

S5D9 Lab QPI Flash Micron

By

Michael Li

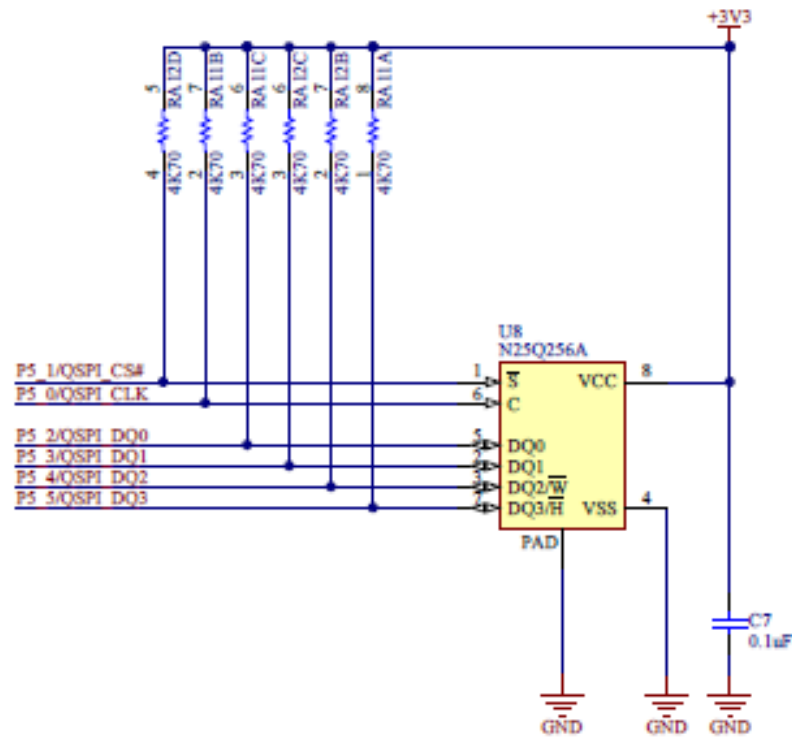
(2/5/2018)

