1.0 Board Configuration

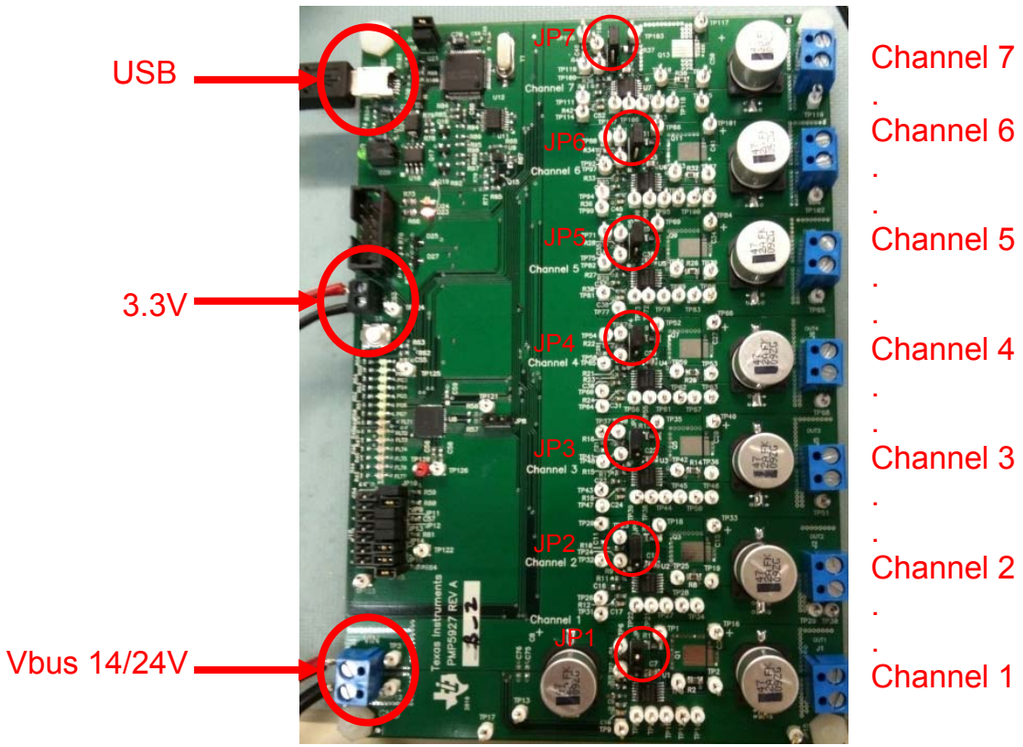


Figure 1

Tie JP1 – JP7 to top two nodes for TPS2492s' enables to be controlled by Vbus. Tie JP1 – JP7 to lower two nodes for TPS2492s' enables to be controlled by UCD9090.

