



## *Positive Voltage Regulator*

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### *ML62 Series Specification*

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**ML62 Series**  
**Positive Voltage Regulator**

❖ **Application**

- ◆ Battery Powered Equipment
- ◆ Palmtops
- ◆ Portable Cameras and Video Recorders
- ◆ Reference Voltage Sources

❖ **Features**

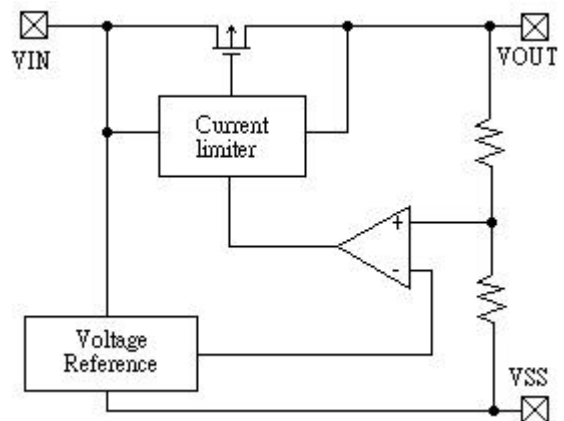
- CMOS Low Power Consumption :  
Typical 3.3uA at Vout=5.0V
- Output Voltage Range : 2.0V to 6.0V in 0.1V increments
- Highly Accurate : Output Voltage  $\pm 2\%$
- Maximum Output Current: 250mA  
(within the maximum power dissipation , Vout=5.0V)
- Small Input-Output Voltage Differential :  
0.12V at 100mA and 0.38V at 200mA
- Input stability : Typ. 0.2%/V
- Package Available :  
SOT- 23 (150mW), SOT- 89 (500mW) & TO- 92 (300mW)

❖ **General Description**

The ML62 is a group of positive voltage output, three-pin regulator which provides high output current even when the input/output voltage differential is small.

The ML62 consists of a high-precision voltage reference, an error correction circuit, and a current limited output driver.

❖ **Block Diagram**



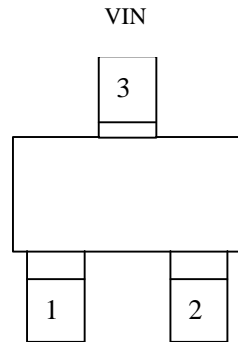
❖ **Absolute Maximum Ratings**

Parameter		Symbol	Ratings	Units
Input Voltage		V <sub>IN</sub>	12	V
Output Current		I <sub>OUT</sub>	500	mA
Output Voltage		V <sub>OUT</sub>	V <sub>SS</sub> -0.3 ~ V <sub>IN</sub> +0.3	V
Continuous Total Power Dissipation	SOT-23	P <sub>d</sub>	150	mW
	SOT-89		500	
	TO-92		300	
Operating Ambient Temperature		T <sub>opr</sub>	-30 ~ +70	°C
Storage Temperature		T <sub>stg</sub>	-30 ~ +70	°C

❖ **Pin Configuration**

SOT-23 :

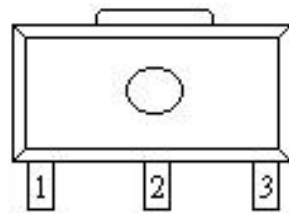
Pin Number	Pin Name	Description
1	VSS	Ground
2	VOUT	Supply Voltage Output
3	VIN	Supply Voltage Input



VSS          VOUT  
SOT-23 (Top View)

SOT-89 :

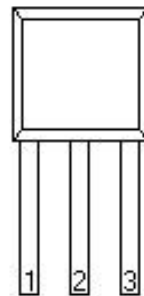
Pin Number	Pin Name	Description
1	VSS	Ground
2	VIN	Supply Voltage Input
3	VOUT	Supply Voltage Output



VSS          VIN          VOUT  
SOT-89 (Top View)

TO-92 :

Pin Number	Pin Name	Description
1	VSS	Ground
2	VIN	Supply Voltage Input
3	VOUT	Supply Voltage Output



VSS    VIN    VOUT  
TO92 (Front View)

