



# RS-232 Transceivers

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ANALOG DEVICES INTERFACE BULLETIN

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### ADM33XXE: Chip Scale +2.7V, 15 kV ESD Protected, RS-232 Transceivers

The ADM3307E, ADM3310E, ADM3311E, ADM3312E and ADM3315E are a family of serial port transceivers designed to fully meet the EIA-232 standard while operating with a single +2.7 to 3.6 V power supply.

The devices are intended for serial port applications in personal computers, laptops, PDAs and peripherals such as printers, and for serial port data cable applications interfacing to mobile phones, digital cameras and other devices.

### 2.7V RS-232 TRANSCEIVER FAMILY FEATURES

- Single +2.7 V to +3.6 V Power Supply
- ESD >15 kV on RS-232 I/Os (on RS-232, CMOS, SD and EN for ADM3307E)
- Green Idle™ Power Saving Mode
- Low EMI
- Ultra Low Power CMOS
- Low Power Shutdown: 20 nA typ. 1µA max.
- 0.1 µF to 1 µF Charge Pump Capacitors
- One or Two Receivers Active in Shutdown
- LFCSP and TSSOP Package Options

### ADM33xxE Selection Guide

Generic	Tx	Rx	No. Rx's Active in SD	Speed	I <sub>cc</sub> Max	Additional Features
ADM3307E	5	3	1	1 Mbps	1.5mA	+/- 15kV ESD protection on RS-232 & CMOS I/O's including SD & EN pins.
ADM3310E	3	5	2	460 kbps	0.85mA	2 Receivers Active in Shutdown. Green Idle Mode Level 6V. Low power version of ADM3311E
ADM3311E	3	5	1	460kbps	1mA	
ADM3312E	3	3	1	460kbps	1mA	
ADM3315E	3	3	1	460kbps	0.75mA	22 kΩ Receiver Input Resistance. Green Idle Mode Level 6V. Low power version of ADM3312E.



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## ADM3307E, ADM3310E and ADM3311E

The ADM3307E contains five drivers and three receivers, and can be used to implement a full RS-232 port for the Data Communications Equipment (DCE) end of the serial link. The ADM3310E and ADM3312E contain three drivers and five receivers, and can implement a full RS-232 port for the Data Terminal Equipment (DTE) end. The low power drain of the ADM3310E makes it particularly suitable for battery-powered equipment such as notebook computers.

