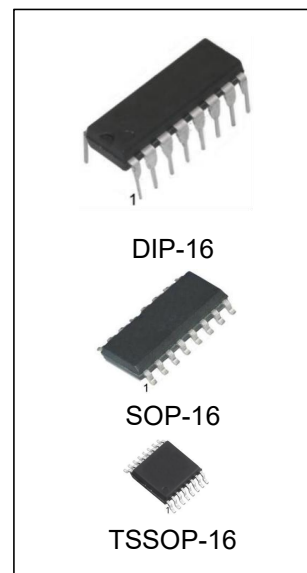


INTERFACE TRANSCEIVER OF RS-232 STANDARD WITH ONE SUPPLY VOLTAGE

DESCRIPTION

IC MAX232 is purposed for application in high-performance information processing systems and control devices of wide application.

- 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.
- 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



Ordering Information

DEVICE	Package Type	MARKING	Packing	Packing Qty
MAX232ECN	DIP-16	MAX232EC,232EC	TUBE	1000pcs/box
MAX232ECM/TR	SOP-16	MAX232EC,232EC	REEL	2500pcs/reel
MAX232ECMT/TR	TSSOP-16	X232EC,232EC	REEL	2500pcs/reel
MAX232EIN	DIP-16	MAX232EI,232EI	TUBE	1000pcs/box
MAX232EIM/TR	SOP-16	MAX232EI,232EI	REEL	2500pcs/reel
MAX232EIMT/TR	TSSOP-16	X232EI,232EI	REEL	2500pcs/reel

Pin symbols in package

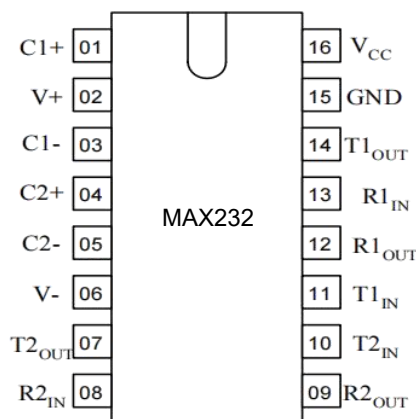


Table of pin description

	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	T2 _{OUT}	Output of transmitter data (levels RS – 232)
08	R2 _{IN}	Input of receiver data (levels RS – 232)
09	R2 _{OUT}	Output of receiver data (levels TTL/KMOS)
10	T2 _{IN}	Input of transmitter data (levels TTL/KMOS)
11	T1 _{IN}	Input of transmitter data (levels TTL/KMOS)
12	R1 _{OUT}	Output of receiver data (levels TTL/KMOS)
13	R1 _{IN}	Input of receiver data (levels RS – 232)
14	T1 _{OUT}	Output of transmitter data (levels RS – 232)
15	GND	Common output
16	V _{CC}	Supply output of voltage source

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

Maximum conditions

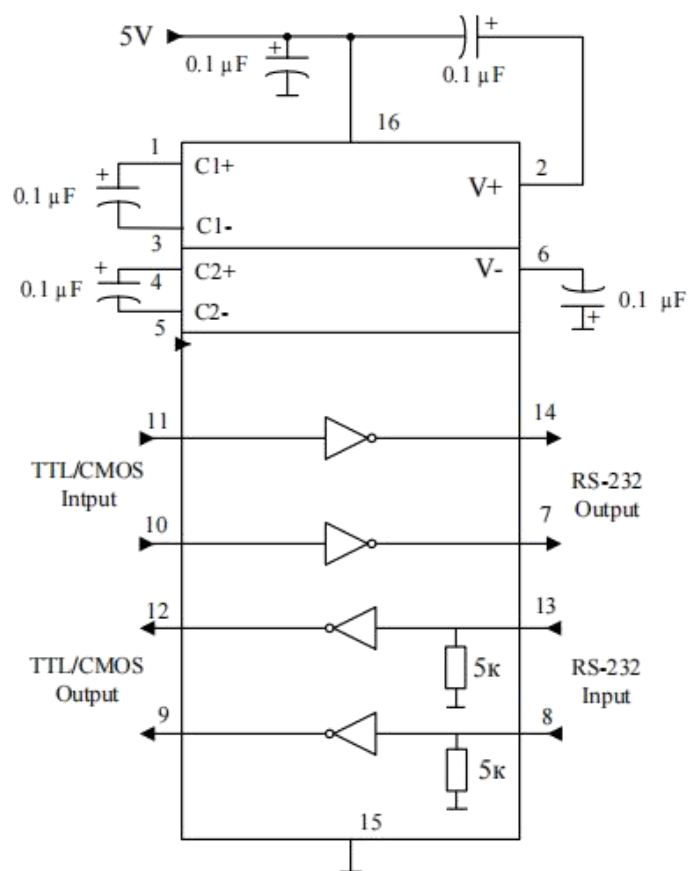
Symbol	Parameter	Rate		Unit
		min	max	
V _{CC}	Supply voltage	-0.3	6.0	V
V ₊	Transmitter high output voltage	V _{CC} -0.3	14	
V ₋	Transmitter low output voltage	-0.3	-14	
V _{TIN}	Transmitter input voltage	-0.3	V ₊ +0.3	
V _{RIN}	Receiver input voltage	-30	30	
P _D	Dissipated power	-		mW
	DIP – package		842	
	SOP - package		762	
I _{SC}	Output current of transmitter short circuit	-	Continu-ously	mA
T _a	Ambient temperature	-60	150	°C
T _L	Lead Temperature (Soldering, 10 seconds)	-	260	°C

