

ECU

Embedded Control Units from RAFI



RAFI ECU AT A GLANCE

Depending on customer requirements, we equip our GLASSCAPE touch displays and control panels with complete processor units. These Embedded Control Units (ECU) take care of control and visualization tasks. From **RAFI** you get your customized control solution comprising touch technology, housing, processor, software and drivers from a single source.

For many years, leading companies in various industries have been counting on **RAFI**.

HMI and controls for coffee machines



Mobile HMI for industrial robots

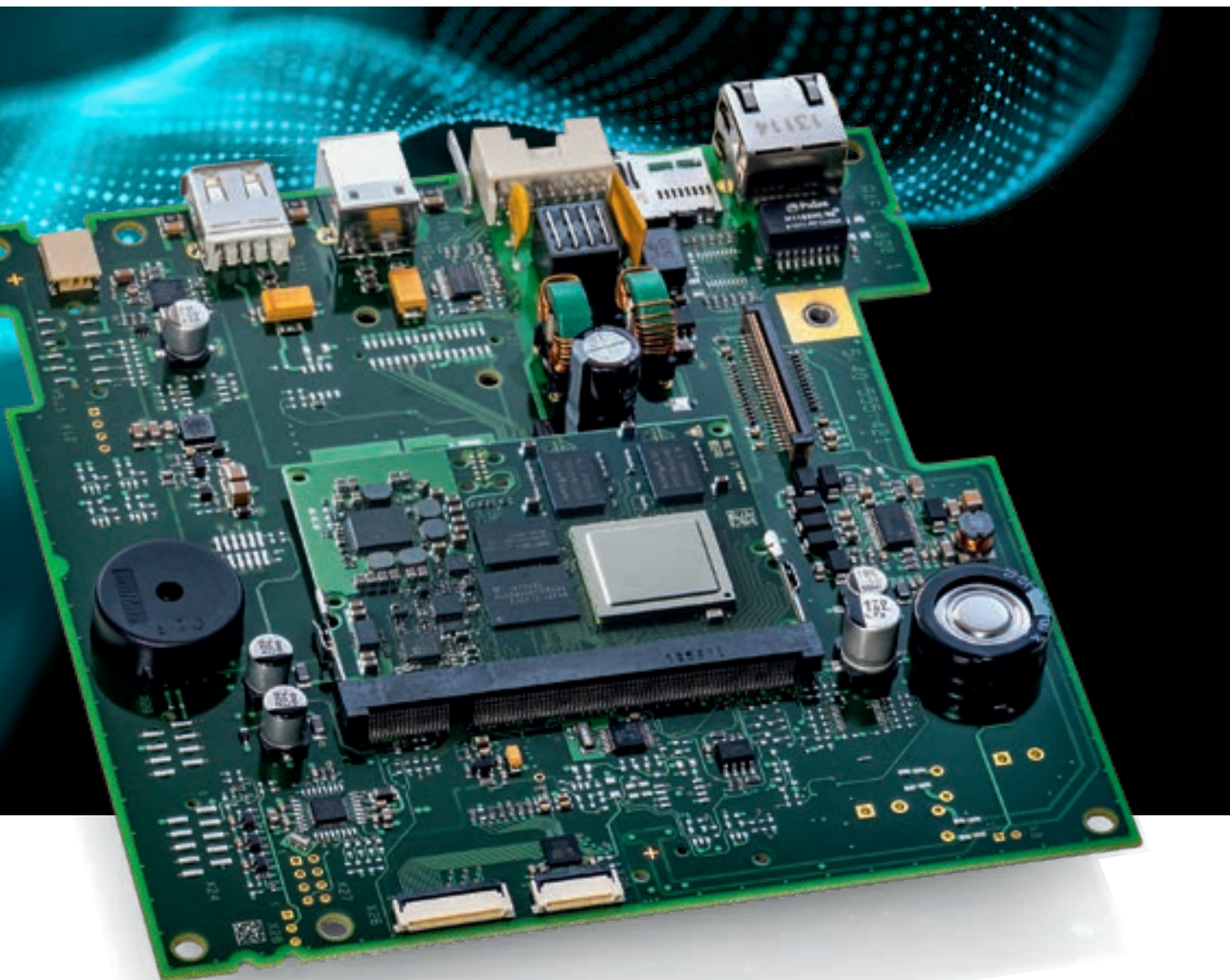


iTerminal for the Pistenbully



HMI for breathing apparatus





Processor unit for simple control and visualization tasks. Our customized, integrated solutions optimize unit costs. We use cost-effective 8, 16, and 32-bit controllers with and without operating systems.

