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2010年4月1日
瑞萨电子公司

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R32C/100系列32位高性能微控制器



R32C/100系列是M16C家族中的顶级产品，它是一个CISC(复杂指令集计算机)微处理器，R32C/100系列是M16C家族中M32C/80系列的后续产品，它是一个50MHz工作频率的带浮点运算单元和九个串行接口通道的32位微处理器。

具备以下特点：

真正5V工作

R32C/100系列的工作电压范围从3.0V至5.5V时，工作频率可以达到50MHz。这样设计工程师可以简化外部电路。R32C/100还可以支持两种截然不同的I/O电压，既可以满足有些客户需要外接3V存储器或者ASIC/FPGA器件的要求，也可以直接提供5V接口。

内置浮点运算单元(FPU)

采用R32C内置FPU时，可使用单精度浮点(Float)运算专用指令，因而能实现高速运算处理。R32C/100系列支持IEEE754所规定的单精度浮点运算。针对浮点型数据的浮点运算指令有ADDF, CMPF, CNVIF, DIVF, MULF, ROUND, SUBF等7种。采用上述指令能高速处理单精度浮点型(Float)数据运算。





R32C/100系列32位高性能微控制器

产品选择范围广

在R32C/111群和R32C/118群之间, R32C/100系列提供各种不同的封装及片上存储器的组合供客户选择。封装从64脚到144脚, 片上存储器从128KB Flash和32KB SRAM的组合到1MB Flash和63KB SRAM的组合。这样有助于客户选择一种最能满足其系统规格的产品以及当有产品移植的需要时可以缩短产品移植的周期。

高集成度

R32C/100系列最多可以配置9个串行接口和2路CAN, 另外还具备丰富的对工业应用有益的外围功能, 其中包括11路16位定时器、三相电机控制定时器、先进的智能I/O、A/D转换器、串行接口、直接存储器存取(DMA)控制器和CAN总线。此外, 使用片上振荡器和等待模式等还可以降低功耗。

R32C/100 CPU Core 50 MHz	Three-phase Motor Cont.		A/D 10bit x 34ch
	Clock Generator		CAN x 2ch 2.0B
Multiplier	Clock Stop Detection		
Interrupt	CRC	WDT	LIN2ch
DMAC-II	NSD	PLL	SPIx 3ch
DMAC 4ch	Serial Interface x 5ch		TimerA 5ch
X-Y Converter			TimerB 6ch
RAM Max 63KB			
Data Flash (Max 4KB x 2ch)	Intelligent I/O Timer measurement 16ch Waveform Generating 16ch Base Timer 2ch		
Flash ROM (Max 1MB)			



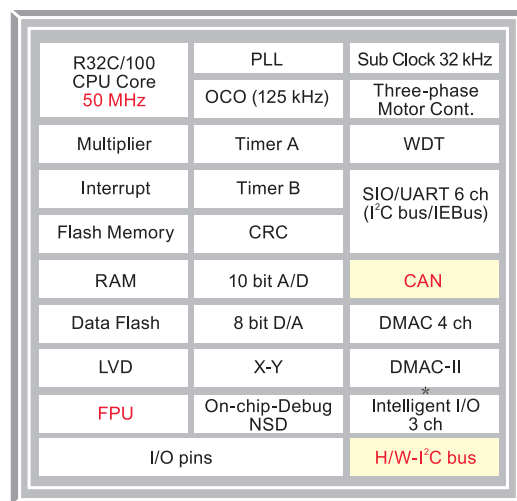


面向工业和消费领域的R32C/100系列高性能MCU R32C/111 R32C/117

R32C/100系列是M16C系列中的顶级产品,它是一个CISC(复杂指令集计算机)微控制器, R32C/100系列是M16C系列中M32C/80系列的后续产品,具有以下共同特点:

- 采用M16C系列的最强大R32C/100 32位CPU内核,由于改进了CPU架构,增强了32位乘法器,单精度FPU和高性能桶状移位器, R32C/100系列可以实现M32C/80系列大约2.3倍的处理能力。
- 内置具有快速读/写功能和高可靠性的闪存, R32C/100系列的写入速度比M32C/80系列快了大约三倍,缩短了将大量数据写入闪存的时间。
- R32C/100系列中R32C/117集成CAN模块,可以支持车载设备领域和工业领域如工厂自动化中广泛采用的网络标准。
- R32C/100集成了单线调试界面,可以通过单线连接一个仿真器来传送用于调试的信号。不仅支持全功能调试,而且可以通过相同界面对闪存进行“板上”编程。

