

The background of the entire page is a photograph of numerous small, stylized human figures made of wood. Some are natural wood color, while others are painted in various colors including green, orange, purple, yellow, and blue. They are scattered across a white surface, creating a diverse and human-centric visual theme.

# RL78/G15 GUIDE FOR ENGINEER

24<sup>TH</sup>, JUL. 2024      EP2P-AA-24-0322 REV.1.00  
EMBEDDED PROCESSING 2ND BUSINESS DIVISION  
EMBEDDED PROCESSING PRODUCT GROUP  
RENESAS ELECTRONICS CORPORATION

The information/materials required at the time of product development summarized and listed for each development phase. Application notes are a list of regrouped by contents.  
Please use it as a guidebook when developing.

# CONTENT

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We summarized and listed up various information and materials required at the time of product development by each development phase.

Also, You can select what you need for your application from our rich selection of application notes that describing how to use a peripheral punction, example applications, how to create a program, and more.

Please use these information, materials and application notes as a guidebook when developing.

List of information and materials required for product development

- [Step1: MCU selection](#)
- [Step2: Designing and evaluating](#)
- [Step3: Mass production](#)

[List of application notes](#)

# STEP1 MCU SELECTION

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	Item	Content	Link
1	Hardware information	Datasheet	<a href="#">Doc</a>
2	Products & Solutions	RL78 Family Features	<a href="#">Web site</a>
3		Video	<a href="#">Web site</a>
4		Blog	<a href="#">Web site</a>
5		Reference designs (Winning combination)	<a href="#">Web site</a>
6		Product longevity program (PLP)	Overview of product longevity program (PLP)
7		Product selection (product selector) Note: Refer to PLP column in the chart.	<a href="#">Web site</a>
8	Product Specification Comparison	Introductory Guide to RL78 Microcontrollers	<a href="#">Web site</a>
9		RL78 FAMILY Selection Guide	<a href="#">Doc</a>

# STEP2 DESIGNING AND EVALUATING (1/3)

	Item	Content	Link
<b>Common</b>			
1	Hardware	User's manual: Hardware	<a href="#">Doc</a>
2		Hardware manual guide (Electrical Characteristic edition)	<a href="#">Doc</a>
3		Technical update (errata information)	<a href="#">Web site</a>
4		Part number guide for RL78 family product (the meaning of character in part number)	<a href="#">Doc</a>
5		Semiconductor reliability handbook	<a href="#">Doc</a>
6		RELIABILITY REPORT	<a href="#">Doc</a>
7		RoHS Product Options → Part Number → Package information → RoHS Info	<a href="#">Web site</a>
8	Software information	RL78 Family User's Manual: Software	<a href="#">Doc</a>
9		RL78 Software Porting Guide Porting sample code generated by Smart Configurator (CS+, e2 studio, IAR)	<a href="#">Doc</a>
10	Evaluation board (for general purpose)	RL78/G15 Fast Prototyping Board (RL78/G15 FPB)	<a href="#">Web site</a>
11	Reference Design	Energy Efficient Single Burner Induction Cooktop Reference Design	<a href="#">Web site</a>
12	Partner information	Partner products (system solutions provider)	<a href="#">Web site</a>
13		RL78 Partner Ecosystem	<a href="#">Web site</a>

# STEP2 DESIGNING AND EVALUATING (2/3)

	Item	Content	Link
<b>Hardware design</b>			
1	Board simulates	ECAD model Note: ECAD can be found by clicking on the respective part number of the product options.	<a href="#">Web site</a>
2	Other	Resonator and matching circuit information	<a href="#">Doc</a>
3		Package information (package outline information, mount manual, etc.)	<a href="#">Web site</a>
4	Development environment	E1/E20/E2 Emulator, E2 Emulator Lite Additional Document for User's Manual (Notes on Connection of RL78)	<a href="#">Doc</a>
<b>Software design</b>			
1	Software information	Getting Started with the RL78 Family Development Environment	<a href="#">Web site</a>
2		RL78 Family Development Environment — Development Tools	<a href="#">Web site</a>
3		RL78 Family Development Environment — Software	<a href="#">Web site</a>
4		RL78 Smart Configurator User's Guide: e <sup>2</sup> studio	<a href="#">Doc</a>
5		RL78 Smart Configurator User's Guide: CS+	<a href="#">Doc</a>
6		RL78 Smart Configurator User's Guide: IAREW	<a href="#">Doc</a>
7	Training information	RL78 Family Software & Tool Course (Video Collection)	<a href="#">Web site</a>
8	System design	RL78 Low Power MCU	<a href="#">Doc</a>

