

3.0V至5.5V、低功耗、1Mbps、真RS-232收发器， 使用四只0.1μF外部电容

概述

MAX3222/MAX3232/MAX3237/MAX3241收发器采用专有的低压差发送器输出级，利用双电荷泵在3.0V至5.5V电源供电时能够实现真正的RS-232性能。器件仅需四个0.1μF的外部小尺寸电荷泵电容。MAX3222、MAX3232和MAX3241确保在120kbps数据速率下维持RS-232输出电平。MAX3237在正常工作模式下可确保250kbps的数据速率，MegaBaud™工作模式下保证1Mbps的速率，同时保持RS-232输出电平。

MAX3222/MAX3232具有2路接收器和2路驱动器。MAX3222提供1μA关断模式，有效降低功耗并延长便携式产品的电池使用寿命。关断模式下，接收器保持有效状态，对外部设备(例如调制解调器)进行监测，仅消耗1μA电源电流。MAX3222和MAX3232的引脚、封装和功能分别与工业标准的MAX242和MAX232兼容。

MAX3241提供一个完整串口(3路驱动器/5路接收器)，设计用于笔记本电脑和亚笔记本电脑。MAX3237(5路驱动器/3路接收器)可理想用于高速调制解调器。这两款器件都具有关断模式，关断时所有接收器保持有效状态，仅消耗1μA电源电流。接收器R1(MAX3237/MAX3241)和R2(MAX3241)除标准输出外还提供附加输出。这些附加输出始终保持有效，可以对调制解调器等外部设备进行监测，电路(可能已完全撤除V_{CC}电源)中无需正向偏置保护二极管。

MAX3222、MAX3232以及MAX3241采用节省空间的TSSOP和SSOP封装。

应用

笔记本电脑、亚笔记本电脑与掌上电脑
高速调制解调器
电池供电设备
手持式装置
外设
打印机

典型工作电路在数据资料的最后给出。

MegaBaud和UCSP是Maxim Integrated Products, Inc.的商标。

下一代器件特性

- ◆ 更小封装的器件：
MAX3228E/MAX3229E：+2.5V至+5.5V、RS-232收发器，采用UCSP™封装
- ◆ 集成ESD保护的器件：
MAX3222E/MAX3232E/MAX3237E/MAX3241E/MAX3246E：±15kV ESD保护、电流低至10nA、3.0V至5.5V供电、速率高达1Mbps的真RS-232收发器
- ◆ 低电压或数据电缆传输应用：
MAX3380E/MAX3381E：+2.35V至+5.5V、1μA、2Tx/2Rx RS-232收发器，带有±15kV ESD保护的I/O和逻辑引脚

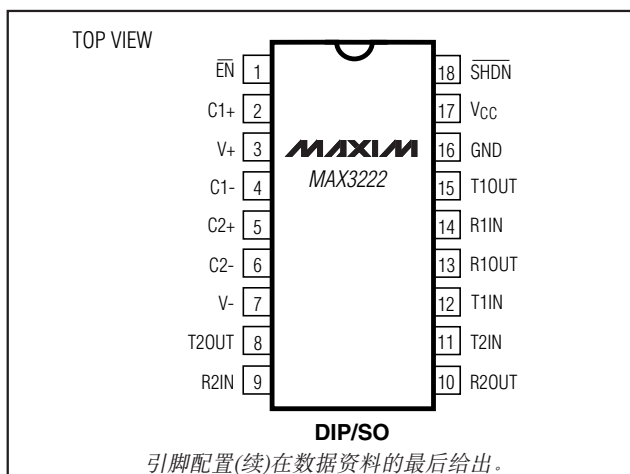
订购信息

PART	TEMP RANGE	PIN-PACKAGE	PKG CODE
MAX3222CUP+	0°C to +70°C	20 TSSOP	U20+2
MAX3222CAP+	0°C to +70°C	20 SSOP	A20+1
MAX3222CWN+	0°C to +70°C	18 SO	W18+1
MAX3222CPN+	0°C to +70°C	18 Plastic Dip	P18+5

+表示无铅封装。

订购信息(续)在数据资料的最后给出。

引脚配置



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ABSOLUTE MAXIMUM RATINGS

V _{CC}	-0.3V to +6V
V ₊ (Note 1)	-0.3V to +7V
V ₋ (Note 1)	+0.3V to -7V
V ₊ + V ₋ (Note 1)	+13V
Input Voltages	
T _{IN} , $\overline{\text{SHDN}}$, $\overline{\text{EN}}$	-0.3V to +6V
MBAUD	-0.3V to (V _{CC} + 0.3V)
R _{IN}	±25V
Output Voltages	
T _{OUT}	±13.2V
R _{OUT}	-0.3V to (V _{CC} + 0.3V)
Short-Circuit Duration	
T _{OUT}	Continuous

Continuous Power Dissipation (T _A = +70°C)	
16-Pin TSSOP (derate 6.7mW/°C above +70°C)	533mW
16-Pin Narrow SO (derate 8.70mW/°C above +70°C)	696mW
16-Pin Wide SO (derate 9.52mW/°C above +70°C)	762mW
16-Pin Plastic DIP (derate 10.53mW/°C above +70°C)	842mW
18-Pin SO (derate 9.52mW/°C above +70°C)	762mW
18-Pin Plastic DIP (derate 11.11mW/°C above +70°C)	889mW
20-Pin SSOP (derate 7.00mW/°C above +70°C)	559mW
20-Pin TSSOP (derate 8.0mW/°C above +70°C)	640mW
28-Pin TSSOP (derate 8.7mW/°C above +70°C)	696mW
28-Pin SSOP (derate 9.52mW/°C above +70°C)	762mW
28-Pin SO (derate 12.50mW/°C above +70°C)	1W
Operating Temperature Ranges	
MAX32__C__	0°C to +70°C
MAX32__E__	-40°C to +85°C
Storage Temperature Range	
Lead Temperature (soldering, 10s)	
+300°C	

Note 1: V₊ and V₋ can have a maximum magnitude of 7V, but their absolute difference cannot exceed 13V.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

(V_{CC} = +3.0V to +5.5V, C1–C4 = 0.1μF (Note 2), T_A = T_{MIN} to T_{MAX}, unless otherwise noted. Typical values are at T_A = +25°C.)

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
DC CHARACTERISTICS						
V _{CC} Power-Supply Current	No load, V _{CC} = 3.3V or 5.0V, T _A = +25°C	MAX3222/MAX3232/ MAX3241		0.3	1.0	mA
		MAX3237		0.5	2.0	
Shutdown Supply Current	SHDN = GND, T _A = +25°C			1.0	10	μA
LOGIC INPUTS AND RECEIVER OUTPUTS						
Input Logic Threshold Low (Note 3)	T _{IN} , EN, SHDN, MBAUD				0.8	V
Input Logic Threshold High (Note 3)	V _{CC} = 3.3V		2.0			V
	V _{CC} = 5.0V		2.4			
Input Leakage Current	T _{IN} , EN, SHDN, MBAUD			±0.01	±1.0	μA
Output Leakage Current	Receivers disabled			±0.05	±10	μA
Output Voltage Low	I _{OUT} = 1.6mA				0.4	V
Output Voltage High	I _{OUT} = -1.0mA		V _{CC} - 0.6	V _{CC} - 0.1		V
RECEIVER INPUTS						
Input Voltage Range			-25		25	V
Input Threshold Low	T _A = +25°C	V _{CC} = 3.3V	0.6	1.2		V
		V _{CC} = 5.0V	0.8	1.5		
Input Threshold High	T _A = +25°C	V _{CC} = 3.3V		1.5	2.4	V
		V _{CC} = 5.0V		1.8	2.4	

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ELECTRICAL CHARACTERISTICS (continued)

(V_{CC} = +3.0V to +5.5V, C1–C4 = 0.1μF (Note 2), T_A = T_{MIN} to T_{MAX}, unless otherwise noted. Typical values are at T_A = +25°C.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Hysteresis			0.3		V
Input Resistance	T _A = +25°C	3	5	7	kΩ
TRANSMITTER OUTPUTS					
Output Voltage Swing	All transmitter outputs loaded with 3kΩ to ground	±5.0	±5.4		V
Output Resistance	V _{CC} = V ₊ = V ₋ = 0V, V _{OUT} = ±2V	300	10M		Ω
Output Short-Circuit Current			±35	±60	mA
Output Leakage Current	V _{OUT} = ±12V, V _{CC} = 0V or 3V to 5.5V, transmitters disabled			±25	μA
MOUSE DRIVEABILITY (MAX3241)					
Transmitter Output Voltage	T1IN = T2IN = GND, T3IN = V _{CC} , T3OUT loaded with 3kΩ to GND, T1OUT and T2OUT loaded with 2.5mA each	±5.0			V

TIMING CHARACTERISTICS—MAX3222/MAX3232/MAX3241

(V_{CC} = +3.0V to +5.5V, C1–C4 = 0.1μF (Note 2), T_A = T_{MIN} to T_{MAX}, unless otherwise noted. Typical values are at T_A = +25°C.)

