PI3USB30532, PI3USB31532 evaluation boards User's manual

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1.0 Introduction

The PI3USB30532, PI3USB31532 type-C evaluation boards are using a demo version of the Cypress CCG2 PD controller to control PI3USB3X532 for the evaluation of the crossover switch functions of DP and USB 3.0.

2.0 Quick start

2.1. Connect the setup (figure 1):

- Connect the +5V >3A power and 0V ground to external +5V >3A power supply for both source and sink evaluation boards.
- Connect to DP source (NB, etc.) and DP sink monitor using the two 3" DP cables provided.
- Connect between source and sink evaluation boards using the 3" type-C cable provided.
- Connect to USB 3.0 host using the 3" USB 3.0 cable provided.
- Connect to USB 3.0 device (HDD, etc.) not provided.

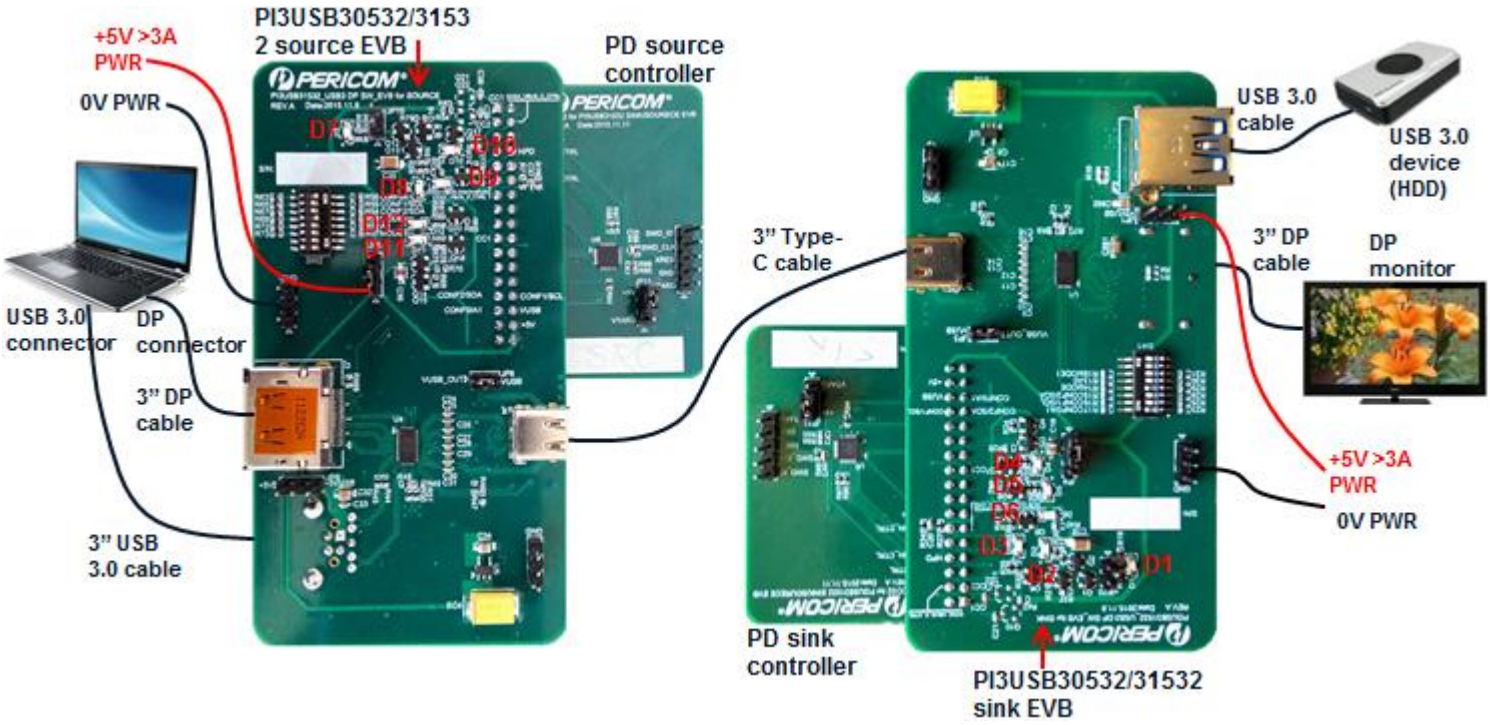


Figure 1, PI3USB30532, PI3USB31532 PD source and sink evaluation boards test setup

