

## Low Consumption Current High PSRR 300mA CMOS Voltage Regulator

### ■ INTRODUCTION

The HG1301 series are a group of positive voltage regulators manufactured by CMOS technologies with high ripple rejection, low power consumption and low dropout voltage, which can prolong battery life in portable electronics. The HG1301 series work with low-ESR ceramic capacitors, reducing the amount of board space necessary for power applications. The HG1301 series consume less than 0.1 $\mu$ A in shutdown mode and have fast turn-on time less than 50 $\mu$ s. The series are very suitable for the battery-powered equipments, such as RF applications and other systems requiring a quiet voltage source.

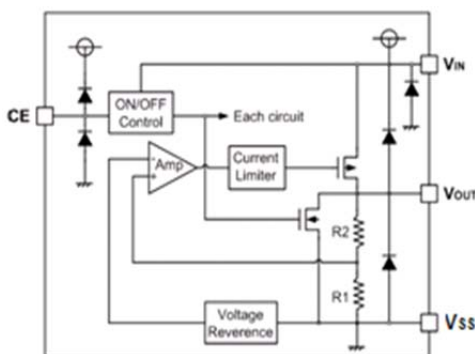
### ■ APPLICATIONS

- Cellular and Smart Phones
- Laptop, Palmtops and PDA
- Digital Still and Video Cameras

### ■ FEATURES

- Low Dropout Voltage: 150mV@150mA
- Low Quiescent Current: 5 $\mu$ A
- High Ripple Rejection: 65dB@1kHz
- Excellent Line and Load Transient Response
- Operating Voltage: 2.0V~7.0V
- Output Voltage: 1.2 ~ 5.0V
- High Accuracy:  $\pm 2\%$  (Typ.)/ $\pm 1\%$  (Typ.)
- Built-in Current Limiter, Short-Circuit Protection
- TTL- Logic-Controlled Shutdown Input
- MP3, MP4 Player
- Radio control systems
- Battery-Powered Equipmen

### ■ BLOCK DIAGRAM



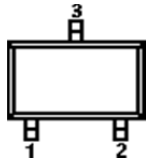
### ■ ORDER INFORMATION

HG1301①②③④⑤

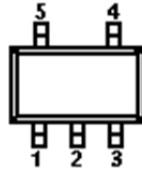
DESIGNATOR	SYMBOL	DESCRIPTION
①	A	Standard
	B	With Shutdown Function
②③	Integer	Output Voltage e.g.1.8V=②:1, ③:8
④	M	Package:SOT-23-3/5
	U	Package:SC-70-5
	P/PT	Package:SOT-89-3/5
	T	Package:TO-92
	F/ FB	Package:DFN1×1-4/ FBP1×1-4
⑤	-	2% Accuracy
	1	1% Accuracy

## ■ PIN CONFIGURATION

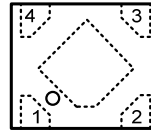
SOT-23-3



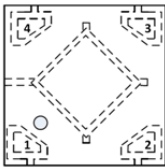
SOT-23-5/  
SOT-353(SC70-5)



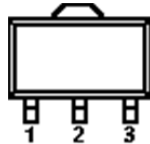
DFN1×1-4



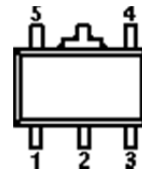
FBP1×1-4



SOT-89-3



SOT-89-5



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

SOT-23-5/SC-70-5

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

DFN1×1-4(HG1301BXXF)/ FBP1×1-4(HG1301BXXFB)

PIN NUMBER	SYMBOL	FUNCTION
F		
1	$V_{OUT}$	Output Pin
2	$V_{SS}$	Ground
3	CE	Chip Enable Pin
4	$V_{IN}$	Power Input Pin
EP	Thermal PAD	Ground

