Evaluation Module for UCD90120 and UCD90124

This User's Guide describes the evaluation modules (EVM) for the UCD90120 (UCD90120EVM) and UCD90124 (UCD90124EVM). The EVM contains evaluation and reference circuitry for the UCD90120 and UCD90124. UCD90120 and UCD90124 are advanced power system controllers containing sequencing, monitoring, fan control and many other power supply system support features.

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1 Description

The UCD90120 and UCD90124 EVM provides many sophisticated power supply system controller application capabilities. The EVM allows direct PMBus (power management bus) communication with the UCD90120 and UCD90124 via an onboard USB interface. This interface allows direct control and feedback with the UCD90120 and UCD90124 when using the TI-Fusion-Digital-Power-Designer-Graphical-User-Interface.

1.1 Features

- General features
  - Single 12V supply input
  - 12 rail sequencing
  - 13 analog monitors
  - Single fan control interface
  - Status LEDs on all GPIOs
  - USB-PMBus interface for communication
- Orderable options
  - UCD90124EVM 12 channel sequencer and monitor with fan control
  - UCD90120EVM 12 channel sequencer and monitor

1.2 Applications

- Industrial / ATE
- Telecommunications and Networking Equipment
- Servers and Storage Systems
- Any System Requiring Sequencing and Monitoring of Multiple Power Rails

2 Quick Start

2.1 Test Setup

Figure 1 shows a typical test setup for UCD90120/4EVM. All that is required is a 12V (500mA for UCD90120EVM or 2000mA for UCD90124EVM running a fan) wall adapter/laptop power supply (see J1 BOM description for receptacle size) and a PC. The USB-EVM cable is provided with the EVM.

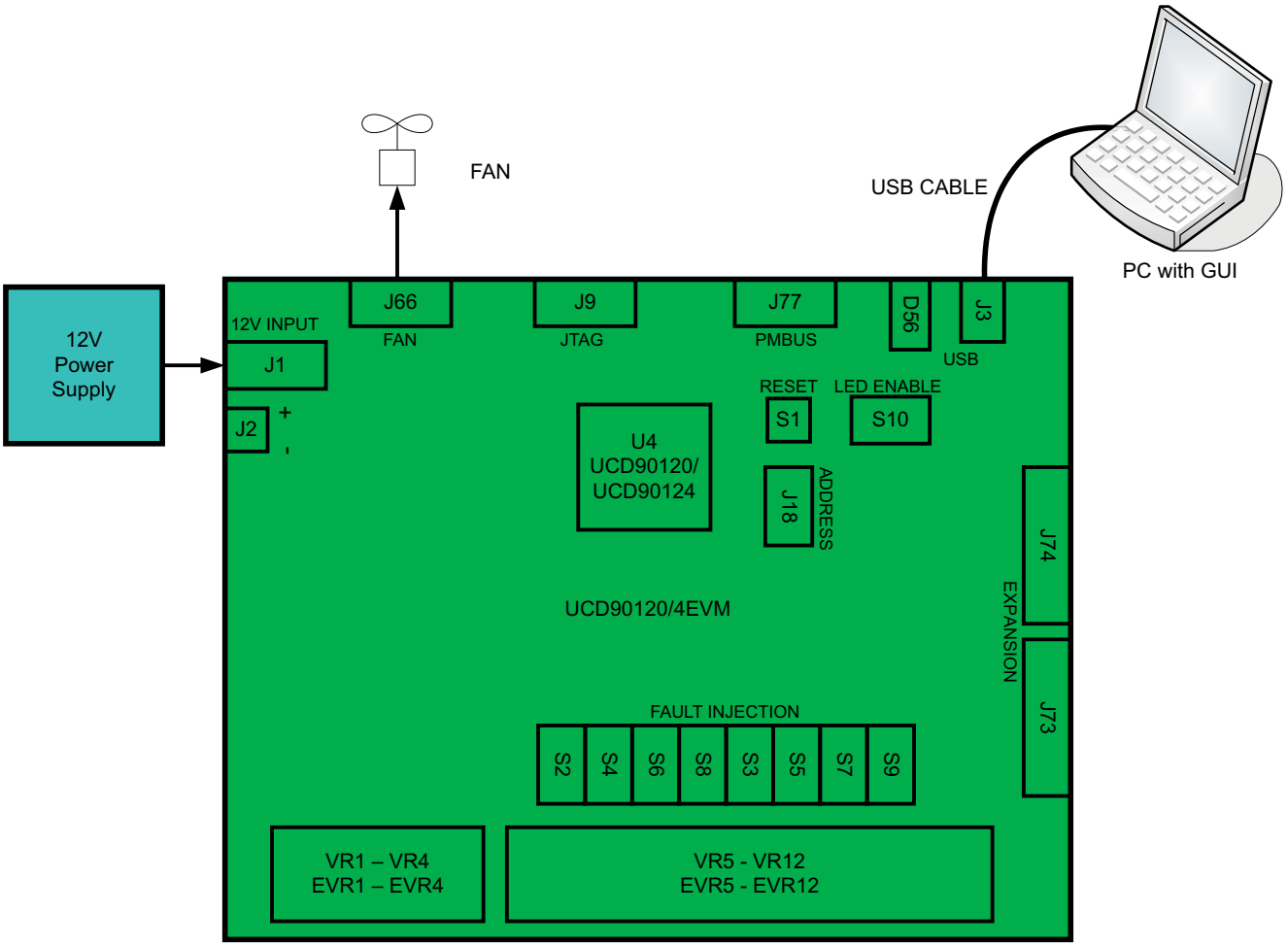


Figure 1. Typical Test Setup

2.2 EVM Layout View

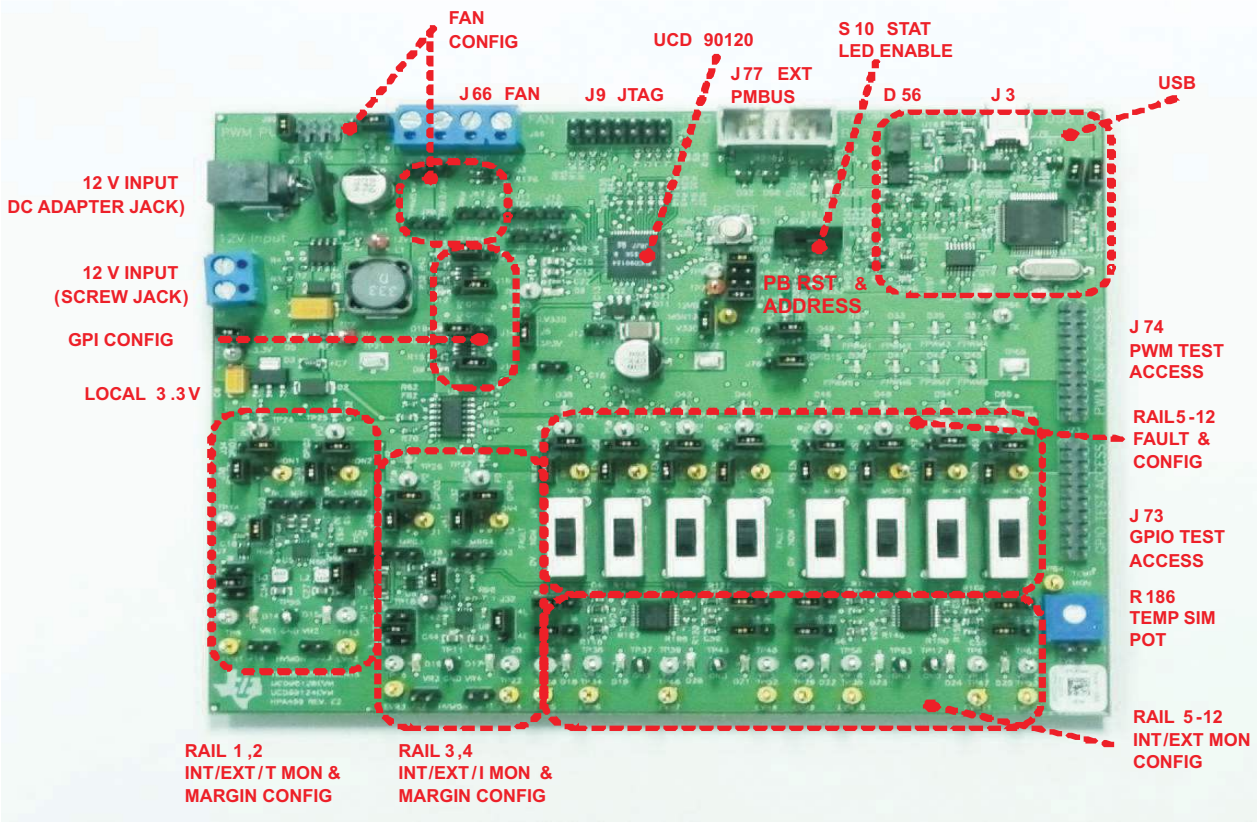


Figure 2. UCD90120/4 EVM View

2.3 EVM Block Diagram

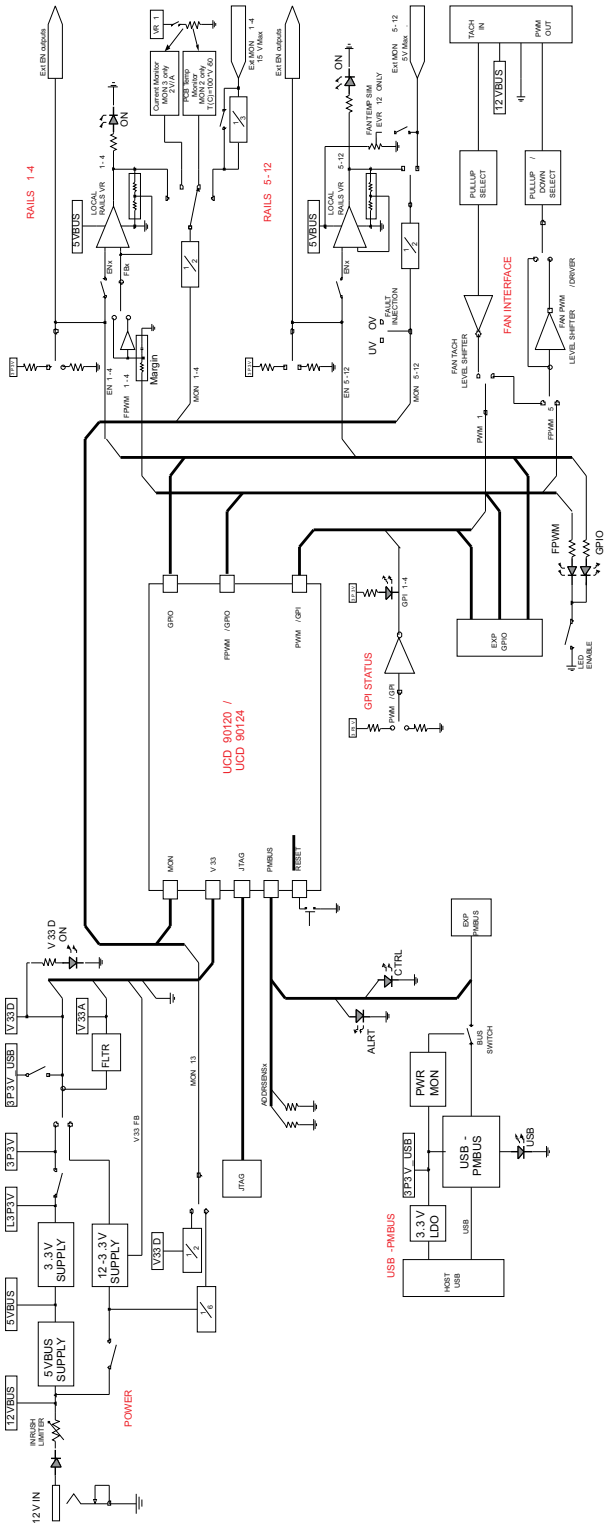


Figure 3. UCD90120/4 EVM Block Diagram

3 UCD90120/4 EVM GUI Setup

3.1 UCD90120/4 EVM GUI Installation

The UCD90120 and UCD90124 EVMs use the Texas Instruments Fusion Digital Power Designer graphical user interface (GUI) which may be downloaded from the following web site: http://focus.ti.com/docs/toolsw/folders/print/fusion_digital_power_designer.html

Place the TI-Fusion-Digital-Power-Designer-zip file in a known location on the PC. Unzip the TI-Fusion-Digital-Power-Designer-zip file.

Double click the unzipped TI-Fusion-Digital-Power-Designer-exe file. Proceed through the installation by accepting the installer prompts and the license agreement. Accept the GUI suggested default PC installation locations to complete the install.

Once the GUI completes the installation it will start. The first time the GUI is launched on a particular PC the user may be prompted to select a device. Choose UCD9xxx. Afterwards, the GUI may be closed.

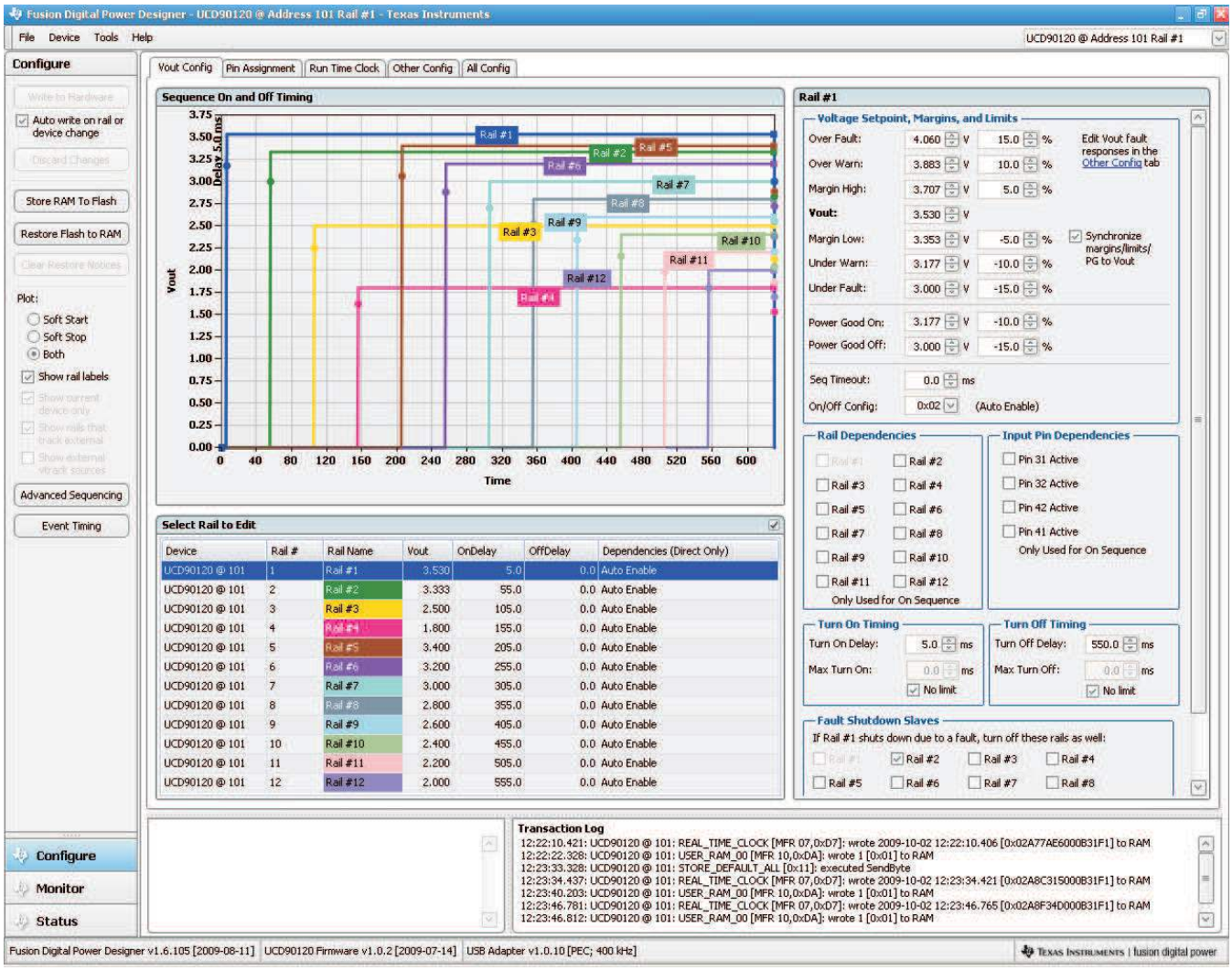
Note that the TI-Fusion-Digital-Power-Designer v1.6.105 was used for the examples to be shown later in the document.

3.2 UCD90120/4 EVM GUI Operation

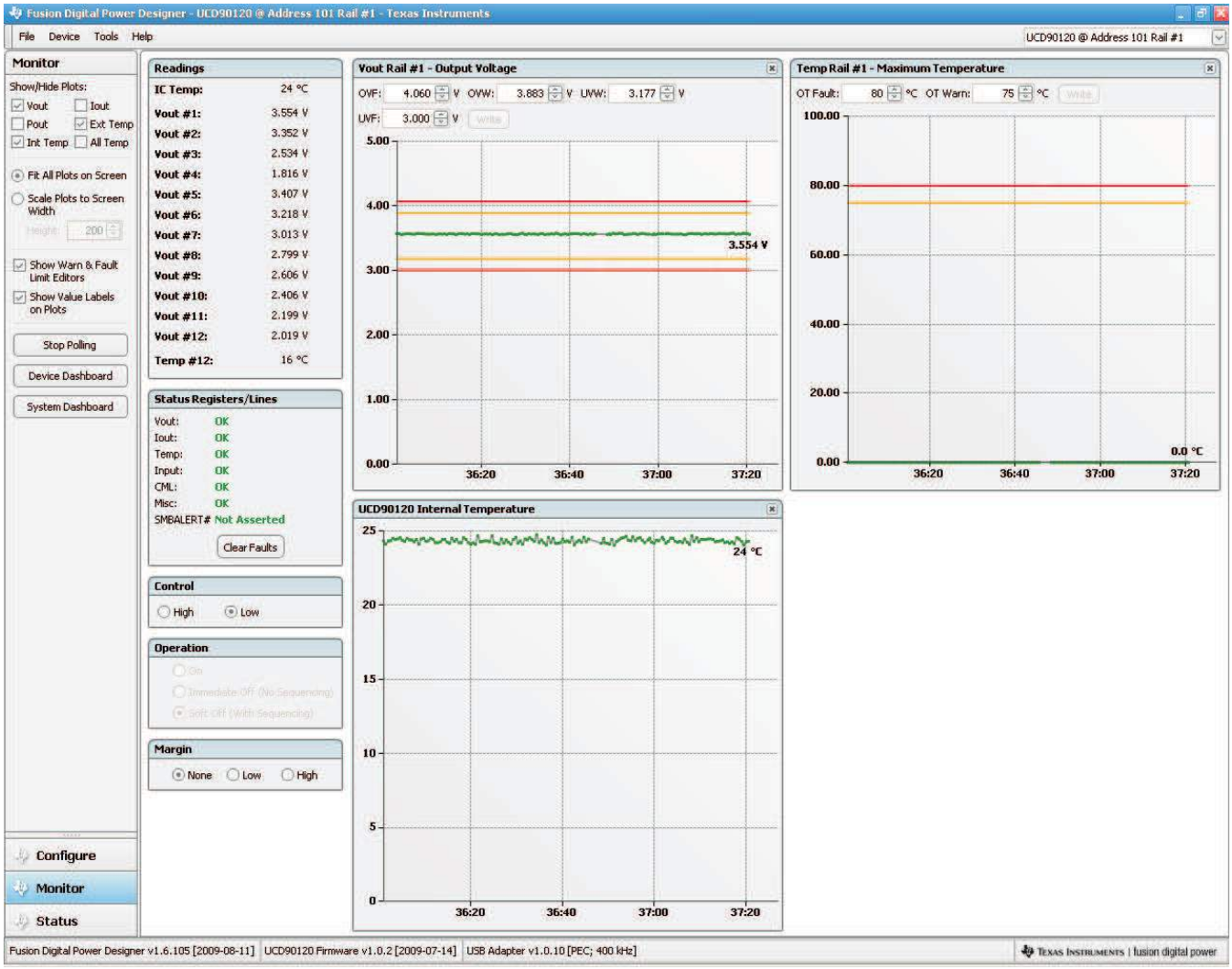
The EVM comes pre-loaded with a 12 rail default project that sequences the EVM rails on at power up. It is a good idea to export the default project to a file on the PC prior to making changes.

