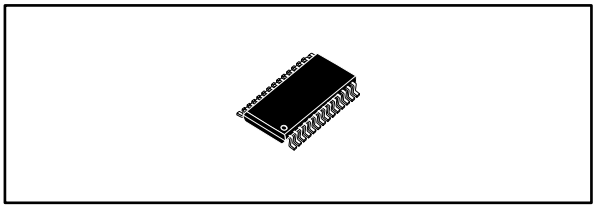
ST3241EB, ST3241EC

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

Datasheet - production data



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/µs 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 the 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.

Contents

1 Pin information

Figure 1: Pin connections (top view)

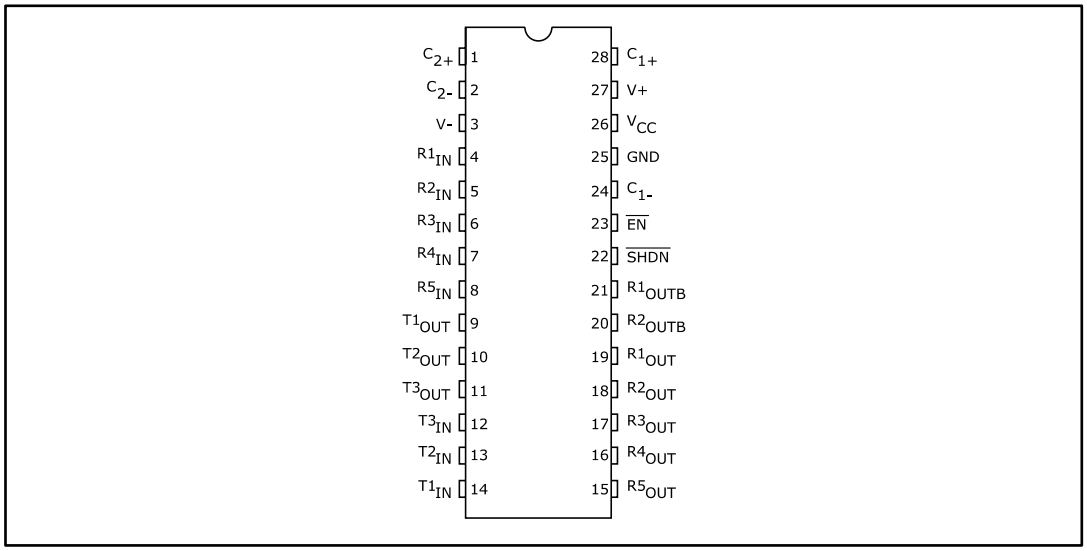


Table 1: Pin description

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
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

Pin number	Symbol	Name and function
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 2: Shutdown and enable control truth table

$\overline{SHDN}$	$\overline{EN}$	T_{OUT}	R_{OUT}	T_{OUTB}
0	0	High Z	Active	Active
	1		High Z	
1	0	Active	Active	
	1		High Z	

2 Absolute maximum ratings and ESD performance

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

Table 3: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	–0.3 to 6	V
V+	Extra positive voltage (1)	(V_{CC} – 0.3) to 7	
V-	Extra negative voltage (1)	0.3 to -7	
V+ + |V-|	(1)	13	
$\overline{SHDN}$, $\overline{EN}$, T_{IN}	Input voltage	-0.3 to 6	
R_{IN}	Receiver input voltage range	± 25	
T_{OUT}	Transmitter output voltage range	± 13.2	
R_{OUT}, R_{OUTB}, $\overline{INVALID}$	Receiver output voltage range	–0.3 to (V_{CC} + 0.3)	
t_{SHORT}	Short circuit duration on T_{OUT} (one at a time)	Continuous	
T_{stg}	Storage temperature range	–65 to 150	°C

Notes:

(1)V+ and V- can have a maximum magnitude of 7 V, 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	± 15	—	—	kV
		IEC 1000-4-2 (contact discharge)	± 8			

3 Electrical characteristics

Table 5: Electrical characteristics, C1 - C4 = 0.1 µF, 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} = 3.3 V or 5 V, T_A = 25 °C	—	0.3	1	mA
I_{SHDN}	Shutdown supply current	$\overline{SHDN}$ = GND, T_A = 25 °C		1	10	µA