2.0 Software Installation

2.1 Download Fusion GUI from Internet

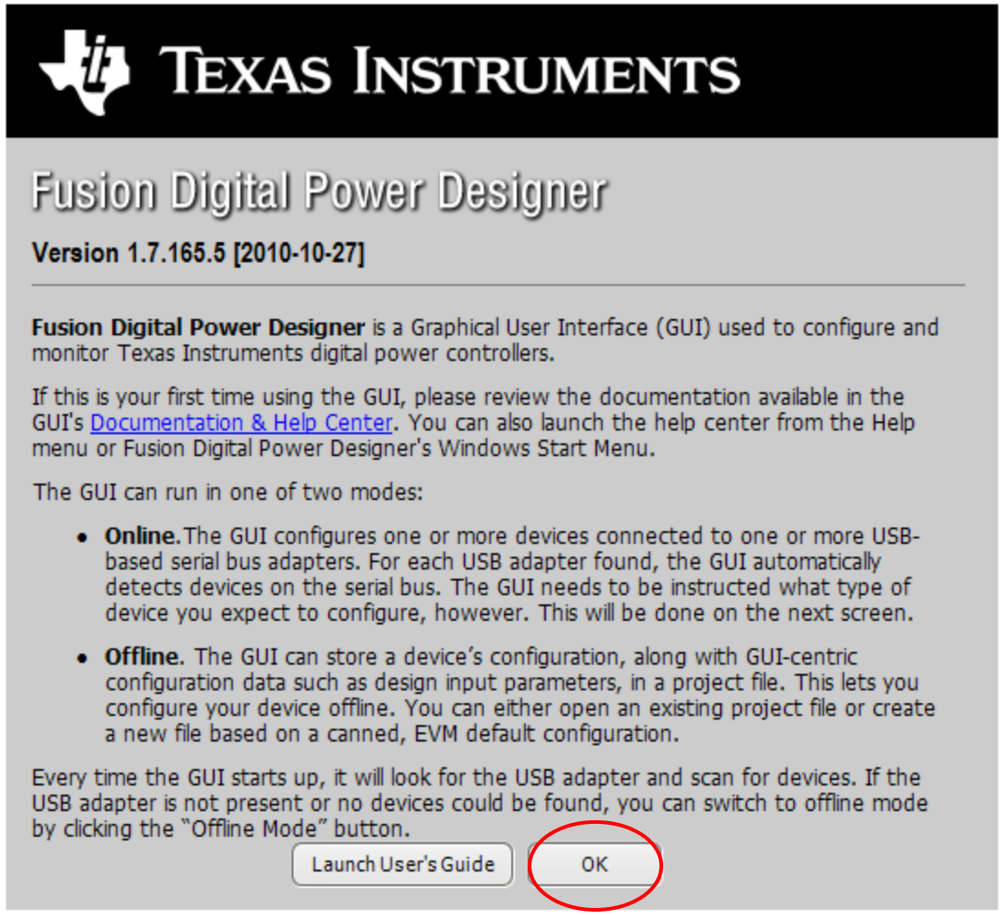
2.2 Run TI-Fusion-Digital-Power-Designer-1.7.165.5.exe application

2.3 Click next, etc. and install

2.4 Before launching software after successful installation, insert USB into computer and board (See Figure 1). Wait for confirmation that hardware is installed and ready to use

