



## ST3241E

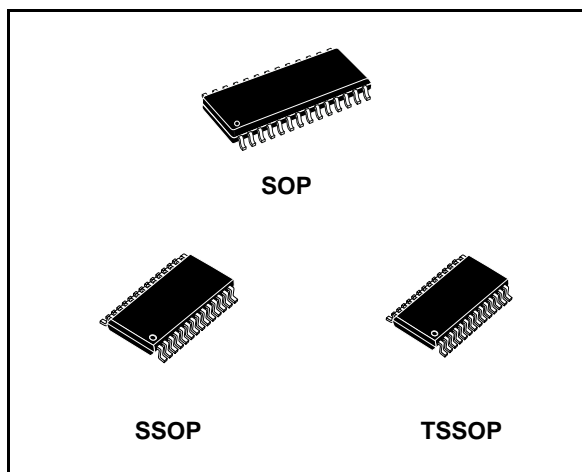
±15kV ESD Protected 3 to 5.5V, 400kbps,  
RS-232 transceiver with auto-powerdown

### General features

- ESD Protection for RS-232 I/O pins:  
±8KV IEC 1000-4-2 Contact discharge  
±15KV Human body model
- 1µA Supply current achieved when in auto-powerdown
- 250Kbps Minimum guaranteed data rate
- Guaranteed 6V/ms slew rate range
- Guaranteed mouse driveability
- 0.1µF External capacitors
- Meet EIA/TIA-232 specifications down to 3V
- Available in SO-28, SSOP-28 and TSSOP28 packages

### Description

The ST3241E device consists of 3 drivers, 5 receivers and a dual charge-pump circuit. The device meets the requirements of EIA/TIA and V.28/V.24 communication standards providing high data rate capability and enhanced electrostatic discharge (ESD) protection. All transmitter outputs and receiver input are protected to ±8KV USING IEC 1000-4-2 contact discharge and ±15KV using the Human Body Model. The receiver R2 is always active to implement a wake-up feature for serial port.



The ST3241E has a proprietary low-dropout transmitter output stage enabling true RS-232 performance from a 3.0V to 5.5V supply with a dual charge pump. The device is guaranteed to run at data rates of 250kbps while maintaining RS-232 output levels.

It is a complete serial port (3 drivers, 5 receivers) intended for notebook or subnotebook computers. Receivers R1 and R2 have extra outputs in addition to their standard outputs. These extra output are always active.

Typical application are in notebook, subnotebook, palmtop computers, battery-powered equipment, hand-held equipment, peripherals and printers..

### Order code

Part number	Temperature range	Package	Comments
ST3241ECDR	0 to 70°C	SO-28 (Tape & Reel)	1000 parts per reel
ST3241EBDR	-40 to 85°C	SO-28 (Tape & Reel)	1000 parts per reel
ST3241ECPR	0 to 70°C	SSOP-28 (Tape & Reel)	1350 parts per reel
ST3241EBPR	-40 to 85°C	SSOP-28 (Tape & Reel)	1350 parts per reel
ST3241ECTR	0 to 70°C	TSSOP28 (Tape & Reel)	2500 parts per reel
ST3241EBTR	-40 to 85°C	TSSOP28 (Tape & Reel)	2500 parts per reel

