Ultra-Fast High PSRR 1A CMOS Voltage Regulator

INTRODUCTION

The FC6210 Series are a group of positive voltage regulators manufactured by CMOS technology with high ripple rejection, ultra-fast transient response and low dropout voltage, which provide large output currents even when the difference of the input-output voltage is small. Each of the FC6210 series consists of a high-precision voltage reference, an error correction circuit, and a current limited output driver. Thus the series are very suitable for the battery-powered equipments, wireless communication applications, industry equipments and so on.

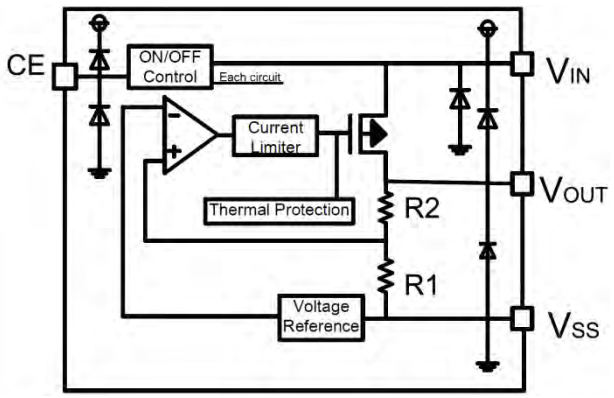
FEATURES

- Guaranteed Output Current :1.0A (Typ.)
- Low Quiescent Current : 80μA (Typ.)
- Output Voltage Range : 1.0V~5.0V
- Input Voltage Range : 2.0V~6.0V
- High Accuracy : ±2% (Typ.)
- Dropout Voltage :
  500mV@1.0A (3.0V Typ.)
- Excellent Line Regulation : 0.02%/V
- High PSRR : 70dB@1KHz
- Built-in Current Limiter & Thermal Protection
- Short Circuit Current Fold-back
- Output Capacitor : Ceramic Compatible

APPLICATIONS

- Battery powered systems
- Portable instrumentations
- PC peripherals
- CD/DVD-ROM, CD/RW
- Wireless devices
- Battery charger

BLOCK DIAGRAM

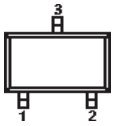


ORDER INFORMATION

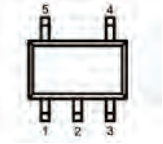
FC6210①②③④

DESIGNATOR	SYMBOL	DESCRIPITION
①	A	Without Shutdown Function
	B	With Shutdown Function
②③	Integer	Output Voltage(1.0~5.0V) e.g:3.0V=②:3, ③:0
④	G/GW/GL	Package:SOT-223
	P/PW/PL	Package:SOT-89
	M	Package:SOT-23-3/5

■ PIN CONFIGURATION



SOT-23-3



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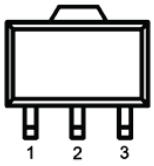

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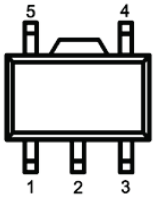

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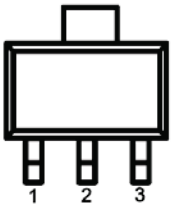


SOT-223

FC6210AXX (SOT-223,SOT-89-3)

PIN NUMBER						PIN NAME	FUNCTION
SOT-223			SOT-89-3				
G	GW	GL	P	PW	PL		
1	1	2	1	1	2	V_{SS}	Ground
2	3	1	2	3	1	V_{IN}	Power input
3	2	3	3	2	3	V_{OUT}	Output

FC6210AXXM (SOT-23-3)

PIN NUMBER	PIN NAME	FUNCTION
1	V_{SS}	Ground
2	V_{OUT}	Output
3	V_{IN}	Power input

FC6210BXXM (SOT-23-5) / FC6210BXXP (SOT-89-5)

PIN NUMBER			PIN NAME	FUNCTION
SOT-23-5	SOT-89-5			
M	P	PL		
3	4	1	CE	Chip Enable
2	2	2	V_{SS}	Ground
4	3	3	NC	No Connection
1	5	4	V_{IN}	Power input
5	1	5	V_{OUT}	Output Pin

