

Ultra Low Current Consumption 300mA CMOS Voltage Regulator

■ INTRODUCTION

The HG1304 series are a group of positive voltage regulators manufactured by CMOS technologies with ultra low power consumption and low dropout voltage, which can prolong battery life in portable electronics. The HG1304 series work with low-ESR ceramic capacitors, reducing the amount of board space necessary for power applications. The series are very suitable for the battery-powered equipments, such as RF applications and other systems requiring a quiet voltage source.

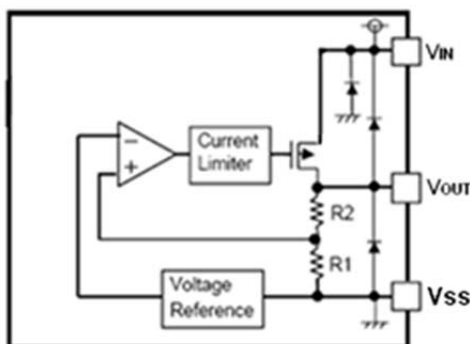
■ FEATURES

- Low Quiescent Current: 0.8 μ A
- Operating Voltage: 1.8V~7V
- Output Current: 300mA
- Low Dropout Voltage: 300mV@100mA
- Excellent Line and Load Transient Response
- Output Voltage: 0.9~ 5.0V
- High Accuracy: $\pm 2\%$ (Typ.)
- Built-in Current Limiter, Short-Circuit Protection
- Ceramic Capacitor Compatible

■ APPLICATIONS

- Portable consumer equipments
- Laptop, Palmtops and PDA
- Digital Still and Video Cameras
- MP3, MP4 Player
- Radio control systems
- Battery-Powered Equipment

■ BLOCK DIAGRAM



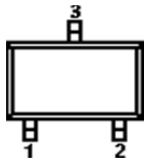
■ ORDER INFORMATION

HG1304①②③④⑤

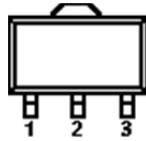
DESIGNATOR	SYMBOL	DESCRIPTION
①	A	Standard
②③	Integer	Output Voltage e.g.1.8V=②:1, ③:8
④	F	Package:DFN1×1-4
	M/MA/MC/MY	Package:SOT-23-3
	MF	Package:SOT-23-5
	P/PT	Package:SOT-89-3
	T	Package:TO-92
⑤	-	2% accuracy
	1	1% accuracy

■ PIN CONFIGURATION

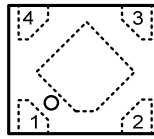
SOT-23-3



SOT-89-3



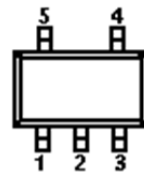
DFN1×1-4



TO-92



SOT-23-5



PIN NUMBER							PIN NAME	FUNCTION
SOT-23-3			SOT-89-3		TO-92			
M	MA	MC	MY	P	PT	T		
1	2	3	3	1	2	1	V_{SS}	Ground
2	1	2	1	3	1	3	V_{OUT}	Output
3	3	1	2	2	3	2	V_{IN}	Power input

DFN1×1-4

PIN NUMBER	SYMBOL	FUNCTION
F		
1	V_{OUT}	Output Pin
2	V_{SS}	Ground
3	NC	No Connection
4	V_{IN}	Power Input Pin

SOT-23-5

PIN NUMBER	SYMBOL	FUNCTION
MF		
1	V_{IN}	Power Input Pin
2	V_{SS}	Ground
3	NC	No Connection
4	NC	No Connection
5	V_{OUT}	Output Pin

■ ABSOLUTE MAXIMUM RATINGS

(Unless otherwise specified, Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNITS	
Input Voltage	V_{IN}	$V_{SS} - 0.3 \sim V_{SS} + 8$	V	
Output Current	I_{OUT}	500	mA	
Output Voltage	V_{OUT}	$V_{SS} - 0.3 \sim V_{IN} + 0.3$	V	
Power Dissipation	SOT-23	P_d	400	mW
	DFN1X1-4	P_d	400	mW
	SOT-89	P_d	600	mW
	TO-92	P_d	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