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
Maximum Data Rate	R _L = 3kΩ, C _L = 1000pF, one transmitter switching		120	235		kbps
Receiver Propagation Delay	R _{IN} to R _{OUT} , C _L = 150pF	t _{PHL}		0.3		μs
		t _{PLH}		0.3		
Receiver Output Enable Time	Normal operation			200		ns
Receiver Output Disable Time	Normal operation			200		ns
Transmitter Skew	t _{PHL} - t _{PLH}			300		ns
Receiver Skew	t _{PHL} - t _{PLH}			300		ns
Transition-Region Slew Rate	V _{CC} = 3.3V, R _L = 3kΩ to 7kΩ, +3V to -3V or -3V to +3V, T _A = +25°C, one transmitter switching	C _L = 150pF to 1000pF	6		30	V/μs
		C _L = 150pF to 2500pF	4		30	

MAX3222/MAX3232/MAX3237/MAX3241

3.0V至5.5V、低功耗、1Mbps、真RS-232收发器， 使用四只0.1μF外部电容

TIMING CHARACTERISTICS—MAX3237

($V_{CC} = +3.0V$ to $+5.5V$, C_1 – $C_4 = 0.1\mu F$ (Note 2), $T_A = T_{MIN}$ to T_{MAX} , unless otherwise noted. Typical values are at $T_A = +25^\circ C$.)

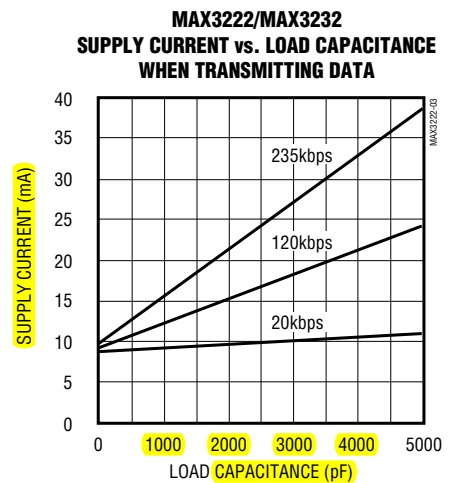
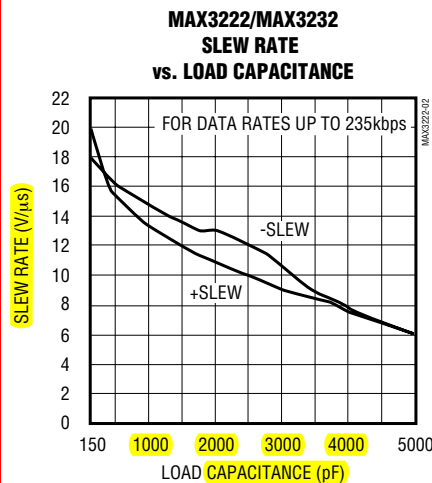
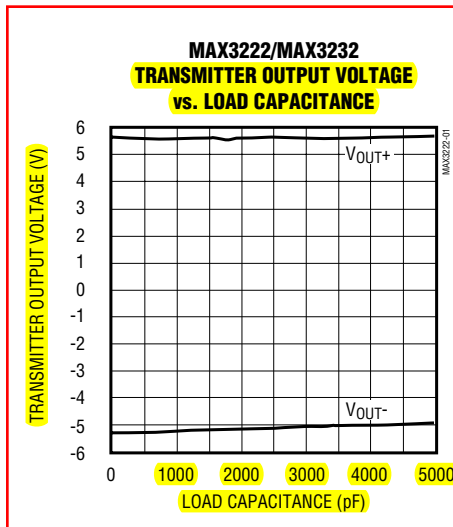
PARAMETER	CONDITIONS			MIN	TYP	MAX	UNITS
Maximum Data Rate	R _L = 3kΩ, C _L = 1000pF, one transmitter switching, MBAUD = GND			250			kbps
	V _{CC} = 3.0V to 4.5V, R _L = 3kΩ, C _L = 250pF, one transmitter switching, MBAUD = V _{CC}			1000			
	V _{CC} = 4.5V to 5.5V, R _L = 3kΩ, C _L = 1000pF, one transmitter switching, MBAUD = V _{CC}			1000			
Receiver Propagation Delay	R _{IN} to R _{OUT} , C _L = 150pF		t _{PHL}	0.15			μs
			t _{PLH}	0.15			
Receiver Output Enable Time	Normal operation			200			ns
Receiver Output Disable Time	Normal operation			200			ns
Transmitter Skew	t _{PHL} - t _{PLH} , MBAUD = GND			100			ns
	t _{PHL} - t _{PLH} , MBAUD = V _{CC}			25			ns
Receiver Skew	t _{PHL} - t _{PLH}			50			ns
Transition-Region Slew Rate	V _{CC} = 3.3V, R _L = 3Ω to 7kΩ, +3V to -3V or -3V to +3V, T _A = +25°C	C _L = 150pF to 1000pF	MBAUD = GND	6	30		V/μs
			MBAUD = V _{CC}	24	150		
			C _L = 150pF to 2500pF, MBAUD = GND	4	30		

Note 2: MAX3222/MAX3232/MAX3241: C_1 – $C_4 = 0.1\mu F$ tested at $3.3V \pm 10\%$; $C_1 = 0.047\mu F$, C_2 – $C_4 = 0.33\mu F$ tested at $5.0V \pm 10\%$.
MAX3237: C_1 – $C_4 = 0.1\mu F$ tested at $3.3V \pm 5\%$; C_1 – $C_4 = 0.22\mu F$ tested at $3.3V \pm 10\%$; $C_1 = 0.047\mu F$, C_2 – $C_4 = 0.33\mu F$ tested at $5.0V \pm 10\%$.

Note 3: Transmitter input hysteresis is typically 250mV.

典型工作特性

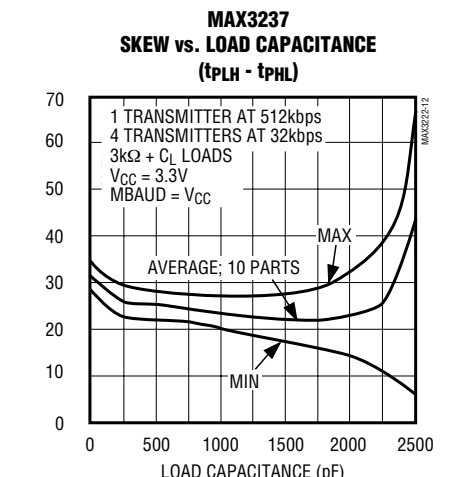
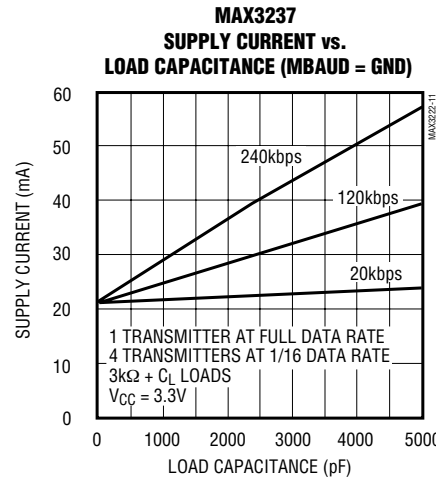
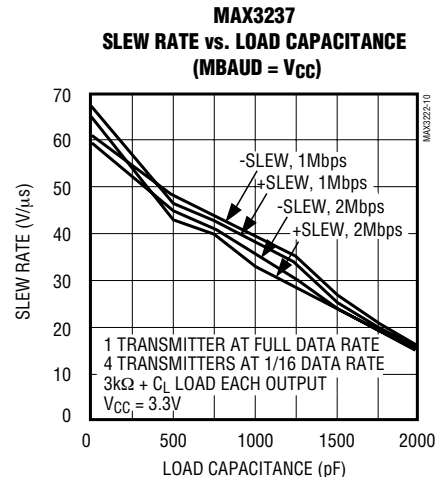
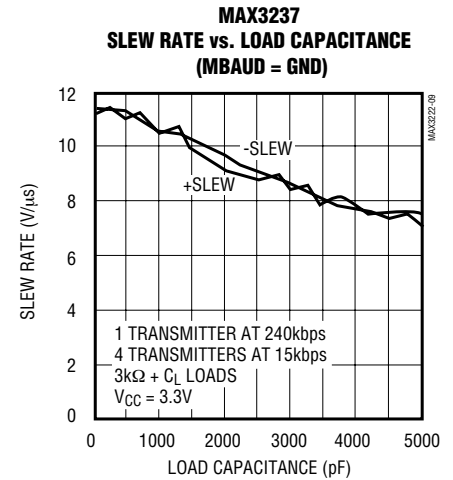
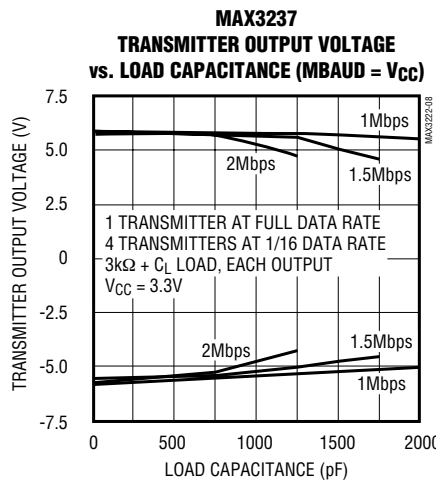
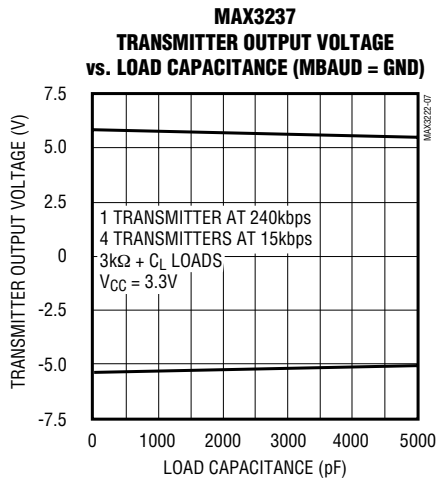
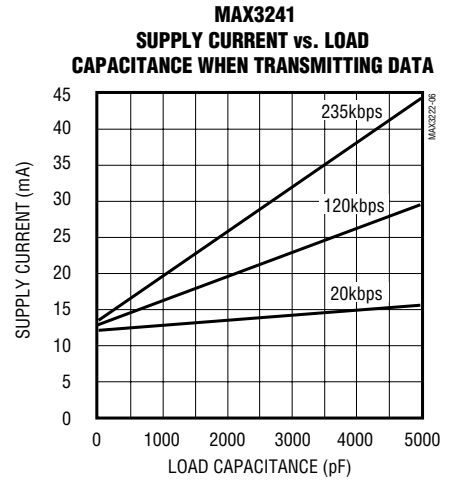
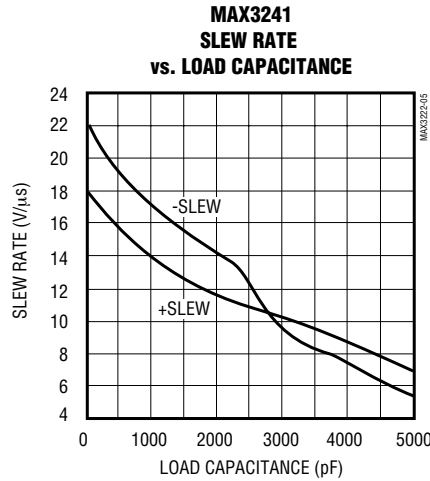
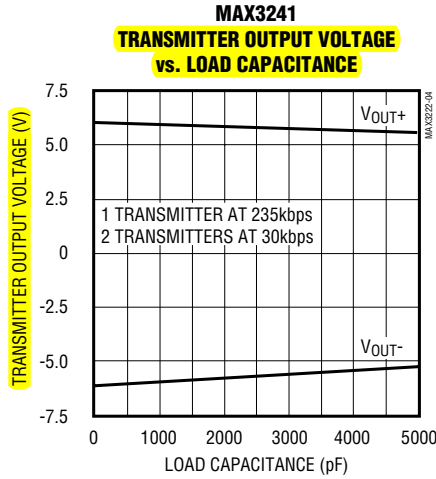
($V_{CC} = +3.3V$, 235kbps data rate, $0.1\mu F$ capacitors, all transmitters loaded with $3k\Omega$, $T_A = +25^\circ C$, unless otherwise noted.)



