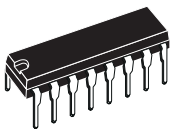
ST26C31B

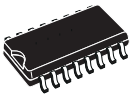
CMOS quad 3-state differential line driver

Features

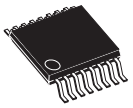
- TTL input compatible
- Typical propagation delay: 6 ns
- Typical output skew: 0.5 ns
- Output will not load line when V_{CC} = 0 V
- Meets the requirements of EIA standard RS-422
- Operation from single 5 V supply
- 3-state outputs for connection to system buses
- Low quiescent current
- Available in surface mount



DIP-16



SO-16



TSSOP16

Description

The ST26C31B is a quad differential line driver designed for digital data transmission over balanced lines and meets all the requirements of EIA standard RS-422 while retaining the low power characteristics of CMOS.

The ST26C31B accepts TTL or CMOS input levels and translates these to RS-422 output levels. This part uses special outputs circuitry common to all four drivers. All outputs are protected against damage due to electrostatic discharge by diode to V_{CC} and ground.

Table 1. Device summary

Order codes	Temperature range	Package	Packaging
ST26C31BN	-40 to 85 °C	DIP-16	25 parts per tube / 40 tube per box
ST26C31BDR	-40 to 85 °C	SO-16 (tape and reel)	2500 parts per reel
ST26C31BTR	-40 to 85 °C	TSSOP16 (tape and reel)	2500 parts per reel

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1 Pin configuration

Figure 1. Pin connections

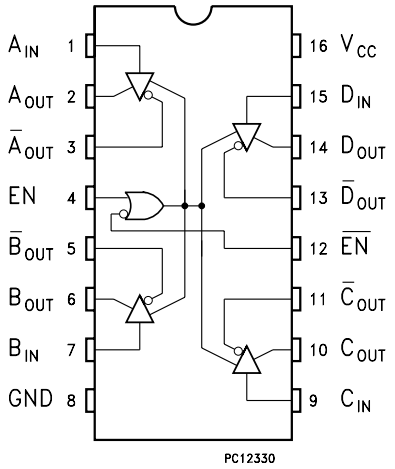


Table 2. Pin description

Pin n°	Symbol	Name and function
1	A_{IN}	Input A
2	A_{OUT}	Channel A output
3	$\overline{A}_{OUT}$	Channel A output
4	EN	ENABLE
5	$\overline{B}_{OUT}$	Channel B output
6	B_{OUT}	Channel B output
7	B_{IN}	Input B
8	GND	Ground
9	C_{IN}	Input C
10	C_{OUT}	Channel C output
11	$\overline{C}_{OUT}$	Channel C output
12	EN	ENABLE
13	$\overline{D}_{OUT}$	Channel D output
14	D_{OUT}	Channel D output
15	D_{IN}	Input D
16	V_{CC}	Supply voltage

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Table 3. Truth table

Enable	Enable	Input	Output	Output
L	H	X	Z	Z
All other combinations of enable inputs		L	L	H
		H	H	L

Note: L = Low voltage state
H = High logic state
X = Don't care
Z = High impedance

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2 Maximum ratings

Table 4. Absolute maximum ratings (1) (2)

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	-0.5 to 7	V
V_{IN}	DC input voltage	-0.5 to (V_{CC} + 0.5)	V
V_{OUT}	DC output voltage (high or low state)	-0.5 to 7	V
I_{IK}	Clamp diode current	± 20	mA
I_{OUT}	DC output current per pin	± 150	mA
I_{CC}	DC V_{CC} or gnd current	± 150	mA
T_{STG}	Storage temperature range	-65 to +150	°C

1. Absolute maximum ratings are those values beyond which the safety of the device cannot be guaranteed. They are not meant to imply that the device should be operated at these limits. The table of electrical characteristics provide conditions for actual device operation.
2. Unless otherwise specified, all voltage are referenced to ground. All currents into the device pins are positive; all currents out of the device pins are negative.

