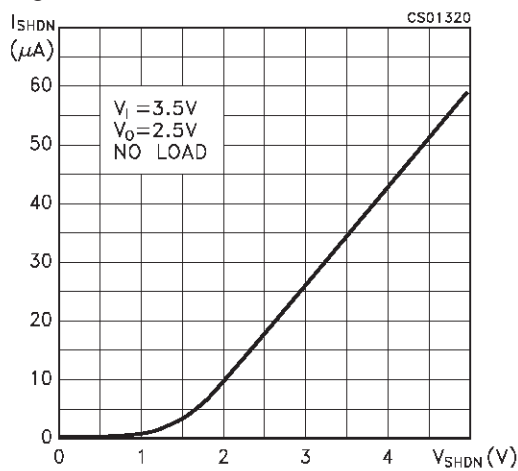
**Figure 8 : Shutdown Voltage vs Temperature**



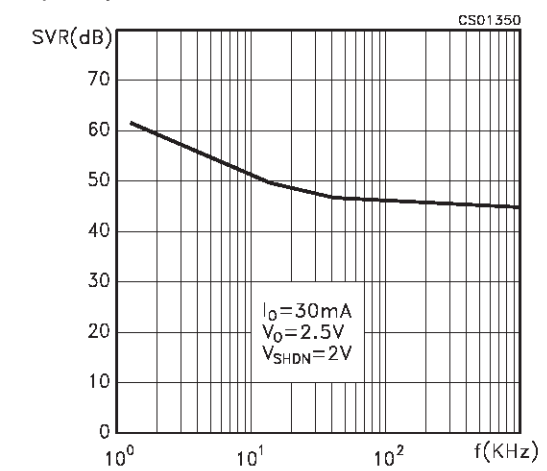
**Figure 11 : Supply Voltage Rejection vs Output Current**



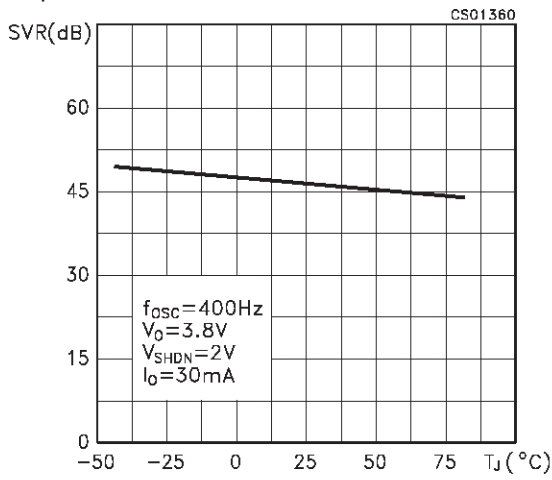
**Figure 9 : Shutdown Current vs Shutdown Voltage**



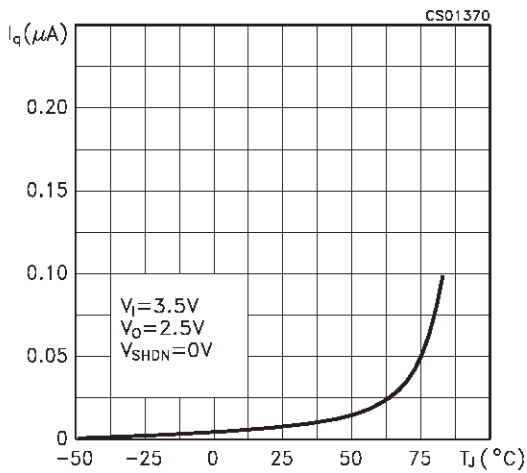
**Figure 12 : Supply Voltage Rejection vs Frequency**



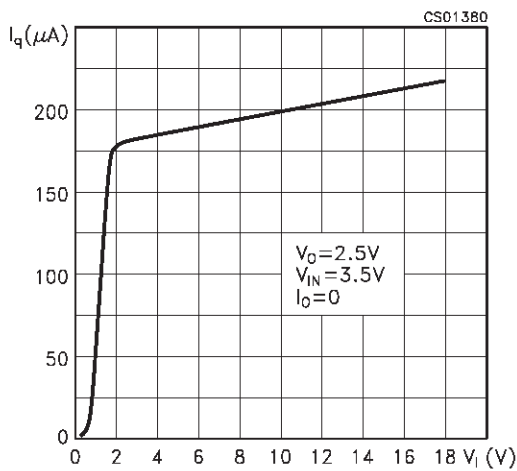
**Figure 13 : Supply Voltage Rejection vs Temperature**



