ADP1043A Evaluation Board
Two Stage Buck + Full Bridge

Reference Design **PRD 1152**

FEATURES

Voltage-Fed Buck+Full Bridge with Synchronous Rectifier
Voltage Feedback Loop
Dimensions: 116.8mm×61mm×12.7mm (Full Brick)
Input Voltage Range: -36V to -60VDC
28V/14A DC Output from -48V DC Input
94% Max. Efficiency
I2C serial interface
Software GUI

PRD 1152 OVERVIEW

This Evaluation Board allows the ADP1043A to be quickly evaluated in a switching power supply application. Using the evaluation board and its accompanying software, the ADP1043A can be interfaced to any PC running Windows 2000, Windows NT, Windows XP and Windows Vista via the computer's USB port.

The software allows control and monitoring of the ADP1043A internal registers. The board is set up for the ADP1043A to act as an isolated switching power supply, outputting a 28V/14A DC voltage from a -36 to -60VDC input.

EVALUATION EQUIPMENT

To evaluate this demo board, a PC, oscilloscope, electronic load and a DC power source are required.

Figure 1 Voltage-Fed Buck+ Full Bridge Converter.

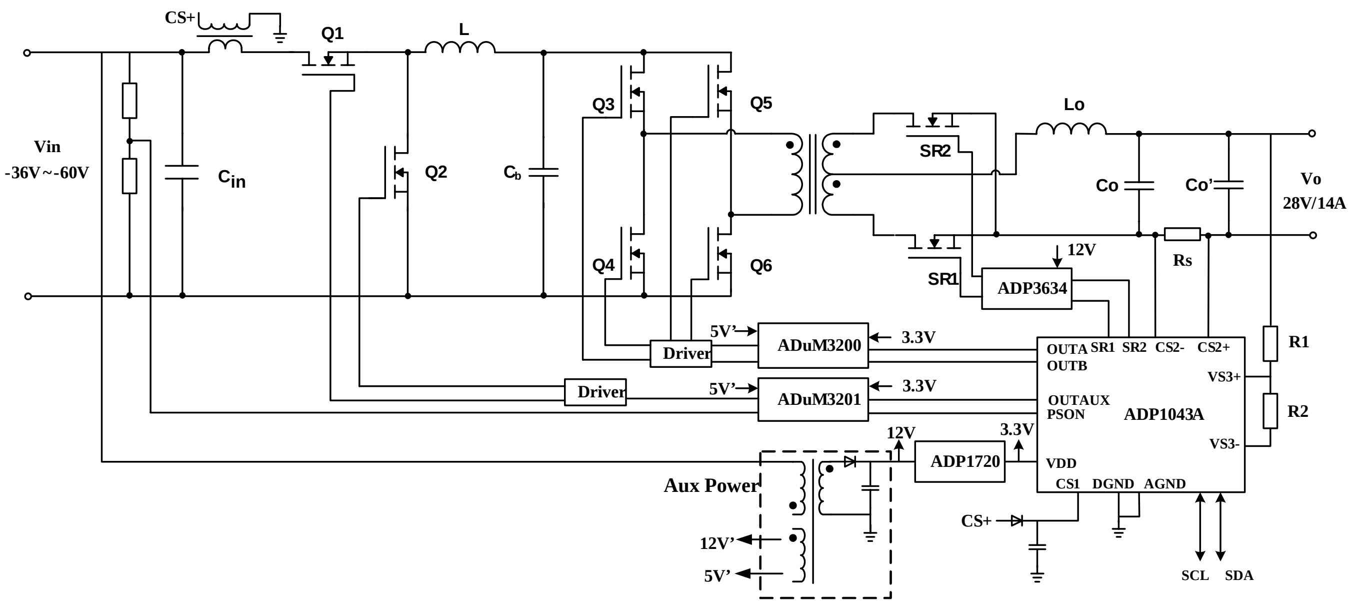

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TABLE OF CONTENTS

TABLE OF FIGURES

EVALUATION BOARD HARDWARE

SPECIFICATIONS

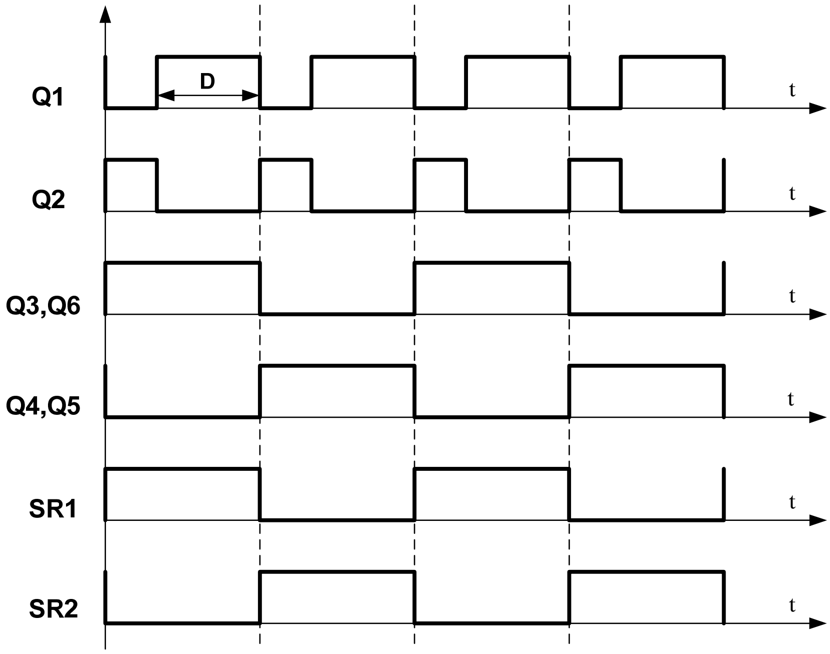
- Nominal input voltage: -48 DC
- Input voltage range: -36~-60V DC
- Nominal output voltage: 28V DC
- Nominal output current: 14A DC
- Buck stage switching frequency: 300kHz
- Full bridge switching frequency: 150kHz
- Efficiency: 93% at full load

TOPOLOGY AND OPERATION WAVEFORMS

A typical DC/DC switching power supply is the basis for the eval board. It is a voltage-fed buck + full bridge topology, shown as Figure 1.The buck converter, as the first stage, regulates the output voltage. The full bridge is an isolated converter, which operates with 50% duty cycle.

The primary side consists of the input terminals, buck and full bridge switches and the inductor and main transformer. The gate driver signal for the switches comes from the ADP1043A, through the iCoupler and the drivers. There is also a current transformer (CT), to transmit the primary side current information to the ADP1043A on the secondary side.

Figure 2 Driver Signal



The secondary side power stage consists of the synchronous rectifiers, output capacitor, sensing resistor. This provides 28V @ 14A at the output. The ADP1043A is located on the secondary side. The ADP1043A provides the feedback signal that is used to regulate the voltage, limit the current, and allow current sharing and shutdown to be implemented. Low side current sensing is used.

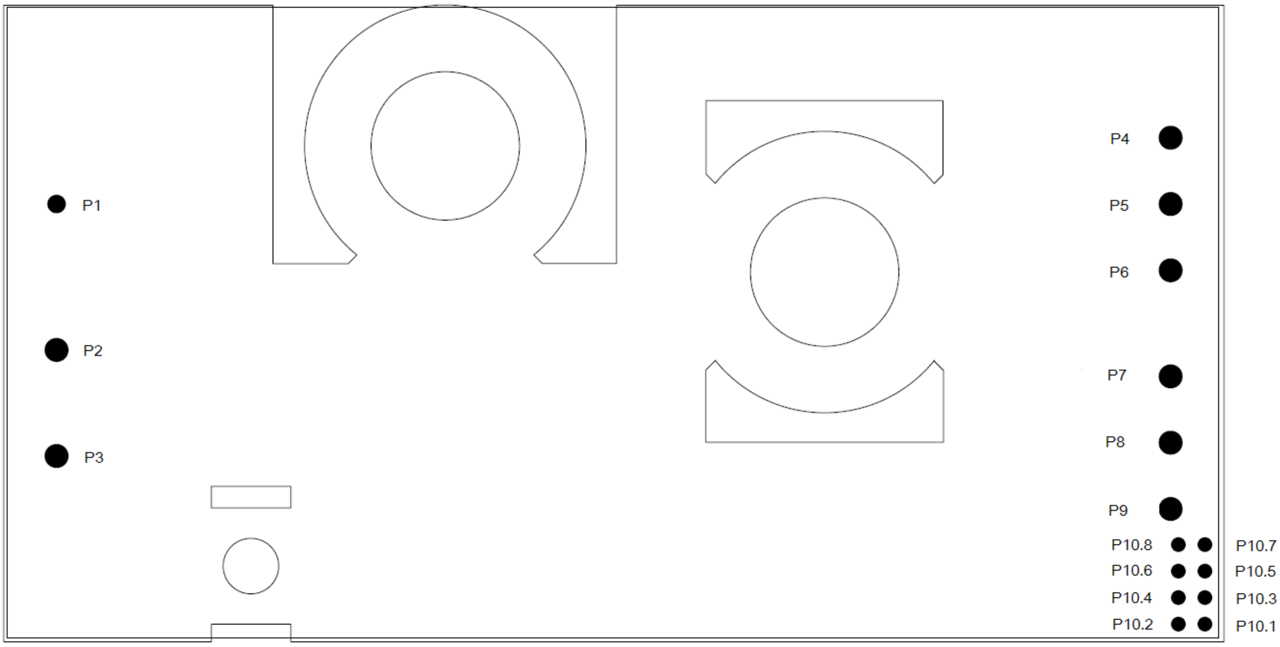
There is a 8pins connector on the board. 4pins of the connector is for I2C. This allows the PC software to communicate with the eval board through the USB port of the PC. The user can readily change register settings on the ADP1043A this way, and also monitor the status registers.

The eval board is designed with a 2mOhm RSENSE resistor. The power supply support a maximum continuous output of 14 A.

A variable load is required to perform a thorough evaluation. The output voltage is available between P4, P5, P6 and P7, P8, P9. This is also where the load should be connected.

The power supply will be in Continuous Conduction Mode. If the synchronous rectifiers are enabled, the power supply will remain in CCM mode over the full load range.

Figure 3 Pin Connection Diagram (Top View)



CONNECTORS

The connections to the eval board are shown in Table 1.

Table 1. Power module pin assignment

Pin	Designation	Eval Board Function
P1	On/Off	Remote Control
P2	Vin+	Positive Input
P3	Vin-	Negative Input
P4-P6	Vo+	Positive Output
P7-P10	Vo-	Negative Output
P10	Interface	Interface

INTERFACE CONNECTOR

The signal pins are P10.1~P10.8 as shown in Table 2. Among them P10.7, P10.5, P10.3 and P10.1 are connected to USB dongle.

Table 2. Signal pins

Pin	Designation	Pin	Designation
P10.1	GND	P10.5	SCL
P10.2	PGOOD	P10.6	Vsen-
P10.3	SDA	P10.7	5V
P10.4	Vsen+	P10.8	Share

Figure 4 shows the photo of eval board. Figure 5 provides a typical circuit diagram which details the filtering for normal operation and output ripple test.

