Small Package PFM Control Step-Up DC/DC Converter

B3PXX Series

■ INTRODUCTION

The B3PXX is a CMOS PFM-control step-up switching DC/DC converter. The VFM controller allows the duty ratio to be automatically switched according to the load, enabling products with a low ripple over a wide range, high efficiency, and high output current. With the B3PXX, 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 B3PXX ideal for applications such as the power supply unit of portable equipment.

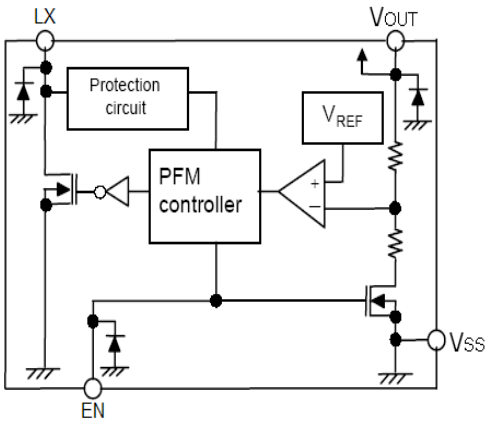
■ FEATURES

- Low voltage operation: Startup at 0.9 V @I_{OUT} = 1 mA
- Work frequency: 300KHz
- External parts: Coil, capacitor, diode
- Accuracy of ±2.5%
- High efficiency： 87%（typ.）
- Shutdown function
- Low ripple, Low noise

■ APPLICATIONS

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

■ BLOCK DIAGRAM



■ ORDER INFORMATION

- **B3PXX 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	M	Package：SOT-23
	P	Package：SOT-89
	T	Package：TO-92

■ PIN CONFIGURATION

SOT-23-3
Top view

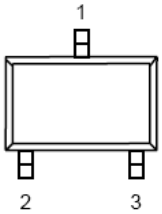


Table 1 B3PXXA Series（SOT-23-3 PKG）

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

Table 2 B3PXXB Series（SOT-23-3 PKG）

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

SOT-23-5
Top view

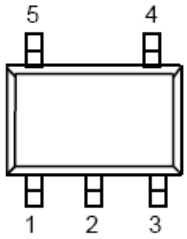


Table 3 B3PXXC Series（SOT-23-5 PKG）

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

Table 4 B3PXXD Series（SOT-23-5 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

SOT-89-3
Top view

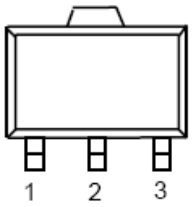


Table 5 B3PXXA Series （SOT-89-3 PKG）

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

Table 6 B3PXXB Series （SOT-89-3 PKG）

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

Table 7 B3PXXC Series （SOT-89-5 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

• SOT-89-5

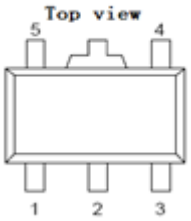


Table 8 B3PXXD Series（SOT-89-5 PKG）

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

Table 9 B3PXXA Series （TO-92 PKG）

TO-92
Bottom view

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-23-5	PD	250	mW
Operating temperature		T_{opr}	-20 ~+85	℃
Storage temperature		T_{stg}	-40 ~+125	℃
Soldering Temperature & Time		T_{solder}	260℃ , 10s	

■ ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, Ta=25°C)

PARAMETER	SYNBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output voltage	V_{OUT}	—	$V_{OUT(S)}$ ×0.975	V_{OUT}	$V_{OUT(S)}$ ×1.025	V
Input voltage	V_{IN}	—	—	—	6	V
Operation start voltage	V_{ST}	I_{OUT}= 1 mA	—	—	1.2	V
Hold voltage	V_{HOLD}	I_{OUT}= 1 mA	0.9	—	—	V
Current consumption	I_{SS}	V_{OUT}=$V_{OUT(S)}$＋0.5 V	—	7	—	μA
Current consumption during shutdown	I_{SSS}	V_{EN} = 0 V, No load	—	—	1.0	μA
Maximum Oscillation frequency	F_{max}	V_{OUT}= 0.95×V_{OUT}， measure waveform at LX pin	—	300	—	KHz
Duty ratio	Duty		—	75	—	%
Efficiency	EFFI		—	84	88	%
Current limit	I_{LIMIT}		—	800	—	mA
Shutdown pin input voltage	V_{SH}		1.5	—	—	V
	V_{SL}		—	—	0.3	V
Shutdown pin input current	I_{SH}		—	—	0.1	μA
	I_{SL}		-0.1	—	—	μA

