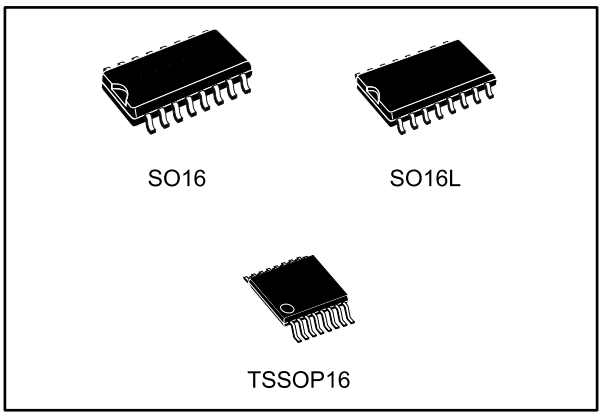
ST3232B, ST3232C

3 to 5.5 V, low-power, up to 400 kbs RS-232 drivers and receivers

Datasheet - production data



Features

- 300 µA supply current
- 300 kbps minimum guaranteed data rate
- 6 V/µs minimum guaranteed slew rate
- Meets EIA/TIA-232 specifications down to 3 V
- Available in SO16, SO16L, and TSSOP16 packages

Description

The ST3232B and ST3232C devices are 3 V powered EIA/TIA-232 and V.28/V.24 communication interfaces with low power requirements and high data-rate capabilities.

These devices have a proprietary low dropout transmitter output stage providing true RS-232 performance from 3 to 5.5 V supplies. The devices require only four small 0.1 mF standard external capacitors for operation from a 3 V supply.

The ST3232B and ST3232C have two receivers and two drivers.

The devices are guaranteed to run at data rates of 250 kbps while maintaining RS-232 output levels. Typical applications are notebooks, subnotebooks and palmtop computers, battery-powered equipment, hand-held equipment, peripherals, and printers.

Table 1: Device summary

Order code	Temp. range	Package	Packaging
ST3232CDR	0 to 70 °C	SO16 (tape and reel)	2500 parts per reel
ST3232BDR	-40 to 85 °C		
ST3232CWR	0 to 70 °C	SO16L (tape and reel)	1000 parts per reel
ST3232BWR	-40 to 85 °C		
ST3232CTR	0 to 70 °C	TSSOP16 (tape and reel)	2500 parts per reel
ST3232BTR	-40 to 85 °C		

Contents

1 Pin configuration

Figure 1: Pin connections

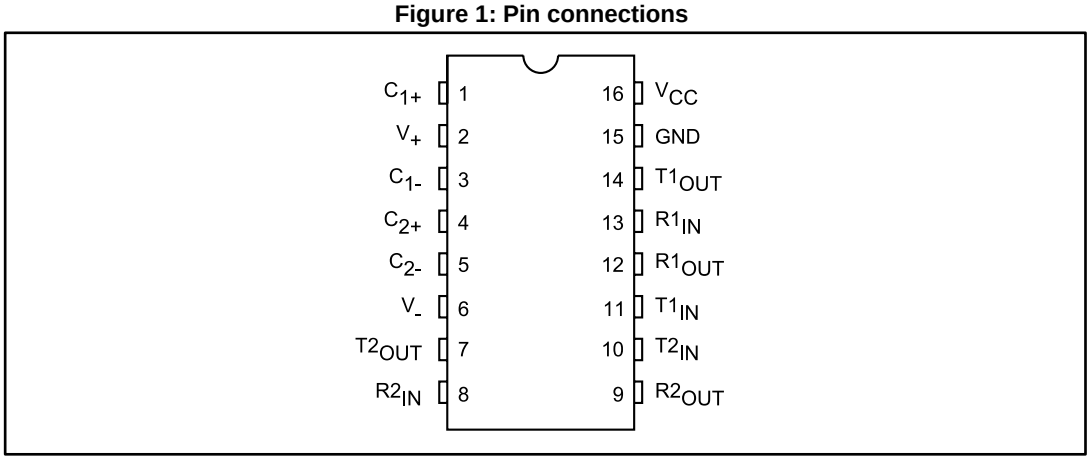


Table 2: Pin description

Pin n°	Symbol	Name and function
1	C_1+	Positive terminal for the first charge pump capacitor
2	V+	Doubled voltage terminal
3	C_1-	Negative terminal for the first charge pump capacitor
4	C_2+	Positive terminal for the second charge pump capacitor
5	C_2-	Negative terminal for the second charge pump capacitor
6	V-	Inverted voltage terminal
7	$T2_{OUT}$	Second transmitter output voltage
8	$R2_{IN}$	Second receiver input voltage
9	$R2_{OUT}$	Second receiver output voltage
10	$T2_{IN}$	Second transmitter input voltage
11	$T1_{IN}$	First transmitter input voltage
12	$R1_{OUT}$	First receiver output voltage
13	$R1_{IN}$	First receiver input voltage
14	$T1_{OUT}$	First transmitter output voltage
15	GND	Ground
16	V_{CC}	Supply voltage