2.5 Apply 3.3V to board (See Figure 1).

2.6 Launch Texas Instruments Fusion Digital Power Designer

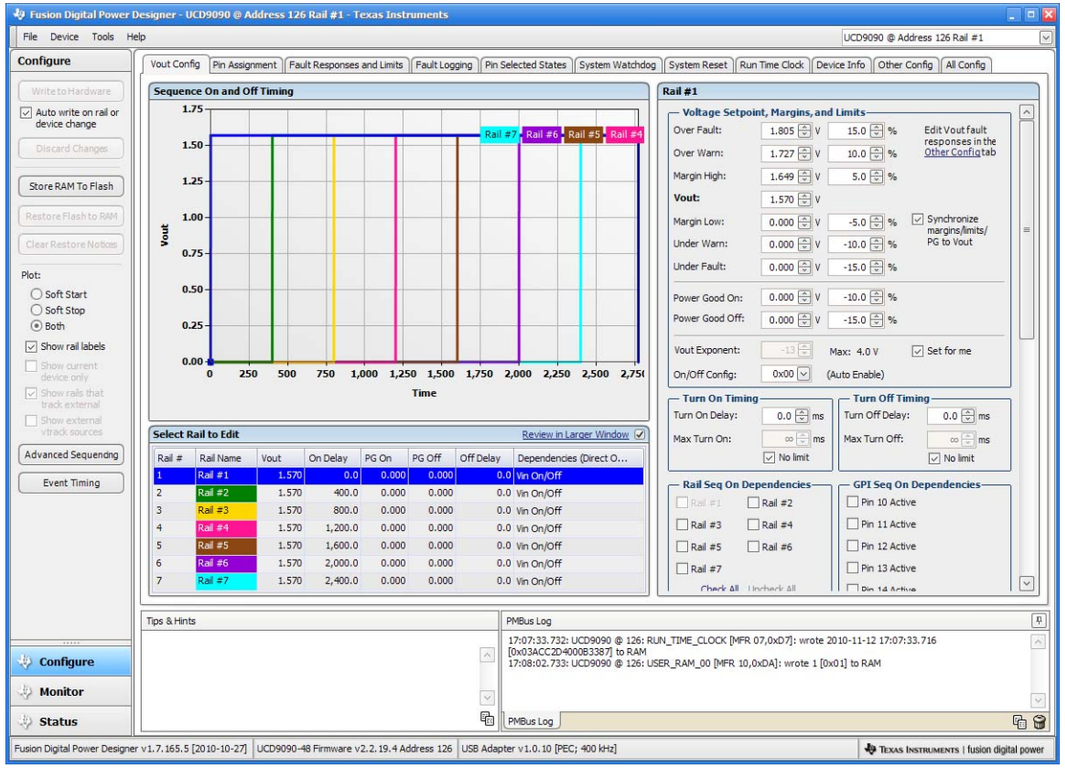

Texas Instruments
Fusion Digital Power Designer
Version 1.7.165.5 [2010-10-27]
Fusion Digital Power Designer is a Graphical User Interface (GUI) used to configure and monitor Texas Instruments digital power controllers.
If this is your first time using the GUI, please review the documentation available in the GUI's Documentation & Help Center. You can also launch the help center from the Help menu or Fusion Digital Power Designer's Windows Start Menu.
The GUI can run in one of two modes:
Online. The GUI configures one or more devices connected to one or more USB-based serial bus adapters. For each USB adapter found, the GUI automatically detects devices on the serial bus. The GUI needs to be instructed what type of device you expect to configure, however. This will be done on the next screen.
Offline. The GUI can store a device's configuration, along with GUI-centric configuration data such as design input parameters, in a project file. This lets you configure your device offline. You can either open an existing project file or create a new file based on a canned, EVM default configuration.
Every time the GUI starts up, it will look for the USB adapter and scan for devices. If the USB adapter is not present or no devices could be found, you can switch to offline mode by clicking the "Offline Mode" button.
Launch User's Guide
OK

2.7


Texas Instruments
Fusion Digital Power Designer
Version 1.7.165.5 [2010-10-27]
Select Device Scanning Mode
Select the method the GUI should use to scan for device(s) on the I2C bus:
UCD Controllers and Sequencers, Isolated Controllers (DEVICE_ID)
UCD92xx, UCD91xx, UCD90xx, Isolated, etc. The GUI will scan the bus for devices that respond to the DEVICE_ID command. This is a Texas Instruments manufacturing specific command (read block 0xFD).
TPS40400, TPS4042x, etc (DEVICE_CODE)
Analog power converters and controllers. The GUI will scan for devices that respond to the Texas Instruments DEVICE_CODE command (read word 0xFC).
DEVICE_ID and DEVICE_CODE
Scan for DEVICE_ID and DEVICE_CODE. Use this option if you have a mix of devices on the bus or do not know which of DEVICE_ID or DEVICE_CODE your device supports. Scanning takes longer in this mode.
Manual Device Selection: TPS53951
Some devices do not support DEVICE_ID or DEVICE_CODE. The GUI scans for devices responding to PMBUS_REVISION and assumes any device(s) found are the device selected.
Device scan may cause STATUS_CML faults. Click for more information.
Your selection will be used the next time Fusion Digital Power Designer launches.
Clear Scan Address Customizations
Offline Mode
Exit Program

