



±15 kV ESD Protected, 3.3 V, RS-232 Line Driver/Receiver

ADM3232E

FEATURES

Data rate: 460 kbps
2 Tx and 2 Rx
Meets EIA-232E specifications
0.1 μ F charge pump capacitors
ESD protection to IEC 1000-4-2 (801.2) on RS-232 I/Os
Contact discharge: ± 8 kV
Air gap discharge: ± 15 kV

APPLICATIONS

General-purpose RS-232 data link
Portable instruments
Handsets
Industrial/telecom diagnostic ports

GENERAL DESCRIPTION

The ADM3232E transceiver is a high speed, 2-channel RS-232/V.28 interface device that operates from a single 3.3 V power supply. Low power consumption makes it ideal for battery-powered portable instruments. The ADM3232E conforms to the EIA-232E and ITU-T V.28 specifications and operates at data rates up to 460 kbps.

All RS-232 (T_{XOUT} and R_{XIN}) inputs and outputs are protected against electrostatic discharges (up to ± 15 kV ESD protection). This ensures compliance with IEC 1000-4-2 requirements.

This device is ideally suited for operation in electrically harsh environments or where RS-232 cables are frequently plugged/unplugged, with the ± 15 kV ESD protection of the ADM3232E RS-232 input/output pins.

FUNCTIONAL BLOCK DIAGRAM

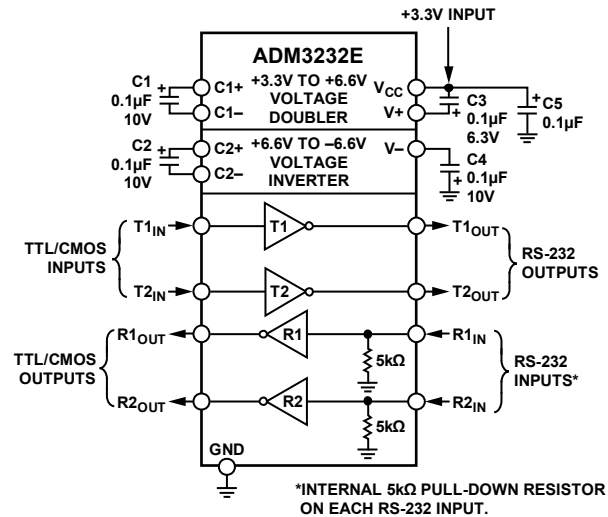


Figure 1.

Emissions are also controlled to within very strict limits. CMOS technology is used to keep the power dissipation to an absolute minimum, allowing maximum battery life in portable applications.

Four external 0.1 μ F charge pump capacitors are used for the voltage doubler/inverter, permitting operation from a single 3.3 V supply.

The ADM3232E is available in a 16-lead narrow and wide SOIC packages, as well as a space-saving 16-lead TSSOP.

Rev. B

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REVISION HISTORY

4/11—Rev. A to Rev. B	
Changes to Features Section and General Description	
Section	1
Change to ESD Protection (RS-232 I/O Pins) Parameter,	
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Change to ESD Protection on RS-232 Pins Section Heading.....	8
7/08—Rev. 0 to Rev. A	
Added 16-Lead SOIC.....	Universal
Updated Outline Dimensions	9
Changes to Ordering Guide	10

12/06—Revision 0: Initial Version

SPECIFICATIONS

$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$, $C1$ to $C4 = 0.1 \text{ }\mu\text{F}$; all specifications T_{MIN} to T_{MAX} , unless otherwise noted.

Table 1.