<https://www.miketechuniverse.com>

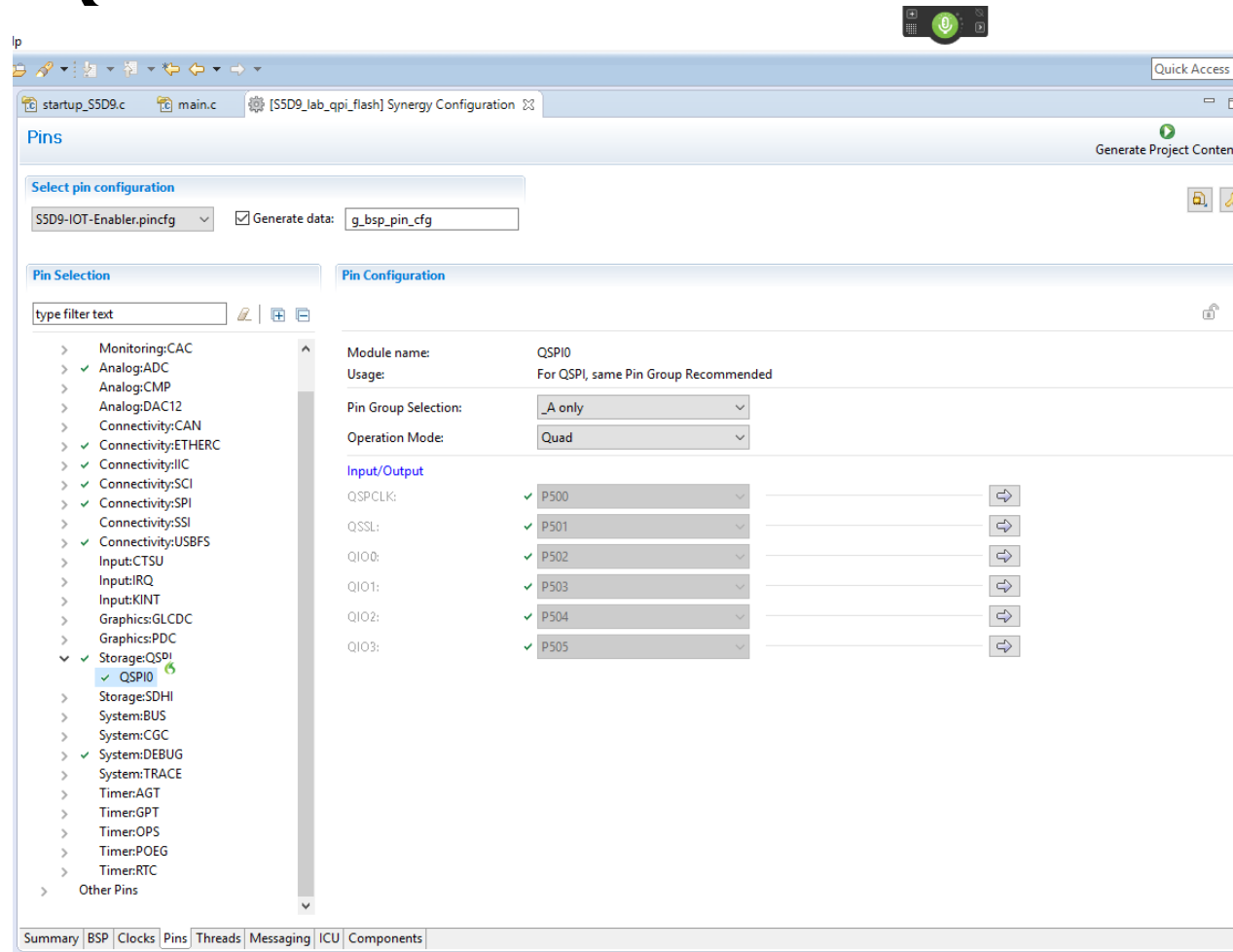
E2 Studio 5.4.0.023

SSP 1.3.0

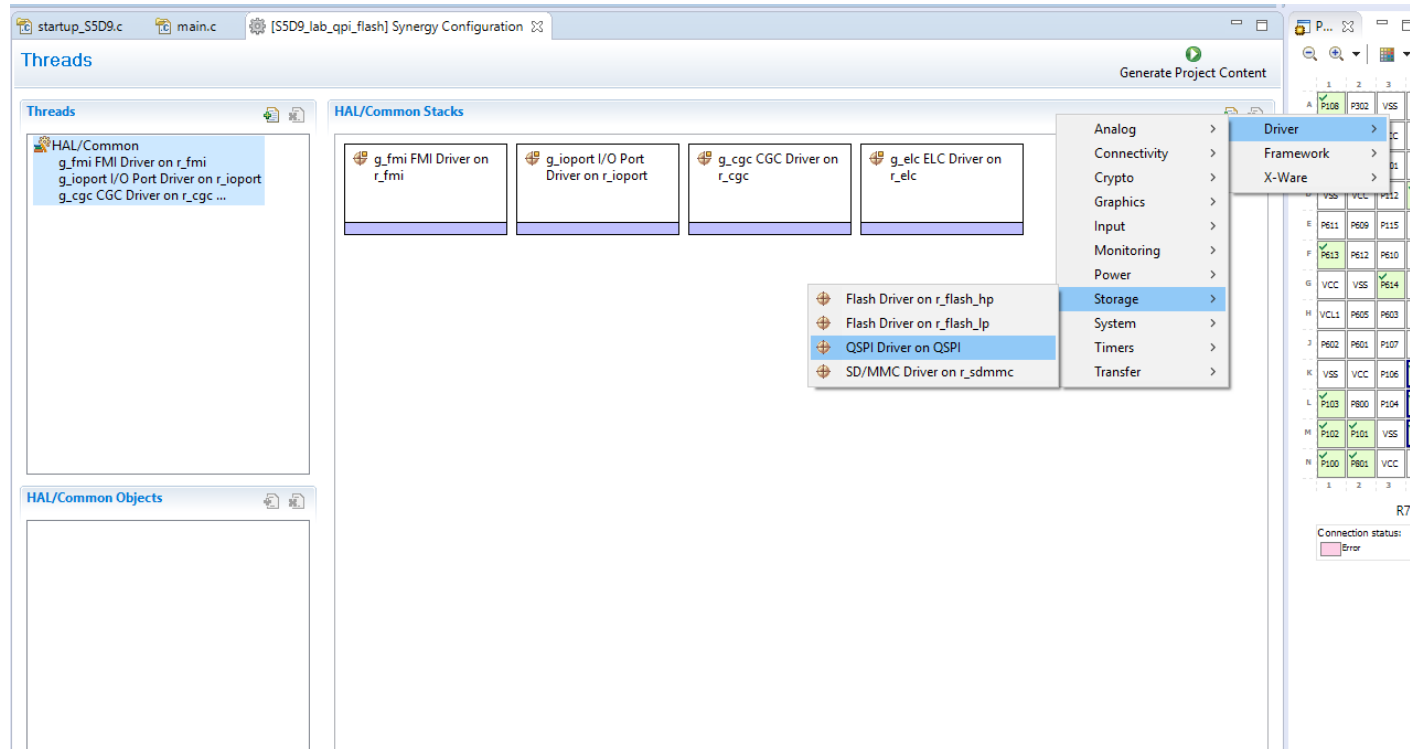
Schematic



QPI Module enabled.