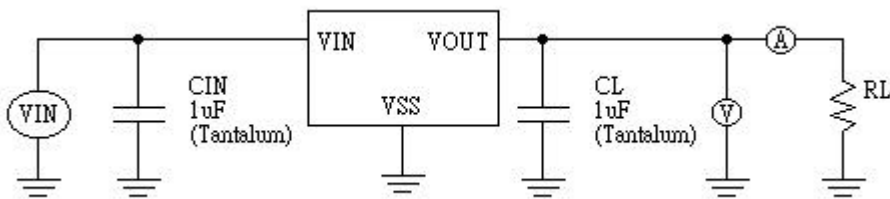
❖ **Standard Circuit**

**Note on Use**

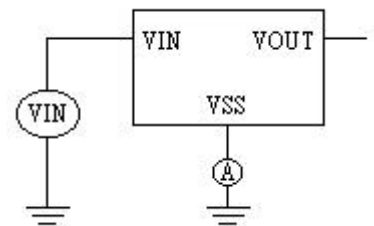
- Oscillation may occur as a result of the impedance present between the power supply and the IC's input. Please use a capacitor (CIN) of at least 1uF, when the impedance is 10 ohm or more.  
With a large output current, Voltage output can be stabilised by increasing capacitor (CIN) size. If CIN is small and capacitor (CL) size is increased, oscillation may occur. In such cases, Voltage output can be stabilised by either increasing the size of CIN or decreasing the size of CL.
- Please ensure that output current (IOUT) is less than  $P_d / (V_{IN} - V_{OUT})$  and does not exceed the stipulated Continuous Total Power Dissipation value (Pd).

❖ **Test Circuit**

**Test Circuit 1**



**Test Circuit 2**



## ❖ Electrical Characteristics

### ML62502 $V_{OUT}(T)=5.0V$ (Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units	Circuit
Output Voltage	$V_{OUT}(E)$ (Note 2)	$I_{OUT}=40mA$ $V_{IN}=6.0V$	4.900	5.000	5.100	V	1
Maximum Output Current	$I_{OUT\ max}$	$V_{IN}=6.0V, V_{OUT}(E) \approx 4.5V$	250			mA	1
Load Stability	$DV_{OUT}$	$V_{IN}=6.0V, 1mA \leq I_{OUT} \leq 100mA$		40	80	mV	1
Input -Output Voltage Differential (Note 3)	$V_{dif1}$	$I_{OUT}=100mA$		120	400	mV	1
	$V_{dif2}$	$I_{OUT}=200mA$		380	750	mV	1
Supply Current	ISS	$V_{IN}=6.0V$		3.3	4.5	$\mu A$	2
Input Stability	$\frac{DV_{OUT}}{DV_{IN} * V_{OUT}}$	$I_{OUT}=40mA$ $6.0V \leq V_{IN} \leq 10.0V$		0.2	0.3	%V	1
Input Voltage	$V_{IN}$				10	V	-

### ML62402 $V_{OUT}(T)=4.0V$ (Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units	Circuit
Output Voltage	$V_{OUT}(E)$ (Note 2)	$I_{OUT}=40mA$ $V_{IN}=5.0V$	3.920	4.000	4.080	V	1
Maximum Output Current	$I_{OUT\ max}$	$V_{IN}=5.0V, V_{OUT}(E) \approx 3.6V$	200			mA	1
Load Stability	$DV_{OUT}$	$V_{IN}=5.0V, 1mA \leq I_{OUT} \leq 100mA$		45	90	mV	1
Input -Output Voltage Differential (Note 3)	$V_{dif1}$	$I_{OUT}=90mA$		170	400	mV	1
	$V_{dif2}$	$I_{OUT}=180mA$		400	750	mV	1
Supply Current	ISS	$V_{IN}=5.0V$		3.0	4.5	$\mu A$	2
Input Stability	$\frac{DV_{OUT}}{DV_{IN} * V_{OUT}}$	$I_{OUT}=40mA$ $5.0V \leq V_{IN} \leq 10.0V$		0.2	0.3	%V	1
Input Voltage	$V_{IN}$				10	V	-

### ML62302 $V_{OUT}(T)=3.0V$ (Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units	Circuit
Output Voltage	$V_{OUT}(E)$ (Note 2)	$I_{OUT}=40mA$ $V_{IN}=4.0V$	2.940	3.000	3.060	V	1
Maximum Output Current	$I_{OUT\ max}$	$V_{IN}=4.0V, V_{OUT}(E) \approx 2.7V$	150			mA	1
Load Stability	$DV_{OUT}$	$V_{IN}=4.0V, 1mA \leq I_{OUT} \leq 80mA$		45	90	mV	1
Input -Output Voltage Differential (Note 3)	$V_{dif1}$	$I_{OUT}=80mA$		180	450	mV	1
	$V_{dif2}$	$I_{OUT}=150mA$		400	850	mV	1
Supply Current	ISS	$V_{IN}=4.0V$		2.8	4.5	$\mu A$	2
Input Stability	$\frac{DV_{OUT}}{DV_{IN} * V_{OUT}}$	$I_{OUT}=40mA$ $4.0V \leq V_{IN} \leq 10.0V$		0.2	0.3	%V	1
Input Voltage	$V_{IN}$				10	V	-

