![RUTRONIK ELECTRONICS WORLDWIDE]

AI³®

RUTRONIK SYSTEM SOLUTIONS

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

V. 2.1

Basic Level   Design Level   Adv. Design Level   Research Level

Content

Innovation
and future DNA

Our Product Portfolio

Semiconductors

Passive Components

Electromechanical Components

Displays & Monitors

Boards & Systems

Storage Technologies

Wireless Technologies

Our Initiatives

RUTRONIK AUTOMOTIVE

RUTRONIK EMBEDDED

RUTRONIK POWER

RUTRONIK SMART

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next generation e-commerce

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https://rutronik-tec.com

www.linkedin.com/company/rutronik

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.

Committed to excellence

RUTRONIK SOLUTIONS

Stephan Menze
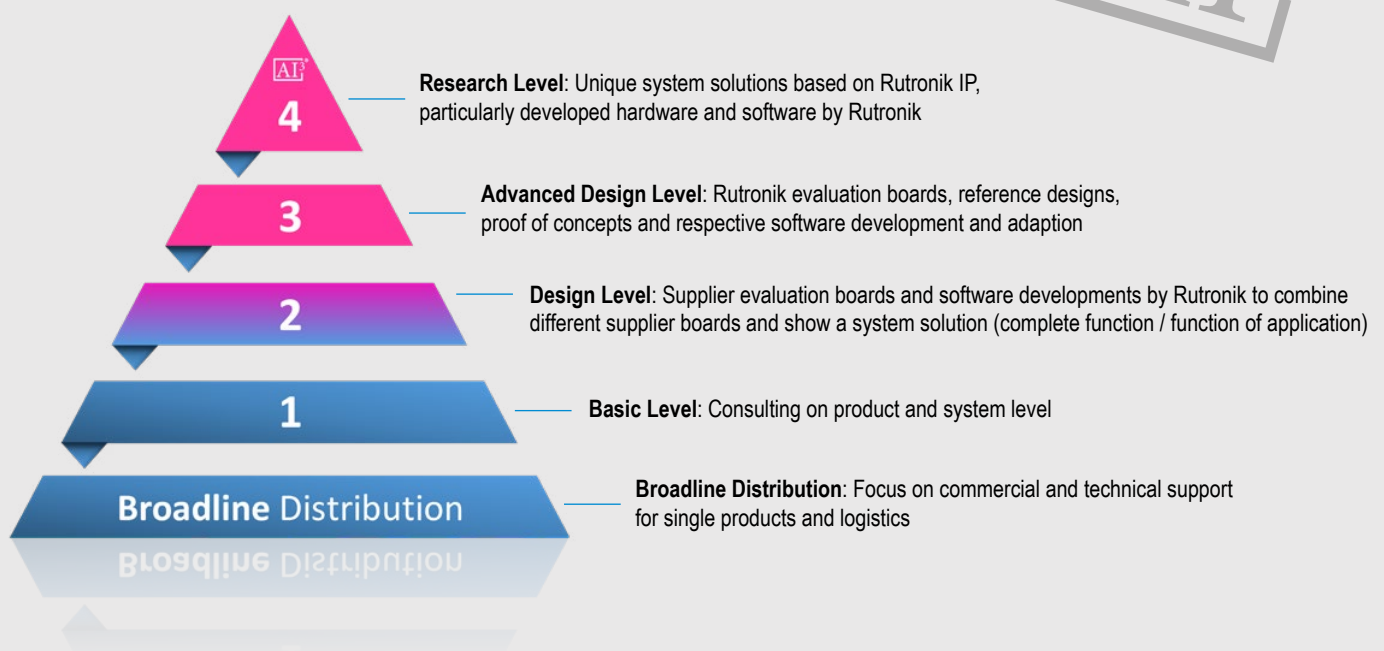Head of Global Innovation Management

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

From Basic Level to Research Level

Significant improvement of excellence – across all levels

4 **Research Level**: Unique system solutions based on Rutronik IP, particularly developed hardware and software by Rutronik

3 **Advanced Design Level**: Rutronik evaluation boards, reference designs, proof of concepts and respective software development and adaption

2 **Design Level**: Supplier evaluation boards and software developments by Rutronik to combine different supplier boards and show a system solution (complete function / function of application)

1 **Basic Level**: Consulting on product and system level

Broadline Distribution **Broadline Distribution**: Focus on commercial and technical support for single products and logistics

Basic Level

- 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 logitics
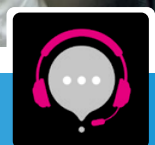
Customer advantage

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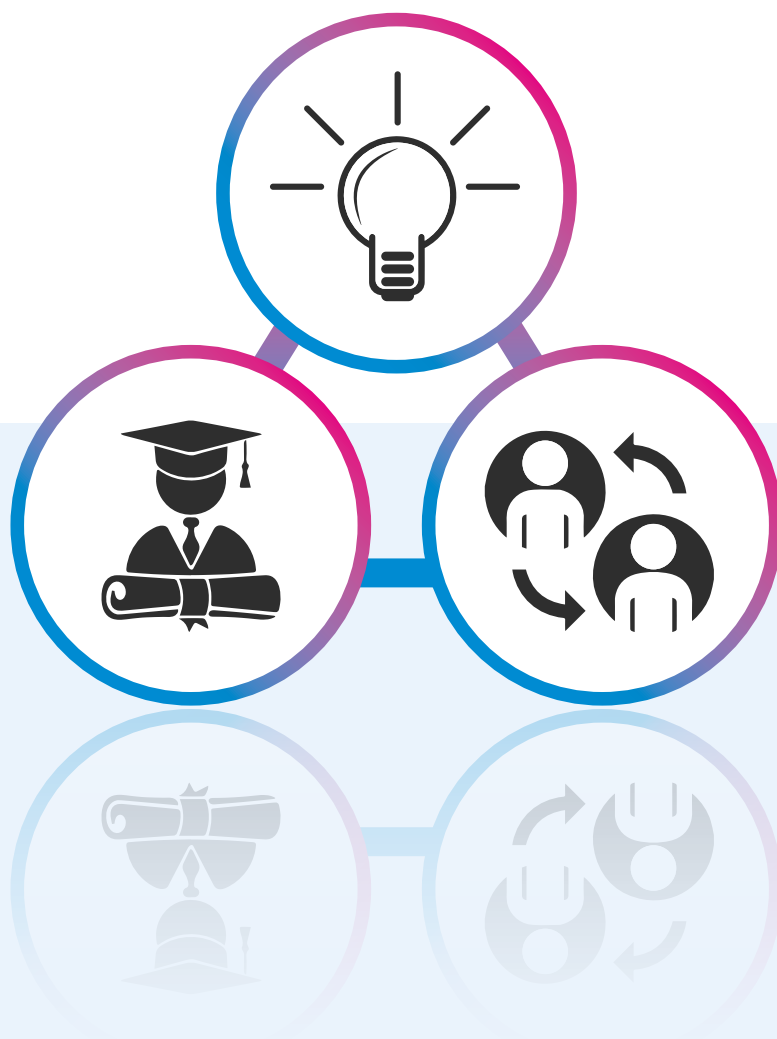
Innovation
Level

Faster
Time to Market

Consulting

Committed to excellence

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.

Design Level

- 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).
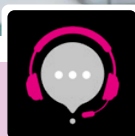
Customer advantage

- The Design Level System Solutions provide the quickest entry in standardised board level from suppliers and the corresponding software
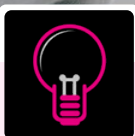
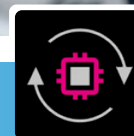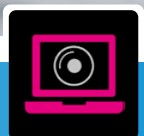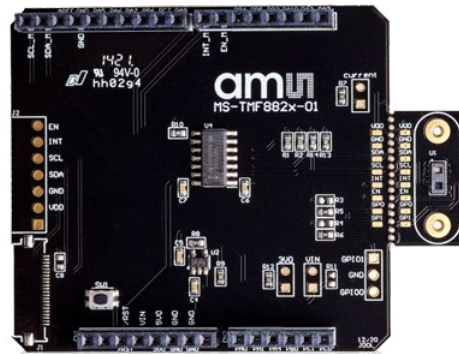| Innovation Level | Faster Time to Market | Consulting | Standard HW (Supplier) | Standard HW (Rutronik) | Standard HW Adaption | SW Adaption (Rutronik) |

