



Hi3521/Hi3520A Demo Board

User Guide

Issue 01

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About This Document

Purpose

This document describes the functions, hardware features, and hardware configurations of the Hi3521 demo board. It also describes how to debug the Hi3521 demo board by using the software.

Related Version

The following table lists the product version related to this document.

Product Name	Version
Hi3521	V100
Hi3520A	V100

Intended Audience

This document is intended for:

- Technical support personnel
- Board hardware development engineers

Change History

Changes between document issues are cumulative. Therefore, the latest document issue contains all changes made in previous issues.

Issue 01 (2013-01-21)

This issue is the first official release.

In section 2.1, descriptions of the external interfaces of the Hi3521 demo board are added.



Issue 00B10 (2012-06-30)

This issue is the first draft release.



Contents

About This Document.....	i
1 Overview.....	1
1.1 Introduction	1
1.2 Features	2
1.3 Deliverable List.....	3
1.4 Related Components	3
2 Hardware Descriptions	4
2.1 Architecture and Interfaces.....	4
2.2 Operating Principle	6
2.3 Functions of the Interfaces on the Hi3521 Demo Board	8
2.4 I ² C Addresses	10
3 Operation Guide	11
3.1 Precautions	11
3.2 Setting the Board.....	12
3.2.1 Configurations of the Hi3521 Demo Board	12
3.2.2 Switching the VOU1120 and VOU656 Multiplexing Relationships.....	16
3.2.3 Selecting I ² C Addresses	16
3.2.4 Daughter Board Interfaces	17
3.2.5 Switching the Application Scenario	20



Figures

Figure 2-1 External interfaces of the Hi3521 demo board	4
Figure 2-2 Functional block diagram of the Hi3521 demo board	7
Figure 3-1 SW2 on the board	13
Figure 3-2 SW4 on the board	14
Figure 3-3 SW3 on the board	16
Figure 3-4 SW5 on the board	17
Figure 3-5 Daughter board socket pin J7.....	18
Figure 3-6 Daughter board socket pin J8.....	19



Tables

Table 1-1 Memory specifications	3
Table 2-1 External interfaces of the Hi3521 demo board	5
Table 2-2 Functions of SIO interfaces	8
Table 2-3 Functions of SPI control pins	8
Table 2-4 Functions of USB pins.....	9
Table 3-1 Functions of DIP switches	12
Table 3-2 Mapping between boot modes and SW2 configurations	12
Table 3-3 Mapping between NAND flash types and DIP switch configurations.....	14
Table 3-4 Mapping between application scenarios and DIP switch configurations.....	20



1 Overview

1.1 Introduction

Developed based on the Hi3521, the Hi3521 demo board supports reference design and chip verification and demonstrates the superior multimedia interfaces and peripheral interfaces of the Hi3521. The Hi3521 demo board enables you to develop hardware by modifying only the module circuits of the reference design or without modifications. The Hi3521 demo board also supports software development kit (SDK) development, application development, and chip test.

The Hi3521 demo board can serve as a basic development system by connecting to a PC through serial ports and Ethernet port cables. It can also act as a complete development system or demonstration environment when being connected to the following devices or components:

- TV set or monitor
- Video source
- Audio capture device and sound box
- Universal Serial Bus 2.0 (USB 2.0) device
- RealView-ICE emulator
- Storage devices such as the USB flash drive and the secure digital (SD) card



NOTE

HiSilicon provides a mature Hi-boot program, that is, the universal boot loader (U-boot). By using it, you can debug the software over the Trivial File Transfer Protocol (TFTP) without emulators.



1.2 Features

The Hi3521 demo board has the following features:

- The Hi3521 provides three physical BT.1120 interfaces: VIU0, VIU1, and VOU1120. VIU0 and VIU1 support BT.1120 input, and VOU1120 supports BT.1120 output. The Hi3521 also provides a VOU656 interface that acts as BT.656 output.
- VIU0 selects the connected component by setting the dual in-line package (DIP) switch SW6 based on the interface multiplexing function:
 - Acts as the interface for 2-channel BT.656 inputs and connects to two TW2867s (8-channel D1 inputs). The data line for lower eight bits and VIU0_VS (multiplexed as CLK) connect to TW2867 A (the I²C address is 0x50). The data line for the upper eight bits and VIU0_CLK connect to TW2867 B (the I²C address is 0x54).
 - Acts as the interface for 1-channel BT.656 input and connects to a TW2960 (4-channel 960H inputs). Only upper eight bits are valid.
 - Acts as a BT.1120 input interface and connects to a GV7601.
- The VOU1120 interface or VOU656 interface connects to two components. The connected components are selected based on the interface multiplexing function by using the DIP switch SW4.

For the VOU1120 interface:

- Connects to the SiI9022 to act as a BT.1120 output interface.
- Acts as the LCD interface to output 24-bit RGB signals.

For the VOU656 interface:

- Connects to the SD card to act as a BT.656 output interface.
- Acts as the LCD interface to output 24-bit RGB signals.

