The LIS25BA is the latest generation of our high-performance 3-axis MEMS accelerometers with low-noise, high-bandwidth and Time-Division Multiplexing (TDM). Due to its high bandwidth, the LIS25BA is particularly suitable for hearables or smart headphones, where it can significantly improve the audio quality especially in systems using ST MEMS microphones to implement noise canceling functions.

**KEY FEATURES**
- Acceleration range: ± 3.85 g
- Signal bandwidth: 2340 Hz
- 16-bit data output
- 20,000 g high shock survivability

**KEY APPLICATIONS**
- Bone vibration detection
- Beam forming enhancement
- Voice detection enhancement

3-axis MEMS digital output motion sensor with a dedicated TDM interface and high shock survivability
THE WORKING PRINCIPLE OF NOISE REDUCTION USING A MEMS DIGITAL ACCELEROMETER AND MICROPHONE

In contact with the head of the speaking person (like a headset), the wearable device has both microphones and an accelerometer.

- Voice is captured by microphones as acoustic waves (propagation medium: air)
- Voice is captured by accelerometer as vibrations (propagation medium: human body)
- The accelerometer is immune to acoustic noise

The Time-Division Multiplexing (TDM) interface synchronizes the signals (vibrations) from the accelerometer with the signals (acoustic waves) from the microphone and outputs an audio signal with reduced noise.

BASIC PRINCIPLE FOR USING MICROPHONES AND INERTIAL SENSORS TO IMPROVE AUDIO QUALITY

- Reference System Architecture based on TDM Interface
- Key Advantages:
  - Single interface for multiple devices
  - Reduces complexity, scalable architecture
  - Reduces power consumption on Host (lower RAM requirements, no need of signals interleaving)

Microphone captures (high quality) Speech + Noise

Adaptive filter

HQ Voice

Microphone captures bone vibrations highly correlated with Speech (low quality Speech, no Env noise)

Axel captures bone vibrations highly correlated with Speech (low quality Speech, no Env noise)

Speech

Env noise

Microphone captures

Audio codec

Speaker

LIS25BA
Vibration detection

TDM

MP23ABS1
Primary Mic

STM32L

MP23ABS1
Secondary Mic

Reference

System

Architecture

based on TDM

Interface

Key

Advantages:

- Single
device

- Reduces complexity, scalable architecture

- Reduces power consumption on Host (lower RAM requirements, no need of signals interleaving)