

# 2. Getting Started with NuMaker-M032KI (pt 1)



## **Introduction #**

In this tutorial we will be opening an example project in Keil for the NuMaker-M032KI board and programming it to the board. For this tutorial you'll need:

- Nuvoton NuMaker-M032KI Contact us for more info
- MicroUSB Cable
- · Windows Computer with Keil Essential or higher or Keil Nuovoton Edition installed
- Nuvoton Nu-Link Keil Driver installed
- Nuvoton M031 device packs installed using the pack installer
  - Nuvoton Nu-Link Keil driver installer should prompt you to install these
- Nuvoton M031 series BSP installed (also suitable for M032)

#### CMSIS #

For almost all their of their microcontrollers, Nuvoton provides a Board Support Package which comes bundled with some example code, libraries (including standard drivers), tools and documentation. All of this is based on Arm's CMSIS (Cortex Microcontroller Software Interface Standard) software.

The CMSIS is a vendor-independent hardware abstraction layer for microcontrollers that is based on Arm® Cortex® processors. It defines generic tool interfaces and enables consistent device support, it provides a simple software interfaces to the processor and peripherals, simplifying software re-use, reducing the learning curve for microcontroller developers, and reducing the time to market for new devices.

The CMSIS is defined in close cooperation with various silicon and software vendors and provides a common approach to interface to peripherals, real-time operating systems, and middleware components. It is intended to enable the combination of software components from multiple middleware vendors.

You can read more on CMSIS on the ARM website.





## Get the "Template" example project running on the NuMaker-M032KI V1.0 #

The initial getting started project for the M03x Series is the "Template" project. This simple example gives out the message "Hello World" via the UART. You can check it with a Terminal Tool on your PC

### **Open the project #**

- Open Keil µVision5 on your machine
- Got to "Project" -> "Open project..."

	Project	Flash	Debug	Peripherals	Tools	SVCS	Window	Help	
1	Ne	ew µVisio	n Project						
	Ne	w Multi-	Project Wo	orkspace					
	0	pen Proje	d						
	CI	ose Proje	ct						
ł	Im	port							
	Ex	port							
	м	anage							
	Se	lect Devi	ce for Targ	et					

Then navigate to the folder where you stored the Board Support Package and open the Template uVision Project file: ... \M031\_Series\_BSP\_CMSIS\_V3.03.000\SampleCode\Template\Keil

Name	Änderungsdatum	Тур	Größe
st Ist	01.04.2021 09:53	Dateiordner	
📙 obj	01.04.2021 09:53	Dateiordner	
RTE	29.03.2021 13:45	Dateiordner	
🔣 Template	30.03.2021 14:00	Vision5 Project	16 KB

(you can also open the project by navigating to the "...\M031\_Series\_BSP\_CMSIS\_V3.03.000\SampleCode\Template\Keil" folder and double-clicking on the  $\mu$ Vision5 Project file without opening  $\mu$ Vision IDE before)

When you open this project it is very likely that you get an error message, saying that the preconfigured device is not found.

UVision	×
Error: Device r	not found -
Device: Vendor:	'M032SE3AE' 'Nuvoton'
Please update	your device selection.
	OF
	UK

To get this problem solved you have to do two things:

• Migrate Project to Version 5 format...

Proj	ect	Flash	Debug	Peripherals	Tools	SVCS	Window	Help				
	New	µVisio	n Project									📃 🗟 🥐 🔍 - 🕚 🤇
	New	Multi-F	Project Wo	orkspace								
	Ope	n Proje	ct							-h		
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	Impo	ort								•		
	Ехро	rt										
	Man	age								•	ŧ.	Project Items
	Sele	t Devic	e for Targ	et						9	2	Multi-Project Workspace
	Rem	ove Iter	n							•	<b></b>	Run-Time Environment
×	Opti	ons for	Target 'P	WM DutySwite	rh'				Alt+F	,   •	<b>?</b>	Select Software Packs
										-	9	Reload Software Packs
242424	Clea	n Targe	ts							6		Pack Installer
	Build	l Target							F	7		Migrate to Version 5 Format
	Rebu	uild all f	arget file	s						1		
1	Batc	h Build								-1		
	Rate	h Setun										

• Select the correct device via the "Options for target..."

• Open the Options via "Project -> Options for Target.." or via the dedicated Icon on the Toolbar



File Edit View Project Flash Debug Peripherals Tools SVCS Wi	ndow Help
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🛛 🛞 🎬 📽 🕶 🧮 🗱 TIMER_Delay 🛛 🔽 🐔 📥 🛸	🐡 💩
Project Flash Debug Peripherals Tools SVCS Window Help	
New µVision Project	
New Multi-Project Workspace	ľ
Open Project	-
Close Project	ŀ
Import	•
Export	
Manage	
Select Device for Target	
Remove Item	c
🔆 Options for Target 'Template'	Alt+F7
Clean Targets	c
Build Target	F7
Rebuild all target files	h

Under the tab "Device" you have to select the M032KIAAE in this case (which is found under "Nuvoton -> NuMicro M0 Family -> M031)