## SOT-89-5

PIN NUMBER		SYMBOL	FUNCTION
P	PT		
1	5	$V_{OUT}$	Output Pin
2	2	$V_{SS}$	Ground
3	1	NC	No Connection
4	3	CE	Chip Enable Pin
5	4	$V_{IN}$	Power Input Pin

## ■ ABSOLUTE MAXIMUM RATINGS

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

PARAMETER		SYMBOL	RATINGS	UNITS
Input Voltage		$V_{IN}$	$V_{SS} - 0.3 \sim V_{SS} + 8$	V
Output Current		$I_{OUT}$	600	mA
Output Voltage		$V_{OUT}$	$V_{SS} - 0.3 \sim V_{IN} + 0.3$	V
Power Dissipation	SOT-23	$P_d$	400	mW
	SC-70	$P_d$	250	mW
	DFN1×1-4/ FBP1×1-4	$P_d$	400	mW
	SOT-89	$P_d$	600	mW
	TO-92	$P_d$	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		$T_{solder}$	$260^{\circ}\text{C}, 10\text{s}$	

## ■ ELECTRICAL CHARACTERISTICS

HG1301 Series ( $V_{IN}=V_{OUT}+1V$ ,  $C_{IN}=C_{OUT}=1\mu F$ ,  $T_a=25^\circ C$ , unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Output Voltage	$V_{OUT(E)}$ (Note 2)	$I_{OUT}=1mA$	$V_{OUT} * 0.98$	$V_{OUT}$	$V_{OUT} * 1.02$	V
			$V_{OUT} * 0.99$	$V_{OUT}$	$V_{OUT} * 1.01$	V
Supply Current	$I_{SS}$	$I_{OUT}=0$		5	10	$\mu A$
Standby Current	$I_{STBY}$	$CE = V_{SS}$			0.2	$\mu A$
Output Current	$I_{OUT}$	—	300			mA
Dropout Voltage (Note 3)	$V_{dif}$	$I_{OUT} = 150mA$ $V_{OUT} \geq 3.0V$		150		mV
Load Regulation	$\Delta V_{OUT}$	$V_{IN} = V_{OUT} + 1V$ , $1mA \leq I_{OUT} \leq 100mA$		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	0.2	%/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	$I_{Short}$	$V_{OUT} = V_{SS}$		50		mA
Input Voltage	$V_{IN}$	—	2.0		7.0	V
Power Supply Rejection Rate	1kHz	PSRR	$I_{OUT}=50mA$	65		dB
	10kHz			50		
CE "High" Voltage	$V_{CE"H"}$		1.5		$V_{IN}$	V
CE "Low" Voltage	$V_{CE"L"}$				0.3	V

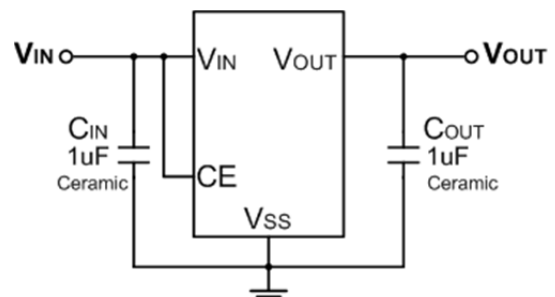
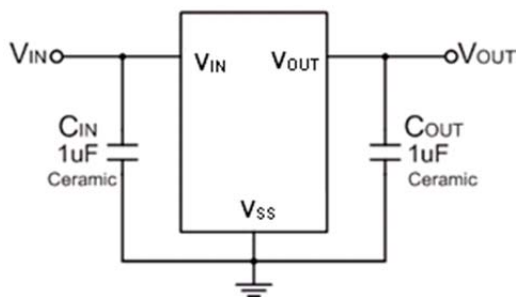
### NOTE:

- $V_{OUT}$ : Specified Output Voltage.
- $V_{OUT(E)}$ : Effective Output Voltage ( i.e. The Output Voltage When  $V_{IN} = (V_{OUT} + 1.0V)$  And Maintain A Certain  $I_{OUT}$  Value).

