



# LC1203

REV1.0-Revised DEC 2007

## 250mA Low Consumption Linear Regulator

### DESCRIPTION

LC1203 series is a group of positive voltage output, low power consumption, low dropout voltage, three terminal regulator. It can provide 250mA output current when input / output voltage differential drops to 400mV ( $V_{in} = 4.0V, V_{out} = 3.0V$ ), The very low power consumption of LC1203 ( $I_q = 3.0\mu A$ ) can greatly improve natural life of batteries.

LC1203 can provide output value in the range of 1.2V~6.0V in 0.1V steps. It also can customized on command.

LC1203 includes high accuracy voltage reference, error amplifier, current limit circuit and output driver module.

LC1203 has well load transient response and good temperature characteristic, which can assure the stability of chip and power system. And it uses trimming technique to guarantee output voltage accuracy within  $\pm 2\%$ .

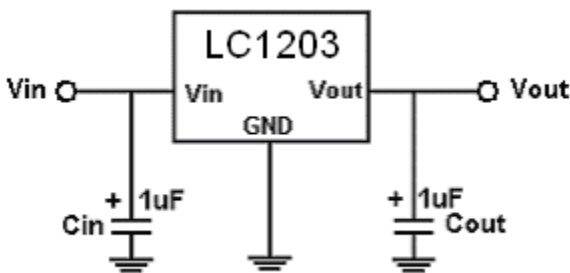
### FEATURES

- Low Power Consumption:  $3.0\mu A$  (Typ.)
- Maximum Output Current: 250mA
- Small Dropout Voltage  
 $170mV @ 100mA$  ( $V_{out} = 3.0V$ )  
 $400mV @ 250mA$  ( $V_{out} = 3.0V$ )
- Input Voltage Range: 1.5V~10V
- Output Voltage Range: 1.2V~6.0V (customized on command in 0.1V steps)
- Highly Accurate:  $\pm 2\%$  ( $\pm 1\%$  customized)
- Output Current Limit

### APPLICATIONS

- Battery Powered equipment
- Power Management of MP3、PDA、DSC、Mouse、PS2 Games
- Reference Voltage Source Regulation after Switching Power

### TYPICAL APPLICATION

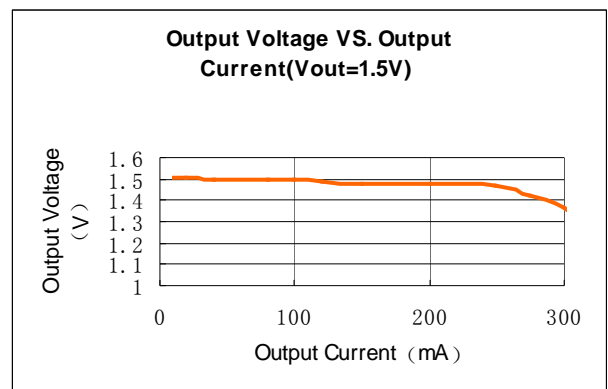


### APPLICATION HINTS

**NOTE1:** Input capacitor ( $C_{in} = 1\mu F$ ) is recommended in all application circuit. Tantalum capacitor is recommended.

**NOTE2:** Output capacitor ( $C_{out} = 1\mu F$ ) is recommended in all application to assure the stability of circuit. Tantalum capacitor is recommended.

### ELECTRICAL CHARACTERISTICS



## ORDERING INFORMATION

LC1203 [1](#) [2](#) [3](#) [4](#) [5](#)

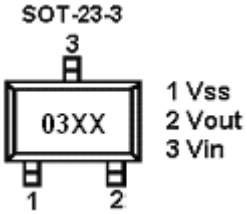
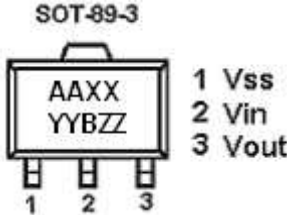
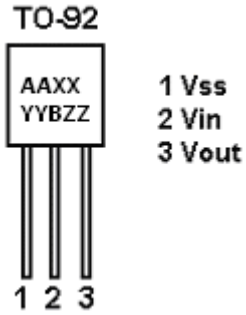
Code	Description
<a href="#">1</a>	Temperature&RoHS: C:-40~85°C ,Pb Free RoHS Std.
<a href="#">2</a>	Package type: B3:SOT-23-3 C3:SOT-89-3 H:TO-92
<a href="#">3</a>	Packing type: TR:Tape&Reel (Standard) BG:Bag (TO-92)
<a href="#">4</a>	Output voltage: e.g. 12=1.2V 15=1.5V 60=6.0V
<a href="#">5</a>	Voltage accuracy: 1=±1% Blank(default)=±2%

