



ST3222E

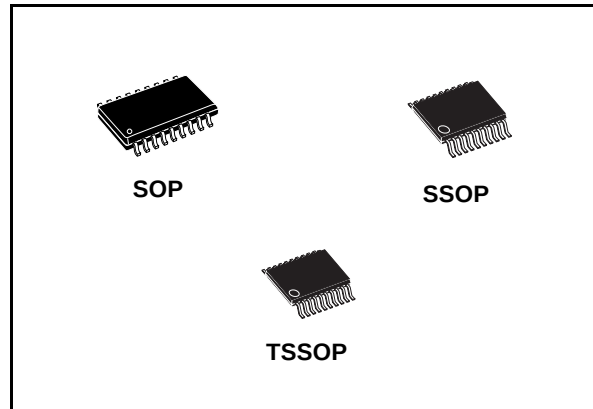
± 15KV ESD-protected, 3 to 5.5V
Low power, up to 250KBps, RS-232 drivers and receivers

General features

- ESD protection for RS-232 I/O pins ± 15KV human body model, ± 8KV IEC 1000-4-2 contact discharge
- 300µA supply current
- 250KBps minimum guarantee data rate
- 6V/µs minimum guarantee slew rate
- Meet EIA/TIA-232 specification down to 3V
- Available in SO-18, SSOP20 and TSSOP20

Description

The ST3222E is a 3V powered EIA/TIA-232 and V.28/V.24 communications interface with low power requirements, high data-rate capabilities and enhanced electrostatic discharge (ESD) protection to ±8kV using IEC1000-4-2 Contact Discharge and ±15kV using the Human Body Model. ST3222E has a proprietary low dropout transmitter output stage providing true RS-232 performance from 3 to 5V supplies with a dual charge pump. The charge pump requires only four small 0.1mF external capacitors for operation from 3V supply. The device has two receivers and two drivers. The ST3222E features a 1mA shutdown mode that reduces power consumption and extends battery life in portable systems. Its receivers can remain active in shutdown mode,



allowing external devices such as modems to be monitored using only 1mA supply current. The device is guaranteed to run at data rates of 250Kbps while maintaining RS-232 output levels. Typical applications are Notebook, Sub-notebook and Palmtop Computers, Battery Powered Equipment, Hand-Held Equipment, Peripherals and Printers.

Order code

Part number	Temperature range	Package	Comments
ST3222ECDR	0 to 70 °C	SO-18 (Tape & Reel)	1000 parts per reel
ST3222ECPR	0 to 70 °C	SSOP20 (Tape & Reel)	1350 parts per reel
ST3222EBPR	-40 to 85 °C	SSOP20 (Tape & Reel)	1350 parts per reel
ST3222ECTR	0 to 70 °C	TSSOP20 (Tape & Reel)	2500 parts per reel
ST3222EBTR	-40 to 85 °C	TSSOP20 (Tape & Reel)	2500 parts per reel

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1 Pin configuration

Figure 1. Pin connection

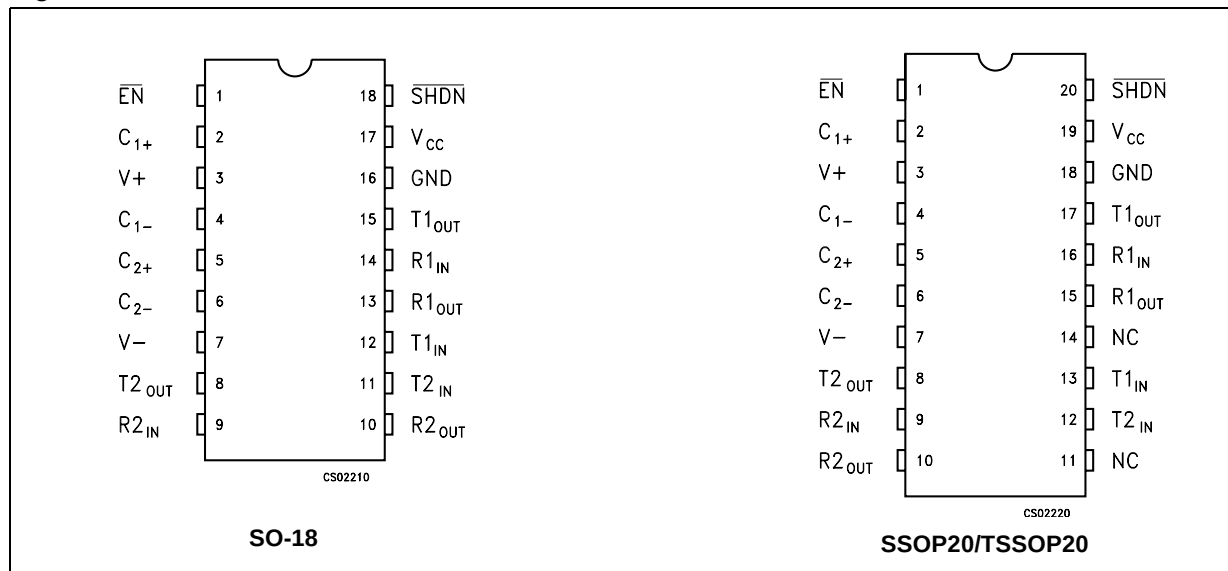


Table 1. Pin description

Pin n° SO-18	Pin n° SSOP/TSSOP20	Symbol	Name and function
1	1	EN	Receiver enable control. drive low for normal operation. Drive high to force the receivers outputs (R_OUT) into a high-impedance state.
2	2	C ₁₊	Positive terminal for the first charge pump capacitor
3	3	V+	5.5V Generated by the charge pump.
4	4	C ₁₋	Negative terminal for the first charge pump capacitor
5	5	C ₂₊	Positive terminal for the second charge pump capacitor
6	6	C ₂₋	Negative terminal for the second charge pump capacitor
7	7	V-	-5.5V Generated by the charge pump.
8	8	T2 _{OUT}	Second transmitter output voltage
9	9	R2 _{IN}	Second receiver input voltage
10	10	R2 _{OUT}	Second receiver output voltage
	11	NC	Not connected
11	12	T2 _{IN}	Second transmitter input voltage
12	13	T1 _{IN}	First transmitter input voltage
	14	NC	Not connected
13	15	R1 _{OUT}	First receiver output voltage
14	16	R1 _{IN}	First receiver input voltage
15	17	T1 _{OUT}	First transmitter output voltage

