



# ST3232

## 3 TO 5.5V, LOW POWER, UP TO 400KBPS, RS-232 DRIVERS AND RECEIVERS

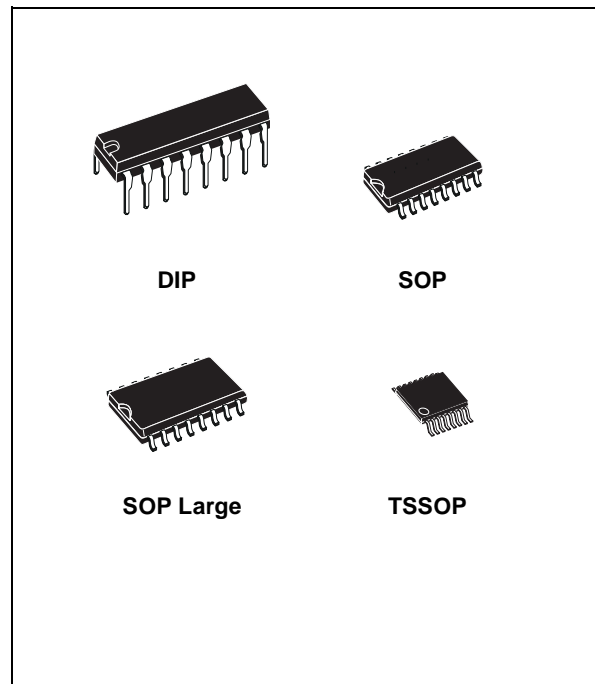
- 300 $\mu$ A SUPPLY CURRENT
- 300Kbps MINIMUM GUARENTEED DATA RATE
- 6V/ $\mu$ s MINIMUM GUARANTEED SLEW RATE
- MEET EIA/TIA-232 SPECIFICATIONS DOWN TO 3V
- AVAILABLE IN DIP-16, SO-16, SO-16 LARGE AND TSSOP16

### DESCRIPTION

The ST3232 is a 3V powered EIA/TIA-232 and V.28/V.24 communication interface with low power requirements, high data-rate capabilities. ST3232 has a proprietary low dropout transmitter output stage providing true RS-232 performance from 3 to 5.5V supplies. The device requires only four small 0.1 $\mu$ F standard external capacitors for operations from 3V supply.

The ST3232 has two receivers and two drivers.

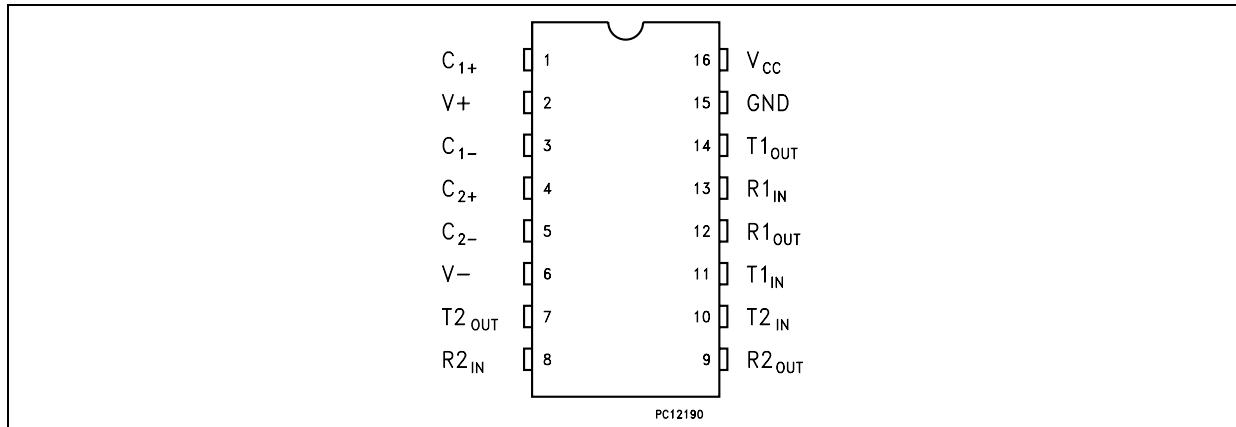
The device is guaranteed to run at data rates of 250Kbps while maintaining RS-232 output levels. Typical applications are Notebook, Subnotebook and Palmtop Computers, Battery Powered Equipment, Hand-Held Equipment, Peripherals and Printers.