QPI Driver



Properties

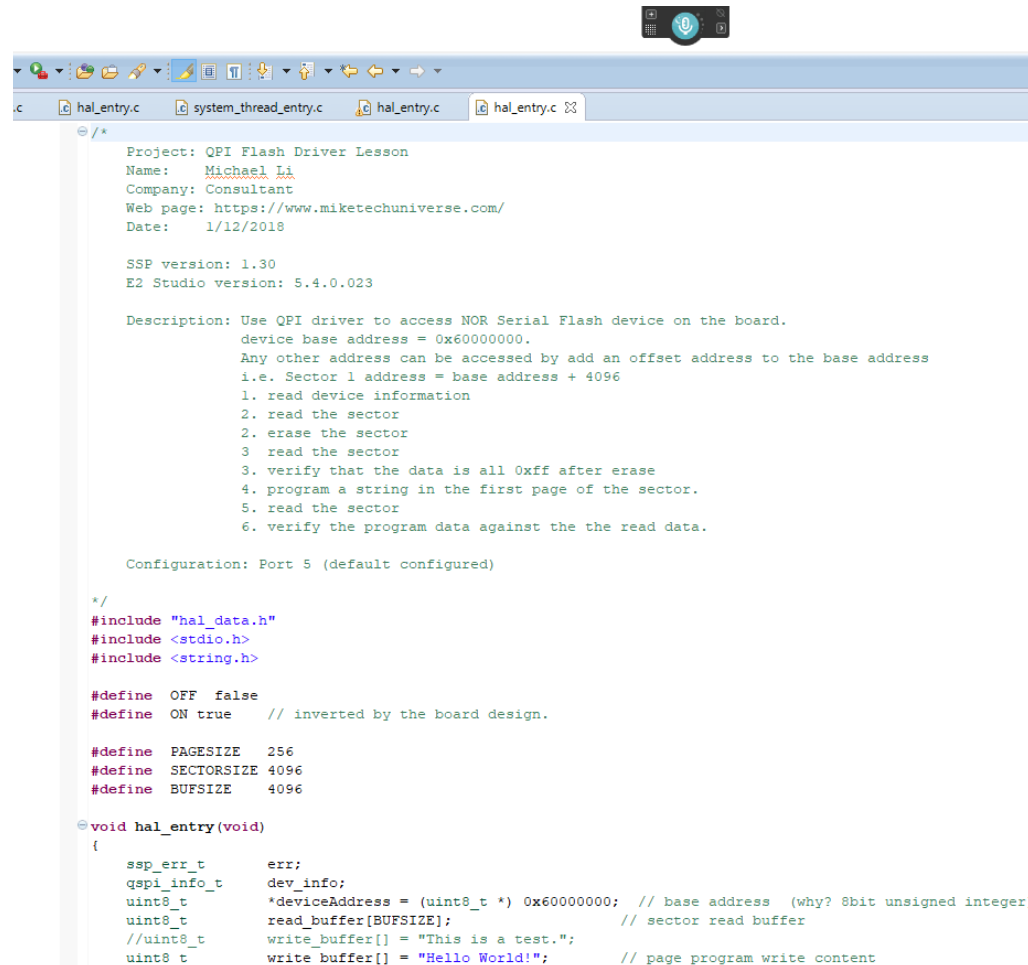
The screenshot displays the Renesas Synergy IDE interface. The top menu bar includes File, Edit, Navigate, Search, Project, Renesas Views, Run, Window, and Help. The Project Explorer on the left lists the project structure, including folders for SSD9_I2C_INT_ENV210_OLED_SHT31_v1, SSD9_I2C_OLED_SHT31_2bus_TX_v1, SSD9_I2C_OLED_SHT31_TX_v2, SSD9_I2C_OLED_SHT31_TX_v3, SSD9_I2C_OLED_SHT31_TX_v4, SSD9_I2C_OLED_SHT31_TX_v4b, SSD9_I2C_OLED_SHT31_TX_v4c, SSD9_I2C_OLED_TX_v1, SSD9_I2C_Sensor_Lab, SSD9_I2C_Sensor_Lab_Framework, SSD9_I2C_SHT31_OLED_TX_UARTBUS_v1, SSD9_I2C_SHT31_OLED_TX_UARTBUS_v2, SSD9_I2C_SHT31_OLED_TX_UARTBUS_v3, SSD9_I2C_SHT31_OLED_TX_UARTBUS_v3a, SSD9_I2C_SHT31_OLED_TX_UARTBUS_v3b, SSD9_I2C_SHT31_OLED_TX_UARTBUS_v3c, SSD9_I2C_SHT31_OLED_TX_UARTBUS_v4, SSD9_I2C_SHT31_TO_BMC_TX_UARTBUS_v1, SSD9_I2C_SHT31_TX_UARTBUS_v1, SSD9_I2C_without_Tx, SSD9_lab_adc_mic_usb_float, SSD9_lab_gpio_input, SSD9_lab_led_loop, SSD9_lab_led_timer, SSD9_lab_led_timer_intr, and SSD9_lab_pwm.

The main area shows the HAL/Common Stacks and HAL/Common Objects. The HAL/Common Stacks section includes the g_qspi0 QSPI Driver on QSPI. The HAL/Common Objects section is empty.

The Properties panel at the bottom left shows the settings for the g_qspi0 QSPI Driver on QSPI. The Name property is set to g_qspi. The Workspace Log on the bottom right shows various messages and errors.

Message	Plug-in	Date
Input file not found: "...". Using first of 1 alternatives:	com.tasking.util	1/15/18, 7:15 PM
Input file not found: "...". Using first of 1 alternatives:	com.tasking.util	1/15/18, 7:15 PM
Input file not found: "...". Using first of 1 alternatives:	com.tasking.util	1/15/18, 7:12 PM
Indexed 'SSD9_lab_qpi_flash' (30 sources, 89 header	org.eclipse.cdt.core	1/15/18, 7:11 PM
Input file not found: "...". Using first of 1 alternatives:	com.tasking.util	1/15/18, 7:10 PM
Input file not found: "...". Using first of 1 alternatives:	com.tasking.util	1/15/18, 7:10 PM
Error logged from Debug UI:	org.eclipse.debug.ui	1/15/18, 7:10 PM
Problems occurred when invoking code from plugi	org.eclipse.debug.ui	1/15/18, 7:10 PM

Code Description



```
Project: QPI Flash Driver Lesson
Name: Michael Li
Company: Consultant
Web page: https://www.miketechuniverse.com/
Date: 1/12/2018

SSP version: 1.30
E2 Studio version: 5.4.0.023

Description: Use QPI driver to access NOR Serial Flash device on the board.
device base address = 0x60000000.
Any other address can be accessed by add an offset address to the base address
i.e. Sector 1 address = base address + 4096
1. read device information
2. read the sector
2. erase the sector
3 read the sector
3. verify that the data is all 0xff after erase
4. program a string in the first page of the sector.
5. read the sector
6. verify the program data against the the read data.

Configuration: Port 5 (default configured)

*/
#include "hal_data.h"
#include <stdio.h>
#include <string.h>

#define OFF false
#define ON true // inverted by the board design.

#define PAGESIZE 256
#define SECTORSIZE 4096
#define BUFSIZE 4096

void hal_entry(void)
{
    ssp_err_t err;
    qspi_info_t dev_info;
    uint8_t *deviceAddress = (uint8_t *) 0x60000000; // base address (why? 8bit unsigned integer)
    uint8_t read_buffer[BUFSIZE]; // sector read buffer
    //uint8_t write_buffer[] = "This is a test.";
    uint8_t write_buffer[] = "Hello World!"; // page program write content
```


