

# BL8591

## 100mA High PSRR, Fast Response Linear Regulator

### DESCRIPTION

BL8591 series is a group of positive voltage output, low power consumption, low dropout voltage regulator.

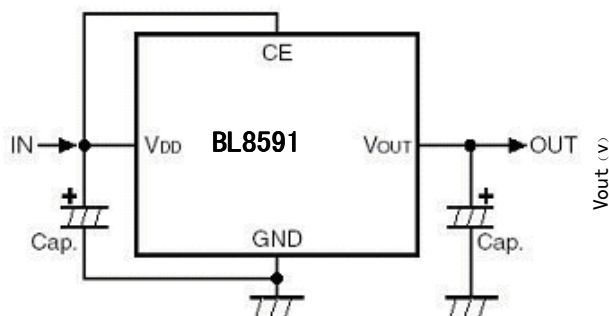
BL8591 can provide output value in the range of 1.2V~4.5V every 0.1V step. It also can be customized on command.

BL8591 includes high accuracy voltage reference, error amplifier, current limit circuit and output driver module with discharge capability.

BL8591 has excellent load and line transient response and good temperature characteristics, which can assure the stability of chip and power system. And it uses trimming technique to guarantee output voltage accuracy within  $\pm 2\%$ .

BL8591 is available in SOT23-3, SOT23-5, SOT89-3, SOT89-5 and TO92 packages which are lead free. It also can available in these packages with lead.

### TYPICAL APPLICATION



**NOTE:** Input capacitor ( $C_{in}=1\mu F$ ) and Output capacitor ( $C_{out}=1\mu F/2.2\mu F$ ) are recommended in all application circuit.

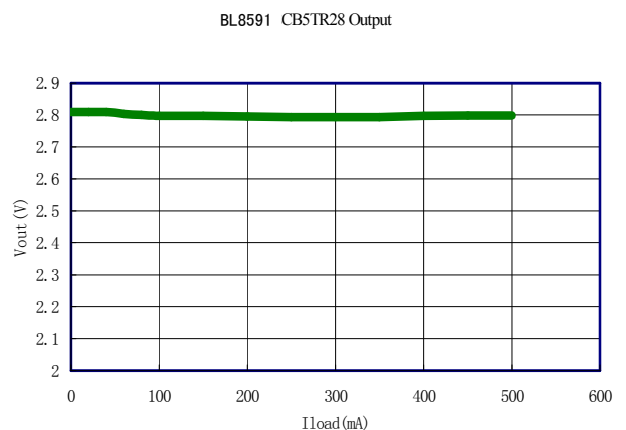
### FEATURES

- Low Power Consumption: 75 $\mu A$  (Typ.)
- Low Output Noise (47 $\mu V_{RMS}$ )
- Standby Mode: 0.1 $\mu A$
- Low Dropout Voltage: 0.1V@100mA (Typ.)
- High Ripple Rejection: 66dB@100Hz (Typ.)
- Low Temperature Coefficient:  $\pm 100\text{ppm}/^\circ\text{C}$
- Excellent Line Regulation: 0.05%/V
- Build-in Chip Enable and Discharge Circuit
- Output Voltage Range: 1.2V~4.5V (Customized on command every 0.1V step)
- Highly Accurate:  $\pm 2\%$  ( $\pm 1\%$  customized)
- Output Current Limit

### APPLICATIONS

- Power Source for cellular phones and various kind of PCSs
- Battery Powered equipment
- Power Management of MP3, PDA, DSC, Mouse, PS2 Games
- Reference Voltage Source
- Regulation after Switching Power

### ELECTRICAL CHARACTERISTICS



# BL8591

## ORDERING INFORMATION

BL8591 1 2 3 4 5

Code	Description
<span style="border: 1px solid black; padding: 0 2px;">1</span>	Temperature&Rohs: C:-40~85°C ,Pb Free Rohs Std.
<span style="border: 1px solid black; padding: 0 2px;">2</span>	Package type: B3:SOT-23-3 B5:SOT-23-5 C3:SOT-89-3 C5:SOT89-5 H:TO-92
<span style="border: 1px solid black; padding: 0 2px;">3</span>	Packing type: TR:Tape&Reel (Standard) BG:Bag(TO-92)
<span style="border: 1px solid black; padding: 0 2px;">4</span>	Output voltage: e.g. 12=1.2V 18=1.8V 45=4.5V
<span style="border: 1px solid black; padding: 0 2px;">5</span>	Voltage accuracy: Blank(default)= ± 2%

