

### ■ Introduction

The **CE8301 Series** is a CMOS PFM-control step-up switching DC/DC converter that mainly consists of a reference voltage source, an oscillator, and a comparator. The PFM controller allows the duty ratio to be automatically switched according to the load (light load: 50%, high output current: 75%), 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 MOS FET 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.

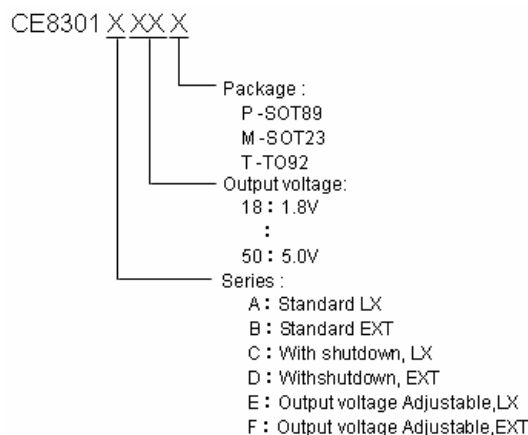
### ■ Applications

- Power supply for portable equipment such as digital cameras, electronic notebooks, and PDAs
- Power supply for audio equipment such as portable CD/MD players
- Constant voltage power supply for cameras, video equipment, and communications equipment
- Power supply for microcomputers

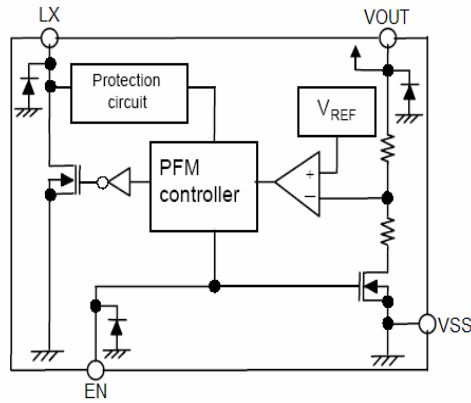
### ■ Features

- Low voltage operation: Startup at 0.9 V min. ( $I_{OUT} = 1 \text{ mA}$ ) guaranteed
- Duty ratio: 66/78%, builtin auto switching type PFM controller
- External parts: Coil, capacitor, diode
- Output voltage: Settable to between 1.8 to 6.5 V in 0.1 V steps
- Accuracy of  $\pm 2\%$
- High efficiency: 85% (typ.)
- Standard function (product type A)
- Shutdown function (product type C、D)
- Output voltage Adjustable type (product type E、F)
- External transistor type available (product type B、E、F)

### ■ Ordering Information



■ Block Diagrams



Pin Assignment

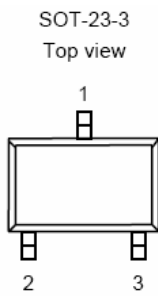


Table 1 CE8301A Series (SOT-23-3 PKG)

Pin No.	Pin Name	Functions
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	Functions
1	V <sub>OUT</sub>	Output voltage pin
2	V <sub>SS</sub>	GND pin
3	EXT	External transistor connection pin

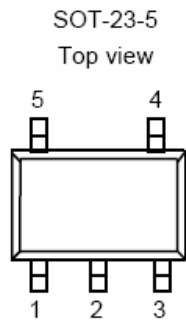


Table 3 CE8301C Series (SOT-23-5 PKG)

Pin No.	Pin Name	Functions
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 transistor connection pin

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

Pin No.	Pin Name	Functions
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

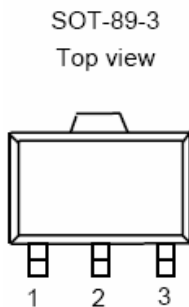
Table 5 CE8301 ESeries (SOT-23-5 PKG)

