

High Efficiency ,synchronous PFM step-up DC-DC converter

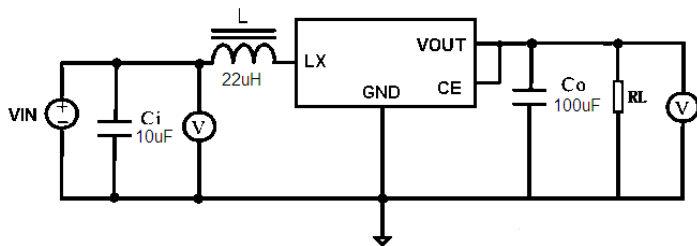
General Description

ECHxxx Series is a PFM Step-up DC/DC converter IC with low supply current by CMOS process. High frequency noise that occurs during switching is reduced by using advanced circuit designed, output voltage is programmable in 0.1V steps between 1.8V~5.0V and maximum frequency is 350KHz(TYP.). A low ripple, high efficiency step-up DC/DC converter can be constructed of ECHxxx with only two external components. ECHxxx is suitable for use with battery-powered instruments with low noise and low supply current.

Features

- High efficiency: 95%
- Maximum frequency: 350KHz
- Low Quiescent Current: 13 μ A
- Input Voltage: 0.9V~5.0V
- Output Voltage Range:1.8V to 5.0V
- High Accuracy: \pm 2%
- Low ripple and Low noise
- Package:
SOT23-3, SOT23-5, SOT23, SOT89-3,
TO-92

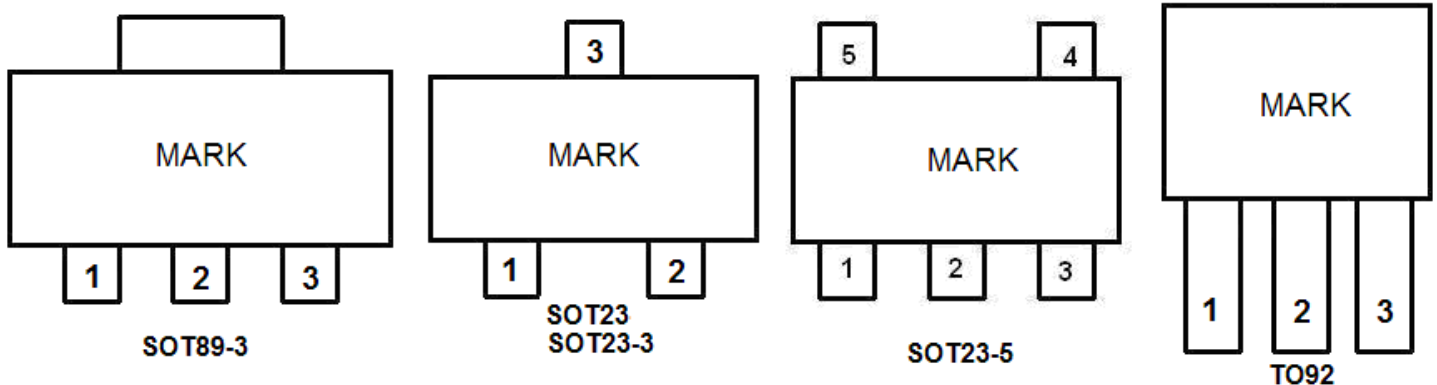
Typical Application Circuit



Typical Application

- Power source for battery-powered equipment
- Power source for Wireless mouse,toys,
Cameras, VCRs, PDAs, MP3, and Led lighting etc

Pin Configuration



Pin Assignment

TYPE	POSTFIX	PACKAGE	SWITCHING TRANSISTOR	CE FUNCTION	FEATURES
ECHAxx	X	SOT23	Build in Transistor	No	Lx
	M3	SOT23-3			
	P	SOT89-3			
	T	TO92			
ECHCxx	M5	SOT23-5	Build in Transistor	Yes	LX+CE

ECHAxxx

Pin Number				Pin Name	Description
SOT89-3	SOT23-3	SOT23	TO-92		
1	1	1	1	GND	Ground
2	3	3	2	VOUT	Voltage output
3	2	2	3	LX	Switch pin

