INTRODUCCIÓN IDE CODE COMPOSER STUDIO v7.3

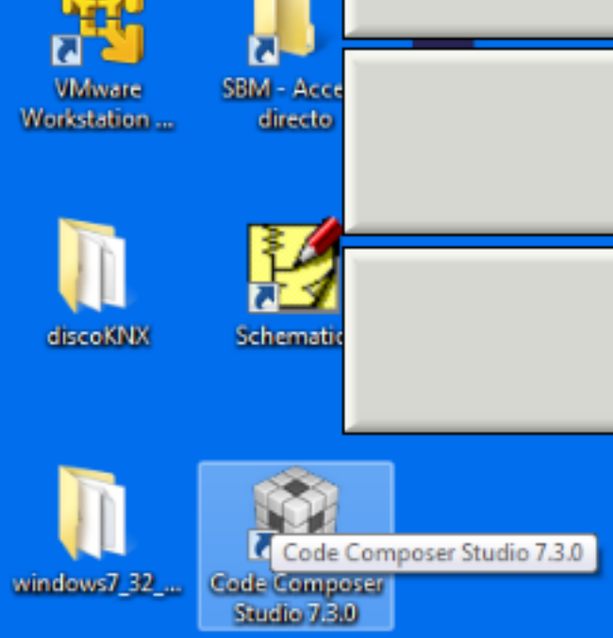
CREACIÓN DE NUEVO PROYECTO

VISIÓN GENERAL DEL EDITOR

PROJECT EXPLORER

BARRA DE HERRAMIENTAS

DEBUGGER



Papelera de reciclaje

Debug PAS - Acceso directo

as_5

ee3376-assembly

slau131p

slau157an

ETS5

Downloads

CONECTAR EN ESTE MOMENTO AL PUERTO USB DE LA BOTONERA DE ENCENDIDO DEL PC:

ISE Design Suite 14.7

Ide68k

Mozilla Firefox

PSpice

VMware Workstation ...

SBM - Acceso directo

Departam

ctrónica

discoKNX

Schematics

windows7_32_...

Code Composer Studio 7.3.0

Code Composer Studio 7.3.0

Alumnos

ES

12:39
05/10/2017

Papelera de reciclaje

Debug PAS - Acceso directo

as_5

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discoKNX

Schematics

windows7_32_...

Code Composer Studio 7.3.0

Ejecutamos CCS 7.3.0

Alumnos

Departamento de Tecnología Electrónica

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12:39
05/10/2017

Papelera de reciclaje

Debug PAS - Acceso directo

as_5

ee3376-assembly

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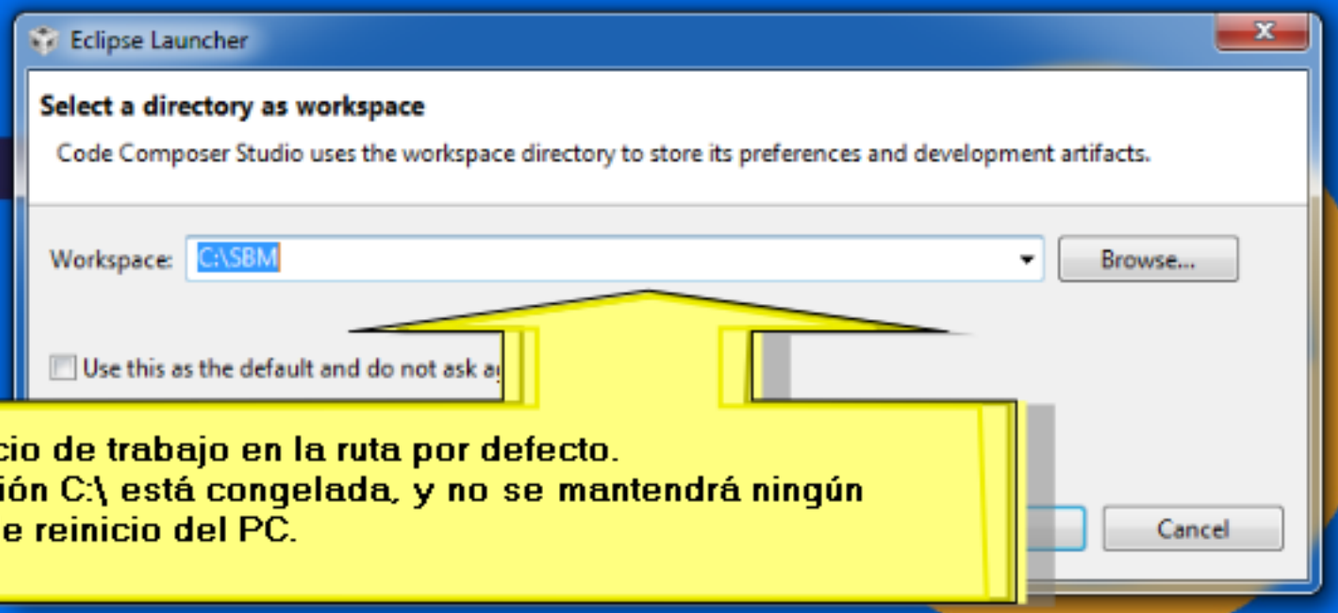
Schematics

windows7_32_...

Code Composer Studio 7.3.0

Alumnos



Dejamos el espacio de trabajo en la ruta por defecto.
¡¡¡¡Ojo!!!! La partición C:\ está congelada, y no se mantendrá ningún cambio en caso de reinicio del PC.

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12:39
05/10/2017

SBM - CCS Edit - Code Composer Studio

File Edit View Navigate Project Run Scripts Window Help

Quick Access

Getting Started

Siempre aparecerá por defecto la pantalla de Getting Started.

New Project

Examples

Project

App Center
(Add Features)

Would you like to use CCS in 'Simple' mode? Yes No
(Recommended for Energia and LaunchPad users)

Loading Video...

Support Forum

Videos

Training

Wiki

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SBM - CCS Edit - Code Composer Studio

File Edit View Navigate Project Run Scripts Window Help

Quick Access

Getting Started

Ejemplos varios .

New Project

Browse Examples

Import Project

App Center *(Add Features)*

Browse the wealth of examples available

Resource Exp

de? Yes No

Para crear nuevo proyecto.

Importar proyecto.

ting Started

Foro de la comunida Texas Instrument.

Wiki Texas Instrument.

Support Forum

Videos

Training

Wiki

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File

Para crear nuevo proyecto, no usaremos el acceso rápido. Pulsaremos en File.

- New
- Open File...
- Open Projects from File System...
- Close Ctrl+W
- Close All Ctrl+Shift+W
- Save Ctrl+S
- Save As...
- Save All Ctrl+Shift+S
- Revert
- Move...
- Rename... F2
- Refresh F5
- Convert Line Delimiters To
- Print... Ctrl+P
- Switch Workspace
- Restart
- Import...
- Export...
- Properties Alt+Enter
- Exit

Quick Access

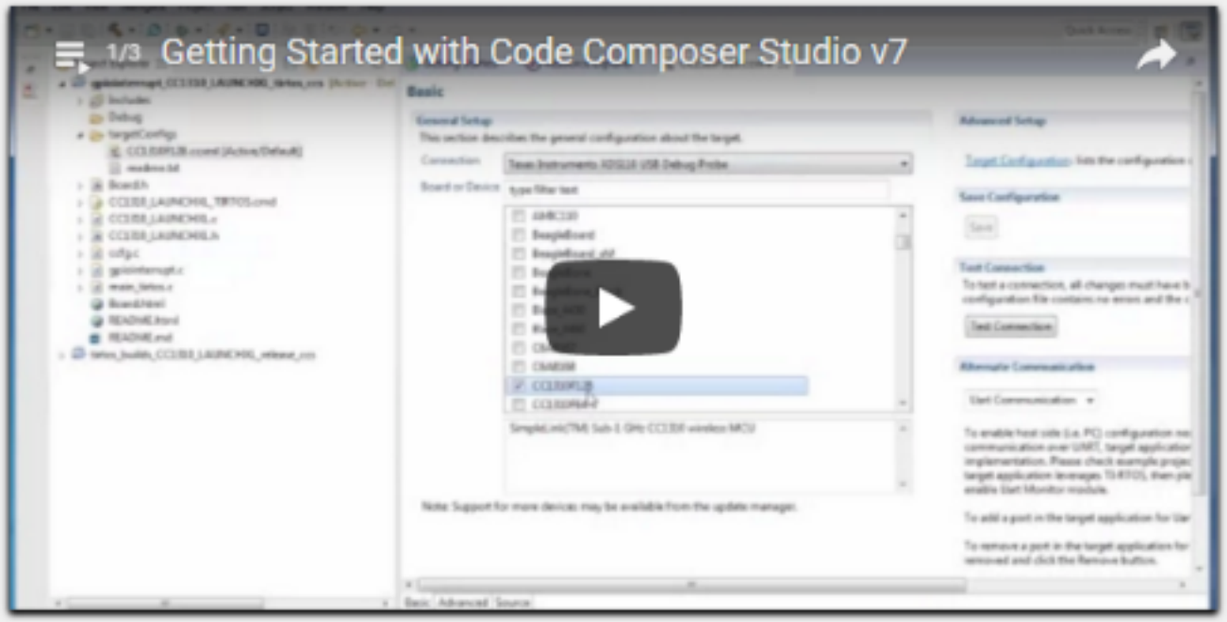
New Project

Browse Examples

Import Project

App Center *(Add Features)*

Would you like to use CCS in 'Simple' mode? Yes No
(Recommended for Energia and LaunchPad users)



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File Edit View Navigate Project Run Scripts Window Help

New Alt+Shift+N

Open File...

Open Project... om File System...

Ctrl+W

Ctrl+Shift+W

Ctrl+S

Ctrl+Shift+S

Move...

Rename... F2

Refresh F5

Convert Line Delimiters To

Print... Ctrl+P

Switch Workspace

Restart

Import...

Export...

Properties Alt+Enter

Exit

CCS Project

Project...

Source File

Header File

Class

File from Template

Folder

Target Configuration File

DSP/BIOS v5.x Configuration File

RTSC Configuration File

Other... Ctrl+N

Nos situaremos sobre New.

Y haremos clic sobre CCS Project.

Quick Access

Import Project

App Center *(Add Features)*

Would you like to use CCS in 'Simple' mode? Yes No
(Recommended for Energia and LaunchPad users)

1/3 Getting Started with Code Composer Studio v7

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SBM - CCS Edit - Code Composer Studio

File Edit View Navigate Project Run Scripts Wind

Quick Access

Getting Started

New CCS Project

CCS Project

Project name must be specified

Target: CC430F5123

Connection: Identify...

<select or type filter text>
Generic Devices
CC430x5xx Family
CC430x6xx Family
MSP430FGxxx Family
MSP430FRxxx Family
RF430FRxxx Family
RF430x5xx Family

Browse...

More...

type filter

Empty Projects
- Empty Project
- Empty Project (with main.c)
- Empty Assembly-only Project
- Empty RTSC Project

Basic Examples
- Blink The LED
- Hello World

Creates an empty project initialized for the selected device. The project will contain an empty 'main.c' source-file.

Open Resource Explorer to browse a wide selection of example projects...

< Back Next > Finish Cancel

Desplegamos la pestaña Target y seleccionaremos la familia de micro que vamos a utilizar. En este caso MSP430FRxxx.

App Center

Forum Videos Training Wiki

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SBM - CCS Edit - Code Composer Studio

File Edit View Navigate Project Run Scripts Wind

Quick Access

Getting Started

New CCS Project

CCS Project

Project name must be specified

Target: MSP430FRxxx Family

Connection: TI MSP430 USB1 [Default]

MSP430

Project name:

Use default location

Location: C:\SBM

Compiler version: TI v16.9.4.LTS

Advanced settings

Project templates and examples

type filter text

- Empty Projects
  - Empty Project
  - Empty Project (with main.c)
  - Empty Assembly-only Project
  - Empty RTSC Project
- Basic Examples
  - Blink The LED
  - Hello World

MSP430FR2111

MSP430FR60471
MSP430FR6820
MSP430FR6822
MSP430FR68221
MSP430FR6870
MSP430FR6872
MSP430FR68721
MSP430FR6877
MSP430FR6879
MSP430FR68791
MSP430FR6887
MSP430FR6888
MSP430FR6889
MSP430FR68891
MSP430FR6920
MSP430FR6922
MSP430FR69221
MSP430FR6927
MSP430FR69271
MSP430FR6928
MSP430FR6970
MSP430FR6972
MSP430FR69721
MSP430FR6977
MSP430FR6979
MSP430FR69791
MSP430FR6987
MSP430FR6988
MSP430FR6989

Open Resou

Luego seleccionaremos el modelo de nuestro micro. MSP430FR6989.

< Back Next > Finish Cancel

App Center

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SBM - CCS Edit - Code Composer Studio

File Edit View Navigate Project Run Scripts Wind

Quick Access

Getting Started

New CCS Project

CCS Project

Create a new CCS Project.

Target: MSP430FRxxx Family | MSP430FR6989

Connection: TI MSP430 USB1 [Default] | Identify...

MSP430

Project name: blink_led

Use default location

Location: C:\SBM\blink_led | Browse...

More...

Le daremos nombre a nuestro proyecto que se almacenará en C:\SBM.
¡¡¡¡Recuerda que el directorio está congelado!!!!

project initialized for the
The project will contain an
source-file.

- Empty Project
- Empty Project (with main.c)
- Empty Assembly-only Project
- Empty RTSC Project
- Basic Examples
  - Blink The LED
  - Hello World

Open Resource Explorer to browse a wide selection of example projects...

< Back | Next > | Finish | Cancel

App Center

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SBM - CCS Edit - Code Composer Studio

File Edit View Navigate Project Run Scripts Wind

Quick Access

Getting Started

Dejaremos la pestaña Connection con TI MSP430 USB1 (Default).

También dejaremos la pestaña de Compiler version con TI v16.9.4.LTS

New CCS Project

CCS Project

Create a new CCS Project.

Target: MSP430FRxxx Family | MSP430FR6989

Connection: TI MSP430 USB1 [Default] | Identify...

MSP430

Location: C:\SBM\blink_led | Browse...

Compiler version: TI v16.9.4.LTS

Advanced settings

Project templates and examples

type filter text

- Empty Projects
  - Empty Project
  - Empty Project (with main.c)
  - Empty Assembly-only Project
  - Empty RTSC Project
- Basic Examples
  - Blink The LED
  - Hello World

Creates an empty assembly-only project initialized for the selected device.

Open Resource Explorer to browse a wide selection of example projects...

< Back | Next > | Finish | Cancel

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File Edit View Navigate Project Run Scripts Wind

Quick Access

Getting Started

New CCS Project

CCS Project

Create a new CCS Project.

Target: MSP430FRxxx Family | MSP430FR6989

Connection: TI MSP430 USB1 [Default] | Identify...

MSP430

Project name: blink_led

Use default location

Location: C:\SBM\blink_led | Browse...

Compiler version: TI v16.9.4.LTS | More...

Advanced settings

Project templates and examples

type filter text

- Empty Projects
  - Empty Project
  - Empty Project (with main.c)
  - Empty Assembly-only Project
- Basic Ex

Creates an empty assembly-only project initialized for the selected device.

Open Resource Explorer to browse a wide selection of example projects...

< Back | Next > | Finish | Cancel

Seleccionaremos la plantilla de Empty Assembly-only Project.

App Center

Add Features)

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SBM - CCS Edit - Code Composer Studio

File Edit View Navigate Project Run Scripts Wind

Quick Access

Getting Started

New CCS Project

CCS Project

Create a new CCS Project.

Target: MSP430FRxxx Family | MSP430FR6989

Connection: TI MSP430 USB1 [Default] | Identify...

MSP430

Project name: blink_led

Use default location

Location: C:\SBM\blink_led | Browse...

Compiler version: TI v16.9.4.LTS | More...

Advanced settings

Project templates and examples

type filter text

- Empty Projects
  - Empty Project
  - Empty Project (with main.c)
  - Empty Assembly-only Project
  - Empty RTSC Project
- Basic Examples
  - Blink The LED
  - Hello World

Creates an empty assembly-only project initialized for the selected device.

Open R...

Pulsamos sobre Finish para generar los ficheros necesarios que compondrán nuestro proyecto.

< Back | Next > | Finish | Cancel

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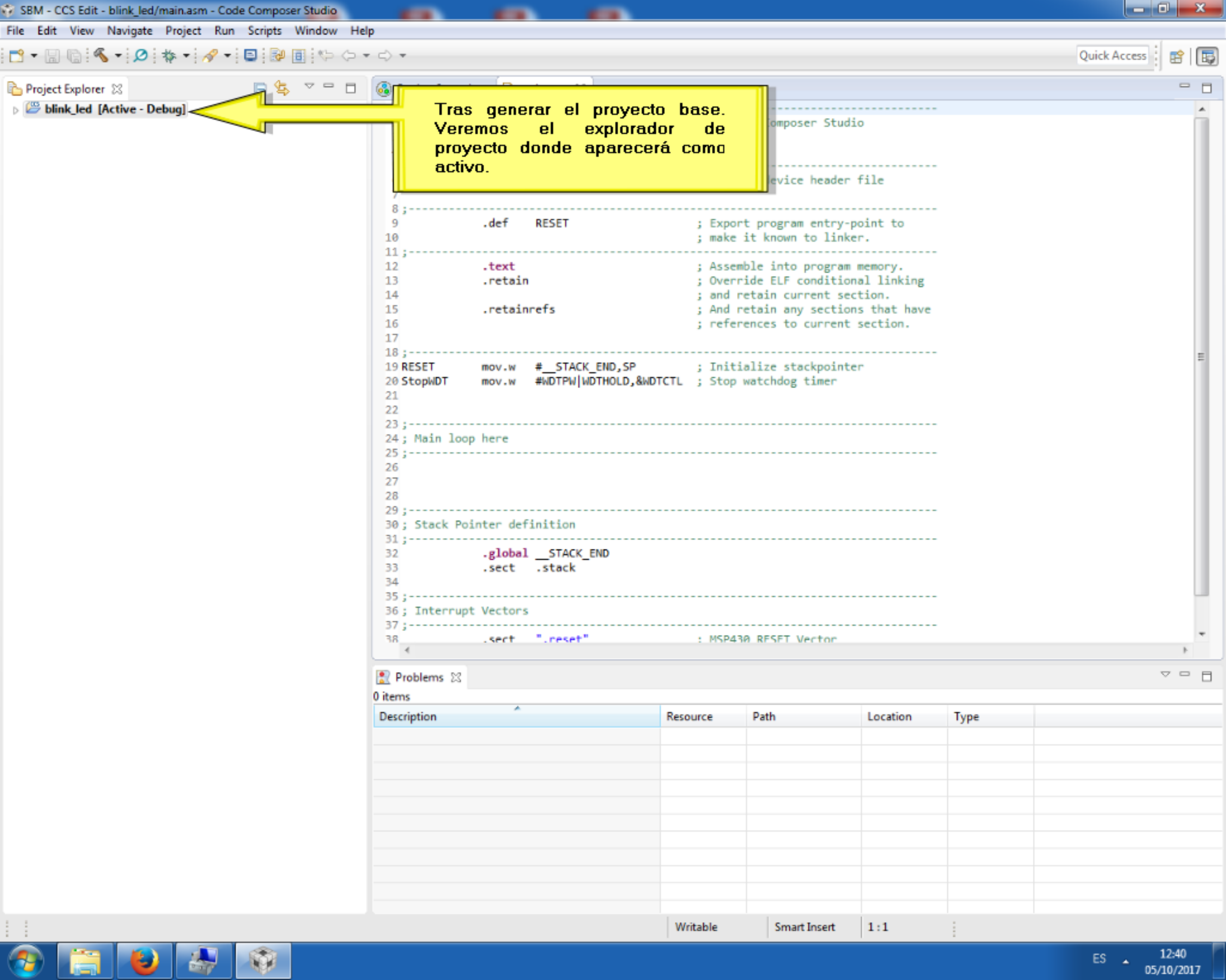
SBM - CCS Edit - blink_led/main.asm - Code Composer Studio
File Edit View Navigate Project Run Scripts Window Help
Quick Access
Project Explorer
blink_led [Active - Debug]
Tras generar el proyecto base. Veremos el explorador de proyecto donde aparecerá como activo.
omposer Studio
evice header file
.def RESET ; Export program entry-point to
; make it known to linker.
.text ; Assemble into program memory.
.retain ; Override ELF conditional linking
; and retain current section.
.retainrefs ; And retain any sections that have
; references to current section.
RESET mov.w #__STACK_END,SP ; Initialize stackpointer
StopWDT mov.w #WDTPW|WDTHOLD,&WDTCTL ; Stop watchdog timer
; Main loop here
; Stack Pointer definition
.global __STACK_END
.sect .stack
; Interrupt Vectors
Problems
0 items
Description
Resource
Path
Location
Type
Writable
Smart Insert
1 : 1
ES
12:40
05/10/2017

SBM - CCS Edit - blink_led/main.asm - Code Composer Studio

File Edit View Navigate Project Run Scripts Window Help

Quick Access

Project Explorer

blink_led [Active - Debug]

Getting Started | main.asm

```
1 ;-------------------------------------------------------------------------------
2 ; MSP430 A                                  for use with TI Code Composer Studio
3 ;
4 ;
                                             ;-----------------------------------
                                                 ; Include device header file
                                             ;-----------------------------------
                                                 ; Export program entry-point to
                                                 ; make it known to linker.
                                             ;-----------------------------------
                                                 ; Assemble into program memory.
13            .retain                            ; Override ELF conditional linking
14                                               ; and retain current section.
15            .retainrefs                        ; And retain any sections that have
16                                               ; references to current section.
17
18 ;-------------------------------------------------------------------------------
19 RESET       mov.w   #__STACK_END,SP          ; Initialize stackpointer
20 StopWDT     mov.w   #WDTPW|WDTHOLD,&WDTCTL   ; Stop watchdog timer
21
22
23 ;-------------------------------------------------------------------------------
24 ; Main loop here
25 ;-------------------------------------------------------------------------------
26
27
28
29 ;-------------------------------------------------------------------------------
30 ; Stack Pointer definition
31 ;-------------------------------------------------------------------------------
32            .global __STACK_END
33            .sect   .stack
34
35 ;-------------------------------------------------------------------------------
36 ; Interrupt Vectors
37 ;-------------------------------------------------------------------------------
38            .sect   ".reset"                 ; MSP430 RESET Vector
```

También veremos el contenido del fichero main.asm.
El que se va a modificar para explicar más funcionalidades del IDE.

