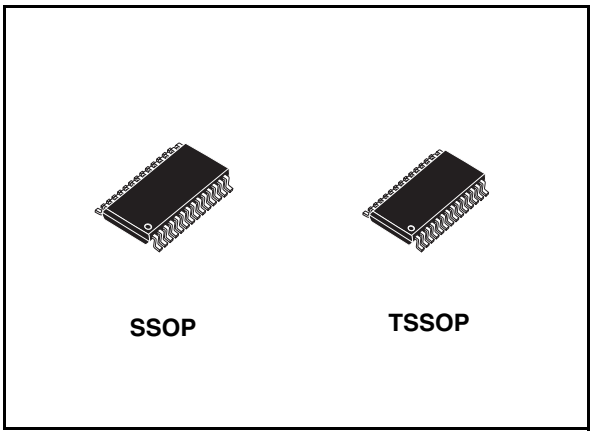
ST3243B
ST3243C

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 and TSSOP28



Description

The ST3243 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.

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

The ST3243 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.

The Auto-power-down feature functions when $\overline{\text{FORCEON}}$ 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 $\overline{\text{FORCEON}}$ 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.

Table 1. Device summary

Order code	Temperature range	Package	Packaging
ST3243CPR	0 to 70 °C	SSOP-28 (tape and reel)	1350 parts per reel
ST3243BTR	-40 to 85 °C	TSSOP28 (tape and reel)	2500 parts per reel

Contents

1 Pin configuration

Figure 1. Pin configuration

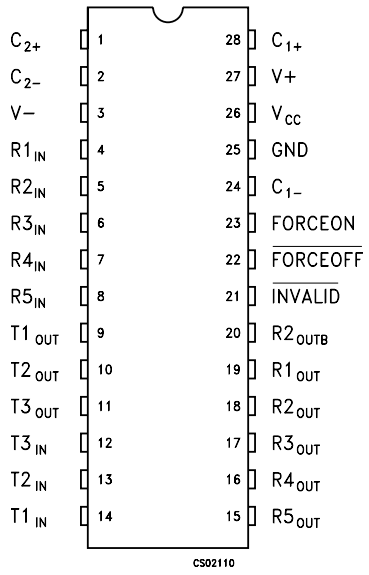


Table 2. Pin description

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-	-5.5V 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 n°	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	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 ($\overline{\text{FORCEOFF}}$ must be high)
24	C_1-	Negative terminal of voltage-charge pump capacitor
25	GND	Ground
26	V_{CC}	Supply voltage
27	V+	5.5V Generated by the charge pump
28	C_1+	Positive terminal of voltage-charge pump capacitor

Table 3. Truth table

FORCE OFF	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 (FORCE OFF = V_{CC}, FORCE ON = GND) it is shutdown, if no valid RS-232 levels are present on all receiver input

2 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
$\overline{FORCEON}$, $\overline{FORCEOFF}$, 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} $\overline{INVALID}$	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

3 Electrical characteristics

Table 5. 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

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

Table 6. Logic input electrical characteristics
(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

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} = 3.3V V_{CC} = 5V	 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} = 1.6mA			0.4	V
V_{OH}	Output voltage high	I_{OUT} = -1mA	V_{CC}-0.6	V_{CC}-0.1		V

Table 7. Auto-power-down 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

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
t_{WU}	Receiver threshold to transmitter enabled	I_{OUT} = 1.6mA		250		ms

Table 7. Auto-power-down 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

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t_{invh}	Receiver positive or negative threshold to $\overline{\text{INVALID}}$ HIGH	I_{OUT} = -1mA		1		ms
t_{invL}	Receiver positive or negative threshold to $\overline{\text{INVALID}}$ LOW			30		ms

Table 8. Transmitter 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

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

Table 9. Receiver 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

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} = 3.3V T_A = 25°C, V_{CC} = 5.0V	0.6 0.8	1.2 1.2		V
V_{RIH}	RS-232 Input threshold high	T_A = 25°C, V_{CC} = 3.3V T_A = 25°C, V_{CC} = 5.0V		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

