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*

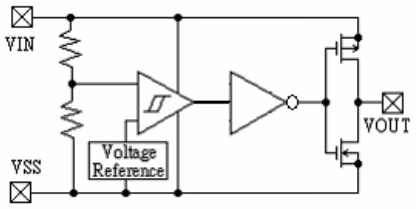
- CMOS Low Power Consumption : Typical 1.0uA at Vin=2.0V
- Selectable Detect Voltage : 1.1V to 6.0V in 0.1V increments
- Highly Accurate : Detect Voltage 1.1V to 1.9V ±3%
  Detect Voltage 2.0V to 6.0V ±2%
- Operating Voltage : 0.8V to 10.0V
- Package Available : SOT23 (150mW), SOT89 (500mW) & TO92 (300mW)

❖ *General Description*

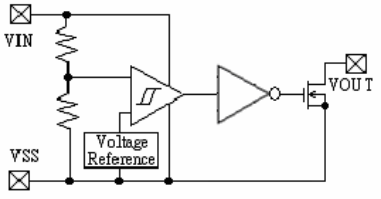
The ML6102 is a group of high-precision and low-power voltage detectors.
The ML6102 consists of a highly-accurate and low-power reference voltage source, a comparator, a hysteresis circuit, and an output driver. Detect voltage is very accurate and stable with N-channel open drain and CMOS, are available. 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 ~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}	-40 ~ +70	°C
Storage Temperature		T_{stg}	-40 ~ +70	°C

❖ *Electrical Characteristics*

Parameter	*Symbol*	*Conditions*	*Min*	*Typ*	*Max*	*Units*
Detect Voltage	V_{DF}	V_{DF} = 1.1V to 1.9V	X*0.97*	V_{DF}	X*1.03*	*V*
		V_{DF} = 2.0V to 7.0V	X*0.98*	V_{DF}	X*1.02*	*V*
Hysteresis Range	V_{HYS}	V_{DF} = 1.1V to 2.9V	X*0.04*	V_{DF} X*0.05*	X*0.06*	*V*
		V_{DF} = 3.0V to 7.0V	X*0.015*	V_{DF} X*0.025*	X*0.035*	*V*
Supply Current	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*	
Operating Voltage	V_{IN}	V_{DF} = *1.1~7.0V*	*0.8*		*10.0*	*V*
Output Current	I_{OUT}	*Nch* V_{DS} = 0.5V				*mA*
		V_{IN} = 1.0V		*1.0*		
		V_{IN} = 2.0V		*3.0*		
		V_{IN} = 3.0V		*5.0*		
		V_{IN} = 4.0V		*11.0*		
		V_{IN} = 5.0V		*13.0*		
		Pch V_{DS} = 1.0V				
		V_{IN} = 5.0V		*-5.0*		
		(CMOS Output)				
Transient Delay Time (V_{DR} -> V_{OUT} *Inversion)*	t_{DLY}	*While V_{IN} changes from 0.6V to 10V*			*0.2*	*ms*

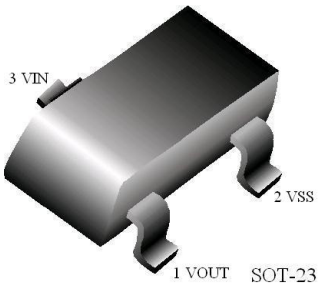
❖ *Electrical Characteristics By Detector Threshold*