Problems

0 items

Description	Resource	Path	Location	Type

Writable | Smart Insert | 1 : 1

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SBM - CCS Edit - blink_led/main.asm - Code Composer Studio

File Edit View Navigate Project Run Scripts Window Help

Quick Access

Project Explorer

blink_led [Active - Debug]

Agrego el código ejemplo que se limita a hacer parpadear ur led conectado a la pata 0 del puerto 1 del microcontrolador.

Getting Started | *main.asm

```
2 ; MSP430 Assembler Code Template for use with TI Code Composer Studio
3 ;
4 ;
5 ;-------------------------------------------------------------------------
6             .cdecls C,LIST,"msp430.h"       ; Include device header file
7 ;-------------------------------------------------------------------------
8             .def    RESET                   ; Export program entry-point to
9                                             ; make it known to linker.
10;-------------------------------------------------------------------------
11            .global _main
12            .global __STACK_END
13            .sect   .stack                  ; Make stack linker segment ?known?
14
15            .text                           ; Assemble to Flash memory
16            .retain                         ; Ensure current section gets linked
17            .retainrefs
18
19_main
20RESET       mov.w   #__STACK_END,SP         ; Initialize stackpointer
21StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL  ; Stop WDT
22SetupP1     bic.b   #BIT0,&P1OUT            ; Clear P1.0 output latch for a defined power-on state
23            bis.b   #BIT0,&P1DIR            ; Set P1.0 to output direction
24UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0      ; Disable the GPIO power-on default
25                                            ; high-impedance mode to activate
26                                            ; previously configured port settings
27
28Mainloop    xor.b   #BIT0,&P1OUT            ; Toggle P1.0
29Wait        mov.w   #50000,R15              ; Delay to R15
30L1          dec.w   R15                     ; Decrement R15
31            jnz     L1                      ; Delay over?
32            jmp     Mainloop                ; Again
33                                            ;
34;-------------------------------------------------------------------------
35;           Interrupt Vectors
36;-------------------------------------------------------------------------
37            .sect   ".reset"                ; MSP430 RESET Vector
38            .short  RESET                   ;
39            .end
```

Problems

0 items

Description	Resource	Path	Location	Type

Writable | Smart Insert | 39 : 17

ES 12:40 05/10/2017

SBM - CCS Edit - blink_led/main.asm - Code Composer Studio

File Edit View Navigate Project Run Scripts Window Help

Compilamos el código con el botón de Buid

Project Explorer

blink_led [Active - Debug]

```
;-------------------------------------------------------------------------------
; MSP430 Assembler Code Template for use with TI Code Composer Studio
;
;
;-------------------------------------------------------------------------------
            .cdecls C,LIST,"msp430.h"       ; Include device header file
;-------------------------------------------------------------------------------
            .def    RESET                   ; Export program entry-point to
                                            ; make it known to linker.
;-------------------------------------------------------------------------------
            .global _main
            .global __STACK_END
            .sect   .stack                  ; Make stack linker segment ?known?

            .text                           ; Assemble to Flash memory
            .retain                         ; Ensure current section gets linked
            .retainrefs

_main
RESET       mov.w   #__STACK_END,SP         ; Initialize stackpointer
StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL  ; Stop WDT
SetupP1     bic.b   #BIT0,&P1OUT            ; Clear P1.0 output latch for a defined power-on state
            bis.b   #BIT0,&P1DIR            ; Set P1.0 to output direction
UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0      ; Disable the GPIO power-on default
                                            ; high-impedance mode to activate
                                            ; previously configured port settings

Mainloop    xor.b   #BIT0,&P1OUT            ; Toggle P1.0
Wait        mov.w   #50000,R15              ; Delay to R15
L1          dec.w   R15                     ; Decrement R15
            jnz     L1                      ; Delay over?
            jmp     Mainloop                ; Again
                                            ;
;-------------------------------------------------------------------------------
;           Interrupt Vectors
;-------------------------------------------------------------------------------
            .sect   ".reset"                ; MSP430 RESET Vector
            .short  RESET                   ;
```

Problems

0 items

Description	Resource	Path	Location	Type

Writable | Smart Insert | 39 : 17

ES 12:40 05/10/2017

SBM - CCS Edit - blink_led/main.asm - Code Composer Studio

File Edit View Navigate Project Run Scripts Window Help

Quick Access

Project Explorer

blink_led [Active - Debug]

Getting Started | main.asm

```
1  ;-------------------------------------------------------------------------------
2  ; MSP430 Assembler Code Template for use with TI Code Composer Studio
3  ;
4  ;
5  ;-------------------------------------------------------------------------------
6              .cdecls C,LIST,"msp430.h"       ; Include device header file
7  ;-------------------------------------------------------------------------------
8              .def    RESET                   ; Export program entry-point to
9                                              ; make it known to linker.
10 ;-------------------------------------------------------------------------------
11             .global _main
12             .global __STACK_END
13             .sect   .stack                  ; Make stack linker segment ?known?
14
15             .text                           ; Assemble to Flash memory
16             .retain                         ; Ensure current section gets linked
17             .retainrefs
18
19 _main
20 RESET       mov.w   #__STACK_END,SP         ; Initialize stackpointer
21 StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL  ; Stop WDT
22 SetupP1     bic.b   #BIT0,&P1OUT            ; Clear P1.0 output latch for a defined power-on state
23             bis.b   #BIT0,&P1DIR            ; Set P1.0 to output direction
24 UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0      ; Disable the GPIO power-on default
25                                             ; high-impedance mode to activate
26                                             ; previously configured port settings
27
28 Mainloop    xor.b   #BIT0,&P1OUT            ; Toggle P1.0
29 Wait        mov.w   #50000,R15              ; Delay to R15
30 L1          dec.w   R15                     ; Decrement R15
31             jnz     L1
32
33
34 ;-------------------
35 ;           Interrupt Ve
36 ;-------------------
37             .sect   ".reset"                ; MSP430 RESET Vector
38             .short  RESET                   ;
```

Y el compilador nos resalta en la línea donde ocurre la advertencia.

Console

CDT Build Console [blink_led]

```
-msp430_16.9.4.LTS
er --warn_sections
.xml"
-o "blink_led.out"
nd"  -llibmpu_init.a
<Linking>
'Finished building target: blink_led.out'
' '

**** Build Finished ****
```

La compilación del código nos lanza un Warning en la pestaña de Problems.
Ya veremos más adelante el motivo de la advertencia.

Problems | Advice

0 errors, 1 warning, 0 others

Description	Resource	Path
Warnings (1 item)		
[W5369] Silicon Errata CPU40: A jump instruc	main.asm	/blink_le

ES 12:40 05/10/2017

SBM - CCS Edit - blink_led/main.asm - Code Composer Studio

File Edit View Navigate Project Run Scripts Window Help

Quick Access

Project Explorer

blink_led [Active - Debug]

Getting Started | *main.asm

```
1  ;-------------------------------------------------------------------------------
2  ; MSP430 Assembler Code Template for use with TI Code Composer Studio
3  ;
4  ;
5  ;-------------------------------------------------------------------------------
6              .cdecls C,LIST,"msp430fr6989.h"       ; Include device header file
7  ;-------------------------------------------------------------------------------
8              .def    RESET                         ; Export program entry-point to
9                                                    ; make it known to linker.
10 ;-------------------------------------------------------------------------------
11
12
13                                                   ; Make stack linker segment ?known?
14
15                                                   ; Assemble to Flash memory
16                                                   ; Ensure current section gets linked
17
18
19 _main
20 RESET                                            ; Initialize stackpointer
21 StopWDT                                          L ; Stop WDT
22 SetupP1                                          ; Clear P1.0 output latch for a defined power-on state
23                                                   ; Set P1.0 to output direction
24 UnlockGPIO                                       ; Disable the GPIO power-on default
25                                                   ; high-impedance mode to activate
26                                                   ; previously configured port settings
27
28 Mainloop    xor.b   #BIT0,&P1OUT                 ; Toggle P1.0
29 Wait        mov.w   #50000,R15                   ; Delay to R15
30 L1          dec.w   R15                          ; Decrement R15
31             jnz     L1                           ; Delay over?
32             jmp     Mainloop                     ; Again
33                                                  ;
34 ;-------------------------------------------------------------------------------
35 ;           Interrupt Vectors
36 ;-------------------------------------------------------------------------------
37             .sect   ".reset"                     ; MSP430 RESET Vector
38             .short  RESET                        ;
```

Para evitar compilar todos los header files de la familia MSP430FR. Definiremos en la cabecera el modelo del micro a utilizar.

Console

CDT Build Console [blink_led]

```
-i"C:/ti/ccsv7/tools/compiler/ti-cgt-msp430_16.9.4.LTS/lib"
-i"C:/ti/ccsv7/tools/compiler/ti-cgt-msp430_16.9.4.LTS/incl
ude" --priority --reread_libs --define=_MPU_ENABLE
--diag_wrap=off --display_error_number --warn_sections
--xml_link_info="blink_led_linkInfo.xml"
--entry_point=RESET --use_hw_mpy=F5 -o "blink_led.out"
"./main.obj" "../lnk_msp430fr6989.cmd"  -llibmpu_init.a
-llibmath.a -llibc.a
<Linking>
'Finished building target: blink_led.out'
' '

**** Build Finished ****
```

Problems | Advice

0 errors, 1 warning, 0 others

Description	Resource	Path
Warnings (1 item)		
[W5369] Silicon Errata CPU40: A jump instruc	main.asm	/blink_le

Writable | Smart Insert | 6 : 41

ES 12:41 05/10/2017

SBM - CCS Edit - blink_led/main.asm - Code Composer Studio

File Edit View Navigate Project Run Scripts Window Help

Volvemos a compilar.

Quick Access

Project Explorer

blink_led [Active - Debug]

main.asm

```
1 ;-------------------------------------------------------------------------------
2 ; MSP430 Assembler Code Template for use with TI Code Composer Studio
3 ;
4 ;
5 ;-------------------------------------------------------------------------------
6             .cdecls C,LIST,"msp430fr6989.h"       ; Include device header file
7 ;-------------------------------------------------------------------------------
8             .def    RESET                         ; Export program entry-point to
9                                                   ; make it known to linker.
10 ;-------------------------------------------------------------------------------
11            .global _main
12            .global __STACK_END
13            .sect   .stack                        ; Make stack linker segment ?known?
14
15            .text                                 ; Assemble to Flash memory
```

Build Project

Building project...

Always run in background

Run in Background | Cancel | Details >>

```
32            jmp     Mainloop                      ; Again
33                                                  ;
34 ;-------------------------------------------------------------------------------
35 ;           Interrupt Vectors
36 ;-------------------------------------------------------------------------------
37            .sect   ".reset"                      ; MSP430 RESET Vector
38            .short  RESET                         ;
```

Console

CDT Build Console [blink_led]

```
-i"C:/ti/ccsv7/tools/compiler/ti-cgt-msp430_16.9.4.LTS/lib"
-i"C:/ti/ccsv7/tools/compiler/ti-cgt-msp430_16.9.4.LTS/incl
ude" --priority --reread_libs --define=_MPU_ENABLE
--diag_wrap=off --display_error_number --warn_sections
--xml_link_info="blink_led_linkInfo.xml"
--entry_point=RESET --use_hw_mpy=F5 -o "blink_led.out"
"./main.obj" "../lnk_msp430fr6989.cmd"  -llibmpu_init.a
-llibmath.a -llibc.a
<Linking>
'Finished building target: blink_led.out'
' '

**** Build Finished ****
```

Problems | Advice

0 errors, 1 warning, 0 others

Description	Resource	Path
Warnings (1 item)		
[W5369] Silicon Errata CPU40: A jump instruc	main.asm	/blink_le

Writable | Smart Insert | 6 : 41 | Build Project: (50%)

ES 12:41 05/10/2017

SBM - CCS Edit - blink_led/main.asm - Code Composer Studio

File Edit View Navigate Project Run Scripts Window Help

Quick Access

Project Explorer

- blink_led [Active - Debug]
  - Binaries
    - blink_led.out - [MSP430/le]
  - Includes
    - blink_led
    - C:/ti/ccsv7/ccs_base/msp430/include
    - C:/ti/ccsv7/tools/compiler/ti-cgt-msp430_16.9.4.LTS/inc
  - Debug
    - blink_led.out - [MSP430/le]
    - main.obj - [MSP430/le]
    - blink_led_linkInfo.xml
    - blink_led.map
    - ccsObjs.opt
    - makefile
    - objects.mk
    - sources.mk
    - subdir_rules.mk
    - subdir_vars.mk
  - targetConfigs
    - MSP430FR6989.ccxml [Active/Default]
    - readme.txt
  - lnk_msp430fr6989.cmd
    - # IPE_MPUIPENA
    - # IPE_MPUIPLOCK
    - # IPE_MPUIPPUC
    - # MPUENA
    - # MPULOCK
    - # MPUPW
    - # MPUSEGIE
  - main.asm

Getting Started | **main.asm**

```
1  ;-------------------------------------------------------------------------------
2  ; MSP430 Assembler Code Template for use with TI Code Composer Studio
3  ;
4  ;
5  ;-------------------------------------------------------------------------------
6           .cdecls C,LIST,"msp430fr6989.h"       ; Include device header file
7  ;-------------------------------------------------------------------------------
8           .def    RESET                         ; Export program entry-point to
9                                                 ; make it known to linker.
10 ;-------------------------------------------------------------------------------
11          .global _main
12          .global __STACK_END
13          .sect   .stack                        ; Make stack linker segment ?known?
14
15          .text
16
17          .retainref
18
19 _main
20 RESET       mov.w   #__
21 StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL    ; Stop WDT
22 SetupP1     bic.b   #BIT0,&P1OUT              ; Clear P1.0 output latch for a defined power-on state
23             bis.b   #BIT0,&P1DIR              ; Set P1.0 to output direction
24 UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0        ; Disable the GPIO power-on default
25                                               ; high-impedance mode to activate
26                                               ; previously configured port settings
27
28 Mainloop    xor.b   #BIT0,&P1OUT              ; Toggle P1.0
29 Wait        mov.w   #50000,R15                ; Delay to R15
30 L1          dec.w   R15                       ; Decrement R15
31             jnz     L1                        ; Delay over?
32             jmp     Mainloop                  ; Again
33                                               ;
34 ;-------------------------------------------------------------------------------
35 ;           Interrupt Vectors
36 ;-------------------------------------------------------------------------------
37             .sect   ".reset"                  ; MSP430 RESET Vector
38             .short  RESET                     ;
```

En el Project explorer prodremos desplegar el árbol de todos los ficheros que componen nuestro proyecto.

Console

CDT Build Console [blink_led]

```
-i"C:/ti/ccsv7/tools/compiler/ti-cgt-msp430_16.9.4.LTS/lib"
-i"C:/ti/ccsv7/tools/compiler/ti-cgt-msp430_16.9.4.LTS/incl
ude" --priority --reread_libs --define=_MPU_ENABLE
--diag_wrap=off --display_error_number --warn_sections
--xml_link_info="blink_led_linkInfo.xml"
--entry_point=RESET --use_hw_mpy=F5 -o "blink_led.out"
"./main.obj" "../lnk_msp430fr6989.cmd"  -llibmpu_init.a
-llibmath.a -llibc.a
<Linking>
'Finished building target: blink_led.out'
' '

**** Build Finished ****
```

Problems | **Advice**

0 errors, 1 warning, 0 others

Description	Resource	Path
Warnings (1 item)		
[W5369] Silicon Errata CPU40: A jump instruc	main.asm	/blink_le

/blink_led/main.asm

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SBM - CCS Edit - blink_led/main.asm - Code Composer Studio

File Edit View Navigate Project Run Scripts Window Help

Quick Access

Project Explorer

- blink_led [Active - Debug]
  - Binaries
    - blink_led.out - [MSP430/le]
  - Includes
    - blink_led
    - C:/ti/ccsv7/ccs_base/msp430/include
    - C:/ti/ccsv7/tools/compiler/ti-cgt-msp430_16.9.4.LTS/inc
  - Debug
    - blink_led.out - [MSP430/le]
    - main.obj - [MSP430/le]
    - blink_led_linkInfo.xml
    - blink_led.map
    - ccsObjs.opt
    - makefile
    - objects.mk
    - sources.mk
    - subdir_rules.mk
    - subdir_vars.mk
  - targetConfigs
    - MSP430FR6989.ccxml [Active/Default]
    - readme.txt
  - lnk_msp430fr6989.cmd
    - # IPE_MPUIPENA
    - # IPE_MPUIPLOCK
    - # IPE_MPUIPPUC
    - # MPUENA
    - # MPULOCK
    - # MPUPW
    - # MPUSEGIE
  - main.asm

Getting Started | main.asm

```
1  ;-------------------------------------------------------------------------------
2  ; MSP430 Assembler Code Template for use with TI Code Composer Studio
3  ;
4  ;
5  ;-------------------------------------------------------------------------------
6              .c                                                          file
7  ;-------------------------------------------------------------------------------
8              .d                                                          p
9
10 ;-------------------------------------------------------------------------------
11             .g
12             .global __STACK_END
13             .sect   .stack                  ; Make stack linker segment ?known?
14
15             .text                           ; Assemble to Flash memory
16             .retain                         ; Ensure current section gets linked
17             .retainrefs
18
19 _main
20 RESET       mov.w   #__STACK_END,SP         ; Initialize stackpointer
21 StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL  ; Stop WDT
22 SetupP1     bic.b   #BIT0,&P1OUT            ; Clear P1.0 output latch for a defined power-on state
23             bis.b   #BIT0,&P1DIR            ; Set P1.0 to output direction
24 UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0      ; Disable the GPIO power-on default
25                                             ; high-impedance mode to activate
26                                             ; previously configured port settings
27
28 Mainloop    xor.b   #BIT0,&P1OUT            ; Toggle P1.0
29 Wait        mov.w   #50000,R15              ; Delay to R15
30 L1          dec.w   R15                     ; Decrement R15
31             jnz     L1                      ; Delay over?
32             jmp     Mainloop                ; Again
33                                             ;
34 ;-------------------------------------------------------------------------------
35 ;           Interrupt Vectors
36 ;-------------------------------------------------------------------------------
37             .sect   ".reset"                ; MSP430 RESET Vector
38             .short  RESET                   ;
```

En esta ruta están alojados todos los header files con las definiciones de los distintos micros.