Committed to excellence

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

NORDIC ®
SEMICONDUCTOR

Committed to excellence

Rohm | Color Sensor

Lite-On | RGB LED

Taoglas | 2.4 GHz Antenna

Power Switch
Alternative: C&K AYZ0102AGRLC

Digital Microphone

Murata | SWF RF port for direct
RF measurements

Nordic | nRF21540 FEM

C&K | User programmable Buttons

Nordic | nRF5340 SoC

External Memory
Alternative: ESMT EN25QH64A-104WIP

Bosch SE
Accelerometer and Gyroscope

Murata | Buzzer

NFC Antenna Connector

Programming & debugging
Connector

External boards connector

Bosch SE | Humidity, temperature,
pressure and gas Sensor

Low-power Accelerometer
Alternative: Bosch SE BMA400

Bosch SE | Magnetometer

Nordic | nPM1100 PMIC

Battery Connector

Amphenol CS | Debug and current
measurement Connector

JAE | USB-C Connector

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
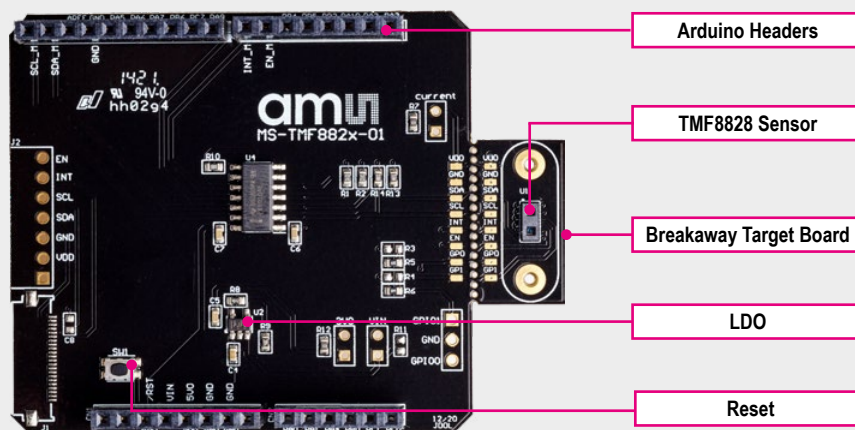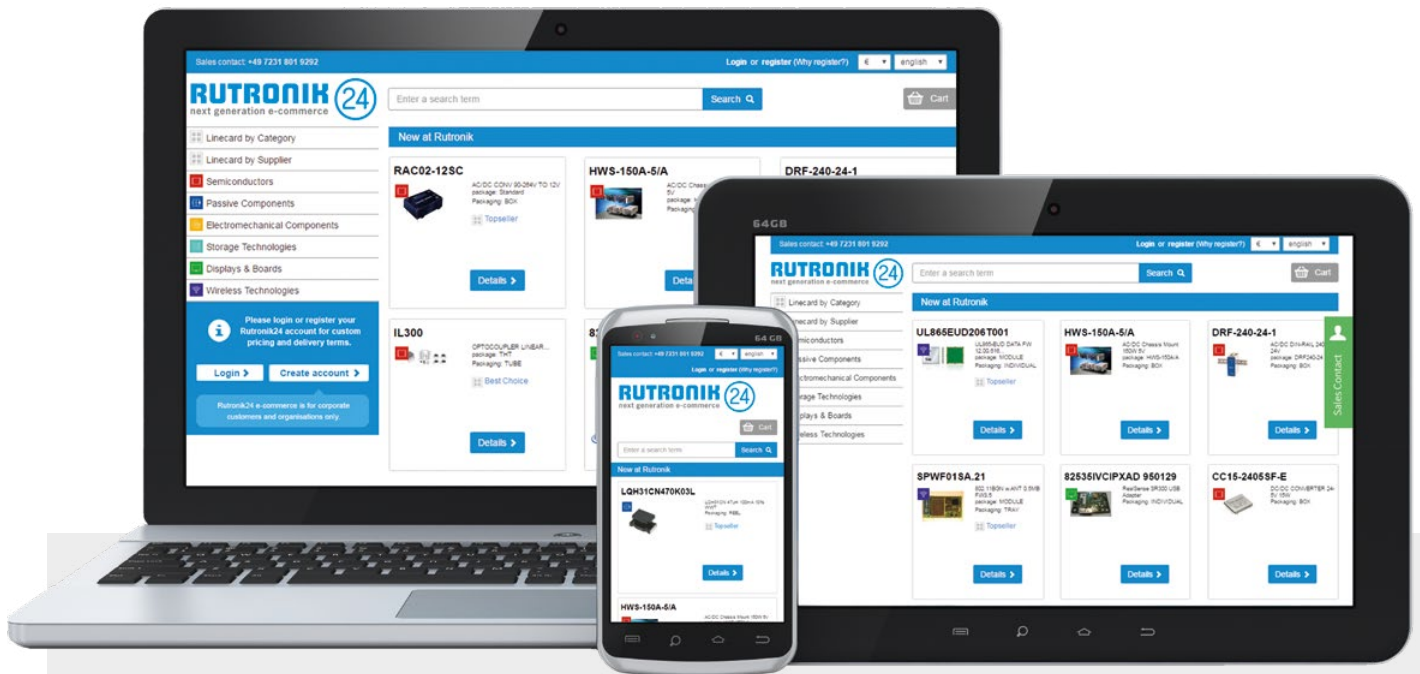
e-commerce made easy

FASTER. EASIER.
JUST MORE PERSONAL.

rutronik24.com

- Own Rutronik hardware (platform/boards) and corresponding software development
- Usage of application modules based on these platforms
- Development of software adaptions 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

ADVANCED DESIGN LEVEL
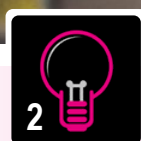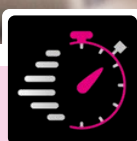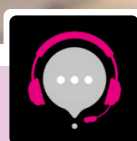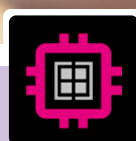
| 2 Innovation Level | Faster Time to Market | Consulting | Standard HW (Rutronik) | App.-specific HW Adaption | SW Adaption (Rutronik) | Close Cooperation |
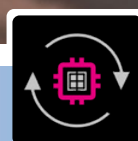
Committed to excellence

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

Board - Overview

Rutronik Development Kits - RDK
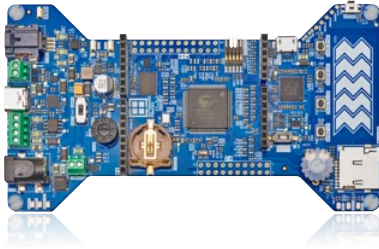
RDK2

RDK3
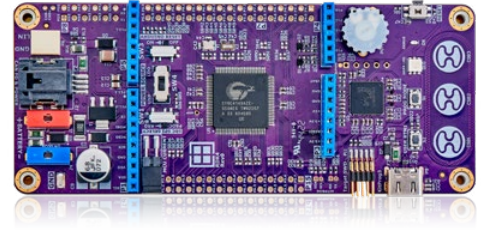
RDK4

Rutronik Adapter Boards - RAB

RAB - TTS

RAB1 – Sensorfusion

RAB2 – CO2
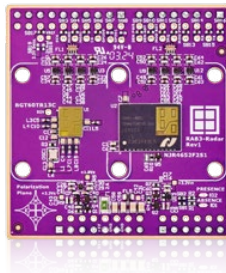
RAB3 - Radar

RAB4 - RTK
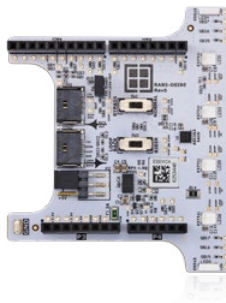
RAB5 - OSIRE

Rutronik Cooperation Boards

HMS Anybus

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

Power Management

ams OSRAM | Power LEDs

Adam Tech | DC Jack

Infineon | EZ-PD™ USB-PD Driver

JAE | USB Type-C

SAURO | Sink Output

SAURO | RS485 Terminal

Amphenol CS | CAN FD Terminal

MaxLinear | RS485 Driver

Infineon | CAN FD Driver

SAURO | Battery Terminal

C&K | SW2 Switch

Nordic | Li-ION Charger

Keystone Electronics | Current monitor

KYOCERA AVX | Varistors

C&K | SW1 Rotary Switch

Infineon | SEMPER™ NOR Flash

ROHM | Secondary SMPS

APMemory | PSRAM

Keystone Electronics | CR1220 Battery

Epson | 24MHz Crystal

CHILISIN | MCU SMPS Inductor

Infineon | PSoC™ 62 MCU

Epson | 32.768kHz Crystal

Amphenol CS | 10-pin ARM SWD

Diptronics | Arduino RESET Switch

Adam Tech | KitProg3 MicroUSB

PIHER | Potentiometer

Infineon | PSoC™ 5 LP MCU

ams OSRAM | User LEDs

Panasonic | User Buttons

Adam Tech | MicroSD Card Socket

Infineon | CAPSENSE™ Slider

Panasonic | RESET Button

Block Diagram

INFINEON

ADAM TECH

TOSHIBA

ROHM SEMICONDUCTOR

KEYSTONE ELECTRONICS CORP.

