User's Guide TPS536C7 DCAP+, DC/DC Step-down Controller Evaluation Module for CPU/ASIC Core Rail Applications

TEXAS INSTRUMENTS

ABSTRACT

The TPS536C7EVM implements a typical application for a low-voltage, high current dual output power converter, operating from a nominal 12-V input rail to produce a 0.88-V output rail at up to 400A(12-phases) of load current and a 1-V rail at up to 50 A(2-phases). The EVM includes test points for evaluating the performance of the TPS536C7 controller and CSD95410 power stages

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1 Introduction

For ease of evaluation, the EVM requires only one (12-V) input supply and an output load to get started with testing, however the user can opt to independently provide 5-V for greater control over the Power Stage voltage. With the addition of the Fusion Digital Power™ Designer software, the EVM's PMBus™ interface allows access to the controller NVM for evaluation of additional configuration, control and monitoring possibilities. Refer to the TPS536C7 datasheet for complete information on configuring multi-phase operation with this controller.

2 Features

- Dual regulated high current outputs
- Configurable as maximum phases 12+0, 11+1 and 10+2.
- Programmable settings available through PMBus[™] interface
 - Output voltage trim
 - Output voltage margin levels (High / Low) within a maximum range
 - UVLO protection threshold
 - Soft-start slew-rate
 - Device enable and disable
 - Overcurrent warning and fault limits
 - Switching frequency
 - BOOT voltage
 - Monitoring of input and output voltage, current, power, and power stage temperature
- · Convenient test points for probing critical waveforms

3 Applications

- High current ASIC and FPGA core power in the following equipment:
 - Wired and Wireless Networking
 - Enterprise Server and Storage Networks
 - Test and Measurement
 - Smart Grid Infrastructure
 - Aerospace and Defense
 - Merchant Power Supplies

4 System Description

The TPS536C7EVM-051 is a 12-phase comprehensive evaluation module (EVM) for CPU/ASIC core power rail applications using the TPS536C7 controller. Figure 4-1 shows the top side of the EVM and Figure 4-2 shows the bottom side of the EVM. The EVM possesses several hooks for placing meters and probes by providing appropriate test points on various nodes .

The copper lugs T1 and T2 are the conversion input terminals to the step-down DC/DC converter. Input terminals are the point of connection of the input DC voltage.

With J5 closed, an on-board buck converter (TPS62133) generates the 5-V power stage VDD voltage. With J5 open, TPS62133 is disabled, and the 5-V supply must be applied to J1 externally. A 5-V to 3.3-V LDO (TLV75733) generates the 3.3-V controller bias voltage, and also supplies auxiliary circuits and LEDs on the EVM.

The output terminals T3, T4, T5, T6,T7,T8,T9,T10 and T11 are copper lugs providing a connection point for the high-current load. Figure 4-3 shows the location of all component details in the EVM. The setup is explained in detail in next section.



Figure 4-1. EVM Top View

4





Figure 4-2. EVM Bottom View



System Description

contr 2 Mbus GUI AILB Powerstages owerstade EN_UOUT_A 115 🛄 PUOUT_B 110 RAILA enable VOUTB EN UN RAILB enable TEXAS INSTRUMENTS 11 BMC051A OAD TPS536C7EVM-05 E **RoHS Exempt** \bigcirc Dent VOUTA : 0.99Vdc Iout: 400Adc Max AD SWI

Figure 4-3. EVM Options

4.1 Phase configuration Selection

This EVM supports testing of both rails (RAILA and RAILB). The maximum number of phases available for RAIL A is 12-phases and for RAILB is 2 phases . PWM11 and PWM12 pins share control for both rails. Select the jumper settings for phase configuration 12+0,11+1,10+2 as shown in Phase configuration selection

	······································								
Phase configuartion	Jumper J10	Jumper J11	Jumper J12	Jumper J13					
12+0	1-2 short	1-2 short	1-2 short	1-2 short					
(Default)									
11+1	1-2 short	1-2 short	2-3 short	2-3 short					
10+2	2-3 short	2-3 short	2-3 short	2-3 short					

Table 4-1. Phase configuation selection

4.2 Jumper details

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All Jumper description as follows



	Table 4-2. Jumper	
Jumper	Description	Default
J1	5V External Supply Input	No external supply
J2	Internal 5V Supply Input	short
J3	3V3 VCC External Supply Input	No external supply
J4	LDO output 3V3 supply	short
J5	5V Supply selector either 12V derived(short) or external(open)	short
J6	VOUTA Sense	Open
J7	VOUTB Sense	Open
J8	PMBUS Connector	Open
J9	Placehodler	Open
J10	Phase configuration selection	Short(pin1-2)
J11	Phase configuration selection	Short(pin1-2)
J12	Phase configuration selection	Short(pin1-2)
J13	Phase configuration selection	Short(pin1-2)
J14	VOUTA Onboard Transient Load Signal Generator Selector	Open

Table 4-3. Connector function

Connector	Description
T1	VIN + Connector
T2	VIN - Connector
T3,T4,T5,T6	VOUTA + Connectors
T7,T8,T9,T11	VOUTA - Connectors
T10	VOUTB - Connectors
T12	VOUTB - Connectors
TP13	External Function generator connector
J15	VOUTAOutput Measurement Point
J16	VOUTB Output Measurement Point

4.3 On-board load transient

EVM board has option of load transient test. There are 4 parallet loads connected for RAILA as shown in Figure 4-4. Each load can be turned-ON/OFF indepedntly with SWITCH S3. Placed Jumper J14 in order to provide drive signal from onboard 555 timer (~1.2 kHz, 8% Duty cycle) or inject drive signal in TP13 from signal generator. The resistor (0.2ohm) packahe is 2502 and maximum power dissipation 2W. so External signal duty cycle shoud not to exceed 20% duty cycle as thermal rating. Each load resistance(R1) is 11.7mohm and Switch RDS(ON) is 2mohm. Total resistance per load bank is 13.7mohm. The total resistance value with all 4 load bank is ~3.8mohm with including board parasitics. so if RAILA output output voltgae is 0.88V, load step is 230A(0.88/3.8m)

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Figure 4-4. On Board Load transient



5 Test Equipment

Voltage sources	Only one DC input voltage sources is needed (VIN). The VIN input voltage source should be a 0 V to 14 V variable DC source capable of supplying 50 Adc. Connect VIN to terminals J6 and J7 as shown in #unique_13/ unique_13_Connect_42_GUID-E4E7EEE8-3440-4623-B755-7451DD1BE9A4. For greater control during testing, one can remove jumpers from J2 and J4 to bypass the onboard 5-V power supply. This external supply should be limited to 1 Adc
Multimeters	Recommended to use two separate multimeters, one meter to measure VIN and the other to measure VOUT.
Output Load	An electronic load is recommended for the test setup shown in #unique_13/unique_13_Connect_42_GUID- E4E7EEE8-3440-4623-B755-7451DD1BE9A4. To observe the Rail A at full load the electronic load should be capable of sinking 400 A at 0.88-V (Rail B, 50 A at 1V)
Oscilloscope	Use an oscilloscope to measure output noise and ripple. Use a coaxial cable to measure output ripple across J15(VOUTA) and J16(VOUTB)
USB-to-GPIO InterfaceAdapter	A communications adapter is required between the EVM and the host computer. This EVM is designed to use the Texas Instruments USB-to-GPIO adapter connected to J12. To purchase this adapter visit the TI USB-to_GPIO tool page
Fan	During prolonged operation at high load (More than 300 A), it is necessary to provide forced air cooling with a small fan aimed at the EVM. Maintain the temperature of the devices on the EVM under115°C

