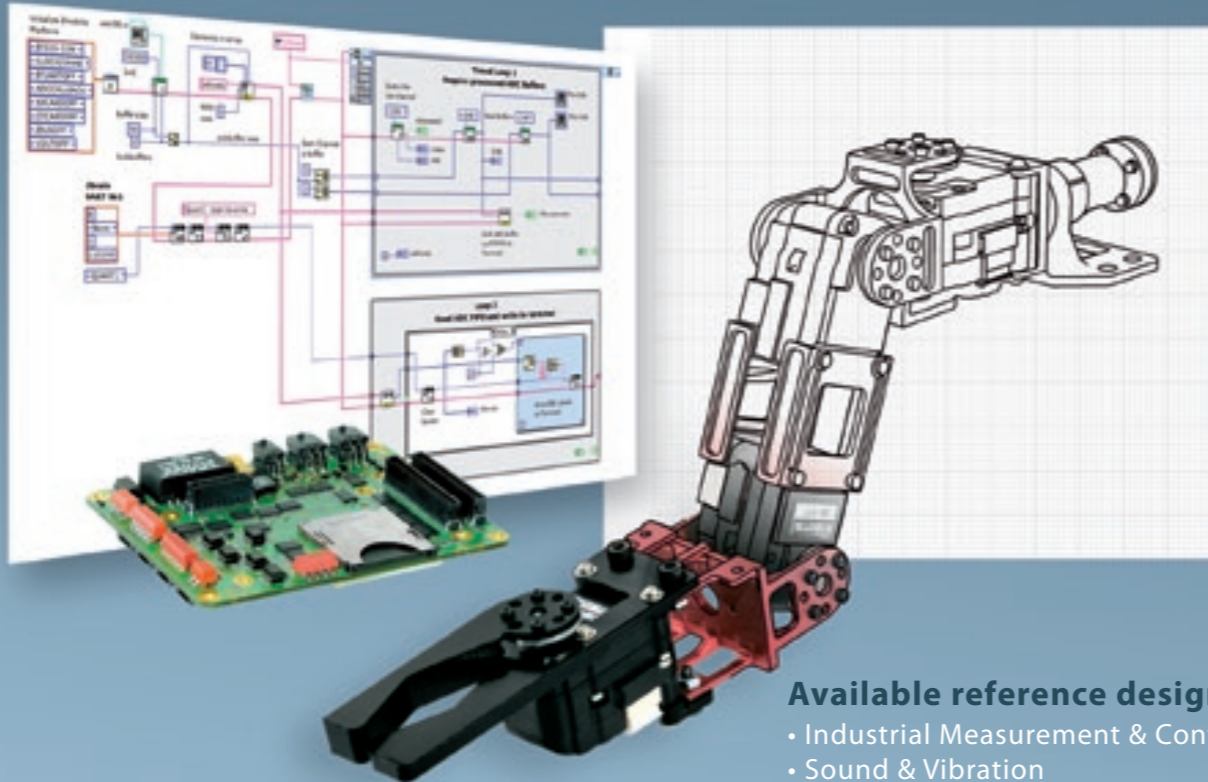


# RAPID PROTOTYPING FOR LOW POWER EMBEDDED MEASUREMENT, CONTROL & MOTION

## Best Practice Reference Designs for Maximum Productivity from Day One

Ready-to-use templates include design and development scenarios, simulation models, software, hardware, block diagrams, code examples, how-to's, FAQ's, benchmarks, examples, and tutorials. Powerful, reusable software frameworks offer built-in multitasking, real-time capability, error-handling, and process I/O. On demand services such as analog, digital and serial I/O; USB, Ethernet and CAN communications; parameter and mass data storage; GUI's; audio and video, provide out-of-the-box embedded system experience.



### Available reference designs:

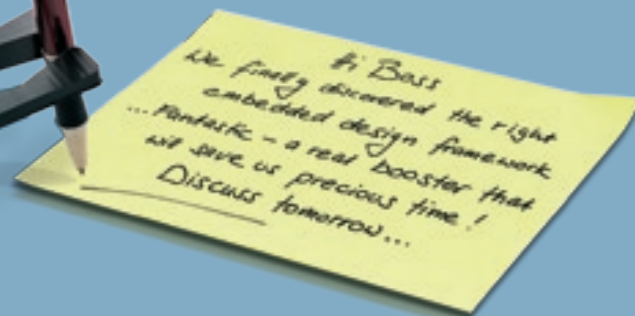
- Industrial Measurement & Control
- Sound & Vibration
- High-Speed ADC/DSP/DAC
- Ultramobile Metering

**Benefit from Schmid Engineerings in-depth embedded design expertise.**

**Ask for customized hardware for your series product.**

**Graphical system design with NI LabVIEW software and the embedded design environment, ZBrain, bring embedded systems to life:**

