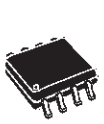
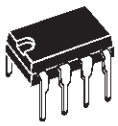
L6902

1A CONSTANT CURRENT BATTERY CHARGER

- UP TO 1A BATTERY CHARGER
- OPERATING INPUT VOLTAGE FROM 8V TO 36V
- PRECISE 3.3V (±2%) REFERENCE VOLTAGE
- 5% CHARGING CURRENT ACCURACY
- OUTPUT VOLTAGE ADJUSTABLE FROM 1.235V TO 34V
- 250KHz INTERNALLY FIXED FREQUENCY
- VOLTAGE FEEDFORWARD
- ZERO LOAD CURRENT OPERATION
- INTERNAL CURRENT LIMITING
- PROTECTION AGAINST FEEDBACK DISCONNECTION
- THERMAL SHUTDOWN



SO8



MINIDIP

ORDERING NUMBERS:

L6902D **L6902N**

APPLICATION

- CHARGES FOR NiCd, NiMH AND LITHIUM BATTERIES
- SIMPLE, SMALLER & EFFICIENT STEP-DOWN CONVERTERS
- BATTERY EQUIPPED SYSTEMS
- DISTRIBUTED POWER SUPPLY
- MOBILE PC & SUBNOTEBOOK

DESCRIPTION

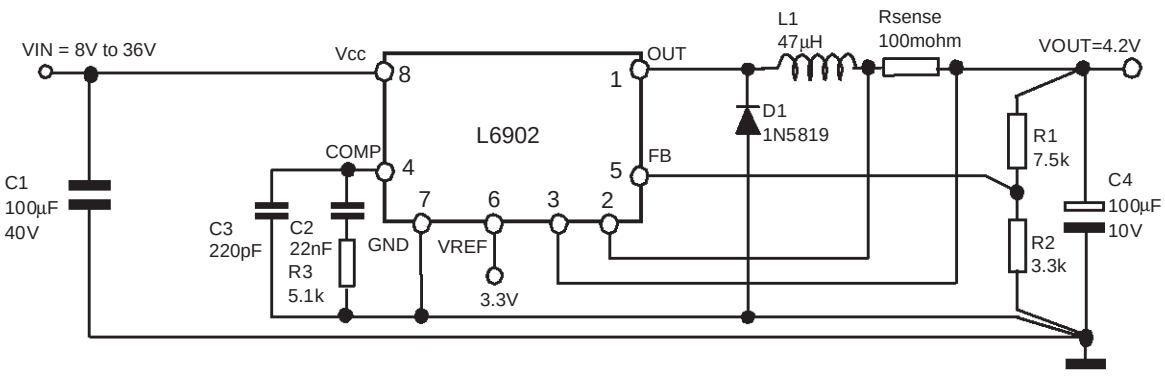
The L6902 is a complete and simplest IC for batteries charging application.
Based a voltage mode structure it is a step down switching converter integrating a current error amplifier to have a constant voltage and constant current control for a most efficient charging solution of the modern rechargeable batteries including lithium-ion, NiMH and NiCd.

By means of 0.1ohm on board current sense resistor and the availability of the current sense pins (both compatible to Vcc and for Cs- compatible with GND too) a charging current programming is very simple and accurate (±5%).

The device can charge batteries in a wide range of outputs voltage (from 1.235 to 34V) from a single cell till to multiple cells or battery packs.

The internal robust P-Chanel DMOS transistor with a typical of 250mohm assures high efficiency and a minimum dropout even at high output current level. The internal limiting current (latched function) of typical value of 2.3A protects the device from accidental output short circuit avoiding dangerous batteries damage.

TEST AND APPLICATION CIRCUIT

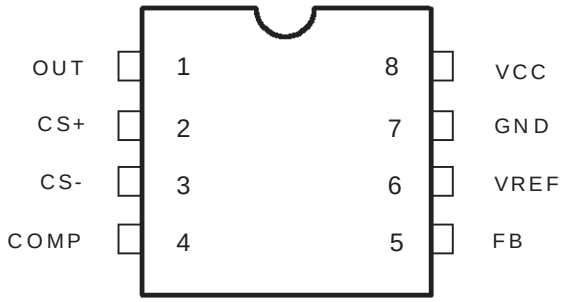


DESCRIPTION (Continued)

Other protections as on chip overvoltage protection, thermal shutdown together the internal frequency modulation complete the device for a safe and reliable application.

