



## ST3243B ST3243C

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

### Features

- 1  $\mu$ A supply current achieved when in auto-power-down
- 250 kbps minimum guaranteed data rate
- Guaranteed 6 V/ $\mu$ s slew rate range
- Guaranteed mouse drive ability
- 0.1  $\mu$ F external capacitors
- Meet EIA/TIA-232 specifications down to 3 V
- Available in SSOP-28

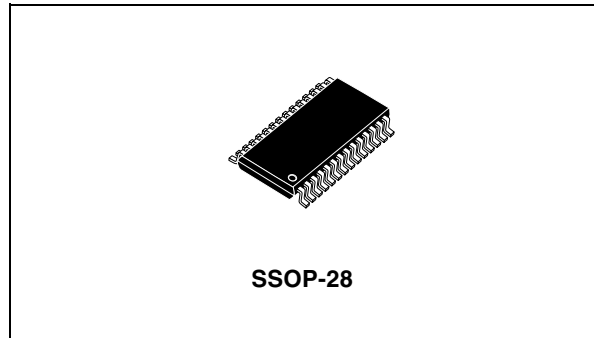


Table 1. Device summary

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

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# 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 (except 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

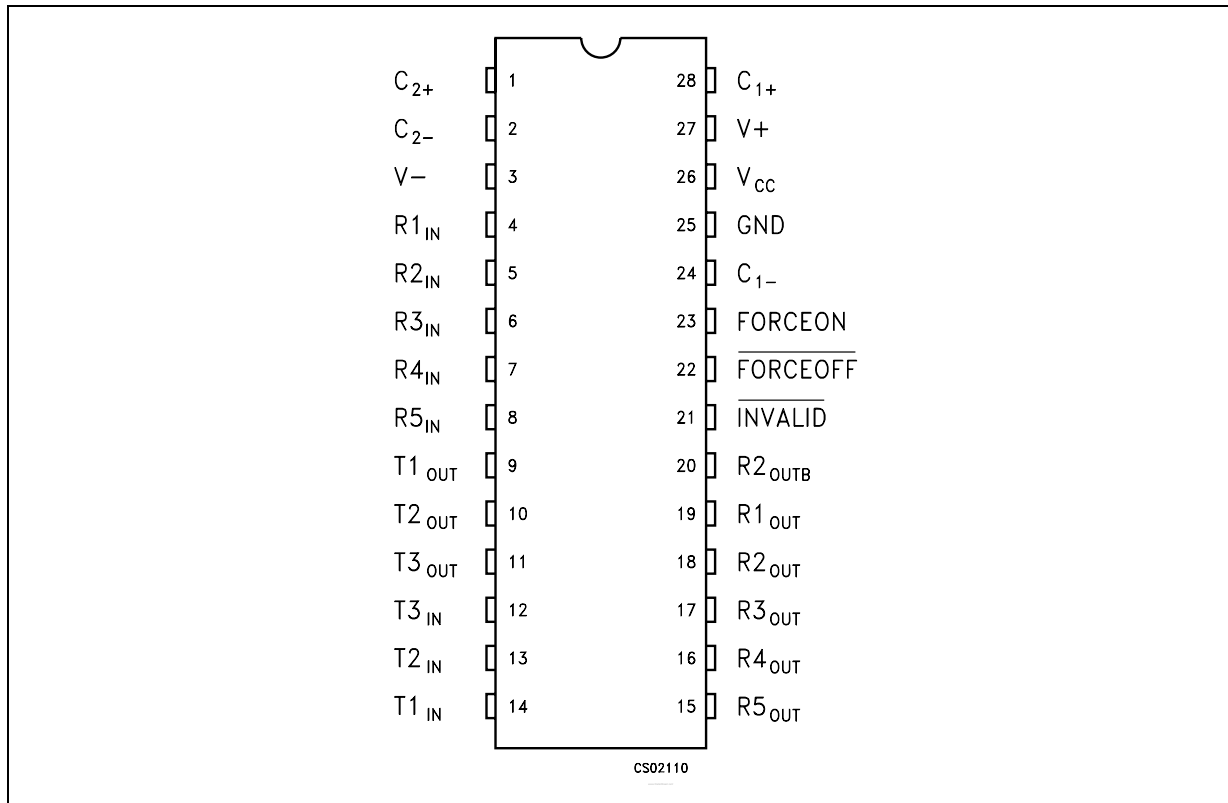


Table 2. Pin description

Pin n°	Symbol	Name and function
1	C <sub>2+</sub>	Positive terminal of inverting charge pump capacitor
2	C <sub>2-</sub>	Negative terminal of inverting charge pump capacitor
3	V-	- 5.5 V 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