### NOTE:

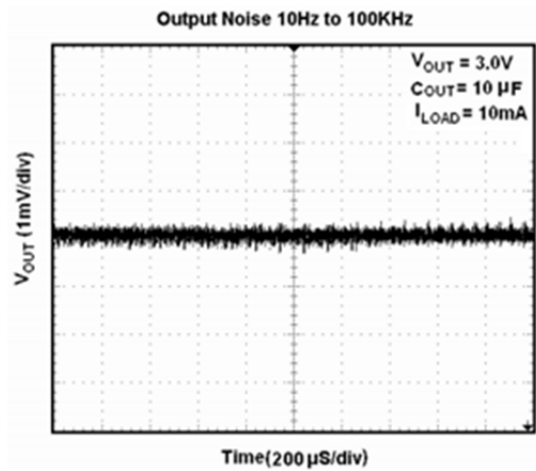
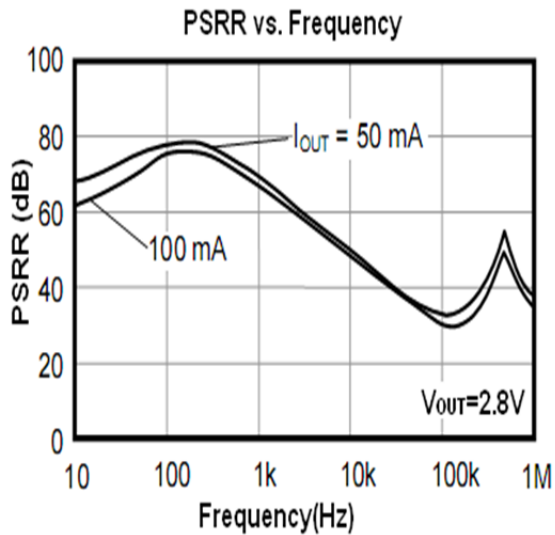
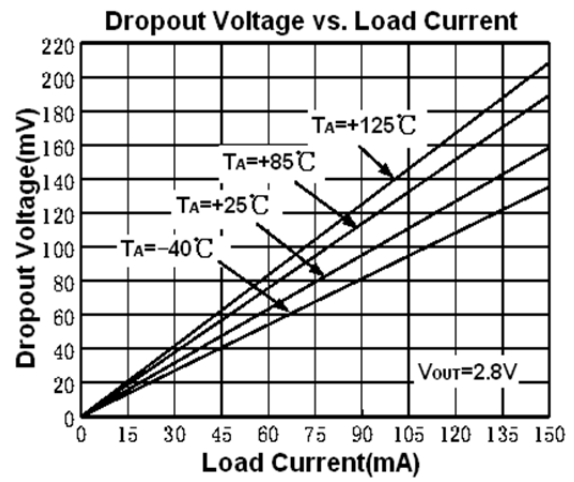
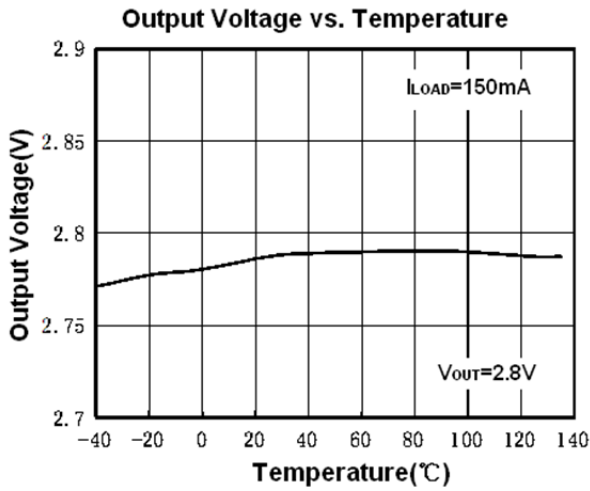
- $V_{dif}$ : The Difference Of Output Voltage And Input Voltage When Input Voltage Is Decreased Gradually Till Output Voltage Equals To 98% Of  $V_{OUT(E)}$ .

