CN159
Personal Blood Glucose Monitor

October 2019

Personal Blood Glucose Monitor

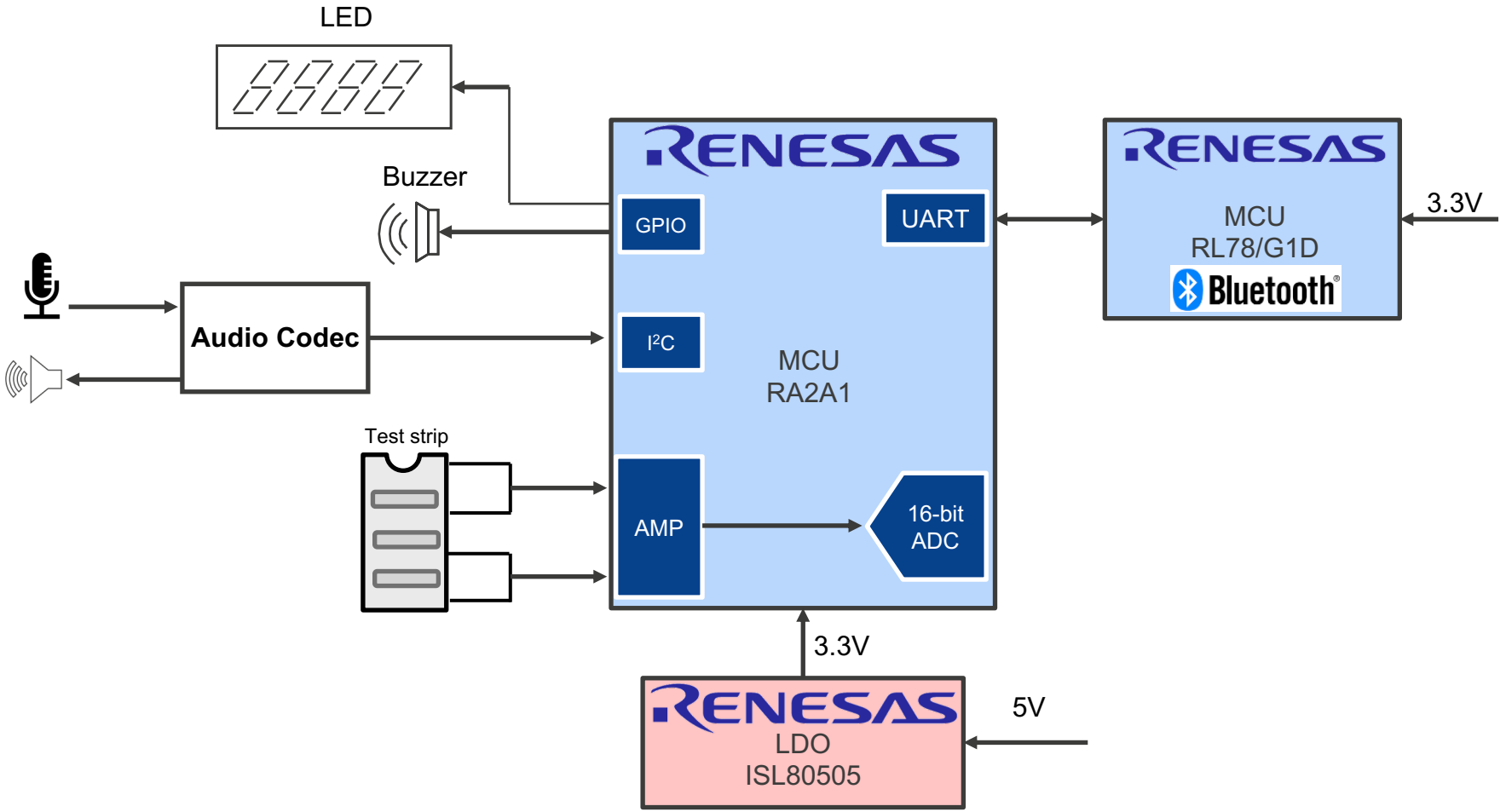
Overview

Renesas' blood glucose monitor (BGM) design utilizes the high-performance RA2 MCU series, a complete solution in a single chip thanks to its integrated 16-bit SAR ADC, 24-bit sigma-delta ADC, op amp, touch control, and lower power performance. The high-performance ADC provides an optimal fit for BGM applications where precision is required. With the addition of the RL78/G1D MCU-based Bluetooth® module, the system can be easily extended to intelligent connections and control via mobile devices.

