Hi3516A/Hi3516D Demo Board

User Guide

Issue **01**

Date **2014-12-20**

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About This Document

Purpose

This document describes the functional features, hardware features, and hardware configurations of the Hi3516A/Hi3516D demo board. It also describes how to debug the Hi3516A/Hi3516D demo board by using software.

Related Version

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

Product Name	Version
Hi3516A	V100
Hi3516D	V100

Intended Audience

This document is intended for:

- Technical support engineers
- 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 (2014-12-20)

This issue is the first official release, which incorporates the following changes:

The contents related to the Hi3516D are added.

Issue 00B02 (2014-11-09)

This issue is the second draft release, which incorporates the following changes:

Chapter 2 Hardware

In section 2.1, Figure 2-1, Figure 2-2, and Table 2-1 are updated.

Issue 00B01 (2014-09-18)

This issue is first draft release.

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1 Overview

1.1 Introduction to the Hi3516A Demo Board

NOTE

This document uses the Hi3516A as an example. Unless otherwise stated, Hi3516D and Hi3516A contents are consistent. Their differences are separately described.

The Hi3516A demo board is a function demonstration board that is developed based on the HiSilicon media processor Hi3516A. The demo board provides superior multimedia processing functions, various peripheral interfaces, and hardware reference designs based on the Hi3516A. You can complete hardware development by modifying only module circuits on the demo board.

1.2 Deliverables

The Hi3516A demo board package provides the following items:

- One Hi3516A core board Hi3516ADMEB
- One Hi3516A peripheral board Hi3516APERB
- One power adapter with the specifications of 100–240 V AC input, 50 Hz and 12 V DC output, 2 A
- One IMX178 sensor board for the Hi3516A

The Hi3516D demo board package provides the following items:

- One Hi3516D core board Hi3516ADMEB
- One Hi3516D peripheral board Hi3516APERB
- One power adapter with the specifications of 100–240 V AC input, 50 Hz and 12 V DC output, 2 A
- One AR0330 sensor board for the Hi3516D

The Hi3516A demo board consists of the Hi3516A core board and peripheral board. They are connected by using a connector.

1.3 Related Components

The following components are not included in the Hi3516A demo board package; however, they are required for program debugging. Therefore, you must prepare them.

- Network cables
- Audio/Video receiving devices such as the TV set, stereo equipment, and camera
- Serial cables

2 Hardware

2.1 Differences Between the Hi3516A Demo Board and the Hi3516D Demo Board

The peripheral boards of the Hi3516A and Hi3516D are the same. The Hi3516A demo board has two 16-bit DDRs, whereas the Hi3516D demo board has only one 16-bit DDR.

2.2 Architecture and Interfaces

Figure 2-1 shows the interfaces on the Hi3516A core board. The connector in the yellow ellipse is used to connect the Hi3516A core board to the peripheral board.

