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STLV3243EB

± 15 kV ESD protected 2.3 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 mA 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
- Meet EIA/TIA-562 specifications
- Available in Flip-Chip28 package

Description

The STLV3243EB device consists of 3 drivers, 5 receivers and a dual charge-pump circuit. All transmitter outputs and receiver inputs are protected up 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 device is guaranteed to run at data rates of 250 kbps while maintaining RS-562 output levels.

The auto-power-down feature operates when FORCEON is low and FORCEOFF is high. During this operation mode, if the device does not sense a valid RS-562 signal, the driver outputs are disabled. If FORCEOFF is set low, both drivers and receivers (except R2B) are shut off, and supply current is reduced to 1 µA. 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 FORCEOFF are high, and this should be done when driving a serial mouse. With

Table 1. Device summary

Order code	Temperature range	Package	Packaging
STLV3243EBJR	- 40 to 85 °C	Flip-Chip28 (6x5 mm)	2500 parts per reel



auto-power-down enabled, the device is automatically activated when a valid signal is applied to any receiver input.

Typical applications are notebooks, PDAs, smart-phones, hand-held equipment, palmtop computers, peripherals, battery-powered equipment, and printers.

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Obsolete Product(s) - Obsolete Product(s)
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1 Pin configuration

Figure 1. Pin configuration (bottom view, bumps side)

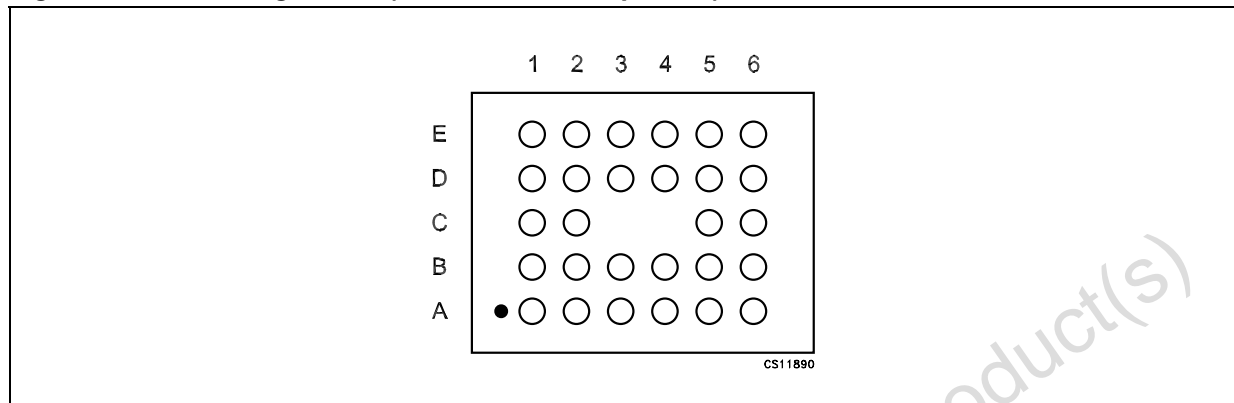


Table 2. Pin description

Pin n°	Symbol	Name and function
A1	R2 _{IN}	Second receiver input voltage
A2	R3 _{IN}	Third receiver input voltage
A3	R4 _{IN}	Fourth receiver input voltage
A4	R5 _{IN}	Fifth receiver input voltage
A5	T1 _{OUT}	First transmitter output voltage
A6	T2 _{OUT}	Second transmitter output voltage
B1	V-	-5.5 V generated by the charge pump
B2	R1 _{IN}	First receiver input voltage
B3	T3 _{OUT}	Third transmitter output voltage
E4	T3 _{IN}	Third transmitter input voltage
P5	T1 _{IN}	First transmitter input voltage
B6	T2 _{IN}	Second transmitter input voltage
C1	C ₂₊	Positive terminal of inverting charge pump capacitor
C2	C ₂₋	Negative terminal of inverting charge pump capacitor
C5	R4 _{OUT}	Fourth receiver output voltage
C6	R5 _{OUT}	Fifth receiver output voltage
D1	C ₁₊	Positive terminal of voltage- charge pump capacitor
D2	V+	5.5 V generated by the charge pump
D3	V _{CC}	Supply voltage
D4	FORCEON	Drive high to override automatic circuitry keeping transmitters on (FORCEOFF must be high)
D5	R1 _{OUT}	First receiver output voltage
D6	R3 _{OUT}	Third receiver output voltage

