

GeneralDescription

The TP3232ES16 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 TP3232ES16 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 TP3232ES16 is available in SOP16 package.

Features

- 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

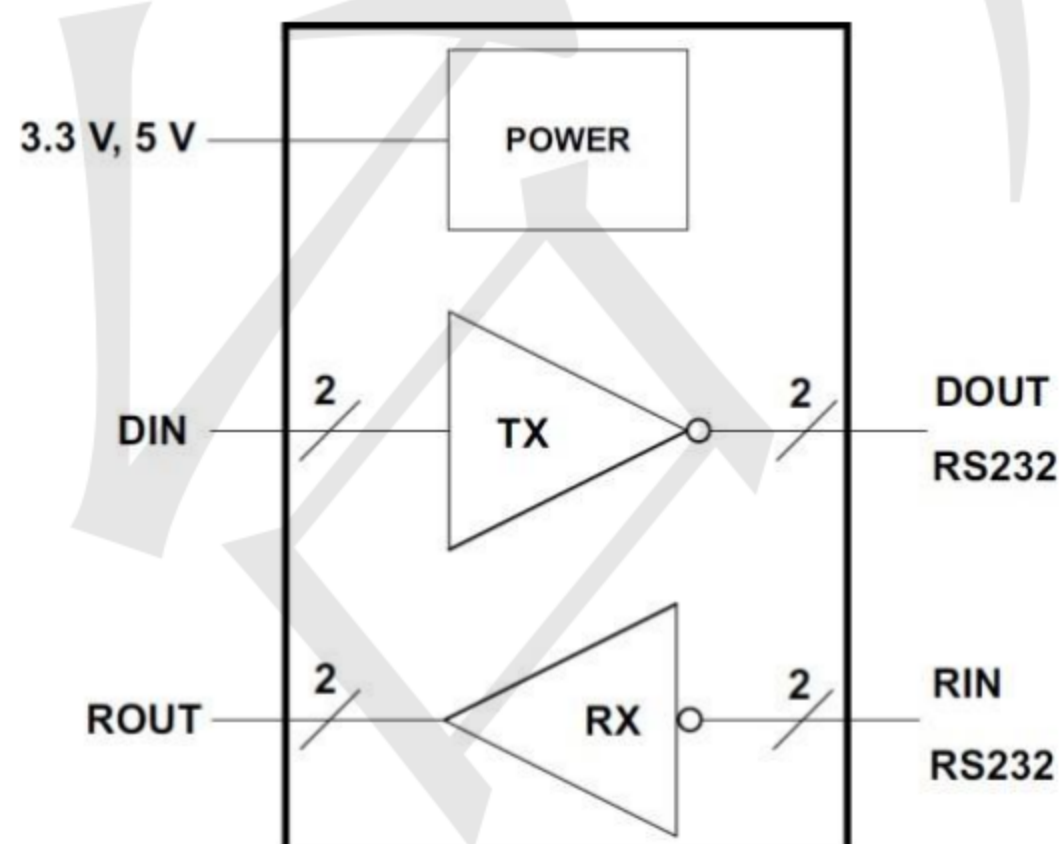
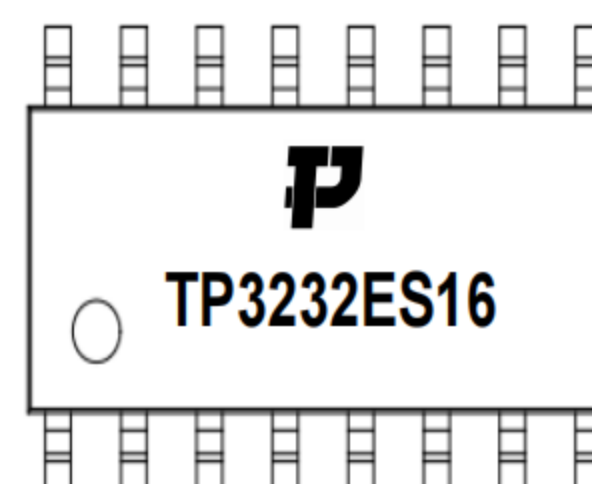
Applications

