Semiconductors

UM10016_3

ISP1581 Hi-Speed USB MPEG2 Encoder Reference Kit

Rev. 03.00 — 12 April 2004 User manual

Document information

Info	Content
Keywords	ISP1581, USB, universal serial bus, MPEG, peripheral controller
Abstract	This document explains the use of the Philips ISP1581 Hi-Speed Universal Serial Bus (USB) MPEG2 Encoder Reference demo board in terms of jumper settings and connector pin assignments. A basic board testing procedure is also provided.

PHILIPS

Revision history

Rev	Date	Description
3.0	April 2004	- Updated Section 2. - Changed terminology from “interface device” to “peripheral controller”.
2.0	December 2003	Changed the power supply input voltage from 5 V to 12 V: • Table 8-2 • Section 7.6 • Section 12.
1.0	January 2003	USB MPEG2 Encoder Reference Kit first release

Contact information

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For sales office addresses, please send an email to: ***sales.addresses@www.semiconductors.philips.com***

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1. Introduction

The Philips ISP1581 Hi-Speed Universal Serial Bus (USB) MPEG2 Encoder Reference Kit is a development tool that consists of an MPEG2 encoder demo board, firmware source code for the onboard microcontroller, and a complete set of documents. This kit guides you in how analog video signals from various sources (S-Video or composite signal) are converted to digital video signals, which are then compressed to an MPEG2 bitstream by the onboard MPEG2 encoder chip. The bitstream is transferred to the PC through a high-speed USB pipe. This kit is very suitable for video capture card applications and digital video (DV) applications.

This document explains the use of the demo board in terms of jumper settings and connector pin assignments. A basic board testing procedure is also provided.

2. System Requirements

- Requires a PC with the following configurations:
  - An 800 MHz Pentium III (or equivalent) CPU or faster
  - A Video Graphics Adaptor (VGA) card with video resolution of 800 x 600 or greater
  - A sound card
  - A hard disk with 300 Mbytes or greater free space
  - System memory size of 128 Mbytes or greater
  - A Hi-Speed USB Host Controller
  - Microsoft Visual C++.
- Operating system supported: Microsoft® Windows® 2000 and Microsoft Windows XP.

3. Connection Diagram

To perform a functionality test, an Audio/Video (AV) source device is required. Its audio and video output signals should be connected to the audio and video input jacks of the demo board, respectively. See Figure 3-1.

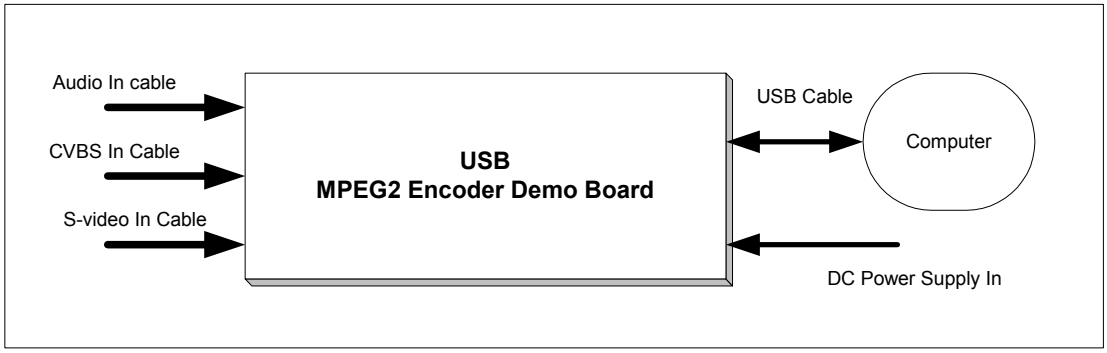


Figure 3-1: Connection Block Diagram

4. PCBA View

Figure 4-1 shows the printed circuit board (PCB) assembly of a USB MPEG2 Encoder reference kit designed using the Philips ISP1581.

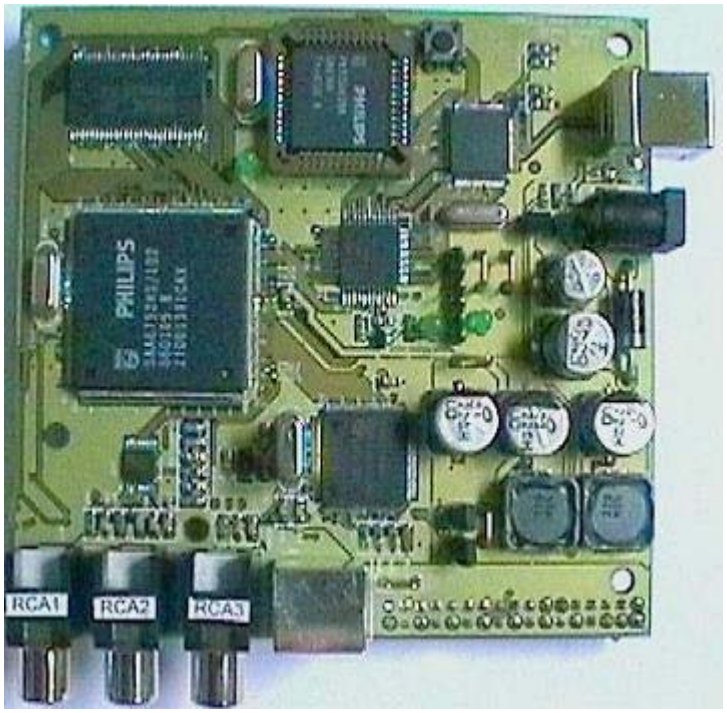


Figure 4-1: PCB Assembly

5. Device Driver and Application Software

5.1. Introduction

The device driver and the application software are stored on a source diskette in mpegtestsuite.zip. The source diskette contains the following files:

- mpegtestsuite.zip
- readme.txt

Unzip mpegtestsuite.zip, you will obtain the following directory structure:

- `<drive>`:\Application\
- `<drive>`:\Driver\
- `<drive>`:\InitFiles\
- `<drive>`:\Decoder\

5.2. Preparing for Software Installation

Create a directory called "C:\philipsMpeg\"[1], and move the following three unzipped directories to this directory.

- <drive>:\Application\
- <drive>:\Driver\
- <drive>:\Decoder\

Copy files in directory "<drive>:\InitFiles*.*" to directory "C:\philipsMpeg". By default, the application software searches initial files under directory C:\philipsMpeg and, therefore, whenever the device is initialized, the application prompts for the current path of the file.

Note: Copy file MSVCRTD.DLL from the Application directory to the WINNT\System32\ directory, if the file is not present on your PC.

5.2.1. Installing the Device Driver

Connect the device to the system. When the system prompts for the INF file, redirect the system to the C:\philipsMpeg\Driver directory and load the driver by using the INF file.

5.2.2. Installing the Decoder

To install the supplied decoder, run the "register.bat" DOS batch file. This file can be found in directory C:\philipsMpeg\Decoder. The decoder consists of eight software components.

The contents of the register.bat batch file are:

- regsvr32 pim2null.ax
- regsvr32 mpgdec.ax
- regsvr32 mpeg2dmx.ax
- regsvr32 pva_dmx.ax
- regsvr32 mlcom.ax
- regsvr32 windivx.ax
- regsvr32 ball.ax
- regsvr32 mpg2splt.ax.

[1] It is strictly recommended to name the directory as philipsMpeg and must be located under the C drive.

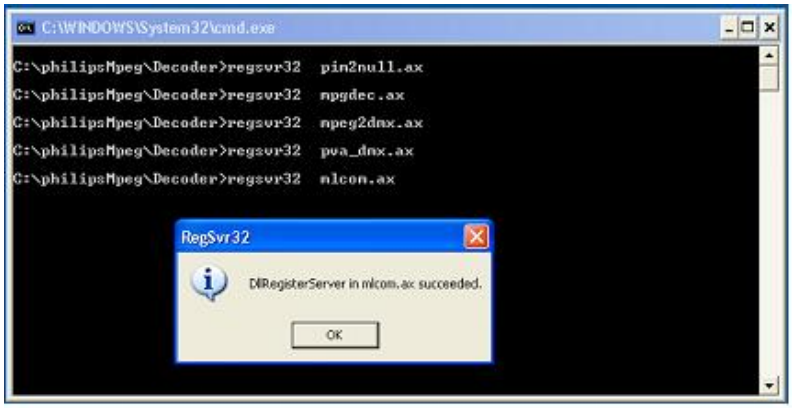


Figure 5-1: Contents of the register.bat Batch File

When running the DOS batch file, carefully check messages (see Figure 5-1) to ensure that all components are successfully loaded.

5.3. Using the Application Software

This application software handles board initialization and MPEG2 stream transfer. Before running this application, make sure that all the cables are connected and A/V sources are present. For details on connection, see Section 8.