Figure 4 Eval Board Picture(Top View)

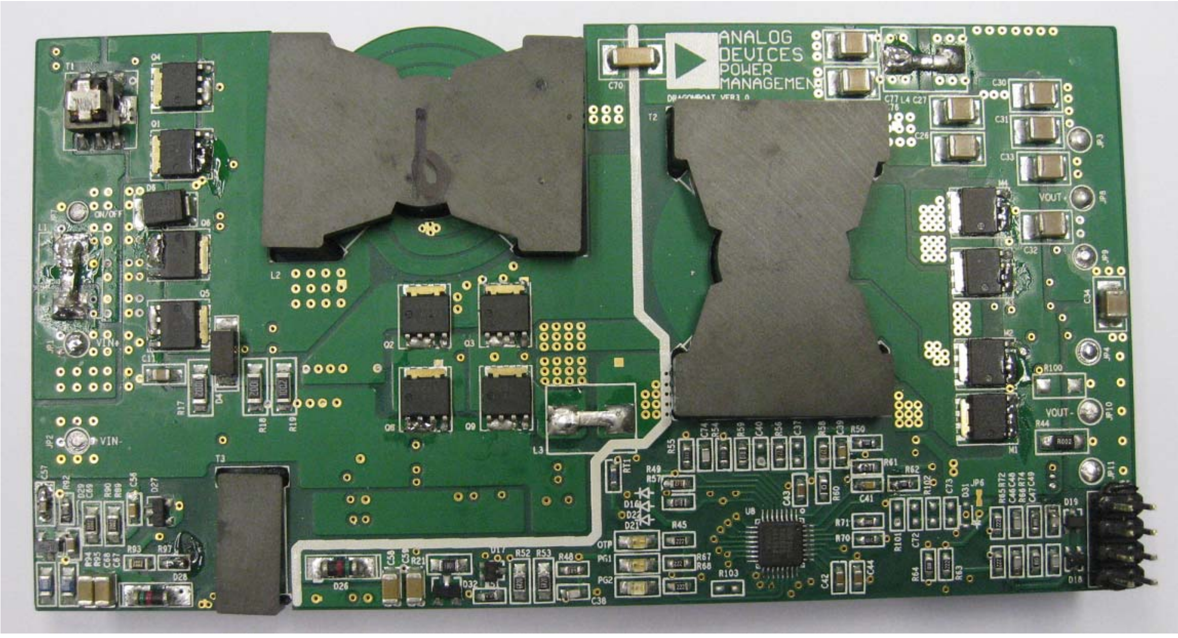
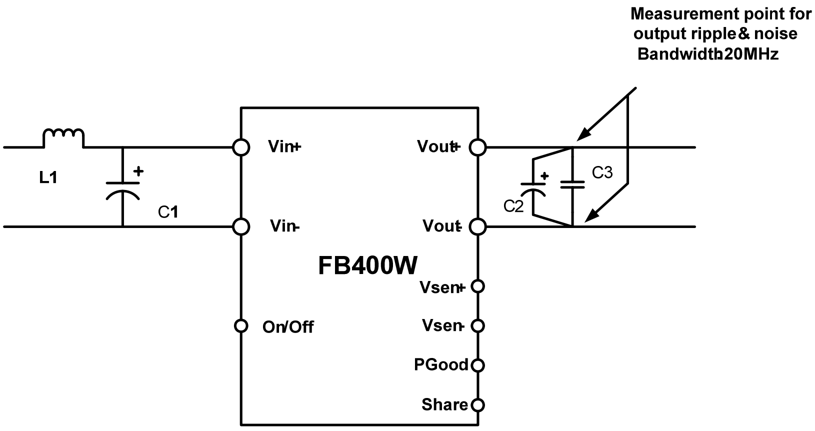


Figure 5 Test Configuration for the Evaluation Board



Note:

1.C1 100uF×2 parallel
2.C2 560uF×2 parallel
3.C3 MLCC10uF
4.L1 0.47uH

TEST RESULTS

Figure 6 Efficiency at nominal output voltage vs. load current for minimum, nominal, and maximum input voltage at 25°C.

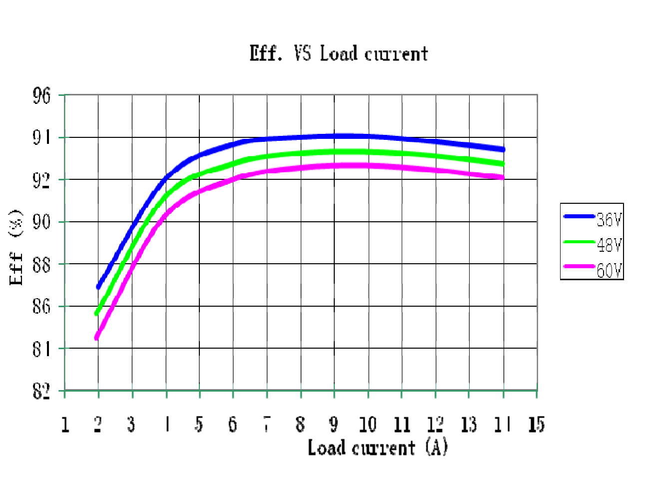


Figure 7 Output voltage response to step-change in load current (25%-50% of Iout(max): dI/dt = 1A/µs). Ch 2: Vout (200mV/div), Ch 4: Iout (5A/div).

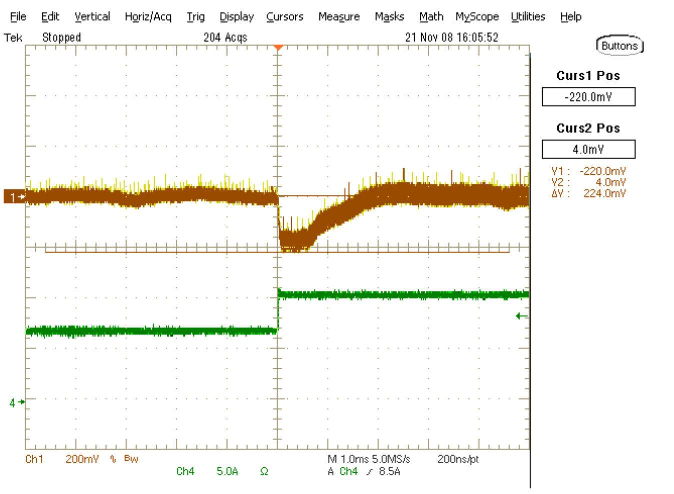


Figure 8 Output voltage response to step-change in load current (50%-25% of Iout(max): dI/dt = 1A/µs). Ch 2: Vout (200mV/div), Ch 4: Iout (5A/div).

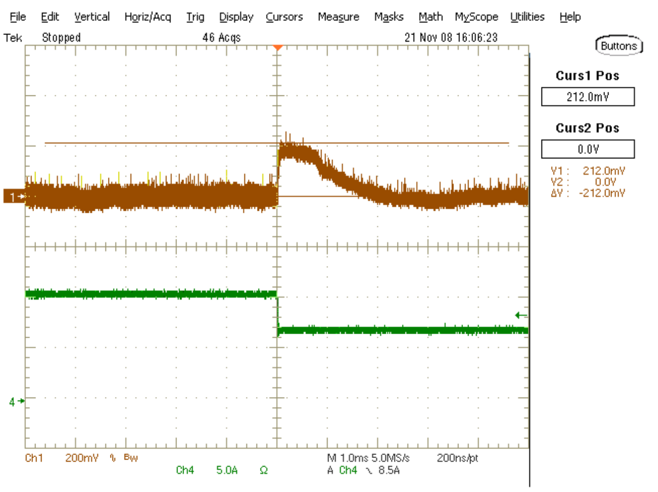


Figure 9 Output voltage ripple at nominal input voltage and no load current . Ch 1: Vout (50mV/div), Bandwidth: 20 MHz.

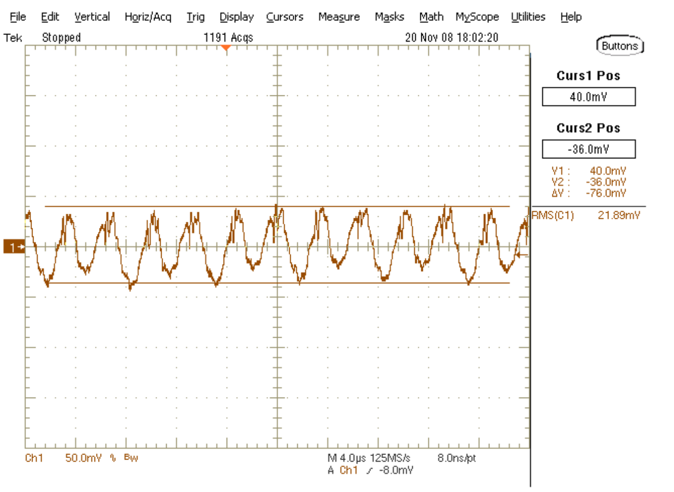


Figure 10 Output voltage ripple at nominal input voltage and nominal load current. Ch 1: Vout (50mV/div), Bandwidth: 20 MHz

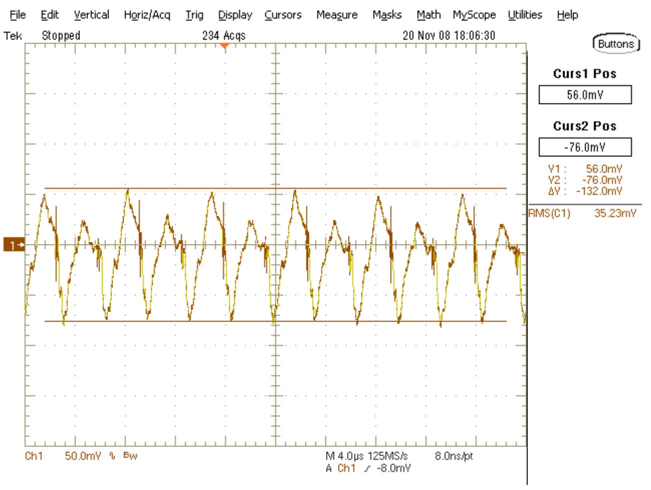


Figure 11 Turn-on transient at nominal input voltage and no load current. Ch 1: Vout (10V/div), Ch 4: Load Current

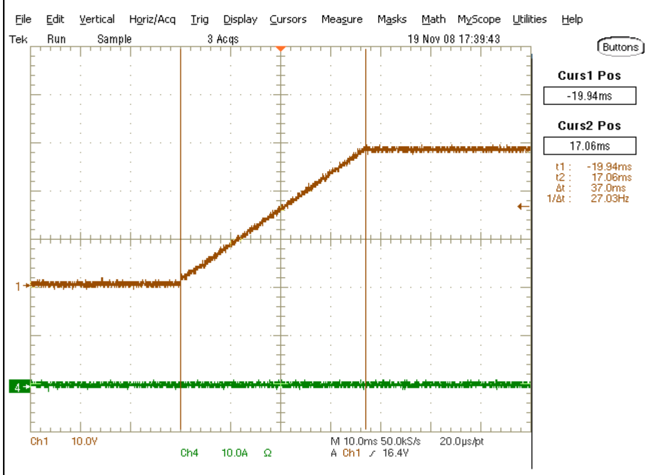


Figure 12 Turn-on transient at nominal input voltage and nominal load current. Ch 1: Vout (10V/div), Ch 4: Load Current (10A/div).

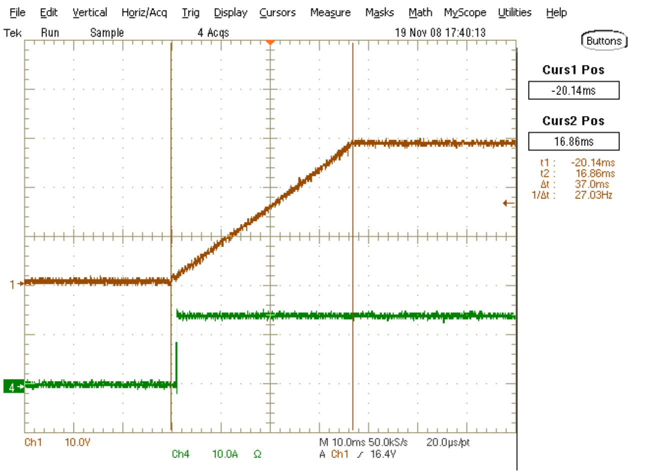


Figure 13 Output over current protection function. Increase load current at nominal input voltage to over current limit. Ch 3: Vout (10V/div), Ch 4: Load Current (10A/div).