Table 1. Pin description

Pin n° SO-18	Pin n° SSOP/TSSOP20	Symbol	Name and function
16	18	GND	Ground
17	19	V _{CC}	Supply voltage
18	20	SHDN	Active low shutdown control input. drive low to shut-down transmitter and charge pump

2 Absolute maximum ratings

Table 2. 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
V-	Inverted voltage terminal	0.3 to -7	V
$V+ + V- $		13	V
T_{IN}	Transmitter input voltage range	-0.3 to 6	V
SHDN	Transmitter input voltage range	-0.3 to 6	V
R_{IN}	Receiver input voltage range	± 25	V
T_{OUT}	Transmitter output voltage range	± 13.2	V
R_{OUT}	Receiver output voltage range	-0.3 to $(V_{CC} + 0.3)$	V
t_{SHORT}	Transmitter output short to GND time	Continuous	

Note: Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied. V+ and V- can have a maximum magnitude of +7V, but their absolute addition can not exceed 13 V.

Table 3. Shutdown and enable control truth table

SHDN	EN	T-OUT	R-OUT
0	0	High Z	Active
0	1	High Z	High Z
1	0	Active	Active
1	1	Active	High Z

Table 4. ESD performance: transmitter outputs, receiver inputs

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
ESD	ESD protection voltage	Human body model	± 15			kV
ESD	ESD protection voltage	IEC-1000-4-2	± 8			kV

3 Electrical characteristics

Table 5. Electrical characteristics ($C_1 - C_4 = 0.1\mu\text{F}$, $V_{CC} = 3\text{V}$ to 5.5V , $T_A = -40$ to 85°C , unless otherwise specified. Typical values are referred to $T_A = 25^\circ\text{C}$)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SUPPLY}	V_{CC} power supply current	No load $\overline{\text{SHDN}}=V_{CC} T_A = 25^\circ\text{C}$		0.3	1	mA
I_{SHDN}	Shutdown supply current	No load $\overline{\text{SHDN}}=V_{CC} T_A = 25^\circ\text{C}$		1	10	μA

Table 6. Logic input electrical characteristics ($C_1 - C_4 = 0.1\mu\text{F}$, $V_{CC} = 3\text{V}$ to 5.5V , $T_A = -40$ to 85°C , unless otherwise specified. Typical values are referred to $T_A = 25^\circ\text{C}$)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{IL}	Input logic threshold low	T-IN, $\overline{\text{EN}}$, $\overline{\text{SHDN}}$ (Note 1)			0.8	V
V_{IH}	Input logic threshold high	$V_{CC} = 3.3\text{V}$	2			V
		$V_{CC} = 5\text{V}$	2.4			
V_{HYS}	Transmitter input hysteresis			0.25		V
I_{IL}	Input leakage current	T-IN, $\overline{\text{EN}}$, $\overline{\text{SHDN}}$		± 0.01	± 1	μA

Note: Note 1: Transmitter input hysteresis is typically 250mV

Table 7. Transmitter electrical characteristics ($C_1 - C_4 = 0.1\mu\text{F}$, $V_{CC} = 3\text{V}$ to 5.5V , $T_A = -40$ to 85°C , unless otherwise specified. Typical values are referred to $T_A = 25^\circ\text{C}$)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{TOUT}	Output voltage swing	All transmitter outputs are loaded with $3\text{K}\Omega$ to GND	± 5	± 5.4		V
R_{TOUT}	Transmitter output resistance	$V_{CC} = V_+ = V_- = 0\text{V}$ $V_{\text{OUT}} = \pm 2\text{V}$	300	10M		Ω
I_{TSC}	Output short circuit current			± 60		mA
I_{TOL}	Output leakage current	$V_{CC} = 0\text{V}$ or 3V to 3.6V $V_{\text{OUT}} = \pm 12\text{V}$ Transmitters disable			± 25	μA

Table 8. Receiver electrical characteristics ($C_1 - C_4 = 0.1\mu\text{F}$, $V_{CC} = 3\text{V}$ to 5.5V , $T_A = -40$ to 85°C , unless otherwise specified. Typical values are referred to $T_A = 25^\circ\text{C}$)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{OL}	Output leakage current	R-OUT, $\overline{\text{EN}} = V_{CC}$, receiver disabled		± 0.05	± 10	μA
V_{RIN}	Receiver input voltage operating range		-25		25	V
V_{RIL}	Input threshold low	$T_A = 25^\circ\text{C}$, $V_{CC} = 3.3\text{V}$	0.6	1.2		V
		$T_A = 25^\circ\text{C}$, $V_{CC} = 5\text{V}$	0.8	1.5		
V_{RIH}	Input threshold high	$T_A = 25^\circ\text{C}$, $V_{CC} = 3.3\text{V}$		1.5	2.4	V
		$T_A = 25^\circ\text{C}$, $V_{CC} = 5\text{V}$		1.8	2.4	
V_{RIHYS}	Input hysteresis			0.5		V
R_{RIN}	Input resistance	$T_A = 25^\circ\text{C}$	3	5	7	$\text{K}\Omega$
V_{ROL}	Output voltage low	$I_{OUT} = 1.6\text{mA}$			0.4	V
V_{ROH}	Output voltage high	$I_{OUT} = -1\text{mA}$	$V_{CC}-0.6$	$V_{CC}-0.1$		V