Figure 2-1 Interfaces on the Hi3516A core board

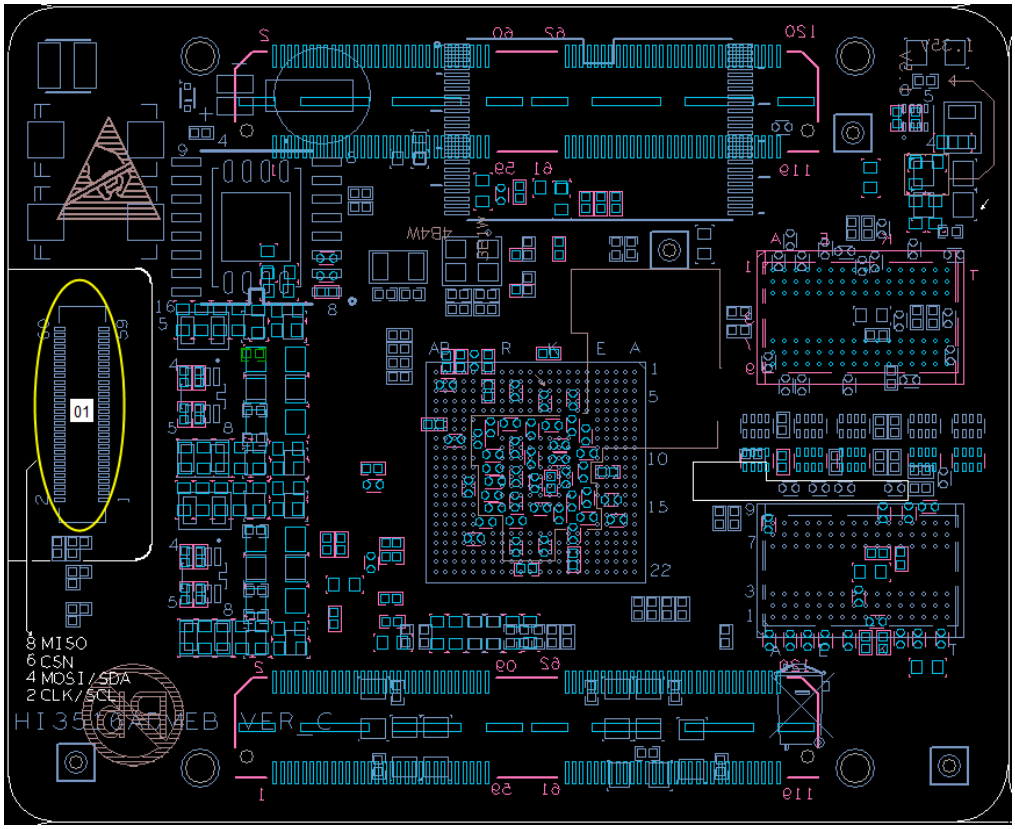


Figure 2-2 shows the peripheral interfaces on the Hi3516A peripheral board.

Figure 2-2 Peripheral interfaces on the Hi3516A peripheral board

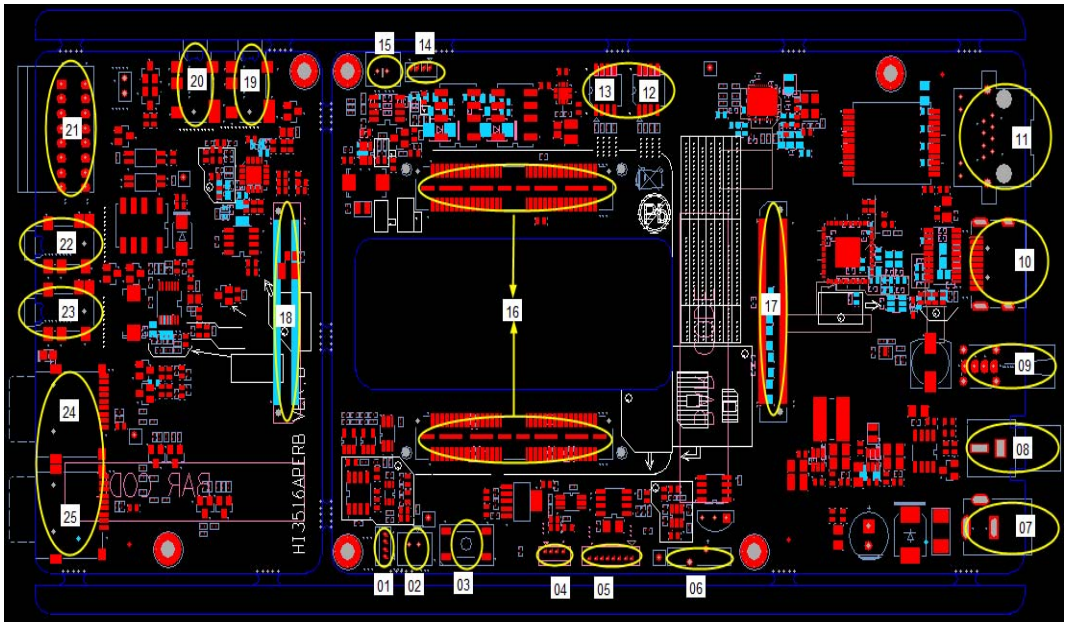


Table 2-1 describes the peripheral interfaces, buttons, and switches in Figure 2-2.

