User's Guide

TPS544C26EVM 4-V to 16-V, 35-A Step-Down Converter Evaluation Module

ABSTRACT

This user's guide contains information for the TPS544C26EVM evaluation module (BSR152) as well as for the TPS544C26 DC/DC converter. This user's guide also includes performance specifications, schematic, layout, and bill of materials for the TPS544C26EVM.

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Trademarks

1 Introduction

1.1 Description

The TPS544C26EVM is an evaluation module for the TPS544C26 DC/DC synchronous buck converter with a digital I^2C and a serial voltage identification (SVID) interface to accommodate Intel processors. The evaluation module accepts an 8-V to 16-V input and can deliver an output current up to 35 A. The converter uses D-CAP+™ control scheme for fast transient response, using less output capacitance to save board space. Rated input voltage and output current range for the evaluation module are given in Table 1-1. Figure 1-1 highlights the user interface items associated with the EVM.

Table 1-1. Input Voltage and Output Current Summary

EVM	INPUT VOLTAGE RANGE	OUTPUT CURRENT RANGE
TPS544C26EVM	8 V to 16 V	0 A to 35 A

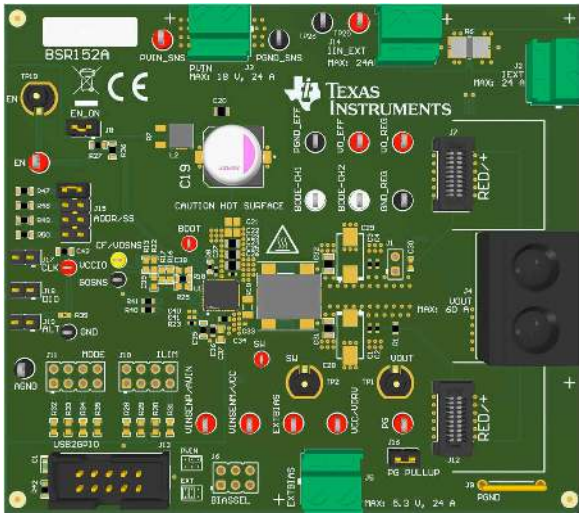

Figure 1-1. EVM User Interface

1.2 Before You Begin

The following warnings and cautions are noted for the safety of anyone using or working close to the TPS544C26EVM. Observe all safety precautions.

	**Warning**	The TPS544C26EVM can become hot during operation due to dissipation of power in some operating conditions. Avoid contact with the board. Follow all applicable safety procedures applicable to your laboratory.

WARNING

The circuit module has signal traces, components, and component leads on the bottom of the board. This can result in exposed voltages, hot surfaces or sharp edges. Do not reach under the board during operation.

CAUTION

Some power supplies can be damaged by application of external voltages. If using more than 1 power supply, check your equipment requirements and use blocking diodes or other isolation techniques, as needed, to prevent damage to your equipment.

2 Performance Characteristics

Table 2-1 provides a summary of the TPS544C26EVM performance characteristics. The TPS544C26EVM is designed and tested for V_{IN} = 8 V to 16 V. Characteristics are given for an input voltage of V_{IN} = 12 V and output voltage of 1.1 V, unless otherwise specified. The ambient temperature is room temperature (20°C to 25°C) for all measurements, unless otherwise noted.

Table 2-1. TPS544C26EVM Performance Characteristics Summary

SPECIFICATION	TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{IN} voltage range		8	12	16	V
PVIN input current	PVIN = 12 V, internal VCC/VDRV, I_O = 0 A, Pulse-skip mode		15		mA
VCC/VDRV input current	External 5-V bias, f_{SW} = 800 kHz, PVIN = 12 V, I_O = 35 A		38		mA
Output voltage setpoint	Set by VBOOT in (C1h) TEMP_MAX bits <3:0>		1.1		V
Output current range	V_{IN} = 8 V to 16 V	0		35	A
Output ripple voltage	f_{SW} = 800 kHz, I_O = 35 A		12		mVPP
Output rise time	Set by (61h) TON_RISE		1		ms
Current limit	Set by (46h) IOUT_OC_FAULT_LIMIT		35		A
Switching frequency (f_{SW})	Set by (33h) FREQUENCY_SWITCH	600	800	1200	kHz
Efficiency	V_{IN} = 12 V, external 5-V Bias, f_{SW} = 800 kHz, I_O = 35 A		87		%
IC case temperature	V_{IN} = 12 V, external 5-V bias, f_{SW} = 1.2 MHz, I_O = 35 A, 15-minute dwell time		101		°C