3.2.1 Launch TI-Fusion-Digital-Power-Designer

Navigate to the location where the Fusion GUI is installed and (Start, All Programs, Texas Instruments Fusion Digital Power Designer, Fusion Digital Power Designer) and start it. A window similar to the following will appear.



Most of the GUI control features are available from the Configure window. Monitor and Status information is available from the respective buttons on the GUI lower left. A typical Monitor window is shown below.



4 General Use Features

4.1 EVM Input/Output Connectors and Switches

Table 1. EVM Input/Output Connectors and Switches

Connector/Switch	Label	Description
J1	12V INPUT	12V DC jack
J2	12V INPUT	12V screw jack
J9	JTAG	JTAG Connector
J66	FAN	Fan interface connector
J73	GPIO TESTACCESS	GPIO expansion
J74	PWM TEST ACCESS	PWM expansion
J77	PMBUS	PMBus expansion
J3	USB IN	USB input connector
S1	RESET	Push button reset
S10	STAT LED	Status LED enable switch
S2	FAULT – MON5	MON5 fault switch
S4	FAULT – MON6	MON6 fault switch
S6	FAULT – MON7	MON7 fault switch
S8	FAULT – MON8	MON8 fault switch
S3	FAULT – MON9	MON9 fault switch
S5	FAULT – MON10	MON10 fault switch
S7	FAULT – MON11	MON11 fault switch
S9	FAULT – MON12	MON12 fault switch
R186	TEMP MON	Fan temperature simulator

4.2 EVM LEDS

Table 2. EVM LED's

LED	Color	Label	Description
D5	RED	5V	5VBUS ON indicator
D9	RED	V33D	UCD90120/4 power ON
D28	RED	ALERT	PMBus Alert
D29	GREEN	CTRL	PMBus Control
D56	GREEN	USB ON	USB attached
D8	AMBER	GPI1	GPI1 input HIGH
D10	AMBER	GPI2	GPI2 input HIGH
D12	AMBER	GPI3	GPI3 input HIGH
D13	AMBER	GPI4	GPI4 input HIGH
D30	GREEN	GPIO1	GPIO1 HIGH
D32	GREEN	GPIO2	GPIO2 HIGH
D34	GREEN	GPIO3	GPIO3 HIGH
D36	GREEN	GPIO4	GPIO4 HIGH
D38	GREEN	GPIO13	GPIO13 HIGH
D47	GREEN	GPIO14	GPIO14 HIGH
D49	GREEN	GPIO15	GPIO15 HIGH
D40	GREEN	GPIO16	GPIO16 HIGH
D42	GREEN	GPIO17	GPIO17 HIGH
D44	GREEN	GPIO18	GPIO18 HIGH
D46	GREEN	GPIO19	GPIO19 HIGH
D48	GREEN	GPIO20	GPIO20 HIGH
D54	GREEN	GPIO21	GPIO21 HIGH
D55	GREEN	GPIO22	GPIO22 HIGH
D31	AMBER	FPWM1	GPIO5 HIGH
D33	AMBER	FPWM2	GPIO6 HIGH
D35	AMBER	FPWM3	GPIO7 HIGH
D37	AMBER	FPWM4	GPIO8 HIGH
D39	AMBER	FPWM5	GPIO9 HIGH
D41	AMBER	FPWM6	GPIO10 HIGH
D43	AMBER	FPWM7	GPIO11 HIGH
D45	AMBER	FPWM8	GPIO12 HIGH
D14	RED	VR1	VR1 ON
D15	RED	VR2	VR2 ON
D16	RED	VR3	VR3 ON
D17	RED	VR4	VR4 ON
D18	RED	VR5	VR5 ON
D19	RED	VR6	VR6 ON
D20	RED	VR7	VR7 ON
D21	RED	VR8	VR8 ON
D22	RED	VR9	VR9 ON
D23	RED	VR10	VR10 ON
D24	RED	VR11	VR11 ON
D25	RED	VR12	VR12 ON

4.3 EVM Test Points

Table 3. EVM Test Points

TP	Color	Label
TP1	RED	12VBUS
TP2	RED	5VBUS
TP3	WHT	L3P3V
TP4	WHT	V33D
TP11	BLK	GND
TP17	BLK	GND
TP6	WHT	ADDRSENS0
TP7	ORG	ADDRSENS1
TP37	BLK	GND
TP43	BLK	GND
TP8	YEL	EVR1
TP13	YEL	EVR2
TP16	YEL	EVR3
TP22	YEL	EVR4
TP28	YEL	EVR5
TP34	YEL	EVR6
TP46	YEL	EVR7
TP52	YEL	EVR8
TP29	YEL	EVR9
TP35	YEL	EVR10
TP47	YEL	EVR11
TP53	YEL	EVR12
TP14	WHT	VR1 LOAD TEMP MON
TP18	WHT	VR1 CURRENT MON
TP9	WHT	VR1
TP12	WHT	VR2
TP19	WHT	VR3
TP20	WHT	VR4
TP36	WHT	VR5
TP38	WHT	VR6
TP39	WHT	VR7
TP40	WHT	VR8
TP54	WHT	VR9
TP56	WHT	VR10
TP61	WHT	VR11
TP62	WHT	VR12
TP55	BLK	GND
TP24	WHT	GPIO1
TP25	WHT	GPIO2
TP26	WHT	GPIO3
TP27	WHT	GPIO4
TP32	WHT	GPIO13
TP66	WHT	GPIO14 (SCI-TX)
TP65	WHT	GPIO15 (SCI-RX)
TP44	WHT	GPIO16
TP48	WHT	GPIO17

Table 3. EVM Test Points (continued)

TP	Color	Label
TP33	WHT	GPIO19
TP57	WHT	GPIO18
TP45	WHT	GPIO20
TP49	WHT	GPIO21
TP58	WHT	GPIO22
TP10	YEL	MON1
TP15	YEL	MON2
TP21	YEL	MON3
TP23	YEL	MON4
TP30	YEL	MON5
TP41	YEL	MON6
TP50	YEL	MON7
TP59	YEL	MON8
TP31	YEL	MON9
TP42	YEL	MON10
TP51	YEL	MON11
TP60	YEL	MON12
TP5	YEL	MON13
TP63	BLK	GND
TP64	YEL	TEMP POT WIPER
TP67	WHT	LA CLOCK
TP68	SM-SLV	GND
TP69	SM-SLV	GND
TP70	SM-SLV	GND
TP71	SM-SLV	GND
TP72	SM-SLV	GND
TP73	SM-SLV	GND

4.4 EVM Test Jumpers

The EVM will be equipped with shunts on the jumper positions identified in the Default Pin Position below. Shunts can be moved and removed as required during use.

Table 4. EVM Jumpers

Jumper	Default Pin Position	Label	Description
J8		3.3VUSB	3.3V USB
J78	1-2		EEPROM SCL
J79	1-2		EEPROM SDA
J69	1-2	PWM PU	Fan PWM pullup/pulldown select
J70	1-2		Fan PWM select (fast or slow) FPWM5
J67	1-2		Fan tach input or slow PWM output
J72	2-3	TACH PU	Fan tach input pullup/pulldown select
J71		EVR12	Fan temperature simulator pot to MON12
J68	2-3		Fan type select (4 or 2/3 wire)
J10	1-2	GPI1	General purpose input #1
J14	1-2	GPI2	General purpose input #2
J16	1-2	GPI3	General purpose input #3
J17	1-2	GPI4	General purpose input #4
J34	2-3	GPIO1	GPIO1 (enable #1) pullup/pulldown
J35	2-3	GPIO2	GPIO2 (enable #2) pullup/pulldown
J36	2-3	GPIO3	GPIO3 (enable #3) pullup/pulldown
J37	2-3	GPIO4	GPIO4 (enable #4) pullup/pulldown
J44	2-3	GPIO13	GPIO13 (enable #5) pullup/pulldown
J45	2-3	GPIO16	GPIO16 (enable #6) pullup/pulldown
J50	2-3	GPIO17	GPIO17 (enable #7) pullup/pulldown
J51	2-3	GPIO18	GPIO18 (enable #8) pullup/pulldown
J56	2-3	GPIO19	GPIO19 (enable #9) pullup/pulldown
J57	2-3	GPIO20	GPIO20 (enable #10) pullup/pulldown
J62	2-3	GPIO21	GPIO21 (enable #11) pullup/pulldown
J63	2-3	GPIO22	GPIO22 (enable #12) pullup/pulldown
J75	2-3	GPIO14	GPIO14 pullup/pulldown
J76	2-3	GPIO15	GPIO15 pullup/pulldown
J18	1-2,7-8	PM ADDR	PMBus address
J11		TCK	JTAG TCK
J6		TDI	JTAG TDI
J12		TDO	JTAG TDO
J7		TMS	JTAG TMS
J4	1-2	L3.3V	LDO 3.3V to board 3.3V
J13		12VB	Local 12VBUS-V33D regulator
J5	1-2		Local or LDO 3.3V
J19		HVMON	EVR1 monitor scaling
J23		HVMON	EVR2 monitor scaling
J27		HVMON	EVR3 monitor scaling
J31		HVMON	EVR4 monitor scaling
J20	1-2	1L 1E	MON1 source select
J24	3-4	E2 L2 T1	MON2 source select
J28	3-4	E3 L3 C1	MON3 source select
J32	1-2	4L 4E	MON4 source select

Table 4. EVM Jumpers (continued)

Jumper	Default Pin Position	Label	Description
J42	1-2	5L 5E	MON5 source select
J48	1-2	6L 6E	MON6 source select
J54	1-2	7L 7E	MON7 source select
J60	1-2	8L 8E	MON8 source select
J43	1-2	9L 9E	MON9 source select
J49	1-2	10L 10E	MON10 source select
J55	1-2	11L 11E	MON11 source select
J61	1-2	12L 12E	MON12 source select
J15	1-2	MON13	MON 13 source select
J26	1-2	C1	VR1 output load
J22		RC MRG1	VR1 margining feedback
J25		RC MRG2	VR2 margining feedback
J30		RC MRG3	VR3 margining feedback
J33		RC MRG4	VR4 margining feedback
J21	1-2	5V	VR1, VR2 5VBUS input
J29	1-2	5V	VR3, VR4 5VBUS input
J38	1-2	R1_EN	VR1 enable
J39	1-2	R2_EN	VR2 enable
J40	1-2	R3_EN	VR3 enable
J41	1-2	R4_EN	VR4 enable
J46	1-2	R5_EN	VR5 enable
J47	1-2	R6_EN	VR6 enable
J52	1-2	R7_EN	VR7 enable
J53	1-2	R8_EN	VR8 enable
J58	1-2	R9_EN	VR9 enable
J59	1-2	R10_EN	VR10 enable
J64	1-2	R11_EN	VR11 enable
J65	1-2	R12_EN	VR12 enable

5 Description

The following paragraphs describe the UCD90120/4 EVM functionality and operation.

5.1 Communication Interfaces

Several communication interfaces to the UCD90120/4 are provided on the EVM.

5.1.1 USB Interface

An onboard USB to PMBus interface is provided through the USB Input (J3) connector. D56 provides USB attach status. The presence of USB power at J3 activates buffer circuitry which gives control of the PMBus to the on board circuitry. The absence of USB power at J3 gives PMBus control through the Expansion PMBus (J77) connector.

5.1.2 PMBus

Standard PMBus interface is provided to the UCD90120/4 through the J77 connector when the on EVM USB-PMBus interface is not used. PMBus addressing is set using the J18 jumper block for ADDRSENS1 and ADDRSENS0 respectively. ADDRx=8 and ADDRx=5 positions for each are provided. The EVM comes with PMBus address set to 101 decimal.

PMBus Address (decimal) = 12 × ADDR1 + ADDR0 jumper block setting.

5.1.3 JTAG

Standard JTAG programming interface is provided to the UCD90120/4 through the J9 connector. Install J6, J7, J11, and J12 jumpers and ensure that rail 9-12 enable jumpers (J47, J53, J59, J65) are removed when using the JTAG interface.

5.2 Power

5.2.1 Input Power

The 12VDC EVM input power is provided through J1 (standard DC jack) or J2 (screw jack). A wall or laptop adapter with 500mA (UCD90120EVM) or 2000mA (UCD90124EVM running a fan) capability and 2.5mm I.D. x 5.5mm O.D. x 9.5mm DC jack can power the EVM. Reverse voltage protection and inrush limiting is provided for 12VBUS. The 12VBUS signal is distributed for fan power and Local 3.3V supply.

5.2.2 5VBUS

5VBUS is derived from 12VBUS and provides the input voltage for rails 1-12. D5 will illuminate when 5VBUS is present.

5.2.3 L3P3V

L3P3V is derived from 5VBUS and provides a general purpose 3.3V supply for the common onboard functions. The L3P3V jumper (J4) is installed to provide a connection to the 3P3V node.

5.2.4 V33D

The V33D node is connected to the UCD90120/4 digital and analog supply pins. V33D can be sourced by 3P3V or Local V33D using the J5 jumper. D9 will illuminate when V33D is present.

5.2.5 Local 3.3V

The UCD90120/4 can be powered from 12VBUS using the local V33D supply. Install J13 (12VB) and ensure J5 is installed in the LV33D position to use the local regulator.

5.2.6 Local USB

When the local 12V power supply source is not available, a subset of EVM functionality is available using only power from the local USB source (3P3V_USB). Install J8 (3.3VUSB) and remove J4 when this operation is desired. Communication to the UCD90120/4 is possible but power supply sequencing and operation is not.

5.3 Test/Debug and Status

5.3.1 GPIO Expansion

J73 and J74 provide EVM to system board expansion capability as well as an HP type logic analyzer interface.

5.3.2 Status LEDs

Visual status information for the GPI, GPIO, and PMBus signals (control and alert) is provided. Logic high at GPI1-4 or GPIO1-22 will illuminate the associated LED. The GPIO status LEDs can be enabled (EN) or disabled (EN bar) through the use of S10 to prevent the LED bias from affecting the logic state of the GPIO signal during device reset.

5.4 Digital I/O Terminations

5.4.1 General Purpose Input/Output Terminations

GPIO1-22 can be pulled up or down with a 10kΩ resistor using jumpers. GPIO14 and GPIO15 can also be used as voltage margining inputs.

5.4.2 General Purpose Input Terminations

GPI1-4 can be pulled up or down with a 10kΩ resistor using jumpers.

5.5 Analog Monitor Inputs

The UCD90120/4 monitor inputs MON1-13 can be used to monitor onboard or off board voltages. Jumpers are used to select the analog source.

5.5.1 MON1 and MON4–MON11

MON1 and MON4-11 can be sourced by the onboard rail (L#) or an external (E#) voltage.

5.5.2 MON2, MON3, MON12 and MON13

MON2 can be sourced by the onboard rail (L2), an external (E2) or the on board temperature sensor (T1) voltage. MON3 can be sourced by the onboard rail (L3), an external (E3) or the on board current monitor (C1) voltage. MON12 can be sourced by onboard rail (12L), an external source (12E) or the onboard fan temperature potentiometer input (TEMP MON) voltage. MON13 can be sourced by the V33D or 12VBUS voltage.

5.5.3 Monitor Scaling

For the external monitor jumper positions (E1-E4), the external supply can be scaled by a selectable factor of 2 for monitoring external voltages up to 5V or 6 for monitoring external voltages up to 15V. For MON13, the scale factor is 6 for the 12VB position and 2 for the V33D position. For all other MON jumper positions, the scale factor is 2.

5.5.4 Monitor Fault Injection

Under voltage or over voltage faults can be injected on MON 5–MON12 through the use of on board switches (S2, S4, S6, S8, S3, S5, S7, S9 respectively). The switches provide a fault bias on the nominal voltage of approximately ±20%

5.6 Local Voltage Rails

Twelve on board voltages are provided for sequencing and monitoring. Each voltage rail has an output on LED. The nominal output voltages are listed in Table 5.

Table 5. Local Rail Nominal Output Voltages

Local Rail	L1	L2	L3	L4	5L	6L	7L	8L	9L	10L	11L	12L
NominalVoltage	3.5V	3.3V	2.5V	1.8V	3.4V	3.2V	3.0V	2.8V	2.6V	2.4V	2.2V	2.0V

5.7 External Temperature Sensor

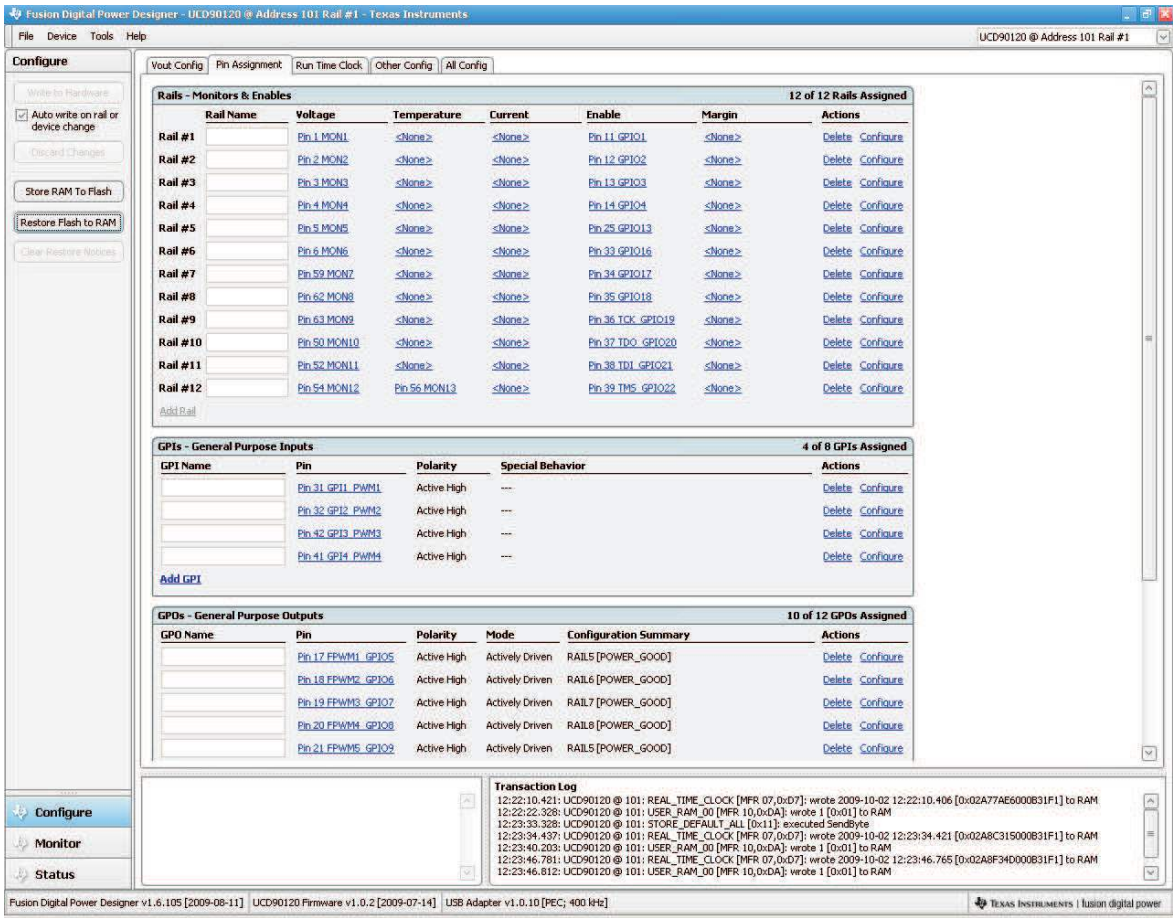
An onboard temperature sensor is provided to measure temperature rise of the VR1 output load (R74). MON2 can be used to monitor the temperature rise caused by heat up of R74 when the shunt on J24 is in the T1 position. When J26 (C1) is installed, the temperature sensor near R74 records temperature rise simulating power supply warm up.