The initialization process is explained in the following sections.

5.3.1. Board Initialization

You can start the application software either by double-clicking the ***MPEG.exe***[1] icon present in the C:\PhilipsMPEG directory, or by double-clicking the ***MPEG.exe*** icon on your desktop if you have already created a shortcut.

To initialize the board, select a proper TV standard under the *Capture* menu. For example: ***Initialize PAL*** (see Figure 5-2) or ***Initialize NTSC*** (see Figure 5-3). S-Video is a default video input source.

[1] In this document, items that you click or type are indicated in ***bold***.

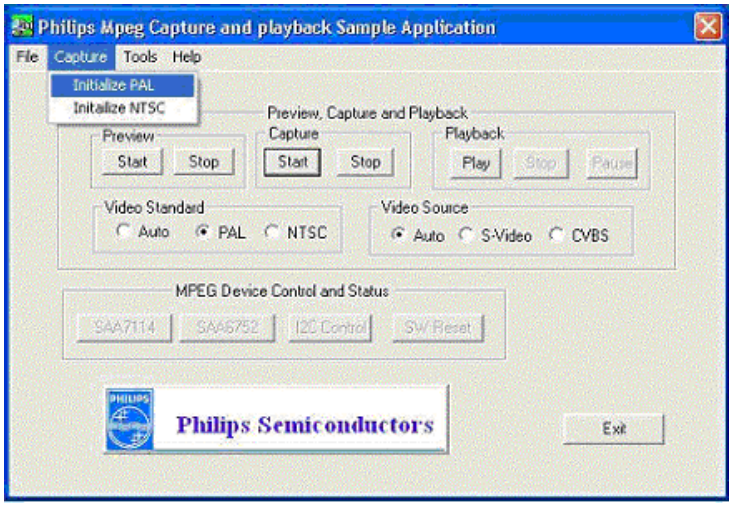


Figure 5-2: Selecting the Initialize PAL Command

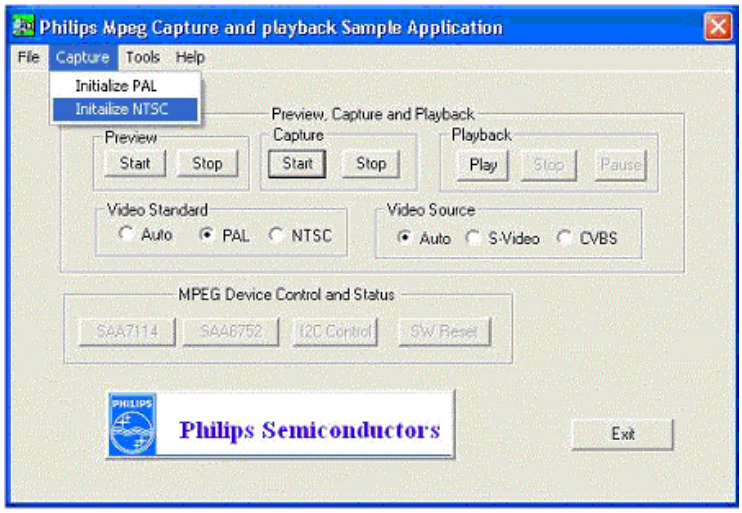


Figure 5-3: Selecting the Initialize NTSC Command

During initialization, the default initial script files will be sent to the board through the USB cable.

You can also select the TV standard (PAL or NTSC) and video input source (S-Video or CVBS) by clicking the appropriate option in the *Video Standard*[1] group and the *Video Source* group, respectively.

The application software can automatically detect the TV standard and video source, if the Auto option is enabled in the *Video Standard* group and *Video Source* group.

[1] In this document, names of windows, dialog boxes and groups are indicated in *italic*.

5.3.2. Running the Application

Using this application software, you can capture and preview the input A/V source. It also provides advanced hardware debugging functions.

Preview

If you want to preview the input A/V source before storing it to the hard disk, use the Preview function.

1. To launch the preview operation and activate an *ActiveMovie Window*, click the ***Start*** button in the *Preview* group.

2. To terminate the preview operation, click the ***Stop*** button.

Capture

The Capture function can be used to capture the input A/V source and store this video signal in MPEG2 format on the hard disk of your PC.

1. To start the capture operation, click the ***Start*** button in the *Capture* group.
2. The *Open* dialog box appears; see Figure 5-4. Enter a file name for the movie or select an existing file, if you want to overwrite an existing file.

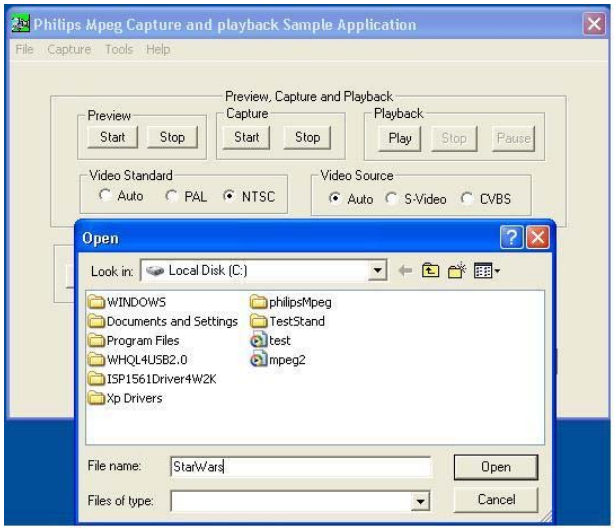


Figure 5-4: Open Dialog Box

3. Click ***Open***. This will launch the capture operation.
4. To terminate the capture operation, click ***Stop***.

Playback

Once an MPEG2 file is stored on the hard disk of your PC, you can use the functions under *Playback* to play the file.

6. Advanced Debugging Function

The application also provides a set of debugging functions for advanced user. It allows user using these functions to directly access the internal registers of SAA7114 and SAA6752.

6.1. Using Advanced Debugging Function

To enable the advanced debugging function, select ***Debugging*** from the *Tools* menu; see Figure 6-1. This activates the buttons under the *MPEG Device Control and Status* group.

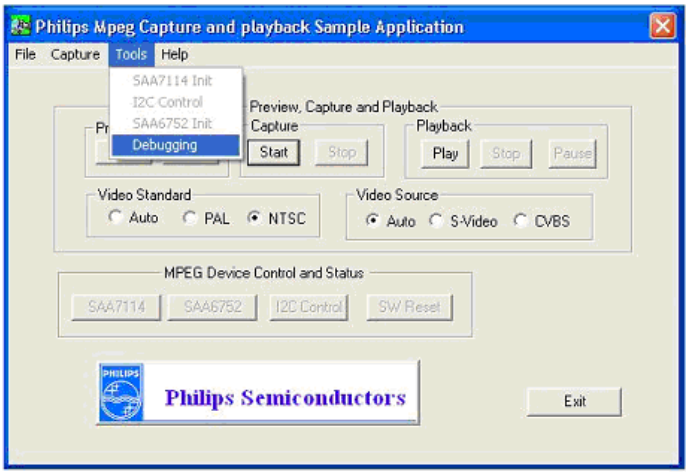


Figure 6-1: Selecting the Debugging Command

6.2. Using the SAA7114 Button

To directly access the internal registers of SAA7114, click ***SAA7114*** in the *MPEG Device Control and Status* group. This will open the *SAA7114 Initialization* dialog box for initializing SAA7114; see Figure 6-2.

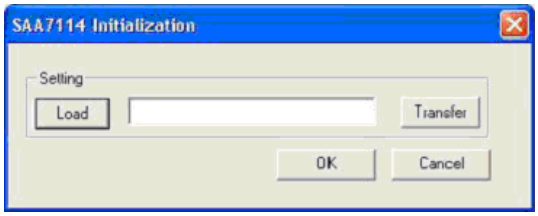


Figure 6-2: SAA7114 Initialization Dialog Box

In the *SAA7114 Initialization* dialog box, click the ***Load*** button and select file SAA7114PAL.URG (if you are using the PAL standard) or SAA7114NTSC_YC_020.URG (if you are using the NTSC standard), to initialize the SAA7114 chip. Then click the ***Transfer*** button to send the initial command to the chip. When the file transfer is complete, click ***OK***.

6.3. Using the SAA6752 Button

To directly access the internal registers of SAA6752, choose ***SAA6752*** in the *MPEG Device Control and Status* group. This will open the *SAA6752 Initialization* dialog box for initializing SAA6752. The procedure to initialize SAA6752 is similar to the SAA7114 initialization procedure given in Section 6.2.

