

M460 Series CMSIS BSP Guide

Directory Introduction for 32-bit NuMicro™ Family

Directory Information

Please extract the “M460_Series_BSP_CMSIS_V3.00.001.zip” file firstly, and then put the “M460_Series_BSP_CMSIS_V3.00.001” folder into the working folder (e.g. .\Nuvoton\BSP Library\).

To experience the powerful features of M460 in few minutes, please refer to NuMaker-PFM-M460 Board Quick Start Guide. You can select the sample code of your interest to download and execute on the M460 board. You can open the project files to build them with Keil® MDK, IAR or Eclipse, and then download and trace them on the M460 board to see how it works.

This BSP folder contents:

Document\	Device driver reference manual and reversion history.
Library\	Device driver header and source files.
SampleCode\	Device driver sample code.
ThirdParty\	Libraries of third parties.

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1 Document

CMSIS.html	<p>Introduction of CMSIS version 5.0. CMSIS components included CMSIS-CORE, CMSIS-Driver, CMSIS-DSP, etc.</p> <ul style="list-style-type: none"> ● CMSIS-CORE: API for the Cortex-M0 processor core and peripherals. ● CMSIS-Driver: Defines generic peripheral driver interfaces for middleware making it reusable across supported devices. ● CMSIS-DSP: DSP Library Collection with over 60 Functions for various data types: fix-point (fractional q7, q15, q31) and single precision floating-point (32-bit).
Revision History.pdf	The revision history of M460 Series BSP.
NuMicro M460 Series Driver Reference Guide.chm	The usage of drivers in M460 Series BSP.

2 Library

CMSIS	Cortex® Microcontroller Software Interface Standard (CMSIS) V5.0 definitions by ARM® Corp.
Device	CMSIS compliant device header file.
SmartcardLib	Library for accessing a smartcard.
StdDriver	All peripheral driver header and source files.
UsbHostLib	USB host library source code.

3 Sample Code

CortexM4	Cortex®-M4 sample code.
Hard_Fault_Sample	<p>Show hard fault information when hard fault happened.</p> <p>The hard fault handler show some information included program counter, which is the address where the processor was executing when the hard fault occurs. The listing file (or map file) can show what function and instruction that was.</p> <p>It also shows the Link Register (LR), which contains the return address of the last function call. It can show the status where CPU comes from to get to this point.</p>
PowerManagement	Power management sample code.
ISP	Sample codes for In-System-Programming.
StdDriver	Demonstrate the usage of M460 series MCU peripheral driver APIs.
Template	A project template for M460.

4 ThirdParty

FatFs	An open source FAT/exFAT file system library.
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5 SampleCode\CortexM4

BitBand	Demonstrate the usage of Cortex®-M4 Bit-band.
DSP_FFT	Demonstrate how to call ARM CMSIS DSP library to calculate FFT.
MPU	Demonstrate the usage of Cortex®-M4 MPU.

6 SampleCode\ISP

ISP_CAN	In-System-Programming Sample code through CAN interface.
ISP_DFU	In-System-Programming Sample code through USB interface and following Device Firmware Upgrade Class Specification.
ISP_DFU_20	In-System-Programming Sample code through HSUSBD interface and following Device Firmware Upgrade Class Specification.
ISP_HID	In-System-Programming Sample code through USB HID interface.
ISP_HID_20	In-System-Programming Sample code through HSUSBD HID interface.
ISP_I2C	In-System-Programming Sample code through I ² C interface.
ISP_RS485	In-System-Programming Sample code through RS485 interface.
ISP_SPI	In-System-Programming Sample code through SPI interface.
ISP_UART	In-System-Programming Sample code through UART interface.

7 SampleCode\PowerManagement

SYS_DPDMode_Wakeup	Show how to wake up system form DPD Power-down mode by Wake-up pin(PC.0), Wake-up Timer, RTC Tick, RTC Alarm or RTC Tamper 0.
SYS_PowerDown_MinCurrent	Demonstrate how to minimize power consumption when entering power down mode.
SYS_PowerDownMode	Show how to enter to different Power-down mode and wake-up by RTC.
SYS_PowerMode	Show how to set different core voltage and main voltage regulator type.
SYS_SPDMode_Wakeup	Show how to wake up system form SPD Power-down mode by GPIO pin(PC.0), Wake-up Timer, Wake-up ACMP, RTC Tick, RTC Alarm, RTC Tamper 0, BOD or LVR.