Pin No.	Pin Name	Functions
1	VOUT (FB)	Output voltage fixed output type; Output voltage monitoring pin (Output voltage external setting type; Feedback pin)
2	V <sub>DD</sub>	IC power supply pin
3	NC	(N.C.)
4	V <sub>SS</sub>	GND pin
5	LX	External transistor connection pin

Table 6 CE8301 FSeries (SOT-23-5 PKG)

Pin No.	Pin Name	Functions
1	VOUT (FB)	Output voltage fixed output type; Output voltage monitoring pin (Output voltage external setting type; Feedback pin)
2	V <sub>DD</sub>	IC power supply pin
3	NC	(N.C.)
4	V <sub>SS</sub>	GND pin
5	EXT	External transistor connection pin

Table 7 CE8301A Series (SOT-89-3 PKG)

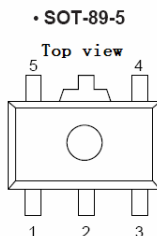


Pin No.	Pin Name	Functions
1	V <sub>SS</sub>	GND pin
2	V <sub>OUT</sub>	Output voltage pin
3	LX	External inductor connection pin

Table 8 CE8301B Series (SOT-89-3 PKG)

Pin No.	Pin Name	Functions
1	V <sub>SS</sub>	GND pin
2	V <sub>OUT</sub>	Output voltage pin
3	EXT	External transistor connection pin

Table 9 CE8301E Series (SOT-89-5 PKG)



Pin No.	Pin Name	Functions
1	NC	(N.C.)
2	V <sub>DD</sub>	IC power supply pin
3	VOUT (FB)	Output voltage fixed output type; Output voltage monitoring pin (Output voltage external setting type; Feedback pin)
4	LX	External transistor connection pin
5	V <sub>SS</sub>	GND pin

Table 10 CE8301F Series (SOT-89-5 PKG)

Pin No.	Pin Name	Functions
1	NC	(N.C.)
2	V <sub>DD</sub>	IC power supply pin
3	V <sub>OUT</sub> (FB)	Output voltage fixed output type; Output voltage monitoring pin (Output voltage external setting type; Feedback pin)
4	EXT	External transistor connection pin
5	V <sub>SS</sub>	GND pin

### ■ Absolute Maximum Ratings

(Unless otherwise specified, Ta=25 °C)

Parameter	Symbol	Ratings	Unit
V <sub>OUT</sub> pin voltage	V <sub>OUT</sub>	V <sub>SS</sub> -0.3 ~ V <sub>SS</sub> +10	V
EN pin voltage	EN	V <sub>SS</sub> -0.3 ~ V <sub>SS</sub> +10	V
LX pin voltage	V <sub>LX</sub>	V <sub>SS</sub> -0.3 ~ V <sub>SS</sub> +10	V
LX pin current	I <sub>LX</sub>	1000	mA
Power dissipation	SOT-23-3	PD	250
	SOT-23-5		250
	SOT-89-3		500
Operating temperature	Topr	-40 ~ +85	°C
Storage temperature	Tstg	-40 ~ +125	°C

### ■ Electrical Characteristics

(Unless otherwise specified, Ta =25 °C)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Output voltage	V <sub>OUT</sub>	—	V <sub>OUT(S)</sub> ×0.98	V <sub>OUT</sub>	V <sub>OUT(S)</sub> ×1.02	V	
Input voltage	V <sub>IN</sub>	—	—	—	10	V	
Operation start voltage	V <sub>ST1</sub>	I <sub>OUT</sub> = 1 mA	—	—	0.9	V	
Oscillation start voltage	V <sub>ST2</sub>	No external parts, voltage applied to V <sub>OUT</sub> LX pulled up to V <sub>OUT</sub> via 300Ω resistor	—	—	0.8	V	
Current consumption 1	I <sub>SS1</sub>	V <sub>OUT</sub> =0.95 ×V <sub>OUT</sub>	V <sub>OUT</sub> : 3.0V	—	30	40	μA
			V <sub>OUT</sub> : 5.0V	—	50	60	μA
Current consumption 2	I <sub>SS2</sub>	V <sub>OUT</sub> =V <sub>OUT</sub> +0.5 V	—	6	10	μA	
Current consumption during shutdown	I <sub>SSS</sub>	V <sub>EN</sub> = 0 V	—	—	0.5	μA	
Switching current	I <sub>SW</sub>	V <sub>LX</sub> = 0.4 V	100	200	—	mA	
Switching transistor leakage current	I <sub>SWQ</sub>	No external parts, V <sub>LX</sub> =V <sub>OUT</sub> =10 V, V <sub>EN</sub> = 0 V	—	—	0.5	μA	
Line regulation	ΔV <sub>OUT1</sub>	V <sub>IN</sub> = 0.4×V <sub>OUT</sub> ~ 0.6×V <sub>OUT</sub>	—	20	50	mV	

