UN3232E

ROHS

High ESD-Protected 3.3V Dual-Channel RS232 transceiver

www.unsemi.com.tw

Features

- Supply voltages from 3V to 5.5V
- Dual Channel
- 120kbps Communication Rate
- 15kV HBM ESD-Protected
- 8kV IEC-4100-4-2 Contact Discharge

Applications

- Automobile electronics;
- Industrial Control Automation
- Security System;
- Instruments and apparatus;
- Road traffic control automation;
- Building automation system;

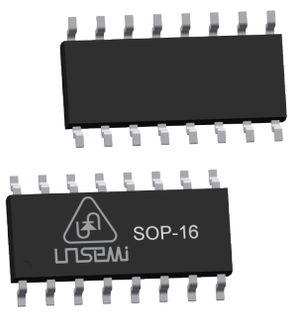
General Description

UN3232E is a 3.3V-power-supply, dual-channel,high ESD-protected, low-power RS-232 transceiver that fully meets the requirements of the TIA/EIA-232 standard.

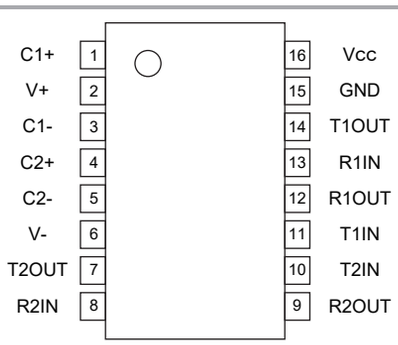
UN3232E includes two drives and two receivers,with enhanced ESD protection function, reaching the protection capacity of HBM ESD above 15kV and 8kV IEC-4100-4-2 contact discharge.

Powered by 3.3V power supply, The charge pump requires only four 0.1μF external capacitance to work at a rate of at least 120Kbps error-free data transmission, both of which can be independently enabled and closed. Each driver and receiver can be used independently.

Configuration



Functional Block



Limiting Values

Parameter	Symbol	Value	Unit
Power Supply	VCC	-0.3~+6	V
Positive Charge Pump Output	V+	VCC-0.3~+7	V
Negative Charge Pump Output	V-	+0.3~-7	V
V+ + |V-|	-	+13	V
Transmitter Input Pins	T1IN、T2IN	-0.3~+6	V
Receiver Input Pins	R1IN、R2IN	±25	V
Transmitter Output Pins	T1OUT、T2OUT	±13.2	V
Receiver Output Pins	R1OUT、R2OUT	-0.3~VCC+0.3	V
Operating Temperature Range	-	-40~85	°C
Storage Temperature Range	-	-60~150	°C
Soldering Temperature Range	-	300	°C
Continuous Power	SOP16	760	mW
	DIP16	840	mW

Limiting Values

The maximum limited parameter means that exceeding these values may cause unrecoverable damage to the device.Under these conditions, it is not conducive to the normal operation of the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. The reference point for all voltages is the ground.

Pin Description

Pin Number	Pin Name	Function
1	C1+	Positive lead of C1 capacitor
2	V+	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-	Negative charge pump output for storage capacitor only
7	T2OUT	RS232 line data output (to remote RS232 system)
8	R2IN	RS232 line data input (from remote RS232 system)
9	R2OUT	Logic data output (to UART)
10	T2IN	Logic data input (from UART)
11	T1IN	Logic data input (from UART)
12	R1OUT	Logic data output (to UART)
13	R1IN	RS232 line data input (from remote RS232 system)
14	T1OUT	RS232 line data output (to remote RS232 system
15	GND	Ground
16	VCC	Power supply

Supply Current

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Supply Current with no Load	Isup	-	-	2	-	mA

(If there is no additional explanation，typical value is tested when VCC=+3.3V，Temp=25℃，C1~C4=1uF)

Logic Input Electrical Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Logic Control Low Level	V_{TTIN_L}	T1IN、T2IN	-	-	0.8	V
Logic Control High Level	V_{TTIN_H}	T1IN、T2IN	2	-	-	V
Logic Control Hysteresis	-	T1IN、T2IN	-	0.3	-	V
Input Logic Current	ITIN	T1IN、T2IN	-	-	±1	uA