Table 5-1. Required Test Equipment



Figure 5-1. EVM Test Setup Showing the Power Supply, Load, and Oscilloscope Connections



Test Equipment

	CONNECT	RECOMMENDED WIRE	MAXIMUM TOTAL WIRE LENGTH (FEET)					
VOLIAGE (V)	CONNECT	SIZE	RETURN	INPUT	OUTPUT			
12	VIN to T1, GND to T2	2 × AWG #8	2	2	n/a			
5 (if J2 open)	5VIN to J1	2 × AWG #18	2	2	n/a			
0.88(RAILA)	Load+ to T3, T4, and T5, Load- to T7, T8, and T9	6 × AWG #4	3	n/a	3			
1(RAILB)	Load+ to T10, Load- to T9 and T12	2 × AWG #8	1	n/a	1			

Table 5-2. Recommended Wire Size



6 Test Procedure

All the below tests are done with 10+2 configuration. So refer to Table 4-1 for jumper setting selection and keep same jumper positions (J10, J11, J12 and J13) for the following tests.

6.1 Start-up Test

Use the following procedure for the start-up test.

RAILA:

- 1. Set the load current to 50 A.
- 2. Make sure all default jumpers(J1 to J9) settings as shown in Table 4-2.
- 3. Connect probes Enable(TP11), VOUTA(J15, BNC cable), PWM1(TP31) and VOUT_A_RDY(TP22).
- 4. Set up the time / div on the oscilloscope to: 500 μ s/div.
- 5. Set the trigger to channel 1 'Enable_A' on the rising edge at about 1 V.
- 6. Turn on the power supply (with the voltage set to 12 V and the current limit set to 10 A).
- 7. Slide the enable switch 'S1' to the ON position .



Figure 6-1. VOUTA Enable startup with TON delay=0ms

RAILB:

- 1. Set the load current to 10 A.
- 2. Make sure all default jumpers(J1 to J9) settings as shown in Table 4-2.
- 3. Connect probes Enable_B(TP12), VOUTB(J16, BNC cable), BPWM1(TP55) and VOUT_B_RDY(TP23).
- 4. Set up the time / div on the oscilloscope to: 500 $\mu s/div.$
- 5. Set the trigger to channel 1 'Enable_B' on the rising edge at about 1 V.

- 6. Turn on the power supply (with the voltage set to 12 V and the current limit set to 5 A).
- 7. Slide the enable switch 'S2' to the ON position .



Figure 6-2. VOUTB Enable startup with TON delay=0ms

6.2 Shut down Test

Use the following procedure for the shut down test:

RAILA:

- 1. Set the load current to 50 A.
- 2. Make sure all default jumpers(J1-J9) settings as shown in Table 4-2 .
- 3. Connect probes Enable(TP11), VOUTA(J15, BNC cable), PWM1(TP31) and VOUT_A_RDY(TP22).
- 4. Set up the time / div on the oscilloscope to: 500 μ s/div.
- 5. Set the trigger to channel 1 'Enable_A' on the falling edge at about 1 V.
- 6. Turn on the power supply (with the voltage set to 12 V and the current limit set to 10 A).
- 7. Slide the enable switch 'S1' to the ON position and measure output voltage as 0.88V.
- 8. Turn-off the switch "S1" to OFF position.







Figure 6-3. VOUTA Enable OFF, Immediate-off





RAILB:

1. Set the load current to 10 A.

- 2. Make sure all default jumpers (J1-J9) settings as shown in Table 4-2.
- 3. Connect probes Enable_B(TP12), VOUTB(J16, BNC cable), BPWM1(TP55) and VOUT_B_RDY(TP23).
- 4. Set up the time / div on the oscilloscope to: 500 μ s/div.
- 5. Set the trigger to channel 1 'Enable_B' on the falling edge at about 1 V.
- 6. Turn on the power supply (with the voltage set to 12 V and the current limit set to 5 A).
- 7. Slide the enable switch 'S2' to the ON position and measure output voltage as 1V.
- 8. Turn-off the switch "S2" to OFF position.



Figure 6-5. VOUTB Enable OFF, Immediate-off





Figure 6-6. VOUTB Enable OFF Soft-off with TOFF delay=1ms

6.3 Steady-state Test

Use the following procedure for the steady-state test:

RAILA:

- 1. Set the load current to 50 A.
- 2. Make sure all default jumpers(J1 to J9) settings as shown in Table 4-2.
- 3. Connect probes VOUTA(J15, BNC cable), PWM1(TP31), PWM2(TP32) and PWM3(TP33).
- 4. Add offset to VOUTA signal as 0.88V, and 4mV/div.
- 5. Set up the time / div on the oscilloscope to: 1 μ s/div.
- 5. Turn on the power supply (with the voltage set to 12 V and the current limit set to 10 A).
- 6. Slide the enable switch 'S1' to the ON position and measure output voltage as 0.88V.
- 7. Measure output voltge rippe and phase interleaving.
- 8. Jitter can be measured with set scope in"Fast aquaition mode".



 PWM1

 FWM2

 FWM3

 FWM3

 FWM4

 FWM3

 FW3

 FW3
 <

Figure 6-8. VOUTA PWM Jitter

RAILB:

1. Set the load current to 10 A.



2. Make sure all default jumpers(J1 to J9) settings as shown in Table 4-2.

- 3. Connect probes VOUTB(J16, BNC cable), BPWM1(TP31), BPWM2(TP55) and PWM3(TP57) as shown.
- 4. Add offset to VOUTB signal as 1V, and 4mV/div.
- 5. Set up the time / div on the oscilloscope to: 1 μ s/div.
- 5.Turn on the power supply (with the voltage set to 12 V and the current limit set to 10 A).
- 6. Slide the enable switch 'S2' to the ON position and measure output voltage as 1V.
- 7. Measure output voltge rippe and phase interleaving.
- 8. Jitter can be measured with set scope in "Fast aquaition mode".



Figure 6-9. VOUTB Steady-state Output voltage Ripple



Figure 6-10. VOUTB PWM jitter

6.4 Load Transient Test

The EVM is equipped with an onboard load transient generator for testing fast transients that is seen in processor type loads. To generate a load transient, it can be used as internal 555 timer or external repetitive pulse function generator. This pulse height must be 5V. Please refer to the Section 4.3 section for details

- 1. Connect jumper J14 to use internal signal or apply external function gernerator at TP13.
- 2. Set the required steady-state load current(50A).
- 3. Connect probes VOUTA(J15, BNC cable), PWM1(TP31), PWM2(TP32).
- 4. Add offset to VOUTA signal as 0.88V, and 20mV/div.
- 5. Meaure output current at one resistor bank. so connect differntial probe paraleel to R60 and 700mV/div.
- 6. Turn on the power supply (with the voltage set to 12 V and the current limit set to 20 A)
- 7. Slide the enable switch 'S1' to the ON position and measure output voltage as 0.88V.
- 8. Turn on all 4 switches at load switch(S3) to get 225A load step at 0.88V.





