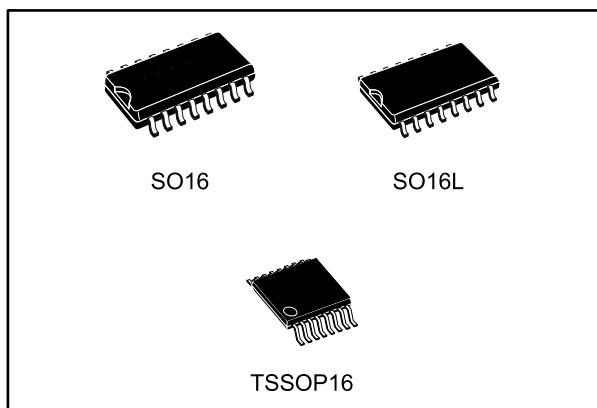


**5 V powered multi-channel RS-232 drivers and receivers**

Datasheet - production data

**Description**

The ST202B, ST202C is a two-driver, two-receiver device following EIA/TIA-232 and V.28 communication standards. It is particularly suitable for applications where  $\pm 12$  V is not available. The ST202B, ST202C uses a single 5 V power supply and only four external capacitors (0.1  $\mu$ F). Typical applications are in: portable computers, low power modems, interface translation, and battery-powered RS-232 networks.

**Features**

- Supply voltage range: 4.5 to 5.5 V
- Supply current no load (typ.): 1.5 mA
- Transmitter output voltage swing (typ):  $\pm 9$  V
- Transition slew rate (typ.): 12 V/ $\mu$ s
- Receiver propagation delay (typ.): 0.1 ms
- Compatible with MAX202
- Receiver input voltage range:  $\pm 30$  V
- Data rate (typ.): 400 kbps/s
- Operating temperature range: -40 to 85 °C, 0 to 70 °C

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# 1 Pinout information

Figure 1: Pin connections (top view)

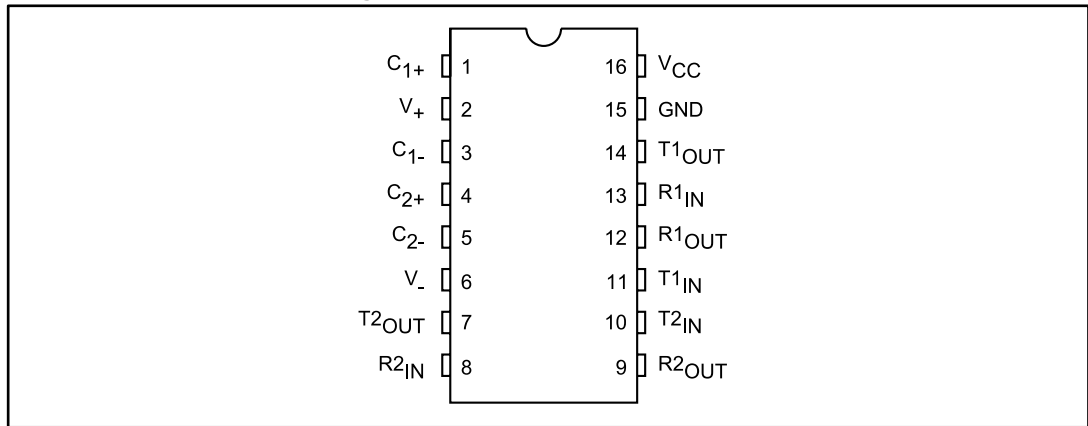


Table 1: Pin description

Pin n°	Symbol	Name and function
1	C <sub>1+</sub>	Positive terminal for the first charge pump capacitor
2	V <sub>+</sub>	Doubled voltage terminal
3	C <sub>1-</sub>	Negative terminal for the first charge pump capacitor
4	C <sub>2+</sub>	Positive terminal for the second charge pump capacitor
5	C <sub>2-</sub>	Negative terminal for the second charge pump capacitor
6	V <sub>-</sub>	Inverted voltage terminal
7	T <sub>2OUT</sub>	Second transmitter output voltage
8	R <sub>2IN</sub>	Second receiver input voltage
9	R <sub>2OUT</sub>	Second receiver output voltage
10	T <sub>2IN</sub>	Second transmitter input voltage
11	T <sub>1IN</sub>	First transmitter input voltage
12	R <sub>1OUT</sub>	First receiver output voltage
13	R <sub>1IN</sub>	First receiver input voltage
14	T <sub>1OUT</sub>	First transmitter output voltage
15	GND	Ground
16	V <sub>CC</sub>	Supply voltage

