RENESAS

RL78/F Series Automotive 16-bit MCUs

The Easiest Path from Idea to Solution

RENESAS RL78

Renesas Electronics America
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The Easiest Path from Idea to Solution – RL78/F Series Automotive 16-bit MCUs

Easy-to-scale up and down

The RL78/F13 and F14 series, as a part of the larger RL78 family, are available in a wide range of different packages and flash sizes. Both CAN and non-CAN versions are available, and a version of the RL78/F14 with two CAN channels is under development. I/Os and peripherals can scale up and down easily, and software can be reused across the full RL78 family.

All devices with the same package are pin compatible. Even among different packages, the peripheral pin layout is kept in the same order/position as the pin count is increased, which makes it easy to change the PCB design.

Easy-to-design for super low power applications

The RL78/F13 and F14 series provide multiple low power modes, such as STOP, HALT and SNOOZE modes, to meet different application needs.

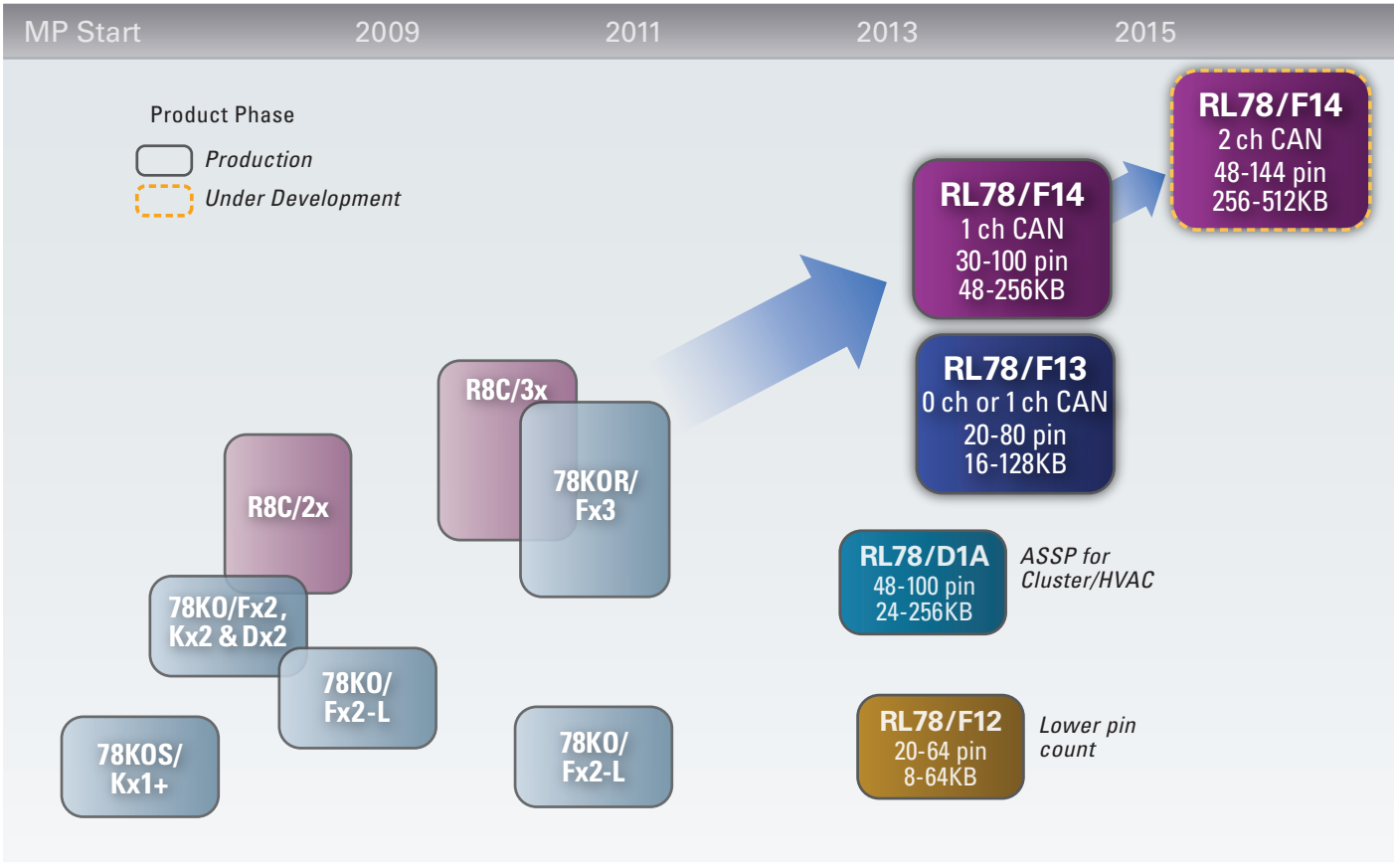
Additionally, the RL78/F13 and F14 series have a high-performance 16-bit CPU core (1.3 DMIPS/MHz) with very low power consumption when running normally (less than 6.5mA at 32MHz CPU clock).