内部框图



针对中国市场的状况和客户的实际需求,我们在R32C/111群和R32C/117群中选择了以下一些型号作为主推产品,我们相信这些产品会是ARM Cortex M3的有力竞争对手。

50MHz
大容量闪存
内置CAN

50MHz
大容量RAM
小型封装

R32C/117 CANx1ch 128KB 20KB ★★ 256KB 20KB ★★ 512KB 40KB ★ 144pin LQFP 100pin LQFP

R32C/111 50MHz 512KB 63KB ★ 100pin LQFP 256KB 32KB ★★ 64pin LQFP

Flash ★ : 新产品
★★ : 开发中

主要特点

- R32C/100系列CPU内核
- 工作频率50MHz(3.0V to 5.5V)
- 乘法器32x32→64
- 乘累加32x32+64→64
- 32位桶状移位器
- 单精度浮点运算单元
- 片内集成256KB to 512KB闪存 (R32C/111)
片内集成384KB to 1MB闪存 (R32C/117)
- 片内集成32KB to 63KB RAM
- 片内集成数据闪存4KBx2blocks
- 时钟电路有主时钟, 副时钟和PLL时钟电路
- 多功能定时器 定时器A: 16位x5通道
定时器B: 16位x6通道
三相马达控制定时器
- 串行接口时钟同步/异步串行x9通道
- DMACx4通道
- DMAC II
- CAN(2.0B)x1通道(R32C/117)
- 10位A/D转换器x26通道(R32C/111)
x34通道(R32C/117)
- 8位D/A转换器x2通道
- 硬件I²C总线x1通道(R32C/117)
- 64管脚, 100管脚和144管脚LQFP封装
- 新型单线调试接口NSD
(NSD: New Single Wire Debugger)





面向工业和消费领域的R32C/100系列高性能MCU R32C/111 R32C/117

R32C/100系列实时操作系统支持

Micrium: R32C/100上的 μ C/OS-II

μ C/OS-II端口

所有 μ C/OS端口都能简单移植到 μ C/OS-II, 如果你所需移植到处理器的 μ C/OS-II不在列表里, 请联系Micrium。请注意所提供的端口不予改变, 除了Micrium支持的Micrium端口。

另外大多数情况下仅提供端口, 其余 μ C/OS-II源代码必须从书上或者升级来得到。

而对于已经包含 μ C/OS-II源代码的情况下, 必须在您注册成为会员并登录后才可下载。

Processor	OS version	Compiler	Contributor
M16C	—	Tasking	Jan Homuth
M16C/60, M16C/Tiny, R8C	V2.83	Renesas HEW4/NC30 and IAR	Micrium
M16C/62 (SKP16C62P Board)			
R32C	—	Renesas HEW4/NC100	Micrium

链接至<http://www.micrium.com/renesas/m16c.html>

Segger: R32C/100上的embOS

CPU	Chip Manufacturer	"C"-compiler	Supported memory models	Trial version incl. manual	Updated YY-MM-DD
R32C	RENESAS	IAR Systems, compiler for R32C	All (in trial version, only Near supported)	V3.60b(3575KB)	08-04-08

链接至<http://www.segger.com/emboscpus.html>

R32C/100系列开发环境(使用E8a仿真器)



R32C/111学习套件(Starter Kit)

- 快速启动指南
- HEW IDE
- 安装有MCU的SKP板
- 免费评估版编译器
- E8a
- 带应用指南的样板工程和代码



TFT直接驱动解决方案: R32C/111RSK板外加Segger液晶面板

控制器:

- R32C/111

外加主要特性:

- 带触摸屏及背光灯的3.5" 1/4 VGA 320x240TFT液晶模块
- 无需显示控制器; 显示可由3个UART来驱动
- 显示可用黑白模式, 2或3bpp单色或者8种颜色模式
- 可通过软件选择显示模式
- 板上控制杆

有效的eval软件包:

Segger Eval Software (emWin, embOS) for IAR R32C compiler V1.30A

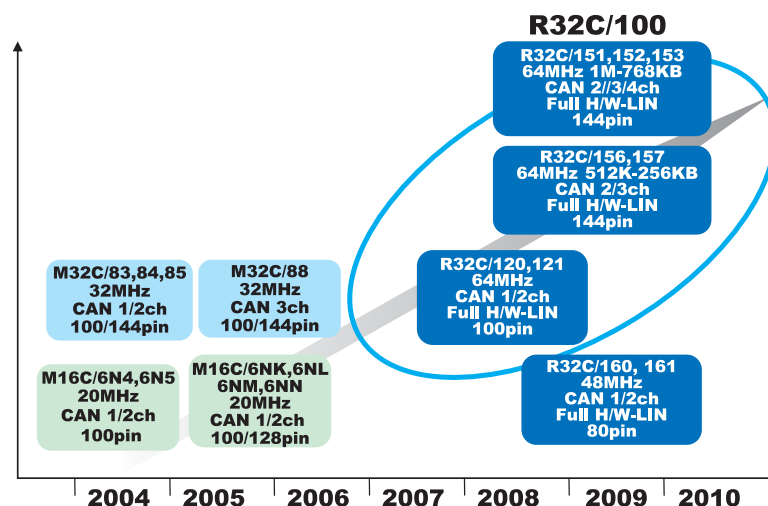
Segger Eval Software (emWin, embOS) for HEW and Renesas toolchain





面向汽车电子应用的R32C/100系列高性能MCU

瑞萨科技公司宣布推出共计11个群的50款新产品，充实了面向汽车电子的内置闪存的R32C/100系列MCU。该系列采用R32C/100高性能32位CPU内核，是M16C系列中最先进的复杂指令集微处理器。



R32C/161的特性及结构框图

- R32C/100系列内核带FPU
- 工作频率48MHz
- 电源电压3.0 to 5.5V
- 片内存储器ROM: 256KB/128KB
RAM: 20KB/12KB
- 片内数据闪存: 4KB x 2
- 片内EEPROM数据闪存(BGO): 4KB
- 智能输入/输出: 输入捕捉16位 x 8个通道
输出比较16位 x 8个通道
- 定时器: 定时器A 16bit x 5
定时器B 16bit x 6
三相马达控制电路

- 串行接口: 多功能UART 5个通道
时钟同步串行, 异步串行, I²C, SPI
UART 2个通道
时钟同步串行, 异步串行
- DMAC: 4个通道
- DMAC-II: 可由任何外围中断源启动
- CAN模块(2.0B): 2个通道 (32个邮箱)
- LIN模块: 1个通道(HW-LIN)
- SPI: 1个通道
- X-Y转换器
- 10位A/D转换器: 23个通道
- 新型单线调试接口NSD

R32C/100 CPU Core 48MHz	Three-phase Motor Cont.		A/D 10bit x 23ch
	Clock Generator		
Multiplier	Clock Stop Detection		CAN x 2ch 2.0B
Interrupt	CRC	WDT	
DMAC-II	NSD	PLL	LIN1ch
DMAC 4ch	Serial Interface x 5ch		SPIx 1ch
X-Y Converter	Intelligent I/O Timer measurement 8ch Waveform Generating 8ch Base Timer 2ch		TimerA 5ch
RAM (Max 20KB)			TimerB 6ch
Data Flash (Max 4KB x 2ch)			
Flash ROM (Max 256KB)			

R32C/121的特性及结构框图

- R32C/100系列内核带FPU
- 工作频率64MHz
- 电源电压3.0 to 5.5V
- 片内存储器ROM: 512KB/384KB/256KB
RAM: 32KB/24KB/20KB
- 片内数据闪存: 4KB x 2
- 片内EEPROM数据闪存(BGO): 4KB
- 智能输入/输出: 输入捕捉16位x16个通道
输出比较16位x16个通道
- 定时器: 定时器A 16bit x 5
定时器B 16bit x 5
三相马达控制电路

- 串行接口: 多功能UART 3个通道
时钟同步串行, 异步串行, I²C, SPI
UART 2个通道
时钟同步串行, 异步串行
- DMAC: 4个通道
- DMAC-II: 可由任何外围中断源启动
- CAN模块(2.0B): 2个通道 (32个邮箱)
- LIN模块: 1个通道(HW-LIN)
- SPI: 3个通道
- X-Y转换器
- 10位A/D转换器: 26个通道
- 8位D/A转换器: 2个通道
- 新型单线调试接口NSD

R32C/100 CPU Core 64MHz	Three-phase Motor Cont.		A/D 10bit x 26ch
	Clock Generator		D/A 8bit x 2ch
Multiplier	Clock Stop Detection		CAN x 2ch 2.0B
Interrupt			LIN 2 ch
DMAC-II	CRC	WDT	SPI x 3ch
DMAC 4ch	NSD	PLL	TimerA 5ch
X-Y Converter	Serial Interface x 5ch		TimerB 6ch
RAM (Max 32KB)			
Data Flash (Max 4KB x 2ch)	Intelligent I/O Timer measurement 16ch Waveform Generating 16ch Base Timer 2ch		
Flash ROM (Max 512KB)			