2 Absolute maximum ratings

Table 3: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	-0.3 to 6	V
V+	Doubled voltage terminal	(V_{CC} - 0.3) to 7	
V-	Inverted voltage terminal	0.3 to -7	
V+ + |V-|		13	
T_{IN}	Transmitter input voltage range	-0.3 to 6	
R_{IN}	Receiver input voltage range	±25	
T_{OUT}	Transmitter output voltage range	±13.2	
R_{OUT}	Receiver output voltage range	-0.3 to (V_{CC} + 0.3)	
t_{SHORT}	Transmitter output short to gnd time	Continuous	
T_{stg}	Storage temperature	-65 to 150	°C

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

Externally applied V+ and V- can have a maximum magnitude of +7 V, but their absolute addition can not exceed 13 V.

Running on internal charge pump, intrinsic self limitation allows exceeding those values without any damage.

Startup voltage sequence (V_{CC}, then V+, then V-) is critical, therefore it is not recommended to use this device using externally applied voltage to V+ and V-.

3 Electrical characteristics

Table 4: Electrical characteristics (C1 - C4 = 0.1 µF, VCC = 3 V to 5.5 V, TA = -40 to 85 °C, unless otherwise specified. Typical values are referred to TA = 25 °C)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SUPPLY}	V_{CC} power supply current	No load, V_{CC} = 3 V ± 10 %, T_A = 25 °C		0.3	1	mA
		No load, V_{CC} = 5 V ± 10 %, T_A = 25 °C		1	2	

Table 5: Logic input (C1 - C4 = 0.1 µF, VCC = 3 V to 5.5 V, TA = -40 to 85 °C, unless otherwise specified. Typical values are referred to TA = 25 °C)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{TIL}	Input logic threshold low	T-IN (1)			0.8	V
V_{TIH}	Input logic threshold high	V_{CC} = 3.3 V	2			
		V_{CC} = 5 V	2.4			
I_{IL}	Input leakage current	T-IN		±0.01	±1	µA

Notes:

(1)Transmitter input hysteresis is typically 250 mV.

Table 6: Transmitter (C1 - C4 = 0.1 µF tested at 3.3 V ±10 %, VCC = 3 V to 5.5 V, TA = -40 to 85 °C, unless otherwise specified. Typical values are referred to TA = 25 °C)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{TOUT}	Output voltage swing	All transmitter outputs are loaded with 3 kΩ to GND	±5	±5.4		V
R_{TOUT}	Transmitter output resistance	V_{CC} = V+ = V- = 0 V, V_{OUT} = ±2 V	300	10 M		Ω
I_{TSC}	Output short circuit current	V_{CC} = 3 V or 5 V, V_{OUT} = ±12			± 60	mA

Table 7: Receiver (C1 - C4 = 0.1 µF tested at 3.3 V ±10 %, VCC = 3 V to 5.5 V, TA = -40 to 85 °C, unless otherwise specified. Typical values are referred to TA = 25 °C)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{RIN}	Receiver input voltage operating range		-25		25	V
V_{RIL}	RS-232 Input threshold low	T_A = 25 °C, V_{CC} = 3.3 V	0.6	1.1		
		T_A = 25 °C, V_{CC} = 5 V	0.8	1.5		
V_{RIH}	RS-232 Input threshold high	T_A = 25 °C, V_{CC} = 3.3 V		1.5	2.4	
		T_A = 25 °C, V_{CC} = 5 V		1.8	2.4	
V_{RIHYS}	Input hysteresis			0.3		
R_{RIN}	Input resistance	T_A = 25 °C	3	5	7	kΩ
V_{ROL}	TTL/CMOS output voltage low	I_{OUT} = 1.6 mA			0.4	V
V_{ROH}	TTL/CMOS output voltage high	I_{OUT} = -1 mA	V_{CC} - 0.6	V_{CC} - 0.1		