Load regulation	$\Delta V_{OUT2}$	$I_{OUT} = 10 \mu A \sim 50mA$	—	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	$I_{SH}$	$V_{EN} = 10V$	-0.1	—	0.1	$\mu A$
	$I_{SL}$	$V_{EN} = 0V$	-0.1	—	0.1	$\mu A$

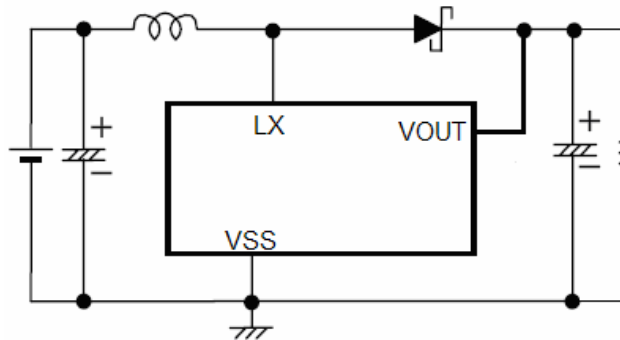
Remark:  $V_{IN} = V_{OUT(S)} \times 0.6$  applied,  $I_{OUT} = V_{OUT(S)} / 250 \Omega$

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

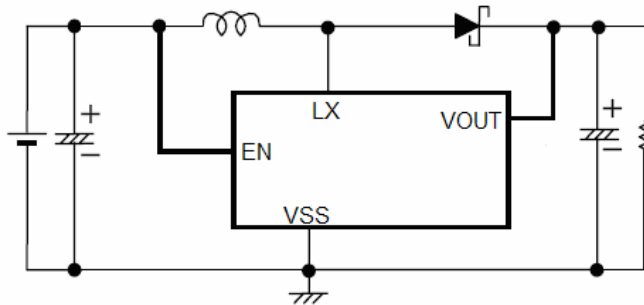
$V_{OUT(S)}$  specified above is the set output voltage value, and  $V_{OUT}$  is the typical value of the actual output voltage.