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# 1 Pin configuration

Figure 1. Pin configuration

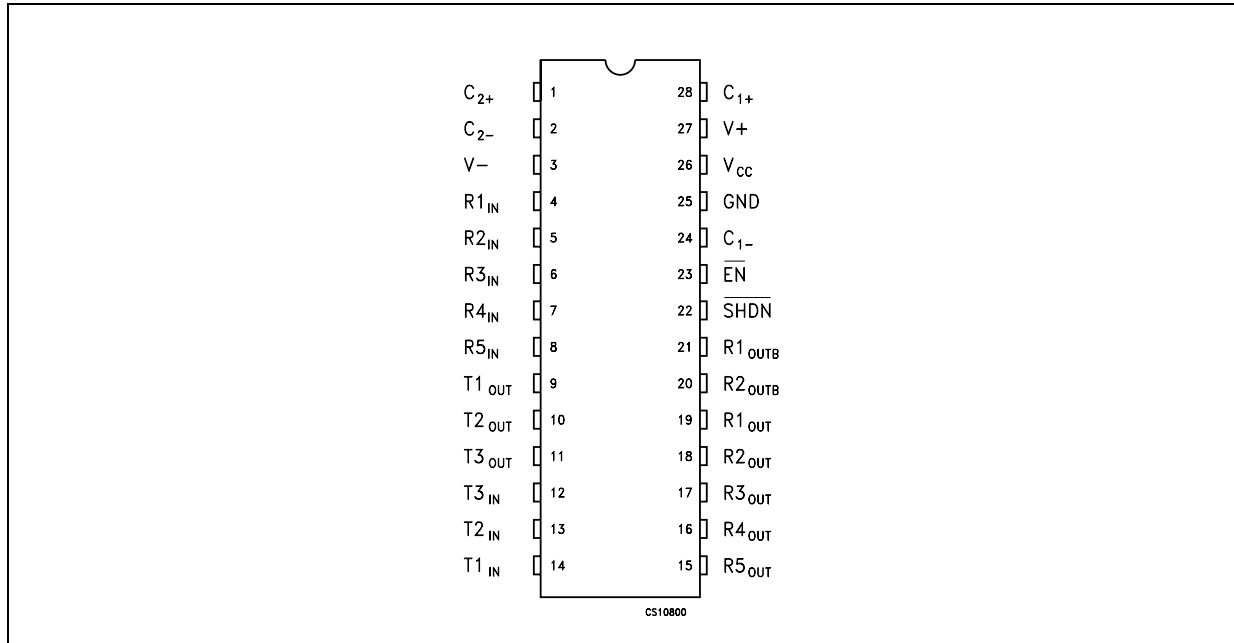


Table 1. Pin description

Pin n°	Symbol	Name and function
1	C <sub>2+</sub>	Positive terminal of inverting charge pump capacitor
2	C <sub>2-</sub>	Negative terminal of inverting charge pump capacitor
3	V-	-5.5V Generated by the Charge Pump
4	R1 <sub>IN</sub>	First receiver input voltage
5	R2 <sub>IN</sub>	Second Receiver Input Voltage
6	R3 <sub>IN</sub>	Third receiver input voltage
7	R4 <sub>IN</sub>	Fourth receiver input voltage
8	R5 <sub>IN</sub>	Fifth receiver input voltage
9	T1 <sub>OUT</sub>	First transmitter output voltage
10	T2 <sub>OUT</sub>	Second transmitter output voltage
11	T3 <sub>OUT</sub>	Third transmitter output voltage
12	T3 <sub>IN</sub>	Third transmitter input voltage
13	T2 <sub>IN</sub>	Second transmitter input voltage
14	T1 <sub>IN</sub>	First transmitter input voltage
15	R5 <sub>OUT</sub>	Fifth Receiver Output Voltage
16	R4 <sub>OUT</sub>	Fourth receiver output voltage
17	R3 <sub>OUT</sub>	Third receiver output voltage

Table 1. Pin description

Pin n°	Symbol	Name and function
18	R2 <sub>OUT</sub>	Second receiver output voltage
19	R1 <sub>OUT</sub>	First receiver output voltage
20	R2 <sub>OUTB</sub>	Non-inverting complementary receiver output, always active for wake-up
21	R1 <sub>OUTB</sub>	Non-inverting complementary receiver output, always active for wake-up
22	SHDN	Shutdown control. Active low.
23	EN	Receiver enable. Active low
24	C <sub>1-</sub>	Negative terminal of voltage- charge pump capacitor
25	GND	Ground
26	V <sub>CC</sub>	Supply voltage
27	V+	5.5V Generated by the charge pump
28	C <sub>1+</sub>	Positive terminal of voltage- Charge pump capacitor

Table 2. Shutdown and enable control truth table

$\overline{\text{SHDN}}$	$\overline{\text{EN}}$	T <sub>OUT</sub>	R <sub>OUT</sub>	R <sub>OUTB</sub>
0	0	HIGH Z	ACTIVE	ACTIVE
0	1	HIGH Z	HIGH Z	ACTIVE
1	0	ACTIVE	ACTIVE	ACTIVE
1	1	ACTIVE	HIGH Z	ACTIVE

## 2 Maximum ratings

**Table 3. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage	-0.3 to 6	V
V+	Extra Positive Voltage (Note 1)	( $V_{CC} - 0.3$ ) to 7	V
V-	Extra negative Voltage (Note 1)	0.3 to -7	V
$V+ +  V- $	(Note 1)	13	V
$\overline{SHDN}$ , EN, $T_{IN}$	Input Voltage	-0.3 to 6	V
$R_{IN}$	Receiver Input Voltage Range	$\pm 25$	V
$T_{OUT}$	Transmitter Output Voltage Range	$\pm 13.2$	V
$R_{OUT}$ , $R_{OUTB}$ INVALID	Receiver Output Voltage Range	-0.3 to ( $V_{CC} + 0.3$ )	V
$t_{SHORT}$	Short Circuit Duration on $T_{OUT}$ (one at a time)	Continuous	
$T_{stg}$	Storage Temperature Range	-65 to 150	°C

Note: Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

Note: 1 V+ and V- can have a maximum magnitude of +7V, but their absolute addition cannot exceed 13 V.

**Table 4. ESD Performance: transmitter outputs, receiver inputs**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
ESD	ESD Protection voltage	Human body model	$\pm 15$			KV
ESD	ESD Protection voltage	IEC 1000-4-2 (contact discharge)	$\pm 8$			KV

### 3 Electrical characteristics

**Table 5. Electrical characteristics**

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{\text{SUPPLY}}$	Supply current	No load $V_{\text{CC}} = 3.3\text{V}$ or $5\text{V}$ , $T_A = 25^\circ\text{C}$		0.3	1	mA
$I_{\text{SHDN}}$	Shutdown supply current	$\overline{\text{SHDN}} = \text{GND}$ , $T_A = 25^\circ\text{C}$		1	10	$\mu\text{A}$

