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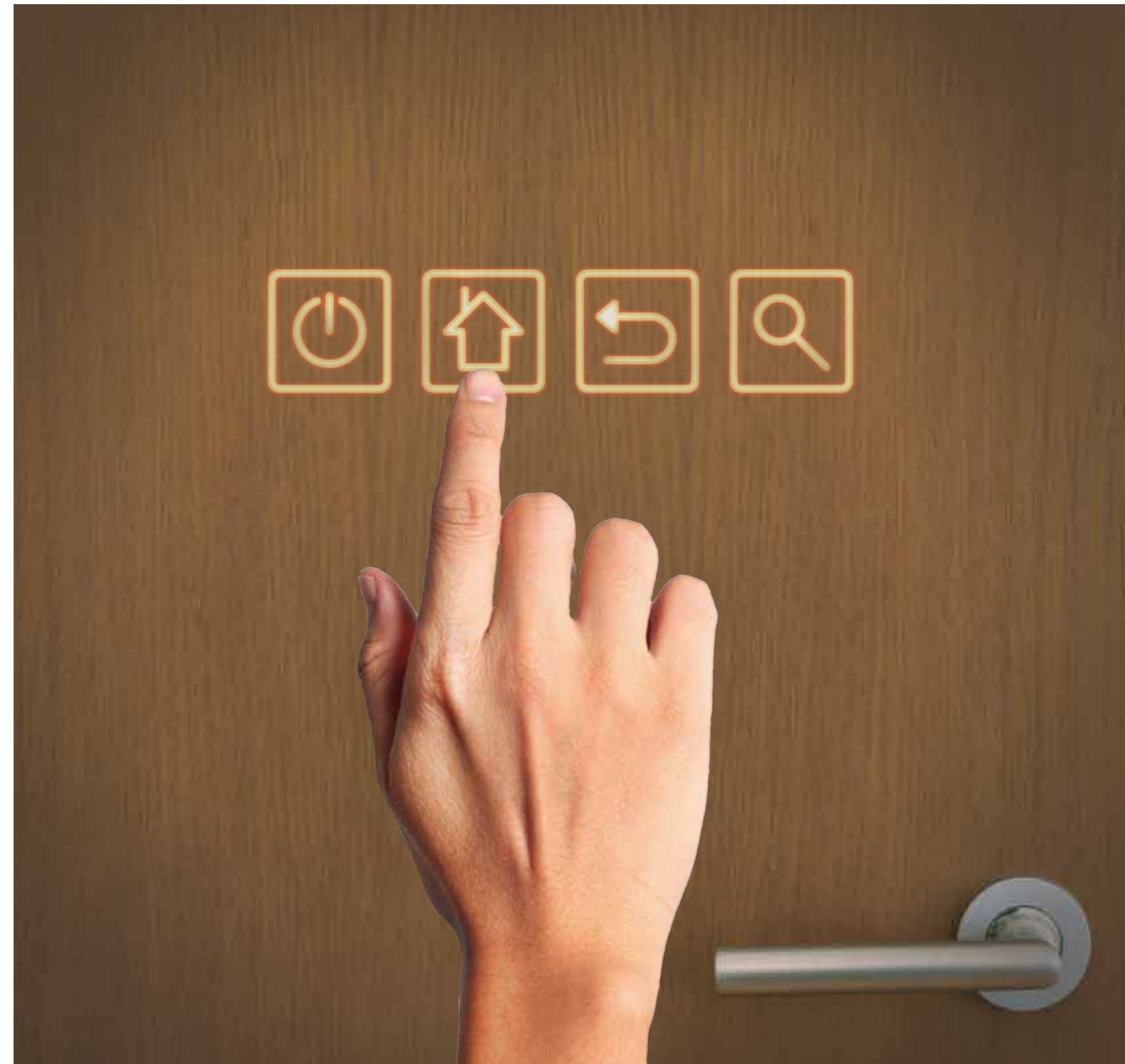
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瑞萨电子电容式触摸按键解决方案



瑞萨电子第二代电容式触摸按键解决方案

为日益普及、发展的人机交互界面(HMI)触摸按键提供最佳解决方案

随着网络在家用电器等住宅设备中日益普及，普适计算的概念已经渗入到我们的日常生活中。与此同时，沟通人和机器的人机交互界面（HMI）进入快速发展时期，其中电容式触摸的发展尤为迅速。电容式触摸可以根据各种应用需求更直观地实现复杂的操作，如用户可以通过滑动手指来轻松调控音量大小等，因此已成功取代了很多传统的功能单一的机械式开关。