## 2 Absolute maximum ratings

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

**Table 2: Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply voltage	-0.3 to 6	V
V+	Extra positive voltage	$(V_{CC} - 0.3)$ to 13.2	
V-	Extra negative voltage	0.3 to -13.2	
$T_{IN}$	Transmitter input voltage range	-0.3 to $(V_{CC} + 0.3)$	
$R_{IN}$	Receiver input voltage range	$\pm 30$	
$T_{OUT}$	Transmitter output voltage range	$\pm 15$	
$R_{OUT}$	Receiver output voltage range	-0.3 to $(V_{CC} + 0.3)$	
$T_{SCTOUT}$	Short circuit duration on $T_{OUT}$	Infinite	

### 3 Electrical characteristics

**Table 3: Electrical characteristics, C1 - C4 = 0.1  $\mu$ F, V<sub>CC</sub> = 5 V  $\pm$  10 %, T<sub>A</sub> = -40 to 85 °C, unless otherwise specified, typical values are referred to T<sub>A</sub> = 25 °C**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I <sub>SUPPLY</sub>	V <sub>CC</sub> power supply current	No load	—	1.5	4	mA

**Table 4: Transmitter electrical characteristics, C1 - C4 = 0.1  $\mu$ F, V<sub>CC</sub> = 5 V  $\pm$  10 %, T<sub>A</sub> = -40 to 85 °C, unless otherwise specified, typical values are referred to T<sub>A</sub> = 25 °C**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V <sub>TOUT</sub>	Output voltage swing	All transmitter outputs are loaded with 3 k $\Omega$ to GND	$\pm$ 5	$\pm$ 9		V
I <sub>TIL</sub>	Logic pull-up current	T <sub>IN</sub> = 0 V		5	40	$\mu$ A
V <sub>TIL</sub>	Input logic threshold low		0.8	1.4		V
V <sub>TIH</sub>	Input logic threshold high			1.4	2	
SR <sub>T</sub>	Transition slew rate	T <sub>A</sub> = 25 °C, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 3 to 7 k $\Omega$ , C <sub>L</sub> = 50 to 2500 pF <sup>(1)</sup>	6	12	30	V/ $\mu$ s
D <sub>R</sub>	Data rate	<sup>(2)</sup>	200	400		kbits/s
R <sub>TOUT</sub>	Transmitter output resistance	V <sub>CC</sub> = V <sub>+</sub> = V <sub>-</sub> = 0 V, V <sub>OUT</sub> = $\pm$ 2 V	300			$\Omega$
I <sub>SC</sub>	Transmitter output short circuit current	One T <sub>XOUT</sub> to GND	$\pm$ 7	$\pm$ 22		mA
t <sub>DT</sub>	Propagation delay time	TTL-CMOS IN to RS-232 OUT, C <sub>L</sub> = 150 pF (50 % to 50 %)		1.3	3.5	$\mu$ s

**Notes:**

<sup>(1)</sup>Measured from 3 V to -3 V or from -3 V to 3 V

<sup>(2)</sup>One transmitter output is loaded with R<sub>L</sub> = 3 k $\Omega$  to 7 k $\Omega$ , C<sub>L</sub> = 50 to 1000 pF

**Table 5: Receiver electrical characteristics, C1 - C4 = 0.1  $\mu$ F,  $V_{CC} = 5\text{ V} \pm 10\%$ ,  $T_A = -40$  to  $85\text{ }^\circ\text{C}$ , unless otherwise specified, typical values are referred to  $T_A = 25\text{ }^\circ\text{C}$**

