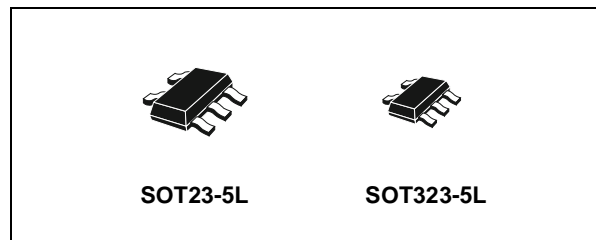


## SINGLE 2-INPUT NOR GATE

- 5V TOLERANT INPUTS
- HIGH SPEED:  $t_{PD} = 4.2\text{ns}$  (MAX.) at  $V_{CC} = 3\text{V}$
- LOW POWER DISSIPATION:  
 $I_{CC} = 1\mu\text{A}$  (MAX.) at  $T_A = 25^\circ\text{C}$
- POWER DOWN PROTECTION ON INPUTS AND OUTPUTS
- SYMMETRICAL OUTPUT IMPEDANCE:  
 $|I_{OH}| = I_{OL} = 24\text{mA}$  (MIN) at  $V_{CC} = 3\text{V}$
- BALANCED PROPAGATION DELAYS:  
 $t_{PLH} \cong t_{PHL}$
- OPERATING VOLTAGE RANGE:  
 $V_{CC}(\text{OPR}) = 1.65\text{V}$  to  $5.5\text{V}$   
(1.2V Data Retention)
- IMPROVED LATCH-UP IMMUNITY



### ORDER CODES

PACKAGE	T & R
SOT23-5L	74LX1G02STR
SOT323-5L	74LX1G02CTR

### DESCRIPTION

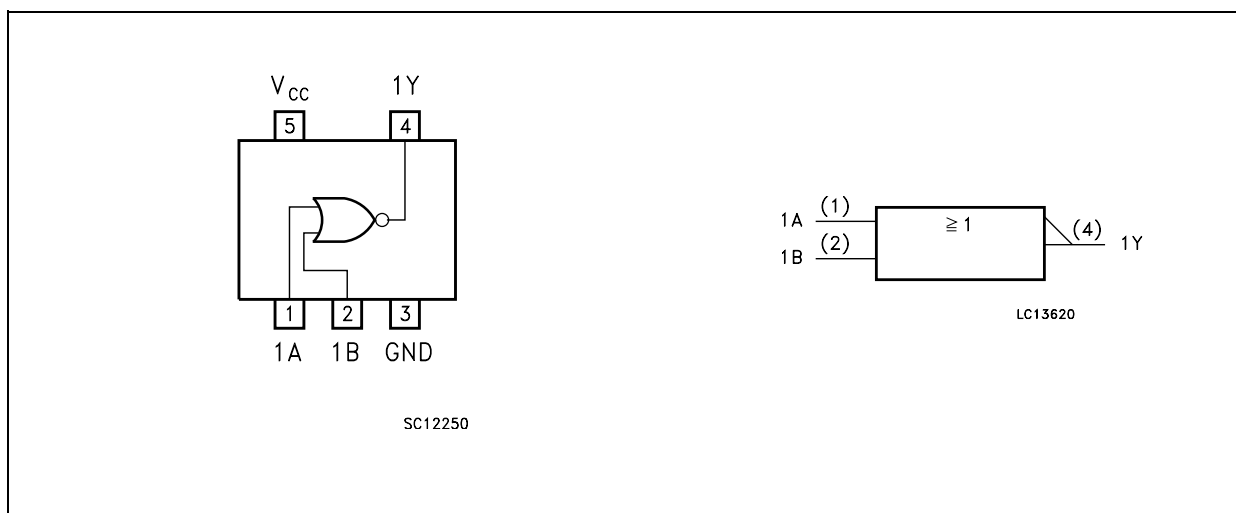
The 74LX1G02 is a low voltage CMOS SINGLE 2-INPUT NOR GATE fabricated with sub-micron silicon gate and double-layer metal wiring C<sup>2</sup>MOS technology.

The internal circuit is composed of 3 stages including buffer output, which provide high noise immunity and stable output.

Power down protection is provided on all inputs and 0 to 7V can be accepted on inputs with no regard to the supply voltage. This device can be used to interface 5V to 3V.

