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ISP118x USB-to-RS-232 Reference Kit

User's Manual

Rev. 1.0

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1. Introduction

The ISP1181x USB-to-RS-232 Reference Kit is a useful development tool, which comes with a demo board, source code for microcontroller firmware, and a full set of documents. It helps you quickly understand how USB-to-RS-232 serial port conversion work, and therefore, helps you speed up your product development.

This document explains the demo board's jumper setting, connector pin assignments, and a basic board testing procedure.

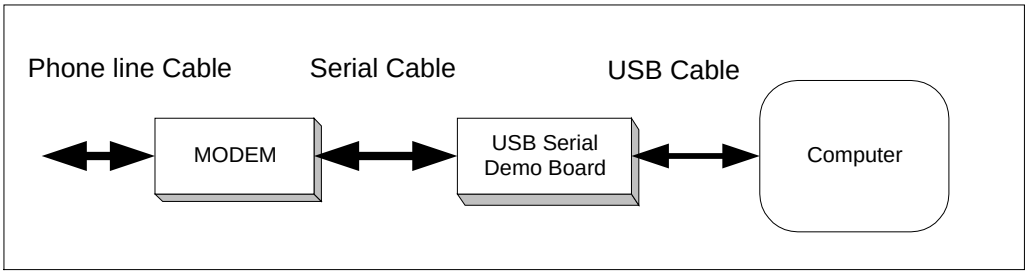
2. System Requirements

This demo board has been tested under Win98/Win2K. The device drivers can be found from "Serial Demo Kit Release Diskette or CDR".

Supported OS: Win98/Win2K.

3. Connection Diagram

To test the functions of this demo board, a 56K or lower bit rate modem is required. Here is the connection diagram:



4. PCBA View

The following figure shows the printed circuit board (PCB) assembly of this USB-to-RS-232 demo board designed using the Philips USB 2.0 full-speed parallel interface device, the ISP1181x.

5. Installing Device Drivers

1) Copy the Phenum.inf, Phserial.inf, phhusbser.inf files to the c:\windows\Inf\Other folder.

2) Copy the Phenum.vxd, Phserial.vxd files to the c:\Windows\System folder.

3) Copy the Phusbser.sys file to the C:\Windows\System32\Drivers folder.

4) Plug in the demo board.

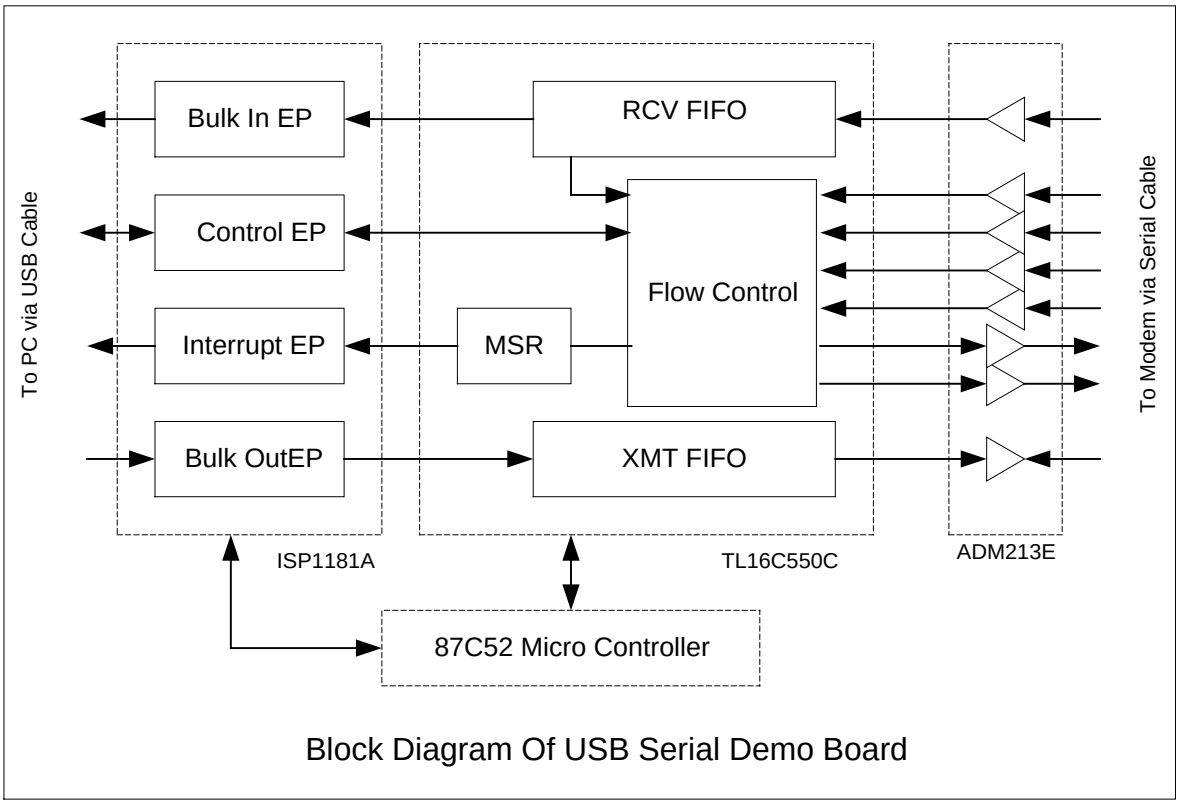
5) When asked for the INF file, direct Windows to the correct folders.