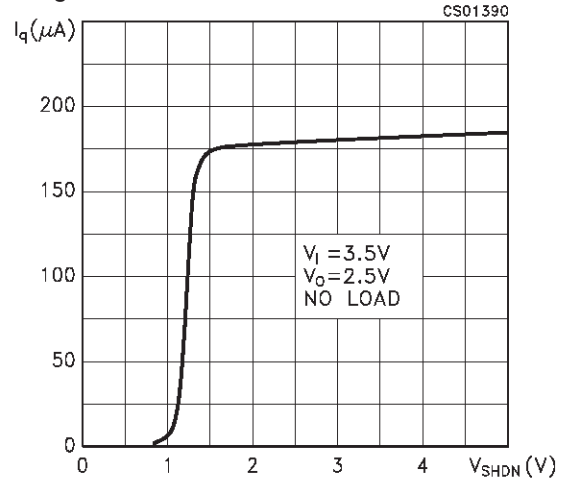
**Figure 14 : Quiescent Current vs Temperature**



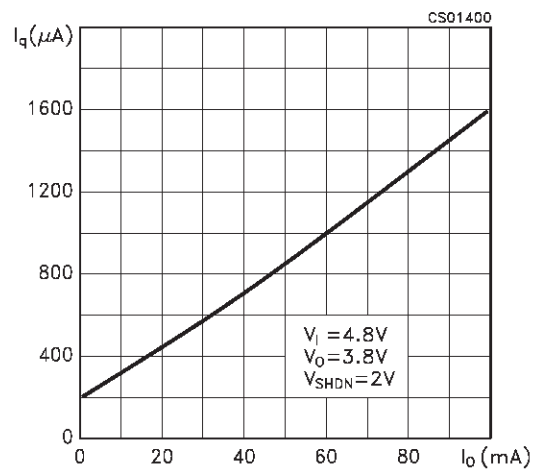
**Figure 15 : Quiescent Current vs Input Voltage**