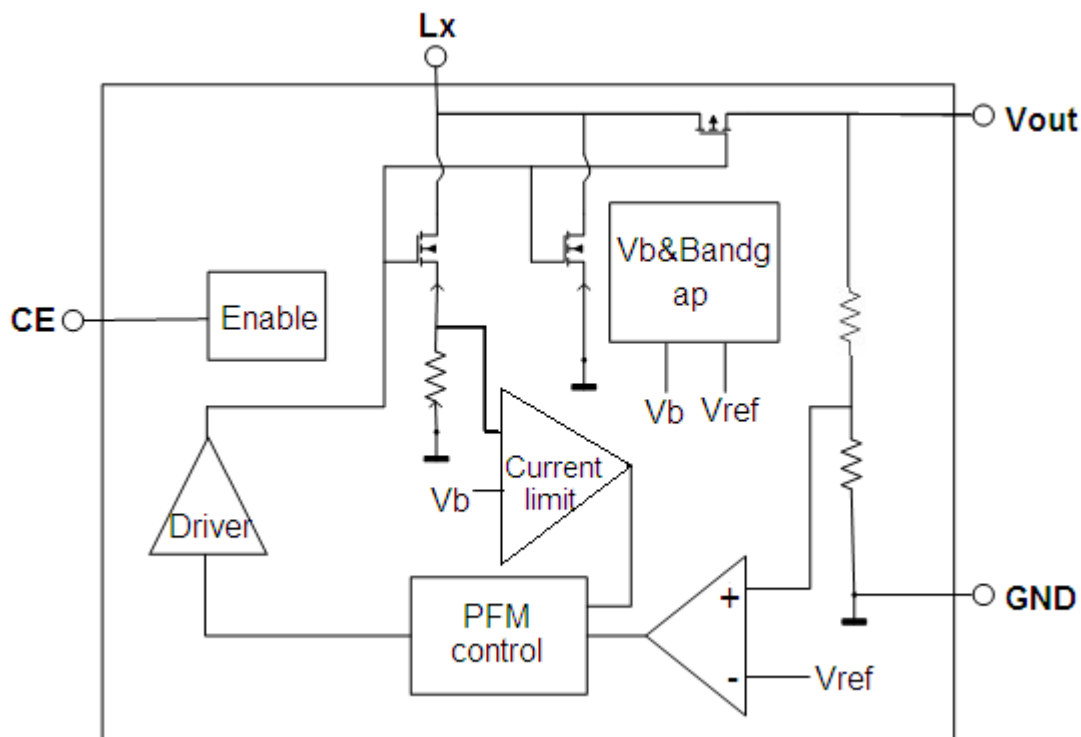
ECHCxxx

PIN Number	Pin Name	Description
SOT23-5		
1	CE	Chip enable
2	VOUT	Output voltage monitor, IC internal power supply
3	NC	NC
4	GND	Ground
5	LX	Switch

Absolute Maximum Ratings

Parameter	Symbol	Ratings	Units	
Supply Voltage	V_{MAX}	8	V	
LX pin current	ILXmax	1000	mA	
Continuous Total Power Dissipation	SOT23	P_D	300	mW
	SOT89	P_D	500	mW
	TO92	P_D	500	mW
Operating Temperature Range	T_{OPR}	-20~+85	°C	
Storage Temperature Range	T_{STG}	-40~125	°C	
ESD	V_{ESD}	2000	V	

Block Diagram



Electrical Characteristics

$T_A=25^{\circ}\text{C}$, $V_{in}=V_{OUT}\times 0.6\text{V}$, $L=22\mu\text{H}$, $C_{IN}=10\mu\text{F}$, $C_{OUT}=100\mu\text{F}$, unless otherwise noted.

