

INTERFACE TRANSCEIVER OF RS-232 STANDARD WITH ONE SUPPLY VOLTAGE

1. Description

MAX232E is purposed for application in high-performance information processing systems and control devices of wide application.

2. Features

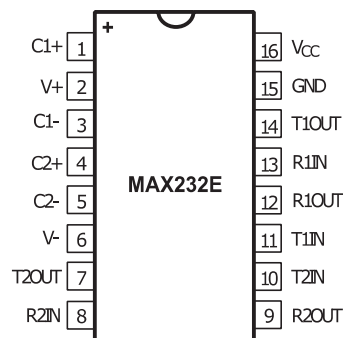
- Input voltage levels are compatible with standard CMOS levels.
- Output voltage levels are compatible with input levels of C-MOS, N-MOS and TTL integrated circuits.
- Supply voltage range from 2.0 to 6.0 V.
- Low input current: 1.0 mA; 0.1 mA at Ta= 25°C
- Output current 24 mA.
- Latching current not less than 450 mA at Ta= 25°C
- Tolerable value of static potential not less than 2000V

3. Ordering Information

Type Number	Package Type	Packing	Notes
MAX232EIN	DIP-16	Tube	
MAX232EID	SOIC-16	Tape & Reel	
MAX232EIPW	TSSOP-16	Tape & Reel	

Note: If the physical information is inconsistent with the ordering information, please refer to the actual product.

4. Pinning



5. Pin Description

	Symbol	Pin name
01	C1+	Output of external capacitance of positive voltage multiplier unit
02	V+	Output of positive voltage of multiplier unit
03	C1-	Output of external capacitance of positive voltage multiplier unit
04	C2+	Output of external capacitance of negative voltage multiplier unit
05	C2-	Output of external capacitance of negative voltage multiplier unit
06	V-	Output of negative voltage of multiplier unit
07	T2OUT	Output of transmitter data (levels RS-232)
08	R2IN	Input of receiver data (levels RS-232)
09	R2OUT	Output of receiver data (levels TTL/KMOS)
10	T2IN	Input of transmitter data (levels TTL/KMOS)
11	T1IN	Input of transmitter data (levels TTL/KMOS)
12	R1OUT	Output of receiver data (levels TTL/KMOS)
13	R1IN	Input of receiver data (levels RS-232)
14	T1OUT	Output of transmitter data (levels RS-232)
15	GND	Common output
16	V _{CC}	Supply output of voltage source

