

Positive Voltage Regulator

ML62 Series Specification

ML62 Series
Positive Voltage Regulator

❖ **Application**

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

❖ **Features**

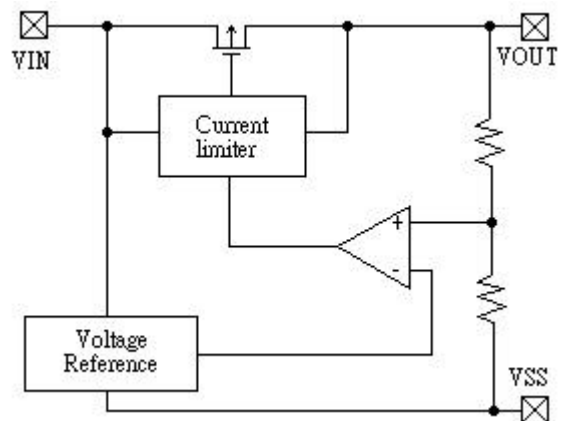
- CMOS Low Power Consumption :
Typical 3.3uA at $V_{out}=5.0V$
- Output Voltage Range : 2.0V to 6.0V in 0.1V increments
- Highly Accurate : Output Voltage $\pm 2\%$
- Maximum Output Current: 250mA
(within the maximum power dissipation , $V_{out}=5.0V$)
- Small Input-Output Voltage Differential :
0.12V 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**



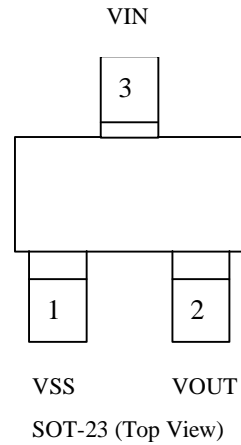
❖ **Absolute Maximum Ratings**

Parameter		Symbol	Ratings	Units
Input Voltage		V_{IN}	12	V
Output Current		I_{OUT}	500	mA
Output Voltage		V_{OUT}	$V_{SS}-0.3 \sim V_{IN}+0.3$	V
Continuous Total Power Dissipation	SOT-23	P_d	150	mW
	SOT-89		500	
	TO-92		300	
Operating Ambient Temperature		T_{opr}	-30 ~ +70	°C
Storage Temperature		T_{stg}	-30 ~ +70	°C

❖ **Pin Configuration**

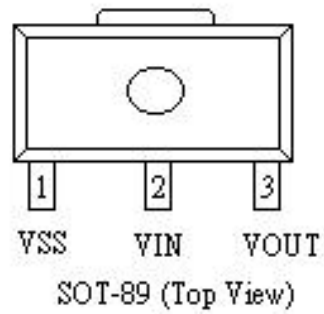
SOT-23 :

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



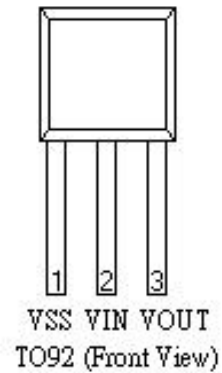
SOT-89 :

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



TO-92 :