Table 10. Timing 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

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
D_R	Maximum data rate	R_L = 3KΩ, C_L= 1000pF one transmitter switching	250	400		kbps
t_{PHL} t_{PLH}	Receiver propagation delay	R_{IN} to R_{OUT}, C_L = 150pF		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 $\overline{\text{INVALID}}$ HIGH			1		ms
t_{INVL}	Receiver positive or negative threshold to $\overline{\text{INVALID}}$ LOW			30		ms
S_{RT}	Transition slew rate	T_A = 25°C R_L = 3K to 7KΩ V_{CC} = 3.3V measured from +3V to -3V or -3V to +3V C_L = 150pF to 1000pF C_L = 150pF to 2500pF	 6 4		 30 30	 V/µs V/µs

4 Application

Figure 2. Application circuits

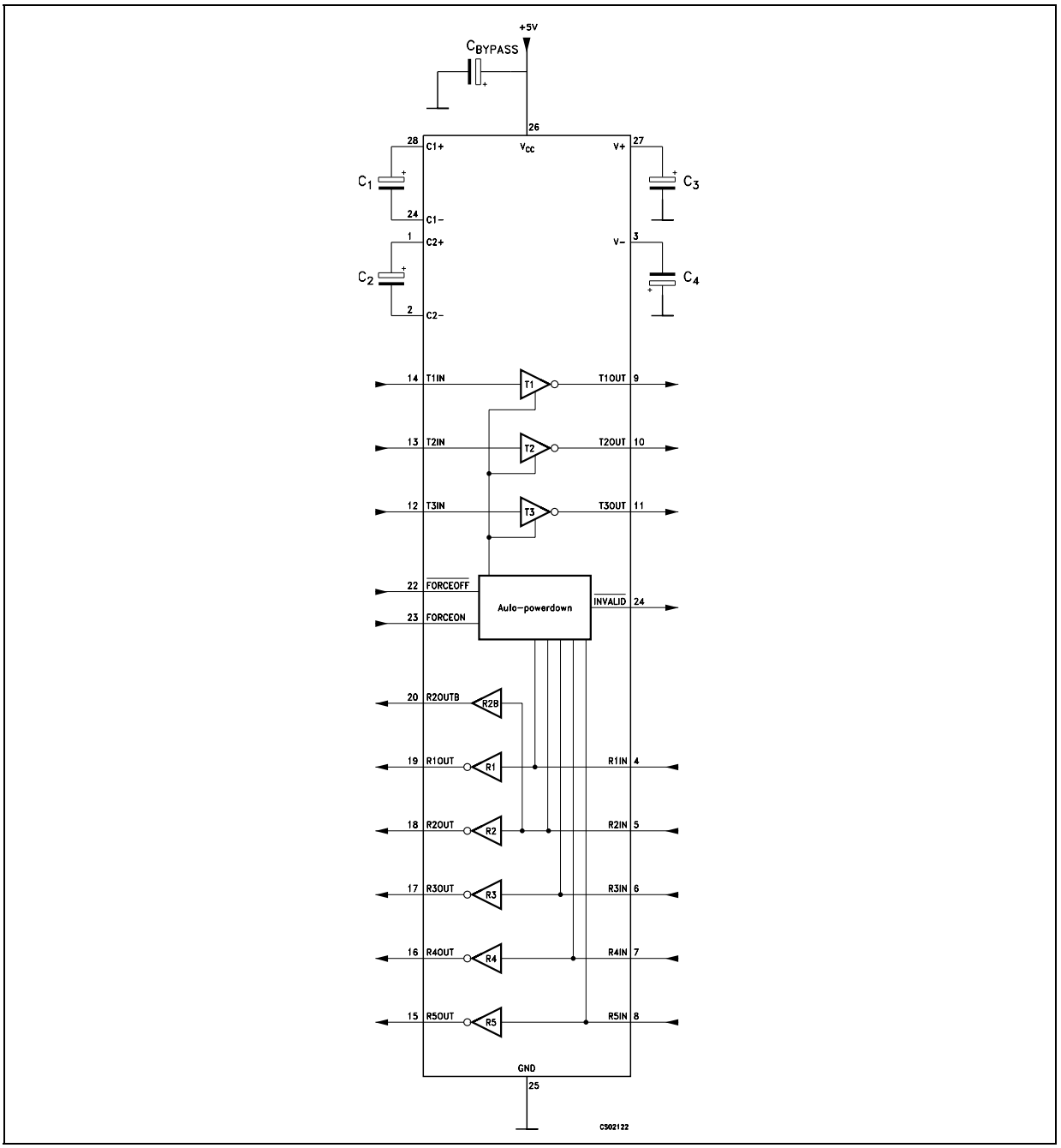


Table 11. Capacitance value (µF)

V_{CC}	C1	C2	C3	C4	Cbypass
3.0 to 3.6	0.1	0.1	0.1	0.1	0.1

Table 11. Capacitance value (µF)

