

AN2142 Application note

ST10F27X firmware development getting started with tasking ST10 toolchain

Introduction

This document provides an introduction to the Tasking toolchain (version v8.5 r1) for the ST10F27x product family. It describes the software environment required to develop an ST10F27x application and summarizes the different steps needed to configure the Tasking development toolset, to build and to debug an application on the target hardware.

Two software examples are supplied with this application note. The first one is a small application demonstrating an input / output toggling function. The required steps to create the project, build and debug it will be described. The second one illustrates another example using interrupts. Both examples are loaded and executed from an external RAM using Tasking RAM monitor.

The application source files are provided within an archived file. This file must be unpacked into a directory before use.

Contents

1	Task	king ST10 toolchain
	1.1	Starting Tasking development environment (EDE)
	1.2	Creating a new project 4
	1.3	Adding files to the project
		1.3.1 Adding existing files
		1.3.2 Adding new files
	1.4	Setting build options
	1.5	Building the application
	1.6	Using the RAM Monitor to debug the application with Cross View debugger 12
2	Арр	lication example: interrupt handling 14
3	Revi	ision history



1 Tasking ST10 toolchain

The TASKING Embedded Development Environment EDE can be divided into three main parts:

- Edit / Project management: In this part, projects are created and maintained, project source files are edited etc.
- Build: Here, a makefile (created by the Edit part) is used to invoke the needed toolchain components, resulting in an absolute object file(*.abs).
- Debug: In this part, the absolute file is used to debug the project.

The figure below shows how these parts interface with each other and enumerates the most imporant generated files.



Neither the toolset installation nor the license management are described in this application note. This section assumes that Tasking is already installed on the development host.

For more details on Tasking installation and license management, refer to Tasking documentation.

This section describes the steps required for creating, building and debugging an ST10F27x application using the tasking toolchain.

1.1 Starting Tasking development environment (EDE)

Getting started with EDE:

- Select Start -> Programs ->Tasking C166-ST10 from the Windows Start menu.
- Select C166-ST10 EDE from the menu





Tasking starts and the following window appears:

The files window is used to edit source files. The project window contains several tabs for viewing information about projects and other files. Finally, the output window contains several tabs to display results of EDE operations such as compiles and builds.

For further information about the window's contents, refer to the Tasking documentation.

1.2 Creating a new project

When you use EDE, you need to setup a project space and add a project to it. A project space stores a set of projects. It allows multiple projects to be displayed at a time and allows the user to organize projects.

A project space file has the extension '*.psp'. A project file has the extension '*.pjt'.

The following steps describe how to create a new project:

- Select New project space from the File menu. A Create a New Project Space dialog box is displayed (see the figure below)
- Use the **Browse** button to select a working directory.
- Enter 'Getting Started Examples' as the project space name in the Filename field.

Create a New Project Space	\times
Current Directory: C:\ST10F27x	
Filename: Getting Started Examples	_
Vorkspace: Type: Auto sync workspace	
Browse OK Cancel Help	

• Click **OK** to confirm your entries and close the **Create a New Project Space** window.



The following window appeals.
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C.\\Getting Started Examples.psp
Getting Started Examples (0 Projects)
E. D. it 0 ♥ B
rino, buing output
Click on 'Getting Started Examples' and choose Add New Project
副 TASKING EDE [C166/ST10]
Eile Edit Search Project Build Text Document Customize Tools Window Help
C\\Getting Started Examples.psp
Getting Started Examples (0 Add New Project
Add Existing Projects Remove Projects
Close
Edit this menu
An Add New Project to Project Space dialog box is displayed (see the figure below)
Add New Project to Project Space
C:\ST10F27x\Example1
Filename: IC:\ST10F27x\Example1\ST10F27x_port2_pins_togding_pit
V Look in same directory for external makefile
Makefile: Type:
Auto sync makefile
Browse OK Cancel Help
Use the Browse button to select a working directory.

The following window appears:



- Enter '*ST10F27x_port2_pins_toggling*' as the project space name in the **Filename** field.
- Click OK to confirm your entries and close the Add New Project to Project Space window

1.3 Adding files to the project

Now, we need to add some source files to the project. This can be done in two ways, either the source file already exists in the working directory (proceed as described in *Section 1.3.1*) or you add new source files and enter your own code (as described in *Section 1.3.2*).

1.3.1 Adding existing files

- Copy in your working directory the *'main.c'* file located in the folder 'Example1' provided with this application note.
- Right-click on 'ST10F27x_port2_pins_toggling' and choose Add Existing Files -> Browse.