### ML62202 $V_{OUT}(T)=2.0V$ (Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units	Circuit
Output Voltage	$V_{OUT}(E)$ (Note 2)	$I_{OUT}=40mA$ $V_{IN}=3.0V$	1.960	2.000	2.040	V	1
Maximum Output Current	$I_{OUT\ max}$	$V_{IN}=3.0V, V_{OUT}(E) \approx 1.8V$	100			mA	1
Load Stability	$DV_{OUT}$	$V_{IN}=3.0V, 1mA \leq I_{OUT} \leq 60mA$		45	90	mV	1
Input -Output Voltage Differential (Note 3)	$V_{dif1}$	$I_{OUT}=60mA$		180	450	mV	1
	$V_{dif2}$	$I_{OUT}=100mA$		400	850	mV	1
Supply Current	ISS	$V_{IN}=3.0V$		2.5	4.5	$\mu A$	2
Input Stability	$\frac{DV_{OUT}}{DV_{IN} * V_{OUT}}$	$I_{OUT}=40mA$ $3.0V \leq V_{IN} \leq 10.0V$		0.2	0.3	%V	1
Input Voltage	$V_{IN}$				10	V	-

- Note :
1.  $V_{OUT}(T)$  = Specified Output Voltage.
  2.  $V_{OUT}(E)$  = Effective Output Voltage (i.e. the output voltage when  $(V_{OUT}(T)+1.0V)$  is provided at the  $V_{IN}$  pin while maintaining a certain  $I_{OUT}$  value).
  3.  $V_{dif} = V_{IN1}(\text{Note 4}) - V_{OUT}(E)$
  4.  $V_{IN1}$  = The input voltage at the time 98% of  $V_{OUT}(E)$  is output (input voltage has been gradually reduced).

### ❖ Electrical Characteristics by Output Voltage

Part Number	Output voltage				Max Output Current		Load Stability			I-O Voltage Differential		
	V <sub>OUT</sub> (V)				I <sub>OUT max</sub> (mA)		D V <sub>OUT</sub> (mV)			V <sub>difl</sub> (mV)		
	Conditions	MIN.	TYP.	MAX.	Conditions	MIN.	Conditions	TYP.	MAX.	Conditions	TYP.	MAX.
ML62202	I <sub>OUT</sub> =40mA V <sub>IN</sub> =V <sub>OUT</sub> (T)+1V	1.960	2.000	2.040	V <sub>IN</sub> =V <sub>OUT</sub> (T)+1V V <sub>OUT</sub> (E)≥ V <sub>OUT</sub> (T)*0.9	100	V <sub>IN</sub> =V <sub>OUT</sub> (T)+1V 1mA≤I <sub>OUT</sub> ≤60mA	45	90	I <sub>OUT</sub> =60mA	180	450
ML62212												
ML62222												
ML62232												
ML62242												
ML62252												
ML62262												
ML62272												
ML62282												
ML62292												
ML62302												
ML62312												
ML62322												
ML62332												
ML62342												
ML62352												
ML62362												
ML62372												
ML62382												
ML62392												
ML62402												
ML62412												
ML62422												
ML62432												
ML62442												
ML62452												
ML62462												
ML62472												
ML62482												
ML62492												
ML62502												
ML62512												
ML62522												
ML62532												
ML62542												
ML62552												
ML62562												
ML62572												
ML62582												
ML62592												
ML62602												
						150	V <sub>IN</sub> =V <sub>OUT</sub> (T)+1V 1mA≤I <sub>OUT</sub> ≤80mA	45	90	I <sub>OUT</sub> =80mA	180	450
						200	V <sub>IN</sub> =V <sub>OUT</sub> (T)+1V 1mA≤I <sub>OUT</sub> ≤100mA	45	90	I <sub>OUT</sub> =90mA	170	400
						250	V <sub>IN</sub> =V <sub>OUT</sub> +1V 1mA≤I <sub>OUT</sub> ≤100mA	40	80	I <sub>OUT</sub> =100mA	120	400