Table 8: Timing characteristics (C1 - C4 = 0.1 µF tested at 3.3 V ±10 %, VCC = 3 V to 5.5 V, TA = -40 to 85 °C, unless otherwise specified. Typical values are referred to TA = 25 °C)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
D_R	Data transfer rate	R_L = 3 kΩ, C_{L2} = 1000 pF one transmitter switching	300	400		kbps
t_{PHLR}, t_{PLHR}	Propagation delay input to output	$R_{XIN} = R_{XOUT}$, C_L = 150 pF		0.2		µs
$\lvert t_{PHLT} - t_{THL} \rvert$	Transmitter propagation delay difference	See (1)		100		ns
$\lvert t_{PHLR} - t_{THR} \rvert$	Receiver propagation delay difference			50		
S_{RT}	Transition slew rate	T_A = 25 °C, R_L = 3 kΩ to 7 kΩ, V_{CC} = 3.3 V measured from 3 V to -3 V or -3 V to 3 V, C_L = 150 pF to 1000 pF	6		30	V/µs
		T_A = 25 °C, R_L = 3 kΩ to 7 kΩ, V_{CC} = 3.3 V measured from 3 V to -3 V or -3 V to 3 V, C_L = 150 pF to 2500 pF	4		30	

Notes:

(1)Transmitter skew is measured at the transmitter zero cross points

4 Application information

Figure 2: Application circuits

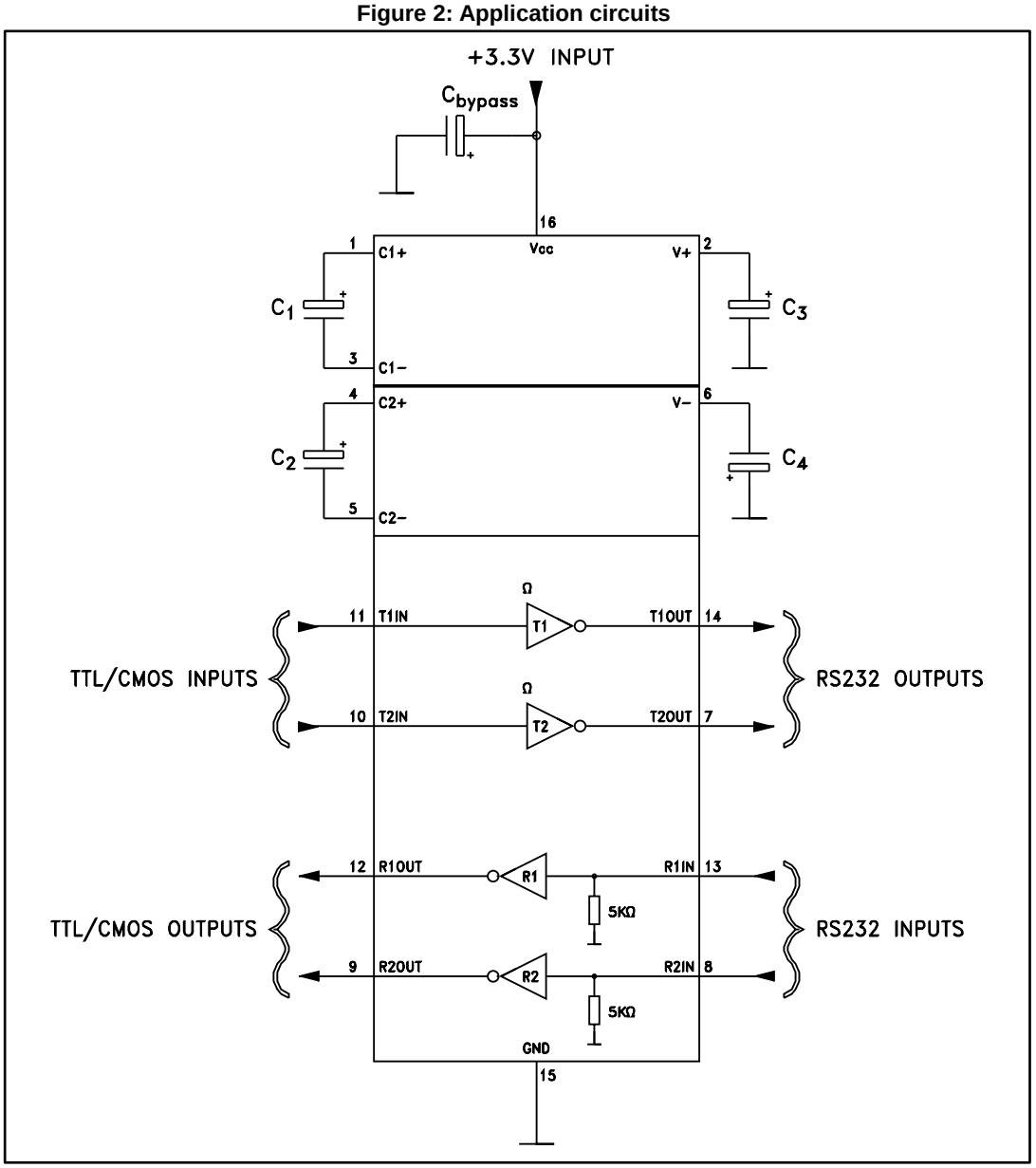


Table 9: Capacitance value (µF)