2.8

2.9 Click “OK” at Address 126 Detected



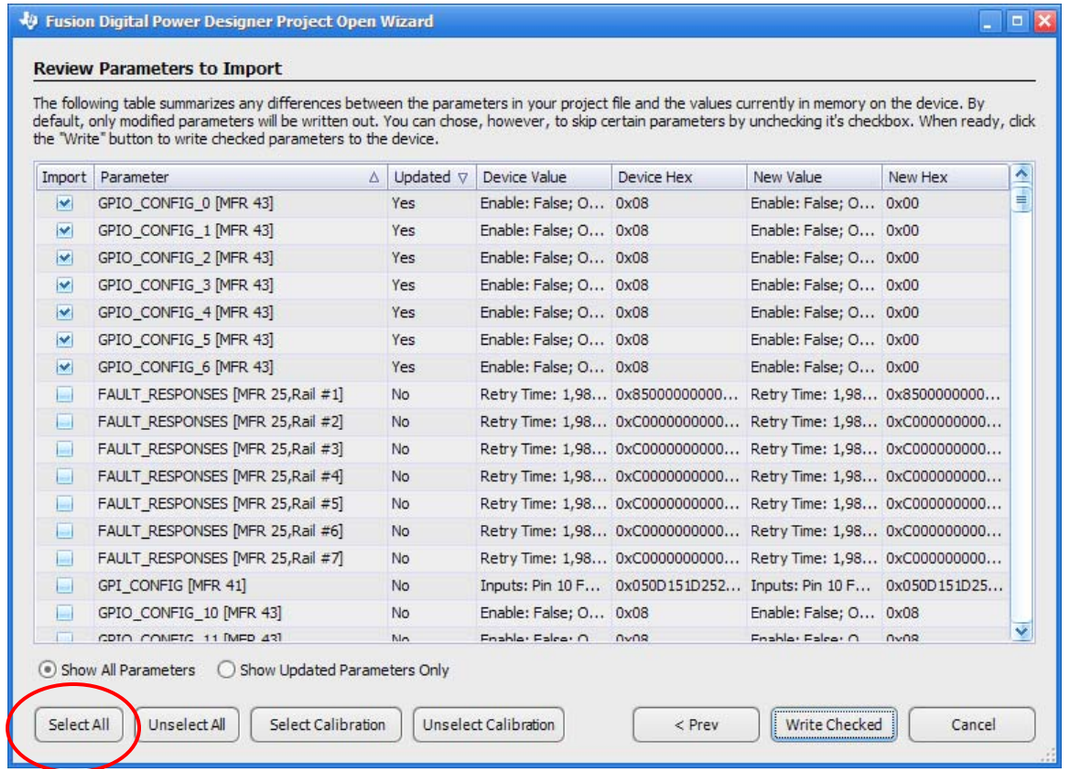
2.10

2.11 Click File -> Import Project

2.12 Open “UCD9090 @ Address 126 Project.xml”

2.13 Click “Next”

2.14 Click “Next”

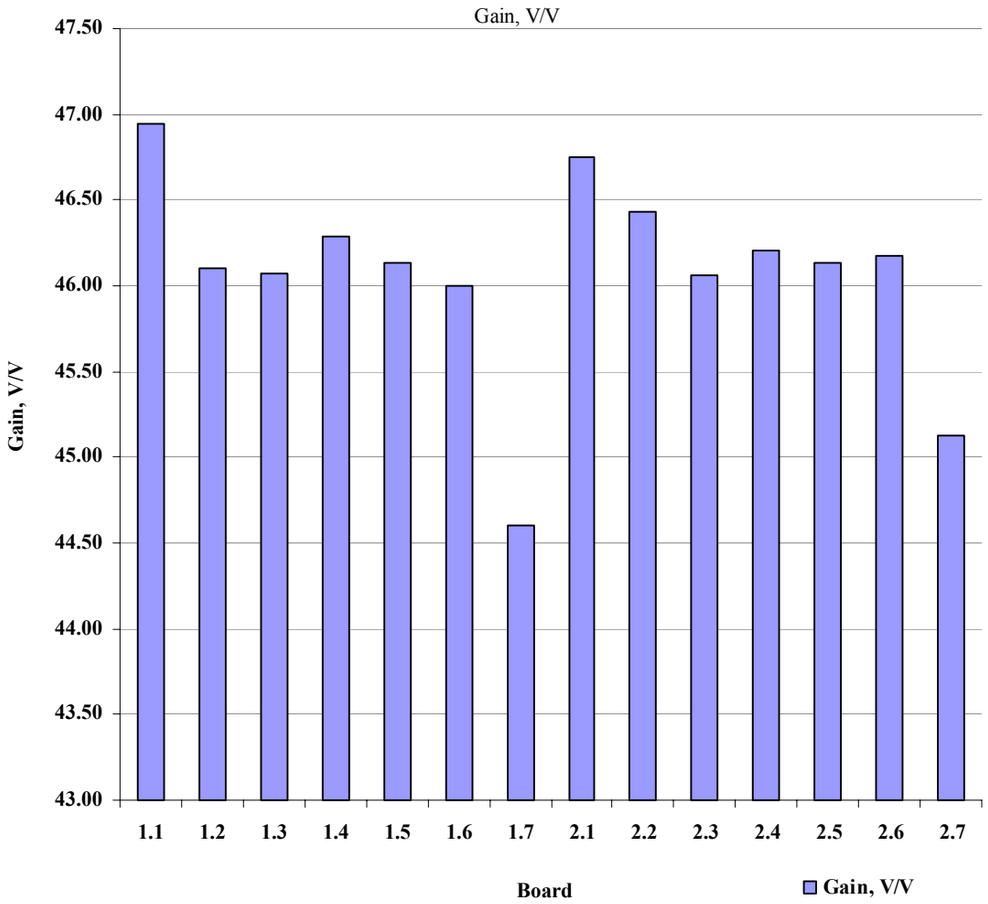


2.15
2.16 **After Selecting All, click “Write Checked”**
