

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)

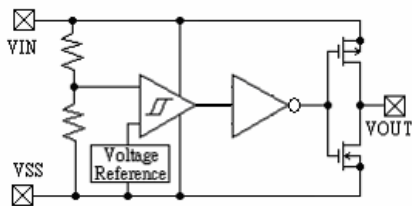
❖ *General Description*

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

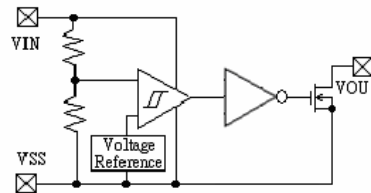
The ML6102 consists of a highly-accurate and low-power reference voltage source, a comparator, a hysteresis circuit, and an output driver. Detect voltage is very accurate and stable with N-channel open drain and CMOS, are available. Output Voltage is in inverted sense compared with ML61 series voltage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

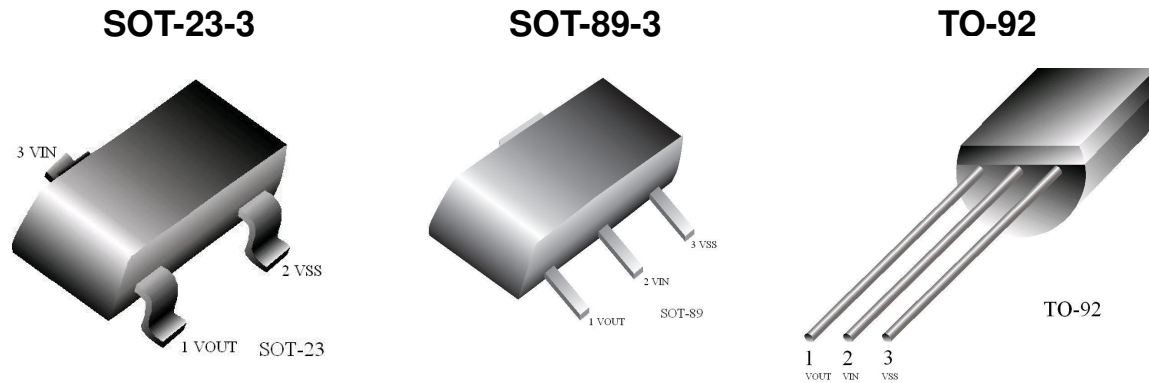
<i>Parameter</i>	<i>Symbol</i>	<i>Conditions</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Units</i>
<i>Detect Voltage</i>	V_{DF}	$V_{DF} = 1.1V \text{ to } 1.9V$	X0.97	V_{DF}	X1.03	V
		$V_{DF} = 2.0V \text{ to } 7.0V$	X0.98	V_{DF}	X1.02	V
<i>Hysteresis Range</i>	V_{HYS}	$V_{DF} = 1.1V \text{ to } 2.9V$	X0.04	$V_{DF} \times 0.05$	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 V_{IN} changes from 0.6V to 10V</i>			0.2	ms

