Using the PWR091EVM Dual-Output DC/DC Analog With PMBus Interface

User's Guide



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Using the PWR091EVM Dual-Output DC/DC Analog With PMBus Interface

The PWR091EVM evaluation module uses the TPS40422. The TPS40422 is a dual-channel, synchronous buck controller that operates from a nominal 4.5-V to 20-V supply. This controller is an analog PWM controller that allows programming and monitoring via the PMBus interface. It can be used as a dual, independent output or a dual-phase output controller.

1 Description

The PWR091EVM is designed as a dual-output converter. It uses a nominal 12-V bus to produce a regulated 1.2-V output at up to 20 A of load current, and a regulated 3.3-V output at up to 15 A of load current. The PWR091EVM demonstrates the TPS40422 in a typical low-voltage application while providing a number of test points to evaluate the performance of the TPS40422.

1.1 Typical Applications

- Smart power systems
- Power supply modules
- Communications equipment
- · Computing equipment

1.2 Features

- Regulated 1.2-V output up to 20-Adc, steady-state output current
- Regulated 3.3-V output up to 15-Adc, steady-state output current
- Both outputs are marginable and trimmable via the PMBus interface.
 - Programmable: UVLO, Soft Start, and Enable via the PMBus interface
 - Programmable overcurrent warning and fault limits and programmable response to faults via the PMBus interface
 - Programmable overvoltage warning and fault limit and programmable response to faults via the PMBus interface
 - Programmable high- and low-output margin voltages with a maximum range of +10%, -20% of nominal output voltage
- Convenient test points for probing critical waveforms

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2 Electrical Performance Specifications

	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
INPUT	INPUT CHARACTERISTICS					
	Voltage range	V _{IN}	8	12	14	V
	Maximum input current	$V_{IN} = 8 V, I_{O1} = 20 A, I_{O2} = 15 A$		10	15	А
	No load input current	$V_{IN} = 14 \text{ V}, \text{ I}_{O1} = 0 \text{ A}, \text{ I}_{O2} = 0 \text{ A}$		100		mA
OUTP	JT CHARACTERISTICS					
V_{OUT1}	Output voltage	Output current = 10 A		1.2		V
V_{OUT2}	Output voltage	Output current = 10 A		3.3		V
I _{OUT1}	Output load current	I _{OUT_min} to I _{OUT_max}	0		20	А
I _{OUT2}	Output load current	I _{OUT_min} to I _{OUT_max}	0		15	А
		Line regulation: Input voltage = 8 V to 14 V		0.5%		
	Output voltage regulation	Load regulation: Output current = 0 A to I_{OUT_max} , both outputs		0.%5		
V _{OUT1}	Output voltage ripple	V _{IN} = 12 V, I _{OUT} = 20 A		30		mVpp
V_{OUT2}	Output voltage ripple	$V_{IN} = 12 \text{ V}, \text{ I}_{OUT} = 15 \text{ A}$		30		mVpp
V_{OUT1}	Output overcurrent			25		А
V_{OUT2}	Output overcurrent			20		А
SYSTE	EMS CHARACTERISTICS					
	Switching frequency	F _{sw}		460		kHz
V_{OUT1}	Peak efficiency	V_{IN} = 8 V, I_{O1} = 10 A, V_{OUT2} disabled, F_{SW} = 300 kHz		92%		
V_{OUT2}	Peak efficiency	V_{IN} = 8 V, I_{O2} = 8.5 A, V_{OUT1} disabled, F_{SW} = 300 kHz		95%		
V_{OUT1}	Full-load efficiency	V_{IN} = 8 V, I_{O1} = 10 A, V_{OUT2} disabled, F_{SW} = 300 kHz		90%		
V_{OUT2}	Full-load efficiency	V_{IN} = 8 V, I_{O2} = 8.5 A, V_{OUT1} disabled, F_{SW} = 300 kHz		93%		
	Operating temperature	T _{oper}		25		°C

Table 1. PWR091EVM-001 Electrical Performance Specifications





Figure 1. PWR091EVM Schematic

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4 Test Setup

4.1 Test and Configuration Software

To change any of the default configuration parameters on the EVM, it is necessary to obtain the TI Fusion Digital Power Designer software.

4.1.1 Description

The Fusion Digital Power Designer is the graphical user interface (GUI) used to configure and monitor the Texas Instruments TPS40422 power controller on this evaluation module. The application uses the PMBus protocol to communicate with the controller over serial bus by way of a TI USB adapter (see Figure 3).

4.1.2 Features

Some of the tasks you can perform with the GUI include:

- Turn on or off the power supply output, either through the hardware control line or the PMBus operation command.
- Monitor real-time data. Items such as input voltage, output voltage, output current, temperature, and warnings and faults are continuously monitored and displayed by the GUI.
- Configure common operating characteristics such as VOUT trim and margin, UVLO, soft-start time, warning and fault thresholds, fault response, and ON/OFF.

This software is available for download at http://www.ti.com/tool/fusion_digital_power_designer

4.2 Test Equipment

Voltage Source: The input voltage source VIN must be a 0-V to 14-V variable dc source capable of supplying 15 Adc. Connect VIN to J5 as shown in Figure 2.

Multimeters: It is recommended to use three separate multimeters as shown in Figure 2. One meter to measure Vin, one to measure Vout1 and the third to measure Vout2.

Output Load: Two variable electronic loads are recommended for the test setup as shown in Figure 2. Load 1 must be capable of 25 A at voltages as low as 0.9 V. Load 2 must be capable of 20 A at voltages as low as 3 V.

Oscilloscope: An oscilloscope is recommended for measuring output noise and ripple. Output ripple must be measured using a Tip-and-Barrel method or better as shown in Figure 4.The scope must be adjusted to 20-MHz bandwidth, ac coupling at 50 mV/division, and must be set to 1-µs/division.

Fan: During prolonged operation at high loads, it may be necessary to provide forced air cooling with a small fan aimed at the EVM. The temperature of the devices on the EVM must be maintained at less than 105°C.

USB-to-GPIO Interface Adapter: A communications adapter is required between the EVM and the host computer. This EVM was designed to use the Texas Instruments USB-to-GPIO Adapter (see Figure 3). This adapter can be purchased at http://www.ti.com/tool/usb-to-gpio.

Recommended Wire Gauge: It is recommended that the voltage drop in the load wires does not exceed 0.2 V total in order to keep the voltage at the load above 1 V. See the following table for recommended wire gauge and length to achieve a voltage drop of no more than 0.2 V at a 20-A load.

AWG Gauge	Ohms per Foot (Ω)	Load Wires Combined Length (Ft)	Each Wire Length (Ft)
12	1.59E-3	6.30	3.15
14	2.53E-3	3.96	1.98
16	4.02E-3	2.49	1.25
18	6.39E-3	1.57	0.78



Test Setup

As an example, if AWG 12 wire is used, no more than 3.15 feet of wire must be used between the EVM and the load.

4.3 Recommended Test Setup



Figure 2. PWR091EVM Recommended Test Setup

4.4 USB Interface Adapter and Cable



Figure 3. Texas Instruments USB-to-GPIO Adapter and Connections



Figure 4. Tip and Barrel Measurement

4.5 List of Test Points

	•		
Test Point	Туре	Name	Description
TP1	T-H Loop	PGOOD2	Power Good signal for Vout 2.
TP2	T-H Loop	VIN	General input voltage measurement.
TP3	T-H Loop	VOUT1	Tip and barrel point for Vout 1.
TP6	T-H Loop	PGND	Tip and barrel point for Vout 1 return.
TP7	T-H Loop	PGND	General input voltage measurement.
TP11	T-H Loop	VOUT2	Tip and barrel point for Vout 2.
TP13	T-H Loop	AGND	Return for PGOOD signals.
TP14	T-H Loop	PGND	Tip and barrel point for Vout 2 return.
TP15	T-H Loop	PGOOD1	Power Good signal for Vout 1.
TP16	T-H Loop	BPEXT	Point to inject BP External.
TP18	T-H Loop	PREBIAS2	Point to inject Prebias for output 2.
TP19	T-H Loop	PREBIAS1	Point to inject Prebias for output 1.
TP20	T-H Loop	PGND	Return for Prebias 2.
TP21	T-H Loop	PGND	Return for Prebias 1.
TP22	T-H Loop	PGND	Return for BP External.
TP4	SMT	AGND	Return for SYNC signal.
TP8	SMT	INPUT1	Input for control loop measurements for Vout 1.
TP9	SMT	OUTPUT1	Output of Vout 1 for control loop measurements.
TP10	SMT	VOUT2	Output of Vout 2 for control loop measurements.
TP12	SMT	INPUT2	Input for control loop measurements for Vout 2.
TP17	SMT	SYNC	Point to inject SYNC signal.
TP5	Copper Dot	VIN	Vin+ measurement point for efficiency of Vout 1.
TP23	Copper Dot	PGND	Vin- measurement point for efficiency of Vout 1.
TP24	Copper Dot	VIN	Vin+ measurement point for efficiency of Vout 2.
TP25	Copper Dot	PGND	Vin- measurement point for efficiency of Vout 2.
TP26	Copper Dot	VOUT2	Vout+ measurement point for efficiency of Vout 2.
TP27	Copper Dot	VOUT1	Vout+ measurement point for efficiency of Vout 1.



5 EVM Configuration Using the Fusion GUI

The TPS40422 on this EVM leaves the factory pre-configured. See Table 3 for a short list of key factory configuration parameters as obtained from the configuration file.