- Use TP14 (T1) to measure the temperature sensor output voltage.
- Temperature (in degrees C) = 100 × VT1 – 50 where VT1 is the voltage at TP14.
- The voltage at TP14 is scaled by a factor of 2 prior to sampling at MON2.
- Set the GUI Temp Cal Gain = 200°C/V and the Temp Cal Offset = –50°C.

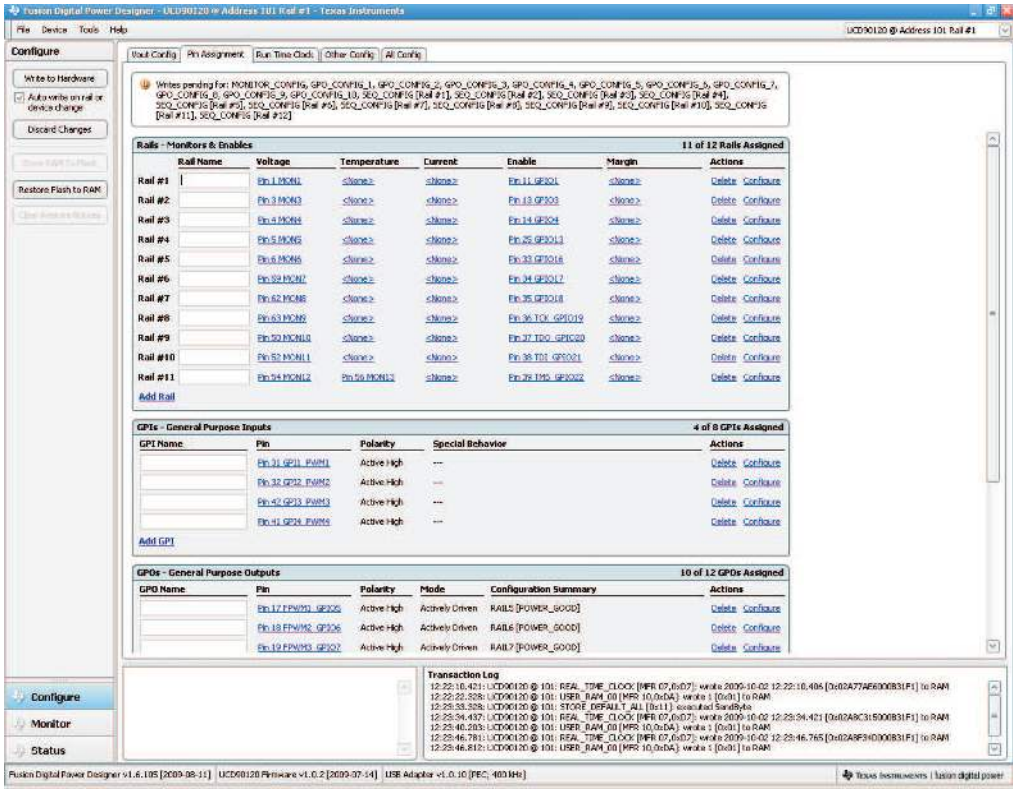
5.7.1 Basic Process for Adding Temperature Monitoring to a Rail

A basic procedure to add temperature monitoring to rail #1, starting with the EVM default configuration will follow. Ensure that rail #1 is selected in the upper right corner.

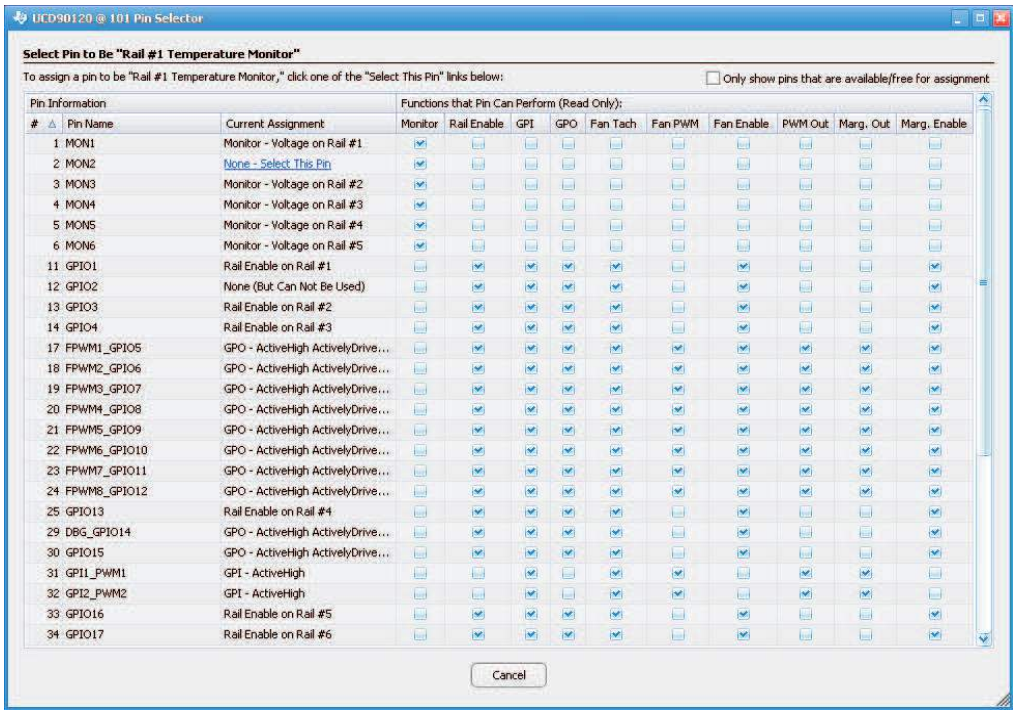
- While in the Configure section of the GUI, select the Pin Assignment tab



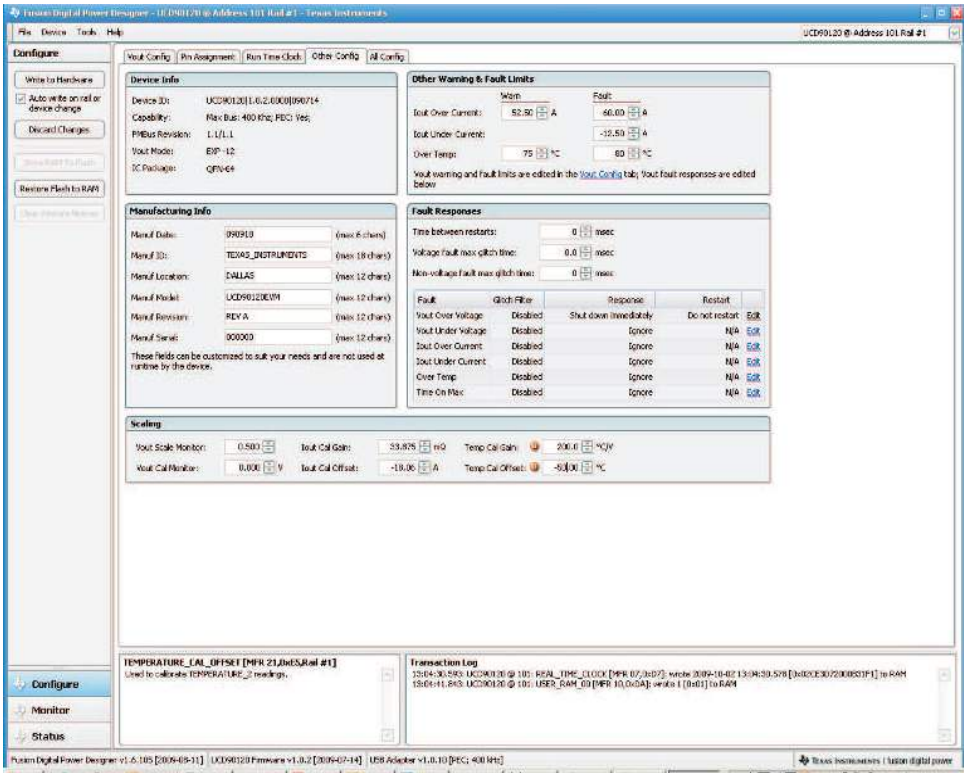
- Delete the current pin assignment for MON2, then add a temperature pin assignment to MON1



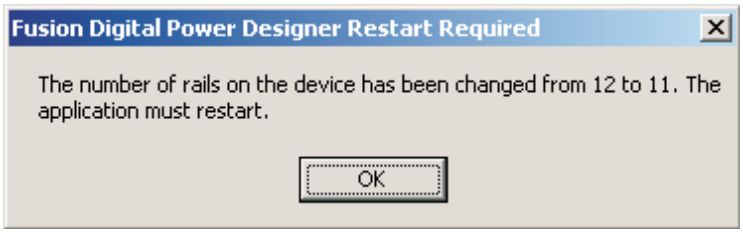
- Choose MON2 then the GUI will switch back to the Pin Assignment tab.



- Switch to the Other Config tab then enter Temp Cal Gain (200) and Temp Cal Offset (-50).

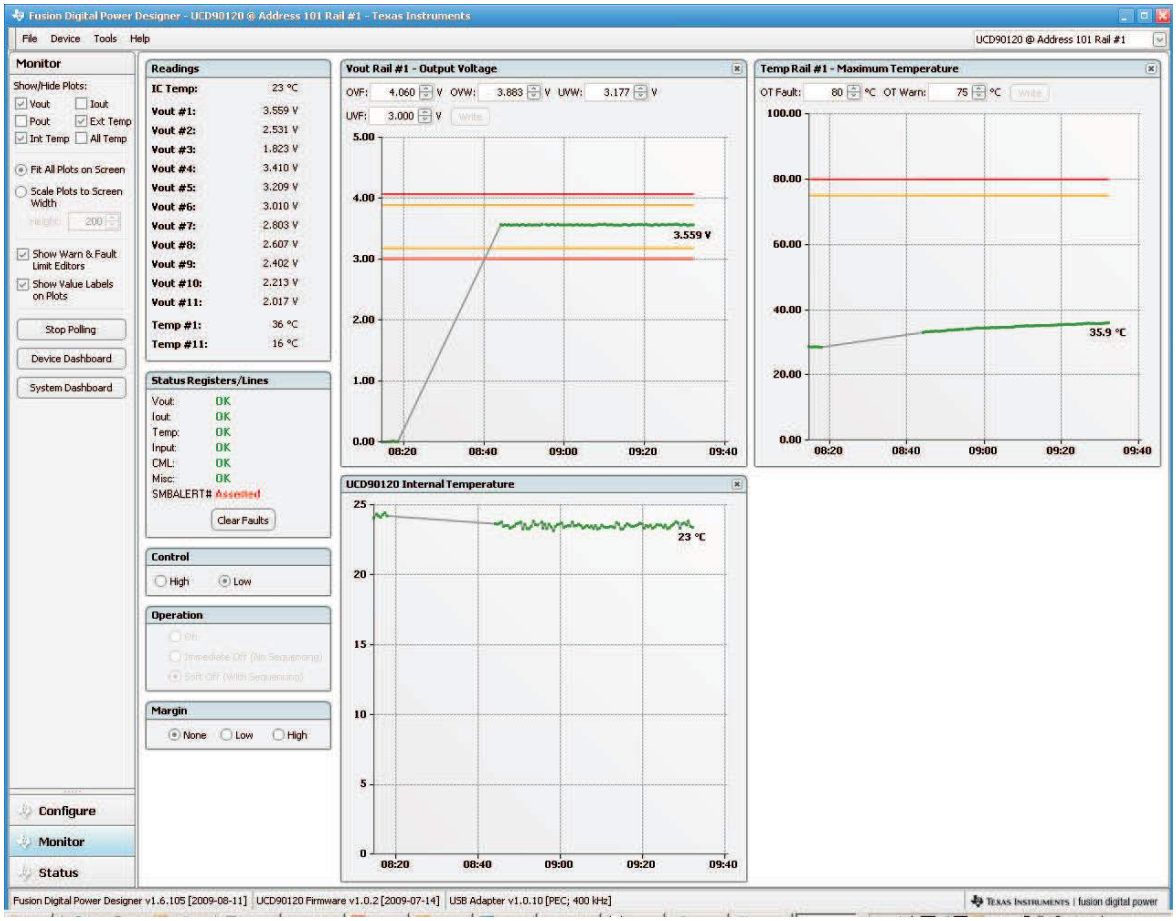


- Press the Write to Hardware Button and OK the window below. Fusion will restart.



- Once Fusion restarts, press the Store RAM to flash and accept the response.

- Press and release the EVM RESET (S1) button and the on EVM temperature sensor will provide rail #1 load temperature.



5.8 Input Current Monitoring

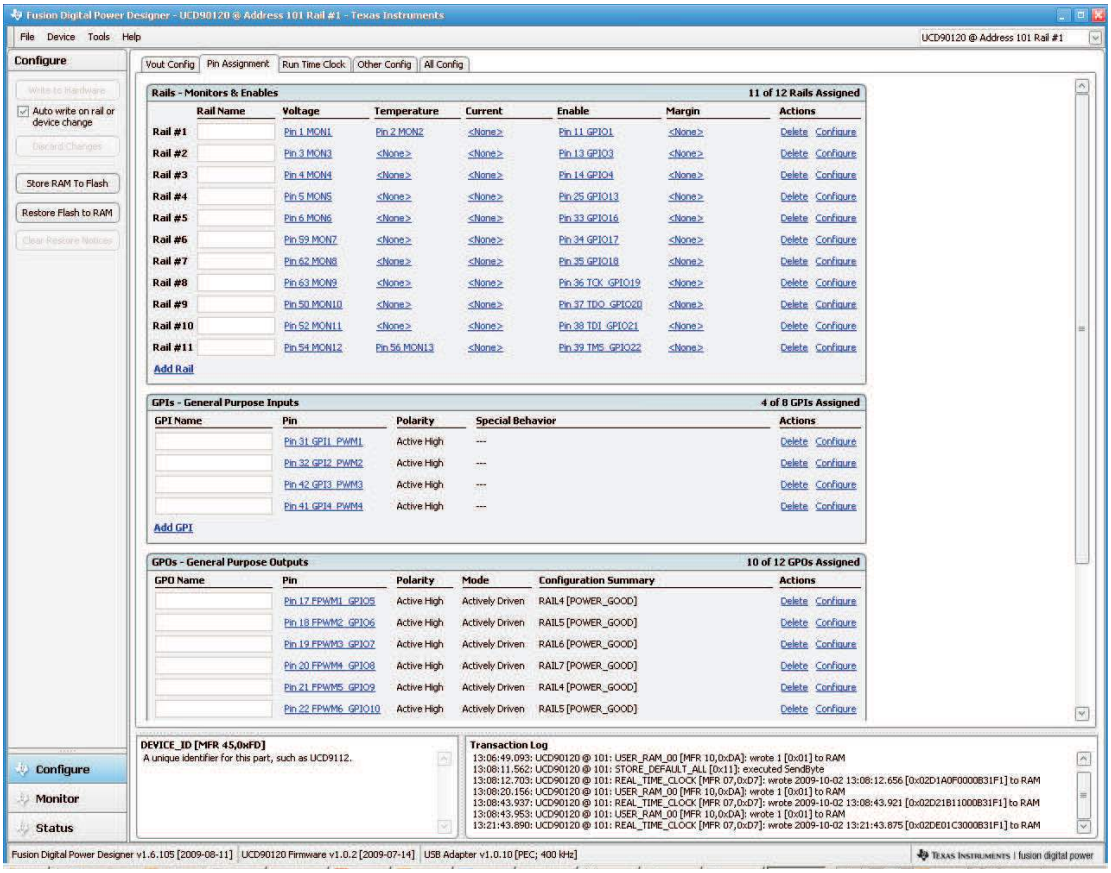
An onboard current monitor is provided to measure VR1 load current. MON3 can be used to monitor VR1 output current when the shunt on J28 is in the C1 position. When J26 (C1) is installed, VR1 output load (R74) is connected causing an increase in current which can be measured by MON3 and at TP18.

- Use TP18 (C1) to measure the current monitor output voltage.
- Current (in amperes) = 0.5 × VC1 where VC1 is the voltage at TP18.
- The voltage at TP18 is scaled by a factor of 2 prior to sampling at MON3.
- Set the GUI Iout Cal Gain = 1000mΩ and the Iout Cal Offset = 0A.