JRC

MAXLINEAR

NORDIC SEMICONDUCTOR

apmemory

POWER MANAGEMENT			
INFINEON EZ-PD™ BCR-LITE USB PD Sink CYPD3177-24LQXQ	**NORDIC** Li-ION Charger nPM1100	**ROHM** Buck-Boost 3.3V BD83070GWL	**KEYSTONE** Coin Battery CR1220 Socket

KITPROG3 DEBUGGER	MCU	EXTERNAL MEMORY
INFINEON PSoC™ 5LP CY8C5868LTI-LP039	**INFINEON** PSoC™ 62 MCU CY8C6245AZI-S3D72	**APMEMORY** PSRAM APS6404L-3SQR-ZR
TOSHIBA Current Limiter TCK22946		**INFINEON**
NJRC Voltage Follower NJU77001F		SEMPER™ NOR Flash S25HL512TFABHI010

INTERFACE				
INFINEON CAPSENSE™ 5 sensors PCB	**INFINEON** CAN FD TLE9251VLE	**MAXLINEAR** RS485 SP3078-EEN-L/TR	**ADAM TECH** microSD Card Slot	**ADAM TECH** Arduino Compatible Headers

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
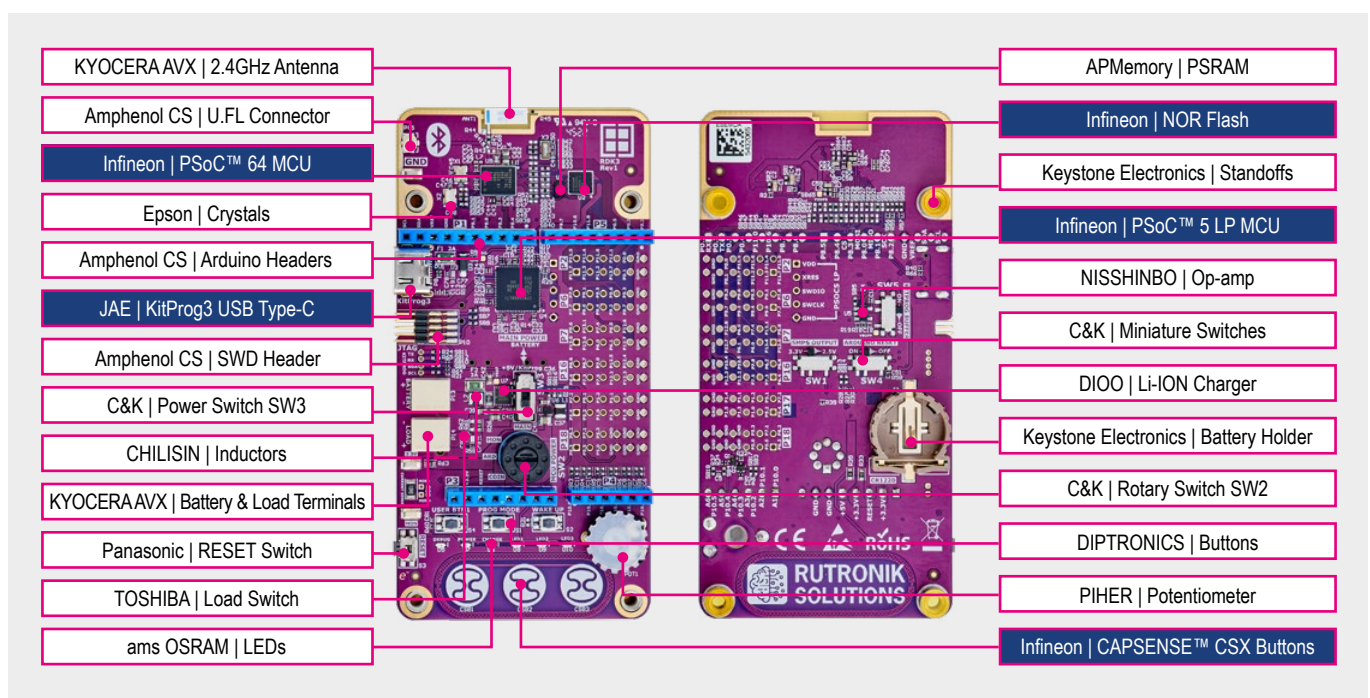- Offers secure element functionality that can be used to build authenticate secure applications
- Ultra low power MCU with Bluetooth® Low Energy

Markets & Applications

- Smart Building
- Robotics
- Smart Factory
- Healthcare

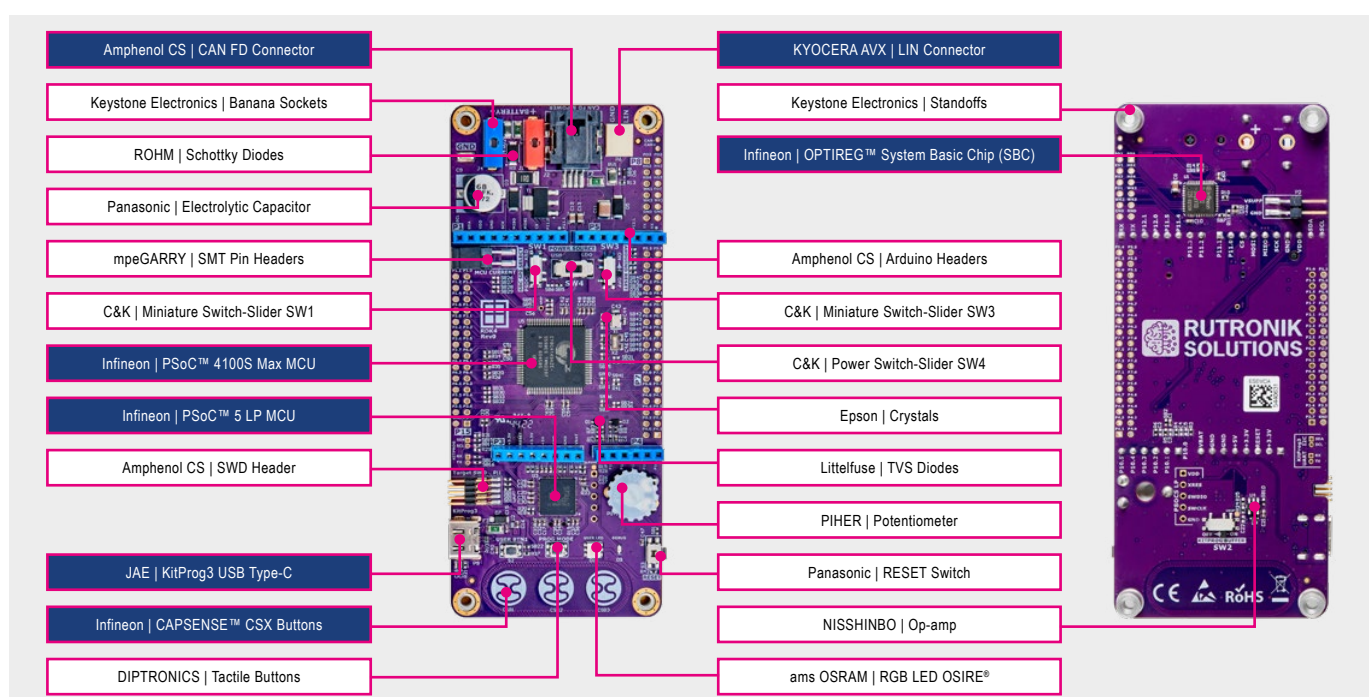|	
KYOCERA AVX | 2.4GHz Antenna	APMemory | PSRAM
Amphenol CS | U.FL Connector	Infineon | NOR Flash
Infineon | PSoC™ 64 MCU	Keystone Electronics | Standoffs
Epson | Crystals	Infineon | PSoC™ 5 LP MCU
Amphenol CS | Arduino Headers	NISSHINBO | Op-amp
JAE | KitProg3 USB Type-C	C&K | Miniature Switches
Amphenol CS | SWD Header	DIOO | Li-ION Charger
C&K | Power Switch SW3	Keystone Electronics | Battery Holder
CHILISIN | Inductors	C&K | Rotary Switch SW2
KYOCERA AVX | Battery & Load Terminals	DIPTRONICS | Buttons
Panasonic | RESET Switch	PIHER | Potentiometer
TOSHIBA | Load Switch	Infineon | CAPSENSE™ CSX Buttons
ams OSRAM | LEDs	

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 PSoCTM 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 – OPTIREGTM 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

Amphenol CS | CAN FD Connector	KYOCERA AVX | LIN Connector
Keystone Electronics | Banana Sockets	Keystone Electronics | Standoffs
ROHM | Schottky Diodes	Infineon | OPTIREG™ System Basic Chip (SBC)
Panasonic | Electrolytic Capacitor	
mpeGARRY | SMT Pin Headers	Amphenol CS | Arduino Headers
C&K | Miniature Switch-Slider SW1	C&K | Miniature Switch-Slider SW3
Infineon | PSoC™ 4100S Max MCU	C&K | Power Switch-Slider SW4
Infineon | PSoC™ 5 LP MCU	Epson | Crystals
Amphenol CS | SWD Header	Littelfuse | TVS Diodes
	PIHER | Potentiometer
JAE | KitProg3 USB Type-C	Panasonic | RESET Switch
Infineon | CAPSENSE™ CSX Buttons	NISSHINBO | Op-amp
DIPTRONICS | Tactile Buttons	ams OSRAM | RGB LED OSIRE®

