

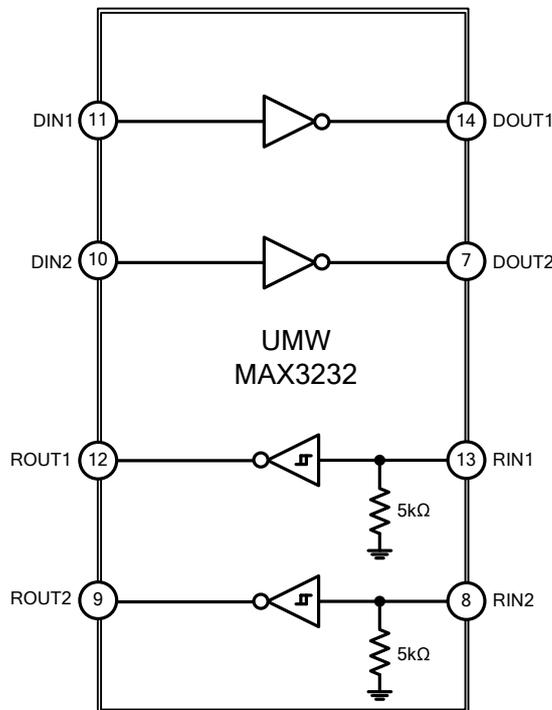
1. Description

The UMW MAX3232 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/μs driver output slew rate.

2. Features

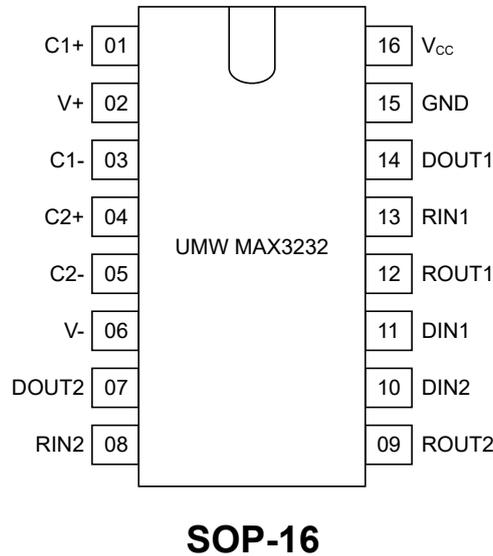
- Exceeds ±8KV ESD Protection(HBM) for RS-232 I/O Pins
- Meets the Requirements of TIA/EIA-232-F and ITU V.28 Standards
- Operates With 3.0V to 5.5V V_{CC} Supply
- Operates Up To 250kbit/s Data Rate
- Two Drivers and Two Receivers
- External Capacitors 4×0.1μF
- Accepts 5.0V Logic Input With 3.3V Supply

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 _{CC}	+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	MAX3232C	T_{STG}	0 ~ +70	°C
	MAX3232I		-40 ~ +85	°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	θ_{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

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



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		1	3	mA
DRIVER SECTION						
High-Level Output Voltage	V_{OH}	DOOUT at $R_L=3k\Omega$ to GND, DIN=GND	+5.0	+5.4		V
Low-Level Output Voltage	V_{OL}	DOOUT at $R_L=3k\Omega$ to GND, DIN= V_{CC}	-5.0	-5.4		V
High-Level input Current	I_{OH}	$V_I=V_{CC}$		± 0.01	± 1	μA
Low-Level input Current	I_{OL}	V_I at GND		± 0.01	± 1	μA
Short-Circuit Output Current (Note 2)	I_{OS}	$V_{CC}=3.6V, V_{OUT}=0V$		± 35	± 60	mA
		$V_{CC}=5.5V, V_{OUT}=0V$		± 35	± 60	mA
Output Resistance	r_o	$V_{CC}, V+$ and $V- =0V, V_{OUT}=\pm 2.0V$	300	10M		Ω
RECEIVER SECTION						
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 Ω

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

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 $C1 \sim C4=0.1\mu F$ at $V_{CC}=3.3V \pm 0.3V$; $C1=0.047\mu F, C2 \sim C4=0.33\mu F$ 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)]

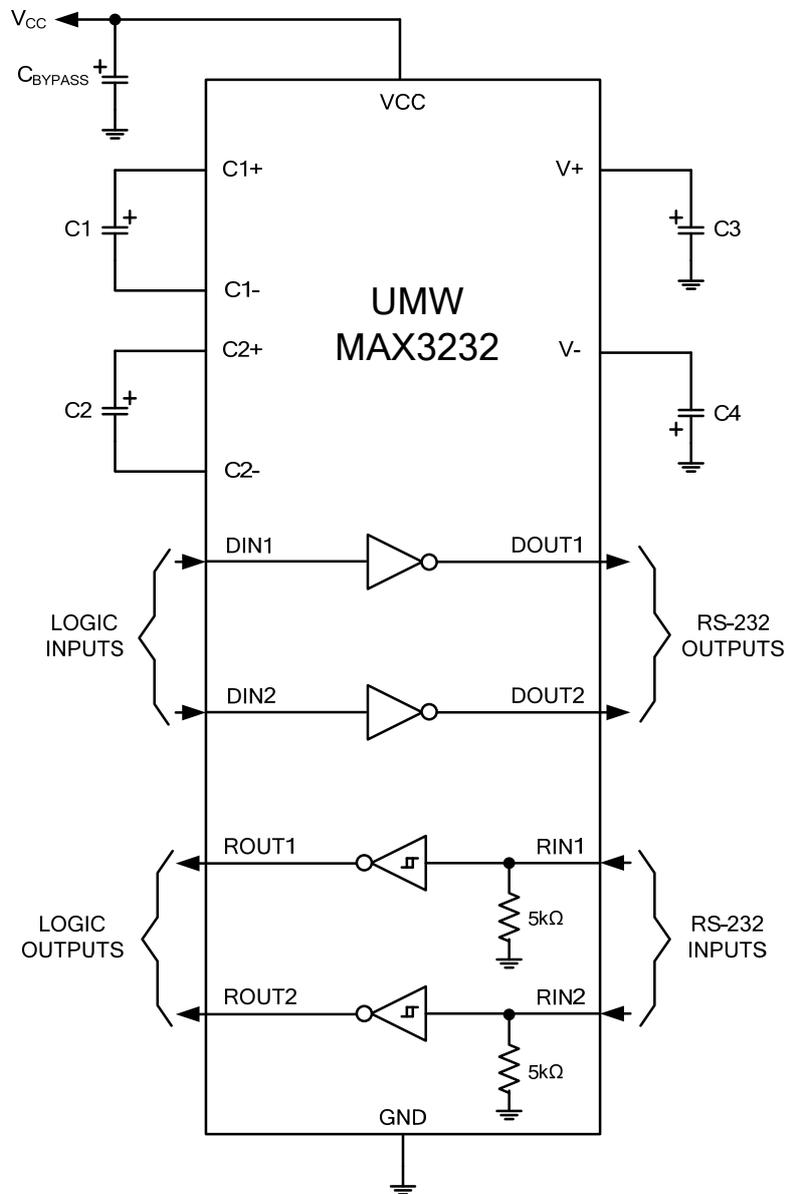
Parameter	Symbol	Conditions	Min	Typ (Note 1)	Max	Units
DRIVER SECTION						
Maximum Data Rate		$C_L=1000\text{pF}$, $R_L=3\text{k}\Omega$, One Driver Switching	120		250	Kbit/s
Pulse Skew (Note 4)	$t_{SK(P)}$	$C_L=220\text{pF}\sim 2500\text{pF}$, $R_L=3\text{k}\Omega\sim 7\text{k}\Omega$		300		ns
Slew Rate, Transition Region	SR(tr)	$R_L=3\text{k}\Omega\sim 7\text{k}\Omega$, $V_{CC}=3.3\text{V}$	$C_L=220\text{pF}\sim 1000\text{pF}$	5	35	V/ μs
			$C_L=220\text{pF}\sim 2500\text{pF}$	3	35	V/ μs
RECEIVER SECTION						
Propagation Delay Time, Low-to High-Level Output	t_{PLH}	$C_L=150\text{pF}$		300		ns
Propagation Delay Time, High to Low-Level Output	t_{PHL}	$C_L=150\text{pF}$		300		ns
Output Enable Time	t_{EN}	$C_L=150\text{pF}$, $R_L=3\text{k}\Omega$		200		ns
Output Disable Time	t_{DIS}	$C_L=150\text{pF}$, $R_L=3\text{k}\Omega$		200		ns
Pulse Skew (Note 4)	$t_{SK(P)}$	$ t_{PLH}-t_{PHL} $		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.

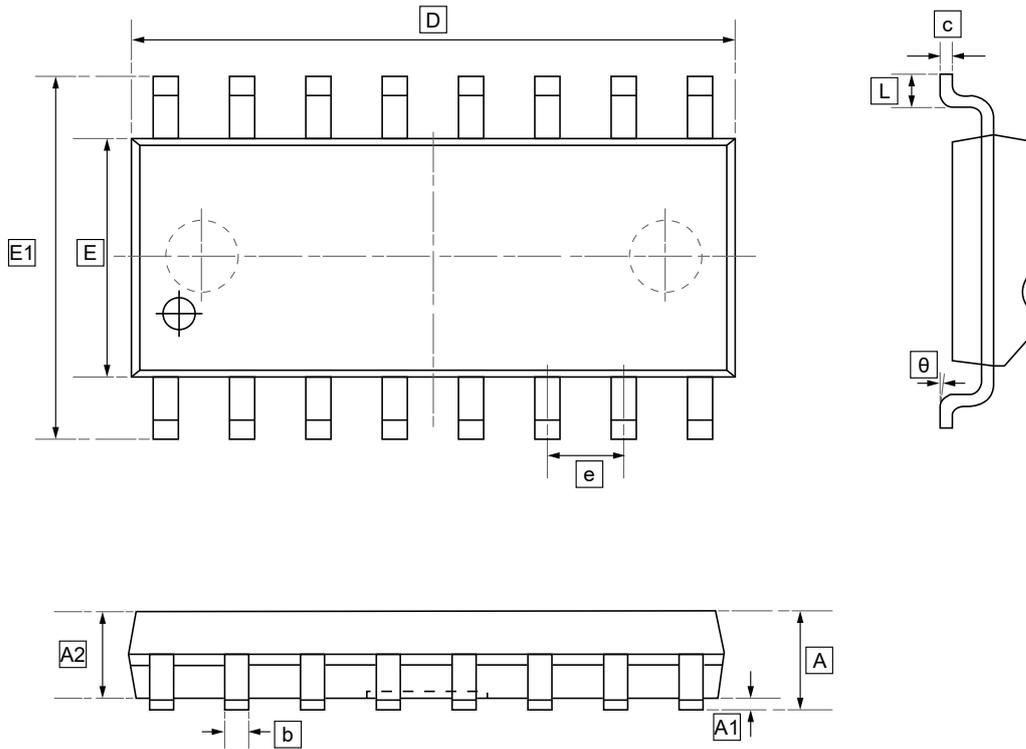


V_{CC}(V)	C1(μF)	C2, C3, C4 (μF)	C_{BYPASS}(μF)
3.0~3.6	0.22	0.22	0.22
3.15~3.6	0.1	0.1	0.1
4.5~5.5	0.047	0.33	0.047
3.0~5.5	0.22	1	0.22

Table1. Typical Operating Circuit and Capacitor Values



10.1 SOP-16 Package Outline Dimensions

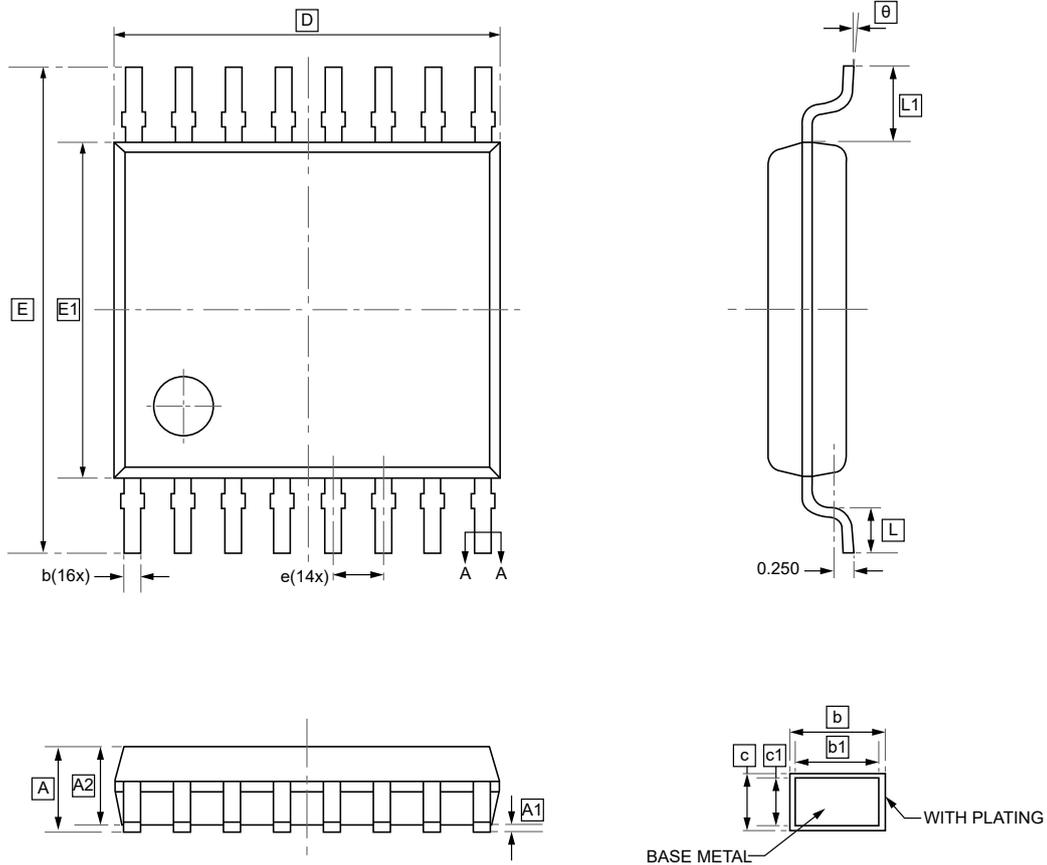


DIMENSIONS (mm are the original dimensions)

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°



10.2 TSSOP-16 Package Outline Dimensions



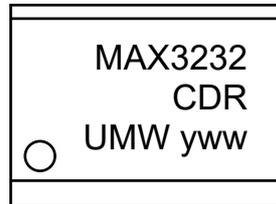
DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	b	b1	c	c1	D	E	E1	e	L1
Min	-	0.05	0.90	0.20	0.19	0.13	0.120	4.90	6.20	4.30	0.65	0.85
Max	1.20	0.15	1.05	0.28	0.25	0.17	0.14	5.10	6.60	4.50	BSC	1.15

Symbol	L	θ
Min	0.45	0°
Max	0.75	8°



11. Ordering information



yww: Batch Code

Order Code	Marking	Package	Base QTY	Delivery Mode
UMW MAX3232CDR	MAX3232 CDR	SOP-16	2500	Tape and reel
UMW MAX3232CSE	MAX3232 CSE	SOP-16	2500	Tape and reel
UMW MAX3232ID	MAX3232 ID	SOP-16	2500	Tape and reel
UMW MAX3232IDR	MAX3232 IDR	SOP-16	2500	Tape and reel
UMW MAX3232CPWR	MA3232C	TSSOP-16	4000	Tape and reel
UMW MAX3232IPWR	MB3232I	TSSOP-16	4000	Tape and reel



12.Disclaimer

UMW reserves the right to make changes to all products, specifications. Customers should obtain the latest version of product documentation and verify the completeness and currency of the information before placing an order.

When applying our products, please do not exceed the maximum rated values, as this may affect the reliability of the entire system. Under certain conditions, any semiconductor product may experience faults or failures. Buyers are responsible for adhering to safety standards and implementing safety measures during system design, prototyping, and manufacturing when using our products to prevent potential failure risks that could lead to personal injury or property damage.

Unless explicitly stated in writing, UMW products are not intended for use in medical, life-saving, or life-sustaining applications, nor for any other applications where product failure could result in personal injury or death. If customers use or sell the product for such applications without explicit authorization, they assume all associated risks.

When reselling, applying, or exporting, please comply with export control laws and regulations of China, the United States, the United Kingdom, the European Union, and other relevant countries, regions, and international organizations.

This document and any actions by UMW do not grant any intellectual property rights, whether express or implied, by estoppel or otherwise. The product names and marks mentioned herein may be trademarks of their respective owners.