

## ML6102 Series Positive Voltage Detector (Inverted Output)

### ❖ Application

- ◆ Memory Battery Back-up Circuits
- ◆ Power Failure Detection
- ◆ Power-on Reset Circuit
- ◆ System Battery Life and Charge Voltage Monitor

### ❖ Features

- CMOS Low Power Consumption : Typical 1.0uA at  $V_{in}=2.0V$
- Selectable Detect Voltage : 1.1V to 6.0V in 0.1V increments
- Highly Accurate : Detect Voltage 1.1V to 1.9V  $\pm 3\%$   
Detect Voltage 2.0V to 6.0V  $\pm 2\%$
- Operating Voltage : 0.8V to 10.0V
- Package Available : SOT23 (150mW), SOT89 (500mW) & TO92 (300mW)

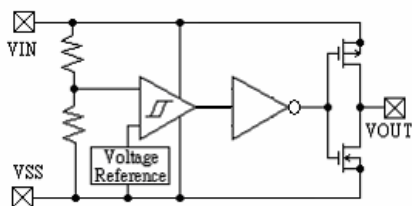
### ❖ General Description

The ML6102 is a group of high-precision and low-power voltage detectors.

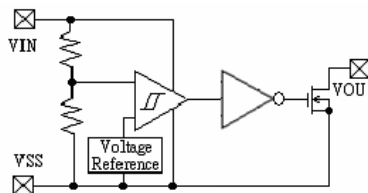
The ML6102 consists of a highly-accurate and low-power reference voltage source, a comparator, a hysteresis circuit, and an output driver. Detect voltage is very accurate and stable with N-channel open drain and CMOS, are available. Output Voltage is in inverted sense compared with ML61 series voltage detector.

### ❖ Block Diagram

(1) CMOS Output



(2) N-Channel Open Drain Output



### ❖ Absolute Maximum Ratings

Parameter	Symbol	Ratings	Units
Input Voltage	$V_{IN}$	10	V
Output Current	$I_{OUT}$	50	mA
Output Voltage	$V_{OUT}$	$V_{SS}-0.3 \sim V_{IN}+0.3$	V
Continuous Total Power Dissipation	$P_d$	SOT-23	150
		SOT-89	500
		TO-92	300
Operating Ambient Temperature	$T_{opr}$	-40 ~ +70	$^{\circ}C$
Storage Temperature	$T_{stg}$	-40 ~ +70	$^{\circ}C$

