Description

The ZL2006 is an integrated mixed-signal power conversion and management IC that combines an efficient step-down DC-DC converter with key power and thermal management functions in a single package. The ZL2006 incorporates current sharing and adaptive efficiency-optimization algorithms to provide a flexible, efficient power IC building block.

The ZL2006EV2 platform is a 6-layer board with two power rails. One rail is a single phase, 30A power rail. The other rail is a dual phase, 60A power rail demonstrating the current sharing capability of the ZL2006.

A USB to SMBus adapter board can be used to connect the eval board to a PC. The PMBus command set is accessed by using the Zilker Labs PowerNavigator™ evaluation software from a PC running Microsoft Windows.

Features

- 30A single-phase and 60A dual-phase rails
- Optimized for efficiency
- Configurable through SMBus
- Onboard enable switch
- Power good indicators

Target Specifications

- V_{IN} = 12 V
- V_{OUT1} = 1.8 V / 60 A max
- V_{OUT2} = 1.5 V / 30 A max
- f_{sw} = 300 kHz
- Efficiency: 90% at 50% load
- Output ripple: ±1.5%
- Dynamic response: ±3%
  (50%-70%-50% load step, di/dt = 2.5 A/µs)
- Board temperature: 25°C

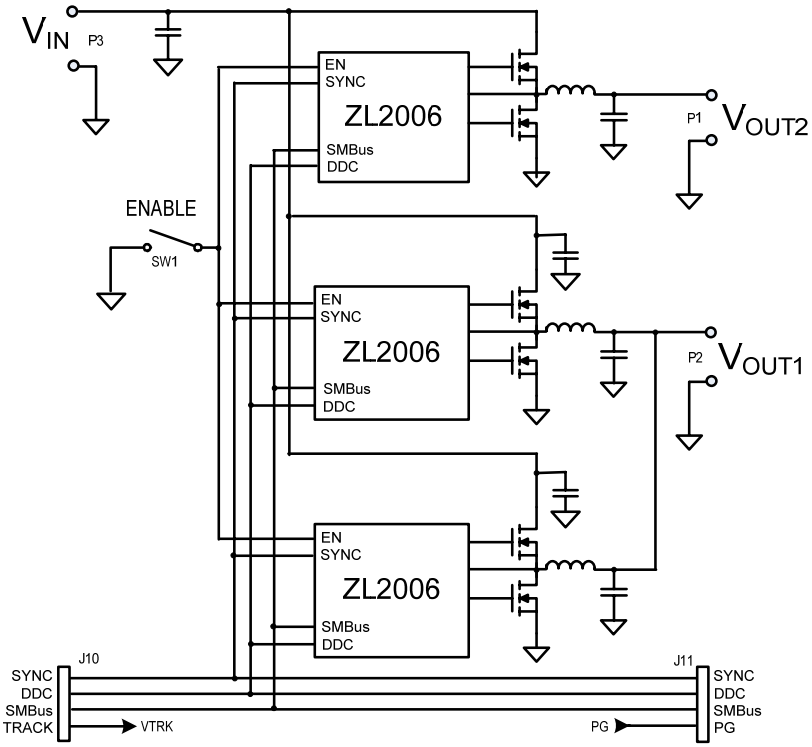

Figure 1. ZL2006EV2 Block Diagram

Functional Description

The ZL2006EV2 provides all circuitry required to demonstrate the features of the ZL2006. The ZL2006EV2 has a functionally-optimized ZL2006 circuit layout that allows efficient operation up to the maximum output current. Power and load connections are provided through plug-in sockets.

All features of the ZL2006 such as current sharing, soft-start delay and ramp times, supply sequencing, voltage tracking, and voltage margining are available on this evaluation board. For voltage tracking, the board is set up for the single phase rail (V_{OUT2}) to track the dual phase rail (V_{OUT1}). Contact the Zilker Labs sales office for configuring the board for other tracking combinations.

Figure 1 shows a functional block diagram of the ZL2006EV2 board. The SMBus address is selectable through a jumper on the top side of the board. All power to the board (VIN and I^2C bus) must be removed before changing the jumpers.

The hardware enable function is controlled by a toggle switch on the ZL2006EV2 board. The power good (PG) LEDs indicate the correct state of PG when external power is applied to the ZL2006EV2 board. (Note: If a USB board is connected to the ZL2006EV2 and no power is applied to the board, the PG LEDs will turn on even though the power rails are not enabled.) The right angle headers at opposite ends of the board are for connecting a USB to SMBus adapter board or for daisy chaining of multiple evaluation boards.

Figure 2 and Figure 3 show the two phases of the 60A circuit. Figure 4 shows the single phase operational circuit. The circuit consists of the ZL2006 IC with its minimal component count to realize a 30 A buck converter. The board layout has been optimized for thermal performance.

Figure 5 is the Interface and Figure 9 SMBus address selection circuitry.

Operation

PMBus Operation

The ZL2006 utilizes the PMBus protocol. The PMBus functionality can be controlled via USB from a PC running the PowerNavigator evaluation software in a Windows XP or Windows 2000/NT operating system.

Install the ZL2006EV2 software using the CD included in the ZL2006EV2 kit.

For board operation, connect the included USB-to-SMBus adapter board to J10 of the ZL2006EV2 board. Connect the desired load and an appropriate power supply to the input and connect the included USB cable to the PC running the PowerNavigator evaluation software. Place the ENABLE switch in "DISABLE" and turn on the power.

The evaluation software allows modification of all ZL2006 PMBus parameters. Each of the ZL2006 devices have been pre-configured as described in this document, but the user may modify the operating parameters through the eval software or by loading a predefined scenario from a configuration file.

Use the mouse-over pop-ups for PowerNavigator help. Refer to Zilker Labs application note AN33 [2] for PMBus details.

The ENABLE switch can then be moved to "ENABLE" and the ZL2006EV2 board can be tested. Alternately, the PMBus ON-OFF CONFIG and OPERATION commands may be used.

Quick Start Guide

Stand Alone Operation

1. Set ENABLE switch to “DISABLE”
2. Apply load to VOUT+/VOUT- for each channel
3. Connect power supply to VIN+/VIN- (supply turned off)
4. Turn power supply on
5. Set ENABLE switch to “ENABLE”
6. Monitor ZL2006EV2 board operation using an oscilloscope

USB (PMBus) Operation

1. Set ENABLE switch to “DISABLE”
2. Apply load to VOUT+/VOUT- for each channel
3. Connect power supply to VIN+/VIN- (supply turned off)
4. Turn power supply on
5. Insert the Zilker Labs Eval Kit CD
6. Connect USB to SMBus adapter board to J10 of ZL2006EV2
7. Connect supplied USB cable from computer to USB to SMBus adapter board
   a. Upon first-time connection, the Found New Hardware Wizard will appear.
   b. Windows XP users: Select ‘No’ at prompt to search the Internet for drivers.
   c. Follow the steps on the screen to install the drivers from the CD.
8. Install the PowerNavigator evaluation software by running setup.exe from the PowerNavigator_installer folder on the CD.
9. Set ENABLE switch on EVB to “ENABLE”
10. Monitor and configure the ZL2006EV2 board using PMBus commands in the evaluation software
11. Test the ZL2006EV2 operation using an oscilloscope and the evaluation software.

