

Low Dropout Voltage

250mA CMOS LDO Regulator

CE6209 Series

■ INTRODUCTION

The CE6209 Series are a group of positive voltage regulators manufactured by CMOS technologies with high ripple rejection, extremely low power consumption (3.0 μ A Typ.) and low dropout voltage, which provide large output currents even when the difference of the input-output voltage is small. Thus the CE6209 series are very suitable for the battery-powered equipments, such as portable/palm computers, portable consumer equipments, industry equipments and so on, which want to prolong the using life of the battery.

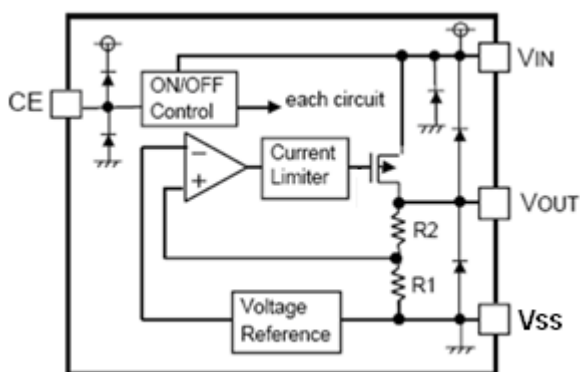
■ FEATURES

- Standby Current: <0.1 μ A
- Output Current: 250mA
- Output Voltage Range: 1.4V ~ 5.0V,(selectable in 0.1V steps)
- High Accuracy: $\pm 2\%$ (Typ.)
- Low Dropout Voltage: 160mV@100mA (3.0V Typ.)
- Excellent Line Regulation: 0.1%/V
- High Ripple Rejection: 60dB @1KHz
- Built-in Current Limiter
- Built-in Short Circuit Protection
- Static safety: 2KV@HBM
- TC: 100ppm/ $^{\circ}$ C
- Ceramic Capacitor Compatible

■ APPLICATIONS

- Battery powered systems
- Portable instrumentations
- Radio control systems
- Portable consumer equipments
- Portable/Palm computers
- Reference Voltage Sources

■ BLOCK DIAGRAM

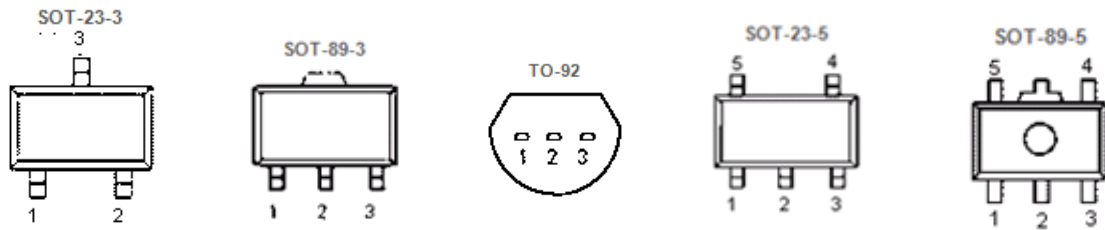


■ ORDER INFORMATION

CE6209①②③④

DESIGNATOR	SYMBOL	DESCRIPTION
①	A	Standard
	B	With Shutdown Function
②③	Integer	Output Voltage (0.9~5V) e.g:3.0V=②:3, ③:0
④	M	Package:SOT-23-3/5
	P	Package:SOT-89-3/5
	T	Package:TO-92

■ **PIN CONFIGURATION**(Pin output sequence can be ordered by customer)



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

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

SOT-89-5

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

■ **ABSOLUTE MAXIMUM RATINGS**

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	250	mW
	SOT-89	P_d	500	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°C , 10s	

