

**Arm® Cortex®-M23**  
**32-bit Microcontroller**

**M251/M252/M254/M256/M258 Series**  
**CMSIS BSP**  
**Revision History**

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### Revision 3.02.004 (Released 2023-02-06)

- Library
  - TKLib: Added hysteresis recover mechanism for baseline tracking.
- Sample code
  - NK\_M256SD\_LCD\_TK and NK\_M258KE\_LCD\_TK: TK\_SE\_NUM added.
  - SYS\_PowerDown\_MinCurrent: Added.
  - USB samples: Avoided wakeup failure.

### Revision 3.02.003 (Released 2022-07-21)

- Standard driver
  - retarget.c: Fixed print issue with IAR EWARM v9.20.
  - CLK
    - CLK\_PowerDown added check of LIRC disable for DPD mode.
    - CLK\_WaitClockDisable added.
  - I2C: Error codes added.
  - LCD
    - LCD output control constant definitions added.
    - LCD\_SetSavingMode added.
  - SYS: SYS\_GPA\_MFPH\_PA8MFP\_DAC0\_OUT and SYS\_GPA\_MFPH\_PA9MFP\_DAC1\_OUT added.
  - UART: UART\_RX\_IDEL replaced by UART\_RX\_IDLE.
- Library
  - SmartcardLib: Supported cards not compatible with ISO-7816.
- Sample code
  - ACMP\_CompareDAC: Added external negative source from DAC voltage output.
  - DAC samples: Extended DAC output pin to support more chips.
  - FreeRTOS Blinky sample: Added.
  - I2C samples: Improved error handling.
  - I2C\_Loopback\_10bit, I2C\_Master\_10bit, I2C\_Slave\_10bit, LCD\_PowerConsumption, TK\_PowerDownMode, and Level1\_Training samples: Added.
  - ISP\_DFU, ISP\_HID, and ISP\_MSC: Enabled USB trim function.
  - ISP\_SPI: Added GCC project.
  - ISP samples
    - Added IAR projects.
    - Added scatter file to check image size.

- Enabled function section linking and image size optimization in KEIL projects.
- NK\_M256SD\_LCD\_TK and NuMaker-M256SD LCD samples: Added.
- NK\_M258KE\_LCD\_TK, NK\_M258KG\_LCD\_TK, and LCD samples: Added LCD output setting.
- RTC samples: Skipped time setting if RTC initialized.
- RTC\_Alarm\_Wakeup: Moved to PowerManagement folder.
- SYS\_DPDMODE\_Wakeup: Added wait for LIRC disable.
- SYS\_DPDMODE\_Wakeup and SYS\_PowerDownMode: Added reset status check.
- UART\_PDMA: Fixed compiling issue of polling method.
- ThirdParty
  - FreeRTOS: Added.

#### Revision 3.02.002 (Released 2022-03-15)

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- Library
  - LCDLib: Synchronized with NuTool-LCDView tool.
  - TKLib: Improved anti-noise capability.
- Sample code
  - DAC\_GroupMode, EADC\_BPWM\_Trigger, EADC\_PDMA\_BPWM\_Trigger, and NK\_M258KG\_LCD\_TK: Added.
  - LCD\_Blinking and LCD\_Pixel\_OnOff: Used default Charge Pump setting.
  - LCD samples: Used new LCDLib.
- Tool
  - NuSenadj\_MP: Updated.

#### Revision 3.02.001 (Released 2022-01-20)

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- Supported CRYPTO.
- Peripheral header
  - dac\_reg.h: Fixed DAC\_CTL\_GRPEN\_Msk.
  - lcd\_reg.h: Updated base on TRM.
  - tk\_reg.h: Supported up to 24 keys.
- Standard driver
  - Improved infinite loop prevention with timeout counter and error code.
  - BPWM: BPWM\_ConfigCaptureChannel and BPWM\_ConfigOutputChannel fixed wrong clock for chips without PLL.
  - CLK: CLK\_EnableSysTick correctly used external reference clock.

- DAC: DAC\_SetDelayTime fixed calculation overflow issue.
- GPIO: PF15 added.
- LCD
  - LCD\_GET\_CHARGE\_TIME and LCD\_WAVEFORM\_TYPE fixed.
  - LCD\_SET\_CONTINUOUS\_FRAME and LCD\_SET\_NULL\_FRAME\_TIME removed.
  - LCD\_SET\_PAUSE\_TIME and LCD\_SET\_PAUSE\_TYPE added.
- PWM: PWM\_ConfigCaptureChannel and PWM\_ConfigOutputChannel fixed wrong clock for chips without PLL.
- RTC: RTC\_Open added return value.
- SCUART: SCUART\_Write added return value.
- SPI: Supported SPI1.
- TIMER: TIMER\_Delay and TIMER\_ResetCounter added return value.
- TK: Supported up to 24 keys.
- Library
  - TKLib: Supported up to 24 keys.
- Sample code
  - EADC\_Timer\_Trigger: Fixed wrong timer period.
  - I2C samples: Removed redundant code.
  - ISP\_I2C, ISP\_RS485, and ISP\_UART: Added GCC project.
  - ISP\_MSC: Added.
  - SPI\_HalfDuplex and SPI\_PDMA\_LoopTest: QSPI0 replaced by USPI0.
  - USB HID samples: Unified INT\_IN interval.
  - USB\_Mass\_Storage\_CDROM: Fixed Linux and Mac compatibility issue.
- Tool
  - NuSenadj: Updated.