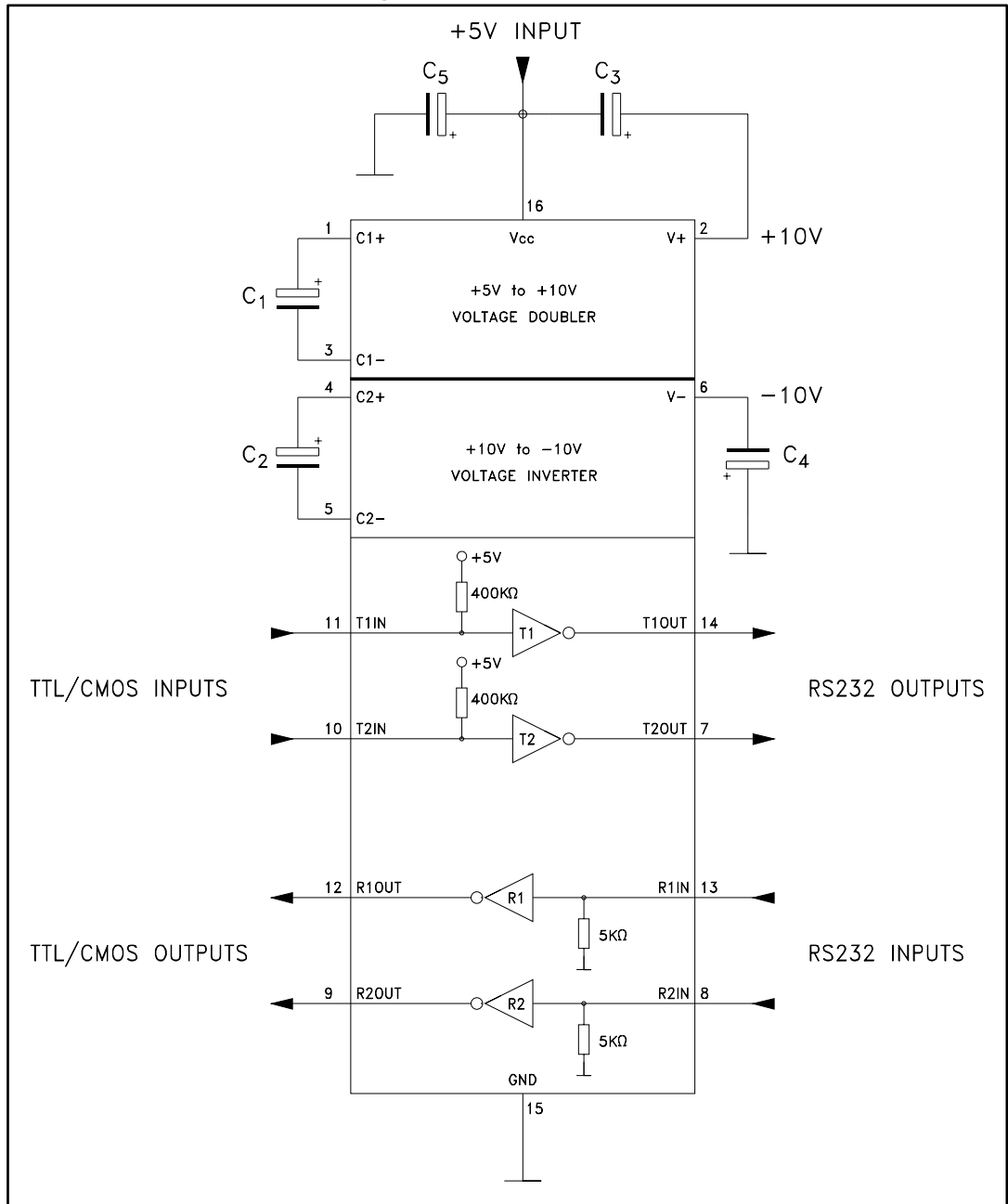
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{RIN}$	Receiver input voltage operating range		-30		30	V
$R_{RIN}$	RS-232 input resistance	$T_A = 25\text{ }^\circ\text{C}$	3	5	7	$k\Omega$
$V_{RIL}$	RS-232 input threshold low		0.8	1.3		V
$V_{RIH}$	RS-232 input threshold high			1.8	2.4	
$V_{RIHYS}$	RS-232 input hysteresis	$V_{CC} = 5\text{ V}$	0.2	0.5	1	
$V_{ROL}$	TTL/CMOS output voltage low	$I_{OUT} = 3.2\text{ mA}$ (to $V_{CC}$ )		0.2	0.4	
$V_{ROH}$	TTL/CMOS output voltage high	$I_{OUT} = 1\text{ mA}$ (to GND)	3.5	$V_{CC} - 0.2$		
$I_{SCR}$	Receiver output short circuit current	To GND	2	10		mA
		To $V_{CC}$	10	30		
$t_{DR}$	Propagation delay time	$C_L = 150\text{ pF}$ <sup>(1)</sup>		0.1	0.5	$\mu\text{s}$

**Notes:**

<sup>(1)</sup>RS-232 in to TTL-CMOS out (from 50 % to 50 %)