**Standard Circuits**

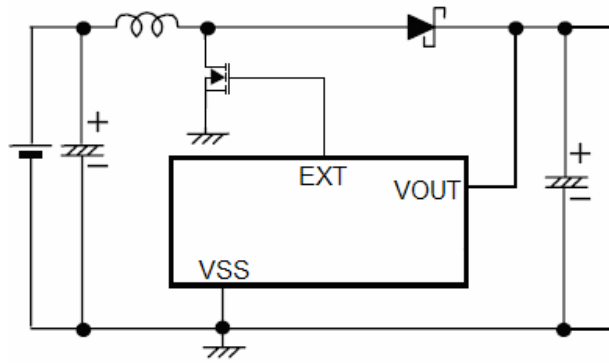
**1、CE8301A Circuits:**



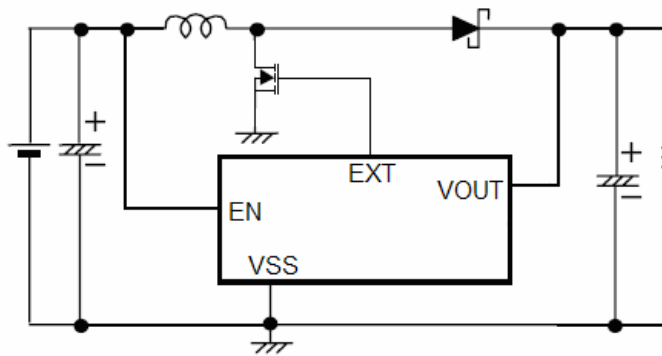
**2、CE8301C Circuits:**



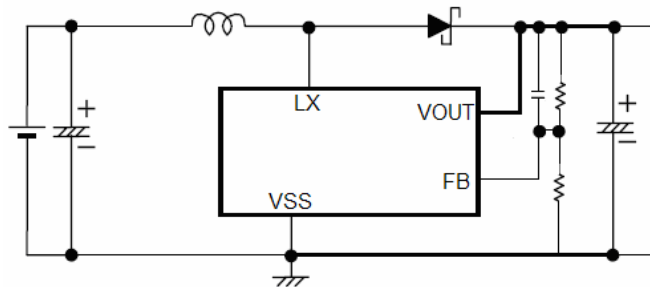
3、CE8301B Circuits:



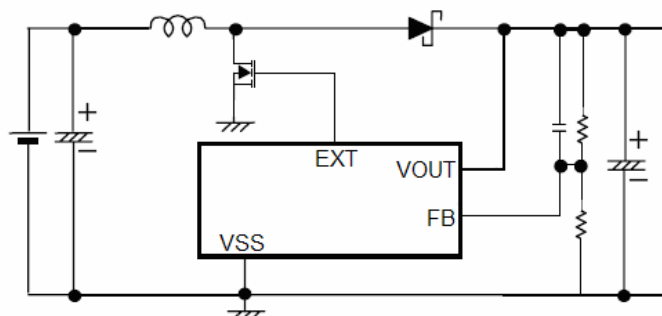
4、CE8301D Circuits:



5、CE8301E Circuits:



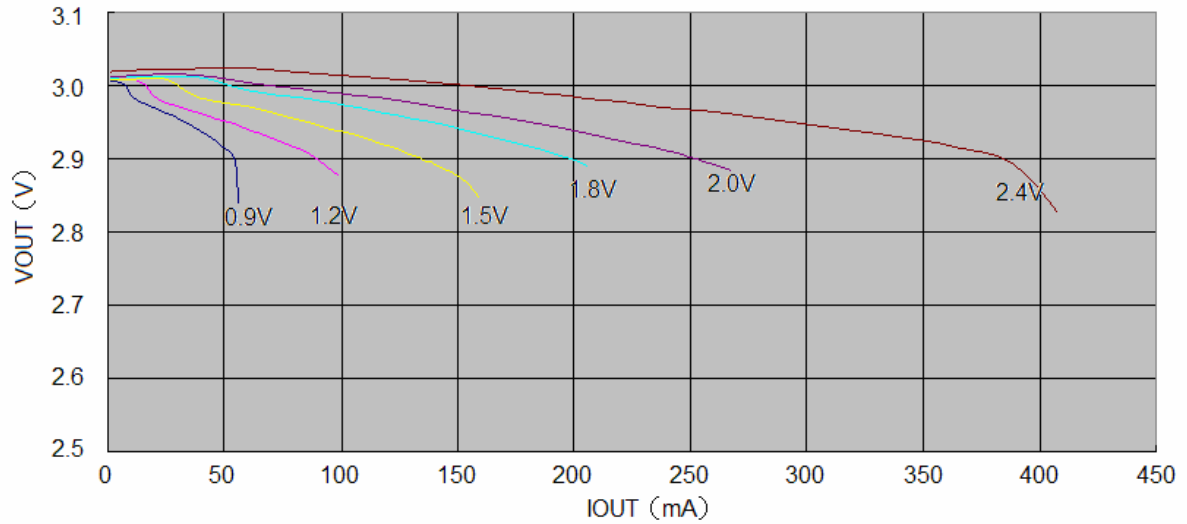
6、CE8301F Circuits:



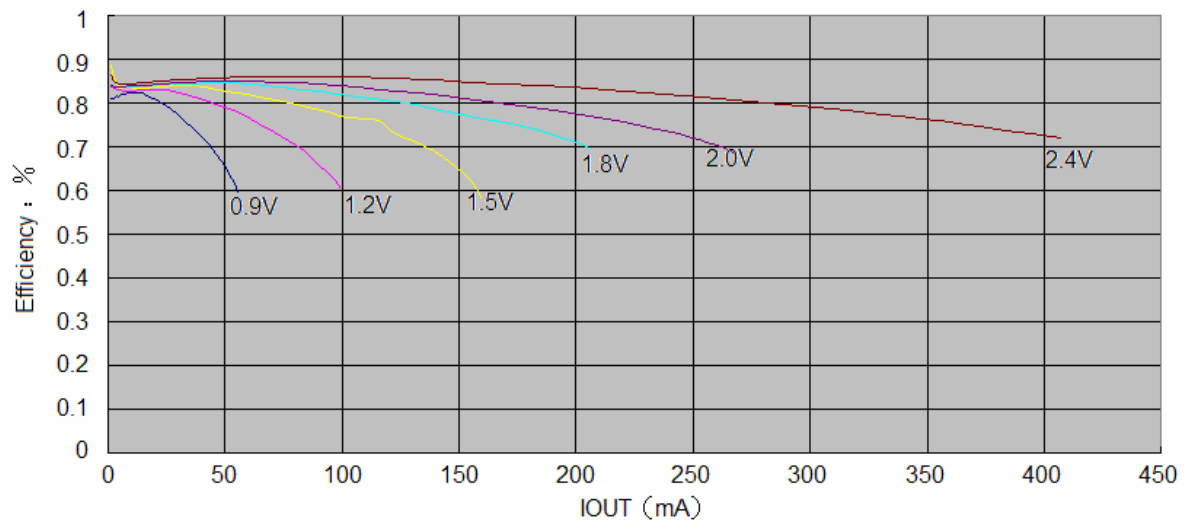
## ■ Characteristics

### 1. CE8301A30P:

#### a. $V_{OUT}$ vs. $I_{OUT}$ :



#### b. Efficiency vs. $I_{OUT}$ :

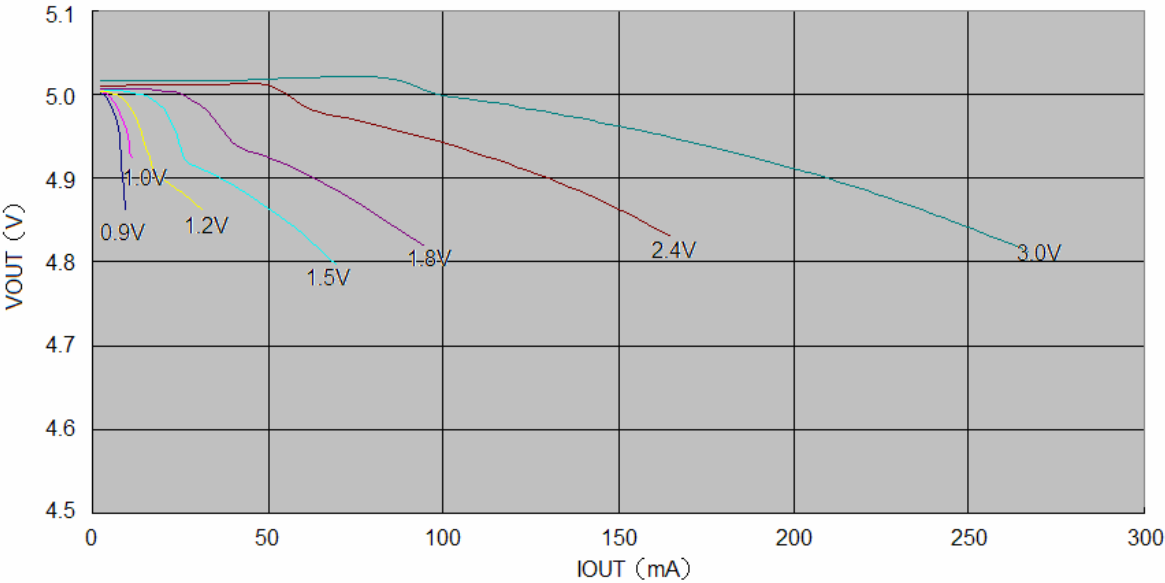




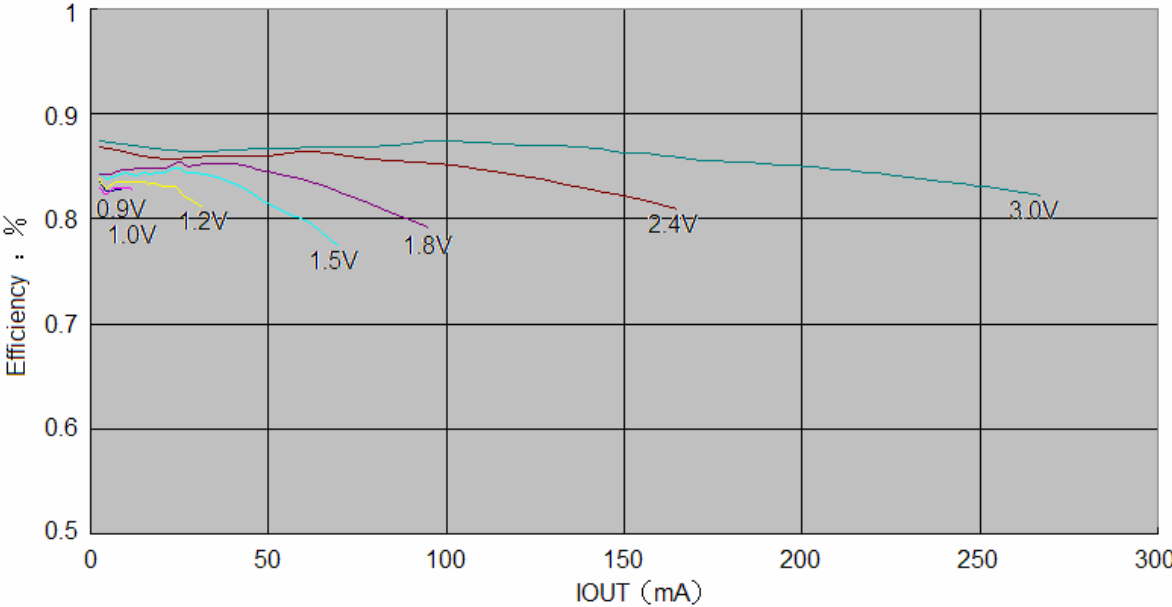


3. CE8301A50P:

a.  $V_{OUT}$  vs.  $I_{OUT}$  :

