

# MX25R Extend in FSP

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## Hardware and Software Requirement

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1. Renesas FSP V5.0.0 or later
2. Renesas RA Series Development Board
3. MX25R Series Flash

## Introduction

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Macronix MX25R series nor Flash has 3 power modes: HighPerformance Mode, LowPower Mode and DeepPowerDown Mode. However, if you want to control MX25R flash in Renesas FSP platform, you can not easily change the power mode.

RDID()

RDSR()

RDSCUR()

RDCR()

MX25R\_HighPerformanceMode()

MX25R\_LowPowerMode()

MX25R\_Enter\_DeepPower()

MX25R\_Exit\_DeepPower()

MX25R\_Device\_Reset()

## Sample Code

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```
void hal_entry (void)
{
    mx25r_ID id                = {0xff,0xff,0xff};
    srand(RANDOM_SEED);

    SEGGER_RTT_printf(0, "Demo Start\r\n");
    g_qspi0.p_api->open(g_qspi0.p_ctrl, g_qspi0.p_cfg);
    g_mx25r0.p_api->rdid(&id);
    SEGGER_RTT_printf(0, "ID = %x%x%x\r\n", id.manufacturer_id,
id.memory_capacity, id.memory_type);
    g_qspi0.p_api->close(g_qspi0.p_ctrl);

    flash_lowpower_mode_test();
    flash_highperformance_mode_test();
    flash_deep_power_down_test();
    reset_device_test();

    while (1)
    {
    }
}
```

```
}
```

```
static fsp_err_t get_flash_status()
{
    spi_flash_status_t status = {.write_in_progress = true};
    int32_t time_out          = (INT32_MAX);
    fsp_err_t err              = FSP_SUCCESS;

    do
    {
        /* Get status from QSPI flash device */
        err = R_QSPI_StatusGet(&g_qspi0_ctrl, &status);
        if (FSP_SUCCESS != err)
        {
            SEGGER_RTT_printf(0, "R_QSPI_StatusGet Failed\r\n");
            return err;
        }

        /* Decrement time out to avoid infinite loop in case of consistent
failure */
        --time_out;

        if (0 >= time_out)
        {
            SEGGER_RTT_printf(0, "\r\n ** Timeout : No result from QSPI flash
status register ** \r\n");
            return FSP_ERR_TIMEOUT;
        }

    }while (false != status.write_in_progress);

    return err;
}
```

```
static void read_flash_register_data()
{
    mx25r_status_reg sr      = {{0xff}};
    mx25r_cfg_reg cr         = {{0xff},{0xff}};
    mx25r_security_reg scur = {{0xff}};

    g_mx25r0.p_api->rdsr(&sr);
    SEGGER_RTT_printf(0, "Status Register = %x\r\n", sr.status);

    g_mx25r0.p_api->rdscur(&scur);
    SEGGER_RTT_printf(0, "Security Register = %x\r\n", scur.security);

    g_mx25r0.p_api->rdcr(&cr);
    SEGGER_RTT_printf(0, "Configuration Register1 = %x\r\n", cr.configuration1);
    SEGGER_RTT_printf(0, "Configuration Register2 = %x\r\n", cr.configuration2);
}
```

```
static void flash_lowpower_mode_test()
{
    SEGGER_RTT_printf(0, "*****LowPower
Test*****\r\n");
}
```

```

g_qspi0.p_api->open(g_qspi0.p_ctrl, g_qspi0.p_cfg);
///Exchange Frequence///
R_QSPI->SFMCMD = 1U;
R_QSPI->SFMSKC = 48;
R_QSPI->SFMCMD = 0U;

/* Fill write buffer with test data. Clear read buffers */
for (int i = 0; i < BUFFER_LENGTH; i++)
{
    writeBuffer[i] = (uint8_t) ( rand() % 256 ) ;
    readBuffer[i] = (uint8_t) 0x00;
}

g_mx25r0.p_api->mx25r_lowpowermode();
read_flash_register_data();
g_qspi0.p_api->erase(g_qspi0.p_ctrl, (uint8_t *)QSPI_DEVICE_START_ADDRESS,
4096);
get_flash_status();

g_qspi0.p_api->write(g_qspi0.p_ctrl, writeBuffer, (uint8_t
*)QSPI_DEVICE_START_ADDRESS, BUFFER_LENGTH);
get_flash_status();

memcpy(readBuffer, (uint8_t *)QSPI_DEVICE_START_ADDRESS, BUFFER_LENGTH);
for(int i = 0; i<BUFFER_LENGTH; i++)
{
    SEGGER_RTT_printf(0, "\t\tAddress: %02X,    ReadData:%02X,
ExpectedData:%02X\n", i,readBuffer[i],writeBuffer[i]);
    if( writeBuffer[i] == readBuffer[i] )
    {
        success = true;
    }
    else
    {
        success = false;
        break;
    }
}
if(success)
{
    SEGGER_RTT_printf(0, (const char *)"\t\tData match\n");
}
else
{
    SEGGER_RTT_printf(0, (const char *)"\t\tData error\n");
}
g_qspi0.p_api->close(g_qspi0.p_ctrl);
}

```

```

static void flash_highperformance_mode_test()
{
    SEGGER_RTT_printf(0, "*****High Performance
Test*****\r\n");
    g_qspi0.p_api->open(g_qspi0.p_ctrl, g_qspi0.p_cfg);

