HEXIWEAR COMPLETE IOT DEVELOPMENT SOLUTION

NXP SEMICONDUCTORS





SECURE CONNECTIONS FOR A SMARTER WORLD

PUBLIC

THE ONLY SUPPLIER TO PROVIDE COMPLETE IOT SOLUTIONS



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Product Development Challenges

Even in the modern connected world, product development challenges still exist...



Although the market requirements have changed, the product development process has not changed in the last several years...



Introducing Hexiwear Complete IoT Development Solution



Completely open source – a foundation for your inventions





Hexiwear Overview

NXP partnered with **MikroElektronika** to create a complete development solution that enables quick and easy application development for the IoT market

Highlights

- Optimized hardware with compact form factor
- Designed for IoT end node applications with onboard sensors such as temperature, pressure, humidity and light
- Ideal for wearable applications with rechargeable battery, OLED screen and sensors such as optical heart rate, accelerometer magnetometer and gyroscope
- Complete software solution with open source embedded software, cell phone apps and cloud connectivity
- Infinitely expandable with the ecosystem of ~200+ Click Modules

Small form factor, low cost (\$49 resale), modular hardware development platform, based on Kinetis MCU, with wireless connectivity and sensors. Comes supported with a development software package, user application demos, mobile app and cloud connectivity.



Hexiwear Value Proposition



Fastest Time to Market

Versatile solution created to reduce development and design time for IoT applications



Path to Manufacturing

Designed to accelerate the customer's time to manufacturing. The BOM is readily available in the market and the design files/schematic is open source.

Optimized Hardware Design

The hardware design is optimized and includes several best practices suggested for designing low power IoT applications



Robust Software

The software includes everything from the embedded drivers to the cloud connectivity - all open source, easy to use and optimized



Community Supported

Hexiwear is a true community based solution and enables customers to access the rich pool of resources created by community





Hardware Overview





Hexiwear Block Diagram







Hexiwear Block Diagram





Hexiwear Sensors

MAX30101

Pulse Oximeter and Hear Rate Sensor high sensitivity with 16-bit ADC

 $\begin{array}{c} \text{Consumption} \\ \text{down to } 600 \mu \text{A in dual active mode} \end{array}$

I2C digital interface up to 400kHz

HTU21D

fully-calibrated Humidity Sensor +/-3%RH tolerance @55%RH

fully-calibrated Temperature Sensor ±0.3°C accuracy from -40 to +125°C

NXP

FXOS8700CQ

Combo Acc. / Mag.

SENSOR

Consumption down to 450µA in active mode

I2C digital interface up to 400kHz dual-mode

FXOS8700CQ

3-axis linear accelerometer ±2 g/±4 g/±8 g dynamic range

3-axis magnetometer ±1200 µT range

 $\begin{array}{l} \text{Low-Power consumption} \\ \text{down to $80 \mu A$ with both sensor active} \end{array}$

I2C digital interface up to 400Hz dual, 800Hz single-mode

FXAS21002CQ

3-axis gyroscope ±250/500/1000/2000°/s dynamic range

MPL3115A2

Barometer & Temp

SENSOR

Consumption down to 2.7mA in active mode

I2C digital interface

NYP

FXAS21002CQ

Gyroscope

SENSOR

MPL3115A2 Absolute pressure sensor calibrated 50kPa to 110kPa range altitude accuracy down to 0.1m

Consumption down to 8.5µA (capt.) max 2mA (with conv.)

Autonomous data-logging 32-sample FIFO up to 12 days

I2C digital interface up to 400Hz

TSL2561

Consumption

up to 400kHz

I2C digital interface

Light to digital converter

0.1 to 40,000 Lux dynamic range

down to 240µA in active mode

inc. both infrared and full spectrum diodes

MEAS-SPEC	TAOS	MAXIM
HTU21D	TSL2561	MAX30101
Humidity & Temp	Ambient Light	Optical Heart Rate
SENSOR	SENSOR	SENSOR



Hexiwear Docking Station

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The Docking Station, compatible with Hexiwear is used to debug **Kinetis K64** and **Kinetis KW40** MCUs



The Docking Station can connect up to 3 external Click Modules out of ~200 available



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Software Overview





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Hexiwear Software Ecosystem

Complete open source software package including the source code for embedded software, application examples, Android and iOS apps and out of the box cloud connectivity