❖ Electrical Characteristics By Detector Threshold

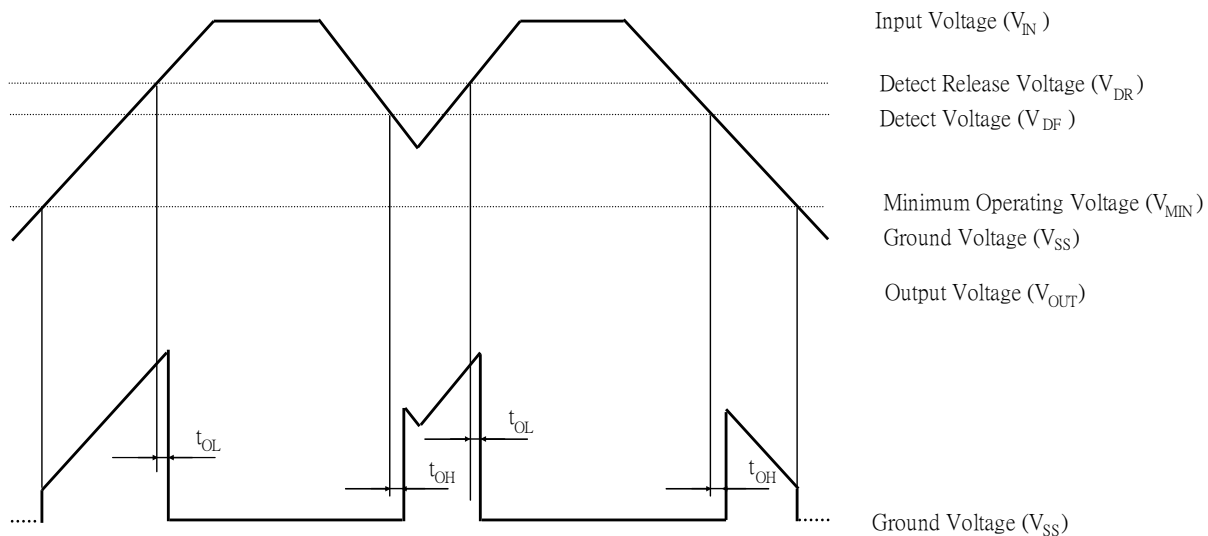
Part Number	Standard Detector Accuracy	Detector Threshold			Hysteresis Range		Supply Current					
		V _{DF} (V)			V _{HYS} (V)		I _{SS} (uA)					
		MIN.	TYP.	MAX.	MIN.	MAX.	Condition	TYP.	MAX.			
ML6102X113XX	3%	1.067	1.100	1.133	V _{DF} x 0.04	V _{DF} x 0.06	V _{IN} = 1.0V	0.8	2.0			
ML6102X123XX												
ML6102X133XX												
ML6102X143XX												
ML6102X153XX												
ML6102X163XX												
ML6102X173XX												
ML6102X183XX												
ML6102X193XX												
ML6102X202XX												
ML6102X212XX	2%	2.058	2.100	2.142	V _{DF} x 0.015	V _{DF} x 0.035	V _{IN} = 2.0V	1.0	2.5			
ML6102X222XX												
ML6102X232XX												
ML6102X242XX												
ML6102X252XX												
ML6102X262XX												
ML6102X272XX												
ML6102X282XX												
ML6102X292XX												
ML6102X302XX												
ML6102X312XX		V _{IN} = 3.0V	3.038	3.100			3.162	V _{DF} x 0.015	V _{DF} x 0.035	V _{IN} = 3.0V	1.3	3.0
ML6102X322XX												
ML6102X332XX												
ML6102X342XX												
ML6102X352XX												
ML6102X362XX												
ML6102X372XX												
ML6102X382XX												
ML6102X392XX												
ML6102X402XX												
ML6102X412XX		V _{IN} = 4.0V	4.018	4.100			4.182	V _{DF} x 0.015	V _{DF} x 0.035	V _{IN} = 4.0V	1.6	3.5
ML6102X422XX												
ML6102X432XX												
ML6102X442XX												
ML6102X452XX												
ML6102X462XX												
ML6102X472XX												
ML6102X482XX												
ML6102X492XX												
ML6102X502XX												
ML6102X512XX	V _{IN} = 5.0V	4.998	5.100	5.202	V _{DF} x 0.015	V _{DF} x 0.035	V _{IN} = 5.0V	2.0	4.0			
ML6102X522XX												
ML6102X532XX												
ML6102X542XX												
ML6102X552XX												
ML6102X562XX												
ML6102X572XX												
ML6102X582XX												
ML6102X592XX												
ML6102X602XX												

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							
ML6102X262XX							
ML6102X272XX							
ML6102X282XX							
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ML6102X352XX							
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ML6102X372XX							
ML6102X382XX							
ML6102X392XX							
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ML6102X472XX							
ML6102X482XX							
ML6102X492XX							
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*