2.2 Start the test

DP test

After connections and power-on, plug the type-C cable (re-plug if needed) till the PD controller randomly fall-in DP mode (rather than USB 3.0 mode) as the DP mode LEDs indication below.

DP mode LEDs indication (the same for both type-C cable flip and non-flip):

- Source evaluation board:
  - D8, D9, D10 = ON;
  - D7, D11, D12 = off

- Sink evaluation board:
  - D2, D3, D4, D6 = ON;
  - D1, D5 = off

USB 3.0 test

After connections and power-on, plug the type-C cable (re-plug if needed) till the PD controller randomly fall-in USB 3.0 mode (rather than DP mode) as the USB 3.0 mode LEDs indication below.

SUB 3.0 mode LEDs indication (the same for both type-C cable flip and non-flip):

- Source evaluation board:
  - D8, D10, D11 = ON;
  - D7, D9, D12 = off;
- Sink evaluation board:
  - D1, D2, D6 = ON;
  - D3, D4, D5 = off

3.0 The over stress evaluation test setup

The PI3USB3X532 evaluation boards shipping package includes two 3" DP cables and one 3" type-C cable to provide an over-stress test setup (figure 1) as to compare to the less stressful real cases using PI3USB3X532 in source and sink system designs, as the comparison below.

1.
Evaluation setup (figure 1) has total 9" cable, two PI3USB3X532 passive switches in cascading, six connectors and 4" extra trace on the two evaluation boards, as:

"Trace + DP source connector" → 3" DP cable → **"DP connector + PI3USB3X532 + 2" trace + type-C source connector"** → 3" type-C cable → **"Type-C sink connector + PI3USB3X532 + 2" trace + DP connector"** → 3" DP cable → "**DP connector in monitor"**

2.
Real source system design using PI3USB3X532 has total 3"-6" type-C cable, one PI3USB3X532, two connectors. No cascading of PI3USB3X532, no extra traces, cables, connectors on evaluation boards, as:

"Trace + PI3USB3X532 + type-C source connector" → 3" – 6" type-C cable → "**Type-C sink connector in monitor"**

3.
Real sink system design using PI3USB3X532 has total 3" - 6" type-C cable, one PI3USB3X532, two connectors. No cascading of PI3USB3X532, no extra traces, cables, connectors on evaluation boards, as:

"Trace + type-C source connector" → 3" - 6" type-C cable → "**Type-C sink connector + PI3USB3X532 in DP monitor**

4.0 The GPIO and I2C control of PI3USB3X532

There is no need to change the original-default settings of the PI3USB3X532 evaluation boards for all the PD evaluation tests.
But for just in case needed, manual GPIO and I2C control tests can be performed as following.

