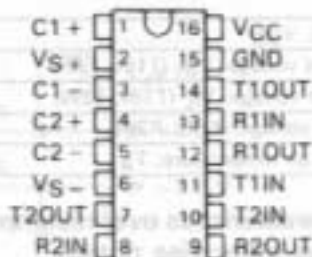


MAX232 DUAL EIA-232 DRIVER/RECEIVER

D3120, FEBRUARY 1989—REVISED JUNE 1989

- Operates with Single 5-V Power Supply
- LinBiCMOS™ Process Technology
- Two Drivers and Two Receivers
- ± 30 -V Input Levels
- Low Supply Current . . . 8 mA Typ
- Meets ANSI/EIA-232-D-1986 Specifications (Revision of EIA Standard RS-232-C)
- Designed to be Interchangeable with Maxim MAX232

D OR N PACKAGE
(TOP VIEW)

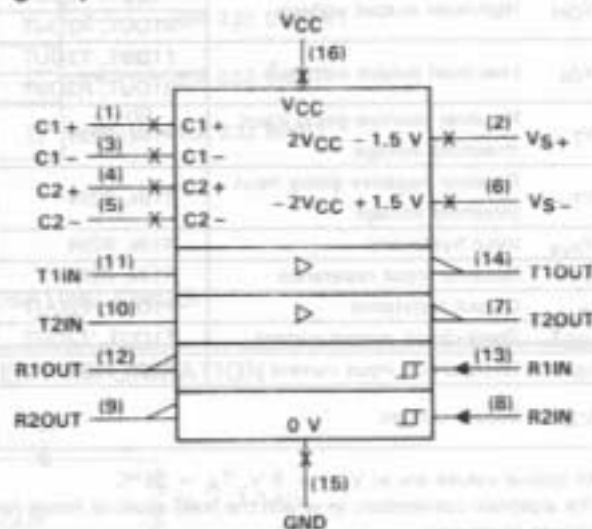


- Applications
 - EIA-232 Interface
 - Battery-Powered Systems
 - Terminals
 - Modems
 - Computers

description

The MAX232 is a dual driver/receiver that includes a capacitive voltage generator to supply EIA-232 voltage levels from a single 5-V supply. Each receiver converts EIA-232 inputs to 5-V TTL/CMOS levels. These receivers have a typical threshold of 1.3 V and a typical hysteresis of 0.5 V, and can accept ± 30 -V inputs. Each driver converts TTL/CMOS input levels into EIA-232 levels. The driver, receiver, and voltage-generator functions are available as cells in the Texas Instruments LinASIC™ library.

logic symbol†



†This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Input supply voltage, V_{CC} (see Note 1)	-0.3 V to 6 V
Positive output supply voltage, V_{S+}	V_{CC} -0.3 V to 15 V
Negative output supply voltage, V_{S-}	0.3 V to -15 V
Input voltage range: Driver	-0.3 V to $V_{CC} + 0.3$ V
Receiver	± 30 V
Output voltage range: T1OUT, T2OUT	$V_{S-} - 0.3$ V to $V_{S+} + 0.3$ V
R1OUT, R2OUT	-0.3 V to $V_{CC} + 0.3$ V
Short-circuit duration: V_{S+}	30 s
V_{S-}	30 s
T1OUT, T2OUT	unlimited
Operating free-air temperature range	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C

NOTE 1: All voltage values are with respect to network ground terminal.

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MAX232

DUAL EIA-232 DRIVER/RECEIVER

recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}	4.5	5	5.5	V
High-level input voltage, V_{IH} (T1IN, T2IN)	2			V
Low-level input voltage, V_{IL} (T1IN, T2IN)			0.8	V
Receiver input voltage, R1IN, R2IN			± 30	V
Operating free-air temperature, T_A	0		70	$^{\circ}\text{C}$

