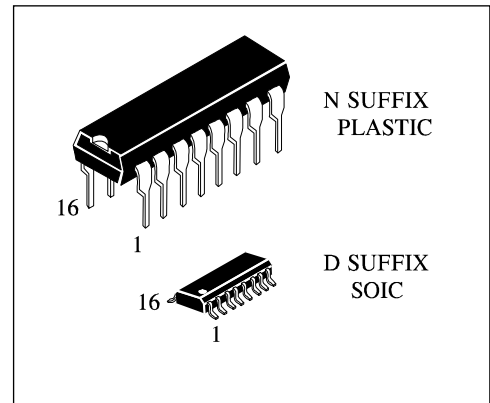


## +5V-Powered, Multichannel RS-232 Drivers / Receivers

HG232E is purposed for application in high-performance information processing systems and control devices of wide application.

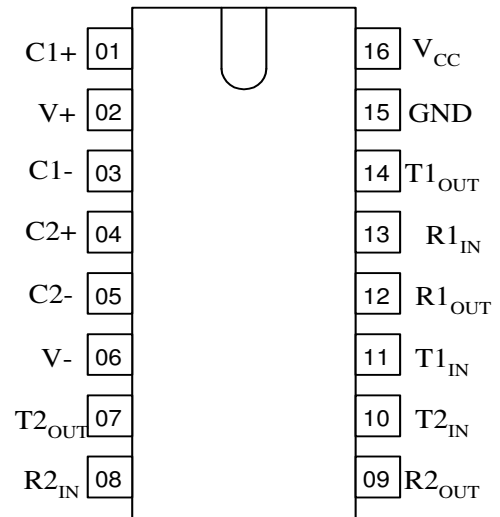
Input voltage levels are compatible with standard CMOS levels.

- Output voltage levels are compatible with input levels of K-MOS, N-MOS and TTL integrated circuits.
- Supply voltage : 5V
- Low input current: 1.0  $\mu\text{A}$ ; 0.1  $\mu\text{A}$  at T = 25 °C.
- Output current 24 mA.
- Latching current not less than 450 mA at T = 25°C
- The transmitter outputs and receiver inputs are protected to  $\pm 15\text{kV}$  Air ESD.



### Truth table

Inputs	Outputs
$R_{IN}, T_{IN}$	$R_{OVT}, T_{OVT}$
H	L
L	H
Note - H – voltage high level; L – low voltage level	



**Table of pin description**

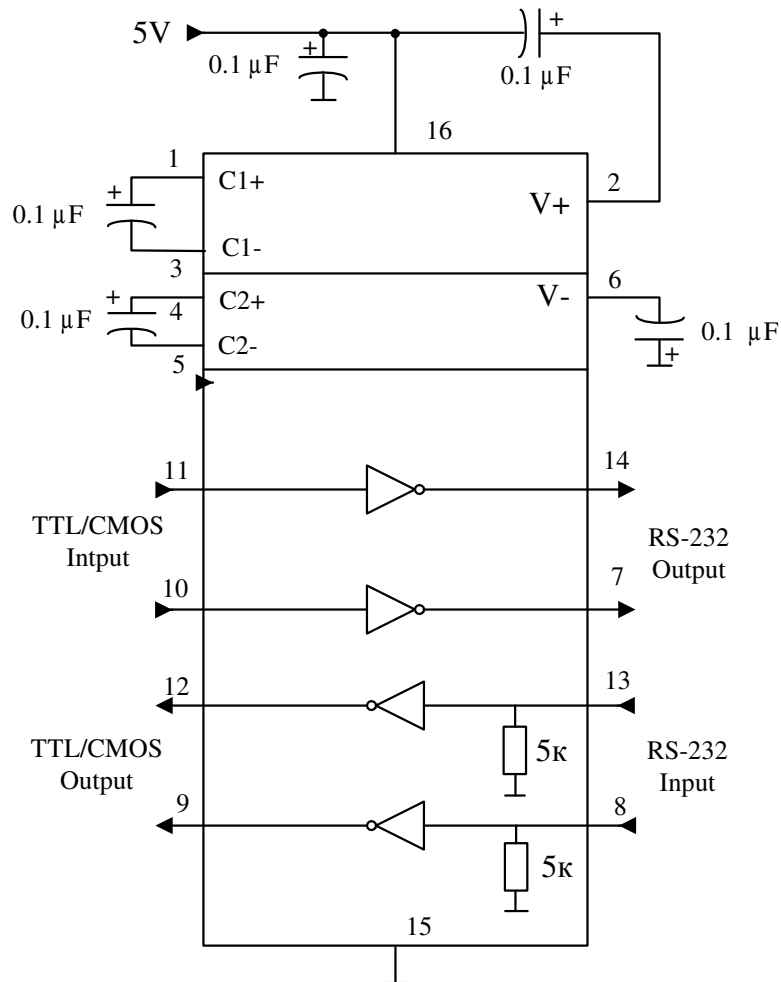
Pin No.	Symbol	Pin name
01	C1+	Output of external capacitance of positive voltage multiplier unit
02	V+	Output of positive voltage of multiplier unit
03	C1-	Output of external capacitance of positive voltage multiplier unit
04	C2+	Output of external capacitance of negative voltage multiplier unit
05	C2-	Output of external capacitance of negative voltage multiplier unit
06	V-	Output of negative voltage of multiplier unit
07	T2 <sub>OUT</sub>	Output of transmitter data (levels RS – 232)
08	R2 <sub>IN</sub>	Input of receiver data (levels RS – 232)
09	R2 <sub>OUT</sub>	Output of receiver data (levels TTL/KMOS)
10	T2 <sub>IN</sub>	Input of transmitter data (levels TTL/KMOS)
11	T1 <sub>IN</sub>	Input of transmitter data (levels TTL/KMOS)
12	R1 <sub>OUT</sub>	Output of receiver data (levels TTL/KMOS)
13	R1 <sub>IN</sub>	Input of receiver data (levels RS – 232)
14	T1 <sub>OUT</sub>	Output of transmitter data (levels RS – 232)
15	GND	Common output
16	V <sub>CC</sub>	Supply output of voltage source

