CDCE(L)9xx Performance Evaluation Module

This user's guide explains how to use the CDCE(L)9xx Performance Evaluation Module (EVM), which is a generic PCB that can handle all the CDCE(L)9xx devices. The CDCE9xx is soldered on the PCB for best performance; therefore, it is necessary to specify the desired device when ordering the EVM. The assembly of the EVM is slightly different for each member of the family. However, the basic functionality remains the same.

The following EVMs will be available within summer 2007:

* CDCE949EVM
* CDCE925EVM
* CDCE913EVM

CDCEL9xx versions will follow later.

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1 Block Diagram

Figure 1. CDCE(L)9xx Simplified Block Diagram (Default Setup)

1.1 Features

- Easy-to-use evaluation module for fast prototyping and application evaluation, supporting the entire clock family.
- Easy and fast device programming through TI Pro-Clock™ software
- Evaluation of multiple crystals and reference clocks due to flexible input structure
- EVM completely USB powered in factory default
- Option for USB power and external power supply
- No need for programming or notebook/PC connection
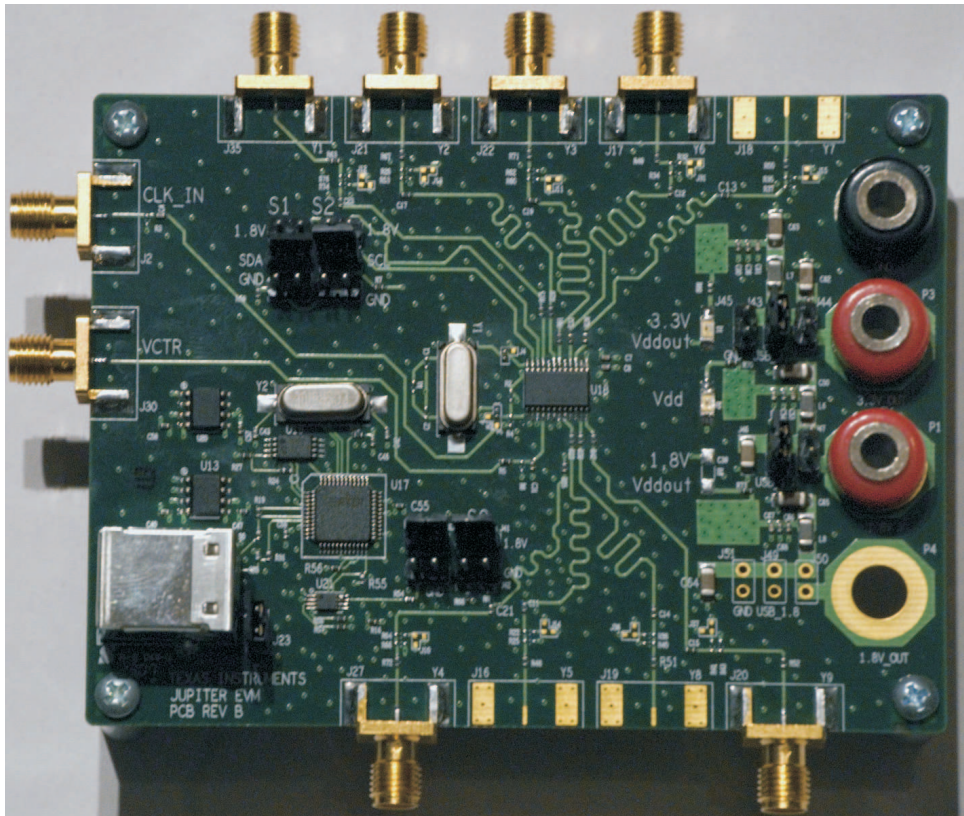
Figure 2. CDCEL9xx Printed-Circuit Board

1.2 Related Documentation From Texas Instruments

- *CDCE949, CDCE(L)949, Programmable, 4-PLL VCXO Clock Synthesizer With 1.8-V and 3.3-V Input/Outputs* data sheet ([SCAS844](#))
- CDCE(L)937 data sheet (Unpublished)
- CDCE(L)925 data sheet (Unpublished)
- CDCE(L)913 data sheet (Unpublished)
- *VCXO Application Guidelines for CDCE(L)9xx Family* application report ([SCAA085](#))

1.3 If You Need Assistance

If you need assistance with this device, send an e-mail to clocks_apps@list.ti.com.

2 About the CDCE(L)9xx Clock-Generator Family

The CDCE9xx and CDCEL9xx are a family of modular PLL-based, low-cost, high-performance, programmable clock synthesizers, multipliers, and dividers. They generate from 3 (1-PLL) up to 9 (4-PLL) output clocks from a single input frequency. A crystal or LVCMOS clock signal is possible as the reference clock. VCXO functionality is built into every member of the CDCE9xx device family, which allows synchronizing the output frequency to an external control signal, e.g., a PWM signal.

A deep M/N divider ratio allows the generation of zero ppm audio/video, networking (WLAN, Bluetooth™, Ethernet™, GPS), or interface (USB, IEEE1394, Memory Stick™) clocks from a 27-MHz reference input frequency, for example.

An inbuilt EEPROM cuts off the need for reprogramming the CDCE(L)9xx in a certain application, but reprogramming is still possible with a 2-wire serial interface. Based on the PLL frequency and the divider settings, the internal loop filter components are automatically adjusted to achieve high stability and optimized jitter transfer characteristic of each PLL. Three, free programmable control inputs, S0, S1, and S2, can be used to select different frequencies, or change SSC setting for lowering EMI, or other control features like outputs disable to low, outputs 3-state, power down, PLL bypass, etc.

The device has separate output supply pins, VDDOUT, which is 1.8 V for CDC**EL**9xx and to 2.5 V to 3.3 V for CDC**E**9xx.

The following is an overview of the devices of the CDCE(L)9xx family:
- CDCE949/CDCEL949: 4-PLL, 9 outputs, fmax = 230 MHz, industrial temperature range, 24 pins
- CDCE937/CDCEL937: 3-PLL, 7 outputs, fmax = 230 MHz, industrial temperature range, 20 pins
- CDCE925/CDCEL925: 2-PLL, 5 outputs, fmax = 230 MHz, industrial temperature range, 16 pins
- CDCE913/CDCEL913: 1-PLL, 3 outputs, fmax = 230 MHz, industrial temperature range, 14 pins
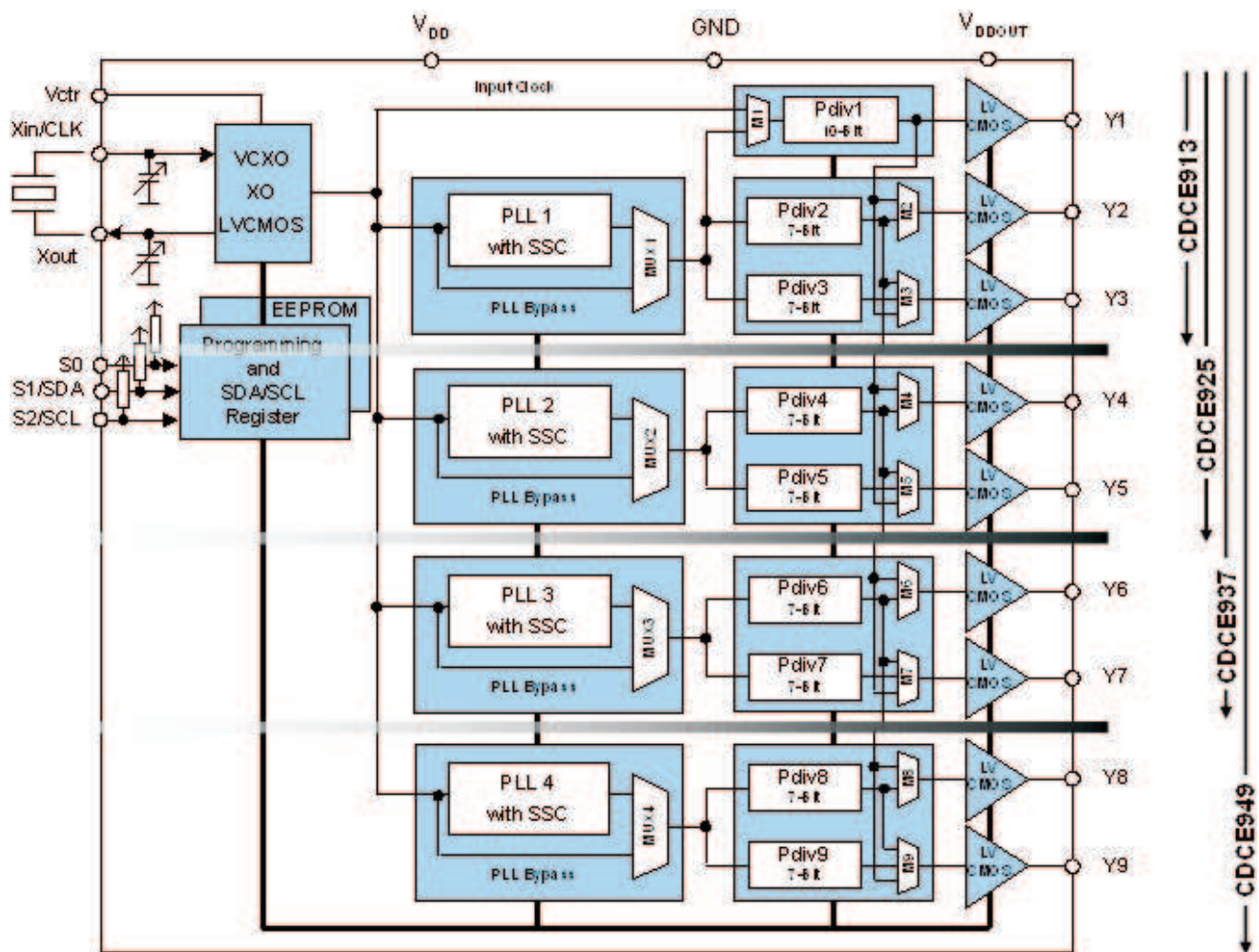
Figure 3. Functional Block Diagram of the CDCE(L)9xx

3   QUICK START (USB PLUG 'N' PLAY)

The following steps allow the user to get started quickly with the EVM.
1. Connect the EVM with the PC with a 2.0 USB cable.
2. Install the driver software using the provided CD-ROM.
3. The EVM is now running and completely powered through USB. Verify it by checking any of the

outputs available at the SMA connectors.