### ORDERING CODES

Type	Temperature Range	Package	Comments
ST3232CN	0 to 70 °C	DIP-16	25parts per tube / 40tube per box
ST3232BN	-40 to 85 °C	DIP-16	25parts per tube / 40tube per box
ST3232CD	0 to 70 °C	SO-16 (Tube)	50parts per tube / 20tube per box
ST3232BD	-40 to 85 °C	SO-16 (Tube)	50parts per tube / 20tube per box
ST3232CDR	0 to 70 °C	SO-16 (Tape & Reel)	2500 parts per reel
ST3232BDR	-40 to 85 °C	SO-16 (Tape & Reel)	2500 parts per reel
ST3232CW	0 to 70 °C	SO-16 Large (Tube)	49parts per tube / 25tube per box
ST3232BW	-40 to 85 °C	SO-16 Large (Tube)	49parts per tube / 25tube per box
ST3232CWR	0 to 70 °C	SO-16 Large (Tape & Reel)	1000 parts per reel
ST3232BWR	-40 to 85 °C	SO-16 Large (Tape & Reel)	1000 parts per reel
ST3232CTR	0 to 70 °C	TSSOP16 (Tape & Reel)	2500 parts per reel
ST3232BTR	-40 to 85 °C	TSSOP16 (Tape & Reel)	2500 parts per reel

**PIN CONFIGURATION**



**PIN DESCRIPTION**

PIN N°	SYMBOL	NAME AND FUNCTION
1	C <sub>1+</sub>	Positive Terminal for the first Charge Pump Capacitor
2	V+	Doubled Voltage Terminal
3	C <sub>1-</sub>	Negative Terminal for the first Charge Pump Capacitor
4	C <sub>2+</sub>	Positive Terminal for the second Charge Pump Capacitor
5	C <sub>2-</sub>	Negative Terminal for the second Charge Pump Capacitor
6	V-	Inverted Voltage Terminal
7	T <sub>2_OUT</sub>	Second Transmitter Output Voltage
8	R <sub>2_IN</sub>	Second Receiver Input Voltage
9	R <sub>2_OUT</sub>	Second Receiver Output Voltage
10	T <sub>2_IN</sub>	Second Transmitter Input Voltage
11	T <sub>1_IN</sub>	First Transmitter Input Voltage
12	R <sub>1_OUT</sub>	First Receiver Output Voltage
13	R <sub>1_IN</sub>	First Receiver Input Voltage
14	T <sub>1_OUT</sub>	First Transmitter Output Voltage
15	GND	Ground
16	V <sub>CC</sub>	Supply Voltage

**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage	-0.3 to 6	V
V+	Doubled Voltage Terminal	(V <sub>CC</sub> - 0.3) to 7	V
V-	Inverted Voltage Terminal	0.3 to -7	V
V+ + V-		13	V
T <sub>IN</sub>	Transmitter Input Voltage Range	-0.3 to 6	V
R <sub>IN</sub>	Receiver Input Voltage Range	± 25	V
T <sub>OUT</sub>	Transmitter Output Voltage Range	± 13.2	V
R <sub>OUT</sub>	Receiver Output Voltage Range	-0.3 to (V <sub>CC</sub> + 0.3)	V
t <sub>SHORT</sub>	Transmitter Output Short to GND Time	Continuous	

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied. V+ and V- can have a maximum magnitude of +7V, but their absolute addition can not exceed 13 V.

