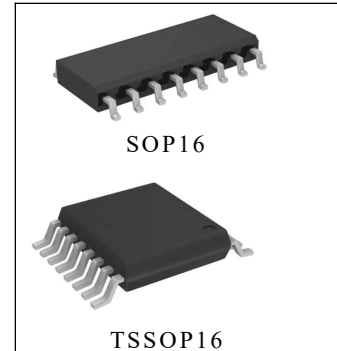


General Description

The D3232 consists of two drivers, two receivers, and a dual charge-pump circuit with $\pm 12\text{kV}$ IEC 61000-4-2 Contact Discharge ESD protection.

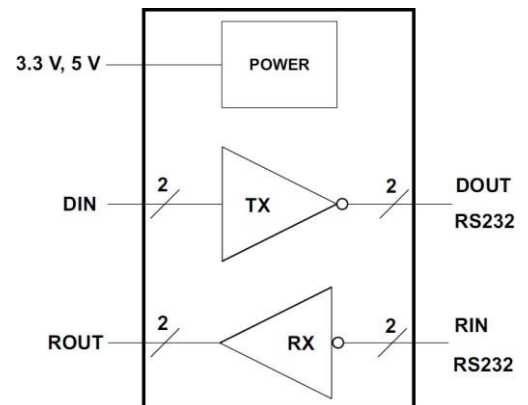
The D3232 meets the requirements of TIA/EIA-232-F and provides the electrical interface between an asynchronous communication controller and the serial-port connector. The charge pump and four small external capacitors allow operation from a single 3V to 5.5V supply. The device operates at data signaling rates up to 250 kbps.

The D3232 is available in SOP16 and TSSOP16 package.



Features Function Block

- ESD protection for RS-232 Bus Pins
 - $\pm 12\text{kV}$ (IEC61000-4-2, Contact Discharge)
 - $\pm 15\text{kV}$ (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: $4 \times 0.1 \mu\text{F}$
- Accepts 5V Logic Input With 3.3V Supply



Package Information

Part NO.	Package Description	Package Marking	Package Option
D3232F	SOP16	CHMC SXXXX D3232F	50/Tube 4000/Reel
D3232T	TSSOP16	CHMC D3232T SXXXX	96/Tube 3000/Reel

CHMC:Trademark

D3232F/D3232T:Part NO.

SXXXX:Lot NO.

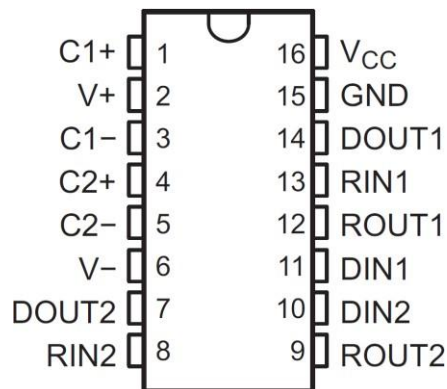
Applications

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

Ordering Information

Part Number	Package	Operation Temp.
D3232	SOP16	-40~ + 125 °C
	TSSOP16	-40~ + 125 °C

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

Pin NO.	Name	I/O	Description
13	RIN1	I	RS232 Receiver Input
14	DOUT1	O	RS232 Driver Output
15	GND	—	Ground
16	VCC	—	Supply Voltage

Absolute Maximum Ratings

Characteristic			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 VCC = 3.3V±0.3V; C1 = 0.047μF, C2–C4 = 0.33μF at VCC = 5V±0.5V)

Characteristic			Min	Typ	Max	Unit
Supply voltage		V _{CC} = 3.3V	3	3.3	3.6	V
		V _{CC} = 5V	4.5	5	5.5	
V _{IH}	Driver high-level input voltage	DIN	V _{CC} = 3.3V		5.5	V
			V _{CC} = 5V		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	°C

Electrical Characteristics

(Test conditions: C1–C4 = 0.1 μ F at VCC = 3.3V \pm 0.3V; C1 = 0.047 μ F, C2–C4 = 0.33 μ F at VCC = 5V \pm 0.5V, TA = -40~125°C, unless otherwise noted. Typical values are at TA = +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 k Ω to GND, DIN = GND	5	5.4		V
V _{OL}	Low-level output voltage	DOUT at R _L = 3 k Ω to GND, DIN = V _{CC}	-5	-5.4		V
I _{IH}	High-level input current	V _I = V _{CC}		\pm 0.01	\pm 1	μ A
I _{IL}	Low-level input current	V _I at GND		\pm 0.01	\pm 1	μ A
I _{OS}	Short-circuit output current	V _{CC} = 3.6 V, V _O = 0 V		\pm 30	\pm 60	mA
		V _{CC} = 5.5 V, V _O = 0 V				
r _o	Output resistance	V _{CC} , V ₊ , and V ₋ = 0 V, V _O = \pm 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	V _{CC} = 3.3 V		1.5	2.4	V
		V _{CC} = 5 V		2.0	2.4	
V _{IT-}	Negative-going input threshold voltage	V _{CC} = 3.3 V	0.6	1.1		V
		V _{CC} = 5 V	0.8	1.5		
V _{hys}	Input hysteresis (V _{IT+} - V _{IT-})			0.4		V
r _i	Input resistance	V _I = \pm 3 V to \pm 25 V	3	5	7	k Ω

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 VCC=3.3V±0.3V; C1=0.047μF, C2–C4=0.33μF at VCC=5V±0.5V, TA = -40~125°C, 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, C _L = 150 pF to 1000 pF	6		30	V/μs
		V _{CC} = 3.3 V, 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.