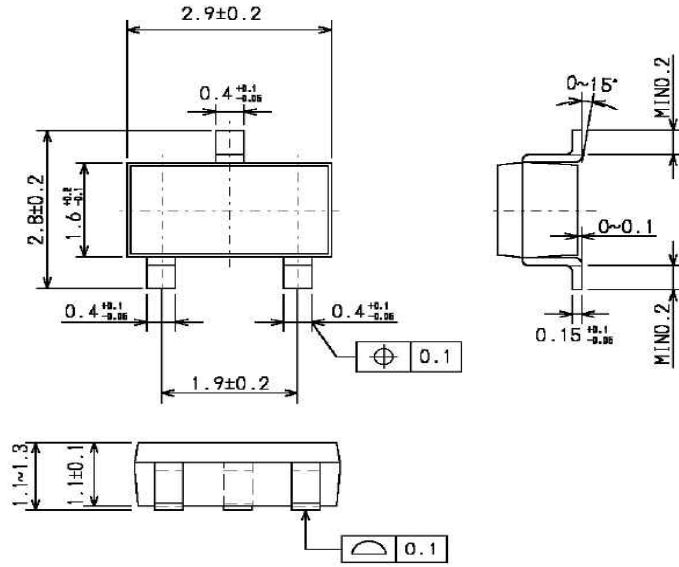


b. Efficiency vs.  $I_{OUT}$  :

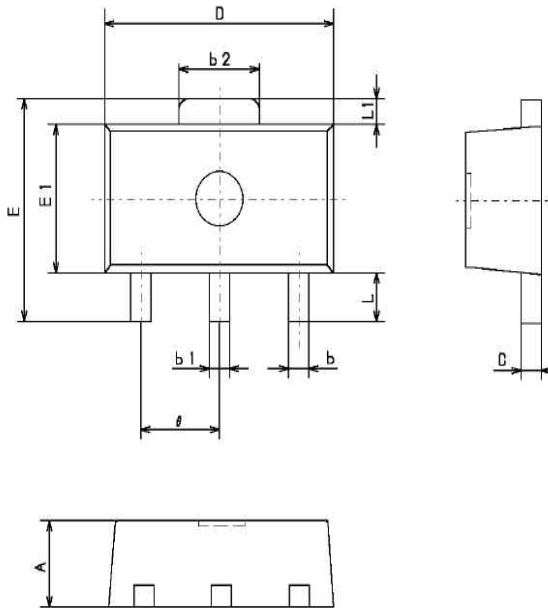


■ Package information

● SOT-23

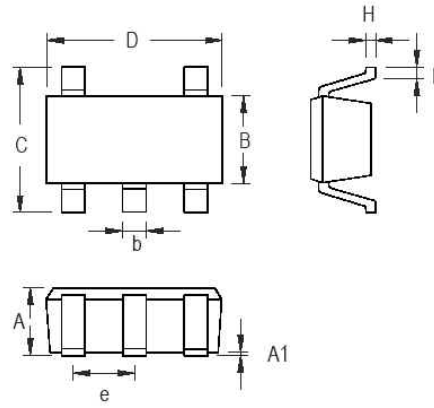


● SOT-89



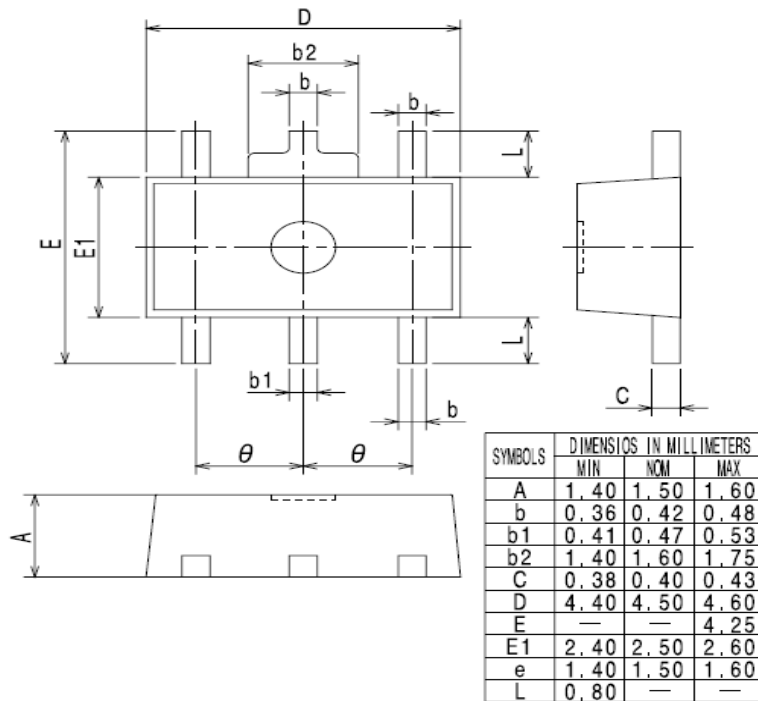
Symbols	Dimensions in millimeters		
	Min	Nom	Max
A	1.40	1.50	1.60
b	0.36	0.42	0.48
b1	0.41	0.47	0.53
b2	1.40	1.60	1.75
C	0.38	0.40	0.43
D	4.40	4.50	4.60
E	—	—	4.25
E1	2.40	2.50	2.60
$\theta$	1.40	1.50	1.60
L	1.80	—	—
L1	—	0.40	—