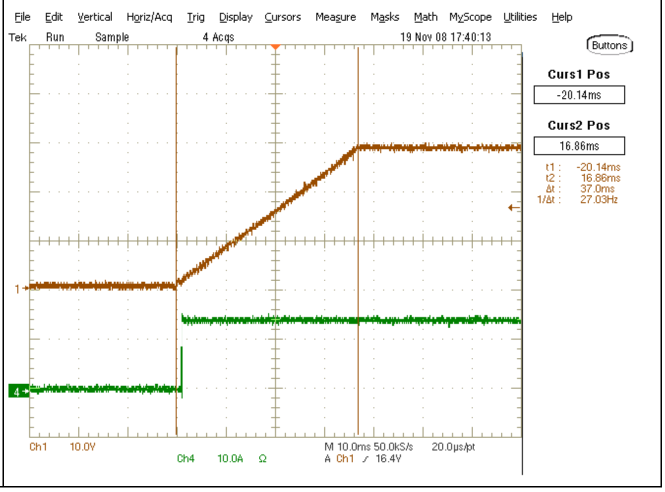
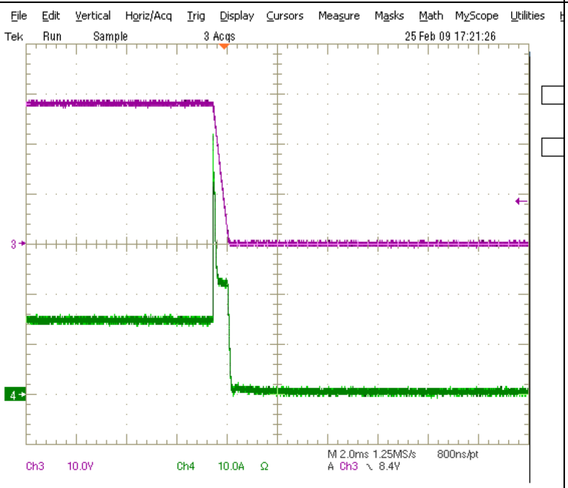
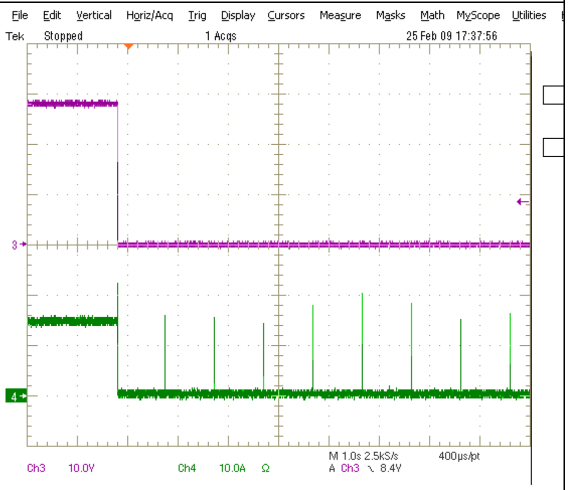


Figure 14 Output short circuit protection function (Latch Mode). Turn on at nominal input voltage and nominal load current then short circuit. Ch 3: Vout (10V/div), Ch 4: Load Current (10A/div).	*Figure 15 Output short circuit protection function (Recovery Mode). Turn on at nominal input voltage and nominal load current then short circuit. Ch 3: Vout (10V/div), Ch 4: Load Current (10A/div).*
	

GETTING STARTED

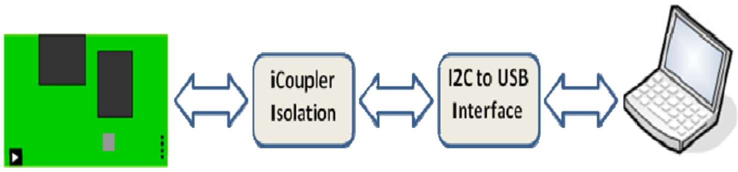
EQUIPMENT

- DC Power Supply 0-60V (Sorensen DLM150-20E)
- Electronic Load capable of 28V/14A (Chroma 63112)
- Oscilloscope (Tektronix TDS5054B)
- PC with ADP1043A GUI installed
- Precision Digital Multi-meters (Agilent 34401A)
- Current Probe for measuring up to 14A DC (Tektronix TCP202)

SETUP

NOTE: DO NOT CONNECT THE USB CABLE TO THE EVAL BOARD UNTIL AFTER THE SOFTWARE HAS BEEN INSTALLED.

Figure 16 Connection with Computer



1. Install the ADP1043A software. Refer to the Quick Start Guide that comes on the CD (If already installed, skip to the next step).

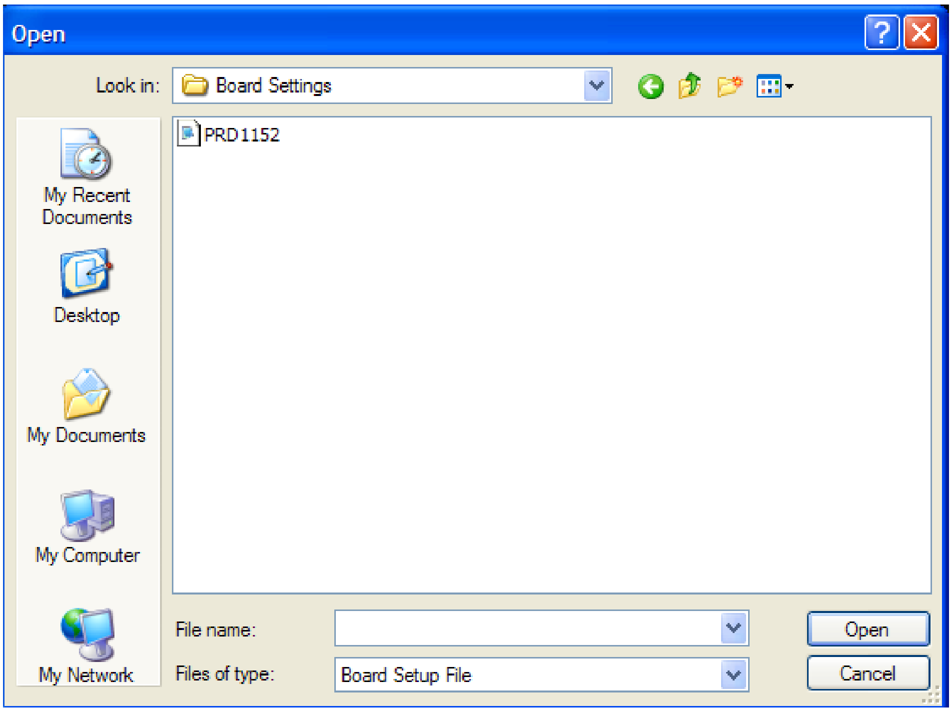
2. Connect the evaluation board to the USB port on the computer, using the "USB to I2C interface" dongle. If the dongle driver was not previously installed, run the software from the Start Menu under "Programs/Analog Devices/ADP1043A".

3. The software should report that the ADP1043A has been located on the board. Click Finish to proceed to the Main Software Interface Window.

Figure 17 Getting Started

4. Click on the  icon and "Load Board Setting": select the "PRD1152.43b" file. This file contains all the board information including values of shunt and voltage dividers.

Figure 18 Load Board Setting



5. The ADP1043A is pre-programmed and calibrated, so there is no programming necessary.
6. Connect an electronic load at the output.
7. For the input voltage source, a DC power supply can be used. The input voltage range is -36V to -60 VDC (-48VDC is recommended). This input voltage is the signal which will be regulated to provide a 28V/14A supply at the output. Set the voltage to -48VDC
8. The evaluation board should now up and running, and ready to evaluate. The output should be 28 VDC.

BOARD EVALUATION

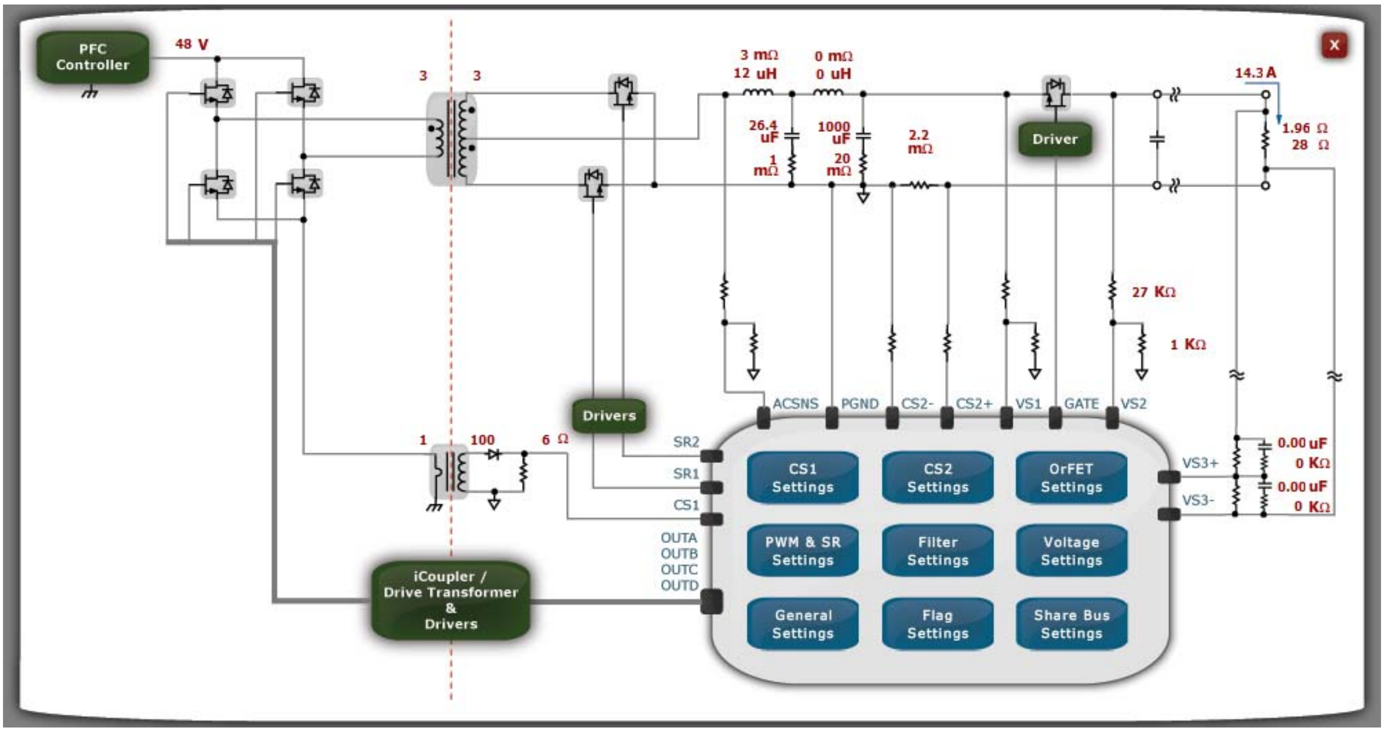
The ADP1043A is optimized for improving the power supply design and evaluation process. The goal of this eval kit is to allow the user to get an insight into the flexibility offered by the extensive programming options offered by the ADP1043A.

The ADP1043A performs many monitoring and housekeeping functions in the power supply. The eval board allows the user to simulate various events that could affect the ADP1043A in a working system. The user can monitor how the ADP1043A handles this event in many ways. One way is to use an oscilloscope and/or multi-meter, and probe the eval board, to see various conditions in the system. The user can also use the software to monitor the conditions of the ADP1043A, and how it has reacted to the event. The following section gives some experiments that the user might typically evaluate.

LINE AND LOAD VOLTAGE REGULATION

Vary the input voltage from -36 VDC to -60VDC. The output voltage remains 28V. Vary the load current from 0 to 14A. The output voltage remains 28V. The line and load regulation are less than ±0.5%.

