# 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 SO-28, SSOP-28, TSSOP28 AND FLIP-CHIP28 PACKAGES

SOP   Flip-Chip28

SSOP   TSSOP

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 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 (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 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.

ORDERING CODES

| Type	Temperature Range	Package	Comments
STLV3243ECD	0 to 70 °C	SO-28 (Tube)	27parts per tube / 12tube per box
STLV3243EBD	-40 to 85 °C	SO-28 (Tube)	27parts per tube / 12tube per box
STLV3243CDR	0 to 70 °C	SO-28 (Tape & Reel)	1000 parts per reel
STLV3243EBDR	-40 to 85 °C	SO-28 (Tape & Reel)	1000 parts per reel
STLV3243ECPR	0 to 70 °C	SSOP-28 (Tape & Reel)	1350 parts per reel
STLV3243EBPR	-40 to 85 °C	SSOP-28 (Tape & Reel)	1350 parts per reel
STLV3243ECTR	0 to 70 °C	TSSOP28 (Tape & Reel)	2500 parts per reel
STLV3243EBTR	-40 to 85 °C	TSSOP28 (Tape & Reel)	2500 parts per reel
STLV3243ECJR	0 to 70 °C	FLIP-CHIP28	coming soon
STLV3243EBJR	-40 to 85 °C	FLIP-CHIP28	coming soon

STLV3243E

PIN DESCRIPTION
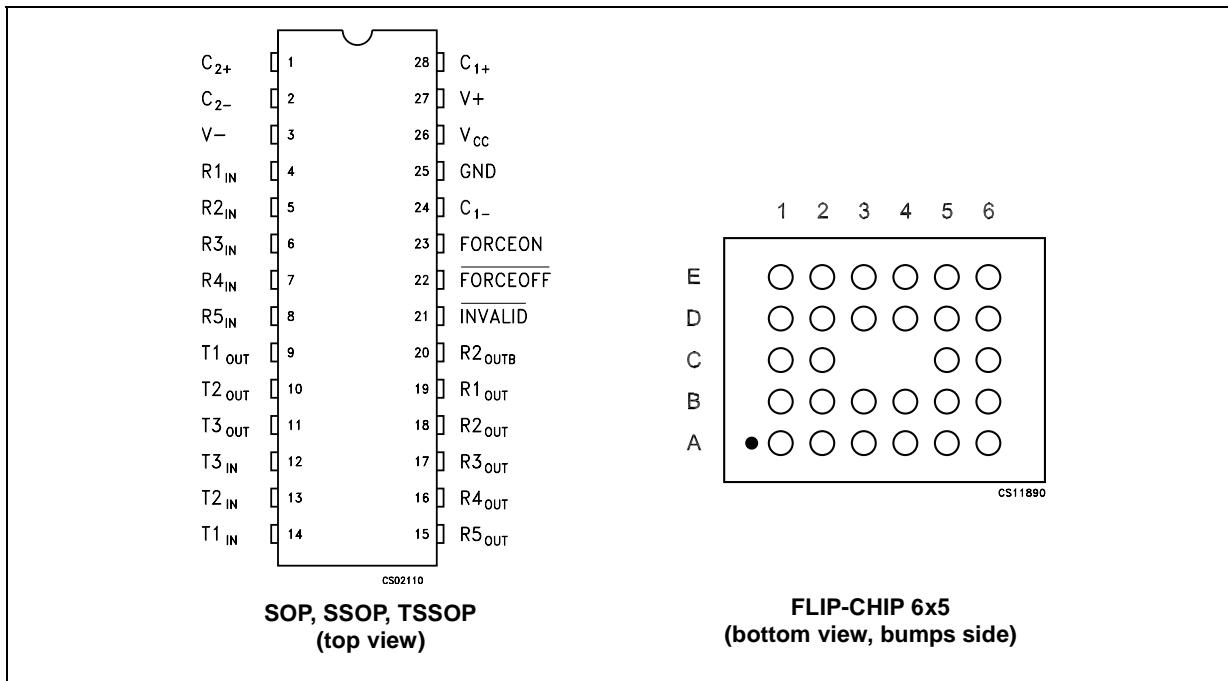
PIN N°	SYMBOL	NAME AND FUNCTION
1	C_2+	Positive Terminal of Inverting Charge Pump Capacitor
2	C_2-	Negative Terminal of Inverting Charge Pump Capacitor
3	V-	-5.5V Generated by the Charge Pump
4	$R1_{IN}$	First Receiver Input Voltage
5	$R2_{IN}$	Second Receiver Input Voltage
6	$R3_{IN}$	Third Receiver 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
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 over-rides all automatic circuitry and FORCEON
23	FORCEON	Drive high to override automatic circuitry keeping transmitters on (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

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 (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	$\overline{FORCEOFF}$	Drive low to shut down transmitters and on-board power supply. This over-rides all automatic circuitry and FORCEON
E4	$\overline{INVALID}$	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

PIN CONFIGURATION

C_{2+} — 1	28 — C_{1+}
C_{2-} — 2	27 — V+
V− — 3	26 — V_{CC}
$R1_{IN}$ — 4	25 — GND
$R2_{IN}$ — 5	24 — C_{1-}
$R3_{IN}$ — 6	23 — FORCEON
$R4_{IN}$ — 7	22 — $\overline{FORCEOFF}$
$R5_{IN}$ — 8	21 — $\overline{INVALID}$
$T1_{OUT}$ — 9	20 — $R2_{OUTB}$
$T2_{OUT}$ — 10	19 — $R1_{OUT}$
$T3_{OUT}$ — 11	18 — $R2_{OUT}$
$T3_{IN}$ — 12	17 — $R3_{OUT}$
$T2_{IN}$ — 13	16 — $R4_{OUT}$
$T1_{IN}$ — 14	15 — $R5_{OUT}$

CS02110

SOP, SSOP, TSSOP
(top view)

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

CS11890

INVALID TRUTH TABLE

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

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

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
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.

