

## Dual-Supply Level Translation

Mismatched I/O voltages between microprocessors and peripheral devices continue to occur as microprocessor I/O voltages migrate to lower nodes, but peripherals maintain higher voltage nodes. Texas Instruments' (TI) new dual-supply level-translation devices allow for communication between two devices that have different interface voltages, while maintaining signal integrity and speed. In the dual-supply product area, there are translators that use either direction-control signals or auto-direction sensing.

### Bidirectional Voltage-Level Translator Solutions Use BGA Package



#### Direction-Control Features

- *Fully configurable rails* — Each  $V_{CC}$  rail is fully configurable from 1.2 V to 3.6 V (AVCxT devices) and from 1.65 V to 5.5 V (LVCxT devices)
- *No power-up sequencing* — Either  $V_{CC}$  can be powered up first (AVCxT and LVCxT devices only)

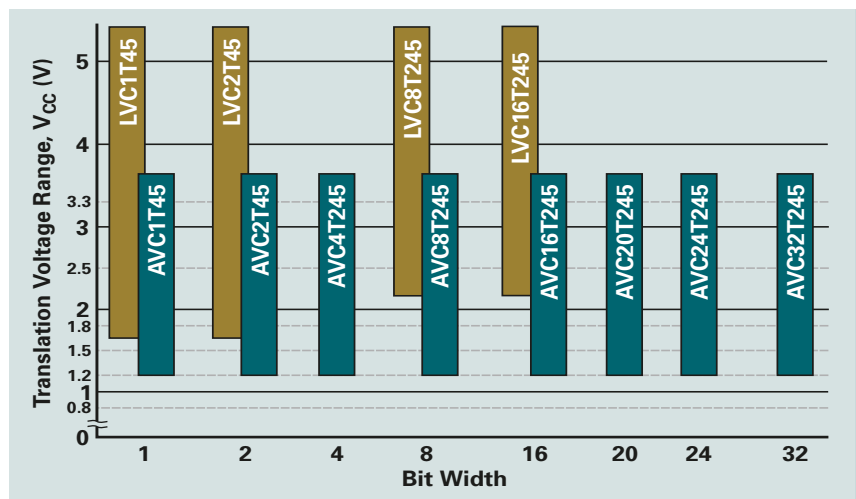
- *Standby mode* — When one  $V_{CC}$  is switched off, all I/O ports are placed in the HiZ mode (AVCxT and LVCxT devices only)

#### Auto-Direction-Sensing Features

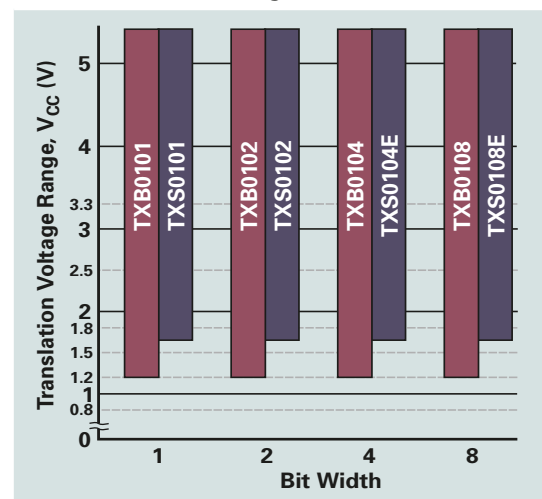
- *Auto-direction sensing* — No direction-control signal needed

- *$V_{CC}$  isolation feature* — If either  $V_{CC}$  input is at GND, all outputs are in the high-impedance state
- *Highly integrated ESD protection* —  $\pm 15$ -kV ESD protection on the B port

#### Direction-Control Devices



#### Auto-Direction-Sensing Devices



## TI's Dual-Supply Portfolio

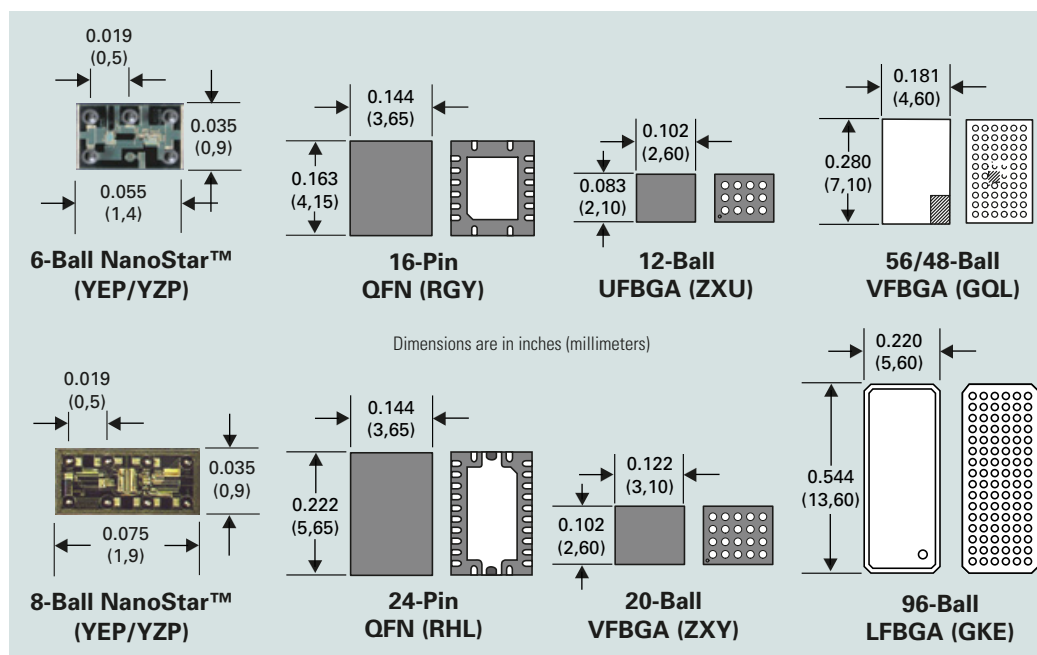
Dual-supply level shifters are the ideal solution for bidirectional level translation. These devices have two separate  $V_{CC}$  supplies, one for each port ( $V_{CCA}$  and  $V_{CCB}$ ), which gives them flexibility to operate in mixed-mode applications. These dual-supply devices

