

# **G4XS\_KV10Z\_XSG\_ParseStatusData**

Processor Expert Example Project

**Date:** 21. 11. 2016

**Revision:** 2.0

## Overview

The purpose of this example project is to show how to parse and interpret status data with use of the Gen4eXtremeSwitch component. The result is printed to the console. Such an implementation can be used to real time status reporting of device condition.

## Requirements

Kinetis Design Studio 3.2.0 and newer

FRDM-KV10Z MCU board

FRDM-32XSG-EVB Gen4 eXtremeSwitch board

2x channel load

USB cable

## Setting up hardware

Target platform for this example is FRDM-KV10Z MCU board with FRDM-32XSG-EVB eXtremeSwitch board.

Chip select on FRDM-32XSG-EVB board has to be properly configured in such way that CSB0 pin is used. This can be achieved by switching **number 0 on SW2 switch** on the eSwitch board to **ON position**. The rest of CSB routes should remain in OFF position.

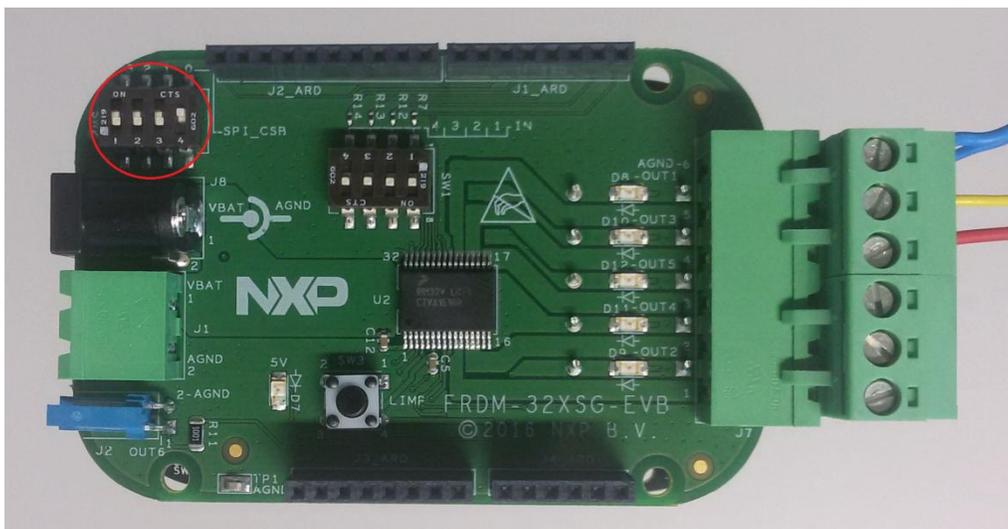
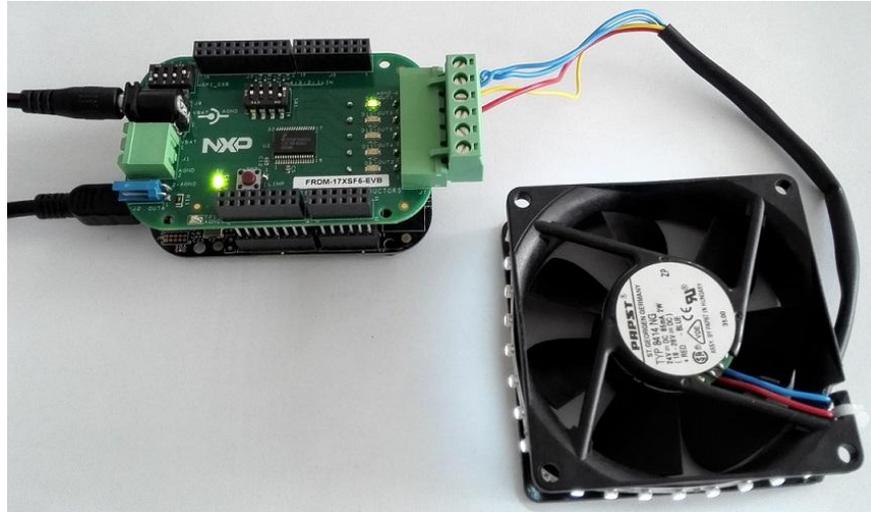


Figure 1 CSB Route Selection

In order to get the project successfully running you need to connect some load to channels 1 and 3 on your FRDM eSwitch board.



