

## NUC1262 Series CMSIS BSP Guide

Directory Introduction for 32-bit NuMicro™ Family

### Directory Information

Please extract the “NUC1262Series\_BSP\_CMSIS\_V3.00.002.zip” file firstly, and then put the “NUC1262Series\_BSP\_CMSIS\_V3.00.002” folder into the working folder (e.g. .\Nuvoton\BSP Library\).

This BSP folder contents:

<b>Document\</b>	Device driver reference manual and reversion history.
<b>Library\</b>	Device driver header and source files.
<b>SampleCode\</b>	Device driver sample code.

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## 1 .\Document\

<b>CMSIS.html</b>	<p>Introduction of CMSIS version 4.5.0. CMSIS components included CMSIS-CORE, CMSIS-Driver, CMSIS-DSP, etc.</p> <ul style="list-style-type: none"> <li>● CMSIS-CORE: API for the Cortex-M0 processor core and peripherals.</li> <li>● CMSIS-Driver: Defines generic peripheral driver interfaces for middleware making it reusable across supported devices.</li> <li>● 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).</li> </ul>
<b>NuMicro NUC126 Series CMSIS BSP Revision History.pdf</b>	<p>The revision history of NUC1262 Series BSP.</p>
<b>NuMicro NUC126 Series Driver Reference Guide.chm</b>	<p>The usage of drivers in NUC1262 Series BSP.</p>

## 2 .\Library\

<b>CMSIS\</b>	Cortex® Microcontroller Software Interface Standard (CMSIS) V4.5.0 definitions by ARM® Corp.
<b>Device\</b>	CMSIS compliant device header file.
<b>StdDriver\</b>	All peripheral driver header and source files.

### 3 .\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 occur. 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>
ISP\	Sample codes for In-System-Programming.
Semihost\	Show how to print and get character through IDE console window.
RegBased\	The sample codes which access control registers directly.
StdDriver\	Demonstrate the usage of NUC1262 series MCU peripheral driver APIs.
Template\	A project template for NUC1262 series MCU.

## 4 .\SampleCode\ISP

<b>ISP_DFU</b>	In-System-Programming Sample code through USB interface and following Device Firmware Upgrade Class Specification.
<b>ISP_HID</b>	In-System-Programming Sample code through USB HID interface.
<b>ISP_I2C</b>	In-System-Programming Sample code through I2C interface.
<b>ISP_RS485</b>	In-System-Programming Sample code through RS485 interface.
<b>ISP_SPI</b>	In-System-Programming Sample code through SPI interface.
<b>ISP_UART</b>	In-System-Programming Sample code through UART interface.

## 5 .\SampleCode\RegBased

<b>ADC_BandGap</b>	Convert Band-gap (channel 29) and print conversion result.
<b>ADC_ContinuousScanMode</b>	Perform A/D Conversion with ADC continuous scan mode.
<b>ADC_PDMA_SingleCycleScanMode</b>	Perform A/D Conversion with ADC single cycle scan mode and transfer result by PDMA.
<b>ADC_PwmTrigger</b>	Demonstrate how to trigger ADC by PWM.
<b>ADC_ResultMonitor</b>	Monitor the conversion result of Channel 2 by the digital compare function.
<b>ADC_SingleCycleScanMode</b>	Perform A/D Conversion with ADC single cycle scan mode.
<b>ADC_SingleMode</b>	Perform A/D Conversion with ADC single mode.
<b>ADC_TempSensor</b>	Convert temperature sensor (channel 30) and print conversion result.
<b>BPWM_Capture</b>	Use BPWM0 channel 0 to capture the BPWM1 channel 0 waveform.
<b>BPWM_DoubleBuffer_PeriodLoadingMode</b>	Change duty cycle and period of output waveform by BPWM Double Buffer function(Period loading mode).
<b>BPWM_DutySwitch</b>	Change duty cycle of output waveform by configured period.
<b>BPWM_OutputWaveform</b>	Demonstrate how to use BPWM output waveform.
<b>BPWM_SyncStart</b>	Demonstrate how to use BPWM counter synchronous start function.
<b>CLK_ClockDetector</b>	Show the usage of clock fail detector and clock frequency monitor function.
<b>CRC_CCITT</b>	Implement CRC in CRC-CCITT mode and get CRC checksum results.
<b>CRC_CRC32</b>	Implement CRC in CRC-32 mode with PDMA transfer.
<b>CRC_CRC8</b>	Implement CRC in CRC-8 mode and get CRC checksum results.

