MediaTek

Driver Customization Tool

User Manual

Preliminary Information

Revision: 0.1

Release Date: Jun. 14, 2006

Legal Disclaimer

Revision History

Revision	Date	Author	Comments
0.1	5/13/05	Simon Shih	Draft version with content to demonstrate how to operate UI.

Table of Contents

1 Introduction

1.1 Introduction

The document is to illustrate the whole procedure for user to customize driver settings with tool DrvGen.exe. The purpose of this procedure is to provide an easy and better way to manage driver settings that can be customized by different project. In other words, the entire related driver settings will be centralized. And this will reduce the complexities and bugs due to wrong settings. Moreover, the tool has been integrated into the project building procedure.

Now there are 5 driver component settings included as below:

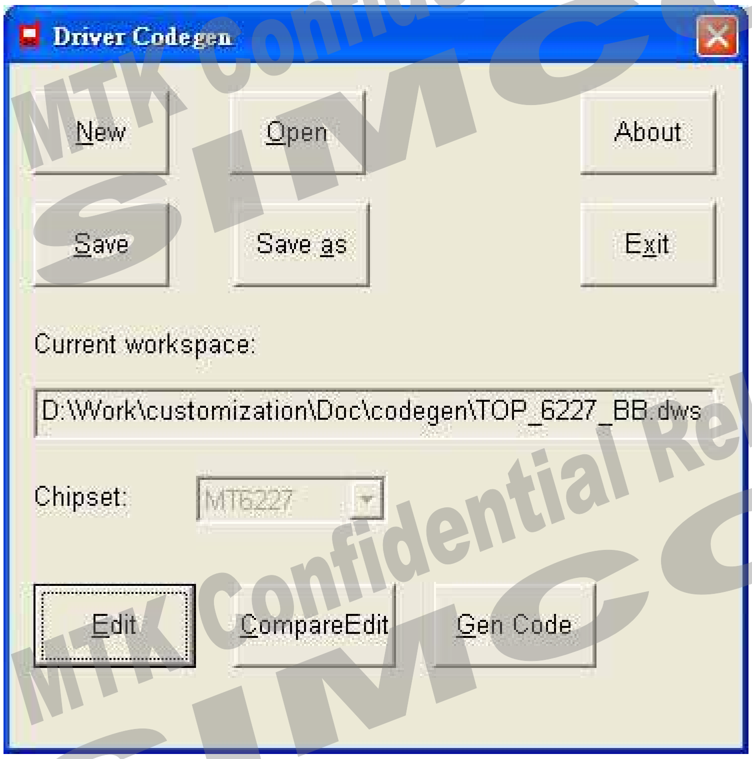
1. GPIO and GPO
2. ADC (Analog to Digital Converter)
3. EINT (External interrupt)
4. UEM (User Equipment Management)
5. Keypad

Each component's settings will be demonstrated in the following sections.

2 Operation of User Interface

User Interface of Driver Customization Tool includes Main Menu and pages for GPIO, GPO, ADC, EINT, Keypad and UEM component. In this chapter, we will see how to use it in detail.

2.1 Main Menu



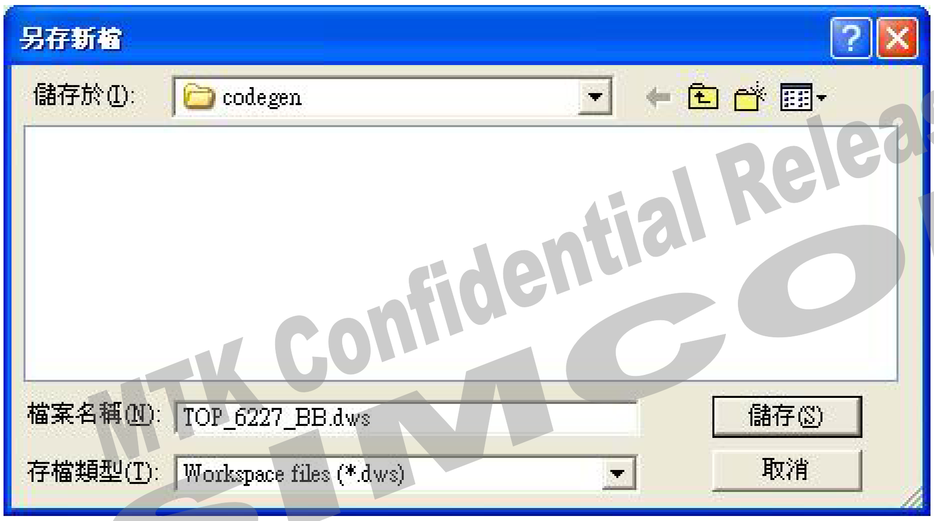
D:\Work\customization\Doc\codegen\TOP_6227_BB.dws

The main menu of this tool includes:

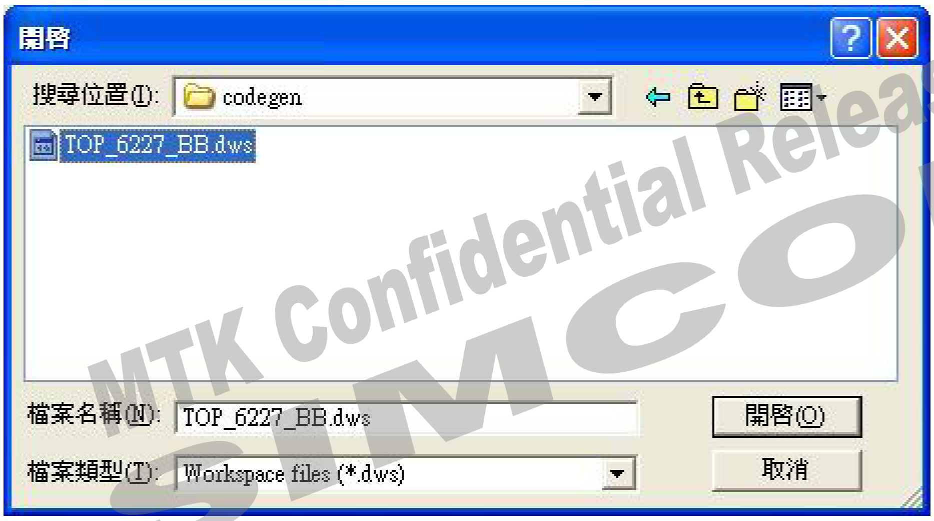
1. [New]/[Open] button
2. [Save]/[Save as] button
3. [About] button
4. [Exit] button
5. Current data workspace path
6. Chipset selection
7. [Edit] button
8. [CompareEdit] button
9. [Gen Code] button

2.1.1 [New]/[Open]

1. New: Start a new data workspace file (.dws) in a fold which user can specify.

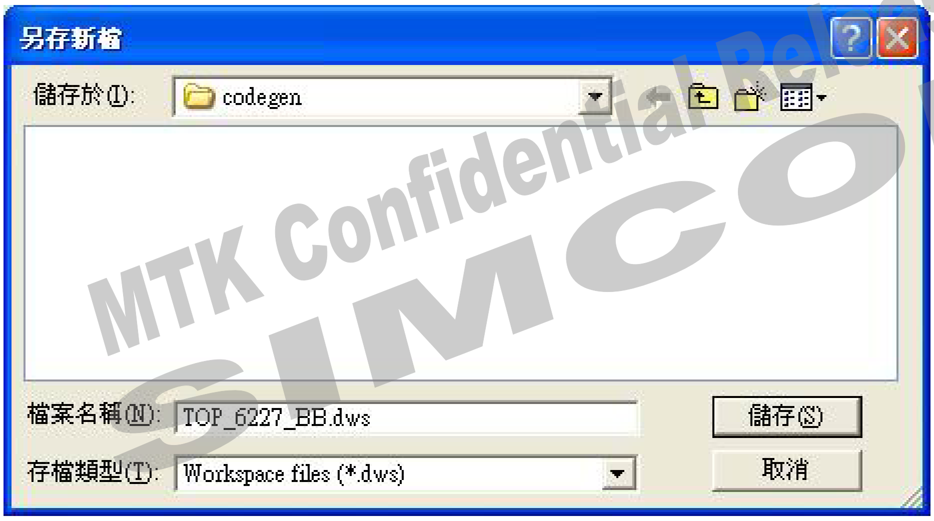


2. Open: Open a previously saved data workspace file in a specified folder.



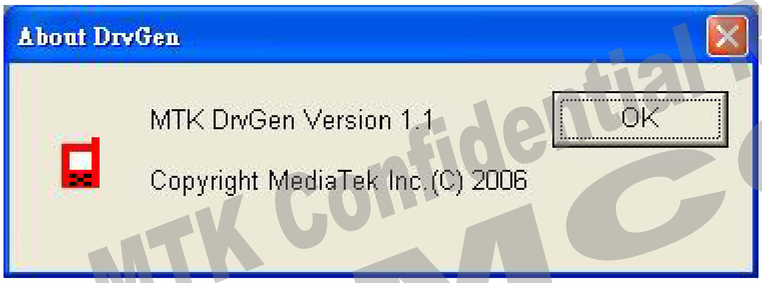
2.1.2 [Save]/[Save as]

1. Save: Save the modification of setting in the original data workspace file.
2. Save as: Save the modification of setting in another data workspace file that can be specified.



2.1.3 [About]

The [About] button shows the version information for this tool.



About DrvGen

MTK DrvGen Version 1.1

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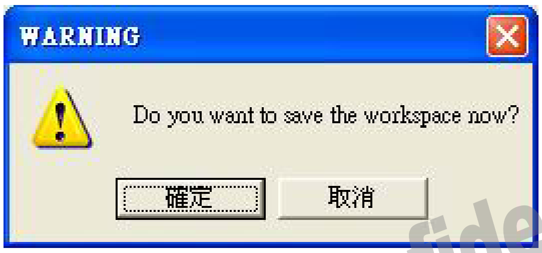
2.1.4 [Exit]

The [Exit] button is to exit the program. Before actually leaving the program, a pop-up message will show up to ask user if he/she wants to save the data workspace file.

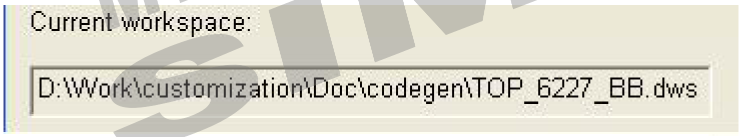


WARNING

Do you want to save the workspace now?

2.1.5 Current Data Workspace File Path

This shows the current data workspace file with the directory path that user are working in.

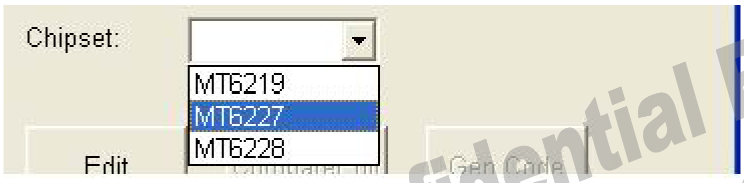


Current workspace:

D:\Work\customization\Doc\codegen\TOP_6227_BB.dws

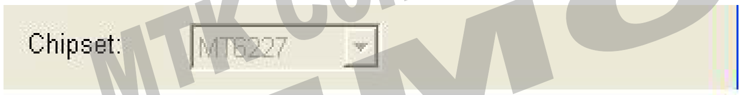
2.1.6 Chipset selection

When a new data workspace file is created, user must select a chipset type via this field.



Chipset:

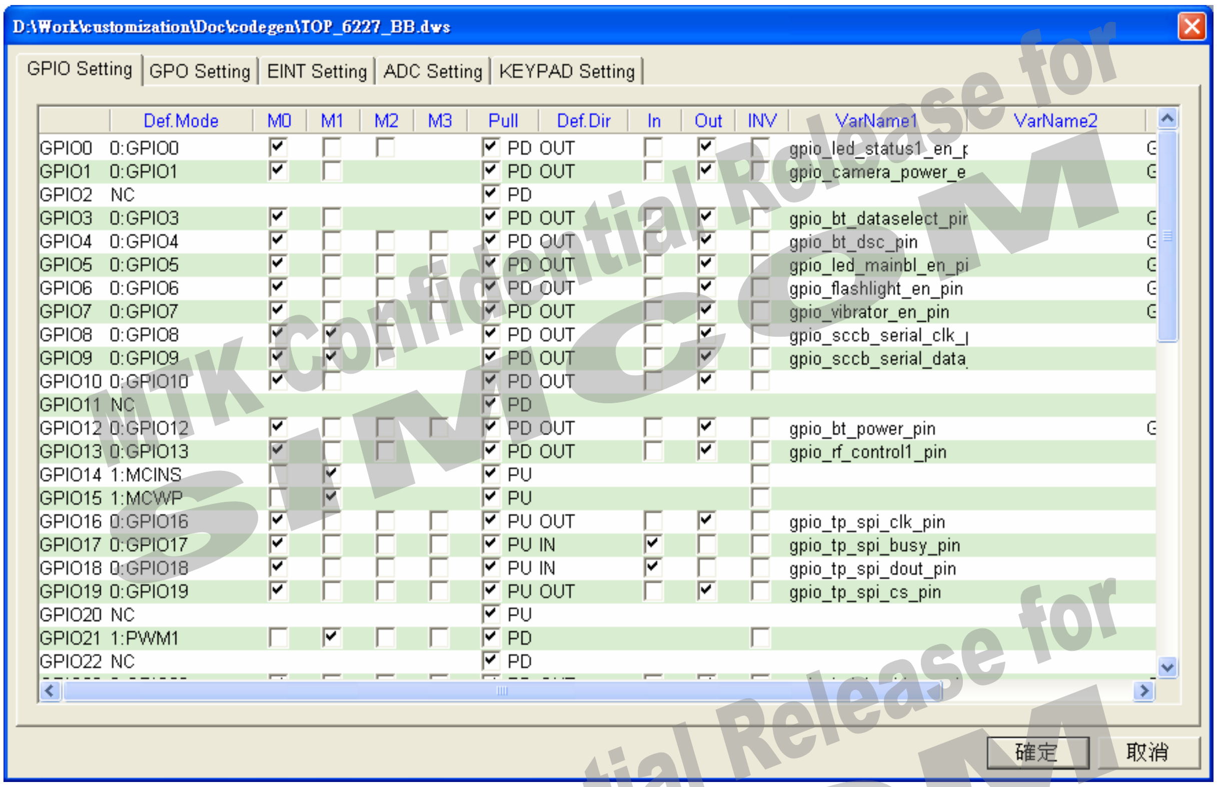
When opening a previous data workspace file, this field just shows the chipset type.



Chipset: MT6227

2.1.7 [Edit]

When the Edit button is pressed, an editing window will appear. It includes 5 components' settings: GPIO, GPO, EINT, ADC and KEYPAD. The detailed descriptions for this window will be in section 2.2 to section 2.6.