Part Number	Standard Detector Accuracy	Detector Threshold V_{DF} (V)			Hysteresis Range V_{HYS} (V)		Supply Current 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		1.164	1.200	1.236					
ML6102X133XX		1.261	1.300	1.339					
ML6102X143XX		1.358	1.400	1.442					
ML6102X153XX		1.455	1.500	1.545					
ML6102X163XX		1.552	1.600	1.648					
ML6102X173XX		1.649	1.700	1.751					
ML6102X183XX		1.746	1.800	1.854					
ML6102X193XX		1.843	1.900	1.957					
ML6102X202XX	2%	1.960	2.000	2.040			V_{IN} = 2.0V	1.0	2.5
ML6102X212XX		2.058	2.100	2.142					
ML6102X222XX		2.156	2.200	2.244					
ML6102X232XX		2.254	2.300	2.346					
ML6102X242XX		2.352	2.400	2.448					
ML6102X252XX		2.450	2.500	2.550					
ML6102X262XX		2.548	2.600	2.652					
ML6102X272XX		2.646	2.700	2.754					
ML6102X282XX		2.744	2.800	2.856					
ML6102X292XX		2.842	2.900	2.958					
ML6102X302XX		2.940	3.000	3.060	V_{DF} x 0.015	V_{DF} x 0.035	V_{IN} = 3.0V	1.3	3.0
ML6102X312XX		3.038	3.100	3.162					
ML6102X322XX		3.136	3.200	3.264					
ML6102X332XX		3.234	3.300	3.366					
ML6102X342XX		3.332	3.400	3.468					
ML6102X352XX		3.430	3.500	3.570					
ML6102X362XX		3.528	3.600	3.672					
ML6102X372XX		3.626	3.700	3.774					
ML6102X382XX		3.724	3.800	3.876					
ML6102X392XX		3.822	3.900	3.978					
ML6102X402XX		3.920	4.000	4.080			V_{IN} = 4.0V	1.6	3.5
ML6102X412XX		4.018	4.100	4.182					
ML6102X422XX		4.116	4.200	4.284					
ML6102X432XX		4.214	4.300	4.386					
ML6102X442XX		4.312	4.400	4.488					
ML6102X452XX		4.410	4.500	4.590					
ML6102X462XX		4.508	4.600	4.692					
ML6102X472XX		4.606	4.700	4.794					
ML6102X482XX		4.704	4.800	4.896					
ML6102X492XX		4.802	4.900	4.998					
ML6102X502XX		4.900	5.000	5.100			V_{IN} = 5.0V	2.0	4.0
ML6102X512XX		4.998	5.100	5.202					
ML6102X522XX		5.096	5.200	5.304					
ML6102X532XX		5.194	5.300	5.406					
ML6102X542XX		5.292	5.400	5.508					
ML6102X552XX		5.390	5.500	5.610					
ML6102X562XX		5.488	5.600	5.712					
ML6102X572XX		5.586	5.700	5.814					
ML6102X582XX		5.684	5.800	5.916					
ML6102X592XX		5.782	5.900	6.018					
ML6102X602XX		5.880	6.000	6.120					

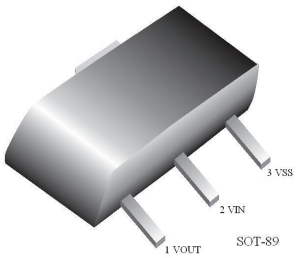
Part Number	Operating Voltage V_{IN} (V)		Pch Output Current Pch I_{OUT} (mA)		Nch Output Current Nch I_{OUT} (mA)		Transient Delay Time t_{DLY} (ms)
	MIN.	MAX.	Condition	TYP.	Condition	TYP.	MAX.
ML6102X113XX	0.8V	10V	V_{DS} = 1.0V V_{IN} = 5.0V	-5.0	V_{DS} = 0.5V V_{IN} = 1.0V	1.0	0.2
ML6102X123XX							
ML6102X133XX							
ML6102X143XX							
ML6102X153XX							
ML6102X163XX							
ML6102X173XX							
ML6102X183XX							
ML6102X193XX							
ML6102X202XX							
ML6102X212XX					V_{DS} = 0.5V V_{IN} = 2.0V	3.0	
ML6102X222XX							
ML6102X232XX							
ML6102X242XX							
ML6102X252XX							
ML6102X262XX							
ML6102X272XX							
ML6102X282XX							
ML6102X292XX							
ML6102X302XX							
ML6102X312XX					V_{DS} = 0.5V V_{IN} = 3.0V	5.0	
ML6102X322XX							
ML6102X332XX							
ML6102X342XX							
ML6102X352XX							
ML6102X362XX							
ML6102X372XX							
ML6102X382XX							
ML6102X392XX							
ML6102X402XX							
ML6102X412XX					V_{DS} = 0.5V V_{IN} = 4.0V	11.0	
ML6102X422XX							
ML6102X432XX							
ML6102X442XX							
ML6102X452XX							
ML6102X462XX							
ML6102X472XX							
ML6102X482XX							
ML6102X492XX							
ML6102X502XX							
ML6102X512XX					V_{DS} = 0.5V V_{IN} = 5.0V	13.0	
ML6102X522XX							
ML6102X532XX							
ML6102X542XX							
ML6102X552XX							
ML6102X562XX							
ML6102X572XX							
ML6102X582XX							
ML6102X592XX							
ML6102X602XX							