V_{CC}	C1	C2	C3	C4	Cbypass
3.0 to 3.6	0.1	0.1	0.1	0.1	0.1
4.5 to 5.5	0.047	0.33	0.33	0.33	0.33

5 Typical performance characteristics

Unless otherwise specified T_J = 25 °C

Figure 3: Driver voltage transfer characteristics for transmitter inputs

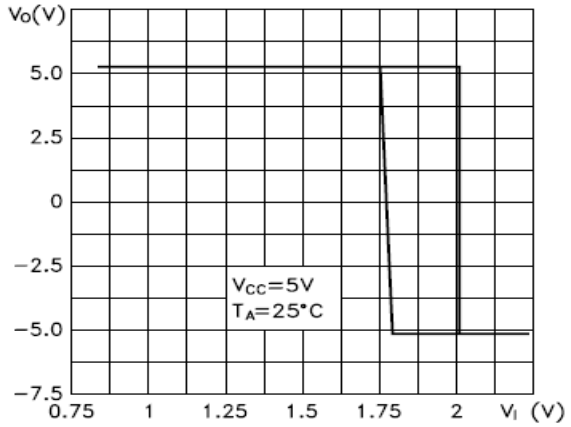


Figure 4: Driver voltage transfer characteristics for receiver inputs

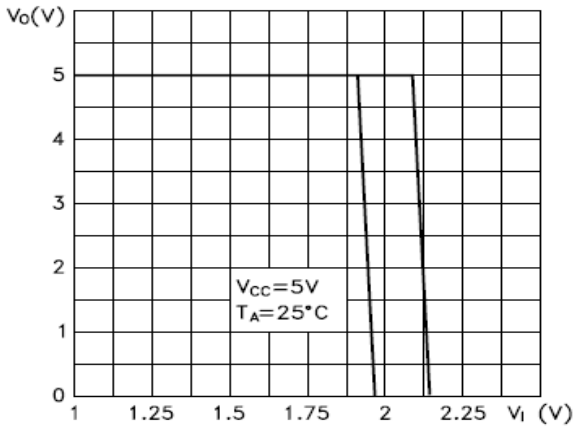


Figure 5: Output current vs output low voltage at VCC = 5.5 V

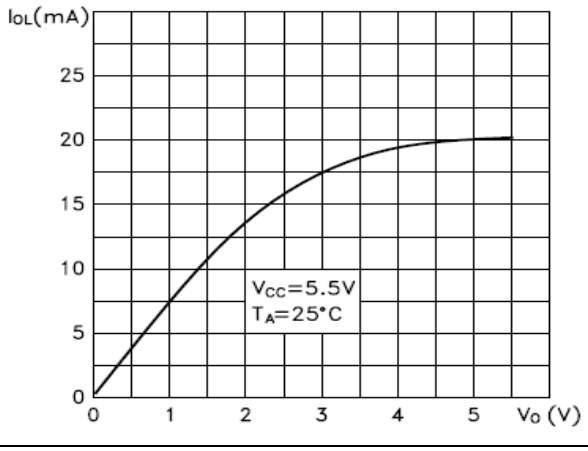


