3.0V to 5.5V, RS-232 Transceivers

Features

- Meets EIA/TIA-232-F standards
- Operates With 3-V to 5.5-V VCC Supply
- Operates up to 250 kbit/s
- Two Drivers and Two Receivers
- Low Supply Current
- External Capacitors: 4x0.1 μF
- Accepts 5-V Logic Input With 3.3-V Supply
- 1μA low power shutdown with receivers active (COSMAX3222)
- Packaging:
  COSMAX3232: SOP16/TSSOP16
  COSMAX3222: SOP20/TSSOP20

Applications

- Battery-Powered Systems
- Hand-Held Equipment
- Laptops
- Notebooks

General Description

The COSMAX3232 and COSMAX3222 family consists of two-line drivers, two-line receivers, and a dual charge-pump circuit. The device 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 3-V to 5.5-V supply. The devices operate at data signaling rates up to 250 kbit/s and a maximum of 30-V/μs driver output slew rate.

The COSMAX3222 device has a low-power shutdown mode where the devices' driver outputs and charge pumps are disabled. During shutdown, the supply current falls to less than 1μA. When the device is powered down, the receivers remain active while the drivers are placed in the high-impedance state. Receiver outputs also can be placed in the high impedance state by setting $\overline{EN}$ high.

Rev1.2
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1. Pin Configuration and Functions