Table 2. Pin description (continued)

Pin n°	Symbol	Name and function
E1	GND	Ground
E2	C ₁₋	Negative terminal of voltage- charge pump capacitor
E3	FORCEOFF	Drive low to shut down transmitters and on-board power supply. This overrides all automatic circuitry and FORCEON
E4	INVALID	Output of the valid signal detector. Indicates if a valid RS-232 level is present on receiver inputs logic "1"
E5	R2 _{OUTB}	Non-inverting complementary receiver output, always active for wake-up
E6	R2 _{OUT}	Second receiver output voltage

Table 3. Invalid truth table

RS-232 signal present at any receiver input	INVALID output
YES	H
NO	L

Table 4. Output control truth table

FORCE ON	FORCE OFF	Valid receiver level	Operation status	T _{OUT}	R _{OUT}	R2 _{OUTB}
X	0	X	Shutdown (FORCEOFF)	HIGH Z	HIGH Z	ACTIVE
1	1	X	Normal operating (FORCEON)	ACTIVE	ACTIVE	ACTIVE
0	1	YES	Normal operating (Auto-power-down)	ACTIVE	ACTIVE	ACTIVE
0	1	NO	Shutdown (Auto-power-down)	HIGH Z	ACTIVE	ACTIVE

2 Maximum ratings

Table 5. 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	± 25	V
T_{OUT}	Transmitter output voltage range	± 13.2	V
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: Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

Table 6. 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 7. Electrical characteristics

(C1 - C4 = 0.1 μ F, V_{CC} = 2.3 V to 5.5 V, T_A = -40 to 85 $^{\circ}$ C, unless otherwise specified. Typical values are referred to T_A = 25 $^{\circ}$ C)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{ASHDN}	Supply current auto-power-down	$\overline{FORCEOFF} = GND, \overline{FORCEON} = V_{CC}$ All R_IN open or grounded		1	10	μ A
I_{SUPPLY}	Supply current	$\overline{FORCEON} = \overline{FORCEOFF} = V_{CC}$		0.3	1	mA
I_{SHDN}	Shutdown supply current	$\overline{FORCEOFF} = GND$		1	10	μ A

Table 8. Logic input electrical characteristics

(C1 - C4 = 0.1 μ F, V_{CC} = 2.3 V to 5.5 V, T_A = -40 to 85 $^{\circ}$ C, unless otherwise specified. Typical values are referred to T_A = 25 $^{\circ}$ C)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{TIL}	Input logic threshold low	T-IN, $\overline{FORCEON}, \overline{FORCEOFF}$ $V_{CC} = 3.0$ V $V_{CC} = 2.3$ V			0.8 0.5	V V
V_{TIH}	Input logic threshold high	T-IN, $\overline{FORCEON}, \overline{FORCEOFF}$ $V_{CC} = 3.0$ V $V_{CC} = 2.3$ V	2 1.4			V V
V_{THYS}	Transmitter input hysteresis			0.4		V
I_{IL}	Input leakage current	T-IN, $\overline{FORCEON}, \overline{FORCEOFF}$		± 0.01	± 1.0	μ A

Table 9. Receiver outputs electrical characteristics

(C1 - C4 = 0.1 μ F, V_{CC} = 2.3 V to 5.5 V, T_A = -40 to 85 $^{\circ}$ C, unless otherwise specified. Typical values are referred to T_A = 25 $^{\circ}$ C)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{OL}	Output leakage current	Receiver disabled		± 0.05	± 10	μ A
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

