ST3243B ST3243C

3 to 5.5 V, 400 kbps, RS-232 transceiver with auto-power-down

Features

- 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
- Meet EIA/TIA-232 specifications down to 3 V
- Available in SSOP-28
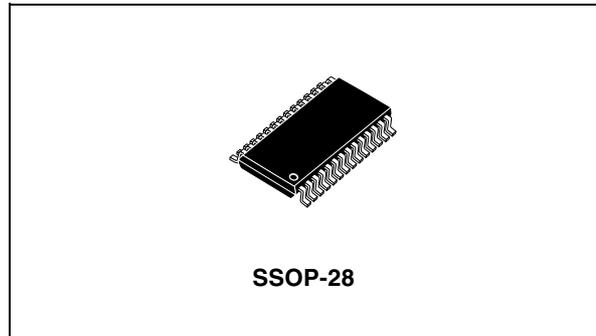
SSOP-28

Table 1.   Device summary

Order code	Temperature range	Package	Packaging
ST3243BPR	-40 to 85 °C	SSOP-28 (tape and reel)	1350 parts per reel
ST3243CPR	0 to 70 °C	SSOP-28 (tape and reel)	1350 parts per reel

Contents

1   Description

The ST3243B / ST3243C devices consist of 3 drivers, 5 receivers and a dual charge-pump circuit. The devices meet the requirements of EIA/TIA and V.28/V.24 communication standards providing high data rate capability.

The receiver R2 is always active to implement a wake-up feature for serial port.

The ST3243B / ST3243C have 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 devices are guaranteed to run at data rates of 250 kbps while maintaining RS-232 output levels.

The auto-power-down feature functions when FORCEON is low and $\overline{\text{FORCEOFF}}$ is high. During this mode of operation, if the device does not sense a valid RS-232 signal, the driver outputs are disabled. If $\overline{\text{FORCEOFF}}$ is set low, both drivers and receivers (expert R2B) are shut off, and supply current is reduced to 1 mA. Disconnecting the serial port or turning off the peripheral drives causes the auto-power-down condition to occur.

Auto-power-down can be disabled when FORCEON and $\overline{\text{FORCEOFF}}$ are high, and should be done when driving a serial mouse. With auto-power-down enabled, the device is activated automatically when a valid signal is applied to any receiver input.

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

2   Pin configuration

Figure 1.   Pin configuration
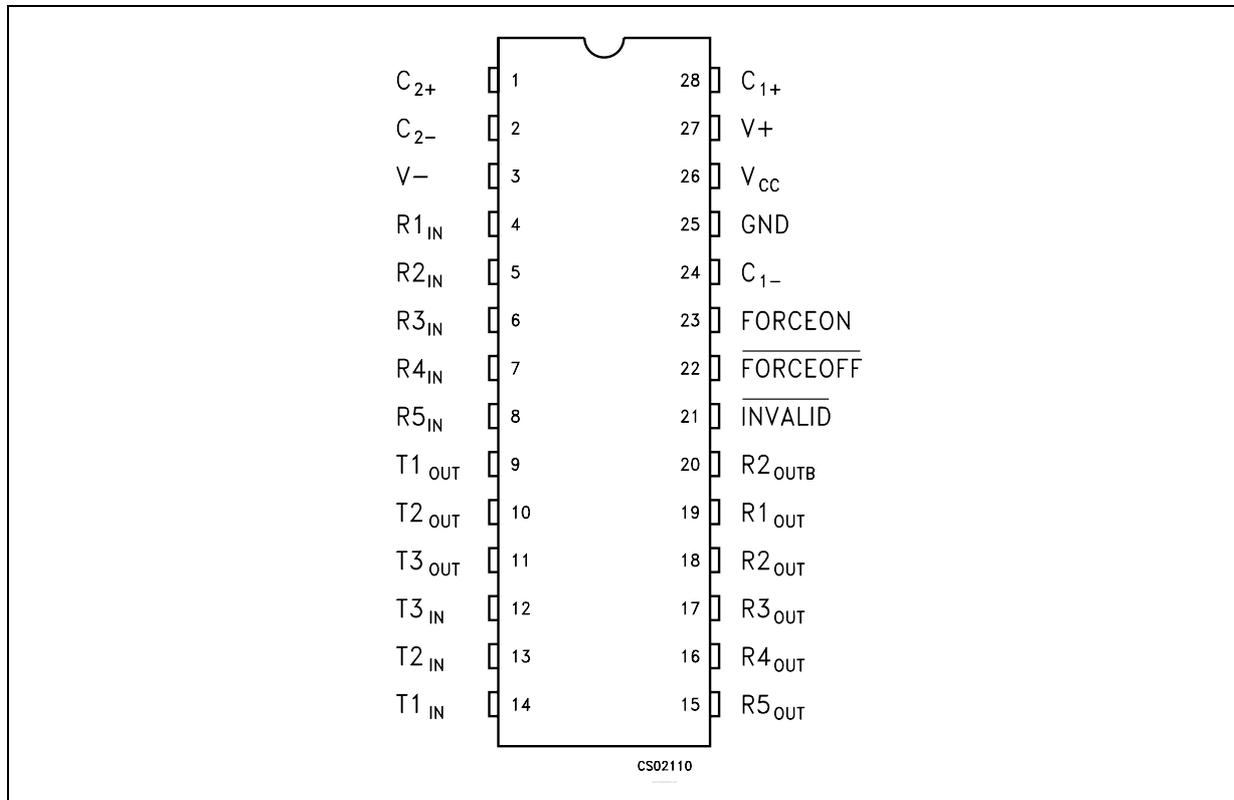
Table 2.   Pin description