Table 2-1 Peripheral interfaces, buttons, and switches on the Hi3516A peripheral board

No.	Description
1	Connector for connecting the infrared light luminance control and ambient luminance detection signals on the infrared light board to those on the demo board
2	12 V power connector, for supplying 12 V power to the infrared light board
3	Reset button
4	UART0 connector, for connecting to a board with the UART0 RS232 debugging port
5	Joint Test Action Group (JTAG) connector, for connecting to a board with the JTAG interface
6	3 V battery
7	12 V power connector
8	Composite video broadcast signal (CVBS) interface
9	USB port
10	High-definition multimedia interface (HDMI)
11	Network port
12	Dual in-line package (DIP) SW2
13	DIP SW1
14	Lens connector, for connecting to the DC_IRIS and P_IRIS signals
15	5 V power connector
16	Core board connector
17	Small daughter board connector, for connecting the PERB mother board to the PERB small daughter board
18	Mother board connector, for connecting the PERB small daughter board to the PERB mother board
19	Inter-IC sound (I^2S) interface, for connecting to the audio output of the AK7756
20	I^2S interface, for connecting to the audio MIC input of the AK7756
21	Peripheral connector, for connecting to the alarm, RS485, or FLASH_TRIG signal lines
22	Analog audio output interface of the Hi3516A
23	Analog audio MIC input interface of the Hi3516A
24	Micro SD card (SD0) connector

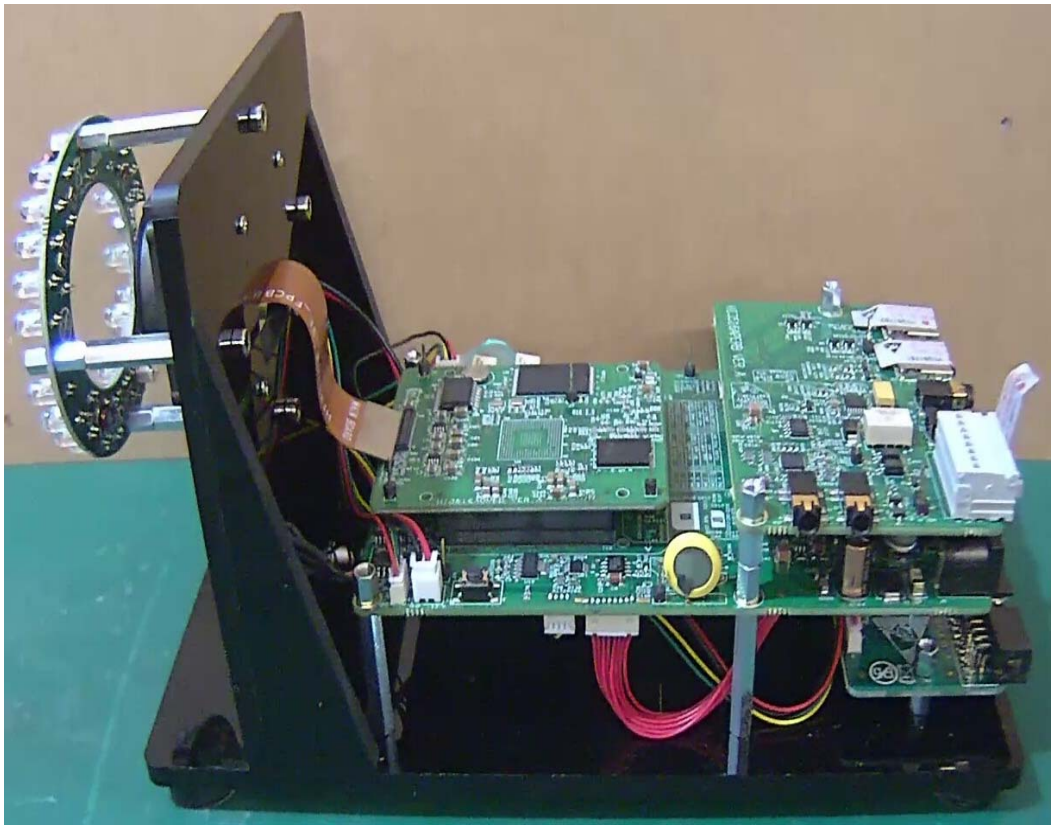
No.	Description
25	Micro SD card (SD1) connector

Note: Configure the DIP switches by following Table 3-1.