Table 5. Recommended operating conditions

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	4.5 to 5.5	V
V_{IN}	DC input voltage	0 to V_{CC}	V
V_{OUT}	DC output voltage (high or low state)	0 to V_{CC}	V
V_{OUT}	DC output voltage (V_{CC} = 0 V or high impedance)	0 to 5	V
T_A	Operating temperature range	-40 to +85	°C
t_r, t_f	Maximum enable input rise or fall times	500	ns

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3 Electrical characteristics

Table 6. Electrical characteristics (V_{CC} = 5 V ± 10 %, unless otherwise specified [1])

Symbol	Parameter	Test conditions		Value			Unit
				Min.	Typ.	Max.	
V_{IH}	High level input voltage			2			V
V_{IL}	Low level input voltage					0.8	V
V_{OH}	High level output voltage	V_{IN} = V_{IH} or V_{IL}, I_{OUT} = -20mA		2.5	3.4		V
V_{OL}	Low level output voltage	V_{IN} = V_{IH} or V_{IL}, I_{OUT} = +20mA			0.3	0.5	V
V_T	Differential output voltage	R_L = 100 Ω [2]		2	3.1		V
V_T-$\overline{V}_T$	Difference in differential output voltage	R_L = 100 Ω [2]				0.4	V
V_{OS}	Common mode output voltage	R_L = 100 Ω [2]			1.8	3	V
V_{OS}-V_{OS}	Difference in common mode output voltage	R_L = 100 Ω [2]				0.4	V
I_{IN}	Input current	V_{IN} = V_{CC}, GND, V_{IH} or V_{IL}				±1	µA
I_{CC}	Quiescent supply current [2]	I_{OUT} = 0 µA	V_{IN} = V_{CC} or GND		200	500	µA
			V_{IN} = 2.4 or 0.5 V [3]		0.8	2	mA
I_{OZ}	3-state output leakage current	V_{OUT} = V_{CC} or GND ENABLE = V_{IL} $\overline{\text{ENABLE}}$ = V_{IH}			±0.5	±5	µA
I_{SC}	Output short circuit current	V_{IN} = V_{CC} or GND [2] [4]		-30		-150	mA
I_{OFF}	Power off output leakage current [2]	V_{CC} = 0 V	V_{OUT} = 6 V			100	µA
			V_{OUT} = -0.25 V			-100	µA

1. Unless otherwise specified, min./max. limits apply across the recommended operating temperature range. All typical are given for V_{CC} = 5 V and T_A = 25 °C
2. See EIA Specification RS422 for exact test conditions.
3. Measured per pin input. All other input at V_{CC} or GND.
4. This is the current sourced when a high output is shorted to ground. Only one output at time should be shorted.

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Table 7. Switching characteristics (V_{CC} = 5 V ± 10 %, $t_r = t_f \leq 6$ ns [1])

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
t_{PLH} t_{PHL}	Propagation delay input to output	S1 Open	2	6	11	ns
Skew	[2]	S1 Open		0.5	2	ns
t_{TLH} t_{THL}	Differential output rise and fall times	S1 Open		6	10	ns
t_{PZH}	Output enable time	S1 Closed		11	19	ns
t_{PZL}	Output enable time	S1 Closed		13	21	ns
t_{PHZ}	Output disable time [3]	S1 Closed		5	9	ns
t_{PLZ}	Output disable time [3]	S1 Closed		7	11	ns
C_{PD}	Power dissipation capacitance [4]			50		pF
C_{IN}	Input capacitance			6		pF

1. Unless otherwise specified, min./max. limits apply across the recommended operating temperature range. All typical are given for V_{CC} = 5 V and T_A = 25 °C
2. Skew is defined as the difference in propagation delays between complementary outputs at the 50 % point.
3. Output disable time is the delay from the control input being switched to the output transistors tuning off. The actual disable times are less than indicated due to the delay added by RC time constant of the load.
4. CPD determines the no load dynamic power consumption, $P_D = C_{PD}V_{CC}^2$, f = $I_{CC}V_{CC}$, and the no load dynamic current consumption, $P_D = C_{PD}\ V_{CC}f + I_{CC}$.