M Options for Target 'Template' X	(
Options for Target Template'      Original Software Packs      Original Software Packs      Vendor: Nuvoton      Device: M032KIAAE      Toolset: ARM      Search:      M032FC1AE      M032FC1AE      M032KG6AE      M032KG6AE      M032KG6AE      M032LC2AE      M032LC2AE      M032LC3AE      M032LC3AE      M032LC6AE      M032LC6AE	
M032LIAAE  OK Cancel Defaults Help	

#### **Further settings #**

Further settings to be done in the "Options for target..." (usually this settings are already preconfigured for the Nuvoton examples, but they might change when migrating to Version 5; for newer Nuvoton BSP the compiler version 6 maybe also supported)

Set the Code Generation ARM Compiler to "Use default compiler version 5" (Tab "Target")



Options for Target 'Template'							×
Device Target Output Listing	User C/C++	Asm	Linker	Debug   t	unces		
Nuvoton M032KIAAE		6	Code C	Generation Compiler:	Use defau	t compiler ver	sion 5
	Xtal (MHz): 12.	0			Toop going	e compiler rei	
Operating system: None		•	U:	e Cross-M	odule Optimizat	ion	
System Viewer File:			V.	e MicroLIE	ПВ	ig Endian	
M031AE_v1.svd							
Use Custom File							
Read/Only Memory Areas			-Read/	Write Mem	ory Areas		
default off-chip Start	Size	Startup	default	off-chip	Start	Size	Nolnit
ROM1:		0		RAM1:			
ROM2:		0		RAM2:			
ROM3:		0		RAM3:			
on-chip				on-chip			_
IROM1: 0x0	0×80000	œ	▼	IRAM1:	0x20000000	0x18000	
IROM2:		0		IRAM2:			
	ОК	Can	cel	Defau	ilts		Help

Under tab "Debug" select "Nuvoton Nu-Link Debugger" from the dropdown list to use it as debugger for the project

Options for Target 'Template'	>				
Device   Target   Output   Listing   User   C/C++   Asm	anker Debug Utilities				
C Use Simulator with restrictions Settings	ⓒ Use: Nuvoton Nu-Link Debugger				
Image:	V Load Application at Startup V Run to main() Initialization File:				
Edit	Edit				
Restore Debug Session Settings	Restore Debug Session Settings				
✓ Breakpoints ✓ Toolbox	I Breakpoints I Toolbox				
✓ Watch Windows & Performance Analyzer	✓ Watch Windows				
V Memory Display V System Viewer	Vemory Display Vemory System Viewer				
CPU DLL: Parameter:	Driver DLL: Parameter:				
SARMCM3.DLL	SARMCM3.DLL				
Dialog DLL: Parameter:	Dialog DLL: Parameter:				
DARMCM1.DLL pCM0	TARMCM1.DLL pCM0				
Warn if outdated Executable is loaded	Wam if outdated Executable is loaded				
Manage Component Vi	iewer Description Files				
ОК Са	ncel Defaults Help				

#### Connect the board #

To later check the given out message via a terminal tool you have to switch on the virtual COM port on the board, by turning on Switch 1+2 on the VCOM Switch (Before connecting the NuMaker board to your PC via USB):



You can now connect the NuMaker-M032KI to your PC with a USB cable. Make sure you're using the port on the Nu-Link2-Me Debugger on the board.



#### Build and run the code#

You're now ready to build the code and debug it or download it directly to the target.

Build Options (or use the dedicated icons on the toolbar):

	Proj	ject	Flash	Debug	Peripherals	Tools	SVCS	Window	Help	
		Nev Nev	v µVisio v Multi-l	n Project Project We	orkspace					
		Clos	en Proje se Proje	α t						
-		Imp	ort							•
1		Exp	ort							•
-		Mar	nage							•
-		Sele	ect Devic	e for Targ	et					
1		Rem	nove Iter	n						
1	ĸ	Opt	tions for	Target 'Te	emplate'					Alt+F7
		Clea	an Targe	ts						
		Buil	ld Target	t						F7
		Reb	uild all t	target file	s					
		Bato	ch Build							
	9	Bate	ch Setup	)						
	٩	Tran	nslate C:	\Users\jar	zen\Nuvoton	Projects	Templat	te\main.c		Strg+F7
		Sto	p build							

Download options (or use dedicated icon on the toolbar):

ject	Flash	Debug	Peripherals	Тос	ols
Da	LOAD D	ownload		F8	
8 5	Er	ase			1
	C	onfigure F	lash Tools		H