CAUTION

Connect the Hi3516A core board to the peripheral board according to Figure 2-3. Pay attention to the position of the sensor connector.

Figure 2-3 Connecting the Hi3516A core board to the peripheral board



2.3 GPIO Distribution

Table 2-2 describes the GPIO distribution of the Hi3516A demo board.

Table 2-2 GPIO distribution of the Hi3516A demo board

GPIO	Description	Board Processing Mode
GPIO0_1/TEMPER_DQ	ETH PHY reset signal 0: reset 1: normal working	-
GPIO14_4/EPHY_CLK	25 MHz ETH PHY working clock	-
SENSOR_RSTN/GPIO0_0/ TEMPER_DQ	Sensor reset signal 0: reset 1: normal working	-
SENSOR_CLK/GPIO0_5	Sensor working clock	-
SPI0_SCLK/GPIO8_0/I2C0 _SCL	Sensor configuration pins	A 1 kΩ pull-up resistor is connected.
SPI0_SDO/GPIO8_1/I2C0_ SDA		A 1 kΩ pull-up resistor is connected.
SPI0_SDI/GPIO8_2		-
SPI0_CSN/GPIO8_3		A 4.7 kΩ pull-up resistor is connected.
I2C2_SCL/GPIO9_1	Peripheral configuration pins, for connecting to the Sil9022, real-time clock (RTC) chip DS3231, I^2S audio chip AK7756EN, and digital-to-analog converter (DAC) chip MCP4725	A 1 kΩ pull-up resistor is connected.
I2C2_SDA/GPIO9_0		A 1 kΩ pull-up resistor is connected.
GPIO10_4/JTAG_TDI/I2S_ SD_TX	JTAG interface on the simulator	A 4.7 kΩ pull-up resistor is connected.
GPIO10_3/JTAG_TDO/I2S _SD_RX		A 4.7 kΩ pull-up resistor is connected.
GPIO10_2/JTAG_TMS/I2S _WS_TX		A 4.7 kΩ pull-up resistor is connected.
GPIO10_1/JTAG_TCK/I2S_ BCLK_TX		A 1 kΩ pull-down resistor is connected.
GPIO10_0/JTAG_TRSTN/I 2S_MCLK		A 10 kΩ pull-down resistor is connected.
GPIO14_0/PWM0/PMC_I2 C_SCL	Pulse width modulation (PWM) signal for scaling the voltage of the VDD core power	-
GPIO14_1/PWM1/PMC_I2 C_SDA	PWM signal for scaling the voltage of the DDR core power	-