# STEP2 DESIGNING AND EVALUATING (3/3)

	Item	Content	Link
<b>Solution</b>			
1	IoT Solutions	IoT Solutions	<a href="#">Doc</a>
<b>Support</b>			
1	Support information	FAQ (frequently asked inquiries)	<a href="#">Web site</a>
2		RL78 forum (community)	<a href="#">Web site</a>
3		Ask to technical support Note: Please click login in the upper right corner	<a href="#">Web site</a>

# STEP3 MASS PRODUCTION

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	Item		Content	Link
1	Writing a program	Programmer	PG-FP6	<a href="#">Web site</a>
2		Writing tool	Renesas flash programmer (GUI tool for PC)	<a href="#">Web site</a>

# RL78/G15 APPLICATION NOTE

SUPPLEMENTARY INFORMATION: PLEASE REFER TO THE APPLICATION NOTE LIST AS NECESSARY.

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#	Main items	Overview
1	<a href="#">Basic</a>	Hardware Design/Clock/Voltage/Memory
2	<a href="#">Peripheral</a>	MCU peripheral function
3	<a href="#">Self programming</a>	Flash writing
4	<a href="#">Security / Crypto</a>	Security/Crypto
5	<a href="#">Connectivity</a>	Bluetooth LE, Zigbee
6	<a href="#">Flash program</a>	Flash programming
7	<a href="#">Memory Driver</a>	Memory driver
8	<a href="#">Sound</a>	ADPCM
9	<a href="#">Sensor</a>	Sensor
10	<a href="#">Software relation</a>	Software
11	<a href="#">Others</a>	Other



# RL78/G15 APPLICATION NOTE [BASIC]

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Item	Title	Summary	Sample code
1	<a href="#">RL78/G23 Hardware Design Guide</a>	The Renesas board support package SIS module (r_bsp) forms the foundation of any project that uses Software Integration System (SIS) modules.	<a href="#">Download</a>
2	<a href="#">RL78 Family Board Support Package Module Using Software Integration System</a>	The purpose of this application note is to show prospective users the advantages of the new Renesas RL78 low power 16bit MCU family over the major 8/16/32 low power MCU competitors, and how to utilize key RL78 low power features	-
3	<a href="#">RL78 Family RL78 Hardware CRC Functions</a>	This application note introduces the current consumption tuning solution using the E2 emulator.	-
4	<a href="#">RL78/G23 Operation State Switching</a>	This application note introduces the current consumption tuning solution using the E2 emulator.	-
5	<a href="#">RL78/G23 CPU Clock Changing and Standby Settings</a>	This document describes methods to minimize power dissipation when monitoring switch inputs.	-

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# RL78/G15 APPLICATION NOTE [PERIPHERAL]