<b>FMC_ExecInSRAM</b>	Implement a code and execute the code in SRAM to program embedded Flash (support KEIL MDK only).
<b>FMC_IAP</b>	Show how to call LDROM functions from APROM. The code in APROM will look up the table at 0x100E00 to get the address of function of LDROM and call the function.
<b>FMC_MultiBoot</b>	Implement a multi-boot system to boot from different applications in APROM. A LDROM code and four APROM code are implemented in this sample code.
<b>FMC_RW</b>	Demonstrate how to read/program embedded Flash by ISP function.
<b>GPIO_EINTAndDebounce</b>	Show the usage of GPIO external interrupt function and de-bounce function.
<b>GPIO_INT</b>	Show the usage of GPIO interrupt function.
<b>GPIO_OutputInput</b>	Show how to set GPIO pin mode and use pin data input/output control.
<b>GPIO_PowerDown</b>	Show how to wake up system from Power-down mode by GPIO interrupt.
<b>I2C_EEPROM</b>	Demonstrate how to access EEPROM through a I2C interface
<b>I2C_GCMode_Master</b>	Demonstrate how a Master uses I2C address 0x0 to write data to I2C Slave. This sample code needs to work with I2C_GCMode_Slave.
<b>I2C_GCMode_Slave</b>	Demonstrate how to receive Master data in GC (General Call) mode. This sample code needs to work with I2C_GCMode_Master.
<b>I2C_Loopback</b>	Demonstrate how a Master access a Slave.
<b>I2C_Loopback_10bit</b>	Demonstrate how a Master uses 10-bit addressing to access a Slave.
<b>I2C_Master</b>	Demonstrate how a Master accesses a Slave. This sample code needs to work with I2C_Slave.
<b>I2C_Master_PDMA</b>	Demonstrate how a Master accesses Slave using PDMA TX mode and PDMA RX mode.

<b>I2C_Slave</b>	Demonstrate how to set I2C in slave mode to receive data from a Master. This sample code needs to work with I2C_Master.
<b>I2C_Slave_PDMA</b>	Demonstrate how a Slave uses PDMA Rx mode to receive data from a Master.
<b>I2C_SMBUS</b>	Demonstrate how I2C SMBUS works.
<b>I2C_Wakeup_Slave</b>	Demonstrate how to set I2C to wake up MCU from Power-down mode. This sample code needs to work with I2C_Master.
<b>I2C_Wakeup_Slave_10bit</b>	Demonstrate how to set I2C uses 10-bit addressing to wake up MCU from Power-down mode. This sample code needs to work with I2C_Master.
<b>I2S_Master</b>	Configure SPI1 as I2S Master mode and demonstrate how I2S works in Master mode. This sample code needs to work with I2S_Slave.
<b>I2S_PDMA_NAU8822</b>	This is an I2S demo with PDMA function connected with NAU8822 codec.
<b>I2S_PDMA_Play</b>	This is an I2S demo for playing data and demonstrating how I2S works with PDMA.
<b>I2S_PDMA_PlayRecord</b>	This is an I2S demo for playing and recording data with PDMA function.
<b>I2S_PDMA_Record</b>	This is an I2S demo for recording data and demonstrating how I2S works with PDMA.
<b>I2S_Slave</b>	Configure SPI1 as I2S Slave mode and demonstrate how I2S works in Slave mode. This sample code needs to work with I2S_Master.
<b>LLSI_Marquee</b>	This is a LLSI demo for marquee display in software mode. It needs to be used with WS2812 LED strip.
<b>LLSI_PDMA_Marquee</b>	This is a LLSI demo for marquee display in PDMA mode. It needs to be used with WS2812 LED strip.
<b>PDMA</b>	Use PDMA Channel 2 to transfer data from memory to memory.
<b>PDMA_ScatterGather_Ping</b>	Use PDMA to implement Ping-Pong buffer by scatter-gather