❖ *Pin Configuration*

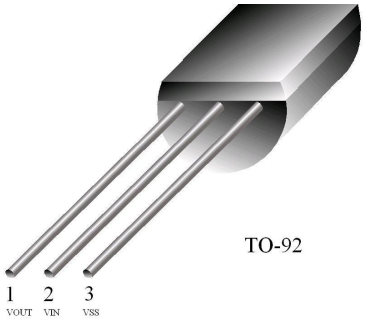
SOT-23-3



SOT-89-3

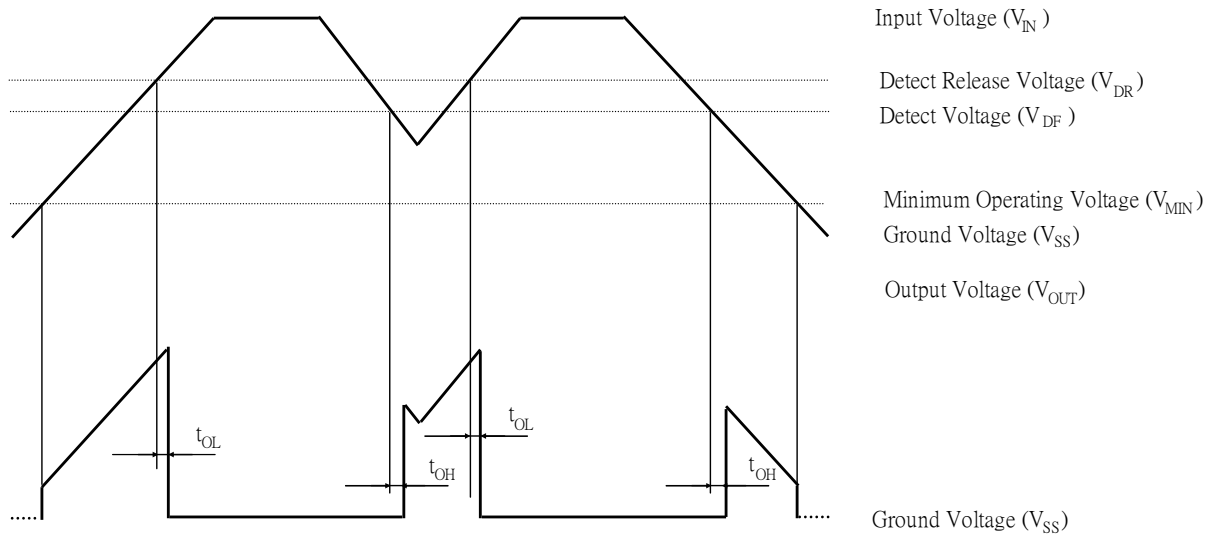


TO-92



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)*

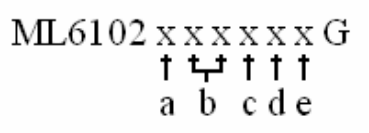


Notes :

