

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

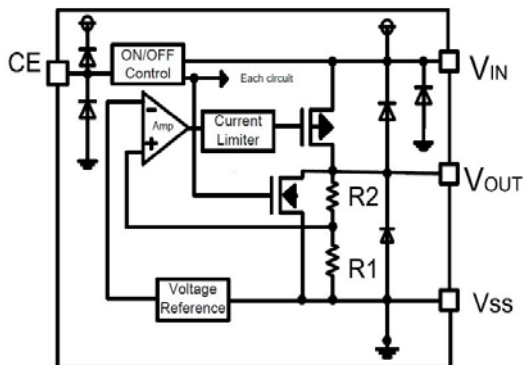
### ■ INTRODUCTION

The SML111 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 SML111 series work with low-ESR ceramic capacitors, reducing the amount of board space necessary for power applications. The SML111 series consume less than 0.1uA in shutdown mode and have fast turn-on time less than 50us. The series are very suitable for the battery-powered equipments, such as RF applications and other systems requiring a quiet voltage.

### ■ APPLICATIONS

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

### ■ BLOCK DIAGRAM



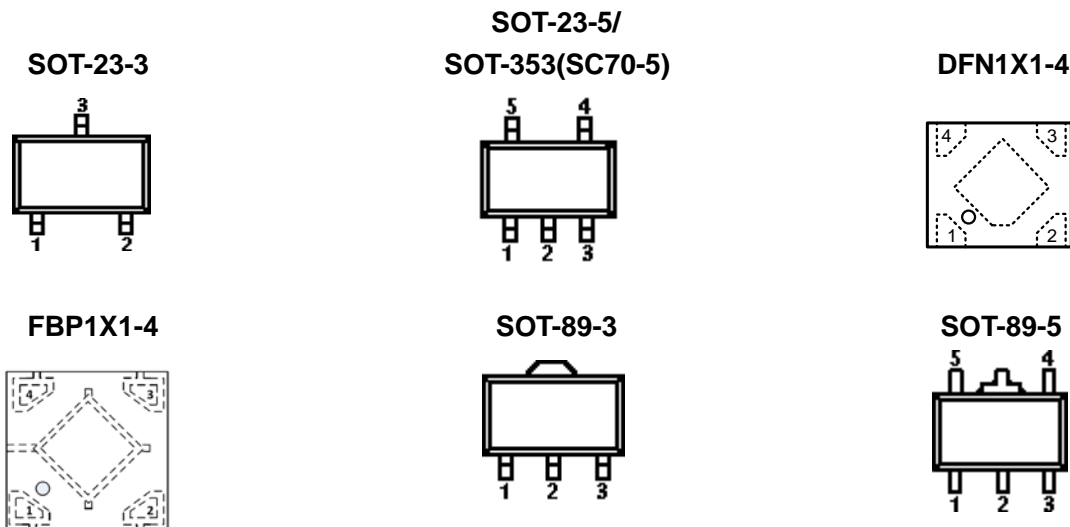
### ■ FEATURES

- Low Dropout Voltage:  
150mV @ 150mA
  - Low Quiescent Current: 5µA
  - High Ripple Rejection: 70dB @ 1kHz
  - Excellent Line and Load Transient Response
  - Operating Voltage: 2.0V ~ 7.0V
  - Output Voltage: 1.2V ~ 5.0V
  - High Accuracy:  
±2% (Typ.) / ±1% (Typ. )
  - Built-in Current Limiter, Short-Circuit Protection
  - TTL- Logic-Controlled Shutdown Input
- 
- MP3, MP4 Player
  - Radio control systems
  - Battery-Powered Equipments

### ■ ORDER INFORMATION

DESIGNATOR	SYMBOL	DESCRIPTION	
SML111①②③④⑤	①	A	Standard
		B	With Shutdown Function
	②	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
	⑤	F/ FB	Package: DFN1X1-4 / FBP1X1-4
		-	2% Accuracy
	1	1% Accuracy	

## ■ PIN CONFIGURATION (Top view)



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

### DFN1X1-4(SML111BXXF)/FBP1X1-4(SML111BXXFB)

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	SC-70-5	250	mW
	SOT-23-3/5	400	mW
	DFN1X1-4 / FBP1X1-4	400	mW
	SOT-89-3/5	600	mW
	TO-92	500	mW
Operating free air temperature range	$T_A$	-40 ~ +85	$^\circ\text{C}$
Operating Junction Temperature Range	$T_j$	-40 ~ +150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 ~ +150	$^\circ\text{C}$
Lead Temperature(Soldering, 10sec)	$T_{solder}$	260	$^\circ\text{C}$
ESD rating: Human Body Model	HBM	$\geq 2$	kV
ESD rating: Machine Model	MM	$\geq 200$	V