Figure 19 Graphical User Interface



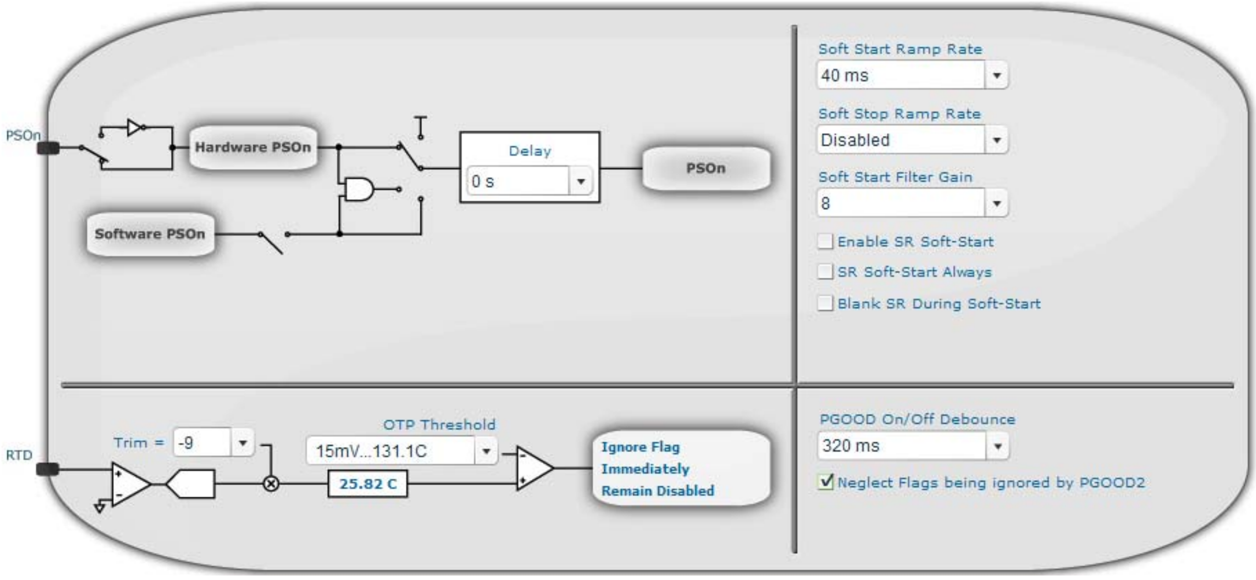
OUTPUT VOLTAGE SETTING

The output voltage setting is programmable. Using the Voltage Setting window in the software, adjust the output voltage (using the o/p trim menu). Monitor the actual output voltage of the power supply using the software or a multi-meter, or looking at the output voltage reading on the electronic load. It should match the programmed value. This will be used to calibrate the power supply in the production environment. By doing this evaluation, the user can see how the ADP1043A can be trimmed digitally to adjust the output voltage.

SOFT START

Once the input voltage is applied it is possible to test the Soft Start of the ADP1043A. The settings are located in the General Settings Window. Please refer to the Software Reference Guide for a detailed explanation of all the controls (EVAL-ADP1043A-GUI-RG).

Figure 20 General Settings Window



Soft Start is enabled and set to 40ms. You can experiment with different times.

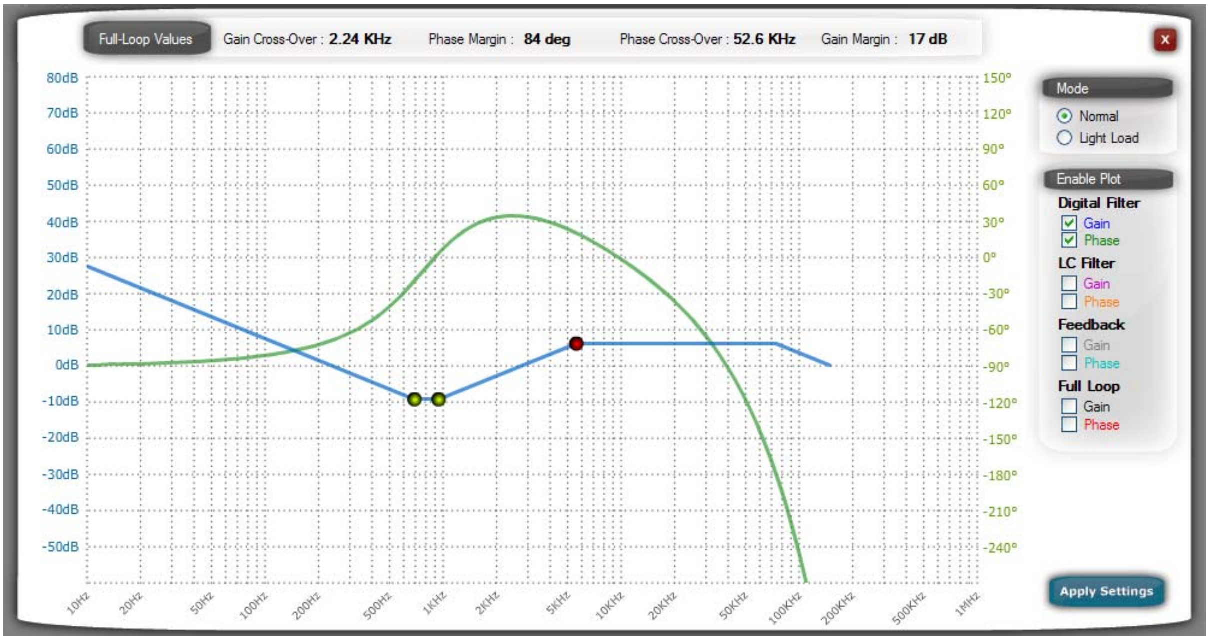
DIGITAL FILTER – TRANSIENT ANALYSIS

The digital filter can be changed using the software. The effect on transient analysis can be evaluated this way. Connect a switching electronic load to the output of the eval board. The load should be set to switch between 25%-50%, changing every 10msecs. Set up an oscilloscope to capture the transient waveform of the power supply output.

Use a differential probe on the scope, connecting it to the eval board output. Turn on the load, and note the waveform response.

Now, vary the digital filter using the software. Click on “Filter Settings” the window shows the filter settings for Normal mode. Click on the curve to move position of poles, zeroes and gains.

Figure 21 Digital Filter Window



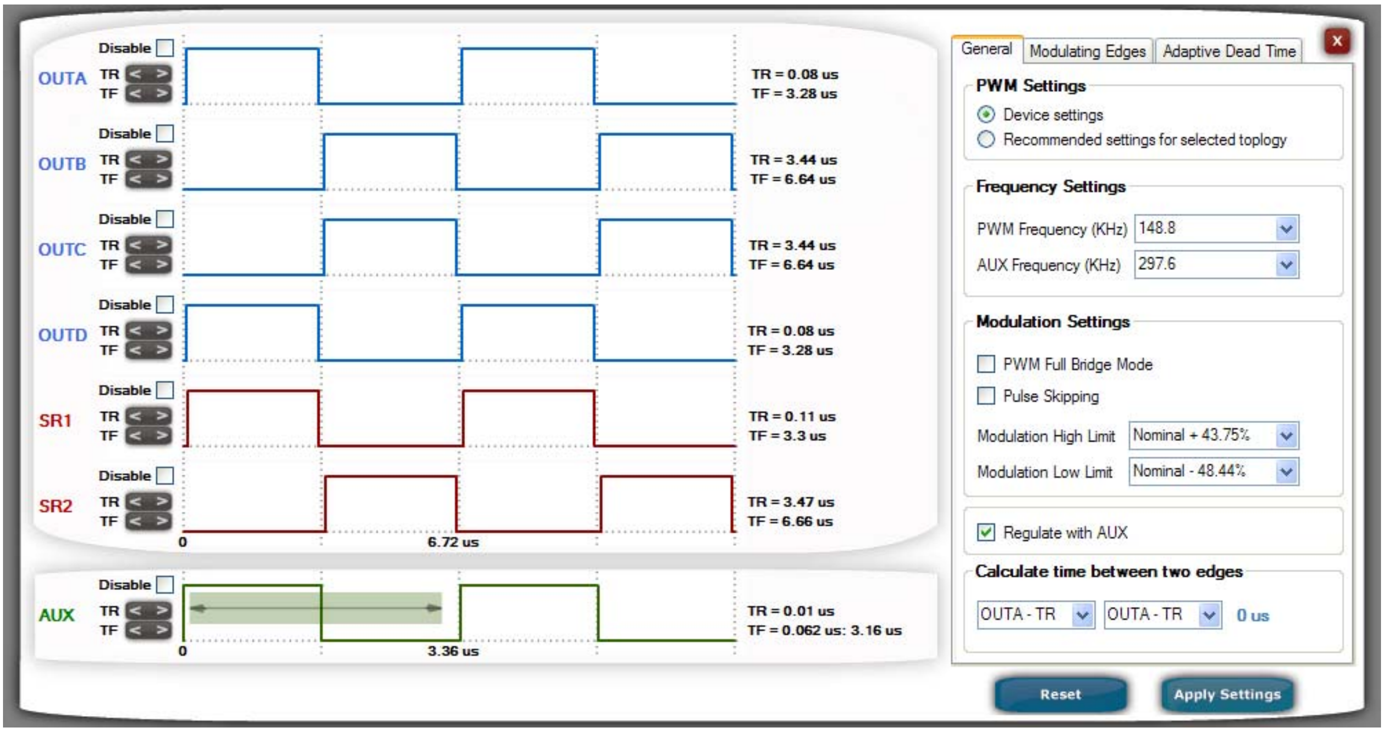
The transient response will change. This evaluation shows the user how the digital filter can easily be programmed to optimize the transient response of the power supply.

PWM – SWITCHING FREQUENCY

The converter switching frequency is programmable. In the "PWM & SR Settings" change the switching frequency.

The minimum and maximum modulation limits can also be modified.

Figure 22 Timing Window



NOTE: It is recommended to evaluate this feature with the power supply turned off. This prevents the chance of damaging the power supply by introducing shoot-through.

LIGHT LOAD OPTIMIZATION

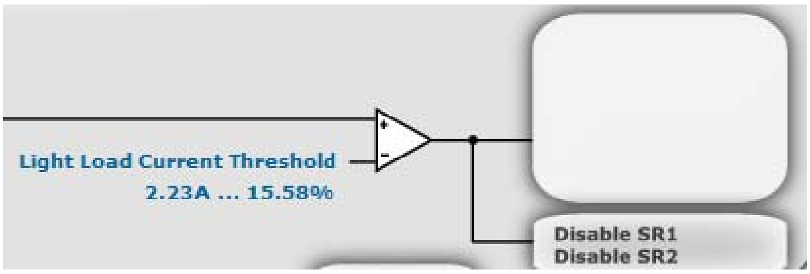
The ADP1043A can be programmed to optimize performance when an output current drops below a certain level.

The threshold for light load mode can be programmed in the digital filter window.

Once the current will drop below this level the sync rectifiers (SR1 and SR2) will be disabled. The "Light Load Mode Settings" will be used. The response time for the ADP1043A to switch from one mode to another is between 10 and 20ms.

The light load mode can be disabled by selecting a Light Load Current Threshold of 0%.

Figure 23 Light Load Current Threshold



PRIMARY SIDE CURRENT SENSE AND SECONDARY SIDE CURRENT SENSE

Current sensing is available for both the primary side current and the secondary side current. Primary side current sensing is performed using the current transformer, T1. Secondary side current sensing uses a low-side sense resistor.