Parameter	Min	Typ	Max	Unit	Test Conditions/Comments
DC CHARACTERISTICS					
Operating Voltage Range	3.0	3.3	5.5	V	No load
V _{CC} Power Supply Current		1.3	3	mA	
LOGIC					
Input Logic Threshold Low, V _{INL}	2.0		0.8	V	T _{IN}
Input Logic Threshold High, V _{INH}				V	T _{IN}
TTL/CMOS Output Voltage Low, V _{OL}	V _{CC} – 0.6		0.4	V	I _{OUT} = 1.6 mA
TTL/CMOS Output Voltage High, V _{OH}				V	I _{OUT} = –1 mA
Logic Pull-Up Current		5	10	μA	T _{IN} = GND to V _{CC}
Transmitter Input Hysteresis		0.5		V	
RS-232 RECEIVER					
Input Voltage Range	–30		+30	V	
Input Threshold Low	0.6	1.2		V	
Input Threshold High		1.6	2.4	V	
Input Hysteresis		0.4		V	
Input Resistance	3	5	7	kΩ	
RS-232 TRANSMITTER					
Output Voltage Swing (RS-232)	±5.0	±5.2		V	V _{CC} = 3.3 V, all transmitter outputs loaded with 3 kΩ to ground
Output Voltage Swing (RS-562)	±3.7			V	V _{CC} = 3.0 V
Transmitter Output Resistance	300			Ω	V _{CC} = 0 V, V _{OUT} = ±2 V
Output Short-Circuit Current (RS-232)		±15		mA	
TIMING CHARACTERISTICS					
Maximum Data Rate	460			kbps	V _{CC} = 3.3 V, R _L = 3 kΩ to 7 kΩ, C _L = 50 pF to 1000 pF, one Tx switching
Receiver Propagation Delay					R _L = 3 kΩ, C _L = 1000 pF
t _{PHL}		0.4	1	μs	
t _{PLH}		0.4	1	μs	
Transmitter Propagation Delay		300	1.2	μs	
Receiver Output Enable Time		200		ns	
Receiver Output Disable Time		200		ns	Measured from +3 V to –3 V or –3 V to +3 V, V _{CC} = 3.3 V; R _L = 3 kΩ, C _L = 1000 pF, T _A = 25°C
Transmitter Skew		30		ns	
Receiver Skew		300		ns	
Transition Region Slew Rate	5.5	10	30	V/μs	
ESD PROTECTION (RS-232 I/O PINS)					
		±15		kV	Human body model
		±15		kV	IEC 1000-4-2 air discharge
		±8		kV	IEC 1000-4-2 contact discharge

ABSOLUTE MAXIMUM RATINGS

$T_A = 25^\circ\text{C}$, unless otherwise noted.

Table 2.

Parameter	Rating
V_{CC}	$-0.3\text{ V to }+6\text{ V}$
V_+	$(V_{CC} - 0.3\text{ V})\text{ to }14\text{ V}$
V_-	$+0.3\text{ V to }-14\text{ V}$
Input Voltages	
T_{XIN}	$-0.3\text{ V to } (V_{CC} + 0.3\text{ V})$
R_{XIN}	$\pm 30\text{ V}$
Output Voltages	
T_{XOUT}	$\pm 15\text{ V}$
R_{XOUT}	$-0.3\text{ V to } (V_{CC} + 0.3\text{ V})$
Short-Circuit Duration	
T_{XOUT}	Continuous
Power Dissipation R-16/RW-16 (Derate 6 mW/°C Above 50°C)	450 mW
θ_{JA} , Thermal Impedance	158°C/W
Power Dissipation RU-16 (Derate 6 mW/°C Above 50°C)	500 mW
θ_{JA} , Thermal Impedance	158°C/W
Operating Temperature Range	
Industrial (A Version)	$-40^\circ\text{C to }+85^\circ\text{C}$
Storage Temperature Range	$-65^\circ\text{C to }+150^\circ\text{C}$
Lead Temperature (Soldering, 10 sec)	JEDEC industry-standard J-STD-020

