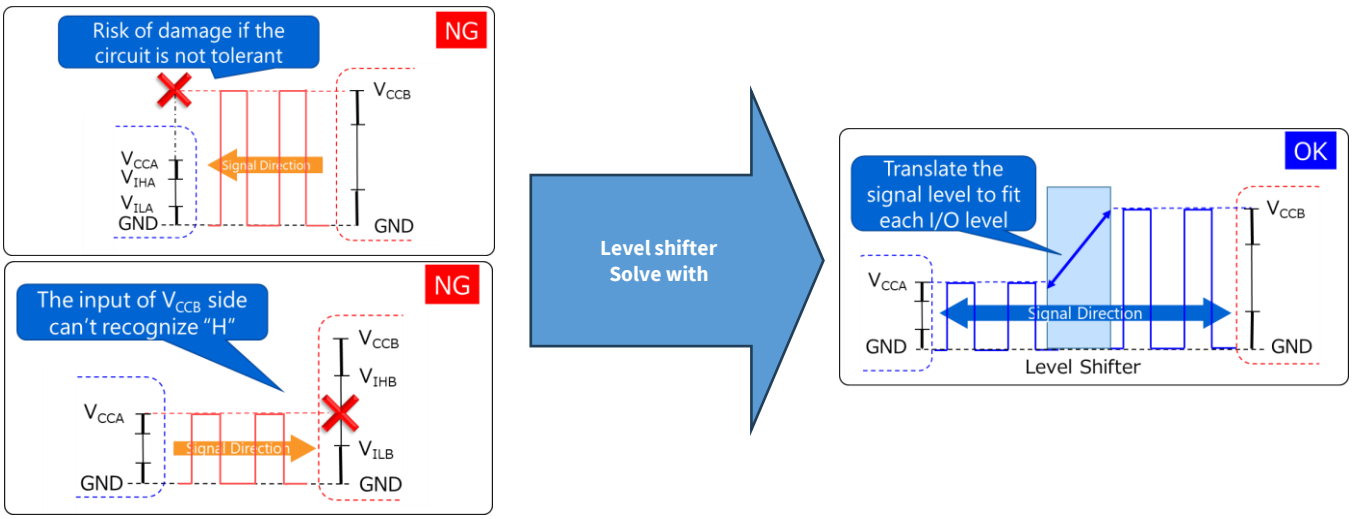
Introduction to Level Shifters (Voltage-Conversion Logic ICs)

A level shifter is an IC that converts voltage. It helps achieve communication between different power supply systems.

Why is a Level Shifter Necessary?

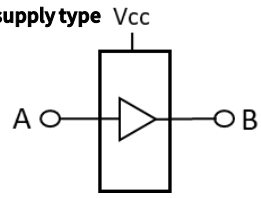
In electronic equipment, System on Chip (SoC) processing is improving because of higher speeds, increased functionality, smaller size, and lower current consumption. As a result, operating voltages are continuously lowering. In contrast, peripheral devices may use existing power supply systems and the signal voltage level at the time of data communication may not match. A level shifter is used as a product to bridge the potential voltage mismatch during this communication.



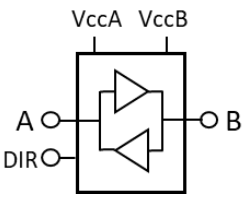
Types of Power Supply for Level Shifters

Level shifters are available in single power supply and dual power supply types. A single power supply type has a simple power circuit, but a narrow voltage conversion range. Dual-power supply types support the power supply voltage on each side and convert the voltage depending on the selected direction. However, the power supply management for IC logical confirmation may be complicated.

Single power supply type products



Dual power supply type product



New products considering power supply management for dual-power supply products

We offer products (74AVC series) that solve power management problems using a dual power supply system. It is characterized by the large-small relationship between the dual-power supplies and the fact that there is no rule in the order of power-on, which facilitates power management.

74AVC Series

0.7V⇔3.6V (Note) level shift transceiver

- The order of ON/OFF of the power supply can be set freely.
- V_{CCA}, V_{CCB} size can be set freely
- Wide operating temp.: Topr= -40 to 125 °C

Here is the link to 74AVC series.→ Click

(Note):74AVC1T45FU, 74AVCH1T45FU, 74AVC2T45FK, 74AVCH2T45FK：support 0.8⇔3.6V translate

Line up

Bit configuration	Product Name
2-bit ×2	74AVC4T245FT 74AVCH4T245FT
1+3-bit	74AVC4T345FT
2-bit	74AVC2T45FK 74AVCH2T45FK
1-bit	74AVC1T45FU/NX 74AVCH1T45FU/NX

Level conversion method and bit expansion

For the level-conversion method, we have developed a bus switch type that enables open-drain communication compatible with I2C communication from a simplified buffer type, and more. Bit expansion is also expanded from 1-bit to 8-bit, and the lineup includes products that can control communication direction control in units of 2bit, compatible with UART communication and products that can control direction with 3bit and 1bit compatible with SPI communication.