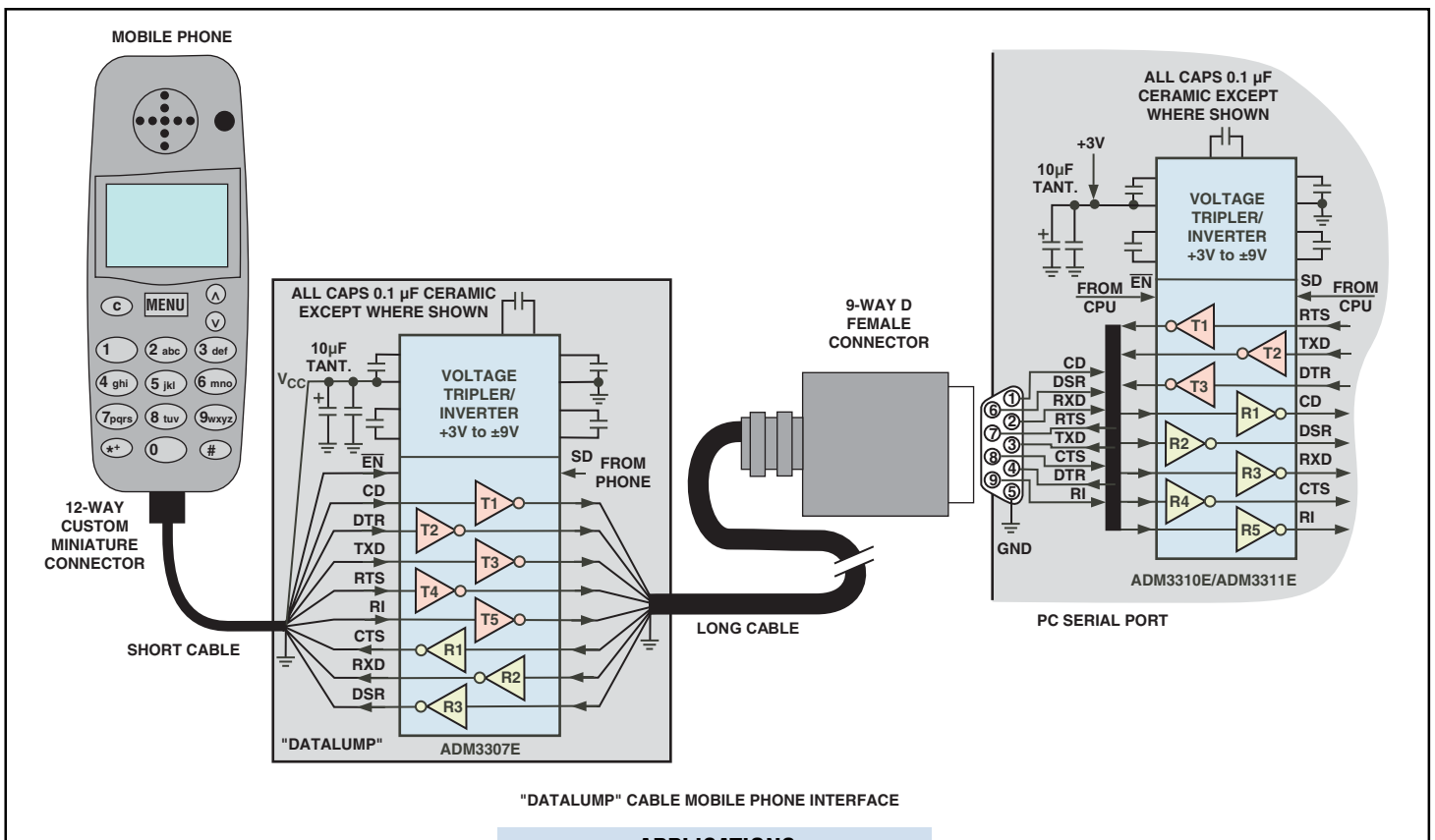
The devices feature an on-board, charge-pump, DC to DC converter, which internally generates positive and negative supplies from the input 3 V power supply, eliminating the need for dual power supplies. The DC-DC converter operates in Green Idle Mode™, whereby the charge pump oscillator is gated on and off to maintain a constant output voltage under varying load conditions. This minimizes the power consumption and makes these products ideal for battery-powered portable devices. A shutdown facility further reduces the power consumption to 66 nW. While

in shutdown, one receiver remains active (two in the ADM3310E), thereby allowing monitoring of peripheral devices. This feature allows the device to be shutdown until a peripheral device begins communication. The active receiver(s) can alert the processor which can then take the device out of the shutdown mode.

The devices are rugged and contain ESD protection up to  $\pm 15$  kV on the RS-232 I-O lines. The ADM3307E also offers similar protection on all the CMOS input and output pins. (driver inputs in, receiver outputs out, EN and SD).

The devices are fabricated using CMOS technology for minimal power consumption, and feature a high level of overvoltage protection and latch-up immunity. They are available in a 28-pin TSSOP package or in a 32 pin  $5 \times 5$  mm LFCSP package.

The diagram shows a typical application using an ADM3307E in a "datalump" cable RS-232 interface to a mobile phone, with an ADM3310E or ADM3311E used in the serial port of a laptop or desktop PC.