Table 9. Timing characteristics ($C_1 - C_4 = 0.1\mu\text{F}$, $V_{CC} = 3\text{V}$ to 5.5V , $T_A = -40$ to 85°C , unless otherwise specified. Typical values are referred to $T_A = 25^\circ\text{C}$)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
D_R	Data transfer rate	$R_L = 3\text{K}\Omega$, $C_{L2} = 1000\text{pF}$ one transmitter switching	250			Kbps
t_{PHLR} t_{PLHR}	Propagation delay input to output	R_{XIN} to R_{XOUT} , $C_L = 150\text{pF}$		0.15		μs
$ t_{PHLT} - t_{THL} $	Transmitter propagation delay difference ⁽¹⁾			200		ns
t_{OER}	Receiver output enable time	Normal operation		50		ns
t_{ODR}	Receiver output disable time	Normal operation		50		ns
$ t_{PHLR} - t_{THR} $	Receiver Propagation Delay Difference			50		ns
S_{RT}	Transition Slew Rate	$T_A = 25^\circ\text{C}$, $R_L = 3\text{K}\Omega$ to $7\text{K}\Omega$ $V_{CC} = 3.3\text{V}$ measured from $+3\text{V}$ to -3V or -3V to $+3\text{V}$ $C_L = 150\text{pF}$ to 1000pF $C_L = 150\text{pF}$ to 2500pF	6 4		30 30	$\text{V}/\mu\text{s}$ $\text{V}/\mu\text{s}$

1. Transmitter Skew is measured at the transmitter zero cross points

4 Application circuits

Figure 2. Application schematic

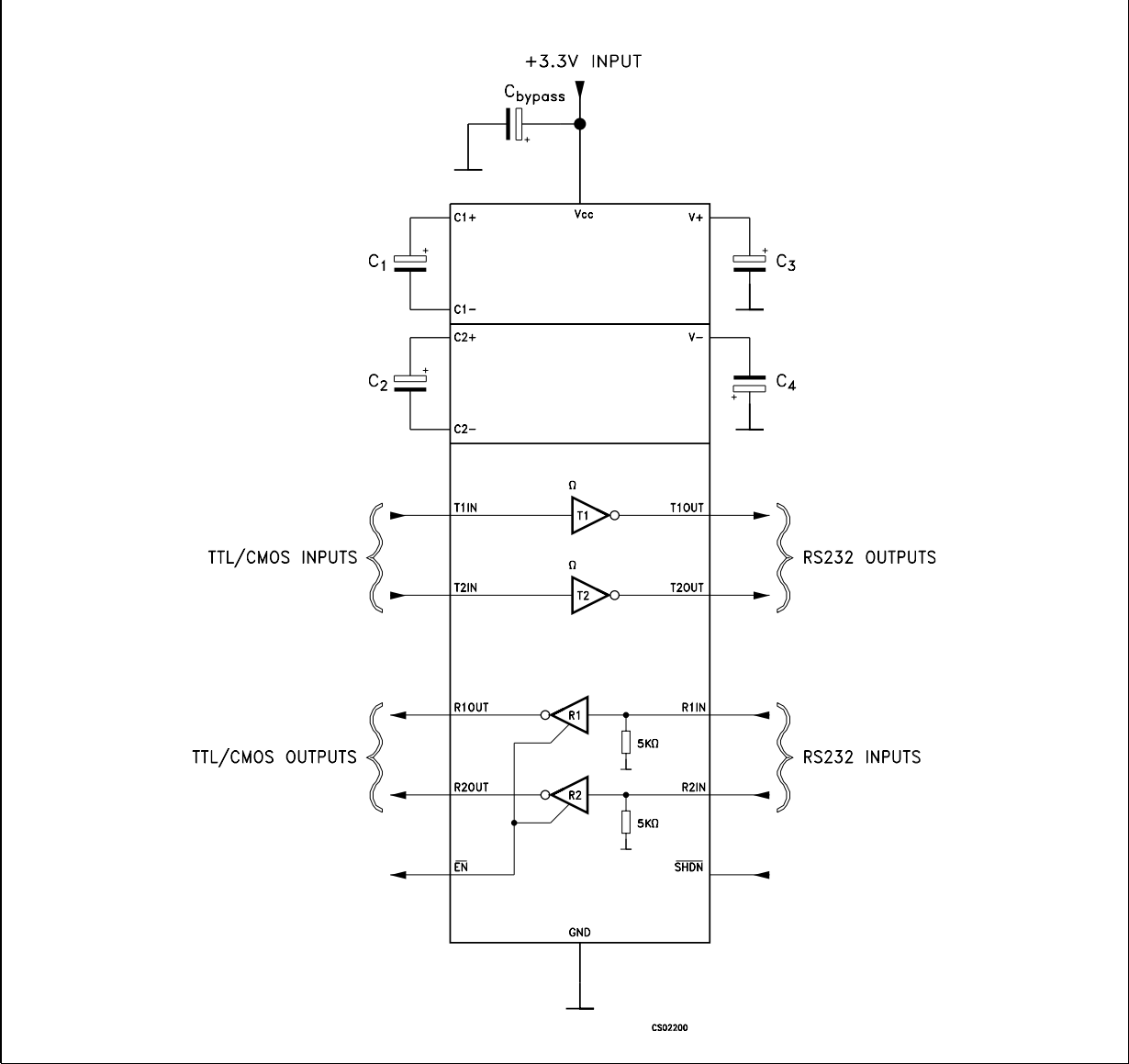


Table 10. Capacitance value (μF)