## ■ TYPICAL APPLICATION



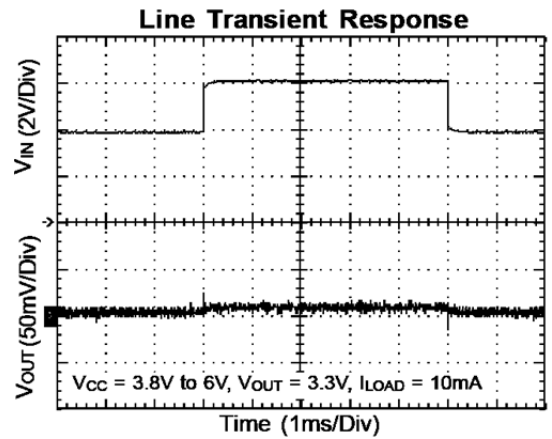
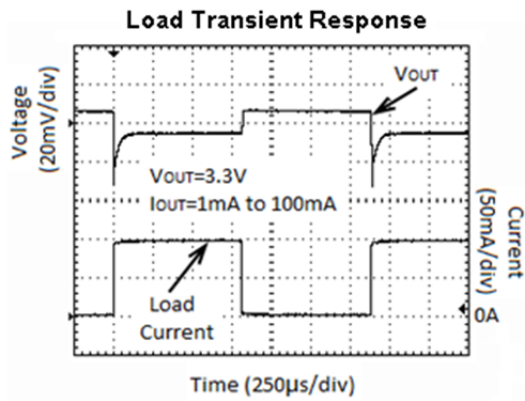
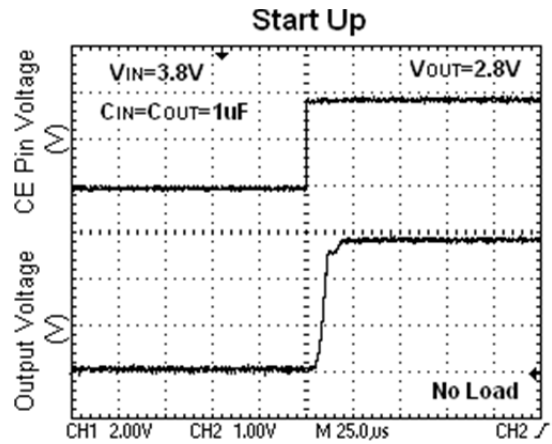
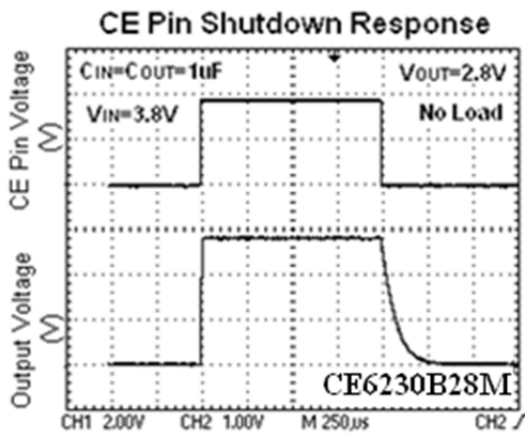
## ■ TYPICAL PERFORMANCE CHARACTERISTICS

( $V_{CE}=V_{IN}=V_{OUT}+1V$ ,  $C_{IN}=C_{OUT}=1\mu F$ ,  $T_A=25^\circ C$ , unless otherwise specified)