YOUR ADVANTAGES

- Five power classes
- Single-board-computers as plug-in modules and integrated solutions
- Pin-compatible connector system
- Low power draw and fan-less design
- Fast and flexible adjustment to customer-specific design
- Continuous platform development and servicing
- Low development costs
- Industrial compatibility and long-term availability



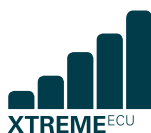
Plug-in module with single-core processor for medium control and visualization tasks. Fast and flexible adjustment to your demands using modular solutions. The BalanceECU module is available with embedded Linux.



Plug-in module with Dual-Core or Quad-Core processor for challenging control tasks, HMI with FullHD video playback and multi-touch. Fast and flexible adjustment to your demands using the platform base board. The PowerECU module is available with embedded Linux.



Processor unit for high-performance control and visualization tasks. The UltimateECU is designed for highest performance requirements in the embedded environment and is available as an integrated solution with embedded Linux.



Plug-in module with X86 architecture for high-end applications. Based on the Intel® Atom® x6000E series, this module enables a powerful but fanless design. The XtremeECU is available as a SMARC module with various standard operating systems.

THE RIGHT UNIT FOR YOUR PROJECT



RAFI ECU

	Touch	Multi-Touch	-	Multi-Touch	Multi-Touch
	Max. resolution	800 x 600; 24 BPP	-	1920 x 1080; 24 BPP	2048 x 2048; 24 BPP
Grafic	Interface	parallel 24 Bit RGB	-	LVDS (optional: Parallel 24 Bit RGB)	parallel 24 Bit RGB
	Special features	OpenVG™ 1.1 2D (GC355)	-	OpenGL® ES 3.0 3D OpenVG™ 1.1 2D	PowerVR SGX530 3D Graphics Engine
Controller	Core	ARM Cortex-A5 + Cortex M4	ARM Cortex-M3/M4	ARM Cortex-A9 / ARM Cor- tex-M4	ARM Cortex-A8
	Typ	NXP Vybrid	STM32F2 / F4	NXP i.MX6SoloX	TI Sitara AM3354
	Clock rate	450 MHz (A5), 166 MHz (M4)	up to 180 MHz	800 MHz	600 MHz
Memory	RAM	up to 2 MB internal; 256 MB DDR3	up to 384 KB internal	512 MB DDR3 SDRAM	512 MB DDR3 SDRAM
	Flash	128 MB NAND-Flash	up to 2 MB internal	4 GB eMMC (optional: 1 GB SLC NAND-Flash)	4 GB eMMC
	EEPROM	32 kByte	-	4 KB	4 KB
RealTime Clock	Typ	NXP PCF2123	-	MCS RV-3029-C3 (temperature compensated)	possible
Temperature range	Operation	0 °C to +70 °C (optional -40 °C to +85 °C)	-40 °C to +85 °C (optional -40 °C to +105 °C)	-40 °C to +85 °C	-0 °C to 70 °C (storage -20 °C to +85 °C)
Interfaces	Ethernet	2 x 10/100 Mbps incl. Phy	1 x 10/100 Mbps incl. Phy	1 x 10/100 Mbps (IEEE1588) incl. Phy	2 x 10/100 Mbps/1Gbps (IEEE1588)
	USB	2 x USB 2.0 High-Speed (480 Mbps) OTG incl. Phy	1 x USB 2.0 High-Speed (480 Mbps) OTG incl. Phy 1 x USB 2.0 Full-Speed (12 Mbps) Host incl. Phy	2 x USB 2.0 High-Speed (480 Mbps) OTG incl. Phy	2 x USB 2.0 High-Speed (480 Mbps) Dual-Role incl. Phy
	CAN	up to 2 x CAN	up to 2 x CAN	up to 2 x CAN	up to 2 x CAN
	UART	up to 6 x UART	up to 4 x UART	up to 5 x UART	up to 6 x UART
	I2C	up to 4 x I2C	up to 3 x I2C	up to 3 x I2C	up to 3 x I2C
	SPI	up to 4 x SPI and up to 2 x QSPI	up to 3 x SPI	up to 4 x SPI	up to 2 x SPI
	Audio	I2S + ESAI + SPDIF	-	2 x serial audio	-
	Camera	up to 4 analog camera inputs (not simultaneous)	-	parallel CSI	-
	SD/MMC	up to 2 x SD/MMC	1 x SDIO	up to 2 x SD/MMC	bis zu 3 x SD/MMC
Analog / Digital Converter		ADC: up to 16 channels @ 12 Bit DAC: up to 2 channels @ 12 Bit	ADC: up to 24 channels @ 12 Bit DAC: up to 3 channels @ 12 Bit	ADC: 2 x 4-channel @ 12 Bit	ADC: 8 channels @ 12 Bit
Plug-in system		integrated solution	integrated solution	1 x 200-pin SO-DIMM (contact baseboard TYCO (AMP) 1717254-1)	integrated solution
Dimensions		integrated solution	integrated solution	67,6 mm x 55,0 mm	integrated solution
Operating system		MQX 4.1.2	-	Linux Kernel 5.10 (LTS) Yocto Honister 3.4	Linux Kernel 4.1.18 Yocto 2.1 Krogoth
Visualization		Embedded Wizard, Easy GUI more on request	-	Qt 5.15 (LTS) more on request	Qt 5.6.3