■ ELECTRICAL CHARACTERISTICS

FC6210 Series (V_{IN}=V_{OUT}+1V, C_{IN}=C_{OUT}=4.7μF, Ta=25℃, unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Output Voltage	V_{OUT}(E) (Note 2)	I_{OUT}=100mA		V_{OUT} *0.98	V_{OUT} (Note 1)	V_{OUT} *1.02	V
Supply Current	I_{SS}				80	120	μA
Shutdown Current	I_{SHDN}	V_{CE}=V_{SS}			0.1	1.0	μA
Output Current	I_{OUT}	—		1000	1300		mA
Dropout Voltage (Note 3)	V_{dif1}	I_{OUT} =300mA	V_{OUT}=1.0V		580	1000	mV
	V_{dif2}		V_{OUT}=1.2V		380	800	mV
	V_{dif3}		V_{OUT}=1.5V		180	500	mV
	V_{dif4}		V_{OUT}=1.8V		130	260	mV
	V_{dif5}		V_{OUT}=2.5V		100	200	mV
	V_{dif6}		V_{OUT}=2.8V		90	180	mV
	V_{dif7}		V_{OUT}=3.0V		85	170	mV
	V_{dif8}		V_{OUT}=3.3V		80	160	mV
Load Regulation	ΔV_{OUT}	V_{IN}= V_{OUT} +1V, 1mA≤I_{OUT}≤1.0A			30		mV
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} * V_{OUT}}$	I_{OUT} =100mA V_{OUT} +1V≤V_{IN}≤6V			0.02	0.2	%/V
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta T * V_{OUT}}$	I_{OUT} =100mA -40℃≤T≤+85℃			50		ppm/℃
Short Current	I_{Short}	V_{OUT} =V_{SS}			200		mA
Input Voltage	V_{IN}	—		2.0		6.0	V
Power Supply Rejection Rate	1KHz	PSRR	I_{OUT}= 100mA		70		dB
	10KHz				50		
CE "High" Voltage	V_{CE}"H"			1.5		V_{IN}	V
CE "Low" Voltage	V_{CE}"L"					0.3	V
Thermal Shutdown Temperature	T_{SD}				150		℃
Thermal Shutdown Temperature Hysteresis	ΔT_{SD}				30		℃

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_{diff}: The Difference Of Output Voltage And Input Voltage When Input Voltage Is Decreased Gradually Till Output Voltage Equals To 98% Of V_{OUT} (E); When V_{OUT}<2.5V, V_{IN}≥2.5V Should be Guaranteed.

■ ABSOLUTE MAXIMUM RATINGS (Ta=25℃ unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNITS
Input Voltage		V_{IN}	V_{SS}-0.3~V_{SS}+7	V
Output Current		I_{OUT}	2000	mA
Output Voltage		V_{OUT}	V_{SS}-0.3~V_{IN}+0.3	V
Power Dissipation	SOT-23	Pd	See dissipation ratings table below	
	SOT-89	Pd	600	mW
	SOT-223	Pd	800	mW
Operating Temperature		T_{opr}	-40~+85	℃
Storage Temperature		T_{stg}	-40~+125	℃
Soldering Temperature & Time		T_{solder}	260℃, 10s	

■ POWER DISSIPATION RATING TABLE

PACKAGE(5)	$R_{\theta JA}$	$T_A \le 25°C$ POWER RATING	$T_A = +70°C$ POWER RATING	$T_A = +85°C$ POWER RATING
SOT-23-5 Low-K (1)	290°C/W	345mW	190 mW	138 mW
SOT-23-5 High-K(2)	210°C/W	476mW	262 mW	190 mW

(1) The JEDEC low-K (1s) board used to derive this data was a 3-inch × 3-inch, two-layer board with 2-ounce copper traces on top of the board.
(2) The JEDEC high-K (2s2p) board used to derive this data was a 3-inch × 3-inch, multilayer board with 1-ounce internal power and ground planes and 2-ounce copper traces on top and bottom of the board.