Table 2. Pin description (continued)

Pin n°	Symbol	Name and function
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
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	INVALID	Output of the valid signal detector. Indicates if a valid RS-232 level is present on receiver inputs logic "1"
22	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 (FORCEOFF must be high)
24	C <sub>1-</sub>	Negative terminal of voltage-charge pump capacitor
25	GND	Ground
26	V <sub>CC</sub>	Supply voltage
27	V+	5.5 V generated by the charge pump
28	C <sub>1+</sub>	Positive terminal of voltage-charge pump capacitor

Table 3. Truth table

FORCEOFF	T <sub>OUT</sub>	R <sub>OUT</sub>	R <sub>2OUTB</sub>
0	HIGH Z	HIGH Z	ACTIVE <sup>(1)</sup>
1	ACTIVE <sup>(1)</sup>	ACTIVE <sup>(1)</sup>	ACTIVE <sup>(1)</sup>

1. If the part is in auto-power-down mode (FORCEOFF = V<sub>CC</sub>, 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
FORCEON, FORCEOFF, $T_{IN}$	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
$\frac{R_{OUT} R_{OUTB}}{INVALID}$	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:*
- 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

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

**Table 5. Electrical characteristics**

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

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

**Table 6. Logic input electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{TIL}$	Input logic threshold low	T-IN, FORCEON, $\overline{\text{FORCEOFF}}$			0.8	V
$V_{TIH}$	Input logic threshold high	T-IN, FORCEON, $\overline{\text{FORCEOFF}}$ $V_{CC} = 3.3 \text{ V}$ $V_{CC} = 5 \text{ V}$	2 2.4			V V
$V_{THYS}$	Transmitter input hysteresis			0.5		V
$I_{IL}$	Input leakage current	T-IN, FORCEON, $\overline{\text{FORCEOFF}}$		$\pm 0.01$	$\pm 1.0$	$\mu\text{A}$
$I_{OL}$	Output leakage current	Receiver disabled		$\pm 0.05$	$\pm 10$	$\mu\text{A}$
$V_{OL}$	Output voltage low	$I_{OUT} = 1.6 \text{ mA}$			0.4	V
$V_{OH}$	Output voltage high	$I_{OUT} = -1 \text{ mA}$	$V_{CC}-0.6$	$V_{CC}-0.1$		V

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

**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 $\mu\text{A}$ supply current	-0.3		0.3	V
$V_{IOL}$	$\overline{\text{INVALID}}$ output voltage LOW				0.4	V
$V_{IOH}$	$\overline{\text{INVALID}}$ 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	$I_{OUT} = 1.6 \text{ mA}$		250		$\mu\text{s}$
$t_{INVH}$	Receiver positive or negative threshold to INVALID HIGH	$I_{OUT} = -1 \text{ mA}$		1		$\mu\text{s}$
$t_{INVL}$	Receiver positive or negative threshold to INVALID LOW			30		$\mu\text{s}$

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

**Table 8. Transmitter electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{TOUT}$	Output voltage swing	All transmitter outputs are loaded with $3 \text{ k}\Omega$ to GND	$\pm 5$	$\pm 5.4$		V
$R_{OUT}$	Output resistance	$V_{CC} = V_+ = V_- = 0 \text{ V}$ , $V_{OUT} = \pm 2 \text{ V}$	300	10 M		$\Omega$
$I_{SC}$	Output short-circuit current			$\pm 35$	$\pm 60$	mA
$V_{OT}$	Transmitter output voltage	$T1IN = T2IN = \text{GND}$ , $T3IN = V_{CC}$ $T3OUT$ loaded with $3 \text{ k}\Omega$ to GND $T1OUT$ and $T2OUT$ loaded with $2.5 \text{ mA}$ each	$\pm 5$			V

