3V to 5.5V，250kbps RS-232 Transceivers

Description

The BL13232E consists of two drivers, two receivers, and a dual charge-pump circuit with ±12kV IEC 61000-4-2 Contact Discharge ESD protection.

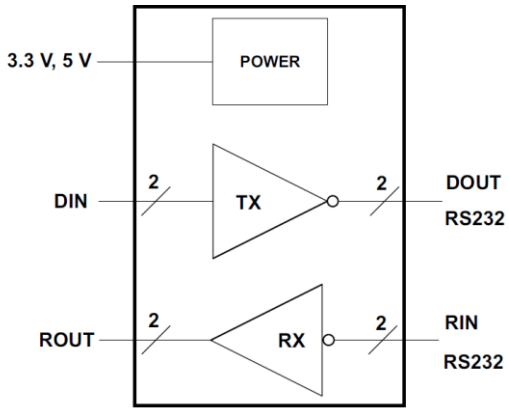
The BL13232E meets the requirements of TIA/EIA-232-F and provides the electrical interface between an asynchronous communication controller and the serial-port connector. The charge pump and four small external capacitors allow operation from a single 3V to 5.5V supply. The device operates at data signaling rates up to 250 kbps.

The BL13232E is available in SOP16 and TSSOP16 package.

Features

- ESD protection for RS-232 Bus Pins
  - ±12kV (IEC61000-4-2, Contact Discharge)
  - ±15kV (IEC61000-4-2, Air-Gap Discharge)
- Meets the Requirements of TIA/EIA-232-F standard
- Wide Power Supply Range: Single +3V to +5.5V
- Operates up to 250kbps
- Two Drivers and Two Receivers
- External Capacitors: 4 × 0.1 μF
- Accepts 5V Logic Input With 3.3V Supply

Function Block



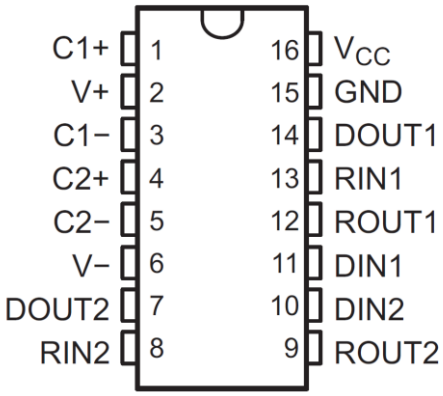
Applications

- Battery-Powered Equipment
- Industry Human Machine Interface
- Notebook, Computers
- Printers

Ordering Information

Part Number	Package	Operation Temp.
BL13232ESO	SOP16	-40~ + 125℃
BL13232ETS	TSSOP16	-40~ + 125℃

Pin Configuration and Functions



PIN NO.	NAME	I/O	DESCRIPTION
1	C1+	—	Positive lead of C1 capacitor
2	V+	O	Positive charge pump output for storage capacitor only
3	C1–	—	Negative lead of C1 capacitor
4	C2+	—	Positive lead of C2 capacitor
5	C2–	—	Negative lead of C2 capacitor
6	V–	O	Negative charge pump output for storage capacitor only
7	DOUT2	O	RS232 Driver Output
8	RIN2	I	RS232 Receiver Input
9	ROUT2	O	TTL/CMOS Receiver Output
10	DIN2	I	TTL/CMOS Driver Input
11	DIN1	I	TTL/CMOS Driver Input
12	ROUT1	O	TTL/CMOS Receiver Output
13	RIN1	I	RS232 Receiver Input
14	DOUT1	O	RS232 Driver Output
15	GND	—	Ground
16	VCC	—	Supply Voltage

Absolute Maximum Ratings

			MIN	MAX	UNIT
V_{CC}	Supply voltage		-0.3	6	V
V+	Positive output supply voltage		-0.3	7	V
V–	Negative output supply voltage		0.3	-7	V
V+ – V–	Supply voltage difference			13	V
V_I	Input voltage	Drivers	-0.3	6	V
		Receivers	-25	25	V
V_O	Output voltage	Drivers	-13.2	13.2	V
		Receivers	-0.3	VCC + 0.3	V
T_J	Operating virtual junction temperature			150	°C
T_{stg}	Storage temperature		-65	150	°C

Note 1 ： Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

Recommended Operating Conditions

(Test conditions: C1–C4 = 0.1μF at V_{CC} = 3.3V±0.3V; C1 = 0.047μF, C2–C4 = 0.33μF at V_{CC} = 5V±0.5V)