Figure 6-11. VOUTA Load transient, Load step=50A to 275A



Figure 6-12. VOUTA Load transient, Load release=275A to 50A

6.5 Efficiency Plot

RAILA is configurated for 12-phases and refer to Table 4-1 for jumper setting (J10,J11,J12,J13)



- 1. Make sure all default jumpers(J1 to J9) settings as shown in Table 4-2.
- 2. Coneect three multimeters to measure Input voltage, Input current, output voltage.
- 3. Meaure Input voltage near powerstage VIN pin capacitor (C96)
- 4. Input current can be measured as volatge between TP14 and TP15 using Rsense(0.5mohm).
- 5. Measure Output voltage on one of the top ceramic capacitor close to center phase (C221).
- 6. Output current is same as electronic load display.



Note

 V_{IN} = 12 V, V_{OUT} = 880 mV, f_{SW} = 500 kHz, L_{OUT} = 150 nH, DPS disabled

Figure 6-13. RAILA, 12+0 configuration, Converter Efficiency and Power Loss Plot

6.6 Bode plot

The EVM includes a provision to also perform a Bode plot to examine the control loop stability. To perform this test, a Spectrum analyzer is required. The resistor R10 (RAILA) or R13 (RAILB) must be replaced with an appropriate terminating resistor (usually 10 Ω or 20 Ω). The signal must be connected to parallel to R10 or R13. The loop gain is measured using the spectrum analyzer . Figure 6-14 and Figure 6-15 shows a measurement of the Bode plot made on this EVM for RAILA and RAILB.











Figure 6-15. VOUTA Bode plot, Load current=20A

7 Fusion GUI

The allows the user to change several parameters of the TPS536C7 controller.

What follows is a brief introduction to familiarize users with the Fusion interface. For more details on the parameters one can modify, please refer to the datasheet.

When the Fusion GUI launches, it restores user preferences and data.

TEXAS INSTRUMENTS	
Fusion Digital Power Designer Version 7.3.2.7 [2020-08-26]	
Scanning USB Adapter #1 for devices	

Figure 7-1. Launch Fusion GUI

The Fusion GUI will open with the rail associated with the TPS536C7 controller on the [System View] screen as shown in Figure 7-2. If this were a power system that was populated with multiple Fusion GUI compatible devices, all of them would show up in the System View window. if TPS536C7 controller configured for only RAIL#1 like N+0, only RAIL#1 display as shown in Figure 7-2. For two rail N+M configuration display as shown in Figure 7-3



Figure 7-2. System View for N+0 phase configuration





Figure 7-3. System View for N+M phase configuration



Fusion GUI

Selecting [System Monitor] tab from the System View adds a new window which displays real-time system level information about all Fusion compatible devices connected as shown in Figure 7-5.

aling		On/Off Config	OPERA	TION			Control Lines (USB)		SMEAK	ert			Fault	lanagement		
1	500 🗟 ms	CONTROL Pin Only	Marga	ing		~	#1 () High	#2	OHeh		ARA	None			Clear Faults		
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PS536C7 @ PHB	vs Address 88d: 1. Re	d #1	-		-			TP	ssai667 (PHBus /	Address 84	Idi 2, Rail #	2				
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	Select Plots						2				Select Plots						
out - Rail #1								Vot	ut - Rail i	#2	_						
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0.20				-		-			0.20							1	
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								-			_						_
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2 58h	2 Ral #2	1.000	-0.844	29.594	CelAn	Off		ine	N/A			ě					

Figure 7-4. System Monitor for N+M phase configuration



Figure 7-5. System Monitor for N+0 phase configuration

Fusion GUI



Fusion GUI

The configuration of a specific device can be accessed through the [Click to Configure Device] link associated with the device in the System View. A new window will open to the [General] tab on the [System Configuration] page of the GUI as shown in Figure 7-6. One can switch between several tabs in the [Rail Configuration] menu to change different parameters of a Rail. The illustrations below show Rail A's parameters. To configure the these parameters on the other Rail, simply change options in the drop-down menu on the top- right corner.





A Konigures State	10.00									
3 Write to Hardiseni 1.3	Discard Drianges "Store Config to NVM 1	Restore NVM Config			_					
Configure	System Configuration Rail Config	uration Protection Calibration SMBAlert I	Mask NVM Programming All Confi	0						
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	Marrie Mithe	0.880	Toff Deleur	0.6250 C mViys						
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	USR2 Threshold:	Dirabled w mV	AC Gan	1.0 🕀		D-(Tipuzzi				
	OSR Threshold	Deabled (v) my	VDINT	60 V mV		and the second second			811	
	OSD Body Bralant	Disabled [V] my				200			-50	
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	MINION	60 💟 ns	DVID Configuration		5		C. Hard		_	~
										3
Configure										
(y soundare										
										9
🤣 Status	PMBus Log									9





Phase configuarion: It can be selected by clicking Advace option on top right side as shown in Figure 7-8. Each phase can be selected as enabled/disabled, RAIL0/RAIL1 and firing order. More details refer to TPS536C7 datasheet.

				Rail #	1				
									_
Phase Configuration	P								0
Phase Config:		Channel	A	Chann	el B		-	-	
Should be changed of switcher is disabled	nly when the		10 😴		2	-	Advance	2	
Frequency Switch:			500 🗸 ki	Name	EN	Page	Phase	Order	Turbo
				PWM1		0 🗸	9 -	0 ~	
Dynamic Phase Shedd	ling			PWM2	\square	0 🗸	12	2 🗸	
Enable dynamic p	hase shedding		0	PWM3	\checkmark	0 🗸	29	4	
himmum # of phases	i Phase 🗸	ZC Threshold		PWM4		0 🗸	3	6 🗸	
TOPS_FIL	0,5 9 119 3	START_PH	A5.mv	PWM5		0 🗸	4	8 🗸	
Drop Hysteress	DA 🗸			PWM6		0 🗸	5	9 🗸	
-				PWM7		0 🗸	6	1~	
	Peak Correct	wal Q Iaun Rope	ac op	PWM8	\checkmark	0 🗸	7~	3 🗸	
I-2 phages	20 🗸	15 M A		PWM9		0~	8 2	5~	
2-3 phases		15 ~		PWM10			4	7	
3-4 phases	54 🗸	15 🔍		PWM11		100			
#-5 phases		15 😽		DWM12		1			
5-6 phases	90 🖓	15 🗸		6.0014175		1	0 ~	1	
6-7 phases	125	15							1

Figure 7-8. Phase N+M Configuration

Protection tab: Depending on applictaions, All protection parametres for Output voltage/current, Input voltage/ current, Temperature can be selected as shown in Figure 7-9.



