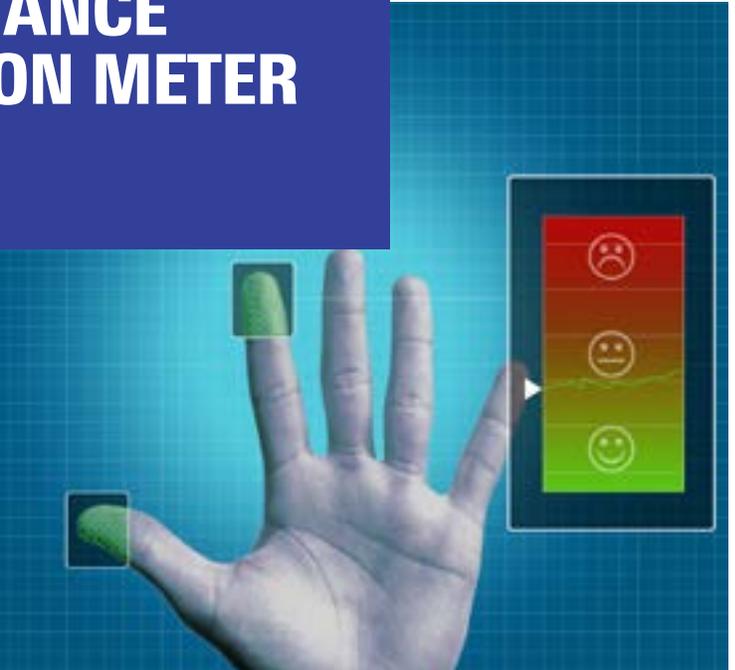


GALVANIC SKIN RESISTANCE AND BODY COMPOSITION METER SOLUTION



Galvanic Skin Resistance (GSR) and Body Composition (BCM) measurements provide valuable biometric information that can be used in inferring emotional state and calculating body fat mass, respectively. Renesas has developed a reference design/solution that can be used by our customers as a starting point for wearable galvanic skin response products and hand held body composition meter systems. This battery-powered device takes DC conductance measurements in GSR mode and high-precision AC impedance measurements in BCM mode, while consuming minimal power.

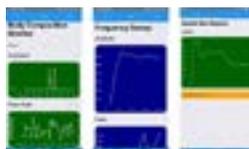
The resolution and the speed of the Analog-to-Digital Converters is critical for the accuracy of GSR-BCM measurements along with skin temperature compensation. Given that these measurements are mostly used in portable or wearable products, they offer energy efficiency and wireless connectivity. The GSR-BCM solution leverages the Renesas Synergy™ S1JA MCU for its high-performance analog and low power capabilities. It also highlights the RL78/G1D for Bluetooth connectivity and the ISL9203A for Li-Ion battery charging.



