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 BAW oscillator, the BAW is integrated with a co-located precision temperature sensor, a ultra-low jitter, low-power fractional output divider (FOD), a single-ended LVCMOS and differential LVPECL, LVDS, and HCSL output driver, 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.

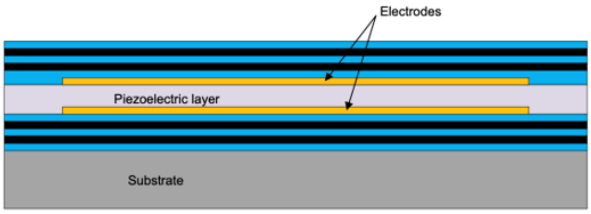

Figure 1. Basic Structure of a Bulk Acoustic Wave (BAW) Resonator

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.

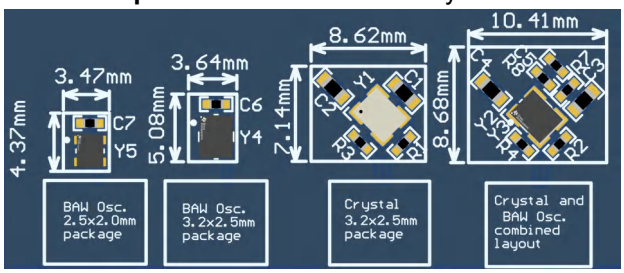

Figure 2. PCB Footprint Comparison of BAW Oscillator and Crystal

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

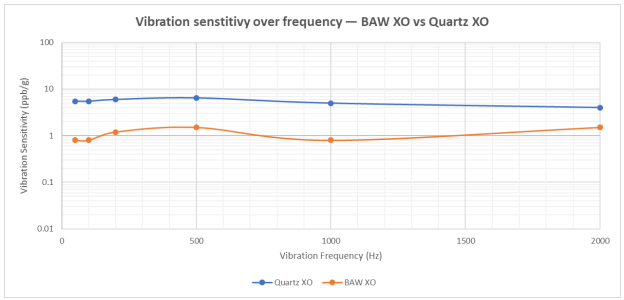

Figure 3. BAW Oscillator Vibration Sensitivity

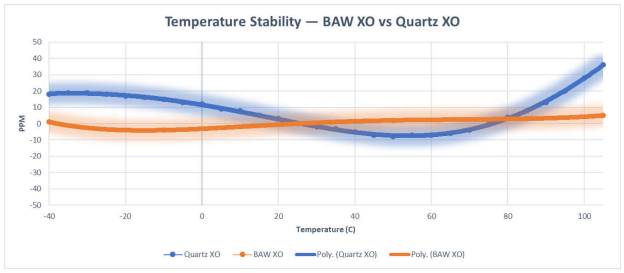

Figure 4. Temperature Stability Comparison of BAW Oscillator and Quartz

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

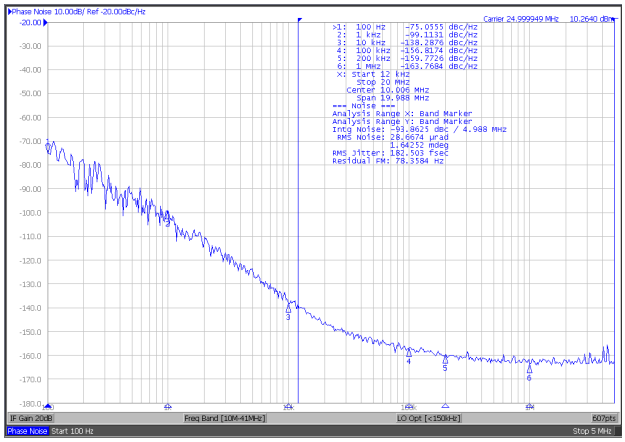

Figure 5. LMK6C BAW Oscillator 25 MHz Phase Noise Performance

In Building automation systems, the BAW oscillator can be used as a reference clock for the following devices:

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

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

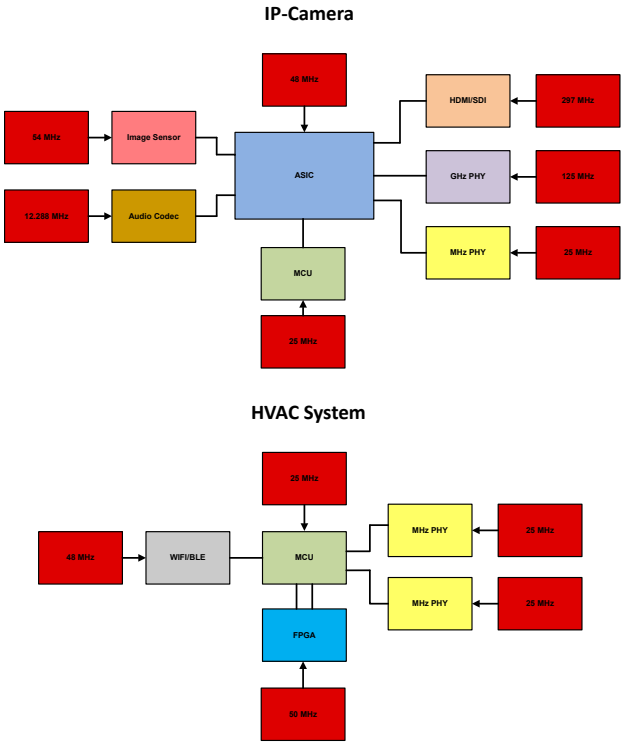

Figure 6. Typical Block Diagrams of BAW Oscillator Used in Building Automation

Devices	Type	Function	Key Features
LMK6C/D/P/H	Ultra-low jitter XO	Reference clock for ASIC, MCU, Image Sensor, Audio Codec, HDMI/SDI, and Ethernet PHYs	1 MHz to 400 MHz, ± 25 ppm, 200 fs jitter
LMK1Cxxxx	1:x LVCMOS buffer	Fan out to clock MCU, PHYs, and HDMI/SDI	1.8 V - 3.3V supply, ultra-low additive jitter of 20 fs
TPL5010	Nanotimer	Ultra-Low Power System Timer with Power Gating Functionality	1.8 V to 5.5 V supply, 35 nA typical current consumption

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Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265