**Table 6. Logic input and receiver output electrical characteristics**

( $C_1 - C_4 = 0.1\mu\text{F}$ ,  $V_{\text{CC}} = 3\text{V}$  to  $5.5\text{V}$ ,  $T_A = -40$  to  $85^\circ\text{C}$ , unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{\text{TIL}}$	Input logic threshold low	$T_{\text{IN}}, \overline{\text{EN}}, \overline{\text{SHDN}}$			0.8	V
$V_{\text{TIH}}$	Input logic threshold high	$V_{\text{CC}} = 3.3\text{V}$ $V_{\text{CC}} = 5\text{V}$	2 2.4			V V
$I_{\text{IL}}$	Input leakage current	$T_{\text{IN}}, \overline{\text{EN}}, \overline{\text{SHDN}}$		$\pm 0.01$	$\pm 1.0$	$\mu\text{A}$

**Table 7. Receiver output electrical characteristics**

( $C_1 - C_4 = 0.1\mu\text{F}$ ,  $V_{\text{CC}} = 3\text{V}$  to  $5.5\text{V}$ ,  $T_A = -40$  to  $85^\circ\text{C}$ , unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{\text{OL}}$	Output Leakage Current	$R_{\text{OUT}}, \overline{\text{EN}}$ , Receiver Disabled		$\pm 0.05$	$\pm 10$	$\mu\text{A}$
$V_{\text{OL}}$	Output Voltage Low	$I_{\text{OUT}} = 1.6\text{mA}$			0.4	V
$V_{\text{OH}}$	Output Voltage High	$I_{\text{OUT}} = -1\text{mA}$		$V_{\text{CC}} - 0.6$	$V_{\text{CC}} - 0.1$	V

**Table 8. Transmitter electrical characteristics**

( $C_1 - C_4 = 0.1\mu\text{F}$ ,  $V_{\text{CC}} = 3\text{V}$  to  $5.5\text{V}$ ,  $T_A = -40$  to  $85^\circ\text{C}$ , unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{\text{TOUT}}$	Output voltage swing	All transmitter outputs are loaded with $3\text{K}\Omega$ to GND	$\pm 5$	$\pm 5.4$		V
$R_{\text{OUT}}$	Output resistance	$V_{\text{CC}} = V_+ = V_- = 0\text{V}$ , $V_{\text{OUT}} = \pm 2\text{V}$	300	10M		$\Omega$
$I_{\text{SC}}$	Output short circuit current			$\pm 35$	$\pm 60$	mA
$I_{\text{L}}$	Output leakage current	$V_{\text{CC}} = 0$ to $5.5\text{V}$ , transmitter output = $\pm 12\text{V}$ , transmitter disabled			$\pm 25$	$\mu\text{A}$
$V_{\text{TO}}$	Transmitter output voltage	$T1\text{IN} = T2\text{IN} = \text{GND}$ , $T3\text{IN} = V_{\text{CC}}$ $T3\text{OUT}$ loaded with $3\text{K}\Omega$ to GND $T1\text{OUT}$ and $T2\text{OUT}$ loaded with $2.5\text{mA}$ each	$\pm 5$			V

**Table 9. Receiver electrical characteristics**(C<sub>1</sub> - C<sub>4</sub> = 0.1μF, V<sub>CC</sub> = 3V to 5.5V, T<sub>A</sub> = -40 to 85°C, unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>RIN</sub>	Receiver input voltage operating range		-25		25	V
V <sub>RIL</sub>	RS-232 Input threshold low	T <sub>A</sub> = 25°C, V <sub>CC</sub> = 3.3V T <sub>A</sub> = 25°C, V <sub>CC</sub> = 5.0V	0.6 0.8	1.2 1.5		V
V <sub>RIH</sub>	RS-232 Input threshold high	T <sub>A</sub> = 25°C, V <sub>CC</sub> = 3.3V T <sub>A</sub> = 25°C, V <sub>CC</sub> = 5.0V		1.5 1.8	2.4 2.4	V
V <sub>RIHYS</sub>	Input hysteresis			0.3		V
R <sub>RIN</sub>	Input resistance	T <sub>A</sub> = 25°C	3	5	7	KΩ

**Table 10. Timing characteristics**(C<sub>1</sub> - C<sub>4</sub> = 0.1μF, V<sub>CC</sub> = 3V to 5.5V, T<sub>A</sub> = -40 to 85°C, unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
D <sub>R</sub>	Maximum data rate	R <sub>L</sub> = 3KΩ, C <sub>L</sub> = 1000pF one transmitter switching	250			Kbps
t <sub>PHL</sub> t <sub>PLH</sub>	Receiver propagation delay	R <sub>IN</sub> to R <sub>OUT</sub> , C <sub>L</sub> = 150pF		0.15		μs
t <sub>T_SKEW</sub>	Transmitter skew			100		ns
t <sub>R_SKEW</sub>	Receiver skew			300		ns
S <sub>RT</sub>	Transition slew rate	T <sub>A</sub> = 25°C R <sub>L</sub> = 3K to 7KΩ V <sub>CC</sub> = 3.3V measured from +3V to -3V or -3V to +3V C <sub>L</sub> = 150pF to 1000pF C <sub>L</sub> = 150pF to 2500pF	6 4		30 30	V/μs V/μs