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

**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	$T_A = 25^\circ\text{C}$ , $V_{CC} = 3.3 \text{ V}$ $T_A = 25^\circ\text{C}$ , $V_{CC} = 5.0 \text{ V}$	0.6 0.8	1.2 1.2		V
$V_{RIH}$	RS-232 Input threshold high	$T_A = 25^\circ\text{C}$ , $V_{CC} = 3.3 \text{ V}$ $T_A = 25^\circ\text{C}$ , $V_{CC} = 5.0 \text{ V}$		1.5 1.8	2.4 2.4	V
$V_{RIHYS}$	Input hysteresis			0.5		V
$R_{RIN}$	Input resistance	$T_A = 25^\circ\text{C}$	3	5	7	$\text{k}\Omega$



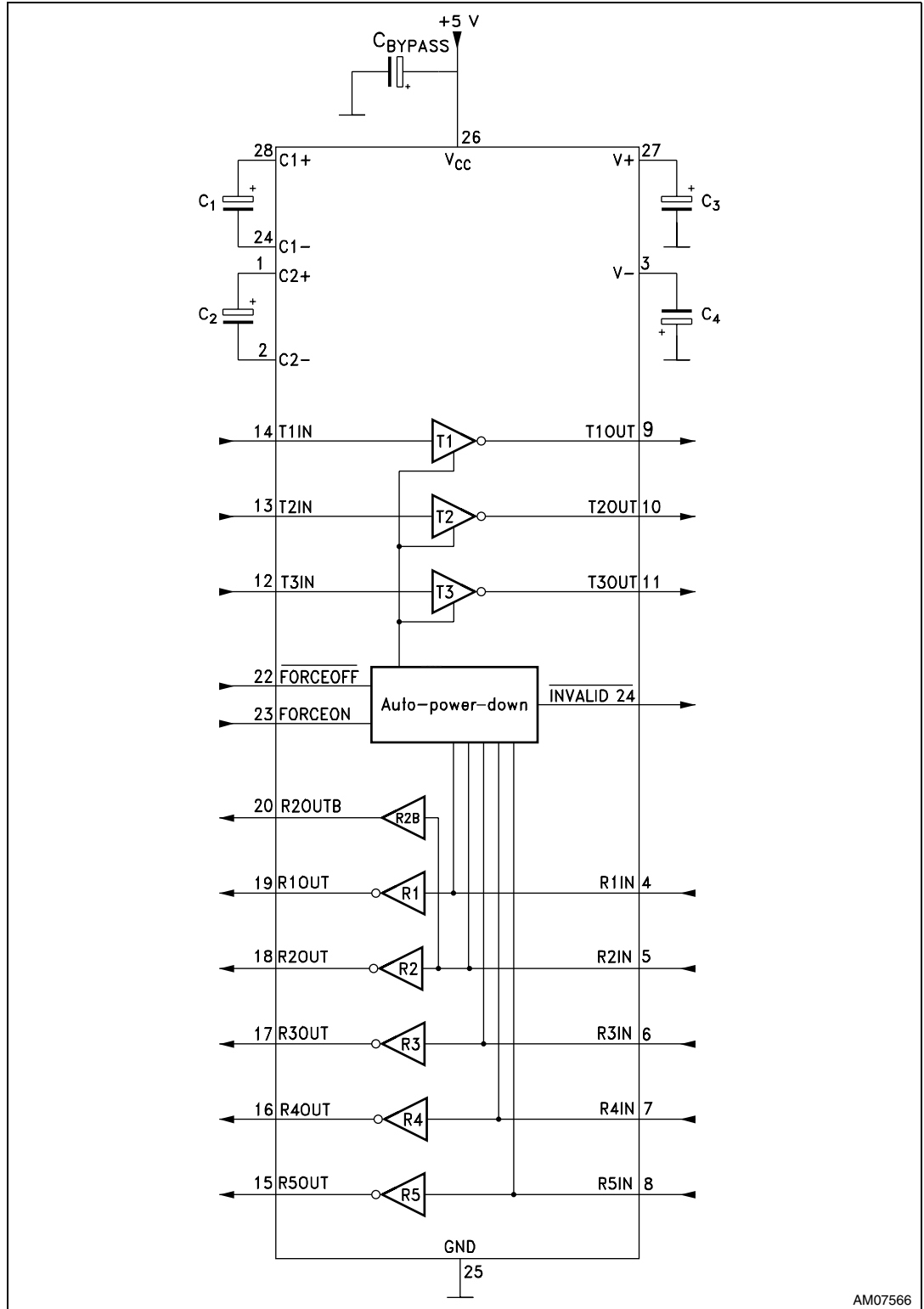
$C_1 - C_4 = 0.1 \mu\text{F}$ ,  $V_{CC} = 3 \text{ V to } 5.5 \text{ V}$ ,  $T_A = -40 \text{ to } 85 \text{ }^\circ\text{C}$ , unless otherwise specified. Typical values are referred to  $T_A = 25 \text{ }^\circ\text{C}$ .