Board Schematics

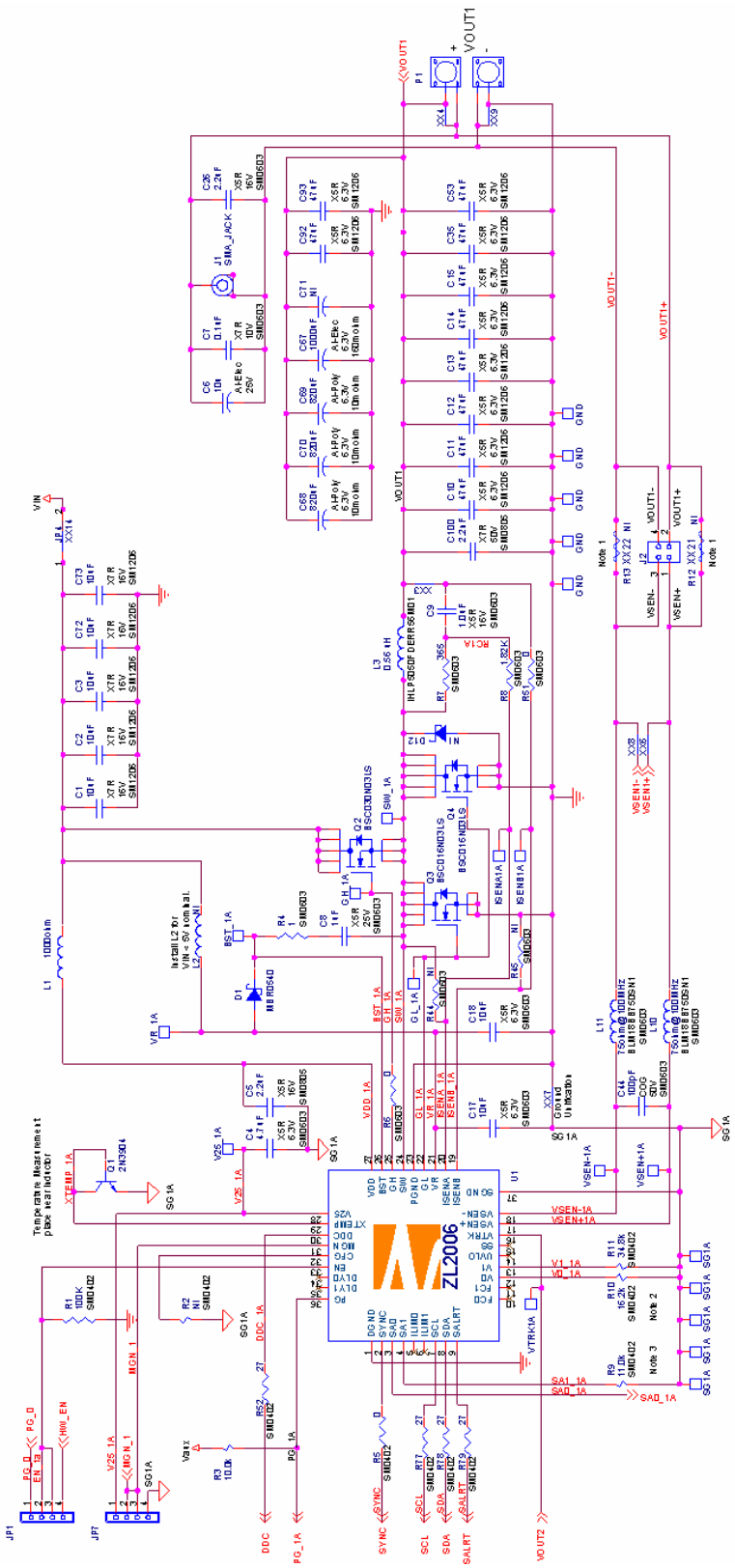

Figure 2. ZL2006EV2 60A Current Sharing Rail (Phase A) Circuit

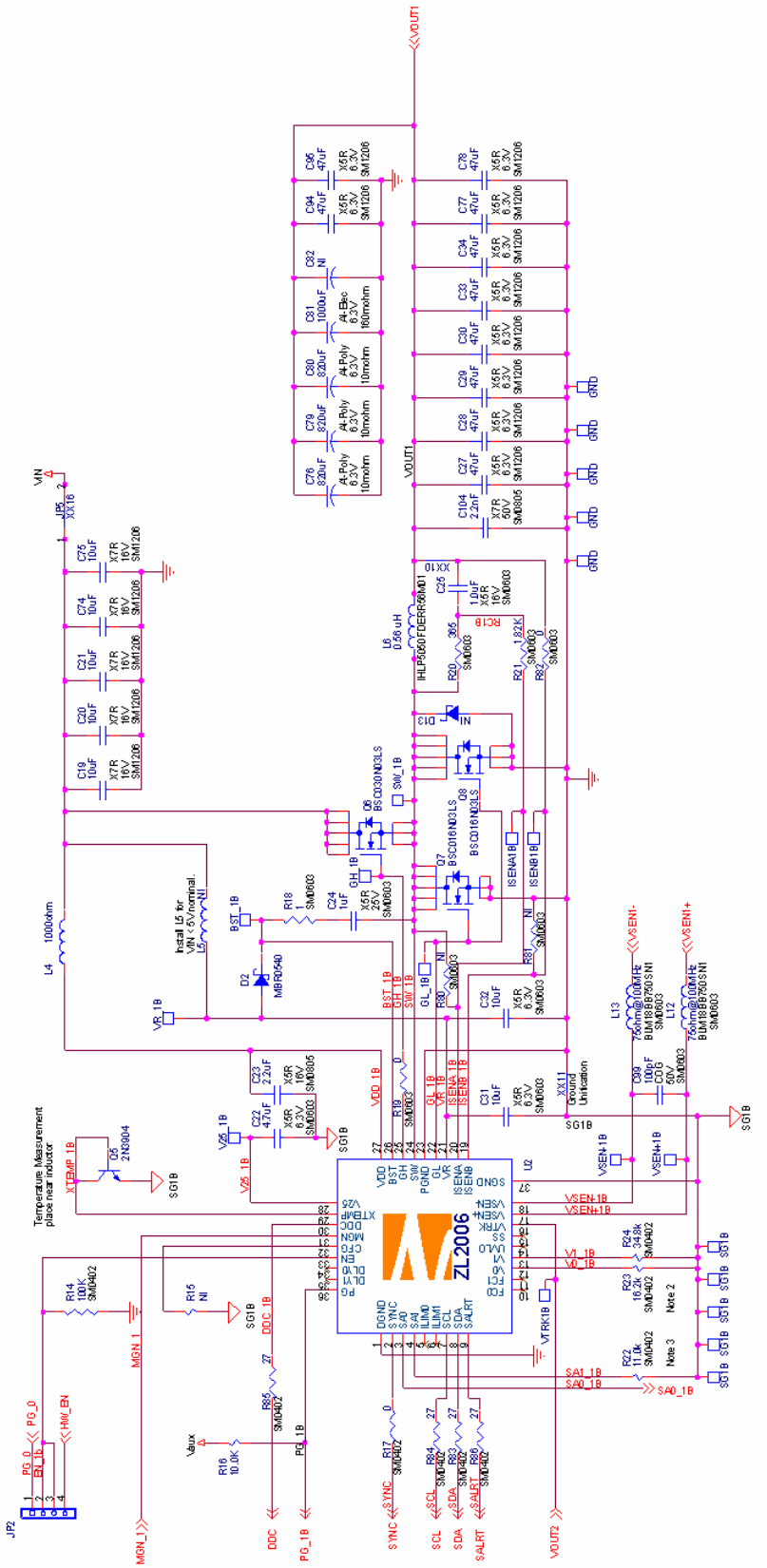

Figure 3. ZL2006EV2 60A Current Sharing Rail (Phase B) Circuit

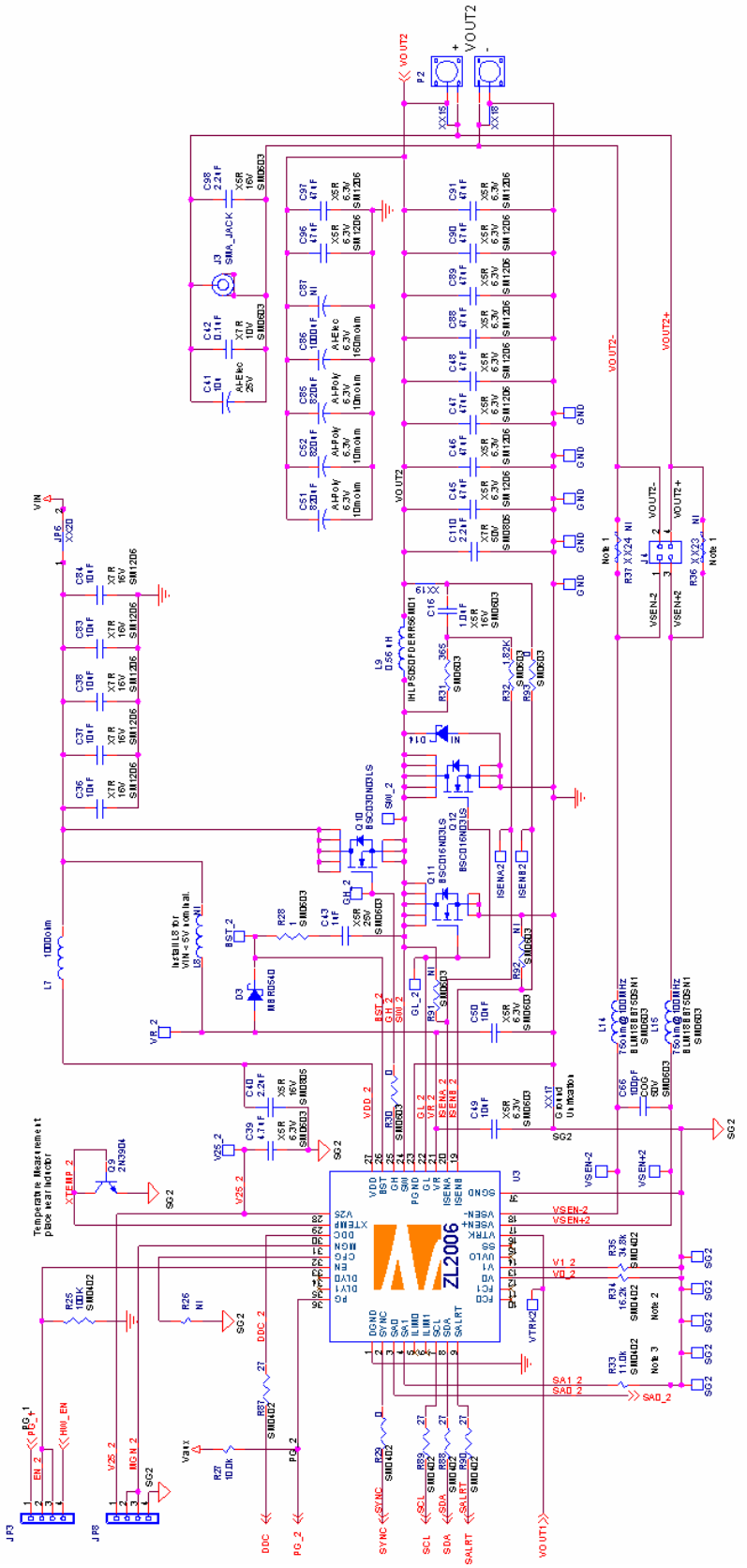

Figure 4. ZL2006EV2 30A Single Phase Rail Circuit