## ABSOLUTE MAXIMUM RATING

Parameter	Value
Max Input Voltage	10V
Operating Junction Temperature(Tj)	125°C
Ambient Temperature(Ta)	-40°C -85°C
Power Dissipation	
SOT-23-3	250mW
SOT-89-3	500mW
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.

## PIN CONFIGURATION

Product Classification		LC1203CB3TR□□□
Marking		SOT-23-3 
03XX	03:Product Code	
	XX:Output Voltage	
Product Classification		LC1203CC3TR□□□
Marking		SOT-89-3 
AAXX YYBZZ	AA:Product Code	
	XX:Output Voltage	
	YY:LOT NO.	
	B:FAB Code	
	ZZ:Data Code	
Product Classification		LC1203CHBG□□□
Marking		TO-92 
AAXX YYBZZ	AA:Product Code	
	XX:Output Voltage	
	YY:LOT NO.	
	B:FAB Code	
	ZZ:Data Code	
Vss	Ground Pin	
Vin	Supply Voltage Input	
Vout	Output Voltage	

## RECOMMENDED WORK CONDITIONS

Item	Min	Recommended	Max.	Unit
Input Voltage Range			8	V
Ambient Temperature	-40		85	°C

## ELECTRICAL CHARACTERISTICS

(Test Conditions:  $C_{in}=1\mu F, C_{out}=1\mu F$ , Unless Otherwise Specified)

### LC1203CB3TR15

Symbol	Parameter	Conditions	Min	Type	Max	Units
$V_{in}$	Input Voltage				8	V
$V_{out}$	Output Voltage		1.47	1.5	1.53	V
$I_{out(Max.)}$	Maximum Output Current	$V_{in}=2.5V, V_{out}>1.47$	250			mA
Dropout Voltage	Input-Output Voltage Differential	$I_{out}=100mA$		270	400	mV
$\frac{\Delta V_{out}}{\Delta V_{in} \cdot V_{out}}$	Line Regulation	$I_{out}=40mA$ $1.6V \leq V_{in} \leq 8V$		0.2	0.3	%/V
$\Delta V_{out}$	Load Regulation	$V_{in}=2.5V$ $1mA \leq I_{out} \leq 100mA$		20	40	mV
$I_q$	Quiescent Current	$V_{in}=2.5V$		3.0	5.0	$\mu A$
$\frac{\Delta V_{out}}{\Delta T \cdot V_{out}}$	Output Voltage Temperature Coefficient	$I_{out}=10mA$		50		ppm/°C