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



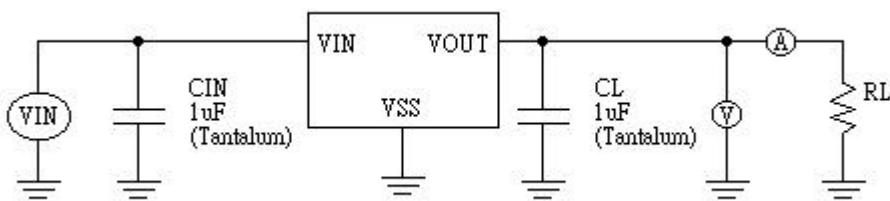
❖ **Standard Circuit**

Note on Use

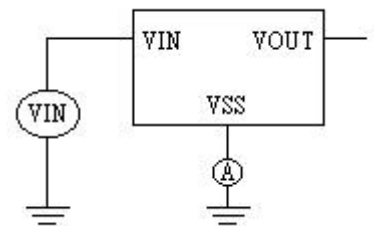
- Oscillation may occur as a result of the impedance present between the power supply and the IC's input. Please use a capacitor (CIN) of at least 1uF, when the impedance is 10 ohm or more.
With a large output current, Voltage output can be stabilised by increasing capacitor (CIN) size. If CIN is small 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	uA	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	uA	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	uA	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	uA	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 _{OUT} (V)				I _{OUT max} (mA)		D V _{OUT} (mV)			V _{difl} (mV)							
	Conditions	MIN.	TYP.	MAX.	Conditions	MIN.	Conditions	TYP.	MAX.	Conditions	TYP.	MAX.					
ML62202	I _{OUT} =40mA V _{IN} =V _{OUT} (T)+1V	1.960	2.000	2.040	V _{IN} =V _{OUT} (T)+1V V _{OUT} (E)≥ V _{OUT} (T)*0.9	100	V _{IN} =V _{OUT} (T)+1V 1mA≤I _{OUT} ≤60mA	45	90	I _{OUT} =60mA	180	450					
ML62212																	
ML62222																	
ML62232																	
ML62242																	
ML62252																	
ML62262																	
ML62272																	
ML62282																	
ML62292																	
ML62302																	
ML62312																	
ML62322																	
ML62332																	
ML62342																	
ML62352		150	3.430	3.500		3.570	V _{IN} =V _{OUT} (T)+1V 1mA≤I _{OUT} ≤80mA	45	90	I _{OUT} =80mA	180	450					
ML62362																	
ML62372																	
ML62382																	
ML62392																	
ML62402																	
ML62412																	
ML62422																	
ML62432																	
ML62442																	
ML62452																	
ML62462																	
ML62472																	
ML62482																	
ML62492																	
ML62502		200	4.900	5.000		5.100	V _{IN} =V _{OUT} (T)+1V 1mA≤I _{OUT} ≤100mA	45	90	I _{OUT} =90mA	170	400					
ML62512																	
ML62522																	
ML62532																	
ML62542																	
ML62552																	
ML62562																	
ML62572																	
ML62582																	
ML62592																	
ML62602																	
ML62512	250		4.998	5.100	5.202	V _{IN} =V _{OUT} +1V 1mA≤I _{OUT} ≤100mA							40	80	I _{OUT} =100mA	120	400
ML62522																	
ML62532																	
ML62542																	
ML62552																	
ML62562																	
ML62572																	
ML62582																	
ML62592																	
ML62602																	

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

❖ **Ordering Information**

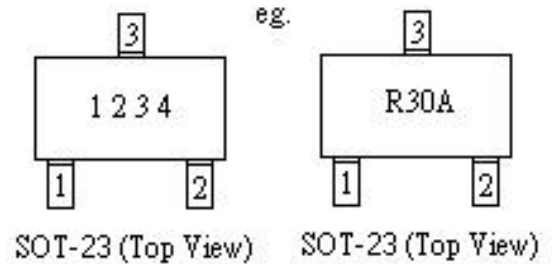
Designator	Description
a	Output Voltage eg. 30=3.0V 50=5.0V
b	Output Voltage Accuracy 2 = ± 2.0%
c	Package Type M = SOT-23 P = SOT-89 T = TO-92
d	Device Orientation R = Embossed Tape (Orientation of Device : Right) L = Embossed Tape (Orientation of Device : Left) B = Bag (TO-92) H = Paper Tape (TO-92)

ML620000x
 ††††
 a bcd

❖ **Marking**

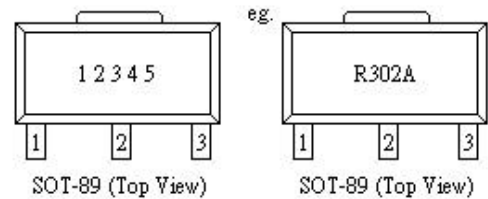
SOT-23 :