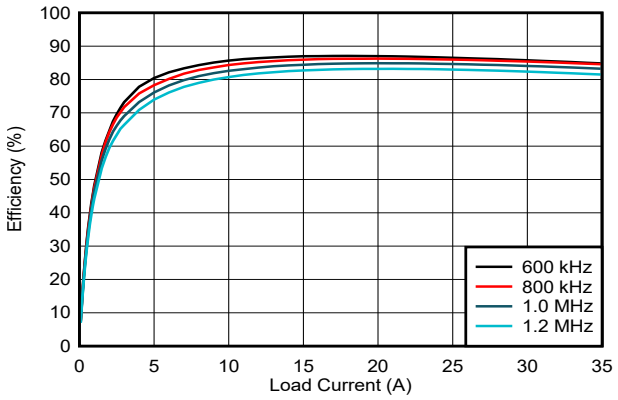

Figure 2-1. Efficiency, FCCM, Internal LDO

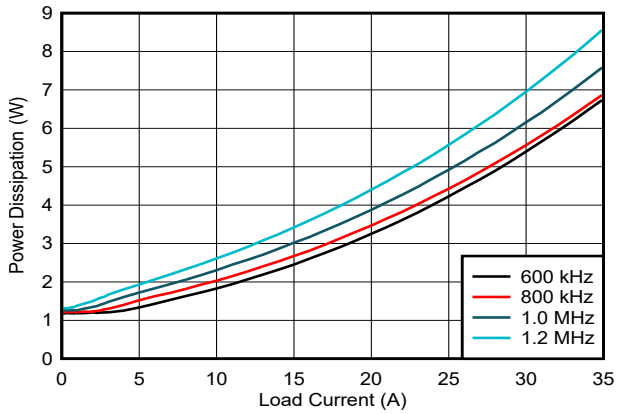

Figure 2-2. Power Dissipation, FCCM, Internal LDO

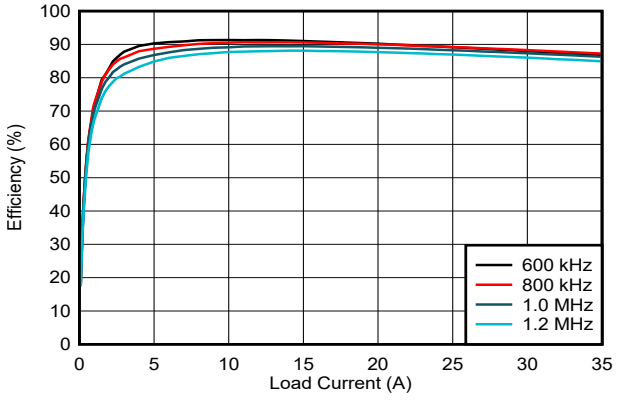

Figure 2-3. Efficiency, FCCM, External 5-V Bias

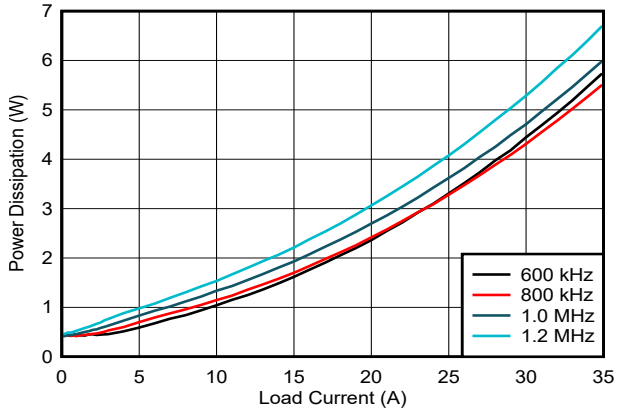

Figure 2-4. Power Dissipation, FCCM, External 5-V Bias

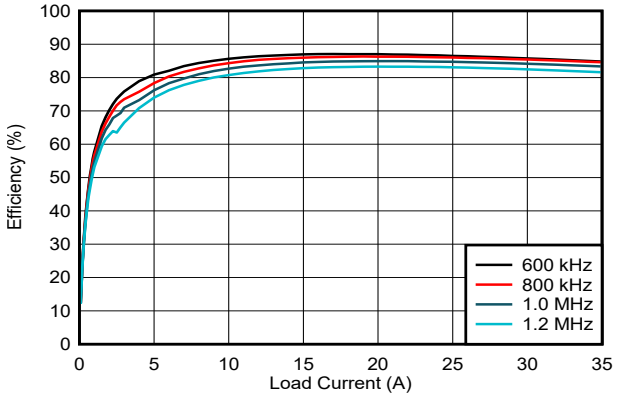

Figure 2-5. Efficiency, DCM. Internal LDO

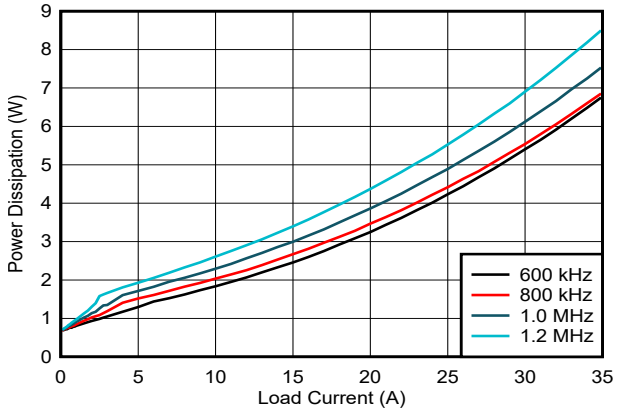

Figure 2-6. Power Dissipation, DCM, Internal LDO

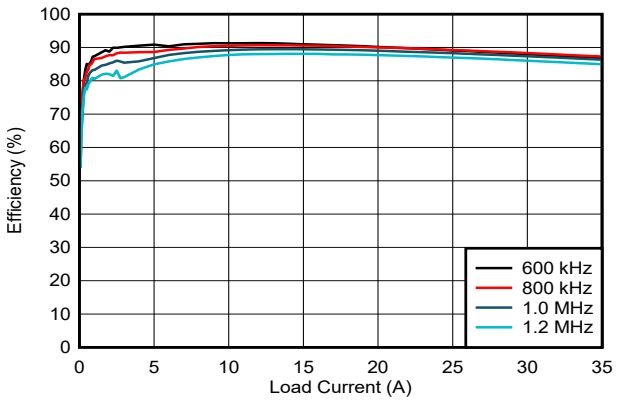

Figure 2-7. Efficiency, DCM, External 5-V Bias

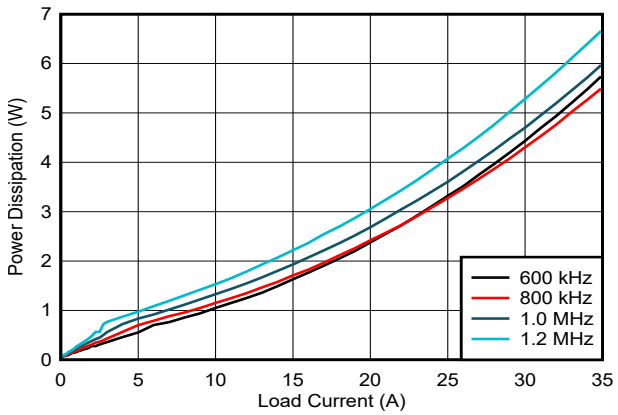

Figure 2-8. Power Dissipation, DCM, External 5-V Bias

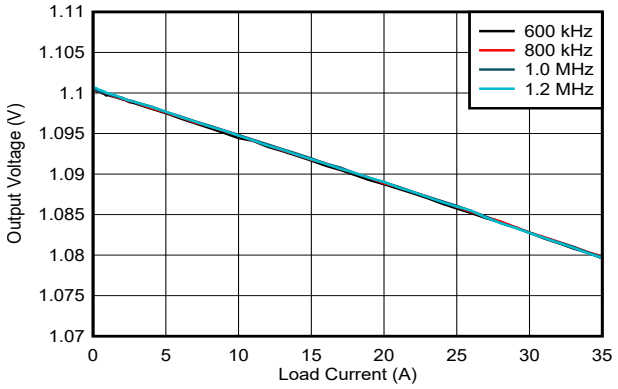

Figure 2-9. Load Regulation, FCCM, Internal LDO

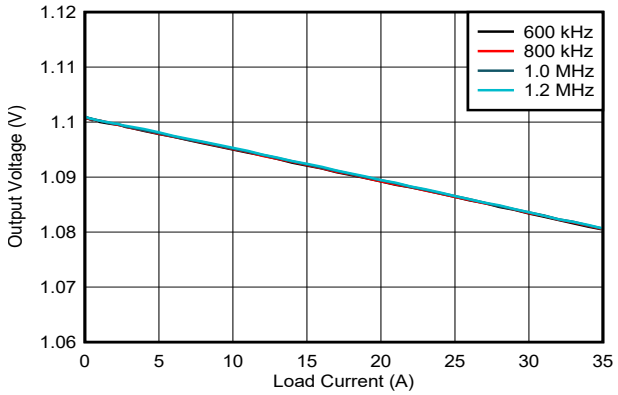

Figure 2-10. Load Regulation, FCCM, External 5-V Bias

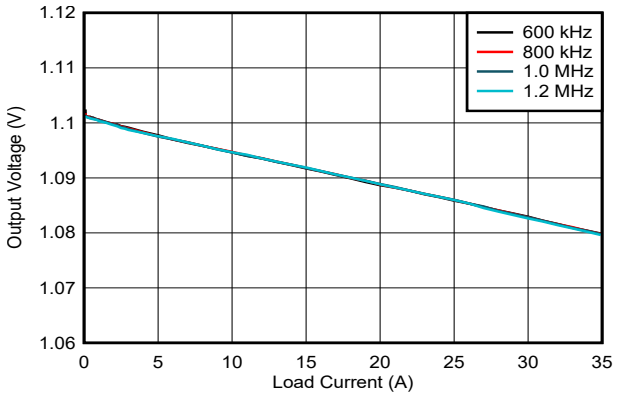

Figure 2-11. Load Regulation, DCM, Internal VCC LDO

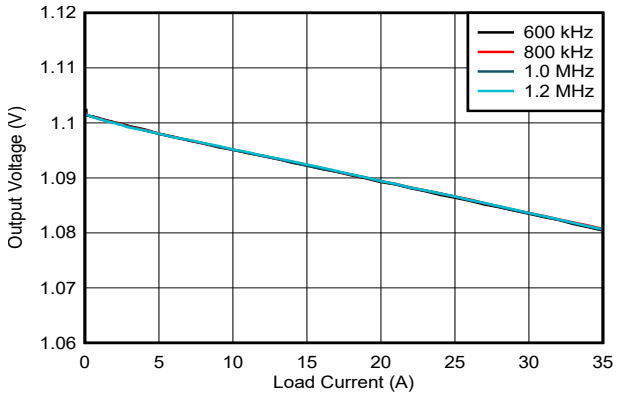

Figure 2-12. Load Regulation, DCM, External 5-V Bias

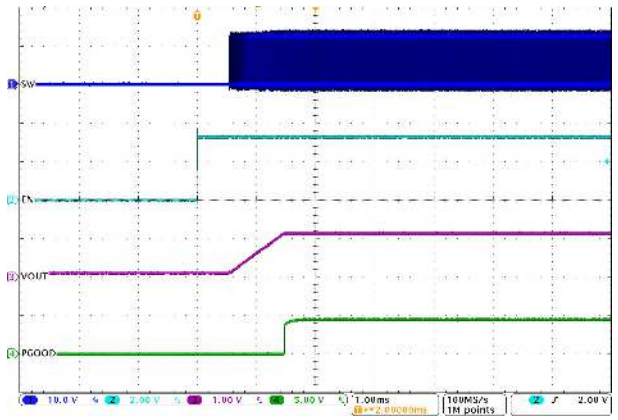

Figure 2-13. ENABLE Start-Up Waveform

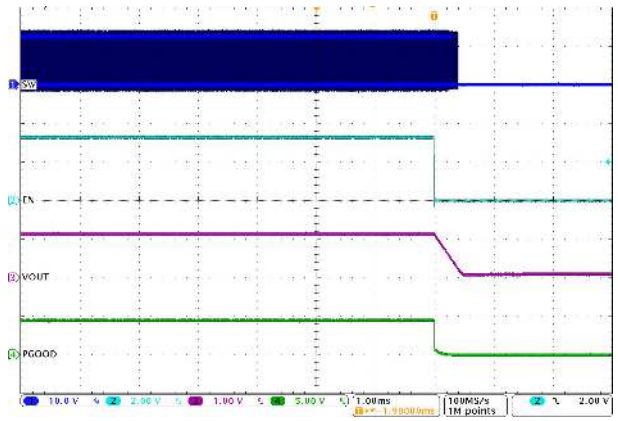

Figure 2-14. ENABLE Shutdown Waveform

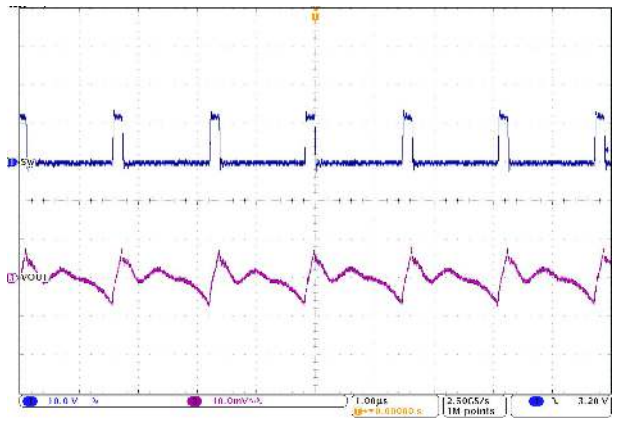

Figure 2-15. Output Voltage Ripple, 600-kHz FCCM, 35-A Load

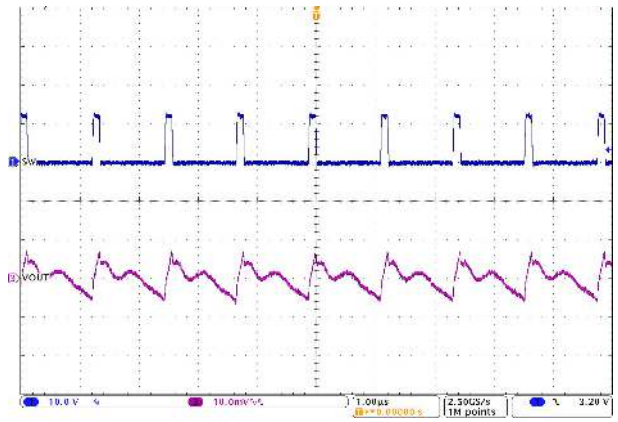

Figure 2-16. Output Voltage Ripple, 800-kHz FCCM, 35-A Load

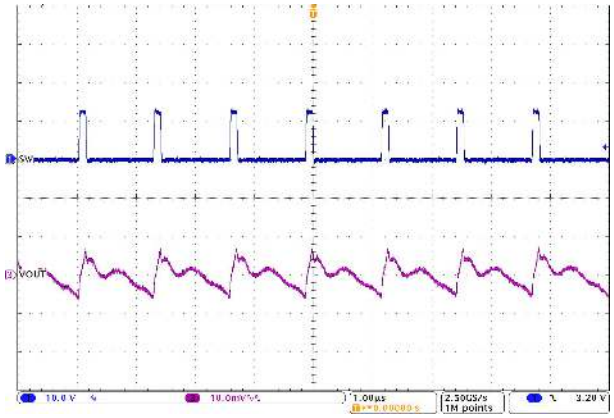

Figure 2-17. Output Voltage Ripple, FCCM, No Load

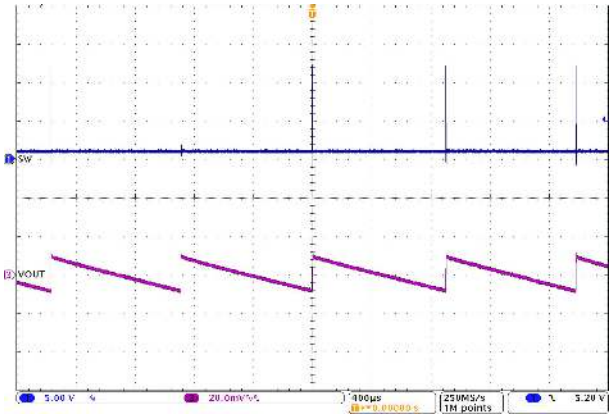

Figure 2-18. Output Voltage Ripple, DCM, No Load

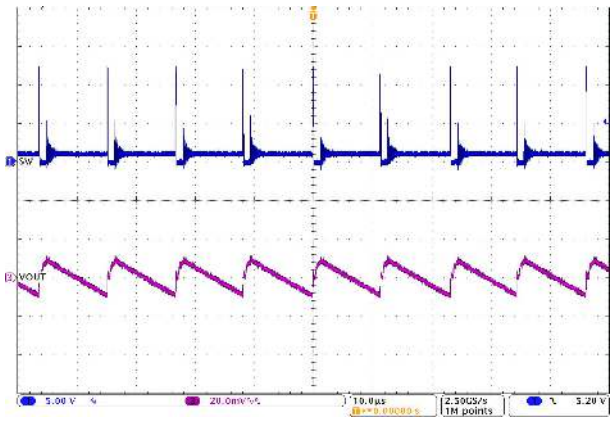

Figure 2-19. Output Voltage Ripple, DCM, 500-mA Load

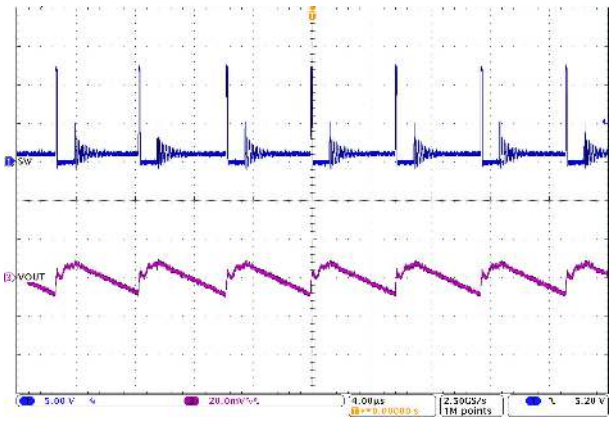

Figure 2-20. Output Voltage Ripple, DCM, 1-A Load

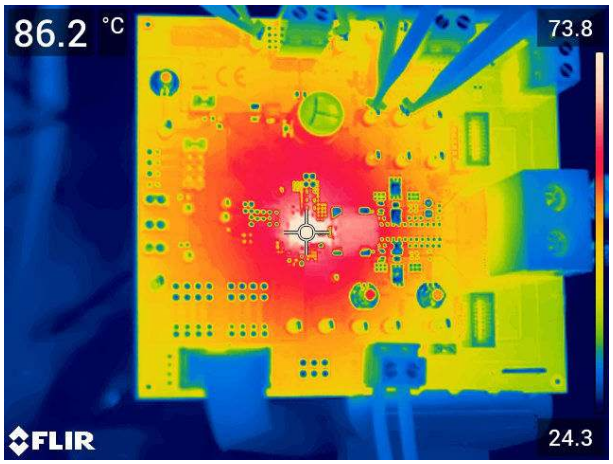

Figure 2-21. Thermal Characteristics, 600-kHz FCCM, Internal LDO, 35-A Load

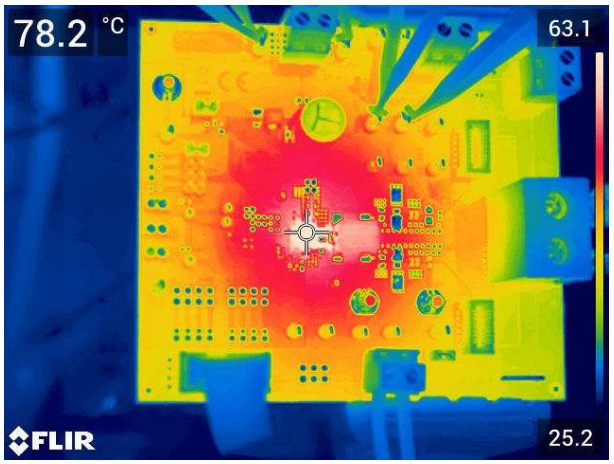

Figure 2-22. Thermal Characteristics, 600-kHz FCCM, External 5-V Bias, 35-A Load

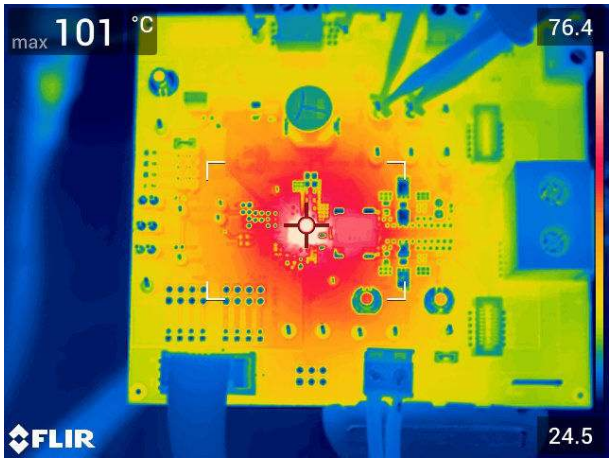

Figure 2-23. Thermal Characteristics, 800-kHz FCCM, Internal LDO, 35-A Load

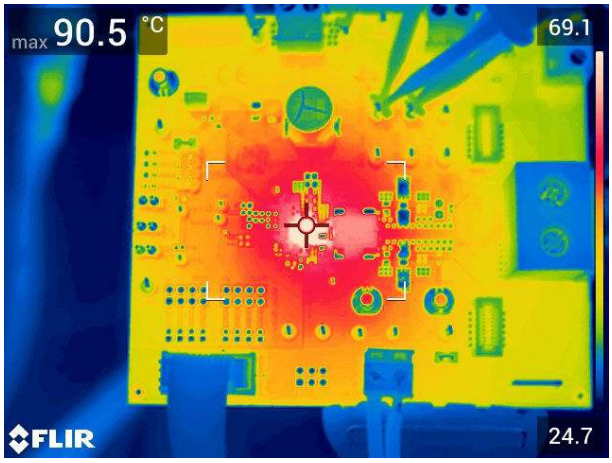

Figure 2-24. Thermal Characteristics, 800-kHz FCCM, External 5-V Bias, 35-A Load

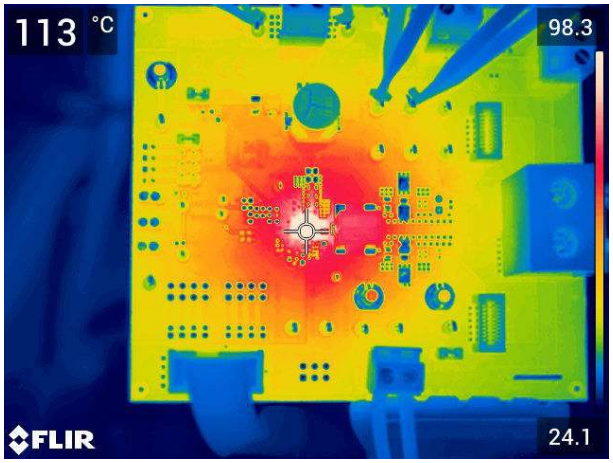

Figure 2-25. Thermal Characteristics, 1.2-MHz FCCM, Internal LDO, 35-A Load

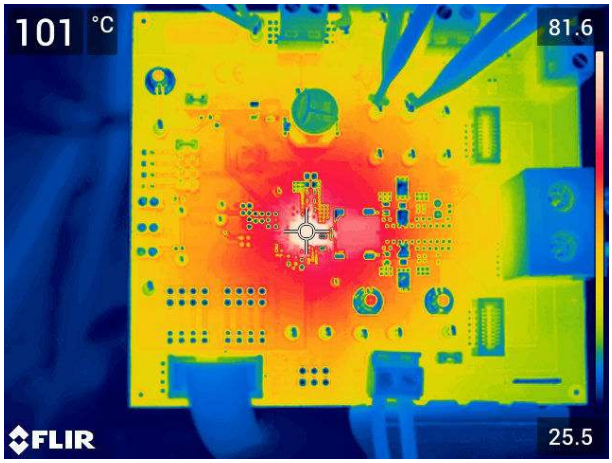

Figure 2-26. Thermal Characteristics, 1.2-MHz FCCM, External 5-V Bias, 35-A Load

3 Test Point Descriptions

A description of each test point follows:

Table 3-1. Connectors and Jumpers

REFERENCE DESIGNATOR	NAME	FUNCTION