electrical characteristics over recommended ranges of supply voltage and operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP [†]	MAX	UNIT
V_{OH} High-level output voltage	T1OUT, T2OUT $R_L = 3\text{ k}\Omega$ to GND	5	7		V
	R1OUT, R2OUT $I_{OH} = -1\text{ mA}$	3.5			
V_{OL} Low-level output voltage [‡]	T1OUT, T2OUT $R_L = 3\text{ k}\Omega$ to GND		-7	-5	V
	R1OUT, R2OUT $I_{OL} = 3.2\text{ mA}$			0.4	
V_{T+} Receiver positive-going input threshold voltage	R1IN, R2IN $V_{CC} = 5\text{ V}, T_A = 25^{\circ}\text{C}$		1.7	2.4	V
V_{T-} Receiver negative-going input threshold voltage	R1IN, R2IN $V_{CC} = 5\text{ V}, T_A = 25^{\circ}\text{C}$	0.8	1.2		V
V_{HYS} Input hysteresis	R1IN, R2IN $V_{CC} = 5\text{ V}$	0.2	0.5	1	k Ω
r_i Receiver input resistance	R1IN, R2IN $V_{CC} = 5\text{ V}, T_A = 25^{\circ}\text{C}$	3	5	7	k Ω
r_o Output resistance	T1OUT, T2OUT $V_{S+} = V_{S-} = 0, V_O = \pm 2\text{ V}$	300			Ω
I_{OS}^{\S} Short-circuit output current	T1OUT, T2OUT $V_{CC} = 5.5\text{ V}, V_O = 0$		± 10		mA
I_{IS} Short-circuit input current	T1IN, T2IN $V_I = 0$			200	μA
I_{CC} Supply current	$V_{CC} = 5.5\text{ V}$, All outputs open, $T_A = 25^{\circ}\text{C}$		8	10	mA

[†]All typical values are at $V_{CC} = 5\text{ V}, T_A = 25^{\circ}\text{C}$.

[‡]The algebraic convention, in which the least positive (most negative) value is designated minimum, is used in this data sheet for logic voltage levels only.

[§]Not more than one output should be shorted at a time.

switching characteristics, $V_{CC} = 5\text{ V}, T_A = 25^{\circ}\text{C}$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{PLH(R)}$ Receiver propagation delay time, low-to-high-level output	See Figure 2		500		ns
$t_{PHL(R)}$ Receiver propagation delay time, high-to-low-level output	See Figure 2		500		ns
SR Driver slew rate	$R_L = 3\text{ k}\Omega$ to $7\text{ k}\Omega$. See Figure 3			30	V/ μs
SR(tr) Driver transition region slew rate	See Figure 4		3		V/ μs

8 08
 4 08
 0 08
 0 08
 0 08
 0 08

FIGURE 2. CONNECTING A...
 FROM $V_{CC} = 10\text{ DRIVING}$...
 BLOCKS OF THE...



TYPICAL APPLICATION DATA

- Four Independent Receivers
- Single Input
- High Input Sensitivity ... 25 mV Above
- High Input Impedance
- MC3450 like Timing
- MC3452 like Operation
- Ghost-Free Tri-State Operation

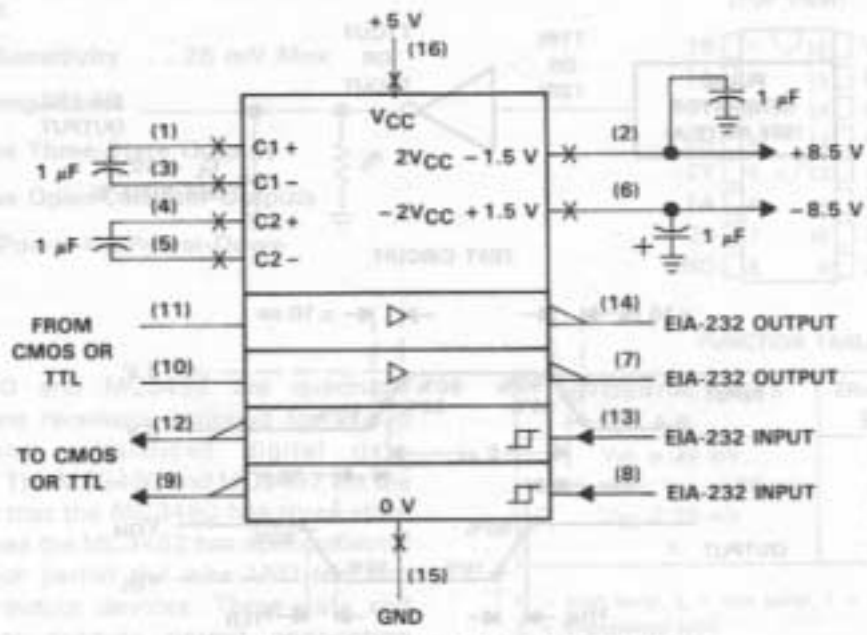
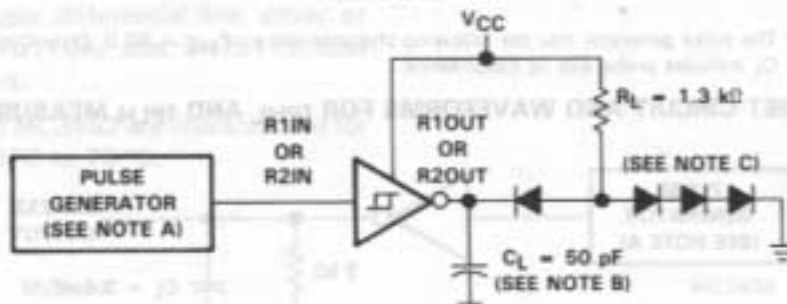
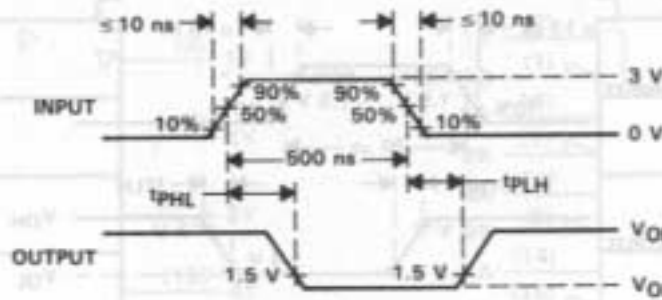


