Configurable RF Architecture Gives Engineers Greater Design Flexibility

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In the automotive environment, RF-enabled sub-systems continue to evolve and proliferate. Such systems include Tire Pressure Monitoring Systems (TPMS), which are mainly unidirectional on a single RF channel at relatively high data rates; Remote Start (RS) systems, which are generally bidirectional on single or multiple RF channels at relatively low data rates; Passive Keyless Entry (PKE) and Remote Keyless Entry (RKE) applications, which are unidirectional on single or multiple RF channels at moderate data rates. TPMS uses both On Off Keyed (OOK) and Frequency Shift Keyed (FSK) modulation, RS uses OOK only, and RKE uses either OOK or FSK. To accommodate such multiple systems and applications, automotive RF semiconductor devices must possess flexible as well as configurable architectures. The need for architectural flexibility, combined with customer expectations of high performance, improved range, and reliability, is driving the next generation of RF IC designs.

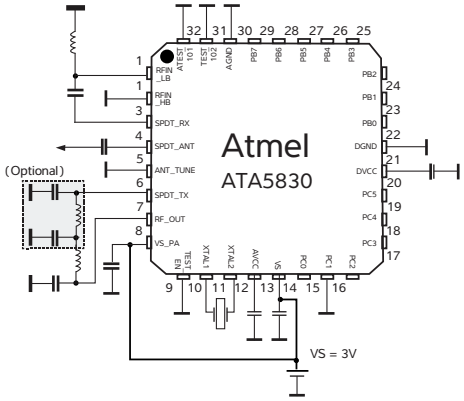
Beginning with range and reliability, improvements here are easier to realize when the transmit path has programmable parameters. One can usefully employ a Power Amplifier (PA) with reserve capacity, which can be trimmed in output power level to provide the maximum allowable output in accordance with local regulatory requirements. Further benefit can be obtained from a PA whose output impedance can be trimmed to optimize the antenna match. Range and reliability gains on the receive side can be enhanced through proper selection of sensitivity-related parameters, such as RF carrier frequency, sub-channels, modulation, data rate, and IF bandwidth.

Atmel Has Introduced Next-Generation Transceiver And Receiver Devices With Configurable Options

Flexibility for the design engineer is also gained through access to a receiver in which these parameters are available as a programmable option. Atmel® has introduced next-generation transceiver and receiver devices with these configurable options. For example, the Atmel ATA5830 transceiver and Atmel ATA5780 receiver can accommodate automotive applications such as RKE, PKE, TPMS, and RS. The devices also support all automotive bands: 310 to 318MHz, 418 to 477MHz, and 836 to 928MHz and use one device and a single crystal frequency.

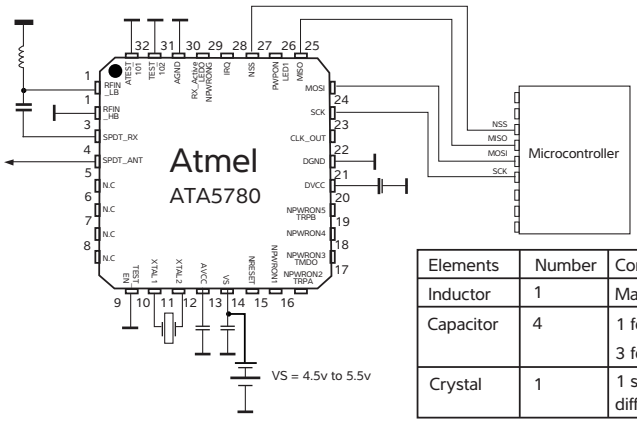
These two devices are also designed for architectural flexibility. A dual-LNA architecture with two separate input pins natively supports multi-band applications using one single IC, PCB, and bill of materials (BOM). Additionally, dual-parallel demodulation paths support simultaneous ASK and FSK sensing capability. These features accommodate multiple polling schemes including TPMS, RS and up to three RKE channels, and can be configured to support RF protocols across multiple frequency bands, modulation schemes, and data rates.

To implement the vast array of configurable content in both Atmel® devices, the desired configuration settings are stored in the built-in EEPROM and automatically applied to



Elements	Number	Comments
Inductor	2 (3)	Matching
Capacitor	7 (9)	3 (5) for matching 4 for Blocking
Crystal	1	1 single crystal for 3 different frequency ranges

Figure 1. Atmel ATA5830 Transceiver Application Circuit



Elements	Number	Comments
Inductor	1	Matching
Capacitor	4	1 for matching 3 for Blocking
Crystal	1	1 single crystal for 3 different frequency ranges

Figure 2. Atmel ATA5780 Receiver Application Circuit

Atmel Devices Also Have Enhancements Which Simplify Design and Reduce BOM Cost

the device on power-up. This enables autonomous (stand-alone) operation and polling for incoming signals from multiple RF systems with differing RF carrier frequency bands, modulation formats, and data rates. Stand-alone operation allows an external controller to sleep while the device polls, validates start of frame, and checks for proper transmitter ID data. The device only wakes the controller when a valid message is detected. This is critical to reducing Ignition Off Draw (IOD) in vehicle-mounted applications and to extending battery life in handheld fob applications.

Atmel devices also have some other enhancements which simplify design and reduce BOM cost. The Atmel ATA5830 transceiver device, for example, has an embedded Atmel AVR® microcontroller on the same silicon die. The microcontroller includes 6kByte of Flash and a 24kByte ROM library of user-accessible firmware, making it possible to develop an entire application using just one single IC. Both the ATA5830 transceiver and the Atmel ATA5780 receiver are also highly integrated, requiring very few external components. The application circuits (see Figures 1 and 2) show a standard implementation of each device. For a typical application, the ATA5830 transceiver only requires 10 external elements and the ATA5780 only six external elements. Both devices are packaged in a 5 x 5mm, 32-pin QFN package.

In conclusion, the newest generation of configurable Atmel RF semiconductor devices provides the design flexibility needed for rapidly evolving automotive RF-enabled subsystems.