

# 11-BIT PARALLEL TO SERIAL CONVERTER

## ■ GENERAL DESCRIPTION

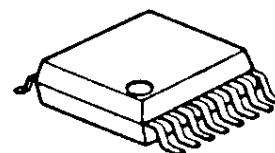
The **NJU3754** is an 11-bit parallel to serial converter especially applying to MCU input port expander. It can operate from 2.7V to 5.5V.

The **NJU3754** requires only 3-port of MCU for data transmission and realizes the effective input port assignment.

The status of the input ports is output through a latch circuit, a shift register and a 3-state buffer as the serial data synchronizing with the serial clock. The hysteresis input circuit of the serial clock terminal realizes 5MHz and more operation.

Furthermore, pull-up resistors on chip of P0 to P10 terminals reduce external components for key-scan circuit, etc.

## ■ PACKAGE OUTLINE

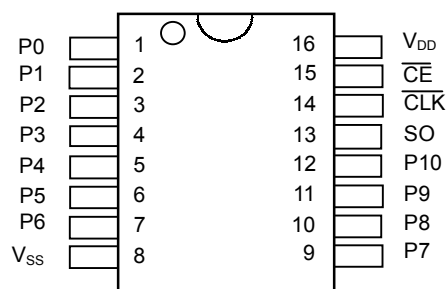


NJU3754V

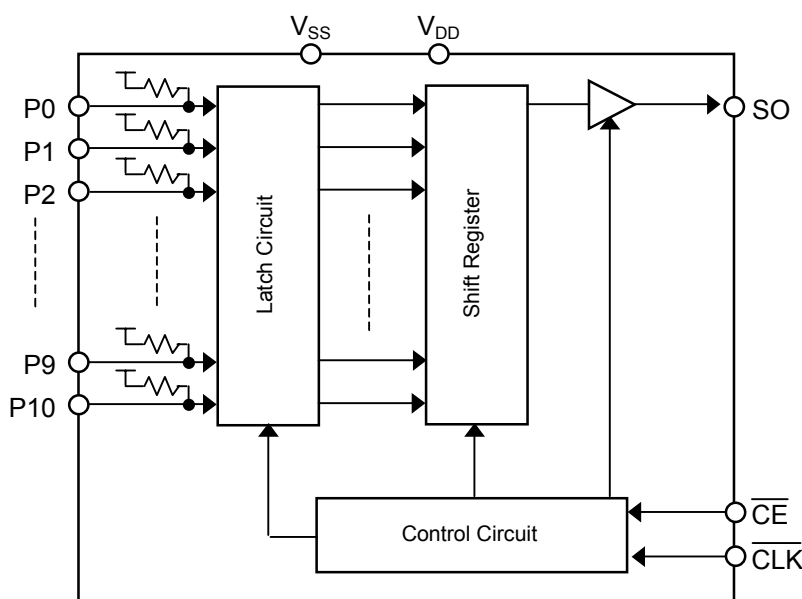
## ■ FEATURES

- 11-Bit Parallel In Serial Out
- 3-line Serial Interface Output
- Hysteresis Input 0.5V typ at 5V
- Maximum Operating Frequency 5MHz and more
- Operating Voltage 2.7 to 5.5V
- C-MOS Technology
- Package Outline SSOP16