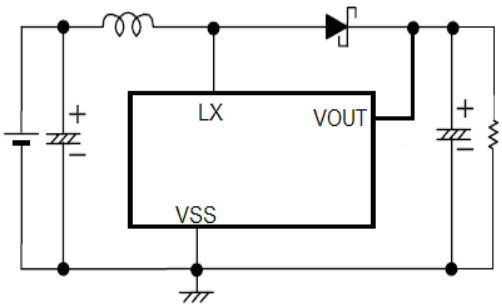
Remark：V_{IN} =$V_{OUT(S)}$ ×0.6 applied, I_{OUT}=$V_{OUT(S)}$ / 250 Ω

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

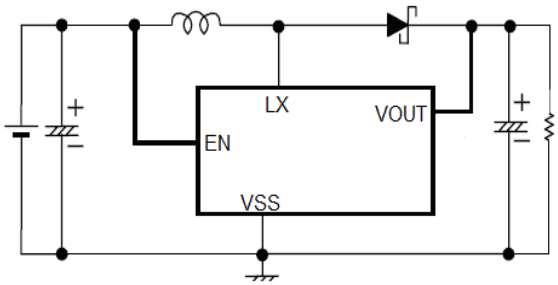
■ STANDARD CIRCUITS

Component: Inductor：22uH(Sumida) Capacitor：47uF/10V(Tantalum)
Diode：IN5817、IN5819 NMOS：XP151、XP161