3.0V至5.5V、低功耗、1Mbps、真RS-232收发器， 使用四只0.1 μ F外部电容

典型工作特性(续)

($V_{CC} = +3.3V$, 235kbps data rate, 0.1 μ F capacitors, all transmitters loaded with 3k Ω , $T_A = +25^\circ C$, unless otherwise noted.)



3.0V至5.5V、低功耗、1Mbps、真RS-232收发器， 使用四只0.1 μ F外部电容

引脚说明

引脚					名称	功能
MAX3222		MAX3232	MAX3237	MAX3241		
DIP/SO	SSOP					
1	1	—	13	23	$\overline{\text{EN}}$	接收器使能，低电平有效。
2	2	1	28	28	C1+	倍压电荷泵电容的正端。
3	3	2	27	27	V+	电荷泵产生的+5.5V。
4	4	3	25	24	C1-	倍压电荷泵电容的负端。
5	5	4	1	1	C2+	反相电荷泵电容的正端。
6	6	5	3	2	C2-	反相电荷泵电容的负端。
7	7	6	4	3	V-	电荷泵产生的-5.5V。
8, 15	8, 17	7, 14	5, 6, 7, 10, 12	9, 10, 11	T_OUT	RS-232发送器输出。
9, 14	9, 16	8, 13	8, 9, 11	4–8	R_IN	RS-232接收器输入。
10, 13	10, 15	9, 12	18, 20, 21	15–19	R_OUT	TTL/CMOS接收器输出。
11, 12	12, 13	10, 11	17, 19, 22, 23, 24	12, 13, 14	T_IN	TTL/CMOS发送器输入。
16	18	15	2	25	GND	地。
17	19	16	26	26	V _{CC}	+3.0V至+5.5V供电电源。
18	20	—	14	22	$\overline{\text{SHDN}}$	关断控制，低电平有效。
—	11, 14	—	—	—	N.C.	没有连接。
—	—	—	15	—	MBAUD	MegaBaud控制输入。连接至GND时，工作在常规速率；连接至V _{CC} 时传输速率达1Mbps。
—	—	—	16	20, 21	R_OUTB	同相互补接收器输出，始终保持有效。

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详细说明

双电荷泵电压转换器

MAX3222/MAX3232/MAX3237/MAX3241的内部电源由两路稳压型电荷泵组成，只要输入电压(V_{CC})在3.0V至5.5V范围内，即可提供+5.5V (倍压电荷泵)和-5.5V (反相电荷泵)输出电压。电荷泵工作在非连续模式，一旦输出电压低于5.5V，将开启电荷泵；输出电压超过5.5V时，即刻关闭电荷泵。每个电荷泵需要一个飞电容(C1、C2)和一个储能电容(C3、C4)，产生 V_+ 和 V_- 电压。

RS-232发送器

发送器为反相电平转换器，将CMOS逻辑电平转换成5.0V EIA/TIA-232电平。

MAX3222/MAX3232/MAX3241在最差工作条件(3kΩ电阻与1000pF电容的并联负载)下能够保证120kbps的数据速率，提供PC至PC通信软件(例如LapLink™)兼容性。通常情况下，这三款器件能够工作于235kbps数据速率。发送器可并联驱动多个接收器或鼠标。

LapLink是Traveling Software, Inc.的商标。

器件处于关断模式时，MAX3222/MAX3237/MAX3241输出级关断(置为高阻)。关闭电源时，MAX3222/MAX3232/MAX3237/MAX3241允许输出端驱动至最高±12V。

发送器输入没有上拉电阻，将未使用的输入连接至GND或 V_{CC} 。

MAX3237 MegaBaud工作模式

常规工作模式(MBAUD = GND)下，MAX3237发送器能够在最差工作条件(3kΩ电阻与1000pF电容的并联负载)下保证250kbps的数据速率，提供PC至PC通信软件(例如LapLink)的兼容性。

为了获得更高的串行通信速率，MAX3237提供MegaBaud工作模式。在MegaBaud工作模式(MBAUD = V_{CC})下，MAX3237发送器能够在最差工作条件(3kΩ电阻与250pF电容的并联负载，3.0V < V_{CC} < 4.5V)下保证1Mbps的数据速率。5V ±10%供电时，MAX3237发送器能够在最差工作条件(3kΩ电阻与1000pF电容的并联负载)下保证1Mbps的数据速率。

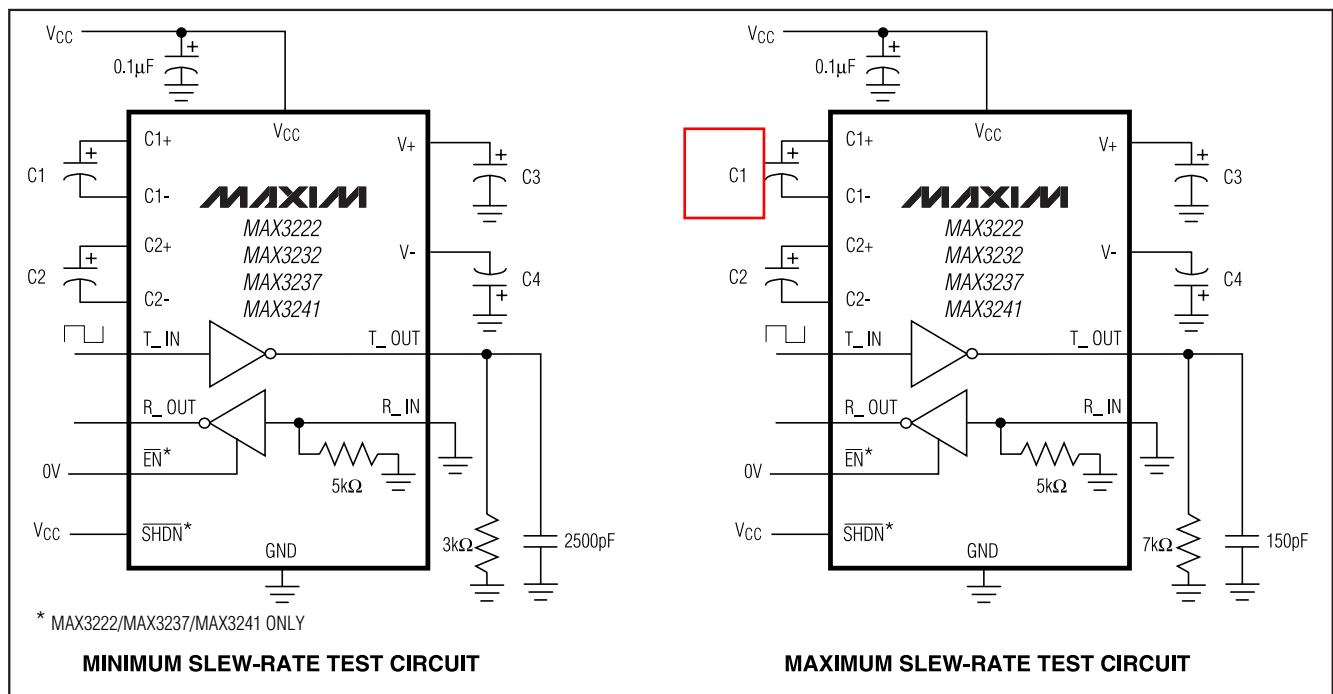
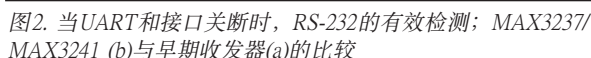


