Xilinx Zynq FPGA, TI DSP, MCU 기반의 회로 설계 및 임베디드 전문가 과정

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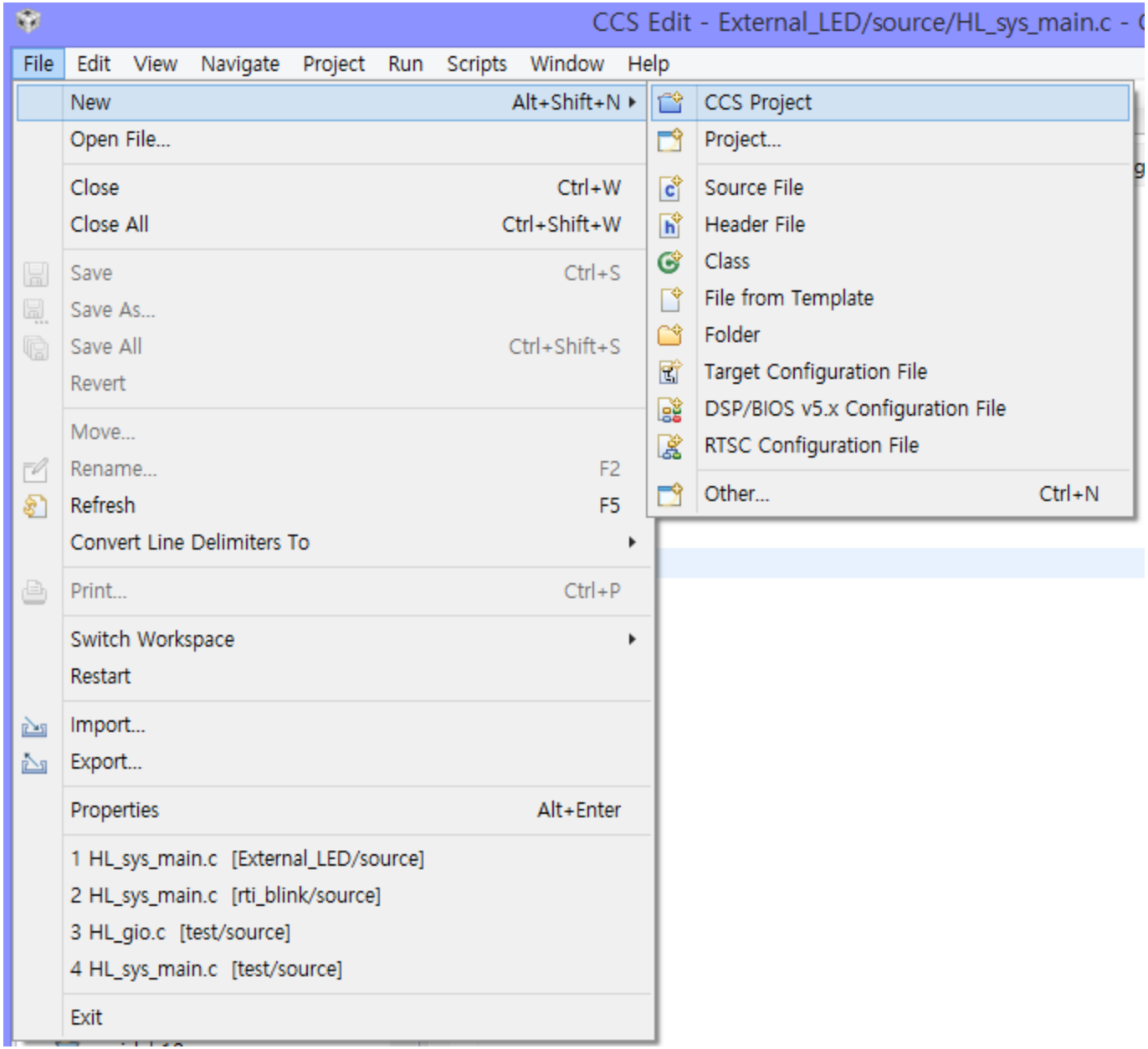
