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ST3241EB ST3241EC

**±15 kV ESD protected 3 to 5.5 V, 400 kbps,
RS-232 transceiver with auto-power-down**

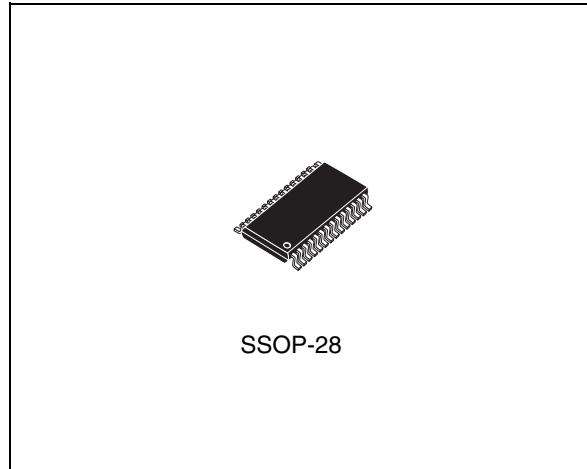
Features

- ESD protection for RS-232 I/O pins:
 ±8 kV IEC 1000-4-2 contact discharge
 ±15 kV human body model
- 1 μ A supply current achieved when in auto-power-down
- 250 kbps minimum guaranteed data rate
- Guaranteed 6 V/ms slew rate range
- Guaranteed mouse drive ability
- 0.1 μ F external capacitors
- Meets EIA/TIA-232 specifications down to 3 V
- Available in SSOP-28 package

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 inputs are protected to ±8 kV using IEC 1000-4-2 contact discharge and ±15 kV 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 3.0 V to 5.5 V supply with a dual charge pump. The device is guaranteed to run at data rates of 250 kbps while maintaining RS-232 output levels.



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

Typical applications are in notebooks, sub-notebooks, palmtop computers, battery-powered equipment, hand-held equipment, peripherals and printers.

Table 1. Device summary

Order code	Temperature range	Package	Packaging
ST3241ECPR	0 to 70°C	SSOP-28 (tape and reel)	1350 parts per reel
ST3241EBPR	-40 to 85°C	SSOP-28 (tape and reel)	1350 parts per reel