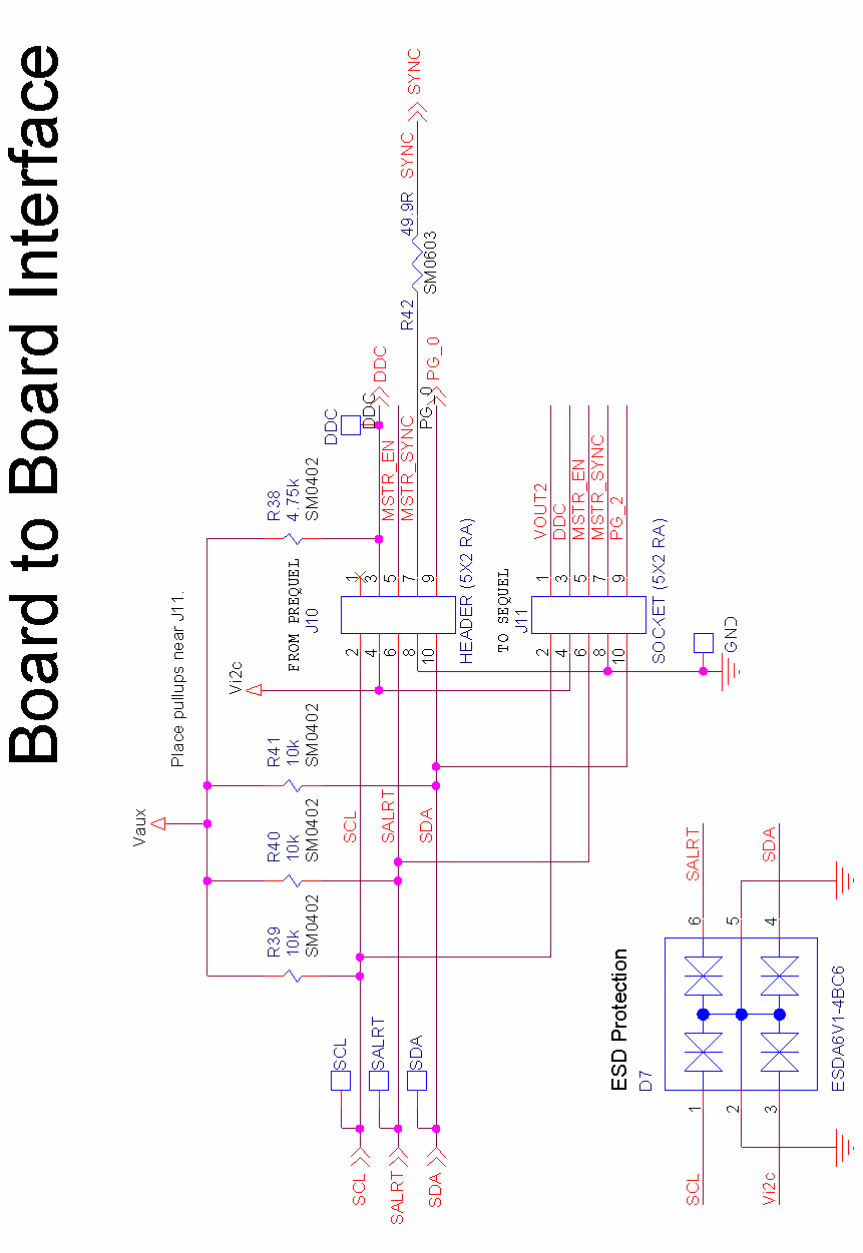

Figure 5. ZL2006EV2 Interface Circuitry

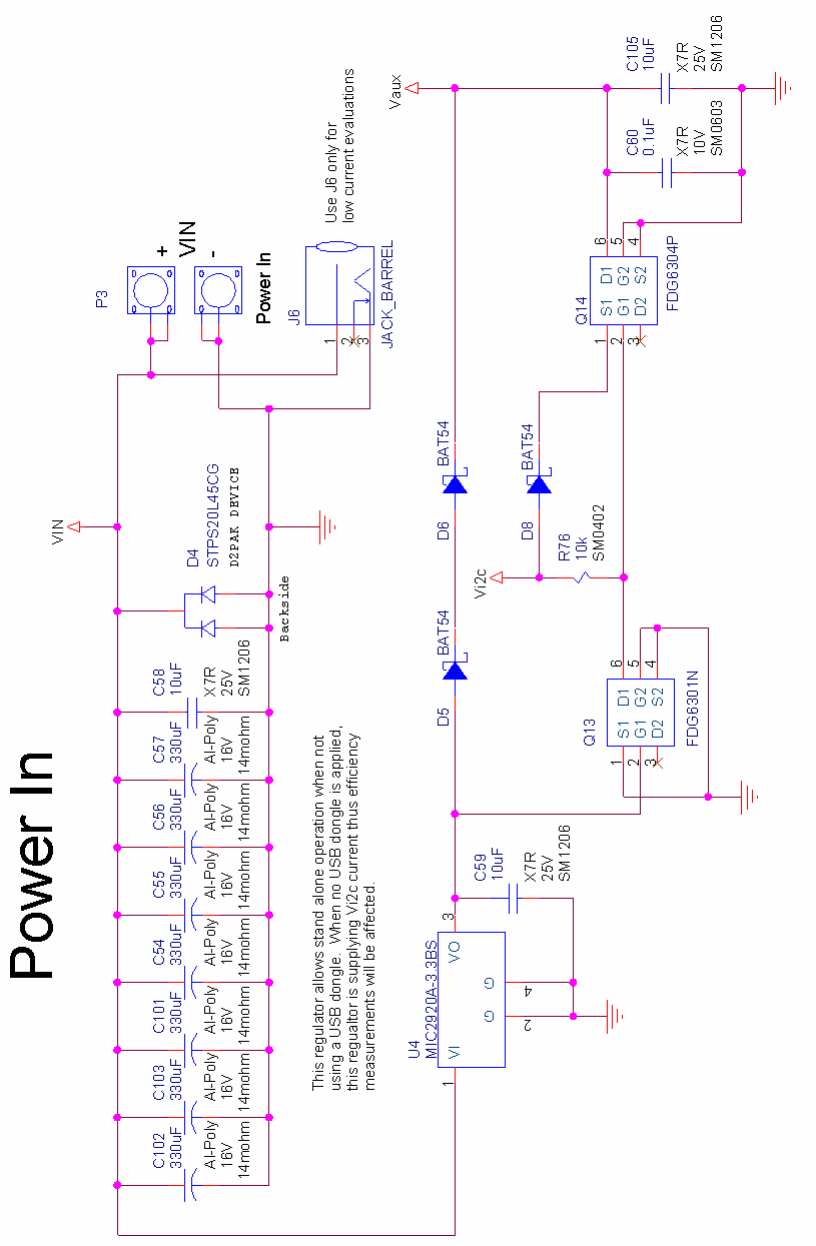

Figure 6. Power-In Circuit

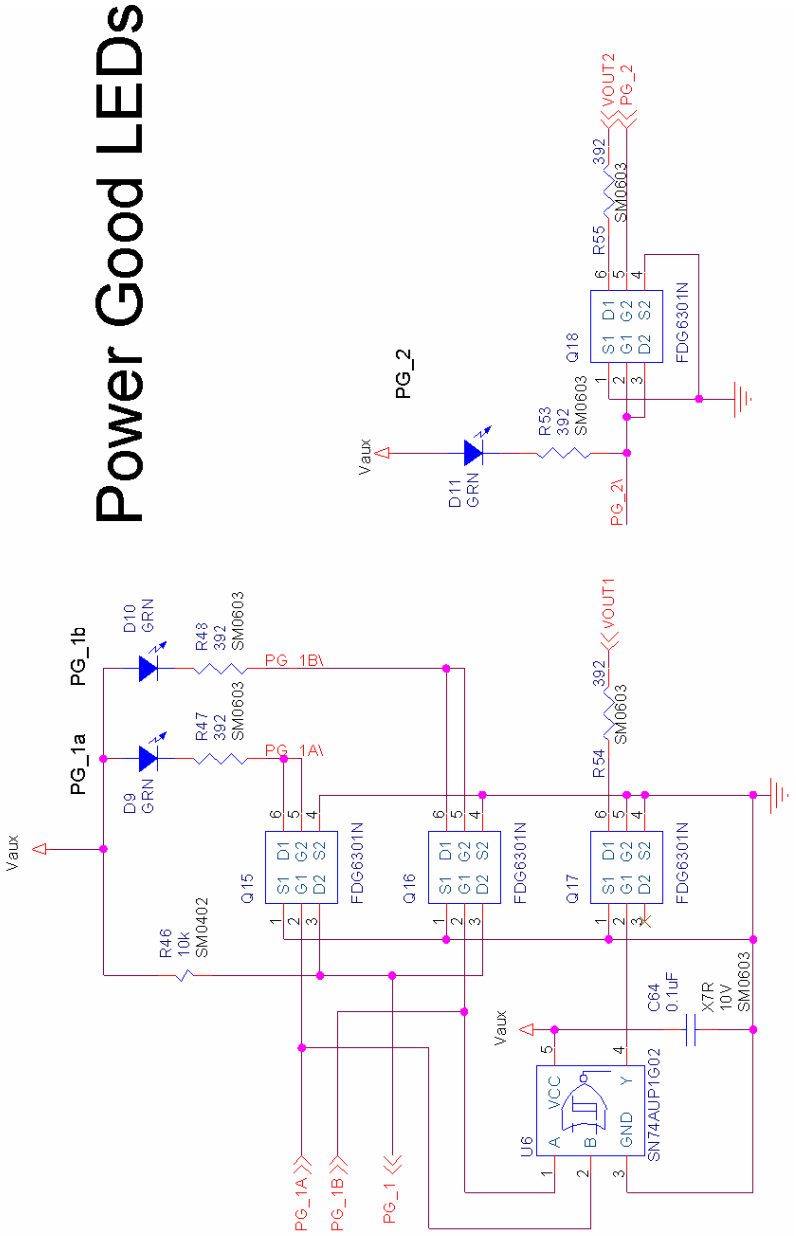

Figure 7. PG LED Circuitry

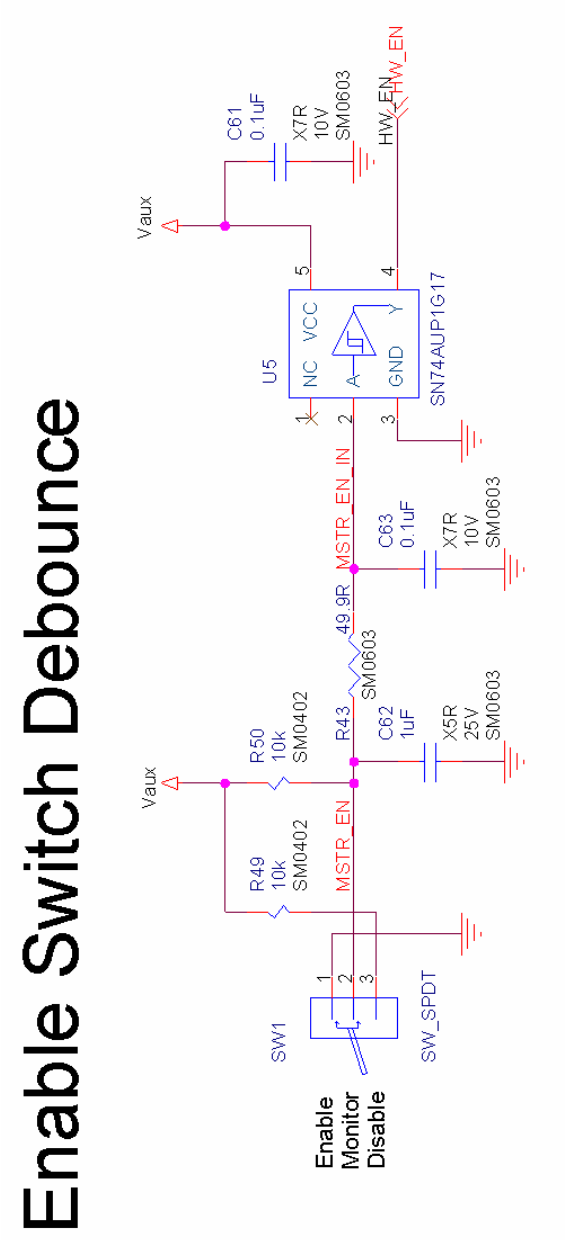