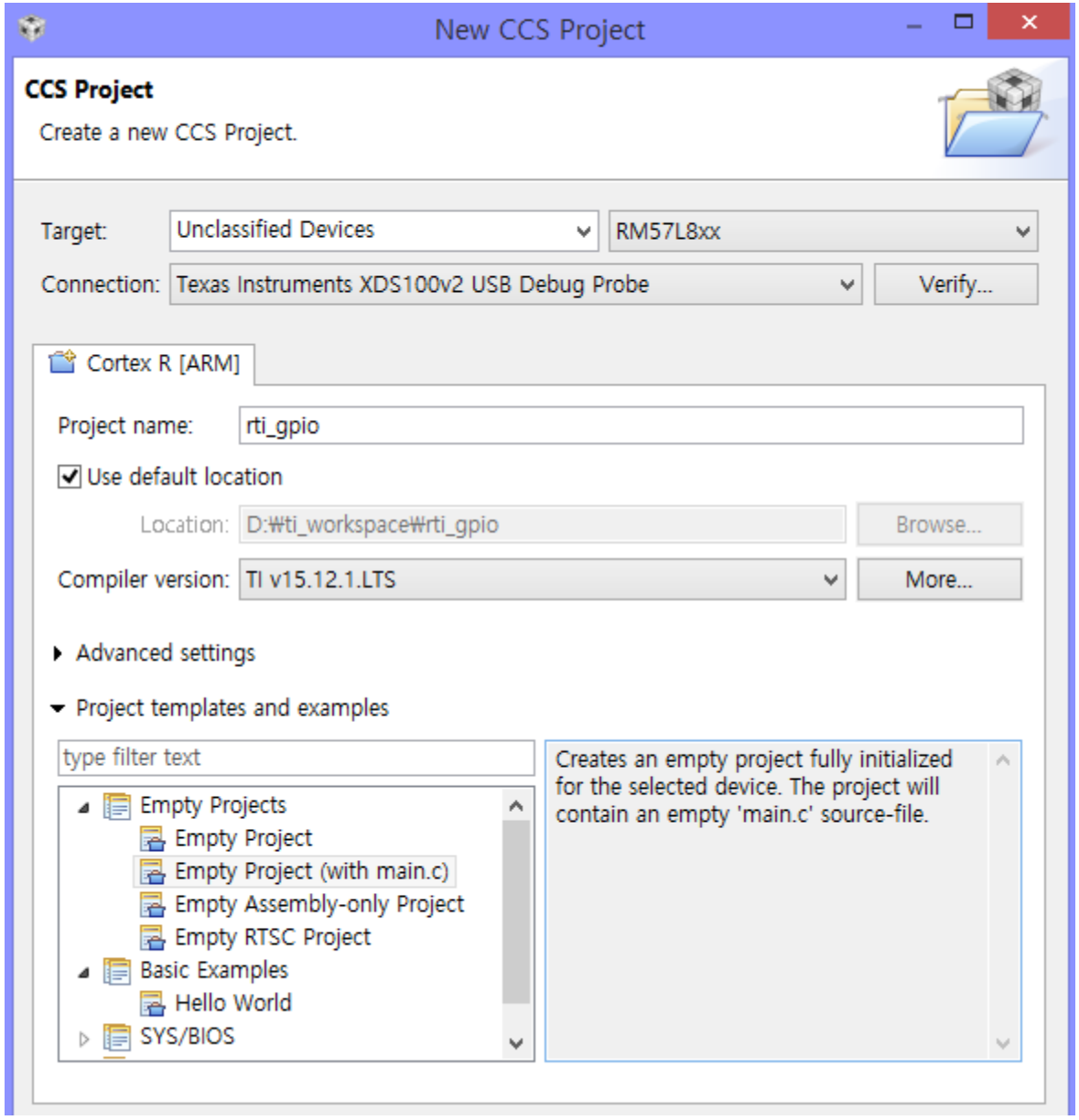
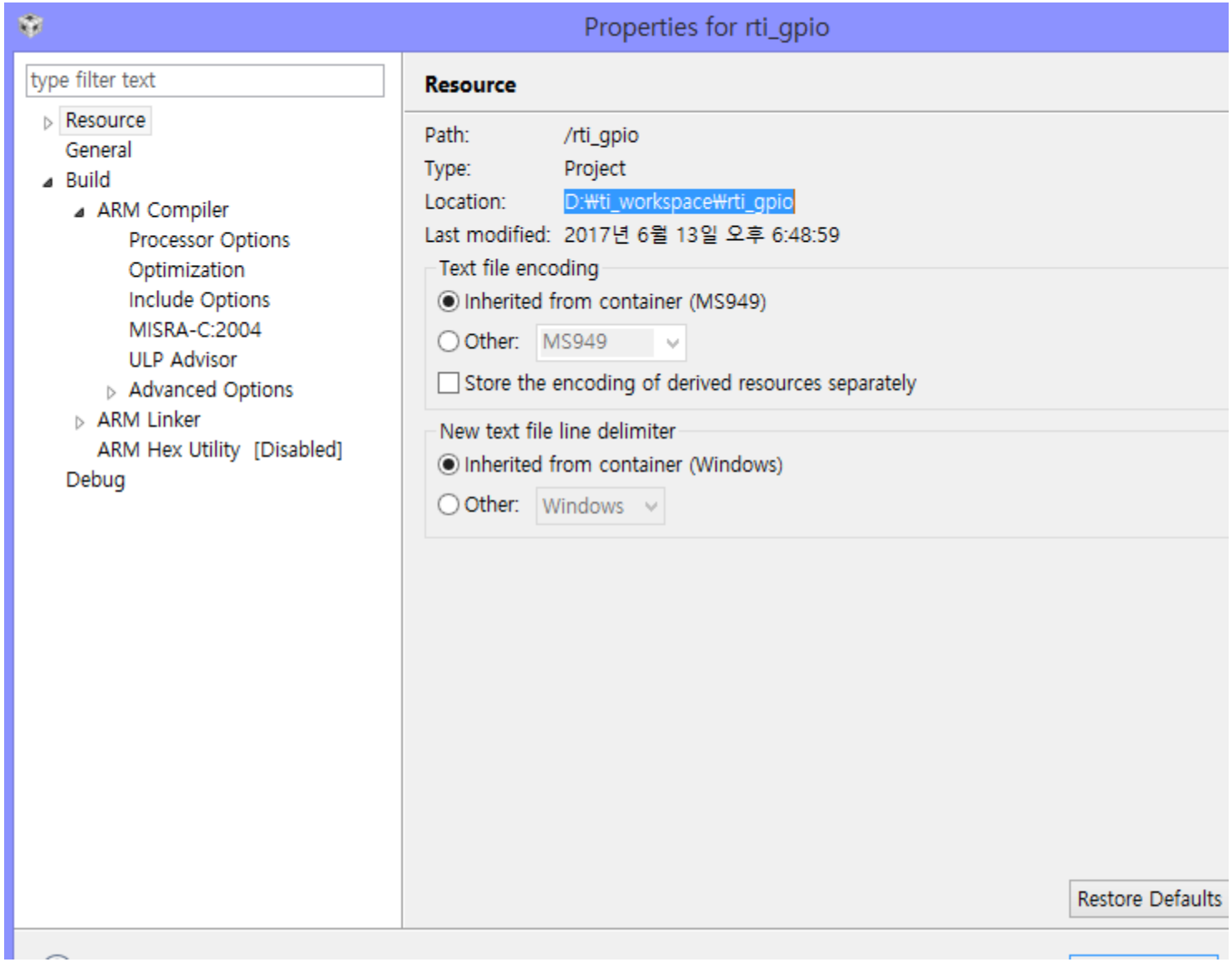
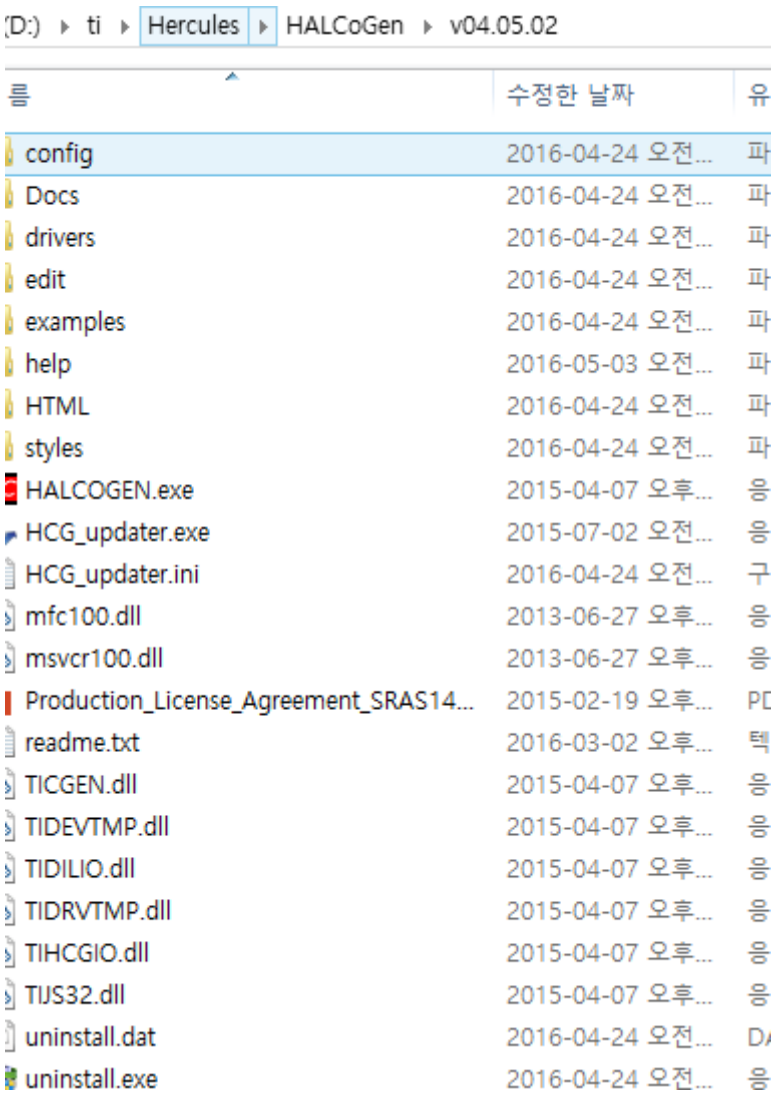
Cortex-R5 GPIO & RTI Based OC Circuit