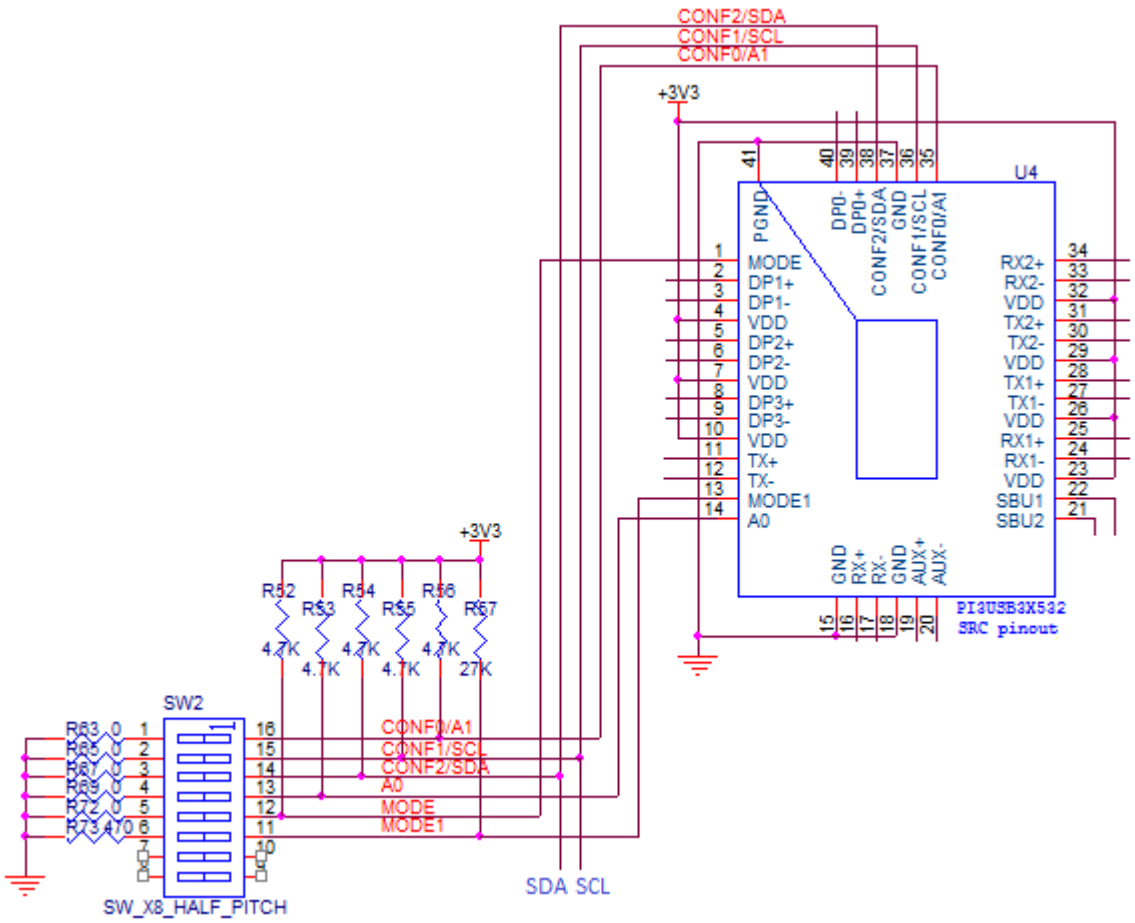


Figure 2, the GPIO and I2C control settings for source evaluation board (settings for sink evaluation board are similar)

GPIO control

Please refer to the "configuration table for source application" and "configuration table for sink application" in PI3USB3X532 datasheet and figure 2 for GPIO crossover switching control settings, also with the settings below:

MODE=0
MODE1=1
A0=0

I2C control

Please refer to the "configuration table for source application" and "configuration table for sink application" in PI3USB3X532 datasheet, figure 2 and figure 3 for I2C crossover switching control settings, also with the settings below:

MODE=1
MODE1=1
A0=0
A1=0

PI3USB3X532 has total three I2C registers as Conf [2:0], which is mapped between the I2C control signals and the configuration tables (source, sink) as in figure-7.

When using I2C interface to control PI3USB3X532, the I2C controller (in PD or MCU) will need sending total three bytes to PI3USB30532 in sequence as:

Start →

→#1 byte for address as "10101000" (assuming A1_A0 set to 00, while last 0 for write)"

→#2 byte for chip-ID as fixed "00000000"

→#3 byte for Conf [2:0] control as "00000111" (assuming Conf [2:0]=111 as for USB3+DPx2 swapped)

→Stop (must have stop, otherwise uncertainty may occur)

Configuration Table for Source Application (page 3)

Switch	Open	Open	4 lane of DP1.2	4 lane of DP1.2 Swap	USB3	USB3 Swap	USB3 +2 lane of DP1.2	USB3 +2 lane of DP1.2 Swap
Conf[2:0]	000	001	010	011	100	101	110	111