Item	Title	Summary	Sample code
1	<a href="#">RL78/G15 Timer Array Unit (Interval timer)</a>	This application note describes the interval timer function of the timer array unit (TAU).	<a href="#">Download</a>
2	<a href="#">RL78/G15 Timer Array Unit (PWM output)</a>	This application note describes how to use the PWM output function of the timer array unit (TAU).	<a href="#">Download</a>
3	<a href="#">RL78/G15 Timer Array Unit (Pulse Interval Measurement: Period)</a>	This application note describes how the timer array unit (TAU) measures the interval of the pulse.	<a href="#">Download</a>
4	<a href="#">RL78/G15 Timer Array Unit (Pulse Interval Measurement : Width)</a>	This application note describes how the timer array unit (TAU) measures the interval of the pulse.	<a href="#">Download</a>
5	<a href="#">RL78/G14, RL78/G1C, RL78/L12, RL78/L13, RL78/L1C, RL78/G23 Group Clock Synchronous Single Master Control Software Using CSI Mode of Serial Array Unit</a>	This application note explains clock synchronous control of a single master by using the 3-wire serial I/O communications (CSI mode) of the serial array unit (SAU) of the RL78/G14, RL78/G1C, RL78/L12, RL78/L13, RL78/L1C, RL78/G23 Group and describes how to use the sample code for this application.	<a href="#">Download</a>
6	<a href="#">RL78/G15 Handshake-based SPI Slave Transmission/Reception</a>	This application note describes how the serial array unit (SAU) performs slave transmission/reception by the simple SPI (CSI).	<a href="#">Download</a>
7	<a href="#">RL78/G15 Handshake-based SPI Master Transmission/Reception</a>	This application note describes how the serial array unit (SAU) performs master transmission/reception by the simple SPI (CSI).	<a href="#">Download</a>
8	<a href="#">RL78/G15 Serial Array Unit (UART Communication)</a>	This application note explains how to use UART communication through the serial array unit (SAU).	<a href="#">Download</a>
9	<a href="#">RL78/G15 Serial Interface IICA (for Master Transmission/Reception)</a>	This application note describes master transmission and reception implemented via serial interface IICA.	<a href="#">Download</a>
10	<a href="#">RL78/G15 Serial Interface IICA (for Slave Transmission/Reception)</a>	This application note describes slave transmission and reception implemented via the serial interface IICA.	<a href="#">Download</a>
11	<a href="#">RL78/G15 A/D Converter</a>	This application note describes how to use the the A/D converter on the RL78/G15 to convert analog voltages into digital values.	<a href="#">Download</a>
12	<a href="#">RL78/G15 Temperature Alarm Device Utilizing Comparator Function</a>	This application note describes how to use the comparator function of RL78/G15 to sound a buzzer (via the clock output/buzzer output control circuit) when a set temperature is exceeded by comparing the analog input voltage at the IVCMP pin with an internal reference voltage.	<a href="#">Download</a>

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# RL78/G15 APPLICATION NOTE [SELF PROGRAMMING]

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Item	Title	Summary	Sample code
1	<a href="#">RL78/G15 Group and RL78/G16 Group Renesas Flash Sample Program Type 01 SC Version (Flash Common)</a>	This document explains Renesas Flash Sample Program Type 01 for the RL78/G15 group and RL78/G16 group in the case of using Smart Configurator(SC). It is an outline about positioning of the Common file for Renesas Flash Sample Program Type 01.	<a href="#">Download</a>
2	<a href="#">RL78/G15 Group and RL78/G16 Group Renesas Flash Sample Program Type 01 SC Version (Code Flash)</a>	This document explains Renesas Flash Sample Program Type 01 for the RL78/G15 group and RL78/G16 group in the case of using Smart Configurator(SC).	<a href="#">Download</a>
3	<a href="#">RL78/G15 Group and RL78/G16 Group Renesas Flash Sample Program Type 01</a>	This application note is intended to give users an understanding of the methods for using the Renesas Flash Sample Program Type 01(RFSP Type 01) for RL78/G15 group and RL78/G16 group.	<a href="#">Download</a>
4	<a href="#">RL78/G15 Group and RL78/G16 Group Renesas Flash Sample Program Type 01 SC Version (Data Flash)</a>	This document explains Renesas Flash Sample Program Type 01 for the RL78/G15 group and RL78/G16 group in the case of using Smart Configurator(SC).	<a href="#">Download</a>

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# RL78/G15 APPLICATION NOTE [SECURITY / CRYPTO]

Item	Title	Summary	Sample code
1	<a href="#">RL78 Family SHA Hash Function Library: Introduction Guide</a>	This document explains SHA Hash Function Library for the RL78 Family (hereafter referred to as "SHA Libraly") that depends on MCUs	<a href="#">Download</a>
2	<a href="#">RL78 Family How to change devices in the sample project for the DSP Library and the Security Library</a>	This document describes the procedures for migrating the driver and middleware sample code projects shown in the table below to other RL78 family devices	-

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# RL78/G15 APPLICATION NOTE [CONNECTIVITY]

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Item	Title	Summary	Sample code
1	<a href="#">RL78/G15 HS300x sensor data communication with Bluetooth LE DA14531</a>	This application note describes a sample program to control the DA14531MOD on the RL78/G15 to perform wireless communication.	<a href="#">Download</a>
2	<a href="#">RL78/G15 Wireless Communication with the XBee ZB S2C and HS300x (AT Solution)</a>	This application note describes a sample program to control the XBee ZB S2C on the RL78/G15 to perform wireless communication.	<a href="#">Download</a>
3	<a href="#">RL78/G15 Wireless Communication with the XBee ZB S2C and HS300x</a>	This application note describes a sample program to control the XBee ZB S2C on the RL78/G15 to perform wireless communication.	<a href="#">Download</a>