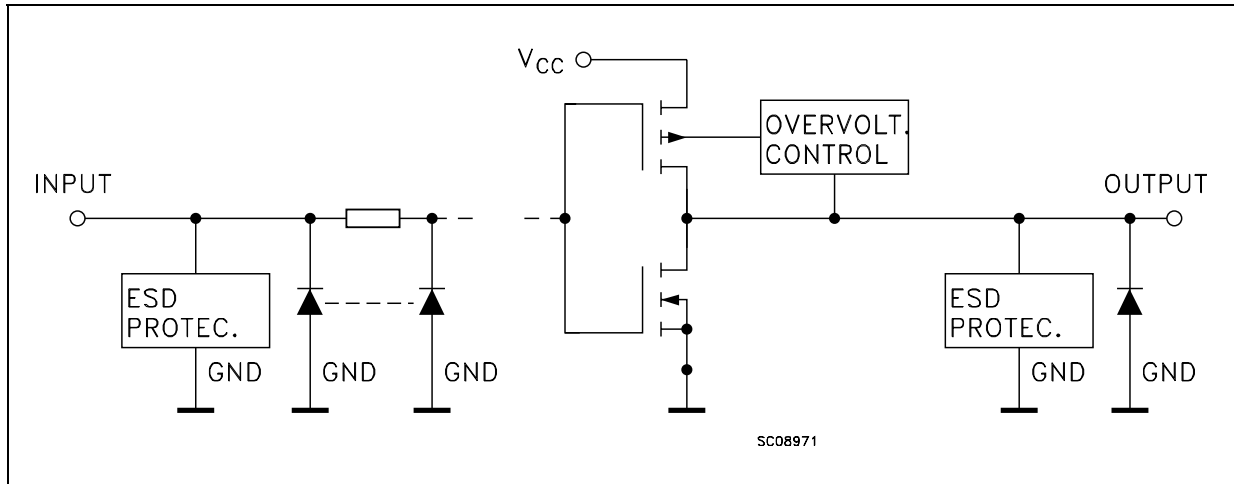
All inputs and outputs are equipped with protection circuits against static discharge.

### PIN CONNECTION AND IEC LOGIC SYMBOLS



# 74LX1G02

## INPUT AND OUTPUT EQUIVALENT CIRCUIT



### PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1	1A	Data Input
2	1B	Data Input
4	1Y	Data Output
3	GND	Ground (0V)
5	V <sub>CC</sub>	Positive Supply Voltage

### TRUTH TABLE

A	B	Y
L	L	H
L	H	L
H	L	L
H	H	L

### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage	-0.5 to +7.0	V
V <sub>I</sub>	DC Input Voltage	-0.5 to +7.0	V
V <sub>O</sub>	DC Output Voltage (V <sub>CC</sub> = 0V)	-0.5 to +7.0	V
V <sub>O</sub>	DC Output Voltage (High or Low State) (note 1)	-0.5 to V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	DC Input Diode Current	- 50	mA
I <sub>OK</sub>	DC Output Diode Current (note 2)	- 50	mA
I <sub>O</sub>	DC Output Current	± 50	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current per Supply Pin	± 50	mA
T <sub>stg</sub>	Storage Temperature	-65 to +150	°C
T <sub>L</sub>	Lead Temperature (10 sec)	300	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied

1) I<sub>O</sub> absolute maximum rating must be observed

2) V<sub>O</sub> < GND, V<sub>O</sub> > V<sub>CC</sub>

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage (note 1)	1.65 to 5.5	V
$V_I$	Input Voltage	0 to 5.5	V
$V_O$	Output Voltage ( $V_{CC} = 0V$ )	0 to 5.5	V
$V_O$	Output Voltage (High or Low State)	0 to $V_{CC}$	V
$I_{OH}, I_{OL}$	High or Low Level Output Current ( $V_{CC} = 4.5$ to $5.5V$ )	$\pm 32$	mA
$I_{OH}, I_{OL}$	High or Low Level Output Current ( $V_{CC} = 3.0$ to $3.6V$ )	$\pm 24$	mA
$I_{OH}, I_{OL}$	High or Low Level Output Current ( $V_{CC} = 2.7$ to $3.0V$ )	$\pm 12$	mA
$I_{OH}, I_{OL}$	High or Low Level Output Current ( $V_{CC} = 2.3$ to $2.7V$ )	$\pm 8$	mA
$I_{OH}, I_{OL}$	High or Low Level Output Current ( $V_{CC} = 1.65$ to $2.3V$ )	$\pm 4$	mA
$T_{op}$	Operating Temperature	-40 to 85	$^{\circ}C$
dt/dv	Input Rise and Fall Time (note 2)	0 to 10	ns/V