Table 10. Auto-power-down electrical characteristics

(C1 - C4 = 0.1 μ F, V_{CC} = 2.3 V to 5.5 V, T_A = -40 to 85 $^{\circ}$ C, unless otherwise specified. Typical values are referred to T_A = 25 $^{\circ}$ C, FORCEON = GND, FORCEOFF = V_{CC})

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{RITE}	Receiver input threshold to INVALID output voltage HIGH (Figure 3)	Positive threshold			2.7	V
		Negative threshold	2.7			V
V_{RITD}	Receiver input threshold to INVALID output voltage LOW (Figure 3)		-0.3		0.3	V
V_{IOL}	INVALID output voltage LOW	$I_{OUT} = 1.6$ mA			2.4	V
V_{IOH}	INVALID output voltage HIGH	$I_{OUT} = -1$ mA	$V_{CC}-0.6$			V
t_{WU}	Receiver or transmitter edge transmitter enabled (Figure 3)			100		μ s
t_{INVH}	Receiver positive or negative threshold to INVALID HIGH (Figure 3)			0.2		μ s
t_{INVL}	Receiver positive or negative threshold to INVALID LOW (Figure 3)			30		μ s

Table 11. Transmitter electrical characteristics

(C1 - C4 = 0.1 μ F, V_{CC} = 2.3 V to 5.5 V, T_A = -40 to 85 $^{\circ}$ C, unless otherwise specified. Typical values are referred to T_A = 25 $^{\circ}$ C)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{TCOUT}	Output voltage swing	All transmitter outputs are loaded with 3 k Ω to GND $V_{CC} = 3.0$ V $V_{CC} = 2.3$ V	± 3.7	± 4.4 ± 3.9		V
R_{OUT}	Output resistance	$V_{CC} = V_+ = V_- = 0$ V, $V_{OUT} = \pm 2$ V	300	10M		Ω
I_{SC}	Output short circuit current	$V_{CC} = 3.3$ V		± 40	± 60	mA
I_L	Output leakage current	$V_{CC} = 0$ to 5.5V, transmitter output = ± 12 V, transmitter disabled			± 25	mA
V_{OT}	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	± 3.7			V

Table 12. Receiver electrical characteristics

(C1 - C4 = 0.1 μ F, V_{CC} = 2.3 V to 5.5 V, T_A = -40 to 85 $^{\circ}$ C, unless otherwise specified. Typical values are referred to T_A = 25 $^{\circ}$ 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 $^{\circ}$ C, V_{CC} = 3.0 V T_A = 25 $^{\circ}$ C, V_{CC} = 2.3 V	0.6 0.4	1.0 0.8		V
V_{RIH}	RS-232 Input threshold high	T_A = 25 $^{\circ}$ C, V_{CC} = 3.0 V T_A = 25 $^{\circ}$ C, V_{CC} = 2.3 V		1.4 1.2	2.4 2.0	V
V_{RIHYS}	Input hysteresis			0.5		V
R_{RIN}	Input resistance	T_A = 25 $^{\circ}$ C	3	5	7	k Ω

Table 13. Timing characteristics

(C1 - C4 = 0.1 μ F, V_{CC} = 2.3 V to 3 V, T_A = -40 to 85 $^{\circ}$ C, unless otherwise specified. Typical values are referred to T_A = 25 $^{\circ}$ C)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
D_R	Maximum data rate	R_L = 3 k Ω , 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		μ s
t_{T_SKEW}	Transmitter skew			60		ns
t_{R_SKEW}	Receiver skew			120		ns
S_{RT}	Transition slew rate	T_A = 25 $^{\circ}$ C R_L = 3k to 7k Ω , V_{CC} = 3 V measured from +3 V to -3 V or -3 V to +3 V C_L = 150 pF to 1000 pF	4		30	V/ μ s