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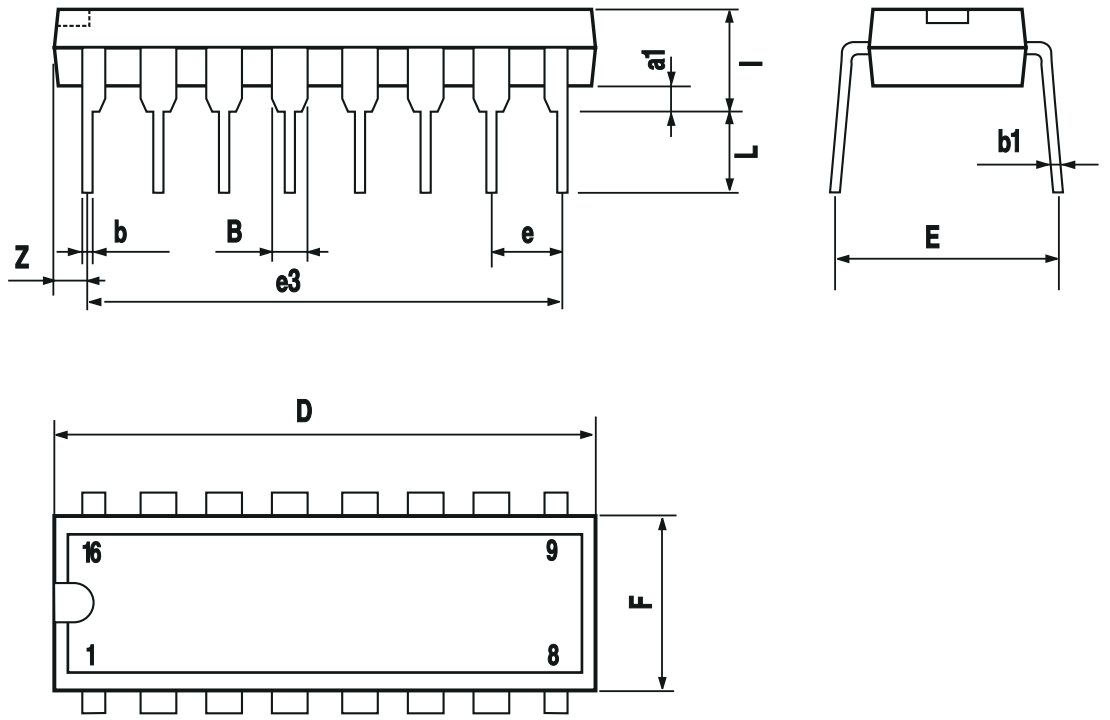
4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com

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Plastic DIP-16 (0.25) mechanical data