Console

CDT Build Console [blink_led]

```
**** Build of configuration Debug for project blink_led ****

"C:\\ti\\ccsv7\\utils\\bin\\gmake" -k -j 4 all -O
gmake[1]: 'blink_led.out' is up to date.

**** Build Finished ****
```

Problems | Advice

0 errors, 1 warning, 0 others

Description	Resource	Path
Warnings (1 item)		
[W5369] Silicon Errata CPU40: A jump instruc	main.asm	/blink_le

Writable | Smart Insert | 6 : 41

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SBM - CCS Edit - blink_led/main.asm - Code Composer Studio

File Edit View Navigate Project Run Scripts Window Help

Quick Access

Project Explorer

- msp430fr6888.h
- msp430fr6889.cmd
- msp430fr6889.h
- msp430fr68891.cmd
- msp430fr68891.h
- msp430fr6920.cmd
- msp430fr6920.h
- msp430fr6922.cmd
- msp430fr6922.h
- msp430fr69221.cmd
- msp430fr69221.h
- msp430fr6927.cmd
- msp430fr6927.h
- msp430fr69271.cmd
- msp430fr69271.h
- msp430fr6928.cmd
- msp430fr6928.h
- msp430fr6970.cmd
- msp430fr6970.h
- msp430fr6972.cmd
- msp430fr6972.h
- msp430fr69721.cmd
- msp430fr69721.h
- msp430fr6977.cmd
- msp430fr6977.h
- msp430fr6979.cmd
- msp430fr6979.h
- msp430fr69791.cmd
- msp430fr69791.h
- msp430fr6987.cmd
- msp430fr6987.h
- msp430fr6988.cmd
- msp430fr6988.h
- msp430fr6989.cmd
- msp430fr6989.h
- msp430fr69891.cmd
- msp430fr69891.h
- msp430fw423.cmd
- msp430fw423.h
- msp430fw425.cmd
- msp430fw425.h
- msp430fw427.cmd
- msp430fw427.h
- msp430fw428.cmd
- msp430fw428.h
- msp430fw429.cmd

Getting Started | main.asm

```
1 ;-------------------------------------------------------------------------------
2 ; MSP430 Assembler Code Template for use with TI Code Composer Studio
3 ;
4 ;
5 ;-------------------------------------------------------------------------------
6             .cdecls C,LIST,"msp430fr6989.h"       ; Include device header file
7 ;-------------------------------------------------------------------------------
8             .def    RESET                         ; Export program entry-point to
9                                                   ; make it known to linker.
10 ;-------------------------------------------------------------------------------
11            .global _main
12            .global __STACK_END
13            .sect   .stack                        ; Make stack linker segment ?known?
14
15            .text                                 ; Assemble to Flash memory
16            .retain                               ; Ensure current section gets linked
17            .retainrefs
18
19 _main
20 RESET       mov.w   #__STACK_END,SP             ; Initialize stackpointer
21 StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL      ; Stop WDT
22 SetupP1     bic.b   #BIT0,&P1OUT                ; Clear P1.0 output latch for a defined power-on state
23             bis.b   #BIT0,&P1DIR                ; Set P1.0 to output direction
24 UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0           ; Disable the GPIO power-on default
25                                                  ; high-impedance mode to activate
26                                                  ; previously configured port settings
27
28 Mainloop    xor.b   #BIT0,&P1OUT                ; Toggle P1.0
29 Wait        mov.w   #50000,R15                  ; Delay to R15
30 L1          dec.w   R15                         ; Decrement R15
31             jnz     L1                          ; Delay over?
32             jmp     Mainloop                    ; Again
33                                                 ;
34 ;-------------------------------------------------------------------------------
35 ;           Interrupt Vectors
36 ;-------------------------------------------------------------------------------
37             .sect   ".reset"                    ; MSP430 RESET Vector
38             .short  RESET                       ;
```

Si pulsamos dos veces sobre msp430fr6989 se abrirá el fichero de cabecera .

```
**** Build Finished ****
```

Problems | Advice

errors, 1 warning, 0 others

Description	Resource	Path
Warnings (1 item)		
[W5369] Silicon Errata CPU40: A jump instruc	main.asm	/blink_le

file:/C:/ti/ccsv7/ccs_base/msp430/include/msp430fr6989.h

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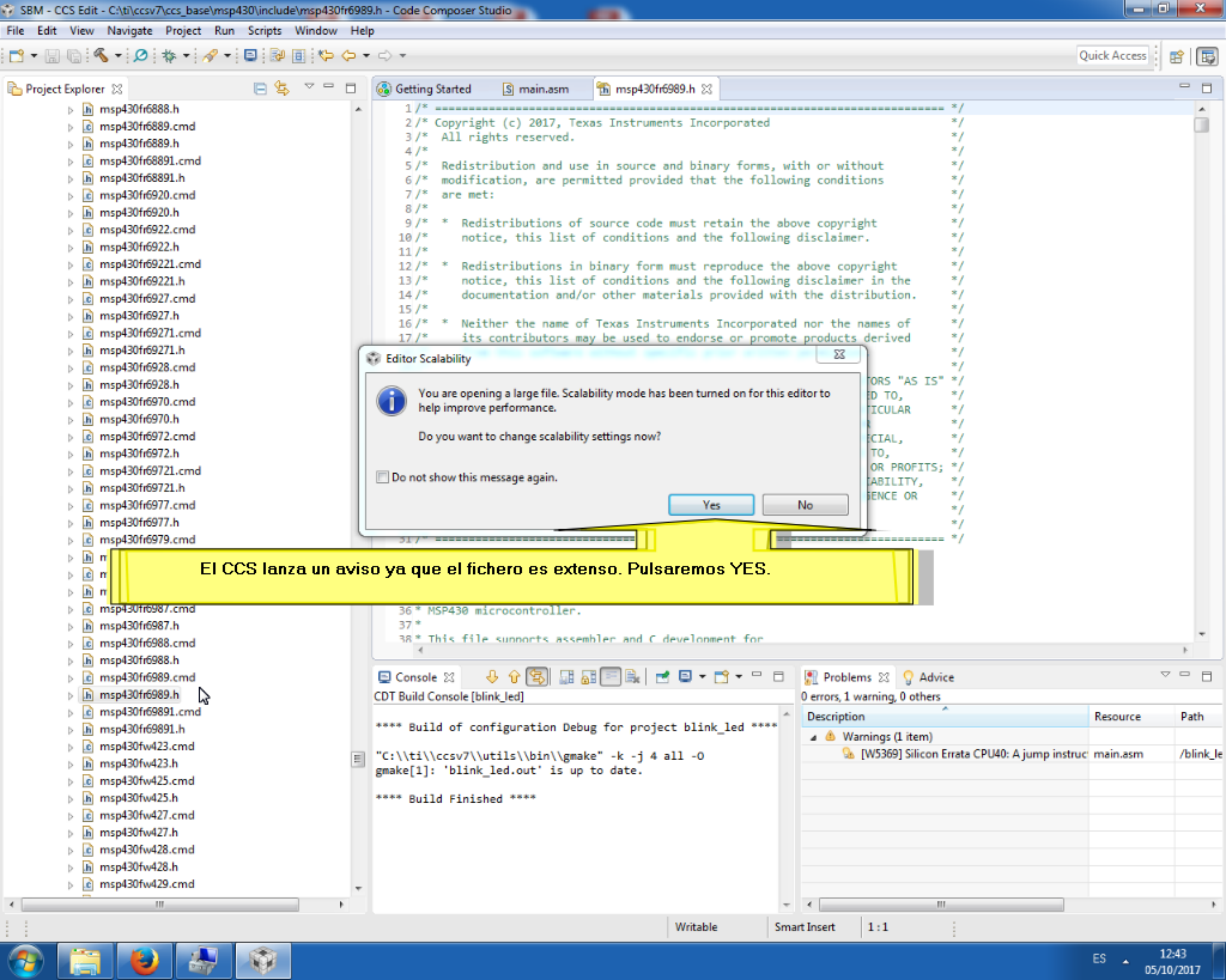
SBM - CCS Edit - C:\ti\ccsv7\ccs_base\msp430\include\msp430fr6989.h - Code Composer Studio
File Edit View Navigate Project Run Scripts Window Help
Quick Access
Project Explorer
msp430fr6888.h
msp430fr6889.cmd
msp430fr6889.h
msp430fr68891.cmd
msp430fr68891.h
msp430fr6920.cmd
msp430fr6920.h
msp430fr6922.cmd
msp430fr6922.h
msp430fr69221.cmd
msp430fr69221.h
msp430fr6927.cmd
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msp430fr69271.cmd
msp430fr69271.h
msp430fr6928.cmd
msp430fr6928.h
msp430fr6970.cmd
msp430fr6970.h
msp430fr6972.cmd
msp430fr6972.h
msp430fr69721.cmd
msp430fr69721.h
msp430fr6977.cmd
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msp430fr6988.h
msp430fr6989.cmd
msp430fr6989.h
msp430fr69891.cmd
msp430fr69891.h
msp430fw423.cmd
msp430fw423.h
msp430fw425.cmd
msp430fw425.h
msp430fw427.cmd
msp430fw427.h
msp430fw428.cmd
msp430fw428.h
msp430fw429.cmd
Getting Started
main.asm
msp430fr6989.h
/* Copyright (c) 2017, Texas Instruments Incorporated */
/* All rights reserved. */
/* Redistribution and use in source and binary forms, with or without */
/* modification, are permitted provided that the following conditions */
/* are met: */
/* * Redistributions of source code must retain the above copyright */
/* notice, this list of conditions and the following disclaimer. */
/* * Redistributions in binary form must reproduce the above copyright */
/* notice, this list of conditions and the following disclaimer in the */
/* documentation and/or other materials provided with the distribution. */
/* * Neither the name of Texas Instruments Incorporated nor the names of */
/* its contributors may be used to endorse or promote products derived */
* MSP430 microcontroller.
Editor Scalability
You are opening a large file. Scalability mode has been turned on for this editor to help improve performance.
Do you want to change scalability settings now?
Do not show this message again.
Yes
No
El CCS lanza un aviso ya que el fichero es extenso. Pulsaremos YES.
Console
CDT Build Console [blink_led]
**** Build of configuration Debug for project blink_led ****
"C:\\ti\\ccsv7\\utils\\bin\\gmake" -k -j 4 all -O
gmake[1]: 'blink_led.out' is up to date.
**** Build Finished ****
Problems
Advice
0 errors, 1 warning, 0 others
Description
Resource
Path
Warnings (1 item)
[W5369] Silicon Errata CPU40: A jump instruc
main.asm
/blink_le
Writable
Smart Insert
1 : 1
ES
12:43
05/10/2017

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File Edit View Navigate Project Run Scripts Window Help

Quick Access

Project Explorer

msp430fr6888.h
msp430fr6889.cmd
msp430fr6889.h
msp430fr68891.cmd
msp430fr68891.h
msp430fr6920.cmd
msp430fr6920.h
msp430fr6922.cmd
msp430fr6922.h
msp430fr69221.cmd
msp430fr69221.h
msp430fr6927.cmd
msp430fr6927.h
msp430fr69271.cmd
msp430fr69271.h
msp430fr6928.cmd
msp430fr6928.h
msp430fr6970.cmd
msp430fr6970.h
msp430fr6972.cmd
msp430fr6972.h
msp430fr69721.cmd
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msp430fr6977.cmd
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msp430fr69891.h
msp430fw423.cmd
msp430fw423.h
msp430fw425.cmd
msp430fw425.h
msp430fw427.cmd
msp430fw427.h
msp430fw428.cmd
msp430fw428.h
msp430fw429.cmd

Getting Started | main.asm | msp430fr6989.h

Preferences

type filter text

- General
- Code Composer Studio
- Help
- Install/Update
- Run/Debug
- Team
- Terminal

Scalability

Settings for editor scalability

Scalability mode detection

Alert me when scalability mode will be turned on

scalability mode when the number of lines in the file is more than: 5000

ility mode settings

bility mode options

or live parsing (Outline view, semantic highlighting and folding will also be disabled)

antic highlighting in editor

tax coloring in editor

sing-based content assist proposals

content assist auto-activation

Parser settings

Skip trivial expressions in initializer lists 1000

Maximum number of tokens per translation unit: 25000000

Note: Some options do not affect open editors

Restore Defaults Apply

Show advanced settings

OK Cancel

Para que no vuelva a avisar desmarcaremos la casilla de Scalability mode detection.

Console

CDT Build Console [blink_led]

```
**** Build of configuration Debug for project blink_led ****

"C:\\ti\\ccsv7\\utils\\bin\\gmake" -k -j 4 all -O
gmake[1]: 'blink_led.out' is up to date.

**** Build Finished ****
```

Problems | Advice

0 errors, 1 warning, 0 others

Description	Resource	Path
Warnings (1 item)		
[W5369] Silicon Errata CPU40: A jump instruc	main.asm	/blink_le

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SBM - CCS Edit - blink_led/main.asm - Code Composer Studio

File Edit View Navigate Project Run Scripts Window Help

Quick Access

Project Explorer

- msp430fr6888.h
- msp430fr6889.cmd
- msp430fr6889.h
- msp430fr68891.cmd
- msp430fr68891.h
- msp430fr6920.cmd
- msp430fr6920.h
- msp430fr6922.cmd
- msp430fr6922.h
- msp430fr69221.cmd
- msp430fr69221.h
- msp430fr6927.cmd
- msp430fr6927.h
- msp430fr69271.cmd
- msp430fr69271.h
- msp430fr6928.cmd
- msp430fr6928.h
- msp430fr6970.cmd
- msp430fr6970.h
- msp430fr6972.cmd
- msp430fr6972.h
- msp430fr69721.cmd
- msp430fr69721.h
- msp430fr6977.cmd
- msp430fr6977.h
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- msp430fr6979.h
- msp430fr69791.cmd
- msp430fr69791.h
- msp430fr6987.cmd
- msp430fr6987.h
- msp430fr6988.cmd
- msp430fr6988.h
- msp430fr6989.cmd
- msp430fr6989.h
- msp430fr69891.cmd
- msp430fr69891.h
- msp430fw423.cmd
- msp430fw423.h
- msp430fw425.cmd
- msp430fw425.h
- msp430fw427.cmd
- msp430fw427.h
- msp430fw428.cmd
- msp430fw428.h
- msp430fw429.cmd

Getting Started | main.asm | msp430fr6989.h

```
1 ;-------------------------------------------------------------------------------
2 ; MSP430 Assembler Code Template for use with TI Code Composer Studio
3 ;
4 ;
5 ;-------------------------------------------------------------------------------
6             .cdecls C,LIST,"msp430fr6989.h"       ; Include device header file
7 ;-------------------------------------------------------------------------------
8             .def    RESET                         ; Export program entry-point to
9                                                   ; make it known to linker.
10 ;-------------------------------------------------------------------------------
11            .global _main
12            .global __STACK_END
13            .sect   .stack                        ; Make stack linker segment ?known?
14
15            .text                                 ; Assemble to Flash memory
16            .retain                               ; Ensure current section gets linked
17            .retainrefs
18
19 _main
20 RESET       mov.w   #__STACK_END,SP             ; Initialize stackpointer
21 StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL      ; Stop WDT
22 SetupP1     bic.b   #BIT0,&P1OUT                ; Clear P1.0 output latch for a defined power-on state
23             bis.b   #BIT0,&P1DIR                ; Set P1.0 to output direction
24 UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0          ; Disable the GPIO power-on default
25                                                  ; high-impedance mode to activate
26                                                  ; previously configured port settings
27
                                                    ; Toggle P1.0
                                                    ; Delay to R15
                                                    ; Decrement R15
                                                    ; Delay over?
                                                    ; Again
                                                    ;
                                                    ; MSP430 RESET Vector
38            .short  RESET                         ;
```

Podemos comprobar con el fichero abierto msp430fr6989.h a que corresponde cada definición.

Console

CDT Build Console [blink_led]

```
**** Build of configuration Debug for project blink_led ****

"C:\\ti\\ccsv7\\utils\\bin\\gmake" -k -j 4 all -O
gmake[1]: 'blink_led.out' is up to date.

**** Build Finished ****
```

Problems | Advice

0 errors, 1 warning, 0 others

Description	Resource	Path
Warnings (1 item)		
[W5369] Silicon Errata CPU40: A jump instruc	main.asm	/blink_le

Writable | Smart Insert | 22 : 26

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SBM - CCS Edit - C:\ti\ccsv7\ccs_base\msp430\include\msp430fr6989.h - Code Composer Studio

File Edit View Navigate Project Run Scripts Window Help

Quick Access

Project Explorer

- msp430fr6888.h
- msp430fr6889.cmd
- msp430fr6889.h
- msp430fr68891.cmd
- msp430fr68891.h
- msp430fr6920.cmd
- msp430fr6920.h
- msp430fr6922.cmd
- msp430fr6922.h
- msp430fr69221.cmd
- msp430fr69221.h
- msp430fr6927.cmd
- msp430fr6927.h
- msp430fr69271.cmd
- msp430fr69271.h
- msp430fr6928.cmd
- msp430fr6928.h
- msp430fr6970.cmd
- msp430fr6970.h
- msp430fr6972.cmd
- msp430fr6972.h
- msp430fr69721.cmd
- msp430fr69721.h
- msp430fr6977.cmd
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- msp430fr6979.cmd
- msp430fr6979.h
- msp430fr69791.cmd
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- msp430fr6988.h
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- msp430fr69891.cmd
- msp430fr69891.h
- msp430fw423.cmd
- msp430fw423.h
- msp430fw425.cmd
- msp430fw425.h
- msp430fw427.cmd
- msp430fw427.h
- msp430fw428.cmd
- msp430fw428.h
- msp430fw429.cmd

Getting Started | main.asm | msp430fr6989.h

```
70 //#define SFR_20BIT(address)  extern volatile unsigned int address
71 typedef void (* __SFR_FARPTR)();
72 #define SFR_20BIT(address) extern __SFR_FARPTR address
73 #define SFR_32BIT(address)  extern volatile unsigned long address
74
75 #endif
76
77
78 /************************************************************
79 * STANDARD BITS
80 ************************************************************/
81
82 #define BIT0                (0x0001)
83 #define BIT1                (0x0002)
84 #define BIT2                (0x0004)
85 #define BIT3                (0x0008)
86 #define BIT4                (0x0010)
                               (0x0020)
                               (0x0040)
                               (0x0080)
                               (0x0100)
                               (0x0200)
                               (0x0400)
                               (0x0800)
                               (0x1000)
                               (0x2000)
                               (0x4000)
97 #define BITF                (0x8000)
98
99 /************************************************************
100 * STATUS REGISTER BITS
101 ************************************************************/
102
103 #define C                   (0x0001)
104 #define Z                   (0x0002)
105 #define N                   (0x0004)
106 #define V                   (0x0100)
107 #define GIE                 (0x0008)
```

Por ejemplo la definición de BIT0 corresponde al valor hexadecimal 0x0001.