■ ELECTRICAL CHARACTERISTICS

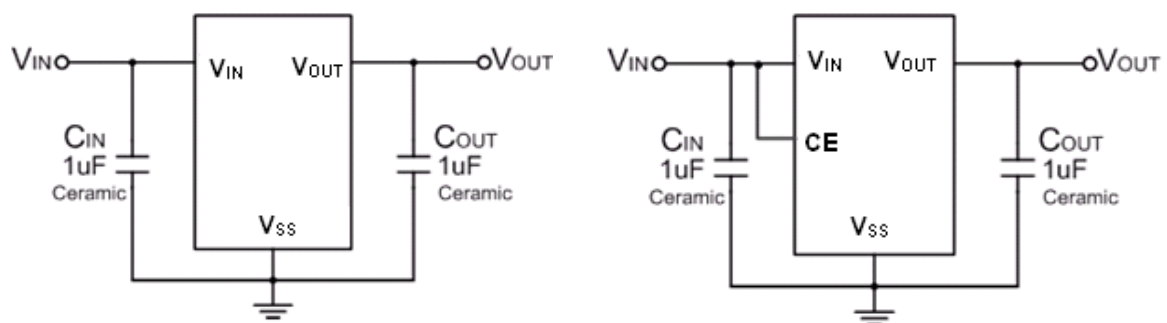
CE6209 Series ($V_{IN}=V_{OUT}+1V$, $C_{IN}=C_{OUT}=1\mu F$, $T_a=25^\circ C$, unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	$V_{OUT(E)}$ (Note 2)	$I_{OUT}=40mA$ $V_{IN}=V_{OUT}+1V$	V_{OUT} *0.98	V_{OUT} (Note 1)	V_{OUT} *1.02	V
Supply Current	I_{SS}	$V_{CE}=V_{IN}=V_{OUT}+1V$		3		μA
Shutdown Current	I_{SHDN}	$V_{CE}=V_{SS}$		0.1	1.0	μA
Output Current	I_{OUT}	$V_{IN}\geq 2.4V$, $V_{IN}=V_{OUT}+1V$	250			mA
Dropout Voltage (Note 3)	V_{dif1}	$I_{OUT}=40mA$		80		mV
	V_{dif2}	$I_{OUT}=100mA$		160		mV
Load Regulation	ΔV_{OUT}	$V_{IN}=V_{OUT}+1V$, $1mA\leq I_{OUT}\leq 100mA$		15	40	mV
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} * V_{OUT}}$	$I_{OUT}=40mA$ $V_{OUT}+1V\leq V_{IN}\leq 6V$		0.1	0.2	%/V
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta T * V_{OUT}}$	$I_{OUT}=40mA$ $-40\leq T\leq +85$		100		ppm/ $^\circ C$
Short Current	I_{Short}	$V_{OUT}=V_{SS}$		50		mA
Input Voltage	V_{IN}	—	2.4		6.0	V
CE "High" Voltage	V_{CE} "H"	—	1.5		V_{IN}	V
CE "Low" Voltage	V_{CE} "L"				0.3	V

NOTE:

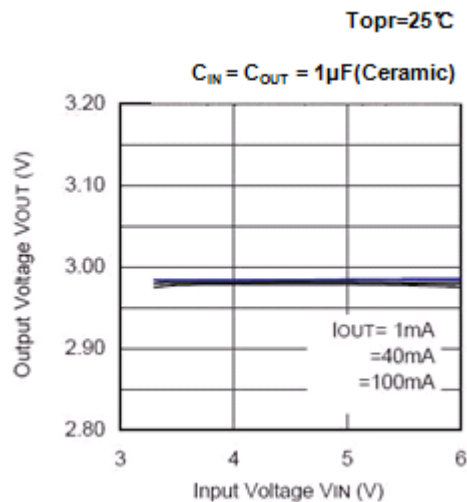
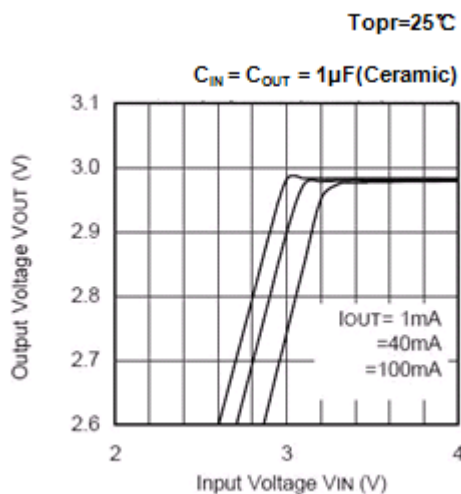
1. V_{OUT} : Specified Output Voltage.
2. $V_{OUT(E)}$: Effective Output Voltage (I.e. The Output Voltage When $V_{IN} = (V_{OUT} + 1.0V)$ And Maintain A Certain I_{OUT} Value).
3. V_{dif} : The Difference Of Output Voltage And Input Voltage When Input Voltage Is Decreased Gradually Till Output Voltage Equals 98% Of $V_{OUT(E)}$; When $V_{OUT}<2.4V$, $V_{IN}\geq 2.4V$ Should be Guaranteed.