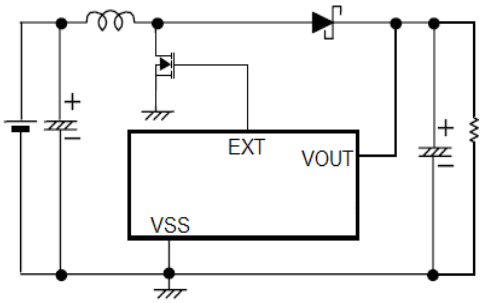
1、B3PXXA Circuits：



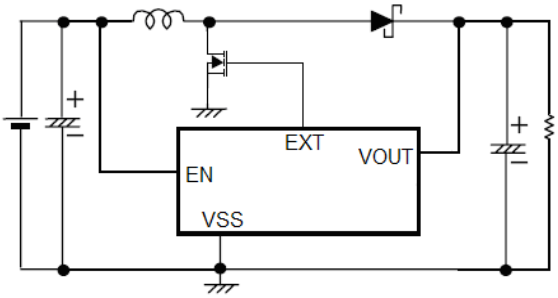
2、 B3PXXC Circuits：



3、B39XXB Circuits：



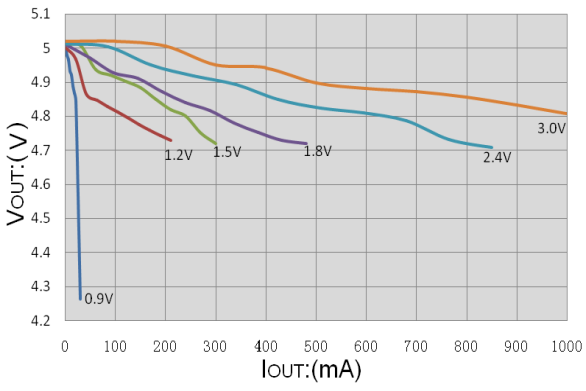
4、 B3PXXD Circuits：



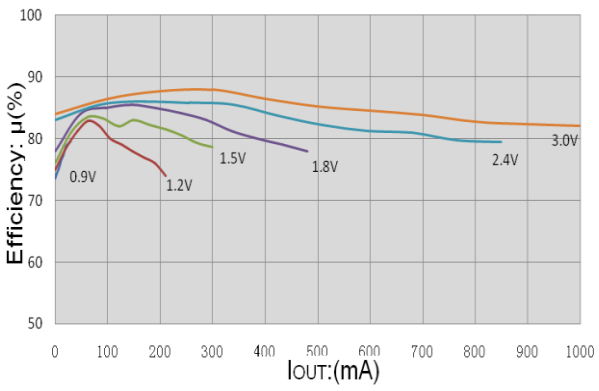
■ TYPICAL PERFORMANCE CHARACTERISTICS

B3PXXB50P

a、V_{OUT} vs. I_{OUT} :

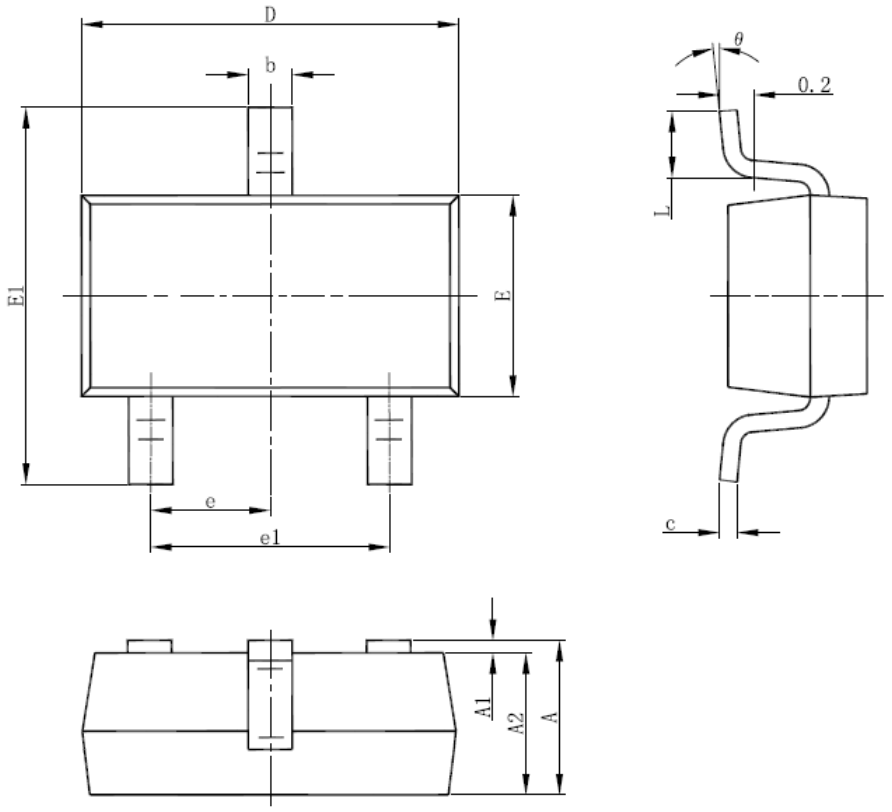


b、 Efficiency vs. I_{OUT} :