面向汽车电子应用的R32C/100系列高性能MCU

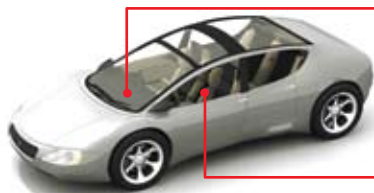
R32C/153的特性及结构框图

- R32C/100系列内核带FPU
- 工作频率64MHz
- 电源电压3.0 to 5.5V
- 片内存储器ROM: 1MB/768KB
RAM: 48KB
- 片内数据闪存: 4KB x 2
- 片内EEPROM数据闪存(BGO): 8KB
- 智能输入/输出: 输入捕捉16位 x 32个通道
输出比较16位 x 32个通道
- 定时器: 基本定时器 4个通道
定时器A 16bit x 5个通道
定时器B 16bit x 6个通道
三相马达控制电路

- 串行接口: 多功能UART 3个通道
时钟同步串行, 异步串行, I²C, SPI
UART 2个通道
时钟同步串行, 异步串行
- DMAC: 4个通道
- DMAC-II: 可由任何外围中断源启动
- CAN模块(2.0B): 4个通道 (32个邮箱)
- LIN模块: 8个通道(HW-LIN)
- SPI: 3个通道
- X-Y转换器
- 10位A/D转换器: 34个通道
- 8位D/A转换器: 2个通道
新型单线调试接口NSD

R32C/100 CPU Core 64MHz	Three-phase Motor Cont.		A/D 10bit x 34ch
	Clock Generator		D/A 8bit x 2ch
Multiplier	Clock Stop Detection		CAN x 4ch 2.0B
Interrupt			LIN 8ch
DMAC-II	CRC	WDT	SPI x 3ch
DMAC 4ch	NSD	PLL	TimerA 5ch
X-Y Converter	Serial Interface x 5ch		TimerB 6ch
RAM (Max 48KB)			
Data Flash (Max 4KB x 2ch)	Intelligent I/O Timer measurement 32ch Waveform Generating 32ch Base Timer 4ch		
Flash ROM (Max 1MB)			

R32C/100系列MCU在汽车上的典型应用

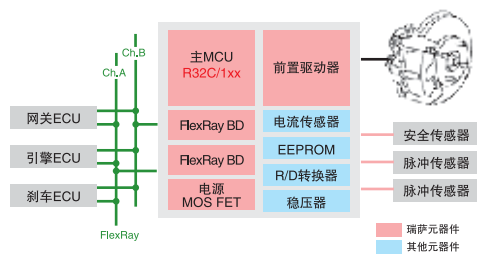


- 低端汽车音响
R32C/116,117,118

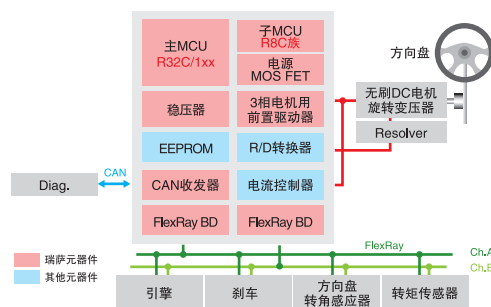


- 中/高端车身控制
R32C/151,152,153
R32C/156,157
R32C/120,121
R32C/160,161

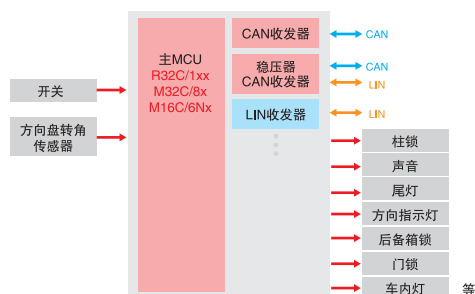
线控制车



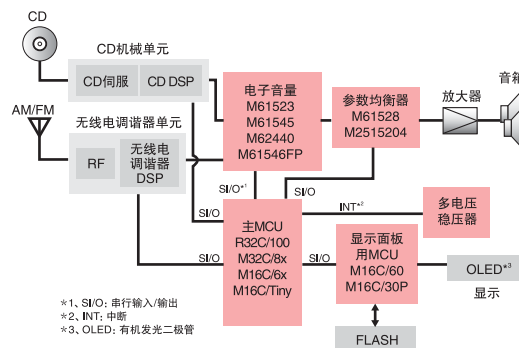
EPS/FlexRay



车身控制器模块(BCM)



车载音响系统



*1. S/I/O: 串行输入/输出
*2. INT: 中断
*3. OLED: 有机发光二极管

