RL78/F2x SERIES

MICROCONTROLLER INTRODUCTION

26/11/2021
AUTOMOTIVE SOLUTION BUSINESS UNIT
RENESAS ELECTRONICS CORPORATION
E/E ARCHITECTURE TREND

- CENTRAL UNIT PERFORMANCE GROWTH WITH CENTRALIZATION
- EVOLVED THROUGH DOMAIN ARCHITECTURE TO ZONE ARCHITECTURE
- MANY PARTIAL INTEGRATIONS IN THE MARKET

PAST

Central Architecture

MIGRATION
2025CY to 2030CY

Domain Architecture

FUTURE
Beyond 2030CY

Zonal Architecture
PRODUCT POSITIONING
RL78/F2x: CROSS DOMAIN AUTOMOTIVE USAGE

Powertrain

xEV

DCU / Zone / Gateway

Chassis & Safety

Energy Management

Body Control / Actuator & Sensor

NEW

RL78/F2x:
Actuator, Sensor, Sub-controller MCU

- Super Low Power
- High Temperature
- Evita-Light Security
  - CAN-FD
  - FuSa: ASIL-B
  - Performance up
  - BLCD h/w

Software Reusability
RL78 EVOLUTION

Adaptation for New demand
- Security (Evita-light + AES-256)
- CAN-FD
- Safety (ASIL-B)
- Performance up
- BLDC H/W

Legacy Re-use
- Existing software
- Pin assign

Conventional Features Continuation
- Low power
- High temperature
Low Power Consumption & Higher Performance

- Super low power consumption
- High temperature operation: Up to Ta = 150°C
- RL78 CPU: Performance increase to 40MHz
- Application Accelerator: To further boost performance for complex trigonometric & arithmetic processing

Scalability & Flexibility

- 128kB and 256kB flash memory versions
- Package line-up from 32QFN (5x5mm) up to 100QFP
- Inherit peripheral functions from RL78/F14, F13 → SW re-usability
- Pin compatible to RL78/F14, F13 → reuse of hardware PCBs

Technologies

- CAN FD communication → supported by RL78/F24
- 12bit A/D converter → up to 31 input channel and 2 x simultaneous Sample & Hold
- 32QFN combined with 256kB flash → unique in the market

Safety & Security → ASIL B and Evita-Light

- ISO26262 → support ASIL-B application
- EVITA-Light, with AES-128/192/256 module, authentication, secure boot

System Development Environment

- Comprehensive Eco-system including starter kits for first evaluation
RL78/F24 Block Diagram

**16-bit CPU**
- **RL78 Core**
  - 40MHz at Ta = -40 to 150°C
  - 2.7 V to 5.5 V

- On-Chip debug (Hot plug in, Live debug)
- MUL, DIV, MAC
- Code Flash: 256 KB, RAM: 24 KB, Data Flash: 16 KB

**System**
- Data Transfer Controller (DTC)
- Event Link Controller (ELC)
- Clock Monitor

**Oscillator**
- PLL 80MHz
- Internal Oscillator 15 kHz
- Internal Oscillator 80 MHz
- External Oscillator 20 MHz
- Ext. Sub Oscillator 32.7 kHz

**Voltage Monitor**
- Power On Reset (POR)
- Low Voltage Detector (LVD)

**Application Accelerator**
- FOC (*) Assist Function
  - SIN, COS, Park/Clark transition, PI control
  - 32-bit Multiplier

**Timer**
- Enhanced Timer RD (16-bit x 2ch)
- Timer Array Unit (16-bit x 16ch)
- Timer RJ (16-bit x 1ch)
- Real Time Clock (RTC)
- Dithering Function

**Digital I/F**
- CANFD (1ch)
- LIN/UART module (2ch)
- Serial Array Unit (SAU)
- CSI (up to 4ch)
- UART (up to 2ch)
- I²C (up to 4ch)
- Multi-master I²C (1ch)
- Ext. Interrupt (up to 15ch)
- Key Return (up to 8ch)
- GP I/O Ports (up to 92)

**Analog I/F**
- 12-bit ADC (up to 31ch), Dedicated S&H (2ch)
- 8-bit DAC
- Comparator (4ch)

**Changing point from RL78/F14**

FOC: Field Oriented Control (BLDC motor vector control method)

ISO26262
ASIL-B
ISO/SAE21434

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BENEFITS FOR A HVAC ECU

Super Low Power Consumption
- Super low-power consumption in Standby (STOP, HALT and SNOOZE) and NORMAL mode

Excellent connectivity
- Supports multiple Interfaces (CAN-FD, LIN, SPI, SENT)
- Secure encrypted connectivity to Central ECU

Small package with 256kB flash
- Small 32QFN (5x5mm) package for minimum footprint

Optimized Peripheral Set for BLDC Control
- Application accelerator and 12bit A/D with 2x sample & hold
FUNCTIONAL SAFETY SUPPORT PROGRAM FOR AUTOMOTIVE
FUNCTIONAL SAFETY
SUPPORT PROGRAM FOR AUTOMOTIVE

Hardware
Safety mechanisms
MCU, SoC, A&P

Software
CPU Core self-test
Safety Software

Work Products
Safety analysis tool,
Report, etc.

Consulting
Workshop
Development support
RL78/F2X ECOSYSTEM
RL78/F2X TOOLS ECO SYSTEM OVERVIEW

Getting Started
Software Manual
User’s Manual
Auto Code Generation
Emulation Manual
Application Notes
Samples
Evaluation Boards
Testing & Evaluation
Starter Kits

IDEs/Compiler
Emulator
Programmer
Timing/Scheduling/
Analysis

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