

**ARM® Cortex®-M0**  
**32-bit Microcontroller**

**NuMicro® Family**  
**M451 Series BSP**  
**Revision History**

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**Revision 3.01.004** (Released 2019-11-11)

1. Added ISP Sample codes to bsp\SampleCode\ISP folder.
2. Supports GNU GCC.
3. Added Mass Storage sample code to support SD Card.

**Revision 3.01.003** (Released 2018-02-21)

1. Fixed I2C driver bug of clock source.
2. Updated USBD\_Audio\_HID\_NAU8822 sample code to support sync frame.
3. Revised I2S driver to improve sample rate calculation accuracy.
4. Revised USB interrupt flag handling of USB device sample code.
5. Added USB Host driver and sample code for CDC.

**Revision 3.01.002** (Released 2017-10-24)

1. Added CLK\_SysTickLongDelay() for long delay.
2. Fixed clear Receive Line Status interrupt flag bug in UART\_ClearIntFlag().
3. Fixed u32idmask for Standard ID issue in CAN\_SetRxMsgObjAndMsk().
4. Fixed PLL clock source selection bug in CLK\_SetCoreClock().
5. Modified to disable debug message when enabling semihost without NuLink connecting.
6. Add ADC\_MeasureAVDD() sample code.

**Revision 3.01.001** (Released 2015-08-15)

1. Added Nu-LB-M451, NuEdu and USB device sample code.
2. Added a lack macro, SYS\_IS\_LVR\_RST() to SYS driver.
3. Added a sample code of DAC\_PDMA\_ScatterGather\_PWMTrigger to use PDMA scatter gather mode and trigger DAC by PWM
4. Added counter type constant definitions: PWM\_UP\_COUNTER, PWM\_DOWN\_COUNTER, PWM\_UP\_DOWN\_COUNTER
5. Added DAC\_PDMA\_PWMTrigger sample code to use PDMA and trigger DAC by PWM.
6. Added EADC\_PDMA\_PWM\_Trigger sample code to trigger EADC with PWM and copy result by PDMA.
7. Added new function to control systick and select systick clock source, CLK\_EnableSysTick() and CLK\_DisableSysTick() in CLK driver.
8. Added 'NMIEN' and 'NMISTS' control registers to M451Series.h for NMI control.
9. Added PDMA\_ScatterGather\_PingPongBuffer sample code to create ping-pong buffer with PDMA scatter gather mode.
10. Added 'PE\_DRVCTL' register of GPIO to M451Series.h for GPIO driving strength control.
11. Added PWM\_PDMA\_Capture sample code to transfer PWM capture data by PDMA.
12. Added SCLIB\_ActivateDelay API for initial SC with non-standard H/W design in SC driver
13. Fixed the bug of EADC\_IS\_INT\_FLAG\_OV() that access the incorrect register.
14. Fixed the bug of EADC\_IS\_SAMPLE\_MODULE\_OV() that access the incorrect register.
15. Fixed the bug of EADC\_SetExtendSampleTime() for shift position error in EADC driver.
16. Fixed the bug of EADC\_SetTriggerDelayTime() for shift position error in EADC driver.

17. Fixed the bug of PWM\_ENABLE\_OUTPUT\_INVERTER () that output inverter function can't be disabled.
18. Fixed the bug of PWM\_MASK\_OUTPUT() in PWM driver that mask function can't be disabled.
19. Fixed CAN\_STATUS\_LEC\_Msk from 0x03 to 0x07.
20. Fixed COUNTFLAG may not be cleared bug of CLK\_SysTickDelay() in CLK driver.
21. Fixed CTL and PINCTL regisiter synchronise issue by wait synchronise ready flag in SC driver.
22. Fix DAC\_SetDelayTime() calculation error in DAC driver. Because the dac->TCTL only use 10bit, not 14bit.
23. Fixed EADC\_CMP\_ADCMPIE\_DISABLE definition error.
24. Fixed EADC\_CMP\_ADCMPIE\_DISABLE definition error.
25. Fixed IAR entry point from \_\_iar\_program\_start to Reset\_Handler
26. Fixed PWM\_ConfigOutputChannel() return value bug in PWM driver.
27. Fixed a bug of PWM\_ConfigSyncPhase() that cannot configure synchronize source for channel2~5.
28. Fixed SC\_SET\_STOP\_BIT\_LEN definition error.
29. Fixed SCUART baudrate return error in SCUART\_Open and SCUART\_SetLineConfig API of SCUART driver.
30. Fixed SCUART\_PARITY\_NONE/SCUART\_PARITY\_EVEN/SCUART\_PARITY\_ODD definition bug in SCUART driver.
31. Fixed setting u32DataWidth error by sc->UARTCTL in SCUART\_SetLineConfig API of SCUART driver.
32. Fixed SMBD\_Enable constant value define error in I2C driver.
33. Fixed the problem that MSC device detection is aborted due to REQUEST\_SENSE command not ready.
34. Fixed UART clock setting bug in UART\_Open(), UART\_SetLine\_Config() and UART\_SelectIrDAMode() of UART driver.
35. Improved compatibility of USBH driver for pen driver.
36. Improved EADC\_ConfigSampleModule() to support rising and falling trigger at the same time.
37. Improved EBI\_SRAM sample code to add PDMA data transfer with EBI.
38. Improved SC driver to support more than one SC port.
39. Improved USBH driver to support composite HID devices
40. Improved USBH driver to support more USB device sample code.
41. Modified I2C\_STOP() from #define to inline and add waiting STO bit clear to 0 . This modified is safe for next START coming soon.
42. Removed CRC clock enabled in CRC\_Open(). User should enable CRC clock in system initialization before any CRC operation.
43. Removed FMC\_ReadDID() in FMC driver. This function was no longer supported.
44. Removed I2C\_CTL\_STA\_STO\_SI and I2C\_CTL\_STA\_STO\_SI\_AA definitions to avoid STOP and START write to control bit at the same time.

