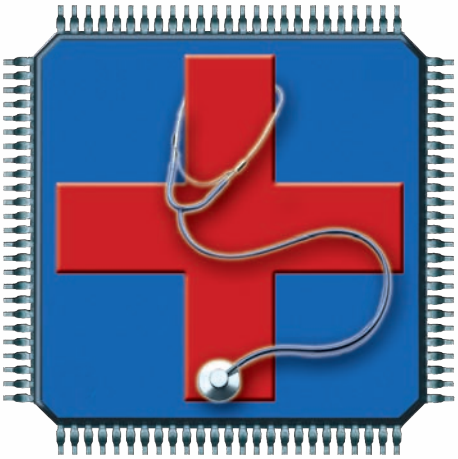
Electronic application solutions

Healthcare



Renesas Electronics
www.renesas.eu

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Introduction

The Healthcare market is increasingly becoming a greater portion of the overall semiconductor market with significant growth expected worldwide.

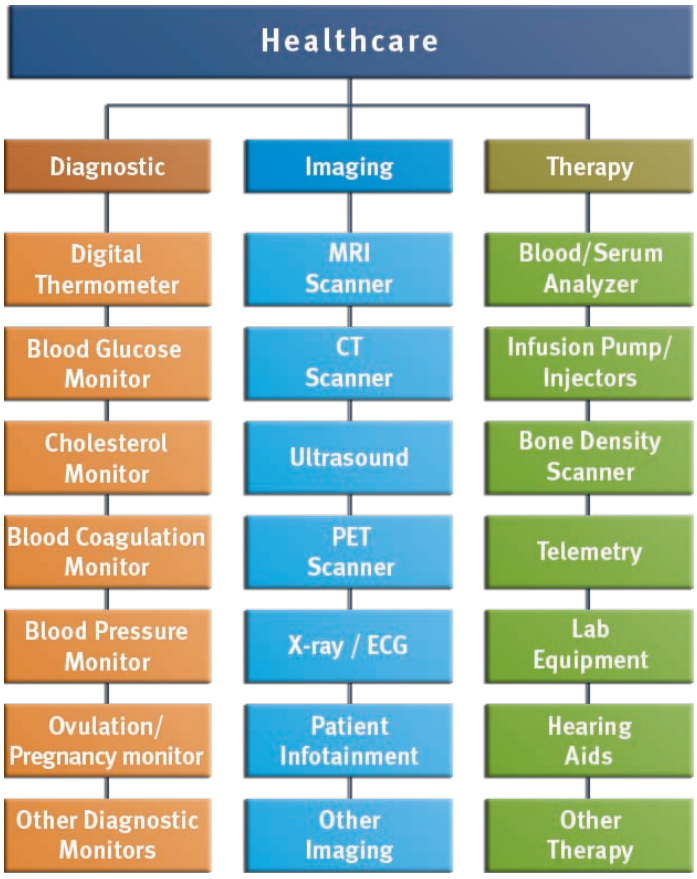
Renesas Electronics recognises that within this market there are multiple applications and many different forces affecting development trends. Some are general trends such as the movement from post care to pre-care, others are legislative trends that have to be adhered too. However, the most important trend is the growing demands of the consumer. This is driving the requirement for more intelligent medical devices, which in turn are demanding the following features:

Performance	• Low Power Consumption • High Speed (MIPS)
Reliability	• Accurate Measurement • High Quality Grades
Enhancements	• Space Saving Packages • Human to Machine Interface (HMI)

As well as providing this within an extensive product range, Renesas Electronics assists your time to market by utilizing our dedicated application team plus infrastructure of application notes, reference designs, software & demo tools.