- The Hi3521 has an HDMI output interface and the Hi3521 demo board provides two HDMI. The other HDMI signal is output after passing the VOU1120 interface and HDMI PHY.
- The Hi3521 provides a gigabit media access control (GMAC) port in reduced gigabit media independent interface (RGMII) or media independent interface (MII) mode, and the interface connects to a GE PHY.
- The Hi3521 demo board supports 2-channel CVBS outputs, and 1-channel VGA output.
- The Hi3521 demo board provides two serial advanced technology attachment (SATA) interfaces and two USB ports.
- The Hi3521 demo board provides one RS485 port and one RS232 serial port with the baud rate of 1200–115200 bit/s.
- The Hi3521 demo board provides one infrared (IR) interface.
- The Hi3521 demo board supports intercom input/output.
- The Hi3521 demo board supports SD card and multimedia card (MMC).

[Table 1-1](#) describes the specifications of the memory (a single DDRC) supported by the Hi3521 demo board.



Table 1-1 Memory specifications

Memory	Bit Width	Frequency	Capacity
DDR3 SDRAM	32 bits	620 MHz	2 Gbits x 2 = 4 Gbits
Serial peripheral interface (SPI) NOR flash	8 bits	None	16 MB
NAND flash	8 bits	None	2 Gbits

1.3 Deliverable List

The Hi3521 demo board package includes the following deliverables:

- A Hi3521 demo board
- A power adapter with the specifications of 100–240 V AC input, 50 Hz and 12 V DC output, 6 A

1.4 Related Components

The following components are not included in the Hi3521 demo board package; however, they are required for program debugging. Therefore, you must prepare them. The components related to the Hi3521 demo board are as follows:

- Video source
- Audio/video receiving devices such as the TV set, stereo equipment, and camera.

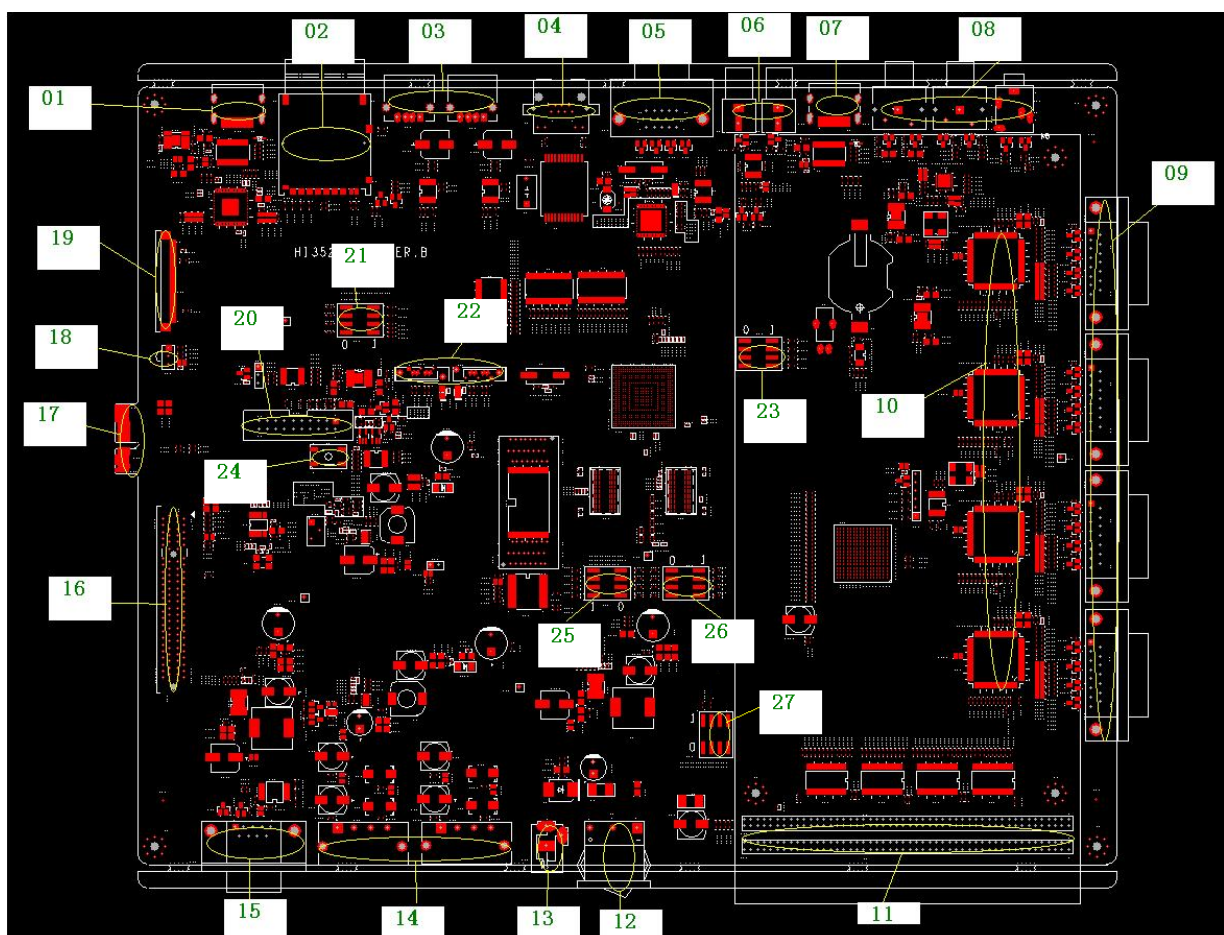


2 Hardware Descriptions

2.1 Architecture and Interfaces

Figure 2-1 shows the external interfaces of the Hi3521 demo board.

