



LVD_Interrupt for KIT_T2G-B-H_LITE

Customer training workshop

Q3 2024



Scope of work

- This code example describes how to configure low-voltage detection (LVD) to monitor V_{DD} and generate an interrupt when V_{DD} drops lower than the configured threshold
- **Device**
 - The TRAVEO™ T2G CYT4BF8CDS device is used in this code example
- **Board**
 - The TRAVEO™ T2G KIT_T2G-B-H_LITE board is used for testing

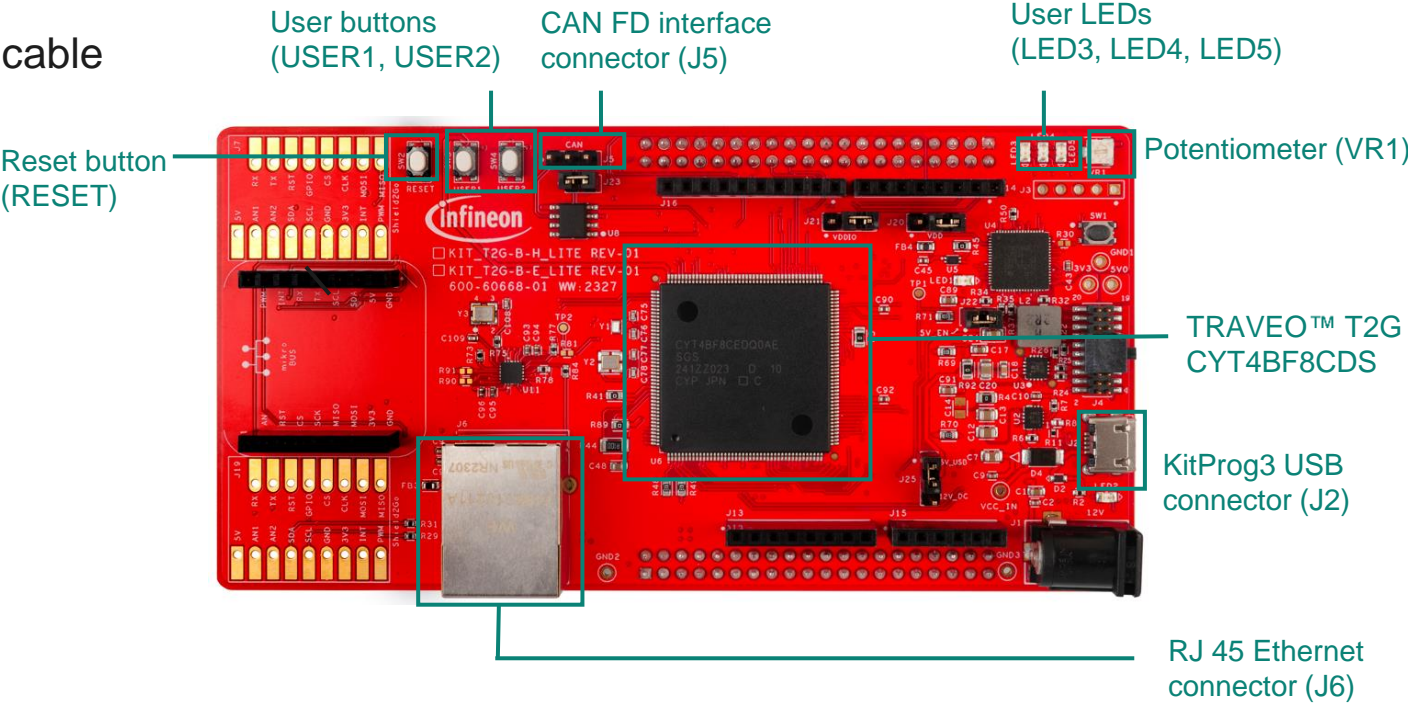
Introduction

– Power supply subsystem has the following features:

- V_{DDD} power supply voltage range of 2.7 V to 5.5 V
- Core supply rail (V_{CCD})
- Independent multiple power supply rails (V_{DDD} , V_{DDA} , V_{CCD} , and multiple V_{DDIO} rails) for peripherals
- Multiple on-chip regulators
 - Active regulator to power the MCU in Active/Sleep mode in case of low current consumption
 - Deep Sleep regulator to power peripherals operating in Deep Sleep mode
 - High-current regulator to support higher current load by using an external pass transistor or by controlling for an external power management integrated circuit (PMIC) or low-dropout (LDO) regulator
- Low-voltage (V_{CCD}) and high-voltage (V_{DDD} and V_{DDA}) brownout detection (BOD) circuits are available in all power modes except Hibernate and XRES modes
- Low-voltage (V_{CCD}) and high-voltage (V_{DDD} and V_{DDA}) OVD circuits are available in all power modes except Hibernate and XRES modes
- Two LVD circuits to monitor V_{DDD} for falling detection (LVD), rising detection (HVD), or both in all power modes except Hibernate and XRES modes
- OCD circuit to monitor V_{CCD} current in all power modes except Hibernate and XRES modes. OCD is not monitored for PMIC

