A closer look at your new LaunchPad Development Kit

Featured microcontroller: MSP430FR6989

This LaunchPad is great for...

- Battery-operated LCD applications enabled by the ultra-low-power and integrated LCD driver on the MSP430FR6989
- Remote sensing and datalogging with up to 128 kB of embedded FRAM
- Rotation detection utilizing the Extended Scan Interface, a dual analog front-end (AFE)

What comes in the box?

MSP-EXP430FR6989 LaunchPad

eZ-FET on-board emulator
Enables programming, debugging & application UART via USB.

Featuring EnergyTrace™++ technology, enabling power-aware debugging

QSG
This Quick Start Guide

Micro-USB Cable

Software @ ti.com/ msp-exp430fr6989

MSP430FR6989 Microcontroller
- 16 MHz CPU
- 128 kB Embedded FRAM
- Liquid Crystal Display (LCD)
    - LCD support up to 320 segments
- Extended Scan Interface (ESI)
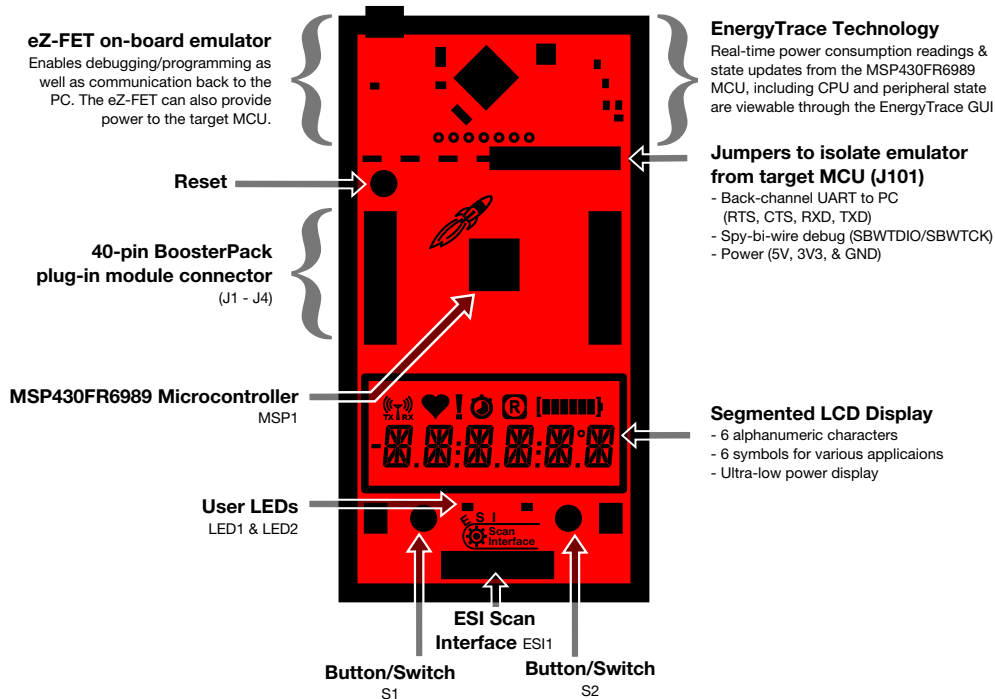- 83 General Purpose Input/Output

- 5 x 16-bit timers, 1 x 16-bit Real-Time Clock (RTC)
- Direct Memory Access (DMA)
- 128-bit or 256-bit AES Security Encryption/Decryption
- 16-channel 12-bit Analog-to-Digital Converter (ADC)
- Serial communication module (eUSCI)
    - UART, SPI, I2C
    - IrDA enhanced IR Modulation

Out-of-box Demo

1. Connecting to the computer
Connect the LaunchPad using the included USB cable to a computer. A green power LED should illuminate. For proper operation, drivers are needed. It is recommended to get drivers by installing an IDE such as TI's CCS or IAR EW430. Drivers are also available at ti.com/MSPdrivers.

2. Running the Out-of-box Demo
When connected to your computer, the LaunchPad will power up and display a greeting message on the LCD. Press and hold the S1 and S2 buttons simultaneously to select a new mode.

Stopwatch Mode
This mode provides a simple stopwatch application. It supports split time, where the display freezes while the stopwatch continues running in the background.

Timer Stopped:
S1 - Start time
S2 - Reset time
Timer Running:
S1 - Stop time
S2 - Split time (lap time)

Temperature Mode
This mode provides a simple thermometer application. Using the on-chip temperature sensor, the temperature is displayed on the LCD.

S1 - Pause current temperature
S2 - Toggle temperature between °F/C

MSP-EXP430FR6989 Overview

eZ-FET on-board emulator
Enables debugging/programming as well as communication back to the PC. The eZ-FET can also provide power to the target MCU.

Reset

40-pin BoosterPack plug-in module connector
(J1 - J4)

MSP430FR6989 Microcontroller
MSP1

User LEDs
LED1 & LED2

Button/Switch
S1

ESI Scan Interface ESI1

Button/Switch
S2

EnergyTrace Technology
Real-time power consumption readings & state updates from the MSP430FR6989 MCU, including CPU and peripheral state are viewable through the EnergyTrace GUI

Jumpers to isolate emulator from target MCU (J101)
- Back-channel UART to PC (RTS, CTS, RXD, TXD)
- Spy-bi-wire debug (SBWTDIO/SBWTCK)
- Power (5V, 3V3, & GND)

Segmented LCD Display
- 6 alphanumeric characters
- 6 symbols for various applicaions
- Ultra-low power display

EnergyTrace++™ Technology

EnergyTrace technology implements a unique method for measuring MCU current consumption. EnergyTrace uses a DC-DC solution to measure the time density of charge pulses. On the MSP430FR6989 device, built in hardware enables EnergyTrace+[CPU States]+[Peripheral States]. The EnergyTrace technology window allows users to view power data and compare power consumption! This makes optimizing the power consumption of an application easier than ever before!

EnergyTrace Profile
EnergyTrace Profile runtime and energy data for low power modes along with each function run during Active Mode.

Graphical Power Data
These three tabs of the EnergyTrace Technology window show a graph over time of power, energy, and device state.

Enable EnergyTrace Technology Window
1. Download CCS version 6.0 and newer
   - ti.com/ccs

2. Enable EnergyTrace Technology Window
   - In CCS, click: Window>> Preferences >> Code Composer Studio >> Advanced Tools >> EnergyTrace Technology
   - Check "Enable" box
   - Select EnergyTrace+[CPU State]+[Peripheral State]

3. Debug your application to launch EnergyTrace Window

EnergyTrace™ Technology — Power — Energy — States

Reference: MSP430_D_2014_03_05_142652

EnergyTrace++™ Profile

Name	Runtime (%)	Energy (%)	Delta Runtime (%)	Delta Energy (%)	Reference Runtime (%)	Reference Energy (%)
System	100	70.9	0	-29.1	100	100
▲ CPU						
▲ Low Power Mode	84.9	81.2	-9.8	-12.0	94.7	93.1
LPM3	84.9	81.2	84.9	81.2	0.0	0.0
LPM1	0.0	0.0	-94.7	-93.1	94.7	93.1
▲ Active Mode	15.1	18.8	9.8	12.0	5.3	6.9
UART_print	4.5	5.5	0.4	0.2	4.1	5.2
USCI_A0_ISR	4.4	5.5	4.4	5.5	0.0	0.0
▲ _RTS_	2.4	2.9	1.4	1.6	0.9	1.3

Current Profile   **Delta Statistics**   **Reference Profile**