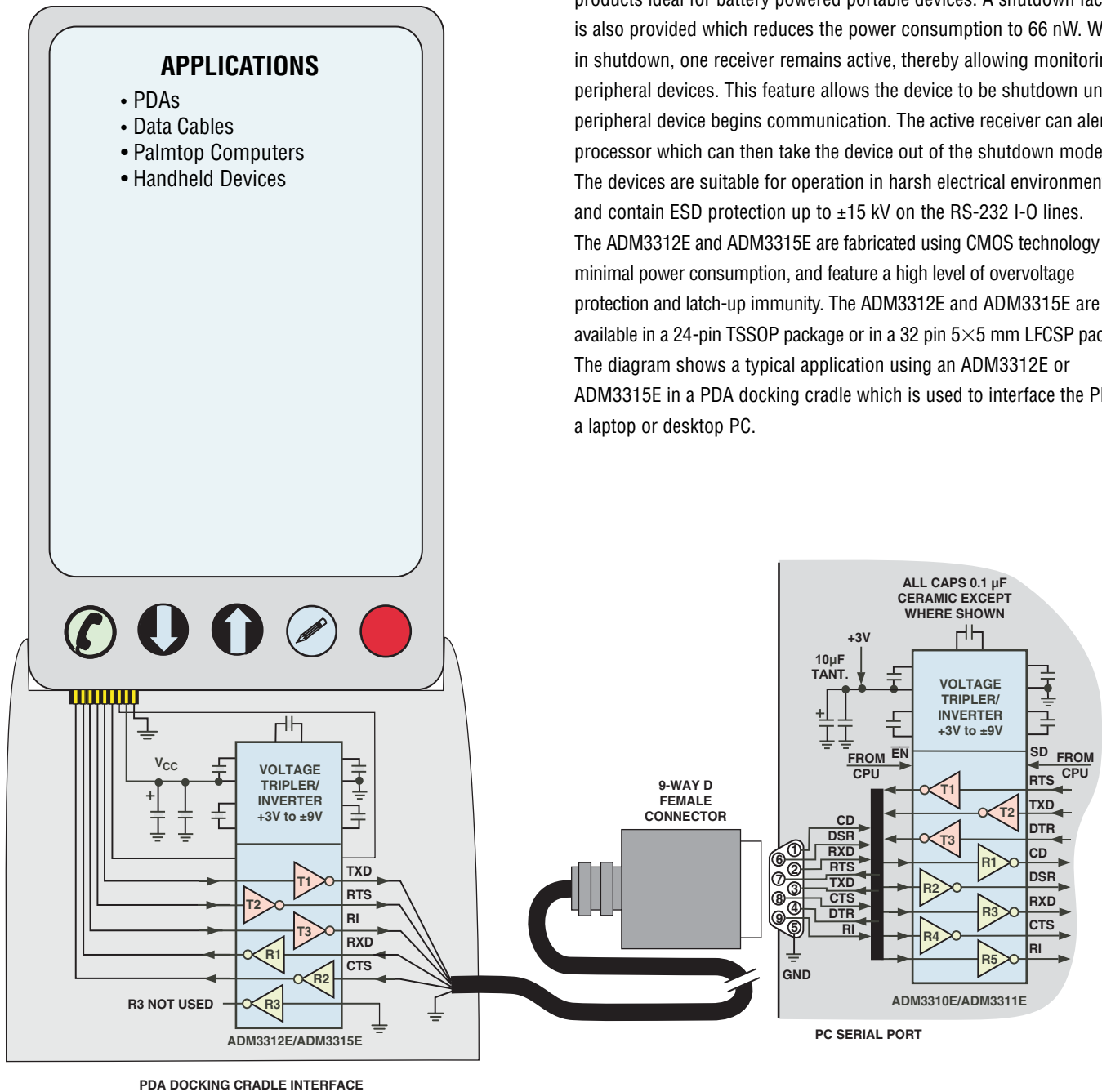
### APPLICATIONS

- Datalump Cables (ADM3307E)
- Portable Computing (ADM3307E)
- Laptop Computers (ADM3310E/ADM3311E)
- Notebook Computers (ADM3310E/ADM3311E)

## ADM3312E and ADM3315E

The ADM3312E and ADM3315E contain three drivers and three receivers and can be used to implement a subset of RS-232 signals for either the Data Terminal Equipment (DTE) end of the serial link or the Data Communications Equipment (DCE) end. The principal difference between the two devices is that the typical current drain of the ADM3315E is just over half that of the ADM3312E, and the ADM3315E features a high receiver input resistance of 22k $\Omega$ .

The devices feature an on-board, charge-pump, DC to DC converter, eliminating the need for dual power supplies. This contains a voltage tripler and voltage inverter, which internally generates positive and negative supplies from the input 3 V power supply. The DC-DC converter operates in Green Idle Mode™, whereby the charge pump oscillator is gated on and off to maintain a constant output voltage under varying load conditions. This minimizes the power consumption and makes these products ideal for battery powered portable devices. A shutdown facility is also provided which reduces the power consumption to 66 nW. While in shutdown, one receiver remains active, thereby allowing monitoring of peripheral devices. This feature allows the device to be shutdown until a peripheral device begins communication. The active receiver can alert the processor which can then take the device out of the shutdown mode. The devices are suitable for operation in harsh electrical environments and contain ESD protection up to  $\pm 15$  kV on the RS-232 I-O lines. The ADM3312E and ADM3315E are fabricated using CMOS technology for minimal power consumption, and feature a high level of overvoltage protection and latch-up immunity. The ADM3312E and ADM3315E are available in a 24-pin TSSOP package or in a 32 pin 5 $\times$ 5 mm LFCSP package. The diagram shows a typical application using an ADM3312E or ADM3315E in a PDA docking cradle which is used to interface the PDA to a laptop or desktop PC.