■ TYPICAL APPLICATION CIRCUITS

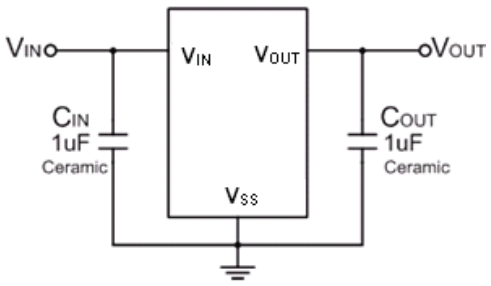


Figure1 FC6210A Typical Application Circuit

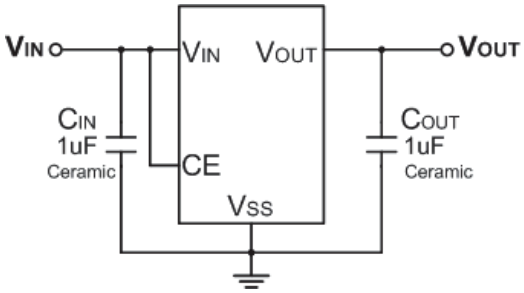


Figure2 FC6210B Typical Application Circuit

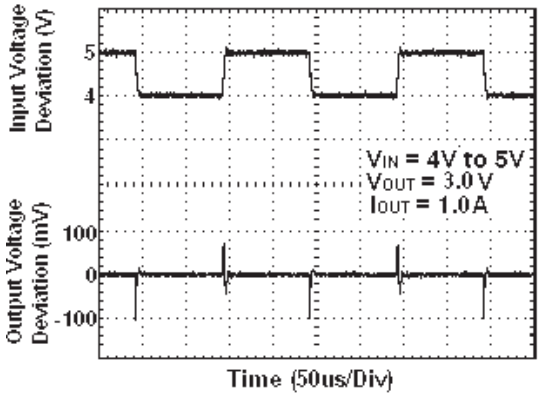
Input capacitor (C_{IN}): 1.0μF or more;

Output capacitor (C_{OUT}): 1.0μF or more;

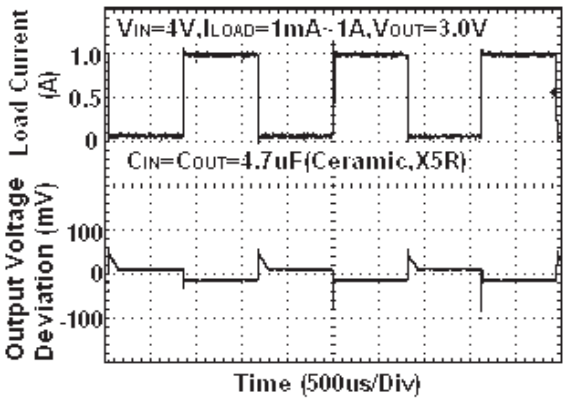
Caution: A general series regulator may oscillate, depending on the external components selected. Check that no oscillation occurs with the application using the above capacitor.

