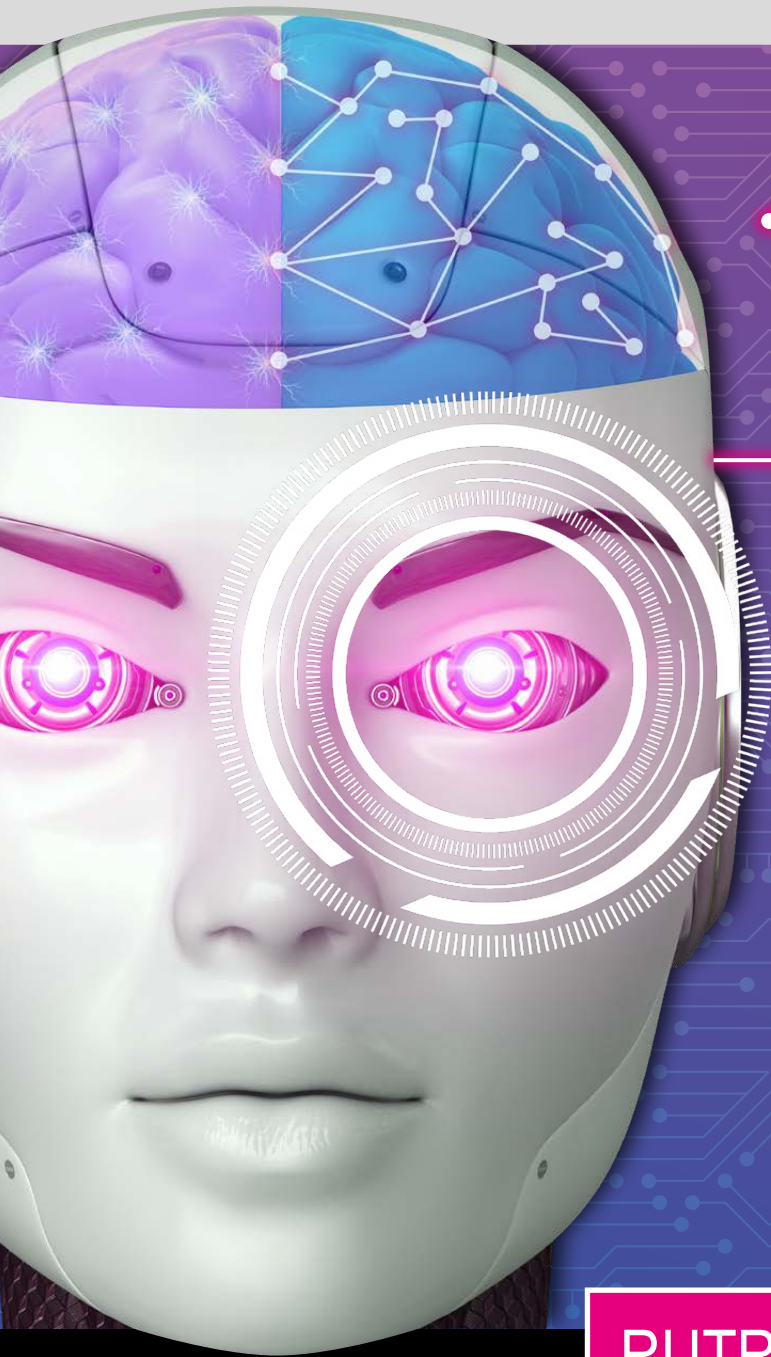




AI³®

RUTRONIK SYSTEM SOLUTIONS

FROM SINGLE PRODUCT TO SOLUTION, FROM BASIC LEVEL TO RESEARCH LEVEL

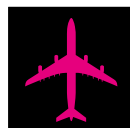
V 2.4.1



Basic
Level



Design
Level



Adv. Design
Level



Research
Level

Introduction	03
Basic Level	04
Design Level	06
Thingy:53	08
TMF882X	10
Advanced Design Level	12
RDK2	14
RDK3	16
RDK4	17
RAB – Text to Speech	18
RAB1 / RAB7 – Sensorfusion	20
RAB2 – CO2	21
RAB3 – Radar	22
RAB4 – RTK	23
RAB5 – Osire	24
RAB6 – VISHAY	25
RAK-GaN	26
HV-Switch	28

Research Level	29
HESS (Hybrid Energy Storage System)	30
Electronic Nose	32
Ambient IoT Remote Control	33
Smart Stations	34
RSS Smartphone APP	35
ModusToolbox™	36
GitHub	36
Additional Information	38

Innovation and future DNA

Our Product Portfolio

	Semiconductors		Boards & Systems
	Passive Components		Storage Technologies
	Electromechanical Components		Wireless Technologies
	Displays & Monitors		

Our Initiatives



Follow us

-  www.facebook.com/rutronik
-  <https://twitter.com/rutronik>
-  www.youtube.com/user/rutronik24
-  <https://rutronik-tec.com>
-  www.linkedin.com/company/rutronik

RUTRONIK 24
next generation e-commerce



Stephan Menze
Head of Global Innovation Management

How do we work?

- We combine the technical excellence of our departments to ignite Rutroniks full potential
- We give support to increase the number of sockets per application
- We communicate with suppliers or external partners like universities, engineering labs or patent holders to create cooperations on a technical or commercial level
- We find new innovative ways to address and support our customers and partners in the best possible way

What are the main benefits?

- We receive the customer and market feedback for new solutions, markets or applications which we could investigate in
- Our sales team addresses as many sockets as possible at a customer from technical and commercial perspective
- Together we increase Rutroniks influence and standing in the market
- Together we find the best ways to address and support our customers and deepen our customer relations
- Together we address the complete solution from our linecard to our customers to support them in the best way and create the best proof of concept to reduce their time to market

Committed to excellence

Consult – Know-how. Built-in.

The Technical Competence from RUTRONIK

Worldwide and individual consulting on the spot by competent sales staff, application engineers & product specialists.

Components – Variety. Built-in.

The Product Portfolio from RUTRONIK

Wide product range of semiconductors, passive and electromechanical components, displays & monitors, boards & systems, storage and wireless technologies for optimum coverage of your needs.

Logistics – Reliability. Built-in.

The Delivery Service from RUTRONIK

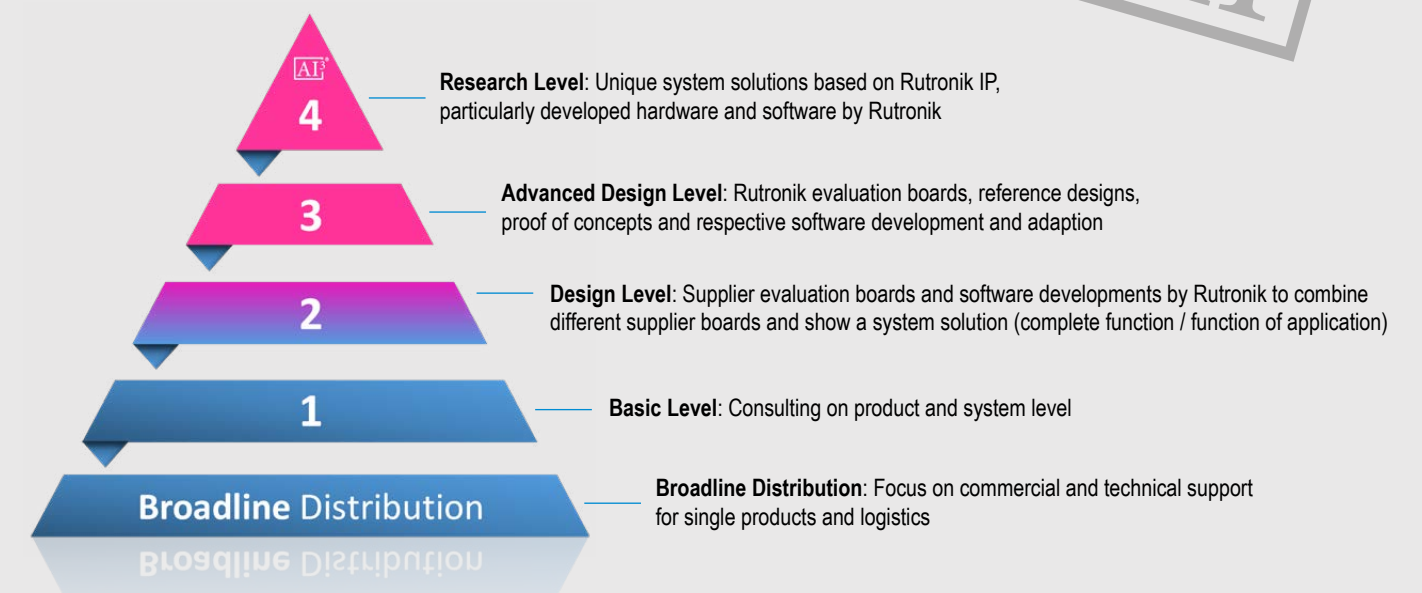
Innovative and flexible solutions: from supply chain management to individual logistics systems.

Quality – Security. Built-in.

Quality without Compromise from RUTRONIK

The integrated management system (IMS) encompasses quality control, information security, environmental protection, occupational health and safety.

From Basic Level to Research Level Significant improvement of excellence – across all levels





- Technical consulting on product and system level using diagrams, data sheets and training materials
- Technical consulting through product and application engineers
- Commercial consulting through sales regarding technologies, procurement and logistics

Customer advantage

- Inspiration system thinking, new technologies, new products
- Education training for new products
- Exchange with experts on application level

BASIC LEVEL



Innovation
Level

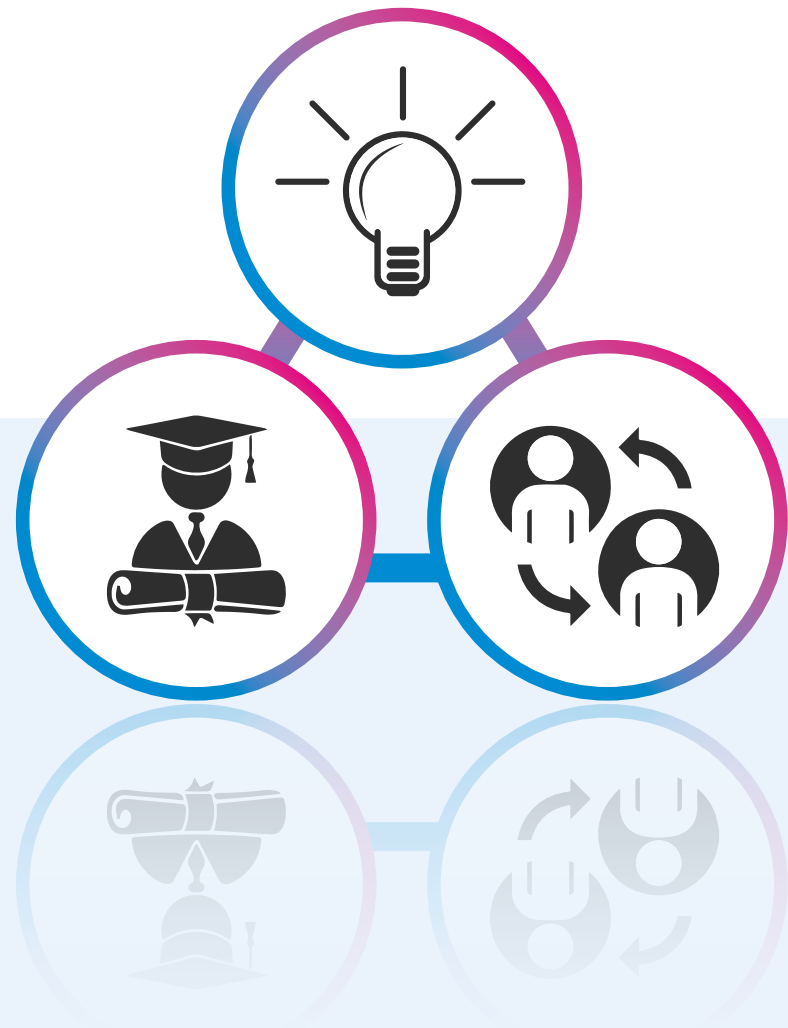


Faster
Time to Market



Consulting

Inspiration. Education. Exchange.



Our daily business is to support our customers by global supply and support for the full range of electronic components.

We rely on our core competencies and services - distribution in high scale and complexity.

Over the years, we accumulated many unique features that have only one purpose: to increase the competitiveness of our customers.

Due to our global presence and expert teams of sales staff, applications engineers and product specialists, we guarantee a high dynamic, highly professional assistance and support in all technical and commercial matters.

The unmatched breadth of our components range ensures that our customers' needs are optimally covered.

High availability combined with maximum safety and reliability based on our strong partnerships with leading manufacturers, external development partners or universities ensures that we maintain a technological edge.

The consistent focus on growth includes investments in our own research and development capacities.

We are aiming at developing new technologies on the one hand and on the other hand at designing highly innovative solutions – precisely tailored to our customers' needs and the expectations of their end users.



- Hardware platforms, evaluation kits and reference designs from suppliers as basis, optional combination of different boards
- Software adaption by Rutronik support engineers which connect different boards with each other to demonstrate the corresponding functions
- Support for implementing the respective software
- Consulting for the functions of the hardware/boards, functions of the products within the boards and system thinking combine different boards and eventually forming a system solution (overall function, application).

Customer advantage

- The Design Level System Solutions provide the quickest entry in standardised board level from suppliers and the corresponding software



Innovation Level



Faster Time to Market



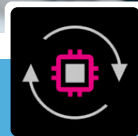
Consulting



Standard HW (Supplier)



Standard HW (Rutronik)



Standard HW Adaption

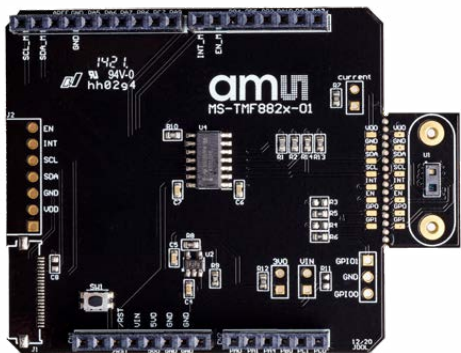


SW Adaption (Rutronik)