## ■ PIN CONFIGURATION



## ■ BLOCK DIAGRAM



## ■ TERMINAL DESCRIPTION

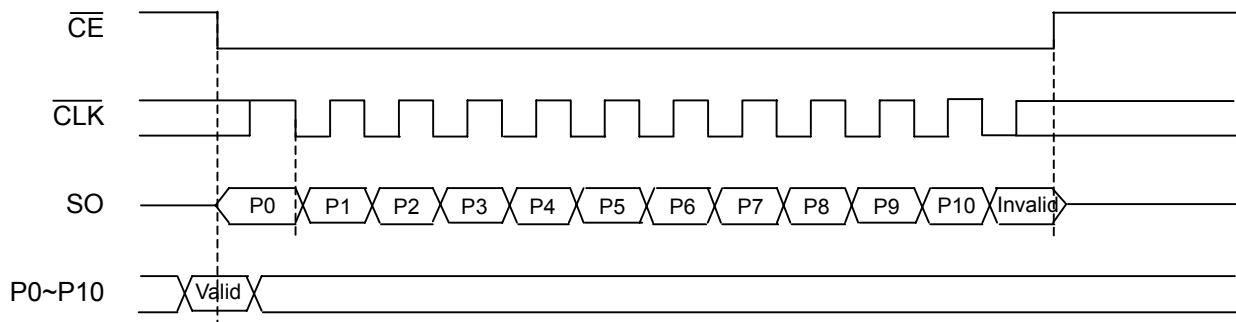
No.	SYMBOL	I/O	FUNCTION
1	P0	I	Parallel Data Input Terminals (with pull-up resistors)
2	P1	I	
3	P2	I	
4	P3	I	
5	P4	I	
6	P5	I	
7	P6	I	
8	V <sub>SS</sub>	-	Ground
9	P7	I	Parallel Data Input Terminals (with pull-up resistors)
10	P8	I	
11	P9	I	
12	P10	I	
13	SO	O	Serial Data Output Terminal
14	CLK	I	Serial Clock Input Terminal
15	$\overline{\text{CE}}$	I	Chip Enable Input Terminal
16	V <sub>DD</sub>	-	Power Supply Terminal (2.7 to 5.5V)

## ■ FUNCTIONAL DESCRIPTION

At the falling edge of  $\overline{\text{CE}}$  terminal, the status of P0 to P10 terminal is latched and transferred to the shift register. At the mean time, the P0 data is output from SO terminal. While  $\overline{\text{CE}}$  terminal is "L", the data from P1 to P10 in the shift register are synchronized with the falling edge of CLK terminal and output from SO terminal.

When  $\overline{\text{CE}}$  terminal is "H", SO terminal is high impedance.

Note 1) If the 11th falling edge and later are input to CLK terminal while  $\overline{\text{CE}}$  is "L", the 12th and the following data are invalid.



## ■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage Range	$V_{DD}$	-0.3 ~ +7.0	V
Input Voltage Range	$V_I$	$V_{SS}-0.3 \sim V_{DD}+0.3$	V
Power Dissipation	$P_D$	300 (SSOP)	mW
Operating Temperature Range	Topr	-40 ~ +85	°C
Storage Temperature Range	Tstg	-65 ~ +150	°C

Note 2) All voltage are relative to  $V_{SS}=0V$  reference.

Note 3) Do not exceed the absolute maximum ratings, otherwise the stress may cause a permanent damage to the IC. It is also recommended that the IC is used in the range specified in the DC electrical characteristics, or the electrical stress may cause malfunctions and impact on the reliability.

Note 4) To stabilize the IC operation, place decoupling capacitor between  $V_{DD}$ - $V_{SS}$ .

## ■ DC ELECTRICAL CHARACTERISTICS

( $V_{DD}=2.7\sim 5.5V$ ,  $V_{SS}=0V$ , Ta=25°C, unless otherwise noted)