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	0.1
3.0 to 5.5	0.1	0.47	0.47	0.47	0.1

4.1 Typical performance characteristics

(unless otherwise specified $T_j = 25^{\circ}\text{C}$)

Figure 3. Output current vs output high voltage

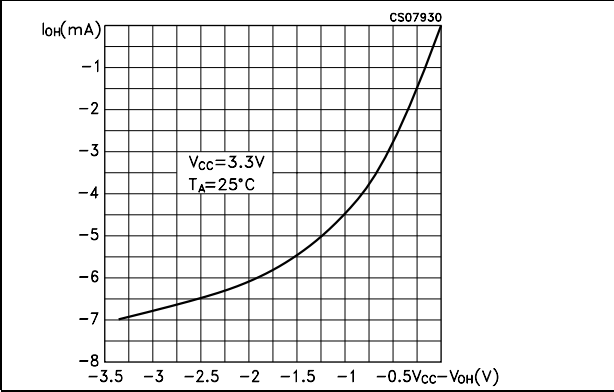


Figure 4. Output current vs output high voltage

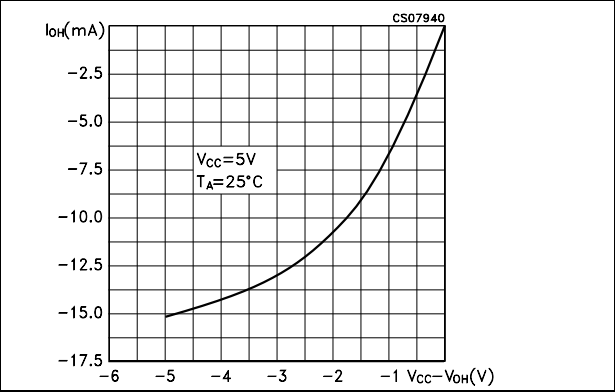


Figure 5. Output current vs output low voltage

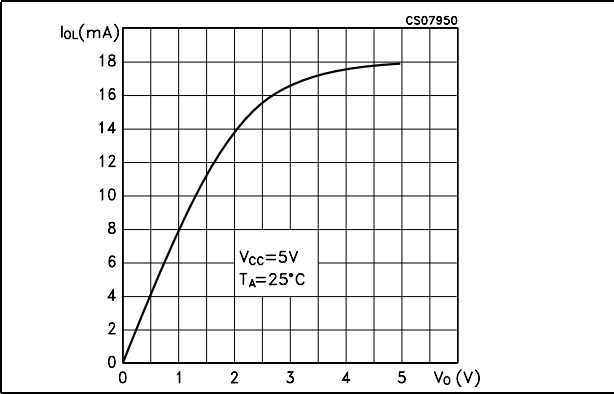


Figure 6. Output current vs output low voltage

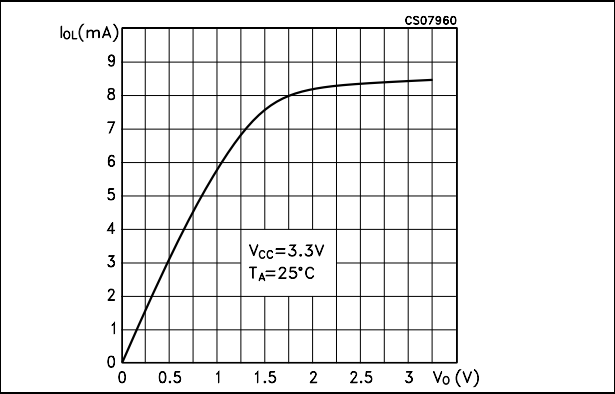


Figure 7. Voltage transfer characteristics for transmitter inputs

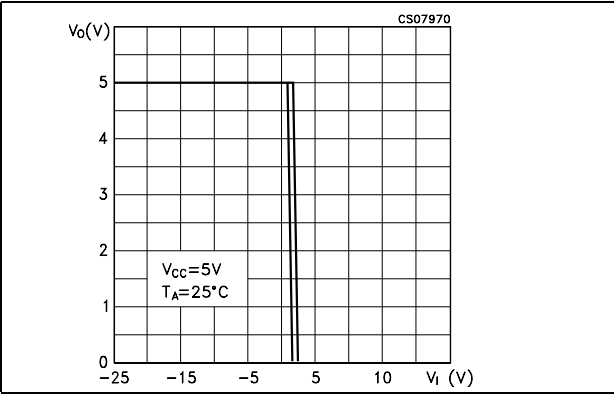
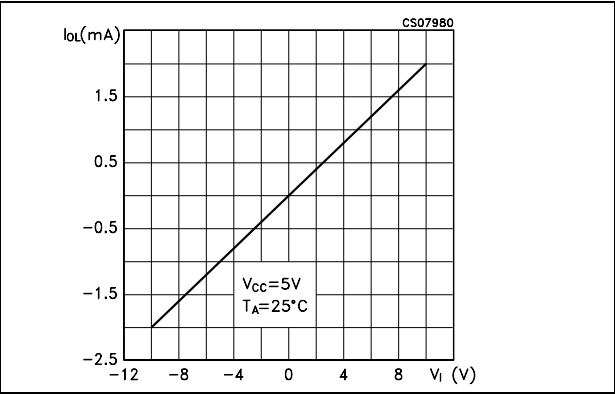


