# RZ/G Series

Current Measurement Program

R01AN7449EJ0100
Rev.1.00
Sep. 13. 24

## 1. Introduction

This document presents the usage of "Current Measurement Program" for RZ/G series.
This "Current Measurement Program" measures the current, plots the graph and saves data.

## Contents

## 2. Block Diagram

Fig. 2-1 shows the block diagram of this system.
In detail, please check the schematic of RZ/G3S EVK.

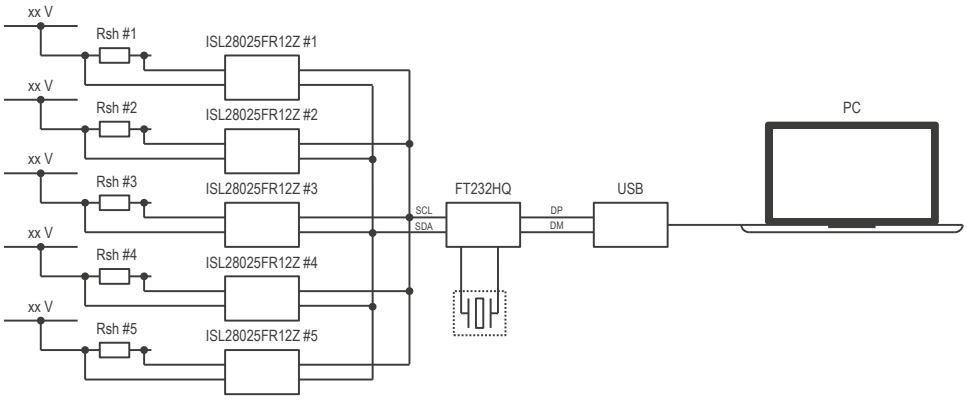



**Fig. 2-1: Block Diagram**

# 3. Specifications

## 3.1 Function Block Diagram

Fig. 3-1 shows the function block diagram.

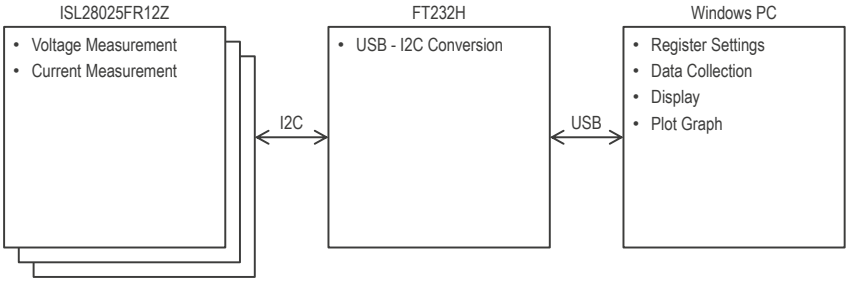



**Fig. 3-1: Function Block Diagram**

## 3.2 Operating Environment

Microsoft Windows 10 PC is required.

# 4. Preparation

## 4.1 Install

Just place 2 files in any folder on PC.

- **`CurrentMeasurementAppFor5ch.exe`**
- **`CurrentMeasurementAppFor5ch.ini`**

## 4.2 Connection

Connect cables like below:

- USB PD cable from AC adapter to "USB-C_PWR_IN" on carrier board of EVK.
- micro-USB from PC to "SER3_UART" on carrier board of EVK. (for serial console)
- micro-USB from PC to USB on main board of EVK. (for this program)