J1	VOUT	Output voltage scope monitor
J2	IEXT	Load current interface for the input power telemetry
J3	PVIN	VIN screw terminal to connect input voltage (see Table 1-1 for V_{IN} range)
J4	VOUT	VOUT screw terminal to connect load to output
J5	EXTBIAS	Monitors internal LDO voltage or override internal LDO with external bias for improving efficiency
J7, J12	RED/+	Connector blocks to interface with Mini Slammer
J8	EN_ON	2-pin header for enable. Add shunt to connect EN to PVIN and enable device. Remove shunt to disable device.
J9	PGND	Power ground test point.
J13	USB2GPIO	I2C interface connector to connect the USB-to-GPIO interface adapter to the EVM.
J14	IIN_EXT	Screw terminal to apply an external voltage source for input power telemetry.
J15	ADDR/SS	Pin header block to select default I2C address
J16	PG_PULLUP	PGOOD pullup pin. 2-pin header to pull up PGOOD to VCC
J17	CLK	2-pin header for CLK line
J18	DIO	2-pin header for SVID bi-directional data pin
J19	ALT	2-pin header for ALERT line

Table 3-2. Test Points

COLOR REFERNCE	NAME	FUNCTION
Red	PVIN_SNS	Positive side of input voltage sensing point
Red	EN	Monitors enable pin
Red	VCCIO	External 1-V pullup for SVID
Red	BOOT	Monitors the boostrap capacitor voltage
Red	VINSENP/AVIN	Positive voltage of the power sense resistor on the input power telemetry
Red	VO_EFF	Excellent output voltage sense point to measure efficiency
Red	VO_REG	Monitors the output voltage
Red	SW	Monitors output switching terminal of the power converter
Red	VINSENM/VCC	Voltage reference point of the power sense resistor on the input power telemetry
Red	EXTBIAS	Monitors the voltage on EXBIAS
Red	VCC/VDRV	Monitors the voltage on VCC/VDRV
Red	PG	Monitors the power good signal
White	BODE-CH1	Inject frequency from the frequency response analyzer
White	BODE-CH2	Measurement point of the receiving end from the frequency response analyzer
Black	PGND_SNS	Reference side of input voltage sensing point
Black	GOSNS	Remote sense reference for PGND
Black	GND	Power ground test point
Black	AGND	Analog ground test point
Black	PGND_EFF	Excellent output voltage reference sense point to measure efficiency
Black	GND_REG	Output voltage PGND sense point
TP1	VOUT	Monitors output voltage
TP2	SW	Monitors output switching terminal of the power converter
TP19	EN	Monitors enable pin
TP25	IIN_EXT S+	Remote sense for the bias voltage used to supply the input power telemetry
TP26	IIN_EXT S-	Negative remote sense for the input power telemetry
TP27	CAT_FAULT	Monitors the catastrophic fault indicator. Signal asserts low when any catastrophic fault even such as overvoltage, overtemperature, and output overcurrent happens. During normal operations, this test point holds high.