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



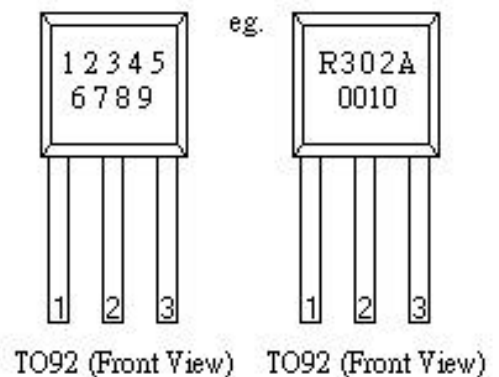
SOT-89 :

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



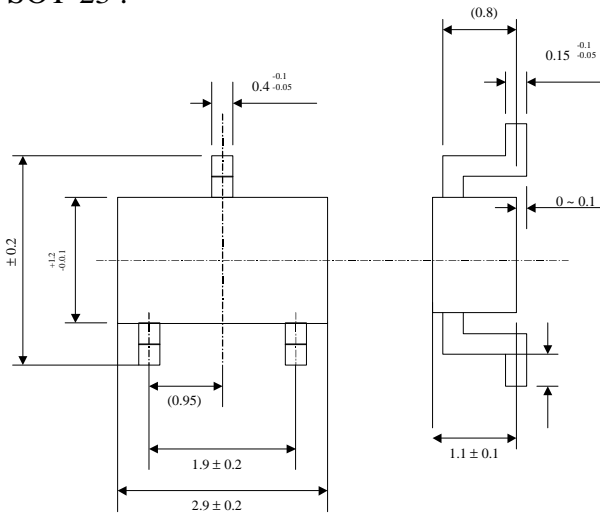
TO-92 :

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

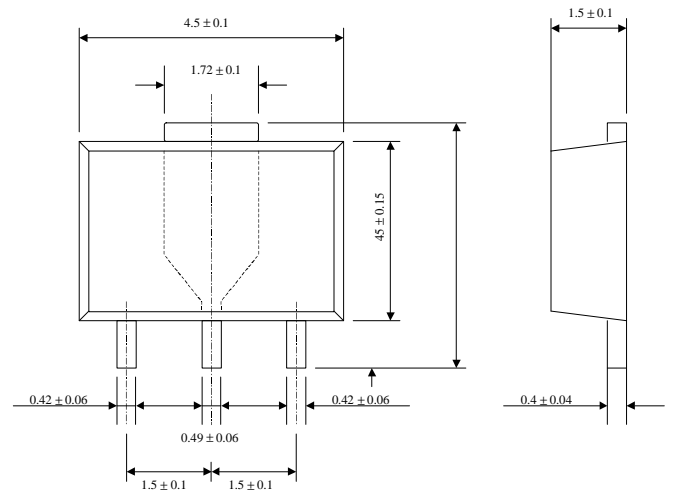


❖ **Packaging Information**

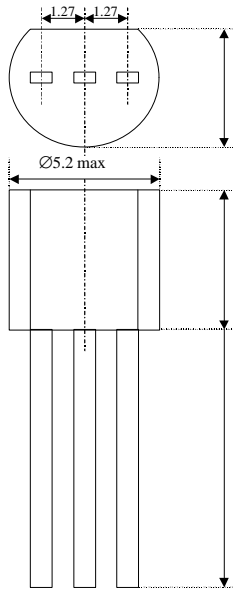
SOT-23 :



SOT-89 :



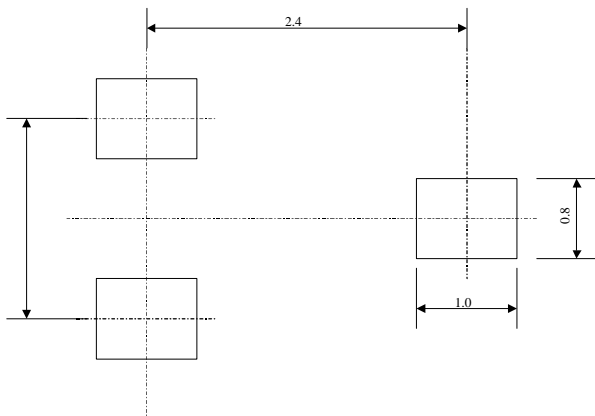
TO-92 :



