

**Small Package PFM Control  
 Step-Up DC/DC Converter**

**CE8301 Series**

■ **INTRODUCTION**

The CE8301 Series is a CMOS PFM-control step-up switching DC/DC converter. The PFM controller allows the duty ratio to be automatically switched according to the load (light load: 66%, high output current: 78%), enabling products with a low ripple over a wide range, high efficiency, and high output current. With the CE8301 Series, a step-up switching DC/DC converter can be configured by using an external coil, capacitor, and diode. 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. This feature, along with the mini package and low current consumption, makes the CE8301 Series ideal for applications such as the power supply unit of portable equipment.

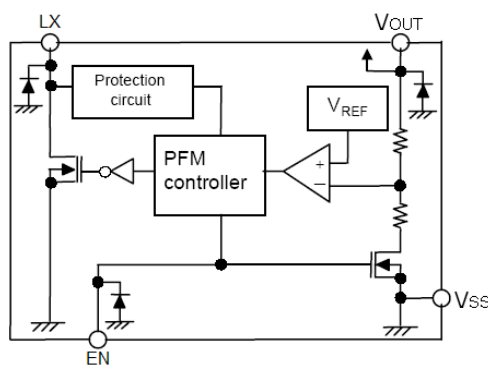
■ **FEATURES**

- Low voltage operation: Startup at 0.9 V min. ( $I_{OUT} = 1 \text{ mA}$ ) guaranteed
- Duty ratio: 66/78%, built in auto switching type PFM controller
- External parts: Coil, capacitor, diode
- Output voltage: Settable to between 1.8V to 6.0 V in 0.1 V steps
- Accuracy of  $\pm 2\%$
- High efficiency:  $\pm 85\%$  (typ.)
- Standard function (product type A)
- Shutdown function (product type C,D)
- External transistor type available (product type B、D)

■ **APPLICATIONS**

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

■ **BLOCK DIAGRAM**



■ **ORDER INFORMATION**

CE8301①②③④

DESIGNATOR	SYMBOL	DESCRIPTION
①	A	Standard LX
	B	Standard EXT
	C	With shutdown, LX
	D	With shutdown, EXT
②③	Integer	Output Voltage (1.8~6.0) e.g.: 3.0V=②:3; ③:0
④	M	Package: SOT-23
	P	Package: SOT-89
	T	Package: TO-92

■ PIN CONFIGURATION

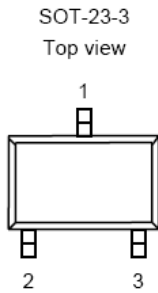


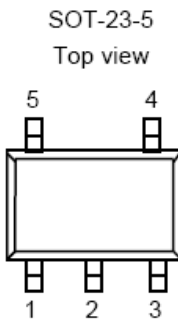
Table 1 CE8301A Series (SOT-23-3 PKG)

PIN NO.	PIN NAME	FUNCTION
1	V <sub>OUT</sub>	Output voltage pin
2	V <sub>SS</sub>	GND pin
3	LX	External inductor connection pin

Table 2 CE8301B Series (SOT-23-3 PKG)

PIN NO.	PIN NAME	FUNCTION
1	V <sub>OUT</sub>	Output voltage pin
2	V <sub>SS</sub>	GND pin
3	EXT	External transistor connection pin

Table 3 CE8301C Series (SOT-23-5 PKG)



PIN NO.	PIN NAME	FUNCTION
1	EN	Shutdown pin “H”: Normal operation “L”: Step-up stopped
2	V <sub>OUT</sub>	Output voltage pin
3	NC	(N.C.)
4	V <sub>SS</sub>	GND pin
5	LX	External inductor connection pin

Table 4 CE8301D Series (SOT-23-5 PKG)

PIN NO.	PIN NAME	FUNCTION
1	EN	Shutdown pin “H”: Normal operation “L”: Step-up stopped
2	V <sub>OUT</sub>	Output voltage pin
3	NC	(N.C.)
4	V <sub>SS</sub>	GND pin
5	EXT	External transistor connection pin

Table 5 CE8301A Series (SOT-89-3 PKG)