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*

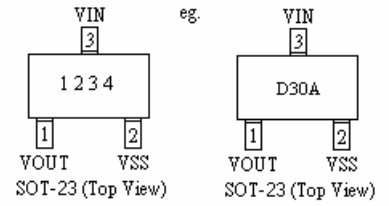
Designator	Description
a	**Output Configuration** C = CMOS Output N = N-Channel Output
b	**Detect Voltage** eg. 30=3.0V 50=5.0V
c	**Detect Voltage Accuracy** 2 = ±2.0% 3 = ±3.0%
d	**Package Type** M = SOT-23-3 P = SOT-89 T = TO-92
e	**Device Orientation** R = Embossed Tape (Orientation of Device : Right)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



❖ *Marking*

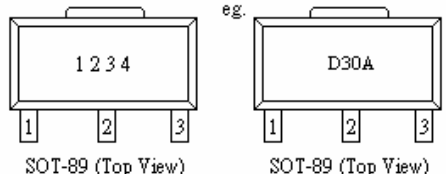
SOT-23-3 :

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**



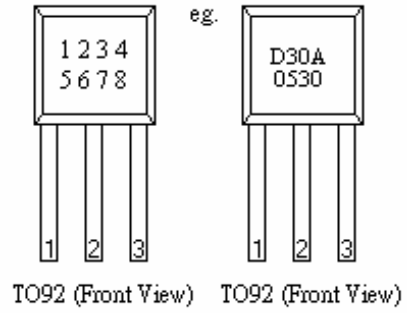
SOT-89-3 :

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**



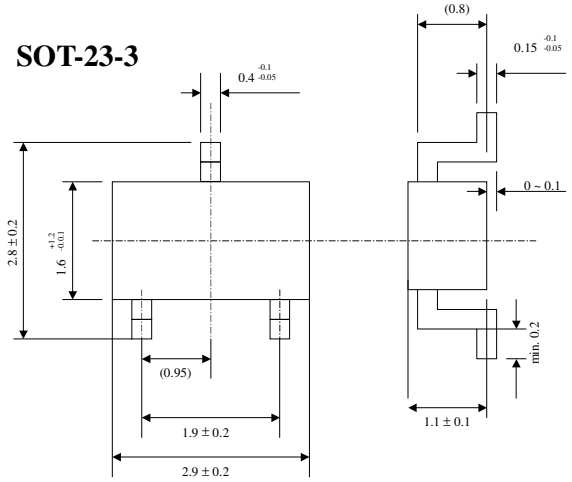
TO-92 :

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

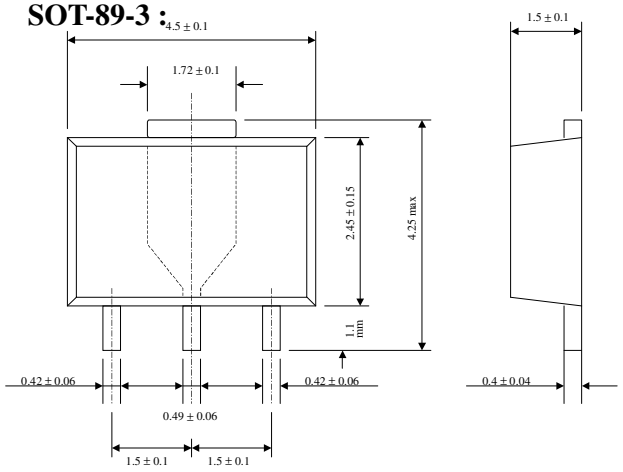


❖ *Packaging Information*

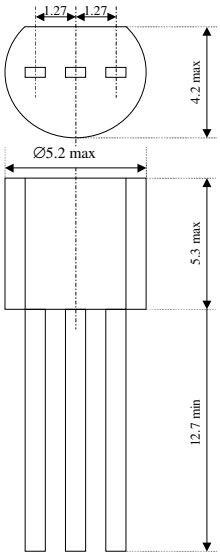
SOT-23-3



SOT-89-3 :