Figure 2-1 External interfaces of the Hi3521 demo board



NOTE

Check the silkscreen marks on the board before using the DIP switches on the board.



Table 2-1 describes the external interfaces of the Hi3521 demo board.

Table 2-1 External interfaces of the Hi3521 demo board

No.	Description
1	HDMI
2	SD card connector
3	USB connector
4	RJ45 connector
5	VGA output
6	CVBS output
7	HDMI
8	Audio intercom input and output interface
9	16-channel D1 (or CIF) video inputs
10	4-channel TW2867
11	Daughter board interface
12	Power switch
13	12 V power input interface
14	SATA power interface
15	Serial port
16	Peripheral component interconnect express (PCIe) slot (not supported by the Hi3521 or Hi3520A)
17	PCIe edge connector
18	IR receiver
19	24-bit RGB connector
20	JTAG interface
21	SW4
22	SATA connector
23	SW6
24	Reset button
25	SW2
26	SW3
27	SW5



2.2 Operating Principle

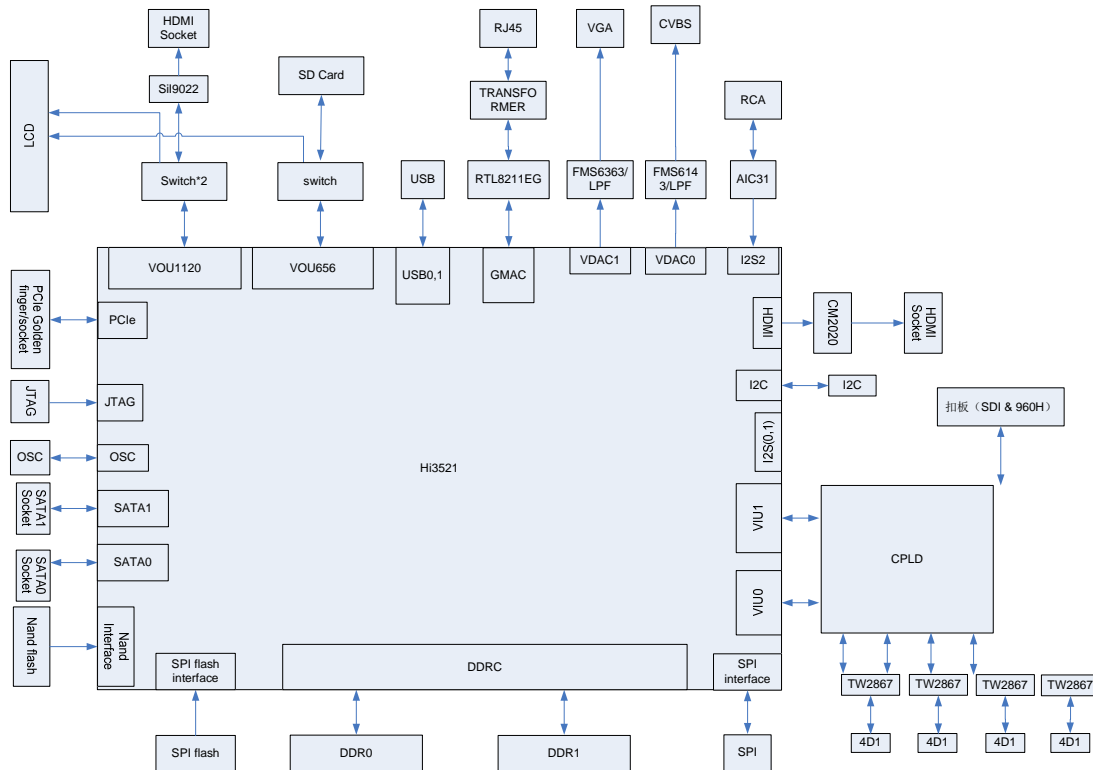
The Hi3521 demo board carries the following common interface circuits of the high-definition digital video recorder (HDVR):

- I/O circuits for video input (VI) and video output (VO), mainly the 16D1 and SDI input circuits
- HDMI, CVBS, VGA, and component VO circuits
- Circuit for Ethernet ports
- RS232 and RS485 interface circuits
- Dual USB port circuits
- SD card interface circuit
- Circuit for dual SATA interfaces



Figure 2-2 is the functional block diagram of the Hi3521 demo board.

Figure 2-2 Functional block diagram of the Hi3521 demo board





2.3 Functions of the Interfaces on the Hi3521 Demo Board

SIO Interfaces

Table 2-1 describes the functions of sonic input/output (SIO) interfaces.