V_{CC}	C1	C2	C3	C4	Cbypass
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

5 Typical performance characteristics

Unless otherwise specified T_J = 25 °C

Figure 3. Invalid high threshold time

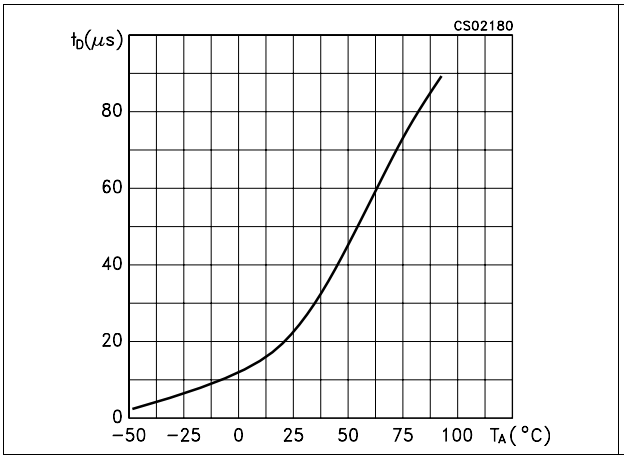


Figure 4. Invalid low threshold time

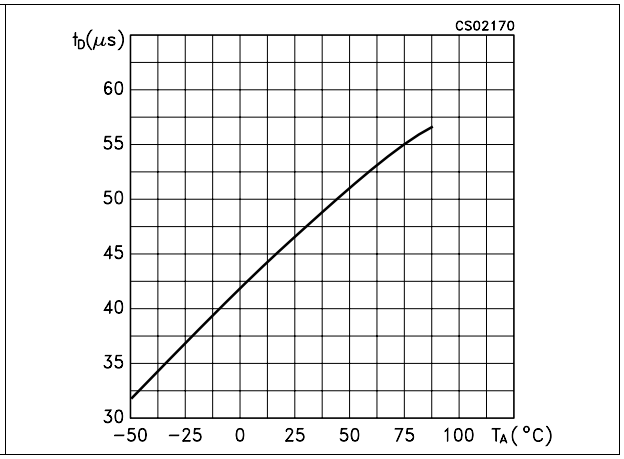