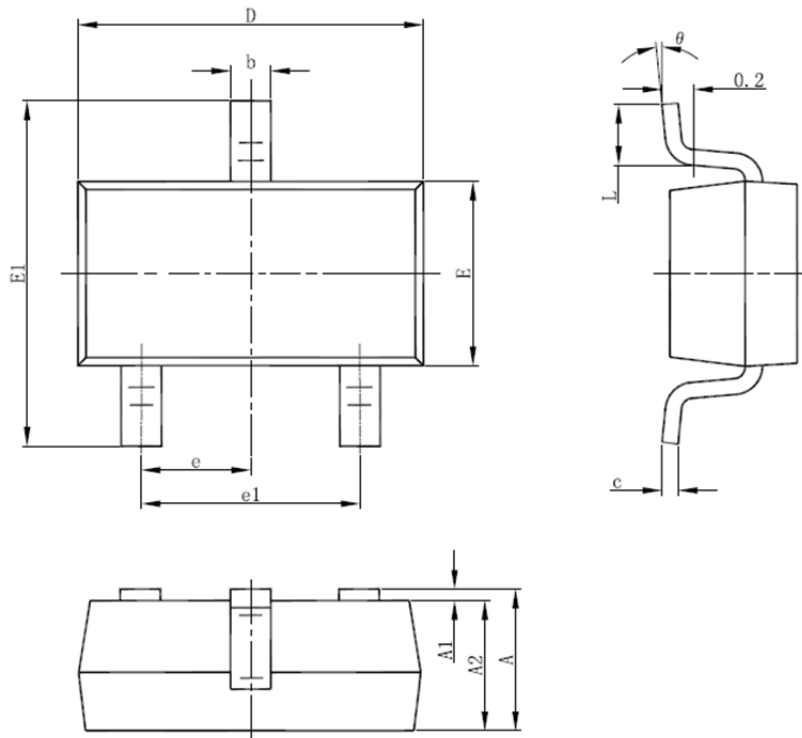
## ■ TYPICAL PERFORMANCE CHARACTERISTICS

( $V_{CE}=V_{IN}=V_{OUT}+1V$ ,  $C_{IN}=C_{OUT}=1\mu F$ ,  $T_A=25^\circ C$ , unless otherwise specified)



