致尊敬的顾客

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NEC电子公司与株式会社瑞萨科技于2010年4月1日进行业务整合（合并），整合后的新公司暨“瑞萨电子公司”继承两家公司的所有业务。因此，本资料中虽还保留有旧公司名称等标识，但是并不妨碍本资料的有效性，敬请谅解。

瑞萨电子公司网址：http://www.renesas.com

2010年4月1日
瑞萨电子公司

【发行】瑞萨电子公司（http://www.renesas.com）

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M37546产品群

32引脚

特性：

- 最短指令执行时间：0.25μs （8MHz，倍速模式）
- 上电复位功能/低电压检测功能
- 内嵌振荡停止检测电路
- 按键唤醒功能：8通道
- LED驱动端口：14通道
- 工作电压：
  - 1.8V – 5.5V（片上振荡器，高速模式）
  - 2.2V – 5.5V（2MHz，高速模式）
  - 2.4V – 5.5V（4MHz，高速模式）
  - 4.0V – 5.5V（8MHz，高速模式）
- 低功耗
  - 使用片上振荡器为时钟源可以降低功耗
  - 进入STOP或WAIT模式
- 温度范围：-20 ～ 85°C

产品扩展：ROM/RAM容量

- M37546G2（8K/384）
- M37546G4（16K/512）

应用：

- ☑ 小家电
- ☑ 消费品
- ☑ 工业设备
- ☑ PC外围 & OA设备

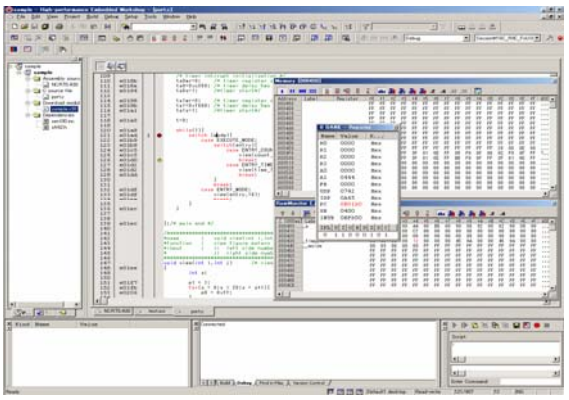
740 CPU	8位定时器：2个
QzROM （8/16K字节×8位）	16位定时器：2个
RAM （384/512字节×8位）	输入捕捉：2通道
监视定时器	串行接口 UART/同步：2通道
主时钟电路 片上振荡器	10位A/D：6通道
低电压检测电路	输出比较：4通道
中断： 18个源，16个向量	上电复位电路
I/O：25	

开发工具—集成开发环境（IDE）

High-performance Embedded Workshop (HEW)：

功能：

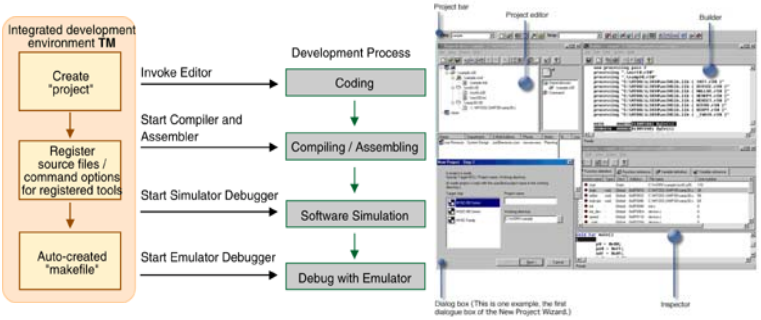
- 项目管理
- 代码编辑、编译-ICC740、汇编-SRA740、链接
- 软件仿真调试—Simulator Debugger
- 外部仿真工具支持，如E8，M38000T2-CPE
- 自动更新等辅助功能



