

Synchronous Step-Up DCDC Converter with PFM Control

1.Descriptions

The FDT2188 Series is a Synchronous step-up DC/DC Converter with PFM Control. With the FDT2188 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.

3.Applications

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

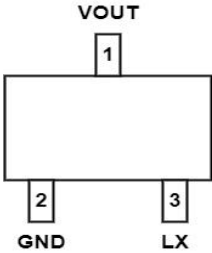
2.Features

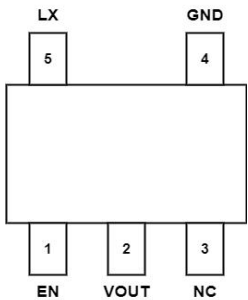
- External parts: Coil, capacitor
- Output voltage: Settable to between 2.1V to 5.5V in 0.1V steps
- Maximum Oscillation frequency :300KHz
- Accuracy of $\pm 2\%$
- High efficiency :95%
- Package:
- SOT-23,SOT23-3,SOT23-5,SOT-89-3L and
- TO-92

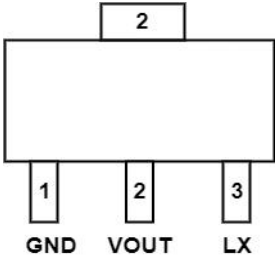
4.Order information

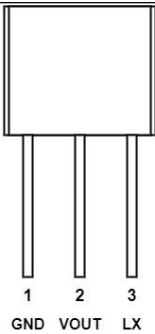
Mode	VOUT	Package	Ordering Number	Packing Option
FDT2188	2.5V	SOT-23	FDT2188-2.5YSOT23G/TR	Tape and Reel,3000
		SOT23-3	FDT2188-2.5YSOT233G/TR	Tape and Reel,3000
		SOT23-5	FDT2188-2.5YSOT235G/TR	Tape and Reel,3000
		SOT-89-3L	FDT2188-2.5YSOT893G/TR	Tape and Reel,1000
		TO-92	FDT2188-2.5YTO-92G/TX	Box,2000
	3.0V	SOT-23	FDT2188-3.0YSOT23G/TR	Tape and Reel,3000
		SOT23-3	FDT2188-3.0YSOT233G/TR	Tape and Reel,3000
		SOT23-5	FDT2188-3.0YSOT235G/TR	Tape and Reel,3000
		SOT-89-3L	FDT2188-3.0YSOT893G/TR	Tape and Reel,1000
		TO-92	FDT2188-3.0YTO-92G/TX	Box,2000
	3.3V	SOT-23	FDT2188-3.3YSOT23G/TR	Tape and Reel,3000
		SOT23-3	FDT2188-3.3YSOT233G/TR	Tape and Reel,3000
		SOT23-5	FDT2188-3.3YSOT235G/TR	Tape and Reel,3000
		SOT-89-3L	FDT2188-3.3YSOT893G/TR	Tape and Reel,1000
		TO-92	FDT2188-3.3YTO-92G/TX	Box,2000
	3.6V	SOT-23	FDT2188-3.6YSOT23G/TR	Tape and Reel,3000
		SOT23-3	FDT2188-3.6YSOT233G/TR	Tape and Reel,3000
		SOT23-5	FDT2188-3.6YSOT235G/TR	Tape and Reel,3000
		SOT-89-3L	FDT2188-3.6YSOT893G/TR	Tape and Reel,1000
		TO-92	FDT2188-3.6YTO-92G/TX	Box,2000
	4.4V	SOT-23	FDT2188-4.4YSOT23G/TR	Tape and Reel,3000
		SOT23-3	FDT2188-4.4YSOT233G/TR	Tape and Reel,3000
		SOT23-5	FDT2188-4.4YSOT235G/TR	Tape and Reel,3000
		SOT-89-3L	FDT2188-4.4YSOT893G/TR	Tape and Reel,1000
		TO-92	FDT2188-4.4YTO-92G/TX	Box,2000
	5.0V	SOT-23	FDT2188-5.0YSOT23G/TR	Tape and Reel,3000
		SOT23-3	FDT2188-5.0YSOT233G/TR	Tape and Reel,3000
		SOT23-5	FDT2188-5.0YSOT235G/TR	Tape and Reel,3000
		SOT-89-3L	FDT2188-5.0YSOT893G/TR	Tape and Reel,1000
		TO-92	FDT2188-5.0YTO-92G/TX	Box,2000