## MARKING DESCRIPTON

J: Product Code(SOT23-3&SOT23-5)

X: Output Voltage(SOT23-3&SOT23-5)

Vout	Code	Vout	Code	Vout	Code
1.2V	2	2.5V	<u>5</u>	3.8V	<u>8</u>
1.3V	3	2.6V	<u>6</u>	3.9V	<u>9</u>
1.4V	4	2.7V	<u>7</u>	4.0V	<u>0</u>
1.5V	5	2.8V	<u>8</u>	4.1V	<u>1</u>
1.6V	6	2.9V	<u>9</u>	4.2V	<u>2</u>
1.7V	7	3.0V	<u>0</u>	4.3V	<u>3</u>
1.8V	8	3.1V	<u>1</u>	4.4V	<u>4</u>
1.9V	9	3.2V	<u>2</u>	4.5V	<u>5</u>
2.0V	<u>0</u>	3.3V	<u>3</u>		
2.1V	<u>1</u>	3.4V	<u>4</u>		
2.2V	<u>2</u>	3.5V	<u>5</u>		
2.3V	<u>3</u>	3.6V	<u>6</u>		
2.4V	<u>4</u>	3.7V	<u>7</u>		

Z: The Year of manufacturing, "7" stands for year 2007, "8" stands for year 2008, and "0" stands for year 2010.

Z: The week of manufacturing. "A" stands for week 1, "Z" stands for week 26, "A" stands for week 27, "Z" stands for week 52.

## PIN CONFIGURATION

Product Classification		BL8591CB3TR□□□
Marking		SOT-23-3
JXZZ	J:Product Code	
	X: Output Voltage	
	ZZ:Data Code	
Product Classification		BL8591CB5TR□□□
Marking		SOT-23-5
JXZZ	J:Product Code	
	X: Output Voltage	
	ZZ:Data Code	
Product Classification		BL8591CC3TR□□□
Marking		SOT-89-3
JAXX YYBZZ	JA:Product Code	
	XX: Output Voltage	
	YY:Lot No.	
	B:Fab code	
ZZ:Data Code		
Product Classification		BL8591CC5TR□□□
Marking		SOT-89-5
JAXX YYBZZ	JA:Product Code	
	XX: Output Voltage	
	YY:Lot No.	
	B:Fab code	
ZZ:Data Code		
Product Classification		BL8591CHBG□□□
Marking		TO-92
JAXX YYBZZ	JA:Product Code	
	XX: Output Voltage	
	YY:Lot No.	
	B:Fab Code	
ZZ:Data Code		
Vss	Ground Pin	
Vin	Supply Voltage Input	
Vout	Output Voltage	
CE	Chip Enable	
NC	No Connection	

## ABSOLUTE MAXIMUM RATING

Parameter		Value
Max Input Voltage		15V
Operating Junction Temperature(Tj)		125°C
Output Current		500mA
Ambient Temperature(Ta)		-40°C –85°C
Power Dissipation	SOT23-3	250mW
	SOT23-5	250mW
	SOT89-3	500mW
	SOT89-5	500mW for normal application 800mW with 10mmx20mm heat dissipation coil
	TO-92	500mW
Storage Temperature(Ts)		-40°C -150°C
Lead Temperature & Time		260°C,10S

Note: Exceed these limits to damage to the device. Exposure to absolute maximum rating conditions may affect device reliability.