**Figure 2 Channel Load**

Set up OpenSDA connection between PC and MCU board with USB cable.



**Figure 3 OpenSDA Connection**

## Setting up software

Make sure you have installed KDS 3.2.0 or newer which comes with Processor Expert support.

These components must be imported to the Processor Expert Component Library.

- **SPI\_Device** component (encapsulates SPI communication)
- **Gen4eXtremeSwitch** component (encapsulates eSwitch configuration)

Component	Description
▶ Kinetis	
▶ Legacy User Components	
▲ My Components	
▶ Software	
▶ User Components	
BC_MC32BC3770	Processor Expert support for battery charger MC32BC3770.
FRDM_BC3770	Processor Expert support for MC32BC3770 Charger Freedom Board
Gen4eXtremeSwitc	Processor Expert support for 32V eXtremeSwitch devices.
LVHBridge	Low voltage H-Bridge supporting MC34933, MPC17529, MPC17C724, M...
SPI_Device	Communication with SPI device placed on SPI bus
ThreePhaseMotorC	Three-Phase BLDC Motor Control
ThreePhasePredriv	Three Phase FET Pre-Driver GD3000/MC33937/MC34937

Figure 4 Processor Expert Component Library

Check that your OpenSDA connection has been set up.

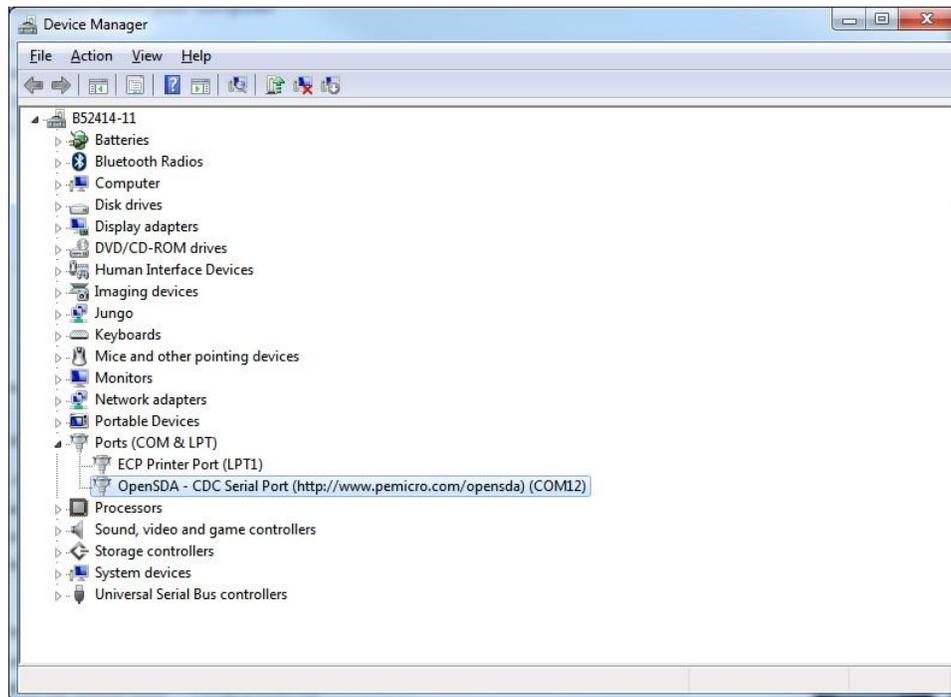


Figure 5 OpenSDA Virtual Port

## Description

The example is preconfigured in the following way. FRDM-32XSG-EVB board is configured in **Gen4eXtremeSwitch** component, see Figure 7. SPI settings are configured separately in **SPIMaster\_LDD** component, see Figure 8 and in inherited **CSpin1** component, see Figure 9. All components can be accessed in component tree, see Figure 6.