System Benefits

- The RA2A1 provides an integrated16-bit SAR ADC, 24-bit sigma-delta ADC, op amp, USB, and touch control with low power
- High-performance power LDO (ISL80505) with a low quiescent current for standby power savings

Personal Blood Glucose Monitor



Block Diagram #CN159
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Device Category	P/N	Key Features
MCU	RA2A1	Ultra-Low Power 48-MHz Arm® Cortex®-M23 Core with highly integrated, high-accuracy analog capabilities and offers complete analog solution for signal conditioning and measurement
	RL78/G1D R5F11AGx	Achieves the lowest level of current consumption in the industry at 4.3 mA RF transmission current (0 dBm output) and 3.5 mA RF receiving current
Power	ISL80505	Single output Low Dropout voltage regulator (LDO) capable of sourcing up to 500mA output current

RA2A1 – Ultra-Low Power 48-MHz Arm® Cortex®-M23 Core

Complete Analog Solution for Signal Conditioning and Measurement

High Performance
- 48MHz Arm® Cortex®-M23 CPU

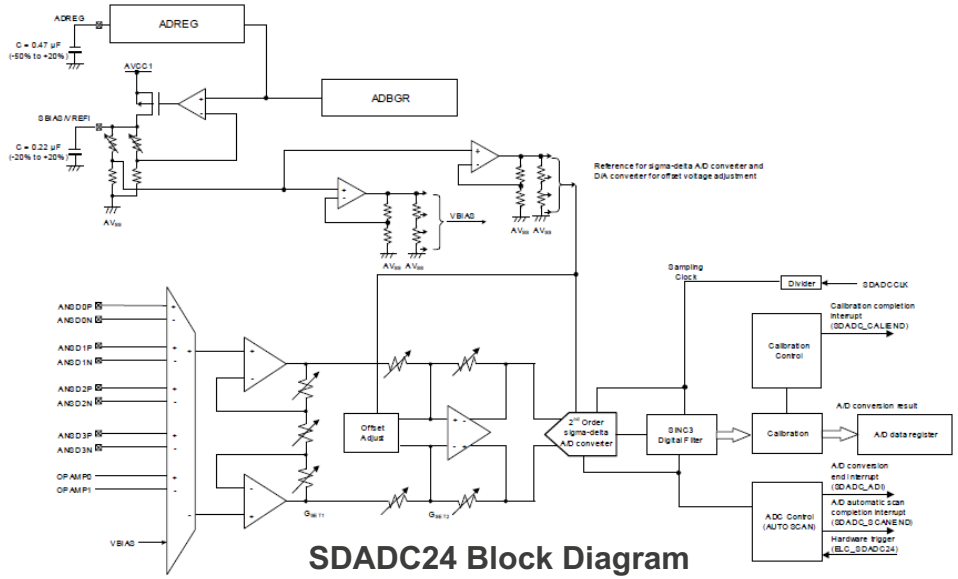
Highly Integrated, High-Accuracy Analog Capabilities
- OPAMP x3
- 24-Bit S/D ADC (10 ch.) /16-Bit SAR ADC (17 ch.)
- 12-Bit DAC (1 ch.)/8-Bit DAC (2 ch.)
- Temperature Sensor (TSN)
- High-Speed Comparator x2
- Low-Power Comparator x2

Communication Interfaces
- USB 2.0 (Full Speed)
- CAN
- SCI x3/SPIx2/IICx2

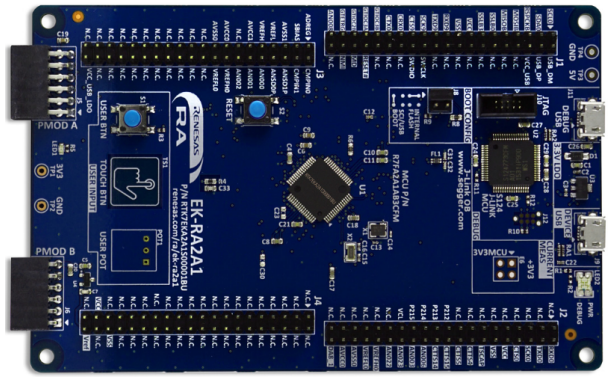
HMI Interface
- Capacitive Touch Sensing Unit (26 ch.)

