



ST3241EB ST3241EC

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

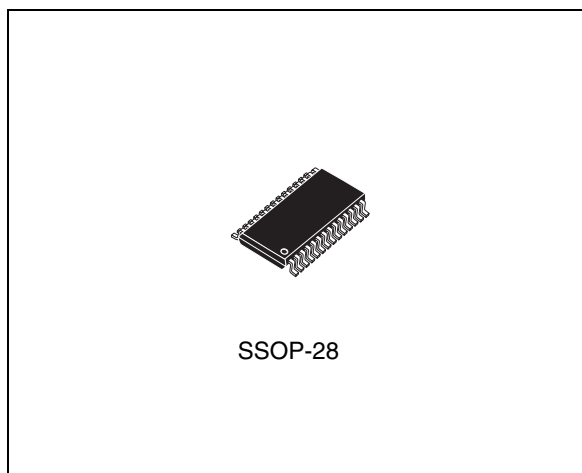
Features

- ESD protection for RS-232 I/O pins:
±8 kV IEC 1000-4-2 contact discharge
±15 kV human body model
- 1 µA 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 µF 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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1 Pin configuration

Figure 1. Pin configuration

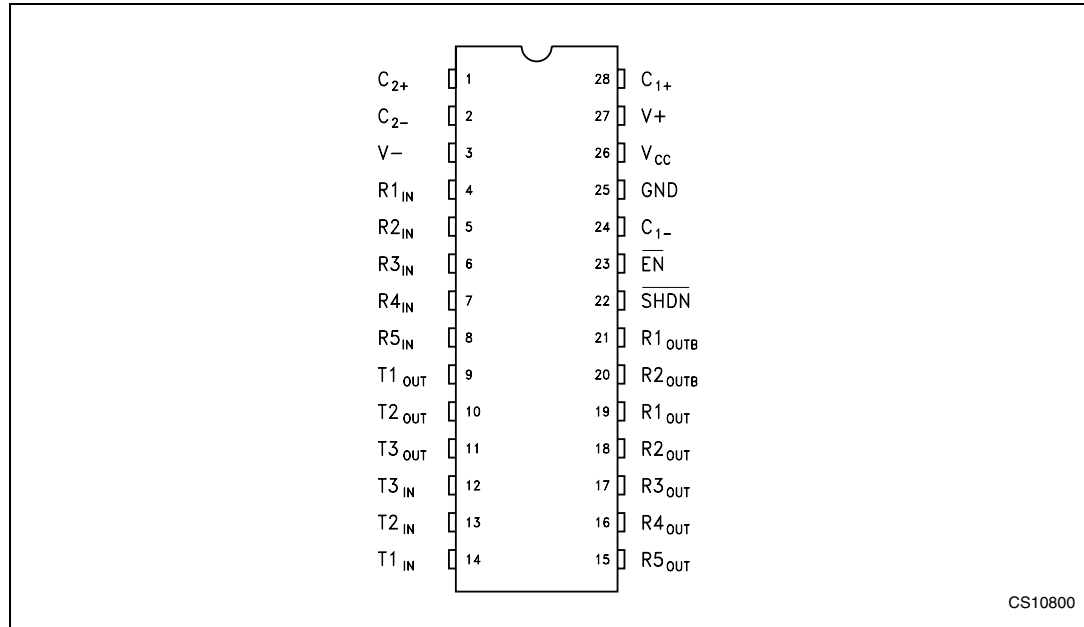


Table 2. Pin description

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	R1 _{IN}	First receiver input voltage
5	R2 _{IN}	Second receiver input voltage
6	R3 _{IN}	Third receiver input voltage
7	R4 _{IN}	Fourth receiver input voltage
8	R5 _{IN}	Fifth receiver input voltage
9	T1 _{OUT}	First transmitter output voltage
10	T2 _{OUT}	Second transmitter output voltage
11	T3 _{OUT}	Third transmitter output voltage
12	T3 _{IN}	Third transmitter input voltage
13	T2 _{IN}	Second transmitter input voltage
14	T1 _{IN}	First transmitter input voltage
15	R5 _{OUT}	Fifth receiver output voltage
16	R4 _{OUT}	Fourth receiver output voltage

Table 2. Pin description (continued)