Healthcare Applications

The key applications within the Healthcare market can be categorized as follows:



Application Requirements

Renesas Electronics, as a solution's provider, offers an excellent mix of technologies:

- ✓ Microcontrollers (8-bit / 16-bit / 32-bit)
- ✓ TFT LCD (Mono/Colour)
- ✓ ASIC (Cell based/Gate Array/ARM)
- ✓ USB2.0
- ✓ MOSFET, Optocoupler & Commodity devices

Diagnostic Requirements

Performance

- Low power consumption for extended battery life
- High CPU performance for monitoring unit
- Flash technology – no volatile data storage for measured data recording
- Connectivity solutions for improving interfaces

Reliability

- High resolution and high speed A/D converters for accurate measurements
- Different quality grades to respond to qualification requirements

Enhancements

- Keypad interface to simplify human body data acquisition
- HMI to improve readability
- Small packages for portable devices

Imaging Requirements

Performance

- High luminance
- High definition
- High contrast

Reliability

- Long term support for Healthcare application requirements
- Wide operating range for intensive use

Enhancements

- Extensive choice of TFT LCDs from small to large sizes
- Monochrome and Color TFT LCD displays

Therapy Requirements

Performance

- High processing speeds for health monitoring applications
- Large memory range for demanding applications
- Abundance of peripherals to meet clinical requirements
- Connectivity solutions for improving communication interfaces

Reliability

- High quality grades for required qualifications
- High resolution A/D converter for accurate measurements

Enhancements

- Monochrome and Color TFT LCD display for monitoring equipment
- Glass LCD controller on board to reduce component costs
- Space saving packages for small design flexibility

Microcontroller Overview

Renesas Electronics **Flash microcontrollers provide solutions that give you the flexibility in peripheral integration needed to meet the design requirements of the Healthcare market.**

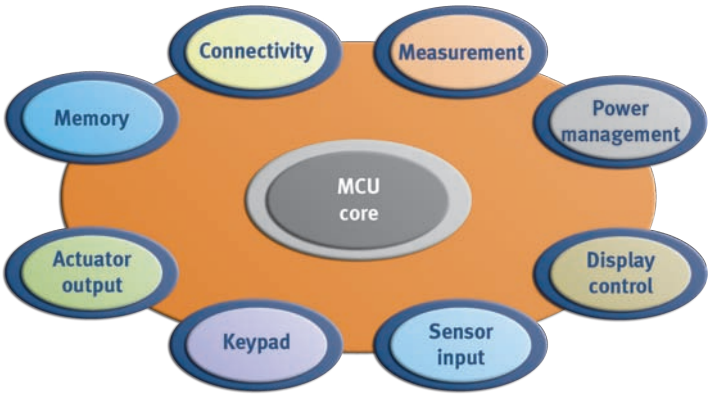
Common solution features versus requirements:

Performance

- Ultra low power microcontrollers: <1 µAmps standby mode (32.768 KHz)
- High performance proprietary CPU
  - 8-bit 2 DMIPS
  - 16-bit 13 DMIPS
  - 32-bit 29 DMIPS with the V850ES core, up to 400 DMIPS with the V850E2 core
- 1.8 V to 5.5 V operation over full industrial temperature range (extended grades available)
- 1 KB to 1 MB of high density, single voltage Flash memory
- Multiple ADC types: 10-bit, 12-bit, 16-bit ΔΣ
- Additional Analog: 12-bit DAC, comparators, opamps, voltage reference
- 30 mAmps GPIO
- Internal oscillators
- Stand-by operation modes with fast wake-up
- CSI, UART, IIC peripheral interfaces
- 8- and 16-bit timer/event counters