FIGURE 1. TYPICAL OPERATING CIRCUIT

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



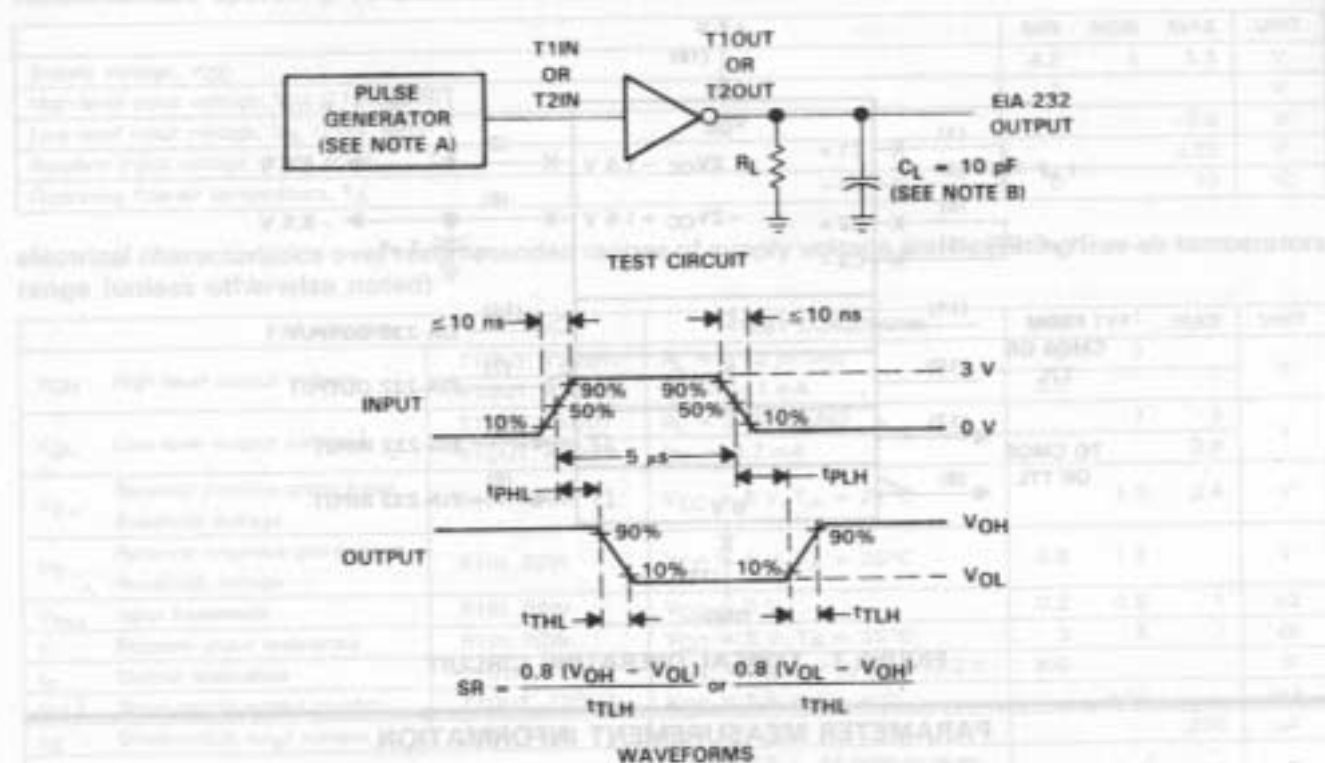
WAVEFORMS

- NOTES: A. The pulse generator has the following characteristics: $Z_{out} = 50 \Omega$, Duty Cycle $\leq 50\%$.
 B. C_L includes probe and jig capacitance.
 C. All diodes are 1N3064 or equivalent.