(If there is no additional explanation，typical value is tested when VCC=+3.3V，Temp=25℃，C1~C4=1uF)

Receiver Output Electrical Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Receiver Output Logic-Low Voltage	V_{ROL}	IOUT=1.6mA VCC=5V or 3.3V	-	-	0.4	V
Receiver Output Logic-High Voltage	V_{ROH}	IOUT=-0.5mA VCC=5V or 3.3V	VCC-0.6	VCC-0.1	-	V

(If there is no additional explanation，typical value is tested when VCC=+3.3V，Temp=25℃，C1~C4=1uF)

Receiver Input Electrical Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Receiver Input Range	V_{RIN}	-	-25	-	+25	V
Receiver Input Low Threshold	V_{RIL}	VCC=3.3V	0.6	1.1	-	V
		VCC=5.0V	0.8	1.5	-	V
Receiver Input High Threshold	V_{RIH}	VCC=3.3V	-	1.5	2.4	V
		VCC=5.0V	-	1.9	2.4	V
Receiver Input Hysteresis	-	-	-	0.4	-	V
Receiver Input Impedance	R_{RIN}	-	3.0	5.0	7.0	kΩ

(If there is no additional explanation，typical value is tested when VCC=+3.3V，Temp=25℃，C1~C4=1uF)

Transmitter Output Electrical Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Transmitter Output Swing	V_{TOUT}	All output ports of transmitter connect 3kΩ load to ground	±4.0	-	±5.0	V
Transmitter Output Impedance	R_{TOUT}	VCC=0V, Transmitter Input =±2V	300	-	-	Ω
Transmitter Short-Circuit Current	Itsc	-	-	-	±60	mA

(If there is no additional explanation，typical value is tested when VCC=+3.3V，Temp=25℃，C1~C4=1uF)

Switching Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Rate	Speed	RL=3kΩ, CL=1000pF	-	120	-	kbps
Receiver Propagation delay	t_{RPHL}	CL=150pF	-	2.0	8.5	us
	t_{RPLH}		-	2.0	8.5	us
$\lvert t_{RPHL} - t_{RPLH} \rvert$	-	-	-	150	-	ns
$\lvert t_{TPHL} - t_{TPLH} \rvert$	-	-	-	150	-	ns
Transmitter Slew Rate	SR	RL=3kΩ~7kΩ, CL=50pF~1000pF form-3.0V to 3.0V or from 3.0V to -3.0V	4.0	-	30	V/us

(If there is no additional explanation，typical value is tested when VCC=+3.3V，Temp=25℃，C1~C4=1uF)

ESD protection

Parameter	Conditions	Min.	Typ.	Max.	Units
R1IN、R2IN T1OUT、T2OUT	HBM	-	±15	-	KV
	Air discharge	-	±15	-	KV
	Contact discharge	-	±8	-	KV