Table 6: Logic input and receiver output electrical characteristics, C1 - C4 = 0.1 µF, 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} = 3.3 V	2			
		V_{CC} = 5 V	2.4			
I_{IL}	Input leakage current	T_{IN}, $\overline{EN}$, $\overline{SHDN}$		± 0.01	± 1.0	µA

Table 7: Receiver output electrical characteristics, C1 - C4 = 0.1 µF, 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	µA
V_{OL}	Output voltage low	I_{OUT} = 1.6 mA			0.4	V
V_{OH}	Output voltage high	I_{OUT} = -1 mA		V_{CC} – 0.6	V_{CC} – 0.1	

Table 8: Transmitter electrical characteristics, C1 - C4 = 0.1 µF, 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 kΩ to GND	± 5	± 5.4		V
R_{OUT}	Output resistance	V_{CC} = V+ = V- = 0 V, V_{OUT} = ± 2 V	300	10 M		Ω
I_{SC}	Output short circuit current			± 35	± 60	mA
I_L	Output leakage current	V_{CC} = 0 to 5.5 V, transmitter output = ±12 V, transmitter disabled			± 25	µA
V_{TO}	Transmitter output voltage	$T1_{IN}$ = $T2_{IN}$ = GND, $T3_{IN}$ = V_{CC}, $T3_{OUT}$ loaded with 3 kΩ to GND, $T1_{OUT}$ and $T2_{OUT}$ loaded with 2.5 mA each	± 5			V

Table 9: Receiver electrical characteristics, C1 - C4 = 0.1 µF, 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_{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	1.2		
		T_A = 25 °C, V_{CC} = 5.0 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} = 5.0 V		1.8	2.4	
V_{RIHYS}	Input hysteresis			0.3		
R_{RIN}	Input resistance	T_A = 25 °C	3	5	7	kΩ

Table 10: Timing characteristics, C1 - C4 = 0.1 µF, 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
D_R	Maximum data rate	R_L = 3 kΩ, 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		
S_{RT}	Transition slew rate	T_A = 25 °C, R_L = 3 k 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 k 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	