8 SampleCode\StdDriver

System Manager (SYS)

SYS_BODWakeup	Show how to wake up system form Power-down mode by brown-out detector interrupt.
SYS_PLLClockOutput	Change system clock to different PLL frequency and output system clock from CLK0 pin.
SYS_TrimIRC	Demonstrate how to use LXT to trim HIRC.

Clock Controller (CLK)

CLK_ClockDetector	Show the usage of clock fail detector and clock frequency monitor function.
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Flash Memory Controller (FMC)

FMC_CRC32	Demonstrate how to use FMC CRC32 ISP Command to calculate the CRC32 checksum of APROM and LDROM.
FMC_DualBank	Demonstrate how dual processes work in dual bank flash architecture.
FMC_ExecInSRAM	Implement a code and execute in SRAM to program embedded Flash (support KEIL MDK only).
FMC_IAP	Show how to call LDROM function from APROM.
FMC_MultiBoot	Implement a multi-boot system to boot from different applications in APROM. A LDROM code and 4 APROM code are implemented in this sample code.
FMC_MultiWordProgram	Show how to read/program embedded flash by ISP function.
FMC_OTP	Demonstrate how to program, read and lock OTP.
FMC_ReadAllOne	Demonstrate how to use FMC Read-All-One ISP command to verify APROM/LDROM pages are all 0xFFFFFFFF or not.
FMC_RW	Demonstrate how to read/program embedded Flash by ISP

	function.
FMC_XOM	This sample code shows how to configure and setup an XOM region the perform XOM function.

General Purpose I/O (GPIO)

GPIO_EINTAndDebounce	Show the usage of GPIO external interrupt function and de-bounce function.
GPIO_INT	Show the usage of GPIO interrupt function.
GPIO_OutputInput	Show how to set GPIO pin mode and use pin data input/output control.
GPIO_PowerDown	Show how to wake up system from Power-down mode by GPIO interrupt.

PDMA Controller (PDMA)

PDMA_BasicMode	Use PDMA0 Channel 2 to transfer data from memory to memory.
PDMA_ScatterGather	Use PDMA0 channel 4 to transfer data from memory to memory by scatter-gather mode.
PDMA_ScatterGather_PingPongBuffer	Use PDMA0 to implement Ping-Pong buffer by scatter-gather mode(memory to memory).
PDMA_StrideRepeat	Use PDMA0 channel 0 to transfer data from memory to memory with stride and repeat.
PDMA_TimeOut	Demonstrate PDMA0 channel 1 get/clear timeout flag with UART1.

Timer Controller (TIMER)

TIMER_ACMPTrigger	Use ACMP to trigger Timer0 counter reset mode.
TIMER_CaptureCounter	Show how to use the timer2 capture function to capture timer2 counter value.

TIMER_Delay	Demonstrate the usage of TIMER_Delay() API to generate a 1 second delay.
TIMER_EventCounter	Demonstrates the timer event counter function.
TIMER_FreeCountingMode	Use the timer0 pin PA.11 to demonstrate timer free counting mode function. And displays the measured input frequency to UART console.
TIMER_InterTimerTriggerMode	Use the timer pin PB.5 to demonstrate inter timer trigger mode function. Also display the measured input frequency to UART console.
TIMER_Periodic	Use the timer periodic mode to generate timer interrupt every 1 second.
TIMER_PeriodicINT	Implement timer counting in periodic mode.
TIMER_PWM_AccumulatorInterruptStopMode	Demonstrate TIMER PWM accumulator interrupt to stop counting.
TIMER_PWM_AccumulatorInterruptTriggerPDMA	Demonstrate TIMER PWM accumulator interrupt to trigger PDMA transfer.
TIMER_PWM_Brake	Demonstrate how to use Timer0 PWM brake function..
TIMER_PWM_ChangeDuty	Change duty cycle and period of output waveform in PWM down count type.
TIMER_PWM_DeadTime	Demonstrate Timer PWM Complementary mode and Dead-Time function.
TIMER_PWM_OutputWaveform	Demonstrate output different duty waveform in Timer0~Timer5 PWM.
TIMER_TimeoutWakeup	Use timer to wake up system from Power-down mode periodically
TIMER_ToggleOut	Demonstrate the timer0 toggle out function on pin PB.5.

