

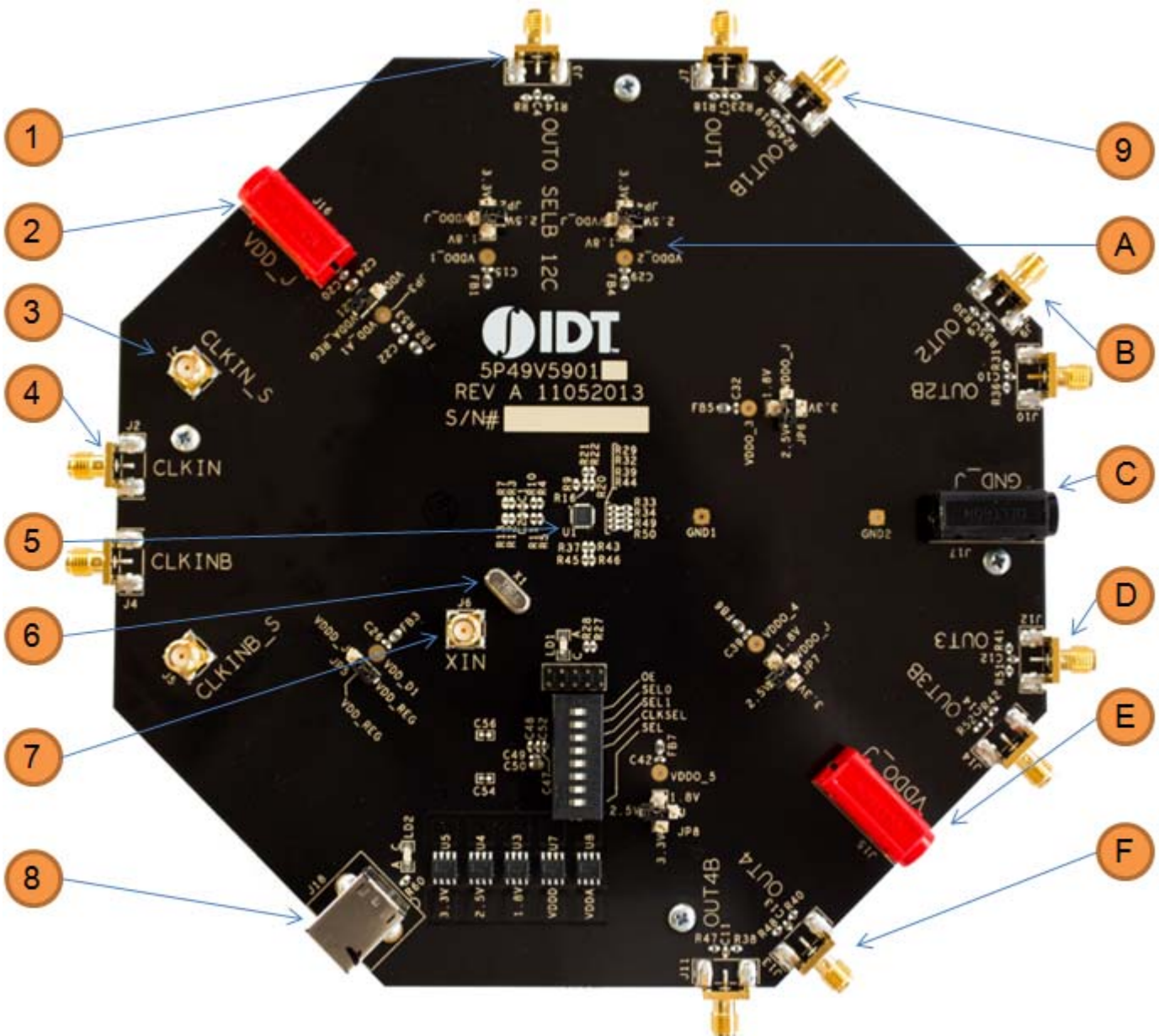
## Introduction

The evaluation board is designed to help the customer evaluate the 5P49V5901, the latest addition to the family of programmable devices in IDT's Timing portfolio. When the board is connected to a PC running IDT Timing Commander™ Software through USB, the device can be configured and programmed to generate frequencies with best-in-class performances.

## Board Overview

Use the following diagram to identify: power supply jacks, USB connector, input and output frequency SMA connectors.

Figure 1. Board Overview



- ① OUT0 - This is a buffered output of the input reference clock, singled ended.
- ② Power supply jack, J16 – Connect to 3.3V, 2.5V or 1.8V for the core voltage of the device.
- ③ CLKIN\_S/CLKINB\_S – SMA pair used to monitor the differential input CLKIN/CLKINB.
- ④ Differential Input clock connector – A differential clock can be connected as a source for the device.
- ⑤ 5P49V5901 – the device to be evaluated.
- ⑥ Crystal – On-board crystal, 25MHz. There are two package holders for crystals: one through-hole and a surface-mount (3225) on the bottom layer of the board.
- ⑦ XIN connector – This SMA connector is for single-ended clock input. Please note the full swing of this input is 1.2V maximum.
- ⑧ USB connector – Used this connector to connect with your PC to run IDT Timing Commander Software.
- ⑨ OUT1 /OUT1B – Output 1. It can be a differential pair or two individual single-ended outputs. By default, it's an LVPECL differential output.
- Ⓐ Output voltage selector – 4-way header to select an output voltage. The center pin is the output voltage. Use the jumper to select from 1.8V, 2.5V or 3.3V. VDDO\_J is the voltage from J15 (see E).
- Ⓑ OUT2/OUT2B – Output 2. It can be a differential pair or two individual single-ended outputs. By default, it's an LVPECL differential output.
- Ⓒ Ground Jack – J17. If J15 and/or J16 is used for power supply, this jack is the power return.
- Ⓓ OUT3/OUT3B – Output 3. It can be a differential pair or two individual single-ended outputs. By default, it's an LVPECL differential output.
- Ⓔ Output Voltage Jack – J15. Connect to a voltage of 1.8V, 2.5V or 3.3V for output voltages.
- Ⓕ OUT4/OUT4B – Output 4. It can be a differential pair or two individual single-ended outputs. By default, it's an LVPECL differential output.

## Board Power Supply

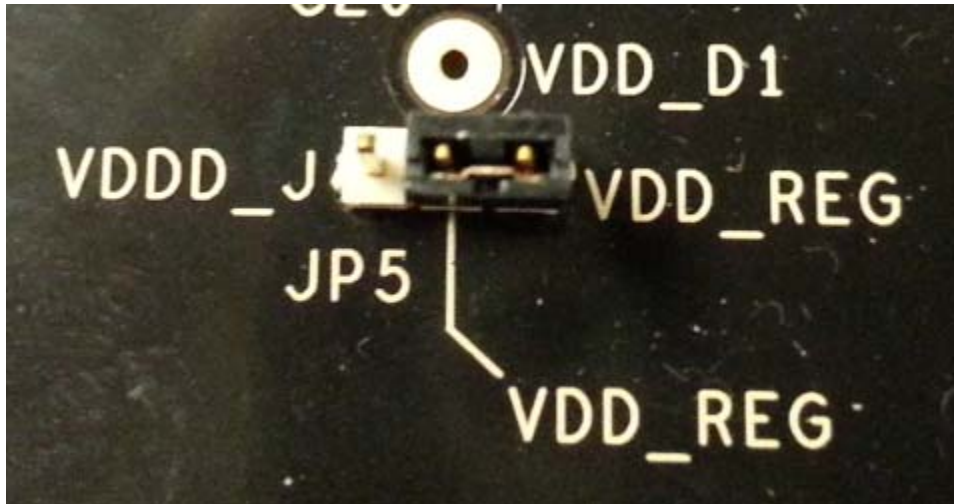
### • Core Voltages

The core voltage includes a digital voltage VDDD and an analog voltage VDDA. Both core voltages can be powered by an external bench power supply or by USB.

**Bench Power Supply** – To supply VDDD with a bench power supply, connect power to J16. To supply VDDA with a bench power supply, connect power to J15. In the same time, place the jumpers in JP3 and JP5 to connect VDDA\_J and VDDD\_J, respectively.

**USB Power Supply** – When the board is connected to a PC through a USB cable, on-board voltage regulators will generate a 3.3V for the device. In this case, place the jumpers in JP3 and JP5 to connect VDDA\_REG and VDDD\_REG, respectively. See JP5 jumper position for VDDD\_REG in the following figure. USB power source is recommended because it's readily available right from your laptop.

**Figure 2. Jumping to the VDDD\_J side will select external bench power supply; Jumping to the VDD\_REG side will select power source from on-board regulators powered by USB**

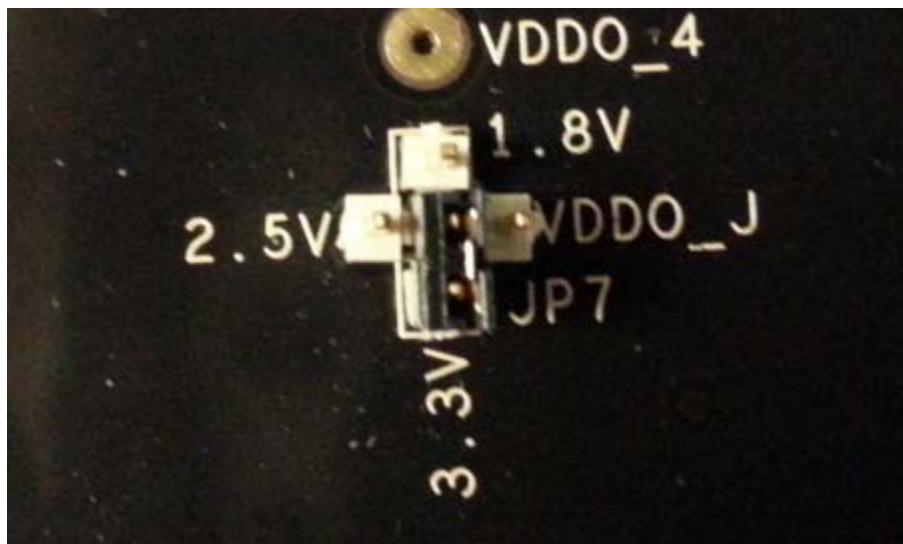


**• Output Clock Voltages**

Like VDDA and VDDD having two sources, each output voltage VDDO0~4 is also provided with two sources to choose from: bench power supply or powered from USB. The selection is made by a 4-way header as shown in Figure 3 below. Jumping to VDDO\_J will select external power supply (JP15 and JP16 are connected to external power supply); Jumping to 1.8V, 2.5V or 3.3V will select each respective voltage from on-board voltage regulators powered by USB port.

**Please note:** each output voltage can be individually selected. Use the label on the evaluation board: VDDO\_1 for OUT0, VDDO\_2 for OUT1, VDDO\_3 for OUT2, VDDO\_4 for OUT3 and VDDO\_5 for OUT4.

**Figure 3. Use the jumper to select a voltage for OUT3: 1.8V/2.5V/3.3V is from on-board voltage regulators powered by USB; VDDO\_J is from external power supply connecting to JP15 and JP16**



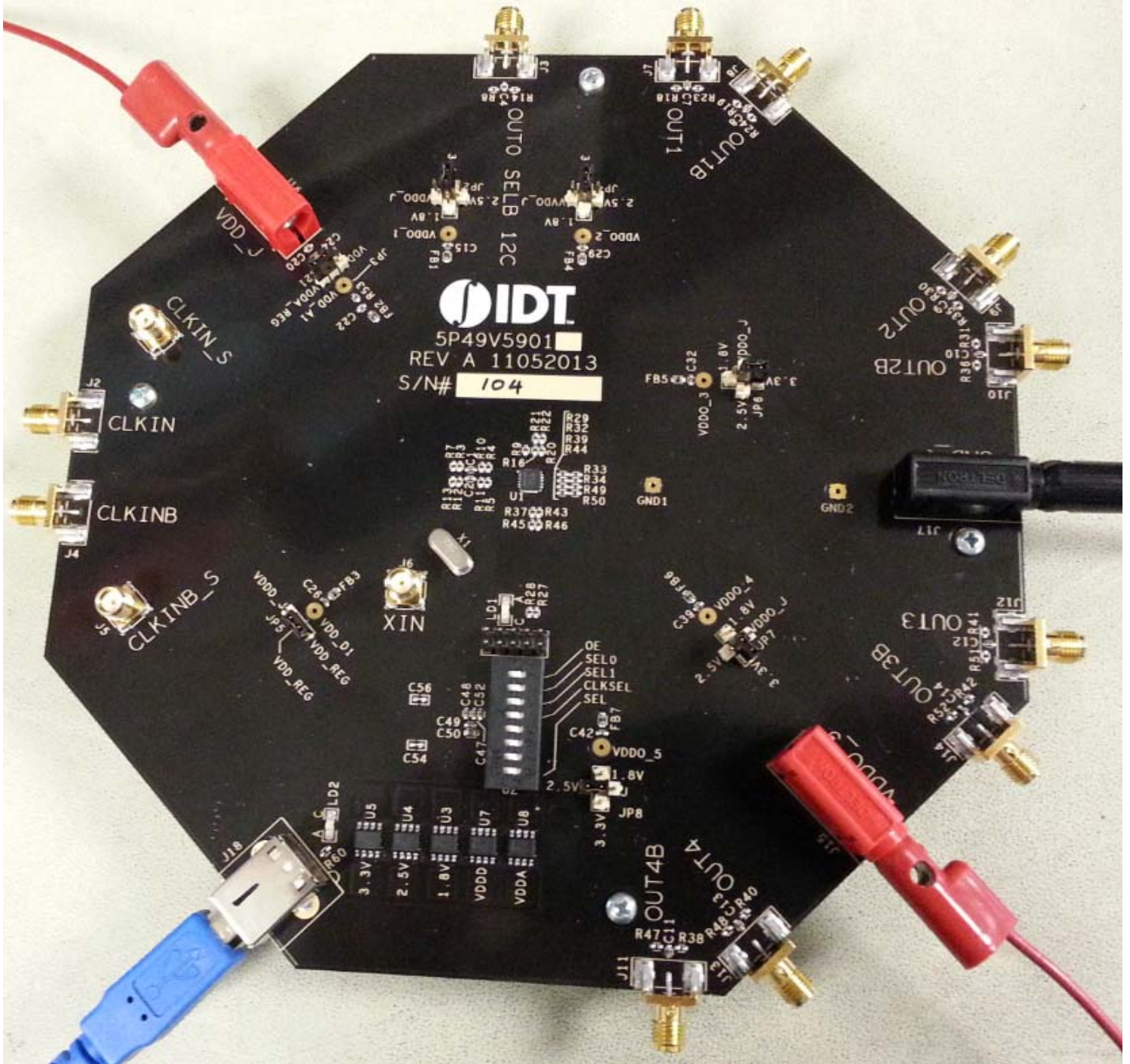
## Connecting the Board

The board is connected to a PC through a USB connector for configuring and programming the device, as shown in Figure 4 below. The USB interface will also provide +5V power supply to the board, from which on-board voltage regulators generate various voltages for the core as well as for each output.

The board can also be powered by a bench power supply by connecting two banana jacks J15, J16 for output and core voltages, respectively. Please see board power supply section for details.

**Note:** The USB port only supports USB 2.0; USB 3.0 is not supported at this time.

**Figure 4. Connecting the Board with USB Port for Communications with Timing Commander Software**



## On-Board Crystal

A 25MHz crystal is installed on the board. It can source a reference frequency to the device when CLKIN/CLKINB is not used. The device can reference from either the crystal or an external clock source. Clock source can be selected within GUI software. Other input reference can be supplied to CLKIN/CLKINB (differential) or XIN (LVCMOS with full swing of 1.2V) connectors.

## Board Default Frequency Output

When 25MHz crystal is installed, the device will have two default outputs: OUT0 = 25MHz, OUT1 = 100MHz.

## Configuration and Setup

Use the following steps to setup the board using I<sup>2</sup>C and start the configuration of the board.

1. Set SEL pin (pin 8) of dip switch (U2) to "0" to select I2C mode.
2. Connect J18 to a USB port of the PC using the supplied I2C cable.
3. Power up the board.
4. Launch VC5 Timing Commander Software (refer to VC5 Timing Commander User Guide - Getting Started Step 1~7).  
Following the Getting Started steps in the Timing Commander software, an I<sup>2</sup>C connection is established between the GUI software and VC5 chip.
5. Load the setting file into the GUI and write the settings to the chip.
6. All intended outputs should be available for measurement.

## Board Schematics

Evaluation board schematics are shown on the following pages.



Figure 6. VersaClock 5 Evaluation Board Schematics – Page 2

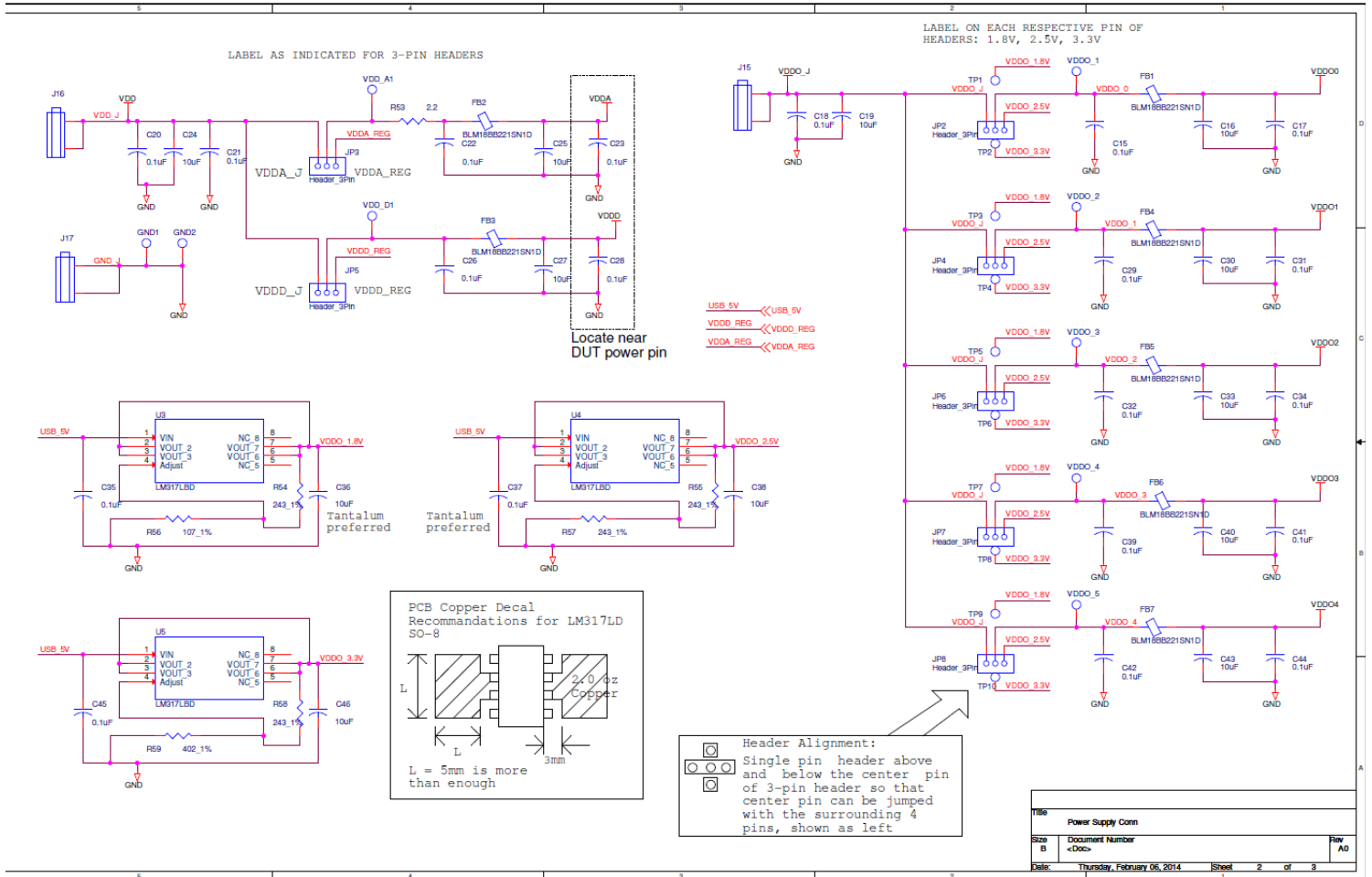
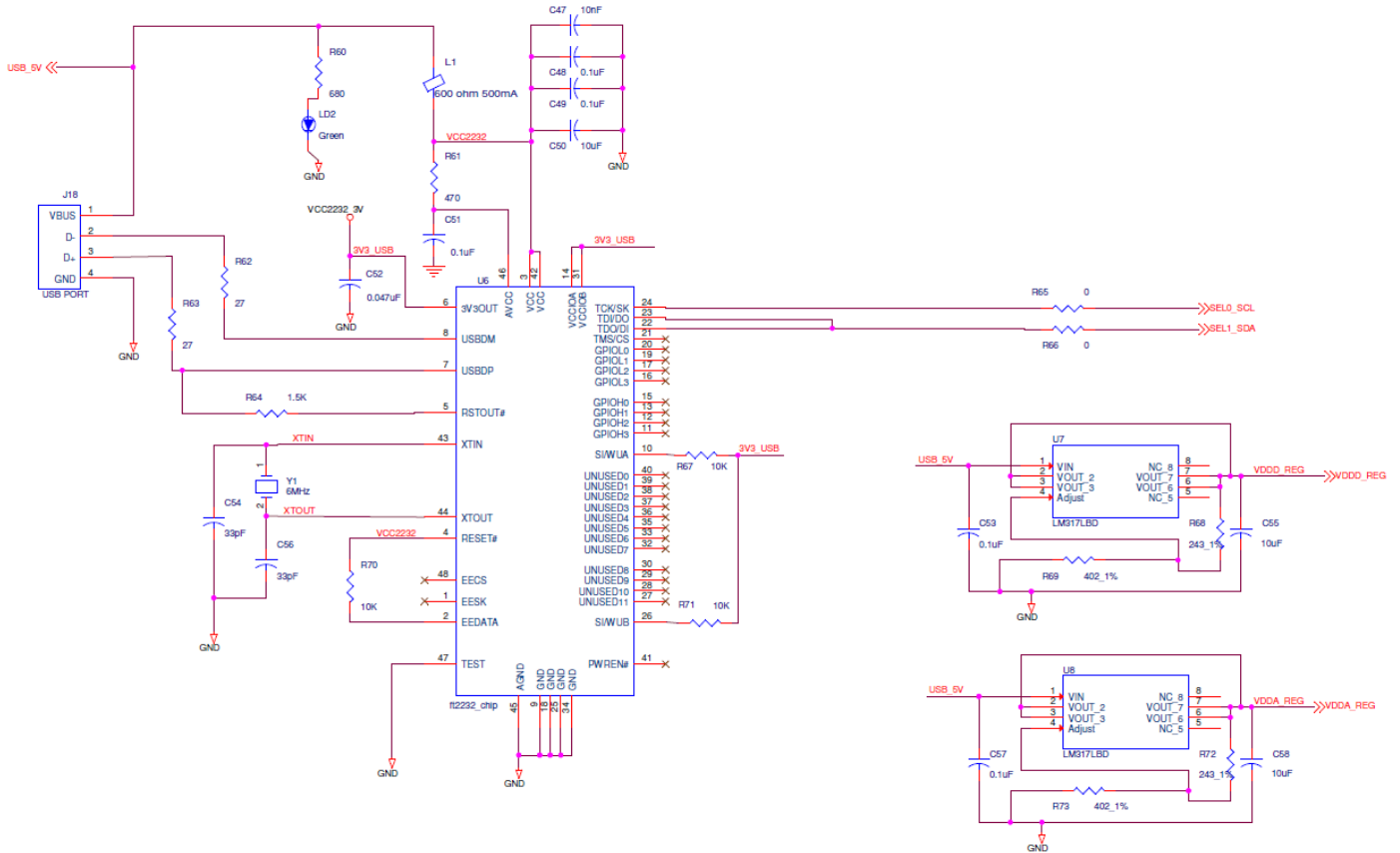


Figure 7. Evaluation Board Schematics – Page 3



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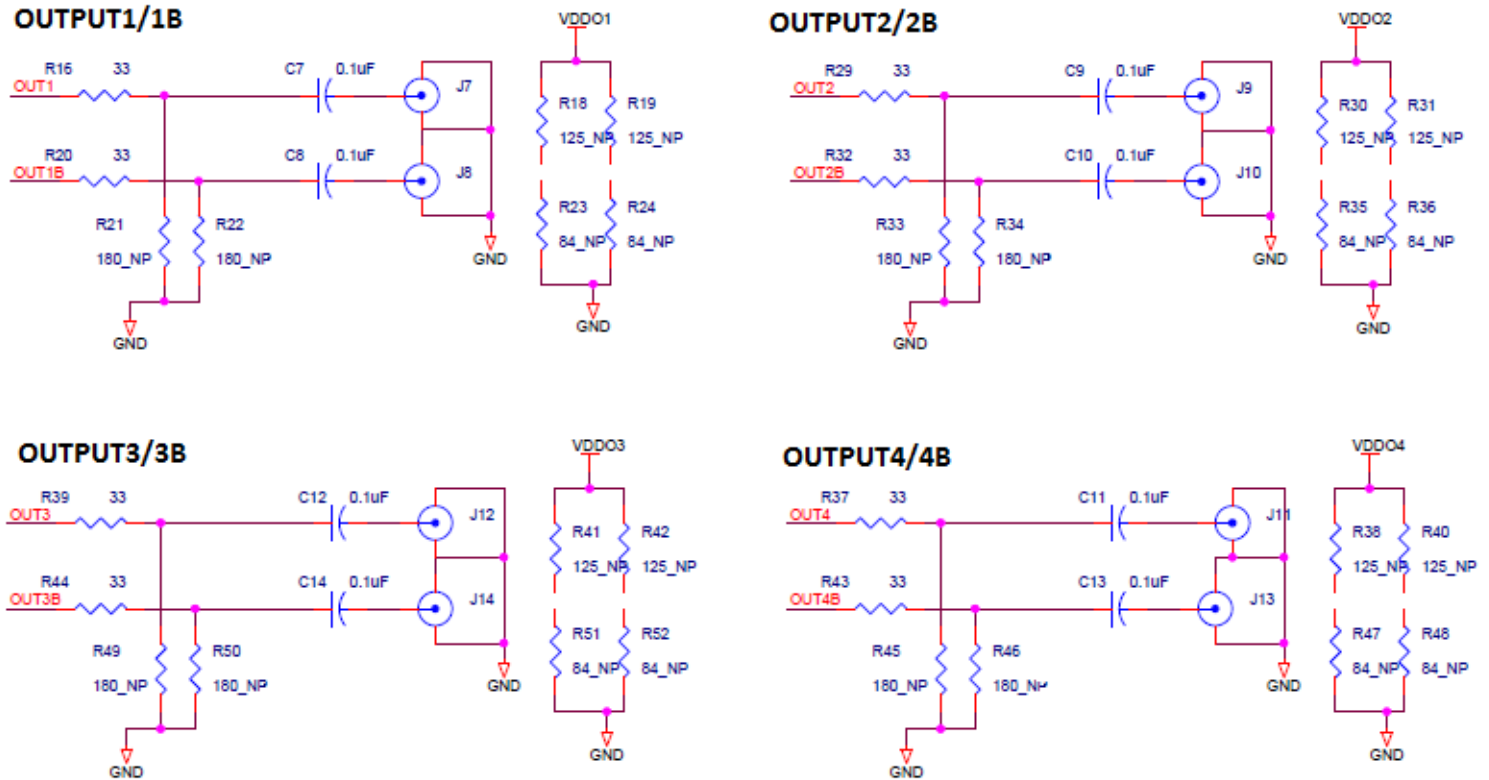


## Signal Termination Options

Termination options for OUTPUT1 – 4 in the evaluation board are displayed in Figure 8. The termination circuits are designed to optionally terminate the output clocks in LVPECL, LVDS, LVCMOS and HCSL signal types by populating (or not-populating) some resistors. DC or AC coupling of these outputs are also supported.

Tables 1 – 4, below, tabulates component installations to support LVPECL, HCSL, LVCMOS and LVDS signal types for OUTPUT1 – 4, respectively. Please note that by doing so, the output signals will be measured and terminated by an oscilloscope with a 50Ω internal termination.

**Figure 8. Output Termination Options**



**Table 1. Termination Options for OUTPUT1**

Signal Type	Series Resistors: R16, R20	180-ohm pull-down: R21, R22	Series Capacitor: C7, C8	Resistor Network: R18, R19, R23, R24
LVPECL	0 Ω	Installed	0.1 μF	Not installed
HCSL	33 Ω	Not installed	0 Ω	Not installed
LVCMOS	33 Ω	Not installed	0.1 μF	Not installed
LVDS	0 Ω	Not installed	0.1 μF	Not installed

**Table 2. Termination Options for OUTPUT2**

Signal Type	Series Resistors: R29, R32	180-ohm pull-down: R49, R50	Series Capacitor: C9, C10	Resistor Network: R30, R31, R35, R36
LVPECL	0 $\Omega$	Installed	0.1 $\mu\text{F}$	Not installed
HCSL	33 $\Omega$	Not installed	0 $\Omega$	Not installed
LVC MOS	33 $\Omega$	Not installed	0.1 $\mu\text{F}$	Not installed
LVDS	0 $\Omega$	Not installed	0.1 $\mu\text{F}$	Not installed

**Table 3. Termination Options for OUTPUT3**

Signal Type	Series Resistors: R39, R44	180-ohm pull-down: R21, R22	Series Capacitor: C12, C14	Resistor Network: R41, R42, R51, R52
LVPECL	0 $\Omega$	Installed	0.1 $\mu\text{F}$	Not installed
HCSL	33 $\Omega$	Not installed	0 $\Omega$	Not installed
LVC MOS	33 $\Omega$	Not installed	0.1 $\mu\text{F}$	Not installed
LVDS	0 $\Omega$	Not installed	0.1 $\mu\text{F}$	Not installed

**Table 4. Termination Options for OUTPUT4**

Signal Type	Series Resistors: R37, R43	180-ohm pull-down: R45, R46	Series Capacitor: C11, C13	Resistor Network: R38, R40, R47, R48
LVPECL	0 $\Omega$	Installed	0.1 $\mu\text{F}$	Not installed
HCSL	33 $\Omega$	Not installed	0 $\Omega$	Not installed
LVC MOS	33 $\Omega$	Not installed	0.1 $\mu\text{F}$	Not installed
LVDS	0 $\Omega$	Not installed	0.1 $\mu\text{F}$	Not installed

As noted, 4-resistor network is not installed in Table-1 – 4 because oscilloscope with internal 50 $\Omega$  termination is utilized for signal termination and measurement. If an AC-coupled, stand-alone LVPECL output is needed (without oscilloscope connections), the 4-resistor network needs to be installed accordingly.

**Table 5. Resistor Network Termination for LVPECL for OUTPUT1**

Signal Type	Series Resistors: R37, R43	180-ohm pull-down: R45, R46	Series Capacitor: C11, C13	Resistor Network: R18, R19, R23, R24
LVPECL	0 $\Omega$	Installed	0.1 $\mu\text{F}$	R18 = R19 = 125 $\Omega$ R23 = R24 = 84 $\Omega$

## Orderable Part Numbers

The following evaluation board part numbers are available for order.

**Table 6. Orderable Part Numbers**

Part Number	Description
EVKVC5-5901HCSL	Evaluation board with all outputs terminated as HCSL
EVKVC55901LPECL	Evaluation board with all outputs terminated as LVPECL
EVKVC5-5901LVDS	Evaluation board with all outputs terminated as LVDS
EVKVC55901LCMOS	Evaluation board with all outputs terminated as LVCMOS
EVKVC5-5901ALL	Evaluation board with one output of each type of signal terminations



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