Part Number	I-O Voltage Differential			Supply Current			Input Stability			Input Voltage
	V <sub>diff2</sub> (mV)			I <sub>SS</sub> (uA)			D V <sub>OUT</sub> /(D V <sub>IN</sub> *V <sub>OUT</sub> ) (%V)			V <sub>IN</sub> (V)
	Conditions	TYP.	MAX.	Conditions	TYP.	MAX.	Conditions	TYP.	MAX.	MAX.
ML62202	I <sub>OUT</sub> =100mA	400	850	V <sub>IN</sub> =V <sub>OUT</sub> (T)+1V	2.5	4.5	I <sub>OUT</sub> =40mA V <sub>OUT</sub> (T)+1V ≤ V <sub>IN</sub> ≤ 10V	0.2	0.3	10
ML62212										
ML62222										
ML62232										
ML62242										
ML62252										
ML62262										
ML62272										
ML62282										
ML62292										
ML62302	I <sub>OUT</sub> =150mA	400	850	V <sub>IN</sub> =V <sub>OUT</sub> (T)+1V	2.8	4.5	I <sub>OUT</sub> =40mA V <sub>OUT</sub> (T)+1V ≤ V <sub>IN</sub> ≤ 10V	0.2	0.3	10
ML62312										
ML62322										
ML62332										
ML62342										
ML62352										
ML62362										
ML62372										
ML62382	I <sub>OUT</sub> =180mA	400	750	V <sub>IN</sub> =V <sub>OUT</sub> (T)+1V	3.0	4.5	I <sub>OUT</sub> =40mA V <sub>OUT</sub> (T)+1V ≤ V <sub>IN</sub> ≤ 10V	0.2	0.3	10
ML62392										
ML62402										
ML62412										
ML62422										
ML62432										
ML62442										
ML62452										
ML62462										
ML62472										
ML62482	I <sub>OUT</sub> =200mA	380	750	V <sub>IN</sub> =V <sub>OUT</sub> (T)+1V	3.3	4.5	I <sub>OUT</sub> =40mA V <sub>OUT</sub> (T)+1V ≤ V <sub>IN</sub> ≤ 10V	0.2	0.3	10
ML62492										
ML62502										
ML62512										
ML62522										
ML62532										
ML62542										
ML62552										
ML62562										
ML62572										
ML62582										
ML62592										
ML62602										

❖ **Ordering Information**

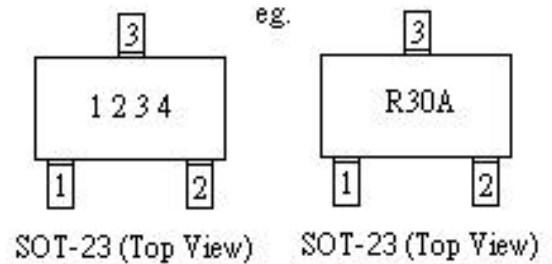
Designator	Description
a	<b>Output Voltage</b> eg. 30=3.0V 50=5.0V
b	<b>Output Voltage Accuracy</b> 2 = ± 2.0%
c	<b>Package Type</b> M = SOT-23 P = SOT-89 T = TO-92
d	<b>Device Orientation</b> R = Embossed Tape (Orientation of Device : Right) L = Embossed Tape (Orientation of Device : Left) B = Bag (TO-92) H = Paper Tape (TO-92)

ML620000x  
 ††††  
 a bcd

❖ **Marking**

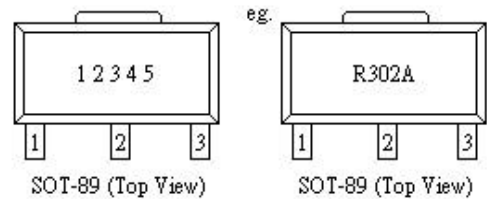
**SOT-23 :**

Designator	Description
1	<b>Type</b> R = Positive Voltage Regulator
2,3	<b>Output Voltage</b> eg. 30 = 3.0V
4	<b>Internal Code</b>



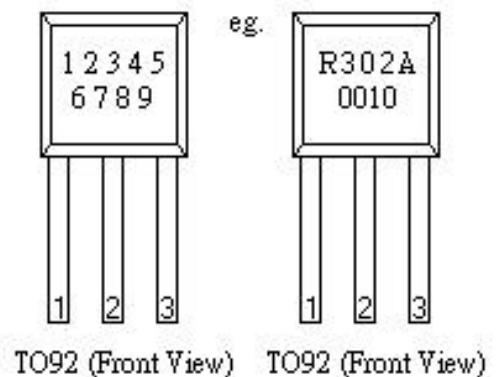
**SOT-89 :**

Designator	Description
1	<b>Type</b> R = Positive Voltage Regulator
2,3	<b>Output Voltage</b> eg. 30 = 3.0V
4	<b>Output Voltage Accuracy</b> 2 = ± 2.0%
5	<b>Internal Code</b>



