# Document Revision History

<table>
<thead>
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1. Overview

MediaTek Easy PinMux Tool (EPT) is a convenient and user-friendly graphical user interface (GUI) to configure pin multiplexor (PinMux) and supported driver settings for MediaTek MT25x3 and MT76x7 HDKs. The tool provides modes and options for each PinMux and enables customized settings for I/O characteristics according to design requirements.

Once configured, all settings can be saved as a workspace file, which can be reloaded to restore the state of the tool settings. The results can also be output as C header and source files.

1.1. Environment

The EPT tool can be used on any edition of Microsoft Windows XP, Vista, 7 and 8.

1.2. Configuring your device with the EPT

To use the tool:

1) Launch the executable (ept.exe) under EPT tool package folder. Create a new workspace or open an existing one, and edit it according to requirements, see section 1.2.1, “Workspace file options”, for more details.

2) Apply user settings, see section 2, “Driver Settings”, for more details on how to configure the I/O parameters and PinMux settings.

3) In Gen menu click GenCode to generate a source code of the driver stored under \output\25x3(76x7) folder of the tool. The main GUI is shown in Figure 1 and Figure 2.

![Figure 1. Main UI of the EPT with an empty workspace](image-url)
1.2.1. Workspace file options

To create a new workspace:

In **File** menu, click **New**, and provide the chipset under **Chip Selection** to create an empty workspace, as shown in Figure 3.

![Figure 2. Main UI of the EPT with a workspace](image)

![Figure 3. Create a new workspace](image)
2) Save the workspace as a .ews file by clicking Save or SaveAs options in File menu.

To open an existing workspace:

3) In File menu, click Open to open an existing workspace. You can use your own workspace file or a demo workspace file with an extension .ews or .dws provided by MediaTek. The demo workspace file (.ews or .dws) is located under:

<sdk_root>\tools\config\<board>ept\

To edit the workspace:

1) When an existing workspace is opened or a new workspace is created, you can configure its parameters according to your requirements in the edit area, as shown in Figure 4.

2) Save the workspace as a .ews file.

To generate a source code for the driver:

1) In Gen menu, click GenCode to generate a source code for the driver. All generated files are saved in \output\25x3 (76x7) folder. The header files (.h files) are saved in the sub-directory 1nc, while the source files (.c files) are saved in the sub-directory src. Once the source code is generated successfully, a popup message will prompt the file path, as shown in Figure 5.
Figure 5. Generate code for the current configuration

A confirmation message will appear, as shown in Figure 6.

Figure 6. Code is successfully generated

3) Copy the generated source code to destination driver folder of the project. The full path of the driver folder for source and header files is as follows.

```plaintext
<sdk_root>/project/<board>/apps/<application>/src
<sdk_root>/project/<board>/apps/<application>/inc
```

Where `<board>` is the name of your board, such as mt2523_evb, mt7687_hdk and `<application>` is the name of your project, such as iot_sdk_dev, iot_sdk.

The GPIO settings configured by the EPT tool take effect only when they are written to GPIO registers. Details about this can be found in the readme file of EPT example code located under the folder:

```plaintext
<sdk_root>/project/<board>/apps/<application>
```

Once the configuration is set, build the load on the target device. More information about building the load can be found at MediaTek LinkIt™ Development Platform for RTOS Get Started Guide.

An example use case to generate the files based on given inputs is shown in Figure 7. The user provides .ews, .chip and .conf files as an input to the EPT tool and the expected outcomes are .ews, .h and .c files.
1.3. **Folder structure of the EPT tool**

The EPT tool contains five main folders and two files. The folder structure is shown in Figure 8.

1) **configuration.** This folder stores the configuration files for MT25x3 and MT76x7 chipset.

2) **output.** This folder contains output files such as source (.c, saved in the src folder) and header (.h, saved in the inc folder) files and the pinout report (pinout_report.csv) generated by the EPT tool.

3) **project.** This folder contains the workspace files (.ews) saved in this folder by default.

4) **EPT.** This folder contains libraries to run the EPT.

5) **jre1.8_win.** This folder includes the supporting files to run EPT on Windows OS.

6) **generate_script.bat.** Provides a command line mode to generate code.