Multi-Touch	Multi-Touch	Multi-Touch	Multi-Touch
1920 x 1200; 24 BPP	1920 x 1200; 24 BPP	1920 x 1080; 24 BPP	4096x2160
LVDS	LVDS	LVDS	LVDS (max 1920 x 1200@60Hz), eDP, MIPI, HDMI (if necessary, converter still required on carrier board)
OpenGL® ES 3.0 3D OpenVG™ 1.1 2D	OpenGL® ES 3.0 3D OpenVG™ 1.1 2D	OpenGL® ES 3.1 3D OpenVG™ 1.1 2D	OpenGL® 4.5 OpenGL® ES 3.2
Dual ARM Cortex-A9	Quad ARM Cortex-A9	Quad ARM Cortex-A35 / Single ARM Cortex-M4	Intel Atom
NXP i.MX6Dual	NXP i.MX6Quad	NXP i.MX8QuadXPlus	X6425RE, X6414RE, X6412RE
852 MHz	852 MHz	900 MHz	1,9GHz
1 GB DDR3 SDRAM	1 GB DDR3 SDRAM	1 GB DDR3 SDRAM or LPDDR4	max. 16GB LPDDR4x
8 GB eMMC (optional: 1 GB SLC NAND-Flash) 16 MB Boot Flash	8 GB eMMC (optional: 1 GB SLC NAND-Flash) 16 MB Boot Flash	8 GB eMMC / 32MB Boot-Flash	up to 64GB
4 KB	4 KB	8 KB	-
MCS RV-3029-C3 (temperature compensated)	MCS RV-3029-C3 (temperature compensated)	MCS RV-3029-C3 (temperature compensated)	-
-40 °C to +85 °C	-40 °C to +85 °C	-40 °C to +85 °C	-40 °C to +85 °C
1 x 10/100 Mbps (IEEE1588) incl. Phy	1 x 10/100 Mbps (IEEE1588) incl. Phy	2 x 1 Gbps Ethernet (IEEE1588, AVB)	2 x GbE
1 x USB 2.0 High-Speed (480 Mbps) OTG incl. Phy 1 x USB 2.0 High-Speed (480 Mbps) Host incl. Phy	1 x USB 2.0 High-Speed (480 Mbps) OTG incl. Phy 1 x USB 2.0 High-Speed (480 Mbps) Host incl.	1 x USB 3.0 Super-Speed (5 Gbps) Dual-Role incl. Phy 1 x USB 2.0 High-Speed (480 Mbps) OTG incl. Phy	2 x USB 3.1 Gen2
up to 2 x CAN	up to 2 x CAN	up to 3 x CAN	up to 2 x CAN
up to 3 x UART	up to 3 x UART	up to 6 x UART	up to 2 x UART
up to 3 x I2C	up to 3 x I2C	up to 9 x I2C	up to 2 x I2C
up to 4 x SPI	up to 4 x SPI	up to 4 x SPI	1 x SPI + 1 x eSPI
up to 2 x serial audio	up to 2 x serial audio	up to 4 x serial audio	1 x serial audio
up to 2 x camera	up to 2 x camera	up to 2 x camera	-
up to 2 x SD/MMC	up to 2 x SD/MMC	up to 2 x SD/MMC	eMMC 5.1 interface
-	-	ADC: 6 channels @ 12 Bit	-
1 x 200-pin SO-DIMM (contact baseboard TYCO (AMP) 1717254-1)	1 x 200-pin SO-DIMM (contact baseboard TYCO (AMP) 1717254-1)	integrated solution	SMARC 2.1
67,6 mm x 55,0 mm	67,6 mm x 55,0 mm	integrated solution	82,0 mm x 50,0 mm
Linux Kernel 5.10 (LTS) Yocto Honister 3.4	Linux Kernel 5.10 (LTS) Yocto Honister 3.4	Linux Kernel 4.19 (LTS) Yocto Thud 2.6	Linux, Windows, Android
Qt 5.15 (LTS) more on request	Qt 5.15 (LTS) more on request	Qt 5.12 (LTS) more on request	Qt, HTML5, more on request

