



# 74AC16541

## 16-BIT BUS BUFFER WITH 3-STATE OUTPUTS (NON INVERTED)

- HIGH SPEED:  
 $t_{PD} = 4.5 \text{ ns}$  (TYP.) at  $V_{CC} = 5V$
- LOW POWER DISSIPATION:  
 $I_{CC} = 8 \mu A$  (MAX.) at  $T_A = 25^\circ C$
- HIGH NOISE IMMUNITY:  
 $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (MIN.)
- POWER DOWN PROTECTION ON INPUTS
- SYMMETRICAL OUTPUT IMPEDANCE:  
 $|I_{OH}| = I_{OL} = 24 \text{ mA}$  (MIN)
- BALANCED PROPAGATION DELAYS:  
 $t_{PLH} \approx t_{PHL}$
- OPERATING VOLTAGE RANGE:  
 $V_{CC(OPR)} = 2V \text{ to } 6V$
- PIN AND FUNCTION COMPATIBLE WITH  
74 SERIES 16541
- IMPROVED LATCH-UP IMMUNITY

### DESCRIPTION

The 74AC16541 is an advanced high-speed CMOS 16-BIT BUS BUFFER (3-STATE) fabricated with sub-micron silicon gate and double-layer metal wiring C<sup>2</sup>MOS technology.

This is composed of two 8-bit sections with separate output-enable signals. For either 8-bit buffers section, the 3 STATE control gate operates as a two input AND such that if either  $\overline{nG1}$  and  $\overline{nG2}$  are high, all outputs are in the high impedance state.