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

Mechanical Characteristics

- Shipping Qty :2.5kpcs Or 4k pcs 7Inch Tape & Reel

Marking



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	V _{CC} + 0.3	V
T _J	Operating virtual junction temperature			150	°C
T _{stg}	Storage temperature		-65	150	°C

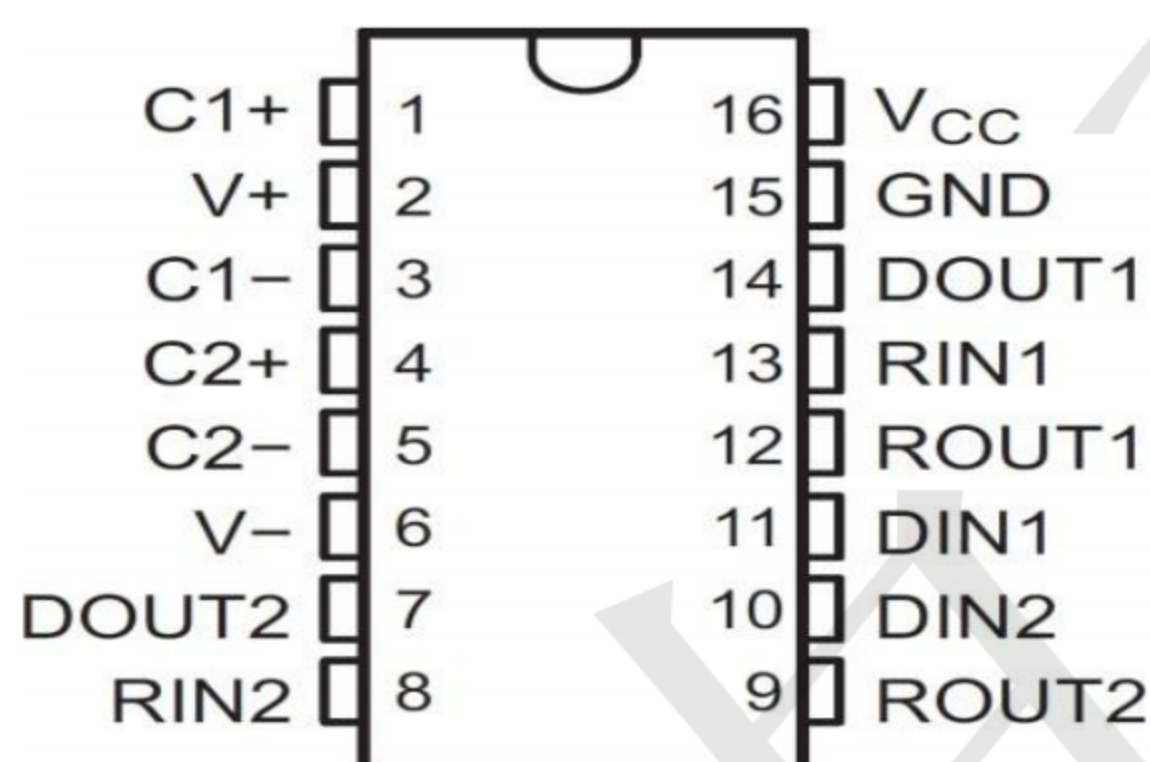
Recommended Operating Conditions

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	2	5.5	V
			V _{CC} = 5V	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	°C

Electrical Characteristics

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	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 = ±3 V to ±25 V	3	5	7	kΩ

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

Switching Characteristics

Parameter		Test Conditions	Min	Typ	Max	Unit
Maximum data rate		$R_L = 3\text{ k}\Omega$, $C_L = 1000\text{ pF}$, One DOUT switching	250			kbps
$t_{sk(p)}$	Driver pulse skew	$R_L = 3\text{ k}\Omega$ to $7\text{ k}\Omega$, $C_L = 150\text{ pF}$ to 2500 pF , see Figure 1		100		ns
$SR(tr)$	Driver slew rate, transition region	$R_L = 3\text{ k}\Omega$ to $7\text{ k}\Omega$, $V_{CC} = 3.3\text{ V}$	6		30	$\text{V}/\mu\text{s}$
		$C_L = 150\text{ pF}$ to 1000 pF $C_L = 150\text{ pF}$ to 2500 pF	4		30	
t_{PLH}	Receiver propagation delay time, low- to high-level output	$C_L = 150\text{ pF}$ 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