## RECOMMENDED WORK CONDITIONS

Item	Min	Recommended	Max.	Unit
Input Voltage Range			14	V
Ambient Temperature	-40		85	°C

## ELECTRICAL CHARACTERISTICS

( Test Conditions: Cin=1uF,Cout=3.3uF,TA=25°C, unless otherwise specified. )  
BL8591, For Arbitrary Output Voltage

Symbol	Parameter		Conditions	Min	Typ	Max	Units
Vin	Input Voltage					14	V
Vout	Output Voltage	Vout>1.5V	Vin=Set Vout+1V 1mA≤Iout≤30mA	Vout x0.98	Vout	Vout X1.02	V
		Vout≤1.5V		Vout -0.03	Vout	Vout +0.03	
Iout (Max.)	Maximum Output Current		Vin-Vout=1V	100			mA
Vdrop <sup>1</sup>	Dropout Voltage,Vout≥2.8V		Iout=100mA		88	120	mV
$\frac{\Delta V_{out}}{\Delta V_{in} \cdot V_{out}}$	Line Regulation		Iout=40mA 2.8V≤Vin≤8V		0.05	0.2	%/V
$\Delta V_{out} / \Delta I_{out}$	Load Regulation		Vin=Set Vout+1V 1mA≤Iout≤500mA		20	40	mV
Iss	Supply Current		Vin=Set Vout+1V		75	90	uA

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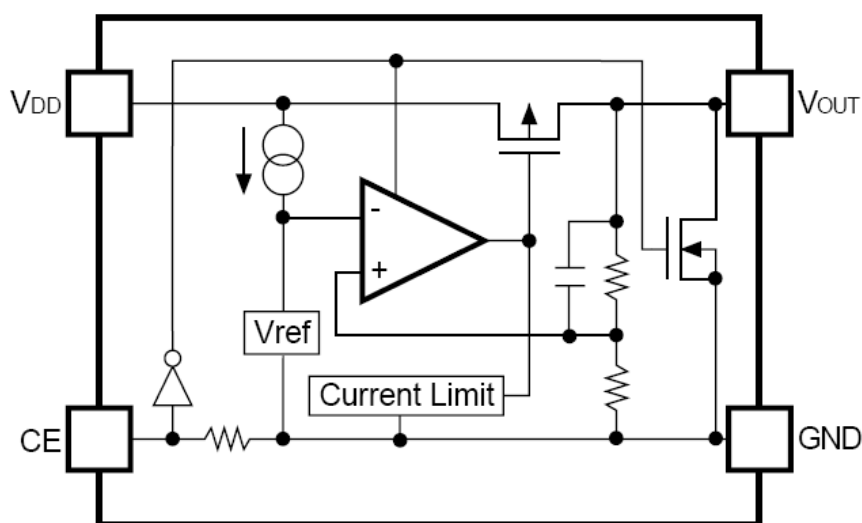
Istandby	Supply Current (Standby)	Vin=Set Vout+1V Vce=GND		0.1	1.0	uA
$\frac{\Delta V_{out}}{\Delta T \cdot V_{out}}$	Output Voltage Temperature Coefficiency	Iout=30mA		±100		ppm/°C
PSRR	Ripple Rejection	F=100Hz, Ripple=0.5Vp-p Vin=Set Vout+1V		65		dB
Ilim	Short Current Limit	Vout=0V		200		mA
Rpd	CE Pull down Resistance		2.0	5.0	10.0	MΩ
Vceh	CE Input Voltage "H"		1.5		Vin	V
Vcel	CE Input Voltage "L"		0		0.25	V

## NOTE1:

$V_{drop} = V_{in1} - (V_{out2} \cdot 0.98)$   $V_{out2}$  is the output voltage when  $V_{in} = V_{out1} + 1.0V$  and  $I_{out} = 100mA$ .

$V_{in1}$  is the input voltage at which the output voltage becomes 98% of  $V_{out1}$  after gradually decreasing the input voltage.

## BLOCK DIAGRAM



## Explanation

BL8591 series is a group of positive voltage output, low noise, low power consumption, low dropout voltage regulator.