Console

CDT Build Console [blink_led]

```
**** Build of configuration Debug for project blink_led ****

"C:\\ti\\ccsv7\\utils\\bin\\gmake" -k -j 4 all -O
gmake[1]: 'blink_led.out' is up to date.

**** Build Finished ****
```

Problems | Advice

0 errors, 1 warning, 0 others

Description	Resource	Path
Warnings (1 item)		
[W5369] Silicon Errata CPU40: A jump instruc	main.asm	/blink_le

Writable | Smart Insert | 82 : 13

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SBM - CCS Edit - blink_led/main.asm - Code Composer Studio

File Edit View Navigate Project Run Scripts Window Help

Quick Access

Project Explorer

- blink_led [Active - Debug]
  - Binaries
    - blink_led.out - [MSP430/le]
  - Includes
    - blink_led
    - C:/ti/ccsv7/ccs_base/msp430/include
    - C:/ti/ccsv7/tools/compiler/ti-cgt-msp430_16.9.4.LTS/inc
  - Debug
    - blink_led.out - [MSP430/le]
    - main.obj - [MSP430/le]
    - blink_led_linkInfo.xml
    - blink_led.map
    - ccsObjs.opt
    - makefile
    - objects.mk
    - sources.mk
    - subdir_rules.mk
    - subdir_vars.mk
  - targetConfigs
    - MSP430FR6989.ccxml [Active/Default]
    - readme.txt
  - lnk_msp430fr6989.cmd
    - # IPE_MPUIPENA
    - # IPE_MPUIPLOCK
    - # IPE_MPUIPPUC
    - # MPUENA
    - # MPULOCK
    - # MPUPW
    - # MPUSEGIE
  - main.asm

Getting Started | main.asm

```
1 ;-------------------------------------------------------------------------------
2 ; MSP430 Assembler Code Template for use with TI Code Composer Studio
3 ;
4 ;
5 ;-------------------------------------------------------------------------------
6             .cdecls C,LIST,"msp430fr6989.h"       ; Include device header file
7 ;-------------------------------------------------------------------------------
8 
9 
10 ;-------------------------------------------------------------------------------
11            .global _main
12            .global __STACK_END
13            .sect   .stack                        ; Make stack linker segment known
14 
15            .text                                 ; Assemble to Flash memory
16            .retain                               ; Ensure current section gets linked
17            .retainrefs
18 
19 _main
20 RESET       mov.w   #__STACK_END,SP             ; Initialize stackpointer
21 StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL      ; Stop WDT
22 SetupP1     bic.b   #BIT0,&P1OUT                ; Clear P1.0 output latch for a defined power-on state
23             bis.b   #BIT0,&P1DIR                ; Set P1.0 to output direction
24 UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0           ; Disable the GPIO power-on default
25                                                 ; high-impedance mode to activate
26                                                 ; previously configured port settings
27 
28 Mainloop    xor.b   #BIT0,&P1OUT                ; Toggle P1.0
29 Wait        mov.w   #50000,R15                  ; Delay to R15
30 L1          dec.w   R15                         ; Decrement R15
31             jnz     L1                          ; Delay over?
32             jmp     Mainloop                    ; Again
33                                                 ;
34 ;-------------------------------------------------------------------------------
35 ;           Interrupt Vectors
36 ;-------------------------------------------------------------------------------
37             .sect   ".reset"                    ; MSP430 RESET Vector
38             .short  RESET                       ;
```

En esta ruta están alojados los ficheros de cabecera que NO son específicos de cada micro.

Console

CDT Build Console [blink_led]

```
**** Build of configuration Debug for project blink_led ****

"C:\\ti\\ccsv7\\utils\\bin\\gmake" -k -j 4 all -O
gmake[1]: 'blink_led.out' is up to date.

**** Build Finished ****
```

Problems | Advice

0 errors, 1 warning, 0 others

Description	Resource	Path
Warnings (1 item)		
[W5369] Silicon Errata CPU40: A jump instruc	main.asm	/blink_le

Writable | Smart Insert | 22 : 33

ES 12:44 05/10/2017

SBM - CCS Edit - blink_led/main.asm - Code Composer Studio

File Edit View Navigate Project Run Scripts Window Help

Quick Access

Project Explorer

- cstring
- ctime
- ctype.h
- cwchar
- cwctype
- deque
- elfnames.h
- errno.h
- exception
- fenv.h
- fenv-softfloat.h
- file.h
- float.h
- fstream
- functional
- hash_map
- hash_set
- intrinsics_legacy_undefs.h
- intrinsics.h
- inttypes.h
- iomanip
- ios
- iosfwd
- iostream
- iso646.h
- istream
- iterator
- limits
- limits.h
- linkage.h
- list
- locale
- locale.h
- lowlev.h
- map
- math.h
- memory
- new
- numeric
- ostream
- pprof.h
- queue
- s__algo.c
- s__algo.h
- s__algobase.c
- s__algobase.h

Getting Started | main.asm

```
1 ;-------------------------------------------------------------------------------
2 ; MSP430 Assembler Code Template for use with TI Code Composer Studio
3 ;
4 ;
5 ;-------------------------------------------------------------------------------
6             .cdecls C,LIST,"msp430fr6989.h"       ; Include device header file
7 ;-------------------------------------------------------------------------------
8             .def    RESET                         ; Export program entry-point to
9                                                   ; make it known to linker.
10 ;-------------------------------------------------------------------------------
11            .global _main
12            .global __STACK_END
13            .sect   .stack                        ; Make stack linker segment ?known?
14
15            .text                                 ; Assemble to Flash memory
16            .retain                               ; Ensure current section gets linked
17            .retainrefs
18
19 _main
20 RESET       mov.w   #__STACK_END,SP             ; Initialize stackpointer
21 StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL      ; Stop WDT
22 SetupP1     bic.b   #BIT0,&P1OUT                ; Clear P1.0 output latch for a defined power-on state
23             bis.b   #BIT0,&P1DIR                ; Set P1.0 to output direction
24 UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0          ; Disable the GPIO power-on default
25                                                  ; high-impedance mode to activate
26                                                  ; previously configured port settings
27
28 Mainloop    xor.b   #BIT0,&P1OUT                ; Toggle P1.0
29 Wait        mov.w   #50000,R15                  ; Delay to R15
30 L1          dec.w   R15                         ; Decrement R15
31             jnz     L1                          ; Delay over?
32             jmp     Mainloop                    ; Again
33                                                 ;
34 ;-------------------------------------------------------------------------------
35 ;           Interrupt Vectors
36 ;-------------------------------------------------------------------------------
37             .sect   ".reset"                    ; MSP430 RESET Vector
38             .short  RESET                       ;
```

Si hacemos doble clic sobre math.h se abrirá el fichero.

Console

```
**** Build Finished ****
```

Problems | Advice

0 errors, 1 warning, 0 others

Description	Resource	Path
Warnings (1 item)		
[W5369] Silicon Errata CPU40: A jump instruc	main.asm	/blink_le

0 items selected

ES 12:44 05/10/2017

SBM - CCS Edit - C:\ti\ccsv7\tools\compiler\ti-cgt-msp430_16.9.4.LTS\include\math.h - Code Composer Studio

File Edit View Navigate Project Run Scripts Window Help

Quick Access

Project Explorer

- cstring
- ctime
- ctype.h
- cwchar
- cwctype
- deque
- elfnames.h
- errno.h
- exception
- fenv.h
- fenv-softfloat.h
- file.h
- float.h
- fstream
- functional
- hash_map
- hash_set
- intrinsics_legacy_undefs.h
- intrinsics.h
- inttypes.h
- iomanip
- ios
- iosfwd
- iostream
- iso646.h
- istream
- iterator
- limits
- limits.h
- linkage.h
- list
- locale
- locale.h
- lowlev.h
- map
- math.h
- memory
- new
- numeric
- ostream
- pprof.h
- queue
- s__algo.c
- s__algo.h
- s__algobase.c
- s__algobase.h

Getting Started | main.asm | math.h

```
103 #define isunordered(x, y)   __builtin_isunordered((x), (y))
104 #else
105 #define isgreater(x, y)     (!isunordered((x), (y)) && (x) > (y))
106 #define isgreaterequal(x, y)    (!isunordered((x), (y)) && (x) >= (y))
107 #define isless(x, y)        (!isunordered((x), (y)) && (x) < (y))
108 #define islessequal(x, y)   (!isunordered((x), (y)) && (x) <= (y))
109 #define islessgreater(x, y) (!isunordered((x), (y)) && \
110                     ((x) > (y) || (y) > (x)))
111 #define isunordered(x, y)   (isnan(x) || isnan(y))
112 #endif /* __MATH_BUILTIN_RELOPS */
113
114 #define signbit(x) (__fp_type_select((x), __signbitf, __signbit, __signbitl))
115
116 /*
117  * XOPEN/SVID
118  */
119 #ifdef __BSD_VISIBLE
120 #define M_E     2.7182818284590452354   /* e */
121 #define M_LOG2E     1.4426950408889634074   /* log 2e */
122 #define M_LOG10E    0.43429448190325182765  /* log 10e */
123 #define M_LN2       0.69314718055994530942  /* log e2 */
124 #define M_LN10      2.30258509299404568402  /* log e10 */
125 #define M_PI        3.14159265358979323846  /* pi */
126 #define M_PI_2      1.57079632679489661923  /* pi/2 */
127 #define M_PI_4      0.78539816339744830962  /* pi/4 */
128 #define M_1_PI      0.31830988618379067154  /* 1/pi */
129 #define M_2_PI      0.63661977236758134308  /* 2/pi */
                        1.12837916709551257390  /* 2/sqrt(pi) */
                        1.41421356237309504880  /* sqrt(2) */
                        0.70710678118654752440  /* 1/sqrt(2) */
138
139 /*---------------------------------------------------------------------------*/
140 /* If --fp-mode=relaxed is used and VFP is enabled, use the hardware square  */
```

Donde por ejemplo, se encuentra la definición del número Pi.

Console

CDT Build Console [blink_led]

```
**** Build of configuration Debug for project blink_led ****

"C:\\ti\\ccsv7\\utils\\bin\\gmake" -k -j 4 all -O
gmake[1]: 'blink_led.out' is up to date.

**** Build Finished ****
```

Problems | Advice

0 errors, 1 warning, 0 others

Description	Resource	Path
Warnings (1 item)		
[W5369] Silicon Errata CPU40: A jump instruc	main.asm	/blink_le

Writable | Smart Insert | 125 : 43

ES 12:44 05/10/2017

SBM - CCS Edit - blink_led/Debug/blink_led_linkInfo.xml - Code Composer Studio

File Edit View Navigate Project Run Scripts Window Help

Quick Access

Project Explorer

- blink_led [Active - Debug]
  - Binaries
    - blink_led.out - [MSP430/le]
  - Includes
    - blink_led
    - C:/ti/ccsv7/ccs_base/msp430/include
    - C:/ti/ccsv7/tools/compiler/ti-cgt-msp430_16.9.4.LTS/inc
  - Debug
    - blink_led.out - [MSP430/le]
    - main.obj - [MSP430/le]
    - blink_led_linkInfo.xml
    - blink_led.map
    - ccsObjs.opt
    - makefile
    - objects.mk
    - sources.mk
    - subdir_rules.mk
    - subdir_vars.mk
  - targetConfigs
    - MSP430FR6989.ccxml [Active/Default]
    - readme.txt
  - lnk_msp430fr6989.cmd
    - # IPE_MPUIPENA
    - # IPE_MPUIPLOCK
    - # IPE_MPUIPPUC
    - # MPUENA
    - # MPULOCK
    - # MPUPW
    - # MPUSEGIE
  - main.asm

Getting Started | main.asm | math.h | blink_led_linkInfo.xml

```
1  <?xml version="1.0"?>
2  <link_info>
3     <banner>MSP430 Linker PC v16.9.4.LTS</banner>
4     <copyright>Copyright (c) 2003-2017 Texas Instruments Incorporated</copyright>
5     <link_time>0x59d60c47</link_time>
6     <link_errors>0x0</link_errors>
7     <output_file>blink_led.out</output_file>
8     <entry_point>
9        <name>RESET</name>
10       <address>0x4400</address>
11    </entry_point>
12    <input_file
13
14
15
16
17
18    </input_
19    <input_file
20       <kind>object</kind>
21       <file>&lt;internal&gt;</file>
22       <name>&lt;internal&gt;</name>
23    </input_file>
24    <input_file id="fl-29">
25       <path>C:\ti\ccsv7\tools\compiler\ti-cgt-msp430_16.9.4.LTS\lib\</path>
26       <kind>archive</kind>
27       <file>rts430x_sc_sd_eabi.lib</file>
28       <name>int27.obj</name>
29    </input_file>
30    <input_file id="fl-2a">
31       <path>C:\ti\ccsv7\tools\compiler\ti-cgt-msp430_16.9.4.LTS\lib\</path>
32       <kind>archive</kind>
33       <file>rts430x_sc_sd_eabi.lib</file>
34       <name>isr_trap.obj</name>
35    </input_file>
36    <input_file id="fl-2b">
37       <path>C:\ti\ccsv7\tools\compiler\ti-cgt-msp430_16.9.4.LTS\lib\</path>
38       <kind>archive</kind>
```

De esta manera podremos ir abriendo y editando todos los ficheros que componen nuestro proyecto.

Console

CDT Build Console [blink_led]

```
**** Build of configuration Debug for project blink_led ****

"C:\\ti\\ccsv7\\utils\\bin\\gmake" -k -j 4 all -O
gmake[1]: 'blink_led.out' is up to date.

**** Build Finished ****
```

Problems | Advice

0 errors, 1 warning, 0 others

Description	Resource	Path
Warnings (1 item)		
[W5369] Silicon Errata CPU40: A jump instruc	main.asm	/blink_le

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SBM - CCS Edit - C:\ti\ccsv7\tools\compiler\ti-cgt-msp430_16.9.4.LTS\include\math.h - Code Composer Studio

File Edit View Navigate Project Run Scripts Window Help

Quick Access

Project Explorer

- blink_led [Active - Debug]
  - Binaries
    - blink_led.out - [MSP430/le]
  - Includes
    - blink_led
    - C:/ti/ccsv7/ccs_base/msp430/include
    - C:/ti/ccsv7/tools/compiler/ti-cgt-msp430_16.9.4.LTS/inc
  - Debug
    - blink_led.out - [MSP430/le]
    - main.obj - [MSP430/le]
    - blink_led_linkInfo.xml
    - blink_led.map
    - ccsObjs.opt
    - makefile
    - objects.mk
    - sources.mk
    - subdir_rules.mk
    - subdir_vars.mk
  - targetConfigs
    - MSP430FR6989.ccxml [Active/Default]
    - readme.txt
  - lnk_msp430fr6989.cmd
    - # IPE_MPUIPENA
    - # IPE_MPUIPLOCK
    - # IPE_MPUIPPUC
    - # MPUENA
    - # MPULOCK
    - # MPUPW
    - # MPUSEGIE
  - main.asm

El fichero con el nombre de nuestro proyecto con la extensión .out es el binario que cargamos en el micro.

Getting Started | main.asm | math.h

```
103 #define isunordered(x, y)   __builtin_isunordered((x), (y))
104 #else
107 #define
108 #define
109 #define
110
111 #define isunordered(x, y)   (isnan(x) || isnan(y))
112 #endif /* __MATH_BUILTIN_RELOPS */
113
114 #define signbit(x) (__fp_type_select((x), __signbitf, __signbit, __signbitl))
115
116 /*
117  * XOPEN/SVID
118  */
119 #ifdef __BSD_VISIBLE
120 #define M_E     2.7182818284590452354   /* e */
121 #define M_LOG2E     1.4426950408889634074   /* log 2e */
122 #define M_LOG10E    0.43429448190325182765  /* log 10e */
123 #define M_LN2       0.69314718055994530942  /* log e2 */
124 #define M_LN10      2.30258509299404568402  /* log e10 */
125 #define M_PI        3.14159265358979323846  /* pi */
126 #define M_PI_2      1.57079632679489661923  /* pi/2 */
127 #define M_PI_4      0.78539816339744830962  /* pi/4 */
128 #define M_1_PI      0.31830988618379067154  /* 1/pi */
129 #define M_2_PI      0.63661977236758134308  /* 2/pi */
130 #define M_2_SQRTPI  1.12837916709551257390  /* 2/sqrt(pi) */
131 #define M_SQRT2     1.41421356237309504880  /* sqrt(2) */
132 #define M_SQRT1_2   0.70710678118654752440  /* 1/sqrt(2) */
133 #endif /* __BSD_VISIBLE */
134
135 #ifdef __cplusplus
136 extern "C" namespace std {
137 #endif
138
139 /*---------------------------------------------------------------------------*/
140 /* If --fp_mode=relaxed is used and VFP is enabled, use the hardware square  */
```

Console

CDT Build Console [blink_led]

```
**** Build of configuration Debug for project blink_led ****

"C:\\ti\\ccsv7\\utils\\bin\\gmake" -k -j 4 all -O
gmake[1]: 'blink_led.out' is up to date.

**** Build Finished ****
```

Problems | Advice

0 errors, 1 warning, 0 others

Description	Resource	Path
Warnings (1 item)		
[W5369] Silicon Errata CPU40: A jump instruc	main.asm	/blink_le

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SBM - CCS Edit - blink_led/targetConfigs/MSP430FR6989.ccxml - Code Composer Studio

File Edit View Navigate Project Run Scripts Window Help

Quick Access

Project Explorer

- blink_led [Active - Debug]
  - Binaries
    - blink_led.out - [MSP430/le]
  - Includes
    - blink_led
    - C:/ti/ccsv7/ccs_base/msp430/include
    - C:/ti/ccsv7/tools/compiler/ti-cgt-msp430_16.9.4.LTS/inc
  - Debug
  - targetConfigs
    - MSP430FR6989.ccxml [Active/Default]
    - readme.txt
  - lnk_msp430fr6989.cmd
    - # IPE_MPUIPENA
    - # IPE_MPUIPLOCK
    - # IPE_MPUIPPUC
    - # MPUENA
    - # MPULOCK
    - # MPUPW
    - # MPUSEGIE
  - main.asm

Getting Started | main.asm | math.h | MSP430FR6989.ccxml

Basic

General Setup

This section describes the general configuration about the target.

Connection: TI MSP430 USB1 [Default]

Board or Device: type filter text

- CC430F5147
- CC430F6125
- CC430F6126

Note: Support for more devices may be available from the update manager.

Advanced Setup

Target Configuration: lists the configuration options for the target.

Save Configuration

...nection, all changes must have been saved, the
...on file contains no errors and the connection type support

Alternate Communication

Si hacemos clic sobre MSP430FR6989ccxml podemos reconfigurar,por ejemplo, el método de acceso a nuestro microcontrolador.

Basic | Advanced | Source

Console

CDT Build Console [blink_led]

```
**** Build of configuration Debug for project blink_led ****

"C:\\ti\\ccsv7\\utils\\bin\\gmake" -k -j 4 all -O
gmake[1]: 'blink_led.out' is up to date.

**** Build Finished ****
```

Problems | Advice

0 errors, 1 warning, 0 others

Description	Resource	Path
Warnings (1 item)		
[W5369] Silicon Errata CPU40: A jump instruc	main.asm	/blink_le

ES 12:45 05/10/2017

SBM - CCS Edit - blink_led/main.asm - Code Composer Studio

File Edit View N...

Podremos ir abriendo los diferentes recursos del IDE a través de la pestaña View.