ESD PERFORMANCE: TRANSMITTER OUTPUTS, RECEIVER INPUTS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
ESD	ESD Protection Voltage	Human Body Model	$\pm$ 15			KV
ESD	ESD Protection Voltage	IEC 1000-4-2 (Contact Discharge)	$\pm$ 8			KV

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	FORCEOFF = GND FORCEON = V_{CC} All R_IN open or grounded		1	10	µA
I_{SUPPLY}	Supply Current	FORCEON = FORCEOFF = V_{CC}		0.3	1	mA
I_{SHDN}	Shutdown Supply Current	FORCEOFF = GND		1	10	µA

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, FORCEOFF, V_{CC} = 3.0V V_{CC} = 2.3V			0.8 0.5	V V
V_{TIH}	Input Logic Threshold High	T-IN, FORCEON, 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, FORCEOFF		$\pm$ 0.01	$\pm$ 1.0	µA

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

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, $\overline{FORCEOFF}$ = 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

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
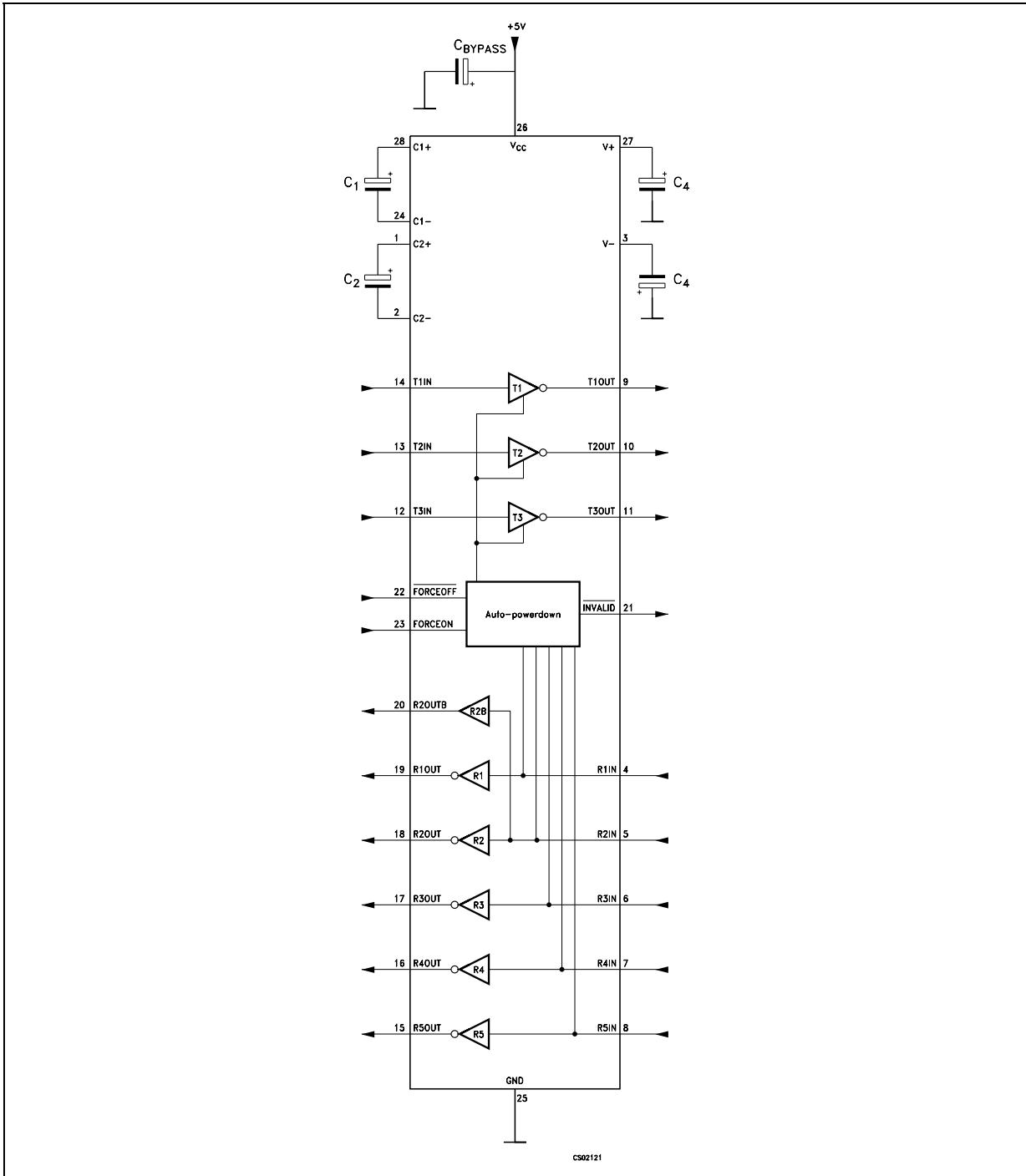
RECEIVER INPUTS ELECTRICAL CHARACTERISTICS