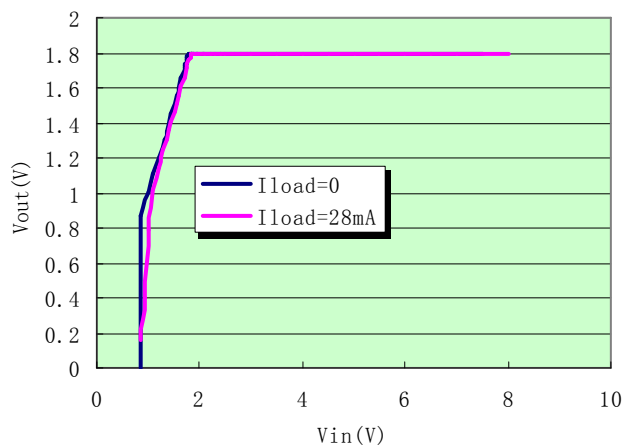
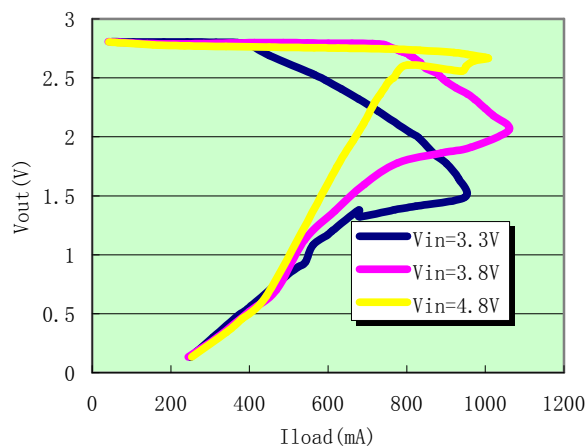
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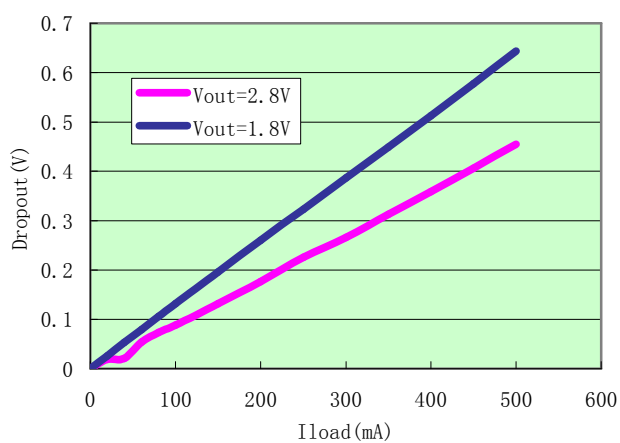
BL8591 has excellent load and line transient response and good temperature characteristics, which can assure the stability of chip and power system. And it uses trimming technique to guarantee output voltage accuracy within  $\pm 2\%$ .

## TYPICAL PERFORMANCE CHARACTERISTICS

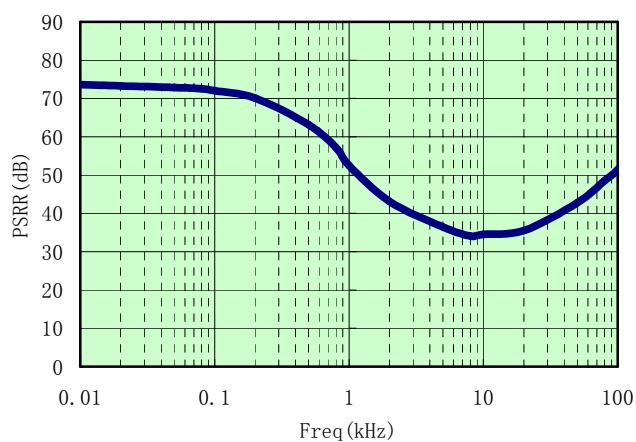
- 1) Output Voltage vs. Output Current (With Output Short Protection)    2) Output Voltage vs. Input Voltage