#### Revision 3.00.005 (Released 2014-12-25)

1. Fixed EADC\_CTL\_DMOF\_STRAIGHT\_BINARY and EADC\_CTL\_DMOF\_TWOS\_COMPLEMENT definition error of EADC driver.
2. Fixed EADC\_FALLING\_EDGE\_TRIGGER definition error of EADC driver.
3. Fixed EADC\_RISING\_EDGE\_TRIGGER definition error of EADC driver.
4. Fixed UART transmit data bug in UART\_TEST\_HANDLE() of UART\_TxRxFunction sample code.

5. Fixed data missing bug when BULK IN transfer is end by max packet size packet at last packet in USBD\_VCOM sample code.
6. Fixed program user configuration area without erase in USBD\_MassStorage\_DataFlash sample code.
7. Fixed switching HCLK to HIRC before enable PLL bug in CLK\_SetCoreClock() of CLK driver.
8. Fixed isochronous transfer bugs of USB Host library.
9. Fixed Clear Modem Status Interrupt flag bug in UART\_ClearIntFlag() of UART driver.
10. Fixed Timeout flag clear bug in I2C\_ClearTimeoutFlag() of I2C driver.
11. Replaced PERIOD0~5 with PERIOD[6] in PWM\_T, and revise PERIOD bit field constant definition in M451Series.h.
12. Replaced CMPDAT0~5 with CMPDAT[6] in PWM\_T, and revise CMPDAT bit field constant definition in M451Series.h.
13. Replaced CNT0~5 with CNT[6] in PWM\_T, and revise CNT bit field constant definition in M451Series.h.
14. Replaced PBUF0~5 with PBUF[6] in PWM\_T, and revise PBUF bit field constant definition in M451Series.h.
15. Replaced CMPBUF0~5 with CMPBUF[6] in PWM\_T, and revise CMPBUF bit field constant definition in M451Series.h.
16. Replaced CURSCAT0~CURSCAT11 with CURSCAT[12] in PDMA\_T of M451Series.h.
17. Modified CLK\_WaitClockReady() timeout to about 300ms in CLK driver.
18. Updated USB USBD\_MassStorage\_DataFlash sample code and USB Driver to pass USB-IF MSC test. (The MassStorage size must > 64KB, otherwise Command Set test will fail in MSC test)
19. Replaced old HID library file (open source) with Nuvoton HID library in USB Host library.
20. Added USBH\_Audio\_Class and USBH\_UAC\_HID sample code for USB Host to support UAC + HID device.

#### Revision 3.00.004 (Released 2014-11-12)

1. Fixed the timeout from 5ms to 300ms in CLK\_WaitClockReady() of CLK driver.
2. Fixed the bug of UART\_ClearIntFlag() of UART driver to only clear one flag at one time.
3. Fixed missing parameter, UART clock source LXT for CLK\_SetModuleClock() of UART driver.
4. Fixed clear data and CTS wake up flag bug to clear one flag in one time in UART1\_IRQHandler() of UART\_Wakeup sample code.
5. Fixed the bug of RS485\_HANDLE() in the UART\_RS485\_Slave sample code to only clear one flag at one time.
6. Fixed clear auto baud rate detect finished and time-out flag bug to clear one flag one time in AutoBaudRate\_RxTest() of UART\_AutoBaudRate\_Slave sample code.
7. Fixed typo that modify NVIC\_EnableIRQ() to NVIC\_DisableIRQ() after CHIP wake-up in I2C\_Wakeup\_Slave sample code.
8. Fixed multi-function setting error of SC CD pin in USBD\_CCID sample code.
9. Fixed PD.7 (Headphone output control pin) output mode configuration in WAU8822\_Setup() of USBD\_Audio\_NAU8822 sample code.
10. Fixed wrong CLK\_WaitClockReady parameter in I2C\_GCMode\_Slave sample code.
11. Fixed UART data transfer bug of USBD\_VCOM sample code.
12. Updated CLK driver to avoid HIRC force enable in CLK\_SetHCLK() and CLK\_SetCoreClock().

13. Updated USB\_Driver for pass USB-IF MSC Test.
14. Updated USB\_D\_MassStorage\_DataFlash sample code to pass USB-IF MSC Test.
15. Updated driver of VCOM for win8 certification of USB\_D\_VCOM sample code.
16. Added HID Media key supporting in USB\_D\_Audio\_HID\_NAU8822 sample code.
17. Added new sample code USBH\_UAC\_HID of USB Host to support UAC + HID device.
18. Added new sample code USBH\_Audio\_Class to support USB audio class device (UAC).

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**Revision 3.00.003** (Released 2014-10-02)

1. Added USB\_D\_Audio\_HID\_NAU8822 sample code

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**Revision 3.00.002** (Released 2014-09-09)

1. Fixed serial number code in device descriptor
2. Fixed EBI\_Open API did not perform u32CSActiveLevel parameters to setting CS pin polar
3. Fixed SMBus Bus time-out & Clock Lo time-out API
4. Fixed I2C0,1 IP reset of SYS\_IPRST1
5. Fixed include path of CMSIS
6. Fixed SPI\_CLR\_UNIT\_TRANS\_INT\_FLAG( ) definition
7. Fixed Revise USB\_D\_INT\_WAKEUP definition
8. Fixed Modify to support USB remote wake-up function
9. Fixed Modify M451 RAM setting for Algorithm

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**Revision 3.00.001** (Released 2014-06-06)

1. Initial Release.

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