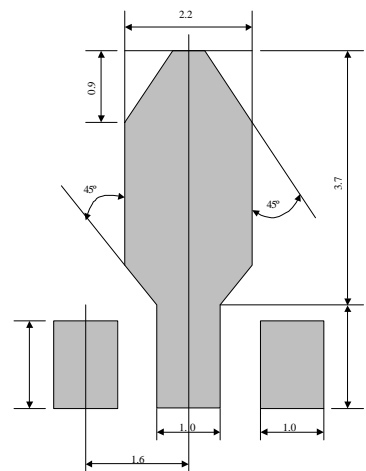
Units : mm

❖ **Recommended Pattern Layout**

SOT-23 :

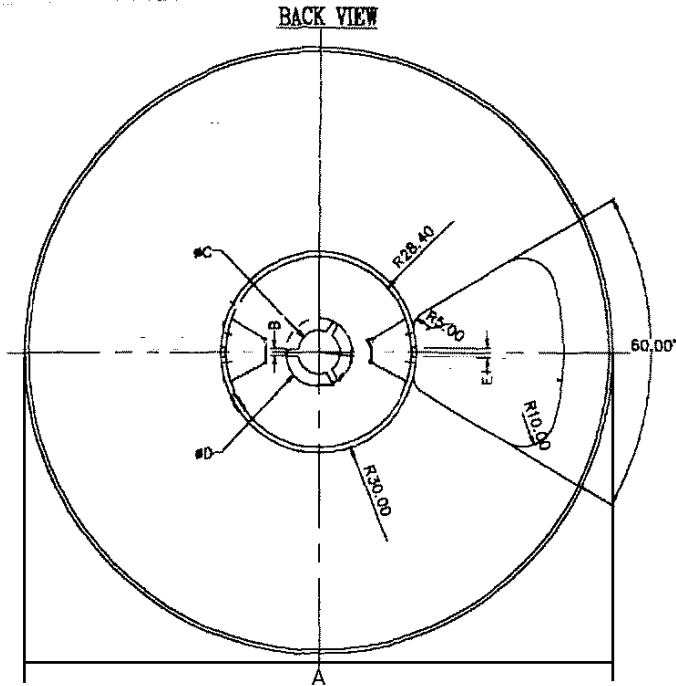


SOT-89 :



❖ **Tape and Reel Information**

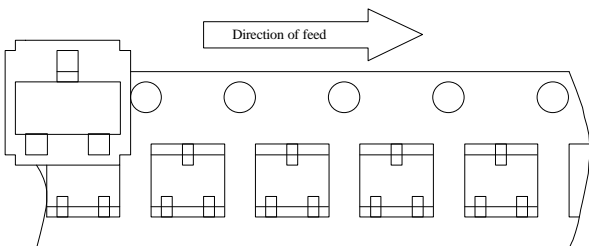
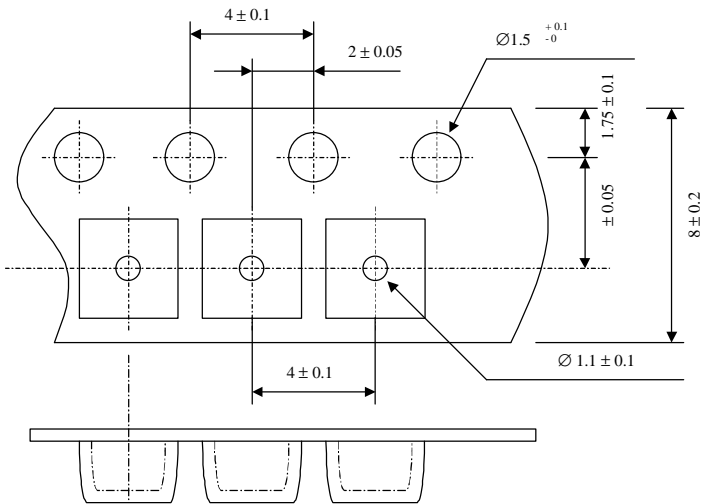
SOT-23 :



