

## Ultralow-Noise, High PSRR, Fast RF Low-Dropout CMOS Voltage Regulator

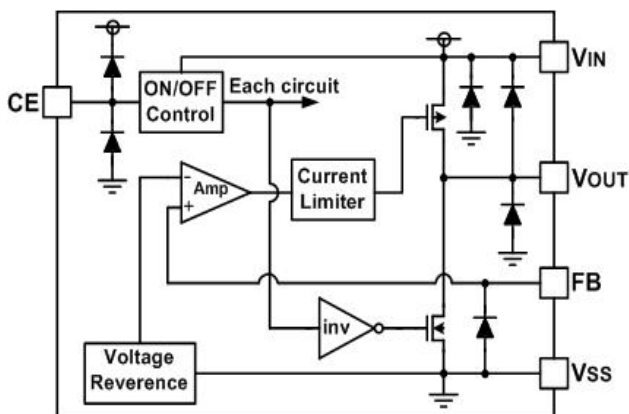
### ■ INTRODUCTION

The SML100 series are a group of positive voltage regulators manufactured by CMOS technologies with high ripple rejection, ultra low noise, low power consumption and low dropout voltage, which can prolong battery life in portable electronics. The SML100 series work with low-ESR ceramic capacitors, reducing the amount of board space necessary for power applications. The SML100 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

- RF: VCOs, Receivers, ADCs
- Cellular and Cordless Telephones
- Handheld Organizers

### ■ BLOCK DIAGRAM



### ■ FEATURES

- 500mA RF Low-Dropout Regulator With Enable
- Ultralow-Noise: 40 $\mu$ V<sub>RMS</sub> (10Hz ~ 100kHz)
- High PSRR: 70dB @ 1kHz
- Fast Start-Up Time (20 $\mu$ s)
- Excellent Load/Line Transient Response
- Low Dropout Voltage: 110mV @ 100mA
- Stable With a 1 $\mu$ F Ceramic Capacitor
- Available in Adjustable Voltage Version (0.6V to 5.5V)
- Built-in Current Limiter, Short-Circuit Protection

- Audio
- Bluetooth, Wireless LAN
- Tablet, MID

### ■ ORDER INFORMATION

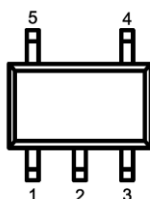
#### SML100①②

DESIGNATOR	SYMBOL	DESCRIPTION
①	B	High Active, pull-down resistor built in, with C <sub>OUT</sub> discharge resistor
	C	High Active, No pull-down resistor built in, with C <sub>OUT</sub> discharge resistor
②	U	Package: SC-70-5
	M	Package: SOT-23-5
	E	Package: SOT-23-6

## ■ PIN CONFIGURATION (Top View)

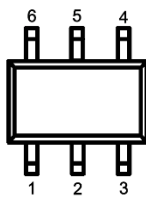
SOT-23-5/SC-70-5

Top view



SOT-23-6

Top view



SOT-23-5/SC-70-5

PIN NUMBER		PIN NAME	FUNCTION
M	U		
1	1	$V_{IN}$	Power input Pin
2	2	$V_{SS}$	Ground
3	3	CE	Chip Enable Pin
4	4	FB	Feedback Pin: Used to Set Output Voltage
5	5	$V_{OUT}$	Output Pin

SOT-23-6

PIN NUMBER		PIN NAME	FUNCTION
E	FC6		
1	6	$V_{IN}$	Power input Pin
2	3	$V_{SS}$	Ground
3	4	CE	Chip Enable Pin
5	2	FB	Feedback Pin: Used to Set Output Voltage
6	1	$V_{OUT}$	Output Pin
4	5	NC	Not Connection
-	7		Thermal Pad

## ■ 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		$I_{OUT}$	750	mA
Output Voltage		$V_{OUT}$	$V_{SS} - 0.3 \sim V_{IN} + 0.3$	V
Power Dissipation	SC-70-5	Pd	250	mW
	SOT-23-5		400	
	SOT-23-6			
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

