



# Capacitive Single Touch Drivers

## Setup and Installation

Touch Controller:

SOLOMON SYSTECH, SSD2531

Touch Panel/Display:

Custom made

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## Related Documentation

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- [1] Capacitive Single Touch Driver, General Functionality
- [2] GPIO Config Tool <http://developer.toradex.com/knowledge-base/gpioconfig>
- [3] SSD2531, Advance Information Application (not available from Toradex, Please ask SOLOMON SYSTECH)
- [3] SSD2531, Application Note (not available from Toradex, Please ask SOLOMON SYSTECH)

## 1. Introduction

This document describes the setup and test of the hardware interface to the Capacitive Touch Controller SSD2531 from Solomon Systech.

The General Functionality of the driver is described in [1].

The Capacitive Touch Controller (CTC) SSD2531 doesn't save his settings locally. At startup, the Driver sends a set of CTC commands to setup the CTC for that specific Touch Panel. Every of these commands have a default value which can be modified with a registry entry.

To tune such a setting very detailed descriptions about the different CTC commands (see [3] and [4]) and about the Touch Panel are needed. Mostly, the manufacture gives this information to their customer only.

Because of the lack of information and the knowledge about a specific Touch Panel, Toradex can't take any responsible for the default settings and the registry entries respectively.

## 2. Register Settings for the Interface

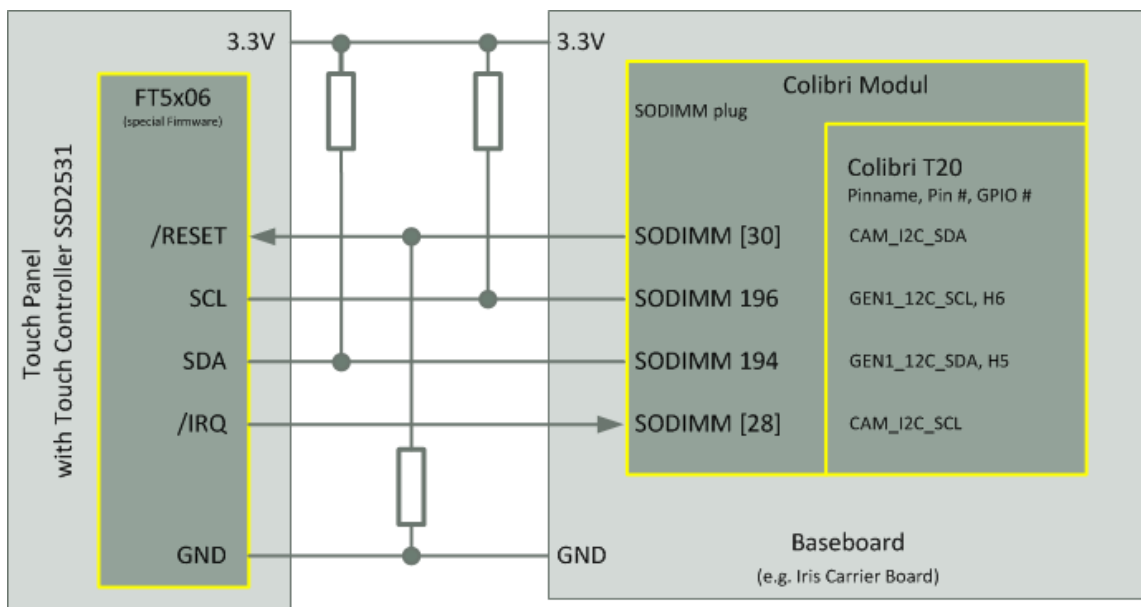


Figure 1 Interface to Capacitive Touch Panel Controller SSD2531

Beside the I2C bus connection the touch panel needs the line /RESET to reset the touch panel and the line /IRQ to signal an interrupt the touch driver.

The SODIMM Pins of the Colibri Modules for these two lines can be defined in the registry. Additional the active level of these two signals and a delay can be defined too (to adapt some logic on the Baseboard which inverts the signals).