**❖ Electrical Characteristics**

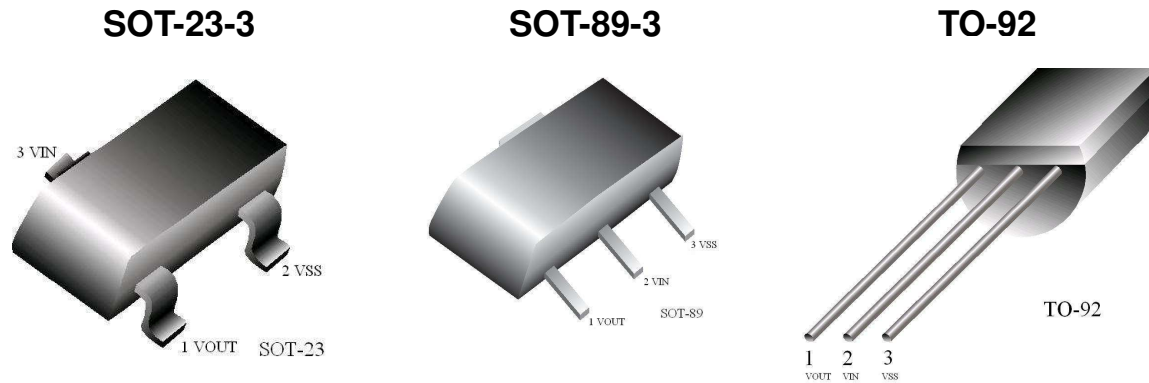
<i>Parameter</i>	<i>Symbol</i>	<i>Conditions</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Units</i>
<i>Detect Voltage</i>	$V_{DF}$	$V_{DF} = 1.1V \text{ to } 1.9V$	X0.97	$V_{DF}$	X1.03	V
		$V_{DF} = 2.0V \text{ to } 7.0V$	X0.98	$V_{DF}$	X1.02	V
<i>Hysteresis Range</i>	$V_{HYS}$	$V_{DF} = 1.1V \text{ to } 2.9V$	X0.04	$V_{DF} \times 0.05$	X0.06	V
		$V_{DF} = 3.0V \text{ to } 7.0V$	X0.015	$V_{DF} \times 0.025$	X0.035	V
<i>Supply Current</i>	$I_{SS}$	$V_{IN} = 1.0V$		0.8	2.0	uA
		$V_{IN} = 2.0V$		1.0	2.5	
		$V_{IN} = 3.0V$		1.3	3.0	
		$V_{IN} = 4.0V$		1.6	3.5	
		$V_{IN} = 5.0V$		2.0	4.0	
<i>Operating Voltage</i>	$V_{IN}$	$V_{DF} = 1.1 \sim 7.0V$	0.8		10.0	V
<i>Output Current</i>	$I_{OUT}$	<i>Nch</i>	$V_{DS} = 0.5V$		1.0	mA
			$V_{IN} = 1.0V$		3.0	
			$V_{IN} = 2.0V$		5.0	
			$V_{IN} = 3.0V$		11.0	
			$V_{IN} = 4.0V$		13.0	
			$V_{IN} = 5.0V$			
	<i>Pch</i>		$V_{DS} = 1.0V$		-5.0	
		$V_{IN} = 5.0V$				
		(CMOS Output)				
<i>Transient Delay Time</i> ( $V_{DR} \rightarrow V_{OUT}$ Inversion)	$t_{DLY}$	<i>While <math>V_{IN}</math> changes from 0.6V to 10V</i>			0.2	ms