Hardware setup

- This code example has been developed for the KIT_T2G-B-H_LITE board
- Connect the PC to the board using the provided USB cable through the KitProg3 USB connector (J2)



Implementation

- This code example shows how to configure low-voltage detection (LVD) to generate an interrupt when V_{DD} drops lower than the configured threshold
- This example needs a power supply for the KIT_T2G-B-H_LITE board (J20)
- Remove the shorting bar from J20, and connect the power supply to pin 2 of the board
- Power the pin 2 of J20 with 3.3 V. Other V_{DD} uses the board's default configuration
- After programming, the application starts automatically. Confirm that user LED (LED3) is blinking at 20 Hz. The external V_{DD} drops from 3.3 V to 2.8 V using the external power supply on pin 2 of the board
- The LVD interrupt occurs and user LED (LED4) toggle

VDD current measurement jumper (J20)



Implementation (contd.)

– Follow these steps to configure this code example:

- Disable LVD
- Adjust the V_{DD} voltage threshold
- Set the interrupt of LVD
- Enable LVD
- LVD interrupt handler

– Disable LVD

- Call the [Cy_LVD_HT_Disable\(\)](#) function to disable a particular LVD
- Call the [Cy_LVD_HT_ClearInterruptMask\(\)](#) function to disable a particular LVD

– Adjust the V_{DD} voltage threshold

- Configure the threshold value and set it 2.8 V
 - Set a threshold for monitoring the V_{DD} voltage by calling [Cy_LVD_HT_SetThreshold\(\)](#)

– Set the LVD Interrupt

- Set an action configuration after the LVD block reaches the threshold by calling the [Cy_LVD_HT_SetActionConfig\(\)](#) function
- The [Cy_LVD_HT_SetInterruptConfig\(\)](#) function configures the LVD interrupt
- This function sets which edge(s) will trigger an interrupt or fault for LVDs and selects the falling edge for LVD_1. When V_{DD} is below the threshold, LVD generates an interrupt
- Call the [Cy_LVD_HT_SetInterruptMask\(\)](#) function to enable the LVD interrupt
- Before enabling LVD interrupt, clear the LVD interrupt first using the [Cy_LVD_HT_ClearInterrupt\(\)](#) function

Implementation (contd.)

– Enable LVD:

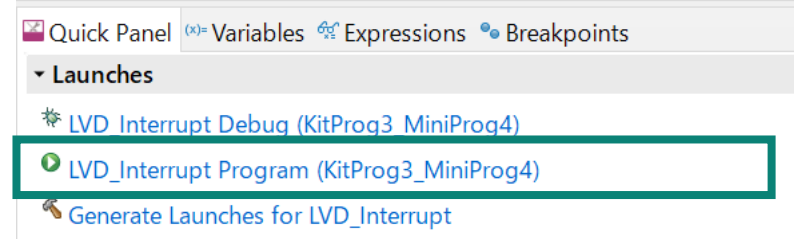
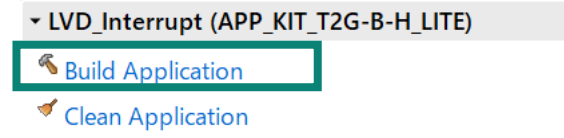
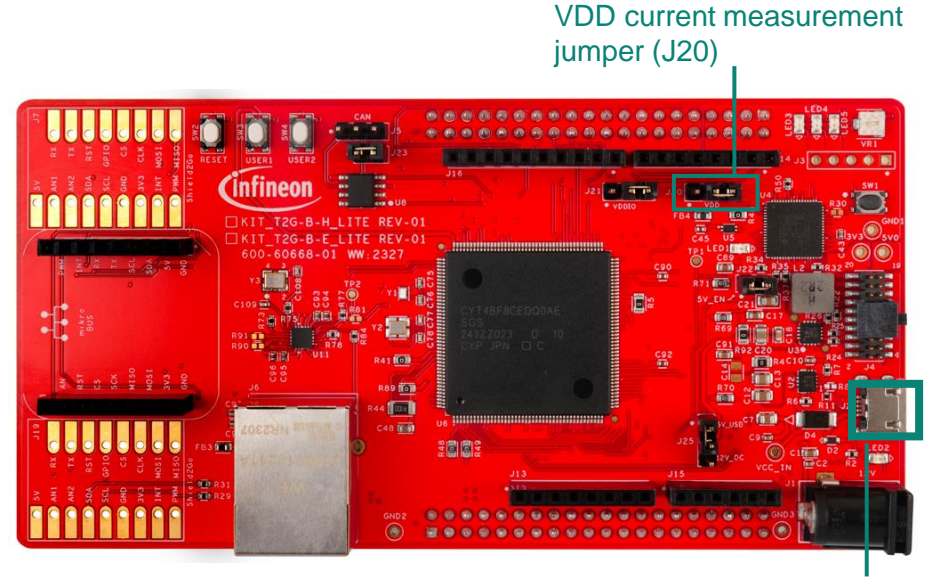
- Enables the LVD output when the V_{DD} voltage is at or below the threshold by calling the [Cy_LVD_HT_Enable\(\)](#) function
 - It needs to wait 25 μ s until it stabilizes; therefore, the code calls [Cy_SysLib_DelayUs\(\)](#) after enabling LVD
- Enables selected LVD during Deep Sleep mode by calling the [Cy_LVD_HT_DeepSleepEnable\(\)](#) function