(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

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
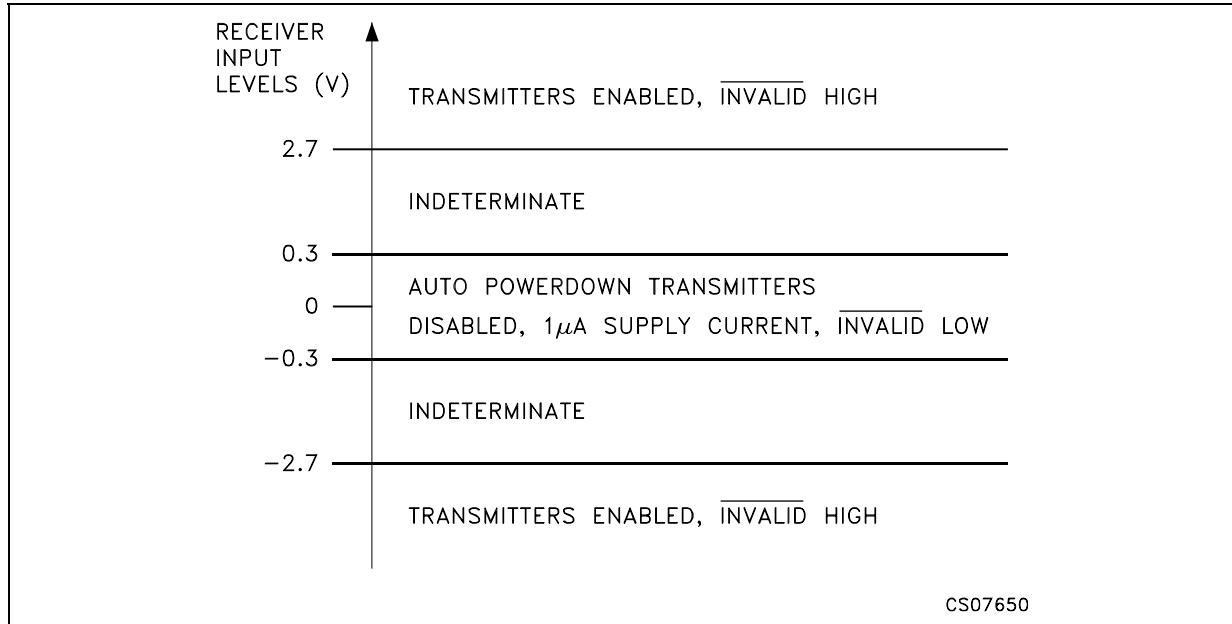
APPLICATION CIRCUITS
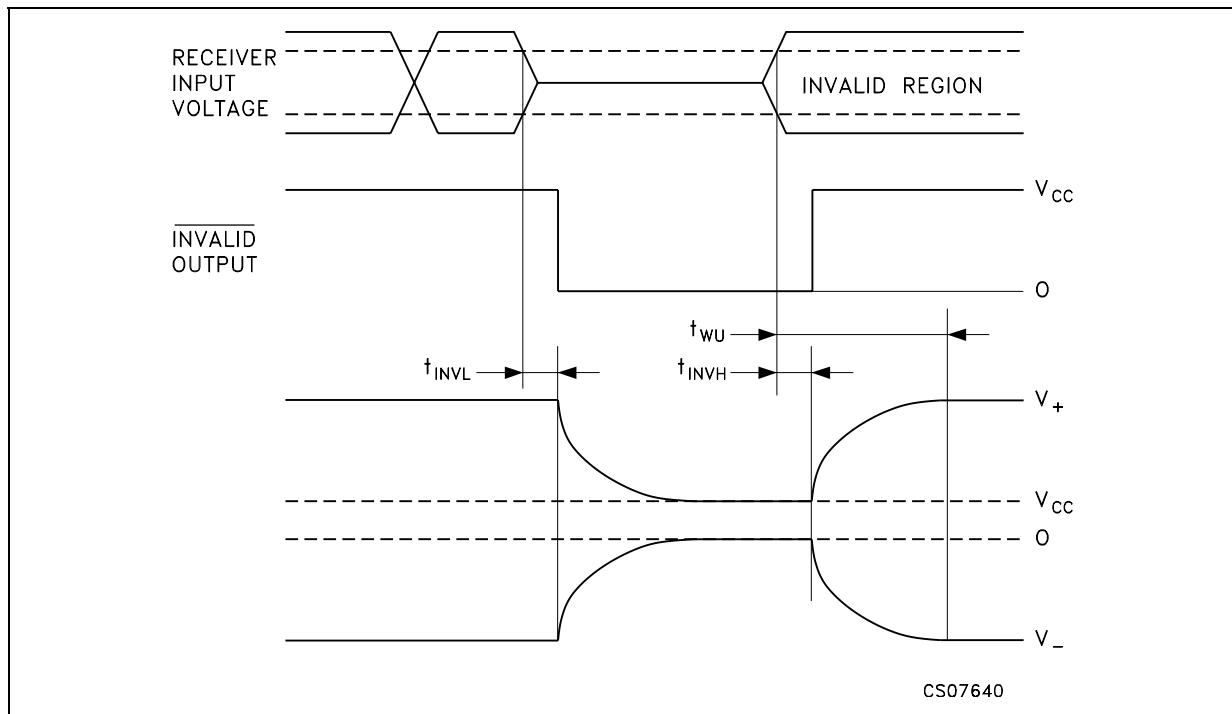
REQUIRED MINIMUM CAPACITANCE VALUE (μF)

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

AUTOPOWERDOWN INPUT LEVELS

RECEIVER
INPUT
LEVELS (V)