Test Circuit

Fig. 1 Minimum swing rate test circuit

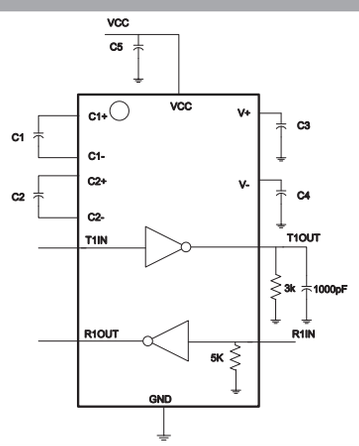


Fig. 2 Maximum swing rate test circuit

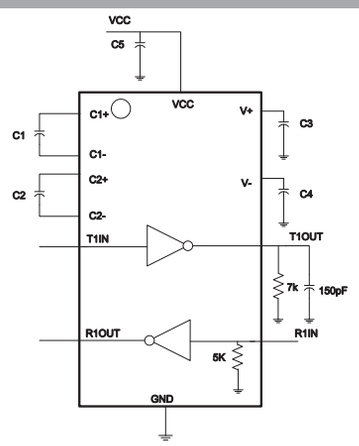


Fig. 3 Human body mode ESD test model

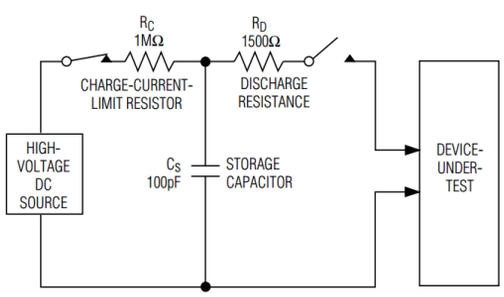


Fig. 4 Human modal current waveform

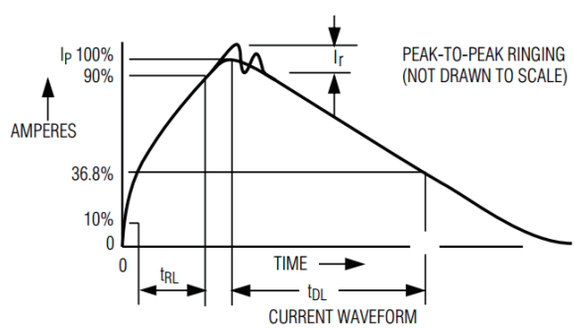


Fig. 5 IEC 1000-4-2 ESD test model

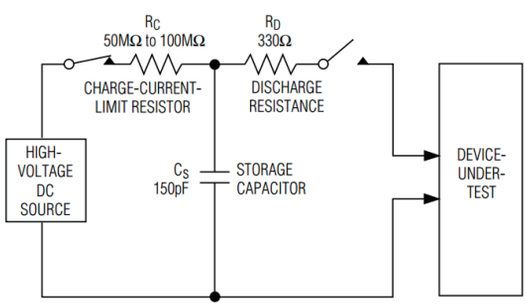
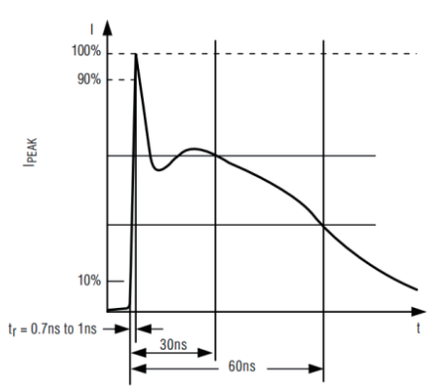


Fig. 6 IEC 1000-4-2 ESD Test current waveform



Summary

1 Dual Charge-Pump Operation

UN3232E has a two-way charge pump inside to support the chip's voltage conversion work. Dual-electric pump provides +5.5V and -5.5V output voltage in the range of 3.0 ~ 5.5V, Each charge pump requires a capacitor(C1,C2) and an energy storage capacitor(C3,C4) to generate V+ and V- power supplies, as shown in Fig 7.

2 RS232 Transmitter

Convert the TTL/CMOS logic voltage to a voltage compatible with the EIA/TIA-232 standard. UN3232E Transmiter can guarantee 120kbps data rate under the worst operating conditions (Parallel load of 3kΩ resistor and 1000pf capacitor). Transmitter can drive multiple receivers in parallel. There is no pull-up resistance inside the input terminals T1IN and T2IN of UN3232E transmitter. If the transmitter is not used, the unused input terminals T1IN and T2IN can be connected to GND or VCC.

3 RS232 Receiver

The UN3232E has two separate receivers that convert the RS-232 signal to the CMOS logic output level.

4 ESD Protection

All pins of UN3232E adopt ESD protection structure, and all driver outputs and receiver inputs have additional electrostatic protection capability. It can withstand ±15kV ESD (HBM) discharge, contact discharge above ±8KV and air gap discharge above ±15kV. The ESD protection structure can withstand the impact of high voltage ESD under all conditions, including standard working mode and power-off mode.

5 Typical Application

Typical dual-Path application scenarios are shown in Fig 7, where the C1-C5 typical capacitance value is 0.1μF.