6. Truth Table

Inputs	Outputs
R _{IN} , T _{IN}	R _{OUT} , T _{OUT}
H	L
L	H

Note -H – voltage high level;L – low voltage level

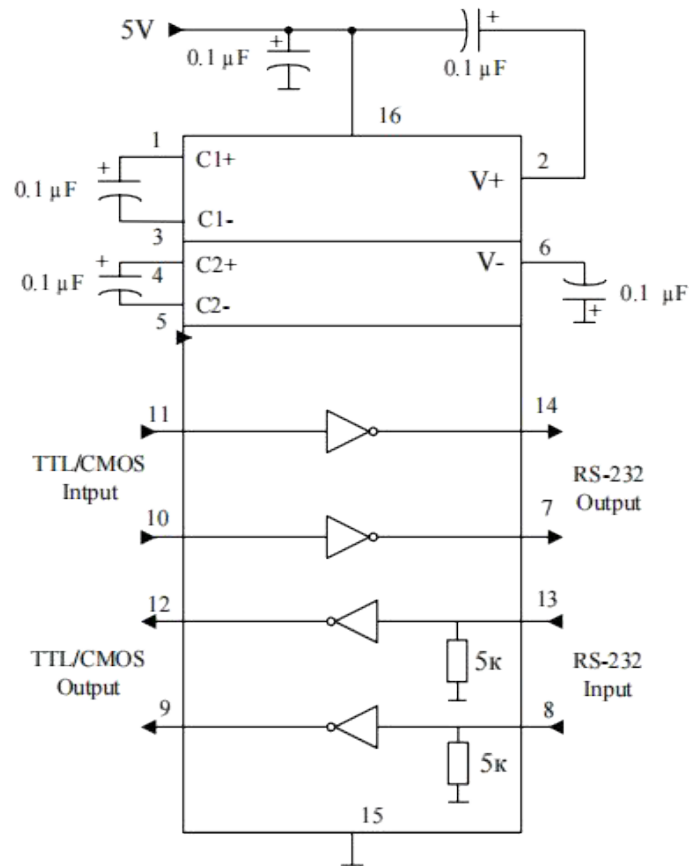
7. Maximum Conditions

Symbol	Parameter	Rate		Unit
		min	max	
V _{CC}	Supply voltage	-0.3	6.0	V
V+	Transmitter high output voltage	V _{CC} -0.3	14	
V-	Transmitter low output voltage	-0.3	-14	
V _{TIN}	Transmitter input voltage	-0.3	V+ +0.3	
V _{RIN}	Receiver input voltage	-30	30	
P _D	Dissipated power			mW
	DIP – package		842	
	SOP - package		762	
I _{SC}	Output current of transmitter short circuit	-	Continuously	mA
T _a	Ambient temperature	-60	150	°C

8. Recommended Operating Conditions

Symbol	Parameter	Rate		Unit
		min	max	
V _{CC}	Supply voltage	4.5	5.5	V
V ₊	Transmitter output high voltage	5.0	-	
V ₋	Transmitter output low voltage	-5.0	-	
V _{TIN}	Transmitter input voltage	0	V _{CC}	
V _{RIN}	Receiver input voltage	-30	30	
I _{SC}	Transmitter short circuit output current	-	±60	mA
T _a	Ambient temperature	-40	85	°C

9. Typical Application



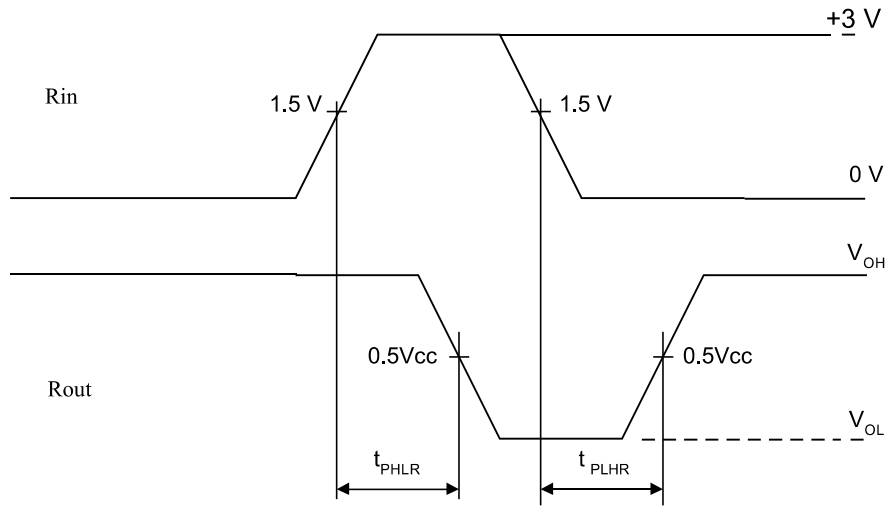
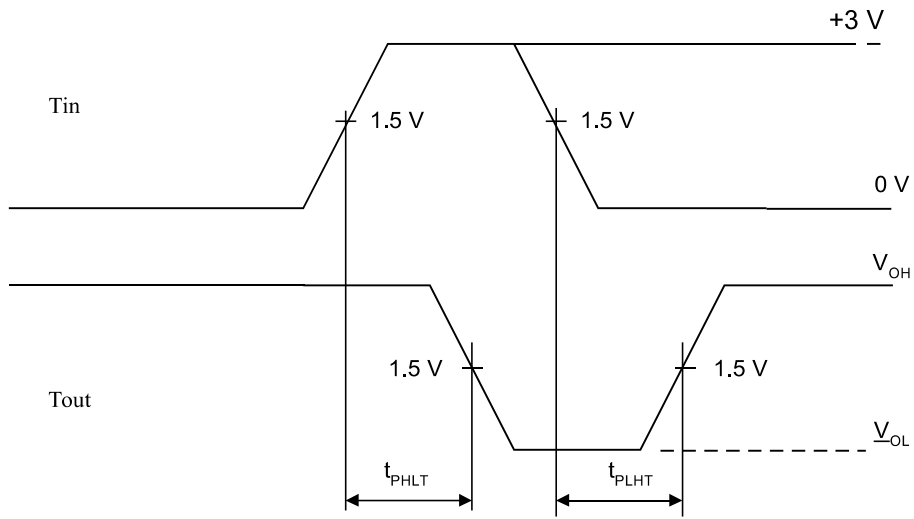
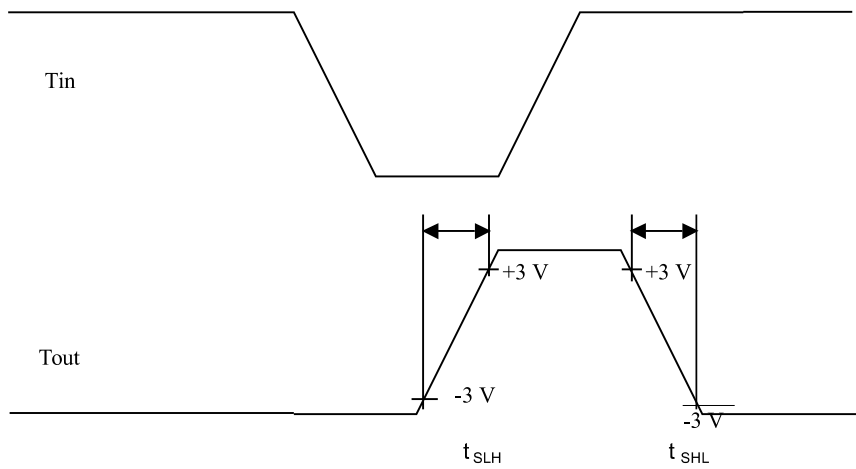
10. Electrical Characteristics