PIN NO.	PIN NAME	FUNCTION
1	V <sub>SS</sub>	GND pin
2	V <sub>OUT</sub>	Output voltage pin
3	LX	External inductor connection pin

Table 6 CE8301B Series (SOT-89-3 PKG)

PIN NO.	PIN NAME	FUNCTION
1	V <sub>SS</sub>	GND pin
2	V <sub>OUT</sub>	Output voltage pin
3	EXT	External transistor connection pin

Table 7 CE8301C Series (SOT-89-5 PKG)

PIN NO.	PIN NAME	FUNCTION
1	NC	(N.C.)
2	V <sub>OUT</sub>	Output voltage pin
3	EN	Shutdown pin “H”: Normal operation “L”: Step-up stopped
4	LX	External inductor connection pin
5	V <sub>SS</sub>	GND pin

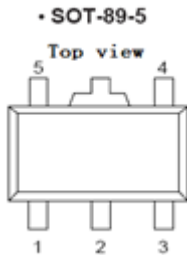


Table 8 CE8301D Series (SOT-89-5 PKG)

PIN NO.	PIN NAME	FUNCTION
1	NC	(N.C.)
2	V <sub>OUT</sub>	Output voltage pin
3	EN	Shutdown pin “H”: Normal operation “L”: Step-up stopped
4	EXT	External transistor connection pin
5	V <sub>SS</sub>	GND pin

Table 9 CE8301A Series (TO-92 PKG)



PIN NO.	PIN NAME	FUNCTION
1	V <sub>SS</sub>	GND pin
2	V <sub>OUT</sub>	Output voltage pin
3	LX	External inductor connection pin

■ ABSOLUTE MAXIMUM RATINGS

(Unless otherwise specified, T<sub>a</sub>=25°C)

PARAMETER	SYMBOL	RATINGS	UNITS	
V <sub>OUT</sub> 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>	1000	mA	
Power dissipation	PD	SOT-23-3	250	mW
		SOT-23-5	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		

## ■ ELECTRICAL CHARACTERISTICS

(Unless otherwise specified,  $T_a=25^\circ\text{C}$ )

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	
Output voltage	$V_{OUT}$	—	$V_{OUT(S)} \times 0.98$	$V_{OUT}$	$V_{OUT(S)} \times 1.02$	V	
Input voltage	$V_{IN}$	—	—	—	6	V	
Operation start voltage	$V_{ST1}$	$I_{OUT} = 1 \text{ mA}$	—	—	0.9	V	
Oscillation start voltage	$V_{ST2}$	No external parts, voltage applied to $V_{OUT}$ LX pulled up to $V_{OUT}$ via $300\Omega$ resistor	—	—	0.8	V	
Current consumption 1	$I_{SS1}$	$V_{OUT} = 0.95 \times V_{OUT}$	$V_{OUT}: 3.0\text{V}$	—	20	40	$\mu\text{A}$
			$V_{OUT}: 5.0\text{V}$	—	30	60	$\mu\text{A}$
Current consumption 2	$I_{SS2}$	$V_{OUT} = V_{OUT} + 0.5 \text{ V}$	—	6	10	$\mu\text{A}$	
Current consumption during shutdown	$I_{SSS}$	$V_{EN} = 0 \text{ V}$	—	—	1.0	$\mu\text{A}$	
Switching current	$I_{SW}$	$V_{LX} = 0.4 \text{ V}$	100	200	—	mA	
Switching transistor leakage current	$I_{SWQ}$	No external parts, $V_{LX} = V_{OUT} = 8 \text{ V}$ , $V_{EN} = 0 \text{ V}$	—	—	1.0	$\mu\text{A}$	
Line regulation	$\Delta V_{OUT1}$	$V_{IN} = 0.4 \times V_{OUT} \sim 0.6 \times V_{OUT}$	—	20	50	mV	
Load regulation	$\Delta V_{OUT2}$	$I_{OUT} = 10 \mu\text{A} \sim 50\text{mA}$	—	20	50	mV	
Maximum Oscillation frequency	$f_{OSC}$	$V_{OUT} = 0.95 \times V_{OUT}$ , measure waveform at LX pin	—	100	—	KHz	
Duty ratio 1	Duty1	$V_{OUT} = 0.95 \times V_{OUT}$ , measure waveform at LX pin	70	78	85	%	
Duty ratio 2	Duty2	Measure waveform at LX pin with light load	—	66	—	%	
Efficiency	EFFI	—	—	85	—	%	
Shutdown pin input voltage	$V_{SH}$	$V_{OUT} = 0.95 \times V_{OUT}$ , judge oscillation at LX pin	0.75	—	—	V	
	$V_{SL1}$	$V_{OUT} = 0.95 \times V_{OUT}$ , judge stop at LX pin	—	—	0.3	V	
Shutdown pin input current	$I_{SH}$	$V_{EN} = 6\text{V}$	-0.1	—	0.1	$\mu\text{A}$	
	$I_{SL}$	$V_{EN} = 0\text{V}$	-0.1	—	0.1	$\mu\text{A}$	