- Highly efficient and productive
- Hard, real-time services in [ $\mu$ s]
- Custom specific form factors down to [ $\text{cm}^2$ ]
- Low-power in [ $\text{mW}$ ]

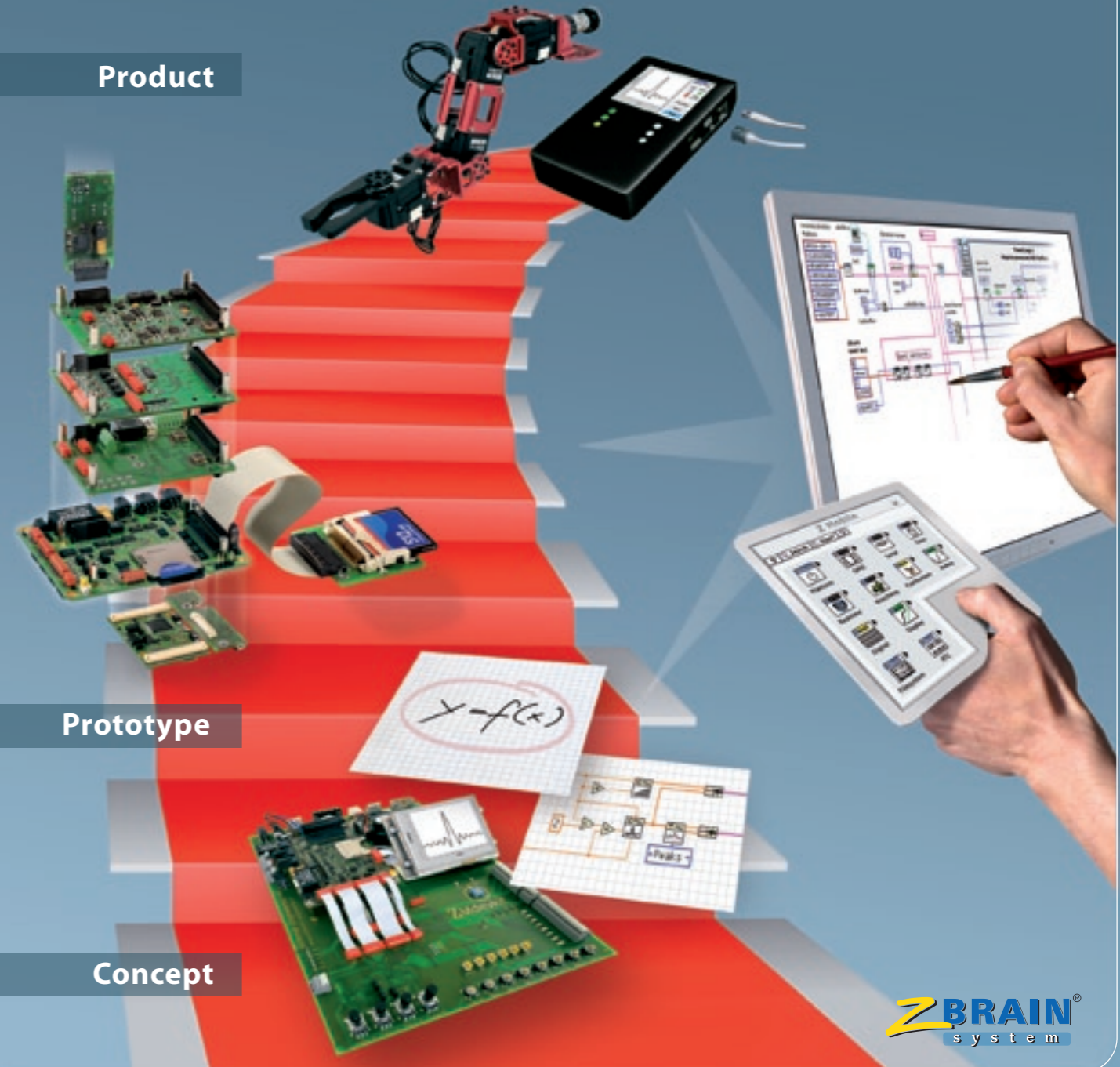


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For more information, visit:  
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[www.zbrain.ch/rapidprototyping](http://www.zbrain.ch/rapidprototyping)  
[www.zbrain.ch/faq](http://www.zbrain.ch/faq)  
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[www.zbrain.ch/articles](http://www.zbrain.ch/articles)  
[www.zbrain.ch/datasheets](http://www.zbrain.ch/datasheets)

Complete the product development cycles in less time  
Proof of Concept • Prototyping • Series Development

### Product



### Prototype

### Concept



A complete and ready-to-run hardware and software development framework supports these three phases while offering full transparency throughout the design cycle. It offers room for creativity, encourages trial and error, and allows for rapid system development to deploy and get to market faster. Graphical programming, combined with scalable hardware, empowers system engineers and domain experts to concentrate on core functions and benefit from fast, easily revisable results. Software, hardware, and mechanics are seamlessly integrated and visualized by self-documented and easy-to-understand graphical block diagrams.