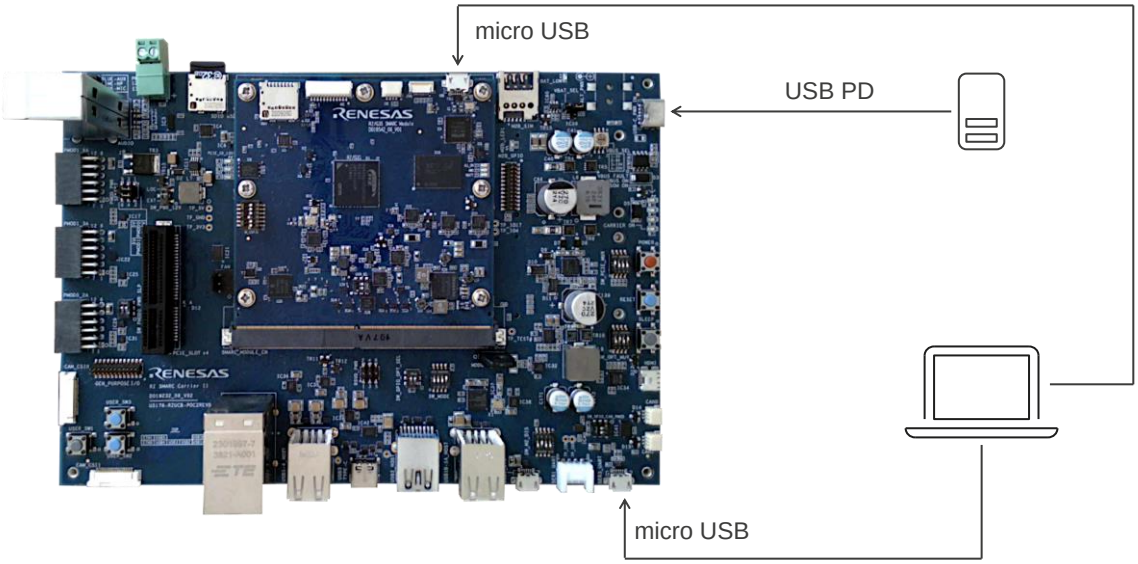



**Fig. 4-1: Connection**

# 5. Operation

## 5.1 Execute

- Double click the executable file "**CurrentMeasurementAppFor5ch.exe**".

The application runs and displays as shown in Fig. 5-1 Screen.

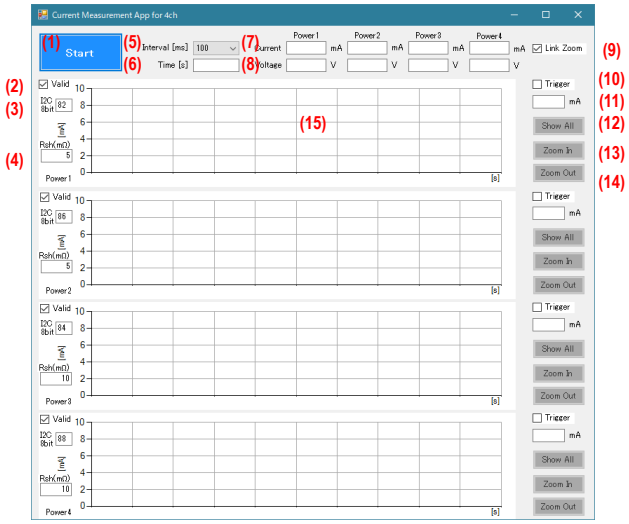



**Fig. 5-1: Screen**

## 5.2 Descriptions of Screen

(1) Start / Stop Button
- Click "Start" to start measurement. This button will become "Stop" during measuring. Click "Stop" to stop measurement.

(2) Enable Check Box
- If unchecked, the graph and measurement will be disabled. It cannot be changed during measurement.

(3) ID of ISL28025FR12Z
- Input the I2C ID of ISL28025FR12Z. (Required)

(4) Value of Shunt Resistance
- Input the value of shunt resistance [Ohm]. (Required)

(5) Measurement Interval
- Select the measurement interval from the drop-down list. Selectable from 100 [ms], 50 [ms], 30 [ms], and 10 [ms]. It cannot be changed during measurement.

(6) Measurement Time Display Area
- Display the measurement time [s].

(7) Current Display Area
- Display the current value [mA].
- The minimum measurement value is 1.25 [mA].

(8) Voltage Display Area
- Display the voltage value [V].
- The minimum measurement value is 0.00125 [V], but this minimum unit is 0.01 [V].

(9) Graph Synchronization
- If checked, the program will synchronize operations (zooming in/out, scrolling…) across all graphs.

(10) Trigger Check Box

- Check this box to enable the trigger function. Uncheck it to disable it. It can be changed during measurement.
- When enabled, a red marker will be placed on the graph where the measurement value is greater than or equal to the trigger value.
- When measurement is stopped, the check is automatically removed. If there is no value in "Trigger Current Value", you cannot check it.

(11) Trigger Current Value
- Enter the current value [mA] you want to trigger. It can be changed during measurement. If you change the value, "Trigger Check Box" will be automatically unchecked.
- Only integers can be entered.

(12) Display All Button
- Click to display the entire time range of the graph (from 0 to stopped time). It cannot be used during measurement.

(13) Zoom in Button
- Click to zoom in the time range of the graph. It cannot be used during measurement.

(14) Zoom out Button
- Click to zoom out the time range of the graph. It cannot be used during measurement.

(15) Plot Area
- Displays a line plot of current value [mA].