TM ：瑞萨集成开发环境

功能：

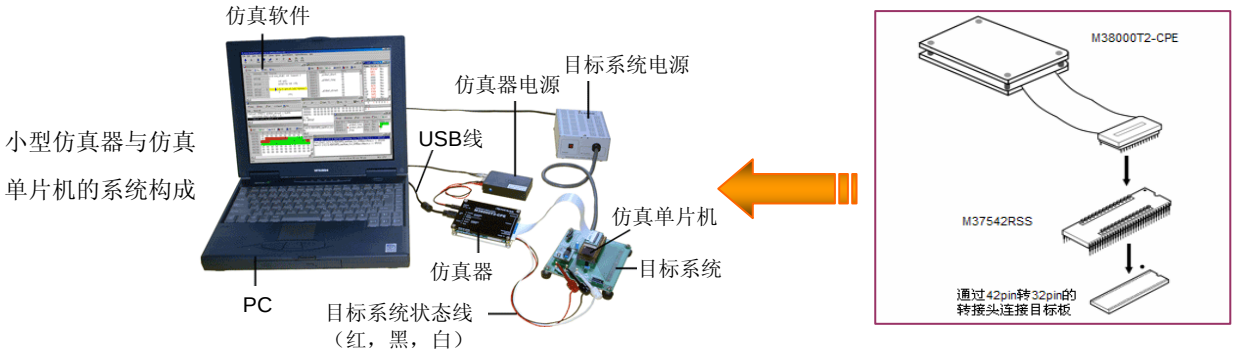
- 项目管理
- 代码编辑、编译、汇编、链接
- 模拟调试程序—M3T-PD38SIM
- 仿真调试程序—M3T-PD38M



开发工具—仿真和调试

- 小型仿真器-M38000T2-CPE：用于740族MCU的仿真功能
  - 实时跟踪，硬件断点，实时RAM监测
  - USB通讯接口
  - 结构紧凑，价格低廉

- 仿真单片机M37542-RSS与M38000T2-CPE组成M37546仿真系统



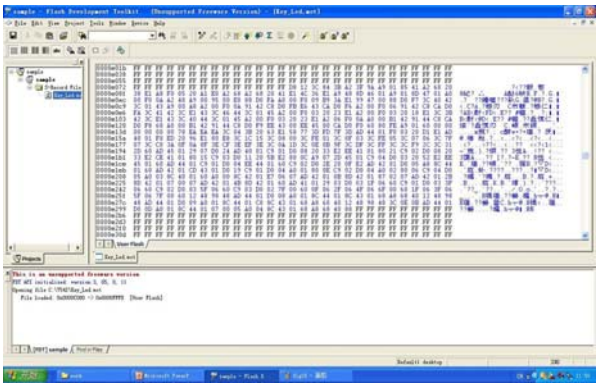
开发工具—Flash Development ToolKit（FDT）

Flash Development ToolKit

是瑞萨公司提供的一款Flash/QzROM单片机专用烧录软件包。

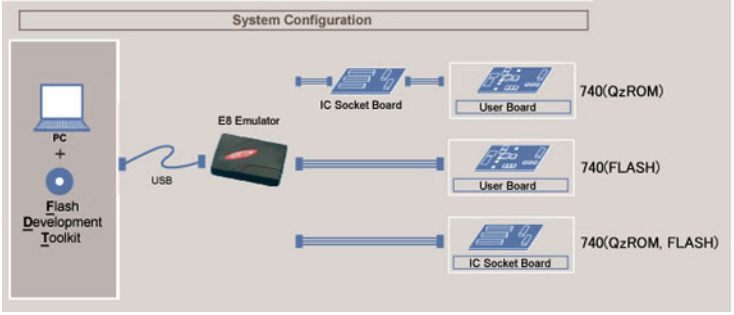
特点：

- 无须单独的编程电源（E8供电）
- 界面友好，操作简单
- 器件保护功能
- 支持文件格式Mot，Bin



FDT烧录系统组成示意图：

- 通过E8和IC-Socket板实现M37546的烧写；
- IC-Socket板提供QzROM烧写电压和芯片插座。



开发工具—彗星编程器

http://www.suisei.co.jp

简单方便的操作

- 把编程器的主体和串行接口单元组合到一起，用连接线缆和用户目标板连接，即可实现程序的在板写入（**On-board Programming**）；
- 结合MCU单元，即使没有用户目标板，同样能够模拟在板写入的工作状态实现芯片的写入。

