

# UM10044

ISP1183 Low-Power USB Peripheral Controller PC Eval Kit

Rev. 04 — 6 February 2007

User manual

## Document information

Info	Content
<b>Keywords</b>	isp1183, universal serial bus, usb
<b>Abstract</b>	This document explains the ISP1183 PC eval kit.

**Revision history**

Rev	Date	Description
04	20070206	Third release; updated <a href="#">Section 8</a> .
03	20041021	Third release; updated the schematics.
02	20041018	Second release; updated Table 1. Updated terminology from “device PC” to “peripheral PC”, and “interface device” to peripheral controller”.
01	20030930	First release.

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## 1. Introduction

The ISP1183 is a cost- and feature-optimized Universal Serial Bus (USB) peripheral. It is typically used in any microcontroller- or microprocessor-based system. The ISP1183 is a full-speed USB Peripheral Controller with up to 14 configurable endpoints. It has a fast general-purpose parallel interface to communicate with many types of microcontrollers or microprocessors.

The ISP1183 has 2462 bytes of internal First In, First Out (FIFO) memory, which is shared among enabled USB endpoints. The type and FIFO size of each endpoint can be individually configured, depending on the required packet size. For increased data throughput, isochronous and bulk endpoints are double-buffered.

To a microcontroller, the ISP1183 appears as a memory device with an 8-bit data bus and a 1-bit address bus. The ISP1183 only supports a nonmultiplexed address and data bus.

The ISP1183 PC evaluation (eval) kit uses two PCs as a complete USB development environment, a host PC with USB host capability and a peripheral PC running the ISP1183 firmware. The ISP1183 eval board is plugged in the peripheral PC as a USB peripheral.

With this set up, you can easily evaluate the features of the ISP1183, and develop firmware and product prototype, without being limited by the choice of a microcontroller. The firmware is written in C, that supports Borland Turbo C for x86.

[Fig 1](#) shows the ISP1183 eval board.



Fig 1. ISP1183 eval board

## 2. System requirements

### For the host PC:

- PC with USB motherboard or add-on card.
- Microsoft Windows 98 and Windows 2000.

### For the peripheral PC:

- PC with Microsoft DOS 6.x.
- ISP1183 eval board, as shown in [Fig 2](#).

**For the firmware development:**

- x86 CPU platform: Borland Turbo C++ 3.0 or above.
- ISP1183 eval diskette.

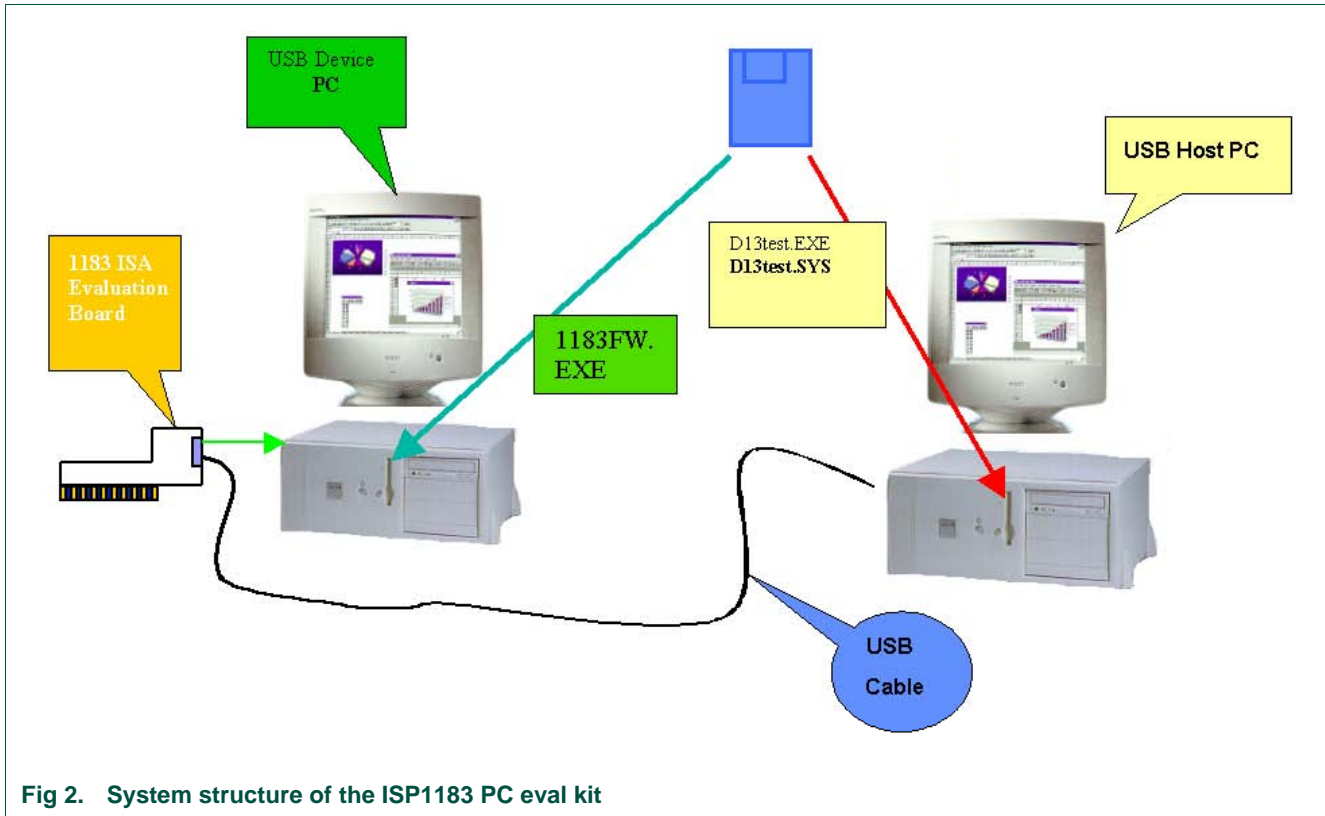


Fig 2. System structure of the ISP1183 PC eval kit

### 3. Jumper settings on the ISP1183 eval board

The ISP1183 eval board is plugged into the peripheral PC. It will occupy I/O and IRQ resources of the peripheral PC. To avoid possible conflicts in settings, remove all unnecessary cards from the peripheral PC. Sound cards and network cards may cause IRQ conflicts.

Jumper JP1 enables and disables the level-shift module.

**Table 1. JP1**

Isolate data bus	Disable	Enable (default)
Short pins	1 - 2	2 - 3

JP2 sets the I/O power supply of the eval board. Default setting is 1.8 V.