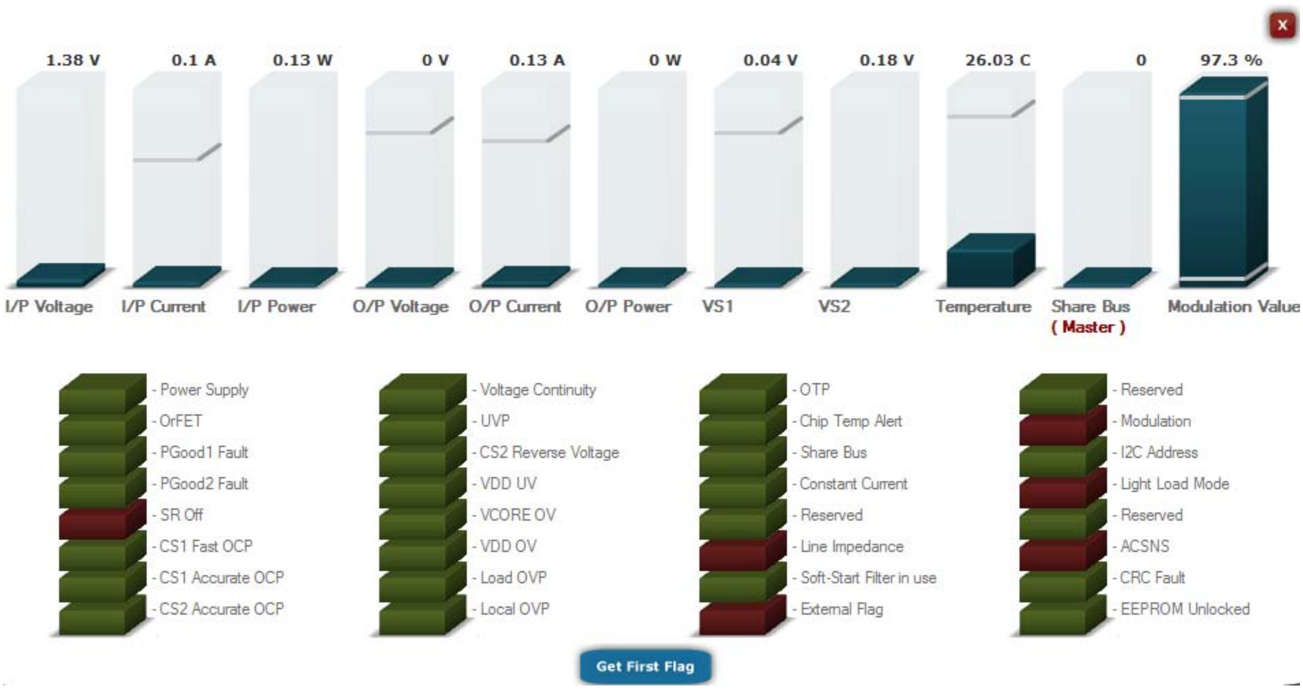
Open the Monitor window in the software. Click on the Flags and Readings tab. Adjust the load current from 0A to 14A. The input current and output current values will change in the software, matching the changes being made at the load.

FLAGS AND FAULT CONFIGURATIONS

Open the Monitor window in the software. Click on the Flags and Readings tab. The window will show all of the fault flags. If a flag is set, then there is a red box next to the flag. If the flag is ok, then there is a green box next to the flag.

Set the load current to 0.3A. The CS2 OCP flag should be green.

Figure 24 Flags



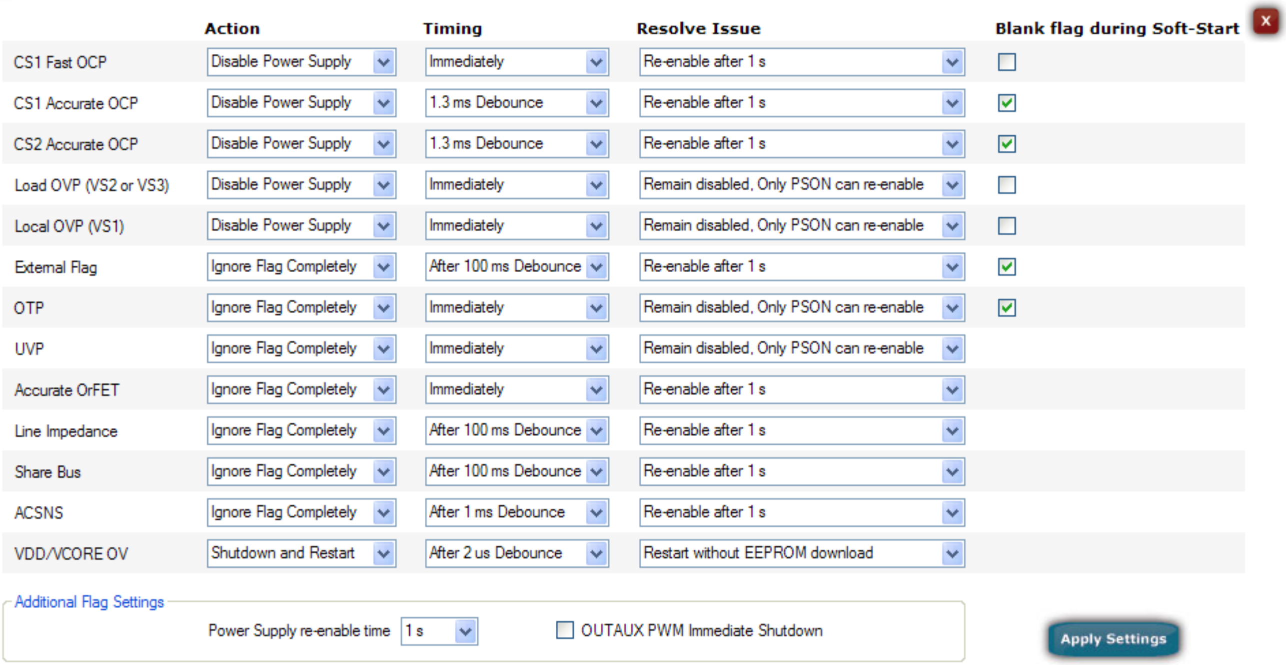
Now change the load to 17 A. The CS2 OCP flag should now have turned red, because the CS2 OCP threshold has been reached. The board wills ender in hiccup mode and try and restart.

Set the load back to 2A, and the flag turns green again. This shows how the user can easily monitor the health of the power supply by monitoring the status of the various flags.

Flag and Fault Response Configuration:

The ADP1043A is programmed to respond to the various fault conditions in the Fault Configuration Tab.

Figure 25 Fault Configurations



	Action	Timing	Resolve Issue	Blank flag during Soft-Start
CS1 Fast OCP	Disable Power Supply	Immediately	Re-enable after 1 s	☐
CS1 Accurate OCP	Disable Power Supply	1.3 ms Debounce	Re-enable after 1 s	☑
CS2 Accurate OCP	Disable Power Supply	1.3 ms Debounce	Re-enable after 1 s	☑
Load OVP (VS2 or VS3)	Disable Power Supply	Immediately	Remain disabled, Only PSON can re-enable	☐
Local OVP (VS1)	Disable Power Supply	Immediately	Remain disabled, Only PSON can re-enable	☐
External Flag	Ignore Flag Completely	After 100 ms Debounce	Re-enable after 1 s	☑
OTP	Ignore Flag Completely	Immediately	Remain disabled, Only PSON can re-enable	☑
UVP	Ignore Flag Completely	Immediately	Remain disabled, Only PSON can re-enable	
Accurate OrFET	Ignore Flag Completely	Immediately	Re-enable after 1 s	
Line Impedance	Ignore Flag Completely	After 100 ms Debounce	Re-enable after 1 s	
Share Bus	Ignore Flag Completely	After 100 ms Debounce	Re-enable after 1 s	
ACSNS	Ignore Flag Completely	After 1 ms Debounce	Re-enable after 1 s	
VDD/VCORE OV	Shutdown and Restart	After 2 us Debounce	Restart without EEPROM download	

You can change the resolve issue to “Remain Disabled”. If the over current is applied again the ADP1043A will shut down and remain off until PSON is cycled.

This evaluation shows how it is quite easy to configure the response to a fault condition. Change the load back to 2A, then toggle the PS_ON switch to restart the power supply.

