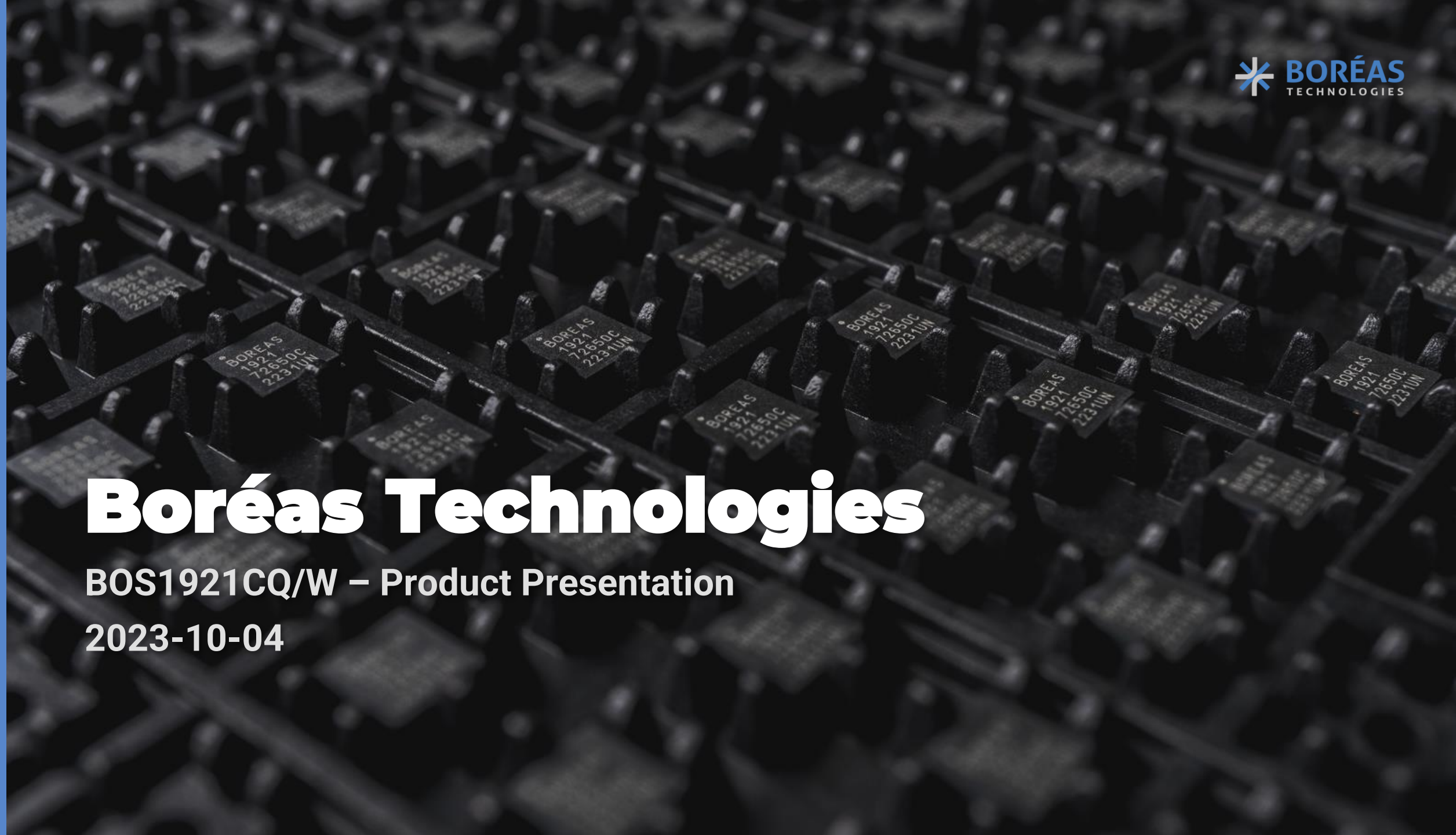


Boréas Technologies

BOS1921CQ/W – Product Presentation

2023-10-04

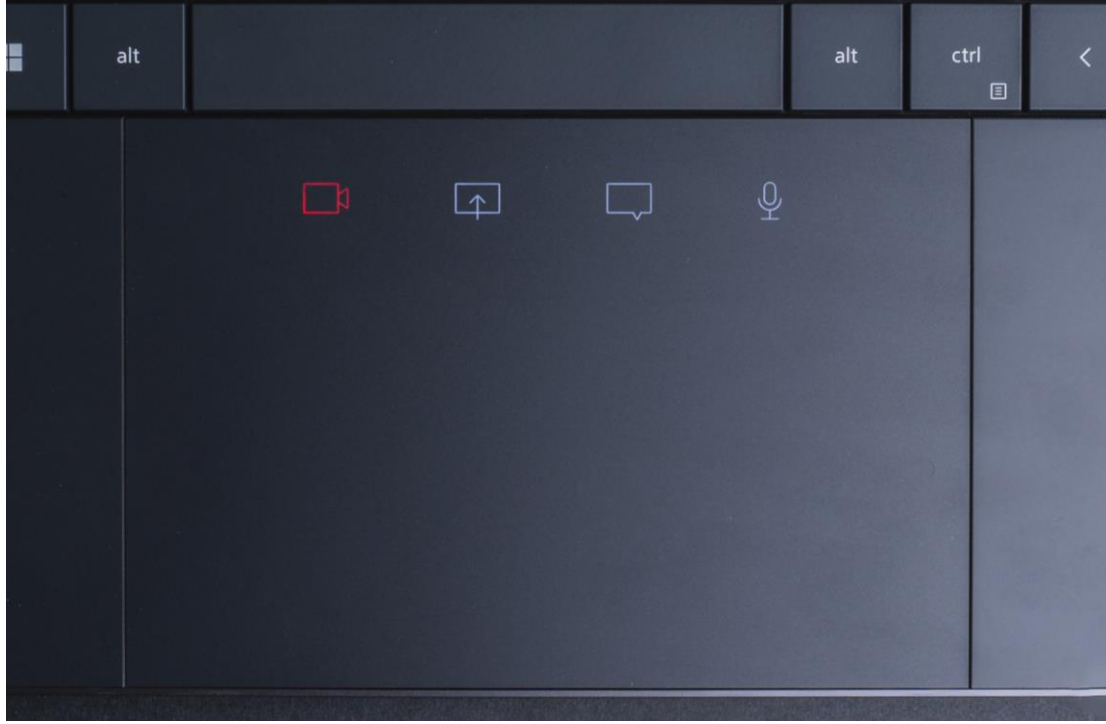
Content

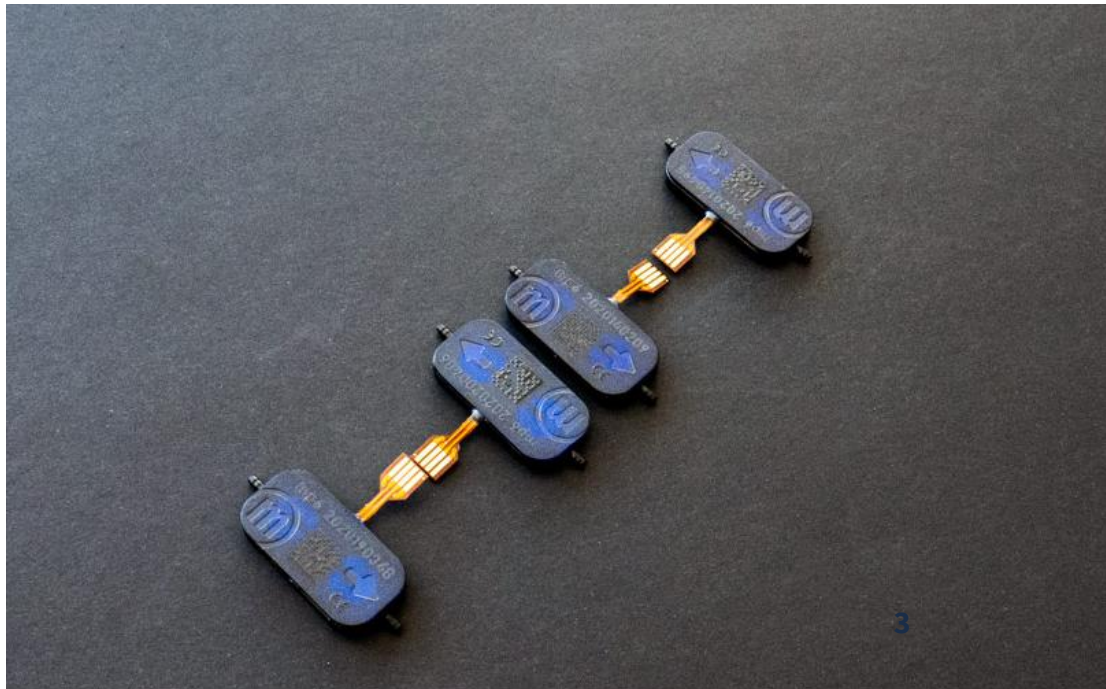
- Applications
- Key Product Features
- Electrical Specifications Summary
- Development Platform

Applications

Many applications exist for the BOS1921. Below are a few examples:

- Haptic
  - Trackpad
  - Smartphone Solid-State Button
  - Piezo Stylus
  - Computer Mice
- Non-haptic
  - Micropump





BOS1921 Key Features

- 190V_{pp} CapDrive™ Bipolar Piezo Driver
  - Drives 100 nF at 190V_{pp} and 300 Hz with only 350 mW
  - Drives capacitive load up to 820 nF
  - Differential Output
- Advanced Piezo Sensing Capabilities
  - 7.6 mV sensing resolution
  - Interrupt Generation
  - Automatic Triggering of Haptic Feedback
- Integrated Digital Front End
  - I3C/I2C with 1.8-5V I/O logic levels
  - 2 kB RAM waveform memory
  - On-chip waveform synthesis
  - State retention in sleep mode
  - 1024 samples FIFO
  - Supports continuous waveform playback
- Multi-Actuator Synchronization
- Unidirectional Power Input (UPI)
- Wide Supply Range, 3 to 5.5 V
- QFN and WLCSP packages available

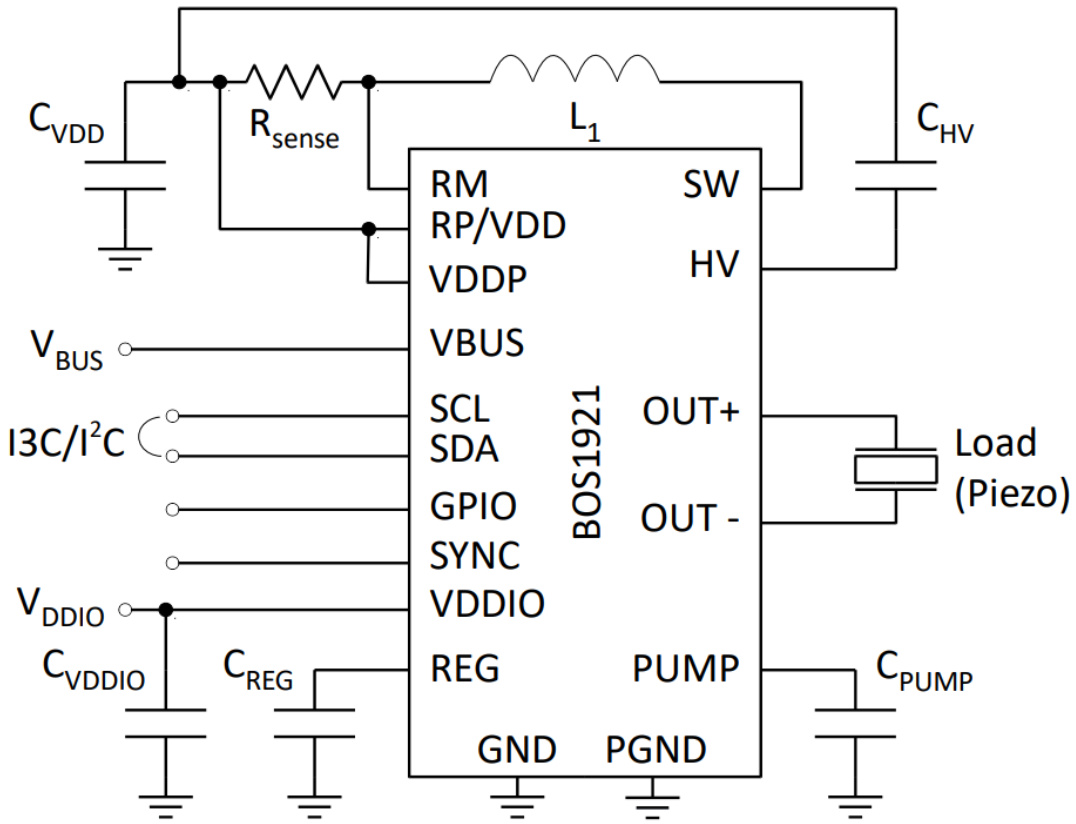
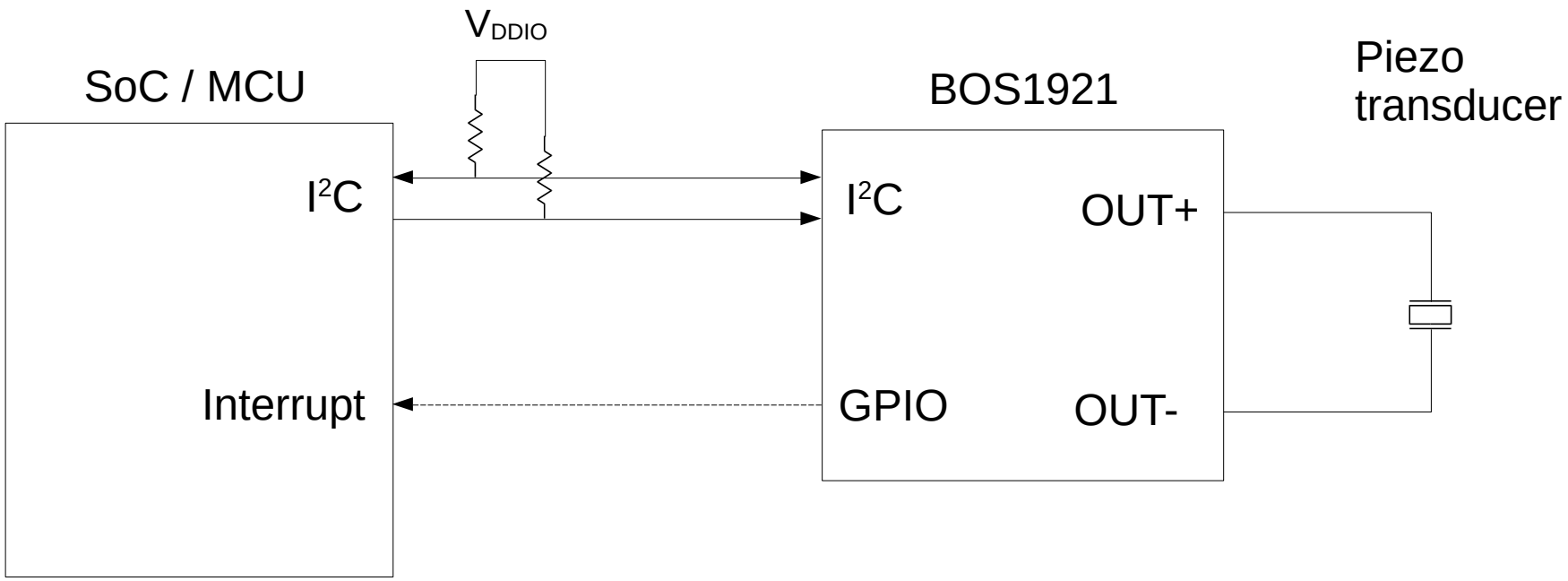


Figure 1: Simplified schematic

Simplified System Block Diagram

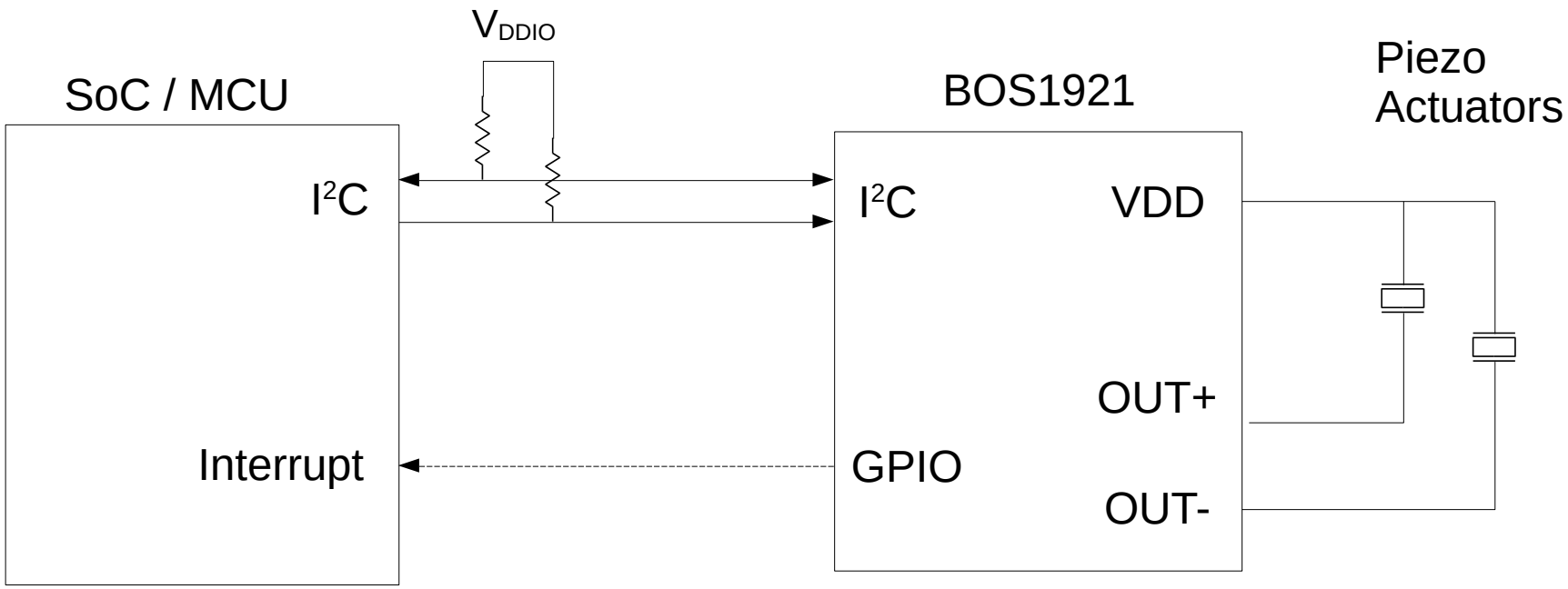
BOS1921 Bipolar Haptic Output & Force Sensing



V_{DDIO} = 1.8-5 V

Simplified System Block Diagram

BOS1921 Dual Channel Unipolar* Haptic Driver

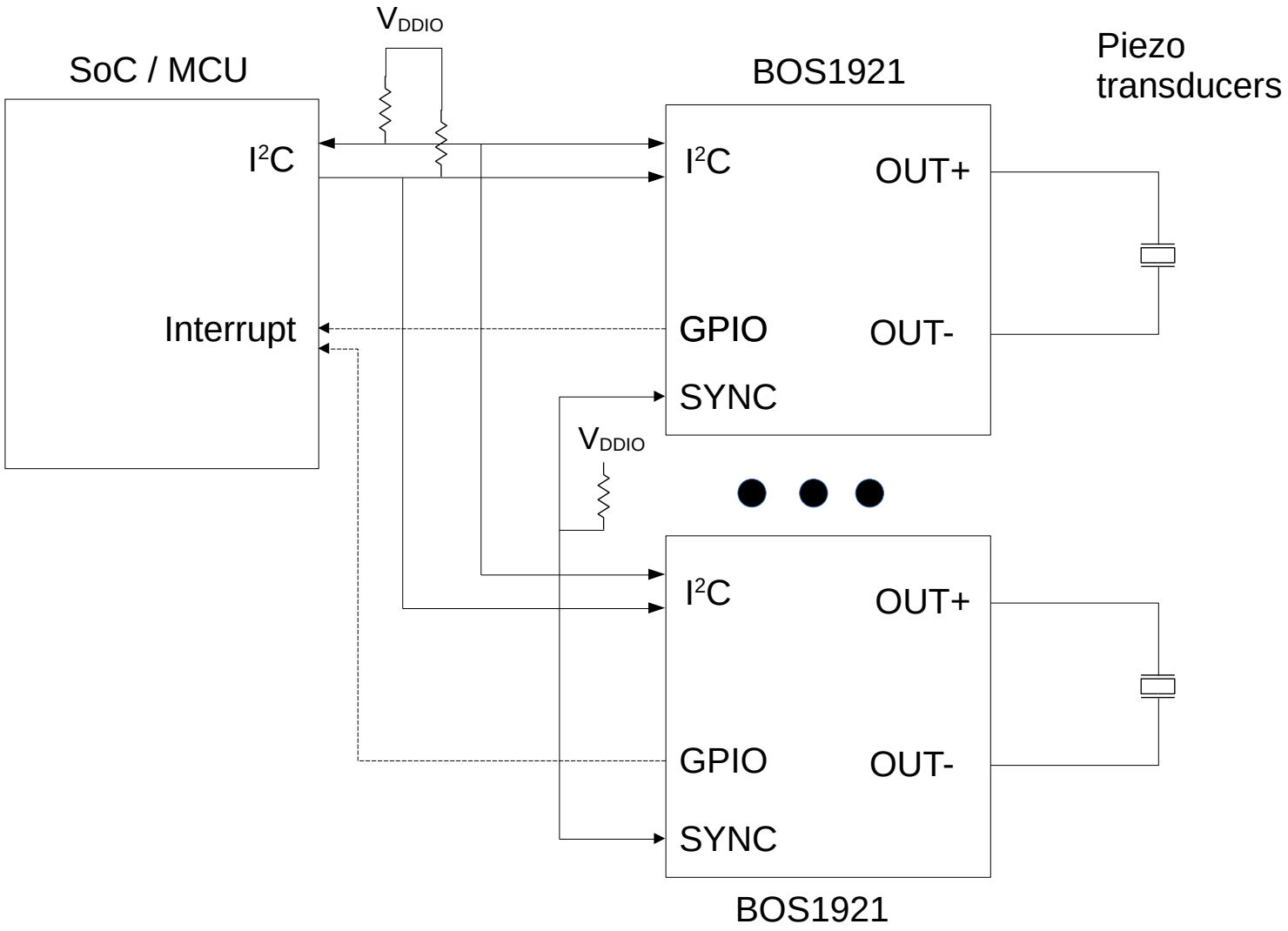


*Each actuator can be driven with a voltage between 0 and 95V. VDD is connected to the negative terminal of each actuator.

V_{DDIO} = 1.8-5 V

Simplified System Block Diagram

Synchronized multi-actuator BOS1921 system



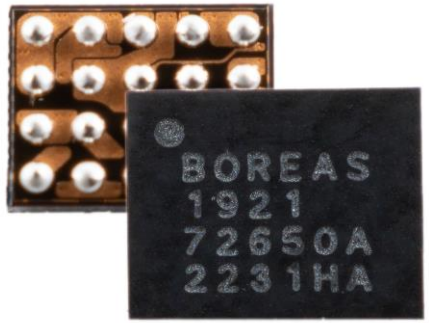
V_{DDIO} = 1.8-5 V

BOS1921CW Solution Footprint

BORÉAS TECHNOLOGIES

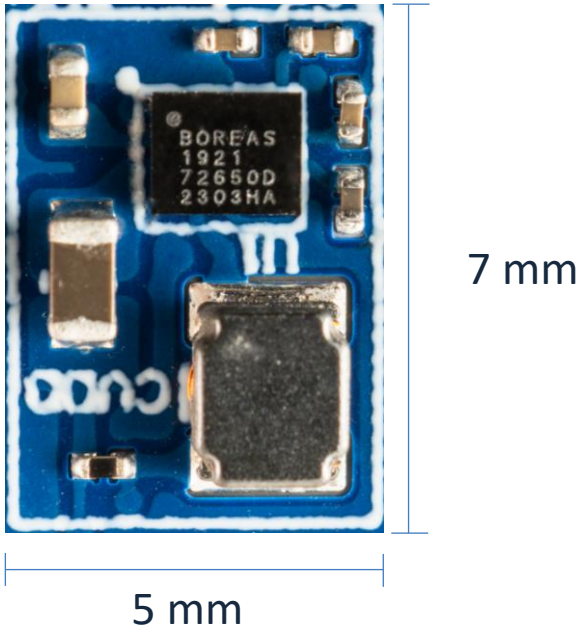
IC size

- WLCSP 20 balls
- 2.1x1.7x0.6 mm
- 0.4 mm pitch



Typical solution size

- 5x7 mm
- 35 mm^2



Number of passive components

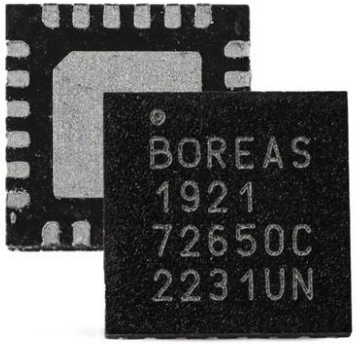
- 8

BOS1921CQ Solution Footprint

BORÉAS TECHNOLOGIES

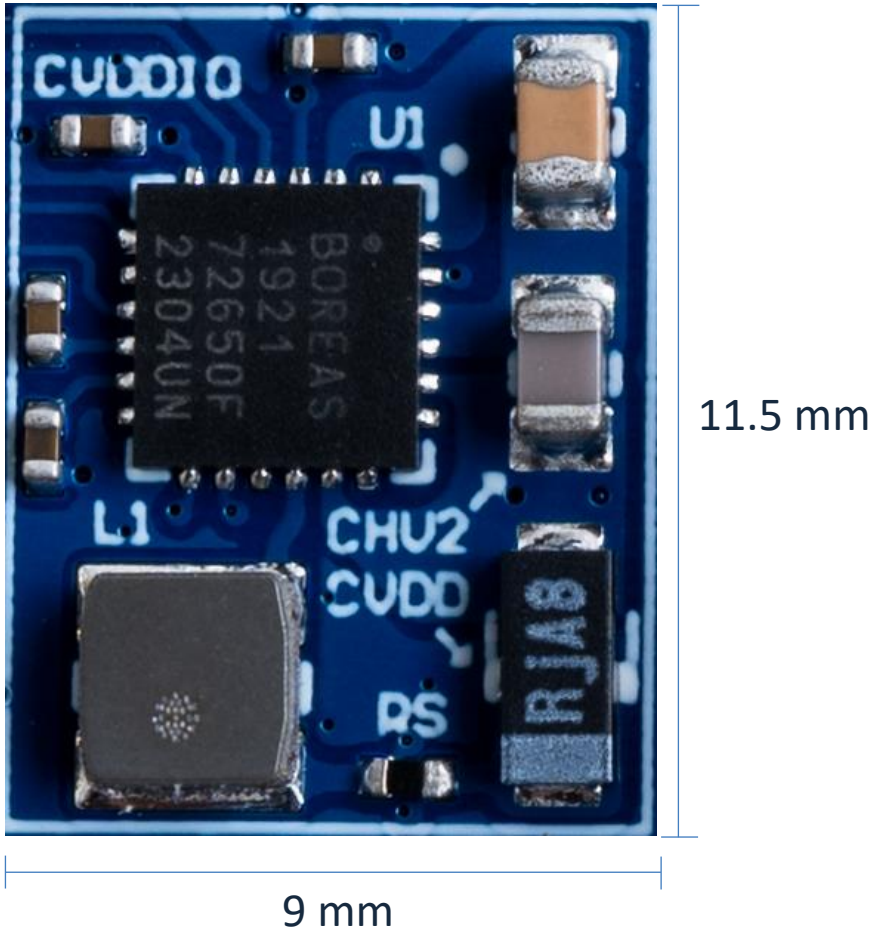
IC size

- QFN 24 pins
- 4x4x0.55 mm
- 0.5 mm pitch



Typical solution size

- 11.5x9 mm
- 103.5 mm^2



Number of passive components

- 8

BOS1921 Current Consumption

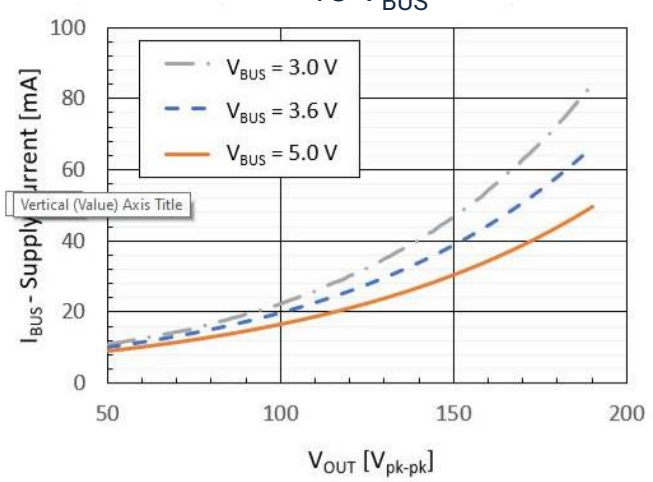
BOS1921 Power consumption is lowest on the market.

Power will vary greatly from one application to the other.

Power scales approximately proportional to:

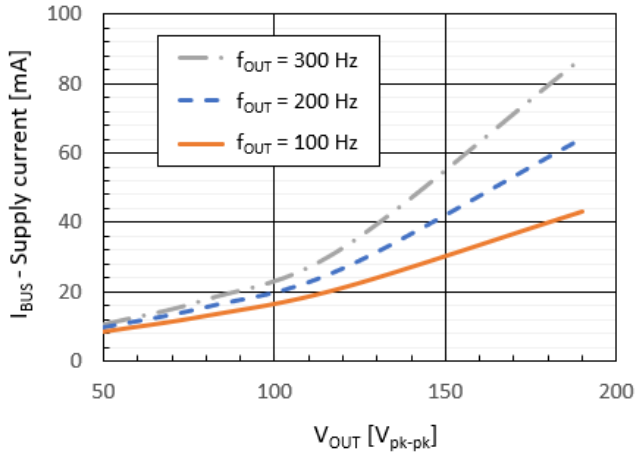
$$\text{Power}_{\text{BOS1921}} \propto f_{sig} C_{LOAD} V_{pk}^2$$

Supply current vs output voltage vs V_{BUS}

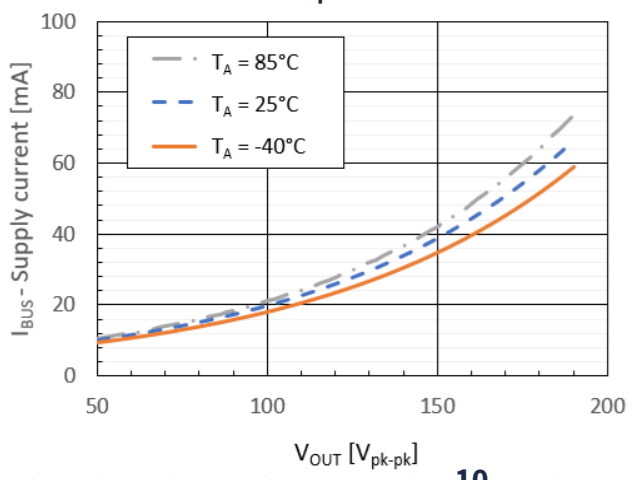


Conditions: T_A = 25°C, V_{BUS} = 3.6 V, L = 10 µH, C_{Load} = 100 nF, f_{SIG} = 200 Hz, sine waveform (unless othewise noted)

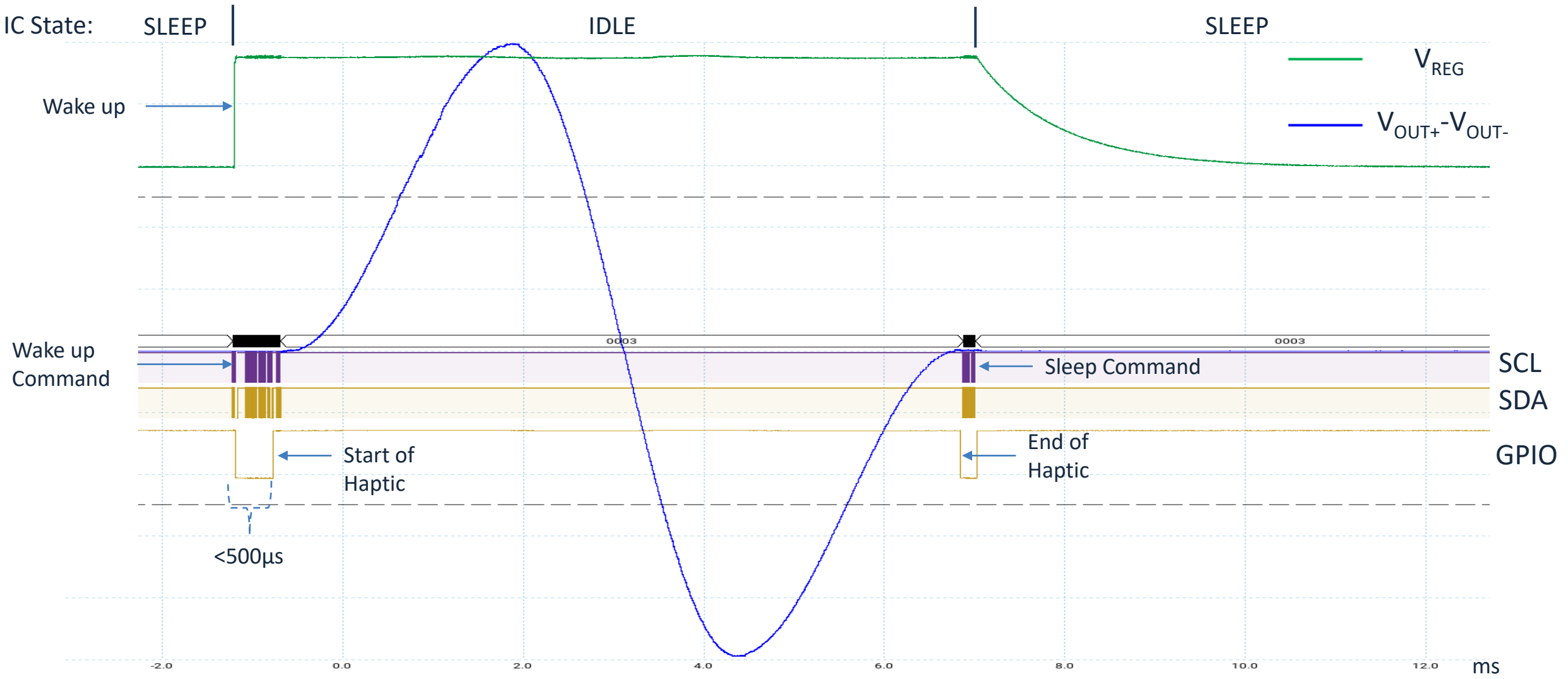
Supply current vs output voltage vs f_{sig}



Supply current vs output voltage vs temperature

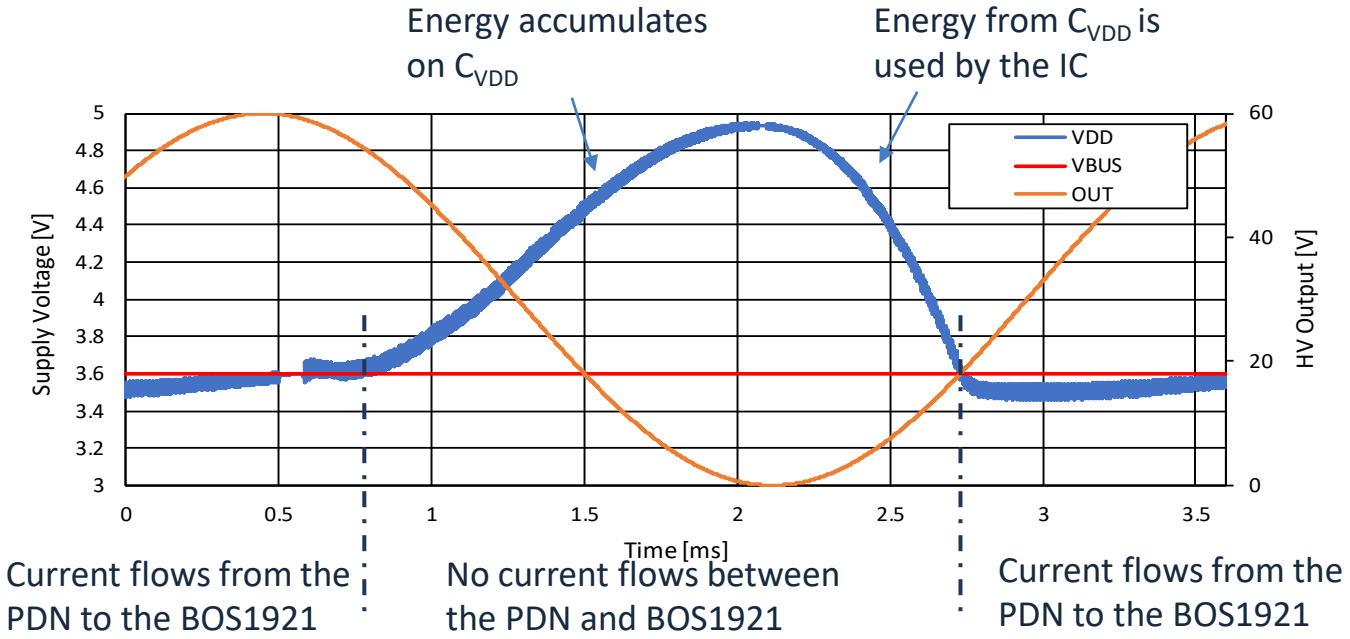


Low Latency, Low Power Haptic



Unidirectional Power Input

- Unidirectional Power Input (UPI) is a system that enables the IC to store the recovered energy near the IC
- The benefits of this optional mode are:
  - Reduce the RMS current on the power delivery network (PDN)
  - Prevent forcing current back into the PDN when it would create system level issues



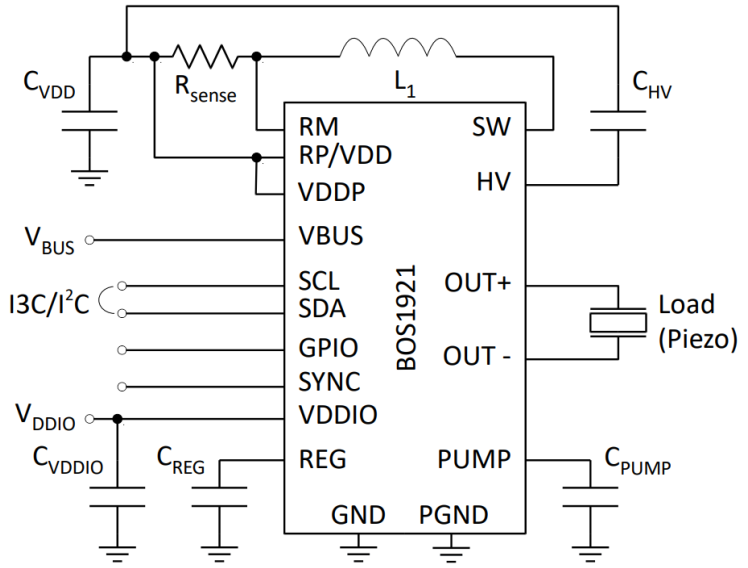


Figure 1: Simplified schematic

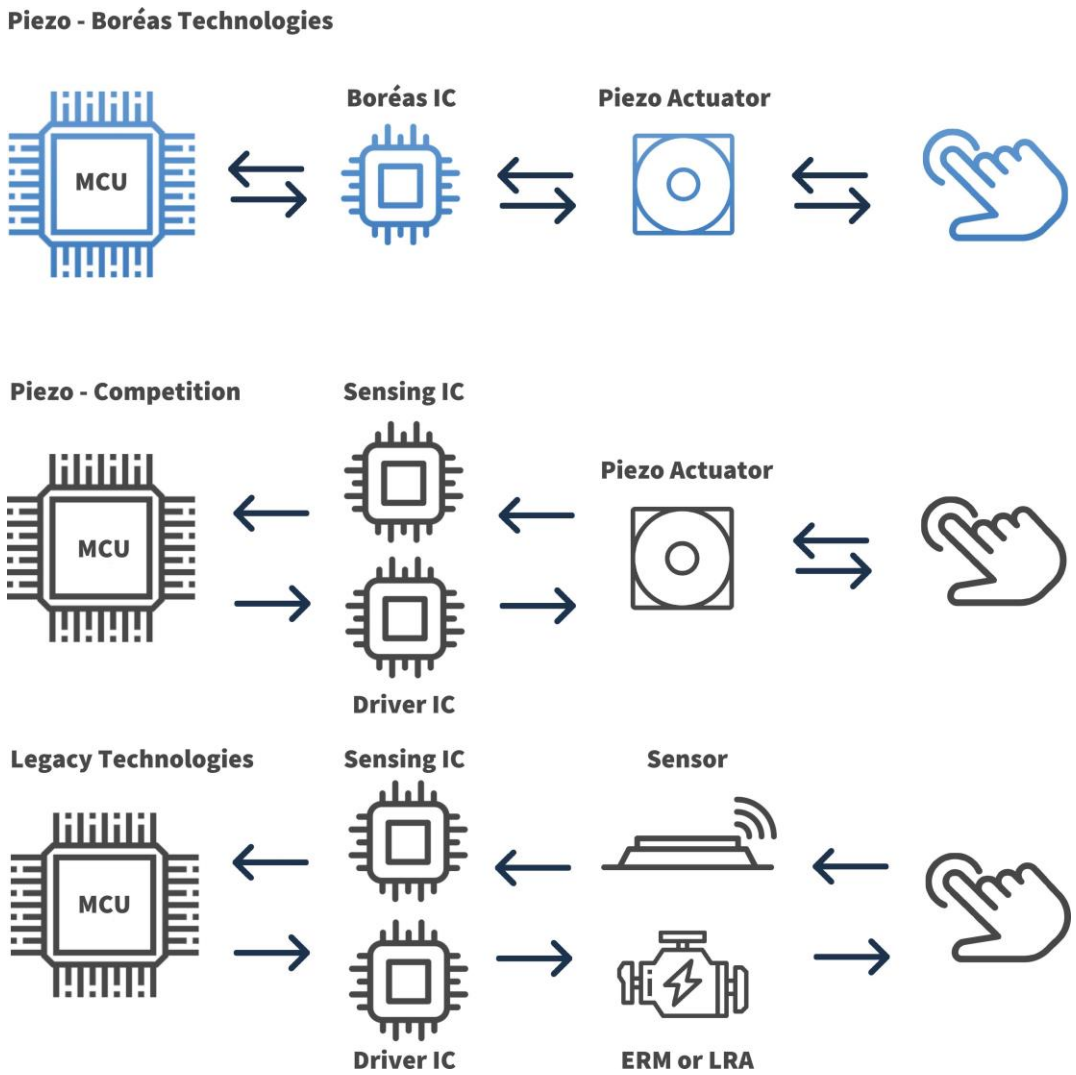
Piezo Sensing Interface

MCU Based Sensing

Resolution: 7.6 mV

Configurable sensitivity in software

Software available from Boréas



Key Electrical Specifications

- Supply
  - V_{BUS} : 3.0V – 5.5V
  - V_{DDIO}: 1.62V – 5.5V
- Waveform output voltage range
  - 0 to ±95V (190 V_{pp})
- Maximum load capacitance
  - See next slide

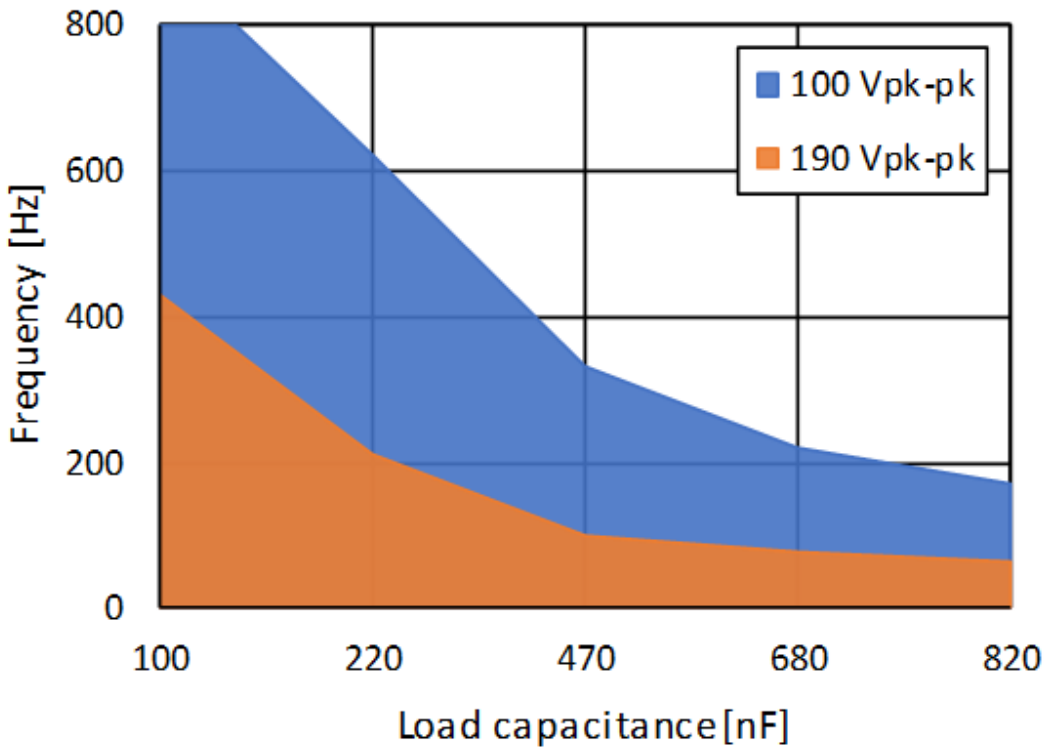
Recommended C_{LOAD}

The BOS1921 has been optimized around loads in the 100s of nF, however, it can also work with smaller or larger loads.

The graph shows the typical load for an output voltage and frequency condition for haptic applications.

It is recommended to use our online tool to analyze easily your application feasibility and recommended BOM.

https://www.boreas.ca/pages/bos1901-bom-calculator

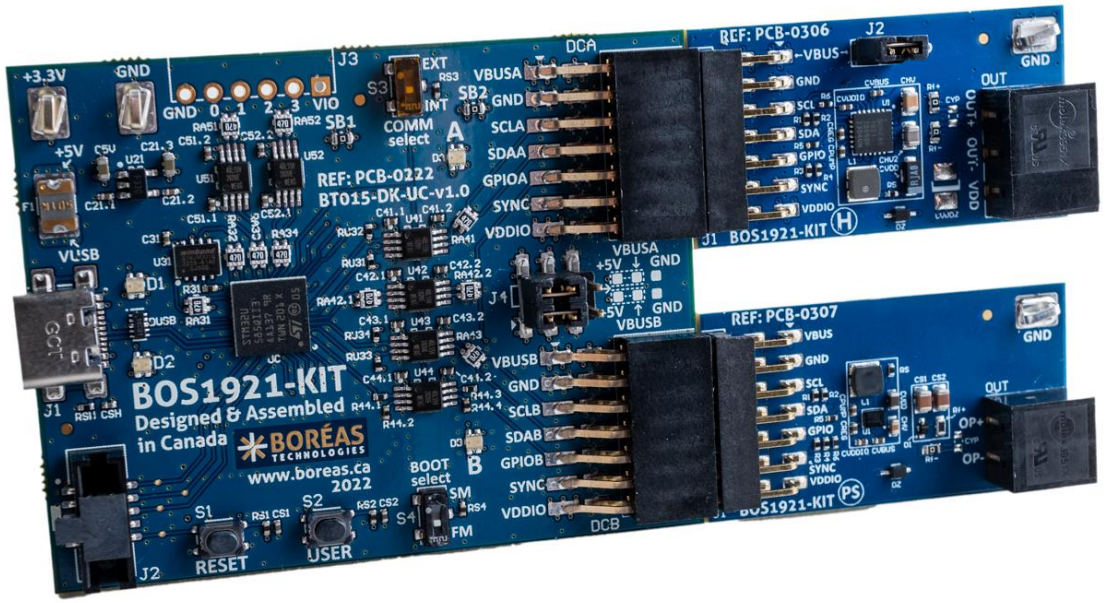


Typical Current Consumption

Symbol	Parameter	Test Conditions*	Typical	Unit
E_{CLICK}	Energy/click	f_{sig} = 300 Hz V_{OUT} = 60V C_{LOAD} = TDK 1204H018V060	0.08	µAh
I_{Q_VBUS}	V_{BUS} supply quiescent current	SLEEP (No state retention)	0.6	µA
		SLEEP (State retention)	2.4	µA
		IDLE	530	µA
$I_{VBUS,AVG}$	Average V_{BUS} supply current during operation	f_{sig} = DC V_{OUT} = 95V C_{LOAD} = 100 nF	3.7	mA
	Average V_{BUS} supply current during operation	f_{sig} = 300 Hz V_{OUT} = 190 V_{pk-pk} C_{LOAD} = 100 nF	90	mA
	Average V_{BUS} supply current during operation	f_{sig} = 200 Hz V_{OUT} = 190 V_{pk-pk} C_{LOAD} = 10 nF	14.5	mA

*V_{BUS} = 3.6V, T_A = 25°C

BOS1921-KIT



Plug & Play Development Platform

Two Channels

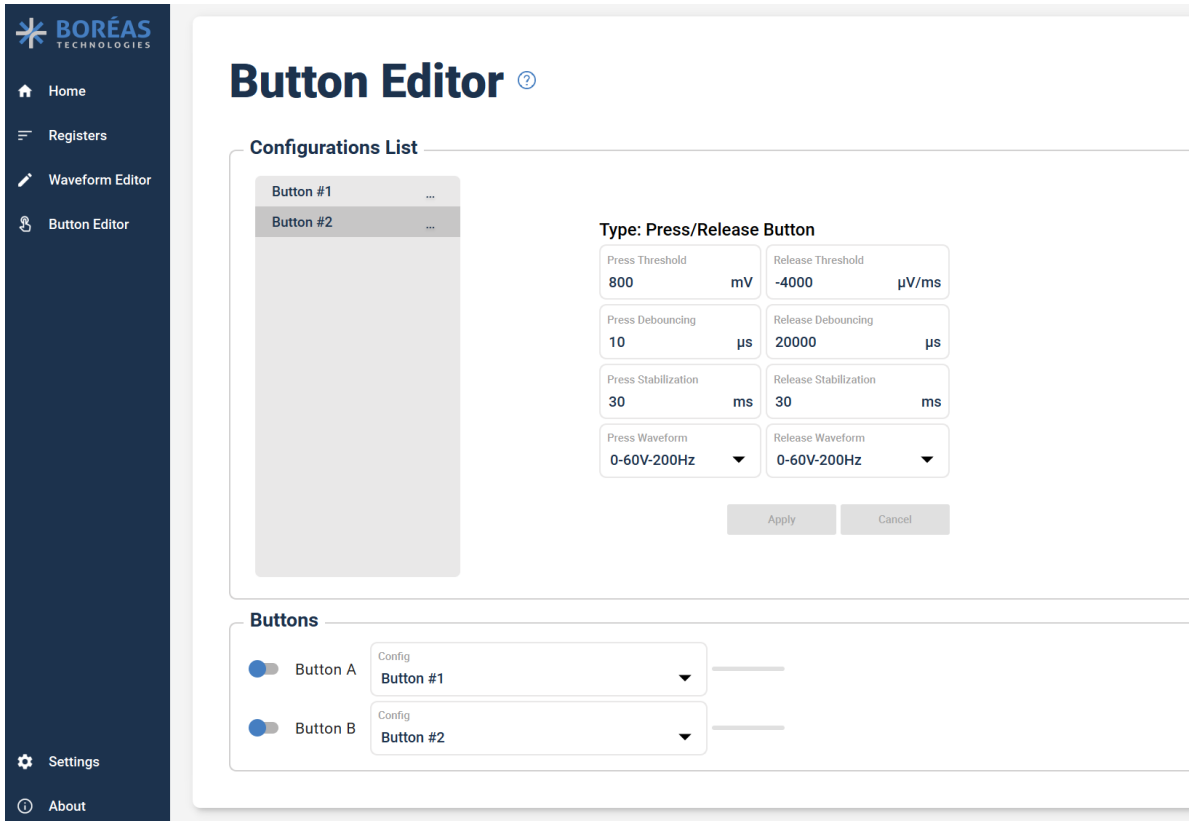
- Haptic Configuration for maximum output power
- Micropump Configuration for lower power at light load

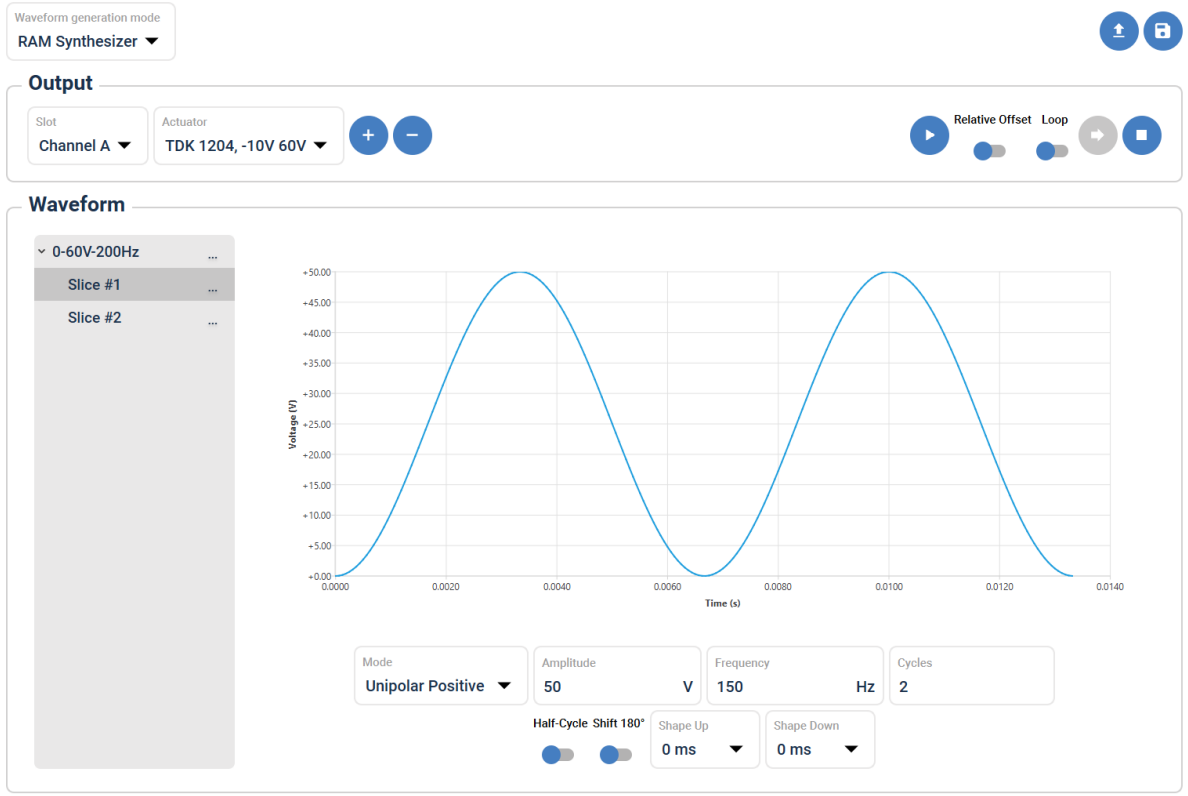
Small independant BOS1921 driver PCB for easy prototyping and debugging

Haptic Studio

BORÉAS TECHNOLOGIES

Easy configuration of Sensing and Haptic behavior





The End

Let’s Grow Your Business Together!