# 4 Typical application

Figure 2: Application circuit



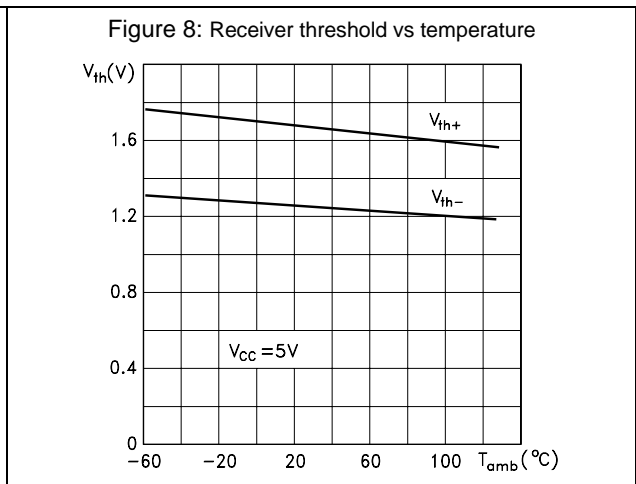
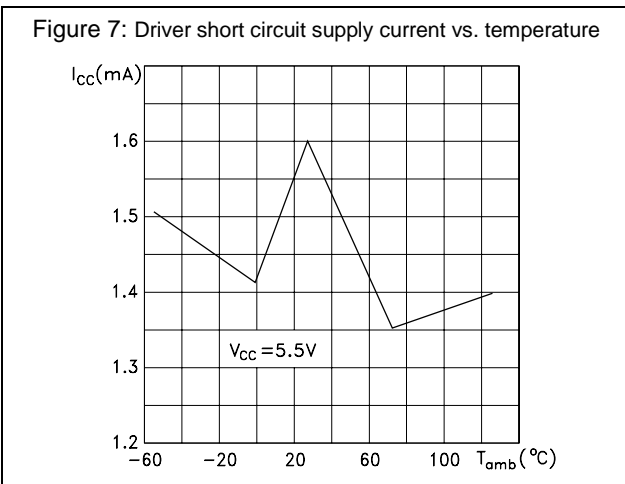
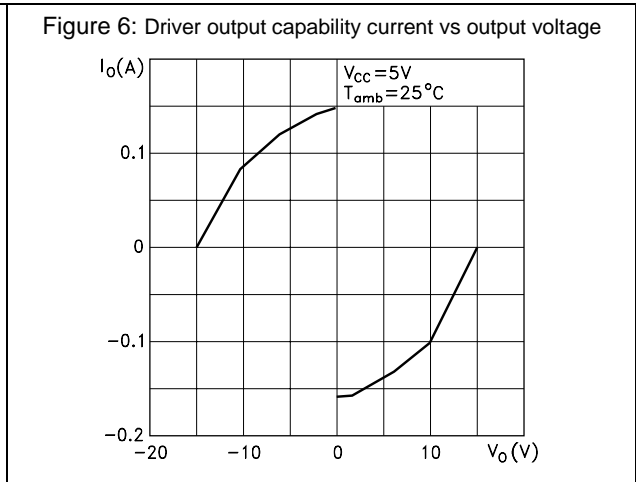
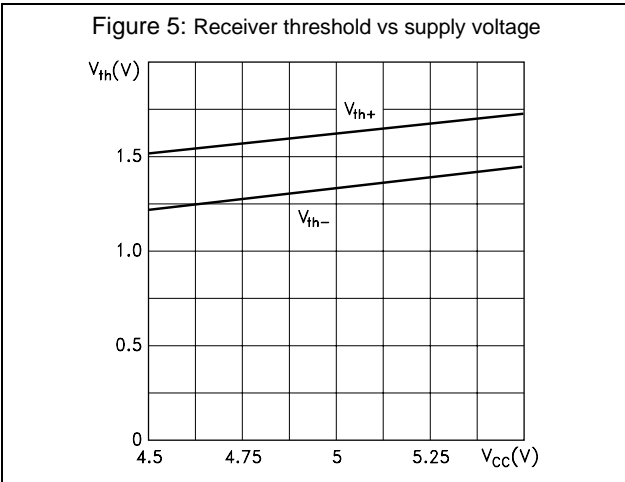
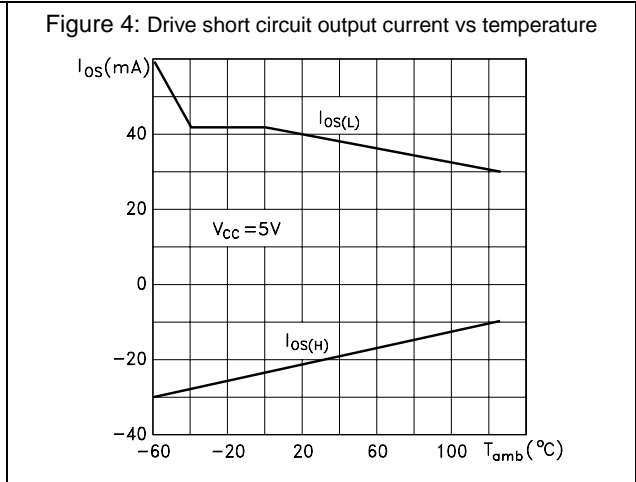
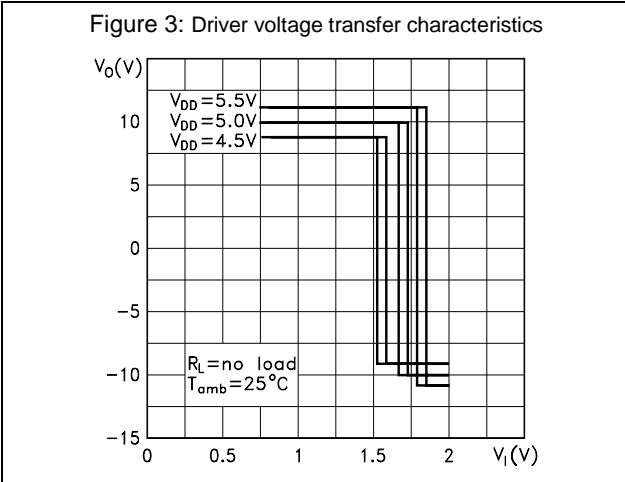
1. C<sub>1-4</sub> can be replaced by the 1 μF capacitors
2. C<sub>1-4</sub> can be common or biased capacitors

Table 6: Capacitance value (μF)

C1	C2	C3	C4	C5
		0.1		

# 5 Typical performance characteristics

Unless otherwise specified  $T_J = 25\text{ }^\circ\text{C}$ .