				MIN	NOM	MAX	UNIT
	Supply voltage		V_{CC} = 3.3 V	3	3.3	3.6	V
			V_{CC} = 5 V	4.5	5	5.5	
V_{IH}	Driver high-level input voltage	DIN	V_{CC} = 3.3 V	2		5.5	V
			V_{CC} = 5 V	2.4		5.5	
V_{IL}	Driver low-level input	DIN		0		0.8	V
V_I	Receiver input voltage	RIN		–25		25	V
T_A	Operating free-air temperature			–40		125	℃

Electrical Characteristics

(Test conditions: C1–C4 = 0.1μF at V_{CC} = 3.3V±0.3V; C1 = 0.047μF, C2–C4 = 0.33μF at V_{CC} = 5V±0.5V, T_A = -40~125℃, unless otherwise noted. Typical values are at T_A = +25°C.)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
I_{CC}	Supply current	No load, V_{CC} = 3.3 V or 5 V		1.5		mA
Driver						
V_{OH}	High-level output voltage	DOUT at R_L = 3 kΩ to GND, DIN = GND	5	5.4		V
V_{OL}	Low-level output voltage	DOUT at R_L = 3 kΩ to GND, DIN = V_{CC}	–5	–5.4		V
I_{IH}	High-level input current	V_I = V_{CC}		±0.01	±1	μA
I_{IL}	Low-level input current	V_I at GND		±0.01	±1	μA
I_{OS}	Short-circuit output current	V_{CC} = 3.6 V, V_O = 0 V		±30	±60	mA
		V_{CC} = 5.5 V, V_O = 0 V				
r_O	Output resistance	V_{CC}, V+, and V– = 0 V, V_O = ±2 V	300	10M		Ω
Receiver						
V_{OH}	High-level output voltage	I_{OH} = –1 mA	V_{CC} – 0.6	V_{CC} – 0.1		V
V_{OL}	Low-level output voltage	I_{OL} = 1.6 mA			0.4	V
V_{IT+}	Positive-going input threshold voltage	VCC = 3.3 V		1.5	2.4	V
		VCC = 5 V		2.0	2.4	
$V_{IT–}$	Negative-going input threshold voltage	VCC = 3.3 V	0.6	1.1		V
		VCC = 5 V	0.8	1.5		
V_{hys}	Input hysteresis (V_{IT+} – $V_{IT–}$)			0.4		V
r_i	Input resistance	VI = ±3 V to ±25 V	3	5	7	kΩ

Note 2：Short-circuit durations should be controlled to prevent exceeding the device absolute power dissipation ratings, and not more than one output should be shorted at a time.

Switching Characteristics

(Test conditions: C1–C4=0.1μF at V_{CC}=3.3V±0.3V; C1=0.047μF, C2–C4=0.33μF at V_{CC}=5V±0.5V, T_A = -40~125℃, unless otherwise noted. Typical values are at TA = +25°C.)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
	Maximum data rate	R_L = 3 kΩ, C_L = 1000 pF, One DOUT switching		250			kbps
$t_{sk(p)}$	Driver pulse skew	R_L = 3 kΩ to 7 kΩ, C_L = 150 pF to 2500 pF, see Figure 1			100		ns
SR(tr)	Driver slew rate, transition region	R_L = 3 kΩ to 7 kΩ, V_{CC} = 3.3 V	C_L = 150 pF to 1000 pF	6		30	V/μs
			C_L = 150 pF to 2500 pF	4		30	
t_{PLH}	Receiver propagation delay time, low- to high-level output	C_L = 150 pF see Figure 2			150		ns
t_{PHL}	Receiver propagation delay time, high- to low-level output				150		ns
$t_{sk(p)}$	Receiver pulse skew				60		ns

Note 3: Pulse skew is defined as $|t_{PLH} - t_{PHL}|$ of each channel of the same device.