5.Pin Configuration

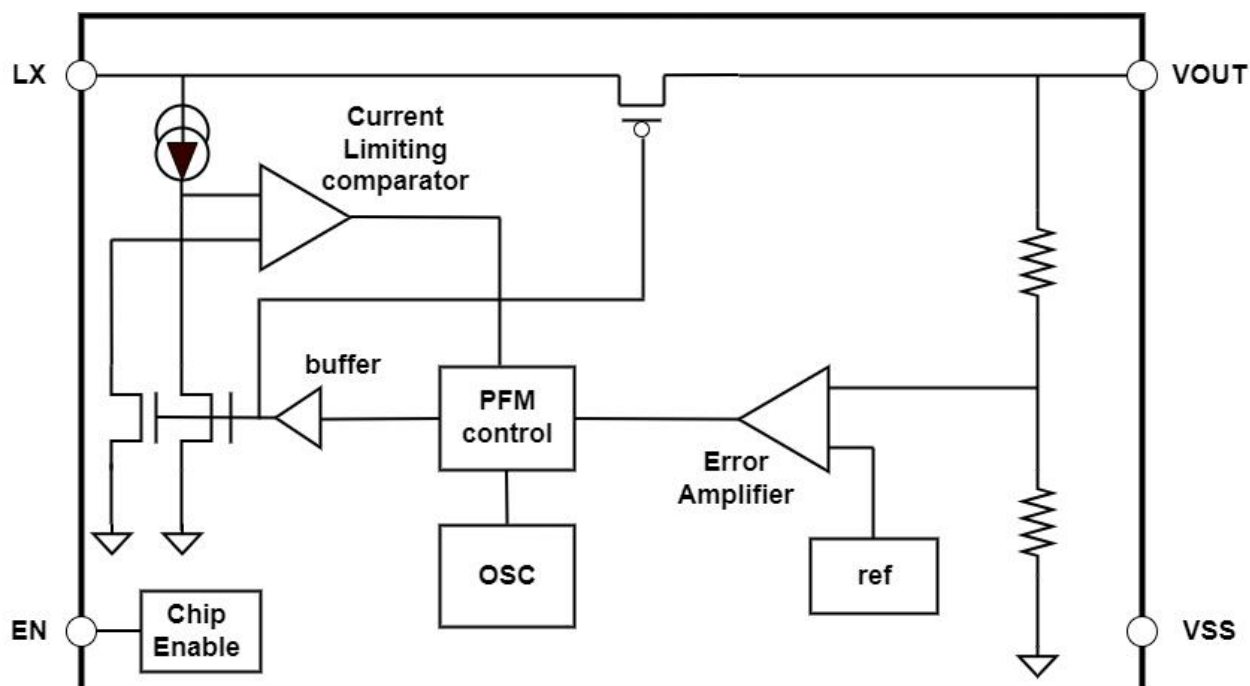
 SOT23 and SOT23-3 (Top View)	Pin No.	Pin Name	Function
	1	VOUT	Output voltage pin
	2	GND	GND pin
	3	LX	External inductor connection pin

 SOT23-5 (Top View)	Pin No.	Pin Name	Function
	1	EN	Shutdown pin “H”: Normal operation “L”: Step-up stopped
	2	VOUT	Output voltage pin
	3	NC	(N.C.)
	4	GND	GND pin
	5	LX	External inductor connection pin

 SOT89 (Top View)	Pin No.	Pin Name	Function
	1	GND	GND pin
	2	VOUT	Output voltage pin
	3	LX	External inductor connection pin

 TO-92 (Front View)	Pin No.	Pin Name	Function
	1	GND	GND pin
	2	VOUT	Output voltage pin
	3	LX	External inductor connection pin

6. Block Diagram



7. Absolute Maximum Ratings

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

Parameter		Symbol	Ratings	Units
VOUT Pin Voltage		V_{OUT}	$V_{SS}-0.3\sim V_{SS}+8$	V
EN Pin Voltage		EN	$V_{SS}-0.3\sim V_{SS}+8$	V
LX Pin Voltage		V_{LX}	$V_{SS}-0.3\sim V_{SS}+8$	V
LX Pin Current		I_{LX}	1000	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_{OPR}	$-40\sim+85$	$^{\circ}\text{C}$
Storage Temperature		T_{STG}	$-40\sim+125$	$^{\circ}\text{C}$
Soldering Temperature & Time		TSOLDER	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