## 5.3 Start Measurement

1. Set "Time Interval".
2. Set " Trigger Current Value" and check "Trigger Check Box". (Optional)
3. Set "Enable Check Box". (Optional)
4. Click "Start / Stop Button".
   - Areas that cannot be used during measurement are grayed out during measurement.

After clicking the "Start / Stop Button", if the evaluation board is not powered on or the USB cable is not connected, the pop-up will be displayed. After checking, click "OK" and then click the "Start / Stop Button" again.

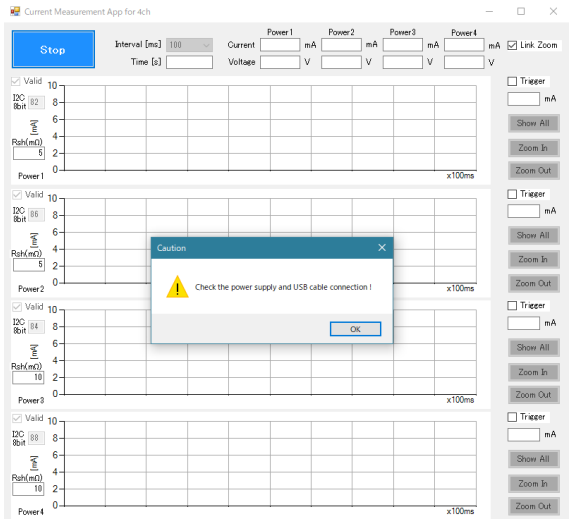



**Fig. 5-2: Caution Pop-up Message**

## 5.4 Set Trigger

1. The trigger value can be changed during measurement.
2. When you change the value, it will be automatically unchecked and disabled, so if you want to enable it, please check it again.

**Information**

When measurement error occurred, the current and voltage value display will be "NaN" and the graph display for the corresponding time will be blank.

## 5.5 Stop Measurement

1. Click the "Start / Stop Button" to stop measurement.
2. When stopped, the time range of the graph becomes all range (from 0 to stopped time). The "Display All Button", "Zoom in Button" and "Zoom out Button" turn blue and become usable.

## 5.6 Shutdown Program

1. When you click the "×" button at the top right, then an exit window will pop up.
2. Click "Yes" to exit.

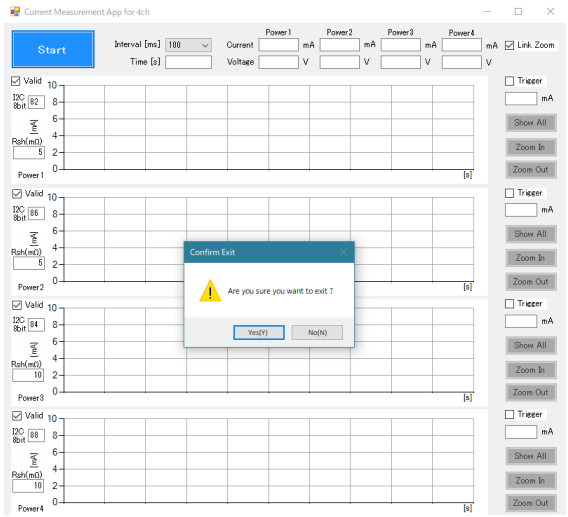



**Fig. 5-3: Exit Pop-up Message**

# 6. Log File

The measurement results are saved in CSV format.

## 6.1 Folder

- The log file will be automatically generated in the same folder as the executable file **`CurrentMeasurementAppFor5ch.exe`**.

## 6.2 File Name

The log file is saved as **`"currentlog_YYMMDD_HHMMSS.csv"`**.

## 6.3 File Format

Table 6-1 shows the log file format. Power supplies for which measurement has been disabled are displayed as "-".

**Table 6-1: File Format**

| Column No. | Descriptions |
|---|---|
| 1 | Measurement Time [s] |
| 2 | Current Value of Power Line #1 [mA] |
| 3 | Voltage Value of Power Line #1 [V] |
| 4 | Current Value of Power Line #2 [mA] |
| 5 | Voltage Value of Power Line #2 [V] |
| 6 | Current Value of Power Line #3 [mA] |
| 7 | Voltage Value of Power Line #3 [V] |
| 8 | Current Value of Power Line #4 [mA] |
| 9 | Voltage Value of Power Line #4 [V] |
| 10 | Current Value of Power Line #5 [mA] |
| 11 | Voltage Value of Power Line #5 [V] |

## 7. Example

This section shows an example to measure current of S2R (suspend to RAM) of RZ/G3S EVK.