Board - Overview



Nordic - Thingy:53



ams OSRAM - TMF882X





Nordic Thingy:53

Multi-protocol easy-to-use IoT prototyping platform

Benefits

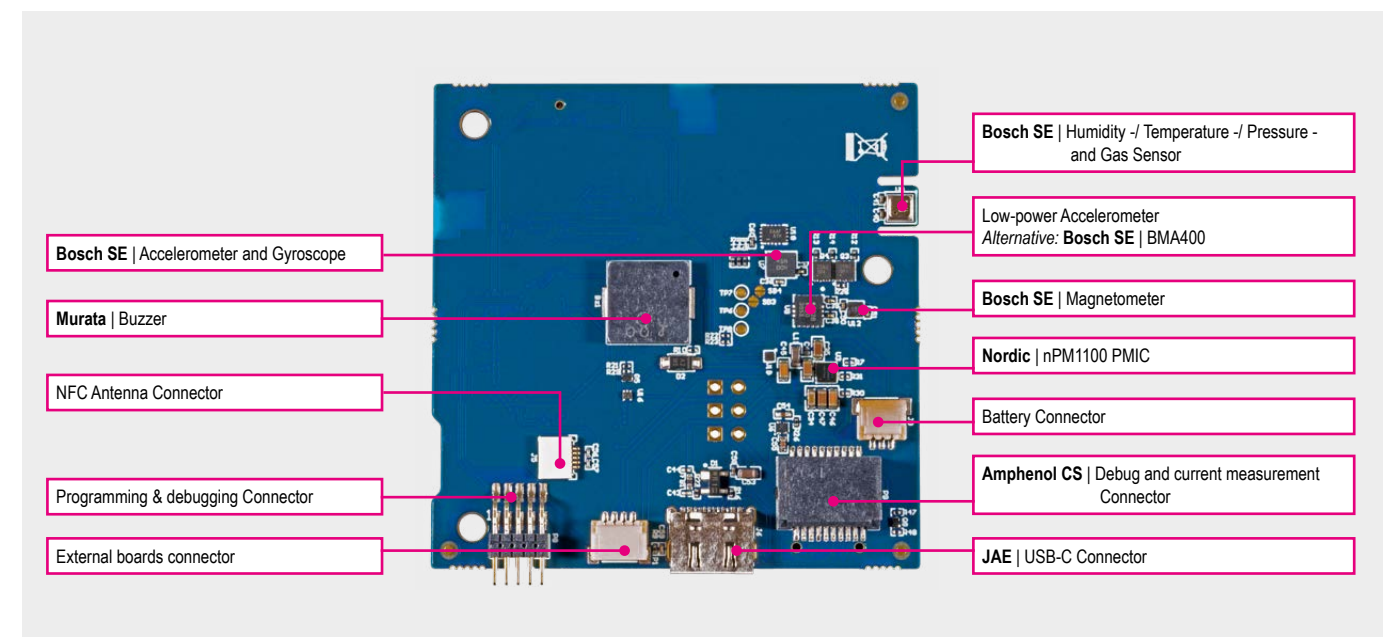
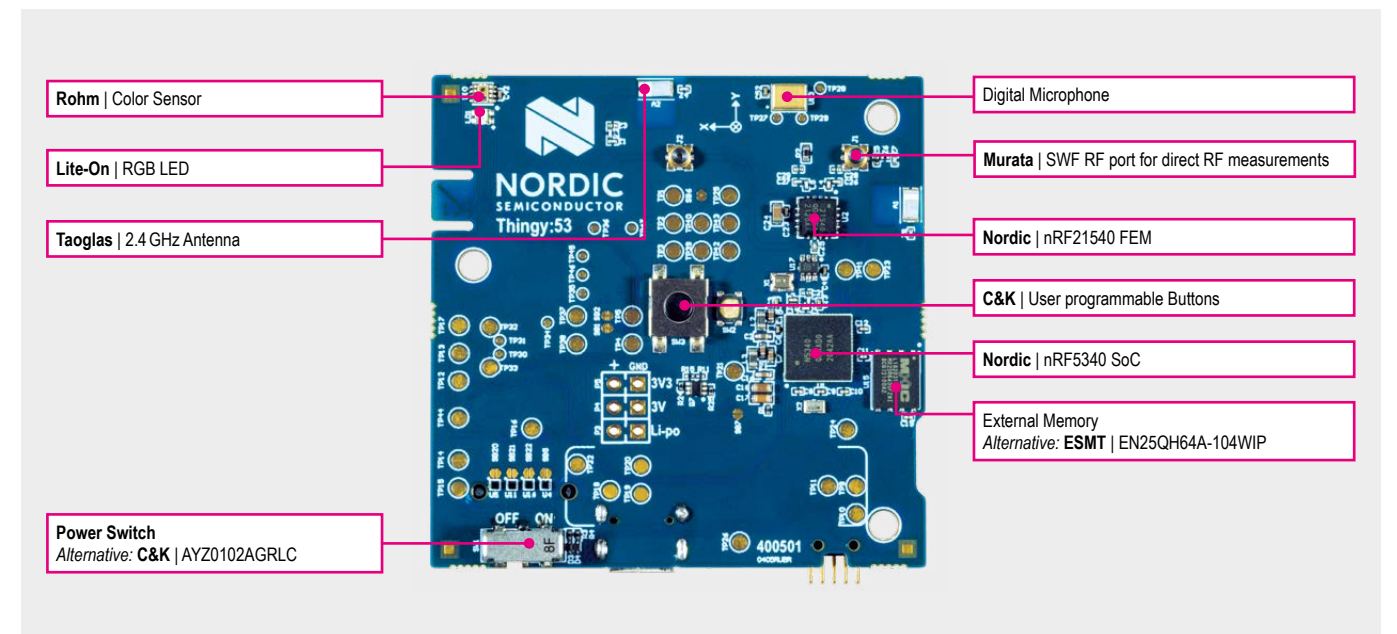
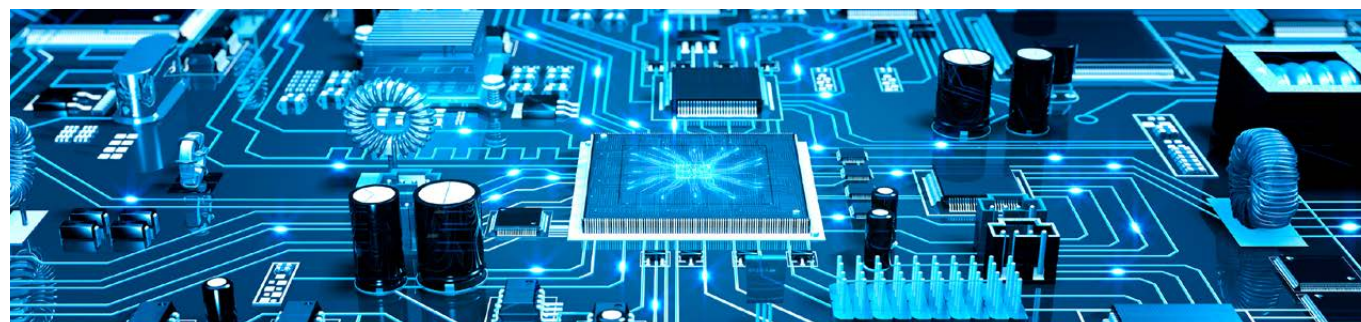
- Makes it possible to create prototypes and proof-of-concepts without building custom hardware
- Thingy:53 is built around the nRF5340 dual-core wireless SoC
- Processing power and memory size of its dual Arm Cortex-M33 processors enables it to run embedded machine learning models directly on the device
- The nRF Edge Impulse app enables users to connect their Thingy:53 to their Edge Impulse studio account through a mobile device
- Allows wireless transfer of sensor data over Bluetooth LE to the mobile device and upload it to the cloud for training and download trained ML models to the Thingy:53 for deployment and inferencing
- App acts as the GUI for viewing inferencing results from a running ML model

Key Features

- Supports Bluetooth LE, Bluetooth mesh, Thread, Zigbee, Matter, proprietary 2.4 GHz, and NFC
- Enabled for embedded machine learning (ML)
- Environmental sensor for temperature, humidity, air quality and air pressure
- Color and light sensor
- Low-power accelerometer and inertial measurement unit (IMU)
- High-quality MEMS microphone and buzzer
- User-programmable buttons and RGB LED
- Rechargeable Li-Po battery with 1350mAh capacity

Markets & Applications

- Machine learning
- Smart home sensing
- Fast prototyping
- Proof-of-concept development





Arduino shield adapter board for TMF882x

Time of flight sensor by ams OSRAM – Designed to fit on our RDK baseboards

Benefits

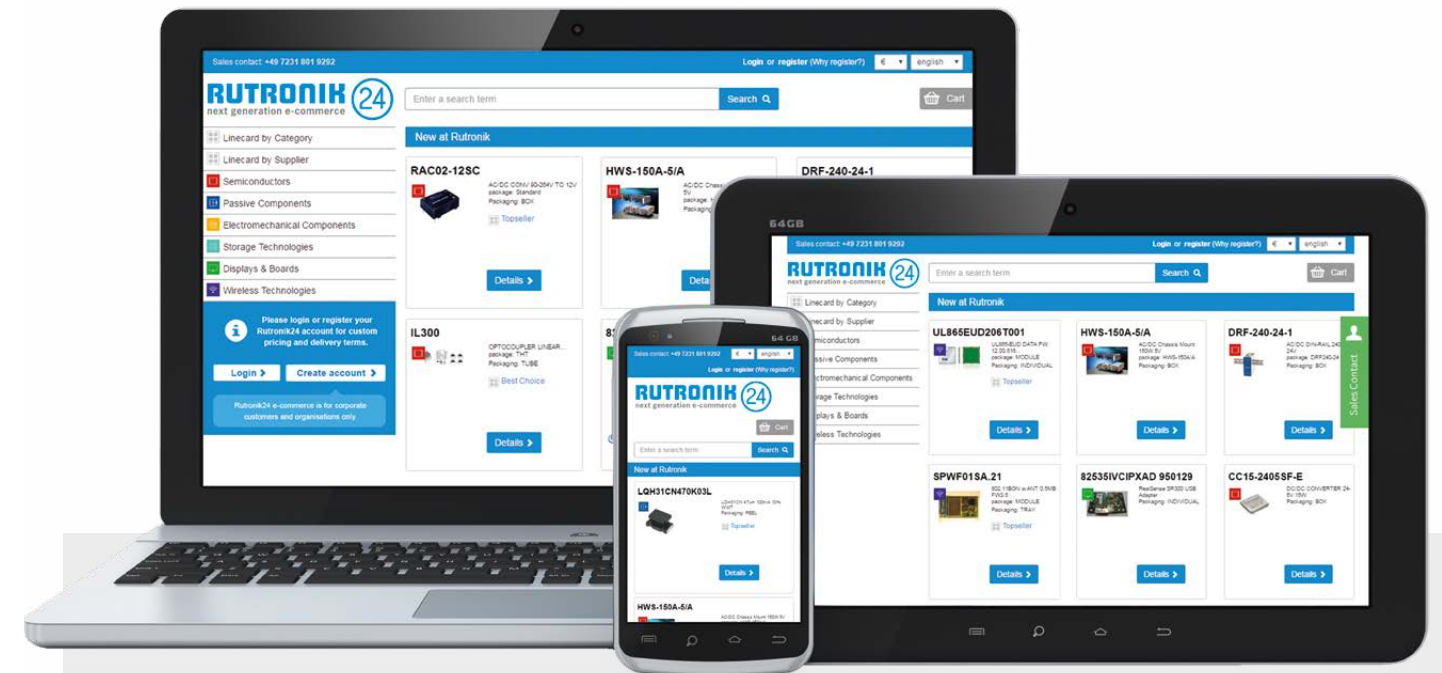
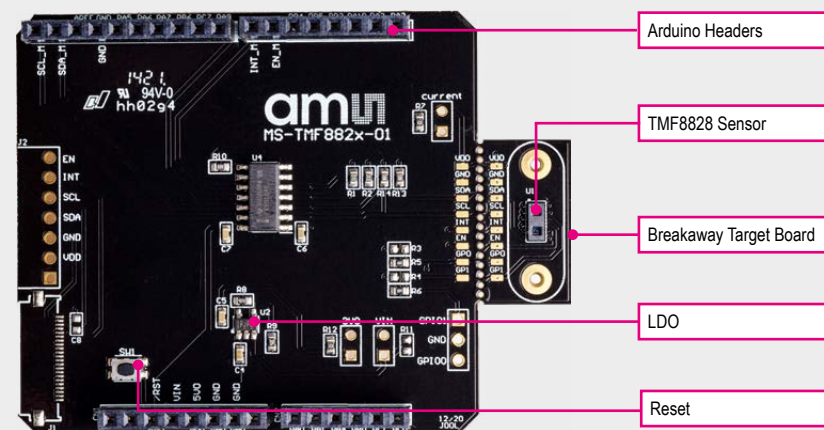
- Arduino form factor development board fits to all RDK baseboards
- Firmware examples available for an easy plug and play start
- You can use all RDKs as a base board for all other Rutronik adapter boards
- Easy integration of all other Rutronik adapter boards (e.g. Sensorfusion, CO2, T-t-S, etc.) or other Arduino based evaluation boards via integrated Arduino headers
- First class hard- and firmware support from our product experts and development engineers

Key Features

- TMF8828 sensor mounted on breakaway board
- Cover glass samples included, 0.5mm / 0.6mm / 0.7mm/ 0.8mm thicknesses
- Air gap spacer samples included, 0.17mm / 0.25mm / 0.38mm / 0.5mm thicknesses
- Breakaway board Vdd current sense test point
- Reset button
- Onboard LDO and I²C level shifter

Markets & Applications

- 3D Vision System
- 3D dToF for mobile AR
- Face Recognition
- Active Stereo Vision
- 2-Step Enrollment & Verification



e-commerce made easy

FASTER. EASIER.
JUST MORE PERSONAL.

rutronik24.com

All components of the BOM can be found in the Rutronik portfolio!



- Own Rutronik hardware (platform/boards) and corresponding software development
- Usage of application modules based on these platforms
- Development of software adaptations for different application modules with self developed software
- Close cooperation with multiple suppliers through the modular set up of the Advanced Design Level System Solutions
- All key components are based on the portfolio of our suppliers
- Fusion of the know-how of multiple suppliers and Rutronik

Customer advantage

- Modular solution with the best fit combination of different suppliers and products
- Time to Market is reduced significantly
- Inspiration for best fit products



2
Innovation Level

Faster Time to Market

Consulting

Standard HW (Rutronik)

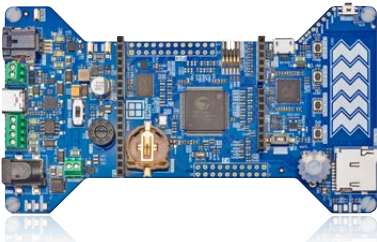
App.-specific HW Adaption

SW Adaption (Rutronik)