Address Hex	Address Dec	Part ID			
0x1B	27	TPS40422			
		General			
Cmd ID With Phase	Cmd Code Hex	Encoded Hex	Decoded	Numeric	Comments
VIN_OFF	0x36	0xF014	5.00 V	5	Turn OFF voltage
VIN_ON	0x35	0xF01C	7.00 V	7	Turn ON voltage
		Vout 1			Comments
IOUT_CAL_GAIN	0x38	0x8821	1.0071 mΩ	1.0071	DCR of output inductor
IOUT_CAL_OFFSET	0x39	0xE000	0.0000 A	0	Current offset for GUI readout
IOUT_OC_FAULT_LIMIT	0x46	0xF83C	30.0 A	30	OC fault level
IOUT_OC_FAULT_RESPONSE	0x47	0x3C	Restart Continuously		Response to OC fault
IOUT_OC_WARN_LIMIT	0x4A	0xF832	25.0 A	25	OC warning level
MFR_04 (VREF_TRIM)	0xD4	0x0000	0.000 V	0	Trim voltage
ON_OFF_CONFIG	0x02	0x02	Mode: Always Converting		Control signal and OPERATION command not required
OPERATION	0x01	0x00	Unit: Immediate Off; Margin: None		Response to turn OFF trigger
OT_FAULT_LIMIT	0x4F	0x007D	125 C	125	OT fault level
OT_WARN_LIMIT	0x51	0x0064	100 C	100	OT warn level
TON_RISE	0x61	0xE02B	2.6875 ms	2.6875	Soft-start time
		Vout 2			Comments
IOUT_CAL_GAIN	0x38	0x8821	1.0071 mΩ	1.0071	DCR of output inductor
IOUT_CAL_OFFSET	0x39	0xE000	0.0000 A	0	Current offset for GUI readout
IOUT_OC_FAULT_LIMIT	0x46	0xF832	25.0 A	25	OC fault level
IOUT_OC_FAULT_RESPONSE	0x47	0x3C	Restart Continuously		Response to OC fault
IOUT_OC_WARN_LIMIT	0x4A	0xF828	20.0 A	20	OC warning level
MFR_04 (VREF_TRIM)	0xD4	0x0000	0.000 V	0	Trim voltage
ON_OFF_CONFIG	0x02	0x02	Mode: Always Converting		Control signal and OPERATION command not required
OPERATION	0x01	0x00	Unit: Immediate Off; Margin: None		Response to turn OFF trigger
OT_FAULT_LIMIT	0x4F	0x007D	125 C	125	OT fault level
OT_WARN_LIMIT	0x51	0x0064	100 C	100	OT warn level
TON_RISE	0x61	0xE02B	2.6875 ms	2.6875	Soft-start time

Table 3. Key Factory Co	figuration Parameters
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If it is desired to configure the EVM to settings other than the factory settings shown in Table 3, the TI Fusion Digital Power Designer software can be used for reconfiguration. It is necessary to have input voltage applied to the EVM prior to launching the software so that the TPS40422 may respond to the GUI and the GUI can recognize the TPS40422. The default configuration for the EVM is to start converting at an input voltage of 7 V; therefore, to avoid any converter activity during configuration, an input voltage less than 7 V must be applied. An input voltage of 5 V is recommended.

5.1 Configuration Procedure

- 1. Adjust the input supply to provide 5 Vdc, current limited to 1 A.
- 2. Apply the input voltage to the EVM. See Figure 2 and Figure 3 for connections and test setup.
- 3. Launch the Fusion GUI software. See the screen shots in Section 10 for more information.
- 4. Configure the EVM operating parameters as desired.



NOTE: The *IOUT_CAL_GAIN* parameter is used by the TPS40422 in the calculation of output current level, and this number is the dc resistance of the output inductor. Although this number can be reconfigured, a number entry that does not match the actual DCR of the inductor on the EVM will result in current reporting inaccuracy. This also affects OC Fault and OC Warn performance.

The *TON_RISE* parameter may affect proper start-up if the rise time and output capacitance bank result in a current that exceeds the OC Fault level. The start-up surge current in the output capacitance bank is added to the load current, so the sum of these two currents must be less than the OC Fault level for proper start-up.

6 Test Procedure

6.1 Line/Load Regulation and Efficiency Measurement Procedure

- 1. Set up the EVM as described in Section 4.3 and Figure 2.
- 2. Ensure that both electronic loads are set to draw 0 Adc.
- 3. Increase Vin from 0 V to 12 V using DMM1 to measure input voltage.
- 4. Use DMM2 to measure output voltage Vout1.
- 5. Vary the load from 0 Adc to 20 Adc. Vout1 must remain in regulation as defined in Table 1.
- 6. Vary Vin from 8 V to 14 V. Vout1 must remain in regulation as defined in Table 1.
- 7. Decrease the load to 0 A.
- 8. Use DMM3 to measure output voltage Vout2.
- 9. Vary the load from 0 Adc to 15 Adc. Vout1 must remain in regulation as defined in Table 1.
- 10. Vary Vin from 8 V to 14 V. Vout2 must remain in regulation as defined in Table 1.
- 11. Decrease the load to 0 A.
- 12. Decrease Vin to 0 V.

6.2 Control Loop Gain and Phase Measurement Procedure

The PWR091EVM includes a 49.9- Ω series resistor in the feedback loop for both Vout1 and Vout2. These resistors are used for loop response analysis and are accessible at the test points TP8 and TP9 for Vout1, and TP10 and TP12 for Vout2. Those test points must be used during loop response measurements as the injection points for the loop perturbation. See the short descriptions listed in Table 4.

Test Daint	Nede News	Description	Comment
Test Point	Node Name	Description	Comment
TP8	INPUT1	Input to feedback divider of Vout1	The amplitude of the perturbation at this node must be limited to less than 100 mV.
TP9	OUTPUT1	Resulting output of Vout1	Bode plot data can be measured by a network analyzer as TP9/TP8.
TP12	INPUT2	Input to feedback divider of Vout2	The amplitude of the perturbation at this node must be limited to less than 100mV.
TP10	VOUT2	Resulting output of Vout2	Bode plot data can be measured by a network analyzer as TP10/TP12.

Table 4. List of Test Points for Loop Response Measurements

Measure only one output at a time with the following procedure:

- 1. Set up the EVM as described in Section 4.3 and Figure 2.
- 2. For Vout1, connect the network analyzer's isolation transformer from TP8 to TP9.
- 3. Connect the input signal measurement probe to TP8. Connect output signal measurement probe to TP9.
- 4. Connect the ground leads of both probe channels to TP4.
- 5. On the network analyzer, measure the Bode plot data as TP9/TP8 (Out/In). The frequency sweep must

be limited to less than the switching frequency divided by 2 (Fsw/2).

- 6. For Vout2, connect the network analyzer's isolation transformer from TP12 to TP10.
- 7. Connect the input signal measurement probe to TP12. Connect output signal measurement probe to TP10.
- 8. Connect the ground leads of both probe channels to TP4.
- 9. On the network analyzer, measure the Bode plot data as TP10/TP12 (Out/In). The frequency sweep must be limited to less than the switching frequency divided by 2 (Fsw/2).
- Disconnect the isolation transformer from the Bode plot test points before making other measurements, because the signal injection into the feedback loop may interfere with the accuracy of other measurements.

6.3 Efficiency

To measure the efficiency of the power train on the EVM, it is important to measure the voltages at the correct location. This is necessary because otherwise the measurements will include losses in efficiency that are not related to the power train itself. Losses incurred by the voltage drop in the copper traces and in the input and output connectors are not related to the efficiency of the power train, and they must not be included in efficiency measurements.

When measuring the efficiency of Vout1, Vout2 must be disabled by the user via the Fusion GUI. Likewise, when measuring the efficiency of Vout2, Vout1 must be disabled by the user. See the list in Table 5 for the proper locations to measure efficiency.

Test Point	Node Name	Description	Comment
TP5	VIN	Measurement point for VIN +VE	Copper dot at high-side FET drain
TP23	PGND	PGND Measurement point for VIN –VE Copper dot at low-side FET sourc	
TP27	VOUT1 Measurement point for VOUT1 +VE Copper dot at output inductor, dc side		Copper dot at output inductor, dc side
TP23	PGND	Measurement point for VOUT1 –VE	Copper dot at low-side FET source
TP24	VIN	VIN Measurement point for VIN +VE Copper dot at high-side FET drain	
TP25	PGND	Measurement point for VIN –VE	Copper dot at low-side FET source
TP26	VOUT2	Measurement point for VOUT2 +VE	Copper dot at output inductor, dc side
TP25	PGND	Measurement point for VOUT2 -VE	Copper dot at low-side FET source

Table 5. List of Test Points for Efficiency Measurements

Input current can be measured at any point in the input wires, and output current can be measured anywhere in the output wires of the output being measured. Using these measurement points result in efficiency measurements that do not include losses due to the connectors and PCB traces.

6.4 Equipment Shutdown

- 1. Reduce the load current on both outputs to 0 A.
- 2. Reduce input voltage to 0 V.
- 3. Shut down the external fan if in use.
- 4. Shut down equipment.

7 Performance Data and Typical Characteristic Curves

Figure 5 through Figure 25 present typical performance curves for the PWR091EVM.



7.1 Efficiency







Figure 6. Efficiency of 3.3-V Output vs Line and Load



7.2 Load Regulation







7.3



Figure 10. Bode Plot of 3.3-V Output at 10-A Load



7.4 Transient Response





Figure 11. Transient Response of 1.2-V Output at 8 Vin, Transient is 5 A to 11 A to 5 A



Ch1 = Vout1 at 50mV/division, Ch2 = lout1 at 5A/division









Figure 13. Transient Response of 3.3-V Output at 8 Vin, Transient is 5 A to 9 A to 5 A









7.5 Output Ripple



Ch1 = Vout1 at 20mV/division, Ch2 = SW Node at 10V/division

Figure 15. Output Ripple and SW Node of 1.2-V Output at 8 Vin, 20-A Output









Ch1 = Vout2 at 20mV/division, Ch2 = SW Node at 10V/division

Figure 17. Output Ripple and SW Node of 3.3-V Output at 8 Vin, 15-A Output









Performance Data and Typical Characteristic Curves

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7.6 HDRV and Switch Node Voltage









Ch1 = SW Node at 5 V/division, Ch2 = HDRV at 10 V/division

Figure 20. HDRV and SW Node of 1.2-V Output at 12 Vin, 20-A Output



Ch1 = SW Node at 5 V/division, Ch2 = HDRV at 5 V/division

Figure 21. HDRV and SW Node of 3.3-V Output at 8-Vin, 15-A Output





Ch1 = SW Node at 5 V/division, Ch2 = HDRV at 10 V/division







Ch1 = Vout1 at 200 mV/division, Ch2 = lout1 at 5 A/division, Ch3 = Vin at 5 V/division Ch2 (lout) Inverted to better display V and I.





