

# AT6230 Series

## Low Power, High Accuracy, High PSRR LDO Regulators

### Description

The AT6230 series are high accuracy, CMOS LDO Voltage Regulators, offering low power, high ripple rejection ratio and low dropout. AT6230 series is ideal for today's cutting edge mobile phone. Internally AT6230 includes a reference voltage source, error amplifiers, driver transistors, current limiters and phase compensators. AT6230's current limiters' foldback circuit also operates as a short protect for the output current limiter and the output pin. The AT6230 series is also fully compatible with low ESR ceramic capacitors, reducing cost and improving output stability. The high level of output stability is maintained even during frequent load fluctuations, due to excellent transient response performance and high PSRR achieved across a broad range of frequencies. The CE function allows the output of regulator to be turned off, resulting in greatly reduced power consumption.

### Feature

- ◆ Maximum Output Current: 400mA ( $V_{IN}=4.3V, V_{OUT}=3.3V$ )
- ◆ Dropout Voltage: 110mV@  $I_{OUT}=100mA$
- ◆ Operating Voltage Range: 1.8V~5.5V Output
- ◆ Voltage Range: 1.2V~4.5V
- ◆ Highly Accuracy:  $\pm 1\%$
- ◆ Low Power Consumption: 1.8uA (TYP.)
- ◆ Standby Current: 0uA (TYP.)
- ◆ High Ripple Rejection: 70dB@1KHz (AT6230C33)
- ◆ Line Regulation: 0.035%/V (TYP.)
- ◆ Built-in temperature protection and current limiting protection

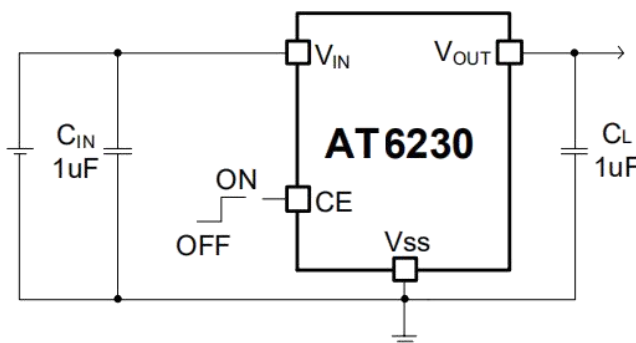
### Applications

- ◆ Mobile phones
- ◆ Cordless phones, radio communication equipment
- ◆ Portable games
- ◆ Cameras, Video cameras
- ◆ Reference voltage sources
- ◆ Battery powered equipment

### Package

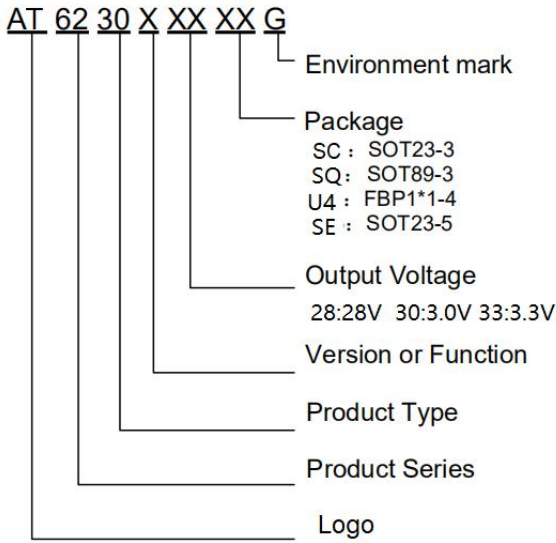
- ◆ 3pin SOT23-3、SOT89-3
- ◆ 4pin FBP1\*1-4
- ◆ 5pin SOT23-5

