



From IoT idea to proof-of-concept as easy as 1-2-3

## Rapid IoT prototyping kit: SLN-RPK-NODE

NXP's Rapid IoT prototyping kit is a comprehensive, secure and power-optimized IoT end node solution with a user-friendly development environment that enables anyone to quickly take their idea to a proof-of-concept

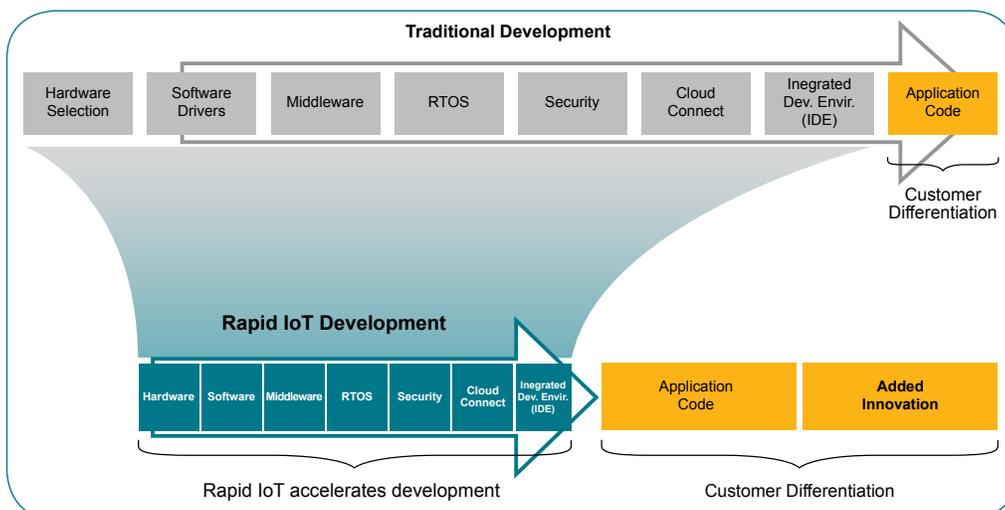
### THE IoT DEVELOPER'S CHALLENGE

IoT and the growth of connected 'things' opens up exciting new possibilities for developers. With the ability to create 'Smart' nodes, we can gather and monitor sensor data, communicate wirelessly and scale using the Cloud. The possibilities are virtually endless: smart mass transit using NFC for smoother access and airborne air-quality monitoring to name just a few. However, most developers ranging from experienced engineers to makers face a confusing number of IoT ecosystems, tools and platform choices. Developing a prototype or proof of concept (POC) can be time-consuming and challenging.

First comes hardware selection: the developer must identify and then aggregate multiple devices (sensors, MCU,

interface, power, security etc.) from different vendors and make sure these devices all operate seamlessly as a 'system'. This involves software: RTOS, Drivers and Middleware. Programming this 'system' requires an IDE and writing code, often in C. Only after completing all these steps can developers use their unique domain knowledge and focus on application code. The Rapid IoT prototyping kit is designed to accelerate the prototype development process. Optimized for small-form factor and low power, it comes pre-configured with 11 NXP devices ranging from MCUs, interface, NFC, anti-counterfeit security and flexible sensor options plus software enablement including drivers, RTOS, middleware and cloud connect.