Note: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performance is not ensured.

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	MAX232EC	0	70	°C
		MAX232EI	-40	85	

Typical Application



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	
SR	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 R _L = 3.0 kOhm t _W = 7mks (for extreme -t _W = 8mks)	140	-	120	-	

Symbol	Parameter	Test conditions	Rate				Unit
			25°C		-40°C to 85°C		
			min	max	min	max	
tPHLR (tPLHR)	Signal propagation delay time when switching on (off)	V _{CC} = 4.5 V C _L = 150 pF V _{IL} = 0 V V _{IH} = 3.0 V t _{LH} = t _{HL} ≤ 10 ns	-	9.7	-	10	mks
tPHLT (tPLHT)	Signal propagation delay time when switching on (off)	V _{CC} = 4.5 V C _L = 2500 pF V _{IL} = 0 V V _{IH} = 3.0 V R _L = 3 kOhm t _{LH} = t _{HL} ≤ 10 ns		5.0*		6.0*	

Capacitance

Symbol	Parameter	V _{CC} , V	Rate	Unit
C _{IN}	Input capacitance	5.0	9.0	pF
CPD	Dynamic capacitance		90	

Timing diagram when measuring IC dynamic parameters

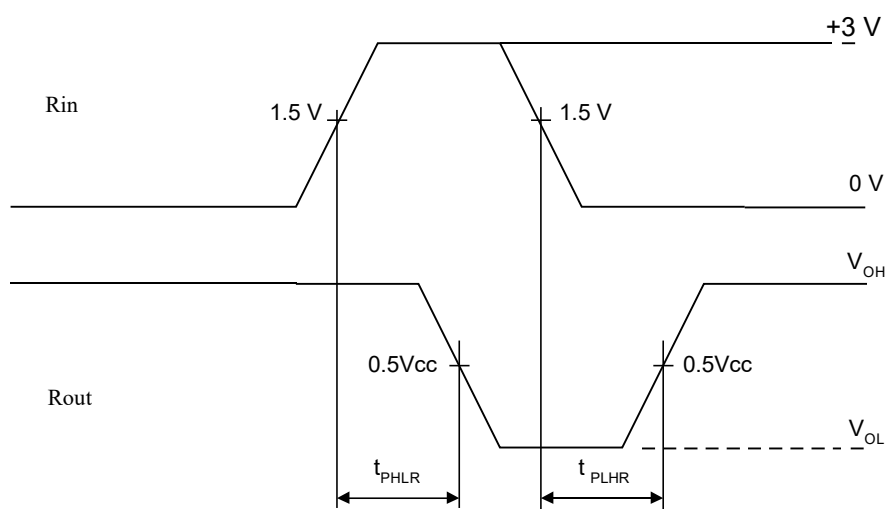


Figure 3

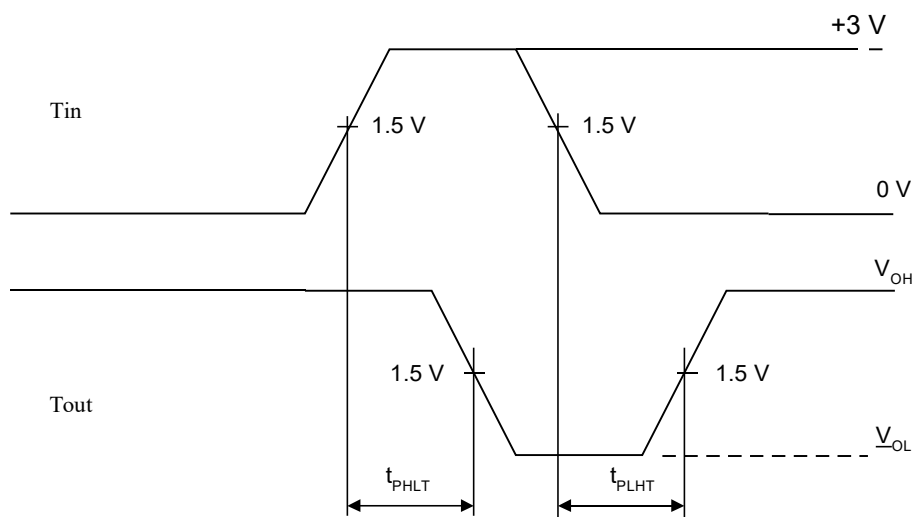


Figure 4

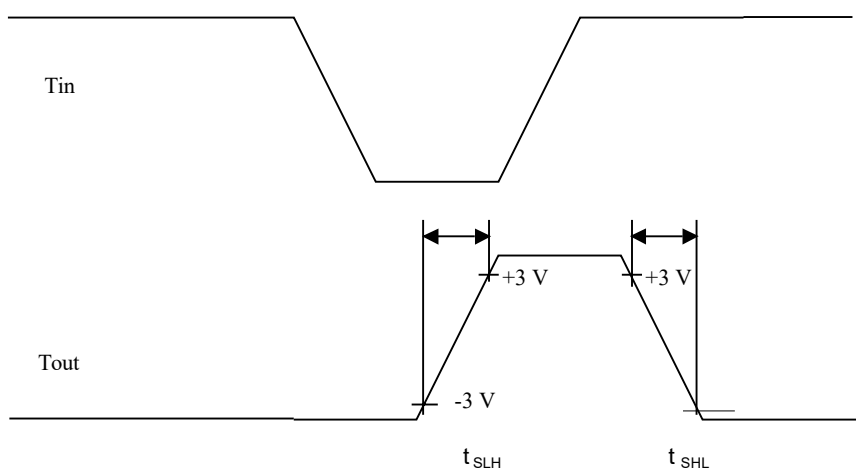


Figure 5

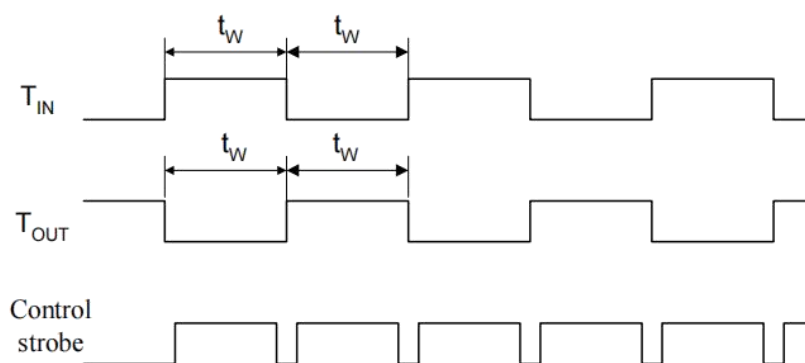
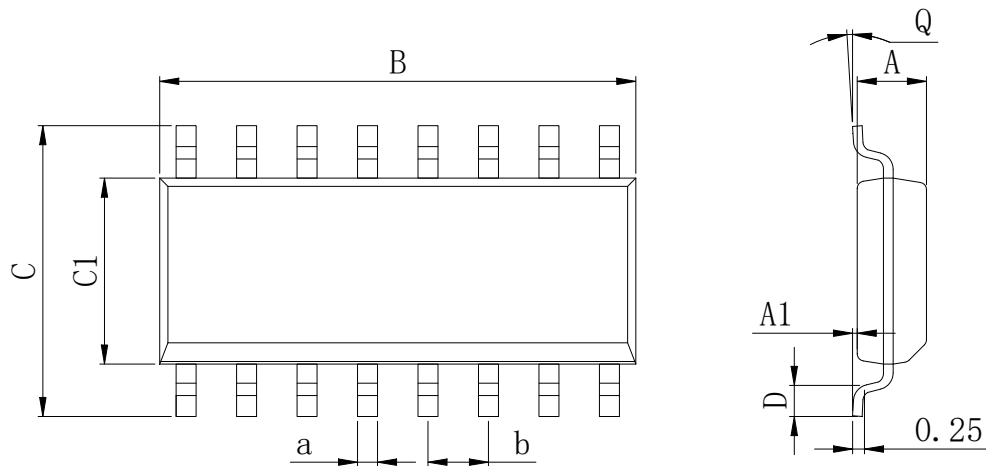