但是，想要实现更高的灵敏度和高抗噪性，确保一定的容错率，在潮湿环境下触摸也能正常操作等，开发周期和成本是最大的壁垒。

瑞萨电子推出第二代电容式触摸按键解决方案可以帮助您降低开发电容式触摸的门槛，同时还能为您开发高附加值产品提供更全面的支持。

电容式 触摸 界面

广泛应用于更多领域的电容式触摸界面

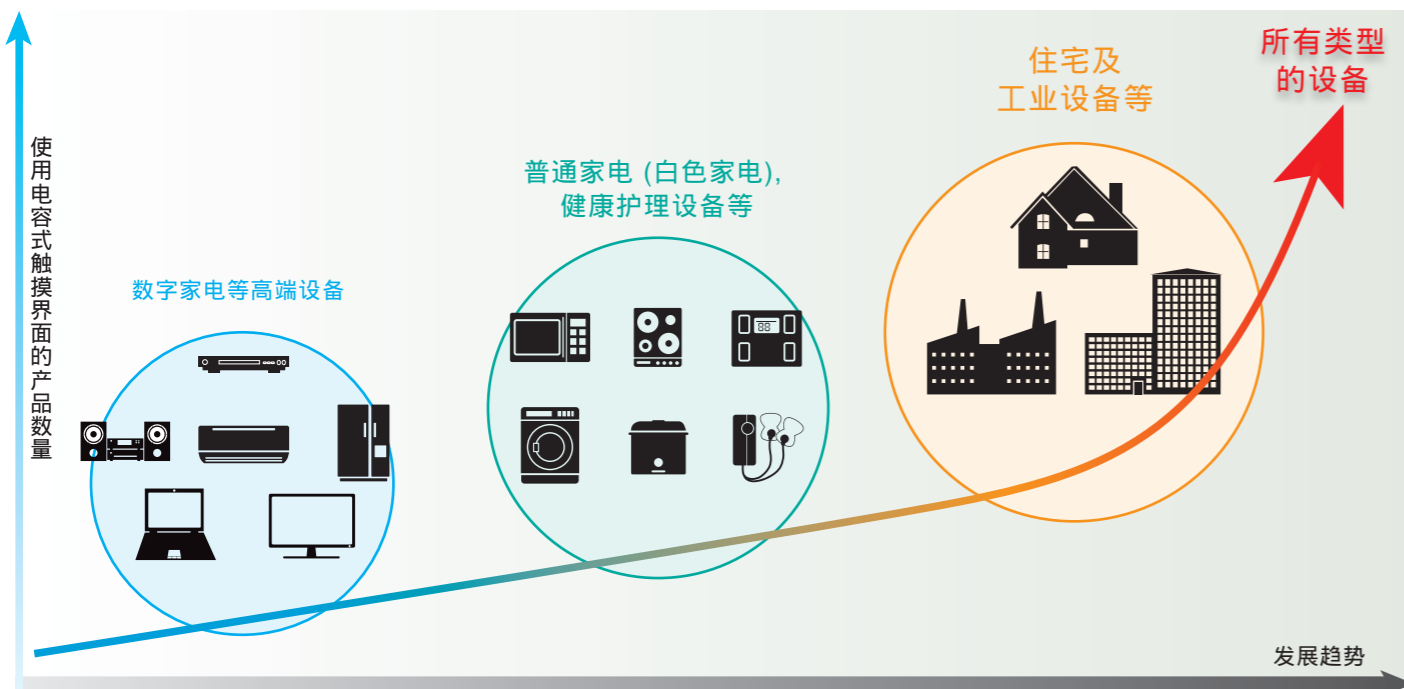
日常生活中，各种各样的家电产品、住宅设备为我们的生活带来的便利。这些设备越来越先进，功能也越来越强大。如果没有更强力的人机交互界面（HMI）支持，将很难操控这些功能。这也是电容式触摸界面备受关注的主要原因。通过电容式触摸界面技术，用户可以更直观地操控设备，并能激发出现有设备的潜在功能。