APPENDIX

SCHEMATIC

Figure 26 Primary Main Circuit

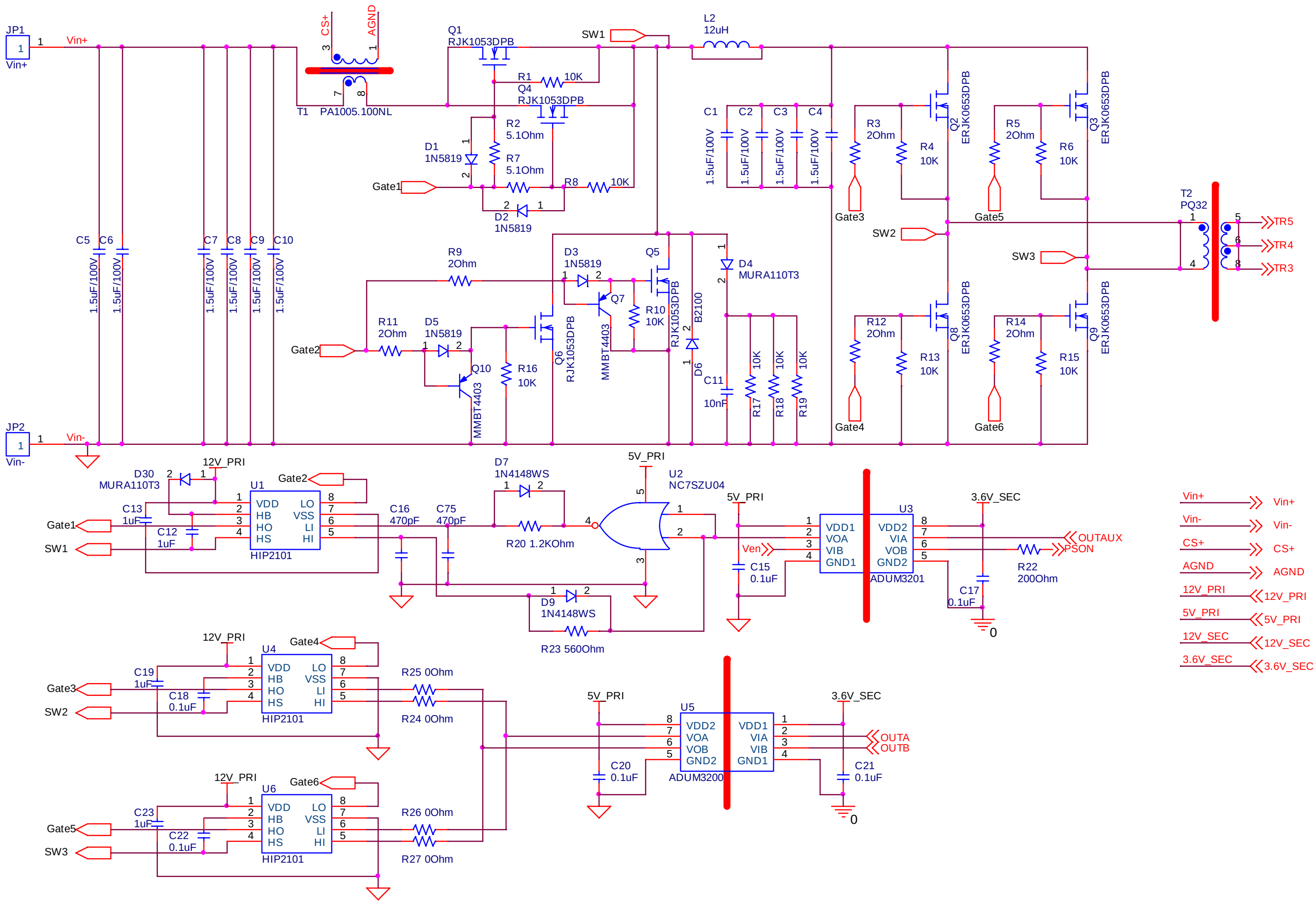


Figure 27 Secondary Main Circuit

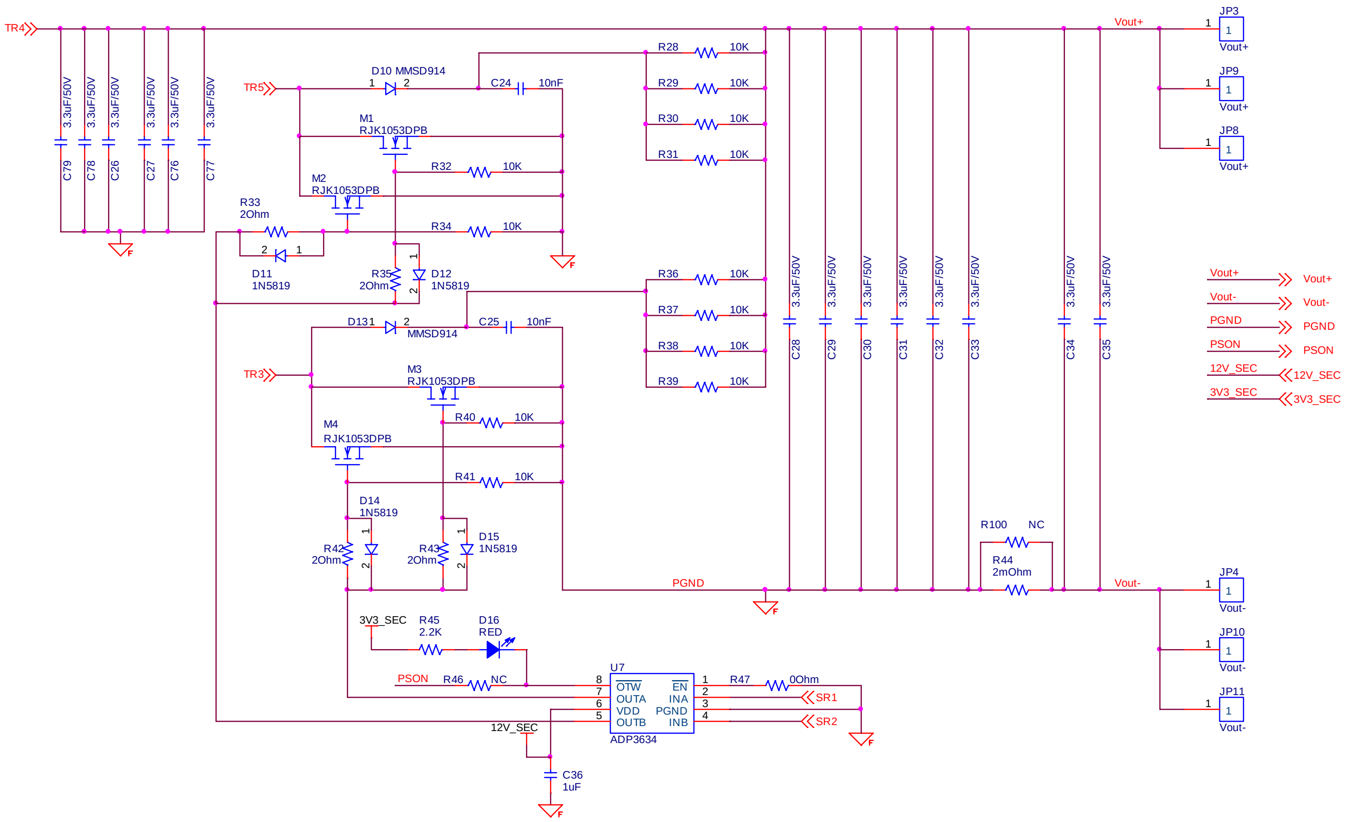


Figure 28 ADP1043A Control Circuit

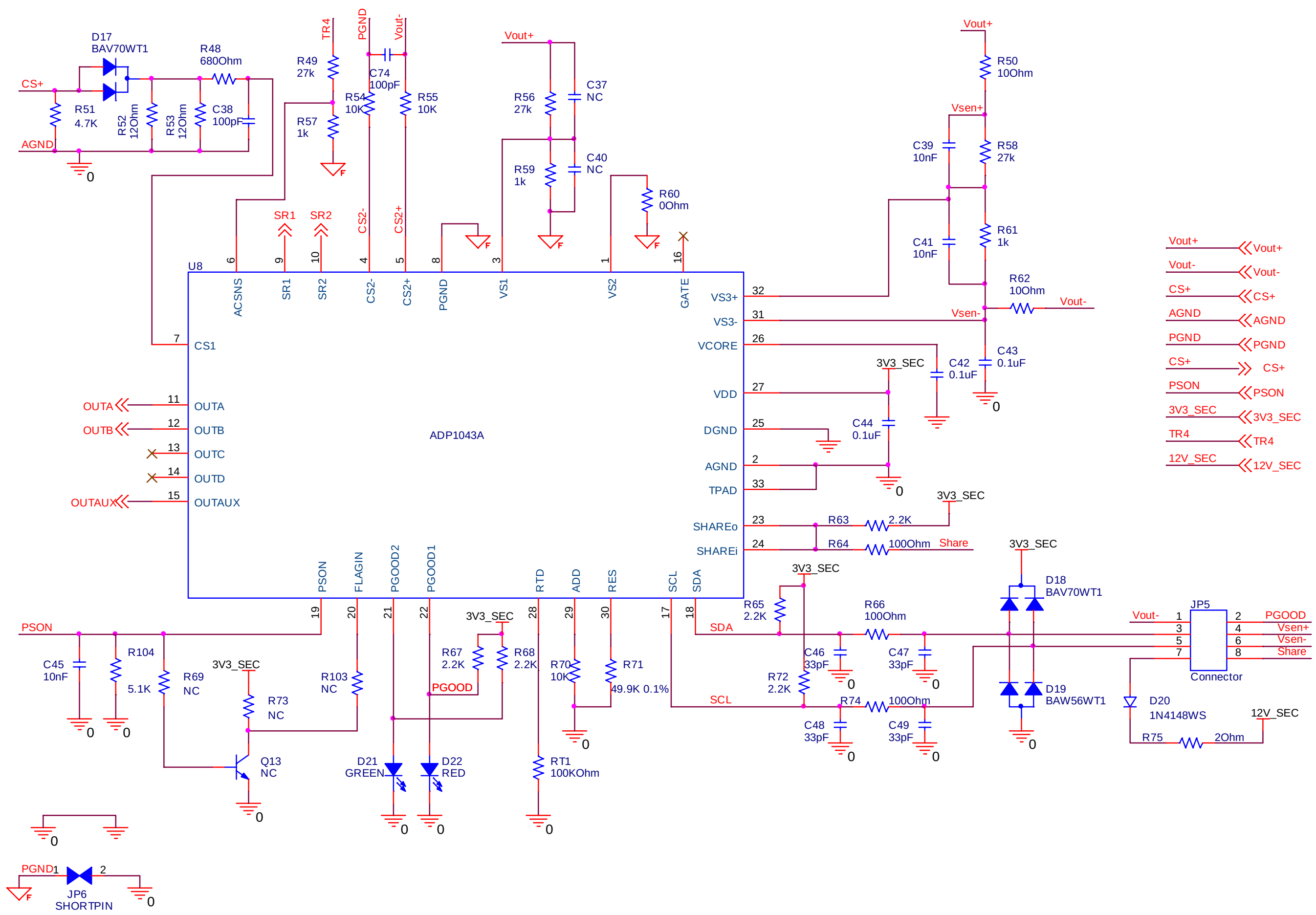
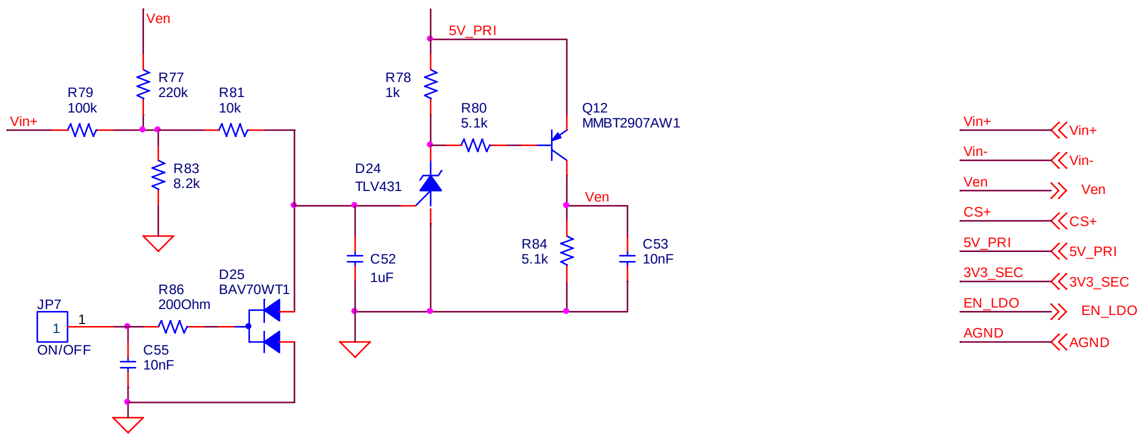
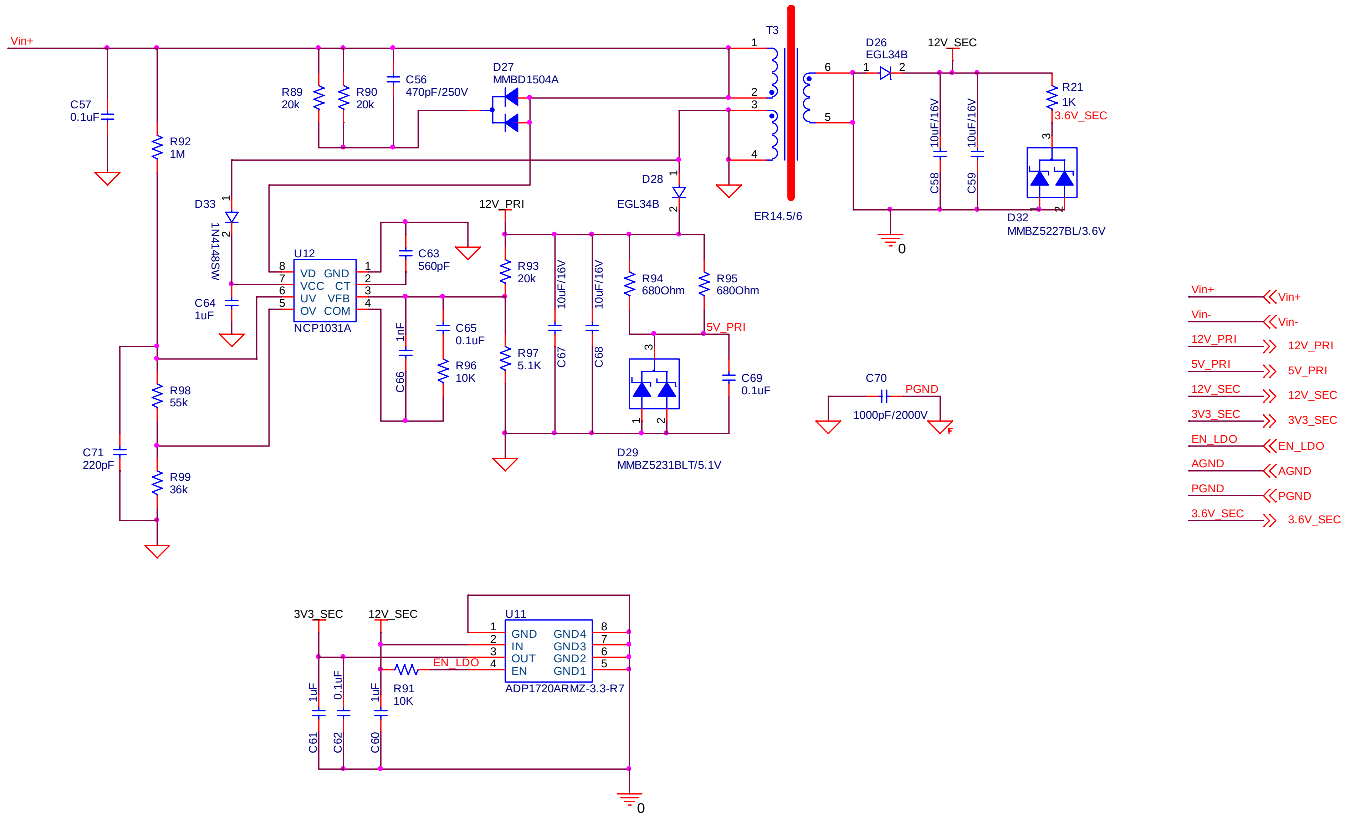