Adapter Board based on Epson Voice/Audio LSI S1V3G340

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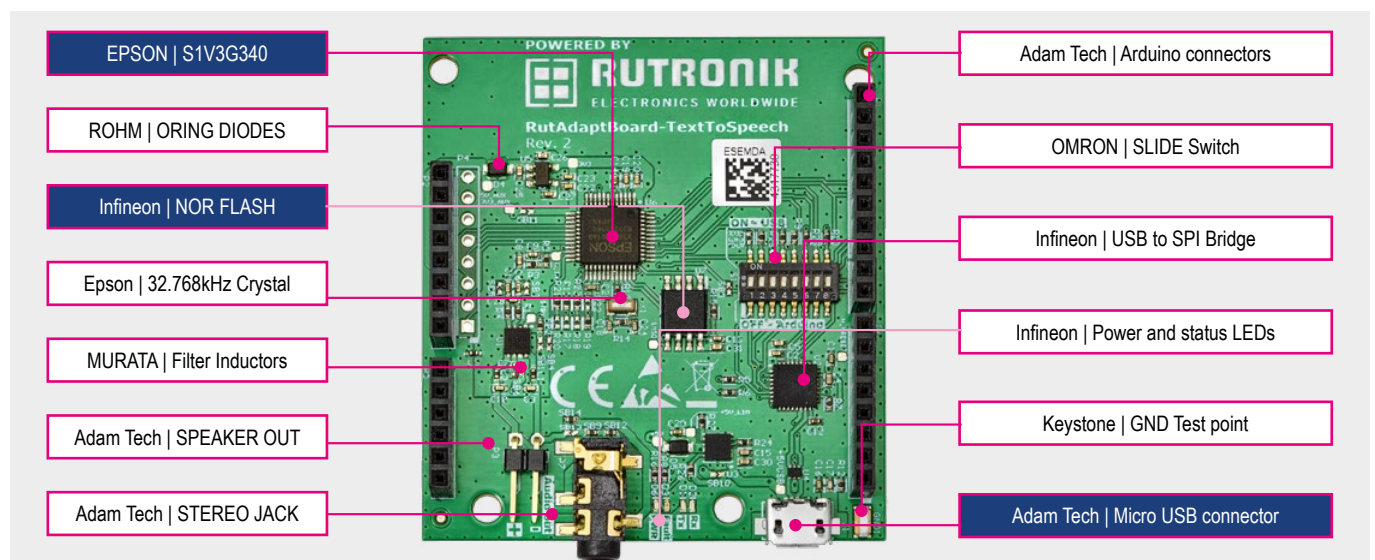
Benefits

- 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 prototype 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
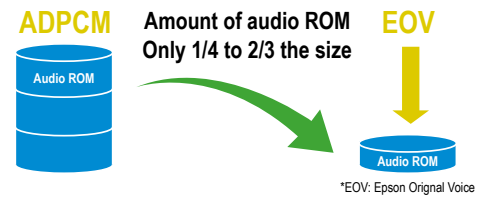- Supports up to 12 languages

Markets & Applications

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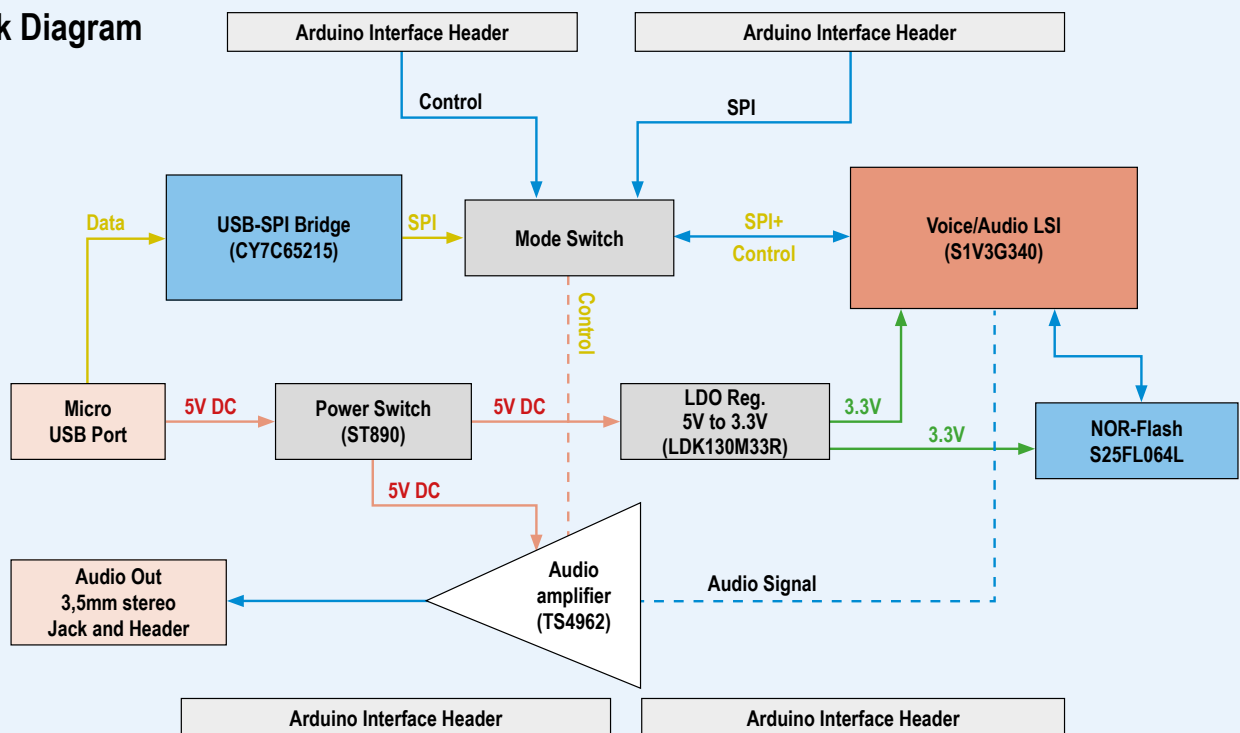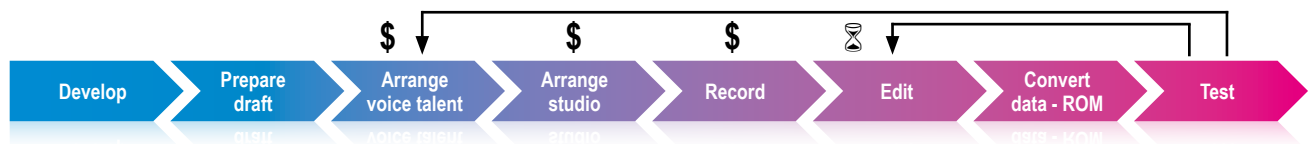- Tracking Devices
- Goods for handicap/ Elder people

EPSON | S1V3G340

ROHM | ORING DIODES

Infineon | NOR FLASH

Epson | 32.768kHz Crystal

MURATA | Filter Inductors

Adam Tech | SPEAKER OUT

Adam Tech | STEREO JACK

Adam Tech | Arduino connectors

OMRON | SLIDE Switch

Infineon | USB to SPI Bridge

Infineon | Power and status LEDs

Keystone | GND Test point

Adam Tech | Micro USB connector

Committed to excellence

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)

ADPCM
Audio ROM

Amount of audio ROM
Only 1/4 to 2/3 the size

EOV
Audio ROM

*EOV: Epson Orignal Voice

Block Diagram

Arduino Interface Header

Arduino Interface Header

Control

SPI

Data

USB-SPI Bridge (CY7C65215)

SPI

Mode Switch

SPI+ Control

Voice/Audio LSI (S1V3G340)

Control

Micro USB Port

5V DC

Power Switch (ST890)

5V DC

LDO Reg. 5V to 3.3V (LDK130M33R)

3.3V

3.3V

NOR-Flash S25FL064L

5V DC

Audio Out 3,5mm stereo Jack and Header

Audio amplifier (TS4962)

Audio Signal

Arduino Interface Header

Arduino Interface Header

Usual process of adding a voice function

Develop → Prepare draft → Arrange voice talent → Arrange studio → Record → Edit → Convert data - ROM → Test

Process with Text To Speech board

Develop → Prepare draft → Prepare data with tool - ROM → Test
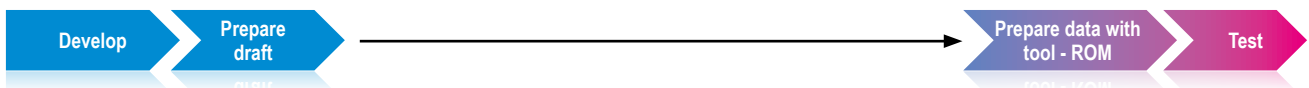
Adapter Board RAB1 – Sensorfusion
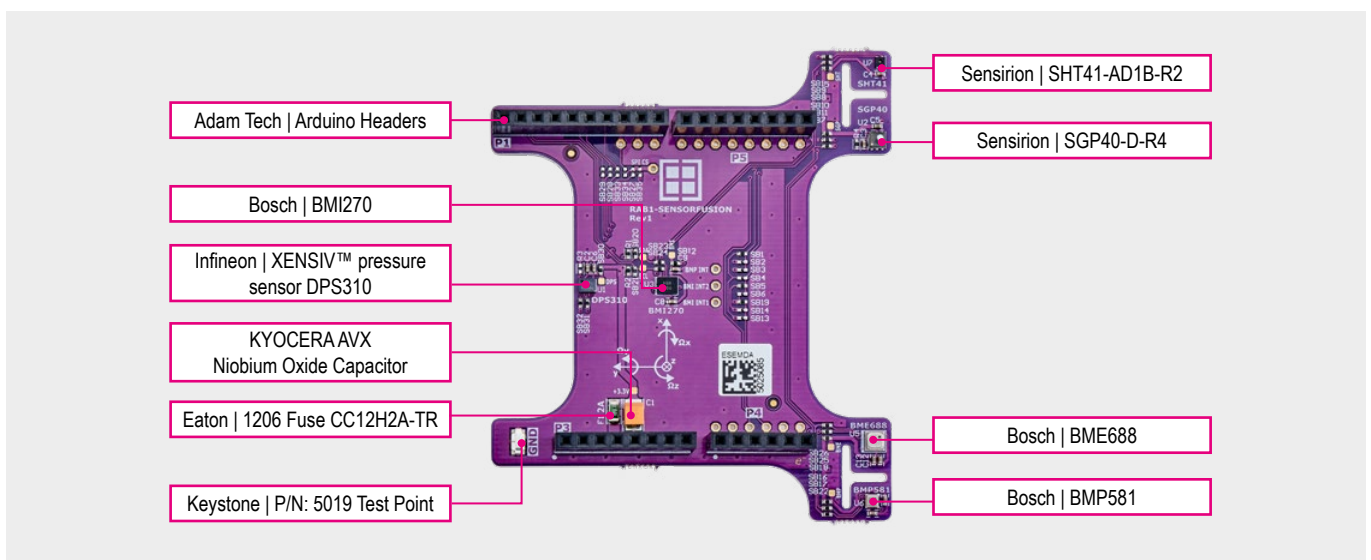## For intelligent sensor fusion