Wide Voltage and Low Power Consumption
- Wide operating voltage range of 1.6V to 5.5V
- Various Low Power Modes

Part #	Flash Memory	RAM	Temp	Package
R7FA2A1AB3CFJ	256KB	32KB	40 ~ 105℃	32 LQFP
R7FA2A1AB3CFM	256KB	32KB	40 ~ 105℃	64 LQFP



SDADC24 Block Diagram



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BIG IDEAS FOR EVERY SPACE RENESAS

RL78/G1D – Bluetooth® Low Energy MCU

Bluetooth® Low Energy MCU with the Lowest Level of Current Consumption in the Industry

High Integration

- Power-efficient low-end microcontrollers with Bluetooth® Low Energy
- 2.4 GHz RF transceiver
  - Compliant with Bluetooth® v4.2 Low Energy (Master/Slave) specification
  - Reception sensitivity: –90 dBm
  - Max. transmission output power: 0 dBm

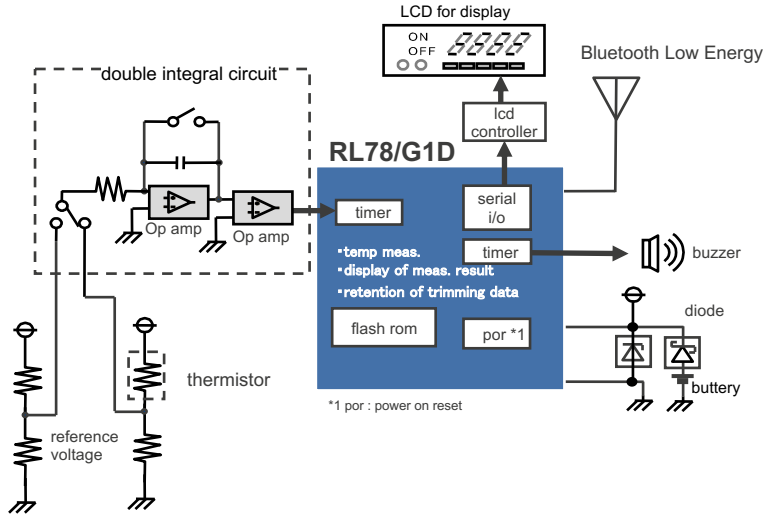
Easy to Develop and Use

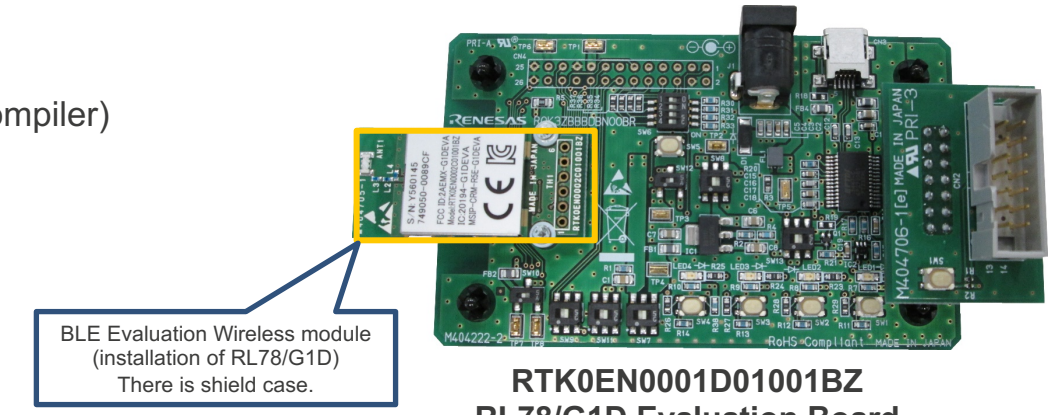
- Since circuit elements are necessary for connecting an antenna are built in, not only does this simplify circuit design for the antenna connection, but it also reduces BOM and overall costs.
- Software stack supports wireless updating, helping to make maintenance of user software more efficient.