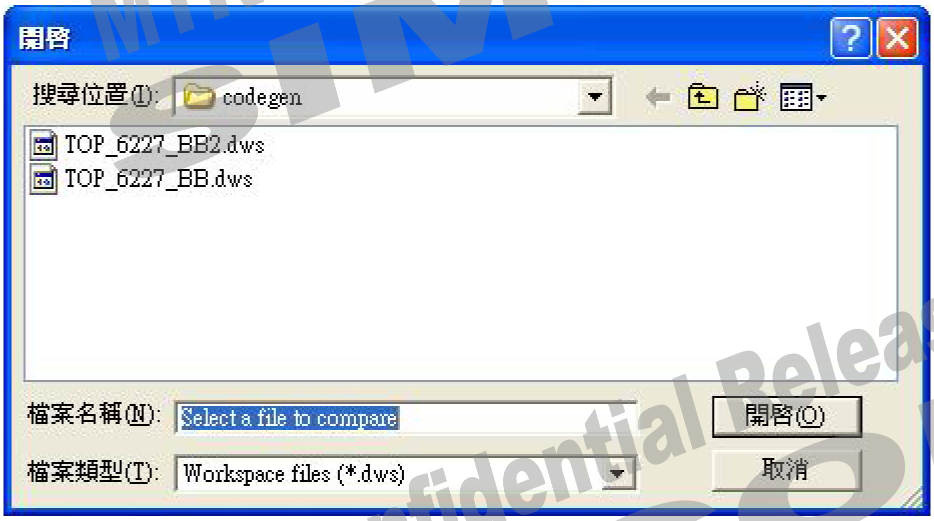
D:\Work\customization\Doc\codegen\TOP_6227_BB.dws

GPIO Setting | GPO Setting | EINT Setting | ADC Setting | KEYPAD Setting

	Def.Mode	M0	M1	M2	M3	Pull	Def.Dir	In	Out	INV	VarName1	VarName2	
GPIO0	0:GPIO0	☑	☐	☐		☑ PD	OUT	☐	☑	☐	gpio_led_status1_en_		G
GPIO1	0:GPIO1	☑	☐			☑ PD	OUT	☐	☑	☐	gpio_camera_power_e		G
GPIO2	NC					☑ PD							
GPIO3	0:GPIO3	☑	☐			☑ PD	OUT	☐	☑	☐	gpio_bt_dataselect_pi		G
GPIO4	0:GPIO4	☑	☐	☐	☐	☑ PD	OUT	☐	☑	☐	gpio_bt_dsc_pin		G
GPIO5	0:GPIO5	☑	☐	☐	☐	☑ PD	OUT	☐	☑	☐	gpio_led_mainbl_en_pi		G
GPIO6	0:GPIO6	☑	☐	☐	☐	☑ PD	OUT	☐	☑	☐	gpio_flashlight_en_pin		G
GPIO7	0:GPIO7	☑	☐	☐	☐	☑ PD	OUT	☐	☑	☐	gpio_vibrator_en_pin		G
GPIO8	0:GPIO8	☑	☑	☐		☑ PD	OUT	☐	☑	☐	gpio_sccb_serial_clk_		
GPIO9	0:GPIO9	☑	☑	☐		☑ PD	OUT	☐	☑	☐	gpio_sccb_serial_data		
GPIO10	0:GPIO10	☑	☐			☑ PD	OUT	☐	☑	☐			
GPIO11	NC					☑ PD							
GPIO12	0:GPIO12	☑	☐	☐	☐	☑ PD	OUT	☐	☑	☐	gpio_bt_power_pin		G
GPIO13	0:GPIO13	☑	☐	☐		☑ PD	OUT	☐	☑	☐	gpio_rf_control1_pin		
GPIO14	1:MCINS	☐	☑			☑ PU				☐			
GPIO15	1:MCWP	☐	☑			☑ PU				☐			
GPIO16	0:GPIO16	☑	☐	☐	☐	☑ PU	OUT	☐	☑	☐	gpio_tp_spi_clk_pin		
GPIO17	0:GPIO17	☑	☐	☐	☐	☑ PU	IN	☑	☐	☐	gpio_tp_spi_busy_pin		
GPIO18	0:GPIO18	☑	☐	☐	☐	☑ PU	IN	☑	☐	☐	gpio_tp_spi_dout_pin		
GPIO19	0:GPIO19	☑	☐	☐	☐	☑ PU	OUT	☐	☑	☐	gpio_tp_spi_cs_pin		
GPIO20	NC					☑ PU							
GPIO21	1:PWM1	☐	☑	☐	☐	☑ PD				☐			
GPIO22	NC					☑ PD							

2.1.8 [CompareEdit]

When the CompareEdit button is pressed, a dialog box will show to indicate user to select another data workspace file in order to do the comparing between 2 different data workspace files.



開啓

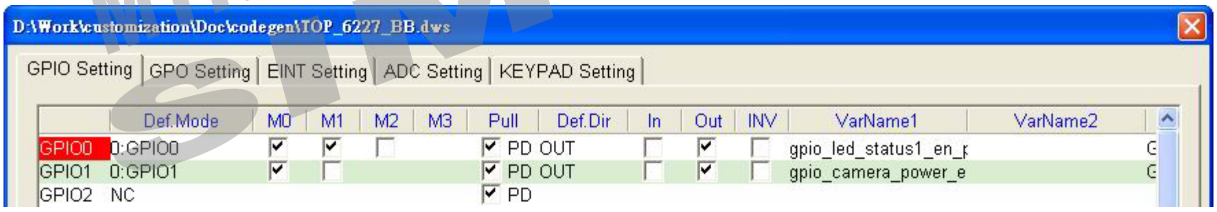
搜尋位置(I): codegen

TOP_6227_BB2.dws
TOP_6227_BB.dws

檔案名稱(N): Select a file to compare

檔案類型(T): Workspace files (*.dws)

After selecting another data workspace file, an editing window will appear just like pressing Edit button except that a red color will show on the head of the row in which the settings on these two data workspace are different.



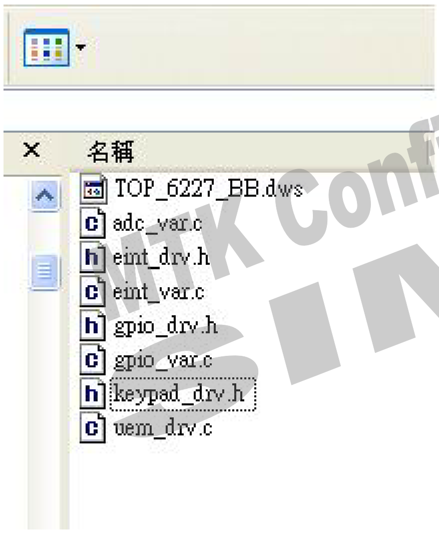
D:\Work\customization\Doc\codegen\TOP_6227_BB.dws

GPIO Setting | GPO Setting | EINT Setting | ADC Setting | KEYPAD Setting

	Def.Mode	M0	M1	M2	M3	Pull	Def.Dir	In	Out	INV	VarName1	VarName2	
🟥 GPIO0	0:GPIO0	☑	☑	☐		☑ PD	OUT	☐	☑	☐	gpio_led_status1_en_		G
GPIO1	0:GPIO1	☑	☐			☑ PD	OUT	☐	☑	☐	gpio_camera_power_e		G
GPIO2	NC					☑ PD							

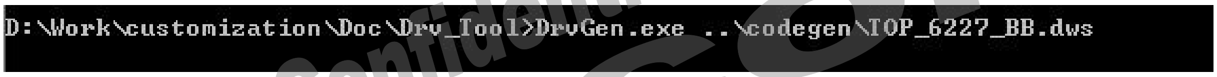
2.1.9 [GenCode]

When the GenCode button is pressed, the corresponding source files and header files will be generated in the same folder as the data workspace file is in. What source files and header files will be generated is illustrated in section 2.2 to section 2.6.



Note that the tool also supports command mode to generate the source files and header files like below:

```
DrvGen.exe   .\path\workspace.dws

For example:
```



```
D:\Work\customization\Doc\Drv_Tool>DrvGen.exe ..\codegen\TOP_6227_BB.dws
```

2.2 Component: GPIO (General Purpose IO)/GPO(General Purpose Output)

2.2.1 In MT6xxx.fig

For each GPIO/GPO pin of the corresponding chipset type MT6xxx, it describes the mode names for each four mode. Also, it describes each pin's pull-up(PU)/pull-down(PD)/high-impedance(Z) for GPIO but not for GPO pins. For example:

```
[GPIO]
GPIO0 =  Mode0(GPIO0)  Mode1(DICL)      Mode2(DSP_GPO3) Mode3() PD
GPIO1 =  Mode0(GPIO1)  Mode1(BSI_RFIN)  Mode2()         Mode3() PD
GPIO2 =  Mode0(GPIO2)  Mode1(DID)       Mode2()         Mode3() PU
GPIO3 =  Mode0(GPIO3)  Mode1(DIMS)      Mode2()         Mode3() PD
GPIO4 =  Mode0(GPIO4)  Mode1(DSP_CLK)   Mode2(DSPLCK)   Mode3(EDICK) Z

[GPO]
GPO0 = Mode0(GPO0) Mode1(SRCLKENA)  Mode2()      Mode3()
GPO1 = Mode0(GPO1) Mode1(SRCLKENAN) Mode2()      Mode3()
GPO2 = Mode0(GPO2) Mode1(EPDN#)     Mode2(6.5MHz)Mode3(26MHz)
```

Inside the parenthesis (), it's the mode name for the corresponding mode (mode0~mode3). If there's nothing in the parenthesis, then it means this mode for the pin is reserved.

2.2.2 In GPIO.cmp

GPIO.cmp will be loaded into the Tool for editing GPIO settings. It contains two parts: 1. GPIO variables and 2. Header and tailer of the generated GPIO files.

2.2.2.1 GPIO variables

This file lists the entire software GPIO variables that may be assigned a GPIO port number. So these GPIO variables should be synchronized with the latest codes and can be added or removed (not recommended because of backward compatibility).

For example:

```
[GPIO_variables]
; gpio_bt_reset_pin is for bluetooth reset
gpio_bt_reset_pin
; gpio_bt_dsc_pin is for bluetooth disconnetion
gpio_bt_dsc_pin
; gpio_bt_power_pin is for bluetooth power on
gpio_bt_power_pin
; gpio_bt_dataselect_pin is for bluetooth data selection
gpio_bt_dataselect_pin
; gpio_rf_control1_pin is for RF control 1
gpio_rf_control1_pin
; gpio_rf_control1_pin is for RF control 2
gpio_rf_control2_pin
; gpio_rf_control3_pin is for RF control 3
gpio_rf_control3_pin
; gpio_bmt_chr_ctrl_pin is for controlling charging circuit
gpio_bmt_chr_ctrl_pin
; gpio_usb_enable_pin is for USB power enable
gpio_usb_enable_pin
```

Note that the semicolon (;) is used for comments.

2.2.2.2 Header and Trailer of the generated GPIO files

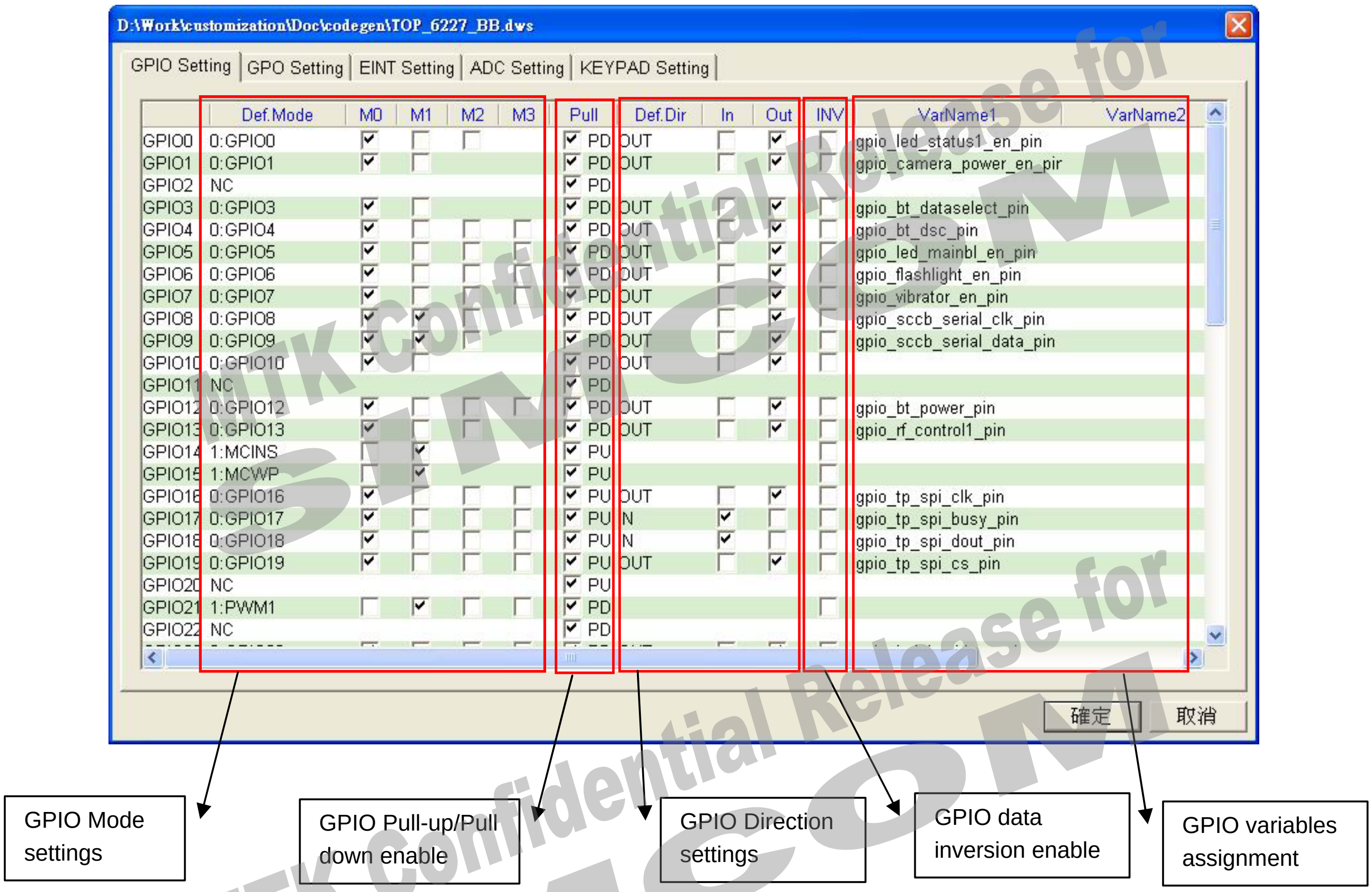
The tool will generate two files for GPIO as gpio_var.c and gpio_drv.h which are introduced in section 2.2.5. And in GPIO.cmp, the header and tailer of these two files will be described for Tool to generate with the setting data.

