Secure Digital (SD) 3.0 compliant bi-directional dual voltage level translator with an integrated auto-direction control, EMI filter and ESD protection

The increase in storage capacity and access speed for use in communication, consumer and computing system applications including smartphone handsets, notebooks, SD/MicroSD card readers, wireless access points. The clock rate requirement to support fastest SD card interface is SD 3.0 SDR104.

NXS0506UP, NXS0506GU - a unique voltage level shifter for SD 3.0-compliant memory cards with integrated ESD/EMI protection. The device is designed to operate at clock frequencies of up to 208 MHz and data rates of up to 104 Mbps. The NXS0506 is the industry's smallest SD 3.0 card level shifter supporting the ultra-high speed SDR104 mode, helping consumers to safely experience the faster data rates offered by SD 3.0 memory card solutions.

Nexperia's newest voltage-level translator is the first device on the market to support the new standard, giving system designers a head-start in developing portable applications with increased storage space and faster access to multimedia content, including music, videos, and pictures etc.

The NXS0506 is housed in a very small wafer-level chip-scale package (16-ball 0.35mm pitch), which saves PCB space. The design architecture minimizes the external component count to zero. This simplifies designs and reduces the total costs for consumer electronic devices such as cell phones, tablets, cameras, set-top boxes and game pads.

Applications
- › Mobile Phones, Tablets, Laptops
- › Digital Cameras,
- › Set-top boxes
- › Game pads
- › SD/MicroSD card readers,
- › 5G - Femtocells
- › Surveillance systems
- › Automotive driver monitoring systems, Navigation systems
- › IOT
- › Medical systems

nexperia

EFFICIENCY WINS.

Features

› Provides bidirectional voltage translation without the need for direction pin (Auto direction Sensing)
› 1.2 V to 1.8 V HOST side interface voltage support
› Supports up to 208 MHz clock rate
› SD 3.0 specification-compliant voltage translation to support SDR104, SDR50, DDR50, SDR25, SDR12, high-speed and default-speed modes
› Low power consumption
› Integrated 8 kV ESD protection according to IEC 61000-4-2, level 4 on card side
› 5V tolerant I/O ports to support mixed-mode signal operation
› Data and CMD channels are easily swappable without impact on functionality of NXS0506
› Channel to channel skew < 200 ps

The bidirectional level translator shifts the data between the I/O supply levels of the HOST and the Memory Card. Auto direction sensing circuitry determines if a command and data signals are transferred from the memory card to the host (card read mode) or from the host to the memory card (card write mode). NXS0506 supports several clock and data transfer rates at the signaling levels specified in the SD 3.0 standard specification.

Benefits

› Fastest SD card Interface available
› Supports latest SD card class
› IEC61000-4-2, level 4 on card side
› Integrated 8 kV ESD protection according to IEC 61000-4-2, level 4 on card side
› Enables fast data transfers
› Integrated pull-up and pull-down resistors reduce the BOM Cost
› Integrated EMI filters suppress higher harmonics of digital I/Os
› Level shifting buffers keep ESD stress away from the HOST
› Direct connection to latest host CPU/SOC ASICS