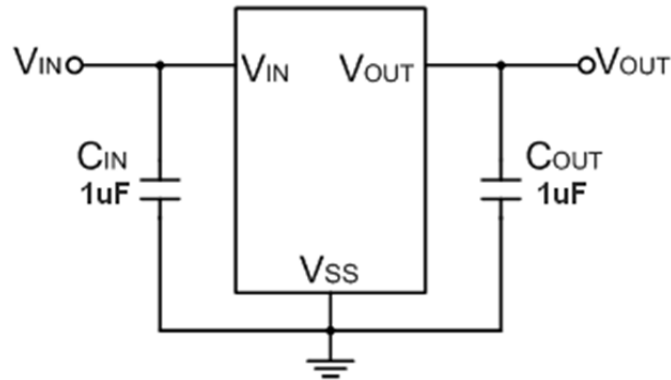
HG1304 Series ($V_{IN} = V_{OUT} + 1V$, $C_{IN} = C_{OUT} = 2.2\mu F$, Ta=25°C, unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Output Voltage	$V_{OUT(E)}$ (Note 2)	$I_{OUT} = 10mA$	V_{OUT} *0.98	V_{OUT}	V_{OUT} *1.02	V
			V_{OUT} *0.99	V_{OUT}	V_{OUT} *1.01	V
Supply Current	I_{SS}	$I_{OUT} = 0$		0.8	2.0	μA
Output Current	I_{OUT}	$V_{OUT} \geq 3.0V$	300			mA
Dropout Voltage (Note 3)	V_{dif}	$I_{OUT} = 100mA$ $V_{OUT} \geq 3.0V$		300		mV
Load Regulation	ΔV_{OUT}	$V_{IN} = V_{OUT} + 1V$, $1mA \leq I_{OUT} \leq 100mA$		10		mV
Line Regulation	$\frac{\Delta V_{OUT}}{V_{OUT} \times \Delta V_{IN}}$	$I_{OUT} = 10mA$ $V_{OUT} + 1V \leq V_{IN} \leq 6V$		0.01	0.3	%/V
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta T \times V_{OUT}}$	$I_{OUT} = 10mA$ $-40 \leq T \leq +85$		100		ppm
Short Current	I_{Short}	$V_{OUT} = V_{SS}$		30		mA
Input Voltage	V_{IN}	—	1.8		7.0	V

NOTE:

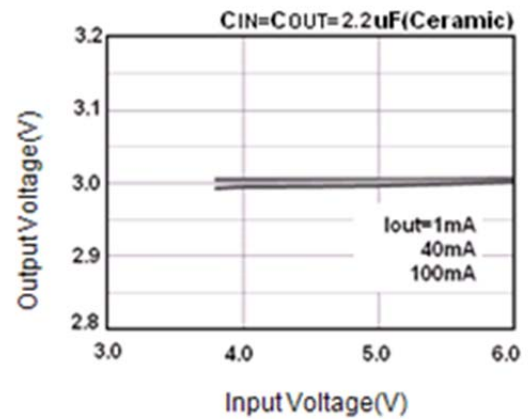
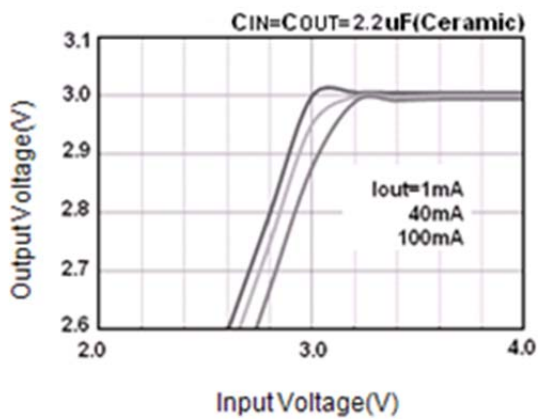
1. V_{OUT} : Specified Output Voltage.
2. $V_{OUT(E)}$: Effective Output Voltage (i.e. The Output Voltage When $V_{IN} = (V_{OUT} + 1.0V)$ And Maintain A Certain I_{OUT} Value).
3. V_{dif} : The Difference Of Output Voltage And Input Voltage When Input Voltage Is Decreased Gradually Till Output Voltage Equals To 98% Of $V_{OUT(E)}$.