Pin number	Symbol	Name and function
17	R3 _{OUT}	Third receiver output voltage
18	R2 _{OUT}	Second receiver output voltage
19	R1 _{OUT}	First receiver output voltage
20	R2 _{OUTB}	Non-inverting complementary receiver output, always active for wake-up
21	R1 _{OUTB}	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

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+ + V- $	(<i>Note: 1</i>)	13	V
\overline{SHDN} , \overline{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} $\overline{INVALID}$	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

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	$\overline{\text{SHDN}}$ = 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} , $\overline{\text{EN}}$, $\overline{\text{SHDN}}$			0.8	V
V _{TIH}	Input logic threshold high	V _{CC} = 3.3V V _{CC} = 5V	2 2.4			V V
I _{IL}	Input leakage current	T _{IN} , $\overline{\text{EN}}$, $\overline{\text{SHDN}}$		± 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} , $\overline{\text{EN}}$, 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	T1IN = T2IN = GND, T3IN = V _{CC} T3OUT loaded with 3 k Ω to GND T1OUT and T2OUT loaded with 2.5 mA each	± 5			V

Table 10. Receiver electrical characteristics $(C_1 - C_4 = 0.1 \mu\text{F}, V_{\text{CC}} = 3 \text{ V to } 5.5 \text{ V}, T_A = -40 \text{ to } 85 \text{ }^\circ\text{C}, \text{ unless otherwise specified.})$

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

Table 11. Timing characteristics $(C_1 - C_4 = 0.1 \mu\text{F}, V_{\text{CC}} = 3 \text{ V to } 5.5 \text{ V}, T_A = -40 \text{ to } 85 \text{ }^\circ\text{C}, \text{ unless otherwise specified.})$

