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Chapter 1 Introduction

1.1 Description

This AMS32M200xA DFP and BSP user guide provides the necessary information for setting up the AMS32M200xA development environment on Keil[®] MDK.

This document includes two major items: Device Family Pack (DFP) for AMS32M200xA and the Board Support Pack (BSP) for AMS32M200xA. The DFP has CMSIS drivers, a device header file, register layer driver, system startup, and initialize file. The BSP mainly contains evaluation board materials, including: a printed circuit board (PCB), demo board, and peripheral example code.

1.2 Terms and Abbreviation

Abbreviation	Description
BSP	Board Support Pack
CMSIS-Pack	Cortex Microcontroller Software Interface Standard-Pack
DFP	Device Family Pack
MDK/MDK-ARM	ARM Keil Microcontroller Development Kit
RL	Register Layer



Chapter 2 Device Family Pack (DFP) for AMS32M200xA

2.1 General Description

The Device Family Pack (DFP) provides the software pack containing the support files for the microcontroller. The AMS32M200xA DFP includes ARM[®] CMSIS for Cortex[®]-M0 drivers, getting started with AMS32M200xA BSP and DFP document, AMS32M200xA device header file, device system initial and startup, and register layer header file.

The default install path is located at: "C:\Diodes\"

2.2 File Tree Diagram

Diodes			
AMS32M200xA_BSP			
V 📜 AMS32M200xA_EVB_V1	0		
Documents			
🔉 📜 Projects			
🗸 📙 AMS32M200xA_DFP	←	AMS	S32M200xA_DFP
CMSIS	4		CMSIS files
📜 Include	•		CMSIS driver
🗸 📙 Drivers			
V 📜 AMS32M200xA_RL			
📜 Include	•		Device Register Layer
V 📜 CMSIS			
🗸 📙 Device			
📙 Include	•		Device header & System files
Source	4		Startup & System files
SVD.	7		

Figure 1. AMS32M200xA DFP file tree diagram



2.3 AMS32M200xA DFP File

2.3.1 Register Layer (RL)Included File

Register Layer (RL) Drivers					
Functionalities	IP Name	RL Include File			
Analog Comparator	ACMP	AMS32M200xA_acmp.h			
Analog Control Unit	ACU	AMS32M200xA_acu.h			
Analog Digital Converter	ADC	AMS32M200xA_adc.h			
Capture Compare Unit 4	CCU4	AMS32M200xA_ccu4.h			
Clock	CLK	AMS32M200xA_clk.h			
Direct Memory Access	DMA	AMS32M200xA_dma.h			
Enhance Capture Compare Unit 6	eCCU6	AMS32M200xA_eccu6.h			
General-purpose I/O	GPIO	AMS32M200xA_gpio.h			
Inter-Integrated Circuit	12C	AMS32M200xA_i2c.h			
Interrupt Unit	ITU	AMS32M200xA_itu.h			
AMS32M200xA Device Macro		AMS32M200xA_macro.h			
Math coprocessor	МАТН	AMS32M200xA_math.h			
Non-Volatile Memory	NVM	AMS32M200xA_nvm.h			
Operational Amplifier	OPA	AMS32M200xA_opa.h			
Position Interface	POSIF	AMS32M200xA_posif.h			
Reset Control Unit	RCU	AMS32M200xA_rcu.h			
System Management Unit	SMU	AMS32M200xA_smu.h			
Serial Peripheral Interface	SPI	AMS32M200xA_spi.h			
Timer Unit	ТМU	AMS32M200xA_tmu.h			
Universal Asynchronous Receiver Transmitter	UART	AMS32M200xA_uart.h			
AMS32M200xA DFP version		AMS32M200xA_version.h			
Watchdog	WDG	AMS32M200xA_wdg.h			

Table 1 - Register Layer (RL) included file list



Chapter 3 Board Support Pack (BSP) for AMS32M200xA

3.1 General Description

The Board Support Pack (BSP) provides the software pack containing the support files for microcontroller. The AMS32M200xA BSP includes AMS32M200xA Emulation (EMU) Board.

