EIA-232-E / V.28 DRIVERS/RECEIVERS

Serial busses find their applications in longer data transmission systems compared to parallel bus structures. The most widely used, and known, serial data transmission standard is the RS-232 which was introduced by the Electronic Industries Association (EIA) in 1962 for the purpose of standardizing the interface between Data Terminal Equipment (DTE) and Data Communication Equipment (DCE).

Although originally developed for modem to terminal equipment interface is widely used as an interface for nearly all PC peripherals (mouse, plotter, scanner, printer). Using a common standard allows widespread compatibility plus a reliable method for interconnecting a PC to peripheral functions.

The revised standard of 1969, EIA RS-232-C has now been superceeded by EIA-232-D (1986) which brings it in-line with CCITT V24, V28 and ISO IS2110. The latest revision reflects the addition of mechanical specifications for the interface connector, loopback and test modes as the major changes. RS-232 provides a low cost communication solution and new products are being developed with a rate faster than over.

The RS232 standard specifies a nominal upper limit for the data signalling rate of 20 000 bits per second (20kbaud). Some applications use however data rates well beyond the maximum 20kbaud but faster transmission standards like RS423, RS422 and RS485 must be recommended. The cable length is in RS232C specified to maximum 15 meters but is not mentioned in EIA-232-D, as the maximum length is normally limited by the load capacitance from the cable (typ. 150pF/m). EIA-232-D specify a maximum generator or driver load capacitance of 2500pF. The combination of the driver's output current capability, the load capacitance (cable length) and the standard's switching requirements should be considered in every design, especially if CCITT V28 should be met, but are often ignored.

A driver converting a TTL/CMOS signal to RS232 levels is usually supplied from +/- 12V. A receiver converting RS232 levels to TTL/CMOS levels requires only a single +5V supply. The receiver input impedance, specified to be in the range from 3k to 7k(ohm), combined with the signal levels dissipate considerable power - even if no transmission takes place.

A minimum time for the signal to stay in the transition region is specified depending on the data rate in order to reduce susceptibility to noise during transition and maintain a well defined signal for asynchronous applications. Also, a maximum dv/dt of 30V/μs minimizes cable crosstalk, high frequency switching emmission and interference with other signals.

The increasing use of laptop PCs and portable equipment with RS232 interface, demands low power devices. Also the increasing integration of modems, PCs and their peripherals requires elimination of passive components and single chip RS232 solutions.

IL145403 are silicon gate CMOS ICs that combine both the transmitter and receiver to fulfill the electrical specifications of EIA Standard 232-E and CCITT V.28. The drivers feature true TTL input compatibility, slew rate limiting outputs, 300 Ω power-off source impedance, and output typically switching to within 25% of the supply rails. The receivers can handle up to $\pm$25 V while presenting 3 to 7 kΩ impedance. Hysteresis in the receivers aid in the reception of noisy signals. By combining both drivers and receivers in a single

CMOS chip, these devices provide efficient, low-power solutions for both EIA-232-E and V.28 applications.

IL145403 consists of 3 drivers and 5 receivers. Pin assignments and functional diagrams of the receiver and driver are presented in Fig.1.

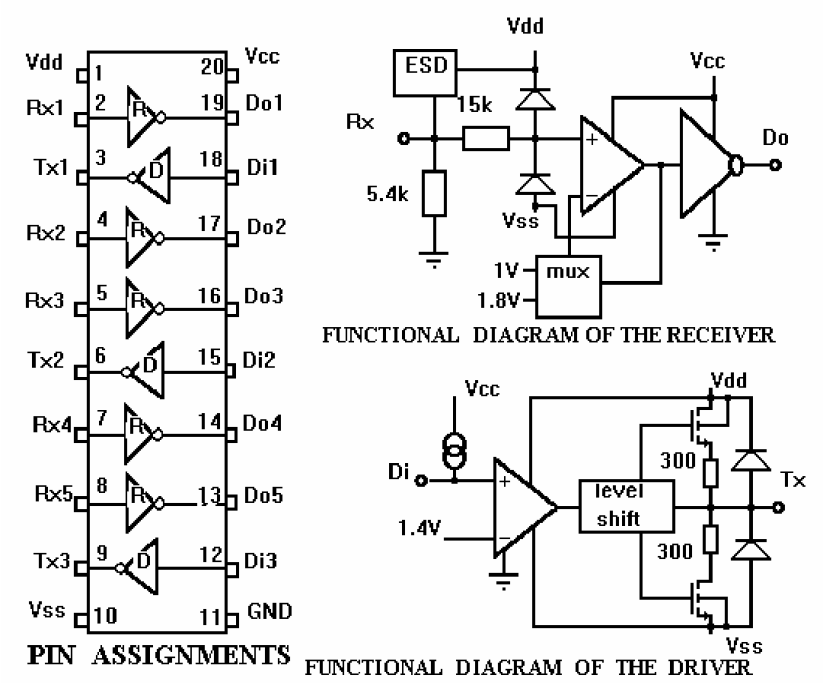

Fig.1 Pin assignment, functional diagrams of the receiver and driver.