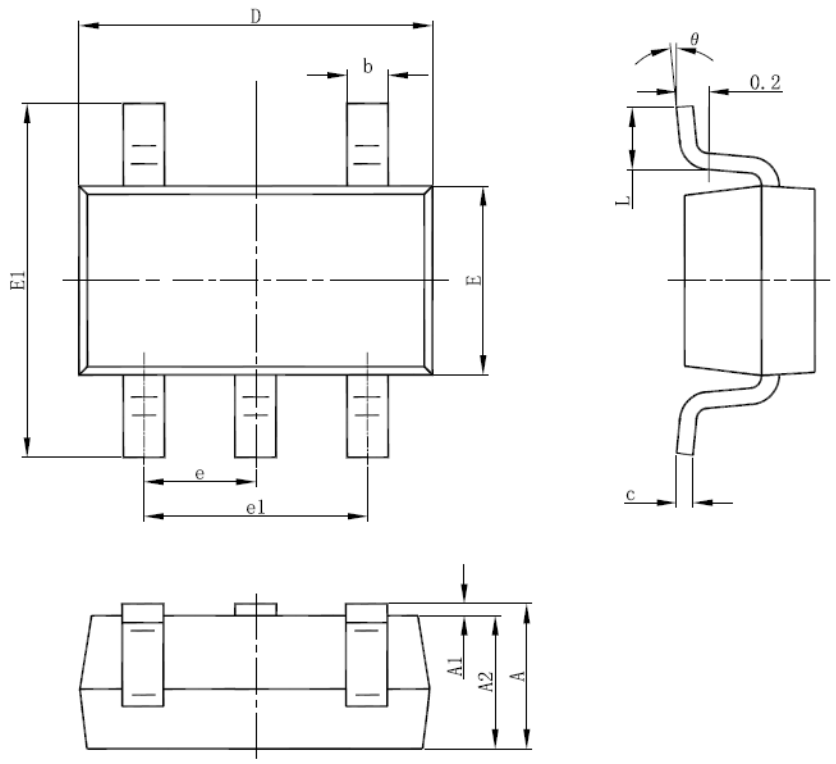
■ PACKAGE INFORMATION

● SOT-23-3



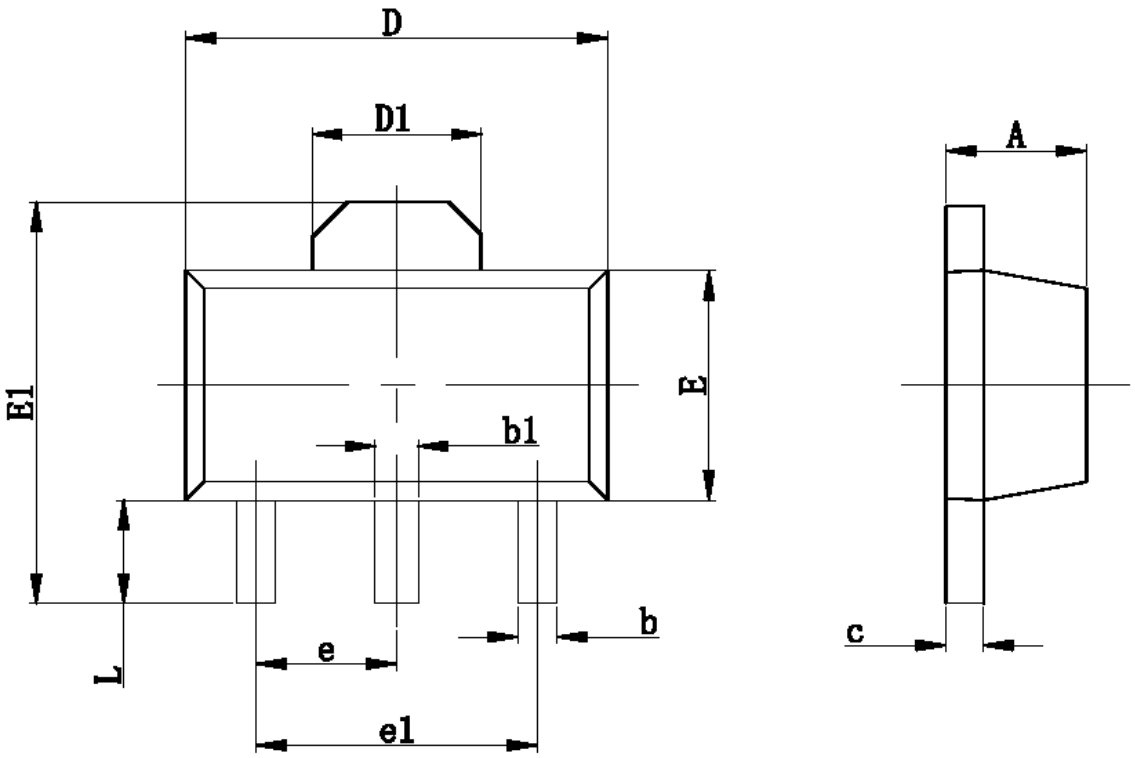
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)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