3.2 AMS32M200xA BSP File

AMS32M200xA Evaluation Board (AMS32M200xA_EMU_V10)

Table 2 – AMS32M200xA EVB BSP items

Items	Files
Document	AMS32M2006X_EMU_V1.0.pdf
РСВ	AMS32M2006A_EMU_V1.0.pcb
Projects	AMS32M200xA example code

Reference Design (Reserved)

Table 3 – AMS32M2006A Reference Design items (Reserved)

Items	Files
Document	
РСВ	
Projecto	
Projects	
Schematic	

Reference Design (Reserved)

Table 4 – AMS32M2006A Reference Design items (Reserved)

Items	Files
Document	
РСВ	
Drojasta	
Projects	
Schematic	

The default install path of AMS32M200xA BSP is located at "C:\Diodes\"



Table 5 – list of AMS32M200xA's example codes

Category	Example	Description		
АСМР	АСМР	ACMP Output		
	LVD	ACU Low Voltage Detect (LVD)		
ACU	LVR	ACU Low Voltage Reset (LVR)		
	Regular_DMA	ADC Regular Mode with DMA Function		
ADC	Injected	ADC Injected		
	Timer_IRQ	CCU40 Timer Mode		
	Capture_IRQ	CCU40 Capture Mode		
	Compare_IRQ	CCU40 Compare Mode		
CCU4	PWM_Edge_Duty	CCU40 PWM Edge-aligned using Duty Mode		
	PWM_Edge_Offset	CCU40 PWM Edge-aligned using Offset Mode		
	PWM_Center_Duty	CCU40 PWM Center-aligned using Duty Mode		
	PWM_Center_Offset	CCU40 PWM Center-aligned using Offset Mode		
	Timer_IRQ	eCCU61 Timer Mode		
	Capture_IRQ	eCCU61 Capture Mode		
	Compare_IRQ	eCCU61 Compare Mode		
eCCU6	PWM_Edge_Duty	eCCU61 PWM Edge-aligned using Duty Mode		
	PWM_Edge_Offset	eCCU61 PWM Edge-aligned using Offset Mode		
	PWM_Center_Duty	eCCU61 PWM Center-aligned using Duty Mode		
	PWM_Center_Offset	eCCU61 PWM Center-aligned using Offset Mode		
DMA	М2М	DMA M2M (Memory to Memory)		
DIMA	M2M_Circular_IRQ	DMA M2M using Circular Mode (Memory to Memory)		
	TTL	GPIO Input Mode with TTL Configuration		
	Schmitt	GPIO Input Mode with Schmitt Configuration		
GPIO	Schmitt _OSPD	GPIO Input Mode with Schmitt and Output Speed Configuration		
	OutputMask	GPIO Output Mode with Masked Configuration		
	LED_Blinky	GPIO LED Blink		



