

MCU

Docupedia Export

Author: Tran Kien Lam (MS/ETA6)

Date: 09-Aug-2023 07:12


Table of Contents

1	1. Table of Content	3
2	2.Change History	4
3	3.Introduction	5
3.1	3.1 Description	5
4	3.2 Category MCU	6

1 1. Table of Content

- 1. Table of Content
- 2. Change History
- 3. Introduction
 - 3.1 Description
 - 3.2 Category MCU
- 4 Feature and Parameter
 - 4.1 Block description
 - 4.2 Safety feature
 - 4.3 Safety Security
 - 4.4 Operation Mode
 - 4.5 Voltage supply and Current
 - 4.6 Power and Junction temperature
 - 4.7 Application area
- 5 Design
 - 5.1 Pin Map
 - 5.2 Data sheet and Reference
- 6 Simulation and Calculation

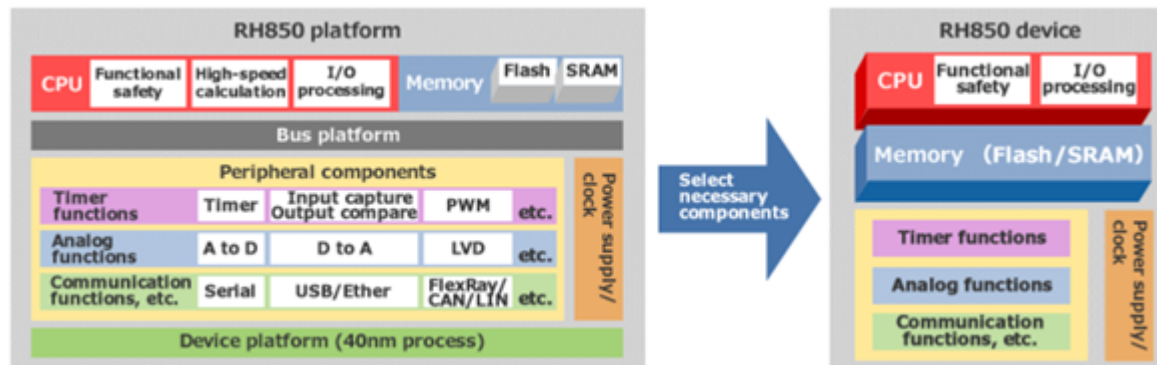
2 2.Change History

Date	Responser	Comments
 17 May 2022	Tian Lei	Initial

3 Introduction

3.1 Description

MCU called Micro-controller Unit, it integrated **CPU, Memory, Timer, A/D converter , UART, SPI, PLC, DMA ,CAN ,WD, RAM, ROM and peripheral circuit** ,Even LCD driver circuit into on chip. For different apply field , there will be different orient function configuration, there will industry , automotive , military, and consumer grade chip. Among them, automotive grade chips have higher reliability, consistency and stability, second only to military grade. From bus width, CPU Category have 4bit, 8bit,16bit,32bit and 64bit.



4 3.2 Category MCU

MCU can offers high performance balanced with very low power consumption over a wide and scalable range of products. can offers rich functional safety and embedded security features needed for new and advanced automotive applications. Depend on used purpose, MCU category as below.

MCU	Category
	ADAS MCU
	Chassis Control MCU
	Automotive Network MCU
	Instrument Cluster MCU
	xEV MCU
	ICE Transmission MCU