8. Electrical Characteristics

(TA=25°C, unless otherwise specified)

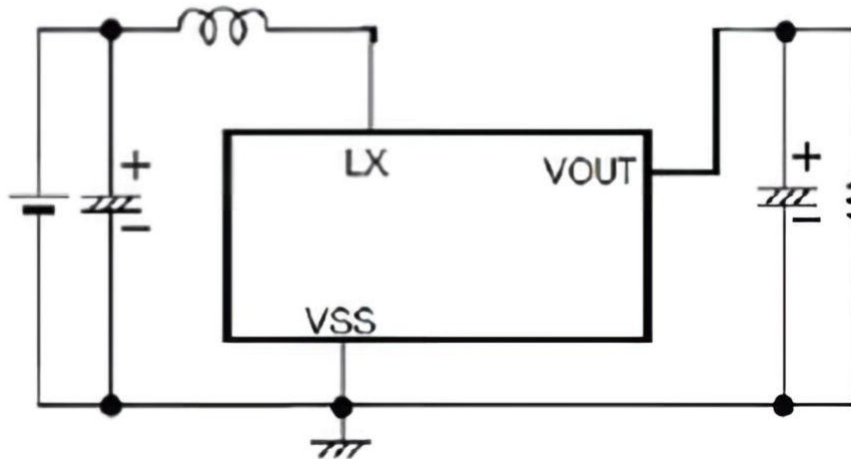
Parameter	Symbol	conditions	Min.	Typ.	Max.	Unit
Output Voltage	V _{OUT}	-	V _{OUT(S)} ×0.98	V _{OUT}	V _{OUT(S)} ×1.02	V
Input Voltage	V _{IN}	-	-	-	7.5	V
Operation Start Voltage	V _{ST1}	I _{out} =1mA, V _{out} =2.2V~4.2V	-	-	0.9	V
Operation Start Voltage	V _{ST2}	I _{out} =1mA, V _{out} =4.2V~5.5V	-	-	1.2	V
Input Current At No Load	I _{SS1}	V _{IN} =1.8V, V _{OUT} =3.0V	-	15	25	uA
		V _{IN} =0.9V, V _{OUT} =3.0V	-	25	35	uA
Current Consumption 2	I _{SS2}	V _{OUT} =V _{OUT(S)} +0.5V	-	6	10	uA
Current Consumption During Shutdown	I _{SSS}	V _{EN} =0V	-	-	1.0	uA
Maximum Oscillation Frequency	f _{osc}	V _{OUT} =0.95×V _{OUT(S)} , measure Waveform at LX pin		300		KHz
Duty Ratio1	Duty1	V _{OUT} =0.95×V _{OUT(S)}	70	78	85	%
Efficiency	EFF1			90		%
Shutdown Pin Input Voltage	V _{SH}	V _{OUT} =0.95×V _{OUT(S)} , Judge Oscillation at LX pin	0.75	-	-	V
	V _{SL}	V _{OUT} =0.95×V _{OUT(S)} , Judge stop at LX pin	-	-	0.3	V
Shutdown Pin input Current	I _{SH}	V _{EN} =6V	-0.1		0.1	uA
	I _{SL}	V _{EN} =0V	-0.1		0.1	uA

Notes:

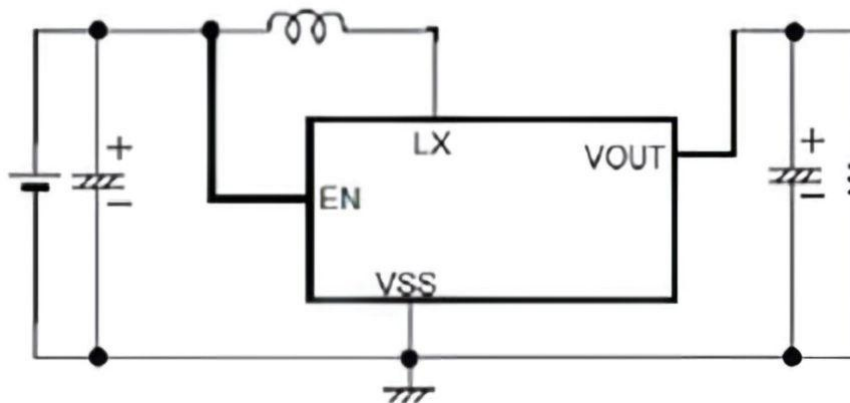
V_{OUT(S)} specified above is the set output voltage value, and V_{OUT} is the typical value of the actual output voltage.