### IoT PROTOTYPE DEVELOPMENT



## Rapid IoT prototyping kit / SLN-RPK-NODE

From IOT idea to proof-of-concept, as easy as 1-2-3

### ACCELERATING IOT DESIGN

Web IDE with GUI-based programming  
**EXTREME EASE OF USE**

MCUXpresso project and source code generation  
**PROTOTYPING TO DEVELOPMENT**

### SECURE, FROM SENSOR TO CLOUD

Secure Element, Secure Boot, Crypto-accelerators  
**UNCOMPROMISED SECURITY**

IOS/Android mobile Apps, IOT Cloud, web visualization  
**SENSOR TO CLOUD**

### COMPREHENSIVE DESIGN & ENABLEMENT

11 NXP part numbers  
**PROCESSING, CONNECTIVITY, SECURITY, SENSING, ANALOG**

RTOS, drivers, middleware, example applications  
**SOFTWARE ENABLEMENT**

400+ Click boards™  
**EXPANDABLE TO MOST IOT END NODE USE CASES**

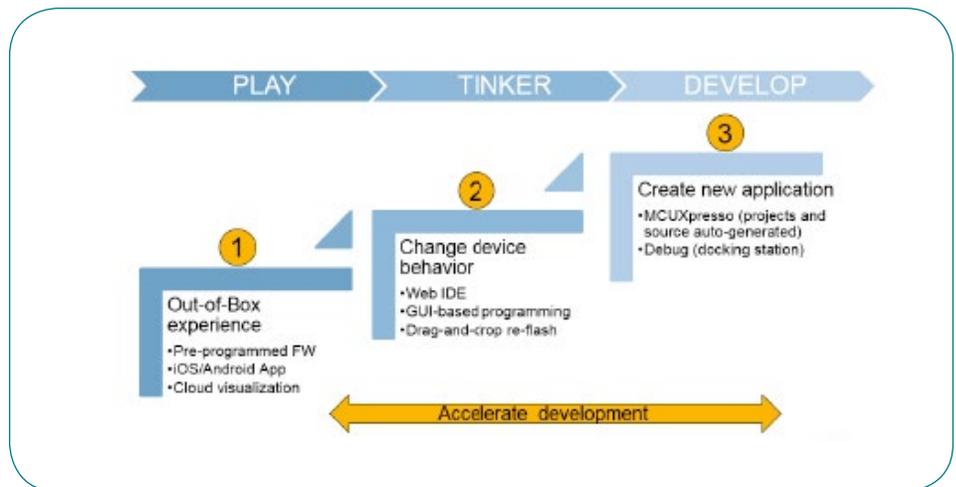


## SUMMARY

Rapid IoT is a low-power, small form-factor device integrating 20+ components including MCUs, connectivity, security plus software. It's mission is to get your IoT node concept to a POC as quickly and easily as possible.

### Rapid IoT simplifies the 3 phases of a typical POC development.

- ▶ **Play:** Pre-programmed applications enable a user to get up and running quickly and 'play' or get familiar with its capabilities right out of the box. Rapid IoT brings IoT to a new generation of innovators with example applications for wirelessly connected end nodes for consumer, commercial and industrial markets
- ▶ **Tinker:** The Web IDE with easy-to-use GUI based programming means anyone can 'tinker' or modify the device's behavior without having to program in C, no embedded coding experience required



- ▶ **Develop:** Rapid IoT ensures a fast and easy transition from prototype to development with automatic source code generation for NXP's MCUXpresso, a comprehensive set of software tools including SDK, IDE and Config Tools

The SLN-RPK-NODE simplifies the 3 phases of a typical POC development. Pre-programmed applications enable a

user to get up and running quickly and 'play' or get familiar with its capabilities. Next, the Web IDE with GUI based programming means anyone can 'tinker' or modify the device's behavior without having to program in C. Finally, production-proven MCUXpresso tools provide a path to validate code and develop new applications.

## KEY FEATURES AND BENEFITS

### Comprehensive, pre-engineered IoT node

- ▶ Kinetis® K64-120 MHz MCU based on Arm Cortex®-M4 Core for application processing
- ▶ KW41Z Wireless MCU: BLE, Thread, Zigbee allows connection to a phone or gateway
- ▶ Enhanced Security
  - A1006 Secure Authentication and anti-counterfeit IC
  - NT3H2211 NFC Forum Type 2 Tag
- ▶ Optimized for low-power and small form factor (49.8 x 49.8 x 14mm)

### Extreme ease-of-use for rapid prototyping

- ▶ Pre-installed applications
  - Weather station incl. Air quality monitor
  - Thermostat
  - Tilt / Fall detection
  - Low-power motion detection
  - Tap converter
  - RGB LED

- ▶ Atmosphere® web IDE with GUI based programming and automatic source code / project generation for MCUXpresso IDE
- ▶ MCUXpresso SDK based (RTOS, drivers, middleware)
- ▶ iOS/ Android mobile apps and IoT Cloud connect
- ▶ Secure bootloader for convenient USB and over-the-air BLE reprogramming