### Typical Application Circuit



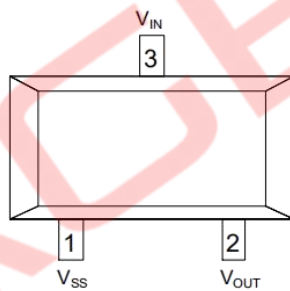
# AT6230 Series

## Selection Guide

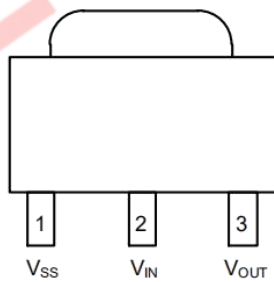


Product series	Product function
AT6230A33SCG	VOUT=3.3V; Package: SOT23-3
AT6230A33SQG	VOUT=3.3V; Package: SOT89-3
AT6230C28SEG	Enable can be set; VOUT=2.8V; Package: SOT23-5
AT6230C30SEG	Enable can be set; VOUT=3.0V; Package: SOT23-5
AT6230C33U4G	Enable can be set; VOUT=3.3V; Package: FBP1*1-4
AT6230C33SEG	Enable can be set; VOUT=3.3V; Package: SOT23-5

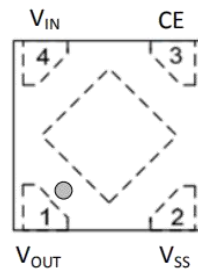
## Pin Configuration and Assignment



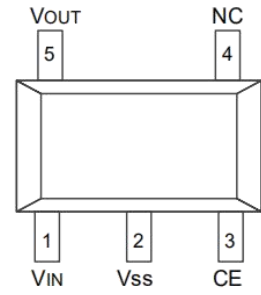
SOT23-3



SOT89-3



FBP1\*1-4

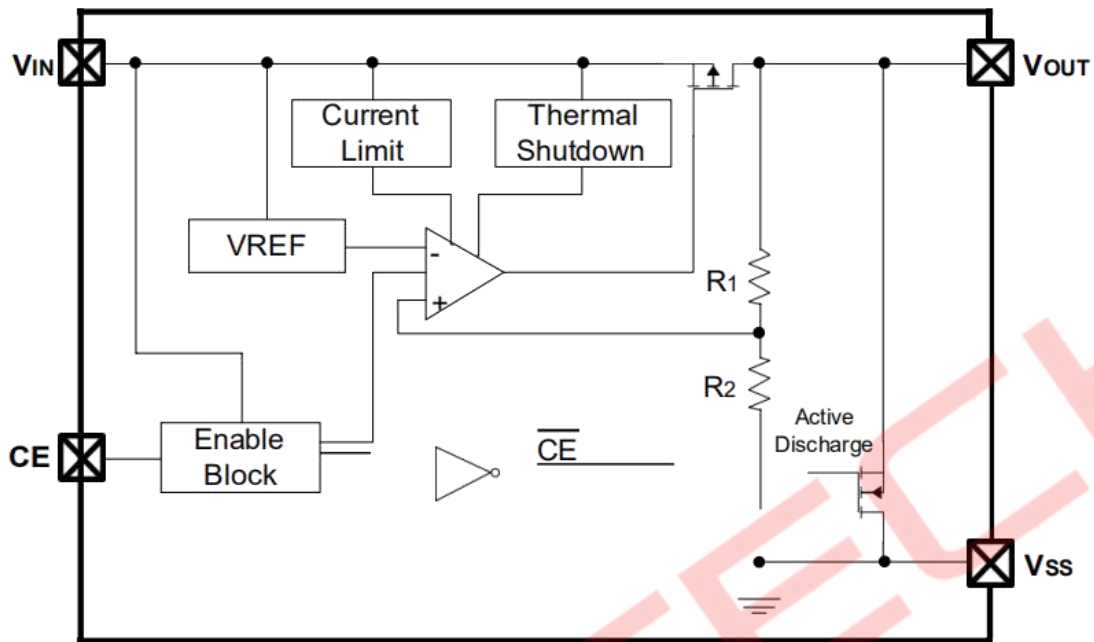


SOT23-5

PIN Number SOT23-3	PIN Number SOT89-3	PIN Number FBP1*1-4	PIN Number SOT23-5	Symbol	Function
3	2	4	1	VIN	Power Input
1	1	2	2	VSS	Ground
		3	3	CE	ON/OFF Control
			4	NC	No Connect
2	3	1	5	VOUT	Output