Low Power Consumption

- Achieved the lowest level of current consumption in the industry (3 V operation)
  . RF transmitter active normal mode: 4.3 mA, Low power mode:2.6 mA
  . RF receiver active normal mode: 3.5 mA
  . Average current: 9.1 µA (1-second intervals, connection maintained, CC-RL compiler)
- Different standby mode for MCU:HALT, STOP, SNOOZE
- Low power saving mode with 6 setting (min. 0.1 µA) for RF part

Part #	Flash ROM	RAM	Package
R5F11AGG	128KB	12KB	48-pin HWQFN (6 × 6) (0.4mm pitch)
R5F11AGH	192KB	16KB	
R5F11AGJ	256KB	20KB	





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RL78/G1D Evaluation Board

BIG IDEAS FOR EVERY SPACE RENESAS

ISL80505/510 – High Performance 0.5A/1A LDO

High PSRR for Instrumentation, Industrial, and Medical Applications

Stable Output Voltage

- ±1.8% V_{OUT} accuracy guaranteed over line, load
- Stable with a 4.7µF output ceramic capacitor

High Efficiency

- Very low 45mV dropout voltage at V_{OUT} = 2.5V
- Very fast transient response

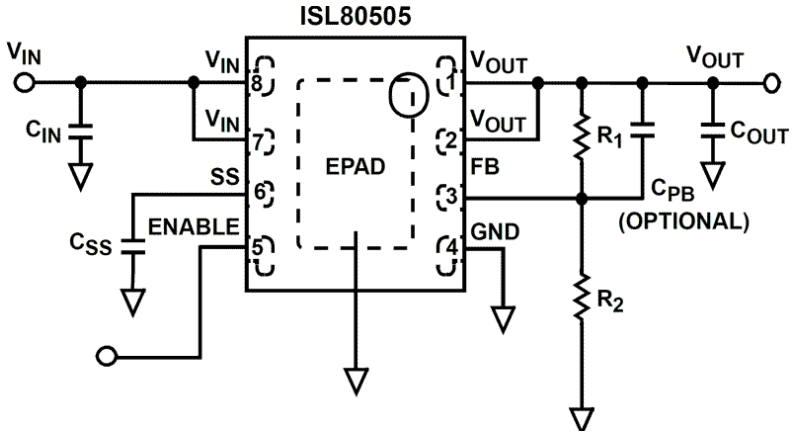
High Performance

- Excellent PSRR over wide frequency range
- Programmable output soft-start time

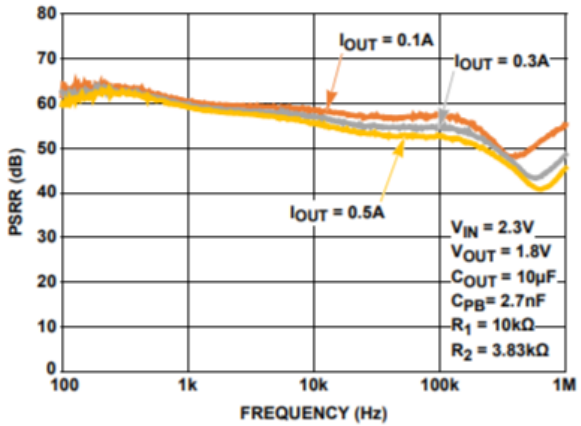
Excellent Safety

- Current limit protection
- Thermal shutdown function

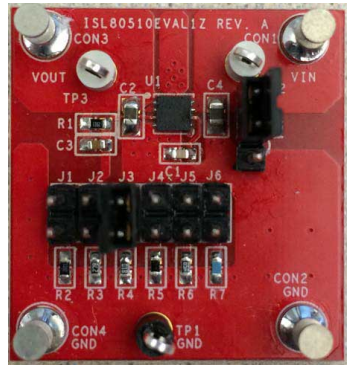
Part #	Vin (V)	Iout (A)	Package
ISL80505IRAJZ	1.8V to 6V	0.5	3x3 DFN
ISL80510IRAJZ	2.2V to 6V	1	3x3 DFN



Typical Application Circuit



PSRR (power supply rejection ratio)



ISL80510EVAL1Z 1A LDO Evaluation Board

Renesas.com