The demo board should be enumerated under the USB Controllers section in the Device Manager.

6. Hardware Description

The demo board consists of four main blocks and provides a function to convert USB data to RS-232 serial port data.

A general block diagram of the demo board is shown here:



Block Diagram Of USB Serial Demo Board

The ISP1181x is a full-speed, cost-optimized and feature-optimized USB interface device with up to 14 configurable endpoints. It has a high-speed general-purpose parallel interface for communication with many kinds of microcontrollers or microprocessors. It supports different bus configurations and local DMA transfers of up to 16 bytes per cycle.

In this USB-toRS-232 demo board, the ISP1181x appears as an I/O device with an 8-bit data bus and a 1-bit chip selection line. Three endpoints are used to directly transfer data or command to or from the TL16c550C chip. Each endpoint corresponds to a task:

- Data Streaming

- Signaling the host
- Enumeration, configuring and controlling

These are the type of endpoints:

Endpoint	Transfer Mode	Direction
0	Control	In/Out
1	Interrupt	In
2	Bulk	Out
3	Bulk	In

The TL16C550C is an asynchronous communications element (ACE), It performs serial-to-parallel conversion on data received from a peripheral device or modem, and parallel-to-serial conversion on data received from its microcontroller unit (MCU). The MCU can read the ACE status at any time. The ACE includes complete modem control capability and a processor interrupt system that can be tailored to minimize software management of the communications link.

The receiver and transmitter FIFOs store up to 16 bytes of data. In this application, there is a selectable autoflow control feature that can significantly reduce software overload and increase system efficiency by automatically controlling serial data flow through the RTS output and the CTS input signals.

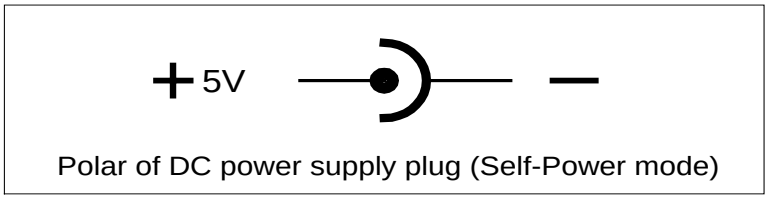
ADM213E is an RS-232 transceiver, which provides ±15 kV ESD protection for all input and output pins. The ADM213E consists of three sections: charge-pump voltage converters, drivers (transmitters), and receivers. Dual charge-pump voltage converters perform the +5V to ±10V conversion. The first charge-pump converter uses double the +5V into +10V. The second charge-pump inverts the +10V into -10V. With V_{CC} = 5V, the typical RS-232 driver output voltage swing is ±8V when loaded with a nominal 5 kohms RS-232 receiver. The output swing is guaranteed to meet EIA/TIA-232E that call for ±5V minimum output levels under worst-case conditions. Input thresholds are CMOS/TTL compatible. The RS-232 receivers convert the RS-232 signals to CMOS-logic output levels.

The components on the demo board are controlled by P87C52, which is a one-time programmable (OTP) 8-bit MCU. P87C52:

- Controls all the components on the board
- Handles all vendor-specific stuff.
- Handles data streaming
- Handles enumeration and configuring

7. Power Supply

The demo board is designed to be self-powered or bus-powered. In self-powered mode, a DC+5V power supply is required. In bus-powered mode, the supply power is drawn from the USB hub or host PC via a USB cable. A toggle switch (S1) selects the power supply mode.



Polar of DC power supply plug (Self-Power mode)

8. Connector Pin information

1) J2, D-SUB 9 pin Connector

PIN	NAME	DESCRIPTION
1	DCD	Data Carrier Detect
2	RX	Serial Data Input
3	TX	Serial Data Output
4	DTR	Data Terminal Ready
5	GND	Signal Ground
6	DSR	Data Set Ready
7	RTS	Request To Send
8	CTS	Clear To Send
9	RI	Ring Indicator

2) J3, USB Up-Stream port

PIN	NAME	DESCRIPTION
1	VBUS	VBUS is nominally +5V at the source.
2	USB D-	Negative Differential Signal of USB
3	USB D+	Positive Differential Signal of USB
4	GND	Signal Ground

9. Test points

1) JP1

PIN	NAME	DESCRIPTION
1	VBUS	Used for monitoring VBUS. It is nominally at +5V.
2	USB D-	Used for monitoring Negative Differential Signal of USB
3	USB D+	Used for monitoring Positive Differential Signal of USB
4	GND	Signal Ground