9.Application Circuits

- Without CE



- With CE

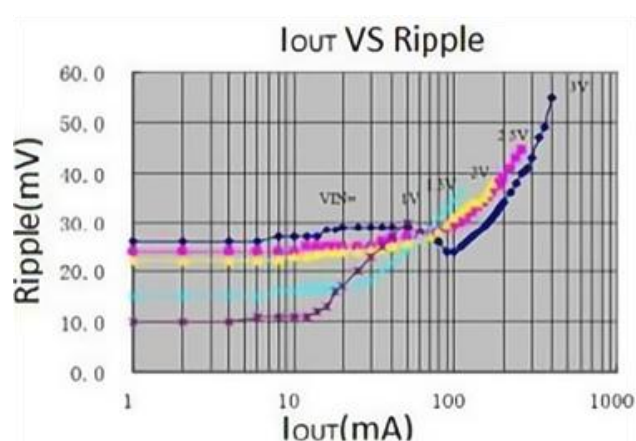
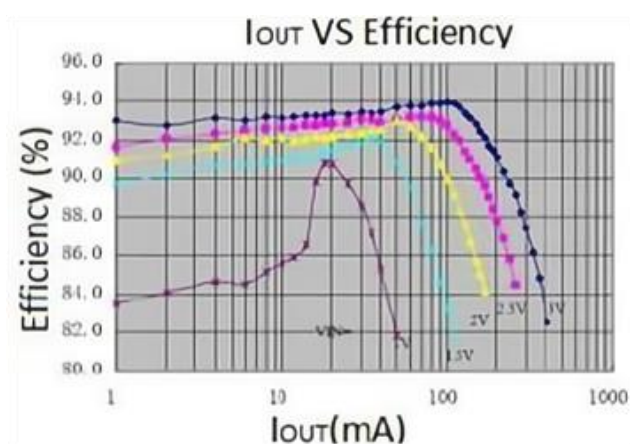
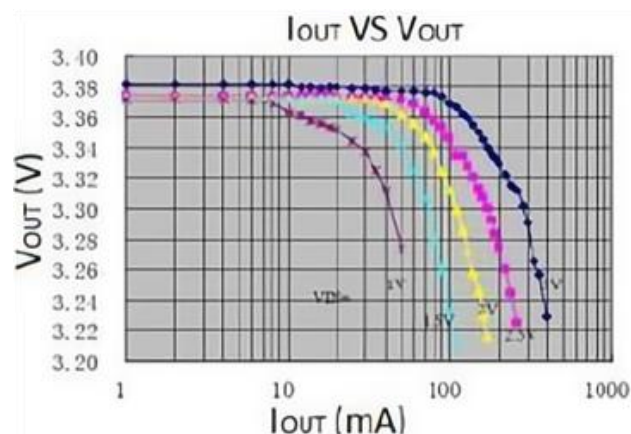
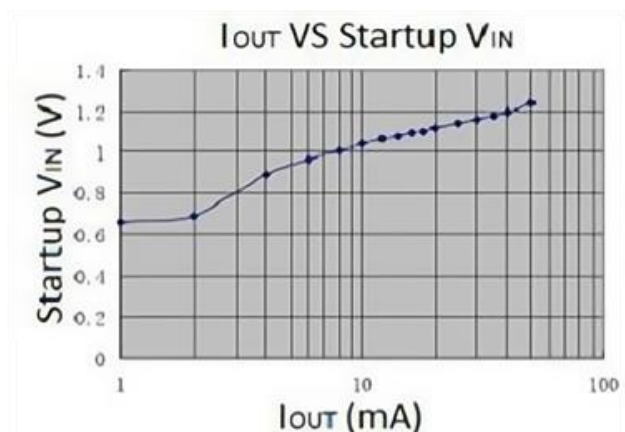


Note:External Component Recommendation:

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

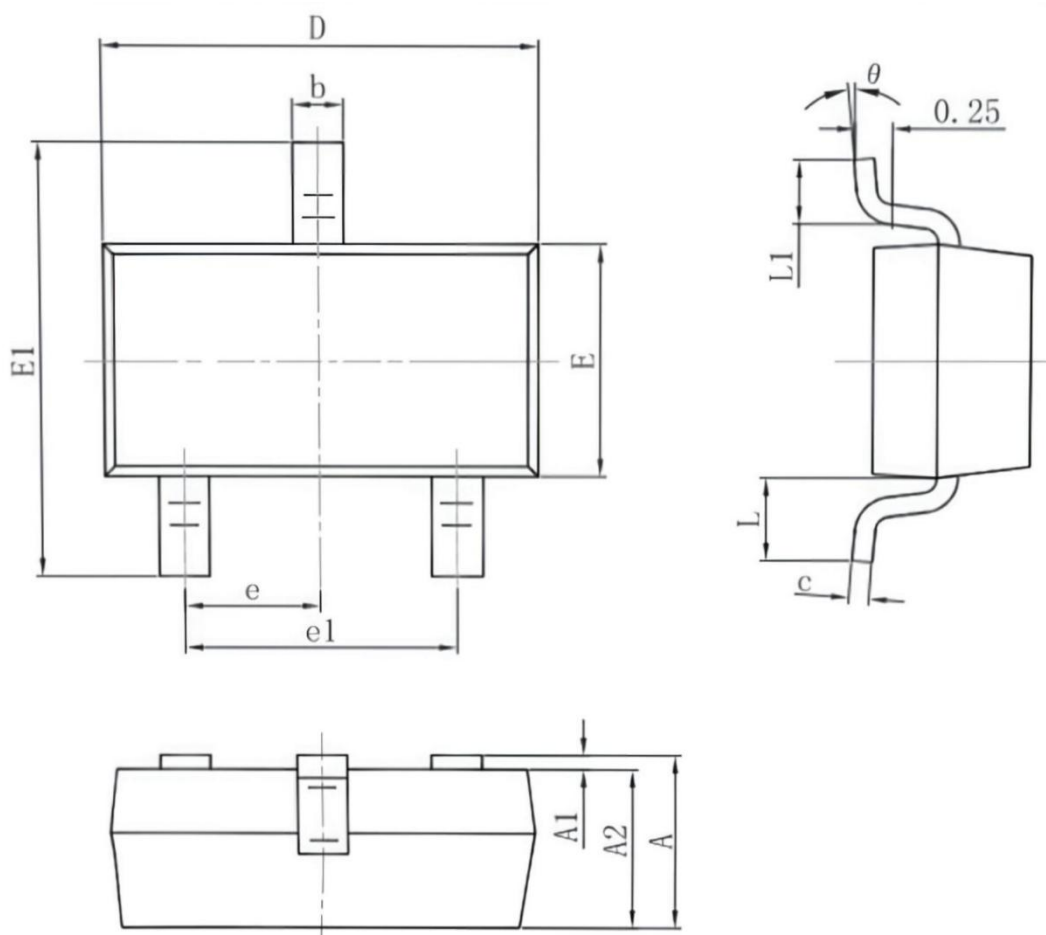
10. Typical Performance Characteristics

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



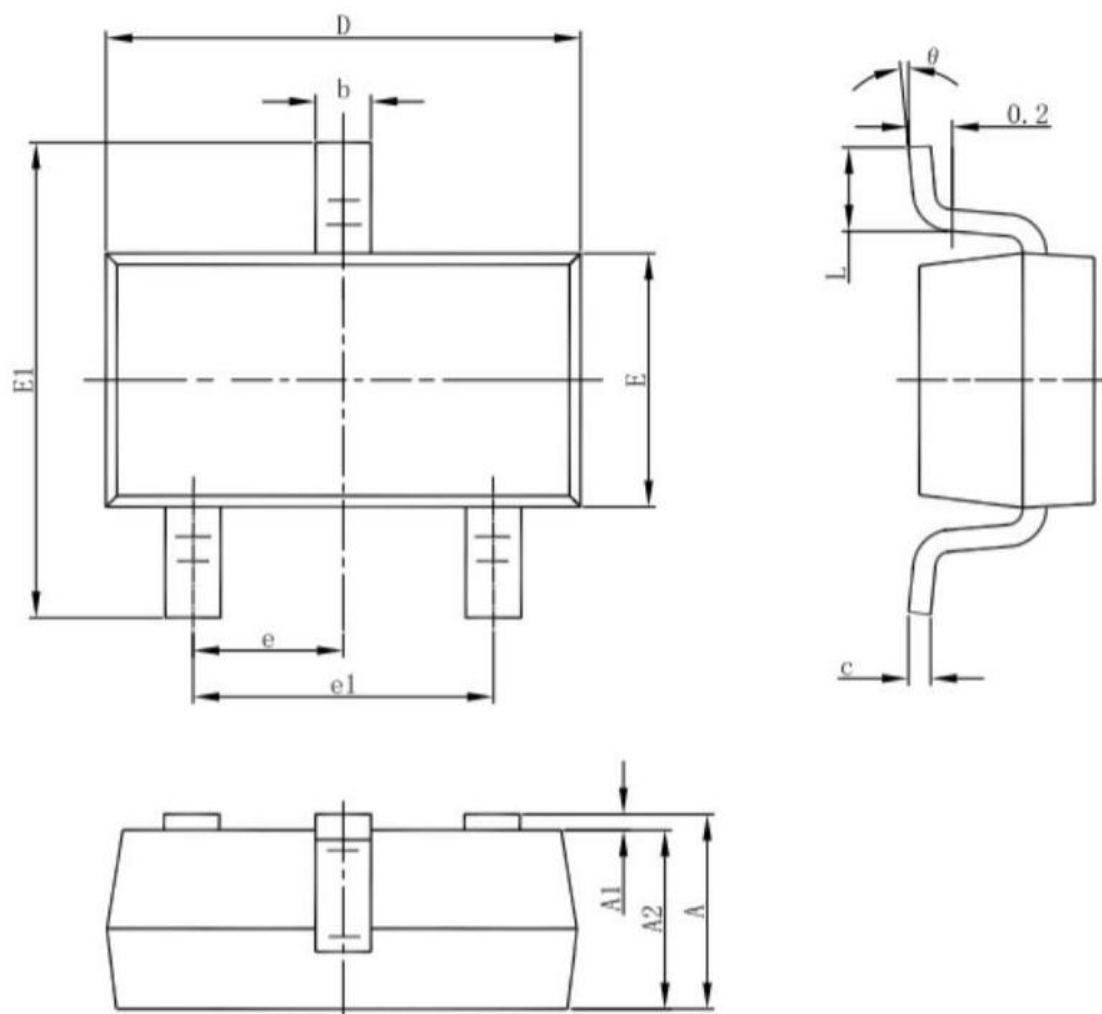
11.Package Outline Dimensions(All dimensions in mm.)