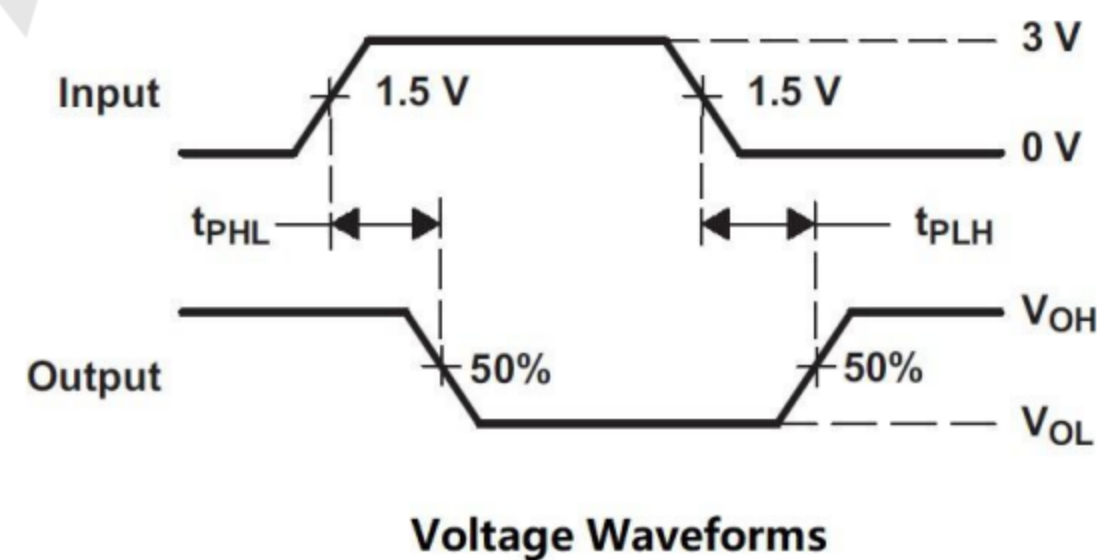
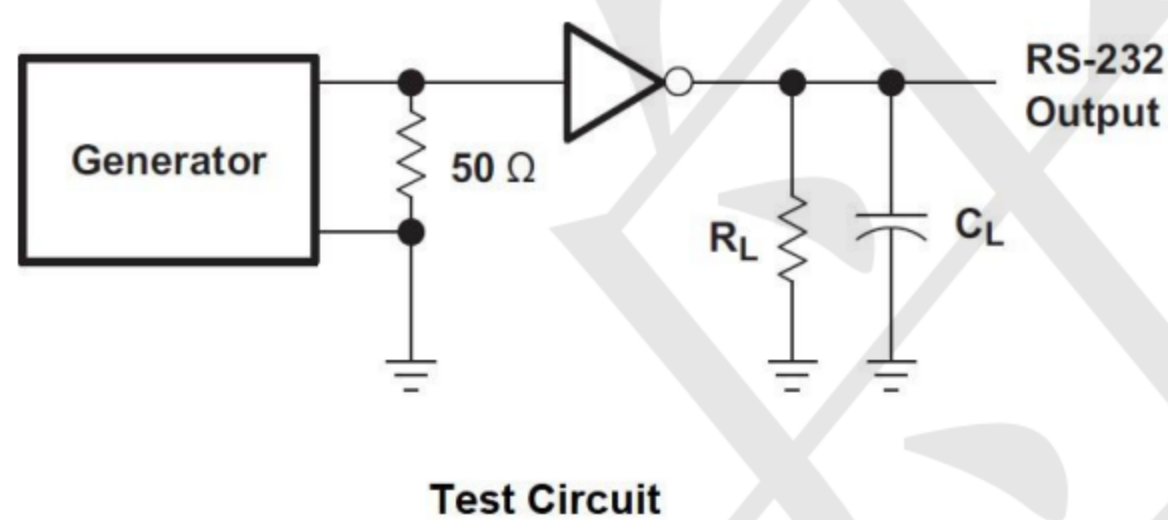