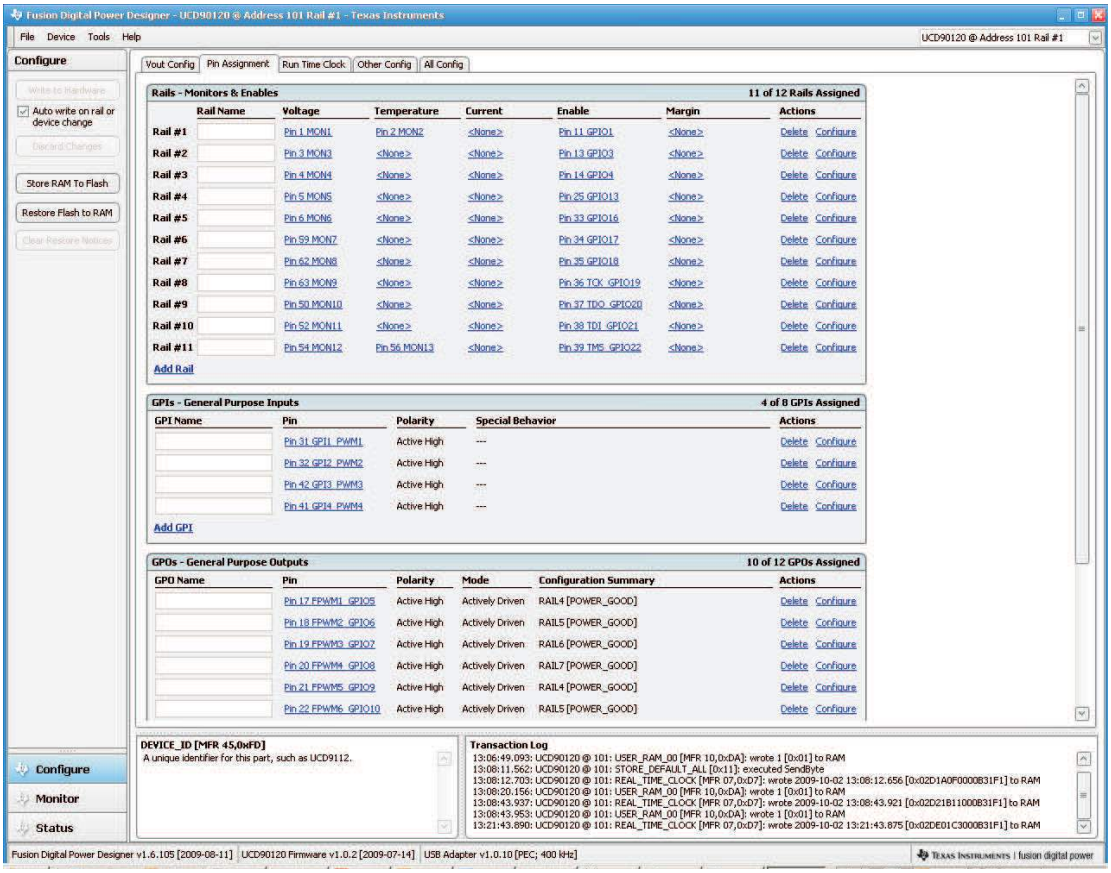
5.8.1 Basic Process for Adding Current Monitoring to a Rail

A basic procedure to add current monitoring to rail #1, starting with the previously modified (adding temperature) configuration will follow. Ensure that rail #1 is selected in the upper right corner.

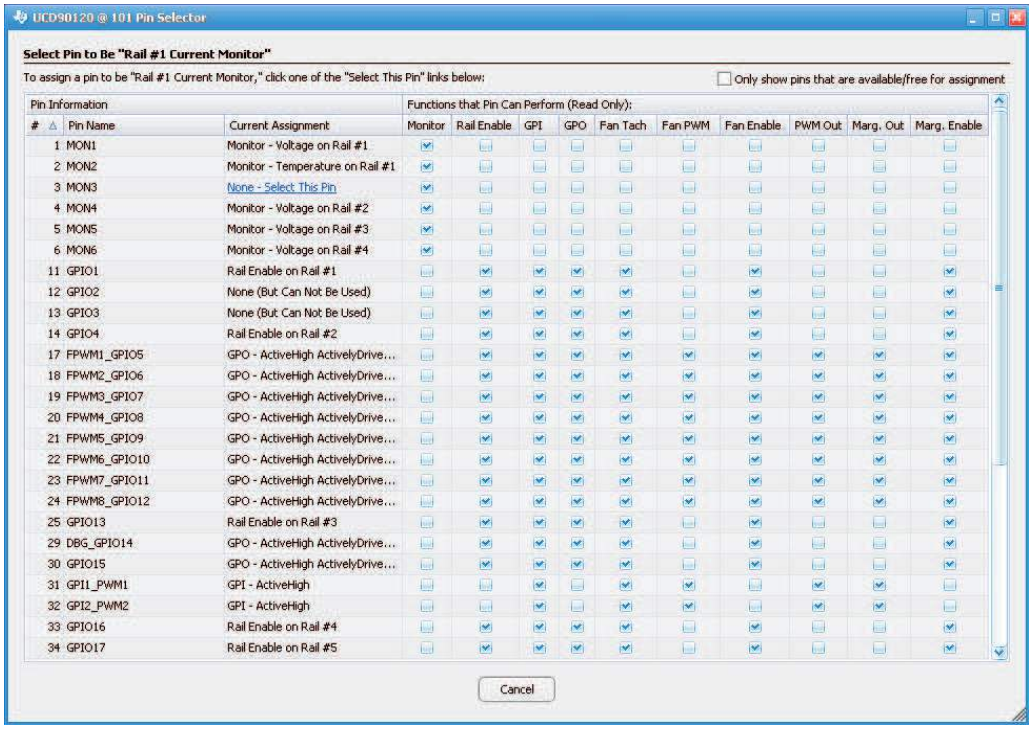
- While in the Configure section of the GUI, select the Pin Assignment tab



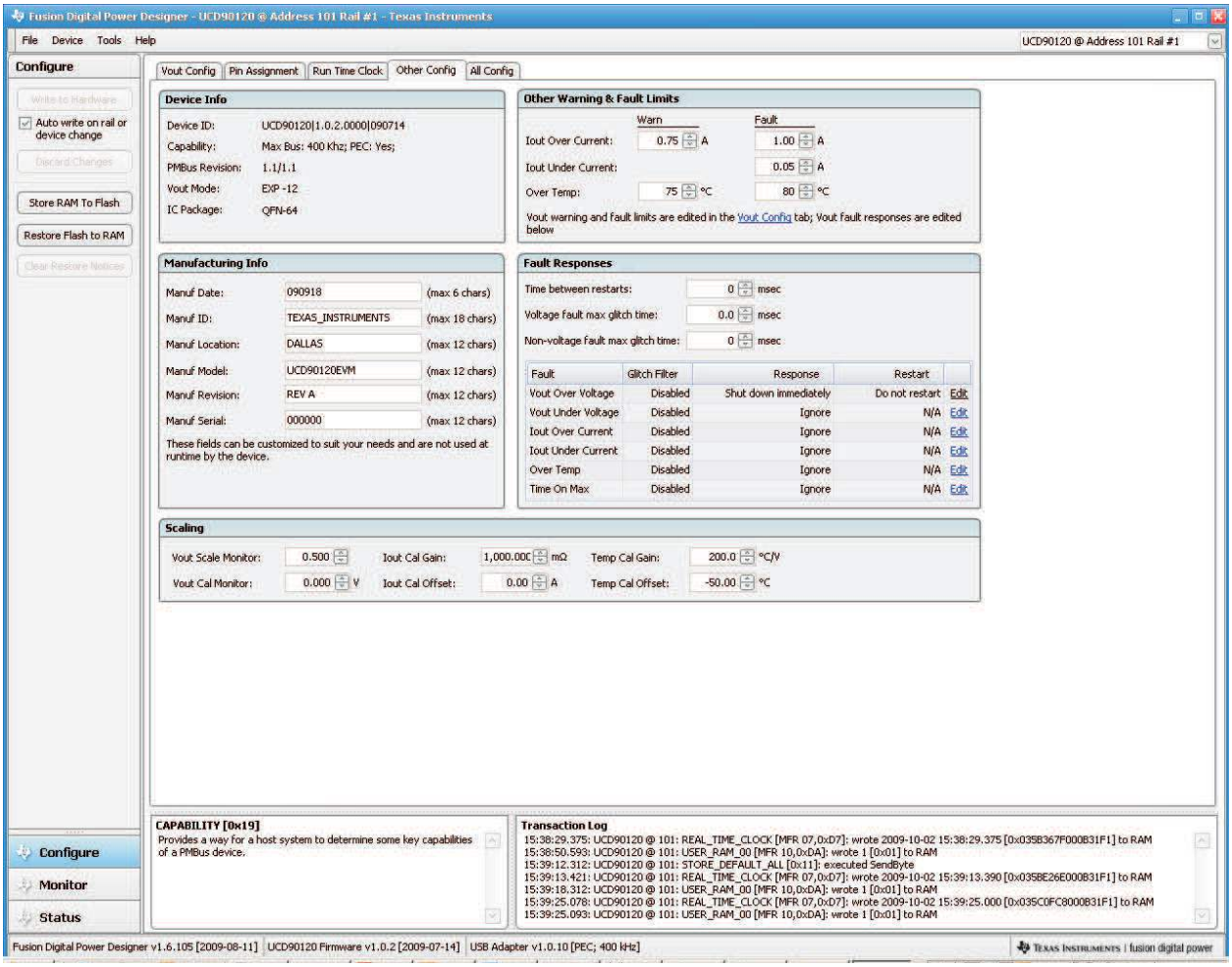
- Delete the current pin assignment for MON3 and add a current pin assignment to MON1.



- Choose MON3 then the GUI will switch back to the Pin Assignment tab.



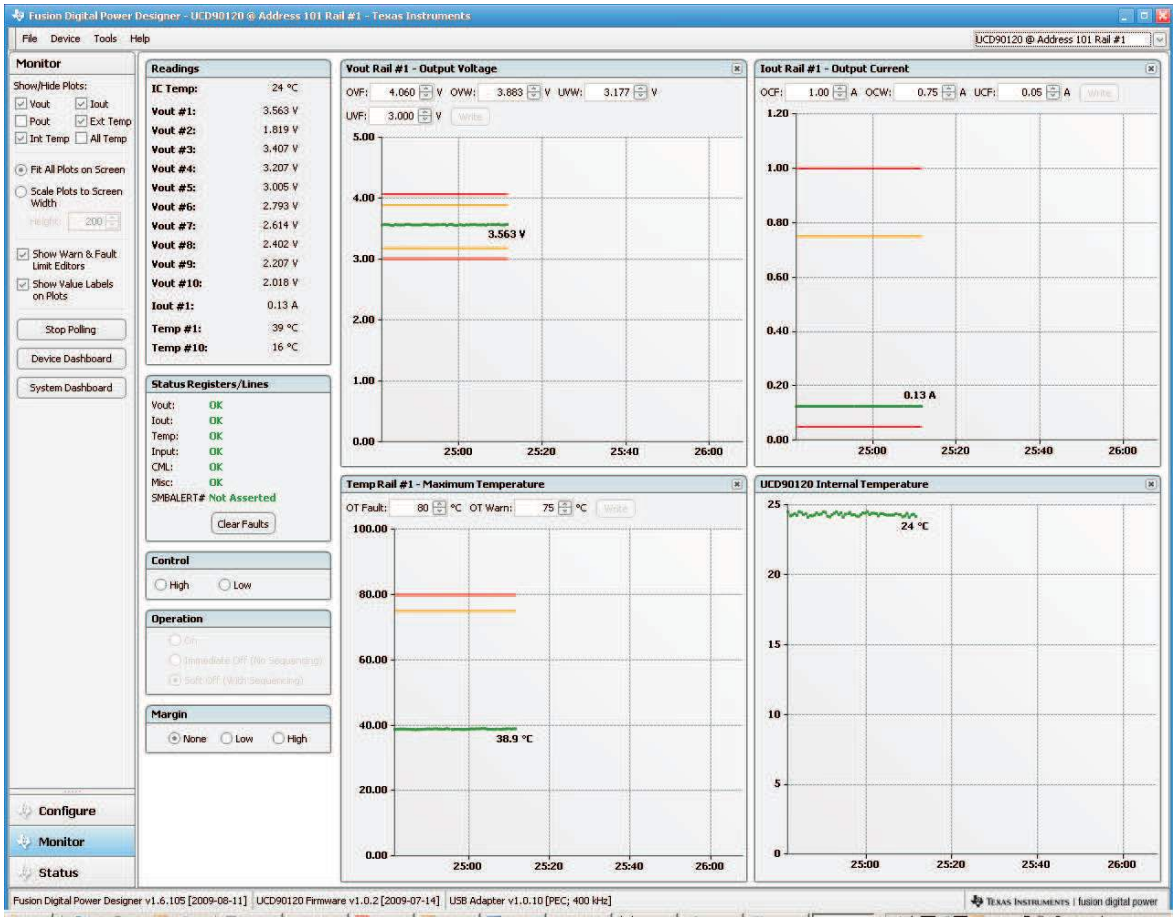
- Switch to the Other Config tab and enter Iout Cal Gain (1000) and Iout Cal Offset (0).



- Press the Write to Hardware Button and OK the window below. Fusion will restart.

- Once Fusion restarts, press the Store RAM to flash and accept the response.

- Press and release the EVM RESET (S1) button and the on EVM current monitor will provide rail #1 load current.



5.9 Closed Loop Voltage Margining

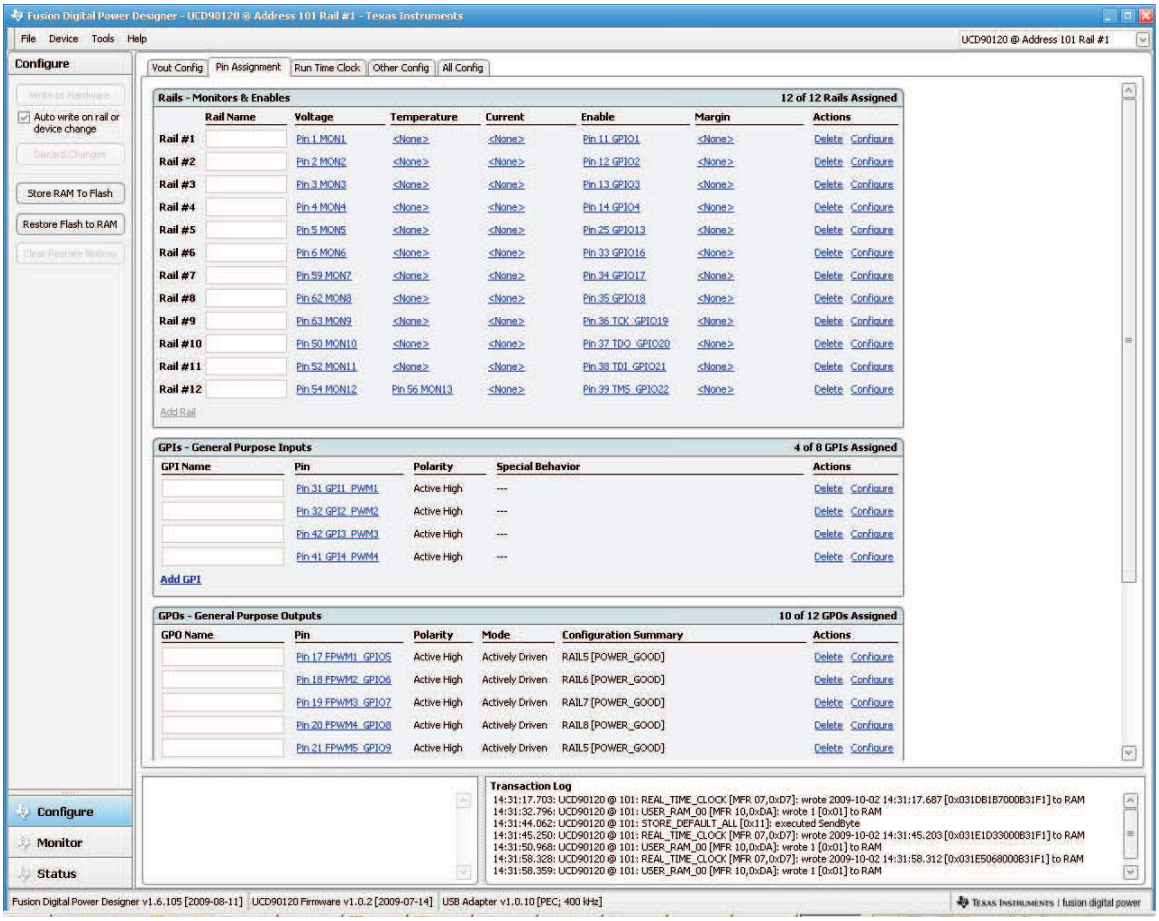
The output voltage of VR1-4 can be varied from nominal in a closed loop fashion for voltage margining. Four duty cycle modulated GPIO signals (FPWM1-4) are filtered to control the rail output voltage. Two GPIO – feedback node filter configurations are provided; simple R-C-R or R-C-buffer-R. Jumpers provide selection of either the simple or buffered method. Install J22, J25, J30, or J33 in either the RC (for R-C-R) or MRGx (for R-C-buffer-R).

5.9.1 Basic Process for Voltage Margining a Rail

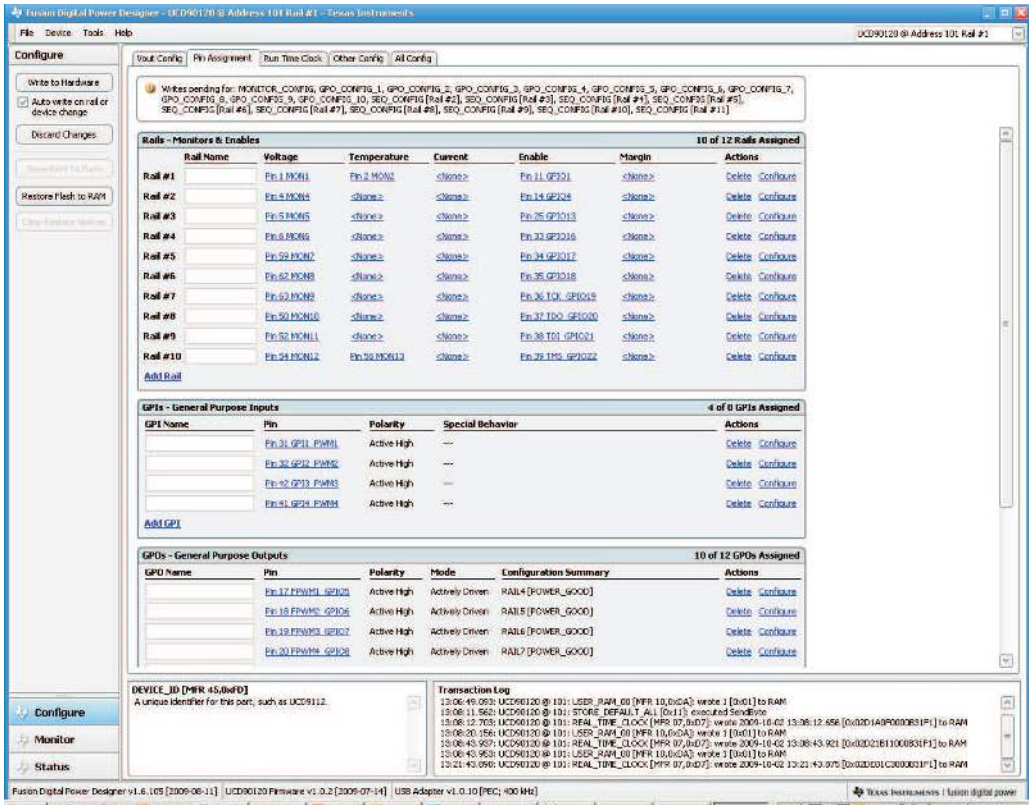
A basic procedure to voltage margin rail #1, starting with the EVM default configuration will follow. For more information on voltage margining please refer to application note (SLVA375). Ensure that rail #1 is selected in the upper right corner.

NOTE: Ensure that S10 (STAT LED) is in the $\overline{\text{EN}}$ position.