## ■ ELECTRICAL CHARACTERISTICS

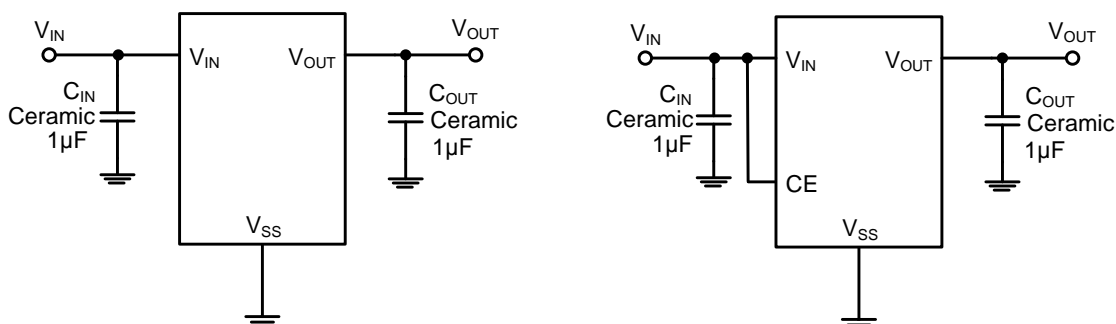
SML111 Series ( $V_{IN} = V_{OUT} + 1V$ ,  $C_{IN} = C_{OUT} = 1\mu F$ ,  $T_A = 25^\circ C$ , unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	$V_{OUT(E)}$ (2)	$I_{OUT} = 1mA$	$V_{OUT} * 0.98$	$V_{OUT}^{(1)}$	$V_{OUT} * 1.02$	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 <sup>(3)</sup>	$V_{dif}$	$I_{OUT} = 150mA$ $V_{OUT} \geq 3.0V$		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	PSRR	$I_{OUT} = 50mA$	1kHz	70		dB
			10kHz	50		
CE "High" Voltage	$V_{CE"H"}$		1.5		$V_{IN}$	V
CE "Low" Voltage	$V_{CE"L"}$				0.3	V

