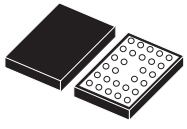
STLV3243E

±15KV ESD PROTECTED 2.3 TO 5.5V, 400KBPS, RS-232 TRANSCEIVER WITH AUTO-POWERDOWN

- ESD PROTECTION FOR RS-232 I/O PINS: ±8KV IEC 1000-4-2 CONTACT DISCHARGE ±15KV HUMAN BODY MODEL
- 1µA SUPPLY CURRENT ACHIEVED WHEN IN AUTO-POWERDOWN
- 250Kbps MINIMUM GUARANTEED DATA RATE
- GUARANTEED 6V/µs SLEW RATE RANGE
- GUARANTEED MOUSE DRIVEABILITY
- 0.1µF EXTERNAL CAPACITORS
- MEET EIA/TIA-562 SPECIFICATIONS
- AVAILABLE IN FLIP-CHIP28 PACKAGES



Flip-Chip28

DESCRIPTION

The STLV3243E device consists of 3 drivers, 5 receivers and a dual charge-pump circuit. All transmitter outputs and receiver inputs are protected up to ±8KV USING IEC 1000-4-2 contact discharge and ±15KV 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 250kbps while maintaining RS-562 output levels.

The Auto-powerdown feature operates when FORCEON is low and $\overline{\text{FORCEOFF}}$ is high. During this operation mode, if the device does not sense a valid RS-562 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 1µA. Disconnecting the serial port or turning off the peripheral drives causes the auto-powerdown condition to occur.

Auto-powerdown can be disabled when FORCEON and $\overline{\text{FORCEOFF}}$ are high, and this should be done when driving a serial mouse. With Auto-powerdown 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.

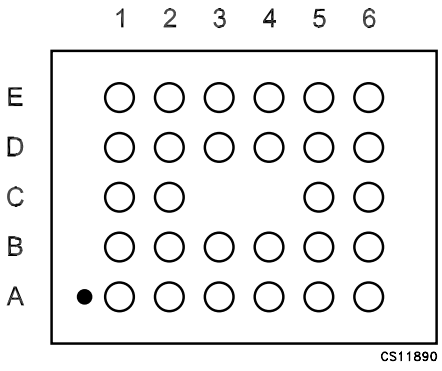
Table 1: Order Codes

Type	Temperature Range	Package	Comments
STLV3243EBJR	-40 to 85 °C	FLIP-CHIP28 (6x5mm)	2500 parts per reel

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-	-5.5V Generated by the Charge Pump
B2	$R1_{IN}$	First Receiver Input Voltage
B3	$T3_{OUT}$	Third Transmitter Output Voltage
B4	$T3_{IN}$	Third Transmitter Input Voltage
B5	$T1_{IN}$	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+	5.5V Generated by the Charge Pump
D3	V_{CC}	Supply Voltage
D4	FORCEON	Drive high to override automatic circuitry keeping transmitters on ($\overline{\text{FORCEOFF}}$ must be high)
D5	$R1_{OUT}$	First Receiver Output Voltage
D6	$R3_{OUT}$	Third Receiver Output Voltage
E1	GND	Ground
E2	C_1-	Negative Terminal of Voltage- Charge Pump Capacitor
E3	$\overline{\text{FORCEOFF}}$	Drive low to shut down transmitters and on-board power supply. This over-rides all automatic circuitry and FORCEON
E4	$\overline{\text{INVALID}}$	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

Figure 1: Pin Configuration



FLIP-CHIP 6x5
(bottom view, bumps side)

Table 3: Invalid Truth Table

RS-232 SIGNAL PRESENT AT ANY RECEIVER INPUT	$\overline{\text{INVALID}}$ OUTPUT
YES	H
NO	L

Table 4: Output Control Truth Table

FORCE ON	FORCE OFF	VALID RECEIVER LEVEL	OPERATION STATUS	T_{OUT}	R_{OUT}	R_{2OUTB}
X	0	X	Shutdown (Force OFF)	HIGH Z	HIGH Z	ACTIVE
1	1	X	Normal Operating (Force ON)	ACTIVE	ACTIVE	ACTIVE
0	1	YES	Normal Operating (Auto-powerdown)	ACTIVE	ACTIVE	ACTIVE
0	1	NO	Shutdown (Auto-power-down)	HIGH Z	ACTIVE	ACTIVE