4 Application circuit

Figure 2. Application circuit

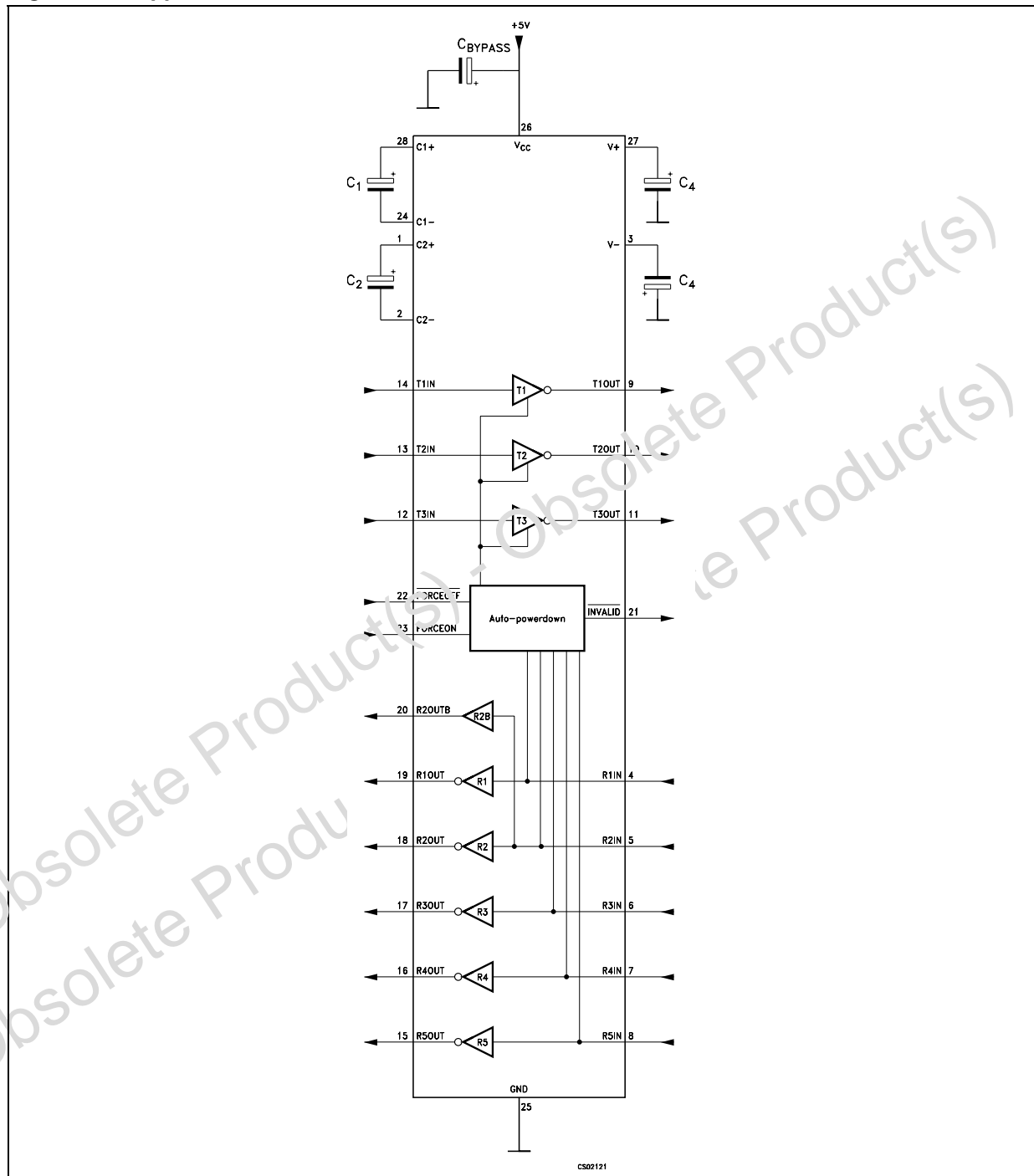


Table 14. Required minimum capacitance value (μF)