**❖ Electrical Characteristics By Detector Threshold**

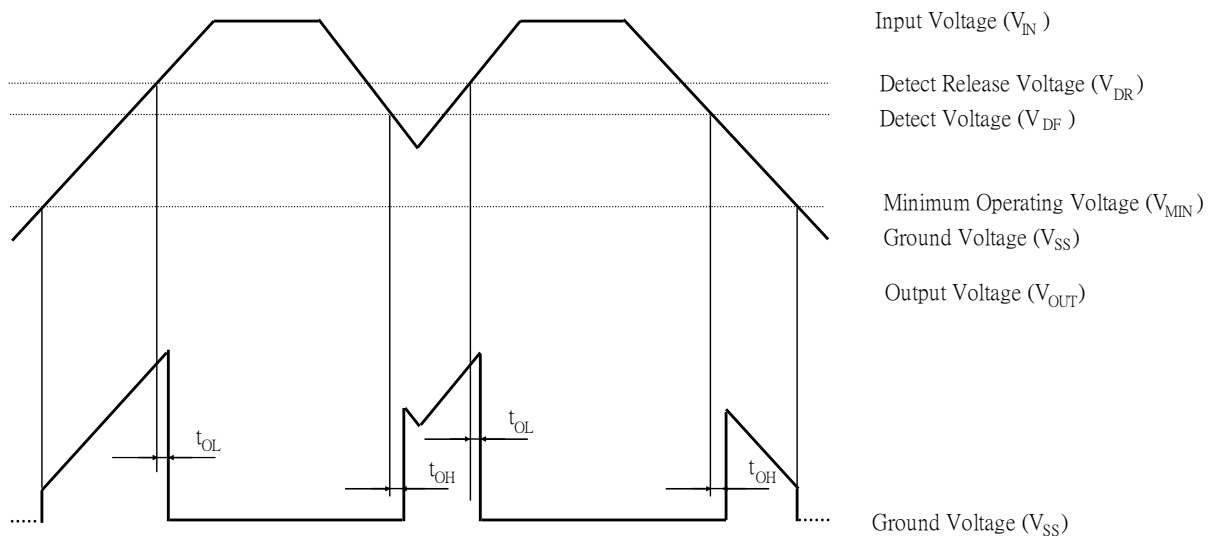
Part Number	Standard Detector Accuracy	Detector Threshold			Hysteresis Range		Supply Current		
		V <sub>DF</sub> (V)			V <sub>HYS</sub> (V)		I <sub>SS</sub> (uA)		
		MIN.	TYP.	MAX.	MIN.	MAX.	Condition	TYP.	MAX.
ML6102X113XX	3%	1.067	1.100	1.133	V <sub>DF</sub> x 0.04	V <sub>DF</sub> x 0.06	V <sub>IN</sub> = 1.0V	0.8	2.0
ML6102X123XX									
ML6102X133XX									
ML6102X143XX									
ML6102X153XX									
ML6102X163XX									
ML6102X173XX									
ML6102X183XX									
ML6102X193XX									
ML6102X202XX									
ML6102X212XX	2%	2.058	2.100	2.142	V <sub>DF</sub> x 0.015	V <sub>DF</sub> x 0.035	V <sub>IN</sub> = 2.0V	1.0	2.5
ML6102X222XX									
ML6102X232XX									
ML6102X242XX									
ML6102X252XX									
ML6102X262XX									
ML6102X272XX									
ML6102X282XX									
ML6102X292XX									
ML6102X302XX									
ML6102X312XX									
ML6102X322XX									
ML6102X332XX									
ML6102X342XX									
ML6102X352XX									
ML6102X362XX									
ML6102X372XX									
ML6102X382XX									
ML6102X392XX									
ML6102X402XX									
ML6102X412XX									
ML6102X422XX									
ML6102X432XX									
ML6102X442XX									
ML6102X452XX									
ML6102X462XX									
ML6102X472XX									
ML6102X482XX									
ML6102X492XX									
ML6102X502XX									
ML6102X512XX									
ML6102X522XX									
ML6102X532XX									
ML6102X542XX									
ML6102X552XX									
ML6102X562XX									
ML6102X572XX									
ML6102X582XX									
ML6102X592XX									
ML6102X602XX									
		5.880	6.000	6.120			V <sub>IN</sub> = 3.0V	1.3	3.0
							V <sub>IN</sub> = 4.0V	1.6	3.5
							V <sub>IN</sub> = 5.0V	2.0	4.0

Part Number	Operating Voltage		Pch Output Current		Nch Output Current		Transient Delay Time
	$V_{IN}$ (V)		Pch $I_{OUT}$ (mA)		Nch $I_{OUT}$ (mA)		$t_{DLY}$ (ms)
	MIN.	MAX.	Condition	TYP.	Condition	TYP.	MAX.
ML6102X113XX	0.8V	10V	$V_{DS} = 1.0V$ $V_{IN} = 5.0V$	-5.0	$V_{DS} = 0.5V$ $V_{IN} = 1.0V$	1.0	0.2
ML6102X123XX							
ML6102X133XX							
ML6102X143XX							
ML6102X153XX							
ML6102X163XX							
ML6102X173XX							
ML6102X183XX							
ML6102X193XX							
ML6102X202XX							
ML6102X212XX							
ML6102X222XX							
ML6102X232XX							
ML6102X242XX							
ML6102X252XX							
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ML6102X272XX							
ML6102X282XX							
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ML6102X302XX							
ML6102X312XX							
ML6102X322XX							
ML6102X332XX							
ML6102X342XX							
ML6102X352XX							
ML6102X362XX							
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ML6102X482XX							
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ML6102X502XX							
ML6102X512XX							
ML6102X522XX							
ML6102X532XX							
ML6102X542XX							
ML6102X552XX							
ML6102X562XX							
ML6102X572XX							
ML6102X582XX							
ML6102X592XX							
ML6102X602XX							