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Pin configuration

1 Pin configuration

Figure 1. Pin configuration

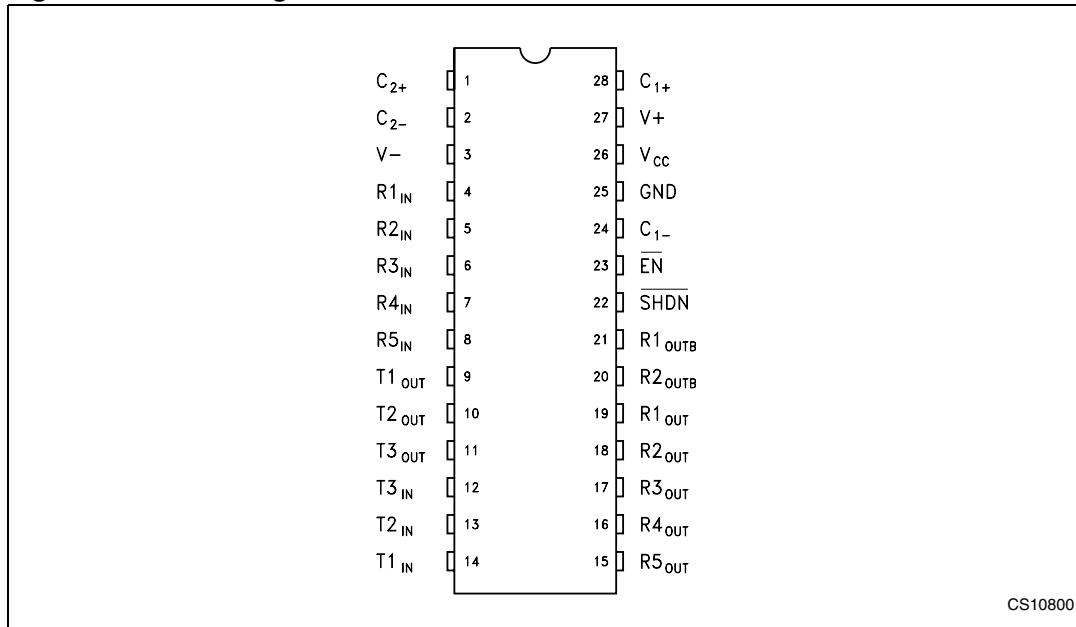


Table 2. Pin description

Pin number	Symbol	Name and function
1	C ₂₊	Positive terminal of inverting charge pump capacitor
2	C ₂	Negative terminal of inverting charge pump capacitor
3	V-	-5.5 V generated by the charge pump
4	R _{1_IN}	First receiver input voltage
5	R _{2_IN}	Second receiver input voltage
6	R _{3_IN}	Third receiver input voltage
7	R _{4_IN}	Fourth receiver input voltage
8	R _{5_IN}	Fifth receiver input voltage
9	T _{1_OUT}	First transmitter output voltage
10	T _{2_OUT}	Second transmitter output voltage
11	T _{3_OUT}	Third transmitter output voltage
12	T _{3_IN}	Third transmitter input voltage
13	T _{2_IN}	Second transmitter input voltage
14	T _{1_IN}	First transmitter input voltage
15	R _{5_OUT}	Fifth receiver output voltage
16	R _{4_OUT}	Fourth receiver output voltage

Pin configuration

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Table 2. Pin description (continued)

Pin number	Symbol	Name and function
17	R _{3OUT}	Third receiver output voltage
18	R _{2OUT}	Second receiver output voltage
19	R _{1OUT}	First receiver output voltage
20	R _{2OUTB}	Non-inverting complementary receiver output, always active for wake-up
21	R _{1OUTB}	Non-inverting complementary receiver output, always active for wake-up
22	SHDN	Shutdown control. Active low.
23	EN	Receiver enable. Active low
24	C ₁₋	Negative terminal of voltage - charge pump capacitor
25	GND	Ground
26	V _{CC}	Supply voltage
27	V ₊	5.5 V Generated by the charge pump
28	C ₁₊	Positive terminal of voltage - charge pump capacitor

Table 3. Shutdown and enable control truth table

SHDN	EN	T _{OUT}	R _{OUT}	R _{OUTB}
0	0	HIGH Z	ACTIVE	ACTIVE
0	1	HIGH Z	HIGH Z	ACTIVE
1	0	ACTIVE	ACTIVE	ACTIVE
1	1	ACTIVE	HIGH Z	ACTIVE

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Maximum ratings

2 Maximum ratings

Table 4. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	-0.3 to 6	V
V_+	Extra positive voltage (<i>Note: 1</i>)	$(V_{CC} - 0.3)$ to 7	V
V_-	Extra negative voltage (<i>Note: 1</i>)	0.3 to -7	V
$V_+ + IV-I$	(<i>Note: 1</i>)	13	V
$SHDN, EN, T_{IN}$	Input voltage	-0.3 to 6	V
R_{IN}	Receiver input voltage range	± 25	V
T_{OUT}	Transmitter output voltage range	± 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 conditions is not implied.*

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

Table 5. 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 (contact discharge)	± 8	-	-	kV

Electrical characteristics

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3 Electrical characteristics

Table 6. Electrical characteristics

(C₁ - C₄ = 0.1 μ F, V_{CC} = 3 V to 5.5 V, T_A = -40 to 85 °C, unless otherwise specified.
 Typical values are referred to T_A = 25 °C)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I _{SUPPLY}	Supply current	No load V _{CC} = 3.3V or 5V, T _A = 25°C	-	0.3	1	mA
I _{SHDN}	Shutdown supply current	SHDN = GND, T _A = 25°C	-	1	10	μ A

Table 7. Logic input and receiver output electrical characteristics

(C₁ - C₄ = 0.1 μ F, V_{CC} = 3 V to 5.5 V, T_A = -40 to 85 °C, unless otherwise specified.

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V _{TIL}	Input logic threshold low	T _{IN} , \overline{EN} , \overline{SHDN}			0.8	V
V _{TIH}	Input logic threshold high	V _{CC} = 3.3V V _{CC} = 5V	2	2.4		V
I _{IL}	Input leakage current	T _{IN} , \overline{EN} , \overline{SHDN}		± 0.01	± 1.0	μ A

Table 8. Receiver output electrical characteristics

(C₁ - C₄ = 0.1 μ F, V_{CC} = 3 V to 5.5 V, T_A = -40 to 85 °C, unless otherwise specified.

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I _{OL}	Output leakage current	R _{OUT} , \overline{EN} , receiver disabled	-	± 0.05	± 10	μ A
V _{OL}	Output voltage low	I _{OUT} = 1.6mA	-		0.4	V
V _{OH}	Output voltage high	I _{OUT} = -1mA	-	V _{CC} -0.6	V _{CC} -0.1	V

Table 9. Transmitter electrical characteristics

(C₁ - C₄ = 0.1 μ F, V_{CC} = 3 V to 5.5 V, T_A = -40 to 85 °C, unless otherwise specified.