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 interial MEMS sensor for manipulation detection or navigation function
- I2C and SPI interface via Arduino compatible connectors
- Test Point connector for ground signal

Markets & Applications

- Building Automation
- Professional Kitchen
- HVAC
- Smart Farming

Adam Tech | Arduino Headers

Bosch | BMI270

Infineon | XENSIV™ pressure sensor DPS310

KYOCERA AVX Niobium Oxide Capacitor

Eaton | 1206 Fuse CC12H2A-TR

Keystone | P/N: 5019 Test Point

Sensirion | SHT41-AD1B-R2

Sensirion | SGP40-D-R4

Bosch | BME688

Bosch | BMP581

Committed to excellence

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

Markets & Applications

- Building Automation
- Professional Kitchen
- HVAC
- Smart City

Sensirion | CO2 sensor SCD41-D-R1

Infineon | XENSIV™ PAS CO2 sensor

KYOCERA AVX | Tantalum capacitor

Murata | Inductor

Eaton | Fuse

Adam Tech | Arduino headers

Keystone | GND Test point

ams OSRAM | Indication LED
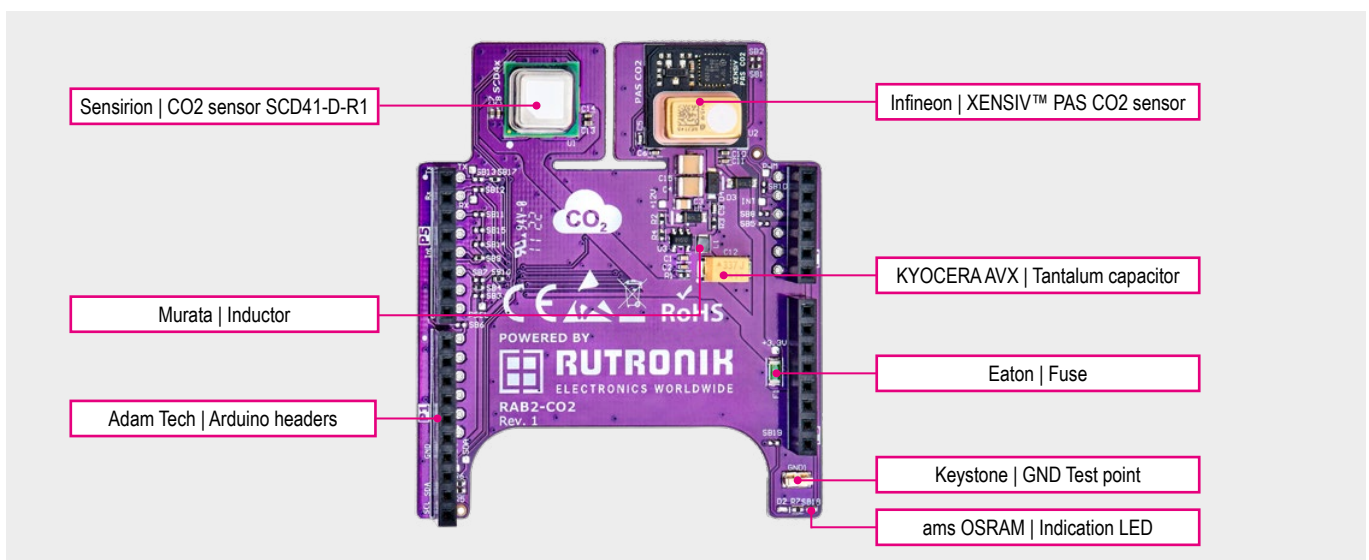
Adapter Board RAB3 – Radar

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 fullly 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

MuRata | EMI Suppression LC Filters

Infineon | XENSIV™ 60 GHz Radar Sensor

MuRata | Ferrite Beads

MuRata | Feed-Through Capacitors

KYOCERA AVX | 80 MHz Clock Oscillator

Samsung EM, Yageo | Capacitors & Resistors

Fischer Elektronik | Arduino Pin Headers

Nisshinbo | 60GHz Smart Sensor Micro-Module

TDK | Ferrite Bead

Panjit | P-Channel MOSFETs

ams OSRAM | TOPLED® E1608 LEDs

Eaton | High I²t Chip Fuse

RAB4 – RTK

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
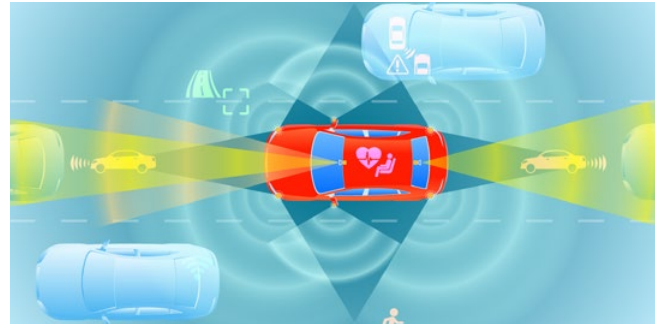- Can be combined with all of our other boards

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

Molex	USB-C USB2.0
Molex	LTE Diversity Socket
JAE	NanoSIM Connector
ams OSRAM	Power, Ready, Status LEDs
Telit Cinterion	LE910C1WX03T037100
Adam Tech	Arduino Headers
Unicore Communications	UM980
Panasonic	Shut Down Button
Molex	UM980 GNSS Socket

Molex	LTE Main Socket
Keystone	Nylon Stand-offs & Screws
Panasonic	On/Off Button
MuRata	2.0A 3.8V DC/DC Converter
MuRata	0.6A 3.3V DC/DC Converter
C&K	UART Direction Switch
Littelfuse	Polymer ESD Suppressors
Molex	LE910 GNSS Socket

Adapter Board in cooperation with HMS –
Communication via all common fieldbus and industrial ethernet networks

Benefits

- Various Anybus connector boards can be attached via the board connector e.g. PROFIBUS, Ethernet, CANopen, CC-Link, DeviceNet, etc.
- Easy integration of all other Rutronik adapter boards (e.g. Sensorfusion, CO2, etc.) or other Arduino based evaluation boards via integrated Arduino headers
- Built-in security features such as packet storm resistance, certificates, access control and more
- Free software updates whenever networks are revised
- Independent from new networks, IIoT, network upgrades, maintenance and conformance issues

Key Features

- Anybus CompactCom B-40-1 module connectors
- Pin header selects the power source between Arduino and DC input
- UART or SPI interface via Arduino compatible connectors
- Auxiliary 5V power source terminal
- LED indicators for power, status and network activity indication
- Test point connector for ground signal
- SMD standoffs for M3 screws

Markets & Applications

- Realtime communication
- Functional safety
- Control and automation
- Security
- Industrial automation
- Medical
- HMI/Displays

Adam Tech | B40-1 Module Connectors

Adam Tech | Arduino Connectors

Keystone Electronics | GND Test Point

Adam Tech | Connector Board

Keystone Electronics | SMD Standoff

Sauro | 5V DC Input

ams OSRAM | LED Indicators

Amphenol CS | Source Selector

Adam Tech | Arduino Connectors
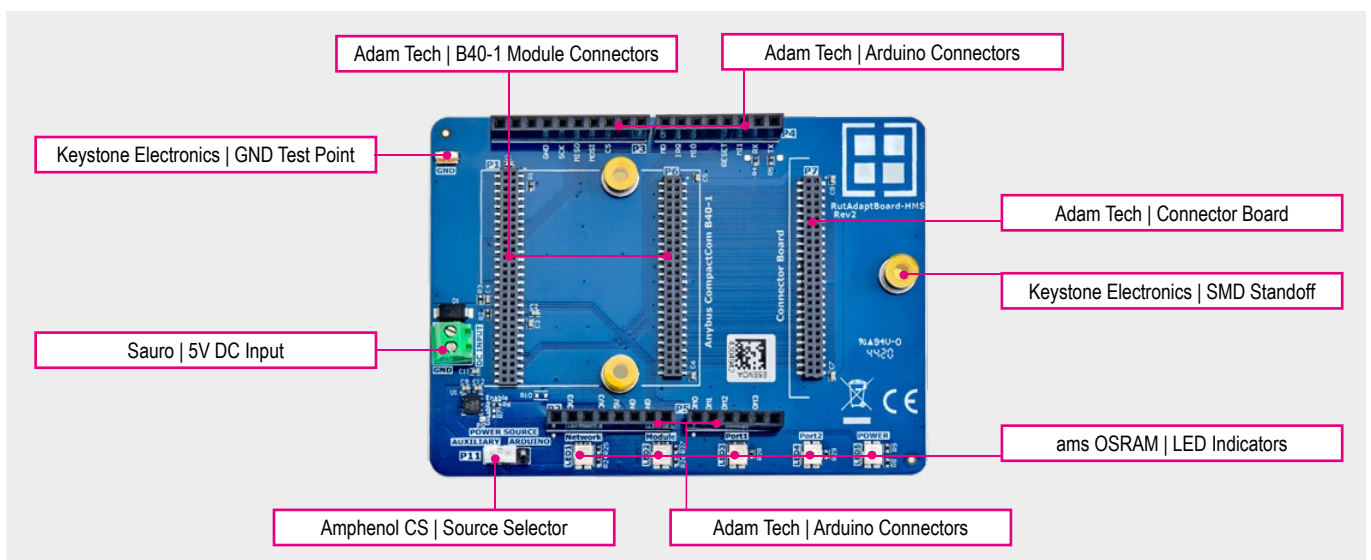
800 VDC Bi-Directional HV-Switch
State-of-the-art innovative bi-directional 800 V eFuse

