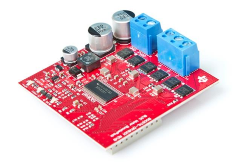
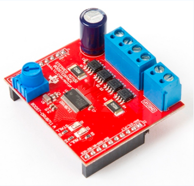
# BoosterPack Ecosystem



**DRV8301 Motor Driver BoosterPack**
- Spin Any Three Phase Motor!
- 6-24V Supply Input
- 10A Continuous/14A Peak
Only $49



**DRV8711 Stepper Motor Driver BoosterPack**
- Design your own CNC or 3D printer!
- 8-52V Supply input
- 4.5A Continuous/15A Peak
Only $25

>> See them all @ ti.com/boosterpacks

# Software Tools

**Energia**
A simple open-source & community-driven code editor.

Easy-to-use functions for blinking LEDs, buzzing buzzers & sensing sensors.
>> www.energia.nu

**Professional Software tools**
LaunchPad is also supported by professional IDEs that provide industrial-grade features and full debug-capability. Set breakpoints, watch variables & more with LaunchPad.

www.ti.com/ccs

Code Composer Studio™ IDE

www.ti.com/motorware

InstaSPIN MOTION

MotorWare™ Solution Software

# Meet the TMS320F28069M LaunchPad Development Kit

Part Number: LAUNCHXL-F28069M

Texas Instruments

## Resources

ti.com/launchpad

- Code examples
- Open Source Design Files
- Documentation
- Example projects
- Videos
- Tutorials
- Other TI products

## Below are the pins exposed @ the BoosterPack connector.

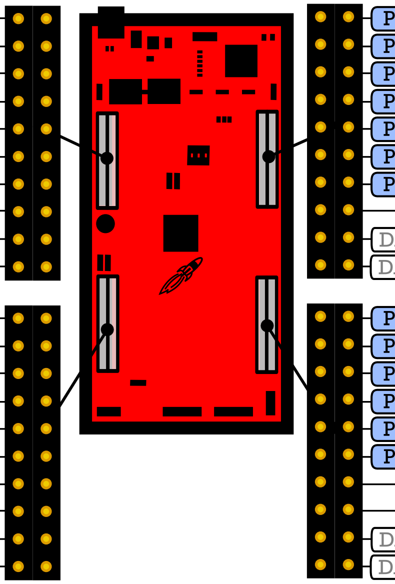
Also shown are functions that map with the BoosterPack standard.

* Note that to comply with the I2C channels of the BoosterPack standard, a software-emulated I2C must be used.

** Some LaunchPads do not 100% comply with the standard, please check your LaunchPad to ensure compatability

(!) Denotes I/O pins that are interrupt-capable.

### LAUNCHXL-F28069M



| LAUNCHXL-F28069M Pin map | | BoosterPack standard | BoosterPack standard | LAUNCHXL-F28069M Pin map |
|---|---|---|---|---|
| | +3.3V | +3.3V | +5V | +5V |
| | ADCINA6 | Analog In | GND | GND |
| SCIA RXD | P28 | UART RX (→MCU) | Analog In | ADCINA7 |
| SCIA TXD | P29 | UART TX (←MCU) | Analog In | ADCINB1 |
| (!) | P12 | GPIO (!) | Analog In | ADCINA2 |
| | ADCINB6 | Analog In | Analog In | ADCINB2 |
| SPIA CLK | P18 | SPI CLK | Analog In | ADCINA0 |
| (!) | P22 | GPIO (!) | Analog In | ADCINB0 |
| I2CA SCL | P33 | I2C SCL | Reserved | ADCINA1 |
| I2CA SDA | P32 | I2C SDA | Reserved | |

| LAUNCHXL-F28069M Pin map | | BoosterPack standard | BoosterPack standard | LAUNCHXL-F28069M Pin map |
|---|---|---|---|---|
| | +3.3V | +3.3V | +5V | +5V |
| | | Analog In | GND | GND |
| SCIB RXD | P15 | UART RX (→MCU) | Analog In | ADCINB7 |
| SCIB TXD | P58 | UART TX (←MCU) | Analog In | ADCINB4 |
| (!) | P20 | GPIO (!) | Analog In | ADCINA5 |
| | | Analog In | Analog In | ADCINB5 |
| SPIB CLK | P14 | SPI CLK | Analog In | ADCINA3 |
| (!) | P21 | GPIO (!) | Analog In | ADCINB3 |
| (!) | P23 | I2C SCL | Reserved | ADCINA4 |
| | P54 | I2C SDA | Reserved | |

| LAUNCHXL-F28069M Pin map | BoosterPack standard | BoosterPack standard | BoosterPack standard | LAUNCHXL-F28069M Pin map |
|---|---|---|---|---|
| P0 (!) EPWM1A | PWM | GPIO (!) | GND | GND |
| P1 (!) EPWM1B | PWM | GPIO (!) | PWM GPIO (!) | P19 (!) ECAP1 |
| P2 (!) EPWM2A | PWM | GPIO (!) | SPI CS GPIO (!) | P44 |
| P3 (!) EPWM2B | PWM | GPIO (!) | GPIO** | |
| P4 (!) EPWM3A | Timer | GPIO (!) | RST | RST |
| P5 (!) EPWM3B | Timer | GPIO (!) | SPI MOSI | P16 SPIA SIMO |
| P13 (!) | | GPIO (!) | SPI MISO | P17 SPIA SOMI |
| | | GPIO (!) | SPI CS GPIO (!) | P50 |
| DAC1 | | GPIO (!) | SPI CS GPIO (!) | P51 |
| DAC2 | | GPIO (!) | GPIO (!) | P55 |

| LAUNCHXL-F28069M Pin map | BoosterPack standard | BoosterPack standard | BoosterPack standard | LAUNCHXL-F28069M Pin map |
|---|---|---|---|---|
| P6 (!) EPWM4A | PWM | GPIO (!) | GND | GND |
| P7 (!) EPWM4B | PWM | GPIO (!) | PWM GPIO (!) | P27 (!) |
| P8 (!) EPWM5A | PWM | GPIO (!) | SPI CS GPIO (!) | P26 (!) |
| P9 (!) EPWM5B | PWM | GPIO (!) | GPIO** | |
| P10 (!) EPWM6A | Timer | GPIO (!) | RST | RST |
| P11 (!) EPWM6B | Timer | GPIO (!) | SPI MOSI | P24 SPIB SIMO |
| | | GPIO (!) | SPI MISO | P25 SPIB SOMI |
| | | GPIO (!) | SPI CS GPIO (!) | P52 |
| DAC3 | | GPIO (!) | SPI CS GPIO (!) | P53 |
| DAC4 | | GPIO (!) | GPIO (!) | P56 |

# A closer look at your new LaunchPad Development Kit

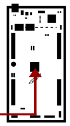
## Featured microcontroller: TMS320F28069M

## This LaunchPad is great for...

- Evaluation of InstaSPIN™-FOC and InstaSPIN-MOTION for three phase motor control, including encoder and sensorless based torque, velocity, and servo position control
- Experimentation with power conversion control including DC-AC, AC-DC, DC-DC, and MPPT algorithms
- Power Line Communications and Metering
- Industrial sensing and interface
- DSP, sensing, and capture applications including radar, Doppler, infrared, and time-of-flight

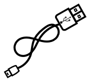
### What comes in the box?

**LAUNCHXL-F28069M LaunchPad**

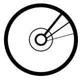


**XDS100v2 On-Board Emulator**
Enables programming, debugging & application UART via USB while protecting your PC with electrical isolation.

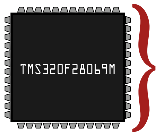
This Quick Start Guide



Mini-USB Cable

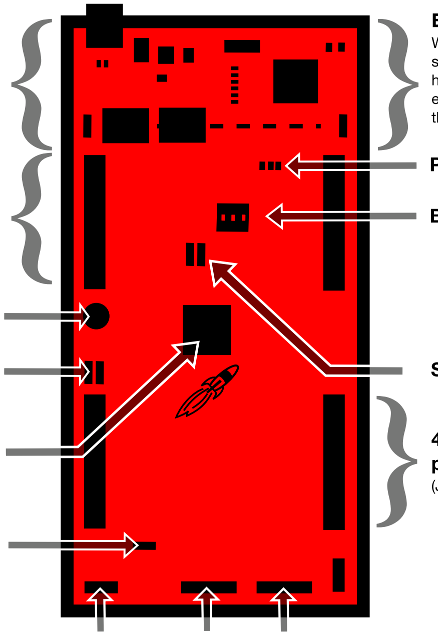


Software @ ti.com/launchxl-f28069m



**TMS320F28069M Microcontroller**
- 90 MHz CPU
- 256 kB Flash and 96 kB RAM
- InstaSPIN-MOTION and FOC Enabled
  - Robust Speed and Position Control
  - Simple Tuning
  - Compensates for Real Mechanics of Systems
- Viterbi, Complex Math, and CRC Accelerator (VCU)
- 16-Channel Enhanced Pulse Width Modulator (ePWM)
- 16-Channel 12-bit Analog-to-Digital Converter (ADC)
  - 3.46 Msps + Internal Reference
- Serial Communications Peripherals
  - SCI, SPI, I2C
  - CAN, McBSP

# LAUNCHXL-F28069M Overview



**XDS100v2 On-Board Emulator**
Enables JTAG debugging/programming as well as provides serial communication back to the PC. The XDS100 can also provide power to the target MCU.

**40-pin BoosterPack plug-in module connector**
(J1, J2, J3, and J4)

**Reset**

**Power Jumpers**
(JP4 and JP5)

**TMS320F28069M Microcontroller**
(U1)

**5V Enable Jumper**
(JP3)

**Electrically Isolated PC Interface**
When power to the F28069M device is supplied externally through the BoosterPack headers, JP1 and JP2 may be removed to enable electrical isolation of the board from the PC.

**Power & User LEDs**
(D1, D9, and D10)

**Boot Configuration Switches**
(S1)

**Serial Muxing Jumpers**
(JP6 and JP7)

**40-pin BoosterPack plug-in module connector**
(J5, J6, J7, and J8)

**CAN Interface w/Transceiver**
(J12)

**Dual 5V Quadrature Interfaces**
(QEP_A and QEP_B)

# Out-of-box Demo

For more detailed instructions refer to the user's guide @ ti.com/launchxl-f28069m

**1. Connecting to the Computer**
Connect the LaunchPad using the included mini-USB cable to a computer. Two green power LEDs should illuminate. For proper operation, drivers are needed. It is recommended to get drivers by installing an IDE such as TI's CCS. Drivers are also available at ti.com/xds100drivers.

**2. Running the Out-of-box Demo**
When connected to your computer, the LaunchPad will power up and flash the red and blue LEDs for approximately 3 seconds. After the LEDs complete flashing the LaunchPad goes into a temperature measurement mode.

**Temperature Mode**
This mode provides a simple thermometer application. Using the on-chip temperature sensor, a reference temperature is recorded when this mode is entered. Once a second thereafter, the device's temperature is measured and compared to the reference temperature.

If the temperature has increased the red LED (D9) will light, and will increase in intensity for each degree above the reference the temperature is.

Conversely, if the temperature has decreased the blue LED (D10) will light, and will increase in intensity for each degree below the reference the temperature is.

Temperature data is also sent serially to the PC through the USB cable using a virtual COM port. The data can be viewed in a terminal using these settings: 115200 baud, 8 data, no parity, and 1 stop bit.

# InstaSPIN™ Technology

Find more information @ ti.com/instaspin

TI's InstaSPIN sensorless, three-phase motor solutions make designing motor control applications easier whether you have a simple application or a complex design.

InstaSPIN MOTION

**InstaSPIN™-MOTION**
TI's InstaSPIN-MOTION is powered by SpinTAC™ from LineStream Technologies. SpinTAC provides robust control across dynamic speed, position, and load ranges of the system. SpinTAC significantly slashes setup time by replacing hard-to-tune PID controllers with simple, single-parameter tuning. InstaSPIN-MOTION is ideal for applications that require accurate speed and position control, minimal disturbance, and for applications that undergo multiple state transititions or experience dynamic changes.

InstaSPIN FOC

**InstaSPIN™-FOC**
TI's InstaSPIN-FOC (field-oriented-control) technology enables designers to identify, tune, and fully control any type of three-phase, variable speed, sensorless, synchronous, or asynchronous motor control system in just minutes

This new technology removes the need for a mechanical motor rotor sensor to reduce system costs and improve operation using TI's new software encoder (sensorless observer) algorithm, FAST™ (Flux, Angle, Speed, and Torque). This enables premium solutions that improve motor efficiency, performance, and reliability in all variable-speed and load motor applications.

**Getting Started with InstaSPIN™**
To get started download MotorWare from www.ti.com/motorware. After MotorWare is installed, run MotorWare.exe and follow the User's Guide for the F28069M LaunchPad.

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