4 Test Setup

- A power supply capable of providing 10 A or greater must be connected to J3 (PVIN) through a pair of 14-AWG wires or better. The PVIN test points, PVIN_SNS and PGND_SNS, provide a place to monitor the PVIN input voltage. Do not use these monitoring test points as the input supply connection points. The PCB traces connecting to these test points are not designed to support high currents.
- The load must be connected to J4 (VOUT) with a pair of 10-AWG wires or better. Wire lengths must be minimized to reduce losses in the wires. If there is too much voltage drops in the wires, then the electronic load may not be able to sink the full rated current. The VO_REG test point is used to monitor the output voltage with GND_REG as the ground reference.
- When testing with an external 5-V bias supply to power VCC/VDRV, connect the external supply to J5 (EXTBIAS) with a pair of 20-AWG wires or better.
- To test the VINSENP function, connect a load to J2 (IEXT) with a pair of 14-AWG wires or better. When testing this function, the PVIN power supply must be capable of sourcing this additional external load current. Additionally, the load must have the proper voltage and power rating. For example, when the voltage at PVIN is 12 V and if pulling 20 A out of J2, the power supply must also source an additional 20 A and the load must have a power rating of at least 240 W.
- The PMBus Interface connector (J13) is provided to connect the USB-to-GPIO interface adapter to the EVM. Click here to order the adapter. The USB-to-GPIO interface adapter connects the EVM to a computer USB port which allows the Fusion Digital Power™ graphical user interface (GUI) to communicate and control the EVM.
- If modifications are made to the TPS544C26EVM, the input current can change. The input power supply and wires connecting the EVM to the power supply must be rated for the input current.

5 Fusion I2C Device GUI

Click here to download the Graphical User Interface (GUI) used to configure and monitor the TPS544C26 with the Fusion Digital Power graphical user interface (GUI).

The Fusion Digital Power graphical user interface (GUI) combined with a TI USB-to-GPIO USB Interface Adapter can be used to communicate with the device.

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

- 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.
- Turn on or off the power supply output.

Get more information about the software tool at *FUSION_DIGITAL_POWER_DESIGNER*.

5.1 Opening the I2C Device GUI

Open either the *I2C Device GUI* directly as shown in Figure 5-1 or open *Fusion Digital Power Designer* then click on *I2C GUI*.

Figure 5-1. I2C Device GUI

After opening the GUI for the first time, the Scan Mode must be adjusted to find the TPS544C26 device. Click on *Change Scan Mode* then click on *TPS54xC2x* to scan all addresses for the TPS544C26 or change to scan only the specific I2C address the TPS544C26 is set to use. By default, the position of the shunt on the EVM jumper sets the TPS544C26 address to 0x70.

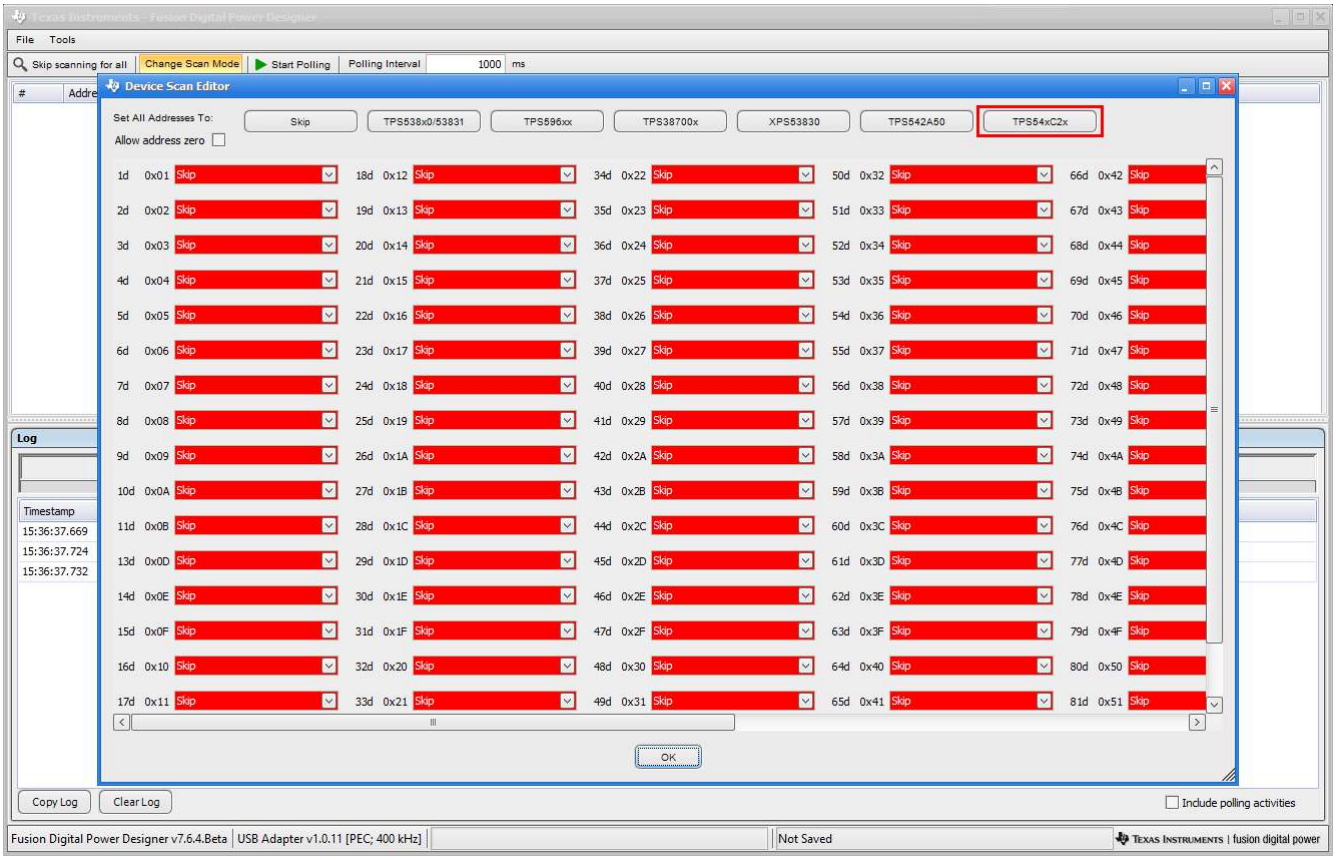

Figure 5-2. I2C GUI Scan Mode

5.2 On and Off Control OPERATION (01h) and ON_OFF_CONFIG (02h)

By default, ON_OFF_CONFIG (02h) is programmed to *turn on and off by EN pin only* as shown in Figure 5-3. To turn the device on and off using OPERATION (01h), change to either the second or fourth option to use I2C control. After selecting a new option in ON_OFF_CONFIG, click on *Write to Hardware*. Clicking on the OPERATION checkbox immediately writes 1 or 0 to OPERATION to turn on or turn off the device respectively.

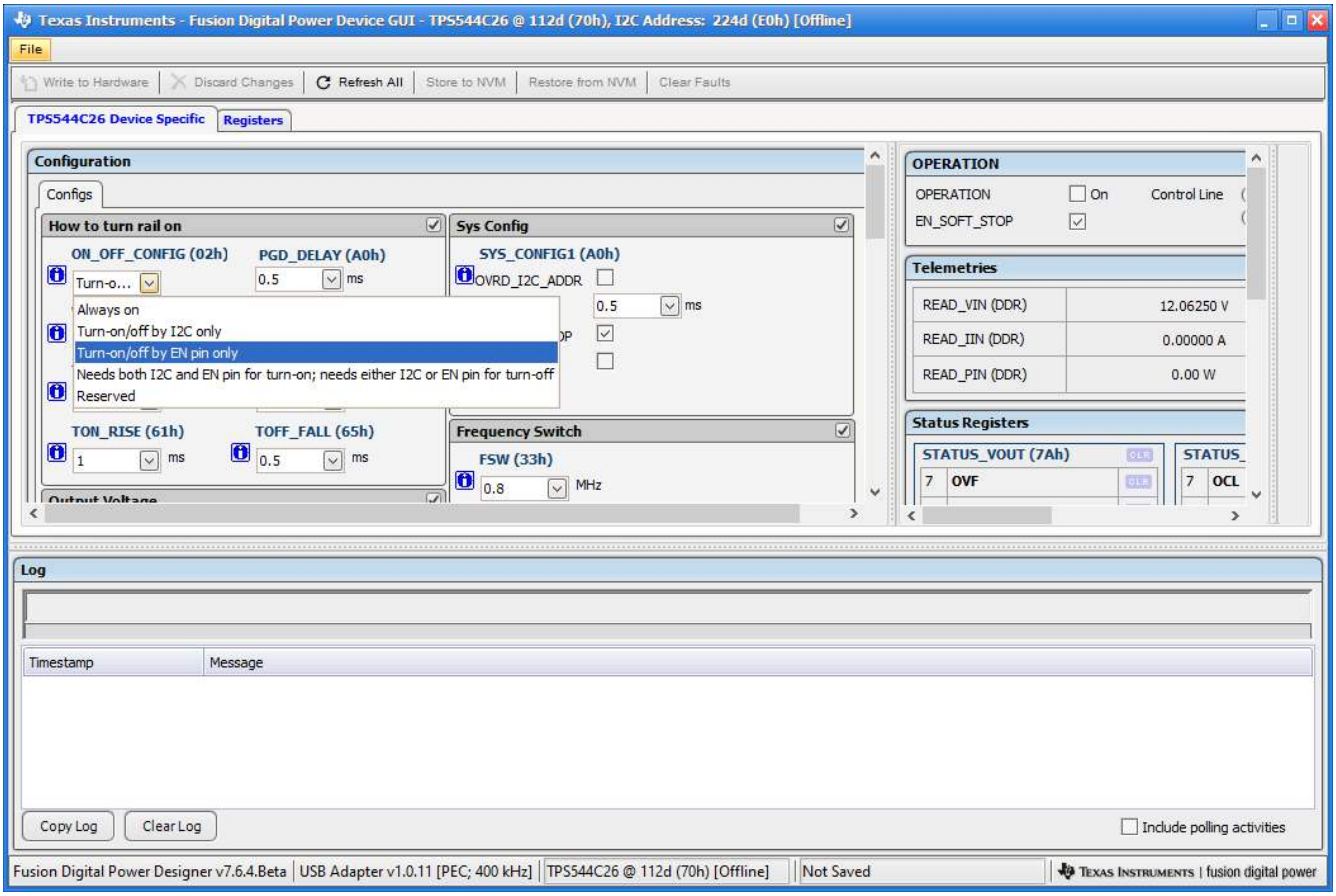

Figure 5-3. On and Off Control in the GUI

5.3 Changing SYS_CONFIG1 (A0h)

The SYS_CONFIG1 (A0h) register contains common settings such as enabling forced CCM and selecting how the output voltage is programmed. To write new settings, switching must first be disabled either through the EN pin or through OPERATION. See Section 5.2 for details on different options to enable and disable switching. If switching is enabled, the TPS544C26 NACKs. The new setting takes effect when switching is enabled again.