Figure 5. Receiver propagation delay

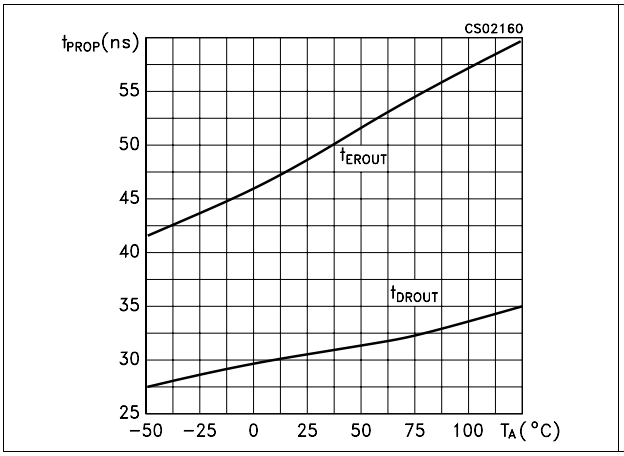


Figure 6. Receiver output enable & disable time

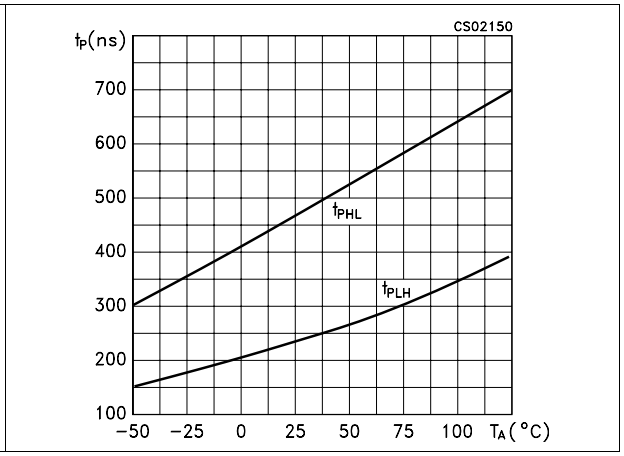


Figure 7. Output current vs output high voltage

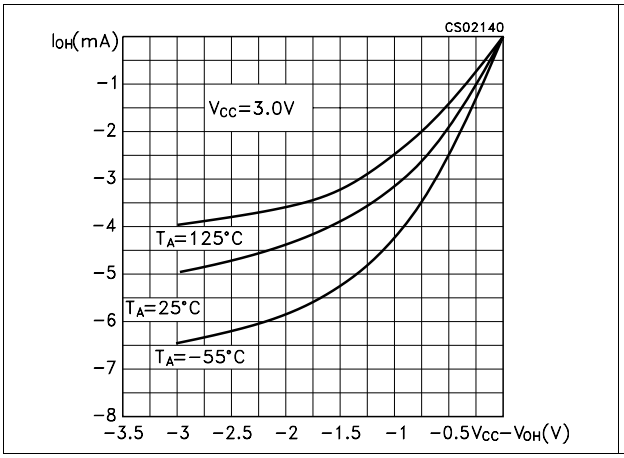
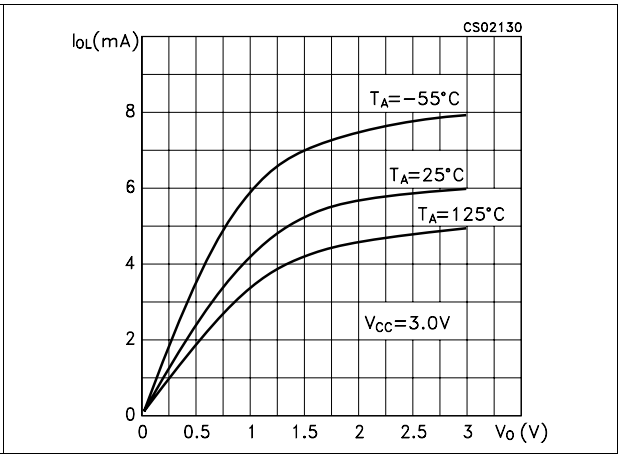