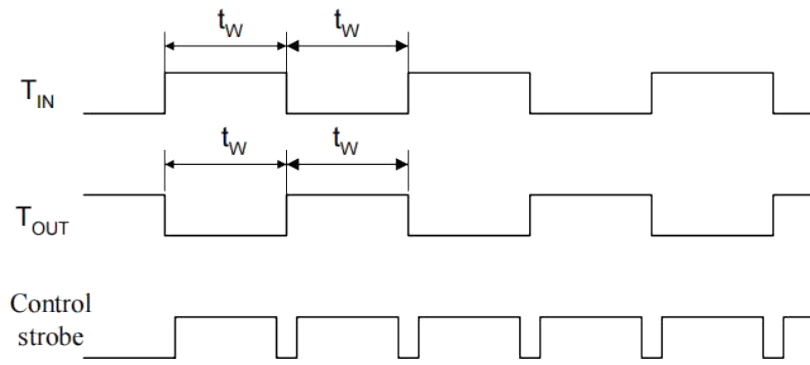
Symbol	Parameter	Test conditions	Rate				Unit
			25°C		-40°C to 85°C		
			min	max	min	max	
I _{CC}	Consumption current static	V _{CC} = 5.5 V V _{IL} = 0 V	-	10.0	-	14.0	mA
Receiver electrical parameters							
V _H	Hysteresis voltage	V _{CC} = 5.0 V	0.2	0.9	0.2	1.0	V
V _{On}	On (operation) voltage	V _O ≅ 0.1 V I _{OL} ≅ 20 mA	-	2.4	-	2.3	
V _{off}	Off (dropout) voltage	V _O ≅ V _{CC} - 0.1 V I _{OH} ≅ -20 mA	0.8	-	0.9	-	
V _{OL}	Output low voltage	I _{OL} = 3.2 mA V _{CC} = 4.5 V V _{IH} = 2.4 V	-	0.3	-	0.4	
V _{OH}	Output high voltage	I _{OH} = -1.0 mA V _{CC} = 4.5 V V _{IL} = 0.8 V	3.6	-	3.5	-	
R _I	Input resistance	V _{CC} = 5.0 V	3.0	7.0	3.0	7.0	kOhm
Transmitter electrical parameters							
V _{OL}	Output low voltage	V _{CC} = 4.5 V V _{IH} = 2.0 V R _L = 3.0 kOhm	-	-5.2	-	-5.0	V
V _{OH}	Output high voltage	V _{CC} = 4.5 V V _{IL} = 0.8 V R _L = 3.0 kOhm	5.2	-	5.0	-	
I _{IL}	Input low current	V _{CC} = 5.5 V V _{IL} = 0 V	-	-1.0	-	-10.0	mA
I _{IH}	Input high current	V _{CC} = 5.5 V V _{IH} = V _{CC}		1.0		10.0	
S _R	Speed of output front change	V _{CC} = 5.0 V C _L = 50 - 1000 pF R _L = 3.0 - 7.0 kOhm	3.0	30	2.7	27	V/mks
R _O	Output resistance	V _{CC} = V ₊ = V ₋ = 0V V _O = 2 V	350	-	300	-	Ohm
I _{SC}	Short circuit output current	V _{CC} = 5.5 V V _O = 0V V _I = V _{CC} V _I = 0V		-50 50		-60 60	mA
ST	Speed of information transmission	V _{CC} = 4.5 V C _L = 1000pF	140	-	120	-	kbit/c