### NOTE:

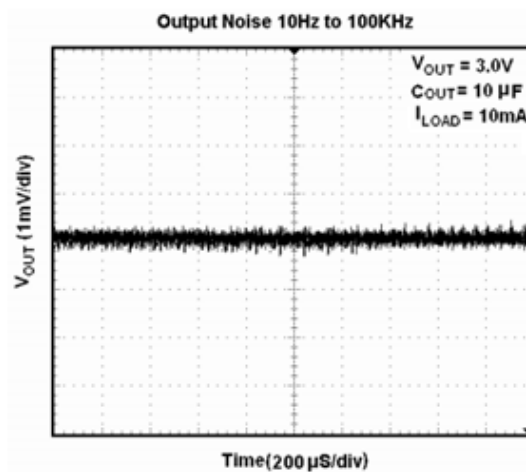
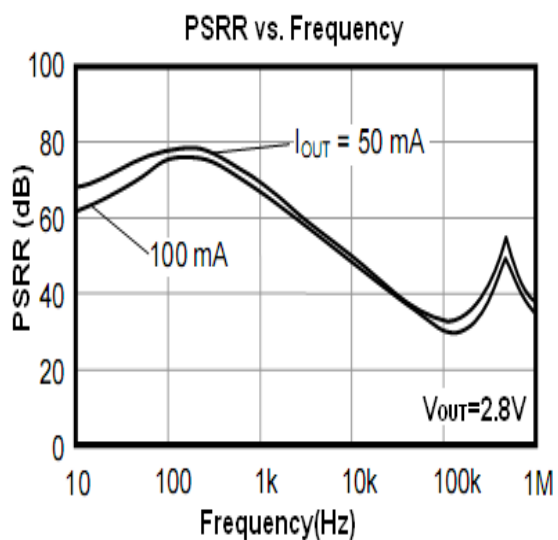
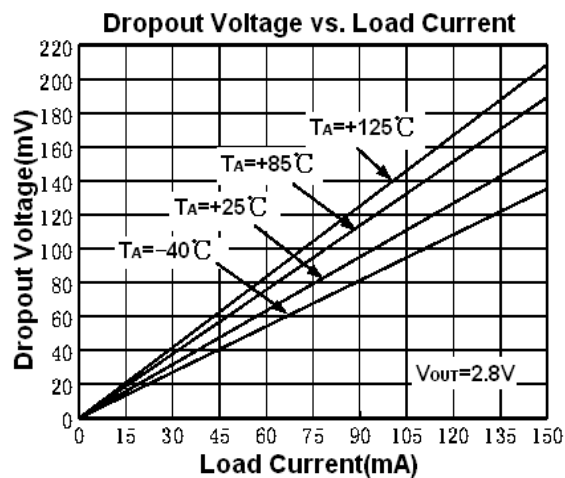
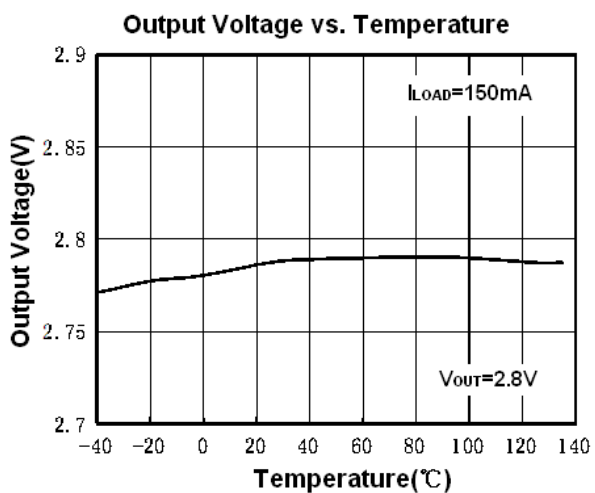
- $V_{OUT}$ : Specified Output Voltage.
- $V_{OUT(E)}$ : Effective Output Voltage (I.e. The Output Voltage When  $V_{IN} = (V_{OUT} + 1.0V)$ , And Maintain A Certain  $I_{OUT}$  Value).
- $V_{dif}$ : The Difference Of Output Voltage And Input Voltage When Input Voltage Is Decreased Gradually Till Output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

## ■ TYPICAL APPLICATION



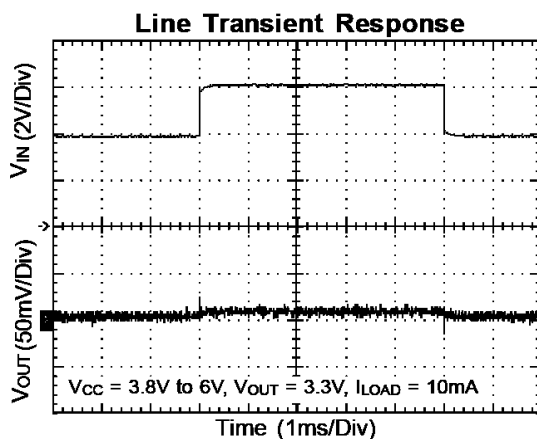
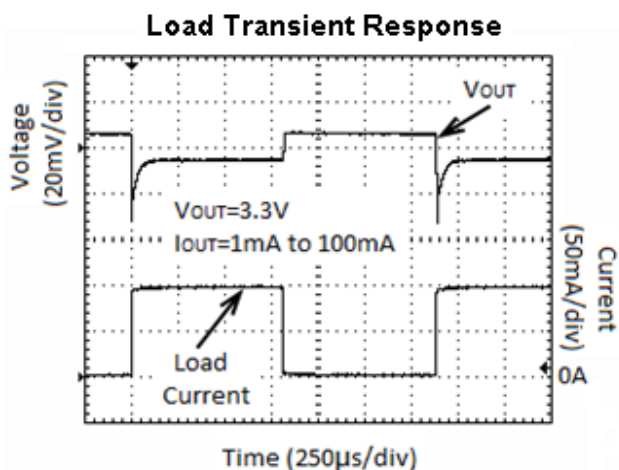
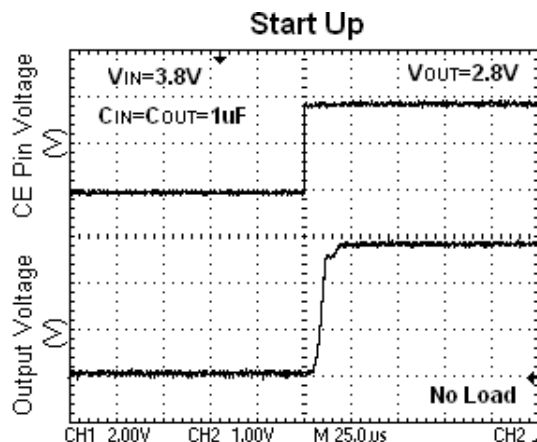
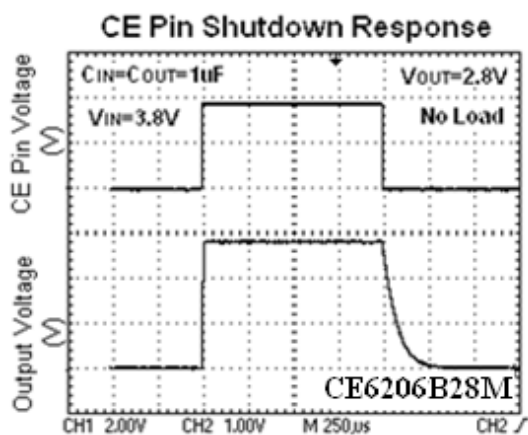
■ TYPICAL PERFORMANCE CHARACTERISTICS

