Small Package PFM Control Step-Up DC/DC Converter

CJ9117 Series

■ INTRODUCTION

The CJ9117 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 CJ9117 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 CJ9117 Series ideal for applications such as the power supply unit of portable equipment.

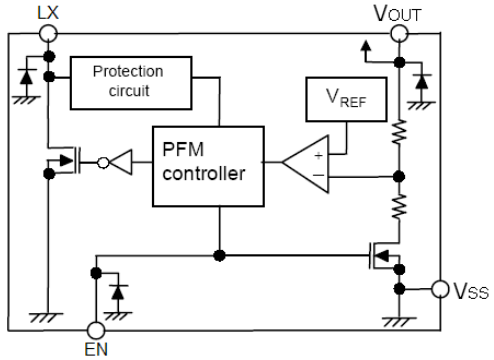
■ FEATURES

- Low voltage operation: Startup at 0.9 V min. (I_{OUT} = 1 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 ±2%
- High efficiency：±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



■ DEVICE INFORMATION:

CJ9117 ①②③④

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	T3/T5	Package：SOT-23-3/5L
	R/H	Package：SOT-89-3/5L
	L	Package：TO-92

Pin Configuration

SOT-23-3L
Top view

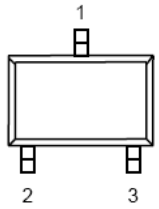


Table 1 CJ9117A Series（SOT-23-3L PKG）

PIN NO.	PIN NAME	FUNCTION
1	V_{OUT}	Output voltage pin
2	V_{SS}	GND pin
3	LX	External inductor connection pin

Table 2 CJ9117B Series（SOT-23-3L PKG）

PIN NO.	PIN NAME	FUNCTION
1	V_{OUT}	Output voltage pin
2	V_{SS}	GND pin
3	EXT	External transistor connection pin

Table 3 CJ9117C Series（SOT-23-5L PKG）

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

SOT-23-5L
Top view

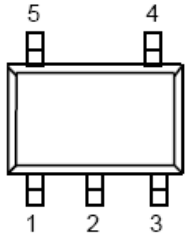


Table 4 CJ9117D Series（SOT-23-5L PKG）

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

Table 5 CJ9117A Series （SOT-89-3L PKG）

PIN NO.	PIN NAME	FUNCTION
1	V_{SS}	GND pin
2	V_{OUT}	Output voltage pin
3	LX	External inductor connection pin

SOT-89-3L
Top view

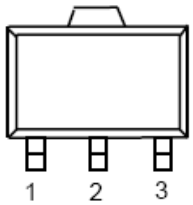


Table 6 CJ9117B Series （SOT-89-3L PKG）

PIN NO.	PIN NAME	FUNCTION
1	V_{SS}	GND pin
2	V_{OUT}	Output voltage pin
3	EXT	External transistor connection pin

SOT-89-5L
Top view

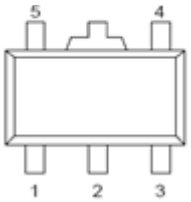


Table 7 CJ9117C Series （SOT-89-5L PKG）

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

Table 8 CJ9117D Series（SOT-89-5L PKG）

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

TO-92
Bottom view

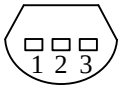


Table 9 CJ9117A Series （TO-92 PKG）

PIN NO.	PIN NAME	FUNCTION
1	V_{SS}	GND pin
2	V_{OUT}	Output voltage pin
3	LX	External inductor connection pin

■ ABSOLUTE MAXIMUM RATINGS

(Unless otherwise specified, Ta=25°C)

PARAMETER		SYMBOL	RATINGS	UNITS
V_{OUT} pin voltage		V_{OUT}	V_{SS}-0.3 ~ V_{SS}+8	V
EN pin voltage		EN	V_{SS}-0.3 ~ V_{SS}+8	V
LX pin voltage		V_{LX}	V_{SS}-0.3 ~ V_{SS}+8	V
LX pin current		I_{LX}	1000	mA
Power dissipation	SOT-23-3L	PD	400	mW
	SOT-23-5L		400	mW
	SOT-89-3/5L		600	mW
	TO-92		500	mW
Operating temperature		T_{opr}	-40 ~+85	°C
Storage temperature		T_{stg}	-40 ~+125	°C
Soldering Temperature & Time		T_{solder}	260°C, 10s	