Watchdog Timer (WDT)

WDT_TimeoutWakeupAndReset	Implement WDT time-out interrupt event to wake up system and generate time-out reset system event while WDT time-out reset delay period expired.
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Extra Watchdog Timer (EWDT)

EWDT_TimeoutWakeupAndReset	Implement EWDT time-out interrupt event to wake up system and generate time-out reset system event while EWDT time-out reset delay period expired
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Window Watchdog Timer (WWDT)

WWDT_CompareINT	Show how to reload the WWDT counter value.
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Extra Window Watchdog Timer (EWWDT)

EWWDT_CompareINT	Show how to reload the EWWDT counter value.
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Real Timer Clock (RTC)

RTC_Alarm_Test	Demonstrate the RTC alarm function. It sets an alarm 10 seconds after execution.
RTC_Alarm_Wakeup	Use RTC alarm interrupt event to wake up system.
RTC_Dynamic_Tamper	Demonstrate the RTC dynamic tamper function.
RTC_Spare_Access	Demonstrate the RTC spare register read/write function and displays test result to the UART console.
RTC_Static_Tamper	Demonstrate the RTC static tamper function.
RTC_Time_Display	Demonstrate the RTC function and displays current time to the UART console.

Basic PWM Generator and Capture Timer (BPWM)

BPWM_Capture	Use BPWM0 Channel 0 to capture the BPWM1 Channel 0 Waveform.
BPWM_DoubleBuffer	Change duty cycle and period of output waveform by BPWM Double Buffer function.

BPWM_OutputWaveform	Demonstrate how to use BPWM counter output waveform.
BPWM_SwitchDuty	Change duty cycle of output waveform by configured period.
BPWM_SyncStart	Demonstrate how to use BPWM counter synchronous start function.

Enhance PWM Generator and Capture Timer (EPWM)

EPWM_AccumulatorINT_Tri ggerPDMA	Demonstrate EPWM accumulator interrupt trigger PDMA.
EPWM_AccumulatorStopMo de	Demonstrate EPWM accumulator stop mode.
EPWM_Brake	Demonstrate how to use EPWM brake function.
EPWM_Capture	Capture the EPWM1 Channel 0 waveform by EPWM1 Channel 2.
EPWM_DeadTime	Demonstrate how to use EPWM Dead Zone function.
EPWM_DoubleBuffer	Change duty cycle and period of output waveform by EPWM Double Buffer function (Period loading mode).
EPWM_OutputWaveform	Demonstrate how to use EPWM output waveform.
EPWM_PDMA_Capture	Capture the EPWM1 Channel 0 waveform by EPWM1 Channel 2, and use PDMA to transfer captured data.
EPWM_SwitchDuty	Change duty cycle of output waveform by configured period.
EPWM_SyncStart	Demonstrate how to use EPWM counter synchronous start function.

UART Interface Controller (UART)

UART_AutoBaudRate	Show how to use auto baud rate detection function.
UART_Autoflow	Transmit and receive data using auto flow control.
UART_IrDA	Transmit and receive data in UART IrDA mode.
UART_LIN	Transmit LIN frame including header and response in UART

	LIN mode.
UART_PDMA	Transmit and receive UART data with PDMA.
UART_RS485	Transmit and receive data in UART RS485 mode.
UART_SingleWire	Transmit and receive data by UART Single-Wire mode.
UART_TxRxFunction	Transmit and receive data from PC terminal through RS232 interface.
UART_Wakeup	Show how to wake up system from Power-down mode by UART interrupt.

Smart Card Host Interface (SC)

SC_ReadATR	Read the smartcard ATR from smartcard 0 interface.
SC_ReadSIM_PhoneBook	Demonstrate how to read phone book information in the SIM card.
SC_Timer	Demonstrate how to use SC embedded timer.
SCUART_TxRx	Demonstrate smartcard UART mode by connecting PB.4 and PB.5 pins.