Flash Info

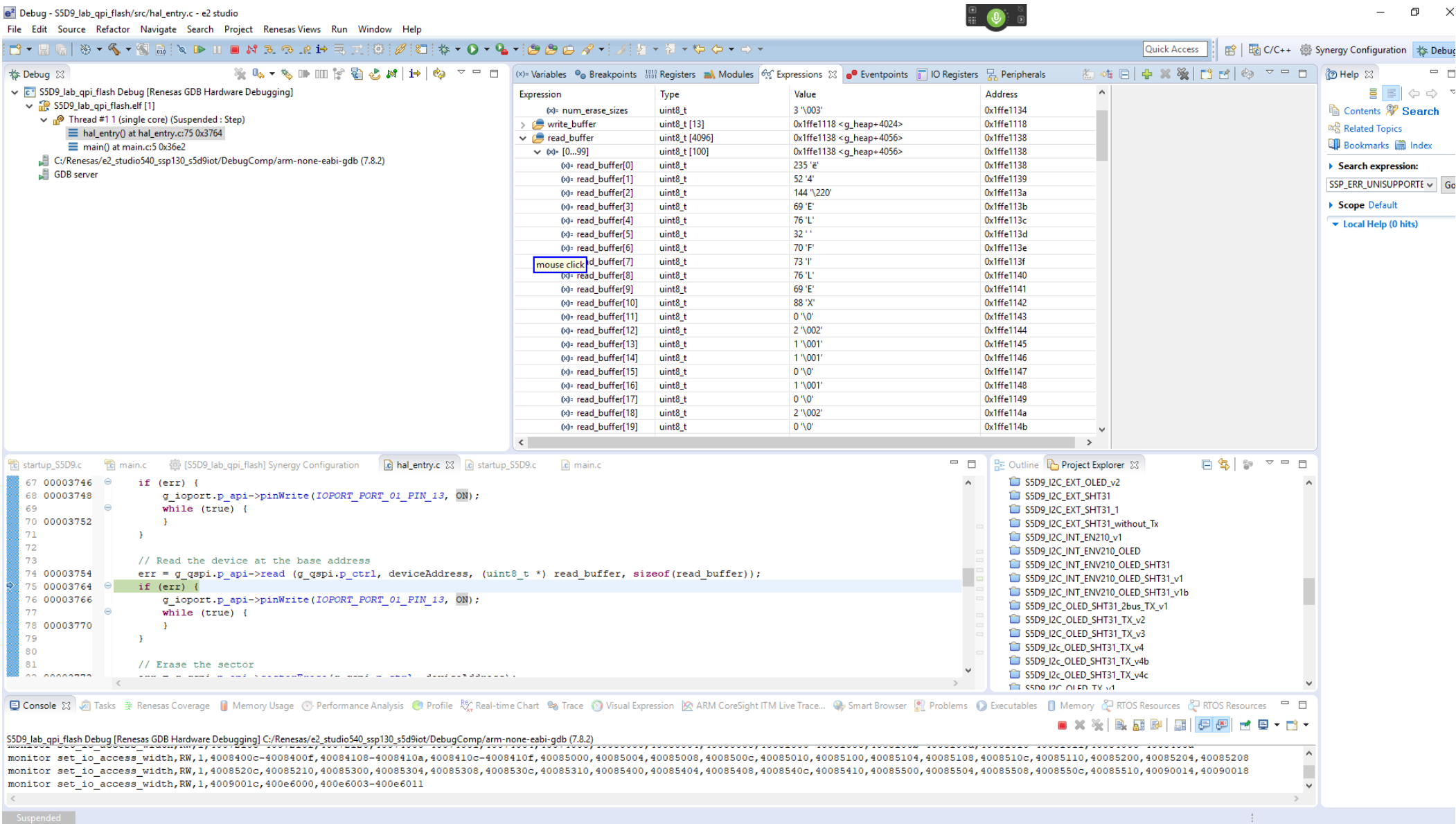
The screenshot shows the e2 studio IDE interface. The 'Variables' window is open, displaying the following data:

Expression	Type	Value	Address
(*) err	ssp_err_t	SSP_SUCCESS	
dev_info	qsapi_info_t	{...}	0x1ffe1128
total_size_bytes	uint32_t	26214400	0x1ffe1128
min_program_size_byte	uint32_t	256	0x1ffe112c
p_erase_sizes_byte	uint32_t *	0x1ffe0000 <n25q256a_flash_erase_sizes>	0x1ffe1130
p_erase_sizes_byte	uint32_t	4096	0x1ffe0000
num_erase_sizes	uint8_t	3 '\003'	0x1ffe1134
write_buffer	uint8_t [13]	0x1ffe1118 <g_heap+4024>	0x1ffe1118
read_buffer	uint8_t [4096]	0x1ffe1138 <g_heap+4056>	0x1ffe1138
pgmfail	_Bool	<optimized out>	
erasetail	_Bool	<optimized out>	
mouse click	int	<optimized out>	
size	int	<optimized out>	
+ Add new expression			

The main editor shows the following C code snippet:

```
61 while (true) {
62     00003736
63 }
64
65 // Get device information (page program size and sector erase size and chip size)
66 err = q_qsapi.p_api->infoGet(q_qsapi.p_ctrl, &dev_info);
67 00003746 if (err) {
68     00003748 q_ioport.p_api->pinWrite(IOPORT_PORT_01_PIN_13, ON);
69     while (true) {
70         00003752
71     }
72 }
73
74 // Read the device at the base address
75 err = q_qsapi.p_api->read(q_qsapi.p_ctrl, deviceAddress, (uint8_t *) read_buffer, sizeof(read_buffer));
76 00003764 if (err) {
77     00003766 q_ioport.p_api->pinWrite(IOPORT_PORT_01_PIN_13, ON);
78 }
```


1st Read (some data) Need to erase the sector.