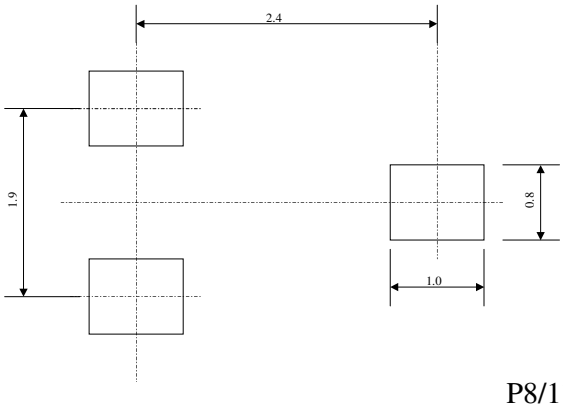
TO-92 :



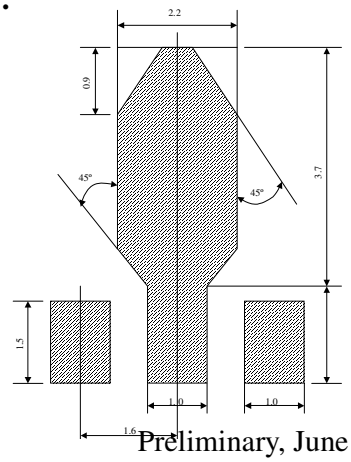
Units : mm

❖ *Recommended Pattern Layout*

SOT-23-3 :

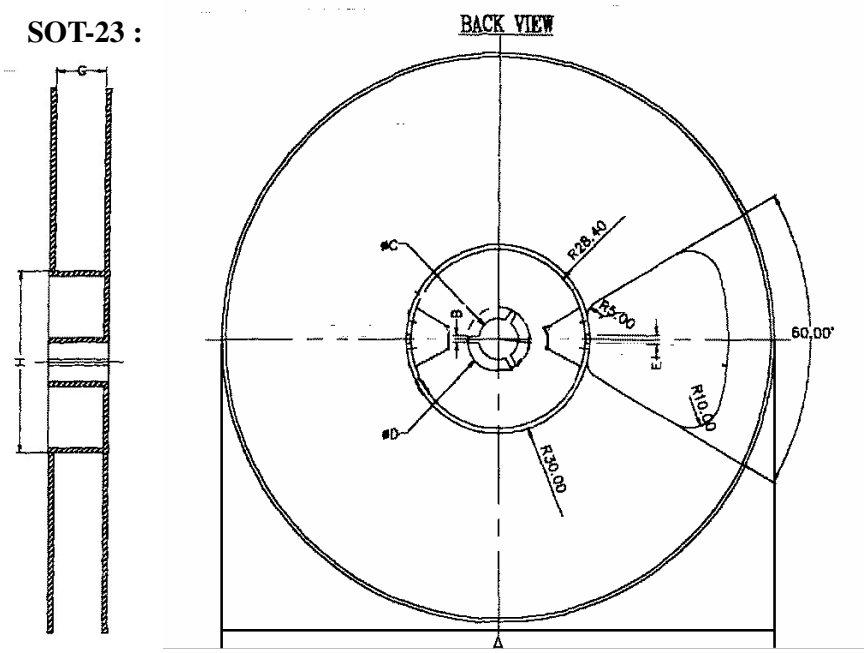


SOT-89-3 :



❖ *Tape and Reel Information*

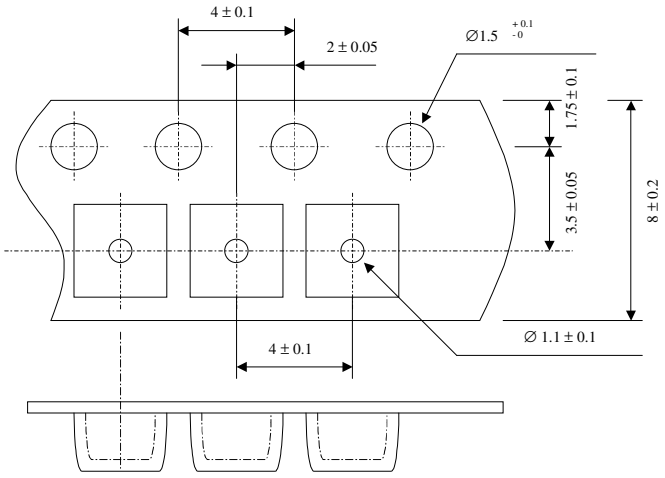
SOT-23 :