Pin n°	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

Table 2. Pin description (continued)

Pin n°	Symbol	Name and function
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
21	$\overline{\text{INVALID}}$	Output of the valid signal detector. Indicates if a valid RS-232 level is present on receiver inputs logic "1"
22	$\overline{\text{FORCEOFF}}$	Drive low to shut down transmitters and on-board power supply. This overrides all automatic circuitry and FORCEON
23	FORCEON	Drive high to override automatic circuitry keeping transmitters on ($\overline{\text{FORCEOFF}}$ must be high)
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. Truth table

$\overline{\text{FORCEOFF}}$	T_{OUT}	R_{OUT}	R_{2OUTB}
0	HIGH Z	HIGH Z	ACTIVE[1]
1	ACTIVE[1]	ACTIVE[1]	ACTIVE[1]

1. If the part is in auto-power-down mode ($\overline{\text{FORCEOFF}}$ = V_{CC}, FORCEON = GND) it is shutdown, if no valid RS-232 levels are present on all receiver input.

3 Maximum ratings

Table 4.   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
$\overline{\text{FORCEON}}$, $\overline{\text{FORCEOFF}}$, 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} $\overline{\text{INVALID}}$	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: *1 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 +7 V, but their absolute addition can not exceed 13 V.*

2 The device doesn't meet 1 kV ESD HBM.

4   Electrical characteristics

C_1 - C_4 = 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.

Table 5.   Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{ASHDN}	Supply current auto-power-down	V_{CC} = 3.3 or 5.0 V, T_A = 25 °C All R_IN open, $\overline{FORCEOFF}$ = V_{CC}		1	10	µA
I_{SHDN}	Shutdown supply current	V_{CC} = 3.3 or 5.0 V, T_A = 25 °C All R_IN open, $\overline{FORCEOFF}$ = GND		1	10	µA
I_{SUPPLY}	Supply current auto-power-down disabled	V_{CC} = 3.3 or 5.0 V T_A = 25 °C FORCEON = $\overline{FORCEOFF}$ = V_{CC} no load		0.3	1	mA

C_1 - C_4 = 0.1 µA, 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.

Table 6.   Logic input electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{TIL}	Input logic threshold low	T-IN, FORCEON, $\overline{FORCEOFF}$			0.8	V
V_{TIH}	Input logic threshold high	T-IN, FORCEON, $\overline{FORCEOFF}$ V_{CC} = 3.3 V V_{CC} = 5 V	2 2.4			V V
V_{THYS}	Transmitter input hysteresis			0.5		V
I_{IL}	Input leakage current	T-IN, FORCEON, $\overline{FORCEOFF}$		±0.01	±1.0	µA
I_{OL}	Output leakage current	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		V

C_1 - C_4 = 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.