Figure 29 ON/OFF Circuit



ON/OFF&UVP CIRCUIT

Figure 30 Aux. Power Circuit



BILL OF MATERIALS

Item	Reference	Description	Part Number	Manufacture	Qty
1	C1,C2,C3,C4,C5,C6 C7,C8,C9,C10	CAP 1.5uF/100V X7R 1210	C3225X7R2A155K	TDK	10
2	C11,C24,C25	CAP 10nF/100V X7R 0805	C2012X7R2E103K	TDK	3
3	C12	CAP 1uF/16V X7R 0603		TDK	1
4	C13,C19,C23,C36	CAP 1uF/25V X7R 0805	C2012X7R1E105K	TDK	4
5	C15,C17,C18,C20,C21,C22 C42,C43,C44,C62,C65,C69	CAP 0.1uF/50V X7R 0603	C1608X7R1H104K	TDK	12
6	C16,C75	CAP 470pF/50V C0G 0603	C1608C0G1H471J	TDK	2
7	C26,C27,C28,C29,C30,C31,C32 C33,C34,C35,C76,C77,C78,C79	CAP 3.3uF/50V X7R 1210	C3225X7R1H335K	TDK	14
8	C37,C40	CAP 100pF/50V C0G 0603		TDK	2
9	C38,C74	CAP 100pF/50V C0G 0603	C1608X7R1H101K	TDK	2
10	C39,C41	CAP 1nF/50V X7R 0603	C1608X7R1H102K	TDK	2
11	C45	CAP 33pF/16V X7R 0603	C1608COG1H330J	TDK	1
12	C46,C47,C48,C49	CAP 33pF/16V X7R 0603	C1608COG1H330J	TDK	4
13	C52,C60,C61,C64	CAP 1uF/16V X7R 0603	C1608X7R1C105K	TDK	4
14	C53,C55	CAP 10nF/50V X7R 0603	C1608X7R1H103J	TDK	2
15	C56	CAP 470pF/250V X7R 0603	C1608C0G2E471J	TDK	1
16	C57	CAP 0.1uF/100V X7R 0805	C2012X7R2A104K	TDK	1
17	C58,C59,C67,C68	CAP 10uF/16V X7R 1206	C3216X7R1C106K	TDK	4
18	C63	CAP 560pF/50V C0G 0603		TDK	1
19	C66	CAP 1nF/50V X7R 0603	C1608X7R1H102K	TDK	1
20	C70	CAP 1000pF/2000V X7R 1808	C4520X7R3D102K	TDK	1
21	C71	CAP 220pF/100V C0G 0603	C1608COG2A221J	TDK	1
22	D1,D2,D3,D5,D11 D12,D14,D15	Diode 1A 40V	1N5819HW	Fairchild	8
23	D4	Diode 1A 100V	MURA110T3	On Semi	1
24	D6	Diode 1A 100V	B2100	Diodes	1
25	D7,D9	Diode 150mA 75V	1N4148WS	Diodes	2
26	D10,D13	Diode 0.2A 100V	MMSD914	Diodes	2
27	D16,D22	RED LED	SML-LXT0805IW-TR	Lumex	2
28	D17,D18,D25	Diode 200mA 70V	BAV70WT1	ON Semi	3
29	D19	Diode 200mA 70V	BAW56WT1	ON Semi	1
30	D20	Diode 150mA 75V	1N4148WS	Diodes	1
31	D21	GREEN LED	SML-LXT0805IW-TR	Lumex	1
32	D24	Adjustable from Vref=1.25V; 1%;	ZR431F01	ON Semi	1
33	D26,D28	Diode 0.5A 100V	EGL34B	Diodes	2

34	D27	Diode 200mA 200V	MMBD1504A	ON Semi	1
35	D29	Zener 5.1V	MMBZ5231BLT	ON Semi	1
36	D30	Diode 1A 100V	MURA110T3	ON Semi	1
37	D32	Zener 3.6V	MMBZ5227BL	ON Semi	1
38	D33	Diode 0.5A 100V	EGL34B	Diodes	1
39	JP1,JP2,JP6,JP7	Vin+, Vin-, ShortPin, ON/OFF		Any	1
41	JP3,JP8,JP9	Vout+		Any	3
42	JP4,JP10,JP11	Vout-		Any	3
43	JP5	8pin Header		Any	1
46	L2	Inductor 12uH		TDK	1
47	Q1,M1,M2,M3,Q4,M4,Q5,Q6	MOSFET	BSC079N10NS	Infineon	8
48	Q2,Q3,Q8,Q9	MOSFET	BSC079N10NS	Infineon	4
49	Q7,Q10	PNP -600mA -40V	MMBT4403	ON Semi	2
50	Q12	PNP -800mA -40V	MMBT2907AWT1	ON Semi	1
51	Q13	NPN 600mA 40V	MMBT4401	ON Semi	1
52	RT1	THERMISTOR 1%		Vishay	1
53	R1,R4,R6,R8,R10,R13,R15,R16 R32,R34,R40,R41,R81,R91,R96	RES 10KOHM 5% 1/10W 0603		Generic	15
54	R2,R7	RES 5.1OHM 5% 1/10W 0603		Generic	2
55	R3,R5,R9,R11,R12,R14,R33 R35,R42,R43	RES 2OHM 5% 1/10W 0603		Generic	10
56	R17,R18,R19,R28,R29,R30 R31,R36,R37,R38,R39	RES 10KOHM 5% 1/4W 1206		Generic	11
57	R20	RES 1.2KOHM 5% 1/10W 0603		Generic	1
58	R21	RES 1KOHM 5% 1/8W 0805		Generic	1
59	R22,R86	RES 200OHM 5% 1/10W 0603		Generic	2
60	R23	RES 560OHM 5% 1/10W 0603		Generic	1
61	R24,R25,R26,R27,R47,R60	RES 0OHM 5% 1/10W 0603		Generic	6
62	R44	RES 2m OHM 1% 1W 1206		Vishay	1
63	R45,R63,R65,R67,R68,R72	RES 2.2KOHM 5% 1/10W 0603		Generic	6
64	R46	RES 2OHM 5% 1/10W 0603		Generic	1
65	R48	RES 680OHM 5% 1/10W 0603		Generic	1
66	R49,R56,R58	RES 27KOHM 5% 1/10W 0603		Generic	3
67	R50,R62	RES 10OHM 5% 1/10W 0603		Generic	2
68	R51	RES 4.7KOHM 5% 1/10W 0603		Generic	1
69	R52,R53	RES 6OHM 5% 1/8W 0805		Generic	2
70	R54,R55,R70	RES 10KOHM 1% 1/16W		Generic	3

		0603			
71	R57,R59,R61,R78	RES 1KOHM 5% 1/10W 0603		Generic	4
72	R64,R66,R74	RES 100OHM 5% 1/10W 0603		Generic	3
73	R69	RES 5.1KOHM 5% 1/10W 0603		Generic	1
74	R71	RES 49.9KOHM 0.1% 1/16W 0603		Generic	1
75	R73	RES 1KOHM 5% 1/10W 0603		Generic	1
76	R75	RES 2OHM 1% 1/10W 0603		Generic	1
77	R77	RES 220KOHM 1% 1/10W 0603		Generic	1
78	R79	RES 100KOHM 5% 1/10W 0603		Generic	1
79	R80,R84,R97,R104	RES 5.1KOHM 5% 1/10W 0603		Generic	4
80	R83	RES 8.2KOHM 1% 1/10W 0603		Generic	1
81	R89,R90	RES 20KOHM 5% 1/8W 0805		Generic	2
82	R92	RES 1MOHM 5% 1/10W 0603		Generic	1
83	R93	RES 20KOHM 5% 1/8W 0805		Generic	1
84	R94,R95	RES 680OHM 5% 1/8W 0805		Generic	2
85	R98	RES 55KOHM 5% 1/10W 0603		Generic	1
86	R99	RES 36KOHM 5% 1/10W 0603		Generic	1
87	R100	RES 2m OHM 1% 1W 1206		Generic	1
88	R103	RES 0OHM 5% 1/10W 0603		Generic	1
89	T1	20A 1:100	PA1005.100NL	PULSE	1
90	T2	Main Transformer	PQ32/PC95	TDK	1
91	T3	Aux Transformer	ER14.5/6	TDK	1
92	U1,U4,U6	Driver IC	HIP2101	Intersil	3
93	U2	NOR Gate	NC7SZU04	ON Semi	1
94	U3	iCoupler	ADuM3201	ADI	1
95	U5	iCoupler	ADuM3200	ADI	1
96	U7	Dual channel driver IC	ADP3634	ADI	1
97	U8	Secondary PWM Controller	ADP1043A	ADI	1
98	U11	LDO	ADP1720ARMZ-3.3-R7	ADI	1
99	U12	NCP1031	NCP1031A	ON Semi	1

PCB LAYOUT

Figure 31 Top View of Board

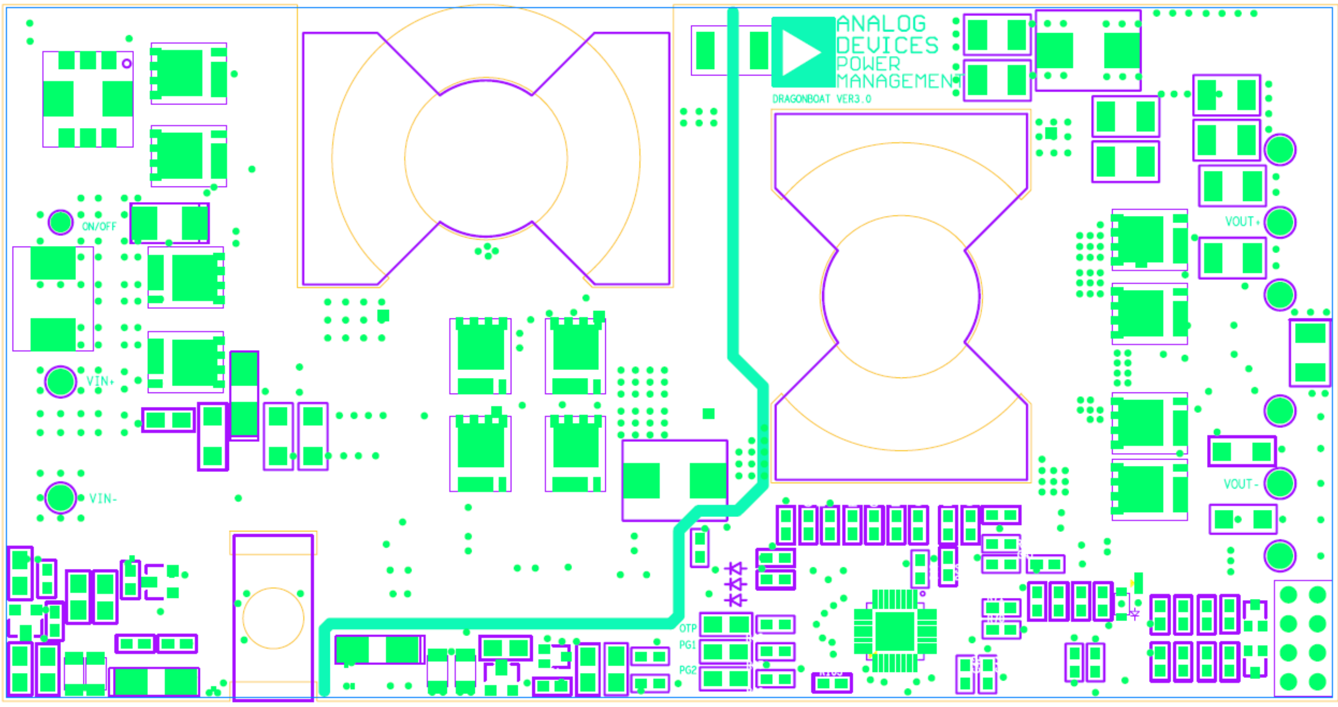
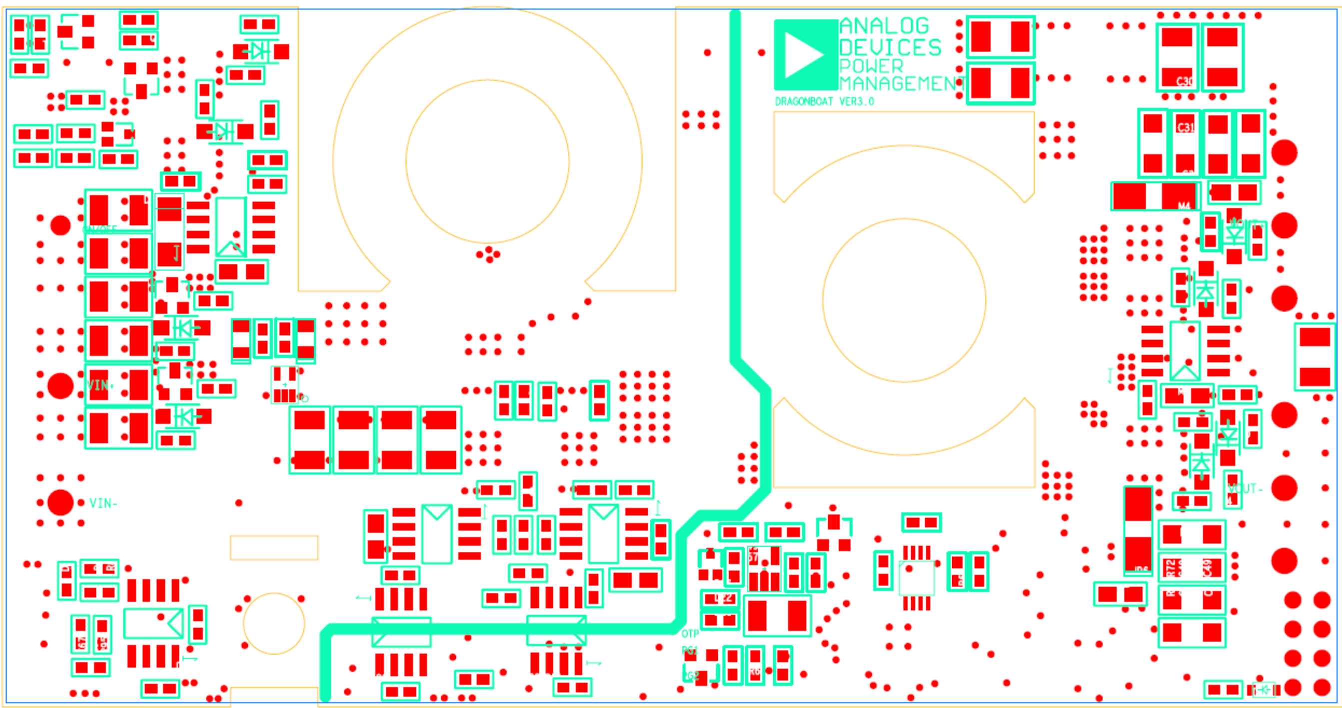