**Figure 16 : Quiescent Current vs Shutdown Voltage**



**Figure 17 : Quiescent Current vs Output Current**



**Figure 18 : Reverse Current vs Reverse Voltage**

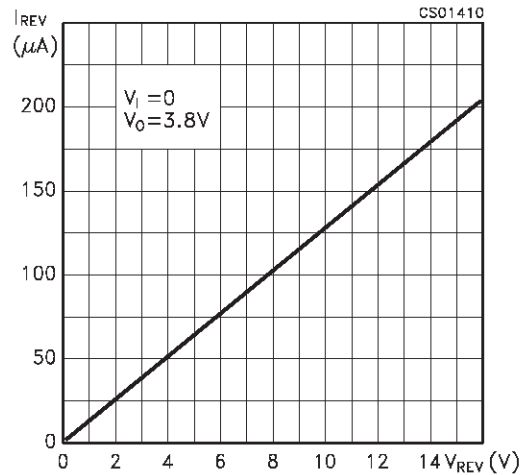


Figure 19 : Stability

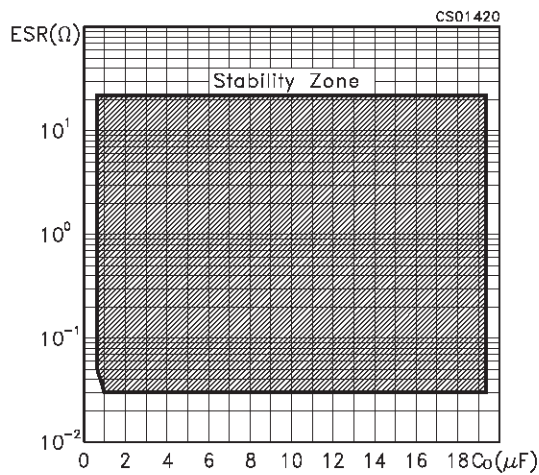


Figure 22 : Start-up Transient

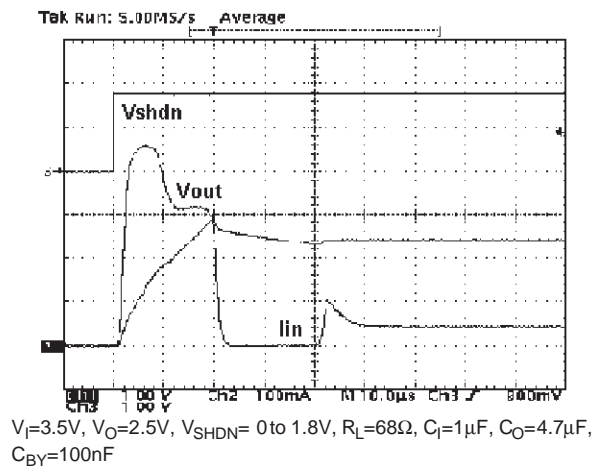


Figure 20 : Spectrum Noise

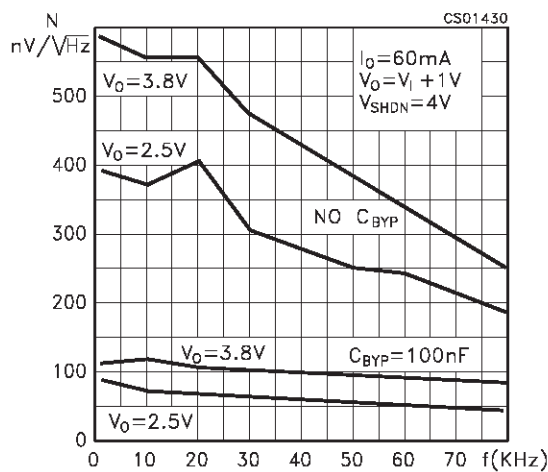


Figure 23 : Line Transient

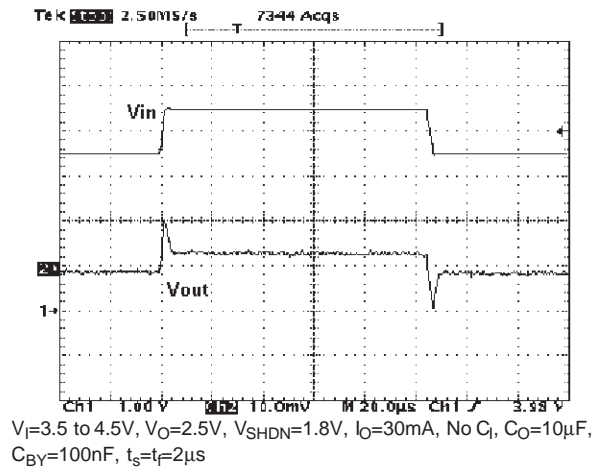


Figure 21 : Start-up Transient

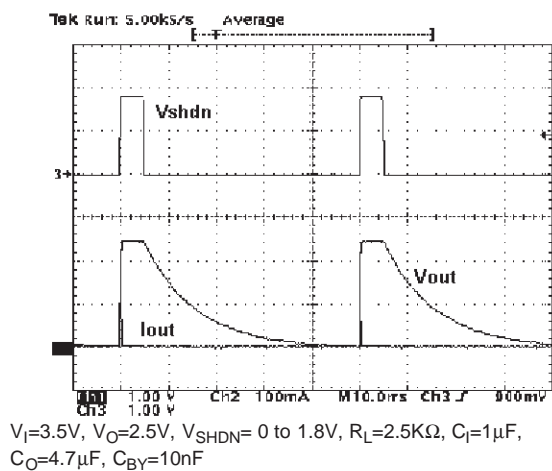