Table 7.   Auto-power-down electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{RITE}	Receiver input threshold to transmitter enabled	Positive threshold Negative threshold	 2.7		2.7	V V
V_{RITD}	Receiver input threshold to transmitter disabled	1 µA supply current	-0.3		0.3	V
V_{IOL}	$\overline{INVALID}$ output voltage LOW				0.4	V
V_{IOH}	$\overline{INVALID}$ output voltage HIGH		V_{CC}-0.6			V

Table 7. **Auto-power-down electrical characteristics (continued)**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t_{WU}	Receiver threshold to transmitter enabled	I_{OUT} = 1.6 mA		250		µs
t_{INVH}	Receiver positive or negative threshold to $\overline{INVALID}$ HIGH	I_{OUT} = -1 mA		1		µs
t_{INVL}	Receiver positive or negative threshold to $\overline{INVALID}$ LOW			30		µs

C_1 - C_4 = 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.

Table 8. **Transmitter electrical characteristics**

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
V_{OT}	Transmitter output voltage	T1IN = T2IN = GND, T3IN = V_{CC} T3OUT loaded with 3 kΩ to GND T1OUT and T2OUT loaded with 2.5 mA each	± 5			V

C_1 - C_4 = 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.

Table 9. **Receiver electrical characteristics**

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 T_A = 25 °C, V_{CC} = 5.0 V	0.6 0.8	1.2 1.2		V
V_{RIH}	RS-232 Input threshold high	T_A = 25 °C, V_{CC} = 3.3 V T_A = 25 °C, V_{CC} = 5.0 V		1.5 1.8	2.4 2.4	V
V_{RIHYS}	Input hysteresis			0.5		V
R_{RIN}	Input resistance	T_A = 25 °C	3	5	7	kΩ

C_1 - C_4 = 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.

Table 10.   Timing characteristics

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	400		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			50		ns
t_{INVH}	Receiver positive or negative threshold to $\overline{INVALID}$ HIGH			1		μs
t_{INVL}	Receiver positive or negative threshold to $\overline{INVALID}$ LOW			30		μs
S_{RT}	Transition slew rate	T_A = 25 °C, R_L = 3 kΩ 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 C_L = 150 pF to 2500 pF	6 4		30 30	V/μs V/μs