- Resource Explorer
- Resource Explorer Classic
- Grace Snippets
- Getting Started
- CCS App Center
- GUI Composer™
- Project Explorer
- Problems Alt+Shift+Q, X
- Console Alt+Shift+Q, C
- Advice
- Debug
- Memory Browser
- Registers
- Expressions
- Variables Alt+Shift+Q, V
- Disassembly
- Breakpoints Alt+Shift+Q, B
- Modules
- Terminal
- Scripting Console
- Target Configurations
- Outline Alt+Shift+Q, O
- Stack Usage
- Memory Allocation
- Optimizer Assistant
- Other... Alt+Shift+Q, Q

Quick Access

```
1 ;-------------------------------------------------------------------------------
2 ; MSP430 Assembler Code Template for use with TI Code Composer Studio
3 ;
4 ;
5 ;-------------------------------------------------------------------------------
6             .cdecls C,LIST,"msp430fr6989.h"       ; Include device header file
7 ;-------------------------------------------------------------------------------
8             .def    RESET                         ; Export program entry-point to
9                                                   ; make it known to linker.
10 ;-------------------------------------------------------------------------------
11            .global _main
12            .global __STACK_END
13            .sect   .stack                        ; Make stack linker segment ?known?
14
15            .text                                 ; Assemble to Flash memory
16            .retain                               ; Ensure current section gets linked
17            .retainrefs
18
19 _main
20 RESET       mov.w   #__STACK_END,SP             ; Initialize stackpointer
21 StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL      ; Stop WDT
22 SetupP1     bic.b   #BIT0,&P1OUT                ; Clear P1.0 output latch for a defined power-on state
23             bis.b   #BIT0,&P1DIR                ; Set P1.0 to output direction
24 UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0          ; Disable the GPIO power-on default
25                                                  ; high-impedance mode to activate
26                                                  ; previously configured port settings
27
28 Mainloop    xor.b   #BIT0,&P1OUT                ; Toggle P1.0
29 Wait        mov.w   #50000,R15                  ; Delay to R15
30 L1          dec.w   R15                         ; Decrement R15
31             jnz     L1                          ; Delay over?
32             jmp     Mainloop                    ; Again
33                                                 ;
34 ;-------------------------------------------------------------------------------
35 ;           Interrupt Vectors
36 ;-------------------------------------------------------------------------------
37             .sect   ".reset"                    ; MSP430 RESET Vector
38             .short  RESET                       ;
```

Console

CDT Build Console [blink_led]

```
**** Build of configuration Debug for project blink_led ****

"C:\\ti\\ccsv7\\utils\\bin\\gmake" -k -j 4 all -O
gmake[1]: 'blink_led.out' is up to date.

**** Build Finished ****
```

Problems Advice

0 errors, 1 warning, 0 others

Description	Resource	Path
Warnings (1 item)		
[W5369] Silicon Errata CPU40: A jump instruc	main.asm	/blink_le

Writable | Smart Insert | 19 : 6

ES 12:45 05/10/2017

SBM - CCS Edit - blink_led/main.asm - Code Composer Studio

File Edit View Navigate Project Run

En la pestaña Project podremos desde compilar, hasta crear un nuevo proyectc como importar Sketchs del IDE Energía.

Project Explorer

- blink_led [Active - De
  - Binaries
    - blink_led.out - [
  - Includes
    - blink_led
    - C:/ti/ccsv7/ccs_
    - C:/ti/ccsv7/too
  - Debug
  - targetConfigs
    - MSP430FR6989.
    - readme.txt
  - lnk_msp430fr6989.c
  - main.asm

Project menu:

- New CCS Project...
- New Energia Sketch...
- Examples...
- Build Project
- Build All Ctrl+B
- Build Configurations
- Build Working Set
- Clean...
- Build Automatically
- Show Build Settings...
- Import CCS Projects...
- Import Legacy CCSv3.3 Projects...
- Add Files...
- RTSC Tools
- Import Energia Sketch...
- Import Energia Libraries...
- C/C++ Index
- Properties

Quick Access

```
;-------------------------------------------------------------------------------
;           .cdecls C,LIST,"msp430fr6989.h"       ; Include device header file
;-------------------------------------------------------------------------------
;           .def    RESET                         ; Export program entry-point to
;                                                 ; make it known to linker.
;-------------------------------------------------------------------------------
;           .global _main
;           .global __STACK_END
;           .sect   .stack                        ; Make stack linker segment ?known?

;           .text                                 ; Assemble to Flash memory
;           .retain                               ; Ensure current section gets linked
;           .retainrefs

;           mov.w   #__STACK_END,SP               ; Initialize stackpointer
;           mov.w   #WDTPW+WDTHOLD,&WDTCTL        ; Stop WDT
;           bic.b   #BIT0,&P1OUT                  ; Clear P1.0 output latch for a defined power-on state
;           bis.b   #BIT0,&P1DIR                  ; Set P1.0 to output direction
;PIO        bic.w   #LOCKLPM5,&PM5CTL0            ; Disable the GPIO power-on default
;                                                 ; high-impedance mode to activate
;                                                 ; previously configured port settings
26
27
28 Mainloop xor.b   #BIT0,&P1OUT                  ; Toggle P1.0
29 Wait     mov.w   #50000,R15                    ; Delay to R15
30 L1       dec.w   R15                           ; Decrement R15
31          jnz     L1                            ; Delay over?
32          jmp     Mainloop                      ; Again
33                                                ;
34;-------------------------------------------------------------------------------
35;           Interrupt Vectors
36;-------------------------------------------------------------------------------
37          .sect   ".reset"                      ; MSP430 RESET Vector
38          .short  RESET                         ;
```

Console

CDT Build Console [blink_led]

```
**** Build of configuration Debug for project blink_led ****

"C:\\ti\\ccsv7\\utils\\bin\\gmake" -k -j 4 all -O
gmake[1]: 'blink_led.out' is up to date.

**** Build Finished ****
```

Problems Advice

0 errors, 1 warning, 0 others

Description	Resource	Path
Warnings (1 item)		
[W5369] Silicon Errata CPU40: A jump instruc	main.asm	/blink_le

Writable Smart Insert 19 : 6

ES 12:45 05/10/2017

SBM - CCS Edit - blink_led/main.asm - Code Composer Studio

File Edit View Navigate Project Run

Debug F11

Debug History

Debug Configurations...

En la pestaña Run se accede al debugger y a su configuración.

Quick Access

Project Explorer

- blink_led [Active - Debug]
  - Binaries
    - blink_led.out - [MSP430/le]
  - Includes
    - blink_led
    - C:/ti/ccsv7/ccs_base/msp430/include
    - C:/ti/ccsv7/tools/compiler/ti-cgt-msp430_16.9.4.LTS/inc
  - Debug
  - targetConfigs
    - MSP430FR6989.ccxml [Active/Default]
    - readme.txt
  - lnk_msp430fr6989.cmd
  - main.asm

Start

```
;-------------------------------------------------------------------------------
; MSP430 Assembler Code Template for use with TI Code Composer Studio
;
;
;-------------------------------------------------------------------------------
            .cdecls C,LIST,"msp430fr6989.h"       ; Include device header file
;-------------------------------------------------------------------------------
            .def    RESET                         ; Export program entry-point to
                                                  ; make it known to linker.
;-------------------------------------------------------------------------------
            .global _main
            .global __STACK_END
            .sect   .stack                        ; Make stack linker segment ?known?

            .text                                 ; Assemble to Flash memory
            .retain                               ; Ensure current section gets linked
            .retainrefs

_main
RESET       mov.w   #__STACK_END,SP               ; Initialize stackpointer
StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL        ; Stop WDT
SetupP1     bic.b   #BIT0,&P1OUT                  ; Clear P1.0 output latch for a defined power-on state
            bis.b   #BIT0,&P1DIR                  ; Set P1.0 to output direction
UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0            ; Disable the GPIO power-on default
                                                  ; high-impedance mode to activate
                                                  ; previously configured port settings

Mainloop    xor.b   #BIT0,&P1OUT                  ; Toggle P1.0
Wait        mov.w   #50000,R15                    ; Delay to R15
L1          dec.w   R15                           ; Decrement R15
            jnz     L1                            ; Delay over?
            jmp     Mainloop                      ; Again
                                                  ;
;-------------------------------------------------------------------------------
;           Interrupt Vectors
;-------------------------------------------------------------------------------
            .sect   ".reset"                      ; MSP430 RESET Vector
            .short  RESET                         ;
```

Console

CDT Build Console [blink_led]

```
**** Build of configuration Debug for project blink_led ****

"C:\\ti\\ccsv7\\utils\\bin\\gmake" -k -j 4 all -O
gmake[1]: 'blink_led.out' is up to date.

**** Build Finished ****
```

Problems Advice

0 errors, 1 warning, 0 others

Description	Resource	Path
Warnings (1 item)		
[W5369] Silicon Errata CPU40: A jump instruc	main.asm	/blink_le

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ES 12:45 05/10/2017

SBM - CCS Edit - blink_led/main.asm - Code Composer Studio

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En Windows se pueden abrir nuevas ventanas y editar las preferencias de las mismas.

Quick Access

Project Explorer

- blink_led [Active - Debug]
  - Binaries
    - blink_led.out - [MSP430/le]
  - Includes
    - blink_led
    - C:/ti/ccsv7/ccs_base/msp430/include
    - C:/ti/ccsv7/tools/compiler/ti-cgt-msp430
  - Debug
  - targetConfigs
    - MSP430FR6989.ccxml [Active/Default]
    - readme.txt
  - lnk_msp430fr6989.cmd
  - main.asm

```
;-------------------------------------------------------------------------------
30 Assembler Code Template for use with TI Code Composer Studio


;-------------------------------------------------------------------------------
            .cdecls C,LIST,"msp430fr6989.h"       ; Include device header file
;-------------------------------------------------------------------------------
            .def    RESET                         ; Export program entry-point to
                                                  ; make it known to linker.
;-------------------------------------------------------------------------------
            .global _main
            .global __STACK_END
            .sect   .stack                        ; Make stack linker segment ?known?

            .text                                 ; Assemble to Flash memory
            .retain                               ; Ensure current section gets linked
            .retainrefs

_main
RESET       mov.w   #__STACK_END,SP               ; Initialize stackpointer
StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL        ; Stop WDT
SetupP1     bic.b   #BIT0,&P1OUT                  ; Clear P1.0 output latch for a defined power-on state
            bis.b   #BIT0,&P1DIR                  ; Set P1.0 to output direction
UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0            ; Disable the GPIO power-on default
                                                  ; high-impedance mode to activate
                                                  ; previously configured port settings

Mainloop    xor.b   #BIT0,&P1OUT                  ; Toggle P1.0
Wait        mov.w   #50000,R15                    ; Delay to R15
L1          dec.w   R15                           ; Decrement R15
            jnz     L1                            ; Delay over?
            jmp     Mainloop                      ; Again
                                                  ;
;-------------------------------------------------------------------------------
;           Interrupt Vectors
;-------------------------------------------------------------------------------
            .sect   ".reset"                      ; MSP430 RESET Vector
            .short  RESET                         ;
```

Console

CDT Build Console [blink_led]

```
**** Build of configuration Debug for project blink_led ****

"C:\\ti\\ccsv7\\utils\\bin\\gmake" -k -j 4 all -O
gmake[1]: 'blink_led.out' is up to date.

**** Build Finished ****
```

Problems | Advice

0 errors, 1 warning, 0 others

Description	Resource	Path
Warnings (1 item)		
[W5369] Silicon Errata CPU40: A jump instruc	main.asm	/blink_le

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File Edit View Navigate Project Run Scripts Window Help

En el menú Help podremos acceder además de a la ayuda integrada, a videos y tutoriales que nos facilitarán el desarrollo de proyectos.

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Cheat Sheets...
CCS App Center
Check for Updates
Install New Software...
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About Code Composer Studio

Project Explorer
- blink_led [Active - Debug]
  - Binaries
    - blink_led.out - [MSP430/le]
  - Includes
    - blink_led
    - C:/ti/ccsv7/ccs_base/msp430/include
    - C:/ti/ccsv7/tools/compiler/ti-cgt-msp430_16.9.4.LTS
  - Debug
  - targetConfigs
    - MSP430FR6989.ccxml [Active/Default]
    - readme.txt
  - lnk_msp430fr6989.cmd
  - main.asm

```
                                        or use with TI Code Composer Studio

;-------------------------------------------------------------------------------
fr6989.h"       ; Include device header file
;-------------------------------------------------------------------------------
            ; Export program entry-point to
            ; make it known to linker.
;-------------------------------------------------------------------------------


            ; Make stack linker segment ?known?

            ; Assemble to Flash memory
            ; Ensure current section gets linked


            ; Initialize stackpointer
,&WDTCTL    ; Stop WDT
            ; Clear P1.0 output latch for a defined power-on state
23          bis.b   #BIT0,&P1DIR        ; Set P1.0 to output direction
24 UnlockGPIO bic.w #LOCKLPM5,&PM5CTL0  ; Disable the GPIO power-on default
25                                      ; high-impedance mode to activate
26                                      ; previously configured port settings
27
28 Mainloop xor.b   #BIT0,&P1OUT        ; Toggle P1.0
29 Wait     mov.w   #50000,R15          ; Delay to R15
30 L1       dec.w   R15                 ; Decrement R15
31          jnz     L1                  ; Delay over?
32          jmp     Mainloop            ; Again
33                                      ;
34 ;-------------------------------------------------------------------------------
35 ;           Interrupt Vectors
36 ;-------------------------------------------------------------------------------
37          .sect   ".reset"            ; MSP430 RESET Vector
38          .short  RESET               ;
```

Console

CDT Build Console [blink_led]

```
**** Build of configuration Debug for project blink_led ****

"C:\\ti\\ccsv7\\utils\\bin\\gmake" -k -j 4 all -O
gmake[1]: 'blink_led.out' is up to date.

**** Build Finished ****
```

Problems | Advice

0 errors, 1 warning, 0 others

Description	Resource	Path
Warnings (1 item)		
[W5369] Silicon Errata CPU40: A jump instruc	main.asm	/blink_le

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Haciendo clic aquí, abriremos un terminal configurable. Podrá ser Local, Serial, SSH o Telnet y además totalmente configurable.

Project Explorer

- blink_led [Active - Debug]
  - Binaries
    - blink_led.out - [MSP430/le]
  - Includes
    - blink_led
    - C:/ti/ccsv7/ccs_base/msp430/include
    - C:/ti/ccsv7/tools/compiler/ti-cgt-msp430_16.9.4.LTS/inc
  - Debug
  - targetConfigs
    - MSP430FR6989.ccxml [Active/Default]
    - readme.txt
  - lnk_msp430fr6989.cmd
  - main.asm

Getting Started | main.asm

```
1 ;-------------------
2 ; MSP430 Assembler Cod
3 ;
4 ;
5 ;-----------------------------------------------------------------------------
6           .cdecls C,LIST,"msp430fr6989.h"       ; Include device header file
7 ;-----------------------------------------------------------------------------
8           .def    RESET                         ; Export program entry-point to
9                                                 ; make it known to linker.
10 ;-----------------------------------------------------------------------------
11          .global _main
12          .global __STACK_END
13          .sect   .stack                        ; Make stack linker segment ?known?
14
15          .text                                 ; Assemble to Flash memory
16          .retain                               ; Ensure current section gets linked
17          .retainrefs
18
19 _main
20 RESET       mov.w   #__STACK_END,SP           ; Initialize stackpointer
21 StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL    ; Stop WDT
22 SetupP1     bic.b   #BIT0,&P1OUT              ; Clear P1.0 output latch for a defined power-on state
23             bis.b   #BIT0,&P1DIR              ; Set P1.0 to output direction
24 UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0        ; Disable the GPIO power-on default
25                                               ; high-impedance mode to activate
26                                               ; previously configured port settings
27
28 Mainloop    xor.b   #BIT0,&P1OUT              ; Toggle P1.0
29 Wait        mov.w   #50000,R15                ; Delay to R15
30 L1          dec.w   R15                       ; Decrement R15
31             jnz     L1                        ; Delay over?
32             jmp     Mainloop                  ; Again
33                                               ;
34 ;-----------------------------------------------------------------------------
35 ;           Interrupt Vectors
36 ;-----------------------------------------------------------------------------
37             .sect   ".reset"                  ; MSP430 RESET Vector
38             .short  RESET                     ;
```

Console

CDT Build Console [blink_led]

```
**** Build of configuration Debug for project blink_led ****

"C:\\ti\\ccsv7\\utils\\bin\\gmake" -k -j 4 all -O
gmake[1]: 'blink_led.out' is up to date.

**** Build Finished ****
```

Problems | Advice

0 errors, 1 warning, 0 others

Description	Resource	Path
Warnings (1 item)		
[W5369] Silicon Errata CPU40: A jump instruc	main.asm	/blink_le

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Si pulsamos en este icono accedermos al entorno del debugger del IDE.

Conmutaremos entre las pantallas de edición y debugger en estos accesos rápidos.

Project Explorer — Debug main.asm

- blink_led [Active - Debug]
  - Binaries
    - blink_led.out - [MSP430/le]
  - Includes
    - blink_led
    - C:/ti/ccsv7/ccs_base/msp430/include
    - C:/ti/ccsv7/tools/compiler/ti-cgt-msp430_16.9.4.LTS/inc
  - Debug
  - targetConfigs
    - MSP430FR6989.ccxml [Active/Default]
    - readme.txt
  - lnk_msp430fr6989.cmd
  - main.asm

```
1 ;-------------------------------------------------------------------------------
2 ; MSP430 Assembler Code Template for use with TI Code Composer Studio
3 ;
4 ;
5 ;-------------------------------------------------------------------------------
6             .cdecls C,LIST,"msp430fr6989.h"       ; Include device header file
7 ;-------------------------------------------------------------------------------
8             .def    RESET                         ; Export program entry-point to
9                                                   ; make it known to linker.
10 ;-------------------------------------------------------------------------------
11            .global _main
12            .global __STACK_END
13            .sect   .stack                        ; Make stack linker segment ?known?
14
15            .text                                 ; Assemble to Flash memory
16            .retain                               ; Ensure current section gets linked
17            .retainrefs
18
19 _main
20 RESET       mov.w   #__STACK_END,SP             ; Initialize stackpointer
21 StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL      ; Stop WDT
22 SetupP1     bic.b   #BIT0,&P1OUT                ; Clear P1.0 output latch for a defined power-on state
23             bis.b   #BIT0,&P1DIR                ; Set P1.0 to output direction
24 UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0           ; Disable the GPIO power-on default
25                                                  ; high-impedance mode to activate
26                                                  ; previously configured port settings
27
28 Mainloop    xor.b   #BIT0,&P1OUT                ; Toggle P1.0
29 Wait        mov.w   #50000,R15                  ; Delay to R15
30 L1          dec.w   R15                         ; Decrement R15
31             jnz     L1                          ; Delay over?
32             jmp     Mainloop                    ; Again
33                                                 ;
34 ;-------------------------------------------------------------------------------
35 ;           Interrupt Vectors
36 ;-------------------------------------------------------------------------------
37             .sect   ".reset"                    ; MSP430 RESET Vector
38             .short  RESET                       ;
```

Console

CDT Build Console [blink_led]

```
**** Build of configuration Debug for project blink_led ****

"C:\\ti\\ccsv7\\utils\\bin\\gmake" -k -j 4 all -O
gmake[1]: 'blink_led.out' is up to date.

**** Build Finished ****
```

Problems | Advice

0 errors, 1 warning, 0 others

Description	Resource	Path
Warnings (1 item)		
[W5369] Silicon Errata CPU40: A jump instruc	main.asm	/blink_le

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Quick Access

Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended)

$../main.asm:20:37$() at main.asm:20 0x004400 (the entry point was reached)

Variables | Expressions | Registers

Name	Type	Value	Location

Getting Started | main.asm

```
2 ; MSP430 Assembler Code Template for use with TI Code Composer Studio
3 ;
4 ;
5 ;-------------------------------------------------------------------------------
6           .cdecls C,LIST,"msp430fr6989.h"       ; Include device header file
7 ;-------------------------------------------------------------------------------
8           .def    RESET                         ; Export program entry-point to
9                                                 ; make it known to linker.
10 ;-------------------------------------------------------------------------------
11          .global _main
12          .global __STACK_END
13          .sect   .stack                        ; Make stack linker segment ?known?
14
15          .text                                 ; Assemble to Flash memory
16          .retain                               ; Ensure current section gets linked
17          .retainrefs
18
19 _main
20 RESET     mov.w   #__STACK_END,SP
21 StopWDT   mov.w   #WDTPW+WDTHOLD,&WDTCTL  ; Stop WDT
22 SetupP1   bic.b   #BIT0,&P1OUT           ; Clear P1.0 output latch for a de
23           bis.b   #BIT0,&P1DIR           ; Set P1.0 to output direction
24 UnlockGPIO bic.w  #LOCKLPM5,&PM5CTL0     ; Disable the GPIO power-on default
25                                          ; high-impedance mode to activate
26                                          ; previously configured port settings
27
28 Mainloop  xor.b   #BIT0,&P1OUT           ; Toggle P1.0
```

El debugger en su inicio se situa en la primera línea de código a partir del _main.