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

ROHM | SiC-MOSFETs
Vishay | Current Shunt Resistor
Vishay | Pre-Charge Resistor
Vishay | Protection Diodes
Vishay | Analog Opto-Coupler
Rohm | Isolated Gate-Driver
Vishay | Capacitive Energy Transfer (MLCC)
Vishay | Opto-Coupler
Vishay | DC/DC Converter IC
Vishay | IHLP® Power Inductor
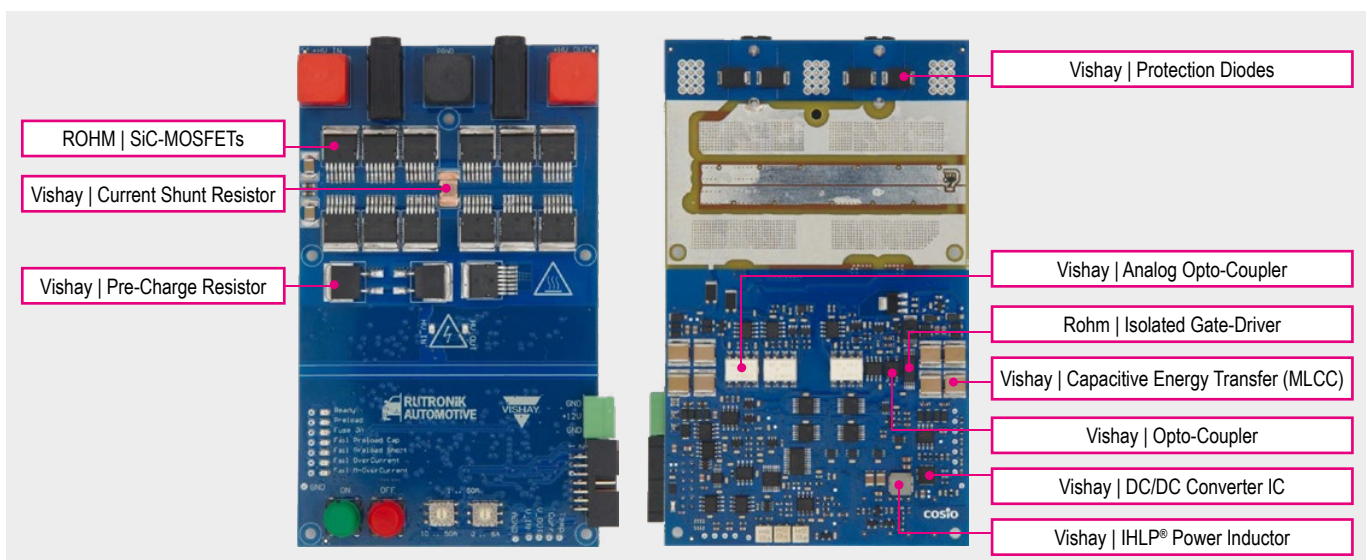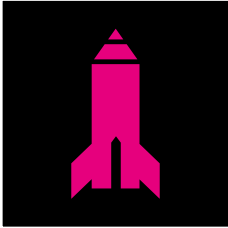
- Hardware developed by Rutronik serving as a proof of concept for system solutions in new markets and new technologies
- Partially based on Rutronik IP
- Development based on cooperations with leading universities and institutions
- Rutronik is following an IP protection program within the research 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
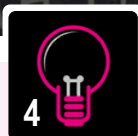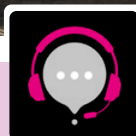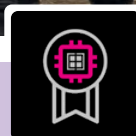
Innovation Level	Faster Time to Market	Consulting	Special HW (Rutronik)	SW Adaption	Close Cooperation	RUT IP/ Partner IP
4						

Committed to excellence

Board - Overview

HESS

Electronic Nose

Concept Phase

Odor Killer

Concept Phase

Virus Killer

Concept Phase

Insect Scare
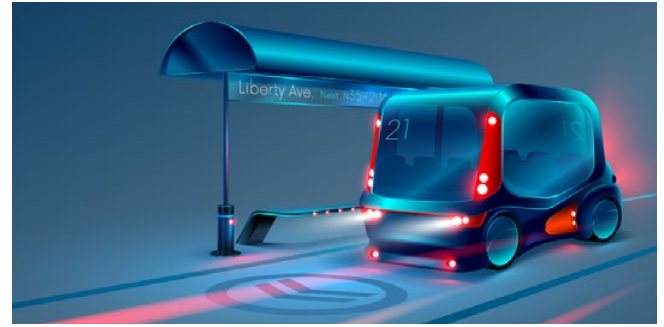
HESS –
Hybrid Energy Storage System in cooperation with HS Zwickau

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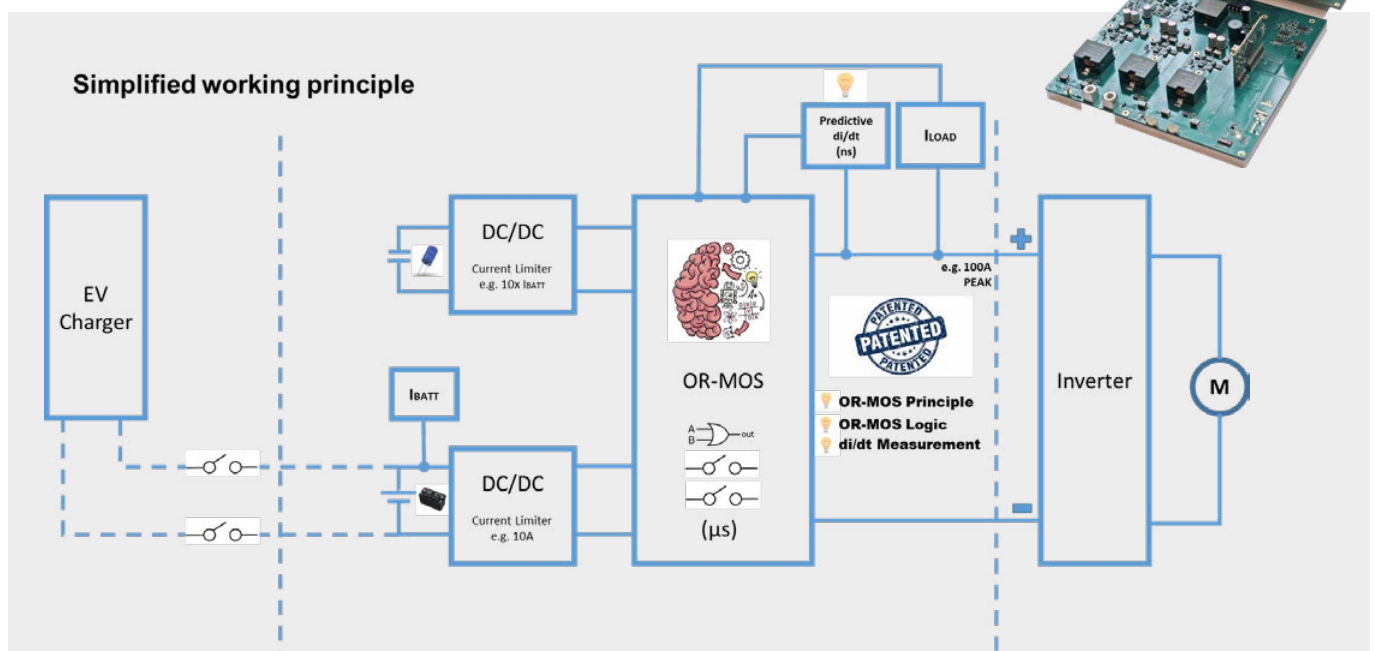
	Li-Ion Cells	Super Cap	Combination Li-Ion Cell + Super-Cap
Power Capability (W/kg)	++	+++	+++
Energy Density (Wh/Dimensions)	++	-	++
Specific Energy(Wh/kg)	++	+	+
Cycle Life	0	+++	+++
Calendar Life	+	++	+++
Price	-	0	0
Self-Discharge	++	-	++
Temperature behavior	0	++	++
Reliability	0	++	++
Fast Charging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