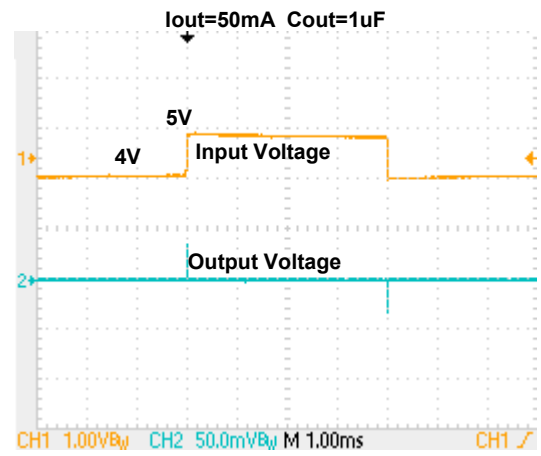
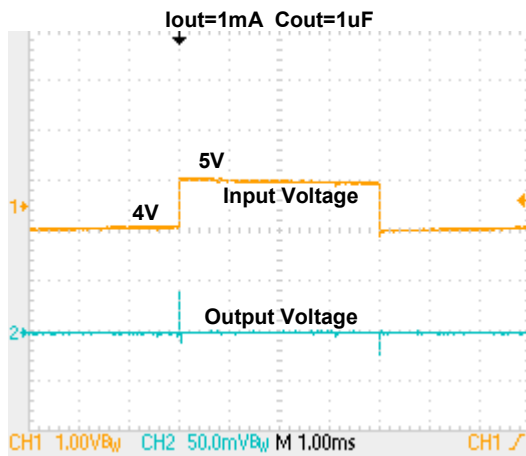
- 3) Dropout Voltage vs. Output Current



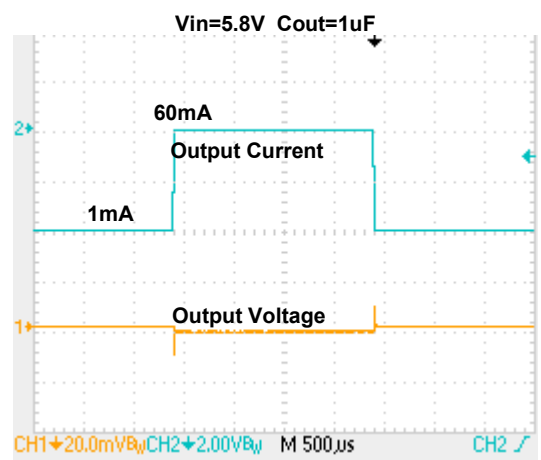
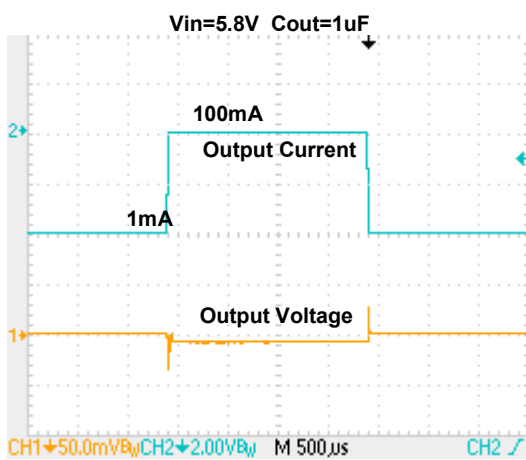
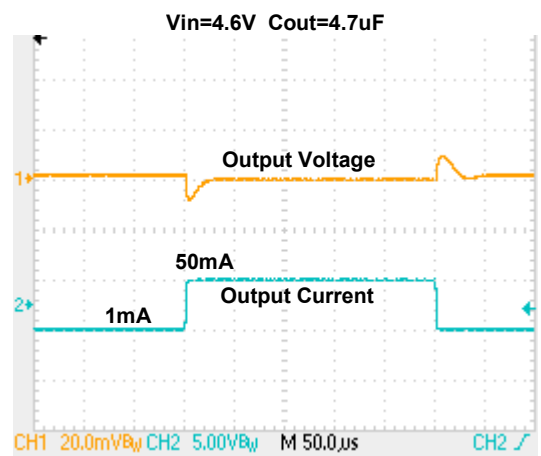
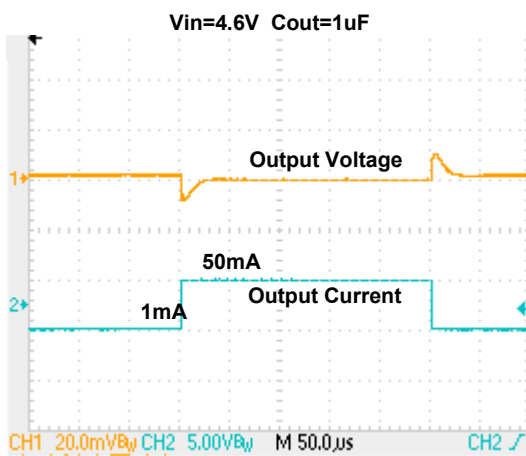
- 4) Ripple Rejection vs. Frequency