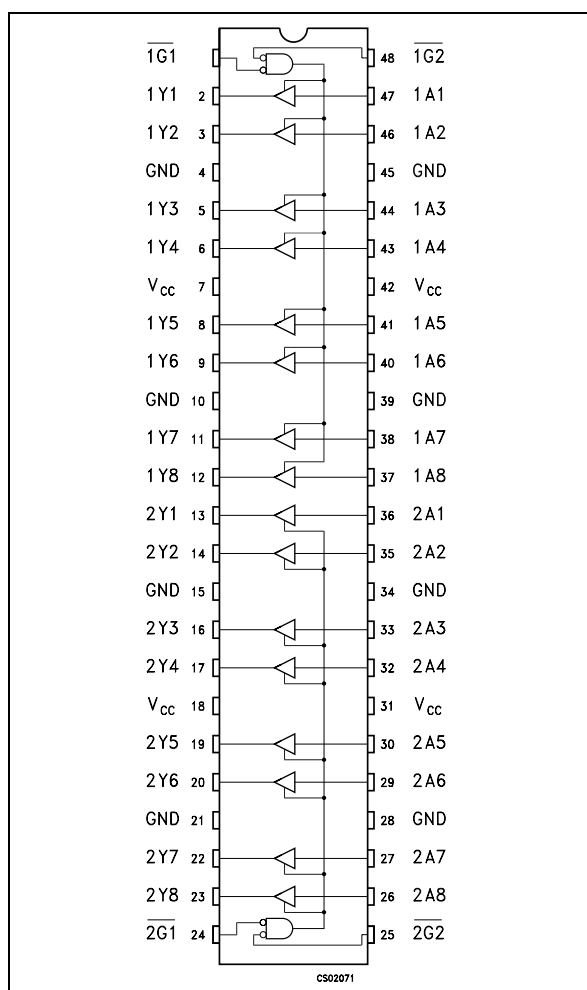


TSSOP

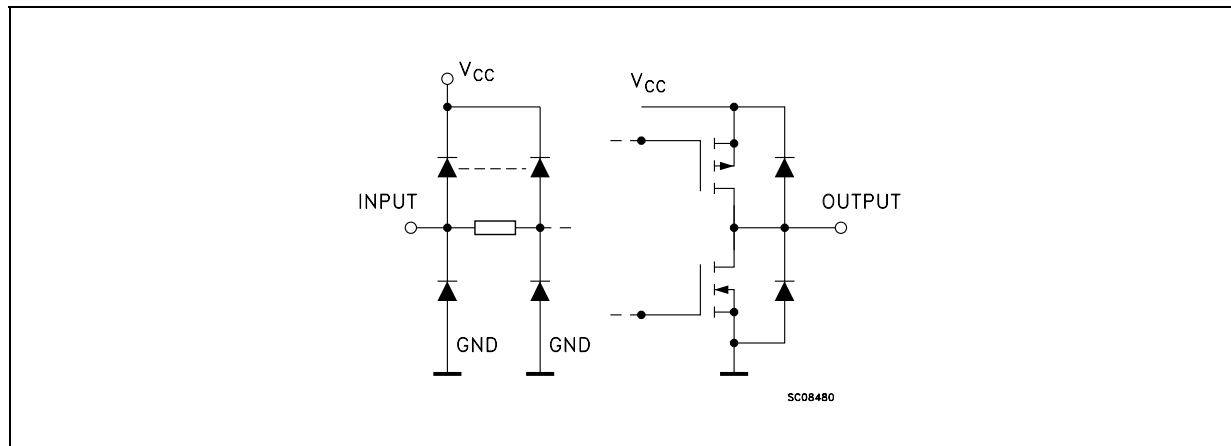
### ORDER CODES

PACKAGE	TUBE	T & R
TSSOP		74AC16541TTR

### PIN CONNECTION



## INPUT AND OUTPUT EQUIVALENT CIRCUIT



## PIN DESCRIPTION

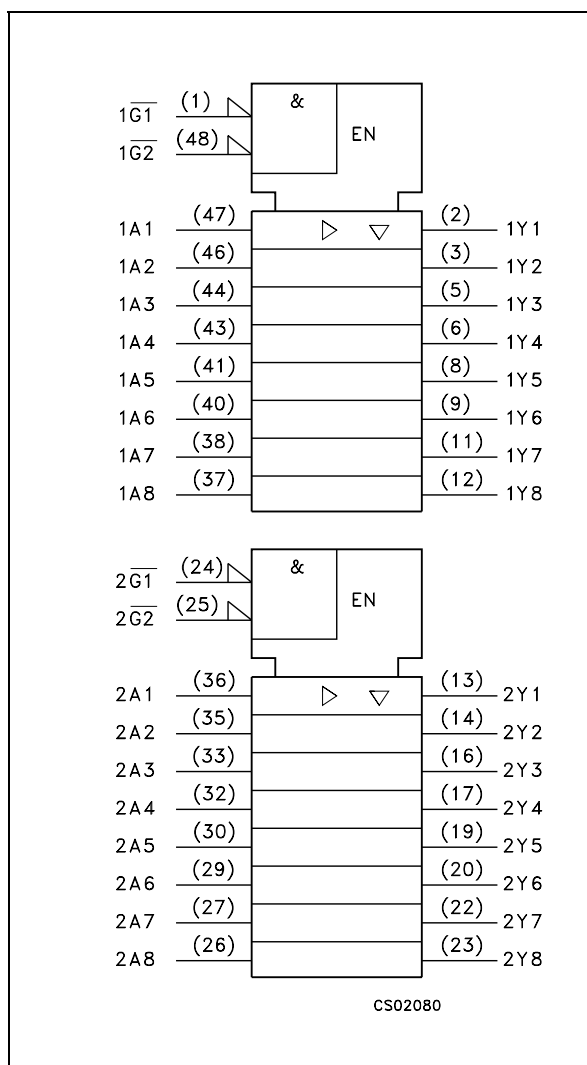
PIN No	SYMBOL	NAME AND FUNCTION
1, 48	1G1, 1G2	Output Enable Inputs
2, 3, 5, 6, 8, 9, 11, 12	1Y1 to 1Y8	Data Outputs
13, 14, 16, 17, 19, 20, 22, 23	2Y1 to 2Y8	Data Outputs
24, 25	2G1, 2G2	Output Enable Inputs
36, 35, 33, 32, 30, 29, 27, 26	2A1 to 2A8	Data Outputs
47, 46, 44, 43, 41, 40, 38, 37	1A1 to 1A8	Data Outputs
4, 10, 15, 21, 28, 34, 39, 45	GND	Ground (0V)
7, 18, 31, 42	V <sub>CC</sub>	Positive Supply Voltage