Close Cooperation

Board - Overview

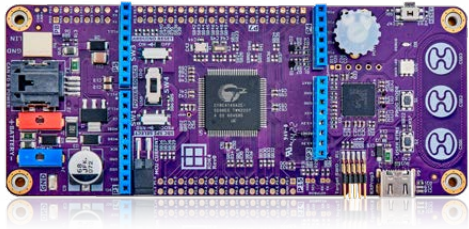
Rutronik Development Kits - RDK



RDK2



RDK3

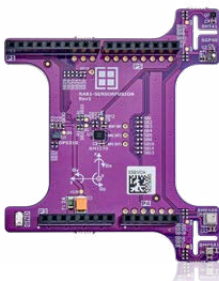


RDK4

Rutronik Adapter Boards - RAB



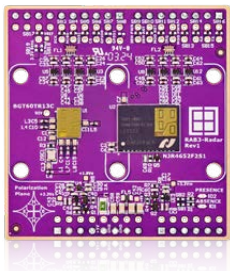
RAB - TTS



RAB1 - Sensorfusion



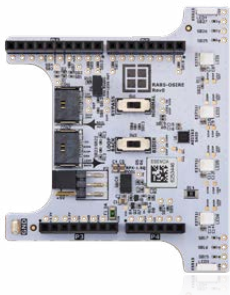
RAB2 - CO2



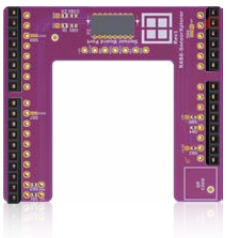
RAB3 - Radar



RAB4 - RTK



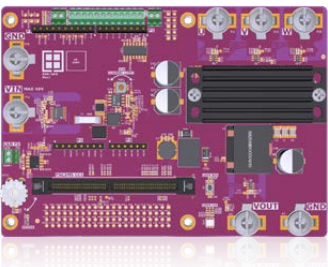
RAB5 - OSIRE



RAB6 - VISHAY



RAB7 - Sensorfusion

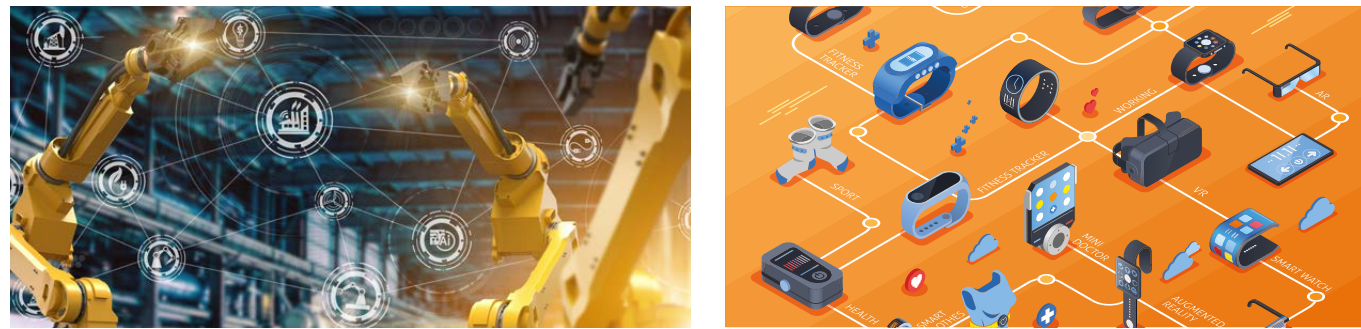


RAK-GAN

Rutronik Cooperation Boards



HV-Switch



RDK2 based on Infineon PSoC™ 62 MCU

Easy approach for firm- and hardware designers

Benefits

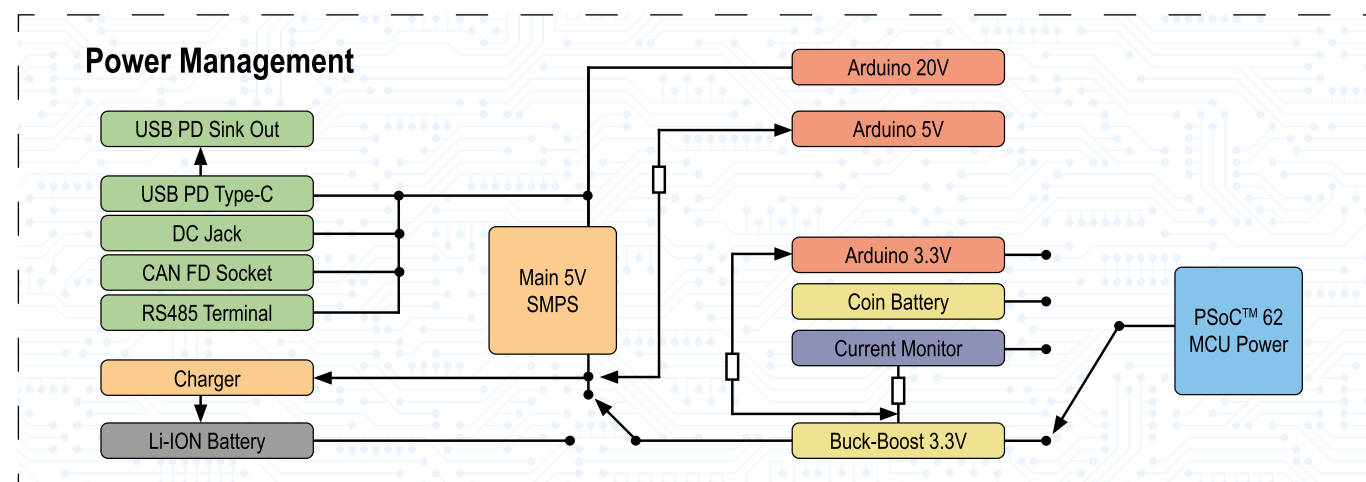
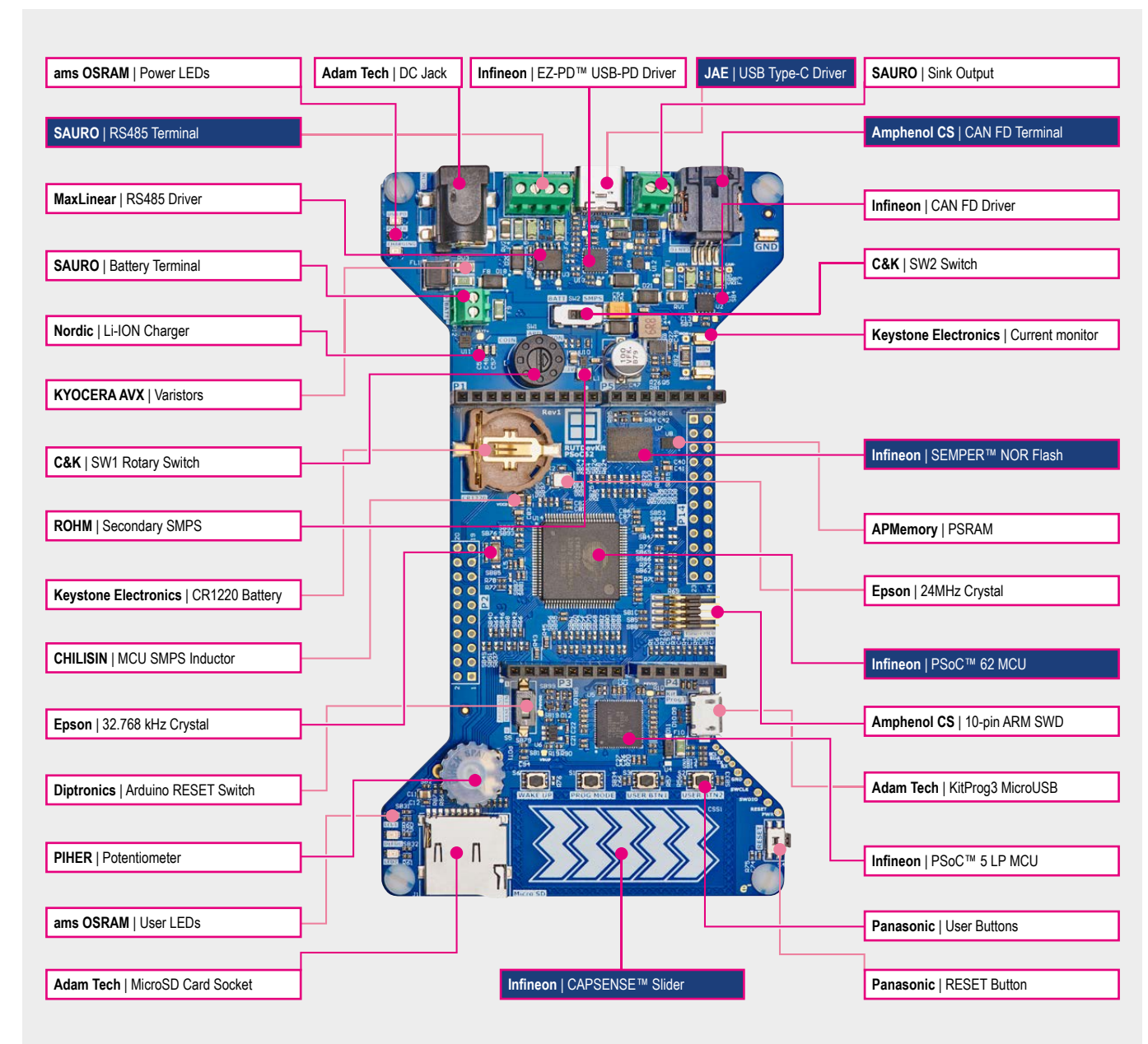
- Offers a complete solution for hard- and firmware development and for proof of concepts in a very short time
- No need of soldering and assembling own prototype builds for first testing and measurements
- Use all RDKs as a base board for all other Rutronik adapter boards
- Easy integration of all other Rutronik adapter boards (e.g. Sensorfusion, CO2, Text-to-Speech, etc.) or other Arduino based evaluation boards via integrated Arduino headers
- Easy evaluation of all the available parts through provided state-of-the-art interfaces directly on the board
- First class hard- and firmware support from our product experts and development engineers

Key Features

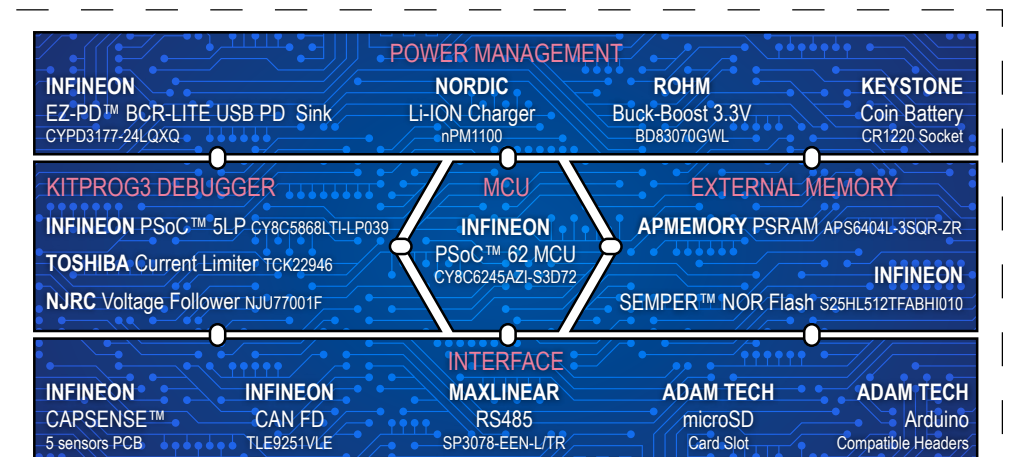
- Boards runs on the PSoC™ 62 MCU with a dual core ARM® Cortex®-M4 and ARM® Cortex®-M0+ architecture
- Includes an integrated power management IC which enables the board to be powered from the Li-ION battery. The high-efficiency buck controller allows having a high-power supply providing developers with up to 3.5A at 5V
- A 512MBit SEMPER™ NOR Flash connected with microcontroller QSPI can be used to store large amounts of data or even the firmware that may run directly from it
- User can access all pins of the PSoC™ 62 MCU via supplied headers

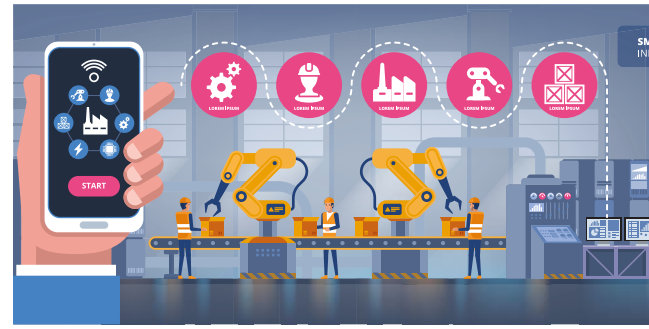
Markets & Applications

- Smart Wearables
- IoT & Industrial IoT
- Smart Home
- Robotics & Automation
- Touch & Gesture based applications



Block Diagram





RDK3 based on Infineon PSoC™ 64 Secured MCU

Wireless ultra-low power IoT Bluetooth board with state of the art hardware-based security features

Benefits & Key Features

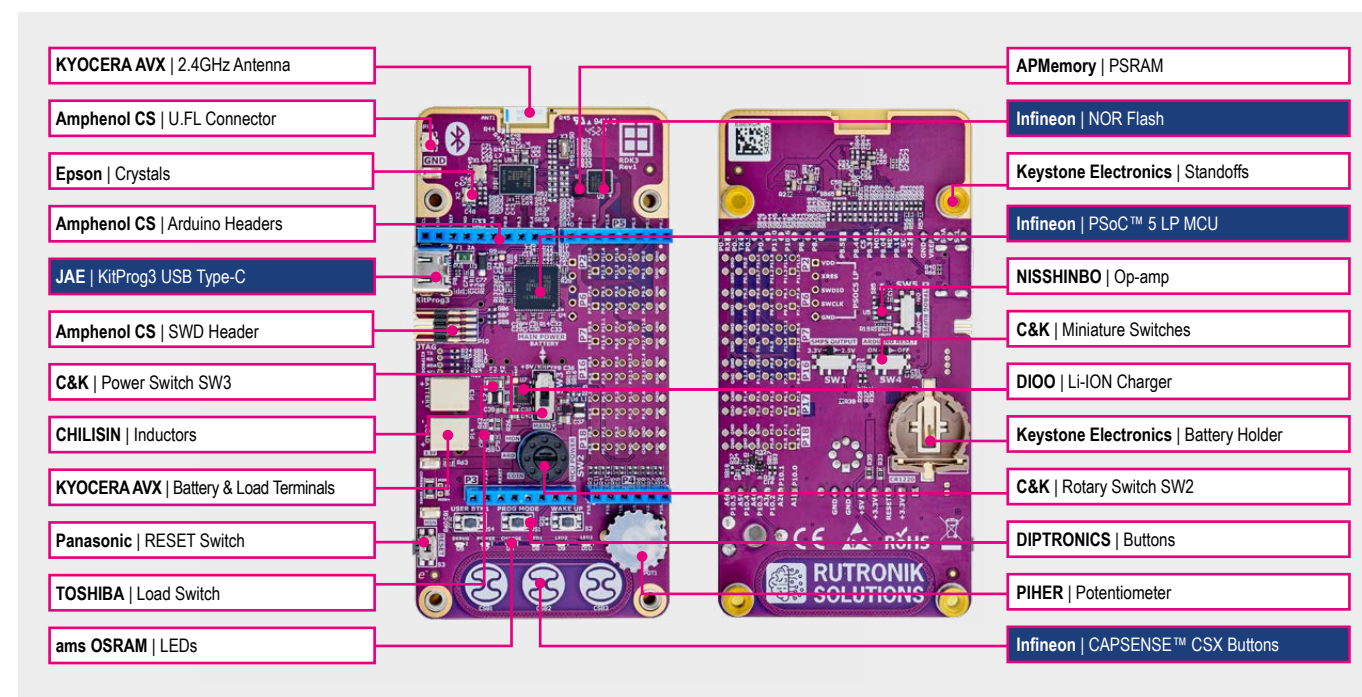
- Offers a complete solution for hardware and firmware developers for proof of concepts in a very short time
- Board runs on the PSoC™ 64 Secured MCU from Infineon with PSA support
- The MCU offers three-levels of hardware- and firmware-based resource isolation
- The Arm® Cortex®-M4/M0+ dual core SOC offers a secured M0+ core, physically separated from an user application running on the other M4 core
- Offers secure element functionality that can be used to build authenticate secure applications
- Ultra low power MCU with Bluetooth® Low Energy

Markets & Applications

- Smart Building
- Robotics
- Smart Factory
- Healthcare

Please Note

Infineon has discontinued the PSoC™ 64 Secured MCU product line. The Infineon CY8C6347BZI-BLD53 MCU may be considered a suitable alternative.



RDK4 based on Infineon PSoC™ 4100S Max

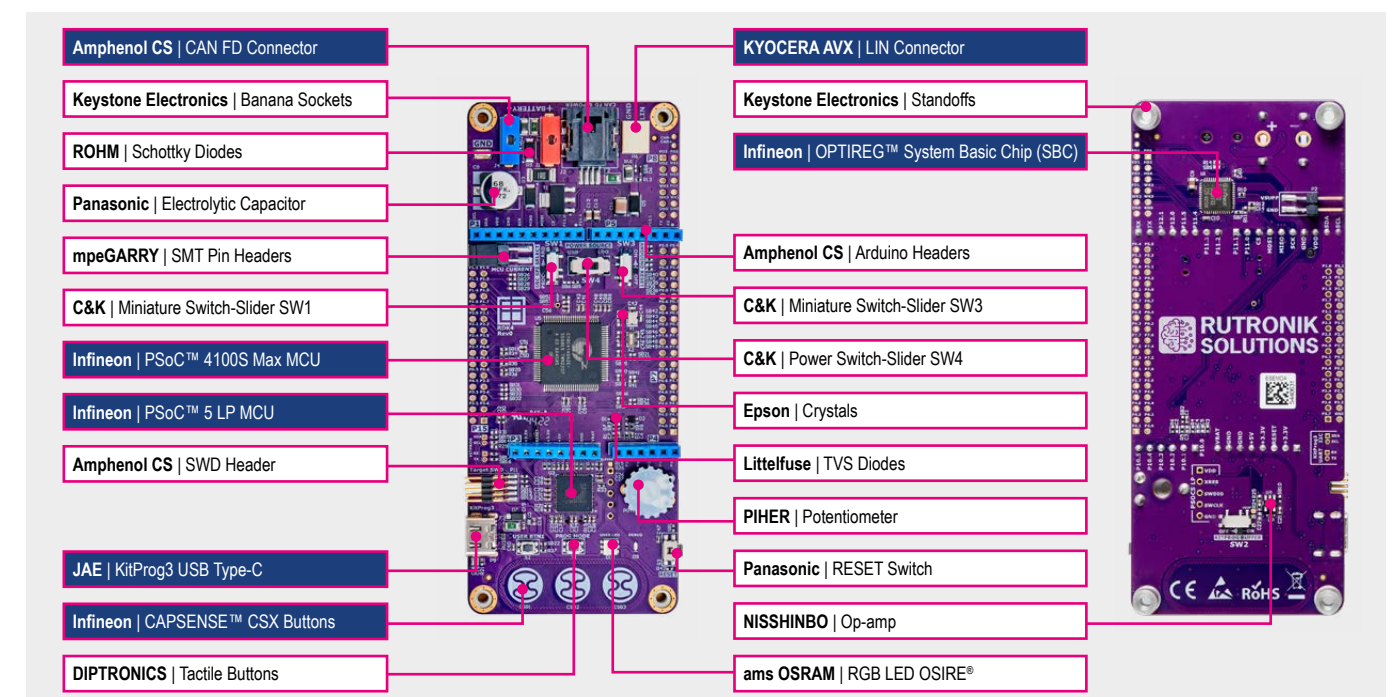
Small, compact automotive qualified controller with most important automotive interfaces like CAN-FD and LIN

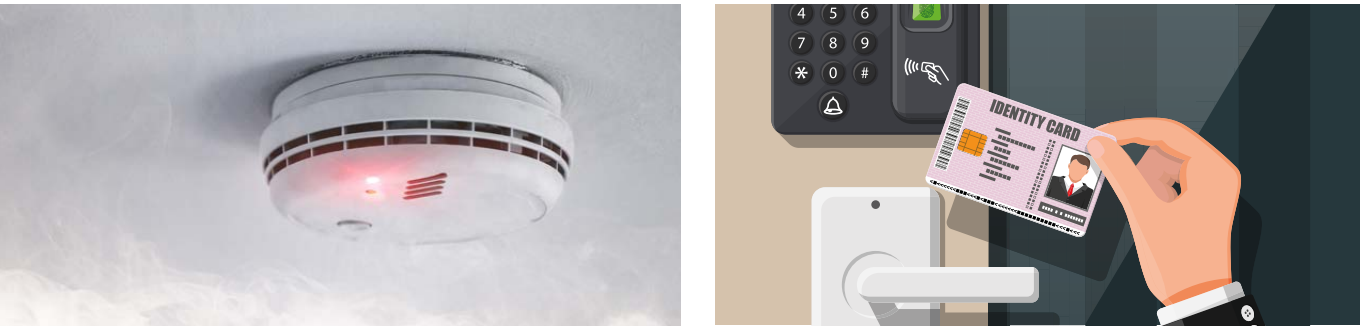
Benefits & Key Features

- Board runs on the PSoC™ 4100S Max with Arm Cortex M0+ MCU (48MHz)
 - CAN-FD (5Mbps) | LIN Interface | Audio I2S | 384/32 KB Flash/SRAM
 - Low-Power 1.71 V to 5.5 V | CAPSENSE™
- Possibility for an easy current measurement with Jumpers
- All Pins reachable for digital analyses like CAN TX RX
- SBC – OPTIREG™ Mid-Range+ with WTD / Voltage Monitoring for Functional Safety
- Perfect fit for development of e.g. various modules like trunk control, door control, seat heating, climate control and many more...