Reliability

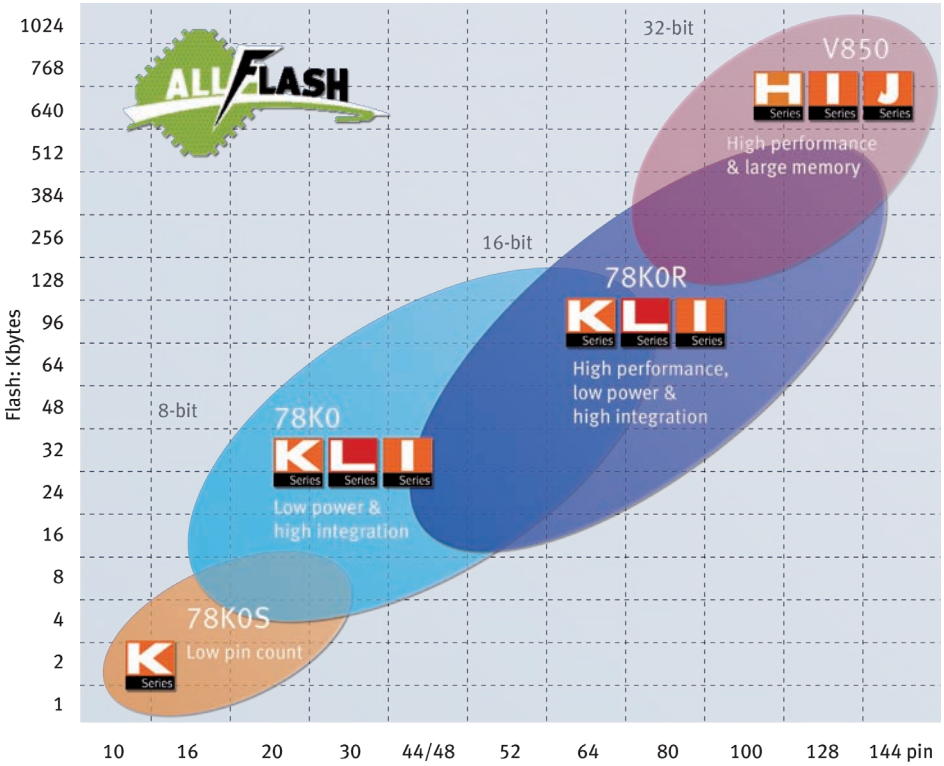
- Improved safety: LVI, POC
- Reliable programming method
- Secure self-programming
- Secure boot loader update
- Flash memory with security features
- High quality and reliability of our products
- Quality management system automotive and standard ISO9001
- Concept of form-fit-function with pin compatibility
- Low EMI noise and high EMS performance



Enhancements

- Space saving packages with the smallest micro: 16-pin, 2 mm x 2 mm
- Human machine interface solutions with Embedded GUI software
- LCD controller/driver up to 400 segments
- Keypad interface decoding
- Audio voice/tone generation & ADCPM middleware
- Wireless software solutions
- Dedicated application notes to support development

Microcontroller Portfolio



Tools & Support

Renesas Electronics MCU products are supported by high quality tools:

- C/C++ IAR compiler for all CPUs as well as the GreenHills Compiler for 32-bit V850 CPUs
- Low cost Starter kits
- On chip debug tools (Minicube)
- Fully featured low cost emulator (IECUBE)
- Dedicated European engineering support

Device Features

Series	CPU	Performance	Flash Memory range	Package range	Description	Peripherals
78K0S/Kx1+	78K0S	1.1 DMIPS @ 10Mhz	1 KB to 8 KB	10-pin, 16-pin, 20-pin, 30-pin	Low Pin Count 8-bit MCU: Inlcuding world's smallest micro	With/without 10-bit ADC, 8 MHz oscillator, PWM, UART
78K0/Kx2-L	78K0	2.9 DMIPS @ 20Mhz	4 KB to 32 KB	16-pin, 20-pin, 30-pin, 44-pin, 48-pin	General purpose, low power 8-bit MCU with good choice of peripherals	8 MHz oscillator, multiplier, ADC, subclock operation
78K0/Kx2	78K1	2.9 DMIPS @ 20Mhz	8 KB to 128 KB	30-pin, 44-pin, 52-pin, 64-pin, 80-pin	General purpose 8-bit MCU with good choice of peripherals	ADC, subclock operation, 16-bit timers, UART/CSI/IIC
78K0/Lx3	78K0	2.9 DMIPS @ 20Mhz	16 KB to 128 KB	48-pin, 52-pin, 64-pin, 80-pin	8-bit MCU with LCD controller up to 288 segments	10-bit SAR ADC and 16-bit ΔΣ ADC
78K0R/Kx3-L	78K0R	16.9 DMIPS @ 20Mhz	16 KB to 64 KB	44-pin, 48-pin, 52-pin, 64-pin	High performance, low power 16-bit MCU with abundance of peripherals	Timer array, serial array, ADC & DAC, multiplier, external bus interface, DMA
78K0R/Kx3	78K0R	16.9 DMIPS @ 20Mhz	64 KB to 256 KB	64-pin, 80-pin, 100-pin	High performance 16-bit MCU with abundance of peripherals	Timer array, serial array, ADC & DAC, multiplier, external bus interface, DMA
78K0R/Lx3	78K0R	16.9 DMIPS @ 20Mhz	64 KB to 128 KB	80-pin, 100-pin, 128-pin	Analog rich 16-bit MCU with LCD controller up to 400 segments	12-bit SAR ADC, 12-bit DAC, Opamps, voltage regulator
V850ES/Hx3	V850	29 DMIPS @ 20Mhz	128 KB to 512 KB	64-pin, 80-pin, 100-pin, 144-pin	5 V High performance 32-bit MCU, multi-chanel ADC	Multiple serial interface, POC, LVI, DMA, MUL
V850ES/Jx3-L	V850	29 DMIPS @ 20Mhz	128 KB to 256 KB	80-pin, 100-pin	3 V High performance 32-bit MCU, high speed operation	DMA, external bus interface, ADC DAC, LVI, POC, MUL, DIV
V50ES/Sx3	V850	29 DMIPS @ 20Mhz	256 KB to 1 MB	100-pin, 144-pin	3 V High performance 32-bit MCU, high memory range	DMA, external bus interface, ADC DAC, LVI