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ESD CAUTION



ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

PIN CONFIGURATION AND FUNCTION DESCRIPTIONS

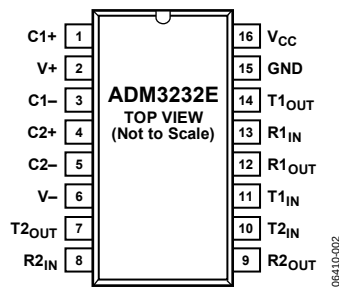


Figure 2. Pin Configuration

Table 3. Pin Function Descriptions

Pin No.	Mnemonic	Description
1, 3	C1+, C1–	External Capacitor 1 is connected between these pins. A 0.1 μ F capacitor is recommended, but larger capacitors of up to 47 μ F can be used.
2	V+	Internally Generated Positive Supply (6 V Nominal).
4, 5	C2+, C2–	External Capacitor 2 is connected between these pins. A 0.1 μ F capacitor is recommended, but larger capacitors of up to 47 μ F can be used.
6	V–	Internally Generated Negative Supply (–6 V Nominal).
7, 14	T2 _{OUT} , T1 _{OUT}	Transmitter (Driver) Outputs. These are RS-232 signal levels (typically ± 6 V).
8, 13	R2 _{IN} , R1 _{IN}	Receiver Inputs. These inputs accept RS-232 signal levels. An internal 5 k Ω pull-down resistor to GND is connected on each input.
9, 12	R2 _{OUT} , R1 _{OUT}	Receiver Outputs. These are TTL/CMOS output logic levels.
10, 11	T2 _{IN} , T1 _{IN}	Transmitter (Driver) Inputs. These inputs accept TTL/CMOS levels.
15	GND	Ground Pin. Must be connected to 0 V.
16	V _{CC}	Power Supply Input (3.3 V $\pm$ 0.3 V).