Figure 6: Output current vs output low voltage at VCC = 3 V

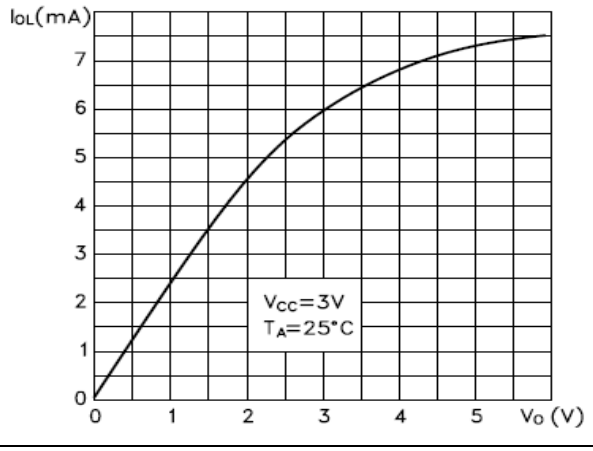


Figure 7: Output current vs output high voltage at VCC = 5.5 V

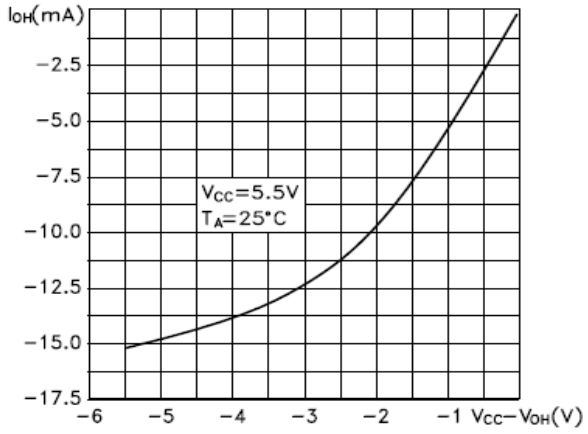


Figure 8: Output current vs output high voltage at VCC = 3 V

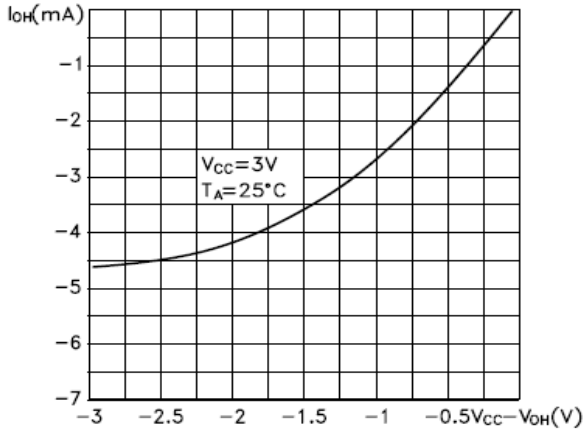
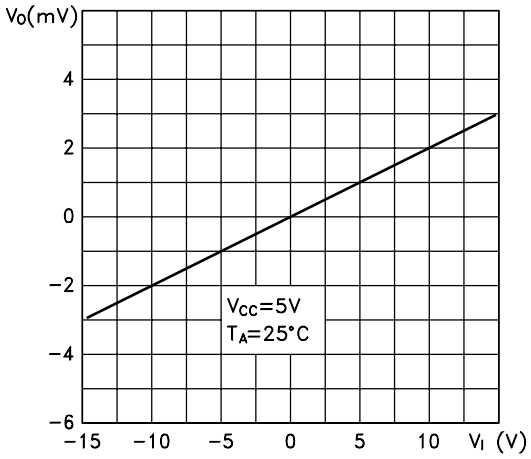


Figure 9: Receiver input resistance



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***. ECOPACK® is an ST trademark.

