RS232C LINE DRIVER/RECEIVER

■ GENERAL DESCRIPTION

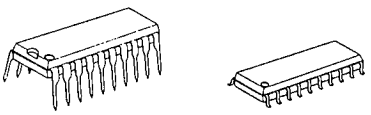
The NJU6401B is a RS232C line driver/receiver composed of 3 drivers and 5 receivers.

The drivers convert the input of TTL level signals into RS232C level signals and limit the slew rate below 30V/μs.

The receivers accept the input levels both of RS-232C standard minimum requirement level(±3V) and TTL level.

Furthermore, the hysteresis circuit and noise filter incorporated on each receiver ensures noise-free operation.

■ PACKAGE OUTLINE

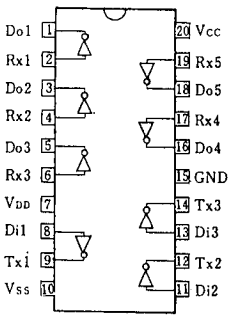


NJU6401BD NJU6401BM

■ FEATURES

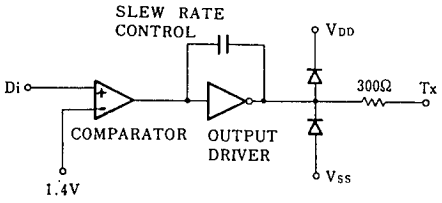
- Based on the RS232C Standard
- 3 Drivers and 5 Receivers
- Low Operating Current
- Driver Output Voltage --- ±25V
- Receiver Input Voltage --- ±27V
- Output Impedance at Power-off (Driver) --- 300Ω (Min)
- Slew Rate (Driver) --- 30V/μs (Max)
- TTL-compatible Input (Driver)
- TTL-compatible Input/Output (Receiver)
- Hysteresis Input (Receiver)
- Noise Filter On-chip (Receiver)
- Package Outline --- DIP/DMP 20
- C-MOS Technology

■ PIN CONFIGURATION

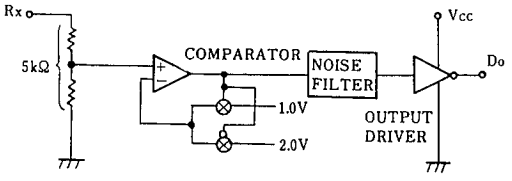


■ BLOCK DIAGRAM

(1) Driver Section (1-circuit)



(2) Receiver Section (1-circuit)



■ TERMINAL DESCRIPTION

NO.	SYMBOL	FUNCTION	NO.	SYMBOL	FUNCTION
1	Do1	Receiver Output 1	11	Di2	Driver Input 2
2	Rx1	Receiver Input 1	12	Tx2	Driver Output 2
3	Do2	Receiver Output 2	13	Di3	Driver Input 3
4	Rx2	Receiver Input 2	14	Tx3	Driver Output 3
5	Do3	Receiver Output 3	15	GND	Ground
6	Rx3	Receiver Input 3	16	Do4	Receiver Output 4
7	V_{DD}	Driver Positive Voltage Supply(+12V)	17	Rx4	Receiver Input 4
8	Di1	Driver Input 1	18	Do5	Receiver Output 5
9	Tx1	Driver Output 1	19	Rx5	Receiver Input 5
10	V_{SS}	Driver Negative Voltage Supply(-12V)	20	V_{CC}	Logic Operating Voltage Supply(+5V)

7

■ FUNCTIONAL DESCRIPTION

(1) Driver Section

The drivers output the RS-232C standard signals which are converted from the TTL level signal to RS-232C standard level by the level shifter and limit the slew rate below 30V/μs(6V/μs typ), to the RS-232C lines.

The each driver incorporate series resistance to keep the output impedance to 300Ω or more during the power-off. This series resistance also protect the internal circuits against the overvoltage of ±25V impressed from outside.

(2) Receiver Section

The input of each receiver incorporate the resistor(TYP:5kΩ) as the drivers load. This resistor also protect the internal circuits against the overvoltage of ±27V. The receiver accept the both of ±3V of RS-232C standard minimum requirement level and TTL level as the threshold voltage of input comparators are adjusted for both input levels.

The noise less than $1V_{P-P}$ and spike noise below 3μs pulse width are eliminated by the hysteresis circuits and noise filter.

The output signals are TTL compatible and capable of 8-LSTTL driving.