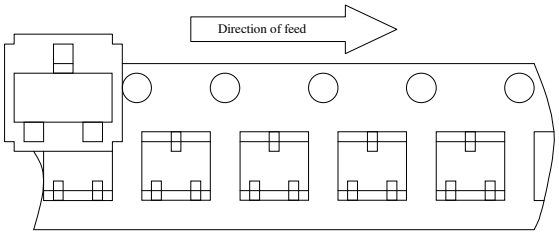


	SIZE (mm)
A	∅ 178 ± 0.8
B	2 ± 0.2
C	∅ 13 ± 0.2
D	∅ 21 ± 0.8
G	8 ± 0.5
H	∅ 60

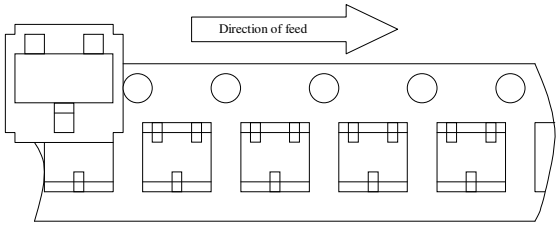
3,000 pcs / reel

SOT-23 Taping Specifications :



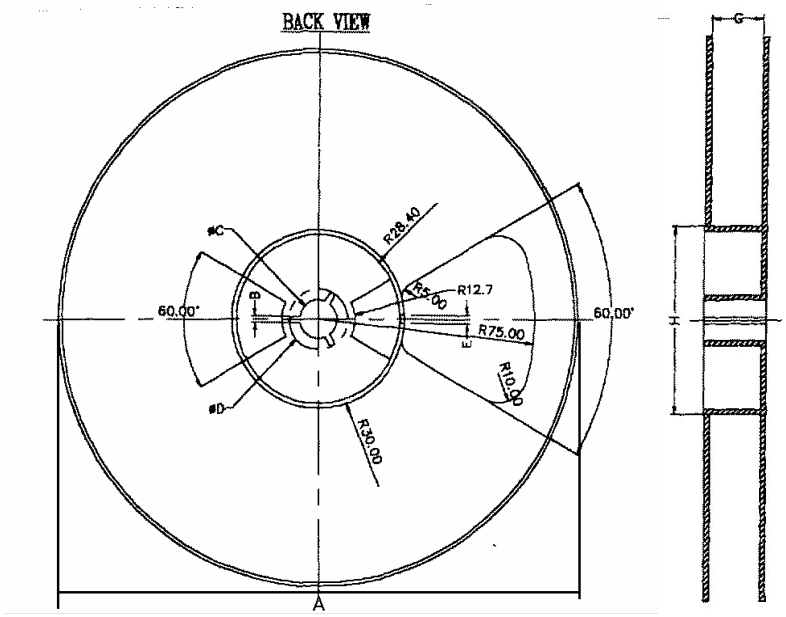


"R" type [Orientation of Device: Right]
Standard Type



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

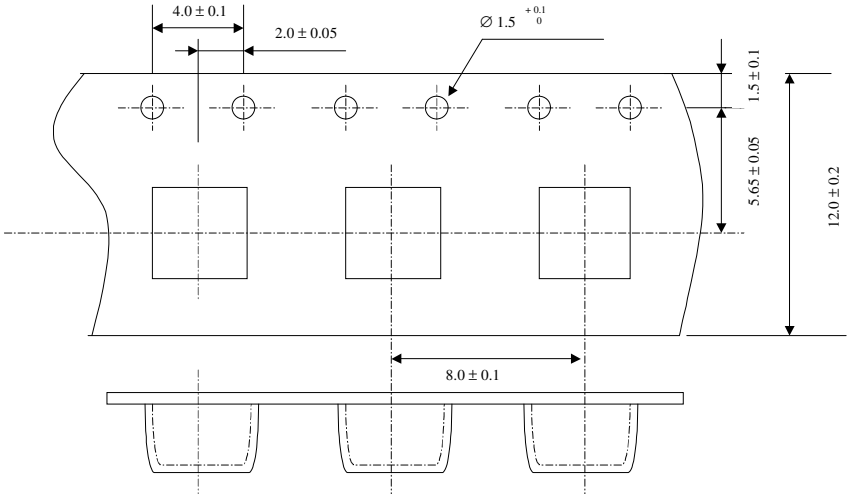
SOT-89 :

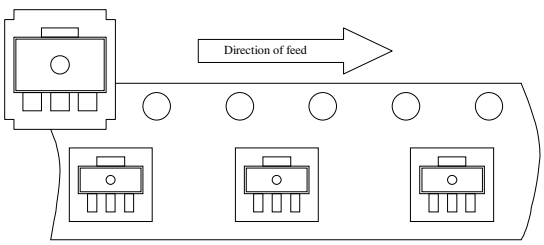


	SIZE (mm)
