



## DESCRIPTION

The MAX3232ESE 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 1.0 $\mu$ F 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 3V to 5.5V
- Low input current: 1.0 $\mu$ A at 25°C
- Available in SOP-16(SOIC-16) Package

## APPLICATIONS

- Portable Computers
- Battery-Powered RS-232 Systems
- Interface Translation
- Low-Power Modems
- Terminals
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## ABSOLUTE MAXIMUM RATINGS

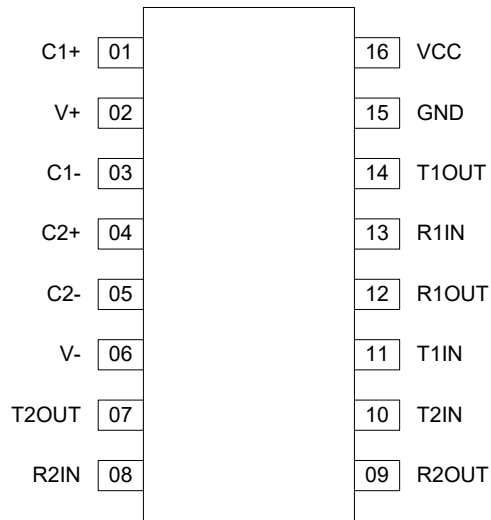
PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage	$V_{CC}$	-0.3	5.5	V
Transmitter High Output Voltage	$V_+$	$V_{CC}-0.3$	7	V
Transmitter Low Output Voltage	$V_-$	-7.0	0.3	V
Transmitter Input Voltage	$V_{TIN}$	-0.3	$V_++0.3$	V
Receiver Input Voltage	$V_{RIN}$	-12	12	V
Voltage Applied to Transmitter Output	$V_{TOUT}$	$V_- - 0.3$	$V_+ + 0.3$	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	$V_{CC}$	3.0	5.5	V
Transmitter Input Voltage	$V_{TIN}$	0	$V_{CC}$	V
Receiver Input Voltage	$V_{RIN}$	-12	12	V
Output Current of Transmitter Short Circuit	$I_{SC}$	-	$\pm 60$	mA
Ambient Temperature Range	$T_A$	-40	+85	°C



## PIN CONFIGURATION



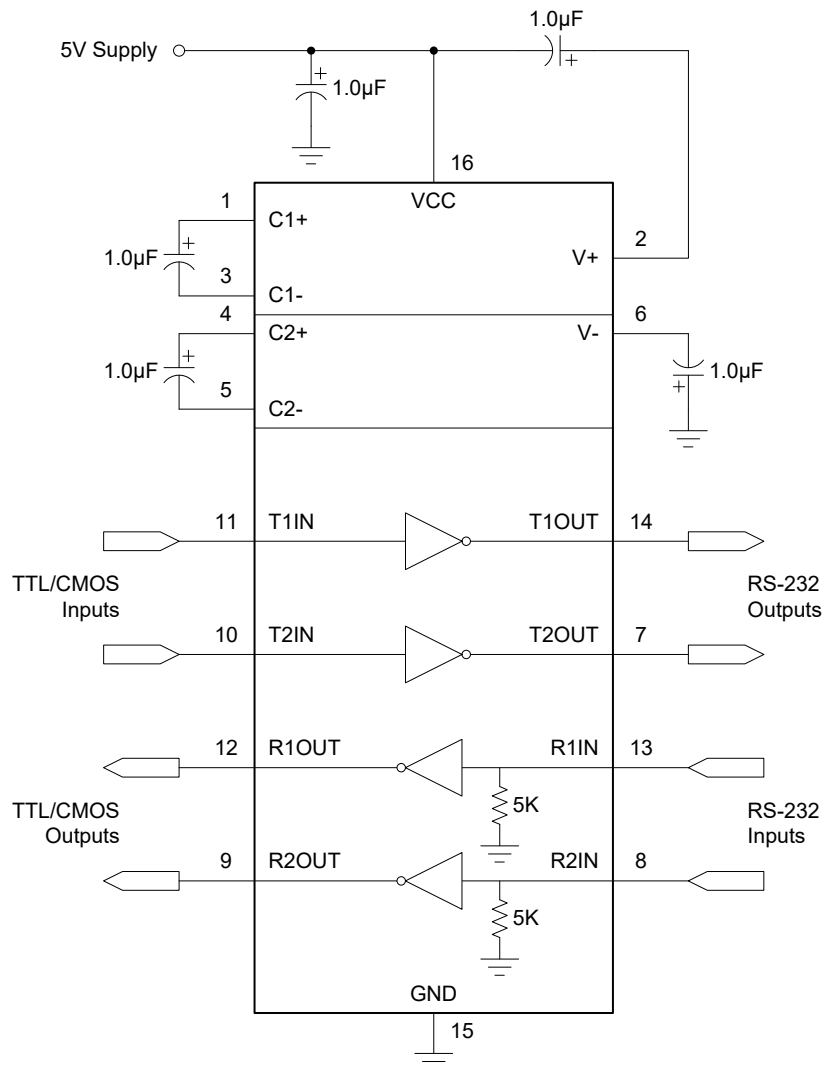
SOP -16(SOIC-16)