Figure 8. ENABLE Switch Debounce Circuit

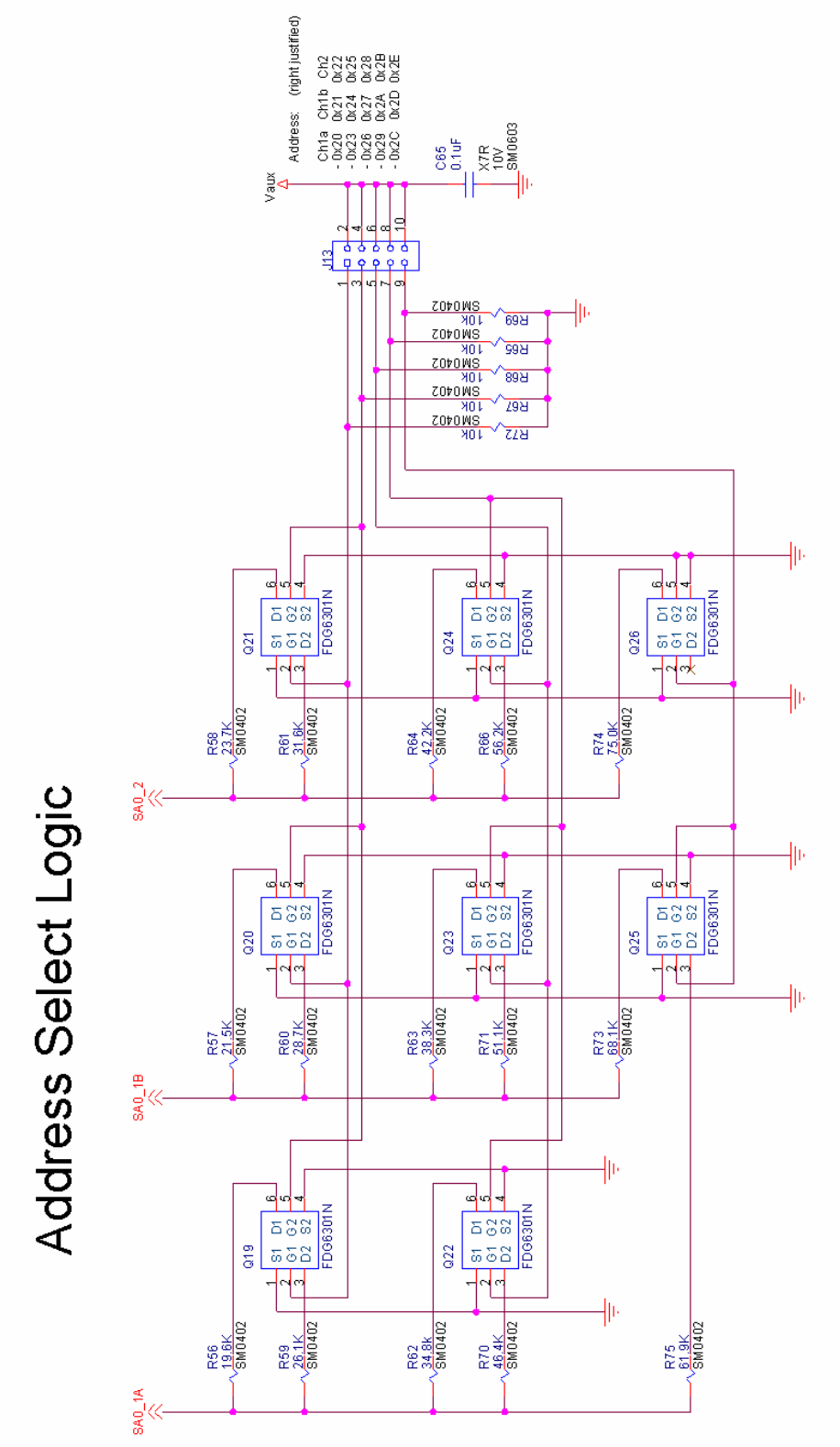

Figure 9. Address Selection Circuitry

Board Layout – 6 Layers

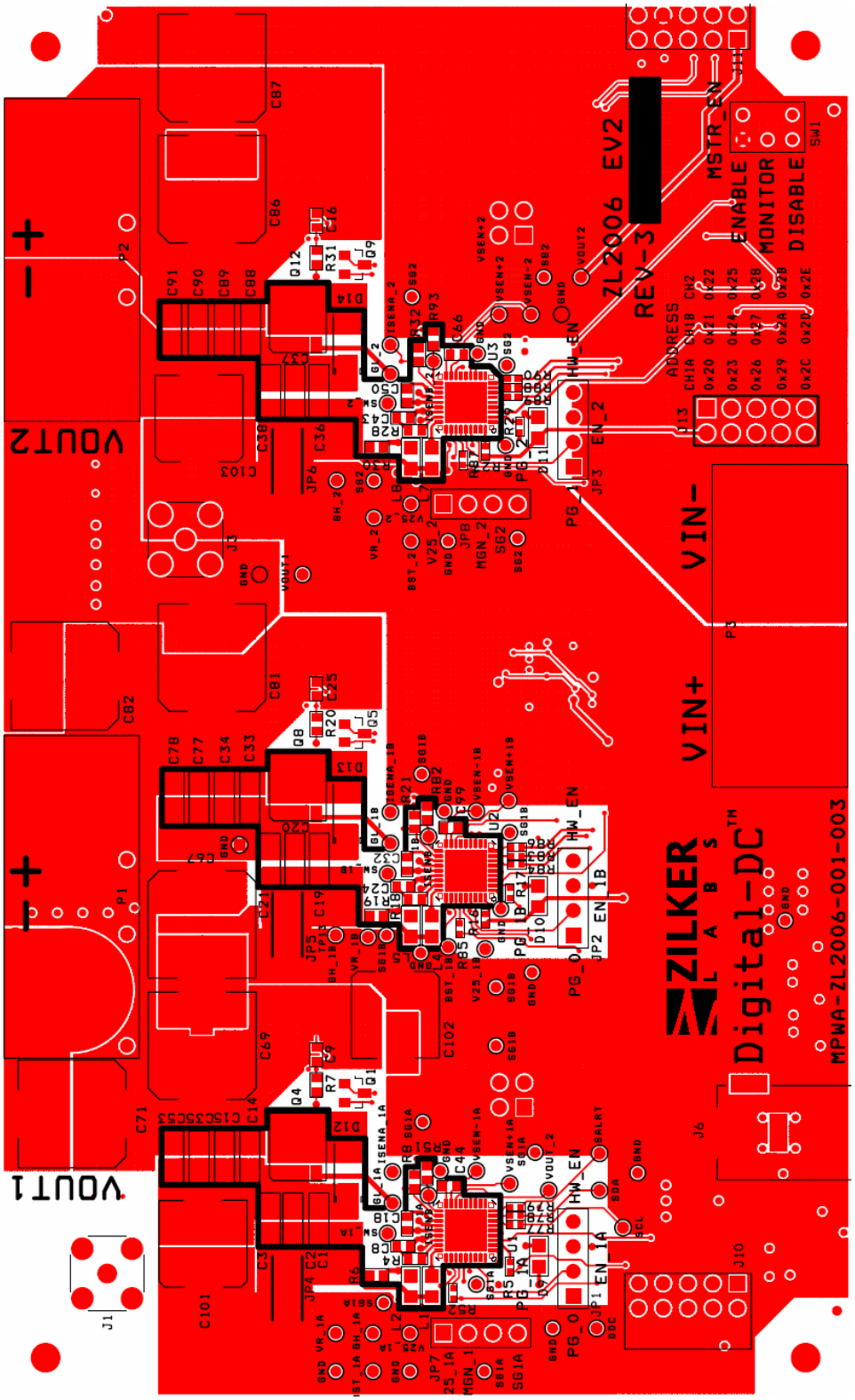

Figure 10. PCB – Top Layer

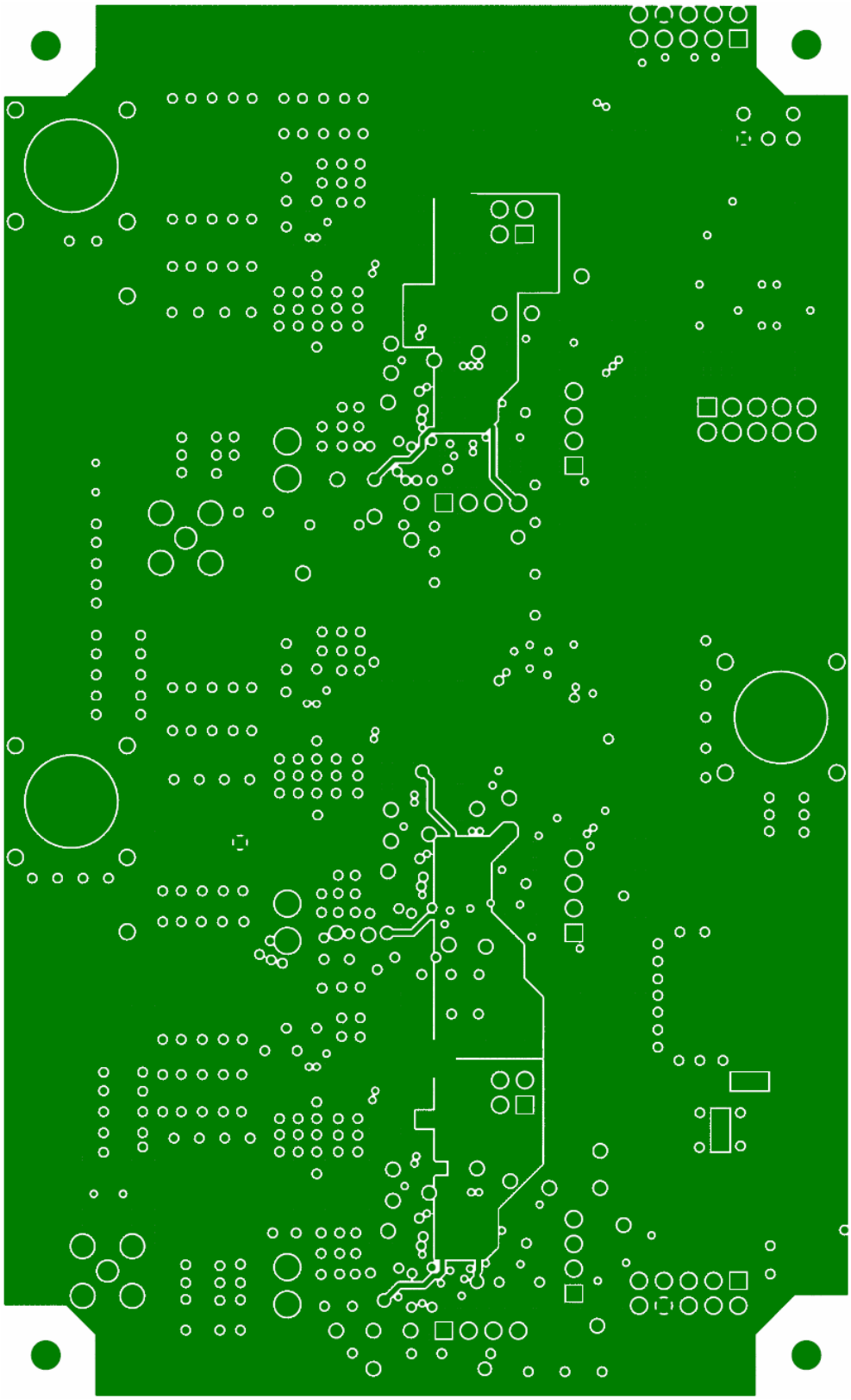

Figure 11. PCB – Inner Layer 1 (Viewed from Top)