Remark:  $V_{IN} = V_{OUT(S)} \times 0.6$  applied,  $I_{OUT} = V_{OUT(S)} / 250 \Omega$

Shutdown function built-in type: EN pin is connected to  $V_{OUT}$

$V_{ST1}$  only is suitable for CE8301A/C

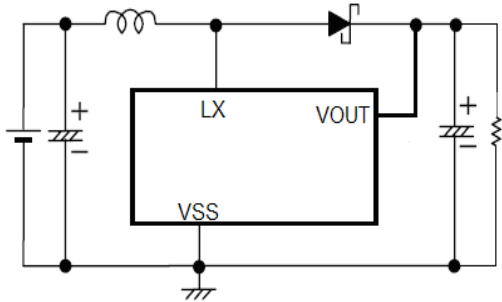
$V_{OUT(S)}$  specified above is the set output voltage value, and  $V_{OUT}$  is the typical value of the actual output voltage.

**STANDARD CIRCUITS**

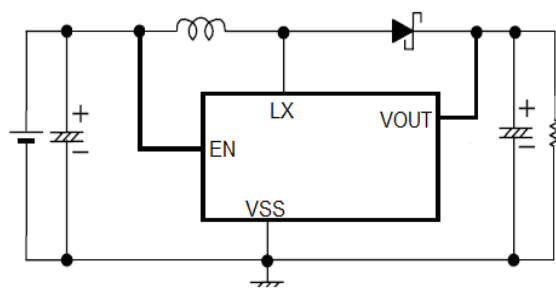
**Component:** Inductor: 47uH(Sumida)  
 Capacitor: 47uF/16V(Tantalum)  
 NMOS: XP151、XP161

Diode: IN5817、IN5819  
 Transistor: 2SD1628G、2SD3279  
 Base Resistor(Rb): 1K Ω

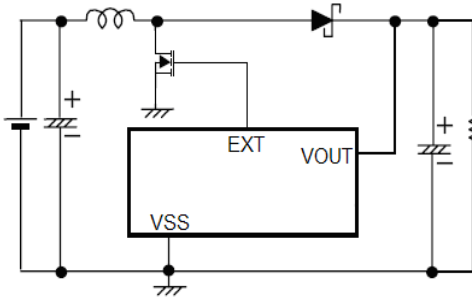
1、CE8301A Circuits:



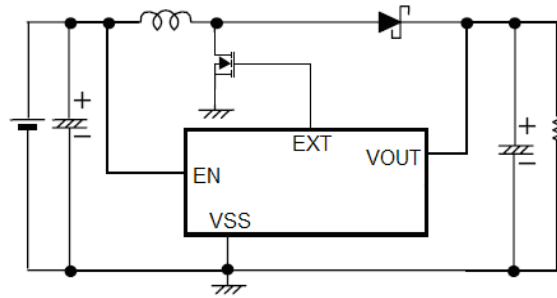
2、CE8301C Circuits:



3、CE8301B Circuits:



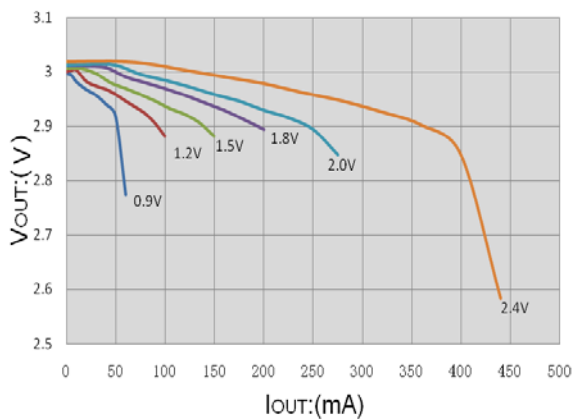
4、CE8301D Circuits:



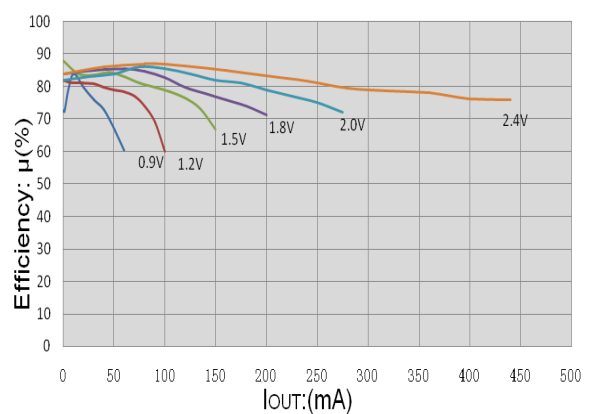
**TYPICAL PERFORMANCE CHARACTERISTICS**

1. CE8301A30P:

a、V<sub>OUT</sub> vs. I<sub>OUT</sub> :

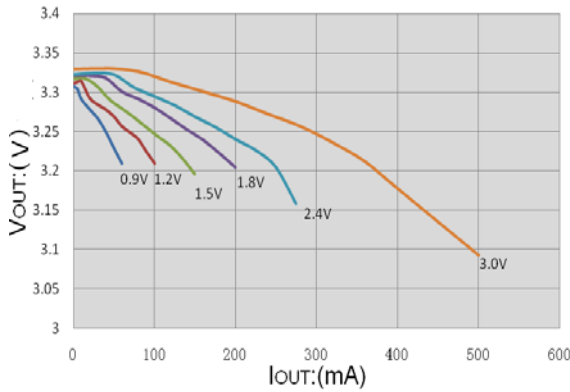


b、Efficiency vs. I<sub>OUT</sub> :

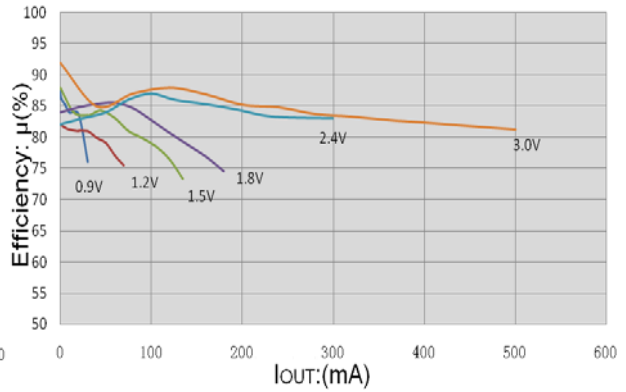


**2. CE8301A33P:**

a、 $V_{OUT}$  vs.  $I_{OUT}$  :

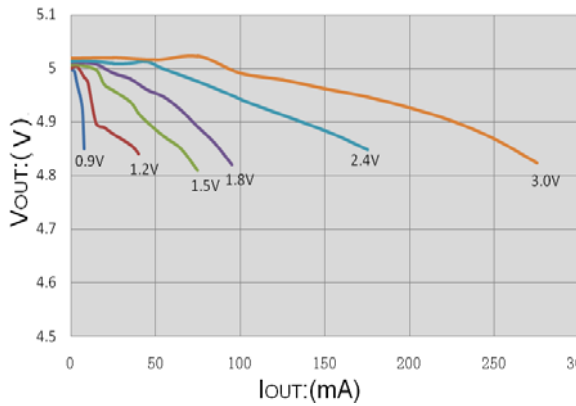


b、Efficiency vs.  $I_{OUT}$  :

