

## SINGLE INVERTER OPEN DRAIN

- 5V TOLERANT INPUTS
- HIGH SPEED:  $t_{PD} = 4.2ns$  (MAX.) at  $V_{CC} = 3V$
- LOW POWER DISSIPATION:  
 $I_{CC} = 1\mu A$  (MAX.) at  $T_A = 25^\circ C$
- POWER DOWN PROTECTION ON INPUTS AND OUTPUTS
- OPERATING VOLTAGE RANGE:  
 $V_{CC}(OPR) = 1.65V$  to  $5.5V$   
(1.2V Data Retention)
- IMPROVED LATCH-UP IMMUNITY

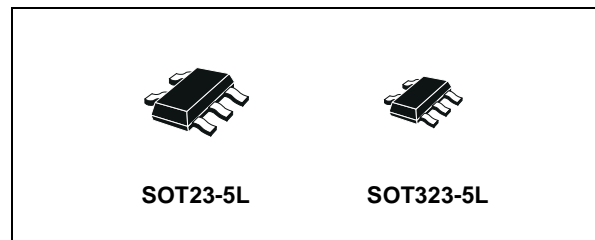
### DESCRIPTION

The 74LX1G05 is a low voltage CMOS SINGLE INVERTER (OPEN DRAIN) 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.

This device can also be used as a led driver in any other application requiring current sink.

Power down protection is provided on all inputs and 0 to 7V can be accepted on inputs with no



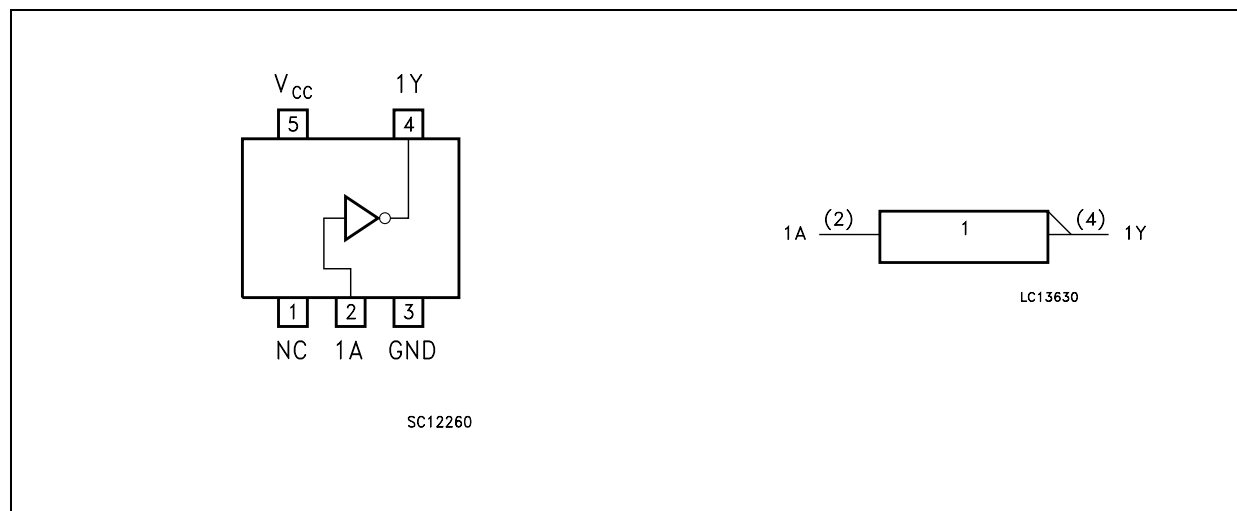
### ORDER CODES

PACKAGE	T & R
SOT23-5L	74LX1G05STR
SOT323-5L	74LX1G05CTR

regard to the supply voltage. This device can be used to interface 5V to 3V.