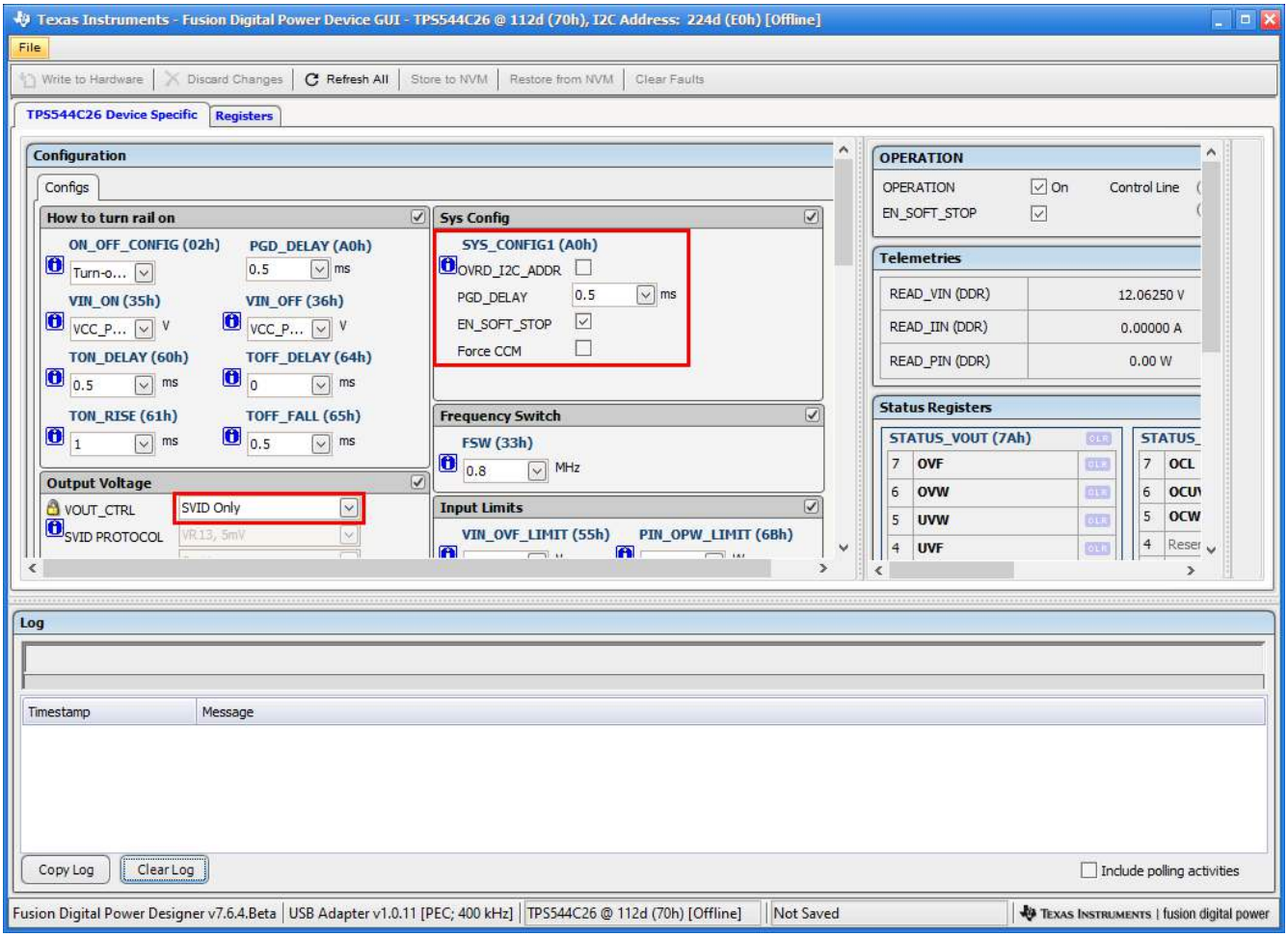

Figure 5-4. SYS_CONFIG1 GUI Updates

5.4 Changing the Output Voltage

SVID Only

By default, the TPS544C26 VOUT_CTRL is programmed to set the output voltage through *SVID Only*. With SVID only, the VBOOT setting within the TEMP_MAX (C1h) I2C register sets the initial output voltage after switching is enabled. When configured for SVID only, changing the VBOOT voltage is the only way to change the output voltage in the GUI. If programmed while the device is switching, switching must be disabled then re-enabled for the new VBOOT voltage to take effect.

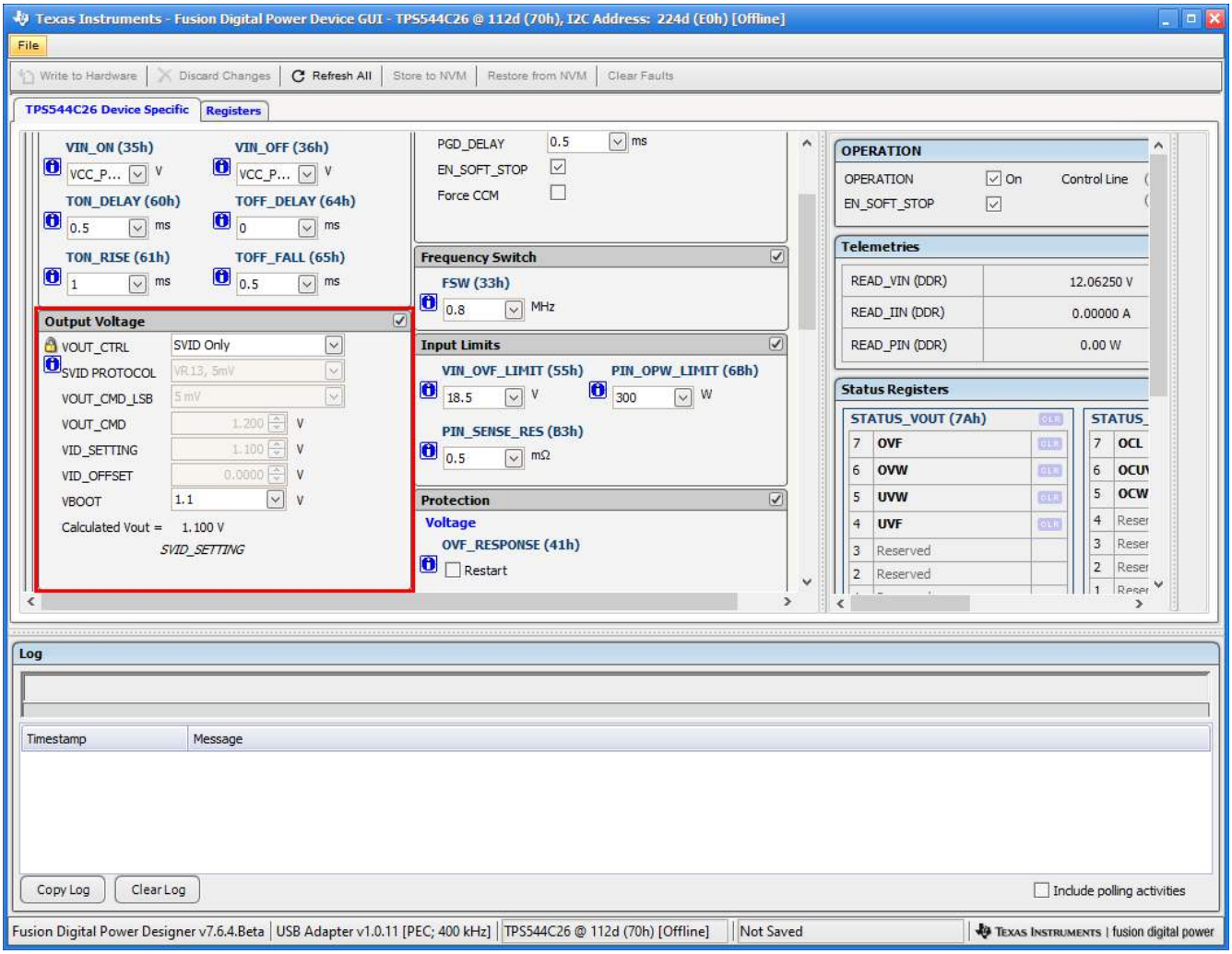

Figure 5-5. VOUT_CTRL - SVID Only

SVID VID_SETTING+ I2C VID_OFFSET

When VOUT_CTRL is programmed for the second setting *SVID VID_SETTING+ I2C VID_OFFSET*, the VBOOT voltage is the only way to set the output voltage. However, with this setting, the offset can be changed through the GUI with the VID_OFFSET (A8h) I2C register. Switching must be disabled when changing the VID_OFFSET value. If the VID_OFFSET is changed while switching is enabled the TPS544C26 ACKs but the updated value is not be written to the register. When using the 5-mV VID table, the step size of VID_OFFSET is 0.5 mV and when using the 10 mV VID table, the step size of VID_OFFSET is 1 mV.

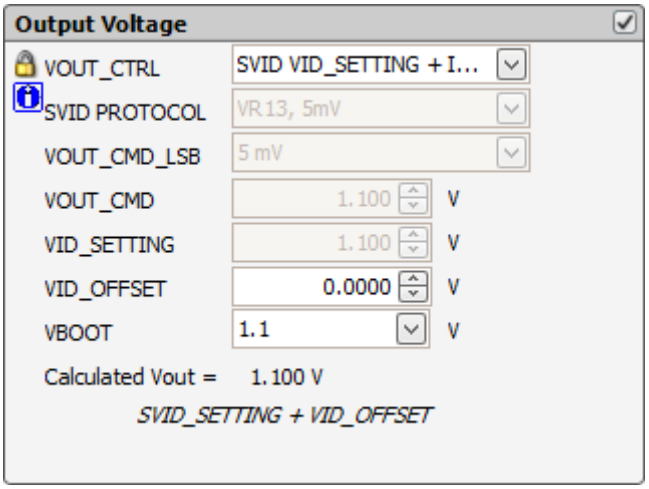

Figure 5-6. VOUT_CTRL - SVID and I2C

I2C Only

Lastly, when configured for the third setting, *I2C Only*, the output voltage is programmed through the I2C registers VOUT_CMD (BFh) and VID_OFFSET (A8h). When using this setting, the 5-mV or 10-mV step size of VOUT_CMD is set by the VOUT_CMD_LSB control in the GUI. The VOUT_CMD_LSB control in the GUI adjusts bit 7 in the COMP3 (ADh) I2C register. With this setting, writes to both VOUT_CMD and VID_OFFSET while the device is switching receives an ACK. However, the new value does not take effect until switching is disabled then re-enabled.