TRANSMITTERS ENABLED, $\overline{\text{INVALID}}$ HIGH

2.7 ——————

INDETERMINATE

0.3 ——————

0 ——

AUTO POWERDOWN TRANSMITTERS
DISABLED, 1μA SUPPLY CURRENT, $\overline{\text{INVALID}}$ LOW

−0.3 ——————

INDETERMINATE

−2.7 ——————

TRANSMITTERS ENABLED, $\overline{\text{INVALID}}$ HIGH

CS07650
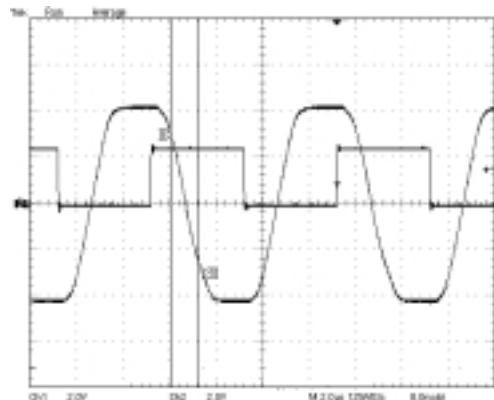
AUTOPOWERDOWN INPUT TIMING

RECEIVER
INPUT
VOLTAGE

INVALID REGION

V_{CC}

$\overline{\text{INVALID}}$
OUTPUT

0

t_{WU}

t_{INVL}

t_{INVH}

V_+

V_{CC}

0

V_-

CS07640

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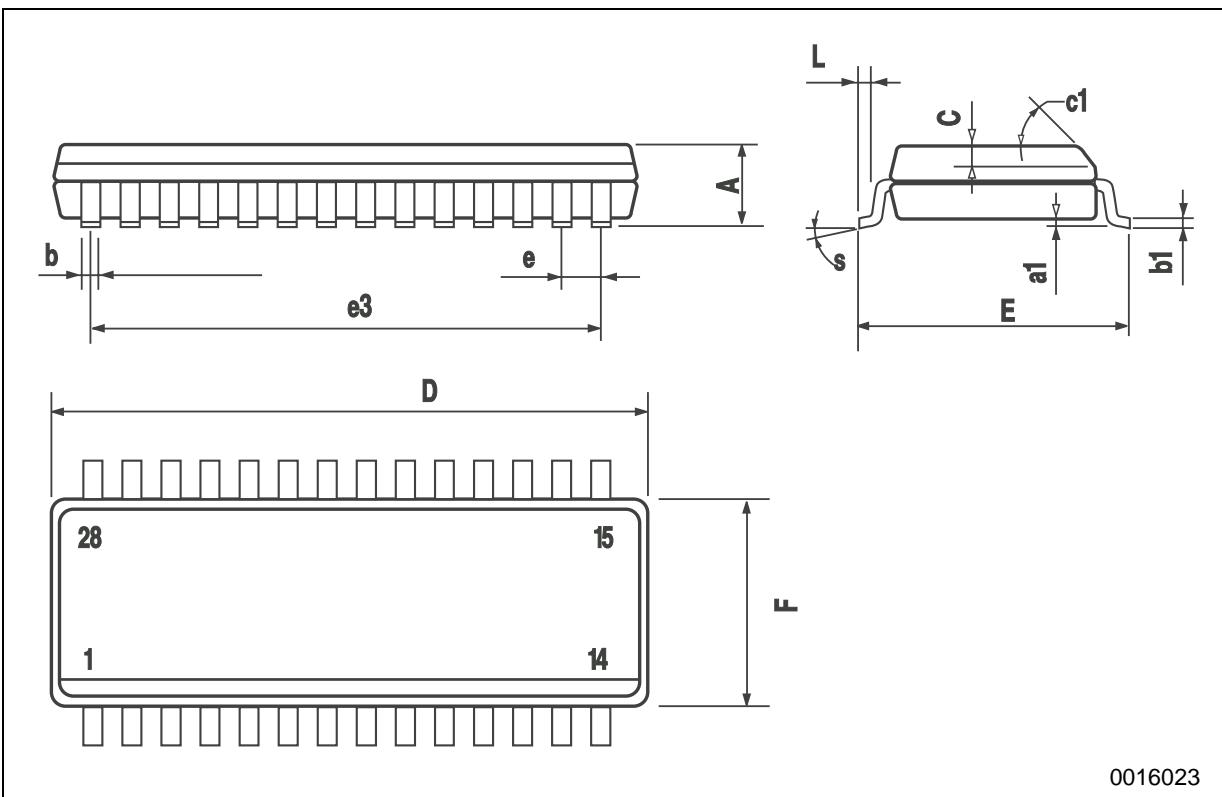
V_{CC}=2.3V, I_O=100mA, C_I = 1µF(tantalum), C_O=10µF(tantalum)

Figure 2 : Receiver shutdown and Powerup

V_I=12 V, I_O=from 0.1A to 7.5A, C_I = 10µF(tantalum), C_O=10µF(tantalum)