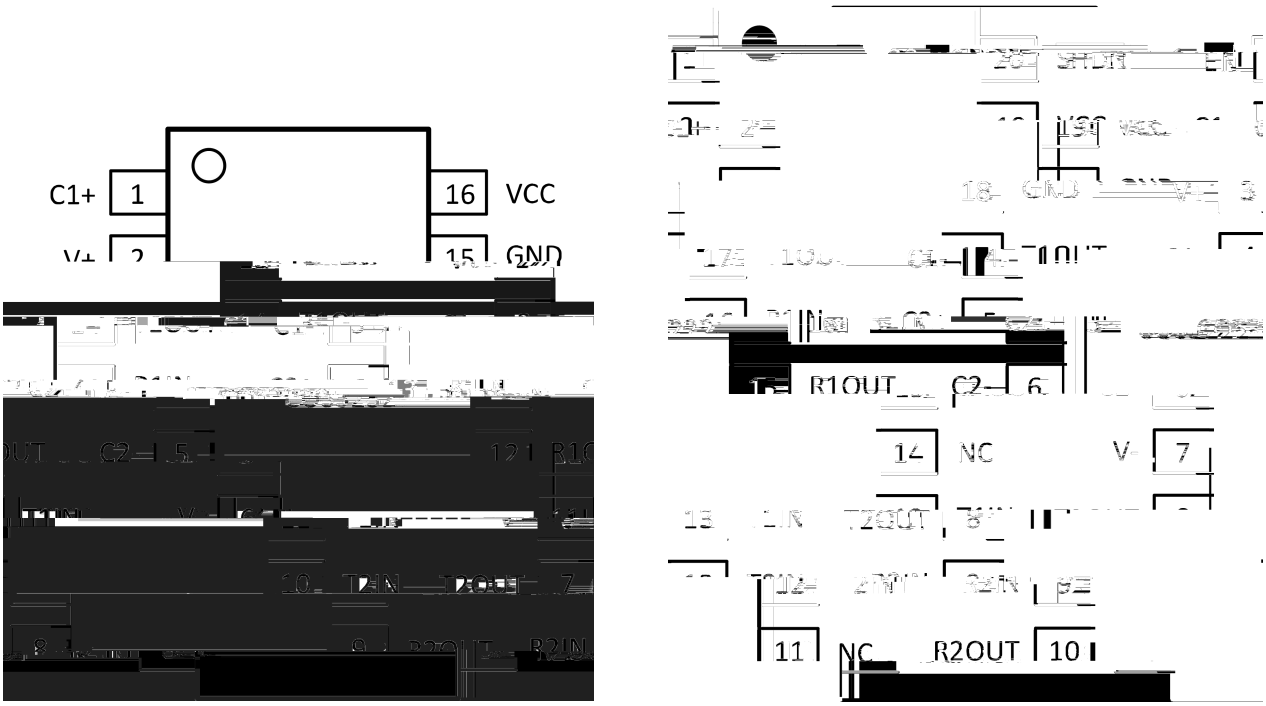


Figure 1 Pin Diagram

Pin Description

Pin Name	Description	Pin Number	
		COSMAX3232	COSMAX3222
$\overline{EN}$	Receiver Enable. Apply logic LOW for normal operation. Apply logic HIGH to disable the receiver outputs (high-Z state).	-	1
C1 +	Positive terminal of the voltage doubler charge-pump capacitor	1	2
V+	5.5V output generated by the charge pump	2	3
C1-	Negative terminal of the voltage doubler charge-pump capacitor	3	4
C2 +	Positive terminal of the inverting charge-pump capacitor	4	5
C2-	Negative terminal of the inverting charge-pump capacitor	5	6

V-	5V output generated by the charge pump	6	7
TOUT1	RS-232 driver output	14	17
TOUT2	RS-232 driver output	7	8
RIN1	RS-232 driver input	13	16
RIN2	RS-232 driver input	8	9
ROUT1	TTL/CMOS receiver output	12	15
ROUT2	TTL/CMOS receiver output	9	10
TIN1	TTL/CMOS driver input, must be volid high or low	11	13
TIN2	TTL/CMOS driver input, must be volid high or low	10	12
GND	Ground	15	18
VCC	3.0V to 5.5V supply voltage	16	19
$\overline{SHDN}$	Shutdown Control Input. Drive HIGH for normal device operation. Drive LOW to shutdown the drivers (high-Z output) and the on-board power supply.	-	20

2.1 Absolute Maximum Ratings (1)

Parameter	Min	Max	Unit
DC supply voltage, Vcc	-0.3	6	V
Positive output supply voltage, V+	-0.3	8	V
Negative output supply voltage, V+	-0.3	-8	V