■ TYPICAL APPLICATION

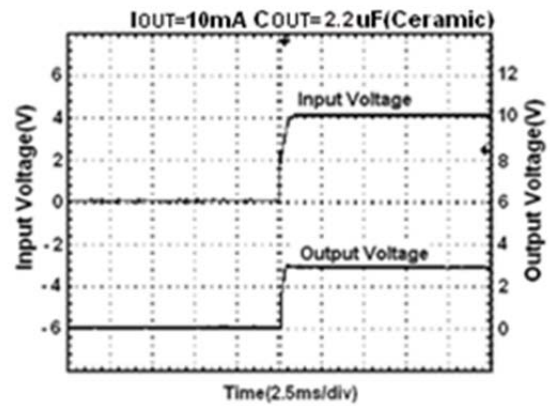
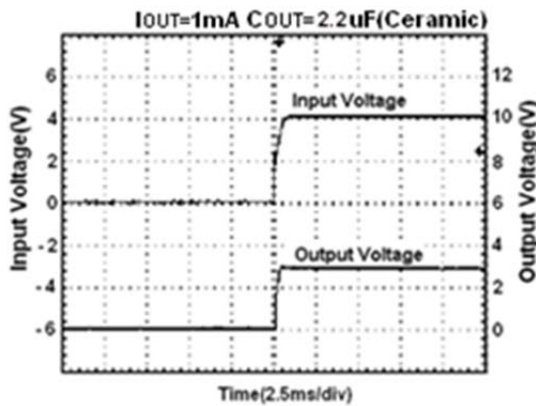