SO-28 MECHANICAL DATA
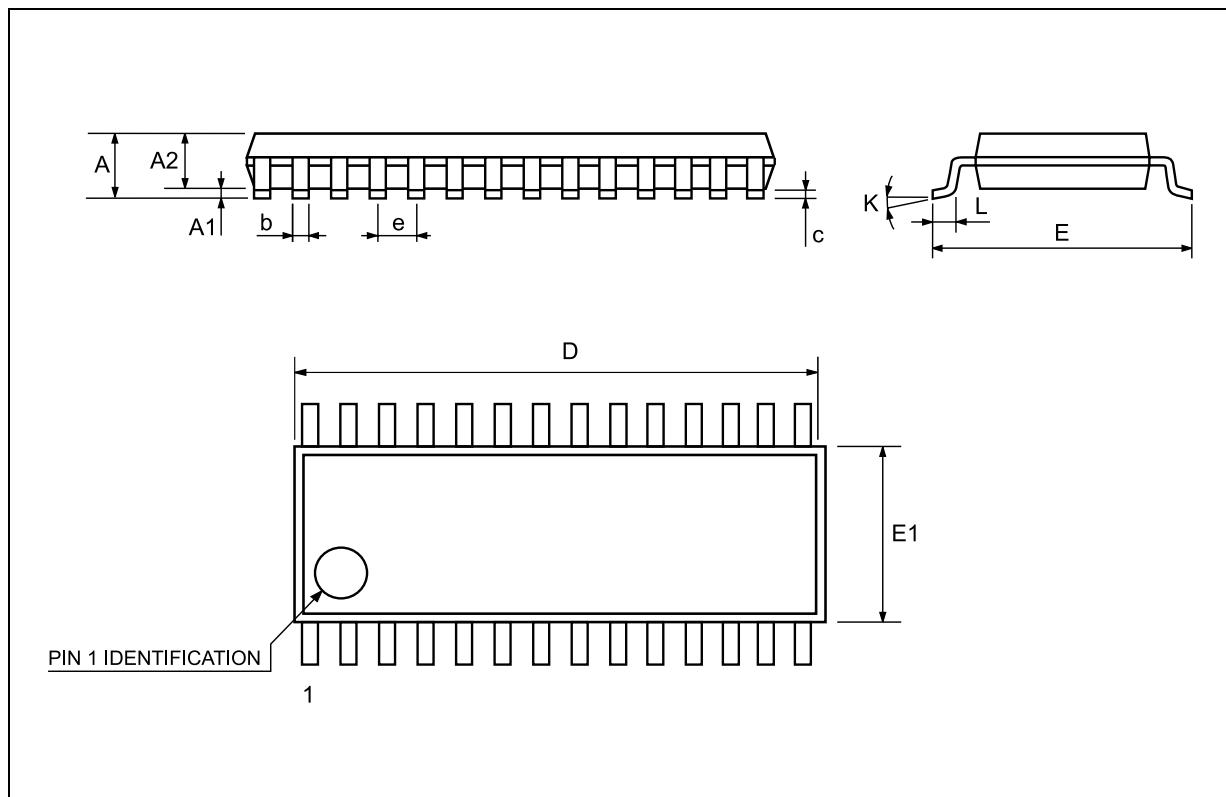
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.1		0.3	0.004		0.012
b	0.35		0.49	0.014		0.019
b1	0.23		0.32	0.009		0.012
C		0.5			0.020	
c1	45° (typ.)					
D	17.70		18.10	0.697		0.713
E	10.00		10.65	0.393		0.419
e		1.27			0.050	
e3		16.51			0.650	
F	7.40		7.60	0.291		0.300
L	0.50		1.27	0.020		0.050
S	8° (max.)					