Markets & Applications

- Automotive motor control modules
- Body & Convenience
- Powertrain
- Industrial HVAC
- Agriculture
- Factory Automation
- Human Machine Interface





Adapter Board based on Epson Voice/Audio LSI S1V3G340

Easy approach for implementing voice guidance for a variety of HMI and IoT applications

Benefits

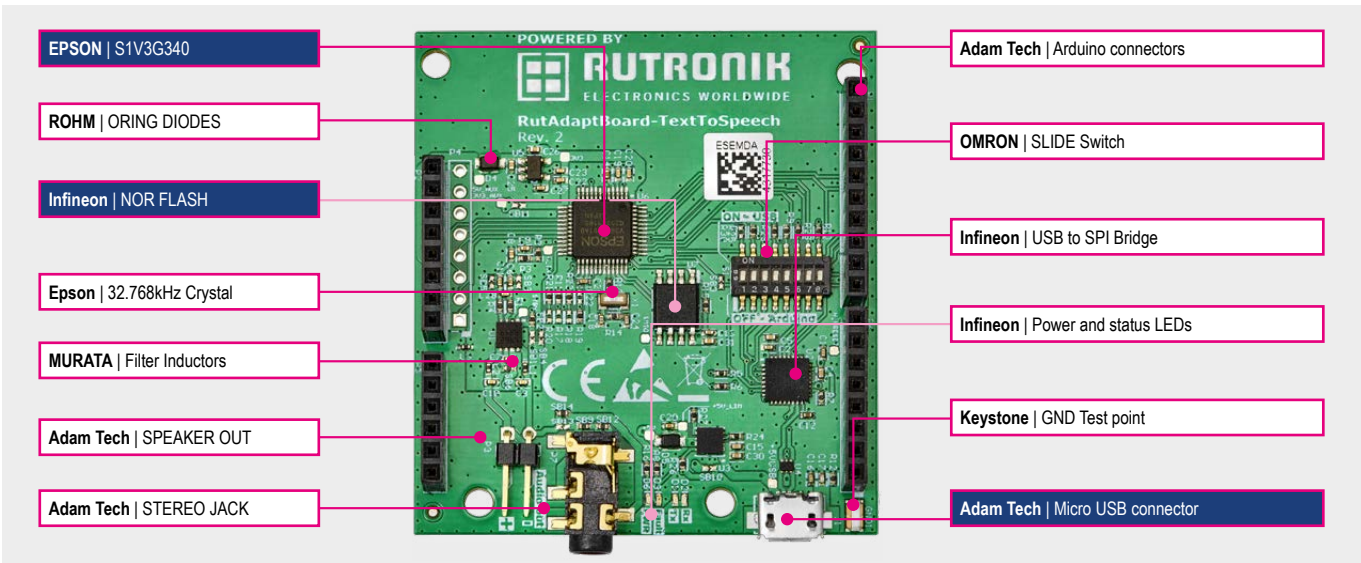
- Offers a complete solution for development of a voice guidance feature and for proof of concepts in a very short time
- No need of soldering and assembling own proto-type builds for first testing and measurements
- You can use all RDKs as a base board for this and all other Rutronik adapter boards
- Easy integration of all other Rutronik adapter boards or other Arduino based evaluation boards via integrated Arduino headers
- Easy evaluation of the Epson Voice/Audio LSI S1V3G340 through provided GPIO pins directly on the board
- Available firmware examples for voice output of sensor data or alarm functions
- First class hard- and firmware support from our product experts and development engineers

Key Features

- Offers easy to use speech IC without traditional costly and time-consuming studio recordings by a person
- Generates high quality natural human voice with a high compression rate
- NOR Flash 64Mbit memory interfaced with Epson Voice/Audio LSI S1V3G340 via SPI enables large amounts of audio data to be stored
- Epson Voice/Audio solutions support both -existing concepts and new designs- by dedicated IC's for a seamless platform transformation adding Voice Guidance function
- 3.5mm stereo jack for stereo speakers or headphones
- Supports up to 12 languages

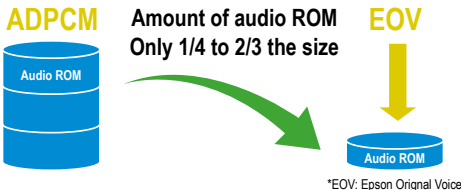
Markets & Applications

- Home Appliances
- Security/Alarms
- Door Locks/ Door Phones
- Healthcare
- Tracking Devices
- Goods for handicap/ Elder people

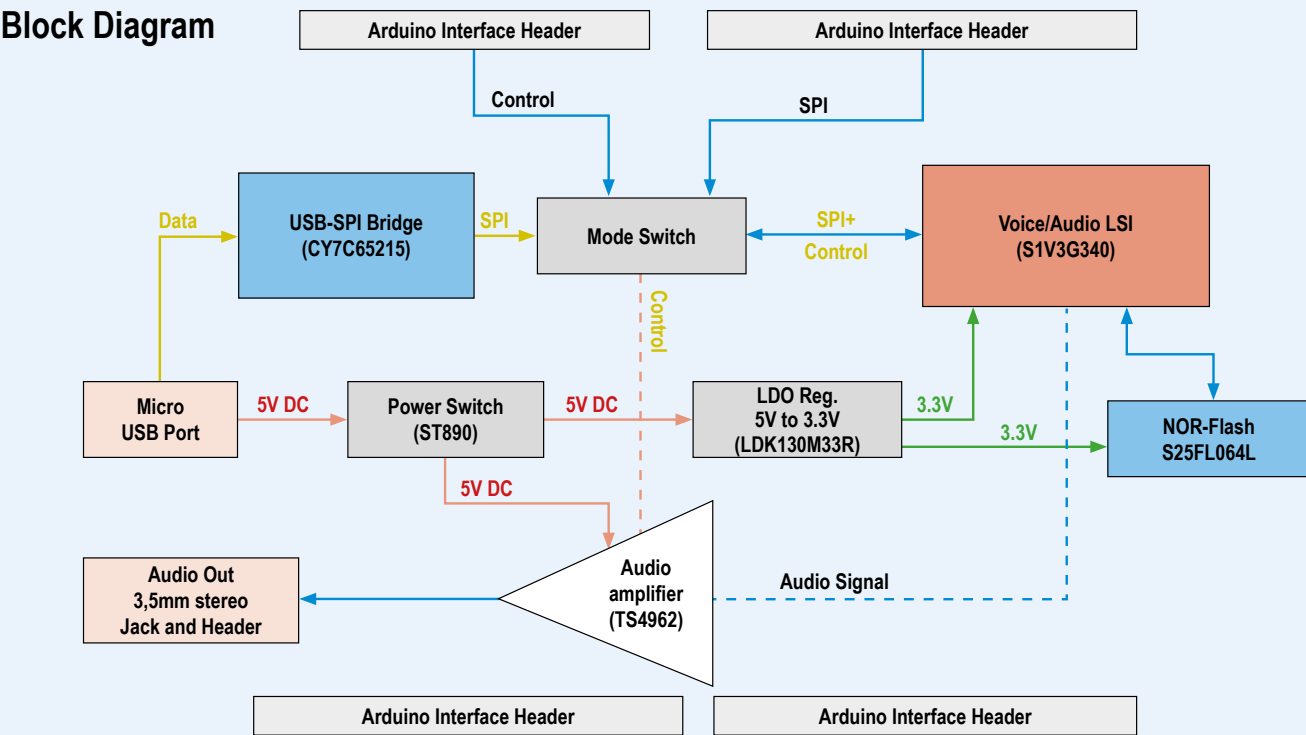


Small amount of ROM space to save space

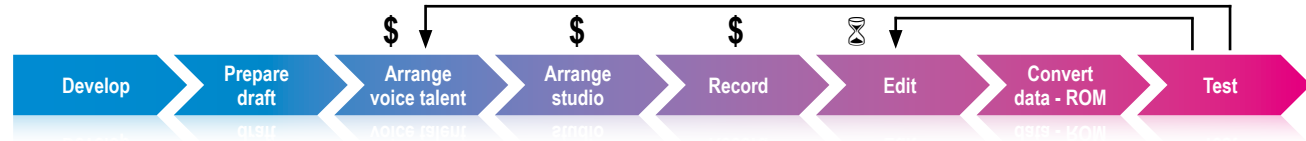
	Format	sampling rate (kHz)	ADPCM (bit)	bitrate (kbps)	Speech time					
					1 (min)	2 (min)	3 (min)	4 (min)	5 (min)	10 (min)
others	ADPCM	16	4	64	480 (kB)	960 (kB)	1.440 (kB)	1.920 (kB)	2.400 (kB)	4.800 (kB)
		8	4	32	240 (kB)	480 (kB)	720 (kB)	960 (kB)	1.200 (kB)	2.400 (kB)
		8	3	24	180 (kB)	360 (kB)	540 (kB)	720 (kB)	900 (kB)	1.800 (kB)
EPSON	EOV (original)	16	-	16	120 (kB)	240 (kB)	360 (kB)	480 (kB)	600 (kB)	1.200 (kB)



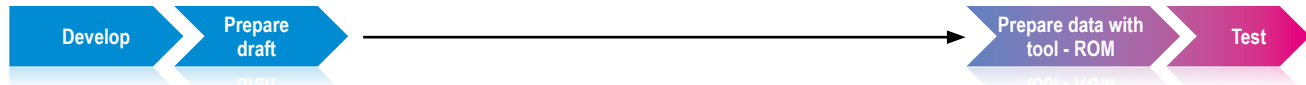
Block Diagram



Usual process of adding a voice function



Process with Text To Speech board



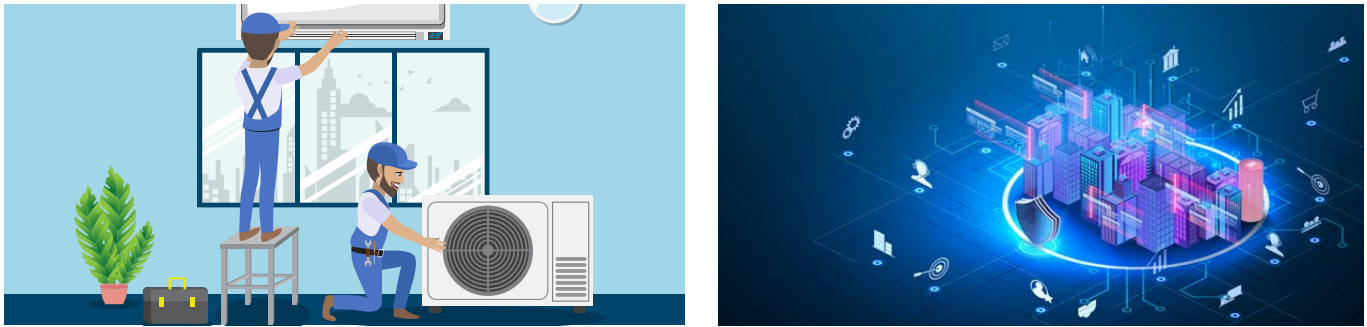


Adapter Boards RAB1- and RAB7 – Sensorfusion
For intelligent sensor fusion

- Benefits**
- With state of the art sensors for all sensorfusion applications
 - User can access all pins via supplied headers
 - Operates on any evaluation board with Arduino Interface and perfect fit for our RDKs
 - Can be combined with all of our other boards
 - Many firmware examples are available on our homepage

- Key Features**
- Additional interal MEMS sensor for manipulation detection or navigation function
 - I2C and SPI interface via Arduino compatible connectors
 - Test Point connector for ground signal
 - RAB7 is an updated version of RAB1 for AI-powered Sensorfusion

- Markets & Applications**
- Building Automation
 - Professional Kitchen
 - HVAC
 - Smart Farming



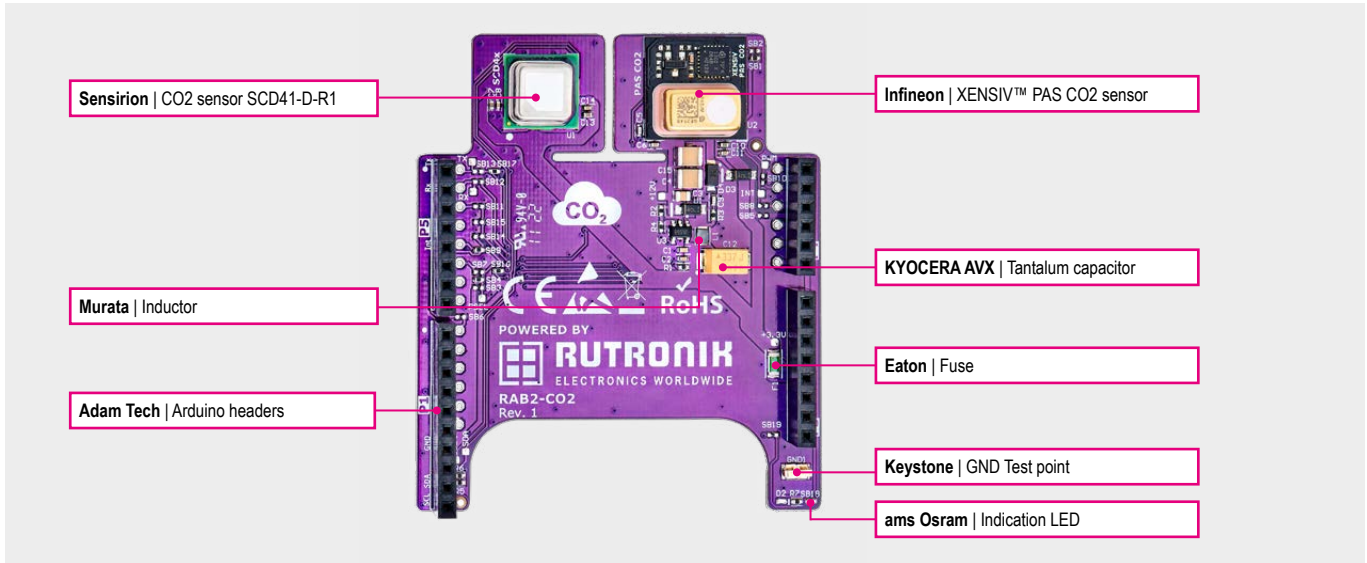
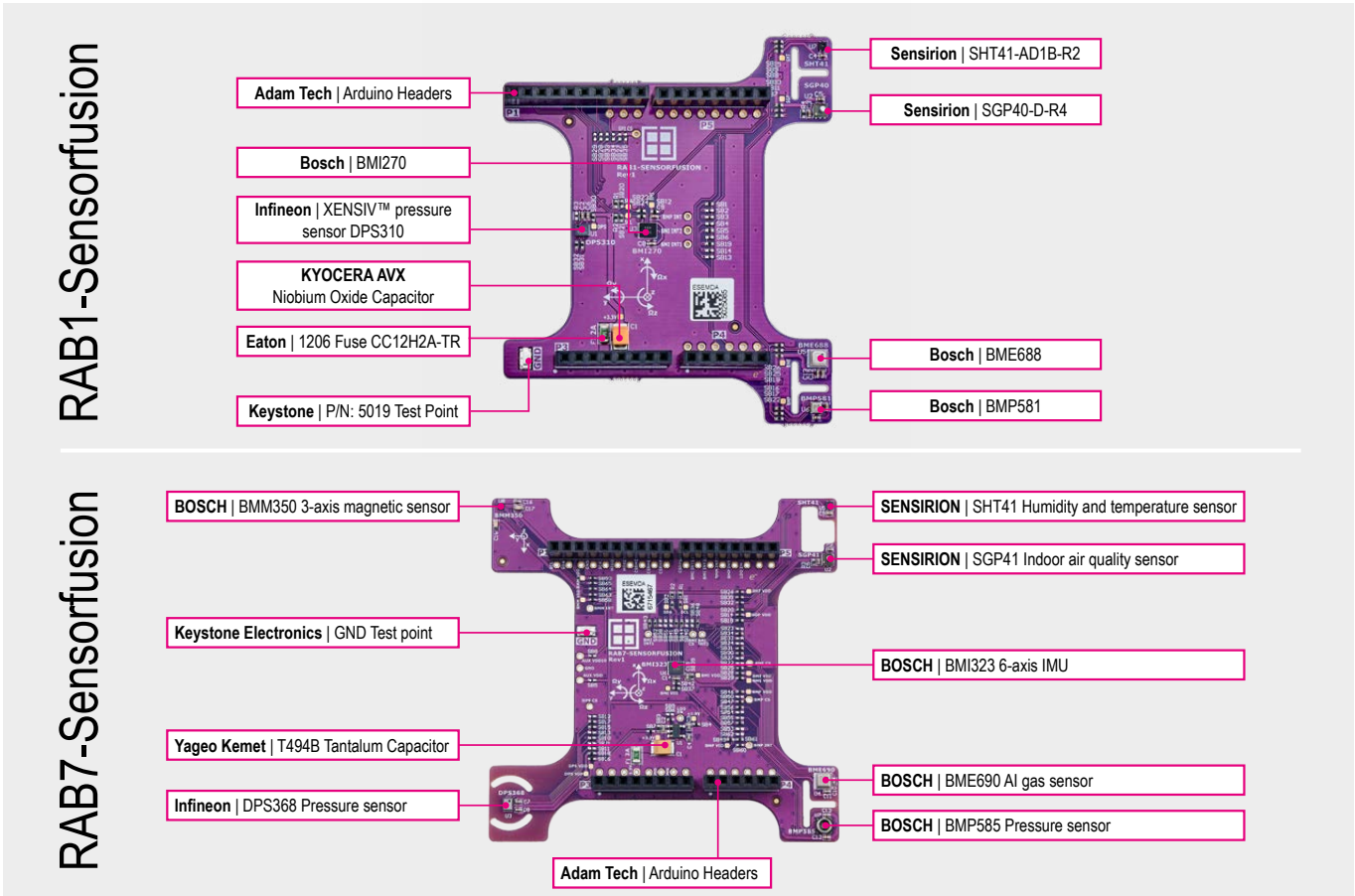
Adapter Board RAB2 – CO2
For best in class CO2 sensing