Category	Example Description		
	Master_TX	I2C Master Transmission Mode	
120	Master_TX_DMA	I2C Master Transmission with DMA Mode	
120	Slave_RX	I2C Slave Receive Mode	
	Slave_RX_DMA	I2C Slave Receive with DMA Mode	
	Ext_FallingEdge_IRQ	ITU External Interrupt at I/O Falling Edge	
	Ext_HighLevel_IRQ	ITU External Interrupt at I/O High Level	
ΙΤυ	Ext_LowLevel_IRQ	ITU External Interrupt at I/O Low Level	
	Ext_RisingEdge_IRQ	ITU External Interrupt at I/O Rising Edge	
	NMI_eCCU61_TMU0_IRQ	Non-Maskable Interrupt with eCCU61 and TMU0	
MATH	Divider	MATH Divider	
MATH	Cordic	MATH CORDIC	
	FLASH	NVM FLASH Erase and Program	
NVW	UserOption	NVM User Option Erase and Program	
ΟΡΑ	ОРА	OPA Operational Amplifier Enable	
DOSIE	Quadrature_IRQ	POSIF Quadrature Mode	
PUSIF	Hall_IRQ	POSIF Hall Mode	
RCU	RCU	RCU Master and System Reset and Reset Status	
	Sleep_WFI	Sleep Mode using WFI	
	Sleep_SleepOnExit_WFI	Sleep-on-exit Mode using WFI	
SLEEP	DeepSleep_WFE	DeepSleep Mode using WFE	
	DeepSleep_SleepOnExit_W FE	DeepSleep Sleep-on-exit Mode using WFE	
	Master_TX	SPI Master Single Byte Transmission with Manual Mode	
	Master_RX	SPI Master Single Byte Receive with Manual Mode	
	Master_TX_DMA	SPI Master Transmission with DMA Mode	
371	Slave_TX	SPI Slave Single Byte Transmission with Manual Mode	
	Slave_RX	SPI Slave Single Byte Receive with Manual Mode	
	Slave_RX_DMA	SPI Slave Receive with DMA Mode	



Category	Example	Description		
	CMSIS_IRQ	SysTick using CMSIS Driver		
SysTick	Ext_CLK_IRQ	SysTick using External Clock: HSIRC8M/2 as Clock Source		
	HCLK_IRQ	SysTick using Internal Clock: HCLK as Clock Source		
	Timer_IRQ	TMU Timer Mode		
ТМU	Capture_IRQ	TMU Capture Mode		
	Compare_IRQ	TMU Compare Mode		
	TX_RX	UART Transmission and Receive Mode		
	TX_RX_Retarget	UART Transmission and Receive Retarget		
UART	TX_RX_IRQ	UART Transmission and Receive Interrupt Mode		
	TX_DMA_IRQ	UART Transmission with DMA Mode		
	RX_DMA_IRQ	UART Receive with DMA Mode		
	Reset	WDG Reset Mode		
WDG	Reset_IRQ	WDG Reset Interrupt Mode		
	Timer	WDG Timer Mode		
	Timer_IRQ	WDG Timer Interrupt Mode		



Chapter 4 Project in Keil[®] MDK version 6 Legacy Format

In the following chapters, the project will be saved in uv4 format (uvproj).

4.1 Create a New Project

1. Click **Project**; then, **New Project**

🔛 μVision			-		×
File Edit View	Pro	ect Flash Debug Peripherals Tools SVCS Window Help			
i 🗋 💕 🖌 🥔		New µVision Project	- 11	2	
	1	New Multi-Project Workspace			
Project		Open Project			
Floject		Close Project			
		Import			
		Export			
		Manage			
		Select Device for Target			
		Remove item			
	100	Options Alt+F7			
		Clean Targets			
	10100 	Build Target F7			
		Rebuild all target files			
		Batch Build			
		Batch Setup			
	٢	Translate Ctrl+F7			
		Stop build			
		1 C:\Diodes\AMS32M200xA_BSP\AMS32M200xA_EVB_V10\Projects\UART\TX_RX_IRQ\AMS32M200xA_UART_TX_RX_IRQ.uvproj			
		2 C:\Diodes\AMS32M200xA_BSP\AMS32M200xA_EVB_V10\Projects\SPI\Master_TX\AMS32M200xA_SPI_Master_TX.uvproj			
		3 C:\Diodes\AMS32M200xA_BSP\AMS32M200xA_EVB_V10\Projects\SPI\Master_RX\AMS32M200xA_SPI_Master_RX.uvproj			
		4 C:\Diodes\AMS32M200xA_BSP\AMS32M200xA_EVB_V10\Projects\\2C\Master_TX_DMA\AMS32M200xA_I2C_Master_TX_DMA.uvproj			
		5 C:\Diodes\AMS32M200xA_BSP\AMS32M200xA_EVB_V10\Projects\\2C\Master_TX\AMS32M200xA_I2C_Master_TX.uvproj			
		6 C:\Diodes\AMS32M200xA_BSP\AMS32M200xA_EVB_V10\Projects\GPIO\TTL\AMS32M200xA_GPIO_TTL.uvproj			
		7 C:\Diodes\AMS32M200xA_BSP\AMS32M200xA_EVB_V10\Projects\eCCU6\PWM_Center_Duty\AMS32M200xA_eCCU6_PWM_Center_Duty.uvproj			
🔚 Р., 🌏 В., {} г		8 C:\Diodes\AMS32M200xA_BSP\AMS32M200xA_EVB_V10\Projects\CCU4\Timer_IRQ\AMS32M200xA_CCU4_Timer_IRQ.uvproj			
Build Output		9 C:\Diodes\AMS32M200xA_BSP\AMS32M200xA_EVB_V10\Projects\ACU\LVD\AMS32M200xA_ACU_LVD.uvproj			л 🕅
		10 C:\Diodes\AMS32M200xA_BSP\AMS32M200xA_EVB_V10\Projects\ACMP\AMS32M200xA_ACMP.uvproj			
			-		
					~
<					>
Create a new µVisio	n pro	ect			C:

Figure 2. Create a new project



2. Select a destination path to save new project. Type a project name and Save it.

🐺 Create New Project						\times
\leftarrow \rightarrow \checkmark \uparrow \square \lt Diodes	> Project	✓ Č S	earch Project			P
Organize 👻 New folder						?
Documents	↑ Name	^	Date modified	Туре		Size
🖶 Downloads			No itoms patch your soarch			
👌 Music			No items match your search.			
Pictures						
📑 Videos						
SSD (C:)						
Diodes						
AMS32M200xA_BSP						
AMS32M200xA_DFP						
- Project						
DRIVERS						
ESD						
eSupport	v <					3
File name: project						~
Save as type: Project File	es (*.uvproj; *.uvprojx)					~
∧ Hide Folders				Save	Cancel	

Figure 3. Save new project name

3. Select Diodes Incorporated's (Diodes) AMS32 Device Database in the Vender list.

Expand Diodes and **Select** the Device for this project. For example, AMS32M2006A. Click **OK** to continue.

Select Device for Target 'Target 1'	×
Device	
Diodes AMS32 Device Database Device Database Device Database Diodes AMS32 Device Database Device: Toolset: Search:	
Des <u>c</u> ription:	
Diodes	~
OK Cancel	Help
	neth

Figure 4. Select vender: Diodes Incorporated AMS32 Device Database



Select Device fo	r Target 'Target 1'	×	Ċ
Device			
Diode	es AMS32 Device Database	•	
Vendor: Diod	es		
Device: AMS	32M2006A		
Toolset: ARM	1		
Search:			
		Description:	
Diodes	IS32M2006A	The AMS32M2006A has an embedded user-programmable non volatile memory (NVM), also called Flash, for storage of user code and data. NVM of AMS32M2006A composed of Program Memory and System Memory. Program Memory where is user application code stroed. The System Memory which to support the boot loader function based on user option. AMS32M2006A supports In-System-Programming (ISP) function and In-Application-Programming (IAP) function for customer to update user code and data.	
		OK Cancel Help	

Figure 5. Select a device of AMS32M200xA series for a new project

4. Keil[®] will pop a dialog asking whether copy 'startup_AMS32M200xA.s' to project folder and add file to project. Select **Yes** to continue.



Figure 6. Adding a startup file into a project



Project and folder tree are demonstrated as following figures.
 Project Tree



Figure 7. Project tree diagram

4.2 Keil® MDK toolbar and debug menu

The Keil[®] MDK IDE user interface is shown in the following figure.



