

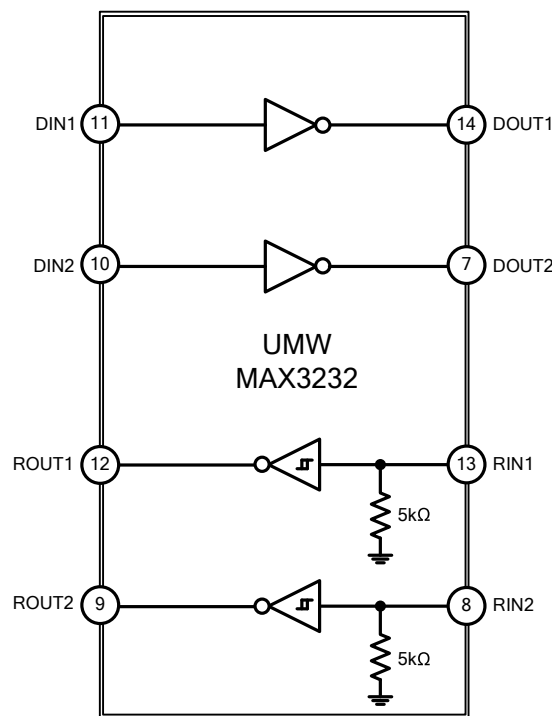
## 1.Description

The UMW MAX3232ESE has two receivers and two drivers, and a dual charge-pump circuit. The device meets the requirements of TIA/EIA-232-F and provides the electrical interface between an asynchronous communication controller and the serial-port connector. The charge pump and four small external capacitors allow operation from a single 3.0V to 5.5V supply. The device operates at data signaling rates up to 250kbit/s and a maximum of 35V/ $\mu$ s driver output slew rate.

## 2.Features

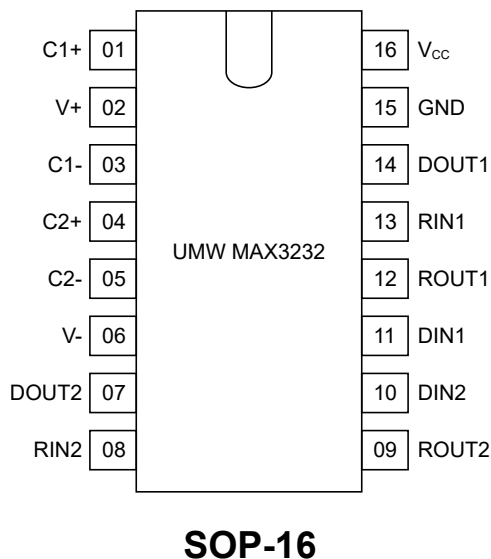
- Exceeds  $\pm 8$ KV ESD Protection(HBM) for RS-232 I/O Pins
- Meets the Requirements of TIA/EIA-232-F and ITU V.28 Standards
- Operates With 3.0V to 5.5V VCC Supply
- Operates Up To 250kbit/s Data Rate
- Two Drivers and Two Receivers
- External Capacitors 4 $\times$ 0.1 $\mu$ F
- Accepts 5.0V Logic Input With 3.3V Supply

## 3.Block Diagram





## 4. Pinning Information



Pin No	Symbol	Function
01	C1+	Positive Terminal of Voltage-Doubler Charge-Pump Capacitor
02	V+	+5.5V Generated by the Charge Pump
03	C1-	Negative Terminal of Voltage-Doubler Charge-Pump Capacitor
04	C2+	Positive Terminal of Inverting Charge-Pump Capacitor
05	C2-	Negative Terminal of Inverting Charge-Pump Capacitor
06	V-	-5.5V Generated by the Charge Pump
07	DOUT2	RS-232 Driver Outputs
08	RIN2	RS-232 Receiver inputs
09	ROUT2	TTL/CMOS Receiver Outputs
10	DIN2	TTL/CMOS Driver inputs
11	DIN1	TTL/CMOS Driver inputs
12	ROUT1	TTL/CMOS Receiver Outputs
13	RIN1	RS-232 Receiver Inputs
14	DOUT1	RS-232 Driver Outputs
15	GND	Ground
16	V <sub>CC</sub>	+3.0V to +5.5V Supply Voltage



## 5. Absolute Maximum Ratings

Parameter		Symbol	Ratings	Units
Supply Voltage Range		$V_{CC}$	-0.3 ~ +6.0	V
Positive Output Supply Voltage Range (Note 2)		$V+$	-0.3 ~ +7.0	V
Negative Output Supply Voltage Range (Note 2)		$V-$	+0.3 ~ -7.0	V
Supply Voltage Difference (Note 2)		$V+ - V-$	+13	V
Input Voltage	Drivers	$V_{IN}$	-0.3 ~ +6.0	V
	Receivers		-25 ~ +25	V
Output Voltage	Drivers	$V_{OUT}$	-13.2 ~ +13.2	V
	Receivers		-0.3 ~ $V_{CC}+0.3$	V
Operating Virtual Junction Temperature		$T_J$	+150	°C
Storage Temperature		$T_{STG}$	-40 ~ + 105	°C

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. All voltages are with respect to network GND.