## TRUTH TABLE

INPUTS			OUTPUT
G1	G2	A <sub>n</sub>	Y <sub>n</sub>
H	X	X	Z
X	H	X	Z
L	L	H	H
L	L	L	L

X : Don't Care  
Z : High Impedance

## IEC LOGIC SYMBOLS



**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage	-0.5 to +7.0	V
$V_I$	DC Input Voltage	-0.5 to +7.0	V
$V_O$	DC Output Voltage	-0.5 to $V_{CC} + 0.5$	V
$I_{IK}$	DC Input Diode Current	$\pm 20$	mA
$I_{OK}$	DC Output Diode Current	$\pm 50$	mA
$I_O$	DC Output Current	$\pm 50$	mA
$I_{CC}$ or $I_{GND}$	DC $V_{CC}$ or Ground Current	$\pm 400$	mA
$T_{stg}$	Storage Temperature	-65 to +150	°C
$T_L$	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.

**RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage	2 to 6	V
$V_I$	Input Voltage	0 to $V_{CC}$	V
$V_O$	Output Voltage	0 to $V_{CC}$	V
$T_{op}$	Operating Temperature	-55 to 125	°C
dt/dv	Input Rise and Fall Time (note 1) $V_{CC} = 3.0, 4.5$ or $5.5$	0 to 8	ns/V

1)  $V_{IN}$  from 30% to 70% of  $V_{CC}$

## DC SPECIFICATIONS

Symbol	Parameter	Test Condition		Value							Unit
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25 °C			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
V <sub>IH</sub>	High Level Input Voltage	3.0	V <sub>O</sub> = 0.1 V or V <sub>CC</sub> -0.1V	2.1	1.5		2.1		2.1		V
		4.5		3.15	2.25		3.15		3.15		
		5.5		3.85	2.75		3.85		3.85		
V <sub>IL</sub>	Low Level Input Voltage	3.0	V <sub>O</sub> = 0.1 V or V <sub>CC</sub> -0.1V		1.5	0.9		0.9		0.9	V
		4.5			2.25	1.35		1.35		1.35	
		5.5			2.75	1.65		1.65		1.65	
V <sub>OH</sub>	High Level Output Voltage	3.0	I <sub>O</sub> =-50 μA	2.9	2.99		2.9		2.9		V
		4.5	I <sub>O</sub> =-50 μA	4.4	4.49		4.4		4.4		
		5.5	I <sub>O</sub> =-50 μA	5.4	5.49		5.4		5.4		
		3.0	I <sub>O</sub> =-12 mA	2.56			2.46		2.46		
		4.5	I <sub>O</sub> =-24 mA	3.86			3.76		3.76		
		5.5	I <sub>O</sub> =-24 mA	4.86			4.76		4.76		
V <sub>OL</sub>	Low Level Output Voltage	3.0	I <sub>O</sub> =50 μA		0.002	0.1		0.1		0.1	V
		4.5	I <sub>O</sub> =50 μA		0.001	0.1		0.1		0.1	
		5.5	I <sub>O</sub> =50 μA		0.001	0.1		0.1		0.1	
		3.0	I <sub>O</sub> =12 mA			0.36		0.44		0.44	
		4.5	I <sub>O</sub> =24 mA			0.36		0.44		0.44	
I <sub>I</sub>	Input Leakage Current	5.5	V <sub>I</sub> = V <sub>CC</sub> or GND			± 0.1		± 1		± 1	μA
I <sub>OZ</sub>	High Impedance Output Leakage Current	5.5	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> V <sub>O</sub> = V <sub>CC</sub> or GND			± 0.5		± 5		± 5	μA
I <sub>CC</sub>	Quiescent Supply Current	5.5	V <sub>I</sub> = V <sub>CC</sub> or GND			8		80		80	μA

AC ELECTRICAL CHARACTERISTICS ( C<sub>L</sub> = 50 pF, R<sub>L</sub> = 500 Ω, Input t<sub>r</sub> = t<sub>f</sub> = 3ns)