**TO-92 :**

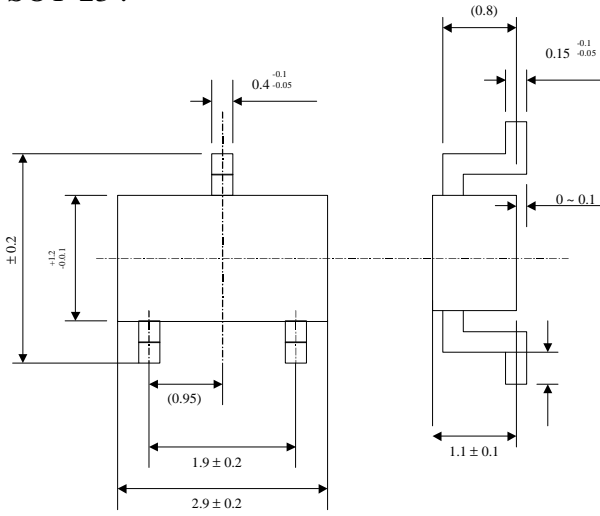
Designator	Description
1	<b>Type</b> R = Positive Voltage Regulator
2,3	<b>Output Voltage</b> eg. 30 = 3.0V
4	<b>Output Voltage Accuracy</b> 2 = ± 2.0%
5	<b>Internal code</b>
6, 7	<b>Year Code</b> eg. 00 = Year 2000
8, 9	<b>Week Code</b> eg. 10 = Week 10



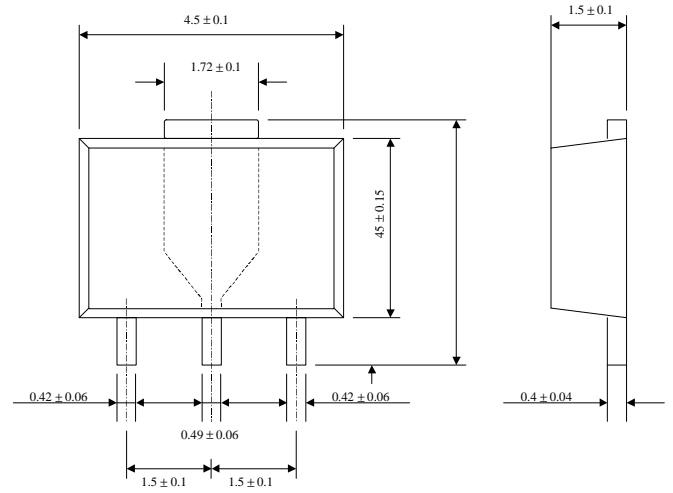


❖ **Packaging Information**

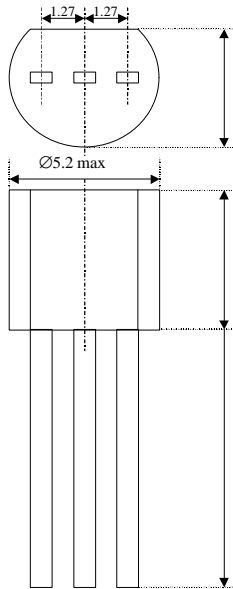
SOT-23 :



SOT-89 :



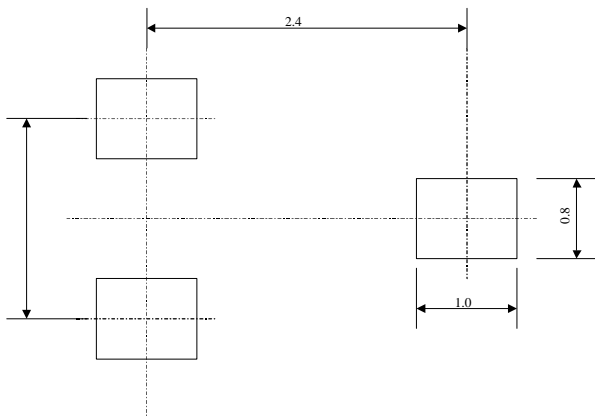
TO-92 :