Electrical Characteristics

(Unless otherwise specified, Ta=25°C)

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

Remark：V_{IN} =$V_{OUT(S)}$ ×0.6 applied, I_{OUT}=$V_{OUT(S)}$ / 250 Ω

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

V_{ST1} only is suitable for SCJ9117A/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

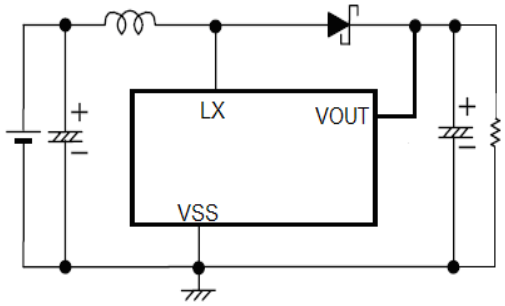
Component: Inductor：47uH(Sumida)

Capacitor：47uF/16V(Tantalum)　　Diode：B5817WS、B5819WS

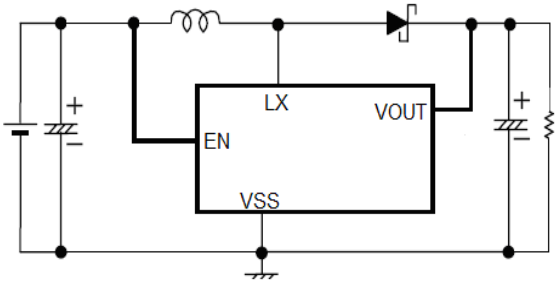
NMOS：CJ3400、CJ2302　　Transistor：2SC1766、2SD965

Base Resistor(Rb)：1K Ω

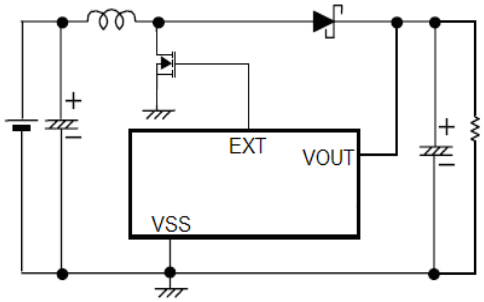
1、 CJ9117A Circuits：



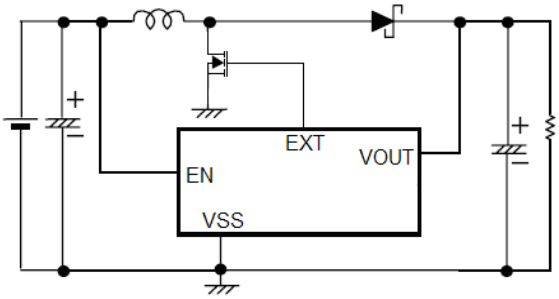
2 、 CJ9117C Circuits：



3、 CJ9117B Circuits：



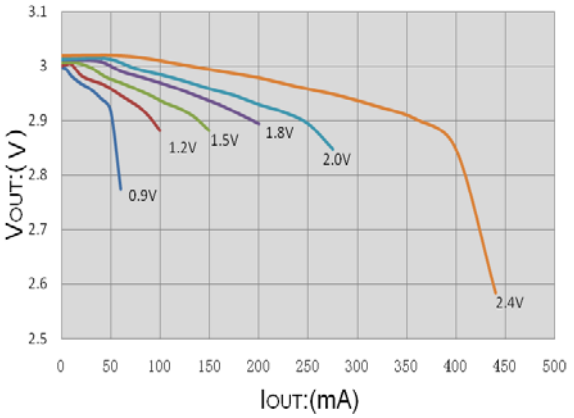
4 、 CJ9117D Circuits：



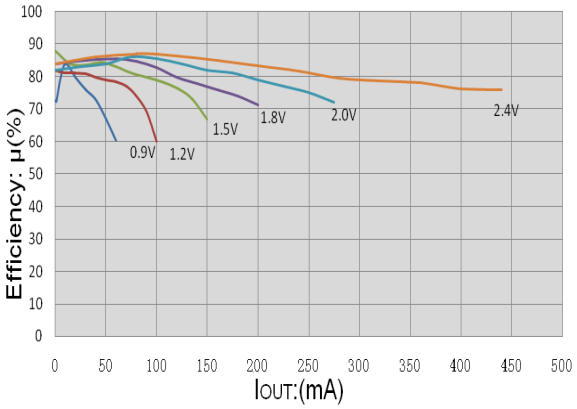
■ TYPICAL PERFORMANCE CHARACTERISTICS

1. CJ9117A30R：

a、V_{OUT} vs. I_{OUT} :