6.4. Using the I²C Control Button

The I²C control allows you to read data from and write data to the internal registers of SAA7114 and SAA6752. This operation is solely for advanced users having strong hardware background who wish to perform low-level debugging of the hardware. For more details on the I²C control operation, refer to the SAA6752 and SAA7114 datasheets–"*SAA6752HS MPEG-2 video and MPEG-audio/AC-3 audio encoder with multiplexer*" and "*SAA7114H PAL/NTSC/SECAM video decoder with adaptive PAL/NTSC comb filter, VBI-data slicer and high performance scaler*." The general read and write operations are given in Figure 6-3 and Figure 6-4, respectively.

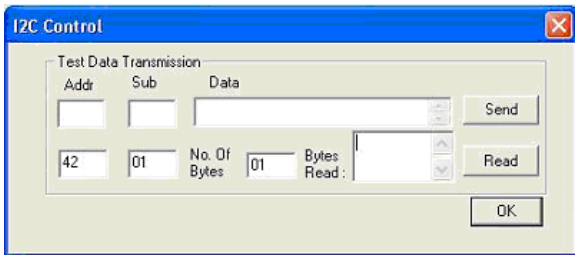


Figure 6-3: Read Operation

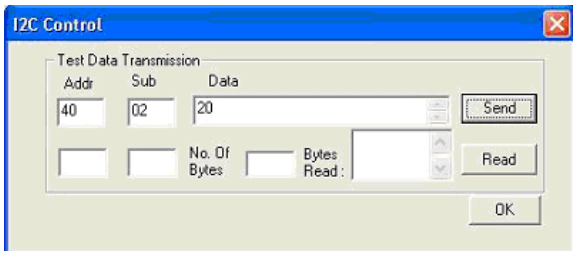


Figure 6-4:Write Operation

6.5. Using the SW Reset Button

Another advanced function is issuing a reset command through the USB cable to the SAA7114 and SAA6752 chips on the board by using the ***SW Reset*** button.

7. Hardware Description

This section briefly describes the hardware implementation of the MPEG2 encoder with Hi-Speed USB solution in terms of functions and connections between various interfaces. A functional block diagram of the reference design is given in Figure 7-1.

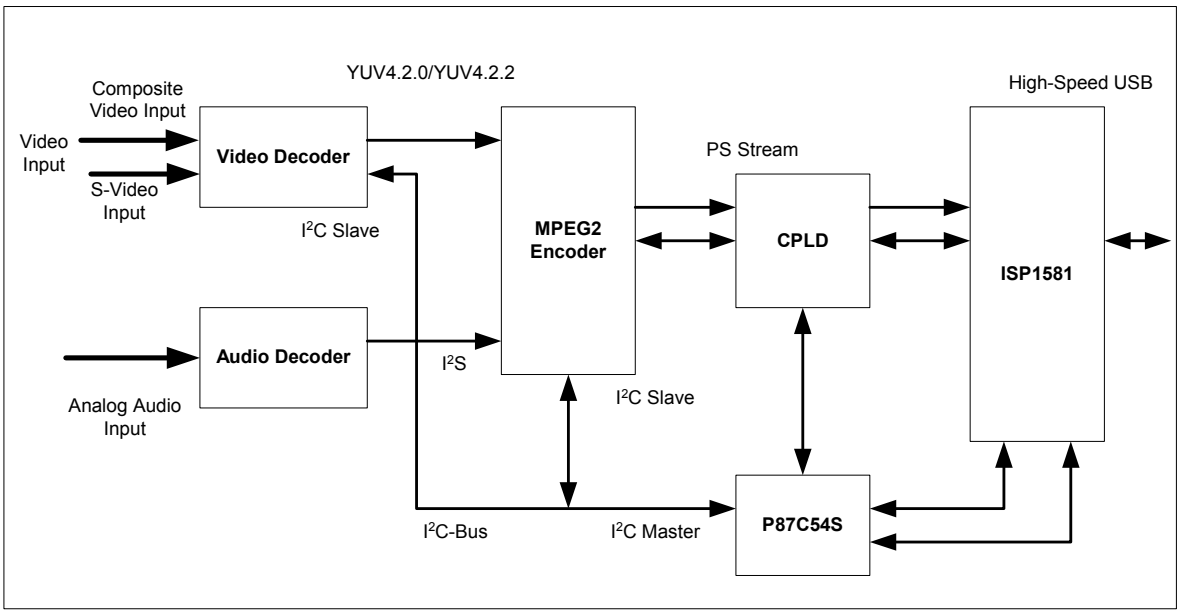


Figure 7-1: Functional Block Diagram of the USB MPEG2 Encoder Reference Kit

7.1. Video-Input Interface

The video-input interface consists of two analog inputs to connect Composite Video Bit Steam (CVBS) and Luminance Chrominance (YC) sources to the board. A video-input processor (VIP) SAA7114 is used on the board for video decoding and analog-to-digital conversion.

7.2. Analog Audio-Input Interface

The serial audio I^2S ports are implemented on the board. These port can be provided with an analog input source, using the audio bit-stream analog-to-digital converter DA1361TS for generating the I^2S signal.

7.3. MPEG Stream (PS Stream) Output Interface

The MPEG stream output port connects the SAA6752HS multiplexer to USB through a Complex Programmable Logic Device (CPLD). The MPEG stream is set to the Data Expansion Bus Interface (DEBI) slave mode. The output format is TTL. This interface also includes the data request signal as SAA6752HS input and the data validated signal as SAA6752HS output.

7.4. I^2C-Bus Interface

The P87C52X2 MCU is a bus master. It relays all I^2C-Bus commands from the host to different components on the board through the control pipe.

7.5. USB Device Endpoints

In the USB environment, pipes or endpoints are used for transferring data and commands. Each endpoint performs a task, such as, enumeration, configuration and vendor-specific device requests handling, and data streaming signaling the host. See Table 7-1 for endpoint types.

Table 7-1: Endpoint Types

Endpoint	Transfer Mode	Direction
0	Control	IN or OUT
1	Bulk	IN

7.6. Power Supply

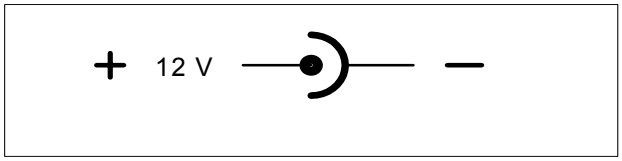


Figure 7-2: Polarity of the DC Power Supply Plug (Self-Powered Mode)

The demo board is designed to be self-powered. A DC power supply with 12 V, 1 amp is required.

8. Connector Pin information

Table 8-1: CON5 In-System Programming Port

Pin	Name	Description
1	3V3D	3.3 V DC power supply
2	TDO	Serial data output for all JTAG instructions and data registers
3	TCK	JTAG test clock
4	TMS	Mode input signal
5	TDI	Serial data Input for all JTAG instructions and data registers
6	DGND	Digital ground

Table 8-2: CON3 DC Power Supply Input Port (DC Jack)

Pin	Name	Description
1	12V VCC	12 V DC power supply input
2	DGND	Digital ground
3	DGND	Digital ground

Table 8-3: CON6 USB Port

Pin	Name	Description
1	VBUS	V_{BUS} is nominally +5 V at the source
2	USB D–	Negative differential signal of USB
3	USB D+	Positive differential signal of USB
4	DGND	Digital ground
5-6	SHIELD	Shield ground

Table 8-4: RCA1 USB Port

Pin	Name	Description
1	LEFT	Audio input (Left channel)
2	AGND	Analog ground

Table 8-5: RCA2 USB Port

Pin	Name	Description
1	RIGHT	Audio input (Right channel)
2	AGND	Analog ground

Table 8-6: RCA3 USB Port

Pin	Name	Description
1	CVBS	Composite video bit-stream input
2	AGND	Analog ground

Table 8-7: CON1 S-Video Port

Pin	Name	Description
1	GND	Analog ground
2	GND	Analog ground
3	C	Digital component video input (Chrominance)
4	Y	Digital component video input (Luminance)

Table 8-8: CON7

Pin	Name	Description
1-20	—	Reserved

Table 8-9: CON2

Pin	Name	Description
1-33	—	Reserved

9. Jumper and Test Points

Table 9-1: JP1

Pin	Name	Description
1	3V3D	3.3 V DC power supply
2	3V3D	3.3 V DC power supply

Table 9-2: JP2

Pin	Name	Description
1	DGND	Digital ground
3	DGND	Digital ground

Table 9-3: JP3

Pin	Name	Description
1	AGND	Analog ground
2	AGND	Analog ground

Table 9-4: JP4

Pin	Name	Description
1	V2V5	2.5 V DC power supply
3	V2V5	2.5 V DC power supply

Table 9-5: JP5

Pin	Name	Description
1	V5V	5 V DC power supply
3	V5V	5 V DC power supply

Table 9-6: Solder Pad Jumper

Name	Description
PD1 to PD12, PD29	No connection (reserved)
PD30 to PD35, PD134 to PD135	No connection (reserved)
PD51	DGND, shorted
PD52	AGND, shorted