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## ADM3202 and ADM3222

The ADM3202 and ADM3222 transceivers are high speed, 2-channel RS-232/V.28 interface devices which operate from a single 3.3 V power supply.

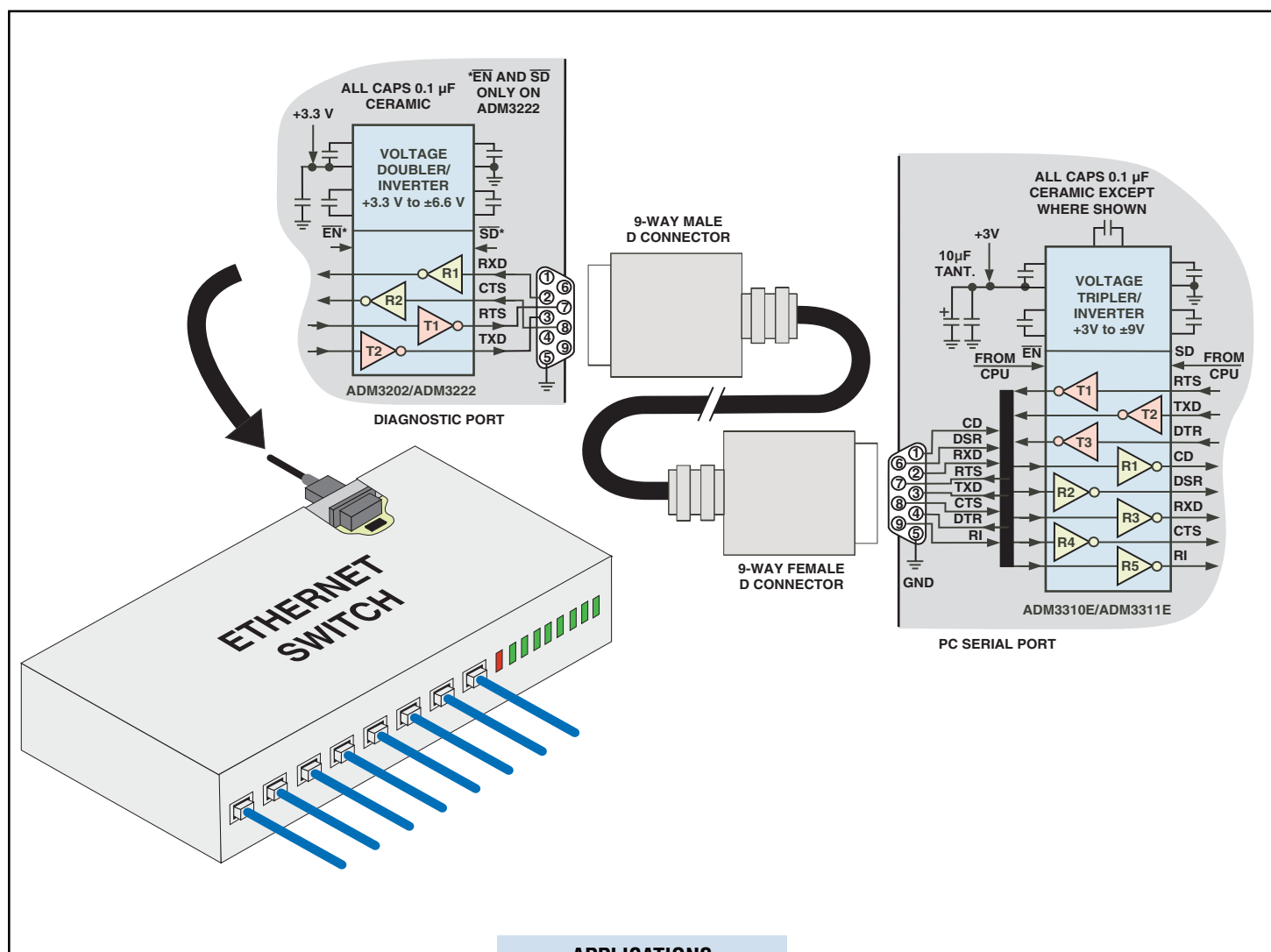
Low power consumption and a shutdown facility on the ADM3222 makes them ideal for battery powered portable instruments.

The ADM3202 and ADM3222 conform to the EIA-232E and CCITT V.28 specifications and operates at data rates up to 460 kbps.