PARAMETER	SYMBOL	CONDITION		MIN	TYP	MAX	UNIT
Operating Voltage	V <sub>DD</sub>			2.7	-	5.5	V
Operating Current	I <sub>DD</sub>	V <sub>DD</sub> =5.5V P0~P10=Open CE=H, CLK=L SO=No load		-	-	10	μA
Input Voltage	V <sub>IH</sub>	P0~P10, CLK, CE Terminals		0.7V <sub>DD</sub>	-	V <sub>DD</sub>	V
	V <sub>IL</sub>			V <sub>SS</sub>	-	0.3V <sub>DD</sub>	V
High-level Input Current	I <sub>IH</sub>	V <sub>DD</sub> =5V, V <sub>I</sub> =5V P0~P10, CLK, CE Terminals		-	-	1	μA
Low-level Input Current 1	I <sub>IL1</sub>	V <sub>DD</sub> =5V, V <sub>I</sub> =0V CLK, CE Terminals		-1	-	-	μA
Low-level Input Current 2	I <sub>IL2</sub>	V <sub>DD</sub> =5V, V <sub>I</sub> =0V P0~P10 Terminals		-100	-40	-15	μA
Output Voltage	V <sub>OH</sub>	I <sub>OH</sub> =-0.4mA	SO Terminal	V <sub>DD</sub> -0.4	-	V <sub>DD</sub>	V
	V <sub>OL</sub>	I <sub>OL</sub> =+3.2mA		V <sub>SS</sub>	-	0.4	V
3-State Leakage Current	I <sub>TSL</sub>	SO Terminal CE=H		-2	-	2	μA

## ■ SWITCHING CHARACTERISTICS

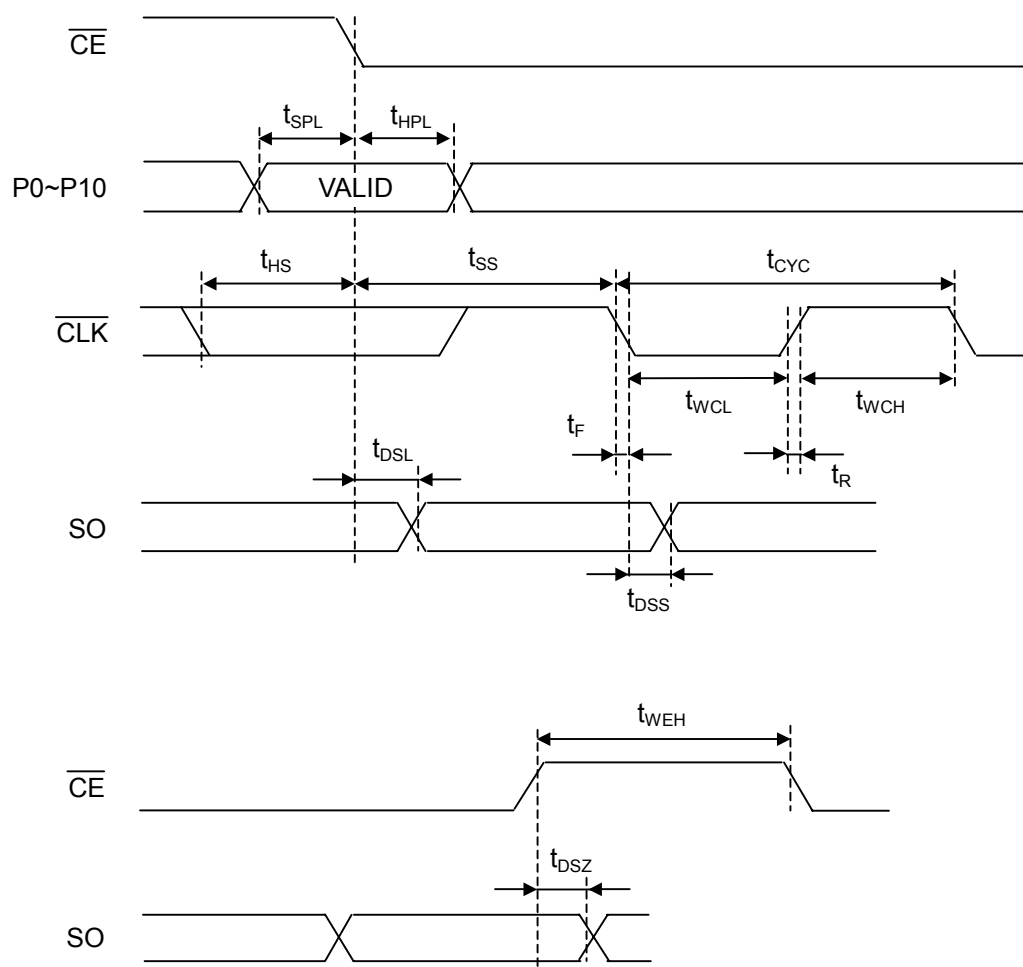
( $V_{DD}=2.7\sim 5.5V$ ,  $V_{SS}=0V$ ,  $T_a=25^\circ C$ , unless otherwise noted)