Debug - SSD9_lab_qpi_flash/src/ha_entry.c - e2 studio

File Edit Source Refactor Navigate Search Project Renesas Views Run Window Help

Debug

SSD9_lab_qpi_flash Debug [Renesas GDB Hardware Debugging]

SSD9_lab_qpi_flash.elf [1]

Thread #1 1 (single core) (Suspended: Step)

ha_entry() at ha_entry.c:75 0x3764

main() at main.c:5 0x36e2

C:/Renesas/e2_studio540_ssp130_s5d9iot/DebugComp/arm-none-eabi-gdb (7.8.2)

GDB server

Expression	Type	Value	Address
num_erase_sizes	uint8_t	3 '\003'	0x1fe1134
write_buffer	uint8_t [13]	0x1fe1118 <g_heap+4024>	0x1fe1118
read_buffer	uint8_t [4096]	0x1fe1138 <g_heap+4056>	0x1fe1138
read_buffer[0..99]	uint8_t [100]	0x1fe1138 <g_heap+4056>	0x1fe1138
read_buffer[0]	uint8_t	235 'e'	0x1fe1138
read_buffer[1]	uint8_t	52 '4'	0x1fe1139
read_buffer[2]	uint8_t	144 '\220'	0x1fe113a
read_buffer[3]	uint8_t	69 'E'	0x1fe113b
read_buffer[4]	uint8_t	76 'L'	0x1fe113c
read_buffer[5]	uint8_t	32 ''	0x1fe113d
read_buffer[6]	uint8_t	70 'F'	0x1fe113e
read_buffer[7]	uint8_t	73 'I'	0x1fe113f
read_buffer[8]	uint8_t	76 'L'	0x1fe1140
read_buffer[9]	uint8_t	69 'E'	0x1fe1141
read_buffer[10]	uint8_t	88 'X'	0x1fe1142
read_buffer[11]	uint8_t	0 '\0'	0x1fe1143
read_buffer[12]	uint8_t	2 '\002'	0x1fe1144
read_buffer[13]	uint8_t	1 '\001'	0x1fe1145
read_buffer[14]	uint8_t	1 '\001'	0x1fe1146
read_buffer[15]	uint8_t	0 '\0'	0x1fe1147
read_buffer[16]	uint8_t	1 '\001'	0x1fe1148
read_buffer[17]	uint8_t	0 '\0'	0x1fe1149
read_buffer[18]	uint8_t	2 '\002'	0x1fe114a
read_buffer[19]	uint8_t	0 '\0'	0x1fe114b

startUp_SSD9.c main.c [SSD9_lab_qpi_flash] Synergy Configuration ha_entry.c startUp_SSD9.c main.c

```
67 00003746 if (err) {
68 00003748     g_ioport.p_api->pinWrite(IOPORT_PORT_01_PIN_13, ON);
69
70 00003752 while (true) {
71
72
73 // Read the device at the base address
74 err = g_qspi.p_api->read (g_qspi.p_ctrl, deviceAddress, (uint8_t *) read_buffer, sizeof(read_buffer));
75 00003764 if (err) {
76 00003766     g_ioport.p_api->pinWrite(IOPORT_PORT_01_PIN_13, ON);
77 while (true) {
78 00003770
79
80
81 // Erase the sector
82 err = g_qspi.p_api->eraseSector(deviceAddress, deviceAddress + 1, deviceAddress + 1024);
```

Outline Project Explorer

- SSD9_I2C_EXT_OLED_v2
- SSD9_I2C_EXT_SHT31
- SSD9_I2C_EXT_SHT31_1
- SSD9_I2C_EXT_SHT31_without_Tx
- SSD9_I2C_INT_ENV210_v1
- SSD9_I2C_INT_ENV210_OLED
- SSD9_I2C_INT_ENV210_OLED_SHT31
- SSD9_I2C_INT_ENV210_OLED_SHT31_v1
- SSD9_I2C_INT_ENV210_OLED_SHT31_v1b
- SSD9_I2C_OLED_SHT31_2bus_TX_v1
- SSD9_I2C_OLED_SHT31_TX_v2
- SSD9_I2C_OLED_SHT31_TX_v3
- SSD9_I2C_OLED_SHT31_TX_v4
- SSD9_I2C_OLED_SHT31_TX_v4b
- SSD9_I2C_OLED_SHT31_TX_v4c
- SSD9_I2C_OLED_TX_v1

Console Tasks Renesas Coverage Memory Usage Performance Analysis Profile Real-time Chart Trace Visual Expression ARM CoreSight ITM Live Trace... Smart Browser Problems Executables Memory RTOS Resources RTOS Resources

SSD9_lab_qpi_flash Debug [Renesas GDB Hardware Debugging] C:/Renesas/e2_studio540_ssp130_s5d9iot/DebugComp/arm-none-eabi-gdb (7.8.2)

```
monitor set_io_access_width,RW,1,4008400c-4008400f,40084108-4008410a,4008410c-4008410f,40085000,40085004,40085008,4008500c,40085010,40085100,40085104,40085108,4008510c,40085110,40085200,40085204,40085208
monitor set_io_access_width,RW,1,4008520c,40085210,40085300,40085304,40085308,4008530c,40085310,40085400,40085404,40085408,4008540c,40085410,40085500,40085504,40085508,4008550c,40085510,40090014,40090018
monitor set_io_access_width,RW,1,4009001c,400e6000,400e6003-400e6011
```

Suspended

After Sector Erase

Debug - SSD9_lab_qpi_flash/src/hal_entry.c - e2 studio

File Edit Source Refactor Navigate Search Project Renesas Views Run Window Help

Quick Access C/C++ Synergy Configuration Debug

Debug SSD9_lab_qpi_flash Debug [Renesas GDB Hardware Debugging]

SSD9_lab_qpi_flash.elf [1]

Thread #1 1 (single core) (Suspended: Step)

hal_entry() at hal_entry.c:91 0x379a

main() at main.c:5 0x36e2

C:/Renesas/e2_studio540_ssp130_s5d9iot/DebugComp/arm-none-eabi-gdb (7.8.2)