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

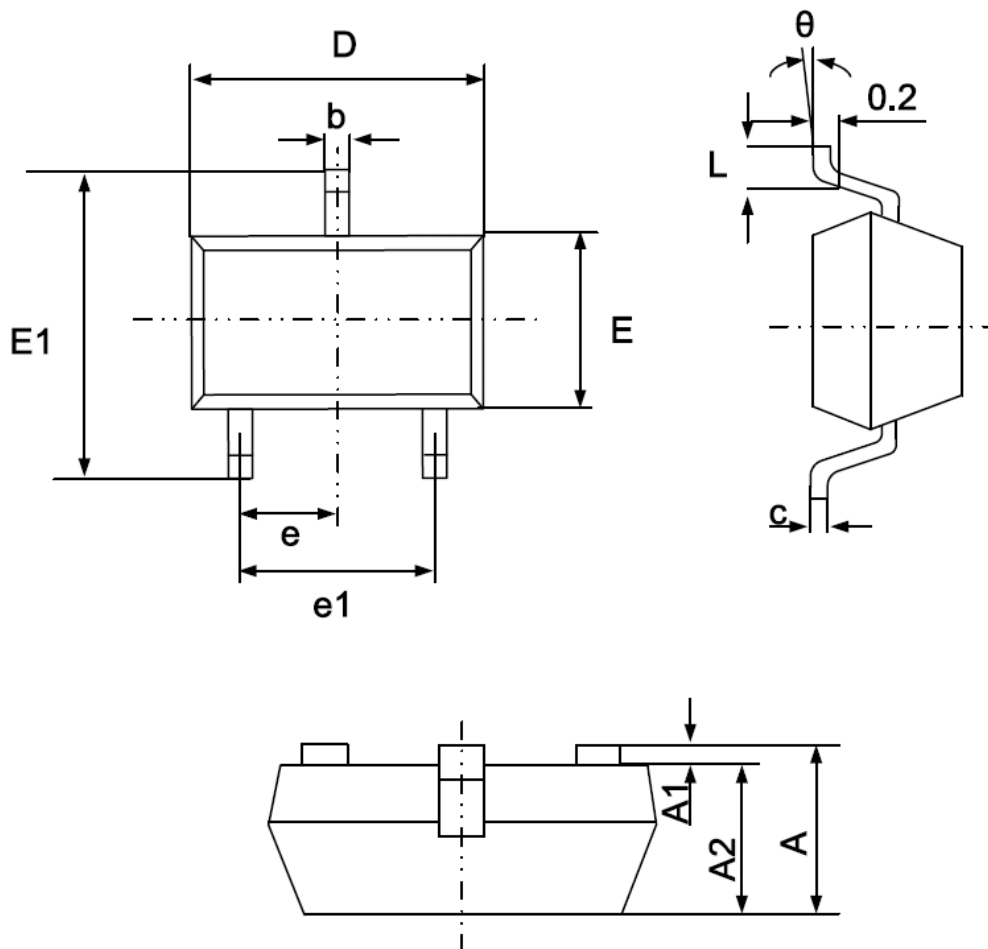


■ TYPICAL PERFORMANCE CHARACTERISTICS

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

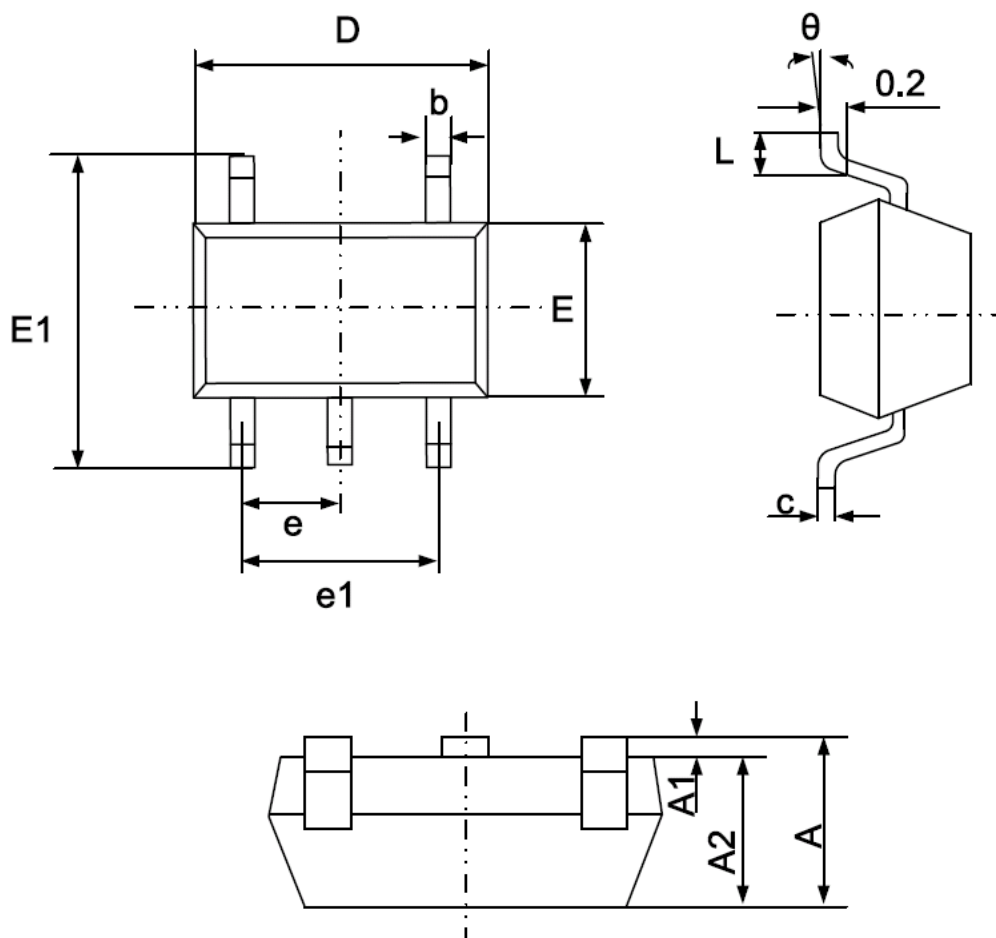


- PACKAGING INFORMATION
- SOT-23-3 PACKAGE OUTLINE DIMENSIONS