**Table 2. JP2**

I/O voltage select	1.8 V (default)	3.3 V
Short pins	1 - 2	2 - 3

JP4 sets the IRQ number for the ISP1183 eval board. Default setting is IRQ5 as shown in [Table 3](#). Short Intx\_IRQ and pin 5.

**Table 3. JP4**

IRQ number	IRQ5 (default)	IRQ3	IRQ4	IRQ6	IRQ7
Short pins	5 - Intx_IRQ	3 - Intx_IRQ	4 - Intx_IRQ	6 - Intx_IRQ	7 - Intx_IRQ

Jumper JP5 is reserved (left open).

**Table 4. S2**

Microcontroller power supply	5 V (default)	3.3 V
Short pins	1 - 2	2 - 3

**Table 5. S4**

Board power supply	Bus-powered	Self-powered (default)
Short pins	1 - 2	2 - 3

**Table 6. S5**

V <sub>BUS</sub> power supply	Bus-powered (default)	Self-powered
Short pins	1 - 2	2 - 3

**Table 7. Possible conflict settings**

IRQ number	Possible conflict
IRQ5	Creative SoundBlaster and compatible sound cards always occupy this IRQ, by default. If this type of sound card is installed, check its settings or remove it. Some network cards may also use this IRQ.
IRQ7	Used by parallel port, by default. May cause printing problem on peripheral PC.

## 4. I/O mapping

The ISP1183 eval board occupies eight I/O locations. The base address is 368h.

**Table 8. I/O mapping**

Offset	Usage
0	ISP1183 data register, read or write
1	Write command register, read data bus state
2	Board control and read chip I/O state
3	Reserved
4 to 7	Reserved for expansion board

## 5. Installing hardware, firmware, INF and driver

The procedure to install hardware, firmware, INF and driver is as follows:

1. Switch off the peripheral PC.
2. Remove all unnecessary cards on the peripheral PC.
3. Plug the ISP1183 eval board in the ISA slot of the peripheral PC.
4. Switch on the peripheral PC.
5. On the peripheral PC, under the DOS mode, run firmware 1183FW.EXE.

If it is the first time that the eval board is connected to the host PC, the host OS Device Manager will prompt for the installation of INF and drivers.

6. Select the location of D13TEST.INF and D13TEST.SYS from the ISP1183 evaluation diskette and complete the installation procedure.

## 6. Using the host applet

Test applet D13TEST.EXE exercises all the ISP1183 endpoints as shown in [Fig 3](#).

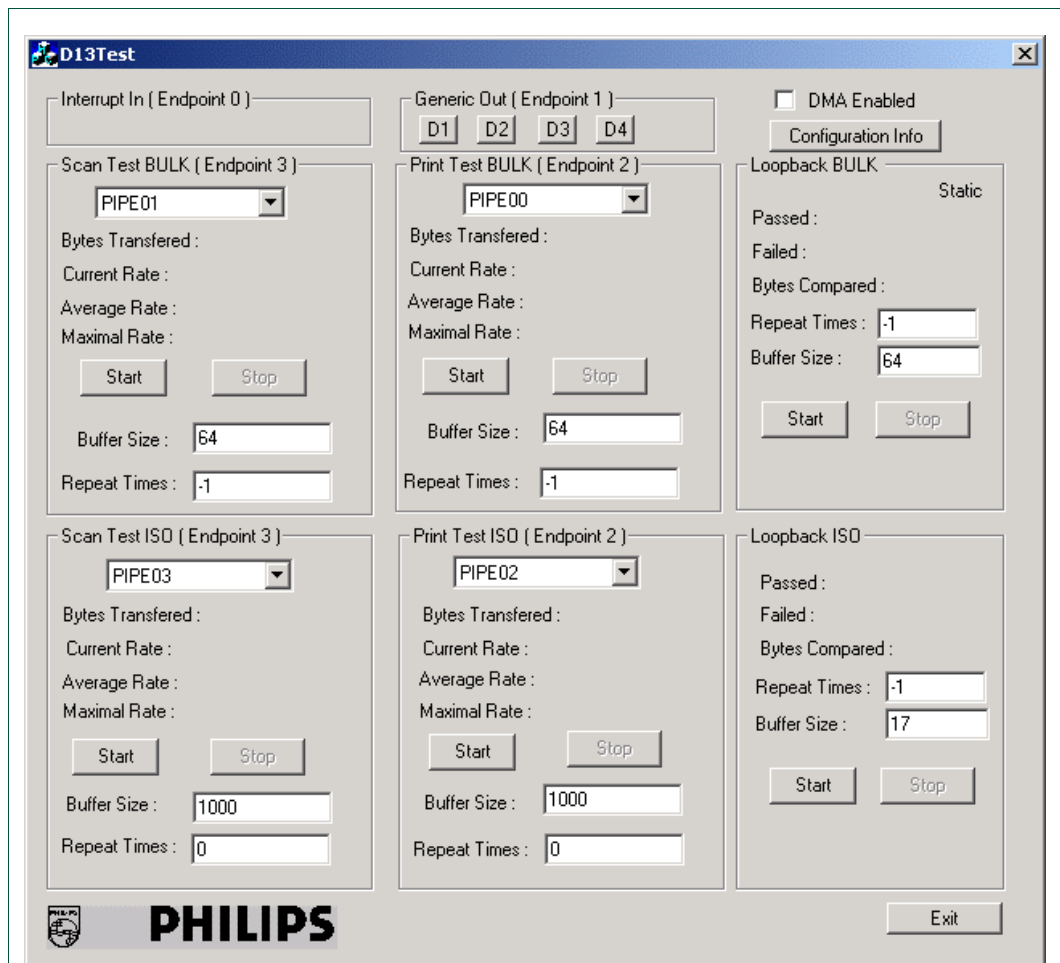


Fig 3. D13Test applet

[Table 9](#) shows a description of endpoints operation on the ISP1183 eval board.

**Table 9. Description of endpoints operation**

The test applet and the ISP1183 eval board support three test modes: loopback, print and scan. The firmware uses I/O accesses on this endpoint.

Endpoint number	Endpoint type	Operations
5	ISO-OUT	This pipe is defined as an isochronous OUT pipe.
6	ISO-IN	This pipe is defined as an isochronous IN pipe.
3	Bulk-OUT	This pipe is defined as a bulk OUT pipe. Supports DMA.
4	Bulk-IN	This pipe is defined as a bulk IN pipe. Supports DMA.