10. LED Indicators

Table 10-1: LED Indicators

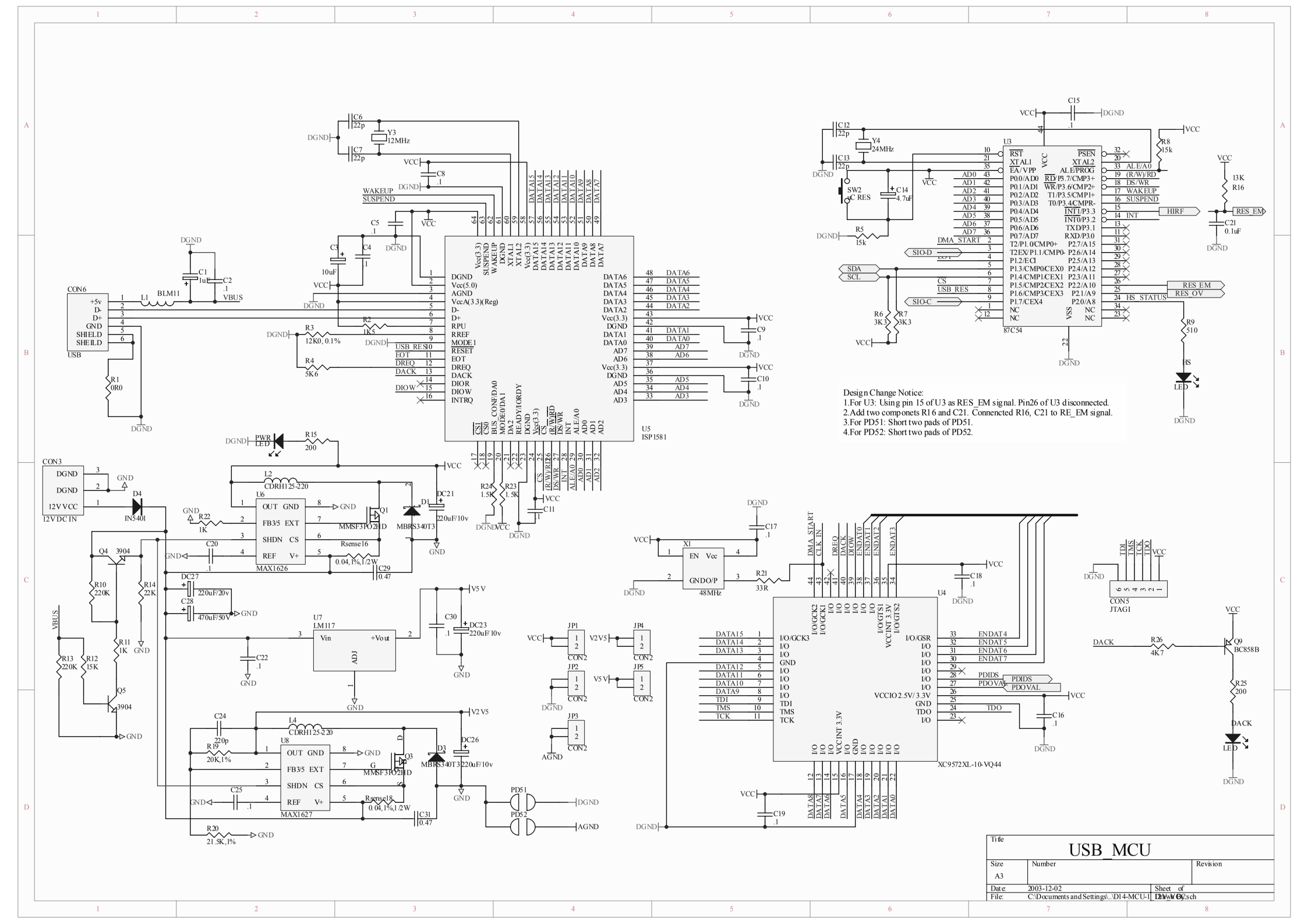
No	Name	Description
1	PWR	POWER ON indication
2	DACK	MPEG2 bit stream transferring indication
3	HS	USB Hi-Speed connection indication