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050

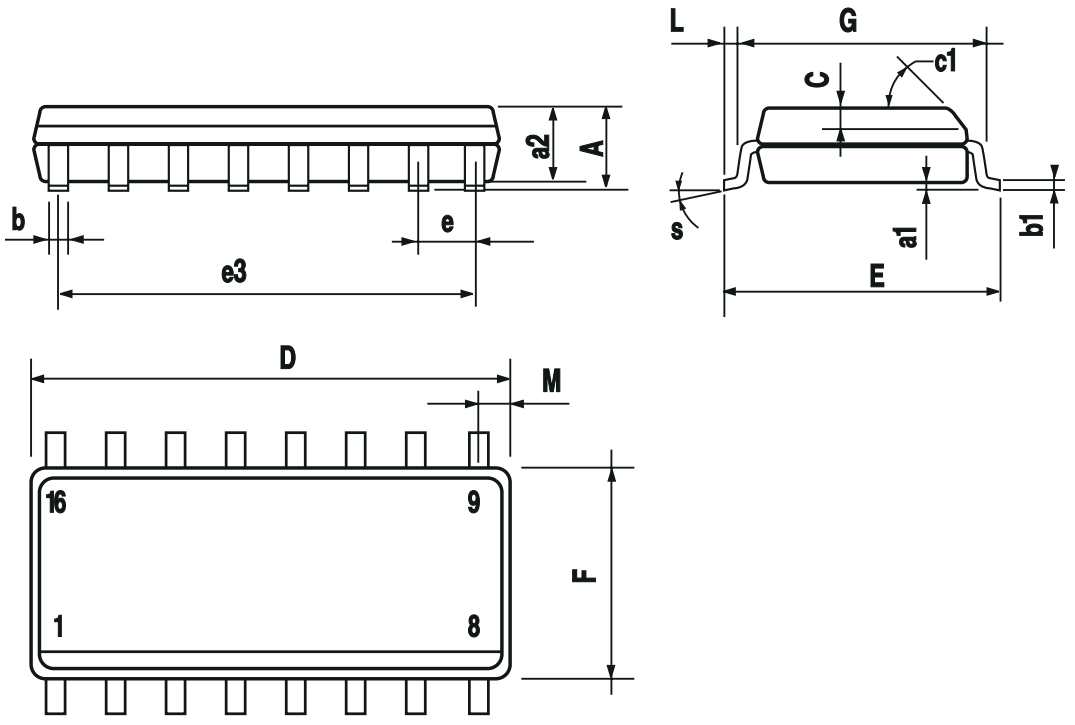


P001C

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SO-16 mechanical data

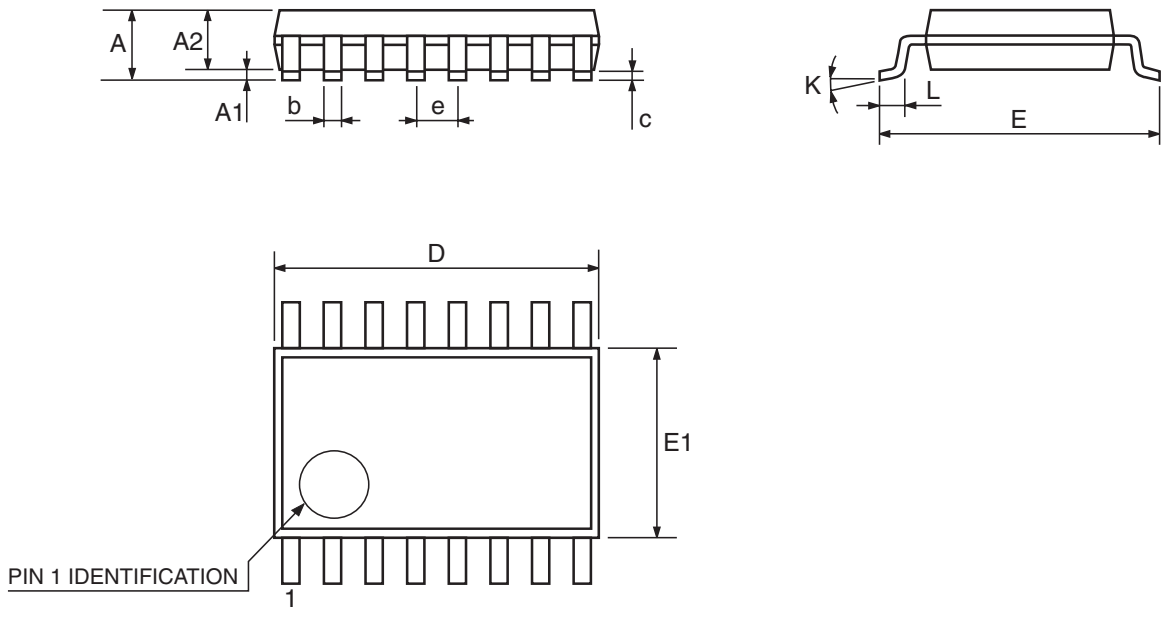
Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.068
a1	0.1		0.25	0.004		0.010
a2			1.64			0.063
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.62			0.024
S	8° (max.)					