GSR-BCM Solution with Electrodes



Biosensing GSR/BCM Reference Design

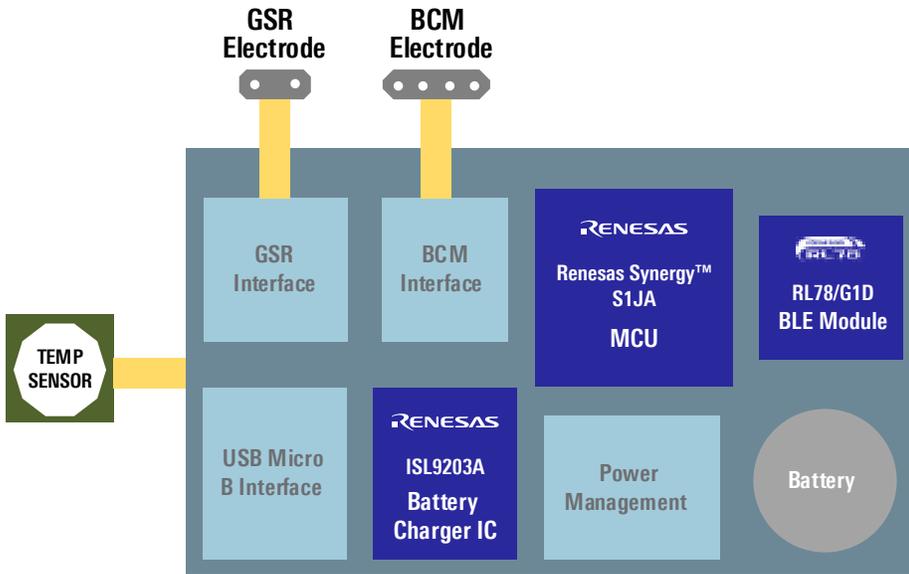


Mobile Apps Screen

Solution Highlights

- GSR Mode
 - Skin conductance as a function of time
 - Infer stress condition
- BCM Mode
 - Body impedance (magnitude & phase) as a function of time, or frequency sweep
 - Body Fat Mass
 - Body Mass Index
- Measures body temperature
- Mobile access via iOS and Android apps

GSR-BCM Module Block Diagram



Features

- Small Form Factor
- Fuel Gauge
- USB Charging
- Bluetooth Low Energy (BLE)
- Temperature Sensor
- DC Conductance Measurements in GSR Mode
- High-precision AC Impedance Measurements in BCM Mode
- Power Switch and LED

Once the device is switched on, the GSR-BCM solution can be selected from the list of Bluetooth supported devices on the mobile app. The GSR measurement page is shown first as soon as the communication is established. Two Velcro covered electrodes are used to collect the GSR data. The DC conductance values are displayed on a time-chart diagram in GSR mode. The Emotion State Curve of a person can be visualized using this data. BCM mode can be selected by swiping the screen sideways or selecting the BCM tab on the top of the mobile app screen. A typical hand electrode is used to collect the BCM data. The frequency sweep measurement plots the body impedance and phase shift caused by the cell capacitance. Another chart displays the measured impedance and phase shift over time for a particular frequency. The specific frequency is selected using the drop-down control above the chart.

An independent temperature sensor enclosed within the finger cuff is used to measure the real-time body temperature which is displayed on both GSR & BCM tabs. The user can enter the weight, height, gender and age to calculate the Body Mass Index (BMI) and Body Fat Percentage using the measured BCM data in a separate tab on the mobile app.

The GSR-BCM solution is based on the Renesas Synergy™ S1JA MCU and the RL78/G1D MCU. The Synergy S1JA MCU features built-in AFE with operational amplifiers, ADCs, DACs and high-speed comparators. In addition to the analog components, S1JA includes all traditional MCU interfaces driven by an energy efficient Arm Cortex-M23 32-bit core. The RL78/G1D is an industry-leading, low-power Bluetooth Smart v4.2 MCU. The reference solution also features the ISL9203A, a Renesas Battery Charger IC that controls the charge current as a function of the battery voltage.



Learn more about our Healthcare Solutions:
www.renesas.com/en-us/solutions/home/healthcare.html

Renesas Synergy™

Learn more about Renesas Synergy:
renesas.com/synergy



Learn more about our GSR-BCM Solutions:
<https://www.renesas.com/gsr-bcm-biosensing-solution>

RENEASAS
RL78

Learn more about Renesas RL78/G1D:
renesas.com/r178

ISL9203A

Learn more about ISL9203A Battery Charger IC:
www.renesas.com/products/isl9203a

RENEASAS

Renesas Electronics America Inc. | renesas.com
 1001 Murphy Ranch Road, Milpitas, CA 95035 | Phone: 1-888-468-3774

© 2019 Renesas Electronics America Inc. (REA). All rights reserved. All trademarks are the property of their respective owners. REA believes the information herein was accurate when given but assumes no risk as to its quality or use. All information is provided as-is without warranties of any kind, whether express, implied, statutory, or arising from course of dealing, usage, or trade practice, including without limitation as to merchantability, fitness for a particular purpose, or non-infringement. REA shall not be liable for any direct, indirect, special, consequential, incidental, or other damages whatsoever, arising from use of or reliance on the information herein, if advised of the possibility of such damages. REA reserves the right, without notice, to discontinue products or make changes to the design or specifications of its products or other information herein. All contents are protected by U.S. and international copyright laws. Except as specifically permitted herein, no portion of this material may be reproduced in any form, or by any means, without prior written permission from Renesas Electronics America Inc. Visitors or users are not permitted to modify, distribute, publish, transmit or create derivative works of any of this material for any public or commercial purposes.