C:\Diodes\AMS32M200xA_BSP\AMS32M20	00xA_EVB_V10\Projects\SysTick\HCLK_IRQ\AMS32M200xA_SysTick_HCLK_IRQ.uvproj - µVision	-	- 🗆	×
File Edit View Project Flash Debug Per	ripherals Tools SVCS Window Help			
🗎 🖻 🖬 🗿 🐰 🖻 🛍 🤟 (~	→ 乾 散 散 读 症 症 // // // Ø sysTick 🛛 🖳 🕸 🔍 - 🔶 O 🔗 🍓 🖬 - 🔦			
😻 🔛 🕮 🧼 - 🤐 💥 Flash	u 🔊 📥 🗟 🔶 🐡 🎰			
Project 📮 🗵	main.c			▼ ×
Project 0 1 2 1 Project: AMS32M200xA_SysTick_HCLK_1 PLASH CMSIS Device Source AMS32M200xA, interrupt.c	<pre>main: % // Extern Parameters /// % % // Extern Parameters /// % % % % % % % % % % % % %</pre>	/.	/	×x
Project Project Project Project Project Build Output	<pre>// SysTick->LOAD = (2300 -1); 77 78 79 79 79 79 79 79 79 79 79 79 79 79 79</pre>			>
				~
<				>
	Diodes AMS32 Driver Lt1 C:	1 CAP NUM	A SCRL OV	R R /W:

Figure 8. Keil[®] MDK IDE user interface





Checksum value display.

After building the target, file checksum value will display in the "Build Output" window.

Build Output			
*** Using Compiler 'V6.10.1', folder: 'C:\Keil_v5\ARM\ARMCLANG\Bin'			
Rebuild target 'FLASH'			
assembling startup_AMS32M200xA.s			
compiling AMS32M200xA_interrupt.c			
compiling system AMS32M200xA.c			
compiling main.c			
linking			
Program Size: Code=572 RO-data=236 RW-data=4 ZI-data=612			
After Build - User command #1: C:\Keil_v5\ARM\Diodes\Tools\KeilElfToBin\KeilElfToBin.exe			
File Checksum: 0x0100ac27 (.\Objects\AMS32M200xA.axf.bin)			
File Checksum: 0x00ecc3ae (.\Objects\AMS32M200xA.axf.program.bin)			
File Checksum: 0x000ff000 (.\Objects\AMS32M200xA.axf.system.bin)			
File Checksum: 0x00000c69 (.\Objects\AMS32M200xA.axf.user.bin)			
".\Objects\AMS32M200xA.axf" - 0 Error(s), 0 Warning(s).			
Build Time Elapsed: 00:00:06			

Figure 9. Keil[®] MDK output window

4.2.1 Project Options for Target

4.2.1.1 Target

User applies the ROM and RAM arrangement based on the below requirements:

- Code Generation: the default ARM compiler version 5 is selected.
- IROM1: A typical IROM setting starts from 0x01000000 and size is 0x8000 (32KB).
- IROM2: System Memory allocates from 0x02000000 and size is 0x1000 (4KB).
- IRAM1: AMS32M200xA series provides 8KB RAM and it starts from 0x20000000 and size is 0x2000.
- The default startup is IROM1 and SRAM is IRAM1.

🖸 Options for Target 'FLASH' 🛛 🕹				
Device Target Output Listing User C/C++ Asm Linker Debug Utilities				
Diodes AMS32M2006A Xtal (MHz): 8.0	Code Generation ARM Compiler: Use default compiler version 5			
Operating system: None System Viewer File:	Use Cross-Module Optimization			
Use Custom File	Dand AWite Manuary Anna			
default off-chip Start Size Startup	default off-chip Start Size Nolnit			
□ ROM1: □ 0	□ RAM1: □ □			
□ ROM2: □ ○	RAM2:			
ROM3:	RAM3:			
on-chip IROM1: 0x1000000 0xF000 © IROM2: 0x2000000 0x1000 C	on-chip IRAM1: 0x20000000 0x2000 □ □ IRAM2: □			
OK Cau	ncel Defaults Help			