Configuration Table for Sink Application (page 4)

Switch	Open	Open	4 lane of DP1.2	4 lane of DP1.2 Swap	USB3	USB3 Swap	USB3 +2 lane of DP1.2	USB3 +2 lane of DP1.2 Swap
Conf[2:0]	000	001	010	011	100	101	110	111

I2C Control register: (page 8)

	Register Bits							
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Slave address (First byte is slave address)	1	0	1	0	1	A1	A0	0/1 (W/R)
Vendor ID (Second byte is vendor ID, read only)	0	0	0	0	0	0	0	0
Selection control (Third byte is for selection control, read/write)	0	0	0	0	0	conf[2]	conf[1]	conf[0]

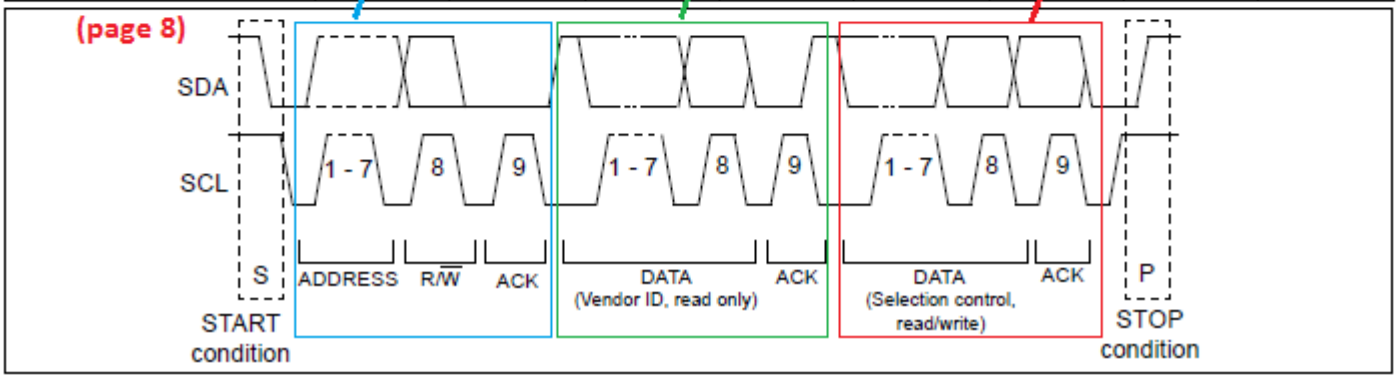


Figure3, the I2C-control of the configuration table for source-sink (source-sink tables are the same)

I2C-control of PI3USB3X532 in real application

For both source and sink applications, when a type-C plug is plugging into the source or sink type-C connectors with PI3USB3X532 and PD, the I2C controller (in PD or MCU) shall I2C-control PI3USB3X532 as:

DPx4 only, non-swap:

Start →10101000 (last 0 for write) →00000000→00000**010**→stop

DPx4 only, swapped:

Start →10101000 →00000000→00000**011**→stop

USB3.0 only, non-swap:

Start →10101000 →00000000→00000**100**→stop

USB3.0 only, swapped:

Start →10101000 →00000000→00000**101**→stop

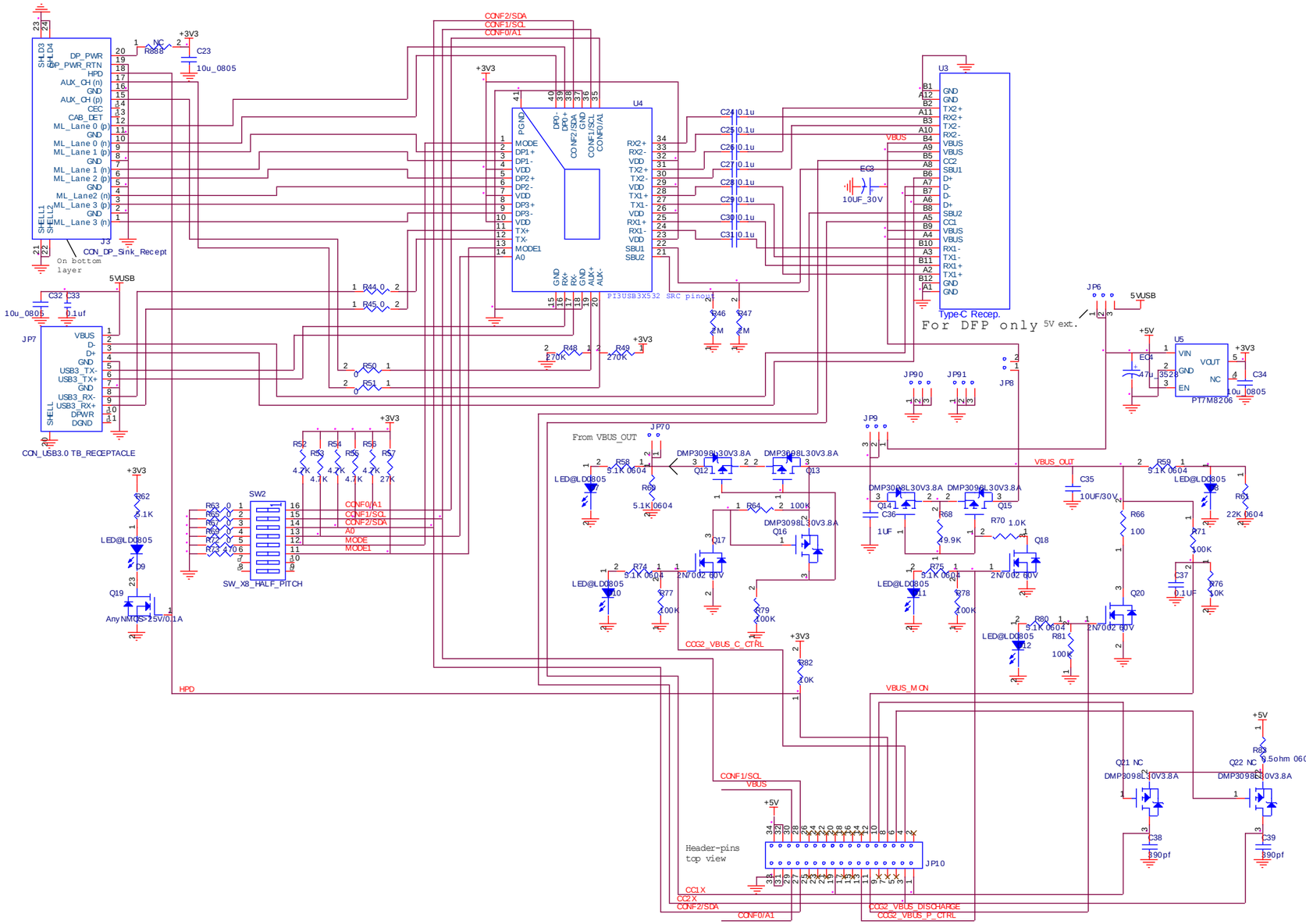
USB3+DPx2, non-swap:

Start →10101000 →00000000→00000**110**→stop

USB3+DPx2, swapped:

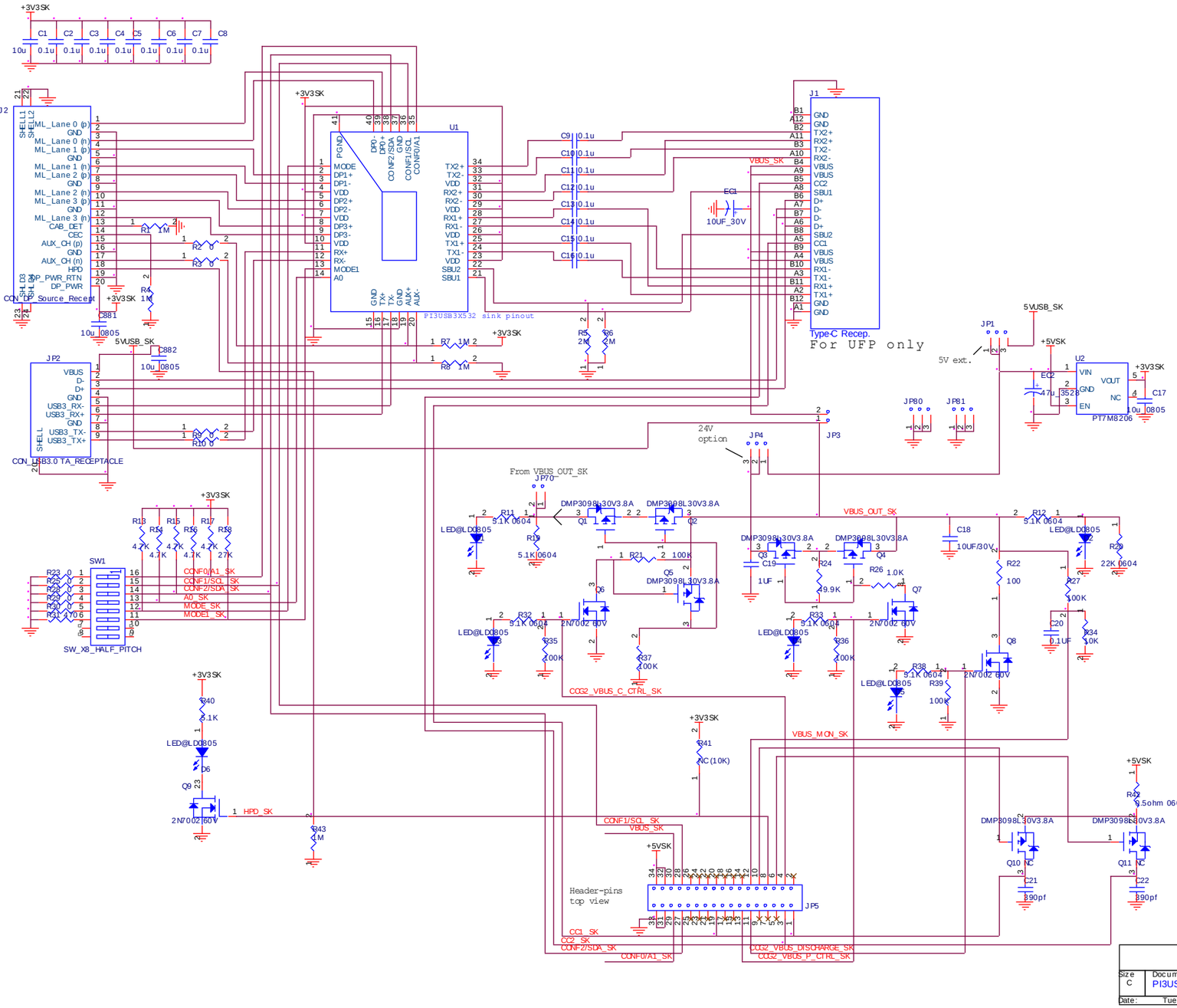
Start →1010100 →00000000→00000**111**→stop

5.0 Appendix: PI3USB30532, PI3USB31532 and PD controller evaluation boards schematics



Pericom Semiconductor Corporation		
Size C	Document Name PI3USB30532 PI3USB31532 source EVB	Rev A
Date: Tuesday, February 23, 2016	Sheet 3 of 4	

PI3USB30532, PI3USB31532 source evaluation board schematic



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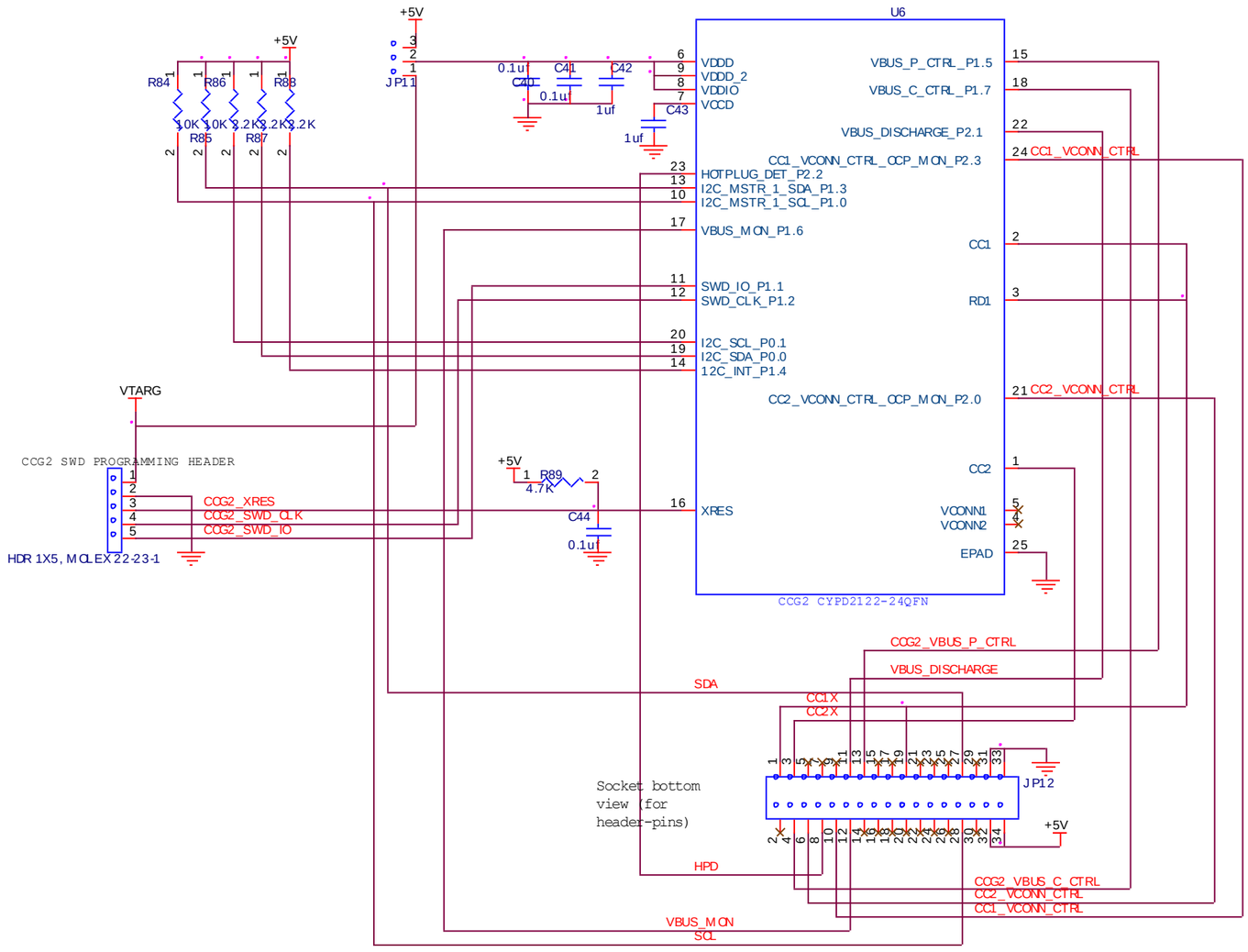
Size C	Document Name: PI3USB30532 PI3USB31532 sink EVB	Rev A
Date: Tuesday, February 23, 2016	Sheet 2 of 4	

PI3USB30532, PI3USB31532 sink evaluation board schematics



Using the same CCG2 board with different firmware for both PI3USB3X532 sink EVB and source EVB

Pericom Semiconductor Corporation		
Size B	Document Name: CCG2 board for both PI3USB3X532 sink source EVB	Rev A
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PD controller schematic for PI3USB30532, PI3USB31532 evaluation boards