## ■ TYPICAL APPLICATION

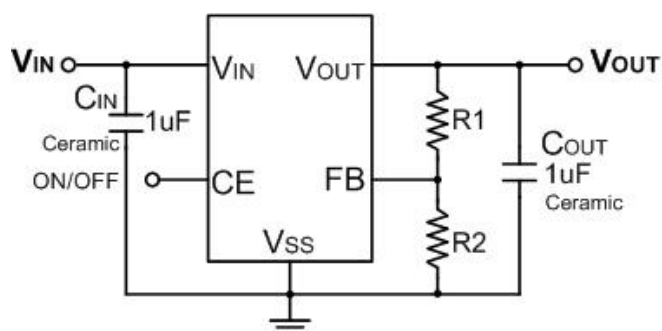


Fig.1 Typical Application Circuit

## ■ ELECTRICAL CHARACTERISTICS

SML100 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
Input Voltage	$V_{IN}$	—	1.8 <sup>(1)</sup>		7.0	V
Output Current	$I_{OUT}$	$V_{OUT} \geq 1.8V$	500			mA
Supply Current	$I_{SS}$	$I_{OUT} = 0mA$		45	80	$\mu A$
Standby Current	$I_{STBY}$	$V_{CE} = 0V$		0.01	1	$\mu A$
CE "High" Voltage	$V_{CEH}$		1.2		$V_{IN}$	V
CE "Low" Voltage	$V_{CEL}$				0.3	V
CE pin current		$V_{CE} = 0V$	-1		1	V
FB Voltage	$V_{FB}$	$I_{OUT} = 1mA$	0.588	0.600	0.612	V
FB pin current		$V_{FB} = 1.8V$			1	$\mu A$
Output voltage range			0.6		$5.5 - V_{DO}$	V
Line Regulation	$\frac{\Delta V_{OUT}}{V_{OUT} \times \Delta V_{IN}}$	$I_{OUT} = 10mA$ $V_{OUT} + 1V \leq V_{IN} \leq 7V$		0.01	0.2	%/V
Load Regulation	$\Delta V_{OUT}$	$V_{IN} = V_{OUT} + 1V$ , $1mA \leq I_{OUT} \leq 100mA$		1		mV
Dropout Voltage <sup>(2)</sup>	$V_{dif}$	$I_{OUT} = 100mA$ $V_{OUT} \geq 3.0V$		110		mV
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta T \times V_{OUT}}$	$I_{OUT} = 10mA$ $-40 \leq T \leq +85$		50		ppm
Current Limit	$I_{LIM}$		600	750		mA
Short Current	$I_{SHORT}$	$V_{OUT} = V_{SS}$		20		mA
Power Supply Ripple Rejection	$V_{OUT} = 1.2V$	PSRR	$f = 100Hz, I_{OUT} = 50mA$	80		dB
			$f = 1kHz, I_{OUT} = 50mA$	70		
			$f = 10kHz, I_{OUT} = 50mA$	50		
Output noise voltage		$BW = 10Hz \text{ to } 100kHz$ , $I_{OUT} = 10mA$		40		$\mu V_{RMS}$
Time, start-up		$I_{OUT} = 0mA, C_{OUT} = 1\mu F$		20		$\mu S$