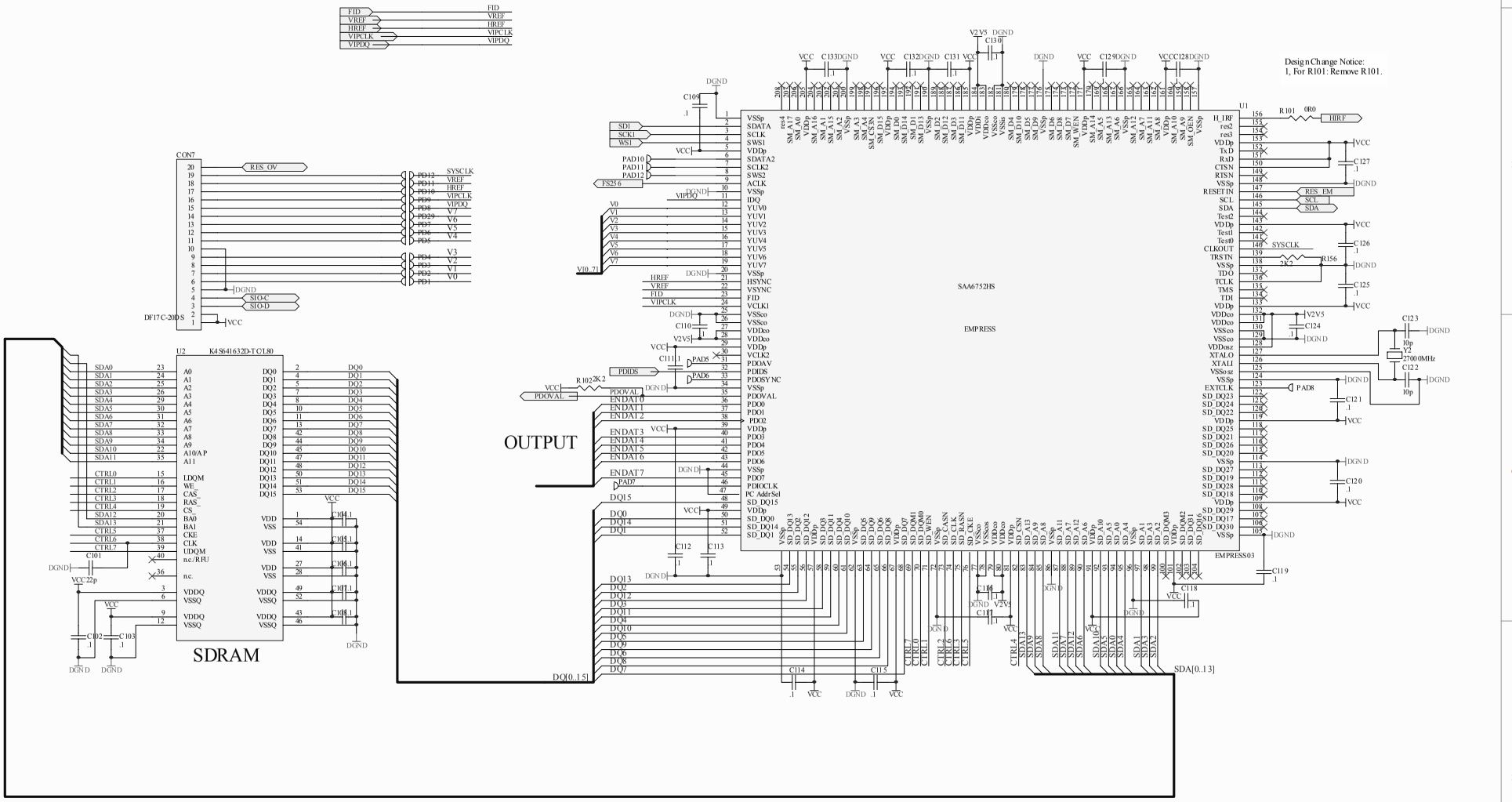
11. RESET Switches

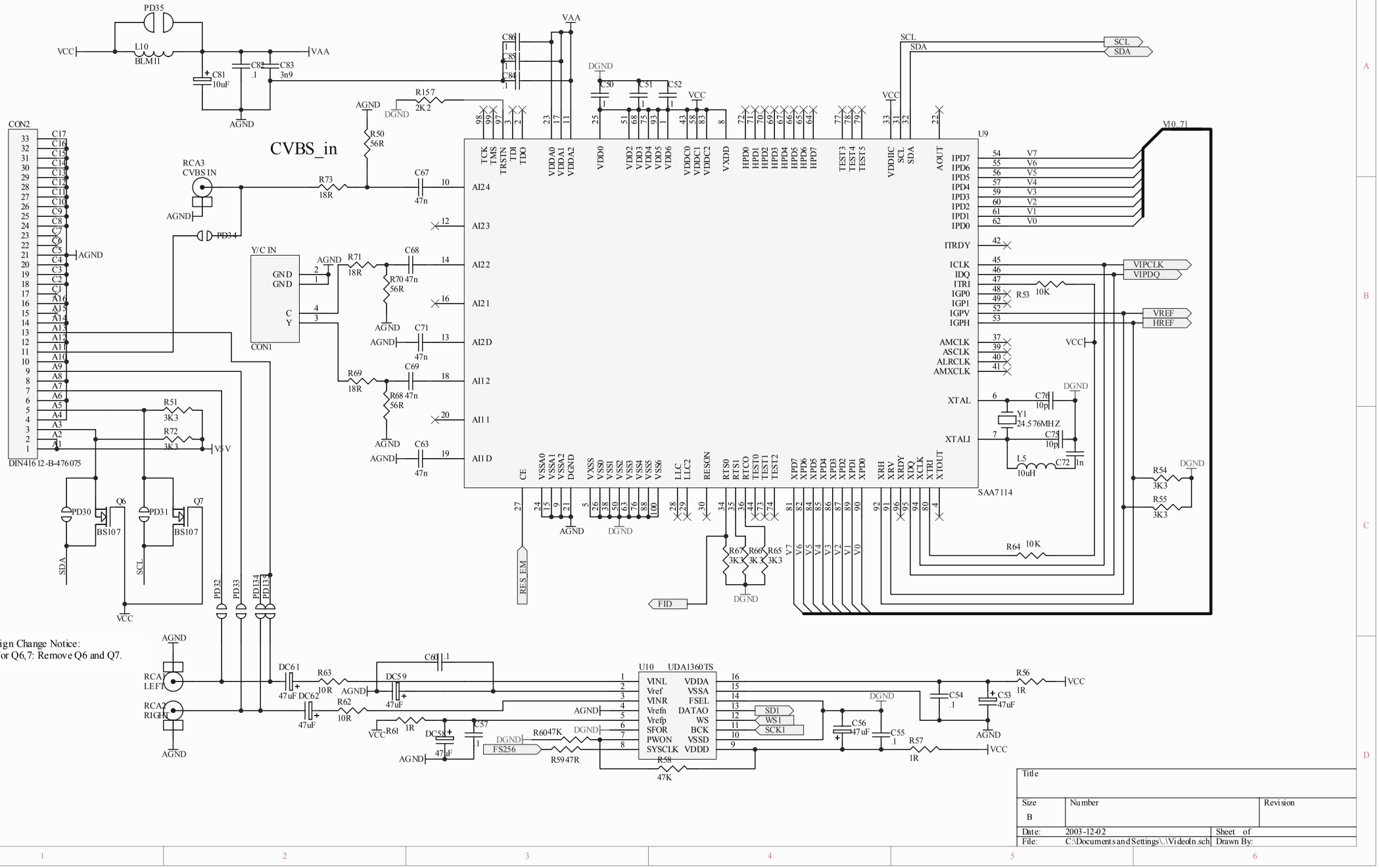
Table 11-1: RESET Switches

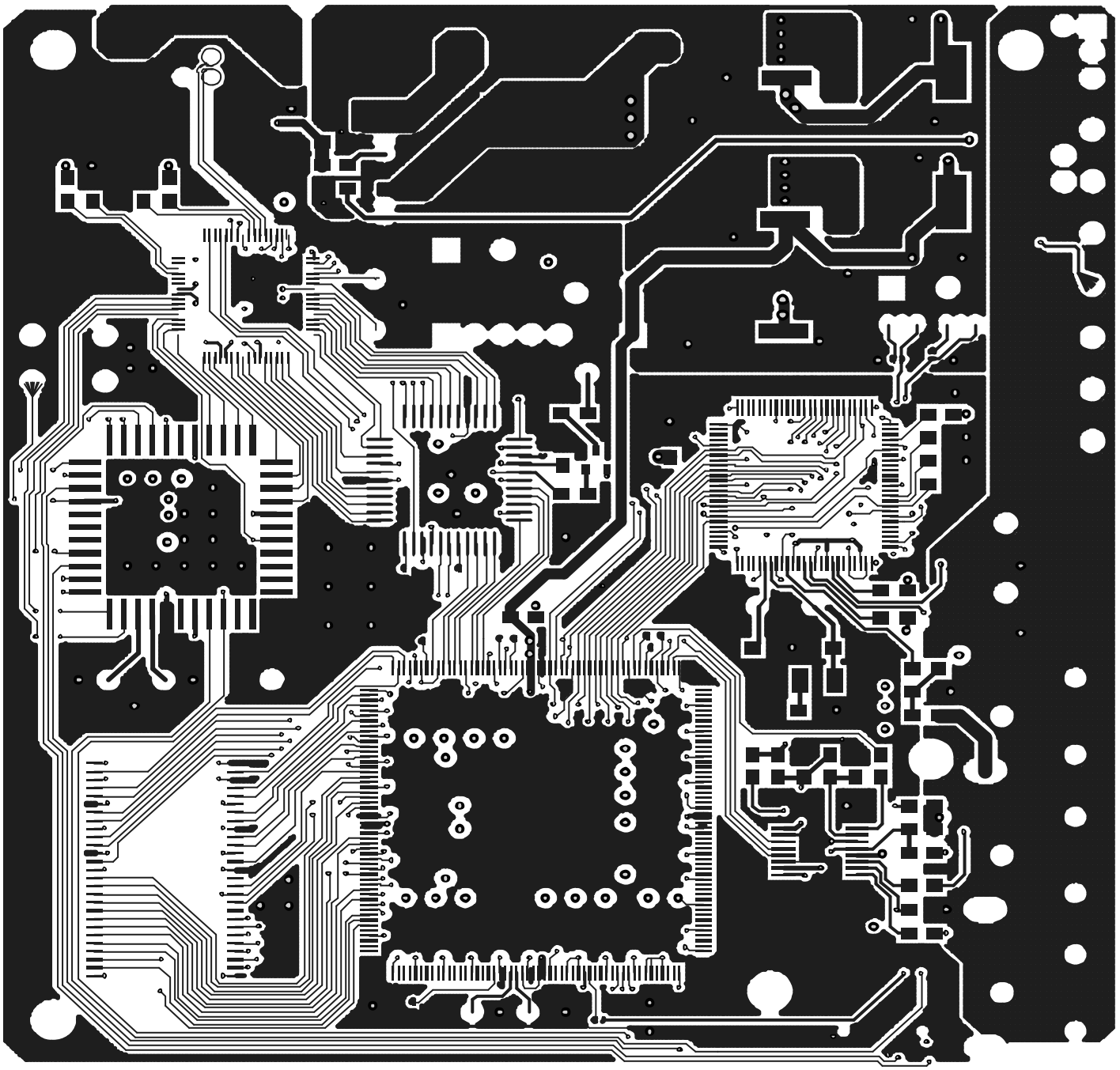
No	Name	Description
1	SW2	MCU reset

12. Schematics


USB_MCU
Design Change Notice:
1.For U3: Using pin 15 of U3 as RES_EM signal. Pin26 of U3 disconnected.
2.Add two componets R16 and C21. Connected R16, C21 to RE_EM signal.
3.For PD51: Short two pads of PD51.
4.For PD52: Short two pads of PD52.
ISP1581
87C54
XC9572XL-10-VQ44
MAX1626
MAX1627
LM117
MBRS340T3
MMSF3P02HD
USB
CON3
CON5
JTAG1
Size
A3
Number
Revision
Date: 2003-12-02
File: C:\Documents and Settings\...\D14-MCU-1.ddb
Drawn by:
Sheet of

