

MG51 Series BSP User Guide

Based on Keil uVision5 and PK51 Development Kit V9.52
 For NuMicro® 8051 Family

Directory Information

Please extract the “MG51_Series_BSP_Keil_V1.00.000.zip” file firstly and confirm the following content of this BSP folder.

MG51	BSP for MG51 series Up to 32KB Flash APROM share with 4KB LDROM 256 Byte RAM, 1024 Byte XRAM
-------------	--

Each folder listed above with following content folders

Document\	Driver reference manual and revision history.
Library\	Device driver header and source files.
SampleCode\	Driver sample code.

The information described in this document is the exclusive intellectual property of Nuvoton Technology Corporation and shall not be reproduced without permission from Nuvoton.

Nuvoton is providing this document only for reference purposes of NuMicro microcontroller based system design. Nuvoton assumes no responsibility for errors or omissions.

All data and specifications are subject to change without notice.

For additional information or questions, please contact: Nuvoton Technology Corporation.

www.nuvoton.com

1 .\Document\

MG51_BSP_Keil_Revisio
n_History.pdf

This document shows the revision history of
MG51_BSP_Keil.

2 .\Library\

Device\	MG51 series flash device header file.
Startup\	A51 startup file and executable file.
StdDriver\	All peripheral driver header and source files.

3 .\SampleCode\

ISP\	Demonstrate theMG51 series ISP boot loader source code.
RegBased\	Demonstrate the usage of MG51 series MCU peripheral driver.
Template\	A project template for MG51 series MCU

4 .\SampleCode\RegBased

ADC_Bandgap	Configure band-gap as ADC input channel and show ADC conversion result in ADCRH and ADCRL register.
ADC_Bandgap_VDD	Calculate the real V_{DD} value of the device system based on the difference between the pre-stored ADC conversion result values when V_{DD} is 3.072V and the system converted band-gap value.
ADC_Continuous	Configure ADC as continuous mode. Define convert result storage in XRAM area. When ADC interrupt means continuous sample finished print all the result from UART0 TXD.
ADC_GPIO_Trig	Demonstrate how to use GPIO to start ADC initial setting and show the conversion result in ADCRH and ADCRL register.
ADC_Multi_channel	Demonstrate how to regularly sample from different ADC input channel.
ADC_PWM_Trig	Demonstrate how to use each of PWM timer period timeout to trigger ADC conversion.
ADC_Simple	Start ADC conversion by triggering ADCS bit [ADCCON0.6] and check the flag register ADCF bit [ADCCON0.7] to confirm if a conversion is finished.
Fsys_ModifyHIRC	Call the library file "sys.c" to modify system setting as 16 MHz or 24 MHz and check clock out pin to confirm if Fsys is modified. The MG51 HIRC can be selected within 16 MHz or 24 MHz.
Fsys_Select_ECLK	Change the MG51 initial setting of system clock from HIRC to the external clock input. The MG51 external clock input ranges from 4 MHz to 24 MHz.
GPIO_ClockOut	Show the MG51 system clock and output from CLKO pin.
GPIO_Input_Output	Toggle each MG51 GPIO pin output from high to low after 200ms delay.
GPIO_PowerDown_BODdisable	Show how to disable MG51 Burn-out detect function and into power down mode. This project is special for measure

	the power down current of MG51.
I2C_Read_EEPROM	Show how to use MG51 as master to read external connect EEPROM by I ² C bus.
IAP_AP_program_AP_Dataflash	Demonstrate how MG51 APROM is used as Data Flash to implement erase / program / read verify function. All APROM memory can be used as Data Flash.
IAP_AP_program_LD	Demonstrate how MG51 IAP runs in APROM to program LDROM and implements erase / program / read verify function. Firstly, user needs to confirm if the LDROM is enabled through CONFIG setting.
IAP_Dataflash_EEPROM_Mode	Simulate Data Flash as EEPROM mode by calling the library file "eeprom.c". This process includes read data and storage in RAM / modify value / erase Data Flash / copy new value from RAM to Data Flash.
IAP_LD_Program_AP	Demonstrate how MG51 IAP runs in LDROM to program APROM and implements erase / program / read verify function.
IAP_program_Config	Demonstrate using MG51 IAP command to modify CONFIG bytes.
IAP_Read_UCID	Demonstrate using MG51 IAP command to read the unique customer ID (UCID). Only for customer special order MG51 MCU. One UCID is only for one customer.
IAP_Read_UID	Demonstrate using MG51 IAP command to read the Unique code of MG51. The UID value of each MG51 is different.
INT0_Ext_Interrupt	Perform MG51 external interrupt pin INT0 enabled initial setting.
INT1_Ext_Interrupt	Perform MG51 external interrupt pin INT1 enabled initial setting.
ISP_UART0	Standard ISP protocol process boot loader source code. Communication with UART0 for NuMicro ISP Programming Tool.
ISP_UART1	Standard ISP protocol process boot loader source code. Communication with UART1 for NuMicro ISP Programming Tool.
Pin_Interrupt	Demonstrate how to wake up MG51 from Idle / Power-down mode through external interrupt input by enabling MG51 pin interrupt function.
PWM0_DeadTime	Configure PWM as Complementary mode. Control 3 pairs output, set each 2 channel PWM output as same duty and insert dead time.