0016023
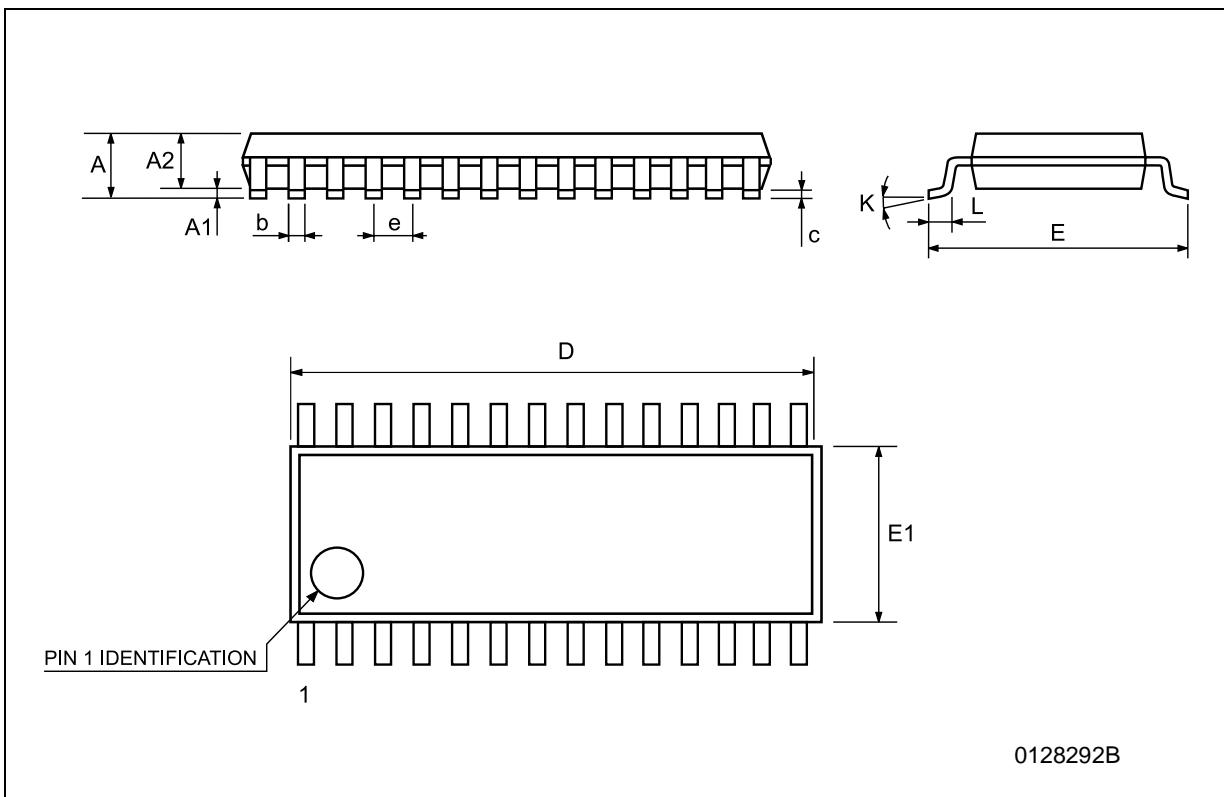
SSOP28 MECHANICAL DATA

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

PIN 1 IDENTIFICATION

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

PIN 1 IDENTIFICATION

1

0128292B

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
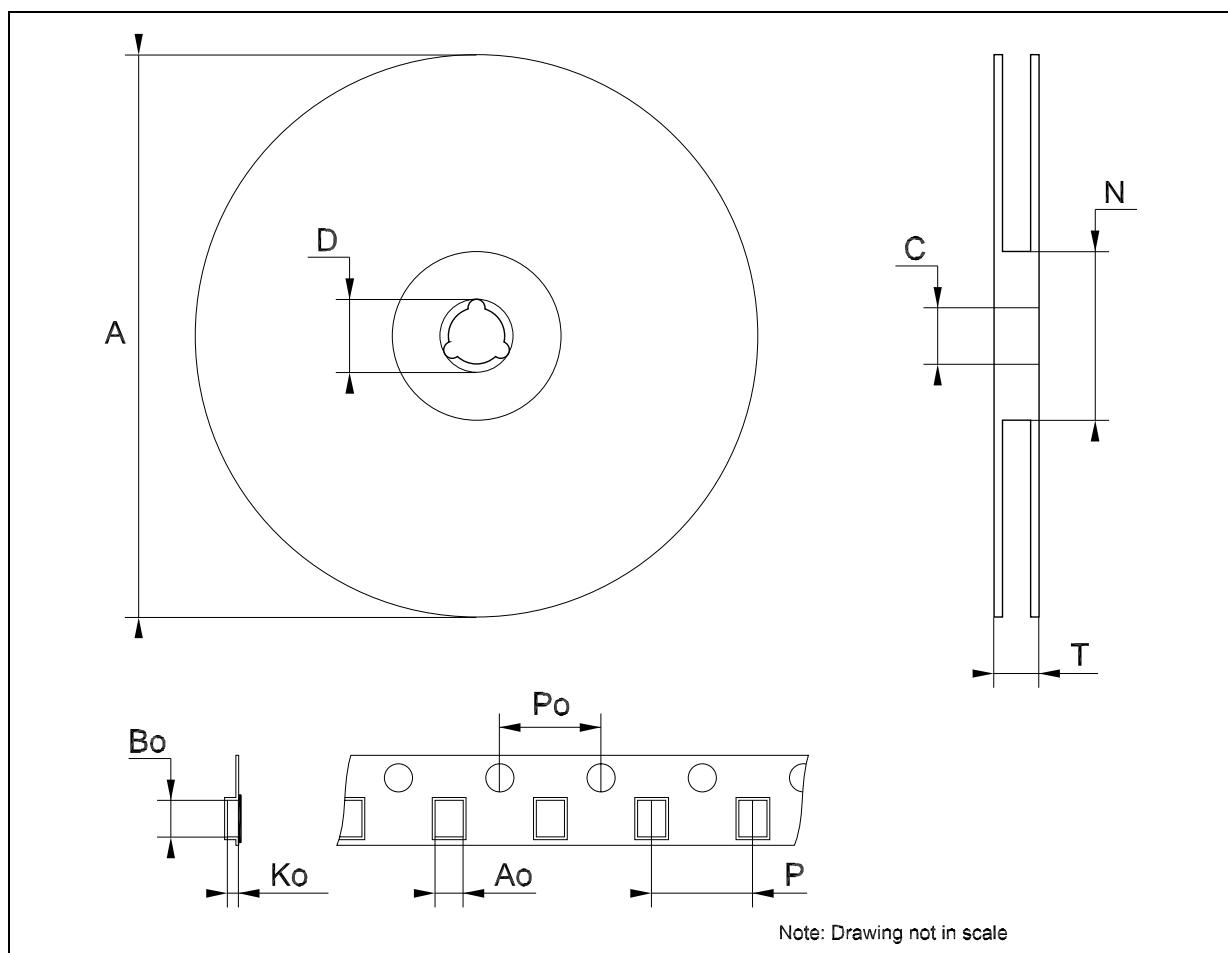
BOTTOM VIEW (BUMPS SIDE)