# 4 Application circuits

Figure 2. Application circuits

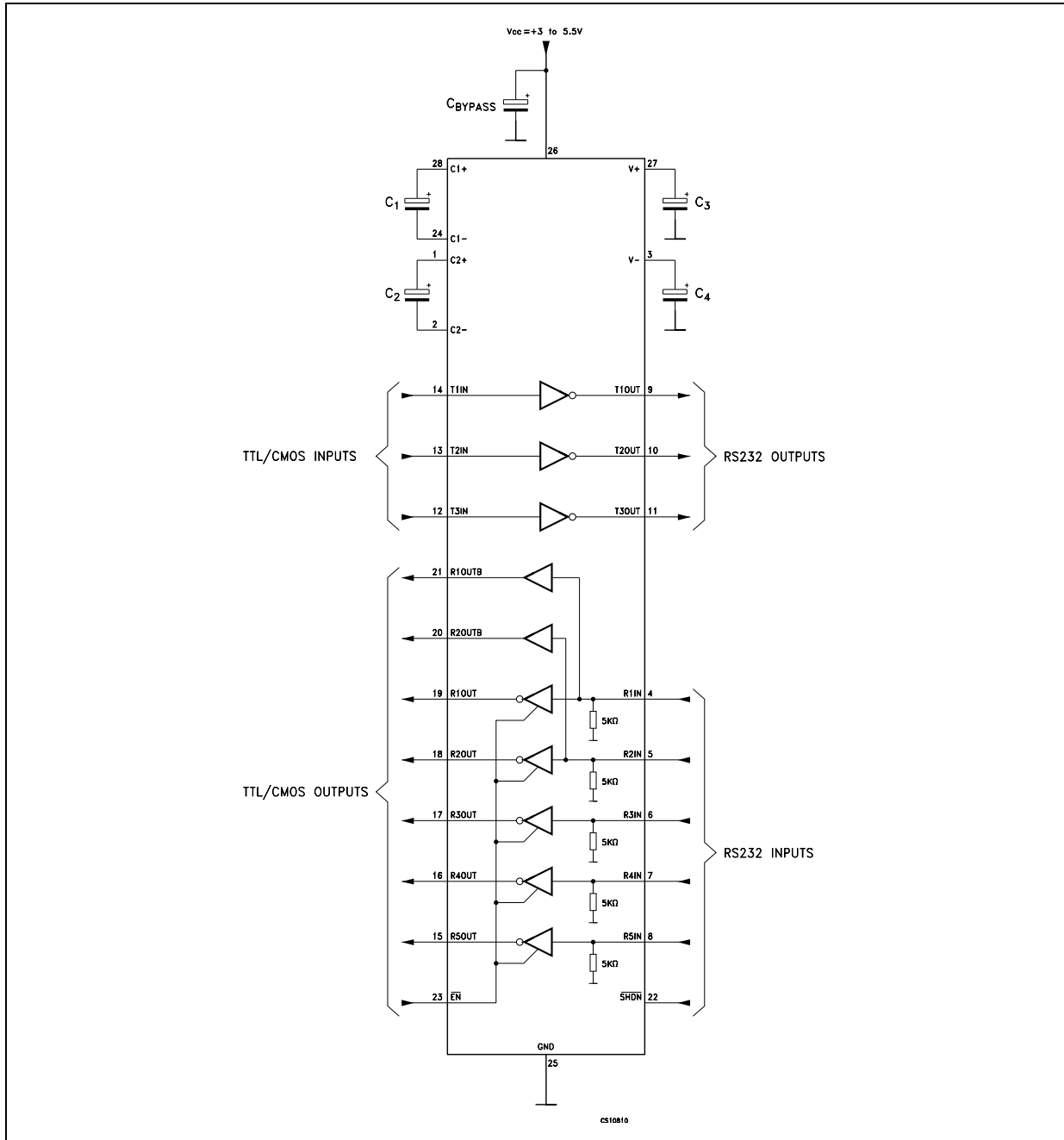


Table 11. Required minimum capacitance value ( $\mu\text{F}$ )