灵活的扩展功能

- MCU单元制作简单、经济，因此能够迅速实现对新型MCU的支持。

EFP-RC支持脱机操作

- EFP-RC是在EFP-S2的基础上制作的支持脱机工作的QzROM编程器。
- 内置Flash，结构紧凑，能保存两个以上的.HEX文件、操作简单。

EFP-RC

EFP-S2

EFP-S2V

EFP-I

开发工具—河洛编程器

http://www.hilosystems.com.tw

功能特点：

- **支持多种文件格式**

  —Bin｜Hex｜Mot｜ASCII-Hex

- **程序追加写入**

  —对芯片追加烧写时，首先执行对芯片的读操作，把已有程序读到编程器的Buffer区，再把要下载的程序追加写入到Buffer区，进行Program操作即可。

- **适于量产使用**

  —有【 AUTO 】按钮，可对其进行编辑，实现对芯片可设定的批处理操作。

- **器件保护功能**
- **控制界面友好，操作简单**

ALL-11A

ALL-100

开发工具—西尔特编程器

http://www.xeltek.com/home.php

功能特点：

- **界面友好易操作**

  —选择芯片后，有关于保留区域和保护位的提示信息。

- **支持多种文件格式**

  —Bin | Hex | Mot | POF | Tektronix | Extern Tektronix

- **适于量产使用**

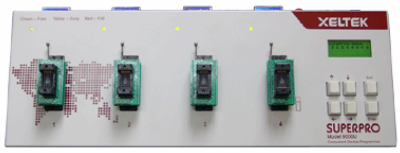
  —量产模式时只需进行插拔芯片的操作即可。

- **程序追加写入**

  —对芯片追加烧写时，首先执行对芯片的读操作，把已有程序读到编程器的Buffer区，再下载要追加的程序也到Buffer区，进行Program操作即可。

- **支持脱机工作方式**

  —适于生产现场编程。

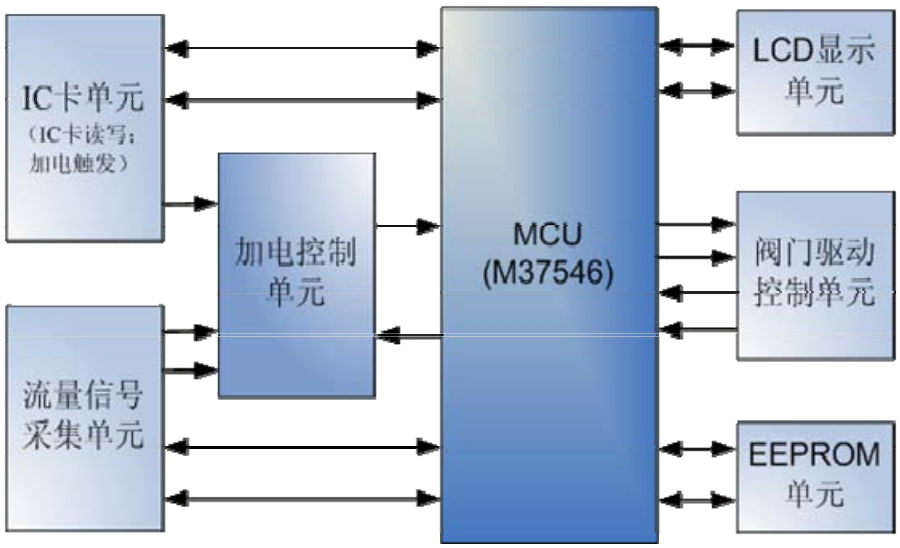


SP9000u

SP3000u

智能水表功能原理框图

- ☑ 基本计量功能
- ☑ LCD显示功能
- ☑ 追加购水功能
- ☑ 二级报警功能
- ☑ 欠费断水功能
- ☑ 余额查询功能
- ☑ 数据采集功能
- ☑ 透支存储功能
- ☑ 节电功能



M37546资源分配

I/O口分配

IO口	功能		IO口	功能
P00	空闲		P20	阀门驱动端口
P01	流量检测端口		P21	
P02			P22	
P03			P23	
P05	空闲		P24	空闲
P04	IC卡读写端口		P25	低电压检测端口
P06			P30	EEPROM读写端口
P07			P31	
P10			P32	
P11	电源保持端口		P33	空闲
P12	LCD驱动端口		P34	
P13			P37	
P14				