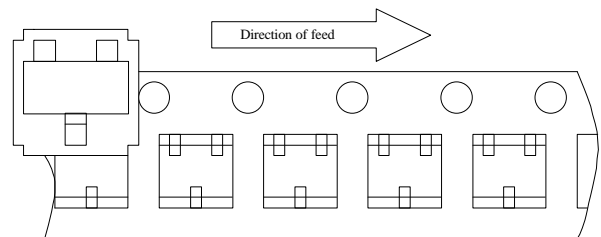
	SIZE (mm)
A	∅ 178 ± 0.8
B	2 ± 0.2
C	∅ 13 ± 0.2
D	∅ 21 ± 0.8
G	8 ± 0.5
H	∅ 60

3,000 pcs / reel

SOT-23 Taping Specifications :

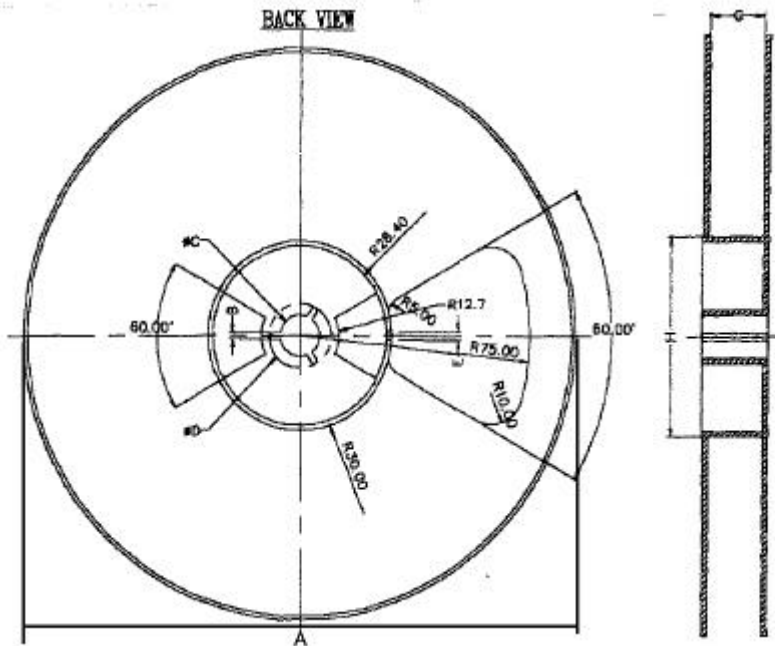


"R" type [Orientation of Device: Right]
Standard Type



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

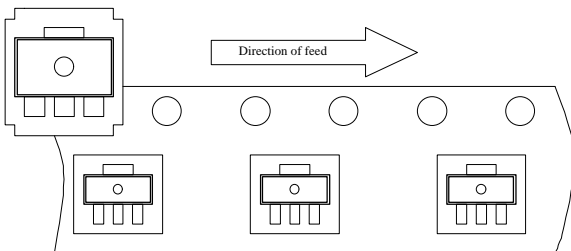
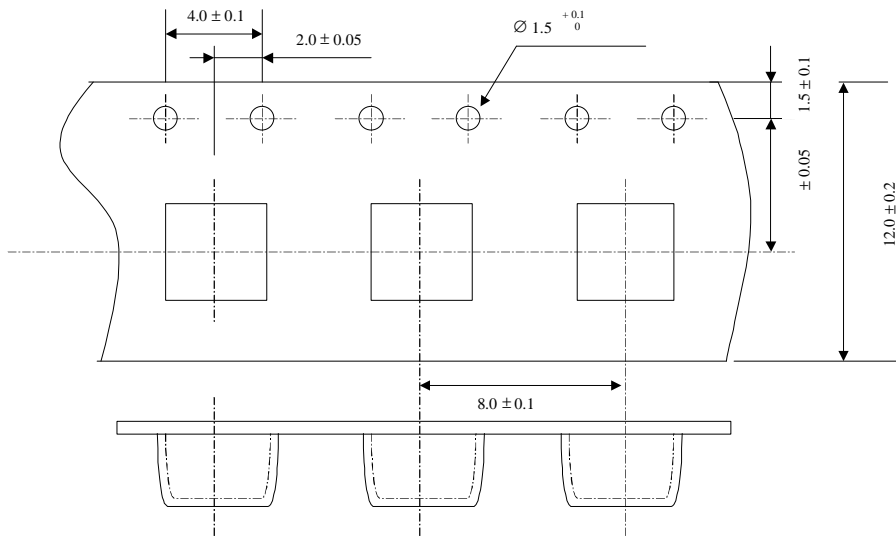
SOT-89 :