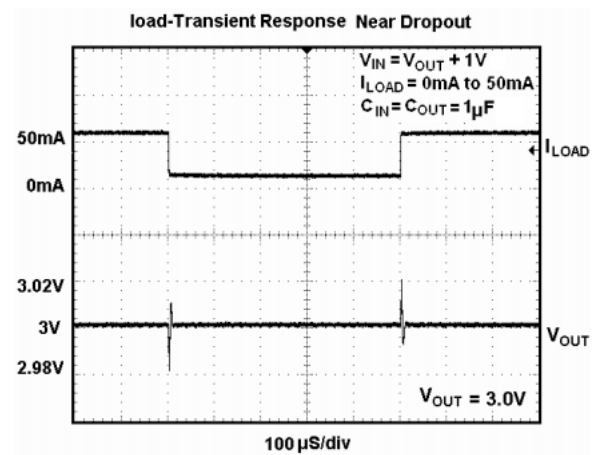
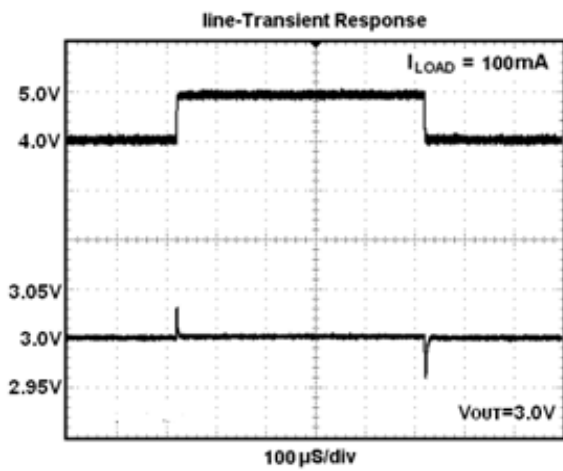
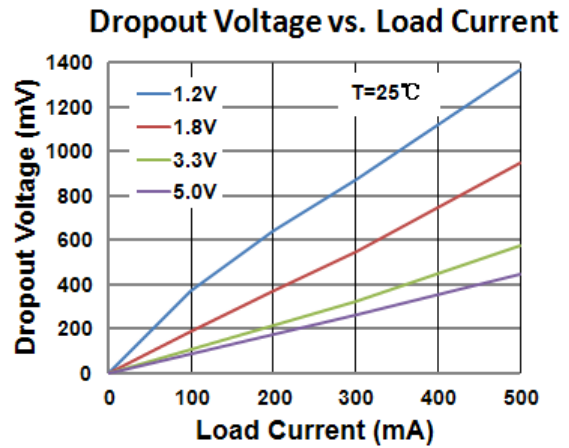
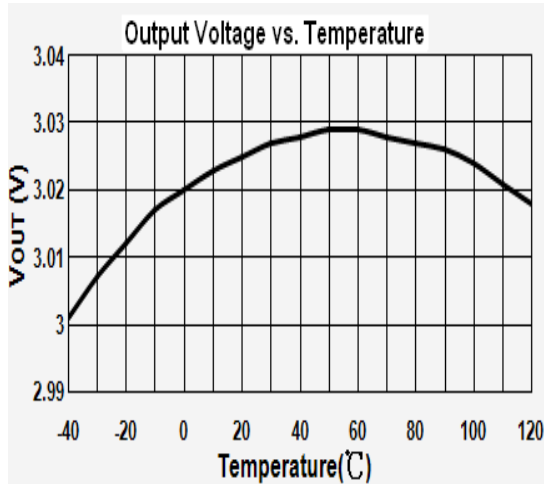
**NOTE:**

- (1) Minimum  $V_{IN}$  is 1.8V or  $V_{OUT} + V_{DO}$ , whichever is greater.
- (2)  $V_{dif}$ : The difference of output voltage and input voltage when input voltage is decreased gradually till output voltage equals to 98% of  $V_{OUT(E)}$ .