TFT Technology

Renesas Electronics **believes that "superior equipment demands a superior TFT".**

To meet the diverse needs of the huge range of healthcare TFT applications - panel computers, programmable displays, measurement instruments, multimedia terminals, high-end monitors and other medical applications – Renesas Electronics offers an extensive product lineup.

	3.5	5.5	5.7	6.5	7	8.4	9	10.4	12.1	15.0	15.3	19.0	20.1	21.3
QVGA 320 x 240	NL2432 HC22-40J	NL3224 BC25-20												
VGA 640 x 480			NL6448 BC18-01	NL6448 BC20-21D		NL6448 BC26-08D		NL6448 BC33-74						
WVGA 800 x 480					NL8048 BC19-02		NL8048 BC24-04							
SVGA 800 x 600						NL8060 BC21-02		NL8060 BC26-28	NL8060 BC31-20					
XGA 1024 x 768				NL10276 BC13-01		NL10276 BC16-01		NL10276 BC20-04	NL10276 BC24-19D	NL10276 BC30-17				
WXGA 1280 x 768						NL8060 BC21-02		NL8060 BC26-27	NL8060 BC31-20		NL12876 BC26-25			
SXGA 1280 x 1024 (1 M pixels)						NL6448 BC26-08D		NL6448 BC33-53				NL128102 BM29-08		
UXGA 1600 x 1200 (2 M pixels)														NL160120 AM27-13A
QXGA 2048 x 1536 (3 M pixels)														NL204153 AM21-07A
QSXGA 2560 x 2048 (5 M pixels)													NL256204 AM15-03A	

Note: for detailed specifications, please visit www.eu.necel.com/displays

Benefits and features of Renesas Electronics' TFT solutions

Performance	• High luminance • High definition • High contrast • Quick response
Reliability	• Long term support for healthcare applications requirements • Wide operating range for intensive use
Enhancements	• Extended choice of small to large colour TFT LCDs • Ultra-wide viewing angle, reduced color shift • Monochrome and colour TFT LCD's

Advanced SFT Technology

- Enhanced transmissive panels
- Standard screen resolution
  - QSXGA: Quantum Super XGA
  - QXGA: Quantum XGA
  - UXGA: Ultra XGA
  - SXGA: Super XGA
  - XGA: eXtended Graphic Array
  - VGA: Video Graphic Array
  - SVGA: Super VGA
  - SFT: Super Fine TFT