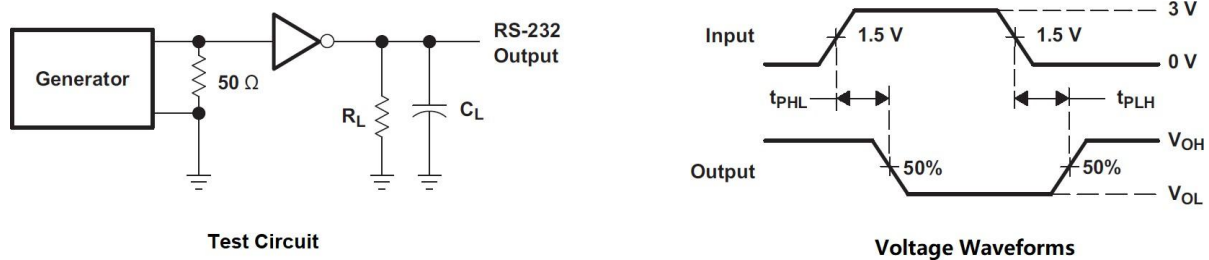


Figure 1. Driver Pulse Skew

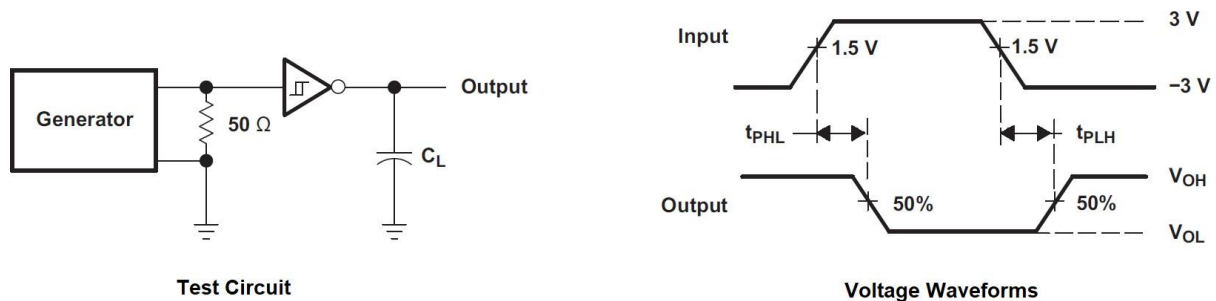
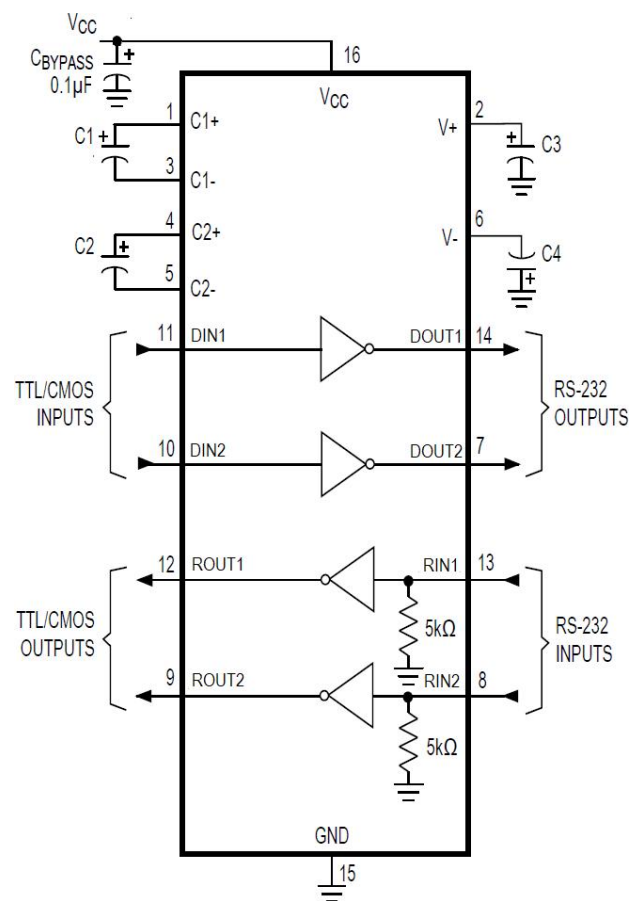