Three test modes:

- **Scan mode:** In this mode, the ISP1183 eval board acts like a scanner. It sends data packets to the host PC as fast as possible. Use this mode to evaluate the isochronous IN and bulk IN transfer rates.
- **Print mode:** In this mode, the ISP1183 eval board acts like a printer. It receives data packets from the host PC as fast as possible. Use this mode to evaluate the isochronous OUT and bulk OUT transfer rates.
- **Loopback mode:** In this mode, the ISP1183 eval board receives data packets on the isochronous OUT (or bulk OUT) endpoint and sends them back to the host PC on isochronous IN (or bulk IN) endpoint. Use this mode to test the data integrity of transfers.

The Buffer Size setting of the test applet is determined by firmware and hardware ability of the eval board. For ISA mode, the maximum size is limited to 64000 bytes for the bulk transfer and 256 bytes for the ISO transfer. For ISO scan mode, if you need to change the buffer size, print a buffer of the same data size first. By default, Buffer Size is set to 64000 when the test applet is launched. Change Buffer Size to 64 before starting the test.

Repeat Times for the loopback test controls the numbers of iterations of loopback, which is useful for debugging. By default, Repeat Times is set to 0 when the test applet is launched. To run the test infinite times, set Repeat Times to -1.

## 7. Testing control endpoints using standard USB compliance tool

To test control endpoints using the standard USB compliance tool:

1. Run the USB compliance tool.

The *USB Compliance Tool*<sup>1</sup> window appears, as in [Fig 4](#).

2. Connect a USB peripheral.

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

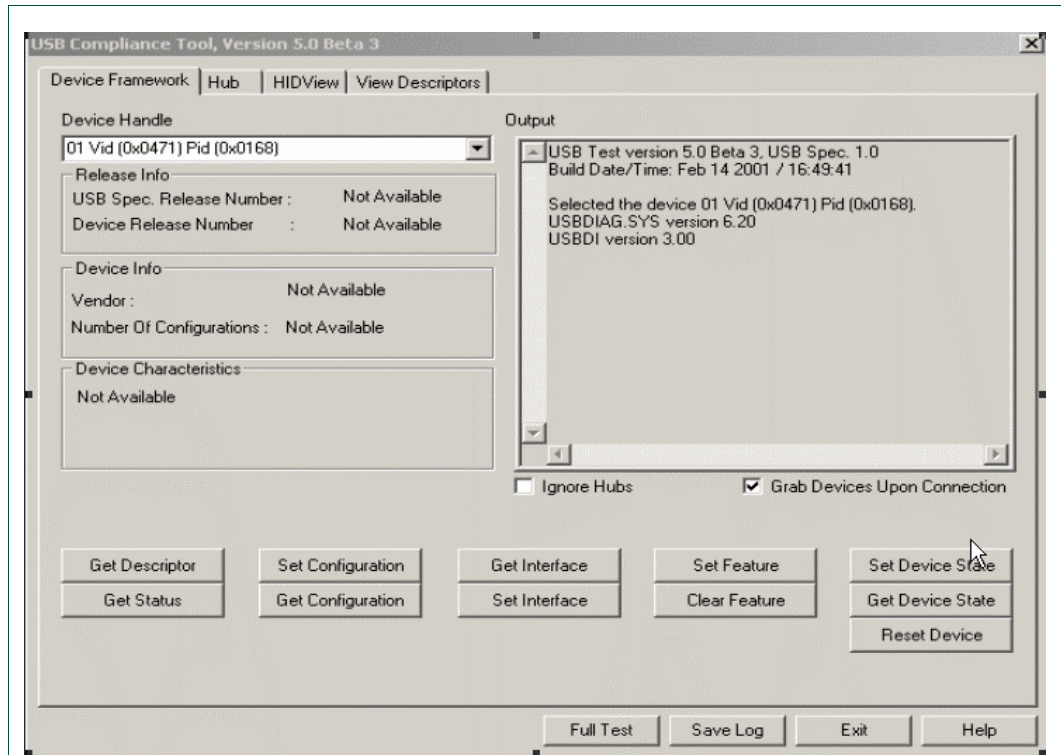


Fig 4. USB Compliance Tool window

3. In the *USB Compliance Tool* window, click the **Full Test<sup>2</sup>** button.

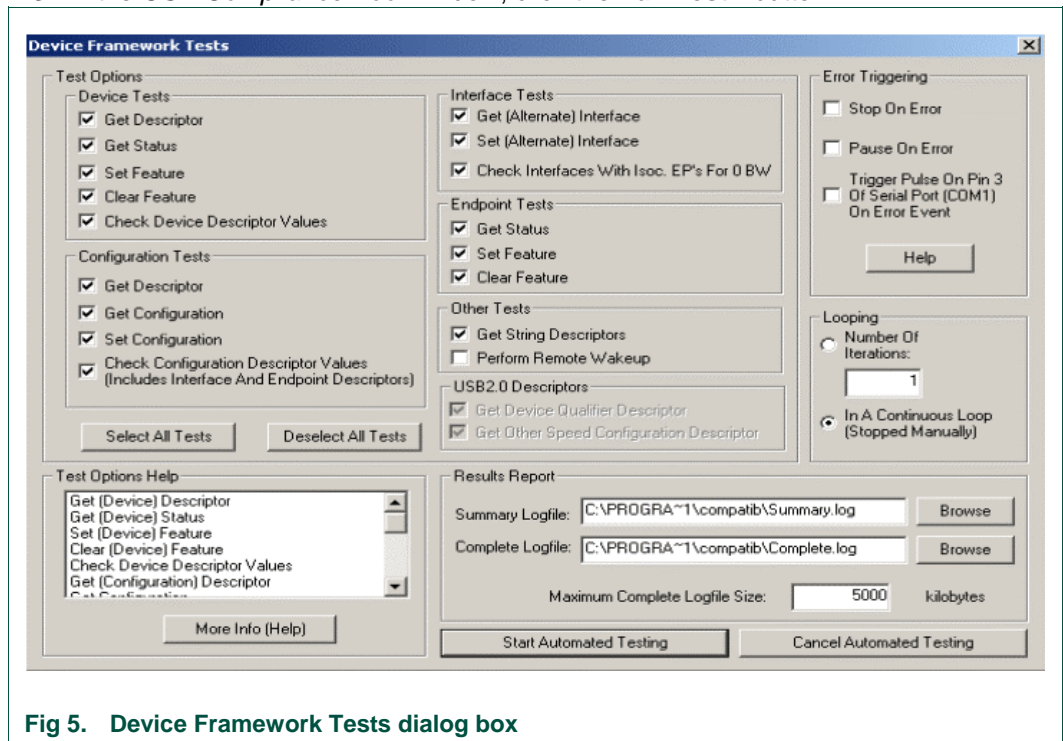


Fig 5. Device Framework Tests dialog box

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



4. In dialog box *Device Framework Tests*, as seen in [Fig 5](#), deselect **Perform Remote Wakeup** and select **In A Continuous Loop**.
5. Click the **Start Automated Testing** button.