### Flexible, scalable

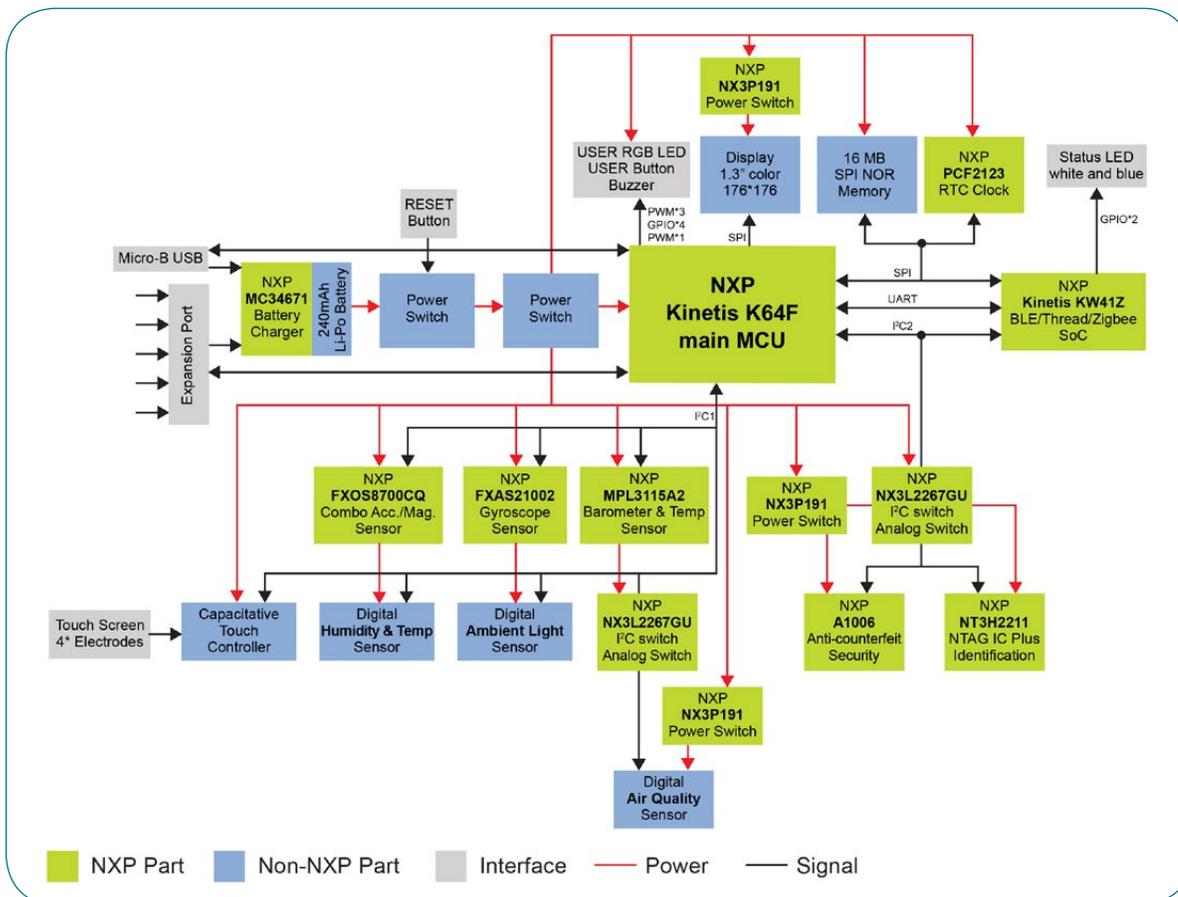
- ▶ Multiple sensors
  - Gyroscope / Accelerometer / Magnetometer
  - Barometer / Temperature / Air Quality
  - Ambient light
  - Capacitive touch
  - More...
- ▶ Easy expandability to 400+ IoT end-node use cases with Click boards™
- ▶ Compatible with NXP IoT Modular Gateway

20+ components: MCU, Security, Interface, NFC, Sensors

Pre-programmed applications provide immediate out-of-box usability

- Weather station (including Air quality monitor)
- Thermostat
- Low-power motion detection
- Tilt / fall detection
- Tap counter
- RGB LED control

## RAPID IoT BLOCK DIAGRAM



## APPLICATIONS

### Home and Building Automation



### Smart Cities



### Smart Wearable and Fitness



### Industrial



### Smart Health



### Use cases yet to be discovered



Use cases requiring low-power, security, sensing, processing, and cloud-connectivity