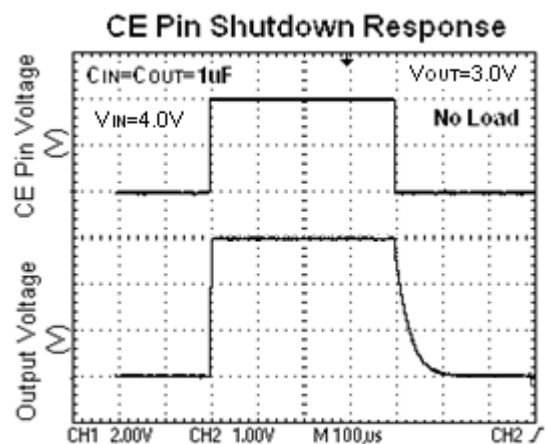
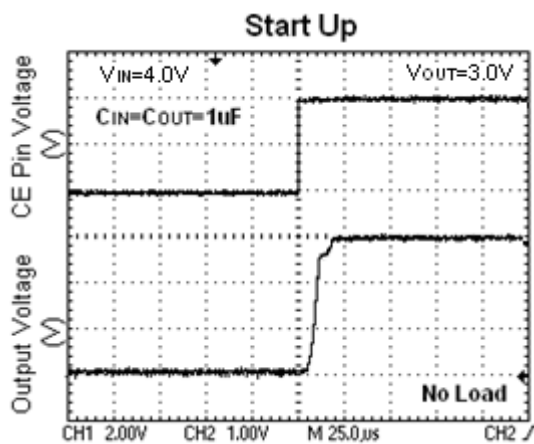
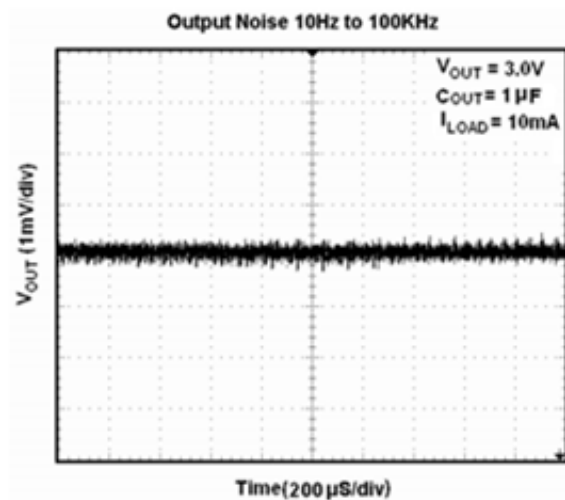
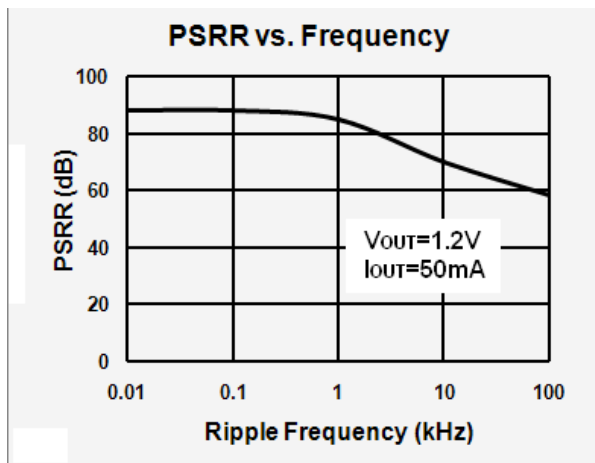
**■ DROPOUT VOLTAGE CHART**

Setting Output Voltage $V_{OUT}(V)$	Dropout Voltage (mV) Typ.			
	$I_{OUT}=100mA$	$I_{OUT}=200mA$	$I_{OUT}=300mA$	$I_{OUT}=500mA$
1.2	372mV	642mV	876mV	1.368V
1.5	248mV	471mV	681mV	1.128V
1.8	189mV	370mV	550mV	947mV
2.1	157mV	311mV	469mV	820mV
2.5	132mV	265mV	400mV	706mV
2.8	120mV	241mV	365mV	645mV
3.0	111mV	229mV	348mV	612mV
3.3	107mV	214mV	325mV	574mV
3.6	101mV	203mV	307mV	542mV
4.0	98mV	184mV	292mV	506Mv
4.5	93mV	183mV	275mV	474mV
5.0	88mV	173mV	261mV	446mV

■ TYPICAL PERFORMANCE CHARACTERISTICS



■ TYPICAL PERFORMANCE CHARACTERISTICS



■ APPLICATION INFORMATION

**Setting The Output Voltage**

Figure 1 shows the typical application circuit with SML100. The external resistor sets the output voltage according to the following equation:

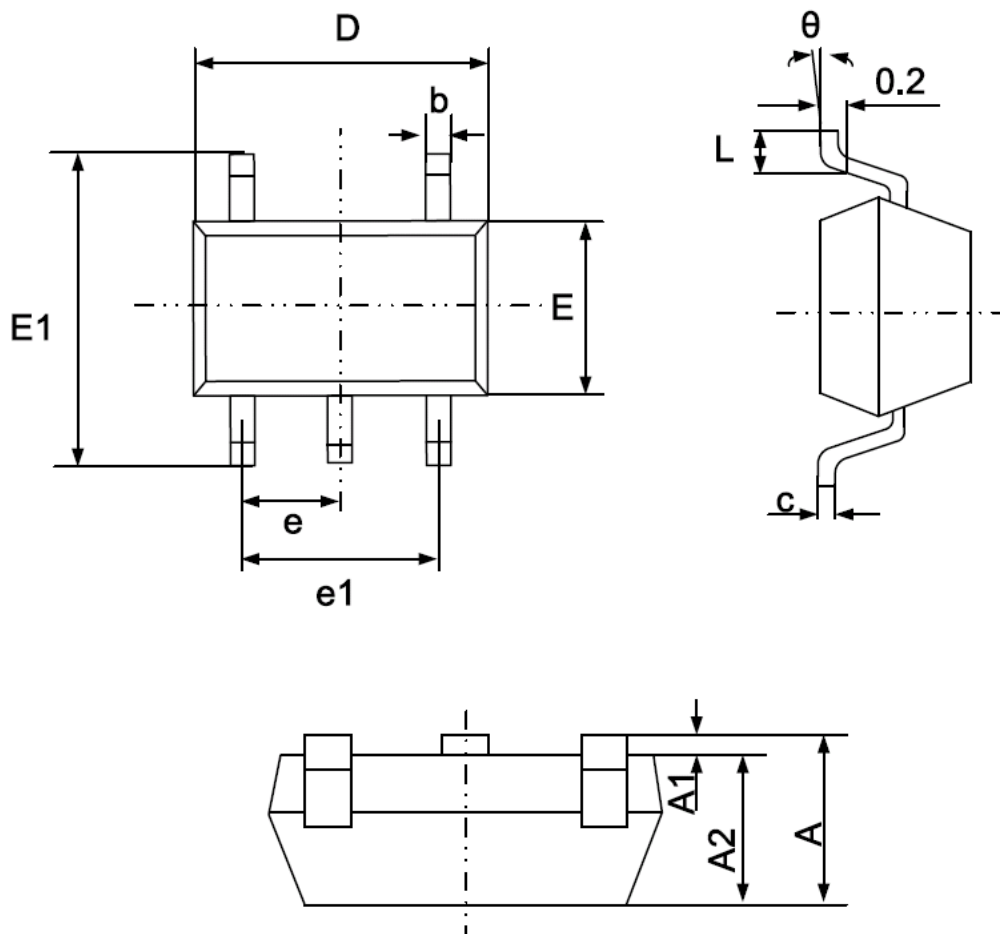
$$V_{OUT} = 0.6V \times \left(1 + \frac{R1}{R2}\right)$$

Table 1. Resistor select for output voltage setting

$V_{OUT}$	R1	R2
1.2V	30.1K	30.1K
1.5V	45.3K	30.1K
1.8V	60.4K	30.1K
2.5V	95.3K	30.1k
2.8V	110K	30.1k
3.0V	120K	30.1K
3.3V	137K	30.1K
5.0V	221K	30.1k