1) Truth Table guaranteed: 1.2V to 3.6V

2)  $V_{IN}$  from 0.8V to 2V at  $V_{CC} = 3.0V$ 

## DC SPECIFICATIONS

Symbol	Parameter	Test Condition		Value				Unit
		$V_{CC}$ (V)		-40 to 85 $^{\circ}C$		-55 to 125 $^{\circ}C$		
				Min.	Max.	Min.	Max.	
$V_{IH}$	High Level Input Voltage	1.65 to 1.95		$0.75V_{CC}$		$0.75V_{CC}$		V
		2.3 to 2.7		$0.7V_{CC}$		$0.7V_{CC}$		
		3.0 to 5.5		$0.7V_{CC}$		$0.7V_{CC}$		
$V_{IL}$	Low Level Input Voltage	1.65 to 1.95			$0.25V_{CC}$		$0.25V_{CC}$	V
		2.3 to 2.7			$0.3V_{CC}$		$0.3V_{CC}$	
		3.0 to 5.5			$0.3V_{CC}$		$0.3V_{CC}$	
$V_{OH}$	High Level Output Voltage	1.65 to 4.5	$I_O = -100 \mu A$	$V_{CC} - 0.1$		$V_{CC} - 0.1$		V
		1.65	$I_O = -4 \text{ mA}$	1.2		1.2		
		2.3	$I_O = -8 \text{ mA}$	1.9		1.9		
		3.0	$I_O = -16 \text{ mA}$	2.4		2.4		
			$I_O = -24 \text{ mA}$	2.2		2.2		
4.5	$I_O = -32 \text{ mA}$	3.8		3.8				
$V_{OL}$	Low Level Output Voltage	1.65 to 4.5	$I_O = 100 \mu A$		0.1		0.1	V
		1.65	$I_O = 4 \text{ mA}$		0.45		0.45	
		2.3	$I_O = 8 \text{ mA}$		0.3		0.3	
		3.0	$I_O = 16 \text{ mA}$		0.4		0.4	
			$I_O = 24 \text{ mA}$		0.55		0.55	
4.5	$I_O = 32 \text{ mA}$		0.55		0.55			
$I_I$	Input Leakage Current	1.65 to 5.5	$V_I = 0$ to $5.5V$		$\pm 10$		$\pm 10$	$\mu A$
$I_{off}$	Power Off Leakage Current	0	$V_I$ or $V_O = 5.5V$		10		10	$\mu A$
$I_{CC}$	Quiescent Supply Current	1.65 to 5.5	$V_I = V_{CC}$ or GND		10		10	$\mu A$

AC ELECTRICAL CHARACTERISTICS (Input  $t_r = t_f = 3\text{ns}$ )