#### Revision 3.01.002 (Released 2021-06-25)

- system\_M251.h: \_\_HXT and \_\_LXT added redefinition check.
- Peripheral header
  - psio\_reg.h: A reserved member added to GNCT\_T structure.
- Standard driver
  - SYS: PF.15 MFP added.
- Library
  - LCDLib
    - Fixed display flicker.
    - Variable legality check for LCD print and putchar.

- TKLib
  - Added all key calibration for power-down mode, store address scan, and store pin selection to Flash.
  - Decreased parameters Flash size.
  - Fixed reference CB overflow, power-on fine tune.
- Sample code
  - BPWM\_Capture: Replaced PWM0 channel 0 with Timer0.
  - I2C and USCI\_I2C samples: Enabled schmitt trigger of I<sup>2</sup>C pins.
  - ISP\_HID, ISP\_I2C, ISP\_RS485, and ISP\_UART: Enabled GPIO and SysTick clocks.
  - NuMaker-M258KE: Supported CKO shielding, default calibration parameters, and null frame in power-down mode.
  - SPI\_SlaveFIFOModelINT, USCI\_SPI\_SlaveModelINT: Added.
  - TIMER\_FreeCountingMode: Saved the first captured data.
  - UART\_Wakeup: Provided more wake-up methods.
  - USB\_D\_Audio\_Codec: Refactored.
  - USB\_D\_MassStorage\_CDRom: Removed 2 KB file size limitation.
  - USB\_D\_VCOM samples: Fixed potential UART Tx FIFO overflow issue.
  - USB\_D\_VCOM\_DaughterPort: Fixed power-down blocked issue and wrong baud rate issue.
- Tool
  - NuSenadj: Moved to TK subfolder.
  - NuSenadj\_MP: Added.

### Revision 3.01.001 (Released 2020-11-16)

- Supported M254/M256/M258 series.
- Peripheral header
  - lcd\_reg.h, tk\_reg.h: Added.
  - eadc\_reg.h: EADC\_T.OFFSETCAL, EADC\_CTL\_CALEN\_Msk, EADC\_CTL\_CALEN\_Pos, EADC\_OFFSETCAL\_OFFSETCANCEL\_Msk, and EADC\_OFFSETCAL\_OFFSETCANCEL\_Pos removed.
- Standard driver
  - retarget.c: Fixed program terminated issue with optimization level 0 of Arm Compiler 6.
  - EADC
    - EADC\_ENABLE\_CMP0, EADC\_ENABLE\_CMP1, EADC\_ENABLE\_CMP2, and EADC\_ENABLE\_CMP3 fixed bits overwritten issue.

- EADC\_DISABLE\_OFFSETCANCEL and EADC\_ENABLE\_OFFSETCANCEL removed.
- LCD, TK: added.
- QSPI: QSPI\_DISABLE\_TX\_RX\_PDMA and QSPI\_TRIGGER\_TX\_RX\_PDMA added.
- SPI: SPI\_DISABLE\_TX\_RX\_PDMA and SPI\_TRIGGER\_TX\_RX\_PDMA added.
- SYS: SYS\_SetPowerLevel improved power level switch stability.
- USCI-SPI: USPI\_DISABLE\_TX\_RX\_PDMA and USPI\_TRIGGER\_TX\_RX\_PDMA added.
- USCI-UART: UART\_PDMA\_DISABLE and UART\_PDMA\_ENABLE added.
- Library
  - LCDLib, TKLib: Added.
- Sample code
  - EADC\_BandGapCalculateAVDD, LCD\_Blinking, LCD\_Pixel\_OnOff, LCD\_Print\_Text, NK\_M258KE\_LCD\_TK, and USBD\_BC12\_HID\_Mouse: Added.
  - EADC\_OffsetCancel: Removed.
  - GPIO samples: Enabled GPIO clock.
  - PDMA\_BasicMode: Fixed miss word alignment.
  - USBD\_Audio\_Codec: Fixed noise and I<sup>2</sup>C timeout.
  - USBD\_VCOM\_DualPort: Fixed only one VCOM port in Linux.