Fusion GUI

File Device Tools	Disant Common Store Confin to MAR Restore MAR Con	da.					Ral #1	_
Configure	System Configuration Rail Configuration Protect	tion Calibration	SMEAlert Mask NVM Programmer	Al Confg				
Config Level:	Con dub		[1	(manual second	3		-
○ Easy ③ Intermediate ○ Adivance	Output Voltage Trucking OFF Office (VID + Office) OVF Peed OVF Office (VID + Office) UVF Office (VID + Office) UVF Office (VID + Office) VOT MAXI VOUT MAXII VOUT MAXII VOUT MAXII VOUT MAXII VOUT MAXII VOUT MAXII	Image: Section 1 Image: Section 1	Input Voltage V(1) СУК V(1) СУК	3100 yr 1100 yr <t< th=""><th>Dulgat Carrent OCP OCP UCP 19448E Pedit Per Paae OCL limit OCP Recome UCP Recome UCP Recome Page fault cycles</th><th>400 [2] A. 400 [2] A 400 [2] A 500 // JOA [2] 100 // JOA [2]</th><th></th><th></th></t<>	Dulgat Carrent OCP OCP UCP 19448E Pedit Per Paae OCL limit OCP Recome UCP Recome UCP Recome Page fault cycles	400 [2] A. 400 [2] A 400 [2] A 500 // JOA [2] 100 // JOA [2]		
	TON MAX Balpone: O	104	IIN OCF: PIN OP Wars IIN OC Response:	52 준 A 562 준 W Cild ()				
	07m 07 Reporter 0	110 문 ·c ldt 오	VR_FAULT assert due	to overcarrent faults to overtemperature faults to faults on either channel				
	[4]							3
Configure								
A Monitor								
Status	P1/Bus Lod							



lile Device Tools				Ral #1
), What is Hardware 20 C	Social Disciplini Store Config to NVM Restore	NVM Config		
Configure	System Configuration Rail Configuration	Protection Calbration SMEAlert Mask NVM Program	mng All Config	
Config Level:	Output Current	3	Output Voltage	
) Easy	IOUT_CAL_GAIN (Tota):	5 000000 (F) eq.	Yout Third Diffeet	
Advance	IOUT_CAL_GAIN (High Temp):	Outrent setting		
	Jout Cal Gain Tamp Thresholdr	0.0 円 で	Input Current	
	Jout Cal Offset (Phase 1)	0.000 🕀 A	Input RShunt: 0.50 🐨 mQr	
	Jout Cal Offset (Phase 2):	5.000 (学) A	Input IIN (MAX): 80.0 🗄 A	
	Jout Cal Offset (Phase 3)	8.000 FBH A	0	
	Jout Cal Offset (Phase 4):	5.000 平 A	Calculated Digital Gain:	
	Jout Cal Offset (Phase 5):	0.000 合) 4	Calculated Analog Gain:	
	Lout Cal Offset (Phase 6)	0.000 田 A	Approximation of the second state ()	
	Jout Cal Offret (Phase 7):	0.000 El A	USER_DATA_13:	
	Jout Cal Offset (Phase 8):	0.000 101 4	IIN_OPS_CHA: 0.0000 A	
	Jour Cal Offset (Phase 9):	0.000 (20) &	IINMAX_CHA: 80.00 🗄	
	Jour Cal Offset (Phase 10):	0.111 (M) A	GINSHUNT_CHAI 20 V	
	Tout Cal Offset (Phase 11):	1000	CALCIIN_GAIN_A 0.925 V A/A	
	Jour Cal Offwer (Phase 17):	ample a	CALCIIN_GAIN_B 0.925 V A/A	
		6 100 (A) #	CALCEIN_FLT Do NOT allow V	
5116	-			
Configure				
Monitor				
() Crature	Phillippi			

Figure 7-10. Calibration tab



The [All Config] tab on the [Configure] page as shown in Figure 7-11 summarizes all the configurable parameters. This screen contains additional details such as the Hexadecimal encoding for the parameters.

prine (a resonance) [>]	Dimmi Charmen Store Config to NVM Restore NV	M Config										
onfigure	System Configuration Rail Configuration	Protection Ca	Ibration SMBAlert N	task NWM Pro	ogramming All Config							
hquri	Command	Code	Value/Edit	Hex/Edit	Command	Code	Value/Edit	Hex/Edit	Command	Code	Value/Edit	Hex/Edit
O Global Device	▼ Calibration	-		-	▼ Lanats	-	-	-	▼ Status	_	-	
Parameters	VOUT_TRIM	0x22	\$.0000 👘 mV	0x0000	VIN_ON	0x35	9.26 🔄 V	0xF025	STATUS_BYTE	0x78	00000000 🖓	0x00
Parameters for this Rail	VOUT_SCALE_LOOP	0:29	1,000 🔽	0xE808	VOUT_OV_FAULT_LIMIT	0x40	0.192 🗹 V	0x0449	STATUS_WORD	0×79	Click	0x0000
Al Parameters	IDUT_CAL_GAIN	0x38	5.0000000 🕀 mG	0xCA80	YOUT_DY_FAULT_RESPONSE	0x41	Click	0x80	STATUS_VOUT	0x7A	00000000	0x00
	IOUT_CAL_OFFSET_1	0x39	0.000 🏯 A	0x6800	VOUT_OV_WARN_LIMIT	0x42	0.160 🖂 V	0x0439	STATUS_IOUT	0x76	00000000	0x00
It Parameters By:	IOUT_CAL_OFFSET_2	0x39	0.000 📇 A	0xE800	VOUT_UV_WARN_LIMIT	(bc43	0.176 V V	0x02D0	STATUS_INPUT	0x7C	00000000	00x00
Command Name	10UT_CAL_OFFSET_3	0x39	0 000 🕀 A	0xE800	YOUT_UV_FAULT_LIMIT	0x44	0.192 🛩 V	0x02C0	STATUS_TEMPERATURE	0×70	00000000	0x00
Con a bu Cabrana	IOUT_CAL_OFFSET_4	0x39	0.000 📳 A	0xE800	VOUT_UV_FAULT_RESPONSE	0x45	Click 👻	0x40	STATUS_CML	0x7E	00000000	00x00
Croup by Casegory	IDUT_CAL_OFFSET_S	0x39	A 2000	0xE800	IOUT_OC_FAULT_LIMIT Per Page	Ox46	480 🕀 A	0x01E0	STATUS_OTHER	0x7F	00000000 🖂	0x00
Config Level:	IOUT_CAL_OFFSET_6	0x39	0.030 👘 A	0xE800	IOUT_OC_FAULT_LIMIT Per Phase	0x46	63 🔍 A	0x0035	STATUS_MFR_SPECIFIC	0x80	00000000	0x00
Easy	IOUT_CAL_OFFSET_7	0:39	0.000 🖹 A	0xE800	IOUT_OC_FAULT_RESPONSE	0x47	Click 🕑	0xC0	READ_VIN	0x68	12.047 V	0xD303
Intermediate	IOUT_CAL_OFFSET_8	0x39	A + 000 0	0xE800	IOUT_OC_WARN_LIMIT	0:c4A	440 🗄 A	0x0188	READ_IIN	Dx89	0.34 A	0xAAB8
Advance	IOUT_CAL_OFFSET_9	0x39	A 🛬 000 0	0xE800	IOUT_UC_FAULT_LIMIT	0x48	-90 🕀 A	0x07A6	READ_IOUT_1	0x80	-0,18 A	0xA500
	IOUT_CAL_OFFSET_10	0x39	0.125 🚍 A	0xE801	IOUT_UC_FAULT_RESPONSE	0x4C	Click	0x00	READ_IOUT_2	0x8C	0 00 A	0x8000
	10UT_CAL_OFFSET_11	0x39	0 000 (*) A	0xE800	OT_FAULT_LIMIT	0x4F	120 🗟 📢	0x0078	READ_IOUT_3	Dx8C	-0.38 A	0xAD00
	IOUT_CAL_OFFSET_12	0x39	0.000 🚔 A	0xE800	OT_FAULT_RESPONSE	0x50	Click 🗸	0x80	READ_IOUT_4	0.60	0.00 A	0x8000
	▼ Configuration				OT_WARN_LIMIT	0:51	110 🕀 🗠	0x006E	READ_IOUT_5	0x8C	0.19 A	0xA300
	WRITE_PROTECT	0x10	0x00 🖂	0x00	VIN_OV_FAULT_LIMIT	0x55	15 🚭 ¥	0x000F	READ_IOUT_6	D/BC	-0 18 A	0xA500
	SMBALERT_MASK_CML	0×18	00000000 🖂	0x00	VIN_OV_FAULT_RESPONSE	0x56	Click 🔽	0x80	READ_LOUT_7	0x8C	0.00 A	0x5000
	SMBALERT_MASK_INPUT	0x1B	00001000	0x08	VIN_OV_WARN_LIMIT	0x57	14 🗮 y	0x000E	READ_IOUT_8	0x80	0.00 A	0x3000
	SMBALERT_MASK_LOUT	0×18	00000000	0x00	VIN_UV_WARN_LIMIT	0x58	8.50 🚔 V	0xF022	READ_IOUT_9	0x80	A 00.0	0x8000
	SMBALERT_MASK_MFR_SPECIFIC	Qx18	00100110 ~	0x26	VIN_UV_FAULT_LIMIT	0x59	8.00 🏠 V	0x#020	READ_IOUT_10	0x8C	-0.06 Å	0x9600
	SMBALERT_MASK_OTHER	0x1B	00000000	0x00	VIN_UV_FAULT_RESPONSE	0:54	Click	0x80	READ_IOUT_11	DxBC	-0.18 A	0xA500
	SMBALERT_MASK_TEMPERATURE	0x18	00000000	0x00	IIN OC FAULT LIMIT	0x58	12⊕A	0x0034	READ TOUT 12	0/85	0.00 A	0x8000
	(I)	1.004	- induita	ST PC		0730	10 De De De D	000004	READ 1001 12	0/05	0.004	OXBUC
Configure												
Monitor												
Cantor												