Figure 24 : Line Transient

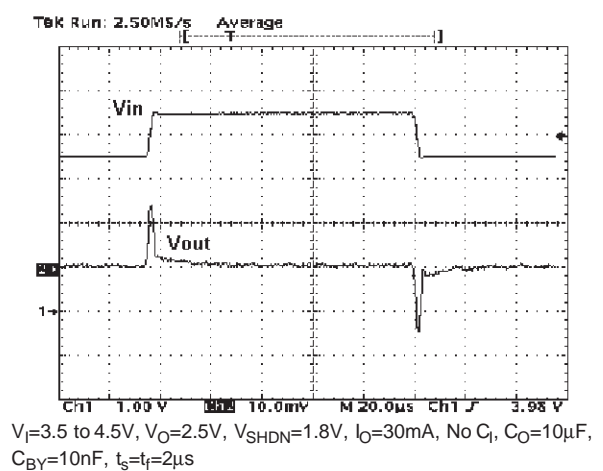
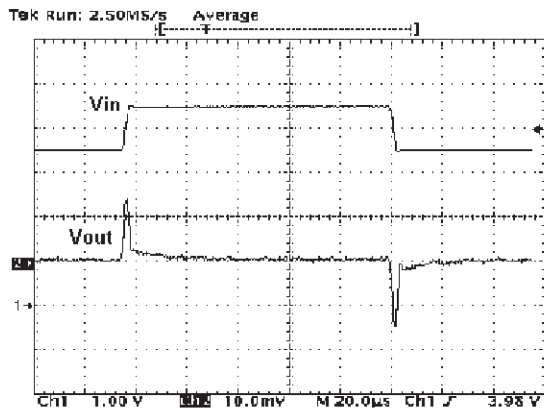
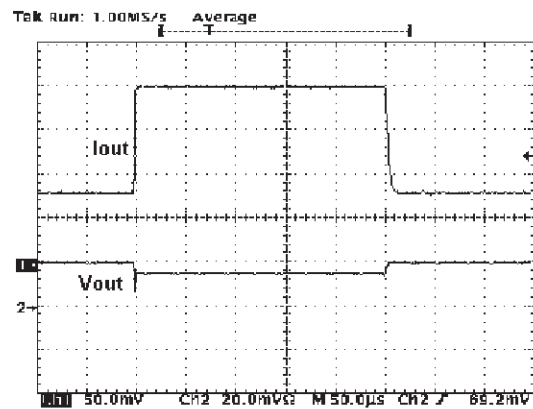


Figure 25 : Line Transient



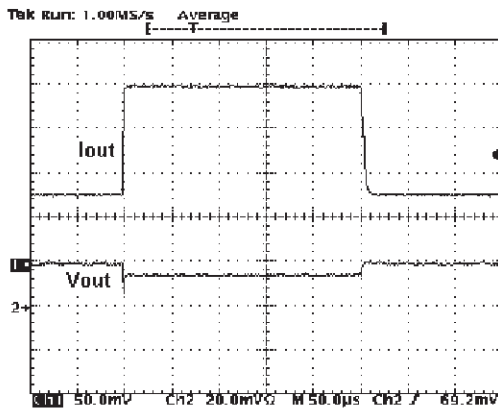
$V_I=3.5$  to  $4.5V$ ,  $V_O=2.5V$ ,  $V_{SHDN}=1.8V$ ,  $I_O=30mA$ , No  $C_I$ ,  $C_O=1\mu F$ ,  $C_{BY}=1nF$ ,  $t_s=t_f=2\mu s$

Figure 27 : Load Transient



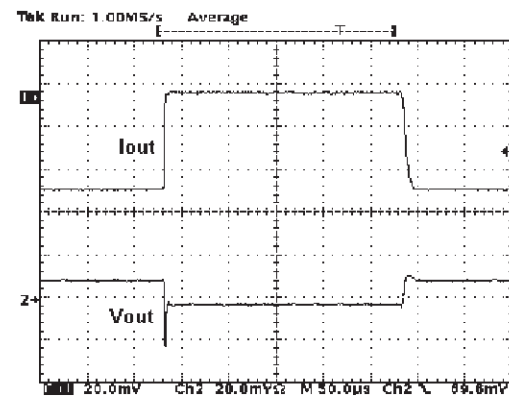
$V_I=3.5V$ ,  $V_O=2.5V$ ,  $V_{SHDN}=1.8V$ ,  $I_O=50$  to  $100mA$ ,  $C_I=1\mu F$ ,  $C_O=10\mu F$ ,  $C_{BY}=100nF$ ,  $t_s=t_f=250ns$