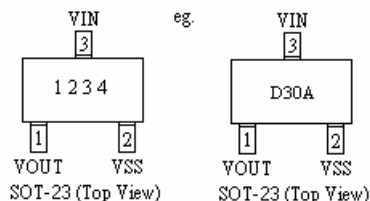
Designator	Description
a	Output Configuration C = CMOS Output N = N-Channel Output
b	Detect Voltage eg. 30=3.0V 50=5.0V
c	Detect Voltage Accuracy 2 = ±2.0% 3 = ±3.0%
d	Package Type M = SOT-23-3 P = SOT-89 T = TO-92
e	Device Orientation R = Embossed Tape (Orientation of Device : Right) L = Embossed Tape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

ML6102 xxxxxx G
 ↑ ↑ ↑ ↑ ↑
 a b c d e

❖ *Marking*

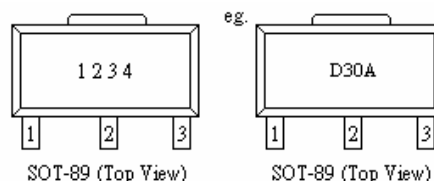
SOT-23-3 :

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



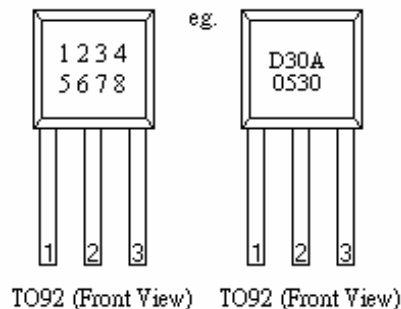
SOT-89-3 :

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

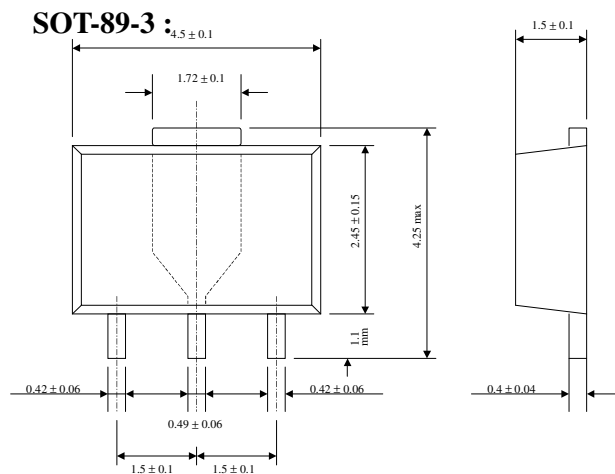
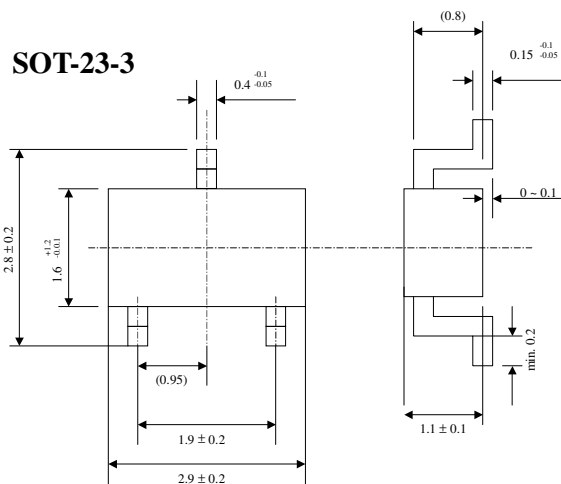


TO-92 :

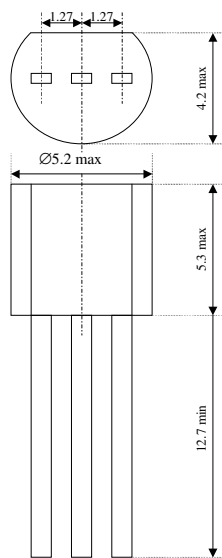
Designator	Description
1	Type D = Voltage Detector (CMOS Output) E = Voltage Detector (N-channel Output)
2,3	Output Voltage eg. 30 = 3.0V
4	Internal code
5, 6	Year Code eg. 05 = Year 2005
7, 8	Week Code eg. 30 = Week 30