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

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

Table 7: Electrical Characteristics

(C_1 - C_4 = 0.1µF, V_{CC} = 2.3V to 5.5V, 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-powerdown	$\overline{FORCEOFF}$ = GND $\overline{FORCEON}$ = V_{CC} All R_IN open or grounded		1	10	µA
I_{SUPPLY}	Supply Current	$\overline{FORCEON}$ = $\overline{FORCEOFF}$ = V_{CC}		0.3	1	mA
I_{SHDN}	Shutdown Supply Current	$\overline{FORCEOFF}$ = GND		1	10	µA

Table 8: Logic Input Electrical Characteristics

(C_1 - C_4 = 0.1µF, V_{CC} = 2.3V to 5.5V, 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, $\overline{FORCEOFF}$, V_{CC} = 3.0V V_{CC} = 2.3V			 0.8 0.5	 V V
V_{TIH}	Input Logic Threshold High	T-IN, FORCEON, $\overline{FORCEOFF}$ V_{CC} = 3.0V V_{CC} = 2.3V	 2 1.4			 V V
V_{THYS}	Transmitter Input Hysteresis			0.4		V
I_{IL}	Input Leakage Current	T-IN, FORCEON, $\overline{FORCEOFF}$		± 0.01	± 1.0	µA

Table 9: Receiver Outputs Electrical Characteristics
(C_1 - C_4 = 0.1µF, V_{CC} = 2.3V to 5.5V, 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_{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 10: Auto-powerdown Electrical Characteristics
(C_1 - C_4 = 0.1µF, V_{CC} = 2.3V to 5.5V, T_A = -40 to 85°C, unless otherwise specified.
Typical values are referred to T_A = 25°C, FORCEON = GND, $\overline{\text{FORCEOFF}}$ = V_{CC})

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{RITE}	Receiver Input Threshold to INVALID Output Voltage HIGH (Fig. 1)	Positive Threshold			2.7	V
		Negative Threshold	2.7			V
V_{RITD}	Receiver Input Threshold to INVALID Output Voltage LOW (Fig. 1)		-0.3		0.3	V
V_{IOL}	INVALID Output Voltage LOW	I_{OUT} = 1.6mA			0.4	V
V_{IOH}	INVALID Output Voltage HIGH	I_{OUT} = -1mA	V_{CC}-0.6			V
t_{WU}	Receiver or Transmitter Edge Transmitter Enabled (Fig. 1)			100		µs
t_{invh}	Receiver Positive or Negative Threshold to INVALID HIGH (Fig. 1)			0.2		µs
t_{invL}	Receiver Positive or Negative Threshold to INVALID LOW (Fig. 1)			30		µs

Table 11: Transmitter Electrical Characteristics
(C_1 - C_4 = 0.1µF, V_{CC} = 2.3V to 5.5V, 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 V_{CC} = 3.0V V_{CC} = 2.3V	 ± 3.7	 ± 4.4 ± 3.9		V
R_{OUT}	Output Resistance	V_{CC} = V+ = V- = 0V V_{OUT} = ± 2V	300	10M		Ω
I_{SC}	Output Short Circuit Current	V_{CC} = 3.3V		± 40	± 60	mA
I_L	Output Leakage Current	V_{CC} = 0 to 5.5V, transmitter output =±12V, transmitter disabled			± 25	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	± 3.7			V

Table 12: Receiver Inputs Electrical Characteristics
(C_1 - C_4 = 0.1µF, V_{CC} = 2.3V to 5.5V, 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} = 3.0V T_A = 25°C V_{CC} = 2.3V	0.6 0.4	1.0 0.8		V
V_{RIH}	RS-232 Input Threshold High	T_A = 25°C V_{CC} = 3.0V T_A = 25°C V_{CC} = 2.3V		1.4 1.2	2.4 2.0	V
V_{RIHYS}	Input Hysteresis			0.5		V
R_{RIN}	Input Resistance	T_A = 25°C	3	5	7	KΩ

Table 13: Timing Characteristics
(C_1 - C_4 = 0.1µF, V_{CC} = 2.3 to 3V, 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			Kbps
t_{PHL} t_{PLH}	Receiver Propagation Delay	R_{IN} to R_{OUT} C_L = 150pF		0.15		µs
t_{T_SKEW}	Transmitter Skew			60		ns
t_{R_SKEW}	Receiver Skew			120		ns
S_{RT}	Transition Slew Rate	T_A = 25°C R_L = 3K to 7KΩ V_{CC} = 3V measured from +3V to -3V or -3V to +3V C_L = 150pF to 1000pF	4		30	V/µs