## HARDWARE SPECIFICATIONS

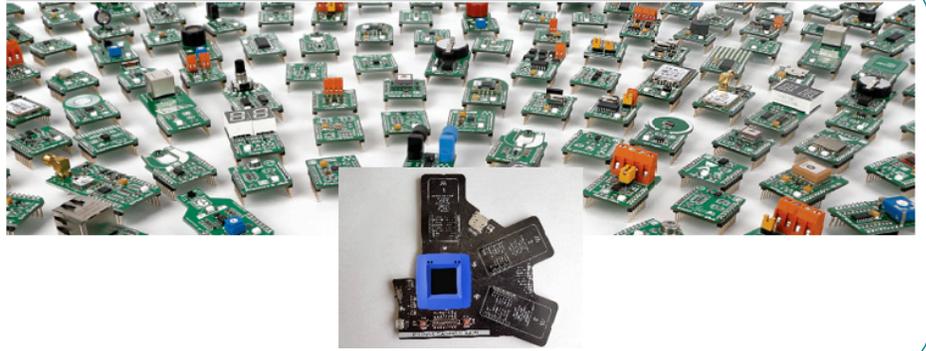
Main MCU	NXP Kinetis® MK64FN1M0VMD12 ARM Cortex-M4 in 144 BGA
Wireless MCU	NXP Kinetis® MKW41Z512VHT4 ARM Cortex M0 in 48 LQFN
NFC	NXP NT3H2211 NFC TAG I <sup>2</sup> C with 2KB memory & flexible 13.56Mhz antenna
Security	NXP A10006 Anti-Counterfeit security chip
Sensors	NXP FXOS8700 Digital Accelerometer/Magneto-meter NXP FXAS21002 Digital Gyroscope NXP MPL3115 Digital Pressure barometric/altitude Sensor Digital Temperature and Humidity Sensor Digital Ambient Light Sensor Digital Air Quality Sensor
Real-time clock	NXP PCF2123 Calendar RTC with Alarm function and SPI Interface
Power	NXP NX3P191 Power Switch NXP MC34671 Battery Charger
Interface	NX3L2267GU I2C Analog Switch USB2.0 Full-speed Device Crystal-less operation with ESD protection
Display	LPM013M126C Low-Power Japan 1.28" Color Display with SPI controller
Memory	128Mbit SPI NOR Flash for Recovery, Update and Data logging
Connectivity	micro USB connector Main and Wireless MCU SWD connectors (DNP) 50-pin Board to board connector compatible with Docking Station 10-pin Board to board connector for future Connectivity Station

## DEVELOPMENT TOOLS AND ECOSYSTEM

### NXP Modular Gateway: Connect large IoT systems to the Cloud

- ▶ Powered by an i.MX6UL processor delivering best performances for Linux based applications with optimal power
- ▶ Simultaneous Zigbee and Thread connectivity for large and secured Node Networks
- ▶ Ethernet or Wi-Fi connectivity to the Cloud
- ▶ NFC and BLE Commissioning