I²S Controller (I²S)

I2S_Codec	This is an I ² S demo using NAU8822/88L25 audio codec, and used to play back the input from line-in.
I2S_Codec_PDMA	This is an I ² S demo with PDMA function connected with codec.
I2S_WAVPLAYER	This is a WAV file player which plays back WAV file stored in SD memory card.

Serial Peripheral Interface (SPI)

SPI_Flash	Access SPI flash through SPI interface.
SPI_HalfDuplex	Demonstrate SPI half-duplex mode. SPI0 will be configured as Master mode and SPI1 will be configured as Slave mode.

	Both SPI0 and SPI1 will be configured as half-duplex mode.
SPI_Loopback	Implement SPI Master loop back transfer. This sample code needs to connect MISO pin and MOSI pin together. It will compare the received data with transmitted data.
SPI_MasterFIFOmode	Configure SPI0 as Master mode and demonstrate how to communicate with an off-chip SPI Slave device with FIFO mode. This sample code needs to work with SPI_SlaveFIFOmode sample code.
SPI_PDMA_LoopTest	Demonstrate SPI data transfer with PDMA. QSPI0 will be configured as Master mode and SPI1 will be configured as Slave mode. Both TX PDMA function and RX PDMA function will be enabled.
SPI_SlaveFIFOmode	Configure SPI0 as Slave mode and demonstrate how to communicate with an off-chip SPI Master device with FIFO mode. This sample code needs to work with SPI_MasterFIFOmode sample code.
SPII2S_Master	Configure SPI0 as I ² S Master mode and demonstrate how I ² S works in Master mode. This sample code needs to work with SPII2S_Slave sample code.
SPII2S_PDMA_Codec	This is an I ² S demo with PDMA function connected with audio codec.
SPII2S_PDMA_Play	This is an I ² S demo for playing data and demonstrate how I ² S works with PDMA.
SPII2S_PDMA_PlayRecord	This is an I ² S demo for playing and recording data with PDMA function.
SPII2S_PDMA_Record	This is an I ² S demo for recording data and demonstrate how I ² S works with PDMA.
SPII2S_Slave	Configure SPI0 as I ² S Slave mode and demonstrate how I ² S works in Slave mode. This sample code needs to work with SPII2S_Master sample code.

Quad Serial Peripheral Interface (QSPI)

QSPI_DualMode_Flash	Access SPI flash using QSPI dual mode.
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QSPI_QuadMode_Flash	Access SPI flash using QSPI quad mode.
QSPI_Slave3Wire	Configure QSPI0 as Slave 3 wire mode and demonstrate how to communicate with an off-chip SPI Master device with FIFO mode. This sample code needs to work with SPI_MasterFIFOmode sample code.

I²C Serial Interface Controller (I²C)

I2C_EEPROM	Demonstrate how to access EEPROM through a I ² C interface
I2C_Loopback	Demonstrate how a Master accesses Slave.
I2C_Master	Demonstrate how a Master accesses Slave. This sample code needs to work with I2C_Slave sample code.
I2C_Master_PDMA	Demonstrate how a Master accesses Slave using PDMA TX mode and PDMA RX mode.
I2C_MultiBytes_Master	Demonstrate how to use multi-bytes API to access slave. This sample code needs to work with I2C_Slave sample code.
I2C_PDMA_TRX	Demonstrate how I2C PDMA mode transfers data between I2C Master and I2C Slave.
I2C_SingleByte_Master	Demonstrate how to use single byte API to access slave. This sample code needs to work with I2C_Slave sample code.
I2C_Slave	Demonstrate how to set I ² C in slave mode to receive the data from a Master. This sample code needs to work with I2C_Master sample code.
I2C_SMBus	Demonstrate how to control SMBus interface and use SMBus protocol between Host and Slave.
I2C_Wakeup_Slave	Demonstrate how to set I ² C to wake up MCU from Power-down mode. This sample code needs to work with I2C_Master sample code.