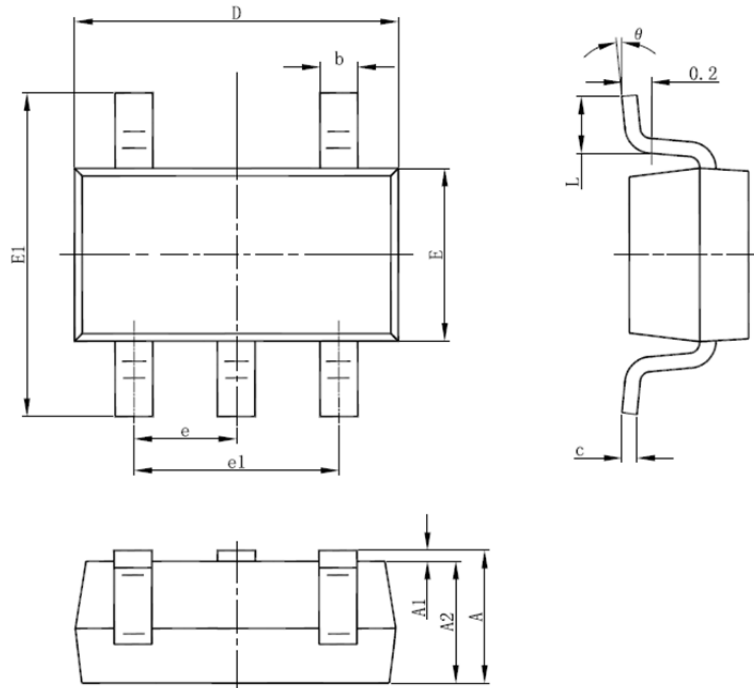
## ■ PACKAGING INFORMATION

### ● 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°

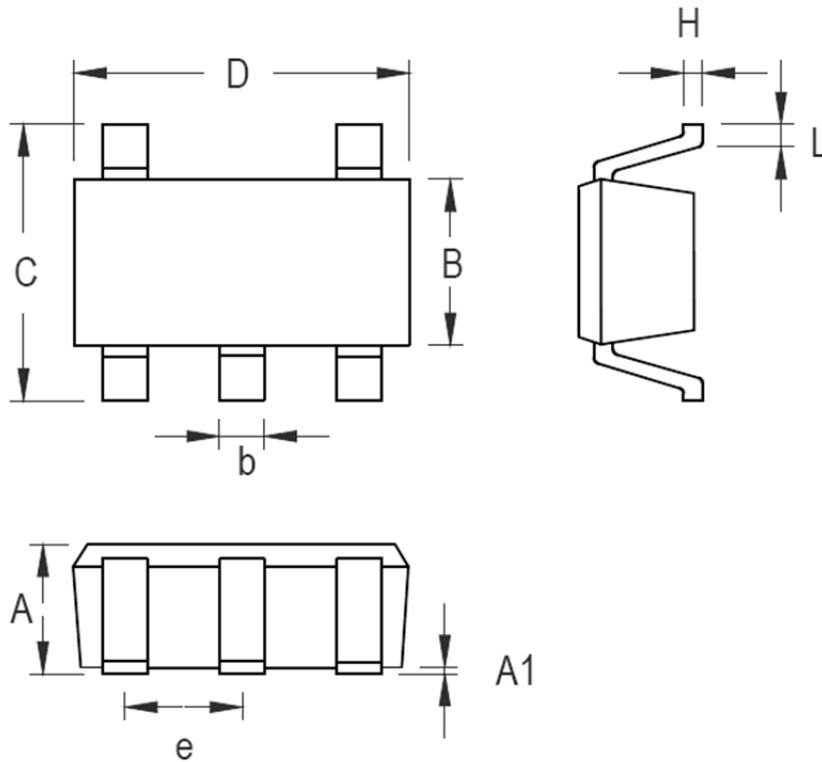
## • SOT-23-5 PACKAGE OUTLINE DIMENSIONS