V_{CC} (V)	C_1	$C_2, C_3, C_4, C_{BYPASS}$
2.3 to 3.0	0.1	0.1

5 Timing diagrams

Figure 3. Auto-power-down input levels

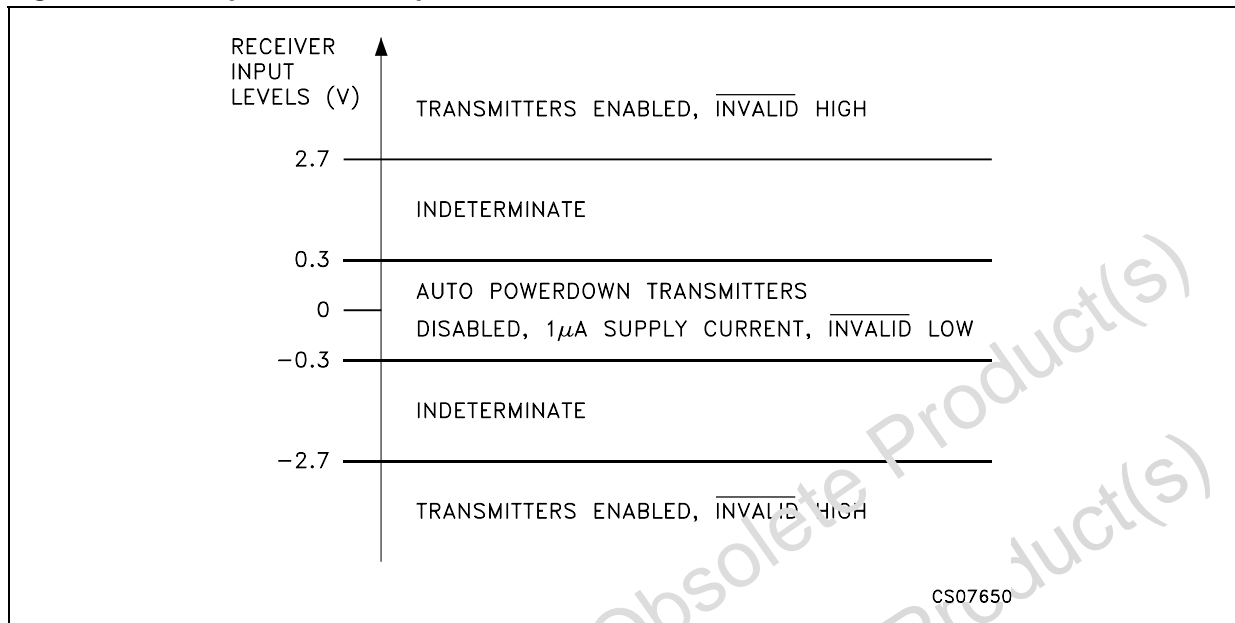