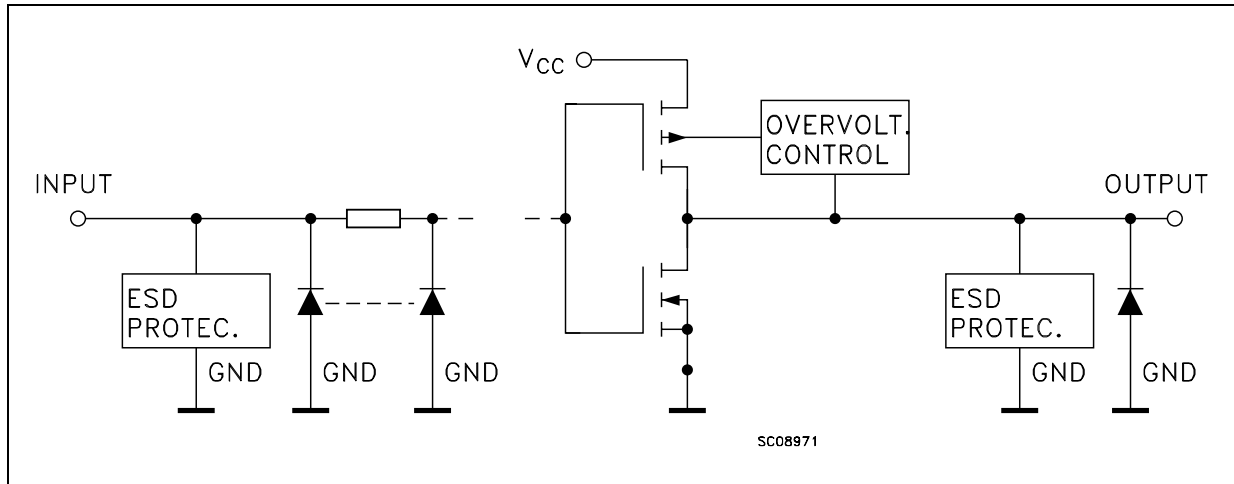
All inputs and outputs are equipped with protection circuits against static discharge.

### PIN CONNECTION AND IEC LOGIC SYMBOLS



# 74LX1G05

## INPUT EQUIVALENT CIRCUIT



## PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1	NC	Not Connected
2	1A	Data Input
4	1Y	Data Output
3	GND	Ground (0V)
5	V <sub>CC</sub>	Positive Supply Voltage

## TRUTH TABLE

A	Y
L	Z
H	L

Z: High Impedance

## 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
$I_{OL}$	High or Low Level Output Current ( $V_{CC} = 4.5$ to $5.5V$ )	+ 32	mA
$I_{OL}$	High or Low Level Output Current ( $V_{CC} = 3.0$ to $3.6V$ )	+ 24	mA
$I_{OL}$	High or Low Level Output Current ( $V_{CC} = 2.7$ to $3.0V$ )	+ 12	mA
$I_{OL}$	High or Low Level Output Current ( $V_{CC} = 2.3$ to $2.7V$ )	+ 8	mA
$I_{OL}$	High or Low Level Output Current ( $V_{CC} = 1.65$ to $2.3V$ )	+ 4	mA
$T_{op}$	Operating Temperature	-55 to 125	°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 °C		-55 to 125 °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			$0.3V_{CC}$		$0.3V_{CC}$	
$V_{OL}$	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			
$I_{OZ}$	High Impedance Output Leakage Current	3.6	$V_I = 0$ to $5.5V$		$\pm 10$		$\pm 10$	$\mu A$
$I_I$	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	$\mu A$
		3.6	$V_I$ or $V_O = 3.6$ to $5.5V$		$\pm 10$		$\pm 10$	