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

4 Application

Figure 2. Application circuits

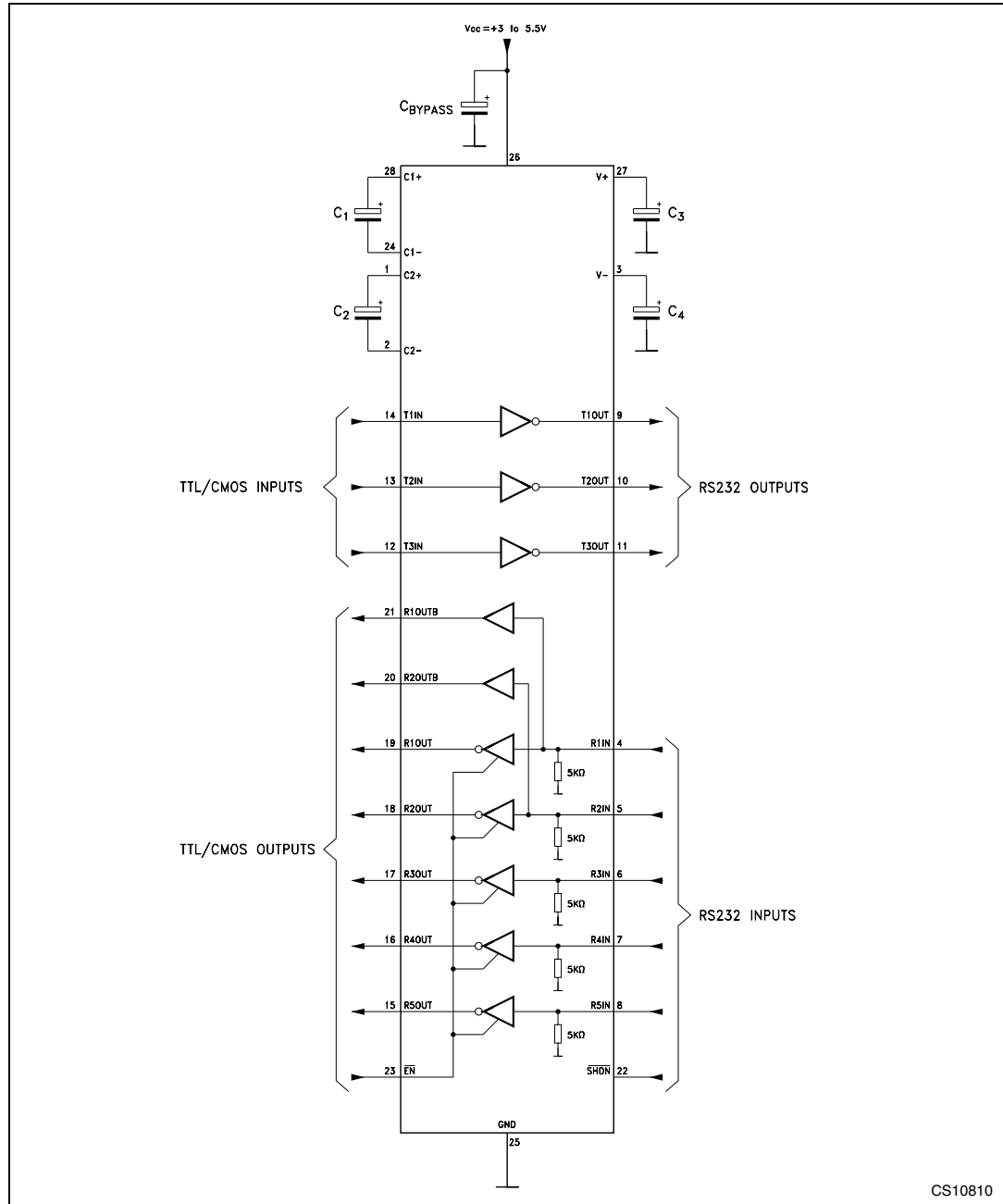


Table 12. Required minimum capacitance value (µF)

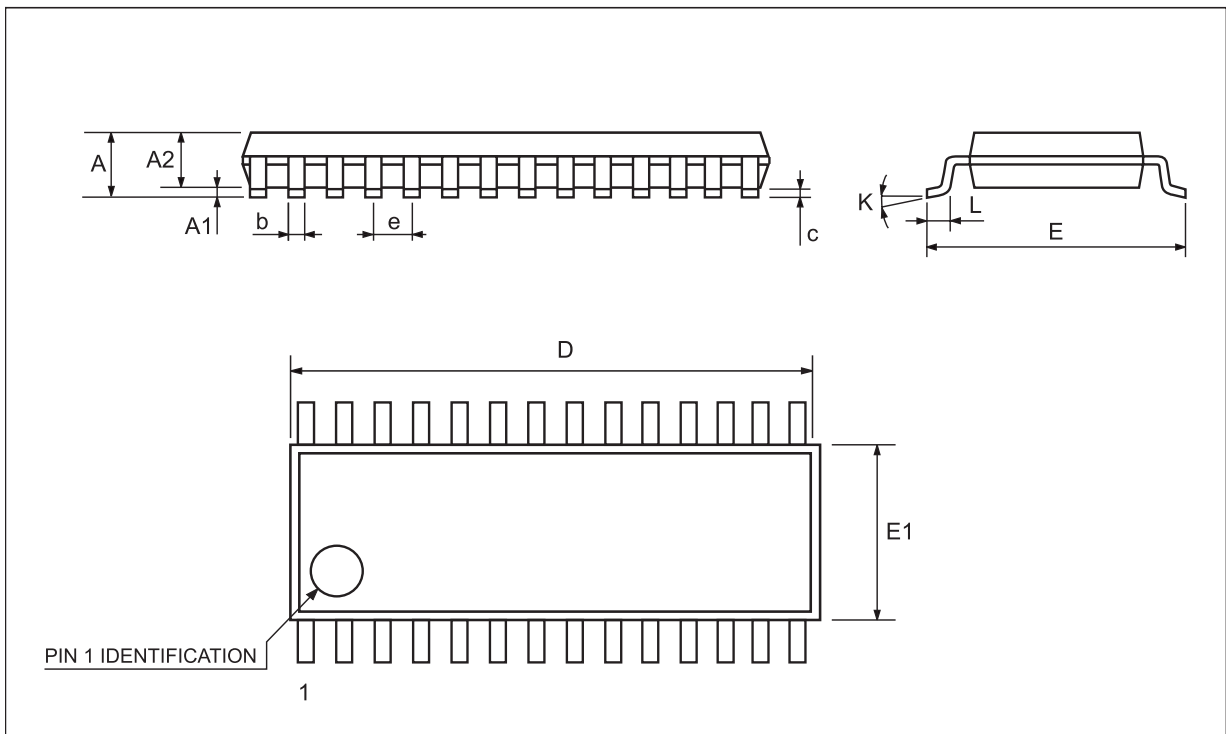
V _{CC}	C1	C2	C3	C4	C _{bypass}
3.0 to 3.6	0.1	0.1	0.1	0.1	0.1
4.5 to 5.5	0.047	0.33	0.33	0.33	0.1
3.0 to 5.5	0.1	0.47	0.47	0.47	0.1

5 Package mechanical data

In order to meet environmental requirements, ST offers these devices in 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.