PWM0_Independent	Configure PWM as independent mode. Each PWM channel outputs independently and each PWM channels output with different duty and interrupt enabled.
PWM0_Independent_Reload	Configure PWM as independent mode. And PWM0 _CH0 channel reload duty every 3 second.
PWM0_Synchronous	Configure PWM as Synchronous mode. Each PWM0 channel 0/2/4 outputs different duty and PWM0 channel 1/3/5 duty following 0/2/4 setting.
PWM0_Interrupt	Configure PWM one channel output with falling edge trig interrupt enable initial setting.
PWM0_Simple	Configure PWM as Independent mode. Only set one channel output.
SPI_Flash_Read_Write	Connect MG51 with W25Q16BV SPI Flash and set it as master to read and write data sample code.
SPI_Master	Configure SPI as master transmit and receive data. Check flag as transmit one byte finish condition.
SPI_Slave_Interrupt	Configure SPI as slave transmit and receive data. Enable interrupt function when slave is receive data.
SPI_Slave_Polling	Configure SPI as slave transmit and receive data. Check flag as received one byte finish condition.
Timer0_mode_0_Interrupt	Configure Timer 0 as mode 0,13-bit timer with interrupt enabled initial setting.
Timer0_mode_1_Interrupt	Configure Timer 0 as mode 1, 16-bit timer with interrupt enabled initial define.
Timer0_mode_2_Interrupt	Configure Timer 0 as mode 2, 8-bit timer with auto reload function and interrupt enabled initial setting.
Timer01_mode_3_Interrupt	Configure Timer 0 mode 3 as two separated timer initial settings with interrupt enabled. Timer0 counter value register high byte TH0 overflow will set the register flag bit TF1 as 1 (Timer1 overflow flag).
Timer1_mode_0_Interrupt	Configure Timer 1 as mode 0,13-bit timer with interrupt enabled initial setting.
Timer1_mode_1_Interrupt	Configure Timer 1 as mode 1, 16-bit timer with interrupt enabled initial setting.

Timer1_mode_2_Interrupt	Configure Timer 1 as mode 2, 8-bit timer with auto reload function and interrupt enabled initial setting.
Timer2_AutoReload_Capture	Configure Timer 2 as one channel input capture with interrupt enabled initial setting. Timer 2 capture interrupt vector is different to the Timer 2 overflow interrupt.
Timer2_AutoReload_Delay	Configure Timer 2 as auto reload delay setting with interrupt enabled initial setting.
Timer3	Configure Timer 3 as auto reload mode initial setting and interrupt enabled.
UART0_Interrupt_RW	Configure UART0 transfer including transmit and receive with interrupt enabled.
UART0_Printf	Demonstrate printf instruction based on transmit from UART0 TXD pin.
UART1	Configure UART1 transmit and receive initial setting and enable interrupt subroutine.
UART1_Printf	Demonstrate printf instruction based on transmit from UART1 TXD pin. Include how to modify putchar.c file.
WakeupTimer_Interrupt	Enable wake-up timer with interrupt function. Main loop enters Power-down mode after initial setting, and once WKT timeout, MG51 will wake up and then jump into interrupt subroutine to toggle GPIO output.
Watchdog_Interrupt	Demonstrate Watchdog Timer (WDT) initial setting with interrupt enabled, and Watchdog Timer reset function disabled. The WDT counter overflow will jump into WDT interrupt subroutine.

Based on the features of the different product these project is not necessarily included in folder of .\SampleCode\RegBased.

5 REVISION HISTORY

Date	Revision	Description
2023.05.23	1.00.000	Initial release.

Important Notice

Nuvoton Products are neither intended nor warranted for usage in systems or equipment, any malfunction or failure of which may cause loss of human life, bodily injury or severe property damage. Such applications are deemed, "Insecure Usage".

Insecure usage includes, but is not limited to: equipment for surgical implementation, atomic energy control instruments, airplane or spaceship instruments, the control or operation of dynamic, brake or safety systems designed for vehicular use, traffic signal instruments, all types of safety devices, and other applications intended to support or sustain life.

All Insecure Usage shall be made at customer's risk, and in the event that third parties lay claims to Nuvoton as a result of customer's Insecure Usage, customer shall indemnify the damages and liabilities thus incurred by Nuvoton.

*Please note that all data and specifications are subject to change without notice.
All the trademarks of products and companies mentioned in this datasheet belong to their respective owners.*