4. Programming the device is also possible using the TI Pro-Clock™ dedicated software (see section 4.2).

4 EVM Hardware

4.1 Hardware Configuration

This section gives an extended description of the board hardware, providing the user with a comprehensive overview of its configuration. Detailed information regarding onboard jumpers, solder-bridges, and communication interface (I^2C/SMBus) is also provided, allowing the user to change the setup and play around according to his needs and wishes.

4.1.1 Power Supply

Power for the EVM can be supplied fully not only via the USB but also through a stabilized external power supply. The following paragraphs describe how to set the board jumpers for both cases. Depending on the device the user is dealing with (CDCE9xx or CDCEL9xx), a guideline of the jumper's setup for the output stage is given.

NOTE: All EVMs are delivered with USB power supply as default.

4.1.1.1 External Power Supply

In order for the board to be supplied with an external power supply generator, follow the instructions regarding the jumpers' setup for both the device core and the output stage. The latter depends on the type of device (CDCE9xx or CDCEL9xx).

Core Supply Voltage

- Insert jumper J47 (leave jumper J46 open).
- Connect the positive pole of the external power supply to P1 and the negative pole to P2 (ground). Voltage ranges between 1.7 V and 1.9 V (nominal 1.8 V).
- Insert jumpers J23 and J25 and plug in the USB cable (use a 2.0 USB male B termination). Even though externally supplied, the board needs this connection to allow the programming of the device.

Output Stage Supply Voltage (Either 3.3 V or 1.8 V)

a) CDCE9XX → VDDOUT = 3.3 V

- Insert jumper J44 (leave J43 and J45 open).
- Connect the positive pole of the external power supply to P3 and the negative pole to P2 (ground). Voltage ranges between 3 V and 3.6 V (nominal 3.3 V).

NOTE: J45→ use this jumper to ground Vddout. In this way, the default functionality for the SDA/S1 and SCL/S2 pins is recalled, and the device can be reprogrammed even though these pins were set to control pins (S1 and S2). Besides, the device default address is also recalled. Set J39 and J33 for SDA and SCL to reprogram the device (leave J32, J34, J38, and J40 open).

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b) CDCE**L**9XX → VDDOUT=1.8 V

- Insert jumper J50 (leave jumpers J49 and J51 open).
- Connect the positive pole of the external power supply to P4 and the negative pole to P2 (ground). Voltage ranges between 1.7 V and 1.9 V (nominal 1.8 V).

NOTE: J51→ use this jumper to ground Vddout. In this way, the default functionality for the SDA/S1 and SCL/S2 pins is recalled, and the device can be reprogrammed even though these pins were set to control pins (S1 and S2). Besides, the device default address is also recalled. Set J39 and J33 for SDA and SCL to reprogram the device (leave J32, J34, J38, and J40 open).

4.1.1.2 USB Power Supply

In order for the board to be fully supplied via USB, follow the instructions regarding the jumpers' setup for both the device core and the output stage. The latter depends on the type of device (CDCE9xx or CDCEL9xx).

NOTE: All EVMs are delivered with the USB power supply as default.

Core Supply Voltage

- Insert jumper J46 (leave jumper J47 open).
- Insert jumper J23 and J25, and plug in the USB cable (use a 2.0 USB male B termination).

Output Stage Supply Voltage (Either 3.3 V or 1.8 V)

a) CDCE9XX → VDDOUT = 3.3 V

- Insert jumper J43 (leave J44 and J45 open).

NOTE: J45 → use this jumper to ground Vddout. . In this way, the default functionality for the SDA/S1 and SCL/S2 pins is recalled and the device can be reprogrammed even though these pins were set to control pins (S1 and S2). Besides, the device default address is also recalled. Set J39 and J33 for SDA and SCL to reprogram the device (leave J32, J34, J38, and J40 open).

b) CDCE**L**9XX → VDDOUT = 1.8 V

- Insert jumper J49 (leave jumper J50 and J51 open).

NOTE: J51→ use this jumper to ground Vddout. In this way, the default functionality for the SDA/S1 and SCL/S2 pins is recalled and the device can be reprogrammed even though these pins were set to control pins (S1 and S2). Besides, the device default address is also recalled. Set J39 and J33 for SDA and SCL to reprogram the device (leave J32, J34, J38, and J40 open).

4.1.2 Programming Interfaces

The device supports nonvolatile EEPROM programming for easy customized applications. Although preset to a factory default configuration (see the relevant data sheet), it can be reprogrammed to a different application configuration. All device settings are programmable through the SDA/SCL bus, a 2-wire serial interface that works according to the I^{2}C standard specification.

Three, free programmable control inputs, S0, S1, and S2, can be used to select different frequencies, or change the SSC setting for lowering EMI, or other control features like, outputs disable to low, outputs 3-state, power down, PLL bypass, etc.

The device can be programmed externally in two ways:

1. Via the USB cable connected to the PC and to the EVM (in this mode, J39 and J33 are set). TI Pro-Clock™ software (see section 4) supports the device programming.
2. By an external pattern generator connected to J39 (clock) and J33 (data).

The EVM also offers the opportunity to change the configuration setting of the device by switching the set of S0, S1, and S2 (see the relevant device data sheet). This can be done by simply inserting and removing the jumpers by the following description:

- S0: Insert J41 to set it HIGH; insert J42 to set it LOW.
- S1: Insert J32 to set it HIGH; insert J34 to set it LOW (always leave J33 open).
- S2: Insert J38 to set it HIGH; insert J40 to set it LOW (always leave J39 open).

4.1.3 Pass Programming Through

This option allows the device to be programmed on your own board, through the CDCE(L)9xx EVM, by simply connecting the SDA/SCL available pins to your programming interface.

- Insert jumper J23 and J25 and plug in the USB cable (use a 2.0 USB male B termination).
- Connect the SDA wire and the SCL wire as shown in Figure 4. This is a zoomed view of the EVM region where the jumpers 32, 33, 34, 38, 39, and 40 are placed.
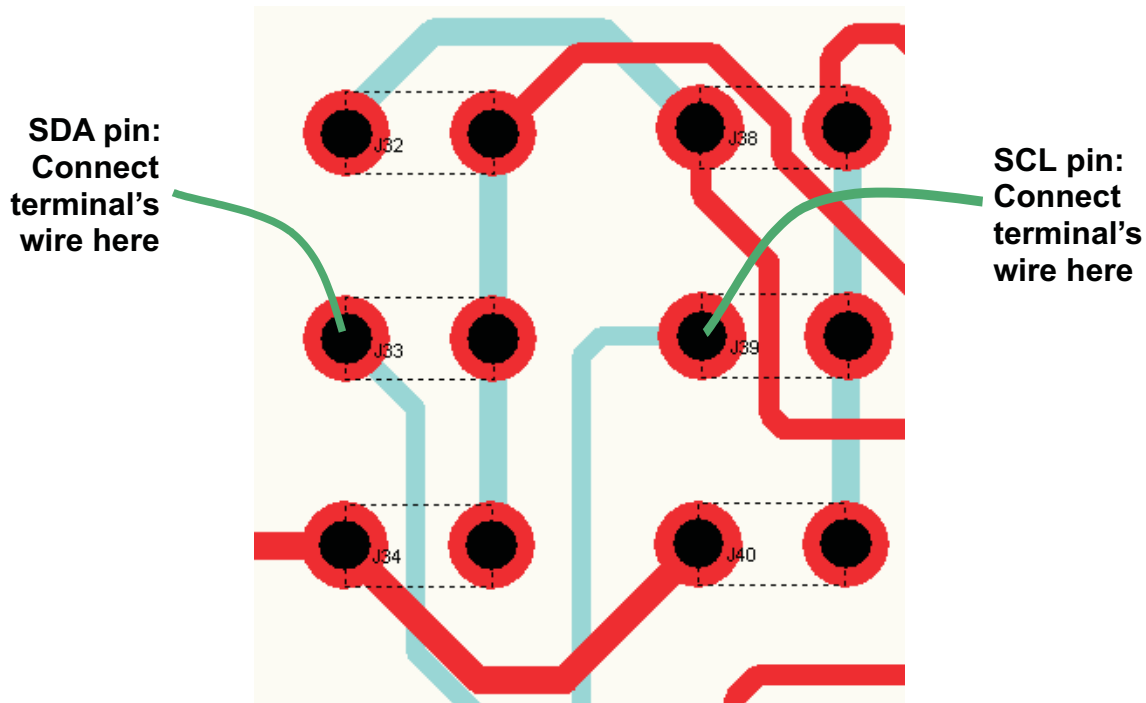
Figure 4. EVM Region Showing SDA Pin and SCL Pin Locations

- Connect the other SDA and SCL wire terminals to your programming interface.
- The setup is ready; communication with the customer onboard device is now possible.