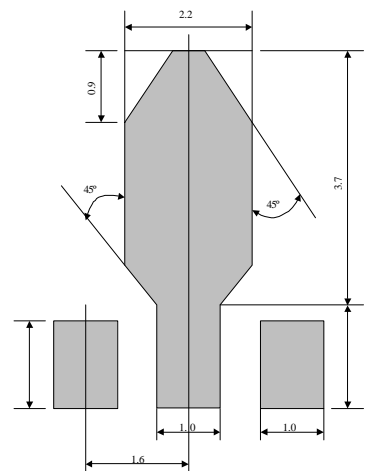
Units : mm

❖ **Recommended Pattern Layout**

SOT-23 :

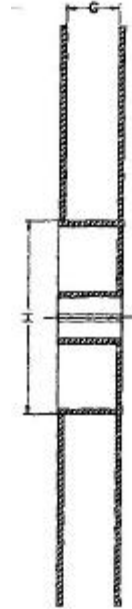
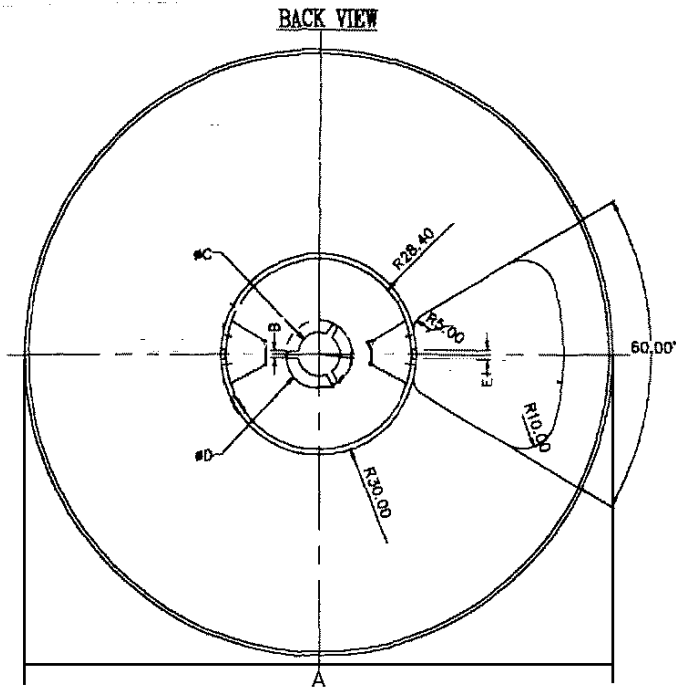


SOT-89 :



❖ **Tape and Reel Information**

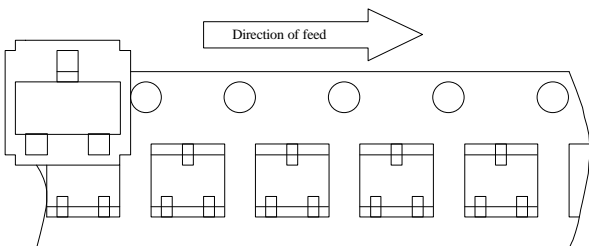
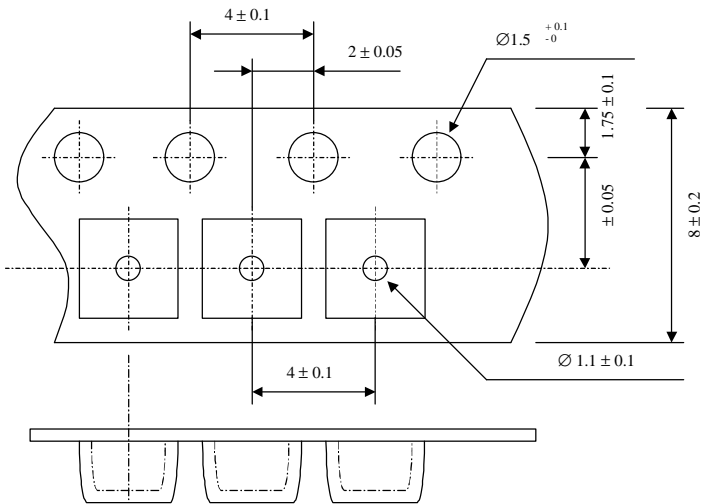
SOT-23 :