## AC ELECTRICAL CHARACTERISTICS

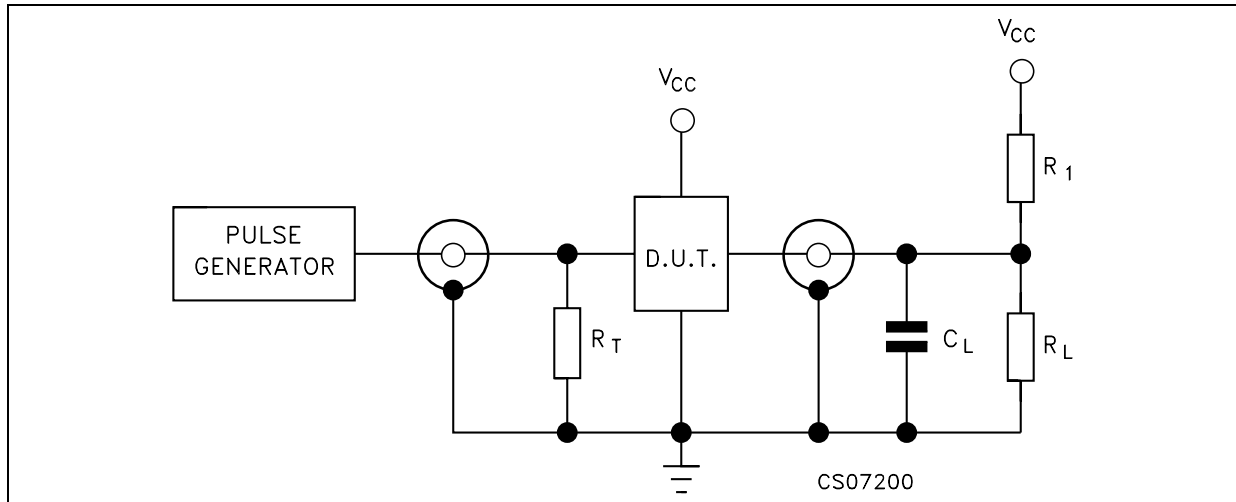
Symbol	Parameter	Test Condition				Value				Unit
		V <sub>CC</sub> (V)	C <sub>L</sub> (pF)	R <sub>L</sub> (Ω)	t <sub>s</sub> = t <sub>r</sub> (ns)	-40 to 85 °C		-55 to 125 °C		
						Min.	Max.	Min.	Max.	
t <sub>PLZ</sub>	Propagation Delay Time	1.65 to 1.95	30	1000	2.0	2.4	8.3	2.4	8.3	ns
		2.3 to 2.7	30	500	2.0	1.0	5.5	1.0	5.5	
		2.7	50	500	2.5	1.0	5.5	1.0	5.5	
		3.0 to 3.6	50	500	2.5	1.5	4.2	1.5	4.2	
		4.5 to 5.5	50	500	2.5	1	3.5	1	3.5	
t <sub>PZL</sub>	Propagation Delay Time	1.65 to 1.95	30	1000	2.0	2.4	8.3	2.4	8.3	ns
		2.3 to 2.7	30	500	2.0	1.0	5.5	1.0	5.5	
		2.7	50	500	2.5	1.0	5.5	1.0	5.5	
		3.0 to 3.6	50	500	2.5	1.5	4.2	1.5	4.2	
		4.5 to 5.5	50	500	2.5	1	3.5	1	3.5	

## CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Condition		Value			Unit
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25 °C			
				Min.	Typ.	Max.	
C <sub>IN</sub>	Input Capacitance		V <sub>IN</sub> = 0 or V <sub>CC</sub>		4		pF
C <sub>OUT</sub>	Output Capacitance		V <sub>IN</sub> = 0 or V <sub>CC</sub>		5	10	pF
C <sub>PD</sub>	Power Dissipation Capacitance (note 1)	1.8	f <sub>IN</sub> = 10MHz		21		pF
		2.5			24		
		3.3			26		

1) C<sub>PD</sub> 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<sub>CC(oper)</sub> = C<sub>PD</sub> × V<sub>CC</sub> × f<sub>IN</sub> + I<sub>CC</sub>

