Application Brief

BAW Oscillator Solutions for Building Automation

BAW Resonator Technology

BAW is a micro-resonator technology that enables the integration of high-precision and ultra-low jitter clocks directly into packages that contain other circuits. In the CDC6C and LMK6C LVCMOS BAW oscillator families, BAW is integrated with a co-located precision temperature sensor, a ultra-low jitter, low-power output divider, and a small power-reset-clock management system consisting of several low noise LDOs.

Figure 1 shows the structure of the the BAW resonator technology. The structure includes a thin layer of piezoelectric film sandwiched between metal films and other layers that confine the mechanical energy. The BAW utilizes this piezoelectric transduction to generate a vibration.

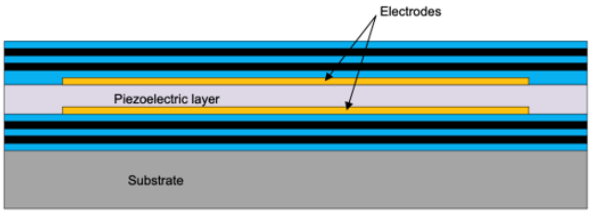

Figure 1. Basic Structure of a Bulk Acoustic Wave (BAW) Resonator

BAW Oscillator in Building Automation

Building automation systems maximize safety, robustness and reliability at a scalable level. To obtain better performance in applications such as IP camera, Video surveillance, and HVAC, a complex and reliable network of accurate clock data is required.

In advanced building automation systems such as the ones listed above, the following performance metrics are required:

- Higher density of product design with **wide thermal performance** and small layout size.

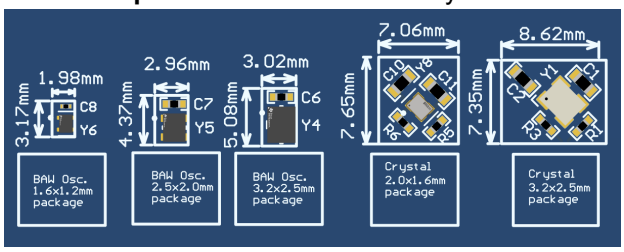

Figure 2. PCB Footprint Comparison of BAW Oscillator and Crystal

- Higher performance with reliability protection for a variety of **vibration and shock** performance requirements.

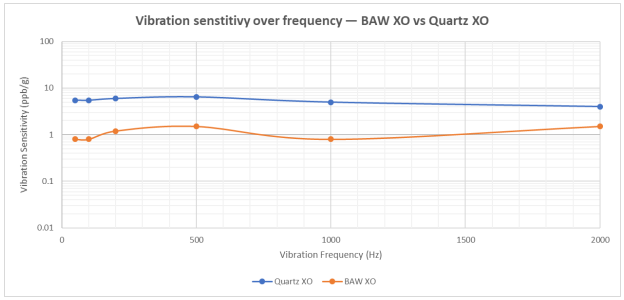

Figure 3. BAW Oscillator Vibration Sensitivity

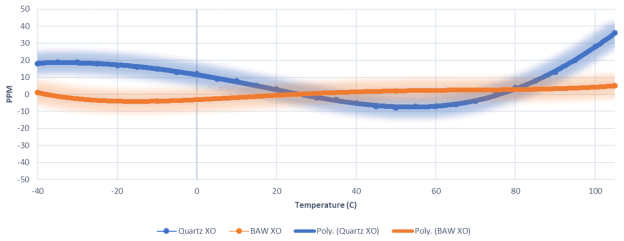

Figure 4. Temperature Stability Comparison of BAW Oscillator and Quartz

- Low jitter **to achieve optimal BER performance in system.**

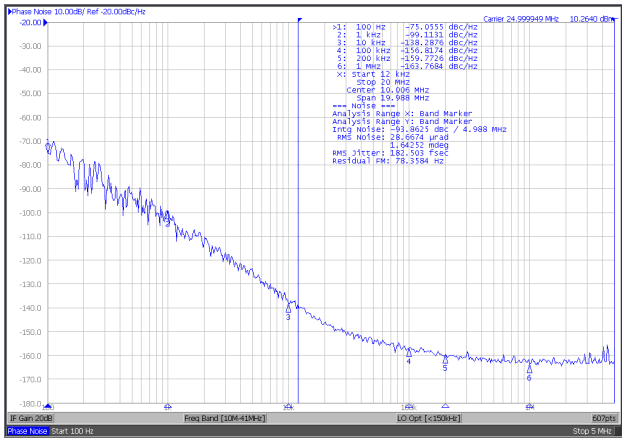

Figure 5. LMK6C BAW Oscillator 25 MHz Phase Noise Performance

In Building automation systems, the CDC6C and LMK6C BAW oscillators can be used as a reference clock for the following devices:

Devices	Frequencies
Audio	12.288MHz/24.576MHz
100M Ethernet	25MHz
MCU	16MHz/25MHz
Image Sensor	37.125MHz/54MHz
SoC system clock	48MHz/50MHz
WIFI/BLE	38.4MHz/48MHz
HDMI/SDI	297MHz
Gb Ethernet	125MHz

For all of the frequencies listed above, jitter performance, reliability, and stability are key performance factors. All of these metrics can be met with a BAW oscillator solution.

Figure 6 shows the typical block diagrams for IP-Camera and HVAC systems. For IP-Camera applications, the BAW oscillator can be used as a reference clock for the ASIC, MCU, Image Sensor, Audio Codec, HDMI/SDI, and Ethernet PHYs. For HVAC systems, the BAW oscillator can be used as a reference to the WIFI/BLE, MCU, FPGA, and Ethernet PHYs.

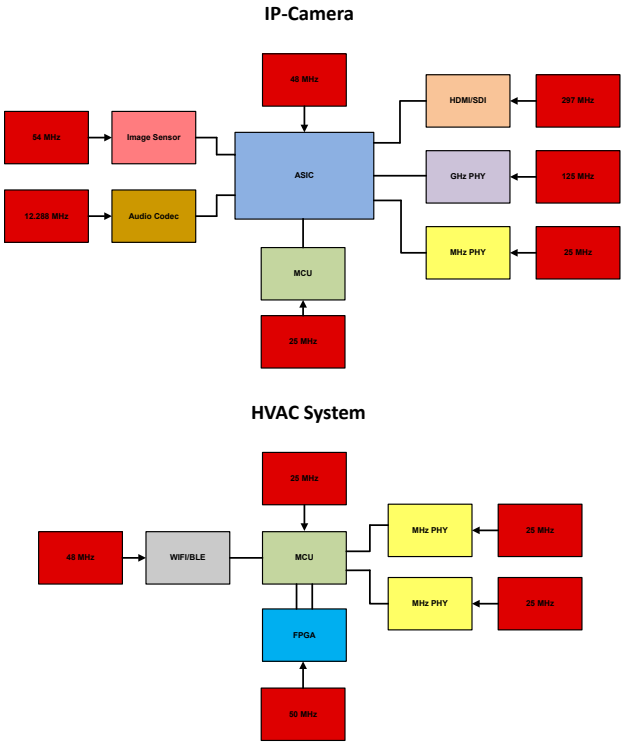

Figure 6. Typical Block Diagrams of BAW Oscillator Used in Building Automation

Devices	Type	Function	Key Features
LMK6C/D/P/H	Ultra-low Jitter Oscillator (LVCMOS, LVDS, LVPECL, and HCSL output formats)	Reference clock for ASIC, MCU, Image Sensor, Audio Codec, HDMI/SDI, and Ethernet PHYs	Any frequency between 1MHz to 400MHz, ± 25ppm frequency accuracy, 200fs RMS jitter
CDC6C	Low-Power LVCMOS Oscillator	Reference clock for ASIC, MCU, Image Sensor, Audio Codec, and Ethernet PHYs	Standard frequencies between 250kHz and 200MHz, ± 50ppm frequency accuracy, 1 ps RMS jitter
LMK1Cxxxx	1:x LVCMOS buffer	Fan out to clock MCU, PHYs, and HDMI/SDI	1.8V - 3.3V supply, ultra-low additive jitter of 20 fs
TPL5010	Nanotimer	Ultra-Low Power System Timer with Power Gating Functionality	1.8V to 5.5V supply, 35nA typical current consumption

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