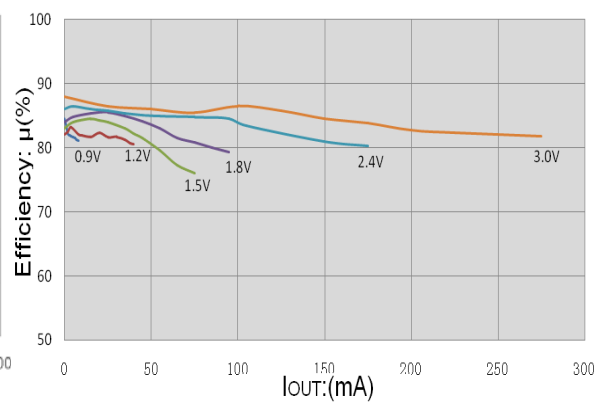


**3. CE8301A50P:**

a、 $V_{OUT}$  vs.  $I_{OUT}$  :

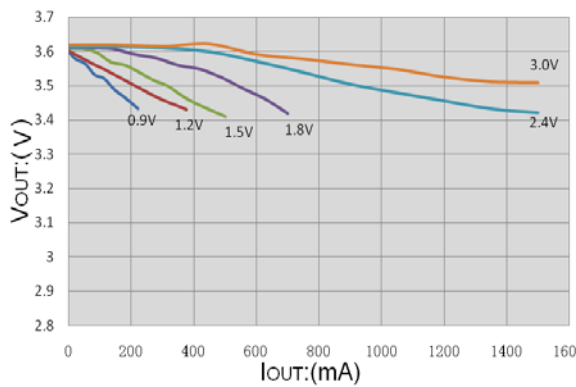


b、Efficiency vs.  $I_{OUT}$  :

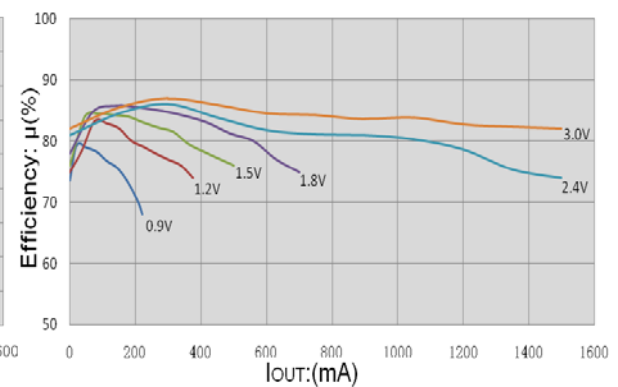


**4. CE8301B36P:**

a、 $V_{OUT}$  vs.  $I_{OUT}$  :

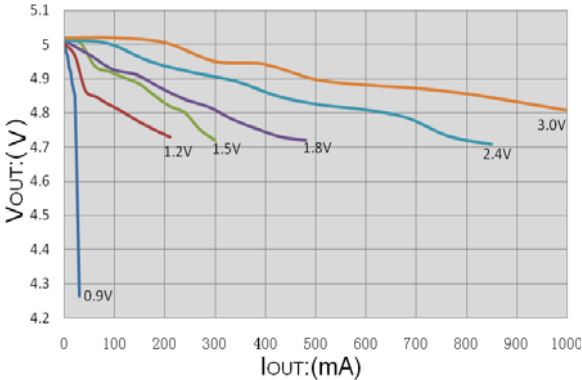


b、Efficiency vs.  $I_{OUT}$  :

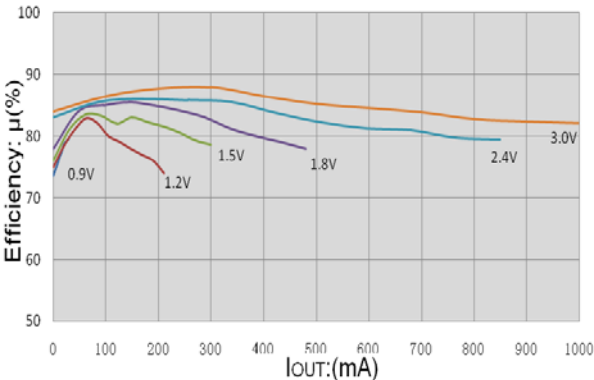


5. CE8301B50P:

a、 $V_{OUT}$  vs.  $I_{OUT}$  :