❖ *Pin Configuration*



Package Pin Number			Pin Name	Function
SOT-23-3	SOT-89-3	TO-92		
1	1	1	VOUT	Supply Voltage Output
3	2	2	VIN	Supply Voltage Input
2	3	3	VSS	Ground

**❖ Functional Description (Refers to CMOS Output)**

**Notes :**

1. Output cannot be specified for power supply voltage under  $V_{MIN}$  (ie. 0.8V) because operation is not guaranteed for that range.
2.  $V_{DF}$  : Detect Voltage for drop in power supply voltage
3.  $V_{DR}$  : Detect Release Voltage for rise in power supply voltage
4.  $V_{HYS} = V_{DR} - V_{DF}$
5.  $t_{OL}$  : Time lag between the time that the power supply voltage rises to the detect release voltage ( $V_{DR}$ ) and the time that the output pin (OUT) goes to “L” level.
6.  $t_{OH}$  : Time lag between the time that the power supply voltage falls to the detect voltage ( $V_{DF}$ ) and the time that the output pin (OUT) goes to “H” level.
7. These characteristics for the N-channel open drain output are when a load resistor is connected between the OUT and IN pins.

❖ *Ordering Information*

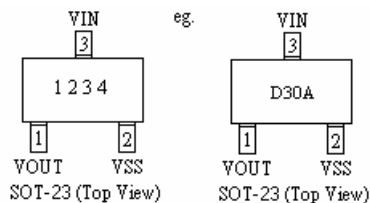
Designator	Description
a	<b>Output Configuration</b> C = CMOS Output N = N-Channel Output
b	<b>Detect Voltage</b> eg. 30=3.0V 50=5.0V
c	<b>Detect Voltage Accuracy</b> 2 = ±2.0% 3 = ±3.0%
d	<b>Package Type</b> M = SOT-23-3 P = SOT-89 T = TO-92
e	<b>Device Orientation</b> R = Embossed Tape (Orientation of Device : Right) L = Embossed Tape (Orientation of Device : Left) B = Bag (TO-92) H = Paper Tape (TO-92)
G	G = Lead Free Part

ML6102 x x x x x x G  
 † † † † † †  
 a b c d e

❖ *Marking*

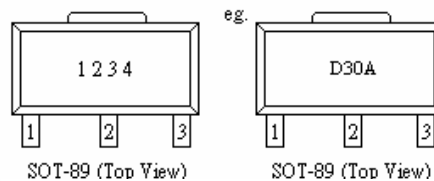
**SOT-23-3 :**

Designator	Description
1	<b>Type</b> D = Voltage Detector (CMOS Output) E = Voltage Detector (N-channel Output)
2,3	<b>Output Voltage</b> eg. 30 = 3.0V
4	<b>Internal Code</b>



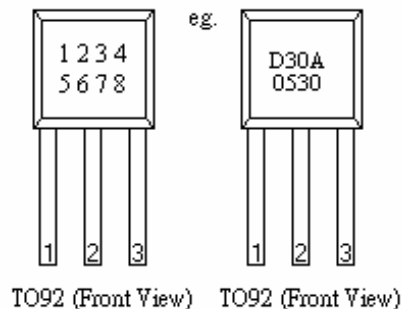
**SOT-89-3 :**

Designator	Description
1	<b>Type</b> D = Voltage Detector (CMOS Output) E = Voltage Detector (N-channel Output)
2,3	<b>Output Voltage</b> eg. 30 = 3.0V
4	<b>Internal Code</b>