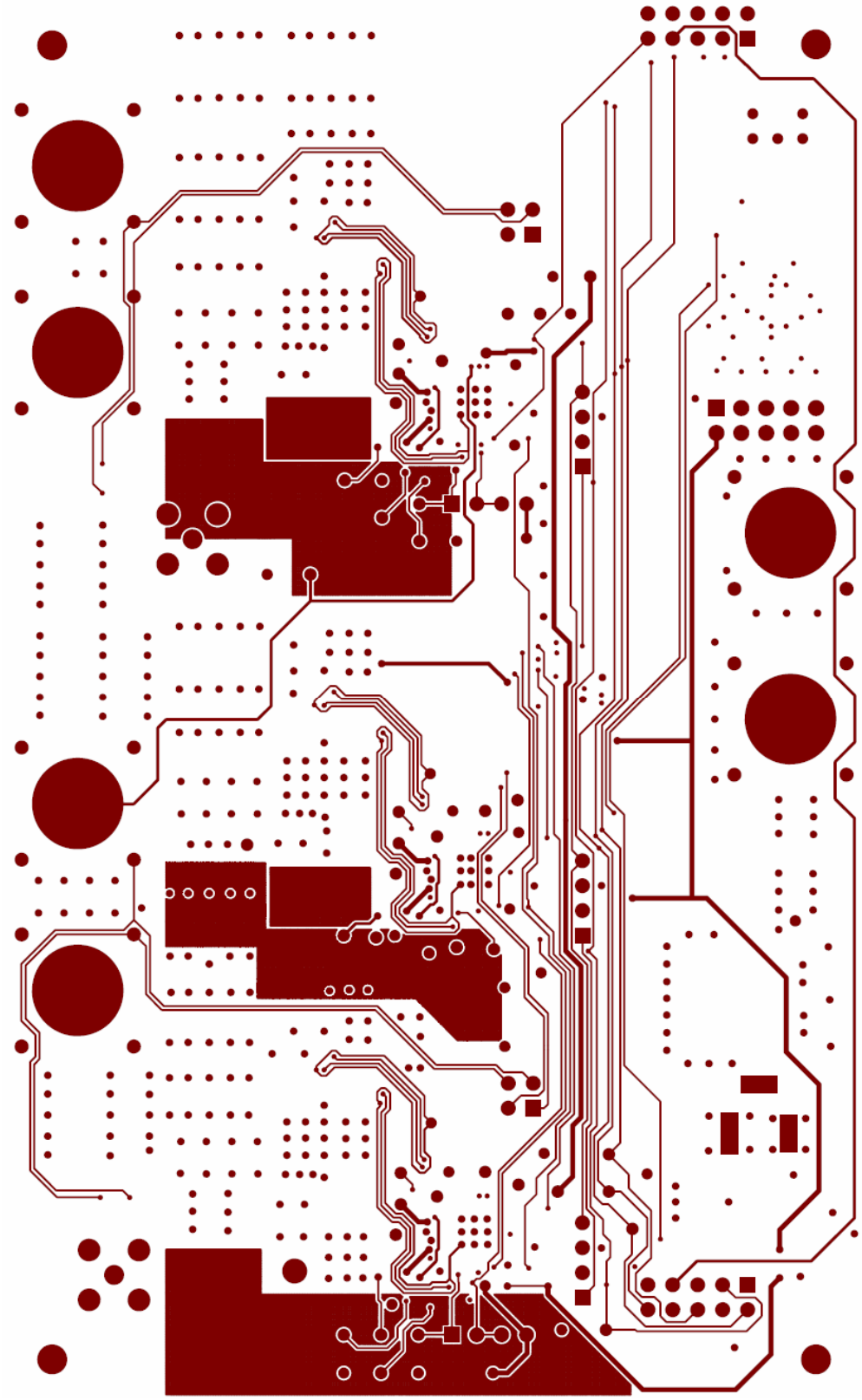

Figure 12. PCB – Inner Layer 2 (Viewed from Top)

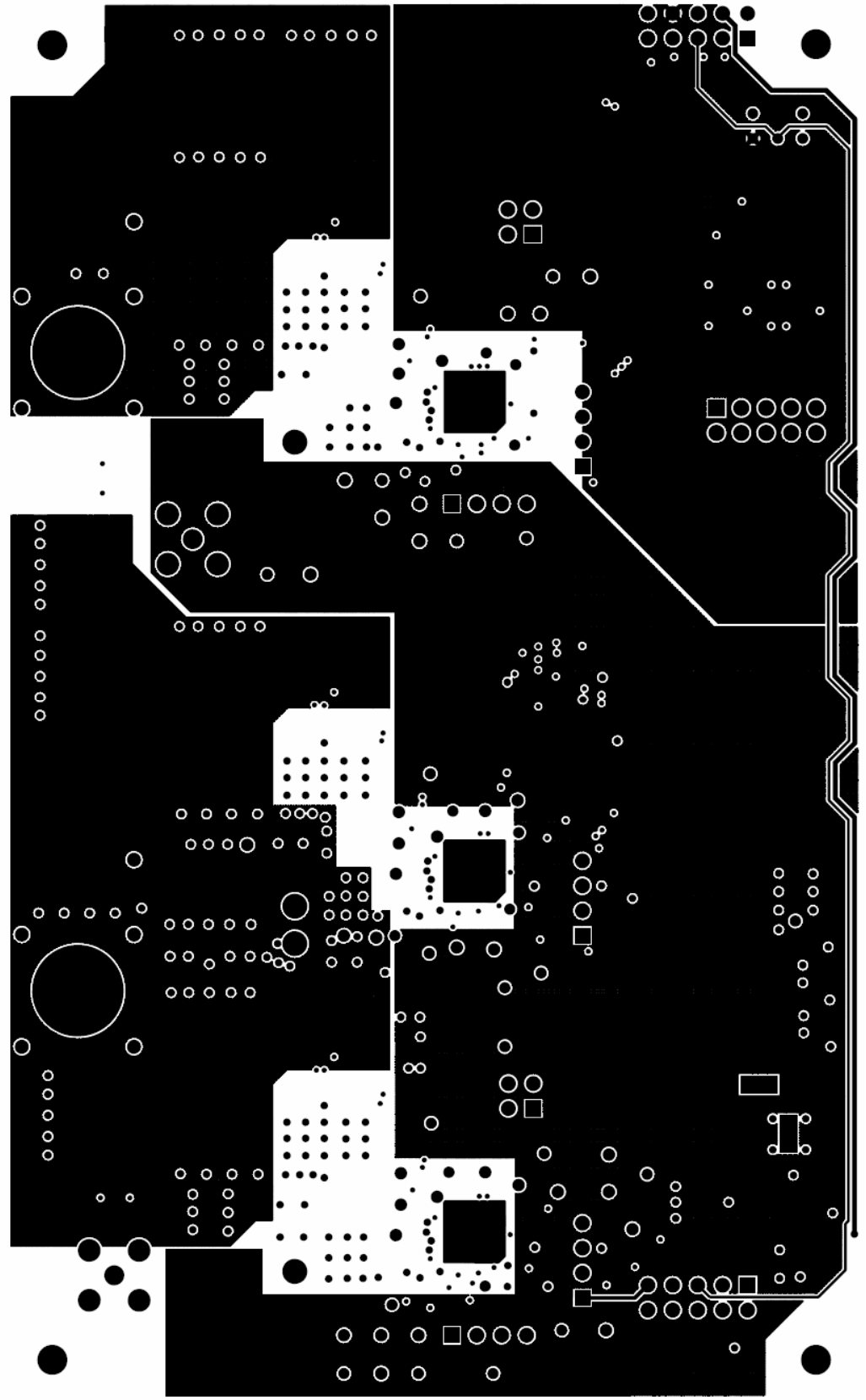

Figure 13. Inner Layer 3 (Viewed from Top)

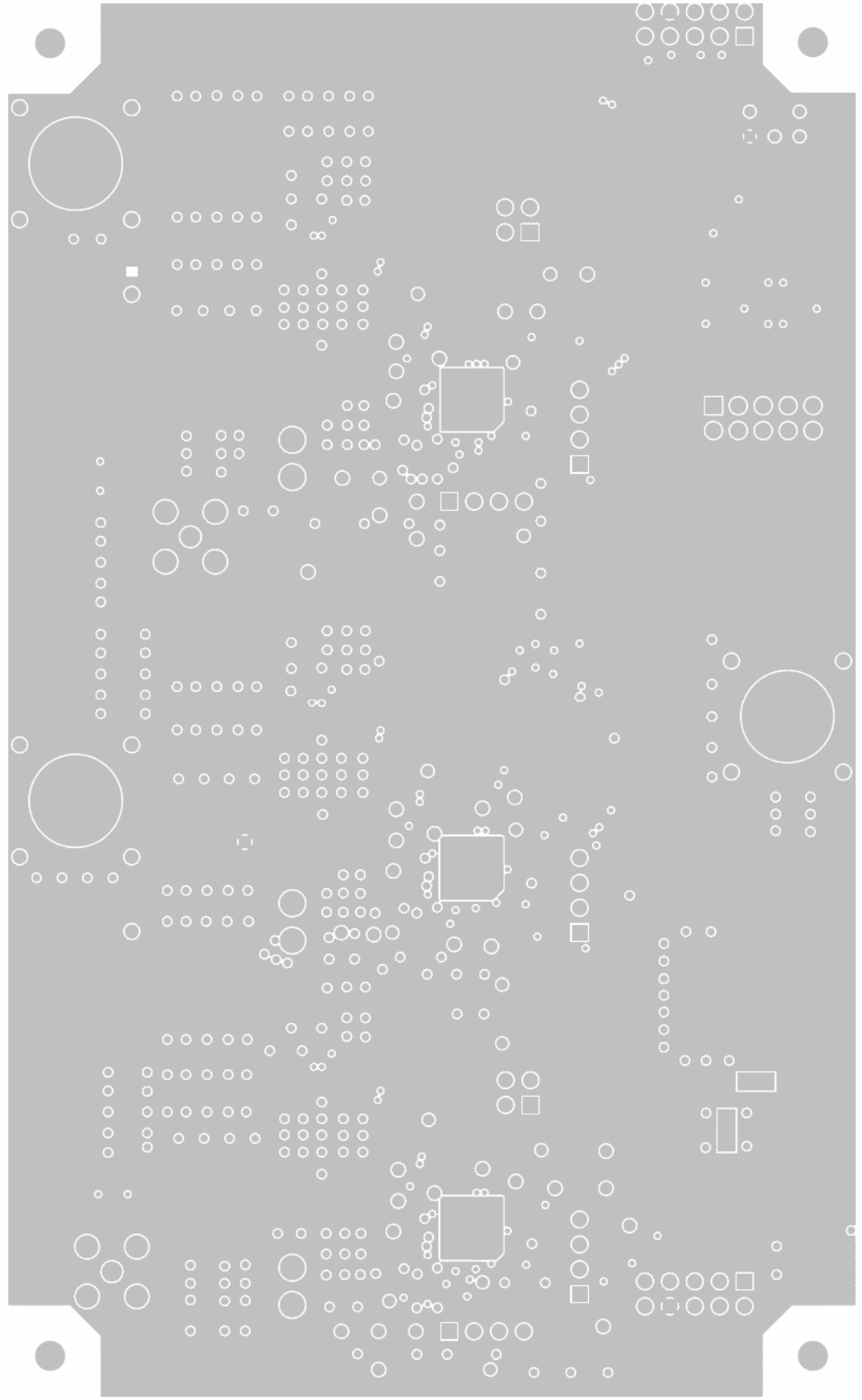

Figure 14. Inner Layer 4 (Viewed from Top)