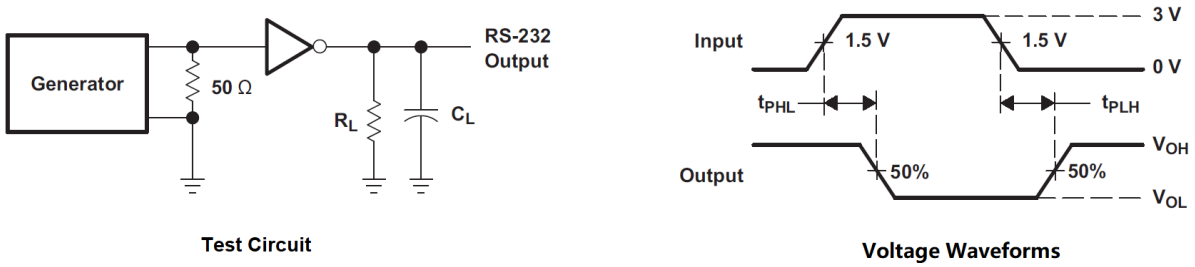


Figure 1. Driver Pulse Skew

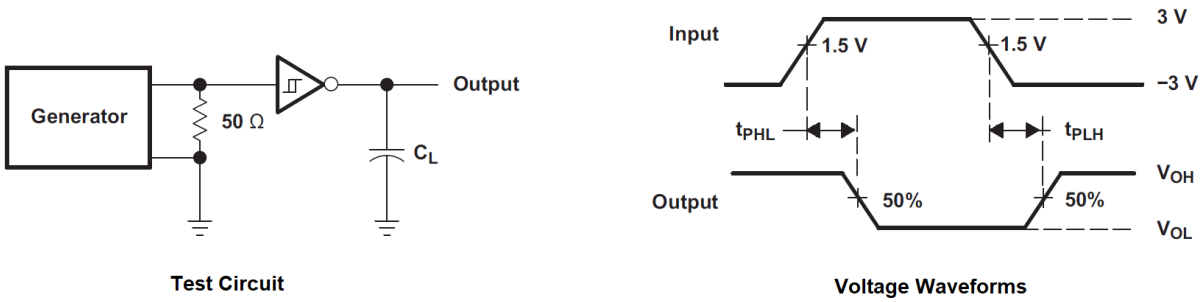
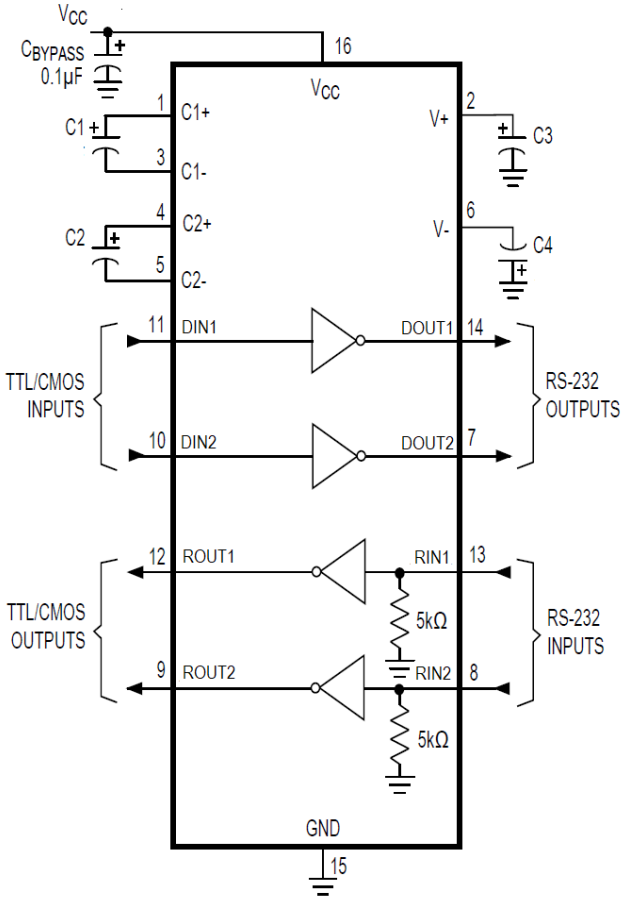


Figure 2. Receiver Propagation Delay Times

Typical Application



Nonpolorized ceramic capacitors are acceptable. If polarized tantalum or electrolytic capacitors are used, they should be connected as shown.