2.17 **Click “Next” then “Ok” and the software is up and running!**

3.0 Channel Gain ($V_{IMON}/V_{(VCC-VSENSE)}$) Characterization

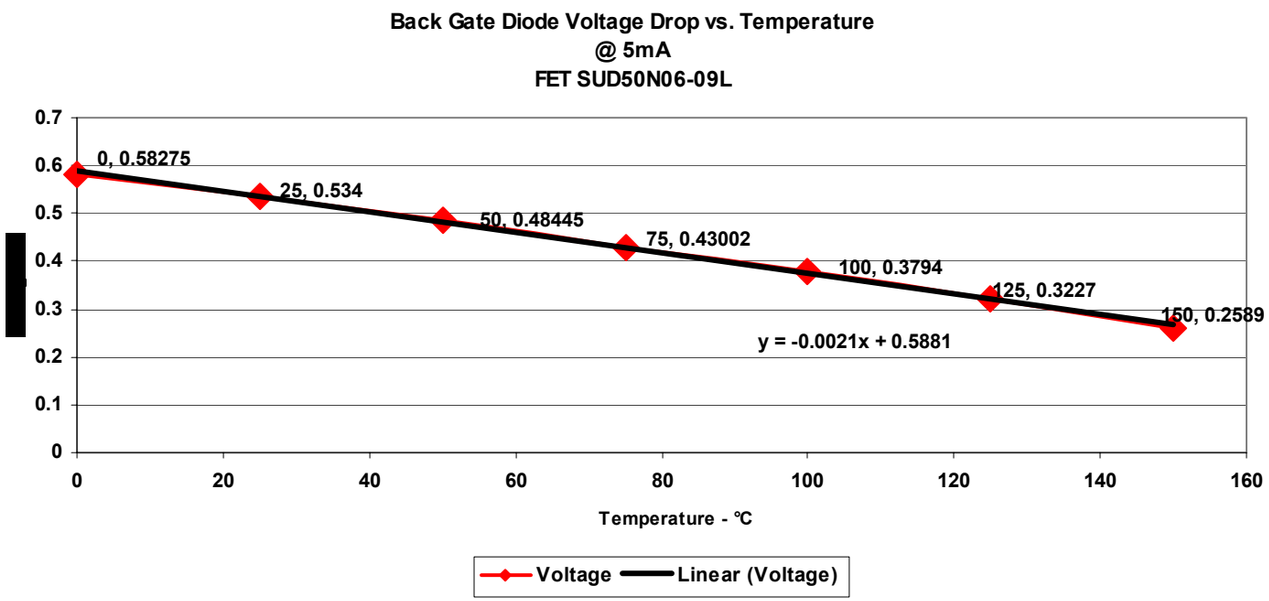
The following data characterizes the Gain ($V_{IMON}/V_{(VCC-VSENSE)}$) for each TPS2492 channel on boards one and two.

