

### Features

- External parts: Coil, capacitor
- frequency :300KHz
- Output voltage: Settable to between 2.1V to 5.5V in 0.1V steps
- Accuracy of  $\pm 2\%$
- Maximum Oscillation
- High efficiency :95%
- Package: SOT23 and TO92

### Applications

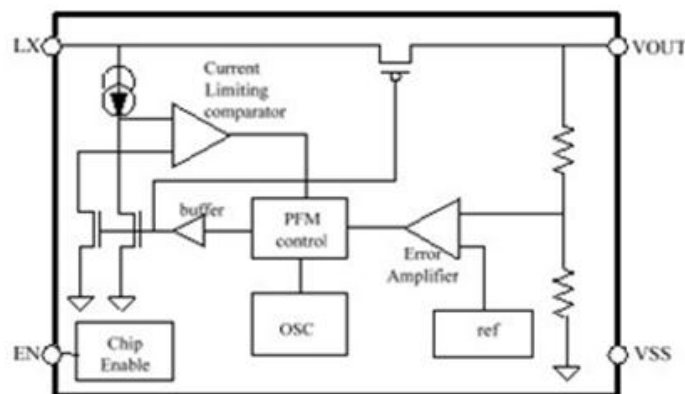
- Digital cameras
- Cameras , video equipment
- Electronic notebooks and PDAS
- Communications equipment
- Portable CD/MD players
- Power supply for microcomputers

### General Description

The HE9116 Series is a Synchronous step-up DC/DC Converter with PFM Control. With the HE Series, a step-up switching DC/DC converter can be configured by using

an external coil, capacitor. The built-in MOSFET is turned off by a protection circuit when the voltage at the LX pin exceeds the limit to prevent it from being damaged.

### Block Diagram



### Order Information

HE9116①②③④⑤

Designator	Symbol	Description
①	A	Standard
	B	Another pin definition
②③	Integer	Output Voltage (2.1~5.5) e.g:3.0V=②: 3; ③: 0
④	N	Package:SOT23
	T	Package:TO-92
⑤	R	RoHS / Pb Free
	G	Halogen Free

### Pin Assignment

#### SOT23 (Top view)

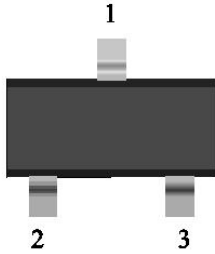


Table1 HE9116A series (SOT23 PKG)

PIN NO.	PIN NAME	FUNCTION
1	VOUT	Output voltage pin
2	GND	GND pin
3	LX	External inductor connection pin

#### TO92 (Front view)

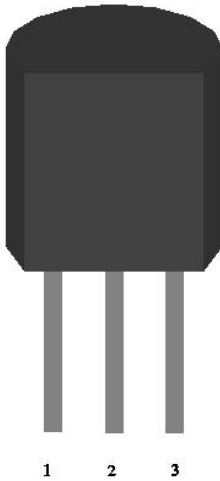


Table2 HE9116A series (TO92 PKG)

PIN NO.	PIN NAME	FUNCTION
1	GND	GND pin
2	VOUT	Output voltage pin
3	LX	External inductor connection pin

Table3 HE9116B series (TO92PKG)

PIN NO.	PIN NAME	FUNCTION
1	VOUT	Output voltage pin
2	GND	GND pin
3	LX	External inductor connection pin

**Absolute Maximum Ratings**

(Unless otherwise specified, Ta=25°C)

PARAMETER		SYMBOL	RATINGS	UNITS
VOUT Pin Voltage		V <sub>OUT</sub>	V <sub>SS</sub> -0.3~V <sub>SS</sub> +8	V
EN Pin Voltage		EN	V <sub>SS</sub> -0.3~V <sub>SS</sub> +8	V
LX Pin Voltage		V <sub>LX</sub>	V <sub>SS</sub> -0.3~V <sub>SS</sub> +8	V
LX Pin Current		I <sub>LX</sub>	500	mA
Power Dissipation	SOT23	PD	250	mW
	SOT23-3/SOT23-5		250	mW
	SOT-89-3		500	mW
	TO-92		500	mW
Operating Temperature		T <sub>OPR</sub>	-40~+85	°C
Storage Temperature		T <sub>STG</sub>	-40~+125	°C
Soldering Temperature & Time		T <sub>SOLDER</sub>	260°C, 10s	