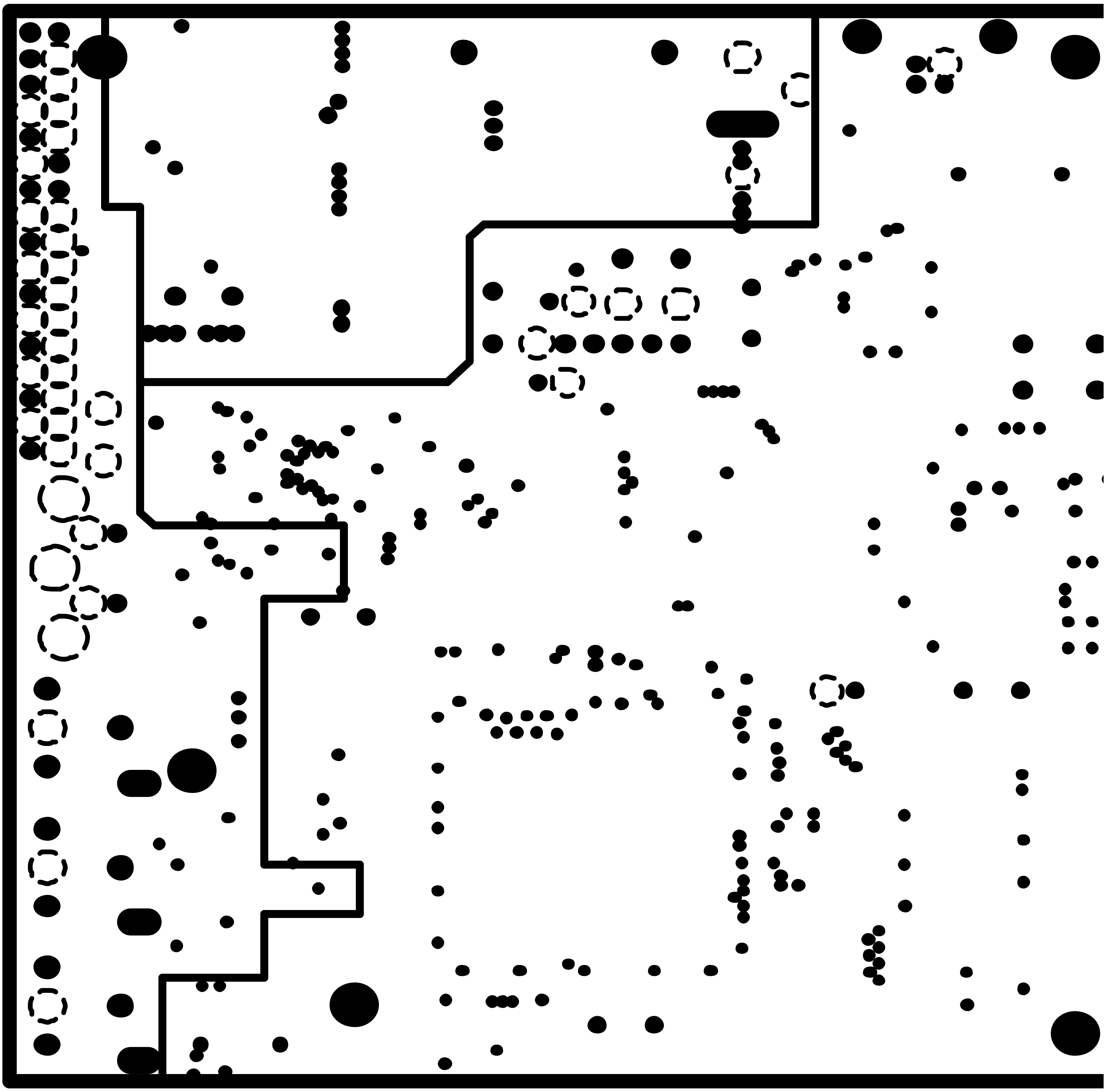

FID
VREF
HREF
VIPCLK
VIPDQ
CON7
DF17C-2000S
RES_OV
SYSCLK
VREF
HREF
VIPCLK
VIPDQ
V7
V6
V5
V4
V3
V2
V1
V0
DGND
STO-C
STO-D
VCC
U2
K4S641632D-TC/L80
SDRAM
SDA0
SDA1
SDA2
SDA3
SDA4
SDA5
SDA6
SDA7
SDA8
SDA9
SDA10
SDA11
CTRL0
CTRL1
CTRL2
CTRL3
CTRL4
SDA12
SDA13
CTRL5
CTRL6
CTRL7
LDQM
WE_
CAS_
RAS_
CS_
BA0
BA1
CKE
CLK
UDQM
n.c./RFU
n.c.
VDDQ
VSSQ
DQ0
DQ1
DQ2
DQ3
DQ4
DQ5
DQ6
DQ7
DQ8
DQ9
DQ10
DQ11
DQ12
DQ13
DQ14
DQ15
VDD
VSS
C101
22p
C102
C103
C104
C105
C106
C107
C108
OUTPUT
SAA6752HS
EMPRESS
EMPRESS03
U1
SD1
SCK1
WS1
PAD10
PAD11
PAD12
FS25.6
VIPDQ
V0
V1
V2
V3
V4
V5
V6
V7
VI0..7]
HREF
VREF
FID
VIPCLK
PDIDS
PAD5
PAD6
R102 2K2
PDOVAL
ENDAT0
ENDAT1
ENDAT2
ENDAT3
ENDAT4
ENDAT5
ENDAT6
ENDAT7
PAD7
DQ15
DQ0
DQ14
DQ1
DQ13
DQ2
DQ12
DQ3
DQ11
DQ4
DQ10
DQ5
DQ9
DQ6
DQ8
DQ7
DQ[0..15]
C110
C111
C112
C113
C114
C115
V2V5
DGND
VCC
C130
C133
C132
C131
C129
C128
Design Change Notice:
1, For R101: Remove R101.
R101 0R0
R156 2K2
RES_EM
SCL
SDA
SYSCLK
PAD8
C123
10p
Y2
27000MHz
C122
10p
C127
C126
C125
C124
C121
C120
C119
C118
H_IRF
res2
res3
VDDp
TxD
RxD
CTSN
RTSN
VSSp
RESETIN
SCL
SDA
Test2
VDDp
Test1
Test0
CLKOUT
TRSTN
VSSp
TDO
TCLK
TMS
TDI
VDDp
VDDco
VDDco
VSSco
VSSco
VDDosz
XTALO
XTALI
VSSosc
VSSp
EXTCLK
SD_DQ23
SD_DQ24
SD_DQ22
VDDp
SD_DQ25
SD_DQ21
SD_DQ26
SD_DQ20
VSSp
SD_DQ27
SD_DQ19
SD_DQ28
SD_DQ18
VDDp
SD_DQ29
SD_DQ17
SD_DQ30
VSSp
SDA[0..13]
Title
Size
C
Number
Revision
Date: 2003-12-02
Sheet of
File: C:\Documents and Settings\...\EMPRESS.SchDoc
Drawn By:


CVBS_in
U9
SAA7114
U10
UDA1360TS
CON2
DIN41612-B-476075
CON1
RCA3
CVBS IN
Y/C IN
RCA1
LEFT
RCA2
RIGHT
Q6
Q7
BS107
PD30
PD31
PD32
PD33
PD34
PD35
PD134
PD133
L10
BLM11
VCC
VAA
AGND
DGND
SDA
SCL
VSV
FID
RES_EM
VIPCLK
VIPDQ
VREF
HREF
Y1
24.576MHZ
SD1
WS1
SCK1
FS256
Design Change Notice:
1, For Q6,7: Remove Q6 and Q7.
Title
Size
B
Number
Revision
Date: 2003-12-02
Sheet of
File: C:\Documents and Settings\..\VideoIn.sch
Drawn By:

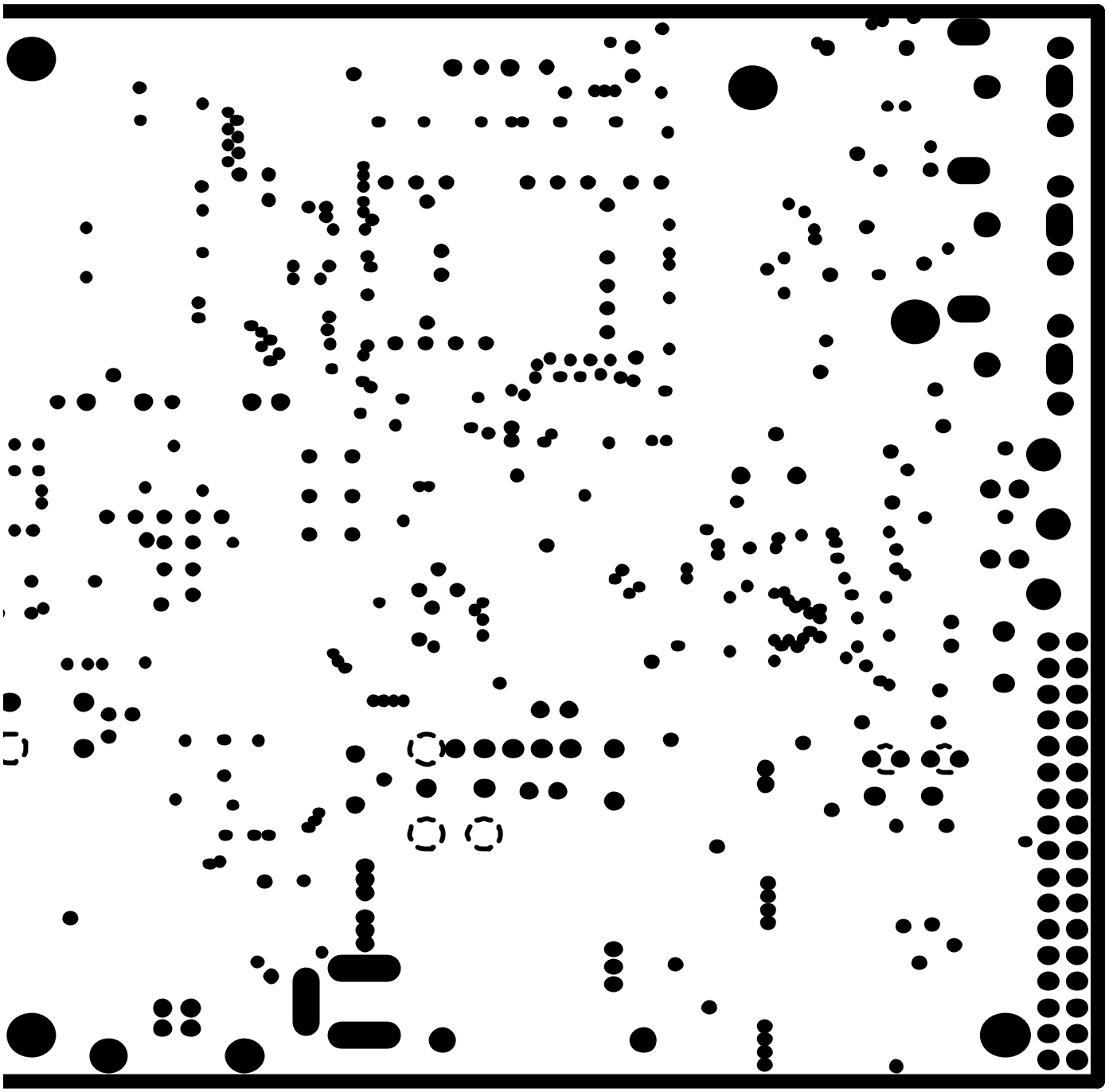


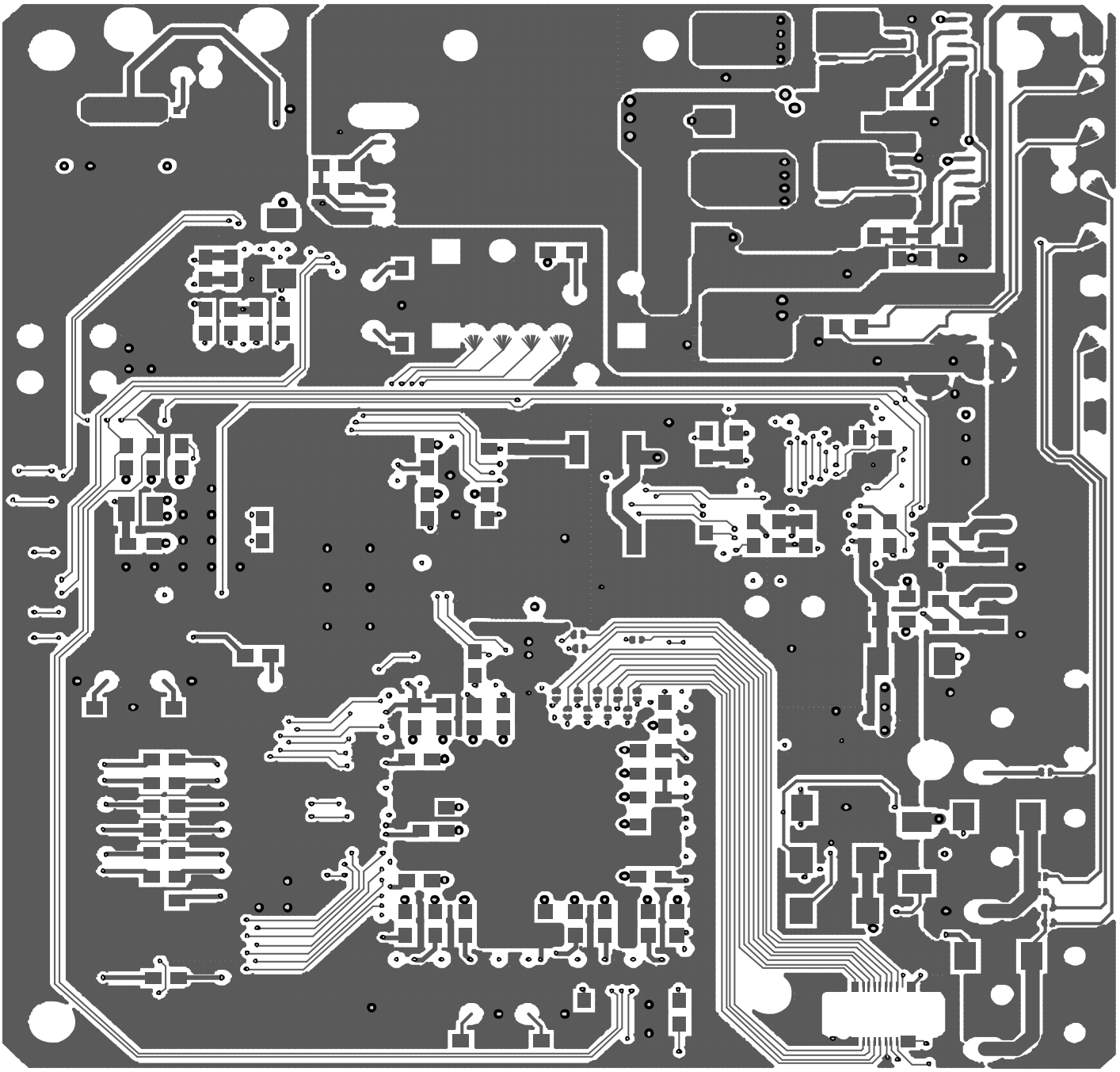
COMPONENT SIDE

1

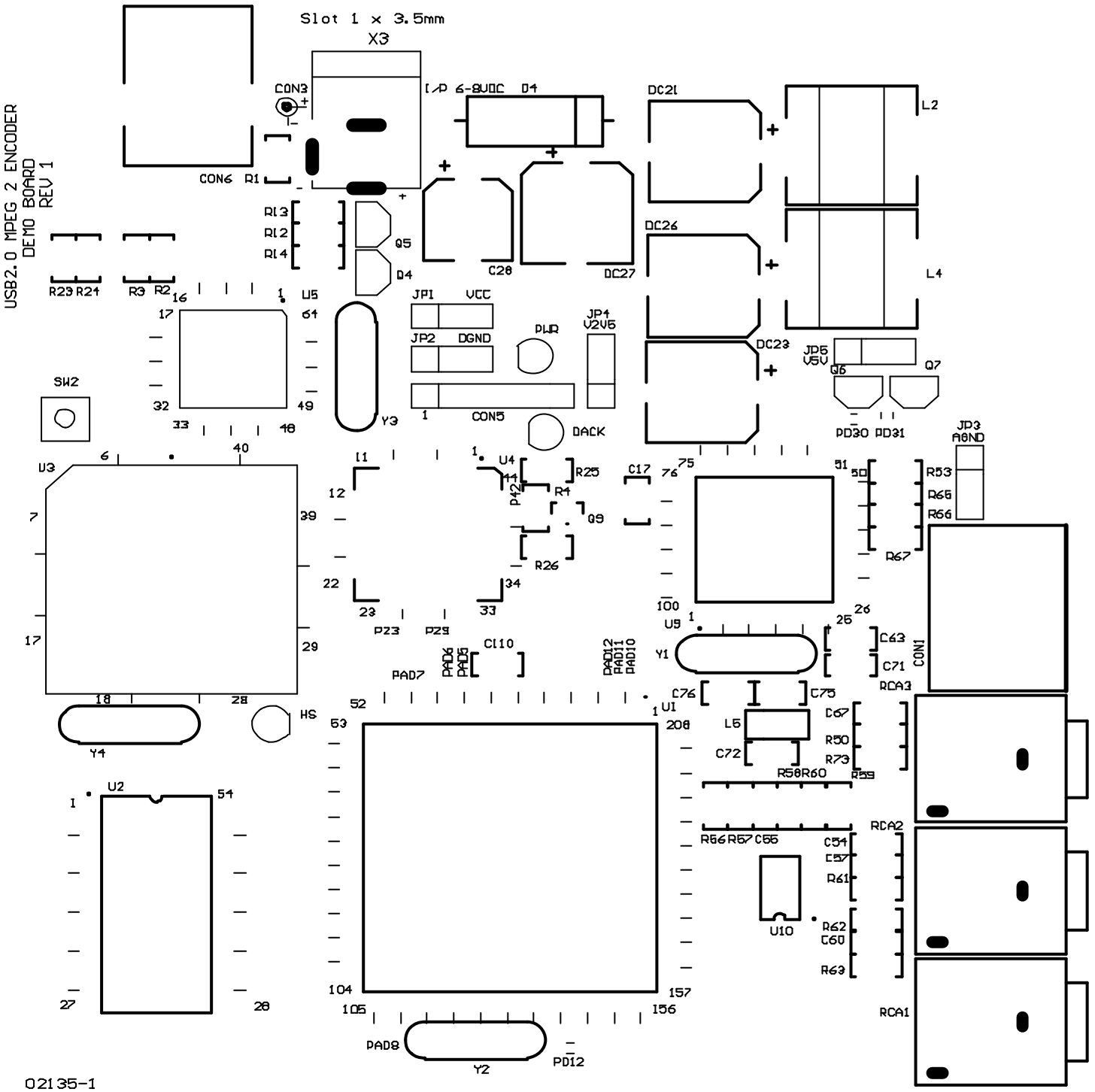


3

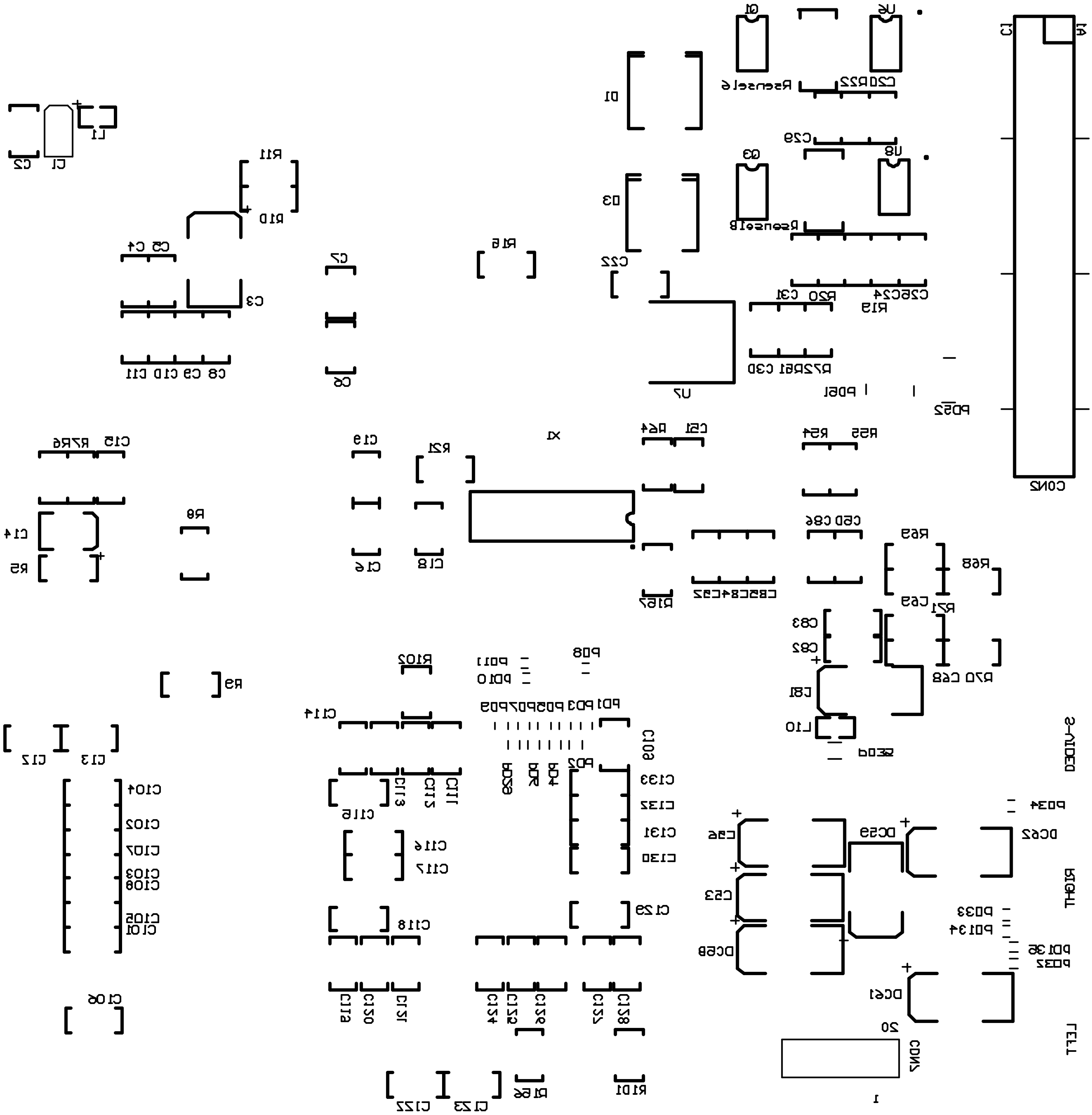




SOLDER SIDE



COMP SIDE LEGEND


CON2
S-VIDEO
RIGHT
LEFT
X1
U7

13. Bill of Materials

Quantity	Part Type	Designator	Footprint	Description
37	—	PD1 PD11 PD13 PD15 PD17 PD19 PD2 PD21 PD23 PD25 PD27 PD28 PD29 PD3 PD30 PD31 PD32 PD33 PD34 PD35 PD36 PD37 PD38 PD39 PD4 PD40 PD41 PD42 PD43 PD44 PD45 PD46 PD47 PD5 PD6 PD8 PD9	SIP2-S	—
3	0.01 µF	C18 C19 C20	0805	Capacitor nonpolar
1	0.027 µF, 1 kV	C26	1206	Capacitor nonpolar
16	0.1 µF	C1 C10 C11 C12 C13 C14 C15 C2 C3 C32 C4 C5 C6 C7 C8 C9	0805	Capacitor nonpolar
3	0 R	R17 R18 R31		Resistor
1	10 k	R19	0805	Resistor
3	120 k	R3 R4 R5	0805	Resistor
1	12K0, 0.1%	R9	0805	Resistor
1	12 MHz	Y1	CRYSTAL	—
2	15 k	R11 R12	0805	Resistor
1	180 R	R7	0805	Resistor
2	1 k	R1 R2	0805	—
1	1K5	R8	0805	—
1	1 µF	C27	CASE A	Capacitor nonpolar
4	20 pF	C22 C23 C24 C25	0805	Capacitor nonpolar
1	220 n	C31	0805	Capacitor nonpolar
1	24 MHz	Y2	CRYSTAL	—
1	2N3904	Q4		—
11	33 R	R20 R21 R22 R23 R24 R25 R26 R27 R28 R29 R30	0805	—
4	3K3	R13 R14 R15 R16	0805	—
1	3n9	C29	0805	Capacitor nonpolar
1	3V3D	JP1	SIP2-J	—
2	4.7 µF	C21 C30	RB.2/.2	Capacitor nonpolar
2	47 µF	C16 C17	RB.2/.2	Capacitor nonpolar
1	48 MHz	X1	DIP14/OSC	—
1	4K7	R6	0805	Resistor
1	5K6	R10	0805	—
1	74LVC08	U4	SO14	Quad 2-In POS and G