(1) Package Type: SOT-23



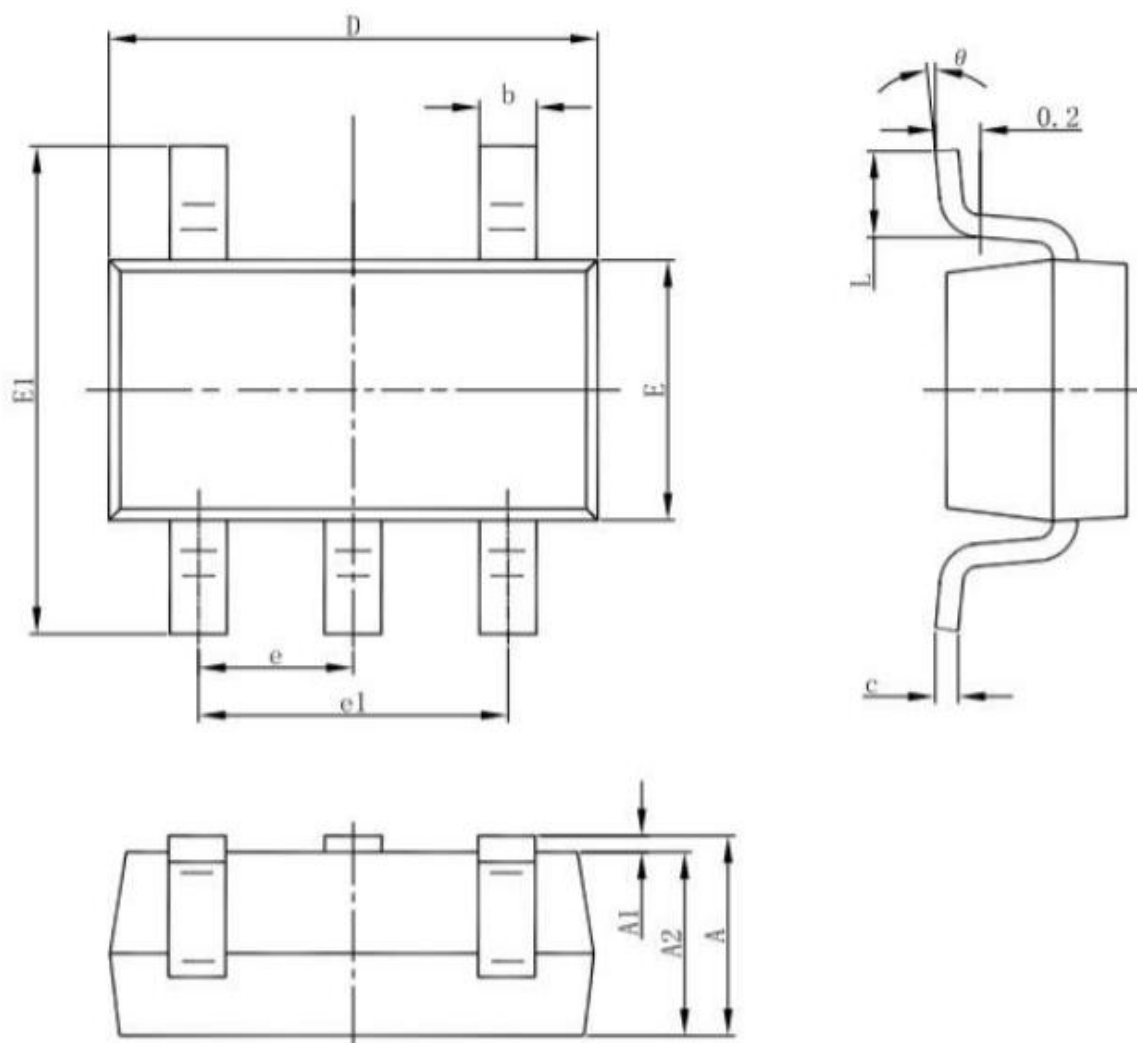
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP.		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°