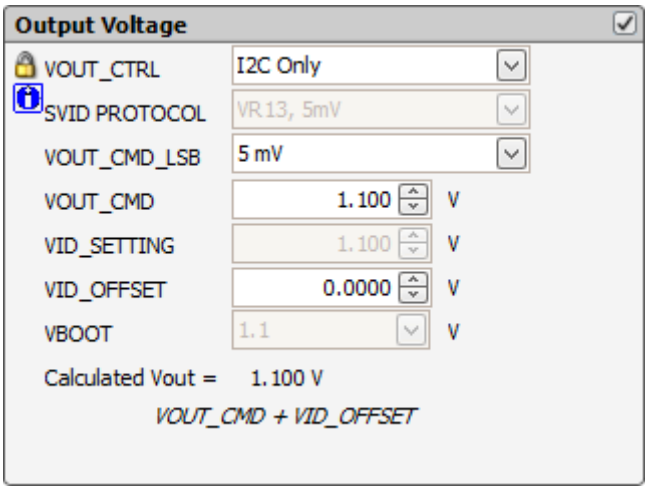

Figure 5-7. VOUT_CTRL - I2C Only

5.5 Exporting and Importing Configurations

Exporting

A device configuration can be exported and saved by going to **File** then **Save As** to save a tii2c file or **File** then **Export** to save a script in csv format to program another device. When exporting a csv script, the window shown in Figure 5-8 opens up to select different export options for the script.

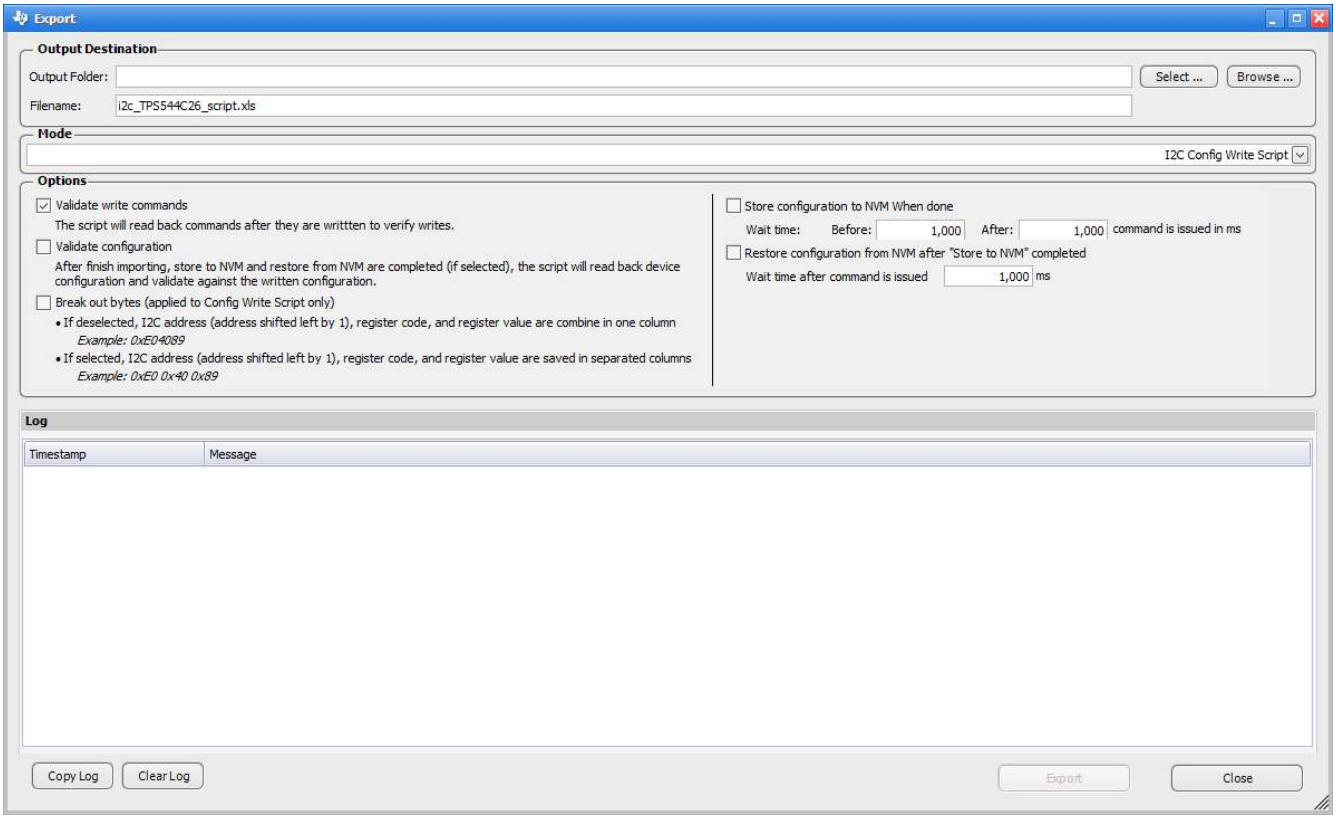

Figure 5-8. Exporting a csv Script from the GUI

Importing

A device configuration can imported by going to **File** then **Import**. Disable switching when importing a file because some registers require switching to be disabled for the TPS544C26 to ACK or to be updated.

When importing a file, switching can be enabled during the import process if OPERATION or ON_OFF_CONFIG is being updated. This action can result in a NACK from the TPS544C26 or registers not being updated. To avoid this event when importing a tii2c file, writes to OPERATION and ON_OFF_CONFIG can simply be skipped as shown in Figure 5-9. To avoid this event when importing a csv script, either ensure the exported script has OPERATION and ON_OFF_CONFIG settings which keep switching disabled or modify the script to move these updates to the end.

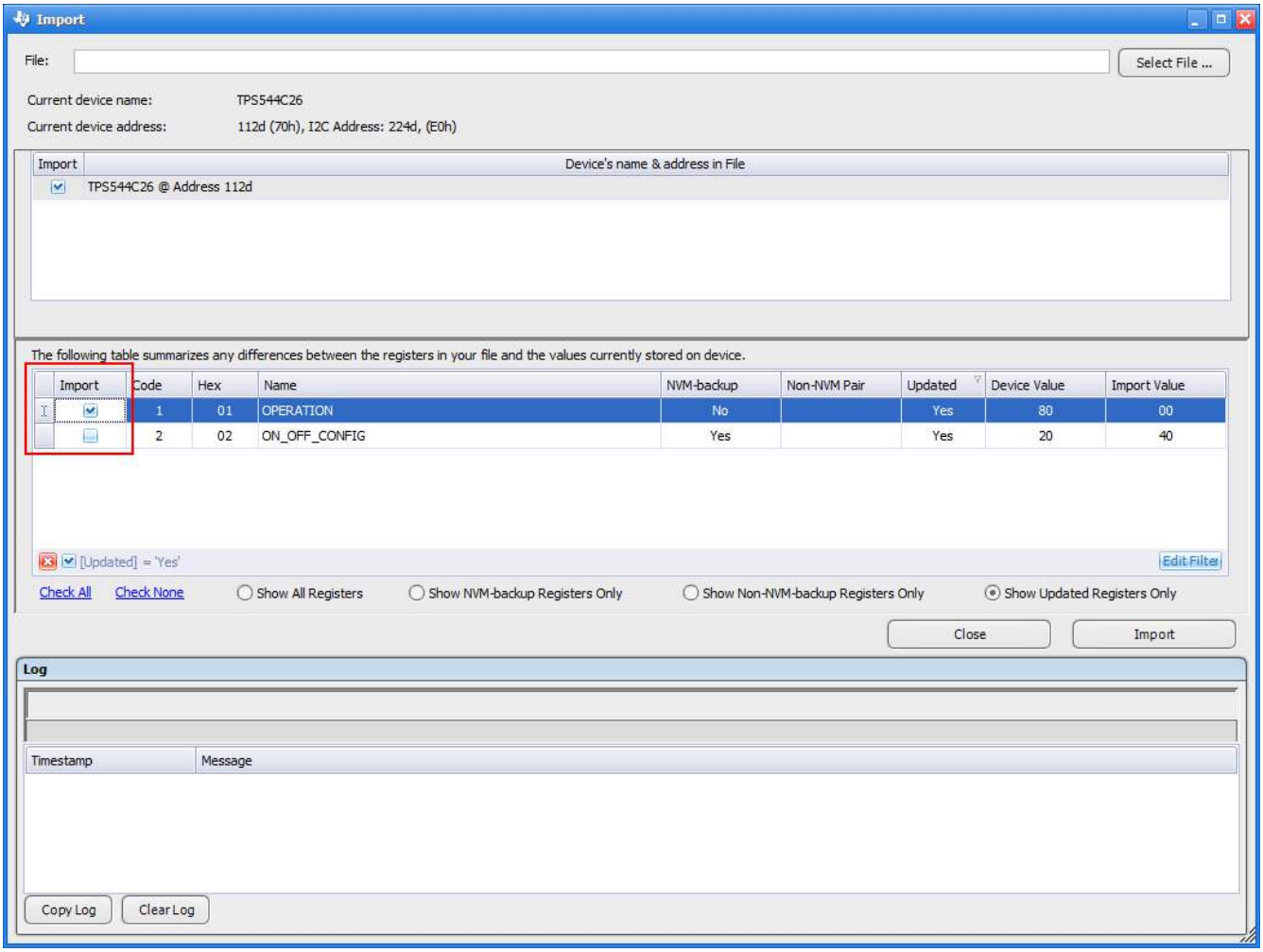

Figure 5-9. Importing tii2c File to the GUI

5.6 Store to and Restore from NVM

The device configuration can be stored to NVM by clicking on *Store to NVM* at the top of the GUI. The device configuration stored in NVM can be restored by clicking on *Restore from NVM* at the top of the GUI. Switching must be disabled before restoring from NVM or the operation NACKs.