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V _{TOUT}	Output voltage swing	All transmitter outputs are loaded with 3 k Ω to GND	± 5	± 5.4		V
R _{OUT}	Output resistance	V _{CC} = V ₊ = V ₋ = 0 V, V _{OUT} = ± 2 V	300	10M		Ω
I _{SC}	Output short circuit current			± 35	± 60	mA
I _L	Output leakage current	V _{CC} = 0 to 5.5V, transmitter output = ± 12 V, transmitter disabled			± 25	μ A
V _{TO}	Transmitter output voltage	T _{1IN} = T _{2IN} = GND, T _{3IN} = V _{CC} T _{3OUT} loaded with 3 k Ω to GND T _{1OUT} and T _{2OUT} loaded with 2.5 mA each	± 5			V

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Electrical characteristics

Table 10. Receiver electrical characteristics

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

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	$T_A = 25 ^\circ C, V_{CC} = 3.3 V$ $T_A = 25 ^\circ C, V_{CC} = 5.0 V$	0.6 0.8	1.2 1.5		V
V_{RIH}	RS-232 Input threshold high	$T_A = 25 ^\circ C, V_{CC} = 3.3 V$ $T_A = 25 ^\circ C, V_{CC} = 5.0 V$		1.5 1.8	2.4 2.4	V
V_{RIHYS}	Input hysteresis			0.3		V
R_{RIN}	Input resistance	$T_A = 25 ^\circ C$	3	5	7	k Ω

Table 11. Timing characteristics

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
D_R	Maximum data rate	$R_L = 3 k\Omega, C_L = 1000 pF$ one transmitter switching	250			kbps
t_{PHL} t_{PLH}	Receiver propagation delay	R_{IN} to $R_{OUT}, C_L = 150 pF$		0.15		μs
t_{T_SKEW}	Transmitter skew			100		ns
t_{R_SKEW}	Receiver skew			300		ns
S_{RT}	Transition slew rate	$T_A = 25 ^\circ C, R_L = 3 k$ to $7 k\Omega, V_{CC} = 3.3 V$ measured from $+3 V$ to $-3 V$ or $-3 V$ to $+3 V$ $C_L = 150 pF$ to $1000 pF$ $C_L = 150 pF$ to $2500 pF$	6 4		30 30	$V/\mu s$ $V/\mu s$