■对电容式触摸界面引领新应用、开拓新市场寄予厚望

近年来，电容式触摸按键的应用领域增长迅速。最初，只是应用在功能复杂、要求美观的高端数字家电产品中。而近几年，触摸按键已经逐渐扩展到“白色家电”等普通家电和医疗保健设备上。

此外，由于电容触摸界面具备防尘防湿等优势，不仅仅是住宅和工业领域的设备，未来在所有设备上都会出现电容触摸界面。

■嵌入式设备中的电容式触摸界面的应用增长迅速



■替代传统机械开关，触摸按键可以支持不同类型的界面形式



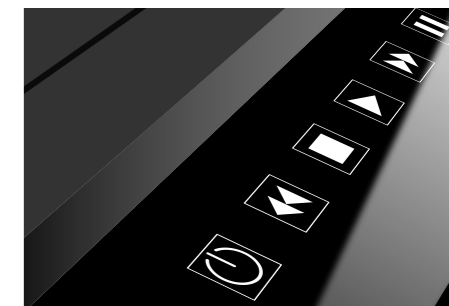
电容式 触摸界面 的优势

电容触摸界面：帮您控制成本、产生更高的附加价值

将电容触摸系统整合入嵌入式设备不仅可以支持更多先进功能，还能带来更多的优势。它具备可以降低生产成本、提供更好的环境适应能力、以及提高设计性、便于清洁等优势，因此备受用户青睐。

■通过减少零部件数量来降低成本

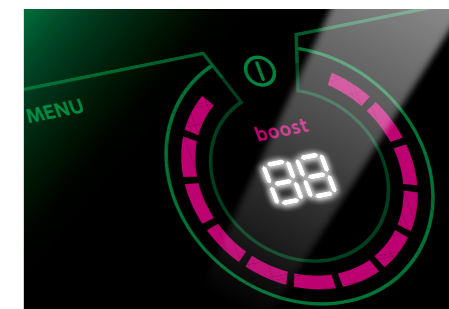
以往当产品的功能越强的时候，需要的控制零部件的数量就越多，从而导致零部件成本和组装成本上升。使用触摸按键后，大幅度简化了产品的机械结构。同时不需要使用弹簧、塑料零件、金属电极等零部件，可以减少零部件数量，从而降低整体成本。



结构简单、功能多样、易于操作

■容易清洁、减少故障

组装机械零部件时必然会有缝隙，容易进灰尘和水。而使用触摸按键时表面是整体平面，可使用抹布轻松清洁。与机械按键相比，触摸按键的防尘防湿能力也有本质性提高，在频繁使用时也不易出现故障。



平板结构、防尘防湿

■轻松实现更美观的设计

触摸按键可以轻松融入产品外观，为设计带来更多灵活性。当为产品增加新功能时，无需再添加各种复杂的轮盘型、按键型或滑动型的机械控制器。电容触摸界面能够将美观设计和方便使用融为一体，实现真正具有高附加值的人机交互界面（HMI）。



各种按键、整齐划一

瑞萨电子 最新 电容式触摸 技术特点

专为高级电容式触摸界面开发准备的开发支持工具

瑞萨电子电容式触摸应用微控制器提高了接触检测电路的灵敏度和噪声容错能力，允许使用不同材质制作电容式触摸面板外表面，例如树脂、玻璃、纤维材料和石材。由于不再受材质的限制，不仅仅是传统的家用电器（白色家电），家庭和工业用设备等更多的产品都可以使用触摸面板。例如嵌入墙面的灯光控制器，不受环境影响的玻璃控制面板，或者是需要高水平防尘防湿的机器控制面板，亦或是需要在厨房中、水槽旁等潮湿环境使用的产品。

高灵敏度和噪声容错能力

瑞萨电子全新的电容式触摸技术能够在各种情况下保证更好的可靠性。例如，可以支持10mm厚的树脂或木质面板，完全可以放心使用到有厚门或者隔墙的家用设备上。同时还能支持最大30cm的接近传感（悬浮操控），对于卫生和安全具有重大意义。瑞萨电子产品的噪声容错能力可在5mm厚的树脂面板情况下满足IEC 61000 4-3/4-6级-3标准。即使有小的传感误差，也能确保可靠操作。