A	∅ 178 ± 0.8
B	2 ± 0.2
C	∅ 13 ± 0.2
D	∅ 21 ± 0.8
G	12 ± 0.5
H	∅ 60

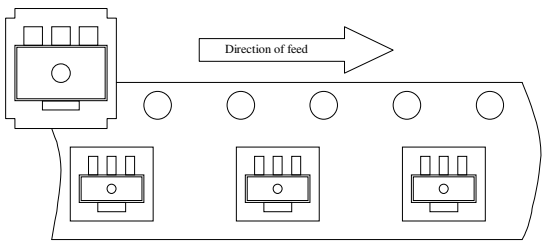
1,000 pcs / reel

SOT-89 Taping Specifications :



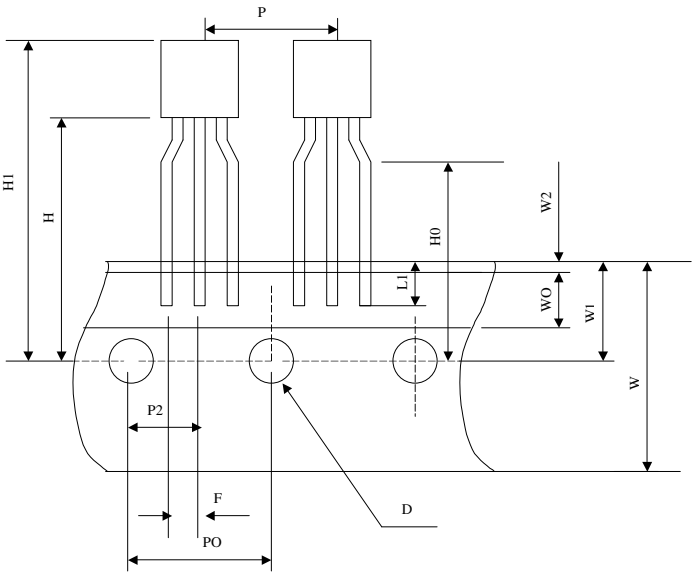


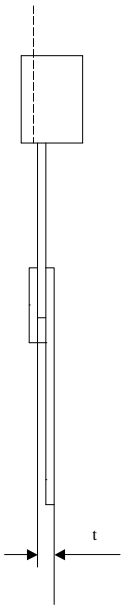
"R" type [Orientation of Device: Right]
Standard Type



"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	$2.5^{+0.45}_{-0.15}$
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

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