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°

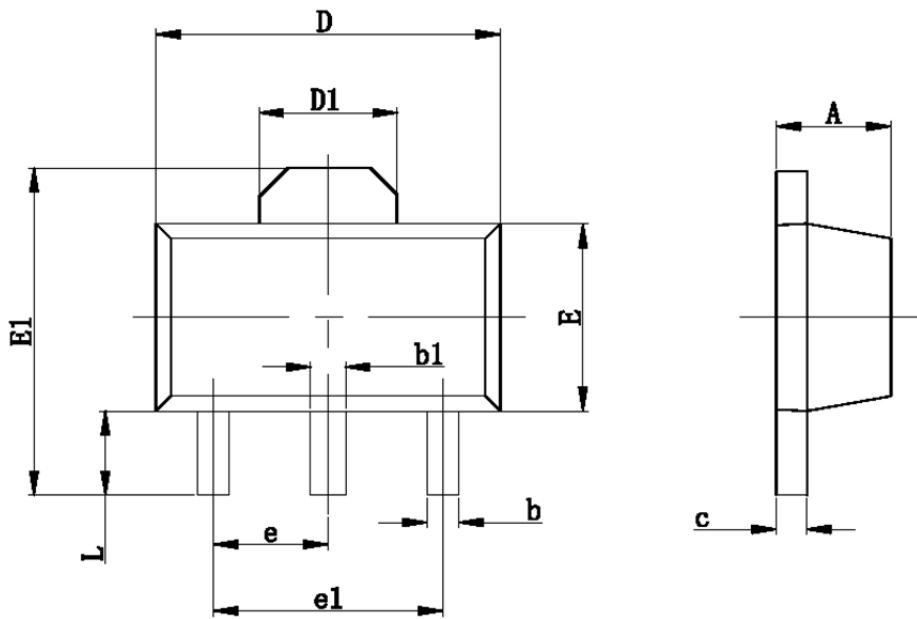


• SC-70-5 PACKAGE OUTLINE DIMENSIONS



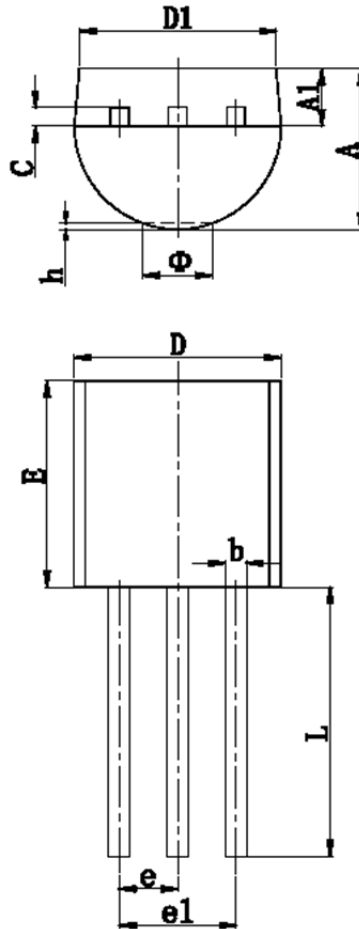
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.100	0.031	0.044
A1	0.000	0.100	0.000	0.004
B	1.150	1.350	0.045	0.054
b	0.150	0.400	0.006	0.016
C	1.800	2.450	0.071	0.096
D	1.800	2.250	0.071	0.089
e	0.650		0.026	
H	0.080	0.260	0.003	0.010
L	0.210	0.460	0.008	0.018

● SOT-89-3 PACKAGE OUTLINE DIMENSIONS



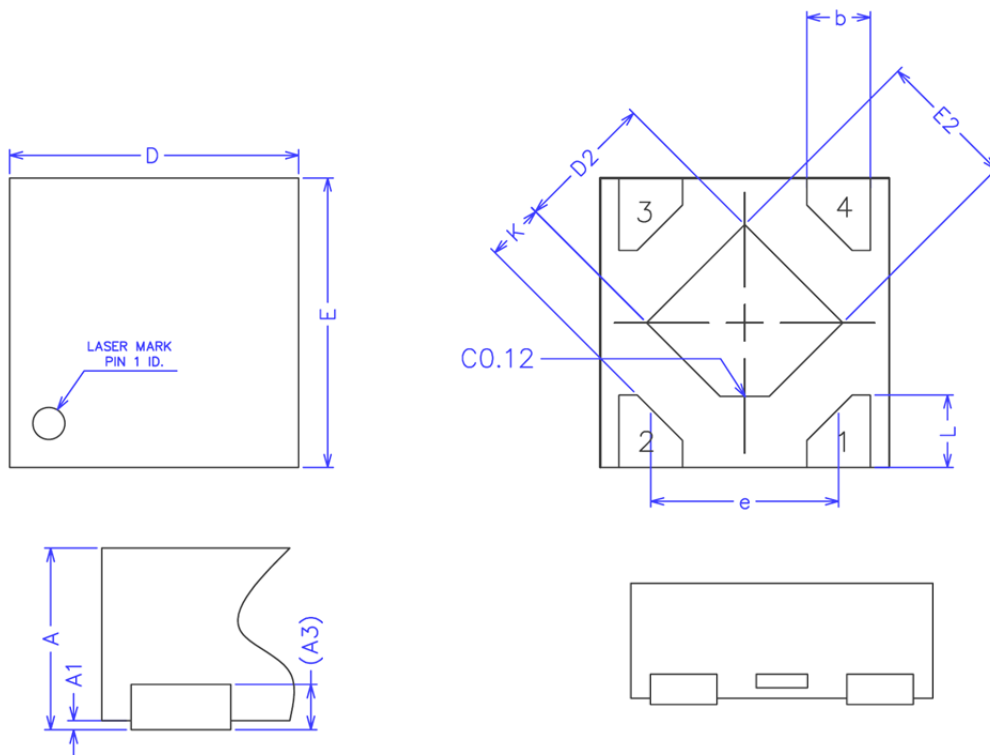
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.197
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF		0.061 REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP		0.060TYP	
e1	3.000 TYP		0.118TYP	
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
$\Phi$		1.600		0.063
h	0.000	0.380	0.000	0.015