Application

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4 Application

Figure 2. Application circuits

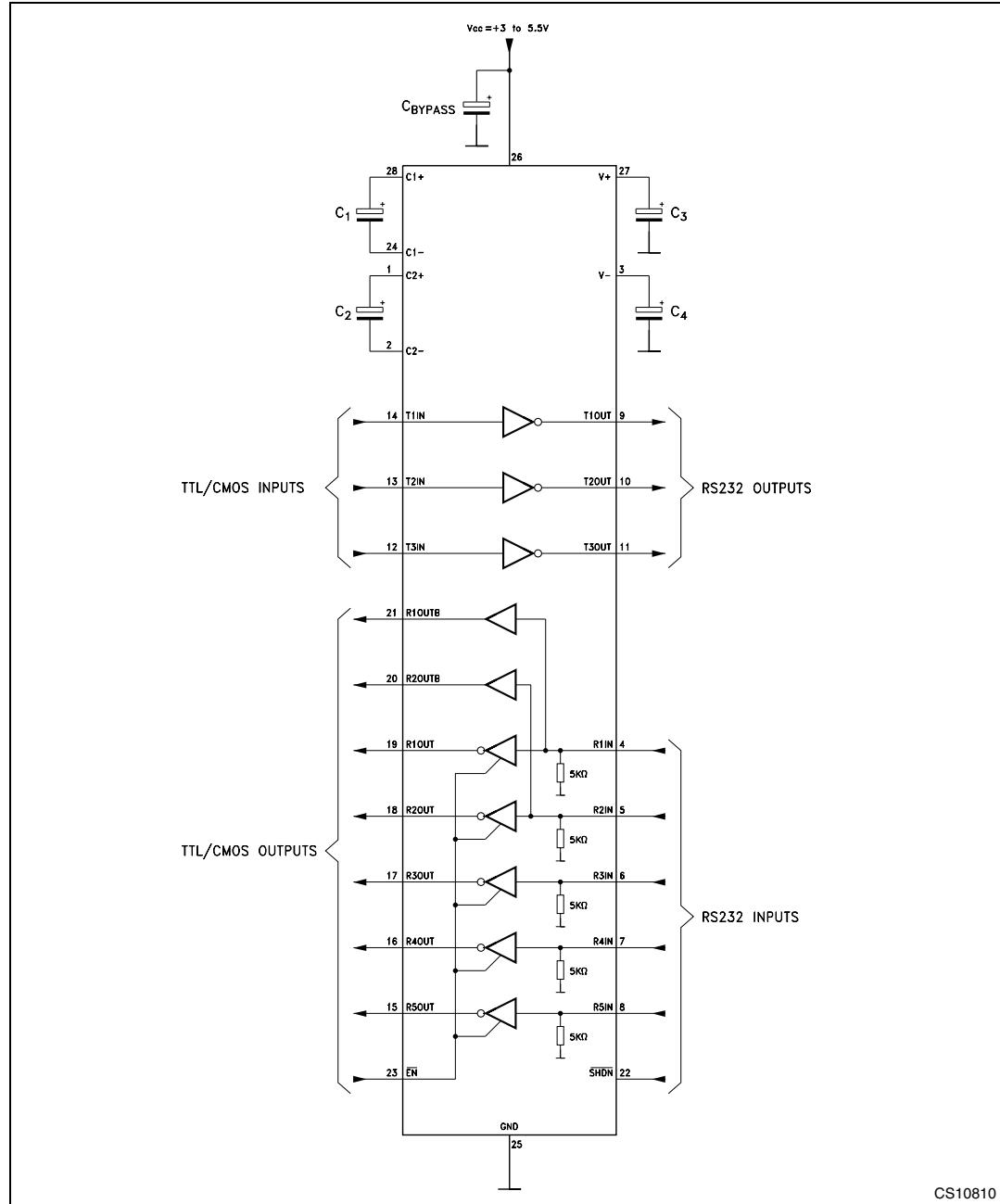


Table 12. Required minimum capacitance value (μ F)

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

ST3241EB - ST3241EC**Package mechanical data****5 Package mechanical data**

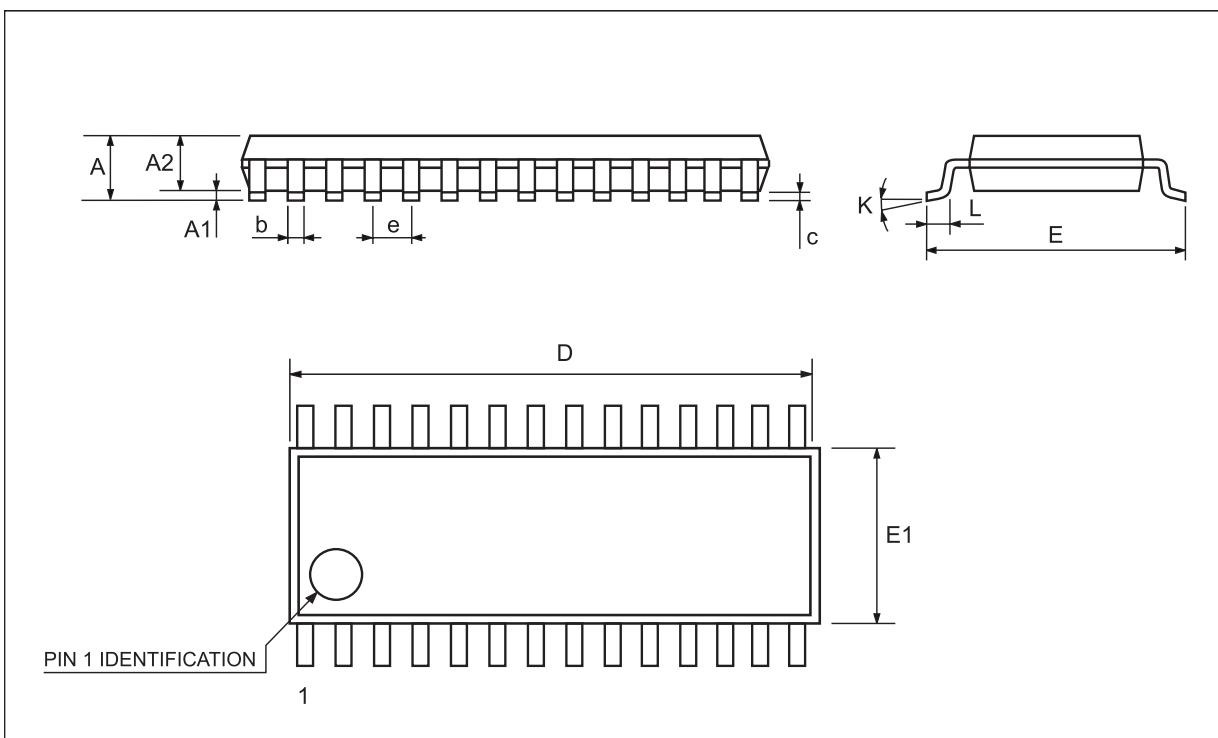
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Package mechanical data