ज्ञी TASKING EDE I C1	66/ST10 - C:\ST10F27x\E	xample1\ST10F2	27x port2 pins to	eelin 🗖 🗖 🗙
	Project Build Te <u>x</u> t Doc	ument <u>C</u> ustomize	<u>T</u> ools <u>W</u> indow <u>H</u> e	
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C:\\Getting Starte	d			
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±-S strorz/x_t	Add New File	_		
	Add Existing Files	Browse		
-	Include Sub-Project	Scan		
	Remove from Project Space			
	Project Options			_
	Build Rebuild			•
-	Version Control	•		
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File: Build Output*		O.	* 📑 🗣 📕 Ins RC	D Line: 133 Col: 62

The following window appears:

is start.asm main.c is ST10F27x_port2_pins_toggling.sli ist10f27x_port2_pins_toggling.pin if st10f27x_port2_pins_toggling.opm ist10f27x_port2_pins_toggling.opm is st10f27x_port2_pins_toggling.err ist10f27x_port2_pins_toggling.err is St10f27x_port2_pins_toggling.bak ist10f27x_port2_pins_toggling.cs	Look in: 🔀	Example1	1	💣 🎟 -
File name: Prain a	start.asm ST10F27x, ST10F27x, st10F27x_ st10F27x_ st10F27x_ st10F27x_ st10F27x_ st10F27x_	port2_pins_toggling.sbl _port2_pins_toggling.pjt port2_pins_toggling.opm port2_pins_toggling.mak port2_pins_toggling.err _port2_pins_toggling.bak	main.c st10f27x_port2_pi st10f27x_port2_pi st10f27x_port2_pi st10f27x_port2_pi st10f27x_port2_pi st10F27x_port2_pi	ns_toggling.xvo ns_toggling.ilo ns_toggling.cfg ns_toggling.CS_
The name. Intaine Open	File name:	main.c		Open
Files of type: All Files (*.*)	Files of type:	All Files (*.*)	-	Cancel

• Choose 'main.c' and Click **Open** to confirm



1.3.2 Adding new files

• Right-click on 'ST10F27x_port2_pins_toggling' and choose Add New File

<u>File E</u> dit <u>S</u> earch <u>P</u> roject <u>B</u>	uild Te <u>x</u> t <u>D</u> ocument <u>C</u> ustomize <u>T</u> ools <u>W</u> indow <u>H</u> elp
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← - → - 🏝 😅 🖡	1 🖨 X 🖻 🖻 🗅 🗠 🔽 🔽 💆 🌺 💡
C:\\Getting Started Example Getting Started Examples (1 Pr A ST10F27x_port2_pins	s.psp Add New File Add Existing Files ► Include Sub-Project Remove from Project Space
-	Project Options
	Build Rebuild
	Version Control
_	Properties

- An Add New File to Project dialog box is displayed (see the figure below)
- Use the **Browse** button to select a working directory.
- Enter *'main.c'* as file name in the **Filename** field.

Add New File to Project	×
Current Directory: C:\ST10F27x\Example1	
Filename:	
C:\ST10F27x\Example1\Main.c	
Create new window	
Browse OK Cancel Help	





Click OK to confirm your entries and close the Add New File to Project window.

In this project, there is only one source file. If the application requires more than one source file and header files, you have to include them in the project in the same way as 'main.c' file.

1.4 Setting build options

Before building your project, you should specify compiler and linker options. This section will present the most important options that must be set.

- Select Project Options from the Project menu. The Project Options dialog appears. This dialog contains several entries where you can specify processor and development tool options.
- In the left pane expand the Application entry and select Processor
- Precise STMicroelectronics as Manufacturer and select ST10F27x as processor. Let's choose ST10F276 for the example.



	 Application Processor ⊕ Flash Setup Memory Model 	Processor Selection Manufacturer: STMicroelectronics	
	Startup C++ Compiler Compiler Compiler Assembler Macro Preprocessor	Processor: ST10F276E User Defined Processor CPU Problem Bypasses and Checks	
	 Linker/Locator CrossView Pro 		
1		OK Cancel	Default

- Now, you have to define the memory mapping. For this purpose, select Project Options -> Linker/Locator -> Memory
- Fill in the table using the ST10F276 datasheet , the Memory Areas part.

Berry Diposition Certe Compiler Compiler Compiler Assemble: Mexico Preprocessor Dipole Format Map File Smart Linking Effect un Casses Interrupt Vector Table Stack Absolute Locate Absolute Locate Absolute Socion Size Adjust Symbols Diagnostics	Memory Are	as Stat	End	Notes
	ВОМ ВАМ ВАМ	00h 0F6D0h 0E000h	07FFFh OFDFFh OE7FFh	DPRAM XRAM
	Map RDM sections in unused reserved RAM area at the bottom of IRAM Mark internal RAM area as RAM Total memory size: Processor defined C			
Locate Absolute Locate Order Section Size Adjust Symbols Dingnostics Miscelaneous	Reserved D Reserved D Options string	temory ledicated Areas		

Select the memory model. For this purpose, select
 Project Options -> Application -> Memory Model



The following window appears:

Application Processor Flash Setup Memory Model Statup C++ Compiler Assembler Macro Preprocessor Linker/Locator CrossView Pro	Memory Model Memory Model: Small Small Default Linear First page of 48K range: 4 Paged Page number for DPP0: 0 Page number for DPP1: 1 Page number for DPP2: 2 Use user stack for return addresses
--	---

There are 5 memory models: Tiny, Small, Medium, Large and Huge. The small memory model is used by default.