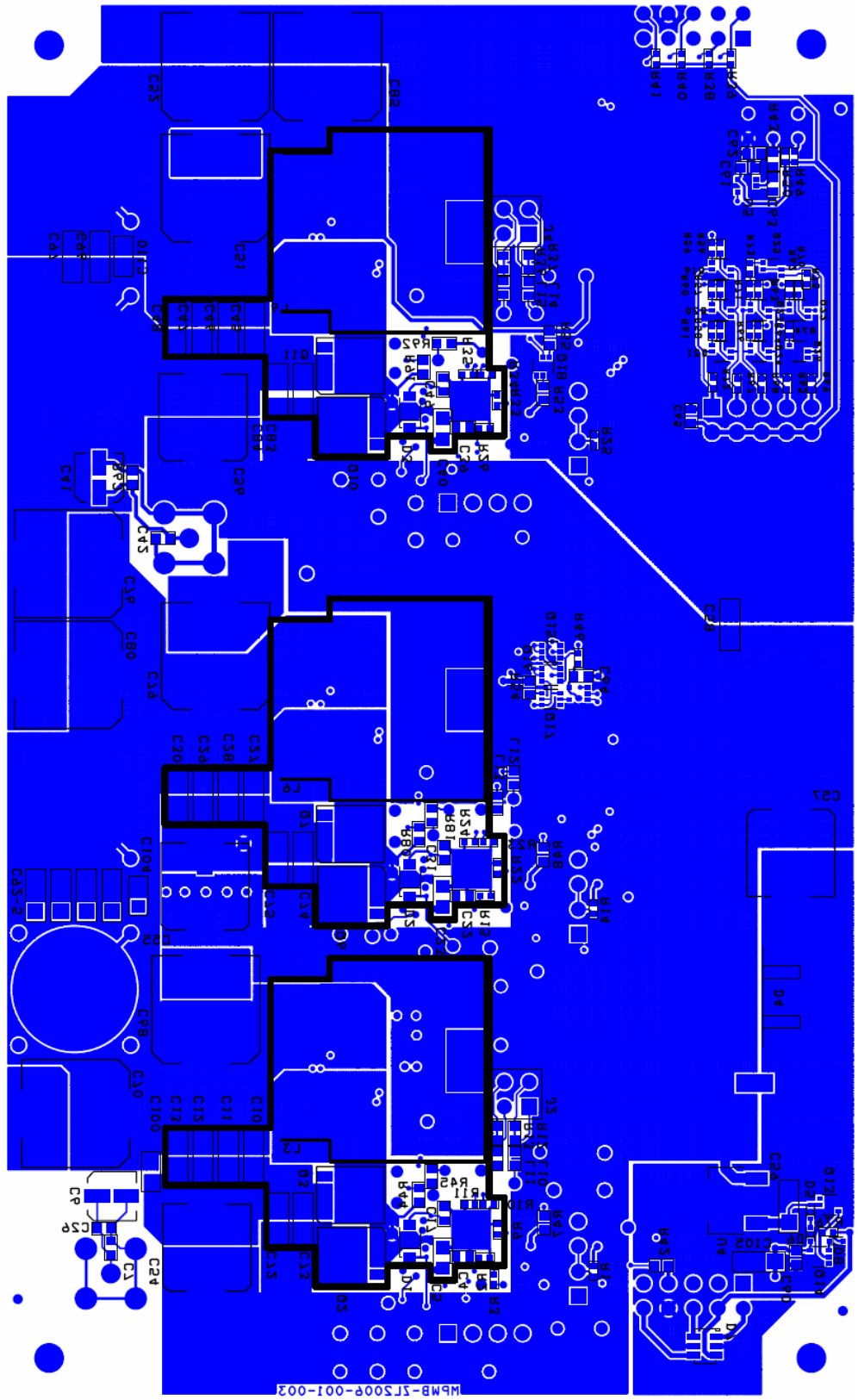

Figure 15. PCB – Bottom Layer (Viewed from Top)