**Table 10. Timing characteristics**

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	400		kbps
$t_{PHL}$ $t_{PLH}$	Receiver propagation delay	$R_{IN}$ to $R_{OUT}$ , $C_L = 150 \text{ pF}$		0.15		$\mu\text{s}$
$t_{T\_SKEW}$	Transmitter skew			100		ns
$t_{R\_SKEW}$	Receiver skew			50		ns
$t_{INVH}$	Receiver positive or negative threshold to $\overline{\text{INVALID HIGH}}$			1		$\mu\text{s}$
$t_{INVL}$	Receiver positive or negative threshold to $\overline{\text{INVALID LOW}}$			30		$\mu\text{s}$
$S_{RT}$	Transition slew rate	$T_A = 25 \text{ }^\circ\text{C}$ , $R_L = 3 \text{ k}\Omega$ to $7 \text{ k}\Omega$ , $V_{CC} = 3.3 \text{ V}$ measured from $+3 \text{ V}$ to $-3 \text{ V}$ or $-3 \text{ V}$ to $+3 \text{ V}$ $C_L = 150 \text{ pF}$ to $1000 \text{ pF}$ $C_L = 150 \text{ pF}$ to $2500 \text{ pF}$	6 4		30 30	$\text{V}/\mu\text{s}$ $\text{V}/\mu\text{s}$

# 5 Application

Figure 2. Application circuits



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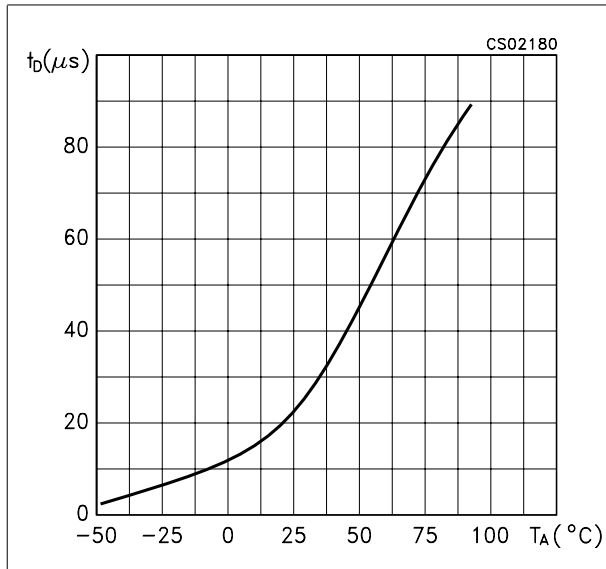
Table 11. Capacitance value ( $\mu\text{F}$ )