If the user selects to change a parameter then the GUI will display an orange "U" icon, which is offering an [Undo Change] option, as shown in Figure 7-12. The software will not update the controller with the change until the user performs a [Write to Hardware].

When a [Write to Hardware] is performed, the change will be implemented in the controller and stored in it's volatile memory. Given that the parameter is stored in volatile memory, if the EVM is power cycled, the parameter will revert back to the previous setting.

If the user wishes to make this the new default value for the parameter then a [Store Config to NVM] must be performed, which commits the value to non-volatile memory.

Configuration TPS53	6C7 @ PMBus Addr 88d (58h) / 12C Add	dr 176d (B0h) - Rail #1 [Offline]			
File Device Tools					
🗅 Write to Hardware 🎽	Store Config to NVM Re	store NVM Config			
Configure	System Configuration Rail Configura	ation Protection Calibration SI	MBAlert Mask	NVM Programming All Confi	
Config Level:	Butout Voltage		I See	quencing	
() Easy	VOD MODE:	FXP =-10	On	/Off Configuration:	0v17
 Intermediate 					0.17
Advance	Vout Scale Deep:	1.000	To	n Delay:	0.0 💭 ms
	VOUT COMMAND:	0.885 🗘 V	Sol	ft On Slew Rate:	0.6250 🗸 mV/µs
	Margin High:	0.000 🗢 V	Tol	ff Delay:	0.0 🔍 ms
	Margin Low:	0.000 🗢 V	Sol	ft Off Slew Rate:	0.6250 V mV/µs
2	Vout Min:	0.000 🔄 V		- Ckin-	
	Vout Max:	1.869 💭 V	LOC	DC load line	
	Vout Trim/Offset:	0.0000		DC Load Line	0.000000 ⊕ mΩ
				AC Load Line	0.203125 🌩 mΩ
	Vout Slew Rate:	5.0000 w mV/µs		DYN Int Time Constant	4 🔷 µs
	Non-Linear			Int Time Constant	1 ♠ µs
	Phases enable during USR 1:	4 v phases		Ramp	360 🗸 mV
	USR.1 Threshold:	Disabled 🗸 mV		Integration Gain	2.0
	USR2 Threshold:	Disabled v mV		AC Gain	1.0 🔍
	OSR Threshold:	Disabled V mV		VDINT	60 🗸 mV

Figure 7-12. Static Configure Pop-Up



Selecting the [Monitor] page from the lower left corner of the TPS536C7 Configuration window will display the Figure 7-13 which shows real-time parameter data as measured by the controller. Note that one can switch between monitoring Rail A and Rail B. This screen provides access to the following parameters:

- Graphs of
 - V_{IN}
 - I_{IN}
 - V_{OUT}
 - I_{OUT}
 - Temperature
- · Start/Stop Polling controls the updating of the real-time display of data
- Quick access to ON or OFF configuration
- · Control pin activation and OPERATION command
- · Margin control
- · Clear Fault clears any prior fault flags



Figure 7-13. Monitor tab



Fusion GUI

Selecting [Status] from lower left corner shows the current status of the controller as well as any prior faults or warnings which had not been cleared, as shown on the Figure 7-14.



Figure 7-14. Status tab



8 Evaluation Module (EVM) Hardware

Board Layout

Figure 8-1 through Figure 8-16 show the TPS536C7EVM-051 assembly drawings and TPS536C7EVM-051 PCB layout images .



Figure 8-1. TPS536C7EVM-051 Assembly Drawing Top View



Figure 8-2. TPS536C7EVM-051 Assembly Drawing Bottom View



Figure 8-3. TPS536C7EVM-051 PCB Top Solder







Figure 8-4. TPS536C7EVM-051 PCB Top layer



Figure 8-5. TPS536C7EVM-051 PCB Layer2-GND





Figure 8-6. TPS536C7EVM-051 PCB Layer03-Signal











Figure 8-8. TPS536C7EVM-051 PCB Layer05-Power



Figure 8-9. TPS536C7EVM-051 PCB Layer06-GND





Figure 8-10. TPS536C7EVM-051 PCB Layer07-Power



Figure 8-11. TPS536C7EVM-051 PCB Layer08-Power





Figure 8-12. TPS536C7EVM-051 PCB Layer09-GND



Figure 8-13. TPS536C7EVM-051 PCB Layer10-Signal





Figure 8-14. TPS536C7EVM-051 PCB Layer11-GND



Figure 8-15. TPS536C7EVM-051 PCB Bottom layer





Figure 8-16. TPS536C7EVM-051 PCB Bottom solder

9 Schematic and Bill of Materials

Figure 9-1 through Figure 9-10 show the TPS536C7EVM-051 schematics.