### Revision 3.00.005 (Released 2020-06-10)

- Added Apache-2.0 license declaration.
- Standard driver
  - retarget.c: SendChar fixed uninitialized pointer.
  - TIMER: TIMER\_SET\_OPMODE added.
  - UART: UART\_DEGLITCH\_DISABLE, UART\_DEGLITCH\_ENABLE, UART\_PDMA\_DISABLE, and UART\_PDMA\_ENABLE added.
  - USCI-UART: UART\_DEGLITCH\_DISABLE and UART\_DEGLITCH\_ENABLE added.
- Sample code
  - CLK\_ClockDetector: HCLK clock source used HXT instead of PLL.
  - GPIO\_SingleCycleIO, I2C\_SMBus, MPU, SYS\_PowerDownMode, Sys\_PowerMode, and USBD\_CCID: Added.
  - QSPI\_DualMode\_Flash, QSPI\_QualMode\_Flash, and SPI\_Flash: Fixed the 256th byte written issue.

### Revision 3.00.004 (Released 2019-12-31)

- Removed CRYPTO.
- Standard driver
  - retarget.c: \_write and SendChar\_ToUART fixed '\r' issue.
  - CRC: CRC\_SET\_WDATA\_LEN added.
  - FMC
    - FMC\_Write128 added note to run in SRAM instead of inline function.
    - FMC\_WriteConfig fixed return value.
  - SYS: Replaced SYS\_PLCTL\_PLSEL\_PL2 with SYS\_PLCTL\_PLSEL\_PL3.
  - TIMER\_PWM: TPWM\_ConfigOutputFreqAndDuty fixed wrong configuration for 1 Hz.
- Sample code
  - FMC\_MultiWordProgram: Used FMC driver API.
  - I2C\_Wakeup\_Slave: Improved wakeup robustness.
  - ISP\_DFU: Added.
  - UART\_LIN and UART\_SingleWire: Fixed '\r' issue.
  - USB samples: Improved USB compatibility.

### Revision 3.00.003 (Released 2019-08-30)

- M251.h: Included core\_cm23.h instead of core\_armv8mbl.h.
- Peripheral header
  - clk\_reg.h, rtc\_reg.h: Updated base on TRM.
- Standard driver
  - I2C: I2C\_SetSlaveAddr and I2C\_SetSlaveAddrMask supported 10-bit slave address and error handling for new transfer.
  - TIMER
    - TIMER\_GetModuleClock used correct PCLK.
    - TIMER\_Open fixed return value.
  - TIMER\_PWM
    - TPWM\_ClearWakeupFlag, TPWM\_DisableTrigger, TPWM\_DisableWakeup, TPWM\_EnableTrigger, TPWM\_EnableWakeup, TPWM\_GetWakeupFlag, TPWM\_CLEAR\_TRG\_DAC\_STATUS, TPWM\_CLEAR\_TRG\_PDMA\_STATUS, TPWM\_GET\_TRG\_DAC\_STATUS, and TPWM\_GET\_TRG\_PDMA\_STATUS added.
    - TPWM\_OUTPUT\_TOGGLE, TPWM\_OUTPUT\_NOTHING, TPWM\_OUTPUT\_LOW, TPWM\_OUTPUT\_HIGH, TPWM\_CLKSRC\_HXT, TPWM\_CLKSRC\_LXT, TPWM\_CLKSRC\_PCLK, TPWM\_CLKSRC\_TX, TPWM\_CLKSRC\_LIRC, and TPWM\_CLKSRC\_HIRC removed.

- USCI\_SPI: USPI\_SET\_SS\_HIGH fixed implementation.
- Library
  - SmartcardLib: SCLIB\_CheckCDEvent\_ByVar added.
- Sample code
  - EADC\_BandGap: Showed voltage result and modified extern sample time for band-gap.
  - FMC\_ExecInSRAM: Added GCC project.
  - I2C\_Master\_PDMA, I2C\_PDMA, and I2C\_Slave\_PDMA: Replaced by I2C\_PDMA\_TRX.
  - ISP samples, QSPI\_Slave3Wire, and SPI\_HalfDuplex: Added.
  - SC\_ReadATR and SC\_ReadSimPhoneBook: Added software card detection.
  - UART\_TxRx\_Function: Fixed data lost.
  - USB\_D samples: Fixed potential issue.
  - USCI\_SPI\_Loopback, USCI\_SPI\_MasterMode, and USCI\_SPI\_SlaveMode: Added using GPIO pin instead of SS pin.

#### Revision 3.00.002 (Released 2019-02-22)

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- system\_M251.c: Set flash access cycle to 0x03.
- Standard driver
  - CLK: CLK\_SET\_PCLK\_DIVIDER removed.
- Sample code
  - Used other clock source instead of HXT.
  - SYS\_TrimHIRC: Added auto trim disable.
  - USB\_D\_Audio\_Codec: Cleared buffer before play / record.

#### Revision 3.00.001 (Released 2018-12-25)

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- Initial release.



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