GPIO	Description	Board Processing Mode
GPIO14_2/PWM2	PWM signal for scaling the voltage of the MEDIA core power	-
GPIO14_3/PWM3	PWM signal for scaling the voltage of the CPU core power	-
USB_OVRCUR/GPIO10_6	USB over-current detection, active low	A 10 kΩ pull-up resistor is connected.
USB_PWREN/GPIO10_7	USB power-on enable 0: power off 1: power on	A 4.7 kΩ pull-down resistor is connected.
UART0_RXD	System debugging serial port	-
UART0_TXD		-
UART1_TXD/GPIO9_5	RS485 transmit (TX) data	-
UART1_RXD/GPIO9_3	RS485 receive (RX) data	-
UART1_RTSN/GPIO9_2/UART3_RXD	RS485 direction control	-
SDIO0_CARD_DETECT/GPIO2_2/I2S_WS_TX	SD card 0 detection. 0: detected 1: default	A 4.7 kΩ pull-up resistor is connected.
SDIO0_CWPR/GPIO2_3/I2S_SD_TX	SD card 0 write protection 0: not protected 1: protected	A 4.7 kΩ pull-down resistor is connected.
SDIO0_CARD_POWER_EN/GPIO2_1/I2S_BCLK_TX	SD card 0 power-on 0: power off 1: power on	A 1 kΩ pull-down resistor is connected.
SDIO1_CARD_DETECT/GPIO11_2	SD card 1 detection. 0: detected 1: default	A 4.7 kΩ pull-up resistor is connected.
SDIO1_CWPR/GPIO11_3	SD card 1 write protection 0: not protected 1: protected	A 4.7 kΩ pull-down resistor is connected.
SDIO1_CARD_POWER_EN/GPIO11_1	SD card 1 power-on 0: power off 1: power on	A 1 kΩ pull-down resistor is connected.
GPIO0_4/PWM7/TEMPER_DQ	Pin connected to the DS18S20	-

GPIO	Description	Board Processing Mode
UART2_TXD/GPIO9_7/I2S_WS_RX	Analog audio output mute 0: mute 1: normal working (default)	Not connected (NC). The pin is pulled up on the output end.
VI_DAT0/GPIO13_7/PWM4	Reserved pin for controlling the AK7756 reset 0: reset (effective only after NC resistors are connected) 1: normal working	NC. The pin is pulled up on the AK7756 end.
SPI1_SCLK/GPIO8_4/I2C1_SCL	Serial peripheral interface 1 (SPI1) clock	A 1 kΩ pull-up resistor is connected.
SPI1_SDO/GPIO8_5/I2C1_SDA	SPI1 output data	A 1 kΩ pull-up resistor is connected.
SPI1_SDI/GPIO8_6	SPI1 input data	-
SPI1_CSN0/GPIO8_7	SPI1 chip select (CS)	A 4.7 kΩ pull-up resistor is connected.
VI_VS/GPIO15_2	Automatic focus (AF) signal	-
VI_DAT1/GPIO13_6	AF signal	-
VI_DAT3/GPIO13_4	DC_IRIS/P_IRIS switching control circuit 0: DC_IRIS 1: P_IRIS	A 1 kΩ pull-down resistor is connected.
VI_DAT7/GPIO13_0	P_IRIS drive signal	-
VI_DAT4/GPIO13_3		-
VI_DAT5/GPIO13_2		-
VI_DAT6/GPIO13_1		-
IR_IN/GPIO10_5/PWM4	PWM signal for adjusting the DC_IRIS	-
VI_HS/GPIO15_1	IR_CUT switching control signal [VI_HS/GPIO15_1: VI_CLK/GPIO15_0]: 00: retained after switching 01: common mode 10: infrared mode	-
VI_CLK/GPIO15_0		-
GPIO0_3/PWM6/TEMPER_DQ	PWM signal for adjusting the luminance of the infrared light	-
SAR_ADC_CH0/GPIO1_6	Input signal of the ambient light sensor	-

GPIO	Description	Board Processing Mode
UART1_CTSN/GPIO9_4/UART3_TXD	Alarm input 0: alarm 1: no alarm	A 1 kΩ pull-up resistor is connected.
UART2_RXD/GPIO9_6/I2S_BCLK_RX	Alarm output 0: alarm output 1: no alarm output	-

2.4 I²C Addresses

The following are the inter-integrated circuit (I^2C) addresses configured for the peripherals of the Hi3516A demo board (the master chip uses I^2C2):

- SiI9022: 0x72
- MCP4725: 0xC6 (U28), 0xC4 (U27)
- DS3231MZ: 0xD0
- AK7756EN: 0x30

2.5 Multiple Functions of the Demo Board

The board uses the 3.3 V reduced gigabit media independent interface (RGMII) communication level. Table 2-3 describes the configuration for switching between the 3.3 V and 1.8 V RGMII communication levels.

