FTF 2016
TECHNOLOGY FORUM

# MAKE YOUR OWN 3D PRINTER WITH NXP TECHNOLOGY

## FTF-SMI-2003

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PRESENTER TITLE
FTF-SMI-2003
MAY 19, 2016

# AGENDA

- What is a 3D Printer?
- Understand the basics of 3D printing
- Understand the basics of assembling a 3D printer
- How can NXP help enable your 3D printer build?
- What are the Electronics involved in creating a 3D printer?

# What is 3D Printing?

**Most printers today are FFF type:**
Fused Filament Fabrication

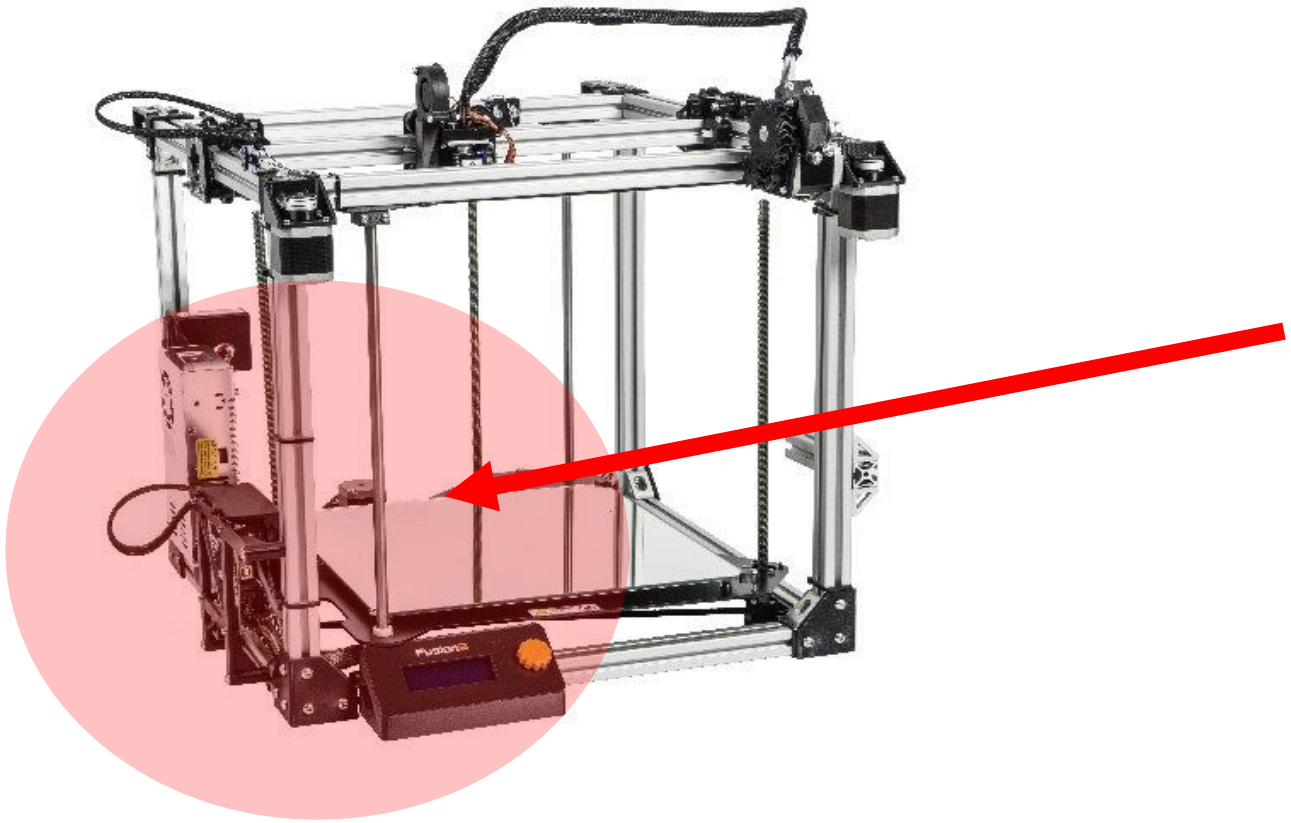
# What Are the Parts that Make Up 3D Printing?

- Printer frame
- Printer mechanical slides
- Print head
- Stepper motors
- Print bed – heated
- Display
- SD card – printing files
- Power supply
- Slicing software – G-code conversion
- Plastic filament
- ELECTRONICS!!!!