6.1 SO16 package information

Figure 10: SO16 package outline

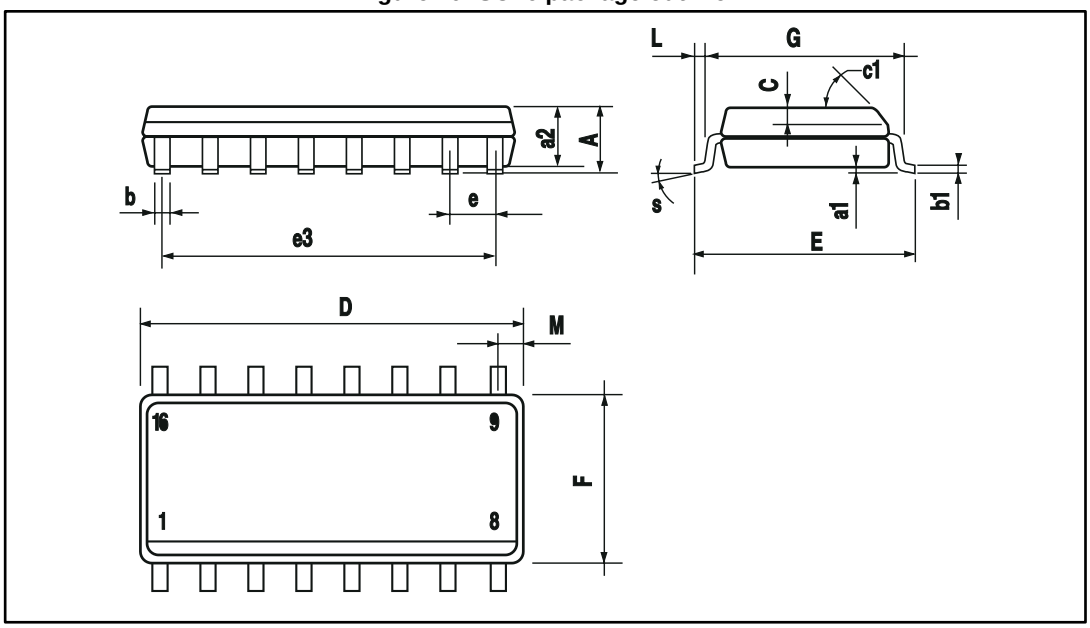


Table 10: SO16 mechanical data

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 11: SO16L package outline

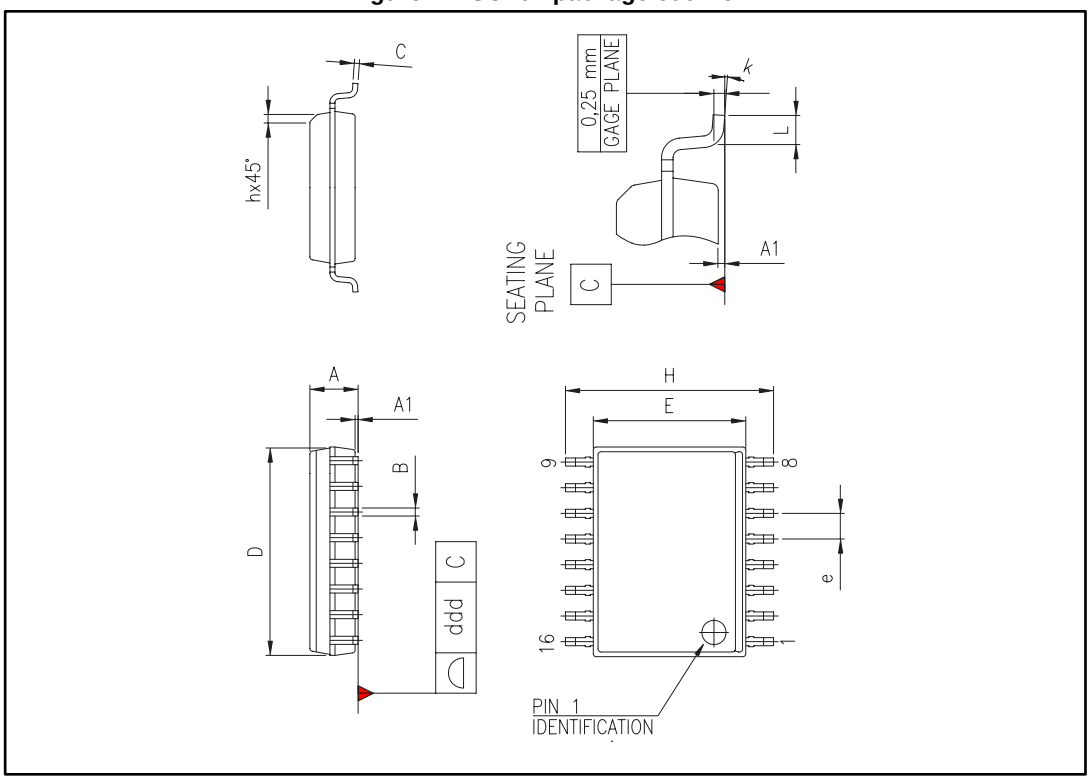


Table 11: SO16L mechanical data

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 12: TSSOP16 package outline