## 6 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK® is an ST trademark.

### 6.1 SO16 package information

Figure 9: SO16 package outline

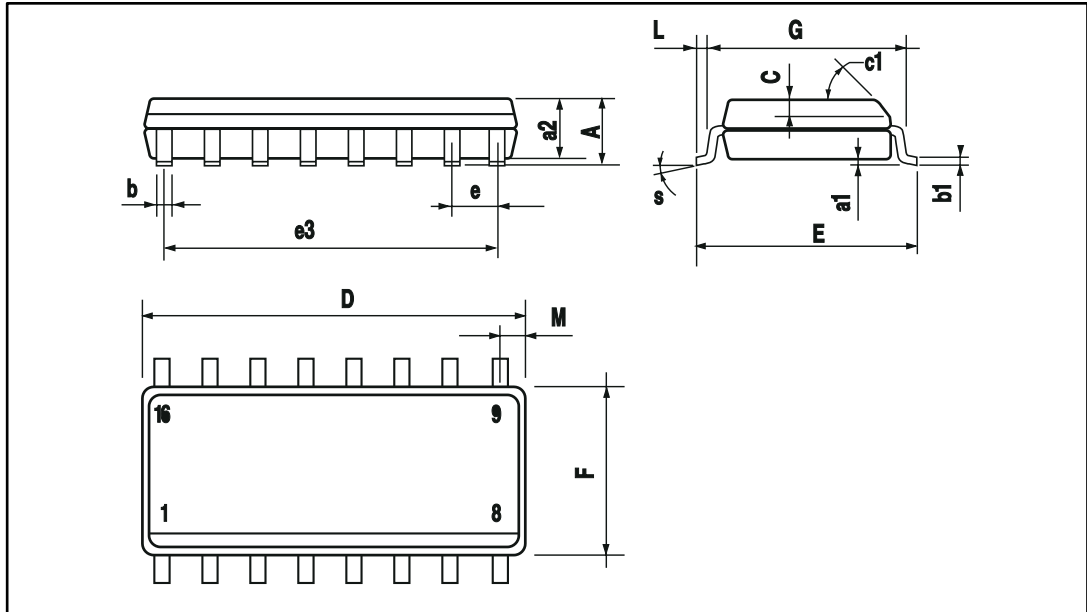


Table 7: SO16 mechanical data

Ref	Dimensions					
	Millimeters			Inches		
	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 °			45 °	
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 °			8 °