Symbol	Parameter	Test Condition			Value						Unit	
		V <sub>CC</sub> (V)	C <sub>L</sub> (pF)		T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C		
					Min.	Typ.	Max.	Min.	Max.	Min.		Max.
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time A to Y	3.3(*)				6.3	7.5		9.5		9.5	ns
		5.0(**)				4.5	7.0		9.0		9.0	
t <sub>PZL</sub> t <sub>PZH</sub>	Output Enable Time	3.3(*)				8.5	10.0		12.0		12.0	ns
		5.0(**)				5.5	7.0		9.0		9.0	
t <sub>PLZ</sub> t <sub>PHZ</sub>	Output Disable Time	3.3(*)				7.5	9.0		11.5		11.5	ns
		5.0(**)				6.0	8.0		11.0		11.0	

(\*) Voltage range is 3.3V ± 0.3V

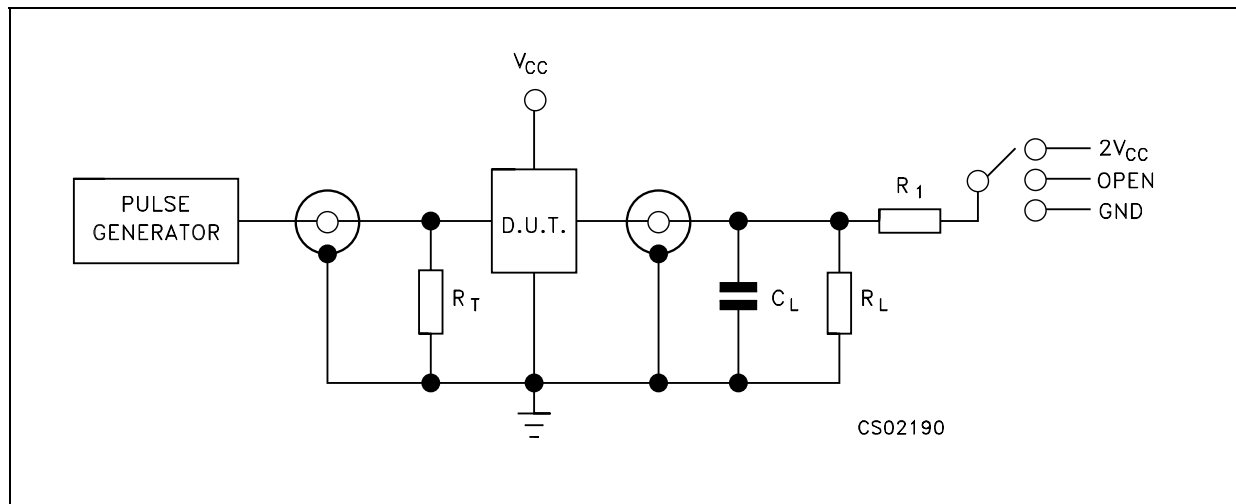
(\*\*) Voltage range is 5.0V ± 0.5V

## CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Condition		Value						Unit	
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
C <sub>IN</sub>	Input Capacitance				7	10		10		10	pF
C <sub>OUT</sub>	Output Capacitance				14						pF
C <sub>PD</sub>	Power Dissipation Capacitance (note 1)	5.0	f <sub>IN</sub> = 10MHz		25						pF

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.  $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/16$