## 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	T2OUT	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	T1OUT	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  $T_A=25^{\circ}\text{C}$ , and the limits in boldface type apply over full operating temperature range.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Supply Current	$I_{CC}$	$V_{CC} = 5.5\text{V}$ $V_{IL} = 0\text{V}$	-	-	8 10.0	mA	
<b>Receiver Parameters</b>							
Hysteresis Voltage	$V_h$	$V_{CC} = 5.0\text{V}$	0.2 0.2	-	0.9 1.0	V	
On (Operation) Voltage	$V_{on}$	$V_O \leq 0.1\text{V}$ , $I_{OL} \leq 20\mu\text{A}$	-	-	2.4 2.3	V	
Off (Dropout) Voltage	$V_{off}$	$V_O \geq V_{CC} - 0.1\text{V}$ $I_{OH} \leq -20\mu\text{A}$	0.8 0.9	-	-	V	
Output Low Voltage	$V_{OL}$	$I_L = 3.2\text{mA}$ , $V_{CC} = 4.5\text{V}$ , $V_{IH} = 2.4\text{V}$	-	-	0.3 0.4	V	
Output High Voltage	$V_{OH}$	$I_{OH} = -1.0\text{mA}$ , $V_{CC} = 4.5\text{V}$ , $V_{IL} = 0.8\text{V}$	3.6 3.5	-	-	V	
Input Resistance	$R_I$	$V_{CC} = 5.0\text{V}$	3.0	-	7.0	k $\Omega$	
<b>Transmitter Parameters</b>							
Output Low Voltage	$V_{OL}$	$V_{CC} = 4.5\text{V}$ , $V_{IH} = 2.0\text{V}$ , $R_L = 3.0\text{k}\Omega$	-	-	-5.2 -5.0	V	
Output High Voltage	$V_{OH}$	$V_{CC} = 4.5\text{V}$ , $V_{IL} = 0.8\text{V}$ , $R_L = 3.0\text{k}\Omega$	5.2 5.0	-	-	V	
Input Low Current	$I_{IL}$	$V_{CC} = 5.5\text{V}$ , $V_{IL} = 0\text{V}$	-	-	-1.0 -10.0	$\mu\text{A}$	
Input High Current	$I_{IH}$	$V_{CC} = 5.5\text{V}$ , $V_{IH} = V_{CC}$	-	-	1.0 10.0	$\mu\text{A}$	
Speed Of Output Front Charge	SR	$V_{CC} = 5.0\text{V}$ , $C_L = 50 - 1000\text{pF}$ , $R_L = 3.0 - 7.0\text{k}\Omega$	3.0 2.7	-	30 27	V/ $\mu\text{s}$	
Output Resistance	$R_O$	$V_{CC} = V_+ = V_- = 0\text{V}$ $V_O = \pm 2\text{V}$	350 300	-	-	$\Omega$	
Short Circuit Output Current	$I_{SC}$	$V_{CC} = 5.5\text{V}$ $V_O = 0\text{V}$	$V_I = V_{CC}$	-	-	-50 -60	mA
			$V_I = 0$	-	-	50 60	
Speed Of Information Transmission	ST	$V_{CC} = 4.5\text{V}$ , $C_L = 1000\text{pF}$ , $R_L = 3.0\text{k}\Omega$ , $t_W = 7\mu\text{s}$ (for extreme, $t_W = 8\mu\text{s}$ )	250 300	-	-	kbit/s	
<b>Dynamic Parameters</b>							
Signal Propagation Delay Time When Switching On (Off)	$t_{PHLR}$ ( $t_{PLHR}$ )	$V_{CC} = 4.5\text{V}$ , $C_L = 150\text{pF}$ , $V_{IL} = 0\text{V}$ , $V_{IH} = 3.0\text{V}$ , $t_{LH} = t_{HL} \leq 10\text{ns}$	-	-	9.7 10.0	$\mu\text{s}$	
Signal Propagation Delay Time When Switching On (Off)	$t_{PHLT}$ ( $t_{PLHT}$ )	$V_{CC} = 4.5\text{V}$ , $C_L = 2500\text{pF}$ , $V_{IL} = 0\text{V}$ , $V_{IH} = 3.0\text{V}$ , $R_L = 3\text{k}\Omega$ , $t_{LH} = t_{HL} \leq 10\text{ns}$	-	-	5.0 6.0	$\mu\text{s}$	