图1. 摆率测试电路



接收器将RS-232信号转换成CMOS逻辑输出电平, MAX3222/MAX3237/MAX3241接收器提供反相三态输出。关断模式下, 接收器可处于有效或无效状态(表1)。

MAX3237 (R1OUTB)和MAX3241 (R1OUTB、R2OUTB)互补输出始终保持有效,与 $\overline{\text{EN}}$ 或 $\overline{\text{SHDN}}$ 状态无关。这些器件适用于振铃指示器等应用,不需要正向偏置连接到接收器输出端的其它器件。该功能可理想用于在关断模式下将 V_{CC} 置为0V以适应外设操作(例如UART)的系统(图2)。

关断模式($\overline{\text{SHDN}}$ = 低电平)下, 电源电流降至 $1\mu\text{A}$ 以内。关断时, 器件的电荷泵关闭, V_+ 下拉至 V_{CC} , V_- 拉至地电位, 发送器输出被禁止(高阻)。退出关断模式的时间通常为 $100\mu\text{s}$, 如图3所示。如果不使用关断模式, 则将 $\overline{\text{SHDN}}$ 连接至 V_{CC} 。 $\overline{\text{SHDN}}$ 不影响 R_{OUT} 或 R_{OUTB} 。

当 $\overline{\text{EN}}$ 为高电平时,反相接收器输出(R_OUT)置为高阻态。互补输出R1OUTB和R2OUTB始终保持有效,与 $\overline{\text{EN}}$ 和 $\overline{\text{SHDN}}$ 的状态无关(表1), $\overline{\text{EN}}$ 不影响T_OUT。

应用信息

C1至C4所使用的电容类型对于正常工作影响不大，可以使用有极性或无极性电容。3.3V供电时，电荷泵需要0.1μF电容；其它供电电压下的电容选择请参考表2，不要使用低于表2所列容值的电容。增大电容值(例如增大2倍)有助于降低发送器输出的纹波，并对降低功耗略有帮助。可以不改变C1，只是增大C2、C3和C4。但是，请勿在C2、C3和C4没有增大的情况下增大C1，需维持这些电容之间的适当比值(C1相对于其它电容)。

如果使用了所要求的最小电容，请确保电容值不会随着温度的变化而出现明显的下降。如果不能确保这一条件，请使用具有较高标称值的电容。电容等效串联电阻(ESR)通常在低温下增大，它会影响V₊和V₋的纹波。

3.0V至5.5V、低功耗、1Mbps、真RS-232收发器， 使用四只0.1μF外部电容

表1. MAX3222/MAX3237/MAX3241关断和使能控制真值表

$\overline{\text{SHDN}}$	$\overline{\text{EN}}$	T_OUT	R_OUT	R_OUTB (MAX3237/ MAX3241)
0	0	High-Z	Active	Active
0	1	High-Z	High-Z	Active
1	0	Active	Active	Active
1	1	Active	High-Z	Active

表2. 所要求的最小电容值

V _{CC} (V)	C1 (μF)	C2, C3, C4 (μF)
MAX3222/MAX3232/MAX3241		
3.0 to 3.6	0.1	0.1
4.5 to 5.5	0.047	0.33
3.0 to 5.5	0.1	0.47
MAX3237		
3.0 to 3.6	0.22	0.22
3.15 to 3.6	0.1	0.1
4.5 to 5.5	0.047	0.33
3.0 to 5.5	0.22	1.0

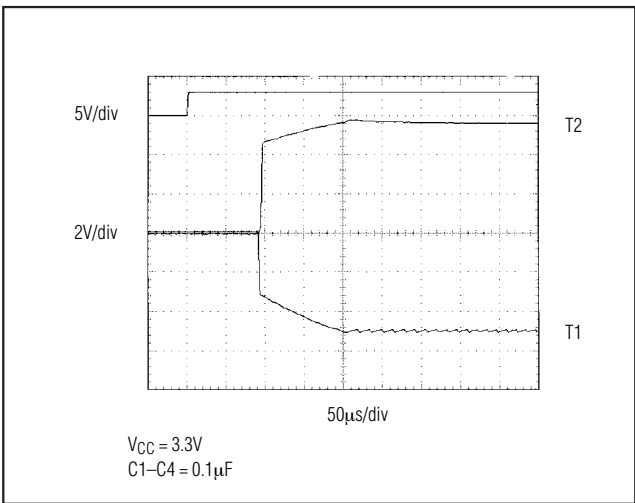


图3. 退出关断模式或上电时发送器的输出

电源去耦

大多数情况下，使用一个0.1μF旁路电容即可满足要求。在对电源噪声敏感的应用中，采用与电荷泵电容C1相同的电容将V_{CC}旁路到地，进行去耦。旁路电容应尽量靠近IC放置。

工作在最低2.7V

当电源电压低至2.7V时，发送器输出仍可满足EIA/TIA-562要求的±3.7V电平。

退出关断模式时发送器的输出

图3所示为退出关断模式时的两路发送器输出。当两路发送器输出有效时，发送器输出与RS-232电平反相的信号（一路发送器输入为高电平，另一路为低电平）。每个发送器负载为3kΩ电阻并联2500pF电容。退出关断模式时，发送器输出显示没有振铃，也不存在所不希望的瞬变电压。注意，只有在V-幅值超过3V左右时，才会使能发送器。

鼠标驱动能力

MAX3241设计用于串口鼠标驱动，能够工作在较低的电源电压。该器件经过一些重要的鼠标生产厂家的测试，例如Microsoft和Logitech。MAX3241能够成功驱动所有测试的串口鼠标，满足相应的电流、电压要求。图4a所示为3.0V供电时，发送器输出电压随负载电流的变化情况；图4b所示为使用MAX3241时典型的鼠标连接。