Figure 2: Application Circuits

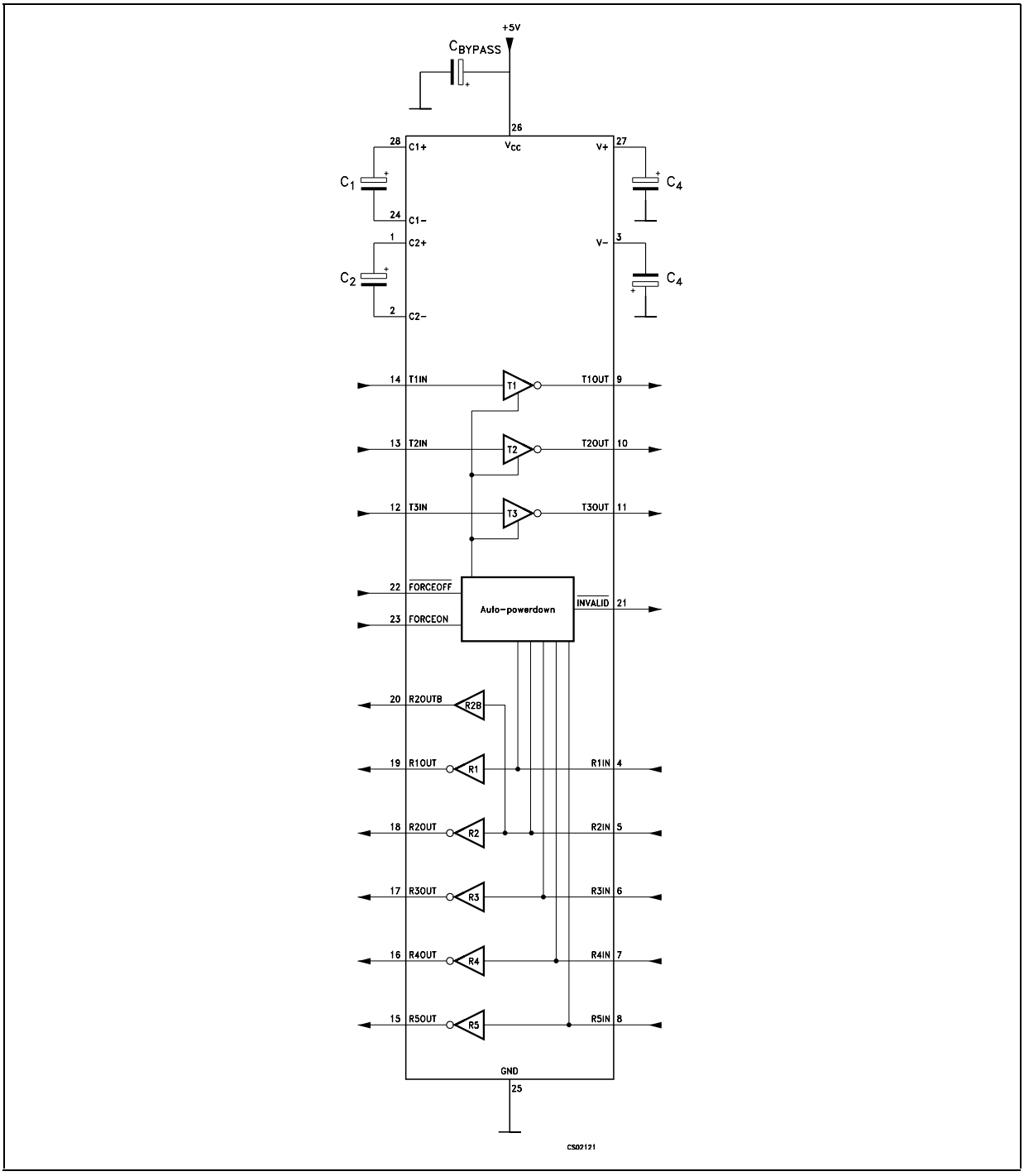


Table 14: Required Minimum Capacitance Value (µF)

