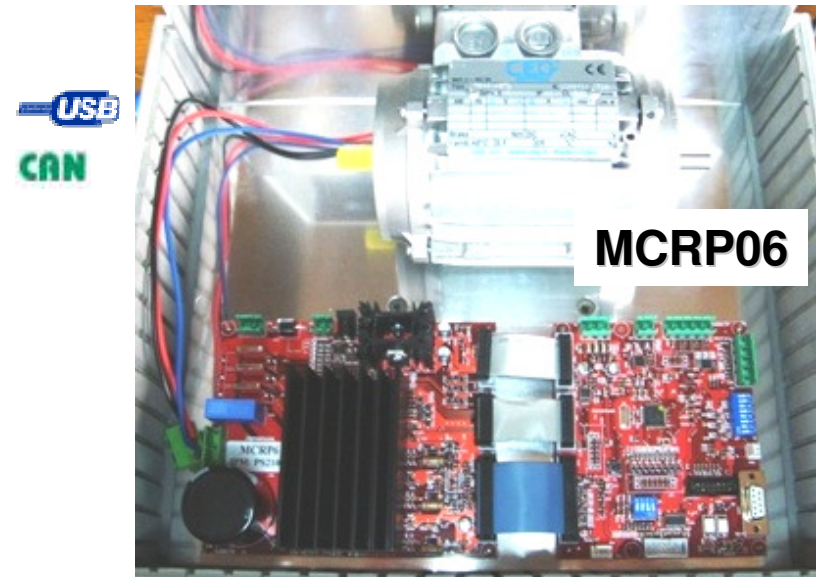


# Sensorless Vector Control **M**otor **C**ontrol **R**ef. **P**latform


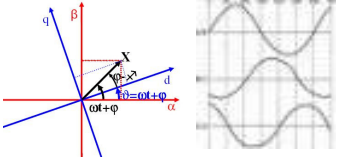




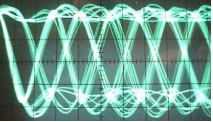

⇒ Dedicated to Induction Motor (ACIM)



## Renesas Technology Europe

Vincent Mignard  
Segment Marketing  
RTE – CID  
January 09

# 1. Motor Control Ref. Platform - Key features

|                          |   |   |
|--------------------------|---|---|
| Motor Type               | Asynchronous AC induction Motor<br>(3-phase Cast Motor)                       |    |
| Control Method           | Sinusoidal waveform control<br>Field Oriented Controlled (FOC)                |    |
| Current measurement      | Sensorless: - Three Shunts  |    |
| MCU type                 | SH7125 or SH7286 (USB, CAN)   |    |
| Flash usage<br>RAM usage | 8KB for motor control algorithm<br><1KB RAM                                   |    |
| Available CPU time       | >50%  |  |
| Switching Frequency      | Up to 20KHz   |  |
| Communication            | Serial: PC GUI interface or LCD display<br>Tool: E10A for debug & development |  |

## 2. SH7125 features & Benefits

**Low pin count:** 48 PIN, from 16KB to 128KB flash

⇒ Smaller PCB, **single MCU solution:** integrate Motor algo., application & safety

Fast RISC 32-bit MCU & Multiplication Unit: **65MIPS**, 50MHz

⇒ Perform Motor algo in 35µs, enable 60% of free CPU for application

⇒ **Source code** available for improvement and fast prototype: **2 months**



Dedicated Motor Control timer unit: Generate any PWM & trigger ADC

Fast 10-bit ADC: **2µs**, 2 independent S/H

⇒ Enable **sensorless** control: reduce system cost: **15% cheaper** by removing sensor

⇒ Field Oriented Control easier to implement enabling **40% more efficiency** than V/f

⇒ Very **silent** solution: no ripples and good **dynamics** results & fast over-run detection

HW built-in safety functions: WDT, flash protection, bridge protection ...

⇒ Reduce external components: **20% less** capacitors & protection circuit

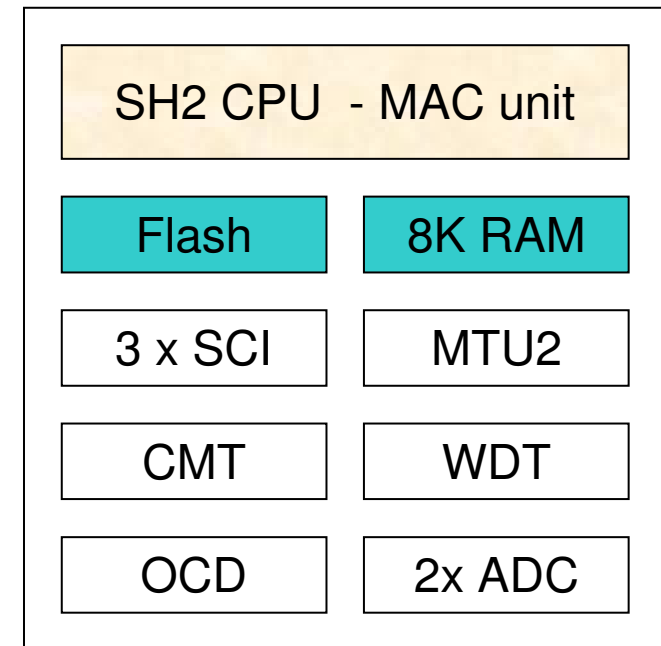
⇒ PCB is **smaller**, system **cost** is reduce by 20% and **flash occupation** by 10%



