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ANTENNA DESIGN CRITICAL FOR SUCCESSFUL IOT DEVICE SYSTEM PERFORMANCE

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The development of the Internet of Things (IoT) is the inter-networking of devices and these devices are typically connected through a wireless link. The exploding use of IOT technology is placing new requirements on antenna design and performance with space, cost, and speed-of-integration as key components in the design, manufacture and use of IoT wireless systems. This evolution is across almost every imaginable segment including, but not limited to Connected Home, Industrial, Automation, Medical, Transportation, and Consumer applications, with annual growth rates expected above 20%.

This growth in IoT will place growing demand for dual-band, multi-band, ultra-wide band, GPS*, Cellular and other antennas. The performance of an antenna within the device is directly linked to the total system performance of the device. A properly designed and integrated antenna will improve data rates, increase range, improve safety and security, and overall offer an improved user experience.

STANDARD ANTENNAS

The use of standard antennas is a common, easy and cost effective way to integrate an antenna into any device. Because of the almost endless ways an antenna can be used in a wireless system, antenna manufacturers will typically specify the performance attributes of a standard antenna in a standard, idealized test configuration. This test configuration will offer the designer some guidance on the antenna's overall performance; but when the antenna is integrated into any device, the performance of the antenna, including frequency tuning, bandwidth and radiation will be modified. In some cases, the performance of the antenna will be drastically modified, which will lead to a very poor performing wireless system. To fully optimize the overall wireless system performance; the integration of the antenna into a device should begin on day 1 of the product conception and design.

With the broad range of wireless systems used in IoT applications, antennas are needed that operate within the required frequencies and meet the specified standards' essential for the device. These can include, but are not limited to BT, BLE, Wi-Fi†, GPS, Cellular, Zigbee‡, LoRa§ and Ultra-wideband (UWB), among others. When designing the device, one significant question; along with antenna frequency requirements; will be how the antenna will be connected and integrated into the device and provide optimal antenna and henceforth system performance.

Questions such as how the antenna will be connected to the RF IC; where the antenna will be located in the device for optimal performance; and how the antenna will be attached to the device; are all questions that should be addressed in the early stages of the project.

For example, if Wi-Fi system capability is required, the antenna could be directly attached to the PCB via SMT process or attached to the device housing via adhesive or via screws. Figure 1 shows an example of Wi-Fi antenna with different integration and connection types; SMT antenna, cabled flexible circuit antenna and cabled PCB antenna.

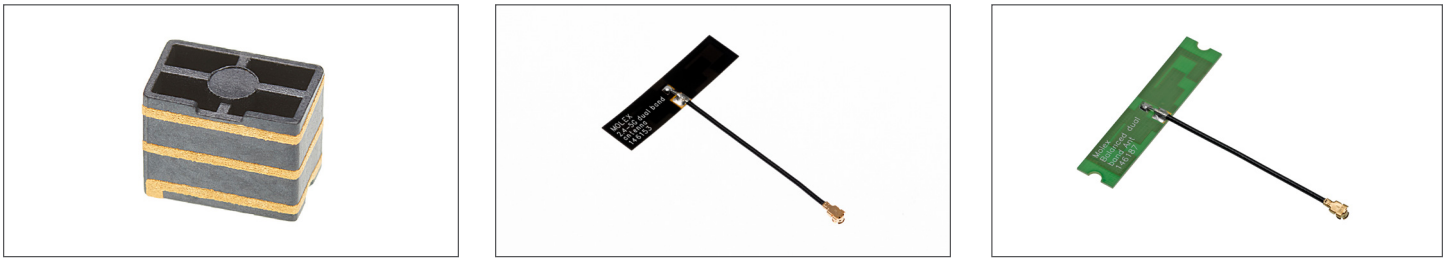

Figure 1: Molex Standard Wi-Fi Antenna Types

MOLEX STANDARD ANTENNAS

Based on diverse manufacturing and RF technologies, Molex standard antennas offer high performance and ease of integration across almost all frequencies and wireless systems; meeting demanding wireless applications spanning the industrial, consumer, medical and automotive markets. Molex antennas are compact and space-saving (on-ground antennas) as well as easy-to-use peel-and-stick flexible circuit antennas and rigid PCB antennas. Molex also offers standard multi-band antennas which will simplify the design and integration of the antennas into the device and lower total antenna system cost within the device.

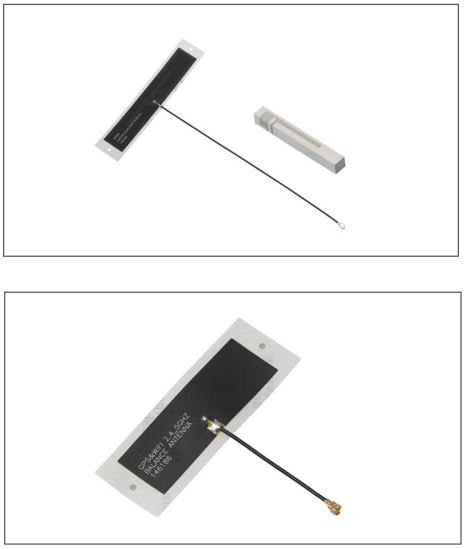

Figure 2: Molex Multi-band Cellular and Wi-Fi/GPS Antennas

CHOOSING AN INDUSTRY LEADER IN CUSTOMIZED ANTENNA DESIGN

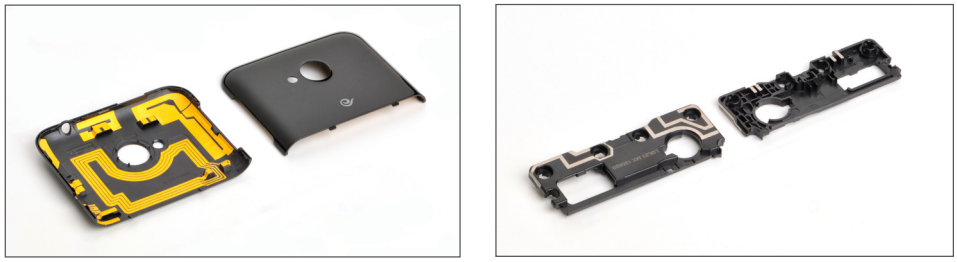

Figure 3: Molex LDS Antennas

While standard antennas can meet a wide range of needs, for the highest performance a customized antenna is often required. Molex designs, develops and manufactures custom and semi-custom antennas and antenna assemblies for wireless applications that work across all communication technologies including cellular, UMTS, Wi-Fi, WiMAX**, Bluetooth††, GPS, LoRa, ZigBee and others. Molex industry leading design and manufacturing know-how will help provide the optimal antenna design, performance and cost based on a customer's requirements. The use of vertically integrated manufacturing allows Molex to design antennas with the best manufacturing technology to meet a customer's needs. This includes Laser Direct Structuring Technology (LDS), which provides the flexibility and geometric 3D design freedom that previously limited other technologies like flexible circuit. Molex is a market leader in LDS technology with over 750 million LDS antennas shipped to date.

We encourage designers to contact Molex through your local Arrow representative for any additional information or antenna design and integration support.

*GPS - Global Positioning System. Civilian GPS uses the L1 frequency of 1575.42 MHz in the Ultra High Frequency (UHF) band spanning 300MHz to 3GHz.

†Wi-Fi is a registered trademarks of the Wi-Fi Alliance.

‡ZigBee is a registered trademark of the ZigBee Alliance.

§LoRa is a trademark of the LoRa Alliance.

**WiMAX is a trademark of WiMAX Forum.

††Bluetooth (BT & BTE) is a registered trademark of Bluetooth SIG, Inc.