All these settings are defined with the registry key:

[HKEY\_LOCAL\_MACHINE\Drivers\BuiltIn\SSD2531]

The following values can be used:

<b>Int_SODIMMPin</b>	Defines the SODIMM Pin# for the /IRQ signal from the SSD2531.
<b>Int_Signal_Inv</b>	The active level of the /IRQ signal is described in the datasheet of the touch panel. This value inverts the active level to adapt level shifter, amplifier etc. on the Baseboard. 0 = not inverted, 1 = inverted.
<b>Reset_SODIMMPin</b>	Defines the SODIMM Pin# for the /RESET signal to the SSD2531. Another way to use this signal is to switch the power of the SSD2531 on and off (maybe in case of EMC issues, power off and on is a better way than a reset signal).
<b>Reset_Line_Inv</b>	The active level of the /RESET signal is described in the datasheet of the touch panel. This value inverts the active level to adapt power switches etc. on the Baseboard. 0 = not inverted, 1 = inverted.
<b>Reset_Post_Delay</b>	This value can be used to define the delay between the end of the active /RESET signal and the first communication over the I2C bus. X = delay in ms
<b>I2CSpeed</b>	Speed of the I2c communication 1=100KB, 2= 400KB.
<b>I2CAddress</b>	I2C address of the SSD2531 touch controller.

The following default values are used if the value is missing in the registry:

Int_SODIMMPin	[28]
Int_Signal_Inv	[0]
Reset_SODIMMPin	[30]
Reset_Line_Inv	[0]
Reset_Post_Delay	[100]
I2CSpeed	[2]
I2CAddress	[0x5C]

### 3. Register Settings for SSD2531

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It is possible to tune the settings or setup the CTC SSD2531 to another kind of Touch Panel. For more information see the Command of the SSD2531 in [3] and [4]. The values of such command can be changed with registry entry.

All these settings are defined with the registry key:

`[HKEY_LOCAL_MACHINE\Drivers\BuiltIn\SSD2531]`

The following additional values can be used:

`Cmd_R2ch`                      `R2ch` is the name of the Command (see [3] and [4])

Depend on the Command one or two 8bit values must be defined. This is done with a 32bit value (dword):

`0x00002211`                      `11` is the first 8bit value  
    `22` is the second 8bit value

The following default values are use if the value is missing in the registry:

<code>Cmd_R2ch</code>	<code>[00000002]</code>
<code>Cmd_Rd4h</code>	<code>[00000000]</code>
<code>Cmd_Rc1h</code>	<code>[00000002]</code>
<code>Cmd_Rd5h</code>	<code>[0000000f]</code>
<code>Cmd_Rd9h</code>	<code>[00000001]</code>
<code>Cmd_R3dh</code>	<code>[00000001]</code>
<code>Cmd_Rd8h</code>	<code>[00000000]</code>
<code>Cmd_R5ah</code>	<code>[00000000]</code>
<code>Cmd_R06h</code>	<code>[0000001f]</code>
<code>Cmd_R07h</code>	<code>[00000006]</code>
<code>Cmd_R08h</code>	<code>[00000000]</code>
<code>Cmd_R09h</code>	<code>[00000001]</code>
<code>Cmd_R0ah</code>	<code>[00000002]</code>
<code>Cmd_R0bh</code>	<code>[00000003]</code>
<code>Cmd_R0ch</code>	<code>[00000004]</code>
<code>Cmd_R0dh</code>	<code>[00000005]</code>
<code>Cmd_R0eh</code>	<code>[00000006]</code>
<code>Cmd_R0fh</code>	<code>[00000007]</code>
<code>Cmd_R10h</code>	<code>[00000008]</code>
<code>Cmd_R11h</code>	<code>[00000009]</code>
<code>Cmd_R12h</code>	<code>[0000000A]</code>
<code>Cmd_R13h</code>	<code>[0000000B]</code>
<code>Cmd_R14h</code>	<code>[0000000C]</code>
<code>Cmd_R15h</code>	<code>[0000000D]</code>
<code>Cmd_R16h</code>	<code>[0000000E]</code>
<code>Cmd_R17h</code>	<code>[0000000F]</code>
<code>Cmd_R18h</code>	<code>[00000010]</code>
<code>Cmd_R19h</code>	<code>[00000011]</code>
<code>Cmd_R1ah</code>	<code>[00000012]</code>

Cmd_R1bh	[00000013]
Cmd_R1ch	[00000014]
Cmd_R8dh	[00000001]
Cmd_R8eh	[00000002]
Cmd_R94h	[00000000]
Cmd_R8dh	[00000000]
Cmd_R33h	[00000001]
Cmd_R34h	[00000050]
Cmd_R35h	[00001000]
Cmd_R36h	[0000001e]
Cmd_R37h	[00000003]
Cmd_R38h	[00000000]
Cmd_R39h	[00000000]
Cmd_R51h	[00001f00]
Cmd_R52h	[00001f00]
Cmd_R53h	[00000008]
Cmd_R54h	[00000014]
Cmd_R55h	[00000014]
Cmd_R56h	[00000001]
Cmd_R58h	[00000001]
Cmd_R66h	[00000082]
Cmd_R67h	[000000c0]
Cmd_R68h	[00000000]
Cmd_R69h	[00000000]
Cmd_R65h	[00000000]
Cmd_R25h	[00000008]

Note: The values of a certain Command can be changed with a registry entry. It is not possible to setup additional Command or to change the order of this Command in the setup sequence.