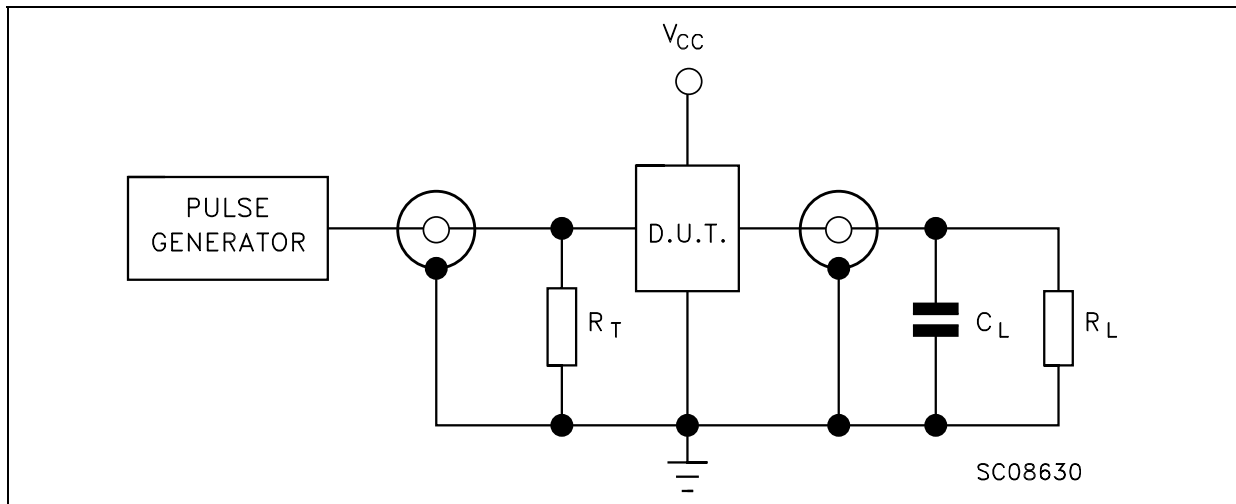
Symbol	Parameter	Test Condition				Value				Unit
		$V_{CC}$ (V)	$C_L$ (pF)	$R_L$ ( $\Omega$ )	$t_s = t_r$ (ns)	-40 to 85 °C		-55 to 125 °C		
						Min.	Max.	Min.	Max.	
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time	1.65 to 1.95	15	1M $\Omega$	3.0	2	12.0	2	12.0	ns
		2.3 to 2.7				2	7.0	2	7.0	
		3.0 to 3.6				1	4.7	1	4.7	
		4.5 to 5.5				1	4.1	1	4.1	
		1.65 to 1.95	30	1000	2.0	2	7.5	2	7.5	
		2.3 to 2.7	30	500	2.0	2	5.5	2	5.5	
		2.7	50	500	2.5	1	5.2	1	5.2	
		3.0 to 3.6	50	500	2.5	1	4.2	1	4.2	
		4.5 to 5.5	50	500	2.5	1	3.7	1	3.7	

## CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Condition		Value			Unit
		$V_{CC}$ (V)		$T_A = 25\text{ °C}$			
				Min.	Typ.	Max.	
$C_{IN}$	Input Capacitance	0			4		pF
$C_{PD}$	Power Dissipation Capacitance (note 1)	1.8	$f_{IN} = 10\text{MHz}$		21		pF
		2.5			24		
		3.3			26		

1)  $C_{PD}$  is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation.  $I_{CC(oper)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$

TEST CIRCUIT

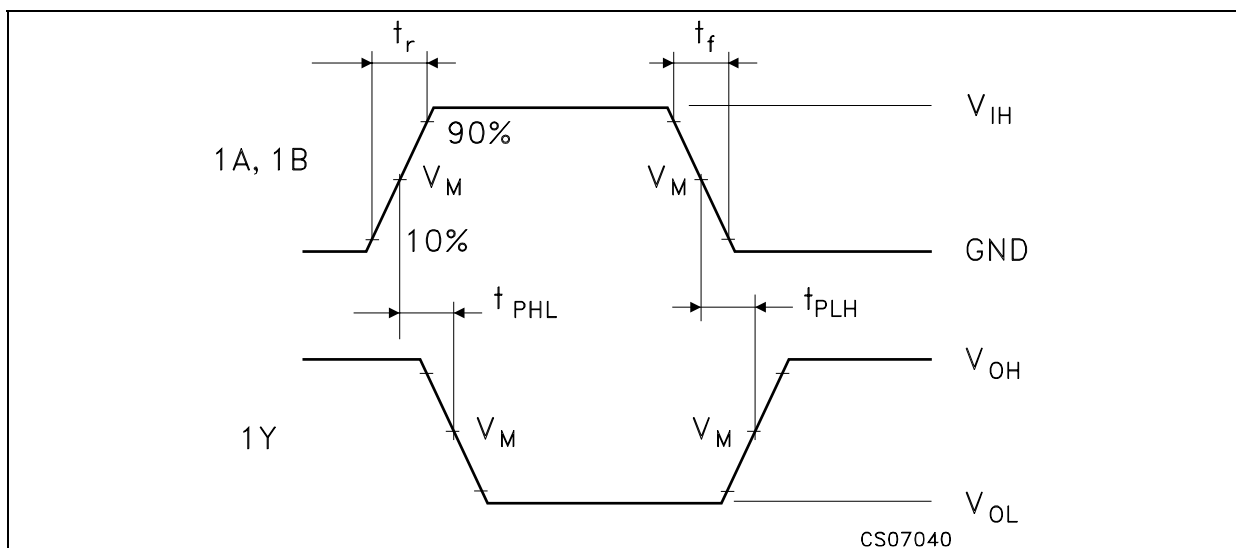


$R_T = Z_{OUT}$  of pulse generator (typically 50Ω)