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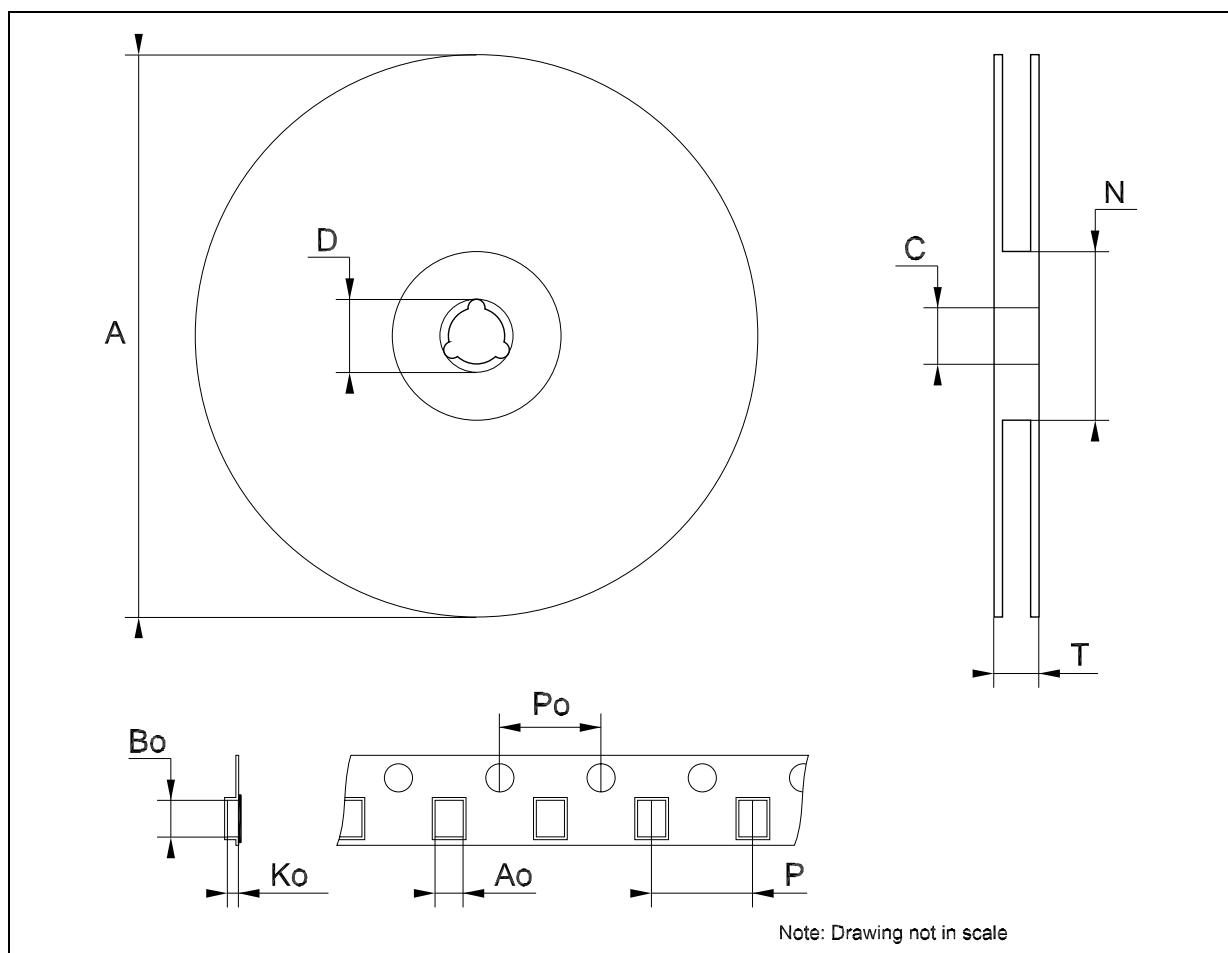
Tape & Reel SO-28 MECHANICAL DATA

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			30.4			1.197
Ao	10.8		11.0	0.425		0.433
Bo	18.2		18.4	0.716		0.724
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
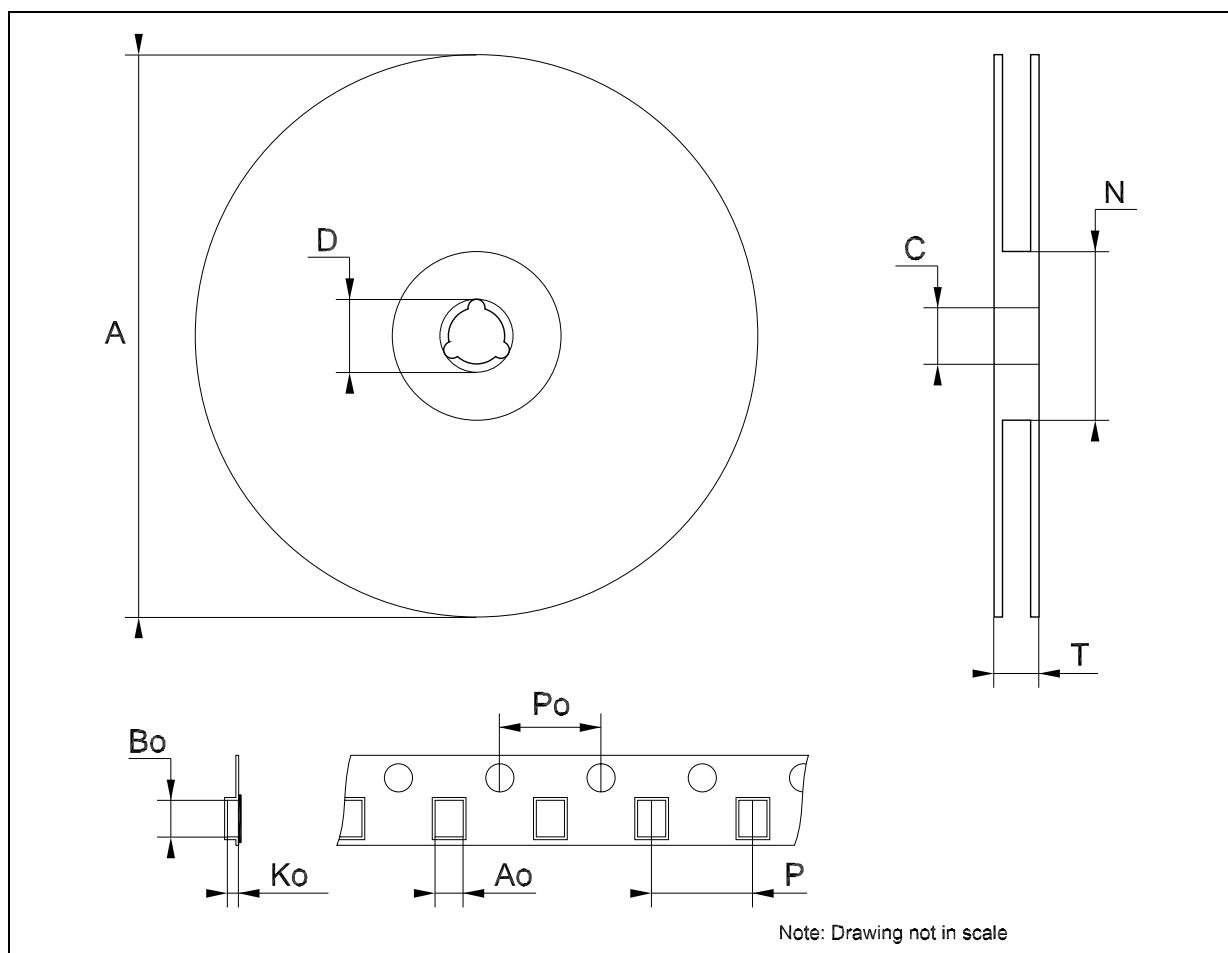
Tape & Reel SSOP28 MECHANICAL DATA