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
```

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SBM - CCS Debug - blink_led/main.asm - Code Composer Studio

File Edit View Project Tools Run Scripts Window Help

Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended)

$../main.asm:20:37$() at main.asm:20 0x004400 (the entry point was reached

Variables Exp Registers

Name

Registers

Para ejecutar el código paso a paso por instrucciones hay que hacer clic en este botón. Es decir ejecuta el código línea a línea.

Para ejecutar el código paso a paso por procedimiento hay que hacer clic en este botón Es decir en caso de querer ejecutar toda una función o subrutina.

Getting Started main.asm

```
2 ; MSP430 Assembler Code Template for use with TI Code Composer Studio
3 ;
4 ;
5 ;-------------------------------------------------------------------------------
6             .cdecls C,LIST,"msp430fr6989.h"       ; Include device header file
7 ;-------------------------------------------------------------------------------
8             .def    RESET                         ; Export program entry-point to
9                                                   ; make it known to linker.
10 ;-------------------------------------------------------------------------------
11            .global _main
12            .global __STACK_END
13            .sect   .stack                        ; Make stack linker segment ?known?
14
15            .text                                 ; Assemble to Flash memory
16            .retain                               ; Ensure current section gets linked
17            .retainrefs
18
19 _main
20 RESET       mov.w   #__STACK_END,SP             ; Initialize stackpointer
21 StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL      ; Stop WDT
22 SetupP1     bic.b   #BIT0,&P1OUT                ; Clear P1.0 output latch for a defined power-on state
23             bis.b   #BIT0,&P1DIR                ; Set P1.0 to output direction
24 UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0           ; Disable the GPIO power-on default
25                                                  ; high-impedance mode to activate
26                                                  ; previously configured port settings
27
28 Mainloop    xor.b   #BIT0,&P1OUT                ; Toggle P1.0
```

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
```

ES 12:46 05/10/2017

SBM - CCS Debug - blink_led/main.asm - Code Composer Studio

File Edit View Project Tools Run Scripts Window Help

Quick Access

Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended)

$../main.asm:20:37$() at main.asm:21 0x004404 (the entry point was reached)

Variables Expr Registers

Name	Value	Description
Core Registers		Core Registers
ADC12		

Usaremos el modo paso a paso. De código en assembler.

Getting Started main.asm

```
3 ;
4 ;
5 ;-------------------------------------------------------------------------
6             .cdecls C,LIST,"msp430fr6989.h"       ; Include device header file
7 ;-------------------------------------------------------------------------
8             .def    RESET                         ; Export program entry-point to
9                                                   ; make it known to linker.
10;-------------------------------------------------------------------------
11            .global _main
12            .global __STACK_END
13            .sect   .stack                        ; Make stack linker segment ?known?
14
15            .text                                 ; Assemble to Flash memory
16            .retain                               ; Ensure current section gets linked
17            .retainrefs
18
19_main
20RESET       mov.w   #__STACK_END,SP               ; Initialize stackpointer
21StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL        ; Stop WDT
22SetupP1     bic.b   #BIT0,&P1OUT                  ; Clear P1.0 output latch for a defined power-on state
23            bis.b   #BIT0,&P1DIR                  ; Set P1.0 to output direction
24UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0            ; Disable the GPIO power-on default
25                                                  ; high-impedance mode to activate
26                                                  ; previously configured port settings
27
28Mainloop    xor.b   #BIT0,&P1OUT                  ; Toggle P1.0
29Wait        mov.w   #50000,R15                    ; Delay to R15
```

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
```

ES 12:46 05/10/2017

SBM - CCS Debug - blink_led/main.asm - Code Composer Studio

File Edit View Project Tools Run Scripts Window Help

Quick Access

Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended)

Variables Expressions Registers

Name Description

USCI_A0__SPI_M

USCI_B1__SPI_Mode

USCI_B1__I2C_Mode

Watchdog_Timer

Desplegando la pestaña de Registers podemos ver el valor de los registros que conforman el micro.

Getting Started main.asm

```
3 ;
4 ;
5 ;-------------------------------------------------------------------------------
6             .cdecls C,LIST,"msp430fr6989.h"       ; Include device header file
7 ;-------------------------------------------------------------------------------
8             .def    RESET                         ; Export program entry-point to
9                                                   ; make it known to linker.
10 ;-------------------------------------------------------------------------------
11            .global _main
12            .global __STACK_END
13            .sect   .stack                        ; Make stack linker segment ?known?
14
15            .text                                 ; Assemble to Flash memory
16            .retain                               ; Ensure current section gets linked
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19 _main
20 RESET       mov.w   #__STACK_END,SP             ; Initialize stackpointer
21 StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL      ; Stop WDT
22 SetupP1     bic.b   #BIT0,&P1OUT                ; Clear P1.0 output latch for a defined power-on state
23             bis.b   #BIT0,&P1DIR                ; Set P1.0 to output direction
24 UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0           ; Disable the GPIO power-on default
25                                                  ; high-impedance mode to activate
26                                                  ; previously configured port settings
27
28 Mainloop    xor.b   #BIT0,&P1OUT                ; Toggle P1.0
29 Wait        mov.w   #50000,R15                  ; Delay to R15
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Console

blink_led

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MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
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SBM - CCS Debug - blink_led/main.asm - Code Composer Studio

File Edit View Project Tools Run Scripts Window Help

Quick Access

Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended)

$../main.asm:20:37$() at main.asm:21 0x

Por ejemplo el valor del registro WDTCTL.

Variables | Expressions | Registers

Name	Value	Description
USCI_B1_I2C_Mode		
Watchdog_Timer		
WDTCTL	0x6904	Watchdog Timer Control [Memory Map
WDTHOLD	0	WDT - Timer hold
WDTSSEL	00 - WDTSSEL_0	WDT - Timer Clock Source Select 0
WDTTMSEL	0	WDT - Timer Mode Select
WDTCNTCL	0	WDT - Timer Clear
WDTIS	100 - WDTIS_4	WDT - Timer Interval Select 0

Getting Started | main.asm

```
3 ;
4 ;
5 ;-------------------------------------------------------------------------------
6             .cdecls C,LIST,"msp430fr6989.h"       ; Include device header file
7 ;-------------------------------------------------------------------------------
8             .def    RESET                         ; Export program entry-point to
9                                                   ; make it known to linker.
10 ;-------------------------------------------------------------------------------
11            .global _main
12            .global __STACK_END
13            .sect   .stack                        ; Make stack linker segment ?known?
14
15            .text                                 ; Assemble to Flash memory
16            .retain                               ; Ensure current section gets linked
17            .retainrefs
18
19 _main
20 RESET       mov.w   #__STACK_END,SP             ; Initialize stackpointer
21 StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL      ; Stop WDT
22 SetupP1     bic.b   #BIT0,&P1OUT                ; Clear P1.0 output latch for a defined power-on state
23             bis.b   #BIT0,&P1DIR                ; Set P1.0 to output direction
24 UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0           ; Disable the GPIO power-on default
25                                                  ; high-impedance mode to activate
26                                                  ; previously configured port settings
27
28 Mainloop    xor.b   #BIT0,&P1OUT                ; Toggle P1.0
29 Wait        mov.w   #50000,R15                  ; Delay to R15
```

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
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ES 12:46 05/10/2017

SBM - CCS Debug - blink_led/main.asm - Code Composer Studio

File Edit View Project Tools Run Scripts Window Help

Quick Access

Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended)

$../main.asm:20:37$() at main.asm:22 0x00440A (the entry

Vemos como se ha escrito en el registro el valor deseado.

Variables Expressions Registers

Name	Value	Description
USCI_B1__I2C_Mode		
Watchdog_Timer		
WDTCTL	0x6980	Watchdog Timer Control [Memory Map
WDTHOLD	1	WDT - Timer hold
WDTSSEL	00 - WDTSSEL_0	WDT - Timer Clock Source Select 0
WDTTMSEL	0	WDT - Timer Mode Select
WDTCNTCL	0	WDT - Timer Clear
WDTIS	000 - WDTIS_0	WDT - Timer Interval Select 0

Getting Started main.asm

```
4 ;
5 ;-------------------------------------------------------------------------------
6             .cdecls C,LIST,"msp430fr6989.h"       ; Include device header file
7 ;-------------------------------------------------------------------------------
8             .def    RESET                         ; Export program entry-point to
9                                                   ; make it known to linker.
10 ;-------------------------------------------------------------------------------
11            .global _main
12            .global __STACK_END
13            .sect   .stack                        ; Make stack linker segment ?known?
14
15            .text                                 ; Assemble to Flash memory
16            .retain                               ; Ensure current section gets linked
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18
19 _main
20 RESET       mov.w   #__STACK_END,SP             ; Initialize stackpointer
21 StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL      ; Stop WDT
22 SetupP1     bic.b   #BIT0,&P1OUT                ; Clear P1.0 output latch for a defined power-on state
23             bis.b   #BIT0,&P1DIR                ; Set P1.0 to output direction
24 UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0          ; Disable the GPIO power-on default
25                                                  ; high-impedance mode to activate
26                                                  ; previously configured port settings
27
28 Mainloop    xor.b   #BIT0,&P1OUT                ; Toggle P1.0
29 Wait        mov.w   #50000,R15                  ; Delay to R15
30 L1          dec.w   R15                         ; Decrement R15
```

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
```

ES 12:46 05/10/2017

SBM - CCS Debug - blink_led/main.asm - Code Composer Studio

File Edit View Project Tools Run Scripts Window Help

Quick Access

Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended)

$../main.asm:20:37$() at main.asm:22 0x00440A (the entry point was reached)

Ahora veremos el estado del registro P1OUT.

Variables Expressions Registers

Name	Value	Description
MPY_32__Multiplier__32_Bit_Mode		
PMM__Power_Management_System		
Port_A		
Port_1_2		
P1IN	0xF0	Port 1 Input [Memory Mapped]
P1OUT	0x57	Port 1 Output [Memory Mapped]
P1OUT7	0	P1OUT7
P1OUT6	1	P1OUT6

Getting Started main.asm

```
4 ;
5 ;-------------------------------------------------------------------------------
6             .cdecls C,LIST,"msp430fr6989.h"       ; Include device header file
7 ;-------------------------------------------------------------------------------
8             .def    RESET                         ; Export program entry-point to
9                                                   ; make it known to linker.
10 ;-------------------------------------------------------------------------------
11            .global _main
12            .global __STACK_END
13            .sect   .stack                        ; Make stack linker segment ?known?
14
15            .text                                 ; Assemble to Flash memory
16            .retain                               ; Ensure current section gets linked
17            .retainrefs
18
19 _main
20 RESET       mov.w   #__STACK_END,SP             ; Initialize stackpointer
21 StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL      ; Stop WDT
22 SetupP1     bic.b   #BIT0,&P1OUT                ; Clear P1.0 output latch for a defined power-on state
23             bis.b   #BIT0,&P1DIR                ; Set P1.0 to output direction
24 UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0          ; Disable the GPIO power-on default
25                                                  ; high-impedance mode to activate
26                                                  ; previously configured port settings
27
28 Mainloop    xor.b   #BIT0,&P1OUT                ; Toggle P1.0
29 Wait        mov.w   #50000,R15                  ; Delay to R15
30 L1          dec.w   R15                         ; Decrement R15
```

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
```

ES 12:46 05/10/2017

SBM - CCS Debug - blink_led/main.asm - Code Composer Studio

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Quick Access

Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended)

$../main.asm:20:37$() at main.asm:22 0x00440A (the entry point was reached)

Variables Expressions Registers

Name	Value	Description
P1OUT7	0	P1OUT7
P1OUT6	1	P1OUT6
P1OUT5	0	P1OUT5
P1OUT4	1	P1OUT4
P1OUT3	0	P1OUT3
P1OUT2	1	P1OUT2
P1OUT1	1	P1OUT1
P1OUT0	1	P1OUT0

Getting Started main.asm

```
4 ;
5 ;-------------------------------------------------------------------------------
6             .cdecls C,LIST,"msp430fr6989.h"       ; Include device header file
7 ;-------------------------------------------------------------------------------
8             .def    RESET                         ; Export program entry-point to
9                                                   ; make it known to linker.
10 ;-------------------------------------------------------------------------------
11            .global _main
12            .global __STACK_END
13            .sect   .stack                        ; Make stack linker segment ?known?
14
15            .text                                 ; Assemble to Flash memory
16            .retain                               ; Ensure current section gets linked
17            .retainrefs
18
19 _main
20 RESET       mov.w   #__STACK_END,SP             ; Initialize stackpointer
21 StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL      ; Stop WDT
22 SetupP1     bic.b   #BIT0,&P1OUT
23             bis.b   #BIT0,&P1DIR                ; Set P1.0 to output d
24 UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0          ; Disable the GPIO pow
25                                                  ; high-impedance mode
26                                                  ; previously configure
27
28 Mainloop    xor.b   #BIT0,&P1OUT                ; Toggle P1.0
29 Wait        mov.w   #50000,R15                  ; Delay to R15
30 L1          dec.w   R15                         ; Decrement R15
```

Comprobamos que el BIT0 del registro P1OUT pasa de 1 a 0.

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
```

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SBM - CCS Debug - blink_led/main.asm - Code Composer Studio

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Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended)

$../main.asm:20:37$() at main.asm:23 0x00440E (the entry point was reached)

Variables | Expressions | Registers

Name	Value	Description
P1OUT7	0	P1OUT7
P1OUT6	1	P1OUT6
P1OUT5	0	P1OUT5
P1OUT4	1	P1OUT4
P1OUT3	0	P1OUT3
P1OUT2	1	P1OUT2
P1OUT1	1	P1OUT1
P1OUT0	0	P1OUT0

Comprobamos en el valor del registro que el BIT0 del registro P1OUT pasa de 1 a 0.

Getting Started | main.asm

```
5  ;-------------------------------------------------------------------------------
6              .cdecls C,LIST,"m                       header file
7  ;-------------------------------------------------------------------------------
8              .def    RESET                   ; Export program entry-point to
9                                              ; make it known to linker.
10 ;-------------------------------------------------------------------------------
11             .global _main
12             .global __STACK_END
13             .sect   .stack                  ; Make stack linker segment ?known?
14
15             .text                           ; Assemble to Flash memory
16             .retain                         ; Ensure current section gets linked
17             .retainrefs
18
19 _main
20 RESET       mov.w   #__STACK_END,SP         ; Initialize stackpointer
21 StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL  ; Stop WDT
22 SetupP1     bic.b   #BIT0,&P1OUT            ; Clear P1.0 output latch for a defined power-on state
23             bis.b   #BIT0,&P1DIR            ; Set P1.0 to output direction
24 UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0       ; Disable the GPIO power-on default
25                                             ; high-impedance mode to activate
26                                             ; previously configured port settings
27
28 Mainloop    xor.b   #BIT0,&P1OUT            ; Toggle P1.0
29 Wait        mov.w   #50000,R15              ; Delay to R15
30 L1          dec.w   R15                     ; Decrement R15
31             jnz     L1                      ; Delay over?
```

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
```

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SBM - CCS Debug - blink_led/main.asm - Code Composer Studio

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Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended)

$../main.asm:20:37$() at main.asm:24 0x004412 (the entry point was reached)

Variables Expressions Registers

Name	Value	Description
PMM__Power_Management_System		
PMMCTL0	0x9640	PMM Control 0 [Memory Mapped]
PMMIFG	0x0200	PMM Interrupt Flag [Memory Mapped]
PM5CTL0	0x0001	PMM Power Mode 5 Control Register 0 |
LOCKLPM5	1	Lock I/O pin configuration upon entry/e
Port_A		
Port_1_2		
P1IN	0xF0	Port 1 Input [Memory Mapped]

Getting Started | main.asm

```
6           .cdecls C,LIST,"msp430fr6989.h"       ; Include device header file
7   ;-------------------------------------------------------------------------------
8           .def    RESET                         ; Export program entry-point to
9                                                 ; make it known to linker.
10  ;-------------------------------------------------------------------------------
11          .global _main
12          .global __STACK_END
13          .sect   .stack                        ; Make stack linker segment ?known?
14
15          .text                                 ; Assemble to Flash memory
16          .retain                               ; Ensure current section gets linked
17          .retainrefs
18
19  _main
20  RESET       mov.w   #__STACK_END,SP           ; Initialize stackpointer
21  StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL    ; Stop WDT
22  SetupP1     bic.b   #BIT0,&P1OUT              ; Clear P1.0 output latch for a defined power-on state
23              bis.b   #BIT0,&P1DIR              ; Set P1.0 to output direction
24  UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0        ; Disable the GPIO power-on default
25                                                ; high-impedance mode to activate
26                                                ; previously configured port settings
27
28  Mainloop    xor.b   #BIT0,&P1O                ; Toggle P1.0
                                                  ; Delay to R15
                                                  ; Decrement R15
                                                  ; Delay over?
                                                  ; Again
```

Comprobamos la deshabilitación del registro que por defecto mantiene los GPIO en alta impedancia.

AM usage is 0 bytes.

ES 12:47 05/10/2017

SBM - CCS Debug - blink_led/main.asm - Code Composer Studio

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Quick Access

Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended)

$../main.asm:20:37$() at main.asm:28 0x004416 (the entry point was reached)

Comprobamos la deshabilitación del registro que por defecto mantiene los GPIO en alta impedancia.