Figure 8. Output current vs output low voltage

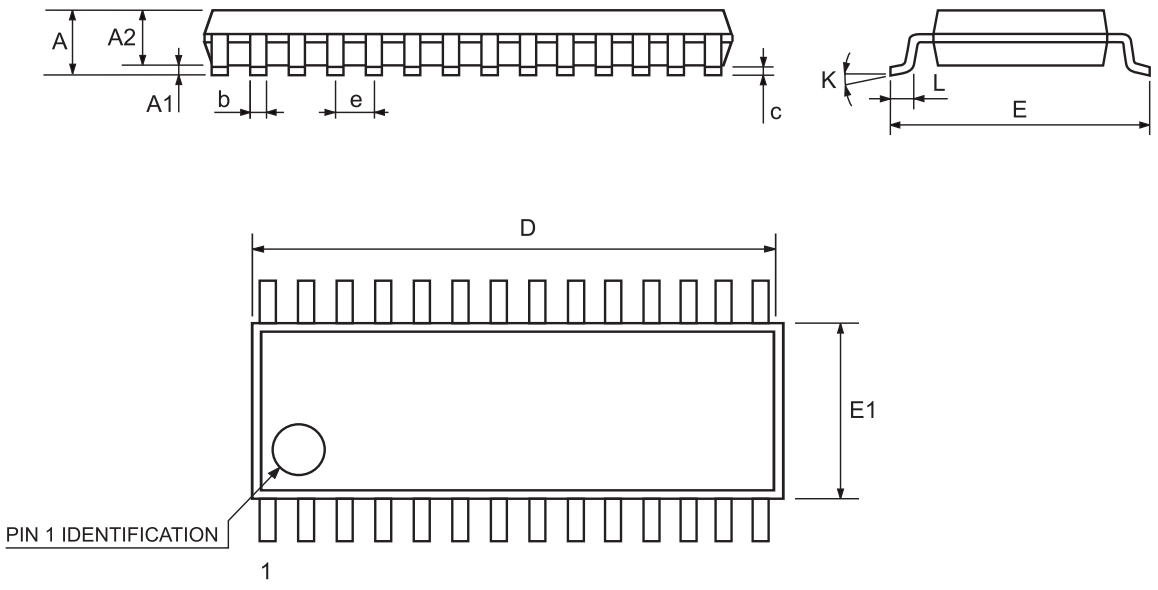


6 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com

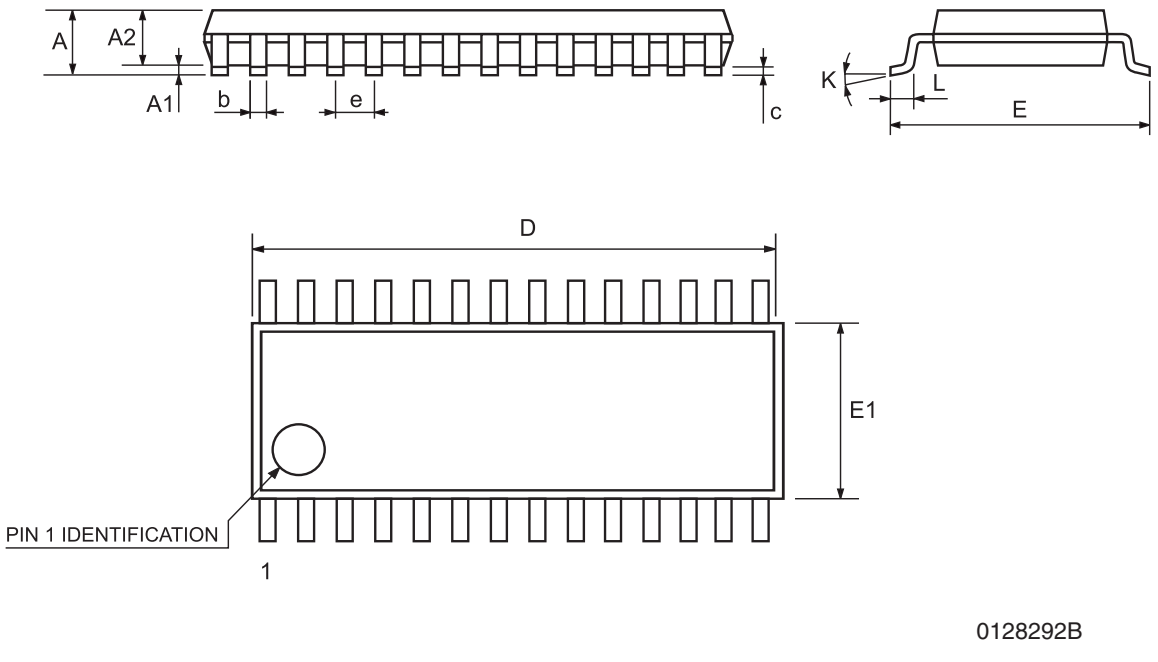
SSOP28 mechanical data

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



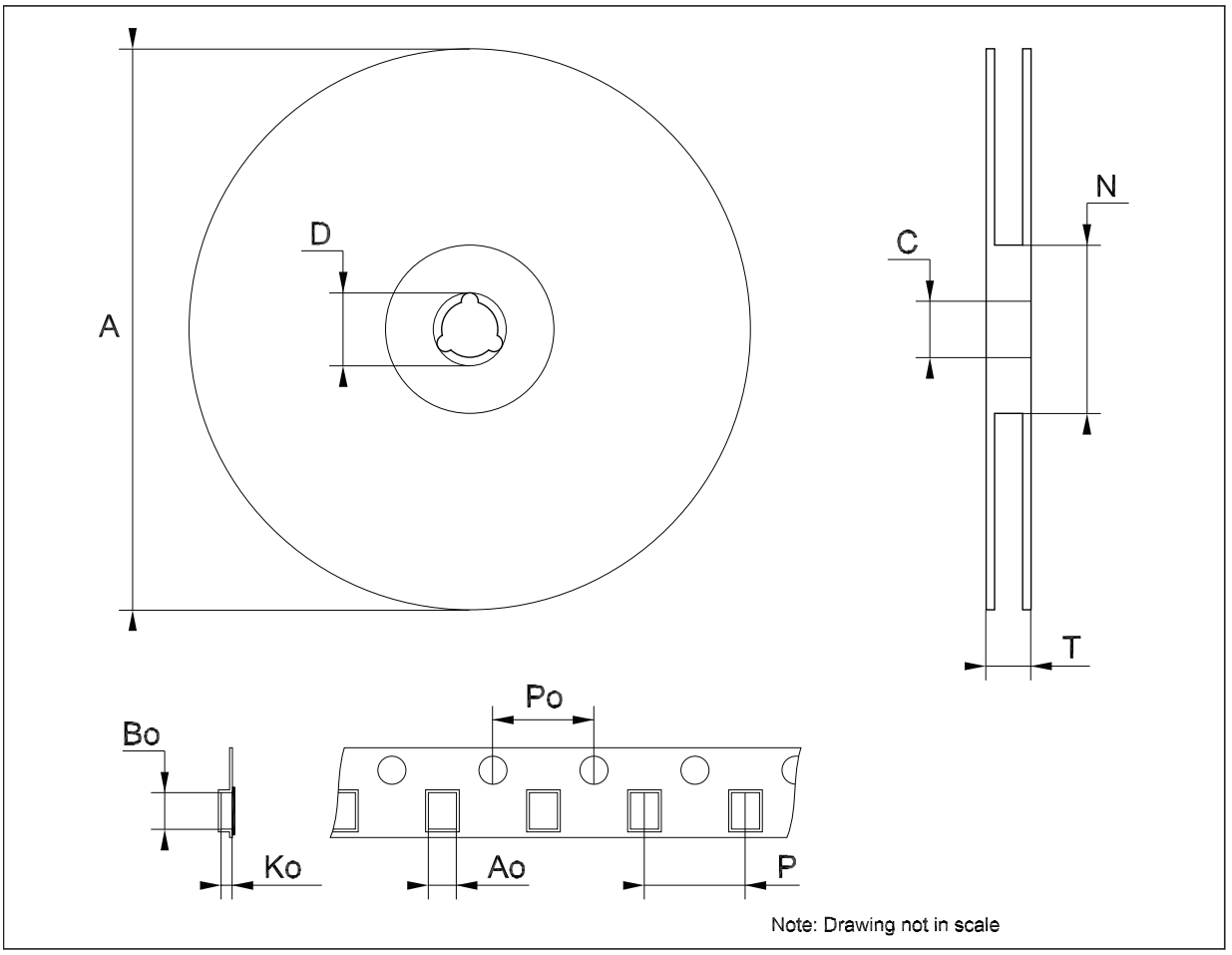
TSSOP28 mechanical data

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.2			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0079
D	9.6	9.7	9.8	0.378	0.382	0.386
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°		8°	0°		8°
L	0.45	0.60	0.75	0.018	0.024	0.030