支持更多的外表面材料和更大的厚度

外表面材料	上一代电容触摸系统	新一代电容触摸系统
玻璃	可以	可以
树脂	可以	可以
木材（干燥）	不可	可以
空气	不可	可以

同时支持“自电容”和“互电容”两种检测方式

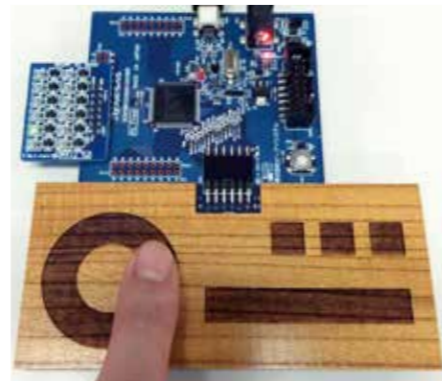
瑞萨电子全新的电容触摸技术不仅支持传统的“自电容”检测方式还能支持“互电容”检测方式。互电容拥有一个传输节点和一个接受节点，组成一组产生电磁场，而在两个节点中的电磁场变化可以被检测到。使用这种检测模式时，即使有水溅到面板表面上也很难改变电磁场，因此在潮湿的环境下也能放心使用。

自电容检测模式和互电容检测模式的特点

	自电容	互电容
电路图	好：简单	不好：比自电容的复杂
基板成本	好：便宜	不好：比自电容贵
防水性能	不好：弱	好：强
矩阵检测	不好：受限制	好：可以实现

使用开发支持工具简化开发流程

电容式触摸界面开发过程中最棘手的问题是调节灵敏度。瑞萨电子全新的电容式触摸技术使用自动按键灵敏度校准软件Workbench6来帮助开发人员通过GUI精确调整按键灵敏度参数。开发流程包含以下步骤：设置→参数计算→修正源程序中的参数→生成。该流程高度自动化，极大地减少了开发工作量。



可以支持木质面板



可以用作浴室控制面板



带有直观GUI的灵敏度自动校准工具 Workbench6

新电容式触摸系统开发工具

即使初次尝试也能轻松开发。可以帮助您减少开发工作量并缩短开发时间。

Workbench6 (自动按键灵敏度校准软件)

第1步 选择MCU品名、检测方式（自电容、互电容）、开发环境。



链接

MCU开发环境 CS+ or e² studio

连接目标电路板



开始自动校准灵敏度

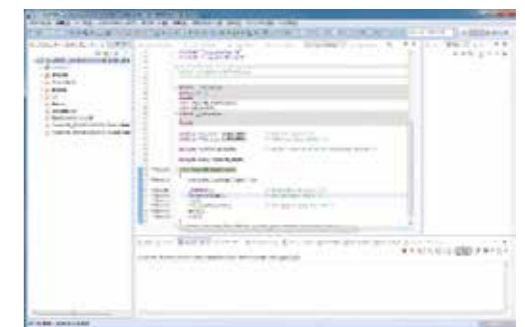
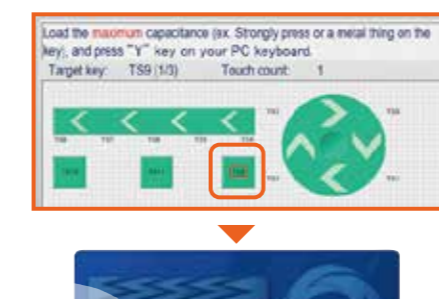


生成用Workbench6
调整了灵敏度的
源代码!