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

Figure 3: Autopowerdown Input Levels

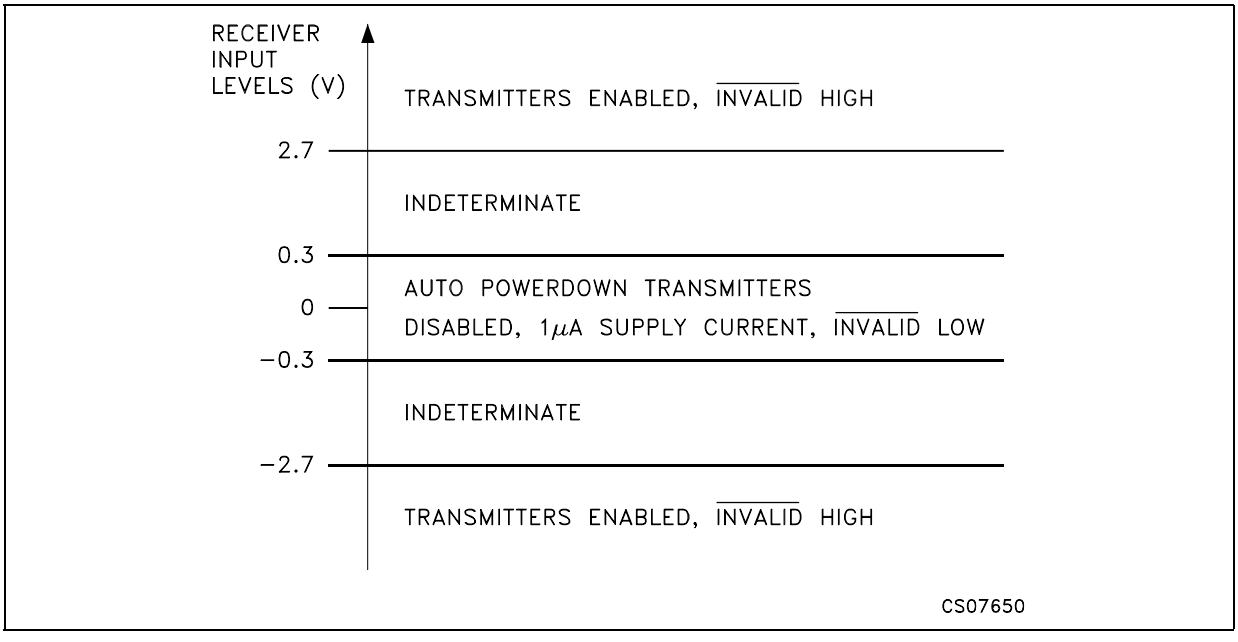


Figure 4: Autopowerdown Input Timing

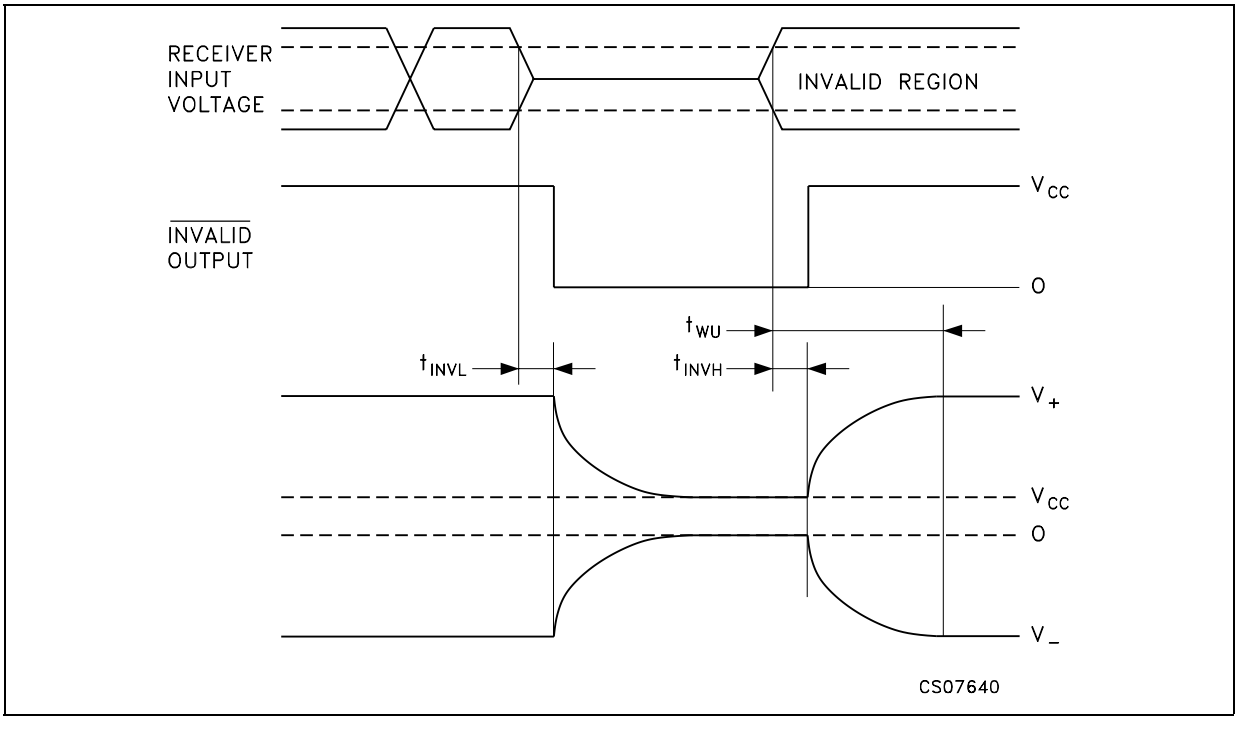
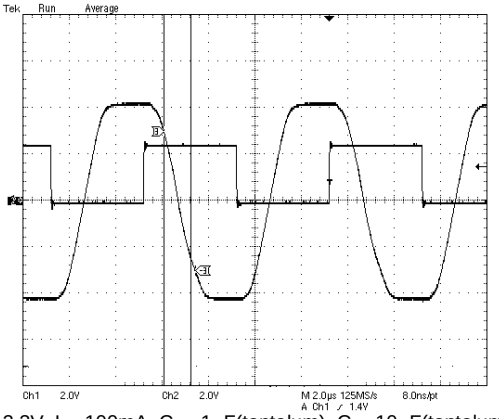