• SOT-23-5

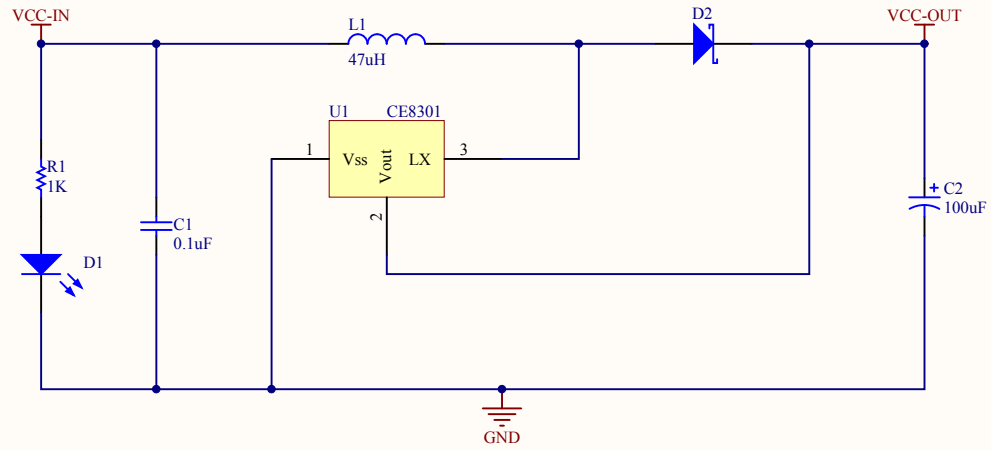


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.889	1.295	0.035	0.051
A1	0.000	0.152	0.000	0.006
B	1.397	1.803	0.055	0.071
b	0.356	0.559	0.014	0.022
C	2.591	2.997	0.102	0.118
D	2.692	3.099	0.106	0.122
e	0.838	1.041	0.033	0.041
H	0.080	0.254	0.003	0.010
L	0.300	0.610	0.012	0.024

• SOT-89-5



SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	1.40	1.50	1.60
b	0.36	0.42	0.48
b1	0.41	0.47	0.53
b2	1.40	1.60	1.75
C	0.38	0.40	0.43
D	4.40	4.50	4.60
E	—	—	4.25
E1	2.40	2.50	2.60
e	1.40	1.50	1.60
L	0.80	—	—



Title		
Size	Number	Revision
A4		
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Comment	Description	Designator	Footprint	LibRef	Quantity
0.1uF	Capacitor	C1	0805	CAP	1
100uF	Polarized Capacitor (Surface Mount)	C2	CAP_6_5	Cap Pol3	1
LED	Typical INFRARED GaAs LED	D1	LED-0805	LED	1
	Schottky Diode	D2	SS14	D Schottky	1
47uH	Inductor	L1	INDUCTOR_6_5	Inductor	1
1K	Semiconductor Resistor	R1	0805	RES	1
CE8301		U1	SOT89L	CE8301	1