Figure 24. Turnon Waveform of 1.2-V Output With 0.5-V Prebias, at 8-V, 12-V and 14-V Input, 0-A Output





Ch1 = Vout2 at 500 mV/division, Ch2 = lout2 at 5 A/division, Ch3 = Vin at 5 V/division Ch2 (lout) Inverted to better display V and I.





Ch1 = Vout1 at 500 mV/division, Ch3 = Vin at 5 V/division

Figure 26. Turnon Waveform of 3.3-V Output With 2-V Prebias, at 8-V, 12-V, and 14-V Input, 0-A Output

8 **EVM Assembly Drawing and PCB Layout**

Figure 27 through Figure 32 show the design of the PWR091EVM printed-circuit board (PCB).





Figure 27. PWR091EVM Top Layer Assembly Drawing (Top View)





Figure 28. PWR091EVM Bottom Assembly Drawing (Bottom View)







Figure 29. PWR091EVM Top Copper (Top View)





Figure 30. PWR091EVM Internal Layer 1 (Top View)





Figure 31. PWR091EVM Internal Layer 2 (Top View)





Figure 32. PWR091EVM Bottom Copper (Bottom View)



9 Bill of Materials

The EVM components list according to the schematic shown in .

Table 6. PWR091 Bill of Materials

Qty	Reference Designator	Description	Manufacturer	Part Number
2	C23 C27	0.47uF, Ceramic, 16V, X5R, 10%, 0402	STD	STD
3	C1 C5 C9	0.1uF, Ceramic, 50V, X7R, 10%, 0603	STD	STD
3	C10-12	1.0uF, Ceramic, 25V, X7R, 10%, 0603	STD	STD
2	C21 C25	1.2nF, Ceramic, 50V, X7R, 10%, 0603	STD	STD
2	C24 C33	470pF, Ceramic, 50V, X7R, 10%, 0603	STD	STD
2	C26 C22	120pF, Ceramic, 50V, NP0, 5%, 0603	STD	STD
6	C31-32 C30 C34-35 C37	1000pF, Ceramic, 50V, X7R, 10%, 0603	STD	STD
4	C19-20 C42-43	22uF, Ceramic, 6.3V, X5R, 20%, 0805	STD	STD
2	C38-39	0.1uF, Ceramic, 6.3V, X5R, 20%, 0805	STD	STD
9	C2-4 C6-8 C36 C40-41	22uF, Ceramic, 25V, X5R, 20%, 1210	STD	STD
6	C18 C15 C44-47	100uF, Ceramic, 6.3V, X5R, 20%, 1210	STD	STD
2	C28-29	330uF, Electrolytic, Aluminum, 25V, 200mohm, 270mArms, 0.406 x 0.406	Panasonic	EEE-TK1E331UP
4	C13-14 C16-17	330uF, Polymer Cap, 330uF, 6.3V, 0.015 Ohms, 20%, 7343(D)	Kemet	T520D337M006ATE015
4	J4 J6-8	33457, Lug, Solderless, #10 - #10-12 AWG, Copper/Tin, Uninsulated, 0.375 x1.00"	Std	CX35-36-CY
2	D1-2	MBRS340, Diode, Schottky, 3A, 40V, SMC	Fairchild	MBRS340
2	J1-2	PEC02SAAN, Header, Male 2-pin, 100mil spacing,, 0.100" x 2	Sullins	PEC02SAAN
1	J3	AWHW10G, Header, Male 2x5-pin, 100mil spacing, 0.100" x 5 X 2	Assmann	AWHW10G-0202-T-R
2	L1-2	820nH, Inductor, SMT, 27A, Shielded, 20%, 0.9mOhm, 0.512" x 0.571"	Wurth	744355182
2	R1 R4	5.1, Resistor, Chip, 1/10W, 1%, 0603	STD	STD
1	R3	0, Resistor, Chip, 1/10W, 1%, 0603	STD	STD
1	R2	0, Resistor, Chip, 1/10W, 5%, 0603	STD	STD
2	R5-6	2.0k, Resistor, Chip, 1/10W, 1%, 0603	STD	STD
0	R7 R16 R21-23 R34	Open, Resistor, Chip, 1/10W, 1%, 0603	STD	STD
3	R12 R13 R38	47.5k, Resistor, Chip, 1/10W, 1%, 0603	STD	STD
2	R8-9	36.5k, Resistor, Chip, 1/10W, 1%, 0603	STD	STD
11	R17 R18 R20 R24-26 R28-30 R33 R36	10, Resistor, Chip, 1/10W, 1%, 0603	STD	STD
1	R10	40.2k, Resistor, Chip, 1/10W, 1%, 0603	STD	STD
3	R11 R27 R31	49.9, Resistor, Chip, 1/10W, 1%, 0603	STD	STD
2	R15 R32	20k, Resistor, Chip, 1/10W, 1%, 0603	STD	STD
1	R35	10.5k, Resistor, Chip, 1/10W, 1%, 0603	STD	STD
3	R19 R37 R40	10.0k, Resistor, Chip, 1/10W, 1%, 0603	STD	STD
2	R14 R39	4.75k, Resistor, Chip, 1/10W, 1%, 0603	STD	STD
1	J5	ED120/2DS, Terminal Block, 2-pin, 15-A, 5.1mm, 0.40" x 0.35"	OST	ED120/2DS
1	U1	TPS40422RHA, IC, PMBUS synchronous buck controller, QFN-40	ТІ	TPS40422RHA
2	Q1-2	CSD87350Q5D, MOSFET, Dual N-Chan, 30-V, 30-A, QFN-8 POWER	ТІ	CSD87350Q5D
2	Q3-4	MMBT3904, Bipolar, NPN, 40V, 200mA, 200mW, SC-75	On Semi	MMBT3904TT1G
1	РСВ	PCB, FR-4, 0.062, 2oz Copper all layers., 4.00" x 4.00"	STD	STD

10 Screen Shots

10.1 Fusion GUI Screen Shots

Texas Instruments	
Fusion Digital Power Designer Version 1.8.138 [2011-11-15]	
Restoring user preferences and data	
Figure 33. First Window at Fusion Launch	

kas Instruments
ital Power Designer 911-11-15]
Device Found

Figure 34. Scan Finds Device Successfully

TEXAS INSTRUMENTS	
Fusion Digital Power Designer Version 1.8.138 [2011-11-15]	
1 device found; continuing with GUI startup	

Figure 35. Software Launch Continued

34 Using the PWR091EVM Dual-Output DC/DC Analog With PMBus Interface





Use this screen to configure (Figure 37):

- OC Fault and OC Warn
- OT Fault and OT Warn
- Power Good Limits
- Fault response
- UVLO
- On/Off Config
- Soft Start time
- Margin voltage

File Device Tools	Help .	1P540422 @ Address 27 - Rai #1
Configure	Limits & On/Off Other All Config	
with the Hardware	Current Limits Temperature Limits	
Auto write on rail or	Roll #1 Roll #2 Roll #1 Roll #2	
device change	Iout OC Warn Limit: 25.0 ⊕ A 20.0 ⊕ A Temp Warn Limit: 200 ⊕ % 100 ⊕ %	
	Isut OC Pault Linit: 20.0 ⊕ A 25.0 ⊕ A Temp Fault Linit: 125 ⊕ 1C 125 ⊕ 1C	
Store User Defaults	Webare & Bousse Could Unite	
Restore User Defailts	Raif at UV Fault DRLow PG High DV Fault Ball #2: UV Fault PG Low PG High DV Fault	
	0 16.5 % 12.5 % 12.5 % 16.5 % 0 16.5 % 12.5 % 15.5 %	
	O -12.0 % -7.0 % +7.0 % +12.0 % O -12.0 % +7.0 % +7.0 % +12.0 %	
	Q -28.0 % -22.0 % +7.0 % +13.0 % Q -28.0 % +2.0 % +7.0 % +12.0 %	
	O ~42.0 % −36.0 % +7.0 % +12.0 % O ~42.0 % −36.0 % +7.0 % +12.0 %	
		-
	Over-Current / Under-Vollage Fault Response	
	Rei #3: 0 ho Not Restart Rei #2: 0 ho Not Restart The sufficient for sector 1 and the sector	
	remains disabled until the fault is deared. disabled until the fault is deared.	
	Restart Continuously Restart Continuously	
	The device goes through a normal startup (Soft start) The device goes through a normal startup (Soft start)	
	continuousy, introuci initiation, unci il a cominandeo continuousy, introut initiation, unci il a cominandeo oti or officio bas poure il arenoveri fuelto table fault bias poure ai removed or another fault containcauses the	
	condition causes the unit to shutdown. Unit to shutdown.	
	Turn On/Off Margining	
	Vin On: 2.00 🗄 V Vin Off: 5.00 🗄 V	
	Raif #1 Raif #2 Vref Margo High: 0.000 문 V 0.000 문 V	
	0x00ffCanfla: 0x02[v] 0x02[v] Vref Margin Low: 0.000 🔁 V 0.000 🔁 V	
	Mode: Always Converting Node: Always Converting	
	Turn On Rase: 2.6875 🔄 ms 2.6875 🐨 ms	2
	Tok & Hhrts PHSus Loc	[
	HFR_07 (PCT_VOUT_FAULT_PG_LIHIT) [0x07.Rail #2]	
Configure	Used to set the PGODD, VOUT_UNDER_VOLTAGE (VV) and VOUT_OVER_VOLTAGE (OV) Limits in as a percentage of nominal.	
U Monitor		
) Status	Philos Log	ចេទ

Figure 37. First Screen After Successful Launch: Configure- Limits & On/Off

Use this screen to configure (Figure 38) :

Vref Trim



Screen Shots

• Iout Cal Gain (DCR of output choke)

	#12		19540422 @ Althess 27 - Rai #1
ntigure	Limits & Ov.Off Other At Carify		
Protection P	Druke Constanta	Write Protect	
	Decise Color: Identifier: INOT (1996-922) Revenue: ILL1 PBus Services: ILL1-Print ILL Print Costoffic: Practice Torrow Creating (PRC) Supported Inte SHIMLER's Supported Inte SHIMLER's Supported Inte SHIMLER's Supported Inte SHIMLER's Supported Inte SHIMLER's Depresentation. Vex/Print DIF	Consider all connext excepts to the solution of the solut	
	Calibrative	ADC & Dead Time	
	Rod #1 Rod #2 Verifities 0.000 (EV 0.000 (EV) SacCAL Serve 0.007 (EV) = 0.000 (EV) 0.007 (EV) = 0.000 (EV) SacCAL Serve 0.007 (EV) = 0.000 (EV) 0.000 (EV) = 0.000 (EV)	Bruik AC, DT, Chi, DTC C	
	HUR_SPECIFIC_00		
	Tax Aren	[Missing	(1)
Configure	HER_22 (OPTIONS) [0x85] Lised for setting user selectable options.	(T)	8
Monitor			

Figure 38. Configure- Other

Use this screen to configure all of the configurable parameters (Figure 39). The screen also shows other details like hexadecimal (hex) encoding.

