

Product Bulletin

TRF6900/MSP430 Chipset - The new Single Chip RF Transceiver & Microcontroller Solution

Key Features

TRF6900 single-chip UHF transceiver

- 850 - 950 MHz operating range
- FSK operating mode
- Low power consumption due to ultra-fast turn-off / turn-on times
- On-chip DDS synthesizer, VCO and reference oscillator enables channelized systems
- Easy-to-use due to application reports, evaluation kit and optional design support from 3rd parties

MSP430 ultra-low-power microcontroller

- Ultra-low power consumption (350 μ A active, 1.3 μ A standby, 0.1 μ A shutdown mode)
- High throughput 16-bit RISC architecture with up to 5 MIPS

Easy-to-use TRF6900/MSP430 chipset for a broad range of applications

The new TRF6900/MSP430 chipset from Texas Instruments offers an easy microcontroller system upgrade by using RF capabilities without the need for extensive expertise in this area. The TRF6900/MSP430 chipset consists of the TRF6900 single-chip UHF transceiver and the MSP430 ultra-low-power microcontroller. It is working in the new 868/915 MHz ISM bands, which ensure excellent data transmission reliability

TRF6900 Single-Chip Transceiver

The TRF6900 is a single-chip 850-950 MHz UHF

transceiver with operating modes including Frequency Shift Keying (FSK) and narrow-band FM along with integrated features such as a Direct Digital Synthesizer (DDS), Voltage Controlled Oscillator (VCO), and data slicer. A transmit power amplifier is integrated as well to provide the needed output power.

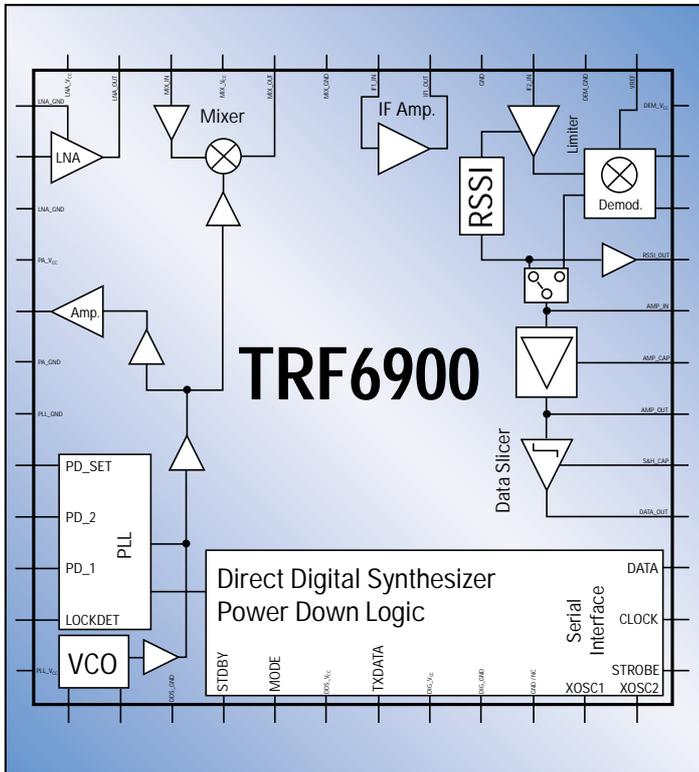
The TRF6900 is designed for low power operation, ensuring long battery life for in-field applications such as utility metering equipment. Designers can program the MSP430 to selectively turn on or off each major functional block. In addition, the transceiver features ultra-fast system turn-on and turn-off times in

order to keep battery drain at a minimum. The TRF6900 consumes typ. 2 μ A in standby mode and operates from a 2.2 to 3.6-V power supply.

By keeping the external component count low, the single-chip integration makes it possible to reduce the system complexity and cost.

For systems that do not require a microcontroller, the TRF6900 can be used as a stand-alone device.





TRF6900 internal block diagram

TRF6900 key benefits for your application:

- High performance, channelized system offering a bi-directional RF data link in a reliable frequency band
- FSK modulation mode possible
- Single-chip transceiver integration lowers the total system cost, increases reliability and simplifies design
- Integrated VCO's and power amplifier
- Data rates up to 200 Kbits/sec
- On-chip Direct Digital Synthesizer provides precision frequency control and fast channel hopping (spread spectrum)
- Ultra-fast system turn-on and turn-off times offer a quick response time and low power consumption as the device can remain longer in standby mode
- No adjustment points which lowers production costs

Ultra-Low-Power Microcontroller Family MSP430

The MSP430 generation of microcontrollers is designed for an unmatched ratio of ultra-low-power operation and high performance - the same performance RF applications demand. The devices feature a 16-bit RISC core with up to five million instructions per second (MIPS), which is much more powerful than standard 4- and 8-bit microcontrollers. The MSP430 generation is built with a highly orthogonal structure that provides developers with many different execution resources. The devices complement this high performance with ultra-low power consumption of 350 μ A in active mode, 1.3 μ A in standby mode, 0.1 μ A in shutdown mode, and a very fast 6 μ s wake-up time.

MSP430 devices control all of the settings of the RF device through a simple universal digital interface and can process and generate the received or transmitted data. The MSP430 can

switch the TRF6900 into standby/shutdown mode to reduce power consumption, while consuming virtually no power of its own.

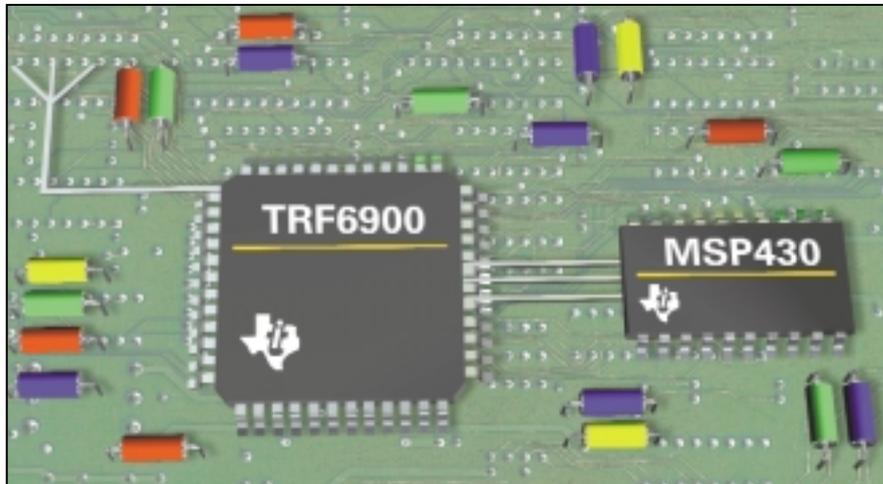
In addition to this core performance, devices in the family are available with a range of integrated peripheral options, including a 14-bit analog to digital converter (ADC), liquid crystal display (LCD) driver, universal synchronous asynchronous receiver transmitter (USART) and several different timer configurations.

The complete, easy-to-use TRF6900/MSP430 chipset solution

This new two-device chipset is designed for simplified and cost-effective implementation across a broad range of applications, such as battery-powered security systems and utility meter reading, that operate in the increasingly popular 870 MHz RF band in Europe and the 915 MHz RF band in the United States.

Design Ease-of-Use

The TRF6900/MSP430 chipset gives designers a highly integrated and cost-effective way to add this value-added system component. In addition, the TRF6900 is designed for simplified implementation, so even designers who don't have extensive RF design experience can easily use it to build RF into their next system design. The chipset's high integration together with the design support from TI and third party companies takes the fear out of RF design, which typically took years to master. Design support materials include a TRF6900/MSP430 Evaluation Kit, schematics, S/W utilities, MSP430 S/W routines and examples to program the TRF6900 to setup a complete RF link, datasheets and application notes.



Low external component count to reduce system complexity and system costs

Low Total System Cost

The TRF6900/MSP430 chipset consists of the TRF6900 single-chip UHF transceiver and one of the MSP430 ultra-low-power microcontrollers. Texas Instruments offers all of this functionality in these two devices. This high-level of integration and functionality, combined with TI's

leading-edge manufacturing capability allow designers to add complete RF functionality for low cost. In addition, the low external component count of the TRF6900 and no required adjustment points reduce the production cost even further.

Benefits the TRF6900/MSP430 chipset provide include:

- Operation in the reliable 850-950 MHz ISM (Instrumentation, Scientific, & Medical) bands
- Easy-to-use because of high integration resulting in low external component count
- Total system solution for low system cost
- Low power consumption for longer battery life (2 μ A standby current for the TRF6900 and 1.3 μ A for the MSP430)
- Fully programmable operating modes and frequency control
- Ready to use MSP430 software routines

Start immediately with the TRF6900/MSP430 Evaluation Kit, MSP-EVKTRF6900

For designers who want to begin application development immediately, TI offers the TRF6900/MSP430 chipset Evaluation Kit (EVK). The easy-to-use Windows® based software offers programming of the evaluation board via the MSP430P112 in a module oriented or binary mode. The board connects directly to a PC's serial port and can give a first demonstration of the chipset. The EVK can also be used to custom program the TRF6900/MSP430 chipset for individual performance tests.

The TRF6900/MSP430 Evaluation Kit (MSP-EVKTRF6900) contains:

- PC-based Evaluation board containing the TRF6900 & the MSP430P112
- TRF6900 Windows® based evaluation software
- MSP430 software baseband subroutines and examples for programming the TRF6900
- Documentation and application notes for the TRF6900 and MSP430x11x



TRF6900/MSP430 Evaluation Kit MSP-EVKTRF6900

TRF6900/MSP430 Third Party Support

Designers looking for off-the-shelf RF solutions can turn to TI's third-party network for design implementation support. Digades (www.digades.com) offers system solutions based on the TRF6900/MSP430 as well as custom developed and manufactured TRF6900/MSP430 solutions. In addition, IAR Consulting and Services (www.iar.de) in Europe

provides consultation on TRF6900/MSP430 designs.

For More Information

RF is becoming more and more important to differentiate applications with value-added features. The TRF6900/MSP430 chipset from Texas Instruments gives designers a cost-effective and simplified way to add this valuable capability. If you would like to learn more about how TI and the

TRF6900/MSP430 chipset can set your system apart, call your regional TI Product Information Centre (addresses below). Or you'll find more information on the TRF6900/MSP430 chipset at www.ti.com/sc/trf6900 on the Internet. For the TRF6900 transceiver as a standalone device, technical documentation can be found at www.ti.com/sc/rf

TI Worldwide Technical Support

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