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## Block Diagram



## Absolute Maximum Ratings

Parameter	Symbol	Ratings	Units	
Input Voltage	V <sub>IN</sub>	-0.3~6.5	V	
CE Pin Voltage	V <sub>CE</sub>	V <sub>IN</sub> -0.3~V <sub>IN</sub> +0.3	V	
V <sub>OUT</sub> Voltage	V <sub>OUT</sub>	V <sub>IN</sub> -0.3~V <sub>IN</sub> +0.3	V	
V <sub>OUT</sub> Current	I <sub>OUT</sub>	600	mA	
Internal Power Dissipation	P <sub>d</sub>	SOT23-3	0.54	W
		SOT89-3	1.25	
		FBP1*1-4	0.5	
		SOT23-5	0.6	
Thermal resistance (Junction to air)	θ <sub>JA</sub>	SOT23-3	230	°C/W
		SOT89-3	100	
		FBP1*1-4	250	
		SOT23-5	210	
Operating Ambient Temperature Range	T <sub>opr</sub>	-40~+85	°C	
Storage Temperature Range	T <sub>stg</sub>	-55~+150	°C	
Maximum junction temperature	T <sub>J</sub>	-40~+150	°C	
Machine Mode	ESD MM	200	V	
Human Body Mode	ESD HBM	2000	V	

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## Electrical Characteristic

(VIN=VOUT+1V, VCE=VIN, Ta=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Operating input voltage	VIN		1.8	-	5.5	V
Output voltage	VOUT(E) (Note 2)	IOUT=10mA, VIN= VOUT+1V	X 0.99	VOUT(T) (Note 1)	X 1.01	V
Maximum output current	IOUTMAX	VIN= VOUT+1V	-	400	-	mA
Load Regulation	ΔVOUT	VIN= VOUT+1V , 1mA ≤ IOUT ≤ 100mA	-	7	20	mV
Dropout voltage(Note 3)	VDIF1	IOUT =100mA	-	110	-	mV
	VDIF2	IOUT=200mA	-	220	-	mV
Supply current	ISS	VIN= VOUT+1V	-	1.8	3.6	uA
Stand-by current	ICEL	VCE=0V	-	0	0.2	uA
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	IOUT=30mA VOUT+1V ≤ VIN ≤ 5.5V	-	0.035	-	%/V
Output current limit	ILIM	Peak Output Current	-	510	-	mA
CE "High" voltage	VCEH	Start up	1.5	-	-	V
CE "Low" voltage	VCEL	Shut down	-	-	0.5	V
Active Output Discharge Resistance	RDIS	VCE<0.5V	-	500	-	Ω
Ripple Rejection Rate (Note 4)	PSRR	VIN= (VOUT+1)V+1VppAC , f=1KHZ	-	70	-	dB
		IOUT=10mA, f=10KHZ	-	55	-	dB
Thermal Shutdown Temperature (Note4)	TSD	Temperature increasing, IOUT=15mA	-	150	-	°C
Thermal Shutdown Hysteresis(Note 4)	ΔTSD	Temperature falling	-	20	-	°C

### NOTES:

- VOUT(T) : Specified Output Voltage
- VOUT(E) : Effective Output Voltage ( i.e. The output voltage when “VOUT(T)+1.0V” is provided at the Vin pin while maintaining a certain Iout value.)
- VDIF: VIN1 - VOUT(E)'  
VIN1: The input voltage when VOUT(E)' appears as input voltage is gradually decreased.  
VOUT(E)' =A voltage equal to 98% of the output voltage whenever an amply stabilized Iout {VOUT(T)+1.0V} is input.
- 4.guaranteed by design.

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## Typical Performance Characteristics

AT6230C33SEG (VCE=VIN, Ta=25°C, unless otherwise noted.)