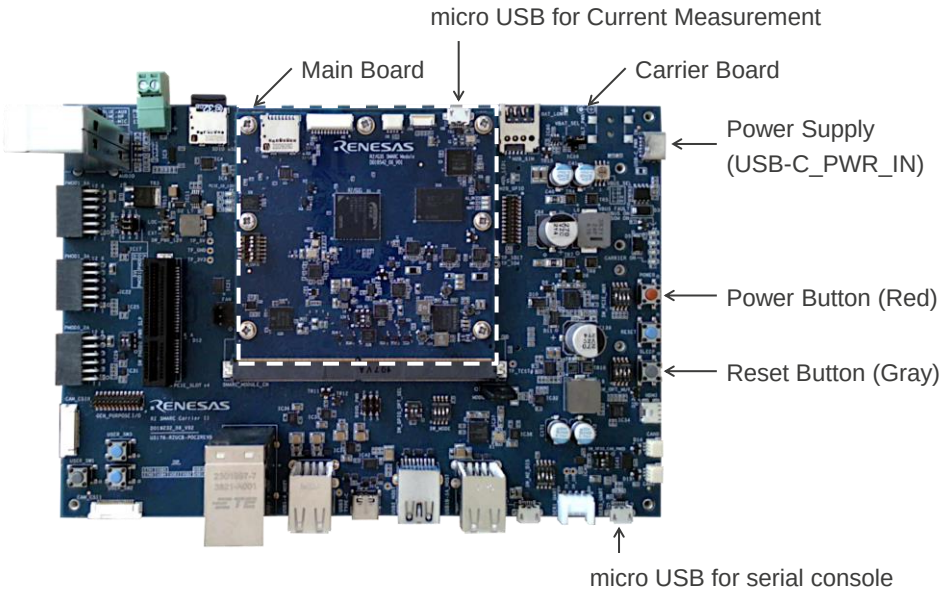


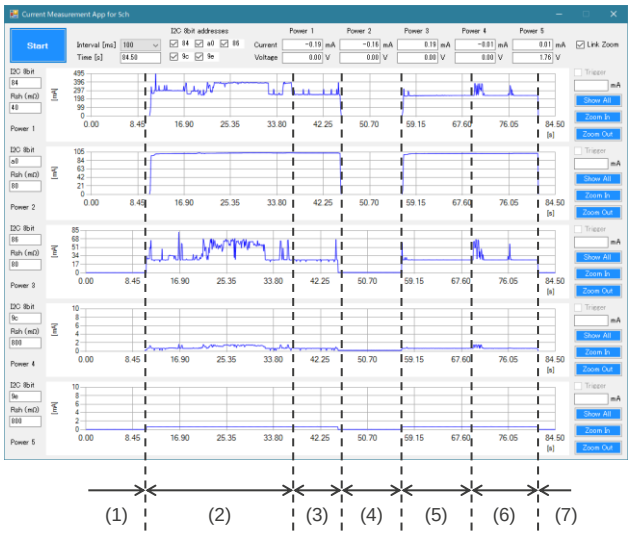

**Fig. 7-1: RZ/G3S EVK**

1. Power off and connect USB lines.
   - See section 4.2.
2. Push the power button to boot Linux and login as root.
3. Wait for seconds.
4. Enter S2R.
   - Enter commands below.

```
# echo deep > /sys/power/mem_sleep
# echo mem > /sys/power/state
```

5. Recover from S2R.
   - Push reset button to recover from S2R.
6. Shut down Linux.
7. Power off.

Then you can see the plot as shown in Fig. 7-2.




(1) Power OFF
(2) Booting Linux
(3) Do Nothing
(4) S2R (Suspend to RAM)
(5) Do Nothing
(6) Shutting down Linux
(7) Power OFF

**Fig. 7-2: Results of example**

## Revision History

| Rev. | Date | Description | |
|---|---|---|---|
| | | Page | Summary |
| 1.00 | Sep. 13. 24 | - | First version |
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## General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. Precaution against Electrostatic Discharge (ESD)
   A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.
2. Processing at power-on
   The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.
3. Input of signal during power-off state
   Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.
4. Handling of unused pins
   Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.
5. Clock signals
   After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.
6. Voltage application waveform at input pin
   Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between $V_{IL}$ (Max.) and $V_{IH}$ (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between $V_{IL}$ (Max.) and $V_{IH}$ (Min.).
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