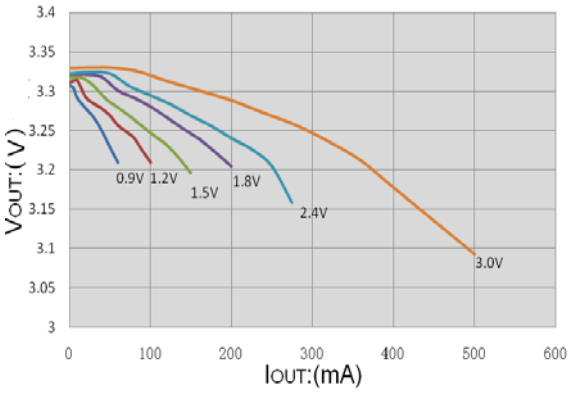


b、 Efficiency vs. I_{OUT} :

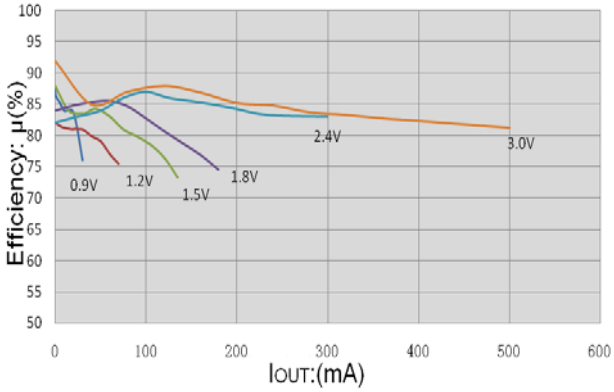


2. CJ9117A33R：

a、V_{OUT} vs. I_{OUT} :

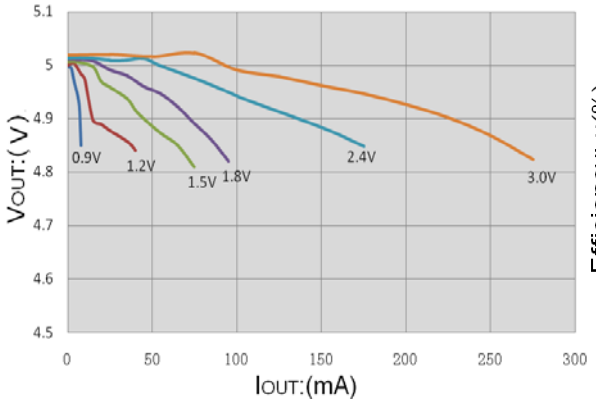


b、 Efficiency vs. I_{OUT} :

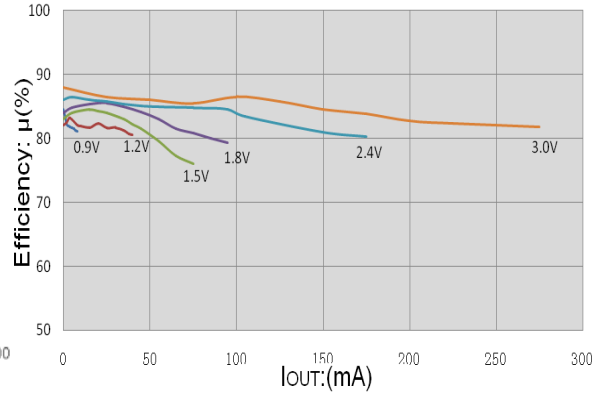


3. CJ9117A50R：

a、V_{OUT} vs. I_{OUT} :