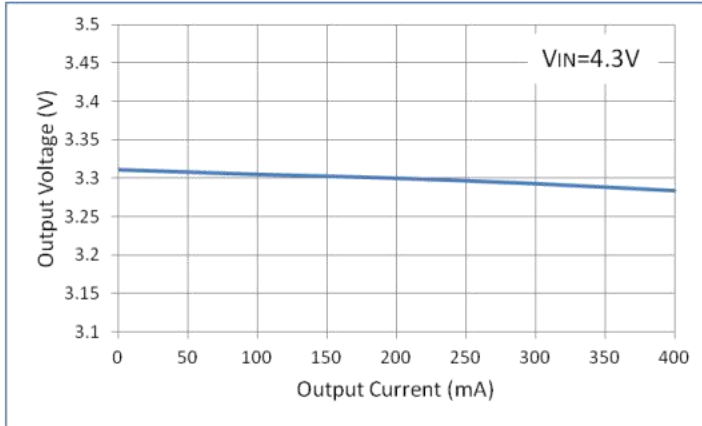


Figure 1. Output Voltage vs. Output Current

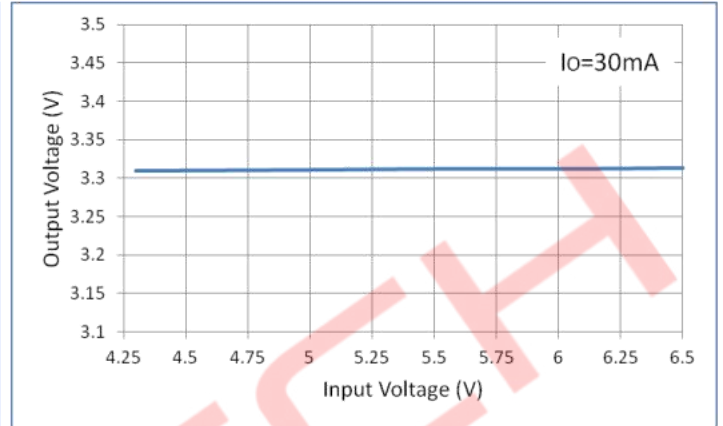


Figure 2. Output Voltage vs. Input Voltage

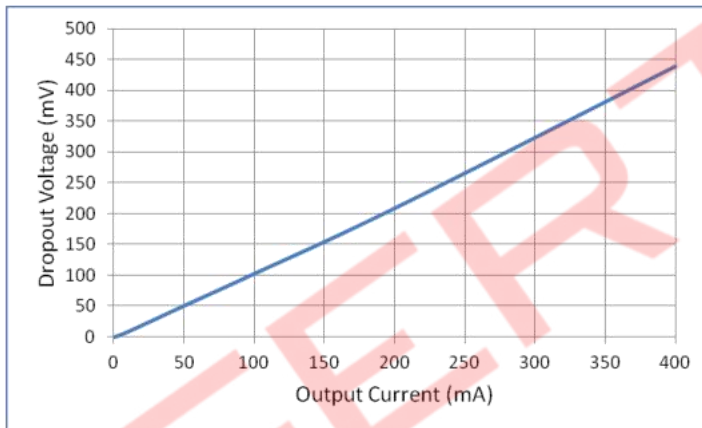


Figure 3. Dropout Voltage vs. Output Current

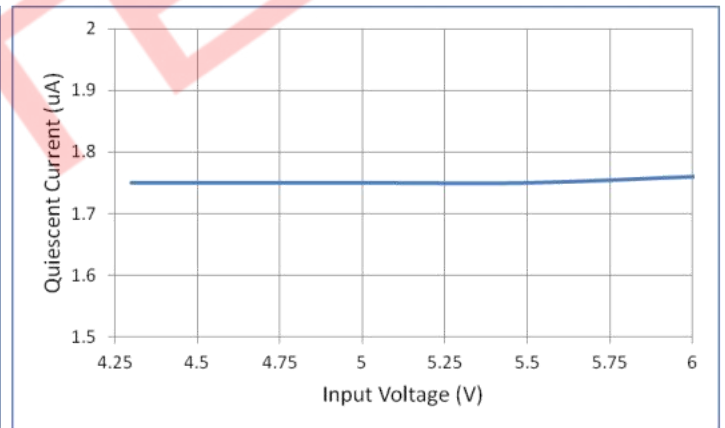


Figure 4. Quiescent Current vs. Input Voltage

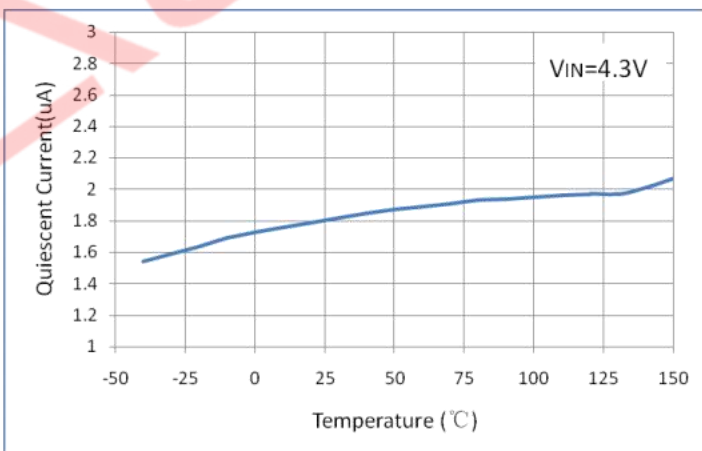