# ZBrain Embedded System Features

ZBrain provides more than +200 VIs for typical embedded system functions on top of the default LabVIEW palette

- Reference Designs**
- Industrial Measurement & Control
  - Sound & Vibration
  - High-Speed ADC/DSP/DAC
  - Ultramobile Metering

- Fast Debug Mode**
- Power up-connect-run
  - Hardware-in-the-loop concept
  - Diagram on the PC, VIs on the target
  - Live access to the targets process I/O
  - Trial and error experience
  - Real-time capable

- Real-time Services**
- Real-time mid-layer
  - Scheduling in [μs]
  - Reaction to events in [μs]
  - Interrupt-level operation
  - Deterministic timestamps
  - Thread safe low-level drivers
  - Built-in error handling
  - Memory management
  - Built-in DMA capability

- Analog Process I/O**
- Single channel ADC
  - Multichannel, simultaneous ADC
  - Event triggered ADC
  - Timestamp related ADC
  - Single and multichannel DAC
  - Data streaming (DMA)
  - Synchronization to internal and external events

- Digital Process I/O**
- Single-line and parallel digital I/O
  - PWM/clock generation
  - Impulse counting and division
  - Pulse measurement
  - Encoder interface
  - Event-driven and timer-driven digital I/O

- Control & Robotics**
- Real-time PID algorithms
  - Multi DOF Kinematics
  - Teach-in and playback
  - Trajectory simulation in CAD
  - Trajectory calculation at runtime
  - Smart vision

- Data Management**
- On-chip and on-board memory
  - Parameter storage
  - Removable media (SD-card)
  - Embedded file systems
  - USB mass storage

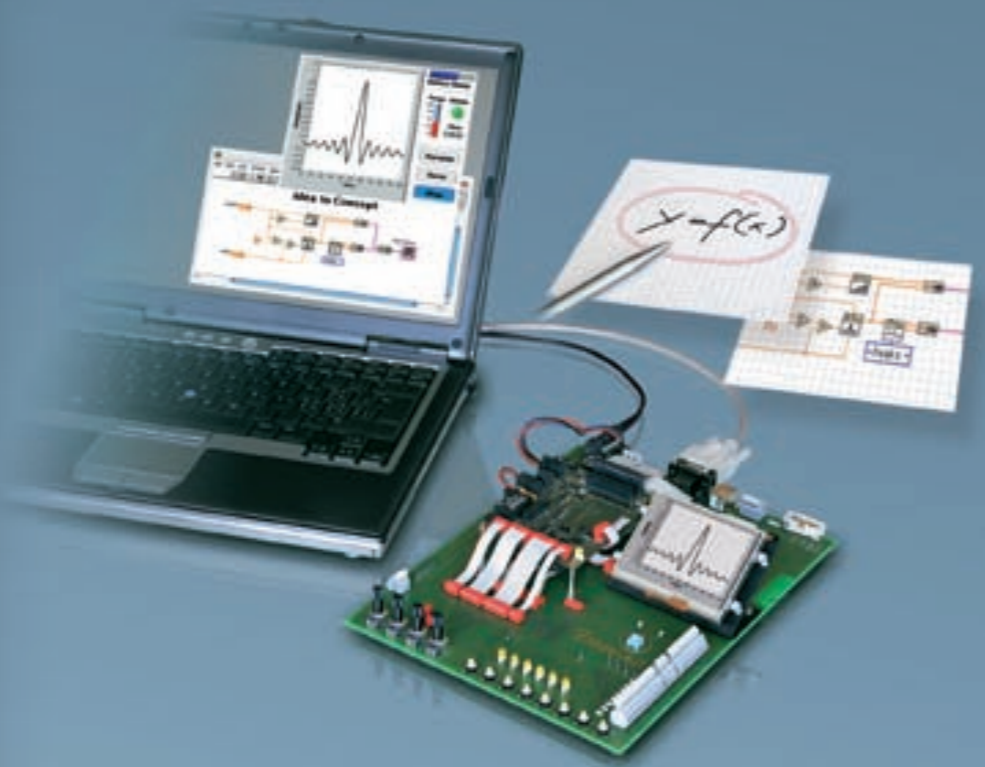
- Communication**
- Wireless communication
  - Fail safe transmission protocols
  - RS232 / RS485 / RS422
  - USB
  - Ethernet , CAN
  - SPI, I<sup>2</sup>C, SPORT, SMBUS, PPI

- Battery, Power and Safety**
- Battery charging
  - Battery level and health monitoring
  - Battery switching
  - CPU voltage/frequency control
  - Sleep modes
  - Shutdown/wake-up
  - Watchdog control
  - Real time clock
  - Hard and soft reboot
  - Memory checks

**Audio, Video**

## Proof of Concept

Bring ideas on embedded targets to life



Transform your measurement and control ideas into graphical concepts, models, and algorithms by combining system function blocks. Test and benchmark concepts directly on field-proven, off-the-shelf hardware.