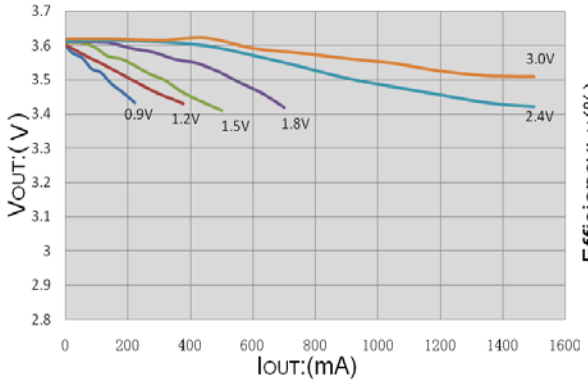


b、 Efficiency vs. I_{OUT} :

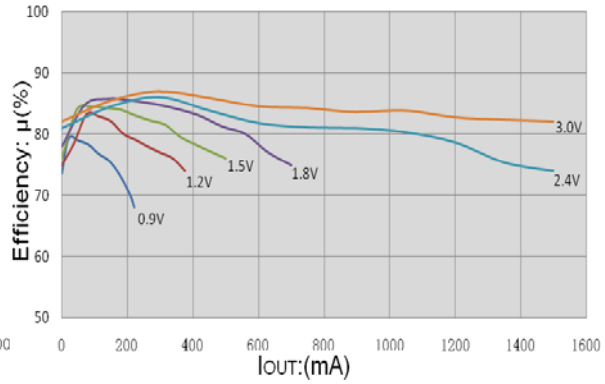


4. CJ9117B36R：

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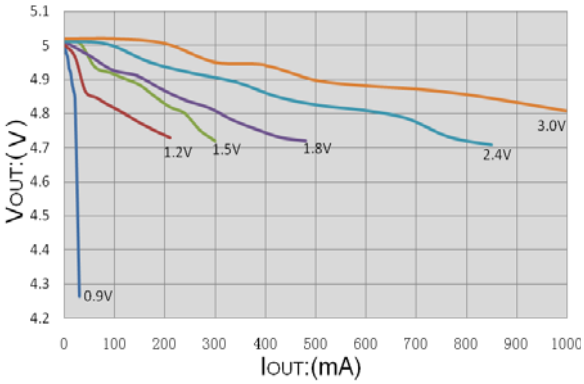


b、 Efficiency vs. I_{OUT} :

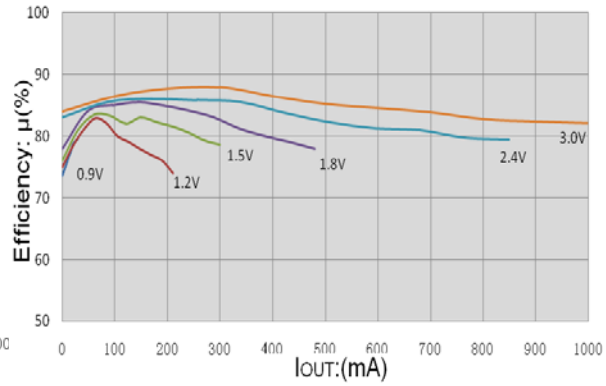


5. CJ9117B50R：

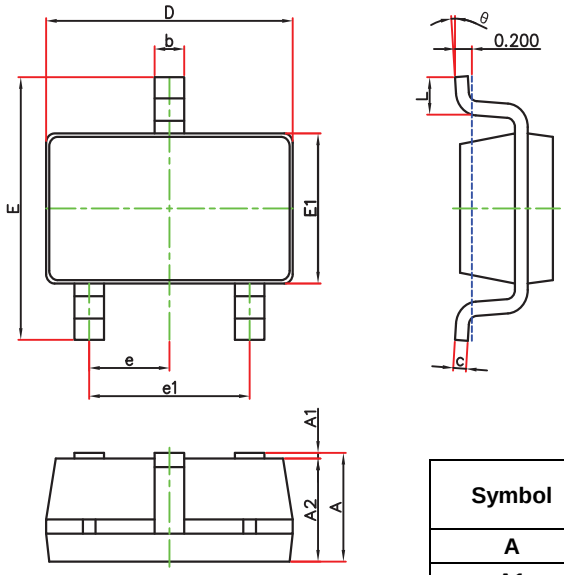
a、V_{OUT} vs. I_{OUT} :



b、 Efficiency vs. I_{OUT} :