The internal fixed switching frequency of 250KHz, and the possibility to have the device in SO-8 pin allows to built an ultra compact battery charger with a minimum board space.

PIN CONNECTION



PIN DESCRIPTION

N°	Pin	Function
1	OUT	Regular Output
2	CS+	Current Error Amplifier input (current sense at higher voltage)
3	CS-	Current Error Amplifier input (current sense at lower voltage)
4	COMP	E/A output to be used for frequency compensation
5	FB	Stepdown feedback input. Connecting directly to this pin results in an output voltage of 1.23V. An external resistive divider is required for higher output voltages.
6	V_{REF}	3.3V VREF. No cap is need for stability.
7	GND	Ground
8	VCC	Unregulated DC input voltage.

THERMAL DATA

Symbol	Parameter	Minidip	SO8	Unit
$R_{th\ j\text{-}amb}$	Thermal Resistance Junction to Ambient Max.	75 (*)	110 (*)	°C/W

(*) Package mounted on board.

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_8	Input Voltage	40	V
V_1	Output DC voltageOutput peak voltage at t = 0.1µs	-1 to 40 -5 to 40	V V
I_1	Maximum output current	Internally limited	
V_4, V_5	Analog pins	4	V
V_2, V_3	Analog pins	-0.3V to V_{CC}	V
P_{tot}	Power dissipation at $T_{amb} \leq 60$ °C Minidip SO8	1 0.75	W W
Tj	Operating junction temperature range	-40 to 150	°C
T_{stg}	Storage temperature range	-55 to 150	°C

ELECTRICAL CHARACTERISTCS

(T_j = 25°C, V_{CC} = 12V, unless otherwise specified.) (•) Specification Referred to Tj from 0 to 125°C.

Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Unit
V_{CC}	Operating input voltage range	V_O = 1.235V; I_O = 1A	•	8		36	V
V_d	Dropout voltage	VCC = 8V; IO = 1A	•		0.25	0.5	V
I_O	Operating charging current	with R_{sense} = 0.1Ω	• •	0.95 0.92	11	1.05 1.08	A A
I_I	Maximum limiting current	VCC = 8V to 36V	•		2.3		A
$V_{batt(max)}$	Maximum Vbatt with switch ON					V_{CC}-2	V
fs	Switching frequency		•	212 225	250 250	287 275	kHz kHz
d	Duty cycle			0		100	%
DYNAMIC CHARACTERISTICS							
V_5	Voltage feedback	8V , V_{CC} , 36V, 20mA < I_O < 1A	• •	1.21 1.198	1.235 1.235	1.259 1.272	V V
η	Efficiency	V_O = 5V, V_{CC} = 12V			90		%
DC CHARACTERISTICS							
I_{qop}	Total operating quiescent current		•		3	5	mA
I_q	Quiescent current	Duty cycle = 0; VFB = 1.5V				2.7	mA
I_{qst-by}	Total stand-by quiescent current	V_{inh} > 2.2V V_{CC} = 36V; V_{inh} > 2.2V	• •		50 80	100 150	µA µA

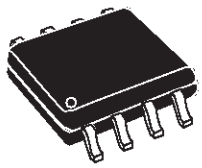
ELECTRICAL CHARACTERISTCS (continued)
(T_j = 25°C, V_{CC} = 12V, unless otherwise specified.) (•) Specification Referred to Tj from 0 to 125°C.

Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Unit
VOLTAGE ERROR AMPLIFIER							
V_{OH}	High level output voltage	V_{FB} = 1V		3.6			V
V_{OL}	Low level output voltage	V_{FB} = 1.5				0.4	V
$I_{o\ source}$	Source output current	V_{comp} = 1.9V; V_{FB} = 1V		250	300		mA
$I_{o\ sink}$	Sink output current	V_{comp} = 1.9V; V_{FB} = 1.5V		1	1.5		mA
I_b	Source bias current				2.5	4	mA
	DC open loop gain	R_L = 0		50	58		dB
g_m	Transconductance	I_{comp} = -0.1 to 0.1mA V_{comp} = 1.9V			2.3		mS
CURRENT ERROR AMPLIFIER							
V_{offs}	Input offset voltage	V_{CS-} = 1.8V; V_{CS+} = V_{comp}		95	100	105	mV
I_P	Pin output current	I_O = 1A; V_{out} < V_{CC}-2V			1.5	3	mA
REFERENCE SECTION							
	Reference Voltage			3.234	3.3	3.366	V
		I_{REF} = 0 to 5mA V_{CC} = 8V to 36V	•	3.2	3.3	3.399	V
	Line Regulation	I_{REF} = 0mA V_{CC} = 8V to 36V			5	10	mV
	Load Regulation	I_{REF} = 0 to 5mA			8	15	mV
	Short Circuit Current			10			mA

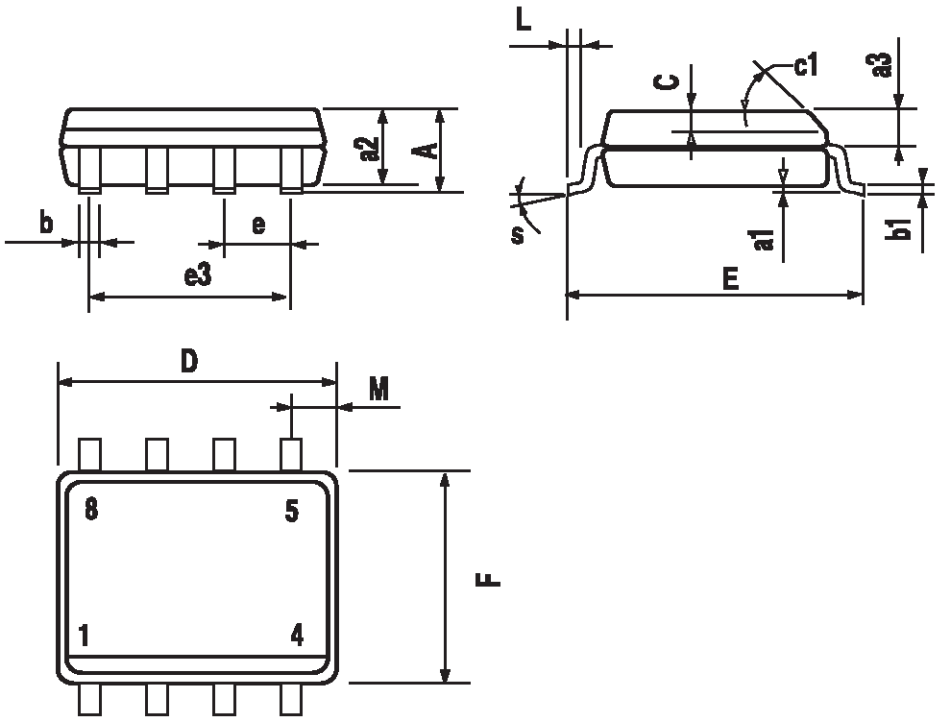
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
a3	0.65		0.85	0.026		0.033
b	0.35		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.020
c1	45° (typ.)					
D (1)	4.8		5.0	0.189		0.197
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F (1)	3.8		4.0	0.15		0.157
L	0.4		1.27	0.016		0.050
M			0.6			0.024
S	8° (max.)					

(1) D and F do not include mold flash or protrusions. Mold flash or potrusions shall not exceed 0.15mm (.006inch).

OUTLINE AND MECHANICAL DATA

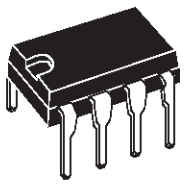


SO8



DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A		3.32			0.131	
a1	0.51			0.020		
B	1.15		1.65	0.045		0.065
b	0.356		0.55	0.014		0.022
b1	0.204		0.304	0.008		0.012
D			10.92			0.430
E	7.95		9.75	0.313		0.384
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			6.6			0.260
I			5.08			0.200
L	3.18		3.81	0.125		0.150
Z			1.52			0.060

OUTLINE AND MECHANICAL DATA



Minidip