

16-BIT SERIAL TO PARALLEL CONVERTER

■ GENERAL DESCRIPTION

The NJU3716 is a 16-bit serial to parallel converter especially apply to MPU output expander.

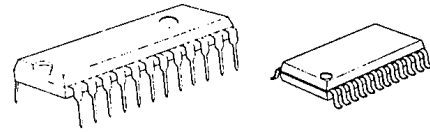
The effective output assignment of MPU is available as the connection between NJU3716 and MPU is required only 4 lines.

Up to 5MHz signal can be input to the serial data input terminal and the data is output from parallel output buffer through serial in parallel out shift register and parallel data latches.

Furthermore, the NJU3716 output the serial data from SO terminal through the shift register, therefore output bit number can increase by cascade connection.

The hysteresis input circuit realized wide noise margin and high drivability output buffer (25mA) can drive LED directly.

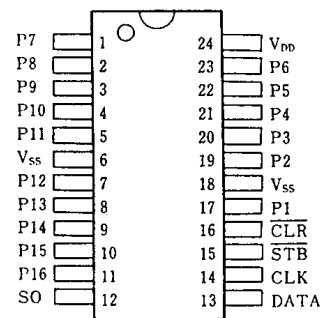
■ PACKAGE OUTLINE



NJU3716L

NJU3716M

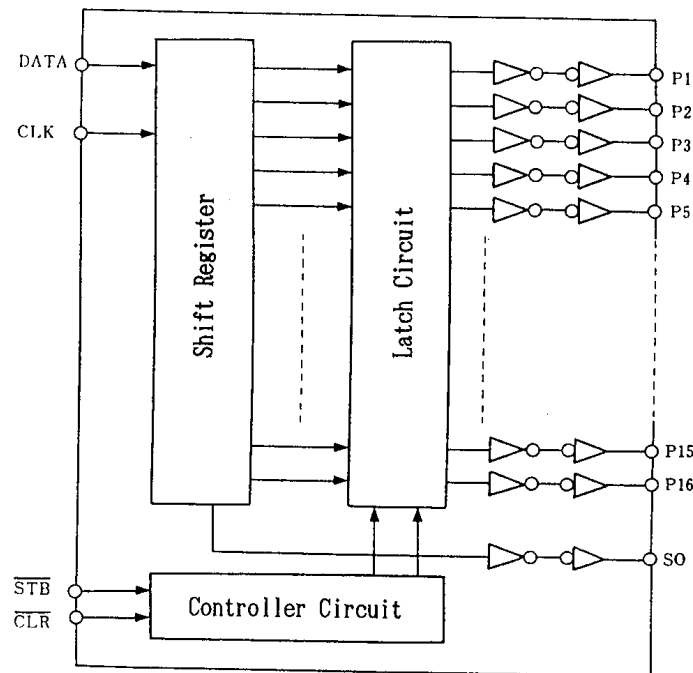
■ PIN CONFIGURATION



■ FEATURES

- 16-Bit Serial In Parallel Out
- Cascade Connection
- Hysteresis Input ---- 0.5V typ
- Operating Voltage ---- 5V±10%
- Operating Frequency ---- 5MHz or more
- Output Current ---- 25mA
- C-MOS Technology
- Package Outline ---- SDIP/DMP 24

■ BLOCK DIAGRAM



■ TERMINAL DESCRIPTION

NO.	SYMBOL	F U N C T I O N	NO.	SYMBOL	F U N C T I O N
1	P7	Parallel Converts Data Output Terminals	13	DATA	Serial Data Input Terminal
2	P8		14	CLK	Clock Signal Input Terminal
3	P9		15	STB	Strobe Signal Input Terminal
4	P10		16	CLR	Clear Signal Input Terminal
5	P11		17	P1	Parallel Converts Data Output Terminals
6	V _{SS}	GND	18	V _{SS}	GND
7	P12	Parallel Converts Data Output Terminals	19	P2	Parallel Converts Data Output Terminals
8	P13		20	P3	
9	P14		21	P4	
10	P15		22	P5	
11	P16		23	P6	
12	S0	Serial Data Output Terminal	24	V _{DD}	Power Supply Terminal

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■ FUNCTIONAL DESCRIPTION
(1) Reset

When the "L" level is input to the $\overline{\text{CLR}}$ terminal, all latches are reset and all parallel conversion output are "L" level.