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
$\theta$	0°	8°	0°	8°

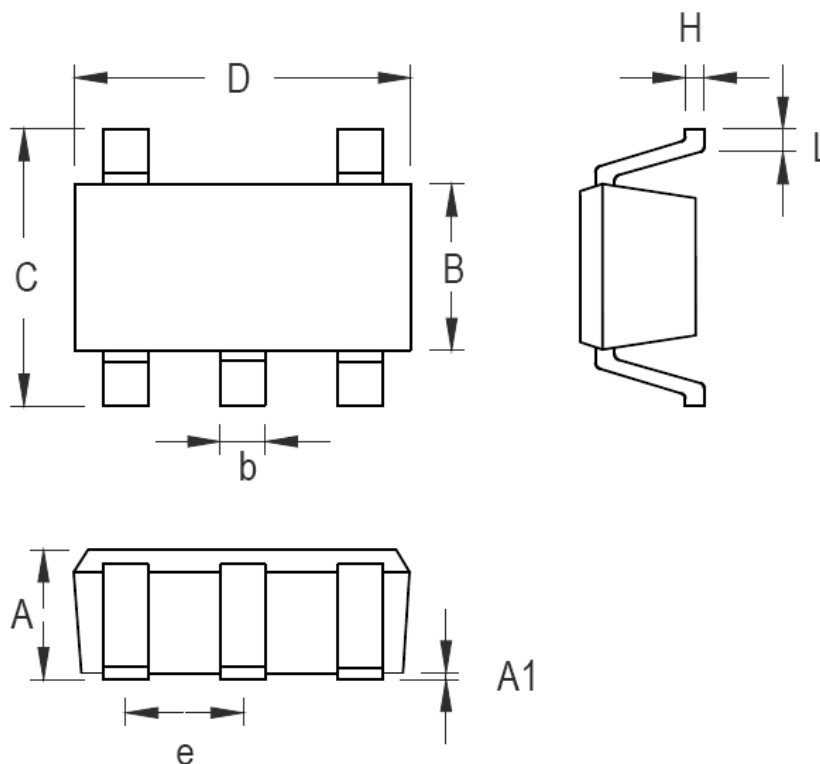
- SOT-23-5 PACKAGE OUTLINE DIMENSIONS



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
$\theta$	0°	8°	0°	8°

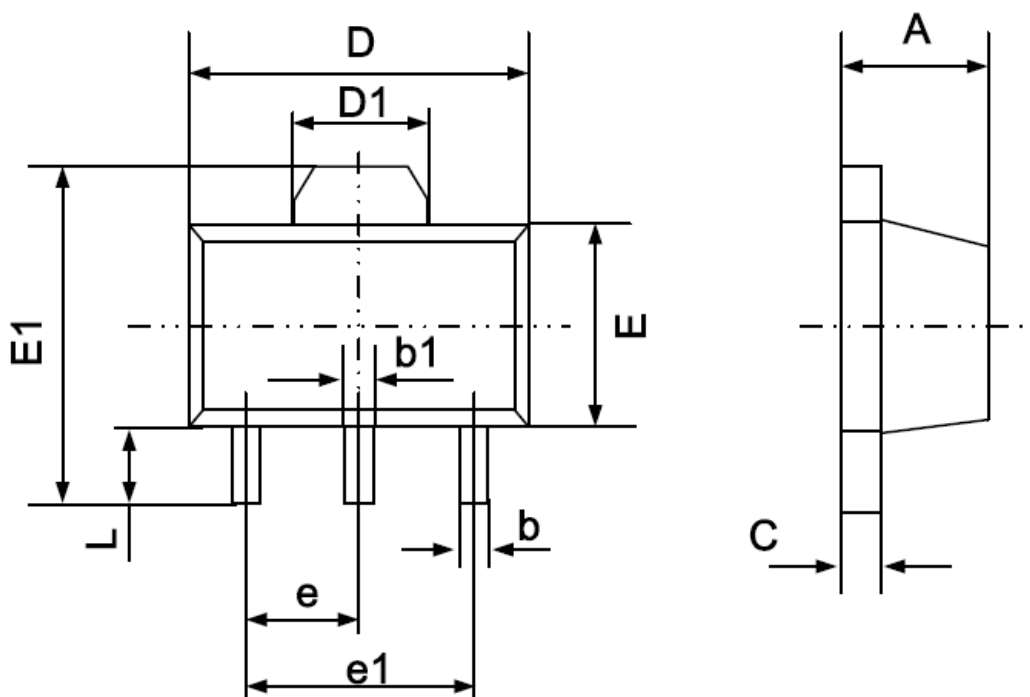