Note: These are stress ratings only. Stresses exceeding the range specified under “Absolute Maximum Ratings” may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

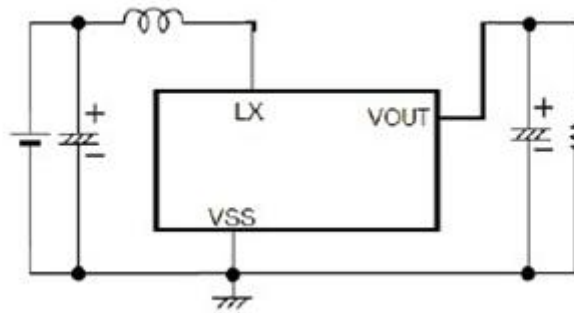
**Electrical Characteristics**

(Unless otherwise specified, Ta = 25°C)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	CONDITION
Output Voltage	V <sub>OUT</sub>	V <sub>OUT(S)</sub> X0.98	V <sub>OUT</sub>	V <sub>OUT(S)</sub> X1.02	V	-
Input Voltage	V <sub>IN</sub>	-	-	7.5	V	-
Operation Start Voltage	V <sub>ST1</sub>	-	-	0.9	V	I <sub>OUT</sub> =1mA
Input Current At No Load	I <sub>SS1</sub>	-	15	-	uA	V <sub>IN</sub> =1.8V, V <sub>OUT</sub> =3.0V
Current Consumption 2	I <sub>SS2</sub>	-	6	10	uA	V <sub>OUT</sub> =V <sub>OUT(S)</sub> +0.5V
Current Consumption During Shutdown	I <sub>SSS</sub>	-	-	1.0	uA	V <sub>EN</sub> =0V
Maximum Oscillation Frequency	f <sub>osc</sub>		300		KHz	V <sub>OUT</sub> =0.95xV <sub>OUT(S)</sub> , measure Waveform at LX pin
Duty Ratio1	Duty1	70	78	85	%	V <sub>OUT</sub> =0.95xV <sub>OUT(S)</sub>
Efficiency	EFF1		90		%	
Shutdown Pin Input Voltage	V <sub>SH</sub>	0.75	-	-	V	V <sub>OUT</sub> =0.95xV <sub>OUT(S)</sub> , judge Oscillation at LX pin
	V <sub>SL</sub>	-	-	0.3	V	V <sub>OUT</sub> =0.95xV <sub>OUT(S)</sub> , judge stop at LX pin
Shutdown Pin input Current	I <sub>SH</sub>	-0.1	-	0.1	uA	V <sub>EN</sub> =6V
	I <sub>SL</sub>	-0.1	-	0.1	uA	V <sub>EN</sub> =0V

Remark: VOUT(S) specified above is the set output voltage value, and VOUT is the typical value of the actual output voltage

