General Description

The MAX232 is a dual driver/receiver of RS-232 standard with a single supply voltage and bipolar output voltage
of the transmitter formed by a built-In voltage multiplying generator on four 1.0μF external capacitors, designed
for use in state-of-the-art high performance computing systems, high-speed electronic devices with high reliability
of information exchange between remote objects.
Input voltage levels are compatible with standard CMOS and TTL levels.

Features

- Output voltage levels are compatible with input levels of CMOS and TTL integrated circuits
- Meets All EIA/TIA-232E and V.28/V.24 Specifications
- Supply voltage range from 5.5V
- Low input current: 1.0μA at 25°C
- Output current 30mA
- Available in SOP-16 Package

Applications

- Portable Computers
- Battery-Powered RS-232 Systems
- Interface Translation
- Low-Power Modems
- Terminals

Order Information

Product Model	Package Type	Marking	Packing	Packing Qty	Additional Remarks
MAX232N	DIP-16	MAX232N	Tape	1000/Box	
MAX232EDTR	SOP-16	MAX232E	Tube	2500/Reel	
MAX232EEDTR	SOP-16	MAX232EE	Tube	2500/Reel	ESD

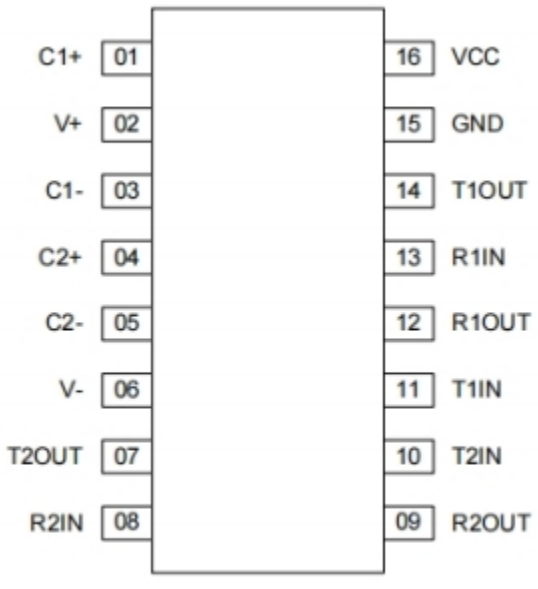
ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage	V_{CC}	-0.3	6.0	V
Transmitter High Output Voltage	V_+	V_{CC}-0.3	9.8	V
Transmitter Low Output Voltage	V_-	-9.0	0.3	V
Transmitter Input Voltage	V_{TIN}	-0.3	V_++0.3	V
Receiver Input Voltage	V_{RIN}	-20	20	V
Voltage Applied to Transmitter Output	V_{TOUT}	V_--0.3	V_++0.3	V
Voltage Applied to Receiver Output	V_{ROUT}	-0.3	V_{CC}+0.3	V
Storage Temperature Range	T_{STG}	-65	150	°C

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage	V_{CC}	4.5	5.5	V
Transmitter Input Voltage	V_{TIN}	0	V_{CC}	V
Receiver Input Voltage	V_{RIN}	-20	20	V
Output Current of Transmitter Short Circuit	I_{SC}	-	±60	mA
Ambient Temperature Range	T_A	-40	+85	°C