3.0V至5.5V、低功耗、1Mbps、真RS-232收发器，
使用四只0.1 μ F外部电容

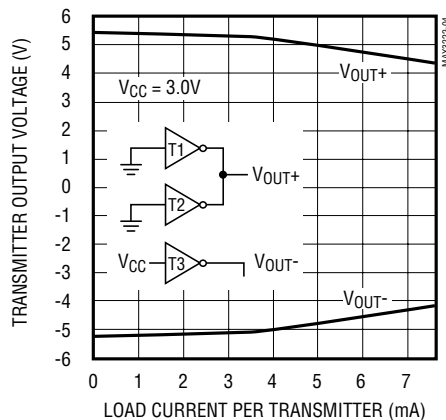


图4a. MAX3241 每路发送器输出电压与负载电流之间的关系

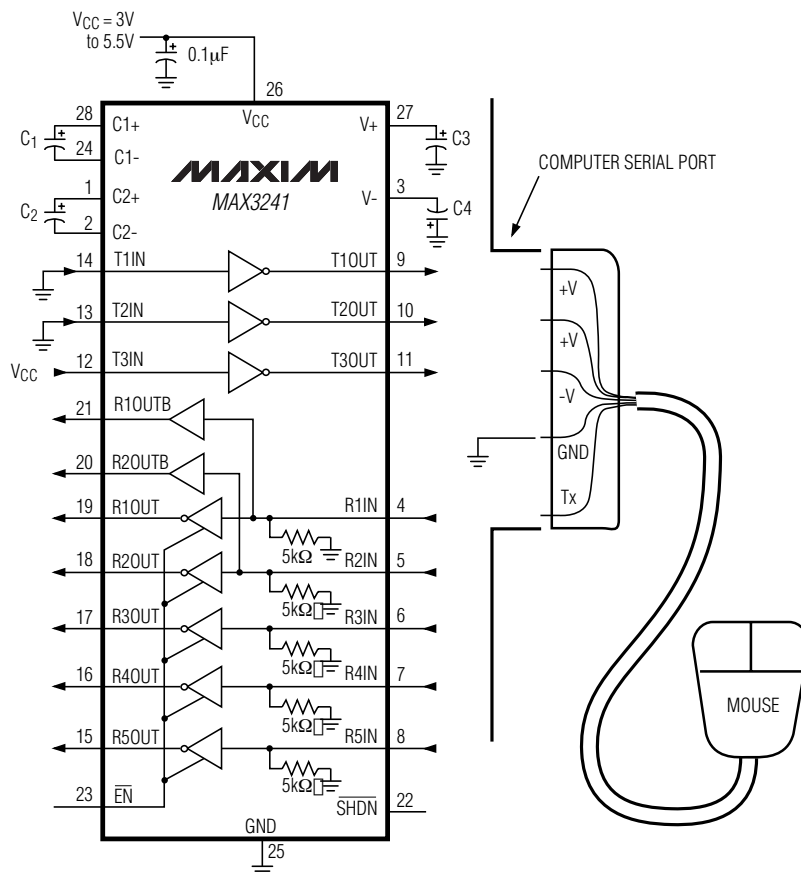


图4b. 鼠标驱动测试电路

3.0V至5.5V、低功耗、1Mbps、真RS-232收发器， 使用四只0.1 μ F外部电容

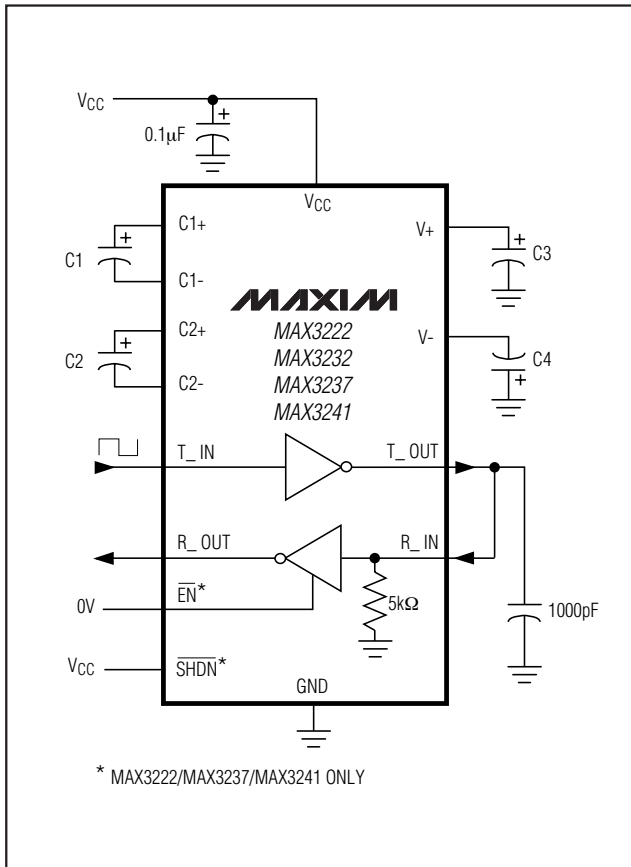


图5. 环回测试电路

高数据速率

即使工作在高数据速率下，MAX3222/MAX3232/MAX3241仍然能够保持RS-232标准要求的 $\pm 5.0V$ 最小发送器输出电压。图5所示为发送器环回测试电路，图6所示为120kbps数据速率下的环回测试结果，图7所示为235kbps数据速率下的相同测试。图6中，所有发送器同时以120kbps的数据速率驱动并接了1000pF电容的RS-232负载。图7中，单个发送器工作在235kbps数据速率，所有发送器的负载都是并接了1000pF电容的RS-232接收器。

MAX3237在高达1Mbps的数据速率下能够保持RS-232标准要求的 $\pm 5.0V$ 最小发送器输出电压。图8所示为1Mbps下，MBAUD = V_{CC}时电路的环回测试结果。对于图8，所有发送器负载为并接了250pF电容的RS-232接收器。

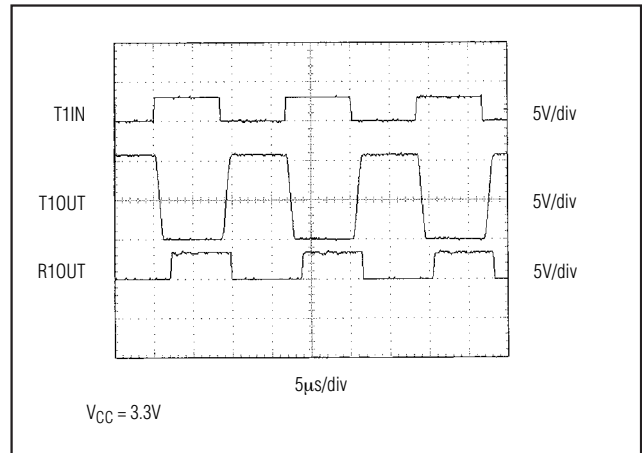


图6. MAX3241在120kbps数据速率下的环回测试结果

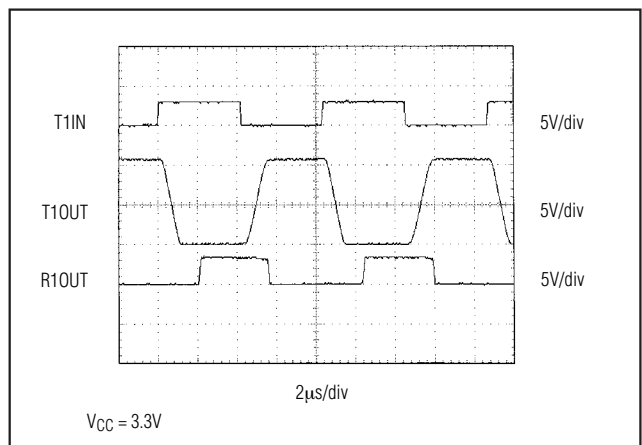
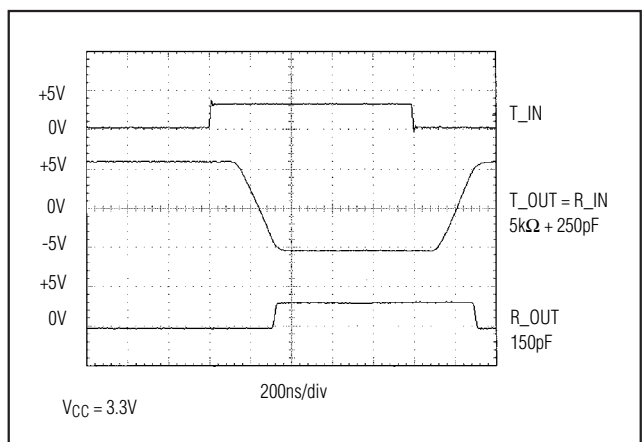


图7. MAX3241在235kbps数据速率下的环回测试结果

图8. MAX3237在1000kbps (MBAUD = V_{CC})数据速率下的环回测试结果

3.0V至5.5V、低功耗、1Mbps、真RS-232收发器，使用四只0.1μF外部电容

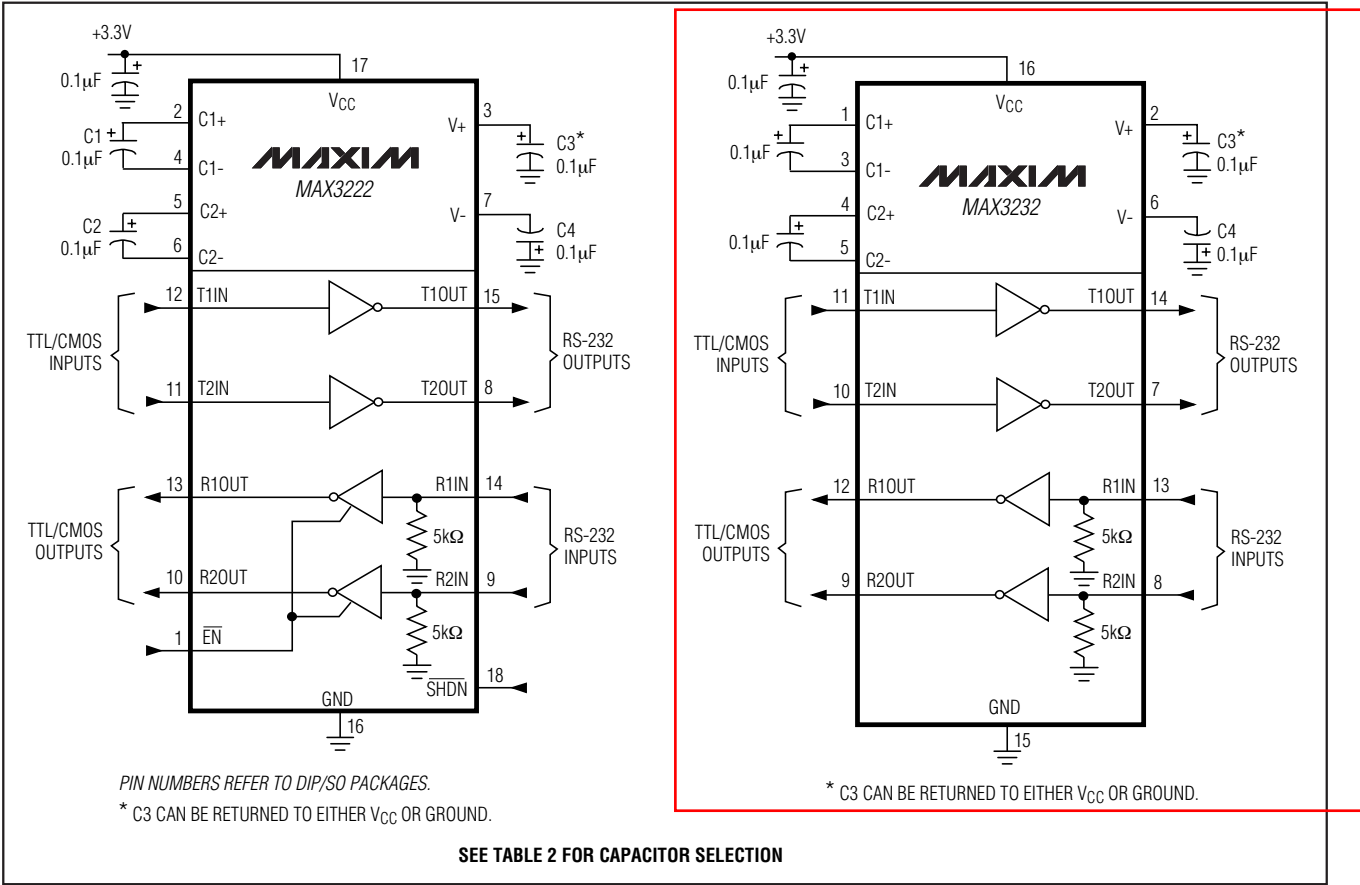
与3V和5V逻辑电平互联

MAX3222/MAX3232/MAX3237/MAX3241可直接与各种5V逻辑电平接口，包括ACT和HCT CMOS。表3列出了各种可能的互联组合的详细信息。

