NFC ISO15693 SENSOR TRANSPONDER

FEATURES

- ISO/IEC 15693, ISO/IEC 18000-3 (Mode 1) Compliant RF Interface
- Power Supply System With Either Battery or 13.56-MHz H-Field Supply
- Full-Differential First-Order Sigma-Delta (ΣΔ) Modulator
- Internal Temperature Sensor
- Resistive Sensor Bias Interface
- CRC16-Bit Generator
- MSP430 Mixed Signal Microcontroller
  - 2-kB FRAM
  - 4-kB SRAM
  - 8-kB ROM
  - Low Supply Voltage Range: 1.45 V to 1.65 V
  - Low Power Consumption
    - Active Mode (AM): 260 µA/MHz (1.5 V)
    - Standby Mode (LPM3, WDT_A Mode): 15 µA
    - Off Mode (LPM4): 9 µA
  - Wake-Up From LPM3 in Less Than TBD µs
  - 16-Bit RISC Architecture
  - Up to 4-MHz System Clock
  - Compact Clock System
    - 4-MHz High-Frequency Clock
    - 256-kHz Internal Low-Frequency Clock Source (Adjustable)
    - External Clock Input
  - 16-Bit Timer_A With Three Capture/Compare Registers
  - LV Port Logic
    - V_{OL} Lower Than 0.15 V at 400 µA
    - V_{OH} Higher Than V_{DDB} – 0.15 at 400 µA
    - Timer0 PWM Signal Available on All Ports
  - eUSCI_B Module Supports 4-Wire SPI and I^2C
  - 32-Bit Watchdog Timer (WDT_A)
  - ROM Development Mode (Map ROM Addresses to SRAM to Enable Firmware Development)
  - Full Four-Wire JTAG Debug Interface
- For Complete Module Descriptions, See the *RF430xxx15xH Family User's Guide* (SLAU419)

PRODUCT PREVIEW

DESCRIPTION

The Texas Instruments RF430FRL15xH is a 13.56-MHz transponder chip with a programmable 16-bit MSP430 low-power microcontroller. It features embedded universal FRAM nonvolatile memory for storage of program code or user data suc as calibration and measurement data. The RF430FRL15xH supports communication, parameter setting, and configuration via the ISO/IEC 15693, ISO18000-3 compliant RFID interface and the SPI or I^2C Interface. Sensor measurements are supported by the internal temperature sensor and the on-board slow-acquisition 14-bit sigma-delta analog-to-digital converter. Two configurable operational amplifiers allow for connection of external analog sensors.

Optimized for operation in fully passive (battery-less) or single-cell battery-powered (semi-active) mode to achieve extended battery life in portable and wireless sensing applications. FRAM is a new nonvolatile memory that combines the speed, flexibility, and endurance of SRAM with the stability and reliability of flash, all at lower total power consumption.

Table 1. Family Members

Device	FRAM (kB)	SRAM (kB)	Timer	13.56 MHz ISO15693 Front End	eUSCI_B	SD14
RF430FRL151H	2	1	Yes	Yes	Yes	Yes
RF430FRL152H	2	4	Yes	Yes	Yes	Yes
RF430FRL153H	2	4	Yes	Yes	No	Yes
RF430FRL154H	2	4	Yes	Yes	Yes	No

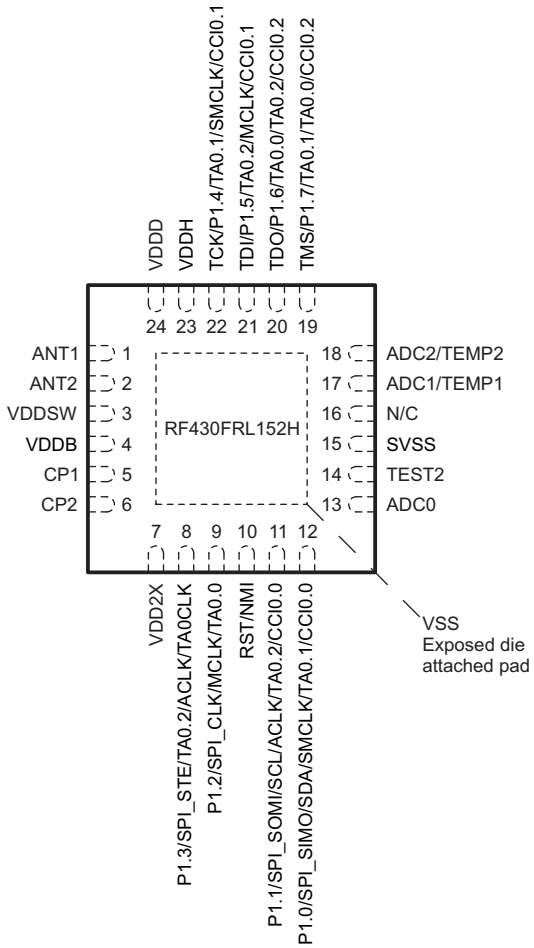
Table 2. Ordering Information(1)