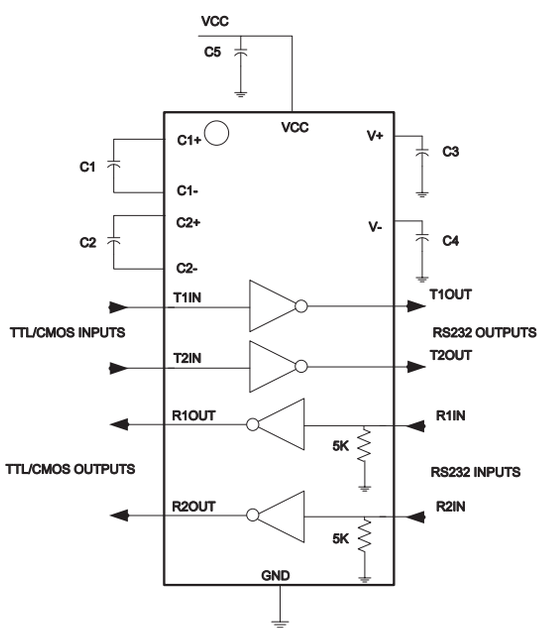
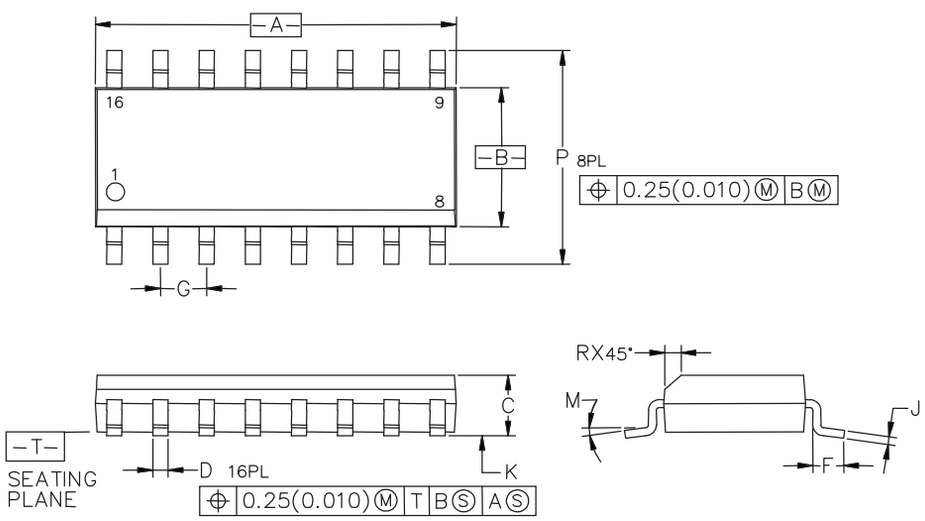
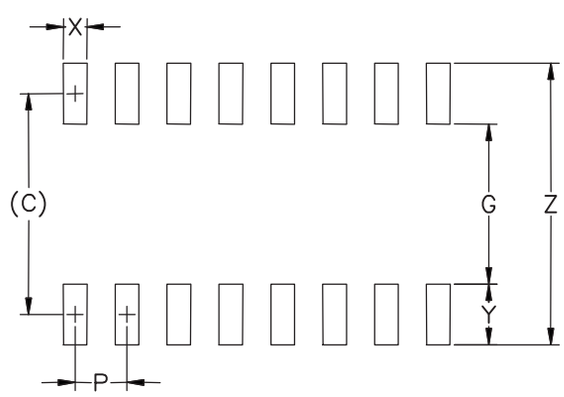


Fig7. Typical two-channel application scenario

Package Outline



Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	9.80	10.0	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27BSC		0.050BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.228	0.244
R	0.25	0.50	0.010	0.019



Symbol	Inches	Millimeters
C	0.205	5.20
G	0.118	3.00
P	0.050	1.27
X	0.024	0.60
Y	0.087	2.20
Z	0.291	7.40

Ordering Information

Type	Temperature	Packaging	Quantity
UN3232E	-40℃~85℃	SOP-16	2500pcs

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