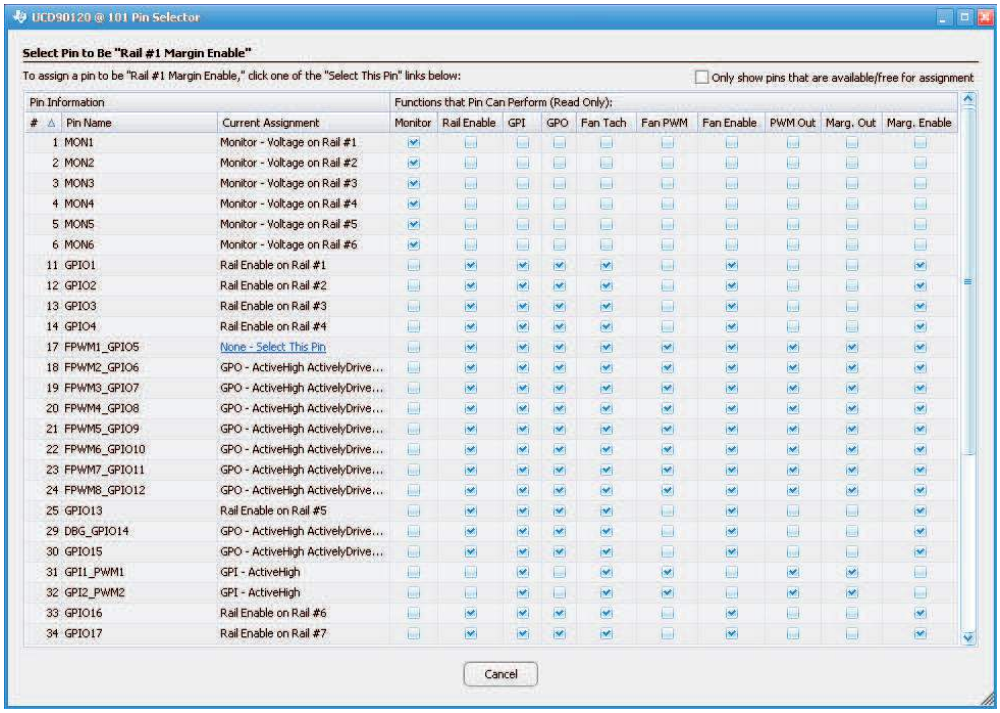
- While in the Configure section of the GUI, select the Pin Assignment tab



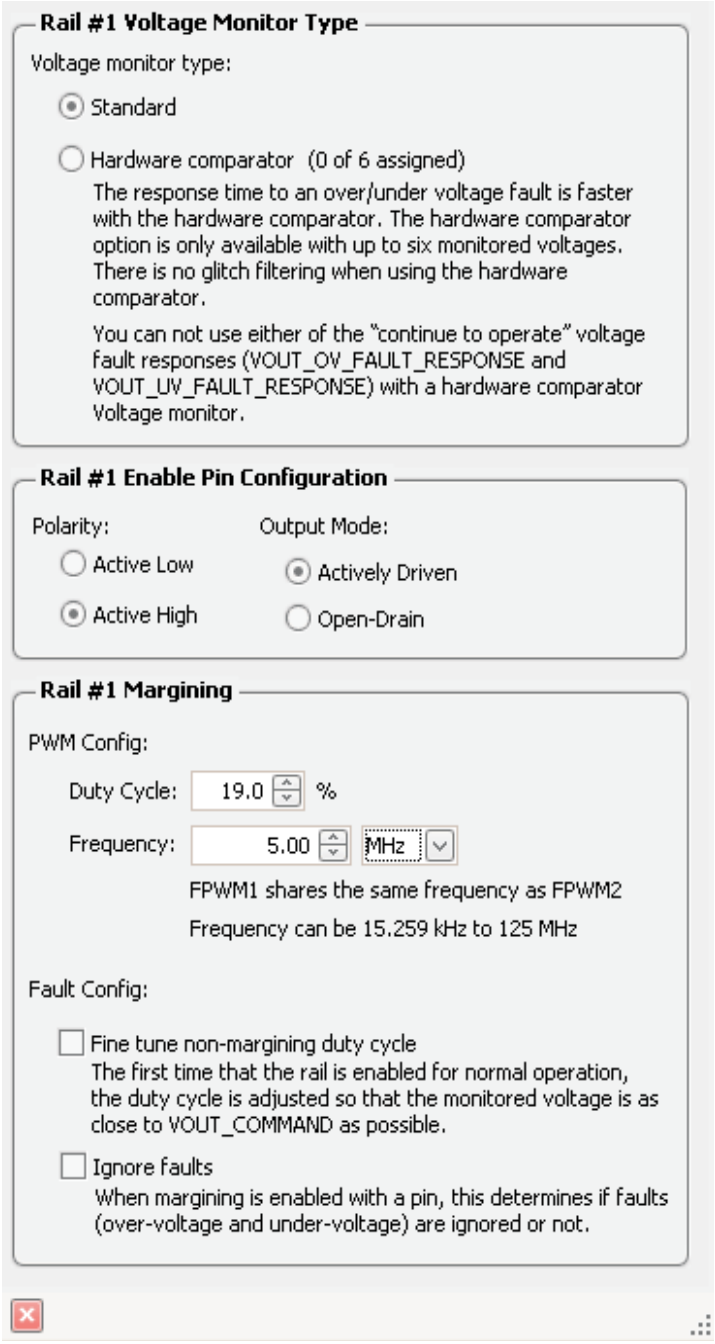
- Delete the pin assignment for FPWM1 and select Margin on rail #1



- Choose FPWM1 then the GUI will switch back to the Pin Assignment tab.



- Click the Configure link for rail #1



- Enter Duty Cycle in percent and Frequency.
- Press the Write to Hardware button and OK the window below (note that the window below may not always be present depending on the version of the GUI used.

- Install a shunt in the RC position of J22. Rail #1 and rail #2 may experience a fault and may turn off.
- Press the Store RAM to flash and accept the response.
- Press and release the EVM RESET (S1) button and rail #1 can now be voltage margined.
- Navigate to the GUI Monitor tab with rail #1 selected and toggle the margin window none-low-high-none switches. Note that rail #1 voltage margins.

5.10 Fan Interface

The UCD90124 provides support for up to four fans. The UCD90124EVM provides a single fan interface from J66. The UCD90124EVM interface can support three fan types including 2-wire, 3-wire, and 4-wire. The FAN connector has four terminals (12V, GND, Tach, and PWM).

5.10.1 Fan Tach Input

The fan tach signal is an input to the UCD90124 providing an indication of fan speed based on signal frequency. The EVM Tach input signal is conditioned prior to being connected to the UCD90124 and can interface with either a 3.3V or 5V signal using J72. Install a shunt in the TACH position of J67 to connect the conditioned signal to the UCD90124. The TACH signal at J66-2 is inverted by the conditioning circuitry prior to J67.

5.10.2 Fan PWM Output

The fan PWM signal is an output from the UCD90124 providing fan speed control using a pulse width modulated signal. The UCD90124 output signal can come from either PWM1 (J67 in the PWM position) or FPWM5 (J70 in the FPWM5 position). The PWM1 or FPWM5 output signal can directly drive the fan PWM input (four wire fan with J68 in the 4W position) or be conditioned prior the fan PWM input (two or three wire fan with J68 in the 2/3W position). When J68 is in the 2/3W position, the PWM signal at J66-3 can drive or modulate the ground of a two or three wire fan. When J68 is in the 2/3W position, the PWM signal at J66-3 can provide a 3.3V, 5V, or 12V level PWM signal with appropriately installed shunts on J69 for use with four wire fans. When J68 is in the 2/3W position, the PWM1 or FPWM5 signal at J70 is inverted by the conditioning circuitry prior to J66-3.

5.10.3 Fan Temperature Simulation

An onboard potentiometer (TEMP MON) can be used to simulate analog temperature when used in conjunction with the fan interface for fan speed control. The potentiometer voltage can be monitored at TP54 (TEMP MON) through MON12. Install a shunt in the 12E position of J61 and install J71 (EVR12). The potentiometer voltage can be varied from 0 to approximately 4.2V. This voltage is scaled by 2 before being sampled at MON12.

6 Bill of Materials

Table 6. UCD90120/4EVM Bill of Materials

Count		RefDes	Value	Description	Size	Part Number	MFR
UCD90124EVM	UCD90120EVM						
2	2	C1, C16	330 µF	Capacitor, Aluminum, 16V, ±20%	0.328 × 0.328 inch	EEE-FK1C331P	Panasonic
3	3	C12, C13, C15	4.7 µF	Capacitor, Ceramic, 25V, X5R, 20%	0805	ECJ-2FB1E475M	Panasonic
3	3	C2, C3, C17	4.7 µF	Capacitor, Ceramic, 50V, X5R, 20%	1812	C4532X5R1H475MT	TDK
3	3	C25, C59, C65	1000 pF	Capacitor, Ceramic, X7R, 16V, 10%	0603	Std	Std
8	8	C26, C27, C30, C31, C33, C34, C43, C44	10 µF	Capacitor, Ceramic, 10V, X5R, 10%	0805	C2012X5R1A106K	TDK
2	2	C28, C39	33 pF	Capacitor, Ceramic, 50V, COG, 5%	0603	Std	Std
4	4	C32, C35, C41, C46	47 pF	Capacitor, Ceramic, X7R, 16V, 10%	0603	Std	Std
4	4	C4, C23, C37, C45	0.01 µF	Capacitor, Ceramic, 50V, X7R, 10%	0603	C1608X7R1H103K	TDK
3	3	C40, C62, C63	22 pF	Capacitor, Ceramic, 50V, C0G, 5%	0603	Std.	Std
9	9	C42, C48, C49, C50, C51, C53–C56	1.0 µF	Capacitor, Ceramic, X7R, 16V, 10%	0603	Std	Std
1	1	C5	100 µF	Capacitor, Tantalum, 10V, 20%	7343(D)	TPSD107M010R0080	AVX
1	1	C57	1 µF	Capacitor, Ceramic, 25V, X7R, 20%	0805	Std	Std
1	1	C6	100 µF	Capacitor, Tantalum, 10V, 10%	6032	TAJC107K010R	AVX
1	1	C68	1 µF	Capacitor, Tantalum, 16V, 20%	3216	293D105X0016A2T	Vishay
3	3	C7, C69, C71	10 µF	Capacitor, Tantalum, 10V, 20%	3216	293D106X0010A2T	Vishay
23	23	C8–C11, C14, C18–C22, C24, C29, C36, C38, C47, C52, C58, C60, C61, C64, C66, C67, C70	0.1 µF	Capacitor, Ceramic, X7R, 16V, 10%	0603	Std	Std
2	2	D1, D4	B340A	Diode, Schottky, 3A, 40V	SMA	B340A	Diodes Inc
1	1	D11	BZX84B5V1LT1G	Diode, Zener, 5.1-V, 2%, 225-mW	SOT-23	BZX84B5V1LT1G	Diodes
1	1	D2	10BQ015	Diode, Schottky, 1A, 15V	SMB	10BQ015	IR
1	1	D26	MMSZ5242BT1G	Diode, Zener, 20-mA, 12-V, 0.5W	SOD123	MMSZ5242BT1G	On Semi
1	1	D27	SMAJ24A	Diode, Transient Voltage Suppressor, 400W, 24V	SMA	SMAJ24A	Littlefuse
15	15	D29, D30, D32, D34, D36, D38, D40, D42, D44, D46– D49, D54, D55	LN1371G	Diode, LED, Green, 20-mA, 0.9-mcd	SMD	LN1371G	Panasonic
1	1	D3	TLV1117-33IDCY	IC, Adj., 3.3 V, 800mA LDO Voltage Regulators	SOT-223	TLV1117-33CDCY	TI
15	15	D5, D9, D14–D25, D28	SML-LXT0805SRW-TR	Diode, LED, Red, 100 mA	0805	SML-LXT0805SRW-TR	Lumex
4	4	D50– D53	GL05T	Diode, TVS, Low Cap., V(RM) = 5 V, 300 W Pk.	SOT-23	GL05T	Vishay
1	1	D56	SSF-LXH305GD-TR	Diode, LED, Green, 20 mA, 30 mcd	SMD	SSF-LXH305GD-TR	Lumex

Table 6. UCD90120/4EVM Bill of Materials (continued)

Count		RefDes	Value	Description	Size	Part Number	MFR
UCD90124EVM	UCD90120EVM						
1	1	D6	MBRA130	Diode, Schottky, 1A, 30V	SMA	MBRA130	IR
1	1	D7	1SMB5922BT3G	Diode, Zener, 7.5V, 3W	SMB	1SMB5922BT3G	On Semi
12	12	D8, D10, D12, D13, D31, D33, D35, D37, D39, D41, D43, D45	LN1471Y	Diode, LED, Amber, 20-mA, 0.4-mcd	0.114 × 0.049 inch	LN1471YTR	Panasonic
3	3	FB1, FB2, FB3	220 Ω	Ferrite Bead, 2A, 0.050 mΩ	0805	BLM21P221SN	Murata
1	1	J1	RAPC 712	Connector, DC Jack, Pin dia.2.5mm, Shell dia 5.5mm	0.57 × 0.35 inch	RAPC 712X	Switchcraft
2	2	J18, J69	PEC04DAAN	Header, Male 2x4-pin, 100mil spacing	0.20 × 0.40 inch	PEC04DAAN	Sullins
1	1	J2	ED120/2DS	Terminal Block, 2-pin, 15-A, 5.1mm	0.40 × 0.35 inch	ED120/2DS	OST
2	2	J24, J28	PEC03DAAN	Header, Male 2x3-pin, 100mil spacing	0.20 inch × 0.30	PEC03DAAN	Sullins
1	1	J3	UX60-MB-5ST	Connector, Recpt, USB-B, Mini, 5-pins, SMT	0.354in × 0.303in	UX60-MB-5S8	Hirose
29	29	J4, J6, J7, J8, J11, J12, J13, J19, J21, J23, J26, J27, J29, J31, J38, J39, J40, J41, J46, J47, J52, J53, J58, J59, J64, J65, J71, J78, J79	PEC02SAAN	Header, Male 2-pin, 100mil spacing,	0.100 inch × 2	PEC02SAAN	Sullins
38	38	J5, J10, J14, J15, J16, J17, J20, J22, J25, J30, J32, J33, J34, J35, J36, J37, J42, J43, J44, J45, J48, J49, J50, J51, J54, J55, J56, J57, J60, J61, J62, J63, J67, J68, J70, J72, J75, J76	PEC03SAAN	Header, Male 3-pin, 100mil spacing,	0.100 inch × 3	PEC03SAAN	Sullins
1	1	J66	ED120/4DS	Terminal Block, 4-pin, 15-A, 5.1mm	0.80 × 0.35 inch	ED120/4DS	OST
2	2	J73, J74	PEC10DAAN	Header, Male 2x10-pin, 100mil spacing	0.100 inch × 10 × 2	PEC10DAAN	Sullins
1	1	J77	N2510-6002-RB	Connector, Male Straight 2x10 pin, 100mil spacing, 4 Wall	0.338 × 0.788 inch	N2510-6002-RB	3M
1	1	J9	PEC07DAAN	Header, Male 2x7 pin, 100mil spacing	0.100 inch × 2×7	PEC07DAAN	Sullins
1	1	L1	33 µH	Inductor, SMT, 2.2A, 75mΩ	0.484 × 0.484 inch	MSS1260-333MLB	Coilcraft
2	2	L2, L3	2.2 µH	Inductor, SMT, 1.5A, 110mΩ	0.118 × 0.118 inch	LPS3015-222MLB	Coilcraft
1	1	Q1	MMBT2222A	Transistor, NPN, 40 V, 500 mA	SOT-23	MMBT2222A	Fairchild
1	1	Q2	FCX491A	Transistor, NPN, 40V, 2A, 300 hfe	SOT89	FCX491A	Zetex
4	4	Q3, Q4, Q11, Q12	FDN5630	MOSFET, N-ch, 60-V,1.7-A, 100-mΩ	SSOT3	FDN5630	Fairchild
1	1	Q5	MMBT2907ALT1	Transistor, PNP, -60V, -600mA, 225-W	SOT23	MMBT2907ALT1	On Semi
5	5	Q6, Q7, Q8, Q9, Q10	BSS84	Transistor, PFET, -50 V, 130 mA, Rds(ON) < 10 Ω at V(gs) = 5 V	SOT-23	BSS84	Fairchild
1	1	R1	590	Resistor, Chip, 1/10W, 1%	0805	Std	Std

Table 6. UCD90120/4EVM Bill of Materials (continued)

Count		RefDes	Value	Description	Size	Part Number	MFR
UCD90124EVM	UCD90120EVM						
10	10	R11, R110, R111, R134, R135, R144, R145, R166, R167, R238	15.0K	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	1	R116	158	Resistor, Chip, 1/10W, 1%	0805	Std	Std
8	8	R117, R119, R121, R123, R155, R157, R159, R161	750	Resistor, Chip, 1/10W, 1%	0805	Std	Std
1	1	R118	191	Resistor, Chip, 1/10W, 1%	0805	Std	Std
23	23	R12, R17, R25, R32, R45, R59, R62, R66, R67, R70, R83, R87, R90, R91, R94, R177, R179, R235, R237, R239, R241, R251, R252	100K	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	1	R120	232	Resistor, Chip, 1/10W, 1%	0805	Std	Std
1	1	R122	280	Resistor, Chip, 1/10W, 1%	0805	Std	Std
8	8	R128, R129, R130, R131, R170, R171, R172, R173	402	Resistor, Chip, 1/10W, 1%	0805	Std	Std
29	29	R15, R23, R30, R42, R154, R195, R203, R204, R205, R207, R208, R211, R212, R216, R217, R218, R219, R220, R221, R222, R223, R226, R227, R230, R231, R232, R233, R234, R236	332	Resistor, Chip, 1/10W, 1%	0805	Std	Std
1	1	R156	392	Resistor, Chip, 1/10W, 1%	0805	Std	Std
1	1	R158	464	Resistor, Chip, 1/10W, 1%	0805	Std	Std
1	1	R160	549	Resistor, Chip, 1/10W, 1%	0805	Std	Std
1	1	R186	5K	Potentiometer, Multi-Turn, 3/8 Hole	0.375 sq inch	3386P-1-502LF	Bourns
2	2	R196, R197	10K	Resistor, Chip, 1/16 W, 5%	0603	Std.	Std.
2	2	R8, R14	0	Resistor, Chip, 1/16W, 1%	0603	Std	Std
0	0	R2, R18	0	Resistor, Chip, 1/16W, 1%	0603	Std	Std
2	2	R20, R240	200	Resistor, Chip, 1/16W, 5%	0603	Std	Std
5	5	R209, R210, R242, R243, R245	2.2K	Resistor, Chip, 1/16 W, 5%	0603	Std.	Std.
1	1	R213	1.00M	Resistor, Chip, 1/16 W, 1%	0603	Std.	Std.
3	3	R214, R215, R255	1.5K	Resistor, Chip, 1/16 W, 5%	0603	Std	Std

Table 6. UCD90120/4EVM Bill of Materials (continued)