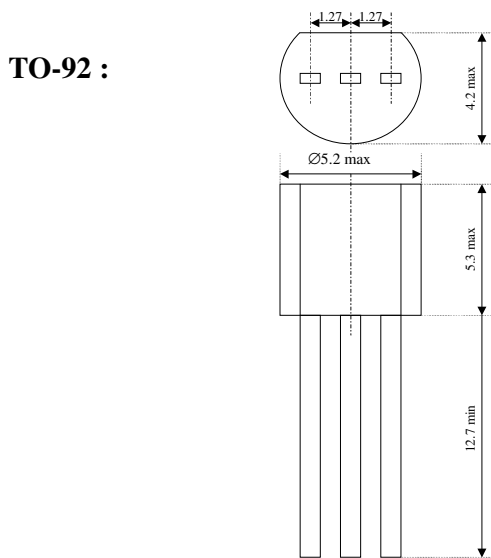
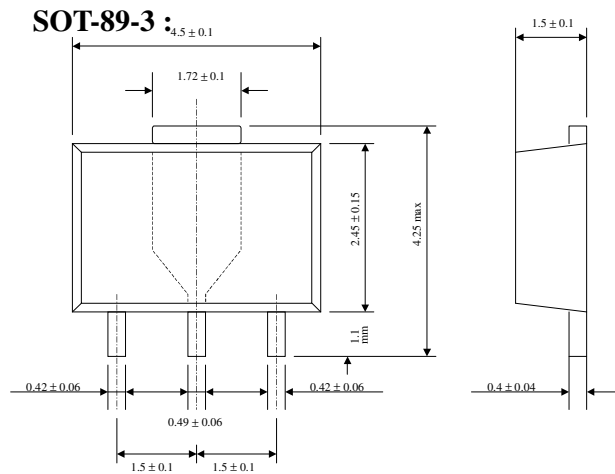
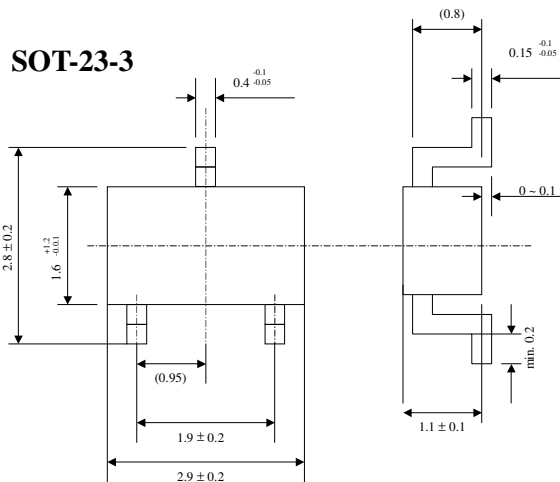


**TO-92 :**

Designator	Description
1	<b>Type</b> D = Voltage Detector (CMOS Output) E = Voltage Detector (N-channel Output)
2,3	<b>Output Voltage</b> eg. 30 = 3.0V
4	<b>Internal code</b>
5, 6	<b>Year Code</b> eg. 05 = Year 2005
7, 8	<b>Week Code</b> eg. 30 = Week 30



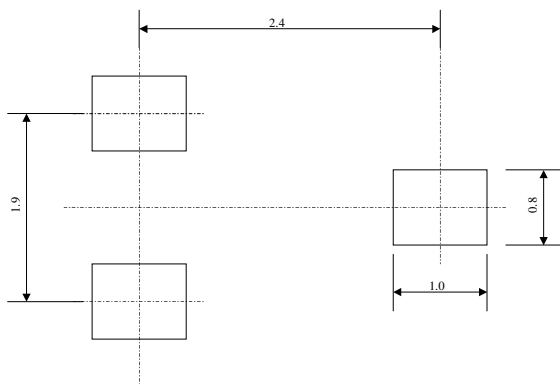
❖ *Packaging Information*



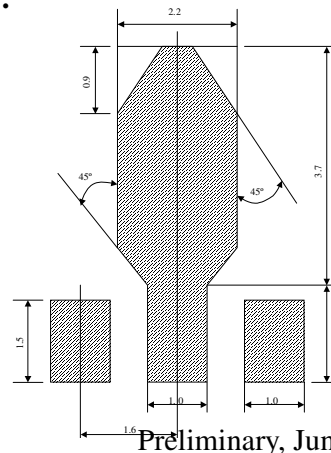
Units : mm

❖ *Recommended Pattern Layout*

SOT-23-3 :