$V_{\text{CC}}$	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

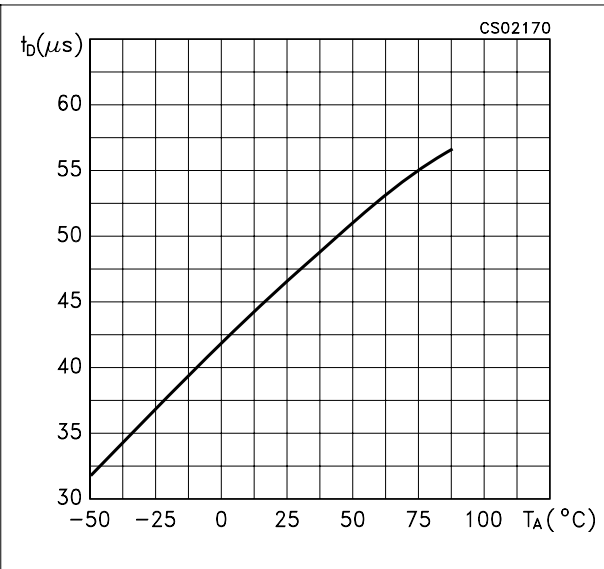
## 6 Typical performance characteristics

Unless otherwise specified  $T_J = 25\text{ }^\circ\text{C}$ .

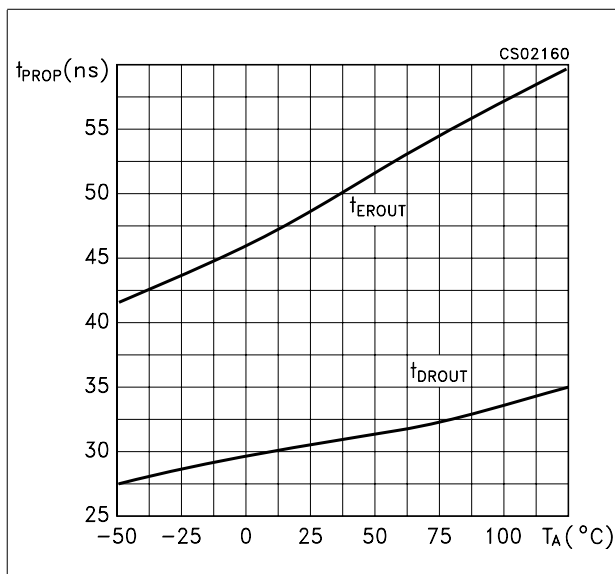
**Figure 3. INVALID HIGH threshold time**