TEST CIRCUIT AND WAVEFORM SYMBOL VALUE

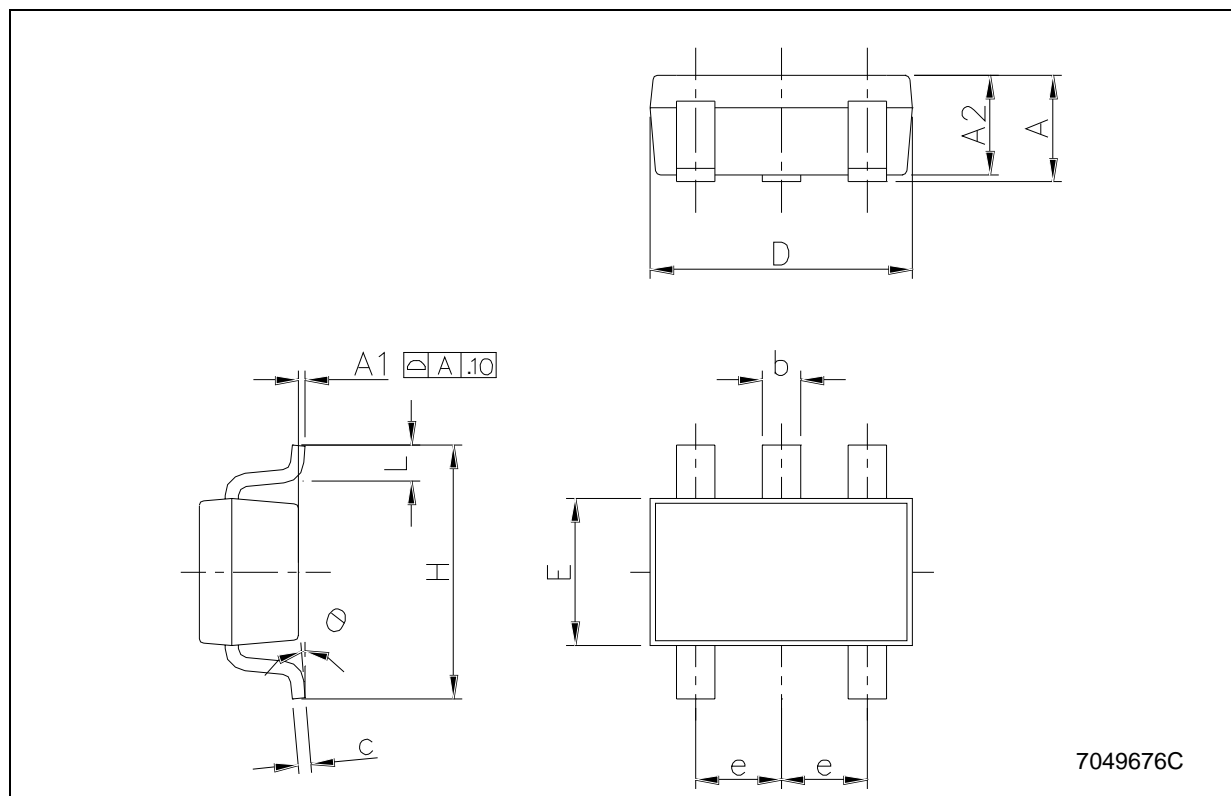
Symbol	$V_{CC}$		
	1.65 to 1.95V	2.3 to 2.7V	2.7 to 5.5V
$C_L$	15pF/30pF	15pF/30pF	15pF/50pF
$R_L$	1MΩ/1000Ω	1MΩ/500Ω	1MΩ/500Ω
$V_{IH}$	$V_{CC}$	$V_{CC}$	$V_{CC}$
$V_M$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$
$t_r = t_f$	<2.0ns	<2.0ns	<2.5ns

WAVEFORM: PROPAGATION DELAY (f=1MHz; 50% duty cycle)