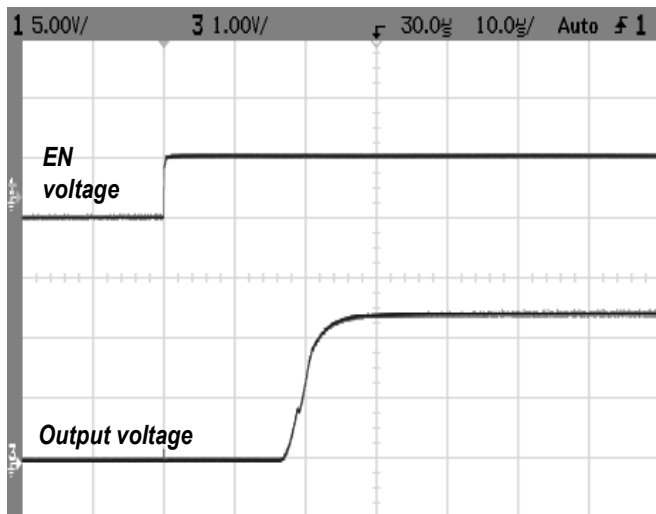
## 5) Line transient response



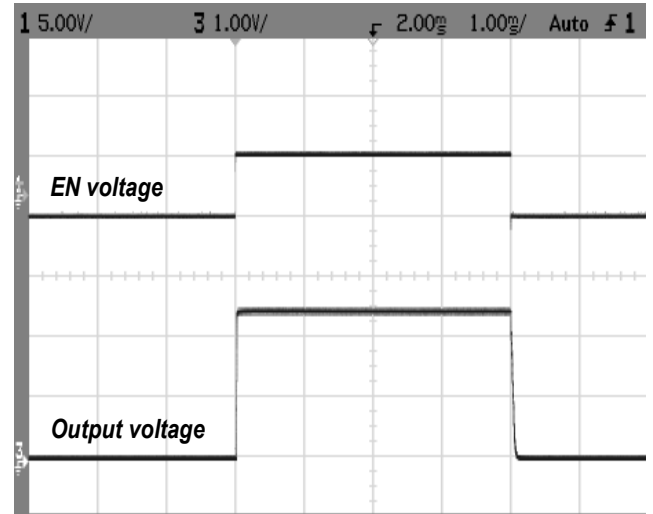
## 6) Load transient response



## 7) Startup Response



## 8) Shutdown Response



## PACKAGE LINE

Package	SOT-23-3	Devices per reel	3000Pcs	Unit	mm
Package dimension:					
<p>Technical drawing of the SOT-23-3 package. The top view shows a rectangular body with a width of <math>2.9 \pm 0.2</math> mm and a length of <math>1.9 \pm 0.2</math> mm. The distance between the two leads (1 and 2) is <math>1.9 \pm 0.2</math> mm, with each lead offset by <math>(0.95)</math> mm from the center. The lead width is <math>0.4 \pm 0.1</math> mm. The body height is <math>1.6 \pm 0.2</math> mm, and the total height including the lead is <math>2.8 \pm 0.3</math> mm. The side view shows a lead height of <math>1.4</math> mm maximum, a lead width of <math>1.1</math> mm with a tolerance of <math>+0.2</math> to <math>-0.1</math> mm, and a lead thickness of <math>0.8</math> mm. The lead is bent at a <math>0</math> to <math>0.1</math> mm angle. The bottom view shows a lead thickness of <math>0.16</math> mm with a tolerance of <math>+0.1</math> to <math>-0.06</math> mm, and a minimum lead height of <math>0.2</math> mm.</p>					