■ TYPICAL APPLICATION CIRCUIT

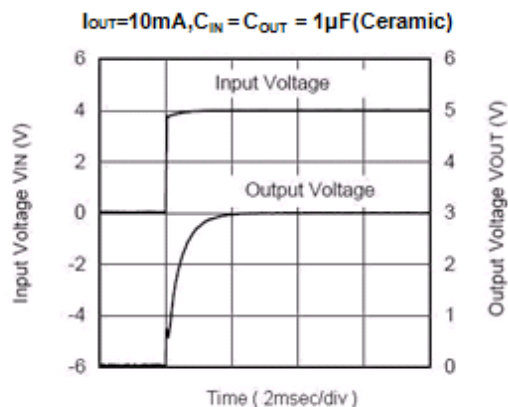
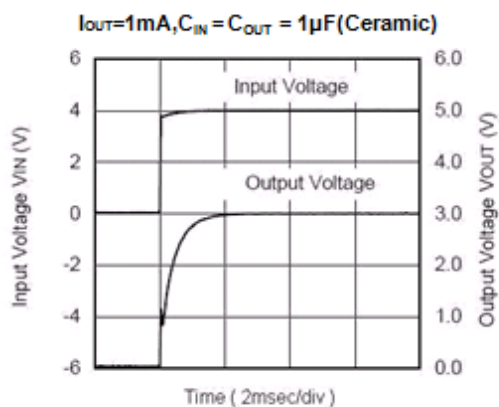


■ TYPICAL PERFORMANCE CHARACTERISTICS (CE6209A30P, for instance)

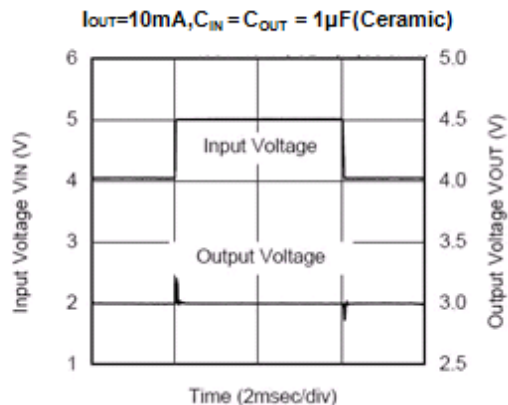
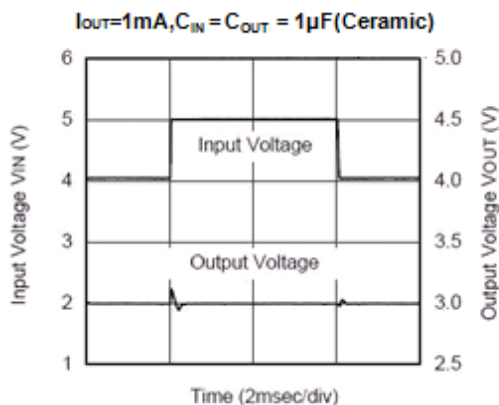
(1) Output Voltage vs. Input Voltage