Table 2-2 Functions of SIO interfaces

SIO Interface	SIO Pin	Function
SIO0	SIO0_RCLK	Connect to the Inter-IC sound (I ² S) interface of the TW2867
	SIO0_RFS	Connect to the I ² S interface of the TW2867
	SIO0_DIN	Connect to the I ² S interface of the TW2867
SIO1	SIO1_RCLK	Connect to the I ² S interface of the TW2867
	SIO1_RFS	Connect to the I ² S interface of the TW2867
	SIO1_DIN	Connect to the I ² S interface of the TW2867
SIO2	SIO2_XCLK/GPIO7_6	Interrupt signal of HDMI PHY SiI9022
	SIO2_XFS/GPIO7_7	Data valid signal, connect to HDMI PHY SiI9022 (called HDMI_DV in the circuit)
	SIO2__RCLK/GPIO8_0	Connect to AIC31
	SIO2_RFS/GPIO8_1	Connect to AIC31
	SIO2_DIN/GPIO8_2	Connect to AIC31
	SIO2_DOUT	Connect to AIC31

SPI Interface

Table 2-2 describes the functions of SPI control pins.

Table 2-3 Functions of SPI control pins

Pin	Function
SPI_SCLK	Clock signal of the SPI interface, connect to the GV7601.
SPI_SDO	Serial data output (SDO) signal of the SPI interface, connect to the GV7601.
SPI_SDI	SDI signal of the SPI interface, connect to the GV7601.
SPI_CSN0	Chip select 0 (CS0) of the SPI interface, connect to the GV7601.



Pin	Function
SPI_CSN1	CS1 of the SPI interface, connect to the GV7601.
SPI_CSN2	CS2 of the SPI interface, connect to the GV7601.
SPI_CSN3	CS3 of the SPI interface, connect to the GV7601.

USB Port

Table 2-3 describes the functions of USB pins.

Table 2-4 Functions of USB pins

Pin	Function
USB0_OVRCUR	USB0 overcurrent detection, active low.
USB0_PWREN	USB0 power-on enable. 0: power off 1: power on
USB0_DM	Data minus (DM) signal of USB0 port.
USB0_DP	Data positive (DP) signal of USB0 port.
USB1_OVRCUR	USB1 overcurrent detection, active low.
USB1_PWREN	USB1 power-on enable. 0: power off 1: power on
USB1_DM	DM signal of USB1 port.
USB1_DP	DP signal of USB1 port.



2.4 I²C Addresses

The following are the inter-integrated circuit (I²C) addresses for the peripherals connected to the Hi3521 demo board:

- Four TW2867s: 0x50, 0x54, 0x52, and 0x56
- SiI9022: 0x72
- AIC31: 0x30
- RTC: 0x68



CAUTION

If a daughter board is used, ensure that the I²C address for the daughter board do not conflict with the I²C addresses for the main board. The I²C address can be switched by using the DIP switches on the main board.



3 Operation Guide

3.1 Precautions

The Hi3521 demo board applies to the laboratory or engineering development environment. Take the following precautions before performing operations:



CAUTION

Do not perform the hot-swap operation on the board in any case.

-
- Take antistatic measures before unpacking or installing the board to prevent the board hardware from being damaged by the electrostatic discharge (ESD).
 - Hold the board on the edge and do not touch the exposed metal on the board; otherwise, the components of the board may be damaged by the ESD.
 - Place the Hi3521 demo board on a dry plane and keep them away from heat sources, electromagnetic interference sources, radiant sources, and electromagnetic susceptibility equipment (such as the medical equipment).
 - Familiarize yourself with the layout of the Hi3521 demo board by following [Figure 2-1](#). This ensures that you know the positions of components such as the switches, connectors, and indicators. For details about the components, see chapter 2 "[Hardware Descriptions](#)."



3.2 Setting the Board

Table 3-1 describes the DIP switches on the board.

Table 3-1 Functions of DIP switches

SIP Switch	S1	S2	S3	S4
SW2	BOOT_SEL[0:1]		BOOTROM_SEL	JTAG_SEL1
SW3	NF_BOOT_PIN[1:4]			
SW4	Switches the VOU1120 multiplexing relationship. Switches the VOU656 multiplexing relationship.		JTAG_SEL0	NF_BOOT_PIN0
SW5	Selects the I ² C address for the TW2867 or TW2960.			
SW6	Switches the application scenario.			

3.2.1 Configurations of the Hi3521 Demo Board

The following describes the configurations of the Hi3521 demo board:

- The system can boot from the SPI flash, NAND flash, or BOOTROM, which is controlled by configuring BOOTROM_SEL and BOOT_SEL[1:0]. S3, S2, and S1 of SW2 map to BOOTROM_SEL, BOOT_SEL1, and BOOT_SEL0 respectively. Table 3-2 describes the mapping between boot modes and SW2 configurations, and Figure 3-1 shows the SW2 position on the board.