Universal Serial Control Interface Controller - UART Mode (USCI-UART)

USCI_UART_AutoBaudRate	Show how to use auto baud rate detection function.
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USCI_UART_AutoFlow	Transmit and receive data using auto flow control.
USCI_UART_PDMA	Transmit and receive UART data with PDMA.
USCI_UART_RS485	Transmit and receive data in RS485 mode.
USCI_UART_TxRxFunction	Transmit and receive data from PC terminal through a RS232 interface.
USCI_UART_Wakeup	Show how to wake up system from Power-down mode by USCI interrupt in UART mode.

Universal Serial Control Interface Controller - SPI Mode (USCI-SPI)

USCI_SPI_Loopback	Implement USCI_SPI1 Master loop back transfer. This sample code needs to connect USCI_SPI1_MISO pin and USCI_SPI1_MOSI pin together. It will compare the received data with transmitted data.
USCI_SPI_MasterMode	Configure USCI_SPI1 as Master mode and demonstrate how to communicate with an off-chip SPI Slave device. This sample code needs to work with USCI_SPI_SlaveMode sample code.
USCI_SPI_SlaveMode	Configure USCI_SPI1 as Slave mode and demonstrate how to communicate with an off-chip SPI Master device. This sample code needs to work with USCI_SPI_MasterMode sample code.

Universal Serial Control Interface Controller - I²C Mode (USCI-I2C)

USCI_I2C_EEPROM	Demonstrate how to access EEPROM through a USCI_I2C interface.
USCI_I2C_Master	Demonstrate how a Master access Slave. This sample code needs to work with USCI_I2C_Slave sample code.
USCI_I2C_Master_10bit	Demonstrate how a Master use 10-bit addressing access Slave. This sample code needs to work with USCI_I2C_Slave_10bit sample code.
USCI_I2C_Monitor	Demonstrate how USCI_I2C Monitors transmission between I2C Master and I2C Slave.

USCI_I2C_MultiBytes_Master	Demonstrate how to use multi-bytes API to access slave. This sample code needs to work with USCI_I2C_Slave sample code.
USCI_I2C_SingleByte_Master	Demonstrate how to use single byte API to access slave. This sample code needs to work with USCI_I2C_Slave sample code.
USCI_I2C_Slave	Demonstrate how to set I ² C in slave mode to receive the data from a Master. This sample code needs to work with USCI_I2C_Master sample code.
USCI_I2C_Slave_10bit	Demonstrate how to set I ² C in 10-bit addressing slave mode to receive the data from a Master. This sample code needs to work with USCI_I2C_Master_10bit sample code.
USCI_I2C_Wakeup_Slave	Demonstrate how to set I ² C to wake up MCU from Power-down mode. This sample code needs to work USCI_I2C_Master sample code.

External Bus Interface (EBI)

EBI_NOR	Configure EBI interface to access MX29LV320T (NOR Flash) on EBI interface.
EBI_SRAM	Configure EBI interface to access BS616LV4017(SRAM) on EBI interface.

USB 1.1 Device Controller (USBD)

USBD_Audio_Codec	Demonstrate how to implement a USB audio class device.
USBD_HID_Keyboard	Demonstrate how to implement a USB keyboard device. It supports to use GPIO to simulate key input.
USBD_HID_Mouse	Show how to implement a USB mouse device. The mouse cursor will move automatically when this mouse device connecting to PC by USB.
USBD_HID_MouseKeyboard	Simulate an USB HID mouse and HID keyboard. Mouse draws circle on the screen and Keyboard use GPIO to simulate key input.