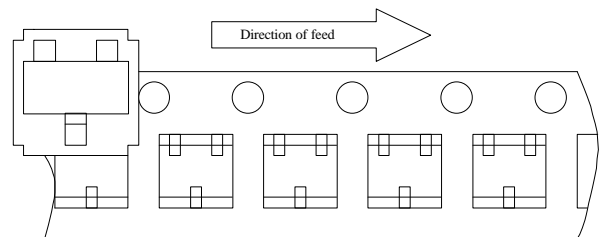
	SIZE (mm)
A	∅ 178 ± 0.8
B	2 ± 0.2
C	∅ 13 ± 0.2
D	∅ 21 ± 0.8
G	8 ± 0.5
H	∅ 60

3,000 pcs / reel

SOT-23 Taping Specifications :

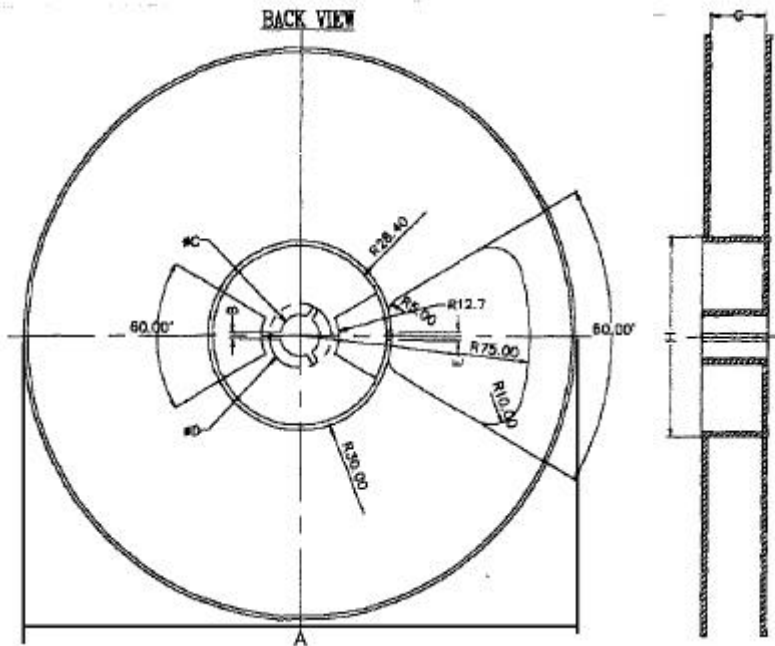


"R" type [Orientation of Device: Right]  
Standard Type



"L" type [Orientation of Device: Left]  
Reverse Type

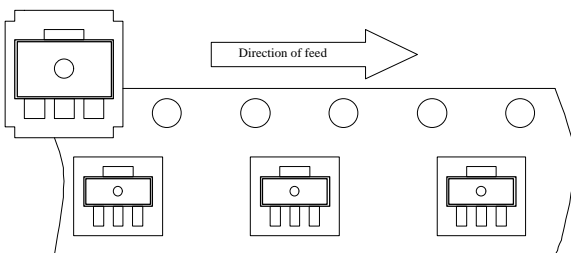
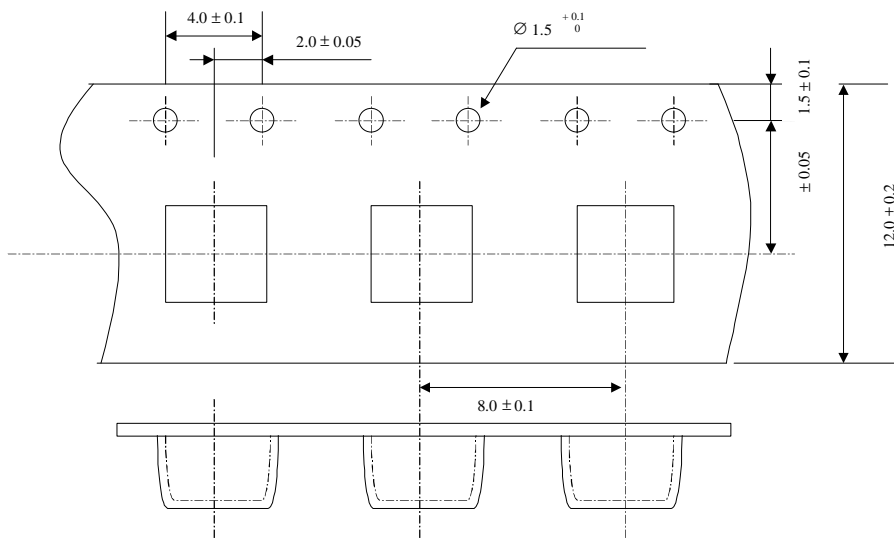
SOT-89 :