Figure 2. Receiver Propagation Delay Times

Typical Application



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

Figure 3. Typical Operating Circuit

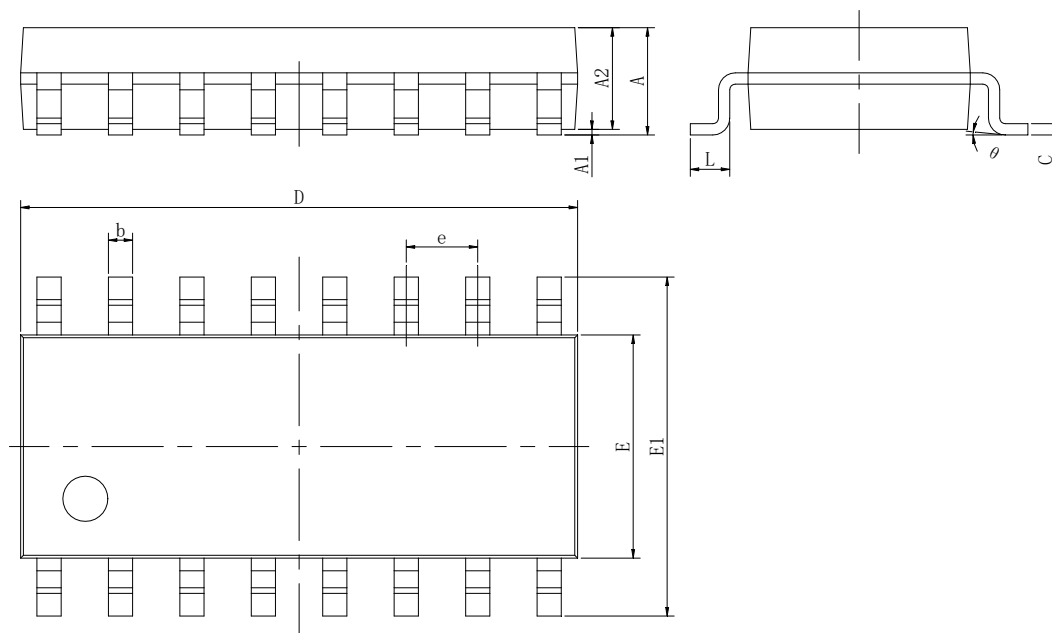
Table 1. VCC vs Capacitor Values

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

Outline Dimensions

SOP16:

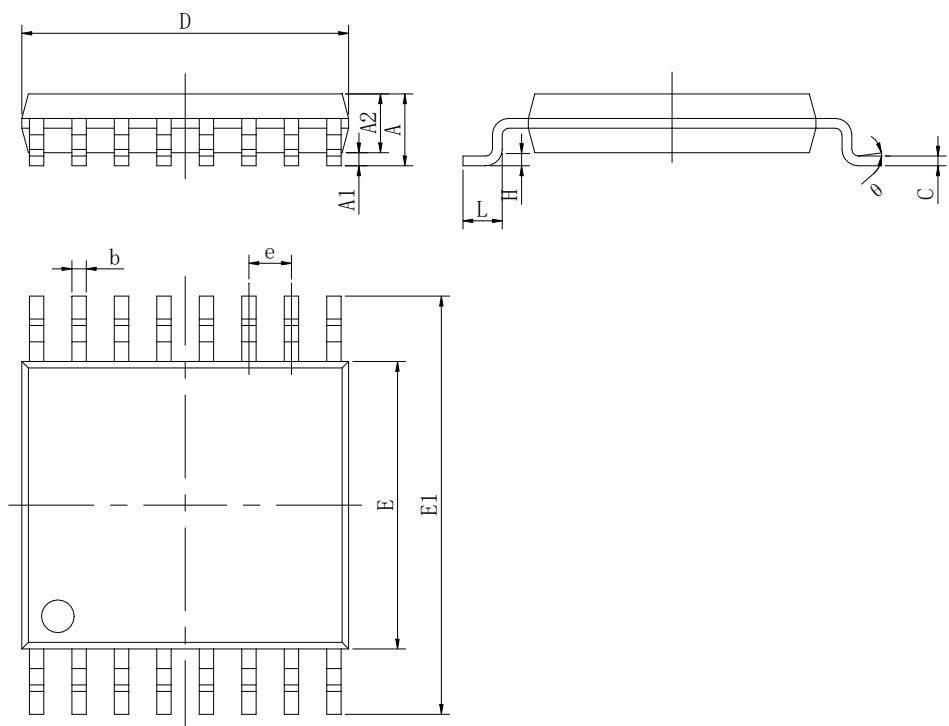
Unit:mm



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	9.800	10.200	0.386	0.402
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

TSSOP16:

Unit:mm



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
D	4.900	5.100	0.193	0.201
E	4.300	4.500	0.169	0.177
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
E1	6.250	6.550	0.246	0.258
A		1.100		0.043
A2	0.800	1.000	0.031	0.039
A1	0.020	0.150	0.001	0.006
e	0.65 (BSC)		0.026(BSC)	
L	0.500	0.700	0.02	0.028
H	0.25(TYP)		0.01(T YP)	
θ	1°	7°	1°	7°

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