Supply voltage difference, V+ - V-		16	V
Driver input voltage, V_{TI}	-0.3	6	] P

	Rating	Unit
Thermal Resistance R_{JA}	80 (SOP16) 90 (TSSOP20)	°C/W

2.3 Recommended Operating Conditions

Output resistance	R_O	V_{CC}, V+, and V– = 0 V V_{OUT} = ±2 V	300			Ω
Output short-circuit current	I_{OS}	V_{OUT}=0		± 35	± 60	mA
Output leakage current	I_{OK}	V_{OUT}= ± 12V, drivers disabled Vcc=0V or 3.0V to 5.5V			± 25	µA

Receiver Characteristics

Input voltage range	V_{IN}		-15		+15	V
Input threshold LOW	V_{ITL}	Vcc = 3.3V	0.6	1.2		V
		Vcc = 5.0V	0.8	1.5		V
Input threshold HIGH	V_{ITH}	Vcc = 3.3V		1.5	2.4	V
		Vcc = 5.0V		1.8	2.4	V
Input hysteresis	V_{HYS}			0.3		V
Input resistance	R_i	V_{IN} = ±3 V to ±15 V	3	5	7	kΩ

Logic Inputs and Receiver Outputs

Input logic threshold LOW		SHDN				

...acte...						
Maximum data rate	t_{PZH}	R_L = 3kΩ, C_L = 1000pF, one driver switching	150	250		kbps
Driver propagation delay	t_{PHL}	R_L = 3kΩ, C_L = 1000pF		1.0		µs
	t_{PLH}	R_L = 3kΩ, C_L = 1000pF		1.0		µs
Receiver propagation delay	t_{PHL}	Receiver input to receiver output, C_L = 150pF		0.3		µs
	t_{PLH}	Receiver input to receiver output, C_L = 150pF		0.3		µs
Receiver output enable time				200		ns
Receiver output disable time				200		ns
Driver skew		$\|t_{PHL} - t_{PLH}\|$		100	500	ns
Receiver skew		$\|t_{PHL} - t_{PLH}\|$		200	1000	ns
Slew Rate	SR	R_L = 3kΩ to 7kΩ, C_L = 150pF to 1000pF	6		30	V/µs