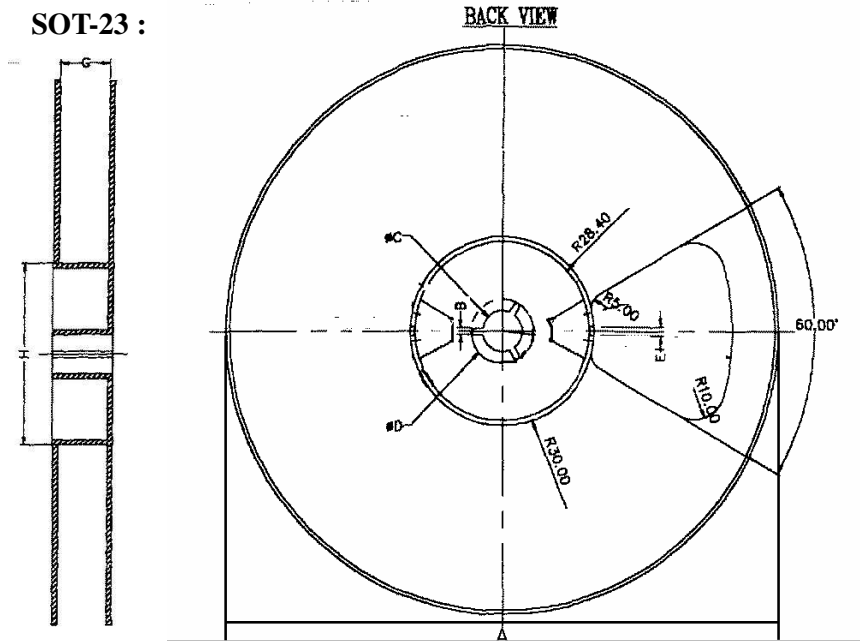


SOT-89-3 :



❖ *Tape and Reel Information*

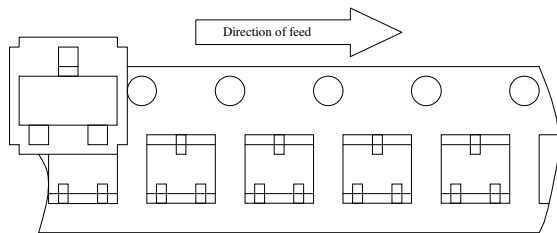
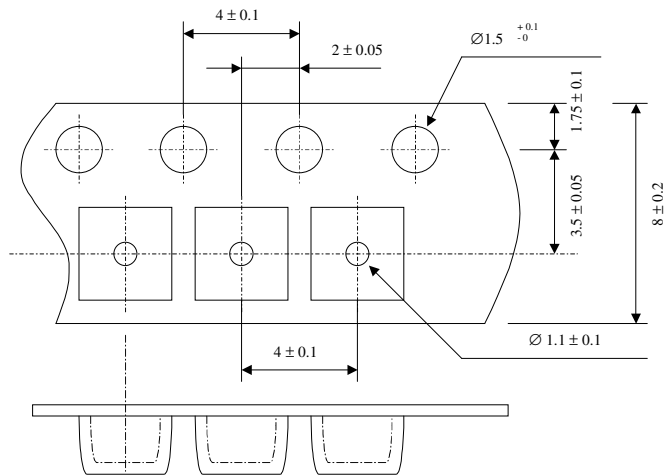
**SOT-23 :**