## TEST CIRCUIT

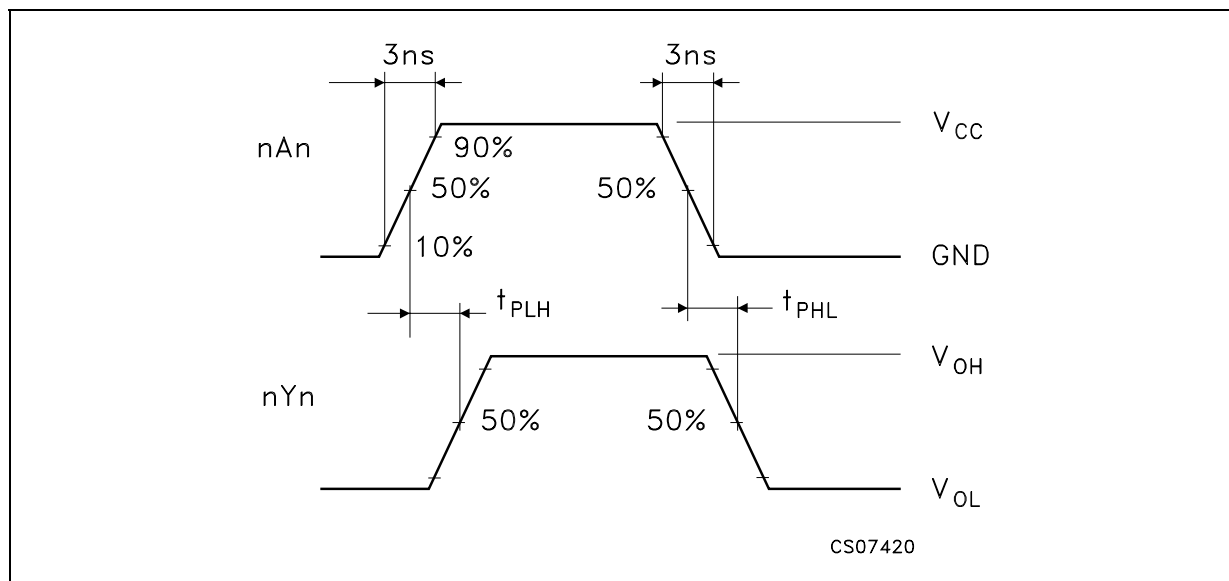
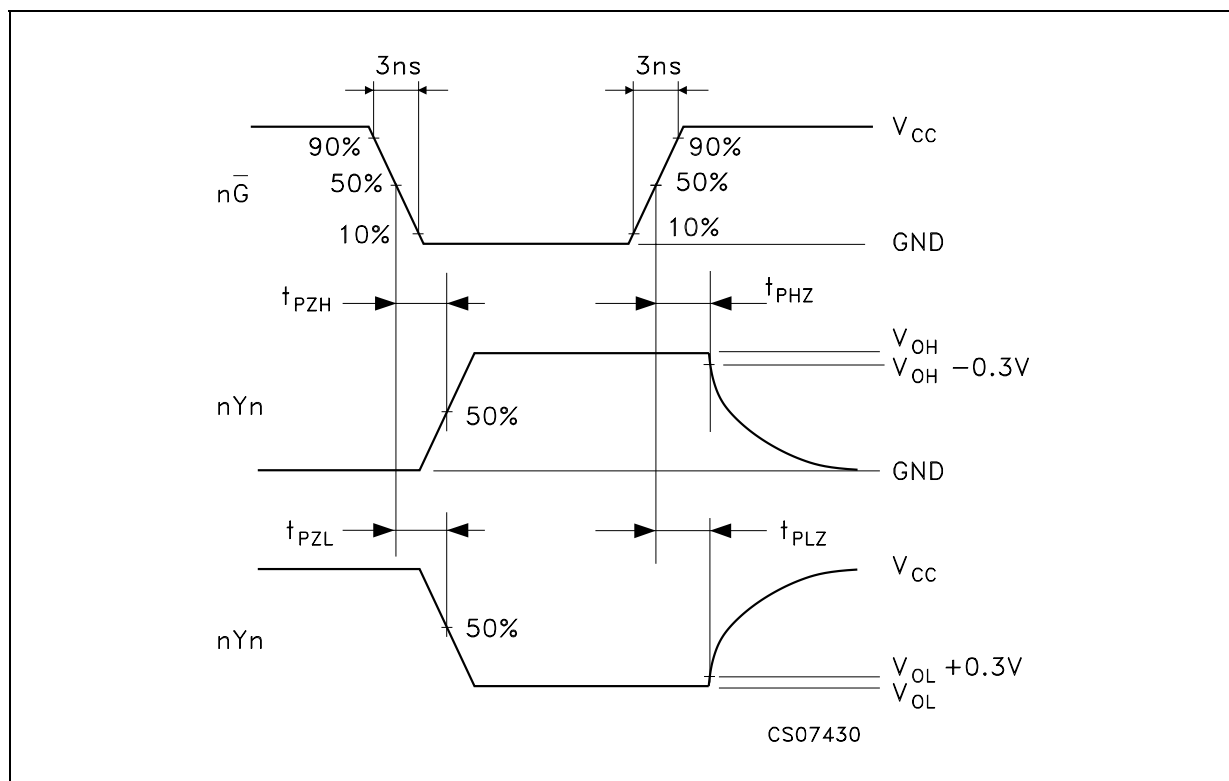