TEST CIRCUIT

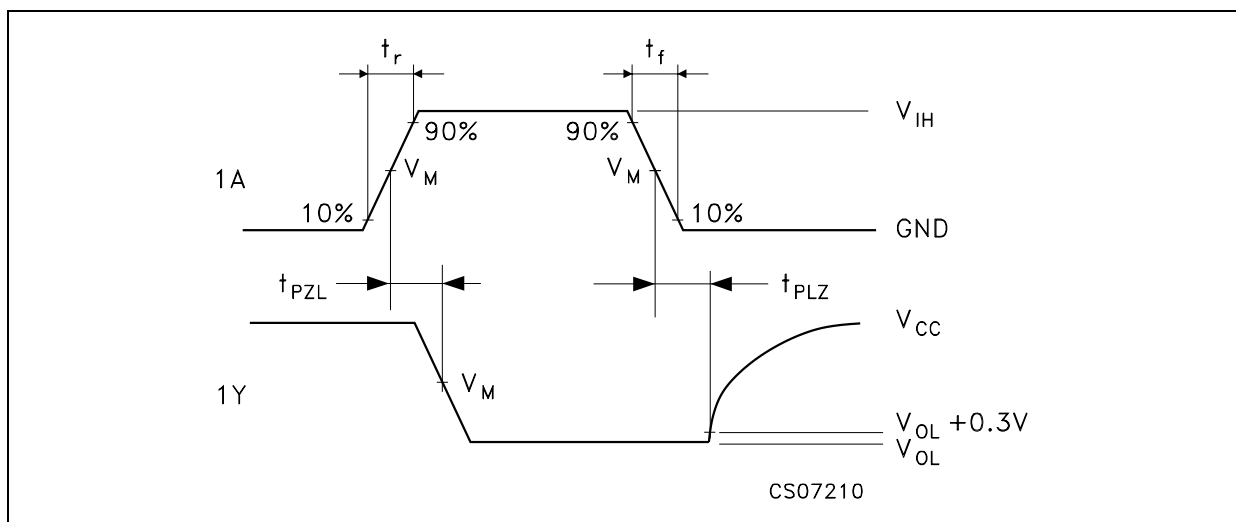


$R_T = Z_{OUT}$  of pulse generator (typically  $50\Omega$ )

TEST CIRCUIT AND WAVEFORM SYMBOL VALUE

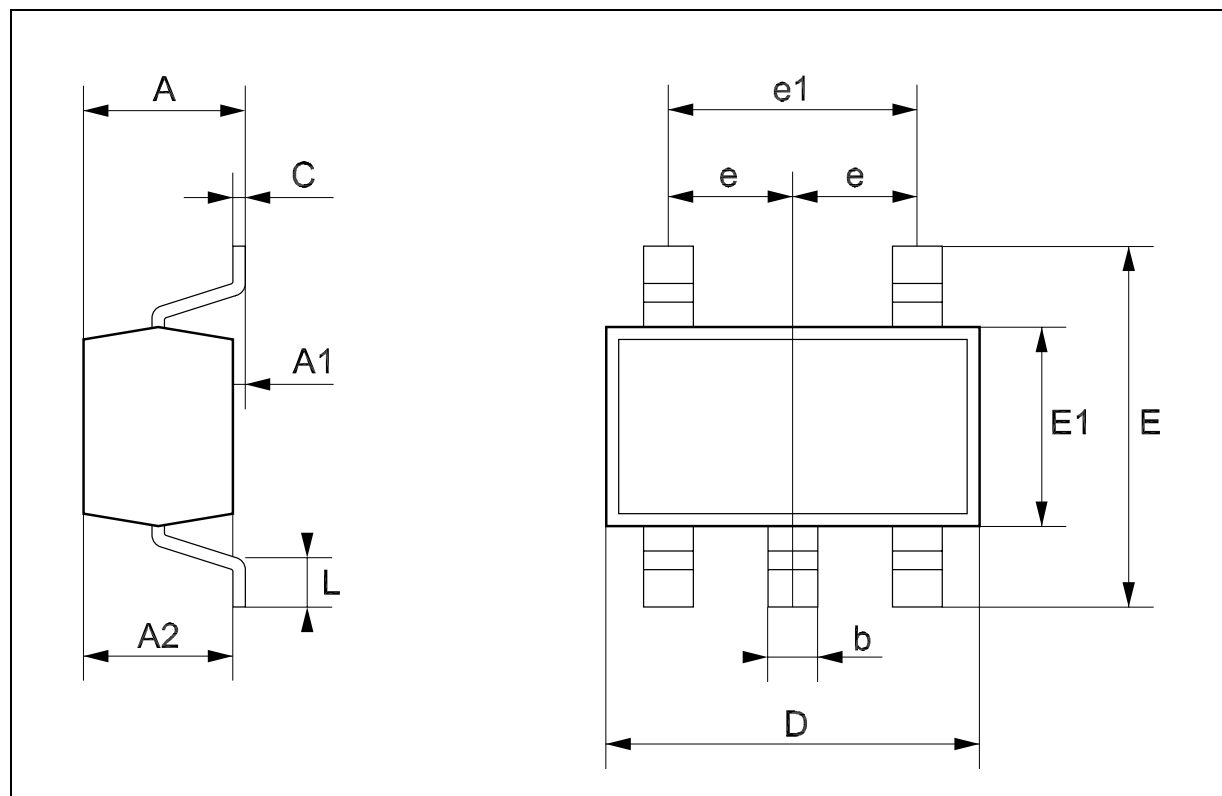
Symbol	$V_{CC}$		
	1.65 to 1.95V	2.3 to 2.7V	2.7 to 5.5V
$C_L$	30pF/50pF	30pF/50pF	50pF
$R_L = R_1$	$1000\Omega$	$500\Omega$	$500\Omega$
$V_{IH}$	$V_{CC}$	$V_{CC}$	$V_{CC}$
$V_M$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$
$t_r = t_f$	$<2.0ns$	$<2.0ns$	$<2.5ns$