For example:

```
[gpio_drv.h_HEADER]
#ifndef _GPIO_DRV_H
#define _GPIO_DRV_H

[gpio_drv.h_TAILER]
#endif /* _GPIO_DRV_H */

[gpio_var.c_HEADER]
#ifdef __CUST_NEW__
#include "gpio_drv.h"

[gpio_var.c_TAILER]
#endif /* __CUST_NEW__ */
```

2.2.3 GPIO Editing Window

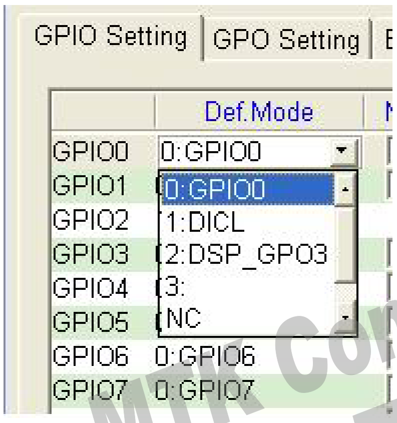
The GPIO editing window contains five categories: GPIO mode settings, GPIO pull-up/pull down enable, GPIO direction settings, GPIO data inversion enable and GPIO variables assignment as below. Note that it will list all the GPIO pins for the chipset selected in the Main Menu window (section 2.1.6). Actually the Tool loads the GPIO configuration from the corresponding MT6xxx.fig file.


D:\Work\customization\Doc\codegen\TOP_6227_BB.dws
GPIO Setting
GPO Setting
EINT Setting
ADC Setting
KEYPAD Setting
確定
取消
GPIO Mode settings
GPIO Pull-up/Pull down enable
GPIO Direction settings
GPIO data inversion enable
GPIO variables assignment

	Def.Mode	M0	M1	M2	M3	Pull		Def.Dir	In	Out	INV	VarName1	VarName2
GPIO0	0:GPIO0	✓	☐	☐		✓	PD	OUT	☐	✓	☐	gpio_led_status1_en_pin	
GPIO1	0:GPIO1	✓	☐			✓	PD	OUT	☐	✓	☐	gpio_camera_power_en_pir	
GPIO2	NC					✓	PD						
GPIO3	0:GPIO3	✓	☐			✓	PD	OUT	☐	✓	☐	gpio_bt_dataselect_pin	
GPIO4	0:GPIO4	✓	☐	☐	☐	✓	PD	OUT	☐	✓	☐	gpio_bt_dsc_pin	
GPIO5	0:GPIO5	✓	☐	☐	☐	✓	PD	OUT	☐	✓	☐	gpio_led_mainbl_en_pin	
GPIO6	0:GPIO6	✓	☐	☐	☐	✓	PD	OUT	☐	✓	☐	gpio_flashlight_en_pin	
GPIO7	0:GPIO7	✓	☐	☐	☐	✓	PD	OUT	☐	✓	☐	gpio_vibrator_en_pin	
GPIO8	0:GPIO8	✓	✓	☐		✓	PD	OUT	☐	✓	☐	gpio_sccb_serial_clk_pin	
GPIO9	0:GPIO9	✓	✓	☐		✓	PD	OUT	☐	✓	☐	gpio_sccb_serial_data_pin	
GPIO10	0:GPIO10	✓	☐			✓	PD	OUT	☐	✓	☐		
GPIO11	NC					✓	PD						
GPIO12	0:GPIO12	✓	☐	☐	☐	✓	PD	OUT	☐	✓	☐	gpio_bt_power_pin	
GPIO13	0:GPIO13	✓	☐	☐		✓	PD	OUT	☐	✓	☐	gpio_rf_control1_pin	
GPIO14	1:MCINS	☐	✓			✓	PU				☐		
GPIO15	1:MCWP	☐	✓			✓	PU				☐		
GPIO16	0:GPIO16	✓	☐	☐	☐	✓	PU	OUT	☐	✓	☐	gpio_tp_spi_clk_pin	
GPIO17	0:GPIO17	✓	☐	☐	☐	✓	PU	N	✓	☐	☐	gpio_tp_spi_busy_pin	
GPIO18	0:GPIO18	✓	☐	☐	☐	✓	PU	N	✓	☐	☐	gpio_tp_spi_dout_pin	
GPIO19	0:GPIO19	✓	☐	☐	☐	✓	PU	OUT	☐	✓	☐	gpio_tp_spi_cs_pin	
GPIO20	NC					✓	PU						
GPIO21	1:PWM1	☐	✓	☐	☐	✓	PD				☐		
GPIO22	NC					✓	PD						

2.2.3.1 GPIO Mode Settings

The first column of this category is to set the DEFAULT MODE for each GPIO pin. It's a selection menu include 4 mode with the mode names plus NC. Note that when the mode name for one mode is blank, it means this mode is for reserved and can't be selected. And the NC means this GPIO pin is not used.

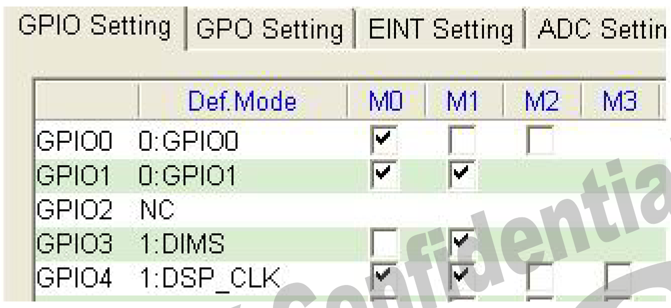


	Def.Mode
GPIO0	0:GPIO0
GPIO1	
GPIO2	
GPIO3	
GPIO4	
GPIO5	
GPIO6	0:GPIO6
GPIO7	0:GPIO7

The M0, M1, M2, M3 columns means the allowed mode (Mode 0, Mode 1, Mode2, Mode3) for the corresponding GPIO pin. Note that:

1. Only the modes that are not for reserved will show the checkboxes.
2. If DEFAULT MODE is Mode 0, then the check box for M0 is mandatory checked. The same as Mode 1, 2 and 3.

3. If DEFAULT MODE is NC, then there will be no checkbox.



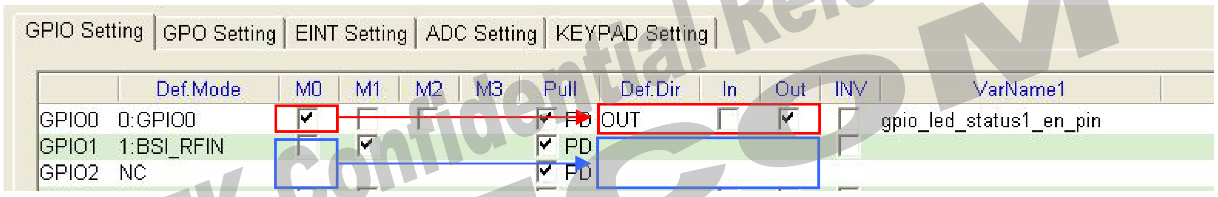
	Def.Mode	M0	M1	M2	M3
GPIO0	0:GPIO0	✓	☐	☐	
GPIO1	0:GPIO1	✓	✓		
GPIO2	NC				
GPIO3	1:DIMS	☐	✓		
GPIO4	1:DSP_CLK	✓	✓	☐	☐

2.2.3.2 GPIO pull-up/pull-down enable

For this category, it is just a checkbox to enable or disable pull-up(PU)/pull-down(PD)/high-impedance(Z) for the corresponding GPIO pin.

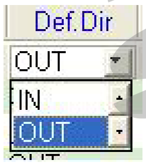
2.2.3.3 GPIO direction settings

This category contains three columns and they are only enabled when the allowed mode (M0, M1, M2 or M3) for the corresponding GPIO is checked. For example, assume Mode 0 of GPIO0 is GPIO mode and if M0 is checked, then GPIO direction settings of GPIO0 will appear for user to manipulate.



	Def.Mode	M0	M1	M2	M3	Pull	Def.Dir	In	Out	INV	VarName1
GPIO0	0:GPIO0	✓	☐	☐		✓ PD	OUT	☐	✓	☐	gpio_led_status1_en_pin
GPIO1	1:BSI_RFIN	☐	✓			✓ PD				☐	
GPIO2	NC					✓ PD					

1. "Def. Dir": A selectable menu to set the default direction (OUT: output, IN: input) for the corresponding GPIO pin.



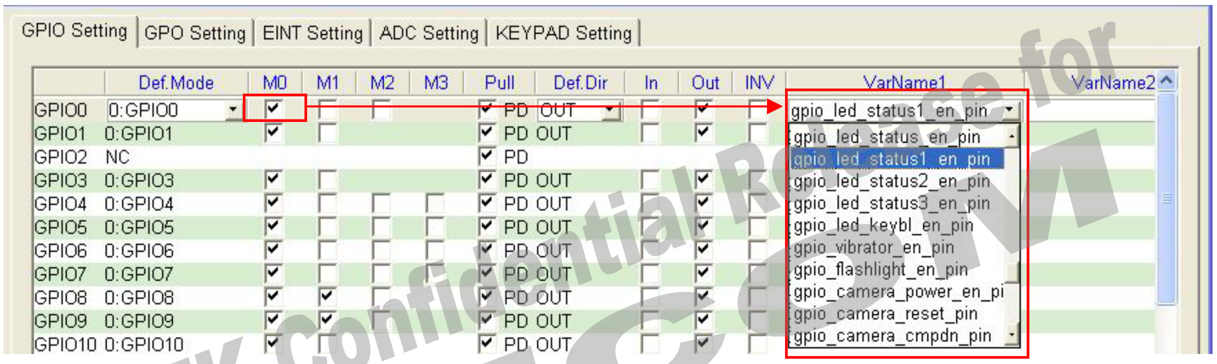
2. "In": A checkbox. When it's checked, it means that input direction (GPI) is allowed for the corresponding GPIO pin. Note that if default direction for the GPIO pin is IN, then this checkbox is mandatory checked.
3. "Out": A checkbox. When it's checked, it means that output direction (GPO) is allowed for the corresponding GPIO pin. Note that if default direction for the GPIO pin is OUT, then this checkbox is mandatory checked.

2.2.3.4 GPIO data inversion enable

It's a checkbox and is showed when the default mode for the corresponding GPIO pin is not NC. When it's check, it means to enable the data inversion for the GPIO pin. Note that it only takes effect on input signal.

2.2.3.5 GPIO variable assignment

It contains two columns: VarName1 and VarName2 and is enabled only when the allowed mode (M0, M1, M2 or M3) for the corresponding GPIO pin is checked.

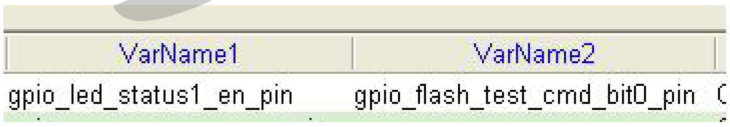


	Def.Mode	M0	M1	M2	M3	Pull	Def.Dir	In	Out	INV	VarName1	VarName2
GPIO0	0:GPIO0	✓	☐	☐		✓ PD	OUT	☐	✓	☐	gpio_led_status1_en_pin	
GPIO1	0:GPIO1	✓	☐			✓ PD	OUT	☐	✓	☐		
GPIO2	NC					✓ PD						
GPIO3	0:GPIO3	✓	☐			✓ PD	OUT	☐	✓	☐		
GPIO4	0:GPIO4	✓	☐	☐	☐	✓ PD	OUT	☐	✓	☐		
GPIO5	0:GPIO5	✓	☐	☐	☐	✓ PD	OUT	☐	✓	☐		
GPIO6	0:GPIO6	✓	☐	☐	☐	✓ PD	OUT	☐	✓	☐		
GPIO7	0:GPIO7	✓	☐	☐	☐	✓ PD	OUT	☐	✓	☐		
GPIO8	0:GPIO8	✓	✓	☐		✓ PD	OUT	☐	✓	☐		
GPIO9	0:GPIO9	✓	✓	☐		✓ PD	OUT	☐	✓	☐		
GPIO10	0:GPIO10	✓	☐			✓ PD	OUT	☐	✓	☐		

gpio_led_status_en_pin
gpio_led_status1_en_pin
gpio_led_status2_en_pin
gpio_led_status3_en_pin
gpio_led_keybl_en_pin
gpio_vibrator_en_pin
gpio_flashlight_en_pin
gpio_camera_power_en_pi
gpio_camera_reset_pin
gpio_camera_cmpdn_pin

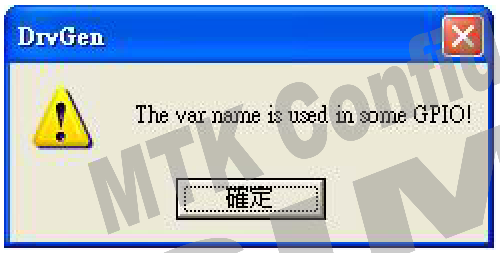
VarName1 or VarName2 is a selectable menu containing the whole software GPIO variable names defined in GPIO.cmp. User can select one of the GPIO variable names in order to assign GPIO port number to it.

In general, only VarName1 will be assigned the GPIO variable name but also can be left blank. VarName2 is for special cases when a GPIO pin is shared between two applications or modules. Therefore there will be two different GPIO variables assigned the same GPIO port number.