Application Information

3.1 Overview

The COSMAX3232 (Figure 2) and COSMAX3222 (Figure 3) are 2-driver / 2-receiver devices ideal for portable or hand-held applications. The COSMAX3222 features a 1µA shutdown mode that reduces power consumption and ex-

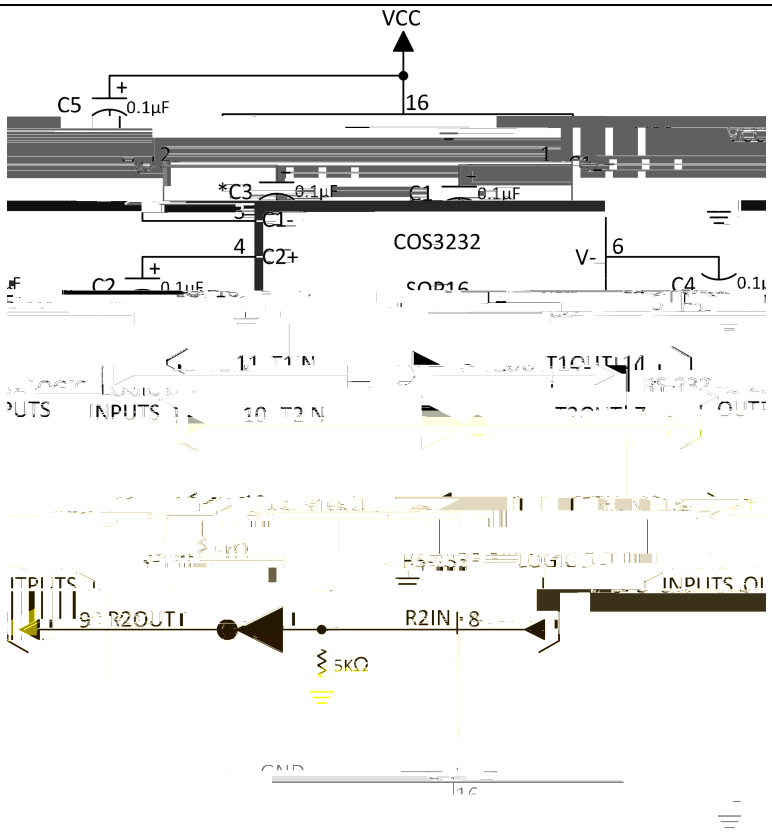


Figure 2 COSMAX3232 Typical Operation Circuit

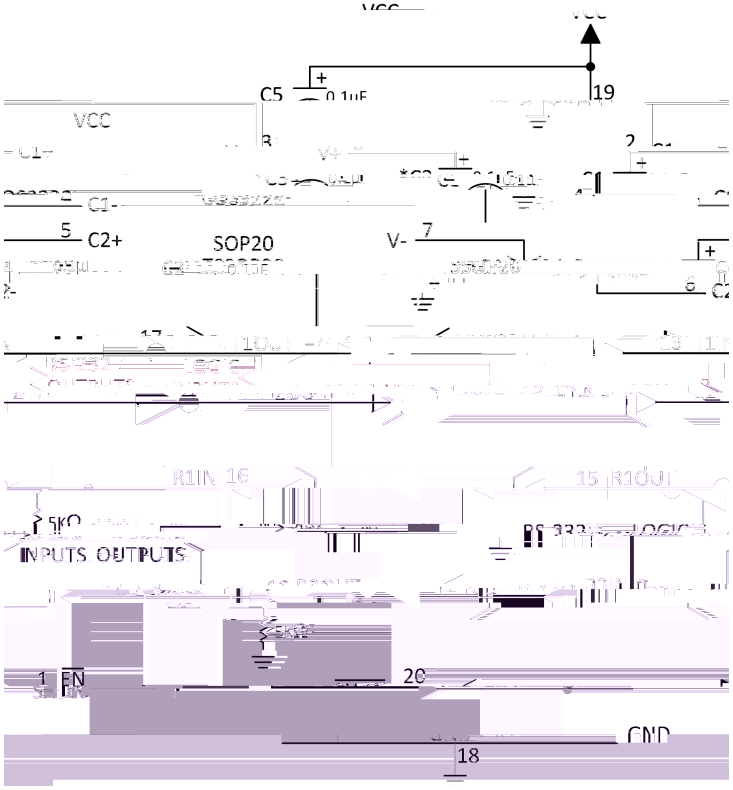


Figure 3 COSMAX3222 Typical Operation Circuit

Table 1. COSMAX3232 Driver Function Modes

INPUT TIN	OUTPUT TOUT
L	H
H	L

Table 2. COSMAX3232 Receiver Function Modes

INPUT RIN	OUTPUT ROUT
L	H
H	L
Open	H

3.2 Drivers

The COSMAX3232/COSMAX3222 drivers are inverting level transmitters that convert TTL or CMOS logic levels to 5.0V EIA/TIA-232 levels with an inverted sense relative to the input logic levels. Typically, the RS-232 output voltage swing is 5.4V with no load and 5V minimum fully loaded. The driver outputs are protected against infinite short-circuits to ground without degradation in reliability. Driver outputs will meet EIA/TIA-562 levels of ±3.7V with supply voltages as low as 2.7V. The drivers can guarantee a data rate of 120kbps fully loaded with 3kΩ in parallel with 1000pF, ensuring compatability with PC-to-PC communication software. The slew rate of the driver is internally limited to a maximum of 30V/µs in order to meet the EIA standards (Ď ed