## 6. Thermal Data

Parameter		Symbol	Ratings	Units
Junction to Ambient	SOP-16	$\theta_{JA}$	105	°C/W



## 7. Recommended Operating Conditions (See Note & Table 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Supply Voltage	$V_{CC}$	$V_{CC}=3.3V$	3	3.3	3.6	V
		$V_{CC}=5V$	4.5	5	5.5	V
Driver and Control High-level Input Voltage	$V_{IH}$	DIN	$V_{CC}=3.3V$	2		V
			$V_{CC}=5.5V$	2.4		V
Driver and Control Low-level Input Voltage	$V_{IL}$	DIN			0.8	V
Driver and Control input Voltage	$V_{IN}$	DIN			5.5	V
Receiver Input Voltage	$V_{RIN}$		-25		25	V
Operating Free-Air Temperature	$T_A$		-40		105	°C

Notes: Test conditions are C1~C4=0.1μF at V =3.3V±0.3V; C1=0.047μF, C2~C4=0.33μF at  $V_{CC}=5.0V\pm0.5V$ .



## 8. Electrical Characteristics

[(over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)  
(see Note 3 & Table 1)]

Parameter	Symbol	Conditions	Min	Typ (Note 1)	Max	Units
Supply Current	$I_{CC}$	No load $V_{CC}=3.3V$		1	3	mA
<b>DRIVER SECTION</b>						
High-Level Output Voltage	$V_{OH}$	DOUT at $R_L=3k\Omega$ to GND, DIN=GND	+5.0	+5.4		V
Low-Level Output Voltage	$V_{OL}$	DOUT at $R_L=3k\Omega$ to GND, DIN= $V_{CC}$	-5.0	-5.4		V
High-Level input Current	$I_{OH}$	$V_I=V_{CC}$		$\pm 0.01$	$\pm 1$	$\mu A$
Low-Level input Current	$I_{OL}$	$V_I$ at GND		$\pm 0.01$	$\pm 1$	$\mu A$
Short-Circuit Output Current (Note 2)	$I_{OS}$	$V_{CC}=3.6V$ , $V_{OUT}=0V$		$\pm 35$	$\pm 60$	mA
		$V_{CC}=5.5V$ , $V_{OUT}=0V$		$\pm 35$	$\pm 60$	mA
Output Resistance	$r_O$	$V_{CC}$ , V+ and V- =0V, $V_{OUT}=\pm 2.0V$	300	10M		$\Omega$
<b>RECEIVER SECTION</b>						
High-Level Output Voltage	$V_{OH}$	$I_{OH}=-1.0mA$	$V_{CC}-0.6V$	$V_{CC}-0.1V$		V
Low-Level Output Voltage	$V_{OL}$	$I_{OH}=1.6mA$			0.4	V
Positive-Going Input Threshold Voltage	$V_{IT+}$	$V_{CC}=3.3V$		1.5	2.4	V
		$V_{CC}=5V$		1.8	2.4	V
Negative-Going Input Threshold Voltage	$V_{IT-}$	$V_{CC}=3.3V$	0.6	1.2		V
		$V_{CC}=5V$	0.8	1.5		V
Input Hysteresis	$V_{HYS}$	$V_{IT+} \sim V_{IT-}$		0.3		V
Input Resistance	$R_I$	$V_I=\pm 3.0V \sim \pm 25V$	3	5	7	k $\Omega$

Notes: 1. All typical values are at  $V_{CC}=3.3V$  or  $V_{CC}=5.0V$ , and  $T_A=25^\circ C$ .

2. Short-circuit durations should be controlled to prevent exceeding the device absolute power-dissipation ratings, and not more than one output should be shorted at a time.

3. Test conditions are C1~C4=0.1 $\mu F$  at  $V_{CC}=3.3V \pm 0.3V$ ; C1=0.047 $\mu F$ , C2~C4=0.33 $\mu F$  at  $V_{CC}=5.0V \pm 0.5V$ .