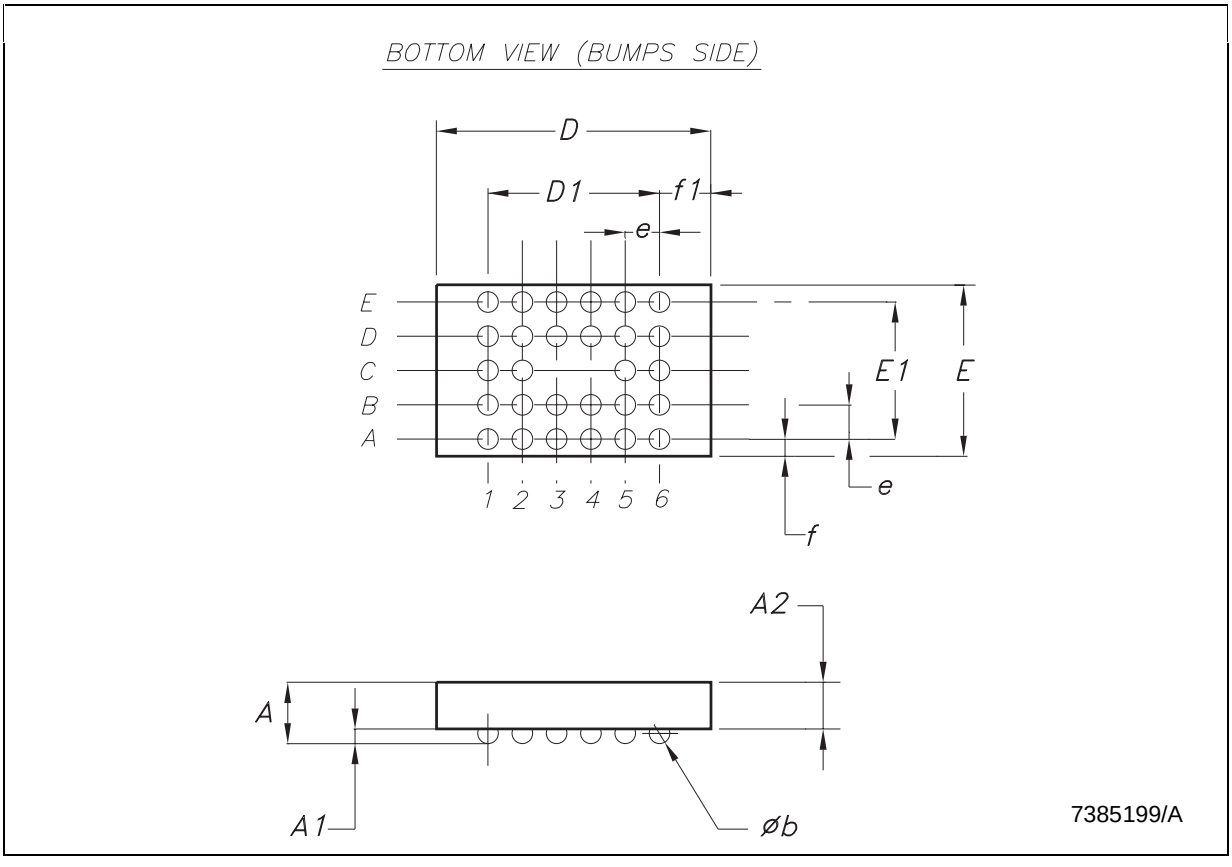
Figure 5: Data Rate



V_{CC}=2.3V, I_O=100mA, C_I = 1µF(tantalum), C_O=10µF(tantalum)

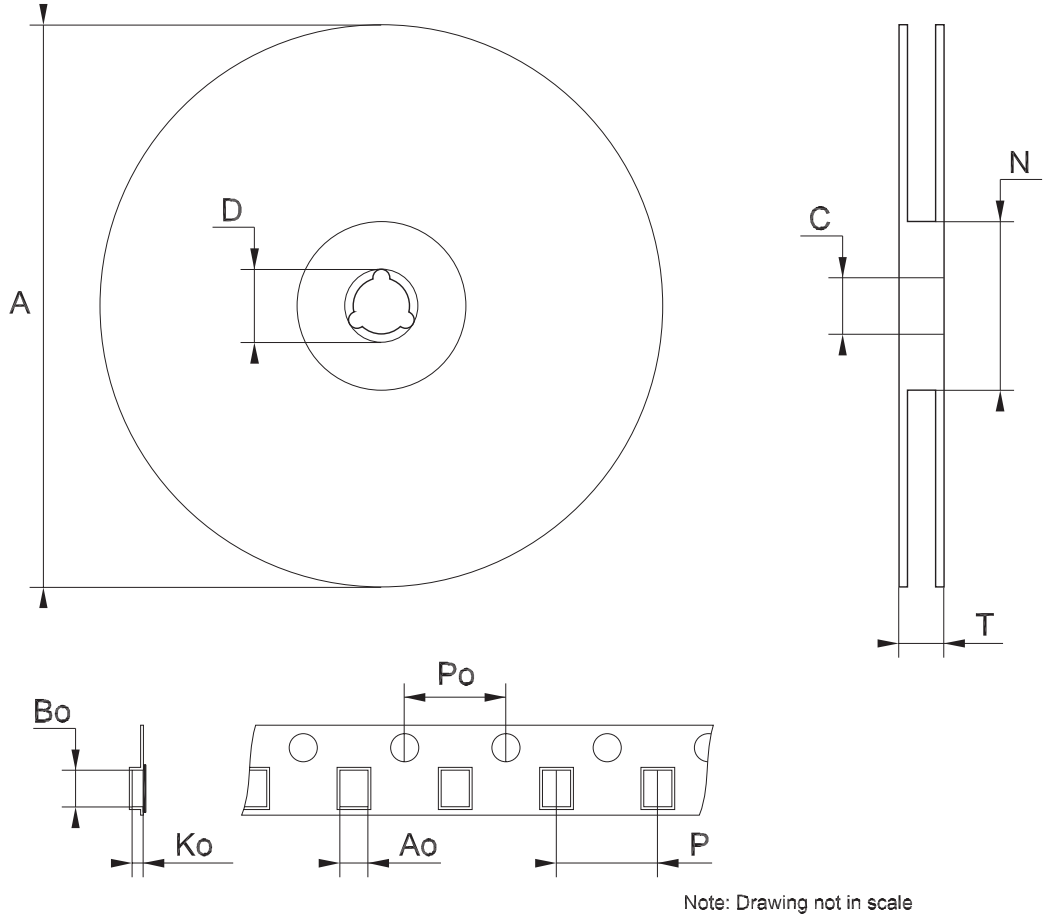
Flip-Chip28 MECHANICAL DATA

DIM.	mm.			mils		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	0.58		0.95	22.8		37.4
A1		0.24			9.4	
A2		0.65			25.6	
b	0.25	0.30	0.35	9.8	11.8	13.8
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



Note: Drawing not in scale

Table 15: Revision History

Date	Revision	Description of Changes
02-May-2005	2	The Packages SOP, SSOP and TSSOP have been obsoleted.