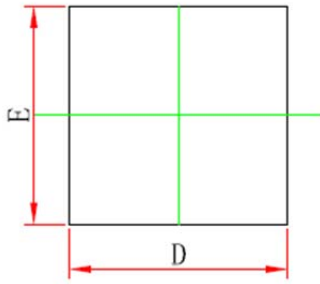
● DFN1×1-4 PACKAGE OUTLINE DIMENSIONS



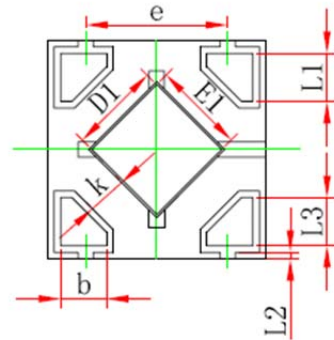
COMMON DIMENSIONS  
(UNITS OF MEASURE=MILLIMETER)

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	—	—

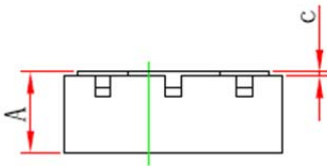
● FBP1×1-4 PACKAGE OUTLINE DIMENSIONS



TOP VIEW  
[顶视图]



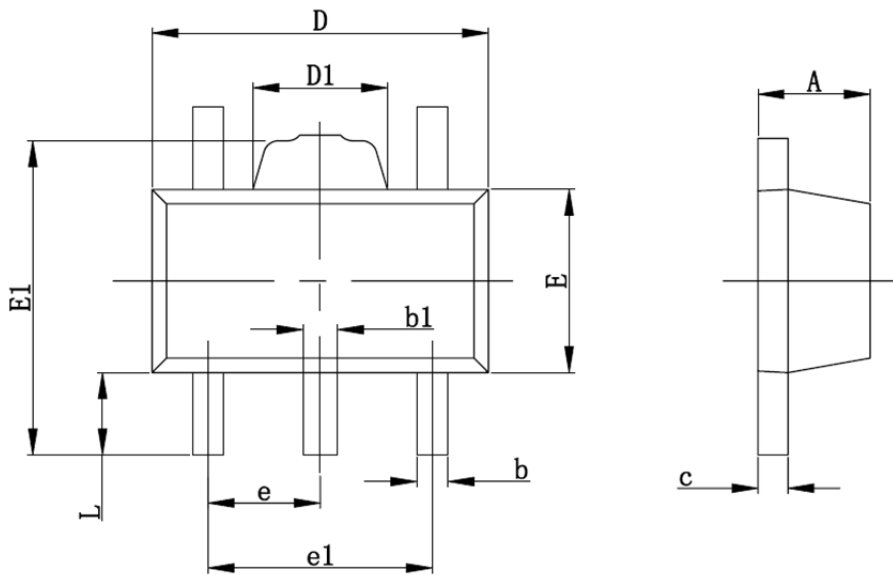
BOTTOM VIEW  
[背视图]



SIDE VIEW  
[侧视图]

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.335	0.405	0.013	0.016
D	0.950	1.050	0.037	0.041
E	0.950	1.050	0.037	0.041
D1	0.370	0.470	0.015	0.019
E1	0.370	0.470	0.015	0.019
k	0.17MIN.		0.007MIN.	
b	0.160	0.260	0.006	0.010
c	0.010	0.090	0.000	0.004
e	0.600	0.700	0.024	0.028
L1	0.185	0.255	0.007	0.010
L2	0.030 REF.		0.001 REF.	
L3	0.185	0.255	0.007	0.010

● SOT-89-5 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	0.020
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