Bus Speed Mode	Signal Level (V)	Clock rate (MHz)	Data rate (MB/s)
Default speed	3.3	25	12.5
High - Speed	3.3	50	25
SDR12	1.8	25	12.5
SDR25	1.8	50	25
SDR50	1.8	100	50
SDR104	1.8	208	104
DDR50	1.8	50	50
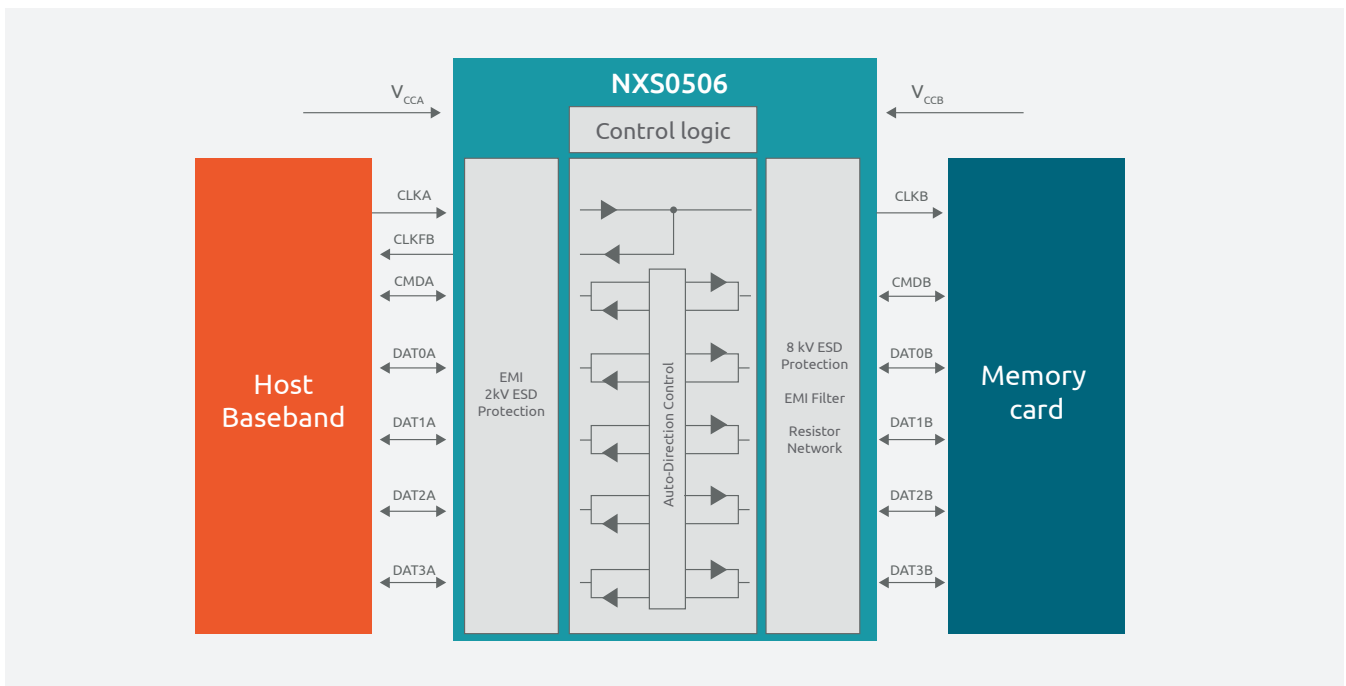
NXS0506 comes with auto-enable feature. If the supply voltage at Memory card side (V_{CCB}) rises above 1.5 V, the level translator logic is enabled automatically. As soon as V_{CCB} drops below 0.65 V, the memory card side drivers and the level translator logic are disabled. The device features an auto correction control for all data channels except CLK.
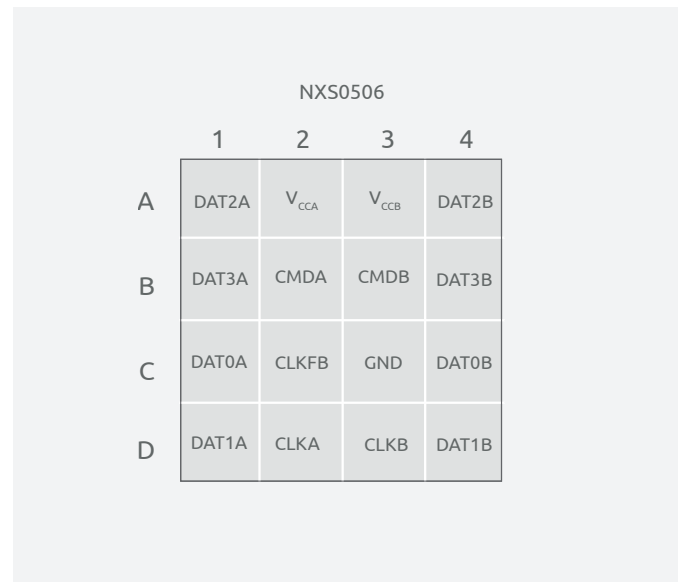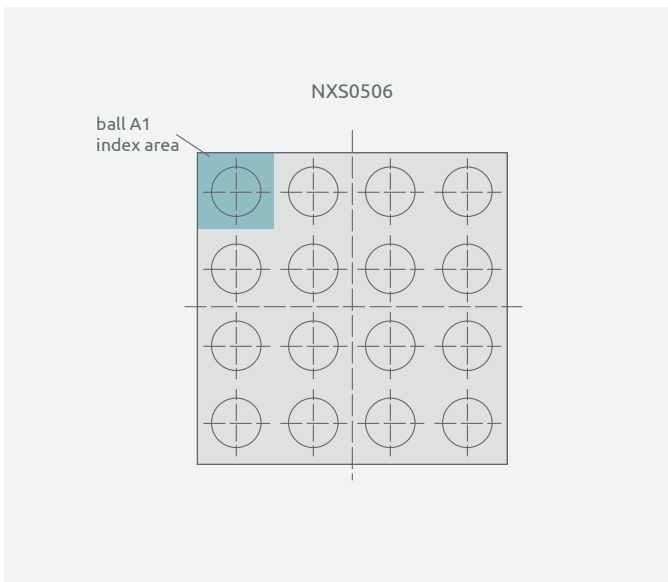
For these pins, the direction of data flow is sensed by the direction control logic and the output drivers are controlled accordingly. There is no need for the host interface to indicate the direction of data flow enabling Bidirectional voltage translation without the need for direction pin.
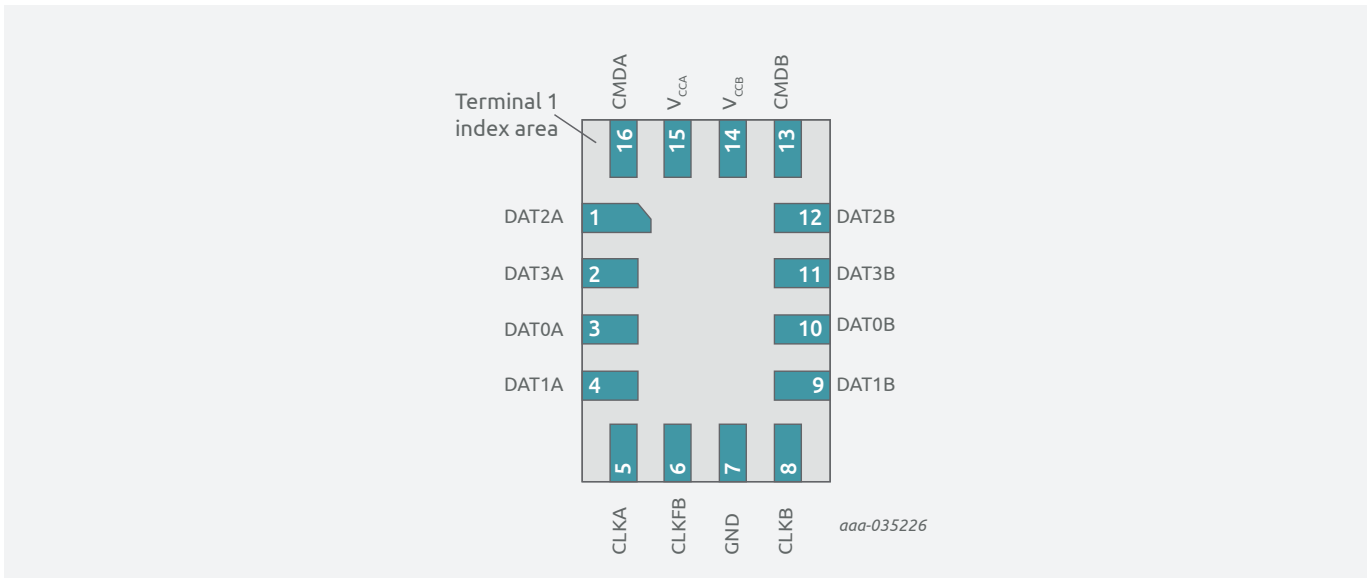
The clock is always transmitted from the host to the memory card side and the data in the timing critical read mode comes from the card. The voltage translator and the PCB (Printed-Circuit Board) tracks introduce some amount of delay. The timing margin is reduced for data to be read back from memory card, especially at higher data rates. In order to compensate for the delay a feedback paths is introduced.