■ TYPICAL PERFORMANCE CHARACTERISTICS

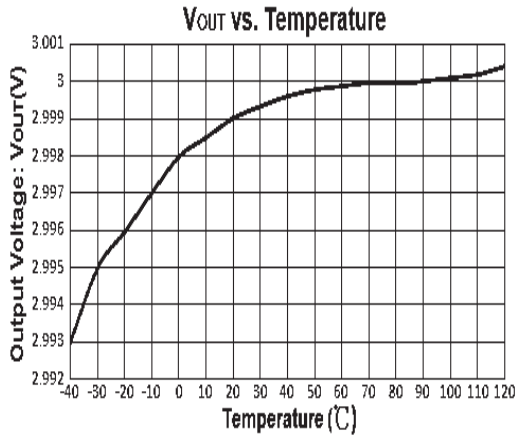
（1）Input Transient Response



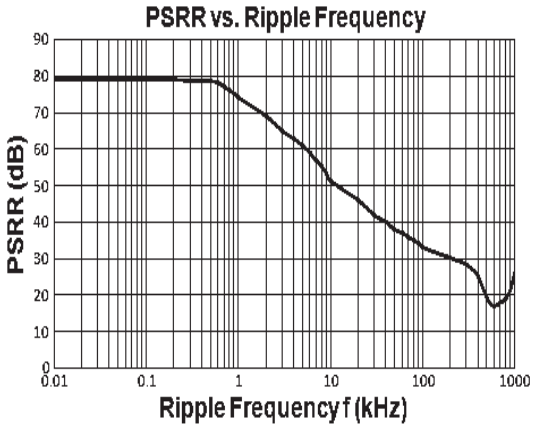
（2）Load Transient Response



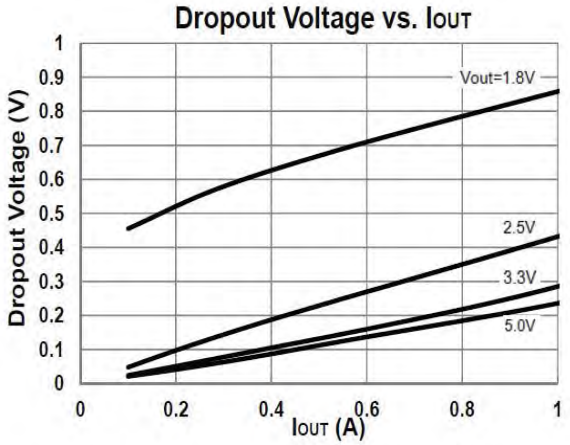
（3）Output Voltage vs. Temperature



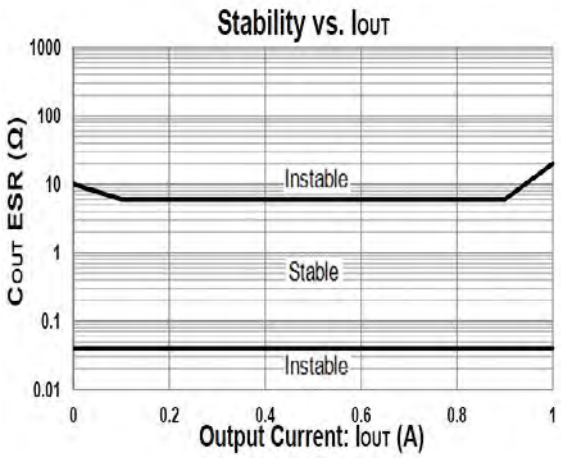
（4）Power Supply Rejection Ratio



（5）Dropout Voltage vs. Output Current

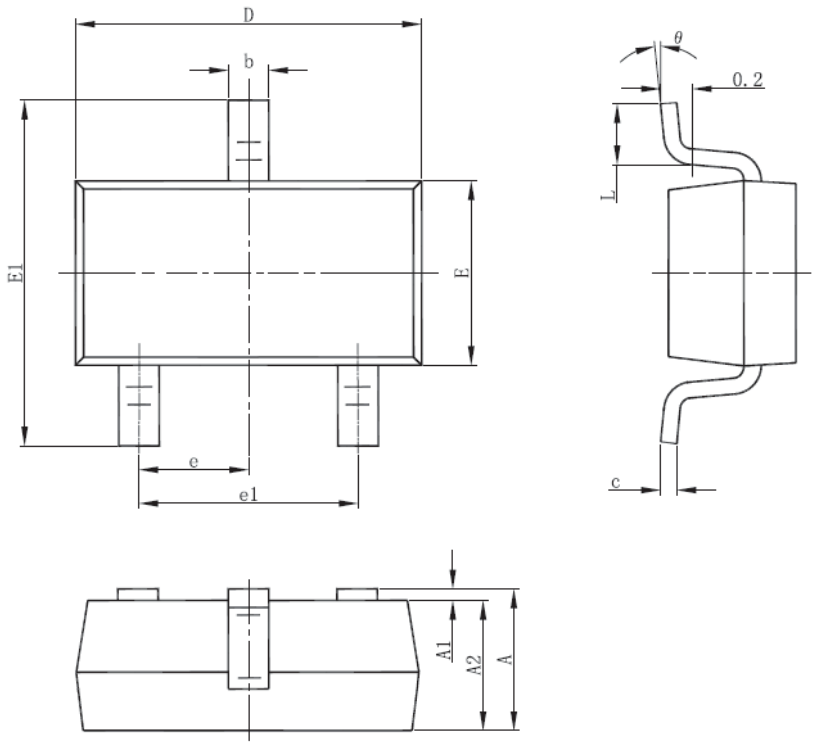


（6）Region of Stable C_{OUT} ESR vs. Load



