Wireless Remote Control on a Chip

Silicon Laboratories Inc. recently introduced an EZRadio® wireless IC solution designed to reduce the cost and complexity of one-way wireless links used in a wide range of consumer, industrial and automotive systems. The new Si4010 system-on-chip (SoC) RF transmitter enables developers to optimize remote keyless entry (RKE), garage door opener, remote control, building automation and security device designs for the lowest system cost and highest performance while ensuring one-way link integrity. The Si4010 RF transmitter is the industry's first single-chip remote control IC requiring only one external bypass capacitor, a printed circuit board, battery and external case with pushbuttons to create a complete wireless remote control. Based on a patented crystal-less architecture, the Si4010 achieves ±150 ppm carrier frequency accuracy over the commercial temperature range and ±250 ppm over the industrial temperature range – twice the accuracy of traditional surface acoustical wave (SAW)-based transmitters – without using an external crystal. "The Si4010 is an optimal sub-GHz transmitter SoC for cost-sensitive wireless one-way link applications," said Rafi Fried, general manager of Silicon Labs' wireless products. "The Si4010's high level of integration significantly reduces the transmitter node's bill of materials, design time and complexity versus competing discrete-intensive solutions that typically contain more than 20 separate components." The Si4010 transmitter SoC is best paired with Silicon Labs' new Si431x RF receivers to enable a transmitter/receiver solution that substantially reduces the total bill of materials (BOM) and saves valuable board space for one-way link systems operating in the sub-GHz range (from 27 to 960 MHz). The Si431x receivers' state-of-the-art integration requires only two external antenna-matching components, a crystal and a bypass capacitor while eliminating the need for costly RF SAW and IF ceramic filters. The Si4010 is the first SoC transmitter with automatic antenna tuning, featuring a patented tuning circuit that automatically fine tunes the antenna for optimum transmit efficiency and constant output power. The Si4010's antenna tuning circuit continuously maximizes antenna efficiency by adjusting an on-chip variable capacitor to resonate with the antenna's inductance. The Si4010 supports programmable edge rate control for on-off keying (OOK) mode to reduce harmonic emissions and comply with governmental RF regulations. The Si4010's low power consumption greatly extends battery life for remote controls. Offering a 1.8 to 3.6 V supply range, ultra-low current consumption (The Si4010 contains an embedded 8051-compatible MCU core with 4 kB of RAM, 8 kB of one-time programmable (OTP) non-volatile memory, a 128-bit EEPROM and 12 kB of ROM for library functions. These ROM-based functions enable developers to easily implement complex features such as security encryption into their remote controls by using proven code to reduce risk and development time. The MCU's on-chip digital peripherals include wake-on-touch general-purpose I/Os (GPIOs), a patented 20-bit EEPROM counter providing one million cycles of read/write endurance, an LED driver, sleep timers, a debugger and a high-speed 128-bit Advanced Encryption Standard (AES) accelerator for secure one-way links.

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