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Products and solutions for Medical Ultrasound





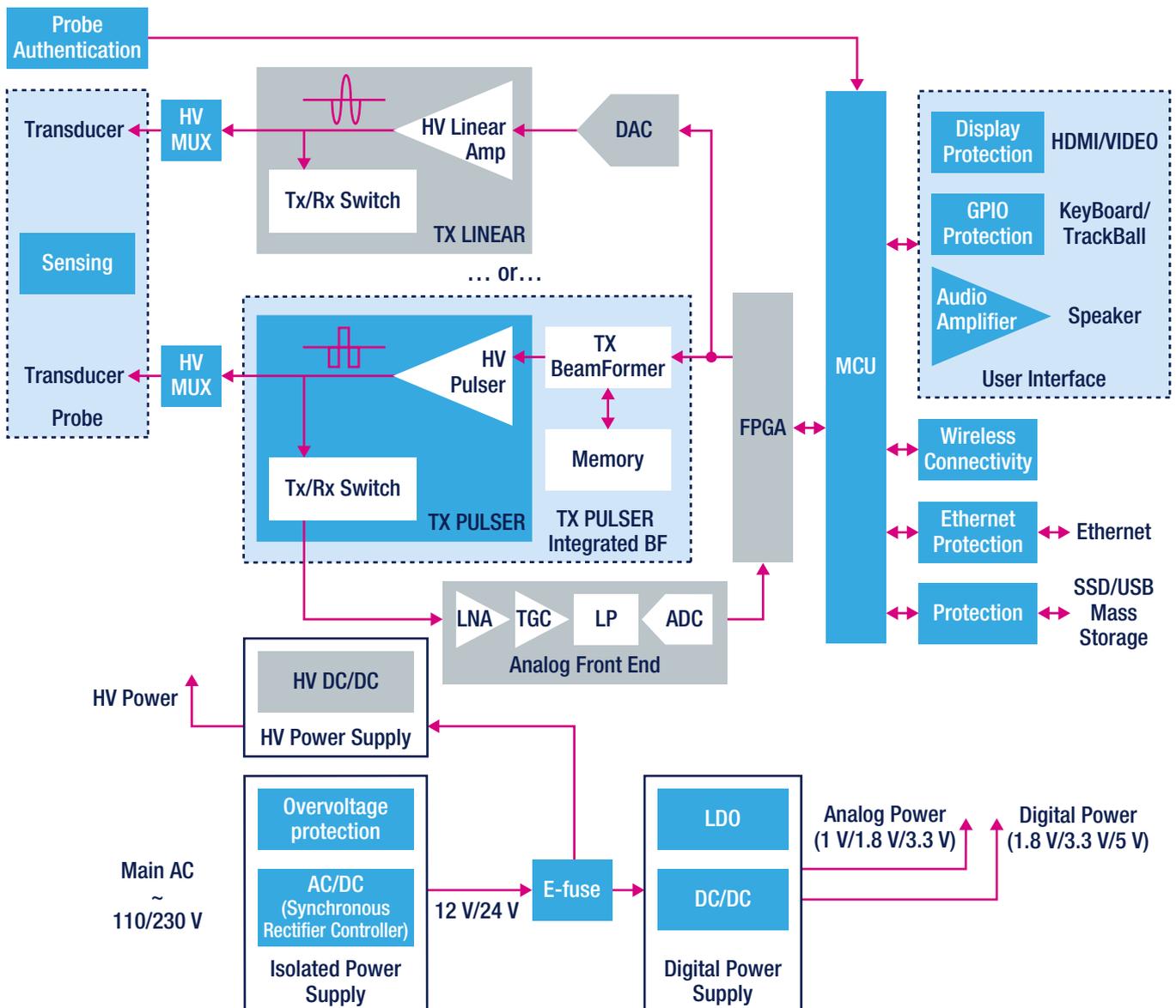
Introduction

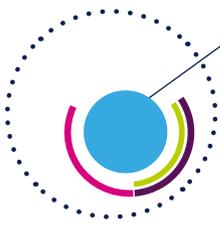
Medical ultrasound systems are among the most used diagnostic and disease identification equipment in gynecology, obstetrics, cardiology and other hospital wards.

Ultrasound machines emit inaudible, high frequency sound waves and capture the reflected echoes that bounce off their target. From these echoes, an image based on the acoustic impedance of different body tissues is generated.

These systems consist of a probe with the acoustic transmitter and receiver stages, and a cart where the doctor can view the images and adjust the focus of the acoustic beam, as well as set all the parameters associated with a particular diagnosis.

Portable and ultra-portable solutions based on computer laptops are now also readily available.





Key products

The probe is one of the most important elements in medical ultrasound systems, containing 48 to 512 micro-coaxial cables ending in transducer elements. To ensure the emission of appropriate waveforms from the transducer stage, ST offers state-of-the-art TX Pulsers integrated in small packages, as well as high voltage multiplexers that switch the analog HV signals independently in order to optimize the number of active channels so that piezoelectric transducer groups can transmit or receive more waveforms at the same time.