**ELECTRICAL CHARACTERISTICS**

( $C_1 - C_4 = 0.1\mu\text{F}$ ,  $V_{CC} = 3\text{V}$  to  $5.5\text{V}$ ,  $T_A = -40$  to  $85^\circ\text{C}$ , unless otherwise specified.  
Typical values are referred to  $T_A = 25^\circ\text{C}$ )

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I <sub>SUPPLY</sub>	V <sub>CC</sub> Power Supply Current	No Load $V_{CC} = 3\text{V} \pm 10\%$ $T_A = 25^\circ\text{C}$		0.3	1	mA
		No Load $V_{CC} = 5\text{V} \pm 10\%$ $T_A = 25^\circ\text{C}$		1	2	mA

**LOGIC INPUT ELECTRICAL CHARACTERISTICS**

( $C_1 - C_4 = 0.1\mu\text{F}$ ,  $V_{CC} = 3\text{V}$  to  $5.5\text{V}$ ,  $T_A = -40$  to  $85^\circ\text{C}$ , unless otherwise specified.  
Typical values are referred to  $T_A = 25^\circ\text{C}$ )

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>TIL</sub>	Input Logic Threshold Low	T-IN (Note 1)			0.8	V
V <sub>TIH</sub>	Input Logic Threshold High	$V_{CC} = 3.3\text{V}$	2			V
		$V_{CC} = 5\text{V}$	2.4			V
I <sub>IL</sub>	Input Leakage Current	T-IN		$\pm 0.01$	$\pm 1$	$\mu\text{A}$

Note 1: Transmitter input hysteresis is typically 250mV

**TRANSMITTER ELECTRICAL CHARACTERISTICS**

( $C_1 - C_4 = 0.1\mu\text{F}$  tested at  $V_{CC} = 3\text{V}$  to  $5.5\text{V}$ ,  $T_A = -40$  to  $85^\circ\text{C}$ , unless otherwise specified.  
Typical values are referred to  $T_A = 25^\circ\text{C}$ )

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>TOUT</sub>	Output Voltage Swing	All Transmitter outputs are loaded with $3\text{K}\Omega$ to GND	$\pm 5$	$\pm 5.4$		V
R <sub>TOUT</sub>	Transmitter Output Resistance	$V_{CC} = V_+ = V_- = 0\text{V}$ $V_{OUT} = \pm 2\text{V}$	300	10M		$\Omega$
I <sub>TSC</sub>	Output Short Circuit Current	$V_{CC} = 3\text{V}$ to $5\text{V}$ $V_{OUT} = \pm 12\text{V}$			$\pm 60$	mA

**RECEIVER ELECTRICAL CHARACTERISTICS**

( $C_1 - C_4 = 0.1\mu\text{F}$  tested at  $V_{CC} = 3\text{V}$  to  $5.5\text{V}$ ,  $T_A = -40$  to  $85^\circ\text{C}$ , unless otherwise specified.  
Typical values are referred to  $T_A = 25^\circ\text{C}$ )

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>RIN</sub>	Receiver Input Voltage Operating Range		-25		25	V
V <sub>RIL</sub>	RS-232 Input Threshold Low	$T_A = 25^\circ\text{C}$ $V_{CC} = 3.3\text{V}$	0.6	1.2		V
		$T_A = 25^\circ\text{C}$ $V_{CC} = 5\text{V}$	0.8	1.5		V
V <sub>RIH</sub>	RS-232 Input Threshold High	$T_A = 25^\circ\text{C}$ $V_{CC} = 3.3\text{V}$		1.5	2.4	V
		$T_A = 25^\circ\text{C}$ $V_{CC} = 5\text{V}$		1.8	2.4	V
V <sub>RIHYS</sub>	Input Hysteresis			0.3		V
R <sub>RIN</sub>	Input Resistance	$T_A = 25^\circ\text{C}$	3	5	7	K $\Omega$
V <sub>ROL</sub>	TTL/CMOS Output Voltage Low	I <sub>OUT</sub> = 1.6mA			0.4	V
V <sub>ROH</sub>	TTL/CMOS Output Voltage High	I <sub>OUT</sub> = -1mA	$V_{CC}-0.6$	$V_{CC}-0.1$		V