Figure 32 Bottom View of Board



BOARD SETTING

Input Voltage = 48 V

N1 = 3

N2 = 3

R (CS2) = 2.2 mOhm

I (load) = 14 A

R1 = 27 KOhm

R2 = 1 KOhm

C3 = 0.001 uF

C4 = 0.001 uF

N1 (CS1) = 1

N2 (CS1) = 100

R (CS1) = 6 Ohm

ESR (L1) = 3 mOhm

L1 = 12 uH

C1 = 26.4 uF

ESR (C1) = 1 mOhm

ESR (L2) = 0 mOhm

L2 = 0 uH

C2 = 1000 uF

ESR (C2) = 20 mOhm

R (Normal-Mode) (Load) = 1.96 Ohm

R (Light-Load-Mode) (Load) = 28 Ohm

Cap Across R1 & R2 = 1 "(1 = Yes: 0 = No)"

Topology = 0 (0 = Full Bridge: 1 = Half Bridge: 2 = Two Switch Forward: 3 = Interleaved Two Switch Forward: 4 = Active Clamp Forward: 5 = Resonant Mode: 6 = Custom)

Switches / Diodes = 0 (0 = Switches: 1 = Diodes)

High Side / Low Side Sense (CS2) = 0 (1 = High-Side: 0 = Low-Side Sense)

Second LC Stage = 1 (1 = Yes: 0 = No)

CS1 Input Type = 0 (1 = AC: 0 = DC)

R3 = 0 KOhm

R4 = 0 KOhm

PWM Main = 6 (0 = OUTA: 1 = OUTB: 2 = OUTC: 3 = OUTD: 4 = SR1: 5 = SR2: 6 = OUTAUX)

REGISTER SETTING

Reg(0h) = F8h - Fault Register 1

Reg(1h) = 20h - Fault Register 2

Reg(2h) = 5h - Fault Register 3

Reg(3h) = 44h - Fault Register 4

Reg(4h) = F8h - Latched Fault Register 1

Reg(5h) = 20h - Latched Fault Register 2

Reg(6h) = 5h - Latched Fault Register 3

Reg(7h) = 45h - Latched Fault Register 4

Reg(8h) = 3Bh - Fault Configuration Register 1

Reg(9h) = BBh - Fault Configuration Register 2

Reg(Ah) = B4h - Fault Configuration Register 3

Reg(Bh) = FCh - Fault Configuration Register 4

Reg(Ch) = CCh - Fault Configuration Register 5

Reg(Dh) = CCh - Fault Configuration Register 6

Reg(Eh) = 1h - Flag Configuration

Reg(Fh) = E6h - Soft-Start Flag Blank

Reg(10h) = 0h - First Flag ID

Reg(11h) = FFh - Reserved

Reg(12h) = 0h - VS1 Value

Reg(13h) = 0h - CS1 Value

Reg(14h) = 0h - CS1 x VS1 Value

Reg(15h) = 0h - VS1 Voltage Value

Reg(16h) = 0h - VS2 Voltage Value

Reg(17h) = A8h - VS3 Voltage Value

Reg(18h) = 60h - CS2 Value

Reg(19h) = 0h - CS2 x VS3 Value

Reg(1Ah) = ADE0h - RTD Temperature Value

Reg(1Bh) = FFh - Reserved

Reg(1Ch) = FFh - Reserved

Reg(1Dh) = 0h - Share Bus Value

Reg(1Eh) = 3h - Modulation Value

Reg(1Fh) = 0h - Line Impedance Value

Reg(20h) = FFh - Reserved

Reg(21h) = 14h - CS1 Gain Trim

Reg(22h) = 31h - CS1 OCP Limit

Reg(23h) = 0h - CS2 Gain Trim

Reg(24h) = 1h - CS2 Offset Trim

Reg(25h) = 6Dh - CS2 Digital Trim

Reg(26h) = 8Bh - CS2 OCP Limit

Reg(27h) = 3h - CS1 and CS2 OCP Setting

Reg(28h) = 3h - VS Balance Gain Setting

Reg(29h) = 1Fh - Share Bus Bandwidth

Reg(2Ah) = 40h - Share Bus Setting

Reg(2Bh) = 16h - Temperature Trim

Reg(2Ch) = 43h - PSON/Soft Start Setting

Reg(2Dh) = 3Ch - Pin Polarity Setting

Reg(2Eh) = 41h - Modulation Limit

Reg(2Fh) = Dh - OTP Threshold

Reg(30h) = 5h - OrFET

Reg(31h) = A4h - VS3 Voltage Setting

Reg(32h) = 18h - VS1 Overvoltage Limit

Reg(33h) = 18h - VS3 Overvoltage Limit

Reg(34h) = 0h - VS1 Undervoltage Limit

Reg(35h) = 3h - Line Impedance Limit

Reg(36h) = 7h - Load Line Impedance

Reg(37h) = FFh - Reserved

Reg(38h) = 8Bh - VS1 Trim

Reg(39h) = Dh - VS2 Trim

Reg(3Ah) = 95h - VS3 Trim

Reg(3Bh) = 0h - Light Load Disable Setting

Reg(3Ch) = 5h - Silicon Revision ID

Reg(3Dh) = 41h - Manufacturer ID

Reg(3Eh) = 43h - Device ID

Reg(3Fh) = 2Bh - OUTAUX Switching Frequency Setting

Reg(40h) = 1Bh - PWM Switching Frequency Setting

Reg(41h) = 1h - PWM 1 Positive Edge Timing

Reg(42h) = 0h - PWM 1 Positive Edge Setting

Reg(43h) = 29h - PWM 1 Negative Edge Timing

Reg(44h) = 4h - PWM 1 Negative Edge Setting

Reg(45h) = 2Bh - PWM 2 Positive Edge Timing

Reg(46h) = 0h - PWM 2 Positive Edge Setting

Reg(47h) = 53h - PWM 2 Negative Edge Timing

Reg(48h) = 4h - PWM 2 Negative Edge Setting

Reg(49h) = 2Bh - PWM 3 Positive Edge Timing

Reg(4Ah) = 0h - PWM 3 Positive Edge Setting

Reg(4Bh) = 53h - PWM 3 Negative Edge Timing

Reg(4Ch) = 4h - PWM 3 Negative Edge Setting

Reg(4Dh) = 1h - PWM 4 Positive Edge Timing

Reg(4Eh) = 0h - PWM 4 Positive Edge Setting

Reg(4Fh) = 29h - PWM 4 Negative Edge Timing

Reg(50h) = 4h - PWM 4 Negative Edge Setting

Reg(51h) = 1h - SR 1 Positive Edge Timing

Reg(52h) = 64h - SR 1 Positive Edge Setting

Reg(53h) = 29h - SR 1 Negative Edge Timing

Reg(54h) = 40h - SR 1 Negative Edge Setting

Reg(55h) = 2Bh - SR 2 Positive Edge Timing

Reg(56h) = 64h - SR 2 Positive Edge Setting

Reg(57h) = 53h - SR 2 Negative Edge Timing

Reg(58h) = 40h - SR 2 Negative Edge Setting

Reg(59h) = 0h - PWM AUX Positive Edge Timing

Reg(5Ah) = 20h - PWM AUX Positive Edge Setting

Reg(5Bh) = 15h - PWM AUX Negative Edge Timing

Reg(5Ch) = 2Ah - PWM AUX Negative Edge Setting

Reg(5Dh) = 0h - PWM and SR Pin Disable Setting

Reg(5Eh) = 0h - Password Lock

Reg(5Fh) = 3h - Soft-Start Digital Filter LF Gain Setting

Reg(60h) = 4h - Normal Mode Digital Filter LF Gain Setting

Reg(61h) = F6h - Normal Mode Digital Filter Zero Setting

Reg(62h) = CAh - Normal Mode Digital Filter Pole Setting

Reg(63h) = Fh - Normal Mode Digital Filter HF Gain Setting

Reg(64h) = 1h - Light Load Digital Filter LF Gain Setting

Reg(65h) = F8h - Light Load Digital Filter Zero Setting

Reg(66h) = D7h - Light Load Digital Filter Pole Setting

Reg(67h) = 4h - Light Load Digital Filter HF Gain Setting

Reg(68h) = 0h - Dead Time Threshold

Reg(69h) = 88h - Dead Time 1

Reg(6Ah) = 88h - Dead Time 2

Reg(6Bh) = 88h - Dead Time 3

Reg(6Ch) = 88h - Dead Time 4

Reg(6Dh) = 88h - Dead Time 5

Reg(6Eh) = 88h - Dead Time 6

Reg(6Fh) = 88h - Dead Time 7

Reg(70h) = 19h -

Reg(71h) = 1Bh -

Reg(72h) = 46h -

Reg(73h) = 12h -

Reg(74h) = 0h -

Reg(75h) = FFh -

Reg(76h) = FFh -

Reg(77h) = 0h -

Reg(78h) = 0h -

Reg(79h) = 1Bh -

Reg(7Ah) = 2h -

Reg(7Bh) = FFh - Factory Default Settings

Reg(7Ch) = 1h - EEPROM X Address

Reg(7Dh) = 35h - EEPROM Y Address

Reg(7Eh) = 35h - EEPROM Register

Reg(7Fh) = FFh -

Reg(80h) = 35h -

Reg(81h) = 35h -

Reg(82h) = 35h -

NOTES