TEST	SWITCH
$t_{PLH}, t_{PHL}$	Open
$t_{PZL}, t_{PLZ}$	$V_{CC}$
$t_{PZH}, t_{PHZ}$	GND

$C_L = 50 \text{ pF}$  or equivalent (includes jig and probe capacitance)

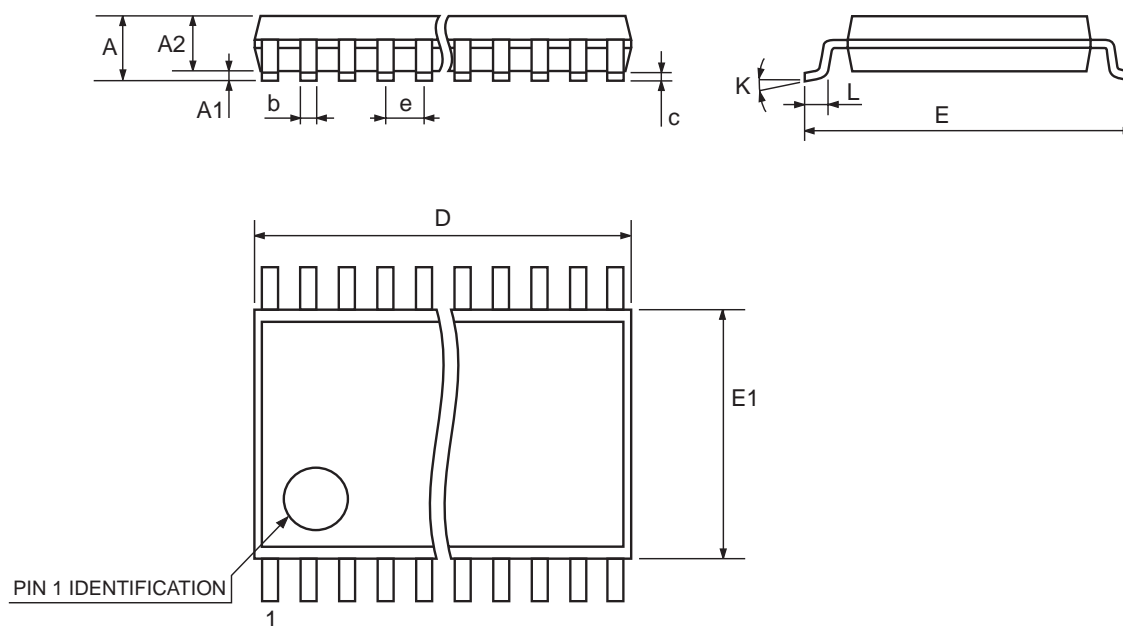
$R_L = R_1 = 500 \Omega$  or equivalent

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

**WAVEFORM 1: PROPAGATION DELAYS** ( $f=1\text{MHz}$ ; 50% duty cycle)**WAVEFORM 2: OUTPUT ENABLE AND DISABLE TIME** ( $f=1\text{MHz}$ ; 50% duty cycle)