**Maximum conditions**

Symbol	Parameter	Rate		Unit
		min	max	
V <sub>CC</sub>	Supply voltage	-0.3	6.0	V
V+	Transmitter high output voltage	V <sub>CC</sub> -0.3	14	
V-	Transmitter low output voltage	-0.3	-14	
V <sub>TIN</sub>	Transmitter input voltage	-0.3	V+ +0.3	
V <sub>RIN</sub>	Receiver input voltage	-30	30	
P <sub>D</sub>	Dissipated power	-	842	mW
	DIP – package SO - package			
I <sub>SC</sub>	Output current of transmitter short circuit	-	Continuously	mA
T <sub>a</sub>	Ambient temperature	-60	150	°C

**Recommended Operating Conditions**

Symbol	Parameter	Rate		Unit
		min	max	
V <sub>CC</sub>	Supply voltage	4.5	5.5	V
V <sub>+</sub>	Transmitter output high voltage	5.0	-	
V <sub>-</sub>	Transmitter output low voltage	-5.0	-	
V <sub>TIN</sub>	Transmitter input voltage	0	V <sub>CC</sub>	
V <sub>RIN</sub>	Receiver input voltage	-30	30	
I <sub>SC</sub>	Transmitter short circuit output current	-	±60	mA
T <sub>a</sub>	Ambient temperature	-40	85	°C



**Static parameters**

Symbol	Parameter	Test conditions	Rate				Unit
			25°C		-40 °C to 85 °C		
			min	max	min	max	
I <sub>CC</sub>	Consumption current static	V <sub>CC</sub> =5.0 V V <sub>IL</sub> = 0 V	-	10.0	-	14.0*	mA

**Receiver electrical parameters**

V <sub>h</sub>	Hysteresis voltage	V <sub>CC</sub> =5.0 V	0.2	0.9	0.2	1.0	V
V <sub>On</sub>	On (operation) voltage	V <sub>O</sub> ≤ 0.1 V I <sub>OL</sub> ≤ 20 uA	-	2.4	-	2.3	
V <sub>off</sub>	Off (dropout) voltage	V <sub>O</sub> ≥ V <sub>CC</sub> -0.1 V I <sub>OH</sub> ≤ -20 uA	0.8	-	0.9	-	
V <sub>OL</sub>	Output low voltage	I <sub>OL</sub> = 3.2 mA V <sub>CC</sub> = 4.5 V V <sub>IH</sub> = 2.4 V	-	0.3	-	0.4	
V <sub>OH</sub>	Output high voltage	I <sub>OH</sub> = -1.0 mA V <sub>CC</sub> = 4.5 V V <sub>IL</sub> = 0.8 V	3.6	-	3.5	-	
R <sub>I</sub>	Input resistance	V <sub>CC</sub> = 5.0 V	3.0	7.0	3.0	7.0	kOhm