Features of Each Series

Simplified selection guide for Toshiba level shifters

Power supply voltage	Type	Communication direction	V_{CCA}	V_{CCB}	Bit	Bit configuration	Product name	Package	Purchase
Single	Buffer	Uni-direction	1.65V to 5.5V	-	4	1bit x 4	74LV4T125FK	US14	Buy Online
							74LV4T125FT	TSSOP14B	Buy Online
							74LV4T126FK	US14	Buy Online
							74LV4T126FT	TSSOP14B	Buy Online
		Uni-direction	1.1V to 2.7V	1.65V to 3.6V	1	1bit	TC7SP3125TU/ TC7SPN3125TU	UF6 (SOT-363F)	Buy Online Buy Online
					2	2bit	TC7WP3125FK/ TC7WPN3125FK	US8 (SOT-765)	Buy Online Buy Online
Dual		Bi-direction ・With DIR	Configurable power supply 0.8V to 3.6V	Configurable power supply 0.8V to 3.6V	2	2bit	74AVC2T45FK/ 74AVCH2T45FK(Note)	US8 (SOT-765)	Buy Online Buy Online
					1	1bit	74AVC1T45FU/ 74AVCH1T45FU(Note)	US6 (SOT-363)	Buy Online Buy Online
			Configurable power supply 0.7V to 3.6V	Configurable power supply 0.7V to 3.6V	1	1bit	74AVC1T45NX/ 74AVCH1T45NX(Note)	XSON6	Buy Online Buy Online
					4	2bit x 2	74AVC4T245FT/ 74AVCH4T245FT(Note)	TSSOP16B	Buy Online Buy Online
					4	3bit 1bit	74AVC4T345FT	TSSOP16B	Buy Online
			Configurable power supply 1.65V to 5.5V	Configurable power supply 1.65V to 5.5V	2	2bit	74LVC2T45FK	US8 (SOT-765)	Buy Online
		Bi-direction ・With DIR	1.1V to 2.7V	1.65V to 3.6V	4	2bit x 2	TC7MP3125FK/ TC7MPN3125FK	US16	Buy Online Buy Online
							TC7MP3125FT/ TC7MPN3125FT	TSSOP16B	Buy Online Buy Online
	Bus Switch	Bi-direction ・No DIR	1.65V to 5.0V	2.3 to 5.5V	1	1bit	TC7SPB9306TU/9307TU	UF6 (SOT-363F)	Buy Online Buy Online
					2	2bit	TC7WPB9306FK/9307FK	US8 (SOT-765)	Buy Online Buy Online
					4	4bit	TC7QPB9306FK/9307FK	US14	Buy Online Buy Online
							TC7QPB9306FT/9307FT	TSSOP14B	Buy Online Buy Online
					8	8bit	TC7MPB9307FK	US20	Buy Online
							TC7MPB9307FT	TSSOP20B	Buy Online

(Note): Products with an “H” after “AVC” in the product name are equipped with a bus-hold function.

TOSHIBA

Package lineup

XSON6	US6(SOT-363)	UF6(SOT-363F)	US8(SOT-765)
			
W : 1.45 mm L : 1.0 mm H : 0.48 mm	W : 2.0 mm L : 2.1mm H : 0.9 mm	W : 2.0 mm L : 2.1 mm H : 0.7 mm	W : 2.0 mm L : 3.1 mm H : 0.7 mm

TSSOP14B	US14	TSSOP16B
		
W : 5.4 mm L : 6.4 mm H : 1.0 mm	W : 4.0 mm L : 4.0 mm H : 0.8 mm	W : 5.4 mm L : 6.4 mm H : 1.0 mm

US16	TSSOP20B	US20
		
W : 4.0 mm L : 4.0 mm H : 0.8 mm	W : 6.5 mm L : 6.4 mm H : 1.0 mm	W : 5.0 mm L : 4.0 mm H : 0.8 mm

Related Links

- **Parametric searches for the products.** Click
- **Application notes** Click
- **FAQ of general-purpose logic IC** Click
- **Online distributor purchase, inventory search page** Click

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