<b>PongBuffer</b>	mode (memory to memory).
<b>PDMA_Scatter_Gather</b>	Use PDMA Channel 4 to transfer data from memory to memory by scatter-gather mode.
<b>SPI_Loopback</b>	Implement SPI Master loop back transfer. This sample code needs to connect SPI0_MISO0 pin and SPI0_MOSI0 pin together. It will compare the received data with transmitted data.
<b>SPI_MasterFifoMode</b>	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.
<b>SPI_PDMA_LoopTest</b>	Demonstrate SPI data transfer with PDMA. SPI0 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.
<b>SPI_SlaveFifoMode</b>	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.
<b>SYS_BODWakeup</b>	Show how to wake up system form Power-down mode by brown-out detector interrupt.
<b>SYS_PLLClockOutput</b>	Change system clock to different PLL frequency and output system clock from CLK0 pin.
<b>SYS_TrimHIRC</b>	Demonstrate how to use LXT to trim HIRC.
<b>SYS_VoltageDetector</b>	Show how to use voltage detector to detect pin input voltage.
<b>TIMER_CaptureCounter</b>	Show how to use the timer2 capture function to capture timer2 counter value.
<b>TIMER_EventCounter</b>	Show how to use the timer2 capture function to capture timer2 counter value.
<b>TIMER_PeriodicINT</b>	Implement timer counting in periodic mode.
<b>TIMER_TimeoutWakeup</b>	Use timer0 periodic time-out interrupt event to wake up system.
<b>UART_AutoBaudRate</b>	Show how to use auto baud rate detection function.

<b>UART_AutoFlow</b>	Transmit and receive data with auto flow control.
<b>UART_IrDA</b>	Transmit and receive data in UART IrDA mode.
<b>UART_PDMA</b>	Transmit and receive UART data with PDMA.
<b>UART_RS485</b>	Transmit and receive data in UART RS485 mode.
<b>UART_TxRxFunction</b>	Transmit and receive data from PC terminal through RS232 interface.
<b>UART_Wakeup</b>	Show how to wake up system from Power-down mode by UART interrupt.
<b>WDT_TimeoutWakeupAndReset</b>	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.
<b>WWDT_CompareINT</b>	Show how to reload the WWDT counter value.

## 6 .\SampleCode\StdDriver

<b>ADC_BandGap</b>	Convert Band-gap (channel 29) and print conversion result.
<b>ADC_ContinuousScanMode</b>	Perform A/D Conversion with ADC continuous scan mode.
<b>ADC_PDMA_SingleCycleScanMode</b>	Perform A/D Conversion with ADC single cycle scan mode and transfer result by PDMA.
<b>ADC_PwmTrigger</b>	Demonstrate how to trigger ADC by PWM.
<b>ADC_ResultMonitor</b>	Monitor the conversion result of Channel 2 by the digital compare function.
<b>ADC_SingleCycleScanMode</b>	Perform A/D Conversion with ADC single cycle scan mode.
<b>ADC_SingleMode</b>	Perform A/D Conversion with ADC single mode.
<b>ADC_TempSensor</b>	Convert temperature sensor (channel 30) and print conversion result.
<b>BPWM_Capture</b>	Use BPWM0 channel 0 to capture the BPWM1 channel 0 waveform.
<b>BPWM_DoubleBuffer_PeriodLoadingMode</b>	Change duty cycle and period of output waveform by BPWM Double Buffer function.(Period loading mode).
<b>BPWM_DutySwitch</b>	Change duty cycle of output waveform by configured period.
<b>BPWM_OutputWaveform</b>	Demonstrate how to use BPWM counter output waveform.
<b>BPWM_SyncStart</b>	Demonstrate how to use BPWM counter synchronous start function.
<b>CLK_ClockDetector</b>	Show the usage of clock fail detector and clock frequency monitor function.
<b>CRC_CCITT</b>	Implement CRC in CRC-CCITT mode and get the CRC checksum result.
<b>CRC_CRC32</b>	Implement CRC in CRC-32 mode with PDMA transfer.
<b>CRC_CRC8</b>	Implement CRC in CRC-8 mode and get the CRC checksum result.
<b>FMC_ExecInSRAM</b>	Implement a code and execute in SRAM to program

