RS232C LINE DRIVER/RECEIVER

■ GENERAL DESCRIPTION

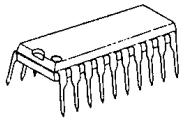
The NJU6401B is a RS232C line driver/receiver composed of 3 drivers and 5 receivers.

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

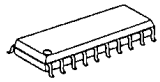
The receivers accept the input levels both of RS-232C standard minimum requirement level(±3V) and TTL level.

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

■ PACKAGE OUTLINE



NJU6401BD

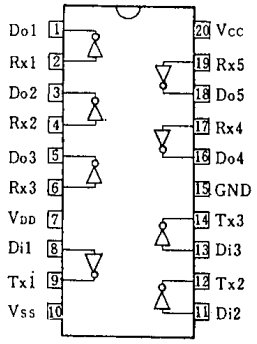


NJU6401BM

■ FEATURES

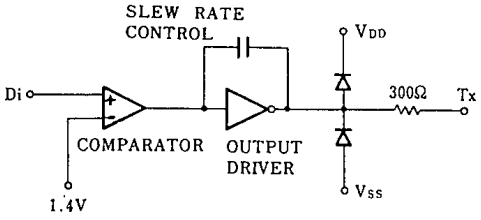
- Based on the RS232C Standard
- 3 Drivers and 5 Receivers
- Low Operating Current
- Driver Output Voltage --- ±25V
- Receiver Input Voltage --- ±27V
- Output Impedance at Power-off (Driver)
  --- 300Ω (Min)
- Slew Rate (Driver) --- 30V/μs (Max)
- TTL-compatible Input (Driver)
- TTL-compatible Input/Output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

■ PIN CONFIGURATION

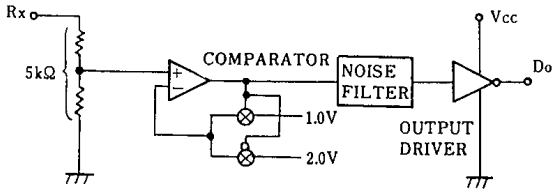


■ BLOCK DIAGRAM

(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)

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■ 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.

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■ 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.

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■ 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

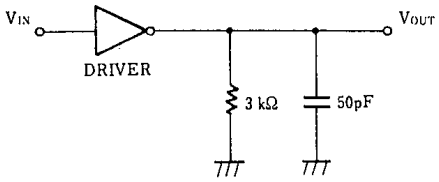
(Ta=25℃, 4.5≦V_{CC}≦5.5V, V_{DD}=4.5～12V, V_{SS}=-4.5V～-12V, GND=0V, CL=50pF) (Note 6)

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

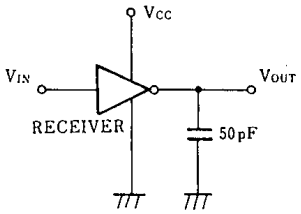
Note 6) AC input waveform tr=tf=200ns, V_{IH}=+3V, V_{IL}=-3V, f=20kHz.

■ MEASUREMENT CIRCUITS

(1) Driver AC Characteristics

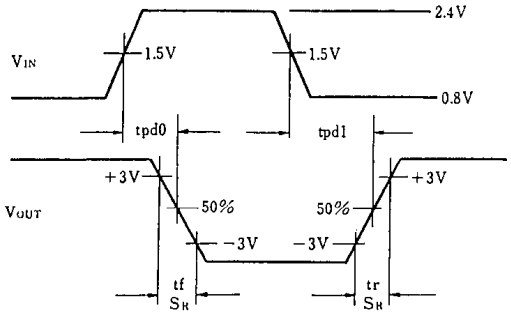


(2) Receiver AC Characteristics

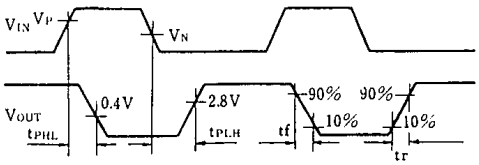


■ MEASUREMENT WAVEFORM

(1) Driver AC Characteristics



(2) Receiver AC Characteristics



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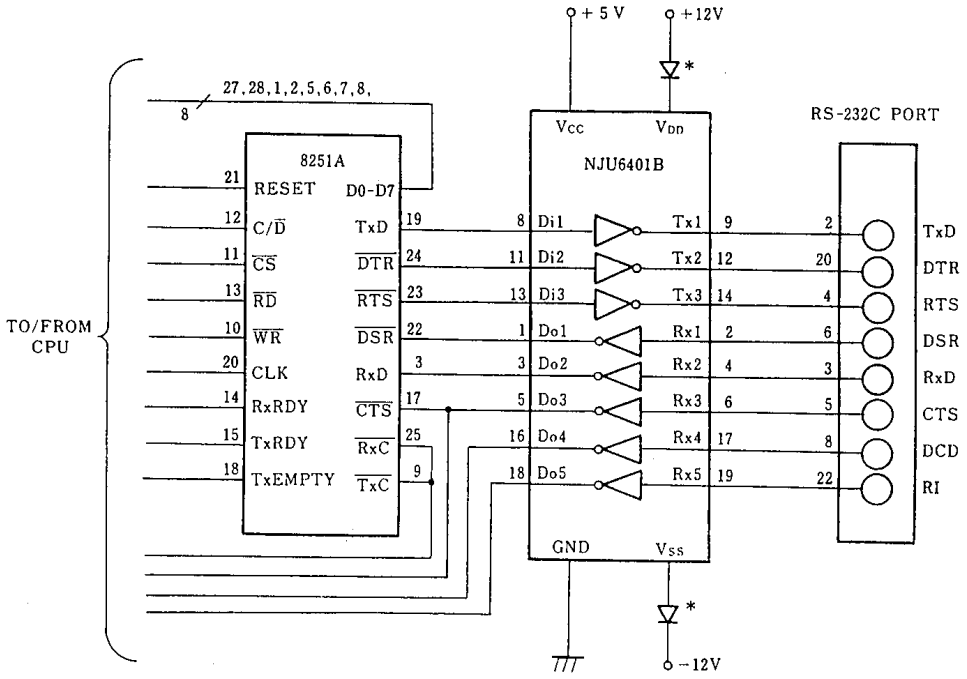
■ APPLICATION CIRCUIT



RS-232C port

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

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