## 6.2 SO16L package information

Figure 10: SO16L package outline

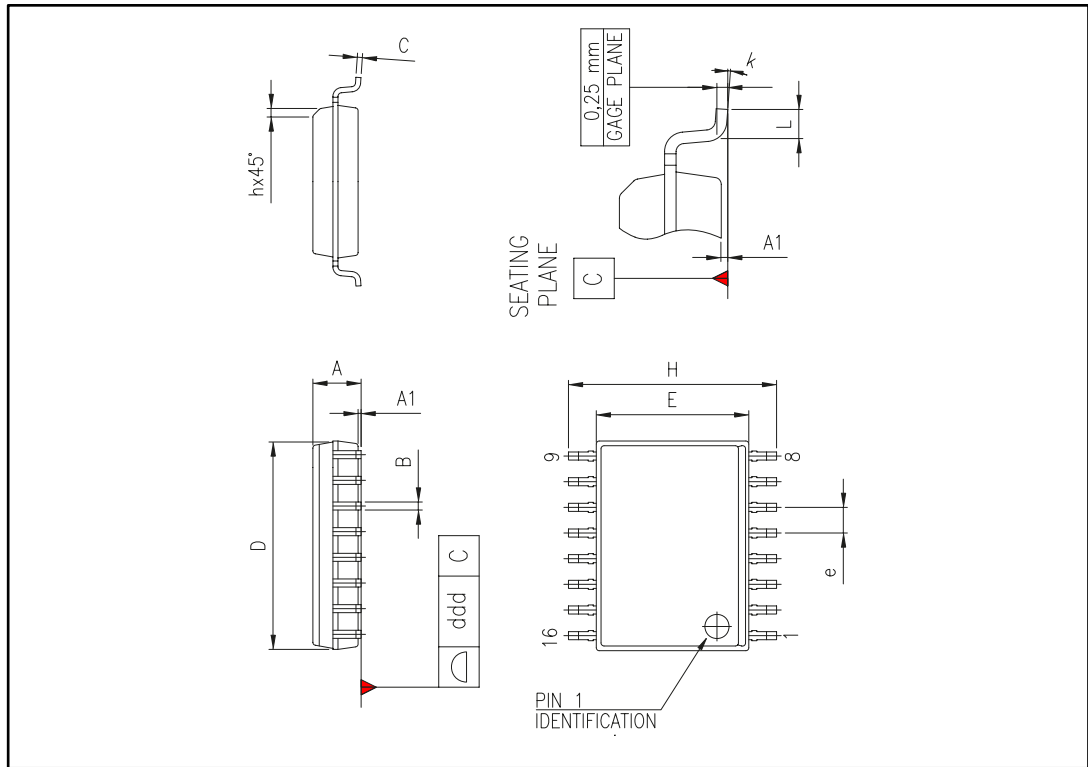


Table 8: SO16L mechanical data

Ref	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max	Min.	Typ.	Max.
A	2.35		2.65	0.093		0.104
A1	0.1		0.3	0.004		0.012
B	0.33		0.51	0.013		0.02
C	0.23		0.32	0.009		0.013
D	10.1		10.5	0.398		0.413
E	7.4		7.6	0.291		0.299
e		1.27			0.05	
H	10		10.65	0.394		0.419
h	0.25		0.75	0.01		0.03
L	0.4		1.27	0.016		0.05
k	0°		8°	0°		8°
ddd			0.1			0.004

### 6.3 TSSOP16 package information

Figure 11: TSSOP16 package outline

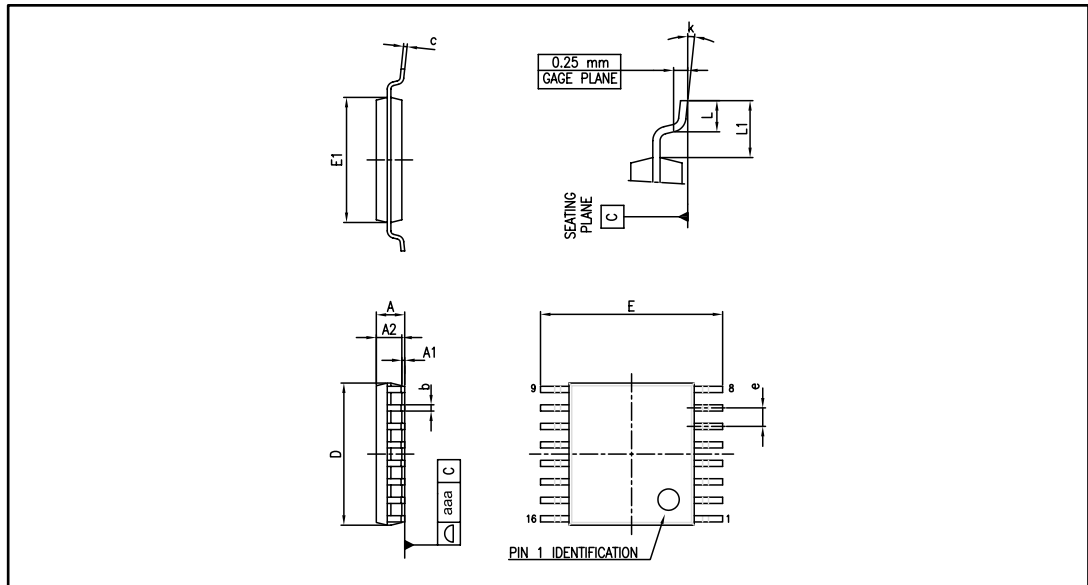
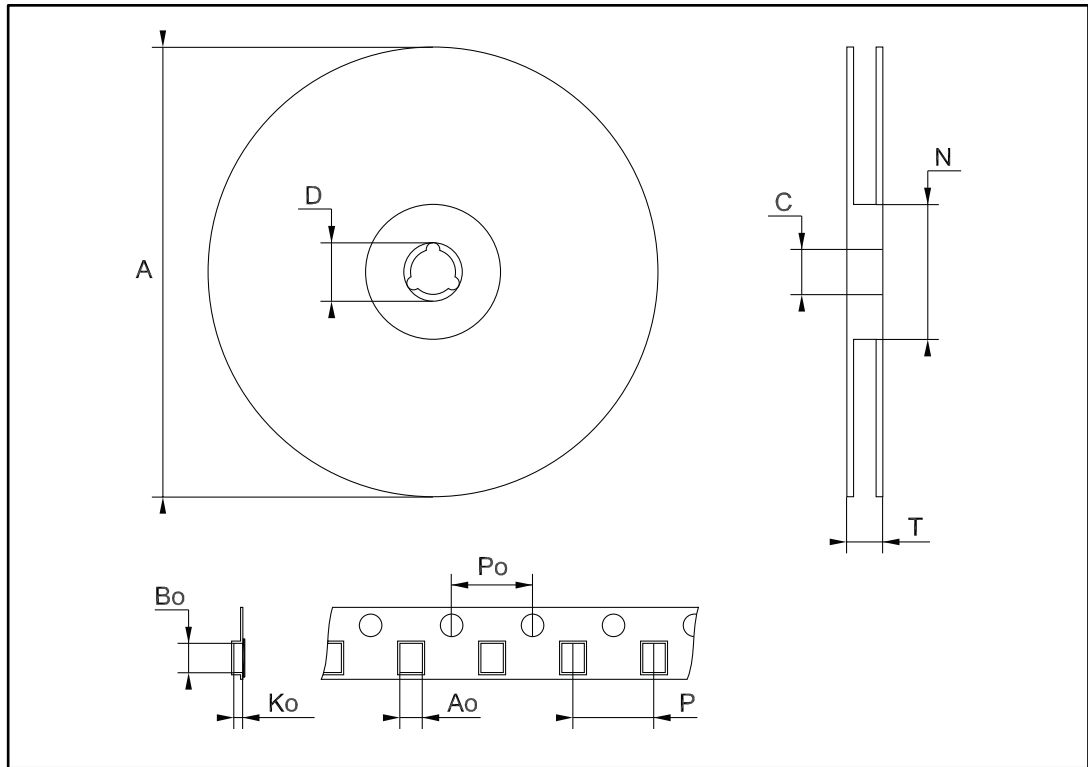