USBD_HID_RemoteWakeup	Demonstrate how to implement a USB mouse device. It uses PA0 ~ PA5 to control mouse direction and mouse key. It also supports USB suspend and remote wakeup.
USBD_HID_Touch	Demonstrate how to implement a USB touch digitizer device. Two lines demo in Paint.
USBD_HID_Transfer	Demonstrate how to transfer data between USB device and PC through USB HID interface. A windows tool is also included in this sample code to connect with a USB device.
USBD_HID_Transfer_And_Keyboard	Demonstrate how to implement a composite device (HID Transfer and Keyboard). Transfer data between USB device and PC through USB HID interface. A windows tool is also included in this sample code to connect with a USB device.
USBD_HID_Transfer_And_MSC	Demonstrate how to implement a composite device (HID Transfer and Mass storage). Transfer data between USB device and PC through USB HID interface. A windows tool is also included in this sample code to connect with a USB device.
USBD_HID_Transfer_CTRL	Use USB Host core driver and HID driver. It shows how to submit HID class request and how to read data from control pipe. A windows tool is also included in this sample code to connect with a USB device.
USBD_Mass_Storage_CDROM	Demonstrate the emulation of USB Mass Storage Device CD-ROM.
USBD_Mass_Storage_Flash	Use Flash as storage to implement a USB Mass-Storage device.
USBD_Mass_Storage_SD	Use SD card as storage to implement a USB Mass-Storage device.
USBD_Mass_Storage_SDCard	Use SD card as storage to implement a USB Mass-Storage device.
USBD_Mass_Storage_SRAM	Use internal SRAM as back end storage media to simulate a 44 KB USB pen drive.
USBD_Micro_Printer	Demonstrate how to implement a USB micro printer device.
USBD_Printer_And_HID_Transfer	Demonstrate how to implement a composite device (USB micro printer device and HID Transfer). Transfer data between a USB device and PC through a USB HID interface.

	A windows tool is also included in this sample code to connect with a USB device.
USBD_VCOM_And_HID_Keyboard	Demonstrate how to implement a composite device(VCOM and HID Keyboard).
USBD_VCOM_And_HID_Transfer	Demonstrate how to implement a composite device(VCOM and HID Transfer). It supports one virtual COM port and transfers data between a USB device and PC through a USB HID interface. A windows tool is also included in this sample code to connect with a USB device.
USBD_VCOM_And_Mass_Storage	Demonstrate how to implement a composite device (Virtual COM port and Mass storage device).
USBD_VCOM_DualPort	Demonstrate how to implement a USB dual virtual COM port device.
USBD_VCOM_SerialEmulator	Demonstrate how to implement a USB virtual COM port device.
USBD_VCOM_SerialEmulator_DoubleBuffer	Demonstrate how to implement a USB virtual COM port device using double buffer mode.
USBD_VENDOR_LBK	This sample works as a proprietary Vendor LBK device. It's created for sample USBH_VENDOR_LBK of this BSP. Vendor LBK device includes Control, Bulk, Interrupt, and Isochronous in/out endpoint pairs. Each endpoint pair receive data from host via the out-endpoint and send data back to host via the in-endpoint.

High Speed USB 2.0 Device Controller (HSUSBD)

HSUSBD_Audio10_Codec	An UAC1.0 sample used to record and play the sound sent from PC through the USB interface
HSUSBD_Audio10_Headset	An UAC1.0 sample and used to plays the sound send from PC through the USB interface
HSUSBD_Audio20_Codec	An UAC2.0 sample used to record and play the sound sent from PC through the USB interface.
HSUSBD_Audio20_Headset	An UAC2.0 sample used to play the sound sent from PC through the USB interface.

HSUSBD_HID_Mouse	Simulate a USB mouse and draws circle on the screen.
HSUSBD_HID_MouseKeyboard	Simulate a USB mouse and a USB keyboard.
HSUSBD_HID_Transfer	Demonstrate how to transfer data between USB device and PC through USB HID interface. A windows tool is also included in this sample code to connect with a USB device.
HSUSBD_HID_Transfer_And_MSC	Demonstrate how to implement a composite device (HID Transfer and Mass storage). Transfer data between USB device and PC through the USB HID interface. A windows tool is also included in this sample code to connect with a USB device.
HSUSBD_Mass_Storage_DataFlash	Use embedded Data Flash as storage to implement a USB Mass-Storage device.
HSUSBD_Mass_Storage_SactterGather	Demonstrate the usage of USBD DMA scatter gather function.
HSUSBD_Mass_Storage_SD	Implement a SD card reader.
HSUSBD_Mass_Storage_ShortPacket	Implement a mass storage class sample to demonstrate how to receive a USB short packet.
HSUSBD_Mass_Storage_SRAM	Use internal SRAM as back end storage media to simulate a 30 KB USB pen drive.
HSUSBD_RNDIS	Demonstrate how to implement a USB Ethernet (Remote Network Driver Interface Specification).
HSUSBD_VCOM_SerialEmulator	Demonstrate how to implement a USB virtual com port device.
HSUSBD_VENDOR_LBK	Implement a proprietary Vendor LBK device. This sample requires a M480 USB host running sample HSUSBD_USBH_VENDOR_LBK to be connected.