$V_{CC}$	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

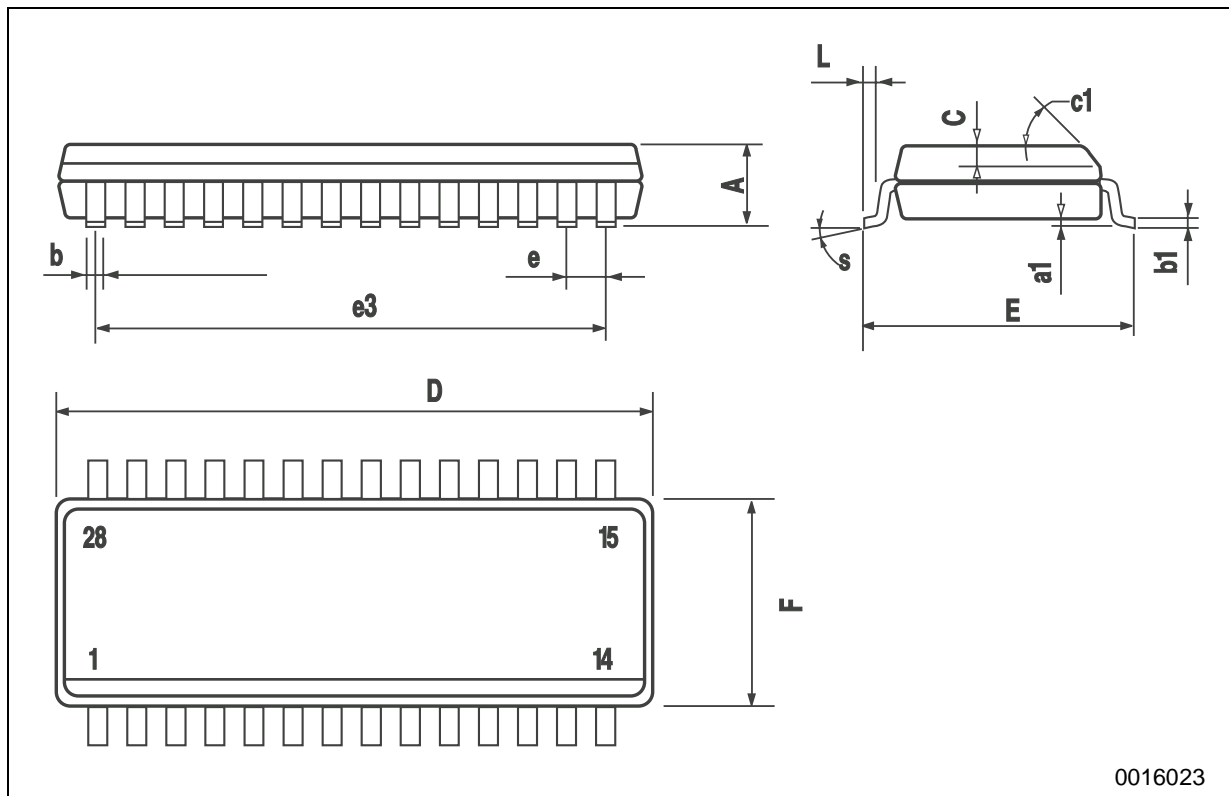


## 5 Package mechanical data

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](http://www.st.com)

**SO-28 MECHANICAL DATA**

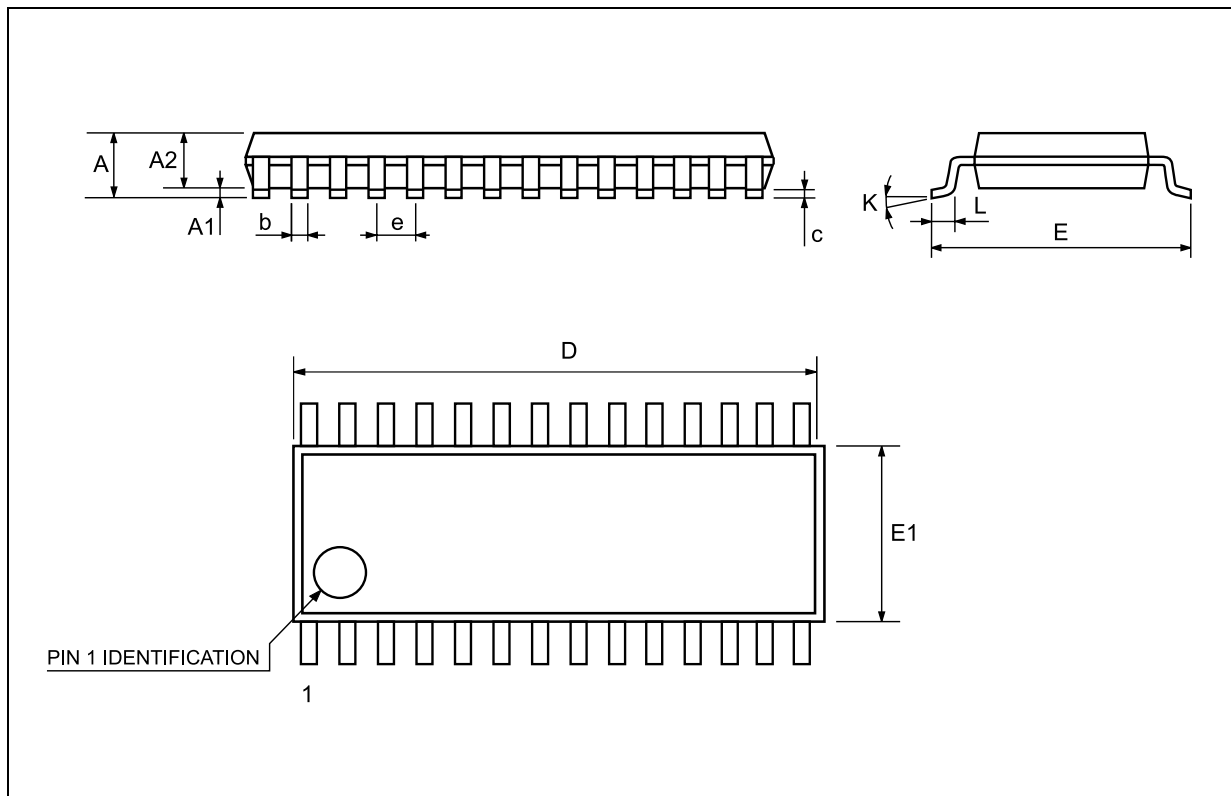
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.1		0.3	0.004		0.012
b	0.35		0.49	0.014		0.019
b1	0.23		0.32	0.009		0.012
C		0.5			0.020	
c1	45° (typ.)					
D	17.70		18.10	0.697		0.713
E	10.00		10.65	0.393		0.419
e		1.27			0.050	
e3		16.51			0.650	
F	7.40		7.60	0.291		0.300
L	0.50		1.27	0.020		0.050
S	8° (max.)					