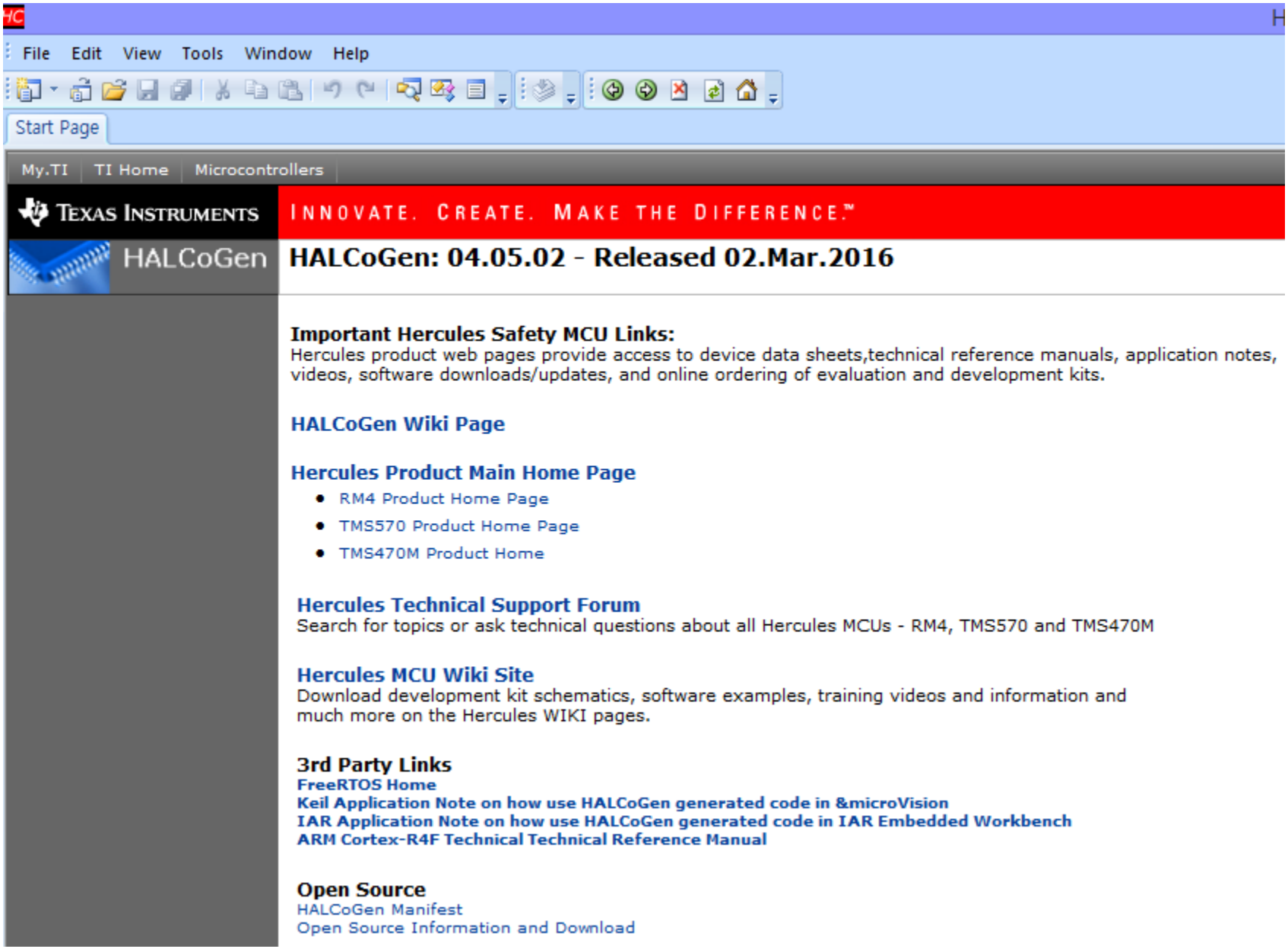

CCS Edit - External_LED/source/HL_sys_main.c -
File
Edit
View
Navigate
Project
Run
Scripts
Window
Help
New Alt+Shift+N
Open File...
Close Ctrl+W
Close All Ctrl+Shift+W
Save Ctrl+S
Save As...
Save All Ctrl+Shift+S
Revert
Move...
Rename... F2
Refresh F5
Convert Line Delimiters To
Print... Ctrl+P
Switch Workspace
Restart
Import...
Export...
Properties Alt+Enter
1 HL_sys_main.c [External_LED/source]
2 HL_sys_main.c [rti_blink/source]
3 HL_gio.c [test/source]
4 HL_sys_main.c [test/source]
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

