16 channel ±100 V, ±2/±4 A, 5/3 level with RTZ, T/R switch, high-speed ultrasound pulser with integrated transmit beamformer



Product status link
STHV1600

Product summary	
Order code	STHV1600
Package	LFBGA-144 10x10x1.4
Packing	Tray

Features

- 0 to 200 V peak-to-peak output signal
- Up to 30 MHz operating frequency
- Gate driver self-biased architecture; no filtering capacitors required
- Pulsed wave (PW) mode operation:
  - 5/3 level output
  - ±2 A / ±4 A source and sink current
- Continuous wave (CW) mode operation:
  - 150 mW power consumption/channel
  - 270 fs RMS jitter (100 Hz-20 kHz)
  - -147 dBc/Hz @ 1 kHz phase noise
- Elastography mode operation
- Fully integrated real clamping-to-ground function
  - 11 Ω synchronous active clamp
  - ±2 A source and sink current
- Fully integrated T/R switch
  - 9 Ω ON resistance
  - 28 pF parasitic capacitance
  - Compliant with receiver multiplexing function
- Auxiliary integrated circuits
  - Noise blocking diode function
  - Recirculation current protection
  - Anti-memory feature
  - Thermal protection
  - Undervoltage protection and bias supply checks
- Programmable power management to optimize the performance into a probe
- TX Beamforming
  - Programmable channels delay for beam-steering and beam-focusing
  - Clock frequency up to 200 MHz
  - Delay from 0 to 327 µs with 5 ns resolution at 200MHz
  - 425 ns minimum delay table writing time
- Embedded volatile memory to store transmission patterns
  - 64 kbit (256 rows x 16 bits per channel)
  - Waveform compression and repetition algorithm
- Easy driving control
  - Device control via serial interface
  - Few input signals to drive several devices
  - Diagnostic interrupt output
  - Single trigger input with anti-glitch to manage TX/RX
- Checksum and parity check
- Very low thermal resistance
- Latch-up free thanks to HV SOI technology
- Only a few passive components required

- differential or rail-to-rail single-ended digital inputs (e.g. LVDS, LVPECL, VML, CML or CMOS)

Applications

- Medical ultrasound imaging
- Pulse waveform generators
- NDT ultrasound transmission
- Piezoelectric transducer drivers

Description

This monolithic, high-speed transmitter features 16 independent channels with built-in digital beamforming, that generates 5-Level high voltage pulses (up to ±100 V) suitable to excite multiple channels of an ultrasound transducer.

Each analog channel structure integrates an active RTZ circuit (Clamp) and a T/R switch guaranteeing high OFF isolation between the high-voltage transmitter and the low-voltage receiver when the pulser is transmitting. T/R switches turn ON while receiving echo signals connecting the transducer to the receiver.

Each channels host two independent half bridges (TX0 and TX1) capable of up to ±2A peak output current in 3 or 5 levels configuration. These half bridges can be put in parallel so to provide 3-level profiles up to ±4A current capability on all 16 outputs.

Anti-leakage, anti-memory block, thermal sensors and recirculation current protection features complete the architecture.

Beamforming in ultrasound transmission has traditionally been implemented using analog delay lines. The STHV1600 embeds a digital beamforming mode allowing to program accurate steering of all channels with a resolution as low as 5ns: the signal from each individual transducer element is properly delayed in order to steer the beam in the desired direction.

Both the digital state machine and serial communication interface can be clocked up to 200MHz with differential or rail-to-rail single-ended embedded options.

A generous memory allows to store several patterns to drive output channels with desired code excitation. Suitable registers allow handling of all device operations in the proper sequence and managing device diagnostic features.

Twelve low voltage capacitors are embedded in the package to reduce the external BoM.

STHV1600 is available in a 10mm x 10mm x 1.4mm 144 pins 0.8mm pitch LFBGA package and is specified for operation from 0°C to 80°C.

Revision history

Table 1. **Document revision history**

Date	Version	Changes
05-Jul-2018	1	Initial release.
12-May-2020	2	Updated coverpage, package, photo, product summary table, part number, features and description

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