

# US-SPI

*New generation of High performances Ultrasonic device*



# US-SPI

## Ultrasound device single channel

### Features

- SPI High Speed connection
- Ultralow noise preamplifier :  $0.74 \text{ nV}/\sqrt{\text{Hz}}$
- - 6 dB bandwidth : 540 KHz to 18 MHz
- High voltage transmitting pulses
- $50 \Omega$  load drive
- Digitizer 12 bits at 80 MSPS
- Programmable gain : 0 to 80 dB
- DAC curve
- 5 Volts power supply necessary
- Very small size : 70 x 36 mm
- Ultra simple integration

### Applications

- Medical ultrasound imaging
- NDT metal flaw detection
- Research and university

### General Description

US-SPI is our new generation ultrasound devices with a single channel to transmit and receive ultrasonic waves. Its very small size and its advanced technology allow to have an unique product for more applications like medical ultrasound imaging, the NDT and also for the research and university.

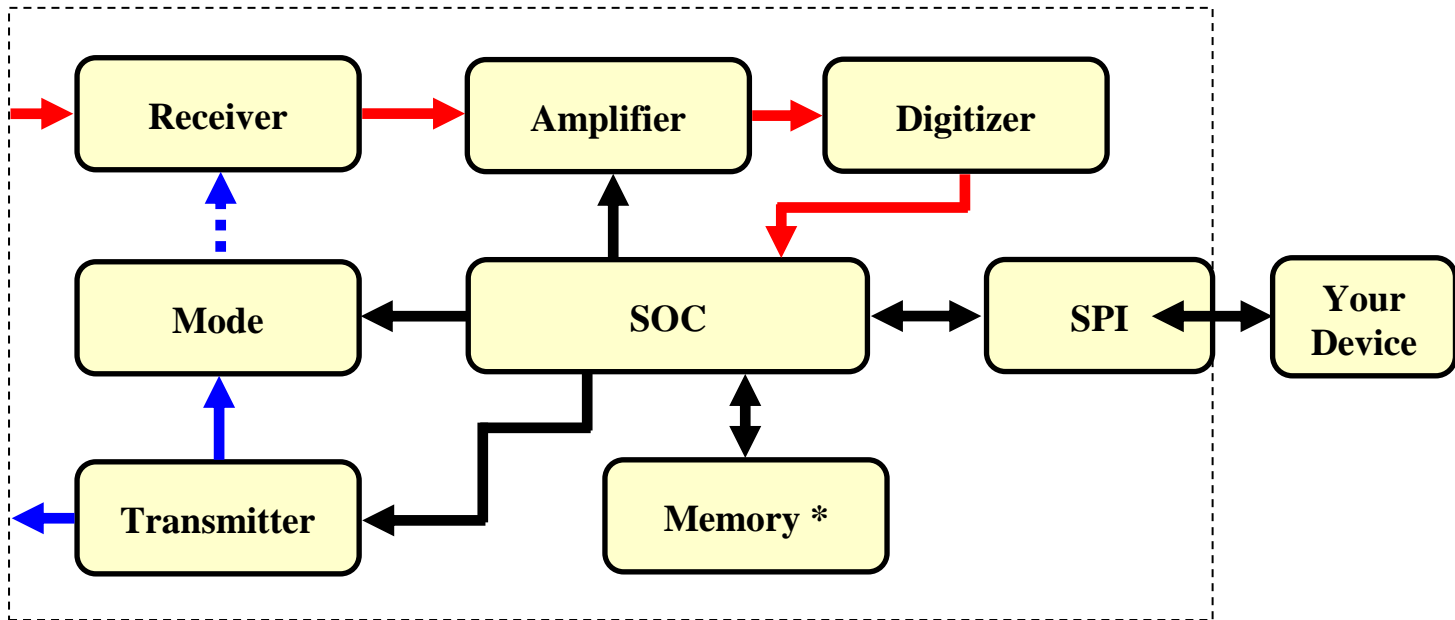
The transmitter can generate pulses with a voltage level and a width programmed by the user. A low noise preamplifier combined to a VGA gives a gain range between 0 and 80 dB, a DAC curve is also available. A 12 bits analog digital converter with a sampling frequency of 80 MHz is used to digitize ultrasound signals.

The device has 2 working modes: Transmission or Reflection. The power supply is delivered by the SPI connector (5 VDC).

There are two versions available:

- one with I/O Sata connector
- one without it

## Block Diagram



SOC : System On Chip  
 \* : 4 Mbits memory option

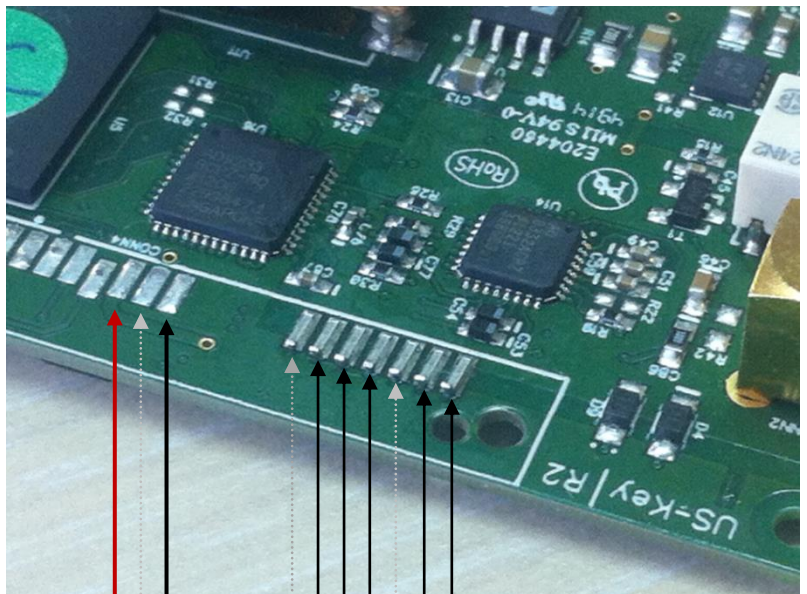
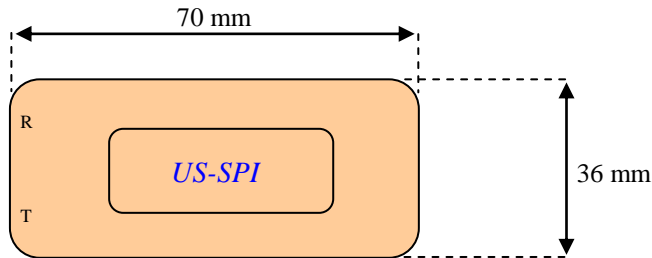
## Absolute Maximum Ratings

Parameter	Value
Power Supply	+ 5.4V
High Voltage	- 230V
Logic signals	+ 3.3V

*Absolute Maximum Ratings are those values beyond damage to the device may occur. Functional operation under these conditions is not implied. Continuous operation of the device at the absolute rating level may affect device reliability. All voltages are referenced to device ground.*

# Outline Dimensions

## US-SPI



10	+5VDC 500mA (IN)
9	+3.3 (out)
8	GND
7	X (not wired)
6	SCLK
5	Data MOSI
4	Data MISO
3	X (not wired)
2	/Enable MISO (SS1)
1	/Enable MOSI (SS0)

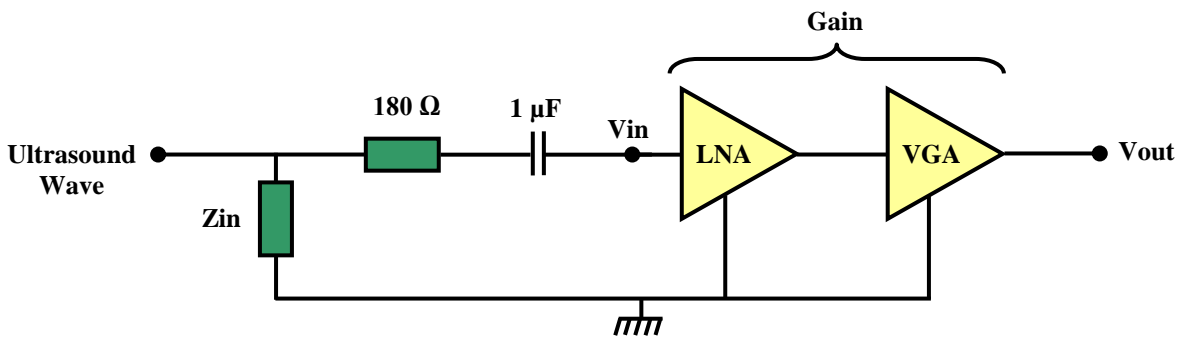
## Operating Conditions

Parameter	Value
Power Supply	+ 5V
Logic signals	+ 3.3V

## Electrical Characteristics

(Over operating conditions unless otherwise specified)

<b>Receiver / Amplifier</b>			
Sym	Parameter	+25°C	Units
BW	Bandwidth to - 6dB	0.54 to 18	MHz
F0	Central Frequency	3	MHz
Lin	Gain Linearity	+/- 0.5	dB
Gain	Gain Range	0 to 80	dB
Zin	Input Impedance (+/- 5%)	100	Ω
Vin	Input Voltage Range	+/- 275	mV
Noise	Preamplifier noise	0.74	nV/√Hz



Simplified Receiver / Amplifier Schematic

### Amplifier's components

- LNA : Low Noise Amplifier (≡ Preamplifier)
- VGA : Variable Gain Amplifier

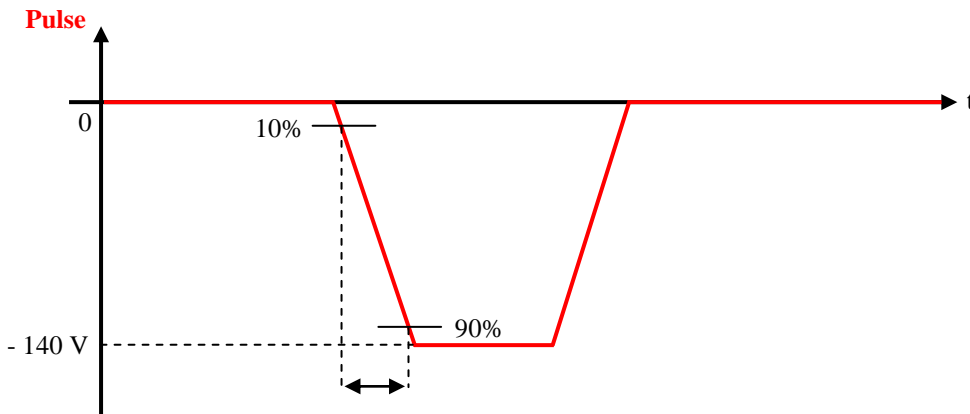
<b>Digitizer</b>			
<b>Sym</b>	<b>Parameter</b>	<b>+25°C</b>	<b>Units</b>
<b>Resolution</b>	<b>ADC Resolution</b>	<b>12</b>	<b>Bits</b>
<b>Fs *</b>	<b>Sampling Frequency</b>	<b>80</b>	<b>MHz</b>

\* Option to increase this value to 160 MHz.

<b>Transmitter *</b>			
<b>Sym</b>	<b>Parameter</b>	<b>+25°C</b>	<b>Units</b>
<b>HV Min</b>	<b>High Voltage Min</b>	<b>- 30</b>	<b>V</b>
<b>HV Max</b>	<b>High Voltage Max</b>	<b>- 230</b>	<b>V</b>
<b>HV Step</b>	<b>High Voltage Variation Step</b>	<b>5</b>	<b>V</b>
<b>PW Min</b>	<b>Pulse Width Min (- 6dB)</b>	<b>16.6</b>	<b>ns</b>
<b>PW Max</b>	<b>Pulse Width Max (- 6dB)</b>	<b>480</b>	<b>ns</b>
<b>PW Mean Step</b>	<b>Pulse Width Variation Step</b>	<b>6</b>	<b>ns</b>
<b>TF **</b>	<b>Pulse Fall Time</b>	<b>5.2 to 7.8</b>	<b>ns</b>

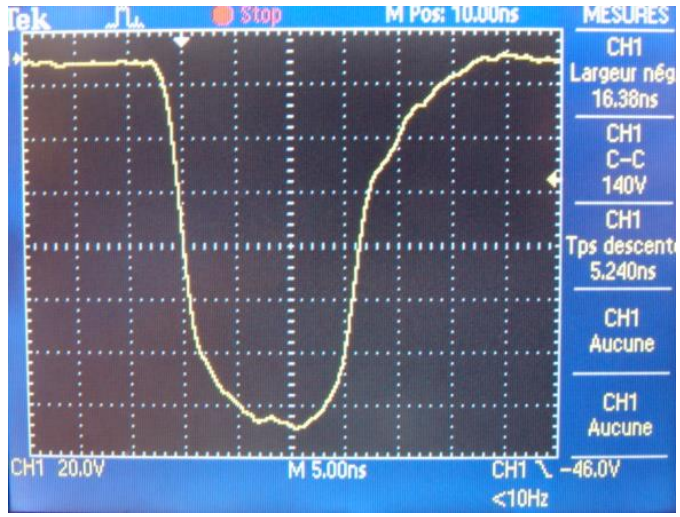
\* These tests were carried out with a 50Ω load and at - 140 V for the widths.

\*\* Depend on the pulse width (5.2 ns for a width of 16.6 ns)



TF

# Typical Performance Characteristic



Pulse with 50Ω load

**More informations on our web site :**  
**[www.lecoeur-electronique.com](http://www.lecoeur-electronique.com)**

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