Figure 26 : Load Transient



$V_I=3.5V$ ,  $V_O=2.5V$ ,  $V_{SHDN}=1.8V$ ,  $I_O=50$  to  $100mA$ ,  $C_I=1\mu F$ ,  $C_O=2.2\mu F$ ,  $C_{BY}=10nF$ ,  $t_s=t_f=250ns$

Figure 28 : Load Transient

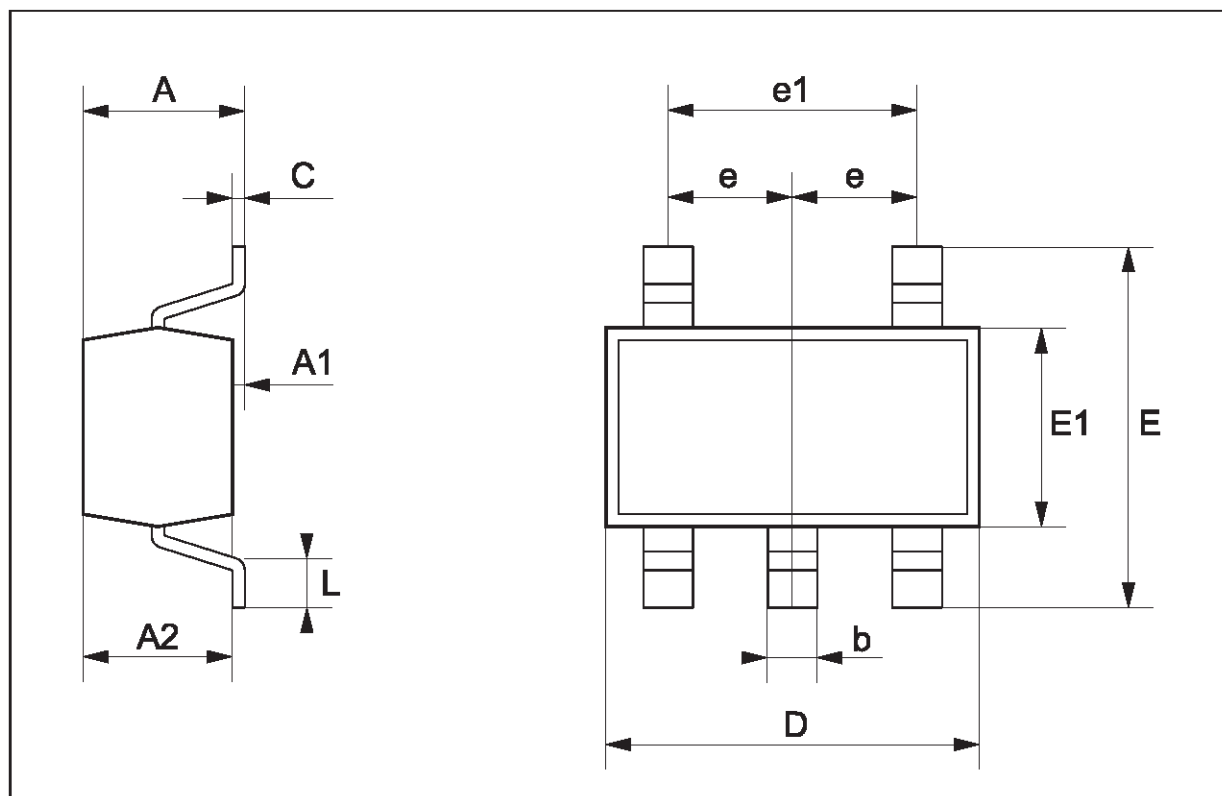


$V_I=4.8V$ ,  $V_O=3.8V$ ,  $V_{SHDN}=1.8V$ ,  $I_O=50$  to  $100mA$ ,  $C_I=1\mu F$ ,  $C_O=2.2\mu F$ ,  $C_{BY}=10nF$ ,  $t_s=t_f=250ns$