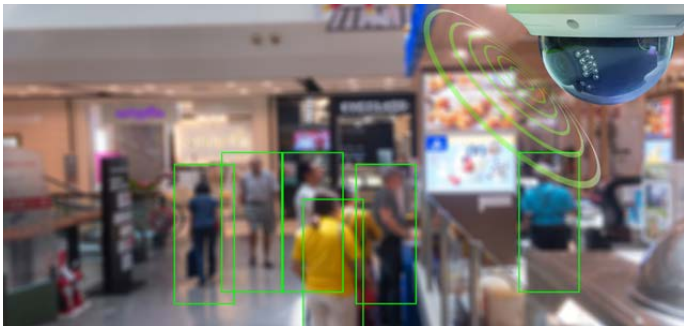
- Benefits**
- Easy evaluation of CO2 sensing
 - Customer can decide which sensor and which measurement method fits the most
 - Demo will be available at our trade fairs
 - Stackable on RDKs and combination with other adapter boards possible

- Key Features**
- I2C and SPI interface via Arduino compatible connectors
 - Test Point connector for ground signal
 - Infineon has discontinued PAS CO2 sensor. The Infineon ICENV1738 – TCIRXT sensor may be considered a suitable alternative

- Markets & Applications**
- Building Automation
 - Professional Kitchen
 - HVAC
 - Smart City

Please Note
Infineon has discontinued PAS CO2 sensor. The Infineon ICENV1738 – TCIRXT sensor may be considered a suitable alternative.





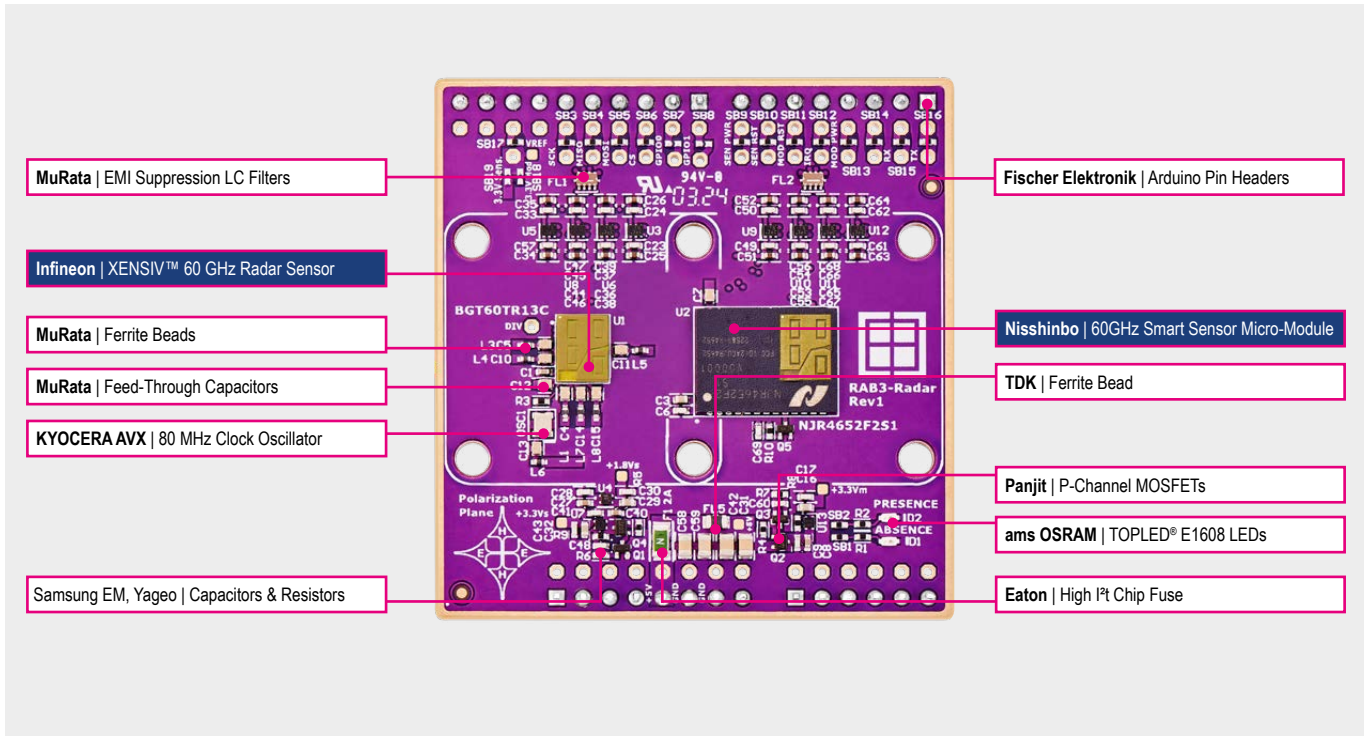
Adapter Board RAB3 – Radar
For distance measurement, people or surface detection

- Benefits**

 - Fully integrated radar solution (Nisshinbo) and a discrete radar IC (Infineon) on one board
 - Operates on any evaluation board with Arduino interface
 - Can be combined with all of our other boards
 - Firmware examples for distance measurement, people and surface detection
- Key Features**

 - One board to test the possibility of a discrete development or the use of a fully integrated module
 - Distance measurement and people detection with the use of our RSS smartphone App
 - High stability against ambient noise
 - Distance measurement up to 15m
 - 3 Rx and 1 Tx antenna integrated
- Markets & Applications**

 - Presence detection
 - People counting
 - Distance measurement



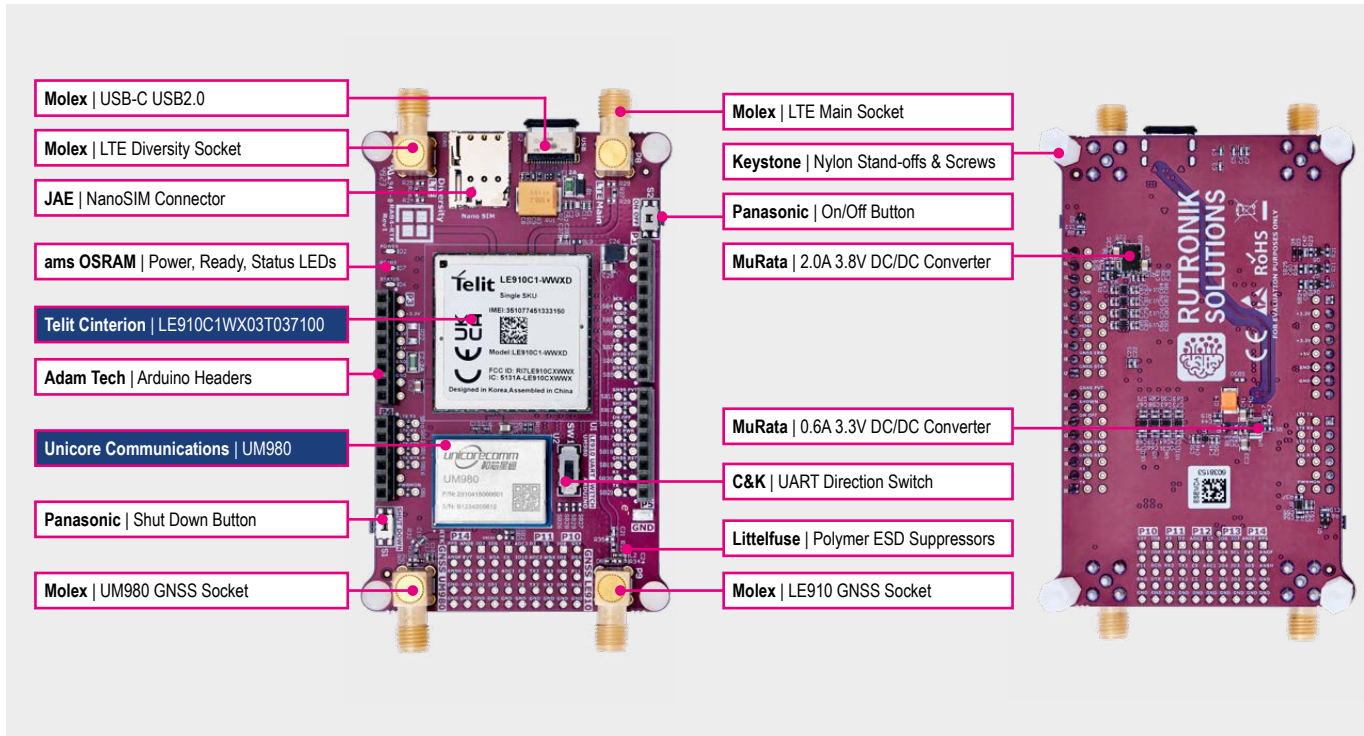
Adapter Board RAB4 – RTK
High precision outdoor navigation

- Benefits**

 - Direct comparison of RTK and GPS possible because of Telit LE910 (with integrated standard GNSS)
 - Operates on any evaluation board with Arduino interface
 - Can be combined with all of our other boards
- Key Features**

 - Up to 50 position measurements per second
 - 1-2cm accuracy
 - Absolut positioning thanks to Telit 4G module
 - Relative positioning thanks to Unicore UM980 Module
- Markets & Applications**

 - Agriculture equipment
 - Self driving outdoor vehicles
 - Robots
 - Lawn mower
 - Drones





Adapter Board RAB5 - OSIRE
Rutronik Adapter Board for high-performance LED applications

Benefits

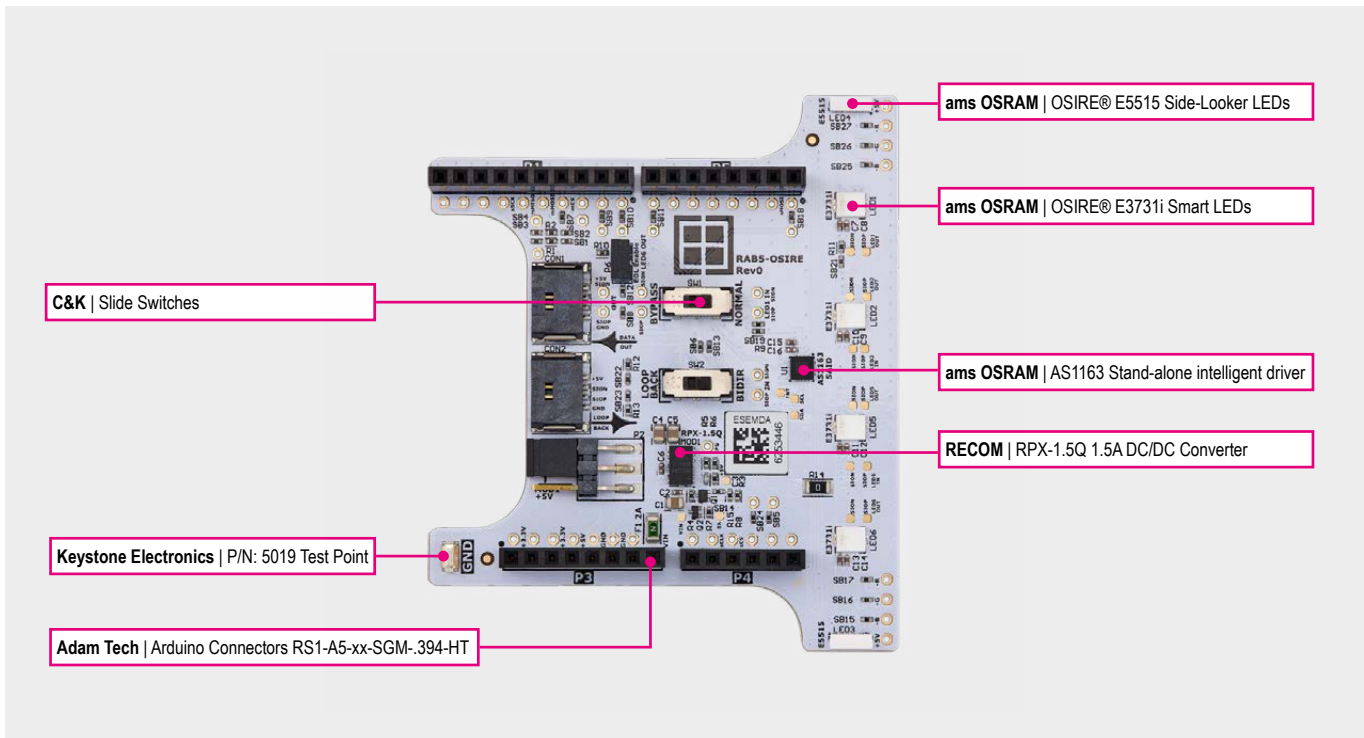
- Highly accurate optical calibration data for all LEDs included
- Dynamic color control and animations
- No flickering, up to 1kHz PWM
- AEC-Q qualified for automotive applications

Key Features

- Temperature sensor for LEDs included for full compensation of all three colors
- Completely open protocol, no license costs
- Auto-addressing included
- Diagnostics and error detection included in IC
- Ultra-fast refresh rate for dynamic animations
- Ideal for systems requiring functional safety features