Embedded software

- Running FreeRTOS as an embedded operating system
- Application examples with IoT and wearable application use cases
- Drivers based on Kinetis SDK
- OpenSDA as a serial and debug adapter
- BLE communication is based on Kinetis Connectivity Software (available in binary)
- Software available at <u>www.Hexiwear.com</u>

Cell phone app

Android app available <u>HERE</u> and iOS App is available <u>HERE</u>



Cloud connectivity

Cloud connectivity integrated in Android and iOS apps



Hexiwear Visualize data

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Visualize the sensor data from Hexiwear device

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	Battery	
	Temperature	
\bigcirc	Humidity	
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	Light	
\downarrow_{Y}^{X}	Accelerometer	
\bigcirc	Magnetometer	
	Gyro	
ÔÔ	Steps	
	Calories	
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Heartrate	

- Set the time on Hexiwear
- Perform OTAP update
- Select which data sensor you want see

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	Cloud settin	ngs	Done	
SIGNED IN				
karangoyanka@gmail.com				
Change pas	ssword		>	
Tap on email to	o sign out			
CLOUD				
Send to W	olkSense			
Send ever	y 5 secs	1 min	5 mins	
When ON, rea	dings will be sent	to the clo	oud	

- Send data to WolkSense Cloud
- Select iteration you want to upload data to cloud

# Hexiwear GitHub





# Use Cases





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## Hexiwear IoT End Node

## Sensor Tag

Internet of Things "node" or "thing", broadcasts sensor data (Broadcasting sensor readings over BLE, Wi-Fi or USB CDC, out of the box support for on-board sensors

> **Bo** HEXIWEAR

Active

buttons

Toggle

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Back

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Hexiwear IoT End Node



IoT End Node developed rapidly with KSDK or FreeRTOS Internet connected Wi-Fi Router Cloud Connectivity provides a scalable foundation for cloud apps connecting to IoT End Node



Hexiwear Wearable Use Case

## Smart Watch

Cell phone notification alert Data transferred to cellphone app Offline data storage in serial flash



## Health/Fitness Band

Pedometer Calories burned Heart rate and pulse oximetry monitoring





## Hexiwear Wearable Use Case



Low power wearables / sensor tag developed rapidly with KSDK or FreeRTOS Internet connected using a mobile device (Android , iOS) Cloud connectivity provides a scalable foundation for cloud apps connecting to wearables / sensor tag



# Infinitely Expandable





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# Hexiwear Infinitely Expandable



### **Compatible docking station**

Where you can use up to 3 expansion modules



### ~200 plug and play add-on sensor boards Currently available which comes with example code to get you started in minutes

More information is available here

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Designed for expansion with easy access to SPI, I2C and other serial interfaces for customization Supported by MikroBUS standard expansion port







# Hexiwear Infinitely Expandable

Leverage and build upon ~200 expansion modules



# Hexiwear Infinitely Expandable

Smart Multimedia	Smart Home	Smart World	Smart Interface	Smart Health	
Buzz Click	Wifi 3 Click	Thunder Click	Relay Click	Optical Heart Rate Monitoring	
MP3 Click	Motion Click	UV Click	NXP NFC Chip	Calorie and Step	
Camera Click	Flame Click	Hydrogen Click	Proto Click	count	
IR Gesture Click	Air Quality Click	Methane Click	4x10 RGB Click	Alcohol Click	
				IRThermo Click	



# Hexiwear Next Gen IoT Solution for Innovators

### Value Proposition

#### **Fastest Time to Market**

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#### Path to Manufacturing

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#### **Optimized Hardware Design**

The hardware design is optimized and includes several best practices suggested for designing low power IoT applications

#### **Robust Software**

The software includes everything from the embedded drivers to the cloud connectivity - all open source, easy to use and optimized

#### **Community Supported**

Hexiwear is a true community based solution and enables customers to access the rich pool of resources created by community

### **Target Applications**

IoT end nodes & Wearables



### Key Components

#### **Total NXP BOM**

\$16 - 7 NXP components: MCUs, connectivity, sensors and battery charger - Kinetis K64 MCU based on ARM Cortex-M4 core

Kinetis KW40Z multimode BLE and 802.15.4 radio SoC

Color OLED Display, Rechargeable battery, External flash

### **Design Resources Available**

#### Software

Schematic, Design Files, Bill of Material (BOM) iOS and Android App

#### Software Development Environment

Kinetis SDK (Open-source and Free) Kinetis Design Studio (Open-source and Free) FreeRTOS (Open-source and Free)





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