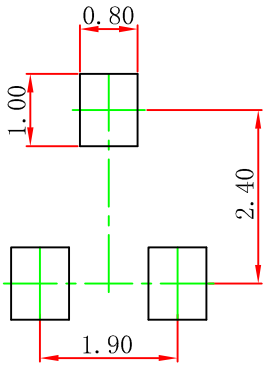


SOT-23-3L Package Outline Dimensions



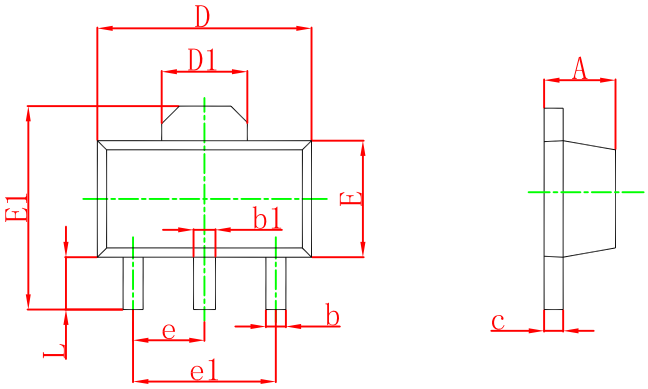
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E1	1.500	1.700	0.059	0.067
E	2.650	2.950	0.104	0.116
e	0.950(BSC)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

SOT-23-3L Suggested Pad Layout



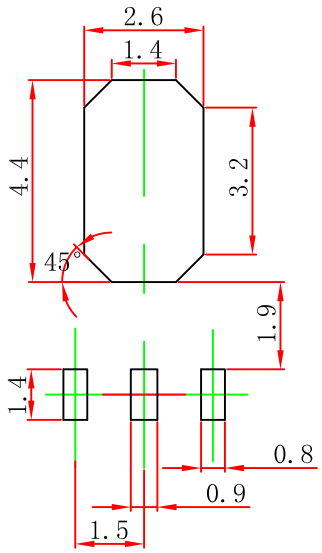
Note:
1.Controlling dimension:in millimeters.
2.General tolerance:± 0.05mm.
3.The pad layout is for reference purposes only.

SOT-89-3L Package Outline Dimensions



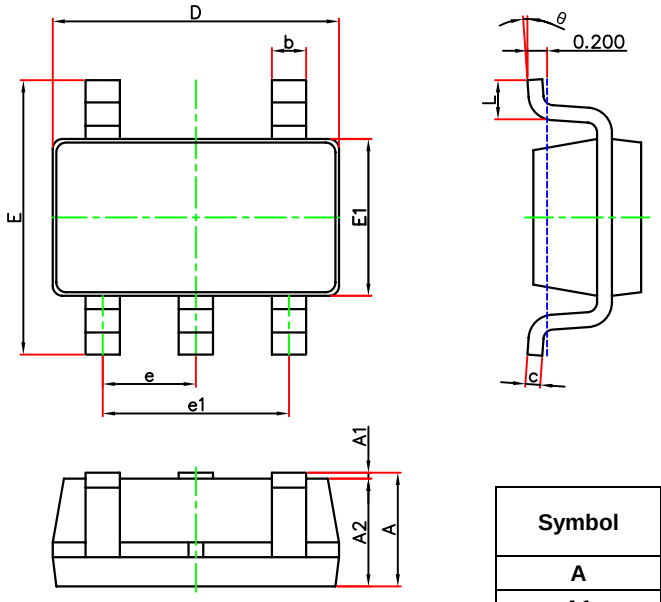
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.197
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF		0.061 REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP		0.060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

SOT-89-3L Suggested Pad Layout



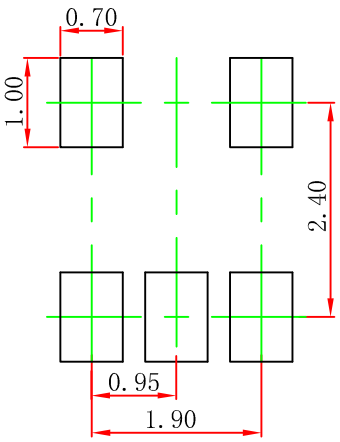
Note:
1.Controlling dimension:in millimeters.
2.General tolerance:±0.05mm.
3.The pad layout is for reference purposes only.