第2步 在PC上用简单拖放决定设计。



第3步 按照指南，设计各个触摸按键的电极。



瑞萨电子 电容式触摸 解决方案 阵容

瑞萨电子用丰富的解决方案满足您的不同需求

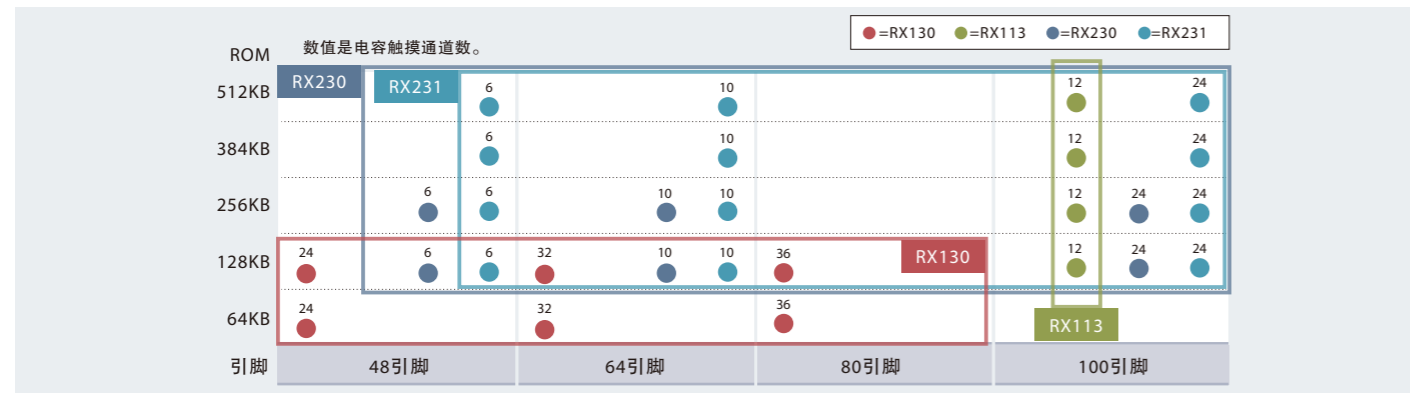
在以往的R8C或者RL78电容式触摸解决方案之外，瑞萨电子还将为您提供了一系列带有最新一代电容式触摸技术模块的微控制器。瑞萨电子用丰富多样的解决方案来满足您的不同需求。

瑞萨电子电容式触摸解决方案路线图



产品线

- 针对不同系统对电容式触摸通道和安装面积的需求，瑞萨电子可以提供从48引脚到100引脚的产品。
- 针对不同系统控制需求，瑞萨电子可以提供64KB到512KB的片上ROM。



产品概述

RX113

第一款RX系列微控制器内置电容触摸按键和LCD 控制/驱动器。
(64引脚-100引脚, 128KB-512KB)
备注: 64引脚产品不支持电容触摸按键

RX113系列支持12 通道电容式触摸按键及最大40 seg × 8 com LCD 控制/驱动器。改进了电容式触摸按键检测方式，比上一代的噪声容错和灵敏度调整有大幅提升。此外，还内置了USB2.0（全速和低速）和片上12位D/A转换器，单芯片即可支持可穿戴设备或医疗健康产品。RX113系列也可以应用于家电和工业检测设备的用户界面。

■RX113 系统框图



RX231

高性能32位 CPU核和DSP/FPU功能外加低功耗性能的最佳组合。同时还配备 SDHI、CAN、USB通信功能和业界最强安全功能，是您在物联网（IoT）领域的不二之选。
(48-100 引脚, 128KB-512KB)

RX231系列配备高性能的32位RXv2 CPU核和增强型DSP/FPU功能，外加低功耗科技，可谓真正达到了完美的功效比。该系列能在一些低电流应用如工业传感器或表计设备中实现高负荷处理和数字滤波。同时该系列的触摸面板功能，配合SD卡主机接口（SDHI）、CAN和USB通讯功能以及业界最强安全功能是物联网（IoT）应用的不二之选。RX231系列适合应用于工业控制、家电、健康医疗、智能仪表和物联网领域。

■RX231 系统框图



■应用实例：使用RX113的计量设备系统框图



产品概述

RX230

高性能32位Rxv2 CPU核，增强的DSP/FPU功能，配合低功耗，不愧是最佳组合
(48 - 100 引脚, 128KB - 512KB).

RX230系列优化集成了Rxv2 CPU核、增强版DSP/FPU及低功耗技术，具有很高的功效比。该系列能够实现高负载处理和数字滤波，可有效应用于工业传感器和计量设备等低电流场景。如果您需要开发5V供电的家用或工业项目，并且需要外部总线和电容触摸按键支持，RX230系列将是您的最佳选择。