4.1.4 Input

The CDCE(L)9xx can be driven either from a crystal or from an LVCMOS input signal. If a crystal is connected, the CDCE(L)9xx can act as a crystal oscillator or as a VCXO with integrated PLLs. Two crystal footprints allow connecting a smaller 4-pin crystal and a larger 2-pin crystal. This eases the evaluation of different crystals with different footprint and size. The 2-pin crystal (Y1) on the EVM top side is used as default.

NOTE: The EVM default is a crystal oscillator with 2-pin crystal (Y1). (See Figure 1)

4.1.4.1 Crystal or VCXO

The following steps are necessary to use the EVM with a crystal or VCXO as reference:

1. General 2-pin crystal or VCXO setup

   The 2-pin crystal footprint allows evaluating crystals with a larger size. Larger size crystals usually offer a wider tuning range for the VCXO functionality.

(a) Short pin 1 and 2 of J52.
(b) Short pin 3 and 2 of J4.
(c) Ensure that R2 and R4 are not installed.
(d) Ensure that C1 and C2 are not installed.

2. General 4-pin crystal or VCXO setup

The 4-pin crystal footprint is a universal footprint that allows evaluating different smaller 2- and 4-pin crystals. Smaller crystals are beneficial, if a simple crystal oscillator without VCXO functionality is needed. Smaller crystals are usually cheaper and need less board space.

(a) Short pin 2 and 4 of J52.
(b) Short pin 1 and 2 of J4.
(c) Ensure that R2 and R4 are not installed.
(d) Ensure that C1 and C 2 are not installed.

3. VCXO setup

Because the device has an integrated VCXO, it is possible to verify its functionality (pull-ability) using the VCTR connector (J30). Install an appropriate resistor R6 to adjust the voltage level according to the need (R5, R6 work together as a voltage divider).

(a) Assemble R5 and C31 (low pass for VCXO) as needed.
(b) R6 and R5 can be used to create a voltage divider for shifting down the control voltage.
(c) Connect the control voltage to J30.

4.1.4.2   LVCMOS

CLK_IN is available via jumper J2 for driving the CDCE(L)9xx with an LVCMOS input. In this case, R2 and R4 can be installed on the EVM. Assembling R2 and R4 with 100 Ω each matches the 50-Ω termination of a signal generator. C4 permits AC coupling to the external signal source. Ensure that the jumper J52 is shorted between pin 3 and pin 2, which connects J2 (CLK_IN) with pin 1 (CLK) of the device.

4.1.5   LVCMOS Output

The CDCE(L)9xx can drive from three LVCMOS outputs (CDCE(L)913) up to nine LVCMOS outputs (CDCE(L)949). Most of them are accessible via SMA connectors. All outputs are series terminated with a 22-Ω resistor in series to the output.

For each output routed on the EVM, it is possible to AC-couple it (i.e., Y1). Depending on the application requirements, install the resistors for adjusting the DC level (for Y1 → R74 and R76). Power this voltage divider with the wanted voltage supply (either 1.8 V or 3.3 V) by using the dedicated jumper (for Y1 → J12), and install a capacitor (for Y1 → C23) with a value between 10 nF and 100 nF.

4.1.5.1   Y4 Output

The pin 7 corresponds to the output Y4, and this is valid for the device CDCE(L)925, CDCE(L)937, and CDCE(L)949. For the CDCE(L)913, this pin serves as VDDOUT. J6, J7, and C28 are set accordingly.

5   TI ClockPro™ Programming Software

The TI ClockPro™ design tool is the evaluation software for the CDCE(L)949, CDCE(L)937, CDCE(L)925, and CDCE(L)913 clocking family.

The software runs under Windows™ 98, NT, 2000, XP, and Vista. A quick installation is required prior to use.

After the loading screen, the start window is shown (Figure 5). This initial window called TI ClockPro™ Wizard recommends devices based on the frequencies and conditions required by the user. It is also possible to skip this window, going directly to the Devices Search Window (Figure 6). The Devices Search Window allows the user to select the EVM to work with or go to local mode. After pressing OK, the user is directed to the Main View Window (Figure 8), that offers the capabilities of communicating with the device, creating new setups, and loading setups in the device. Under the Tools menu option, other views [Direct register view (Figure 9), the bits View (Figure 10)] and utilities [Pulling Range Tool (Figure 11) and Checksum Calculator (Figure 12)] can be accessed.

5.1   *Loading and Saving a Setup*

Saving and loading the setup of the CDCE(L)9xx software can be done in several different ways.

Click *File*, and select one of the following options to save or load the current setup.

1. Load Setup/Save Setup — loads/saves the setup from/to an encrypted file
2. Load *.txt/Save *.txt — loads/saves the setup from/to a text file. Use this format to view the setup later with a text editor.
3. Load *.csv/Save *.csv — loads/saves the setup from/to a comma-delimited file. Use this format to view the setup later with Microsoft™ Excel™.
4. Load Intel™ Hex*.hex/Save Intel Hex*.hex — loads/saves the setup from/to hexadecimal object file format. Usually, programmers can directly read-in this file format.
5. Configuration Code Release Sheet — use this option to order factory-programmed EEPROM specials of the CDCE(L)9xx. Contact your regional TI marketing or sales representative for further information.
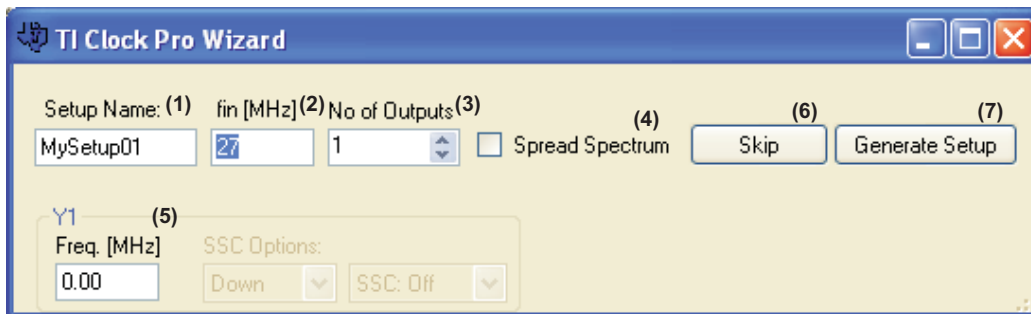

Figure 5. TI ClockPro™ Start Window

1. **Setup Name**. Customized level that refers to the set of solutions that the wizard can generate
2. **fin(MHz)**. User's input frequency in MHz
3. **No of Outputs**. Number of outputs to generate out of the input frequency introduced in (2)
4. **Spread Spectrum**. If the outputs require spread spectrum, checking this option allows the customer to introduce the SSC settings per output.
5. Output conditions. This group of controls allows the user to introduce output frequency in MHz and if required SSC Conditions (offset and percentage)
6. **Skip** button directs the user to device selection window (Figure 6)
7. **Generate Setup** button recommends devices that generate out of fin the fout conditions introduced by the user. The solutions are listed in the window (Figure 7)
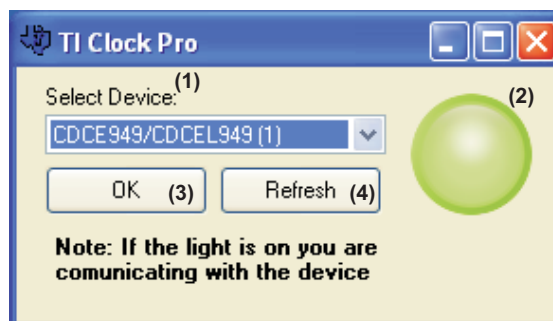

Figure 6. TI ClockPro™ Devices Search Window

1. **Select Device** chooses the device to work with. When an EVM is connected, it appears as a first option. Nonconnected options (local mode) are also available.
2. It is green when an EVM is connected. It is black when working in local mode (no data is transferred to the EVM).
3. **OK** button directs to the Main View (Figure 8), or if Generation Setup button was pressed on the

Wizard Window, it directs to the Solution Selection Window (Figure 7).