	embedded Flash (support KEIL MDK only).
<b>FMC_IAP</b>	Show how to set VECMAP to LDROM and reboot to LDROM from APROM.
<b>FMC_RW</b>	Demonstrate how to read/program embedded Flash by ISP function.
<b>GPIO_EINTAndDebounce</b>	Show the usage of GPIO external interrupt function and debounce function.
<b>GPIO_INT</b>	Show the usage of GPIO interrupt function.
<b>GPIO_OutputInput</b>	Show how to set GPIO pin mode and use pin data input/output control.
<b>GPIO_PowerDown</b>	Show how to wake up system from Power-down mode by GPIO interrupt.
<b>I2C_EEPROM</b>	Demonstrate how to access EEPROM through a I2C interface
<b>I2C_GCMode_Master</b>	Demonstrate how a Master uses I2C address 0x0 to write data to I2C Slave. This sample code needs to work with I2C_GCMode_Slave.
<b>I2C_GCMode_Slave</b>	Demonstrate how to receive Master data in GC (General Call) mode. This sample code needs to work with I2C_GCMode_Master.
<b>I2C_Loopback</b>	Demonstrate how a Master access Slave.
<b>I2C_Loopback_10bit</b>	Demonstrate how a Master uses 10-bit addressing to access a Slave.
<b>I2C_Master</b>	Demonstrate how a Master accesses Slave. This sample code needs to work with I2C_Slave.
<b>I2C_Master_PDMA</b>	Demonstrate how a Master accesses Slave using PDMA TX mode and PDMA RX mode.
<b>I2C_MultiBytes_Master</b>	
<b>I2C_SingleByte_Master</b>	
<b>I2C_Slave</b>	Demonstrate how to set I2C in slave mode to receive the data from a Master. This sample code needs to work with

	I2C_Master.
<b>I2C_Slave_PDMA</b>	Demonstrate how a Slave uses PDMA Rx mode receive data from a Master.
<b>I2C_SMBUS</b>	Demonstrate how I2C SMBUS works.
<b>I2C_Wakeup_Slave</b>	Demonstrate how to set I2C to wake up MCU from Power-down mode. This sample code needs to work with I2C_Master.
<b>I2C_Wakeup_Slave_10bit</b>	Demonstrate how to set I2C uses 10-bit addressing to wake up MCU from Power-down mode. This sample code needs to work with I2C_Master.
<b>I2S_Master</b>	Configure SPI1 as I2S Master mode and demonstrate how I2S works in Master mode. This sample code needs to work with I2S_Slave.
<b>I2S_PDMA_NAU8822</b>	This is an I2S demo with PDMA function connected with NAU8822 codec.
<b>I2S_PDMA_Play</b>	This is an I2S demo for playing data and demonstrating how I2S works with PDMA.
<b>I2S_PDMA_PlayRecord</b>	This is an I2S demo for playing and recording data with PDMA function.
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<b>LLSI_Marquee</b>	This is a LLSI demo for marquee display in software mode. It needs to be used with WS2812 LED strip.
<b>LLSI_PDMA_Marquee</b>	This is a LLSI demo for marquee display in PDMA mode. It needs to be used with WS2812 LED strip.
<b>PDMA</b>	Use PDMA Channel 2 to transfer data from memory to memory.
<b>PDMA_ScatterGather_PingPongBuffer</b>	Use PDMA to implement Ping-Pong buffer by scatter-gather mode (memory to memory).

<b>PDMA_Scatter_Gather</b>	Use PDMA Channel 4 to transfer data from memory to memory by scatter-gather mode.
<b>SPI_Loopback</b>	Implement SPI Master loop back transfer. This sample code needs to connect MISO_0 pin and MOSI_0 pin together. It will compare the received data with transmitted data.
<b>SPI_MasterFifoMode</b>	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.
<b>SPI_PDMA_LoopTest</b>	Demonstrate SPI data transfer with PDMA. SPI0 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.
<b>SPI_SlaveFifoMode</b>	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.
<b>SYS_BODWakeup</b>	Show how to wake up system form Power-down mode by brown-out detector interrupt.
<b>SYS_PLLClockOutput</b>	Change system clock to different PLL frequency and output system clock from CLK0 pin.
<b>SYS_TrimHIRC</b>	Demonstrate how to use LXT to trim HIRC.
<b>SYS_VoltageDetector</b>	Show how to use voltage detector to detect pin input voltage.
<b>TIMER_CaptureCounter</b>	Show how to use the timer2 capture function to capture timer2 counter value.
<b>TIMER_Delay</b>	Show how to use timer0 to create various delay time.
<b>TIMER_EventCounter</b>	Implement timer1 event counter function to count the external input event.
<b>TIMER_InterTimerTriggerMode</b>	Demonstrate how to use Inter-Timer trigger function.
<b>TIMER_PeriodicINT</b>	Implement timer counting in periodic mode.
<b>TIMER_TimeoutWakeup</b>	Use timer0 periodic time-out interrupt event to wake up system.