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TSSOP16 mechanical data

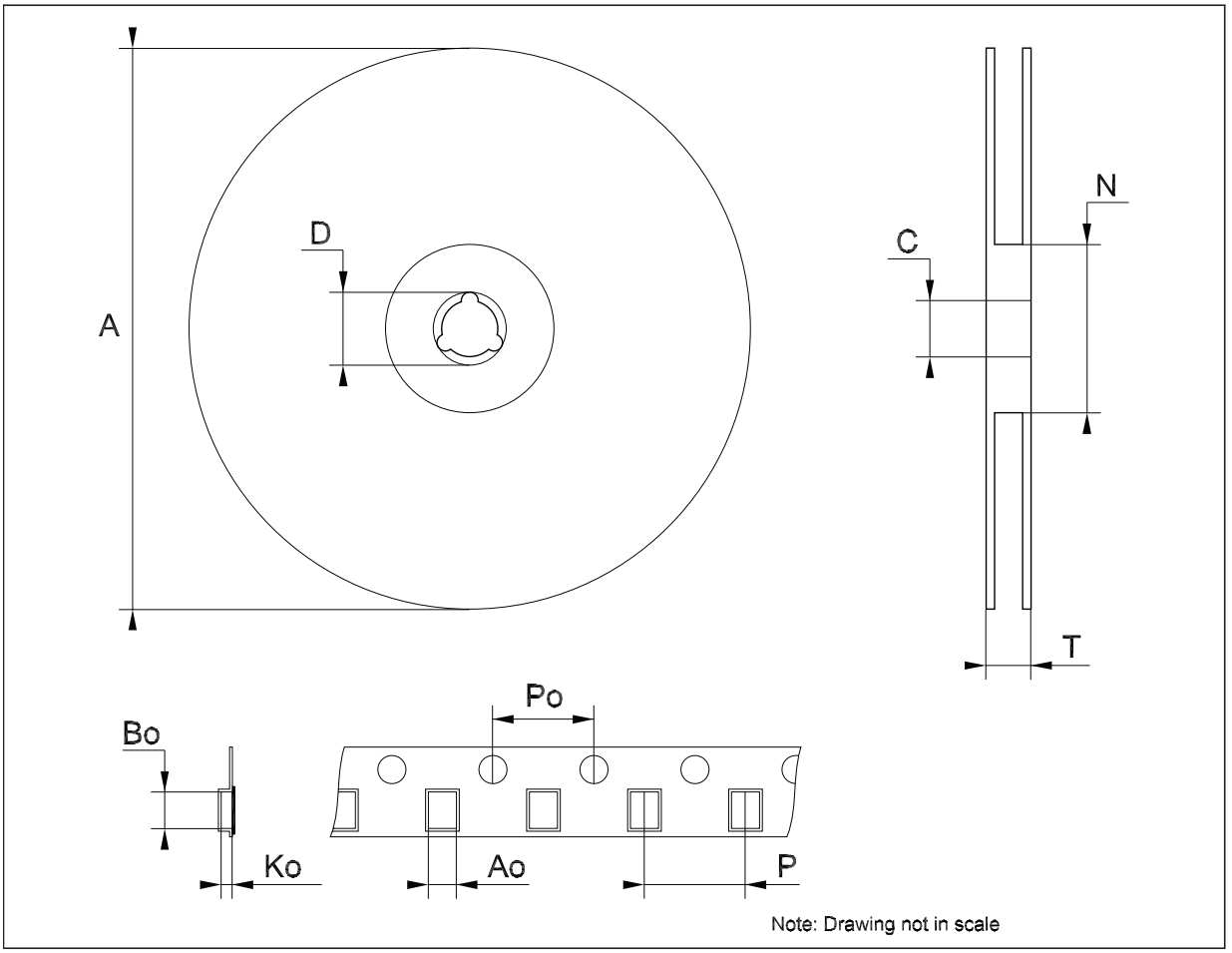
Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.2			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0079
D	4.9	5	5.1	0.193	0.197	0.201
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°		8°	0°		8°
L	0.45	0.60	0.75	0.018	0.024	0.030



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Tape & reel SO-16 mechanical data