5 Application

Figure 2. Application circuits
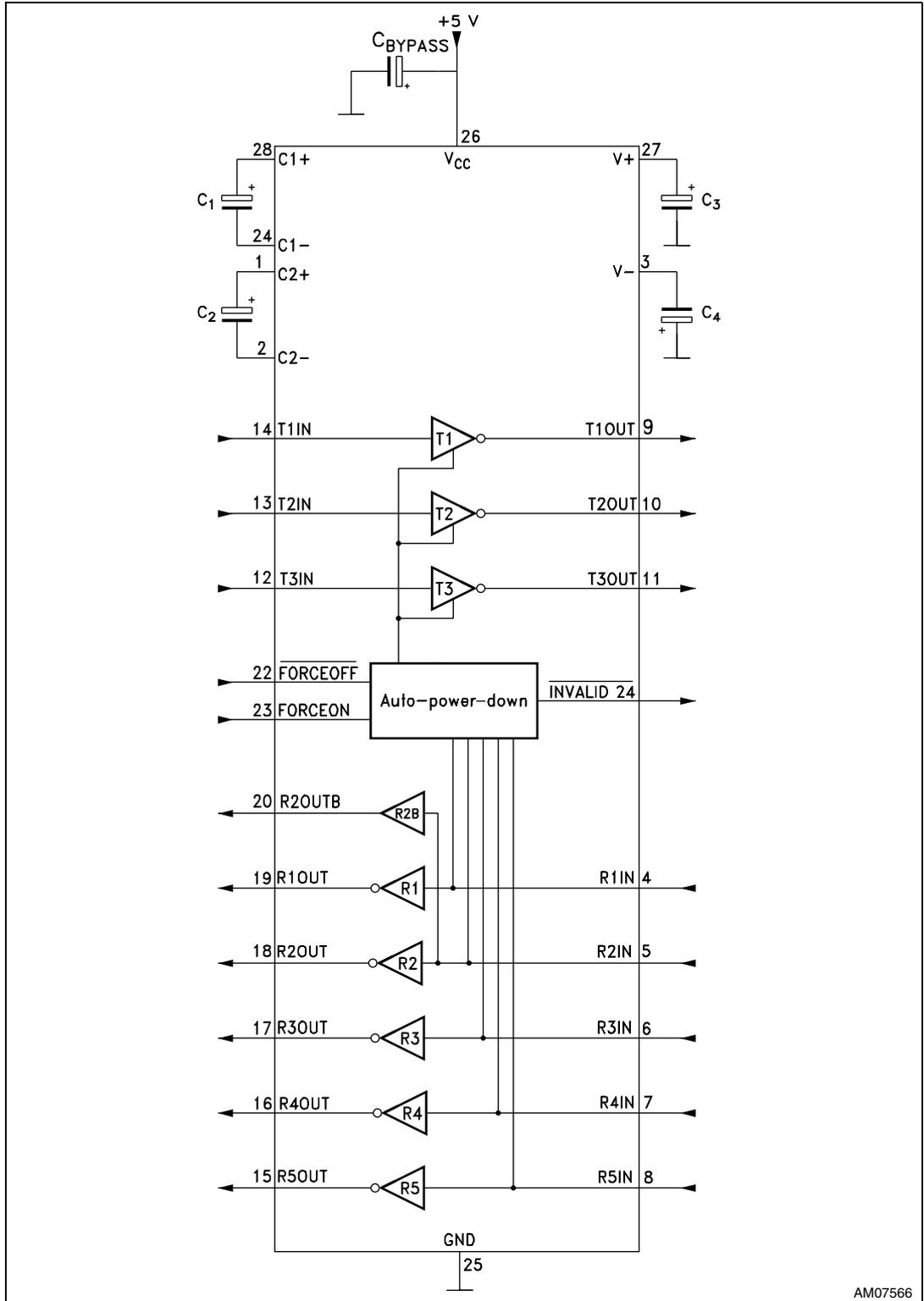
Table 11.   Capacitance value (µF)

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	0.33
3.0 to 5.5	0.22	1.0	1.0	1.0	0.22

6 Typical performance characteristics

Unless otherwise specified $T_J = 25\ °C$.