Figure 10. Options for Target: Target



4.2.1.2 Output

Make sure the Objects folder name is the same as what is shown in the Figure . The Objects folder must be ${\mbox{Objects.}}$

🔣 Options for Target 'FLASH'	×
Device Target Output Listing User C/C++ Asm Linker Debug Utilities	
Select Folder for Objects Name of Executable: AMS32M200xA	
Create Batch File	
Create HEX File	
✓ Browse Information	
C Create Library: .\Objects\AMS32M200xA.lib	
OK Cancel Defaults Help	

Figure 11. Options for Target: Output



4.2.1.3 Listing

Make sure the Objects folder name is the same as what is shown in Figure 12. The Listing folder must be named "Listings".

🔞 Options for Target 'FLASH'	×
Device Target Output Listing User C/C++ Asm Linker Debug Utilities	_
Select Folder for Listings Page Width: 79 - Page Length: 66 -	
Image: Assembler Listing: .\Listings*lst Image: Cross Reference	
C Compiler Listing: .\Listings*.txt	
✓ Linker Listing: .\Listings\AMS32M200xA.map	
I✓ Memory Map I✓ Symbols I✓ Size Info	
IV Caligraph IV Cross Reference IV Totals Into	
OK Cancel Defaults Help	

Figure 12. Options for Target: Listing

4.2.1.4 User

The after Build/Rebuild command is used for generating a binary file. The ElfToBin converter is built into Diodes' Keil[®] MDK ICE Driver.

Command Items	User Command		Stop on Exi	S
Before Compile C/C++ File				
<mark></mark> Run #1		2	Not Specified	
Run #2		2	Not Specified	
Before Build/Rebuild				
Run #1		2	Not Specified	
🗌 Run #2		2	Not Specified	
After Build/Rebuild				
🔽 Run #1	$\label{eq:KARMDiodes} \end{tabular} \label{eq:KARMDiodes} \end{tabular} \label{eq:KARMDiodes} \end{tabular} \label{eq:KARMDiodes} \end{tabular} tabul$	2	Not Specified	
Run #2		1	Not Specified	\Box
Run 'After-Build' Conditionally Ron When Complete Start Debugging				





After being successfully complied, the BIN file will be automatically generated and the size of the BIN file will be 65KB. The ElfToBin converter command and location of the BIN file are shown by the following description:

%KARM\Diodes\Tools\KeilElfToBin\KeilElfToBin.exe ".\Objects\%L" ".\Objects\%L.bin" "%KARM\Diodes\Tools\KeilElfToBin\Body\\$D.json"

Note: The command path should be filled in one line. For your convenience, copying the above content and pasting to the project is recommended.

Note: The default path of objects is located at \Objects\, which is the sub-folder of the project.

4.2.1.5 C/C++

Setup the included path described as follows. This step is mandatory for including all required files.

Options for Target 'FLASH'		
evice Target Output Listing User	C/C++ Asm Linker Debug Utilities	
Preprocessor Symbols		
Define:		_
Undefine:		_
Language / Code Generation		
Execute-only Code	Strict ANSIC Warnings: All Warnings	-
Optimization: Level 0 (-00)	Enum Container always int Thumb Mode	
Optimize for Time	Plain Char is Signed No Auto Include	es
Split Load and Store Multiple	Read-Only Position Independent 🔽 C99 Mode	
One ELF Section per Function	Read-Write Position Independent GNU extension:	s
Include Paths Misc	DFP\CMSIS\Include;C:\Diodes\AMS32M200xA_DFP\Drivers\CMSIS\D	
Controls Controls Context-M0 -li g -00 -apcs=interwork -split_sections -l C:/Diodes/AMS32M200xA_DFP/CMSIS/Include -l v		
OK	Cancel Defaults He	lp

Figure 14. Options for Target: C/C++

Included paths are listed as below.