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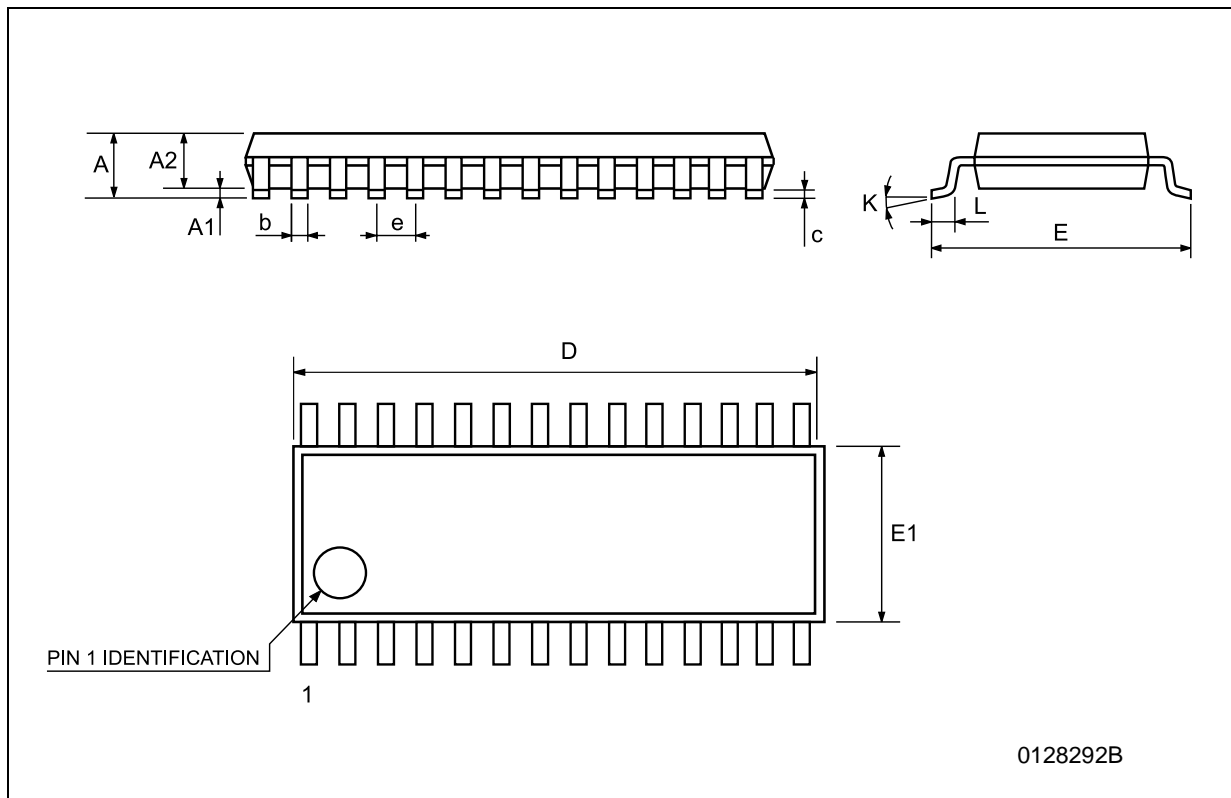
**SSOP28 MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			2			0.079
A1	0.050			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	9.9	10.2	10.5	0.390	0.402	0.413
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°		10°	0°		10°
L	0.55	0.75	0.95	0.022	0.030	0.037