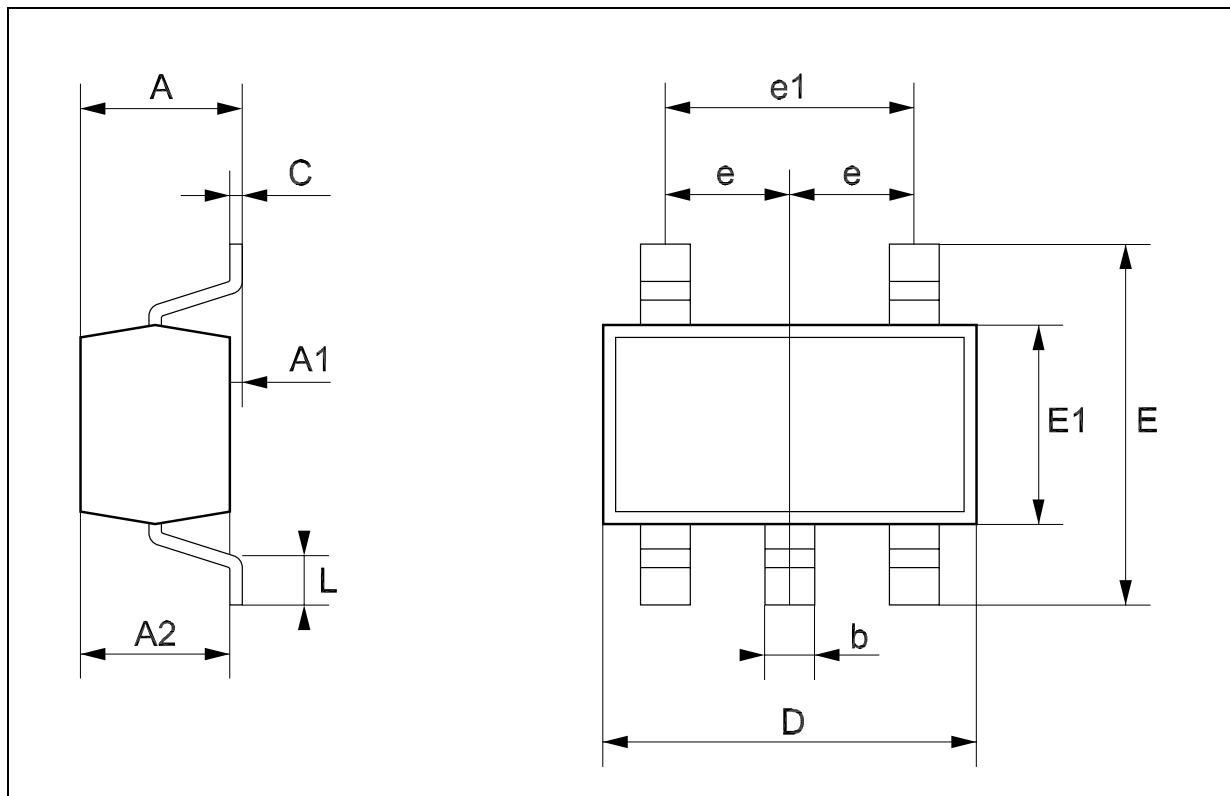
## SOT23-5L MECHANICAL DATA

DIM.	mm.			mils		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	0.90		1.45	35.4		57.1
A1	0.00		0.10	0.0		3.9
A2	0.90		1.30	35.4		51.2
b	0.35		0.50	13.7		19.7
C	0.09		0.20	3.5		7.8
D	2.80		3.00	110.2		118.1
E	1.50		1.75	59.0		68.8
e		0.95			37.4	
H	2.60		3.00	102.3		118.1
L	0.10		0.60	3.9		23.6