EVALUATION KIT

YOUR SYSTEM DEVELOPMENT

With the Evaluation Kit for the **POWER^{ECU}**, you get a fully functioning system development package for testing your application or fast design of prototypes.

The outside of the Evaluation Kit features all current interfaces for simple connection. The Evaluation Kit is supplied with embedded LINUX, a Qt demo application as well as a virtual machine with SDK and Qt Creator.



Processor

i.MX6Dual / i.MX6Quad

Display

12.1" PCAP touch and TFT display

Resolution

1280 x 800

Interfaces

USB, serial, CAN, Ethernet etc.

Operating system

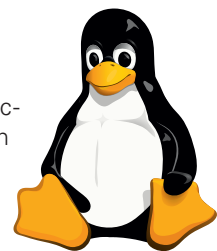
Embedded LINUX

Scope of delivery

- Qt demo application
 - Virtual machine with SDK and Qt Creator
 - User Manual
 - LINUX Reference Guide
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YOCTO LINUX BSP

CUSTOMIZED AND FLEXIBLE



The BalanceECU, PowerECU as well as UltimateECU are equipped with a Yocto-based Linux Board Support Package (BSP). Thanks to the high integration of interface drivers, functions and graphics performance, an easy and cost-effective implementation of your application is possible.

SYSTEM

Kernel

5.10 (LTS)

Bootloader

U-Boot 2021.07

Distribution

Yocto Honister 3.4

File system

Ext4 (UBIFS on request)

Init system

systemd

GRAPHIC

Graphic library

OpenVG 1.1 / OpenGL ES 3.0 / EGL 1.4

Window system

Wayland display protocol with Weston compositor

GUI Framework

QT 5.15 (LTS) / DRM KMS
further on request

LICENSES

GNU General Public License (GPL)

Version 3, June 2007
Version 2, June 1991

GNU Lesser General Public License (LGPL)

Version 3, June 2007
Version 2.1, February 1999
Version 2, June 1991

Depending on the scope of delivery, further licenses may be affected.

DRIVERS AND INTERFACES

Memories

NAND-Flash / QSPI-NOR-Flash / EEPROM /
SD-Card / USB Mass-Storage / eMMC

Input devices

Mouse, Keyboard, RAFI-Touch (PCAP)

WLAN / Bluetooth

optional

FUNCTIONS AND SERVICES

Console

Serial consoles / network consoles

Shell

Bash

Connectivity

OpenSSH (Client & Server) / SFTP

Audio

PulseAudio / ALSA (Advanced Linux Sound Architecture)

Video

V4L (Video for Linux) mit H.264 Video-Decoding (HW-accelerated)

Package Manager

dpkg (Debian Package Manager)

Webserver

Apache2 mit PHP7-Support /
Lighttpd on request

Database

MariaDB v10.6.4 (former MySQL)

Script Support

Python v2.7.18 / v3.9.9 / Further on request

Splashscreen

Adaptable

Image Update

Kernel, Bootloader, RootFS, Splashscreen

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