■ ABSOLUTE MAXIMUM RATINGS

(Ta=25℃)

PARAMETER		SYMBOL	RATINGS	UNIT
Supply Voltage		V_{CC} V_{DD} V_{SS}	-0.3 ~ +6 V_{CC} ~ +14 (Note1) +0.3 ~ -14	V
Receiver	Input Voltage Output Voltage	V_{RI} V_{DO}	±27 -0.3 ~ V_{CC}+0.3	V
Driver	Input Voltage Output Voltage Output Current	V_{DI} V_{TX} I_{TX}	-0.3 ~ V_{CC}+0.3 ±25 ±60	V V mA
Power Dissipation		P_D	DIP 500	mW
Operating Temperature		Topr	- 20 ~ + 75	℃
Storage Temperature		Tstg	- 65 ~ + 150	℃

Note1) The V_{DD} level must be maintained higher than V_{CC} level. If the V_{CC} rise up before V_{DD} supply when the power is turned on, the latch-up may occur because of the reverse current flows from V_{CC} to V_{DD}. If there are possibilities of early V_{CC} supply, the diode connect to V_{DD} and V_{SS} terminals shown in application circuits are required.

7

■ ELECTRICAL CHARACTERISTICS

(Ta=25℃)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Quiescent Current	I_{CC} I_{DD} I_{SS}	V_{CC}=5.5V V_{DD}=12V V_{SS}=-12V			1 1 1	mA
Operating Voltage	V_{CC} V_{DD} V_{SS}		4.5 4.5 -12		5.5 12 -4.5	V

■ DRIVER ELECTRICAL CHARACTERISTICS

(Ta=25℃, 4.5≦V_{CC}≦5.5V, V_{DD}=4.5~12V, V_{SS}=-4.5V~-12V, GND=0V)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNIT
Input Voltage H Level L Level	V_{IH} V_{IL}			2.0		 0.8	V
Maximum Input Current	I_{IL}, I_{IH}	V_{IN}=GND or V_{DD}		-10		10	μA
H Level Output Voltage	V_{OH}	V_{IN}=V_{IL} R_L=3kΩ	V_{DD}=+4.5V, V_{SS}=-4.5V V_{DD}=+9V, V_{SS}=-9V V_{DD}=+12V, V_{SS}=-12V	3.0 6.5 9.0			V
L Level Output Voltage	V_{OL}	V_{IN}=V_{IH} R_L=3kΩ	V_{DD}=+4.5V, V_{SS}=-4.5V V_{DD}=+9V, V_{SS}=-9V V_{DD}=+12V, V_{SS}=-12V			-3.0 -6.5 -9.0	V
Output Short Current (Note 2)	I_{OS}^+	V_{OUT}=GND, V_{DD}=+12V	V_{IN}=V_{IL}			45	mA
	I_{OS}^-	V_{SS}=-12V	V_{IN}=V_{IH}	-45			
Output Impedance	R_{OUT}	V_{CC}=V_{DD}=V_{SS}=0V, -2V≦V_{OUT}≦+2V		300			Ω

Note 2) The output short current is specified by 1 output terminal. If plural outputs short at once, the NJU6401B may destroy due to the power over the package power dissipation.

■ **DRIVER AC CHARACTERISTICS**

(Ta=25℃, 4.5≦V_{CC}≦5.5V, V_{DD}=4.5～12V, V_{SS}=-4.5V～-12V, GND=0V, R_L=3kΩ, C_L=50pF) (Note 3,4)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Propagation Delay Time	t_{pdl}	V_{DD}=+4.5V, V_{SS}=-4.5V V_{DD}=+9V, V_{SS}=-9V V_{DD}=+12V, V_{SS}=-12V			6.0 5.0 4.0	μs
Propagation Delay Time	t_{pdo}	V_{DD}=+4.5V, V_{SS}=-4.5V V_{DD}=+9V, V_{SS}=-9V V_{DD}=+12V, V_{SS}=-12V			6.0 5.0 4.0	μs
Rise/Fall Time (Note 5)	t_r/t_f		0.2			μs
Delay Time Skew	t_{sk}	V_{DD}=+12V, V_{SS}=-12V		400		ns
Slew Rate (Note 5)	S_R	R_L=3 to 7kΩ, 15pF≦C_L≦2.5nF		6	30	v/μs

Note 3) AC input waveform: t_r=t_f≦20ns, V_{IH}=2.0V, V_{IL}=0.8V

Note 4) Input Rise/Fall time are less than 5μs.

Note 5) Output slew rate, output rise time and fall time are specified output waveform changing time either from +3V to -3V or -3V to +3V.