6 Schematics

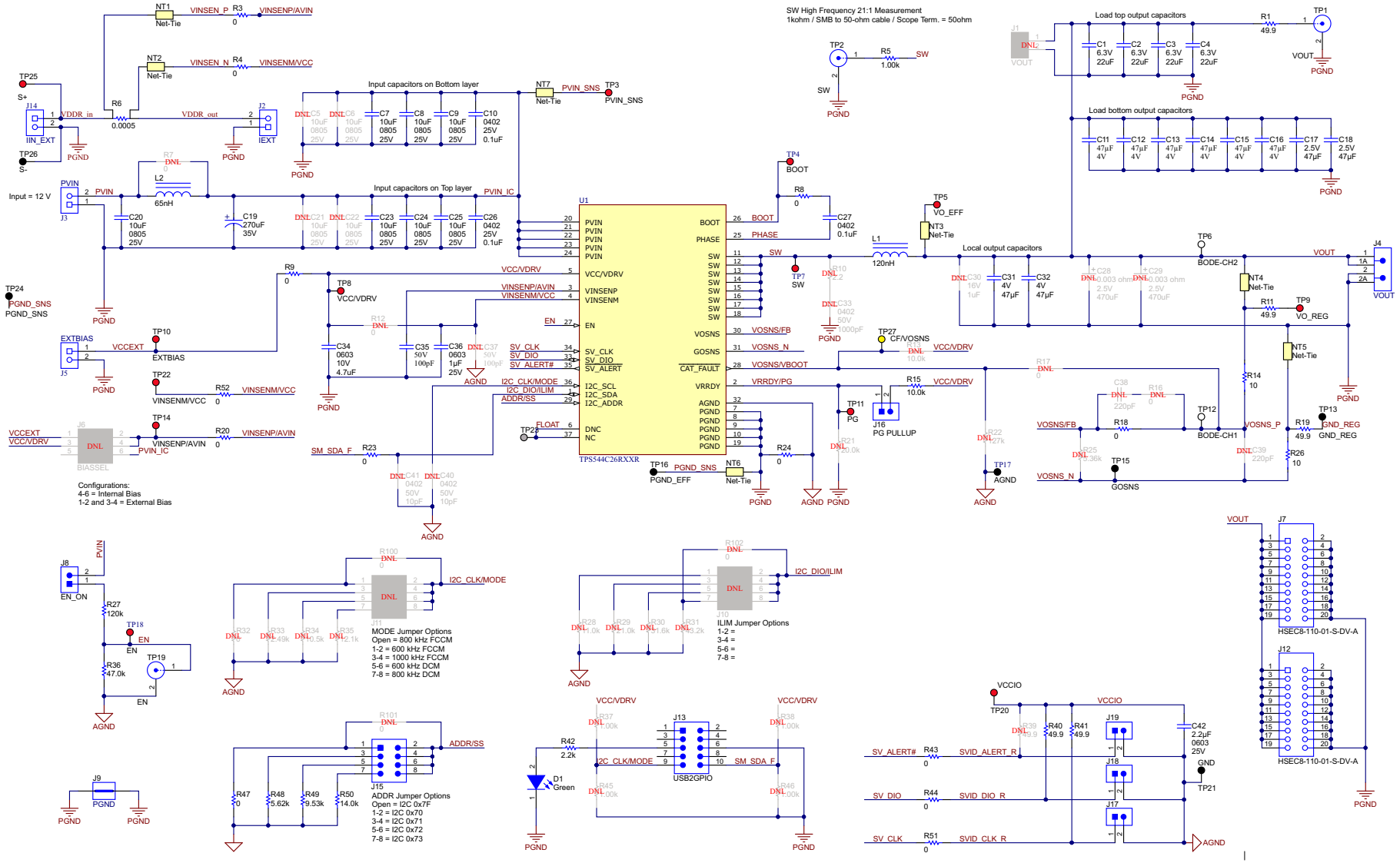

Figure 6-1. TPS548C26EVM Schematic

7 PCB Layout

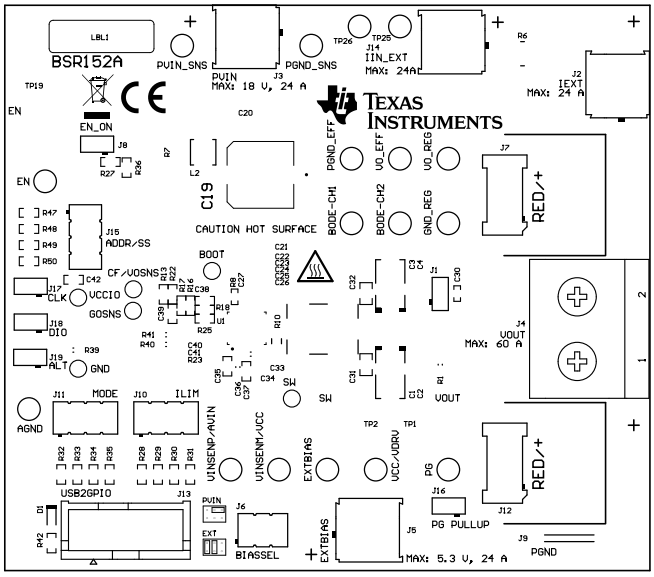

Figure 7-1. TPS544C26EVM Top Composite View

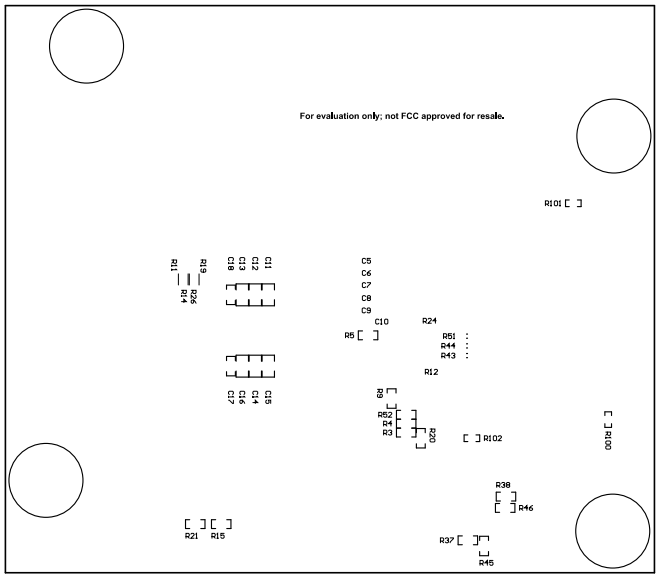

Figure 7-2. TPS544C26EVM Bottom Composite View (Viewed From Bottom)