### NXP Modular IoT Gateway

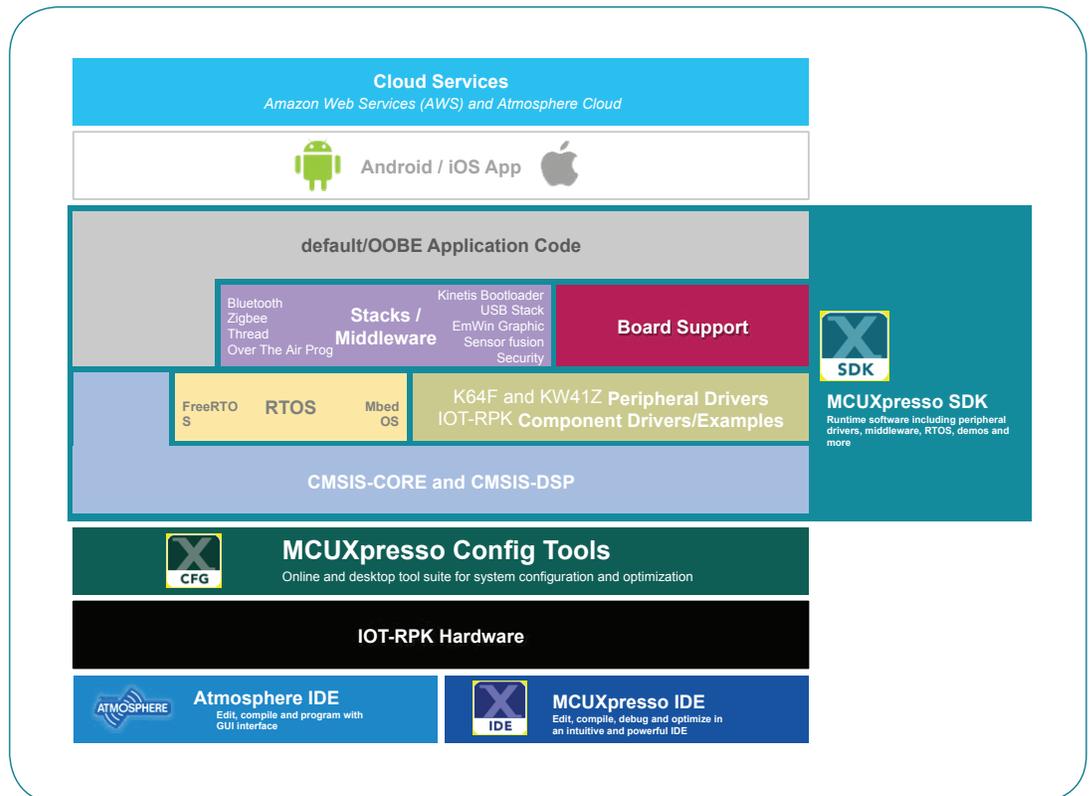


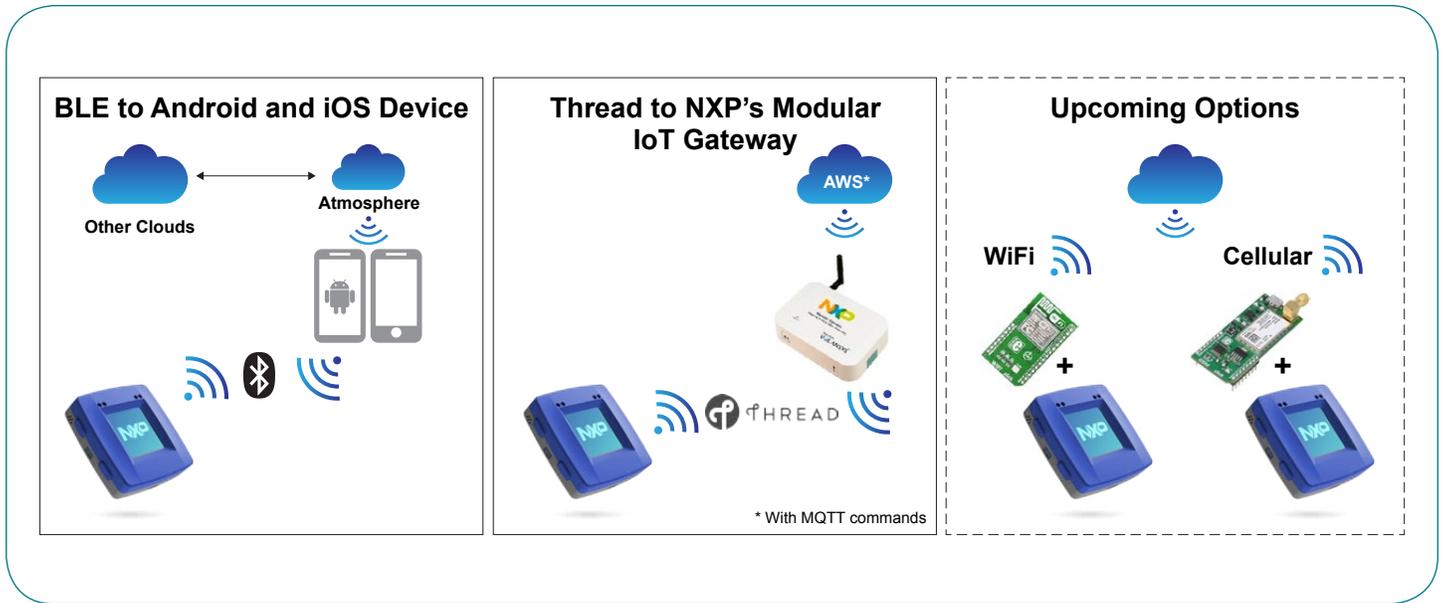
### MikroElektronika Docking Station

- ▶ 400+ Click boards™ with mikroBUS™ connector and drivers provide flexibility to expand to most IoT node use cases. The mikroBUS™ socket comprises a pair of 1x8 female headers with a proprietary pin configuration and silkscreen markings. The pinout (always laid out in the same order) consists of three groups of communications

pins (SPI, UART and I<sup>2</sup>C), six additional pins (PWM, Interrupt, Analog input, Reset and Chip select), and two power groups (+3.3V and GND on the left, and 5V and GND on the right 1x8 header). The spacing of pins is compatible with standard (100 mil pitch) breadboards. Detailed specifications at [www.mikroe.com](http://www.mikroe.com)

- ▶ The Docking Station integrates open SDA debug, JTAG, I<sup>2</sup>S





Rapid IoT supports flexible connectivity options for your IoT end node applications. Pre- installed applications combined with a user-friendly interface enable users to quickly select and configure a Cloud connection and create a sensor-to-cloud proof-of-concept

**Atmosphere Cloud over BLE**  
 Rapid IoT application will push selected sensor data or pull actuator commands to/from iOS/Android equipment over Bluetooth. A phone App available from the Apple and Google App Stores will transfer the data to Atmosphere, allowing user to select Atmosphere Cloud or other Cloud suppliers for their application.