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
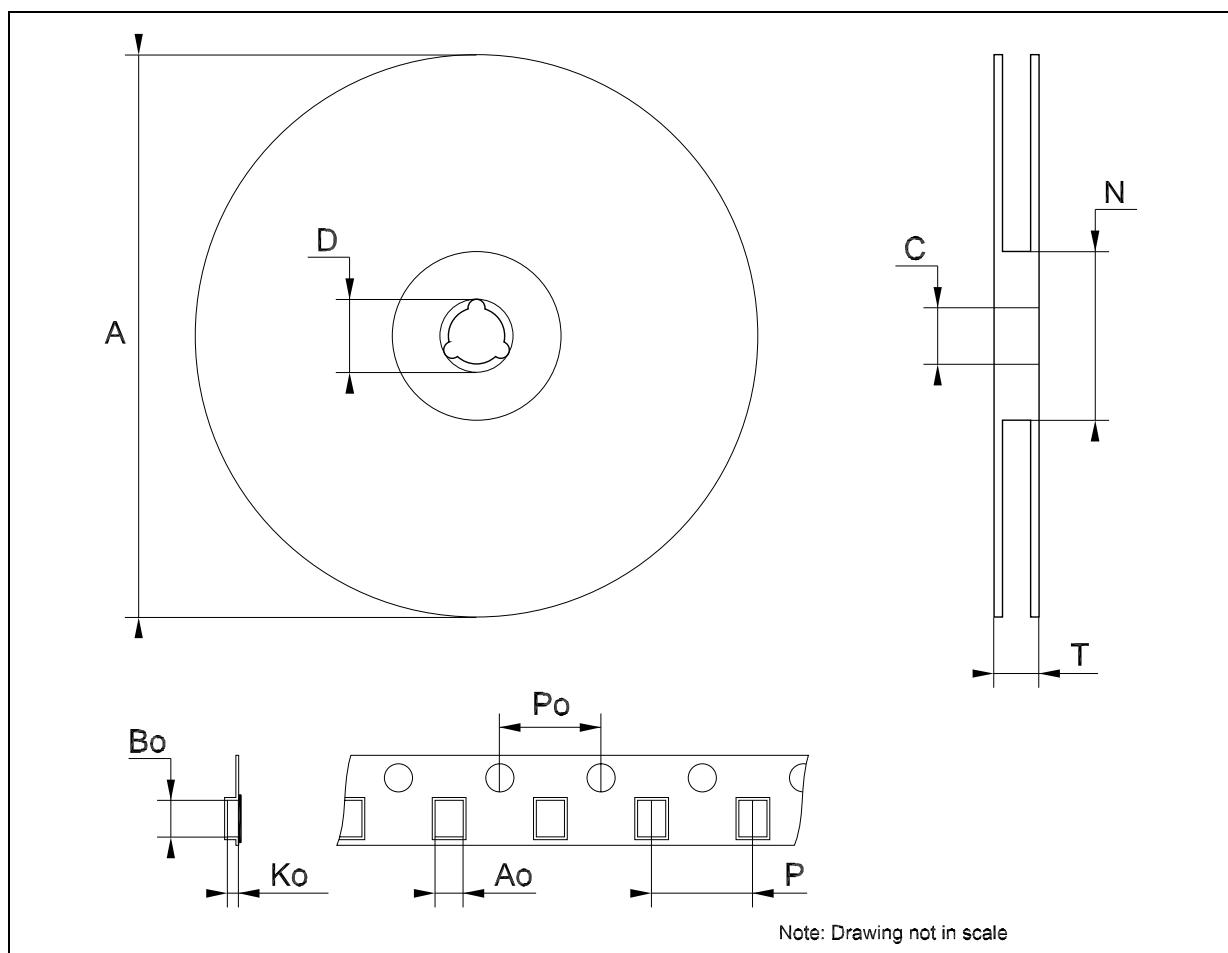
Tape & Reel TSSOP28 MECHANICAL DATA

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

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