## 4. Example of all Registry entries

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### [HKEY\_LOCAL\_MACHINE\Drivers\BuiltIn\SnglTchPanel]

```
"MouseEmulation"=dword:00000001
"TouchEmulation"=dword:00000000
"CapTouchMapping"="799,479,0,0,799,479,0"
"TouchButton0" = .....

"Threshold"=dword:00000028
"Gain"=dword:00000008
"Offset"=dword:00000000
```

### [HKEY\_LOCAL\_MACHINE\Drivers\BuiltIn\ SSD2531]

```
"dll"="sngltchdrv_SSD2531.dll"
"prefix"="TCH"
"index"=dword:00000001

"Int_SODIMMPin"=dword:0000001C
"Int_Signal_Inv"=dword:00000000
"Reset_SODIMMPin"=dword:0000001E
"Reset_Post_Delay"=dword:00000064
"Reset_Line_Inv"=dword:00000000
"I2CSpeed"=dword:00000002
"I2CAddress"=dword:0000005C

"Cmd_R38h"=dword:00000000
"Cmd_R39h"=dword:00000000
"Cmd_R51h"=dword:00001f00
```

- Red line: Values for the Panel Definition (see [1])
- Grey line: Values for adjustments (see [3])
- Blue line: Values for loading the driver
- Green line: Values for the Interface setup
- Yellow line: Values for Commands

The file

```
SSD2531_ToolDrv.reg
```

contains a base register setting without the values for loading the driver (red line) and values to change some command (yellow line).

The file

```
SSD2531_ToolDrv_Init.reg
```

contains a base register setting with all the Commands and without the values for loading the driver (red line).

These files can be modified and imported in the registry (double click on the file).

These registry settings is used by

Capacitive Single Touch Driver

and partly by

All Capacitive Single Touch Driver Tools

## 5. Install the Single Touch Driver

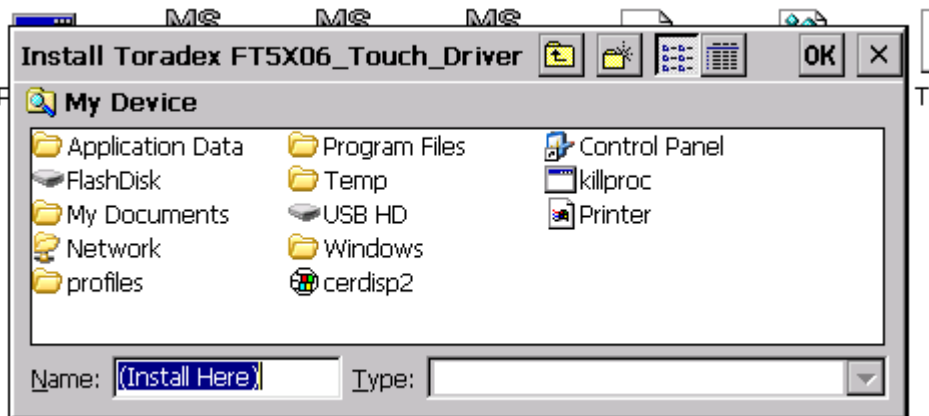
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Before installing this driver no other Single Touch Driver should be installed (see chapter 6).

To Install the driver copy the File “SingleTouchDriverSSD2531.cab” to a Colibri (Desktop, Temp folder etc.) and execute it.

The following screen is popping up.





After confirm (OK button) the driver file “sngltchdrv\_SSD2531.dll” is copied to “\FlasDisk\System\“ and all necessary entries in the registry are made.

Save the registry before reboot (Start->ColibriTools->SaveReg).

**Remark:** Install or reinstall the driver overrides only the settings for loading the driver (see blue line in chapter 4). The other registry entries are not changed or must be adapted to your display/touch and interface.

## 6. Uninstall the Single Touch Driver

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To uninstall the driver use:

“Start->Settings->Control Panel->Remove Program”.