4. Pulse skew is defined as  $|t_{PLH}-t_{PHL}|$  of each channel of the same device.



## 9. Switching Characteristics

[over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Note 3 and Table 1)]

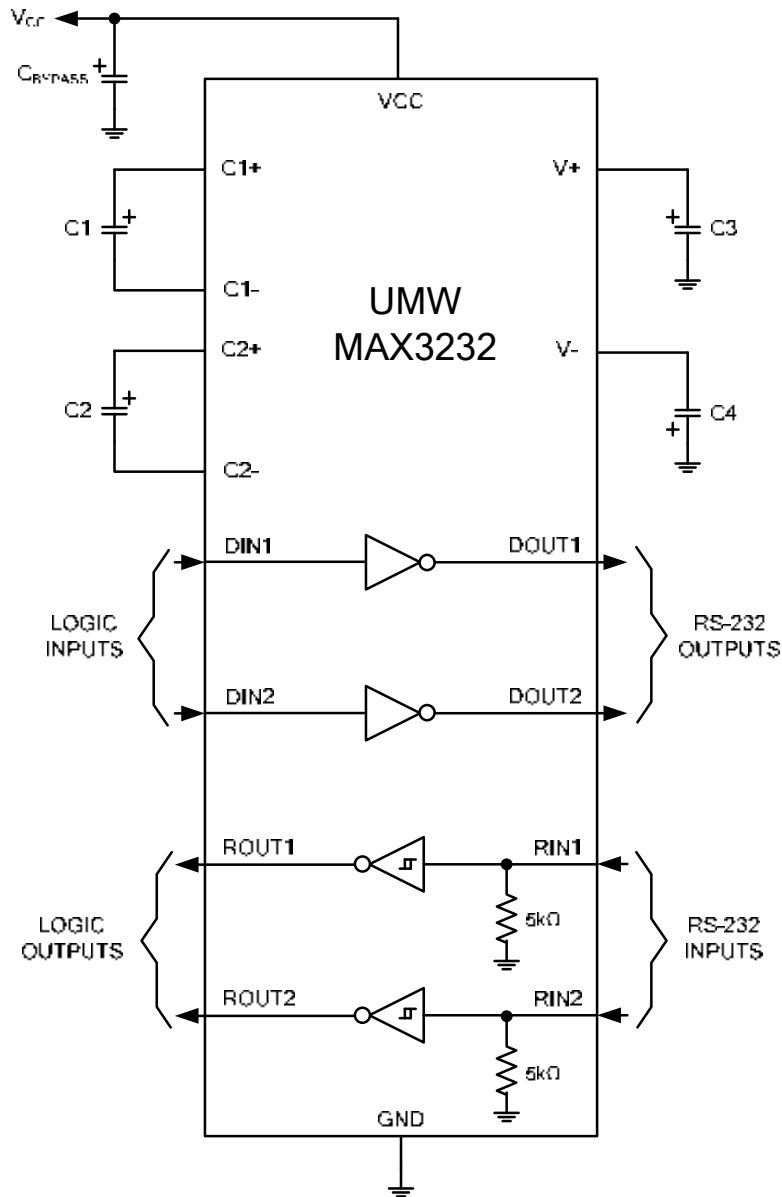
Parameter	Symbol	Conditions		Min	Typ (Note 1)	Max	Units
DRIVER SECTION							
Maximum Data Rate		C <sub>L</sub> =1000pF, R <sub>L</sub> =3kΩ, One Driver Switching				250	Kbit/s
Pulse Skew (Note 4)	t <sub>SK(p)</sub>	C <sub>L</sub> =220pF~2500pF, R <sub>L</sub> =3kΩ~7kΩ			300		ns
Slew Rate, Transition Region	SR(tr)	R <sub>L</sub> =3kΩ~7kΩ, V <sub>CC</sub> =3.3V	C <sub>L</sub> =220pF~1000pF	5		35	V/μs
			C <sub>L</sub> =220pF~2500pF	3		35	V/μs
RECEIVER SECTION							
Propagation Delay Time, Low-to High-Level Output	t <sub>PLH</sub>	C <sub>L</sub> =150pF			300		ns
Propagation Delay Time, High to Low-Level Output	t <sub>PHL</sub>	C <sub>L</sub> =150pF			300		ns
Output Enable Time	t <sub>EN</sub>	C <sub>L</sub> =150pF, R <sub>L</sub> =3kΩ			200		ns
Output Disable Time	t <sub>DIS</sub>	C <sub>L</sub> =150pF, R <sub>L</sub> =3kΩ			200		ns
Pulse Skew (Note 4)	t <sub>SK(P)</sub>	t <sub>PLH</sub> -t <sub>PHL</sub>			300		ns

Notes: 1. All typical values are at  $V_{CC}=3.3\text{V}$  or  $V_{CC}=5.0\text{V}$ , and  $T_A=25^\circ\text{C}$ .

2. Short-circuit durations should be controlled to prevent exceeding the device absolute power-dissipation ratings, and not more than one output should be shorted at a time.

3. Test conditions are  $C1\sim C4=0.1\mu\text{F}$  at  $V_{CC}=3.3\text{V}\pm 0.3\text{V}$ ;  $C1=0.047\mu\text{F}$ ,  $C2\sim C4=0.33\mu\text{F}$  at  $V_{CC}=5.0\text{V}\pm 0.5\text{V}$ .

4. Pulse skew is defined as  $|t_{PLH}-t_{PHL}|$  of each channel of the same device.



Notes: 1.C3 can be connected to  $V_{CC}$  or GND.

2.Resistor values shown are nominal.

3.NC: No internal connection.

4. Nonpolarized ceramic capacitors are acceptable. If polarized tantalum or electrolytic capacitors are used, they should be connected as shown.



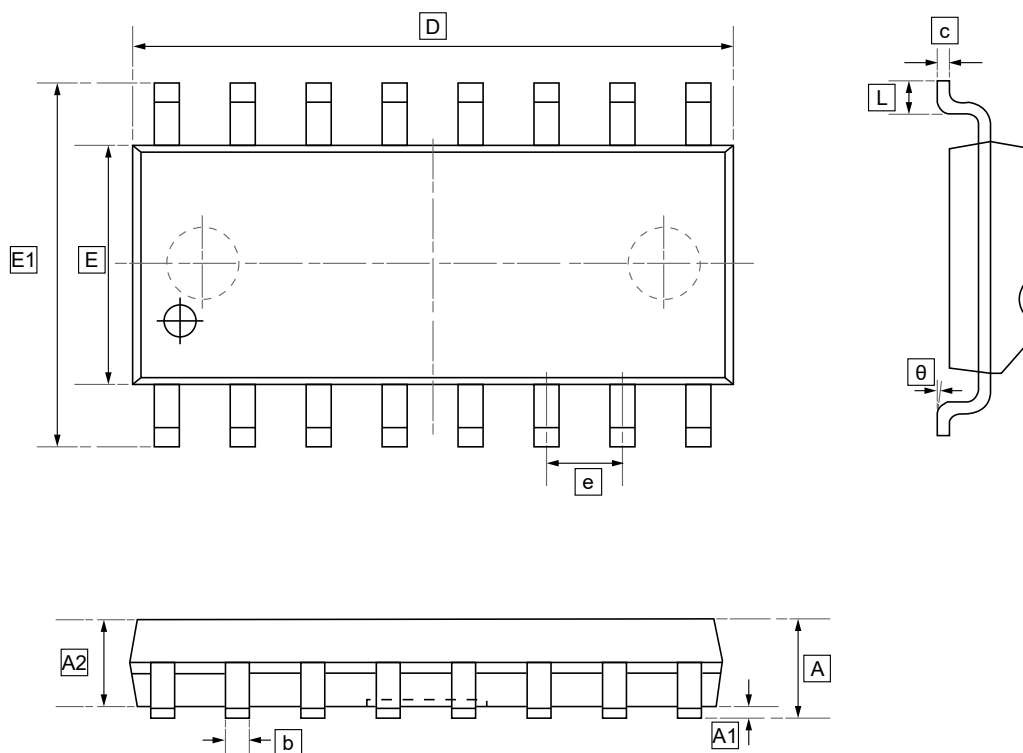
V <sub>CC</sub> (V)	C1(μF)	C2, C3, C4 (μF)
3.0~3.6	0.1	0.1
4.5~5.5	0.047	0.33
3.0~5.5	0.1	0.47

Table1. Typical Operating Circuit and Capacitor Values





## 8.SOP-16 Package Outline Dimensions

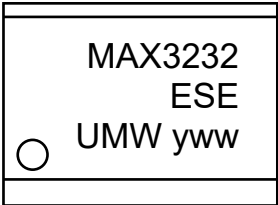


**DIMENSIONS (mm are the original dimensions)**

Symbol	A	A1	A2	b	c	D	E	E1	e	L	θ
Min	1.350	0	1.350	0.330	0.170	9.800	3.800	5.800	1.270	0.400	0°
Max	1.750	0.100	1.550	0.510	0.250	10.200	4.000	6.200	BSC	1.270	8°



9.Ordering information



yww: Batch Code

Order Code	Package	Base QTY	Delivery Mode
UMW MAX3232ESE	SOP-16	2500	Tape and reel



## **10.Disclaimer**

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