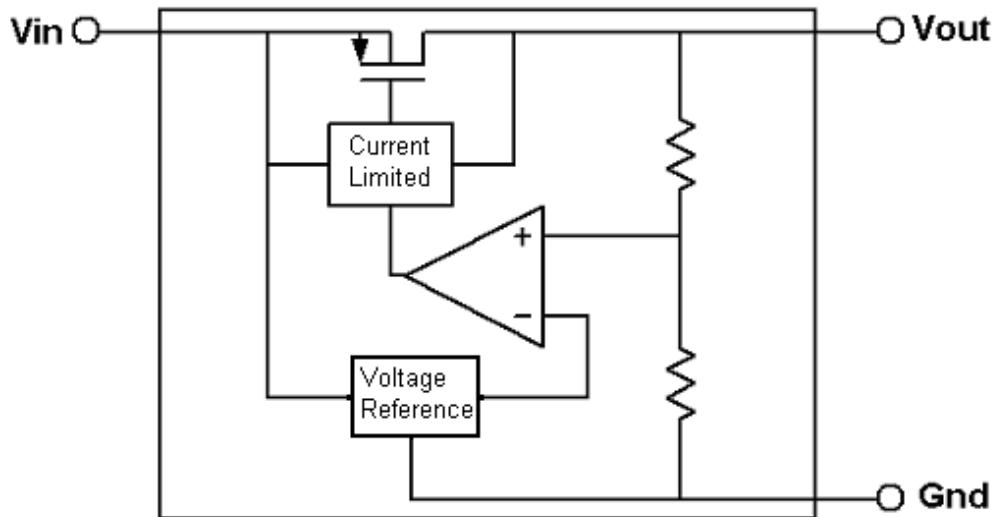
### LC1203CB3TR30

Symbol	Parameter	Conditions	Min	Type	Max	Units
$V_{in}$	Input Voltage				8	V
$V_{out}$	Output Voltage		2.94	3.0	3.06	V
$I_{out(Max.)}$	Maximum Output Current	$V_{in}=2.5V, V_{out}>1.47$	250			mA
Dropout Voltage	Input-Output Voltage Differential	$I_{out}=100mA$		170	300	mV
$\frac{\Delta V_{out}}{\Delta V_{in} \cdot V_{out}}$	Line Regulation	$I_{out}=40mA$ $1.6V \leq V_{in} \leq 8V$		320	500	%/V
$\Delta V_{out}$	Load Regulation	$V_{in}=2.5V$ $1mA \leq I_{out} \leq 100mA$		0.2	0.3	mV

# LC1203

$I_q$	Quiescent Current	$V_{in}=2.5V$		20	40	$\mu A$
$\frac{\Delta V_{out}}{\Delta T \cdot V_{out}}$	Output Voltage Temperature Coefficient	$I_{out}=10mA$		3.0	5.0	ppm/°C

## BLOCK DIAGRAM



## Explanation

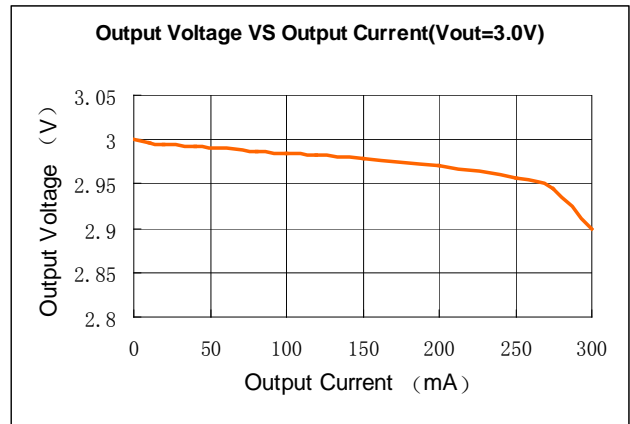
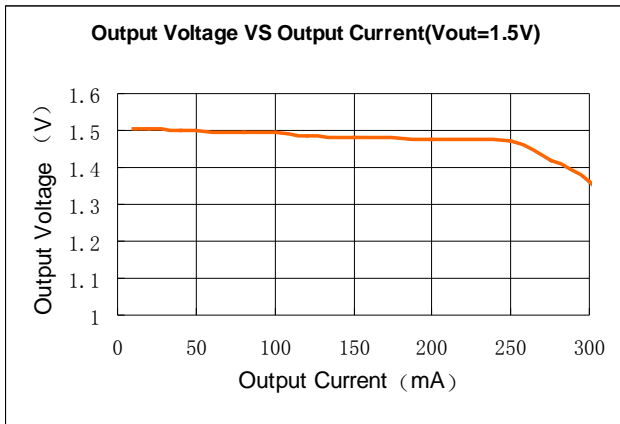
LC1203 is a series of low dropout voltage and low power consumption three pins regulator. Its application circuit is very simple, which only needs two outside capacitors. It is composed of these modules: high accuracy voltage reference, current limit circuit, error amplifier, output driver and power transistor.

Current Limit module can keep chip and power system away from danger when load current is more than 250mA.