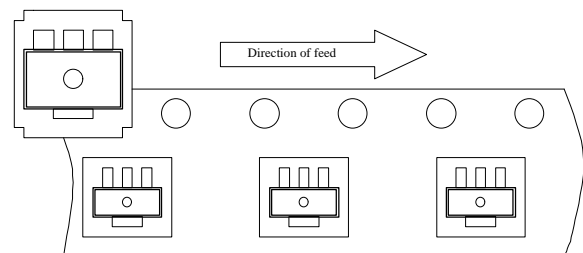
	SIZE (mm)
A	∅ 178 ± 0.8
B	2 ± 0.2
C	∅ 13 ± 0.2
D	∅ 21 ± 0.8
G	12 ± 0.5
H	∅ 60

1,000 pcs / reel

SOT-89 Taping Specifications :

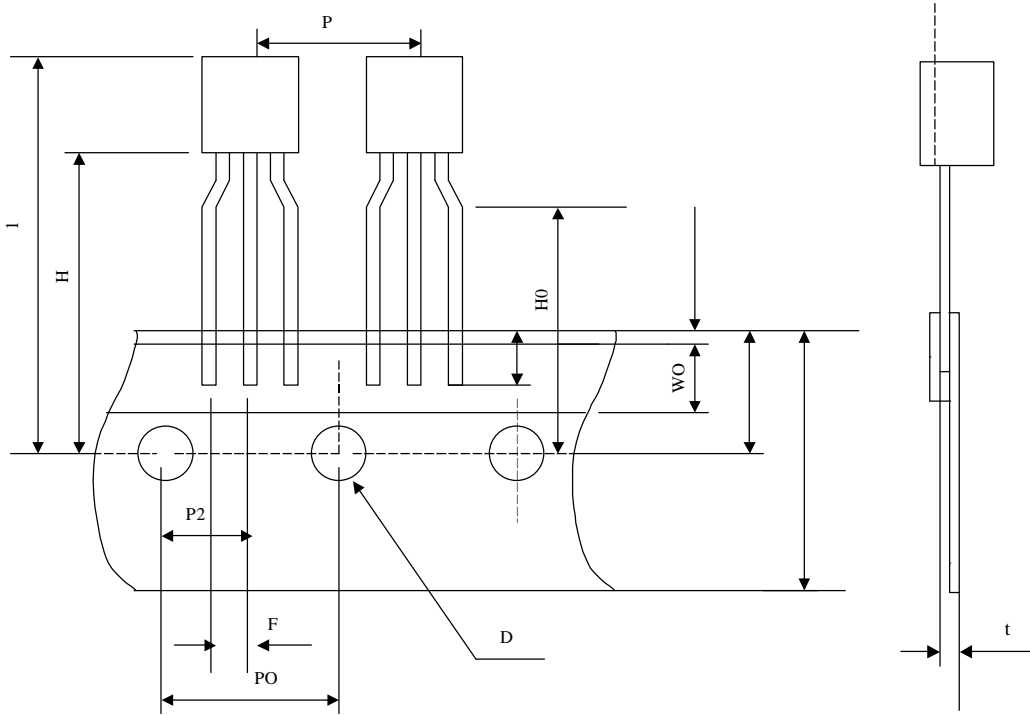


"R" type [Orientation of Device: Right]  
Standard Type



"L" type [Orientation of Device: Left]  
Reverse Type

TO-92 Taping Specifications :



	SIZE (mm)
P	12.7 ± 1.0
PO	12.7 ± 0.3
P2	6.35 ± 0.4
F	2.5 <sup>+0.45</sup> <sub>-0.15</sub>
W	18.0 ± 1.0
WO	6.0 ± 0.3
W1	9.0 ± 0.5
W2	0.5 MAX
H	19.0 ± 0.5
H0	16.0 ± 0.5
H1	32.25 MAX
D	∅ 4.0 ± 0.2
t	0.6 ± 0.2
L1	3.5 MIN

2,000 pcs / box

❖ *History of Revision*

<b>REV</b>	<b>DESCRIPTION</b>	<b>DATE</b>
	First Official Specification	04/04/01
A	SOT-23, SOT-89 & TO-92 Package and packing description added. Operating and Storage Temperature modified.	23/10/01
B	Absolute Maximum Input Rating of Input Voltage increased from 10V to 12V.	02/08/02