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



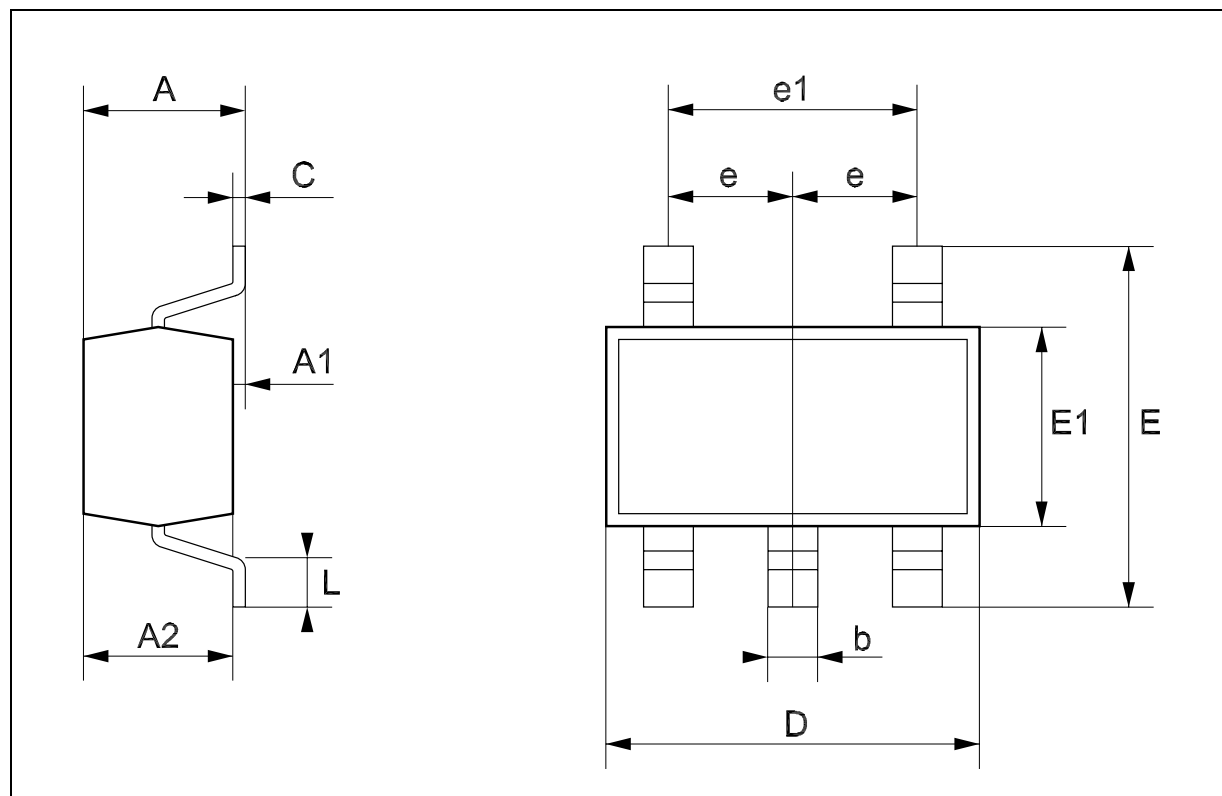
## SOT23-5L MECHANICAL DATA

DIM.	mm.			mils		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	0.90		1.45	35.4		57.1
A1	0.00		0.15	0.0		5.9
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	2.60		3.00	102.3		118.1
E1	1.50		1.75	59.0		68.8
e		0.95			37.4	
e1		1.9			74.8	
L	0.35		0.55	13.7		21.6