USB 1.1/2.0 Host Controller (HSUSBH)

HSUSBH_USBH_AudioClass	Demonstrate how to use USBH Audio Class driver. It shows the mute, volume, auto-gain, channel, and sampling rate control.
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HSUSBH_USBH_DEV_CONN	Use connect/disconnect callback functions to handle of device connect and disconnect events.
HSUSBH_USBH_Firmware_Update	Automatically search and read new firmware from USB drive, if found, update APROM Flash with it.
HSUSBH_USBH_HID	Use USB Host core driver and HID driver. This sample demonstrates how to submit HID class request and read data from interrupt pipe. This sample supports dynamic device plug/un-plug and multiple HID devices.
HSUSBH_USBH_HID_Keyboard	Demonstrate reading key inputs from USB keyboards. This sample includes an USB keyboard driver which is based on the HID driver.
HSUSBH_USBH_HIDMouse_Keyboard	Demonstrates how to support USB mouse and keyboard input.
HSUSBH_USBH_MassStorage	Use a command-shell-like interface to demonstrate how to use USBH mass storage driver and make it work as a disk driver under the FATFS file system.
HSUSBH_USBH_SPIM_Writer	Provide a command line interface for reading files from USB disk and writing to SPIM Flash. This sample code also provides functions of dump SPIM Flash, compares USB disk file with SPIM Flash, and branches to run code on SPIM.
HSUSBH_USBH_UAC_HID	Show how to use USBH Audio Class driver and HID driver at the same time. The target device is a Game Audio (UAC+HID composite device).
HSUSBH_USBH_UAC_LoopBack	Receive audio data from an UAC device, and immediately send back to the UAC device.
HSUSBH_USBH_VCOM	Demonstrate how to use the USB Host core driver and CDC driver to connect a CDC class VCOM device.
HSUSBH_USBH_VENDOR_LBK	Show how to do transfer on a known device with a vendor driver. This sample requires a M480 USB device running sample HSUSBD_VENDOR_LBK or USBD_VENDOR_LBK to be connected.

USB On-The-Go (OTG)

OTG_Dual_Role_UMAS	An OTG sample code that will become a USB host when connected with a Micro-A cable, and can access the pen drive when plugged in. It will become a removable disk when connected with a Micro-B cable, and then plug into PC.
OTG_HNP	Show HID mouse with OTG HNP protocol.

High Speed USB On-The-Go (HSOTG)

HSOTG_Dual_Role_UMAS	An OTG sample code that will become a USB host when connected with a Micro-A cable, and can access the pen drive when plugged in. It will become a removable disk when connected with a Micro-B cable, and then plug into PC.
HSOTG_HNP	Show HID mouse with OTG HNP protocol.

Ethernet MAC Controller (EMAC)

EMAC_TxRx	This Ethernet sample tends to get a DHCP lease from DHCP server, and use 192.168.10.10 as IP address if failed to get a lease. After IP address configured, this sample can reply to PING packets.
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CRC Controller (CRC)

CRC_CCITT	Implement CRC in CRC-CCITT mode and get the CRC checksum result.
CRC_CRC8	Implement CRC in CRC-8 mode and get the CRC checksum result.
CRC_CRC32	Implement CRC in CRC-32 mode with PDMA transfer.

Enhance 12-bit Analog-to-Digital Converter (EADC)

EADC_Accumulate	Demonstrate how to get accumulate conversion result.
EADC_ADINT_Trigger	Use ADINT interrupt to do the EADC continuous scan

	conversion.
EADC_Average	Demonstrate how to get average conversion result.
EADC_BandGap	Convert Band-gap (Sample module 16) and print conversion result.
EADC_EPWM_Trigger	Demonstrate how to trigger EADC by EPWM.
EADC_PDMA_EPWM_Trigger	Demonstrate how to trigger EADC by EPWM and transfer conversion data by PDMA.
EADC_Pending_Priority	Demonstrate how to trigger multiple sample modules and got conversion results in order of priority.
EADC_ResultMonitor	Monitor the conversion result of channel 2 by the digital compare function.
EADC_SWTRG_Trigger	Trigger EADC by writing EADC_SWTRG register.
EADC_TempSensor	Convert temperature sensor (Sample module 17) and print conversion result.
EADC_Timer_Trigger	Show how to trigger EADC by timer.
EADC_VBat	Convert VBAT/4 (Sample module 18) and print conversion result.