		$R_L = 3.0 \text{ k}\Omega$ $t_w = 7 \text{ mks}$ (for extreme $-t_w = 8 \text{ mks}$)				
t_{PHLR}	Signal propagation delay time when switching on (off)	$V_{CC} = 4.5 \text{ V}$ $C_L = 150 \text{ pF}$ $V_{IL} = 0 \text{ V}$ $V_{IH} = 3.0 \text{ V}$ $t_{LH} = t_{HL} \leq 10 \text{ ns}$		9.7	10	mks
t_{PLHT}	Signal propagation delay time when switching on (off)	$V_{CC} = 4.5 \text{ V}$ $C_L = 2500 \text{ pF}$ $V_{IL} = 0 \text{ V}$ $V_{IH} = 3.0 \text{ V}$ $R_L = 3 \text{ k}\Omega$ $t_{LH} = t_{HL} \leq 10 \text{ ns}$		5.0*	6.0*	

Capacitance

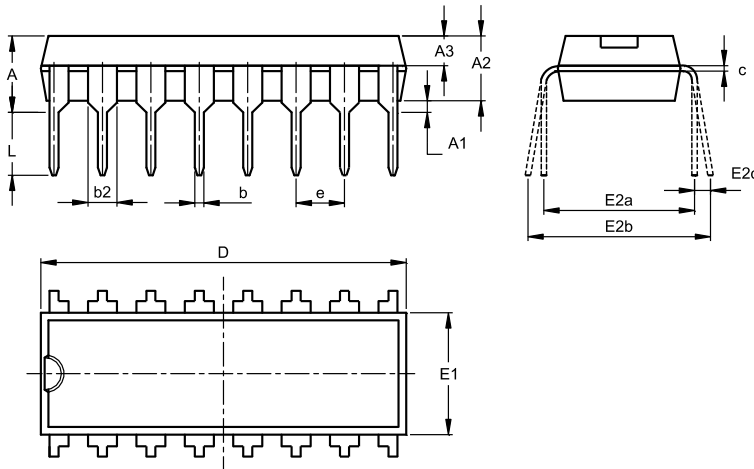
Symbol	Parameter	$V_{CC}, \text{ V}$	Rate	Unit
C_{IN}	Input capacitance	5.0	9.0	pF
C_{PD}	Dynamic capacitance		90	