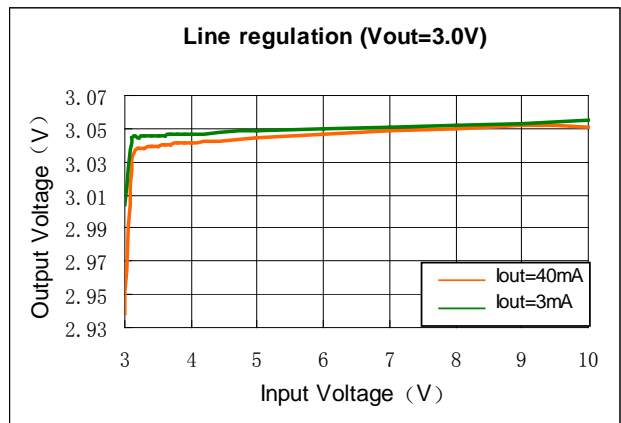
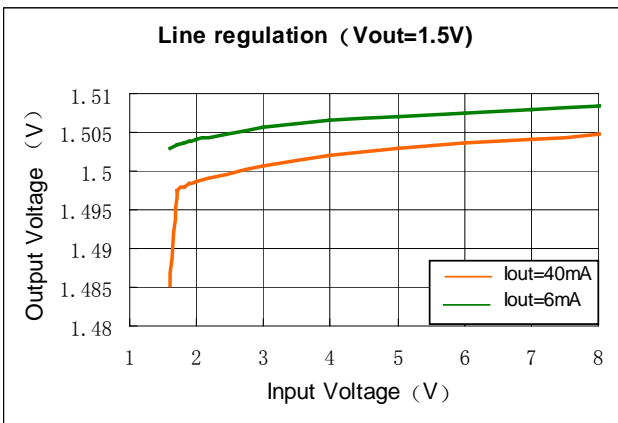
LC1203 uses trimming technique to assure the accuracy of output value within  $\pm 2\%$ , at the same time, temperature compensated is elaborately considered in this chip, which makes LC1203's temperature coefficient within 50ppm/°C.

## TYPICAL PERFORMANCE CHARACTERISTICS

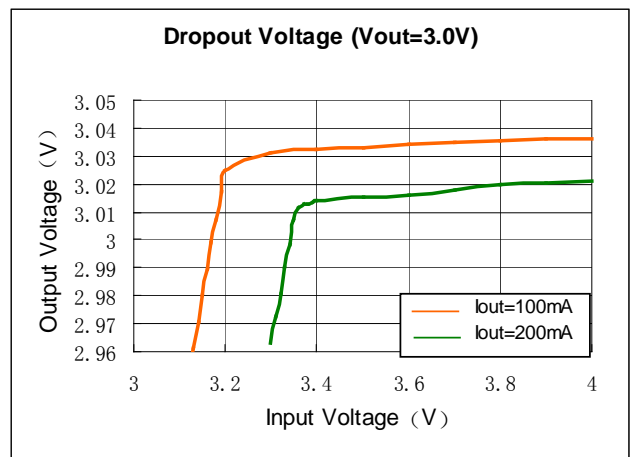
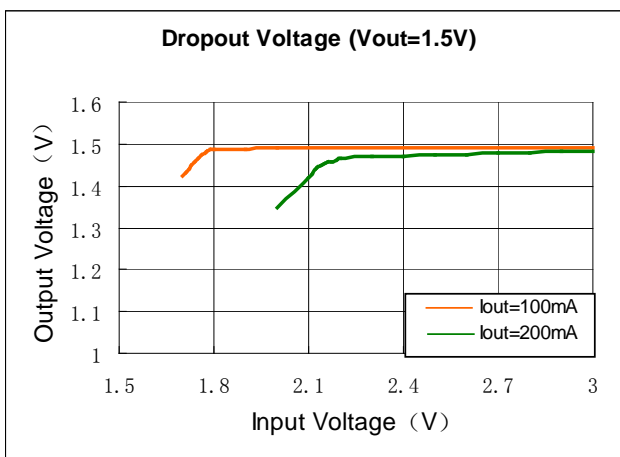
### 1. Load regulation