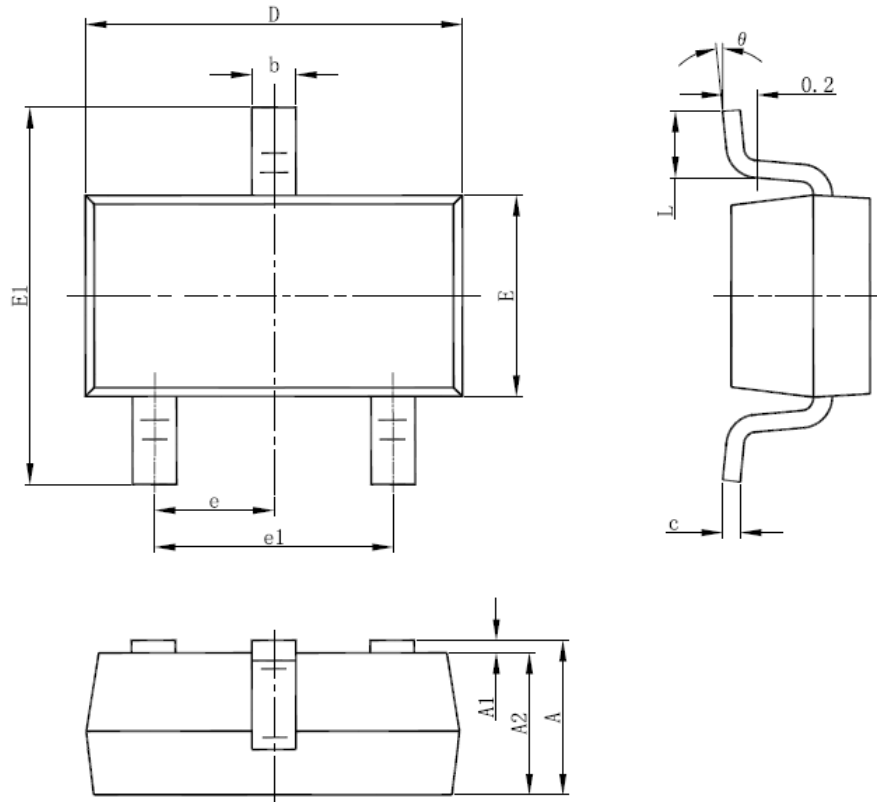


b、Efficiency vs.  $I_{OUT}$  :