Figure 5. Quiescent Current vs. Temperature

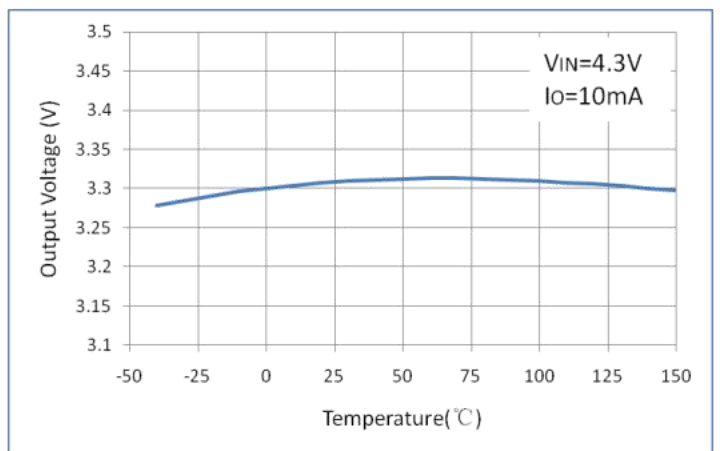


Figure 6. Output Voltage vs. Temperature

# AT6230 Series

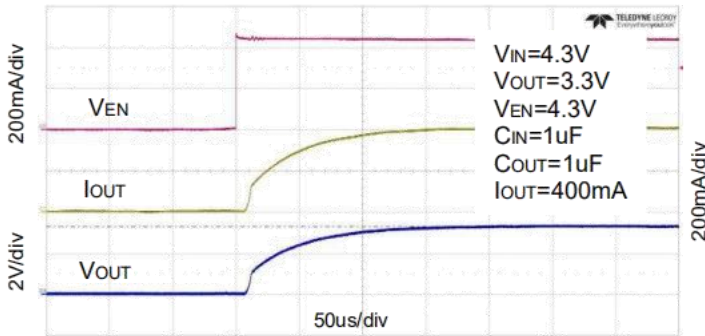


Figure 7. Enable Turn-on Response

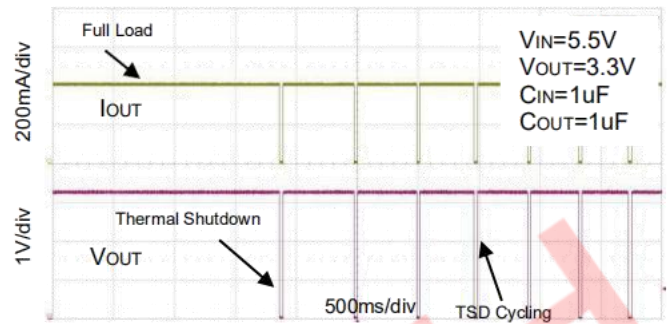


Figure 8. Thermal Shutdown

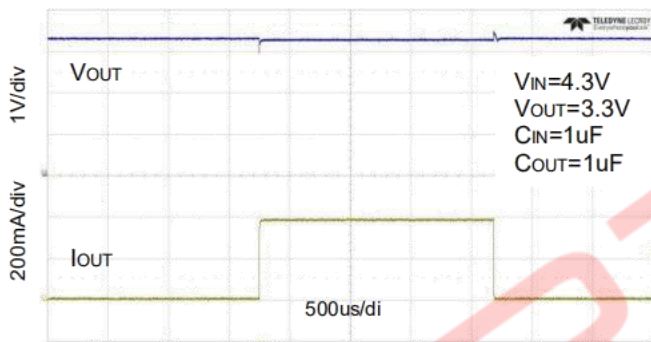


Figure 9. Load Transient Response  