PIN CONFIGURATION

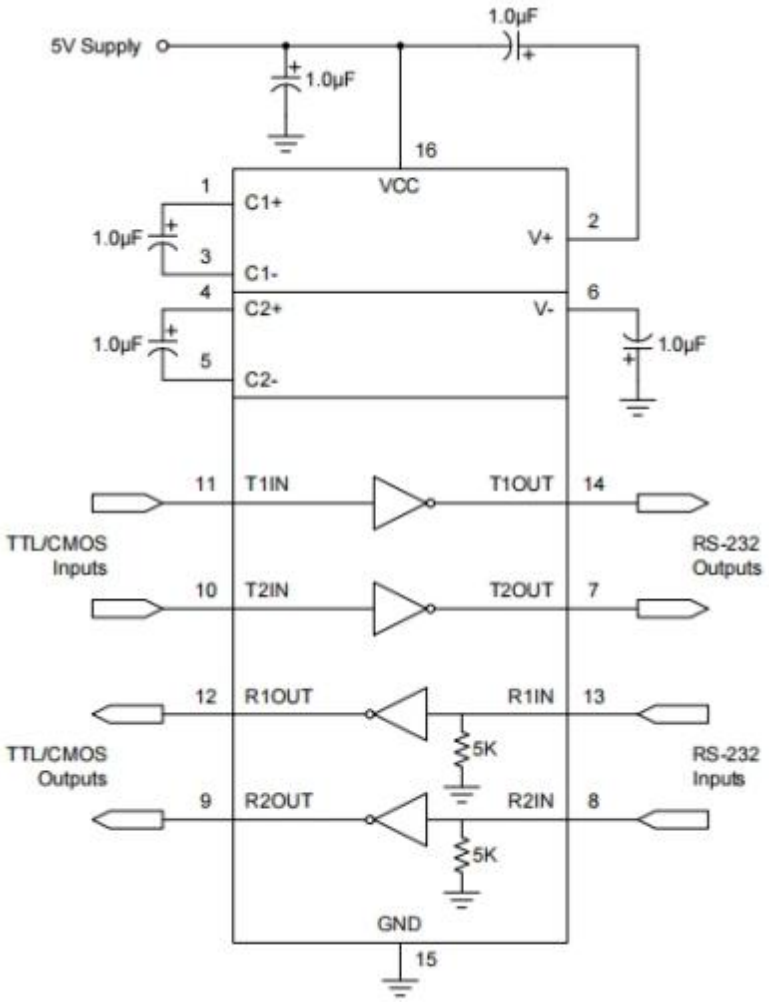


SOP-16 PKG

PIN DESCRIPTION

Pin No.	Pin Name	Pin Description
1	C1+	Terminal for Positive Charge- Pump C1 Capacitor
2	V+	Positive Voltage Generated by the Charge- Pump
3	C1-	Terminal for Negative Charge- Pump C1 Capacitor
4	C2+	Terminal for Positive Charge- Pump C2 Capacitor
5	C2-	Terminal for Negative Charge- Pump C2 Capacitor
6	V_	Negative Voltage Generated by the Charge- Pump
7	T2 OUT	RS-232 Driver Output (Levels RS-232)
8	R2IN	RS-232 Receiver Input (Levels RS-232)
9	R2OUT	RS- 232 Receiver Output (Levels TTL/CMOS)
10	T2IN	RS-232 Driver Input (Levels TTL/CMOS)
11	T1IN	RS-232 Driver Input (Levels TTL/CMOS)
12	R1OUT	RS- 232 Receiver Output (Levels TTL/CMOS)
13	R1IN	RS-232 Receiver Input (Levels RS-232)
14	T1 OUT	RS-232 Driver Output (Levels RS-232)
15	GND	Ground
16	VCC	Supply Voltage Input

TYPICAL APPLICATION CIRCUIT



FUNCTION TABLE

INPUT (RIN, TIN)	OUTPUT (ROUT, TOUT)
L (Low Level)	H (High Level)
H (High Level)	L (Low Level)