Markets & Applications

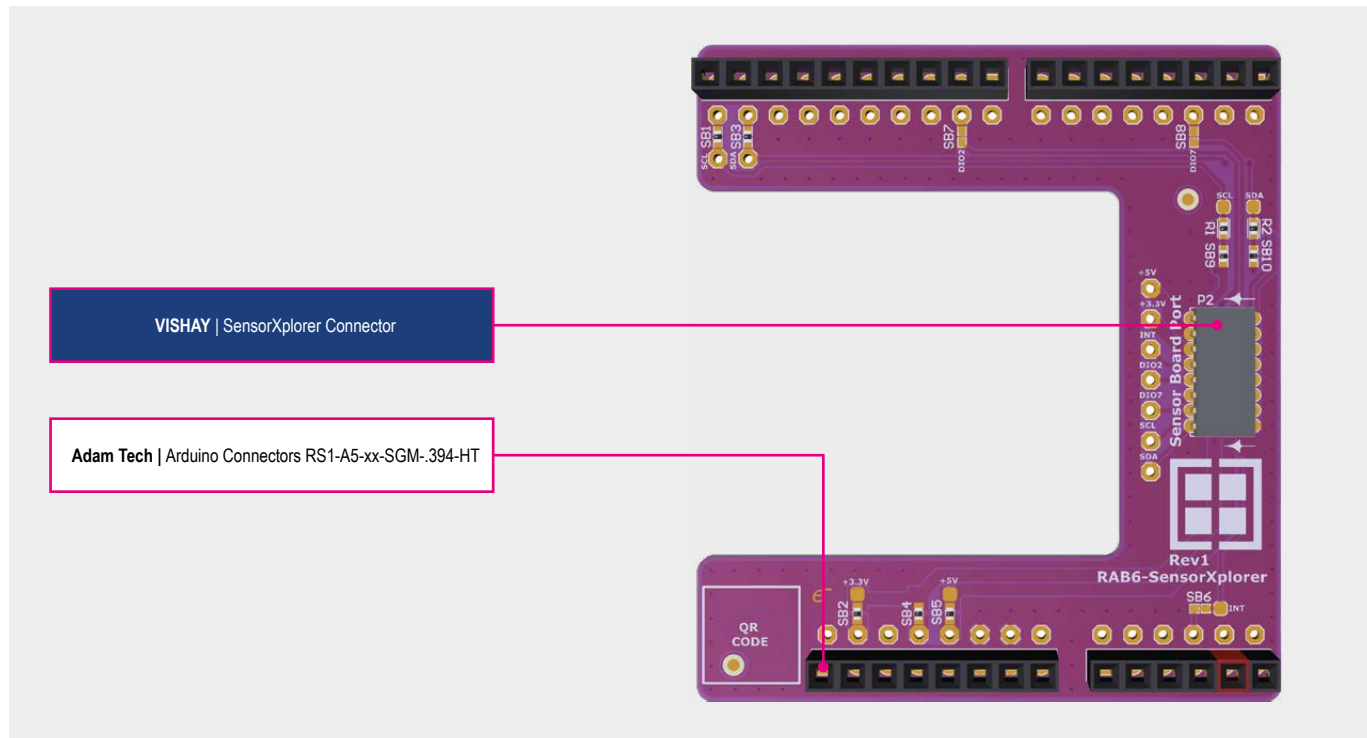
- Interior/ambient lighting (automotive, railway, home)
- Control elements with RGB (car, industrial, home)



Adapter board RAB6 – VISHAY
Connection between VISHAY SensorXplorer boards and Rutronik development kits

Benefit

RAB6 board enables all the SensorXplorer boards from VISHAY to be used with Rutronik development kits (RDKs).





Application Kit RAK-GaN

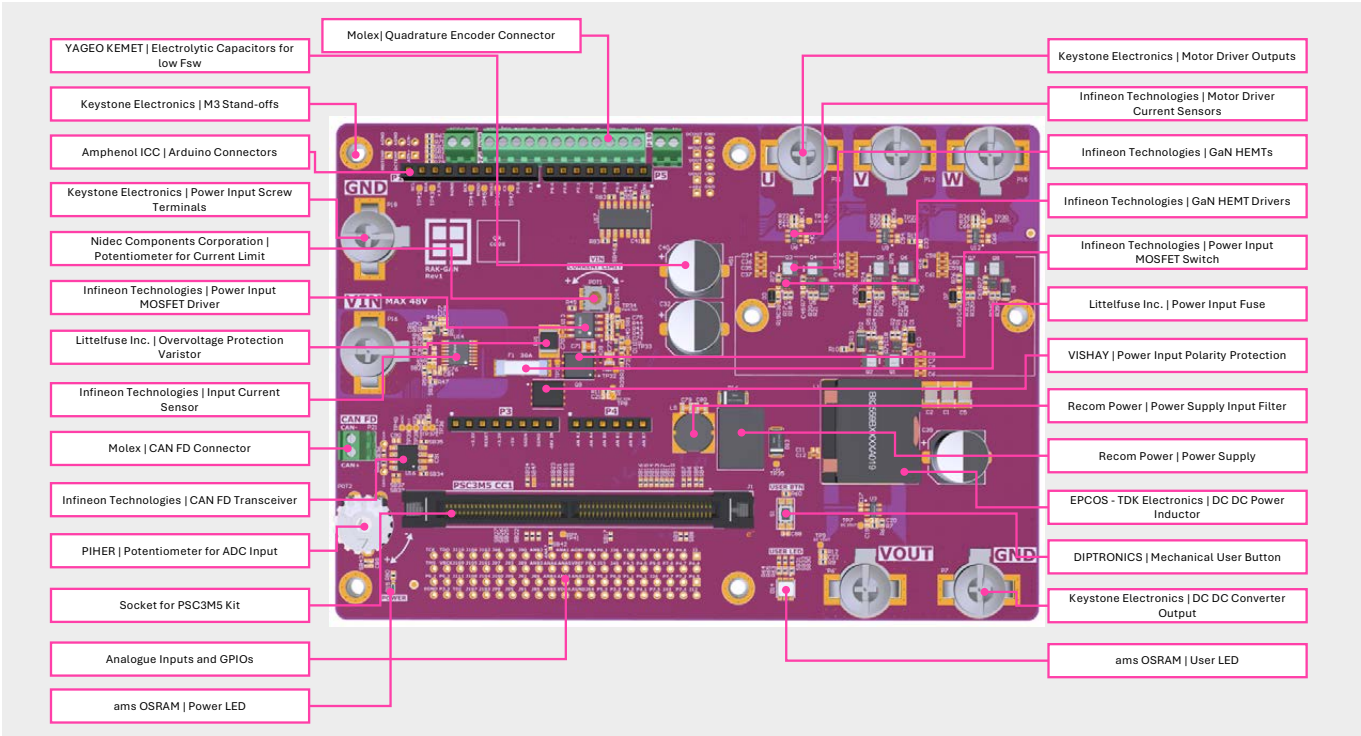
First compact GaN-based application kit for motor control and power conversion

Benefits & Key Features

- The kit includes the Infineon PSOC™ Control C3M5 Digital Power Control Card with PSOC™ C3, the best-in-class MCU that enables fast switching frequencies and control algorithms.
- Independent control and power stage boards ensure an easy replacement and an uninterrupted evaluation.
- GaN transistors (HEMTs) enable state-of-the-art technology for high-frequency switching with the lowest possible switching losses, reducing costs and system size.
- The ability to drive a 48 V motor and DC-DC Buck Converters.
- HALL and Encoder (single ended and differential) Interfaces.
- An inrush current protection circuit with Linear FET 2 technology.
- Hardware based Overcurrent detection.
- Additional current measurement with Infineon TMR sensors provides extra protection from high currents.
- An isolated debug interface for programming, debugging, and GUI control.
- The CAN-FD interface expands evaluation options.
- Compatible with Infineon ModusToolbox™ Motor Suite.

Markets & Applications

- Motor control
- Power conversion
- Industrial control
- Robotics
- White goods
- Smart home
- E-bikes



PSOC™ Edge E84

Next Generation of ML Enabled MCUs High-Performance / Low-Power fully integrated microcontrollers with advanced ML hardware acceleration and Graphics

PSOC™ Edge E84 series of Arm® Cortex®-M MCUs feature high-performance, low-power, secured MCUs with advanced machine learning (ML) acceleration for next generation AI/ML applications. The PSOC™ Edge E84 MCUs are based on Arm Cortex-M55, with Helium DSP support paired with Ethos-U55 NPU as well as a low-power Cortex-M33 paired with Infineon's ultra-low power NNLite hardware accelerator and advanced HMI interfaces including graphics.

Benefits & Key Features

- Cortex®-M55 CPU with Helium™ DSP
- Low-power Cortex®-M33 with DSP
- Advanced ML with Arm Ethos-U55 NPU
- NN Lite for Low-Power Always-On ML
- Up to 6MB SRAM for Next Gen Apps
- Ultra-low power RRAM Technology
- Rich Peripheral Set to Reduce BOM
- Low-Power 2.5D GPU and Interfaces
- ModusToolbox™ Software Support
- End-to-end ML Solution w/DEEPCRAFT™
- State-of-the-Art Secured Enclave
- Infineon Edge Protect Technology

Markets & Applications

- Smart speaker designs
- Consumer Wearables
- Smart and feature watches
- Home appliances
- Smart door lock
- Smart thermostat
- Human Machine Interface
- Security camera and video doorbell





800 VDC Bi-Directional HV-Switch

State-of-the-art innovative bi-directional 800 V eFuse

Benefits

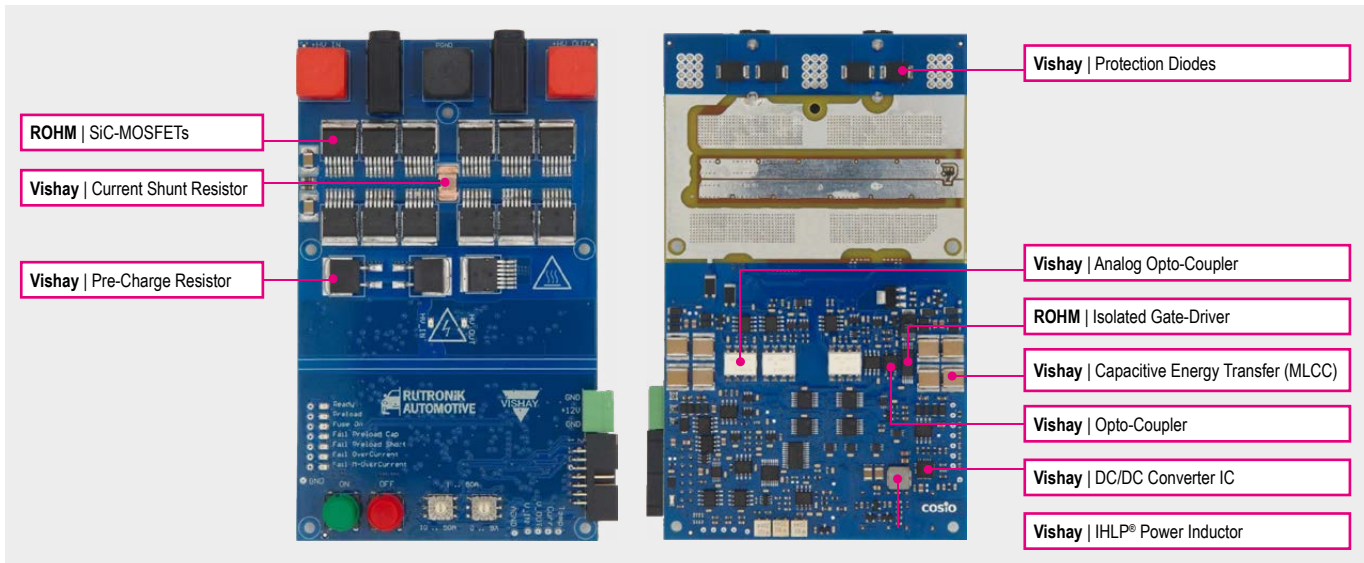
- Innovative new trend for protecting user and hardware in high power applications
- Operates at full power with less than 25W of losses without requiring active cooling
- Included preload function, continuous current monitoring and overcurrent protection
- Protects both power source, cabling and connected load
- Fast disconnect keeps rest of boardnet unaffected from short circuit in load
- Pre-charging enables loading of connected DC-Link capacitors
- Solid State Switch, no arcing, no contact wear
- Feedback of actual voltage and current values enables load monitoring from remote

Key Features

- SiC MOSFETs and a VOA300 optocoupler
- Designed to handle continuous power up to 40kW
- Shut down after a fault - 2.5µs
- Developed as reference design for continuous load power up to 40 kW
- Bidirectional capability handles both motor and regenerative loads
- Overcurrent protection, ultrafast switch-off (~2.5 µs)
- Protection against overtemperature
- Pre-charging of capacitive loads
- Solid State Switch with SiC-MOSFETs
- Operation via push-buttons or communication bus

Markets & Applications

- Current sensing
- Power supply
- Galvanic isolation
- Protection & Discretes
- Automotive HV-switching
- Fuse & contactor replacement in HV-boardnet
- Switching of HV-DC-currents in Ex-protected areas
- Load control and monitoring

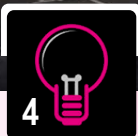
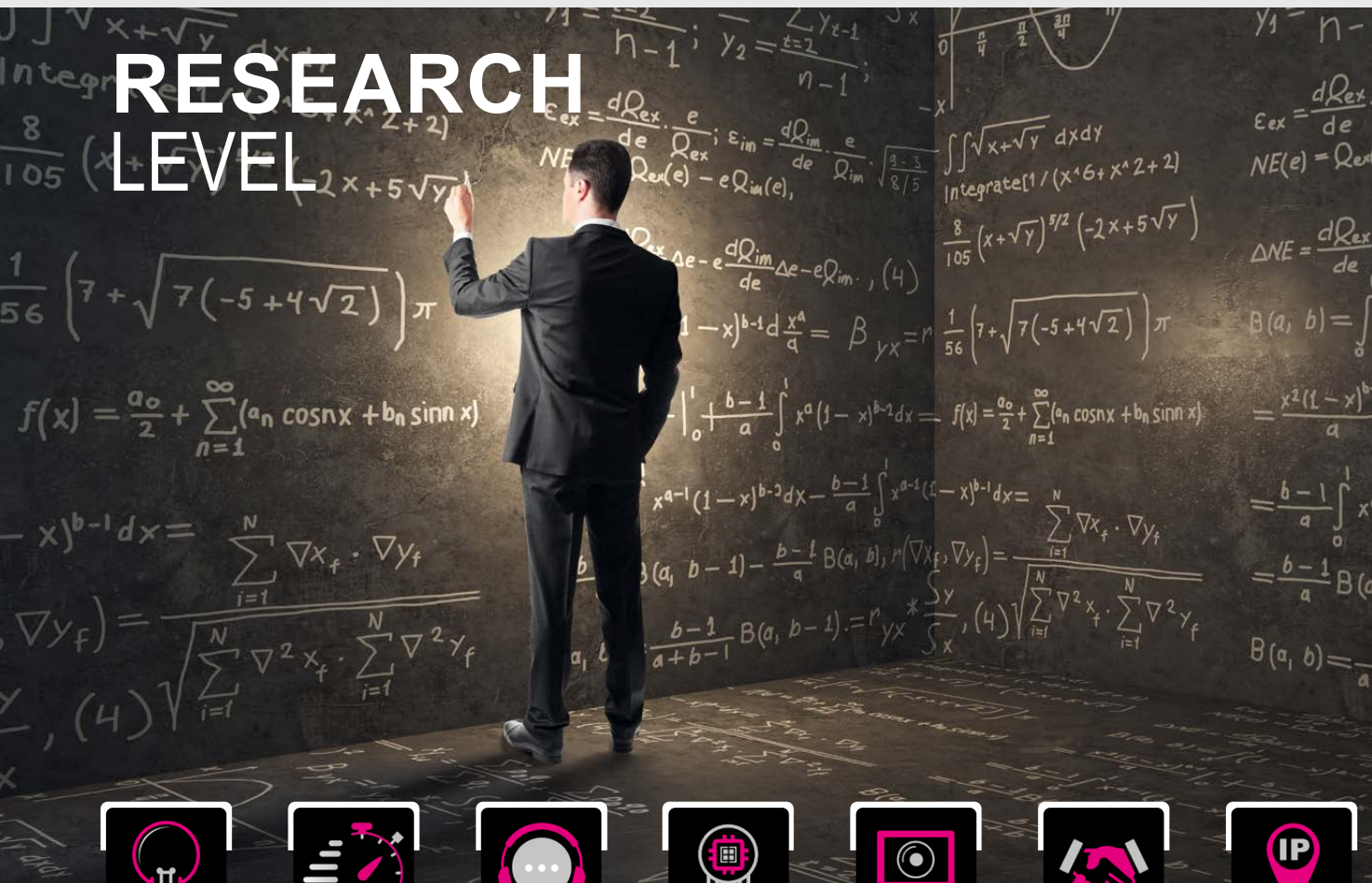