VarName1	VarName2
gpio_led_status1_en_pin	gpio_flash_test_cmd_bit0_pin

Note that no GPIO variable name can be assigned in any two different fields even in GPO Setting (GPIO variables names are shared with GPO Setting), otherwise there will be an error pop-up message as below:

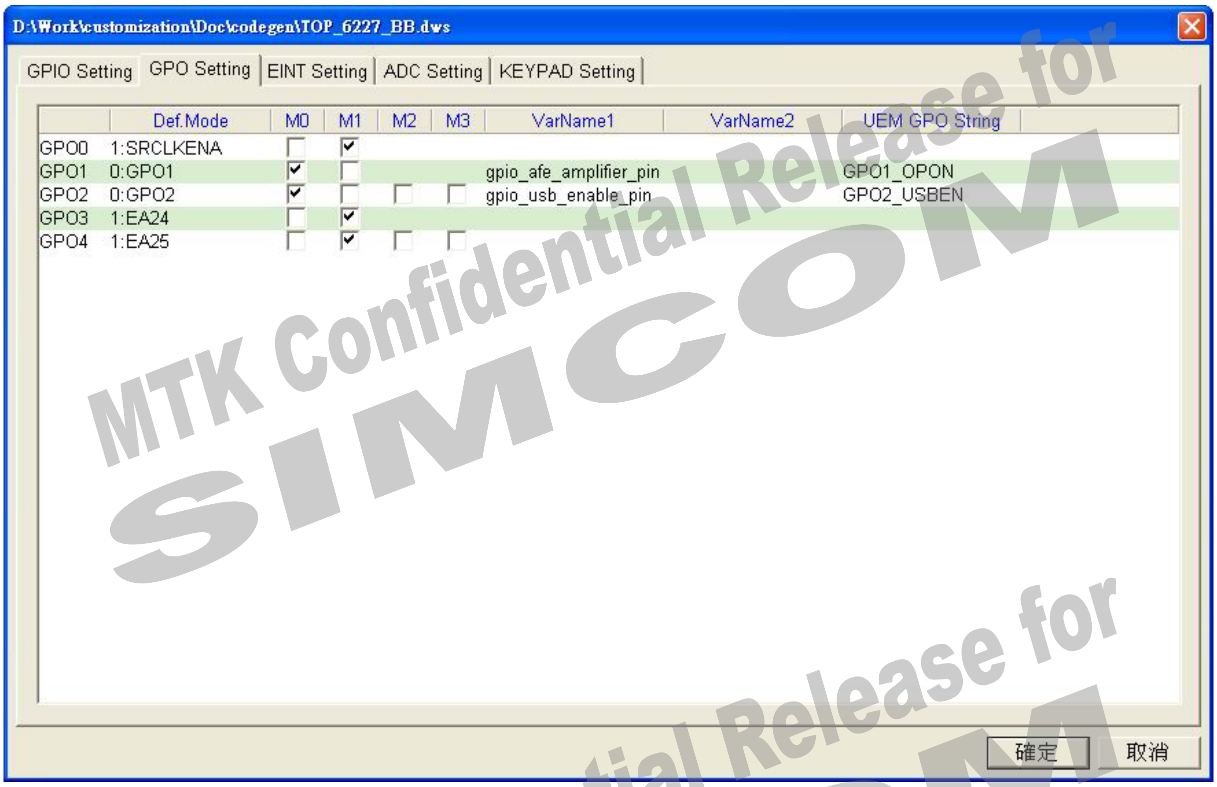

DrvGen

The var name is used in some GPIO!

2.2.4 GPO Editing Window

The GPO editing window is just like GPIO editing window except that it only contains two categories: GPO mode settings and GPIO variables assignment as below. Note that it will list all the GPO pins for the chipset selected in the Main Menu window (section 2.1.6). Actually the Tool loads the GPO configuration from the corresponding MT6xxx.fig file.

About the manipulation, please refer to section 2.2.3.1 GPIO Mode Settings and section 2.2.3.5 GPIO variable assignment.


D:\Work\customization\Doc\codegen\TOP_6227_BB.dws

GPIO Setting | GPO Setting | EINT Setting | ADC Setting | KEYPAD Setting

	Def.Mode	M0	M1	M2	M3	VarName1	VarName2	UEM GPO String
GPO0	1:SRCLKENA	☐	☑					
GPO1	0:GPO1	☑	☐			gpio_afe_amplifier_pin		GPO1_OPON
GPO2	0:GPO2	☑	☐	☐	☐	gpio_usb_enable_pin		GPO2_USBEN
GPO3	1:EA24	☐	☑					
GPO4	1:EA25	☐	☑	☐	☐			

Note that the column “UEM GPO String” is for UEM component and will be illustrated in section 2.2.6.

2.2.5 Generated Source and Header files

2.2.5.1 gpio_drv.h

1. Header defined in gpio.cmp:

```
#ifndef _GPIO_DRV_H
#define _GPIO_DRV_H
```

2. Defined the default mode for each GPIO port:

```
#define GPIO_PORT0_MODE   MODE_0
#define GPIO_PORT1_MODE   MODE_1
#define GPIO_PORT2_MODE   MODE_NC
#define GPIO_PORT3_MODE   MODE_0
#define GPIO_PORT4_MODE   MODE_0
.....
```

3. Define the port values for those GPIOs which are permitted to set as GPIO mode:

```
#define GPIO_PORT_0   (0|0x80)
#define GPIO_PORT_1   (1|0x80)
#define GPIO_PORT_3   (3|0x80)
#define GPIO_PORT_4   (4|0x80)
#define GPIO_PORT_5   (5|0x80)
.....
```

Note these values have been “OR” with a magic value “0x80”. This magic value is to be used in GPIO driver for validating operations.

4. Define the permission for each mode (mode0 ~ mode3) of each GPIO port. Value “1” means permitted and value “0” means not permitted:

```
#define MODE0_GPIO0   1
#define MODE1_GPIO0   0
#define MODE2_GPIO0   0
```

```
#define MODE3_GPIO0   0
#define MODE0_GPIO1   1
#define MODE1_GPIO1   0
#define MODE2_GPIO1   0
#define MODE3_GPIO1   0
#define MODE0_GPIO2   0
#define MODE1_GPIO2   0
#define MODE2_GPIO2   0
#define MODE3_GPIO2   0
#define MODE0_GPIO3   1
.....
```

5. Define enable or disable the PULL-UP/PULL-DOWM for each GPIO port:

```
#define GPIO_PORT0_PULL   PULL_ENABLE
#define GPIO_PORT1_PULL   PULL_ENABLE
#define GPIO_PORT2_PULL   PULL_ENABLE
#define GPIO_PORT3_PULL   PULL_DISABLE
#define GPIO_PORT4_PULL   PULL_ENABLE
#define GPIO_PORT5_PULL   PULL_DISABLE
#define GPIO_PORT6_PULL   PULL_ENABLE
.....
```

6. Define the default value of GPIO direction for each port:

```
#define GPIO_PORT0_DIR   DIR_OUTPUT
#define GPIO_PORT1_DIR   DIR_OUTPUT
#define GPIO_PORT2_DIR   DIR_NULL
#define GPIO_PORT3_DIR   DIR_OUTPUT
#define GPIO_PORT4_DIR   DIR_OUTPUT
#define GPIO_PORT5_DIR   DIR_INPUT
.....
```

7. Define the permission for each direction (input, output) of each GPIO port. Value “1” means permitted and value “0” means not permitted:

```
#define DIR_IN_GPIO0      0
#define DIR_OUT_GPIO0     1
#define DIR_IN_GPIO1      0
#define DIR_OUT_GPIO1     1
#define DIR_IN_GPIO2      0
#define DIR_OUT_GPIO2     0
#define DIR_IN_GPIO3      0
#define DIR_OUT_GPIO3     1
#define DIR_IN_GPIO4      1
.....
```

8. Define the enable or disable data inversion for each GPIO port:

```
#define GPIO_PORT0_INV   INV_DISABLE
#define GPIO_PORT1_INV   INV_DISABLE
#define GPIO_PORT2_INV   INV_NULL
#define GPIO_PORT3_INV   INV_DISABLE
#define GPIO_PORT4_INV   INV_ENABLE
#define GPIO_PORT5_INV   INV_DISABLE
.....
```

9. Defined the default mode for each GPO port:

```
#define GPO_PORT0_MODE   MODE_1
#define GPO_PORT1_MODE   MODE_0
#define GPO_PORT2_MODE   MODE_0
#define GPO_PORT3_MODE   MODE_1
```

```
#define GPO_PORT4_MODE   MODE_1
```

10. Define the permission for each mode (mode0 ~ mode3) of each GPO port. Value “1” means permitted and value “0” means not permitted:

```
#define MODE0_GPO0   0
#define MODE1_GPO0   1
#define MODE2_GPO0   0
#define MODE3_GPO0   0
#define MODE0_GPO1   1
#define MODE1_GPO1   0
#define MODE2_GPO1   0
.....
```

11. Define the port values for those GPIOs which are permitted to set as GPO mode:

```
#define GPO_PORT_1   (1|0x70)
#define GPO_PORT_2   (2|0x70)
.....
```

Note these values have been “OR” with a magic value “0x70”. This magic value is to be used in GPIO driver for validating operations.

12. Tailor defined in gpio.cmp:

```
#endif /* _GPIO_DRV_H */
```

2.2.5.2 gpio_var.c

1. Header defined in gpio.cmp:

```
#ifdef __CUST_NEW__
#include "gpio_drv.h"
```

2. Declare all the GPIO variables that are previously selected on the Tool and assign the port values:

```
const char gpio_led_status1_en_pin = GPIO_PORT_0;
const char gpio_camera_power_en_pin = GPIO_PORT_1;
const char gpio_bt_dataselect_pin = GPIO_PORT_3;
const char gpio_bt_dsc_pin = GPIO_PORT_4;
const char gpio_led_mainbl_en_pin = GPIO_PORT_5;
.....
```

3. Tailor defined in gpio.cmp:

```
#endif /* __CUST_NEW__ */
```

2.2.6 Rules for GPIO

1. All GPIO pin assignments and setting are done in the Tool side.
2. When a new application or module needs to use GPIOs, new GPIO variables must be added into gpio.cmp file. Thus these variables can be assigned GPIO pin numbers on Tool side.
3. If the mode or the direction for a specific GPIO won’t change dynamically in runtime, user shall not call `GPIO_ModeSetup()` or `GPIO_InitIO()` in modules or tasks because the mode and the direction have been configured well in custom file gpio_setting.c.
4. For GPIO API fuctions:

4.1 `GPIO_InitIO(char direction, char port)`: The `port` MUST be an extern variable that is declared in gpio_var.c (assigned by tool). Otherwise it will be an invalid operation when debug mode is on.

4.2 `GPIO_WriteIO(char data, char port)`: The `port` MUST be an extern variable that is declared in gpio_var.c (assigned by tool). Otherwise it will be an invalid operation when debug mode is on. Also note that this function should be called when the GPIO port is configured as GPO under GPIO mode or it’s invalid too. In other words, the following example may cause an error:

```
   void Function(void)
   {
   …
```

```
GPIO_WriteIO(1, gpio_led_mainbl_en_pin);
GPIO_InitIO(1, gpio_led_mainbl_en_pin);
GPIO_ModeSetup(gpio_led_mainbl_en_pin, 0);
…
}
```

The function should be altered as:

```
void Function(void)
{
…
GPIO_InitIO(1, gpio_led_mainbl_en_pin);
GPIO_ModeSetup(gpio_led_mainbl_en_pin, 0);
GPIO_WriteIO(1, gpio_led_mainbl_en_pin);
…
}
```

4.3 `GPIO_ReadIO(char port)`: The `port` MUST be an extern variable that is declared in gpio_var.c (assigned by tool). Otherwise it will be an invalid operation when debug mode is on. Also note that this function should be called when the GPIO port is configured as GPI under GPIO mode or it's invalid too.

4.4 `GPIO_ModeSetup(kal_uint16 pin, kal_uint16 conf_dada)`: The `pin` can be a normal constant value. However when the debug mode is on, it will check if the mode is permitted to be set to or not.

4.5 There is no restriction for the usage of other GPIO API functions.

5. It is prohibited to directly access GPIO related registers.

2.3 Component: EINT (External Interrupt)

2.3.1 In MT6xxx.fig

For the corresponding chipset type MT6xxx, it describes the total external interrupt pin count and the total count of external interrupt pins that use software debounce time delay.

```
[EINT]
EINT_COUNT = 8
EINT_DEBOUNCE_TIME_COUNT = 4
```

2.3.2 In EINT.cmp

EINT.cmp will be loaded into the Tool for editing EINT settings. It contains two parts: 1. EINT variables and 2. Header and tailer of the generated EINT files.

2.3.2.1 EINT variables

This file lists the entire EINT variables that may be assigned an EINT port number. So these EINT variables should be synchronized with the latest codes and can be added or removed (not recommended because of backward compatibility).

For example:

```
[EINT_variables]
; AUX_EINT_NO is for external device interrupt
AUX_EINT_NO
; TOUCH_PANEL_EINT_NO is for touch panel interrupt
TOUCH_PANEL_EINT_NO
; CHRDET_EINT_NO is for charger detection interrupt
CHRDET_EINT_NO
; BT_EINT_NO is for Bluetooth interrupt
BT_EINT_NO
; CLAMDET_EINT_NO is for clam shell interrupt
CLAMDET_EINT_NO
```

Note that the semicolon (;) is used for comments.

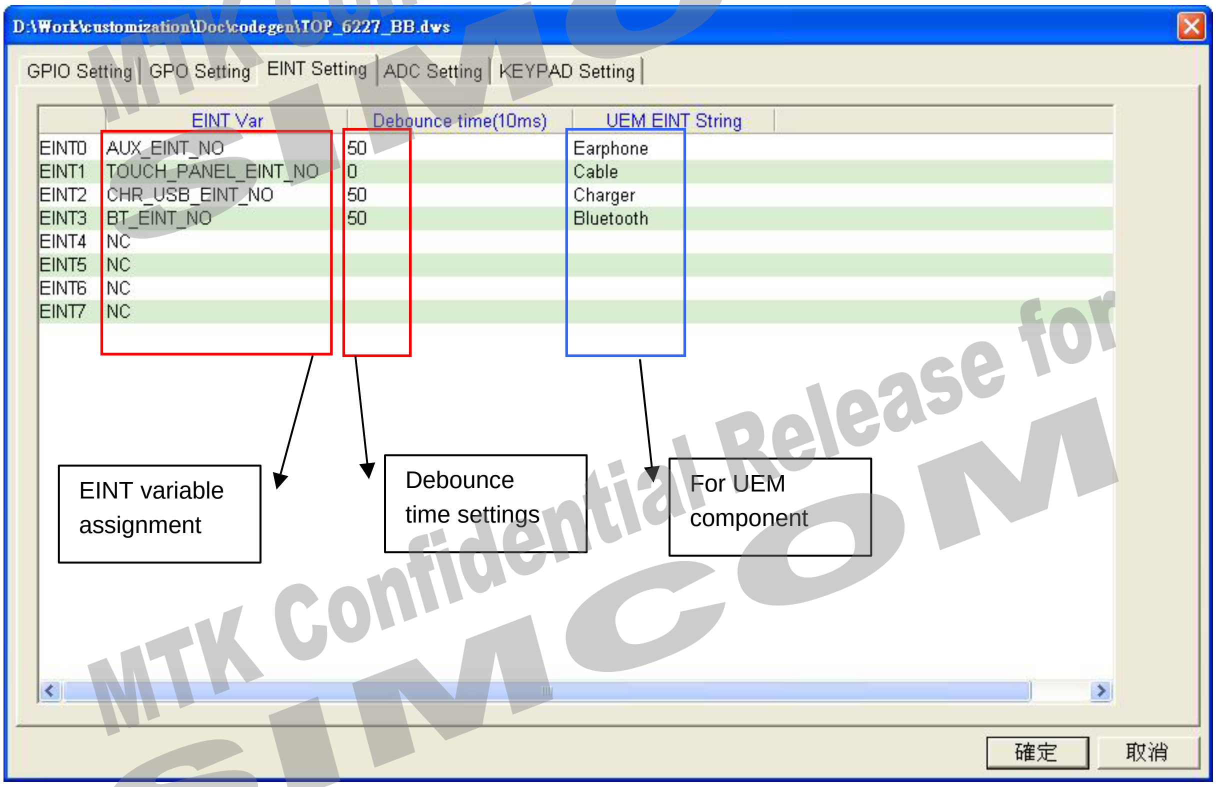
2.3.2.2 Header and Tailer of the generated EINT files