**Figure 4. INVALID LOW threshold time**



**Figure 5. Receiver propagation delay**



**Figure 6. Receiver output enable and disable time**

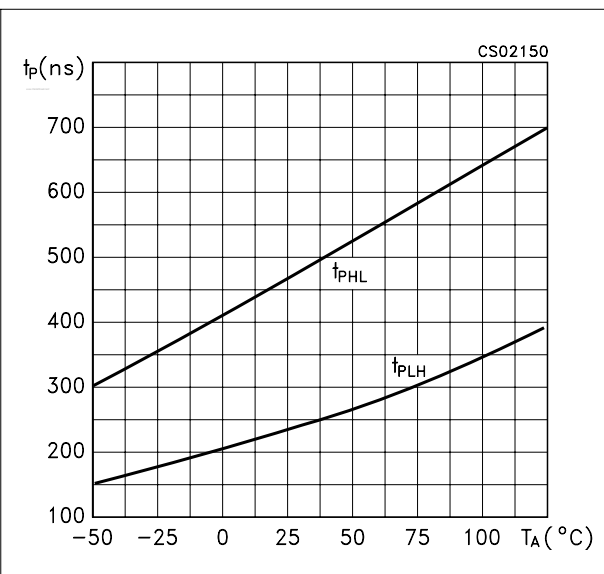


Figure 7. Output current vs. output high voltage

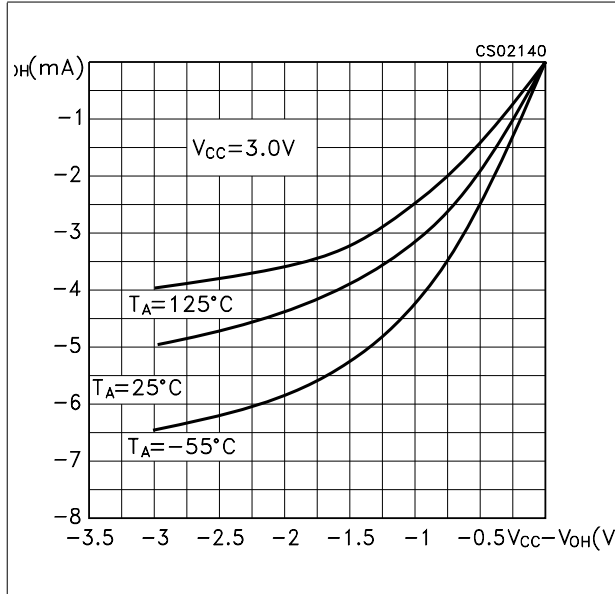
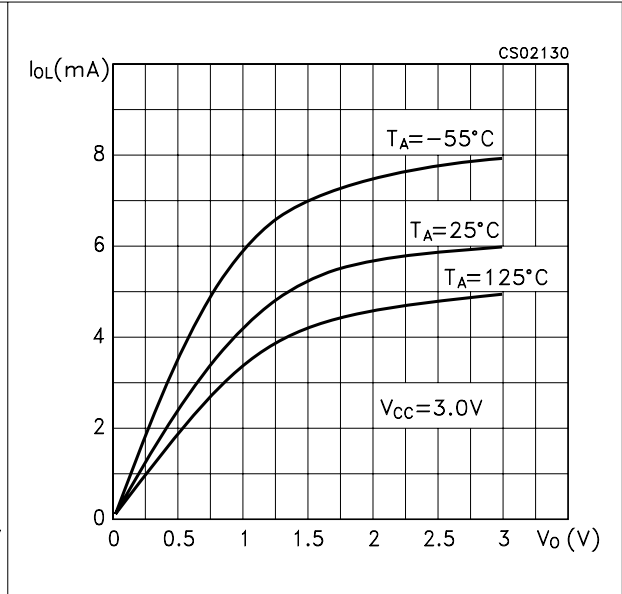