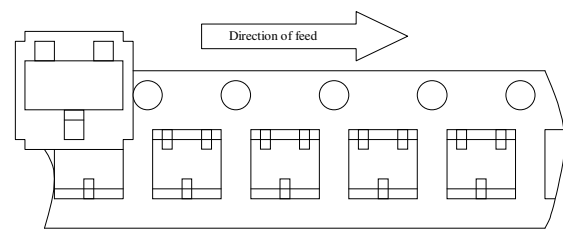
	SIZE (mm)
A	∅ 178 ± 0.8
B	2 ± 0.2
C	∅ 13 ± 0.2
D	∅ 21 ± 0.8
G	8 ± 0.5
H	∅ 60

3,000 pcs / reel

**SOT-23 Taping Specifications :**

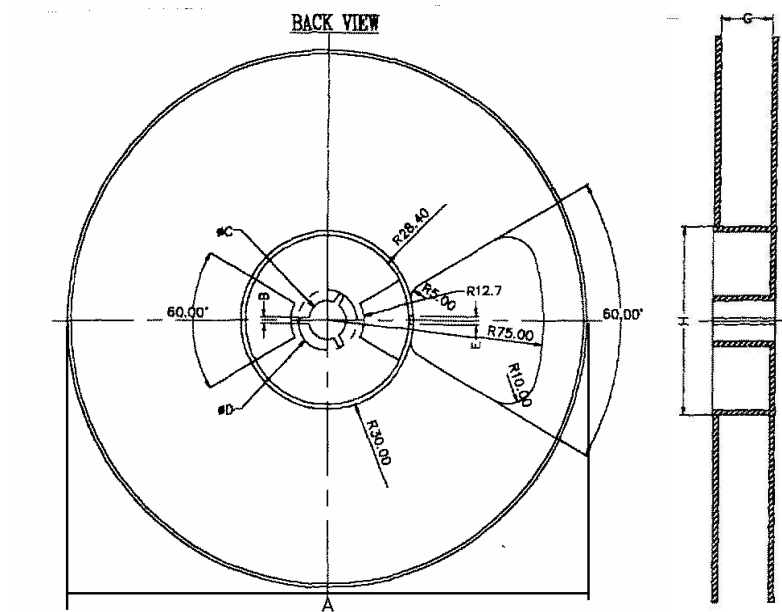


"R" type [Orientation of Device: Right]  
Standard Type



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

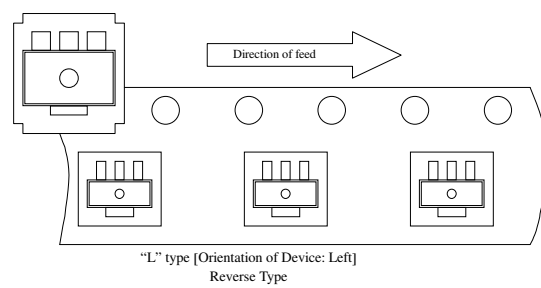
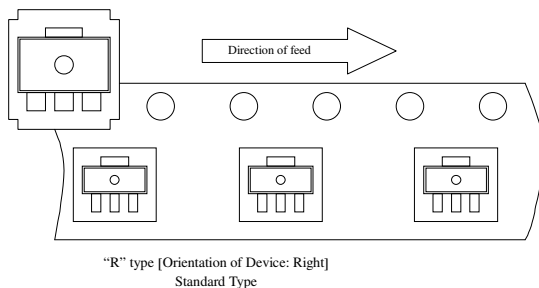
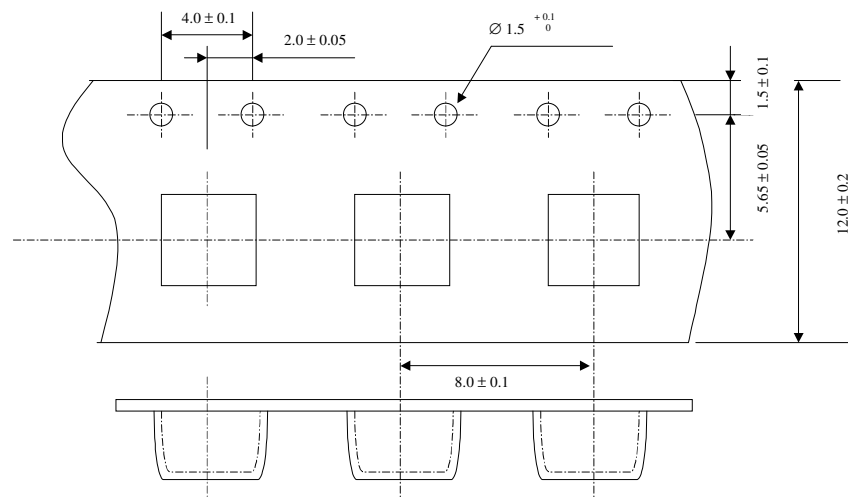
**SOT-89 :**