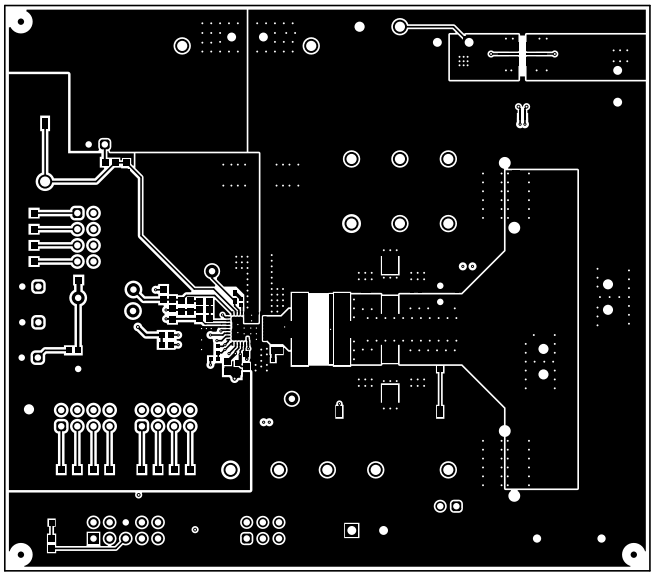

Figure 7-3. TPS544C26EVM Top Layer

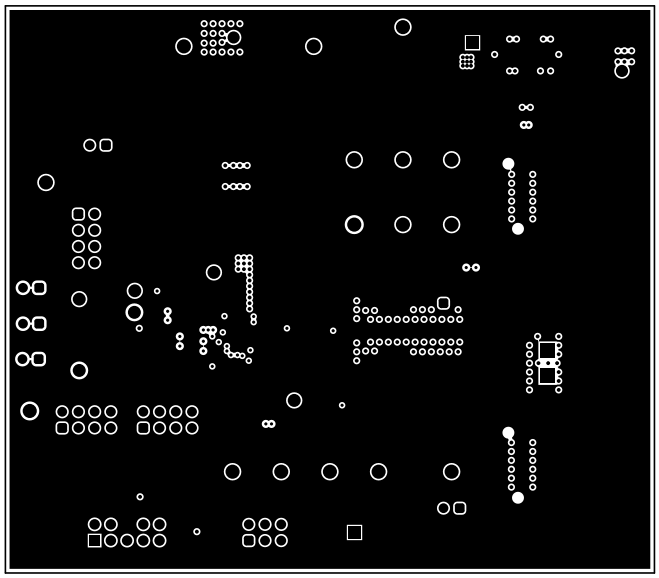

Figure 7-4. TPS544C26EVM Layer 2

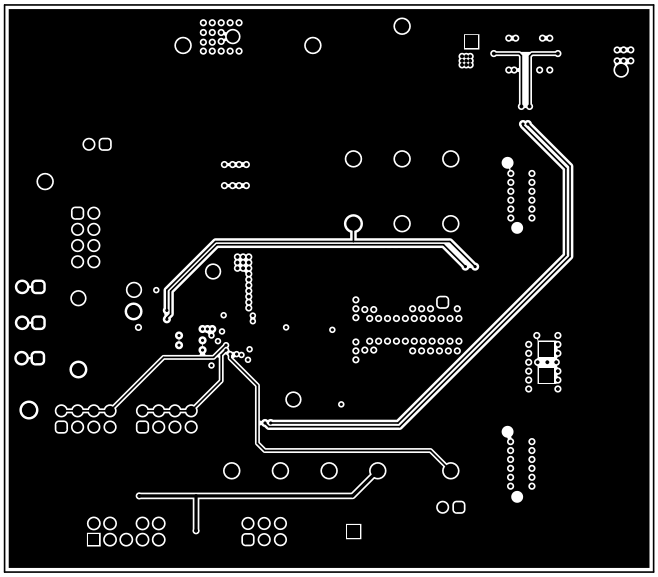

Figure 7-5. TPS544C26EVM Layer 3

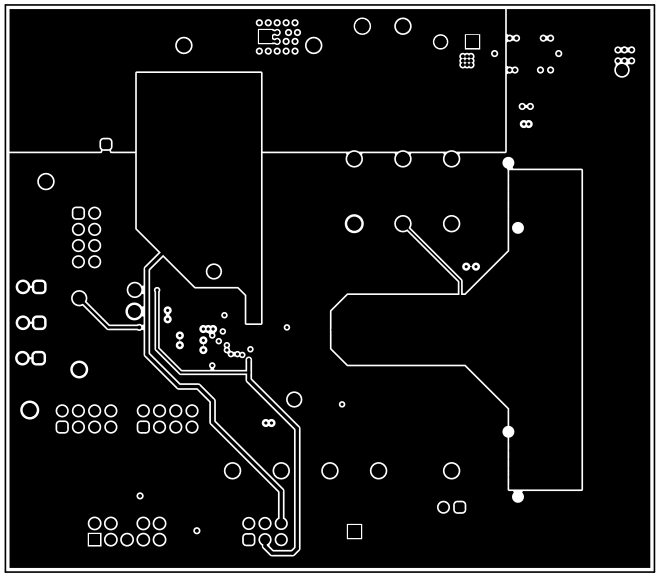

Figure 7-6. TPS544C26EVM Layer 4

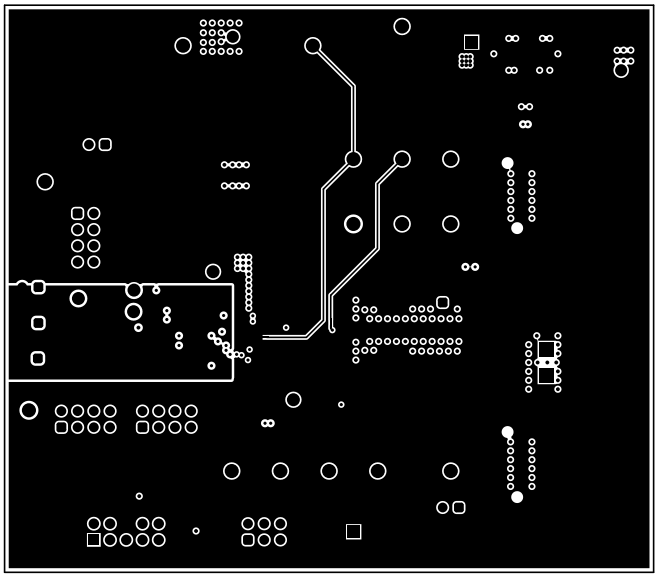

Figure 7-7. TPS544C26EVM Layer 5

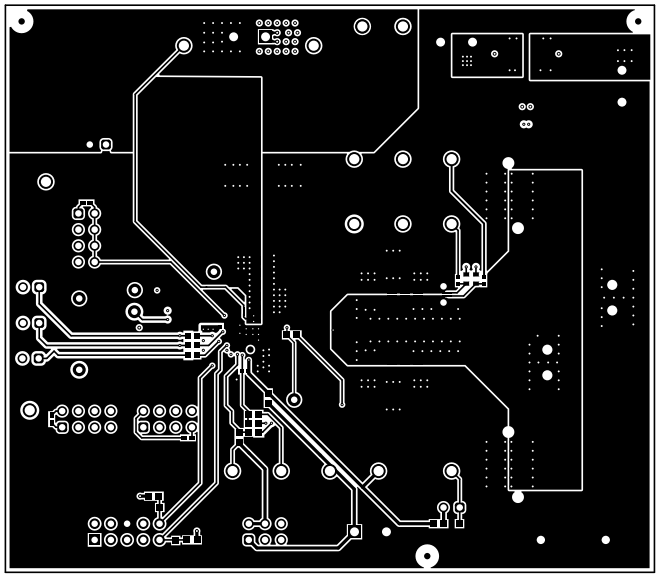

Figure 7-8. TPS544C26EVM Bottom Layer

8 BOM

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
!PCB1	1		Printed Circuit Board		BSR152	Any
C1, C2, C3, C4	4		CAP CER 22UF 6.3V X5R 0402	0402	CL05A226MQ5N6J8	Samsung Electro-Mechanics
C7, C8, C9, C20, C23, C24, C25	7	10 uF	CAP, CERM, 10 uF, 25 V, +/- 10%, X7R, 0805	0805	GRM21BZ71E106KE15L	MuRata
C10, C26, C27	3	0.1 uF	CAP, CERM, 0.1 uF, 25 V, +/- 10%, X7R, 0402	0402	GRM155R71E104KE14D	MuRata
C11, C12, C13, C14, C15, C16, C31, C32	8	47 uF	CAP, CERM, 47 µF, 4 V,+/- 20%, X6S, 0805	0805	GRM21BC80G476ME15L	MuRata
C17, C18	2	47 uF	CAP, CERM, 47 µF, 2.5 V,+/- 20%, X6S, 0603	0603	GRM188C80E476ME05D	MuRata
C19	1	270 µF	Cap Aluminum Polymer 270 uF 35 V 20% Solder Cylindrical 22 m Ohm 2200 mA 2000 hr 125°C T/R	SMT_CAP_10MM3_10MM3	A768MS277M1VLAE022	KEMET
C34	1	4.7 uF	CAP, CERM, 4.7 uF, 10 V, +/- 10%, X7S, 0603	0603	C1608X7S1A475K080AC	TDK
C35	1	100 pF	CAP, CERM, 100 pF, 50 V, +/- 5%, C0G/NP0, 0603	0603	GRM1885C1H101JA01D	MuRata
C36	1	1 uF	CAP, CERM, 1 µF, 25 V,+/- 10%, X7R, 0603	0603	C1608X7R1E105K080AE	TDK
C42	1	2.2 uF	CAP, CERM, 2.2 µF, 25 V,+/- 10%, X7S, 0603	0603	GRM188C71E225KE11D	MuRata
D1	1	Green	LED, Green, SMD	LED_0603	150060GS75000	Wurth Elektronik
H1, H2, H3, H4	4		Bumpon, Hemisphere, 0.44 X 0.20, Clear	Transparent Bumpon	SJ-5303 (CLEAR)	3M
J2, J3, J5, J14	4		Therminal Block, 5 mm, 2-pole, Tin, TH	TH, 2-Leads, Body 10x10mm, Pitch 5mm	282856-2	TE Connectivity
J4	1		Terminal Block, 60 A, 10.16-mm Pitch, 2-Pos, TH	21.8x30x19 mm	399100102	Molex
J7, J12	2		Card Edge Socket, 0.8mm, 10x2, SMT	Card Edge Socket, 0.8mm, 10x2, SMT	HSEC8-110-01-S-DV-A	Samtec
J8, J16, J17, J18, J19	5		Header, 2.54mm, 2x1, Gold, TH	Header, 2.54mm, 2x1, TH	TSW-102-08-G-S	Samtec
J9	1		1-mm Uninsulated Shorting Plug, 10.16-mm spacing, TH	Shorting Plug, 10.16mm spacing, TH	D3082-05	Harwin
J13	1		Header (shrouded), 100mil, 5x2, Gold, TH	5x2 Shrouded header	5103308-1	TE Connectivity
J15	1		Header, 2.54mm, 4x2, Gold, TH	Header, 2.54mm, 4x2, TH	TSW-104-08-L-D	Samtec
L1	1	120 nH	Inductor, Shielded, Ferrite, 120 nH, 35.5 A, 0.000228 ohm, SMD	10.8x7.2x7.5mm	SLC1175-121MEB	Coilcraft
L2	1	65 nH	Inductor, Ferrite, 65 nH, 19 A, 0.00032 ohm, SMD	4.0x4.0x4.0mm	FP0404R1-R065-R	Coiltronics
LBL1	1		Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	PCB Label 0.650 x 0.200 inch	THT-14-423-10	Brady
R1, R40, R41	3	49.9	RES, 49.9, 1%, 0.1 W, 0603	0603	RC0603FR-0749R9L	Yageo
R3, R4, R9, R18, R20, R43, R44, R47, R51, R52	10	0	RES, 0, 5%, 0.1 W, 0603	0603	RC0603JR-070RL	Yageo

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
R5	1	1.00k	RES, 1.00 k, 1%, 0.1 W, 0603	0603	RC0603FR-071KL	Yageo
R6	1	0.0005	RES, 0.0005, 1%, 3 W, AEC-Q200 Grade 0, 2512	2512	WSLP2512L5000FEA	Vishay-Dale
R8, R23, R24	3	0	RES, 0, 5%, 0.1 W, AEC-Q200 Grade 0, 0402	0402	ERJ-2GE0R00X	Panasonic
R11, R19	2	49.9	RES, 49.9, 1%, 0.1 W, AEC-Q200 Grade 0, 0402	0402	ERJ-2RKF49R9X	Panasonic
R14, R26	2	10	Thick Film Resistors - SMD 0603 10ohms 5% AEC-Q200	0603	ERJ-3GEYJ100V	Panasonic
R15	1	10.0k	RES, 10.0 k, 1%, 0.1 W, 0603	0603	ERJ-3EKF1002V	Panasonic
R27	1	120k	RES, 120 k, 1%, 0.1 W, 0603	0603	RC0603FR-07120KL	Yageo
R36	1	47.0k	RES, 47.0 k, 1%, 0.1 W, 0603	0603	RC0603FR-0747KL	Yageo
R42	1	2.2k	RES, 2.2 k, 5%, 0.1 W, 0603	0603	RC0603JR-072K2L	Yageo
R48	1	5.62k	RES, 5.62 k, 1%, 0.1 W, 0603	0603	RC0603FR-075K62L	Yageo
R49	1	9.53k	RES, 9.53 k, 1%, 0.1 W, 0603	0603	RC0603FR-079K53L	Yageo
R50	1	14.0k	RES, 14.0 k, 1%, 0.1 W, 0603	0603	RC0603FR-0714KL	Yageo
SH-J1, SH-J2, SH-J7	3	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec
TP1, TP2, TP19	3		Connector, Receptacle, 50 ohm, TH	SMB Connector	SMBR004D00	JAE Electronics
TP3, TP5, TP8, TP9, TP10, TP11, TP14, TP18, TP22, TP25	10		Test Point, Multipurpose, Red, TH	Red Multipurpose Testpoint	5010	Keystone
TP4, TP7, TP20	3		Test Point, Miniature, Red, TH	Red Miniature Testpoint	5000	Keystone
TP6, TP12	2		Test Point, Multipurpose, White, TH	White Multipurpose Testpoint	5012	Keystone
TP13, TP16, TP17, TP24, TP26	5		Test Point, Multipurpose, Black, TH	Black Multipurpose Testpoint	5011	Keystone
TP15, TP21	2		Test Point, Miniature, Black, TH	Black Miniature Testpoint	5001	Keystone
TP27	1		Test Point, Miniature, Yellow, TH	Yellow Miniature Testpoint	5004	Keystone
U1	1		4-V – 16-V, 35-A Synchronous Buck Converter with SVID and I2C Interface for Intel CPU Power	WQFN-FCRLF37	TPS544C26RXXR	Texas Instruments

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