T_A	PACKAGED DEVICES(2) PLASTIC 24-PIN QFN (RGE)
0°C to 70°C	RF430FRL151HCRGER RF430FRL152HCRGER RF430FRL153HCRGER RF430FRL154HCRGER

(1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at www.ti.com.
(2) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/packaging.

TERMINAL ASSIGNMENTS

RGE PACKAGE
(TOP VIEW)



PRODUCT PREVIEW

Functional Block Diagram

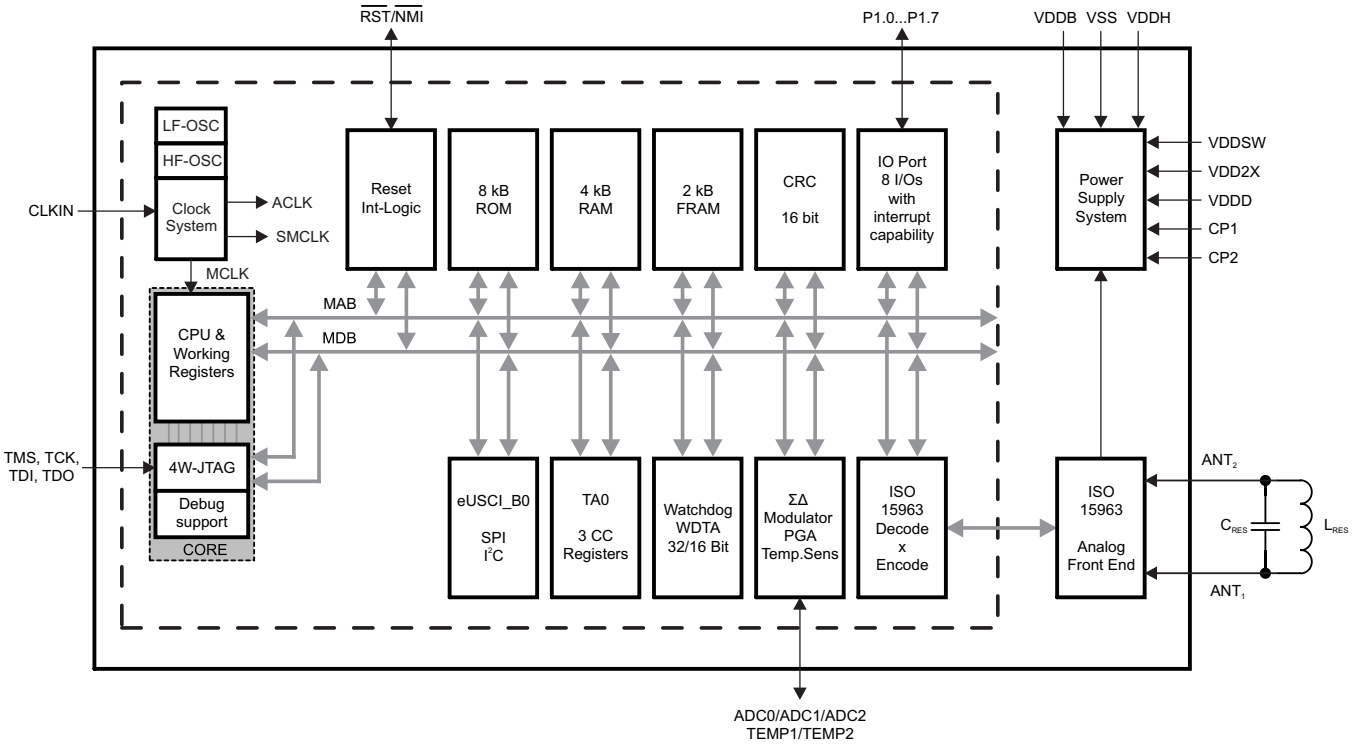


Table 3. Terminal Functions

TERMINAL		I/O(1)	DESCRIPTION
NAME	NO.		
ANT1	1	I	Antenna input 1
ANT2	2	I	Antenna input 2
V_{DDSW}	3		Selected supply voltage
V_{DDB}	4		Battery supply voltage
CP1	5		Charge pump flying cap terminal 1
CP2	6		Charge pump flying cap terminal 2
V_{DD2X}	7		Voltage doubler output
P1.3 SPI_STE TA0.2 ACLK TA0CLK	8	I/O	General-purpose digital I/O SPI slave transmit enable Timer_A TA0 OUT2 output ACLK output (divided by 1, 2, 4, 8, 16, or 32) Timer_A TA0 clock signal TA0CLK input
P1.2 SPI_CLK MCLK TA0.0	9	I/O	General-purpose digital I/O SPI clock MCLK output Timer_A TA0 OUT0 output
RST/NMI	10	I	Reset input active low Non-maskable interrupt input

(1) I = input, O = output

PRODUCT PREVIEW

Table 3. Terminal Functions (continued)

TERMINAL		I/O(1)	DESCRIPTION
NAME	NO.		
P1.1 SPI_SOMI SCL ACLK TA0.2 CCI0.0	11	I/O	General-purpose digital I/O SPI slave out master in I2C clock ACLK output (divided by 1, 2, 4, or 8) Timer_A TA0 OUT2 output Timer_A TA0 CCR0 capture: CCI0B input, compare
P1.0 SPI_SIMO SDA SMCLK TA0.1 CCI0.0	12	I/O	General-purpose digital I/O SPI slave in master out I2C data SMCLK output Timer0_A3 OUT1 output Timer_A TA0 CCR0 capture: CCI0A input, compare
ADC0	13	I	ADC input pin 0
TEST	14		Test Pin
SVSS	15		Sensor reference potential
NC	16		N/C
ADC1 / TEMP1	17		ADC input pin 1 / Resistive bias pin 1
ADC2 / TEMP2	18		ADC input pin 2 / Resistive bias pin 2
TMS P1.7 TA0.1 TA0.0 CCI0.2	19	I/O	JTAG test mode select General-purpose digital I/O Timer_A TA0 OUT1 output Timer_A TA0 OUT0 output Timer_A TA0 CCR2 capture: CCI2B input, compare
TDO P1.6 TA0.0 TA0.2 CCI0.2	20	I/O	JTAG test data output General-purpose digital I/O Timer_A TA0 OUT0 output Timer_A TA0 OUT2 output Timer_A TA0 CCR2 capture: CCI2A input, compare
TDI P1.5 TA0.2 MCLK CCI0.1	21	I/O	JTAG test data input General-purpose digital I/O Timer_A TA0 OUT2 output MCLK output Timer_A TA0 CCR1 capture: CCI1B input, compare
TCK P1.4 TA0.1 SMCLK CCI0.1 CLKIN	22	I/O	JTAG test clock General-purpose digital I/O Timer_A TA0 OUT1 output SMCLK output Timer_A TA0 CCR1 capture: CCI1A input, compare External clock input pin
V_{DDH}	23		Rectified voltage from RF-AFE
V_{DDD}	24		Digital supply voltage
V_{SS}			Ground reference, bonded to exposed pad(2)

(2) VSS combines both digital ground (DV_{SS}) and analog ground (AV_{SS})

PRODUCT PREVIEW

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
RF430FRL151HSRGER	PREVIEW	VQFN	RGE	24	3000	TBD	Call TI	Call TI			
RF430FRL152HSRGER	PREVIEW	VQFN	RGE	24	3000	TBD	Call TI	Call TI			
RF430FRL153HSRGER	PREVIEW	VQFN	RGE	24	3000	TBD	Call TI	Call TI			
RF430FRL154HSRGER	PREVIEW	VQFN	RGE	24	3000	TBD	Call TI	Call TI			

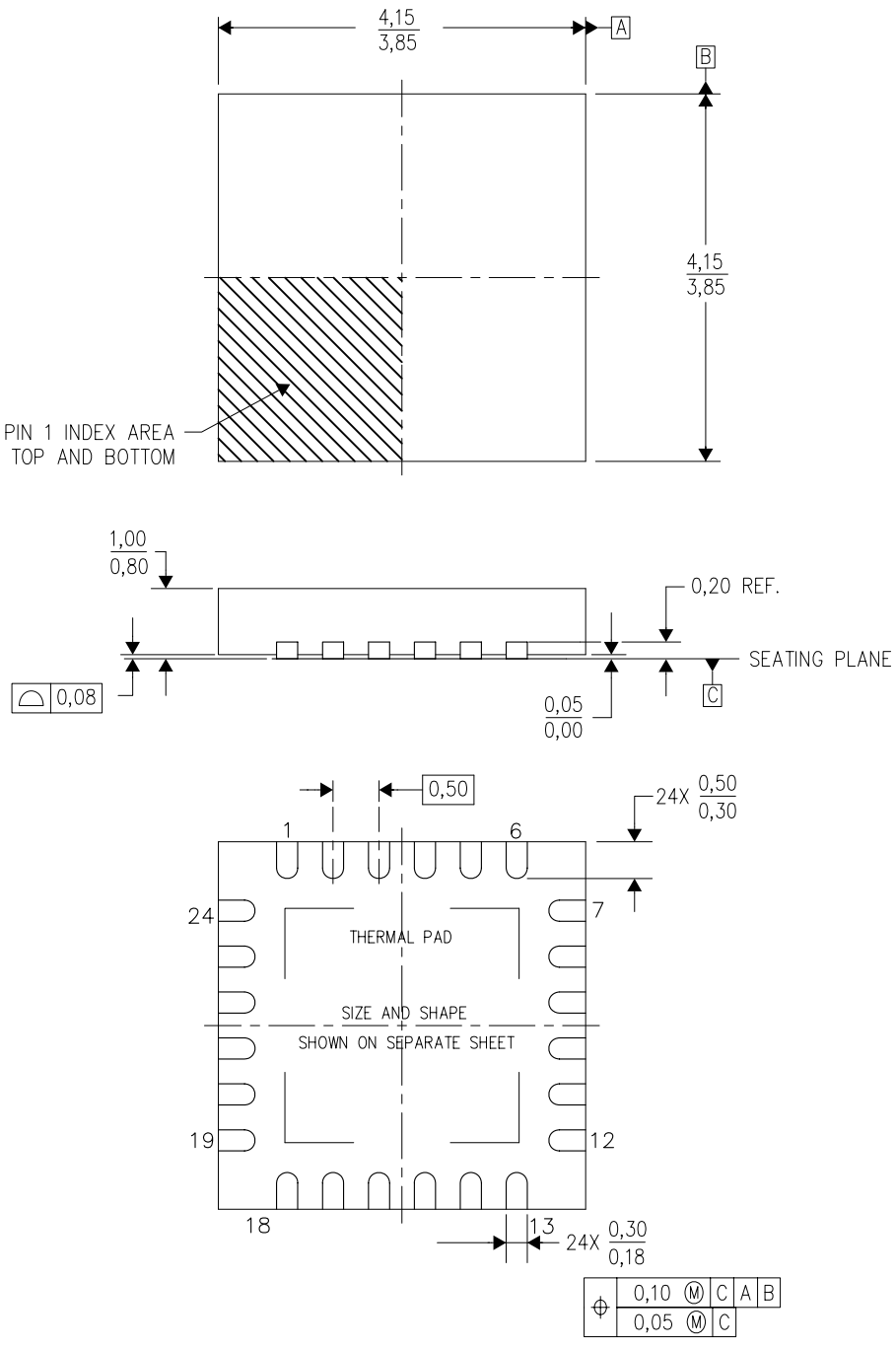
(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) Multiple Top-Side Markings will be inside parentheses. Only one Top-Side Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Top-Side Marking for that device.

RGE (S–PVQFN–N24) PLASTIC QUAD FLATPACK NO–LEAD



NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. Quad Flatpack, No–Leads (QFN) package configuration.
D. The package thermal pad must be soldered to the board for thermal and mechanical performance.
E. See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.
F. Falls within JEDEC MO–220.

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Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265