CAUTION

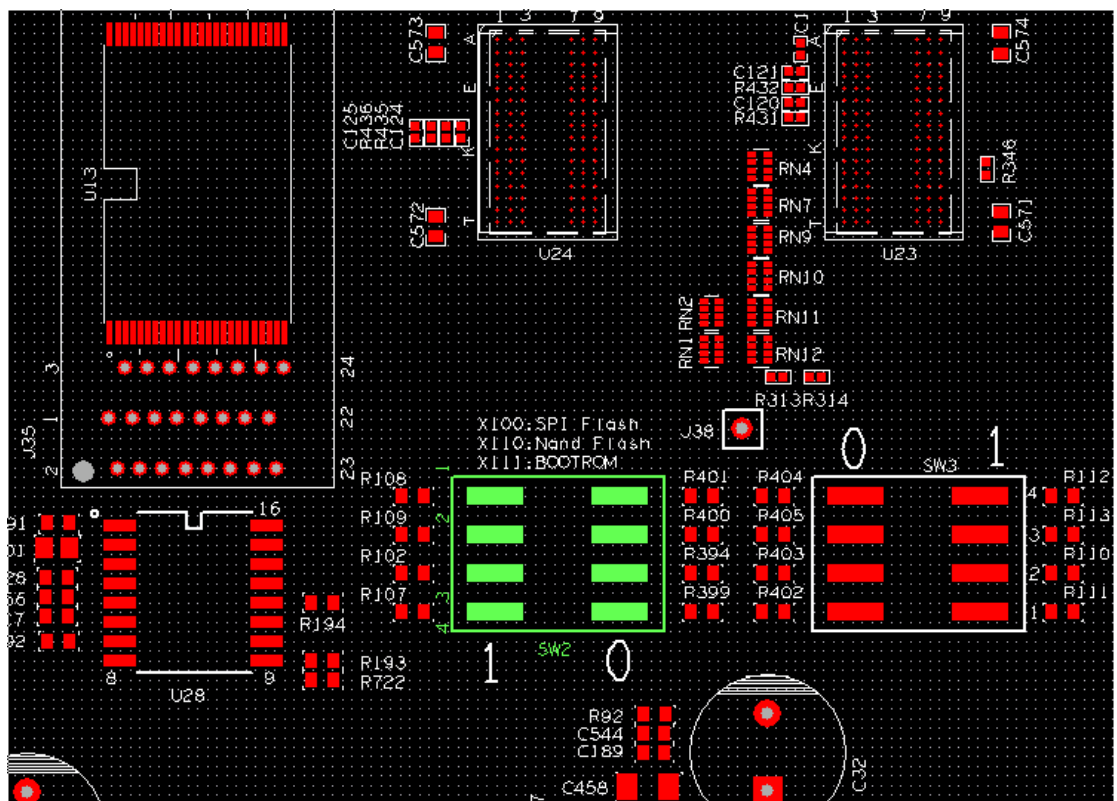
- Set DIP switches to select the boot mode by following Table 3-1.
- Set S3 to **1** when the fastboot is used, and set S3 to **0** when an emulator is used.

Table 3-2 Mapping between boot modes and SW2 configurations

Boot Mode	S3	S2	S1	Remarks
BOOTROM	1	0	0	The system boots from the BOOTROM. If the BOOTROM detects that it is not required to communicate with the PC to burn programs, the system boots from the SPI flash.

Boot Mode	S3	S2	S1	Remarks
	1	1	0	The system boots from the BOOTROM. If the BOOTROM detects that it is not required to communicate with the PC to burn programs, the system boots from the NAND flash.
SPI Flash	0	0	0	The system boots from the SPI flash.
NAND Flash	0	1	0	The system boots from the NAND flash.

Figure 3-1 SW2 on the board



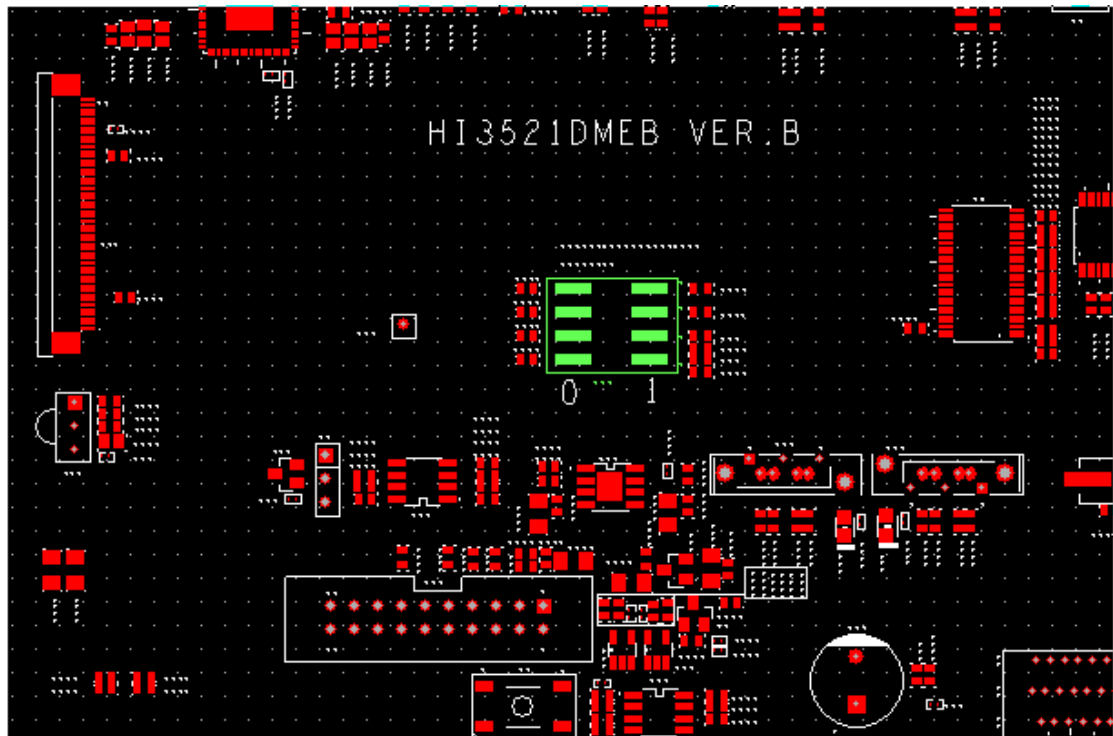
- The Joint Test Action Group (JTAG) connection mode is controlled by configuring JTAG_SEL[1:0].