- Hardware developed by Rutronik serving as a proof of concept for system solutions in new markets and new technologies
- Partially based on Rutronik IP
- Development based on cooperations with leading universities and institutions
- Rutronik is following an IP protection program within the research programs
- Fusion of the know-how of suppliers on one board with the product know-how of Rutronik
- Fusion of the research know-how of universities and Rutronik know-how

Customer advantage

- Ready proof of concept on research level
- Combination of scientific know-how and newest products
- Therefore greater competitive advantage regarding know-how and time to market

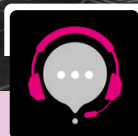
RESEARCH LEVEL



Innovation Level



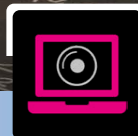
Faster Time to Market



Consulting



Special HW (Rutronik)



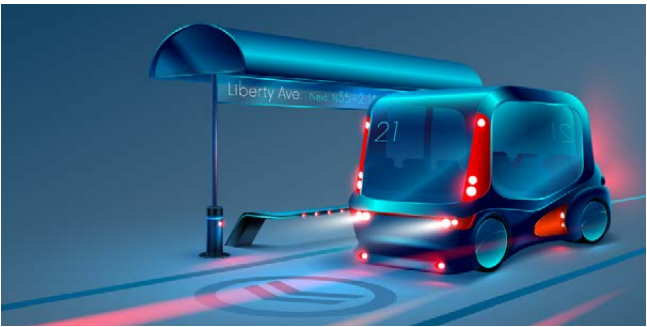
SW Adaption



Close Cooperation



RUT IP/ Partner IP



HESS –
Hybrid Energy Storage System in cooperation with HS Zwickau

Benefits

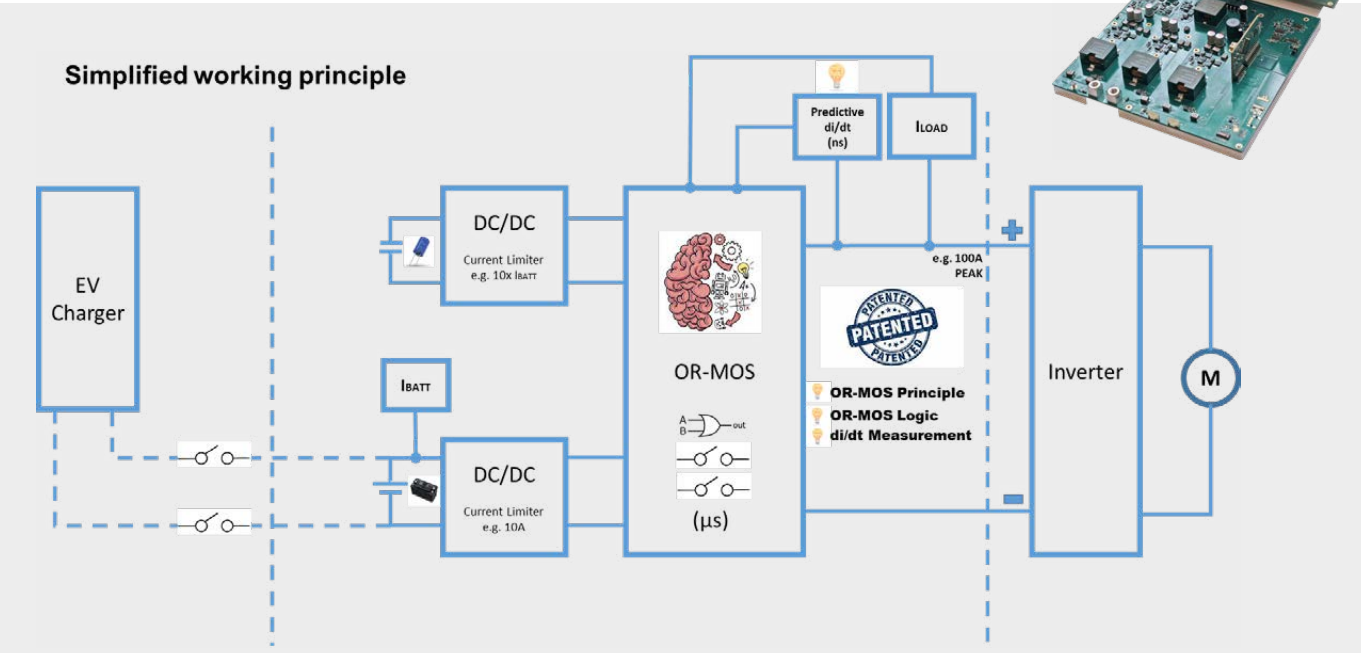
- Extended battery lifetime
- Ultra-fast detection and switching
- Combines the advantages of Li-Ion cells and super caps
- Adjustable battery current limiter
- Recuperation charging available
- High Power Scalable from 1KW to 10KW at 36V-72V

Key Features

- High speed analog/ mixed signal processing
- di/dt detection within ns
- Reverse current detection
- Recuperation current detection
- High speed control logic of a buck or MOS boost converter
- Anti-cross conduction drive control
- Ultra fast detection (ns) and switching (µs) algorithm
- Extremely high peak current performance
- Predicted battery lifetime and state-of-health (SoH)
- Best trade-off between energy density, power density, capacity, cost, weight and volume of the storage system

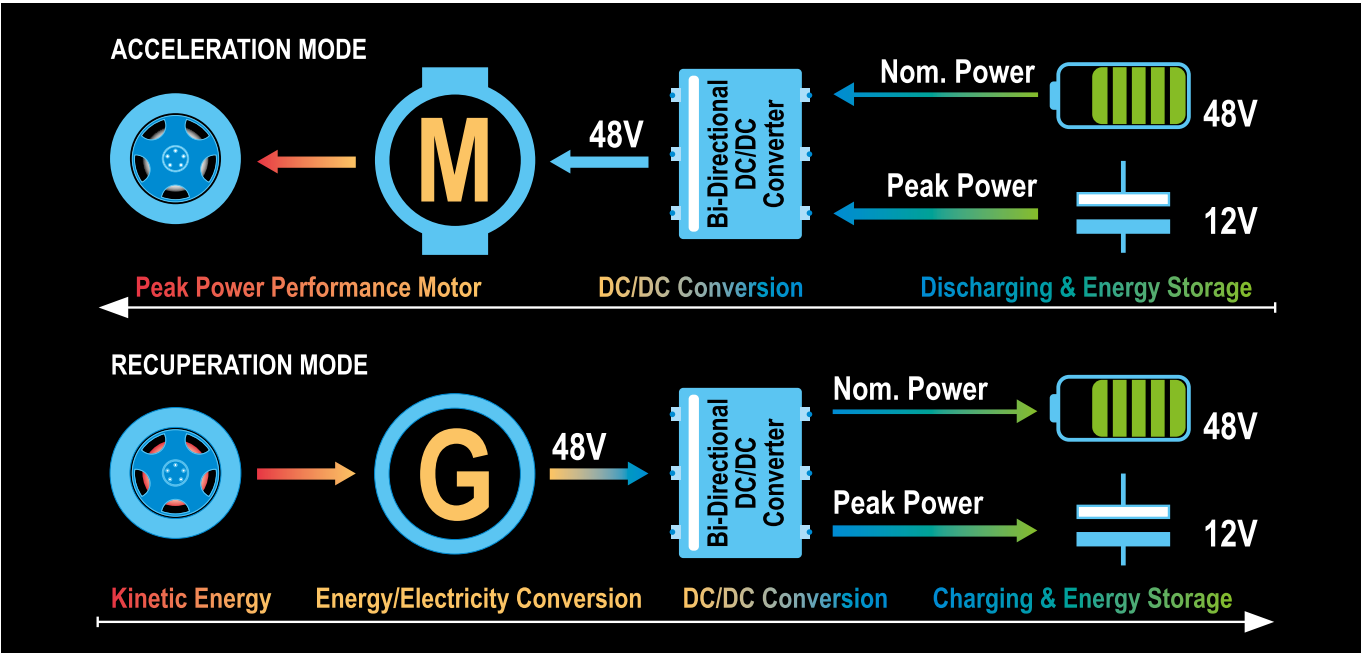
Markets & Applications

- LEV
- City busses
- Golf carts
- Material Handling
- Marine
- Gardening
- Industrial Vehicle
- Agriculture
- Aviation



	Li-Ion Cells	Super Cap	Combination Li-Ion Cell + Super-Cap
Power Capability (W/kg)	++	+++	+++
Energy Density (Wh/Dimensions)	++	-	++
Specific Energy(Wh/kg)	++	+	+
Cycle Life	0	+++	+++
Calendar Life	+	++	+++
Price	-	0	0
Self-Discharge	++	-	++
Temperature behavior	0	++	++
Reliability	0	++	++
Fast Charging	0	+++	+++

Scoring : +++ extremely good; ++, very good + good 0 neutral - disadvantage





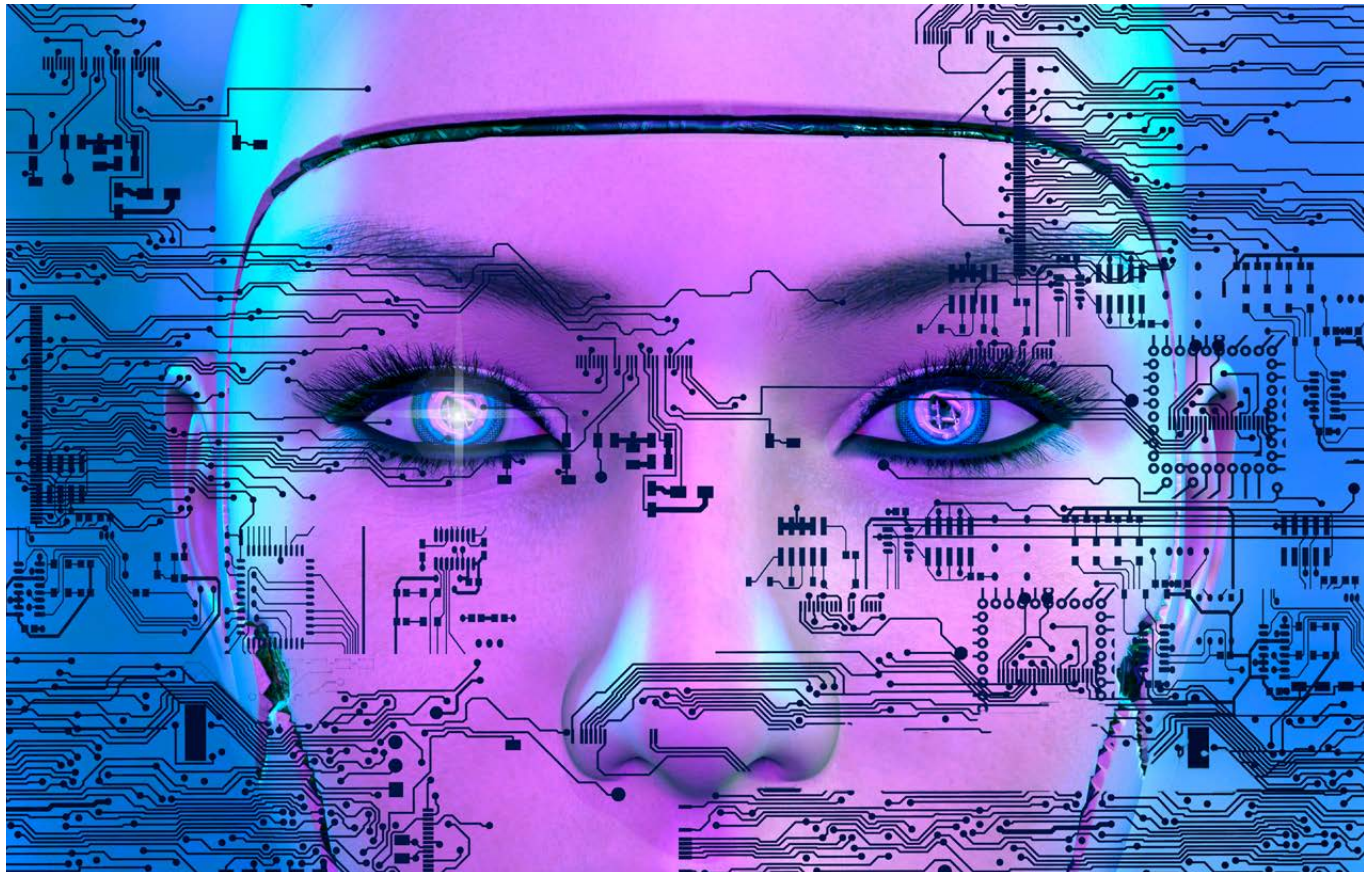
Electronic Nose

Working like a human sensory organ

The electronic nose works like the human sensory organ. Like our nose the system detects volatile compounds and volatile organic compounds (VOC) that emit odors or can be harmful to ones health. This system selectively stimulates the compounds, analyses and characterizes the behavior of the compounds physically and biochemically. When observing volatile compounds in the air, the state is not stationary, it is a volatile state. The status depends on the chemical and physical parameters that are not constant. Thus, a volatile and multidimensional and ever changing system exists.

Markets & Applications

- Home Appliances
- Gas detection
- Liquid detection
- Perishable food evaluation



Maintenance-free Ambient IoT Remote Control for RDK3

Control your RDK3 with a Battery-free Bluetooth Button

To control your development board remotely, you can use the Bluetooth interface of RDK3. To make this maintance-free and without the need of an battery, we used the EnOcean PTM216B Module, which contains the Bluetooth transmitter as well as an energy harvesting electronic to convert the kinematic power of pushing the button to generate enough electrical power to send the command to the RDK3.

The example source code is available on GitHub:



To quickstart your development, we also offer the EnOcean Easyfit EWSSB (single button) and EnOcean Easyfit EWSDB (double button) which is white label light switch (plastic housing) with PTM216B integrated.



EWSSB / EWSDB – Easyfit Single / Double Rocker Wall Switch for BLE

Self-powered wireless controls are simple to install. The Single / Double Rocker Wall Switch using the European 55 x 55 form factor uses energy harvesting technology to communicate wirelessly with other devices supporting the Bluetooth Low Energy (BLE) Advertising standard. They provide convenient control of lighting, temperature and miscellaneous electric loads.

The wall switches are self-powered and never require batteries because the simple act of pressing the rocker generates enough energy to send wireless Bluetooth Low Energy (BLE) Advertising telegrams to other devices. The Single and Double Rocker Pads can optionally be configured by means of an NFC (ISO 14443) interface.

The enclosed switch frame can be replaced by frames of the following design programs: BERKER S1, B1, B3, B7 Glas, or GIRA Standard55, E2, Event, Esprit or JUNG A500, Aplus or MERTEN M-Smart, M-Arc, M-Plan.

EnOcean
Sustainable IoT



BLE Pushbutton Transmitter Module PTM 216B with NFC Interface

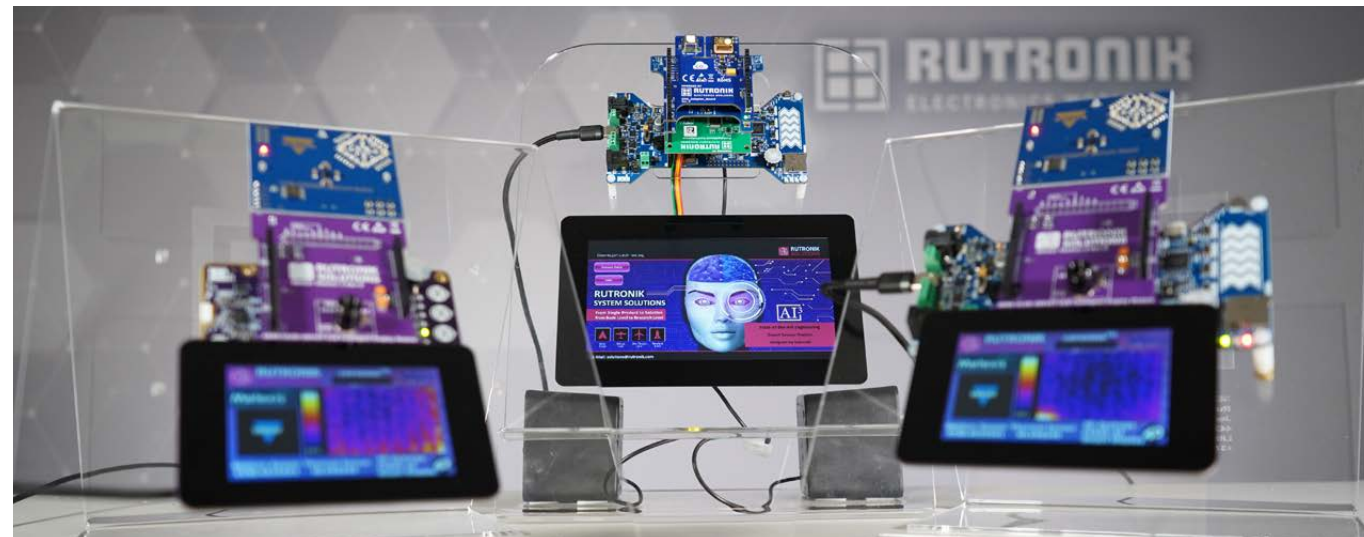
PTM 216B enables the realization of energy harvesting wireless switches for EnOcean systems communicating based on the BLE radio standard.

PTM 216B is mechanically compatible with the established PTM 21x form factor enabling quick integration into a wide range of designs.

Key applications are wall-mounted or portable switches either with up to two rockers or up to four push buttons.

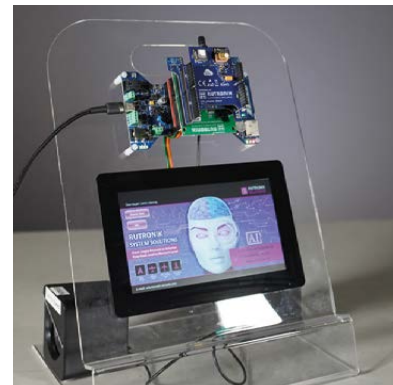
PTM 216B provides an NFC interface according to ISO 14443 for configuration.

EnOcean
Sustainable IoT



Smart Sensor Station – Intelligent Environment

The Smart Sensor Station - Intelligent Environment shows the concept with a perfect combination of our RDK2 with the adapter boards TextToSpeech, Sensorfusion and CO2 with an additional smart display to visualize the data.



- RDK2 ensures smooth communication of the boards
- TextToSpeech provides an acoustic data and alarm output
- RAB1 provides a large amount of available sensor data
- RAB2 provides a direct comparison of two CO2 sensors
- A smart display provides visual data output and easy navigation

Included boards: RDK2 | Adapter Board - TextToSpeech
RAB1 - Sensorfusion | RAB2 - CO2 | 4DSysyems display

Smart Sensor Station – Gesture & Presence Control

The Smart Sensor Station – Gesture & Presence Control shows the concept with the usage of RDK3 and the adapter boards for a FIR thermal- ,an IR gesture detection as well as presence and gesture detection with the RAB3 for 60 GHz radar technology plus an additional smart touch display to visualize the data.



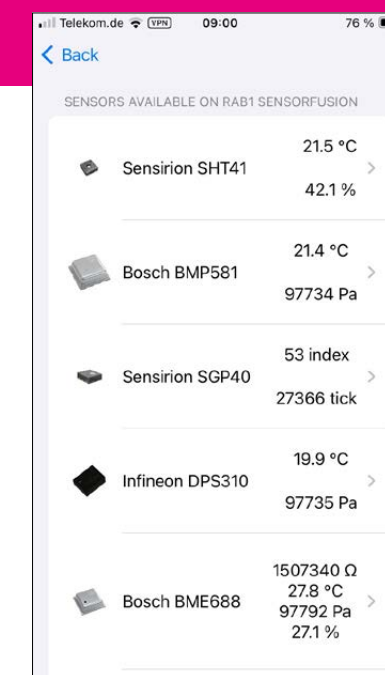
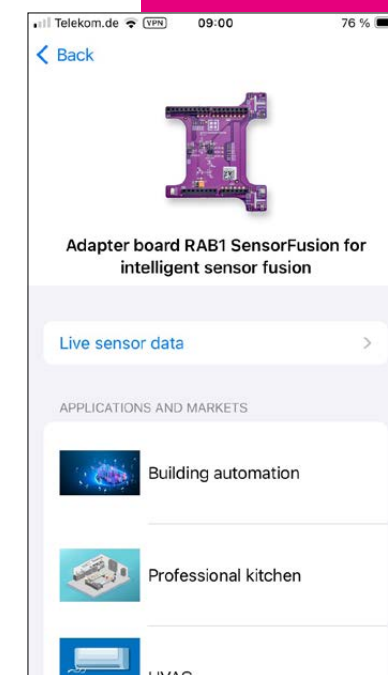
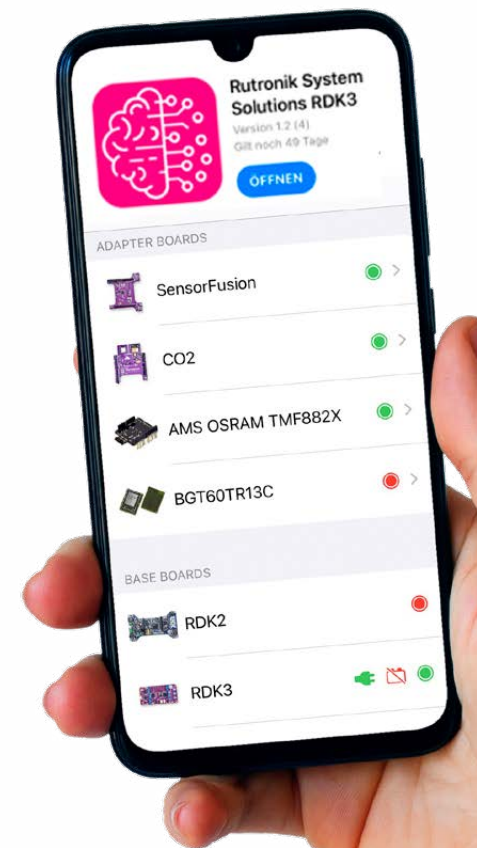
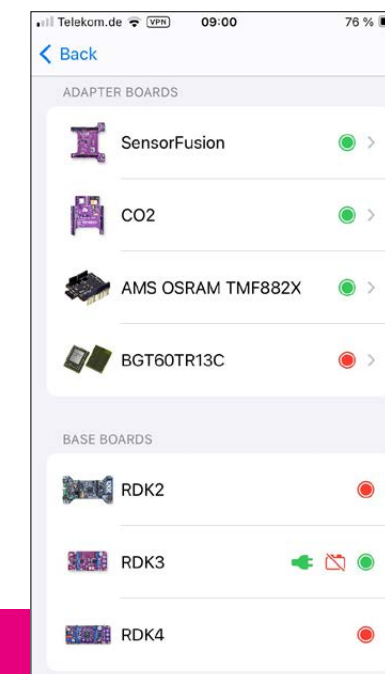
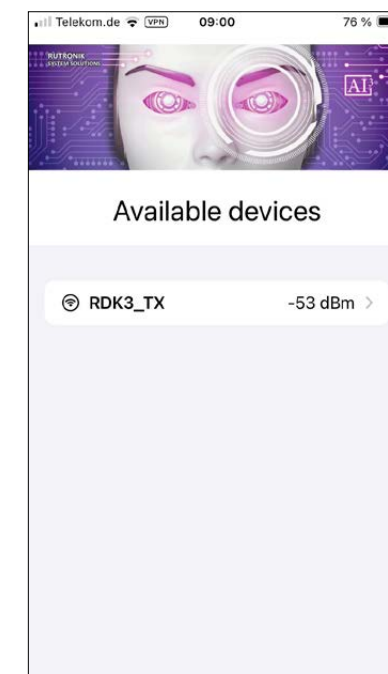
- RDK3 ensures smooth communication of the boards
- IR gesture detection board for low cost gesture control
- FIR thermal array sensor for people counting, presence detection or temp. measurement
- Gesture control & distance measurement with 60 GHz radar technology
- Smart touch display provides visual data output and easy navigation

Included boards: RDK3 | Evaluation Board – FIR thermal sensor
Evaluation Board – VCNL4035X01 | RAB3 | 4DSysyems Display

Rutronik System Solutions APP

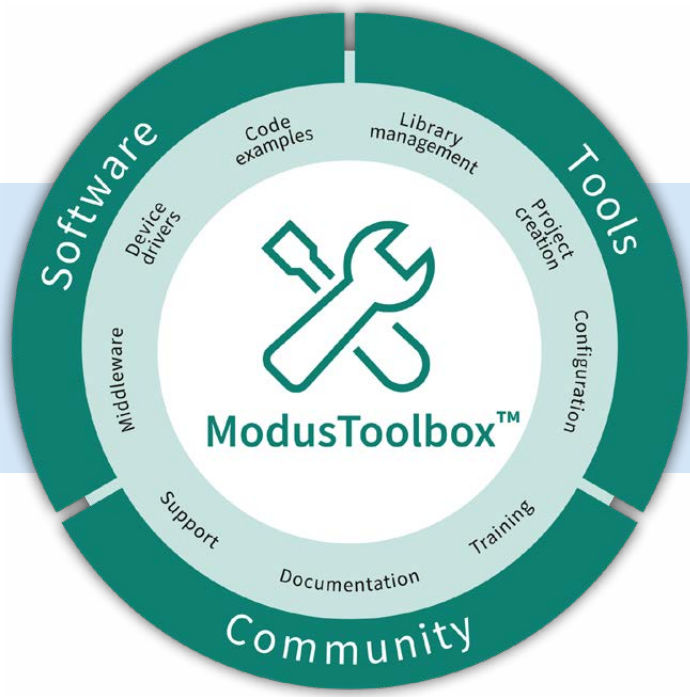
Utilize Rutronik System Solutions for iOS to:

- Demonstrate Bluetooth functions.
- Test various Rutronik development boards.
- Retrieve live sensor data (including environmental, radar, real-time kinematic, CO₂, and time-of-flight sensors).
- Explore new and trending repositories

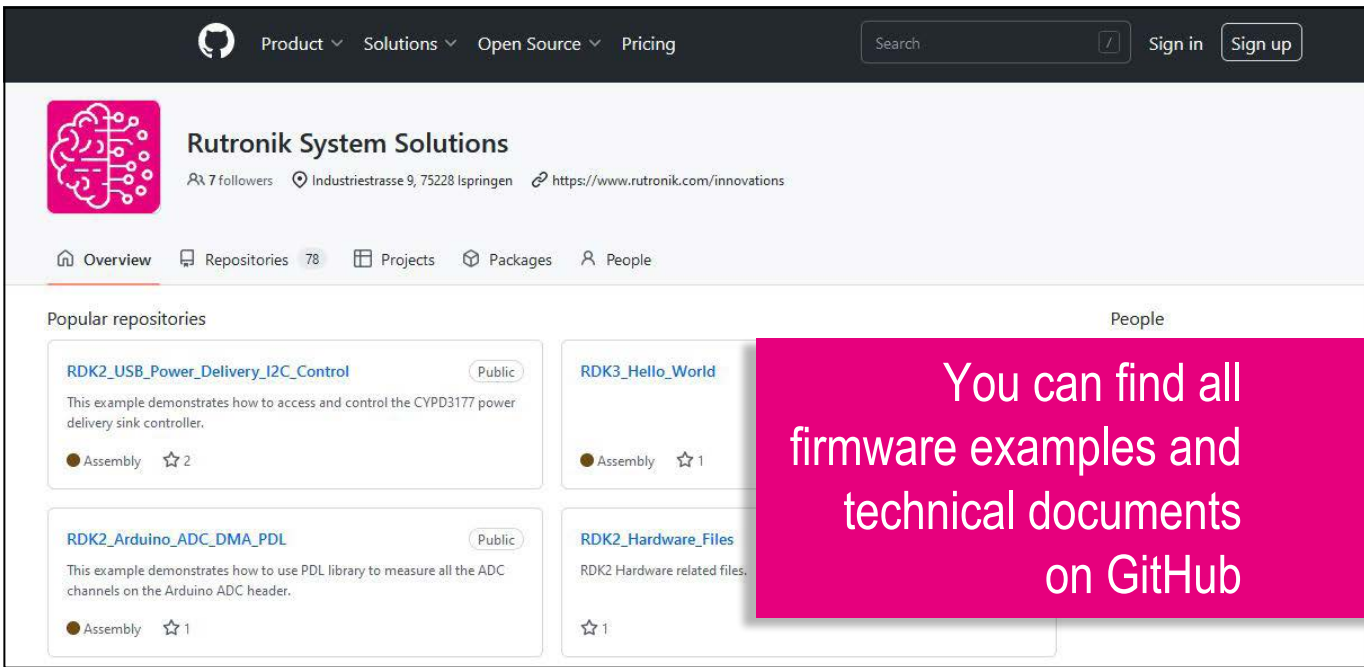


ModusToolbox™ & Friends program

As partner of the ModusToolbox™ & Friends program you can find all our RDKs in the ModusToolbox™ development environment

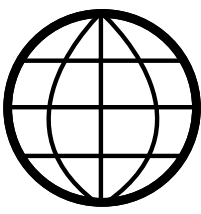


Quelle: Infineon



You can find all
firmware examples and
technical documents
on GitHub

Find us on www.rutronik.com



- Information and descriptions about all available Rutronik boards
- Download section for all technical documents and other information material
- Contact form for customer requests and questions
- Information about Rutroniks future markets
- Direct link to our R24 shop to directly order the boards

Electronics for Future Markets



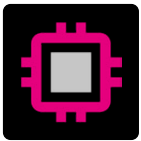


INNOVATION
& FUTURE DNA



Consulting

The consulting regarding individual conditions is part of every system solution and rooted in the existing business as broadline distributor. At the forefront is the system thinking and the extensive know-how regarding the single products and the system of the Rutronik product and application engineers.



Standard HW
(Supplier)

The standard hardware of our suppliers contain starter kits, evaluation boards or reference designs among others. These can be the basis for technical contexts in many use cases.



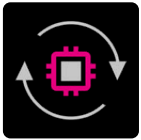
Standard HW
(Rutronik)

The standard hardware by Rutronik comprises own developed reference designs which combine best fit products from our suppliers on one board. All products can be found in the Rutronik portfolio.



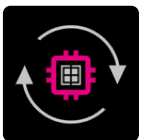
Special HW
(Rutronik)

The special and dedicated hardware by Rutronik can only be found in the research level. For every IP protected proof of concept an own basis is developed. This happens in close cooperation with the suppliers and development experts.



Standard
HW Adaption

Besides the standard hardware, suppliers also offer hardware adaptations that are designed for specific functions. They are extensions of the standard hardware.



App.-specific
HW Adaption

Within the Advanced Design Level System solutions Rutronik offers application specific hardware adaptations. They extend the functions of the hardware and represent application modules.



SW Adaption
(Rutronik)

Rutronik offers software adaptations for a variety of hardware within the Design, Advanced Design and Research Level. They are based on Open Access Tools or own developed software.



Close
Cooperation

Important for every level of system solutions is the close cooperation with our suppliers. It ranges from product trainings to development support for Research Level applications. They are the central partner for all developments by Rutronik.



RUT IP/
Partner IP

The Research Level System Solutions are based on research papers and cooperations with leading universities and institutions. An IP protection program is being followed. All Research Level System Solutions contain unique know-how with corresponding IP protection.



Innovation
Level

The innovation level is different for every system solution. It is the highest for the Research Level because it represents a unique proof of concept with IP protection. Due to the novelty and specific adaptations of the boards a higher innovation level is also given on the other levels.



Faster
Time to Market

The time to market refers to the advantages for the development departments of our customers. It is significantly reduced for system solutions in the Research Level because the functionality is already shown. Only adaptations regarding the suitability for series production have to be made by the customer. The other system solutions shorten the time to market as well because they show the challenges along the development stages and give solutions accordingly.

SYSTEM SOLUTION	STANDARD	BASIS			TECHNOLOGY ADAPTION					CUSTOMER ADVANTAGE	
	CONSUTLING	STANDARD HW (SUPPLIER)	STANDARD HW (RUTRONIK)	SPECIAL HW (SUPPLIER)	STANDARD HW ADAPTION (SUPPLIER)	APP-SPECIFIC HW ADAPTION (RUTRONIK)	SW ADAPTION (RUTRONIK)	RUT IP/ PARTNER IP	CLOSE COOPERATION WITH SUPPLIERS	INNOVATION LEVEL	FASTER TIME TO MARKET
RESEARCH LEVEL	■			■			■	■	+++	4	3
ADVANCED DESIGN LEVEL	■		■			■	■		++	2	2
DESIGN LEVEL	■	■			■		■		+	2	2
BASIC LEVEL	■								+	1	1
BROADLINE DISTRIBUTION											



Rutronik Elektronische Bauelemente GmbH
Industriestraße 2 | 75228 Ispringen | Deutschland | rutronik.com