(2) Package Type: SOT23-3



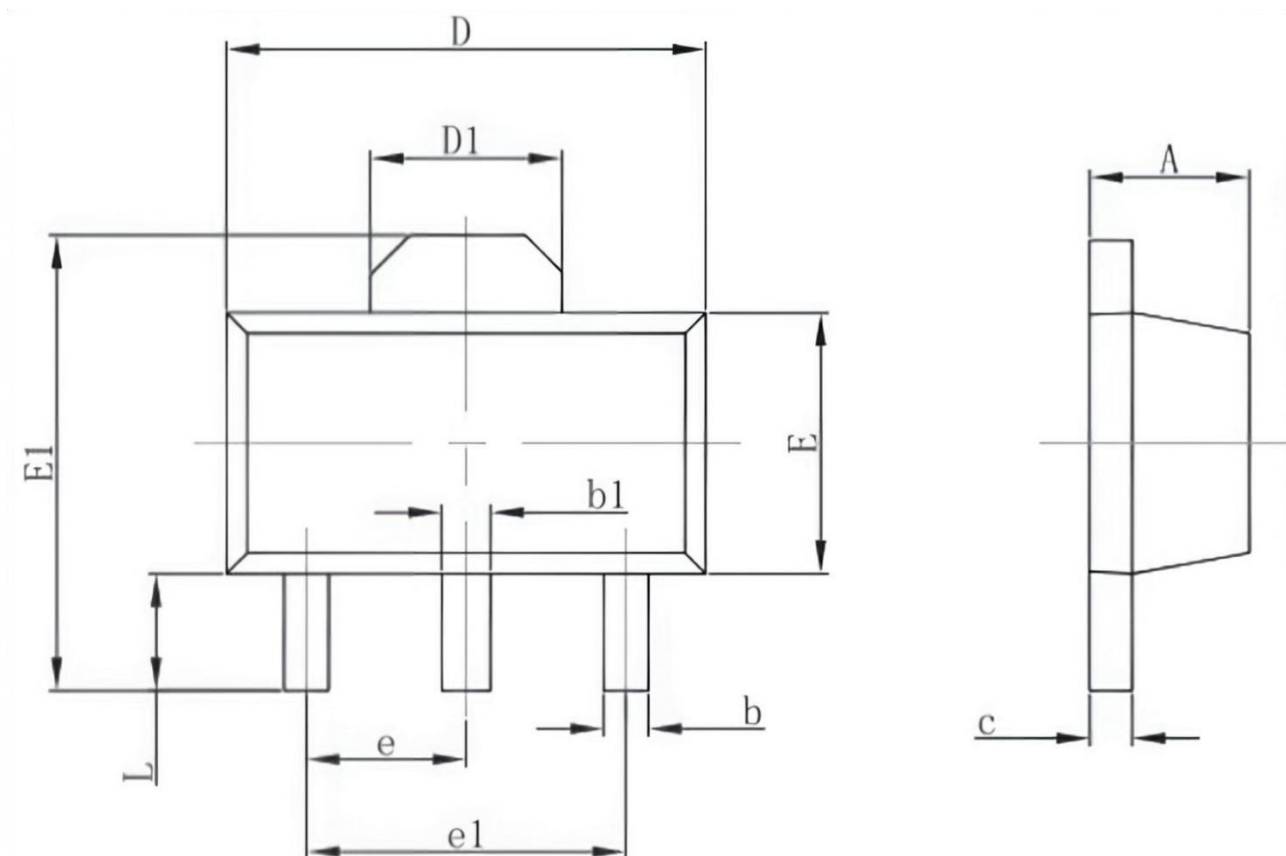
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)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