**Application Circuits**

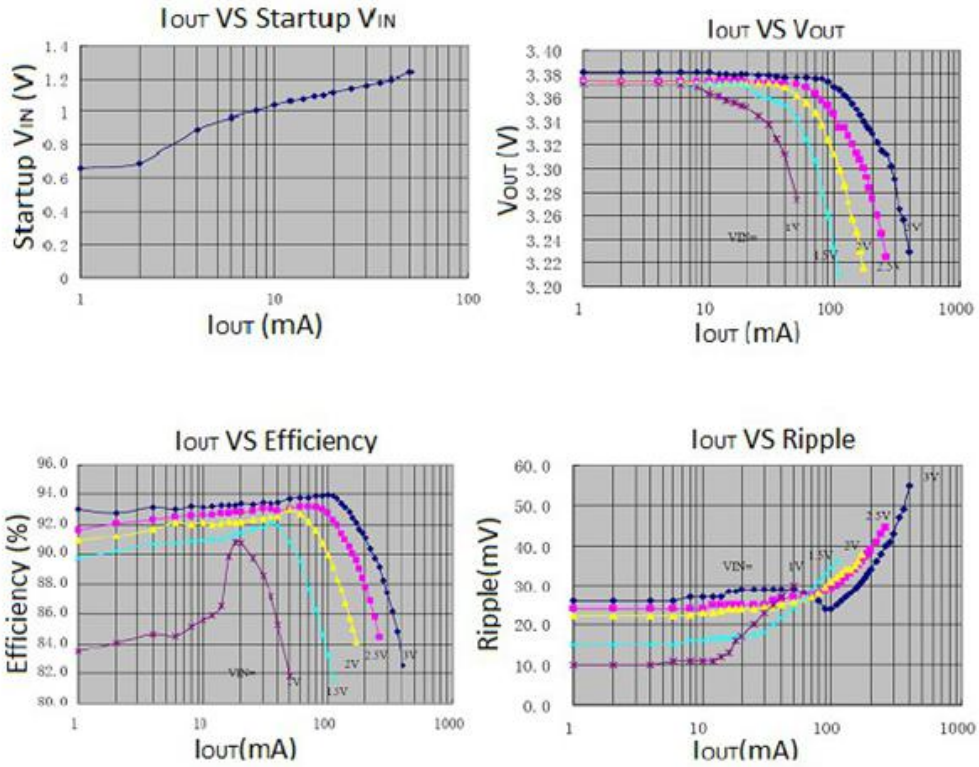


Note: External Component Recommendation:

- 1)  $L=47\mu\text{H}$ (Sumida)
- 2)  $C=100\mu\text{F}/16\text{V}$ (Tantalum)