❖ *Packaging Information*



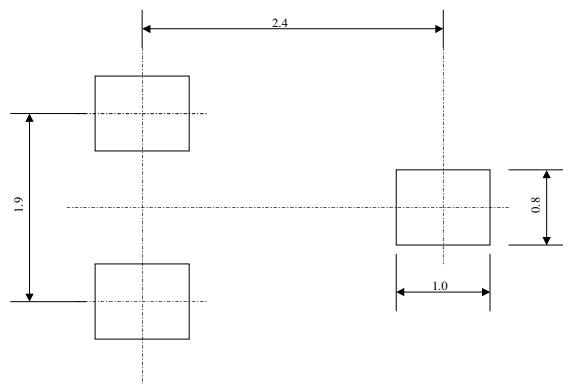
TO-92 :



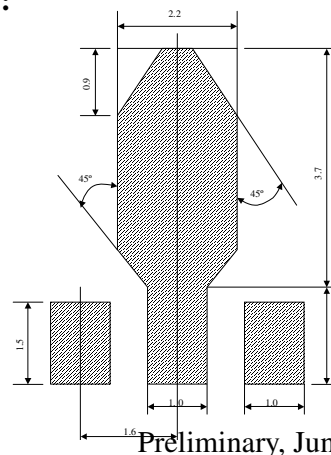
Units : mm

❖ *Recommended Pattern Layout*

SOT-23-3 :

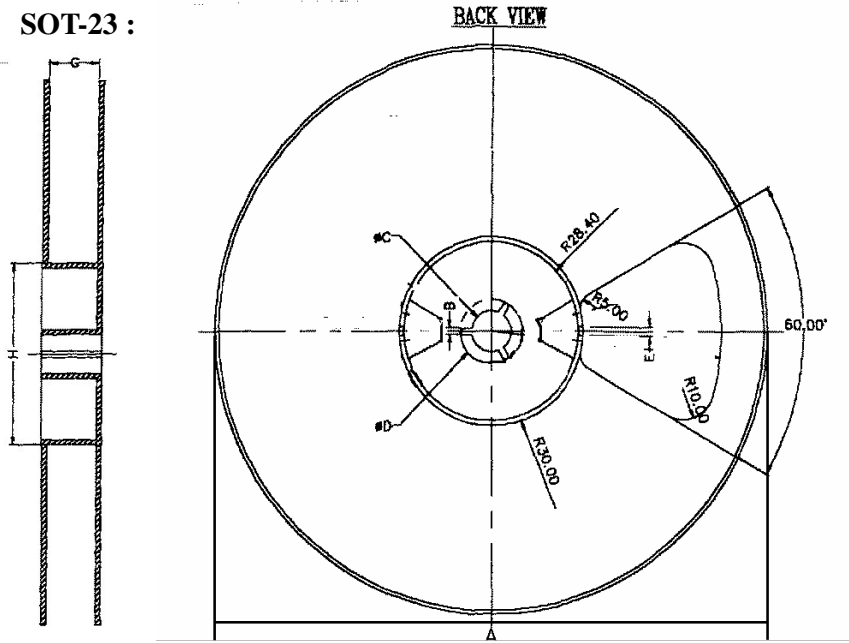


SOT-89-3 :