ECHAx/Cxx

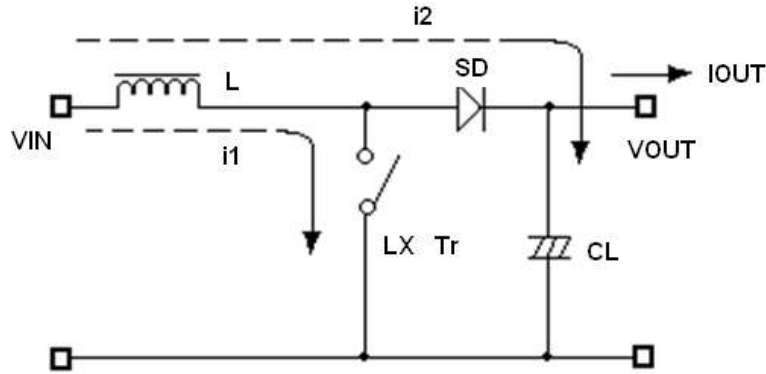
Symbol	Parameter	Test Conditions	MIN	TYP	MAX	UNIT
V_{OUT}	Output Voltage		$V_{OUT}\times 0.98$	V_{OUT}	$V_{OUT}\times 1.02$	V
V_{IN}	Supply Voltage		0.9	-	5	V
V_{START}	Start voltage	$I_{load}=1\text{mA}$, $V_{in}: 0\rightarrow 2\text{V}$	-	0.85	1.1	V
V_{hold}	Hold voltage	$I_{load}=1\text{mA}$, $V_{in}: 2\rightarrow 0\text{V}$	0.5	-	-	V
F_{OSC}	oscillation frequency		-	350	-	KHz
η	Efficiency		-	90	95	%
I_{limit}	Current limit		800	1000	1200	mA
I_{IN}	Quiescent Current		-	13	15	μA

Note: 1、Inductor: $22\mu\text{H}$ ($r<0.5\Omega$)

2、Capacitor: Tantalum type

Operation Description

ECHxxx step-up DC/DC converter charges energy in the inductor when Lx Transistor is on, and discharges the energy with the addition of the energy from input power source thereto, so that a higher output voltage than the input voltage is obtained. Following is the operation diagram.



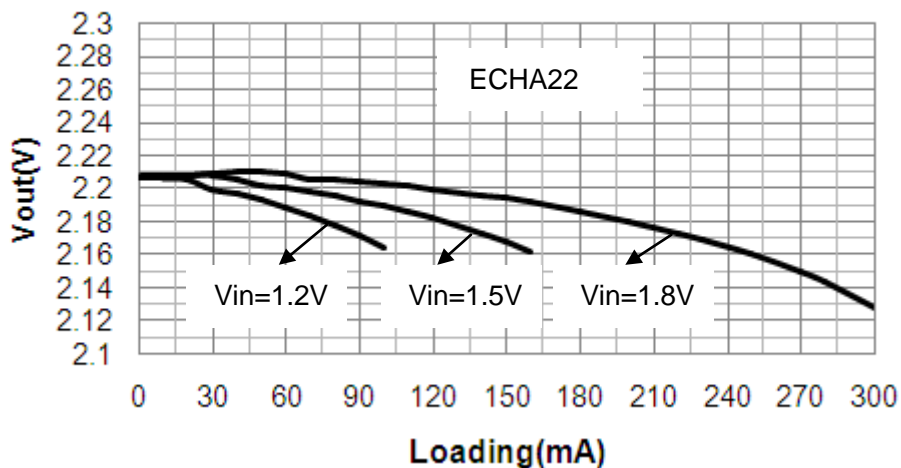
Switching DC/DC Step up Converter operating process

➤ PCB Layout:

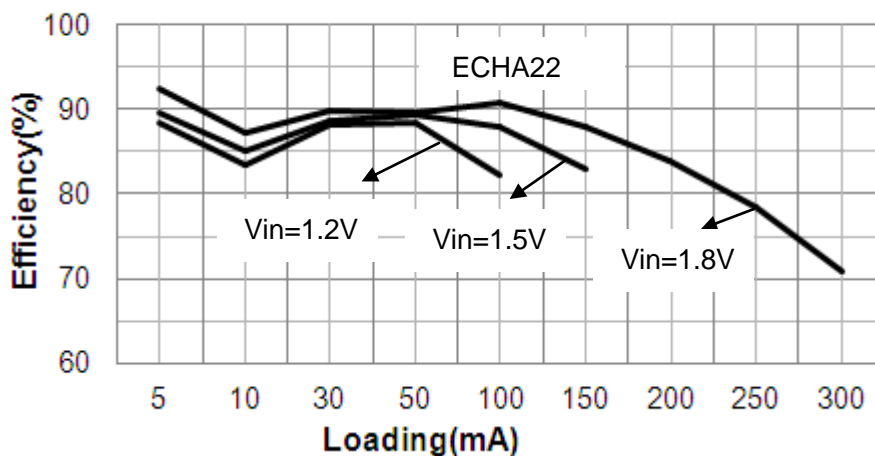
- ✧ Set external components as close as possible to the IC and minimize the connection between the components and the IC. In particular, when an external component is connected to VOUT Pin, make minimum connection with the capacitor.
- ✧ Make Vss pin sufficient grounding, otherwise, the zero level within IC will varied with the switching current. This may result in unstable operation of IC.