The ept folder also contains the executable file (ept.exe) to start the configuration. Launch the program by double-clicking the executable file, no need to install it.
1.3.1. Chip files

Chip files store the chip parameters and options shown on the EPT UI. Every chip has its own chip file. The user must not modify the content of the chip file.

1.3.2. Configuration files

MT25x3 and MT76x7 chipsets share the same configuration (.conf) files. Usually there are multiple *.conf files for different modules, such as gpio.conf, eint.conf and keypad.conf. An example .conf file is shown in Figure 9.

1) gpio.conf — contains the header and tail information of .h file for GPIOs.
2) keypad.conf — contains the key symbols of the keyboard.
3) eint.conf — contains the header and tail information of .h file for EINTs.

Figure 8. Folder structure
1.3.3. **EWS files**

EWS (.dws for versions before 2.0.1) files are the EPT workspace files. The file contains customized PinMux and I/O settings, see section 1.2.1, “Workspace file options” to create or modify a workspace file. MediaTek also provides demo workspace files where many PinMux settings are already configured. These demo .dws or .ews files are stored under /project folder. It is recommended to modify and save an existing demo workspace file as a reference for custom design configuration.

1.3.4. **Pinout report**

To generate a pinout report (pinout_report.csv), click **GenReport** in **Gen** menu. The report contains the PinMux information set by the user, including seven columns for **Name**, **Mode**, **Pull Up & Pull Down**, **Direction**, **OutHigh**, **VarName** and **User Information**.

**Figure 9. Keypad .conf file**

```plaintext
DEVICE_KEY_F3
DEVICE_KEY_F4
DEVICE_KEY_F5
DEVICE_KEY_F6
DEVICE_KEY_F7
DEVICE_KEY_F8
DEVICE_KEY_F9
DEVICE_KEY_F10
DEVICE_KEY_F11
DEVICE_KEY_F12
DEVICE_KEY_BACK
DEVICE_KEY_HOME

[keypad_drv.h_HEADER]

#ifndef _EPT_KEYPAD_DRV_H
#define _EPT_KEYPAD_DRV_H

#endif /* _EPT_KEYPAD_DRV_H */
```
2. Driver Settings

This section describes the driver settings for General Purpose Input Output (GPIO), External Interrupt (EINT) and Keypad modules.

2.1. GPIO

Open the GPIO page by open or creating a workspace on the main UI, as shown in Figure 2. It is used to set the GPIO parameters. The GUI enables setting up the Mode, Pull up/down, Direction, OutHigh, variable name VarName and User Information for the GPIO pins.

2.1.1. Setting up the Mode option

Figure 10 shows the relationship between the GPIO Mode selected by the user and the code generated in ept_gpio_drv.h header file. The GPIO0 pin has 10 modes. In the example, the user selects EINT0 corresponding to Mode 1 for the GPIO0.

```
#define GPIO_PORT0_MODE0    MODE_1 // 1:EINT0 : Used for EINT0
#define GPIO_PORT1_MODE3    MODE_3 // 3:U2TXD : Used for U2TXD
#define GPIO_PORT2_MODE8    MODE_NC
#define GPIO_PORT3_MODE8    MODE_NC
#define GPIO_PORT4_MODE8    MODE_NC
#define GPIO_PORT5_MODE8    MODE_NC
#define GPIO_PORT6_MODE8    MODE_NC
#define GPIO_PORT7_MODE8    MODE_NC
#define GPIO_PORT8_MODE8    MODE_NC
#define GPIO_PORT9_MODE8    MODE_NC
#define GPIO_PORT10_MODE8   MODE_NC
#define GPIO_PORT11_MODE8   MODE_NC
#define GPIO_PORT12_MODE8   MODE_NC
#define GPIO_PORT13_MODE8   MODE_NC
#define GPIO_PORT14_MODE8   MODE_NC
#define GPIO_PORT15_MODE8   MODE_NC
#define GPIO_PORT16_MODE8   MODE_NC
```

Figure 10. GPIO0 mode and generated code

2.1.2. Setting up the Pull Up/Down, Direction, OutHigh options

The Pull Up/Down and Direction options are available when the Mode 0 is selected, such as for GPIO10 shown in Figure 11. Additionally, the OutHigh checkbox is invisible until the GPIO pin Direction is set to OUT. Figure 11 shows the GPIO10 options and generated code for Pull Up/Down, Direction and OutHigh values are again stored in the ept_gpio_drv.h header file.
Figure 11. GPIO10 option and generated code in ept_gpio_drv.h header file

Figure 12. Pull Up/Down options for GPIO6
The option list shown in Figure 12, includes five items. The mapping relationship between user’s selections for **Pull Up/Down** and generated code is shown in Figure 13 and Table 1.