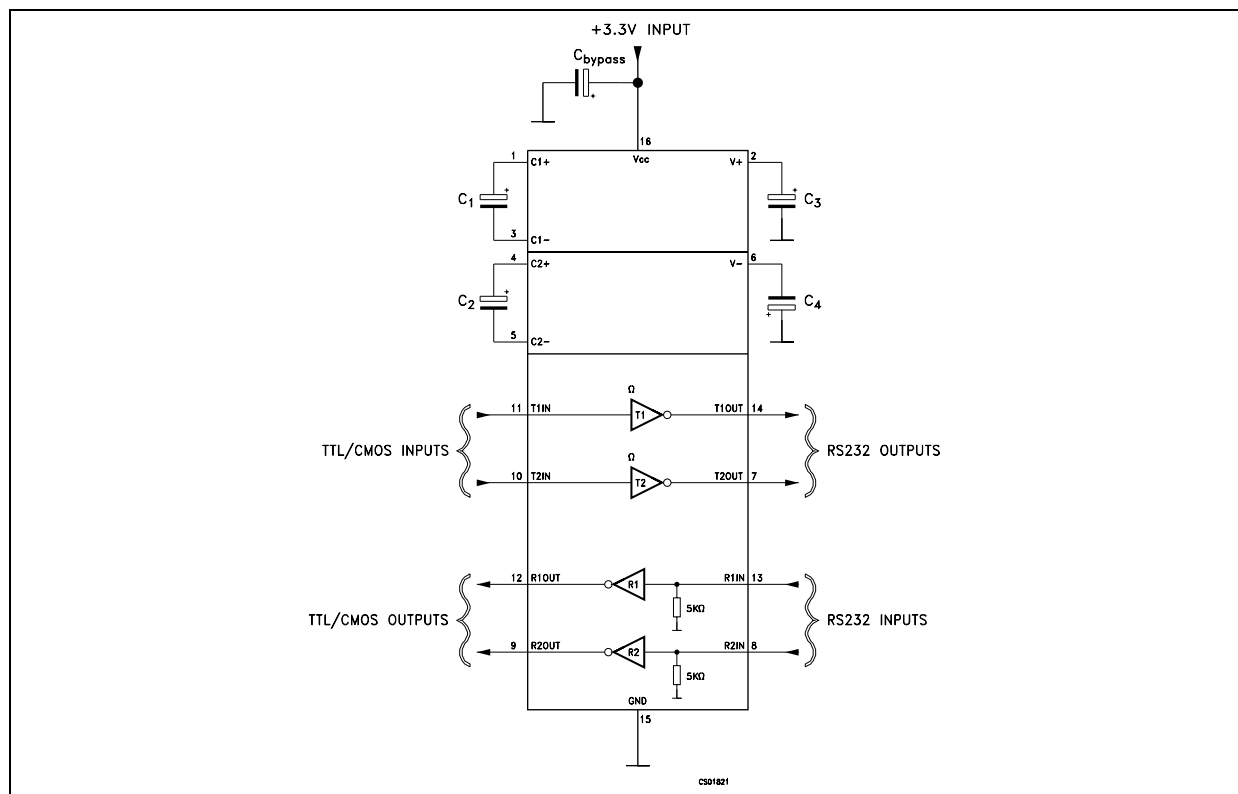
**TIMING CHARACTERISTICS**

( $C_1 - C_4 = 0.1\mu\text{F}$ ,  $V_{CC} = 3\text{V to } 5.5\text{V}$ ,  $T_A = -40 \text{ to } 85^\circ\text{C}$ , unless otherwise specified.  
 Typical values are referred to  $T_A = 25^\circ\text{C}$ )