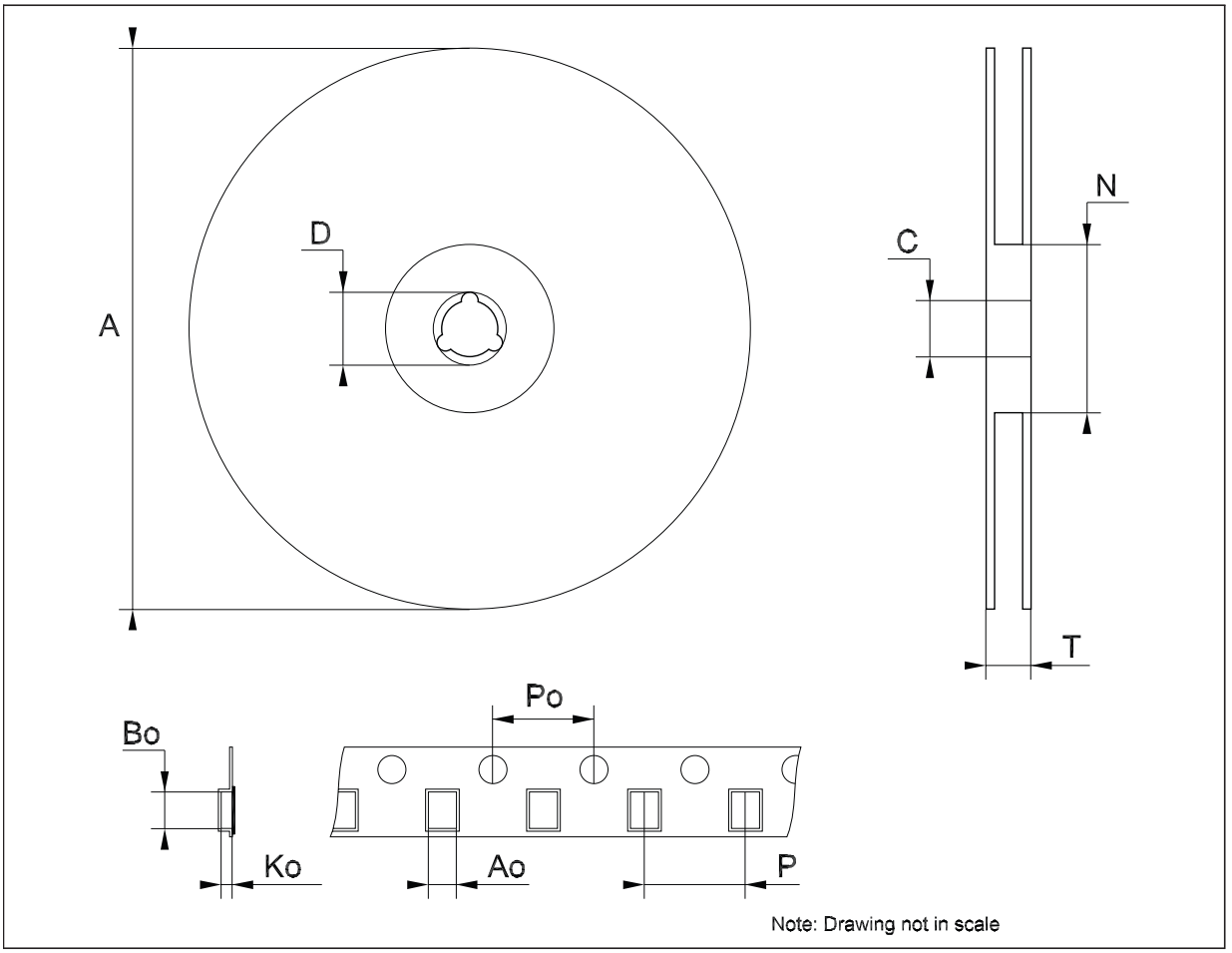
Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882
Ao	6.45		6.65	0.254		0.262
Bo	10.3		10.5	0.406		0.414
Ko	2.1		2.3	0.082		0.090
Po	3.9		4.1	0.153		0.161
P	7.9		8.1	0.311		0.319



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Tape & reel TSSOP16 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			22.4			0.882
Ao	6.7		6.9	0.264		0.272
Bo	5.3		5.5	0.209		0.217
Ko	1.6		1.8	0.063		0.071
Po	3.9		4.1	0.153		0.161
P	7.9		8.1	0.311		0.319



Note: Drawing not in scale

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5 Revision history

Table 8. Document revision history

Date	Revision	Changes
02-May-2006	7	Order codes updated.
12-Jun-2008	8	Added: *Table 1 on page 1*.

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