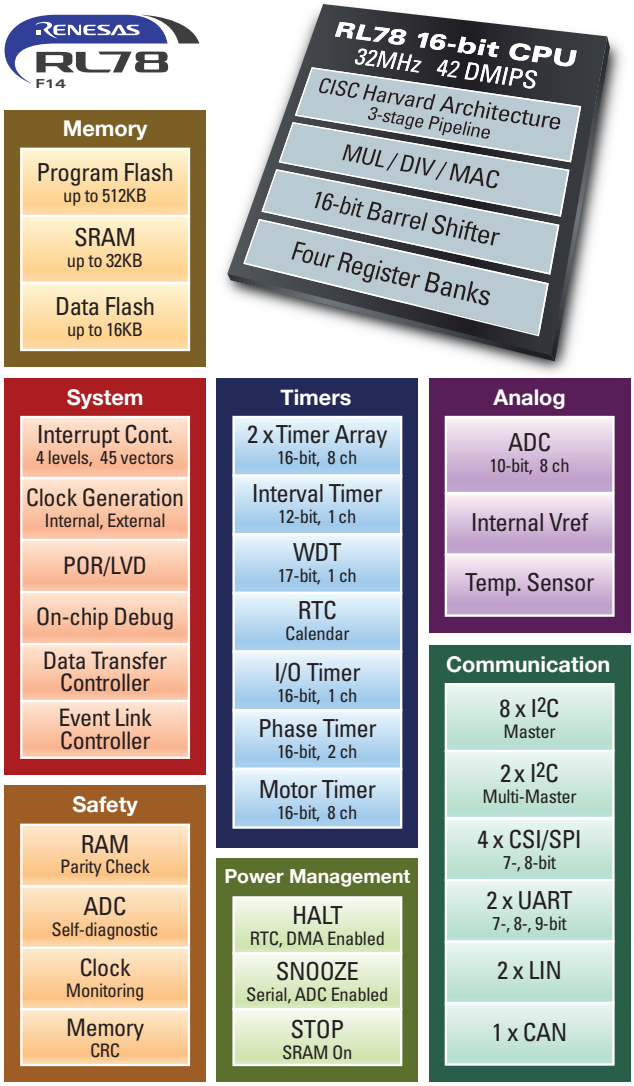
Easy-to-meet temperature and safety requirements

The RL78/F13 and F14 series support three different ambient temperature ranges: -40 to 105°C, -40 to 125°C and even -40 to 150°C, making them suitable for a wide range of automotive applications.

The RL78/F13 and RL78/F14 also incorporate several hardware features that support functional safety. The A/D test function performs a self-check of the A/D conversion by performing A/D conversion on the internal reference voltage. The CPU stack pointer monitor function prevents software runaway by detecting stack overflow with an interrupt. The clock monitoring function detects and changes the CPU clock to the internal oscillator if an external clock oscillator has stopped.