4. Refresh updates the choices in (1).
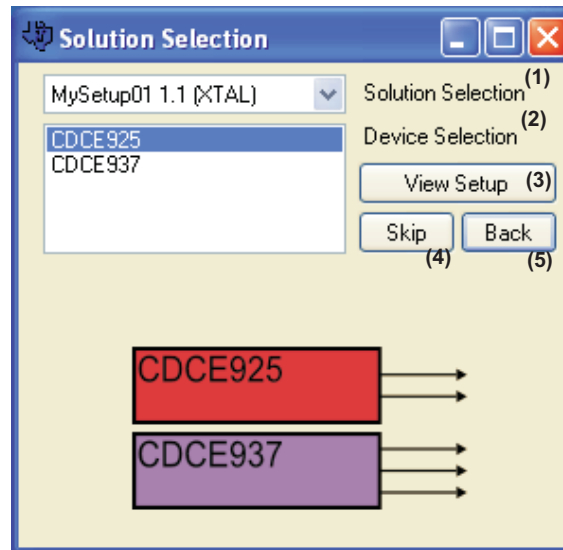
Figure 7. TI ClockPro™ Solution Selection Window

1. **Solution Selection** selects the solution to view when pressing the button View Setup (3). Many different solutions can be generated by different combinations of the devices and the input stage.
2. **Device Selection** chooses the initial setup to load in the Main View (Figure 8).
3. **View Setup** loads the selected device for the selected solution in the Main View (Figure 8).
4. **Skip** button skips loading a solution showing the Main View (Figure 8).
5. **Back** button goes back to the Wizard View (Figure 5).
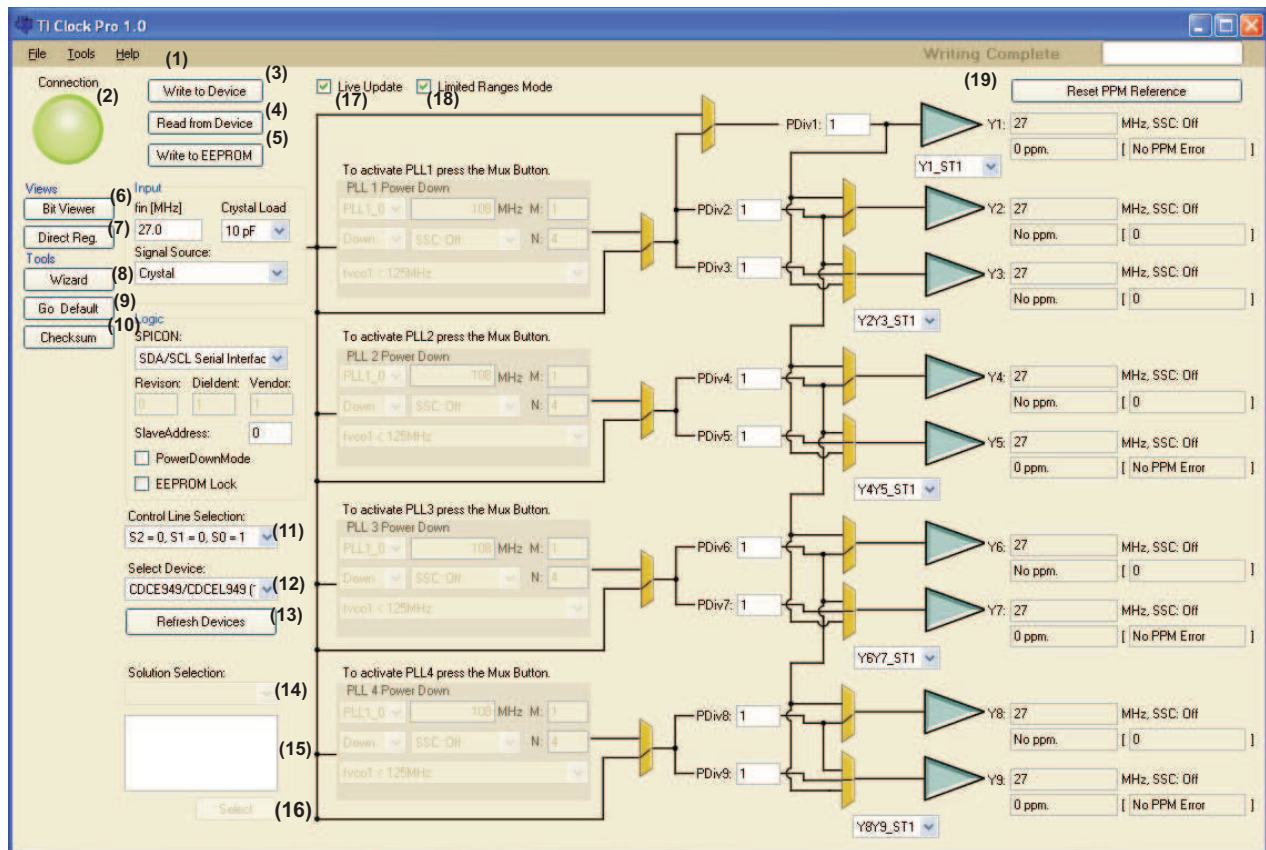
Figure 8. TI Clock Pro Main View

1. Main Menu bar with three menu options. File menu option supports loading and saving of files (.isf, .csv, .txt, .hex, .configuration code release sheet) and exiting the program. With the Through the Tools menu, the following tools can be accessed: Bit Viewer, Pulling Range Tool, Check sum calculator, Direct Register View, and Wizard View. Also via the Tools menu, the device can be reset to default (menu option: Go Default) and the current setup can be written to EEPROM (menu option: Write to EEPROM). The Help menu has a link to the About window that contains information about the version number of the current software.

2. The Connection indicator is Green when the device selected in (12) is a device in a performance EVM. When it is black, the device selected in (12) is working in local mode.

3. If connected, the Write to Device button writes all the displayed contents in the Main View (Figure 8) and the Direct Register View (Figure 9) in the device's control register.

4. If connected, the Read from Device button reads all the contents of the device's control register in the Main View (Figure 8) and in the Direct Register View (Figure 9).

5. If connected, the Write to EEPROM button writes all the displayed contents in the Main View (Figure 8) and in the Direct Register View (Figure 9) in the device's EEPROM.

6. Bit Viewer button. When it is pressed, it shows the Bits Viewer Tool (Figure 10).

7. Direct Reg. button. When it is pressed, it shows the Direct Register View (Figure 9).

8. Wizard button. When it is pressed, it shows the Wizard View (Figure 5).

9. Go default button. When it is pressed, it loads the default setup as per device selected in (12).

10. Checksum button. When it is pressed, it shows the Checksum Calculator Tool (Figure 12).

11. Control Line Selection. This displays the control pins settings linked to the active setup. This control does not change the control pins voltages in the performance EVM. In order to ensure that the active setup in the performance EVM is the same as the setup displayed in this view, ensure that (11) and the jumpers in the EVM are set to the same values.

    The use of S1 and S2 depends on SPICON, which decides if S1 and S2 are used as control pins or as

serial interface pins.

If SPICON is logic 0, the serial control interface is enabled. In this case, S1 is used as SDA, and S2 is used as SCL. For the internal logic, S1 and S2 are considered to be "0". This means that either control pin selection "000" or "001" is active, depending on the logic level at S0.

If SPICON is logic 1, S1 and S2 are used as control pins, and the serial interface is disabled. The internal logic S1 and S2 are considered to be 0 or 1, according to the logic level that is connected to these pins. In this case, up to eight different device setups can be selected through S2, S1, and S0.

The SPICON configuration is possible in the generic control register (GCR). For the EVM default configuration, SPICON is logic 0. This results in S0 = 1, S1 = 0, S2 = 0, according to the default jumper setting on the EVM.

If Vdd is connected and Vddout is forced to GND, S1, and S2 act as serial interface pins – even if SPICON is logic 1. This allows reprogramming the device, if the control pin functionality is enabled. For more information, see the CDCE(L)9xx data sheet.

12. Select Device chooses the device where all the actions are performed.

13. Refresh devices button. When pressed, it looks for the EVMs connected.

14. Solution selection shows the solution generated by the Wizard View (Figure 5).

15. List of devices shows those devices that are part of the solution selected in (14).

16. Select button. When it is pressed, the selected device in (15) are loaded in the program.

17. Life update. When checked and the device selected, all changes in the setup (Wizard View (Figure 8) or Direct Register View (Figure 9) are automatically written to the control register.

18. Limited Ranges Mode. When checked when a setup is loaded or a change is performed in the setup, the change is ensured to be within the specifications. If not checked, the verification of settings within specifications is skipped.