The Device Type He	0	_							79540422 @ Althress 27 - Rail #1	
Configure	Linits & On Off Other All Carlie									
distant and and	Command	Code	Volue/Edit	Hesc/Edit	Conveniend	Code	Value/Edit	Hex/Edit		
auto vinte an rali ar	* Califration			-	manufacturer lafe				1	
Devia tra de	TOUT_CAL_GAIN	0.36	1.0071	OKBMIT1	CAPABILITY	0/19	0.00	0.00		
	IOUT_CAL_OFFNET	0.09	0.0000 (EA	0x8000	PHILIS_REVISION	0:98	1111-Part	0x11		
Store User Defaults	MER_84 (VRIF_TRD4)	0.04	9.000 EE ¥	0x0000	▼ On/Off Configuration		2011 C 2011		1	
Restore User Defailts	V Geethjutation				MER_DS (STEP_VREF_MARGEN_HIGH)	0.05	0.000 🗄 V	0x0000		
The Association	MRR_13	0:00	12114	0x053F	MER_D6 (STEP_WREF_MARGEN_LOW)	0.04	v 🗄 000.0	0x0000		
-	MER_14	0-DE	1222d	040400	MF8_D8 (SEQUENCE_TON_TOFF_DELAY)	0.06	6×00 🐨	0x00		
C) Stobel Device	HER_17	0.01	12406	0.0-08	ON_OFF_CONTIG	0.02	0x02	0x03		
Paraheters	HER_21 (OPTIONS)	0.05	91,400. 3	0x0004	OPERATION	0:01	D=00 -	0x00.		
C) Parameters for this Rail	MFR_44 (DEVICE CODE)	0.00	0x0073 **	0x0075	TON_RESE	0.61	2.6675 (El ma	0×6038		
AlParaneters	VOUT_MODE	0:20	0.0-9	0417	► Status			Colorine (1	
Sort Parameters By:	WRITE_PROTECT	0:10	0-00	0x00	 UserTatameters 				1	
(Connant) have	₩ Lands			-	MER_00	0:00	De00000	0x0000	1	
Comment Caste	TOUT_OC_FAULT_LIMIT	0.46	30.0 (BA	DH ⁴ 83C						
Conce by Category	TOUT_OK_FAULT_INISPONSE	0.47	Restart	Dx3C						
	IOUT_DC_WARN_LIMBT	DefA.	25.0 (EA.	0+1532						
	MER_UP (PCT_VOUT_FAULT_PG_LIMIT)	0.07	PQ. (025 (-)	0x00						
	OT_FAULT_LIMIT	0.45	123 25 ~	0.0040						
	OT_WARN_LIMET	0.01	100 🗄 🛩	0x0064						
	VIN_OFF	0.06	3-00 (EE) V	0,0014						
	VIN_ON	0.05	7.00 (ETV	Differic						
	hexanion				1					
	Tax know				Detain					1
	1978_44 (DEVECK CODE) [0xFC]	020								1
D Configure	Device type and revealer. Bits 15+9 + 12 bit units code.	#30 for #3	pert. Bits 3-0 is a +0-0	(W)007						
4 Monitor				4						
and the second sec				6	Profestop					Eh f

Figure 39. Configure- All

Changing the On/Off Config prompts a pop-up window with details of the options Figure 40).



File Device Tools H	Hela						TPS40422 @ Address 27 - Rail #1	
onfigure	Limits & On/Off Other All Confi	0]						
	Current Limits	Tempera	ture Limi	ts			E	
Auto write on rai or device change Decort Overge Store User Defaults Restore User Defaults	Rail Rail Jout OC Wern Limit: 25.6 Lout OC Pault Limit: 30.0 Voltage 8. Power Good Limits Rail #1: Write #1: UV Pault PG Lo	On / Off Costrol One / Off Costrol Off Costrol One / Off Costrol Off Costrol Off Costrol Off Costrol One / Off Costrol Off Costrol Off Costrol One / Off Costrol Off Costrol Off Costrol Off Costrol One / Off Costrol Off Costrol Off Costrol One / Off Costrol Off Costrol One / Off Costrol Off Costrol Off Costrol Off Costrol Off Costrol One / Off Costrol Off Costrol Off Costrol Off Costrol Off Costrol Off Costrol One / Off Costrol Off Costrol One / Off Costrol Ostrol O	mit: mit: // Fault	Rail #1 100 10 10 125 10 10 PG Low PG High	Rail #2 100 (
Gener Kentinen Hallens /	© 1-8-8 % -12-5 0 1-2-0 % -7-8 % 0 2-2-0 % -7-8 % 0 -42-0 % -45-0 0 -45-0	s converted when the CONTROL pin is active. OPERATION CONTROL pin is active. OPERATION Command is an experiment converted when the orieff portion of the OPERATION command is on. The CONTROL pin Active and the orieff portion of the CORTATION The CONTROL pin Active active and the orieff portion of the CORTATION Control Pin Plantary Control Pin Plantary Control Pin Plantary Control Pin Turn Off Configuration	05.5 % 32.0 % 42.0 % 42.0 % 0 D 0 D 0 R 0 R	-12.5 % +12.5 % -12.5 % -12.5 % -12.5 % -12.5 % -12.6 % -12.0	+16.8 % +12.0 % +12.0 % +12.0 % +12.0 % to restart. The red. small startup (3 sm, unbilit is con- other fault cond	output retrains on the sam to from causes the		
	Turn On/Off Vin On: 7.00 🔂 V W	 Date that soft delay configured for SCHP_CHLAY and full been configured for TCHP_CHLA. Control filler contact and story maniference. 		Margining	Rail #1	Rail #2		
	Chuyôff Config: Rail #1 Onuôff Config: Ould 2 Mode: Always (Turm On Rise: 2.6875 (2) m	0x02 ⊆ Converting Mode: Always Sa 2.6375 ∰ ms		vref Margin Lowi	0.000 🔄 V 0.000 🗄 V	0.000 (E) V		
	Tine & Hinte		- 1	DVB.ston		2.0		17
> Configure > Monitor	OR_OFF_CONFIG[0x02,Rail #1] Configures the combination of CORTR unit on and off. This includes how the	OL on hout and setul bus commands needed to turn unit responds when power is applied.	te 🗐	C L'ANNE AUG				6
Status			6	PMBus ion				E S

Figure 40. Configure- Limits and On/Off- On/Off Config Pop-up

After a change is selected, orange **U** icon is displayed to offer *Undo Change* option. Change is not retained until either *Write to Hardware* or *Store User Defaults* is selected. When *Write to Hardware* is selected, change is committed to volatile memory and defaults back to previous setting on input power cycle. When *Store User Defaults* is selected, change is committed to nonvolatile memory and becomes the new default (Figure 41).

Configure Immediate Immediate Immediate Wind structure Immediate Immediate Immediate Immediate Bootlame Order Immediate Immediate Immediate Immediate Immediate Bootlame Order Immediate	File Device Tools +	19		19540402 @-Address 27 - Rail #1
Writest-Headwide Construction And and the state of th	onfigure	Lints & DhDM Dther (A2 Config.)		ACC-3404-05-05-010-00
¹ Answert Burger ¹ Burger	WitetsHattware	Current Lands	afure Lends	6
Configure Monitor Monitor Monitor Monitor Status Configure Monitor Status Monitor	Miles of bardgeone Barter Olevand Bester Olevand Bester Olevand Miles of Control unit Bester Olevand Miles of Control unit Bester Olevand Office Control Office Control <tr< th=""><th>Learning Learning Control Control Description Start OC Were Learning Base Control Control Allean Converting Starting Start OC Were Learning Base Allean Converting Starting Starting Werkage & Proven Good Learning Base Organization Starting Starting Start of the Unit Root of the Internet Start Starting Starting Starting Starting Out of the Unit Root of the Internet Start Starting Starting Starting Starting Out of the Unit Root of the Internet Start Starting Starting Starting Starting Out of the Unit Root of the Internet Start Starting Starting Starting Starting Out of the Unit Root of the Un</th><th>Mark Ends Red #2 Red #2 min 100 100 ℃ 100 100 ℃ 100 100 ℃ min 100 100 ℃ 100 100 ℃ 100 100 ℃ Ministration 100 100 ℃ 100 100 ℃ 100 100 ℃ Ministration 100 100 ℃ 100 100 ℃ 100 100 ℃ Ministration 100 % +0.0 % +0.0 % Ministration 100 % +0.0 % +0.0 % Ministration +0.0 % +0.0 % +0.0 %</th><th>- - -</th></tr<>	Learning Learning Control Control Description Start OC Were Learning Base Control Control Allean Converting Starting Start OC Were Learning Base Allean Converting Starting Starting Werkage & Proven Good Learning Base Organization Starting Starting Start of the Unit Root of the Internet Start Starting Starting Starting Starting Out of the Unit Root of the Internet Start Starting Starting Starting Starting Out of the Unit Root of the Internet Start Starting Starting Starting Starting Out of the Unit Root of the Internet Start Starting Starting Starting Starting Out of the Unit Root of the Un	Mark Ends Red #2 Red #2 min 100 100 ℃ 100 100 ℃ 100 100 ℃ min 100 100 ℃ 100 100 ℃ 100 100 ℃ Ministration 100 100 ℃ 100 100 ℃ 100 100 ℃ Ministration 100 100 ℃ 100 100 ℃ 100 100 ℃ Ministration 100 % +0.0 % +0.0 % Ministration 100 % +0.0 % +0.0 % Ministration +0.0 % +0.0 % +0.0 %	- - -
Configure Monitor Product Set Set Set Set Set Set Set Set Set Se		• Tassart Cor • Tassart C	(C) Restart Contrustually The device gene through a normal starture (Soft start) The device gene through a soft and the so	
Configure Configure		On (D) ***********************************		
Configure Index or (FC, VOIT_AVAX_P, K_AITU2 (DAD/Aud #1) Index or #4000, VOIT_AUD Index or #4000, VOIT_AUD Index or #4000, VOIT_AUD		Tips 8-H0100	2×6.4 (22	
	Coofigure	Print_or (nct_voidARAE_LPG_LBHIT) [0x07:Aad #1] Linet to set the PEODO, Void_LPGEB_VOITAGE (V/) and VOIT_DHEL_VOLTAGE (V/) as a percentage of nonnel.	1991 (m)	
		1	Ph Instant	D. (