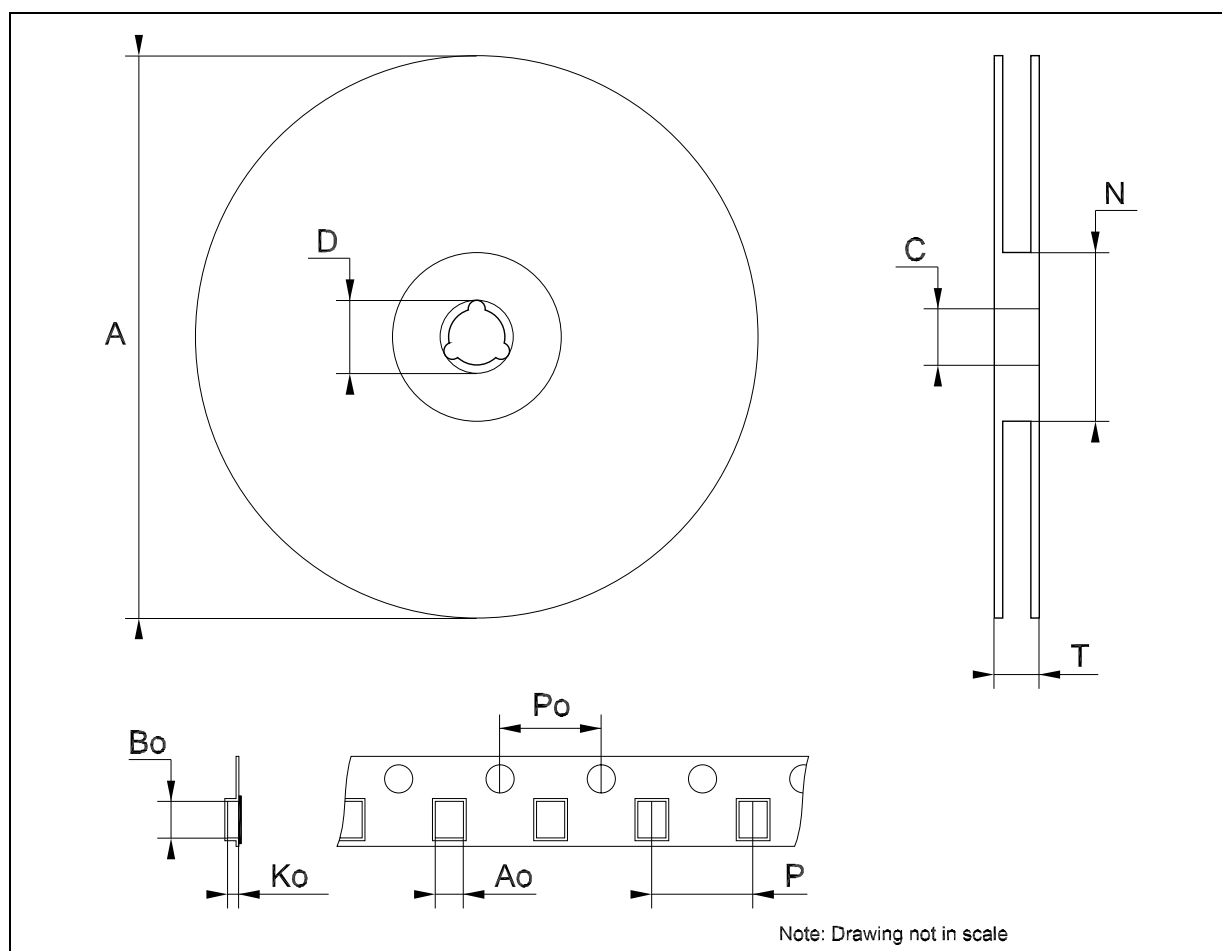
## SOT323-5L MECHANICAL DATA

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

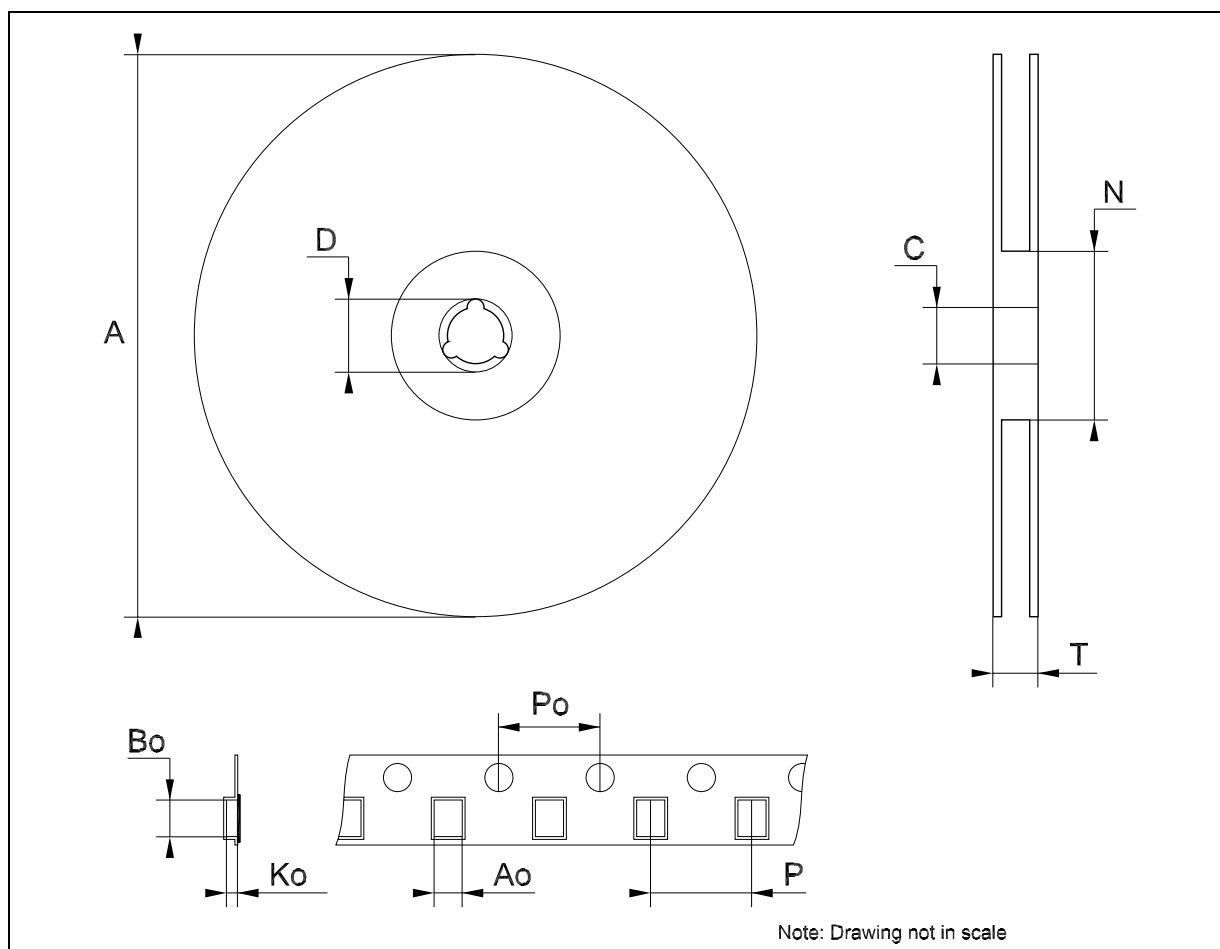
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			180			7.086
C	12.8	13.0	13.2	0.504	0.512	0.519
D	20.2			0.795		
N	60			2.362		
T			14.4			0.567
Ao	3.13	3.23	3.33	0.123	0.127	0.131
Bo	3.07	3.17	3.27	0.120	0.124	0.128
Ko	1.27	1.37	1.47	0.050	0.054	0.058
Po	3.9	4.0	4.1	0.153	0.157	0.161
P	3.9	4.0	4.1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





## Tape &amp; 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	3.98	4	4.2	0.156	0.157	0.165
P	3.98	4	4.2	0.156	0.157	0.165



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