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$D_R$	Data Transfer Rate	$R_L = 3\text{K}\Omega$ $C_{L2} = 1000\text{pF}$ one transmitter switching	300	400		Kbps
$t_{PHLR}$ $t_{PLHR}$	Propagation Delay Input to Output	$R_{XIN} = R_{XOUT}$ $C_L = 150\text{pF}$		0.2		$\mu\text{s}$
$ t_{PHLT} - t_{THL} $	Transmitter Propagation Delay Difference	(Note 1)		100		ns
$ t_{PHLR} - t_{THR} $	Receiver Propagation Delay Difference			50		ns
$S_{RT}$	Transition Slew Rate	$T_A = 25^\circ\text{C}$ $R_L = 3\text{K}\Omega \text{ to } 7\text{K}\Omega$ $V_{CC} = 3.3\text{V}$ measured from +3V to -3V or -3V to +3V $C_L = 150\text{pF to } 1000\text{pF}$ $C_L = 150\text{pF to } 2500\text{pF}$	6 4		30 30	$\text{V}/\mu\text{s}$ $\text{V}/\mu\text{s}$

Transmitter Skew is measured at the transmitter zero cross points

**APPLICATION CIRCUITS**

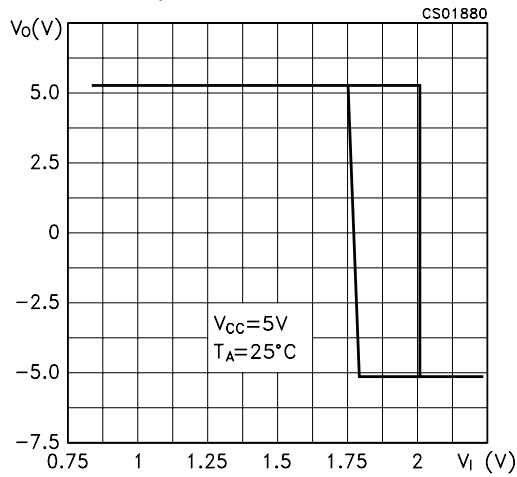


**CAPACITANCE VALUE ( $\mu\text{F}$ )**

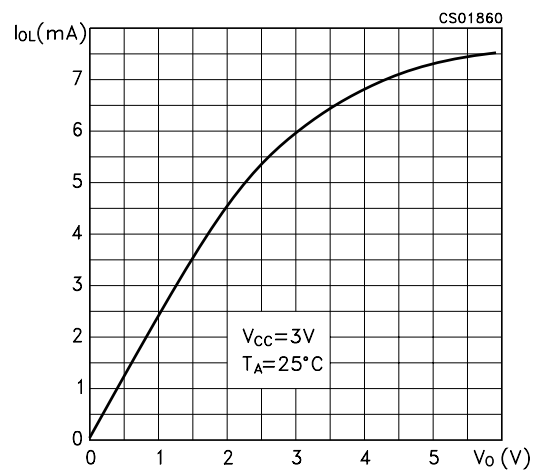
$V_{CC}$	C1	C2	C3	C4	$C_{bypass}$
3.0 to 3.6	0.1	0.1	0.1	0.1	0.1
4.5 to 5.5	0.047	0.33	0.33	0.33	0.33

**TYPICAL PERFORMANCE CHARACTERISTICS** (unless otherwise specified  $T_j = 25^\circ\text{C}$ )

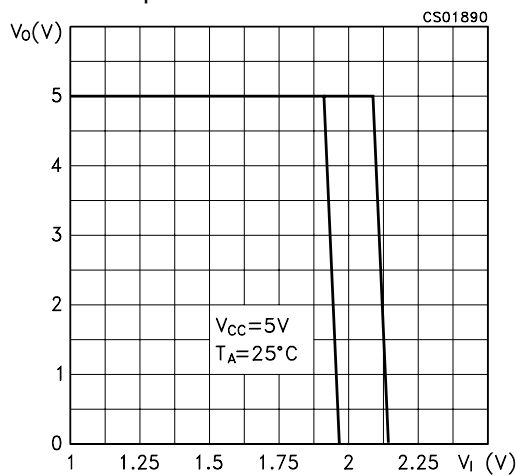
**Figure 1 :** Driver Voltage Transfer Characteristics for Transmitter Inputs