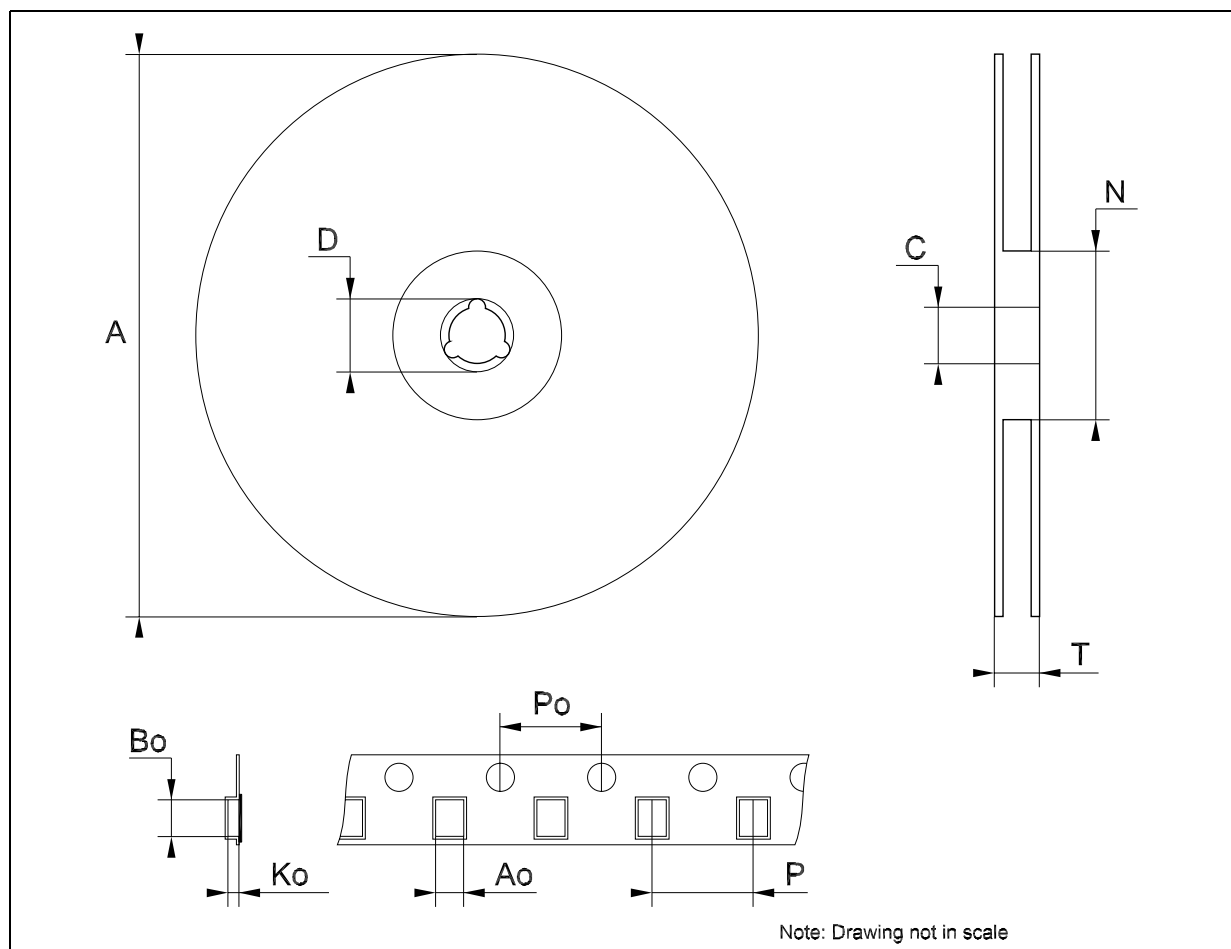
## SOT323-5L MECHANICAL DATA

DIM.	mm.			mils		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	0.80		1.10	31.5		43.3
A1	0.00		0.10	0.0		3.9
A2	0.80		1.00	31.5		39.4
b	0.15		0.30	5.9		11.8
C	0.10		0.18	3.9		7.1
D	1.80		2.20	70.9		86.6
E	1.80		2.40	70.9		94.5
E1	1.15		1.35	45.3		53.1
e		0.65			25.6	
e1		1.3			51.2	
L	0.10		0.30	3.9		11.8