Figure 4. Auto-power-down input timing

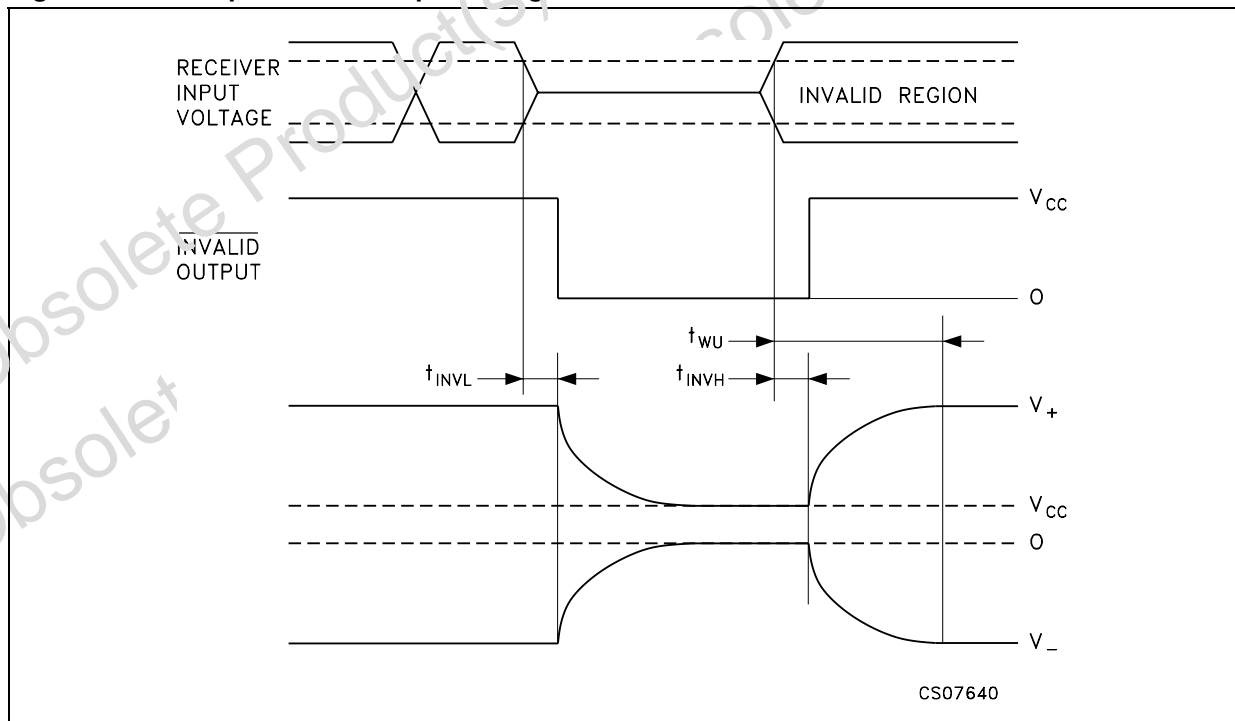
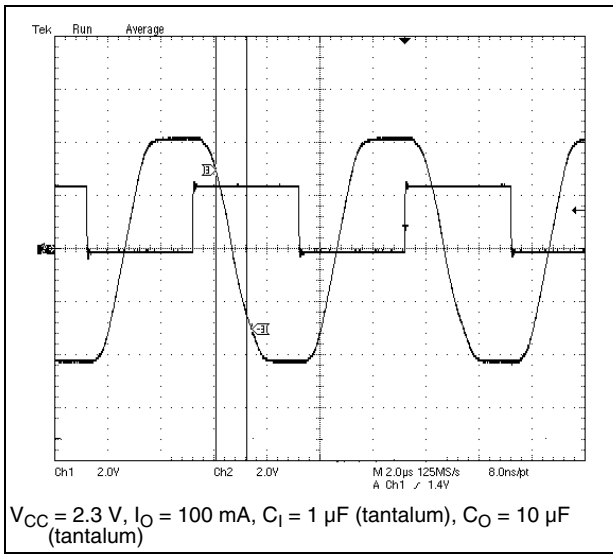