## TIMING DIAGRAM

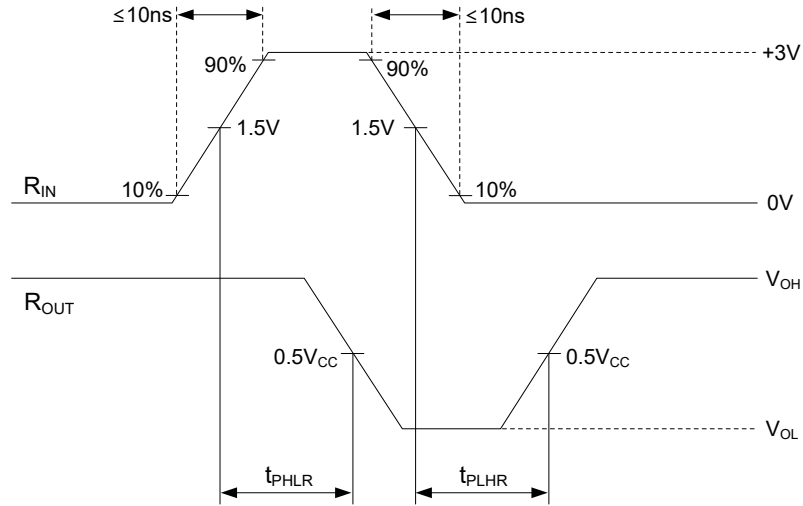


Figure 1.  $t_{PHL}$  and  $t_{PLH}$  waveforms of Receiver

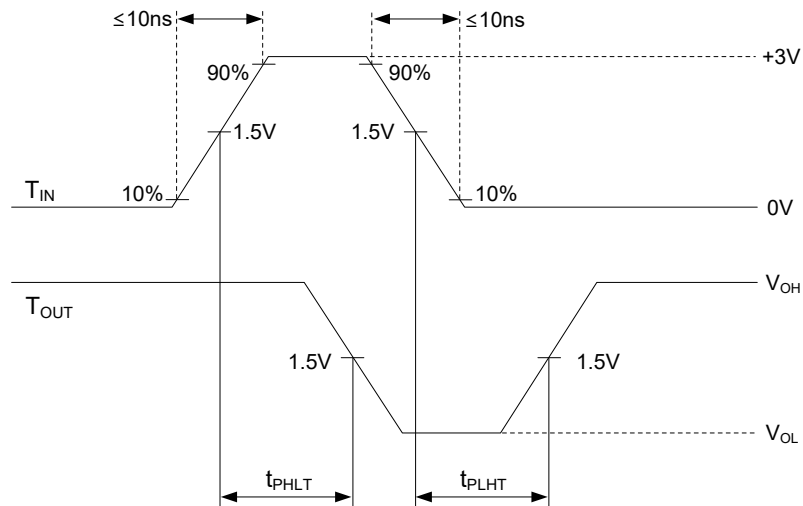


Figure 2.  $t_{PHL}$  and  $t_{PLH}$  waveforms of Transmitter

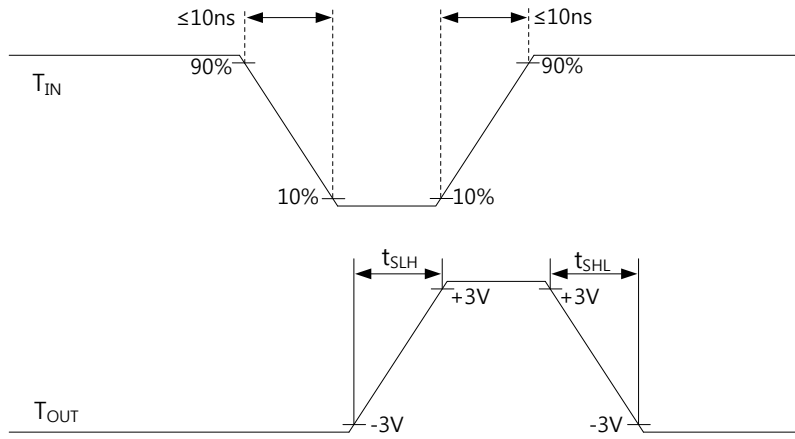
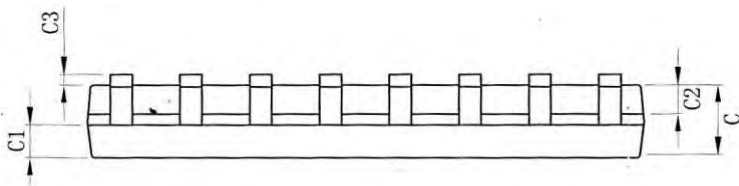
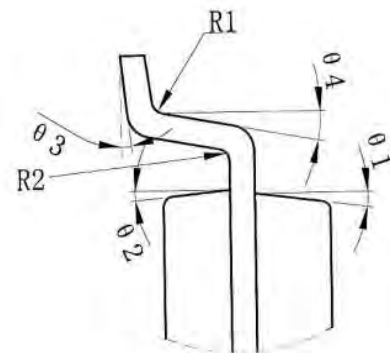
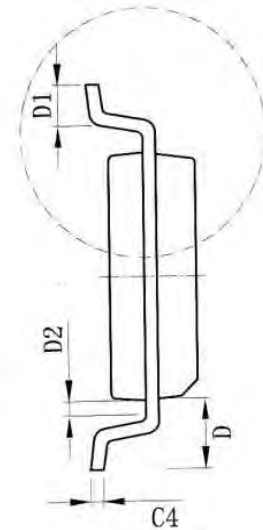
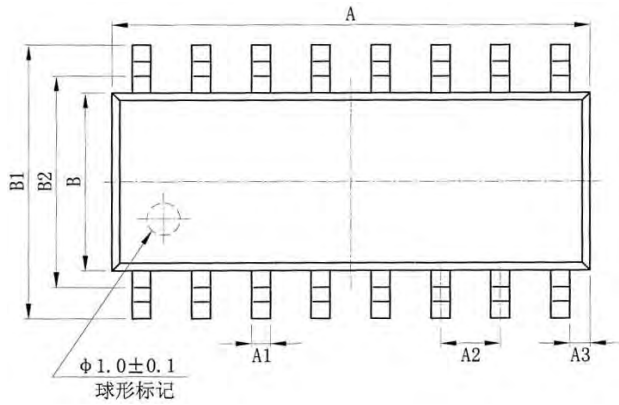


Figure 3.  $t_{SLH}$  and  $t_{SHL}$  waveforms of Transmitter



SOP-16(SOIC-16) Package overall dimensions

SYMBOL	MIN/mm	MAX/mm
A	9.80	10.00
A1	0.356	0.456
A2	1.27TYP	
A3	0.302TYP	
B	3.85	3.95
B1	5.84	6.24
B2	5.00 TYP	
C	1.40	1.60
C1	0.61	0.71
C2	0.54	0.64
C3	0.05	0.25
C4	0.203	0.233
D	1.05 TYP	
D1	0.40	0.70
D2	0.15	0.25
R1	0.20TYP	
R2	0.20TYP	
θ1	8°~12°TYP4	
θ2	8°~12°TYP4	
θ3	0°~8°	
θ4	4°~12°	





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