■ TYPICAL PERFORMANCE CHARACTERISTICS

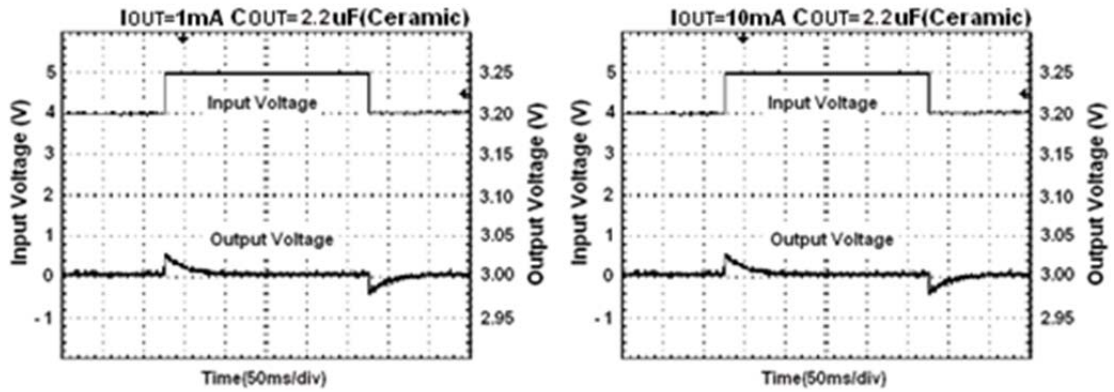
(1) Output Voltage vs. Input Voltage



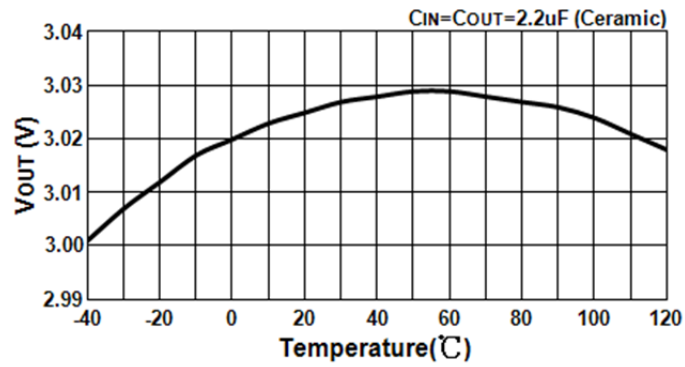
(2) Input Transient Response 1



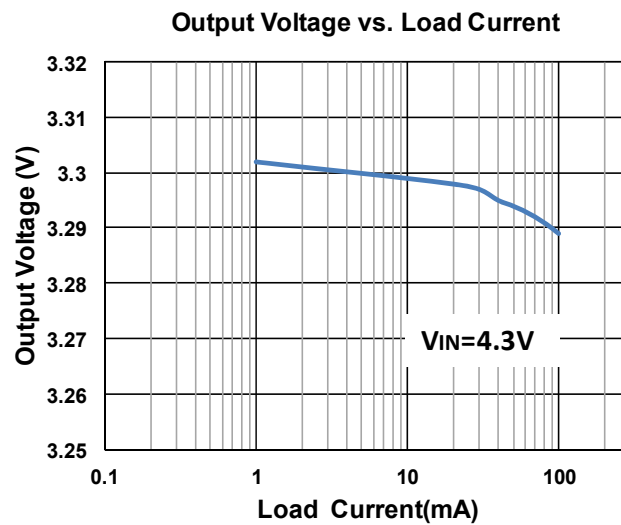
(3) Input Transient Response 2



(4) Output Voltage vs. Temperature