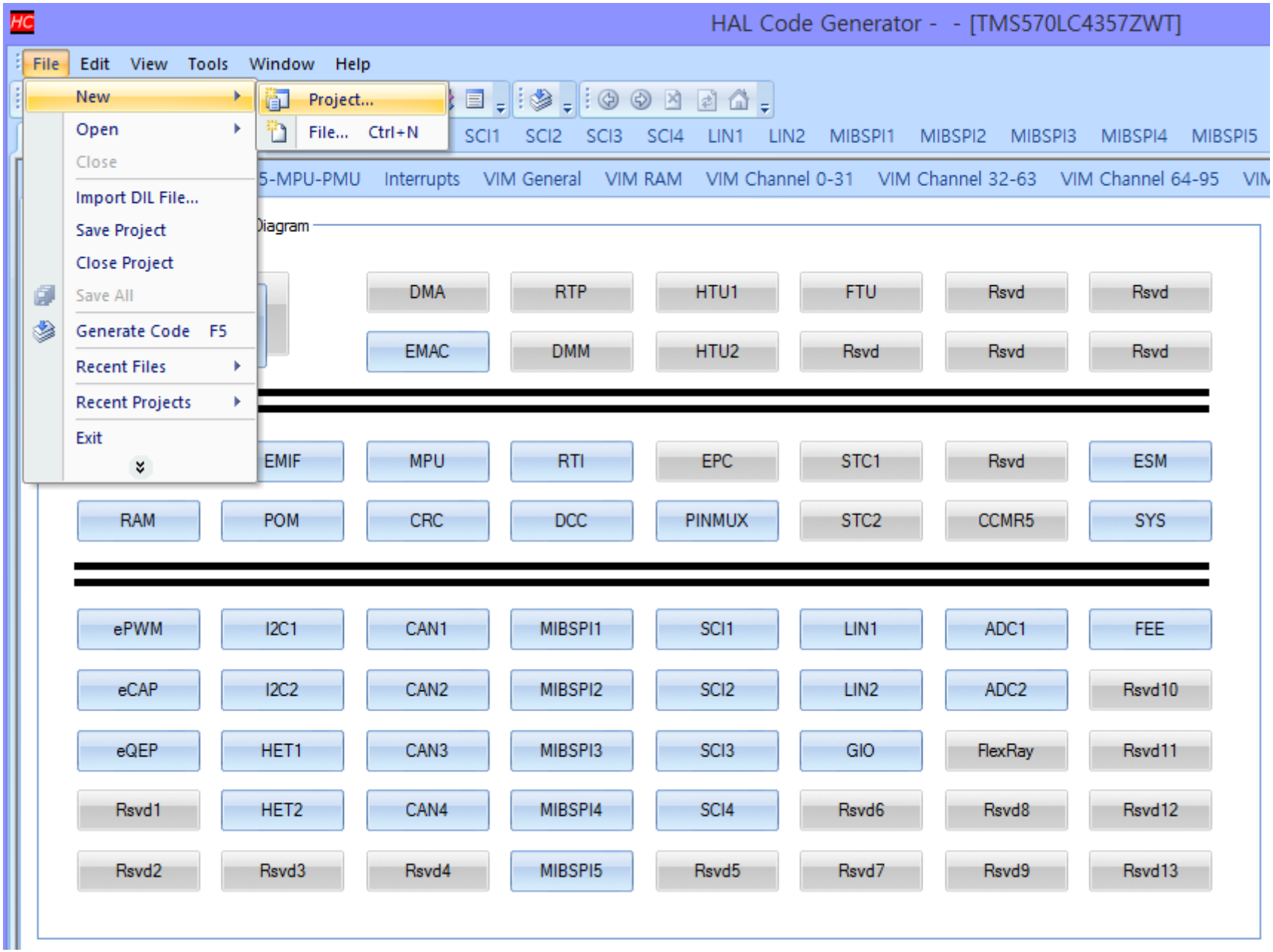

New CCS Project
CCS Project
Create a new CCS Project.
Target:
Unclassified Devices
RM57L8xx
Connection:
Texas Instruments XDS100v2 USB Debug Probe
Verify...
Cortex R [ARM]
Project name:
rti_gpio
Use default location
Location:
D:₩ti_workspace₩rti_gpio
Browse...
Compiler version:
TI v15.12.1.LTS
More...
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
Hello World
SYS/BIOS
Creates an empty project fully initialized for the selected device. The project will contain an empty 'main.c' source-file.