Four external 0.1  $\mu\text{F}$  charge pump capacitors are used for the voltage doubler/inverter permitting operation from a single 3.3 V supply.

The ADM3222 contains additional enable and shutdown circuitry. The EN input may be used to three-state the receiver outputs. The SD input is used to power down the charge pump and transmitter outputs reducing the quiescent current to less than 0.5  $\mu\text{A}$ . The receivers remain enabled during shutdown unless disabled using EN.

The ADM3202 is available in a 16-lead DIP, narrow and wide SOIC as well as a space saving 16-lead TSSOP package. The ADM3222 is available in 18-lead DIP, SO and in 20-lead SSOP and TSSOP.



## 5 Volt RS-232 Transceivers

For systems where a 5 volt supply is available, Analog Devices has a range of over 25 RS-232 transceivers that operate from a single +5V rail, which are featured on this page and subsequent pages.

These range from devices having a single driver and receiver to devices having up to five drivers and five receivers.

Some typical examples of these parts, the ADM202E, ADM211E, ADM213E and ADM232A, are featured on this page, and on pages 6 and 7. A selection guide for other 5 volt parts is given on page 8.

The ADM232A contains two drivers and two receivers. It meets all EIA-232-E and V.28 specifications, accepts  $\pm 30$  V receiver input levels, produces  $\pm 9$  V driver output levels, and is a plug-in upgrade for the MAX202E, MAX232E and LT1181A.

The ADM232A is available in a choice of 16-lead DIP or 16-lead narrow and wide SO packages.

In addition to fully meeting EIA-232-E and V.28 specifications, the

ADM202E, ADM211E and ADM213E also offer enhanced ESD and EMI immunity and reduced EMI emissions. They comply with the 89/336/EEC EMC directive, offer ESD protection to IEC-4-2 (801.2) and EMI emissions to EN5022.

The ADM202E has two drivers and two receivers, and is a plug-in upgrade for the MAX202E, MAX232E and LT1181A. It is available in a choice of 16 lead, DIP, narrow SO, wide SO, and TSSOP packages.

The ADM211E contains four drivers and five receivers, and is a plug-in upgrade for the MAX211E. It is available in a choice of 24-lead DIP, SO, SSOP and TSSOP packages.

The ADM213E has the same features as the ADM211E, but in shutdown mode two receivers remain active to allow monitoring of peripheral devices.

The ADM213E is a plug-in upgrade for the MAX2213E, and is available in 28-lead DIP, SO, SSOP and TSSOP packages.

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>• Meets All EIA-232-E and V.28 Specifications</li> <li>• Small (0.1 <math>\mu</math>F) Charge Pump Capacitors</li> <li>• Single 5 V Power Supply</li> </ul> | <ul style="list-style-type: none"> <li>• On-Board DC-DC Converters</li> <li>• 9 V Output Swing with 5 V Supply</li> <li>• 30 V Receiver Input Levels</li> </ul> |
|--|---|

### Selection Guide for Featured 5 Volt Parts

Generic	Supply Voltage	Tx	Rx	No. Rx's Active in SD	External Capacitors	Speed	15kV ESD	Shutdown	Tri-State Rx Enable	I <sub>cc</sub> Max	I <sub>cc</sub> Shutdown Max	Other Features
ADM202E	+4.5V to +5.5V	2	2	n/a	4	230 kbps	Y	N	N	6 mA	n/a	$\pm 15$ kV ESD protection on RS-232 & CMOS I/O's
ADM211E	+4.5V to +5.5V	4	5	n/a	4	230 kbps	Y	Y	y	13 mA	10 $\mu$ A	
ADM213E	+4.5V to +5.5V	4	5	2	4	230 kbps	Y	Y	Y	13 mA	10 $\mu$ A	2 Rx's Active in Shutdown.
ADM232A	+4.5V to +5.5V	2	2	n/a	4	200 kbps	Y	N	N	8 mA	n/a	$\pm 15$ kV ESD protection on RS-232 & CMOS I/O's

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## ADM202E and ADM232A

The ADM202E is a robust, high speed, 2-channel RS232/V.28 interface device that operates from a single 5 V power supply. It is suitable for operation in harsh electrical environments and are compliant with the EU directive on EMC (89/336/EEC). Both the level of electromagnetic emissions and immunity are in compliance. EM immunity includes ESD protection in excess of  $\pm 15$  kV on all I/O lines, Fast Transient burst protection (1000-4-4) and Radiated Immunity (1000-4-3). EM emissions include radiated and conducted emissions as required by Information Technology Equipment EN55022, CISPR22. The ADM202E conforms to the EIA-232E and CCITT V.28 specifications and operates at data rates up to 230 kbps.