Figure 3. $\overline{\text{INVALID}}$ **HIGH threshold time**
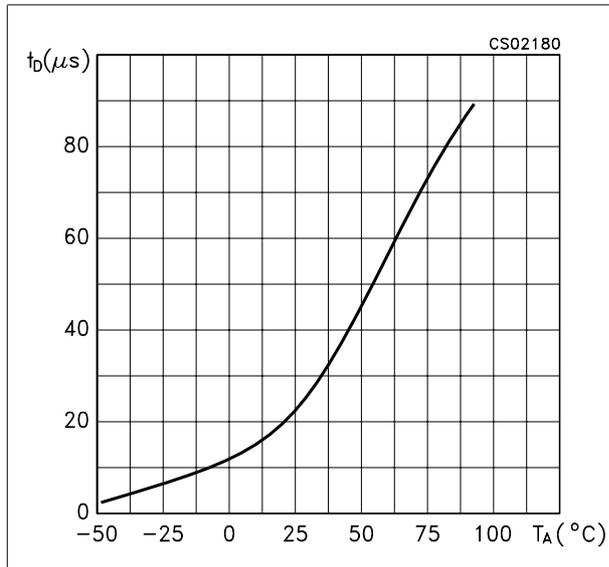
Figure 4. $\overline{\text{INVALID}}$ **LOW threshold time**
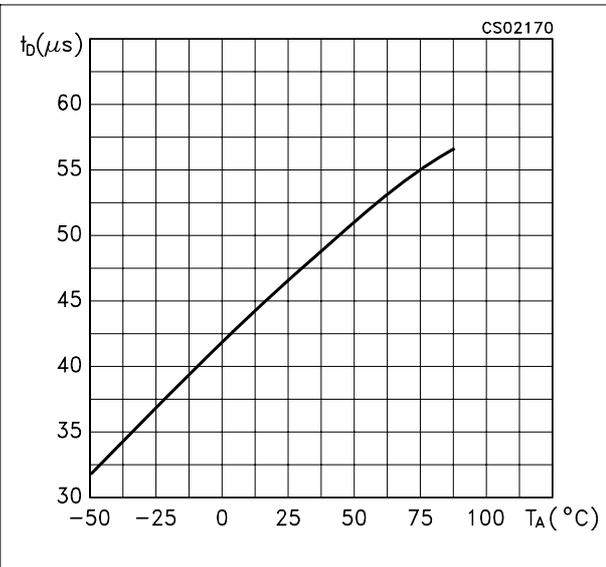
**Figure 5.** **Receiver propagation delay**
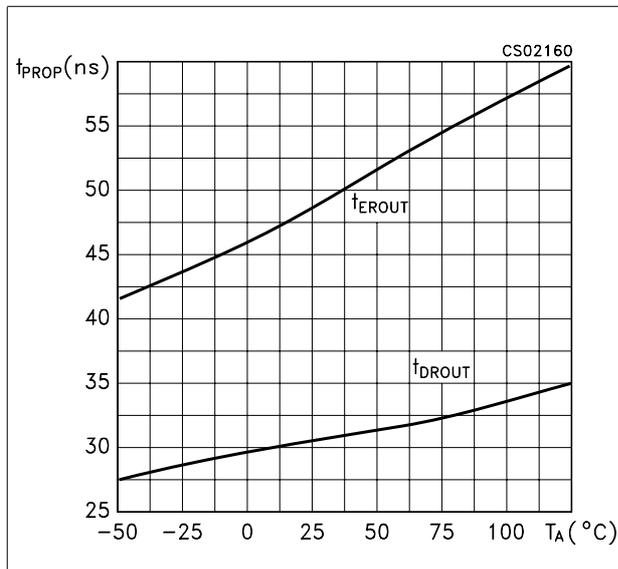
**Figure 6.** **Receiver output enable and disable time**
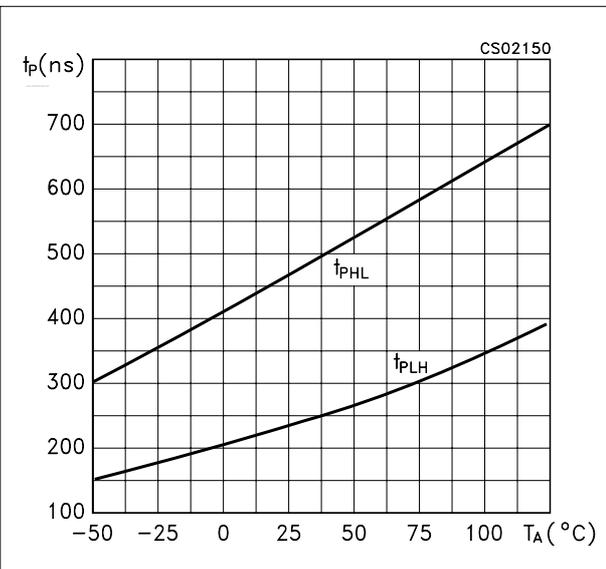
**Figure 7.   Output current vs. output high voltage**
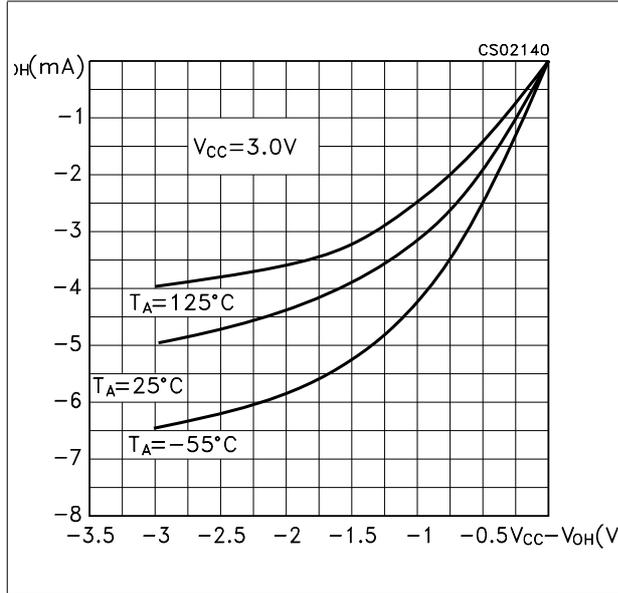
Figure 8.   Output current vs. output low voltage
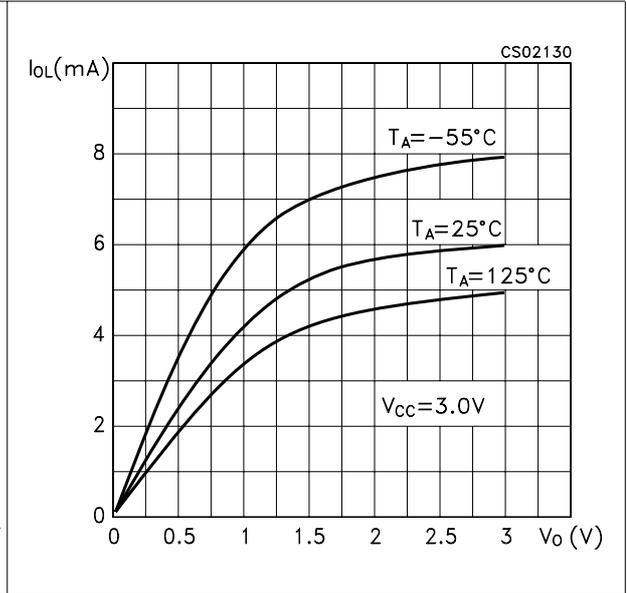
7   Package mechanical data