Figure 1. Driver Pulse Skew

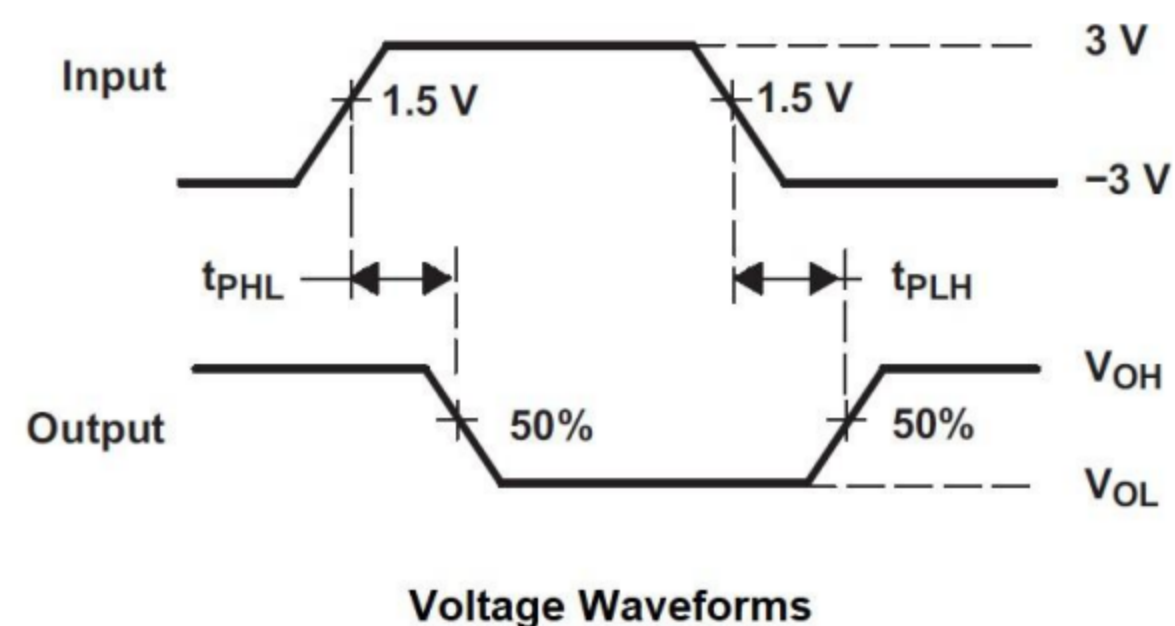