- SC-70-5 PACKAGE OUTLINE DIMENSIONS



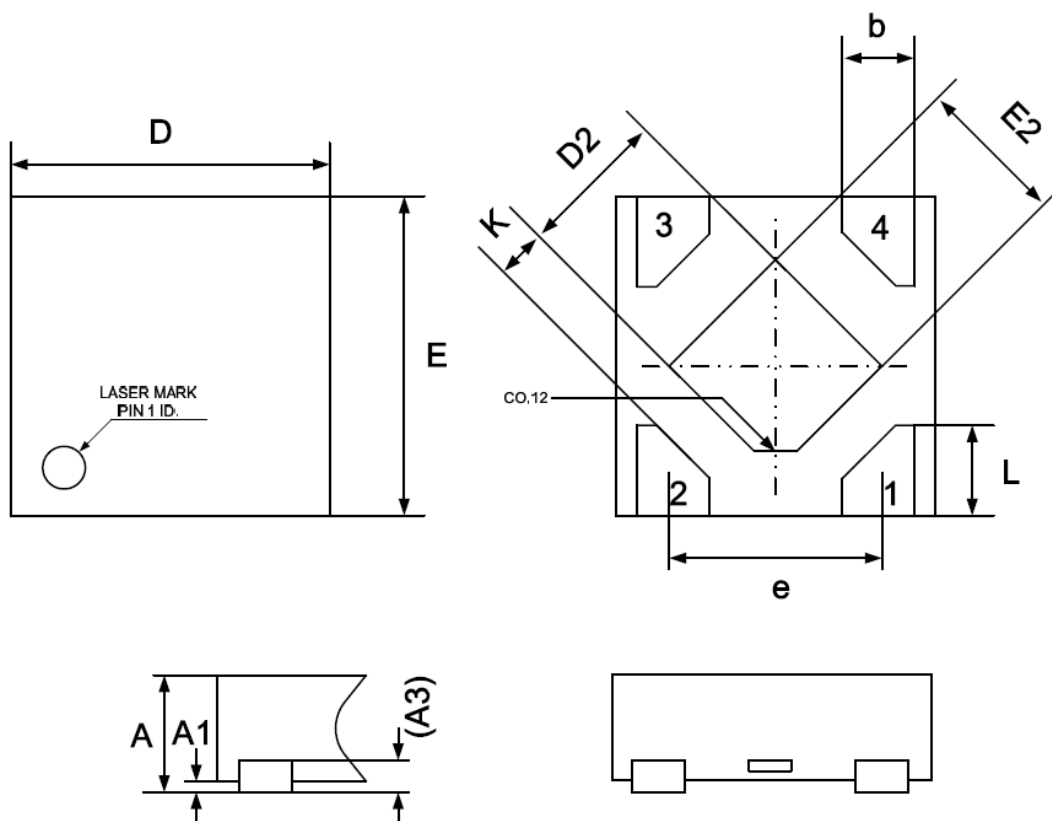
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.100	0.031	0.044
A1	0.000	0.100	0.000	0.004
B	1.150	1.350	0.045	0.054
b	0.150	0.400	0.006	0.016
C	1.800	2.450	0.071	0.096
D	1.800	2.250	0.071	0.089
e	0.650		0.026	
H	0.080	0.260	0.003	0.010