Figure 6

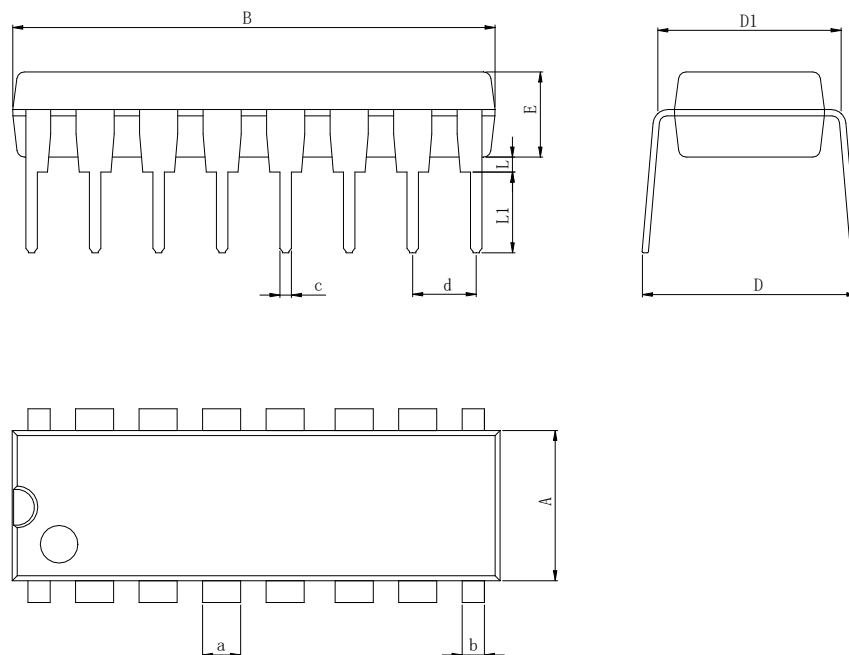
Physical Dimensions

SOP-16



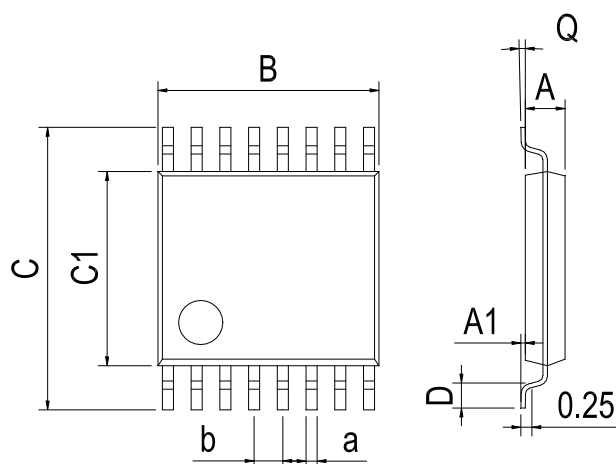
Dimensions In Millimeters(SOP-16)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	1.35	0.05	9.80	5.80	3.80	0.40	0°	0.35	1.27 BSC
Max:	1.55	0.20	10.0	6.20	4.00	0.80	8°	0.45	

DIP-16



Dimensions In Millimeters(DIP-16)											
Symbol:	A	B	D	D1	E	L	L1	a	b	c	d
Min:	6.10	18.94	8.10	7.42	3.10	0.50	3.00	1.50	0.85	0.40	2.54 BSC
Max:	6.68	19.56	10.9	7.82	3.55	0.70	3.60	1.55	0.90	0.50	

TSSOP-16



Dimensions In Millimeters(TSSOP-16)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	0.85	0.05	4.90	6.20	4.30	0.40	0°	0.20	0.65 BSC
Max:	0.95	0.20	5.10	6.60	4.50	0.80	8°	0.25	

Revision History

REVISION NUMBER	DATE	REVISION	PAGE
V1.0	2018-8	New	1-11
V1.1	2019-9	Update encapsulation、 Add annotation for Maximum Ratings.	1、 3
V1.2	2024-11	Add a model marking name、 Update Lead Temperature	1、 3
V1.3	2025-9	Delete the power supply voltage range 2.0 to 6.0 V	1

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