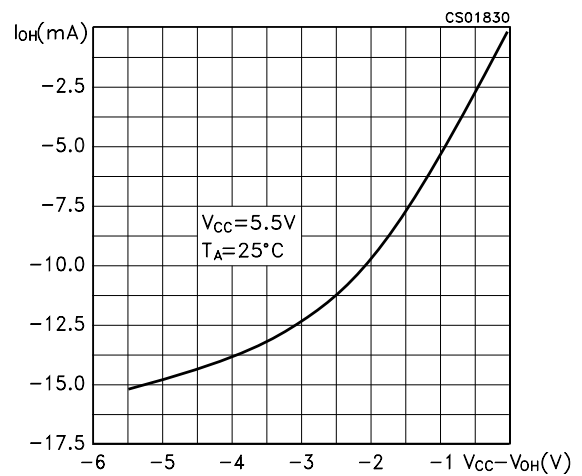
**Figure 4 :** Output Current vs Output Low Voltage



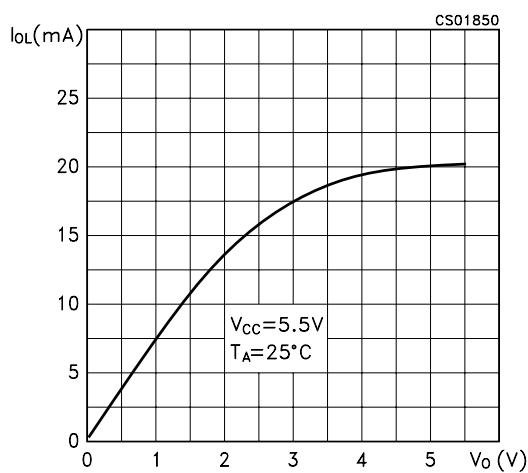
**Figure 2 :** Driver Voltage Transfer Characteristics for Receiver Inputs