2) J2

PIN	NAME	DESCRIPTION	PIN	NAME	DESCRIPTION
1	DCD	RS-232 level DCD	2	GND	Signal Ground
3	RX	RS-232 level RX	4	GND	Signal Ground
5	TX	RS-232 level TX	6	GND	Signal Ground
7	DTR	RS-232 level DTR	8	GND	Signal Ground
9	GND	Signal Ground	10	GND	Signal Ground
11	DSR	RS-232 level DSR	12	GND	Signal Ground
13	RTS	RS-232 level RTS	14	GND	Signal Ground
15	CTS	RS-232 level CTS	16	GND	Signal Ground
17	RI	RS-232 level RI	18	GND	Signal Ground

3) JP2

PIN	NAME	DESCRIPTION	PIN	NAME	DESCRIPTION
1	VCC		2	GND	Signal Ground
3	BD0		4	GND	Signal Ground
5	BD1		6	GND	Signal Ground
7	BD2		8	GND	Signal Ground
9	BD3		10	GND	Signal Ground
11	BD4		12	GND	Signal Ground
13	BD5		14	GND	Signal Ground
15	BD6		16	GND	Signal Ground
17	BD7		18	GND	Signal Ground
19	_EA		20	GND	Signal Ground
21	ALE		22	GND	Signal Ground
23	_PSEN*		24	GND	Signal Ground
25	OUT1		26	GND	Signal Ground
27	OUT2		28	GND	Signal Ground
29	P2.5		30	GND	Signal Ground
31	ACE_CS		32	GND	Signal Ground
33	ISP1181_CS		34	GND	Signal Ground
35	A2		36	GND	Signal Ground
37	A1		38	GND	Signal Ground
39	A0		40	GND	Signal Ground

4) JP3

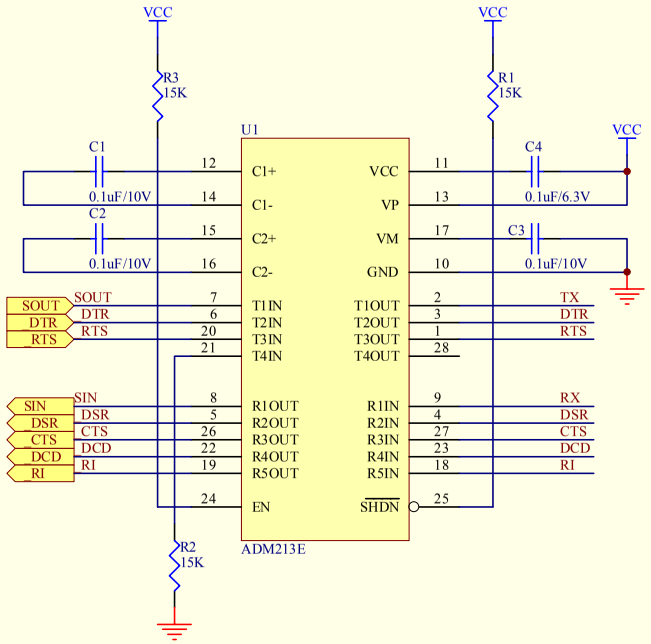
PIN	NAME	DESCRIPTION	PIN	NAME	DESCRIPTION
1	P1.0		2	GND	Signal Ground
3	P1.1		4	GND	Signal Ground
5	P1.2		6	GND	Signal Ground
7	SUSPEND		8	GND	Signal Ground
9	WAKEUP		10	GND	Signal Ground
11	READY		12	GND	Signal Ground
13	ISP1181_RST		14	GND	Signal Ground
15	ACE_RST		16	GND	Signal Ground
17	RESET		18	GND	Signal Ground
19	RXD*		20	GND	Signal Ground
21	TXD*		22	GND	Signal Ground
23	ISP1181_INT		24	GND	Signal Ground
25	ACE_INT		26	GND	Signal Ground
27	T0*		28	GND	Signal Ground
29	T1*		30	GND	Signal Ground
31	WR		32	GND	Signal Ground
33	RD		34	GND	Signal Ground
35	XTAL2		36	GND	Signal Ground
37	XTAL1		38	GND	Signal Ground
39	GND	Signal Ground	40	GND	Signal Ground