4 Application

Figure 2: Application circuits

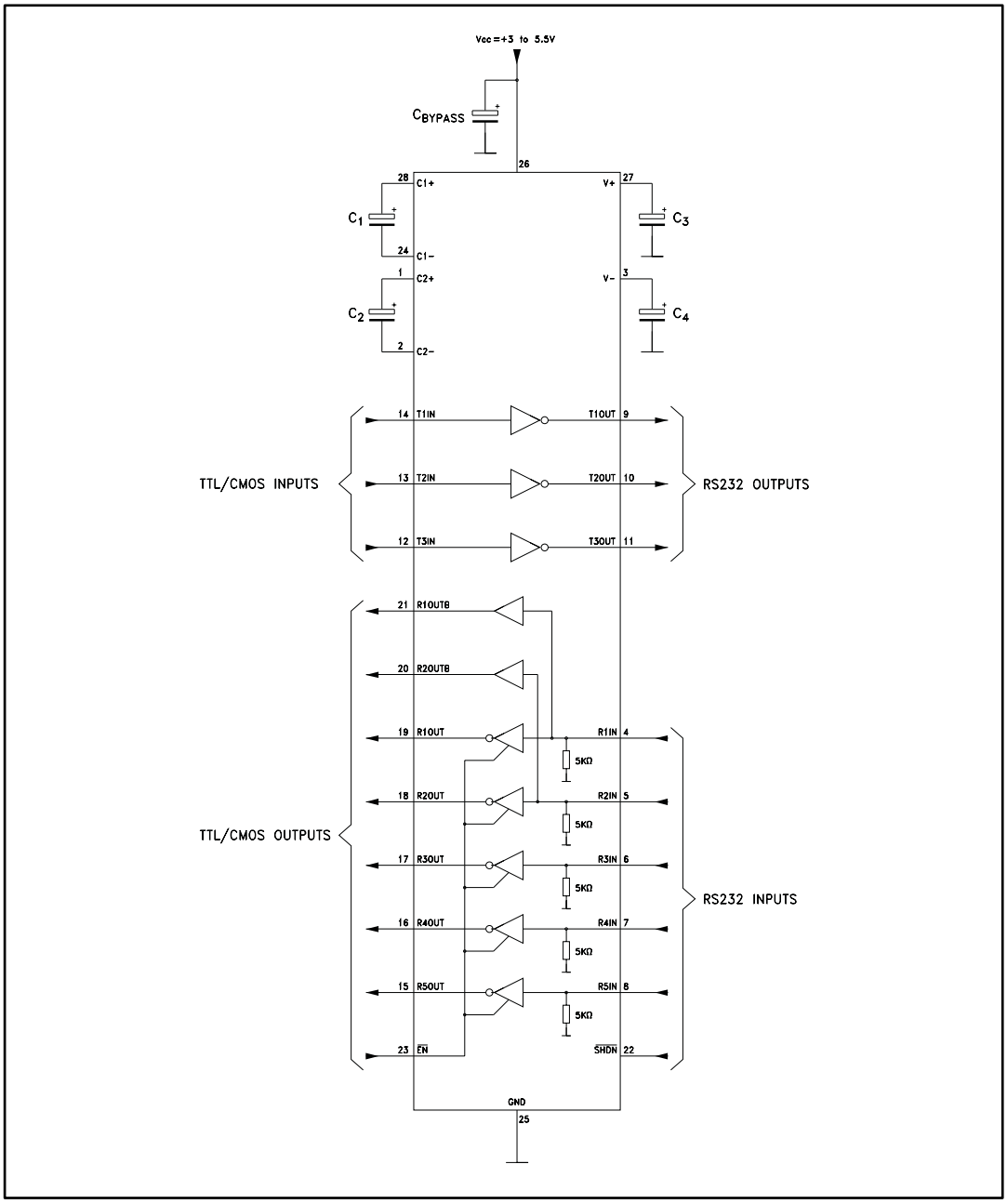


Table 11: Required minimum capacitance value (µF)

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

5 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.