The tool will generate two files for EINT as eint_var.c and eint_drv.h which are introduced in section 2.3.4. And in EINT.cmp, the header and tailer of these two files will be described for Tool to generate with the setting data.
For example:

```
[eint_drv.h_HEADER]
#ifndef _EINT_DRV_H
#define _EINT_DRV_H

[eint_drv.h_TAILER]
#endif /* _EINT_DRV_H */

[eint_var.c_HEADER]
#ifdef __CUST_NEW__
#include "eint.h"

[eint_var.c_TAILER]
#endif /* __CUST_NEW__ */
```

2.3.3 EINT Editing Window

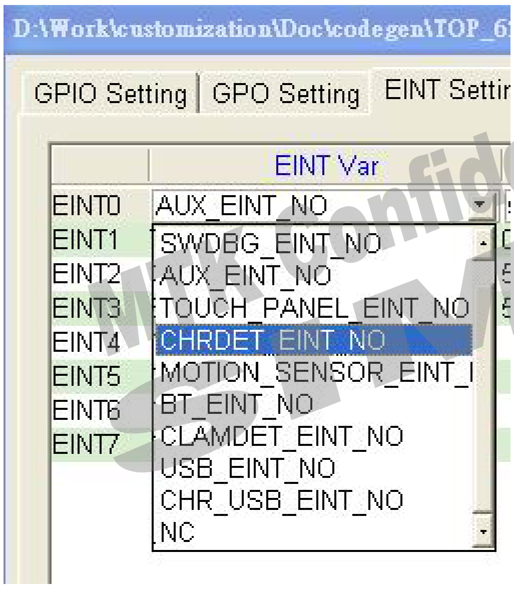
The EINT editing window contains two categories: EINT variables assignment and Software ebounce Time settings as below. Note that it will list all the EINT pins for the chipset selected in the Main Menu window (section 2.1.6). Actually the Tool loads the EINT configuration from the corresponding MT6xxx.fig file.



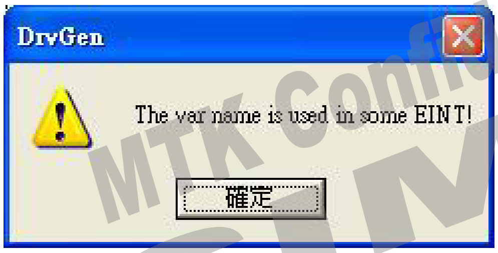
	EINT Var	Debounce time(10ms)	UEM EINT String
EINT0	AUX_EINT_NO	50	Earphone
EINT1	TOUCH_PANEL_EINT_NO	0	Cable
EINT2	CHR_USB_EINT_NO	50	Charger
EINT3	BT_EINT_NO	50	Bluetooth
EINT4	NC		
EINT5	NC		
EINT6	NC		
EINT7	NC		

2.3.3.1 EINT variable assignment

This column is a selectable menu containing the whole software EINT variable names defined in EINT.cmp. User can select one of the EINT variable names in order to assign EINT pin number to it.



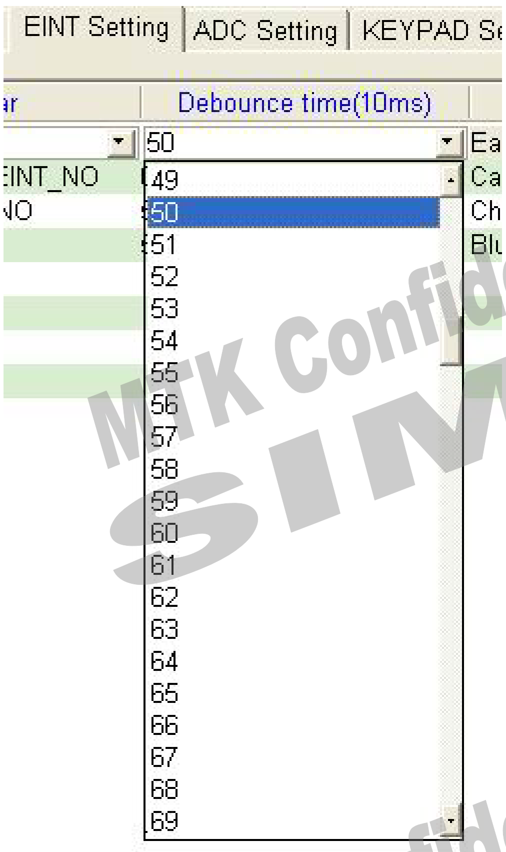
Note that no EINT variable name can be assigned in two different fields, otherwise there will be an error pop-up message as below:


DrvGen

The var name is used in some EINT!

2.3.3.2 Software Debounce Time Settings

This column is a selectable menu containing value 0 to 255. Note the unit is 10ms. So if user selects 10, it represents the software debounce time for this EINT pin is 100ms. Also note that not all of the EINT pin can be set for software debounce time. If the value `EINT_DEBOUNCE_TIME_COUNT` in MT6xxx.fig is 4, then only EINT0 to EINT3 can be set for software debounce time.



2.3.4 Generated Source and Header files

2.3.4.1 eint_drv.h

1. Header defined in EINT.cmp:

```
#ifndef _EINT_DRV_H
#define _EINT_DRV_H
```

2. Define the software debounce time for each EINT pin. Note that the unit is 10ms:

```
#define EINT0_DEBOUNCE_TIME_DELAY 50
#define EINT1_DEBOUNCE_TIME_DELAY 0
#define EINT2_DEBOUNCE_TIME_DELAY 50
#define EINT3_DEBOUNCE_TIME_DELAY 50
```

.....

3. Tailer defined in gpio.cmp:

```
#endif /* __CUST_NEW__ */
```

2.3.4.2 eint_var.c

1. Header defined in EINT.cmp:

```
#ifdef __CUST_NEW__
#include "eint.h"
```

2. Declare all the EINT variables that are previously selected on the Tool and assign the pin values:

```
const unsigned char AUX_EINT_NO = 0;
const unsigned char TOUCH_PANEL_EINT_NO = 1;
const unsigned char CHR_USB_EINT_NO = 2;
const unsigned char BT_EINT_NO = 3;
const unsigned char SWDBG_EINT_NO = EINT_CHANNEL_NOT_EXIST;
const unsigned char CHRDET_EINT_NO = EINT_CHANNEL_NOT_EXIST;
const unsigned char MOTION_SENSOR_EINT_NO = EINT_CHANNEL_NOT_EXIST;
const unsigned char CLAMDET_EINT_NO = EINT_CHANNEL_NOT_EXIST;
const unsigned char USB_EINT_NO = EINT_CHANNEL_NOT_EXIST;
.....
```

Note that for those EINT variables which haven't been selected on the Tool side, they will be assigned values by `EINT_CHANNEL_NOT_EXIST`.

3. Tailor defined in EINT.cmp:
```
#endif /* __CUST_NEW__ */
```

2.3.5 Rules for EINT

1. All EINT pin assignments and debounce time setting are done in the Tool side.
2. When a new application or module needs to use EINT, new EINT variables must be added into EINT.cmp file. Thus these variables can be assigned EINT pin numbers on Tool side.
3. Whoever wants to use EINT must extern the variables declared in EINT_drv.c or call the custom function `kal_uint8 custom_eint_get_channel(eint_channel_type type)` to get it. And then call EINT APIs based on these variables.

2.4 Component: ADC (Analog to Digital Converter)

2.4.1 In MT6xxx.fig

For the corresponding chipset type MT6xxx, it describes the total ADC channel count.
```
[ADC]
ADC_COUNT = 7
```

2.4.2 In ADC.cmp

ADC.cmp will be loaded into the Tool for editing ADC settings. It contains two parts: 1. EINT variables and 2. Header and tailer of the generated ADC file.

2.4.2.1 ADC variables

This file lists the entire ADC variables that may be assigned an ADC channel number. So these ADC variables should be synchronized with the latest codes and can be added or removed (not recommended because of backward compatibility).
For example:
```
[ADC_variables]
; ADC_VBAT is to measure the battery voltage.
ADC_VBAT
; ADC_VISENSE is to measure the charging current.
ADC_VISENSE
; ADC_VBATTMP is to measure the battery temperature.
ADC_VBATTMP
; ADC_VCHARGER is to measure the charger voltage.
ADC_VCHARGER
; ADC_ACCESSORYID is to measure the plug-in accessory voltage.
ADC_ACCESSORYID
```

```
; ADC_CHR_USB is to measure the cable voltage in order to recognize Charger or USB.
ADC_CHR_USB
```

Note that the semicolon (;) is used for comments.

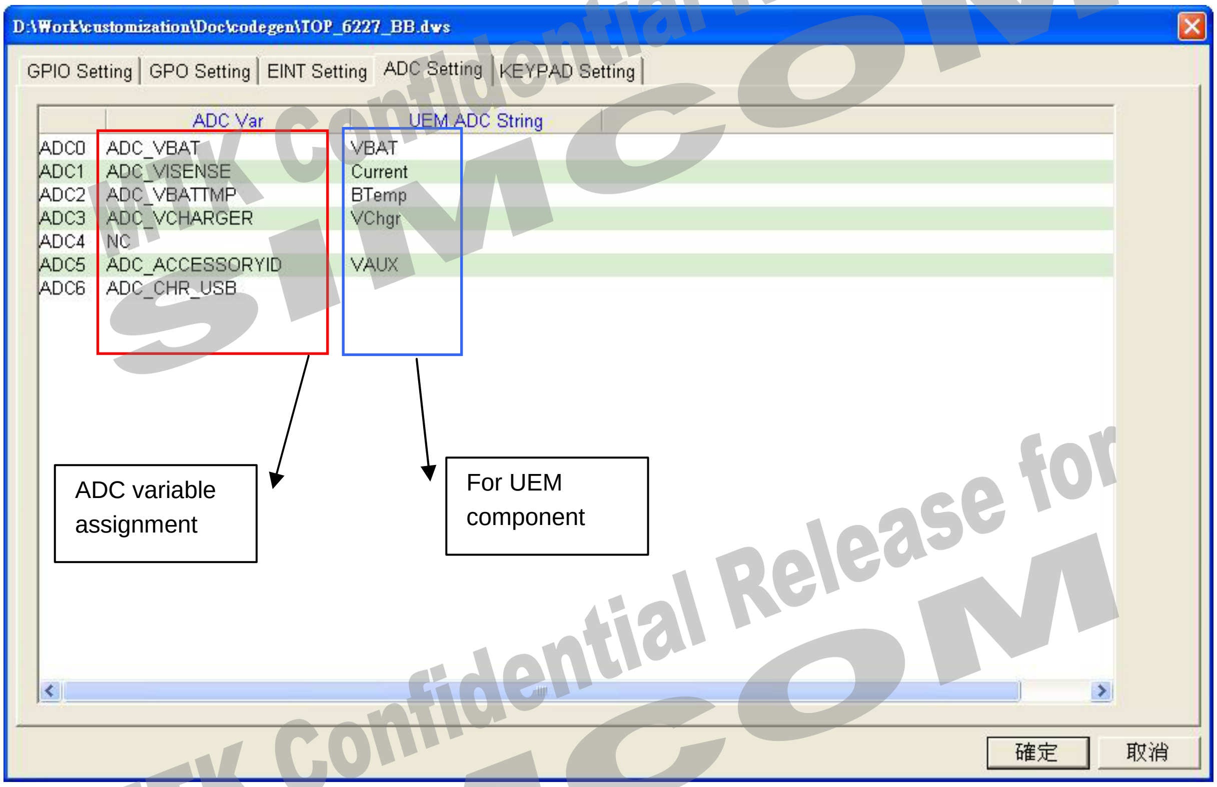
2.4.2.2 Header and Tailer of the generated ADC file

The tool will generate one file for ADC as adc_var.c which is introduced in section 2.4.4. And in ADC.cmp, the header and tailer of this file will be described for Tool to generate with the setting data.
For example:

```
[adc_var.c_HEADER]
#ifdef __CUST_NEW__
#include "kal_release.h"
#include "adc.h"

[adc_var.c_TAILER]
#endif /* __CUST_NEW__ */
```

2.4.3 ADC Editing Window

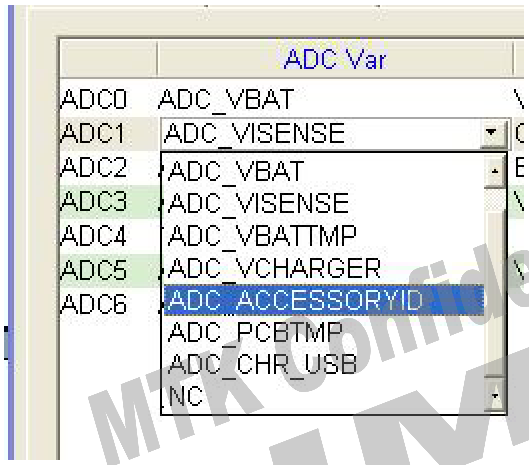
The ADC editing window contains just one category: ADC variables assignment as below. Note that it will list all the ADC pins for the chipset selected in the Main Menu window (section 2.1.6). Actually the Tool loads the ADC configuration from the corresponding MT6xxx.fig file.



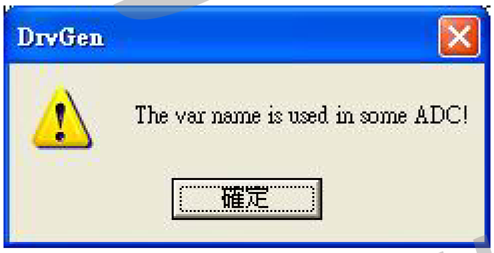
	ADC Var	UEM ADC String
ADC0	ADC_VBAT	VBAT
ADC1	ADC_VISENSE	Current
ADC2	ADC_VBATTMP	BTemp
ADC3	ADC_VCHARGER	VChgr
ADC4	NC	
ADC5	ADC_ACCESSORYID	VAUX
ADC6	ADC_CHR_USB	

2.4.3.1 ADC variables assignment

This column is a selectable menu containing the whole software ADC variable names defined in ADC.cmp. User can select one of the ADC variable names in order to assign ADC channel number to it.



Note that no ADC variable name can be assigned in two different fields, otherwise there will be an error pop-up message like below:


DrvGen

The var name is used in some ADC!