4 Feature and Parameter

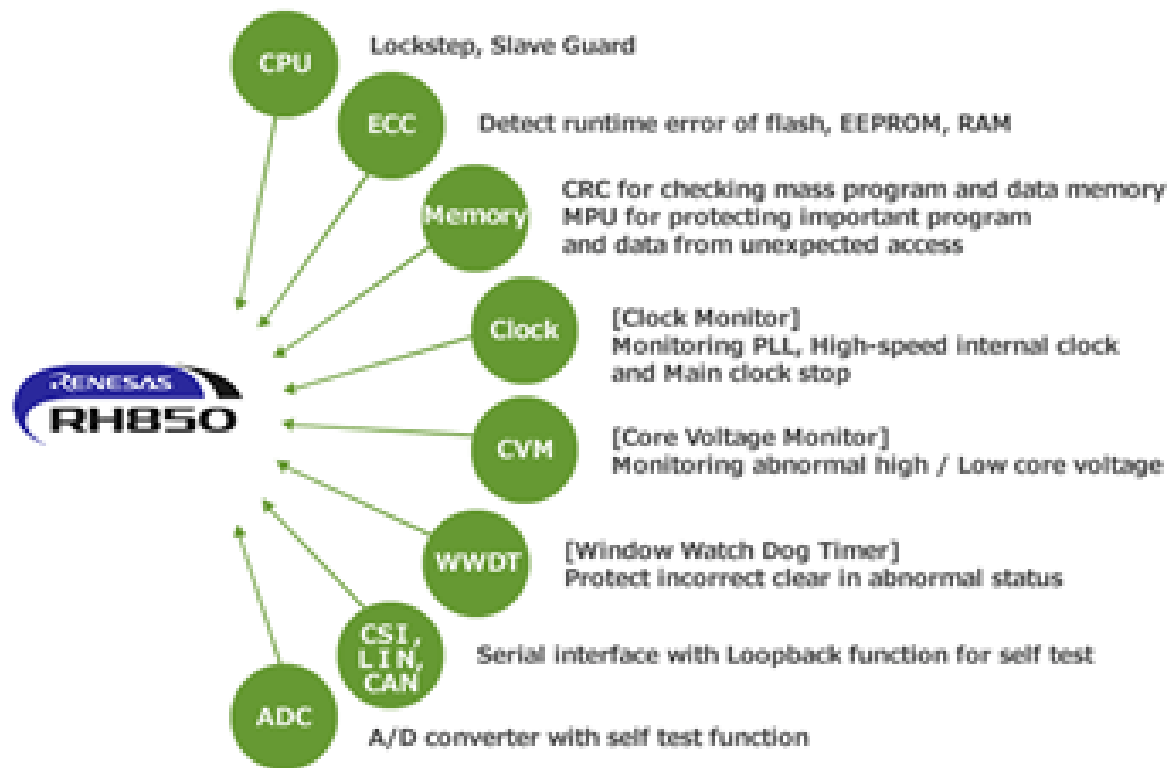
4.1 Block description

CPU:	include arithmetic unit, control and register group. It is the core components inside the MCU. Arithmetic unit complete data calculation and logic operation, bit variable process and data transfer operation, and control group coordinate task work according to certain time sequence and analysis ,executes instruction.
Memory:	Include ROM and RAM,ROM program memory. MCU execute one by one according to the program. The ROM program memory is used to store the SW. ROM data doesn't disappear after power off. ROM will have on-chip memory and extend memory. RAM data memory can be written at any time during the running of the program, and the data can be read at any time. The stored data can't be retained after power off. RAM also have on-chip memory and extend memory.
IO interface:	Connect with external input and output circuit, the internal circuit include port latches, output driver and input buffers.
Timer:	it is timer and counter, there will two register, TMOD set timer function and mode, TCON set start or stop counter.

CPU:	include arithmetic unit, control and register group. It is the core components inside the MCU. Arithmetic unit complete data calculation and logic operation, bit variable process and data transfer operation, and control group coordinate task work according to certain time sequence and analysis ,executes instruction.
Interrupt:	An interrupt request from an interrupt source to the CPU. The CPU temporarily interrupts the original transaction A and transfers to handle the event B. After processing event B, return to the place where it was interrupted (ie, breakpoint), which is called interrupt return. The component that realizes the above interrupt function is called the interrupt system.
Interface:	serial communication port ,there will be TX,RX and GND , similar port have LIN, Uart, IIC, SPI, CAN, USB .etc.
A/D converter:	<ul style="list-style-type: none"> • Convert analog signal to digital signal. • Temperature sensor
System :	DMA : direct memory access ICU-M: Hardware security module ECM: Error Control module CVM:Core voltage monitor ECC:Error correction coding PIC: Peripheral interconnection Main OSC: Main Oscillator CLMA: Clock Monitor DRCA: Data CRC JTAG/LPG: Comunication

4.2 Safety feature

If MCU need support safety feature, need compliance with ISO26262 as below, for example.



4.3 Security feature

Supports various security features such as **SWDT for the periodic check of secure application, the protection scheme for debug and test functionality**. also has ICUSE to support Secure Hardware Extension standard (SHE).

4.4 Operation Mode

Usually MCU support **User mode and test mode** by select mode terminals FLMD0, FLMD1, MODE0 and MODE1.

Category	Mode	Description
User mode	Normal Operation Mode	MCU is in work status
	Serial Flash Programming Mode	MCU is in programming

Catergory	Mode	Description
	Boundary SCAN mode	MCU is in data register chain for logical and IO test
Test Mode	Structural Test Mode (SCAN/BSCAN/MBIST)	Internal structuure block test
	Functional Test Mode (RAM fetch)	for function test
	OSC Monitor Mode	for clock test

4.5 Voltage supply and Current

Need to take attention the required power supply of MCU, need to meet system power concept.

Need to take attention the required current of MCU, need to meet system power concept.

4.6 Power and Junction temperature

For the Junction temperature must meet max production work environment, and consider power to caculate MCU self heating temperature, then can get max real used chip internal temperature, it must <Jucation temperature.

4.7 Application area

Need to check if meet **automotive or industry** , if automotive, ACE_Q100/200 should be qualified.

5. Design.

5.1 Pin mapping

Usually MCU will provide pin map, and port configuration table. Hardware could give out port requirement.

5.2 Data sheet and Reference design

Can get from supplier.

6. Calculation and Specification

Document Summary in [07_Electronic knowledge_tian lei](#)

- MCU Hardware Design specification create by [TIAN Lei \(XC-DX/ECE2-CN\)](#) : [\bosch.com\dfsrb\DfsCN\DIV\XC\Engineering\domain\DA\05_Hardware\07_Common_Excellence\02_Competence_Matrix\03_CptM_Camp_EHW-CN\02_Topic_Followup\07_Electronic knowledge_tian lei\Safety MCU](#)

2. MPC3_Caculation as reference :

[\bosch.com\dfsrb\DfsCN\DIV\XC\Engineering\domain\DA\05_Hardware\07_Common_Excellence\02_Competence_Matrix\03_CptM_Camp_EHW-CN\02_Topic_Followup\07_Electronic knowledge_tian lei\Safety MCU\Caculation](#)