GDB server

Expression	Type	Value	Address
(*) err	ssp_err_t	SSP_SUCCESS	
dev_info	qspi_info_t	{...}	0x1ffe1128
total_size_bytes	uint32_t	26214400	0x1ffe1128
min_program_size_bytes	uint32_t	256	0x1ffe112c
p_erase_sizes_bytes	uint32_t *	0x1ffe0000 <n25q256a_flash_erase_sizes>	0x1ffe1130
p_erase_sizes_byte	uint32_t	4096	0x1ffe0000
num_erase_sizes	uint8_t	3 '\003'	0x1ffe1134
write_buffer	uint8_t [13]	0x1ffe1118 <g_heap+4024>	0x1ffe1118
read_buffer	uint8_t [4096]	0x1ffe1138 <g_heap+4056>	0x1ffe1138
[0...99]	uint8_t [100]	0x1ffe1138 <g_heap+4056>	0x1ffe1138
read_buffer[0]	uint8_t	255 'y'	0x1ffe1138
read_buffer[1]	uint8_t	255 'y'	0x1ffe1139
read_buffer[2]	uint8_t	255 'y'	0x1ffe113a
read_buffer[3]	uint8_t	255 'y'	0x1ffe113b
read_buffer[4]	uint8_t	255 'y'	0x1ffe113c
read_buffer[5]	uint8_t	255 'y'	0x1ffe113d
read_buffer[6]	uint8_t	255 'y'	0x1ffe113e
read_buffer[7]	uint8_t	255 'y'	0x1ffe113f
read_buffer[8]	uint8_t	255 'y'	0x1ffe1140
read_buffer[9]	uint8_t	255 'y'	0x1ffe1141
read_buffer[10]	uint8_t	255 'y'	0x1ffe1142
read_buffer[11]	uint8_t	255 'y'	0x1ffe1143
read_buffer[12]	uint8_t	255 'y'	0x1ffe1144
read_buffer[13]	uint8_t	255 'y'	0x1ffe1145
read_buffer[14]	uint8_t	255 'y'	0x1ffe1146

close window

startup_SSD9.c main.c [SSD9_lab_qpi_flash] Synergy Configuration hal_entry.c startup_SSD9.c main.c

```
79 }
80
81 // Erase the sector
82 err = g_qspi.p_api->sectorErase(g_qspi.p_ctrl, deviceAddress);
83 if (err) {
84     g_ioport.p_api->pinWrite(IOPORT_PORT_01_PIN_13, ON);
85     while (true) {
86     }
87 }
88
89 // Read the sector
90 err = g_qspi.p_api->read(g_qspi.p_ctrl, deviceAddress, (uint8_t *) read_buffer, sizeof(read_buffer));
91 if (err) {
92     g_ioport.p_api->pinWrite(IOPORT_PORT_01_PIN_13, ON);
93 }
```

Console Tasks Renesas Coverage Memory Usage Performance Analysis Profile Real-time Chart Trace Visual Expression ARM CoreSight ITM Live Trace Smart Browser Problems Executables Memory RTOS Resources RTOS Resources

SSD9_lab_qpi_flash Debug [Renesas GDB Hardware Debugging] C:/Renesas/e2_studio540_ssp130_s5d9iot/DebugComp/arm-none-eabi-gdb (7.8.2)

```
monitor set_io_access_width,RW,1,4008400c-4008400f,40084108-4008410a,4008410c-4008410f,40085000,40085004,40085008,4008500c,40085010,40085100,40085104,40085108,4008510c,40085200,40085204,40085208
monitor set_io_access_width,RW,1,4008520c,40085210,40085300,40085304,40085308,4008530c,40085310,40085400,40085404,40085408,4008540c,40085410,40085500,40085504,40085508,4008550c,40085510,40090014,40090018
monitor set_io_access_width,RW,1,4009001c,400e6000,400e6003-400e6011
```

Suspended

Erase Fail = False (Operation Success)

Debug - SSD9_lab_qpi_flash/src/hal_entry.c - e2 studio

File Edit Source Refactor Navigate Search Project Renesas Views Run Window Help

Debug

SSD9_lab_qpi_flash Debug [Renesas GDB Hardware Debugging]

SSD9_lab_qpi_flash.elf [1]

Thread #1 1 (single core) (Suspended: Breakpoint)

hal_entry() at hal_entry.c:112 0x37cc

main() at main.c:5 0x36e2

C:/Renesas/e2_studio540_ssp130_s5d9iot/DebugComp/arm-none-eabi-gdb (7.8.2)

GDB server

Expression	Type	Value	Address
err	ssp_err_t	SSP_SUCCESS	
dev_info	qspi_info_t	{...}	0x1ffe1128
total_size_bytes	uint32_t	26214400	0x1ffe1128
min_program_size_byte	uint32_t	256	0x1ffe112c
p_erase_sizes_bytes	uint32_t *	0x1ffe0000 <n25q256a_flash_erase_sizes>	0x1ffe1130
p_erase_sizes_byte	uint32_t	4096	0x1ffe0000
num_erase_sizes	uint8_t	3 ^003	0x1ffe1134
write_buffer	uint8_t [13]	0x1ffe1118 <g_heap+4024>	0x1ffe1118
read_buffer	uint8_t [4096]	0x1ffe1138 <g_heap+4056>	0x1ffe1138
pgmfail	_Bool	<optimized out>	
erasefail	_Bool	false	
i	int	4096	
size	int	<optimized out>	
Add new expression			

startUp_SSD9.c main.c [SSD9_lab_qpi_flash] Synergy Configuration hal_entry.c startUp_SSD9.c main.c

```
102         break;
103     }
104 }
105 if (erasefail) {
106     g_ioport.p_api->pinWrite(IOPORT_PORT_01_PIN_13, ON);
107     while (true) {
108         // Program for a number of bytes.
109         err = g_qspi.p_api->pageProgram (g_qspi.p_ctrl, deviceAddress, (uint8_t *) write_buffer, sizeof(write_buffer) );
110         if (err) {
111             g_ioport.p_api->pinWrite(IOPORT_PORT_01_PIN_13, ON);
112             while (true) {
```