Timing diagram when measuring IC dynamic parameters

Figure 3

Figure 4

Figure 5


Figure 6

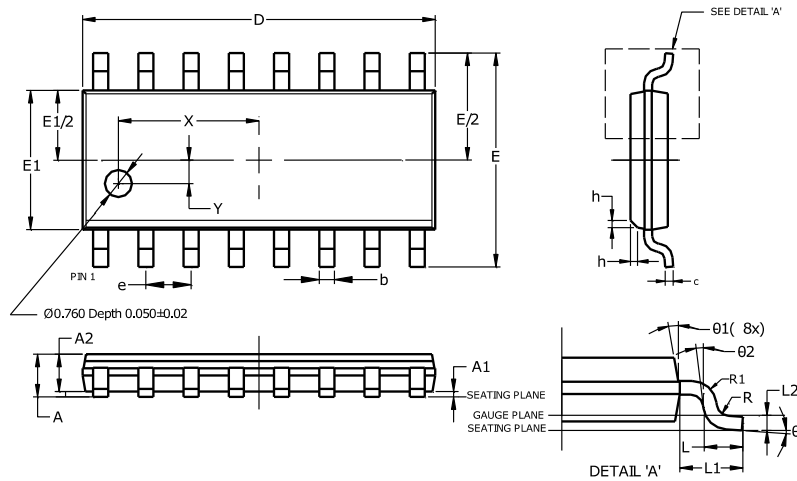
11. Package Outlines

DIP-16

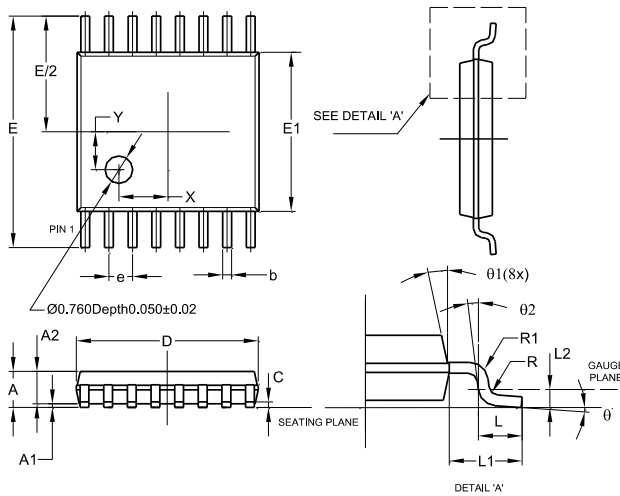


PDIP-16			
Dim	Min	Max	Nom
A	3.60	4.00	3.80
A1	0.51	-	-
A2	3.20	3.40	3.30
A3	1.47	1.57	1.52
b	0.44	0.53	-
b2	1.52BSC		
c	0.25	0.31	-
D	18.90	19.30	19.10
E1	6.15	6.55	6.35
E2a	7.62 BSC		
E2b	7.62	9.30	-
E2c	0.00	0.84	-
e	2.54BSC		
L	3.00	-	-
All Dimensions in mm			

SOIC-16



SOIC-16			
Dim	Min	Max	Typ
A	--	1.260	--
A1	0.10	0.23	--
A2	1.02	--	--
b	0.31	0.51	--
c	0.10	0.25	--
D	9.80	10.00	--
E	5.90	6.10	--
E1	3.80	4.00	--
e	1.27 BSC		
h	0.15	0.25	0.20
L	0.40	1.27	--
L1	1.04 REF		
L2	0.25 BSC		
R	0.07	--	--
R1	0.07	--	--
X	3.945 REF		
Y	0.661 REF		
theta	0°	8°	--
theta1	5°	15°	--
theta2	0°	--	--
All Dimensions in mm			

TSSOP-16


TSSOP-16			
Dim	Min	Max	Typ
A	-	1.08	-
A1	0.05	0.15	-
A2	0.80	0.93	-
b	0.19	0.30	-
c	0.09	0.20	-
D	4.90	5.10	-
E	6.40 BSC		
E1	4.30	4.50	-
e	0.65 BSC		
L	0.45	0.75	-
L1	1.00 REF		
L2	0.25 BSC		
R / R1	0.09	-	-
X	-	-	1.350
Y	-	-	1.050
θ	0°	8°	-
$\theta 1$	5°	15°	-
$\theta 2$	0°	-	-
All Dimensions in mm			

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