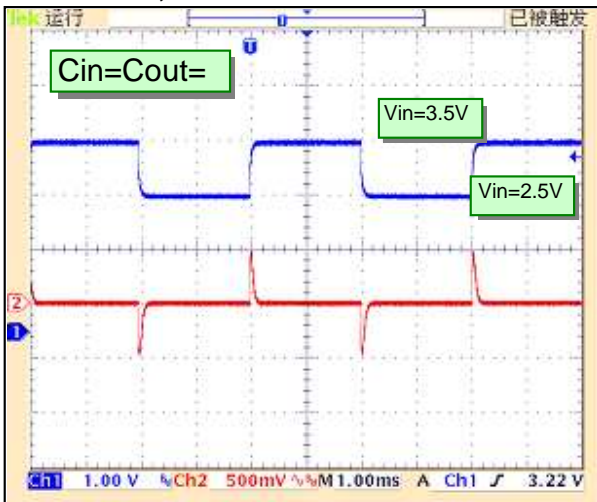
### 2. Line Regulation



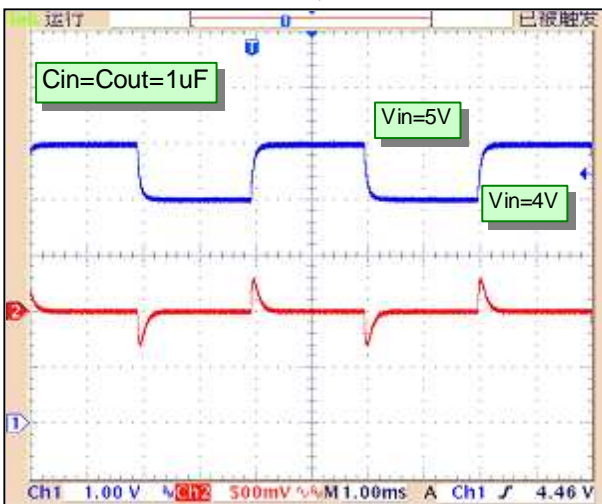
### 3. Dropout Voltage



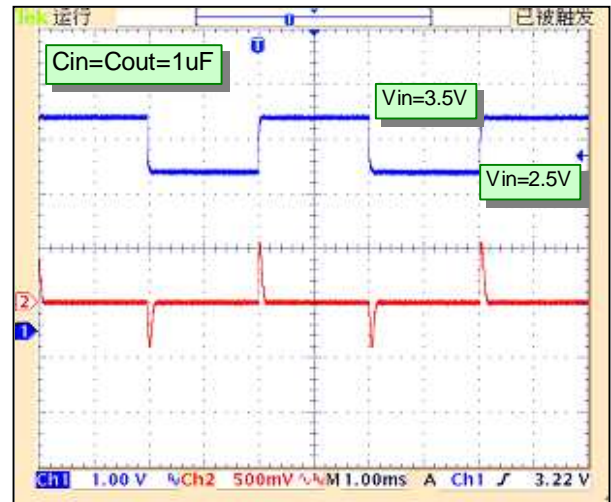
## 4. Input Voltage transient response (Vout=1.5V, Iout=10mA)



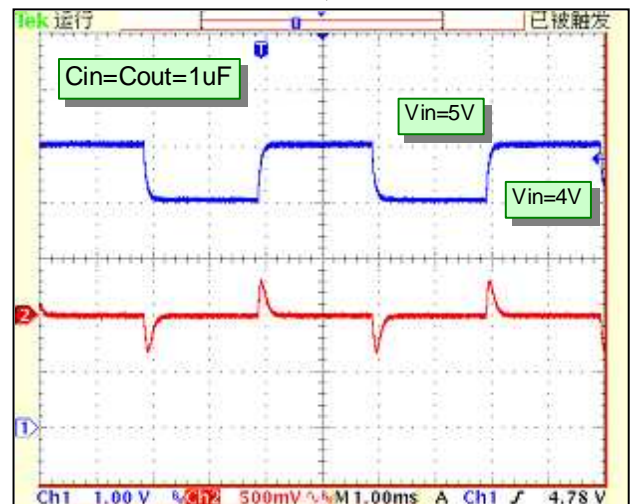
Input Voltage transient response (Vout=3.0V, Iout=10mA)



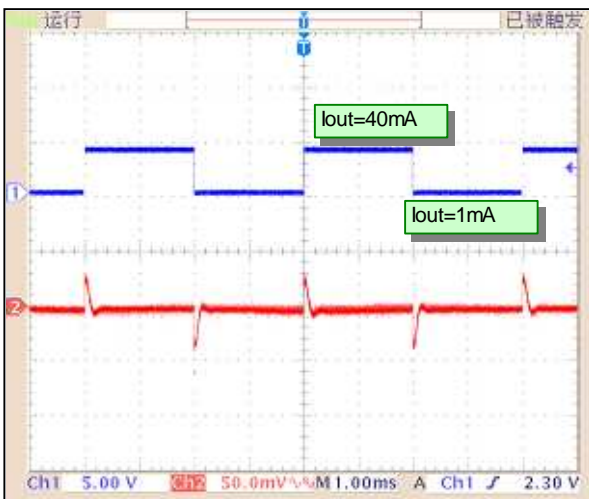
## Input Voltage transient response (Vout=1.5V, Iout=1mA)