2.4.4 Generated Source and Header files

2.4.4.1 adc_var.c

1. Header defined in ADC.cmp:

```
#ifdef __CUST_NEW__
#include "kal_release.h"
#include "adc.h"
```

2. Declare all the ADC variables that are previously selected on the Tool and assign the pin values:

```
const unsigned char ADC_VBAT = 0;
const unsigned char ADC_VISENSE = 1;
const unsigned char ADC_VBATTMP = 2;
const unsigned char ADC_VCHARGER = 3;
const unsigned char ADC_ACCESSORYID = 5;
const unsigned char ADC_CHR_USB = 6;
const unsigned char ADC_PCBTMP = ADC_ERR_CHANNEL_NO;
.....
```

Note that for those ADC variables which haven't been selected on the Tool side, they will be assigned values by `ADC_ERR_CHANNEL_NO`.

3. Tailor defined in ADC.cmp:

```
#endif /* __CUST_NEW__ */
```

2.4.5 Rules for ADC

1. All ADC channel assignments are done in the Tool side.

2. When a new channel needs to use ADC, new ADC variables must be added into ADC.cmp file. Thus these variables can be assigned to ADC channels on Tool side.
3. Whoever wants to measure ADC channel must extern the variables declared in ADC_drv.c or call the custom function `kal_uint8 custom_adc_get_channel(adc_channel_type type)` to get it. And then call ADC APIs based on these variables.

2.5 Component: KEYPAD

2.5.1 In MT6xxx.fig

For the corresponding chipset type MT6xxx, it describes the HW keypad matrix size.

```
[Keypad]
KEY_ROW = 6
KEY_COLUMN = 7
```

2.5.2 In KEYPAD.cmp

KEYPAD.cmp will be loaded into the Tool for editing KEYPAD settings. It contains two parts: 1. Logical key definition and 2. Header and tailer of the generated KEYPAD file.

2.5.2.1 Logical Key definition

This file lists the entire logical key definitions that may be assigned to a certain position on the keypad mapping matrix. So these KEYPAD definition should be synchronized with the latest codes.
For example:
[Key_definition]

```
DEVICE_KEY_0
DEVICE_KEY_1
DEVICE_KEY_2
DEVICE_KEY_3
DEVICE_KEY_4
DEVICE_KEY_5
DEVICE_KEY_6
DEVICE_KEY_7
DEVICE_KEY_8
DEVICE_KEY_9
DEVICE_KEY_STAR
DEVICE_KEY_HASH
DEVICE_KEY_VOL_UP
DEVICE_KEY_VOL_DOWN
DEVICE_KEY_UP
DEVICE_KEY_DOWN
DEVICE_KEY_LEFT
DEVICE_KEY_RIGHT
DEVICE_KEY_MENU
DEVICE_KEY_FUNCTION
DEVICE_KEY_SK_LEFT
DEVICE_KEY_SK_RIGHT
DEVICE_KEY_SEND
DEVICE_KEY_END
DEVICE_KEY_POWER
DEVICE_KEY_CLEAR
DEVICE_KEY_EXT_FUNC1
```

```
DEVICE_KEY_EXT_FUNC2
MAX_DEVICE_KEYS
DEVICE_KEY_NONE
```

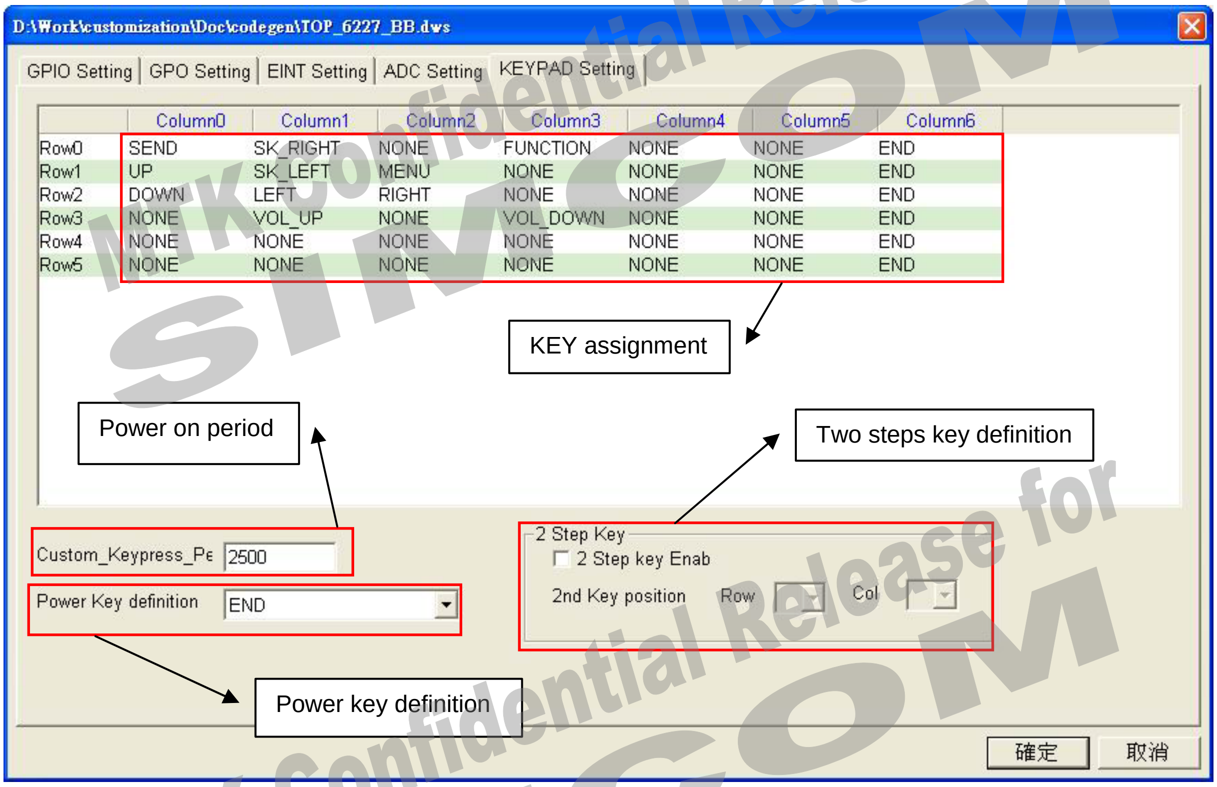
2.5.2.2 Header and Tailer of the generated KEYPAD files

The tool will generate one file for KEYPAD as keypad_drv.h which is introduced in section 2.5.4. And in KEYPAD.cmp, the header and tailer of this file will be described for Tool to generate with the setting data.
For example:

```
[keypad_drv.h_HEADER]
#ifndef _KEYPAD_DRV_H
#define _KEYPAD_DRV_H

[keypad_drv.h_TAILER]
#endif /* _KEYPAD_DRV_H*/
```

2.5.3 KEYPAD Editing Window

The KEYPAD editing window contains just four categories: KEY assignment, Power on period, Power key definition and two steps key definition. Note that it shows the HW keypad matrix layout for the chipset selected in the Main Menu window (section 2.1.6). Actually the Tool loads the KEYPAD configuration from the corresponding MT6xxx.fig file.



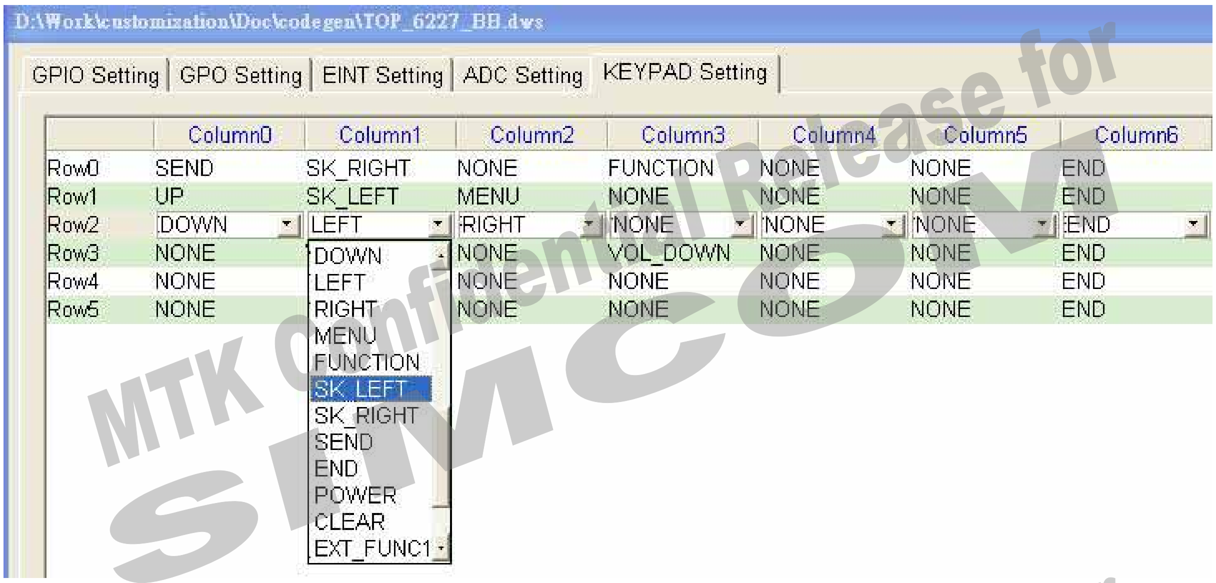
	Column0	Column1	Column2	Column3	Column4	Column5	Column6
Row0	SEND	SK_RIGHT	NONE	FUNCTION	NONE	NONE	END
Row1	UP	SK_LEFT	MENU	NONE	NONE	NONE	END
Row2	DOWN	LEFT	RIGHT	NONE	NONE	NONE	END
Row3	NONE	VOL_UP	NONE	VOL_DOWN	NONE	NONE	END
Row4	NONE	NONE	NONE	NONE	NONE	NONE	END
Row5	NONE	NONE	NONE	NONE	NONE	NONE	END

Custom_Keypress_Pe 2500
Power Key definition END

2 Step Key
☐ 2 Step key Enab
2nd Key position Row Col

2.5.3.1 KEY assignment

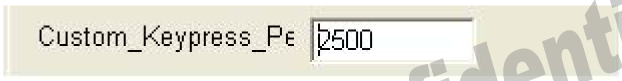
These fields are selectable menu to assign a KEY defined in KEYPAD.cmp on each position of the KEYPAD matrix. Note that any KEY can be assigned on more than one position.



	Column0	Column1	Column2	Column3	Column4	Column5	Column6
Row0	SEND	SK_RIGHT	NONE	FUNCTION	NONE	NONE	END
Row1	UP	SK_LEFT	MENU	NONE	NONE	NONE	END
Row2	DOWN	LEFT	RIGHT	NONE	NONE	NONE	END
Row3	NONE		NONE	VOL_DOWN	NONE	NONE	END
Row4	NONE		NONE	NONE	NONE	NONE	END
Row5	NONE		NONE	NONE	NONE	NONE	END

2.5.3.2 Power on period

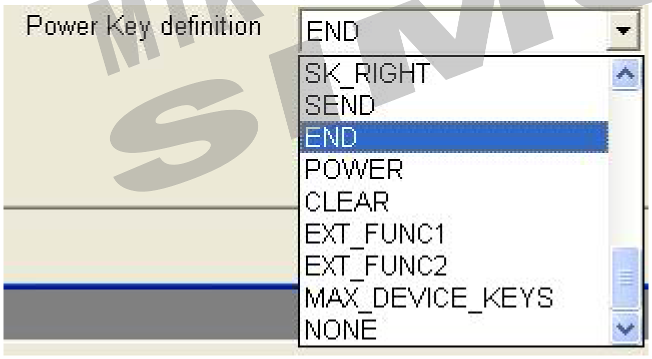
This is a number key-in field for customized power on period (A period from power key pressed to the LCD on). The unit is ms.



Custom_Keypress_Pe 2500

2.5.3.3 Power key definition

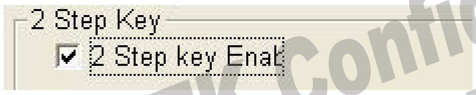
This field is a selectable menu to assign a KEY to be the power key.



Power Key definition END

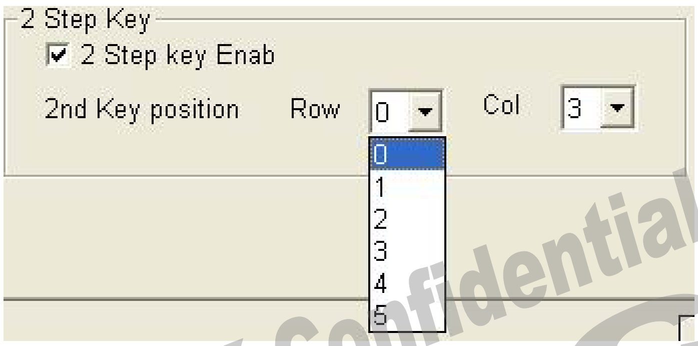
2.5.3.4 Two steps key definition

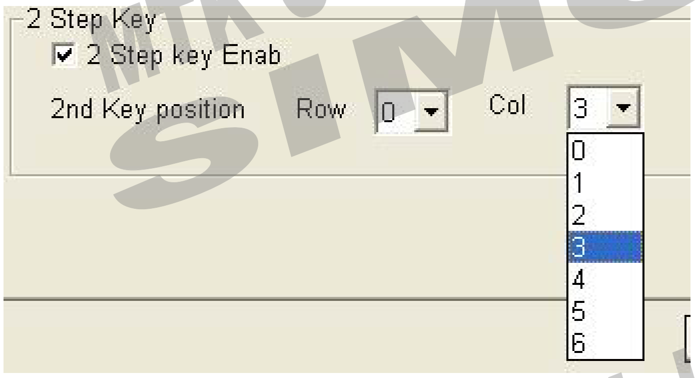
Two steps key is implemented by two key positions with the same key definition. One is the first key (half pressed key) and the other is the second key (full pressed key). This field is optional. It can be enabled or disabled.