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

With HESS	Without HESS
Rutronik System Solutions	Rutronik System Solutions
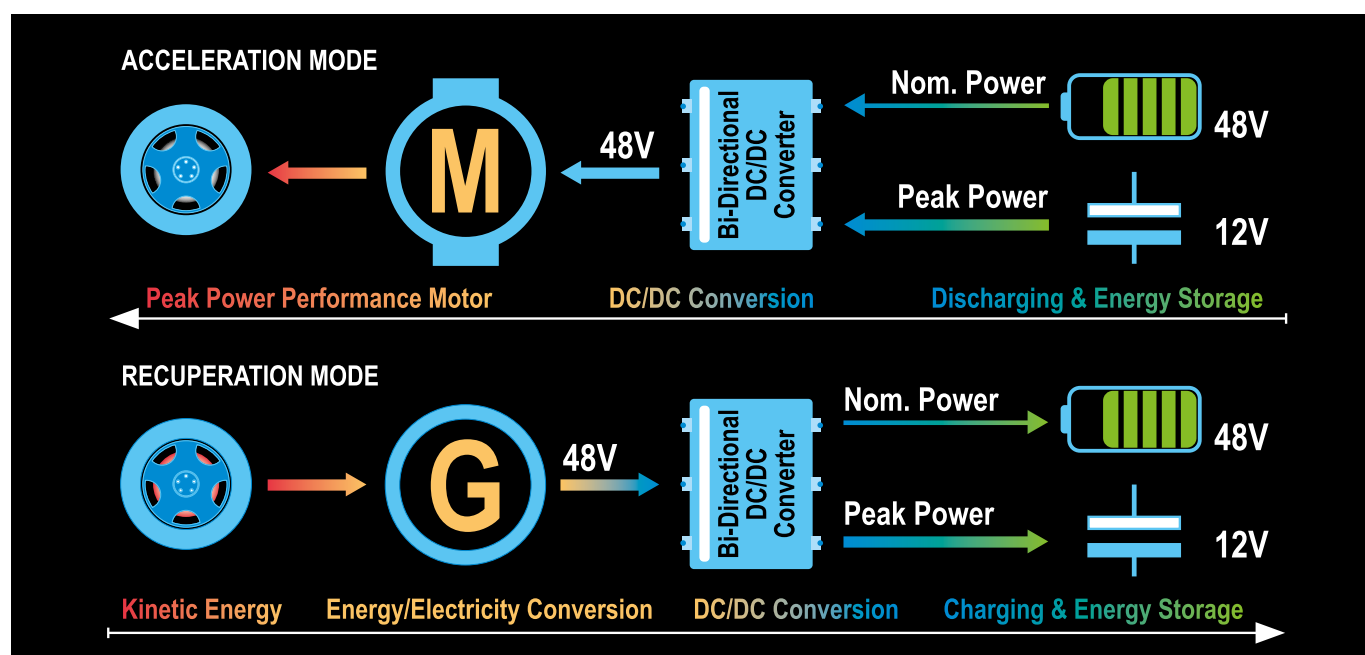
Electronic Nose
Working like a human sensory organ

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

Odor Eliminator

Odor Eliminator
Detect, analyze and eliminate smells for fresh air in every room

Concept Phase

The odor eliminator makes use of the odor destroying properties of UVA LEDs. Volatile compounds and volatile organic compounds (VOC) can cause odors and can be harmful in certain concentration. 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. The odor eliminator is a system that selectively stimulates volatile compounds. The molecular composition of the VOCs can be changed, analyzed and destroyed with the help of UVA LEDs.

Markets & Applications
- White Goods
- Indoor Applications
- Air purifier

Virus Killer
Safe UVC-LED disinfection of viruses & bacteria

Concept Phase

The system solution virus eliminator makes use of the disinfecting effect of UVC LEDs. When observing volatile compounds and volatile organic compounds (VOC) 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. The virus eliminator is a safe and closed system, that precisely destroys the molecular and organic composition of viruses and bacteria in the air.

Markets & Applications

- Home Appliances
- Water taps
- Refrigerators & Freezers

Insect Scare

Insect Scare
Unique technology to manipulate the sense of insects to keep them away

Concept Phase

The insect scare is a system solution that selectively influences the senses of insects. Depending on the insect either the odors need to be manipulated by ionization of the air, or the hairs of the insect by sending out specific signals to stimulate them. The influence of smells only occur within a defined radius. The sense of smell is being limited, so that the insects cannot sense stimuli within that radius. This can be for example the smell of fruit or meat. In general the technical solution can be adapted to a variety of insects.

Markets & Applications

- Table devices
- Windows
- Outdoor devices
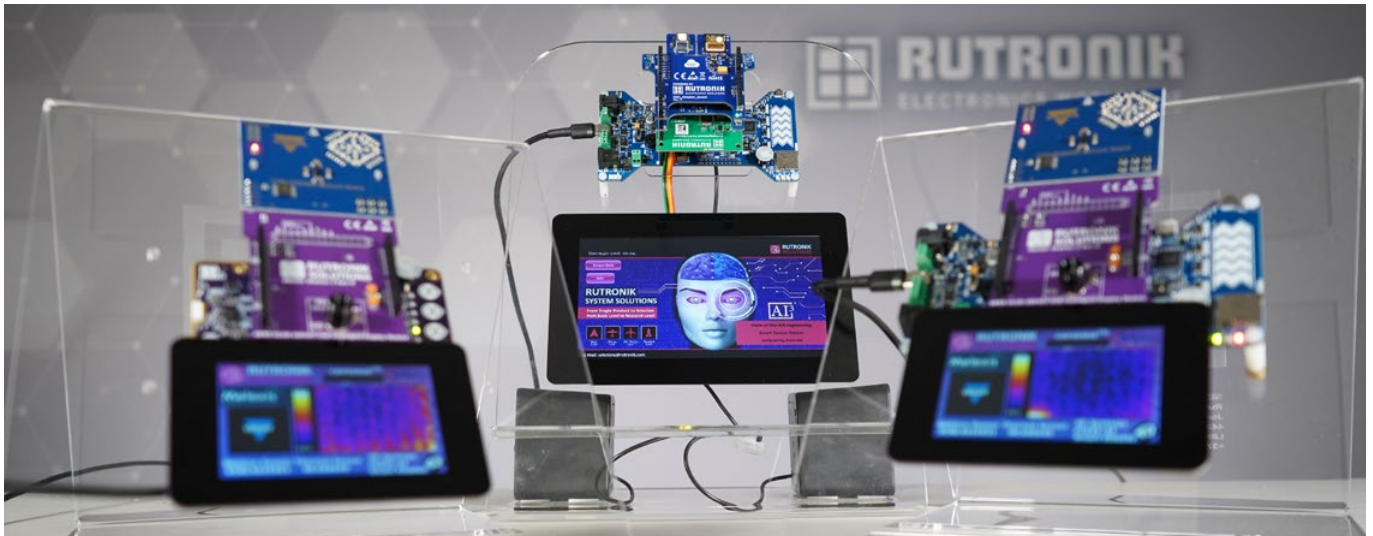
Smart Sensor Station 1

The Smart Sensor Station 1 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.
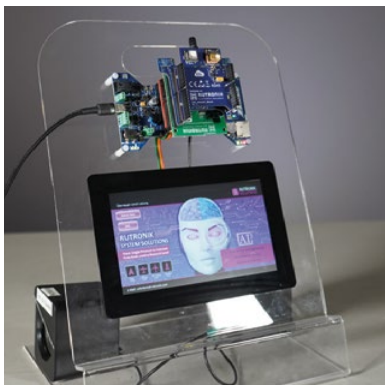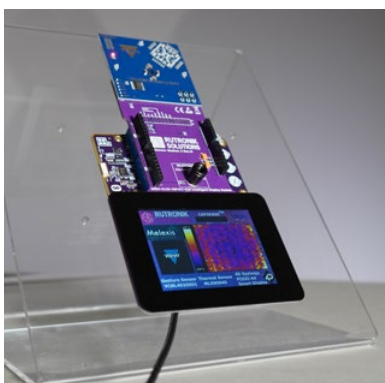

- RDK2 ensures smooth communication of the boards
- TextToSpeech provides an acoustic data and alarm output
- RAB1 provides a large amount of available sensor data
- RAB2 provides a direct comparison of two CO2 sensors
- A smart display provides visual data output and easy navigation

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

Smart Sensor Station 2

The Smart Sensor Station 2 shows the concept with the usage of RDK2 or RDK3 and the adapter boards for a FIR thermal- and IR gesture detection with an additional smart touch display to visualize the data

- RDK2 or 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 temperature measurement
- CSX capacitive CAPSENSE™ buttons for touch control
- Smart touch display provides visual data output and easy navigation