RX230 系统框图



RX130

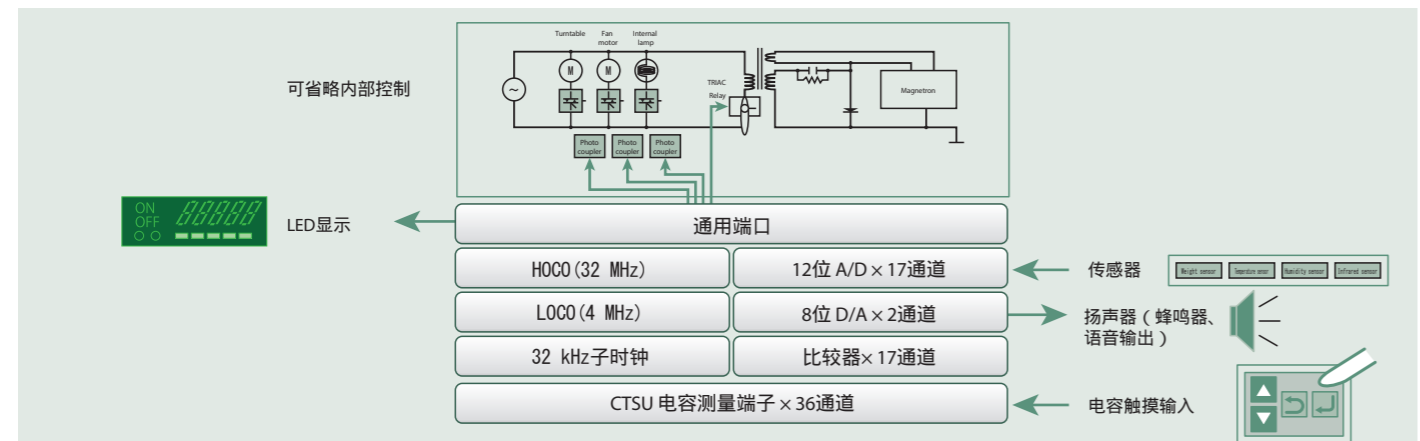
RX系列微控制器，内置触摸面板功能，支持5V供电，性能优秀。
(48 - 80 引脚, 64KB - 128KB).

RX130系列闪存具有64KB和128KB两种，封装有48引脚、64引脚和80引脚3种。这是第一款支持5V供电的RX100系列产品，并且具有很强的噪声容错和抗噪声能力。特别适合应用于一些靠近噪声源的设备，如电磁炉、微波炉或者工业设备。较小的ROM和少引脚，是您在开发低成本电容式触摸按键应用时的最佳选择。

RX130 系统框图



应用实例：使用RX130的微波炉系统框图



电容式触摸
传感系统
介绍网站

http://www.renesas.com/applications/key_technology/human_interface/touch_sensor_top/index.jsp

您可以在这个网站中找到有关电容式触摸解决方案的最新信息，还可以轻松翻阅数据手册 (Data sheet) 和用户手册 (User Manual) 及了解其他相关内容。

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Capacitive Touch Sensor System

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Applications Overview

Key Technology Human Interface

Capacitive Touch Sensor System

Overview

Capacitive touch sensor systems are typical human machine interfaces (HMI) which operate by detecting changes in electrostatic capacitance produced by the touch of a finger or other conductor.

The use of capacitive touch technology can easily improve reliability in product design, and enhance the end-user experience. It also enables manufacturing costs to be lowered, so the use of capacitive touch technology is being rapidly adopted in recent years in a wide range of fields such as household appliances (white goods), healthcare devices, and other electric and electronic equipment.

There is a demand for the semiconductor components used in a capacitive touch sensor system to be more compact, lower in cost, use less power, and deliver better performance. Single-chip solutions combining a touch sensor IC to detect touch events and a microcontroller to receive detection data and control the system are becoming popular.

As a leader in the global microcontroller (MCU) industry, Renesas launched its R8C/3xT Series of MCUs supporting capacitive touch interfaces in October 2009, thus contributing to the proliferation of touch sensor systems. Renesas expects strong growth in the market for touch sensor systems and intends to be a key player with technology and products supporting HMI applications.

Second-Generation Capacitive Touch Technology NEW!

First-Generation Capacitive Touch Technology

Roadmap

First-Generation Cap Touch IP (TSCU: Touch Sensor Control Unit)

Used in over 200 end products!

RBC/38T-A
RBC/36T-A
RBC/3JT
RBC/33T

Up to 5 channels of cap touch realized by RL78 MCU and software

NEW!!

Second-Generation Cap Touch IP (CTSU: Capacitive Touch Sensing Unit)

Improved sensitivity! Support for mutual capacitance! Tool for automatically adjusting cap touch sensitivity is available!

Next MCU

RX113

Number of cap touch

'09~'13 '14 '15~ Year

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