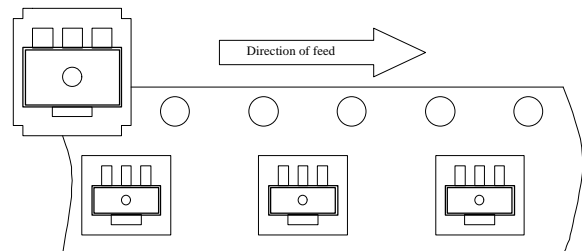
	SIZE (mm)
A	$\varnothing 178 \pm 0.8$
B	2 ± 0.2
C	$\varnothing 13 \pm 0.2$
D	$\varnothing 21 \pm 0.8$
G	12 ± 0.5
H	$\varnothing 60$

1,000 pcs / reel

SOT-89 Taping Specifications :

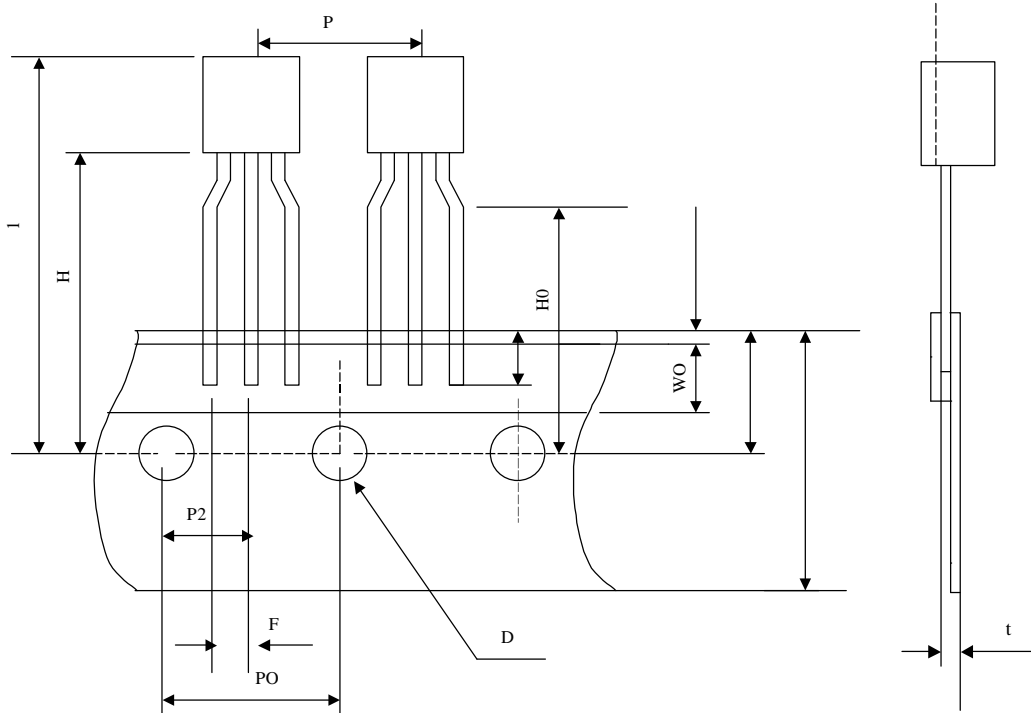


"R" type [Orientation of Device: Right]
Standard Type



"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 ^{+0.45} _{-0.15}
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*

REV	DESCRIPTION	DATE
	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