(3) Package Type: SOT23-5



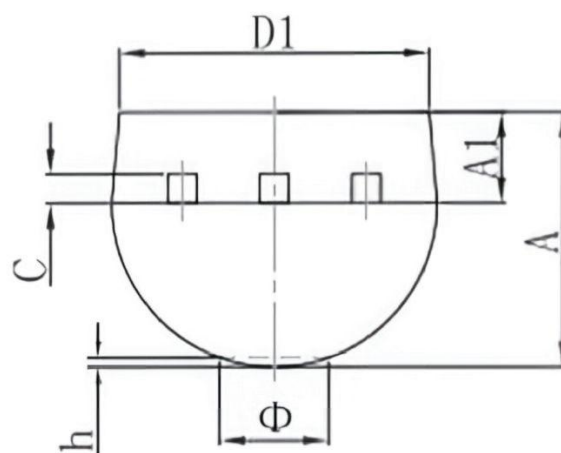
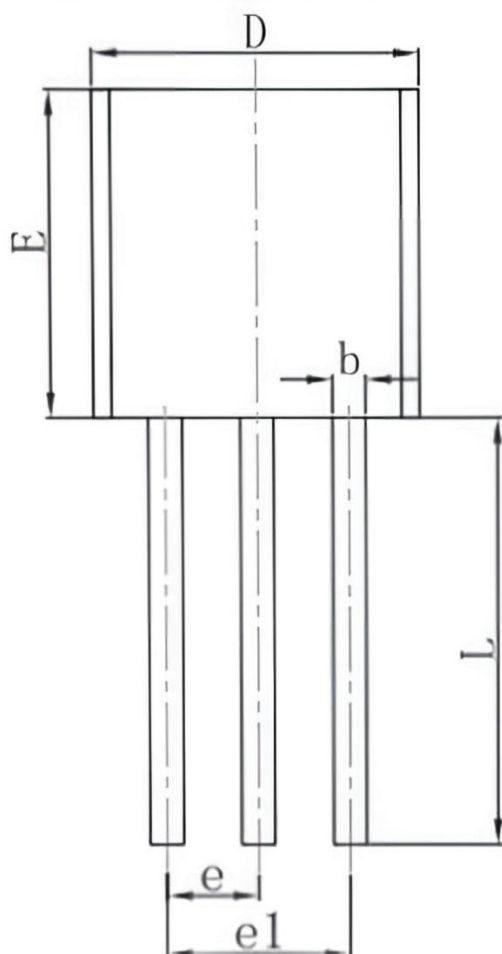
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)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

(4) Package Type: SOT-89-3L



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	0.400	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

(5) Package Type: 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	4.300	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

12.Important Notice And Disclaimer

- We reserve the right to change the instruction manual without prior notice.
- Any semiconductor product has a certain possibility of failure or malfunction under specific conditions. The buyer is responsible for complying with safety standards and taking safety measures when using our products for system design and overall manufacturing to avoid potential failure risks that may cause personal injury or property damage.
- The improvement of product quality is endless, our company will be dedicated to provide customers with better products.