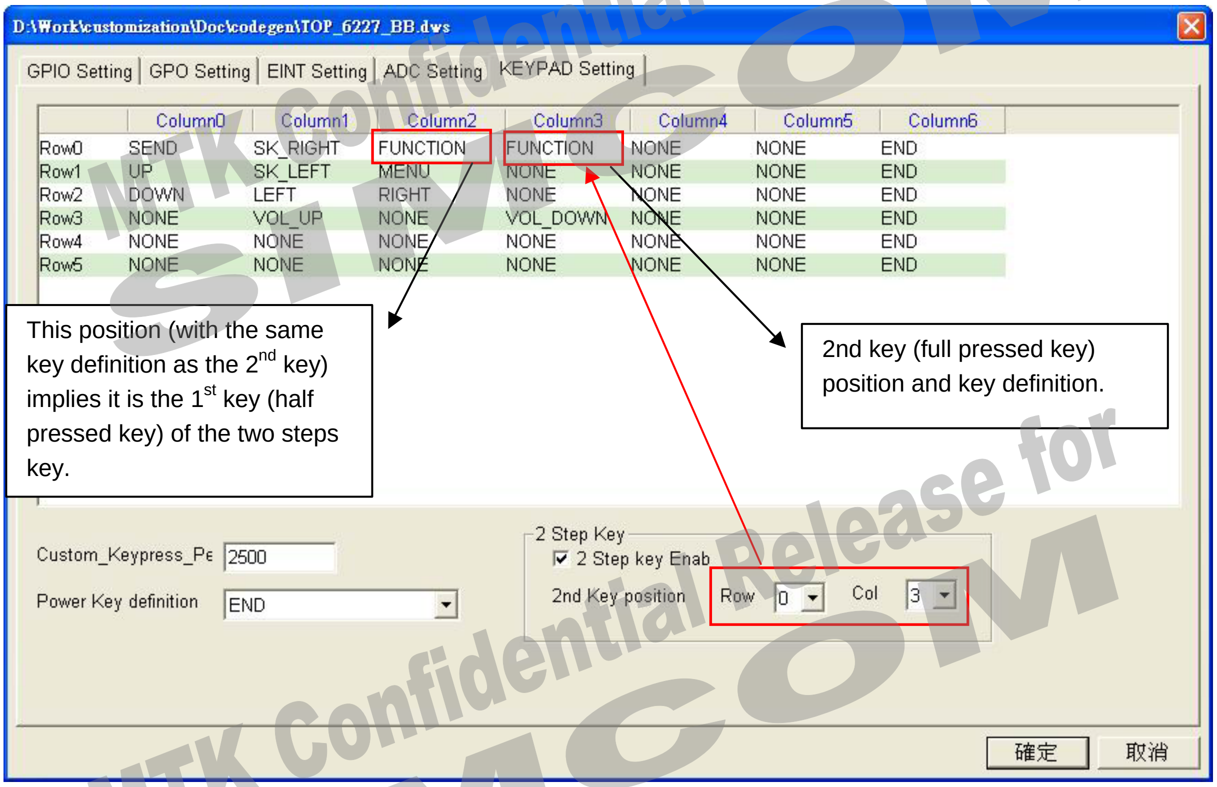


2 Step Key
☑ 2 Step key Enat

When this field is enabled, user can assign the full pressed position (2nd key position) on the keypad matrix for the two steps key.


2 Step Key
☑ 2 Step key Enab
2nd Key position Row 0 Col 3


2 Step Key
☑ 2 Step key Enab
2nd Key position Row 0 Col 3


D:\Work\customization\Doc\codegen\TOP_6227_BB.dws

GPIO Setting | GPO Setting | EINT Setting | ADC Setting | KEYPAD Setting

	Column0	Column1	Column2	Column3	Column4	Column5	Column6
Row0	SEND	SK_RIGHT	FUNCTION	FUNCTION	NONE	NONE	END
Row1	UP	SK_LEFT	MENU	NONE	NONE	NONE	END
Row2	DOWN	LEFT	RIGHT	NONE	NONE	NONE	END
Row3	NONE	VOL_UP	NONE	VOL_DOWN	NONE	NONE	END
Row4	NONE	NONE	NONE	NONE	NONE	NONE	END
Row5	NONE	NONE	NONE	NONE	NONE	NONE	END

This position (with the same key definition as the 2nd key) implies it is the 1st key (half pressed key) of the two steps key.

2nd key (full pressed key) position and key definition.

Custom_Keypress_Pe 2500
Power Key definition END

2 Step Key
☑ 2 Step key Enab
2nd Key position Row 0 Col 3

Note that the 1st key position (half pressed key position) is implied on the position which has the same key definition as the 2nd key. User should take care of having 1st key on the keypad matrix. The tool would not check it.

2.5.4 Generated Source and Header files

2.5.4.1 Keypad_drv.h

1. Header defined in KEYPAD.cmp:
```
#ifndef _KEYPAD_DRV_H
#define _KEYPAD_DRV_H
```

2. Macro of the keypad mapping:
```
#define KEYPAD_MAPPING \
DEVICE_KEY_SEND, \
DEVICE_KEY_SK_RIGHT, \
DEVICE_KEY_NONE, \
DEVICE_KEY_FUNCTION, \
DEVICE_KEY_NONE, \
DEVICE_KEY_NONE, \
DEVICE_KEY_END, \
DEVICE_KEY_UP, \
.....
```

3. Define the power on period:
```
#define KEY_PRESS_PERIOD 2500
```

4. Define the power key position:
```
#define POWERKEY_POSITION DEVICE_KEY_END
```

5. Define the 2-steps keys parameter (Optional):
```
#define SECOND_KEY_ROW 0
#define SECOND_KEY_COLUMN 3
#define TWO_STEP_KEY DEVICE_KEY_FUNCTION
```

6. Tailer defined in KEYPAD.cmp
#endif /* _KEYPAD_DRV_H*/

2.6 Component: UEM (User Equipment Management)

2.6.1 In MT6xxx.fig

None.

2.6.2 In UEM.cmp

UEM.cmp will be loaded into the Tool for editing UEM settings. It contains two parts: 1. Maximum maximum length and 2. Header and tailer of the generated UEM file.

2.6.2.1 Maximum string length

It defines the maximum length for UEM strings:
```
[UEM]
MAX_NETNAME_TEXT = 16
```

2.6.2.2 Header and Tailer of the generated UEM files

The tool will generate one file for UEM as uem_drv.c which is introduced in section 2.6.4. And in UEM.cmp, the header and tailer of this file will be described for Tool to generate with the setting data.

For example:

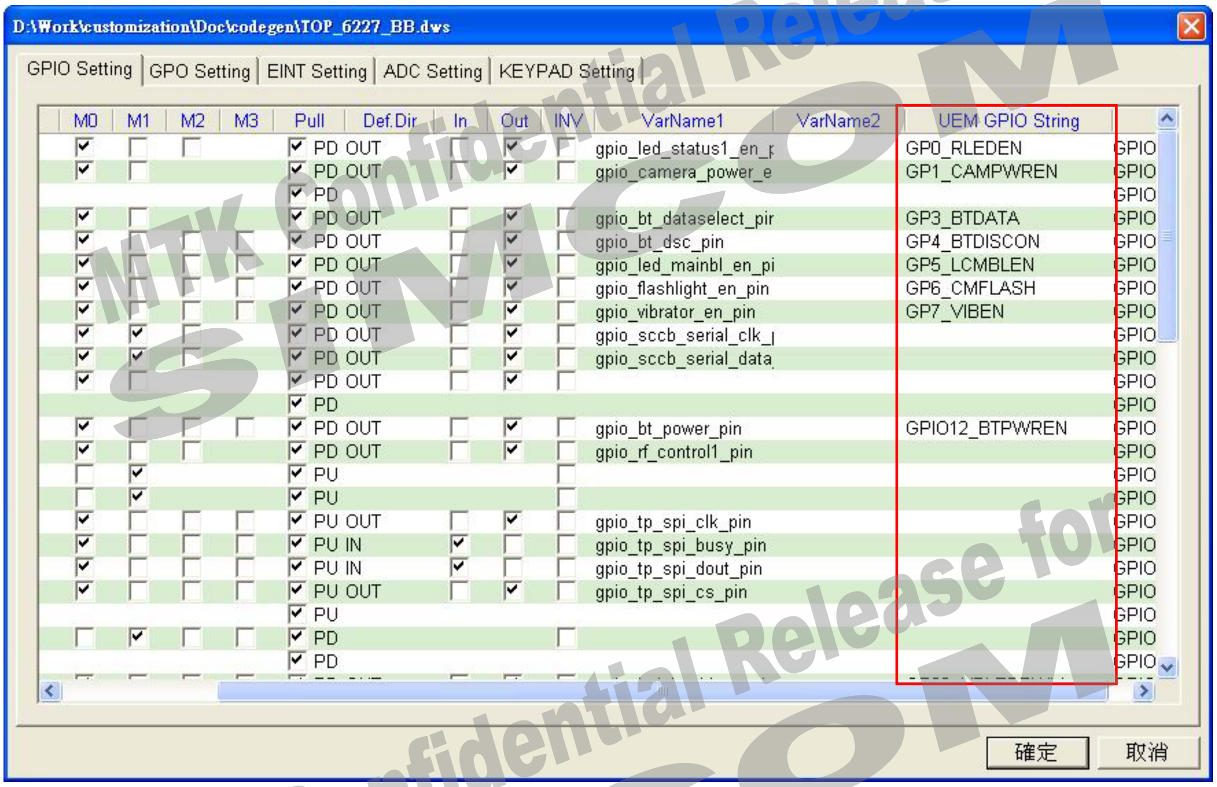
```
[uem_drv.c_HEADER]
#ifdef __CUST_NEW__
#include "kal_release.h"
#include "gpio_drv.h"
#include "custom_em.h"
#include "custom_equipment.h"

[uem_drv.c_TAILER]
#endif /* __CUST_NEW__ */
```

2.6.3 UEM Editing Window

The UEM editing windows contain four categories: UEM GPIO String, UEM GPO String, UEM EINT String and UEM ADC String as below. Note that these editing windows are attached to GPIO/GPO/EINT/ADC Editing Windows.

2.6.3.1 UEM GPIO String

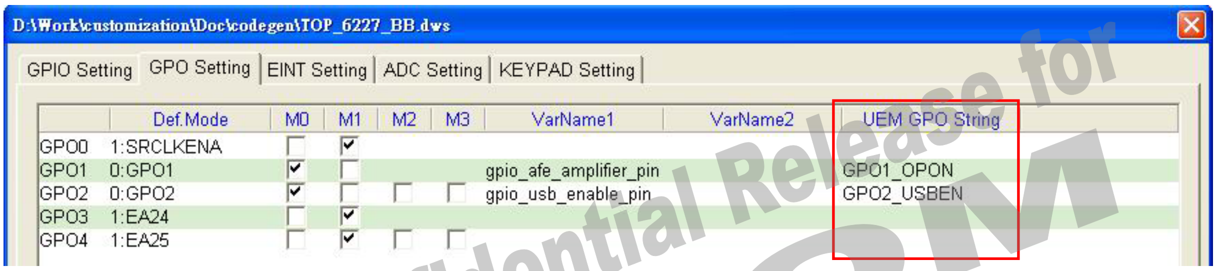
The UEM GPIO String Editing field is in the last column of GPIO Setting window. User can key string names in these fields. The maximum string length is defined in UEM.comp by MAX_NETNAME_TEXT. Note that only for those GPIO ports which are permitted to set as GPIO mode, these corresponding fields can be edited.



M0	M1	M2	M3	Pull	Def.Dir	In	Out	INV	VarName1	VarName2	UEM GPIO String	
✓	☐	☐		✓ PD	OUT	☐	✓	☐	gpio_led_status1_en_p		GP0_RLEDEN	GPIO
✓	☐			✓ PD	OUT	☐	✓	☐	gpio_camera_power_e		GP1_CAMPWREN	GPIO
				✓ PD								GPIO
✓	☐			✓ PD	OUT	☐	✓	☐	gpio_bt_dataselect_pir		GP3_BTDATA	GPIO
✓	☐	☐	☐	✓ PD	OUT	☐	✓	☐	gpio_bt_dsc_pin		GP4_BTDISCON	GPIO
✓	☐	☐	☐	✓ PD	OUT	☐	✓	☐	gpio_led_mainbl_en_pi		GP5_LCMBLEN	GPIO
✓	☐	☐	☐	✓ PD	OUT	☐	✓	☐	gpio_flashlight_en_pin		GP6_CMFLASH	GPIO
✓	☐	☐	☐	✓ PD	OUT	☐	✓	☐	gpio_vibrator_en_pin		GP7_VIBEN	GPIO
✓	✓	☐		✓ PD	OUT	☐	✓	☐	gpio_sccb_serial_clk_p			GPIO
✓	✓	☐		✓ PD	OUT	☐	✓	☐	gpio_sccb_serial_data			GPIO
✓	☐			✓ PD	OUT	☐	✓	☐				GPIO
				✓ PD								GPIO
✓	☐	☐	☐	✓ PD	OUT	☐	✓	☐	gpio_bt_power_pin		GPIO12_BTPWREN	GPIO
✓	☐	☐		✓ PD	OUT	☐	✓	☐	gpio_rf_control1_pin			GPIO
☐	✓			✓ PU				☐				GPIO
☐	✓			✓ PU				☐				GPIO
✓	☐	☐	☐	✓ PU	OUT	☐	✓	☐	gpio_tp_spi_clk_pin			GPIO
✓	☐	☐	☐	✓ PU	IN	✓	☐	☐	gpio_tp_spi_busy_pin			GPIO
✓	☐	☐	☐	✓ PU	IN	✓	☐	☐	gpio_tp_spi_dout_pin			GPIO
✓	☐	☐	☐	✓ PU	OUT	☐	✓	☐	gpio_tp_spi_cs_pin			GPIO
				✓ PU								GPIO
☐	✓	☐	☐	✓ PD				☐				GPIO
				✓ PD								GPIO

2.6.3.2 UEM GPO String

The UEM GPO String Editing field is in the last column of GPO Setting window. User can key string names in these fields. The maximum string length is defined in UEM.comp by MAX_NETNAME_TEXT. Note that only for those GPO ports which are permitted to set as GPO mode, these corresponding fields can be edited.

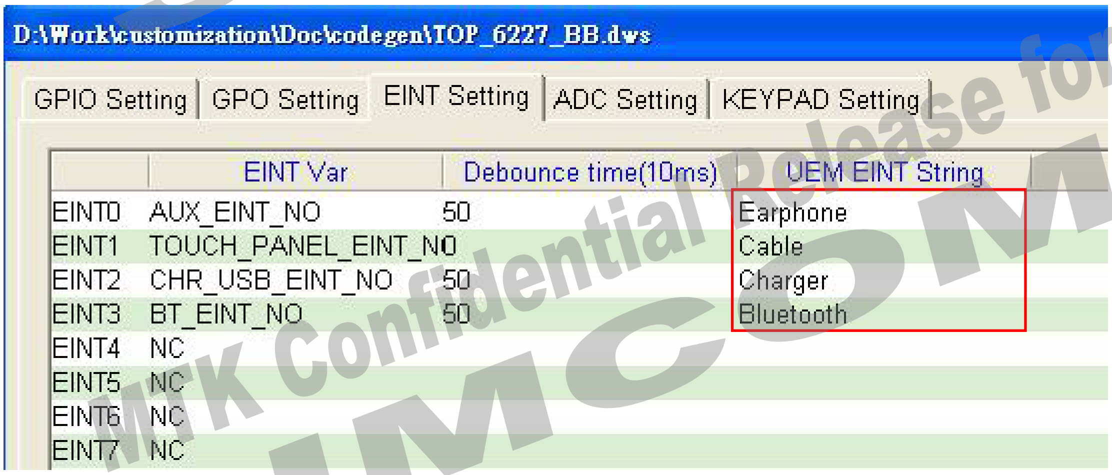


	Def.Mode	M0	M1	M2	M3	VarName1	VarName2	UEM GPO String
GPO0	1:SRCLKENA	☐	✓					
GPO1	0:GPO1	✓	☐			gpio_afe_amplifier_pin		GPO1_OPON
GPO2	0:GPO2	✓	☐	☐	☐	gpio_usb_enable_pin		GPO2_USBEN
GPO3	1:EA24	☐	✓					
GPO4	1:EA25	☐	✓	☐	☐			

Also note that at least one string name must exist for UEM GPIO/GPO String. Otherwise, there will be a pop-up error message when generating codes.

