



RS232C LINE DRIVER/RECEIVER

■ GENERAL DESCRIPTION

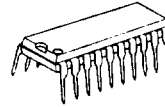
The NJU6401B is a RS232C line driver/receiver composed of 3 drivers and 5 receivers.

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

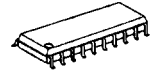
The receivers accept the input levels both of RS-232C standard minimum requirement level ($\pm 3V$) and TTL level.

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

■ PACKAGE OUTLINE



NJU6401BD

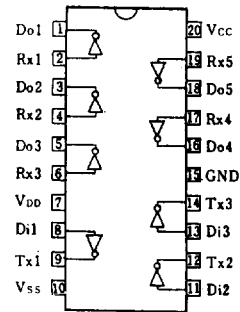


NJU6401BM

■ FEATURES

- Based on the RS232C Standard
- 3 Drivers and 5 Receivers
- Low Operating Current
- Driver Output Voltage --- $\pm 25V$
- Receiver Input Voltage --- $\pm 27V$
- Output Impedance at Power-off (Driver) --- 300Ω (Min)
- Slew Rate (Driver) --- $30V/\mu s$ (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

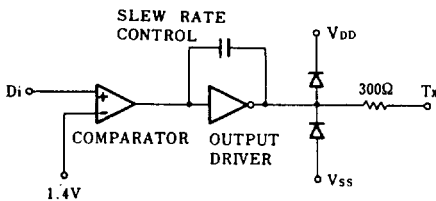
■ PIN CONFIGURATION



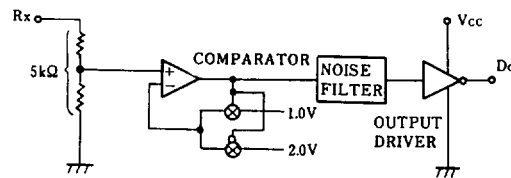
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■ BLOCK DIAGRAM

(1) Driver Section (1-circuit)



(2) Receiver Section (1-circuit)




■ TERMINAL DESCRIPTION

NO.	SYMBOL	F U N C T I O N	NO.	SYMBOL	F U N C T I O N
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 $30V/\mu s(6V/\mu s \text{ typ})$, 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 $\pm 25V$ impressed from outside.

(2) Receiver Section

The input of each receiver incorporate the resistor(TYP:5k Ω) as the drivers load. This resistor also protect the internal circuits against the overvoltage of $\pm 27V$. The receiver accept the both of $\pm 3V$ 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 $3\mu s$ 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°C)

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	V _{RI}	±27	V
	Output Voltage	V _{DO}	-0.3 ~ V _{CC} +0.3	V
Driver	Input Voltage	V _{DI}	-0.3 ~ V _{CC} +0.3	V
	Output Voltage	V _{TX}	±25	V
	Output Current	I _{TX}	±60	mA
Power Dissipation		P _D	DIP 500	mW
Operating Temperature		T _{opr}	- 20 ~ + 75	°C
Storage Temperature		T _{stg}	- 65 ~ + 150	°C

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°C)

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

■ DRIVER ELECTRICAL CHARACTERISTICS

 (Ta=25°C, 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}			2.0			V
	V _{IL}					0.8	
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	3.0			V
			V _{DD} =+9V, V _{SS} =-9V	6.5			
			V _{DD} =+12V, V _{SS} =-12V	9.0			
L Level Output Voltage	V _{OL}	V _{IN} =V _{IH} R _L =3kΩ	V _{DD} =+4.5V, V _{SS} =-4.5V			-3.0	V
			V _{DD} =+9V, V _{SS} =-9V			-6.5	
			V _{DD} =+12V, V _{SS} =-12V			-9.0	
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°C, 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 _{od1}	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 _{od0}	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°C, 4.5 ≤ V_{CC} ≤ 5.5V, V_{DD}=4.5~12V, V_{SS}=-4.5V~-12V, GND=0V)

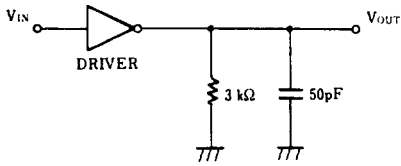
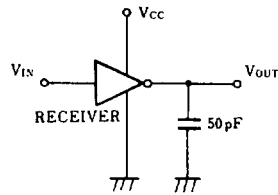
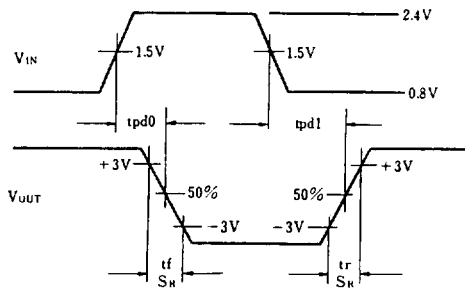
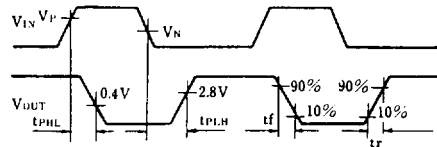
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage H Level L Level	V _P V _N		1.3 0.5	2.0 1.0	2.5 1.7	V
Hysteresis Voltage	V _H			1.0		V
Input Impedance	R _{IN}	V _{IN} =±3V~±12V	3	5	7	kΩ
Output Voltage H Level L Level	V _{OH} V _{OL}	V _{IN} =V _N (Min.), I _{OUT} =-3.2mA V _{IN} =V _P (Max.),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

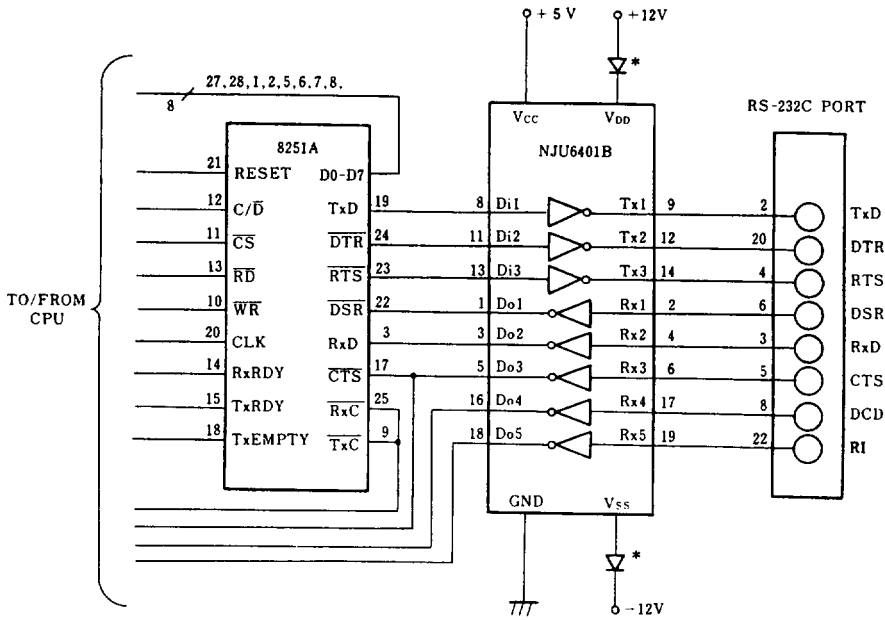
■ RECEIVER AC CHARACTERISTICS

 (Ta=25°C, 4.5 ≤ V_{CC} ≤ 5.5V, V_{DD}=4.5~12V, V_{SS}=-4.5V~-12V, GND=0V, C_L=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 t_r=t_f=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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