Tape & reel SSOP28 mechanical data

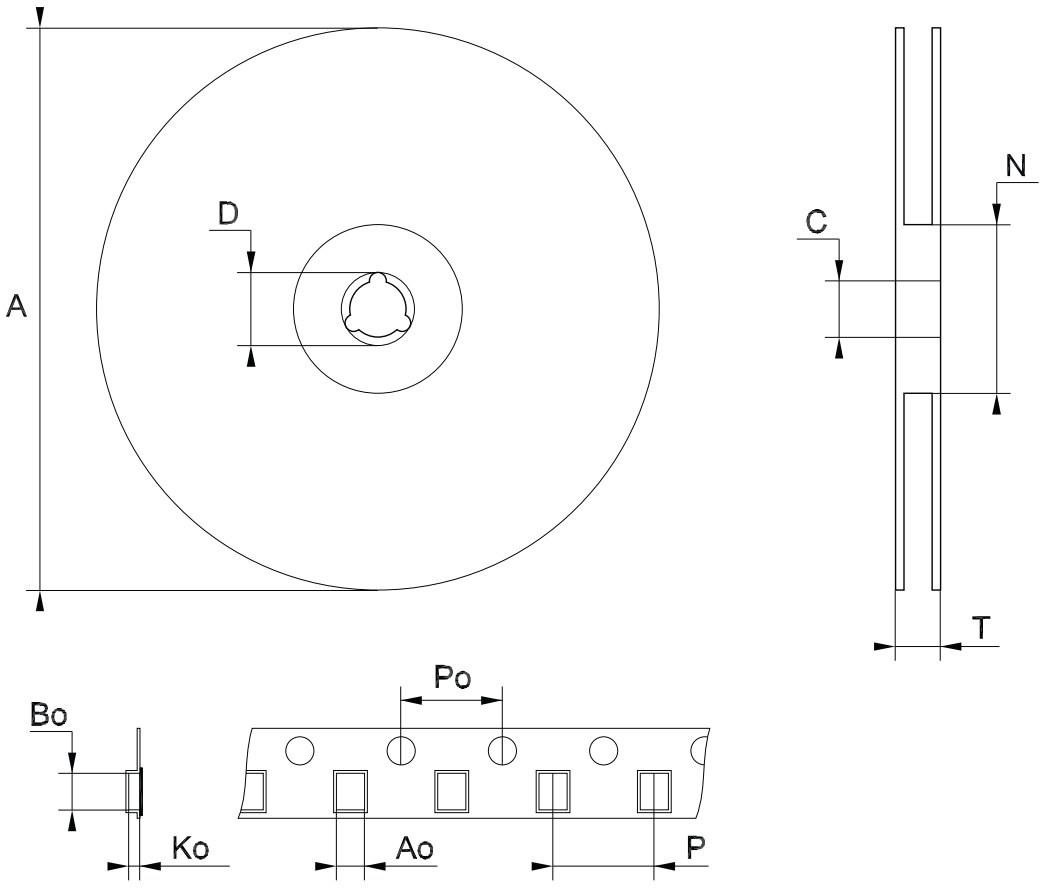
Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882
Ao	8.4		8.6	0.331		0.339
Bo	10.7		10.9	0.421		0.429
Ko	2.9		3.1	0.114		0.122
Po	3.9		4.1	0.153		0.161
P	11.9		12.1	0.468		0.476



Note: Drawing not in scale

Tape & reel TSSOP28 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	6.8		7	0.268		0.276
Bo	10.1		10.3	0.398		0.406
Ko	1.7		1.9	0.067		0.075
Po	3.9		4.1	0.153		0.161
P	11.9		12.1	0.468		0.476



Note: Drawing not in scale

7 Revision history

Table 12. 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*.

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