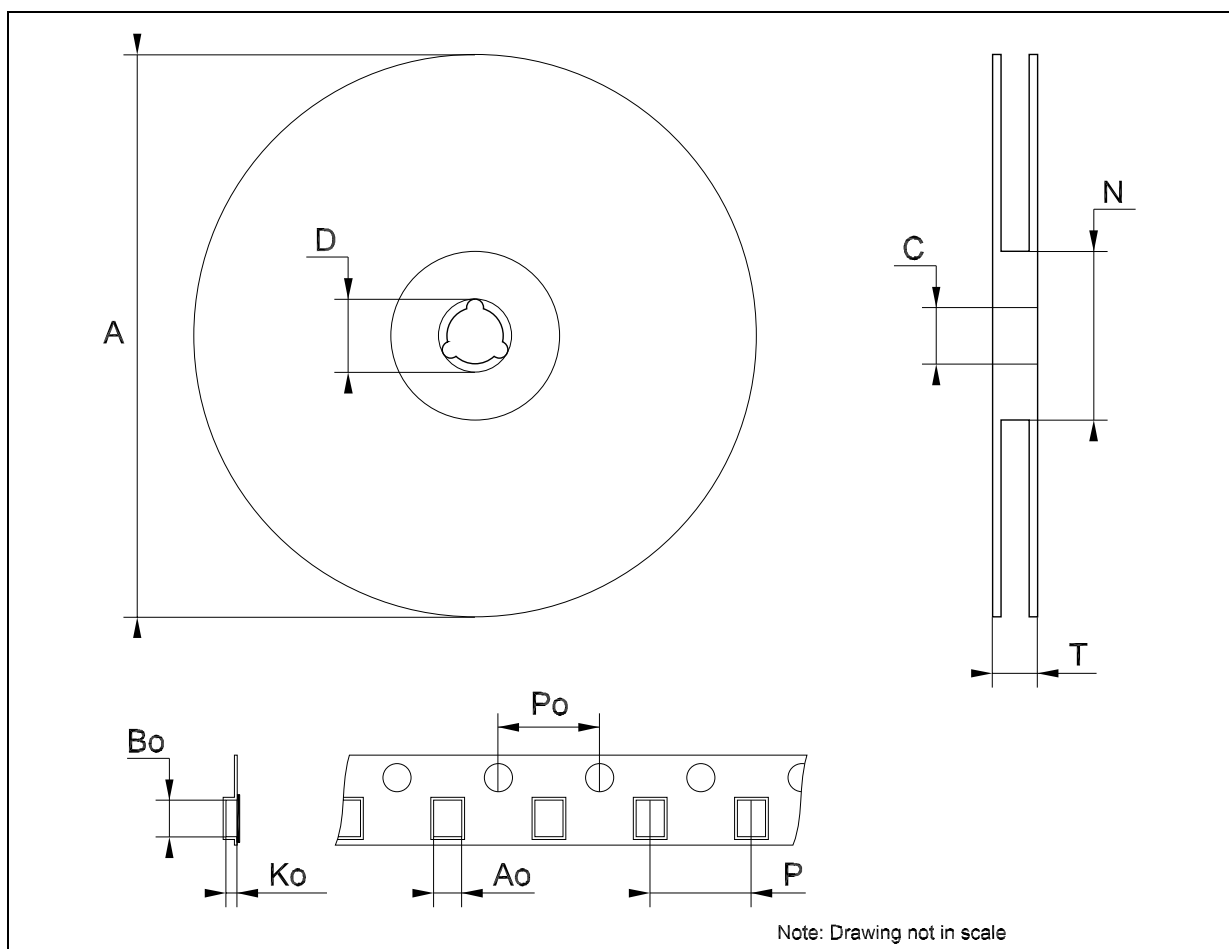
## Tape &amp; Reel SOT23-xL MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			180			7.086
C	12.8	13.0	13.2	0.504	0.512	0.519
D	20.2			0.795		
N	60			2.362		
T			14.4			0.567
Ao	3.13	3.23	3.33	0.123	0.127	0.131
Bo	3.07	3.17	3.27	0.120	0.124	0.128
Ko	1.27	1.37	1.47	0.050	0.054	0.058
Po	3.9	4.0	4.1	0.153	0.157	0.161
P	3.9	4.0	4.1	0.153	0.157	0.161



### Tape & Reel SOT323-xL MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	175	180	185	6.889	7.086	7.283
C	12.8	13	13.2	0.504	0.512	0.519
D	20.2			0.795		
N	59.5	60	60.5		2.362	
T			14.4			0.567
Ao		2.25			0.088	
Bo		2.7			0.106	
Ko		1.2			0.047	
Po	3.9	4	4.1	0.153	0.157	0.161
P	3.8	4	4.2	0.149	0.157	0.165



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