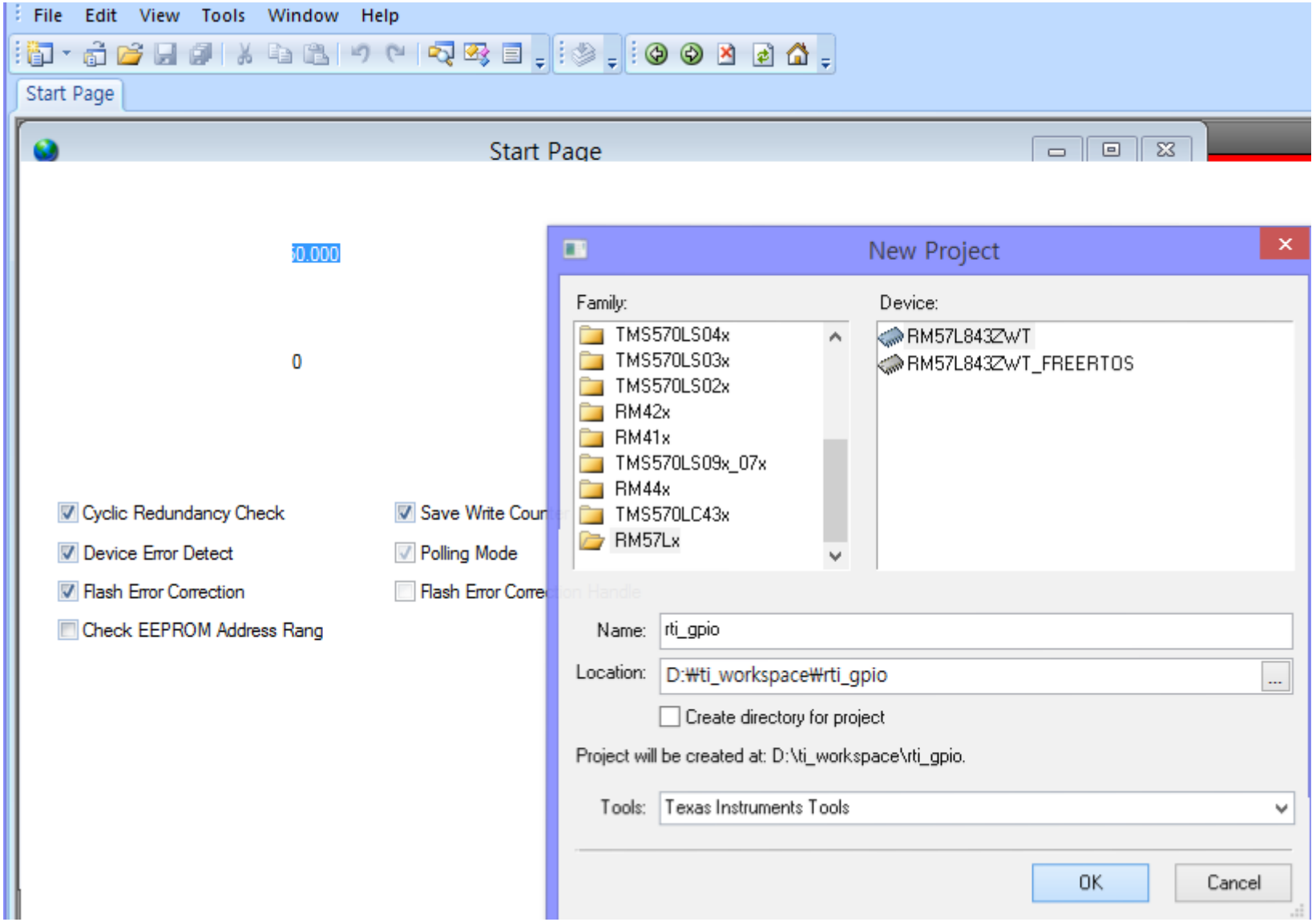

Properties for rti_gpio
type filter text
Resource
General
Build
ARM Compiler
Processor Options
Optimization
Include Options
MISRA-C:2004
ULP Advisor
Advanced Options
ARM Linker
ARM Hex Utility [Disabled]
Debug
Resource
Path: /rti_gpio
Type: Project
Location: D:₩ti_workspace₩rti_gpio
Last modified: 2017년 6월 13일 오후 6:48:59
Text file encoding
Inherited from container (MS949)
Other: MS949
Store the encoding of derived resources separately
New text file line delimiter
Inherited from container (Windows)
Other: Windows
Restore Defaults

복사한 상태로 HALCoGen을 동작시킨다.