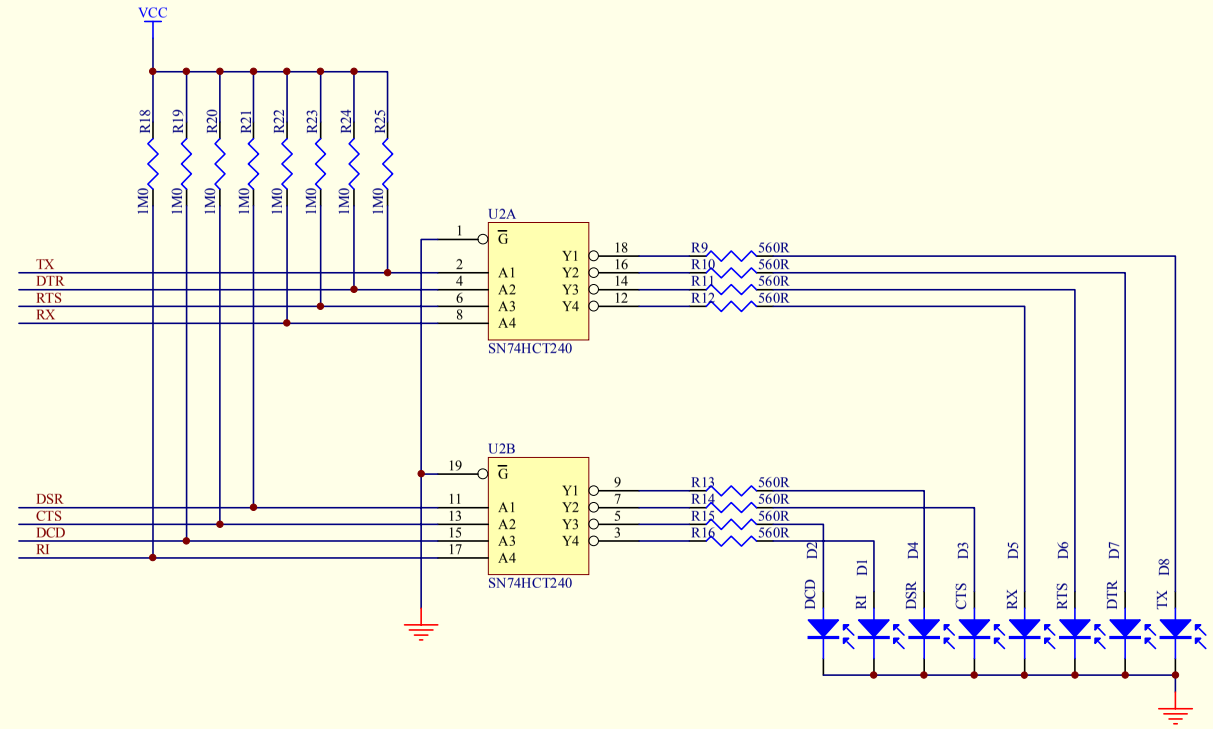
10. Bill of Material

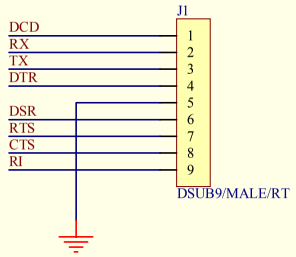
Used	Value	Designator	Description
1		TP1	TEST PIN
1	0.027uF, 2KV(CERAMIC CAP)	C30	CAPACITOR POLAR
17	0.1uF	C10 C11 C12 C13 C14	CAPACITOR NONPOLAR
		C15 C16 C17 C18 C19	
		C20 C21 C5 C6 C7 C8	
		C9	
3	0.1uF/10V	C1 C2 C3	CAPACITOR NONPOLAR
1	0.1uF/6.3V	C4	CAPACITOR NONPOLAR
8	0R0	R27 R28 R29 R30 R31	RESISTER
		R32 R33 R34	
1	1.5K	R46	RESISTER
2	10K	R48 R49	RESISTER
5	10uF/10V	C23 C24 C25 C26 C27	CAPACITOR POLAR
8	15K	R1 R2 R3 R4 R5 R6 R7	RESISTER
		R8	
2	18pF	C28 C29	CAPACITOR NONPOLAR
2	18R+/-1%	R42 R43	RESISTER
2	1K	R35 R36	RESISTER
1	1K5	R50	RESISTER
4	1M	R37 R38 R44 R45	RESISTER
9	1M0	R18 R19 R20 R21 R22	RESISTER
		R23 R24 R25 R26	
1	1uF/6.3V	C22	CAPACITOR POLAR
3	22pF	C31 C32 C33	CAPACITOR NONPOLAR
1	24MHz	Y3	CRYSTAL
2	3.686400MHz	X1 Y2	OSC, CRYSTAL
1	330R	R39	RESISTER
2	33pF	C35 C36	CAPACITOR NONPOLAR
1	47pF	C34	CAPACITOR NONPOLAR
2	4K7	R40 R41	RESISTER
9	560R	R10 R11 R12 R13 R14	RESISTER
		R15 R16 R17 R9	
1	6MHz	Y1	CRYSTAL
1	87C52(40)	U5	CMOS MICROCONTROLLER
1	8K2	R51	RESISTER
1	ADM213E	U1	RS232 TRANSCEIVER
5	BLM21A10	L1 L2 L3 L4 L5	INDUCTOR
1	LED	D1 D2 D3 D4 D5	SMD LED DISPLAY
		D6 D7 D8	
1	DC-JACK	S2	DC-JACK
1	DSUB9/MALE/RT	J1	DSUB-CONNECTOR
2	HEADER 20X2	JP2 JP3	HEADER
1	HEADER 4	JP1	HEADER
1	HEADER 9X2	J2	HEADER
1	ISP1181-1	U3	ISP1181 USB Device
2	LED	D10 D9	LED DISPALY
1	SN74HC04	U4	Hex Inverters

