Introduction

The 8T49N240, 8T49N241 and 8T49N242 evaluation boards are designed to help the customer evaluate the 8T49N240i, 8T49N241, and 8T49N242 devices, respectively. For the sake of simplicity this User Guide refers to the 8T49N242i evaluation board though all statements also apply to the 8T49N240 and 8T49N241 evaluation board. 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.

Requirements

- PC Requirements:
  — IDT Timing Commander Software Installed
  — USB 2.0 or 3.0 interface
  — Windows XP SP3 or later
  — Processor: Minimum 1GHz
  — Memory: Minimum 512MB, recommended 1GB
  — Available Disk Space: Min 600MB (1.5GB, 64-bit), recommended 1GB (2GB 64-bit)
  — Network access during installation if the .NET framework is not currently installed on the system
- Power Supply with 3.3V and 1000mA rating
- Four banana plug cables to connect the power supply to the board

Quick Start: Powering Up the Board

1. Set 3.3V supply current limit to 500mA.
2. Remove all output terminations.
3. Set Dip Switch selectors to the middle position.
4. Connect a cable from a PC to the USB port.
5. Connect VEE to the GND jack.
6. Connect 3.3V to Vcc_J, Vcca_J, and Vcco_J jacks.
7. Power on the Power Supply.
8. Press the Reset Button.
   Once correct operation is verified, set the power supply limit for the number of outputs to be active.

⚠ The USB port must be powered by the PC in order to have the correct I^{2}C bus voltage levels.

Default Power-Up Condition

The 8T49N241 and 8T49n242 boards ship with a 38.88MHz surface-mount crystal populated on the top of the board. The 8T49N240 board ships with a 49.152MHz crystal. If a different crystal frequency is needed, this part must be removed (for more information, see Crystal Interface).

All outputs should be off and the current should measure ~236mA with 3.3V on Vcc_J, Vcca_J, and Vcco_J.

When evaluating performance with the default hardware configuration, it is recommended that all active outputs be terminated 50ohms to VEE by either terminator plugs or an instrument.

Board Overview

Use the following diagram to identify and locate: power supply jacks, USB connector, input and output SMA connectors, reset button, EEPROM, etc.

Figure 1. Evaluation Board Overview
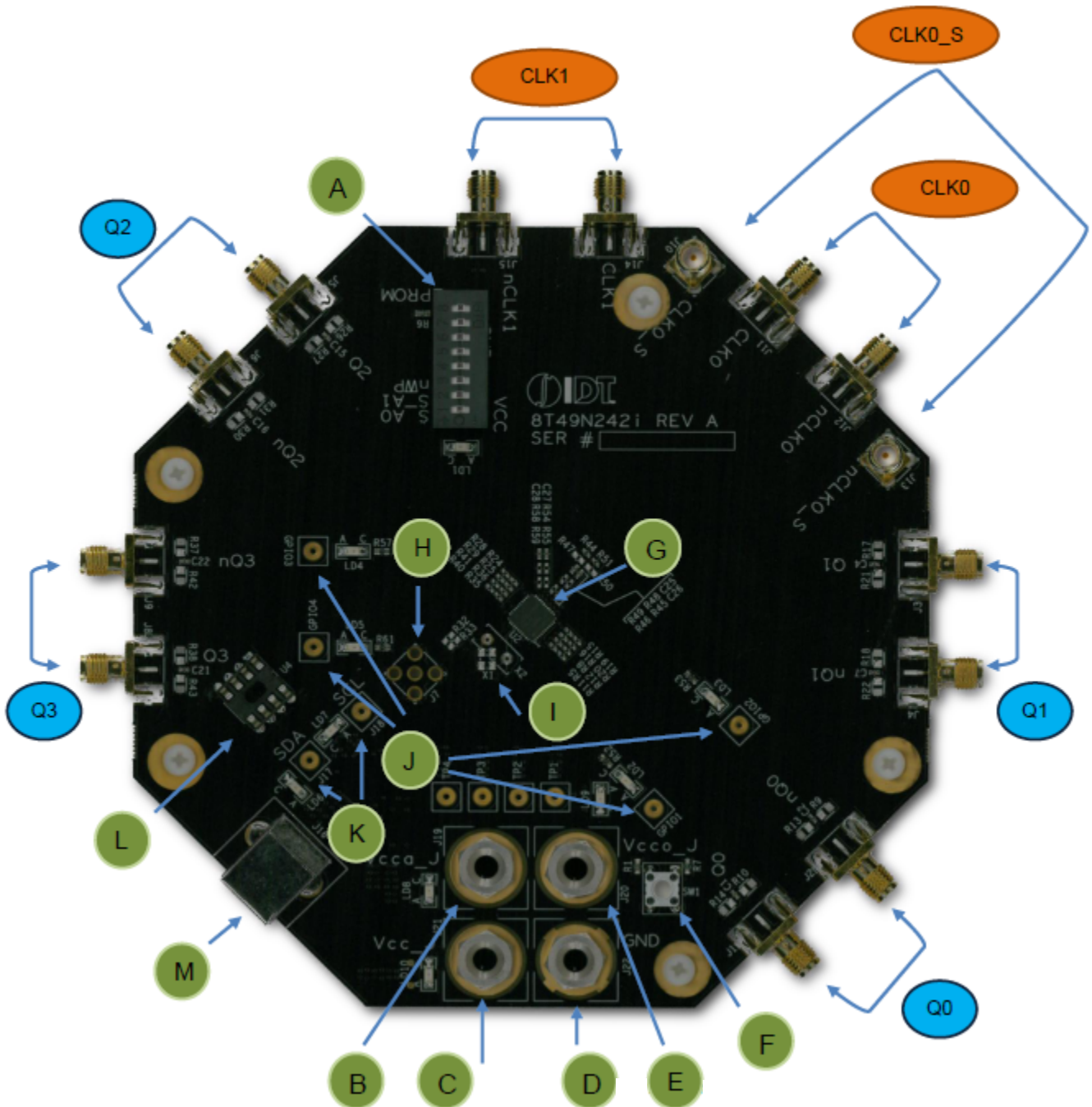
Legend–Evaluation Board

Inputs

CLK0_S   Clock 0 sense lines.

CLK0   Clock 0 input lines. Can be configured for differential or single-ended input.

CLK1   Clock 1 input lines. Can be configured for differential or single-ended input.

Outputs

Q0   Output Q0. Can be a differential pair or two individual single-ended outputs.

Q1   Output Q1. Can be a differential pair or two individual single-ended outputs

Q2   Output Q2. Can be a differential pair or two individual single-ended outputs.

Q3   Output Q3. Can be a differential pair or two individual single-ended outputs.

Other

A   Dip Switch for DC control signals (EEPROM_WP, S_A0/1, nWP)

B   Vcca_J

C   Vcc_J

D   GND

E   Vcco_J

F   RESET

G   IDT8T49N24x- the device to be evaluated

H   OSCI crystal overdrive connector (not installed by default)

I   Crystal connectors (HC49/US through-hole socket and 3.2x2.5 SMD footprint)

J   GPIO test points

K   I2C test points

L   EEPROM socket (AT24C04C)

M   USB connector

Software GUI Overview

The 8T49N24x devices are programmed using IDT's Timing Commander software, which provides an interactive and intuitive Graphical User Interface to program and adjust the many settings that are available for the devices. Timing Commander is the generic platform upon which many devices' GUIs run on. Each GUI has a file called a "personality" that is loaded by Timing Commander so that it can interface with the supported devices. Timing Commander installation and personality files, as well as tutorials and support are available at http://www.idt.com/products/clocks-timing/timing-commander-software-download-resource-guide. The GUI for the 8T49N24x devices is shown below.

Figure 2. Timing Commander 8T49N24x GUI
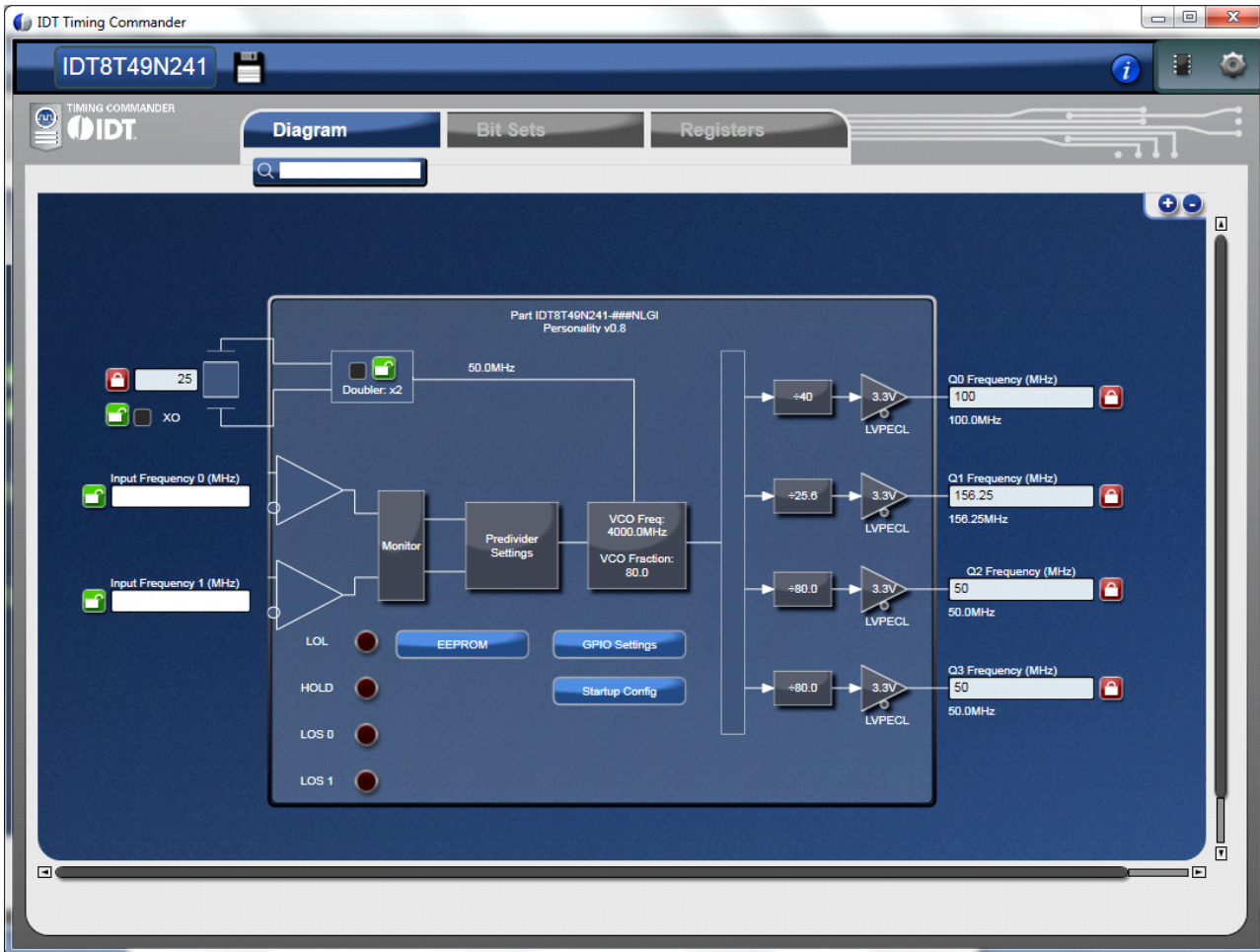
Schematics

The following figures are schematics that are applicable to specific sections of this User Guide. The complete schematics are available in a separate document.
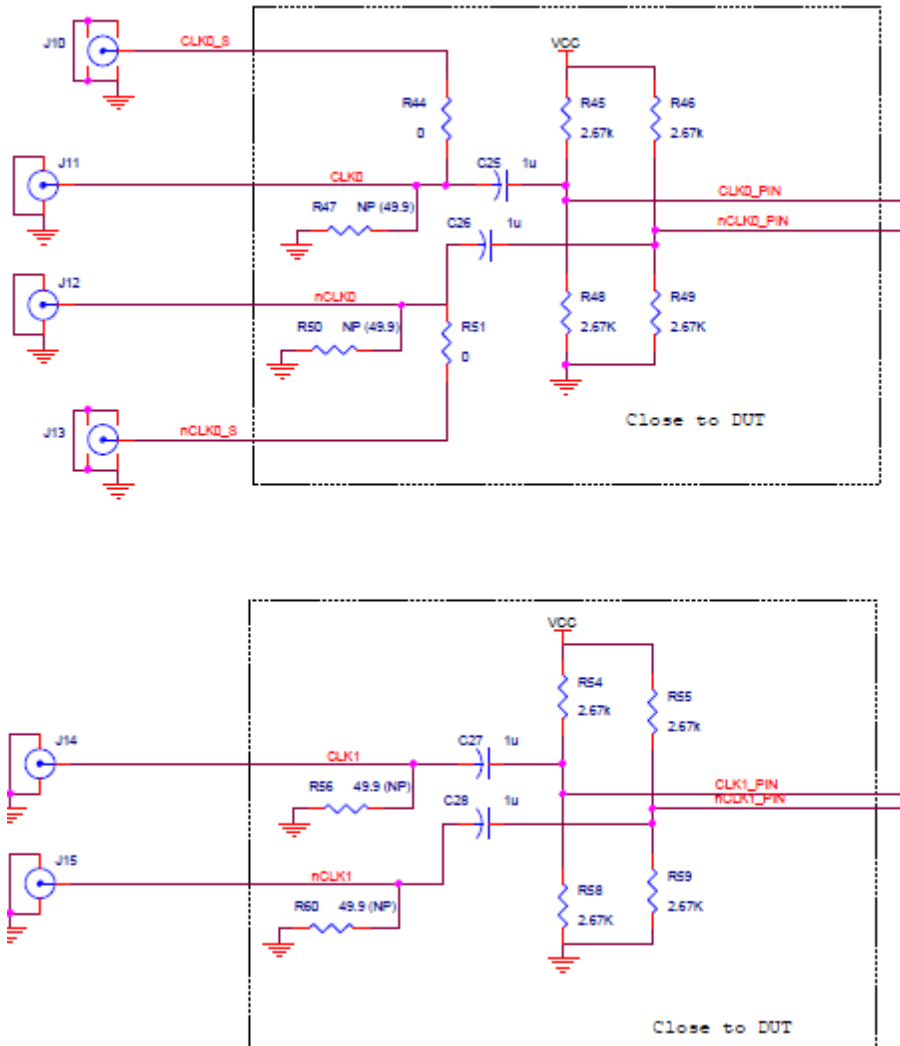
Figure 3. Inputs Schematic
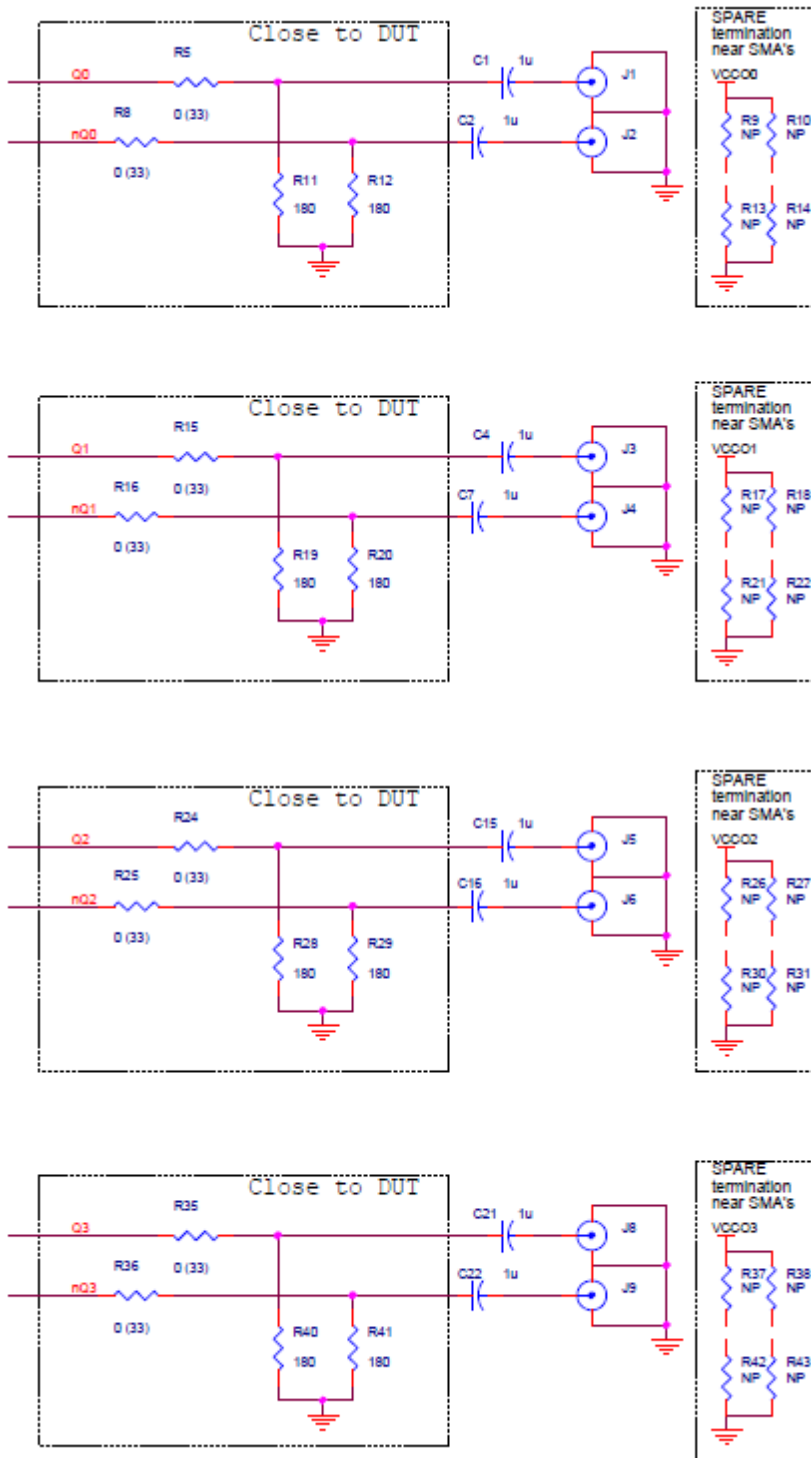
Figure 4. Output Termination Schematic

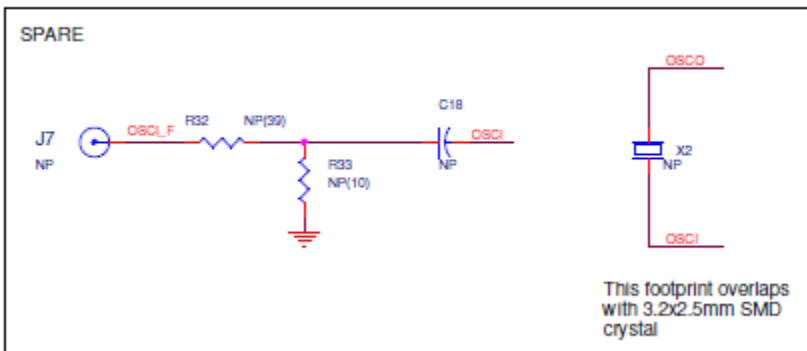**Figure 5. Crystal Interface Schematic**

Crystal Interface

Figure 6. EEPROM/I2C Schematic

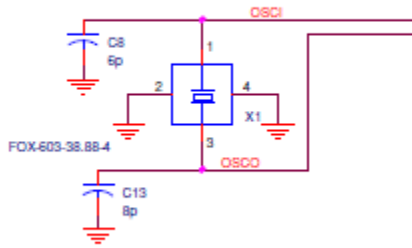Note: if booting from EEPROM in a system, then use the following values: R66=1K, R65=1K, R63=0ohm , LD7= No Populate
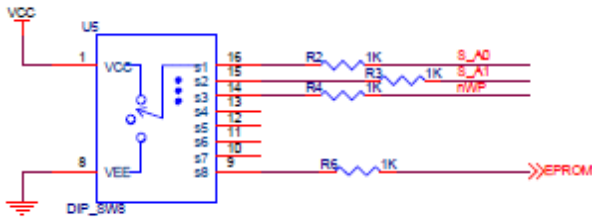
Figure 7. DC Control Schematic
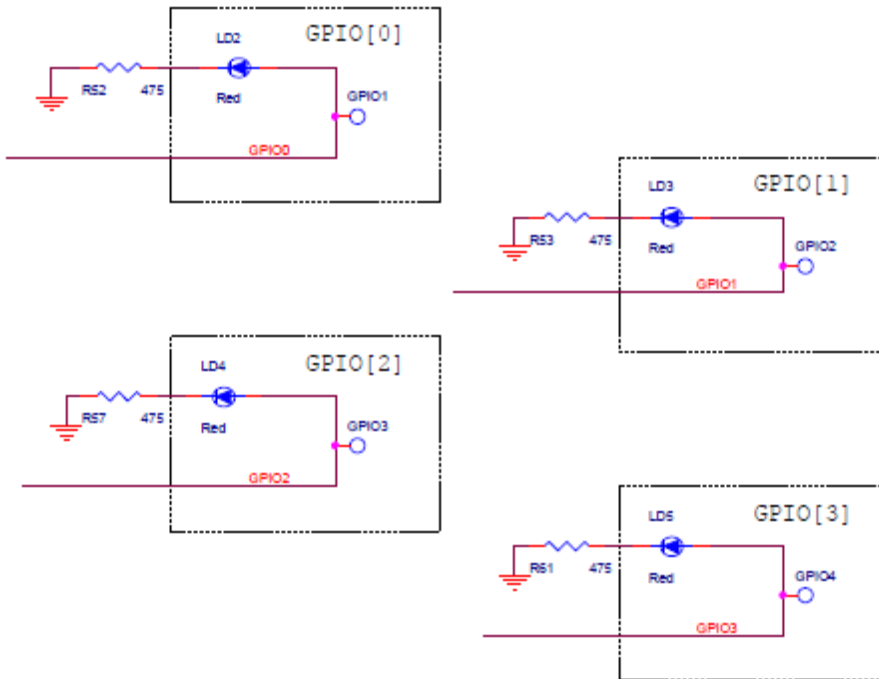

Figure 8. GPIOs Schematic
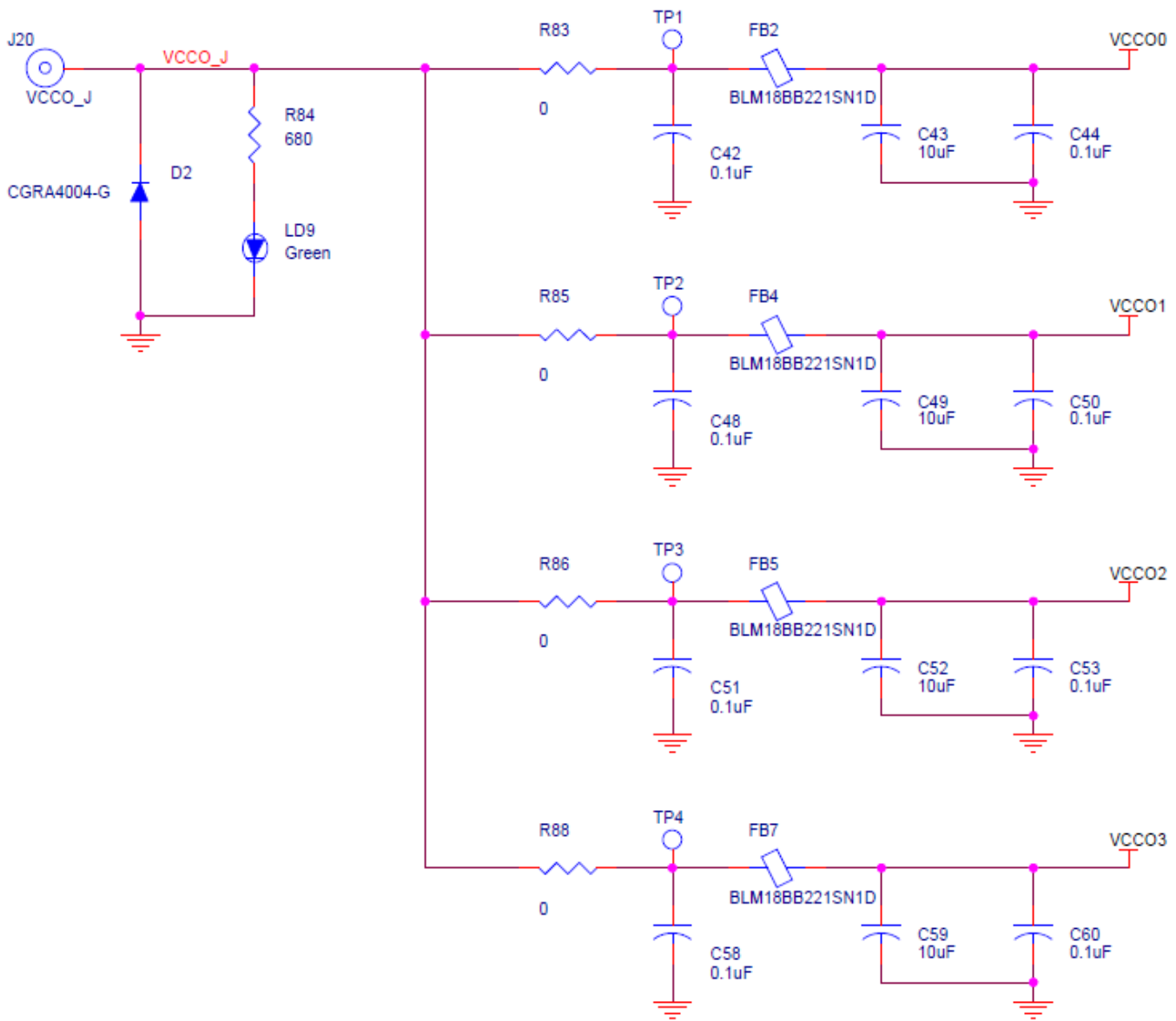
Figure 9. VCCO Power Filtering Schematic

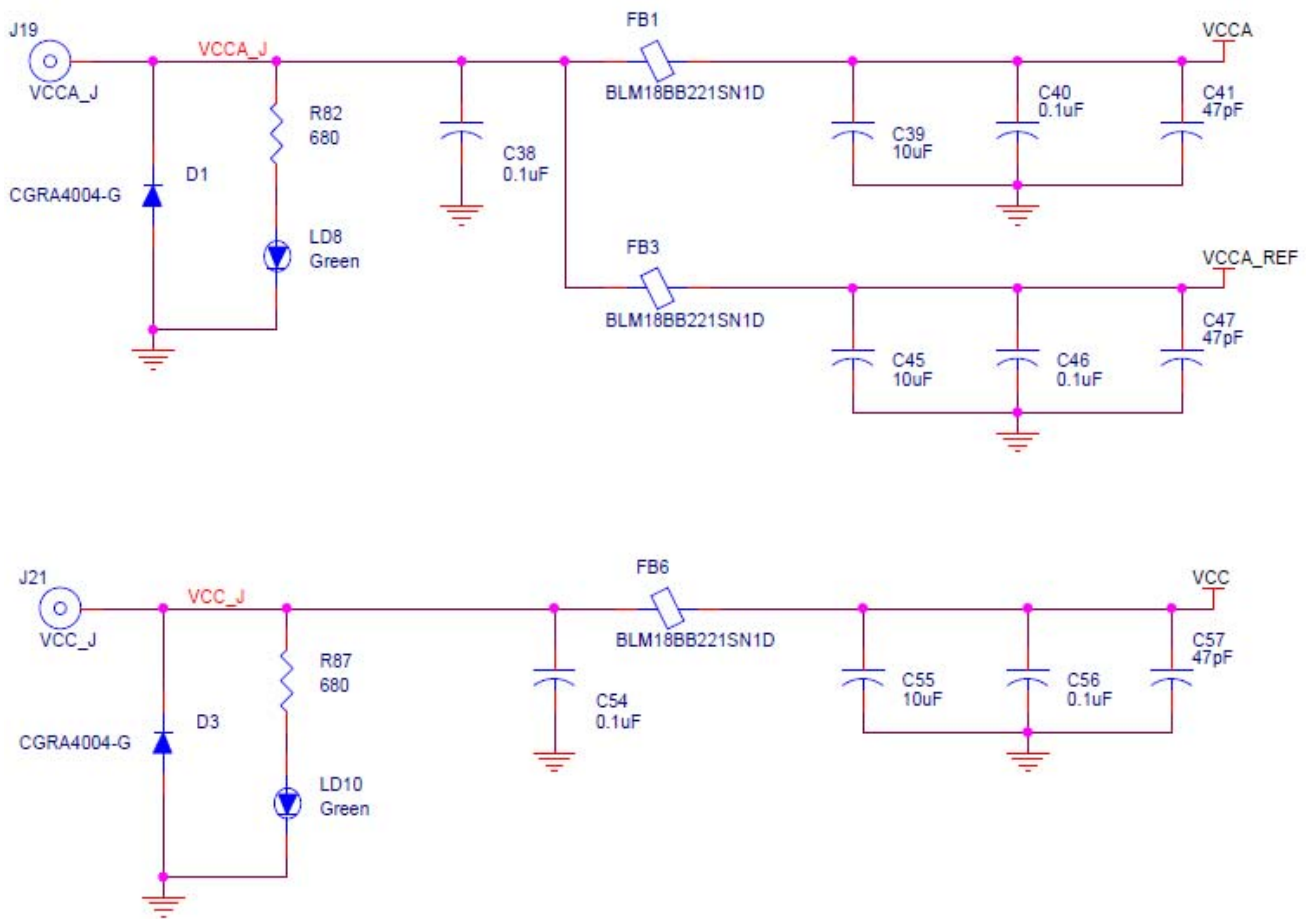**Figure 10. VCC Power Filtering Schematic**

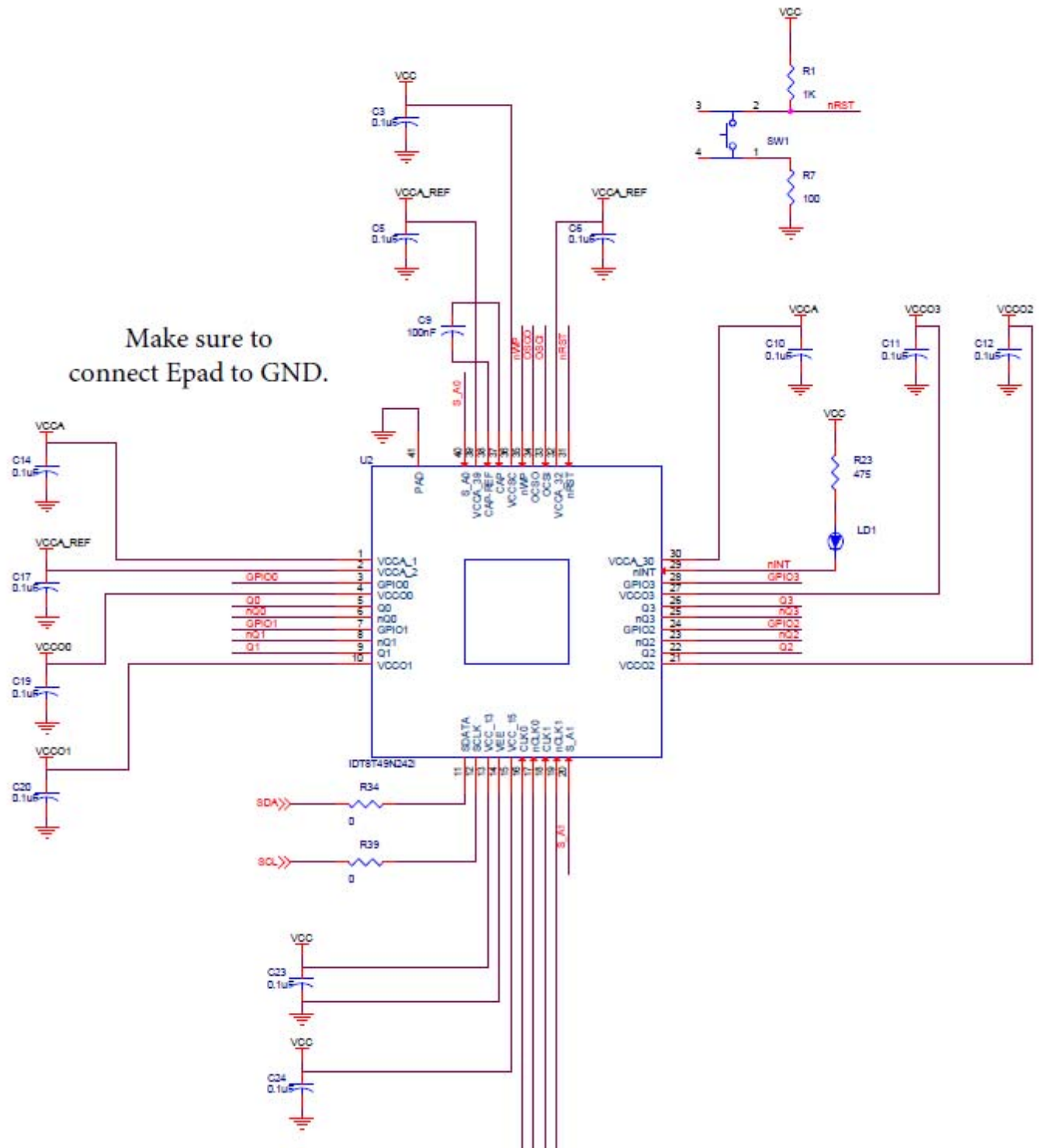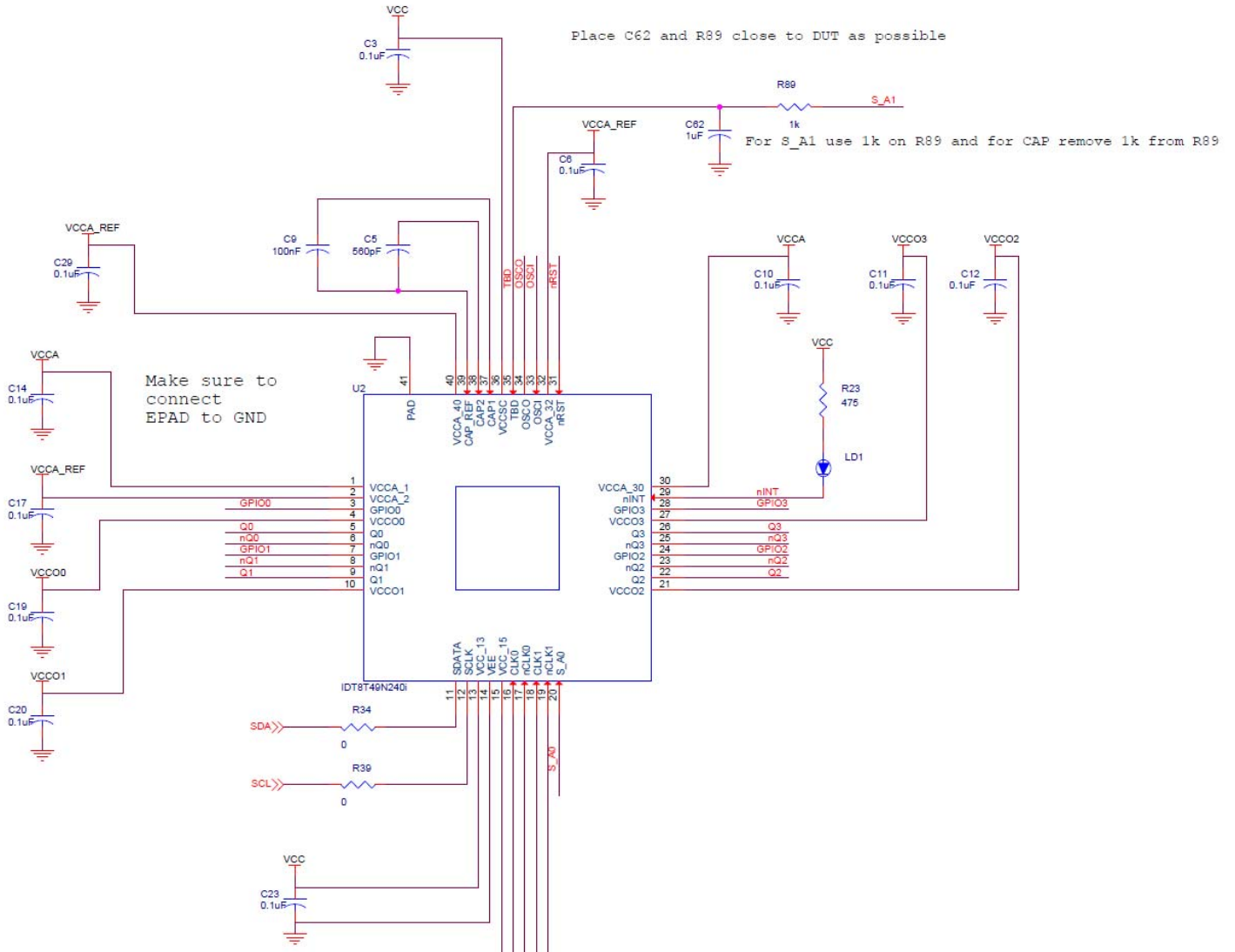**Figure 11. 8T49N241 and 8T49N242 DUT Schematic**

Figure 12. 8T49N240 DUT Schematic

Board Power Supply

Core Voltages

The core voltage includes a digital supply voltage VCC and an analog supply voltage VCCA. The digital supply voltage is powered by an external bench power supply connected to J19 (VCCA_J). The analog supply voltage is powered by an external bench power supply connected to J21 (VCC_J) (see Figure 9).

Output Voltages

VDDO_J (J1) supplies the global voltage for the outputs and can be biased by the external power supply at 1.8V (using LVCMOS for all outputs), 2.5V, or 3.3V.

Mixed Voltage Operation

This board provides the option to operate the outputs with a mixed combination of output voltages. Refer to Figure 8 for a complete view of the VCCO schematic. Each VCCOx has a 0Ω resistor that connects it to the global VCCO_J power rail. This resistor can be removed and the voltage can be provided using the test point. For example, the schematic below can be configured so that Q0 (VCCO0) operates at 2.5V and Q1 (VCCO1) operates at LVCMOS 1.8V as follows:

1. Connect 2.5V to J20 (VCCO_J).

2. Remove R85. This isolates VCCO1 from global VCCO_J.

3. Solder a wire onto test point TP2 and bias with a 1.8V supply.

Figure 13. Mixed Output Voltage Operation
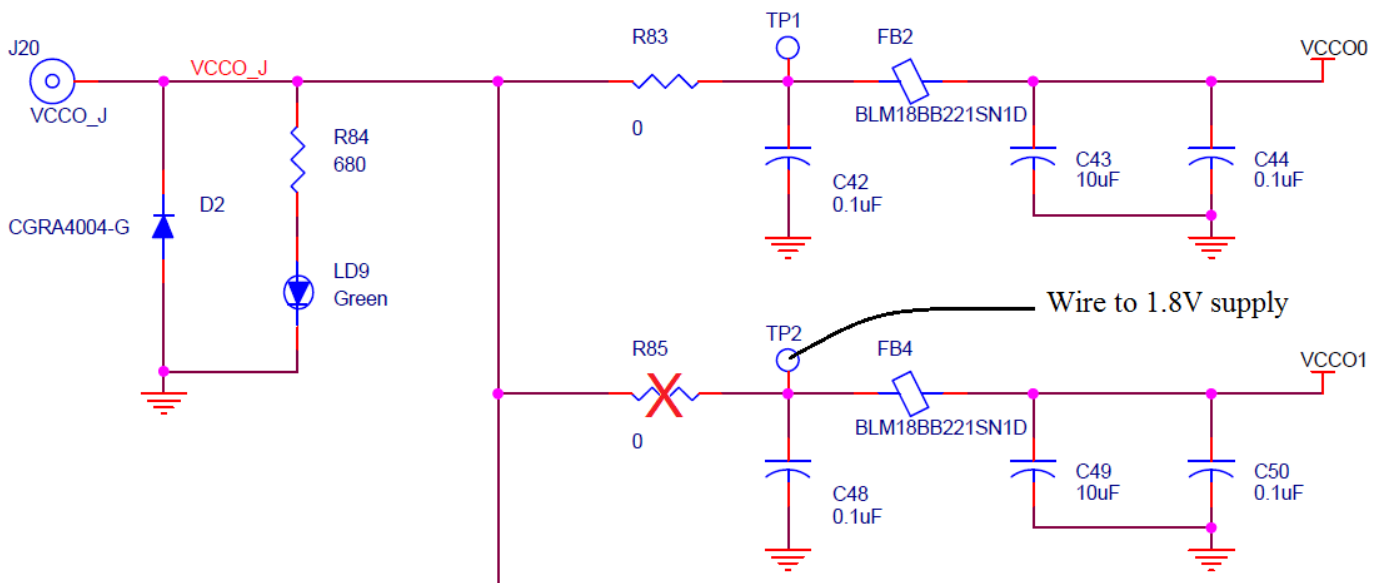
Input Configuration

The inputs are configured with an AC-coupling termination scheme. This scheme allows flexibility for either differential or single-ended inputs. The default configuration is as follows:

Table 1. Default Input Configuration

Input	Default Termination	Sense Lines
CLK0	Unterminated, AC-coupled into the device and terminated via sense line connector to equipment or termination connector.	Use SMAs J10/J13 for observation of the input signal and termination of the input signal
CLK1	Terminated, AC-coupled into the device	Not available

Differential Input

Connect the input signal to CLKx and nCLKx. For CLK0, the CLK0_S and nCLK0_s sense lines are available for observation of the signal. They can be connected with 50ohm impedance cables to an oscilloscope with 50ohm termination, otherwise, they should be terminated with 50ohm plugs in order prevent reflections. The CLK1 input is 50ohm terminated to ground.

Single-ended Input

Connect the input signal to CLKx and float nCLKx. For CLK0, connect CLK0_S with a 50ohm impedance cable to an oscilloscope with 50ohm termination or terminate with a 50ohm plug.

Input Signals Below 1MHz

For slow-frequency signals below 1MHz, we recommend that the AC-coupling capacitors for the corresponding input be replaced with zero-ohm resistors and that the signal input DC-offset be set so that it meets the device's Vcmr requirements. Refer to Figure 3 to locate the components listed below.

Table 2. Input Termination Schemes

Signal Frequency	AC-coupling capacitors: CLK0 (C25, C26); CLK1 (C27,C28)	Input Signal DC Offset
>1MHz	1uF	Don't care
<1MHz	0 Ω	Must meet datasheet Vcmr specs

Output Configuration

The outputs are AC-coupled, allowing for maximum flexibility for observation of the output whether configured for LVPECL, LVDS, LVCMOS, or HCSL levels. The default termination scheme can be used to measure any of the three output level-types but is not optimal. The optimal termination circuits are tabulated below. Refer to Figure 4 to locate the components listed below.

Table 3. Termination Outputs for Q0

Signal Type	Source resistors: R5, R8	180ohm pull-down: R11, R12	Series capacitors: C1,C2	Spare Resistors: R9, R10, R13, R14
LVPECL (Default)	0ohm	Installed	1uF	Not Installed
LVCMOS	33ohm	Not Installed	1uF	Not Installed
LVDS	0ohm	Not Installed	1uF	Not Installed
HCSL	33ohm	Not Installed	1uF	Not Installed

Table 4. Termination Outputs for Q1

Signal Type	Source resistors: R15, R16	180ohm pull-down: R19, R20	Series capacitors: C4,C7	Spare Resistors: R17, R18, R21, R22
LVPECL (Default)	0ohm	Installed	1uF	Not Installed
LVCMOS	33ohm	Not Installed	1uF	Not Installed
LVDS	0ohm	Not Installed	1uF	Not Installed
HCSL	33ohm	Not Installed	1uF	Not Installed

Table 5. Termination Outputs for Q2

Signal Type	Source resistors: R24, R25	180ohm pull-down: R28, R29	Series capacitors: C15,C16	Spare Resistors: R26, R27, R30, R31
LVPECL (Default)	0ohm	Installed	1uF	Not Installed
LVCMOS	33ohm	Not Installed	1uF	Not Installed
LVDS	0ohm	Not Installed	1uF	Not Installed
HCSL	33ohm	Not Installed	1uF	Not Installed

Table 6. Termination Outputs for Q3

Signal Type	Source resistors: R35, R36	180ohm pull-down: R40, R41	Series capacitors: C21,C22	Resistor Network: R37,R38, R42, R43
LVPECL (Default)	0ohm	Installed	1uF	Not Installed
LVCMOS	33ohm	Not Installed	1uF	Not Installed
LVDS	0ohm	Not Installed	1uF	Not Installed
HCSL	33ohm	Not Installed	1uF	Not Installed

Table 7. Spare Resistor Termination for LVPECL for Q0

Signal Type	Source resistors: R5, R8	180ohm pull-down: R11, R12	Series capacitors: C1,C2	Spare Resistors: R9, R10, R13, R14
LVPECL (Default)	0ohm	Not Installed	0ohm	R9=R10=125ohm R13=R14=84ohm
HCSL	33ohm	Not Installed	0ohm	R9=R10=Not Installed R13=R14=50ohm

Output Signals Below 1MHz

For output signals below 1MHz we recommend that the 1uF AC-coupling capacitors be replaced with 0ohm resistors and that the correct terminations be provided at the receiver.

EEPROM Boot

The evaluation board ships with an IDT8T49N24x-998 device, which will attempt to boot from the EEPROM at power-up. If an EEPROM is not present, the device registers will need to be set by Timing Commander. The EEPROM must have at least 85 bytes, have an I2C address of 0xA0, use 1-byte addressing, and conform to the 8-DIP package shown in Figure 1 (symbol "L") and Figure 6. An AT24C04 is typically used. The EEPROM is programmed through Timing Commander. Once connected to the chip using the "Connect to the chip" button in the top-right corner of the window, a button for "Write All" will appear that is used to write all registers to either the IDT8T49N24x device or the EEPROM.

Figure 14. EEPROM Programming

To write to the EEPROM, make sure the I2C slave address is set to 0xA0 and the address type is set to "One Byte Addresses", then click "Write to Alternate". A confirmation message box will appear when the write is completed.

DC Controls

The DIP switch has three settings: 0V, Float, and VCC. This board ships with all switches in the Float (middle) position. Refer to Figure 1, label "A" for the location of the DIP Switch. The functions for the switches are:

- S1: 8T49N24x I2C slave address bit 0
- S2: 8T49N24x I2C slave address bit 1
- S3: 8T49N24x nWP, 0=Registers write protected, 1=Normal operation

Crystal Interface

The board supports three types of crystals that can be used for the local reference oscillator of the device. If overdriving the crystal oscillator with an external signal, an optional extra connector must be attached to allow this. The board ships with a 38.88MHz surface-mount crystal populated in X1. If a different crystal is desired, or if overdriving the crystal oscillator externally, this part must be removed. See Figure 1, label "I". Crystal load capacitors support a 12pF crystal. If a crystal with a different load capacitance is used, C8 and C13 may need to be modified. These capacitors are on the bottom side of the board, next to the through-hole crystal socket (see Figure 15).

Figure 15. Crystal Load Capacitors
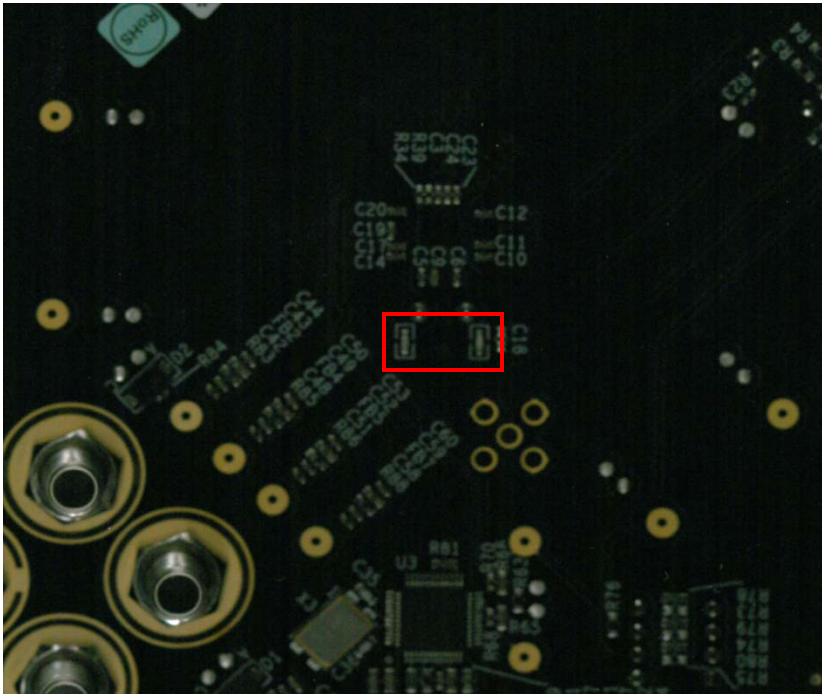
1. Through-hole crystal. With this option, the device can be evaluated with different crystals without the need to solder each time the crystal is replaced. Insert the crystal into the socket labeled X2 on the board (see Figure 1, label "I").

2. Surface-mount crystal. With this option, a 3.2x2.5 SMD crystal may be soldered onto the footprint labeled X1 on the board (see Figure 1, label "I"). The board ships with a 38.88MHz crystal installed here.

3. External Crystal Overdrive. With this option, the device can be evaluated using an external source, such as a frequency generator, XO, or other device. The following modifications are needed for this option (see Figure 1 and Figure 4 for identification and location of the components):

    a. Populate SMA J7 (see Figure 1, label "H").

    b. Solder a 1uF capacitor onto C18. Note: The input must be AC-coupled.

    c. R33 may be populated with a 50ohm resistor for input sources requiring such termination.

    d. Populate R32 with either a 0ohm or 33ohm (LVCMOS) resistor.

Application Notes and Resources

Design guidelines and resources may be found online for the 8T49N24x devices, at the following addresses:

8T49N240

http://www.idt.com/8T49N240

8T49N241

http://www.idt.com/8T49N241

8T49N242

http://www.idt.com/8T49N242

The site contains a wealth of information, including:

- Device datasheets and errata
- Package and dash-code options and ordering guide
- Evaluation board resources, including guides and schematics
- Cadence schematic symbols and footprints
- IBIS simulation models
- Application notes, including power-up configuration, frequency programming, EEPROM programming, output termination guidelines, and more
- Timing Commander installation and 8T49N24x personality files to allow programming of settings and creation of settings files used to create new dash-codes from a PC
- Example settings files and phase noise plots
- Tutorial videos for Timing Commander and the 8T49N24x evaluation boards

For more questions or support, please submit a technical support request.

Revision History

Revision Date	Description of Change
June 6, 2017	▪ Added support for the 8T49N240i device ▪ Converted the document to the latest template
August 6, 2015	Initial release.

IMPORTANT NOTICE AND DISCLAIMER

RENESAS ELECTRONICS CORPORATION AND ITS SUBSIDIARIES ("RENESAS") PROVIDES TECHNICAL SPECIFICATIONS AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for developers skilled in the art designing with Renesas products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. Renesas grants you permission to use these resources only for development of an application that uses Renesas products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Renesas intellectual property or to any third party intellectual property. Renesas disclaims responsibility for, and you will fully indemnify Renesas and its representatives against, any claims, damages, costs, losses, or liabilities arising out of your use of these resources. Renesas' products are provided only subject to Renesas' Terms and Conditions of Sale or other applicable terms agreed to in writing. No use of any Renesas resources expands or otherwise alters any applicable warranties or warranty disclaimers for these products.

(Rev.1.0 Mar 2020)

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Clock & Timer Development Tools *category:*

Click to view products by Renesas *manufacturer:*

Other Similar products are found below :

AD9517-0A/PCBZ AD9522-4/PCBZ AD9520-5PCBZ AD9530/PCBZ AD9553/PCBZ ADCLK914PCBZ LMH2180SDEVAL DSC400-0333Q0032KE1-EVB TDGL013 MAX2880EVKIT# MAX2750EVKIT MAX2752EVKIT ADCLK946PCBZ ADCLK946/PCBZ MAX2622EVKIT EKIT01-HMC1032LP6G Si5332-8IX-EVB Si5332-12IX-EVB RV-3029-C2-EVALUATION-BOARD-OPTION-B Si5332-6IX-EVB SKY72310-11-EVB EV1HMC8364LP6G RV-8263-C7-EVALUATION-BOARD EVK9FGV1002 EVK9FGV1008 EV1HMC6832ALP5L EVAL01-HMC830LP6GE EVAL01-HMC911LC4B EVAL01-HMC988LP3E TS3002DB 125605-HMC702LP6CE LMX2487E-EVM MIKROE-2481 2045 EKIT01-HMC835LP6G EKIT01-HMC834LP6GE TS3006DB DSC-TIMEFLASH2-KIT1 110227-HMC510LP5 110227-HMC513LP5 AD9515/PCBZ ADCLK948/PCBZ ADCLK954/PCBZ 112261-HMC739LP4 ADCLK925/PCBZ AD9522-0/PCBZ AD9520-4/PCBZ AC164147 DFR0469 LMK04133EVAL/NOPB