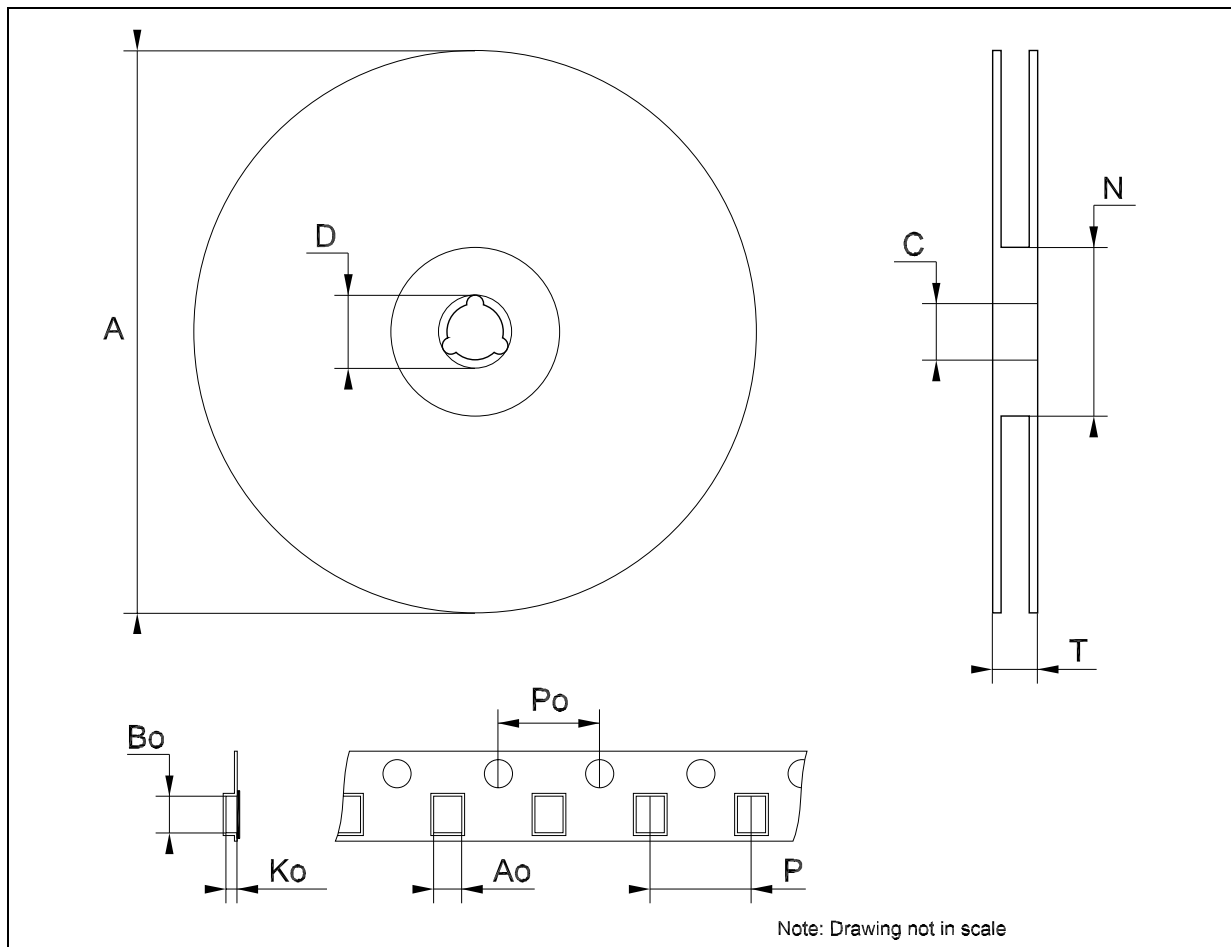
**TSSOP28 MECHANICAL DATA**

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	9.6	9.7	9.8	0.378	0.382	0.386
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