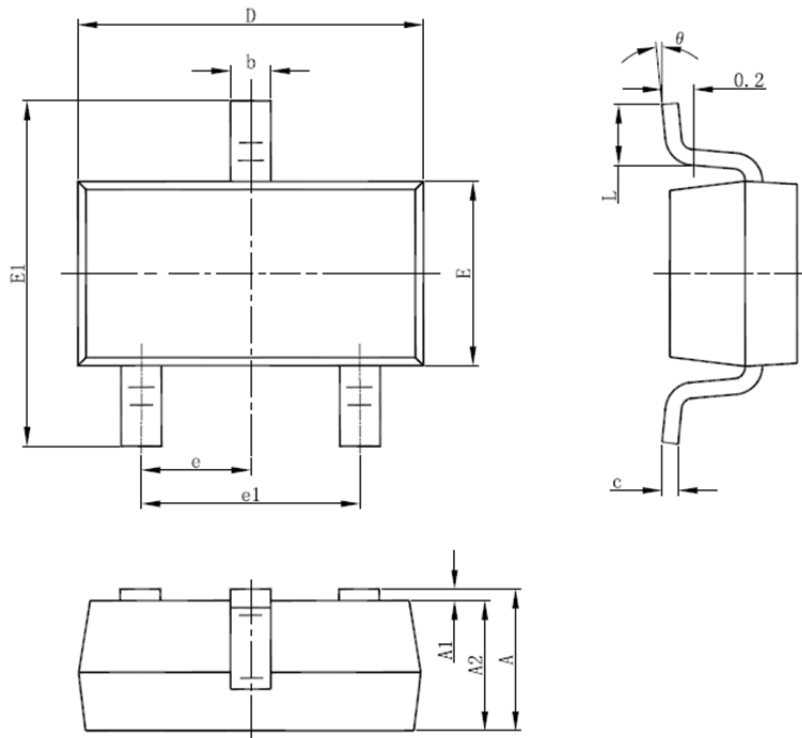


(5) Output Voltage vs. Load Current



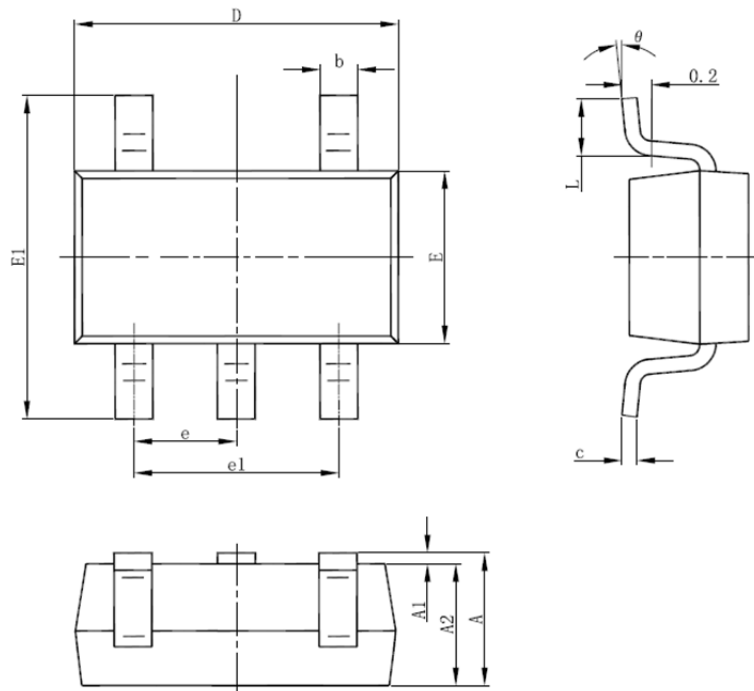
■ PACKAGING INFORMATION

● SOT-23-3 PACKAGE OUTLINE DIMENSIONS



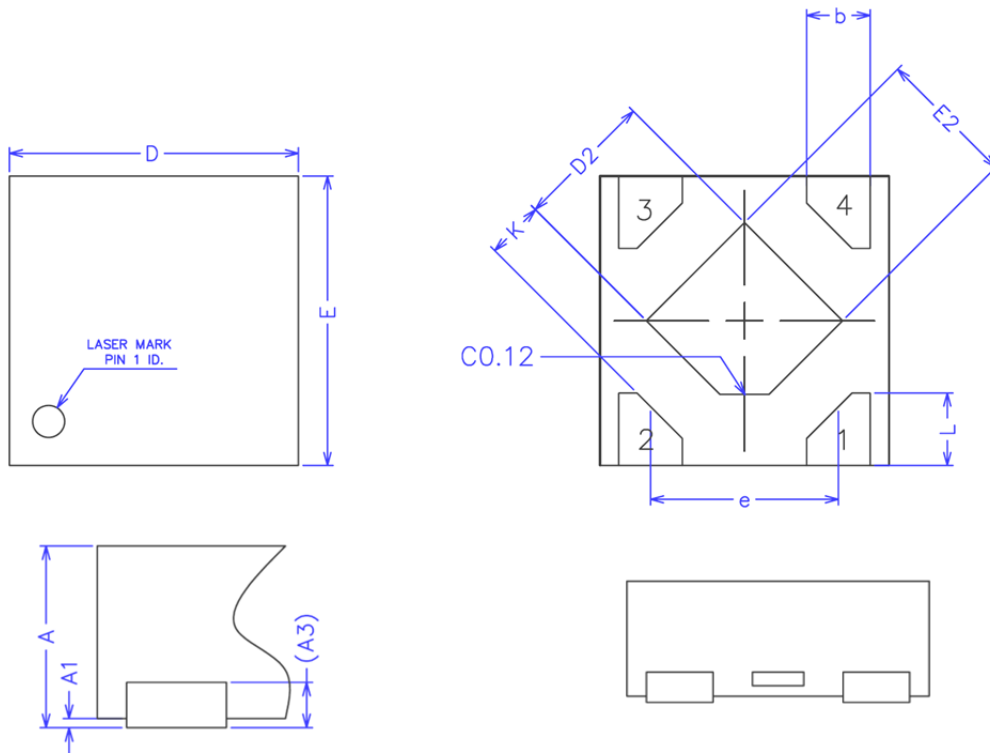
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)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