Type Characteristics

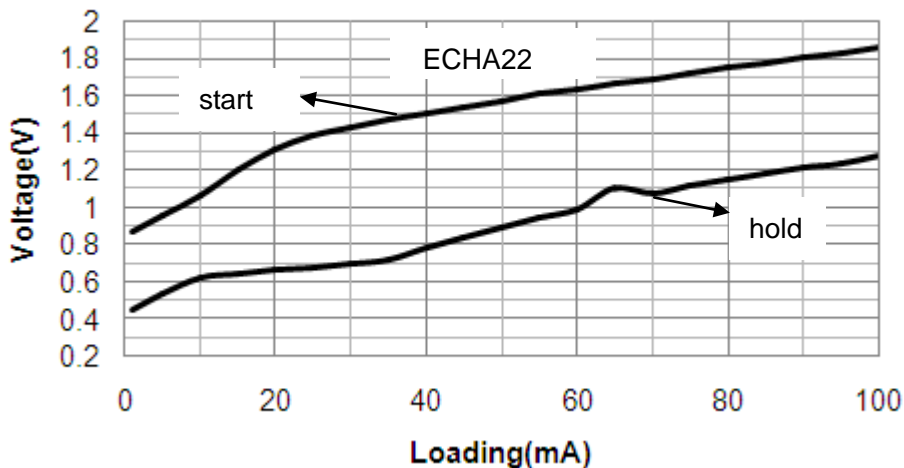
Vout vs. Loading

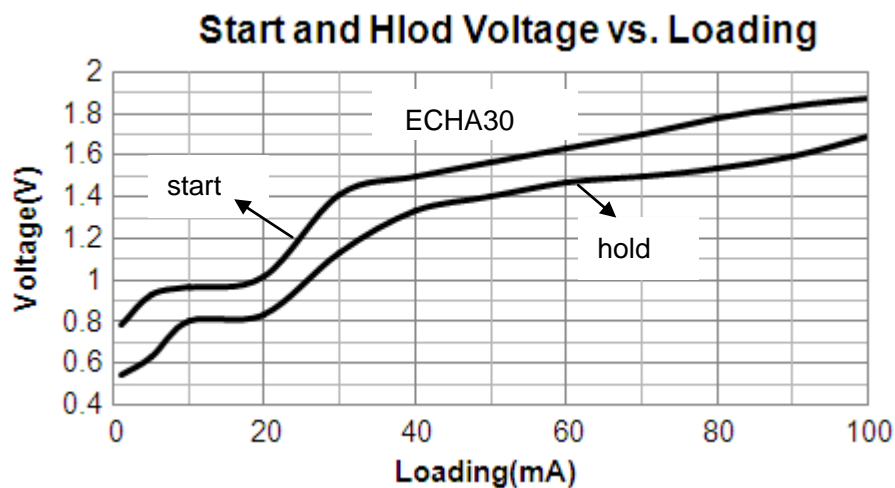