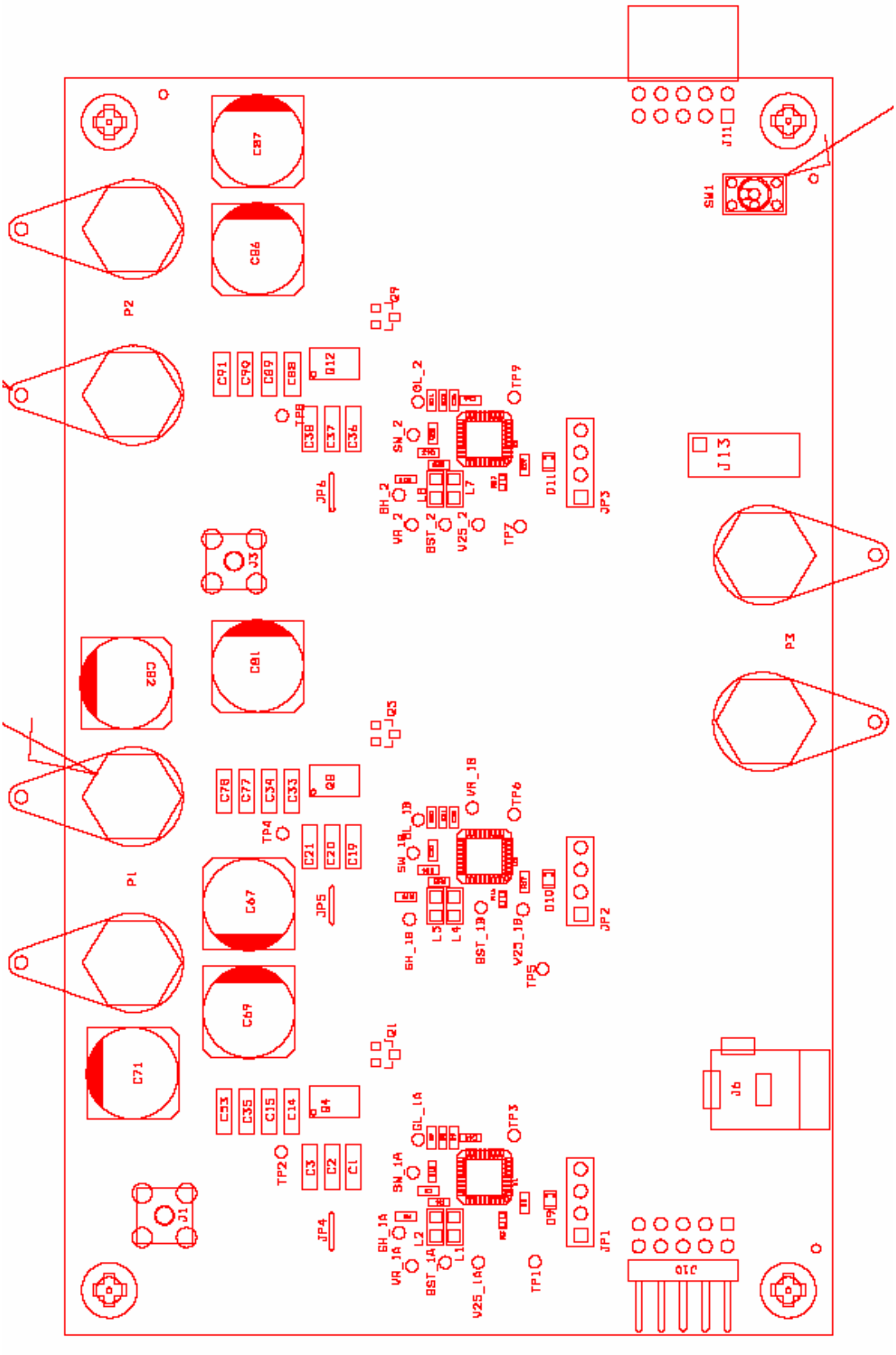

Figure 16. Top Assembly Drawing

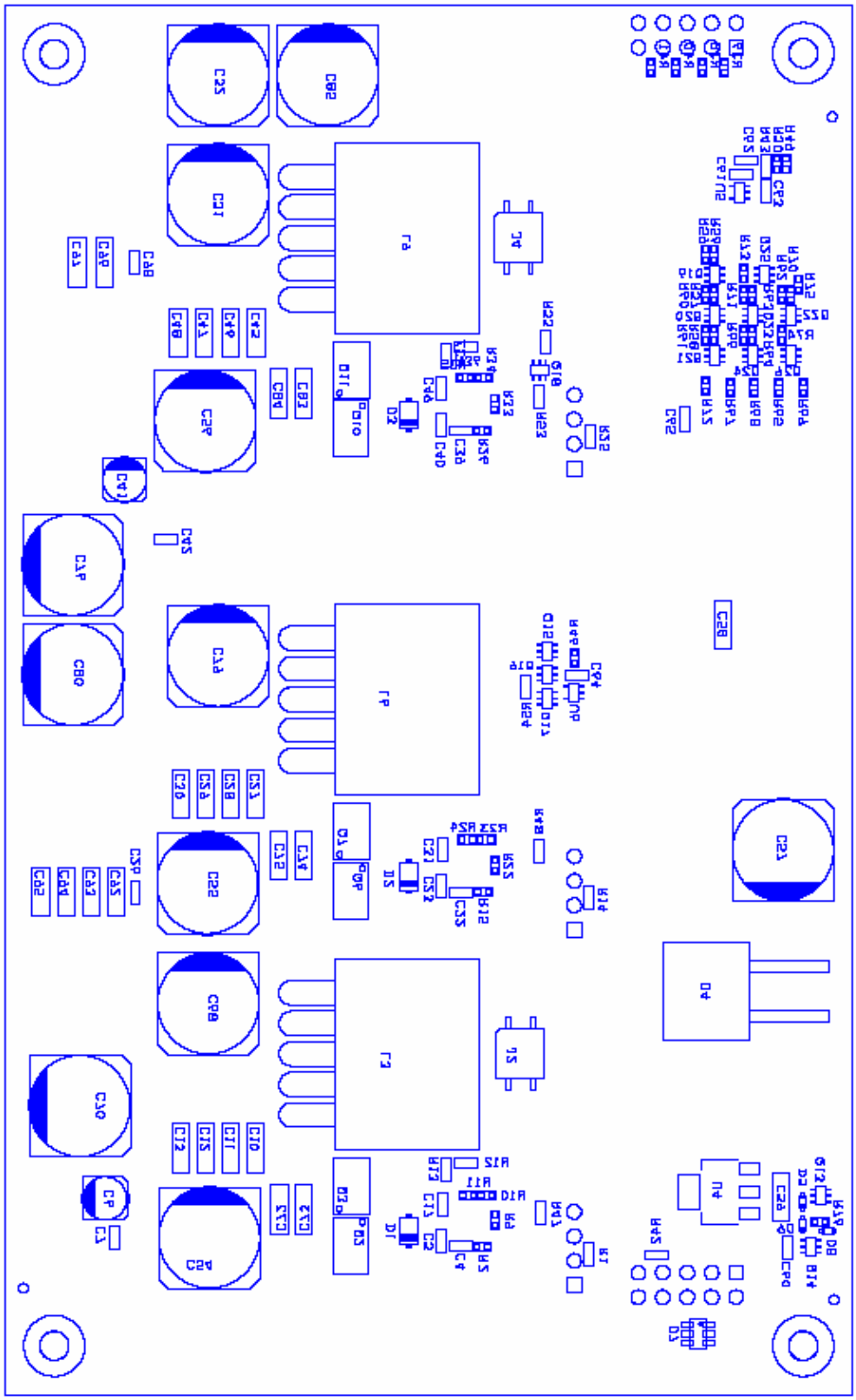

Figure 17. Bottom Assembly Drawing

Bill of Materials

Qty	Reference	Value	Rating	Type	PCB Footprint	Manufacturer	Part Number
3	C4,C22,C39	4.7uF	6.3V	X5R	SM0603	PANASONIC-ECG	ECJ-1VB0J475M
3	C5,C23,C40	2.2u, 10%	25V	X5R	SM0805	MURATA	GRM21BR71E225KA73L
2	C6,C41	10u	25V		4.5X4.5_MVA	UCC	EMVA250ADA100MD55G
7	C7,C42,C60,C61,C63, C64,C65	0.1uF, 10%	10V	X7R	SM0603	KEMET	C0603C104K8RACTU
7	C8,C9,C16,C24,C25, C43,C62	1uF	25V	X5R	SM0603	Taiyo Yuden	TMK107BJ105KA-T
6	C17,C18,C31,C32, C49,C50	10uF	6.3V	X5R	SM0603	Panasonic - ECG	ECJ-1VB0J106M
2	C26,C98	2.2uF	16V	X5R	SM0603	Taiyo Yuden	EMK107BJ225KA-T
30	C10,C11,C12,C13,C14, C15,C27,C28,C29,C30, C33,C34,C35,C45,C46, C47,C48,C53,C77,C78, C88,C89,C90,C91,C92, C93,C94,C95,C96,C97	47uF, 20%	6.3V	X5R	SM1206	TDK	C3216X5R0J476M
9	C51,C52,C68,C69,C70, C76,C79,C80,C85	820uF	6.3V, 10mohm	Al-Poly	10.5SQ_PXA	UNITED CHEMI-CON	APXA6R3ARA821MJC0G
7	C54,C55,C56,C57, C101, C102, C103	330uF	16V	ELECT POLY	10.3X10.3_PXA	UNITED CHEMI-CON	APXA160ARA331MJC0G
18	C1,C2,C3,C19,C20, C21,C36,C37,C38, C58,C59, C72,C73, C74,C75,C83,C84, C105	10uF, 10%	25V	X7R	SM1206	PANASONIC-ECG	ECJ-13YB1E106K
3	C67,C81,C86	1000uF	6.3V, 160mohm	Al-Elec	10.5SQ_PXA	UNITED CHEMI-CON	EMZA6R3ADA102MHA0G
3	D1,D2,D3	MBR0540	40V	Schottky	SOD123	ON SEMI	MBR0540T1
1	D4	STPS20L45CG	45V-20A	Schottky	D-2PAK	ST MICRO	STPS20L45CG
3	D5,D6,D8	BAT54	30V	Schottky	SOD523	ON SEMI	BAT54XV2T1OS
1	D7	ESDA6V1-4BC6	6.1V, 80W		SOT23_6L	ST Micro	ESDA6V1-4BC6
3	D9,D10,D11	GRN	2V		SM0805	CHICAGO MINIATURE	CMD17-21VGC
3	JP1,JP2,JP3	4 PIN			SIP4/100	TYCO/AMP	3-644456-4
1	J6	JACK_BARREL	1.5A		0.079PIN	KOBICONN	163-5004-E
1	J10	HEADER (5X2 RA)			100X100	SAMTEC	TSW-105-08-T-D-RA
1	J11	SOCKET (5X2 RA)			100X100	SAMTEC	SSQ-105-02-T-D-RA
1	J13	HEADER 5x2 PIN			100X100	SAMTEC	TSW-105-07-T-D
3	L1,L4,L7	1000ohm	200mA	FERRITE	SM0805	MURATA	BLM21AG102SN1D
3	L3,L6,L9	0.56uH, 20%				VISHAY	IHLP5050FDERR56M01
6	L10,L11,L12,L13, L14,L15	75ohm@100MHz 200mA	FERRITE	SM0603	MURATA	BLM18BB750SN1	
3	P1,P2,P3	JACK_DUAL	15A		0.75	EMERSON	108-0740-001
3	Q1,Q5,Q9	2N3904	40V	NPN	SOT-23	ON SEMI	MMBT3904LT3
3	Q2,Q6,Q10	BSC030N03LS	30V		FLMP_S08_ALLP	INFINEON	BSC030N03LS
6	Q3,Q4,Q7,Q8,Q11,Q12	BSC016N03LS	30V		FLMP_S08_ALLP	INFINEON	BSC016N03LS
13	Q13,Q15,Q16,Q17,Q18, Q19,Q20,Q21,Q22,Q23, Q24,Q25,Q26	FDG6301N	25V	Dual N-Ch	SC70_6	FAIRCHILD	FDG6301N
1	Q14	FDG6304P	25V	Dual P-Ch	SC70_6	FAIRCHILD	FDG6304P
3	R1,R14,R25	100K, 1%			SM0603	SUSUMU	RR0816P-104-D
1	R38	2.70K, 1%	63mW	THK FILM	SM0402	ROHM	MCR01MZPF2701
3	R3,R16,R27	10.0k, 1%		1/16W	SM0402	YAGEO	RC0402FR-0710KL
2	R4,R18	1, 1%			SM0603	YAGEO	RC0603FR-071RL
15	R5,R17,R29,R52,R77, R78,R79,R83,R84,R85, R86,R87,R88,R89,R90	0		SM0402	ROHM	MCR01MZPJ000	
7	R6,R19,R28,R30,R51, R82,R93	0, 5%			SM0603	YAGEO	RC0603JR-070RL
3	R7,R20,R31	365, 1%	100mW	THK FILM	SM0603	PANASONIC-ECG	ERJ-3EKF3650V
3	R8,R21,R32	1.87K, 1%	100mW	THK FILM	SM0603	PANASONIC-ECG	ERJ-3EKF1871V
3	R9,R22,R33	11.0k, 1%		1/16W	SM0402	VISHAY	CRCW040211K0FKED
3	R10,R23,R34	16.2k, 1%		1/16W	SM0402	PANASONIC-ECG	ERJ-2RKF1622X
4	R11,R24,R35,R62	34.8k, 1%		1/16W	SM0402	PANASONIC-ECG	ERJ-2RKF3482X
2	R42,R43	49.9R, 1%	100mW	THK FILM	SM0603	ROHM	MCR03EZPFX49R9
12	R39,R40,R41,R46,R49, R50,R65,R67,R68,R69, R72,R76	10k, 1%		1/16W	SM0402	YAGEO	RC0402FR-0710KL
5	R47,R48,R53,R54,R55	392, 1%		THK FILM	SM0603	PANASONIC-ECG	ERJ-3EKF3920V
1	R56	19.6K, 1%		1/16W	SM0402	VISHAY	CRCW040219K6FKED
1	R57	21.5K, 1%		1/16W	SM0402	VISHAY	CRCW040221K5FKED
1	R58	23.7K, 1%		1/16W	SM0402	VISHAY	CRCW040223K7FKED
1	R59	26.1K, 1%		1/16W	SM0402	VISHAY	CRCW040226K1FKED
1	R60	28.7K, 1%		1/16W	SM0402	VISHAY	CRCW040228K7FKED
1	R61	31.6K, 1%		1/16W	SM0402	VISHAY	CRCW040231K6FKED
1	R63	38.3K, 1%		1/16W	SM0402	PANASONIC-ECG	ERJ-2RKF3832X
1	R64	42.2K, 1%		1/16W	SM0402	VISHAY	CRCW040242K2FKED
1	R66	56.2K, 1%		1/16W	SM0402	PANASONIC-ECG	ERJ-2RKF5622X
1	R70	46.4K, 1%		1/16W	SM0402	PANASONIC-ECG	ERJ-2RKF4642X
1	R71	51.1K, 1%		1/16W	SM0402	VISHAY	CRCW040251K1FKED
1	R73	68.1K, 1%		1/16W	SM0402	VISHAY	CRCW040268K1FKED
1	R74	75.0K, 1%		1/16W	SM0402	VISHAY	CRCW040275K0FKED
1	R75	61.9K, 1%		1/16W	SM0402	ROHM	CRCW040261K9FKED
1	SW1	SW_SPDT			ULTRAMIN_SPDT	NKK	G-13AP-RO
3	U1,U2,U3	ZL2006			MLF36_6X6BX	ZILKER LABS, INC.	ZL2006ALNFT
1	U4	MIC2920A-3.3BS			SOT223	Micrel	MIC2920A-3.3WS
1	U5	SN74AUP1G17			SC70_5	TI	SN74AUP1G17DCKR
1	U6	SN74AUP1G02			SC70_5	TI	SN74AUP1G02DCKR
4	JP1,JP2,JP3,J13	SHUNT 30AU				TYCO	881545-2
4	corner holes	SCREW 4-40X1/4				BLDG FASTENERS	PMS 440 0025 PH
4	corners holes	STANDOFF				KEYSTONE ELEC	3481