**Remark:** If you reinstall the driver the settings for load the driver are removed (see blue line in chapter 4).

The other register settings are unchanged and must be removed manual with a registry editor if needed.

## 7. Capacitive Touch Driver Tools

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For testing the hardware and the registry settings are several tools available:

- SSD2531\_I2CAdrScan.exe      Scan the I2C bus to detect all active device
- SSD2531\_ContrlTest.exe      Show the RAW touch coordinates from the  
Touch Controller
- SSD2531\_DriverTest.exe      Test all settings for the driver

All these tool runs as an application and can be started from the desktop without any installation. The tools use all or some settings of the registry which should be made in advanced (see below).

**Remark:**

It is not possible to run these tools together with Capacitive Single Touch Driver. In this case the driver must be uninstalled first (see chapter 6.)

If this tools are closed regular (ESC and or Enter) then the tools can be run again. Otherwise the Colibri Modul needs to be restarted.

### 7.1. SSD2531\_I2CAdrScan.exe

This tool reset the Touch Panel using the line /RESET and the according settings in the registry. After the reset sequence the tool send out all I2C addresses and waits for a response.

Addresses with a valid acknowledge are shown on the screen.

This tools use the registry settings for the interface (see green line in chapter 4).

### 7.2. SSD2531\_ContrlTest.exe

This tool is mainly used to test the interface and communication to the SSD2531 and check the panel settings.

The tool resets the Touch Panel using the line /RESET according the settings in the registry. After the reset sequence the tool initialize the touch controller and waits until a finger touches the panel. If the touch controller signals an activity on the touch panel with the /IRQ line the the tool reads out the touch position and display it on the screen.

The displayed coordinates are in RAW format of the SSD2531 controller.

This tool show only one single touch and waits until the finger is released. Coordinates of a moving finger are not shown.

The tools is very helpful for compare the resister settings for the Panel definition (see [1]) with the RAW position of the touch panel.

This tools use the registry settings for the interface, the adjustments and the Commands (see green, grey and yellow lines in chapter 4).

### 7.3. SSD2531\_DriverTest.exe

With this tool the setting for the driver can be tested because it works with the same registry settings like the real driver does (except the values for loading the driver DLL).

After start the Driver Test Tool reads out the registry settings and prints out some status message on the same port like the Bootloader does (to connect to the Bootloader port you need: a Null Modem Cable a PC with a serial com port (RS232) a terminal application (e.g. HyperTerminal or TeraTerm).

On the standard display is no output from the Driver Test at all.

The Driver Test Tool reads out the touch data and generates the according mouse events. If mouse emulation is set in the registry the cursor on the display should following a touching finger.

This tools use the registry settings for the interface, adjustments and commands (see green and yellow lines in chapter 4) and the Panel definition (see red and grey linen in chapter 4).

## 8. Bring up the Touch Panel

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After the Hardware connection is setup (I2C Bus, /IRQ and /RESET are connected) the following steps and tools helps to bring up the device:

- Set the register values for the Interface at least (see green line in chapter 4).
- Control the settings and wiring of the /RESET and /IRQ lines.
  - With the help of the GPIO Config Tool [2] the chosen SODIMM pin can monitor and set respectively.
- Run the Tool to scan the I2C addresses (`SSD2531_I2CAdrScan.exe`).

The tool shows the I2C addresses of all devices on the I2C bus. One of these addresses should be the address of the touch controller.

Please note the shown addresses are the addresses of the devices on the I2C bus and not addresses set in the registry.

- Run the tool to test the touch controller (`SSD2531_ContrlTest.exe`).

The tool establishes the communication to the touch controller. In case of an error the tool retries it.

If the communication is ok then the tools waits until a finger touches the panel and shows it position.

- The show position can be used set or verify the register settings for the Panel Definition (see red line in chapter 4).
- It is also possible to adjust the SSD2531 and test it with the Controller Test Tool (see grey and yellow lines in chapter 4).
- Set the register values for the Panel Definition (see red line in chapter 4).
- Run the Driver Test Tool test the settings (`SSD2531_DriverTest.exe`).
- If mouse events are enabled the cursor on the screen should jump to the position of touching finger. If the finger moves on the touch panel then the cursor should following it.
- If anything works the install the driver (see chapter 5).

### Revision History

Date	Changes
28.Dec-12	Initial release
25.Mrz-13	Reworked to a touch controller specific description without the general chapters
29.May-13	Changed the driver installation path to work with Win CE7, Beta 1.1 and later

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