Figure 8. Output current vs. output low voltage



## 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](http://www.st.com). ECOPACK® is an ST trademark.

Figure 9. SSOP-28 outline

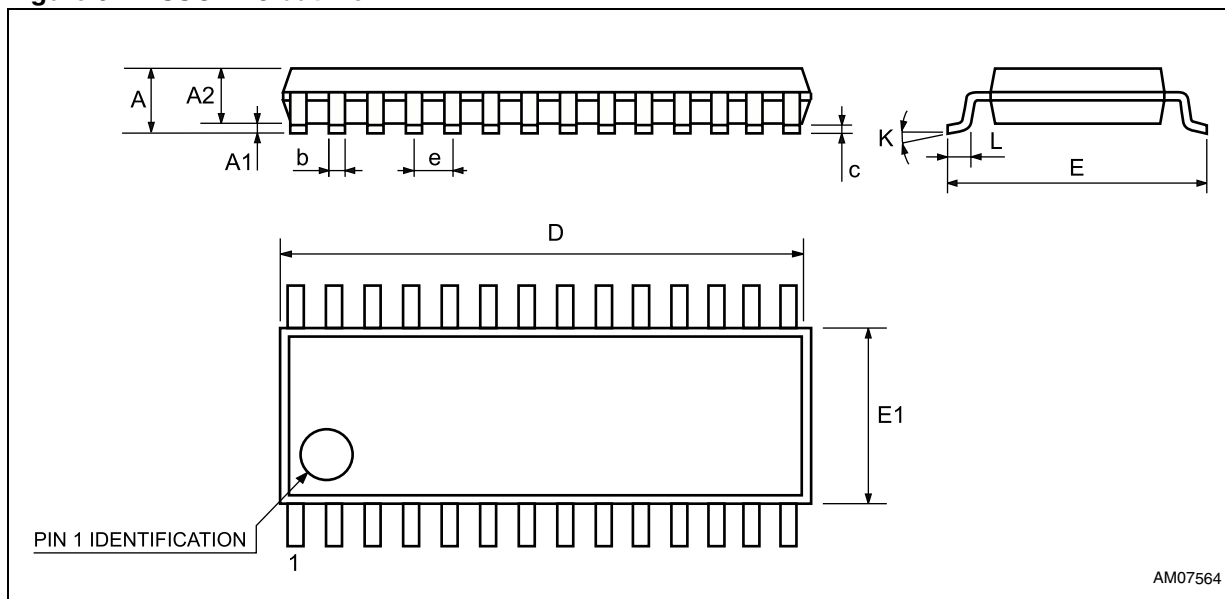
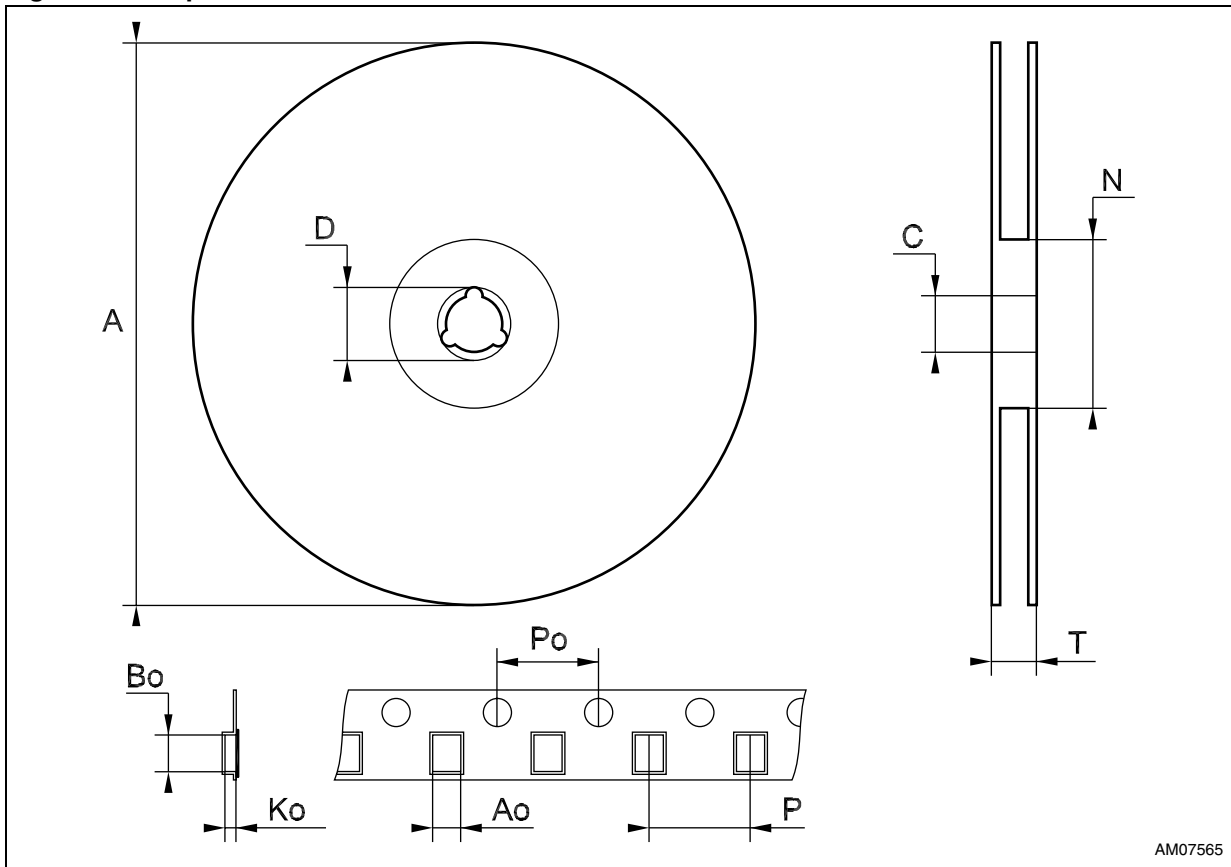


Table 12. SSOP-28 mechanical data

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<sup>(1)</sup>



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 <a href="#">Table 1</a> .
21-Oct-2009	9	Modified <a href="#">Table 1 on page 1</a> .
07-Oct-2011	10	Added ST3243B device, document reformatted, updated/added <a href="#">Figure 9</a> and <a href="#">Figure 10</a> , <a href="#">Table 12</a> and <a href="#">Table 13</a> , minor text and typo modifications throughout the document.



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