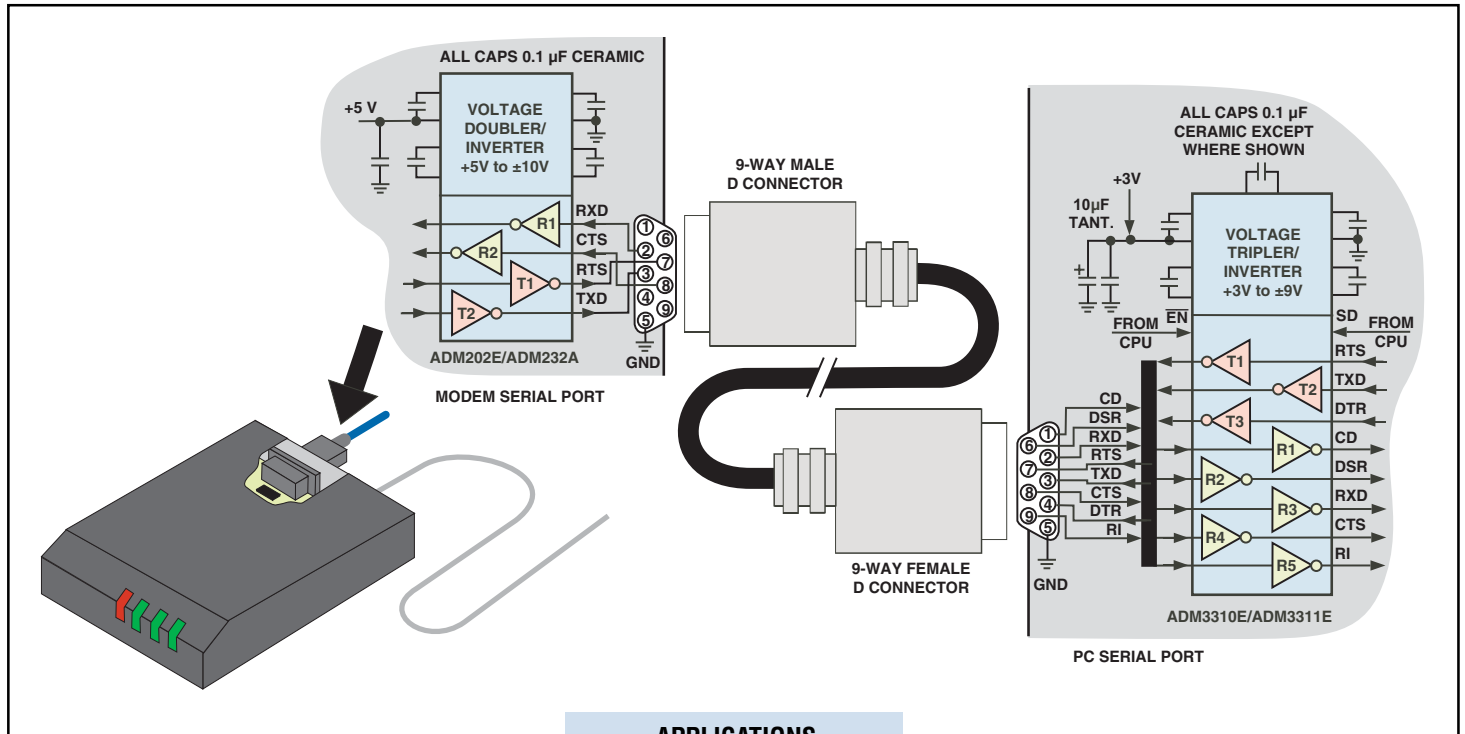
Four external 0.1  $\mu\text{F}$  charge pump capacitors are used for the voltage doubler/inverter permitting operation from a single 5 V supply.

The ADM232A is a high-speed RS-232 line driver/receiver offering

transmission rates up to 200 kB/s. Operating from a single 5 V power supply, a highly efficient on-chip charge pump using small (0.1  $\mu\text{F}$ ) external capacitors allows RS-232 bipolar levels to be developed. Two RS-232 drivers and two RS-232 receivers are provided on each device. The device is fabricated on BiCMOS, an advanced mixed technology process that combines low power CMOS with high-speed bipolar circuitry. This allows for transmission rates up to 200 kB/s, yet minimizes the quiescent power supply current to under 5 mA.