TYPICAL PERFORMANCE CHARACTERISTICS

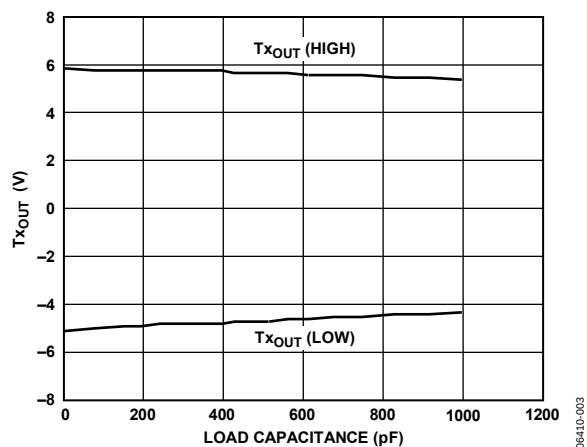


Figure 3. Transmitter Output Voltage High/Low vs. Load Capacitance @ 460 kbps

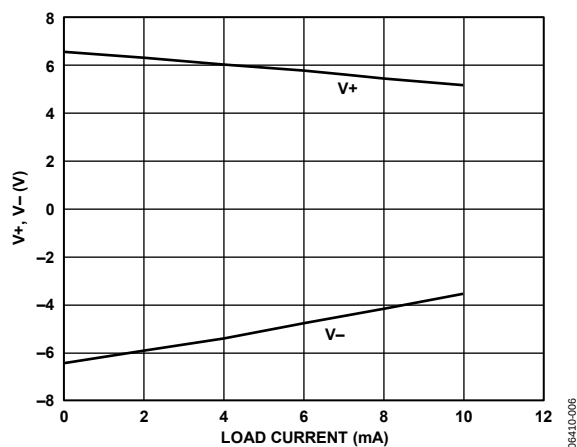


Figure 6. Charge Pump V+, V- vs. Load Current

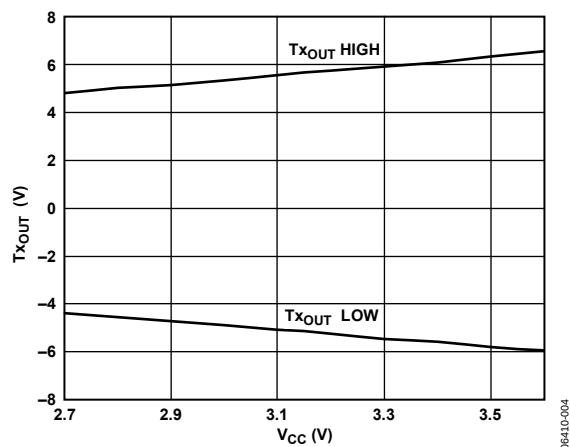


Figure 4. Transmitter Output Voltage vs. VCC

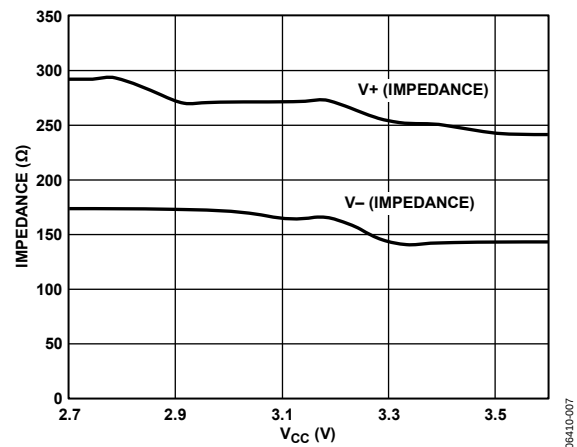


Figure 7. Charge Pump Impedance vs. VCC

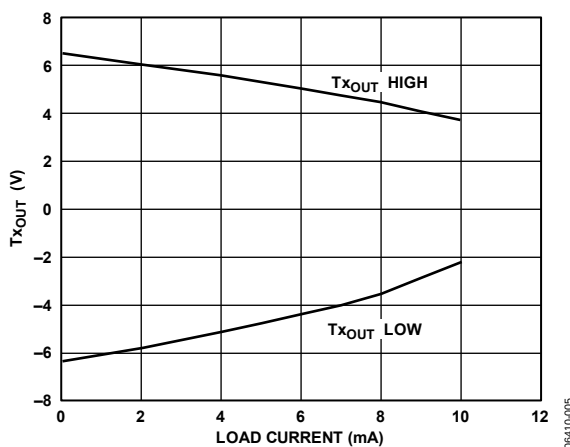


Figure 5. Transmitter Output Voltage High/Low vs. Load Current

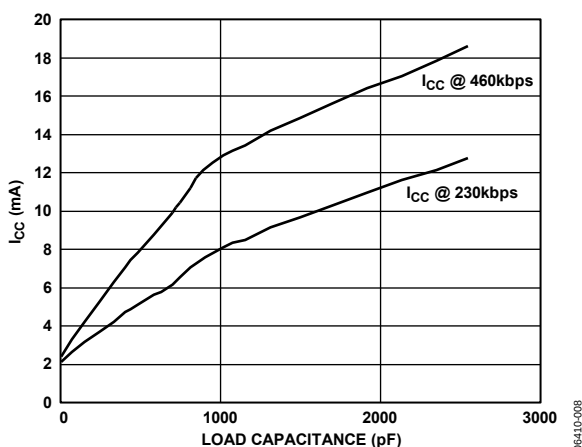


Figure 8. Power Supply Current vs. Load Capacitance

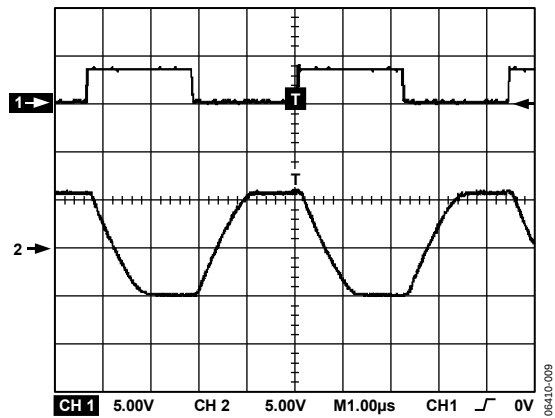
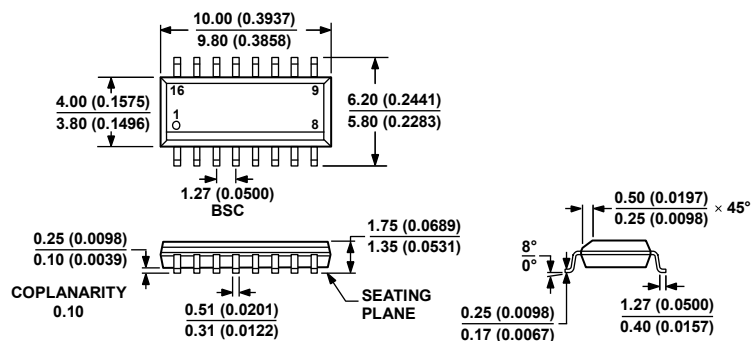