FIGURE 2. RECEIVER TEST CIRCUIT AND WAVEFORMS FOR t_{PHL} AND t_{PLH} MEASUREMENT

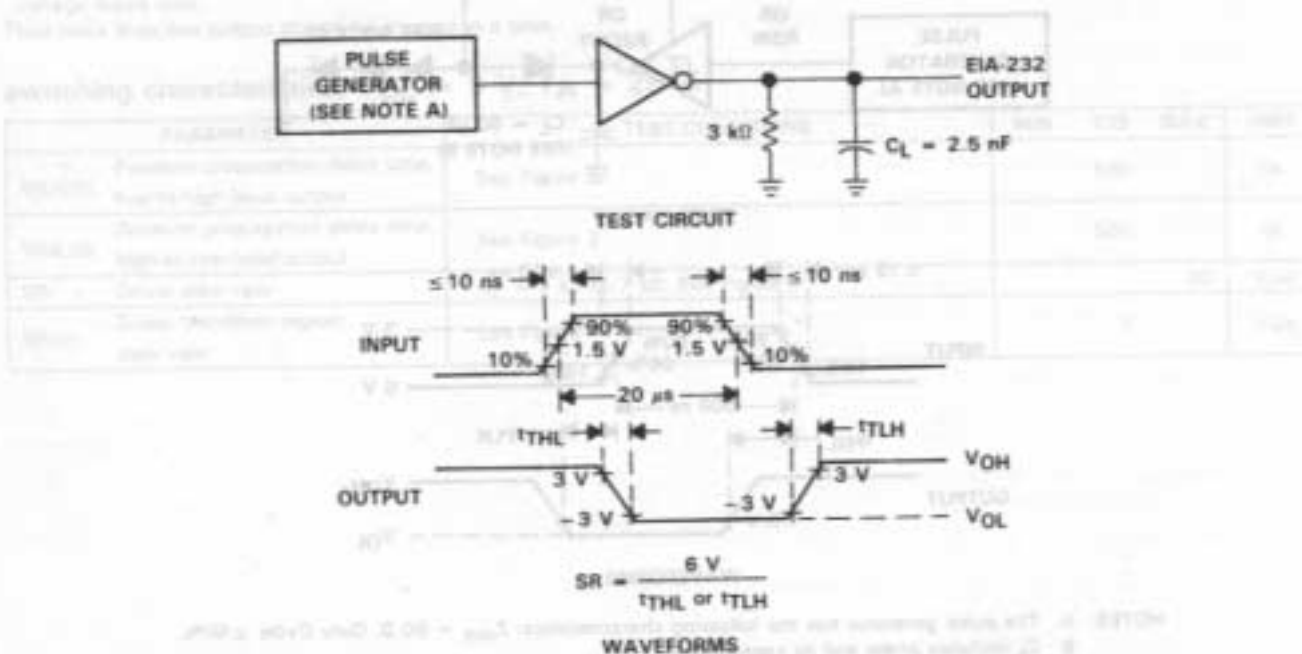
MAX232 DUAL EIA-232 DRIVER/RECEIVER

PARAMETER MEASUREMENT INFORMATION



NOTES: A. The pulse generator has the following characteristics: $Z_{out} = 50 \Omega$, Duty Cycle $\leq 50\%$.
B. C_L includes probe and jig capacitance.

FIGURE 3. DRIVER TEST CIRCUIT AND WAVEFORMS FOR t_{PHL} AND t_{PLH} MEASUREMENT (5- μs INPUT)



NOTE A: The pulse generator has the following characteristics: $Z_{out} = 50 \Omega$, Duty Cycle $\leq 50\%$

FIGURE 4. TEST CIRCUIT AND WAVEFORMS FOR t_{THL} AND t_{TLH} MEASUREMENT (20- μs INPUT)

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