Schematic and Bill of Materials



Figure 9-3. TPS536C7EVM-051 Rail A Power Stages 1-2-3 Schematic



Schematic and Bill of Materials



Figure 9-4. TPS536C7EVM-051 Rail A Power Stages 4-5-6 Schematic



Schematic and Bill of Materials



Figure 9-5. TPS536C7EVM-051 Rail A Power Stages 7-8-9 Schematic



Schematic and Bill of Materials



Figure 9-6. TPS536C7EVM-051 Rail A Power Stages 10-11-12 Schematic









Figure 9-8. TPS536C7EVM-051 Input and output filter Schematic



Schematic and Bill of Materials



Figure 9-9. TPS536C7EVM-051 On Board transient Load Schematic



Figure 9-10	. TPS536C7EVM-051	Helper Circuits	and Indicators S	Schematic
-------------	-------------------	------------------------	------------------	-----------

Designator	Qty Value	Description	Package	Reference	Part Number	Manufacturer			
C1, C3, C9	3	10uF	CAP, CERM, 10 uF, 25 V, +/- 10%, X5R, 0805	805	C2012X5R1E10 6K125AB	TDK			
C2, C7, C18, C20, C23	5	0.1uF	CAP, CERM, 0.1 uF, 50 V, +/- 10%, X7R, 0603	603	06035C104KAT2 A	AVX			
C4, C19, C22, C24, C26, C30, C33, C35	8	1uF	CAP, CERM, 1 uF, 16 V, +/- 10%, X7R, AEC- Q200 Grade 1, 0603	603	GCM188R71C1 05KA64D	MuRata			

Table 9-1. Bill of Materials



		Table	9-1. Bill of Materials	(continued)		
Designator	Qty Value	Description	Package	Reference	Part Number	Manufacturer
C5	1	47uF	CAP, Polymer Hybrid, 47 uF, 35 V, +/- 20%, 60 ohm, 6.3x5.8 SMD	6.3x5.8	EEHZC1V470P	Panasonic
C6	1	10uF	CAP, CERM, 10 uF, 25 V, +/- 20%, X5R, 0603	603	C1608X5R1E10 6M080AC	TDK
C8	1	3300pF	CAP, CERM, 3300 pF, 50 V, +/- 10%, X7R, 0603	603	C0603X332K5R ACTU	Kemet
C10	1	22uF	CAP, CERM, 22 uF, 16 V, +/- 20%, X5R, 0805	805	GRM21BR61C2 26ME44L	MuRata
C11, C13	2	100pF	CAP, CERM, 100 pF, 25 V, +/- 5%, C0G/NP0, 0402	402	C0402C101J3G ACTU	Kemet
C17	1	4.7uF	CAP, CERM, 4.7 uF, 10 V, +/- 10%, X5R, 0603	603	C0603C475K8P ACTU	Kemet
C21, C25, C27, C28	4	1000pF	CAP, CERM, 1000 pF, 50 V, +/- 10%, X7R, 0402	402	C0402C102K5R ACTU	Kemet
C29, C34	2	0.1uF	CAP, CERM, 0.1 uF, 25 V, +/- 10%, X7R, 0805	805	08053C104KAT2 A	AVX
C31, C32	2	0.01uF	CAP, CERM, 0.01 uF, 100 V, +/- 5%, X7R, 0805	805	08051C103JAT2 A	AVX
C36	1	0.082uF	CAP, CERM, 0.082 uF, 16 V, +/- 10%, X7R, 0603	603	0603YC823KAT 2A	AVX
C37, C38, C39	3	270uF	CAP, Polymer Hybrid, 270 uF, 35 V, +/- 20%, 20 ohm, 10x10 SMD	10x10	EEHZA1V271P	Panasonic
C40, C41	2	22uF	CAP, CERM, 22 uF, 35 V, +/- 20%, X5R, 1206	1206	C3216X5R1V22 6M160AC	TDK
C42, C43, C44, C45, C46, C47, C48, C49, C50, C51, C52, C53, C54, C55, C56, C57, C58, C59, C60, C61, C62, C63, C64, C65, C66, C67, C68, C69, C70, C71, C72, C73, C74, C75, C76, C77, C78, C79, C80, C81, C82, C83, C84, C85, C86, C87	46	100uF	CAP, CERM, 100 uF, 4 V, +/- 20%, X5R, 1206	1206	GRM31CR60G1 07ME39L	MuRata
C89, C94, C105, C110, C121, C126, C137, C142, C153, C158, C169, C174, C185, C190, C201, C206, C217, C222, C233, C238, C249, C254, C265, C270, C281, C286, C297, C302	28	470uF	CAP, Aluminum Polymer, 470 uF, 2.5 V, +/- 20%, 0.003 ohm, SMD_7.3x1.9x4.3mm SMD	SMD_7.3x1.9x4.3mm	EEF-GX0E471R	Panasonic



	n		9-1. Bill of Materials	(continued)		
Designator	Qty Value	Description	Package	Reference	Part Number	Manufacturer
C90, C91, C92, C93, C106, C107, C108, C109, C122, C123, C124, C125, C138, C139, C140, C141, C154, C155, C156, C157, C170, C171, C172, C173, C186, C187, C188, C189, C202, C203, C204, C205, C218, C219, C220, C221, C234, C235, C236, C237, C250, C251, C252, C253, C266, C267, C268, C269, C282, C283, C284, C285, C298, C299, C300, C301	56	220uF	CAP, CERM, 220 uF, 4 V, +/- 20%, X5R, 1206_190	1206_190	GRM31CR60G2 27ME11L	MuRata
C95, C97, C98, C111, C112, C113, C127, C128, C129, C143, C144, C145, C159, C160, C161, C175, C176, C177, C191, C192, C193, C207, C208, C209, C223, C224, C225, C239, C240, C241, C255, C256, C257, C271, C272, C273, C287, C288, C289, C303, C304, C305	42	22uF	CAP, CERM, 22 uF, 16 V, +/- 20%, X5R, 0805	805	GRM21BR61C2 26ME44	MuRata
C96, C114, C130, C146, C162, C178, C194, C210, C226, C242, C258, C274, C290, C306	14	1uF	CAP, CERM, 1 uF, 25 V, +/- 10%, X5R, 0402	402	GRM155R61E10 5KA12D	MuRata
C99, C100, C115, C116, C131, C132, C147, C148, C163, C164, C179, C180, C195, C196, C211, C212, C227, C228, C243, C244, C259, C260, C275, C276, C291, C292, C307, C308	28	2.2uF	CAP, CERM, 2.2 uF, 10 V, +/- 10%, X5R, 0402	402	C1005X5R1A22 5K050BC	ТDК
C103, C119, C135, C151, C167, C183, C199, C215, C231, C247, C263, C279, C295, C311	14	0.1uF	CAP, CERM, 0.1 uF, 50 V, +/- 10%, X7R, AEC- Q200 Grade 1, 0402	402	GCM155R71H1 04KE02D	MuRata
D1, D2, D4, D5, D8, D9, D11, D12	8	30V	Diode, Schottky, 30 V, 0.5 A, SOD-123	SOD-123	MBR0530T1G	ON Semiconductor
D3, D6, D10, D13, D18	5	Red	LED, Red, SMD	Red 0805 LED	LTST- C170KRKT	Lite-On
D7	1	30V	Diode, Schottky, 30 V, 0.2 A, SOT-23	SOT-23	BAT54-7-F	Diodes Inc.
D14, D15, D16, D17	4	Green	LED, Green, SMD	LED_0805	LTST- C170KGKT	Lite-On
H1, H2, H3, H4, H5, H6, H7, H8, H9, H10, H11, H12	12		Machine Screw Pan Philips 10-32		PMSSS 102 0050 PH	B&F Fastener Supply