# How Can NXP Help Me Enable My 3D Printer? …Electronics!

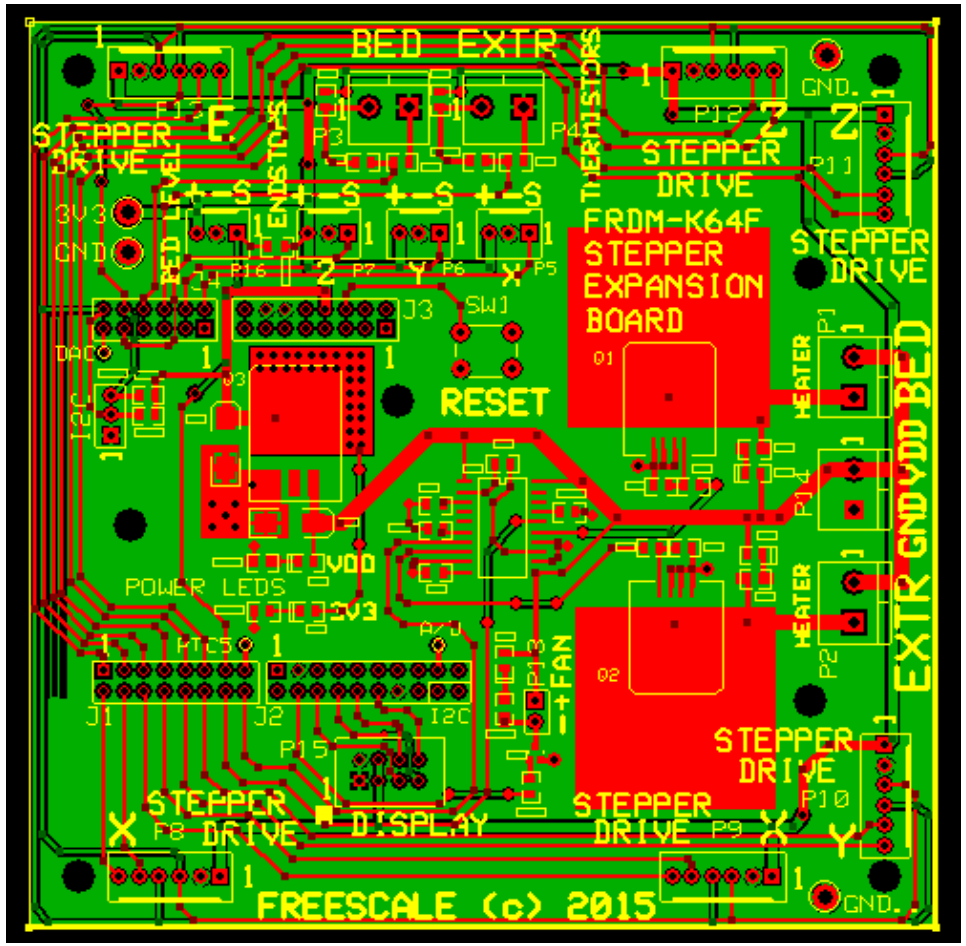
- NXP has just about everything in the electronics that you need to get your 3D printer up and running!
  - Microcontrollers – ARM® Cortex® Core-M0+, M4
  - Power supply components
  - Motor control components
    - MOSFETS
    - DC-to-DC converters
    - Transistors
    - Temperature sensors
    - H-Bridge pre-drivers
  - Motor Control Software -  Kinetis motor suite!
  - Stepper motor control library code

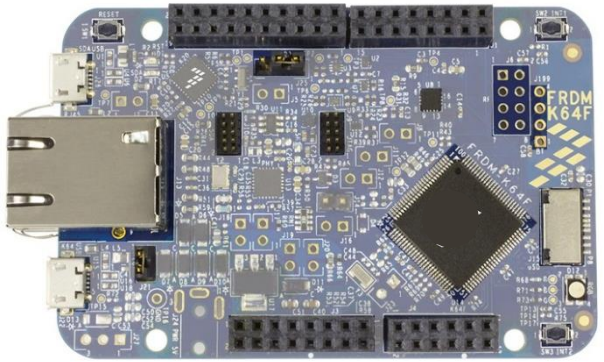
# See Where NXP Can Help Enable Your Design for Hardware!

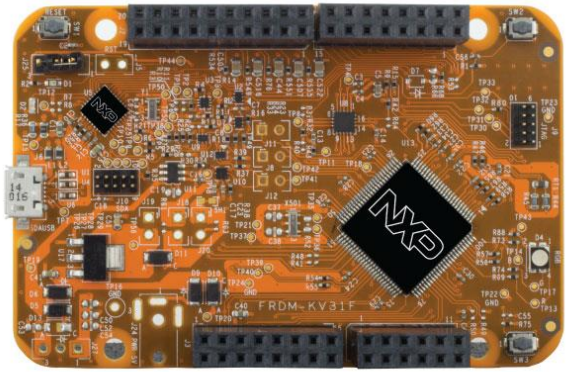


Microcontrollers – ARM M0+, M4
Power supply components
Motor control components
MOSFETS
DC-to-DC converters
Transistors
Temperature sensors
H-Bridge pre-drivers

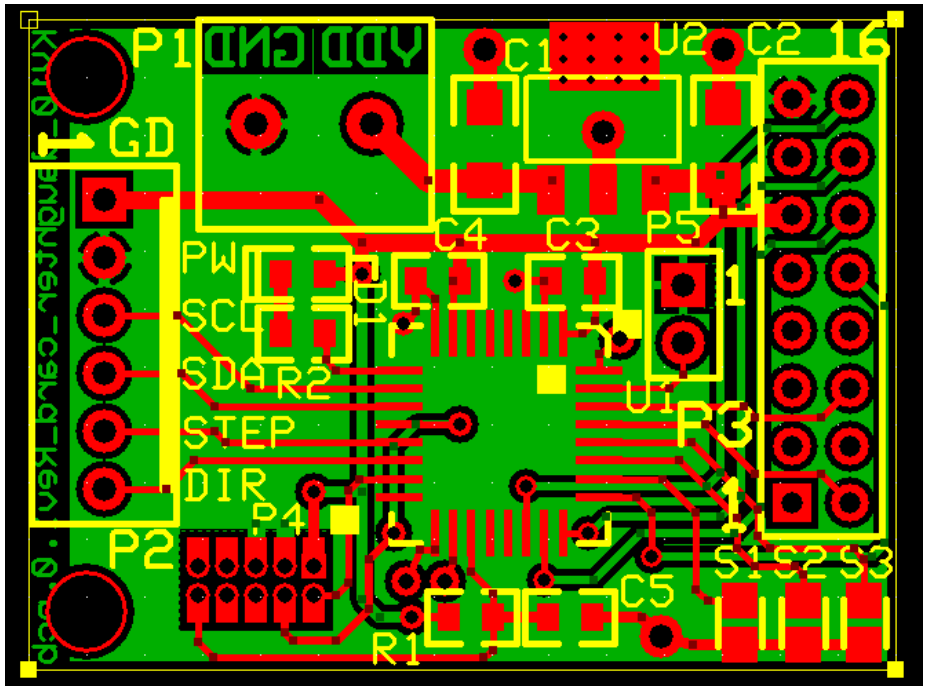
# Custom Hardware Using the FRDM-K64F, FRDM-KV31, MC33932EK EVB Boards



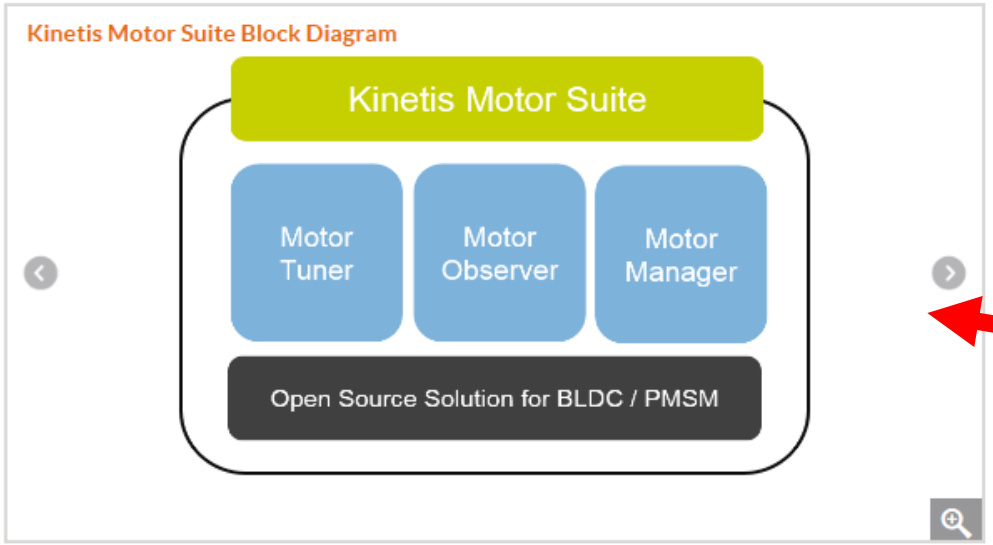



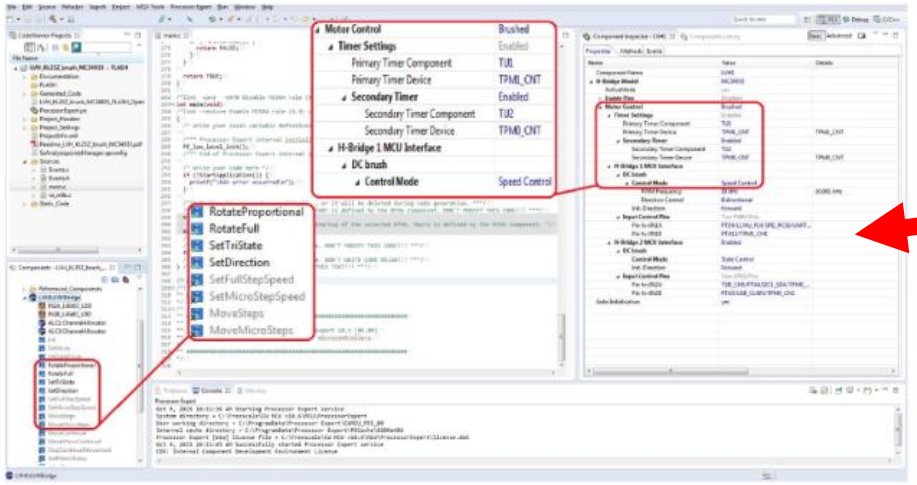

# Custom Hardware Using the MKV10 Microcontroller as Motor Drives




# See Where NXP Can Help Enable Your Design for Software!




Motor Control Software - Kinetis Motor Suite!




Stepper Motor control library code

# COME DOWN TO THE TECH LAB TO SEE A DEMONSTRATION OF THE NXP 3D PRINTER!

# SENSOR PRODUCTS TIMELINE

**1980**

We manufacture our first uncompensated pressure sensor

**1981**

Production start of First Temperature Sensor KTY81

**1982**

Pressure sensors are supplied for manifold absolute pressure (MAP), enabling a major reduction in emissions and fuel consumption

**1985**

Development of first magnet sensor family KMZ10

**1985**

A temperature-compensated pressure sensor is unveiled

**1989**

Development of first ABS sensor

**1991**

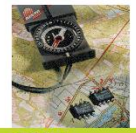
Bipolar integrated pressure sensor production begins

**1992—present**

Dedicated supplier to the critical care medical market shipping over 90 million units for the invasive blood pressure market

**1994**

Start angular sensor Production KMZ41

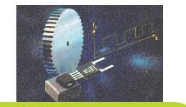


**1995**

Start production Compass sensor KMZ51

**1996**

Inertial sensors start volume production



**1996**

Start production Integrated ABS Sensor family

**Late 1990s**

A new wingback/PDIP package is developed for the Z-axis inertial sensor

**Early 2000s**

Inertial sensor portfolio expands with X-, XY- and Z-axis low-g products

**2002**

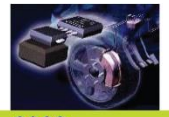
Began providing pressure sensors for respiratory medical equipment

**2003**

Tire pressure monitoring system developed, utilizing capacitive technology to save power

**2003**

Smarter, faster airbag deployment enabled by satellite accelerometer introduction



**2003**

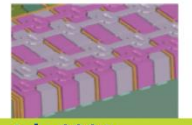
100 mill sensors shipped

**2004**

Launch integrated angular sensor system KMA200

**May 2005**

Freescale introduces its first 3-axis MMA7260Q low-g inertial senso



**July 2006**

First HARMEMS technology MMA62xxEG products shipped for airbags with robust accuracy

**2007**

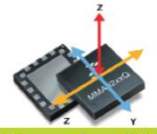
Launch integrated angular sensor system KMA199

**2008**

TPMS highly integrated, single-package, low-power solution introduced with pressure sensor, 8-bit MCU, RF transmitter, 2-axis X- and Z-axis accelerometer

**November 2008**

Synerject announces its ongoing use of Freescale pressure sensors for robust, cost-effective ECUs for two- and four-stroke engine management



**December 2008**

3-axis accelerometers offer reliable, cost-effective freefall detection to help protect data stored on laptop hard disks

**June 2009**

MPL115A released, the first digital barometric pressure sensor with easy-to-use digital interface and low power


**January 2010**

Freescale Sensors Group marks thirty years of industry innovation and leadership

**February 2010**

MMA845xQ unveiled, a very low- power 12-bit digital (I²C) resolution accelerometer with embedded functions to enable next-generation intelligent motion features

**June 2010**

Freescale launches Xtrinsic sensing solutions, the first smart sensors in the market

**January 2011**

Freescale introduces the first magnetometer in its Xtrinsic sensor portfolio

**2011**

Launch BL DC Sensor KMZ60

**2011**

Select Comfort launches production using differential pressure sensors to enable tracking & sleep optimization through SleepIQ


**February 2012**

Award-winning Xtrinsic eCompass software introduced

**2012**

MPL3115A2 altimeter released

**2012**

Launch throttle Sensor KMA220

**June 2012**

Joint announcement with Kinetis introducing the MMA8491Q

**June 2012**

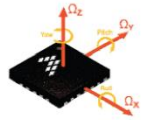
Accelerometers for smart meter physical tamper detection debut

**2013**

Wide bandwidth 3 axis accelerometer for vibration sensing applications launched

**August 2013**

Xtrinsic MMA9550L motion-sensing platform detects falls and an Xtrinsic MAG3110 3-axis magnetometer works in conjunction for accurate compass-based location information in Numera's Personal Emergency Response System



**October 2013**

Gyroscope sampling began



**2014**

Launch angular sensor with SENT output



**2014**

Alternative Fuel (LPG) after-market installs with ported pressure sensors



**2014**

First 3 axis gyroscope launched–FXA21002



**2015**

MPL3115A2 altimeter used in inhaler applications



**2015**

Ikeg uses ported differential sensor used to detect amount of beer remaining



**2016**

Launch of first monolithic integrated MR sensor




**2016**

Reached 3 billion sensors shipped milestone

# Other Sensor Sessions This Week

| Session | Day | Time | Title | Room |
|---|---|---|---|---|
| FTF-SMI-N1946 | Monday | 16:15 | Build Better Drones with NXP Products | 301 & 302 – Level 3* |
| FTF-AUT-N1821 | Tuesday | 11:00 | Automotive Sensors Portfolio | Lone Star Ballroom E - Level 3 |
| FTF-INS-N1820 | Tuesday | 14:30 | Hands-On Workshop: Sensor Mining and Algorithm Development (Reserved Seat Required) | Griffin Hall 1 - Level 2 |
| FTF-INS-N2014 | Wednesday | 11:00 | Collecting and Analyzing Sensor Data Readily using NXP Hardware and Software Tools Including Kinetis SDK and IS-SDK | Lone Star Ballroom H - Level 3 |
| FTF-INS-N1819 | Wednesday | 14:30 | Sensor Deep-Dive Demos and Data Collection Techniques | Lone Star Ballroom H - Level 3 |
| FTF-INS-N1816 | Wednesday | 16:45 | Sensors for Industrial and Medical IoT Applications | 301 & 302 - Level 3 |
| FTF-INS-N1818 | Thursday | 9:00 | The Fundamentals of Sensor Data Analytics | 301 & 302 - Level 3 |
| FTF-INS-N1817 | Thursday | 09:00 | Introduction to Sensor Toolbox and IoT Sensing SDK | Lone Star Ballroom F – Level 3 |
| FTF-SMI-N2003 | Thursday | 11:00 | Make Your Own 3D Printer with NXP Technology | Lone Star Ballroom G - Level 3 |



* Cross BU session, intro to sensors for drones

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# ATTRIBUTION STATEMENT