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# RL78/G15 APPLICATION NOTE [FLASH PROGRAM]

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Item	Title	Summary	Sample code
1	<a href="#">RL78 Family RL78 Microcontroller (RL78 Protocol B) Serial Programming Guide</a>	This application note describes the specifications of the boot firmware in RL78 microcontrollers. If the firmware is used in a way that does not conform with the descriptions in this document, correct operation is not guaranteed.	-
2	<a href="#">RL78 Flash Programmer (RL78 Protocol B)</a>	This application note describes how to write the program to the internal flash memory of the RL78 microcontroller that supports the RL78 Protocol B.	<a href="#">Download</a>
3	<a href="#">Flash programmer with Raspberry Pi (RL78 Protocol B)</a>	This application note describes a sample program for a flash programmer that writes to the flash memory of a microcontroller that supports Protocol B.	<a href="#">Download</a>

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# RL78/G15 APPLICATION NOTE [MEMORY DRIVER]

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Item	Title	Summary	Sample code
1	<a href="#">RL78 Family Serial NOR Flash Memory Control Module Software Integration System</a>	This application note describes the serial NOR flash memory control module conforming to the Software Integration System (SIS).	<a href="#">Download</a>
2	<a href="#">RX Family, RL78 Family, 78K0R/Kx3-L Macronix International MX25/66L Family Serial NOR Flash Memory Control Software</a>	This application note describes how to control MX25/66L serial NOR flash memory, manufactured by Macronix International Co., Ltd., using an MCU manufactured by Renesas Electronics, and it explains the usage of the sample code provided for that purpose.	<a href="#">Download</a>

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# RL78/G15 APPLICATION NOTE [SOUND]

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Item	Title	Summary	Sample code
1	<a href="#">RL78 Family Sound Playback/Compression System (Original ADPCM Codec) M3S-S2-Tiny: Introduction Guide</a>	This document explains M3S-S2-Tiny for the RL78 Family (hereafter referred to as "S2 library").	<a href="#">Download</a>

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# RL78/G15 APPLICATION NOTE [SENSOR]

Item	Title	Summary	Sample code
1	<a href="#">RL78 Family Sensor I2C Communication Middleware Control Module Software Integration System</a>	This application note explains sensor I2C communication middleware control module for Renesas sensors using Software Integration System (SIS).	<a href="#">Download</a>
2	<a href="#">RL78 Family Sensor Control Modules Software Integration System</a>	This application note explains the sensor control modules for HS300x and HS400x (Renesas high performance relative humidity and temperature sensor), FS2012, FS3000 and FS1015 (Renesas High Performance Flow Sensor Module), ZMOD4410 and ZMOD4510 (Digital Gas Sensors), OB1203 (Heart Rate, Blood Oxygen Concentration, Pulse Oximetry, Proximity, Light and Color Sensor) and I2C communication middleware for Renesas sensors using Software Integration System (SIS).	-
3	<a href="#">RL78 Family HS300x Sensor Control Module Software Integration System</a>	This application note explains the sensor control module for Renesas sensor HS300x (Renesas high performance relative humidity and temperature sensor) using Software Integration System (SIS).	<a href="#">Download</a>
4	<a href="#">RL78 Family HS400X Sensor Control Module Software Integration System</a>	This application note explains the sensor control module for Renesas sensor HS400x (Renesas high performance relative humidity and temperature sensor) using Software Integration System (SIS).	<a href="#">Download</a>
5	<a href="#">RL78 Family FS2012 Sensor Control Module Software Integration System</a>	This application note explains the sensor control modules for FS2012 (Renesas High Performance Flow Sensor Module) using Software Integration System (SIS).	<a href="#">Download</a>
6	<a href="#">RL78 Family FS3000 Sensor Control Module Software Integration System</a>	This application note explains the sensor control module for FS3000 (Renesas air velocity sensor) sensor using Software Integration System (SIS).	<a href="#">Download</a>
7	<a href="#">RL78 Family FS1015 Sensor Control Module Software Integration System</a>	This application note explains the sensor control module for FS1015 (Renesas air velocity sensor) sensor using Software Integration System (SIS).	<a href="#">Download</a>
8	<a href="#">RL78 Family OB1203 Sensor Control Module Software Integration System</a>	This application note explains the sensor control module for OB1203 (Heart Rate, Blood Oxygen Concentration, Pulse Oximetry, Proximity, Light and Color Sensor) using Software Integration System (SIS).	<a href="#">Download</a>
9	<a href="#">RL78 Family ZMOD4410, ZMOD4450 and ZMOD4510 Sensor Control Module Software Integration System</a>	This application note explains the sensor control modules for ZMOD4410, ZMOD4450 and ZMOD4510 (Digital Gas Sensors) using Software Integration System (SIS)	<a href="#">Download</a>
10	<a href="#">Digital angle meter using I2C communication</a>	This application note explains how to receive acceleration data from a gyro sensor (BMX055), convert it into angle data, and display the sensor's tilt information on an LCD (ACM1602NI-FLW-FBW-M01) using I2C communication.	<a href="#">Download</a>