The ADM202E and ADM232A provide a robust pin-compatible upgrade for the MAX202E and MAX232E.

The ADM202E and ADM232A are available in a 16-lead DIP, and wide and narrow SO packages. The ADM202E is also available in a space saving TSSOP package. The TSSOP package gives a 44% space saving over SOIC.



### APPLICATIONS

- General-Purpose RS-232 Data Link
- Portable Instruments
- PDAs
- Modems

## ADM211E and ADM213E

The ADM211E and ADM213E are robust RS-232 and V.28 interface devices that operate from a single 5 V power supply. These products are suitable for operation in harsh electrical environments and are compliant with the EU directive on EMC (89/336/EEC). The level of emissions and immunity are both in compliance. EM immunity includes ESD protection in excess of  $\pm 15$  kV on all I-O lines (1000-4-2), Fast Transient Burst protection (1000-4-4) and Radiated Immunity (1000-4-3). EM emissions include radiated and conducted emissions as required by Information Technology Equipment EN55022, CISPR22.

Both devices fully conform to the EIA-232E and CCITT V.28 specifications and operate at data rates up to 230 kbps.

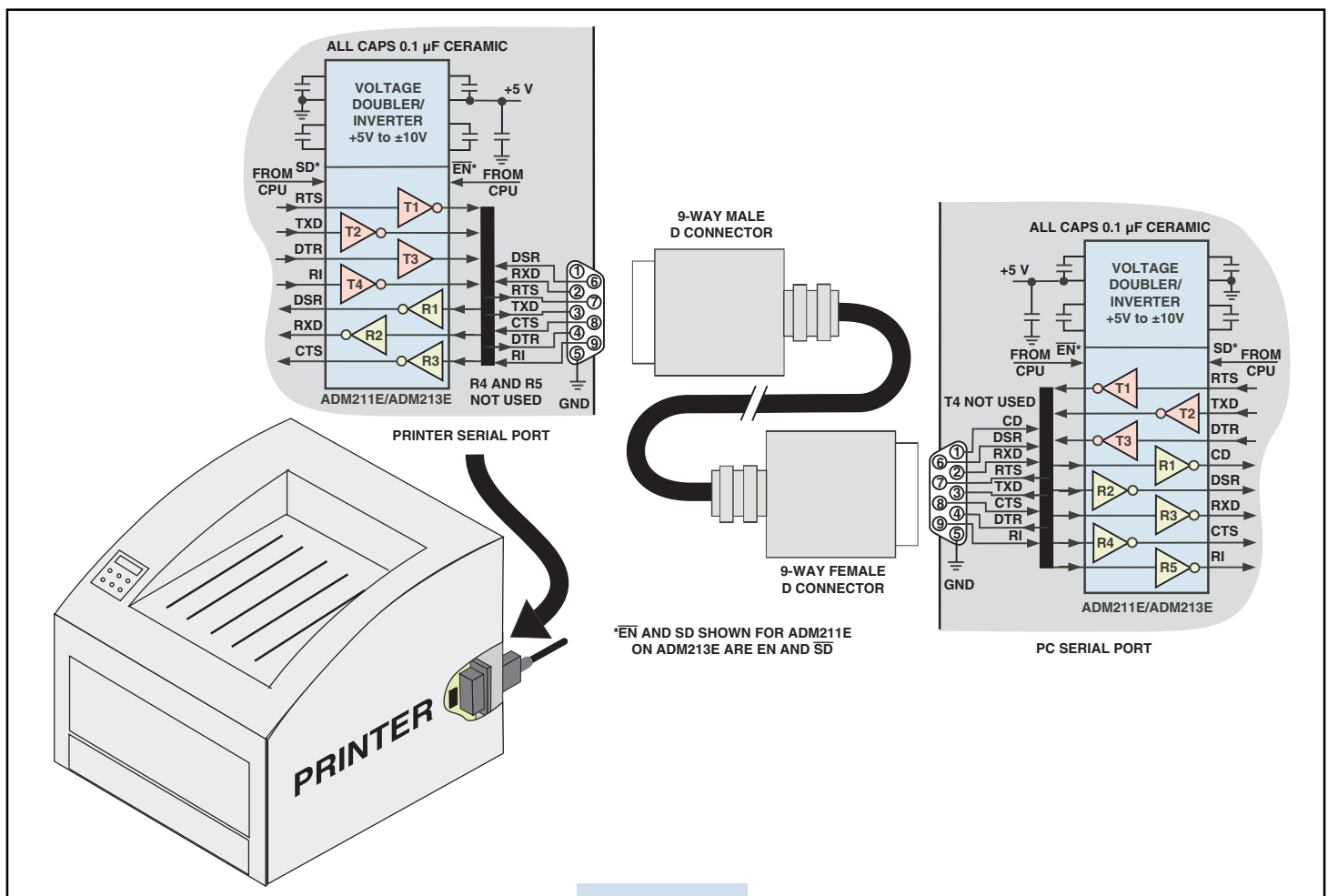
Shutdown and Enable control pins are provided. The shutdown function on the ADM211E disables the charge pump and all transmitters and