Figure 5. Data rate



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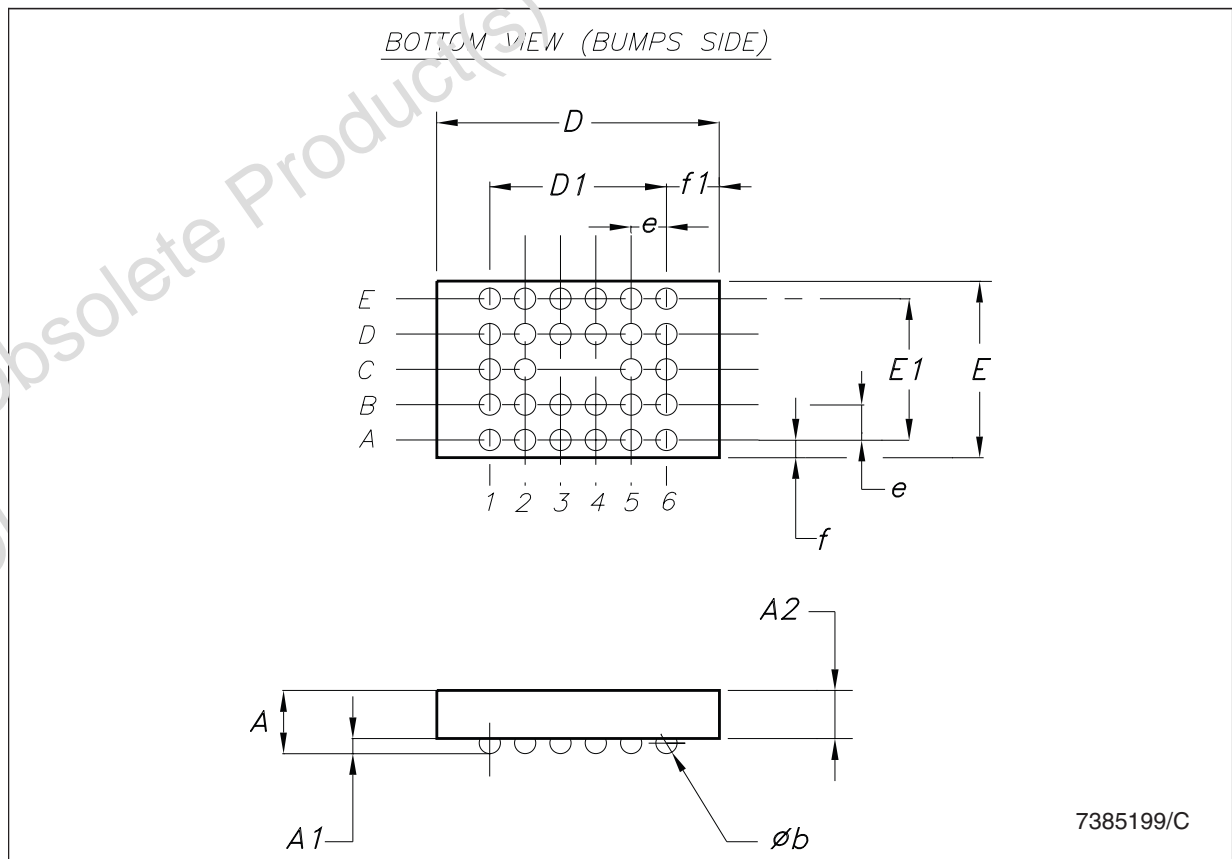
6 Package mechanical data