The *Full Test Results* dialog box appears, as seen in [Fig 6](#).

6. To stop the loop test, click **Stop Testing**.

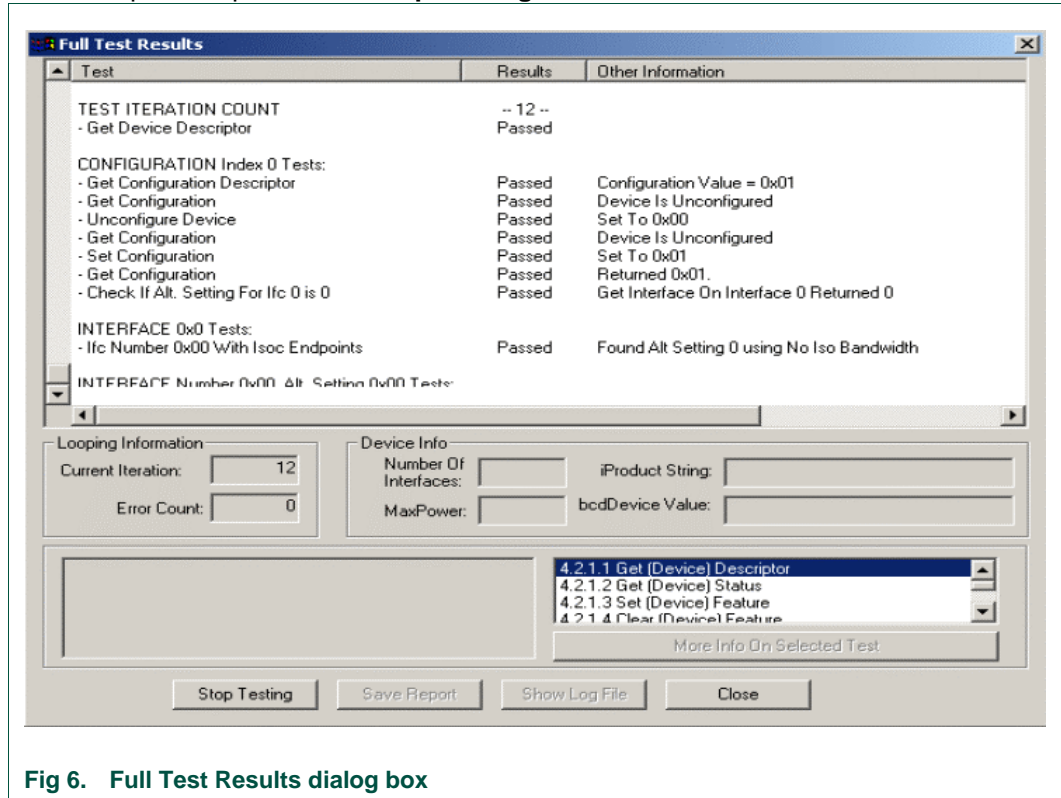


Fig 6. Full Test Results dialog box

The USBCV testing tool can be downloaded from the USB website. Check the website for the latest version of the tool.