SOT-23-5L Package Outline Dimensions



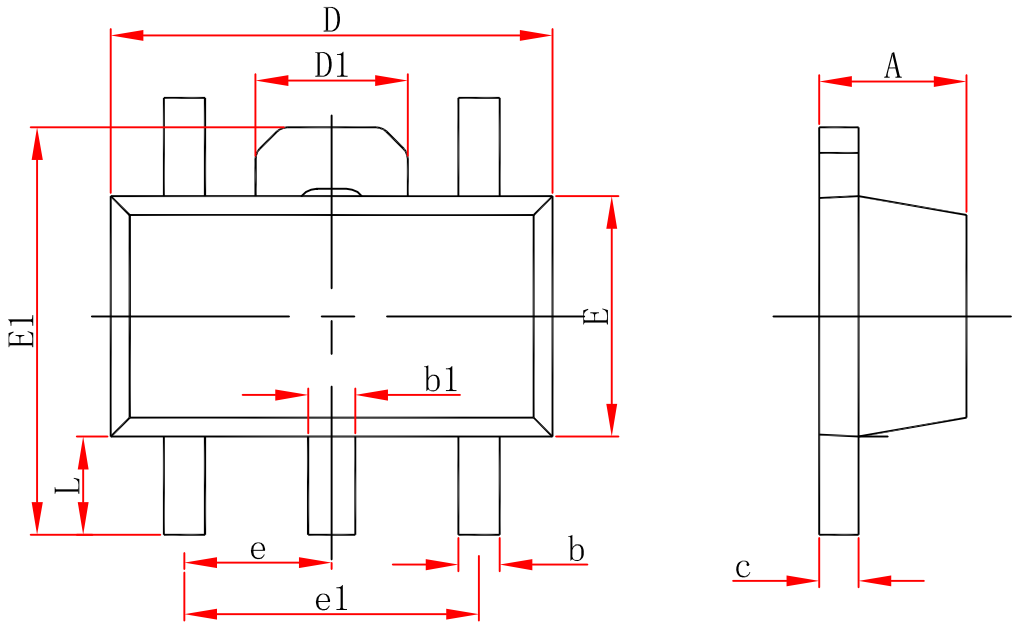
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E1	1.500	1.700	0.059	0.067
E	2.650	2.950	0.104	0.116
e	0.950(BSC)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

SOT-23-5L Suggested Pad Layout



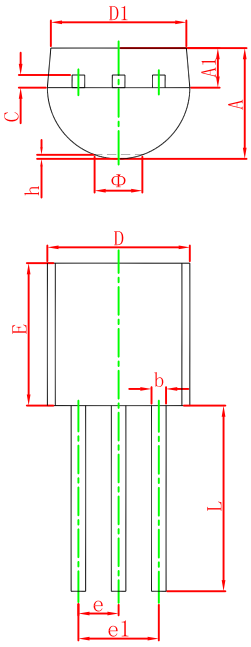
Note:
1.Controlling dimension:in millimeters.
2.General tolerance:± 0.05mm.
3.The pad layout is for reference purposes only.

● **SOT-89-5L**



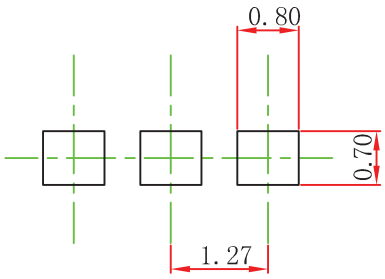
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.380	0.580	0.015	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP.		0.060TYP.	
e1	3.000 TYP.		0.118 TYP.	
L	0.900	1.200	0.035	0.047

TO-92 Package 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	4.400	4.700	0.173	0.185
D1	3.430		0.135	
E	4.300	1.400	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

TO-92 Suggested Pad Layout



Note:
1.Controlling dimension:in millimeters.
2.General tolerance:± 0.05mm.
3.The pad layout is for reference purposes only.

DISCLAIMER

IMPORTANT NOTICE, PLEASE READ CAREFULLY

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