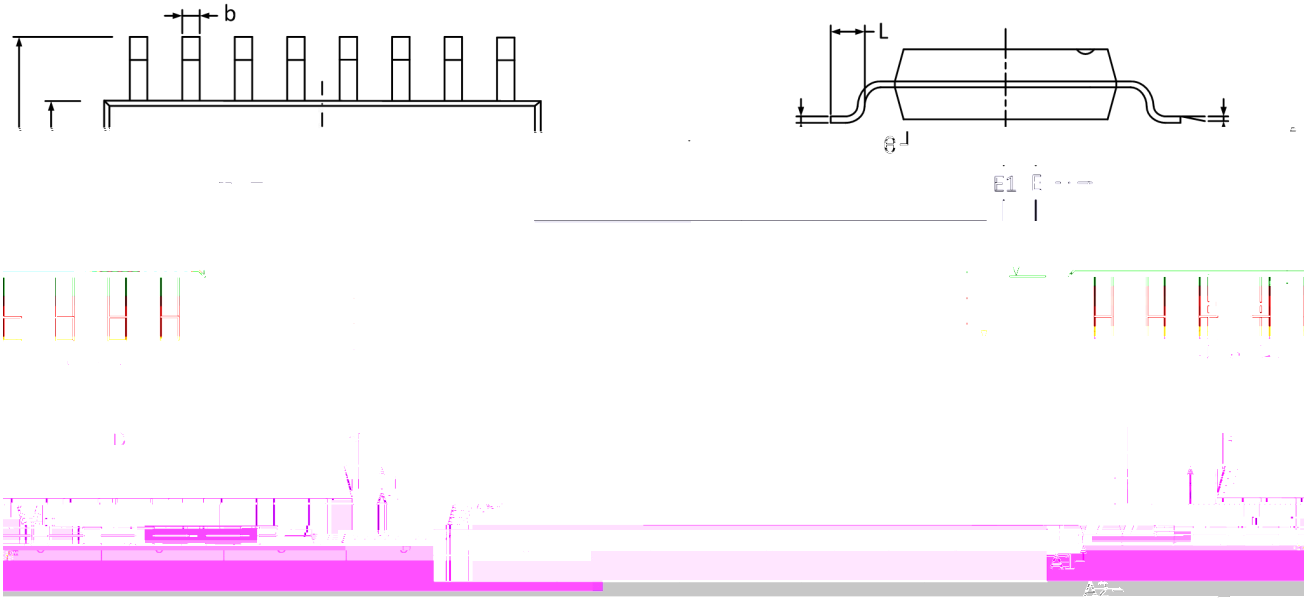
3.3 Receivers

The Receivers convert EIA/TIA-232 levels to TTL or CMOS logic output levels. The COSMAX3222 receivers have an inverting tri-state output. These receiver outputs (RxOUT) are tri-stated when the enable control $\overline{EN}$ = HIGH. In the shutdown mode, the receivers can be active or inactive. $\overline{EN}$ has no effect on TxOUT. The truth table logic of the COSMAX3222 driver and receiver outputs can be found in Table 3.

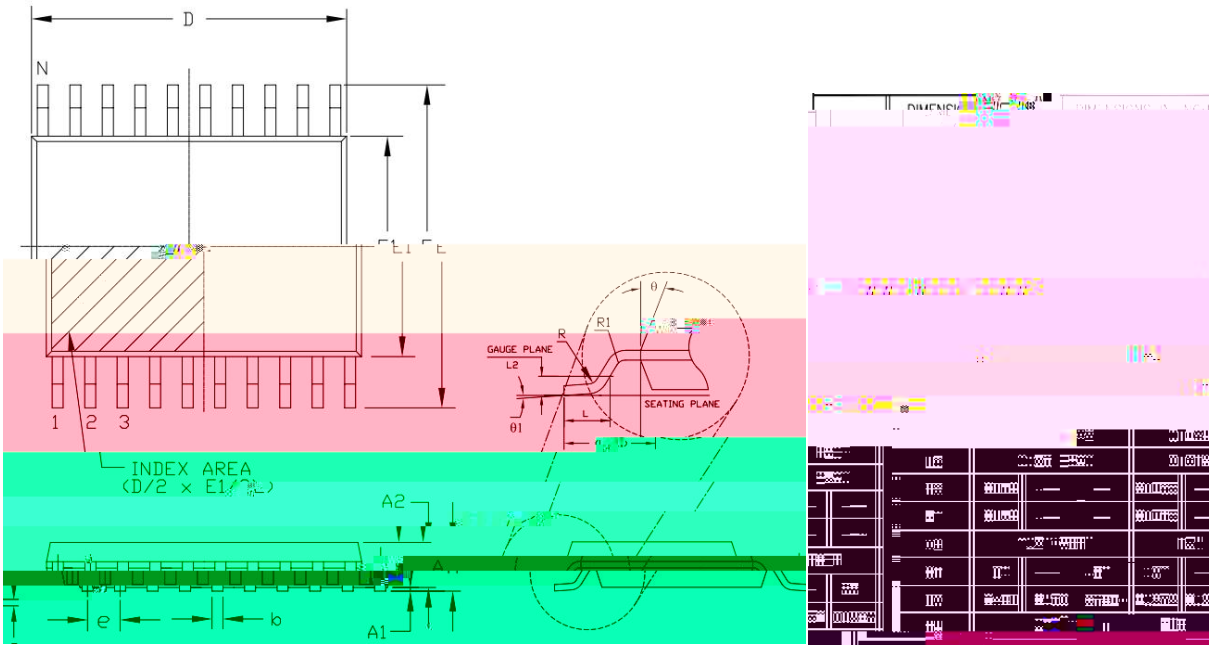
Table 3 COSMAX3222 Truth Table Logic for Shutdown and Enable Control

4. Package Information

4.1 SOP16 (Package Outline Dimensions)



4.2 TSSOP20 (Package Outline Dimensions)



5. Order Information

Model	Order Number	Package	P