Figure 41. Configure- Limits and On/Off- On/Off Config Pop-up



Screen Shots

The lout Cal Gain can be typed in or scrolled to a new value. The range for lout Cal Gain is 0.244 m Ω to 15.5 m Ω and the resolution step is 30.5 $\mu\Omega$. If a value is typed in that is between the available discrete steps, the typed-in value does not change but the nearest discrete step is retained. The actual step is displayed on relaunch of the Fusion GUI (Figure 42).

rie Denne Topa r	¥9		1725-40422 @ A001855 27 - Rail #3
onfigure	Units & DruOff Driver All Config		
and a factor back	Device Constants	Write Protect	
Auto sente pri rel or deciso d'arge Deciso d'arge Sone User Cellado Restare User Cellado Deciso d'arge	sante privalar se chiege se chiege se chiege se chiege se chiege statem Outlade statem	Control of universe execution to the MADES, MARCINE CONTROL OF MADES, MARCINE CONTROL OF MADES, MARCINE CONTROL OF MADES, MARCINES, CONTROL OF MADES, PARTICIPACIES, CONTROL OF MADES, PART	
	Collector	ADC & Dead Tane	
	See Three S.000 (EV) / 0.000 (the state of	
	HIR_SPECIFIC_00		
	Later Sorandi Pedi (MODO)		
	Tes Arristo Multi Cali, California and anti	246ALBF	
O Coofigure	Ratio of the voltage at the Current serve pris to the served Current.	(m)	
4 Monitor			
		1	

Figure 42. Configure- Other- lout Cal Gain Change

On/Off Config can also be configured from the All Config screen, and the same process applies (Figure 43).

the sector rates rates									19540422 @ Address 17 - Rail #
Configure	Units & On/Off Other All Config								
antelerations.]	Command	Code	Volue/Edit	Hex/Edit	Command	Code	Value/Edit	Hex/Edit	
auto entre entrel er	V Calibration			-	Handacturer Infe				
on a rega	IDUT_CAL_GAIN	0.36	1.0071 📰 🖬	0+8823	CAPABILITY	0.09	0.00	0.00	
	IDUT_CAL_OFFSIT	0.09	8.0000 EA	0+6000	PHILIS_REVISION	0.98	LLLI-Pert	0:15	
Rote User Definits	HFR_04 (VRIF_183H)	0.04	0.000 EB y	0w0000	♥ On/Off Configuration				
Testore User Defails	Carfiguration				MER_05 (STEP_VREF_MARGEN_HIGH)	0.05	0.000 TH V	Gx0000	1
Citer Research Review	MR_13	0.00	13204	0x0528	MER_06 (STEP_WREF_MARGIN_LOW)	0.04	6.000 🕀 ¥	0x0008	3
-	MRR_14	0.0E	12408	0.0-00	MPR_00 (SEQUENCE_TON_TOFF_DELAY)	906	6x00 📖	0×00-	1
O GaberDevice	M98_17	D/E1	05. 555	Dv0000	DN_ONF_CON15	0.02	0x02	0+02	1
Faraneters	HER_21 (OPTIONS)	0.45	BLACC.	0x0004	OPERATION	0.01	1 00x6	On / Off Ca	ntrol
C Parameters for the Rail	MPR_++ (DEVICE CODE)	0.#C	0+0072 (~)	0x0073	TON_RESE	0.61	2.6875	Unit powers	Lot any bre pover is prevent.
ALParameters	VOUT_HODE	0,29	812-9	0+17	► Statae			OPERATIO	of visite of the CONTROL pin or . Il commend.
otParaneters Ru:	WHETE_PROTECT	8:18	0.00 -	0x00	V Uner Parameters			C conmou	In Only
() Connections	w Landa				MFR_00	0.00	0x0000 H	OPERATIO	groves the or/off portion of the Is command than serial bue. Power
Camnand Code	TOUT_OC_FAUCT_LIMIT	Dc46	30.0 EE A	0v/93C				C Official	Content the CONTROL on A Adve
Group by Category	IDUT_OC_FAULT_RESPONSE	0:47	Restart	0.30				The device	groves the CONTROL privile
	IDUT_OC_WARN_LIMIT	Dir4A	25.0 (E) A	0+932				OPERATIO	V constant/ in orc.
	HIR OF (PCT_VOUT_FAURT_PG_LEMIT)	D:07	PS.: 60h (y)	0+00				O sue color	ILOS PHY & OPERATION
	OF FAULT LIMET	Deff.	125 121 ~	0.00070				sn/bff part	ten of the OFERATION command
	OT_WARN_LIMIT	Dd1	100 🖽 <	0x0064				Control Day	Polarity
	VD-007	0:36	5.00 EV	0(4014				Constanting of	Pullips for the start fire setting
	VIN_ON	0.05	2.00 1014	Computer -					
				1.1				Control No.	Tores Cill Conference
17	for largers				Industor			(1)	
	00_0FF_CONFIG [0x02,Rail #1]				1				
Coofigure	Configures the contoniation of CONTROL on mout init on and off. This includes how the unit respond	and serve a	us commands needed er's socied.	D Prus Le					e suiput and ther transferring . Ne complet al fair le produc
0 Monitor									
a Realized				62	The second se			-	

Figure 43. Configure- All Config- On/Off Config Pop-up



After making changes to one or more configurable parameters, the changes can be committed to nonvolatile memory by selecting *Store User Defaults*. This action prompts a *confirm selection* pop-up, and if confirmed, the changes are committed to nonvolatile memory (Figure 44).

Lonngure	Linets & On/Off Dthen All Config								
and a local design of the	Command	Code	Yolue/Edit	Hex/Edit	Command	Code	Value/Edit	Hex/Edit	
te las se arris en calar	· Coldeston				* Handacturer John				
denta trança	IDUT_CAL_GAIN	0.36	1.0071 🗐 🛍	0+9821	CAPABILITY	10039	0.00	0.00	
	IDUT_CAL_OFFSET	0.09	N.0000 (3.4	0+5000	PHILIS_REVISION	0.98	LLLI-Pert	0111	
Stote User Defaults	HER_04 (VREF_TRIM)	DiD4	0.000 EBy	0x0000	▼ 0s/0ff Configuration				
Restore User Defailts	▼ Configuration				MPR_05 (STEP_VILLF_MARGEN_HIGH)	0.05	0.000 EE v	Gx0000	
Cline Research Roberts	MR_13	0.00	13136	0x0521	MPR_06 (STEP_WREF_MARGIN_LOW)	0.04	6.000 🐨 ¥	(9x0000)	
	MRR_34	0.0€	1211A(2)	0+0643	MPR_00 (SEQUENCE_TON_TOFF_DELAY)	900	0×00 💷	0x00	
Opperation	MFR_17	0,61	2445,0	DV00F4	EN_ENT_CONTE	0.02	0+02 -	0402	
Faraneters	HRR_21 (OPTIONS)	0.45	BLACC.	0x0004	OPERATION	0.65	2 00x6	0x00	
C Paraneters for the Rail	HFR_++ (DEVICE CODE)	0.#C	0+0072 (~)	0x0073	TON_RESE	0.61	2.6675	0x6028	
AlParameters	VOUT_HODE	0,29	812-9	0+17	▶ Statae				
lot Paraneters Ru:	WRITE_PROTECT	8:18	0.00	1.00	The David Proceedings				
(Connectione	▼ Landa		Confirm	Stere to Tia	h 🛛 🖉	0.00	6x00000 H	0x0000	
Camnard Code	10UT_DC_FAULT_LIMIT	Dc46	2 1	The specific	m will store all configuration values to fast-				
🖓 Qrouge by Category	IDUT_OC_FAULT_RESPONSE	8:47	lettert		re 79540422 @ 4dilress 27. Do you with to proceed?				
	IDUT_OC_WARN_LIMET	Dir4A	22	1	Tes No				
	HER_OF (PCT_VONT_FAILT_PG_LEHIT)	D:07	PSJ P		100 CAN 10	1			
	OT_FAULT_LIMIT	D.M	125 图 4	0.0070					
	OT_WARN_LEMIT	0.51	100 🖽 🗠	0x0064					
	VP_OFF	0.36	5.00 🗄 v	0(9014					
	VIN_ON	0.05	7.00 ER#	(average					
	VIN_ON	0.05	2.00 1314	(ewearc					
	Two is remain				Proble Leg				
0 Coofgure	BOUT_CAL_OFFET [0x39,Rod #1] Host after used in cargunation with the SOUT_CAL current sensing prout.	SADI com	nand to minimize the e	ov of the 🔄					
U Monitor	A CONTRACTOR AND A CONTRACTOR AND								

Figure 44. Configure- Store User Defaults

A scroll-down menu in the upper right corner can be selected to change the view screens to one output rail or the other (Figure 45).