Debug Options (or use dedicated icons on the toolbar):

bug	Peripherals	Tools	SVCS	Window	Help		
Sta	rt/Stop Debug	Session				Strg+F5	
Ene	ergy Measurem	ent with	nout Deb	ug			
Res	et CPU						
Rui	n					F5	
Sto	р						
} Ste	р					F11	
Ste	p Over					F10	
Ste	p Out					Strg+F11	
Rui	n to Cursor Lin	e				Strg+F10	
Sho	ow Next Staten	nent					
Bre	akpoints					Strg+B	
Ins	ert/Remove Bre	eakpoint				F9	
Ena	able/Disable Br	reakpoin	t			Strg+F9	
Dis	able All Breakp	points in	current	Target			
Kill	All Breakpoint	ts in Curr	rent Targ	let	Strg+U	mschalt+F9	
OS	Support					I	
Exe	cution Profilin	g				i i	
Me	mory Map						
Inli	ne Assembly						
Fur	nction Editor (	Open Ini	File)				
	bug Sta Sta Res Sta Sta Sta Sta Sta Sta Sta Sta Sta Sta	bug       Peripherals         Start/Stop Debug         Energy Measurem         Reset CPU         Run         Stop         Step         Step Over         Step Out         Run to Cursor Lin         Show Next Statem         Breakpoints         Insert/Remove Breakpoint         OS Support         Execution Profilin         Memory Map         Inline Assembly         Function Editor (#	bug       Peripherals       Tools         Start/Stop Debug Session       Energy Measurement with         Reset CPU       Reset CPU         Run       Stop         Stop       Step         Step Over       Step Out         Run to Cursor Line       Show Next Statement         Breakpoints       Insert/Remove Breakpoint         Disable All Breakpoints in Curr       OS Support         Execution Profiling       Memory Map         Inline Assembly       Function Editor (Open Ini	bug       Peripherals       Tools       SVCS         Start/Stop Debug Session       .         Energy Measurement without Deb         Reset CPU         Run         Stop         Step         Step Over         Step Out         Run to Cursor Line         Show Next Statement         Breakpoints         Insert/Remove Breakpoint         Enable/Disable Breakpoints in current         Kill All Breakpoints in Current Targ         OS Support         Execution Profiling         Memory Map         Inline Assembly         Function Editor (Open Ini File)	bug       Peripherals       Tools       SVCS       Window         Start/Stop Debug Session       Energy Measurement without Debug         Reset CPU       Reset CPU         Run       Stop         Stop       Step         Step Over       Step Out         Run to Cursor Line       Show Next Statement         Breakpoints       Insert/Remove Breakpoint         Enable/Disable Breakpoint       Disable All Breakpoints in current Target         Kill All Breakpoints in Current Target       OS Support         Execution Profiling       Memory Map         Inline Assembly       Function Editor (Open Ini File)	bug       Peripherals       Tools       SVCS       Window       Help         Start/Stop Debug Session          Energy Measurement without Debug          Reset CPU          Run          Stop          Step          Step Over          Step Out          Run to Cursor Line          Show Next Statement          Breakpoints          Insert/Remove Breakpoint          Disable All Breakpoints in current Target          Kill All Breakpoints in Current Target          OS Support          Execution Profiling          Memory Map          Inline Assembly       Function Editor (Open Ini File)	bug       Peripherals       Tools       SVCS       Window       Help         Start/Stop Debug Session       Strg+F5         Energy Measurement without Debug         Reset CPU         Run       F5         Stop         Step       F11         Step Over       F10         Step Over       F10         Step Out       Strg+F11         Run to Cursor Line       Strg+F10         Show Next Statement       Strg+F8         Insert/Remove Breakpoint       F9         Enable/Disable Breakpoints in current Target       Strg+F9         OS Support       O         Kill All Breakpoints in Current Target       Strg+Umschalt+F9         OS Support       Memory Map         Inline Assembly       Function Editor (Open Ini File)



It might happen that Nu-Link driver version and debugger version on the board do not match. Then you have to update the firmware on the board. Just follow the instructions.

## Check the COM port for "Hello World" message #

After flashing the MCU you can check the given out message on the VCOM port with a terminal tool you like. Just open your Device Manager to check for the corresponding COM Port (look for Nu-Link2 Virtual Com Port)



Then open your Terminal Tool (e.g. HTerm) and connect to the COM port of your board with a Baud rate of 115200 (8-bit data; parity: none; stop bits: 1 bit). You have to reset the MCU by pushing the nReset button on the board to get the message:

📲 HTerm 0.8.5 – 🗆 X
File Options View Help
Disconnect Port COM5 V R Baud 115200 V Data 8 V Stop 1 V Parity None V CTS Flow control
Rx 13 Reset Tx 0 Reset Count 0 + Newline at None V Show newline
Clear received Ascii Hex Dec Bin Save output V Clear at 0 V Newline every 0 V Autoscroll Show error
Sequence Overview × Received Data
1 5 10 15 20 25 30 35 40 45 50 55 60 65 70 Hello Worldww
Insut control
Clear transmitted Ascii Hex Dec Bin Send on enter None Send file DTR RTS
Type ASC V ASend
Transmitted data
1 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
History -/0/10 Connected to COM5 (b:115200 d:8 s:1 p:None)

For more information on the Board and other IDEs check the dedicated webpage on Nuvoton's website (you'll find the User Manual under "Quick Start" tab -> point 6.).

## **Conclusion #**

Now you've gone through part 1 of the tutorial, you're ready to take Getting Started with NuMaker-M032KI part 2 or one of our more advanced tutorials.