    /* Fill write buffer with test data. Clear read buffers */
    for (int i = 0; i < BUFFER_LENGTH; i++)

```

```

{
    writeBuffer[i] = (uint8_t) ( rand() % 256 ) ;
    readBuffer[i]  = (uint8_t) 0x00;
}

g_mx25r0.p_api->mx25r_highperformancemode();
read_flash_register_data();
g_qspi0.p_api->erase(g_qspi0.p_ctrl, (uint8_t *)QSPI_DEVICE_START_ADDRESS,
4096);
get_flash_status();

g_qspi0.p_api->write(g_qspi0.p_ctrl, writeBuffer, (uint8_t
*)QSPI_DEVICE_START_ADDRESS, BUFFER_LENGTH);
get_flash_status();

memcpy(readBuffer, (uint8_t *)QSPI_DEVICE_START_ADDRESS, BUFFER_LENGTH);
for(int i = 0; i<BUFFER_LENGTH; i++)
{
    SEGGER_RTT_printf(0, "\t\tAddress: %02X,    ReadData:%02X,
ExpectedData:%02X\n", i, readBuffer[i], writeBuffer[i]);
    if( writeBuffer[i] == readBuffer[i] )
    {
        success = true;
    }
    else
    {
        success = false;
        break;
    }
}
if(success)
{
    SEGGER_RTT_printf(0, (const char *)"\t\tData match\n");
}
else
{
    SEGGER_RTT_printf(0, (const char *)"\t\tData error\n");
}
g_qspi0.p_api->close(g_qspi0.p_ctrl);
}

```

```

static void flash_deep_power_down_test()
{
    SEGGER_RTT_printf(0, "*****DeepPowerDown
Test*****\r\n");
    g_qspi0.p_api->open(g_qspi0.p_ctrl, g_qspi0.p_cfg);
    /* Fill write buffer with test data. Clear read buffers */
    for (int i = 0; i < BUFFER_LENGTH; i++)
    {
        writeBuffer[i] = (uint8_t) ( rand() % 256 ) ;
        readBuffer[i]  = (uint8_t) 0x00;
    }

    g_qspi0.p_api->erase(g_qspi0.p_ctrl, (uint8_t *)QSPI_DEVICE_START_ADDRESS,
4096);
    get_flash_status();
}

```

```

    g_qspi0.p_api->write(g_qspi0.p_ctrl, writeBuffer, (uint8_t
*)QSPI_DEVICE_START_ADDRESS, BUFFER_LENGTH);
    get_flash_status();

    if(!(memcmp(writeBuffer, (uint8_t *)QSPI_DEVICE_START_ADDRESS,
BUFFER_LENGTH)))
    {
        SEGGER_RTT_printf(0, "Data has been writed to Flash\r\n");
    }
    else
    {
        SEGGER_RTT_printf(0, "Write data error\r\n");
    }

    SEGGER_RTT_printf(0, "Change Macronix MX25xxx power mode to
ENTER_DEEP_POWER_DOWN\r\n");

    g_mx25r0.p_api->mx25r_enter_deeppower();

    memcpy(readBuffer, (uint8_t *)QSPI_DEVICE_START_ADDRESS, BUFFER_LENGTH);
    for(int i = 0; i<BUFFER_LENGTH; i++)
    {
        SEGGER_RTT_printf(0, "\t\tAddress: %02X,    ReadData:%02X,
ExpectedData:%02X\n", i,readBuffer[i],writeBuffer[i]);
        if( 0xff == readBuffer[i] )
        {
            success = true;
        }
        else
        {
            success = false;
            break;
        }
    }
    if(success)
    {
        SEGGER_RTT_printf(0, (const char *)"\t\tData match\n");
    }
    else
    {
        SEGGER_RTT_printf(0, (const char *)"\t\tData error\n");
    }

    SEGGER_RTT_printf(0, "Change Macronix MX25xxx power mode to
RELEASE_DEEP_POWER_DOWN\r\n");
    g_mx25r0.p_api->mx25r_exit_deeppower();

    memcpy(readBuffer, (uint8_t *)QSPI_DEVICE_START_ADDRESS, BUFFER_LENGTH);
    for(int i = 0; i<BUFFER_LENGTH; i++)
    {
        SEGGER_RTT_printf(0, "\t\tAddress: %02X,    ReadData:%02X,
ExpectedData:%02X\n", i,readBuffer[i],writeBuffer[i]);
        if( writeBuffer[i] == readBuffer[i] )
        {
            success = true;
        }
        else
        {

```

```

        success = false;
        break;
    }
}
if(success)
{
    SEGGER_RTT_printf(0, (const char *)"\t\tData match\n");
}
else
{
    SEGGER_RTT_printf(0, (const char *)"\t\tData error\n");
}
g_qspi0.p_api->close(g_qspi0.p_ctrl);
}

```

```

static void reset_device_test()
{
    SEGGER_RTT_printf(0, "*****Reset Device
Test*****\r\n");
    g_qspi0.p_api->open(g_qspi0.p_ctrl, g_qspi0.p_cfg);
    SEGGER_RTT_printf(0, "Before reset the MX25R register is:\r\n");
    g_mx25r0.p_api->mx25r_highperformancemode();
    read_flash_register_data();
    g_mx25r0.p_api->mx25r_device_reset();
    SEGGER_RTT_printf(0, "After reset the MX25R register is:\r\n");
    read_flash_register_data();
    g_qspi0.p_api->close(g_qspi0.p_ctrl);
}

```