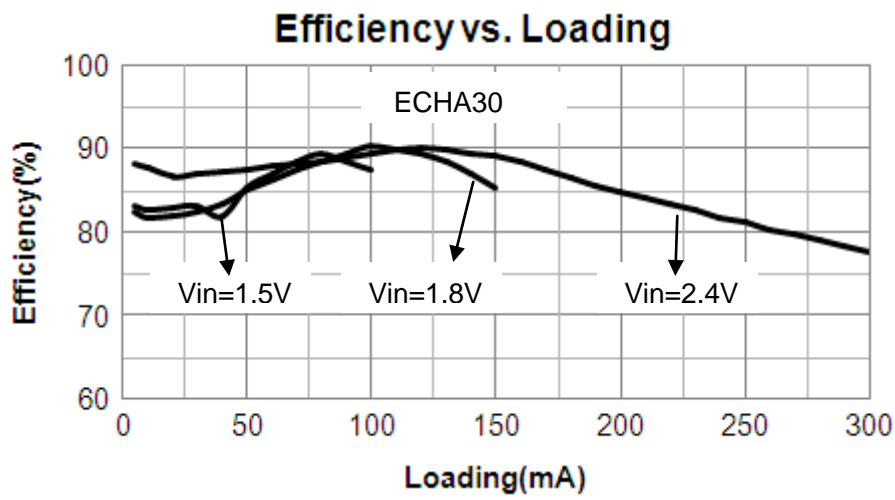
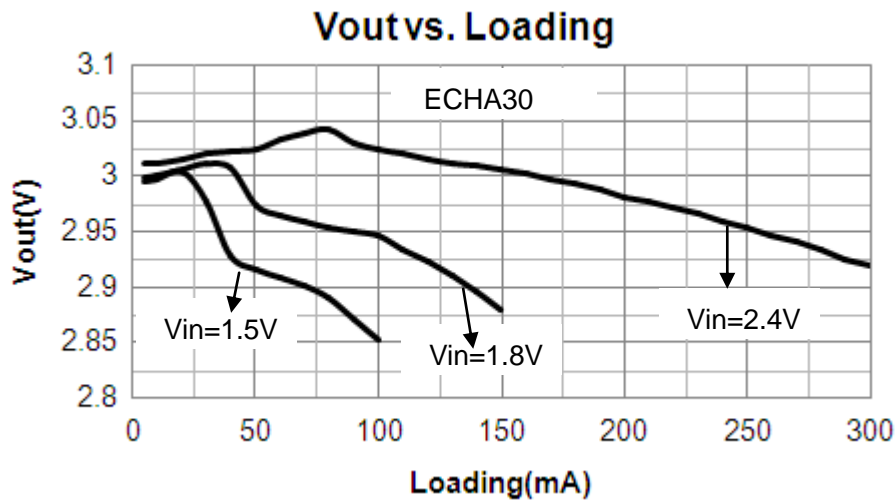