定时器A

- 用于控制LCD显示时间和系统掉电时间。

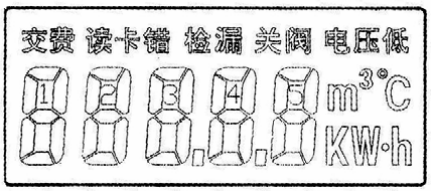
智能水表功能实现

流量计：

- 两根干簧管和一块小磁铁配合构成流量计；
- 磁铁转动一圈，两根干簧管各闭合一次为一次完整流量；
- 干簧管闭合触发系统加电。

LCD：

- 段码LCD面板如右图所示；
- LCD电路板自带HT1621驱动芯片；
- 加电后显示水表状态、用户剩余量。



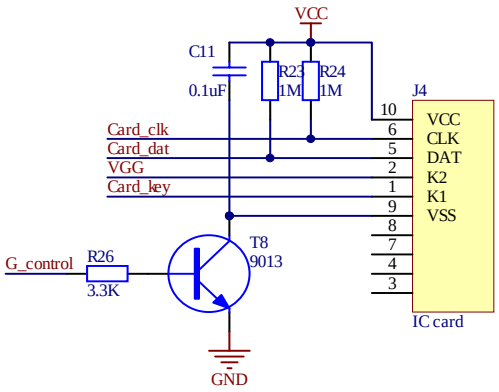
阀门驱动：

- 两个IO口组合控制阀门电机的开/关；
- 两个IO口检测阀门的开/关到位信号；
- 欠费关阀，限制用水；
- 关阀提醒用户购水（插卡开阀）。

智能水表功能实现

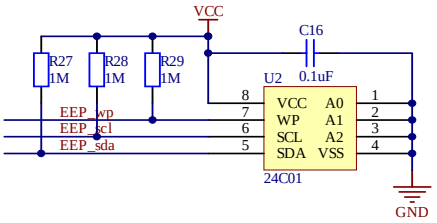
❍ **IC卡读写：**

- IC卡读写电路如右图所示；
- 使用ATMEL24C02接触式存储卡；
- 接受用户卡以及各种功能管理卡；
- 控制卡片数字地，防止IC卡口意外短路；
- 插卡触发系统加电。