![Figure 13. GPIO6 Pull Up/Down state](image)

**Table 1. Register and Pull Up/Down mapping options**

<table>
<thead>
<tr>
<th>PUPD</th>
<th>R1</th>
<th>R0</th>
<th>Pull Up/Down State</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Disable both registers</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
<td>PU-47kΩ</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
<td>PU-47kΩ</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td>PU-23.5kΩ</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>Disable both registers</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>PU-47kΩ</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>PU-47kΩ</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>PU-23.5kΩ</td>
</tr>
</tbody>
</table>

### 2.1.3. Setting up the VarName

Users can also select a variable name for the given GPIO pin. The selected variable name should be unique.
There is a list of options to choose from **VarName** and the default value is set and stored in the `ept_gpio_var.h` file, as shown in Figure 14. The final configuration of all pins with their corresponding modes is stored in a file, as shown in Figure 15.
Figure 14. Variable name set for the GPIO0

Code generated according to selected VarName

Figure 15. VarName column stored in file
2.1.4. Setting up the Comments

The Comments define the use of its corresponding pin, as shown in Figure 16.

By default, it provides three options to choose from:

1) **Used for “pin name”** — assigned to a valid pin mode selection. You can modify the default option. However, it’s recommended not to change it, unless it’s necessary.

2) **No User** — assigned to an invalid pin mode selection and cannot be edited.

3) **No Pin** — assigned to the pin mode that's not available for the current chip and cannot be edited.

---

2.2. EINT

Click the EINT tab to set the EINT parameters. You can only set the EINT variable name (**EINT Var**) for the pins that already enabled under the GPIO tab. The variable name option list won’t appear if you click on a disabled EINT row. Figure 17 shows the relationship between the GPIO page and the EINT.
Figure 17. EINT settings corresponding to the GPIO pin settings

By default, the option list for variable names under EINT VarName column is mapped from chip file, as shown in Figure 18.

Figure 18. Initialize EINT variable name list

In some cases, several EINT pins are already used by modules defined in section [EINT_USED] in .chip file. For these EINT pins, you are not allowed to set the variable name. Figure 19 shows that EINTs from EINT20 to EINT31 are used by other modules.
2.3. Keypad

Click the Keypad tab to set the keypad options. The two parameters that could be configured are Power Key and Key Type.

2.3.1. Setting up the Key Type

The Key Type could be defined as SINGLE_KEYPAD (Figure 20) or DOUBLE_KEYPAD (Figure 21). When the user chooses SINGLE_KEYPAD type, the Keypad configuration contains three rows and three columns. When the user selects the DOUBLE_KEYPAD type, the Keypad configuration contains three rows and six columns.
There are three parameters: Debounce time, Longpress time and Repeat time for keypad.
• **Debounce time** — defines the waiting period before key press or release events are considered stable. If the de-bounce setting is too small, the keypad will be too sensitive and detect too many unexpected key presses. The suitable de-bounce time setting must be adjusted according to the user’s habits.

• **Longpress time** — the event time setting of longpress action. If the key is pressed and held for longer than Longpress time, the keypad driver will report a HAL_KEYPAD_KEY_LONG_PRESS event.

• **Repeat time** — the interval time of key event report while a key is pressed and hold. If the HAL_KEYPAD_KEY_LONG_PRESS is reported, and the key is still on hold, the keypad driver will report the HAL_KEYPAD_KEY_REPEAT event every Repeat time interval.

Each row item corresponds to a key that is configured in keypad.conf file under [Key_definition] section, as shown in Figure 22.

![Figure 22. Choose a key](image)

### 2.3.2. Setting up the Power Key

An example of **Power Key** configuration is shown in Figure 23, where it is set to DOWN. After generating the output code, the ept_keypad_drv.h file defines the **POWERKEY_POSITION** as **DEVICE_KEY_DOWN** (see Figure 23).
Figure 23. The Power Key configuration