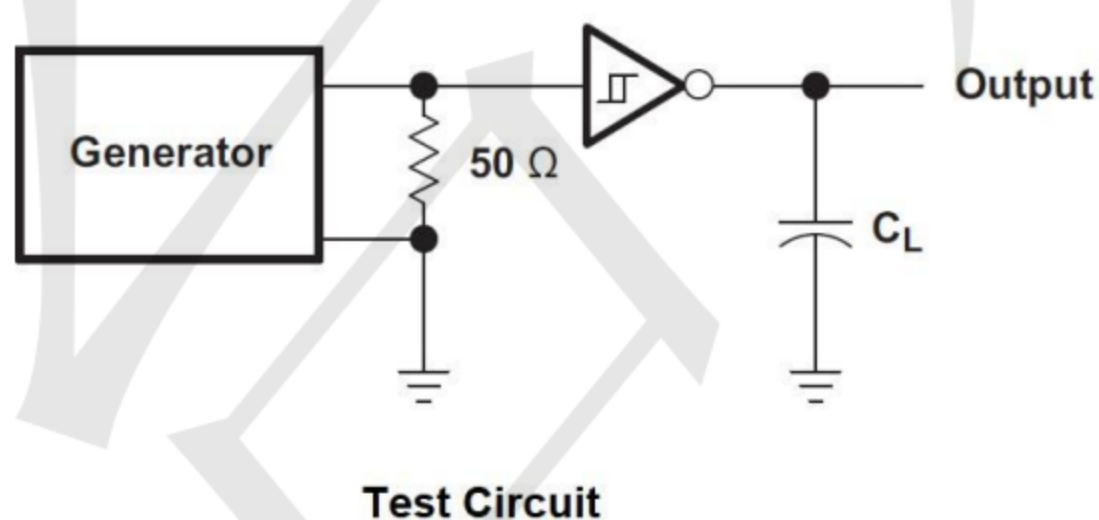
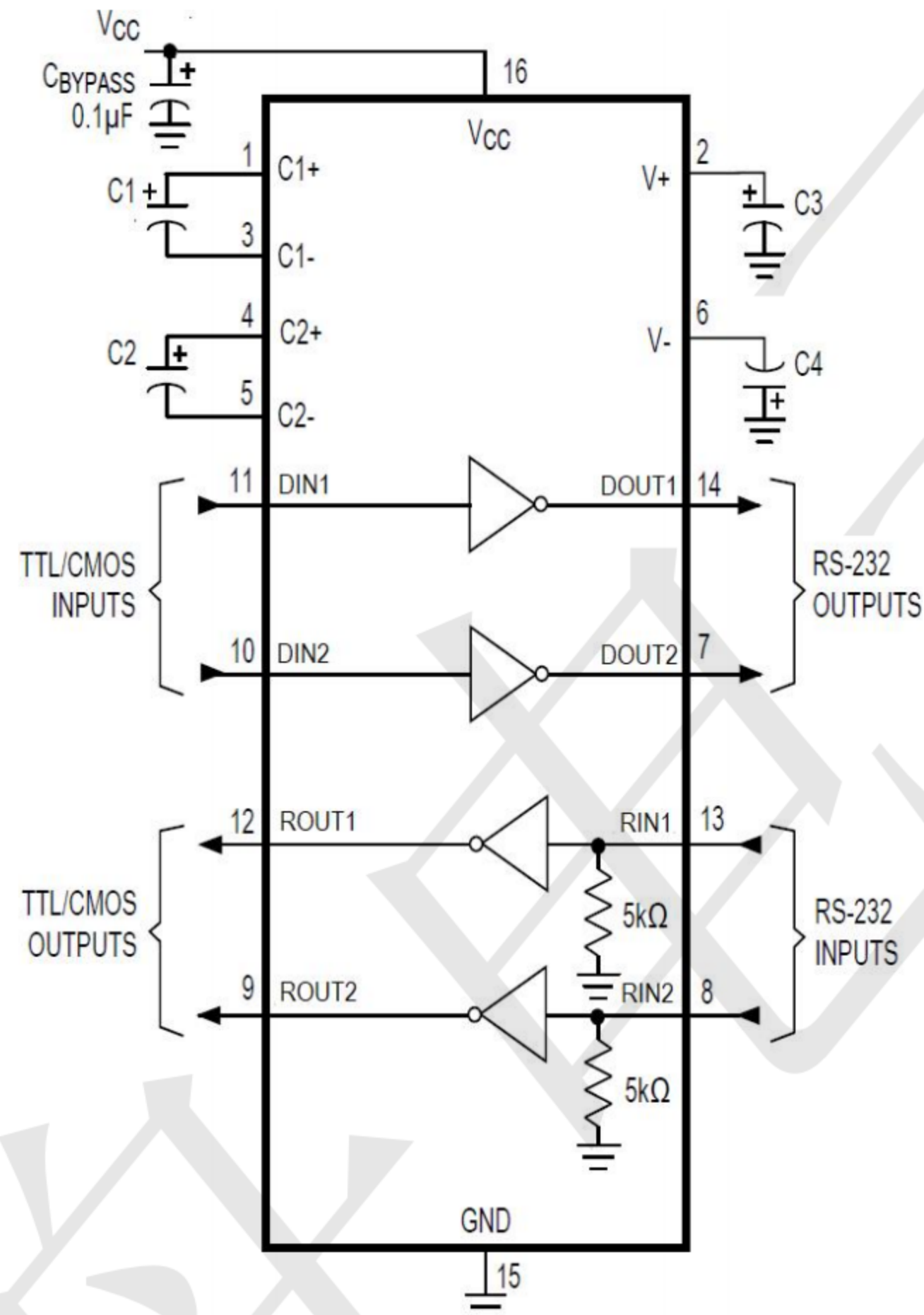