L	0.210	0.460	0.008	0.018

- SOT-89-3 PACKAGE OUTLINE DIMENSIONS



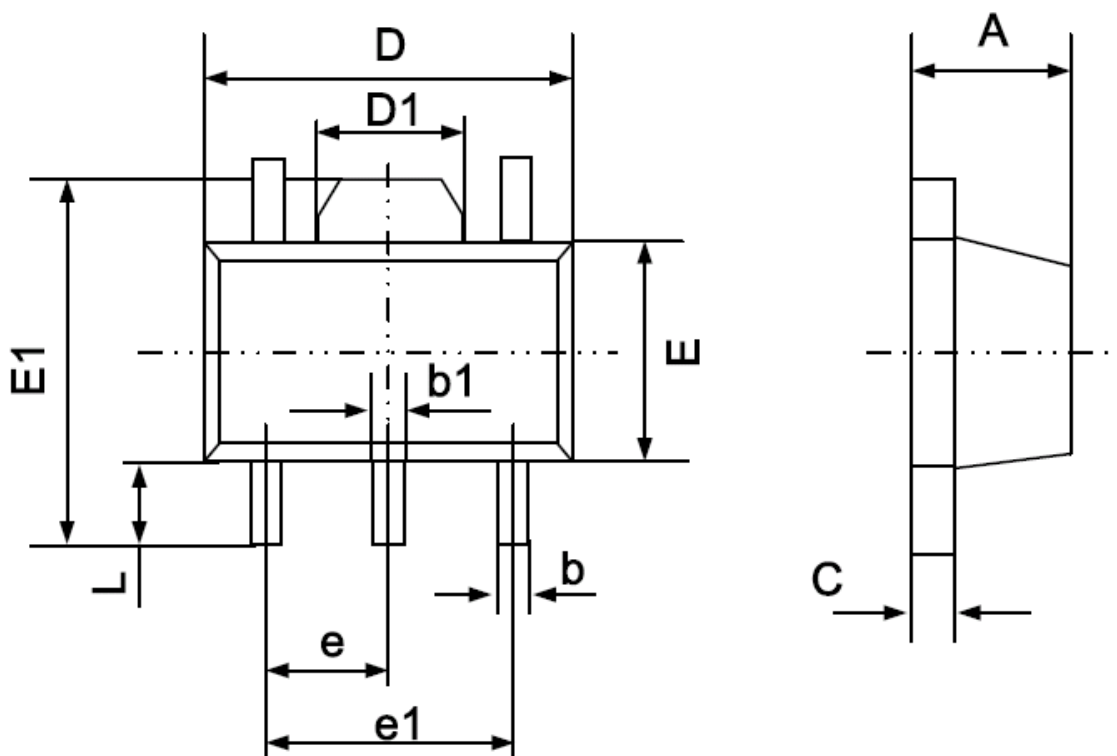
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF		0.061 REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP		0.060 TYP	
e1	3.000 TYP		0.118 TYP	
L	0.900	1.200	0.035	0.047