Board.Channel	Gain	Board.Channel	Gain
1.1	46.944096	2.1	46.748704
1.2	46.104304	2.2	46.426459
1.3	46.067347	2.3	46.065434
1.4	46.284893	2.4	46.205581
1.5	46.138208	2.5	46.128933
1.6	45.996859	2.6	46.170561
1.7	44.605642	2.7	45.124558


Gain, V/V
47.50
47.00
46.50
46.00
45.50
45.00
44.50
44.00
43.50
43.00
Gain, V/V
1.1
1.2
1.3
1.4
1.5
1.6
1.7
2.1
2.2
2.3
2.4
2.5
2.6
2.7
Board
Gain, V/V

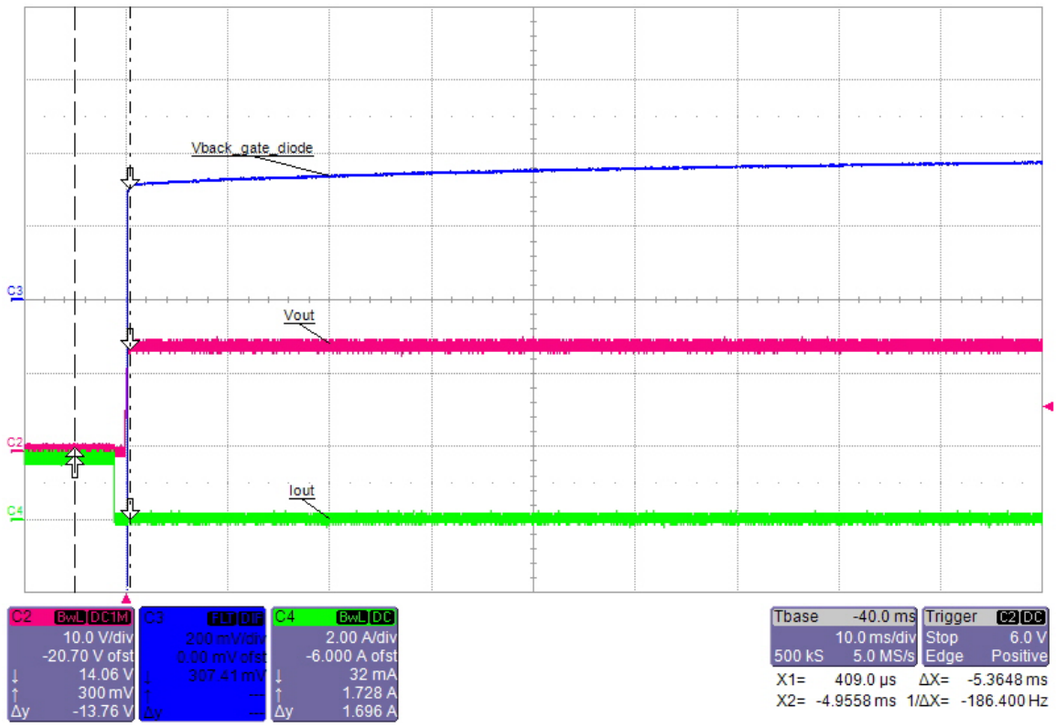
4.0 SUD50N06-09L FET Thermal Characterization

The backgate diode of SUD50N06-09L is sourced with a constant 5mA. The corresponding diode drop voltage is then characterized over temperature. The figure below illustrates the results:

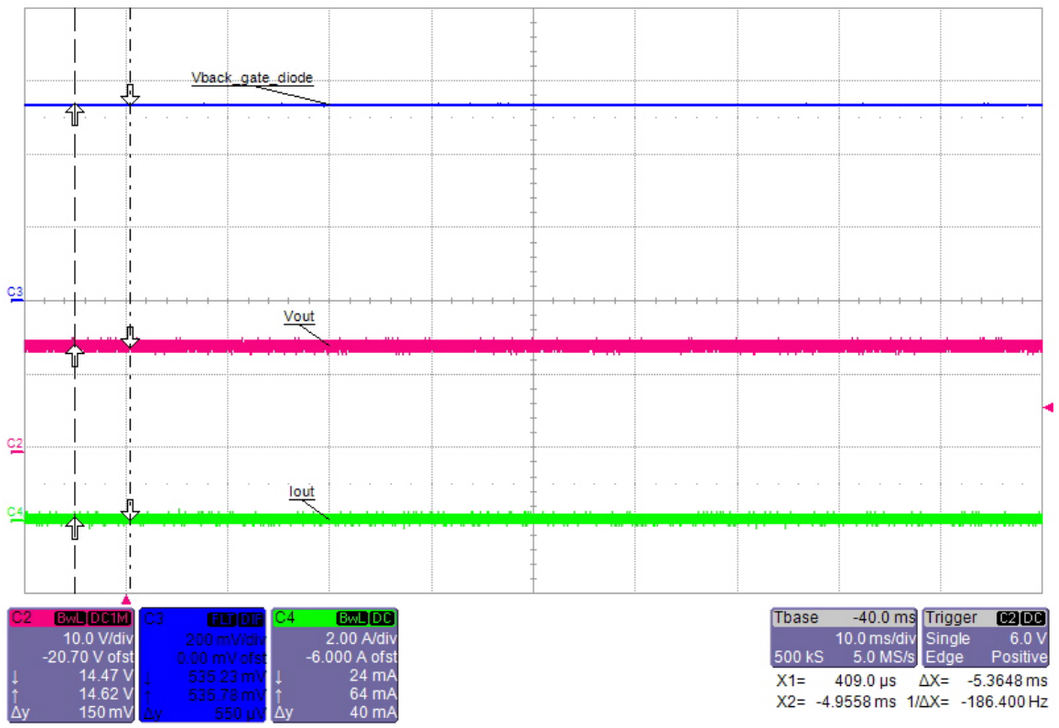


Plotting a best-fit line gives the voltage drop of 2.1mV/°C. The FET temperature rise during a short-circuit event can now be estimated on the PMP5927 board.

The TPS2492 is short-circuited on the output, which rails the current out at ~1.7A for the 0.5sec programmed time. The input voltage in this case is 14V. With a 5mA current generator fed into the backgate diode, the differential voltage across the source to drain of the FET is measured immediately after the over-current timer times out. This is shown on the next page.



The instantaneous $V_{back\_gate\_diode}$ voltage after the fault is 307.41mV. At steady-state and room temperature, this voltage is 535.23mV as shown below.


Vback_gate_diode
Vout
Iout
C3
C2
C4
C2 BwL DC1M
10.0 V/div
-20.70 V ofst
14.47 V
14.62 V
Δy 150 mV
C3 FLT DIF
200 mV/div
0.00 mV ofst
535.23 mV
535.78 mV
Δy 550 µV
C4 BwL DC
2.00 A/div
-6.000 A ofst
24 mA
64 mA
Δy 40 mA
Tbase -40.0 ms
10.0 ms/div
500 kS 5.0 MS/s
Trigger C2 DC
Single 6.0 V
Edge Positive
X1= 409.0 µs ΔX= -5.3648 ms
X2= -4.9558 ms 1/ΔX= -186.400 Hz

The voltage difference between these two states is 227.82 mV. Dividing this by 2.1 mV/°C suggests a temperature delta of 108.5°C. Taking into account the input voltage of 14V and short-circuit current of 1.7A, the FET therefore is shown to heat up at a rate of 4.56 °C/W.

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