Digital-to-Analog Converter (DAC)

DAC_EPWMTrigger	Demonstrate how to trigger DAC by EPWM.
DAC_ExtPinTrigger	Demonstrate how to trigger DAC conversion by external pin.
DAC_GroupMode	Demonstrate DAC0 and DAC1 work in group mode
DAC_PDMA_EPWMTrigger	Demonstrate how to use PDMA and trigger DAC0 by EPWM.
DAC_PDMA_TimerTrigger	Demonstrate how to PDMA and trigger DAC by Timer.
DAC_SoftwareTrigger	Demonstrate how to trigger DAC conversion by software.
DAC_TimerTrigger	Demonstrate how to trigger DAC by timer.

Analog Comparator Controller (ACMP)

ACMP_CompareDAC	Demonstrate how ACMP compare DAC output with ACMP1_P1 value.
ACMP_CompareVBG	Demonstrate how ACMP compare VBG output with ACMP1_P1 value.
ACMP_Wakeup	Show how to wake up MCU from Power-down mode by ACMP wake-up function.
ACMP_WindowComapre	Demonstrate the usage of ACMP window compare function.

BMC

BMC_Output	BMC output demo
BMC_PDMA_Output	BMC with PDMA output demo

Controller Area Network (CAN)

CANFD_CANFD_Loopback	Use CAN FD mode function to do internal loopback test.
CANFD_CANFD_TxRx	Transmit and receive CAN FD message through CAN interface.
CANFD_CANFD_TxRxINT	An example of interrupt control using CAN FD bus communication.

Key Store (KS)

KS_AESKey	Demo to use the AES in Key Store.
KS_ECDH	Demo to use ECC ECDH with Key Store.
KS_ECDSA	Demo to use the ECC ECDSA with Key Store.

Cryptographic Accelerator (CRYPTO)

CRYPTO_AES	Show Crypto IP AES-128 ECB mode encrypt/decrypt function.
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CRYPTO_AES_CCM	Demonstrate how to encrypt/decrypt data by AES CCM.
CRYPTO_AES_GCM	Demonstrate how to encrypt/decrypt data by AES GCM.
CRYPTO_ECC_Demo	ECDSA signature and verification demo
CRYPTO_ECC_ECDH	ECDH demonstrate how to calculate share key by A private key and B private key.
CRYPTO_HMAC	Show Crypto IP HMAC function.
CRYPTO_RSA	Show how to use Crypto RSA engine to sign and verifysignatures.
CRYPTO_RSA_AccessKeyStore	Use Crypto RSA engine accesses key from key store to sign and verify signatures.
CRYPTO_RSA_CRTBypass	Show how to use Crypto RSA engine CRT/CRT bypass mode to sign two signatures.
CRYPTO_RSA_CRTBypass AccessKeyStore	Use Crypto RSA engine CRT/CRT bypass mode accesses key from key store to sign and verify signatures.
CRYPTO_RSA_SCAP	Show how to use Crypto RSA engine SCAP mode to sign and verify signatures.
CRYPTO_SHA	Use Crypto IP SHA engine to run through known answer SHA1 test vectors.

USB On-The-Go (OTG)

OTG_Dual_Role_UMAS	Demonstrate how USB works as a dual role device. If it works as USB Host, it can access a mass storage device. If it works as USB Device, it acts as a mass storage device.
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Enhanced Input Capture Timer (ECAP)

ECAP_GetInputFreq	Show how to use ECAP interface to get input frequency
ECAP_GetQEIFreq	Show how to use ECAP interface to get QEI frequency.

Random Number Generator (RNG)

RNG_Random

Demo to use ECC ECDH with Key Store.

Secure Digital Host Controller (SDH)

SDH_FATFS

Access a SD card formatted in FAT file system.

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