RL78/F Series roadmap





Key Features (RL78/F13, F14)

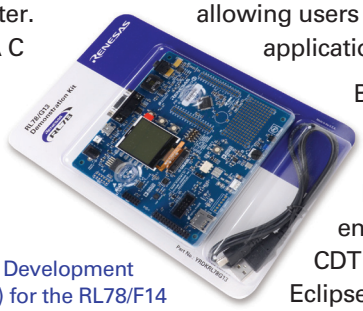
- Wide scalability
  - 20-pin to 100-pin package (144-pin under development)
  - 16KB to 256KB flash (512KB under development)
- Low power consumption
  - <200µA/MHz full speed operation
  - 0.5µA at STOP mode with LVD and WDT
  - 0.7µA at HALT mode with 32kHz clock
  - SNOOZE mode – A/D sampling or UART communication without waking up CPU
- High performance
  - 1.3 DMIPS/MHz
  - Max. 32MHz operation
  - Hardware Mul/Div/MAC
  - 2.7V to 5.5V operation
  - High temperature support (Ta = 150°C)
- System integration
  - High (64MHz) and low (15kHz) speed on-chip oscillator
  - 4KB to 8KB Data flash (16KB under development)
  - Real-time clock
  - Low-voltage detection function
  - Power-on reset
  - Temperature sensor
- Quality and safety
  - RAM/ROM ECC
  - Memory guard function
  - Flash memory CRC operation function
  - PLL lock detection function
  - Windowed watchdog
  - A/D test function

Easy-to-use ecosystem for fast development

Both the RL78/F13 and F14 are supported by the QuantiPhi Renesas Edition, a powerful new configuration and driver generation tool developed by SimuQuest. QuantiPhi automates the low-level driver code generation so that users can focus on their applications, and therefore, get products to market faster. Low-level drivers generated by QuantiPhi are MISRA C compliant, fully tested, and well documented. A state-of-the-art device configuration interface is provided so that the pin assignment and peripheral configuration of a device can be done without reading the device's user manual. Live error checking in the configuration interface prevents configuration errors such as pin/function assignment overlap instantly.

QuantiPhi also supports model-based development using Simulink and Stateflow. A blockset is provided to link the Simulink application directly to QuantiPhi drivers for seamless automatic code generation and automatic integration.

In addition to QuantiPhi, a Renesas Development Kit (RDK) for the RL78/F14 is available. This full-featured, affordable kit with an on-board debugger, full I/O and extensive software support enables users to jump-start their hardware development. This RDK also supports a motor control extension board, allowing users to quickly develop advanced motor control applications configured in QuantiPhi.



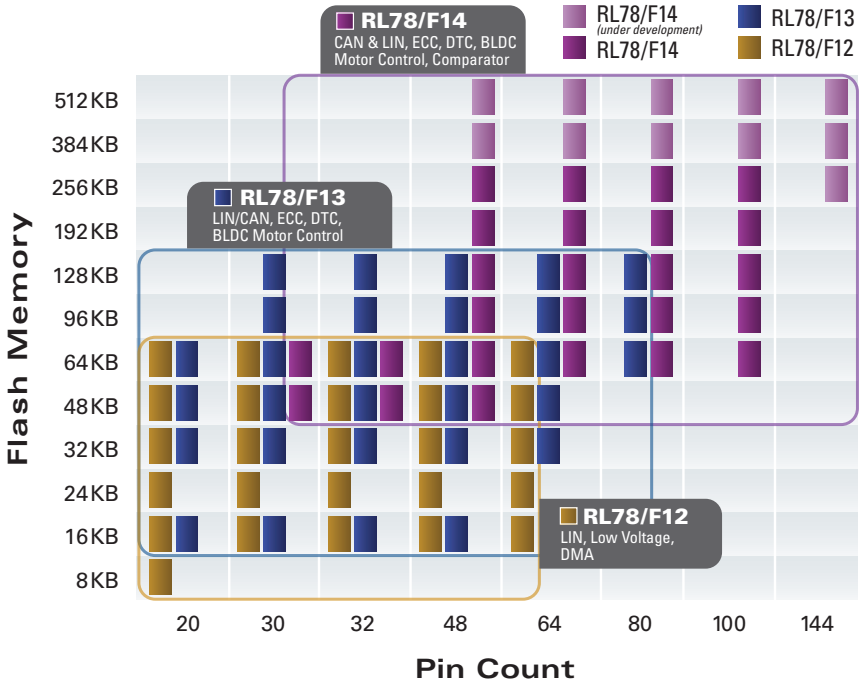
Renesas Development Kit (RDK) for the RL78/F14