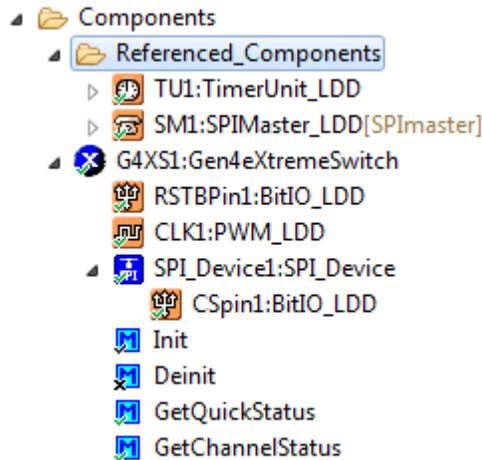


Figure 6 Component Tree

**Channels 1 and 3** are enabled and configured in Gen4eXtremeSwitch component properties, see Figure 7. Both channels are enabled by default with PWM duty set to maximum value (256). Watchdog timeout period is set to 128 ms. Make sure that if you modify the project, you still hold this watchdog period. All other features are set to default values except pin selection which follows **Error! Reference source not found.**

Component Name	G4XS1	
SPI Configuration	Parallel SPI	
<b>Global Configuration</b>		
RSTB Pin	ADC0_SE6/ADC1_SE1/ADC1_DP1/...	
External Clock Frequency	50000	<b>D</b>
CLK Pin	PTE25/FTM0_CH1/I2C0_SDA/EWM...	PTE25/FTM0_CH1/I2C0_SDA/EWM...
Watchdog Timeout	128 ms	
▷ Direct Input Control	Disabled	
▷ Current, Voltage and Temperature	Disabled	
<b>Devices</b>	1	
<b>Device1</b>		
Device Model	MC17XSF500	
SOA Mode	Single read	
Overtemperature Warning	115 °C	
HID Selection	Disabled	
OCHI Type	Default	
Global PWM Duty Cycle	0	<b>D</b>
<b>Channels</b>	6	
<b>Output1</b>	Enabled	Corresponds to channel with index...
<b>PWM Output Control</b>		
Global PWM	Disabled	
Channel Duty Cycle	256	<b>D</b>
Phase Selection	0°	
Pulse Skipping	Disabled	
Slew Rate Presc	1	
Output Initial State	On	
<b>Direct Input Control</b>	Disabled	
<b>Open Load</b>		
Open Load LED	Disabled	
OLON Deglitch	64 us	
<b>Overcurrent</b>		
OCLO Threshold	Low	
Advanced Current	Disabled	
Short OCHI	Disabled	
No OCHI	Disabled	
▷ Output2	Disabled	Channel disabled.
▷ Output3	Enabled	Corresponds to channel with index...
▷ Output4	Disabled	Channel disabled.
▷ Output5	Disabled	Channel disabled.
▷ Output6	Disabled	Channel disabled.
Auto Initialization	yes	

Figure 7 G4XS Component Settings

SPI setting involves pin selection (MISO, MOSI, CLK and CSB). The first three pins are configured in **SPIMaster\_LDD**, see Figure 8 and the last one is configured in **CSPin** component, see Figure 9, which is inherited by **SPI\_Device** component.

Device	SPI0
Interrupt service/event	Enabled
▲ Settings	
▲ Input pin	Enabled
Pin	PTD3/SPI0_SIN/UART0_TX/FTM0_CH3/I2C0_SDA
▲ Output pin	Enabled
Pin	CMP0_IN0/PTC6/LLWU_P10/SPI0_SOUT/PDB0_EXTRG/UART0_RX/I..
▲ Clock pin	
Pin	PTC5/LLWU_P9/SPI0_SCK/LPTMR0_ALT2/CMP0_OUT/FTM0_CH2
Chip select list	0
▲ Attribute set list	1
▲ Attribute set 0	
Width	8 bits
MSB first	yes
Clock polarity	Low
Clock phase	Change on leading edge
Parity	None
Chip select toggling	no
Clock rate index	0
Delay after transfer index	0
CS to CLK delay index	0
CLK to CS delay index	0
Clock rate	0.667572 $\mu$ s
Delay after transfer	0.190735 $\mu$ s
CS to CLK delay	0.190735 $\mu$ s
CLK to CS delay	0.190735 $\mu$ s
▲ Initialization	
Auto initialization	yes