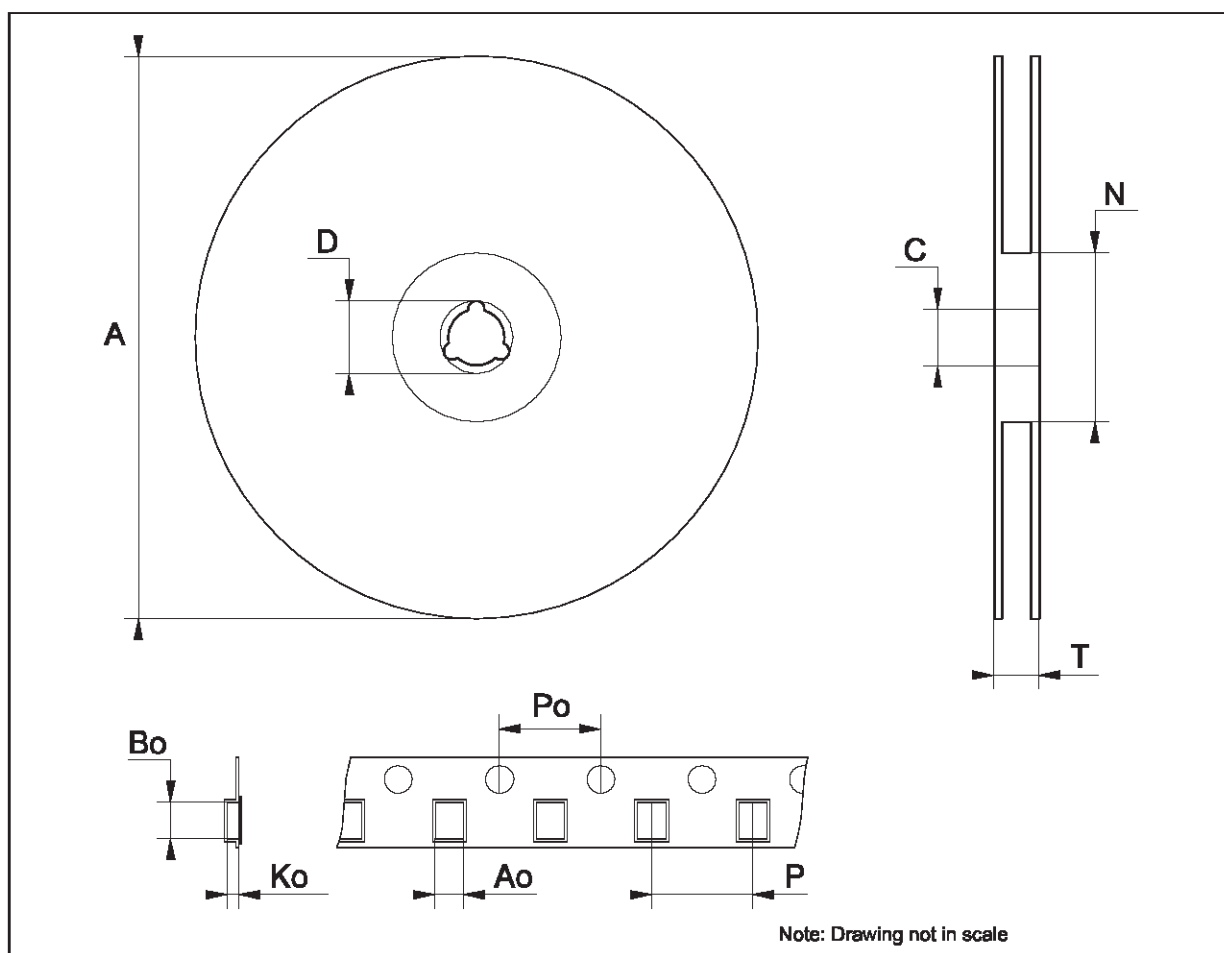
## SOT23-5L MECHANICAL DATA

DIM.	mm.			mils		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	0.90		1.45	35.4		57.1
A1	0.00		0.15	0.0		5.9
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	2.60		3.00	102.3		118.1
E1	1.50		1.75	59.0		68.8
e		0.95			37.4	
e1		1.9			74.8	
L	0.35		0.55	13.7		21.6



**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	0.058
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



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