Both in-house and third-party IDE (integrated development environment)/compilers are available. e² studio, Renesas' Eclipse-based IDE, is a complete development and debug environment based on the popular Eclipse CDT project. Essentially an open source, the Eclipse CDT covers build (editor, compiler and linker control), as well as debug phases, based on an extended GDB interface. A wide range of compilers can be integrated into e² studio to ensure the choice of tools match different project requirements.

RL78/F1x Selector Guide

Group	Pins	Base Part No.	Flash (KB)	RAM (KB)	Data Flash (KB)	Freq (MHz)	Voltage (V)	I/O	DMA (ch) / DTC (sets)	ELC	A/D (ch)	D/A (ch)	Comp. (ch)	CSI (ch)	UART (ch)	I2C (ch)	H/W LIN	CAN	16-bit Timers	Motor Timers
F12	20	R5F1096x	8-64	0.5-4	4	32	2.7-5.5	16	2	–	4	–	–	2	2	1	1	–	9	–
	30	R5F109Ax	16-64	1-4				26			8			4	4	4				
	32	R5F109Bx	16-64	1-4				28			8			4	4	4				
	48	R5F109Gx	16-64	1-4				44			10			6	4	6				
	64	R5F109Lx	16-64	1-4				58			12			6	4	6				
F13 w/o CAN	20	R5F10A6x	16-64	0.5-4	4	32	2.7-5.5	16	24	–	6	–	–	2	1	2	1	–	16	2
	30	R5F10AAx	16-64	1-4				26			12								17	
	32	R5F10ABx	16-64	1-4				28			10								17	
	48	R5F10AGx	16-128	1-8				44			14-17								17	
	64	R5F10ALx	24-128	1.5-8				58			14-21								17	
	80	R5F10AMx	64-128	4-8				74			22								17	
F13 w/ CAN	30	R5F10BAx	32-128	2-8	4	32	2.7-5.5	26	24	–	14	–	–	3	2	3	1	1	21	2
	32	R5F10BBx	32-128	2-8				28			12			3		4				
	48	R5F10BGx	32-128	2-8				44			17			4		5				
	64	R5F10BLx	32-128	2-8				58			21			4		5				
	80	R5F10BMx	64-128	4-8				74			22			4		5				
F14	30	R5F10PAx	48-64	4-6	4	32	2.7-5.5	26	24	Yes	14	1	1	3	2	3	1	1	21	2
	32	R5F10PBx	48-64	4-6	4			28			12			3		4	1		21	
	48	R5F10PGx	48-256	4-20	4-8			44			17-20			4		5	1-2		21-25	
	64	R5F10PLx	64-256	6-20	4-8			58			21-22			4		5	1-2		21-25	
	80	R5F10PMx	64-256	6-20	4-8			74			22-27			4		5	1-2		21-25	
	100	R5F10PMPx	64-256	6-20	8			92			31			4		5	2		25	
F14*	40	TBD	384-512	26-32	16	32	2.7-5.5	36	24	Yes	16	1	1	4	2	5	3	1	33	2
	48	TBD	384-512	26-32			2.7-5.6	44			20							1-2		
	64	TBD	256-512	20-32			2.7-5.7	58			22							1-2		
	80	TBD	256-512	20-32			2.7-5.8	74			27							1-2		
	100	TBD	256-512	20-32			2.7-5.9	92			31							2		
	144	TBD	256-512	20-32			2.7-5.11	132			31							2		

**Under development; features listed are tentative.*



For more information, go to: **am.renesas.com/rl78f1x**

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