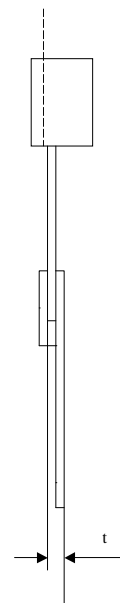
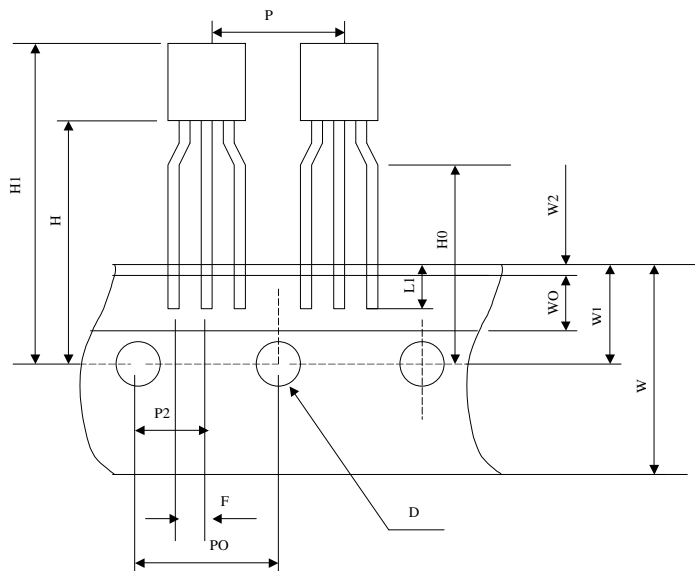
	SIZE (mm)
A	$\varnothing 178 \pm 0.8$
B	$2 \pm 0.2$
C	$\varnothing 13 \pm 0.2$
D	$\varnothing 21 \pm 0.8$
G	$12 \pm 0.5$
H	$\varnothing 60$

1,000 pcs / reel

**SOT-89 Taping Specifications :**



**TO-92 Taping Specifications :**



	SIZE (mm)
<b>P</b>	12.7 ± 1.0
<b>PO</b>	12.7 ± 0.3
<b>P2</b>	6.35 ± 0.4
<b>F</b>	2.5 <sup>+0.45</sup> <sub>-0.15</sub>
<b>W</b>	18.0 ± 1.0
<b>W0</b>	6.0 ± 0.3
<b>W1</b>	9.0 ± 0.5
<b>W2</b>	0.5 MAX
<b>H</b>	19.0 ± 0.5
<b>H0</b>	16.0 ± 0.5
<b>H1</b>	32.25 MAX
<b>D</b>	∅ 4.0 ± 0.2
<b>t</b>	0.6 ± 0.2
<b>L1</b>	3.5 MIN

2,000 pcs / box

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