Table 9: TSSOP16 mechanical data

Ref	Dimensions					
	Millimeters			Inches		
	Min	Typ	Max	Min	Typ	Max
A			1.20			0.047
A1	0.05		0.15	0.002		0.006
A2	0.80	1.00	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.008
D	4.90	5.00	5.10	0.193	0.197	0.201
E	6.20	6.40	6.60	0.244	0.252	0.260
E1	4.30	4.40	4.50	0.169	0.173	0.177
e		0.65			0.026	
k	0°		8°	0°		8°
L	0.45	0.60	0.75	0.018	0.024	0.030
L1		1.00			0.039	
aaa			0.10			0.004

### 6.4 SO16 tape and reel package information

Figure 12: SO16 tape and reel package outline



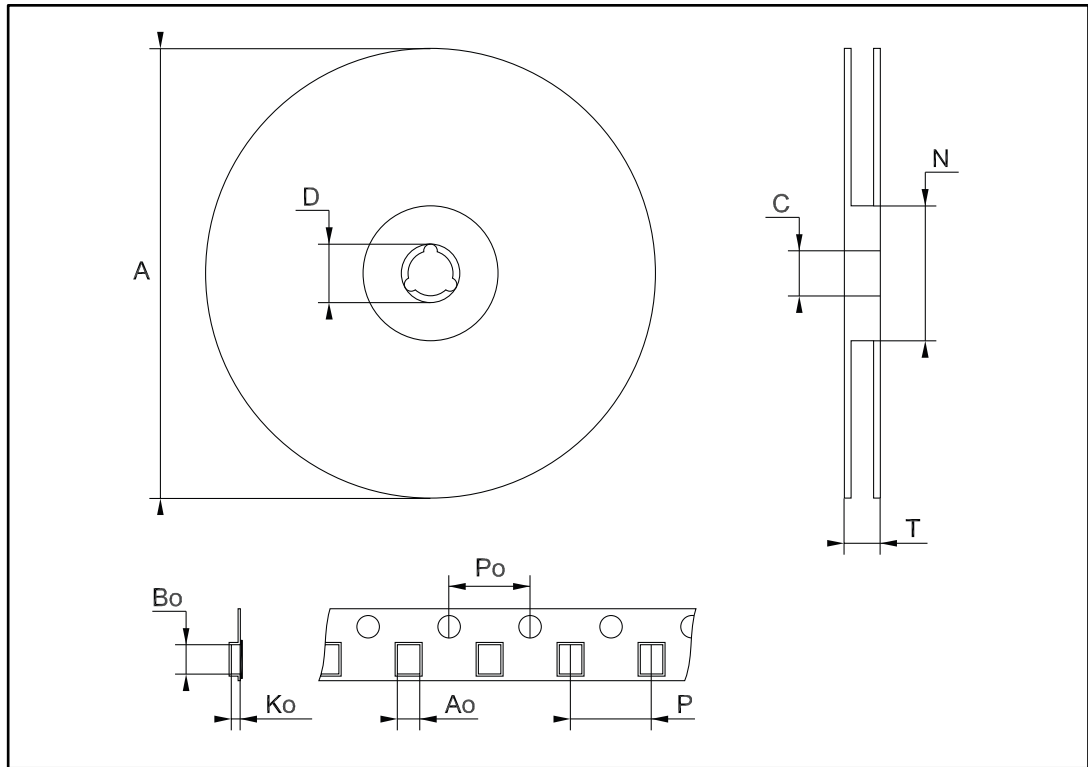
1. Drawing not to scale

Table 10: SO16 tape and reel mechanical data

Ref	Dimensions					
	Millimeters			Inches		
	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