## TSSOP48 MECHANICAL DATA

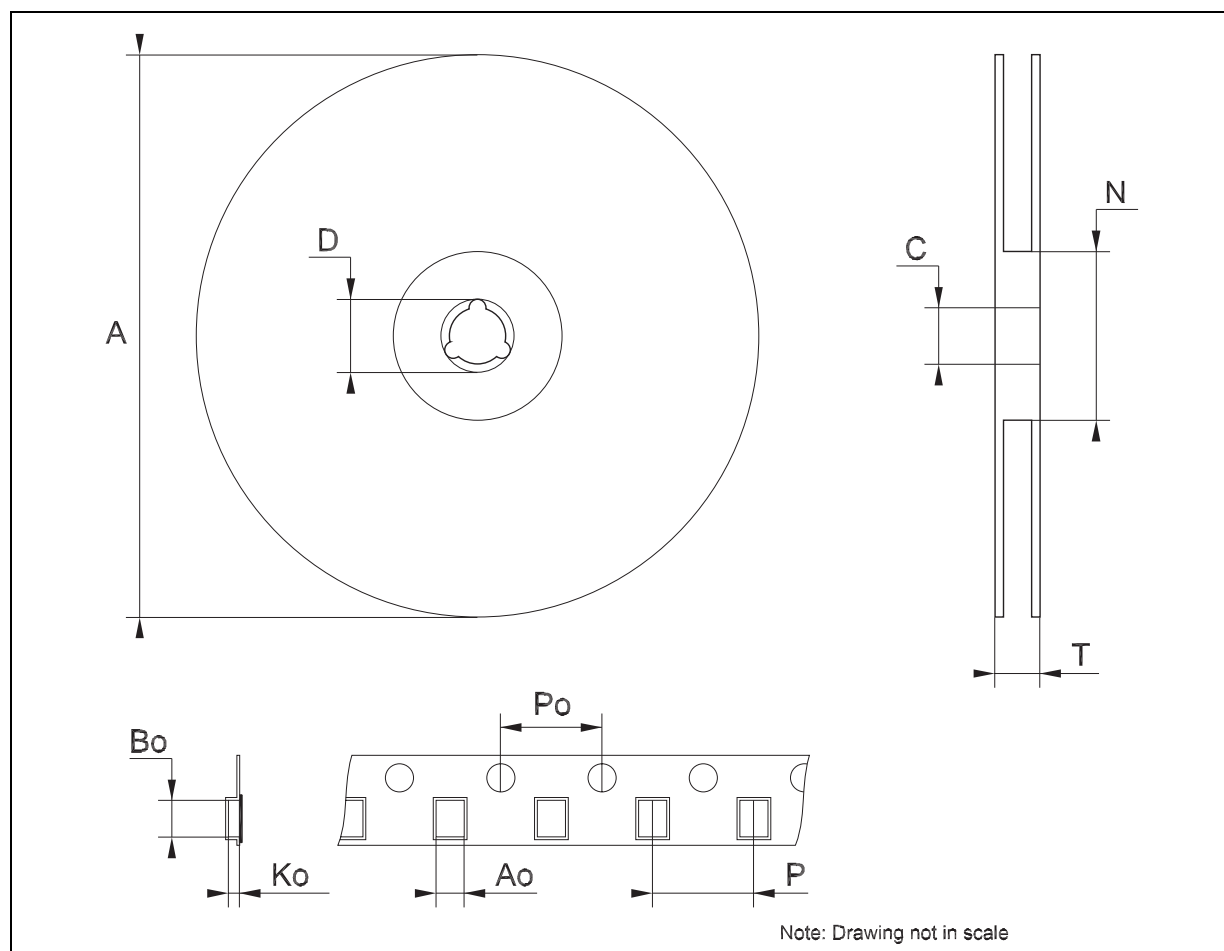
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.2			0.047
A1	0.05		0.15	0.002		0.006
A2		0.9			0.035	
b	0.17		0.27	0.0067		0.011
c	0.09		0.20	0.0035		0.0079
D	12.4		12.6	0.488		0.496
E		8.1 BSC			0.318 BSC	
E1	6.0		6.2	0.236		0.244
e		0.5 BSC			0.0197 BSC	
K	0°		8°	0°		8°
L	0.50		0.75	0.020		0.030



7065588C

### Tape & Reel TSSOP48 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			30.4			1.197
Ao	8.7		8.9	0.343		0.350
Bo	13.1		13.3	0.516		0.524
Ko	1.5		1.7	0.059		0.067
Po	3.9		4.1	0.153		0.161
P	11.9		12.1	0.468		0.476





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