Normally, the $\overline{\text{CLR}}$ terminal should be "H" level.

(2) Data Transmission

In the $\overline{\text{STB}}$ terminal is "H" level and input the clock signal to the CLK terminal, the serial data input from DATA terminal shift in the shift register by synchronizing at rising edge of the clock signal.

When the $\overline{\text{STB}}$ terminal change to "L" level, the data in the shift register transfer to the latch.

Even if the $\overline{\text{STB}}$ terminal is "L" level, the input clock signal shift the data in the shift register, therefore, the clock signal control is needed.

(3) Cascade Connection

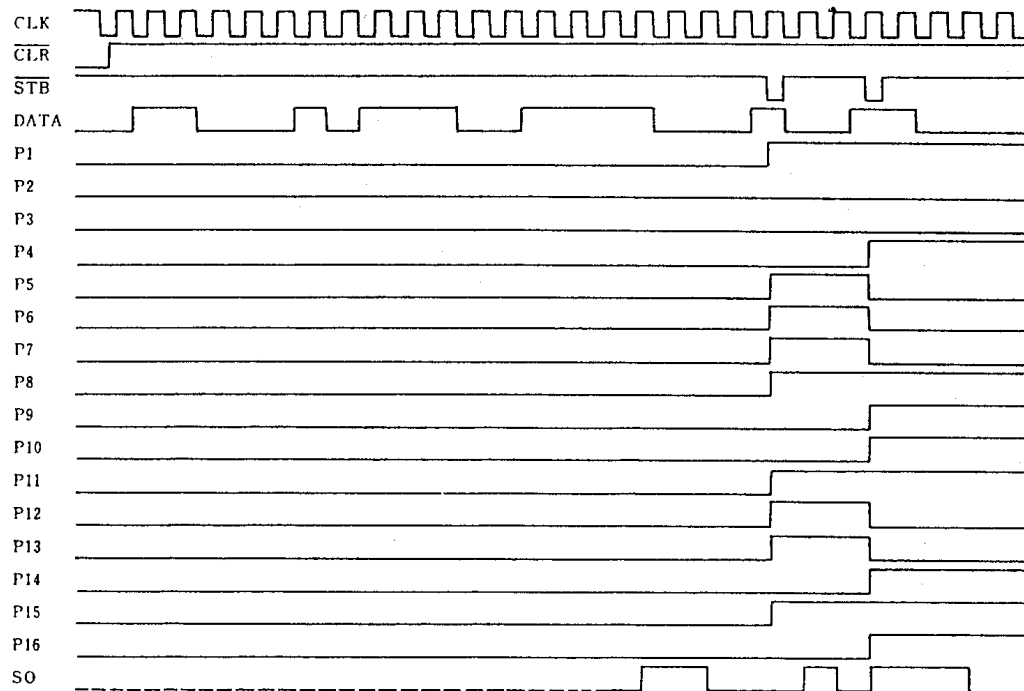
The serial data input from DATA terminal output from the S0 terminal through internal shift register unrelated the $\overline{\text{CLR}}$ and $\overline{\text{STB}}$ status.

Furthermore, the 4 input terminals have a hysteresis characteristics by using the schmitt trigger structure to protect the noise.

CLK	STB	CLR	O P E R A T I O N
X	X	L	All latch are reset (the data in the shift register is no change). All of Parallel convert output are "L".
	H	H	The serial data input from DATA terminal input to the shift register. In this stage, the data in the latch is no change.
L	L	H	The data in the shift register transfer to the latch. And the data in the latch output from parallel output.
H			
	L	H	The CLK input in the $\overline{\text{STB}}$ ="L" and $\overline{\text{CLR}}$ ="H" state, the data shift in the shift register and latched data also change in accordance with the shift register.