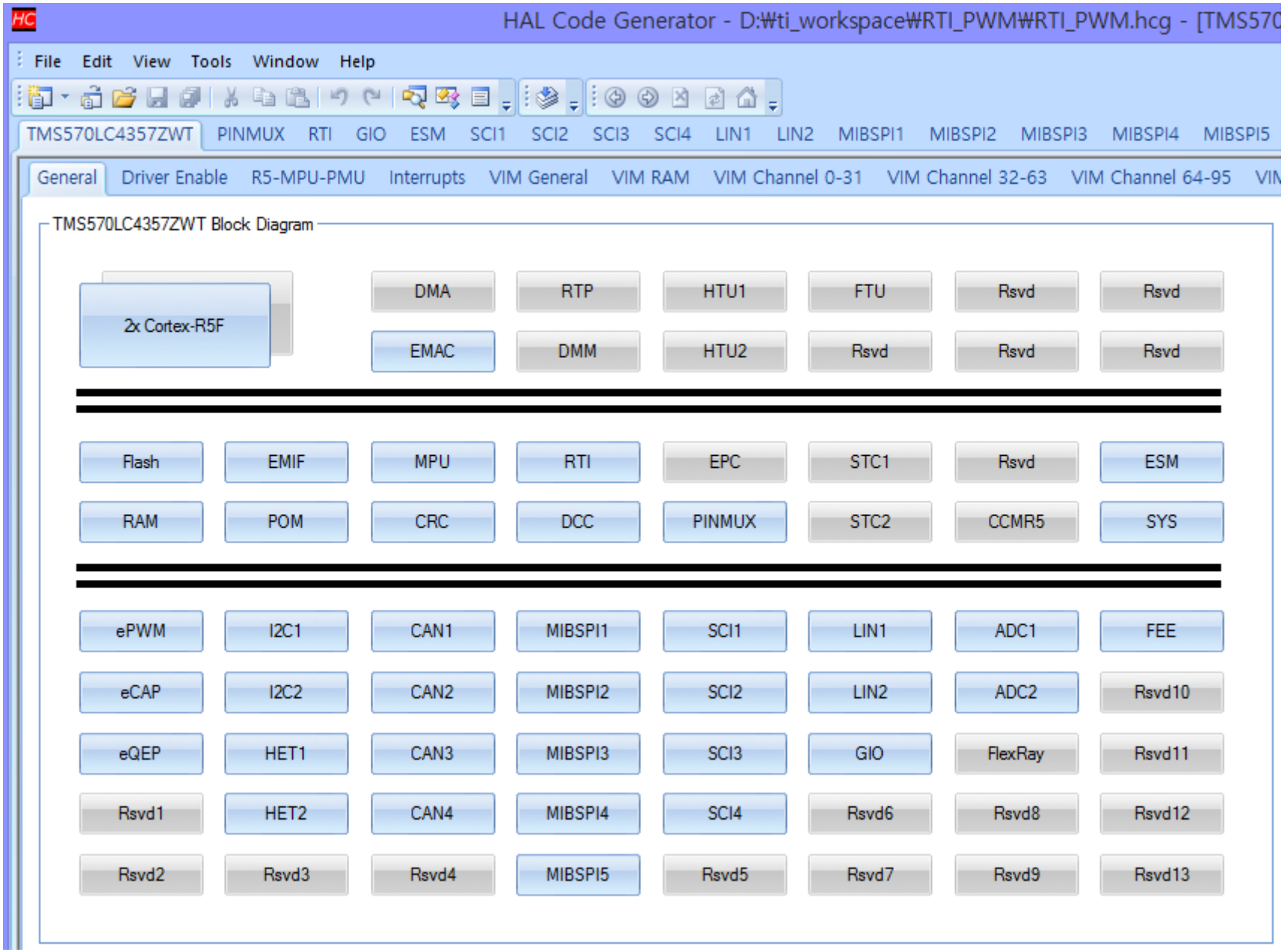


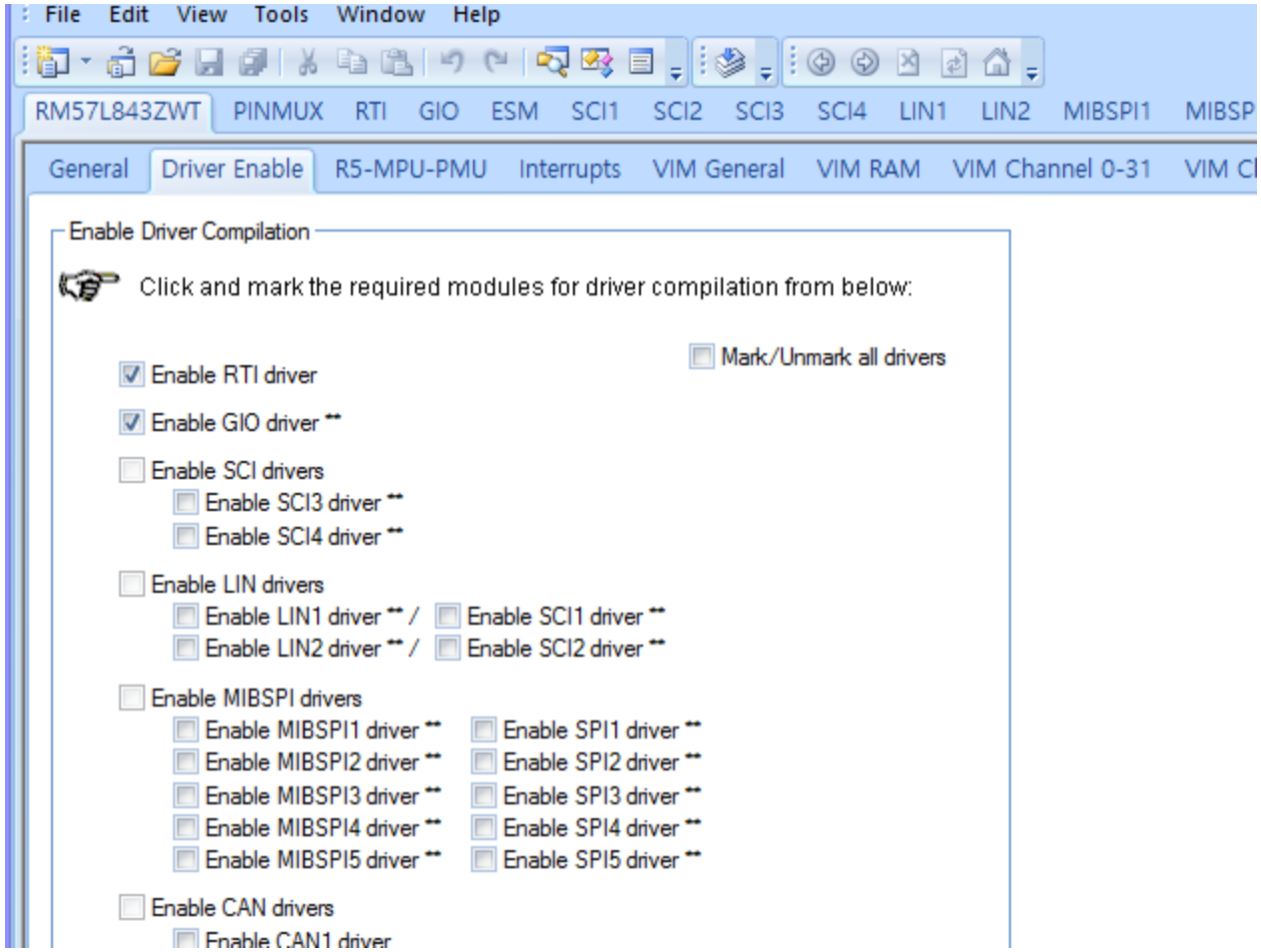

File Edit View Tools Window Help
Start Page
My.TI TI Home Microcontrollers
Texas Instruments
INNOVATE. CREATE. MAKE THE DIFFERENCE.™
HALCoGen
HALCoGen: 04.05.02 - Released 02.Mar.2016
Important Hercules Safety MCU Links:
Hercules product web pages provide access to device data sheets,technical reference manuals, application notes, videos, software downloads/updates, and online ordering of evaluation and development kits.
HALCoGen Wiki Page
Hercules Product Main Home Page
RM4 Product Home Page
TMS570 Product Home Page
TMS470M Product Home
Hercules Technical Support Forum
Search for topics or ask technical questions about all Hercules MCUs - RM4, TMS570 and TMS470M
Hercules MCU Wiki Site
Download development kit schematics, software examples, training videos and information and much more on the Hercules WIKI pages.
3rd Party Links
FreeRTOS Home
Keil Application Note on how use HALCoGen generated code in &microVision
IAR Application Note on how use HALCoGen generated code in IAR Embedded Workbench
ARM Cortex-R4F Technical Technical Reference Manual
Open Source
HALCoGen Manifest
Open Source Information and Download