● DFN1X1-4 PACKAGE OUTLINE DIMENSIONS



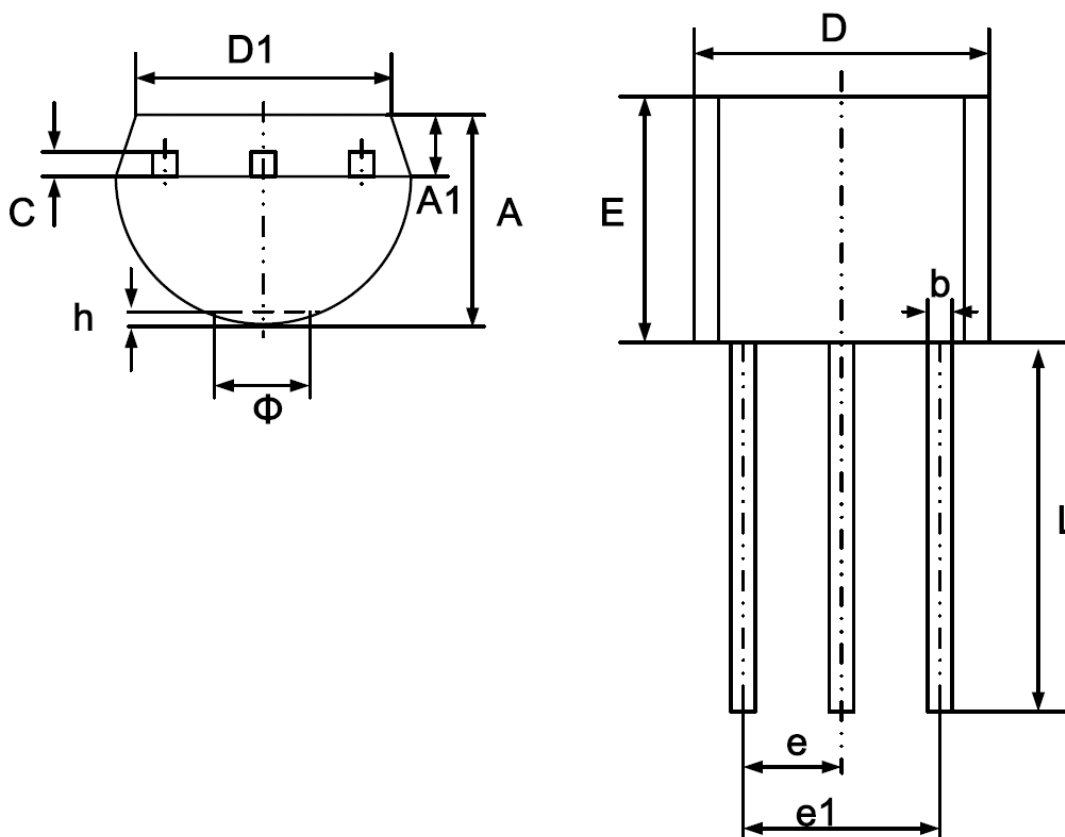
Symbol	Dimensions In Millimeters		
	Min.	Nom.	Max.
A	0.340	0.370	0.400
A1	0.000	0.020	0.050
A3	0.100REF		
b	0.170	0.220	0.270
D	0.950	1.000	1.050
E	0.950	1.000	1.050
D2	0.430	0.480	0.530
E2	0.430	0.480	0.530
L	0.200	0.250	0.300
e	-	0.650	-
K	0.150	-	-

- 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	1.500 TYP		0.060 TYP	
e1	2.900	3.100	0.114	0.122
L	0.900	1.100	0.035	0.043

- 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

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