I<sub>OUT</sub>=1mA to 400mA

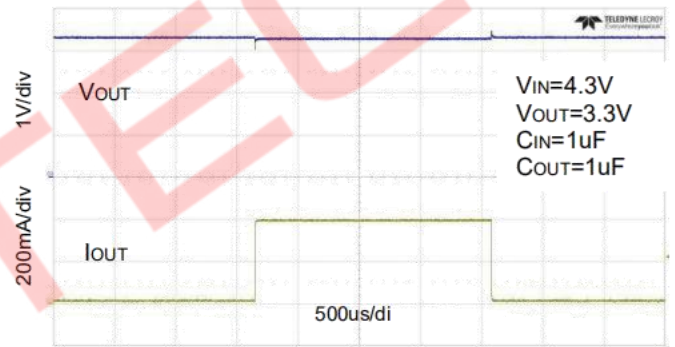


Figure 10. Load Transient Response  
I<sub>OUT</sub>=10mA to 400mA

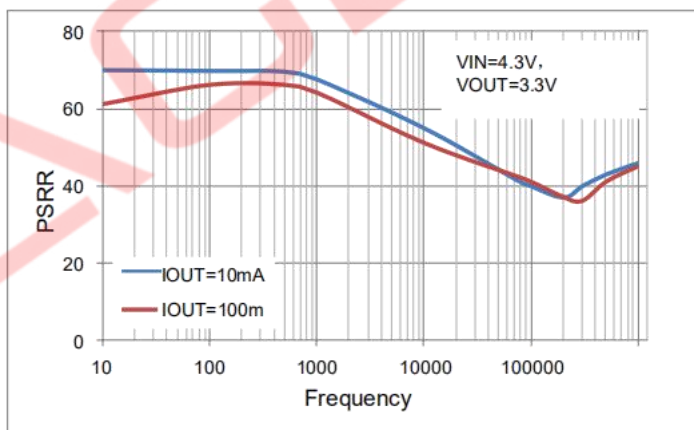
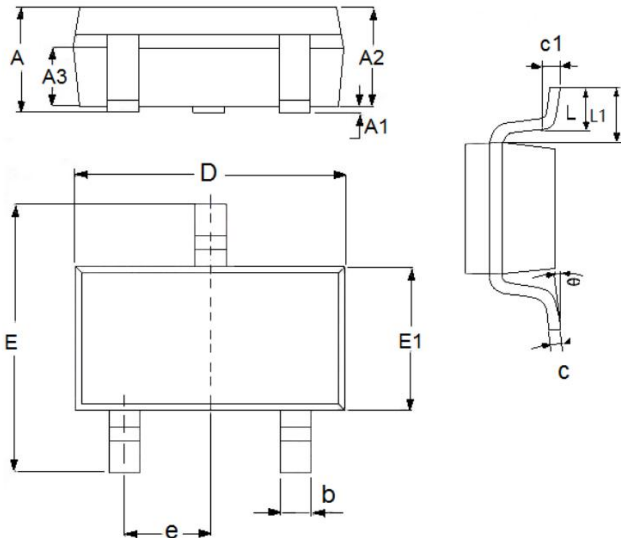


Figure 11. PSRR vs. Frequency

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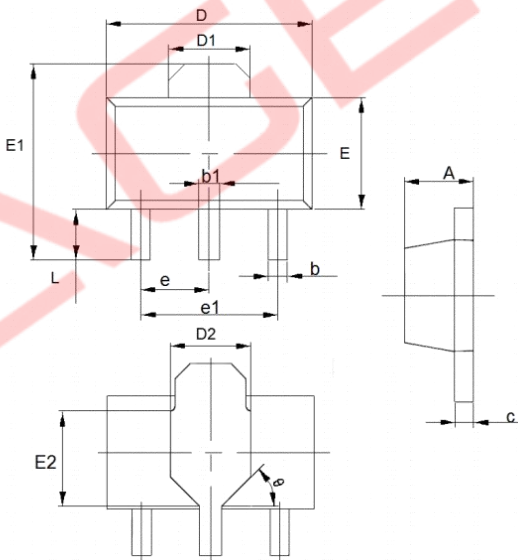
## Package Information