❖ *Tape and Reel Information*

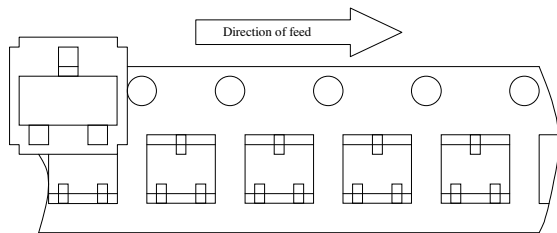
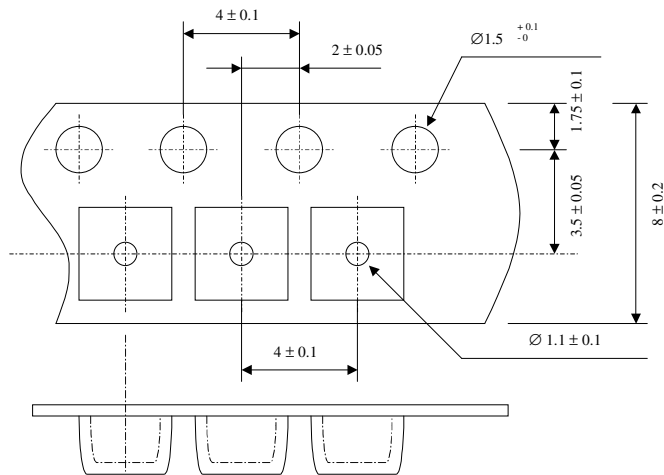
SOT-23 :



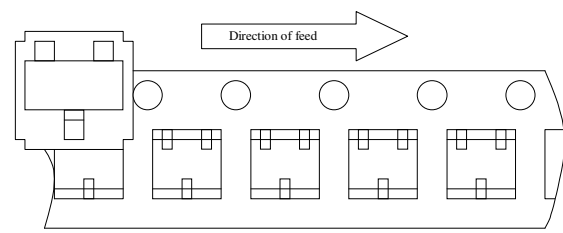
	SIZE (mm)
A	∅ 178 ± 0.8
B	2 ± 0.2
C	∅ 13 ± 0.2
D	∅ 21 ± 0.8
G	8 ± 0.5
H	∅ 60

3,000 pcs / reel

SOT-23 Taping Specifications :