■ PACKAGING INFORMATION

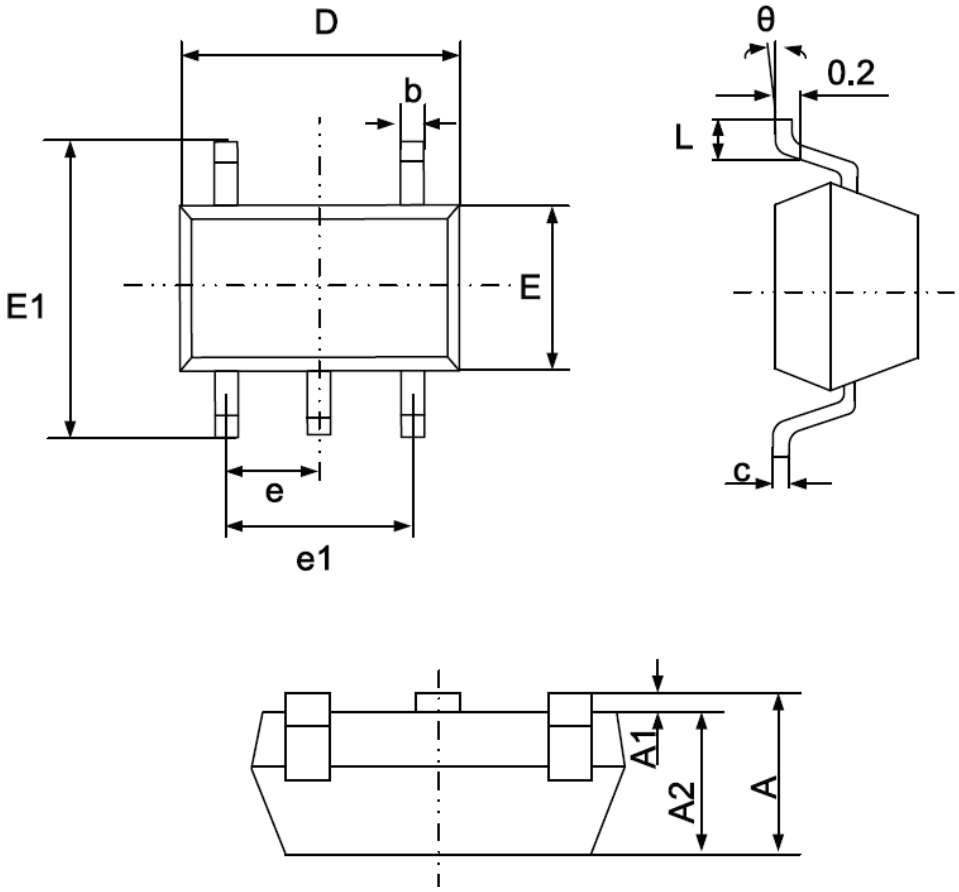
● SOT-23-3 PACKAGE OUTLINE DIMENSIONS



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°

■ PACKAGING INFORMATION

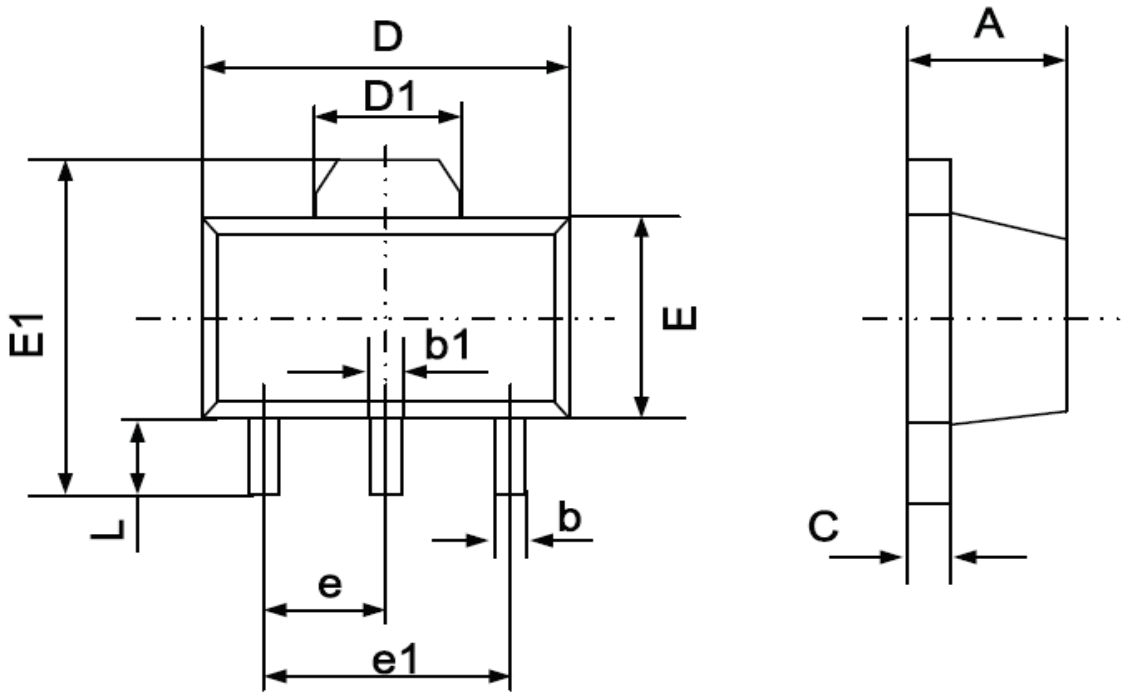
● SOT-23-5 PACKAGE OUTLINE DIMENSIONS



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
θ	0°	8°	0°	8°

■ PACKAGING INFORMATION

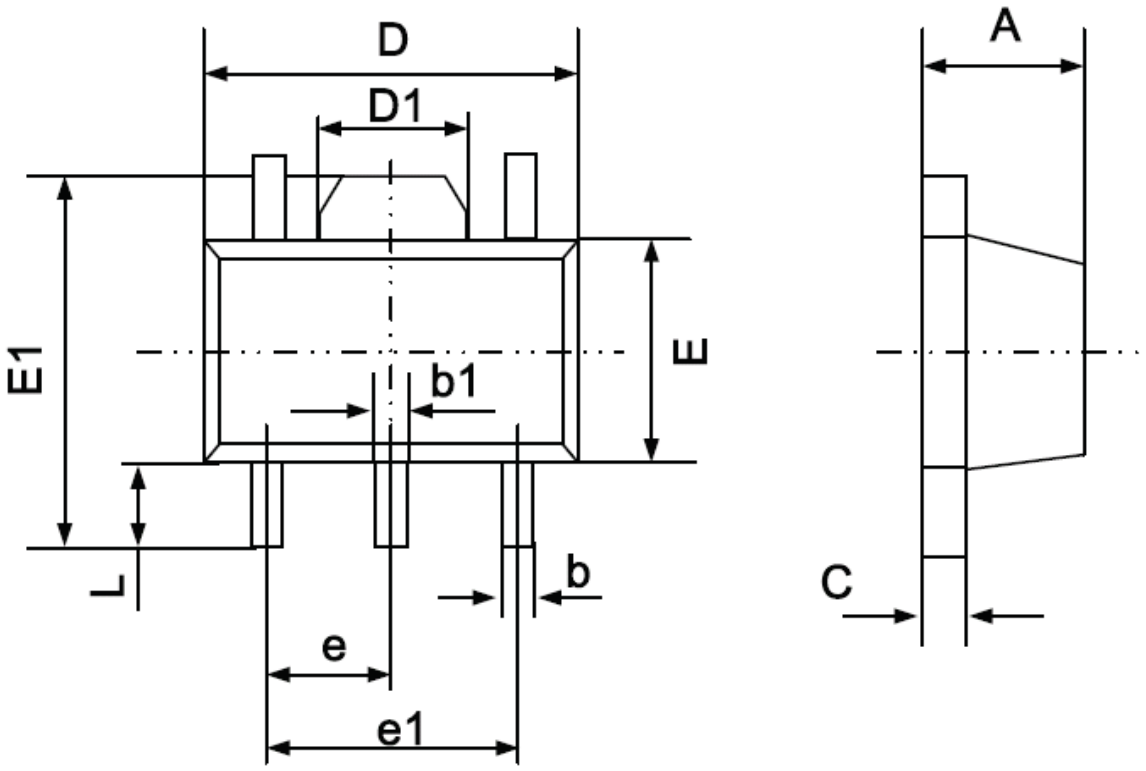
● SOT-89-3 PACKAGE OUTLINE DIMENSIONS