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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

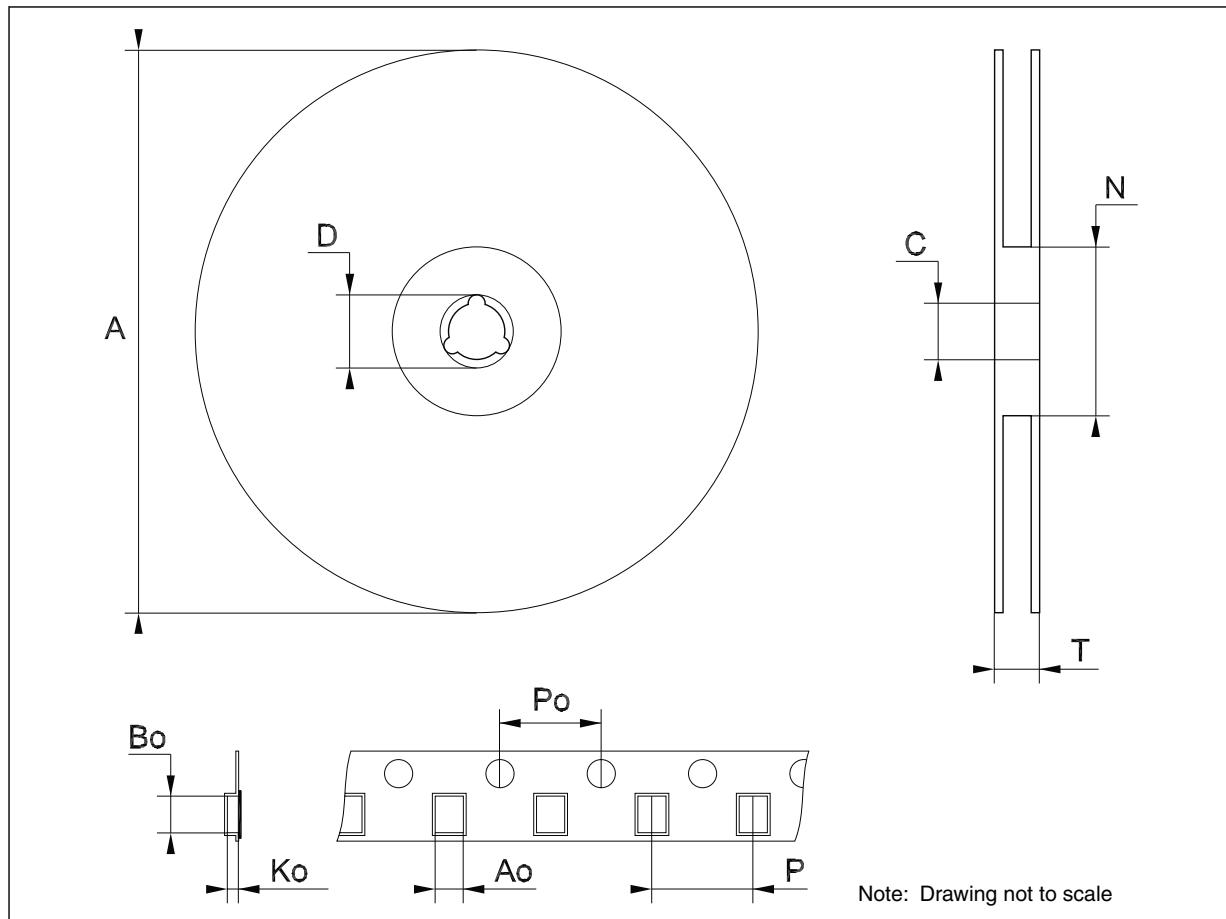


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Package mechanical data

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



Revision history**ST3241EB - ST3241EC**

6 Revision history

Table 13. Document revision history

Date	Revision	Changes
21-Jun-2004	2	The I_L (Output Leakage Current) mA ==> μ A in table 8.
03-Apr-2006	3	Order code updated.
13-Nov-2007	4	Added Table 1
28-Sep-2010	5	Removed TSSOP28 package and all references from datasheet; updated ECOPACK® text in Section 5 ; reformatted document; minor textual updates.

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