Figure 8. Receiver Input Resistance

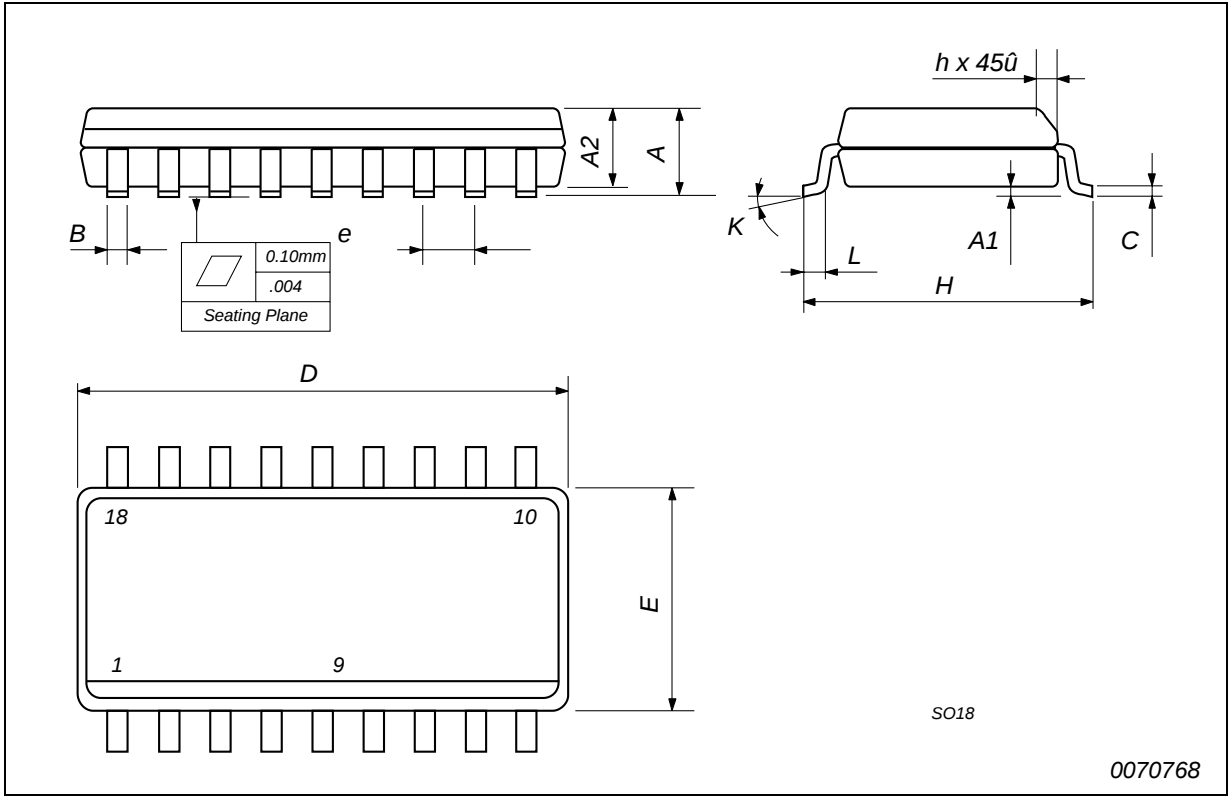


5 Package mechanical data

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

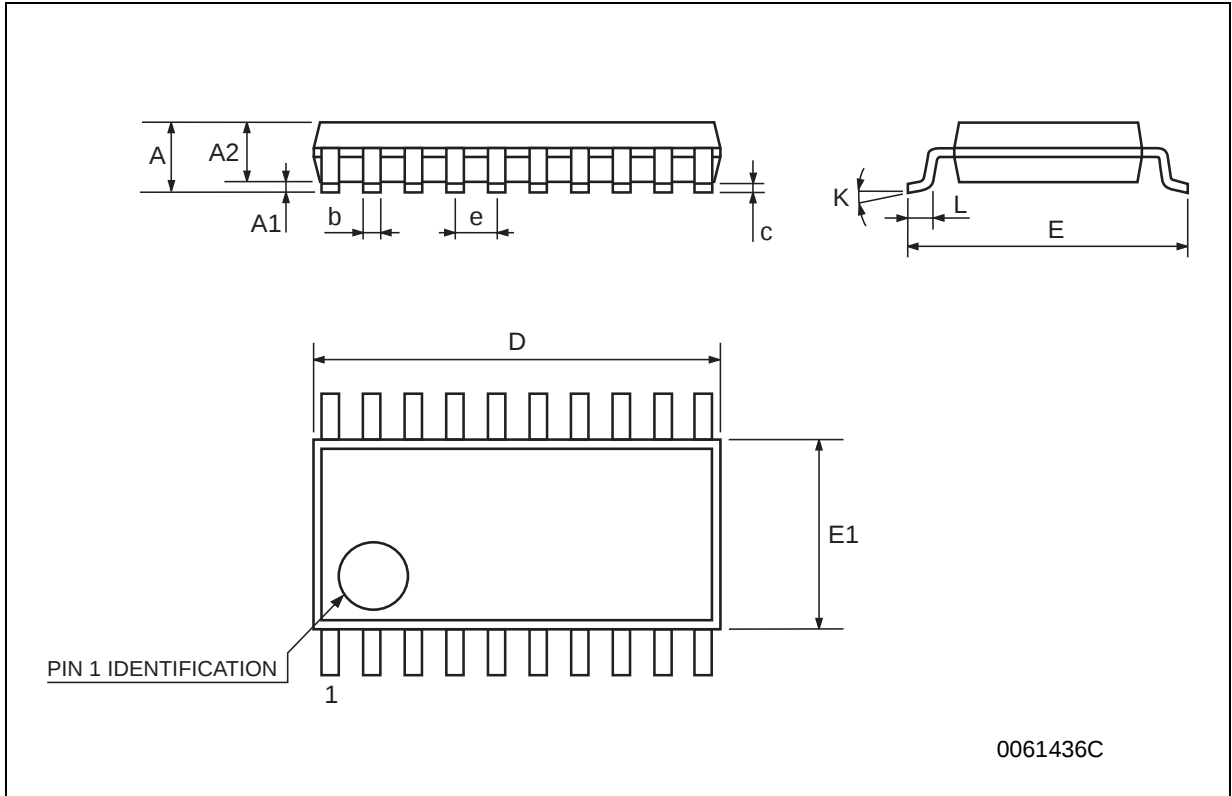
SO-18 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	2.35		2.65	0.092		0.104
A1	0.1		0.3	0.004		0.012
A2			2.55			0.100
B	0.33		0.51	0.013		0.020
C	0.23		0.32	0.009		0.012
D	11.35		11.75	0.447		0.462
E	7.4		7.6	0.291		0.299
e		1.27			0.050	
H	10.00		10.65	0.393		0.419
h	0.25		0.75	0.010		0.029
k	8 ° (max.)					
L	0.4		1.27	0.016		0.050