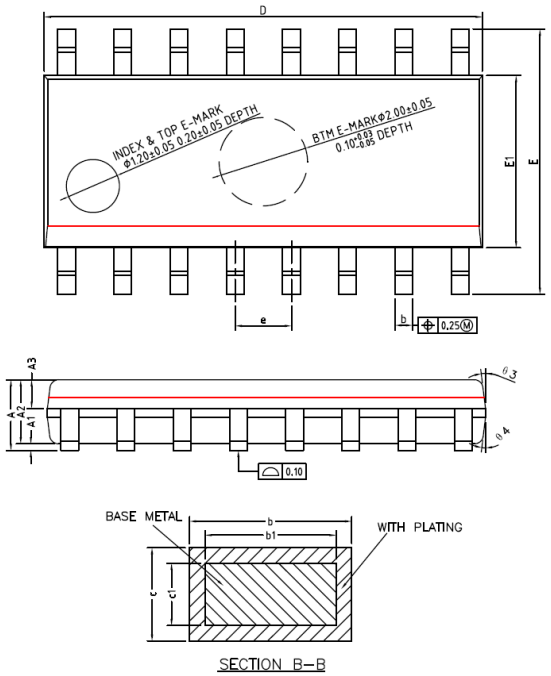
Figure 3. Typical Operating Circuit

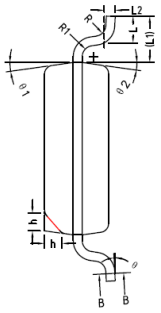
Table 1. VCC vs Capacitor Values

VCC	C1	C2, C3, C4
3.3 V ± 0.3 V	0.1 µF	0.1 µF
5 V ± 0.5 V	0.047 µF	0.33 µF
3 V to 5.5 V	0.1 µF	0.47 µF

Package Outline Dimensions

SOP16

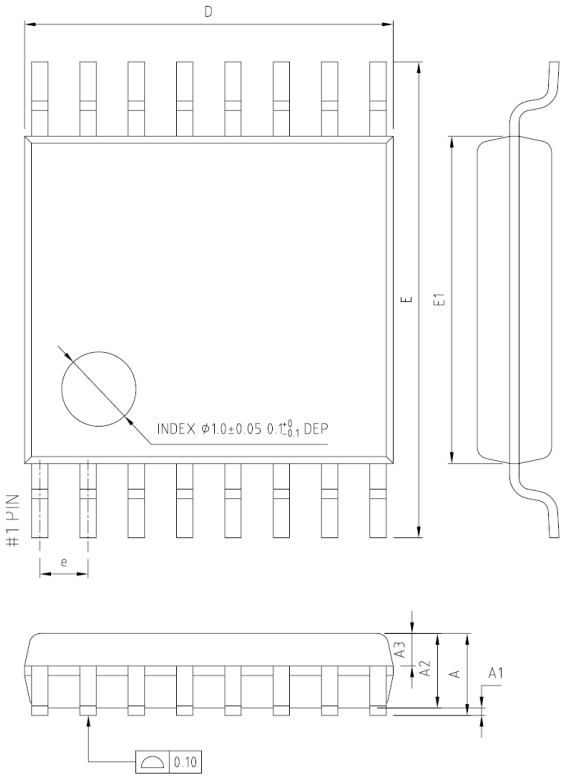


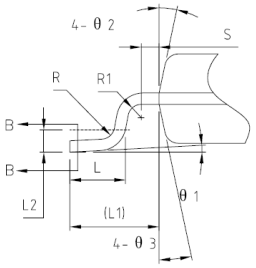


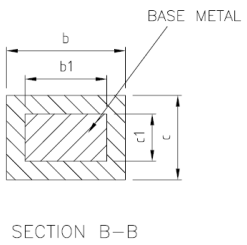
COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	–	–	1.75
A1	0.10	0.15	0.25
A2	1.35	1.45	1.55
A3	0.55	0.65	0.75
b	0.36	–	0.51
b1	0.35	0.40	0.45
c	0.18	–	0.25
c1	0.17	0.20	0.23
D	9.80	9.90	10.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.22	1.27	1.32
L	0.45	0.60	0.80
L1		1.04REF	
L2		0.25BSC	
R	0.07	–	–
R1	0.07	–	–
h	0.30	0.40	0.50
θ	0°	–	8°
θ 1	6°	8°	10°
θ 2	6°	8°	10°
θ 3	5°	7°	9°
θ 4	5°	7°	9°

TSSOP16







COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	–	–	1.20
A1	0.05	–	0.15
A2	0.90	1.00	1.05
A3	0.34	0.44	0.54
b	0.20	–	0.28
b1	0.20	0.22	0.24
c	0.10	–	0.19
c1	0.10	0.13	0.15
D	4.86	4.96	5.06
E	6.20	6.40	6.60
E1	4.30	4.40	4.50
e		0.65BSC	
L	0.45	0.60	0.75
L1		1.00REF	
L2		0.25BSC	
R	0.09	–	–
R1	0.09	–	–
S	0.20	–	–
θ 1	0°	–	8°
θ 2	10°	12°	14°
θ 3	10°	12°	14°

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