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Shortening Wi-Fi product design cycles with integrated filtering

One of the most fundamental changes of recent history is that the internet has become nearly ubiquitous. Initially connecting computers, it now connects homes and buildings. And with the advent of wireless technology (Wi-Fi, LTE), access to the internet changed from a technology into a commodity – and, for some people, a number one ranking on Maslow's hierarchy of needs. Today, any given Wi-Fi network is likely providing simultaneous wireless internet access for multiple laptops, smartphones, tablets and electronic gaming consoles, not to mention the ever-growing installations of smart home or smart business IoT applications.

So, it's no wonder that interference and coexistence are still the main pain points, more specifically in the area of 2.4 GHz Wi-Fi. The sheer volume of surrounding signals from other wireless products such as Bluetooth speakers, security cameras, smart home devices, remote controls and microwaves is a challenge. The only way to address this interference is by using RF filter technologies.

The companies that make these Wi-Fi-based products depend on quality of service (ie performing well, with few interference issues) to sell their solutions. Products with a high quality of service generate the largest revenue, by reducing the costs of service calls, truck rolls and additional hardware/software solutions needed to solve user experience concerns. Take, for example, a company that manufactures and sells indoor/outdoor wireless speakers. It's imperative to have a high quality of service to transmit at long range and without interruption. Other adjacent signals like Bluetooth or cellular bands must be attenuated to mitigate interference.

For 2.4 GHz, so-called band edge and coexistence filters are required to solve the issue. For example, discrete band edge filters help to create steep skirts and high attenuation in the out-of-band regions – though with the tradeoff of providing insertion loss. There are also complete solutions using LTE coexistence filtering and/or band edge filtering, fully integrated in a single front-end package for Wi-Fi 802.11 systems.

FEMs with integrated BAW filter technology check off the expectations

A good fully integrated front-end module (FEM) will ideally have a small form factor, high transmit/receive gains and an integrated high-performance, temperature-stable bulk acoustic wave (BAW) filter. BAW is a technology with superior filtering capabilities. It also provides LTE coexistence receive immunity, maximizing Wi-Fi range and coverage. There are also integrated FEMs that include a transmit and receive 802.11ax module with a band edge BAW filter, regulator, transmit/receive switch, along with an LNA with bypass opportunity.

Today's device manufacturers need component products to be plug-and-play and work without extra design effort. This way, they can meet their tight schedules and easily pass regulatory certification. FEMs with integrated BAW filter technology check off these expectations. Additionally, BAW filters resolve interference, and when manufacturers place them in their small, sleek products, they can be assured they'll meet stringent design criteria when operating at temperature swings of -40 to +105 °C.

All in all, the opportunities are exciting and vast. Yet, the development of Wi-Fi products is increasing in complexity and the demands on developers to rapidly deliver higher-performance products in aesthetically pleasing designs are growing immensely. No matter the obstacle, developers can achieve their design cycles when they use solutions made to address technology complexities. Just remember, devices such as FEMs with integrated filter technologies are here to help.