**Figure 5 :** Output Current vs Output High Voltage



**Figure 3 :** Output Current vs Output Low Voltage



**Figure 6 :** Output Current vs Output High Voltage

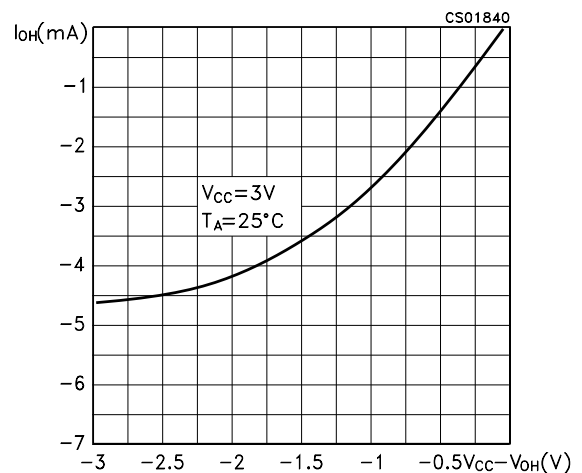
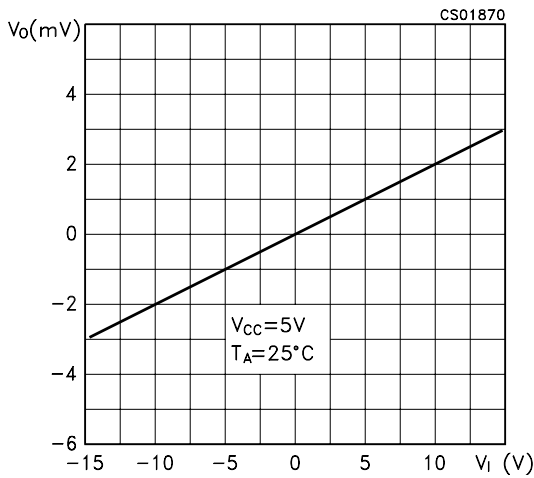
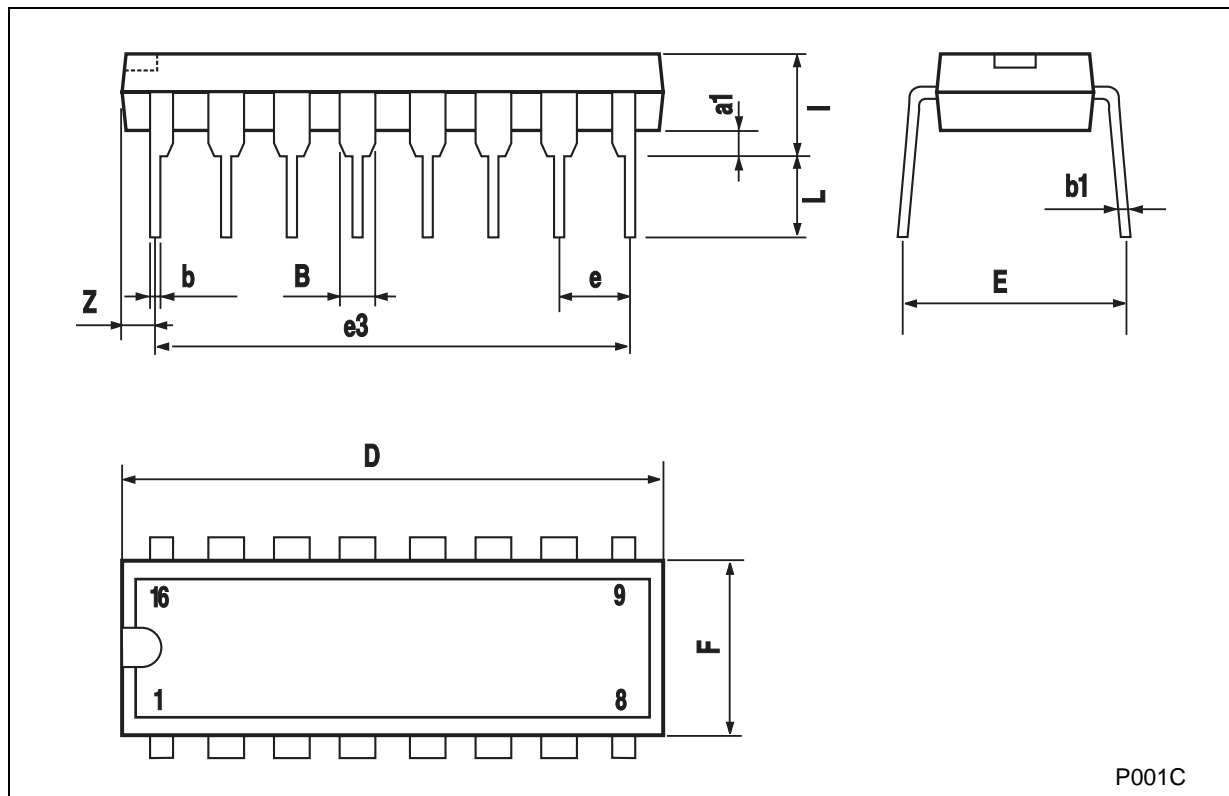