Note) X: Don't care

■ TIMING CHART



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■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage Range	V_{DD}	- 0.5 ~ + 7.0	V
Input Voltage Range	V_i	$V_{SS}-0.5 \sim V_{DD}+0.5$	V
Output Voltage Range	V_o	$V_{SS}-0.5 \sim V_{DD}+0.5$	V
Output Current	I_o	± 25	mA
Power Dissipation	P_D	700 (SDIP) 500 (DMP)	mW
Operating Temperature Range	T_{opr}	-25 ~ +85	°C
Storage Temperature Range	T_{stg}	-65 ~ +150	°C

DC ELECTRICAL CHARACTERISTICS

 (V_{DD}=4.5~5.5V, V_{SS}=0V, T_a=25°C)

PARAMETER		SYMBOL	CONDITION		MIN	TYP	MAX	UNIT	
Operating Current		I _{DDs}	V _{IH} =V _{DD} , V _{IL} =V _{SS}				0.1	mA	
Output Voltage	High-Level	V _{OH}	I _{OH} =-0.4mA	SO Terminal	4.0		V _{DD}	V	
	Low-Level	V _{OL}	I _{OL} =+3.2mA		V _{SS}		0.4		
Input Voltage	High-Level	V _{IH}			0.7V _{DD}		V _{DD}	V	
	Low-Level	V _{IL}			V _{SS}		0.3V _{DD}		
Input Leakage Current		I _{LI}	V _I =0~V _{DD}		-10		10	μA	
High-Level Output Voltage		V _{OHD}	I _{OH} =-25mA	P1~P16 Terminals (Note 1)	V _{DD} -1.5		V _{DD}	V	
			I _{OH} =-15mA		V _{DD} -1.0		V _{DD}		
			I _{OH} =-10mA		V _{DD} -0.5		V _{DD}		
Low-Level Output Voltage		V _{OLD}	I _{OL} =+25mA		P1~P16 Terminals (Note 1)	V _{SS}		1.5	V
			I _{OL} =+15mA			V _{SS}		0.8	
			I _{OL} =+10mA			V _{SS}		0.4	
Output Short Current		I _{OS}	V _O =7V, V _I =0V	SO Terminal (Note 2)				10	mA
			V _O =0V, V _I =7V					-10	
		I _{OSD}	V _O =7V, V _I =0V	P1~P16 Terminals (Note 2)				20	mA
			V _O =0V, V _I =7V				-20		

Note 1) Specified value represent output current per pin. When use, total current consideration and less than power dissipation rating operation should be required.

Note 2) V_{DD}=7V, V_{SS}=0V, 1 second per pin.

SWITCHING CHARACTERISTICS

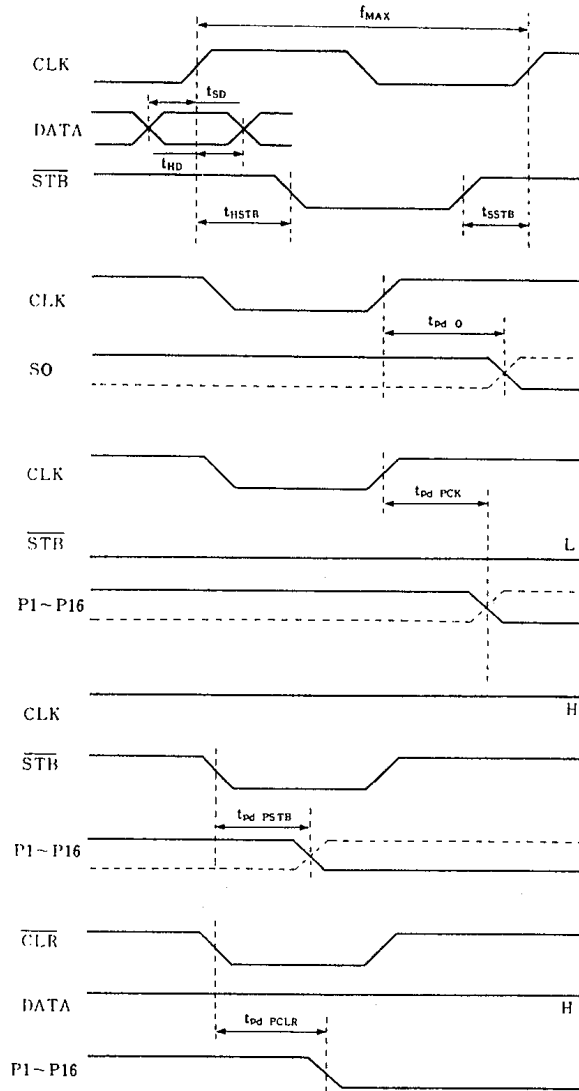
 (V_{DD}=4.5V~5.5V, V_{SS}=0V, T_a=-20~75°C)