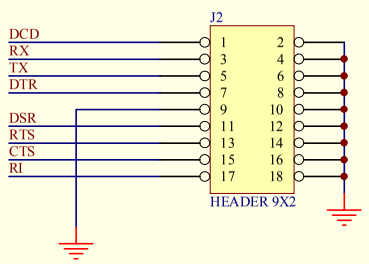
Used	Value	Designator	Description
1	SN74HCT240	U2	OCTAL BUF AND LIN DRV
1	SW DPDT	S1	DPDT SWITCH
1	SW-PB	S3	BUTTOM SWITCH
1	TL16C550C_TQFP48	R47	TI UART CHIP
1	USB_UPCON	J3	USB UPSTREAM CONNECTOR

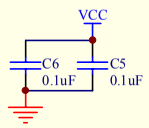
11. Schematics of the Demo Board









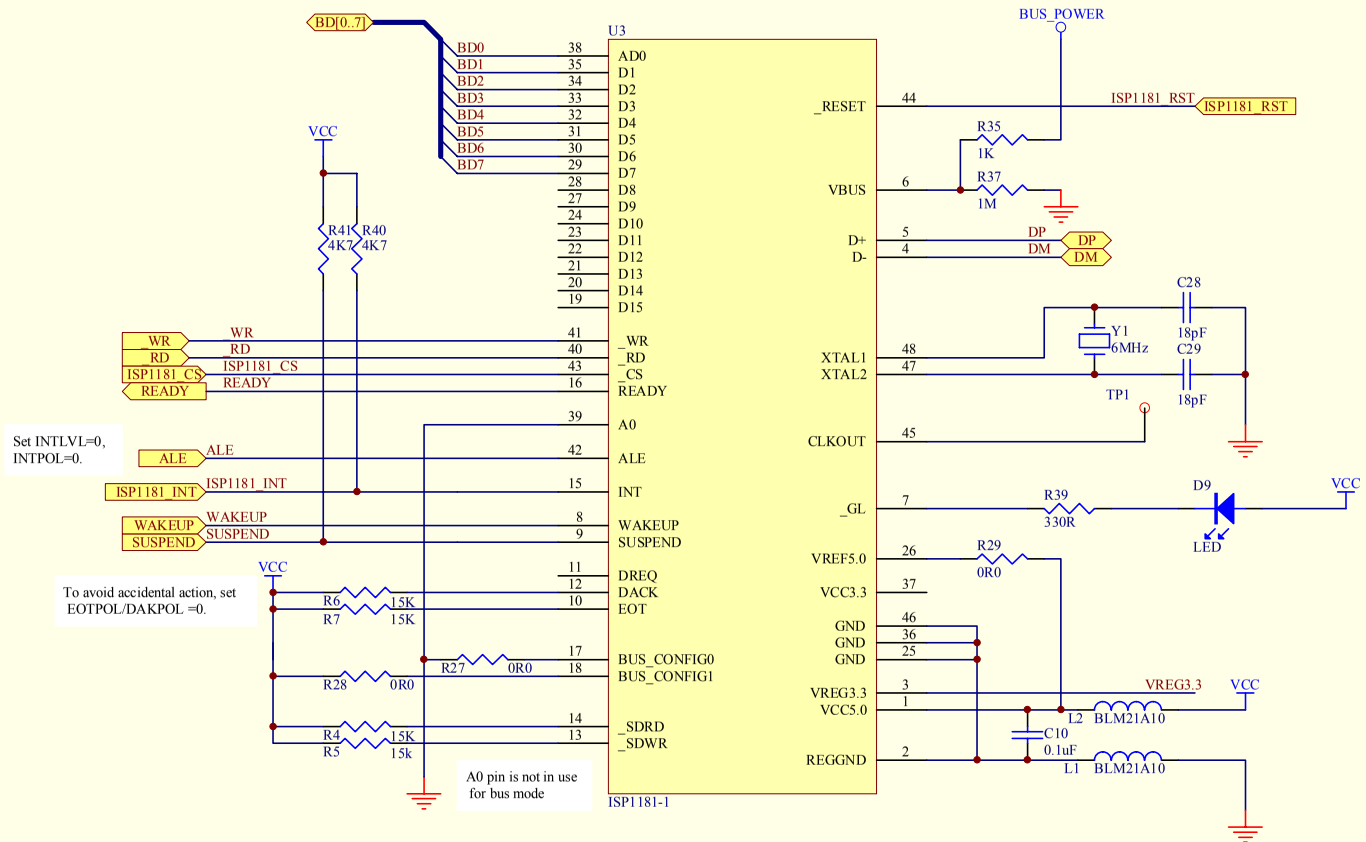


Design Change Notice:

1.U1: The Pin 11 of U1(ADM213E) should be directly connected to Vcc. The Pin13 of U1 should be connected to Vcc via a Capacitor (C4).

2.U2A/B: All input pins (Pin2, 4, 6, 8, 11,13,15 and 17) of U2A/B should be connected to Net SOUT, _DTR, _RTS, SIN, _DSR, _CTS, _DCD and _RI respectively.

Title			Protel Technology Inc. 4675 Stevens Creek Blvd. Suite 200 Santa Clara, CA 95051 USA
Size: A3	Number:	Revision:	
File: H:\APPS_TEMP\Projects\USB2SER\USB2SER.ddb	Drawn By:	Date: 14-Dec-2001	Time: 11:08:24 Sheet 2 of 6

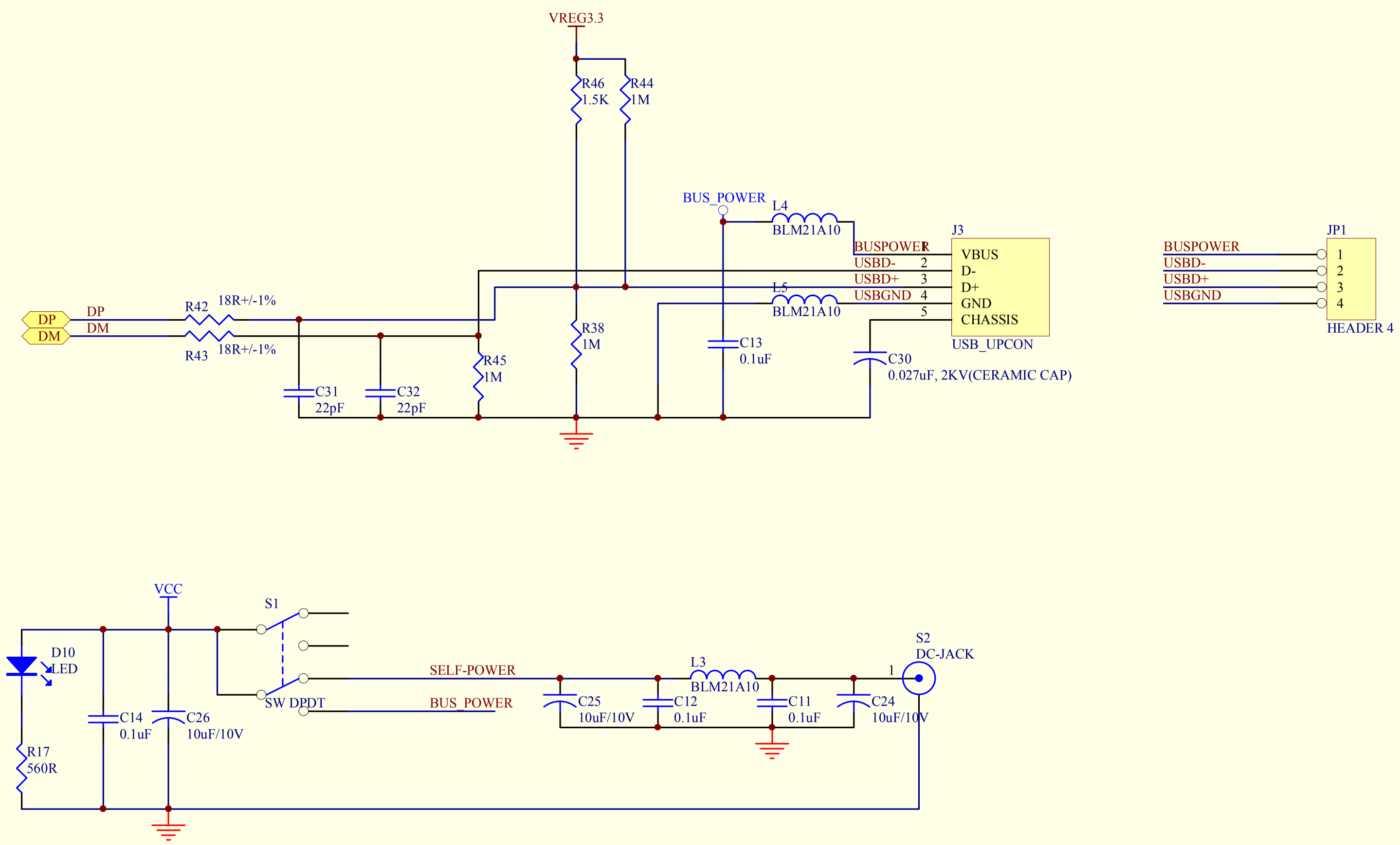


Design Change Notice:

1. U3: The pin26 of U3 should be connected to GND via a capacitor (0.1uF). So remove R29 first. then replace a 0.1 cap and connected this cap to ground.

2. U3: Remove L1 and connect pin2 of U3 to GND directly.

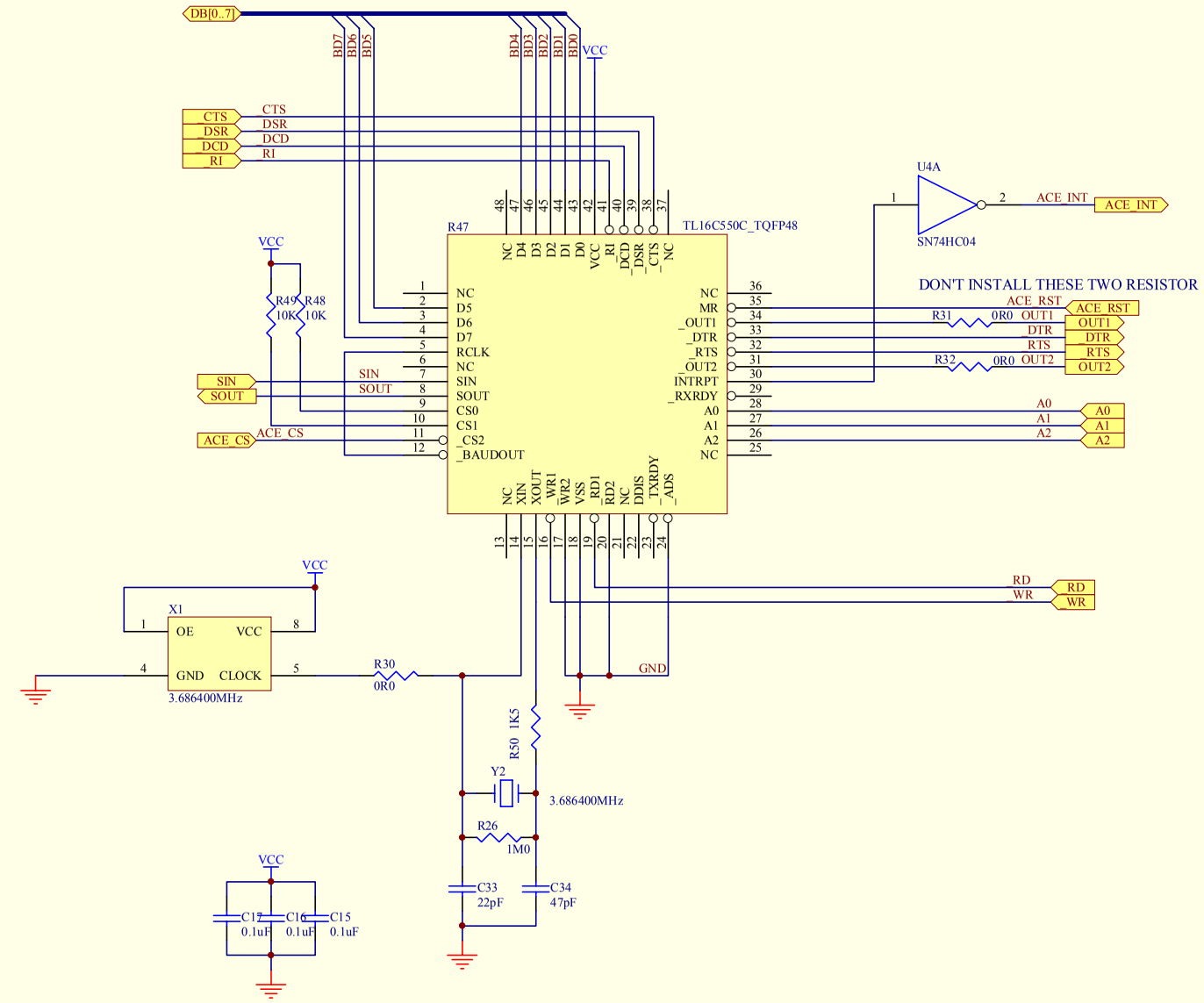
Title: *ISP1181 EVALUATION BOARD - ISP1181*			*Protel Technology Inc.* *4675 Stevens Creek Blvd.* *Suite 200* *Santa Clara, CA 95051* *USA*
Size: A3	Number: 0000	Revision: 0.0	
File: H:\APPS_TEMP\Projects\USB2SER\Doc\SCH\Design2\PCB\ISP1181.ddb			Sheet 3 of 6



Design Change Notice:

1. C31, C32, R46, R38: Remove C31, C32, R46 and R38 permanently.

Title: ISP1181 EVALUATION BOARD - ISP1181			Protel Technology Inc. 5675 Stevens Creek Blvd. Suite 200 Santa Clara, CA 95051 USA
Size: A3	Number: 0000	Revision: 0.0	
File: H:\APPS_TEMP\Projects\USB2SER\DataSCH ...			Sheet 4 of 6



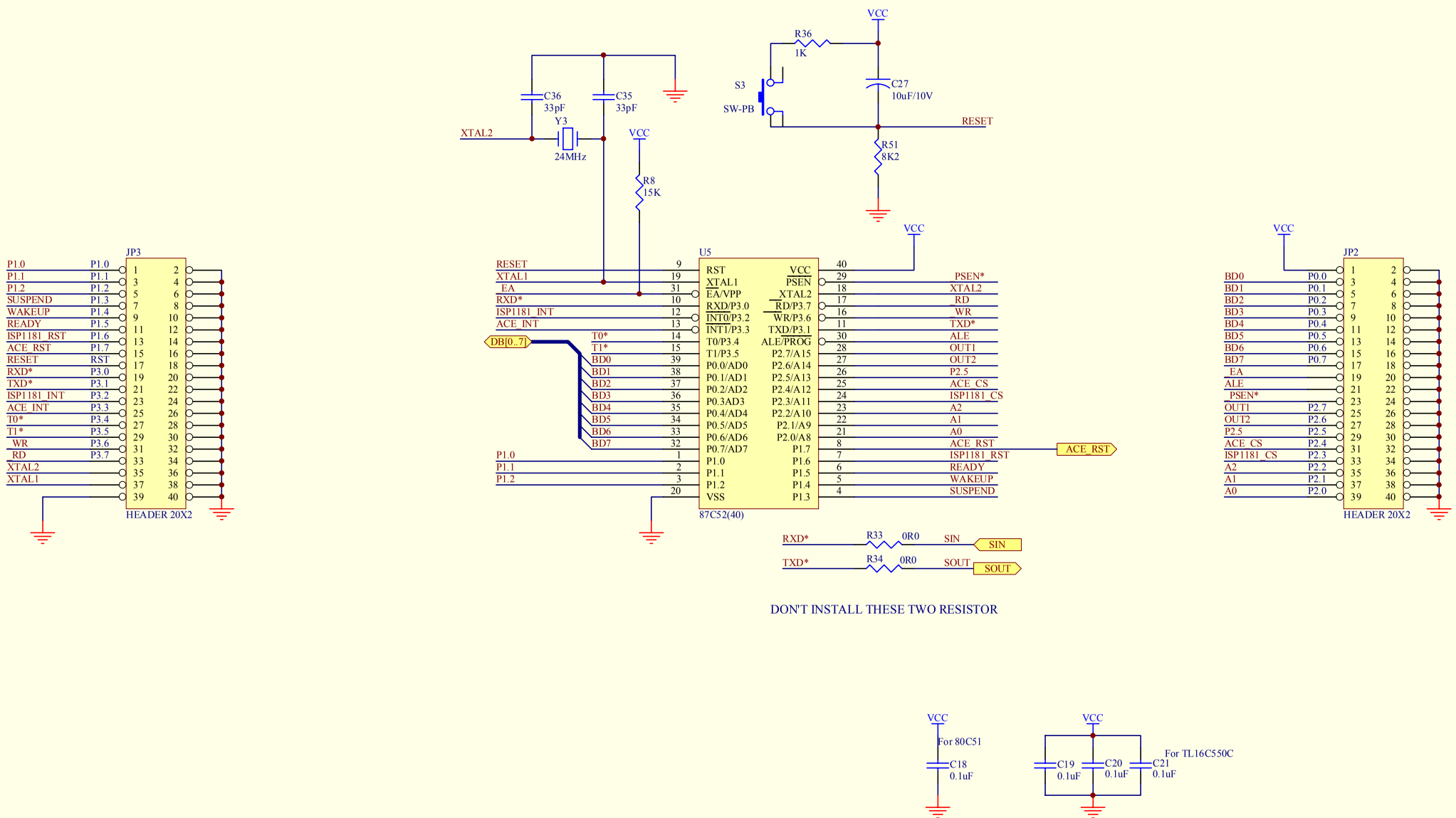
Design Change Notice:

1. X1, R30: Remove X1 and R30 if a crystal is uesd to generate the clock..

2. Y2, R50, R26, C33, C34: Remove all these parts (Y2, R50, R26,C33 and C34), if X1 is uesd.

3. R31, R32: Remove R31 and R32.

Title			Protel Technology Inc. 4675 Stevens Creek Blvd. Suite 200 Santa Clara, CA 95051 USA
Size: A3	Number:	Revision:	
File: H:\APPS_TEMP\Projects\USB2SER1\USB2SCI1.ddb	Date: 14-Dec-2001	Time: 14:23	Sheet 5 of 6



Design Change Notice:

1. R33, R34: Remove R33 and R34.

Title			Protel Technology Inc. 4675 Stevens Creek Blvd. Suite 200 Santa Clara, CA 95051 USA
Size: A3	Number:	Revision:	
File: H:\APPS_TEMP\Projects\USB2SER1\USB2SER1.DDB	Drawn: 14-Dec-2001	Time: 11:51:57	Sheet 6 of 6