19. Reset PPM Reference. The ppm is calculated with respect to the requested output frequency in the Wizard View. After this button is pressed, the ppm is calculated with respect to the output frequency when that occurred.
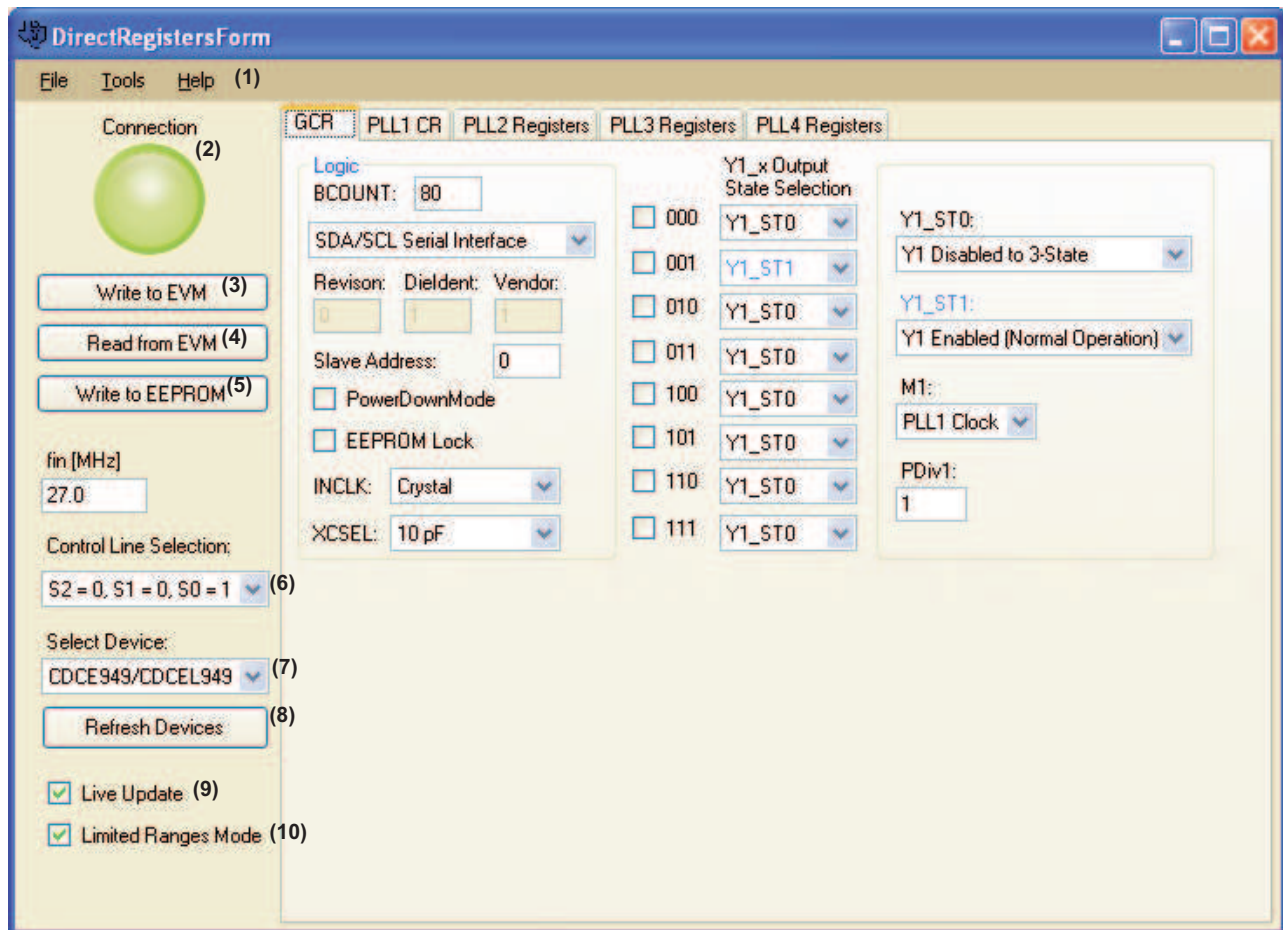
20. Current status

Figure 9. TI ClockPro™ Direct Register View

1. Main Menu bar with three menu options as per Main View Menu Bar (Figure 8)
2. The Connection indicator is green when the device selected in (7) is a device in a performance EVM. When black, the device selected in (7) is working in local mode.
3. If connected, the Write to Device button writes all the displayed contents in the Main View (Figure 8) and in the Direct Register View (Figure 9) in the device's control register.
4. If connected, the Read from Device button reads all the contents of the device's control register in the Main View (Figure 8) and in the Direct Register View (Figure 9).
5. If connected, the Write to EEPROM button writes all the displayed contents in the Main View (Figure 8) and in the Direct Register View (Figure 9) in the device's EEPROM.
6. Control Line Selection. This shows the control pins settings linked to the active setup. This control does not change the control pins voltages in the performance EVM. In order to ensure that the active setup in the performance EVM is the same as the setup displayed in this view, ensure that (6) and the jumpers in the EVM are set to the same values.
7. Select Device chooses the device where all the actions are performed.
8. Refresh devices button. When pressed, it looks for EVMs connected.
9. Live update. When checked and the device is selected, all changes in the setup (Wizard View, Figure 8, or Direct Register View, Figure 9, are automatically written to the control register.
10. Limited Ranges Mode. When checked and a setup is loaded or a change is performed in the setup, the change is ensured to be within the specifications. If not checked, the verification of settings within specifications is skipped.

Figure 10. TI ClockPro™ Bits Viewer – Bit Contents of the Control Register
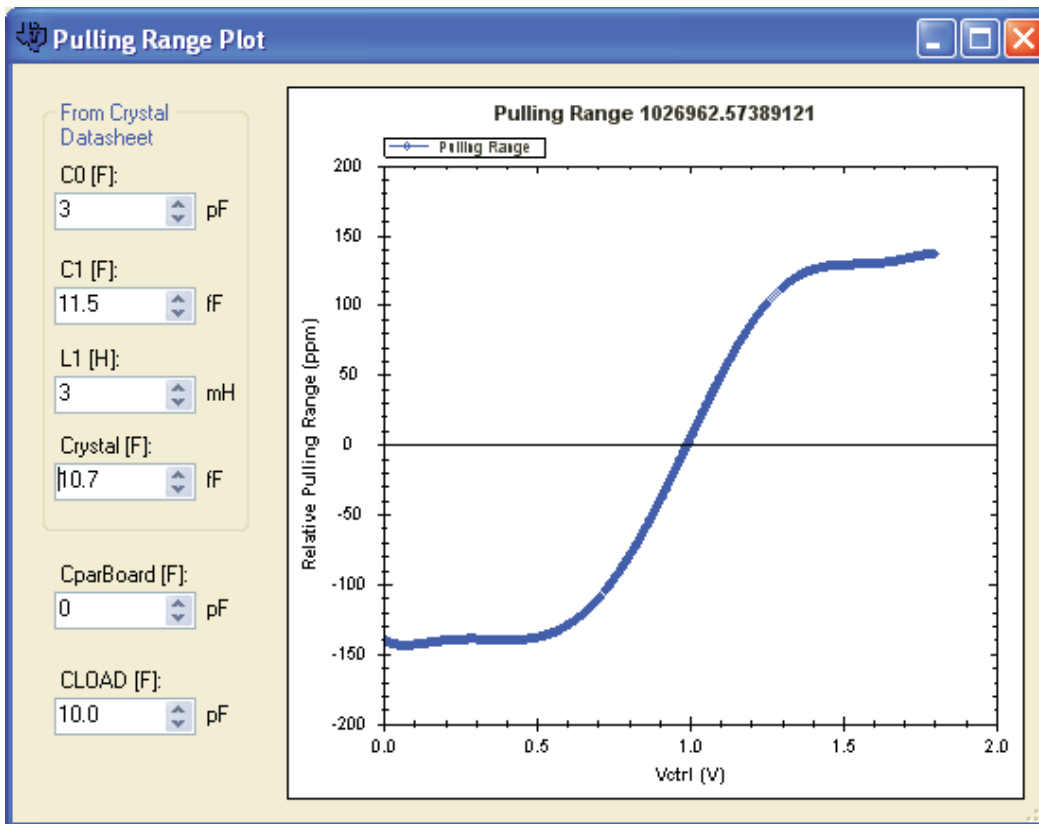
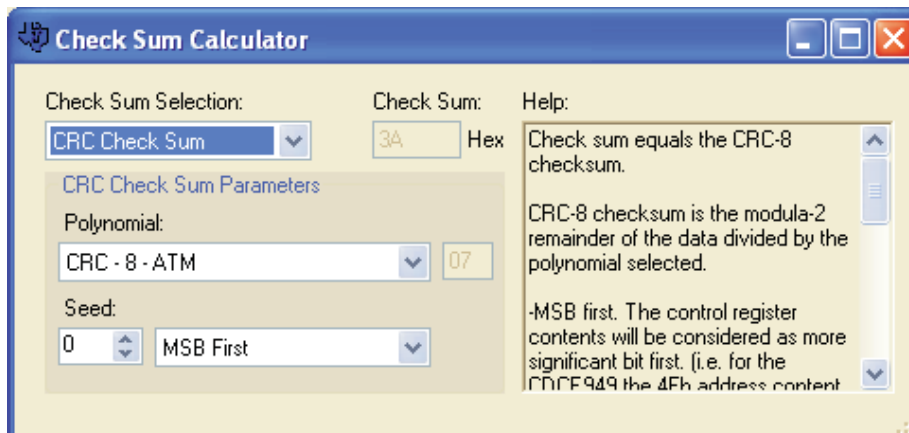**Figure 11. TI ClockPro™ Pulling Range Calculator**

Figure 12. TI ClockPro™ Checksum Calculator

5.2   Software Installation

Use the following steps to install the CDCE(L)9xx evaluation software:

1. Insert CDCE(L)9xx EVM compact disc.
2. Click on setup.exe to install *TI Pro Clock* software.
    → Folder: TI-Pro-Clock
3. Reboot your computer
4. Run software from desktop Ti ProClock™ icon.

or
Start → Programs → Texas Instruments → TI Pro Clock

Three different drivers are available.

1. Windows 98 and Windows ME in folder *w-98-ME*
2. Windows XP, Windows Vista, Windows Server 2003, Windows 2000 in folder *w-xp-vista-server-2000*
    Windows XP x64,
3. Windows Vista x64 and Windows Sever 2003 x64 in folder *w-xp-vista-server-64*

6   Bill of Materials and Schematic

6.1   Bill of Materials

Table 1. Bill of Materials

Item	Qty	RefDes	Value	Manufacturer	Part Number
1	0	C1, C2	10 pF		NU
2	0	C3, C9	NU		NU
3	9	C11-C15, C17, C19, C21, C23	0 Ω	Panasonic - ECG	ERJ-2GE0R00X
4	8	C4, C5, C7, C26, C37,C41, C53,C67	10 nF	Panasonic - ECG	ECJ-0EB1E103K
5	3	C6, C8, C61	1 nF	Panasonic - ECG	ECJ-0EB1E102K
6	8	C16, C20, C39,C50, C62-C65	4.7 μF	Panasonic - ECG	ECJ-3YB1C475M
7	5	C18, C24, C51, C60,C66	1 μF	Panasonic - ECG	ECJ-0EB1A105M
8	0	C28	10 nF	Panasonic - ECG	ECJ-0EB1E103K
9	18	C29, C31-C33, C36, C40, C44-C48, C54-C59, C68	0.1 μF	Panasonic - ECG	ECJ-0EB1A104K
10	1	C35	10 μF	Panasonic - ECG	ECJ-3YB1A106M
11	1	C38	47 pF	AVX Corporation	04025A470JAT2A
12	2	C42, C43	27 pF	AVX Corporation	04025A270JAT2A
13	2	C49, C52	33 nF	AVX Corporation	0402YD333KAT2A
14	1	C70	220 pF	Panasonic	ECJ-0EB1E221K
15	2	D1, D2	Red	Lumex Opto/Components Inc	SML-LX1206SR-TR
16	0	D3	Red		NU
17	1	J1	Conn USB Typ B Fem	Mill-Max	897-30-004-90-000
18	2	J2, J30	SMA	Johnson Comp	142-0701-851
19	3	J4, J24, J29	SMD3P_BRIDGE	Panasonic - ECG	ERJ-2GE0R00X
20	3	J6-J8	SMD3P_BRIDGE	Panasonic - ECG	ERJ-2GE0R00X
21	0	J10-J15,J31, J36, J37	SMD3P_BRIDGE	Panasonic - ECG	ERJ-2GE0R00X
22	0	J16	Y5		NU
23	1	J17	Y6	Johnson Comp	142-0701-851
24	0	J18	Y7		NU
25	0	J19	Y8		NU
26	1	J20	Y9	Johnson Comp	142-0701-851
27	1	J21	Y2	Johnson Comp	142-0701-851
28	1	J22	Y3	Johnson Comp	142-0701-851
29	16	J23, J25, J26, J32-J34, J38-J47	Jumper		Header 2 pos, 0.100 ctr
30	0	J49-J51	Jumper		NU
31	1	J27	Y4	Johnson Comp	142-0701-851
32	1	J35	Y1	Johnson Comp	142-0701-851
33	1	J52	SMD4P_BRIDGE	Panasonic - ECG	ERJ-2GE0R00X

Table 1. Bill of Materials (continued)

Item	Qty	RefDes	Value	Manufacturer	Part Number
34	2	L4, L5	1k @ 100 MHz	Murata Electronics	BLM21AG102SN1D
35	3	L6-L8	50 Ω @ 100 MHz	Murata Electronics	BLM31PG500SN1L
36	1	P1	1.8 V	SPC Technologies	845R
37	1	P2	GND	SPC Technologies	845R
38	1	P3	3.3V_OUT	SPC Technologies	845R
39	0	P4			NU
40	0	R1	1M	Panasonic - ECG	ERJ-2RKF1004X
41	0	R2, R4		Panasonic - ECG	ERJ-2GEJ101X
42	0	R3			NU
43	2	R5, R54	200k	Panasonic - ECG	ERJ-2GEJ204X
44	0	R6	NU		NU
45	5	R7, R8, R26, R59, R68	1k	Panasonic - ECG	ERJ-2GEJ102X
46	0	R9	1M	Panasonic - ECG	ERJ-2RKF1004X
47	1	R16	470	Yageo Corporation	RC0402FR-07470RL
48	1	R19	1.5k	Panasonic - ECG	ERJ-2GEJ152X
49	0	R22, R25, R28, R32, R34, R35, R37, R38, R40,R41, R43, R53, R60, R62, R64,R66, R74, R76		Panasonic - ECG	ERJ-2RKF1000X
50	9	R23, R29, R33, R36, R39, R42, R61, R65, R75	22 Ω	Panasonic - ECG	ERJ-2GEJ220X
51	1	R24	2.2k	Panasonic - ECG	ERJ-2GEJ222X
52	1	R27	10k	Panasonic - ECG	ERJ-2GEJ103X
53	2	R30, R31	26.7	Panasonic - ECG	ERJ-2RKF26R7X
54	9	R48-R52, R63, R67, R71, R72	0 Ω	Panasonic - ECG	ERJ-2GE0R00X
55	2	R55, R56	5.6k	Panasonic - ECG	ERJ-2GEJ562X
56	2	R57, R58	10k	Panasonic - ECG	ERJ-2GEJ103X
57	1	R69	160	Yageo Corporation	9C04021A1600JLHF3
58	2	R70, R73	10	Panasonic - ECG	ERJ-2RKF10R0X
59	1	U13	TPS77533D	TI	TPS77533D
60	1	U16	93C66B/TSSOP	MicroChip	93C66B
61	1	U17	FT2232	FTDI	FT2232L
62	1	U18	CDCE949	TI	CDCE949PW
63	1	U20	TPS77518D	TI	TPS77518D
64	1	U21	PCA9306	TI	PCA9306DCU
65	1	Y1	Crystal 27 MHz, 10-pF Load	KDS	SMD-49 (PN ZD02580)
66	1	Y2	6 MHz	ECS Inc	ECS-60-32-5PDN-TR
67	0	Y3	Variable Crystal		Variable
68	4	Screw	H781-ND	Building Fasteners	PMS 440 0038 PH
69	4	Standoff	3481K-ND	Keystone Electronics	3481

Table 1. Bill of Materials (continued)

Item	Qty	RefDes	Value	Manufacturer	Part Number
70	6	2-Pin Jumper/Short for J23, J25, J39, J41, J43, J46	AMP Novo Shunt	Tyco Electronics	0-0881545-1

6.2 Schematic
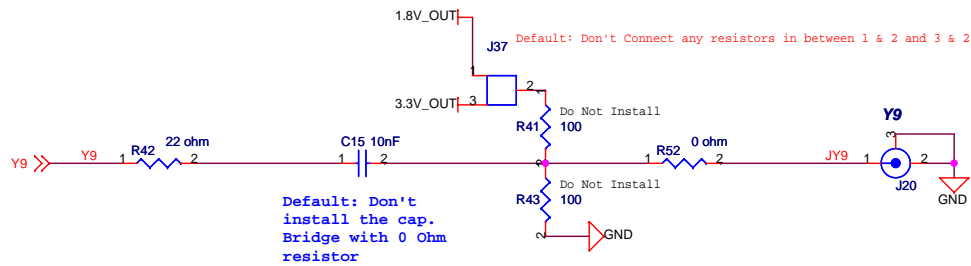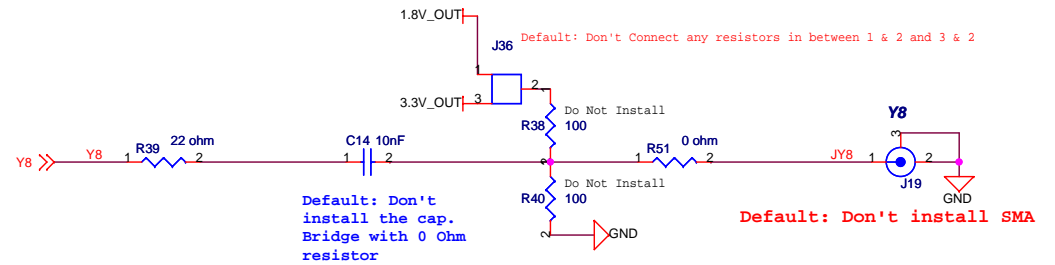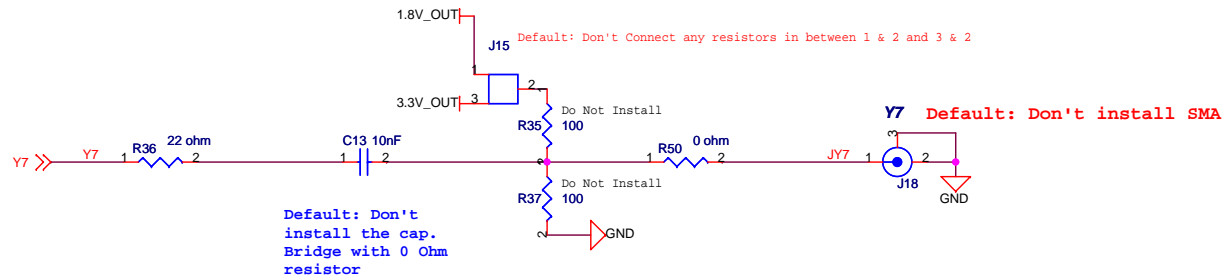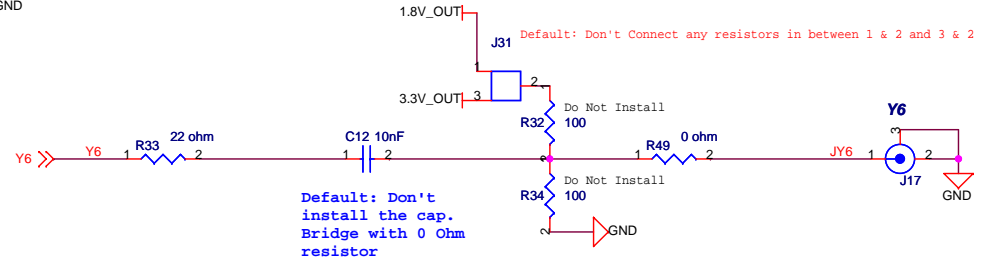
The CDCE9xx EVM schematic is appended to this page.

XOUT1

Default: Short 2 & 1 on J52

1.8V

Do Not Install

R9 1M

XOUT1

Default: Short 3 & 2 on J4

XOUT1

R1 1M Do Not Install

J52

R2 100

J4

Y3 Do Not Install

Y1

Do Not Install

C9 NU

C3 NU

C1 10 pF

27 MHz

C2 10 pF

XinO

Do Not Install

Do Not Install

Do Not Install

Do Not Install

Do Not Install

Do Not Install

Do Not Install

XinO

Xin2

R4 100

Do Not Install

Xin2

Do Not Install

U18

J2

C4

CLKIN_SMA

1 Xin/Clk   Xout 24

S0

S1/SDA

SMA

10nF

2 S0   S1/SDA 23

S2/SCL

Vctr

3 VDD   S2/SCL 22

Default: Short 2 & 3 on J6

1.8V

4 Vctr   Y1   21

Y1

R3 50

Do Not Install

C32 100nF

J6

5 GND   GND   20

Y2

C28 100nF

6 Vddout   Y2   19

Y3

J8

Y4

Do Not Install

7 Y4   Y3   18

J30

R5

3.3V_OUT

Y4

8 Y5   Vddout   17

Y5

SMA

200k

1.8V_OUT

9 GND   Y6   16

Y6

R6 N.U.

Default: Short 2 & 3 on J8

Y5

10 Vddout   Y7   15

Y7

Do Not Install

C31 0.1uF

J7

Y8

11 Y8   GND   14

C29 100nF

C33 100nF

1.8V

1.8V_OUT 3.3V_OUT

Y9

12 Y9   VDD   13

R7 1k

Default: Short 2 & 3 on J7

CDCE949

1.8V

J24

J29

1.8V

R8 1k

1.8V_OUT 3.3V_OUT

1.8V_OUT 3.3V_OUT

Default: Insert Jumper of J41

JUMPER J38

J32 JUMPER

Default: Short 2 & 3 on J24

Default: Short 2 & 3 on J29

JUMPER J41

JUMPER J39

J33 JUMPER

S0

S2/SCL

SDA

S1/SDA

JUMPER J42

SCL

Default: Insert Jumper of J33

R68 1k

JUMPER J40

J34 JUMPER

Default: Insert Jumper of J39

R59 1k

TEXAS INSTRUMENTS

Title
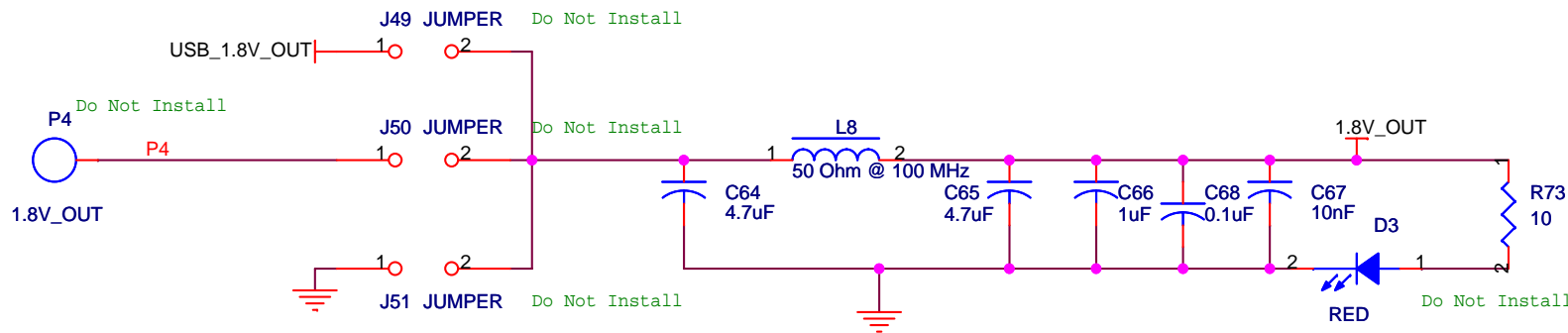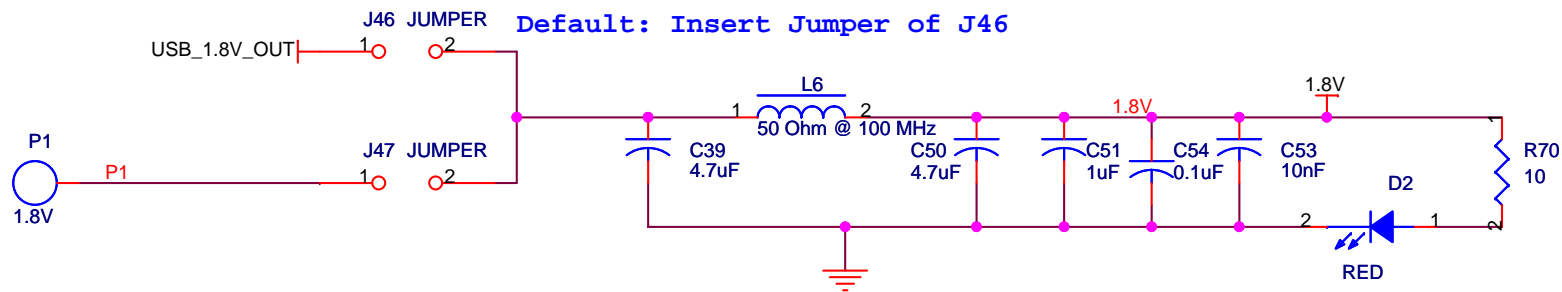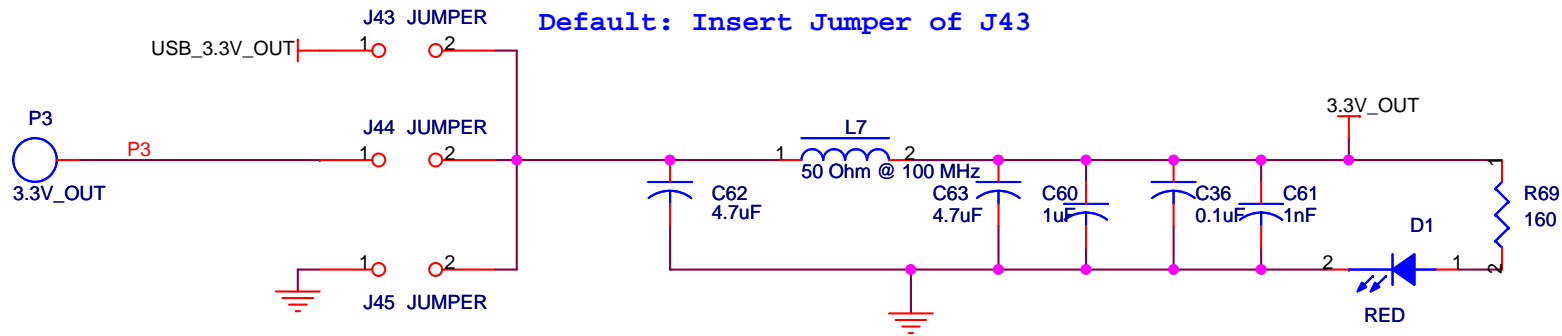Jupiter Evaluation Module

Size A

Document Number CDCE949 EVM

Rev B1

Date: Wednesday, May 16, 2007 Sheet 1 of 4

Title
Jupiter Evaluation Module
Size
B
Document Number
CDCE949 EVM
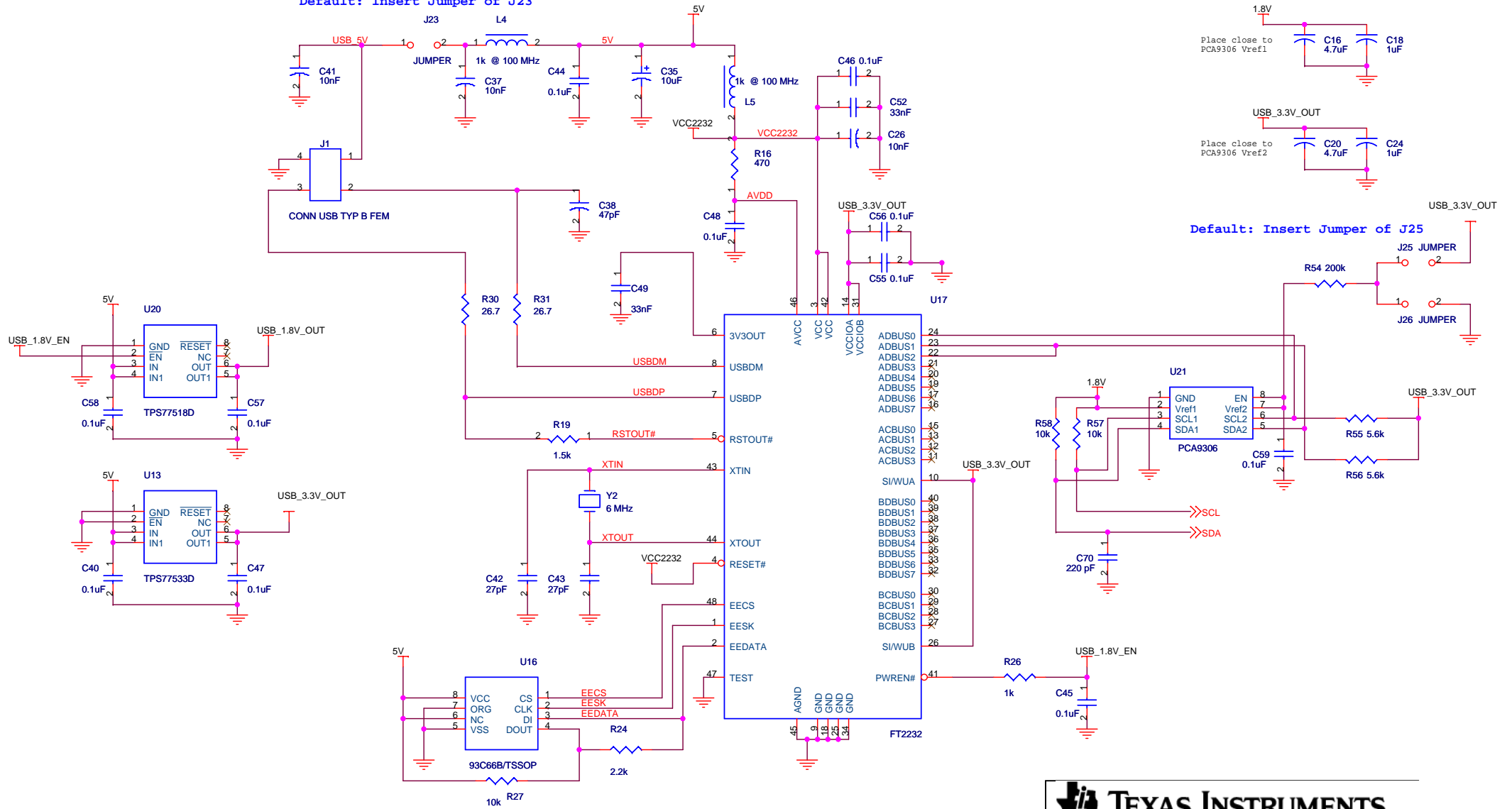Rev
B1
Date: Monday, April 16, 2007   Sheet   2   of   4

1.8V_OUT

J12   Default: Don't Connect any resistors in between 1 & 2 and 3 & 2

Default: Don't install the cap. Bridge with 0 Ohm resistor

3.3V_OUT   3   2

Do Not Install
R74   100

Y1

Y1   Y1   1   R75   22 ohm   2   C23 10nF   1   2   R63   0 ohm   1   2   JY1   1   2

Do Not Install
R76   100

J35

GND

GND

1.8V_OUT

J13
Default: Don't Connect any resistors in between 1 & 2 and 3 & 2

3.3V_OUT   3   2

Do Not Install
R28   100

Y2

Y2   Y2   1   R29   22 ohm   2   C17 10nF   1   2   R67   0 ohm   1   2   JY2   1   2

Default: Don't install the cap. Bridge with 0 Ohm resistor

Do Not Install
R53   100

J21

GND

GND

1.8V_OUT

J11
Default: Don't Connect any resistors in between 1 & 2 and 3 & 2

3.3V_OUT   3   2

Do Not Install
R60   100

Y3

Y3   Y3   1   R61   22 ohm   2   C19 10nF   1   2   R71   0 ohm   1   2   JY3   1   2

Default: Don't install the cap. Bridge with 0 Ohm resistor

Do Not Install
R62   100

J22

GND

GND

1.8V_OUT

J10
Default: Don't Connect any resistors in between 1 & 2 and 3 & 2

3.3V_OUT   3   2

Do Not Install
R64   100

Y4

Y4   Y4   1   R65   22 ohm   2   C21 10nF   1   2   R72   0 ohm   1   2   JY4   1   2

Default: Don't install the cap. Bridge with 0 Ohm resistor

Do Not Install
R66   100

J27

GND

GND

TEXAS INSTRUMENTS

Title		
	Jupiter Evaluation Module	
Size	Document Number	Rev
A	**CDCE949 EVM**	B1
Date:	Monday, April 16, 2007 Sheet 2 of 4	

Default: Insert Jumper of J43

J43 JUMPER
USB_3.3V_OUT 1 2

P3
3.3V_OUT

J44 JUMPER
P3 1 2

J45 JUMPER
1 2

L7
50 Ohm @ 100 MHz

3.3V_OUT

C62 4.7uF
C63 4.7uF
C60 1uF
C36 0.1uF
C61 1nF

D1
RED

R69 160

Default: Insert Jumper of J46

J46 JUMPER
USB_1.8V_OUT 1 2

P1
1.8V

J47 JUMPER
P1 1 2

L6
50 Ohm @ 100 MHz

1.8V

C39 4.7uF
C50 4.7uF
C51 1uF
C54 0.1uF
C53 10nF

D2
RED

R70 10

J49 JUMPER   Do Not Install
USB_1.8V_OUT 1 2

P4   Do Not Install
1.8V_OUT

J50 JUMPER   Do Not Install
P4 1 2

J51 JUMPER   Do Not Install
1 2

L8
50 Ohm @ 100 MHz

1.8V_OUT

C64 4.7uF
C65 4.7uF
C66 1uF
C68 0.1uF
C67 10nF

D3
RED   Do Not Install

R73 10

P2
GND

1.8V

close to device btw.
3 and 5 (C5 &C6)

C5 10nF
C6 1nF
C7 10nF
C8 1nF

close to device btw. 13
and 14 (C7 & C8)

Title
Jupiter Evaluation Module

Size
A

Document Number
CDCE949 EVM

Rev
B1

Date: Monday, June 18, 2007   Sheet   3   of   3

Default: Insert Jumper of J23

J23   L4

JUMPER   1k @ 100 MHz

USB_5V

C41 10nF

C37 10nF

C44 0.1uF

C35 10uF

5V

5V

1k @ 100 MHz
L5

C46 0.1uF

C52 33nF

VCC2232   VCC2232

R16 470

C26 10nF

J1

CONN USB TYP B FEM

C38 47pF

AVDD

C48 0.1uF

C49 33nF

USB_3.3V_OUT

C56 0.1uF

C55 0.1uF

1.8V

Place close to PCA9306 Vref1

C16 4.7uF   C18 1uF

USB_3.3V_OUT

Place close to PCA9306 Vref2

C20 4.7uF   C24 1uF

USB_3.3V_OUT

Default: Insert Jumper of J25

R54 200k

J25 JUMPER

J26 JUMPER

5V   U20

USB_1.8V_EN

GND   RESET
EN   NC
IN   OUT
IN1   OUT1

USB_1.8V_OUT

TPS77518D

C58 0.1uF   C57 0.1uF

R30 26.7   R31 26.7

U17

46 3 42 14 31
AVCC VCC VCC VCCIOA VCCIOB

6 3V3OUT   ADBUS0 24
8 USBDM   ADBUS1 23
7 USBDP   ADBUS2 22
                ADBUS3 21
                ADBUS4 20
                ADBUS5 19
                ADBUS6 17
                ADBUS7 16

5 RSTOUT#   ACBUS0 15
                ACBUS1 13
                ACBUS2 12
                ACBUS3 11

43 XTIN   SI/WUA 10

44 XTOUT   BDBUS0 40
                BDBUS1 39
                BDBUS2 38
4 RESET#   BDBUS3 37
                BDBUS4 36
                BDBUS5 35
48 EECS   BDBUS6 33
1 EESK   BDBUS7 32
2 EEDATA   BCBUS0 30
                BCBUS1 29
                BCBUS2 28
47 TEST   BCBUS3 27
                SI/WUB 26

PWREN# 41

AGND GND GND GND GND
45 9 18 25 34

FT2232

USBDM
USBDP

R19 1.5k

XTIN

Y2 6 MHz

XTOUT

VCC2232

C42 27pF   C43 27pF

5V   U16

VCC   CS
ORG   CLK
NC   DI
VSS   DOUT

93C66B/TSSOP

EECS
EESK
EEDATA

R24 2.2k

R27 10k

USB_3.3V_OUT

1.8V   U21

R58 10k   R57 10k

GND   EN
Vref1   Vref2
SCL1   SCL2
SDA1   SDA2

PCA9306

C59 0.1uF

R55 5.6k

R56 5.6k

USB_3.3V_OUT

SCL

SDA

C70 220 pF

R26 1k   USB_1.8V_EN

C45 0.1uF

5V   U13

GND   RESET
EN   NC
IN   OUT
IN1   OUT1

USB_3.3V_OUT

TPS77533D

C40 0.1uF   C47 0.1uF

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 0 V to 1.9 V and the output voltage range of 0 V to 3.6 V.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, some circuit components may have case temperatures greater than 85°C. The EVM is designed to operate properly with certain components above 85°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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