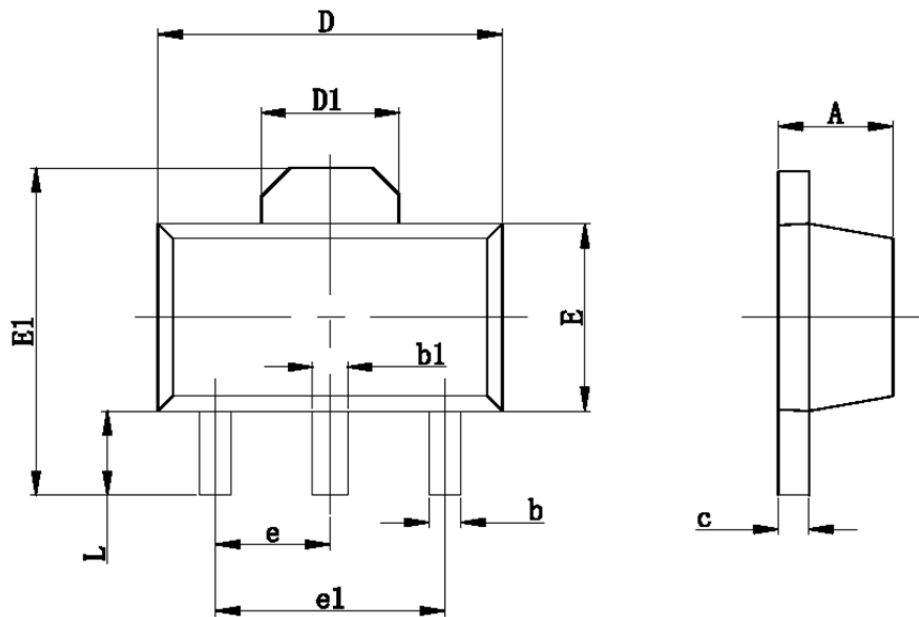
● DFN1×1-4 PACKAGE OUTLINE DIMENSIONS



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

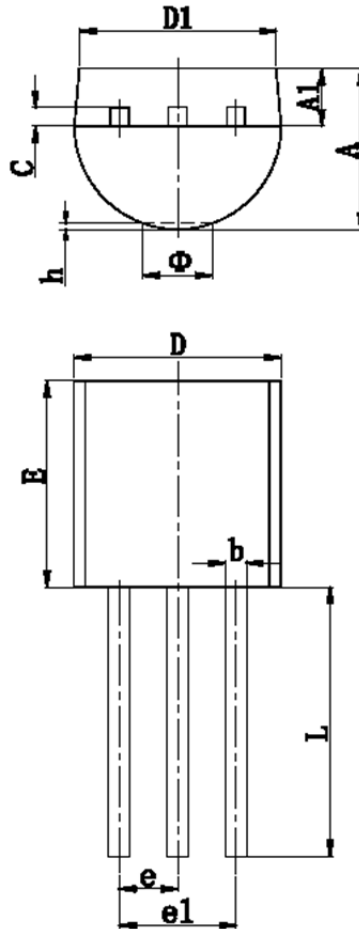
SYMBOL	MIN	NOM	MAX
A	0.34	0.37	0.40
A1	0.00	0.02	0.05
A3	0.100REF		
b	0.17	0.22	0.27
D	0.95	1.00	1.05
E	0.95	1.00	1.05
D2	0.43	0.48	0.53
E2	0.43	0.48	0.53
L	0.20	0.25	0.30
e	-	0.65	-
K	0.15	-	-

- SOT-89-3 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

- 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	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