ELECTRICAL CHARACTERISTICS

(Limits in standard typeface are for T_A= 25 °C, and the limits in boldface type apply over full operating temperature range.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supply Current	I_{CC}	V_{CC} = 5.5V V_{IL} = 0V	- -	-	10.0 **14.0**	mA
Receiver Parameters						
Hysteresis Voltage	V_h	V_{CC} = 5.0V	0.2 **0.2**	-	0.9 **1.0**	V
On (Operation) Voltage	V_{on}	V_O ≤ 0.1V, I_{OL} ≤ 20μA	-	-	2.4 **2.3**	V
Off (Dropout) Voltage	V_{off}	V_O ≥ V_{CC} - 0.1V I_{OH} ≤ -20μA	0.8 **0.9**	-	-	V
Output Low Voltage	V_{OL}	I_L = 3.2mA, V_{CC} = 4.5V, V_{IH} = 2.4V	-	-	0.3 **0.4**	V
Output High Voltage	V_{OH}	I_{OH} = -1.0mA, V_{CC} = 4.5V, V_{IL} = 0.8V	3.6 **3.5**	-	-	V
Input Resistance	R_I	V_{CC} = 5.0V	3.0 **3.0**	-	7.0 **7.0**	kΩ
Transmitter Parameters						
Output Low Voltage	V_{OL}	V_{CC} = 4.5V, V_{IH} = 2.0V, R_L = 3.0kΩ	-	-	-5.2 **-5.0**	V
Output High Voltage	V_{OH}	V_{CC} = 4.5V, V_{IL} = 0.8V, R_L = 3.0kΩ	5.2 **5.0**	-	-	V
Input Low Current	I_{IL}	V_{CC} = 5.5V, V_{IL} = 0V	-	-	-1.0 **-10.0**	μA
Input High Current	I_{IH}	V_{CC} = 5.5V, V_{IH} = V_{CC}	-	-	1.0 **10.0**	μA
Speed Of Output Front Charge	SR	V_{CC} = 5.0V, C_L = 50 - 1000pF, R_L = 3.0 - 7.0kΩ	3.0 **2.7**	-	30 **27**	V/ μs
Output Resistance	R_O	V_{CC} = V+ = V- = 0V V_O = ±2V	350 **300**	-	-	Ω
Short Circuit Output Current	I_{SC}	V_{CC} = 5.5V, V_O = 0V; V_I = V_{CC}	- -	-	-50 **-60**	mA
		V_{CC} = 5.5V, V_O = 0V; V_I = 0	- -	-	50 **60**	mA
Speed Of Information Transmission	ST	V_{CC} = 4.5V, C_L = 1000pF, R_L = 3.0kΩ , t_W = 7 μs (for extreme, t_W = 8 μs)	140 **120**	-	-	kbit/s
Dynamic Parameters						
Signal Propagation Delay Time When Switching On (Off)	t_{PHLR} (t_{PLHR})	V_{CC} = 4.5V, C_L = 150pF, V_{IL} = 0V, V_{IH} = 3.0V, t_{LH} = t_{HL} ≤ 10ns	-	-	9.7 **10.0**	μs
Signal Propagation Delay Time When Switching On (Off)	t_{PHLT} (t_{PLHT})	V_{CC} = 4.5V, C_L = 2500pF, V_{IL} = 0V, V_{IH} = 3.0V, R_L = 3kΩ , t_{LH} = t_{HL} ≤ 10ns	-	-	5.0 **6.0**	μs