表3. 不同电源电压下的逻辑电平兼容性

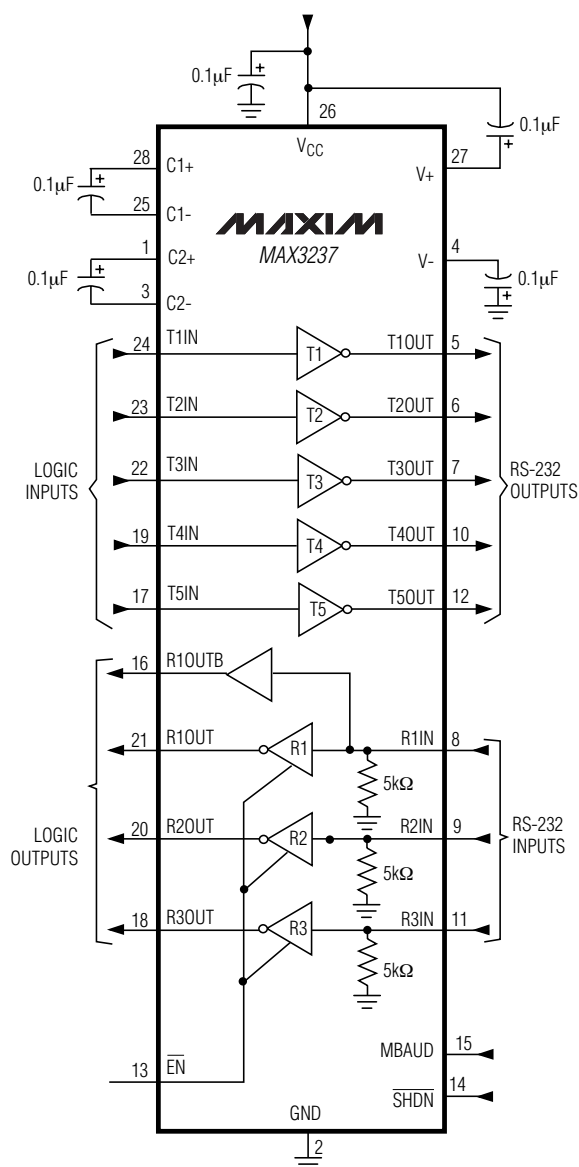
SYSTEM POWER-SUPPLY VOLTAGE (V)	MAX32 _ VCC SUPPLY VOLTAGE (V)	COMPATIBILITY
3.3	3.3	Compatible with all CMOS families.
5	5	Compatible with all TTL and CMOS-logic families.
5	3.3	Compatible with ACT and HCT CMOS, and with TTL. Incompatible with AC, HC, and CD4000 CMOS.

典型工作电路

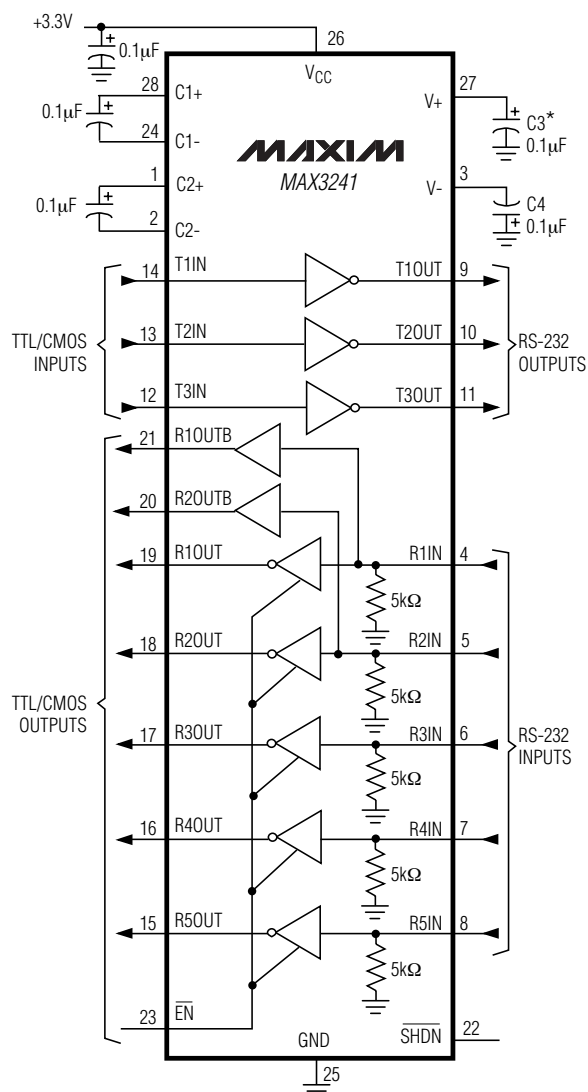


3.0V至5.5V、低功耗、1Mbps、真RS-232收发器， 使用四只0.1μF外部电容

典型工作电路(续)



* C3 CAN BE RETURNED TO EITHER V_{CC} OR GROUND.



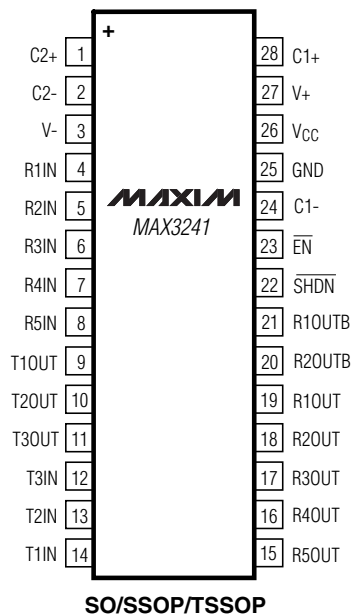
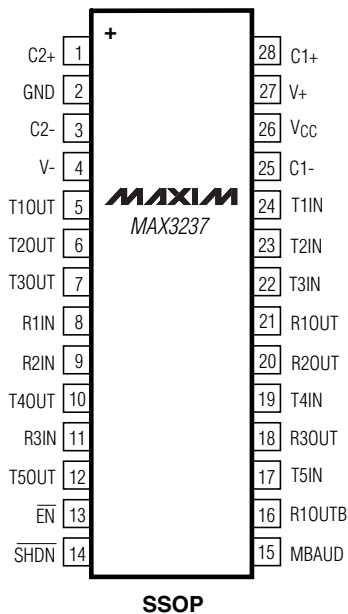
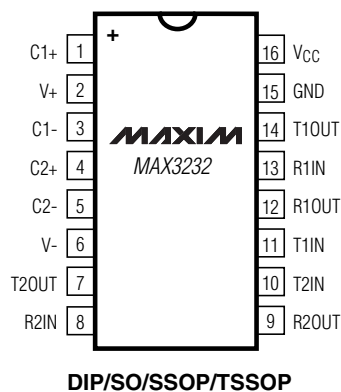
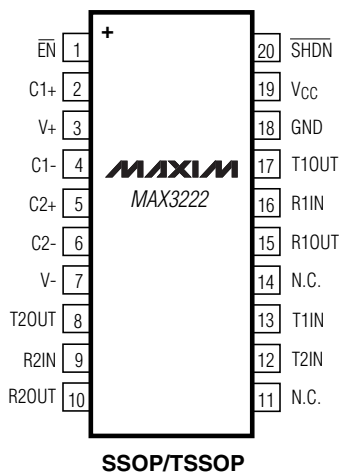
* C3 CAN BE RETURNED TO EITHER V_{CC} OR GROUND.

MAX3222/MAX3232/MAX3237/MAX3241

3.0V至5.5V、低功耗、1Mbps、真RS-232收发器，
使用四只0.1 μ F外部电容

引脚配置(续)

TOP VIEW



3.0V至5.5V、低功耗、1Mbps、真RS-232收发器， 使用四只0.1μF外部电容

订购信息(续)

PART	TEMP RANGE	PIN-PACKAGE	PKG CODE
MAX3222EUP+	-40°C to +85°C	20 TSSOP	U20+2
MAX3222EAP+	-40°C to +85°C	20 SSOP	A20+1
MAX3222EWN+	-40°C to +85°C	18 SO	W18+1
MAX3222EPN+	-40°C to +85°C	18 Plastic Dip	P18+5
MAX3222C/D	0°C to +70°C	Dice*	—
MAX3232CUE+	0°C to +70°C	16 TSSOP	U16+1
MAX3232CSE+	0°C to +70°C	16 Narrow SO	S16+1
MAX3232CWE+	0°C to +70°C	16 Wide SO	W16+1
MAX3232CPE+	0°C to +70°C	16 Plastic DIP	P16+1
MAX3232EUE+	-40°C to +85°C	16 TSSOP	U16+1
MAX3232ESE+	-40°C to +85°C	16 Narrow SO	S16+5

PART	TEMP RANGE	PIN-PACKAGE	PKG CODE
MAX3232EWE+	-40°C to +85°C	16 Wide SO	W16+1
MAX3232EPE+	-40°C to +85°C	16 Plastic DIP	P16+1
MAX3232CAE+	0°C to +70°C	16 SSOP	A28+2
MAX3237CAI+	0°C to +70°C	28 SSOP	A28+1
MAX3237EAI+	-40°C to +85°C	28 SSOP	A28+1
MAX3241CAI+	0°C to +70°C	28 SSOP	A28+1
MAX3241CWI+	0°C to +70°C	28 SO	W28+6
MAX3241EUI+	-40°C to +85°C	28 TSSOP	U28+2
MAX3241EAI+	-40°C to +85°C	28 SSOP	A28+1
MAX3241EWI+	-40°C to +85°C	28 SO	W28+6