JTAG_SEL1 maps to S4 of SW2, and JTAG_SEL0 maps to S3 of SW4. [Figure 3-2](#) shows the SW4 position on the board.

The following describes the configurations of SW2 and SW4:

- A9: SW2[0XXX], SW4[X0XX] (set S4 of SW2 and S3 of SW4 to **0**)
- PCIe: SW2[0XXX], SW4[X1XX] (set S4 of SW2 to **0** and S3 of SW4 to **1**)
- Serial advanced technology attachment (SATA): SW2[1XXX], SW4[X0XX] (set S4 of SW2 to **1** and S3 of SW4 to **0**)

Figure 3-2 SW4 on the board



- NAND flash configurations

No dedicated pins are provided to configure the Page_Size, ECC_bit, and ADDR_NUM for the NAND flash. Instead, five configuration pins NF_BOOT_PIN[4:0] are provided to select the NAND flash type. A total of 14 NAND flash types are supported.

NF_BOOT_PIN0 maps to pin 4 of SW4, and NF_BOOT_PIN[4:1] map to SW3[4:1].

[Figure 3-3](#) shows the SW3 position on the board.

[Table 3-3](#) describes the mapping between NAND flash types and DIP switch configurations. If you do not need to replace the NAND flash or perform compatibility tests, use the default configuration.

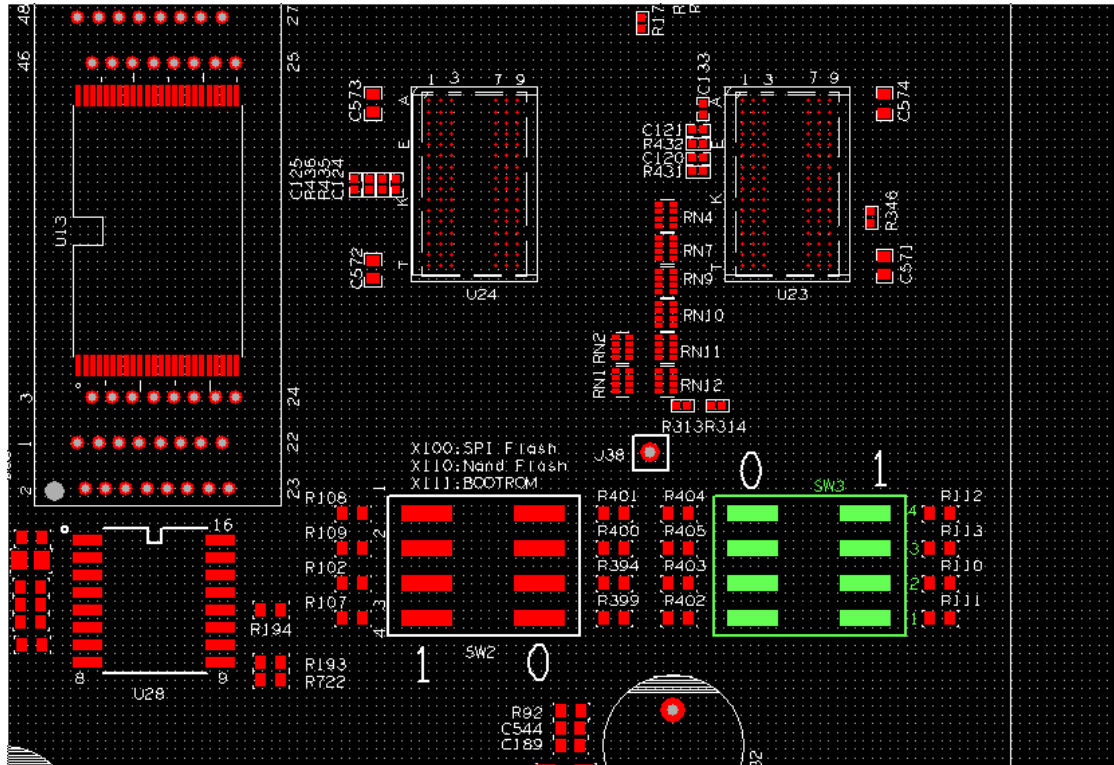
Table 3-3 Mapping between NAND flash types and DIP switch configurations

NAND Flash Type	SW3 Configuration	SW4 Configuration
2 KB page size, 1-bit error correcting code (ECC), 64 pages/blocks, 5 addresses (default)	0000	1XXX
2 KB page size, 4-bit ECC, 64 pages/blocks, 5 addresses	0001	1XXX
2 KB page size, 24-bit ECC, 64 pages/blocks, 5 addresses	0010	1XXX
2 KB page size, 1-bit ECC, 64 pages/blocks, 4 addresses	0011	0XXX