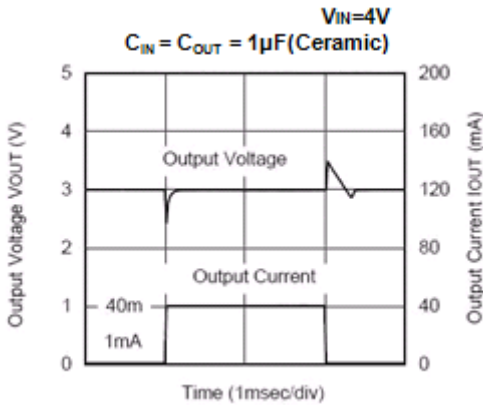
(2) Input Transient Response 1



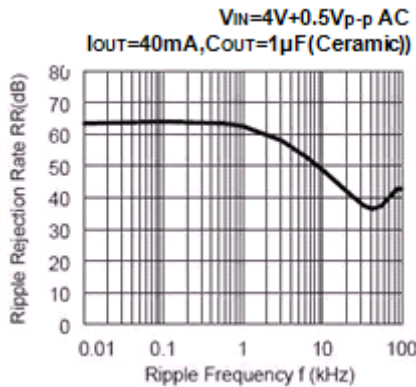
(3) Input Transient Response 2



(4) Load Transient Response

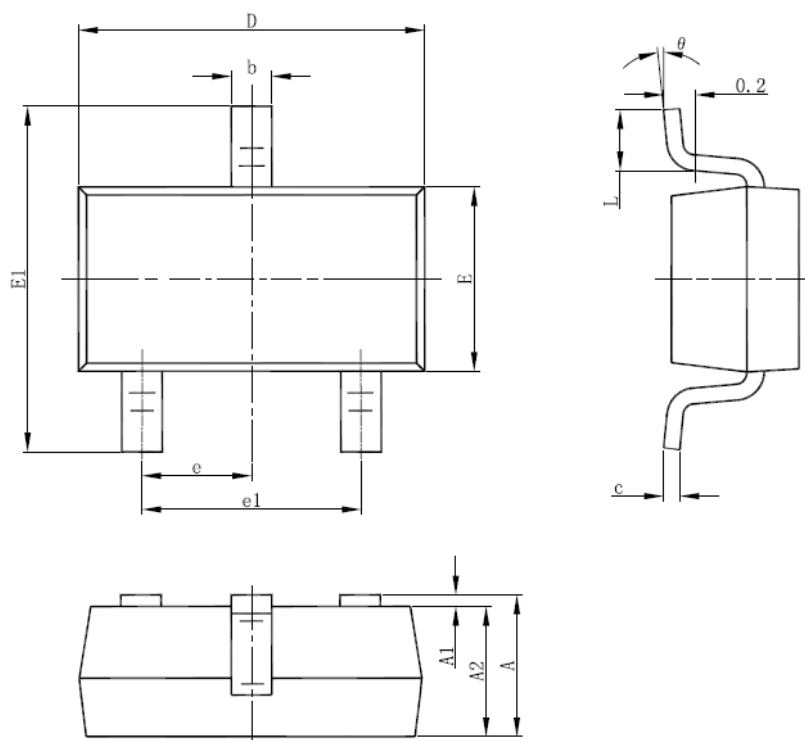


(5) Ripple Rejection Rate



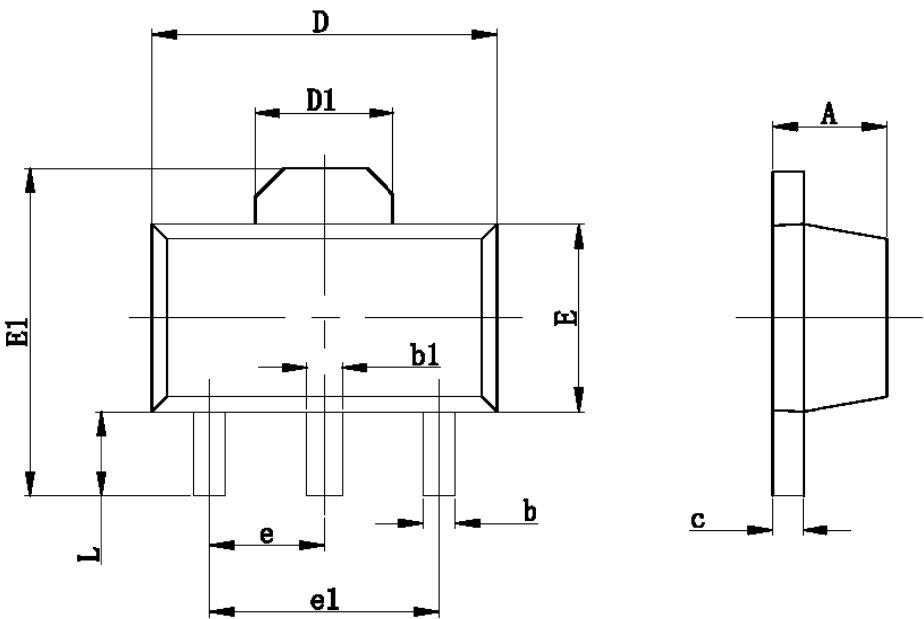
■ PACKAGING INFORMATION

● SOT-23-3 PACKAGE OUTLINE DIMENSIONS



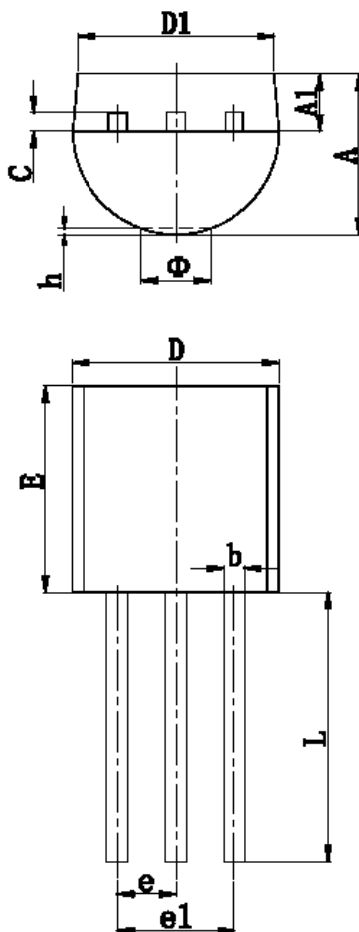
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)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