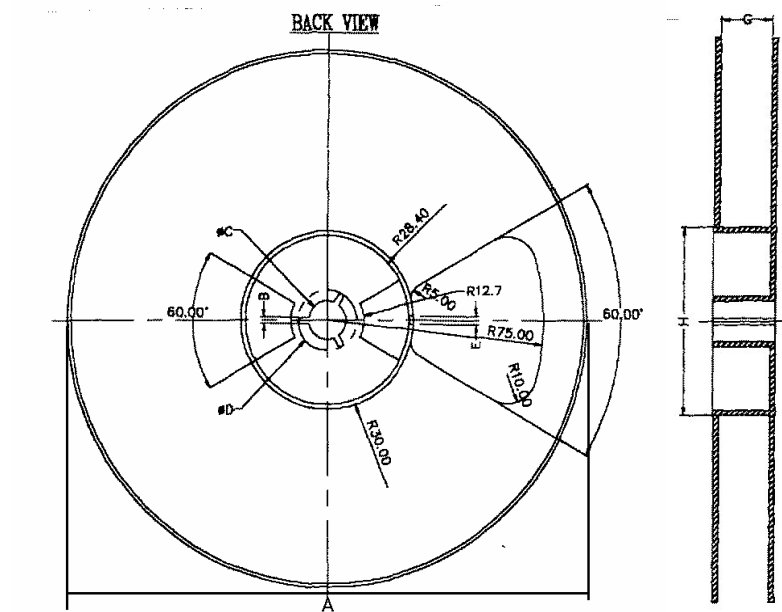


"R" type [Orientation of Device: Right]
Standard Type



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

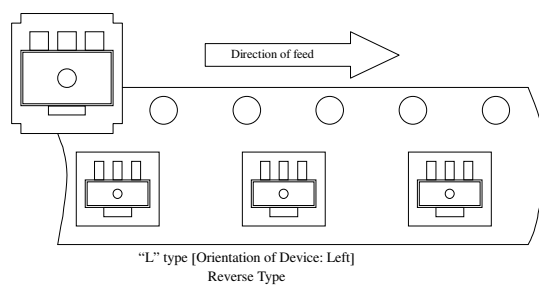
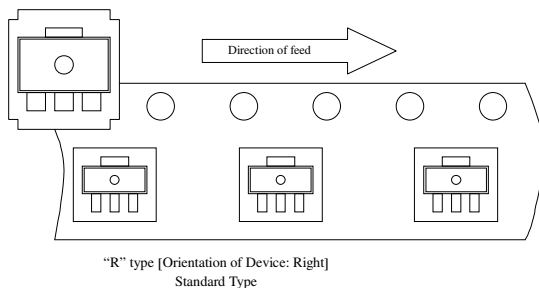
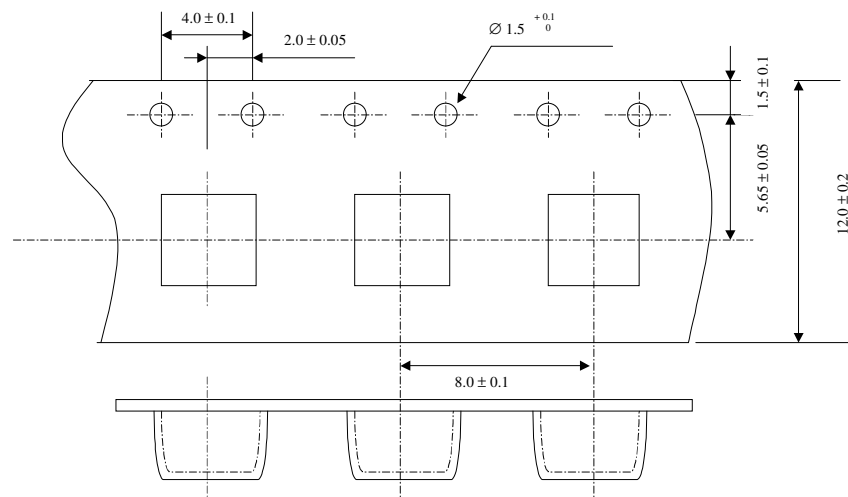
SOT-89 :

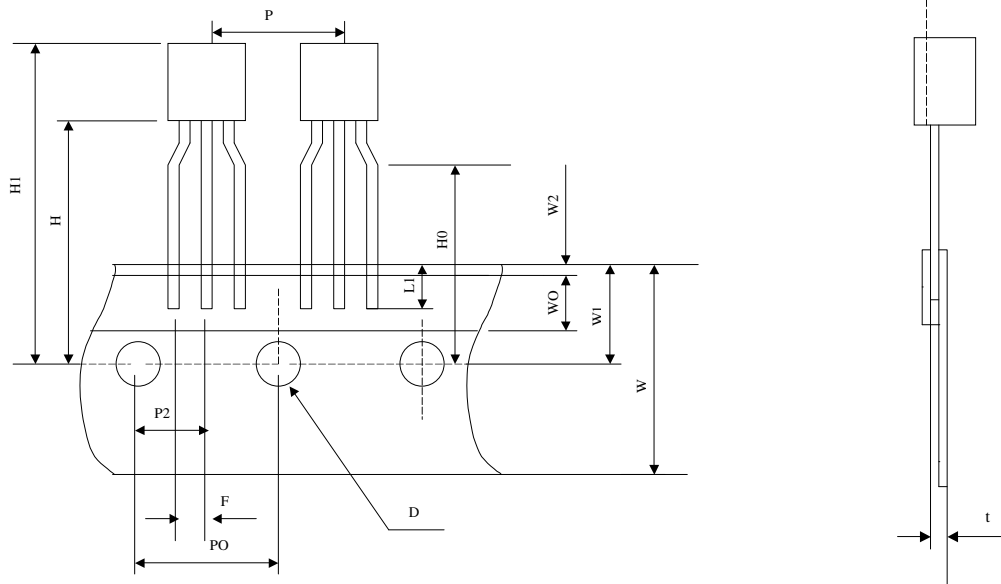


	SIZE (mm)
A	$\varnothing 178 \pm 0.8$
B	2 ± 0.2
C	$\varnothing 13 \pm 0.2$
D	$\varnothing 21 \pm 0.8$
G	12 ± 0.5
H	$\varnothing 60$

1,000 pcs / reel

SOT-89 Taping Specifications :



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
W0	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

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