Table 9.1 Bill of Materials (.... -



		Table	9-1. Dill Of Materials	(continueu)		
Designator	Qty Value	Description	Package	Reference	Part Number	Manufacturer
H13, H14, H15, H16, H17, H18, H19, H20, H21, H22, H23, H24	12		Machine Screw Nut, Hex, 3/8', Stn, Steel, 10-32		HNSS 102	B&F Fastener Supply
H25, H26, H27, H28	4		Machine Screw, Round, #4-40 x 1/4, Nylon, Philips panhead	Screw	NY PMS 440 0025 PH	B&F Fastener Supply
H29, H30, H31, H32, H33, H34, H35, H36, H37, H38, H39, H40	12		Washer, Split Lock, #10		1477	Keystone
H41, H42, H43, H44	4			Standoff	1902C	Keystone
J1, J4	2		Terminal Block, 3.5 mm, 2x1, Tin, TH	Terminal Block, 3.5 mm, 2x1, TH	39357-0002	Molex
J2, J3, J5, J6, J7, J14	6		Header, 100mil, 2x1, Gold, TH	2x1 Header	TSW-102-07-G- S	Samtec
J8	1		Header (shrouded), 100mil, 5x2, Gold, TH	5x2 Shrouded header	5103308-1	TE Connectivity
PG GL	1		Header, 100mil, 5x2, Gold, TH	5x2 Header	TSW-105-07-G- D	Samtec
J10, J11, J12, J13	4		Header, 100mil, 3x1, Gold, TH	3x1 Header	TSW-103-07-G- S	Samtec
J15, J16	2		Connector, SMT, SMB Jack Assembly 50 ohm	Connector, SMT, SMB Jack Assembly	131-3711-201	Cinch Connectivity
L1	1	2.2uH	Inductor, Shielded, Composite, 2.2 uH, 3.7 A, 0.02 ohm, SMD	4x2x4mm	XFL4020-222ME B	Coilcraft
L2	1	50nH	Inductor, Ferrite, 50 nH, 53 A, 0.0002889 ohm, SMD	5.2x5mm	AH2026A- R05LHF	Inter-Technical Group
L3, L4, L5, L6, L7, L8, L9, L10, L11, L12, L13, L14, L15, L16	14	150nH	Inductor, 150 nH, 68 A, 0.0002035 ohm, SMD	10x7x10mm	PA4390.151HLT	Pulse Engineering
Q1, Q2, Q3, Q4	4	30V	MOSFET, N-CH, 30 V, 100 A, DQH0008A (VSON-CLIP-8)	DQH0008A	CSD17303Q5	Texas Instruments
Q5	1	-20V	MOSFET, P-CH, -20 V, -0.39 A, SOT-323	SOT-323	BSS223PWH63 27	Infineon Technologies
Q6, Q7, Q8, Q9	4	100V	MOSFET, N-CH, 100 V, 0.17 A, SOT-23	SOT-23	BSS123	Fairchild Semiconductor
R1, R2, R3	3	1	RES, 1.00, 1%, 0.1 W, 0603	603	RC0603FR-071 RL	Yageo America
R4	1	1	RES, 1.0, 5%, 1 W, 2010	2010	CRCW20101R0 0JNEFHP	Vishay-Dale
R5, R7, R8, R9, R12, R17, R23, R30, R31, R40, R144, R145, R146, R147, R148, R150, R151	17	0	RES, 0, 5%, 0.1 W, 0603	603	CRCW06030000 Z0EA	Vishay-Dale
R6, R119	2	100k	RES, 100 k, 1%, 0.1 W, 0603	603	CRCW0603100 KFKEA	Vishay-Dale
R10, R11, R13, R14	4	0	RES, 0, 5%, 0.063 W, 0402	402	CRCW04020000 Z0ED	Vishay-Dale
R15, R22	2	20.0k	RES, 20.0 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	603	CRCW060320K 0FKEA	Vishay-Dale



	Table 9-1. Bill of Materials (continued)									
Designator	Qty Value	Description	Package	Reference	Part Number	Manufacturer				
R16	1	1.30Meg	RES, 1.30 M, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	603	CRCW06031M3 0FKEA	Vishay-Dale				
R18, R19, R20, R32, R33, R34, R79, R80, R86, R122, R123, R138, R140, R141, R142, R143	16	10k	RES, 10 k, 5%, 0.1 W, 0603	603	CRCW060310K 0JNEA	Vishay-Dale				
R21	1	59.0k	RES, 59.0 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	603	CRCW060359K 0FKEA	Vishay-Dale				
R35, R36, R130	3	1.0k	RES, 1.0 k, 5%, 0.1 W, 0603	603	CRCW06031K0 0JNEA	Vishay-Dale				
R41, R42, R43, R44, R46, R47, R48, R49, R50, R51, R52, R53, R54, R55, R56, R57, R58, R59, R60, R61, R62, R63, R64, R65, R66, R67, R68, R69, R70, R71, R72, R73, R74, R75, R84, R85, R88, R89, R90, R91, R92, R93, R94, R95, R96, R97, R98, R99, R100, R101, R102, R103, R104, R105, R106, R107, R108, R109, R110, R111, R112, R113, R114, R115, R116, R117, R127, R128	68	0.2	RES, 0.2, 1%, 2 W, 2512	2512	CSRN2512FKR2 00	Stackpole Electronics Inc				
R45	1	10k	RES, 10 k, 5%, 0.0625 W, 3.2x1.6mm	3.2x1.6mm	TC164- JR-0710KL	Yageo America				
R76, R77, R120, R121	4	75	RES, 75.0, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	603	CRCW060375R 0FKEA	Vishay-Dale				
R78, R83, R124, R129	4	330	RES, 330, 5%, 0.125 W, 0805	805	CRCW0805330 RJNEA	Vishay-Dale				
R81, R82, R125, R126	4	100	RES, 100, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	603	CRCW0603100 RFKEA	Vishay-Dale				
R87, R118	2	8.06k	RES, 8.06 k, 1%, 0.1 W, 0603	603	CRCW06038K0 6FKEA	Vishay-Dale				
R131	1	6.04k	RES, 6.04 k, 1%, 0.1 W, 0603	603	CRCW06036K0 4FKEA	Vishay-Dale				
R132	1	499	RES, 499, 1%, 0.1 W, 0603	603	CRCW0603499 RFKEA	Vishay-Dale				
R133	1	10	RES, 10.0, 1%, 0.063 W, 0402	402	CRCW040210R 0FKED	Vishay-Dale				
R134	1	0.0005	RES, 0.0005, 1%, 3 W, 4026	4026	WSL4026L5000 FEB	Vishay-Dale				
R135, R136, R137, R139, R149	5	180	RES, 180, 5%, 0.1 W, 0603	603	CRCW0603180 RJNEA	Vishay-Dale				