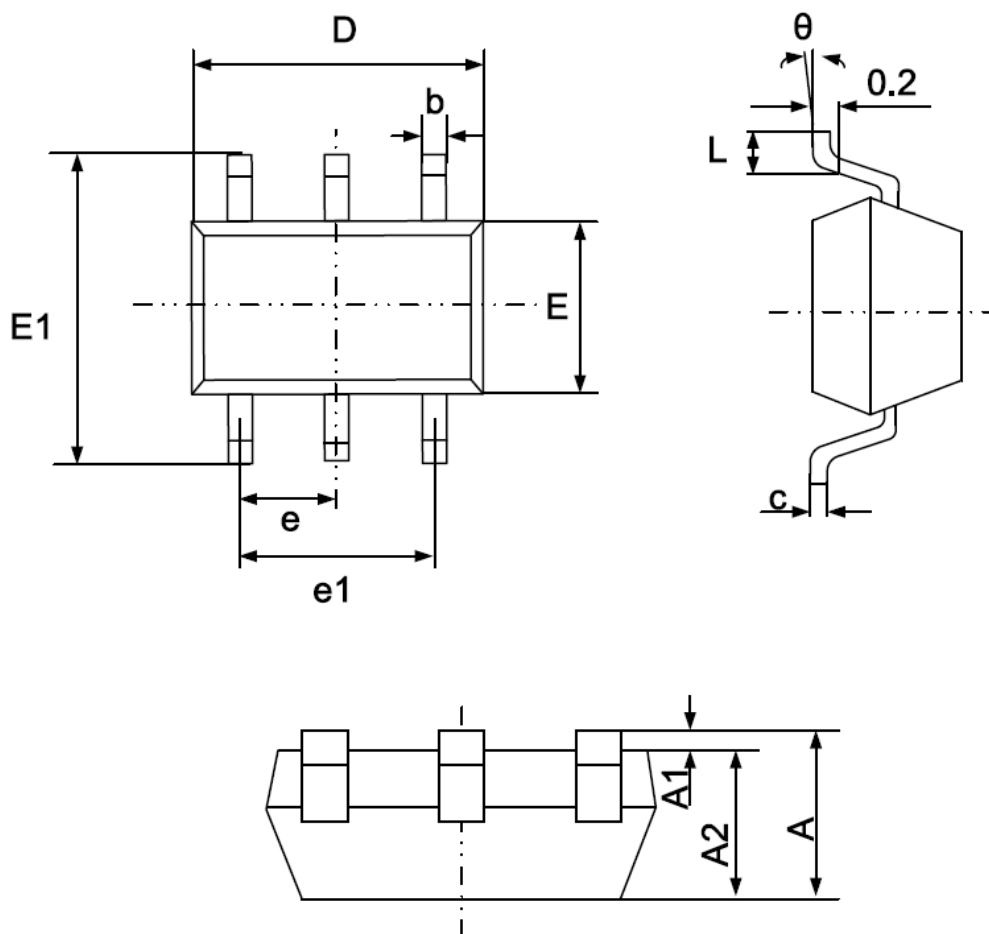
## ■ PACKAGING INFORMATION

### ● 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°

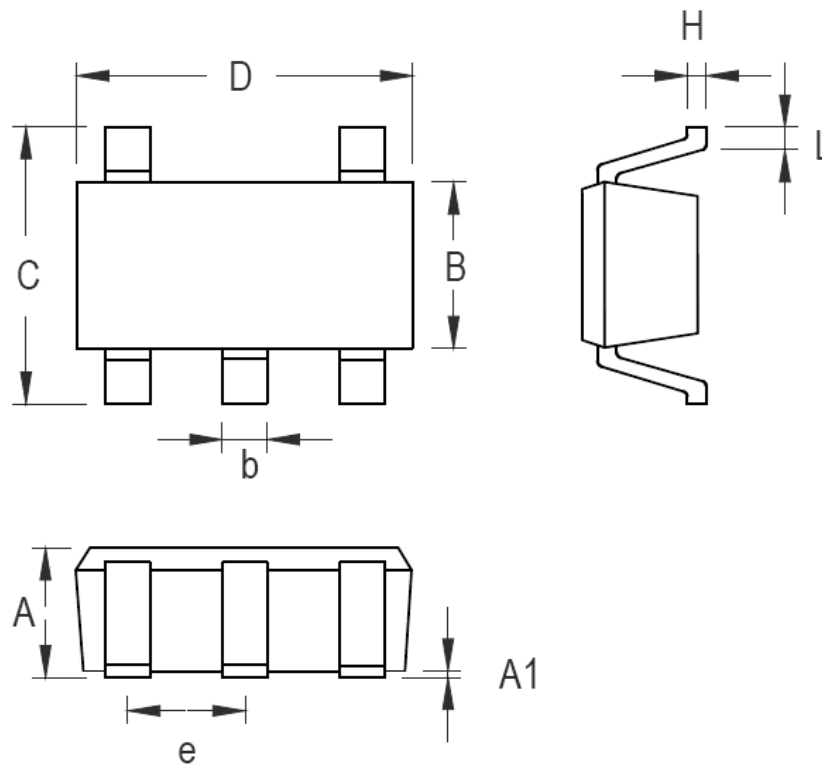
• SOT-23-6 PACKAGE OUTLINE DIMENSIONS



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		Dimension 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	1.100	1.400	0.044	0.055
b	0.150	0.300	0.006	0.012
C	1.950	2.200	0.077	0.087
D	1.800	2.150	0.071	0.085
e	0.650BSC		0.026BSC	
H	0.080	0.260	0.003	0.010
L	0.260	0.460	0.010	0.018

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