1	7805 (8 V to 5.0 V)	U3	TO252	—
1	820 n	C28	0805	Capacitor nonpolar
1	87C54	U6	DIP40	—
1	BC858B	Q1	PNP	PNP Bipolar transistor
6	BLM11	L1 L2 L3 L4 L5 L7	0805A	Inductor
2	BS107	Q2 Q3	MOSFET	—
1	CD +8 V	CON3		RCA connector
1	DEBI	CON2		—
1	DGND	JP2	SIP2-J	—
1	ENCODING	LED2	LED-SMT	—
1	HS	LED3		—
1	I2C	CON5	SIP4	—
1	ISP1581	U5	IC51A	Hi-Speed USB Peripheral Controller

Quantity	Part Type	Designator	Footprint	Description
1	JTAGI	CON1	SIP6	Connector
1	LM1117 (8 V to 3.3 V)	U2	TO252	—
1	PWR ON	LED1		—
1	µC RES	SW1	SW-TACT	—
1	USB	CON4		—
1	USB RES	SW2	SW-TACT	—
1	XC9572XL-10-VQ44	U1	VQ44	—

14. Known Issues

- Does not support Windows 98.
- Does not support the USB full-speed mode.
- When playing a captured MPEG2 file from the hard disk, you may encounter video picture jogging because the freeware version (Copyright Moonlight Cordless LIMITED) of the decoder software is used with this version of the reference kit.
  - Read the license.txt file of the decoder software before use.
  - For better quality pictures, get commercial version of the decoder software.
- MFC application error occasionally encountered, if MSVCRTD.DLL is not present on the system. Copy MSVCRTD.DLL from the Application directory to the \System32 directory of your PC.

15. References

- *Universal Serial Bus Specification Rev. 2.0* (www.usb.org)
- *ISP1581 Hi-Speed Universal Serial Bus interface device* data sheet (http://www.semiconductors.philips.com/pip/isp1581/)