Count		RefDes	Value	Description	Size	Part Number	MFR
UCD90124EVM	UCD90120EVM						
2	2	R26, R53	20K	Resistor, Chip, 1/16W, 1%	0603	Std	Std
2	2	R27, R29	4.02K	Resistor, Chip, 1/16W, 1%	0603	Std	Std
63	63	R3, R5, R6, R7, R9, R10, R13, R16, R19, R21, R22, R24, R28, R31, R33, R44, R96, R97, R98, R99–R103, R106–R109, R114, R115, R124, R125, R132, R133, R138, R139, R142, R143, R148, R149, R150–R153, R162, R163, R174–R176, R180–R182, R185, R187–R191, R194, R198, R200, R247, R248	10K	Resistor, Chip, 1/16W, 1%	0603	Std	Std
24	24	R34–R41, R43, R46–R48, R178, R224, R225, R228, R229, R249, R250, R253–R258	33	Resistor, Chip, 1/16W, 5%	0603	Std	Std
1	1	R4	3.24k	Resistor, Chip, 1/16W, 1%	0603	Std	Std
2	2	R49, R51	84.5K	Resistor, Chip, 1/16W, 1%	0603	Std	Std
2	2	R50, R52	36.5K	Resistor, Chip, 1/16W, 1%	0603	Std	Std
11	11	R54, R183, R184, R192, R193, R199, R201, R202, R206, R244, R246	1K	Resistor, Chip, 1/16W, 1%	0603	Std	Std
6	6	R55, R68, R76, R88, R89, R92	30.1K	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	1	R56	732K	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	1	R57	374	Resistor, Chip, 1/16W, 1%	0603	Std	Std
24	24	R58, R61, R71, R73, R79, R80, R93, R95, R104, R105, R112, R113, R126, R127, R136, R137, R140, R141, R146, R147, R164, R165, R168, R169	7.50K	Resistor, Chip, 1/16W, 1%	0603	Std	Std
2	2	R60, R69	150K	Resistor, Chip, 1/16W, 1%	0603	Std	Std
2	2	R63, R72	1.20M	Resistor, Chip, 1/16 W, 1%	0603	Std.	Std.
1	1	R64	681K	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	1	R65	316	Resistor, Chip, 1/16W, 1%	0603	Std	Std

Table 6. UCD90120/4EVM Bill of Materials (continued)

Count		RefDes	Value	Description	Size	Part Number	MFR
UCD90124EVM	UCD90120EVM						
1	1	R74	24	Resistor, Chip, 1W, 5%	2512	STD	STD
1	1	R75	0.1	Resistor, Chip, 1/2W, 1%	2010	STD	STD
2	2	R77, R78	10	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	1	R81	31.6K	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	1	R82	14.3K	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	1	R84	243	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	1	R85	49	Resistor, Chip, 1/16W, 5%	0603	Std	Std
1	1	R86	162K	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	1	RT1	5 Ohms	Inrush current limiter, 4.7A, 0.11 Ω	0.180 × 0.550	CL-150	GE Sensing
1	1	S1	KT11P2JM34LFS	Switch, SPST, PB Momentary, Sealed Washable	0.245 × 0.251	KT11P2JM34LFS	C & K
1	1	S10	EG1218	Switch, 1P2T, Slide, PC-mount, 200-mA	0.46 × 0.16	EQ1218	E_Switch
8	8	S2, S3, S4, S5, S6, S7, S8, S9	MHS12304	Switch, ON-OFF-ON Miniature Slide	0.268 × 0.630 inch	MHS12304	Tyco
2	2	TP1, TP2	5010	Test Point, Red, Thru Hole	0.125 × 0.125 inch	5010	Keystone
6	6	TP11, TP17, TP37, TP43, TP55, TP63	5011	Test Point, Black, Thru Hole	0.125 × 0.125 inch	5011	Keystone
32	32	TP3, TP4, TP6, TP9, TP12, TP14, TP18, TP19, TP20, TP24–TP27, TP32, TP33, TP36, TP38, TP39, TP40, TP44, TP45, TP48, TP49, TP54, TP56, TP57, TP58, TP61, TP62, TP65, TP66, TP67	5012	Test Point, White, Thru Hole	0.125 × 0.125 inch	5012	Keystone
26	26	TP5, TP8, TP10, TP13, TP15, TP16, TP21, TP22, TP23, TP28, TP29, TP30, TP31, TP34, TP35, TP41, TP42, TP46, TP47, TP50, TP51, TP52, TP53, TP59, TP60, TP64	5014	Test Point, Yellow, Thru Hole	0.125 × 0.125 inch	5014	Keystone
6	6	TP68–TP73	5016	Test Point, SM, 0.150 x 0.090"	0.185 × 0.135	5016	Keystone
1	1	TP7	5013	Test Point, Orange, Thru Hole	0.125 × 0.125 inch	5013	Keystone
1	1	U1	TPS5420D	IC, Switching Step-Down Regulator, 36V, 2A	SO8	TPS5420D	TI
2	2	U10, U11	SN74LV126ADBR	IC, Quad Bus Buffer with 3-State Outputs	VSSOP-14	SN74LV126ADBR	TI
1	1	U12	SN74LVC2G125DCU	IC, Dual Bus Buffer with 3-State Outputs	VSSOP-8	SN74LVC2G125DCU	TI
1	1	U13	24LC64-I/SN	IC, Serial EEPROM, 64K, 2.5-5.5V, 400 kHz Max	SO-8	24LC64-I/SN	Microchip

Table 6. UCD90120/4EVM Bill of Materials (continued)

Count		RefDes	Value	Description	Size	Part Number	MFR
UCD90124EVM	UCD90120EVM						
1	1	U14	SN74CBTLV3125DBQ	IC, Low Voltage Quad FET Bus Switch	TSSOP-16	SN74CBTLV3125DBQ	TI
1	1	U15	TUSB3210PM	IC, USB, General Purpose Device Controller	PQFP-64	TUSB3210PM**	TI
1	1	U16	TPS76333DBV	IC, Micro-Power 100 mA LDO Regulator	SOT23-5	TPS76333DBV	TI
2	2	U2, U3	SN74LVC2G04DBV	IC, Dual Schmitt-Trigger Inverter	SOT23-6	SN74LVC2G04DBV	TI
0	1	U4	UCD90120RGC	IC, Digital PWM System Controller	PFC-64	UCD90120RGC	TI
1	0	U4	UCD90124RGC	IC, Digital PWM System Controller w/Fan Control	PFC-64	UCD90124RGC	TI
1	1	U5	TPS62420DRC	IC, 2.25 MHz Dual Step Down Converter	QFN10	TPS62420DRC	TI
1	1	U6	TLC274CD	IC, CMOS, Quad Operational Amplifier	SO14	TLC274CD	TI
1	1	U7	MCP9700T-E	IC, Low-Power Voltage output Temperature Sensor	SC70-5	MCP9700T-E	Microchip
1	1	U8	INA196AIDBV	IC, Current Shunt Monitor, –16V to 80V Common-Mode Range	SOT23-5	INA196AIDBV	TI
1	1	U9	TPS71202DRC	IC, Dual 250mA Output, Ultralow Noise, High PSRR, LDO Linear Regulator	DRC10	TPS71202DRC	TI
1	1	Y1	12MHZ	Crystal, 12-MHz, 20 pF, ±50 PPM at 25C	0.185 × 0.532	CY12BPSMD	Crystek
57	57	–		Shunt, Black	100-mil	929950-00	3M
4	4		SJ-5003	BUMPON HEMISPHERE 0.44×0.20 BLACK		SJ-5003	3M
1	1	–		PCB, 6 In × 5 In × 0.062 In		HPA459	Any
1	1			USB Cable, 5-pin, B-Mini Male to Type A Male, 2m		AK672M/2-2-R	Assman

7 Layout Guidelines, EVM Schematic, and Assembly Drawings

7.1 Layout Guidelines

Thermal pad

The thermal pad provides a thermal and mechanical interface between the device and the printed circuit board (PCB). While device power dissipation is not of primary concern, a more robust thermal interface can help the internal temperature sensor provide a better representation of PCB temperature. Connect the exposed thermal pad of the PCB to the device VSS pins and provide at least a 4 × 4 pattern of PCB vias to connect the thermal pad and VSS pins to the circuit ground on other PCB layers.

Supply voltage decoupling

Provide power supply pin bypass to the device as follows:

- 0.1µF, X7R ceramic in parallel with 0.01µF, X7R ceramic at pin 47 (BPCAP)
- 0.1µF, X7R ceramic in parallel with 4.7µF, X5R ceramic at pin 44 (V33D)
- 0.1µF, X7R ceramic at pin 7 (V33DIO)
- 0.1µF, X7R ceramic in parallel with 4.7µF, X5R ceramic at pin 46 (V33A)

Digital output signals

Depending on use and application of the various GPIO signals used as digital outputs, some impedance control may be desired to quiet fast signal edges. For example, when using the FPWM pins for fan control or voltage margining the pin will be configured as a digital *clock* signal. Route these signals away from sensitive analog signals. It is also good design practice to provide a series impedance of 20–33 Ω at the signal source to slow fast digital edges.

PMBus clock and data

Route PMBUS_CLK and PMBUS_DATA in a careful fashion away from sensitive analog signals. Provide a series impedance of 20–33 Ω at the signal source.

7.2 EVM Schematic

The searchable PDF of the schematic is appended to this User's Guide.

7.3 Assembly Drawings

The assembly drawings are appended to this User's Guide. The topside and bottomside component layouts are searchable.

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EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of 0 V to 20 V and the output voltage range of 0 V to 5 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.

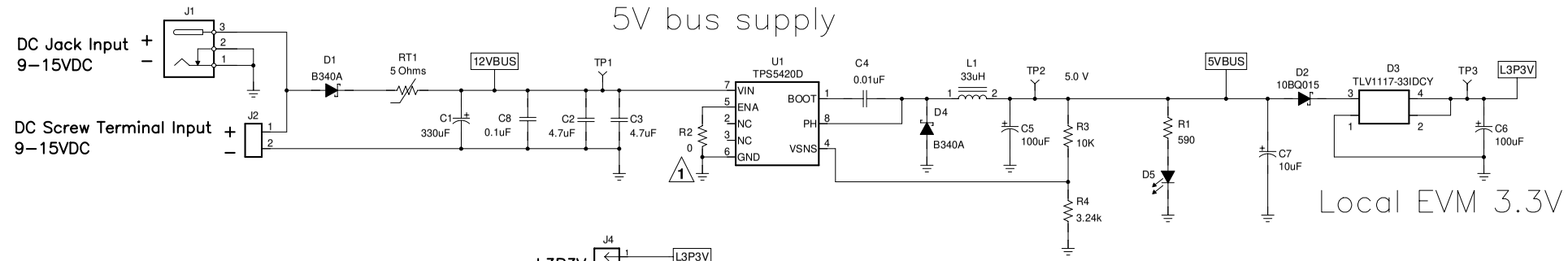
During normal operation, some circuit components may have case temperatures greater than 85°C. The EVM is designed to operate properly with certain components above 85°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching 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.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265

UCD90120/4EVM

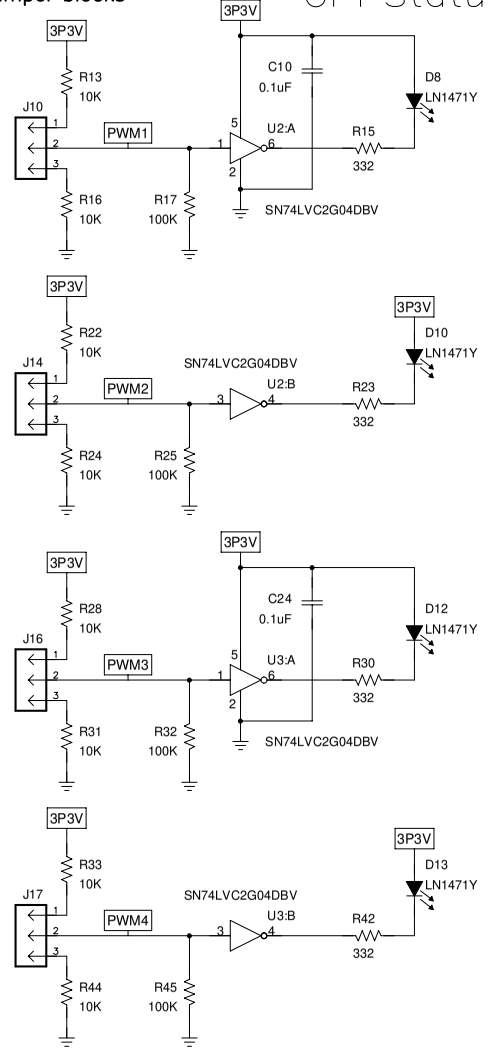
1. UCD90120/4
2. Main power bus
3. Communication (UAR/T, JTAG)

5V bus supply

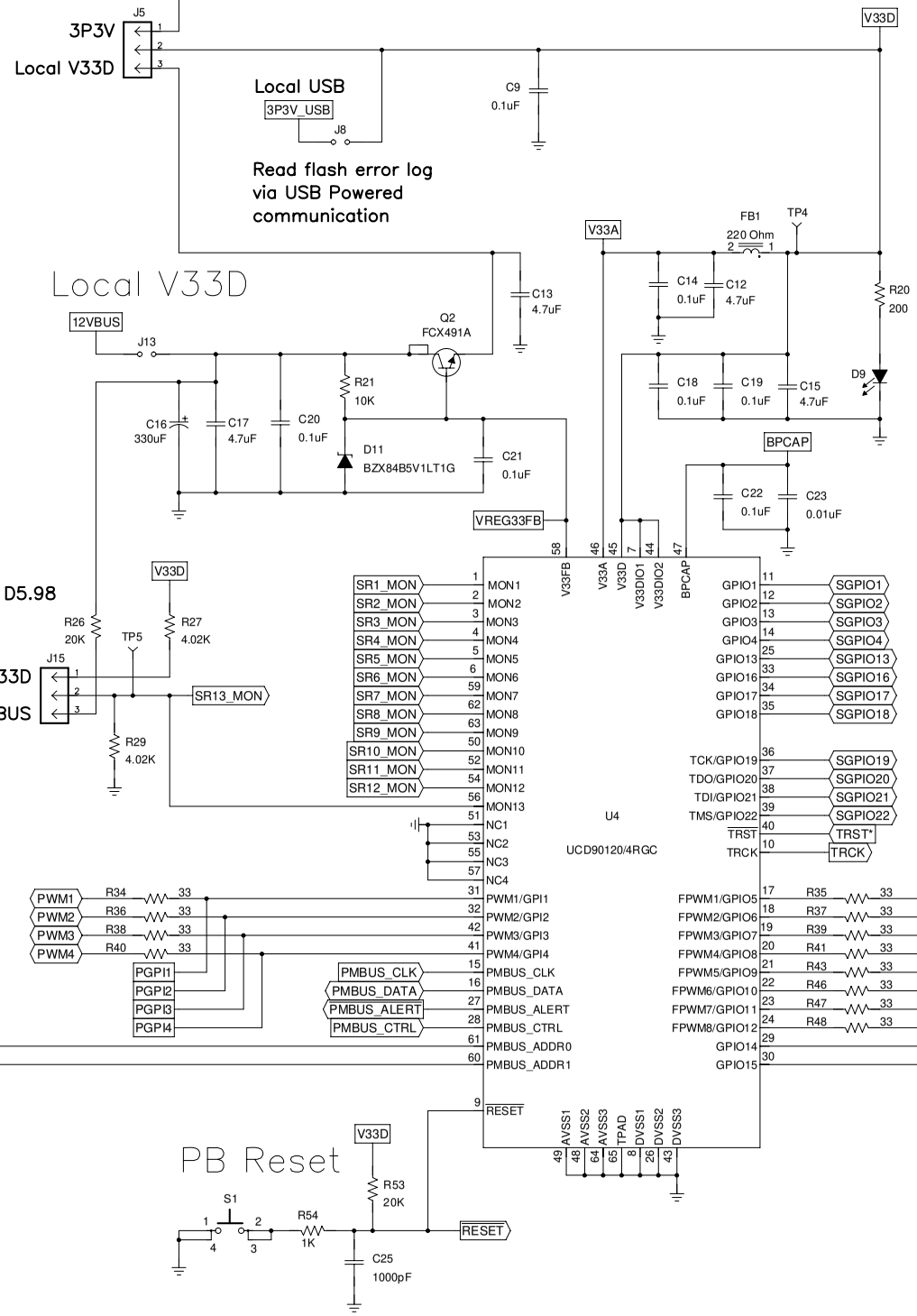


GPI pullup/pulldown jumper blocks

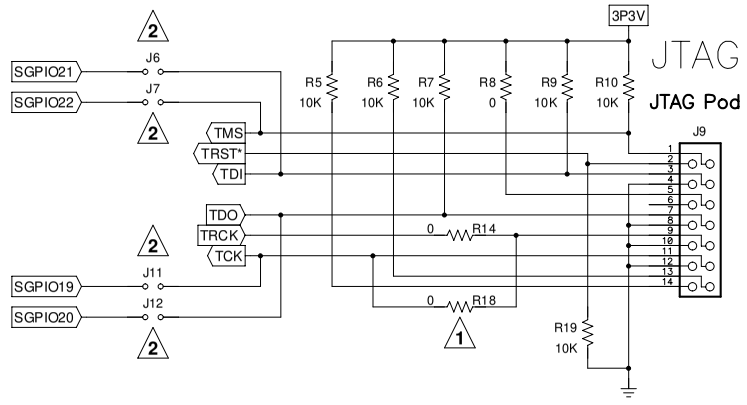
GPI Status LEDs



Local V33D

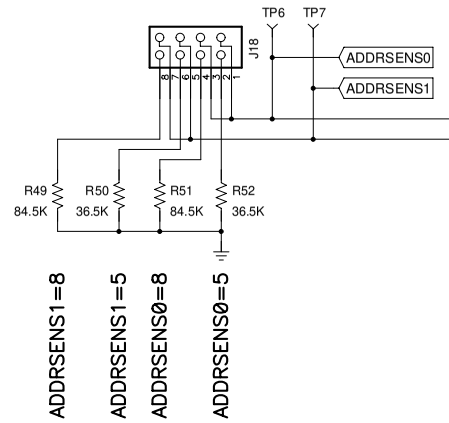


JTAG



PMBus Address

PMBus Address (decimal) = 12*ADDRSENS1 + ADDRSENS0



PB Reset

EVM	U4
UCD90120EVM	UCD90120RGC
UCD90124EVM	UCD90124RGC

NOTES:

1. NOT INSTALLED
2. WHEN USING JTAG INTERFACE:
   REMOVE SHUNTS AT J47, J53, J59, J65
   INSTALL SHUNTS AT J6, J7, J11, J12

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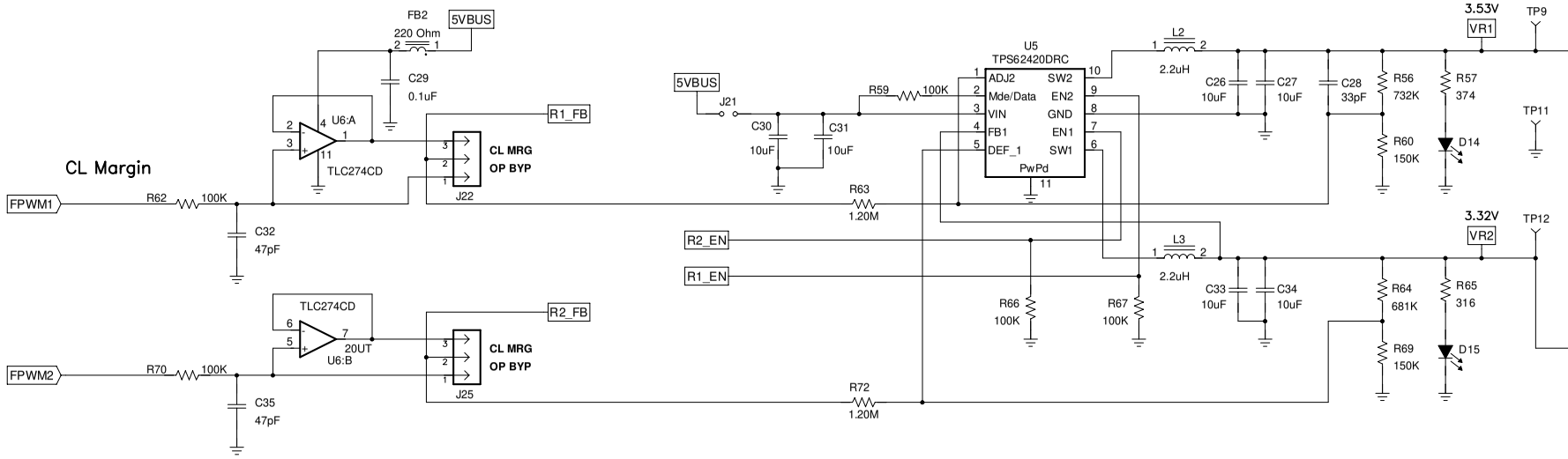
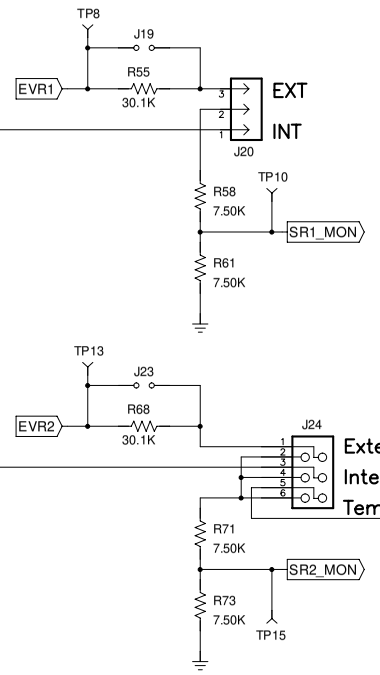
UCD90120/4EVM

1. Local power supply rails 1–4
2. Closed loop margining
3. Current/temperature monitor

Local rails 1–4

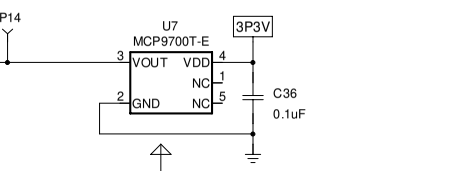


EXTERNAL PS IN
15V MAX (/6) w/o JPR
5V MAX (/2) w JPR

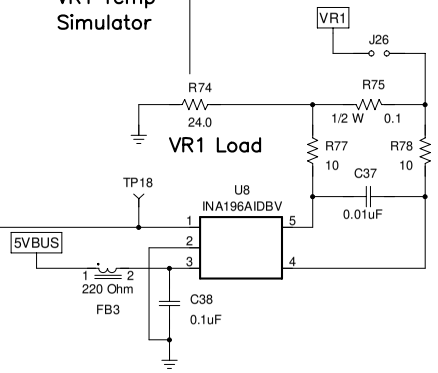


VR1 Load Temp Sensor

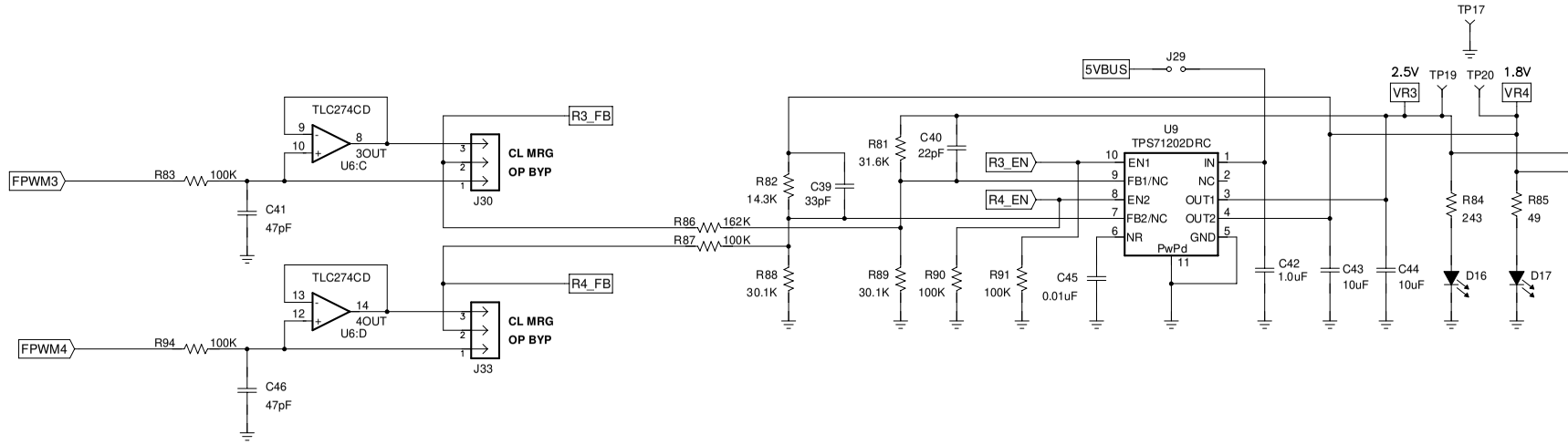
Temp (C) = 100Vout−50

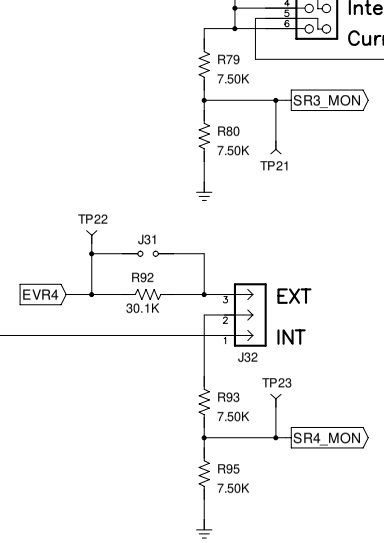


VR1 Temp Simulator



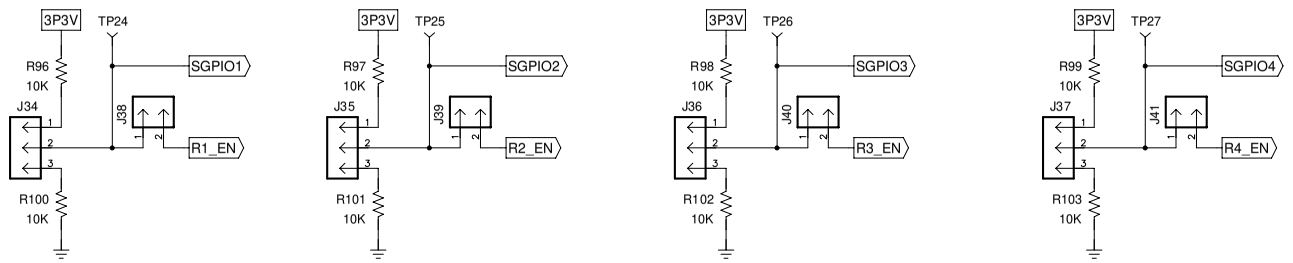
Closed Loop Voltage Margin





VR1 Current Monitor (2V/A)

Enable pullup/pulldown jumper blocks



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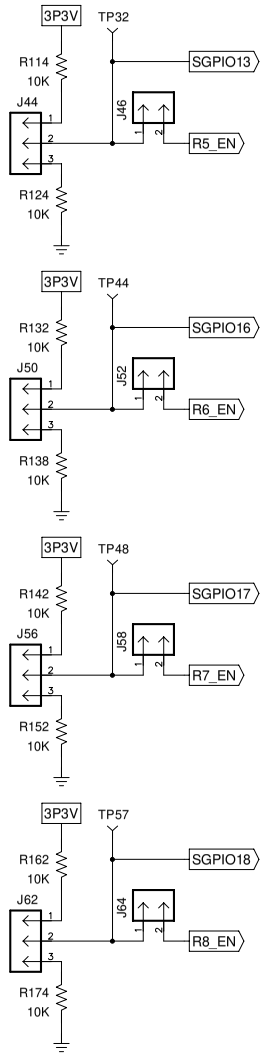
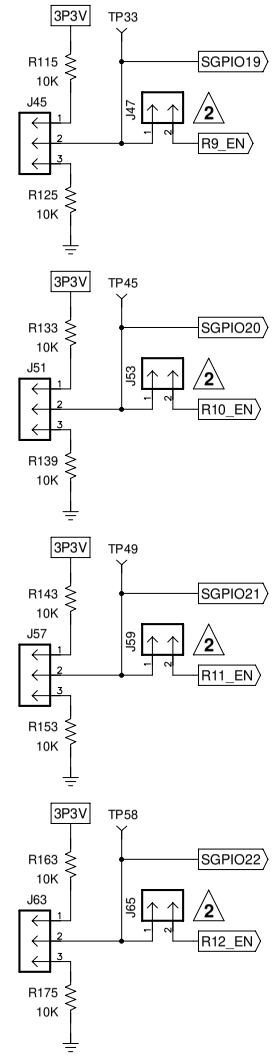
UCD90120/4EVM

1. Local rails 5–12
2. Fan control

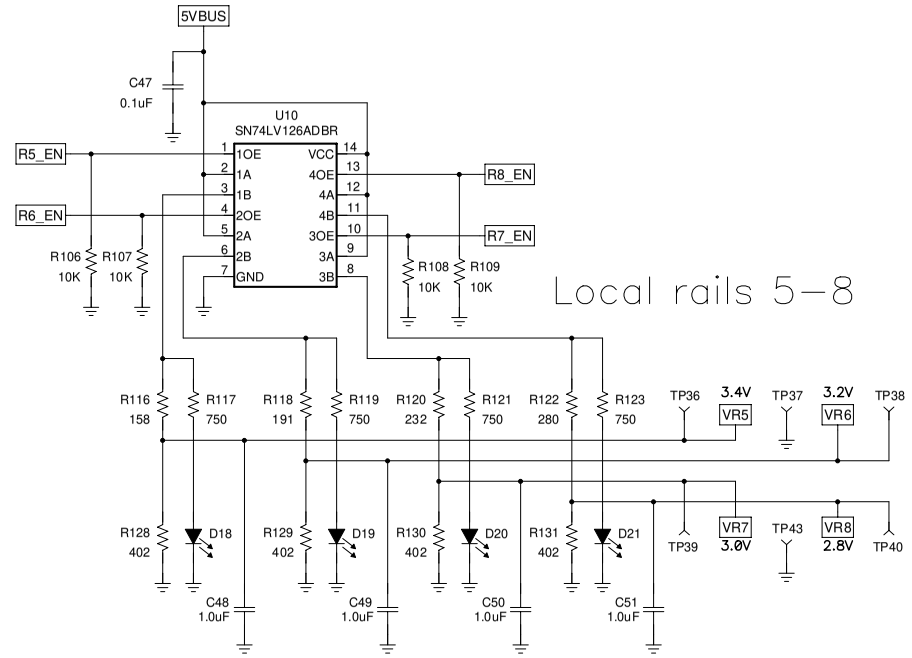
Enable pullup/pulldown jumper blocks



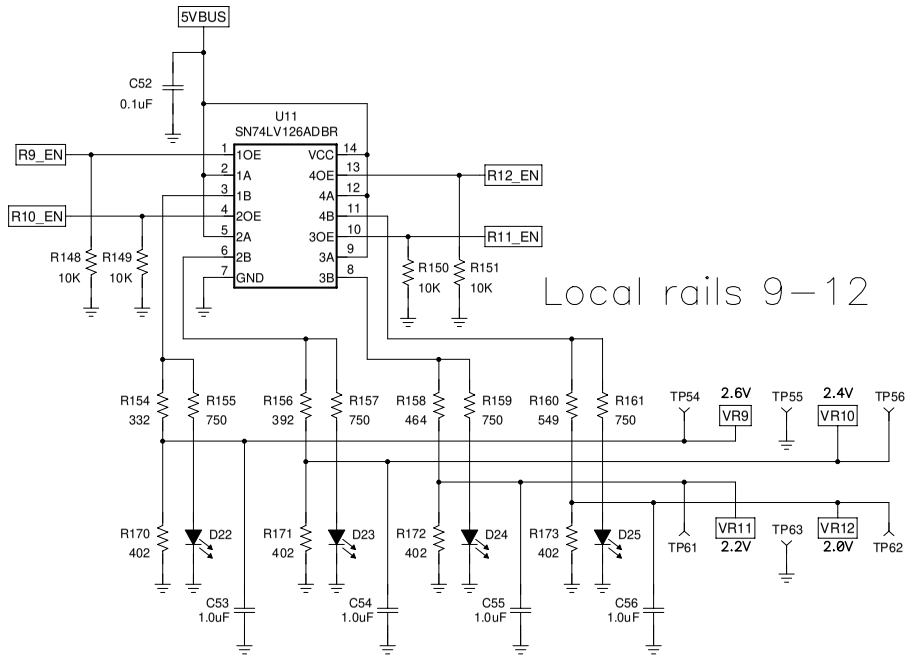
Internal enalble disconnect jumpers

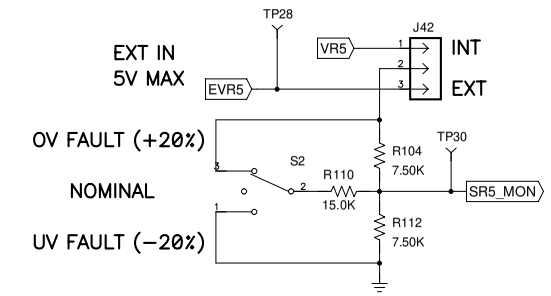


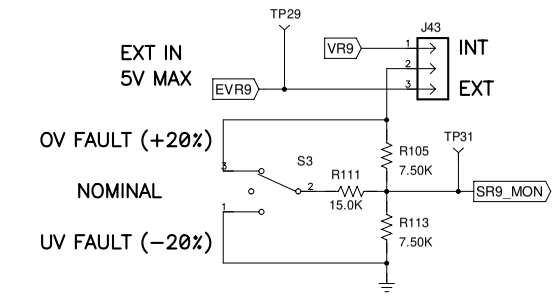
Local rails 5–8

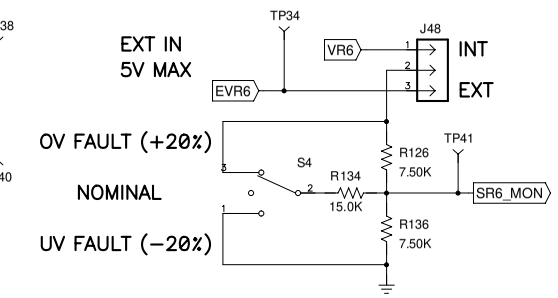


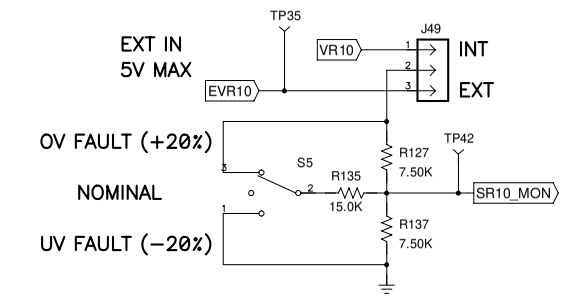
Local rails 9–12

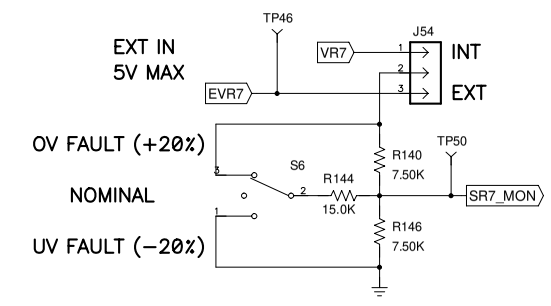


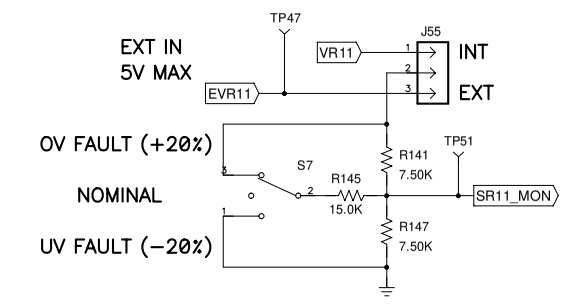


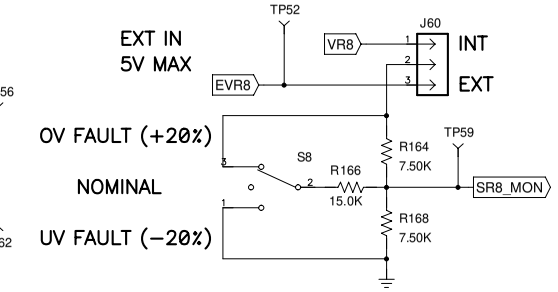


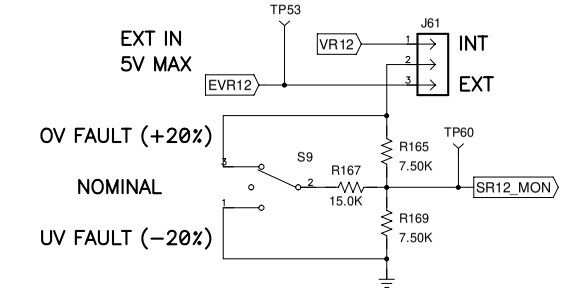


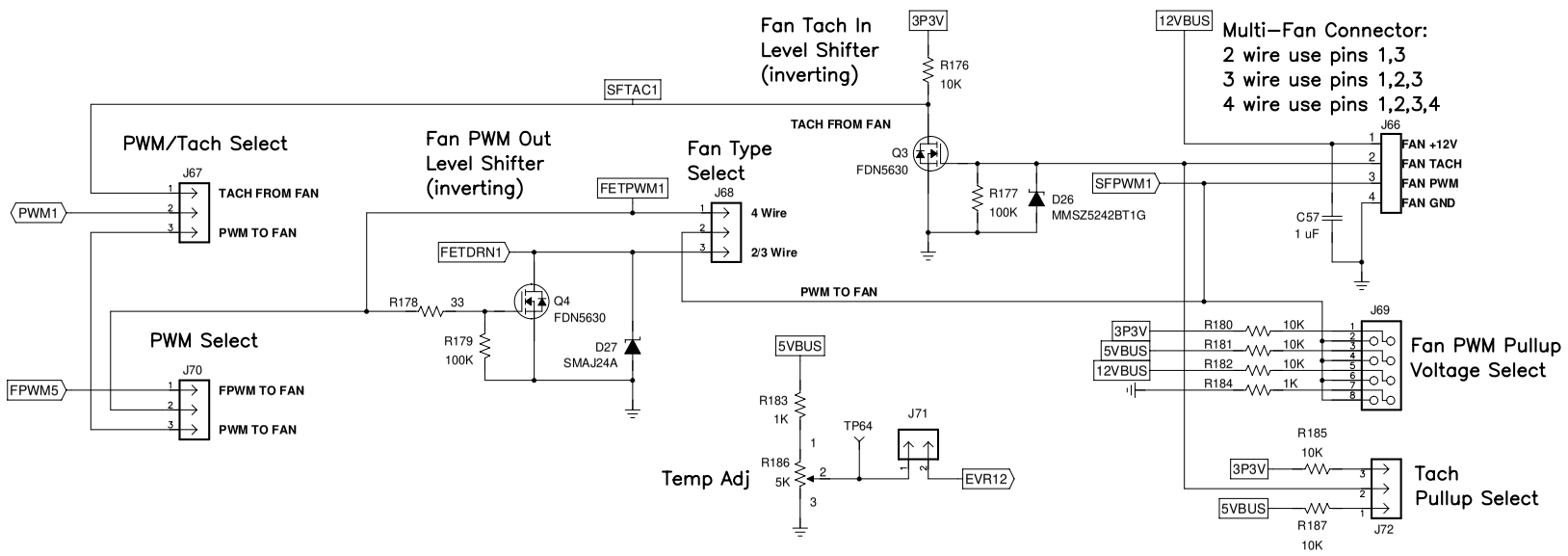












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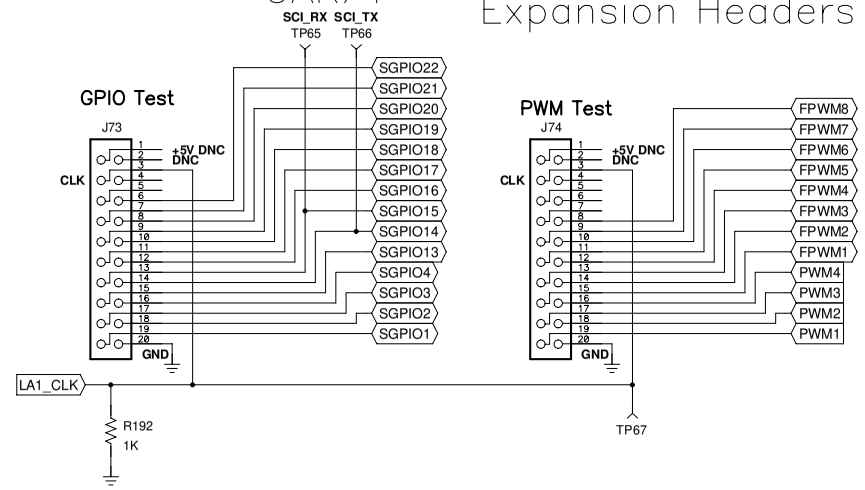
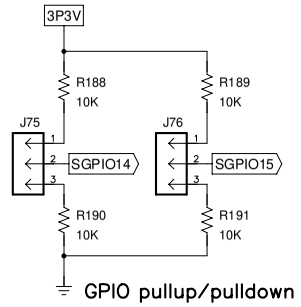
UCD90120/4EVM