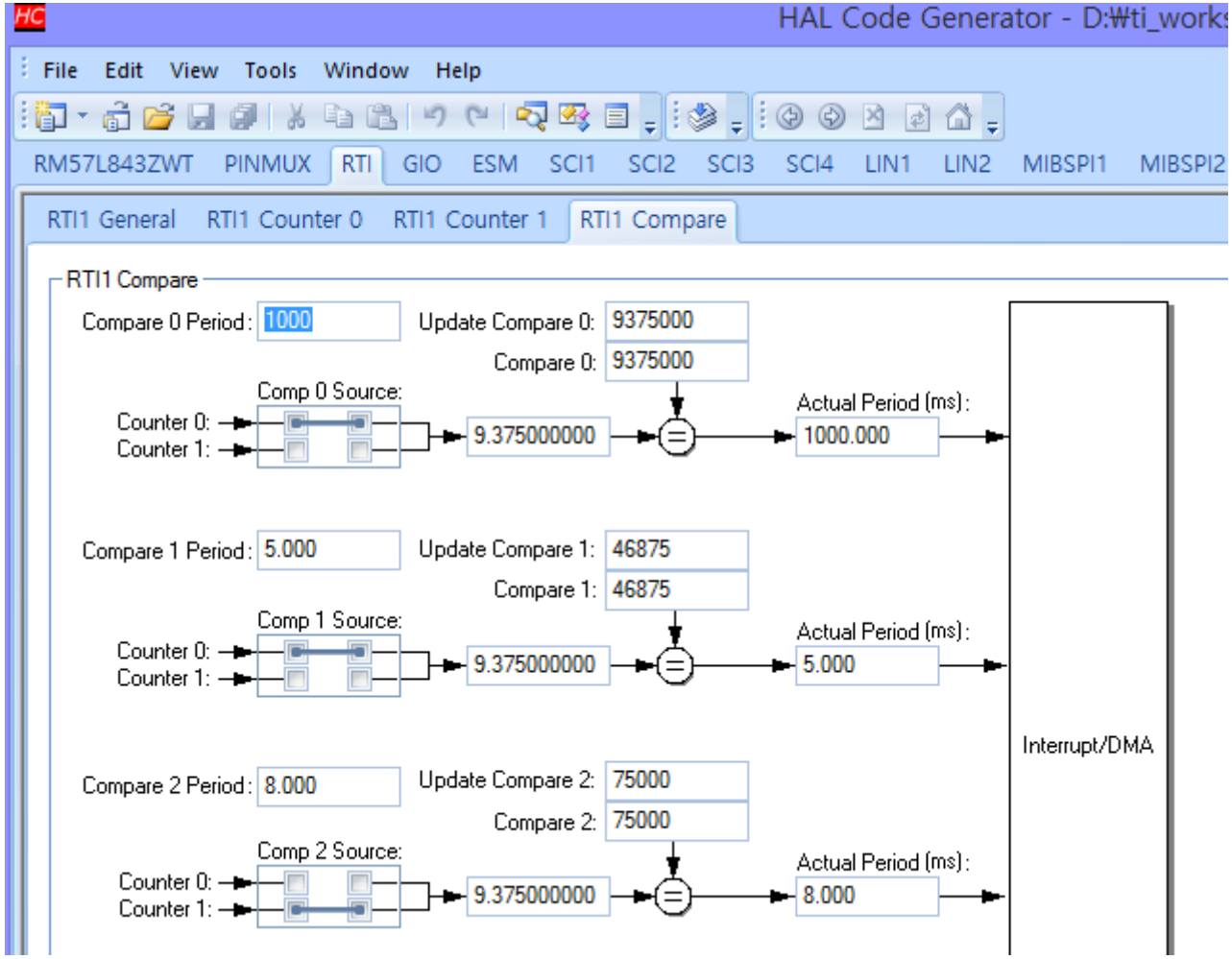

HAL Code Generator - - [TMS570LC4357ZWT]
File
Edit
View
Tools
Window
Help
New
Open
Close
Import DIL File...
Save Project
Close Project
Save All
Generate Code F5
Recent Files
Recent Projects
Exit
Project...
File... Ctrl+N
SCI1 SCI2 SCI3 SCI4 LIN1 LIN2 MIBSPI1 MIBSPI2 MIBSPI3 MIBSPI4 MIBSPI5
5-MPU-PMU Interrupts VIM General VIM RAM VIM Channel 0-31 VIM Channel 32-63 VIM Channel 64-95
Diagram
DMA RTP HTU1 FTU Rsvd Rsvd
EMAC DMM HTU2 Rsvd Rsvd Rsvd
EMIF MPU RTI EPC STC1 Rsvd ESM
RAM POM CRC DCC PINMUX STC2 CCMR5 SYS
ePWM I2C1 CAN1 MIBSPI1 SCI1 LIN1 ADC1 FEE
eCAP I2C2 CAN2 MIBSPI2 SCI2 LIN2 ADC2 Rsvd10
eQEP HET1 CAN3 MIBSPI3 SCI3 GIO FlexRay Rsvd11
Rsvd1 HET2 CAN4 MIBSPI4 SCI4 Rsvd6 Rsvd8 Rsvd12
Rsvd2 Rsvd3 Rsvd4 MIBSPI5 Rsvd5 Rsvd7 Rsvd9 Rsvd13

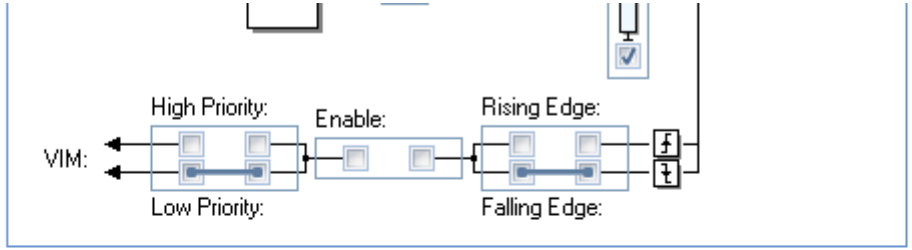

File Edit View Tools Window Help
Start Page
Start Page
0.000
0
Cyclic Redundancy Check
Device Error Detect
Flash Error Correction
Check EEPROM Address Rang
Save Write Cour
Polling Mode
Flash Error Corre
New Project
Family:
TMS570LS04x
TMS570LS03x
TMS570LS02x
RM42x
RM41x
TMS570LS09x_07x
RM44x
TMS570LC43x
RM57Lx
Device:
RM57L843ZWT
RM57L843ZWT_FREERTOS
Name: rti_gpio
Location: D:₩ti_workspace₩rti_gpio
Create directory for project
Project will be created at: D:\ti_workspace\rti_gpio.
Tools: Texas Instruments Tools
OK
Cancel

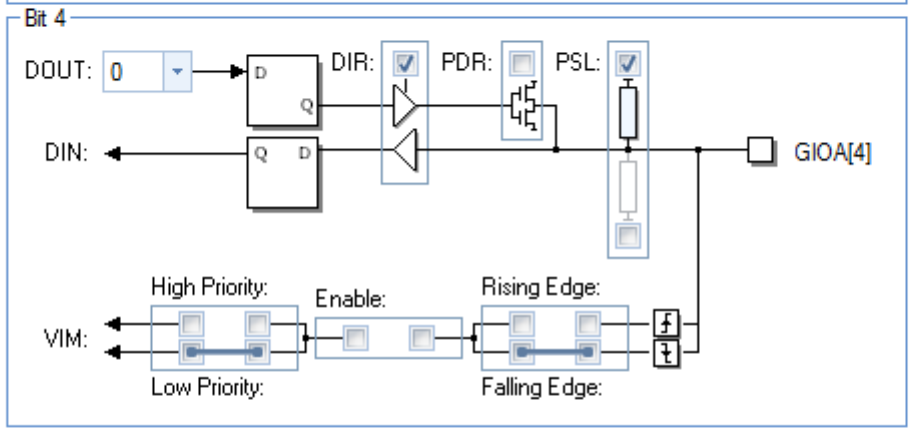
이번엔 PWM 을 활용하여 LED 를 제어해보도록 하자!

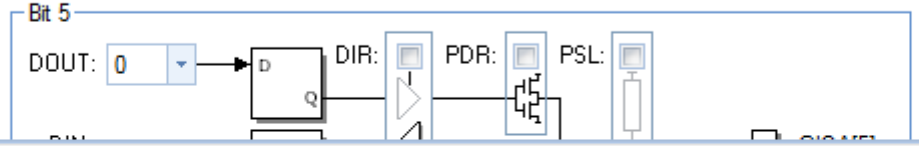



File Edit View Tools Window Help
RM57L843ZWT PINMUX RTI GIO ESM SCI1 SCI2 SCI3 SCI4 LIN1 LIN2 MIBSPI1 MIBSP
General Driver Enable R5-MPU-PMU Interrupts VIM General VIM RAM VIM Channel 0-31 VIM Cl
Enable Driver Compilation
Click and mark the required modules for driver compilation from below:
Mark/Unmark all drivers
Enable RTI driver
Enable GIO driver **
Enable SCI drivers
Enable SCI3 driver **
Enable SCI4 driver **
Enable LIN drivers
Enable LIN1 driver ** / Enable SCI1 driver **
Enable LIN2 driver ** / Enable SCI2 driver **
Enable MIBSPI drivers
Enable MIBSPI1 driver ** Enable SPI1 driver **
Enable MIBSPI2 driver ** Enable SPI2 driver **
Enable MIBSPI3 driver ** Enable SPI3 driver **
Enable MIBSPI4 driver ** Enable SPI4 driver **
Enable MIBSPI5 driver ** Enable SPI5 driver **
Enable CAN drivers
Enable CAN1 driver