● **SOT-23- 5**



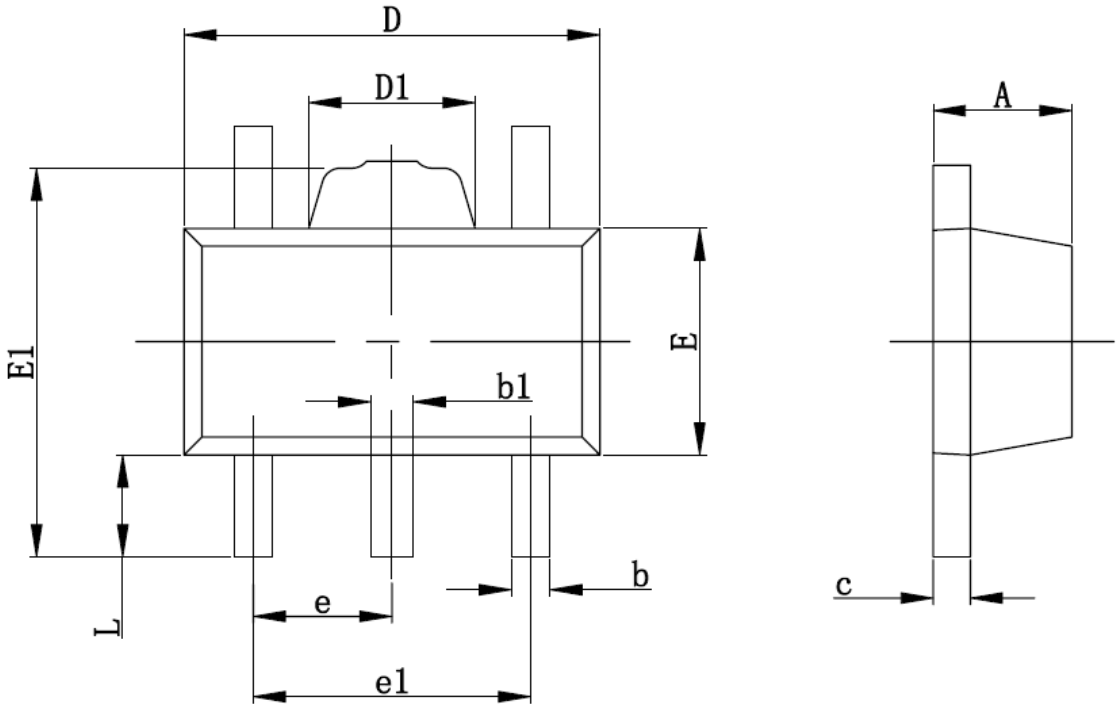
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)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

- **SOT-89-3**



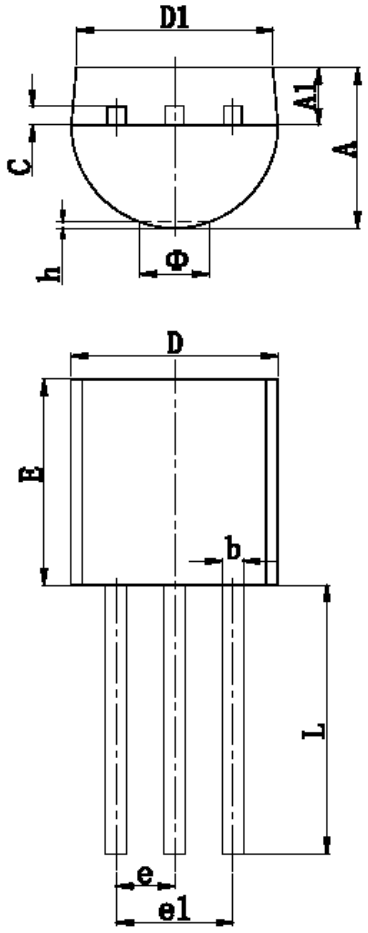
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.197
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF		0.061 REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP		0.060TYP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

● **SOT- 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
Φ		1.600		0.063
h	0.000	0.380	0.000	0.015