Efficiency vs. Loading



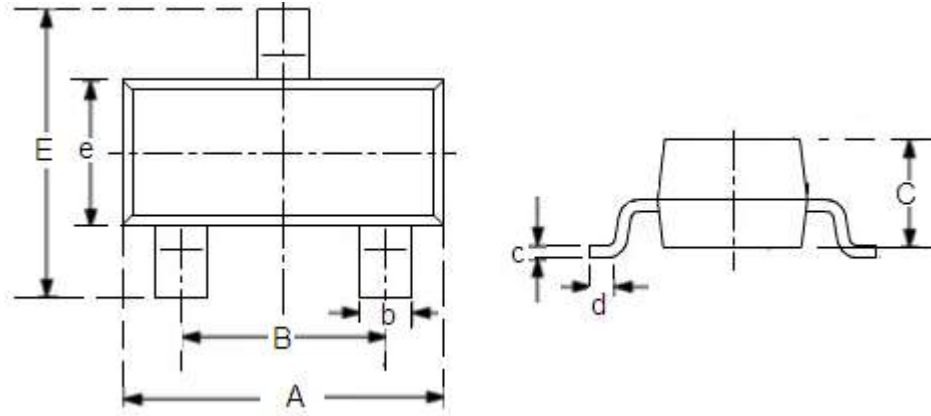
Start and Hold Voltage vs. Loading





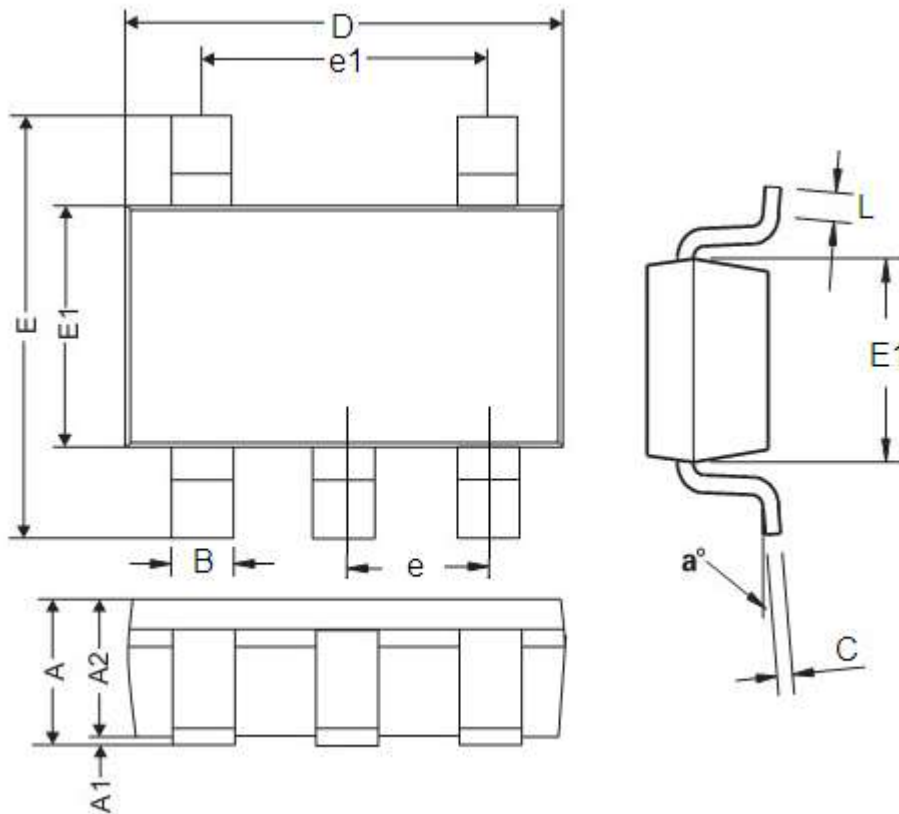
Packaging Information

● SOT23-3



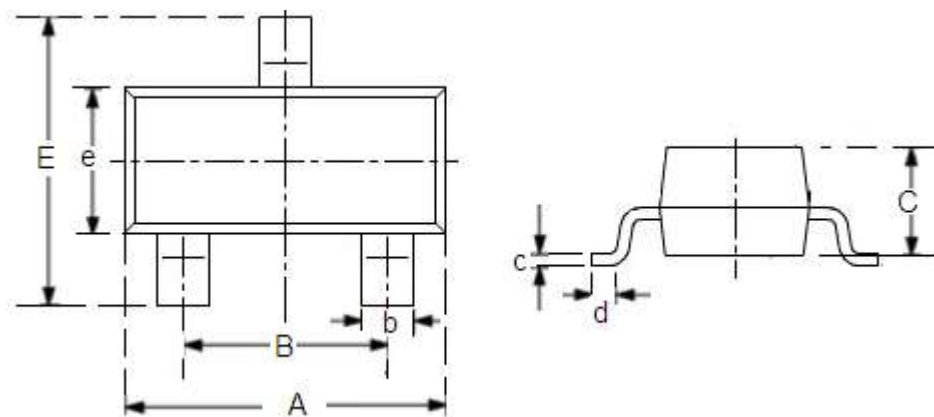
DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	2.7	3.1	0.1063	0.122
B	1.7	2.1	0.0669	0.0827
b	0.35	0.5	0.0138	0.0197
C	1.0	1.2	0.0394	0.0472
c	0.1	0.25	0.0039	0.0098
d	0.2	-	0.0079	-
E	2.6	3.0	0.1023	0.1181
e	1.5	1.8	0.059	0.0708