receivers. On the ADM213E the charge pump, all transmitters, and three of the five receivers are disabled. The remaining two receivers remain active, thereby allowing monitoring of peripheral devices. This feature allows the device to be shut down until a peripheral device begins communication.

The active receivers can alert the processor which can then take the ADM213E out of the shutdown mode.

Operating from a single 5 V supply, four external 0.1  $\mu$ F capacitors are required. The ADM211E and ADM213E are available in 28-lead SO, SSOP and TSSOP packages.

The devices are backward-compatible with earlier ADM2xx products, facilitating easy upgrading of older designs, and are upgrades for the MAX211E and MAX213E.



### APPLICATIONS

- PC RS-232 Port
- Printers
- Peripherals
- Modems

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### Selection Guide for Additional 5 Volt Parts

Generic	Supply Voltage	Tx	Rx	No. Rx's Active in SD	External Capacitors	Speed	15kV ESD	Shutdown	Tri-State Rx Enable	I <sub>cc</sub> Max	I <sub>cc</sub> Shutdown Max
ADM101E	+4.5V to +5.5V	1	1	1	3	460 kbps	Y	Y	N	1 mA	1µA
ADM202	+4.5V to +5.5V	2	2	n/a	4	120 kbps	N	N	N	6 mA	n/a
ADM203	+4.5V to +5.5V	2	2	n/a	None	120 kbps	N	N	N	6 mA	n/a
ADM206E	+4.5V to +5.5V	4	3	None	4	230 kbps	Y	Y	Y	13 mA	10 µA
ADM207E	+4.5V to +5.5V	5	3	n/a	4	200 kbps	Y	N	N	13 mA	n/a
ADM208E	+4.5V to +5.5V	4	4	n/a	4	200 kbps	Y	N	N	13 mA	n/a
ADM222	+4.5V to +5.5V	2	2	None	4	200 kbps	N	Y	N	8 mA	10 µA
ADM223	+4.5V to +5.5V	4	5	2	4	200 kbps	N	Y	Y	13 mA	10 µA
ADM230L	+4.5V to +5.5V	5	0	None	4	120 kbps	N	Y	Y	13 mA	10 µA
ADM231L	+4.5V to +5.5V & +7.5V to +13.2V	2	2	n/a	2	120 kbps	N	N	N	13 mA	n/a
ADM232L	+4.5V to +5.5V	2	2	n/a	4	120 kbps	N	N	N	13 mA	n/a
ADM233L	+4.5V to +5.5V	2	2	n/a	None	120 kbps	N	N	N	13 mA	n/a
ADM234L	+4.5V to +5.5V	4	0	n/a	4	120 kbps	N	N	N	13 mA	n/a
ADM235L	+4.5V to +5.5V	5	5	None	None	120 kbps	N	Y	Y	13 mA	10 µA
ADM236L	+4.5V to +5.5V	4	3	None	4	120 kbps	N	Y	Y	13 mA	10 µA
ADM237L	+4.5V to +5.5V	5	3	n/a	4	120 kbps	N	N	N	13 mA	n/a
ADM238L	+4.5V to +5.5V	4	4	n/a	4	120 kbps	N	N	N	13 mA	n/a
ADM239L	+4.5V to +5.5V & +7.5V to +13.2V	3	5	None	2	120 kbps	N	N	Y	13 mA	10 µA
ADM241L	+4.5V to +5.5V	4	5	None	4	120 kbps	N	Y	Y	13 mA	10 µA
ADM242	+4.5V to +5.5V	2	2	2	4	200 kbps	N	Y	Y	8 mA	10 µA
ADM1181A	+4.5V to +5.5V	2	2	n/a	4	230 kbps	Y	N	N	6 mA	n/a