STHVUP32

32-channel pulser with integrated beamformer channel

Very integrated ultrasound transmitter to enhance portability for compact ultrasound systems

With an advanced 32-channel beamforming control unit, the STHVUP32 embeds two half-bridges (±100 V, 0.4/0.8 A) and 3- or 5-level outputs in addition to fully integrated Tx/Rx switches and clamp functions for each channel.

Optimized for portable ultrasound topologies for use in point-of-care testing areas and emergency units, it offers excellent design opportunities for compact scanner solutions.

Available in a 168-ball FC-BGA package (11.5x10.5 mm).

KEY FEATURES & BENEFITS

- 0 to 200 V output signal (peak-to-peak)
- Self-biased gate driver architecture, no filtering capacitors required
- Pulsed wave (PW) and continuous wave (CW) mode operations
  - Programmable ±200 mA or ±400 mA or ±800 mA source and sink current in 3-level configuration
- Fully integrated, true clamping to ground
- Fully integrated TX/RX switches
- Programmable power management to optimize performance in ultra-portable applications
- Beamforming in TX mode
  - Programmable single-channel delay for beam steering and beam focusing
  - Clock frequency up to 200 MHz
  - 5ns delay resolution
- Embedded memory to store transmission patterns
  - 32 states for waveform definition
  - Waveforms compression algorithm
- Easy driving control
  - Control through standard Quad Serial Peripheral Interface (QSPI)
- Checksum control
- Very low package thermal resistance

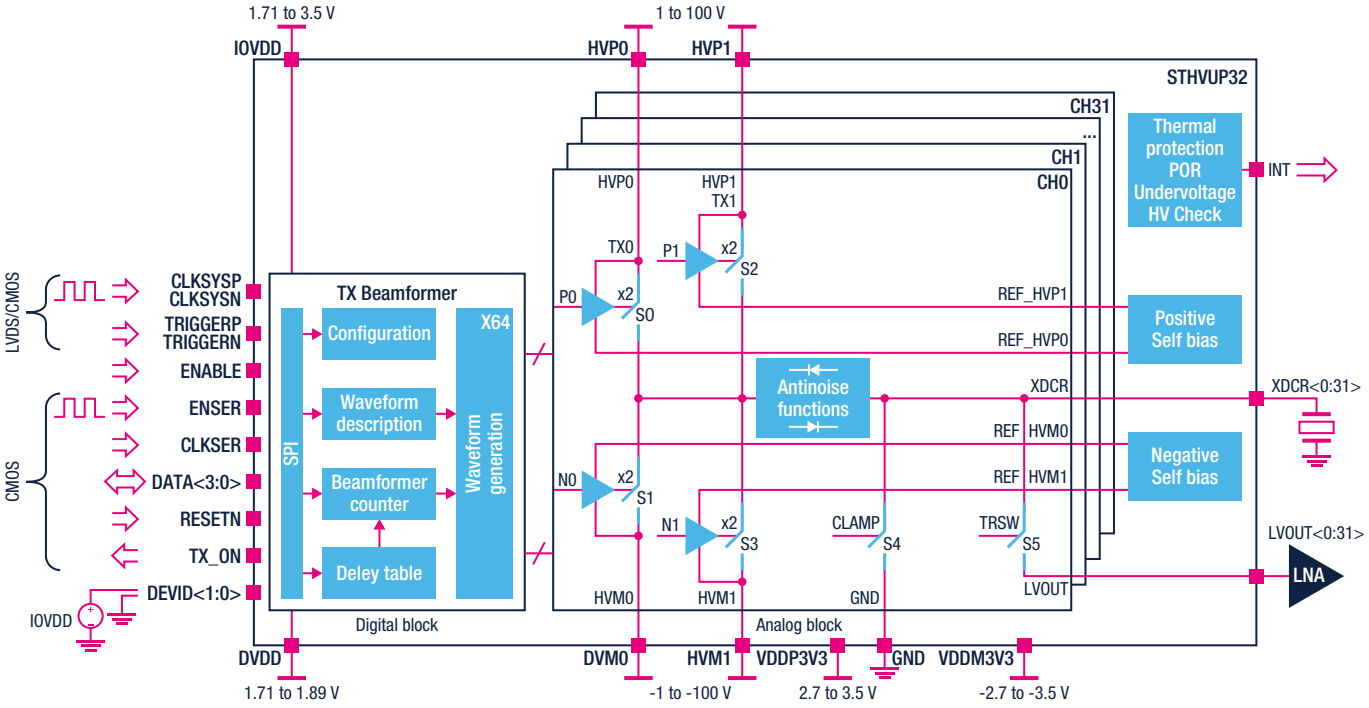
KEY APPLICATIONS

- Ultra-portable ultrasound imaging
- Medical ultrasound imaging
- Pulse waveform generators
- Piezoelectric transducer drivers

Device description

The STHVUP32 is monolithic, high-voltage and high-speed pulse generator features a beamformer with 32 independent channels for pulse generation in multi-channel medical ultrasound applications for portable low-power imaging systems.
A pure analog section provides each channel four half-bridges (four high-voltage P-channel and four high-voltage N-channel MOSFETs), a clamping-to-ground circuit and a transmitting/receiving switch structure which guarantees an effective isolation during the transmission phase. Each channel features also integrated high-voltage level translators, noise blocking diodes and an anti-leakage circuit.
Through a dedicated bit, channels can be programmed as a 3-or 5-level output. In 3-level mode, the four half-bridges are driven in parallel to provide a default peak current of 800 mA. However, it is also possible to program a low-consumption mode to decrease the overall power consumption: in this case, it is possible to use only one, two or three half-bridges, therefore the peak current can be reduced to 200, 400 or 600 mA respectively. In 5-level mode, the four half-bridges can be driven independently, and each half-bridge has a current capability of 200 mA. The clamp circuit, used to force the XDCR[31:0] output pins down to GND, has a resistance of 23 Ω and a peak current capability of 0.64 A. The 32 independent Tx/Rx switches can be used in a multiplexing configuration.
The STHVUP32 also includes thermal protection circuits, undervoltage checks on VDDP3V3, VDDM3V3 and DVDD, a power-on-reset (POR) on DVDD and a global self-biased high-voltage MOSFET gate driver with internal check of the correct value and of the HV supplies.
All functions are managed by a digital core working at a maximum clock frequency of 200 MHz. This block manages the delay profiles used in the beamformer, the waveform generation and the various global settings and ensures that all device operations are performed in the correct sequence.

Application block diagram



Main specifications

Order code	Package	Max HV	Max Ipeak	TRSW	Sys CLK	Serial interface	HD2	Min state duration
STHVUP32	168-ball FC-BGA 11.5x10.5x1.35 mm	200 Vpp	800 mA	R = 23 Ω C = 36 pF	200 MHz	Compatible with QSPI, single data wire and double data wires SPI	-40 dB (@ 5 MHz/HV = ±40 V)	5 ns