● SOT23-5



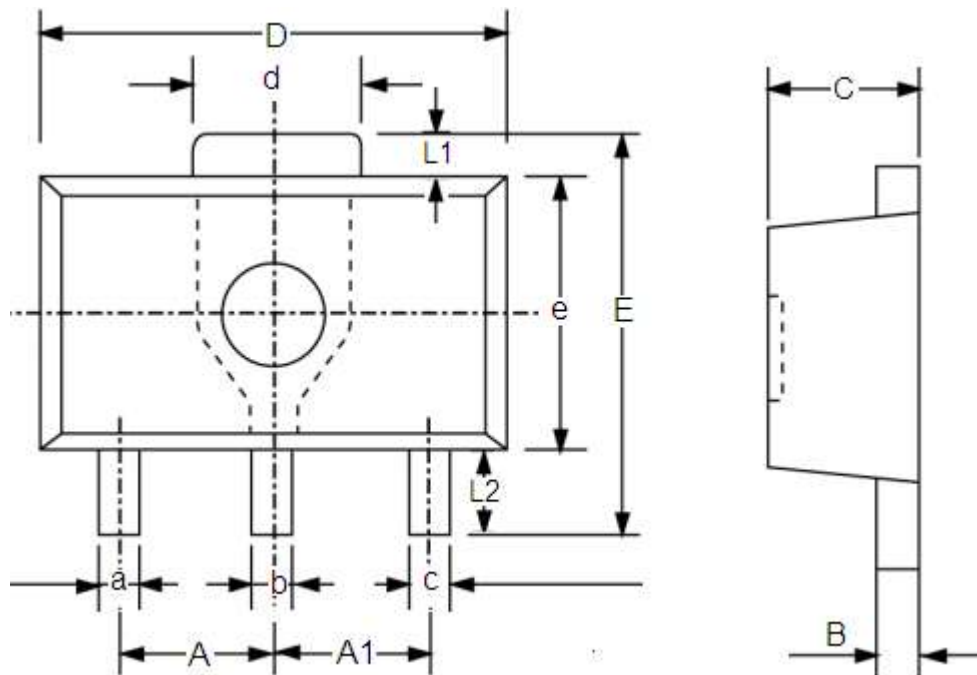
DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	0.9	1.45	0.0354	0.0570
A1	0	0.15	0	0.0059
A2	0.9	1.3	0.0354	0.0511
B	0.2	0.5	0.0078	0.0196
C	0.09	0.26	0.0035	0.0102
D	2.7	3.10	0.1062	0.1220
E	2.2	3.2	0.0866	0.1181
E1	1.30	1.80	0.0511	0.0708
e	0.95REF		0.0374REF	
e1	1.90REF		0.0748REF	
L	0.10	0.60	0.0039	0.0236
a°	0°	30°	0°	30°

● SOT23



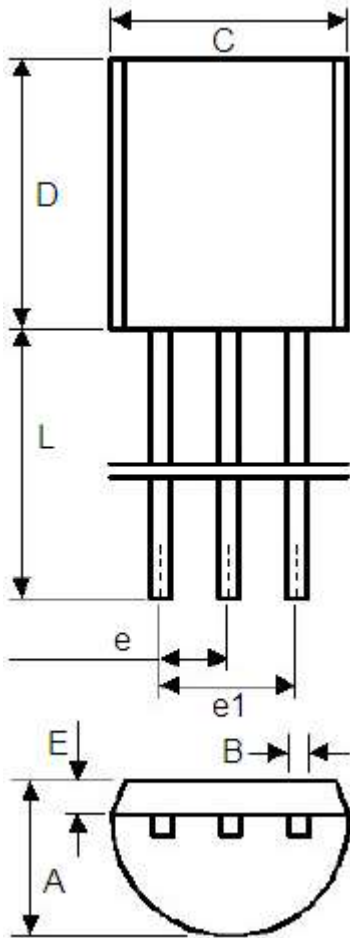
DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	2.7	3.1	0.1063	0.122
B	1.7	2.1	0.0669	0.0827
b	0.35	0.5	0.0138	0.0197
C	1.0	1.2	0.0394	0.0472
c	0.1	0.25	0.0039	0.0098
d	0.2	-	0.0079	-
E	2.1	2.64	0.0827	0.1039
e	1.2	1.4	0.0472	0.0551

● SOT89-3



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	1.4	1.6	0.0551	0.0630
A1	1.4	1.6	0.0551	0.0630
a	0.36	0.48	0.0142	0.0189
b	0.41	0.53	0.0161	0.0209
c	0.36	0.48	0.0142	0.0189
d	1.4	1.75	0.0551	0.0689
B	0.38	0.43	0.015	0.0169
C	1.4	1.6	0.0551	0.0630
D	4.4	4.6	0.1732	0.181
E	-	4.25	-	0.1673
e	2.4	2.6	0.0945	0.1023
L1	0.4	-	0.0157	-
L2	0.8	-	0.0315	-

● TO-92



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	3.4	3.8	0.13386	0.1496
B	0.3	0.5	0.0118	0.0197
C	4.4	4.8	0.1732	0.189
D	4.4	4.8	0.1732	0.189
E	0.9	1.5	0.0354	0.059
e	1.17	1.37	0.046	0.0539
e1	2.39	2.69	0.094	0.1059
L	12	16	0.4724	0.6299