ST also offers STM32 Microcontrollers, high voltage power discretes and modules, analog ICs, mixed signal drivers, and controllers for various connectivity solutions.

HV MUX

ST's Medical Ultrasound Imaging IC Solutions include the most highly integrated STHV64SW 64-channel high voltage analog independent switches. These low harmonic distortion ICs are designed for use in applications such as medical ultrasound imaging and other piezoelectric transducer drivers, where high voltage switching is controlled by low voltage control signals.

The STHV64SW comprises a shift register for serial communication, self-biased high voltage MOSFET gate drivers, and high power N-channel MOSFETs for each switch. The switches are capable of providing up to ± 3 A peak output current, and are suitable for various combinations of high voltage supplies, such as -100 V/+100 V, 0V/200 V, -200 V/0V, etc.



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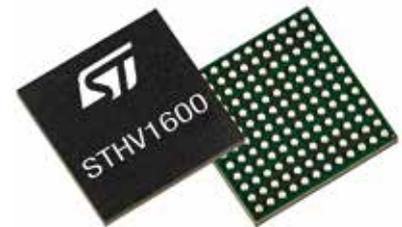
Behind the unprecedented levels of integration is ST's proprietary BCD6s-SOI and BCD8sSOI process technologies, which have allowed combinations of low-voltage CMOS logic, precise analog circuitry and robust power stages, all on the same chip.

Part Number	Description	Reference Evaluation Board
STHV64SW	64 Independent High Voltage Analog Bi-directional Switches, 200 Vpp, 3 A, LV=+3 V	STEVAL-IME015V1

TX PULSER

The TX Pulser integrates a controller logic interface circuit, level translators, MOSFET gate drivers, noise-blocking diodes, and high-power P-channel and N-channel MOSFETs as the output stage for each channel. It also integrates the waveform generator & beamforming to enable phase delay generation.

The STHV1600 features 16 independent channels and integrates a 16-channel beamformer. A purely analog section provides each channel with voltage level translators, a noise blocking diode function, and two identical high voltage P- and N-channel MOSFETs. Its digital core logic is responsible for managing channel delay transmission used in the beamformer, waveform generation and compression algorithms, configuration and data storage, as well as managing all the device operation sequences.



Part Number	Number of Channels	Output Voltage (V)	Output Current (A)	Output Levels	Package (size in mm)	Reference Evaluation Board
STHV748S	4	+/- 90	+/- 2	3/5	VFQFPN2 64 (9 x 9 x 1)	STEVAL-IME011V2
STHV800	8	+/- 90	+/- 2	3 RTZ	TFLGA-56LD (8 x 8 x 0.9)	STEVAL-IME009V1 STEVAL-IME013V1
STHV1600	16	+/- 100	+/- 2/4	3/5 RTZ	LFBGA144(10 x 10 x 1.4)	STEVAL-IME014V1B

CUSTOM ICs SERVICE

ST is a leading provider of complete ASIC design and turnkey manufacturing services for fabless companies and OEMs that develop advanced SoC devices for Ultrasound Medical Imaging applications. ST is experienced in both digital and analog mixed-signal technologies and can offer SoC solutions based on the most advanced BCD process nodes from 4 μm down to 110 nm technologies, and large voltage ranges spanning from 5 V to 800 V.

ST recently released ASIC solutions to support the most advanced Trans-Esophageal Echocardiography (TEE) probes and Intracardiac Echocardiography (ICE) probes for cardiovascular imaging. The adoption of SOI-BCD technology offers best-in-class HV devices with large CMOS integration tailoring TX/RX functions to enable multichannel integration in a single-chip. In fact, ST offers state-of-the-art IPs dedicated to Ultrasound application to make TX Pulser and TX Linear beamforming.

ST even offers a broad spectrum of HV and mixed-signal IPs to complete the value chain for customer design expectations and targets.

The flexibility that ST brings to any project allows customers to optimize required resources and services. We offer the following different business models and can adapt each model to fit specific customer requirements.

ASIC	COT	FOUNDRY
<ul style="list-style-type: none"> Customer defines the specification for own product ST designs the product and is in charge of whole supply chain 	<ul style="list-style-type: none"> Customer designs own products ST in charge of whole supply chain 	<ul style="list-style-type: none"> ST provides wafers to customer
ONE STOP SHOP	Foundry ++	

SENSING

ST has shipped more than 15 billion micro-electromechanical sensors and has one of the most extensive sensor portfolios in the industry, including proximity and MEMS accelerometers, gyroscopes, digital compasses, inertial modules, microphones, and environmental sensors such as pressure, temperature and humidity sensors.

The inertial sensors can be used in probes to detect their spatial movement and rotation.

Part Number	Description	Reference Evaluation Board*
IIS2DLPC	3-axis accelerometer ultra-low-power high performance	STEVAL-MKI191V1
IIS3DHHC	High Resolution, High Stability 3-axes Digital Inclinator (to detect accurate inclination of the probe)	STEVAL-MKI186V1
H3LIS331DL	high-g, low power, 3-axis digital output accelerometer (to detect possible drop of the probe for warranty and or guarantee reliable operation of the probe – not damaged by drop)	STEVAL-MKI153V1
ISM330DLC	iNEMO inertial module: 3D accelerometer and 3D gyroscope with digital output	STEVAL-MKI182V2
ISM330DHCX	iNEMO inertial module: 3D accelerometer and 3D gyroscope with digital output, superior accuracy and stability and embedded Machine learning core	STEVAL-MKI207V1
ISM303DAC	e-Compass with 3D digital linear acceleration sensor, 3D digital magnetic sensor	STEVAL-MKI184V1

Note: * To use the sensor board listed it is needed a motherboard STEVAL-MKI109V3

ST time-of-flight proximity and ranging sensors provide accurate distance measurements and can be used to determine the distance of probes from the patient (also used in phones to switch off the screen when you talk).

Part Number	Description	Reference Evaluation Board
VL53LOX	World smallest Time-of-Flight (ToF) ranging sensor	X-NUCLEO-53LOA1

As human activities are affected by environmental conditions, knowing the actual value of certain physical variables such as temperature, pressure, humidity, light and sound, or the presence of chemicals, are crucial to providing greater comfort and the lowest possible energy consumption.

Part Number	Description	Reference Evaluation Board*
LPS22HH	MEMS nano pressure sensor: 260-1260 hPa absolute digital output barometer	STEVAL-MKI192V1
HTS221	Capacitive digital sensor for relative humidity and temperature	STEVAL-MKI141V2
STTS751	2.25 V low-voltage local digital temperature sensor	STEVAL-MKI198V1K

Note: * To use the sensor board listed it is needed a motherboard STEVAL-MKI109V3

PROBE AUTHENTICATION

ST offers a comprehensive portfolio of NFC/RFID products operating at 13.56 MHz and based on NFC and ISO standards:

- Dynamic NFC tag, featuring a reliable EEPROM memory with data protection (password), an I2C interface to connect to a MCU and a RFID/NFC tag interface
- NFC/RFID Readers, which support multiple NFC protocols in Reader, Writer and Peer-to-Peer modes, accessed by SPI interface and able to cope with the most challenging environment thanks to High RF performances and advanced features

Part Number	Mode	Protocol	Reference Evaluation Board
ST25R3911B ST25R3912 ST25R3913	Reader/Writer P2P	ISO14443A/B ISO15693 FeliCa	ST25R3911B-DISCO X-NUCLEO-NFC05A1
ST25R3916	Reader/Writer Card Emulation P2P	ISO14443A/B ISO15693 FeliCa	X-NUCLEO-NFC06A1
ST25DV-I2C	Dynamic Tag	ISO15693	ST25DV-DISCOVERY

For maximum security, ST offers the STSAFE product range of secure elements providing authentication and data management services to local or remote hosts. The family of products represent full turnkey solutions with secure operating systems running on the latest generation secure microcontrollers.

MICROCONTROLLERS



ST's product portfolio contains a comprehensive range of microcontrollers, from robust, low-cost 8-bit MCUs up to 32-bit Arm®-based Cortex®-M0 and M0+, Cortex®-M3, Cortex®-M4, Cortex®-M33 and Cortex®-M7 Flash microcontrollers with a surprising range of peripherals. ST's portfolio covers MCU platforms from high-performance to ultra-low-power solutions.

With more than 700 STM32 and STM8 MCUs to choose from, ST provides an MCU Finder to identify the best fit for your application. This free app for mobiles and desktops guides you through our portfolio and allows you to share selections and corresponding technical characteristics, as well as provide immediate access to relevant documentation and other resources. An integrated feed provides up-to-date worldwide and local news around STM32 and STM8 MCUs. Supported languages are English, Chinese and Japanese.

The STM32 Microcontroller portfolio also features wireless connectivity solutions, including our new ultra-low-power, dual-core STM32WB microcontroller series. This multi-protocol wireless MCU platform is able to run Bluetooth™ 5, OpenThread, ZigBee 3.0* and IEEE 802.15.4 communication protocols simultaneously.

With the addition of the STM32 Microprocessor (MPU) and its heterogeneous architecture combining Arm® Cortex®-A and Cortex®-M Cores, we have provided new design possibilities to embedded system engineers, as well as access to open-source Linux and Android platforms. This flexible architecture allows advanced digital and analog peripherals to be allocated on either core, while achieving the best power efficiency according to processing and real-time execution requirements. To help engineers reduce application development times, a fully maintained open-source Linux distribution and a new-generation system toolset from ST and 3rd parties are now available for STM32 MCUs and MPUs.

For further details on Product Families: <https://www.st.com/en/microcontrollers-microprocessors.html>

FURTHER PRODUCTS

ST's portfolio includes also power management ICs, power discrete, wireless communication solutions, and many other products. You can find more information at:

<https://www.st.com/en/applications/medical-and-healthcare/ultrasound-imaging.html>



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