TIMING DIAGRAM

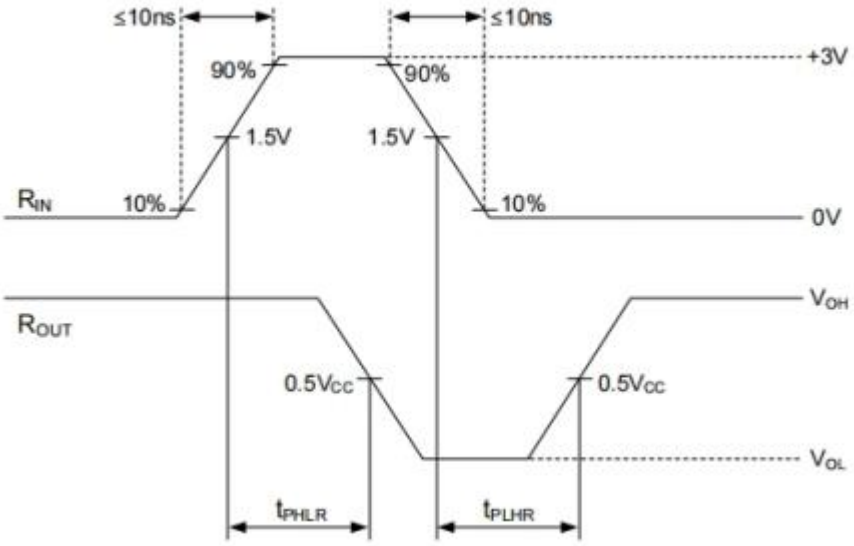


Figure 1 . t_{PHL} and t_{PLH} waveforms of Receiver

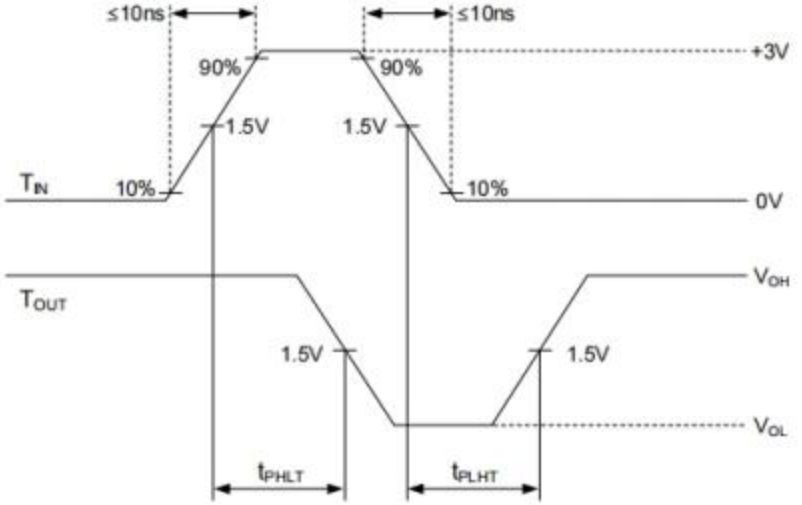


Figure 2 . t_{PHL} and t_{PLH} waveforms of Transmitter

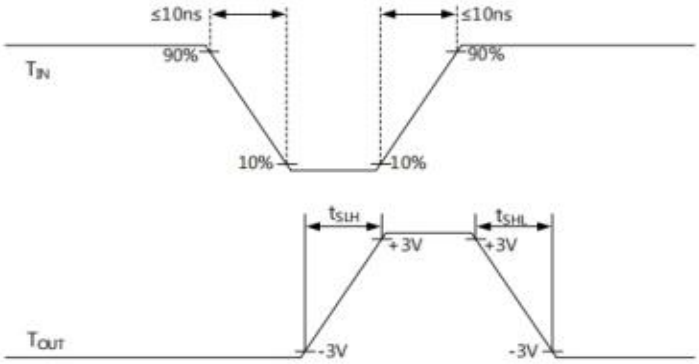
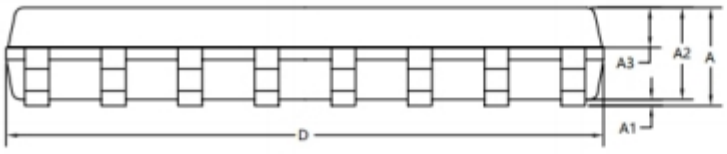
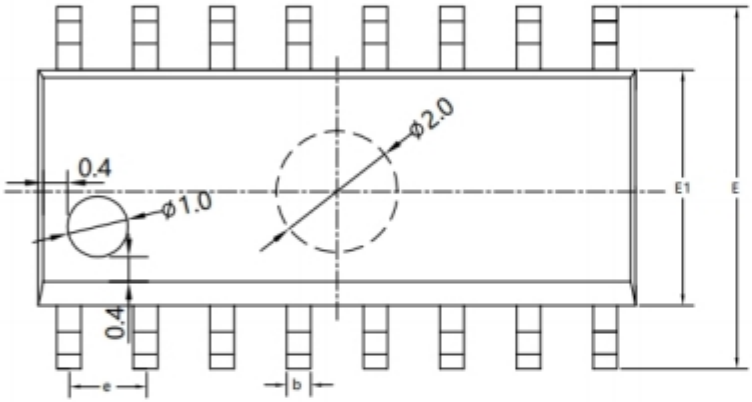


Figure 3 . t_{SLH} and t_{SHL} waveforms of Transmitter

Package Information

SOP16





SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	1.50	1.60	1.70
A1	0.10	0.15	0.25
A2	1.40	1.45	1.50
A3	0.60	0.65	0.70
b	0.30	0.40	0.50
c	0.15	0.20	0.25
D	9.80	9.90	10.00
E	5.80	6.00	6.20
E1	3.85	3.90	3.95
e	1.27BSC		
L	0.50	0.60	0.70
L1	1.05BSC		