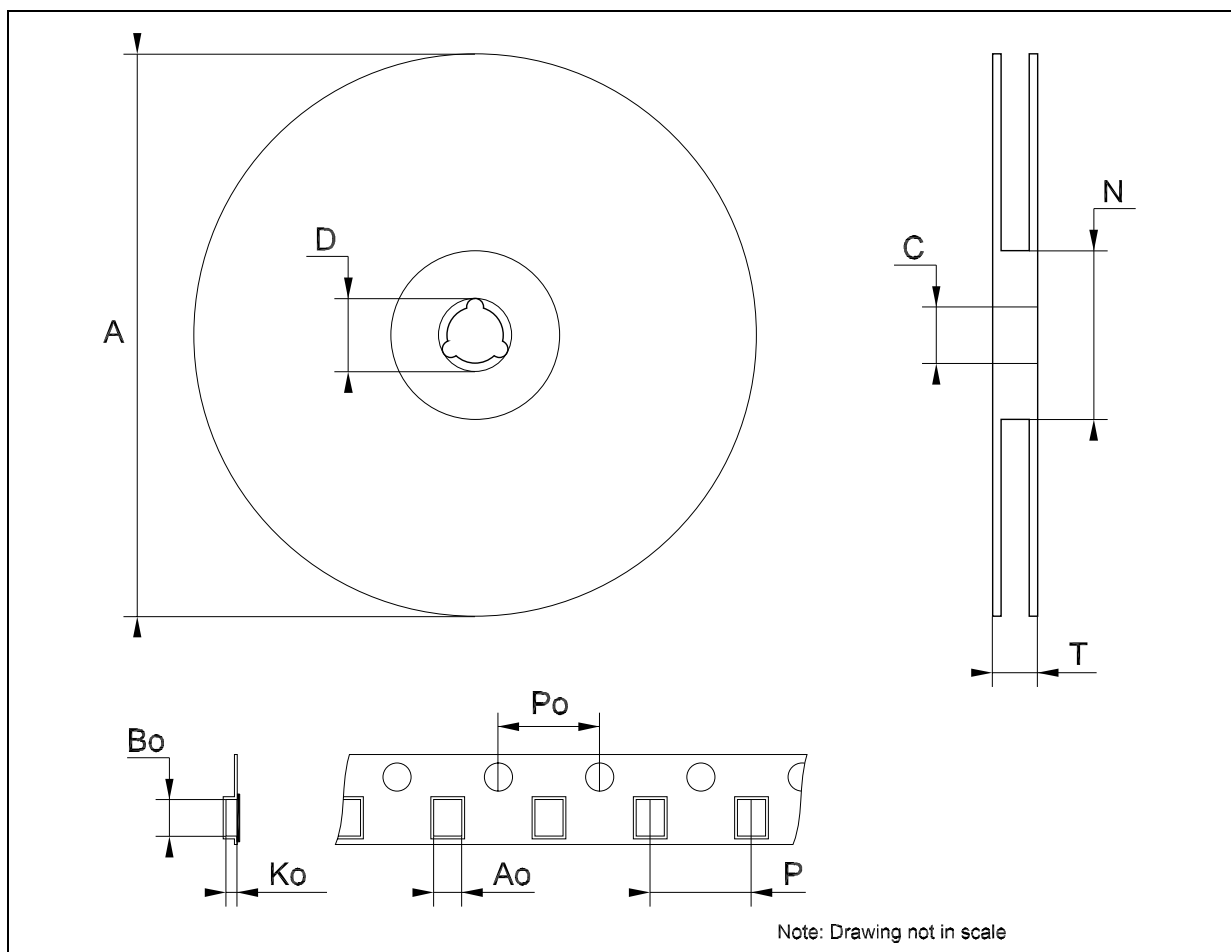
**Tape & Reel SO-28 MECHANICAL DATA**

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	10.8		11.0	0.425		0.433
Bo	18.2		18.4	0.716		0.724
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



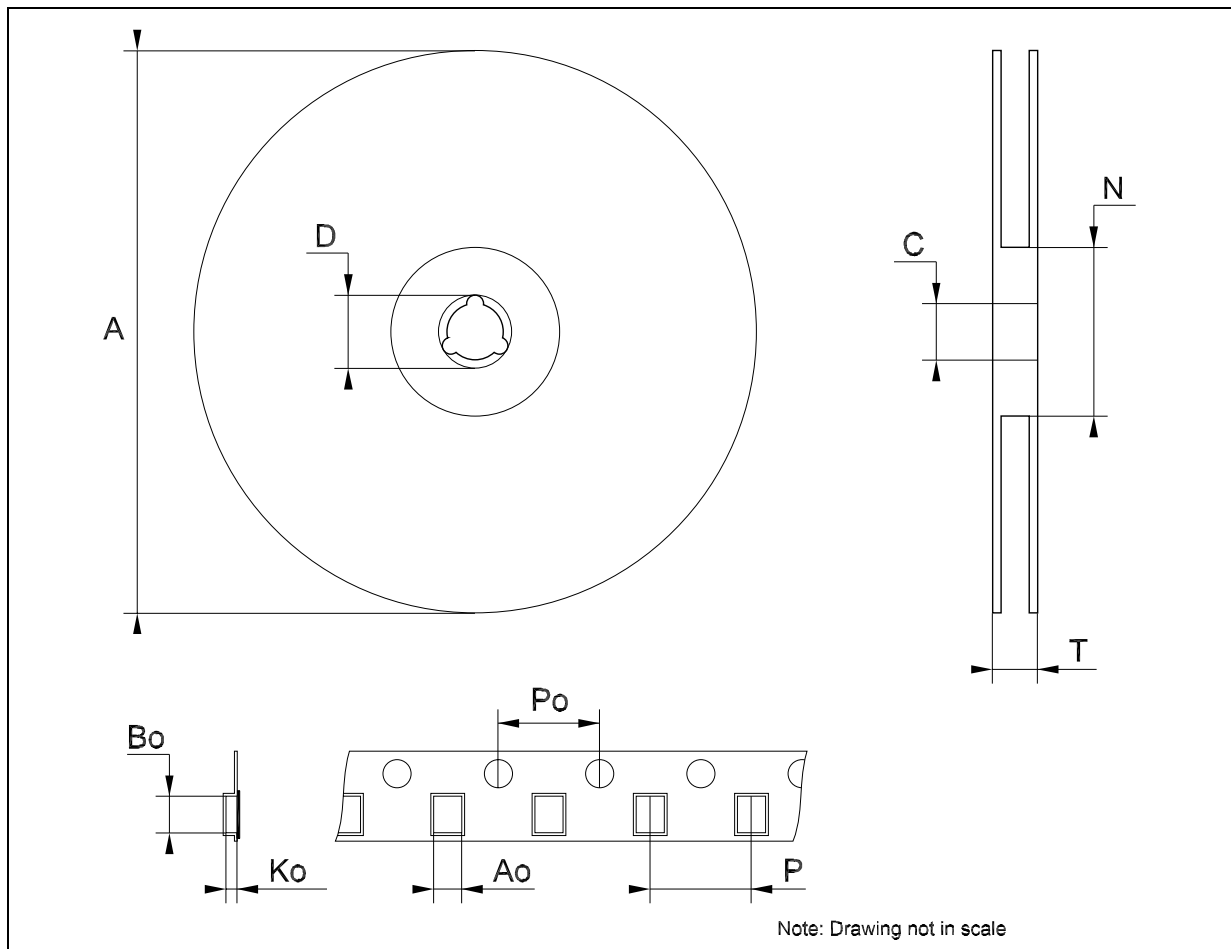
**Tape & Reel SSOP28 MECHANICAL DATA**

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	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



**Tape & Reel TSSOP28 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	10.1		10.3	0.398		0.406
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 12. Revision history**

Date	Revision	Changes
21-Jun-2004	2	The $I_L$ (Output Leakage Current) mA ==> $\mu$ A in table 8.
03-Apr-2006	3	Order codes has been updated and new template.



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