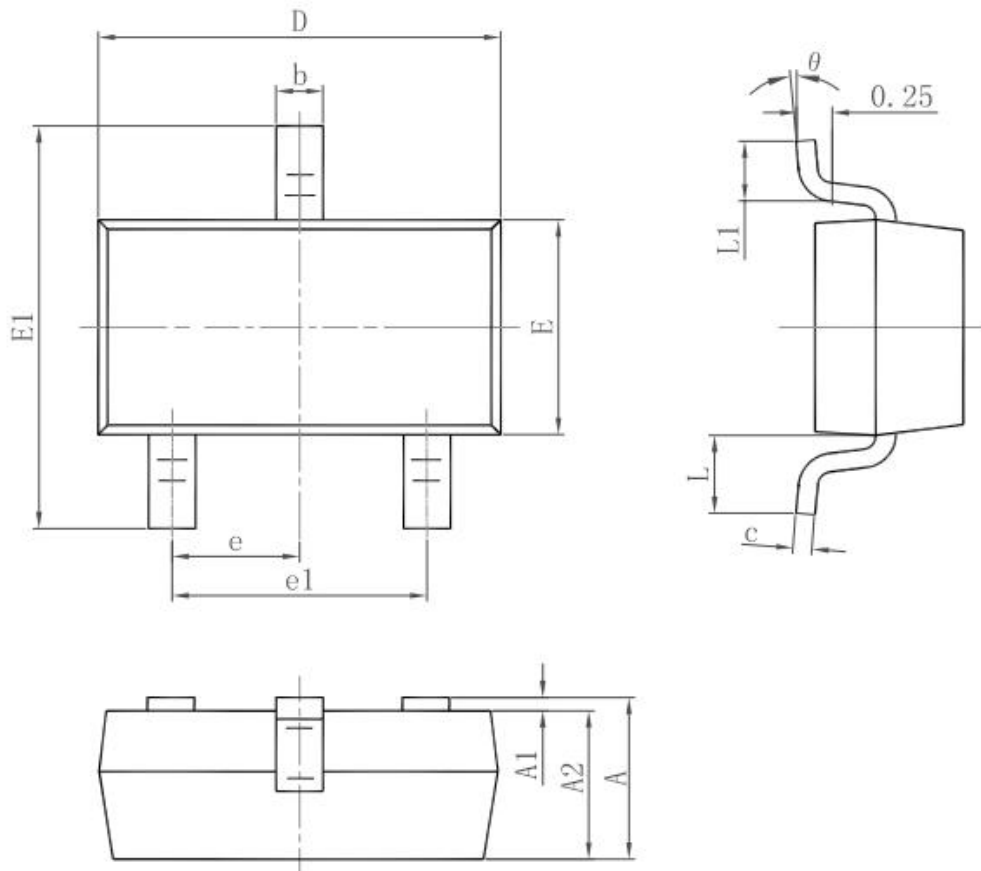
**TYPICAL PERFORMANCE CHARACTERISTICS**

( $C_{in}=C_{out}=100\mu F, L=47\mu H$ )



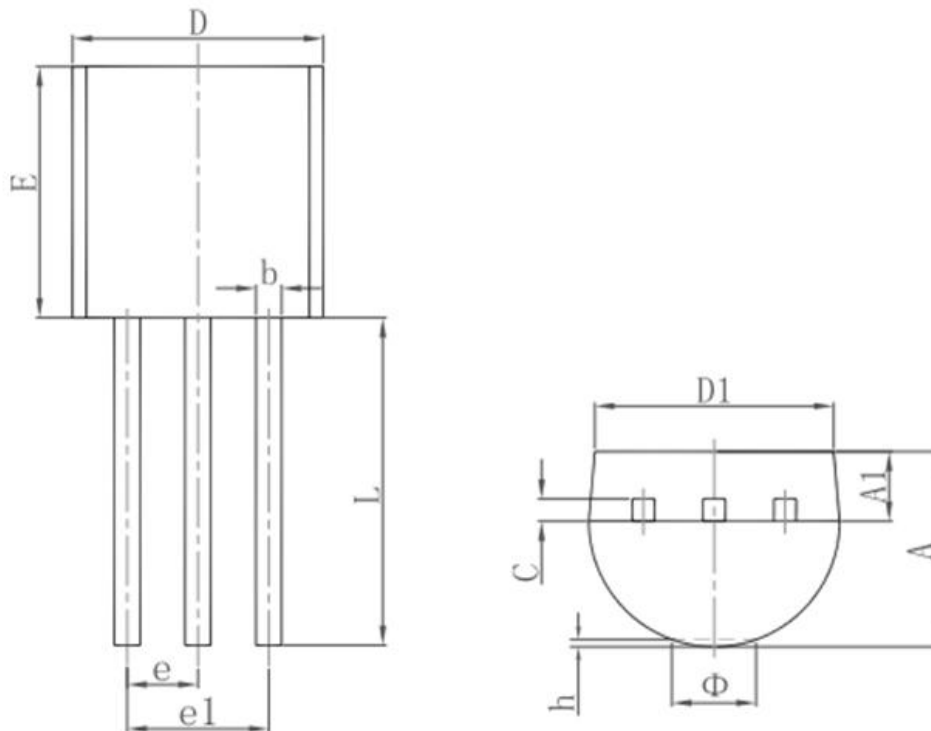
**Package Information**

**3-pin SOT23 Outline Dimensions**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP.		0.037 TYP.	
e1	1.800	2.000	0.071	0.079
L	0.550 REF.		0.022 REF.	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

**3-pin TO92 Outline Dimensions**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	3.300	3.700	0.130	0.146
A1	1.100	1.400	0.043	0.055
b	0.380	0.550	0.015	0.022
c	0.360	0.510	0.014	0.020
D	4.300	4.700	0.169	0.185
D1	3.430		0.135	
E	4.300	4.700	0.169	0.185
e	1.270 TYP.		0.050 TYP.	
e1	2.440	2.640	0.096	0.104
L	14.100	14.500	0.555	0.571
Φ		1.600		0.063
h	0.000	0.380	0.000	0.015

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