Figure 9. 460 kbps Data Transmission

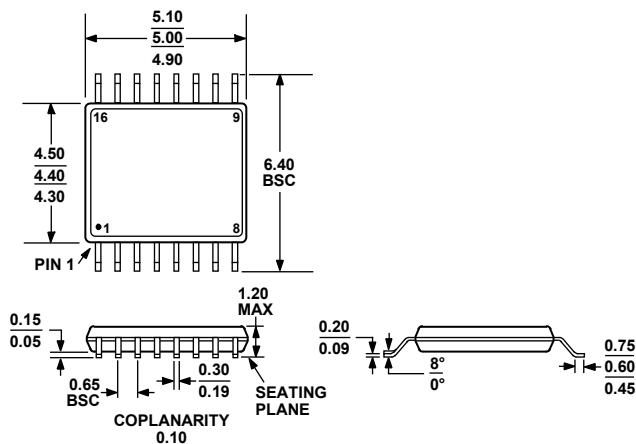
OUTLINE DIMENSIONS



COMPLIANT TO JEDEC STANDARDS MS-012-AC
CONTROLLING DIMENSIONS ARE IN MILLIMETERS; INCH DIMENSIONS
(IN PARENTHESES) ARE ROUNDED-OFF MILLIMETER EQUIVALENTS FOR
REFERENCE ONLY AND ARE NOT APPROPRIATE FOR USE IN DESIGN.

Figure 13. 16-Lead Standard Small Outline Package [SOIC_N]
Narrow Body
(R-16)

Dimensions shown in millimeters (and inches)

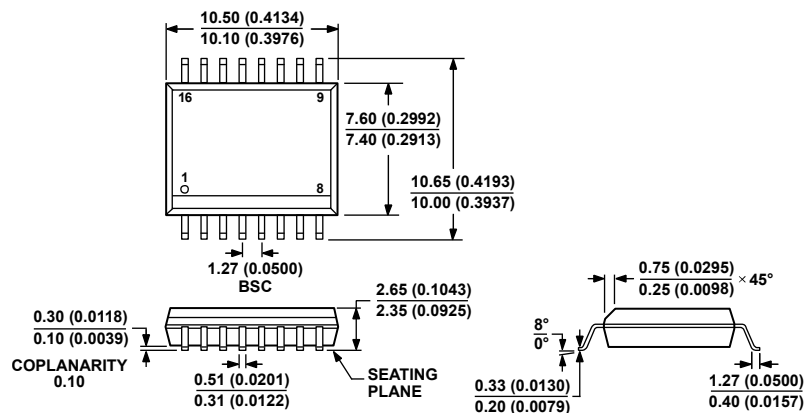


COMPLIANT TO JEDEC STANDARDS MO-153-AB

Figure 14. 16-Lead Thin Shrink Small Outline Package [TSSOP]
(RU-16)

Dimensions shown in millimeters

ADM3232E



COMPLIANT TO JEDEC STANDARDS MS-013-AA
CONTROLLING DIMENSIONS ARE IN MILLIMETERS; INCH DIMENSIONS
(IN PARENTHESES) ARE ROUNDED-OFF MILLIMETER EQUIVALENTS FOR
REFERENCE ONLY AND ARE NOT APPROPRIATE FOR USE IN DESIGN.

Figure 15. 16-Lead Standard Small Outline Package [SOIC_W]
Wide Body
(RW-16)
Dimensions shown in millimeters (and inches)

03-27-2007-B

ORDERING GUIDE

Model ¹	Temperature Range	Package Description	Package Option
ADM3232EARNZ	−40°C to +85°C	16-Lead SOIC_N	R-16
ADM3232EARNZ-REEL7	−40°C to +85°C	16-Lead SOIC_N	R-16
ADM3232EARUZ	−40°C to +85°C	16-Lead TSSOP	RU-16
ADM3232EARUZ-REEL7	−40°C to +85°C	16-Lead TSSOP	RU-16
ADM3232EARWZ	−40°C to +85°C	16-Lead SOIC_W	RW-16
ADM3232EARWZ-REEL	−40°C to +85°C	16-Lead SOIC_W	RW-16

¹ Z = RoHS Compliant Part.

NOTES

ADM3232E

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