File Device Tools 1	40								TP540422 @	Address 17 - Ra	6.81	-
Configure	Lines & On/Off Other All Config								Rate	Railliene	Pert:	Ad
	Command	Code	Value/Edit	Hest/Edit	Constant	Code	Value (Edd	Hex/Edit	() tPS	10422 () Aildre	cns 27	
[7] auto entre on rail or	* Calibration	10000	1.000000000		 Hamdedurer Infe 			10001000		6.81.91	12540402	27
device change	IDUT CAL GAIN	0.08	1.0071 FIR mp	Country 1	CAPAGE ITY	10.05	0.00	0.00			Lange and the	100
Stand (Decate	IDUT CAL OFFSET	0.09	BLOODD FIRM	0+6000	PHILIS REVISION	0.98	LLLI-Pert	Ox11	-			_
Store User Defauts		0.04	0.000 1974	0+000	▼ Ow/Off Configuration		ALC: A Design The					
Restore User Defailts	Gentepration		- Lose	-	MER_DS (STEP_VILEF_MARG2N_HIGH)	0.05	0.000 EE v	Gx0000				
	MR_13	0.00	13246	040522	MER_06 (STEP_WREF_MARGEN_LOW)	0.04	C.000 (25) w	010008				
	MR.14	0.0E	12-04(V)	0.0-00	MER_DO (SEQUENCE_TON_TOFF_DELAY)	904	0+00	0×00				
200	M98_17	0.11	04. 000	040000	ON OFF CONTIG	0.02	0x02 -	0+02				
Faraneters	HER_21 (OPTIONS)	0.45	PLACE.	0x0004	OPERATION	0.01	8×00	Gx00				
C Paraneters for the Rail	MPR_++4 (DEVICE CODE)	0.40	0x0072 (**)	0x0073	TON_RESE	0.61	2.6875 (1)-06	0x6028				
 Al Parameters 	VOUT_MODE	0/20	819-0	0+17	▶ States	_		-				
Sort Paranteters Rul	WHITE PROTECT	B-IB	0.00 (*)	0.00	V Uner Parameters				i			
(Connerd have	Colorest .				ME8_00	0.00	0x0000	0x0000				
Cammand Code	TOUT OC FAULT LIMIT	Dc46	30.0 EE A	04/930					20			
Group by Category	TOUT_OC_FAULT_RESPONSE	Br47	Restart	0.X								
	IDUT_OC_WARN_LIMIT	Dir4A	25.0 (ESA	0+932								
	MIR.07 (PCT_VOUT_FAILT_PG_LPHIT)	DxD7	PG.: 00h (*)	0+00								
	TIMULT LIMIT	Doff.	125 123 14	0.00.70								
	OT_WARN_LEMIT	D:dil	100 (23.40	0+0064								
	AT# OM	0.36	5.00 EV	0,4014								
	VIN_ON	0.05	7.00 ERe	1 (outduc								
	L'anne and a second sec			1.1								
	Too kineta				Providence							1
VINESSENIET	HIFR_05 (STEP_VREF_HARGER_HIGH) [0x05 Used to increase the value of the reference value	(Rei #1)	o the reference higher	when the Im								13
Cooldine	CPERATION command is set to Margin High, the re indicated by the command. UREP + 600ml + (VREP	Farence sol	TEP VIEW MARCEL	ge (n niv) (1°2e-3								
Jy Monitor	100000000000000000000000000000000000000			1								
5 Status				晒	Probleming							9h 8

Figure 45. Change Screens to Other Vout Rail



In the lower left corner, the different view screens can be changed. The view screens can be changed between *Configure*, *Monitor* and *Status* as needed (Figure 46).

Common Digital Nomer	Designer - trocholdz @ Address 27 - Rad #1 - treas unitraments			
Pie Dence Toos H	**			17540422 & Address 27 - Rail #1
Configure	Linits & On/Off Other (Al Config)			
antedatedated	Correct Lawla	Temperature Las	da .	a
Ruto write on rel or	Rad #1 Rad #2		Rai #1 Rai #2	
theside change	3aut OC Ware Limit: 25.0 田本 25.0 田本	Tenplianumb	200 图 元 100 图 元	
	30.0 C Feut Limit: 30.0 11 4 25.0 11 4	Terrefeatures	13图< 13图<	
Store User Defaults	Contra a la contra de la contra	Careful Control Incon		
Restore User Defeits	Red with an and an	at any list fact	Alian Plant Orfait	
Constant and the second	0 (885 (235 +255 +365)	10.444	1235 +235 +3455	
	0-1205 -205 +205 +1205	C -12.03	- 30% +70% +120%	
	0 -28.0 % -22.0 % +7.0 % +12.0 %	O 48.0 1	6 -02.0 % +7.0 % +12.0 %	
	0 400 365 470 4105	0 44.11	4 -36.5 % +7.5 % +12.8 %	
		05000420	Staway (Saadhinacah)	-
	Over-Current / Under-Voltage Fault Response			
	Rel #1: Obstitic Restort	H#2: 0	So fact Restart	
	remains doubled until the fault is deared.		isobied until the fault is depred.	
	Restart Continuautiv	(0)	Restart Continuoualy	
	continuously, without imitation, unit it is commanded	8 - C	prictice goes shough a normal scarsup contraction pricticeusly, without instation, until it is contracted off or	
	off or lase power is removed or another fault condition causes the unit to shuldown.		sas pouer is renoved or another fault condition baues the ritt to shufdown.	
	Tarm On/Off) (*******	
	and the testing where it and the		Ref #1 Ref #2	
	The contract of the contract		aner Hargen Highs 6.000 FET V 0.000 FET V	
	Kat P1 Kat P2		performances 0.000 PELy 0.000 PELy	
	Conjuni Carrigo Conz (v) Conz (v)	Concernan	Contraction Contraction Contraction	
	The second			
	Turn On Rose: 2.6675 (1) == 2.6675 (1)	-		
	device the second se		a de la companya de la	100 100
	796 S.HVITO		Prillacity	1
.() Configure	Auto of the voltage at the current serve pro to the served current.	1		.23
Up Monitor				127
🧦 Status		电	Pression	69
Fusion Digital Power Designs	e =1.8.118 [2011-11-12] 79540422 @ kddress 29 (ut8 Adepter v1.0.11 P6C)	100 642		- Trace immediates (being digital power

Figure 46. Change View Screen to Monitor Screen

When the *Monitor* screen is selected (Figure 47), the screen changes to display real-time data of the parameters that are measured by the controller. This screen provides access to:

- Graphs of Vout, Iout, Temperature, and Pout. As shown, Pout display is turned off.
- Start/Stop Polling which turns on or off the real-time display of data.
- Quick access to On/Off config
- Control pin activation, and OPERATION command. As shown, because the device is configured for *Always Converting*, these radio buttons are either grayed-out or have no effect.
- Margin control.
- PMBus log which displays activity on the PMBus.
- *Tips* & *Hints* which displays additional information when the cursor is hovered over configurable parameters.

As shown, when the EVM is still off due to UVLO, no output voltage or current is displayed.

At first GUI launch, Faults may occur due to communications during power up. These faults can be cleared once the device is enabled.



File Device Tools H	49					12540422 8-1	donate 17 - Rai	#1
Monitor	Readings - Rad #1	Yout - Rail #1		Iout - Rad	#1			
Neurinde Ritell Set 2 Start Net 2 Start See Photo Screen Week See Photo Screen Week See Photo Screen See Photo Screen See Photo Screen See Photo Screen See Photo Screen Sec Pacific Device Davidued Sector California	Operation Ref #3 Ref #2 Voc 0.002 V 0.008 V Deit 0.002 V 0.008 V Deit 0.00 4 0.00 V Prestizacion 0.00 4 0.00 V Statuszych 0.00 4 0.00 V Statuszych 0.00 4 0.00 V Statuszych 0.00 V 0.00 V Statuszych 0.00 V 0.00 V Dec #31 0.00 V 0.00 V Dyce 0.00 V 0.00 V	Control (Control (Contro) (Control (Contro) (Contro) (Contro) (Contro) (Contro) (Contro	93.40 94.69	0C fault 35.00 25.00 25.00 13.00 5.00 0.00	00.00	23.00 (E) A	03:40	54.00
	Pargining Rall #1	0.00 00100 00.20	03:40 04:00					
	Tax Errors		Main					
U Coofigure	OH_OFF_CONTSC (0x02,ILuil #2) Configures the cambination of CONTRCL on unit on and off. This includes how the unit re	riput and seriel bus commands needed to turn the sponds when power is applied.	19-02-46,735 L08-544 #1: CONTROL1 reso Lev					
D-Monitor								
Status		PD	Prinates					Ph

Figure 47. Monitor Screen

Selecting System Dashboard from mid-left screen adds a new window which displays system-level information (Figure 48).