## 6.5 SO16L tape and reel package information

Figure 13: SO16L tape and reel package outline



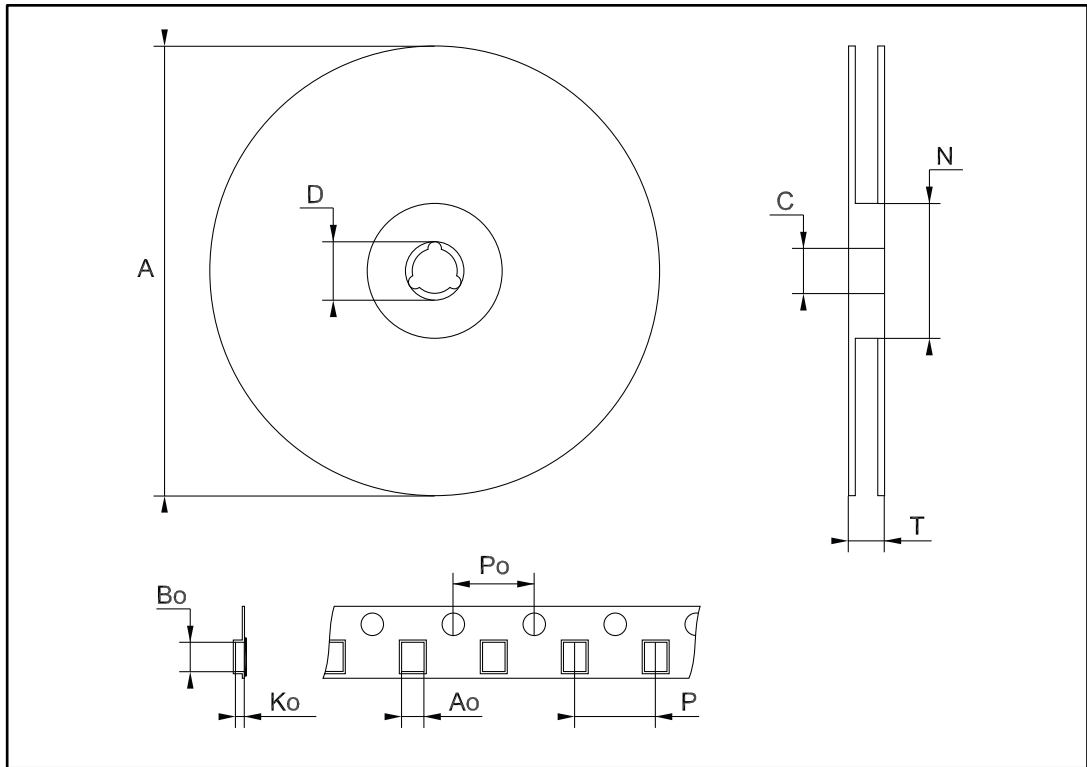
1. Drawing not to scale

Table 11: SO16L tape and reel mechanical data

Ref	Dimensions					
	Millimeters			Inches		
	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	10.8	—	11.0	0.425	—	0.433
Bo	10.7		10.9	0.421		0.429
Ko	2.9		3.1	0.114		0.122
Po	3.9		4.1	0.153		0.161
P	11.9		12.1	0.468		0.476

### 6.6 TSSOP16 tape and reel package information

Figure 14: TSSOP16 tape and reel package outline



1. Drawing not to scale

Table 12: TSSOP16 tape and reel mechanical data

Ref	Dimensions					
	Millimeters			Inches		
	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

## 7 Ordering information

**Table 13: Order codes**

Order code	Temperature range	Package	Packaging	Marking
ST202BDR	-40 to 85 °C	S016 (tape and reel)	2500 parts per reel	ST202B
ST202CDR	0 to 70 °C			ST202C
ST202BTR	-40 to 85 °C	TSSOP16 (tape and reel)	1000 parts per reel	ST202B
ST202CWR	0 to 70 °C	S016L (tape and reel)		ST202C



## 8 Revision history

**Table 14: Document revision history**

Date	Revision	Changes
09-Mar-2006	5	Order codes updated and the document has been reformatted.
16-Jul-2007	6	Device summary updated.
14-Nov-2007	7	Modified: Table 1.
11-Feb-2008	8	Modified: Table 1 on page 1.
03-Mar-2017	9	<p><i>Cover image</i>: replaced silhouettes "SOP" and "SOP Large" with SO16 and SO16L respectively.</p> <p><i>Features</i>: updated units of transition slew rate (typ.) from 12 V/ms to 12 V/<math>\mu</math>s.</p> <p>Moved "Device summary" table to <i>Section 7: "Ordering information"</i> section. Removed obsolete order codes ST202BD and ST202CTR from this table and added "Markings".</p> <p><i>Section 6.2: "SO16L package information"</i>: replaced package outline and mechanical data.</p> <p><i>Section 6.3: "TSSOP16 package information"</i>: added dimensions "L1" and "aaa", replaced dimension "K" with "k", and removed BSC from dimension "e".</p>

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