HAL Code Generator - D:¥ti_works
File Edit View Tools Window Help
RM57L843ZWT PINMUX RTI GIO ESM SCI1 SCI2 SCI3 SCI4 LIN1 LIN2 MIBSPI1 MIBSPI2
RTI1 General RTI1 Counter 0 RTI1 Counter 1 RTI1 Compare
RTI1 Compare
Compare 0 Period: 1000
Update Compare 0: 9375000
Compare 0: 9375000
Comp 0 Source:
Counter 0:
Counter 1:
9.375000000
Actual Period (ms):
1000.000
Compare 1 Period: 5.000
Update Compare 1: 46875
Compare 1: 46875
Comp 1 Source:
Counter 0:
Counter 1:
9.375000000
Actual Period (ms):
5.000
Compare 2 Period: 8.000
Update Compare 2: 75000
Compare 2: 75000
Comp 2 Source:
Counter 0:
Counter 1:
9.375000000
Actual Period (ms):
8.000
Interrupt/DMA







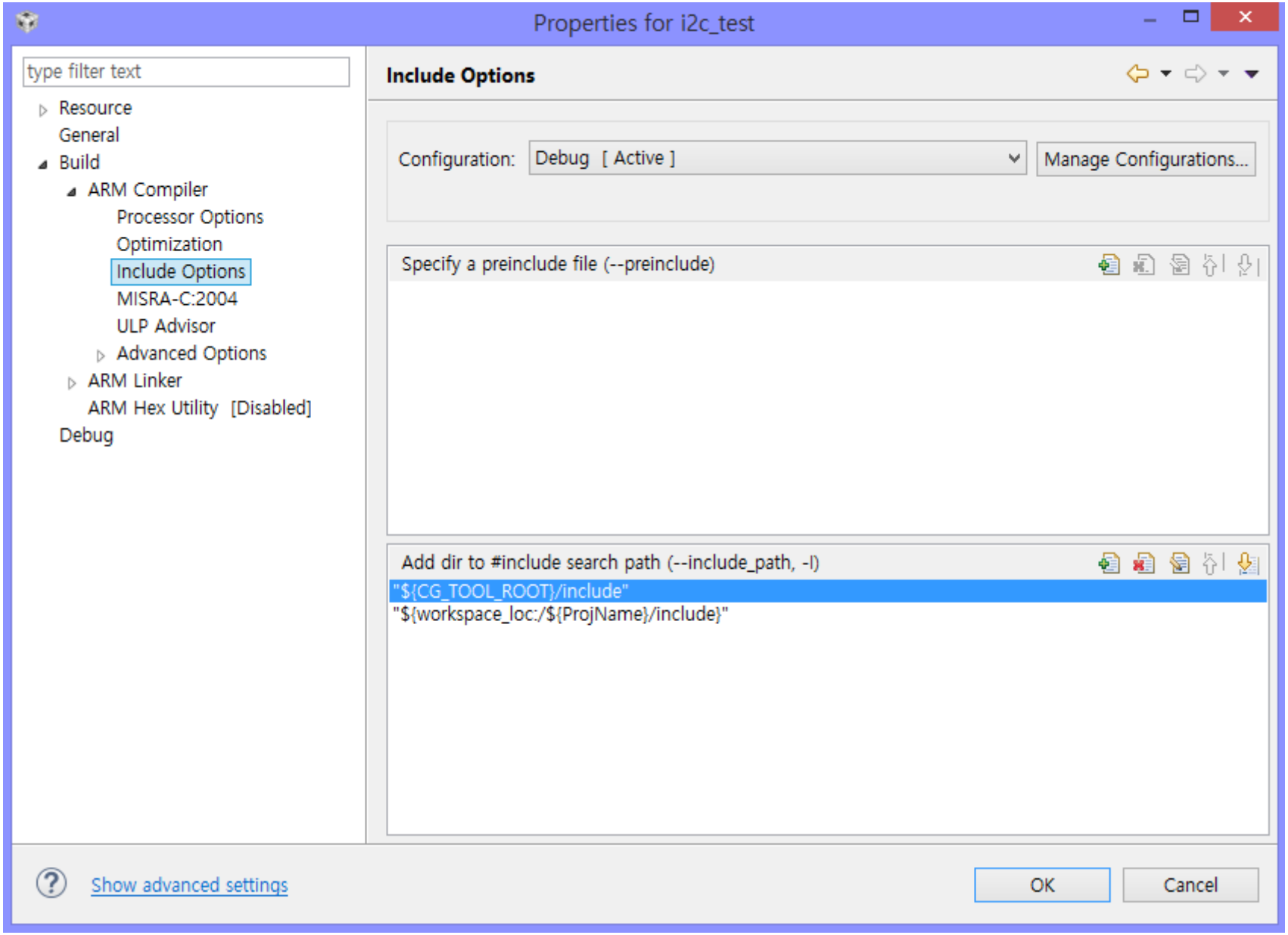
tive - Debu

s

he package
ew is current
TSC Config

Output

```
Loading: ETPWM: 'ETPWMv000.xml'
Loading: ECAP: 'ECAPv000.xml'
Loading: EQEP: 'EQEPv000.xml'
Loading: FEE: 'FEEv000.xml'
Load complete
```


Properties for i2c_test
type filter text
Resource
General
Build
ARM Compiler
Processor Options
Optimization
Include Options
MISRA-C:2004
ULP Advisor
Advanced Options
ARM Linker
ARM Hex Utility [Disabled]
Debug
Include Options
Configuration: Debug [Active]
Manage Configurations...
Specify a preinclude file (--preinclude)
Add dir to #include search path (--include_path, -I)
"${CG_TOOL_ROOT}/include"
"${workspace_loc:/${ProjName}/include}"
Show advanced settings
OK
Cancel

이후의 코드 부분은 github 에 올려놓은
main 코드를 통해 Real-Time Interrupt 기반으로 GPIO 스위치를 활용해보도록 한다.

실질적으로 다양한 센서 회로들의 전압을 분리하고
각각의 장치들에 대한 스위치로서 이를 활용할 수 있을 것이다.