Figure 7 : Receiver Input Resistance



### Plastic DIP-16 (0.25) MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



**SO-16 MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.62			0.024
S	8° (max.)					

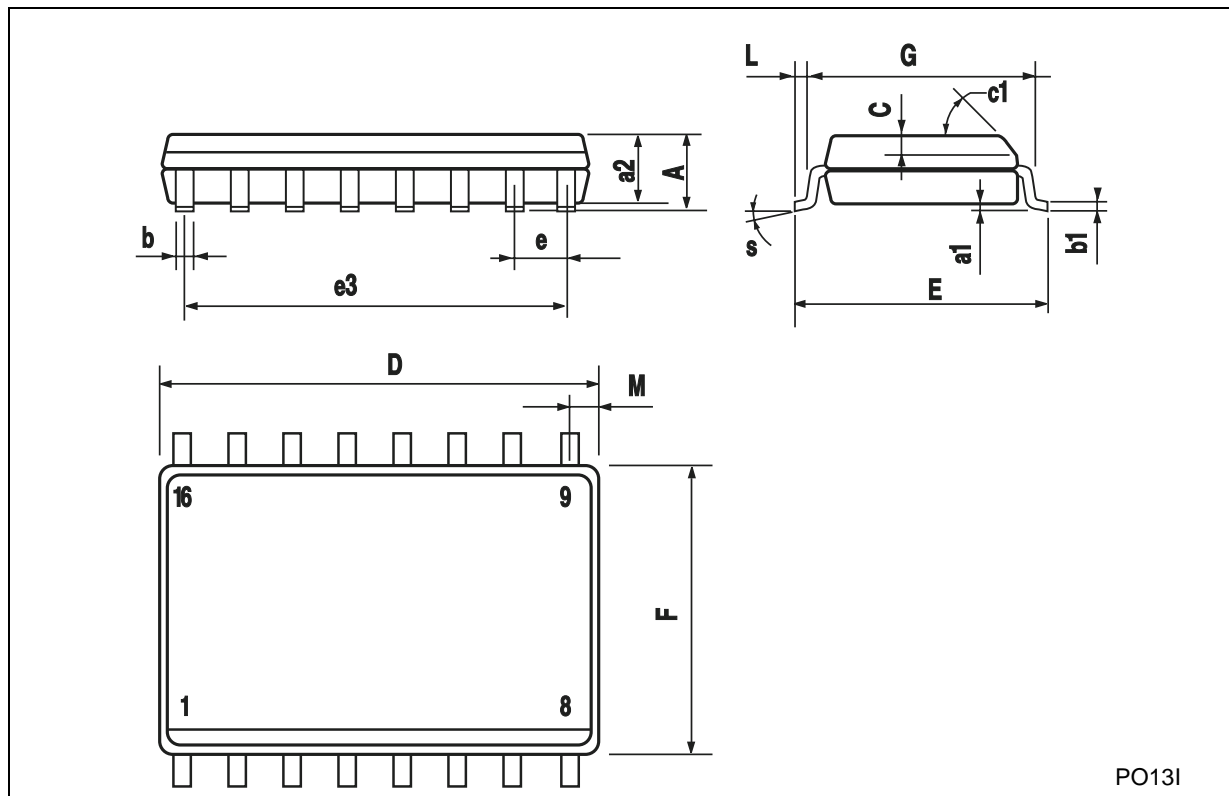


PO13H



## SO-16L MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.1		0.2	0.004		0.008
a2			2.45			0.096
b	0.35		0.49	0.014		0.019
b1	0.23		0.32	0.009		0.012
C		0.5			0.020	
c1	45° (typ.)					
D	10.1		10.5	0.397		0.413
E	10.0		10.65	0.393		0.419
e		1.27			0.050	
e3		8.89			0.350	
F	7.4		7.6	0.291		0.300
G						
L	0.5		1.27	0.020		0.050
M			0.75			0.029
S	8° (max.)					



PO131

**TSSOP16 MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.2			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0089
D	4.9	5	5.1	0.193	0.197	0.201
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°		8°	0°		8°
L	0.45	0.60	0.75	0.018	0.024	0.030



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