*裸片在 $T_A = +25^\circ\text{C}$ 下经过测试，仅限直流参数。

+表示无铅封装。

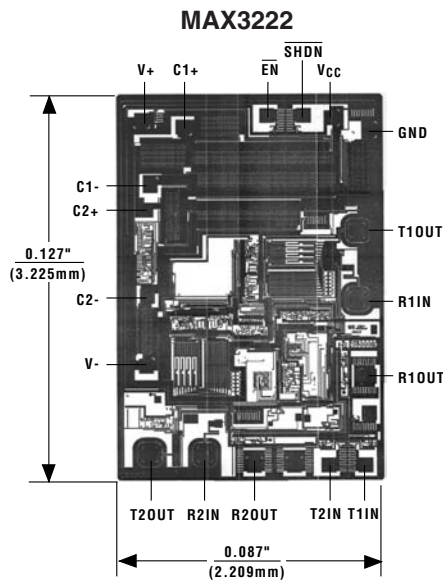
Maxim提供的3V供电EIA/TIA-232和EIA/TIA-562收发器

PART	POWER-SUPPLY VOLTAGE (V)	No. OF TRANSMITTERS/RECEIVERS	No. OF RECEIVERS ACTIVE IN SHUTDOWN	GUAR-ANTEED DATA RATE (kbps)	EIA/TIA-232 OR 562	FEATURES
MAX212	3.0 to 3.6	3/5	5	120	232	Drives mice
MAX218	1.8 to 4.25	2/2	2	120	232	Operates directly from batteries without a voltage regulator
MAX562	2.7 to 5.25	3/5	5	230	562	Wide supply range
MAX563	3.0 to 3.6	2/2	2	230	562	0.1μF capacitors
MAX3212	2.7 to 3.6	3/5	5	235	232	AutoShutdown, complementary receiver, drives mice, transient detection
MAX3222	3.0 to 5.5	2/2	2	120	232	0.1μF capacitors
MAX3223	3.0 to 5.5	2/2	2	120	232	0.1μF capacitors, AutoShutdown
MAX3232	3.0 to 5.5	2/2	N/A	120	232	0.1μF capacitors
MAX3237	3.0 to 5.5	5/3	3	250/1000	232	0.1μF capacitors, 1 complementary receiver, MegaBaud operation
MAX3241	3.0 to 5.5	3/5	5	120	232	0.1μF capacitors, 2 complementary receivers, drives mice
MAX3243	3.0 to 5.5	3/5	1	120	232	0.1μF capacitors, AutoShutdown, complementary receiver, drives mice

3.0V至5.5V、低功耗、1Mbps、真RS-232收发器，
使用四只0.1μF外部电容

芯片拓扑

芯片信息



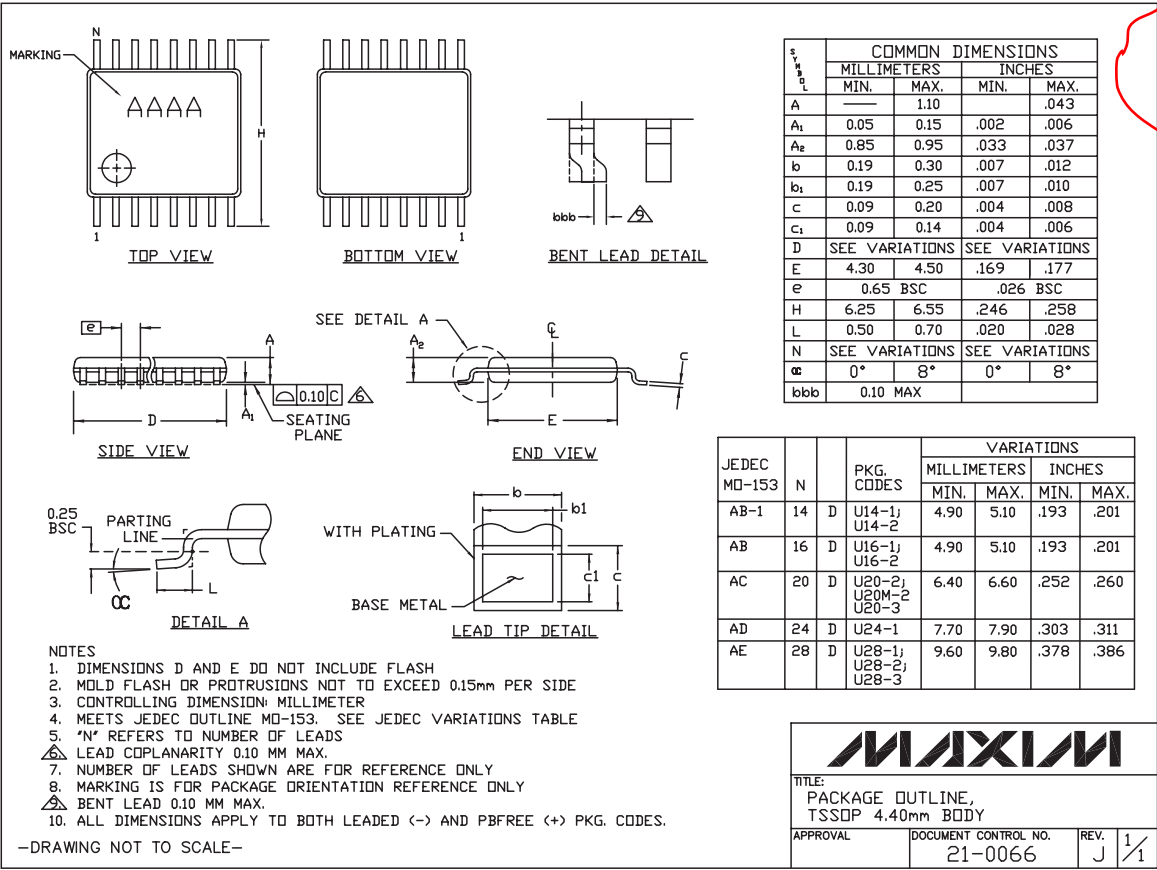
PART	TRANSISTOR COUNT
MAX3222	339
MAX3232	339
MAX3237	1212
MAX3241	894

TRANSISTOR COUNT: 339
SUBSTRATE CONNECTED TO GND

3.0V至5.5V、低功耗、1Mbps、真RS-232收发器，
使用四只0.1μF外部电容

封装信息

如需最近的封装外形信息和焊盘布局，请查询 china.maxim-ic.com/packages。



TSSOP4.40mm.EPS

MAX3222/MAX3232/MAX3237/MAX3241

修订历史

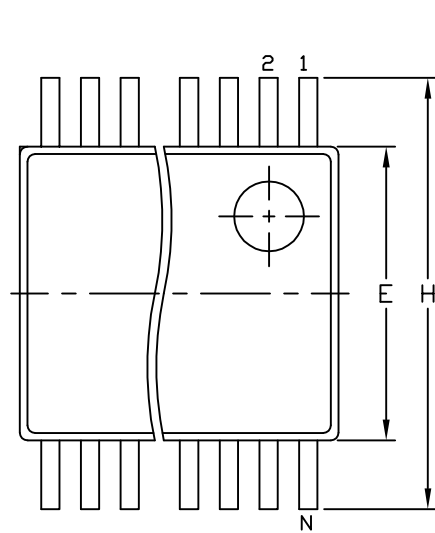
Rev 7中的修改页：1、15、16、17

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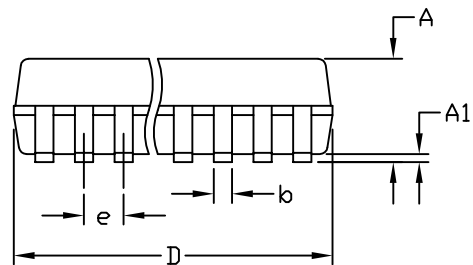
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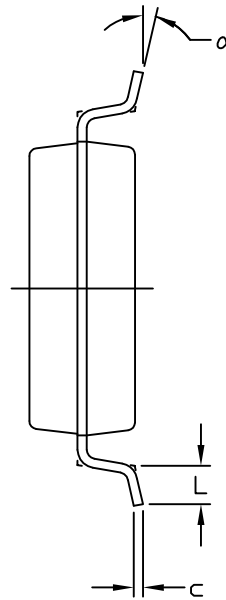
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TOP VIEW



SIDE VIEW



SIDE VIEW

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.068	0.078	1.73	1.99
A1	0.002	0.008	0.05	0.21
b	0.010	0.015	0.25	0.38
c	0.004	0.008	0.09	0.20
D	SEE VARIATIONS			
E	0.205	0.212	5.20	5.38
e	0.0256	BSC	0.65	BSC
H	0.301	0.311	7.65	7.90
L	0.025	0.037	0.63	0.95
α	0°	8°	0°	8°

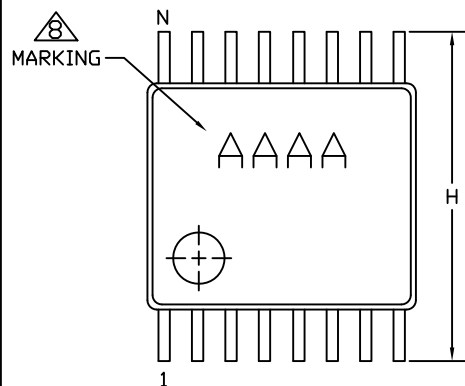
D	INCHES		MILLIMETERS		N	PKG CODE
	MIN	MAX	MIN	MAX		
D	0.239	0.249	6.07	6.33	16L	A16-2, A16-3
D	0.278	0.289	7.07	7.33	20L	A20-1, A20-2, A20-5
D	0.317	0.328	8.07	8.33	24L	A24-1, A24-2, A24-3
D	0.397	0.407	10.07	10.33	28L	A28-1, A28-2, A28-3, A28-4, A28M-2, A28M-3

NOTES:

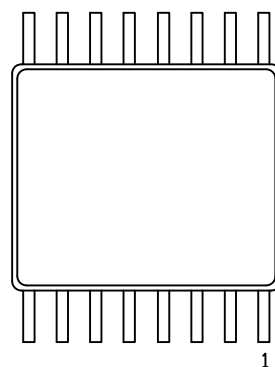
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
2. MATERIAL MUST COMPLY WITH BANNED AND RESTRICTED SUBSTANCES SPEC # 10-0131.
3. D & E DO NOT INCLUDE MOLD FLASH.
4. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED .15 MM (.006").
5. MEETS JEDEC MO-150.
6. LEADS TO BE COPLANAR WITHIN 0.10 MM.
7. ALL DIMENSIONS APPLY TO BOTH LEADED (-) AND PbFREE (+) PKG. CODES.