❍ **EEPROM读写：**

- EEPROM读写电路如右图所示；
- 使用ATMEL24C01 EEPROM存储芯片；
- 存储水表参数、状态，用户账户参数、状态。



智能水表样机系统参数

用到的MCU资源：

RAM：260

ROM：7K

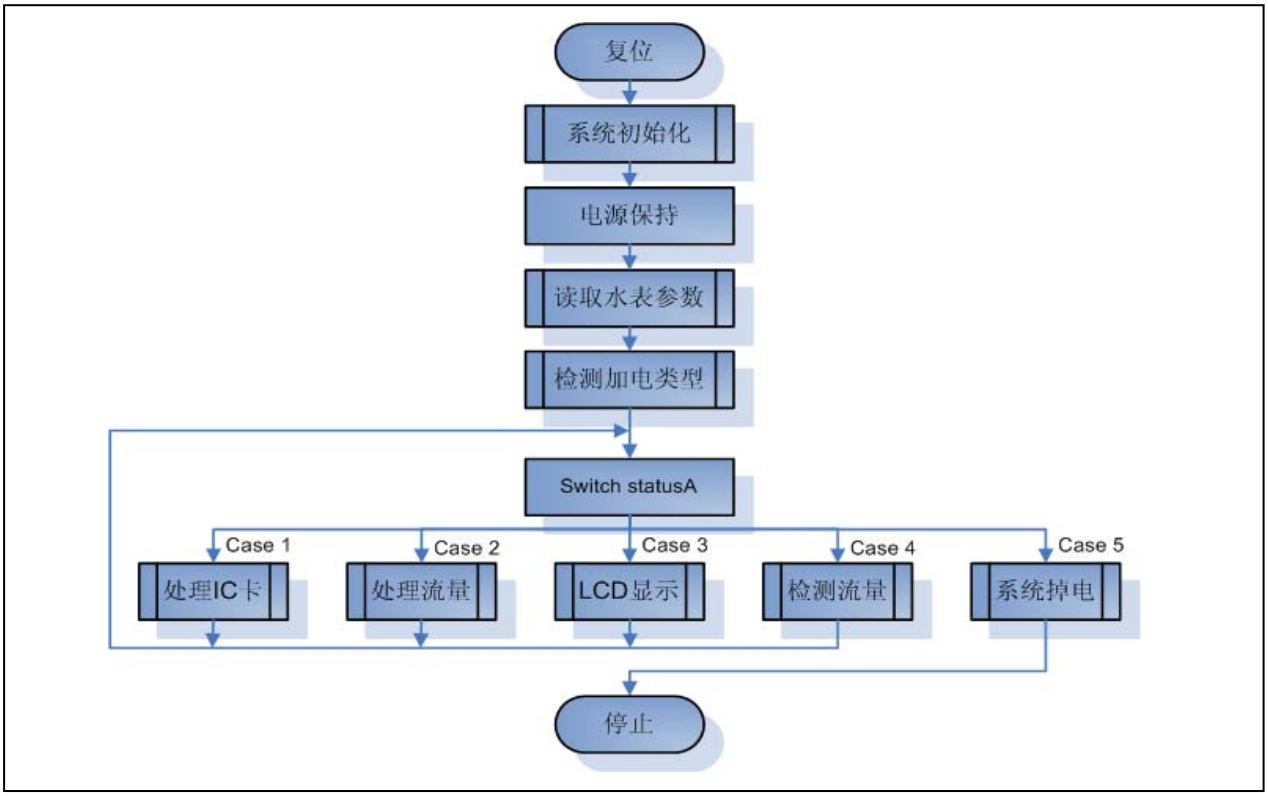
IO口：19个

系统功耗：

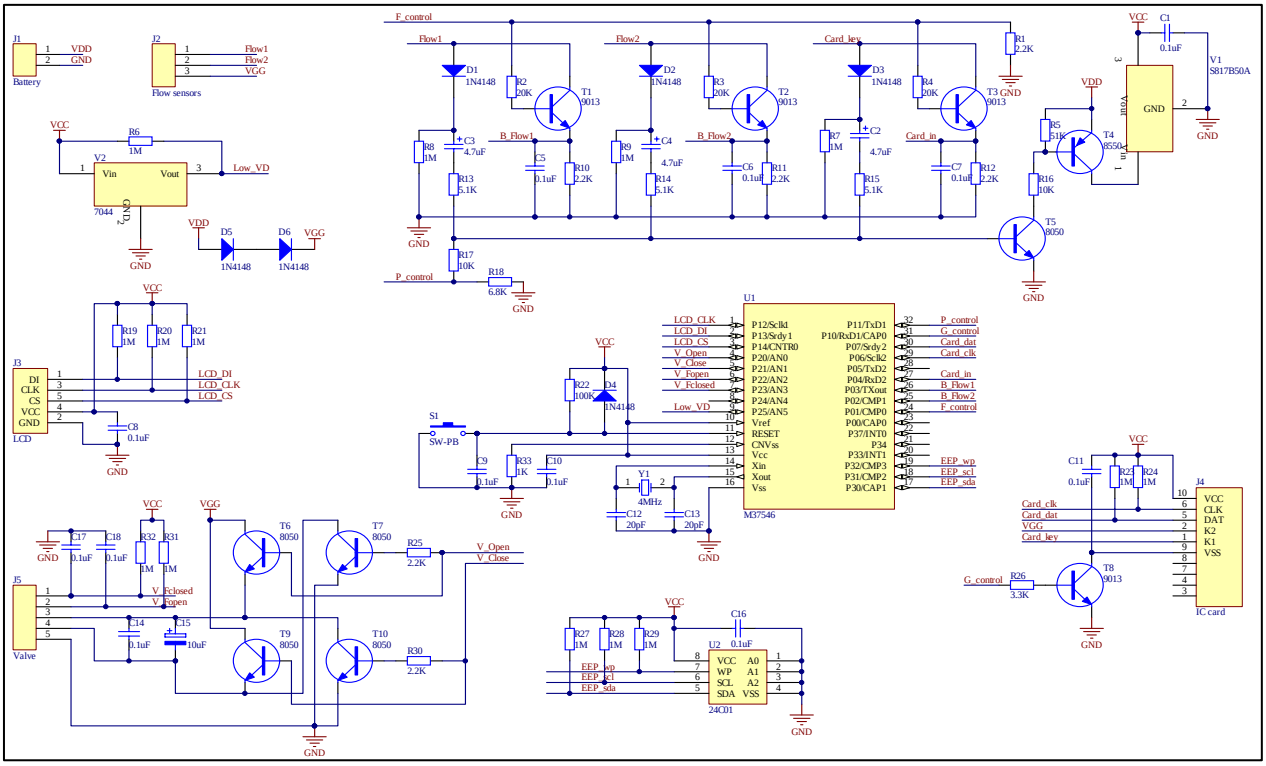
状态	工作电流	工作时间
掉电	6Ua（静态电流）	
LCD不显，阀门不动作	4.4mA	0.5s
LCD显示，阀门不动作	5.6mA	5s
LCD显示，阀门动作	27mA	10s

用一块6V容量为2.4AH的电池供电，水表能正常工作超过10年。

智能水表程序控制流程



MCU主控板电气原理图



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   2）植埋于人体使用的装置。
   3）用于治疗（切除患部、给药等）的装置。
   4）其他直接影响到人的生命的装置。
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