### 3. SH7125 Overview



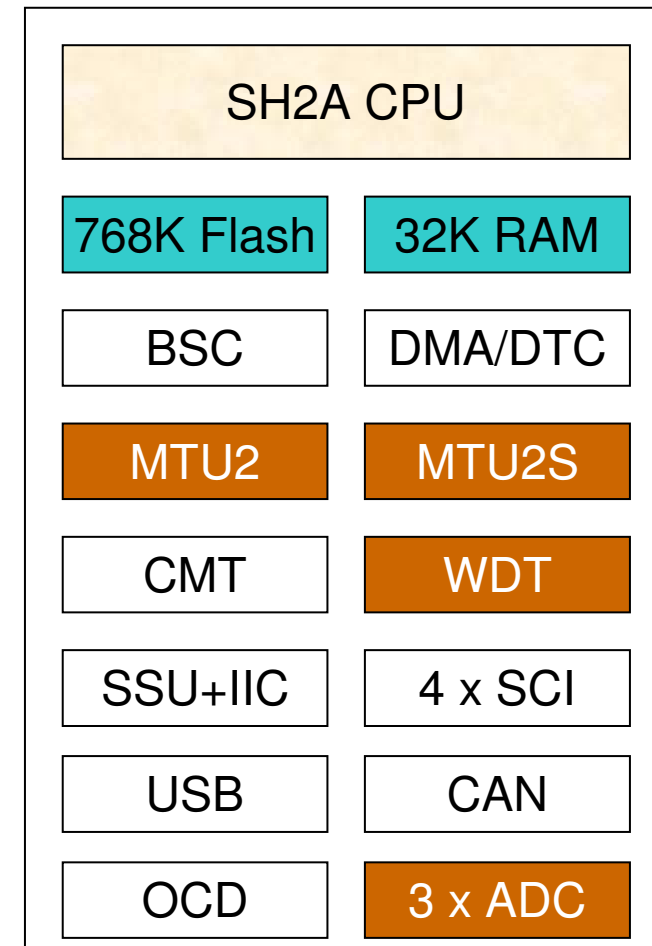
- High-performance single-chip RISC with SH-2 core
  - 65 MIPS: 50MHz, **5V**
  - Built-in 32-bit multiplier: MAC unit
- Built-in large capacity memory
  - 16K to 128KB Flash & 8KB RAM
  - 32-bit single cycle access
- Various peripheral functions
  - Motor Control timer: MTU2 (16-bit x 6ch)
  - Compare match timer (16-bit x 2ch)
  - A/D converters: 10-bit, 8ch (4ch x 2unit)
  - Serial (SCI): 3ch
  - H-UDI: On-chip debugging functions
- Package
  - FP-48F – 48 pin (0.65mm pin pitch)
  - LQFP64 – 64 pin (0.50mm pin pitch)



### 3. SH7286 Overview



- High-performance single-chip RISC with SH-2A core
  - 240 MIPS: 100MHz, 3V, **5V**
  - Built-in 32-bit multiplier: MAC unit
- Built-in large capacity memory
  - 768KB Flash & 32KB RAM
  - 32-bit single cycle access
- Various peripheral functions
  - Motor Control timer: MTU2 & MTU2S
  - Compare match timer (16-bit x 2ch)
  - A/D converters: 12-bit, 8ch (4ch x 3unit)
  - 4x SCI and 1x IIC, 1x SSU
  - H-UDI: On-chip debugging functions
  - CAN & USB
- 176-pin package



## 4. MCRP06 for High Speed Induction Motor



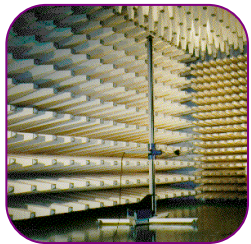
**Low cost & robust solution**  
as less external components are used  
high MCU immunity is guarantee



**Provide Self-Test CPU SW**  
Get it reviewed by VDE



**Get source code from Renesas**  
On-site support for MC algo.  
& motor calibration



**Highest Immunity: Burst tests**  
Report from Langer EMV available  
Cheaper: no ext. components needed

**HW Platform & SW  
algo. for any 3-  
phase induction  
motors fully  
available for fast  
development, quick  
certification at  
reduced cost**