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Set-Up Time	t _{SD}	DATA - CLK	20			ns
Hold Time	t _{HD}	CLK - DATA	20			ns
Set-Up Time	t _{SSTB}	STB - CLK	30			ns
Hold Time	t _{HSTB}	CLK - STB	30			ns
Output Delay Time	t _{pdO}	CLK - SO			70	ns
	t _{pdPCK}	CLK - P1~P16			100	ns
	t _{pdPSTB}	STB - P1~P16			80	ns
	t _{pdPCLR}	CLR - P1~P16			80	ns
Max. Operating Frequency	f _{MAX}		5			MHz

*) C_{OUT}=50pF

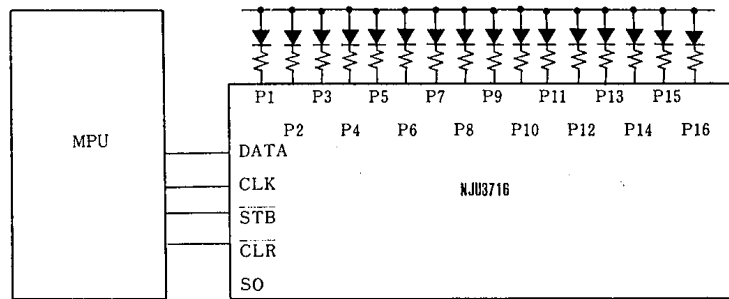
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■ SWITCHING CHARACTERISTICS TEST WAVEFORM



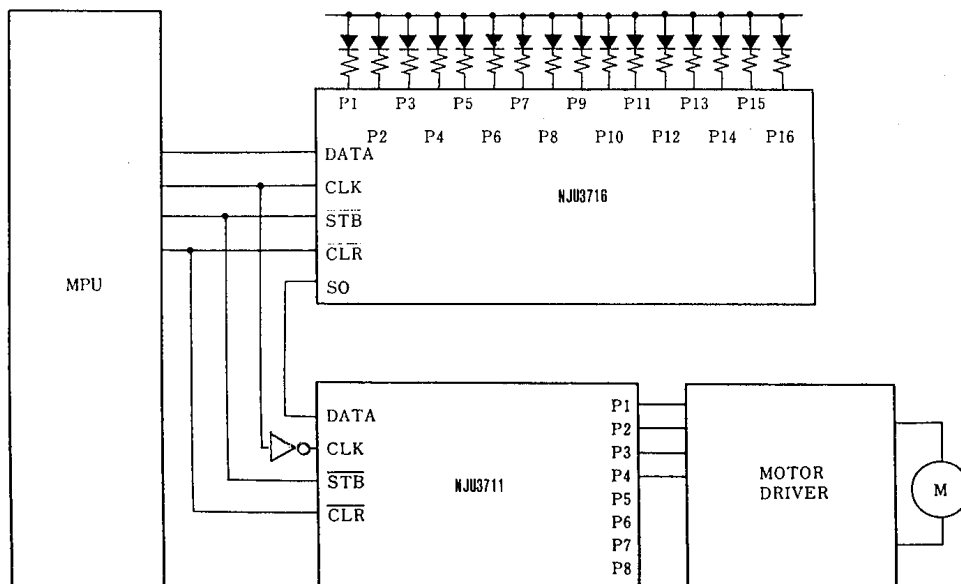
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■ APPLICATION CIRCUIT (1)



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■ APPLICATION CIRCUIT (2) (Combined with NJU3711)



MEMO

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