■ PACKAGE INFORMATION

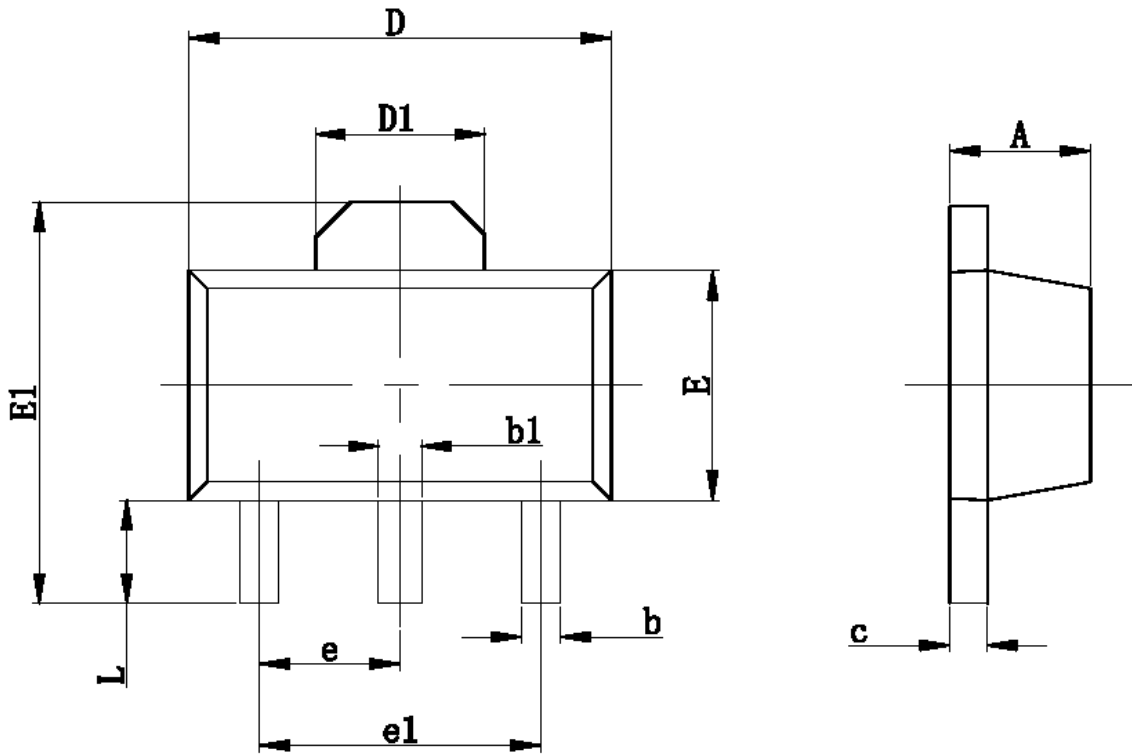
- SOT-23-3



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
$\theta$	0°	8°	0°	8°

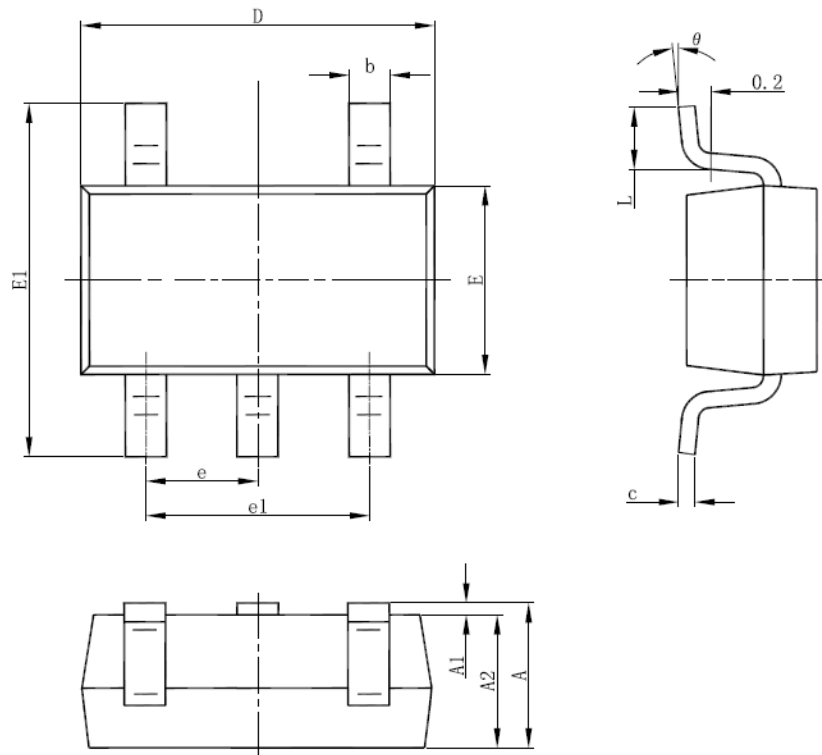


- SOT-89-3



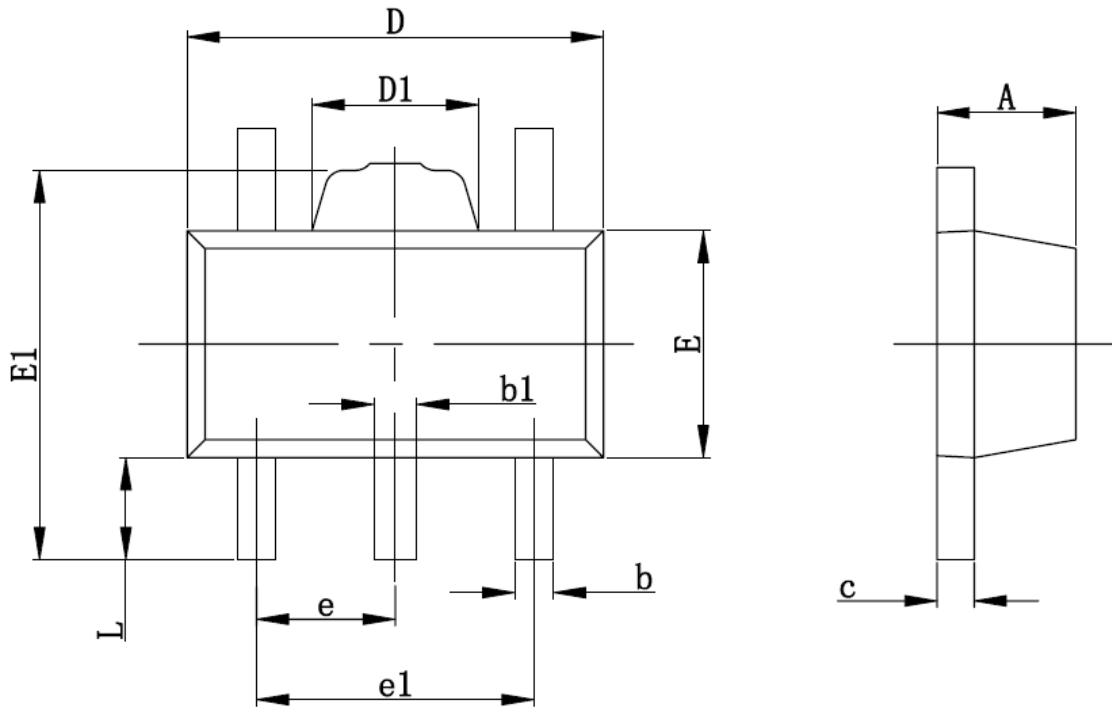
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.197
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF		0.061 REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP		0.060TYP	
e1	3.000 TYP		0.118TYP	
L	0.900	1.200	0.035	0.047

• SOT-23-5



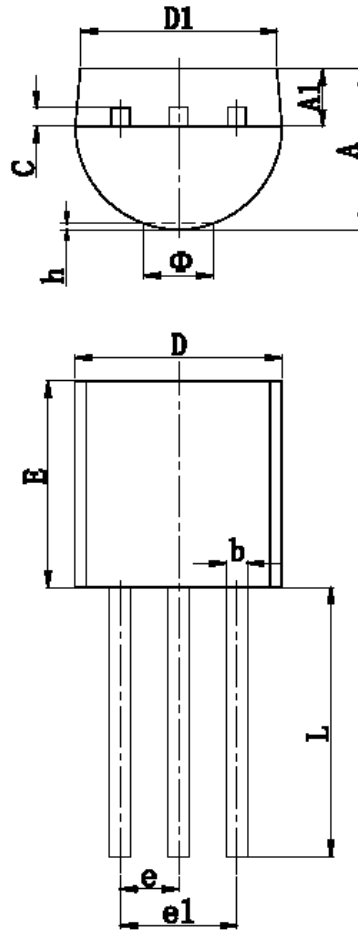
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
$\theta$	0°	8°	0°	8°

- SOT-89-5



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.360	0.560	0.014	0.022
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.400	1.800	0.055	0.071
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500TYP		0.060TYP	
e1	2.900	3.100	0.114	0.122
L	0.900	1.100	0.035	0.043

- TO-92



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	4.400	4.700	0.173	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
Phi		1.600		0.063
h	0.000	0.380	0.000	0.015

© Nanjing Chipower Electronics Inc.

Chipower cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Chipower product. No circuit patent license, copyrights or other intellectual property rights are implied. Chipower reserves the right to make changes to their products or specifications without notice. Customers are advised to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete.