

15kv ESD保护，低功耗 保证数据速率250kbps Rs232收发器

产品特性

- MAX32xxE 在 3.3V 或 5V 供电时，满足 EIA/TIA-232F 和 CCITT V. 28/V. 24 协议的通信要求
- 低静态工作电流：典型值 0.5mA，最大值 1mA
- 低关断电流：典型值 1uA，最大值 10uA。
- 保证 250kbps 数据传输速率
- 专用开关电容电压转换器
- 专用 XPWRSAVE 自动待机节能
- RS-232 I/O 的 ESD 防护
 - ±15kV Human Body Model (HBM)
 - ±15kV EN61000-4-2 Air Gap Discharge
 - ±8kV EN61000-4-2 Contact Discharge
- MAX32xxF 系列保证传输速率为 1000kbps

简要概述

MAX32xxE系列是采用3V供电的满足EIA/TIA-232和CCITT V. 28/V. 24通信要求的接口芯片，符合低功耗要求。内部包括两个驱动器、两个接收器和专用的开关电容稳压转换器。MAX3220具有一个驱动器和一个接收器。这些器件能够在3V至5.5V电源条件下工作，保证数据传输速率为250kbit/s，所有RS232 I/O引脚的静电放电(ESD)保护均超过EN61000-4-2标准下的±15kV空气放电和±8kV接触放电。

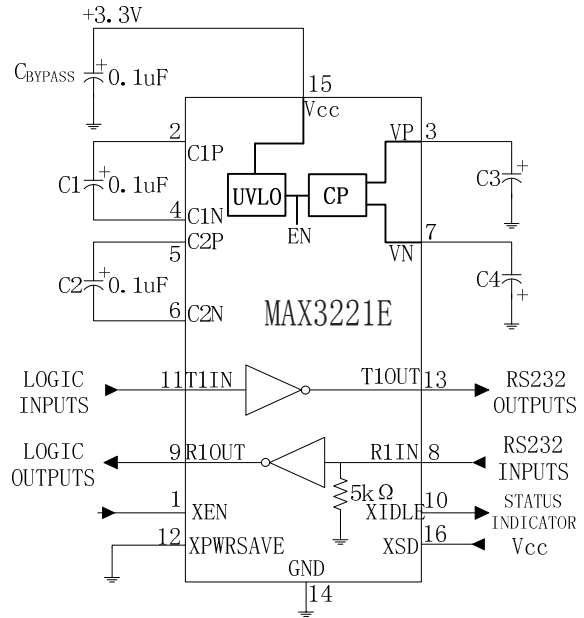
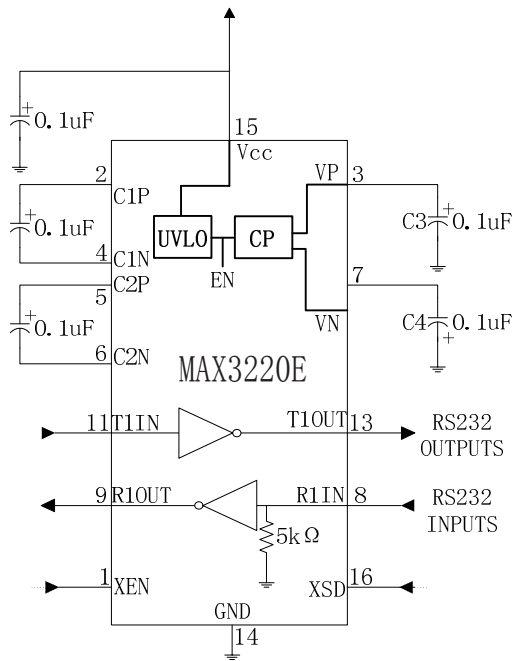
应用

- 电池供电设备和手持设备
- 笔记本和掌上电脑
- 蜂窝电话数据线缆
- 终端适配器和 POS 终端
- 调制解调器

产品选择指南

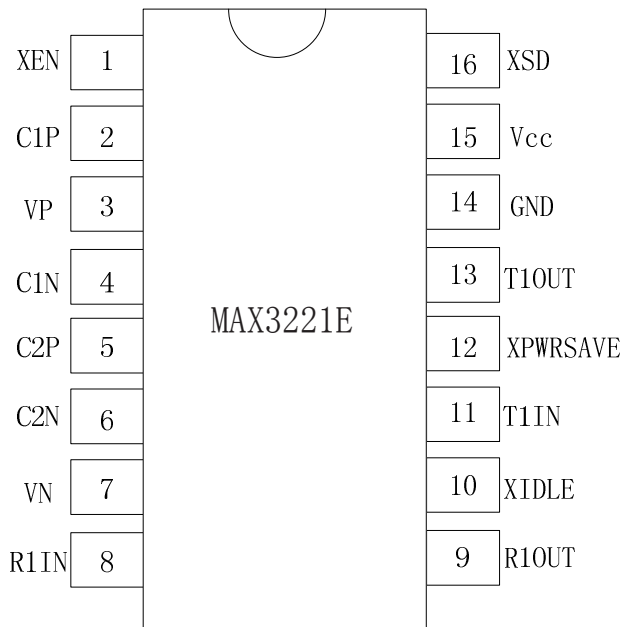
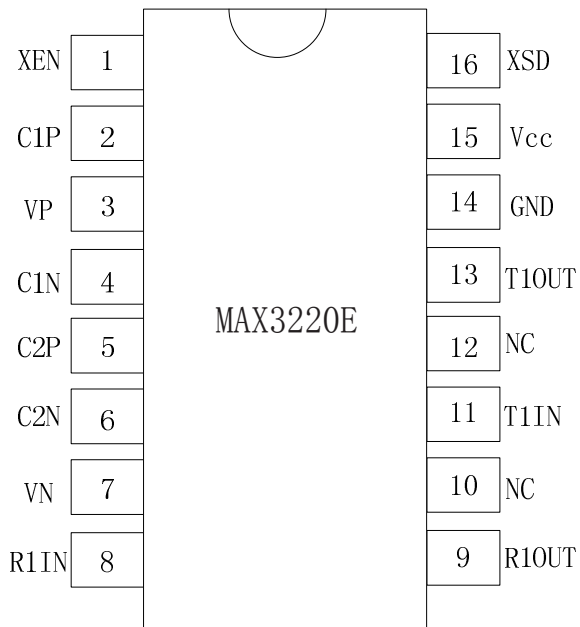
型号	供电	RS232 驱动器	RS232 接收器	传输速率 (kbps)	15KV ESD IEC1000-4-2	接收器 使能	关断使能	XPWRSAVE 功能	引脚数量	封装类型
MAX3220E	+3V to +5.5V	1	1	250	RS232 I/O	YES	YES	NO	16	SSOP, TSSOP, WSOIC
MAX3221E	+3V to +5.5V	1	1	250	RS232 I/O	YES	YES	YES	16	SSOP, TSSOP
MAX3222E	+3V to +5.5V	2	2	250	RS232 I/O	YES	YES	NO	18, 20	18-WSOIC 20-SSOP, 20-TSSOP,
MAX3232E	+3V to +5.5V	2	2	250	RS232 I/O	NO	NO	NO	16	NSOIC, WSOIC, SOP, TSSOP
MAX3223E	+3V to +5.5V	2	2	250	RS232 I/O	YES	YES	YES	20	SSOP, TSSOP
MAX1385E	+3V to +5.5V	2	2	250	RS232 I/O	NO	YES	NO	18, 20	18-WSOIC, 20-SSOP

典型外围电路和引脚图

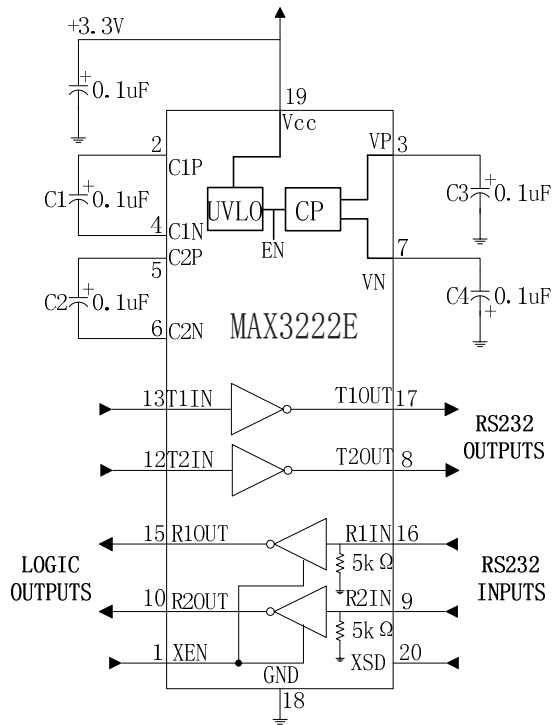


16-pin SSOP/TSSOP/WSOIC

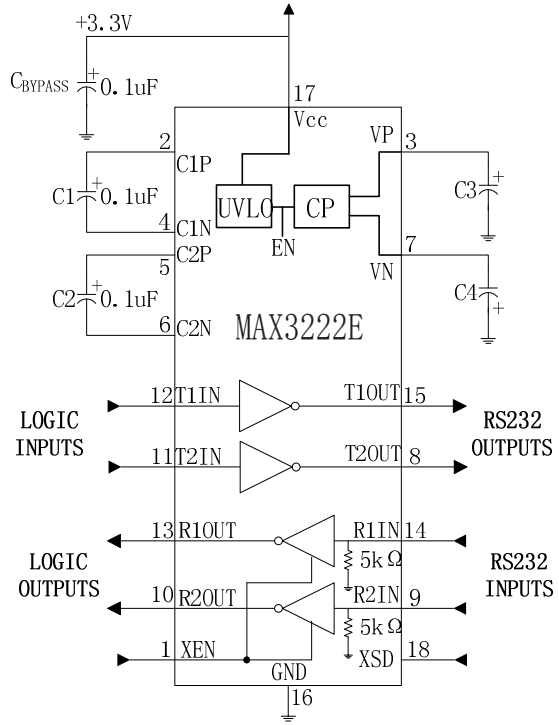
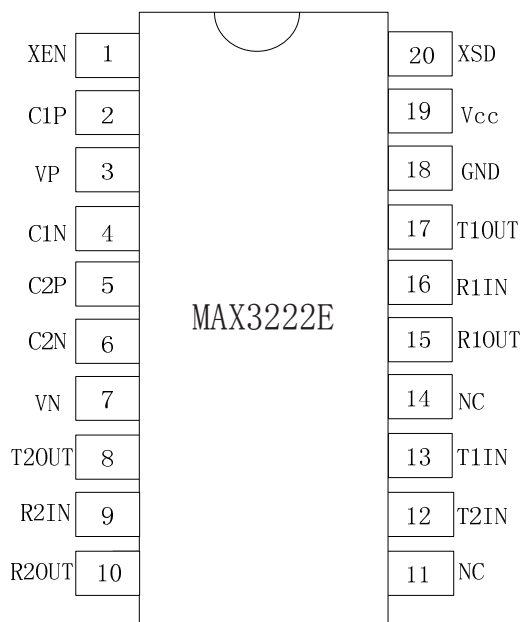
16-pin SSOP/TSSOP



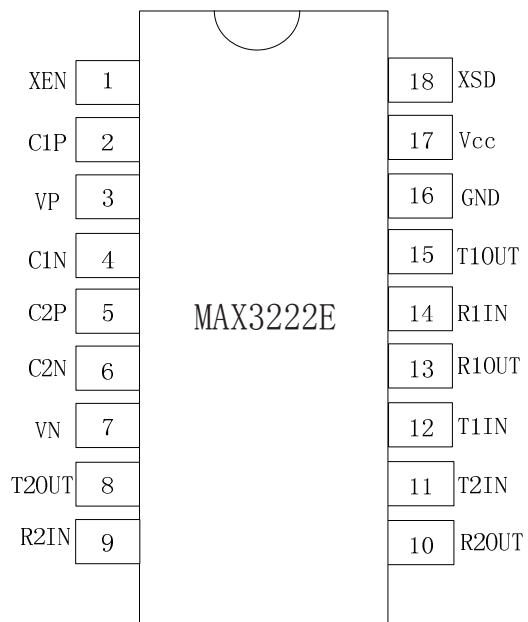
典型外围电路和引脚图



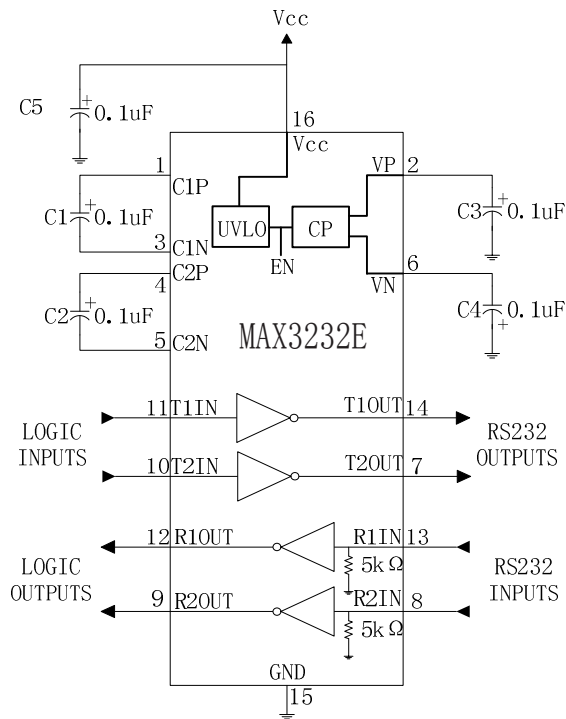
20-pin SSOP/TSSOP



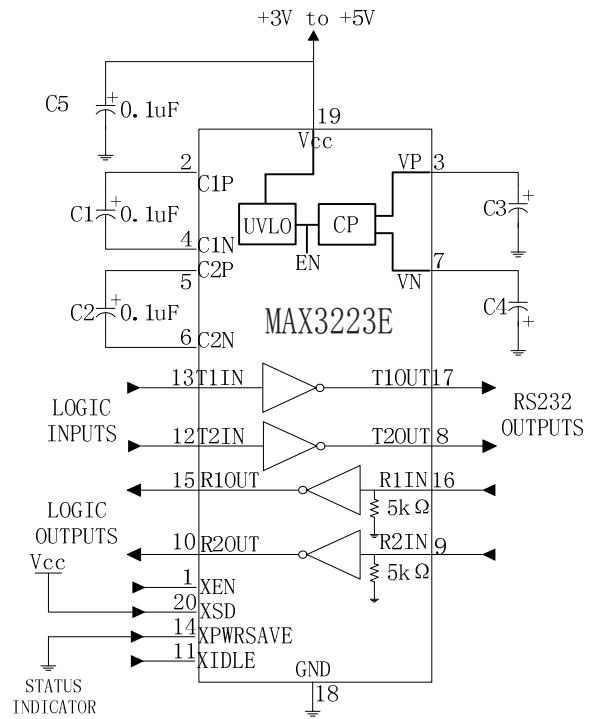
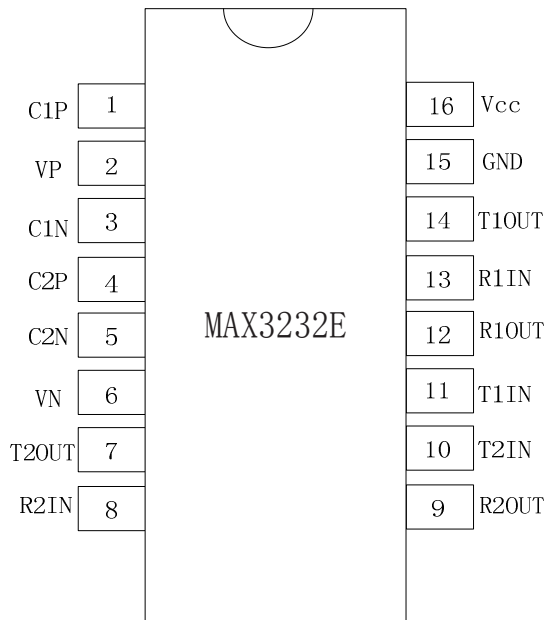
18-pin WS0IC



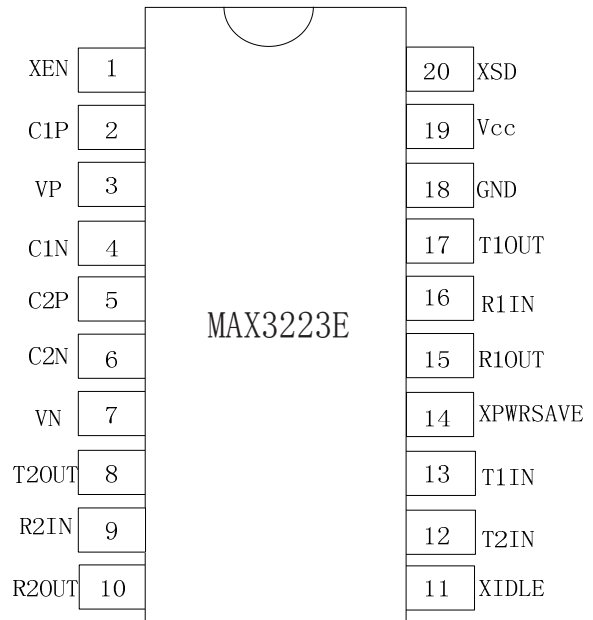
典型外围电路和引脚图



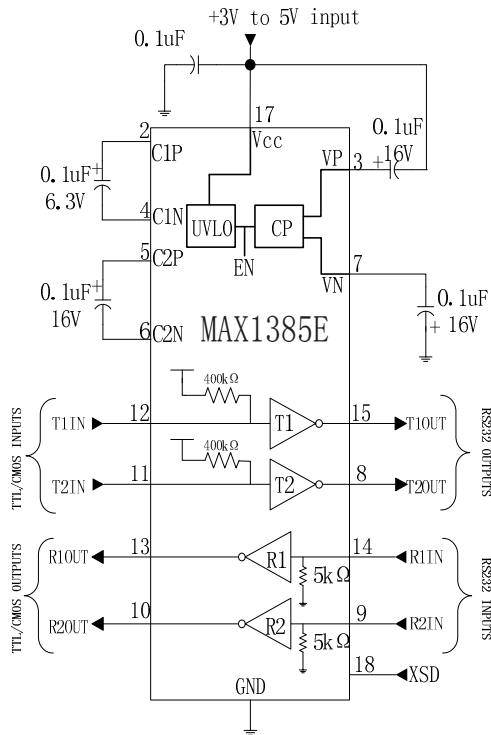
16-pin SSOP/TSSOP/NSOIC/WSOIC



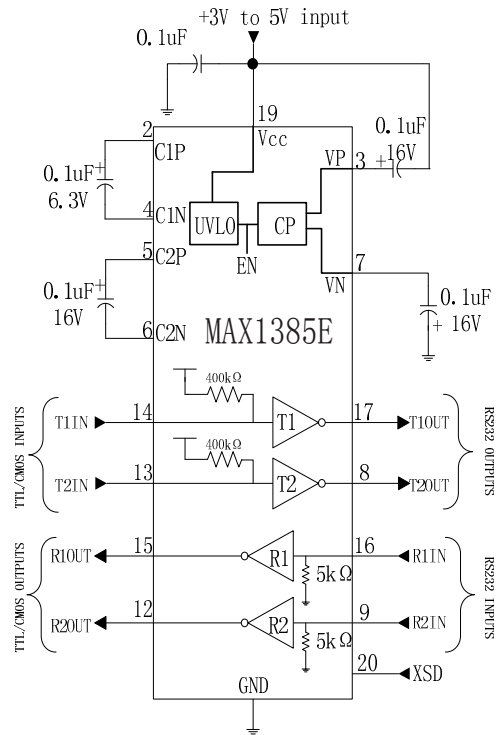
20-pin SSOP/TSSOP



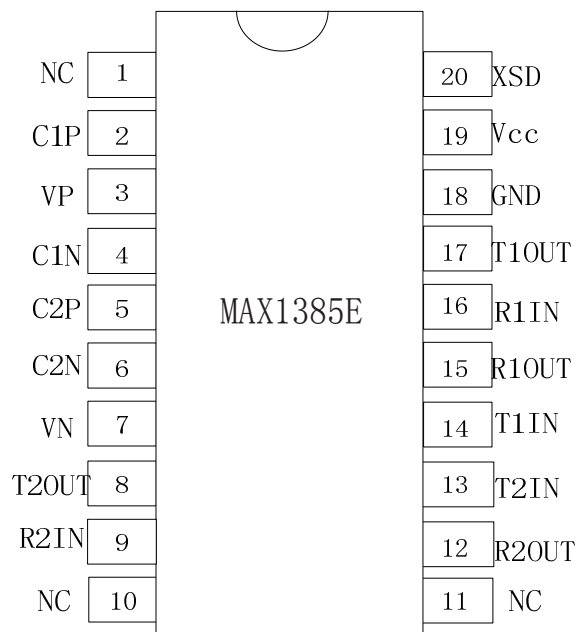
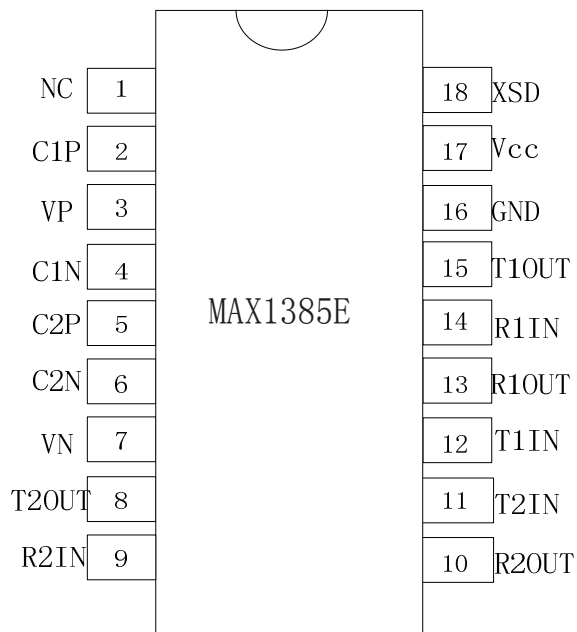
典型外围电路和引脚图



18-pin WS01C



20-pin SSOP/TSSOP



绝对最大额定值

这些仅是产品测试最大额定值,但并不代表设备可以在这些额定值下或在操作中的任何其它额定值以上进行通讯操作。长时间应用在绝对最大额定值条件下可能会影响芯片可靠性。

Power Supply, (V_{CC}) -0.3V to +6.0V
 VP -0.3V to +7.0V
 VN +0.3V to -7.0V
 $|VP| + |VN|$ +13.0V
 I_{CC} (DC V_{CC} or GND current) $\pm 100\text{mA}$

Input Voltages

TxIN, XPWRSAVE, XSD, XEN -0.3V to +6.0V
 RxIN $\pm 20\text{V}$

Output Voltages

TxOUT $\pm 15\text{V}$
 RxOUT, XIDLE -0.3V to ($V_{CC} + 0.3\text{V}$)

Short-Circuit Duration

TxOUT Continuous
 Operating Temperature -40°C to $+85^{\circ}\text{C}$
 Storage Temperature -65°C to $+150^{\circ}\text{C}$

Power Dissipation Per Package

16-pin SSOP (derate $7.20\text{mW}/^{\circ}\text{C}$ above $+70^{\circ}\text{C}$).. 584mW
 16-pin nSOIC (derate $10.00\text{mW}/^{\circ}\text{C}$ above $+70^{\circ}\text{C}$) 720mW
 16-pin WSOIC (derate $10.10\text{mW}/^{\circ}\text{C}$ above $+70^{\circ}\text{C}$) 787mW
 16-pin TSSOP (derate $6.80\text{mW}/^{\circ}\text{C}$ above $+70^{\circ}\text{C}$).. 556mW
 16-pin PDIP (derate $11.20\text{mW}/^{\circ}\text{C}$ above $+70^{\circ}\text{C}$).... 896mW
 18-pin PDIP (derate $12.60\text{mW}/^{\circ}\text{C}$ above $+70^{\circ}\text{C}$).... 962mW
 18-pin WSOIC (derate $11.10\text{mW}/^{\circ}\text{C}$ above $+70^{\circ}\text{C}$) 850mW
 20-pin PDIP (derate $12.80\text{mW}/^{\circ}\text{C}$ above $+70^{\circ}\text{C}$).... 976mW
 20-pin SSOP (derate $8.10\text{mW}/^{\circ}\text{C}$ above $+70^{\circ}\text{C}$).... 647mW
 20-pin TSSOP (derate $7.20\text{mW}/^{\circ}\text{C}$ above $+70^{\circ}\text{C}$).. 584mW

电气特性

除非特殊说明, $V_{CC} = +3.0\text{V}$ to $+5.0\text{V}$, $T_A = T_{\min}$ to $T_{\max}$, C1 to C4 = $0.1\mu\text{F}$, 典型值应用条件为 $V_{CC} = +3.3\text{V}$ or $+5.0\text{V}$ and $T_A = 25^{\circ}\text{C}$.

参数	条件	最小	典型	最大	单位
驱动输入 驱动输出 RS-232 输入 RS-232 输出 电荷泵 电源脚	T1IN, T2IN, XPWRSAVE, XSD, XEN R1OUT, R2OUT, XIDLE R1IN, R2IN T1OUT, T2OUT C1P, C1N, C2P, C2N V_{CC} , V_{GND} , V_{DD} , V_{SS}				
电荷泵电容 温度 0°C to $+70^{\circ}\text{C}$ 温度 -40°C to $+85^{\circ}\text{C}$ 电源电压	C1P, C1N, C2P, C2N Commercial Grade Industrial Grade $V_{CC} = +5.0\text{V}$ Supply $V_{CC} = +3.3\text{V}$ Supply	0.1 0 -40 4.5 3	0.1 +25 +25 5 3.3	1 +70 +85 5.5 3.6	μF $^{\circ}\text{C}$ $^{\circ}\text{C}$ V V
工作电流	TTL Inputs = V_{CC}/GND , RS-232 Input = float, $V_{CC} = 3.3\text{V}$ (For MAX3220E, MAX3222E, MAX3232E and MAX1385E)		0.5	1	mA
XPWRSAVE 不使能时工作电流	XPWRSAVE = V_{CC} , (For MAX3221E and MAX3223E); XSD = V_{CC} , (For MAX3221E, MAX3222E, MAX1385E and MAX3223E), TTL Inputs = V_{CC}/GND , RS-232 Input = float, $V_{CC} = 3.3\text{V}$		0.5	1	mA
XPWRSAVE 使能时工作电流	XPWRSAVE = GND, (For MAX3221E and MAX3223E); XSD = V_{CC} , (For MAX3221E, MAX3222E, MAX1385E and MAX3223E), TTL Inputs = V_{CC}/GND , RS-232 Input = float, $V_{CC} = 3.3\text{V}$		1	10	μA
SHUTDOWN 使能时电流	XPWRSAVE = V_{CC}/GND , (For MAX3221E and MAX3223E); XSD = GND, (For MAX3221E, MAX3222E, MAX1385E and MAX3223E), TTL Inputs = V_{CC}/GND , RS-232 Inputs = float, $V_{CC} = 3.3\text{V}$		1	10	μA

参数	条件	最小	典型	最大	单位
驱动器输入 输入阈值电压 Low 输入阈值电压 High 输入阈值电压迟滞 输入漏电流	$V_{CC} = +5.0V$ Supply $V_{CC} = +3.3V$ Supply $V_{IN} = V_{CC}$ and GND, TIN, XEN, XPWRSERVE, XSD $V_{IN} = V_{CC}$ and GND, TIN (For MAX1385E)	2.4 2	0.5 ± 0.01 50	0.8 ± 1 200	V V V μA μA
接收器输出 输出电压 Low 输出电压 High 输出漏电流	$I_{OUT} = 1.6mA$ $I_{OUT} = -1.0mA$ Receiver Outputs Disabled, $V_{OUT} = V_{CC}$ or GND, XSD= GND, XEN= V_{CC}	$V_{CC}-0.6$	$V_{CC}-0.1$ ± 0.05	0.4 ± 10	V V μA
接收器输入 输入电压摆幅 输入阈值电压 Low 输入阈值电压 High 输入阈值电压迟滞 输入电阻	$T_A = T_{min} - T_{max}$ $T_A = 25^\circ C$, $V_{CC} = 5.0V$ $T_A = 25^\circ C$, $V_{CC} = 3.3V$ $T_A = 25^\circ C$ $T_A = 25^\circ C$ $V_{IN} = \pm 20V$, $T_A = 25^\circ C$	-20 0.8 0.6 3	1.5 1.2 0.5	20 2.4 7	V V V V k Ω
驱动器输出 输出电压幅值 输出电阻 输出短路电流 输出漏电流	$R_L = 3k\Omega$, All Outputs are loaded $V_{CC} = V_{DD} = V_{SS} = GND$, $V_{OUT} = \pm 2V$ $V_{OUT} = GND$ Transmitter Disabled, $V_{OUT} = \pm 12V$	± 5 300	 ± 5	 ± 60	V Ω mA μA
最大数据传输速率	$R_L = 3k\Omega$, $C_L = 1000pF$, One Transmitter Switching, $T_A = 25^\circ C$, Refers to Figure 1 and 2.	250			kbps
传输限摆率	$R_L = 3\sim 7k\Omega$, $C_L = 150pF$ to $1000pF$, One Transmitter Switching, $T_A = 25^\circ C$, Measured from $3V$ to $-3V$ or $-3V$ to $3V$	6		30	V/ μs
接收器输入输出延时 接收器输入输出延时之差 接收器使能到输出时间 接收器输出高到关断时间	$C_L = 150pF$ $C_L = 150pF$ $t_{PHL} - t_{PLH}$ For MAX3220E, MAX3221E, MAX3222E, MAX3223E only For MAX3220E, MAX3221E, MAX3222E, MAX3223E only		0.15 0.15 50 0.2 0.2		μs μs ns μs μs
XPWRSERVE Timing 接收器输入到 XIDLE 输出高 接收器输入到 XIDLE 输出低 Power Save 模式到驱动器使能	For MAX3221E and MAX3223E only For MAX3221E and MAX3223E only For MAX3221E and MAX3223E only		1 30 100		μs μs μs
ESD 防护能力 ESD HBM EN61000-4-2ContactDischarge EN61000-4-2AirGapDischarge	RS-232 Inputs and Outputs RS-232 Inputs and Outputs RS-232 Inputs and Outputs		± 15 ± 8 ± 15		kV kV kV

引脚定义

Pin Numbers								Name	Description
MAX3220E 16 Pins	MAX3221E 16 Pins	MAX3222E		MAX3232E 16 Pins	MAX1385E		MAX3223E 20 Pins		
		18 Pins	20 Pins		18Pins	20 Pins			
1	1	1	1	–	–	–	1	XEN	接收器使能。低电平有效。高电平强制使接收器输出为高阻态。
2	2	2	2	1	2	2	2	C1+	升压电荷泵电容的正端
3	3	3	3	2	3	3	3	V+	电荷泵产生的+5.4V 电压
4	4	4	4	3	4	4	4	C1-	升压电荷泵电容的负端
5	5	5	5	4	5	5	5	C2+	反向电荷泵电容的正端
7	7	7	7	6	7	7	7	V-	电荷泵产生的-5.4V 电压
6	6	6	6	5	6	6	6	C2-	反向电荷泵电容的负端
8	8	14	16	13	14	16	16	R1 IN	第一个 RS232 接收器输入
–	–	9	9	8	9	9	9	R2 IN	第二个 RS232 接收器输入
9	9	13	15	12	13	15	15	R1 OUT	第一个 TTL/CMOS 接收器输出
–	–	10	10	9	10	12	10	R2 OUT	第二个 TTL/CMOS 接收器输出
11	11	12	13	11	12	14	13	T1 IN	第一个 TTL/CMOS 驱动器输入
–	–	11	12	10	11	13	12	T2 IN	第二个 TTL/CMOS 驱动器输入
13	13	15	17	14	15	17	17	T1 OUT	第一个 RS232 驱动器输出
–	–	8	8	7	8	8	8	T2 OUT	第二个 RS232 驱动器输出
–	10	–	–	–	–	–	11	XIDLE	TTL/CMOS 输出，指示 XPWRSAVE 或者关断状态
16	16	18	20	–	18	20	20	XSD	关断控制。低有效，关断驱动器和电压转换器
–	12	–	–	–	–	–	14	XPWRSAVE	高电平强制使驱动器工作 (SHUTDOWN 必须为高)
14	14	16	18	15	16	18	18	GND	地
15	15	17	19	16	17	19	19	VCC	+3V 到 +5.5V 供电电压
10, 12	–	–	11, 14	–	1	1, 10, 11	–	NC	不连接

典型测试电路

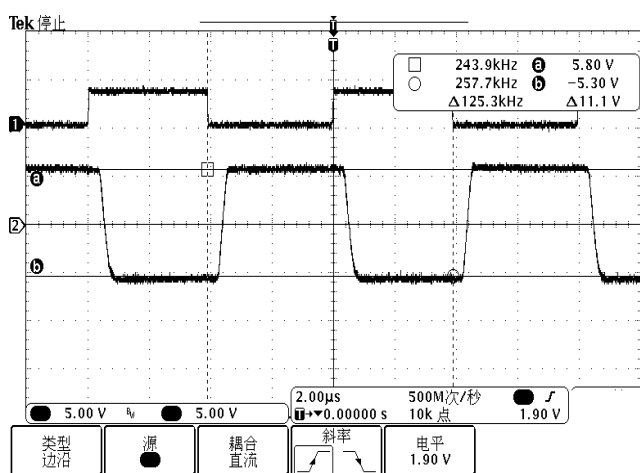
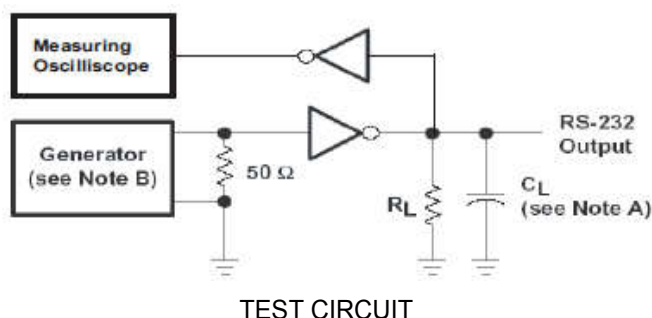


Figure 1. MAX32xxE TxIN to TxOUT (no load) at 250kbps waveform

RS232 信号特性

图1显示了RS232收发器功能，TTL/CMOS信号施加到驱动器输入端如通道1，RS232驱动器输出结果显示在通道2上。此图显示了典型的RS232不加负载驱动器输出，即这是一个RS232开路的输出电压。电荷泵电压转换器有效地转换出驱动器输出所需的电压，使得RS232输出接近理想的5.8V电压。

图2显示了RS232收发器功能，TTL/CMOS信号施加到驱动器输入端如通道1，RS232驱动器输出结果显示在通道2上。当输出负载为3KΩ和1000pF时，RS232

最大速率测试电路

注：

A. $R_L = 3k\Omega$, $C_L = 1000pF$, $T_A = 25^\circ C$,

一个驱动器工作

B. 波形发生器要求以下参数特性：

PRR = 250 kbps, $Z_o = 50\Omega$, 50% duty cycle,

T_r & $T_f \leq 10ns$.

C. $XSD = V_{CC}$

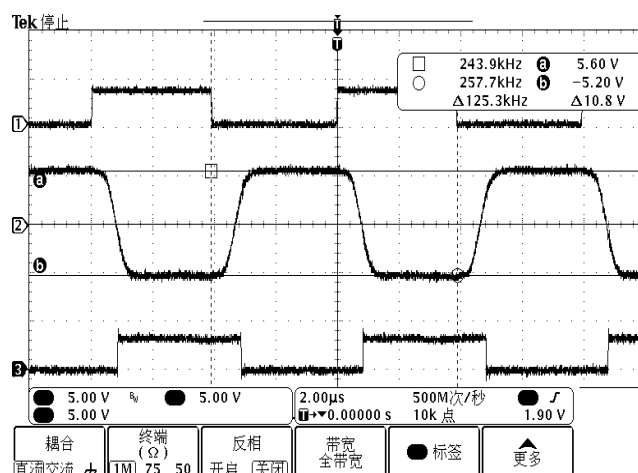
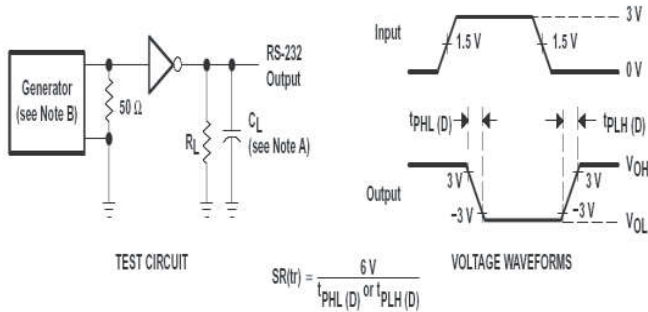


Figure 2. MAX32xxE TxIN to TxOUT (loopback to Rx with 1000pF load) at 250kbps waveform

信号如图所示。电阻负载是当驱动器的输出接到接收器的输入时接收器的输入阻抗。通道3是接收器的TTL /CMOS输出。当负载为典型RS232负载时，在传输速率250kbps条件下驱动器的输出电平仅比其开路电压下降0.2V。通道2上的RS-232驱动器输出表现出高速下的信号完整性，这允许接收器在处理信号时最小化斜率和延迟。MAX32xxE的低压降驱动电路配合高效稳压器，可提供卓越的线路驱动能力，并具有±15kV ESD抗冲击能力。

典型测试电路

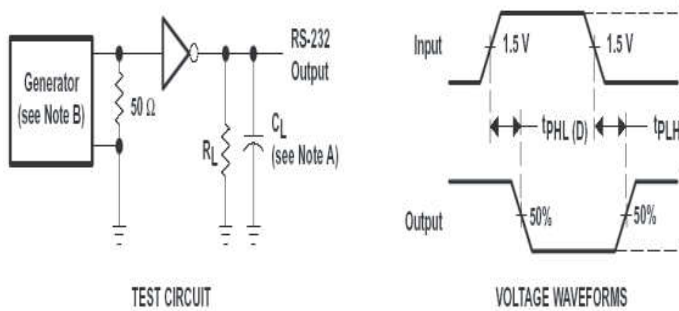
**Driver Transition-Region Slew Rate Test Circuit**

Notes:

A. $R_L = 3\text{k}\sim 7\text{k}\Omega$, $C_L = 150\text{pF}$ to 1000pF ,One Driver Switching, $T_A = 25^\circ\text{C}$,

Measured from +3V to -3V or -3V to +3V.

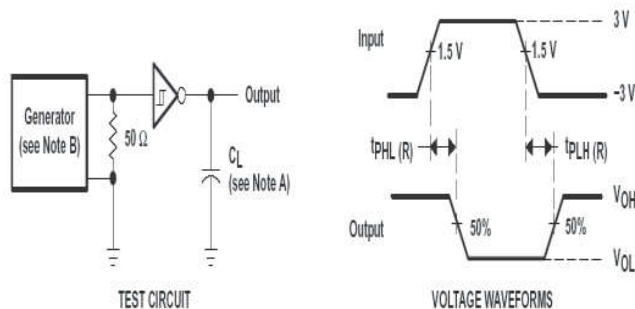
B. The pulse generator had the following characteristics:

PRR = 250 kbps, $Z_o = 50\Omega$, 50% duty cycle, T_r & $T_f < 10\text{ns}$.C. XSD = V_{CC} when applicable**Driver Propagation (t_{PHL} & t_{PLH}) Test Circuit**

Notes:

A. All drivers loaded with $R_L = 3\text{k}\Omega$, $C_L = 1000\text{pF}$.

B. The pulse generator had the following characteristics:

PRR = 250 kbps, $Z_o = 50\Omega$, 50% duty cycle, T_r & $T_f < 10\text{ns}$.C. XSD = V_{CC} when applicable**Receiver Propagation Delay Times Test Circuit**

Notes:

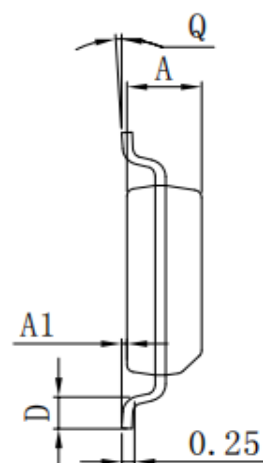
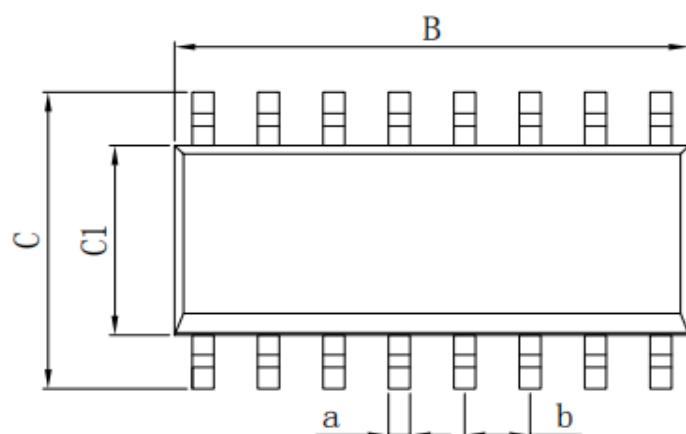
A. $C_L = 150\text{pF}$, including probe and jig capacitance.

B. The pulse generator had the following characteristics:

PRR = 250 kbps, $Z_o = 50\Omega$, 50% duty cycle, T_r & $T_f < 10\text{ns}$.C. XSD = V_{CC} when applicable

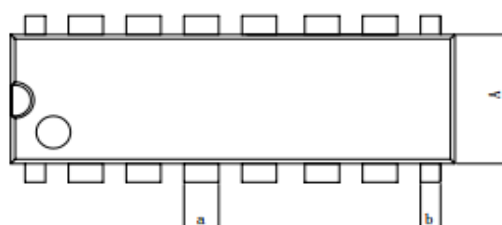
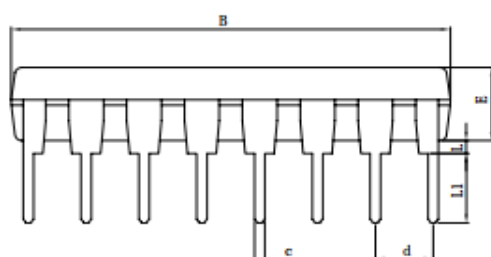
PACKAGE

SOP16



Dimensions In Millimeters					
Symbol :	Min :	Max :	Symbol :	Min :	Max :
A	1.225	1.570	D	0.400	0.950
A1	0.100	0.250	Q	0°	8°
B	9.800	10.00	a	0.420 TYP	
C	5.800	6.250	b	1.270 TYP	
C1	3.800	4.000			

DIP16



Dimensions In Millimeters					
Symbol :	Min :	Max :	Symbol :	Min :	Max :
A	6.100	6.680	L	0.500	0.800
B	18.940	19.560	a	1.524 TYP	
D	8.200	9.200	b	0.889 TYP	
D1	7.42	7.820	c	0.457 TYP	
E	3.100	3.550	d	2.540 TYP	
L	0.500	0.800			