NAND Flash Type	SW3 Configuration	SW4 Configuration
4 KB page size, 4-bit ECC, 128 pages/blocks, 5 addresses	0100	0XXX
4 KB page size, 4-bit ECC, 64 pages/blocks, 5 addresses	0100	1XXX
2 KB page size, 4-bit ECC, 64 pages/blocks, 4 addresses	0101	0XXX
4 KB page size, 24-bit ECC, 128 pages/blocks, 5 addresses	0101	1XXX
8 KB page size, 24-bit ECC, 128 pages/blocks, 5 addresses	0110	1XXX
8 KB page size, 24-bit ECC, 64 pages/blocks, 5 addresses	1000	0XXX
4 KB page size, 24-bit ECC, 64 pages/blocks, 5 addresses	1000	1XXX
4 KB page size, 1-bit ECC, 64 pages/blocks, 5 addresses	1001	1XXX
2 KB page size, 4-bit ECC, 128 pages/blocks, 5 addresses	1010	1XXX
2 KB page size, 24-bit ECC, 128 pages/blocks, 5 addresses	1100	1XXX

Figure 3-3 SW3 on the board



3.2.2 Switching the VOU1120 and VOU656 Multiplexing Relationships

The VOU1120 interface is multiplexed as HDMI output and LCD output, and the VOU656 interface is multiplexed as SD card output and LCD output. The multiplexing relationships are switched by setting pin 1 and pin 2 of SW4:

- SD Card & SiI9022(HDMI): SW4[XX01]
- LCD: SW4[XX10]

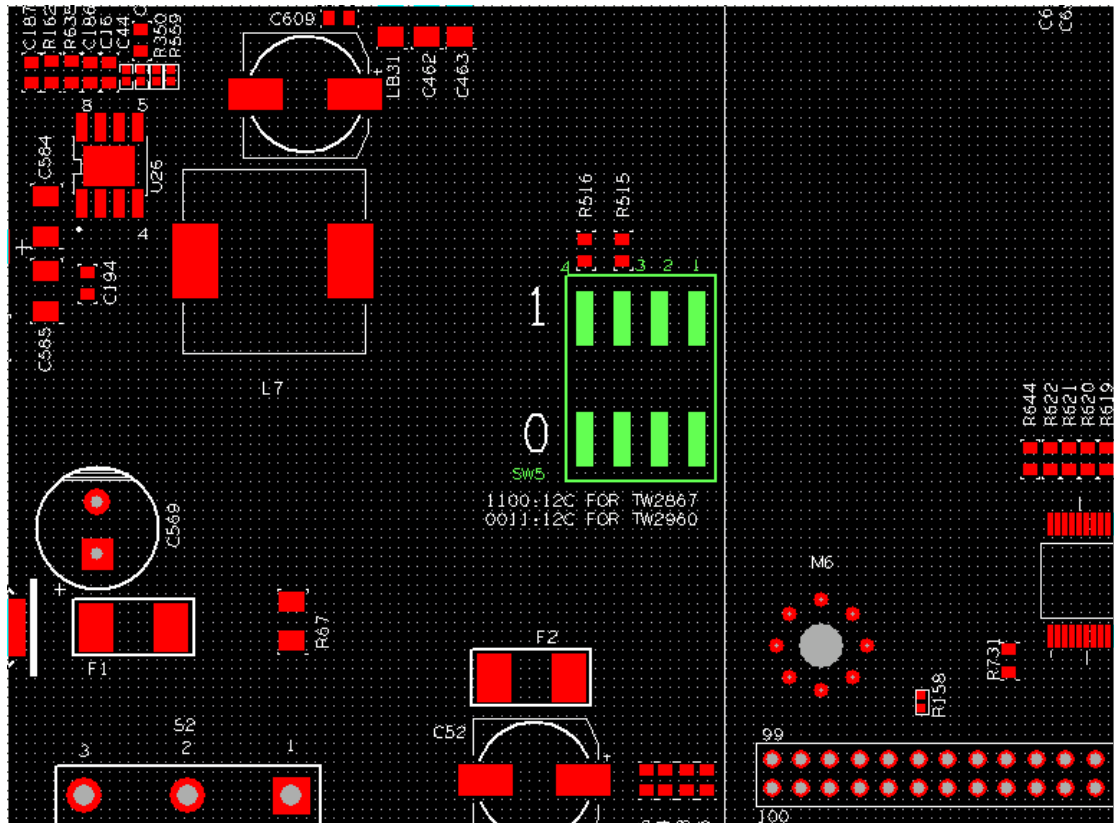
3.2.3 Selecting I²C Addresses

As the I²C addresses for the TW2867 and TW2960 conflict, select the I²C address by setting SW5 when connecting a 960H daughter board to the main board. [Figure 3-4](#) shows the SW5 position on the board.

The following shows the mapping between I²C addresses and SW5 configurations:

- I2C FOR TW2867: SW5[1100]
- I2C FOR TW2960: SW5[0011]

Figure 3-4 SW5 on the board



3.2.4 Daughter Board Interfaces



NOTE

Design the daughter board circuit as required. This section describes only the daughter board socket pins J7 and J8. For details, contact field application engineers (FAEs).