PECHADOP	To another the second s	171	-					
Contraction of the second seco	Steadings - Roll		West Rolat	Design of the local data		5.00	Stood - Rod #1	
Shave Protect		O Spitzen Daubberriter	states Depital Powers D	and the latest				Sector 1
Leiveut Leiteut	NAUTE 0	Laynut Devices						
Chent (S) senting)	Dat:	System-Level Actions an	d Settinge					
Trt All Plats on Scient	Political	CryOff Config		OPERATOON		Fault Hanagement 1	EPROM Polyer-On Defaults	
C tole Puts to Screen	Tange	Always Comercing	U vivite Setting	Hargining (Turr	DK Dened Off	Cearfailts	Store User Defaults Restore User Defaults	
Whate	Status Register				- 1990 - 199	1. Contraction (1. Contraction		
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Contract Street	INTER OK							
UnitÉditars	Ters: #1 06	Reda						
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(Design and the set of the set o	DELEU'S UN	TP540422.0 27 2 R	al #2 0.006 V	0.00 A 23 %	0140 0 0		Evil2 (w) Winays Converting	8.00.8
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System Dashboard								
	Ou/Off Coofig							
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	Did2 🗐 Nobr							_
	Dirigit Mode	Status Registers						
	Ext2 II Node	Status Registers	Raid			Rail #2		-
	Custori Law #1	Status Registers STATUS_WORD	Rad #1 CPR, Separt UK			Rel #2 CH, Smal		-
	Control Line #1	Status Registers STATUS_WORD STATUS_VOUT STATUS_VOUT	Rad #1 CHL, Oxford III ON			Rail #2 CTR, Denait	100	
	Control Line #1	Status Registers STATUS_WORD STATUS_VOUT STATUS_TOUT STATUS_TUBEREVISE	Ref #1 Off, Ortput Int Off			Ref #2 CRL, Ontrol OK OK		
	Control Line #1	Status Registers STATUS WORD STATUS JOUT STATUS JOUT STATUS THEPRATURE STATUS CHI	Rad #1 CHL Output III OK OK OK			Red #2 CPL, Orma ON ON		
	Control Line #5	Status Registers STATUS, WORD STATUS, JOUT STATUS, JOUT STATUS, JUHPERATURI STATUS, CH.	Ref #1 CHL, Origet III OR OR OR Systeld Command OR			Red #2 CTL_bread OK OK		
	Control Law #1 Contro	Status Registers STATUS, WORD STATUS, YOUT STATUS, YOUT STATUS, CHU STATUS, CHU STATUS, STATU, STATUS,	Rad #1 CHL, Corport III OI OI OI Swedd Cormoned OK			Red #2 C31L, Datas OK OK OK		
	Castrol Line #1 Orgenetics - Ras Operation - Ras Margining - Ras Nacional Control	Status Registers STATUS, WORD STATUS, WORT STATUS, DUT STATUS, TURREATURE STATUS, JUR, SPECIFIC STATUS, JUR, SPECIFIC STATUS, JUR, SPECIFIC	Rad #1 CHL, Serger III On On On Serger Command On On On On On			Red #2 CTR, Orthol OK OK		
	Castrol Lan #2 Oray: Operation - Rat Operation - Rat Neight O Java Fault Actor: Fault Actor:	Status Registers STATUS, WORD STATUS, JOUT STATUS, JOUT STATUS, THEREASTUR STATUS, THEREASTUR STATUS, JUR, SPECUTE STATUS, JUR, SPECUTE	Red #1 CTA, corpus (M OR OR Synthe Command OR OR			Rad #2 CTR, Surger OK OK OK		
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2 Configure	Control Law #1 Oright Operation - Rai Negli Comp Tos Serritis Of Walks Life	Status Registers STATUS, WORD STATUS, WORD STATUS, YOUT STATUS, OUT STATUS, OUT STATUS, JURR, SPECIFIC STATUS, JURR, SPECIFIC STATUS, JURR, SPECIFIC STATUS, JURR, SPECIFIC Status Registers Status Status Registers Status Status Registers Status Status Registers Status Status Registers Status Status Registers Status Registers Sta	Rad #1 CHL (Spreed III) Col: Col: Col: Col: Col: Col: Col: Col:			Red #2 CTR, Dorped OR OR OR		
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Figure 48. System Dashboard



Screen Shots

www.ti.com

When the EVM starts converting power, the Vout graph changes scale to display both the zero and Vout level. Only one rail can be displayed on the graphs at any time, but the other rail voltage, current, power, and temperature are displayed in the upper left window. Once the EVM is converting and clear of any faults, selecting *Clear Faults* clears any prior fault flags (Figure 49).



Figure 49. Display Change on Power Up

Selecting *Clear Faults* clears any prior fault flags. Scrolling time window of Vout still shows the turnon event (Figure 50).



Figure 50. Faults Cleared





Selecting Status from lower left corner shows the status of the controller (Figure 51).

Figure 51. Status Screen

Selecting the pull-down menu *File- Import Project* from the upper left menu bar can be used to configure all parameters in the device at once with a desired configuration, or even revert back to a *known-good* configuration. This action results in a browse-type sequence where the desired config file can be located and loaded (Figure 52).



Figure 52. Import Project / Import Configuration File



Screen Shots

Selecting *Store User Configuration to Flash Memory* from the Device pull-down menu has the same functionality as the *Store User Defaults* button from within the Configure screen. It results in committing the current configuration to nonvolatile memory (Figure 53).



Figure 53. Store Config To Memory

Selecting *Data Logging* (Figure 54) from the Tools drop-down menu enables the logging of common operating values such as Vout, lout, and Temperature for both output rails. The user is prompted to select a location for the file to be stored as well as the type of file. See next screen (Figure 55).

41 Former Digital Proserv	Designer - 17540422 @ Address 27 - R	el #1 - Trous I	natramenta :								2010 B
File Device Toola	48								19546422 B	Address 17 - Ra	£#1 (5
Monitor Dr	nox/Project Configuration Company	Yest-	Rail#1			10	lout - Rad	#1			1.
Shoultide Plate: De	bug Canade	0.05			11		OC Parity	30.00 (E) a 100 ma	A STOCKED		
Elvant El pa	te jogane	6	12 14				35.00-				
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(e) Fit All Posts at \$14	Bur & SAA Tosi		1	or each market of	a creation de	. And the A	30.00			_	
O Scale Plots to have	neric Brunde, Decode Tester						25.00-			_	
Width De	vice Read/Write Stress Tester						20.00				
01	kg Connand Protocal Tester	-									
Grow ziem i Co	infiguration brooks Tester	0.04					15.00-		_		
CT Chanciples 1 AS	CII Tool						10.00		_		
dri Plata (15	ROM Rie Tool	0.01	1								
C DALLA	NON Ple Consere Tool						3.00-				
3600 100	NoT rotalment 221 104	. 0.00	13:20	13:40	14:00	14:20	8.00	13.20	11:40	14:00	14:20
Device Deshi Do	onload USB Adapter formulare			2004	(20020)			Lones			
System Dashboard		Temp	Had#1 - Maximum	a Temperature		1.4	+				
	Ou/Off Config - Rail #1	OTFR	a 111 12 1 1	OT Wette 10	o on termination of the second secon						
	0x02 (*) Hade: Average Converting	140.	- 95								
		120									
	Control Lane #1	105	.00	_		_					
	Ongh Guar	80.	00			_					
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		20.	00			24.0.%					
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	ranging that at		13:20	13:40	14:00	14:20					
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	100/T_OC_WARN_LIMIT [0x4A.Rail a	(1)			19:08:33.057:1/58-54	#1: CONTROL 1 room Law					022
U Coofigure	Sets the value of the subjut current that	Challes an output	Diversionent Herring,	(4)							
Up Monitor											
🤌 Status				ъ	Preusiog						09
Fuel Digital Power Design	e =1.8.135 [2011-11-15] [79940422 @ kdd	ten 27 Lida Adi	enter VI.0.11 PEC: 40	in with					3	to be and income.	sames Salies digital power

Figure 54. Data Logging



Select the storage location for the file and the type of file. As shown (Figure 55), the file will be a CSV file to be stored in the directory path shown. Logging begins when the *Start Data Logging* button is selected, and stops when it is reselected (as *Stop Data Logging*).

Monitor			
Provincial	Readings - Had #1	Yout-Rail #1	s lost - Raf #1
Shou Hoad Husi. Shou Taka Husi. Plant. Plant.	Ref #3 Sel #4 Vach 6.00 Y Backter() 5.00 H Packter() 5.00 H Status Begisters(Uses Vackter() 5.00 H Status Begisters(Uses) 5.00 H Status Begisters(Consented 5.00 H Status Begisters Asserted 5.00 H Cathol Lise #1 5.00 H	Construction C	Conseld
	New Olars Class Date		
	The Entre		
	HER OF INTER VERY HARGE LOUGH	StartDataLogging OK	
	Used to decrease the reference voltage by all OPERATION command is set to Margin Low, 1	forgithe reference over the votage indicated	
// Coofigure	ing the descent		
4 Coofigure 4 Monitor	by the connext.		

Figure 55. Data Logging Details

Data is stored in a CSV file, with date-stamp name (Figure 56).

	-,	
Microsoft Office Exc	6 KB	Mata-Log-2011.12.07-19.15.33.csv
1.11	0.05	

Figure 56. Data Log

Common contents of the data log. As shown (Figure 57), the UUT had been disabled, and both rails were off .



B)	H. S. C. H	0.0				Data-Log-201	111:0-013.0	Rand-Dely	Kiter Bick	1					_ 17 1
	Hone Buart	Page Leym	d Farmulai	Data Revo	n then 1	leistpper &	ender.								W - C
ŝ	A Cit	Tahone	- 10 - A	· = = =	-	ag Test	General	- ÷					Autolian - Ar	A	
-	A Long Doors	8.7.11	11113-2		1 (# (#))u	rige & Carton +	5-16-1	dig Cond	ionat Pormat	Cell	brieft Delete	Format .	Case and S	Final S.	
	Capboard -		Farek	15	Alignment	-	Burnings	- Person	Shiei	2.20140	091		Eating.	Phone.	
	A3 .	(c	Timestamp												
	A:	В	С	D	ε	F	G	H.	I		1	K	L	M	N
	Timestam/	Adapter	Part_ID	Address	VOUT1	IOUT1	TEMP1	VOUT2	IOUT2	- 1	TEMP2				
2	15:34.0	1	TPS40422	27	0.037		0 25	0.00	4	0	24				
3	15:34.6	1	TPS40422	27	0.039		0 25	0.00	4	0	24				
	15:35.1	1	TPS40422	27	0.037		0 26	0.00	4	0	23				
	15:35.6	1	TPS40422	27	0.039		0 24	0.00	6	0	25				
	15:36.2	1	TPS40422	27	0.037		0 23	0.00	6	0	23				
	15:36.7	1	TPS40422	27	0.037		0 22	0.00	4	0	23				
	15:37.2	1	TPS40422	27	0.039		0 24	0.00	2	0	24				
	15:37.7	1	TPS40422	27	0.037		0 25	0.00	2	0	24				
3	15:38.3	1	TPS40422	27	0.037		0 23	0.00	2	0	24				
6	15:38.8	1	TPS40422	27	0.039		0 23	0.00	4	0	26				
£.	15:39.2	1	TPS40422	27	0.039		0 24	0.00	2	0	25				
ŝ	15:39.4	1	TPS40422	27	0.041		0 24	0.00	4	0	24				
ŧ.	15:40.3	1	TPS40422	27	0.037		0 25	0.00	2	0	23				
;	15:40.8	1	TPS40422	27	0.039		0 25	0.00	4	0	23				
5	15:41.2	1	TPS40422	27	0.039		0 24	0.00	6	0	26				
7	15:41.5	1	TPS40422	27	0.039		0 24	0.00	2	0	24				
3	15:42.1	1	TPS40422	27	0.037		0 23	0.00	4	0	24				
9	15:42.5	1	TPS40422	27	0.039		0 25	0.00	2	0	24				
5	15:43.2	1	TPS40422	27	0.037		0 25	0.00	4	0	23				
í.	15:43.6	1	TPS40422	27	0.037		0 24	0.00	4	0	24				
2	15:44.2	1	TPS40422	27	0.037		0 25	0.00	2	0	24				
5	15:44.6	1	TPS40422	27	0.037		0 24	0.00	4	0	24				
į.	15:45.1	1	TPS40422	27	0.039		0 26	0.00	8	0	25				
5	15:46.0	1	TPS40422	27	0.039		0 23	0.00	4	0	24				
	+ Distation in	11.12.02.10	TOC 10:122		0.007	2	0	0.00	Annual Voters						-