Bill of Materials (Not Installed)

	Not installed.						
NI	C44,C66, C99	NI			SM0603		
NI	C71,C82,C87	NI	6.3V, 160mohm	Al-Elec	10.5SQ_PXA	Nippon Chemicon	EMZA6R3ADA102MHA0G
NI	C100, C104, C110	NI					
NI	D12, D13, D14						
NI	JP4,JP5,JP6, JP7, JP8	NI			18AWGX.150LS		
NI	J1,J3	NI			SMA_PCB	EMERSON	142-0701-201
NI	J2,J4	NI			2x2P_SM_0.100	SAMTEC	TSM-102-01-T-DV
NI	L2,L5,L8	NI	200mA	FERRITE	SM0805	MURATA	BLM21AG102SN1D
NI	R12,R13,R36,R37,R44, R45,R80,R81,R91,R92	NI, 1%	100mW	THK FILM	SM0603	ROHM	MCR03EZPFX49R9
NI	R2,R15,R26	NI, 1%			SM0402		
NI	TP - no test point intallations						

Default Configuration Text

The following text is loaded into the ZL2006 devices on the EV2 as default settings. Each PMBus command is loaded via the PowerNavigator software. The # symbol is used for a comment line.

```
# Configuration file for ZL2006EV2-Ch1A
#Erase default and user stores
RESTORE_FACTORY
STORE_USER_ALL
STORE_DEFAULT_ALL
RESTORE_DEFAULT_ALL

MFR_ID                      Zilker_Labs
MFR_MODEL                   ZL2006EV2R2
MFR_REVISION                Prod_Rev8
MFR_LOCATION                Austin_TX
MFR_DATE                    10_1_08
MFR_SERIAL                  ch1A

VOUT_COMMAND                1.80
VOUT_MAX                    3.65
VOUT_DROOP                  0.5
VOUT_MARGIN_HIGH            1.89
VOUT_MARGIN_LOW             1.71
VOUT_UV_FauLT_LIMIT         1.53
VOUT_UV_FAULT_RESPONSE      0x80
VOUT_OV_FauLT_LIMIT         2.07
VOUT_OV_FAULT_RESPONSE      0x80
OVUV_CONFIG                 0x80

IOUT_SCALE                  1.13
IOUT_CAL_OFFSET             1.00

IOUT_OC_FAULT_LIMIT                45.0
IOUT_AVG_OC_FAULT_LIMIT            40.0
IOUT_UC_FAULT_LIMIT                -40.0
IOUT_AVG_UC_FAULT_LIMIT            -40.0
MFR_IOUT_OC_FAULT_RESPONSE         0xBF
MFR_IOUT_UC_FAULT_RESPONSE         0xBF

VIN_OV_FAULT_LIMIT           14.0
VIN_OV_WARN_LIMIT            13.5
VIN_OV_FAULT_RESPONSE        0x80

VIN_UV_WARN_LIMIT            4.641
VIN_UV_FAULT_LIMIT           4.50
VIN_UV_FAULT_RESPONSE        0x80

OT_WARN_LIMIT               110.0
OT_FAULT_LIMIT              120
OT_FAULT_RESPONSE           0xBF

UT_WARN_LIMIT               -20
UT_FAULT_LIMIT              -30
UT_FAULT_RESPONSE           0xBF

POWER_GOOD_ON               1.35
POWER_GOOD_DELAY            10.0

TON_DELAY                   15
TON_RISE                    5
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```
TOFF_DELAY                15
TOFF_FALL                 5
DEADTIME                  0x3838
DEADTIME_CONFIG           0x0404
MAX_DUTY                  96
INDUCTOR                  0.56

FREQUENCY_SWITCH          300 # kHz

#CompZL Taps for G=31.596,     Q=0.301,      f=3.506kHz,   fsw=300kHz, Vi=12, Vo=1.8
PID_TAPS    A=7948.25,  B=-14135.50, C=6225.25  # dIo=30-60A @ 2.5A/us, dVo=+/-3.5%

# Advanced
USER_CONFIG               0x6051 # SYNC Input
MFR_CONFIG                0x82D4
NLR_CONFIG                0xE2010355
INTERLEAVE                0x0000
TEMPCO_CONFIG             0xA8
TRACK_CONFIG              0x00

# Advanced 2
MISC_CONFIG               0x4080
ISHARE_CONFIG             0x0121 # Ishare Group 1, members 2, position 1, CS En
DDC_CONFIG                0x0101 # DDC Rail ID 1, Broadcast Group 1
DDC_GROUP                 0x00000000

STORE_DEFAULT_ALL
RESTORE_DEFAULT_ALL



-------------------------------------------------------------------------------
# Configuration file for ZL2006EV2-Ch1B

#Erase default and user stores
RESTORE_FACTORY
STORE_DEFAULT_ALL
STORE_USER_ALL
RESTORE_DEFAULT_ALL

MFR_ID                    Zilker_Labs
MFR_MODEL                 ZL2006EV2R2
MFR_REVISION              Prod_Rev8
MFR_LOCATION              Austin_TX
MFR_DATE                  10_1_08
MFR_SERIAL                ch1B

VOUT_COMMAND              1.80
VOUT_MAX                  3.65
VOUT_DROOP                0.5
VOUT_MARGIN_HIGH          1.89
VOUT_MARGIN_LOW           1.71
VOUT_UV_FauLT_LIMIT       1.53
VOUT_UV_FAULT_RESPONSE    0x80
VOUT_OV_FauLT_LIMIT       2.07
VOUT_OV_FAULT_RESPONSE    0x80
OVUV_CONFIG               0x80

IOUT_SCALE                1.13
IOUT_CAL_OFFSET           1.00
```

```
IOUT_OC_FAULT_LIMIT              45.0
IOUT_AVG_OC_FAULT_LIMIT          40.0
IOUT_UC_FAULT_LIMIT              -40.0
IOUT_AVG_UC_FAULT_LIMIT          -40.0
MFR_IOUT_OC_FAULT_RESPONSE       0xBF
MFR_IOUT_UC_FAULT_RESPONSE       0xBF

VIN_OV_FAULT_LIMIT              14.0
VIN_OV_WARN_LIMIT               13.5
VIN_OV_FAULT_RESPONSE           0x80

VIN_UV_WARN_LIMIT               4.641
VIN_UV_FAULT_LIMIT              4.50
VIN_UV_FAULT_RESPONSE           0x80

OT_WARN_LIMIT             110.0
OT_FAULT_LIMIT            120.0
OT_FAULT_RESPONSE         0xBF

UT_WARN_LIMIT             -20
UT_FAULT_LIMIT            -30
UT_FAULT_RESPONSE         0xBF

POWER_GOOD_ON             1.35
POWER_GOOD_DELAY          10.0

TON_DELAY                 5
TON_RISE                  5
TOFF_DELAY                5
TOFF_FALL                 5
DEADTIME                  0x3838
DEADTIME_CONFIG           0x0404
MAX_DUTY                  96
INDUCTOR                  0.56

FREQUENCY_SWITCH          300 # kHz

#CompZL Taps for G=31.596,     Q=0.301,      f=3.506kHz,   fsw=300kHz, Vi=12, Vo=1.8
PID_TAPS   A=7948.25,  B=-14135.50, C=6225.25  # dIo=30-60A @ 2.5A/us, dVo=+/-3.5%

# Advanced
USER_CONFIG               0x0051 # SYNC INPUT
MFR_CONFIG                0x82D4
NLR_CONFIG                0xE2010355
INTERLEAVE                0x0000
TEMPCO_CONFIG             0xA8
TRACK_CONFIG              0x00

# Advanced 2
MISC_CONFIG               0x4080
ISHARE_CONFIG             0x0125 # Ishare Group 1, members 2, position 2, CS En
DDC_CONFIG                0x0101 # DDC Rail ID 1, Broadcast Group 1
DDC_GROUP                 0x00000000
STORE_DEFAULT_ALL
RESTORE_DEFAULT_ALL
```

```
--------------------------------------------------------------------------------
# Configuration file for ZL2006EV2-Ch2

#Erase default and user stores
RESTORE_FACTORY
STORE_DEFAULT_ALL
STORE_USER_ALL
RESTORE_DEFAULT_ALL

MFR_ID                      Zilker_Labs
MFR_MODEL                   ZL2006EV2R2
MFR_REVISION                Prod_Rev8
MFR_LOCATION                Austin_TX
MFR_DATE                    10_1_08
MFR_SERIAL                  ch2

VOUT_COMMAND                1.50
VOUT_MAX                    1.65
VOUT_DROOP                  0.0
VOUT_MARGIN_HIGH            1.575
VOUT_MARGIN_LOW             1.425
VOUT_UV_FauLT_LIMIT         1.275
VOUT_UV_FAULT_RESPONSE      0x80
VOUT_OV_FauLT_LIMIT         1.80
VOUT_OV_FAULT_RESPONSE      0x80
OVUV_CONFIG                 0x80

IOUT_SCALE                  1.16
IOUT_CAL_OFFSET             -0.25

IOUT_OC_FAULT_LIMIT               45.0
IOUT_AVG_OC_FAULT_LIMIT           38.0
IOUT_UC_FAULT_LIMIT               -15.0
IOUT_AVG_UC_FAULT_LIMIT           -12.0
MFR_IOUT_OC_FAULT_RESPONSE        0xBF
MFR_IOUT_UC_FAULT_RESPONSE        0xBF

VIN_OV_FAULT_LIMIT              14.0
VIN_OV_WARN_LIMIT               13.5
VIN_OV_FAULT_RESPONSE           0x80

VIN_UV_WARN_LIMIT               4.641
VIN_UV_FAULT_LIMIT              4.50
VIN_UV_FAULT_RESPONSE           0x80

OT_WARN_LIMIT              110.0
OT_FAULT_LIMIT             120.0
OT_FAULT_RESPONSE          0xBF

UT_WARN_LIMIT              -20
UT_FAULT_LIMIT             -30
UT_FAULT_RESPONSE          0xBF

POWER_GOOD_ON              1.35
POWER_GOOD_DELAY           10

TON_DELAY                  20
TON_RISE                   5
TOFF_DELAY                 20
TOFF_FALL                  5
DEADTIME                   0x3838
DEADTIME_CONFIG            0x0404
```

```
MAX_DUTY                    96
INDUCTOR                    0.56

FREQUENCY_SWITCH            300 # kHz

# Vi=12,     Vo=1.5,     dIo=15-30A @ 2.5A/us, dVo=+/-3.5%
PID_TAPS     A=10531.25, B=-17323.50, C=6855.12

# