NXP's Complete Sensor Overview:

Motion, Pressure and Magnetic Sensors for Automotive and IoT Applications

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BL Sensors

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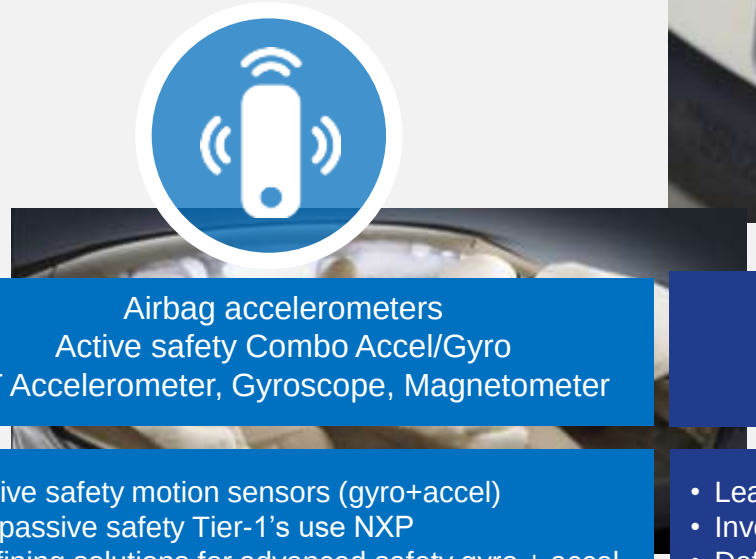
SECURE CONNECTIONS FOR A SMARTER WORLD

Agenda

- NXP's Sensor Portfolio
  - Motion Sensors Portfolio Overview
  - Pressure Sensors Portfolio Overview
  - Magnetic Sensors Portfolio Overview
- NXP's Sensor Enablement
  - Sensor Toolbox Ecosystem

NXP Sensors

Motion Sensors
#1 Merchant Passive Safety



Airbag accelerometers
Active safety Combo Accel/Gyro
IoT Accelerometer, Gyroscope, Magnetometer

- Active safety motion sensors (gyro+accel)
- All passive safety Tier-1's use NXP
- Defining solutions for advanced safety gyro + accel
- UMEMS foundational for Auto & IoT future
- IoT focus on high value / performance solutions

Pressure Sensors
#1 in TPMS

Tire Pressure Monitoring System
Engine Management, Medical
& Airbag Satellite Pressure

- Lead TPMS supplier in OEM & after-market
- Investing lowest power, smallest size solutions
- Defining solutions for Tire & Road Safety Sensor
- High accuracy pressure - flow meas. for I&M

Magnetic Sensors
#1 AMR Speed & Angular

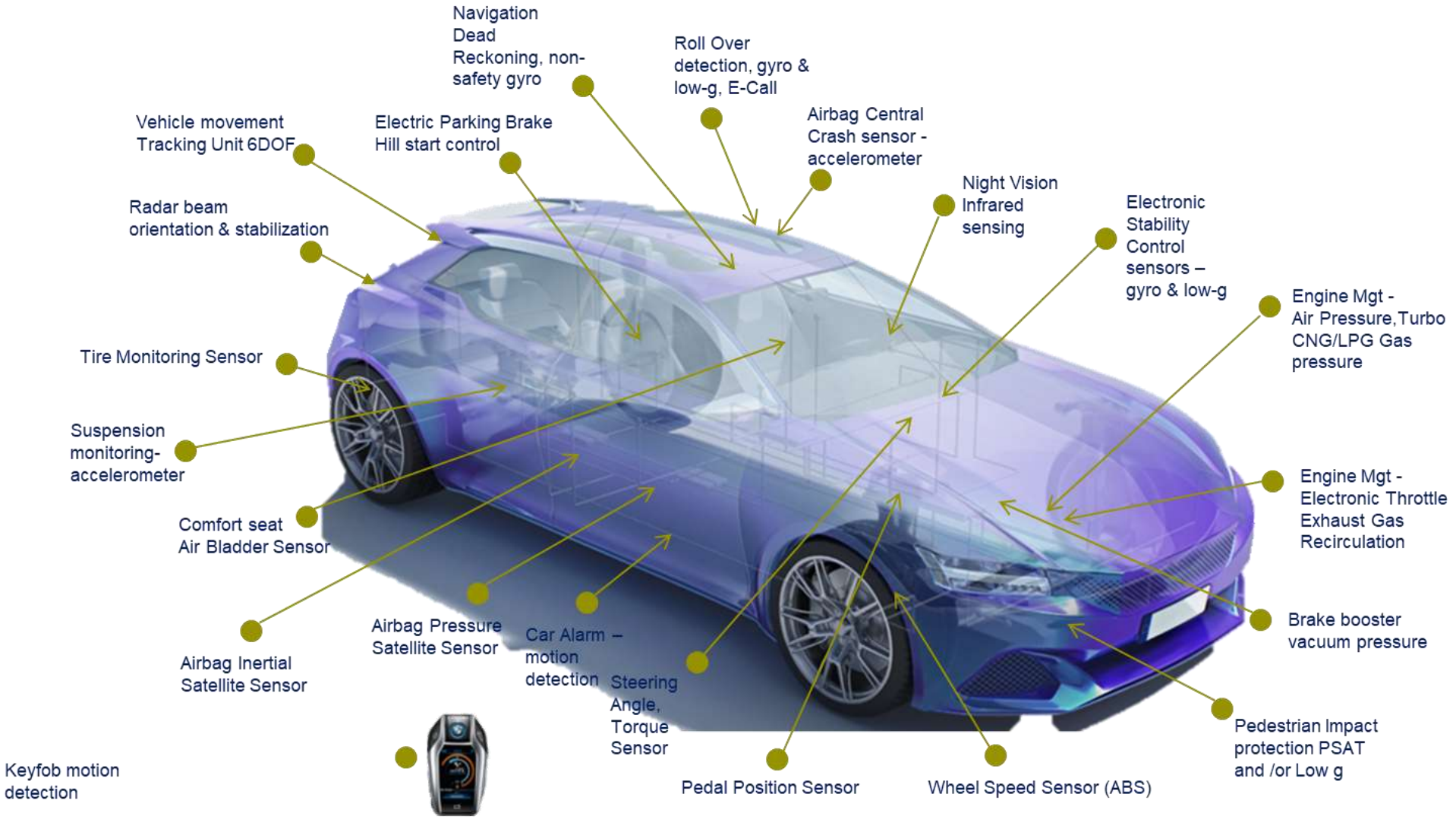
Speed & Angular Sensors
Angular engine control, ABS speed sensors

- Angular sensors: engine control & steering
- Speed wheel sensors for ABS

#1 in Automotive Safety Sensors

Motion Sensors: Automotive

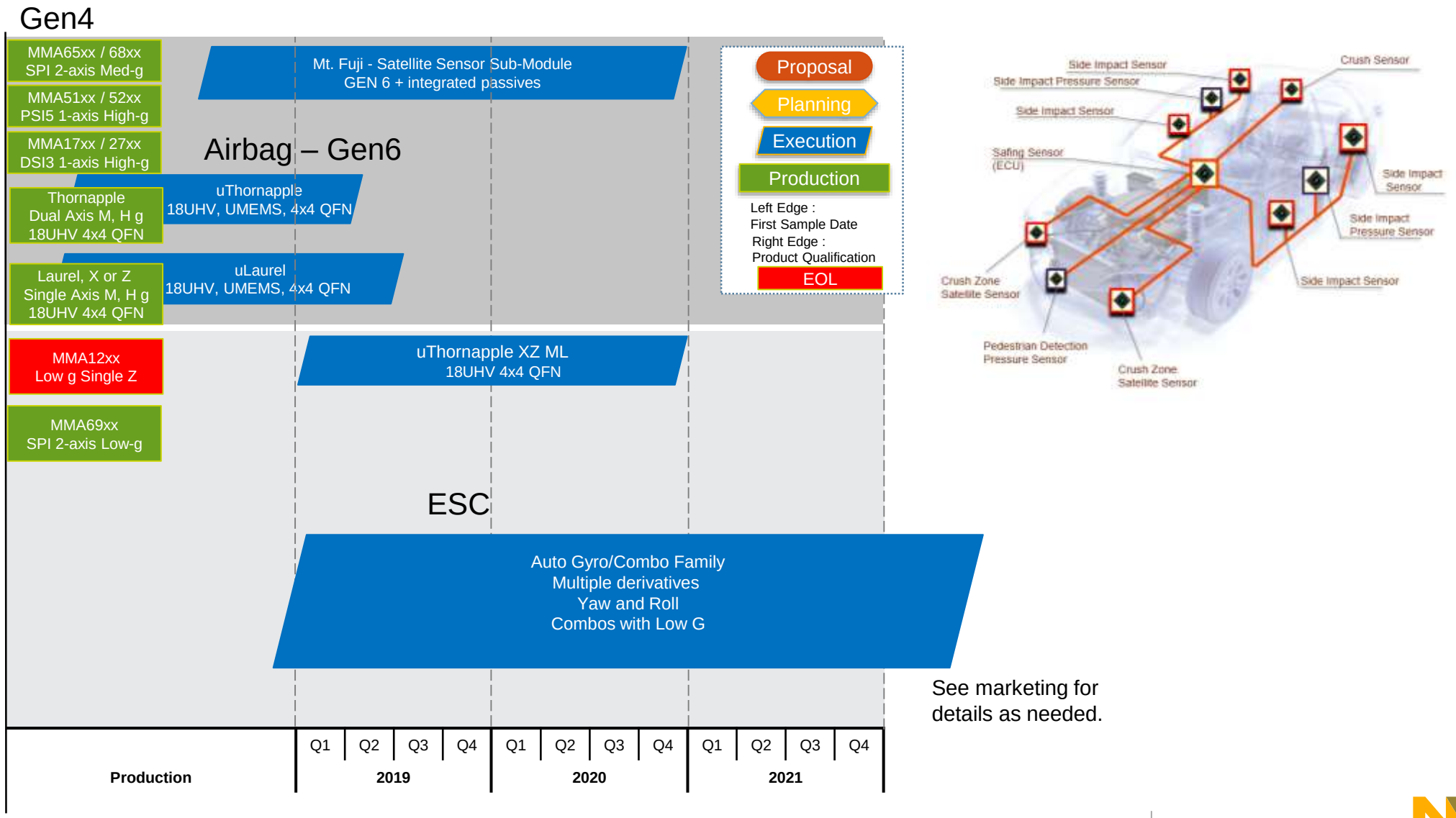
Sensors in Automotive Applications



Automotive Safety Roadmaps

Airbag
Main & Satellite
Accelerometers

ESC & Rollover
Accelerometers,
Gyroscopes
& Combos



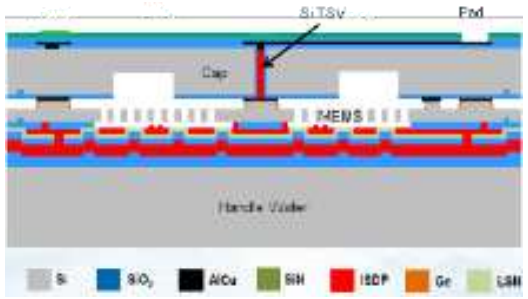
See marketing for details as needed.

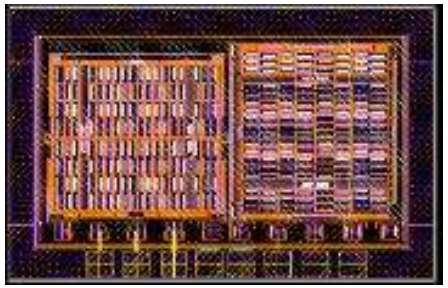
Gen6 Project Scope – Covering All Airbag Requirements

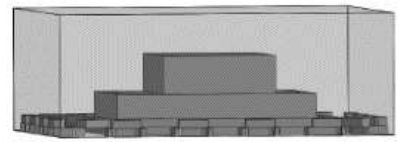
- UMEMS Gcell
  - Three g-ranges (low, med, high)
  - Three orientation (x, y, z)
- LL18UHV ASIC
  - Single channel PSI5/DSI3/SPI
  - Dual channel PSI5/DSI3/SPI
- Package type
  - QFN 4x4 mm
- Core projects
  - Single Chanel Med/High
  - Dual Channel Med/High
  - Accel Low G single

UMEMS	Single Axis			Dual Axis		
Gen 6	X	Y	Z	XY	XZ	YZ
Low g 1.5g to 20g				LL (Gen4)	ML	
Medium g 15g to 150g	M	M	M	MM	MM	MM
High g 50g to 500g	H	H	H	HH	HH	HH

L: Low; M: Medium; H: High







Automotive Safety Motion Sensor: New Generation of Airbag Crash Sensors (Gen6)

Application Focus	Airbag Front and Side Crash Detection					
Part Number	PXLS60322	PXLS60333	PXLS63333	PXLS60220	PXLS60230	PXLS63230
Package	4x4x1.45 mm QFN	4x4x1.45 mm QFN	4x4x1.45 mm QFN	4x4x1.45 mm QFN	4x4x1.45 mm QFN	4x4x1.45 mm QFN
Sensing Axis	XY	XY	XY	X	X	X
Communication	SPI/DSI3	SPI/DSI3	PSI5 2.1	SPI/DSI3	SPI/DSI3	PSI5 2.1
Resolution	10, 12, 16 bits	10, 12, 16 bits	10, 16 bits	10, 12, 16 bits	10, 12, 16 bits	10, 16 bits
Measurement Range	From 15 to 150g	From 50 to 500g	From 50 to 500g	From 15 to 150g	From 50 to 500g	From 50 to 500g
Sensitivity Error Including Linearity	+/- 5 %	+/- 5 %	+/- 5 %	+/- 5 %	+/- 5 %	+/- 5 %
Zero g Offset	+/- 100 LSB	+/- 100 LSB	+/- 100 LSB	+/- 100 LSB	+/- 100 LSB	+/- 100 LSB
Noise	1 LSB RMS (50g – 12 bits mode)	1 LSB RMS (125g – 12 bits mode)	0.3 LSB RMS (120g – 10 bits mode)	1 LSB RMS (50g – 12 bits mode)	1 LSB RMS (125g – 12 bits mode)	0.3 LSB RMS (120g – 10 bits mode)
Supply Voltage	3.135 to 20 V	3.135 to 20 V	4.2 to 16 V	3.135 to 20 V	3.135 to 20 V	4.2 to 16 V
Operating Temperature	-40 to 125°C	-40 to 125°C	-40 to 125°C	-40 to 125°C	-40 to 125°C	-40 to 125°C

uThornapple – Dual Channel Accelerometer

Transducer / Sensor

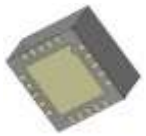
- 2 Independent transducers in a common cavity
- X-Axis and Z-Axis UMEMS (Unique Range for each Channel)
- Bidirectional Self Test, Independently Controlled for each Channel

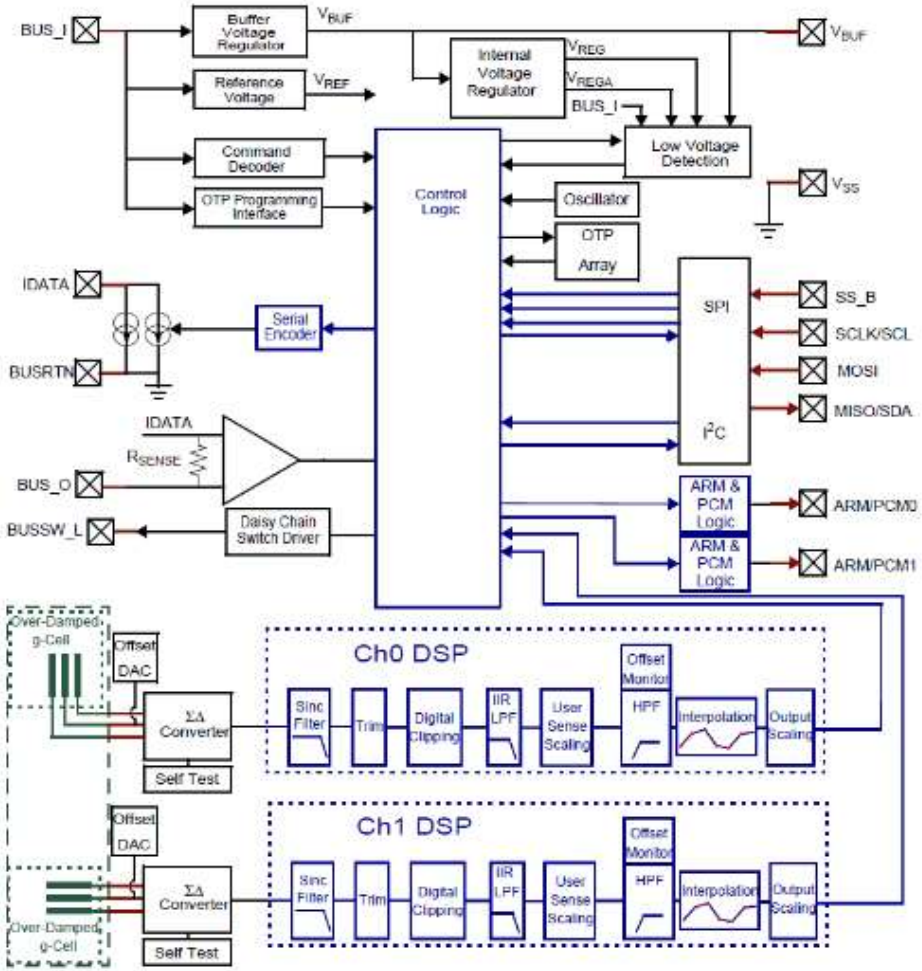
ASIC / Signal Processing

- 180nm CMOS
- Digital Signal Processing
- Temperature Range: -40°C to 125°C
- DSI3 Compatible
- AKLV27 Compatible, PSI5 V2.1 Compatible, Airbag Substandard
- 32-Bit SPI
- Independent Arming Functions for each channel
- HVST, IDDQ, Analog IDDQ, Scan, Logic BIST

Package

- 16 pin QFN 4 mm x 4 mm x 1.45 mm
- Inspectable Solder Joints



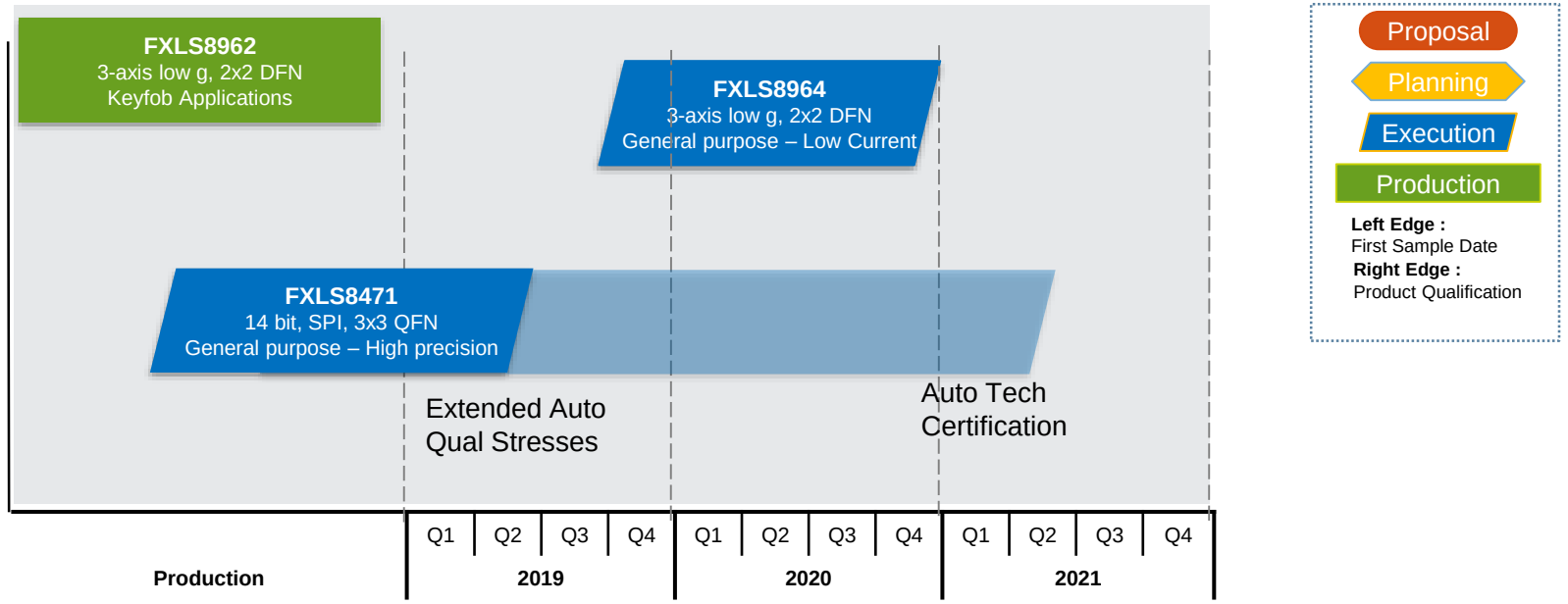


Automotive Safety Motion Sensor: Electronic Stability Control and Other Auto Applications

Application Focus	Electronic Stability Control (ESC) Tilt measurement Electronic parking brake	
Part Number	MMA690x	MMA6910
Package	6x6x2 mm QFN	6x6x2 mm QFN
Sensing Axis	XY	XY
Communication	SPI	SPI
Resolution	11 bits	11 bits
Measurement Range	3.5, 5 g	3.5 g
Sensitivity	291.5 LSB/g (3.5g mode) 203.7 LSB/g (5g mode)	291.5 LSB/g
Sensitivity Error Including Linearity	+/- 3 % (3.5g mode) +/- 3.5 % (5g mode)	+/- 3 %
Zero g Offset	+/- 20.4 LSB	+/- 20.4 LSB
Noise	140 µg/√Hz	140 µg/√Hz
Supply Voltage	3.15 to 5.25 V	3.15 to 5.25 V
Operating Temperature	-40 to 105°C	-40 to 105°C

Automotive Convenience & Security Motion Sensor – Roadmaps

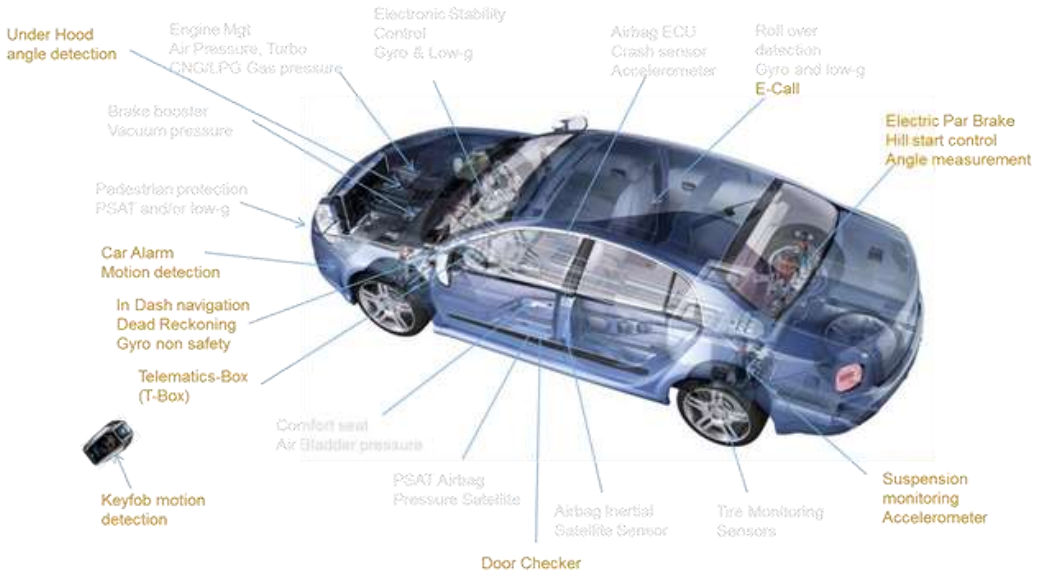
3 Axis Accelerometers



Proposal
Planning
Execution
Production

Left Edge :
First Sample Date
Right Edge :
Product Qualification

Keyfob Motion Detection



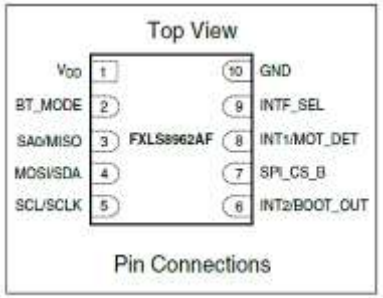
- Application description
  - Relay attack prevention, power management
  - LF/RF communication, UWB for time-of-flight in future
- Key motion sensor attributes
  - Low power, small size
  - Robustness to drop (3 m+ drop survivability) and stiction (10's of thousands of low level shock events due to handling in lifetime)
- Market detail
  - UWB promises to solve relay attack issue without need of motion sensor, but power management will be needed
  - Key differentiator will be robustness (more drops, higher drop heights)
  - Extended features (activity detection) also being requested by OEMs

FXLS8962AF

3-Axis Automotive Qualified Motion Sensor

- Differentiating points
  - AEC-Q100 qualification for temp range -40 to +105°C
  - EMC Class III compliant
  - 10-pin DFN 2x2x0.95 mm with wettable flanks
  - Low power:
    - < 50nA hibernate, < 650 nA standby,
    - < 1.0 µA in motion wake-up mode at 0.78Hz – 6.25 Hz ODR
  - Dedicated low-power motion detection function with one wire interface
  - Configurable interrupts: Significant Data Change, Vector Magnitude, Orientation
  - Self-test diagnostic: can be run in field to assess device health (unaffected by device orientation or motion)
  - Optimized to work with NXP TOKEN family, multiple pre-loaded boot configurations

- Performance features
  - Full scale range: ±2g/±4g/±8g/±16g
  - Output resolution:12-bit
  - Pin configurable I2C/SPI Interface: I2C up to 1 MHz and SPI up to 4 MHz
  - Designed for ultra-low power applications: configurable I/O for optimal power management in demanding motion detection applications such as keyfob wake-up
  - FIFO / LIFO: 32 sample (144 bytes) buffer
  - Voltage / Temp: 1.71V to 3.6V / -40 to 105°C operating temperature



- Typical applications
  - Automotive security and convenience: keyfob motion detection, telematics, navigation

Motion Sensors: IoT

Motion Sensor Target Markets

Internet of Tomorrow Applications

Industrial Transportation

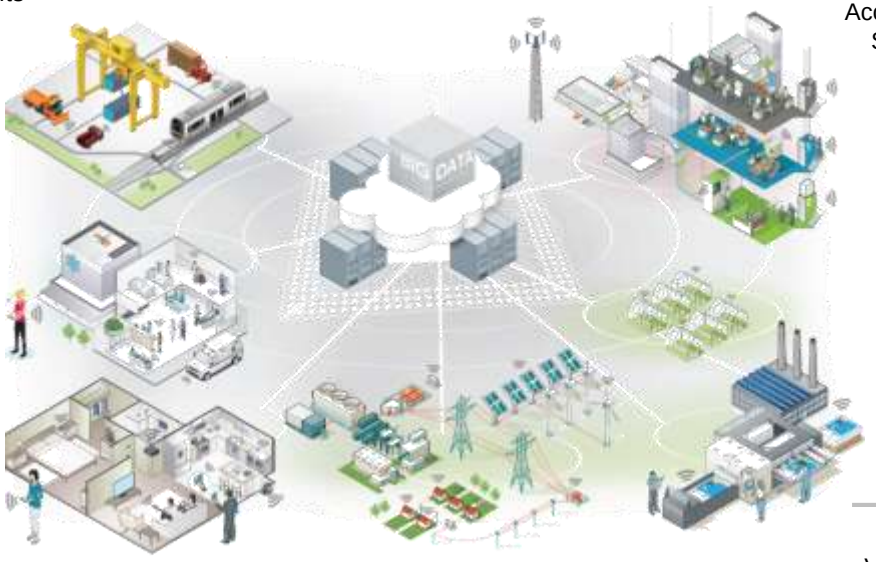
Heavy Machinery – ex: Forklifts
Farm Equipment
Asset Tracking

Patient Care

Medical Wearables
Portable Healthcare
Asset Tracking
Clinical care
(Patient Monitor Infusion Pump)
Drug Delivery
(Inhalers, Insulin pen)

Connected Portables

Wearables
ePOS
Asset tracking



Connected Home

Smart Doors/windows
Smart appliances

Conservation

Smart metering
(tamper detection)
Tools & Appliances

Building Control

HVAC
Access / Security
Surveillance

Remote Sensor

Tamper Detect
System Monitors

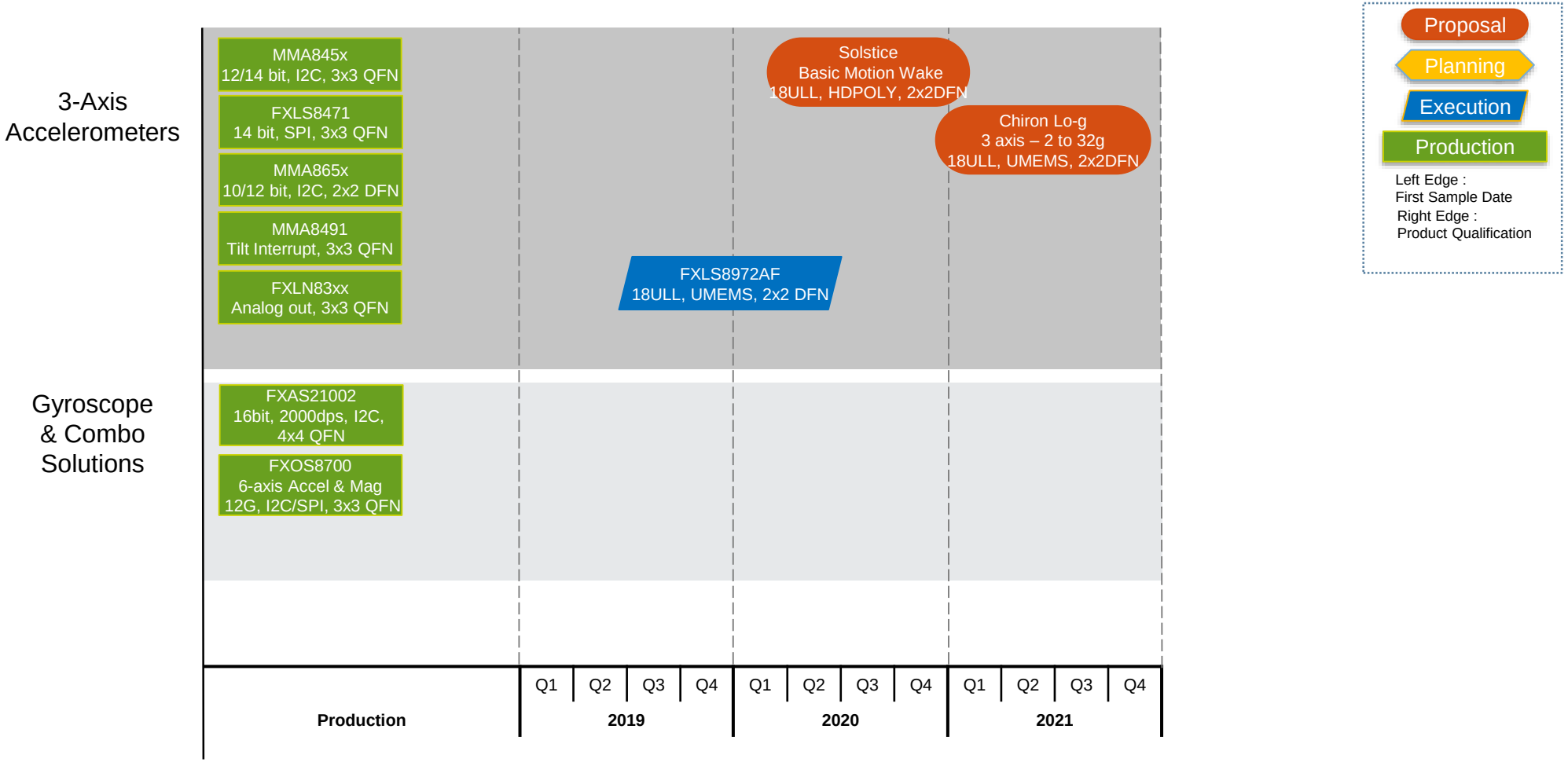
Factory Automation

Robotics
Vibration Monitors
BLDC Control

Sensor Proliferation:

- Human Interaction: Gesture, Orientation, Vibration, Tap
- Machine Learning: Motion and Vibration detection for Preventive Maintenance and Anomaly Detection
- Intelligent Sensors for increasing motion detection at lower power
- Always on applications: Asset Tracking, Security,

Motion Sensor IoT Roadmaps



Accelerometers

- Detects acceleration resulting from orientation vs gravity, motion, shock, and vibration
- Single, dual, or triple axis sensing capability with wide g ranges
- Applications
  - Activity monitors
  - Anti-tampering
  - Asset tracking
  - Crash detection
  - Human machine interface
  - Inclinometer
  - Pedometer
  - Vehicle stability
  - Vibration monitoring

MMA845x

- **3 x 3 x 1 mm QFN**
- I²C output
- 10, 12, 14 Bit Resolution
- 2, 4, 8g range
- < 100 µg/√Hz noise density
- Up to 800Hz data rate
- Extended Features
  - FIFO
  - Configurable P/L
  - High Pass Filter
  - Tap Detection

FXLS8471

- **3 x 3 x 1 mm QFN**
- I²C / SPI output
- 14 Bit Resolution
- 2, 4, 8g range
- < 150 µg/√Hz noise density
- Up to 800Hz data rate
- Extended Features
  - FIFO
  - Configurable P/L
  - High Pass Filter
  - Tap Detection

FXLN83xx

- **3 x 3 x 1 mm QFN**
- Analog output
- 8g, 16g range
- 150 µg/√Hz noise density
- Up to 2.7kHz bandwidth
- -40° to 105°C

MMA849x

- **3 x 3 x 1 mm QFN**
- I²C output
- 14 Bit Resolution
- 2, 4, 8g range
- XYZ tilt detection outputs
- Triggerable sampling: 0.4µA/Hz
- 700µs detection latency

MMA865x

- **2 x 2 x 1 mm DFN**
- I²C output
- 10, 12 Bit Resolution
- 2, 4, 8g range
- < 150 µg/√Hz noise density
- Extended Features
  - FIFO
  - Configurable P/L
  - High Pass Filter
  - Tap Detection

FXLS896xCF, FXLS8972CF

3-Axis Accelerometer with Robust Design and Extended Qualification

Differentiating Points

- Industrial Qualification for Temp Range -40 to 105°C
- EMC Class III Compliant
- 10-pin DFN 2x2x1 mm with wettable flanks
- Low power: 650nA standby; < 1 µA for ODR < 6.25 Hz; 18 µA at 400 Hz ODR

Performance Features

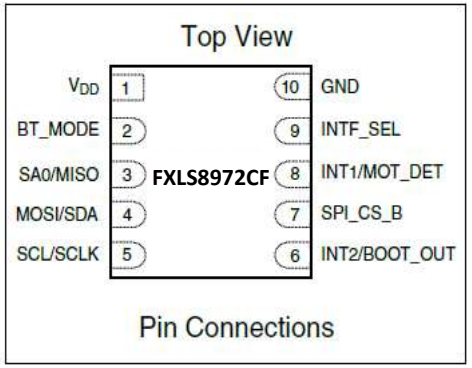
- Full scale range: ±2g/±4g/±8g/±16g
- Output resolution:12-bit
- Noise: 280 µg/√Hz noise spectral density
- TCO: ±1 m*g*/°C; TCS: ±0.01 %/°C
- ODR range: 0.78 Hz to 3.2 kHz
- Pin configurable I2C/SPI Interface: I2C up to 1 MHz and SPI up to 4 MHz
- Configurable interrupts: Significant Data Change, Vector Magnitude, Orientation
- Designed for ultra-low power applications: Configurable I/O for optimal power management in demanding motion detection applications
- FIFO / LIFO: 32 sample (144 bytes) buffer
- Voltage / Temp: 1.71V to 3.6V / -40 to 105°C operating temperature

Typical Applications

- Quantified Health: wearables: headphones, smart jewelry, smart clothing, sleep tracking, activity monitors: invisibles, sports: apparel/equipment, fitness devices, pedometers
- Portable electronics: remote controls, pointers, wearable payments
- Industrial IOT: smart home: door/window monitors, security: cameras, asset tracking: smart labels, equipment monitoring, smart grid: tamper detect, white goods tilt, industrial: directional drilling, unmanned aerial vehicles (UAVs)
- Medical Devices: hearing aides, cold chain monitoring, medical beds, patient activity monitors: blood glucose monitors, CPAP machines, drug delivery: inhalers, insulin pen, injection pens, pumps, self-care medical devices: weight scale, activity monitors

FXLS8972CF

10-pin DFN with wettable flanks
2 mm x 2 mm x 1 mm



Pin Connections

Key Milestones	Dates
Alpha Samples / Eval Kits	Q4'18
Product Launch	2H 2020

Magnetometers for the IoT

- Measure direction and magnitude of a magnetic field
- Can be used to measure radial distances, angular positions and rates
- Applications
  - Angular position monitor
  - Angular rate monitor
  - Anti-tampering
  - Electronic compass
  - Magnetic field measurements
  - Wheel speed detection

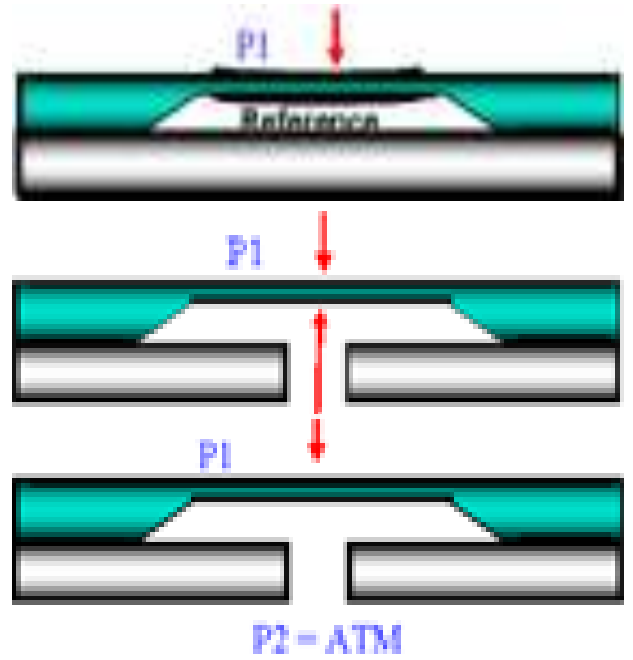
FXOS8700

- **3 x 3 x 1.2 mm QFN**
- I^2C output
- Accel + Mag combo
- 1.6 to 800Hz output data rate
- Low power: 80µA @25 Hz
- Magnetic calibration S/W support
- Vector magnitude trigger

Pressure Sensors: Automotive and IoT

What is a Pressure Sensor?

- A device that detects an absolute value or a change in a physical quantity and converts it into a useful input signal
  - Absolute pressure
  - Differential pressure
  - Gauge pressure
- Medical/Industrial Applications
  - Air conditioning
  - Blood pressure monitor
  - Breathing machines
  - Inhalers
  - Water level monitor
- Automotive Applications
  - Engine Management
  - Safety
  - Emission control
  - LPG/CNG systems



Pressure Sensor Portfolio

A – Absolute
D – Differential
G – Gauge
V – Vacuum

MPX10/12/53 D G 10...53 kPa SOP, Unibody	Uncompensated High sensitivity analog output Need external circuit for compensation and amplification
MPX2 Series A D G V 10...300 kPa ChipPak, Unibody	Temperature Compensated Integrated temperature compensation Need external circuit for amplification
MPX7 Series D G ±2...±25 kPa SOP	Integrated Pressure Sensor Integrated signal conditioning for temperature compensation, linearization and amplification
MPX4 Series A D G 6...250 kPa SOP, SSOP, Unibody	
MPX5 Series A D G V 4...1'000 kPa SOP, SSOP, Unibody	
MPX6 Series A 100...400 kPa SOP, SSOP	
MPL3115 (Digital I²C) A 115 kPa Smart Baro/Pressure 3 x 5 mm LGA	Integrated Digital Pressure Sensor I2C Digital Interface with digitized output in Pascal or meters.
MPL3150 (Digital I²C) A 50 to 150 kPa Baro/Pressure 3 x 5 mm LGA	
FXPQ3115 (Digital I²C) A 110 kPa Biomedical Precision 3 x 5 mm LGA	

Package Examples

SOP Basic Case | SOP Side Port | SOP Axial Port | Unibody Dual Port | SSOP Basic Case | Medical ChipPak Case | LGA 3 x 5 mm Case

Pressure Sensor NPI Portfolio – New

A – Absolute
D – Differential
G – Gauge
V – Vacuum
R - Relative

FXPS7015/115 15...115 kPa 4x4 FAM-QFN	A	Compensated 32-bit SPI or I2C configurable Digital output Analog output version for MAP
FXPS7140 40...140 kPa 4x4 FAM-QFN	A	Compensated DSI3 or PSI5 Absolute or Relative pressure sensor for crash detection, Pedestrian protection
NPS30xx Series -2...5 kPa LGA	D G	Compensated High accuracy Differential pressure sensor SPI or I2C compatible digital interface
FXPS7250/400/550 20...250/400/550 kPa 4x4 FAM-QFN	A	Compensated High accuracy small package, 32-bit SPI or I2C configurable Digital output Analog output versions for LPG and Turbo-MAP

Package Examples

FAM-QFN
4 x 4 x 1.98 mm

LGA
4 x 5 mm

LGA
3 x 5 mm

FXPS7140: PSAT DSI3 & PSI5

Satellite Absolute & Relative Pressure Sensor

Package

4 x 4 x 1.98 QFN

Differentiating Points

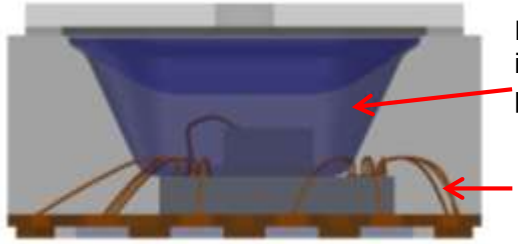
- Redundant P-Cells with Mismatch and common Mode Error Detection
- Discovery Protocol for physical location identification
- Analog output for monitoring of the absolute pressure signal
- Smallest size QFN 4x4x2.0 mm (27% of competitor footprint)
- High-speed Programming Mode via DSI3 for DSI3 or PSI5 satellites
- ISO26262 design and support circuitry for IS026262 compliance
- DSI3 Compatible (Airbag comm standard)
- AKLV29 V1.3 Compatible, PSI5 V2.1 Compatible, Airbag Substandard

Product Features

- 40kPa - 140kPa Absolute Pressure Range
- 10 bit Relative pressure output (through DSP signal chain)
- -40°C to 125°C Operating Temperature Range
- ASIC technology: 180 nm CMOS, LL18UHV
- Digital Signal Processing

Key Applications

- Side crash detection
- Pedestrian protection
- Pinch detection for doors and windows



Package Technology

- QFN Film Assisted Mold Technology
- Air vent in 4x4 QFN package stainless steel lid = 0.5mm diameter
- Small hole prevents large insect intrusion

Product Status

Status	FXPS7140D4 / FXPS7140P4
Released	In production
Qualification	Automotive and Industrial

FXPS7115 DBAP (SPI / I2C) Barometric Absolute Pressure Sensor

Differentiating Points

- Redundant Pressure Transducers enable embedded self test
- 12-bit absolute pressure output
- 8-bit temperature sensor output
- Common-Mode and Digital self test for Transducer and signal chain verification
- Interrupt capabilities
- Unique serial number in OTP register + additional traceability information
- Pb-Free 16-Pin QFN 4mm x 4mm x 2.00mm Package (27% of competitor's footprint)
- Open OTP registers for user data (30 bytes)

Product Features

- Pressure range: 40-115 kPa
- ±1.5% accuracy Temperature Range: -40C to 130C
- Multi interface: SPI, I2C,
- Film assisted molding technology
- QFN 4x4x1.98mm package (16 leads)
- 2 die stacked – Pcell over ASIC
- Pressure sensor protected by chemical resistant gel

Key Applications

- Barometric Air Measurement
- Manifold Air Pressure
- Vacuum Measurement
- Comfort Seating
- Small Engine Control
- Compressed air
- Manufacturing line control
- Gas metering
- Weather stations
- Blood pressure monitor
- Medicine dispensing systems
- White goods

Package

4 x 4 x 1.98 QFN

Product Status

Status	FXPS7115DS4 / FXPS7115DI4
Production	Volume Production
Qualification	Automotive and Industrial

FXPS7 AMAP & DBAP Medium Pressure: 250, 400, 550 kPa

Differentiating Points

- Redundant Pressure Transducers enable embedded self test
- 12-bit absolute pressure output
- 8-bit temperature sensor output
- Common-Mode and Digital self test for Transducer and signal chain verification
- Interrupt capabilities
- Unique serial number in OTP register + additional traceability information
- Pb-Free 16-Pin QFN 4mm x 4mm x 2.00mm Package (27% of competitor's footprint)
- Open OTP registers for user data (30 bytes)
- Moving average function

Product Features

- Pressure ranges: 20-250 kPa; 20-400 kPa; 20-550 kPa
- ±1.5% accuracy & temperature range: -40C to 130C (+/- 2.5% for Analog variants)
- interface: SPI, I2C, Analog
- 2-die stacked – Pcell over ASIC
- Pressure sensor protected by chemical-resistant gel

Key Applications

- Engine Management LPG / CNG applications
- Engine Management BAP Engine Management MAP
- Engine Management Turbo
- Comfort seating
- Barometric Air Pressure
- Gas metering
- Compressed air
- Manufacturing line control

Package

4 x 4 x 1.98 QFN

Part Number	Output, Pressure Range
FXPS7400DS4	SPI, 20 – 400 kPa
FXPS7550DS4	SPI, 20 – 550 kPa
FXPS7400DI4	I2C, 20 – 400 kPa
FXPS7550DI4	I2C, 50 – 550 kPa
FXPS7400A4	Analog, 20 – 400 kPa
FXPS7550A4	Analog, 20 – 550 kPa
FXPS7250DS4	SPI, 20 – 250 kPa
FXPS7250DI4	I2C, 20 – 250 kPa
FXPS7250A4	Analog, 20 – 250 kPa

Product Status

Status	
Production	Platform qualified
Market Launch	Q3-2019
Qualification	Automotive and Industrial

TPMS Implementation In Light or Heavy Vehicles

Modules installed on the valve stems

- Rim or valve stem mounted
- Pressure and temperature sensing
- Roll switch, wheel localization
- Battery operated
- Independent from the tires

Modules installed on the tire treads

- Tire mounted sensors
- Pressure, temperature, radial and tangential tire acceleration
- Battery operated
- Linked to the tire

Modules installed on the tip of the valves

- Sensors mounted on top of the tire valves
- Pressure, temperature, radial tire acceleration
- Battery operated
- Common in aftermarket solutions

TPMS – NXP Solution Roadmap

GEN5 Solutions

Focus: Increased functionality and communication bandwidth for new applications / new business models

PROOF OF CONCEPT
Wireless Connectivity
B.L.E. 5.0, NFC, WiFi
Sensor Cluster:
Motion, Pressure, Gyro
Low Power Processing
ARM MCU + Sensor interface
Software Stack
Rx and Trx

GEN4 Solutions

Focus: Meet the regulation standard at optimum system cost & enable simple migration path

FXTH87
450, 900, 1500kPa
Z & XZ Axis 2-poly Gcell
0.25um TSMC 8-bit MCU
7x7x2.2mm FAM QFN

+30%
battery life
improvement

FXTH87E
500, 900 kPa
Z & XZ Axis 2-poly Gcell
0.25um TSMC 8-bit MCU
7x7x2.2mm FAM QFN

70% size reduction

NTM88
900 kPa 2-poly Pcell
Single Axis UMEMS Gcell
0.25um TSMC 8-bit MCU
4x4x1.98mm FAM QFN

Dual Axis UMEMS Gcell

Proposal
Planning
Execution
Production

Left Edge :
First Sample Date

Right Edge :
Product Qualification

In Production | 2018 | 2019 | 2020

NTM88 New Product Introduction

Comparison to Legacy TPMS

	FXTH87	FXTH87E	NTM88
Smaller Package	7 x 7 x 2.2mm QFN FAM		4 x 4 x 1.98mm QFN FAM
Silicon To Enable more Features	2-poly G-cell, 2-poly P-cell		uMEMS G-cell, 2-poly P-cell
	8-bit MCU, 16kB flash, 512B RAM, 64B Registers		
Lower Power Consumption	Stop @ 25ºC 3V: 500nA typ, 700nA max	Stop @ 25ºC 3V: 180nA typ, 270nA max	
	4MHz Run: 2.5mA typ, 2.9mA max	4MHz Run: 2.1mA typ, 2.4mA max	
	5dBm 434MHz FSK ±35kHz: 6.6mA typ, 7.6mA max 9.6kb/s	5dBm 434MHz FSK ±35kHz: 6.5mA typ, 7.1mA max 38.4kb/s US/EU, 19.2kb/s JA, 9.6kb/s KR	
Transfer Functions	Offsets can under/overflow 9-bit data range	In-spec tolerances within 9-bit data range	In-spec tolerances within 10-bit data range
Improved Pressure Accuracy	0ºC to 70ºC 100 to 900 kPa: ±10 kPa	-40ºC to 85ºC 100 to 900 kPa: ±5 kPa	
More Algorithms, Functions	NXP provides software	NXP provides more software for reduced power consumption (using the FRC hardware block)	Add SPI Slave to connect to BLE host

IOT Pressure Sensor Applications

Industrial

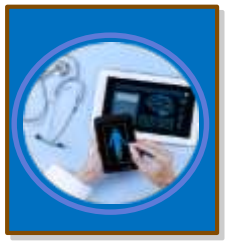
- HVAC
- Gas metering
- Water metering
- Water Heaters
- Leak detection for gas & water media
- Beverage dispensing

Commercial

- Washing machines
- Dishwashers
- Smart appliances
- Smart watches
- Bike computers
- Fitness trackers

Medical

- Drug Delivery Systems
- Respiratory Monitoring
- Medical Implant Monitoring
- Activity monitors
- Blood Pressure Monitoring
- Liquid level detection
- Surgical equipment
- Negative pressure wound management



NPS30 Diff_P: Precision Differential / Gauge Low Pressure Sensors

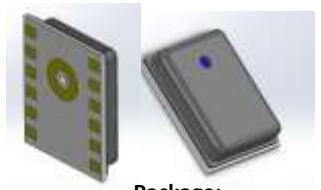
Differentiating Points

- High precision low-pressure sensor product family in differential and gauge configurations.
- Calibrated pressure range: -2 kPa to 5 kPa
- Relative Accuracy: ±3 Pa
- I2C or SPI digital interface
- Digitized output in Pascal
- 3.0V/5.5V Operating Supply Voltage
- Calibrated Temperature Range -40°C to 85°C
- Automated offset correction
- Two programmable interrupt pins
- 24bit Sigma Delta ADC
- High precision achieved through NXP MEMS technology coupled with a digital state machine (compensates, calibrates and digitizes output)

Product Features

- Enables multiple porting options at PCB level
- Seal ring on back side of the package

Part Number	Output, Pressure Range
NPS3000VV	-500 – 500 Pa
NPS3001DV	0 – 1 kPa
NPS3002VV	-2 – 2 kPa
NPS3005DV	0 – 5 kPa



Package:
LGA 5mm x 4mm

Key Applications

- CPAP machines/masks
- Blood pressure monitoring
- Drug dosimetry
- Smart hospital beds
- Inhalers
- Oxygen concentrators
- Patient monitoring
- Negative pressure wound management
- HVAC/transmitters
- Pneumatic control/regulators
- Smart metering
- Valve positioning

Product Status

Status	NPS30 Family
Production / Market Launch	Q4-2019
Qualification	Industrial and Commercial

Sensor Toolbox Ecosystem: IoT Motion and Pressure Sensors

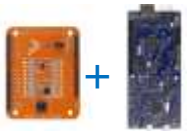
Sensor Toolbox Ecosystem

Encompassing evaluation boards, a sensor SDK and a sensor evaluation software

Demo Kit (Shield + MCU)

Shield Board

Breakout Board



Custom Kit NEW

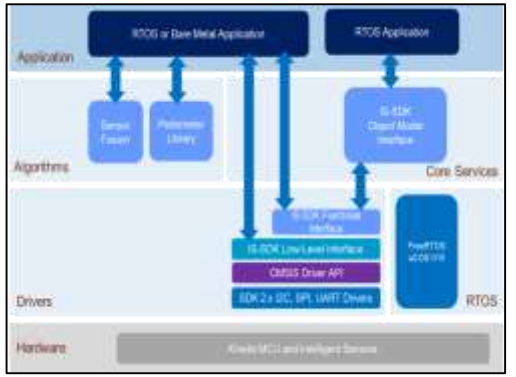
NXP Sensor Toolbox

NXP Sensor Toolbox is the complete ecosystem for product development with NXP sensors. It encompasses a wide spectrum of sensor hardware and software, making NXP sensors easy to use.

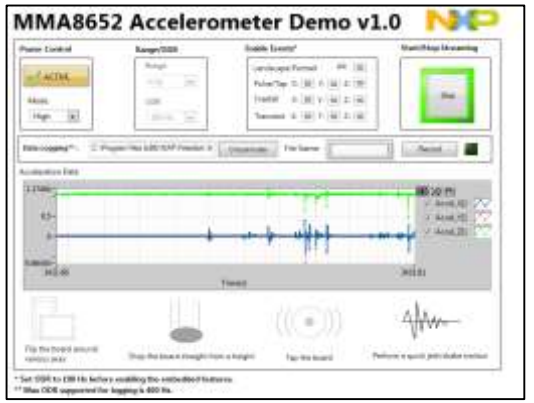
Sensor Evaluation Boards — **Demonstration kits, Custom Kits, Shield boards and Breakout boards**

Embedded Software Framework — **IoT Sensing SDK (ISSDK)**

Sensor Evaluation & Visualization Software—Sensor Toolbox Community Edition (STB-CE)



IoT Sensing SDK (ISSDK)



Sensor Toolbox - Community Edition (STB-CE)

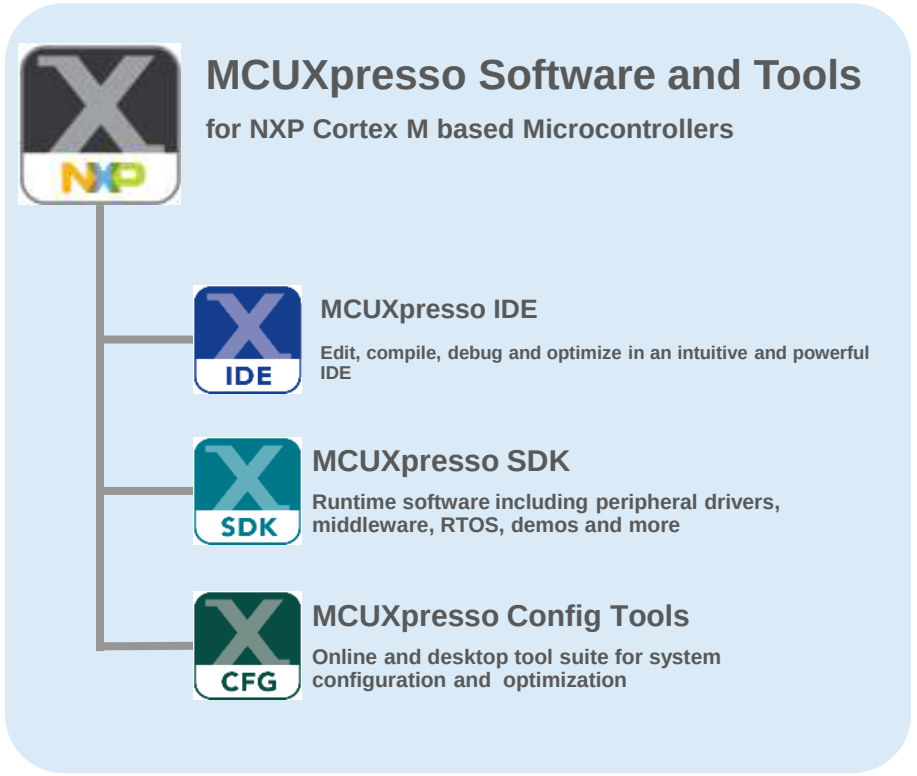
The complete Hardware and Software ecosystem for NXP sensors

Supported Sensors by Sensor Toolbox Ecosystem

Sensor Part Number	Sensor Type	Interface		
		SPI	I2C	ADC
FXAS21002	Gyroscope	✓	✓	—
FXLS8471	Digital Accelerometer	✓	✓	
FXOS8700	Digital Accelerometer and Magnetometer	✓	✓	—
MMA845X	Digital Accelerometer	—	✓	—
MMA8491	Digital Accelerometer	—	✓	—
MMA865X	Digital Accelerometer	—	✓	—
MPL3115	Digital Pressure	—	✓	—
FXLS8962	Accelerometer	✓	✓	—
FXPQ3115	Pressure/Bio-Compatible	—	✓	—
MPXV5004DP	Differential and gauge, integrated analog pressure sensor	—	—	✓
NPS300xxx	Precise low-pressure gauge/differential sensor	✓	✓	—

IoT Sensing SDK (ISSDK)

MCU Attach: Sensor Enablement SW



NXP MCUs supported by ISSDK:

Kinetis: K64F, KL27Z, KL25Z, K22F, KW41Z, KE15Z

I.MX: I.MXRT1020, I.MXRT1050, I.MXRT1060

LPC: LPCXpresso54114, LPC55xx

Sensor Toolbox – CE: Visualization / Out of Box

- Quickly Demonstrate & Evaluate
- Customizable GUIs
- Integrated with IoT Sensing SDK
- Supports all Sensor kits (Demo kits + custom kits)

IoT Sensing SDK (ISSDK)

- Go-To Solution for Sensor Application Development
- Provides Sensor Drivers, Algorithms and Examples
- Enables prototyping and production applications
- Supports Kinetis, LPC and I.MXRT + sensors (All sensor kits)
- Supports sensor based Host Io Applications

Application Algorithms / SW

- 6 & 9 axis Sensor Fusion
- Pedometer
- Precision inclinometer

IoT Sensing SDK (ISSDK)

- The IoT Sensing Software Development Kit (ISSDK) is an embedded software framework enabling NXP's digital and analog sensors
- ISSDK provides a unified set of sensor support models that target NXP's portfolio of sensors across a broad range of ARM® Cortex® core based Microcontrollers
- ISSDK combines a set of robust sensor drivers and algorithms along with example applications to allow users to get started with using NXP sensors. ISSDK is being offered as "middleware" component in MCUXpresso SDK
- ISSDK Provides
  - Out of Box Projects for Every Sensor Kit: Visualize sensor output on Terminal Application
  - Template to Create Custom Embedded Applications: Modify the out of box templates for custom use cases with NXP sensor kits.
  - Detailed Sensor Register Definition File: Complete bit map of each sensor register. Can be used for development with any MCU platform.
  - Generic Sensor Drivers: Easy to use common set APIs such as Sensor Init, Configure, Read and DeInit for quick sensor application development
  - Arduino IO Header Pin Mapping Files: Arduino board + NXP Sensor shield pin mapping definition files for Arduino enthusiasts.
  - Generic Host Io Template Projects: Enables sensor data transmission including STB-CE, cloud or any host GUI.

Sensor Fusion

Offered as a part of IoT Sensing SDK

- Supports 3, 6 and 9-axis sensor fusion options:
  - Accelerometer only (roll, pitch and tilt)
  - Magnetometer only (2D auto)
  - Gyro only
  - Accelerometer plus magnetometer (e-Compass)
  - Accelerometer plus gyro (gaming)
  - Accelerometer plus magnetometer plus gyroscope
- Includes NXP's award-winning magnetic compensation software
- Provides geomagnetic field strength, hard soft-iron corrections, and quality-of-fit indication
- Very low power consumption
  - 1.4 mA 9-axis fusion IDD on Kinetis ARM Cortex M4F devices at 40 Hz fusion rate
  - 0.4 mA 6-axis fusion IDD on Kinetis ARM Cortex M4F devices at 40 Hz fusion rate
- Supports multiple 3D frames of reference (aerospace NED, Android and Windows 8)
- Library is coded in standard C99 ANSI C
- Compatible with the NXP Sensor Fusion Toolbox for Android and Windows

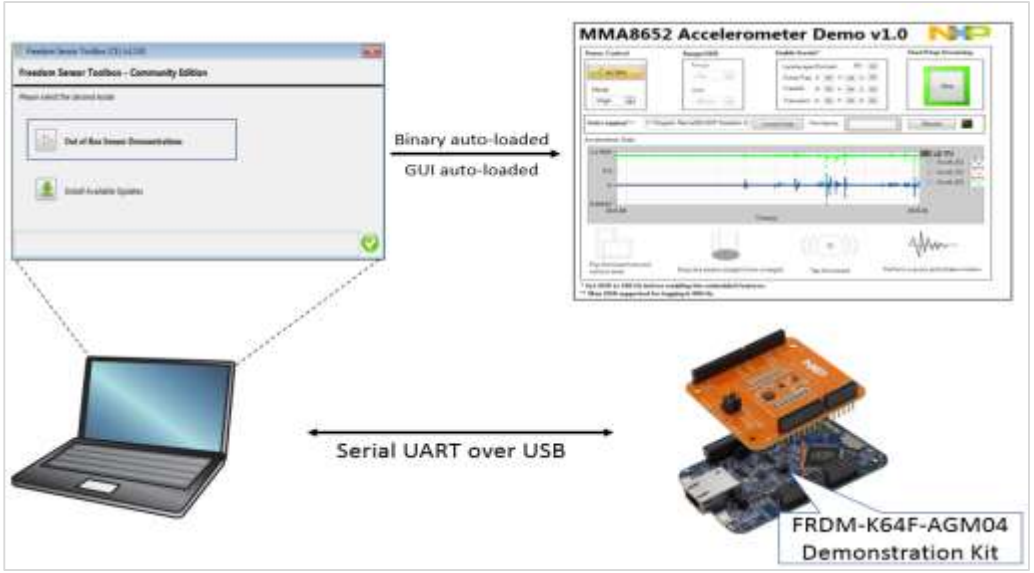
Visualize sensor fusion output on Sensor Fusion Toolbox

Sensor Toolbox Community Edition (STB-CE)

Sensor Toolbox – Community Edition

The Sensor Evaluation and Visualization SW Tool for NXP Sensors

- Quick Sensor Demonstration: Enables quick visualization of sensor data and other sensor outputs based on the pre-configured sensor settings in the firmware
- Real Time Sensor Evaluation: Enables changing critical sensor settings (ODR, FSR, power modes) and data logging during sensor demonstrations
- Register Interface: Provides a register map for the sensors and allows quick read and write of different register bits, allowing detailed sensor evaluation



Latest version of STB-CE 2.5 released on May 2018

Reference Designs/Demos/Evaluation Platforms

Name	Type	Availability
Asset Tracking Demo using Motion Sensors	Demo	Demo Available for showcase. Contact factory for more information
Condition Monitoring using NTAG and Motion Sensors*	Reference Design/Demo	Reference Design and Starter Kit will be available in Q3, 2019. Demo available for showcase. Contact factory for more information
Sigfox Low power Asset Tracking Demo	Evaluation Platform	Will be available on nxp.com in Q4, 2019
Sensor Anomaly Detection	Demo	Demo Available for showcase. Contact factory for more information
Smart Home Demo (3 demos in one) 1)Door Open/Close Detect 2) Door Knock 3)Safe Box	Demo	Demo Available for showcase. Contact factory for more information
9-axis activity monitoring with BLE	Demo	Demo available for showcase. Contact factory for more information
Smart Torch with FXLS8962	Demo	Demo available for showcase. Contact factory for more information
Key fob design with FXLS8962 demo	Reference Design	Demo available for showcase. Contact factory for more information
"subMicro-Ampermeter" sensor shield	Evaluation Platform	Will be available on nxp.com in Q4, 2019
LYNQ low power long range tracker*	Demo	Product can be ordered on lynqme.com
Alexa based Sensor Alert Demo based on LPC55xx family	Demo	Will be available in Q4, 2019
Smart Pool Pump	Reference Design	Will be available in Q3, 2019
Inclinometer	Evaluation Platform	Will be available in Q3, 2019
HVAC Demo*	Demo	Demo Available for showcase. Contact factory for more information
Smart Sensing Inhaler	Demo	Demo Available for showcase. Contact factory for more information
Smart IoT Ball	Demo	Demo Available for showcase. Contact factory for more information
Magnetic Rotary Encoder	Reference Design	Available on nxp.com
10 axis Data logger	Reference Design	Available on nxp.com

Enablement Resources

Sensor Toolbox Ecosystem

- www.nxp.com/sensortoolbox
- www.nxp.com/iotsensingsdk
- www.nxp.com/sensortoolboxcommunityedition
- www.nxp.com/sensorevaluationboards
- www.nxp.com/sensorfusion

Training and Videos on Sensor Fusion

- https://www.nxp.com/support/developer-resources/software-development-tools/sensor-developer-resources/nxp-sensor-fusion:XTRSICSNSTLBOXX?tab=Design_Support_Tab

SECURE CONNECTIONS
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