The memory model defines the default variable and function location and their default pointer size. The right selection depends on the application and impacts the compiler efficiency.

The memory models with their characteristics are represented in the following table:

	Data size	Code size	Far/Huge/Shuge data allowed	Near data allowed
Tiny	<64K	<64K	No	Not applicable
Small	<64K	>64K	Yes	Not applicable
Medium	>64K	<64K	Yes	Yes
Large	>64K	>64K	Yes	Yes
Huge	>64K	>64K	Yes	Yes

For more details about memory models and choice criteria, please refer to Tasking documentation.



 If you want to generate HEX or Motorla S formats, select
 Project Options -> Linker/Locator -> Output Format -> Intel HEX Records (or Motorola S records).

 Processor Flash Setup Menory Model Startup C+ Compiler C Compiler Assembler Macro Preprocessor Linker/Locator Output Formal Map File Smart Linking Menory Classes Interrupt Vector Table Stack and Heap Locate Absolute Locate Absolute Locate Absolute Section Size Adjust Symbols Diagnostics Miscellaneous 	Output Format I IEEE-695 TASKING internal C166 format Library Linker object Intel HEX records Motorola S records Hitex emulator Kontron emulator IteE-695 Output Format Options Intel Hex Output Format Options Intel Hex Output Format Options Hitex Output Format Options S-Record Output Format Options Hitex Output Format Options Winton Output Format Options PRINT("\$".map") -Ms -xmilp -Bhoeufmknladij -cf "stiftof27x_port2_pins_toggling.ilo"
---	--

 Hardware configuration: before building the application and starting CrossView, the board configuration must be selected in the dialog 'EDE -> Project Options -> CrossView Pro -> Execution environment". Also, the check box "Use Simulator" must be disabled in this dialog.

When using one of the default board configurations, there is no need to change the startup registers like SYSCON. With a user-defined configuration, many more settings and startup registers must be initialized, also in the cfg file. Please refer to the cfg file(s) belonging to the default boards for more information.

1.5 Building the application

The project has been configured. You can now build it. Select **Build** from the **Build** menu. If there are no errors, a file.abs will be generated in order to debug the application.



When building the application successfully, many files will be generated automatically (as described at the beginning of this document) and placed in the working directory.



Cross View debugger provides a high level interface between the user and a program running in the target system (execution environment).

Cross View debugger runs on a PC computer and is connected to the ST10F27x target microcontroller via an RS232 interface.

The connection to the target and the debug of the application require that you have successfully compiled and built your application.

The monitor requires an external RAM memory to run. This RAM memory must be selected at reset.

- External RAM Chip select should be active
- Make sure that ROMEN bit in SYSCON register is cleared (Internal ROM is disabled)



• Enter the bootstrap loader mode by forcing P0L.4 to 0 at reset



12/16



Select **Debug** from the **Build** menu. The Cross View debugger window appears:

Once the 'st10f27x_port2_pins_toggling.abs' file has been loaded on the target, you can debug it. To execute the application, Select Run from the Run menu of the Cross View window.

You can use breakpoints, a simple double click on a line sets a breakpoint on that location. You can also run the application step by step. You can display memory and register contents. Select View -> Register from the Cross View window to display the Register pane or View -> Memory from the Cross View window to display the Memory pane. By means of these panes, you can view and set the content of a register and a memory location.

For more details on CrossView debugging features, refer to the Cross View Debugger documentation.



2 Application example: interrupt handling

This section describes a simple ST10F27x software example making use of the interrupts. The application uses Timers' overflow interrupts to generate two square signals with different frequencies on two standard port pins: P2.0 & P2.1.

The project contains 3 source files:

- Timer.c: It contains c source code for the following project routines
 - Configure_GPT1_Timer_2(): In this routine, GPT1 Timer 2 is set up to operate in Timer mode and is configured to generate an interrupt every 1.678 seconds.
 - *Configure_GPT1_Timer_3()*: In this routine, GPT1 Timer 3 is set up to operate in Timer mode and is configured to generate an interrupt every 104.8 milliseconds.
 - Timer 2 and Timer 3 interrupts' definitions: Timer 2 interrupt is toggling P2.0 while Timer 3 interrupt is toggling P2.1.
- Timer.h: It contains Timer.c routines prototypes.
- main.c: It uses the routines described in Timer.c in order to start the two timer overflow interrupts.

Timings suppose that the chip is operating at a frequency of 40 Mhz.

Both hardware and software environments have been setup as described in the first chapter.

The figure below shows the behaviour of the port 2 pins 0 and 1 and the GPT1 Timer 2 & Timer 3 overflow interrupts.



The example source code is located in the '..\Example2' directory.

For more details about the timers' functionalities, their registers and interrupts' handling, refer to the ST10F27x user's manual.

3 Revision history

Table 1. Document revision history

Date	Revision	Changes
30-Jun-2006	1	Initial release.
24-Sep-2013	2	Updated Disclaimer.



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