Figure 57. Data Log File

Selecting *PMBus Logging* (Figure 58) from the Tools drop-down menu enables the logging of all PMBus activity. This includes communications traffic for each polling loop between the GUI and the device. It also includes common operating values such as Vout, lout, and Temperature for both output rails. The user is prompted to select a location for the file to be stored. See next screen (Figure 59).

	Help				19546422 @ Address 27 - Rai #1
Monitor 0	Sevice,Project Configuration Company	West-Ball #1	3	(Inst - Red #1	
Shavultide Plata. 0	Nebug Console	0.04		and all an an OD a second	Mar Bol
Elvant Elt o	v. proping			DC-Fault 30:00 [[] & OC 01811	\$2.00 (12 A
One DA	Millie Logging	//////////////////////////////////////	WUMPNEMM WWWLIGht	35.00	
TRAP N	Pillue & SAA Teel	0.03	.1	38.00	
Scale Plots to h	umeric Brande, Decode Tester	910000000000000000000000000000000000000		25.00	
Width D	Sevice Read/Write Stress Tester	0.02		20.00	
0	Volg Connerd Protocol Texter	1.1.1			
Stow Same C	Configuration Deport Tester			15.00	
T Show Links 1	KSCII Teel	0.01		10.00	
dri Plata E	EPRON File Tool			5.00	
Day Tell	BROH Re Consere Task				A 01.0
3600 1614	NooT notelenerT 221 au8+8: 8 28	- 19:40 30:00	29:20 20:40 21:00	0.00 19:40 20:00	20:20 20:40 21:0
Device Death 0	Novriced USB Adapter Primare			Д	
System Dashboed		Temp - Rad #1 - Maximum Temperature	5	-	
	Ge/Off Config - Rail #1	OT PARE 125 E C OT Were 3	100 🐼 🕫 🔰 100 million		
	0x02 (-) Made: An Ays Converting	140.86 -			
	The second s	130.30			
		120.00			
	Costrol Line #1	128.89			
	Control Line #1	320.00 300.00 80.00			
	Control Line #1	120.00 300.00 80.00			
	Control Line #1 Orgen O Line Operation - Had #1	120.00 300.00 80.00 60.00			
	Control Line #1 Only: Olice Operation - Hall #1	128.00 306.00 84.00 64.00 64.00			
	Control Line #1 Origin Origin Operation - Rail #1 Operation - Rail #1	126.00 106.00 66.00 66.00 66.00 26.00	259 - 5		
	Control Line #1 Orget Scient Operation - Rail #1 Disk Control	120.00 100.00 80.00 40.00 20.00			
	Control Line #1 Origin @ Line Operation - Half #1 Frequency - Rail #5	128.80 106.80 80.90 40.00 20.00 13%40 20.90	20.20 29.40 21:90		
	Control Line #1 Origin Origin Operation - Rail #1 Operation - Rail #1 Pressiong - Rail #1 Pressiong - Rail #1 Pression Origin Origin	128.00 306.00 60.00 60.00 20.00 39.40 20.00 39.40 20.00	20.20 20.40 21.00		
	Control Line #1 Origin O'Line Operation - Nail #1 Operation - Nail #1 Perging - Nail #5 Perging - Perging - P		20.20 20.40 21.90		
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Jy Cooligure	Control Line #1 Origin @ Line Operation - Rail #1 Pergeneng - Pergeneng - Pergene	11) 120.00 100.00 1	20.00 20.40 21.00 Prifink tog 10:00:23.057 L08:544 #J: CONTROL I new Lo	5	
4 Cooligure Monitor	Control Line #1 Page Outer Operation - Null #1 Operation - Null #1 Page Outer Page Ou	1) 128.00 1300.00 1	20:20 20:40 21:00 20:00 20:40 20:00 20:40 20:000	**	

Figure 58. PMBus Logging



Select the storage location for the file and the type of file. As shown (Figure 59), the file is a CSV file to be stored in the directory path shown. Logging begins when the *Start Logging* button is selected, and stops when it is reselected (as *Stop Logging*). This file can rapidly grow in size, so caution is advised when using this function.

File Device Tops H	43				12540402 @ Address 27 - Ral #1	
Monitor	Readings - Rad #1	Vest - Rail #1	a lost - Raf	*1		11
Here Andre Paral Case - Case	Test #1 Kat #2 Viscili 0.031 V 0.044 V Dahit 0.00 V 0.00 V Dahit 0.00 V 0.00 V Status Brighten/Lines 15 < 23 < Status Brighten/Lines 15 < 23 < Status Brighten/Lines 15 23 < Status Brighten/Lines 00 V 5.00 H Disc #1 OK 10 10 Disc #10 10 10 Disc #1 10 10 Operation - Had #1 10 10 Operation - Had #1 10 10	Control of the section of the s	C - Full C - Full S - 00 - 00	00.00 (E) 4 - OC (Ham)	21.20 21.4	8.00 A 221.00
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Figure 59. PMBus Log Details

Data is stored in a CSV file, with date-stamp name (Figure 60).

MBus-Log-2011.12.07-19.21.46.csv	43 KB	Microsoft Office Exc
7		

Figure 60. PMBus Log

Common contents of the PMBus log. As shown (Figure 61), the UUT had been disabled, and both rails were off.



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t	21:46 3	SAA	1	27	TPS40422	PAGE	0x00			ReadByte	ACK	1	0x01			
t	21:46.3	PMBus	1	27	TPS40422	PAGE	00x00			WRITE	ACK	1	0x01	Rail #2 / P	AGE 0x01	
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Ť	21:46.3	PMBus	1	27	TPS40422	READ V	OL 0x8B	0x01		READ	ACK	1	0x0002	0.004 V	0.004	
	21:46.4	SAA	1	27	TPS40422	PAGE	00x00			WriteByte	ACK	1	0x00			
	21:46.4	SAA	1	27	TPS40422	PAGE	0x00			ReadByte	ACK	1	0x00			
	21:46.4	PMBus	1	27	TPS40422	PAGE	0x00			WRITE	ACK	1	0x00	Rail #1/P	AGE 0x00	
	21:46.4	SAA	1	27	TP\$40422	READ_I	DL 0x8C			ReadWord	ACK	1	0xE000			
	21:46.4	PMBus	1	27	TPS40422	READ_N	OL 0x8C	0x00		READ	ACK	1	0xE000	0.00 A	0	
	21:46.4	SAA	1	27	TPS40422	READ_T	EN 0x8E			ReadWord	ACK	1	0x0018			
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	21:46.5	SAA	1	27	TPS40422	STATUS	_V 0x79			ReadWord	ACK	1	0x0042			
	21:46.5	PMBus	1	27	TPS40422	STATUS	_Vi0x79	0x00		READ	ACK	1	0x0042	CML,OFF		
	21:46.5	SAA	-1	27	TPS40422	PAGE	0x00			WriteByte	ACK	1	0x01			
	21:46.5	SAA	1	27	TPS40422	PAGE	0x00			ReadByte	ACK	1	0x01			
	21:46.5	PMBus	1	27	TP540422	PAGE	0x00			WRITE	ACK	- 1	0x01	Rail #2 / P	AGE 0x01	
1	21:46.6	SAA	1	27	TPS40422	READ_H	OL 0x8C			ReadWord	ACK	1	0xE000			
	21:46.6	PMBus	1	27	TP540422	READ_I	OL 0x8C	0x01		READ	ACK	1	0xE000	0.00 A	0	
4	21:46.6	SAA	1	27	TPS40422	READ_T	EP 0x8E	10.000		ReadWord	ACK	1	0x0018	21.72		
ą.	21:46.6	PMBus	1	27	TPS40422	READ_T	EM 0x8E	0x01		READ	ACK	1	0x0018	24 C	24	
Į.	Z1:46.6	SAA	1	27	TPS40422	STATUS	C 0x/E			ReadByte	ACK	1	0x80			
1	Z1:46.6	PMBus	1	27	TP540422	STATUS	C 0x7E			READ	ACK	1	0x80	INVALID_C	MD	
4	21:46.8	SAA	12.10.21.44	27	TP540422	PAGE	00x00	-		WriteByte	ACK	1	0x00			

Figure 61. PMBus Log File

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It is important to operate this EVM within the input voltage range of 8 V to 14 V and the output voltage range of 1.2 V to 3.3 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.

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During normal operation, some circuit components may have case temperatures greater than 60° C. The EVM is designed to operate properly with certain components above 60° 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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General Statement for EVMs including a radio

User Power/Frequency Use Obligations: This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant

Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- · Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Concerning EVMs including radio transmitters

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concerning EVMs including detachable antennas

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

Concernant les EVMs avec appareils radio

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

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This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

- Use this product in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
- 2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
- 3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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