Figure 8 SPI Master Component Settings

Pin for I/O	ADC1_SE6/PTD6/LLWU_P15/SPI0_PCS3/UART0_RX/FTM0_CH0/FT...
Direction	Output
▲ Initialization	
Init. direction	Output
Init. value	0
Auto initialization	yes

Figure 9 Chip Select Pin Settings

In order to be able to print status information, **ConsoleIO** component is used. This component encapsulates UART communication protocol. UART settings can be accessed through inherited **Serial\_LDD** component, see Figure 10.

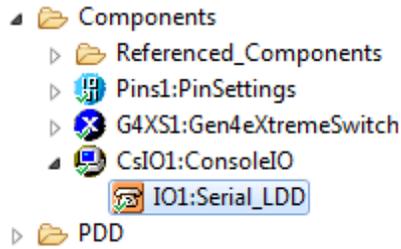


Figure 10 ConsoleIO Component Tree

Receiver and transmitter port selection and baud rate value is in Figure 11.

Device	UART0
Interrupt service/event	Disabled
▲ Settings	
Data width	8 bits
Parity	None
Baud rate	115200 baud
▲ Receiver	Enabled
RxD	PTB16/UART0_RX/FTM_CLKIN2/EWM_IN
▲ Transmitter	Enabled
TxD	PTB17/UART0_TX/FTM_CLKIN1/EWM_OUT_b
▲ Initialization	
Auto initialization	yes

Figure 11 ConsoleIO Component Settings

Implementation itself is quite straightforward. All of the implemented functions in **main.c** (Figure 12) are responsible for parsing selected status register. The result is printed to the console. Functions implement the following logic.

1. **Fetch** content of the selected status register.
2. **Parse** obtained value with use of predefined macros.
3. **Take action** (print to console or something else) if some flag is or is not present.

```

int main(void)
/*lint -restore Enable MISRA rule (6.3) checking. */
{
    /* Write your local variable definition here */

    /** Processor Expert internal initialization. DON'T REMOVE THIS CODE!!! */
    PE_low_level_init();
    /** End of Processor Expert internal initialization. */

    printf("32eXtremeSwitch\n");

    if (G4XS1_Init(NULL) == ERR_OK) {
        printf("Initialization was successful.\n");
    }
    else {
        printf("Initialization failed.\n");
    }

    ParseDeviceID();
    ParseIOStatusData();

    while (1) {
        printf("\n<G4XS Status Report>\n\n");

        PrintStatusRegisters();

        ParseQuickStatusData();
        ParseChannelStatusData();
        ParseDeviceStatusData();

        for (uint8_t i = 0; i < 40; i++) { /* waits for 2 sec */
            WaitMS(10);
            G4XS1_FeedWatchdog();
        }
    }
}

```

Figure 12 Content of main.c

Functions **ParseDeviceID()** and **ParseIOStatusData()** are called just once. The first one gives information about device type, family and development design status. The second gives information whether channel is on or off.

The rest of functions are called in infinite loop to provide real-time status report (for all enabled channels). Function **ParseQuickStatusData()** gives overall information for all channels, **ParseChannelStatusData()** expands this information with specific status for each channel and **ParseDeviceStatusData()** informs about device state and condition.

## Import the example project

Pre-requisites such as needed components are assumed to be imported already. If that is correct, you can approach to importing of the example project.

1. In KDS click on the ***File / Import***.
2. Choose ***General / Existing Projects into Workspace***.
3. Click ***Browse to select root directory*** with your downloaded example projects.
4. ***Select project*** named **G4XS\_KV10Z\_XSG\_ParseStatusData** and click ***Finish*** to complete the process.
5. Now the example project should be copied to your workspace and ready to run.

## Build and Debug

In order to build and run the project you need to ***generate code*** at first. Then you can ***build*** the project usual way. If the build is successful, ***debug and run*** the project.