**Transmitter electrical parameters**

V <sub>OL</sub>	Output low voltage	V <sub>CC</sub> = 4.5 V V <sub>IH</sub> = 2.0 V R <sub>L</sub> = 3.0 kOhm	-	-5.2	-	-5.0	V
V <sub>OH</sub>	Output high voltage	V <sub>CC</sub> = 4.5 V V <sub>IL</sub> = 0.8 V R <sub>L</sub> = 3.0 kOhm	5.2	-	5.0	-	
I <sub>IL</sub>	Input low current	V <sub>CC</sub> =5.5 V V <sub>IL</sub> = 0 V	-	-1.0	-	-10.0	uA
I <sub>IH</sub>	Input high current	V <sub>CC</sub> =5.5 V V <sub>IH</sub> = V <sub>CC</sub>		1.0		10.0	
SR	Speed of output front change	V <sub>CC</sub> =5.0 V C <sub>L</sub> =50 - 1000 pF R <sub>L</sub> = 3.0 - 7.0 kOhm	3.0	30	2.7	27	V/μs
R <sub>O</sub>	Output resistance	V <sub>CC</sub> = V <sub>+</sub> = V <sub>-</sub> = 0 V V <sub>O</sub> = ± 2 V	350	-	300	-	Ohm
I <sub>SC</sub>	Short circuit output current	V <sub>CC</sub> =5.5 V V <sub>O</sub> = 0 V V <sub>I</sub> = V <sub>CC</sub> V <sub>I</sub> = 0 V		-50 50		-60 60	mA
ST	Speed of information transmission	V <sub>CC</sub> =4.5 V C <sub>L</sub> = 1000 pF R <sub>L</sub> = 3.0 kOhm t <sub>w</sub> = 7us (for extreme -t <sub>w</sub> = 8us)	140	-	120	-	

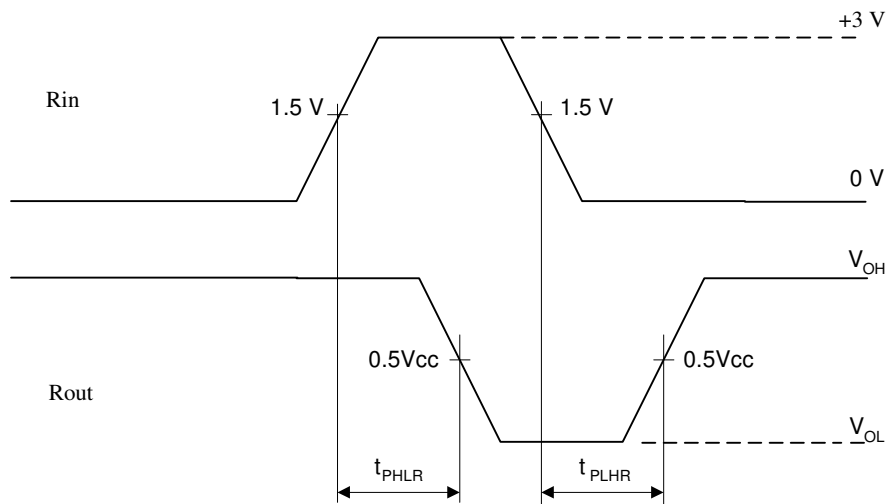
**Dynamic parameters**

Symbol	Parameter	Test conditions	Rate				Unit
			25 °C		from -40 °C to 85 °C		
			min	max	min	max	
$t_{PHLR}$ ( $t_{PLHR}$ )	Signal propagation delay time when switching on (off)	$V_{CC} = 4.5\text{ V}$ $C_L = 150\text{ pF}$ $V_{IL} = 0\text{ V}$ $V_{IH} = 3.0\text{ V}$ $t_{LH} = t_{HL} \leq 10\text{ ns}$	-	9.7	-	10	us
$t_{PHLT}$ ( $t_{PLHT}$ )	Signal propagation delay time when switching on (off)	$V_{CC} = 4.5\text{ V}$ $C_L = 2500\text{ pF}$ $V_{IL} = 0\text{ V}$ $V_{IH} = 3.0\text{ V}$ $R_L = 3\text{ kOhm}$ $t_{LH} = t_{HL} \leq 10\text{ ns}$		5.0*		6.0*	