Table 1 DC/AC electrical characterisrics are presented

PARAMETER	ELECTRICAL SPECIFICATIONS		
	min	typ	max
DC SUPPLY VOLTAGE, V_{cc} ,B	4.5	5	5.5
V_{DD} ,B	4.5	от 5 до 12	13.2
V_{SS} ,B	- 4.5	от-5 до -12	- 13.2
ABSOLUTE MAXIMUM V_{CC},B	-0.5	-	+6.0
DC SUPPLY VOLTAGE V_{DD},B	-0.5	-	+13.5
V_{SS},B	+0.5	-	-13.5
QUIESCENT SUPPLY I_{CC},мкА при V_{CC}=+5В	-	110	200
CURRENT I_{DD},мкА при V_{DD}=+12В	-	425	635
I_{SS},мкА при V_{SS} =-12В	-	-400	-600
INPUT TURN-ON THRESHOLD V_{on},B	1.35	1.8	2.35
OF THE RECEIVER $V_{DO}=V_{OL}$			
INPUT TURN-OFF THRESHOLD Voff,B	0.75	1	1.25
OF THE RECEIVER $V_{DO}=V_{OH}$			
INPUT THRESHOLD HYSTERESIS $\Delta=V_{on}-V_{off}$,B	0.6	0.8	-
INPUT RESISTANCE OF THE RECEIVER R_{in},кОм	3	5.4	7
INPUT VOLTAGE RANGE			
RECEIVER R_X1-R_Xn V_{IR},B	V_{SS}-15	-	V_{DD}+15
DRIVER DI1-DIn V_{IR},B	0.5	-	V_{CC}+15

INTEGRAL

PARAMETER	ELECTRICAL SPECIFICATIONS		
	min	typ	max
HIGH LEVEL OUTPUT I_{out}=-20мкА,V_{OH},В	4.9	4.9	-
VOLTAGE OF RECEIVER I_{out}=-1.0мА,V_{OH},В	3.8	4.3	-
LOW LEVEL OUTPUT I_{out}=+2мА,V_{OL},В	-	0.02	0.5
VOLTAGE OF RECEIVER I_{out}=+4.0мА,V_{OL},В	-	0.5	0.7
DIGITAL INPUT VOLTAGE OF DRIVER			
LOGIC 0 V_{IL},В	-	-	0.8
LOGIC 1 V_{IH},В	2	-	-
DRIVER'S INPUT CURRENT			
V_{DI}=GND I_{IL},мкА	-	7	-
V_{DI}=V_{CC} I_{IH},мкА	-	-	±1.0
DRIVER'S OUTPUT HIGH VOLTAGE			
V_{DD}=+5.0 В,V_{SS}=-5.0 В V_{OH},В	3.5	3.9	-
V_{DD}=+6.0 В,V_{SS}=-6.0 В V_{OH},В	4.3	4.7	-
V_{DD}=+12.0 В,V_{SS}=-12.0 В $V_{OH,B}$	9.2	9.5	-
DRIVER'S OUTPUT LOW VOLTAGE			
V_{DD}=+5.0 В,V_{SS}=-5.0 В V_{OL},В	-4	-4.3	-
V_{DD}=+6.0 В,V_{SS}=-6.0 В V_{OL},В	-4.5	-5.2	-
V_{DD}=+12.0 В,V_{SS}=-12.0 В $V_{OL,B}$	-10	-10.3	-
OUTPUT DRIVER RESISTANCE Z_{off},Ом	300	-	-
PROPAGATION DELAY TIME OF THE DRIVER			
t_{PLH},нс	-	500	1000
t_{PHL},нс	-	700	1000
DRIVER'S OUTPUT SLEW RATE			
MINIMUM LOAD SR,В/мкс			
R_L=7кОм,C_L=0пФ(V_{DD}=6to12В,V_{SS}=-6to-12		±6	±30
MAXIMUM LOAD SR,В/мкс	-		
R_L=3кОм,C_L=2500пФ,(V_{DD}=12В,V_{SS}=-12В, V_{CC}=5В)	4		
PROPAGATION DELAY TIME OF THE RECEIVER			
t_{PLH},нс	-	360	610
t_{PHL},нс	-	130	610
OUTPUT RISE TIME OF THE RECEIVER t_r,нс	-	250	400
OUTPUT FALL TIME OF THE RECEIVER t_f,нс	-	40	100
OPERATING TEMPERATURE RANGE T_A, ^{0}C	-40	+25	+85