5.1 SSOP 28 package information

Figure 3: SSOP 28 package outline

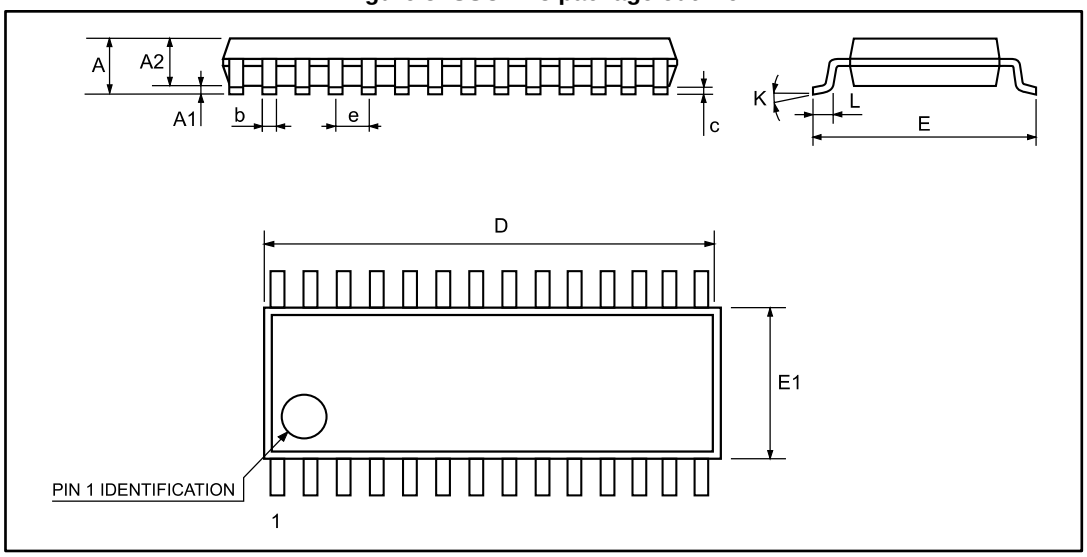
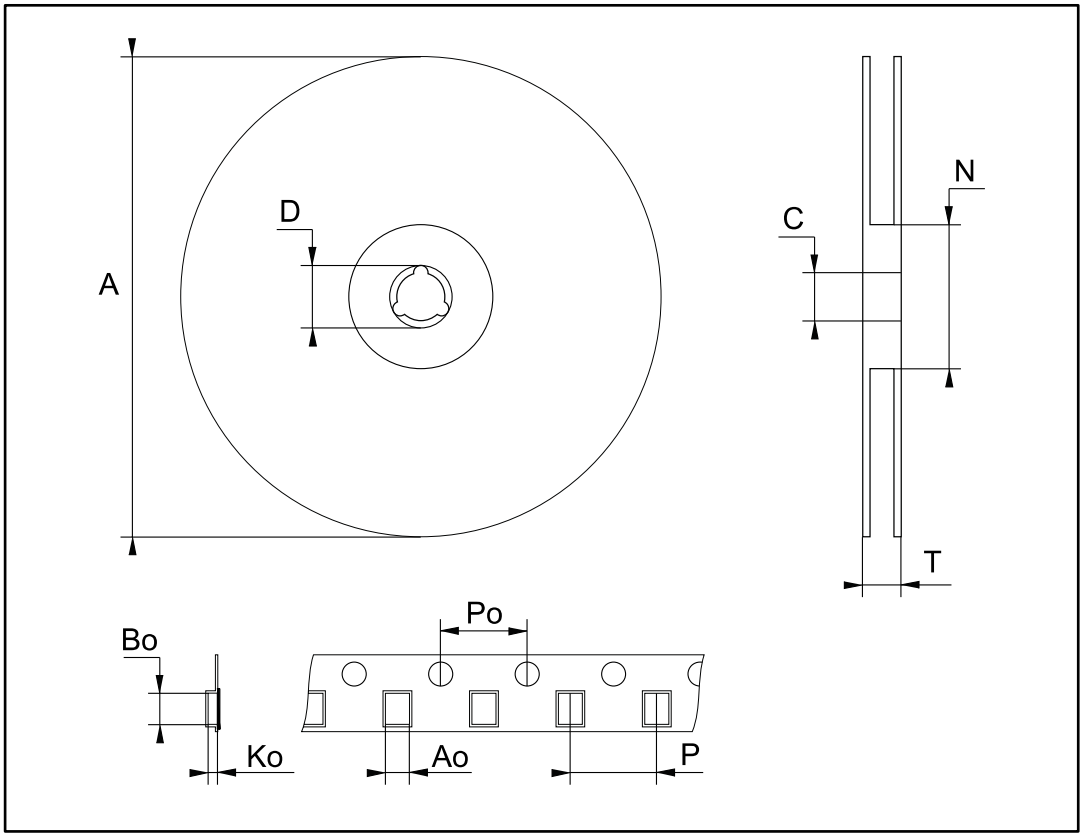


Table 12: SSOP 28 mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	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			0.0256	
K	0 °		10 °	0 °		10 °
L	0.55	0.75	0.95	0.022	0.030	0.037

5.2 SSOP 28 tape and reel package information

Figure 4: SSOP 28 tape and reel package outline



1. Drawing is not to scale

Table 13: SSOP 28 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	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 Ordering information

Table 14: Order codes

Order code	Temperature range	Package	Packaging	Marking
ST3241EBPR	-40 to 85 °C	SSOP 28 (tape and reel)	1350 parts per reel	ST3241EB
ST3241ECPR	0 to 70 °C			ST3241EC

7 Revision history

Table 15: Document revision history

Date	Revision	Changes
21-Jun-2004	2	The I_L (Output Leakage Current) mA ==> µA 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.
08-Mar-2017	6	*Features*: updated units of slew rate change (from 6 V/ms to 6 V/µs) Moved "Device summary" table to *Section 6: "Ordering information"* and added "Marking". *Table 12*: removed "BSC" from "e" dimension

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