Table 2-3 Configuration for switching between the 3.3 V and 1.8 V RGMII communication levels

Mode	PHY Clock Source	ETH PHY	Resistors to Be Connected	Resistors to Be Disconnected
3.3 V	Hi3516A	U3 is replaced with RTL8211E_VB.	R152, R202	R153, R201
3.3 V	25 MHz crystal	U3 is replaced with RTL8211E_VB.	R152, R201	R153, R202
1.8 V	Hi3516A	U3 is replaced with RTL8211E_VL.	R153, R202	R152, R201
1.8 V	25 MHz crystal	U3 is replaced with RTL8211E_VL.	R153, R201	R152, R202

3 Operation Guide

3.1 Precautions

The Hi3516A demo board applies to the laboratory or engineering development environment. Take the following precautions before performing operations:

CAUTION

Never 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 board components may be damaged by the ESD.
- Place the Hi3516A demo board on a dry workstation and keep it 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 Hi3516A demo board. See Figure 2-1 and Figure 2-2. Ensure that you can identify the components such as the switches, connectors, and indicators and know their positions.

3.2 Configuring the Board

The operating mode of the Hi3516A is selected by configuring the DIP switches on the Hi3516A demo board. See Table 3-1 and Table 3-2.

NOTE

SW1 is set to **0010** and SW2 is set to **0100** by default. Check the settings of these DIP switches before operations.

Table 3-1 Settings of the DIP switches on the demo board

DIP Switch	Pin	Description
SW1	Pin 1	Power-on reset (POR) enable 0: enabled 1: disabled (default)
	Pin 2	Boot mode select 0: enable BOOTFLASH 1: enable BOOTROM (default)
	Pin 3	BOOT_SE 0: SPI flash (default) 1: NAND flash
	Pin 4	SFC_DEVICE_MODE 0: SPI NOR flash (default) 1: SPI NAND flash
SW2	Pin 1	SFC_NAND_BOOT_PIN2 0: 2 KB page size (default) 1: 4 KB page size
	Pin [2:3]	SFC_NAND_BOOT_PIN[1:0] 00: reserved 01: 8-bit ECC (default) 10: reserved 11: 24-bit ECC
	Pin 4	FLASH_TRIG_VALID 0: valid (default) 1: invalid

Table 3-2 Board settings in various boot modes

Boot Mode	Value	Resistor Connection	Remarks
SFC_ADDR_MODE	1	R58 is connected, and R57 is removed.	When SFC_DEVICE_MODE is 0, the default addressing mode of the SPI NOR flash is 4-byte mode. When SFC_DEVICE_MODE is 1, the default addressing mode of the SPI NAND flash is 4-wire boot mode

Boot Mode	Value	Resistor Connection	Remarks
	0	R58 is removed.	When SFC_DEVICE_MODE is 0, the default addressing mode of the SPI NOR flash is 3-byte mode. When SFC_DEVICE_MODE is 1, the default addressing mode of the SPI NAND flash is 1-wire boot mode

The NAND flash does not need to be configured, because the controller automatically adapts to it.

Table 3-3 Supported specifications of the NAND flash from which the Hi3516A boots

Page Size	ECC
2 KB	8 bits/1024 bytes
2 KB	24 bits/1024 bytes
4 KB	8 bits/1024 bytes
4 KB	24 bits/1024 bytes
8 KB	24 bits/1024 bytes
8 KB	40 bits/1024 bytes
8 KB	64 bits/1024 bytes
16 KB	40 bits/1024 bytes
16 KB	64 bits/1024 bytes

NOTE

The 8-bit/1024-byte ECC mode is selected for the 2-bit/1024-byte ECC component.

3.3 Connecting the Sensor Board to the Demo Board

The Hi3516A supports various sensors. The I/O power of the sensors is 1.8 V or 2.8 V.

The sensor connector on the Hi3516A demo board supports both 1.8 V and 2.8 V levels. The board automatically switches the level based on the VI_POWER signal of the connected sensor board.

Note that the sensor connector is J1 (60-pin FPC connector).