Package Type: SOT23-3



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	1.05	1.45	0.0413	0.0571
A1	0	0.15	0.0000	0.0059
A2	0.9	1.3	0.0354	0.0512
A3	0.6	0.7	0.0236	0.0276
b	0.25	0.5	0.0098	0.0197
c	0.1	0.25	0.0039	0.0098
D	2.8	3.1	0.1102	0.1220
E	2.6	3.1	0.1023	0.1220
E1	1.5	1.8	0.0591	0.0709
e	0.95(TYP)		0.0374(TYP)	
L	0.25	0.6	0.0098	0.0236
L1	0.59(TYP)		0.0232(TYP)	
θ	0	8°	0.0000	8°
C1	0.2(TYP)		0.0079(TYP)	

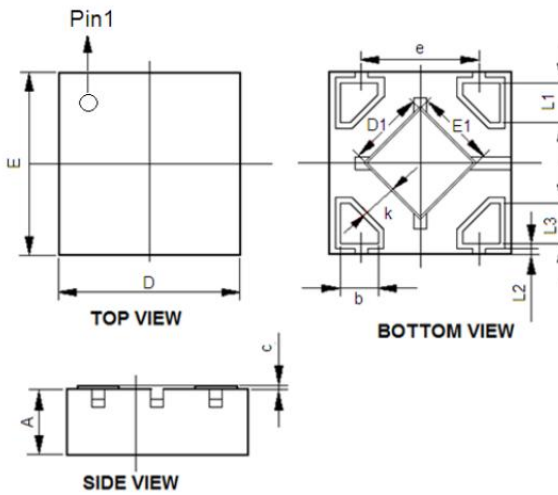
Package Type: SOT89-3



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	1.4	1.6	0.0551	0.0630
b	0.32	0.52	0.0126	0.0205
b1	0.4	0.58	0.0157	0.0228
c	0.35	0.45	0.0138	0.0177
D	4.4	4.6	0.1732	0.1811
D1	1.55(TYP)		0.061(TYP)	
D2	1.75(TYP)		0.0689(TYP)	
e1	3.0(TYP)		0.1181(TYP)	
E	2.3	2.6	0.0906	0.1023
E1	3.94	4.4	0.1551	0.1732
E2	1.9(TYP)		0.0748(TYP)	
e	1.5(TYP)		0.0591(TYP)	
L	0.8	1.2	0.0315	0.0472
θ	45°		45°	

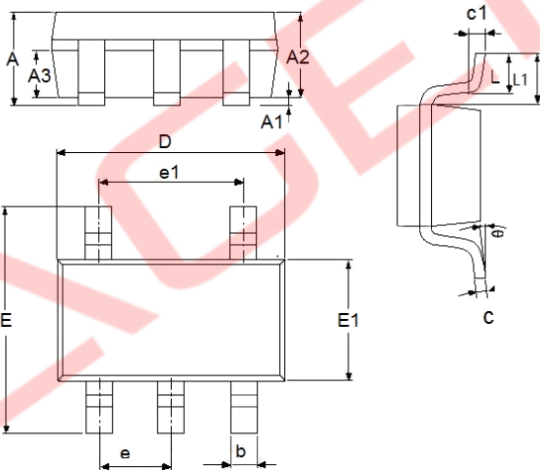
# AT6230 Series

## Package Type: FBP1\*1-4



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	0.335	0.410	0.013	0.016
D	0.950	1.100	0.037	0.043
E	0.950	1.100	0.037	0.043
D1	0.370	0.470	0.015	0.019
E1	0.370	0.470	0.015	0.019
k	0.170(MIN)		0.007(MIN)	
b	0.160	0.260	0.060	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	0.03REF		0.0001REF	
L3	0.185	0.255	0.007	0.010

## Package Type: SOT23-5



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	1.05	1.45	0.0413	0.0571
A1	0	0.15	0.0000	0.0059
A2	0.9	1.3	0.0354	0.0512
A3	0.6	0.7	0.0236	0.0276
b	0.25	0.5	0.0098	0.0197
c	0.1	0.23	0.0039	0.0091
D	2.82	3.05	0.1110	0.1201
e1	1.9(TYP)		0.0748(TYP)	
E	2.6	3.05	0.1024	0.1201
E1	1.5	1.75	0.0512	0.0689
e	0.95(TYP)		0.0374(TYP)	
L	0.3	0.6	0.0118	0.0236
L1	0.59(TYP)		0.0232(TYP)	
$\theta$	0	8°	0.0000	8°
C1	0.2(TYP)		0.0079(TYP)	