		Table	5-1. Dill Of Materials	(continueu)		
Designator	Qty Value	Description	Package	Reference	Part Number	Manufacturer
R153, R155, R156, R158, R159, R161, R163, R165, R166, R167, R169, R171, R173, R174, R175, R177, R179, R180, R182, R183, R185, R187, R189, R190, R191, R193, R195, R197, R198, R199, R201, R203, R204, R206, R207, R209, R211, R213, R214, R215, R217, R219, R221, R227, R228, R230, R231, R233, R235, R237, R238, R239, R241, R243, R245, R246, R247, R249, R255, R257, R259, R261, R262, R263	70	0	RES, 0, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW04020000 Z0ED	Vishay-Dale
R154, R162, R170, R178, R186, R194, R202, R210, R218, R226, R234, R242, R250, R258	14	10.2k	RES, 10.2 k, 0.1%, 0.063 W, AEC-Q200 Grade 1, 0402	402	ERA-2AEB1022 X	Panasonic
R157, R164, R172, R181, R188, R196, R205, R212, R220, R229, R236, R244, R253, R260	14	2.2	RES, 2.2, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW04022R2 0JNED	Vishay-Dale
RT1	1	1k	Thermistor NTC, 1.0k ohm, 5%, 0603	603	NCP18XQ102J0 3RB	MuRata
S1, S2	2		Switch, SPDT, Slide, On-On, 2 Pos, TH	4x11.6mm	EG1218	E-Switch
S3	1		DIP Switch, SPST 4Pos, Slide, TH	DIP Switch, 4 Pos	78B04ST	Grayhill
SH-J1, SH-J2, SH-J3, SH-J4, SH-J5, SH-J6, SH-J7, SH-J8	8	1x2	Shunt, 100mil, Flash Gold, Black	Closed Top 100mil Shunt	SPC02SYAN	Sullins Connector Solutions
T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, T11, T12	12		Terminal 90A Lug	CB70-14-CY	CB70-14-CY	Panduit
TP1, TP2, TP3, TP4, TP5, TP7, TP16, TP19, TP20	9		Test Point, Compact, Red, TH	Red Compact Testpoint	5005	Keystone
TP6, TP17, TP18, TP24, TP25, TP26, TP27, TP28, TP29, TP30	10		Test Point, Compact, Black, TH	Black Compact Testpoint	5006	Keystone

Table 9-1. Bill of Materials (continued)



Table 9-1. Bill of Materials (continued)										
Designator	Qty Value	Description	Package	Reference	Part Number	Manufacturer				
TP8, TP9, TP10, TP11, TP12, TP13, TP14, TP15, TP21, TP22, TP23, TP31, TP32, TP33, TP34, TP35, TP36, TP37, TP38, TP39, TP40, TP41, TP42, TP43, TP44, TP45, TP46, TP47, TP48, TP49, TP50, TP51, TP52, TP53, TP54, TP55, TP56, TP57, TP58	39		Test Point, Compact, White, TH	White Compact Testpoint	5007	Keystone				
U1	1		1A Low-Quiescent- Current Low-Dropout (LDO) Regulator, DRV0006A (WSON-6)	DRV0006A	TLV75733PDRV R	Texas Instruments				
U2	1		Buck Step Down Regulator with 3 to 17 V Input and 5 V Output, -40 to 85 degC, 16-Pin QFN (RGT), Green (RoHS & no Sb/Br)	RGT0016C	TPS62133RGTR	Texas Instruments				
U3	1		Dual-Channel D-CAP +™, Dual-Channel (12+0, 11+1, 10+2, 9+3, 8+4, 7+5, 6+6 Phases) Step-Down, Multiphase Controller, RSL0048B (VQFN-48)	RSL0048B	TPS536C7RSLR	Texas Instruments				
U4	1		High Speed CMOS Logic Quad 2-Input AND Gates, D0014A, TUBE	D0014A	CD74HCT08M	Texas Instruments				
U5, U7	2		Dual 4 A Peak High Speed Low-Side Power MOSFET Drivers, D0008A (SOIC-8)	D0008A	UCC27324DR	Texas Instruments				
U6	1		2.1-MHz, 250-uA, Low- Power Timer, D0008A (SOIC-8)	D0008A	TLC555CD	Texas Instruments				
U8, U9, U10, U11, U12, U13, U14, U15, U16, U17, U18, U19, U20, U21	14		Synchronous Buck NexFET Smart Power Stage, RWJ0041A (VQFN-CLIP-41)	RWJ0041A	CSD95410RWJ	Texas Instruments				
C12, C14, C15, C16	0	22pF	CAP, CERM, 22 pF, 50 V, +/- 5%, C0G/NP0, 0402	402	GRM1555C1H2 20JA01D	MuRata				
C88, C104, C120, C136, C152, C168, C184, C200, C216, C232, C248, C264, C280, C296	0	1000pF	CAP, CERM, 1000 pF, 50 V, +/- 10%, X7R, 0402	402	GRM155R71H1 02KA01D	MuRata				
C101, C117, C133, C149, C165, C181, C197, C213, C229, C245, C261, C277, C293, C309	0	0.1uF	CAP, CERM, 0.1 uF, 50 V, +/- 10%, X7R, AEC- Q200 Grade 1, 0402	402	GCM155R71H1 04KE02D	MuRata				

Table 9-1 Bill of Materials (continued)



Designator	Qty Value	Description	Package	Reference	Part Number	Manufacturer				
C102, C118, C134, C150, C166, C182, C198, C214, C230, C246, C262, C278, C294, C310	0	100pF	CAP, CERM, 100 pF, 25 V, +/- 5%, C0G/NP0, 0402	402	C0402C101J3G ACTU	Kemet				
FID1, FID2, FID3, FID4, FID5, FID6	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A				
R24, R26, R27, R28	0	0	RES, 0, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW04020000 Z0ED	Vishay-Dale				
R25, R38	0	121k	RES, 121 k, 1%, 0.1 W, 0603	603	CRCW0603121 KFKEA	Vishay-Dale				
R29, R37, R39	0	0	RES, 0, 5%, 0.1 W, 0603	603	CRCW06030000 Z0EA	Vishay-Dale				
R152, R160, R168, R176, R184, R192, R200, R208, R216, R224, R232, R240, R248, R256	0	1	RES, 1.0, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	603	CRCW06031R0 0JNEA	Vishay-Dale				

Table 9-1. Bill of Materials (continued)

10 Read This First

10.1 About This Manual

This document describes the hardware architecture of the TPS536C7 Evaluation Module (EVM).

10.2 Glossary

TI Glossary This glossary lists and explains terms, acronyms, and definitions.

10.3 Related Documentation From Texas Instruments

For product information, visit the Texas Instruments website at http://www.ti.com.

SLUSDI9 TPS536C7 Data sheet

10.4 Support Resources

TI E2E[™] support forums are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

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