<b>TIMER_ToggleOut</b>	Implement timer counting in toggle-output mode.
<b>UART_AutoBaudRate</b>	Show how to use auto baud rate detection function.
<b>UART_Autoflow</b>	Transmit and receive data with auto flow control.
<b>UART_IrDA</b>	Transmit and receive data in UART IrDA mode.
<b>UART_PDMA</b>	Transmit and receive UART data with PDMA.
<b>UART_RS485</b>	Transmit and receive data in UART RS485 mode.
<b>UART_TxRxFunction</b>	Transmit and receive data from PC terminal through RS232 interface.
<b>UART_Wakeup</b>	Show how to wake up system from Power-down mode by UART interrupt.
<b>USBD_Audio_NAU8822</b>	This sample code demonstrates how to implement a USB audio class device. NAU8822 is used in this sample code to play the audio data from Host. It also supports to record data from NAU8822 to Host.
<b>USBD_HID_Keyboard</b>	Show how to implement a USB keyboard device. This sample code supports to use GPIO to simulate key input.
<b>USBD_HID_Mouse</b>	Show how to implement a USB mouse device. The mouse cursor will move automatically when this mouse device connecting to PC by USB.
<b>USBD_HID_Mouse2</b>	Demonstrate how to implement a USB mouse device. It uses PC0 ~ PC5 to control mouse directions and mouse keys. It also supports USB suspend and remote wakeup.
<b>USBD_HID_MouseKeyboard</b>	Demonstrate how to implement a USB mouse function and a USB keyboard on the same USB device. The mouse cursor will move automatically when this mouse device connecting to PC. This sample code uses a GPIO to simulate key input.
<b>USBD_HID_Transfer</b>	Transfer data between USB device and PC through USB HID interface. A windows tool is also included in this sample code to connect with USB device.
<b>USBD_HID_Transfer_and_Keyboard</b>	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 USB device.



<b>USBD_HID_Transfer_and_MSC</b>	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.
<b>USBD_MassStorage_CDROM</b>	Demonstrate how to simulate a USB CD-ROM device.
<b>USBD_MassStorage_DataFlash</b>	Demonstrate how to implement a USB mass storage. It uses embedded Data Flash as storage.
<b>USBD_MassStorage_SDCard</b>	Use SD card as storage to implement a USB mass storage device.
<b>USBD_Micro_Printer</b>	Show how to implement a USB micro printer device.
<b>USBD_Printer_and_HID_Transfer</b>	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.
<b>USBD_VCOM_and_HID_Keyboard</b>	Implement a USB composite device with virtual COM port and keyboard functions.
<b>USBD_VCOM_and_HID_Transfer</b>	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.
<b>USBD_VCOM_and_MassStorage</b>	Implement a USB composite device. It supports one virtual COM port and one USB mass storage device.
<b>USBD_VCOM_DualPort</b>	Demonstrate how to implement a USB dual virtual COM port device.
<b>USBD_VCOM_SinglePort</b>	Implement a USB virtual COM port device. It supports one virtual COM port.
<b>WDT_TimeoutWakeupAndReset</b>	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.
<b>WWDT_CompareINT</b>	Show how to reload the WWDT counter value.





## 7 REVISION HISTORY

Date	Revision	Description
2021.07.05	3.00.002	<ol style="list-style-type: none"> <li>1. Updated PDMA configuration sequence in LLSI_PDMA_Marquee sample code.</li> <li>2. Fixed build error by Idrom/aprom build order in FMC_IAP sample code.</li> <li>3. Added LVR and BOD de-glitch time selection definitions in sys.h file.</li> <li>4. Added new api used for select timer capture source in timer.c file.</li> <li>5. Added Voltage Detector(VDET) definitions in SYS driver for NuCodeGen tool.</li> <li>6. Updated auto trim to use HW boundary function in USB sample code.</li> <li>7. I2C pins enabled schmitt trigger and added I2C hangup/recover flow in I2C sample code.</li> </ol>
2021.03.18	3.00.001	<ol style="list-style-type: none"> <li>1. Initially issued.</li> </ol>

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