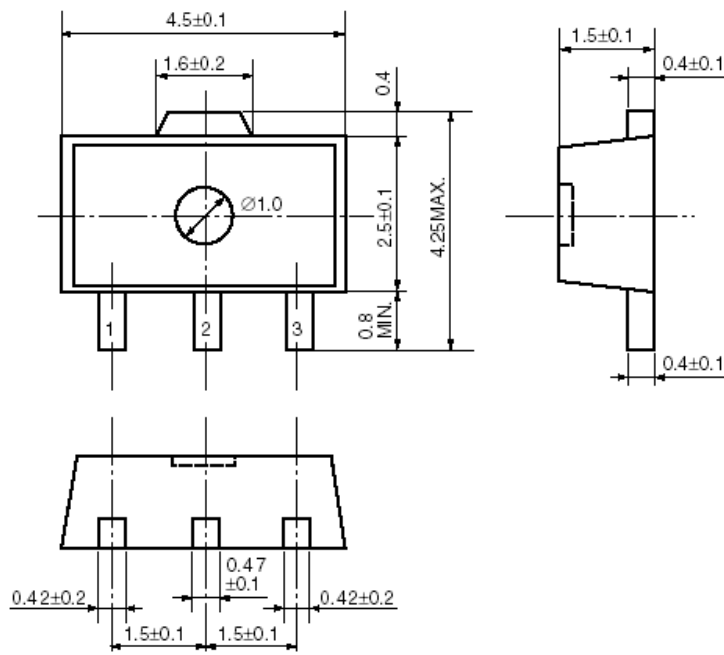
Package	SOT-23-5	Devices per reel	3000Pcs	Unit	mm
Package Dimension:					
<p>Technical drawing of the SOT-23-5 package. The top view shows a rectangular body with a width of <math>2.9 \pm 0.2</math> mm and a length of <math>1.9 \pm 0.2</math> mm. The distance between the two leads (1 and 2) is <math>1.9 \pm 0.2</math> mm, with each lead offset by <math>(0.95)</math> mm from the center. The lead width is <math>0.4 \pm 0.1</math> mm. The body height is <math>1.6</math> mm with a tolerance of <math>+0.2</math> to <math>-0.1</math> mm, and the total height including the lead is <math>2.8 \pm 0.3</math> mm. The side view shows a lead height of <math>1.1</math> mm with a tolerance of <math>+0.2</math> to <math>-0.1</math> mm, a lead width of <math>0.8 \pm 0.1</math> mm, and a lead thickness of <math>0.15</math> mm with a tolerance of <math>+0.1</math> to <math>-0.05</math> mm. The lead is bent at a <math>0</math> to <math>0.1</math> mm angle. The bottom view shows a lead thickness of <math>0.15</math> mm with a tolerance of <math>+0.1</math> to <math>-0.05</math> mm, and a minimum lead height of <math>0.2</math> mm.</p>					