DFP path

C:\Diodes\AMS32M200xA_DFP\CMSIS\Include

C:\Diodes\AMS32M200xA_DFP\Drivers\CMSIS\Device\Include

C:\Diodes\AMS32M200xA_DFP\Drivers\AMS32M200xA_RL\Include

Project Local path

.\Inc

Table 6 – AMS32M200xA BSP and DFP path list



4.2.1.6 Linker

This section contains ARM Liner setup. User should select **Use the Memory Layout from Target Dialog** as the default by checking the check box shown in Figure 15. It is recommended to generate the Scatter file by Keil for the first time.

👿 Options for Target 'FLASH'	×
Device Target Output Listing User C/C++ Asm Linker Debug Utilities	
✓ Use Memory Layout from Target Dialog X/O Base: ✓ Make RW Sections Position Independent R/O Base: ✓ Make RO Sections Position Independent R/O Base: ✓ Dont Search Standard Libraries Øx20000000 ✓ Report 'might fail' Conditions as Errors disable Warnings:	
Scatter	Edit
Misc controls Linker control stringcpu Cortex-M0 *.o strictscatter ".\Objects\AMS32M200xA.sct"	< >
OK Cancel Defaults	Help

Figure 1. Options for Target: Linker

In addition, the user may arrange the Memory Layout by modifying the Scatter File. This is done by unchecking the box in front of the **Use the Memory Layout from Target Dialog** and clicking **Edit** to open the scatter file to modify.

Both Figure 16 and Figure 17 show the components and organization of a typical scatter file.

<u>AM</u>	S32M200xA.sct
1	* ****************
2	; *** Scatter-Loading Description File generated by uVision ***
3	; ************************
4	
5	<pre>LR_IROM1 0x01000000 0x0000F000 { ; ; load region size_region</pre>
6	<pre>ER_IROM1 0x01000000 0x0000F000 { ; load address = execution address</pre>
7	*.o (RESET, +First)
8	* (InRoot\$\$Sections)
9	.ANY (+RO)
10	.ANY (+XO)
11	}
12	RW_IRAM1 0x20000000 0x00002000 { ; RW data
13	.ANY (+RW +ZI)
14	}
15	}
16	
17	

Figure 16. Options for Target: Linker: Scatter file





Figure 17. Options for Target: Linker: Scatter Syntax

For more information, please go to ARM Keil website.

4.2.1.7 Debuger Setting

 Choose Diodes AMS32 Driver to debug the program Select Run to main()

Make sure to select Diodes AMS32 Driver in debugger.



🔣 Options for Target 'FLASH'	Х
Device Target Output Listing User C/C++ A	sm Linker Debug Utilities
C Use Simulator <u>with restrictions</u> Settings	I Use: Diodes AMS32 Driver ▼ Settings
Load Application at Startup Initialization File: Initialization File: Initialization File: Initialization File:	Load Application at Startup Initialization File: Load Application at Startup Initialization File: Load Application at Startup Edit
Restore Debug Session Settings Image: Breakpoints Image: Breakpoints	Restore Debug Session Settings Image: Breakpoints Image: Toolbox Image: Watch Windows Image: Memory Display Image: System Viewer Driver DLL: Parameter:
SARMCM3.DLL Dialog DLL: Parameter: DARMCM1.DLL •pCM0	SARMCM3.DLL Dialog DLL: Parameter: TARMCM1.DLL -pCM0
Wam if outdated Executable is loaded Manage Component Vie	Warn if outdated Executable is loaded
OK Ca	ncel Defaults Help

Figure 18. Options for Target: Debug

2. Setting:

Device Info Name: AM Family: Cor	S32M2006A tex-M0	Device	ID: 0x0bb11477	
Debug Reset: Aut	0 💌	Clock F	Rate: 6000 💌	
Download				
Verify Downle	bad	Erase	bug without downloa Type: Chip Erase	d T
 Verify Downle Debug log Download 	Address	Del Erase	bug without downloa Type: Chip Erase Smart Download	d •
Verify Downlo Debug log Download Flash	Address 0x01000000	Size	bug without downloa Type: Chip Erase Smart Download N/A	d •
 Verify Download Debug log Download Flash Flash 	Address 0x01000000 0x02000000	Del Erase Size 0x0000F000 0x00001000	bug without downloa Type: Chip Erase Smart Download N/A N/A	d •
 Verify Downlo Debug log Download Flash Flash 	Address 0x01000000 0x02000000 0x0F000000	Del Erase	bug without downloa Type: Chip Erase Smart Download N/A N/A N/A	d •