Product	Description	V_{CCA}(V)	V_{CCB} (V)	Tamb (°C)	Package
NXS0506UP	SD 3.0-compatible memory card integrated auto-direction control and level translator with EMI filter and ESD protection	1.1 – 1.95	1.7 – 3.6	-40 °C to +85 °C	WLCSP16P
NXS0506GU	SD 3.0-compatible memory card integrated auto-direction control and level translator with EMI filter and ESD protection	1.1 – 1.95	1.7 – 3.6	-40 °C to +85 °C	XQFN16
NXS0506GU-Q100	SD 3.0-compatible memory card integrated auto-direction control and level translator with EMI filter and ESD protection	1.1 – 1.95	1.7 – 3.6	-40 °C to +125 °C	XQFN16

Pin Configuration SOT8025-1 (WLCSP16)

NXS0506

ball A1 index area

Ball Mapping SOT8025-1 (WLCSP16)

NXS0506

	1	2	3	4
A	DAT2A	V_{CCA}	V_{CCB}	DAT2B
B	DAT3A	CMDA	CMDB	DAT3B
C	DAT0A	CLKFB	GND	DAT0B
D	DAT1A	CLKA	CLKB	DAT1B

Pin Configuration SOT1161-1 (XQFN16)

Terminal 1 index area

Top pins (16–13)	CMDA	V_{CCA}	V_{CCB}	CMDB
	16	15	14	13

DAT2A — 1   12 — DAT2B
DAT3A — 2   11 — DAT3B
DAT0A — 3   10 — DAT0B
DAT1A — 4   9 — DAT1B

Bottom pins: 5 CLKA, 6 CLKFB, 7 GND, 8 CLKB

aaa-035226

SOT	Package suffix	No of balls / pins	Package dimensions (mm)	Pitch (mm)	Package
SOT8025-1	UP	16	1.4555 x 1.4555 x 0.43	0.35	
SOT1161-1	GU	16	1.80 × 2.60 × 0.50	0.4	