Outline Project Explorer

- SSD9_I2C_EXT_OLED_v2
- SSD9_I2C_EXT_SHT31
- SSD9_I2C_EXT_SHT31_1
- SSD9_I2C_EXT_SHT31_without_Tx
- SSD9_I2C_INT_ENV210_v1
- SSD9_I2C_INT_ENV210_OLED
- SSD9_I2C_INT_ENV210_OLED_SHT31
- SSD9_I2C_INT_ENV210_OLED_SHT31_v1
- SSD9_I2C_INT_ENV210_OLED_SHT31_v1b
- SSD9_I2C_OLED_SHT31_2bus_TX_v1
- SSD9_I2C_OLED_SHT31_TX_v2
- SSD9_I2C_OLED_SHT31_TX_v3
- SSD9_I2C_OLED_SHT31_TX_v4
- SSD9_I2C_OLED_SHT31_TX_v4b
- SSD9_I2C_OLED_SHT31_TX_v4c

Console Tasks Renesas Coverage Memory Usage Performance Analysis Profile Real-time Chart Trace Visual Expression ARM CoreSight ITM Live Trace... Smart Browser Problems Executables Memory RTOS Resources

SSD9_lab_qpi_flash Debug [Renesas GDB Hardware Debugging] C:/Renesas/e2_studio540_ssp130_s5d9iot/DebugComp/arm-none-eabi-gdb (7.8.2)

Breakpoint 2, hal_entry () at ../src/hal_entry.c:112

```
112     err = g_qspi.p_api->pageProgram (g_qspi.p_ctrl, deviceAddress, (uint8_t *) write_buffer, sizeof(write_buffer) );
```

Suspended

Read After Program

Debug - SSD9_lab_qpi_flash/src/hal_entry.c - e2 studio

File Edit Source Refactor Navigate Search Project Renesas Views Run Window Help

Debug SSD9_lab_qpi_flash Debug [Renesas GDB Hardware Debugging]

SSD9_lab_qpi_flash.elf [1]

Thread #1 1 (single core) (Suspended: Step)

hal_entry() at hal_entry.c:121 0x37f8

main() at main.c:5 0x36e2

C:/Renesas/e2_studio540_ssp130_s5d9iot/DebugComp/arm-none-eabi-gdb (7.8.2)

GDB server

Expression	Type	Value	Address
(*) err	ssp_err_t	SSP_SUCCESS	
dev_info	qspi_info_t	{...}	0x1ffe1128
total_size_bytes	uint32_t	26214400	0x1ffe1128
min_program_size_byte	uint32_t	256	0x1ffe112c
p_erase_sizes_bytes	uint32_t *	0x1ffe0000 <n25q256a_flash_erase_sizes>	0x1ffe1130
p_erase_sizes_byte	uint32_t	4096	0x1ffe0000
num_erase_sizes	uint8_t	3 '003'	0x1ffe1134
write_buffer	uint8_t [13]	0x1ffe1118 <g_heap+4024>	0x1ffe1118
read_buffer	uint8_t [4096]	0x1ffe1138 <g_heap+4056>	0x1ffe1138
read_buffer[0..99]	uint8_t [100]	0x1ffe1138 <g_heap+4056>	0x1ffe1138
read_buffer[0]	uint8_t	72 'H'	0x1ffe1138
read_buffer[1]	uint8_t	101 'e'	0x1ffe1139
read_buffer[2]	uint8_t	108 'l'	0x1ffe113a
read_buffer[3]	uint8_t	108 'l'	0x1ffe113b
read_buffer[4]	uint8_t	111 'o'	0x1ffe113c
read_buffer[5]	uint8_t	32 ''	0x1ffe113d
read_buffer[6]	uint8_t	87 'W'	0x1ffe113e
read_buffer[7]	uint8_t	111 'o'	0x1ffe113f
read_buffer[8]	uint8_t	114 'r'	0x1ffe1140
read_buffer[9]	uint8_t	108 'l'	0x1ffe1141
read_buffer[10]	uint8_t	100 'd'	0x1ffe1142
read_buffer[11]	uint8_t	33 '!'	0x1ffe1143
read_buffer[12]	uint8_t	0 '\0'	0x1ffe1144
read_buffer[13]	uint8_t	255 'y'	0x1ffe1145
read_buffer[14]	uint8_t	255 'y'	0x1ffe1146

startup_SSD9.c main.c [SSD9_lab_qpi_flash] Synergy Configuration hal_entry.c startup_SSD9.c main.c

```
116 000037e6      }
117      }
118
119      // Read the device at the base address
120 000037e8      err = g_qspi.p_api->read (g_qspi.p_ctrl, deviceAddress, (uint8_t *) read_buffer, sizeof(read_buffer));
121 000037f8      if (err) {
122 00003824          g_ioport.p_api->pinWrite(IOPORT_PORT_01_PIN_13, ON);
123          while (true) {
124 0000382e          }
125      }
126
127      // Verify the page program write data
128      pgmfail = false;
129      size = sizeof(write_buffer);
```

Outline Project Explorer

- SSD9_I2C_EXT_OLED_v2
- SSD9_I2C_EXT_SHT31
- SSD9_I2C_EXT_SHT31_1
- SSD9_I2C_EXT_SHT31_without_Tx
- SSD9_I2C_INT_ENV210_v1
- SSD9_I2C_INT_ENV210_OLED
- SSD9_I2C_INT_ENV210_OLED_SHT31
- SSD9_I2C_INT_ENV210_OLED_SHT31_v1
- SSD9_I2C_INT_ENV210_OLED_SHT31_v1b
- SSD9_I2C_OLED_SHT31_2bus_TX_v1
- SSD9_I2C_OLED_SHT31_TX_v2
- SSD9_I2C_OLED_SHT31_TX_v3
- SSD9_I2C_OLED_SHT31_TX_v4
- SSD9_I2C_OLED_SHT31_TX_v4b
- SSD9_I2C_OLED_SHT31_TX_v4c

Console Tasks Renesas Coverage Memory Usage Performance Analysis Profile Real-time Chart Trace Visual Expression ARM CoreSight ITM Live Trace... Smart Browser Problems Executables Memory RTOS Resources