● SOT-89-3 PACKAGE OUTLINE DIMENSIONS



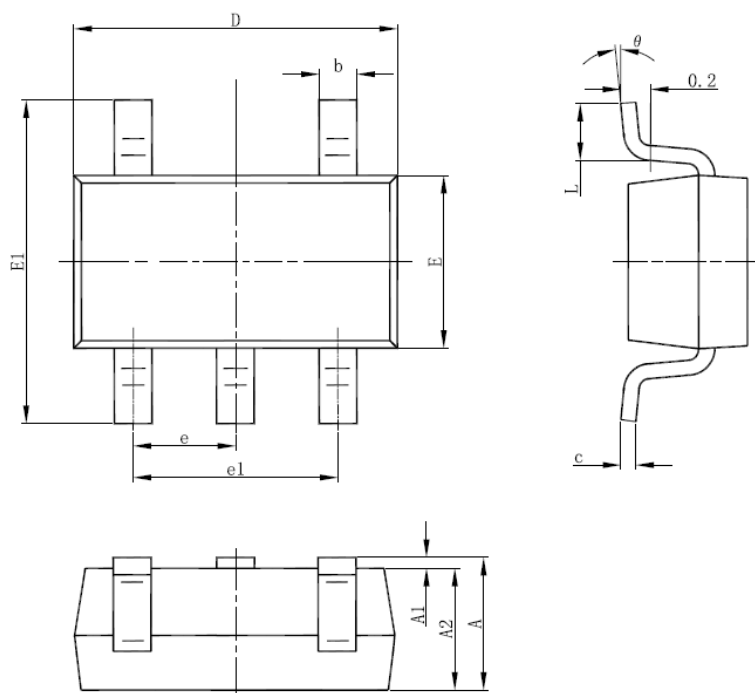
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.197
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF		0.061 REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP		0.060TYP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

● TO-92 PACKAGE OUTLINE DIMENSIONS



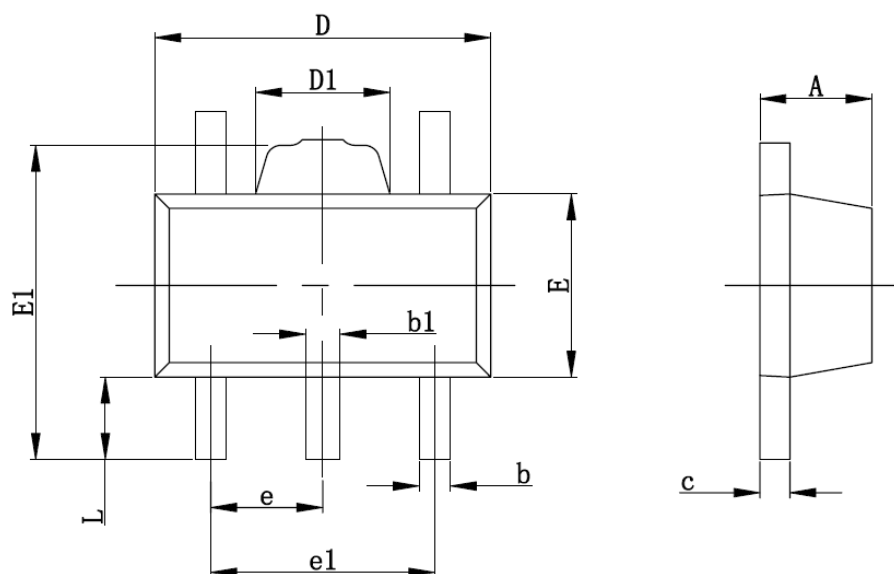
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.300	3.700	0.130	0.146
A1	1.100	1.400	0.043	0.055
b	0.380	0.550	0.015	0.022
c	0.360	0.510	0.014	0.020
D	4.400	4.700	0.173	0.185
D1	3.430		0.135	
E	4.300	4.700	0.169	0.185
e	1.270 TYP		0.050 TYP	
e1	2.440	2.640	0.096	0.104
L	14.100	14.500	0.555	0.571
Φ		1.600		0.063
h	0.000	0.380	0.000	0.015

● 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°

- 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

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