3. OpenOCD Setting

For the first time connecting Diodes Debug to PC, click **Allow access** to add OpenOCD into the whitelist in Windows Firewall.



Figure 20. Windows firmware security alert

4. Start / Stop Debug Session

In Keil-MDK, in the Debug menu, select Debug and choose Start/Stop Debug Session function.







5. Use the Keil "Periodic Window Update" to monitor variables.



ime	Value	Туре
🛛 🔗 Dividend	87654321	int
Divisor	-1234	int
🛛 🔗 Quotient	-71032	int
🔗 Remainder	833	int
<enter expression=""></enter>		





4.3 Debug Interface

C\Diodes\AMS32M200xA_BSP\AMS32M200xA_EVB	V10\Projects\MATH\Divider\AMS32M200xA_MATH_Divider.uvproj - uVision					- п х
File Edit View Project Flash Debug Peripherals	Tools SVCS Window Help					
	(1 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2					
Řer (≝↓ © (*) (* (* 10) 🌳 ▶ (@, 📾 🚍						
Registers 🖗 🖬 Disassembly						
Regime Yabe 0 □ Core 0.00000001 2 − R0 0.0000000 2 3 − R1 0.0000000 2 3 − R3 0.0000000 2 3 − R4 0.0000008 0.00100 0.00100 − R5 0.0000008 0.00100 0.00100 − R5 0.0000000 9 9 − R5 0.0000000 9 9 − R4 0.0000000 9 9 − R5 0.00000000 9 9 − R10 0.00000000 9 9 − R11 0.00000000000000000000000000000000000	<pre>SET_BIT(MATH->DIV, MATH_DIV_STR); i // Wait until MATH calculation is completed. // Wait until MATH calculation is completed. 002D6 4600 LDR r2,r2,r0 002D4 4000 GRRS r2,r2,r0 002D4 4000 STR r2,r1,i,f0x00] 4: while(!(READ_BIT(MATH->INTF, MATH_INTF_DIV))); 5: 6: // Clear Divider flag 002DC 6900 LDR r2,r0 002DC 4000 LD</pre>					~
R13 (SP) 0x20000278 <						>
R15 (PC) 0x01000153	ain.c startup_AMS32M200xA.s system_AMS32M200xA.c					▼ ×
← → xSR.	<pre>6 // Enable AHB Math Clock SET_BIT(CLK->AHBCLKE, CLK_AHB_CLKEN_MATH); 7 // Set the Divident</pre>				11	^
E Project Registers <	s 11					>
Command	÷ 🖬	Watch 1				a
Load "C:\Ubicdex\Ubicdex\Ubicdex\Ubicdex\Ubicdex\Ubicdex\Ubicdex\Ubicdex\Ubicdex\UbicdexUbicd	M200xA_EVB_V10\\Projects\\MATH\\Divider\\Objects\\AMS32M20 ~	Name Dividend Divisor Quotient Remainder CEnter expression>	Value 87654321 -1234 0 0	Type int int int int		
ASSIGN BreakDisable BreakEnable BreakKill	1 BreakList BreakSet BreakAccess COVERAGE COVTOFILE DEFINE	Call Stack + Locals Watch 1				
			Diodes AMS32	Driver t1: 0.000	00000 sec 1:80 C-1 CAP	NUM SCRL OVR R/W

Figure 23. Debug interface

For more information on how to use the Debug Toolbar, please visit www.keil.com



Figure 24. Debug toolbar



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