Application	Screen size	Part Number	Resolution	Display color	Lumination	Contrast	Viewing angle	Interface
Mammography	20.1 inch	NL256204AM15-03A	2560 x 2048	766 gray scales	850 cd/m²	600:1	88º U/D/R/L	4 port LVDS LCR
MRI, CT	21.3 inch	NL204153AM21-07A	2048 x 1536	766 gray scales	1450 cd/m²	900:1	88º U/D/R/L	4 port LVDS LCR
MRI, CT	21.3 inch	NL160120AM27-13A	1600 x 1200	766 gray scales	1650 cd/m²	850:1	88º U/D/R/L	2 port LVDS LCR
X-ray	19.0 inch	NL128102BM29-08	1280 x 1024	766 gray scales	1000 cd/m²	900:1	88º U/D/R/L	2 port LVDS LCR
Patient monitor	15.0 inch	NL12876BC26-25	1280 x 768	16,777,216 colors	470 cd/m²	700:1	88º U/D/R/L	1 port LVDS RGB
Patient monitor	15.0 inch	NL10276BC30-17	1024 x 768	16,777,216 colors	350 cd/m²	700:1	88º U/D/R/L	1 port LVDS RGB

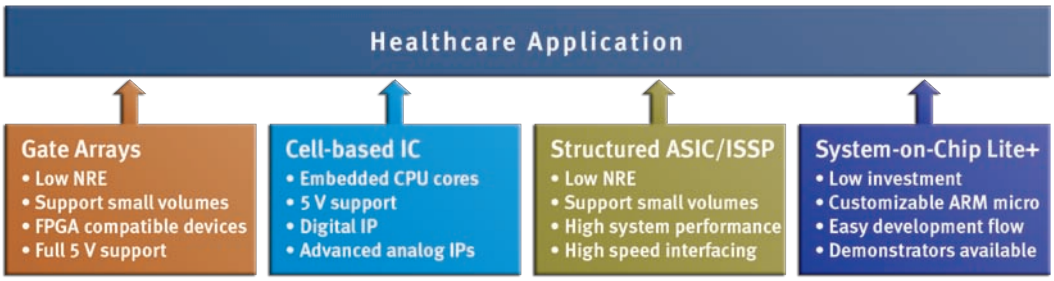
Other Key Products

ASIC

Using ASIC technology allows customers to integrate exactly those functions that ideally suit their equipment, making use of the benefits of the underlying process technology (e.g. low-power, high-speed, etc).

- Own wafer production for all ASIC technologies
- High-speed measurement and data manipulation for advanced diagnostics
- Networking for laboratory equipment
- HMI and diagnostic controls
- Laboratory equipment
- Data encryption (e.g. patient data handling)

www.renesas.eu/asic



USB2.0

RENESAS ELECTRONICS is the market leader in providing USB2.0 certified devices, as well as having industry leading data transmission rate and power consumption levels, we also provide reference design to reduce development time.

Product line up:

- Host controllers
- Hub controllers
- IDE bridges
- Function controllers
- Wireless USB (hub & host)

www.renesas.eu/usb

Power MOSFET

RENESAS ELECTRONICS solutions reflect our extensive engineering expertise and our comprehensive insight into our customers' applications to reflect the numerous power management functions found in healthcare market.

- Portfolio contains over 750 devices
- Complete range from low voltage to high voltage MOSFET
- All popular packages available including ultra small packages, high current packages and bare die
- Class leading UMOS4 process featuring ultra low on-resistance, lower gate charge and lower leakage current

www.renesas.eu/mosfet

Opto-Electronic devices

RENESAS ELECTRONICS offers over 400 different optocoupler devices to provide optimal performance, reliability and quality to meet the requirements of many healthcare/medical instruments.

- 3.3 V operating Voltage
- High CMR: 15 KV/us min
- High speed CMOS output
- Smallest package: Flat lead

www.renesas.eu/opto

Microwave Devices

RENESAS ELECTRONICS provide solutions in both discrete and packaged high frequency microwave devices suitable for various communication systems.

- IC products: Amplifiers, convertors, switches, transceivers
- Discrete products: Low noise bipolar SiGeHBT Power transistor / MOSFET
- MCM: Push-pull amplifiers, power doubler amplifiers

www.renesas.eu/microwave

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