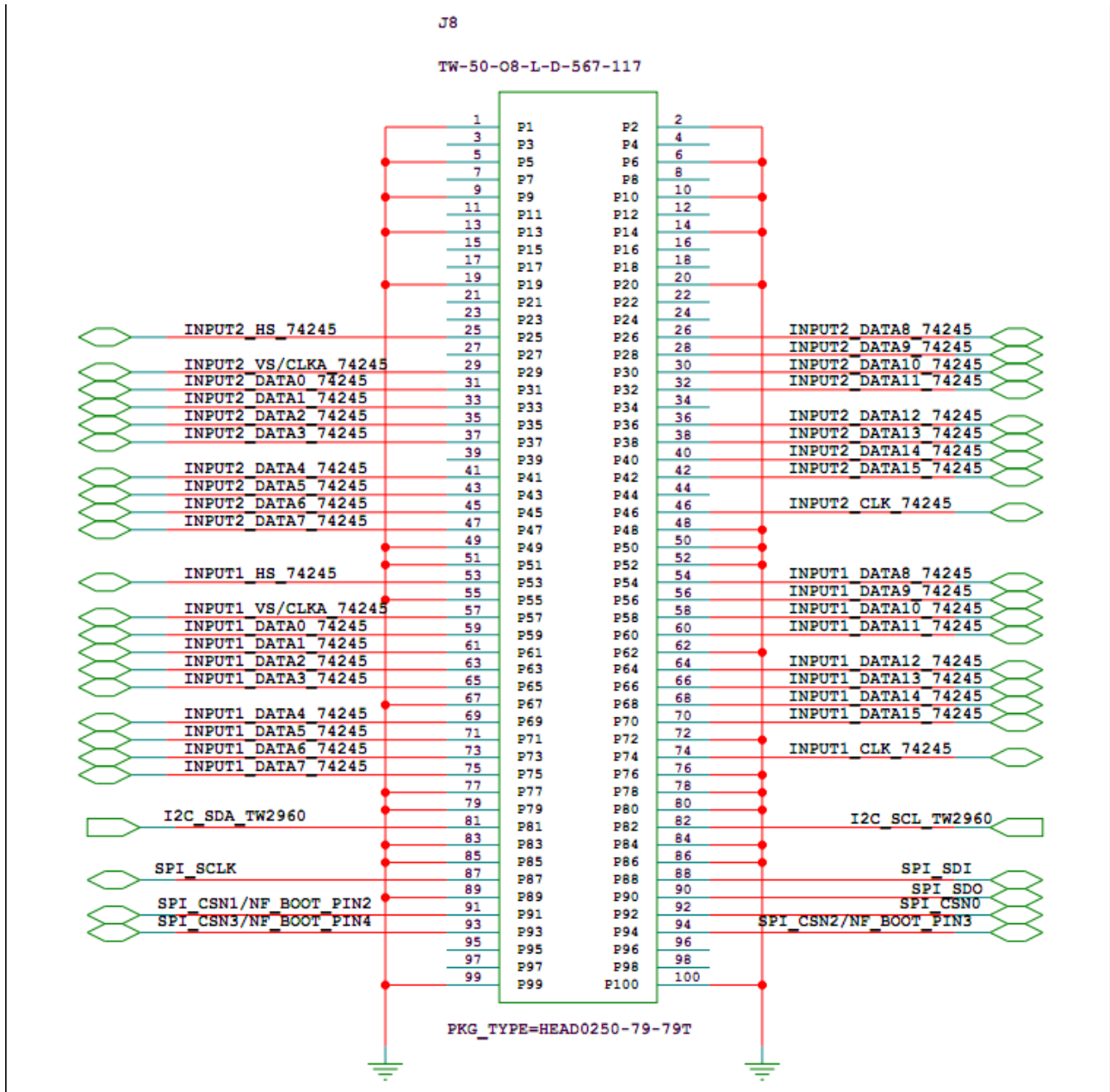
Figure 3-5 shows the daughter board socket pin J7, and Figure 3-6 shows the daughter board socket pin J8.



Figure 3-5 Daughter board socket pin J7



Figure 3-6 Daughter board socket pin J8



Daughter board interfaces can connect to the Hi3521 high-definition (HD) serial digital interface (SDI) daughter board or Hi3521 960H daughter board. This implements HD and 960H inputs. The following circuits are included:

- 2-channel BT.1120 inputs
- 1-channel I²C output
- 1-channel SPI output (four CSs)
- 4-channel SIOs
- Reset output



3.2.5 Switching the Application Scenario

Table 3-4 describes the mapping between application scenarios and DIP switch configurations.

Table 3-4 Mapping between application scenarios and DIP switch configurations

Board Version	Application Scenario	DIP Switch Configuration
Hi3521 DMEB	16-channel CIF	SW6: 0000 SW5: 1100
	8-channel D1	SW6: 0001 SW5: 1100
	8-channel 960H	SW6: 1100 SW5: 0011
	4-channel 720p	SW6: 1000
	2-channel 1080p	SW6: 1000
	1-channel 720p and 7-channel D1	SW6: 1001