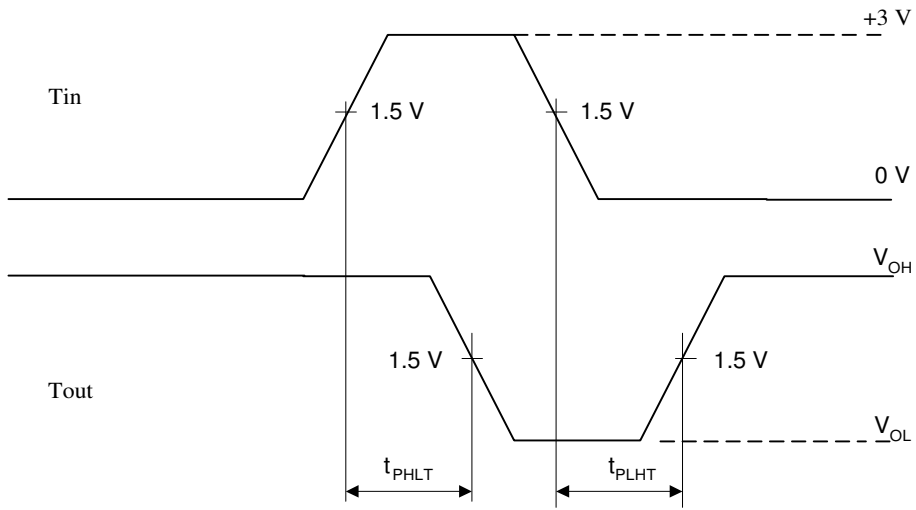
**Capacitance**

Symbol	Parameter	$V_{CC}$	Rate	Unit
$C_{IN}$	Input capacitance	5.0	9.0	pF
$C_{PD}$	Dynamic capacitance		90	

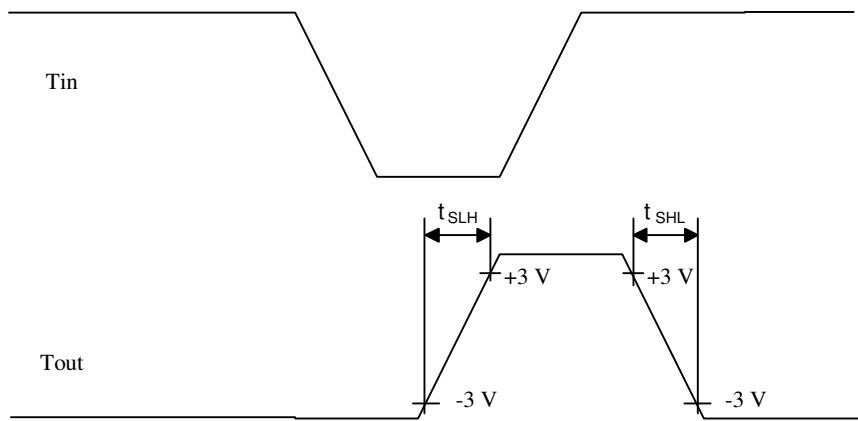
Timing diagram when measuring IC dynamic parameters



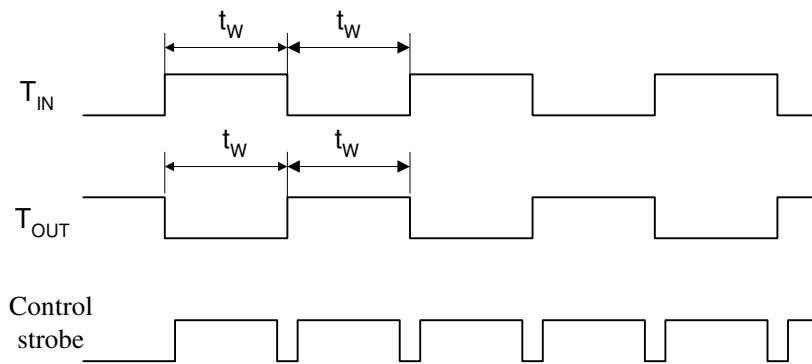
**Figure 3**



**Figure 4**



**Figure 5**



**Figure 6**

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