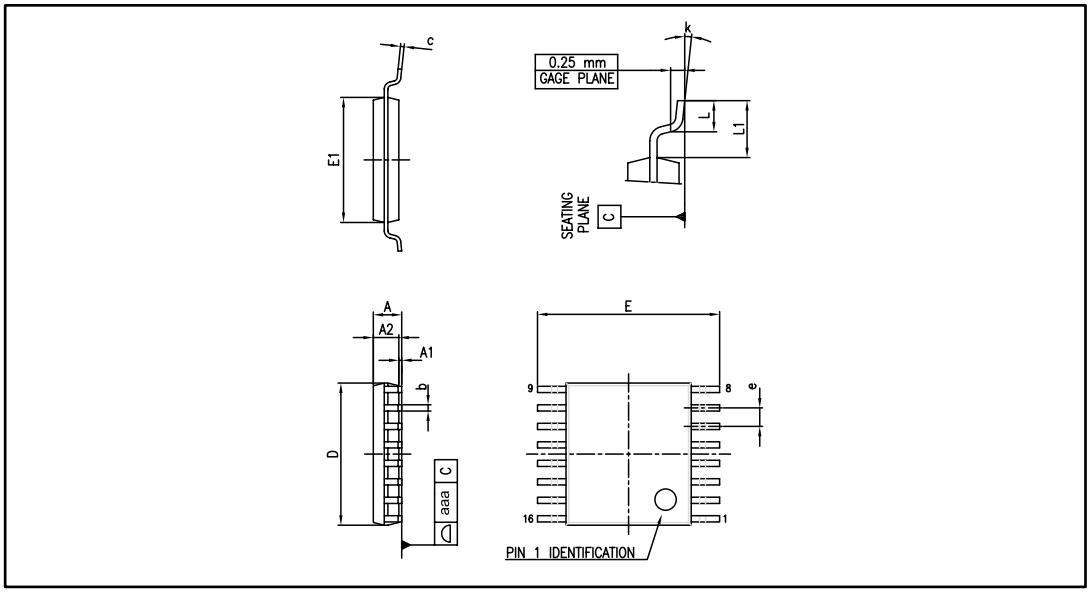
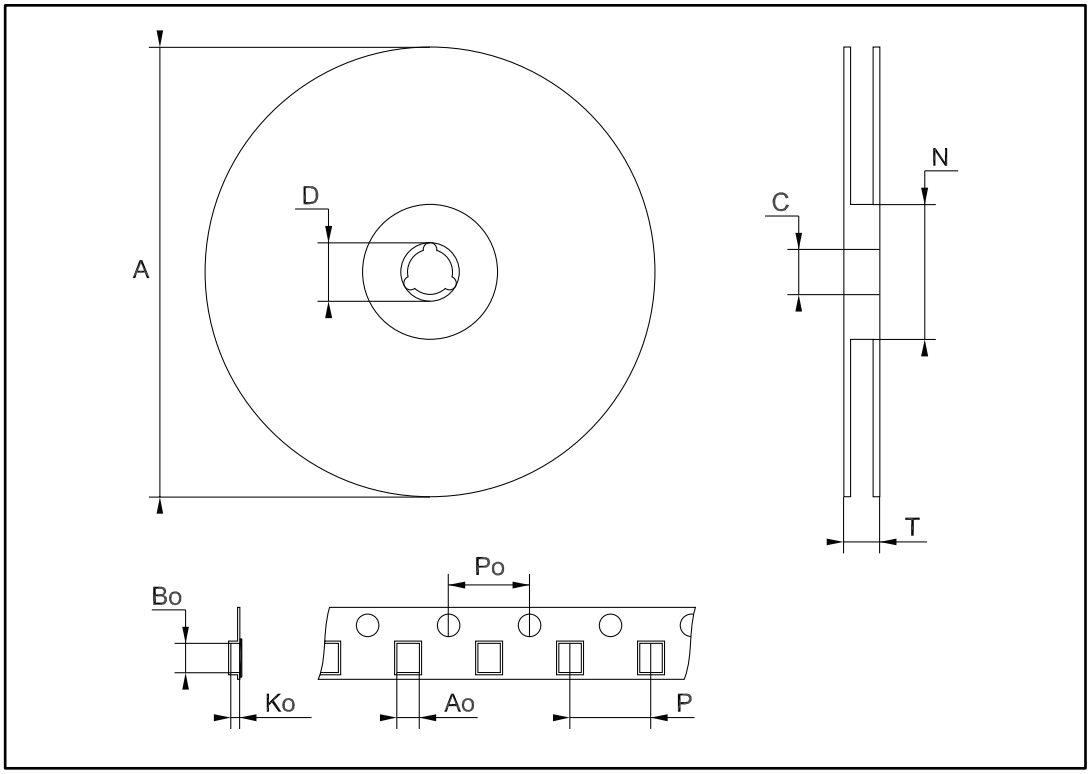


Table 12: TSSOP16 mechanical data

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 13: SO16 tape and reel package outline