8. Schematics

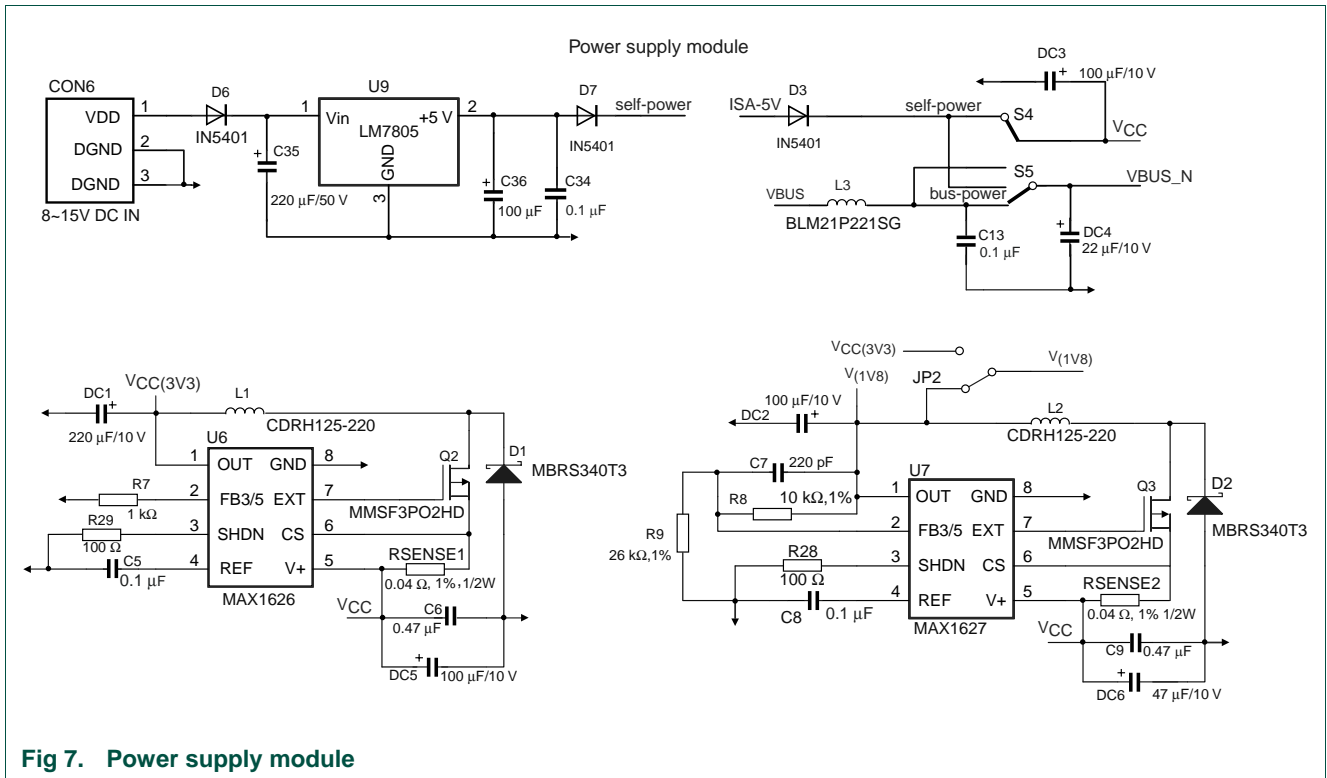


Fig 7. Power supply module

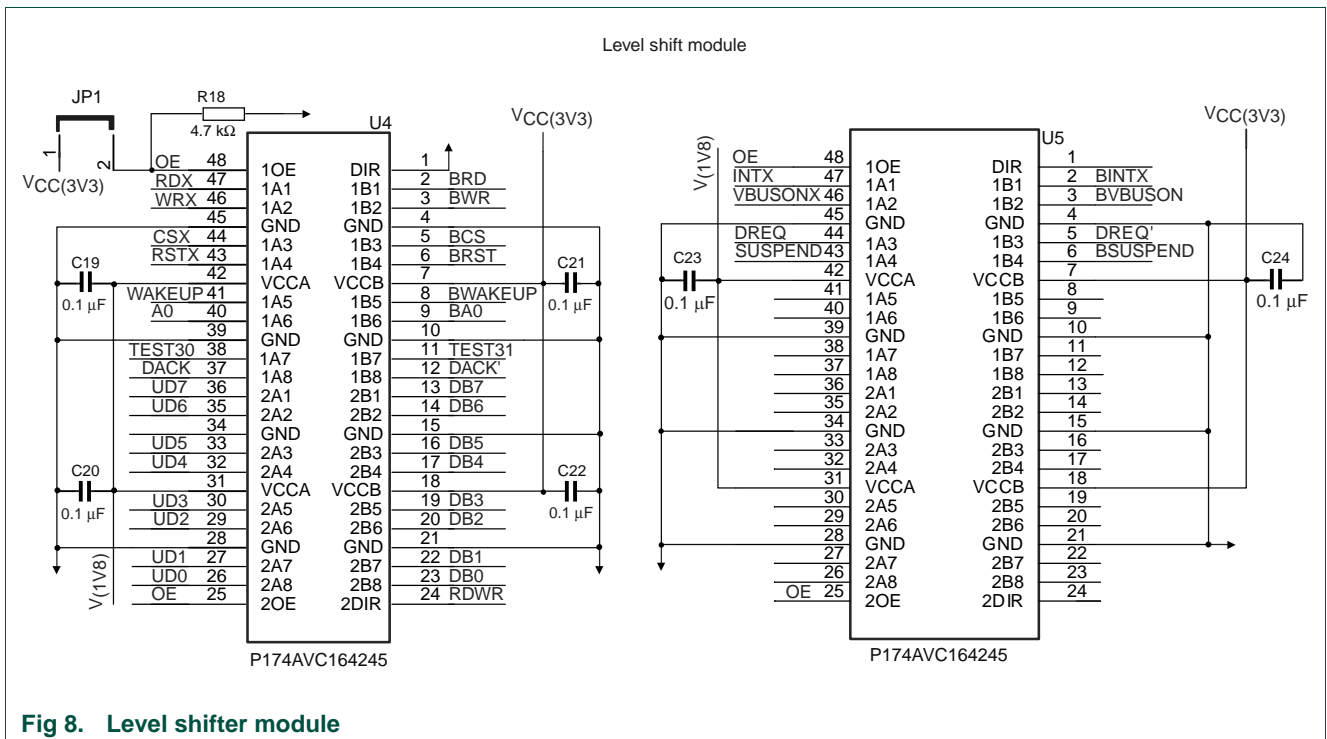


Fig 8. Level shifter module

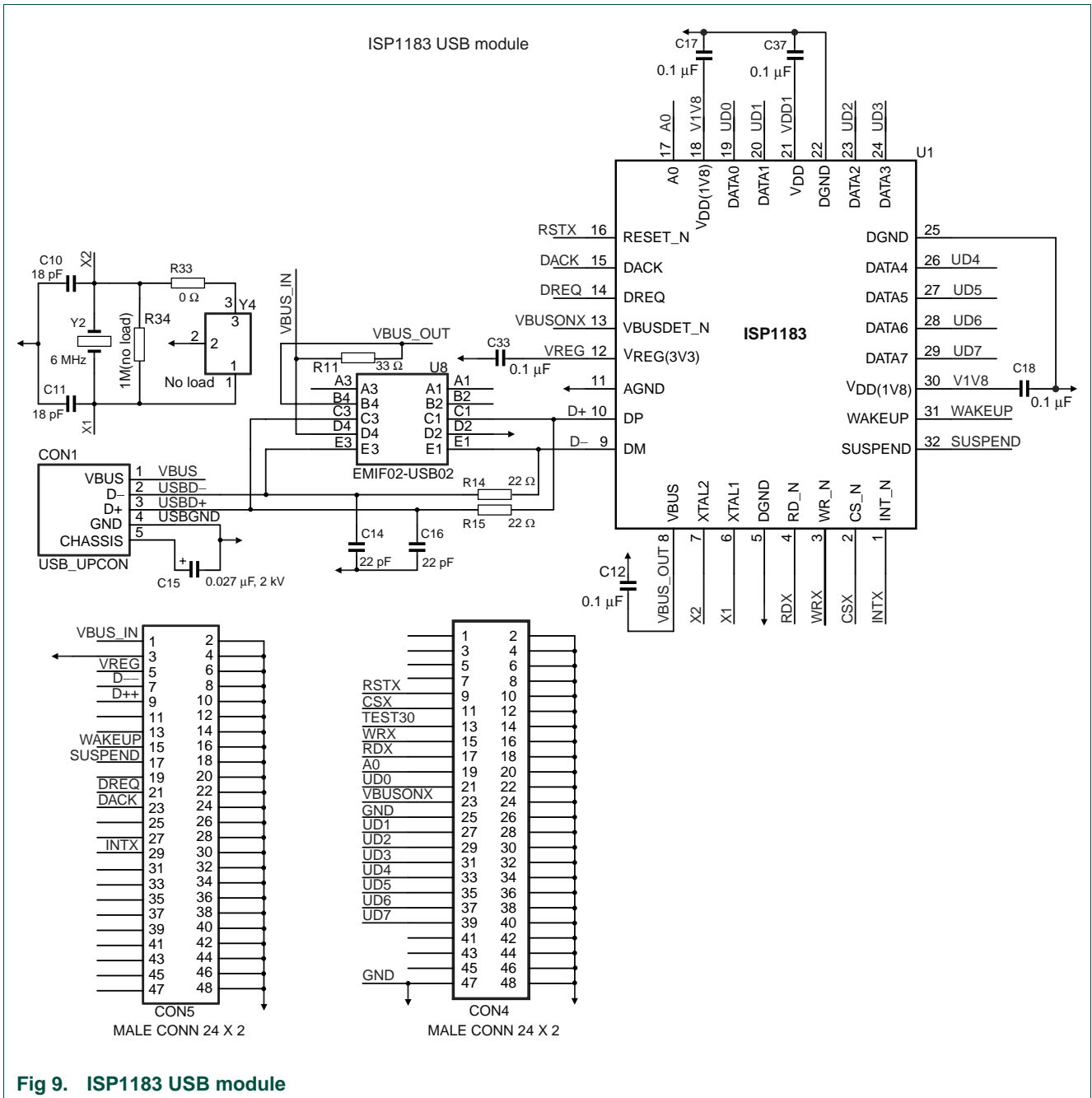


Fig 9. ISP1183 USB module

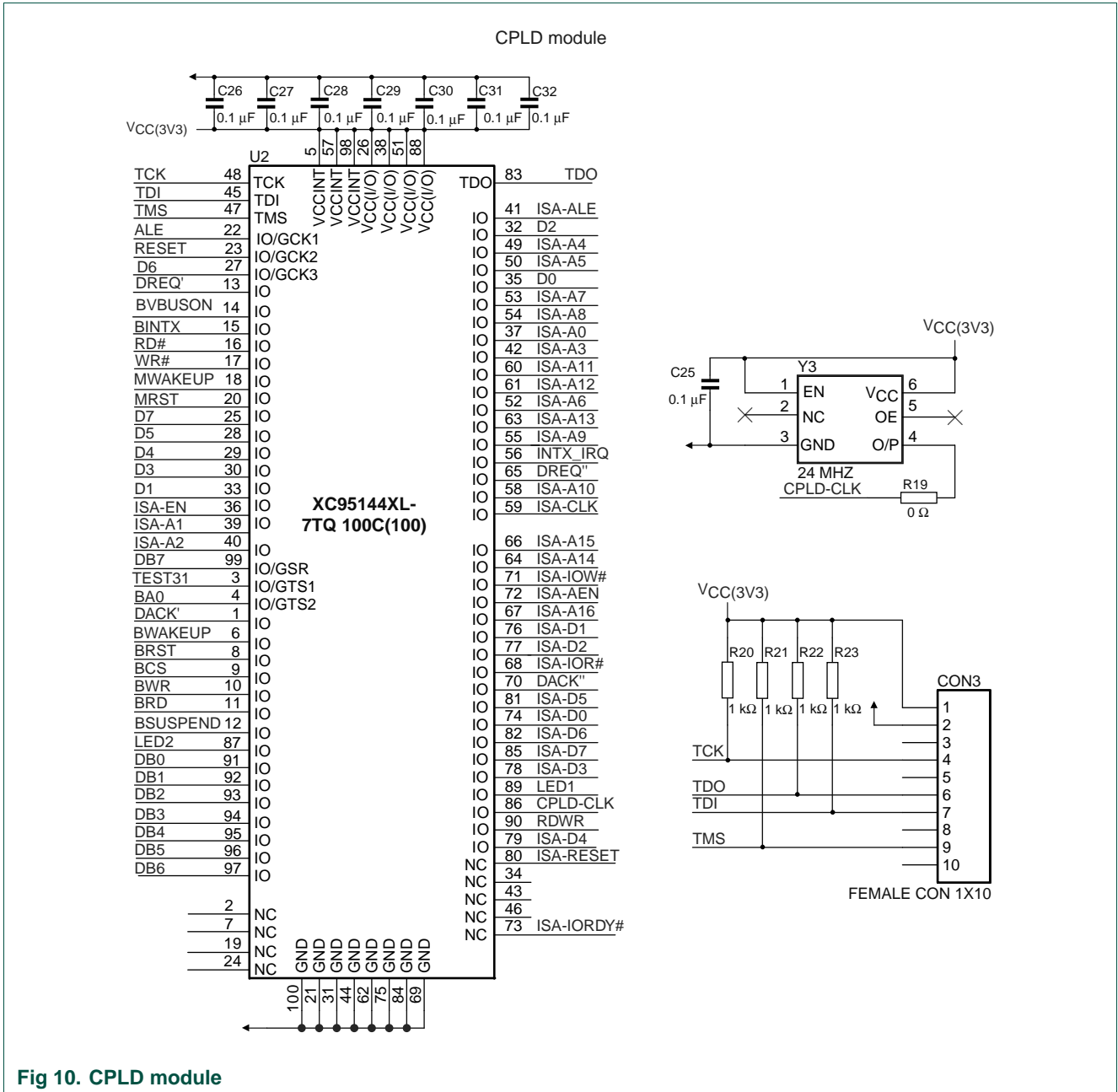


Fig 10. CPLD module

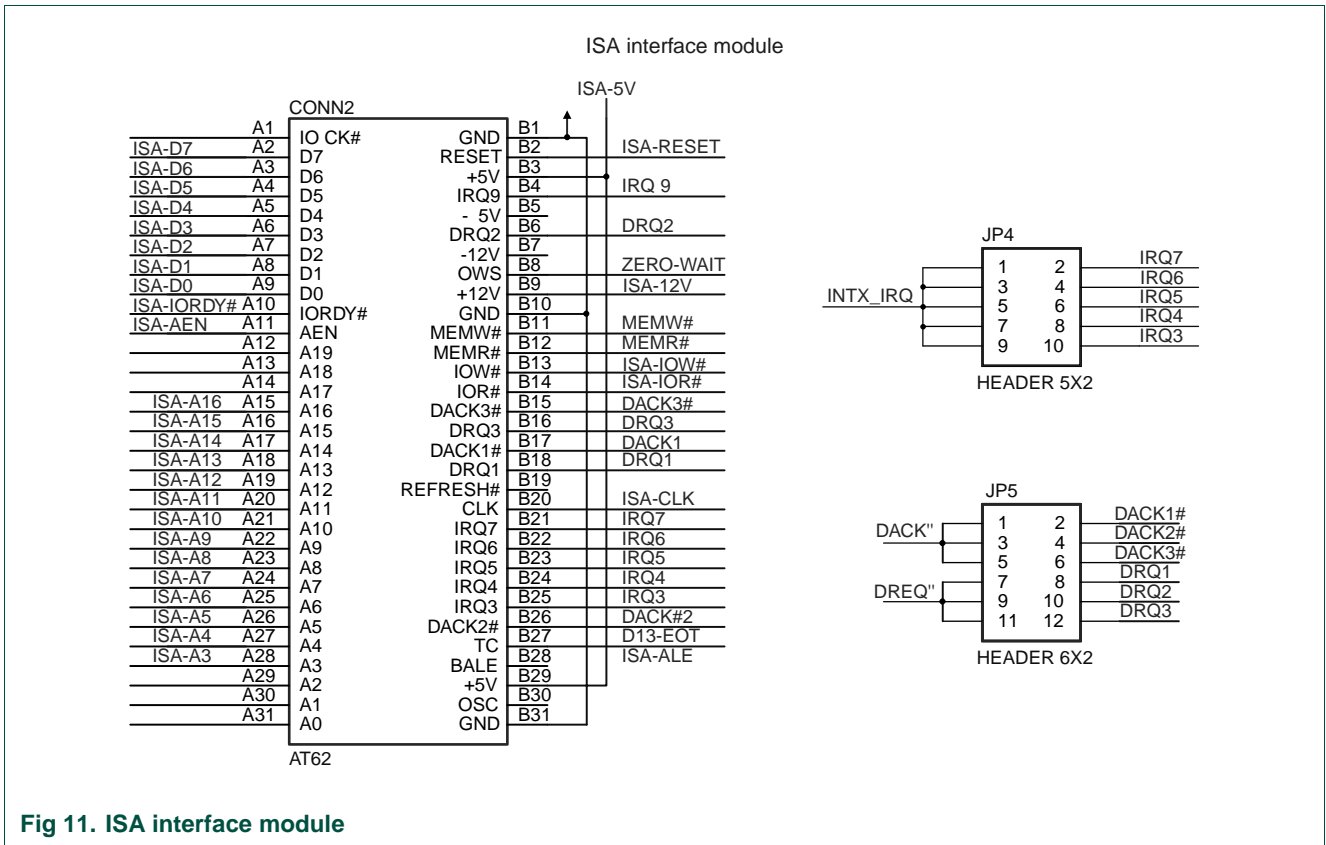


Fig 11. ISA interface module

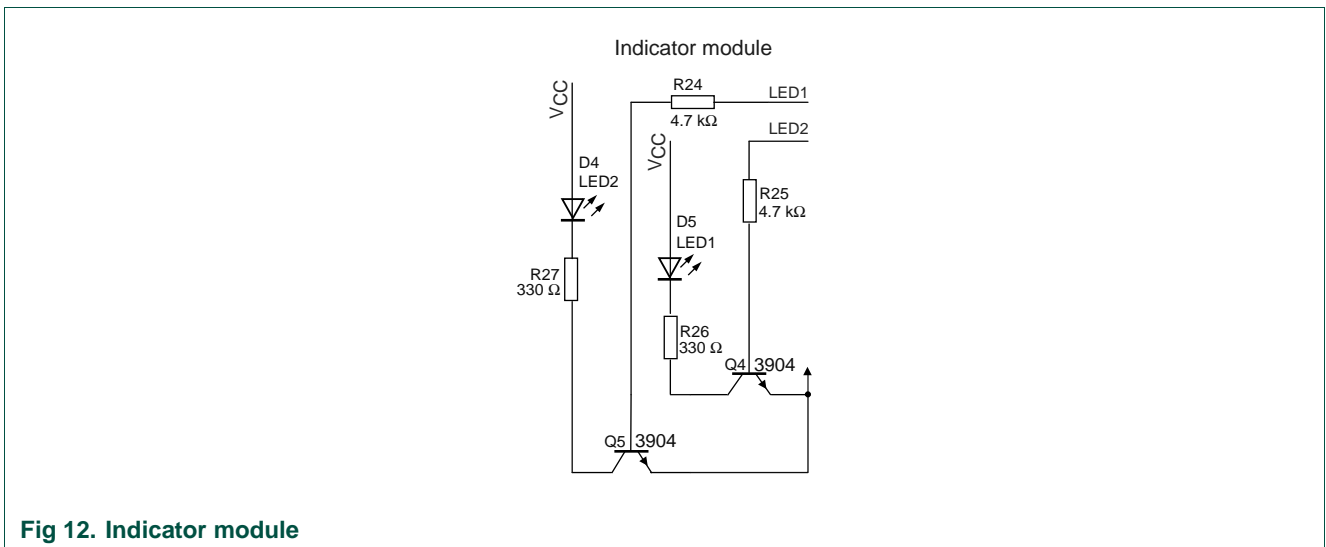


Fig 12. Indicator module

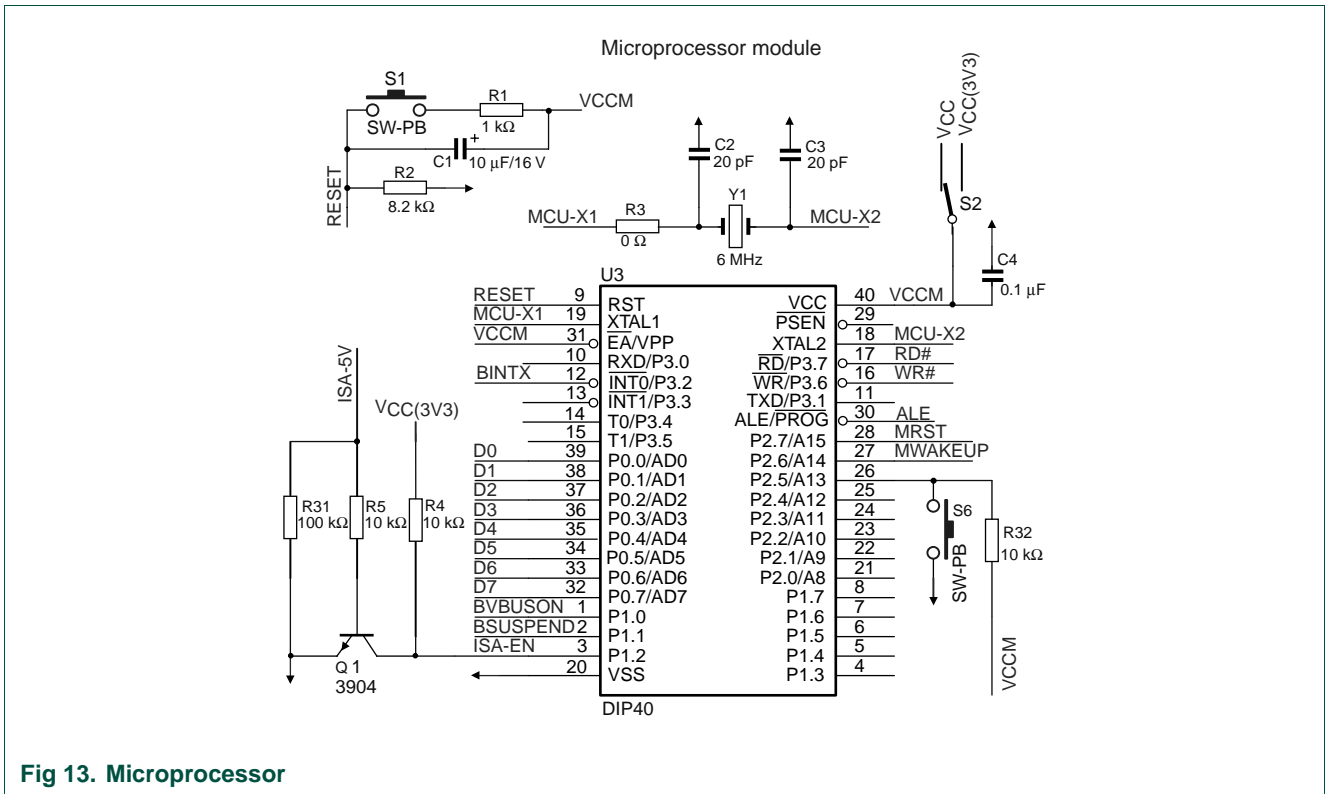


Fig 13. Microprocessor

## 9. Bill of materials

Table 10. Bill of materials

Used	Part Type	Designator	Footprint	Description
1	10 µF/16 V	C1	CASE_C	Capacitor polar
2	18 pF	C10 C11	0805	Capacitor
24	0.1 µF	C12 C13 C17 C18 C19 C20 C21 C22 C23 C24 C25 C26 C27 C28 C29 C30 C31 C32 C33 C34 C37 C4 C5 C8	0805	Capacitor
2	22 pF	C14 C16	0805	Capacitor
1	0.027 µF, 2 kV	C15	1206	Capacitor polar
2	20 pF	C2 C3	0805	Capacitor
1	220 µF/50 V	C35	-	Electrolytic capacitor
1	100 µF	C36	-	Electrolytic capacitor
2	0.47 µF	C6 C9	0805	Capacitor
1	220 pF	C7	0805	Capacitor
1	USB_UPCON	CON1	USB_UPCON	USB upstream connector

Used	Part Type	Designator	Footprint	Description
1	FEMALE CON1 X 10	CON3	-	Connector
2	MALE CONN 24 X 2	CON4 CON5	-	Connector
1	8~15V DC IN	CON6	-	DC-JACK
1	AT62	CONN2	-	Gold finger
2	MBRS340T3	D1 D2	-	Schottky diode
3	IN5401	D3 D6 D7	-	Diode
1	LED2	D4	LED	LED
1	LED1	D5	LED	LED
1	220 $\mu$ F/10 V	DC1	-	Electrolytic capacitor
3	100 $\mu$ F/10 V	DC2 DC3 DC5	-	Electrolytic capacitor
1	22 $\mu$ F/10 V	DC4	-	Electrolytic capacitor
1	47 $\mu$ F/10 V	DC6	-	Electrolytic capacitor
5	-	JP1 JP2 S2 S4 S5	-	Jumper
1	HEADER 5X2	JP4	-	Connector
1	HEADER 6X2	JP5	-	Connector
2	CDRH125-220	L1 L2	-	Inductor
1	BLM21P221SG	L3	1206	Inductor
3	3904	Q1 Q4 Q5	-	NPN transistor
2	MMSF3PO2HD	Q2 Q3	-	-
6	1 k $\Omega$	R1 R20 R21 R22 R23 R7	0805	Resistor
1	33 $\Omega$	R11	0805	Resistor
2	22 $\Omega$	R14 R15	0805	Resistor
3	4.7 k $\Omega$	R18 R24 R25	0805	Resistor
2	0 $\Omega$	R19 R3	0805	Resistor
1	8.2 k $\Omega$	R2	0805	Resistor
2	330 $\Omega$	R26 R27	0805	Resistor
3	100 $\Omega$	R28 R30 R29	0805	Resistor
1	100 k $\Omega$	R31	0805	Resistor
3	10 k $\Omega$	R32 R4 R5	0805	Resistor
1	0 $\Omega$	R33	-	Resistor

Used	Part Type	Designator	Footprint	Description
1	1 MΩ (No load)	R34	0805	Resistor (no load)
1	10 kΩ, 1 %	R8	0805	Resistor
1	26 kΩ, 1 %	R9	0805	Resistor
2	0.04,1 %, 1/2W	Rsense1 Rsense2	-	-
2	SW-PB	S1 S6	-	Push-button
99	-	TP1 TP10 TP100 TP101 TP102 TP104 TP11 TP12 TP13 TP14 TP15 TP16 TP17 TP18 TP19 TP2 TP20 TP21 TP22 TP23 TP24 TP25 TP26 TP27 TP28 TP29 TP3 TP30 TP31 TP32 TP33 TP34 TP35 TP36 TP37 TP38 TP39 TP4 TP40 TP41 TP42 TP43 TP47 TP48 TP49 TP5 TP50 TP51 TP52 TP53 TP54 TP55 TP56 TP57 TP58 TP59 TP6 TP60 TP61 TP62 TP63 TP64 TP65 TP66 TP67 TP68 TP69 TP7 TP70 TP71 TP72 TP73 TP74 TP75 TP76 TP77 TP78 TP79 TP8 TP80 TP81 TP82 TP83 TP84 TP85 TP87 TP88 TP89 TP9 TP90 TP91 TP92 TP93 TP94 TP95 TP96 TP97 TP98 TP99	-	Test pad
1	ISP1183	U1	-	ISP1183
1	XC95144XL	U2	SQFP14X14-100 (N)	CPLD
1	DIP40	U3	CDIP40	Microcontroller
2	PI74AVC164245	U4 U5	TSSOP48	Level shift
1	MAX1626	U6	SO8	CMOS step-up switching regulators
1	MAX1627	U7	SO8	CMOS step-up switching regulators
1	EMIF02-USB02	U8	EMIF02-USB02	-
1	LM7805	U9	TO-3	-
2	6 MHz	Y1 Y2	-	Crystal
1	24 MHz	Y3	CSX-750	-
1	No load	Y4	CN	-

## 10. References

- ISP1183 Low-power Universal Serial Bus interface device with DMA data sheet
- Universal Serial Bus Specification Rev. 2.0



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