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

■ PACKAGING INFORMATION

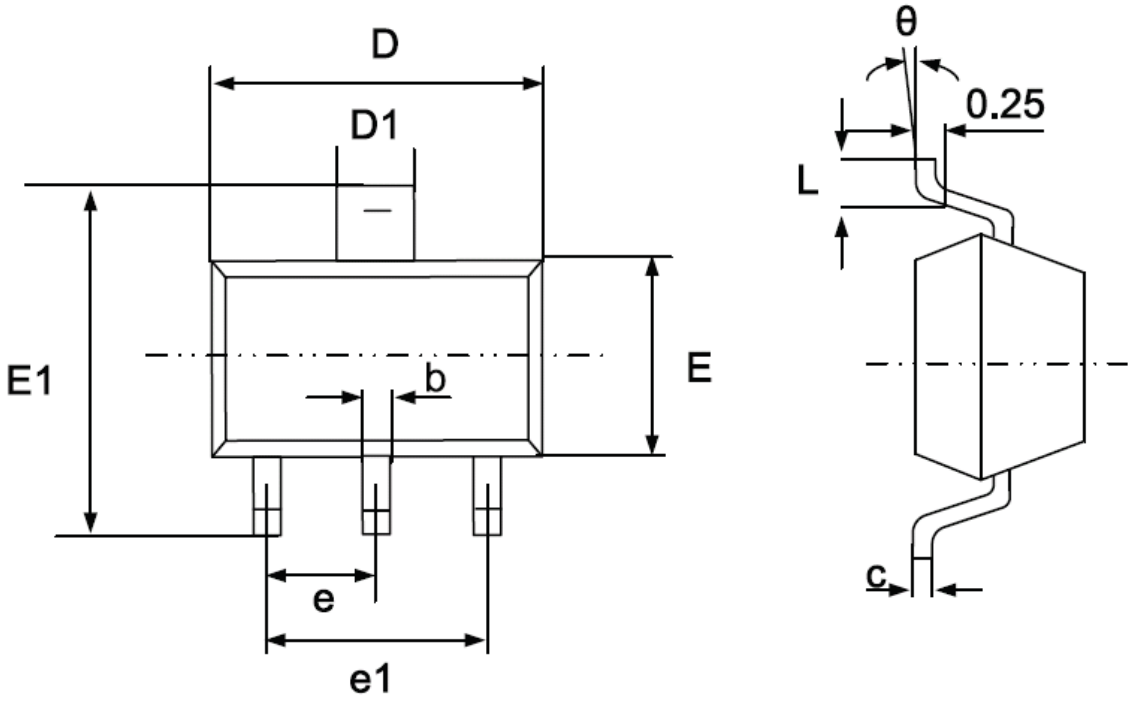
● SOT-89-5 PACKAGE OUTLINE DIMENSIONS

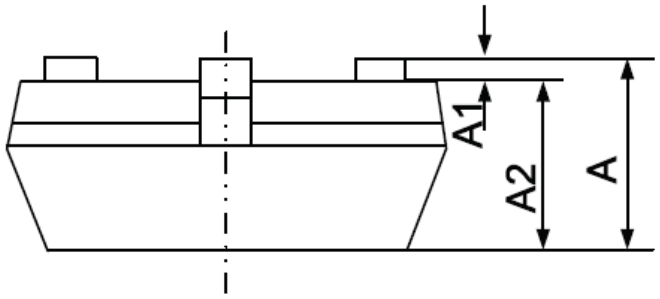


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.360	0.560	0.014	0.022
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.400	1.800	0.055	0.071
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP		0.060 TYP	
e1	2.900	3.100	0.114	0.122
L	0.900	1.100	0.035	0.043

■ PACKAGING INFORMATION

● SOT-223 PACKAGE OUTLINE DIMENSIONS





Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.520	1.800	0.060	0.071
A1	0.000	0.100	0.000	0.004
A2	1.500	1.700	0.059	0.067
b	0.660	0.820	0.026	0.032
c	0.250	0.350	0.010	0.014
D	6.200	6.400	0.244	0.252
D1	2.900	3.100	0.114	0.122
E	3.300	3.700	0.130	0.146
E1	6.830	7.070	0.269	0.278
e	2.300 (BSC)		0.091 (BSC)	
e1	4.500	4.700	0.177	0.185
L	0.900	1.150	0.035	0.045
θ	0°	10°	0°	10°