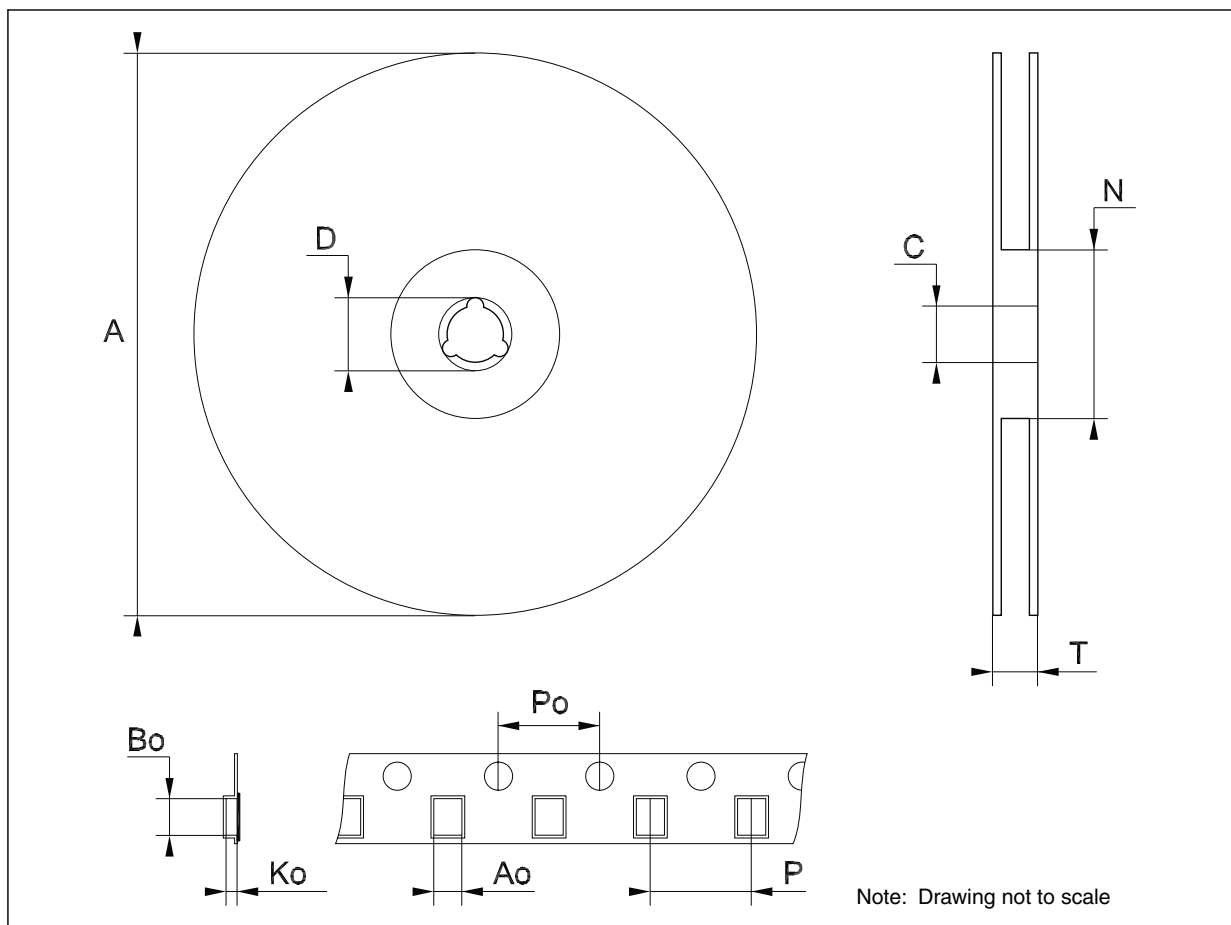
SSOP28 mechanical data

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



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



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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