Figure 2. Receiver Propagation Delay Times

Typical Application

www.sot23.com.tw



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

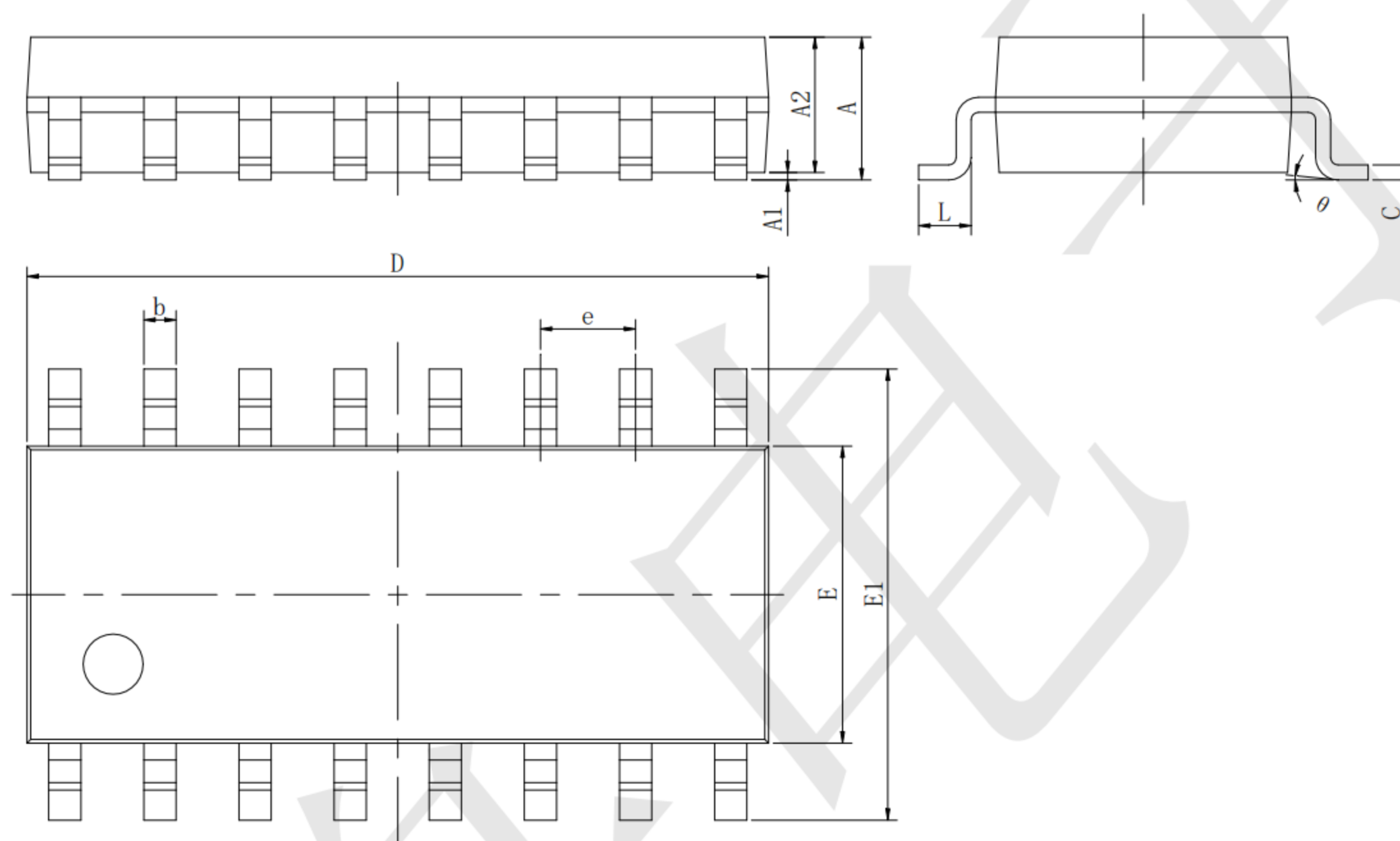
Figure 3. Typical Operating Circuit

Table 1. VCC vs Capacitor Values

VCC	C1	C2, C3, C4
3.3 V $\pm$ 0.3 V	0.1 μ F	0.1 μ F
5 V $\pm$ 0.5 V	0.047 μ F	0.33 μ F
3 V to 5.5 V	0.1 μ F	0.47 μ F

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°