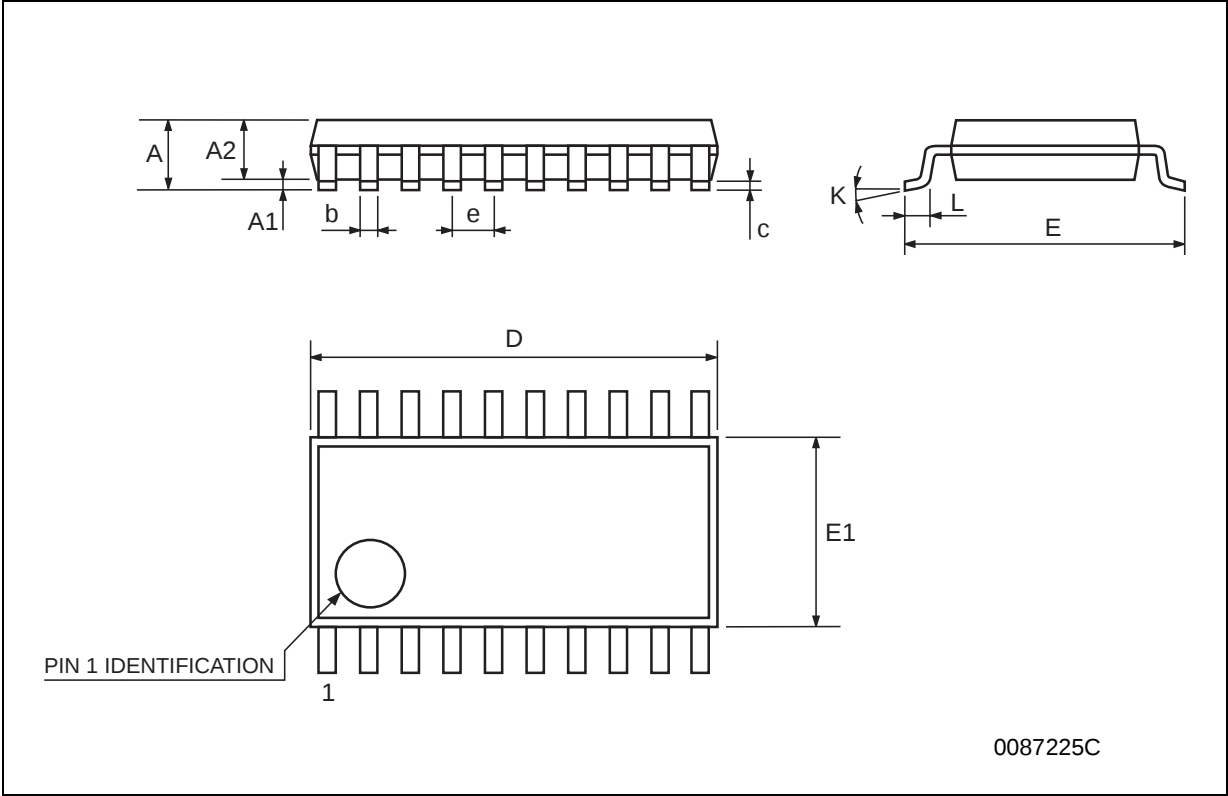
SSOP20 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			2			0.079
A1	0.05			0.002		
A2	1.65	1.75	1.85	0.065	0.069	0.073
b	0.22		0.38	0.009		0.015
c	0.09		0.25	0.004		0.010
D	6.9	7.2	7.5	0.272	0.283	0.295
E	7.4	7.8	8.2	0.291	0.307	0.323
E1	5	5.3	5.6	0.197	0.209	0.220
e		0.65 BSC			0.0256 BSC	
K	0°	4°	8°	0°	4°	8°
L	0.55	0.75	0.95	0.022	0.030	0.037