# BL8591

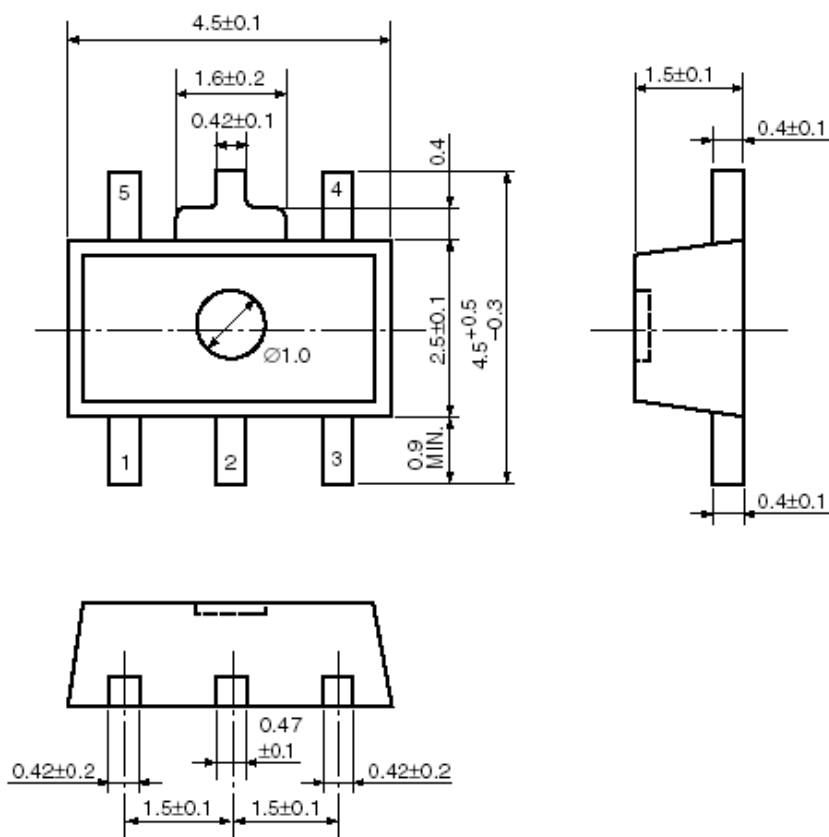
Package	SOT-89-3	Devices per reel	1000Pcs	Unit	mm
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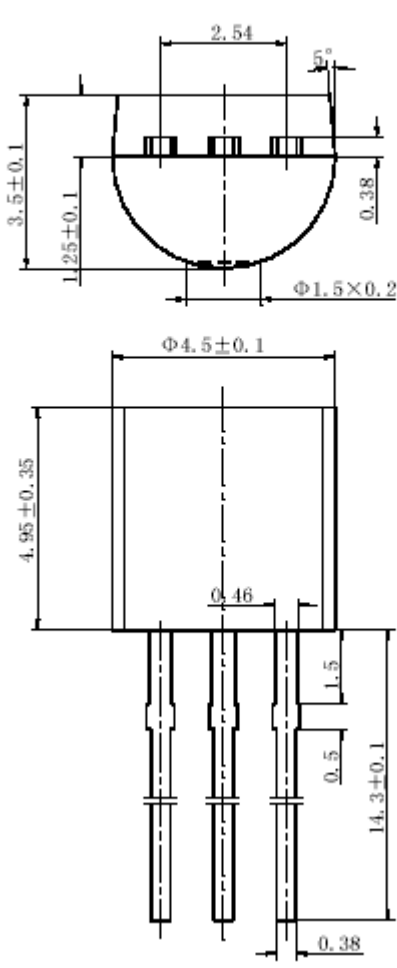
Package Dimension:



Package	SOT89-5	Devices per reel	1000Pcs	Unit	mm
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Package Dimension:



Package	TO-92	Devices per Bag	1000Pcs	Unit	mm
Package Dimension:					
<b>TO-92</b>					
 <p>The technical drawing illustrates the dimensions of a TO-92 package. The top view shows a semi-circular body with a diameter of <math>\Phi 1.5 \pm 0.2</math> mm. The total width of the package is <math>2.54</math> mm. The height from the base to the top edge is <math>3.5 \pm 0.1</math> mm, and the height from the base to the center of the top edge is <math>1.25 \pm 0.1</math> mm. The top edge is chamfered at a <math>5^\circ</math> angle. The side view shows a total height of <math>4.95 \pm 0.35</math> mm and a diameter of <math>\Phi 4.5 \pm 0.1</math> mm. The distance from the base to the top edge of the body is <math>0.46</math> mm. The distance from the base to the top edge of the leads is <math>14.3 \pm 0.1</math> mm. The distance from the base to the top edge of the lead insulation is <math>1.5</math> mm. The distance from the base to the top edge of the lead insulation is <math>0.5</math> mm. The distance from the base to the top edge of the lead insulation is <math>0.38</math> mm.</p>					