allow for bidirectional level translation between different voltage nodes from 1.2 V to 3.6 V and 1.65 V to 5.5 V. TI also offers a wide range of bit-width options.

	Bit	V <sub>CC</sub> Min. to Max. (V)		V <sub>CCA</sub> (V)							V <sub>CCB</sub> (V)							
Device	Width	V <sub>CCA</sub>	V <sub>CCB</sub>	1.2	1.5	1.8	2.5	2.7	3.3	5	1.2	1.5	1.8	2.5	2.7	3.3	5	Smallest Package
SN74AVC1T45 <sup>1</sup>	1	1.2 to 3.6	1.2 to 3.6	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		6-ball NanoStar™/NanoFree™
SN74LVC1T45	1	1.65 to 5.5	1.65 to 5.5			✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	6-ball NanoStar/NanoFree
TXB0101	1	1.2 to 3.6	1.65 to 5.5	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	6-ball NanoFree
TXS0101	1	1.65 to 3.6	2.3 to 5.5			✓	✓	✓	✓					✓	✓	✓	✓	6-ball NanoFree
SN74AVC2T45 <sup>1</sup>	2	1.2 to 3.6	1.2 to 3.6	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		8-ball NanoStar/NanoFree
SN74LVC2T45	2	1.65 to 5.5	1.65 to 5.5			✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	8-ball NanoStar/NanoFree
TXB0102	2	1.2 to 3.6	1.65 to 5.5	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	8-ball NanoFree
TXS0102	2	1.65 to 3.6	2.3 to 5.5			✓	✓	✓	✓					✓	✓	✓	✓	8-ball NanoFree
SN74AVC4T245 <sup>1</sup>	4	1.2 to 3.6	1.2 to 3.6	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		16-pin QFN
TXB0104	4	1.2 to 3.6	1.65 to 5.5	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	12-ball UFBGA
TXS0104E	4	1.65 to 3.6	2.3 to 5.5			✓	✓	✓	✓					✓	✓	✓	✓	12-ball UFBGA
SN74AVC8T245 <sup>1</sup>	8	1.2 to 3.6	1.2 to 3.6	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		24-pin QFN
SN74LVC8T245 <sup>1</sup>	8	1.65 to 5.5	1.65 to 5.5			✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	24-pin QFN
TXB0108	8	1.2 to 3.6	1.65 to 5.5	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	20-ball VFBGA
TXS0108E	8	1.65 to 3.6	2.3 to 5.5			✓	✓	✓	✓					✓	✓	✓	✓	20-ball VFBGA
SN74AVC16T245 <sup>1</sup>	16	1.2 to 3.6	1.2 to 3.6	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		56-ball VFBGA
SN74LVC16T245 <sup>1</sup>	16	1.65 to 5.5	1.65 to 5.5			✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	56-ball VFBGA
SN74AVC20T245 <sup>1</sup>	20	1.2 to 3.6	1.2 to 3.6	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		56-ball VFBGA
SN74AVC24T245 <sup>1</sup>	24	1.2 to 3.6	1.2 to 3.6	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		83-ball LFBGA
SN74AVC32T245 <sup>1</sup>	32	1.2 to 3.6	1.2 to 3.6	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		96-ball LFBGA

<sup>1</sup>Bus hold option available.

## Packages Available



## For More Information

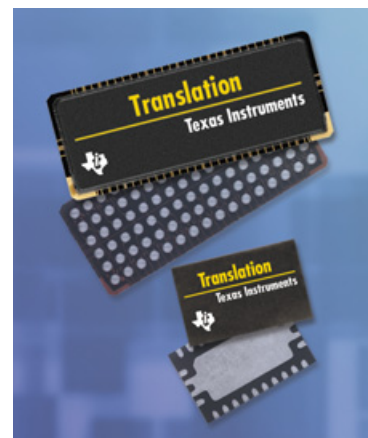
Translation Home Page:

[www.ti.com/trans](http://www.ti.com/trans)

Translation Selection Tool:

[www.ti.com/transtool](http://www.ti.com/transtool)

## BGA and QFN Packages



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