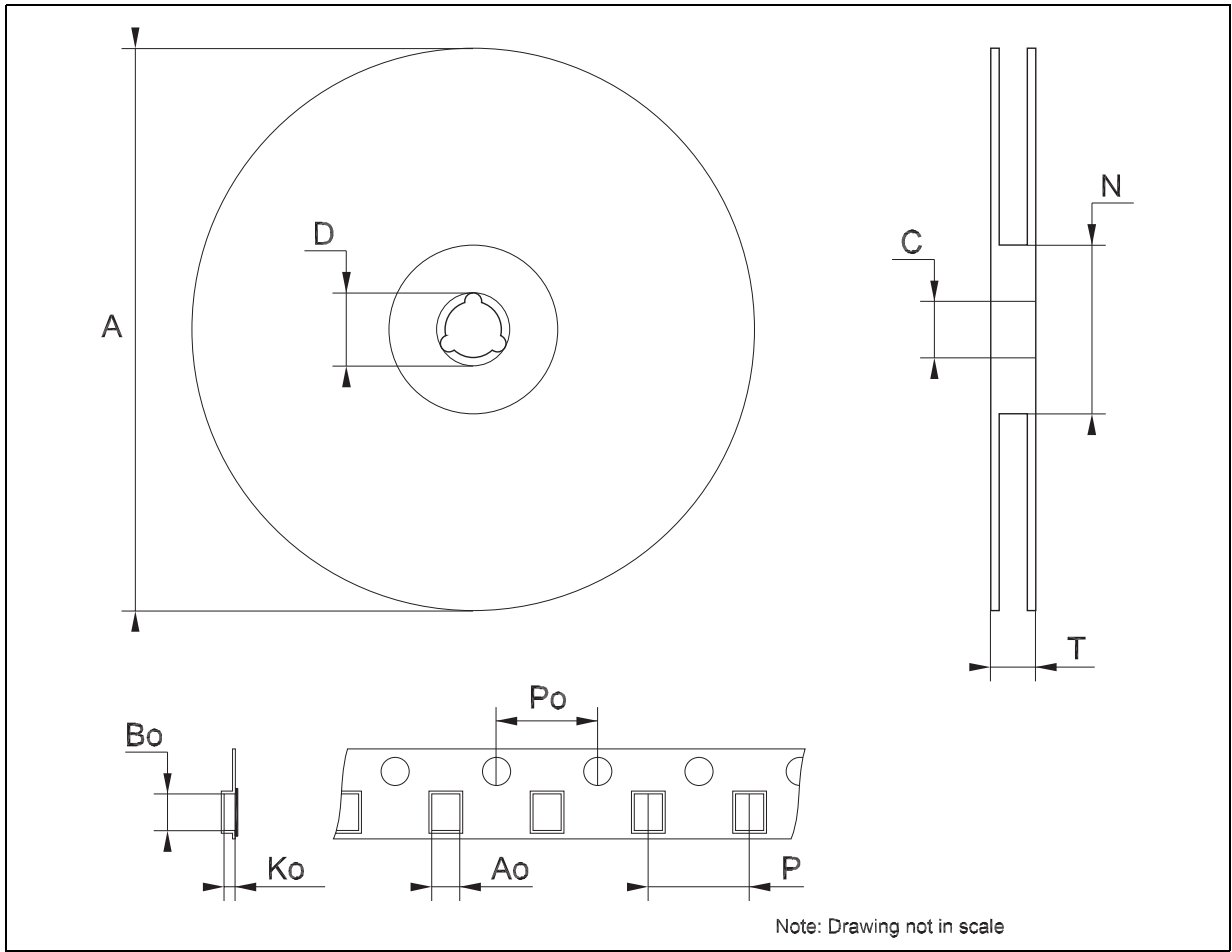
TSSOP20 MECHANICAL DATA

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	6.4	6.5	6.6	0.252	0.256	0.260
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