– LVD interrupt handler:

- Call the [Cy_SysInt_Init\(\)](#) function to register *ISR_LVD_1()* as the ISR
- The ISR clears the interrupt by calling the [Cy_LVD_HT_ClearInterrupt\(\)](#) function; then, set the 'flagLVDIRQ' flag to notify the main loop that the interrupt has occurred
- When the flag is set, the main loop calls the [cyhal_gpio_toggle\(\)](#) function to toggle user LED (LED4)

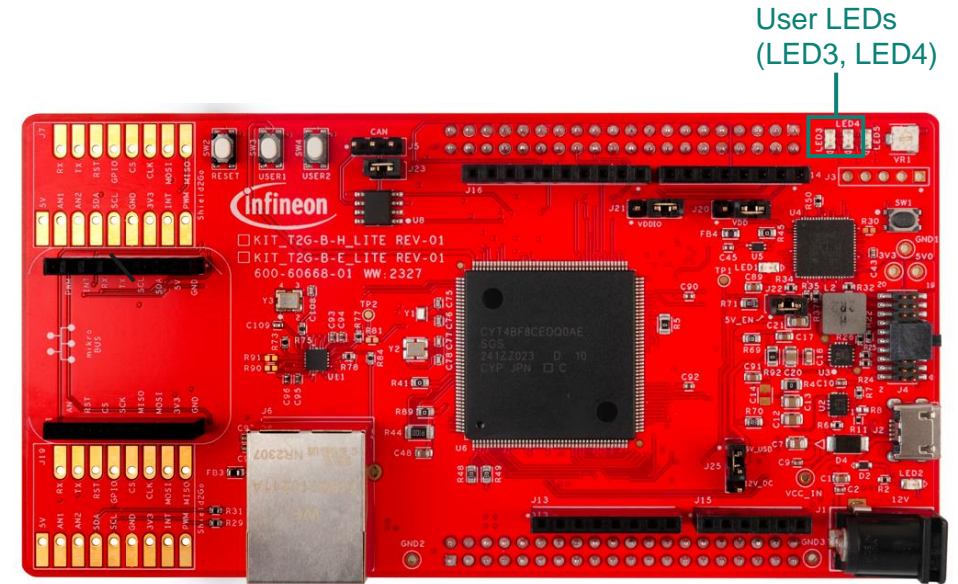
Compiling and programming

1. Connect to power and USB cable
2. Power V_{DD} (pin 2) of the board (J20) with 3.3 V from external power supply
3. Use Eclipse IDE for ModusToolbox™ software for compiling and programming
4. For compilation:
 - a. Select the target application project in the Project Explorer
 - b. In the Quick Panel, scroll to click **Build Application** in LVD_Interrupt (APP_KIT_T2G-B-H_LITE)
5. For programming:
 - a. Select the target application project in the Project Explorer
 - b. In the Quick Panel, scroll down, and click **LVD_Interrupt Program (KitProg3_MiniProg4)** in the Launches



Run and test

1. After successful programming, the application starts automatically. Confirm that the user LED (LED3) is blinking at 20 Hz.
2. The external V_{DD} drops from 3.3 V to 2.8 V and observe that the user LED (LED4) blinks five times.



References

- **Datasheet**
 - [CYT4BF TRAVEO™ T2G 32-bit Automotive MCU based on Arm® Cortex®- M7 dual](#)

- **Architecture reference manual**
 - [TRAVEO™ T2G Automotive MCU body controller high architecture reference manual](#)

- **Registers reference manual**
 - [TRAVEO™ T2G Automotive MCU: TVII-B-H-8M body controller high registers reference manual](#)

- **PDL/HAL**
 - [Peripheral driver library \(PDL\)](#)
 - [Hardware abstraction layer \(HAL\)](#)

- **Training**
 - [TRAVEO™ T2G training](#)

Revision History

Revision	ECN	Submission Date	Description of Change
**	7782924	2022/07/07	Initial release
*A	7841591	2022/11/08	Changed the function from Cy_GPIO_Inv() to cyhal_gpio_toggle() and added the details. The figure on page10 has been updated.
*B	7876708	2023/03/01	Added the link for functions in “Implementation”
*C	8080728	2024/10/04	Replaced development board from KIT_T2G-B-H_EVK to KIT_T2G-B-H_LITE