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.

Figure 9.   SSOP-28 outline
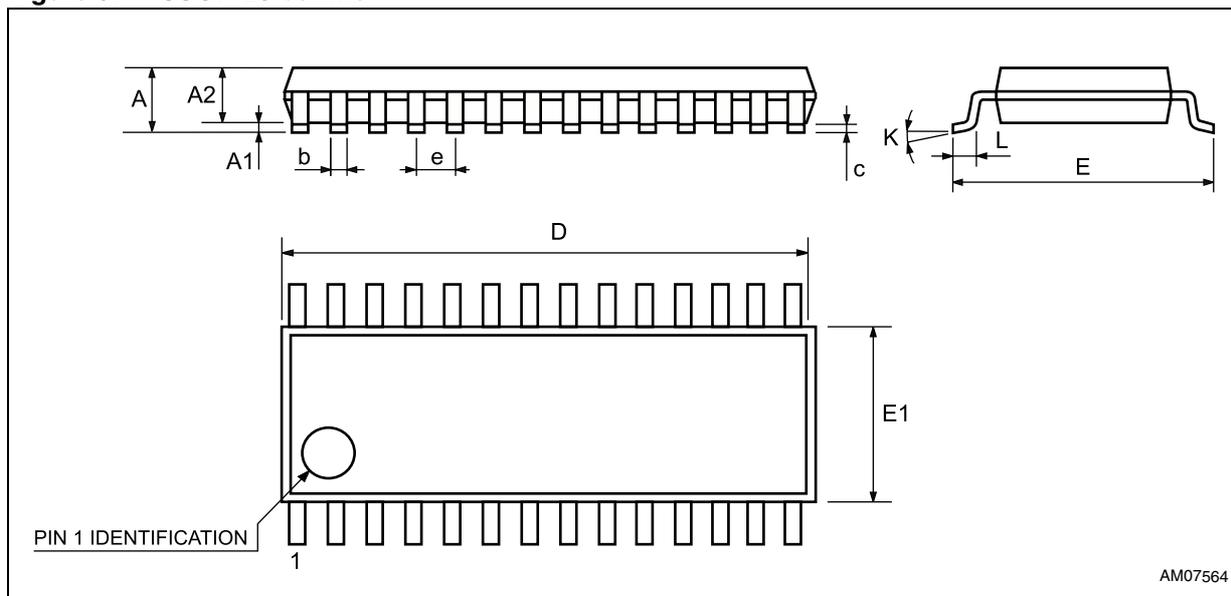
Table 12.   SSOP-28 mechanical data