Included boards: RDK2 or RDK3 | Evaluation Board – FIR thermal sensor
Evaluation Board – VCNL4035X01 | 4DSystems 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, CO_2, and time-of-flight sensors).
- Explore new and trending repositories
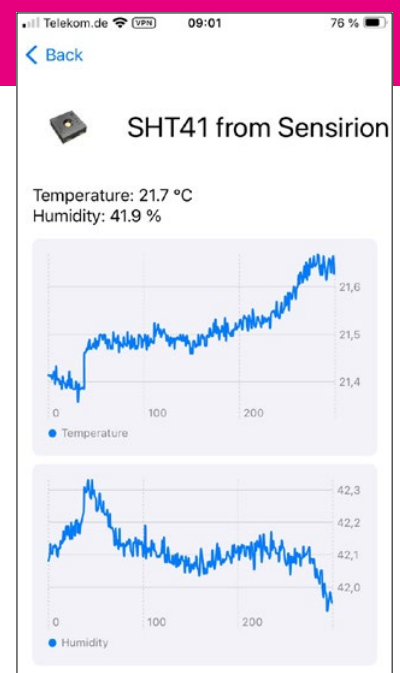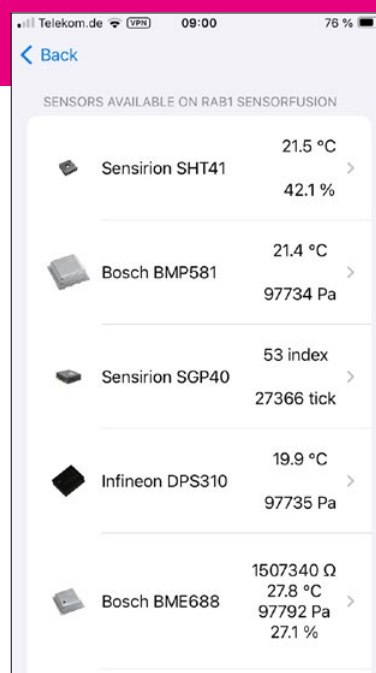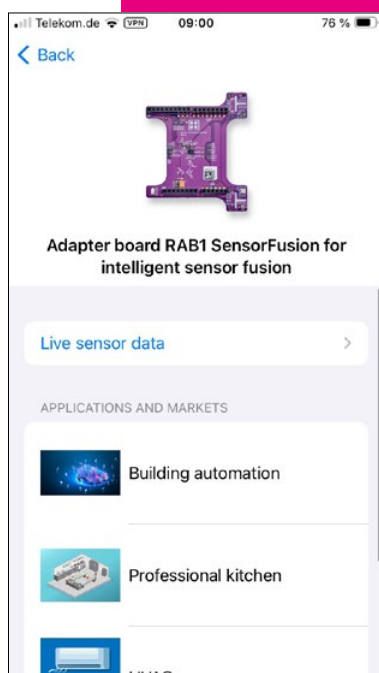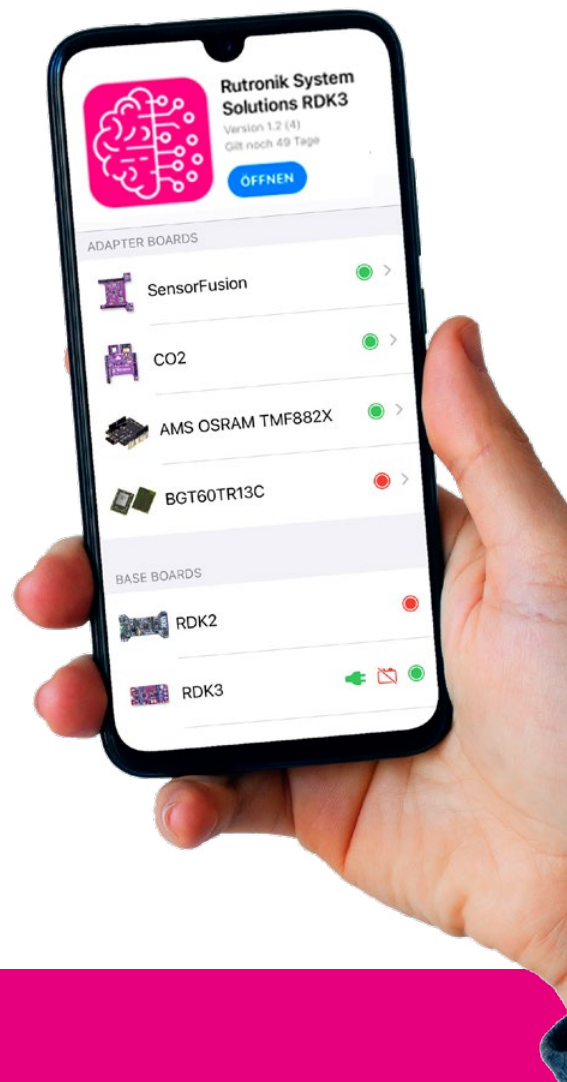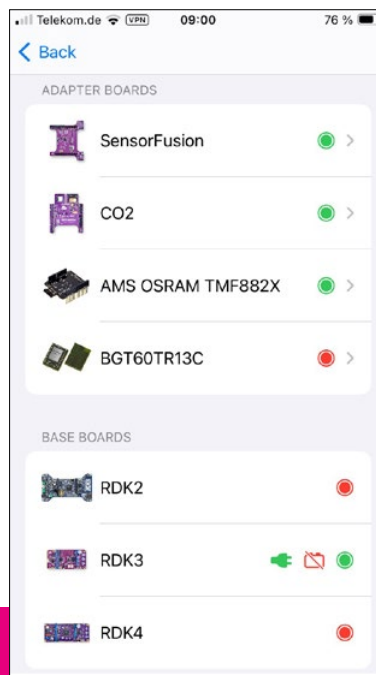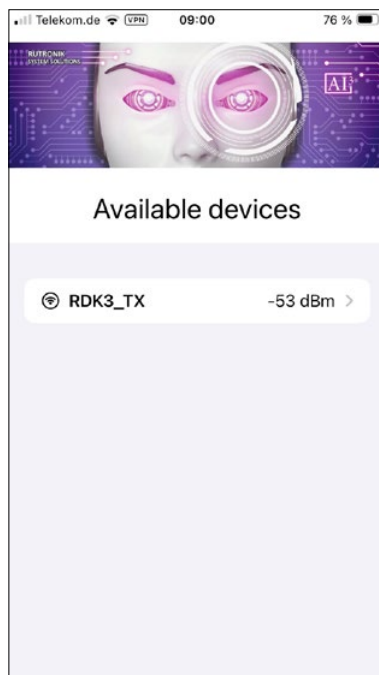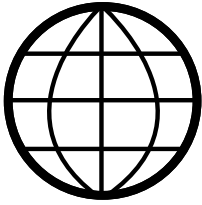
ModusToolbox™ & Friends program

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

Quelle: Infineon

GitHub
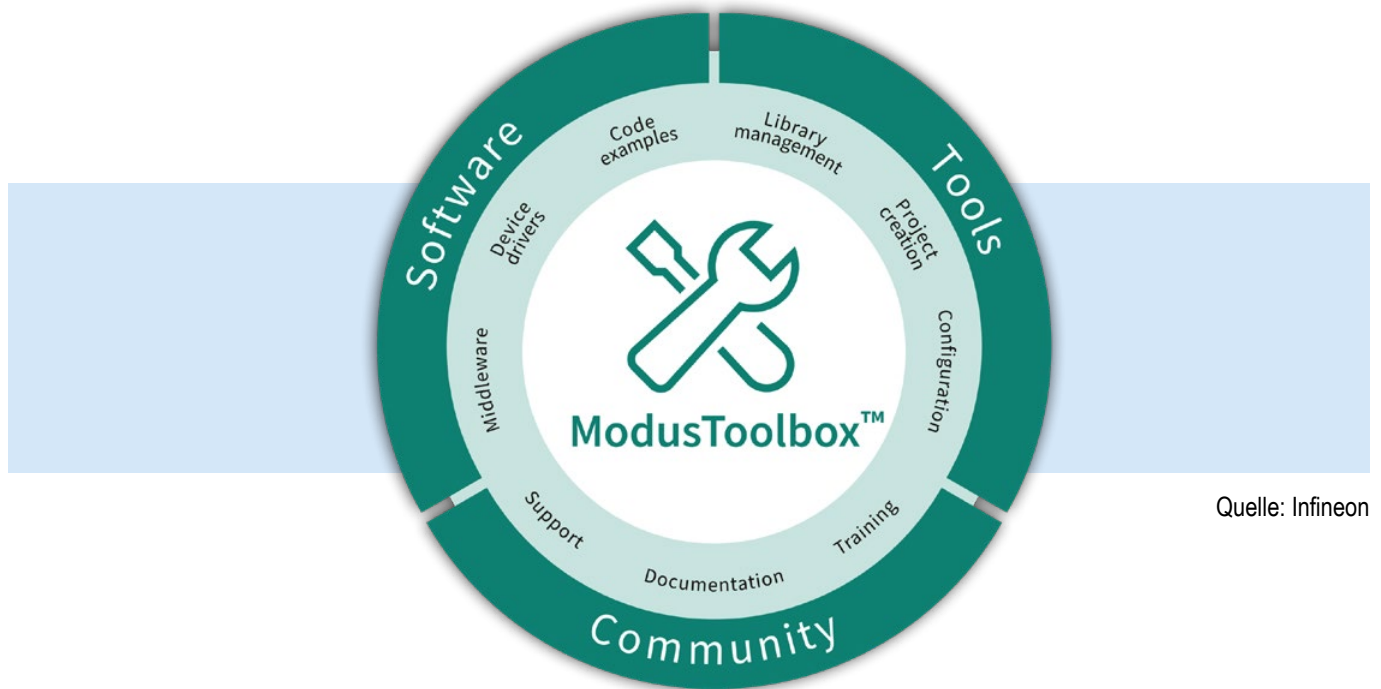
You can find all firmware examples and technical documents on GitHub

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

Rutronik Elektronische Bauelemente GmbH

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