7

■ **RECEIVER ELECTRICAL CHARACTERISTICS**

(Ta=25℃, 4.5≦V_{CC}≦5.5V, V_{DD}=4.5～12V, V_{SS}=-4.5V～-12V, GND=0V)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage H Level L Level	V_P V_N		1.3 0.5	2.0 1.0	2.5 1.7	V
Hysteresis Voltage	V_H			1.0		V
Input Impedance	R_{IN}	V_{IN}=±3V～±12V	3	5	7	kΩ
Output Voltage H Level L Level	V_{OH} V_{OL}	V_{IN}=V_N(Min.), I_{OUT}=-3.2mA V_{IN}=V_P(Max.), I_{OUT}=+3.2mA	2.8		 0.4	V

■ **RECEIVER AC CHARACTERISTICS**

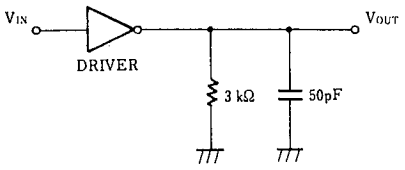
(Ta=25℃, 4.5≦V_{CC}≦5.5V, V_{DD}=4.5～12V, V_{SS}=-4.5V～-12V, GND=0V, CL=50pF) (Note 6)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Propagation Delay Time	t_{PLH}, t_{PHL}	Input Pulse Width≧10μs			6.5	μs
Delay Time Skew	t_{SK}			400		ns
Output Rise Time	t_r				300	ns
Output Fall Time	t_f				300	ns

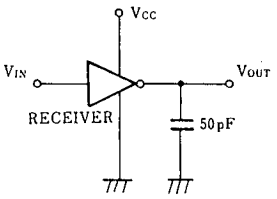
Note 6) AC input waveform tr=tf=200ns, V_{IH}=+3V, V_{IL}=-3V, f=20kHz.

■ MEASUREMENT CIRCUITS

(1) Driver AC Characteristics

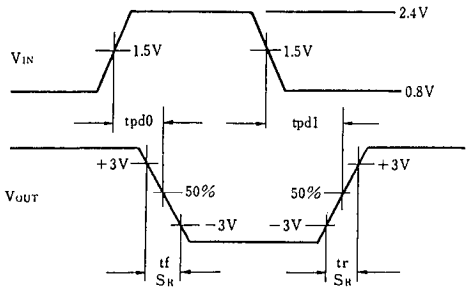


(2) Receiver AC Characteristics

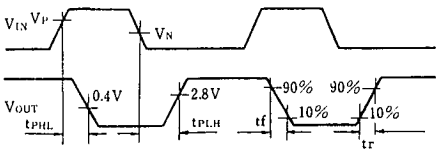


■ MEASUREMENT WAVEFORM

(1) Driver AC Characteristics

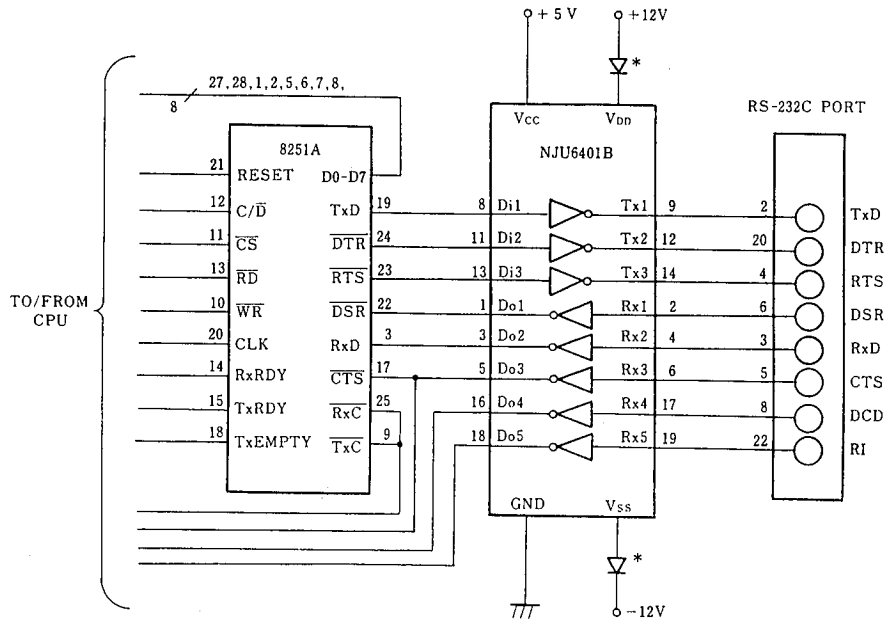


(2) Receiver AC Characteristics



7

■ APPLICATION CIRCUIT



RS-232C port

* External diode for protective use.
Protection of in case +5V voltage supplied before than +12V and overvoltage stress.

MEMO

[CAUTION]
The specifications on this databook are only given for information , without any guarantee as regards either mistakes or omissions. The application circuits in this databook are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.