Variables Expressions Registers

Name	Value	Description
PMM__Power_Management_System		
PMMCTL0	0x9640	PMM Control 0 [Memory Mapped]
PMMIFG	0x0200	PMM Interrupt Flag [Memory Mapped]
PM5CTL0	0x0000	PMM Power Mode 5 Control Register 0 |
LOCKLPM5	0	Lock I/O pin configuration upon entry/e
Port_A		
Port_1_2		
P1IN	0x00	Port 1 Input [Memory Mapped]

Getting Started | main.asm

```
10 ;-------------------------------------------------------------------------------
11             .global _main
12             .global __STACK_END
13             .sect   .stack                  ; Make stack linker segment ?known?
14
15             .text                           ; Assemble to Flash memory
16             .retain                         ; Ensure current section gets linked
17             .retainrefs
18
19 _main
20 RESET       mov.w   #__STACK_END,SP         ; Initialize stackpointer
21 StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL  ; Stop WDT
22 SetupP1     bic.b   #BIT0,&P1OUT            ; Clear P1.0 output latch for a defined power-on state
23             bis.b   #BIT0,&P1DIR            ; Set P1.0 to output direction
24 UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0      ; Disable the GPIO power-on default
25                                             ; high-impedance mode to activate
26                                             ; previously configured port settings
27
28 Mainloop    xor.b   #BIT0,&P1OUT            ; Toggle P1.0
29 Wait        mov.w   #50000,R15              ; Delay to R15
30 L1          dec.w   R15                     ; Decrement R15
31             jnz     L1                      ; Delay over?
32             jmp     Mainloop                ; Again
33                                             ;
34 ;-------------------------------------------------------------------------------
35 ;           Interrupt Vectors
36 ;-------------------------------------------------------------------------------
```

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
```

ES 12:47 05/10/2017

SBM - CCS Debug - blink_led/main.asm - Code Composer Studio

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Quick Access

Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended)

$../main.asm:20:37$() at main.asm:31 0x004420 (the entry point was reached)

Variables Expressions Registers

Name	Value	Description
P1OUT1	1	P1OUT1
P1OUT0	1	P1OUT0
P1DIR	0x01	Port 1 Direction [Memory Mapped]
P1REN	0x00	Port 1 Resistor Enable [Memory Mappec
P1SEL0	0x00	Port 1 Selection 0 [Memory Mapped]
P1SEL1	0x00	Port 1 Selection 1 [Memory Mapped]
P1SELC	0x00	Port 1 Complement Selection [Memory
P1IV	0x0000	Port 1 Interrupt Vector Word [Memory M

Getting Started | main.asm

```
13              .sect   .stack                  ; Make stack linker segment ?known?
14
15              .text                           ; Assemble to Flash memory
16              .retain                         ; Ensure current section gets linked
17              .retainrefs
18
19  _main
20  RESET       mov.w   #__STACK_END,SP         ; Initialize stackpointer
21  StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL  ; Stop WDT
22  SetupP1     bic.b   #BIT0,&P1OUT            ; Clear P1.0 output latch for a defined power-on state
23              bis.b   #BIT0,&P1DIR            ; Set P1.0 to output direction
24  UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0      ; Disable the GPIO power-on default
25                                              ; high-impedance mode to activate
26                                              ; previously configured port settings
27
28  Mainloop    xor.b   #BIT0,&P1OUT            ; Toggle P1.0
29  Wait        mov.w   #50000,R15              ; Delay to R15
30  L1          dec.w   R15                     ; Decrement R15
31              jnz     L1                      ; Delay over?
32  [W5369] Silicon Errata CPU40: A jump instruction at the end of a section should be followed by a NOP.
33                                              ;
34  ;-------------------------------------------------------------------------------
35  ;           Interrupt Vectors
36  ;-------------------------------------------------------------------------------
37              .sect   ".reset"                ; MSP430 RESET Vector
38              .short  RESET                   ;
39              .end
```

Como comentamos antes, el compilador nos avise que el código puede ser optimizado agregando un NOP tras un salto al final de una sección.

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
```

ES 12:48 05/10/2017

SBM - CCS Debug - blink_led/main.asm - Code Composer Studio

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Quick Access

Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended)

$../main.asm:20:37$() at main.asm:31 0x004420 (the entry point was reached)

Variables Expressions Registers

Name	Value	Description
P1OUT1	1	P1OUT1
P1OUT0	1	P1OUT0
P1DIR	0x01	Port 1 Direction [Memory Mapped]
P1REN	0x00	Port 1 Resistor Enable [Memory Mappec
P1SEL0	0x00	Port 1 Selection 0 [Memory Mapped]
P1SEL1	0x00	Port 1 Selection 1 [Memory Mapped]
P1SELC	0x00	Port 1 Complement Selection [Memory
P1IV	0x0000	Port 1 Interrupt Vector Word [Memory M

Getting Started *main.asm

```
13              .sect   .stack                  ; Make stack linker segment ?known?
14
15              .text                           ; Assemble to Flash memory
16              .retain                         ; Ensure current section gets linked
17              .retainrefs
18
19  _main
20  RESET       mov.w   #__STACK_END,SP         ; Initialize stackpointer
21  StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL  ; Stop WDT
22  SetupP1     bic.b   #BIT0,&P1OUT            ; Clear P1.0 output latch for a defined power-on state
23              bis.b   #BIT0,&P1DIR            ; Set P1.0 to output direction
24  UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0      ; Disable the GPIO power-on default
25                                              ; high-impedance mode to activate
26                                              ; previously configured port settings
27
28  Mainloop    xor.b   #BIT0,&P1OUT            ; Toggle P1.0
29  Wait        mov.w   #50000,R15              ; Delay to R15
30  L1          dec.w   R15                     ; Decrement R15
31              jnz     L1                      ; Delay over?
32              jmp     Mainloop                ; Again
33              nop
34  ;-------------------------------------------------------------------------------
35  ;           Interrupt Vectors
36  ;-------------------------------------------------------------------------------
37              .sect   ".reset"                ; MSP430 RESET Vector
38              .short  RESET                   ;
39              .end
```

Agregaremos NOP en la línea 33 en el código aunque estemos en la pantalla de debugger.

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
```

Writable | Smart Insert | 33 : 16

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SBM - CCS Debug - blink_led/main.asm - Code Composer Studio

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Volvemos a compilar.

Quick Access

Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended)

$../main.asm:20:37$() at main.asm:31 0x004420 (the entry point was reached)

Variables Expressions Registers

Name	Value	Description
P1OUT1	1	P1OUT1
P1OUT0	1	P1OUT0
P1DIR	0x01	Port 1 Direction [Memory Mapped]
P1REN	0x00	Port 1 Resistor Enable [Memory Mappec
P1SEL0	0x00	Port 1 Selection 0 [Memory Mapped]
P1SEL1	0x00	Port 1 Selection 1 [Memory Mapped]
P1SELC	0x00	Port 1 Complement Selection [Memory
P1IV	0x0000	Port 1 Interrupt Vector Word [Memory M

Getting Started *main.asm

```
13              .sect   .stack                  ; Make stack linker segment ?known?
14
15              .text                           ; Assemble to Flash memory
16              .retain                         ; Ensure current section gets linked
17              .retainrefs
18
19  _main
20  RESET       mov.w   #__STACK_END,SP         ; Initialize stackpointer
21  StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL  ; Stop WDT
22  SetupP1     bic.b   #BIT0,&P1OUT            ; Clear P1.0 output latch for a defined power-on state
23              bis.b   #BIT0,&P1DIR            ; Set P1.0 to output direction
24  UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0      ; Disable the GPIO power-on default
25                                              ; high-impedance mode to activate
26                                              ; previously configured port settings
27
28  Mainloop    xor.b   #BIT0,&P1OUT            ; Toggle P1.0
29  Wait        mov.w   #50000,R15              ; Delay to R15
30  L1          dec.w   R15                     ; Decrement R15
31              jnz     L1                      ; Delay over?
32              jmp     Mainloop                ; Again
33              nop                             ;
34  ;-------------------------------------------------------------------------------
35  ;           Interrupt Vectors
36  ;-------------------------------------------------------------------------------
37              .sect   ".reset"                ; MSP430 RESET Vector
38              .short  RESET                   ;
39              .end
```

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
```

Writable | Smart Insert | 33 : 45

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SBM - CCS Debug - blink_led/main.asm - Code Composer Studio

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Quick Access

Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended)

$../main.asm:20:37$() at main.asm:31 0x004420 (the entry point was reached)

Variables Expressions Registers

Name	Value	Description
P1OUT1	1	P1OUT1
P1OUT0	1	P1OUT0
P1DIR	0x01	Port 1 Direction [Memory Mapped]
P1REN	0x00	Port 1 Resistor Enable [Memory Mappec
P1SEL0	0x00	Port 1 Selection 0 [Memory Mapped]
P1SEL1	0x00	Port 1 Selection 1 [Memory Mapped]
P1SELC	0x00	Port 1 Complement Selection [Memory
P1IV	0x0000	Port 1 Interrupt Vector Word [Memory M

Getting Started | main.asm

```
13              .sect   .stack                  ; Make stack linker segment ?known?
14
15              .text                           ; Ass
16              .retain                         ; Ens
17              .retainrefs
18
19  _main
20  RESET       mov.w   #__STACK_END,SP         ; Ini
21  StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL  ; Sto
22  SetupP1     bic.b   #BIT0,&P1OUT            ; Cle
23              bis.b   #BIT0,&P1DIR            ; Set
24  UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0      ; Dis
25                                              ; hig
26                                              ; pre
27
28  Mainloop    xor.b   #BIT0,&P1OUT            ; Tog
29  Wait        mov.w   #50000,R15              ; Delay to R15
30  L1          dec.w   R15
31              jnz     L1
32              jmp     Mainloop
33              nop
34  ;-------------------------------------------------------------------------
35  ;           Interrupt Vectors
36  ;-------------------------------------------------------------------------
37              .sect   ".reset"                ; MSP430 RESET Vector
38              .short  RESET                   ;
39              .end
```

Build Project

Reload the program automatically

A file that you are debugging (blink_led.out) has been modified.

Do you want to reload this file?

Remember my decision

Yes No

El software nos avisa que vamos a modificar el fichero que estamos depurando.

Console

CDT Build Console [blink_led]

```
--silicon_errata=CPU40 -z -m"blink_led.map" --heap_size=0 --stack_size=0 --cinit_hold_wdt=on -i"C:/ti/ccsv7/ccs_base/msp430/include"
-i"C:/ti/ccsv7/ccs_base/msp430/lib/5xx_6xx_FRxx" -i"C:/ti/ccsv7/ccs_base/msp430/lib/FR59xx" -i"C:/ti/ccsv7/tools/compiler/ti-cgt-msp430_16.9.4.LTS/lib"
-i"C:/ti/ccsv7/tools/compiler/ti-cgt-msp430_16.9.4.LTS/include" --priority --reread_libs --define=_MPU_ENABLE --diag_wrap=off --display_error_number --warn_sections
--xml_link_info="blink_led_linkInfo.xml" --entry_point=RESET --use_hw_mpy=F5 -o "blink_led.out" "./main.obj" "../lnk_msp430fr6989.cmd"  -llibmpu_init.a -llibmath.a -llibc.a
<Linking>
'Finished building target: blink_led.out'
' '

**** Build Finished ****
```

Writable | Smart Insert | 33 : 45 | Build Project: (100%)

ES 12:49 05/10/2017

SBM - CCS Debug - blink_led/main.asm - Code Composer Studio

File Edit View Project Tools Run Scripts Window Help

Quick Access

Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended)

$../main.asm:20:37$() at main.asm:20 0x004400 (the entry point was reached)

Variables Expressions Registers

Name	Value	Description
P1OUT1	1	P1OUT1
P1OUT0	1	P1OUT0
P1DIR	0x00	Port 1 Direction [Memory Mapped]
P1REN	0x00	Port 1 Resistor Enable [Memory Mappec
P1SEL0	0x00	Port 1 Selection 0 [Memory Mapped]
P1SEL1	0x00	Port 1 Selection 1 [Memory Mapped]
P1SELC	0x00	Port 1 Complement Selection [Memory
P1IV	0x0000	Port 1 Interrupt Vector Word [Memory M

Getting Started | main.asm | 0x4420

```
14
15          .text                       ; Assemble to Flash memory
16          .retain                     ; Ensure current section gets linked
17          .retainrefs
18
19 main
20 RESET    mov.w   #__STACK_END,SP     ; Initialize stackpointer
21 StopWDT  mov.w   #WDTPW+WDTHOLD,&WDTCTL  ; Stop WDT
22 SetupP1  bic.b   #BIT0,&P1OUT        ; Clear P1.0 output latch for a defined power-on s
23          bis.b   #BIT0,&P1DIR        ; Set P1.0 to output direction
24 UnlockGPIO bic.w #LOCKLPM5,&PM5CTL0  ; Disable the GPIO power-on default
25                                      ; high-impedance mode to activate
26                                      ; previously configured port settings
27
28 Mainloop xor.b   #BIT0,&P1OUT        ; Toggle P1.0
29 Wait     mov.w   #50000,R15          ; Delay to R15
30 L1       dec.w   R15                 ; Decrement R15
31          jnz     L1                  ; Delay over?
32          jmp     Mainloop            ; Again
33          nop                         ;
34 ;-------------------------------------------------------------------------------
35 ;           Interrupt Vectors
36 ;-------------------------------------------------------------------------------
37          .sect   ".reset"            ; MSP430 RESET Vector
38          .short  RESET               ;
39          .end
40
```

Volvemos a la línea de inicio del programa.

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
MSP430:  Flash/FRAM usage is 120 bytes. RAM usage is 0 bytes.
```

Writable | Smart Insert | 20 : 1

ES 12:49 05/10/2017

SBM - CCS Debug - blink_led/main.asm - Code Composer Studio

File Edit View Project Tools Run Scripts Window Help

Quick Access

Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended)

$../main.asm:20:37$() at main.asm:20 0x004400 (the entry point was reached)

Variables Expressions Registers

Name	Value	Description
P1OUT1	1	P1OUT1
P1OUT0	1	P1OUT0
P1DIR	0x00	Port 1 Direction [Memory Mapped]
P1REN	0x00	Port 1 Resistor Enable [Memory Mappec
P1SEL0	0x00	Port 1 Selection 0 [Memory Mapped]
P1SEL1	0x00	Port 1 Selection 1 [Memory Mapped]
P1SELC	0x00	Port 1 Complement Selection [Memory
P1IV	0x0000	Port 1 Interrupt Vector Word [Memory M

Getting Started | main.asm | 0x4420

```
14
15          .text                       ; Assemble to Flash memory
16          .retain                     ; Ensure current section gets linked
17          .retainrefs
18
19 _main
20 RESET    mov.w   #__STACK_END,SP     ; Initialize stackpointer
21 StopWDT  mov.w   #WDTPW+WDTHOLD,&WDTCTL  ; Stop WDT
22 SetupP1  bic.b   #BIT0,&P1OUT        ; Clear P1.0 output latch for a defined power-on state
23          bis.b   #BIT0,&P1DIR        ; Set P1.0 to output direction
24 UnlockGPIO bic.w #LOCKLPM5,&PM5CTL0  ; Disable the GPIO power-on default
25                                      ; high-impedance mode to activate
26                                      ; previously configured port settings
27
28 Mainloop xor.b   #BIT0,&P1OUT        ; Toggle P1.0
29 Wait     mov.w   #50000,R15          ; Delay to R15
30 L1
31          jnz     L1                  ; Dela
32          jmp     Mainloop            ; Agai
33          nop                         ;
34 ;-------------------------------------------------------------------------
35 ;           Interrupt Vectors
36 ;-------------------------------------------------------------------------
37          .sect   ".reset"            ; MSP430 RESET Vector
38          .short  RESET               ;
39          .end
40
```

Pondremos un breakpoint en la línea 30 de código pulsando dos veces sobre ella.

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
MSP430:  Flash/FRAM usage is 120 bytes. RAM usage is 0 bytes.
```

Writable | Smart Insert | 20 : 1

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SBM - CCS Debug - blink_led/main.asm - Code Composer Studio

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Quick Access

Debug

blink_led [Code Composer Studio - Device Debu]

TI MSP430 USB1/MSP43

$../main.asm:20:37$ entry point was reached)

Volvemos a ejecutar el programa .

Variables Expressions Registers

Name	Value	Description
P1OUT1	1	P1OUT1
P1OUT0	1	P1OUT0
P1DIR	0x00	Port 1 Direction [Memory Mapped]
P1REN	0x00	Port 1 Resistor Enable [Memory Mappec
P1SEL0	0x00	Port 1 Selection 0 [Memory Mapped]
P1SEL1	0x00	Port 1 Selection 1 [Memory Mapped]
P1SELC	0x00	Port 1 Complement Selection [Memory
P1IV	0x0000	Port 1 Interrupt Vector Word [Memory M

Getting Started | main.asm | 0x4420

```
14
15          .text                       ; Assemble to Flash memory
16          .retain                     ; Ensure current section gets linked
17          .retainrefs
18
19  main
20  RESET       mov.w   #__STACK_END,SP         ; Initialize stackpointer
21  StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL  ; Stop WDT
22  SetupP1     bic.b   #BIT0,&P1OUT            ; Clear P1.0 output latch for a defined power-on state
23              bis.b   #BIT0,&P1DIR            ; Set P1.0 to output direction
24  UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0      ; Disable the GPIO power-on default
25                                              ; high-impedance mode to activate
26                                              ; previously configured port settings
27
28  Mainloop                                    ; Toggle P1.0
29                                              ; Delay to R15
30                                              ; Decrement R15
31                                              ; Delay over?
32                                              ; Again
33                                              ;
34  ;-------------------------------------------------------------------------
35  ;
36  ;-------------------------------------------------------------------------
37          .sect   ".reset"                ; MSP430 RESET Vector
38          .short  RESET                   ;
39          .end
40
```

Símbolo que indica donde hemos insertado un breakpoint.

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
MSP430:  Flash/FRAM usage is 120 bytes. RAM usage is 0 bytes.
```

Writable | Smart Insert | 20 : 1

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Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended - HW Breakpoint)

$../main.asm:20:37$() at main.asm:30 0x00441E (the entry point was reached)

Variables Expressions Registers

Name	Value	Description
P1OUT1	1	P1OUT1
P1OUT0	1	P1OUT0
P1DIR	0x01	Port 1 Direction [Memory Mapped]
P1REN	0x00	Port 1 Resistor Enable [Memory Mappec
P1SEL0	0x00	Port 1 Selection 0 [Memory Mapped]
P1SEL1	0x00	Port 1 Selection 1 [Memory Mapped]
P1SELC	0x00	Port 1 Complement Selection [Memory
P1IV	0x0000	Port 1 Interrupt Vector Word [Memory M

Getting Started | main.asm | 0x4420

```
14
15          .text                       ; Assemble to Flash memory
16          .retain                     ; Ensure current section gets linked
17          .retainrefs
18
19 _main
20 RESET     mov.w   #__STACK_END,SP     ; Initialize stackpointer
21 StopWDT   mov.w   #WDTPW+WDTHOLD,&WDTCTL ; Stop WDT
22 SetupP1   bic.b   #BIT0,&P1OUT        ; Clear P1.0 output latch for a defined power-on state
23          bis.b   #BIT0,&P1DIR        ; Set P1.0 to output direction
24 UnlockGPIO bic.w  #LOCKLPM5,&PM5CTL0  ; Disable the GPIO power-on default
25                                      ; high-impedance mode to activate
26                                      ; previously configured port settings
27
28 Mainloop  xor.b   #BIT0,&P1OUT        ; Toggle P1.0
29 Wait      mov.w   #50000,R15          ; Delay to R15
30 L1        dec.w   R15                 ; Decrement R15
31          jnz     L1                  ; Delay over?
32          jmp     Mainloop            ; Again
33          nop                         ;
34 ;-------------------------------------------------------------------------
35 ;           Interrupt Vectors
36 ;-------------------------------------------------------------------------
37          .sect   ".reset"            ; MSP430 RESET Vector
38          .short  RESET               ;
39          .end
40
```

Y la ejecución del mismo parará en el breakpoint.

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
MSP430:  Flash/FRAM usage is 120 bytes. RAM usage is 0 bytes.
```

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SBM - CCS Debug - blink_led/main.asm - Code Composer Studio

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Podremos hacer un soft c hard reset desplegando esta pestaña.

Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended)

$../main.asm:20:37$() at main.asm:31 0x004420 (the entry point was reached)

Variables Expressions Registers

Name	V	
P1OUT1	1	P1OUT1
P1OUT0	1	P1OUT0
P1DIR	0x01	Port 1 Direction [Memory Mapped]
P1REN	0x00	Port 1 Resistor Enable [Memory Mappec
P1SEL0	0x00	Port 1 Selection 0 [Memory Mapped]
P1SEL1	0x00	Port 1 Selection 1 [Memory Mapped]
P1SELC	0x00	Port 1 Complement Selection [Memory
P1IV	0x0000	Port 1 Interrupt Vector Word [Memory M

Getting Started | main.asm | 0x4420

```
14
15          .text                       ; Assemble to Flash memory
16          .retain                     ; Ensure current section gets linked
17          .retainrefs
18
19 _main
20 RESET    mov.w   #__STACK_END,SP     ; Initialize stackpointer
21 StopWDT  mov.w   #WDTPW+WDTHOLD,&WDTCTL  ; Stop WDT
22 SetupP1  bic.b   #BIT0,&P1OUT        ; Clear P1.0 output latch for a defined power-on state
23          bis.b   #BIT0,&P1DIR        ; Set P1.0 to output direction
24 UnlockGPIO bic.w #LOCKLPM5,&PM5CTL0  ; Disable the GPIO power-on default
25                                      ; high-impedance mode to activate
26                                      ; previously configured port settings
27
28 Mainloop xor.b   #BIT0,&P1OUT        ; Toggle P1.0
29 Wait     mov.w   #50000,R15          ; Delay to R15
30 L1       dec.w   R15                 ; Decrement R15
31          jnz     L1                  ; Delay over?
32          jmp     Mainloop            ; Again
33          nop                         ;
34 ;-------------------------------------------------------------------------
35 ;           Interrupt Vectors
36 ;-------------------------------------------------------------------------
37          .sect   ".reset"            ; MSP430 RESET Vector
38          .short  RESET               ;
39          .end
40
```

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
MSP430:  Flash/FRAM usage is 120 bytes. RAM usage is 0 bytes.
```

Writable | Smart Insert | 31 : 1

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SBM - CCS Debug - blink_led/main.asm - Code Composer Studio

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Quick Access

Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended)

$../main.asm:20:37$() at main.asm:31 0x004420 (the entry point was reached)

So Reset Ctrl+Shift+R

Hard Reset

Name	Value	Description
P1OUT1	1	P1OUT1
P1OUT0	1	P1OUT0
P1DIR	0x01	Port 1 Direction [Memory Mapped]
P1REN	0x00	Port 1 Resistor Enable [Memory Mappec
P1SEL0	0x00	Port 1 Selection 0 [Memory Mapped]
P1SEL1	0x00	Port 1 Selection 1 [Memory Mapped]
P1SELC	0x00	Port 1 Complement Selection [Memory
P1IV	0x0000	Port 1 Interrupt Vector Word [Memory M

Getting Started | main.asm | 0x4420

```
14
15          .text                       ; Assemble to Flash memory
16          .retain                     ; Ensure current section gets linked
17          .retainrefs
18
19 _main
20 RESET    mov.w   #__STACK_END,SP     ; Initialize stackpointer
21 StopWDT  mov.w   #WDTPW+WDTHOLD,&WDTCTL  ; Stop WDT
22 SetupP1  bic.b   #BIT0,&P1OUT        ; Clear P1.0 output latch for a defined power-on state
23          bis.b   #BIT0,&P1DIR        ; Set P1.0 to output direction
24 UnlockGPIO bic.w #LOCKLPM5,&PM5CTL0  ; Disable the GPIO power-on default
25                                      ; high-impedance mode to activate
26                                      ; previously configured port settings
27
28 Mainloop xor.b   #BIT0,&P1OUT        ; Toggle P1.0
29 Wait     mov.w   #50000,R15          ; Delay to R15
30 L1       dec.w   R15                 ; Decrement R15
31          jnz     L1                  ; Delay over?
32          jmp     Mainloop            ; Again
33          nop                         ;
34 ;-------------------------------------------------------------------------
35 ;           Interrupt Vectors
36 ;-------------------------------------------------------------------------
37          .sect   ".reset"            ; MSP430 RESET Vector
38          .short  RESET               ;
39          .end
40
```

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
MSP430:  Flash/FRAM usage is 120 bytes. RAM usage is 0 bytes.
```

Writable | Smart Insert | 31 : 1

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SBM - CCS Debug - blink_led/main.asm - Code Composer Studio

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Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended)

$../main.asm:20:37$() at main.asm:20 0x004400 (the entry point was reached)

Variables Expressions Registers

Name	Value	Description
P1OUT1	1	P1OUT1
P1OUT0	1	P1OUT0
P1DIR	0x00	Port 1 Direction [Memory Mapped]
P1REN	0x00	Port 1 Resistor Enable [Memory Mappec
P1SEL0	0x00	Port 1 Selection 0 [Memory Mapped]
P1SEL1	0x00	Port 1 Selection 1 [Memory Mapped]
P1SELC	0x00	Port 1 Complement Selection [Memory
P1IV	0x0000	Port 1 Interrupt Vector Word [Memory M

Getting Started | main.asm | 0x4420

```
14
15          .text                       ; Assemble to Flash memory
16          .retain                     ; Ensure current section gets linked
17          .retainrefs
18
19 main
20 RESET    mov.w   #__STACK_END,SP     ; Initialize stackpointer
21 StopWDT  mov.w   #WDTPW+WDTHOLD,&WDTCTL  ; Stop WDT
22 SetupP1  bic.b   #BIT0,&P1OUT        ; Clear P1.0 output latch for a defined power-on st
23          bis.b   #BIT0,&P1DIR        ; Set P1.0 to output direction
24 UnlockGPIO bic.w #LOCKLPM5,&PM5CTL0  ; Disable the GPIO power-on default
25                                      ; high-impedance mode to activate
26                                      ; previously configured port settings
27
28 Mainloop xor.b   #BIT0,&P1OUT        ; Toggle P1.0
29 Wait     mov.w   #50000,R15          ; Delay to R15
30 L1       dec.w   R15                 ; Decrement R15
31          jnz     L1                  ; Delay over?
32          jmp     Mainloop            ; Again
33          nop                         ;
34 ;-------------------------------------------------------------------------------
35 ;           Interrupt Vectors
36 ;-------------------------------------------------------------------------------
37          .sect   ".reset"            ; MSP430 RESET Vector
38          .short  RESET               ;
39          .end
40
```

Volveremos a estar en el vector de RESET.

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
MSP430:  Flash/FRAM usage is 120 bytes. RAM usage is 0 bytes.
```

Writable | Smart Insert | 20 : 1

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Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended)

$../main.asm:20:37$() at main.asm:20 0x004400 (the entry point was reached)

Variables ... Registers

Name	Value	Description
P1O	1	P1OUT1
P1O	1	P1OUT0
	0x00	Port 1 Direction [Memory Mapped]
	0x00	Port 1 Resistor Enable [Memory Mappec
	0x00	Port 1 Selection 0 [Memory Mapped]
	0x00	Port 1 Selection 1 [Memory Mapped]
	0x00	Port 1 Complement Selection [Memory
	0x0000	Port 1 Interrupt Vector Word [Memory M

Aquí podremos desplegar el menú de breakpoint.

Getting Started | main.asm | 0x4420

```
14
15          .text                       ; Assemble to Flash memory
16          .retain                     ; Ensure current section gets linked
17          .retainrefs
18
19  main
20  RESET   mov.w   #__STACK_END,SP     ; Initialize stackpointer
21  StopWDT mov.w   #WDTPW+WDTHOLD,&WDTCTL  ; Stop WDT
22  SetupP1 bic.b   #BIT0,&P1OUT        ; Clear P1.0 output latch for a defined power-on state
23          bis.b   #BIT0,&P1DIR        ; Set P1.0 to output direction
24  UnlockGPIO bic.w #LOCKLPM5,&PM5CTL0 ; Disable the GPIO power-on default
25                                      ; high-impedance mode to activate
26                                      ; previously configured port settings
27
28  Mainloop xor.b  #BIT0,&P1OUT        ; Toggle P1.0
29  Wait    mov.w   #50000,R15          ; Delay to R15
30  L1      dec.w   R15                 ; Decrement R15
31          jnz     L1                  ; Delay over?
32          jmp     Mainloop            ; Again
33          nop                         ;
34  ;-------------------------------------------------------------------------
35  ;           Interrupt Vectors
36  ;-------------------------------------------------------------------------
37          .sect   ".reset"            ; MSP430 RESET Vector
38          .short  RESET               ;
39          .end
40
```

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
MSP430:  Flash/FRAM usage is 120 bytes. RAM usage is 0 bytes.
```

Writable | Smart Insert | 20 : 1

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Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MS

$../main.asm:20:

as reached)

Podremos parar la ejecución del debugger aquí.

Variables | Expressions | Registers

Name	Value	Description
P1OUT1	1	P1OUT1
P1OUT0	1	P1OUT0
P1DIR	0x01	Port 1 Direction [Memory Mapped]
P1REN	0x00	Port 1 Resistor Enable [Memory Mappec
P1SEL0	0x00	Port 1 Selection 0 [Memory Mapped]
P1SEL1	0x00	Port 1 Selection 1 [Memory Mapped]
P1SELC	0x00	Port 1 Complement Selection [Memory
P1IV	0x0000	Port 1 Interrupt Vector Word [Memory M

Getting Started | main.asm | 0x4420

```
14
15          .text                       ; Assemble to Flash memory
16          .retain                     ; Ensure current section gets linked
17          .retainrefs
18
19 _main
20 RESET     mov.w   #__STACK_END,SP     ; Initialize stackpointer
21 StopWDT   mov.w   #WDTPW+WDTHOLD,&WDTCTL  ; Stop WDT
22 SetupP1   bic.b   #BIT0,&P1OUT        ; Clear P1.0 output latch for a defined power-on state
23          bis.b   #BIT0,&P1DIR        ; Set P1.0 to output direction
24 UnlockGPIO bic.w  #LOCKLPM5,&PM5CTL0  ; Disable the GPIO power-on default
25                                      ; high-impedance mode to activate
26                                      ; previously configured port settings
27
28 Mainloop  xor.b   #BIT0,&P1OUT        ; Toggle P1.0
29 Wait      mov.w   #50000,R15          ; Delay to R15
30 L1        dec.w   R15                 ; Decrement R15
31          jnz     L1                  ; Delay over?
32          jmp     Mainloop            ; Again
33          nop                         ;
34 ;-------------------------------------------------------------------------
35 ;           Interrupt Vectors
36 ;-------------------------------------------------------------------------
37          .sect   ".reset"            ; MSP430 RESET Vector
38          .short  RESET               ;
39          .end
40
```

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
MSP430:  Flash/FRAM usage is 120 bytes. RAM usage is 0 bytes.
```

Writable | Smart Insert | 31 : 1

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Debug

blink_led [Code Composer Studio - De

TI MSP430 USB1/MSP430 (Suspend

$../main.asm:20:37$() at main.a ached)

En la pestaña Expressions podremos agregar valores de registro.

(x)= Variables | Expressions | Registers

Expression	Type	Value	Address
Add new expression			

Getting Started | main.asm | 0x4420

```
14
15            .text                         ; Assemble to Flash memory
16            .retain                       ; Ensure current section gets linked
17            .retainrefs
18
19 _main
20 RESET      mov.w   #__STACK_END,SP       ; Initialize stackpointer
21 StopWDT    mov.w   #WDTPW+WDTHOLD,&WDTCTL ; Stop WDT
22 SetupP1    bic.b   #BIT0,&P1OUT          ; Clear P1.0 output latch for a defined power-on state
23            bis.b   #BIT0,&P1DIR          ; Set P1.0 to output direction
24 UnlockGPIO bic.w   #LOCKLPM5,&PM5CTL0    ; Disable the GPIO power-on default
25                                          ; high-impedance mode to activate
26                                          ; previously configured port settings
27
28 Mainloop   xor.b   #BIT0,&P1OUT          ; Toggle P1.0
29 Wait       mov.w   #50000,R15            ; Delay to R15
30 L1         dec.w   R15                   ; Decrement R15
31            jnz     L1                    ; Delay over?
32            jmp     Mainloop              ; Again
33            nop                           ;
34 ;-------------------------------------------------------------------------
35 ;           Interrupt Vectors
36 ;-------------------------------------------------------------------------
37            .sect   ".reset"              ; MSP430 RESET Vector
38            .short  RESET                 ;
39            .end
40
```

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
MSP430:  Flash/FRAM usage is 120 bytes. RAM usage is 0 bytes.
```

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SBM - CCS Debug - blink_led/main.asm - Code Composer Studio

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Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1/MSP430 (Suspended)

$../main.asm:20:37$() at main.asm:31 0x004420 (the entry point was reached)

Variables | Expressions | Registers

Expression	Type	Value	Address
R15			

R15

Introducimos el R15 para obtener su valor.

Getting Started | main.asm | 0x4420

```
14
15          .text                       ; Assemble to Flash
16          .retain                     ; Ensure current section gets linked
17          .retainrefs
18
19 _main
20 RESET     mov.w   #__STACK_END,SP     ; Initialize stackpointer
21 StopWDT   mov.w   #WDTPW+WDTHOLD,&WDTCTL ; Stop WDT
22 SetupP1   bic.b   #BIT0,&P1OUT        ; Clear P1.0 output latch for a defined power-on state
23          bis.b   #BIT0,&P1DIR        ; Set P1.0 to output direction
24 UnlockGPIO bic.w  #LOCKLPM5,&PM5CTL0  ; Disable the GPIO power-on default
25                                      ; high-impedance mode to activate
26                                      ; previously configured port settings
27
28 Mainloop  xor.b   #BIT0,&P1OUT        ; Toggle P1.0
29 Wait      mov.w   #50000,R15          ; Delay to R15
30 L1        dec.w   R15                 ; Decrement R15
31          jnz     L1                  ; Delay over?
32          jmp     Mainloop            ; Again
33          nop                         ;
34 ;-------------------------------------------------------------------------
35 ;           Interrupt Vectors
36 ;-------------------------------------------------------------------------
37          .sect   ".reset"            ; MSP430 RESET Vector
38          .short  RESET               ;
39          .end
40
```

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
MSP430:  Flash/FRAM usage is 120 bytes. RAM usage is 0 bytes.
```

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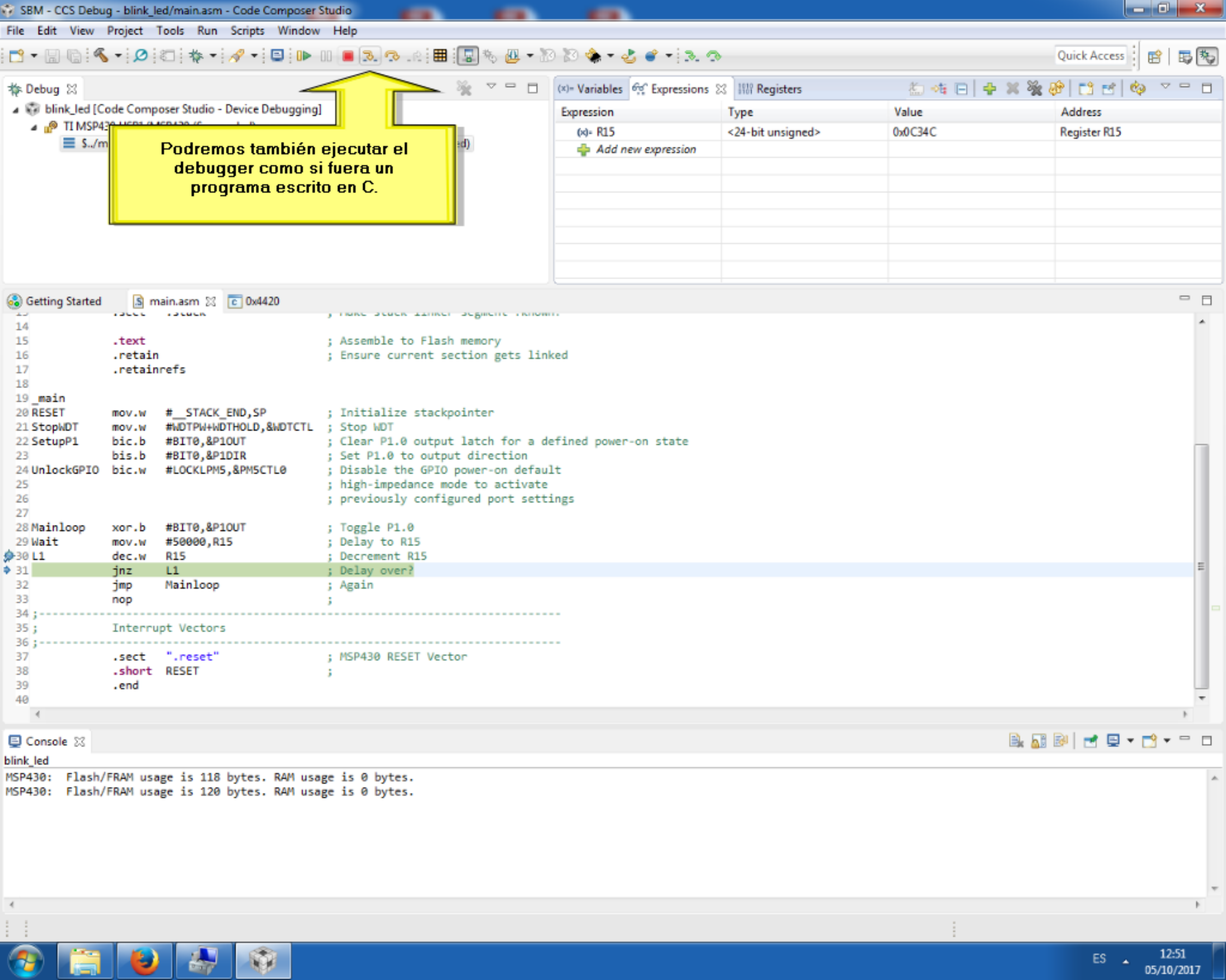
SBM - CCS Debug - blink_led/main.asm - Code Composer Studio
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Quick Access
Debug
blink_led [Code Composer Studio - Device Debugging]
Podremos también ejecutar el debugger como si fuera un programa escrito en C.
Variables Expressions Registers
Expression Type Value Address
R15 <24-bit unsigned> 0x0C34C Register R15
Add new expression
Getting Started main.asm 0x4420
.text ; Assemble to Flash memory
.retain ; Ensure current section gets linked
.retainrefs
_main
RESET mov.w #__STACK_END,SP ; Initialize stackpointer
StopWDT mov.w #WDTPW+WDTHOLD,&WDTCTL ; Stop WDT
SetupP1 bic.b #BIT0,&P1OUT ; Clear P1.0 output latch for a defined power-on state
bis.b #BIT0,&P1DIR ; Set P1.0 to output direction
UnlockGPIO bic.w #LOCKLPM5,&PM5CTL0 ; Disable the GPIO power-on default
; high-impedance mode to activate
; previously configured port settings
Mainloop xor.b #BIT0,&P1OUT ; Toggle P1.0
Wait mov.w #50000,R15 ; Delay to R15
L1 dec.w R15 ; Decrement R15
jnz L1 ; Delay over?
jmp Mainloop ; Again
nop ;
; Interrupt Vectors
.sect ".reset" ; MSP430 RESET Vector
.short RESET ;
.end
Console
blink_led
MSP430: Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
MSP430: Flash/FRAM usage is 120 bytes. RAM usage is 0 bytes.
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Quick Access

Debug

blink_led [Code Composer Studio - Device Debugging]

TI MSP430 USB1 (MSP430 (Suspended - HW Breakpoint

Terminate (Ctrl+F2)

oint was reached)

¡¡¡¡¡¡¡¡¡¡SIEMPRE HAY QUE PARAR LA DEPURACIÓN ANTES DE DESCONECTAR EL DISPOSITIVO DEL PUERTO USB!!!!!!!!!!. ES TU RESPONSABILIDAD.

Variables | Expressions | Registers

Expression	Type	Value	Address
(x)= R15	<24-bit unsigned>	0x0C344	Register R15
Add new expression			

Getting Sta

```
14
15                                  le to Flash memory
16                                  current section gets linked
17
18
19 _main
20 RESET       mov.w   #__STACK_END,SP         ; Initialize stackpointer
21 StopWDT     mov.w   #WDTPW+WDTHOLD,&WDTCTL  ; Stop WDT
22 SetupP1     bic.b   #BIT0,&P1OUT            ; Clear P1.0 output latch for a defined power-on state
23             bis.b   #BIT0,&P1DIR            ; Set P1.0 to output direction
24 UnlockGPIO  bic.w   #LOCKLPM5,&PM5CTL0      ; Disable the GPIO power-on default
25                                             ; high-impedance mode to activate
26                                             ; previously configured port settings
27
28 Mainloop    x
29 Wait        n
30 L1          c
31             i
32             i
33             nop                             ;
34 ;-------------------------------------------------------------------------
35 ;           Interrupt Vectors
36 ;-------------------------------------------------------------------------
37             .sect   ".reset"                ; MSP430 RESET Vector
38             .short  RESET                   ;
39             .end
40
```

FIN INTRODUCCIÓN IDE CODE COMPOSER STUDIO v7.3

Console

blink_led

```
MSP430:  Flash/FRAM usage is 118 bytes. RAM usage is 0 bytes.
MSP430:  Flash/FRAM usage is 120 bytes. RAM usage is 0 bytes.
```

ES 12:51 05/10/2017