**Amazon Web Services over Thread using NXP's Modular IoT Gateway**  
 Rapid IoT application will push selected sensor data or pull actuator commands to/from the NXP Modular IoT Gateway over Thread. The IoT Gateway will transfer the data to Amazon Cloud (AWS) using MQTT commands and enable users to monitor and control the Rapid IoT node from the Cloud using an iOS/ Android App.

## SOFTWARE ASSETS

### MCUXpresso suite

- ▶ Free IDE toolchain
- ▶ Comprehensive SDK package
  - Operating System: Free RTOS
  - Libraries: Peripheral and component drivers, middleware and connectivity stacks for both K64F and KW41Z controllers
  - Project examples: Basic and Application examples for each controller, each peripheral and board component, each middleware or connectivity service

### Atmosphere IoT

- ▶ Free web based IDE with GUI programming services
  - Simultaneously builds Embedded Code, Mobile App Code and Cloud Instance Code
  - Builds on MCUXpresso for code compatibility
  - Customizable Embedded Elements give you flexibility to Tinker
  - Manages multiple wireless protocols in a single chip
- ▶ Online libraries and examples



## SOFTWARE ARCHITECTURE

### Firmware

KW41Z default firmware includes

- ▶ NXP driver for the Freescale Serial Connectivity Interface (FSCI)
- ▶ NXP Bluetooth Stack with support for the following profiles:
  - Bluetooth LE v4.2 compliant host and controller stack
  - Phone Alert Status Service
  - Tx Power Service
  - Over-The-Air Programming support
- ▶ NXP Thread Stack with support for the following services:
  - Thread v1.1 compliant stack
  - power optimizations for sleepy end devices
  - serial IP transport using FSCI
  - optimized security provisioning for Thread encryption, authentication and commissioning
  - Over-The-Air (OTA) Programming support
- ▶ Atmosphere Cloud  
[atmosphereiot.com/nxp](http://atmosphereiot.com/nxp)

### ORDERABLE PART #AND ECCN

- ▶ Rapid IoT prototyping kit: Part # SLN-RPK-NODE
- ▶ [www.nxp.com/Rapid-IoT](http://www.nxp.com/Rapid-IoT)
- ▶ Export compliance information
  - US Export Control Classification Number (ECCN) and Export Classification: 5A992|NON-RESTRICTED
  - CCATS Number: G162018~CCATS
  - Harmonized Tariff: 8471.50.0150~CPU WITH I/O, OTHER

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Home Page: [www.nxp.com](http://www.nxp.com)

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### USA/Europe or Locations Not Listed:

NXP Semiconductor  
Technical Information Center, EL516  
2100 East Elliot Road  
Tempe, Arizona 85284  
+1-800-521-6274 or +1-480-768-2130  
[www.nxp.com/support](http://www.nxp.com/support)

### Europe, Middle East, and Africa:

NXP Halbleiter Deutschland GmbH  
Technical Information Center  
Schatzbogen 7  
81829 Muenchen, Germany  
+44 1296 380 456 (English)  
+46 8 52200080 (English)  
+49 89 92103 559 (German)  
+33 1 69 35 48 48 (French)  
[www.nxp.com/support](http://www.nxp.com/support)

### Japan:

NXP Japan Ltd.  
Yebisu Garden Place Tower 24F  
4-20-3 Ebisu, Shibuya-ku,  
Tokyo 150-6024, Japan  
0120-950-032 (Domestic Toll Free)  
<http://www.nxp.com/jp/support/>

### Asia/Pacific:

NXP Semiconductor Hong Kong Ltd.  
Technical Information Center  
2 Dai King Street  
Tai Po Industrial Estate  
Tai Po, N.T., Hong Kong  
+800 2666 8080  
[support.asia@nxp.com](mailto:support.asia@nxp.com)

[www.nxp.com/rapid-iot](http://www.nxp.com/rapid-iot)

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