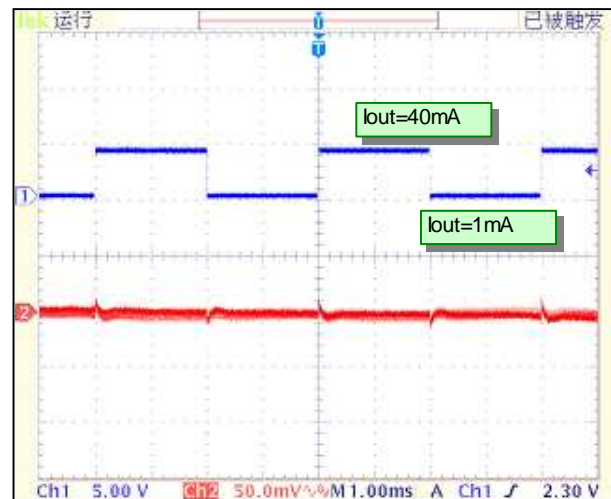
Input Voltage transient response (Vout=3.0V, Iout=1mA)



## 5. Load transient response (Vout=1.5V)



## Load transient response (Vout=3.0V)



## PACKAGE LINE

Package	SOT-23-3	Devices per reel	3000Pcs	Unit	mm
<p>Package dimension:</p> <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 height of the package 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 lead height is <math>0.8</math> mm. The side view shows a maximum height of <math>1.4</math> mm, a lead height of <math>1.1 \pm 0.1</math> mm, and a lead width of <math>0.16 \pm 0.06</math> mm. The lead thickness is <math>0.2</math> mm minimum. The bottom view shows a trapezoidal shape with a width of <math>1.5 \pm 0.1</math> mm and a height of <math>0.42 \pm 0.2</math> mm.</p>					

Package	SOT-89-3	Devices per reel	1000Pcs	Unit	mm
<p>Package Dimension:</p> <p>Technical drawing of the SOT-89-3 package. The top view shows a rectangular body with a width of <math>4.5 \pm 0.1</math> mm and a length of <math>1.6 \pm 0.2</math> mm. The distance between the three leads (1, 2, and 3) is <math>1.5 \pm 0.1</math> mm, with each lead offset by <math>0.42 \pm 0.2</math> mm from the center. The lead width is <math>0.47 \pm 0.1</math> mm. The height of the package is <math>2.5 \pm 0.1</math> mm, and the total height including the lead is <math>4.25</math> mm maximum. The lead height is <math>0.8</math> mm minimum. The side view shows a maximum height of <math>1.5 \pm 0.1</math> mm, a lead height of <math>0.4 \pm 0.1</math> mm, and a lead width of <math>0.4 \pm 0.1</math> mm. The bottom view shows a trapezoidal shape with a width of <math>1.5 \pm 0.1</math> mm and a height of <math>0.42 \pm 0.2</math> mm.</p>					

Package	TO-92	Devices per Bag	1000Pcs	Unit	mm
<p>Package Dimension:</p> <p style="text-align: center;"><b>TO-92</b></p> <p>The technical drawing shows two views of a TO-92 package. The top view is a semi-circle with a diameter of <math>\Phi 1.5 \pm 0.2</math> mm. The width of the top flat portion is 2.54 mm. The total height from the top flat surface to the bottom of the semi-circle is <math>3.5 \pm 0.1</math> mm. The height of the top flat portion is <math>1.25 \pm 0.1</math> mm. The thickness of the top flat portion is 0.38 mm. The side view shows a cylindrical body with a diameter of <math>\Phi 4.5 \pm 0.1</math> mm and a height of <math>4.95 \pm 0.35</math> mm. The distance from the top of the cylindrical body to the top of the leads is 0.46 mm. The leads are spaced 1.5 mm apart. The length of the leads is <math>14.3 \pm 0.1</math> mm. The thickness of the leads is 0.38 mm.</p>					


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