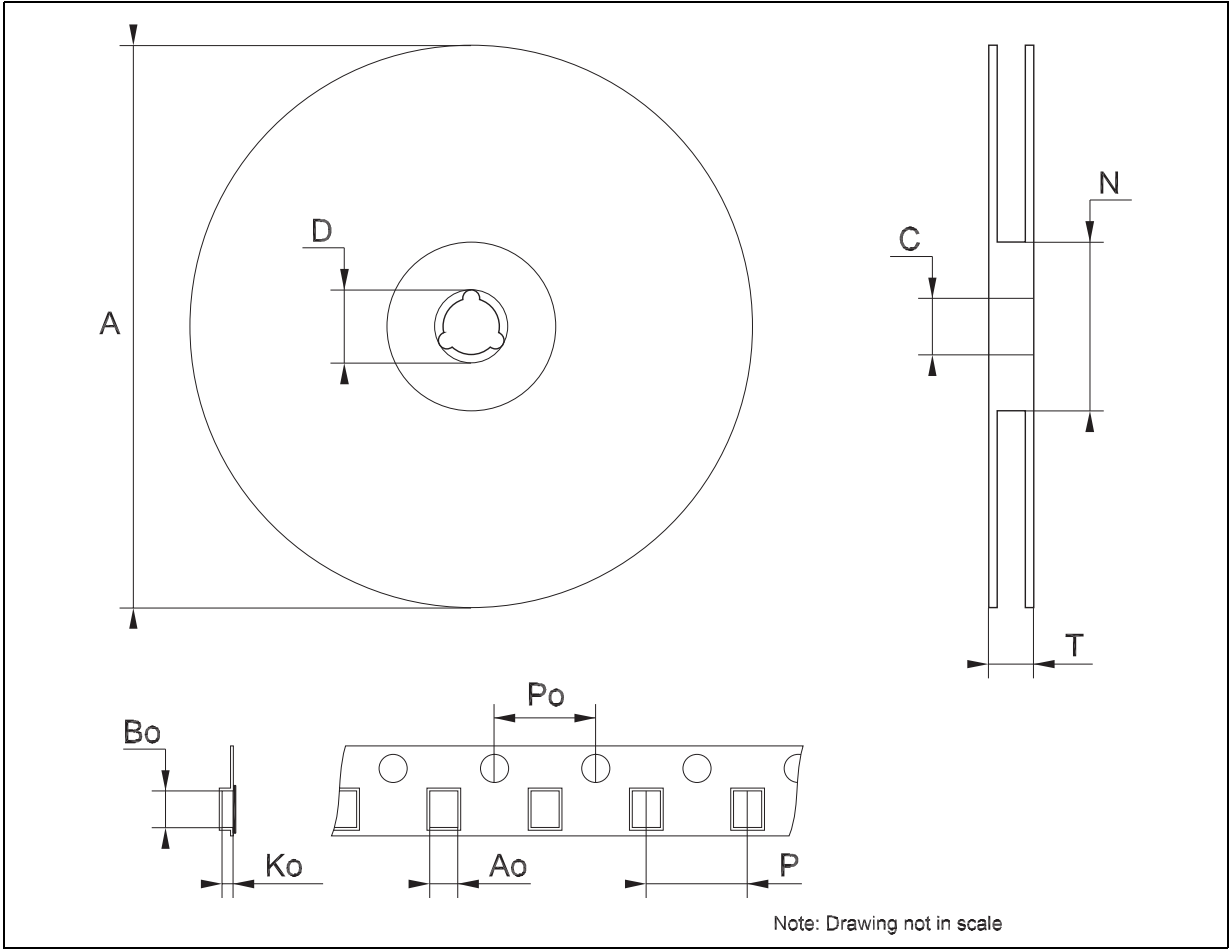
Tape & Reel SO-18 MECHANICAL DATA

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	10.8		11.0	0.425		0.433
Bo	11.9		12.1	0.468		0.476
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



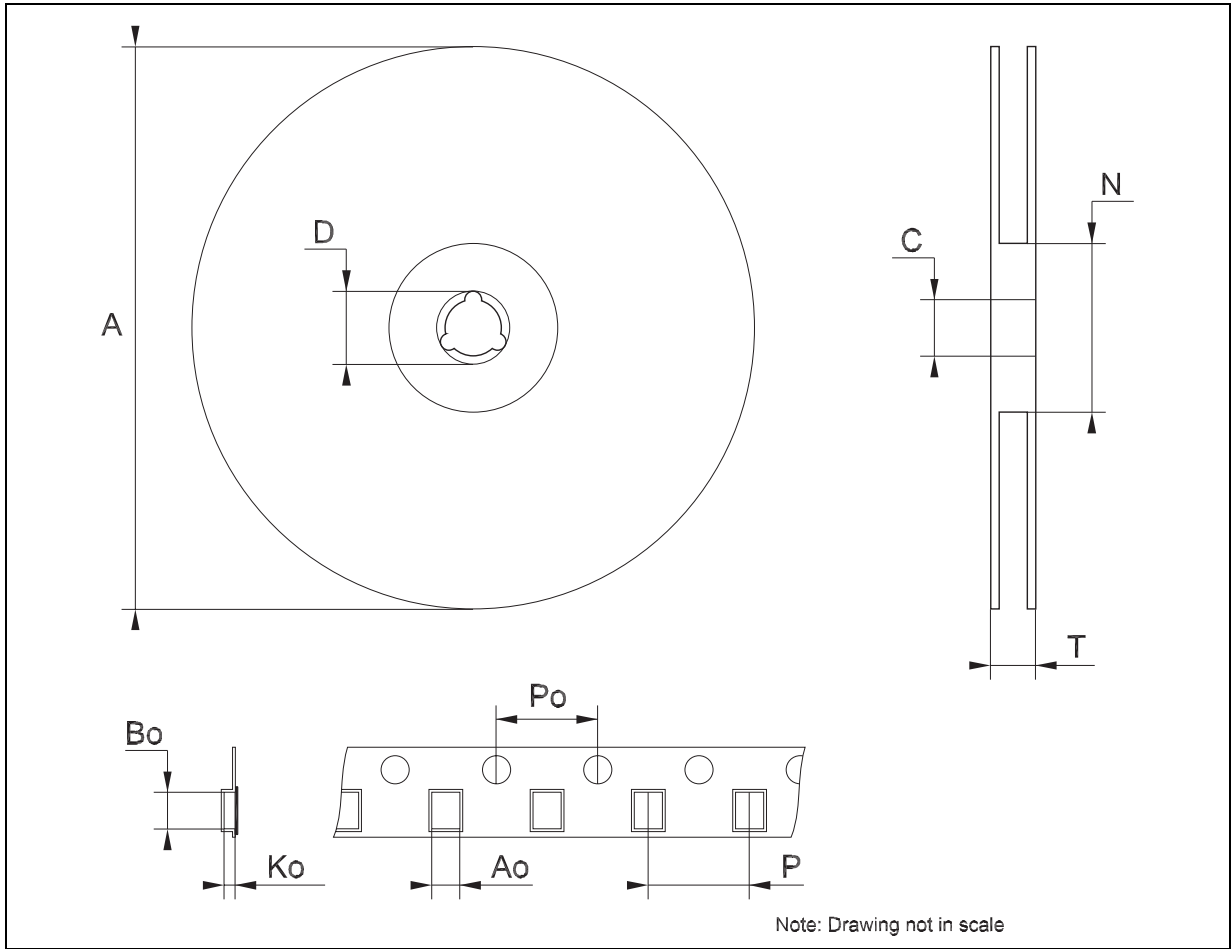
Tape & Reel SSOP20 MECHANICAL DATA

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	8.4		8.6	0.331		0.339
Bo	7.7		7.9	0.303		0.311
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



Tape & Reel TSSOP20 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	6.8		7	0.268		0.276
Bo	6.9		7.1	0.272		0.280
Ko	1.7		1.9	0.067		0.075
Po	3.9		4.1	0.153		0.161
P	11.9		12.1	0.468		0.476



6 Revision history

Table 11. Revision history

Date	Revision	Changes
22-Mar-2006	6	Order codes has been updated and new template.

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