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# RL78/G15 APPLICATION NOTE [SOFTWARE RELATION]

Item	Title	Summary	Sample code
1	<a href="#">RL78 Software Porting Guide Porting sample code generated by Smart Configurator (CS+, e2 studio, IAR)</a>	This application note describes how to port a software generated by RL78 Smart Configurator to another RL78. As an example, this application note explains the procedure to port the RL78/G23 sample code to the RL78/G15 sample code.	-
2	<a href="#">RL78 Software Porting Guide RL78/G13 sample code porting (CC-RL) (CS+, e2 studio)</a>	This application note describes how to port the RL78/G13 peripheral sample code to another RL78.	-
3	<a href="#">RL78 Software Migration Guide Source Code Migration from Assembly Language to C Language CC-RL</a>	This application note describes how to migrate the program in the assembly language for the CS+, which is the integrated development environment (IDE), to the inline assembler functions in the C language.	-
4	<a href="#">RL78 Software Migration Guide Migrating from CA78K0R to CC-RL (CS+)</a>	This application note describes how to replace the source codes created by the CA78K0R C compiler for the integrated development environment CS+ with the source codes supported by the CC-RL C compiler for the integrated development environment CS+.	-
5	<a href="#">RL78 Debugging Functions Using the Serial Port</a>	This application note describes how to use the RL78 debugging functions using the serial port.	-
6	<a href="#">RL78 Family C compiler CC-RL Programming Techniques</a>	This application note describes how to reduce the code size, increase the execution speed, and programming techniques to avoid bugs when using the C compiler CC-RL.	-
7	<a href="#">RL78 Family C Compiler Package (CC-RL) Application Guide: Programming Techniques</a>	This application note describes methods of programming for efficiency in terms of code size, speed of execution, and ROM size.	-
8	<a href="#">IAR Embedded Workbench for RL78 Programming Techniques</a>	This application note describes how to reduce the code size, increase the execution speed, and programming techniques to avoid bugs when using IAR Embedded Workbench for RL78.	-
9	<a href="#">Integrated Development Environment e<sup>2</sup> studio How to use IAR Systems compiler in e<sup>2</sup> studio</a>	This document describes the procedure for using the IAR Systems compiler on the e2 studio.	-

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# RL78/G15 APPLICATION NOTE [OTHERS]

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Item	Title	Summary	Sample code
1	<a href="#">RL78 Family Notes and Countermeasures Against Noise</a>	This document describes notes and countermeasures against noise for the RL78 Family.	-
2	<a href="#">RL78 Family FFT Library: Deployment Guide</a>	This document provides information for deploying FFT Library. Fast Fourier transform (FFT) is an algorithm that executes the discrete Fourier transform at high speed.	<a href="#">Download</a>
3	<a href="#">RL78 Family RL78 Digital Signal Controller Library - Filter</a>	This document presents the specifications for a Digital Signal Controller(DSC) Library function library for the Renesas RL78 which includes generic specifications, detailed specifications for filter algorithm kernels and guidelines for the DSC Library API.	<a href="#">Download</a>
4	<a href="#">Application execution from RAM</a>	A lot of applications require the code execution from RAM like for example due to safety reasons or e.g. in case of bootloader for flash self-programming. This document will help you to set-up the projects based on the IAR environment.	-

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