## Embedded Software

Real-time and multitasking application development



Develop application software with the programming model of your choice. Benefit from high-level abstraction while achieving full transparency for dataflow, timing, and process I/O. Debug on-target in the graphical context with live access to all hardware resources. Profit from requirement and version control.

## Graphical User Interfaces

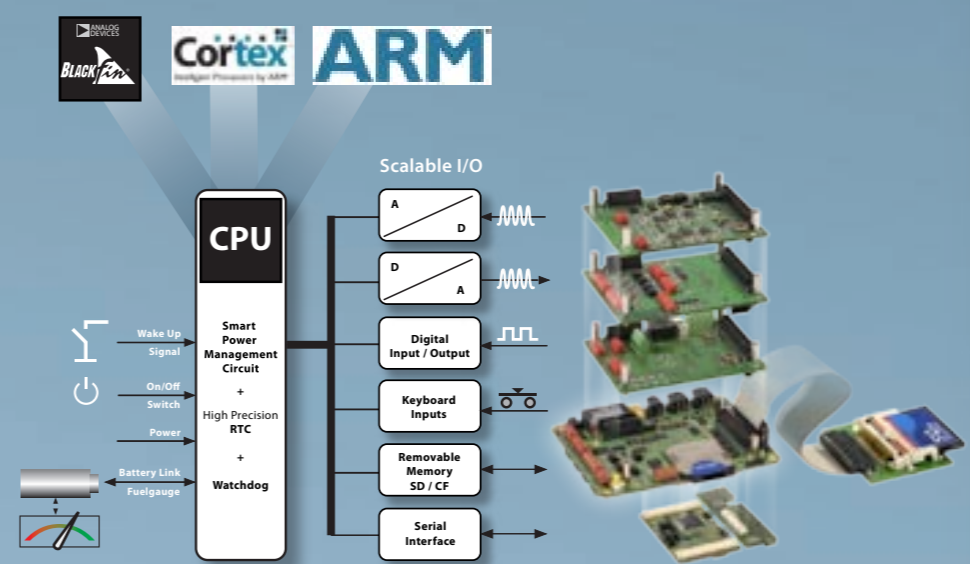
Drag-and-drop and embed at the push of a button



Design your embedded GUI on the PC with standard instruments including buttons, sliders, menus, list-boxes, knobs, images and graphs. Involve management, marketing, operators, and end-users. Develop and test several user interface strategies before downloading the GUI to embedded targets.

## Embedded Hardware

Scalable, modular and low-power for battery operation



Combine field-proven, off-the-shelf, embedded hardware modules within days. Access low-level devices with high-level function blocks. Address external devices using standardized bus systems. Scale CPU-power to gain headroom (multicore, DSP and FPGA). Deploy LabVIEW applications to custom hardware.

# LabVIEW Application Programming

With NI LabVIEW Microprocessor SDK on ADI Blackfin Processors and ARM/Cortex Microcontrollers

- Project Management**
- Working in teams
  - File management
  - PC, Single-Board RIO, Blackfin, ARM/Cortex Targets
  - I/O management
  - Graphical merging
  - Graphical comparison

- Quality Control**
- Live documentation
  - Requirement control
  - Revision control
  - Source code control
  - Automated unit test

- Programming Models**
- A single environment
  - Block diagrams
  - Statecharts
  - Simulation models
  - Embedded "C"
  - Textual math
  - I/O abstraction

- Algorithm Engineering**
- Elementary math (e.g. trigonometry)
  - Linear algebra
  - Fitting, interpolation, extrapolation
  - Integration and differentiation
  - Differential equations
  - Probability and statistics
  - Optimization
  - Geometry
  - Polynomials
  - System identification
  - Waveform generation
  - Waveform measurement
  - Windows and digital filters
  - Spectral analyses and transformations
  - Control design
  - Filter design

- Graphical Debugging**
- Live dataflow visualisation
  - Live I/O updates
  - Breakpoints / Pause
  - Single stepping
  - Probes
  - Realtime on-target debugging
  - Application profiling

- Timing Control**
- Real-time Services in [μs]
  - Graphical multithreading
  - Configurable timings and priorities
  - Thread synchronisation (e.g. semaphores)
  - Buffered intertask communication with real-time FIFOs
  - Synchronous and asynchronous event handling

- Standalone Operation**
- C-Code generation
  - Real-time kernel
  - Fast booting
  - Small memory footprint
  - Deterministic scheduling
  - Bootloader