2.6.3.3 UEM EINT String

The UEM EINT String Editing field is in the last column of EINT Setting window. User can key string names in these fields. The maximum string length is defined in UEM.comp by `MAX_NETNAME_TEXT`. Note that only for those EINT pins which are assigned variables, these corresponding fields can be edited.

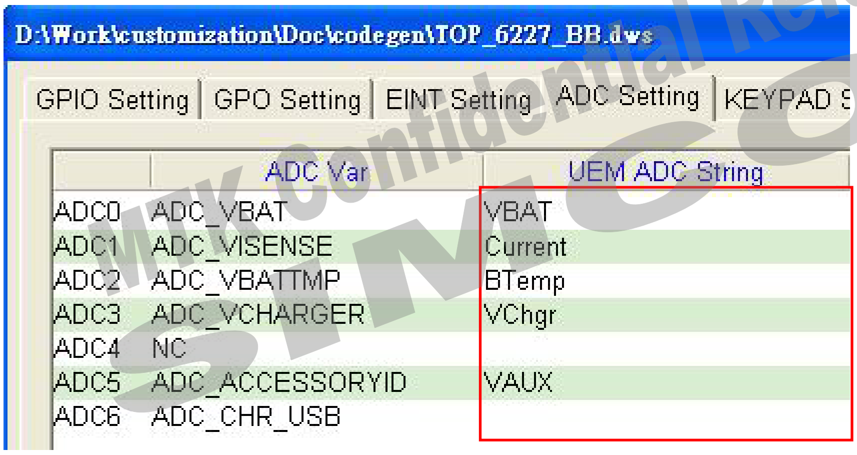


	EINT Var	Debounce time(10ms)	UEM EINT String
EINT0	AUX_EINT_NO	50	Earphone
EINT1	TOUCH_PANEL_EINT_NO		Cable
EINT2	CHR_USB_EINT_NO	50	Charger
EINT3	BT_EINT_NO	50	Bluetooth
EINT4	NC		
EINT5	NC		
EINT6	NC		
EINT7	NC		

Also note that at least one string name must exist for UEM EINT String. Otherwise, there will be a pop-up error message when generating codes.

2.6.3.4 UEM ADC String

The UEM ADC String Editing field is in the last column of ADC Setting window. User can key string names in these fields. The maximum string length is defined in UEM.comp by `MAX_NETNAME_TEXT`. Note that only for those ADC channels which are assigned variables, these corresponding fields can be edited.



	ADC Var	UEM ADC String
ADC0	ADC_VBAT	VBAT
ADC1	ADC_VISENSE	Current
ADC2	ADC_VBATTMP	BTemp
ADC3	ADC_VCHARGER	VChgr
ADC4	NC	
ADC5	ADC_ACCESSORYID	VAUX
ADC6	ADC_CHR_USB	

Also note that at least one string name must exist for UEM ADC String. Otherwise, there will be a pop-up error message when generating codes.

2.6.4 Generated Source and Header files

2.6.4.1 uem_drv.c

1. Header defined in UEM.cmp:

```
#ifdef __CUST_NEW__
#include "kal_release.h"
#include "gpio_drv.h"
#include "custom_em.h"
#include "custom_equipment.h"
```

2. GPIO/GPO strings and table:

```
const kal_uint8 GPIO_LABELID_MAX = 15;
kal_uint8 EmGpioIdxMenu2Tbl[15];
const unsigned char netname[][MAX_NETNAME_TEXT] = {
"GP0_RLEDEN",
"GP1_CAMPWREN",
"GP3_BTDATA",
"GP4_BTDISCON",
"GP5_LCMBLEN",
"GP6_CMFLASH",
"GP7_VIBEN",
"GPIO12_BTPWREN",
"GP23_KPLEDPWM",
"GP31_CHRCTL",
"GP38_BLED_EN",
"GP39_BTRESET",
"GPIO52_GLED0",
"GPO1_OPON",
"GPO2_USBEN",
};
GPIO_MAP_ENTRY gpio_map_tbl[] = {
{GPIO_VALID, GPIO_PORT_0, netname[0], NULL},
{GPIO_VALID, GPIO_PORT_1, netname[1], NULL},
{GPIO_VALID, GPIO_PORT_3, netname[2], NULL},
{GPIO_VALID, GPIO_PORT_4, netname[3], NULL},
{GPIO_VALID, GPIO_PORT_5, netname[4], NULL},
{GPIO_VALID, GPIO_PORT_6, netname[5], NULL},
{GPIO_VALID, GPIO_PORT_7, netname[6], NULL},
{GPIO_VALID, GPIO_PORT_12, netname[7], NULL},
{GPIO_VALID, GPIO_PORT_23, netname[8], NULL},
{GPIO_VALID, GPIO_PORT_31, netname[9], NULL},
{GPIO_VALID, GPIO_PORT_38, netname[10], NULL},
{GPIO_VALID, GPIO_PORT_39, netname[11], NULL},
{GPIO_VALID, GPIO_PORT_52, netname[12], NULL},
{GPO_VALID, GPO_PORT_1, netname[13], NULL},
{GPO_VALID, GPO_PORT_2, netname[14], NULL},
};
```

3. EINT strings and table

```
const kal_uint8 EINT_LABELID_MAX = 4;
const unsigned char eintname[][MAX_NETNAME_TEXT] = {
"Earphone",
"Cable",
"Charger",
"Bluetooth",
};
GPIO_MAP_ENTRY eint_map_tbl[] = {
{GPIO_VALID, 0, eintname[0], NULL},
{GPIO_VALID, 1, eintname[1], NULL},
{GPIO_VALID, 2, eintname[2], NULL},
{GPIO_VALID, 3, eintname[3], NULL},
};
```

4. ADC strings and table

```
const kal_uint8 ADC_LABELID_MAX = 5;
const unsigned char adcname[][MAX_NETNAME_TEXT] = {
"VBAT",
"Current",
"BTemp",
"VChgr",
"VAUX",
};
GPIO_MAP_ENTRY adc_map_tbl[] = {
{GPIO_VALID, 0, adcname[0], NULL},
{GPIO_VALID, 1, adcname[1], NULL},
{GPIO_VALID, 2, adcname[2], NULL},
{GPIO_VALID, 3, adcname[3], NULL},
{GPIO_VALID, 5, adcname[4], NULL},
};
```

5. Tailer defined in UEM.cmp

```
#endif /* __CUST_NEW__ */
```

3 Customization Procedure for a New Project

3.1 Step 1: Turn on Feature

In the Project_Name.mak file, turn on the customization tool feature as below:

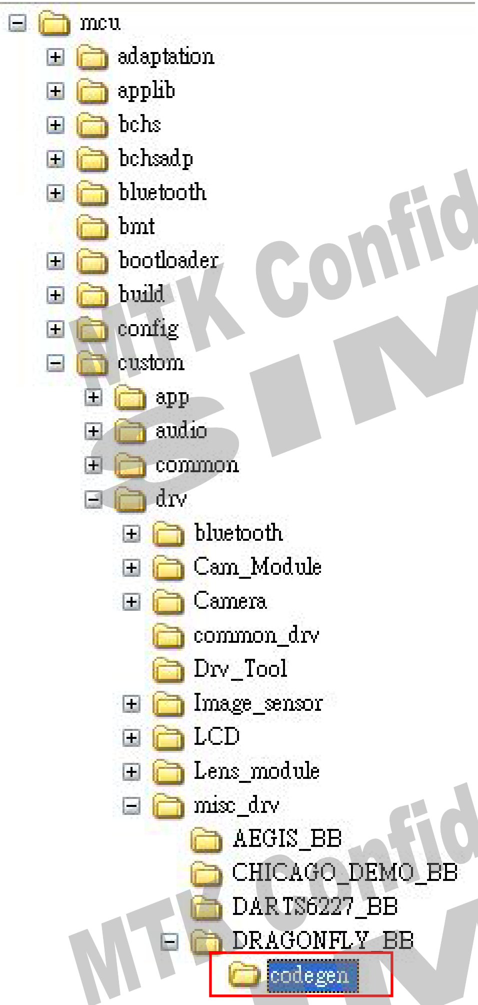
```
DRV_CUSTOM_TOOL_SUPPORT  = TRUE        # TRUE or FALSE
```

Note that when this feature is turned on, a compile option `__CUST_NEW__` will be defined.

3.2 Step 2: Create a data workspace file

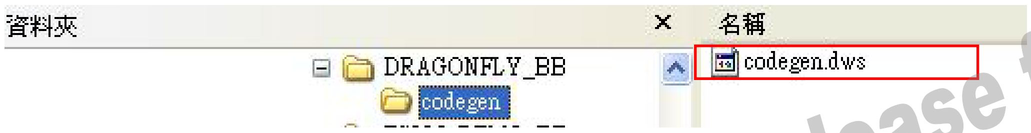
3.2.1.1 Create a codegen folder

Create a folder \mcu\custom\drv\misc_drv\BOARD_VER\codegen where BOARD_VER is the Baseband main board description in the Project_Name.mak. For example, if `BOARD_VER = DRAGONFLY_BB` in DRAGONFLY_DEMO_GPRS.mak, then create a codegen folder under \mcu\custom\drv\misc_drv\DRAGONFLY_BB\.



3.2.1.2 Create a data workspace file

New a data workspace by tool as described in section 2.2.1 in the folder as mentioned above: \mcu\custom\drv\misc_drv\BOARD_VER\codegen. And the file name of this data workspace must be codegen.dws.



3.3 Step 3: Edit settings on Tool

Based on the created data workspace file, edit the GPIO/GPO/EINT/ADC/KEYPAD/UEM settings as described in section 2. When it's done, save the workspace file.

3.4 Step 4: Settings beyond the Tool

3.4.1 Debug Mode

In gpio_drv.c, one global variable `kal_bool gpio_debug_enable` is declared for GPIO debug mode enable/disable. When users want to turn on GPIO debug mode, assign value KAL_TRUE to it otherwise just assign KAL_FALSE to it.

3.4.2 GPIO output initial value

Users may like to set the value of one particular GPIO port which is configured as GPO in the beginning. Then it is suggested to call GPIO_WriteIO() in the bottom of function GPIO_init() of file gpio_drv.c. For example as below, users want to set USB enable pin to low in the beginning:

```
void GPIO_init(void)
{
  GPIO_setting_init();

  /* Set the GPIO initial value below. */
  GPIO_WriteIO(0,gpio_usb_enable_pin);
}
```

3.4.3 Settings for unused GPIO pins

In gpio_def.h, it defines the mode for those unused GPIO pins (NC) as mode 0 (GPIO mode):

```
#define MODE_NC           0
```

And normally it will be GPIO mode. However not mode 0 of each GPIO pins is GPIO mode. Therefore if one GPIO pin is unused but its mode 0 is not GPIO mode and user still wants to set it to GPIO mode, then in tool side this pin should select as "GPIO" instead of "NC".

Moreover the direction of the unused GPION pins is defined as below:

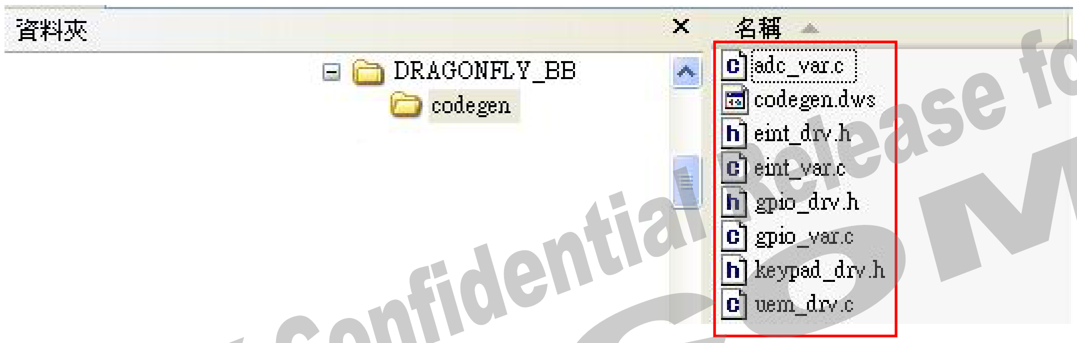
```
#define DIR_NULL            0  /* 0: Input, 1: Output */
```

User can choose to set it as GPO or GPI by the value 0 or 1.

3.5 Step 5: Build the load

Build the load on the command script window with "new" parameter. Note that users don't have to click GenCode button to generate source and header files. These files will be automatically generated in the process of building load. For example:

```
make DRAGONFLY_DEMO gprs new
```



These generated source and header files belongs to custom.lib. Therefore if there's any modification on the tool, user can re-build the custom library by "update" or "remake" parameter. For example:

```
make DRAGONFLY_DEMO gprs update custom
Or
make DRAGONFLY_DEMO gprs remake custom
```

The "update" parameter is recommended because the source and header files will be automatically generated. If "remake" parameter is used, users have to click "GenCode" button on the tool in order to generate the files in advance.

3.6 Step 6: Misc. and Debug

3.6.1 Case 1

If there is linking error as below:

```
Error: L6218E: Undefined symbol gpio_vibrator_en_pin (referred from uem_gpio.obj)
```

In this example, it means that the GPIO variable `gpio_vibrator_en_pin` is refered in uem_gpio.c but it is not declared. So user should check which GPIO port ought to be assigned this GPIO variable on the Tool. And rebuild the load.

3.6.2 Case 2

The load has been downloaded into the target and target powers on. Assert happens somewhere in gpio.c with debug mode turned on.
If assert happens in the function GPIO_ModeSetup(), it means that some module tries to set one disallowed mode for a GPIO port showed on the tool. User should check if the access of GPIO mode is valid or not. If it's valid, the mode for that GPIO port should be set as permitted.

If assert happens in the function GPIO_WriteIO(), it may be cause by
1. Invalid GPIO port number that is without GPIO_MAGIC_NUM.
2. This GPIO port is not in the GPIO mode or in the GPIO mode but not GPO.

[References]