SSD9_lab_qpi_flash Debug [Renesas GDB Hardware Debugging] C:/Renesas/e2_studio540_ssp130_s5d9iot/DebugComp/arm-none-eabi-gdb (7.8.2)

Breakpoint 2, hal_entry () at ../src/hal_entry.c:112

```
112      err = g_qspi.p_api->pageProgram (g_qspi.p_ctrl, deviceAddress, (uint8_t *) write_buffer, sizeof(write_buffer));
```

Suspended

Program Fail = False (Program Success)

The screenshot displays the e2 studio IDE interface during a debug session. The main window shows the source code of `hal_entry.c` at line 141, where the program is suspended at a breakpoint. The `err` variable is assigned the value `SSP_SUCCESS`, and the `pgmfail` variable is `false`. The console window at the bottom shows the execution flow, including the breakpoint hit at line 141.

Expression	Type	Value	Address
<code>err</code>	<code>ssp_err_t</code>	<code>SSP_SUCCESS</code>	
<code>dev_info</code>	<code>qspi_info_t</code>	<code>{...}</code>	<code>0x1ffe1128</code>
<code>total_size_bytes</code>	<code>uint32_t</code>	<code>26214400</code>	<code>0x1ffe1128</code>
<code>min_program_size_byte</code>	<code>uint32_t</code>	<code>256</code>	<code>0x1ffe112c</code>
<code>p_erase_sizes_bytes</code>	<code>uint32_t *</code>	<code>0x1ffe0000 <n25q256a_flash_erase_sizes></code>	<code>0x1ffe1130</code>
<code>p_erase_sizes_byte</code>	<code>uint32_t</code>	<code>4096</code>	<code>0x1ffe0000</code>
<code>num_erase_sizes</code>	<code>uint8_t</code>	<code>3 '\003'</code>	<code>0x1ffe1134</code>
<code>write_buffer</code>	<code>uint8_t [13]</code>	<code>0x1ffe1118 <g_heap+4024></code>	<code>0x1ffe1118</code>
<code>read_buffer</code>	<code>uint8_t [4096]</code>	<code>0x1ffe1138 <g_heap+4056></code>	<code>0x1ffe1138</code>
<code>pgmfail</code>	<code>_Bool</code>	<code>false</code>	
<code>erasesize</code>	<code>_Bool</code>	<code>false</code>	
<code>i</code>	<code>int</code>	<code>13</code>	
<code>size</code>	<code>int</code>	<code><optimized out></code>	

```
131 000037fc if (write_buffer[i] != read_buffer[i]) {
132      pgmfail = true;
133      break;
134  }
135  }
136  if (pgmfail) {
137 00003818     g_ioport.p_api->pinWrite(IOPORT_PORT_01_PIN_13, ON);
138      while (true) {
139 00003822     }
140  }
141 00003810 err = g_qspi.p_api->close (g_qspi.p_ctrl);
142
143      while (true) {
144 00003816     }
```

Read Again After Power down/up (Data is still good)

The screenshot shows the Renesas Studio IDE interface during a debug session. The main window displays the 'Variables' pane, which lists various variables and their values. The 'read_buffer' array is highlighted, showing the string 'Please say that again'. The 'Console' pane at the bottom shows the execution flow and a temporary breakpoint.

Variables Pane:

Expression	Type	Value	Address
(*) err	ssp_err_t	SSP_SUCCESS	0x1ffe1128
> dev_info	qspi_info_t	{...}	0x1ffe1118
> write_buffer	uint8_t [13]	0x1ffe1118 <g_heap+4024>	0x1ffe1138
> read_buffer	uint8_t [4096]	0x1ffe1138 <g_heap+4056>	0x1ffe1138
(*) [0..99]	uint8_t [100]	0x1ffe1138 <g_heap+4056>	0x1ffe1138
(*) read_buffer[0]	uint8_t	72 'H'	0x1ffe1138
(*) read_buffer[1]	uint8_t	101 'e'	0x1ffe1139
(*) read_buffer[2]	uint8_t	108 'l'	0x1ffe113a
(*) read_buffer[3]	uint8_t	108 'l'	0x1ffe113b
(*) read_buffer[4]	uint8_t	111 'o'	0x1ffe113c
(*) read_buffer[5]	uint8_t	32 ''	0x1ffe113d
Please say that again [6]	uint8_t	87 'W'	0x1ffe113e
(*) read_buffer[7]	uint8_t	111 'o'	0x1ffe113f
(*) read_buffer[8]	uint8_t	114 'r'	0x1ffe1140
(*) read_buffer[9]	uint8_t	108 'l'	0x1ffe1141
(*) read_buffer[10]	uint8_t	100 'd'	0x1ffe1142
(*) read_buffer[11]	uint8_t	33 'I'	0x1ffe1143
(*) read_buffer[12]	uint8_t	0 '\0'	0x1ffe1144
(*) read_buffer[13]	uint8_t	255 'ÿ'	0x1ffe1145
(*) read_buffer[14]	uint8_t	255 'ÿ'	0x1ffe1146
(*) read_buffer[15]	uint8_t	255 'ÿ'	0x1ffe1147
(*) read_buffer[16]	uint8_t	255 'ÿ'	0x1ffe1148
(*) read_buffer[17]	uint8_t	255 'ÿ'	0x1ffe1149
(*) read_buffer[18]	uint8_t	255 'ÿ'	0x1ffe114a
(*) read_buffer[19]	uint8_t	255 'ÿ'	0x1ffe114b

Console:

```
SSD9_lab_qpi_flash Debug [Renesas GDB Hardware Debugging] C:/Renesas/e2_studio540_ssp130_s5d9iot/DebugComp/arm-none-eabi-gdb (7.8.2)
Temporary breakpoint 3, main () at ../src/synergy_gen/main.c:5
5      hal_entry ();
```