1. Expansion headers
2. Status LED's
3. Communication
   (Local/external PMBUS/USB-I2C)

UAR/T

Expansion Headers





GPIO pullup/pulldown jumper blocks

USB Power Monitor
3P3V_USB < 2.5V, local USB disabled
3P3V_USB > 2.7V, local USB enabled

Local USB Bus Switch:
Local USB present, B=A
Local USB not present, B=HIZ

When local USB is not present, PMBUS_CTRL is low (CTRL LED OFF)

Expansion PMBus
J77
CTRL
ALERT
CLK
DATA

EEPROM Programming
J78
J79

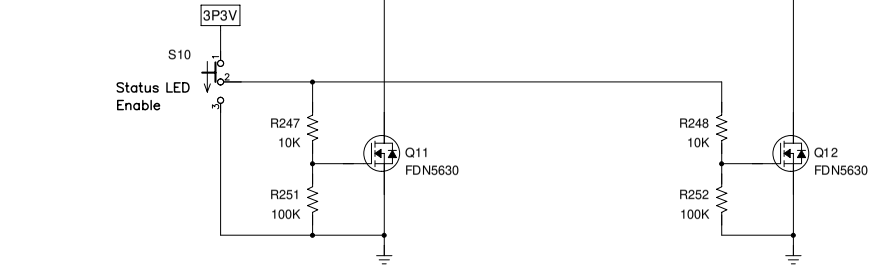
Effective pull-up resistor for SDA and SCL lines can be either open, 2.2K, 1K, or 2.2K//1K = 688 ohm.

Pull-up resistor for ALERT line can be switched on or off.

USB attached indication.

J3
USB Input

GPIO Status LEDs



SM GND TP's.

TP68 TP69 TP70 TP71 TP72 TP73

Local
USB to GPIO (I2C)

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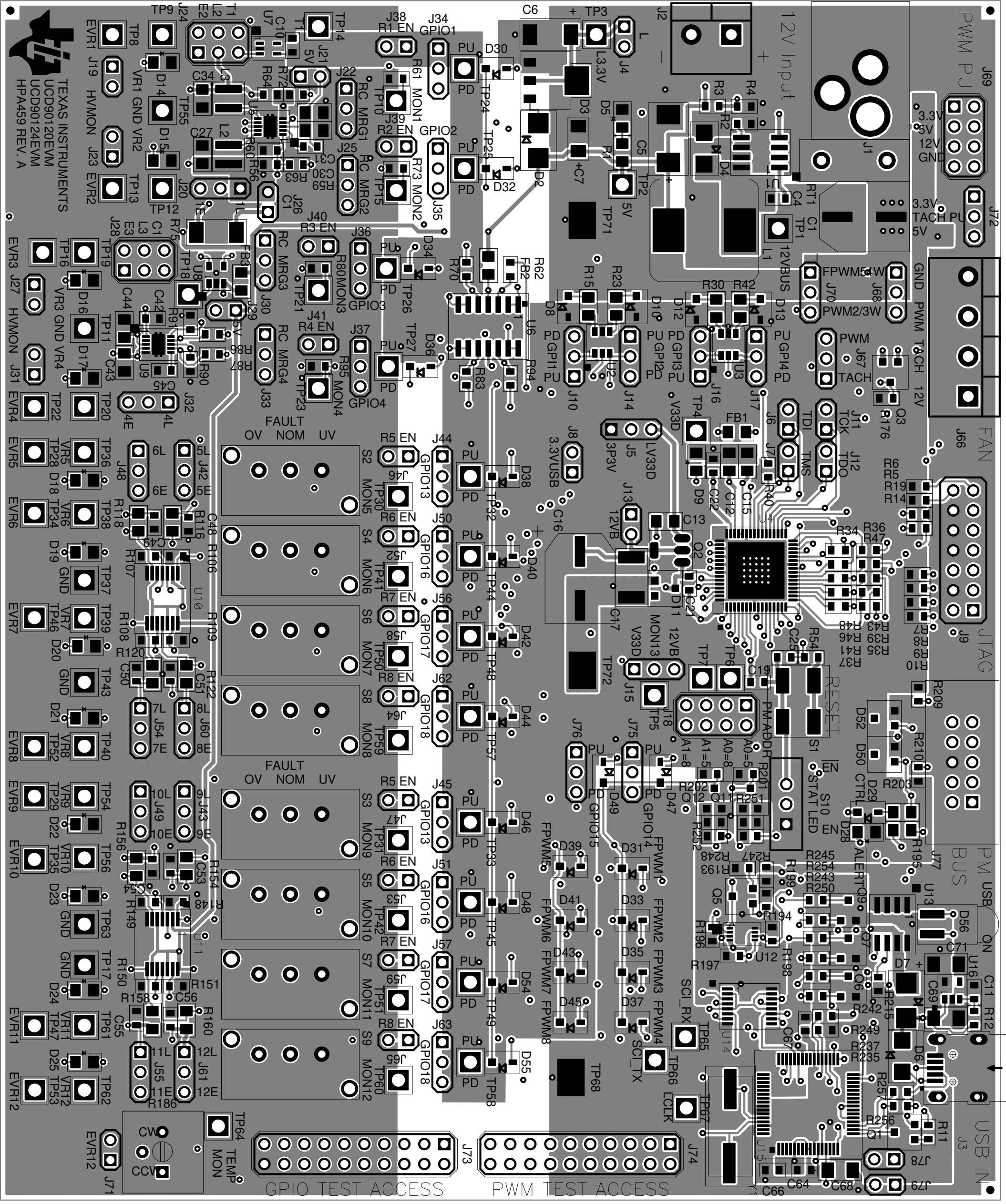
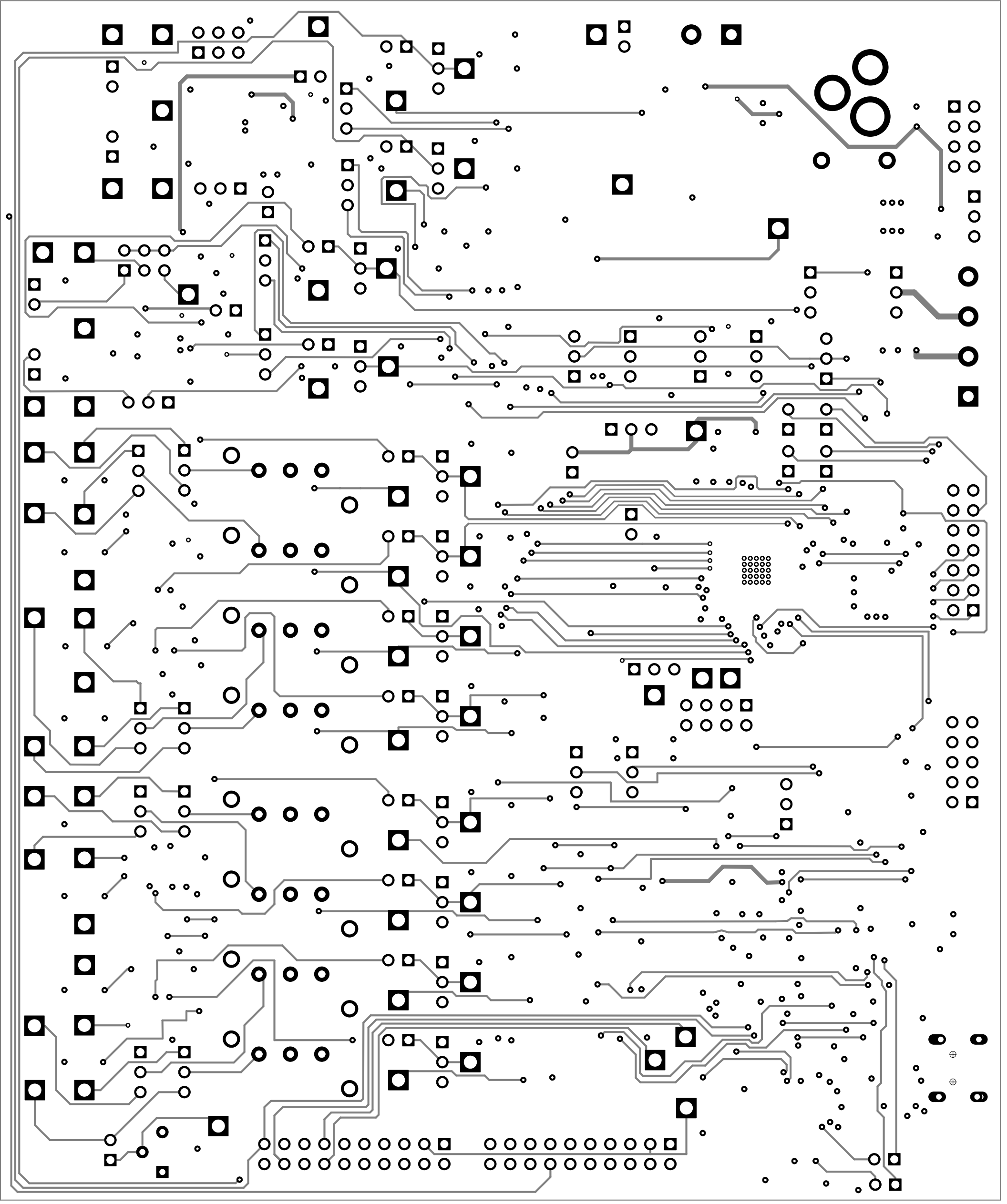
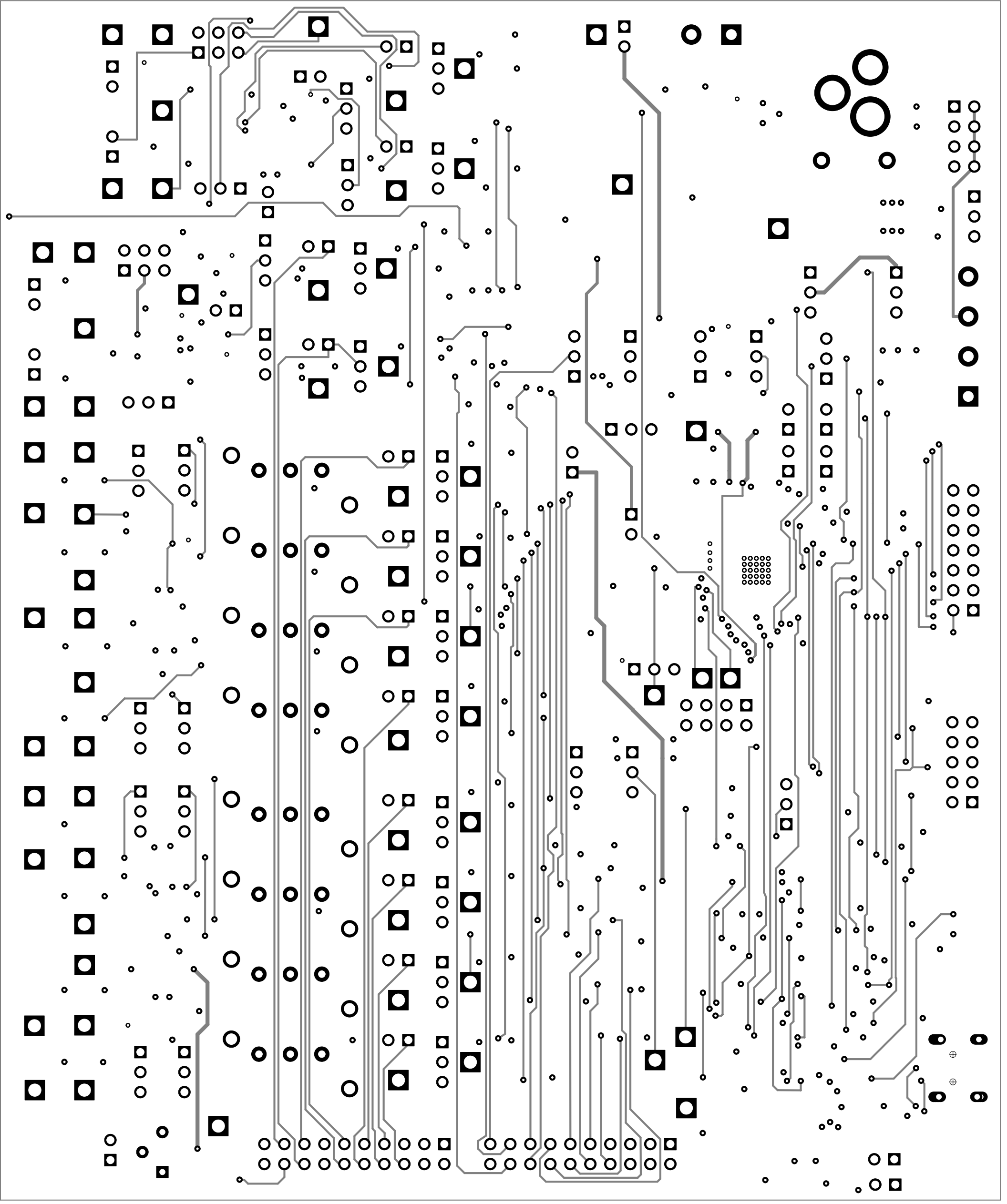


Top Layer
Layout/Routing

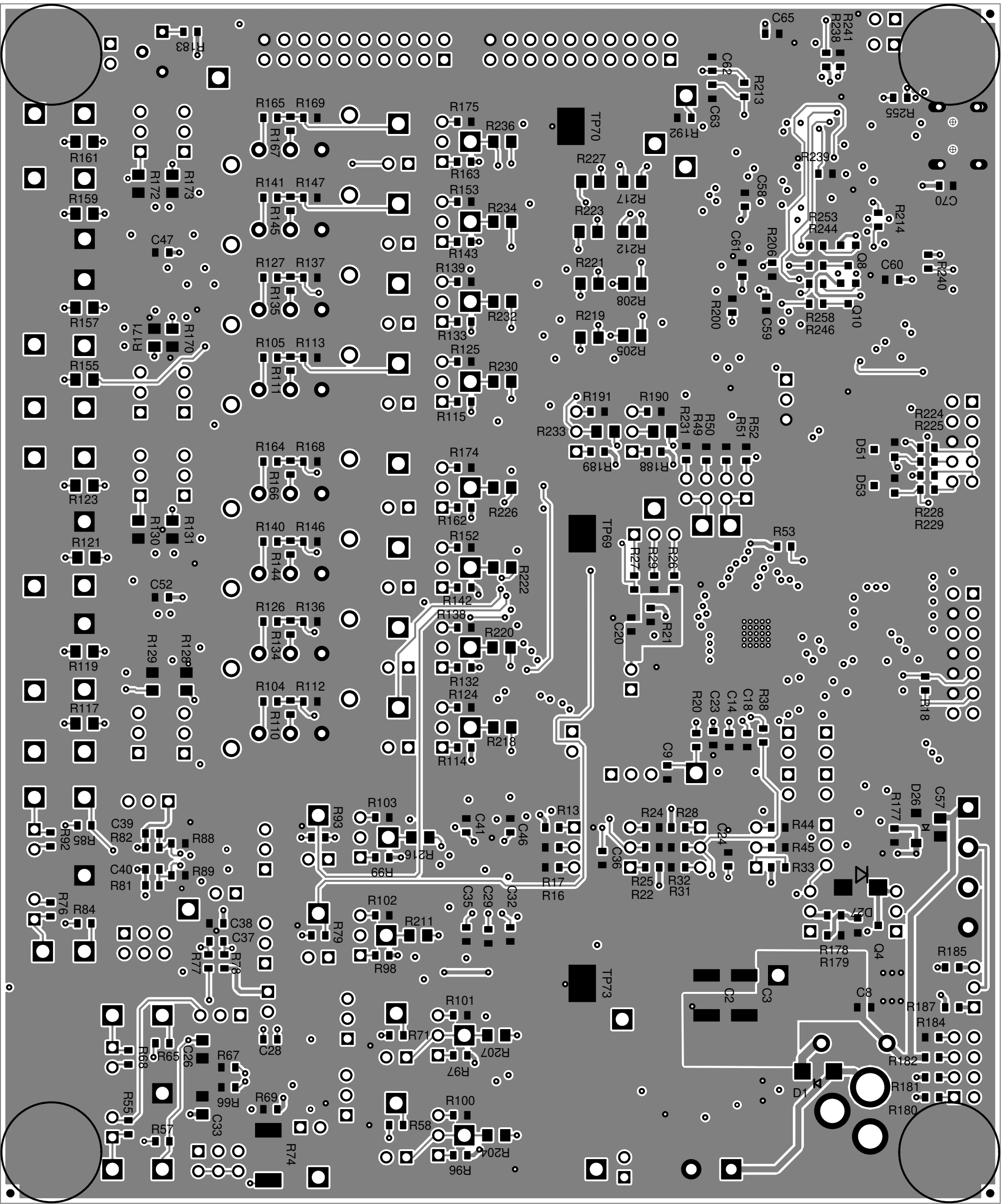


Layer 2 Routing



Layer 3 Routing

Bottom Layer
Placement/Routing



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DSP	dsp.ti.com	Computers and Peripherals	www.ti.com/computers
Clocks and Timers	www.ti.com/clocks	Consumer Electronics	www.ti.com/consumer-apps
Interface	interface.ti.com	Energy	www.ti.com/energy
Logic	logic.ti.com	Industrial	www.ti.com/industrial
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