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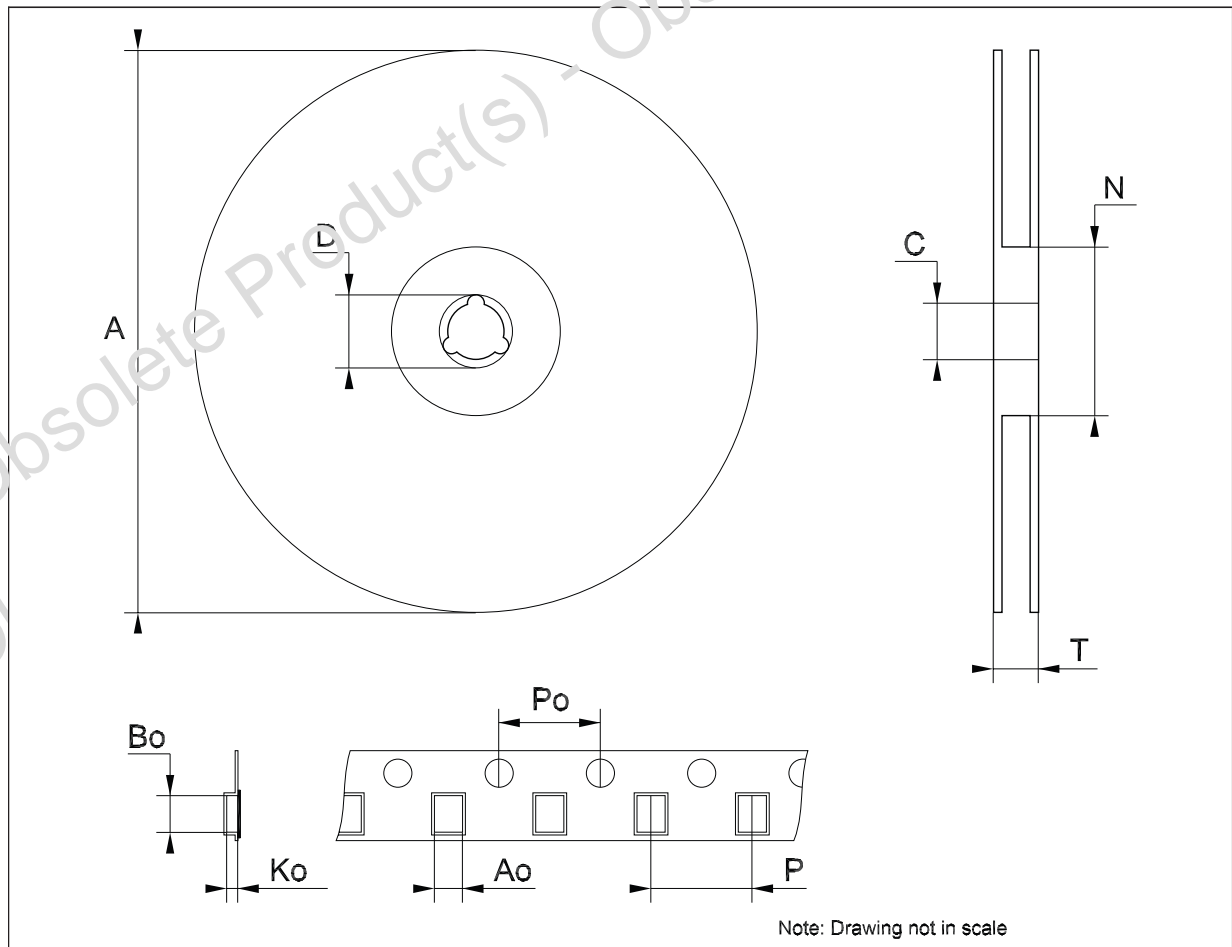
Flip-Chip28 mechanical data

Dim.	mm.			mils.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.83		0.95	32.7		37.4
A1		0.24			9.4	
A2		0.65			25.6	
b	0.25	0.30	0.35	9.8	11.8	13.9
D	3.97		4.17	156.3		164.2
D1		2.5			98.4	
E	2.47		2.67	97.2		105.1
E1		2			78.7	
e	0.45		0.55	17.7		21.7
f	0.23		0.34	9.1		13.4
f1	0.80		0.91	31.5		31.8



Tape & reel Flip-Chip28 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			18.4			0.882
Ao	2.6		2.8	0.102		0.110
Bo	4.1		4.3	0.161		0.169
Ko	1.1		1.3	0.043		0.051
Po	3.9		4.1	0.153		0.161
P	3.9		4.1	0.153		0.161



7 Revision history

Table 15. Document revision history

Date	Revision	Changes
02-May-2005	2	Removed: packages SOP, SSOP and TSSOP.
21-Jan-2009	3	Modified Table 1 on page 1 .

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