Symbol	Dimensions					
	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

Figure 10. Tape and reel SSOP-28 outline[1]
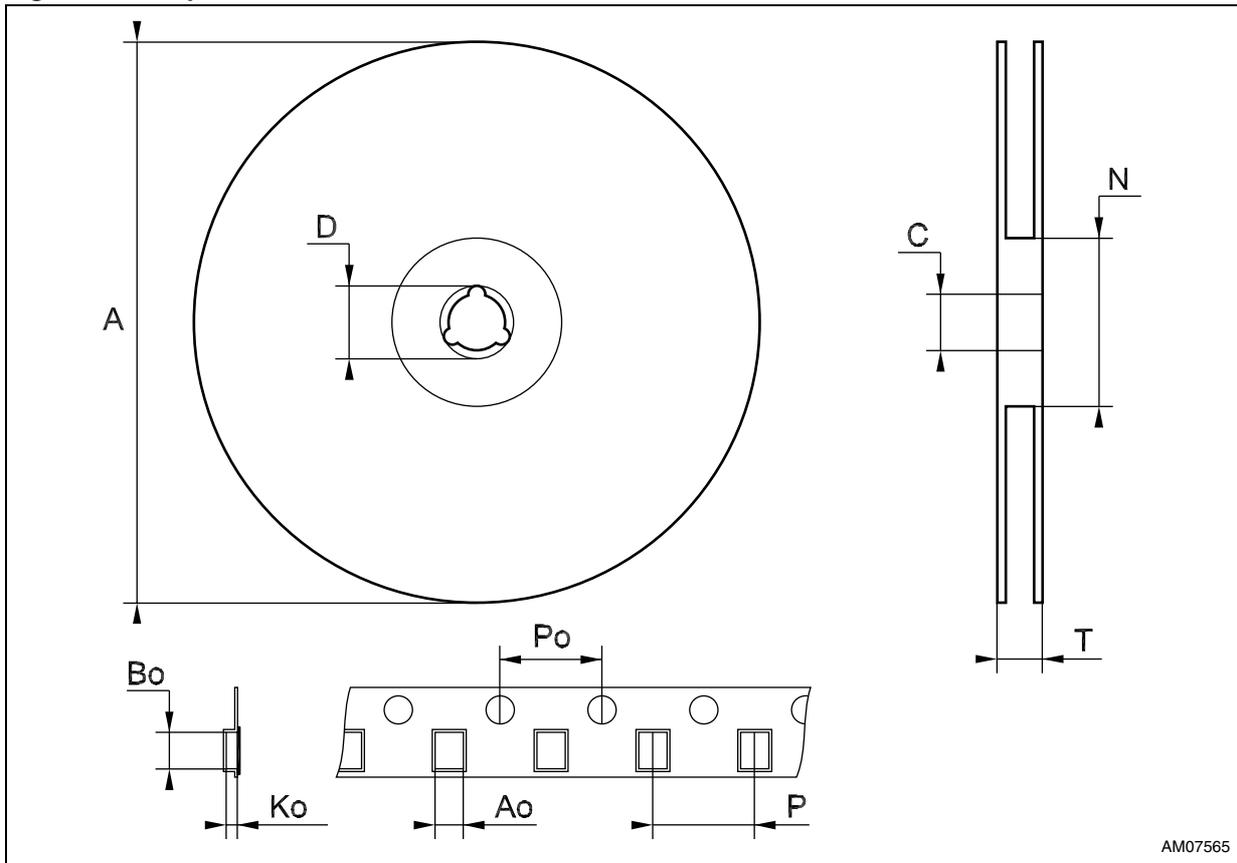
AM07565

1. Drawing not in scale.

Table 13. Tape and reel SSOP-28 mechanical data

Symbol	Dimensions					
	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

8 Revision history

Table 14. Document revision history

Date	Revision	Changes
19-Sep-2004	6	Document updating.
31-Mar-2006	7	Order codes updated.
12-Nov-2007	8	Added *Table 1*.
21-Oct-2009	9	Modified *Table 1 on page 1*.
07-Oct-2011	10	Added ST3243B device, document reformatted, updated/added *Figure 9* and *Figure 10*, *Table 12* and *Table 13*, minor text and typo modifications throughout the document.

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