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
$\overline{CLK}$ Cycle Time	$t_{CYC}$	$\overline{CLK}$	200	-	-	ns
$\overline{CLK}$ Pulse Width (H)	$t_{WCH}$	$\overline{CLK}$	90	-	-	ns
$\overline{CLK}$ Pulse Width (L)	$t_{WCL}$	$\overline{CLK}$	90	-	-	ns
$\overline{CE}$ Pulse Width (H)	$t_{WEH}$	$\overline{CE}$	100	-	-	ns
$\overline{CE}$ Set-up Time before $\overline{CLK}$ Falling	$t_{SS}$	$\overline{CE} - \overline{CLK}$	100	-	-	ns
$\overline{CE}$ Hold Time after $\overline{CLK}$ Falling	$t_{HS}$	$\overline{CLK} - \overline{CE}$	100	-	-	ns
Parallel Data Set-up Time	$t_{SPL}$	$P0\sim P10 - \overline{CE}$	50	-	-	ns
Parallel Data Hold Time	$t_{HPL}$	$\overline{CE} - P0\sim P10$	50	-	-	ns
SO Delay Time after $\overline{CE}$ Falling	$t_{DSL}$	$\overline{CE} - SO$ (Note 6)	-	-	50	ns
SO Delay Time after $\overline{CLK}$ Falling	$t_{DSS}$	$\overline{CLK} - SO$ (Note 6)	-	-	50	ns
SO Hold Time after $\overline{CE}$ Rising	$t_{DSZ}$	$\overline{CE} - SO$ (Note 6)	-	-	20	ns
Rise Time	$t_R$	$\overline{CLK}$ Terminal	-	-	20	ns
Fall Time	$t_F$	$\overline{CLK}, \overline{CE}$ Terminals	-	-	20	ns

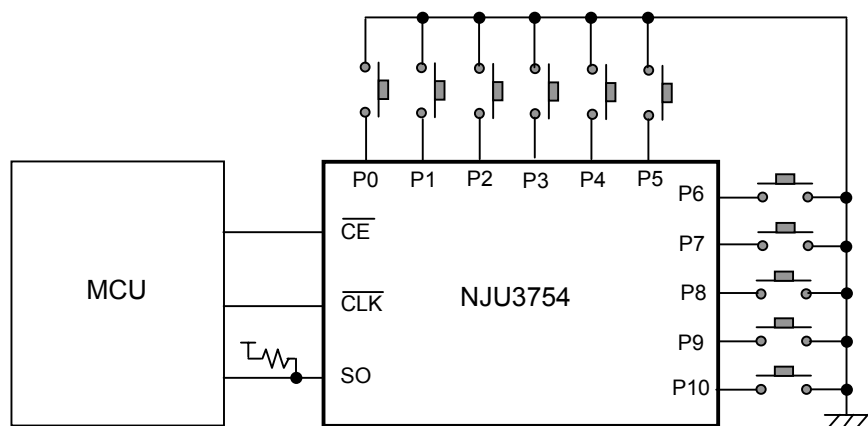
Note 5) A 15k $\Omega$  pull-up or pull-down resistor and a 50pF capacitor on the SO terminal.

Note 6) All timings are based on 30% and 70% voltage level of  $V_{DD}$ .

## ■ TIMING CHARTS



## ■ APPLICATION CIRCUIT



### [CAUTION]

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