-DRAWING NOT TO SCALE-

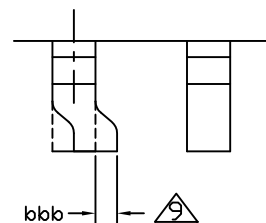
TITLE: PACKAGE OUTLINE, SSOP 5.3mm BODY			
APPROVAL	DOCUMENT CONTROL NO.	REV.	1/1
	21-0056	C	



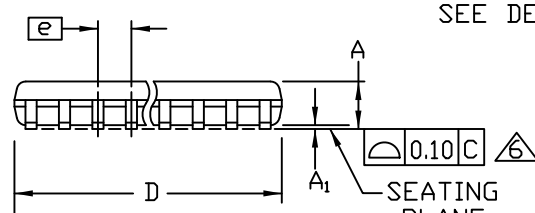
TOP VIEW



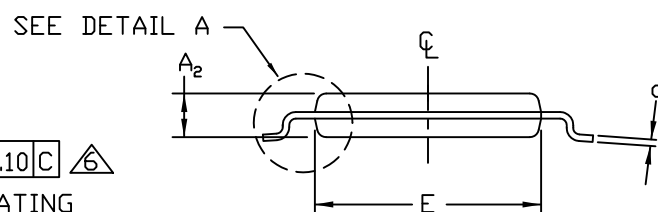
BOTTOM VIEW



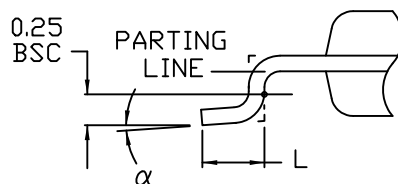
BENT LEAD DETAIL



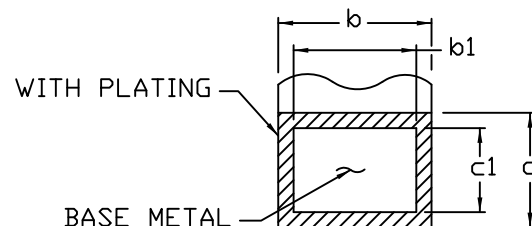
SIDE VIEW



END VIEW



DETAIL A



LEAD TIP DETAIL

NOTES

1. DIMENSIONS D AND E DO NOT INCLUDE FLASH
2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED 0.15mm PER SIDE
3. CONTROLLING DIMENSION: MILLIMETER
4. MEETS JEDEC OUTLINE MO-153. SEE JEDEC VARIATIONS TABLE
5. "N" REFERS TO NUMBER OF LEADS
6. LEAD COPLANARITY 0.10 MM MAX.
7. NUMBER OF LEADS SHOWN ARE FOR REFERENCE ONLY
8. MARKING IS FOR PACKAGE ORIENTATION REFERENCE ONLY
9. BENT LEAD 0.10 MM MAX.
10. MATERIAL MUST COMPLY WITH BANNED AND RESTRICTED SUBSTANCES SPEC # 10-0131.
11. ALL DIMENSIONS APPLY TO BOTH LEADED (-) AND PBFREE (+) PKG. CODES.

-DRAWING NOT TO SCALE-

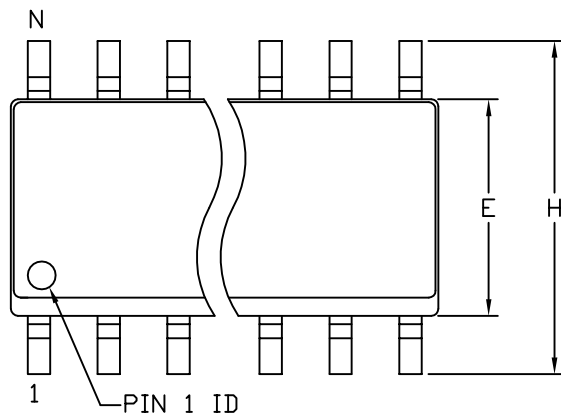
SYMBOL	COMMON DIMENSIONS			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A		1.10		.043
A ₁	0.05	0.15	.002	.006
A ₂	0.85	0.95	.033	.037
b	0.19	0.30	.007	.012
b ₁	0.19	0.25	.007	.010
c	0.09	0.20	.004	.008
c ₁	0.09	0.14	.004	.006
D	SEE VARIATIONS		SEE VARIATIONS	
E	4.30	4.50	.169	.177
e	0.65 BSC		.026 BSC	
H	6.25	6.55	.246	.258
L	0.50	0.70	.020	.028
N	SEE VARIATIONS		SEE VARIATIONS	
α	0°	8°	0°	8°
bbb	0.10 MAX			

JEDEC MO-153	N	SYMBOL	PKG. CODES	VARIATIONS			
				MILLIMETERS		INCHES	
				MIN.	MAX.	MIN.	MAX.
AB-1	14	D	U14-1, U14-2, U14-3	4.90	5.10	.193	.201
AB	16	D	U16-1, U16-2, U16-1F, U16M-1	4.90	5.10	.193	.201
AC	20	D	U20-1, U20-2, U20-3, U20-5, U20-1F, U20M-2	6.40	6.60	.252	.260
AD	24	D	U24-1, U24-2	7.70	7.90	.303	.311
AE	28	D	U28-1, U28-2, U28-3	9.60	9.80	.378	.386

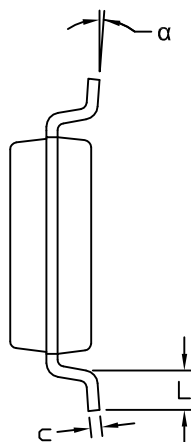
MAXIM

TITLE:
PACKAGE OUTLINE,
TSSOP 4.40mm BODY

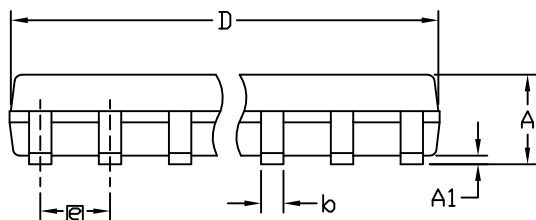
APPROVAL	DOCUMENT CONTROL NO.	REV.	1/1
	21-0066	L	



TOP VIEW



END VIEW



SIDE VIEW

COMMON DIMENSIONS				
SYMBOL	INCHES		MM	
	MIN.	MAX.	MIN.	MAX.
A	.053	.069	1.35	1.75
A1	.004	.010	0.10	0.25
b	.014	.019	0.35	0.49
c	.007	.010	0.19	0.25
E	.150	.157	3.80	4.00
e	.050 BSC		1.27 BSC	
H	.228	.244	5.80	6.20
L	.016	.050	0.40	1.27
α	0°	8°	0°	8°

Narrow SO
窄体SO封装

VARIATION A				
SYMBOL	INCHES		MM	
	MIN.	MAX.	MIN.	MAX.
D	.189	.197	4.80	5.00
N	8			
MS012	AA			
PKG. CODE	S8-2, S8-4, S8-5, S8-6F, S8-7F, S8-8F, S8-10F, S8-11F, S8-16F			

VARIATION B				
SYMBOL	INCHES		MM	
	MIN.	MAX.	MIN.	MAX.
D	.337	.344	8.55	8.75
N	14			
MS012	AB			
PKG. CODE	S14-1, S14-4, S14-5, S14-6, S14M-4, S14M-5, S14M-6, S14M-7			

VARIATION C				
SYMBOL	INCHES		MM	
	MIN.	MAX.	MIN.	MAX.
D	.386	.394	9.80	10.00
N	16			
MS012	AC			
PKG. CODE	S16-1, S16-3, S16-5, S16-6, S16-8, S16-7F, S16-9F, S16-10F, S16M-3, S16M-6			

NOTES:

- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
- MATERIAL MUST COMPLY WITH BANNED AND RESTRICTED SUBSTANCES SPEC # 10-0131.
- DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTRUSION IS 0.15 MM (.006") PER SIDE.
- LEADS TO BE COPLANAR WITHIN 0.10mm (.004").
- MEETS JEDEC MS012
- ALL DIMENSIONS APPLY TO BOTH LEADED (-) AND PbFREE (+) PKG. CODES.

-DRAWING NOT TO SCALE-

MAXIM

TITLE:
PACKAGE OUTLINE,
8L, 14L, 16L **SOIC .150 INCH**

APPROVAL	DOCUMENT CONTROL NO. 21-0041	REV. C	1/1
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