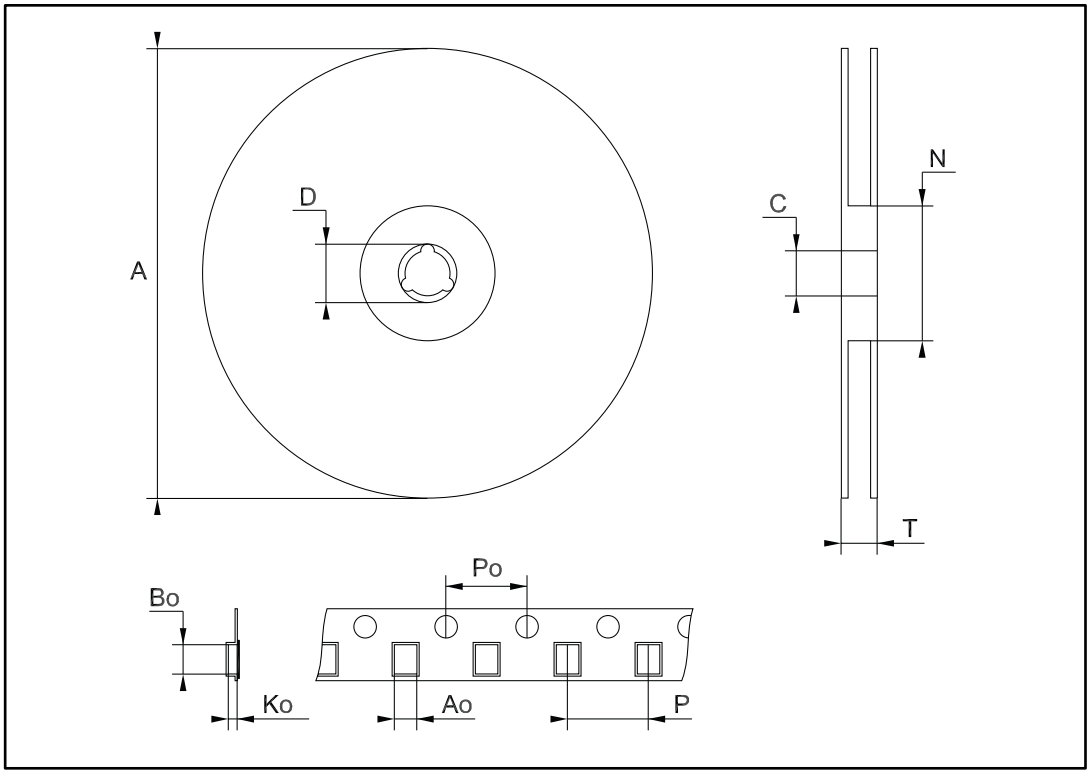
1. Drawing not to scale

Table 13: 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 14: SO16L tape and reel package outline



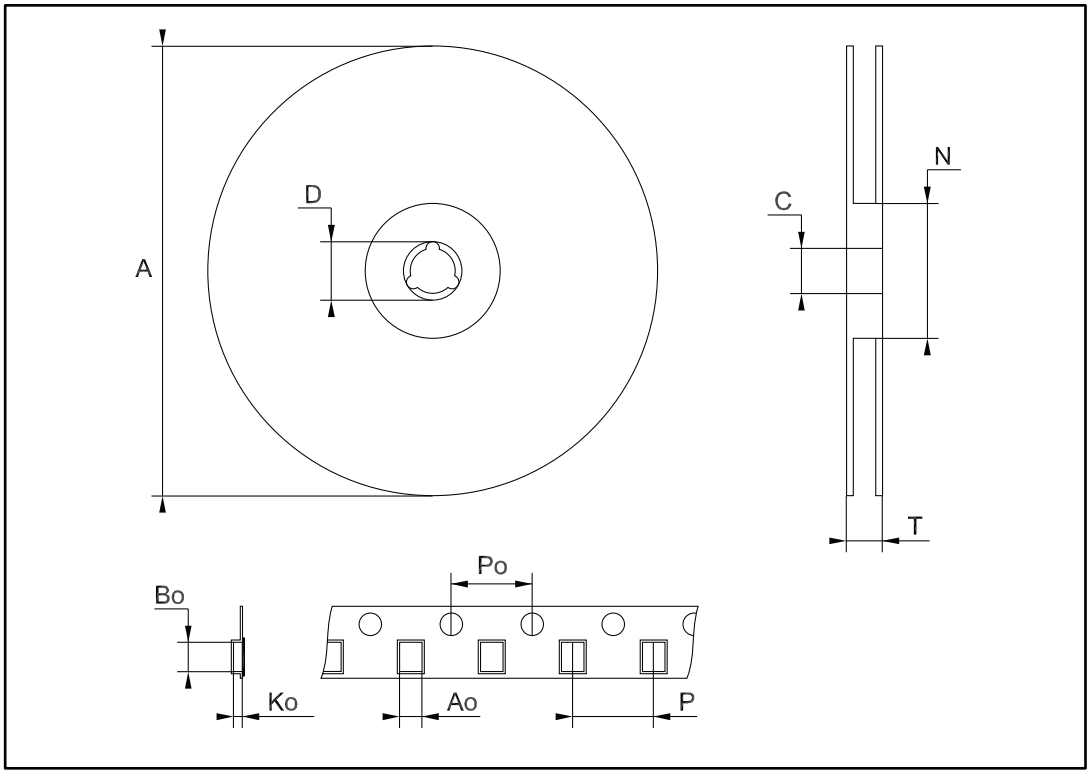
1. Drawing not to scale

Table 14: 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 15: TSSOP16 tape and reel package outline



1. Drawing not to scale

Table 15: 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 Revision history

Table 16: Document revision history

Date	Revision	Changes
06-Sep-2006	8	Order codes has been updated and new template.
25-Oct-2006	9	Order codes has been updated.
21-Jan-2008	10	Added note on Table 3.
08-Feb-2008	11	Modified: Table 1 on page 1.
25-Jan-2016	12	Updated document layout *Table 3: "Absolute maximum ratings"*: added T_{stg} Updated titles of *Figure 5*, *Figure 6*, *Figure 7*, and *Figure 8* *Section 6.2*: replaced SO16L package outline and mechanical data *Section 6.3*: removed A1 (typ: inches), updated E1 (max: mm and inches), added L1 and aaa.

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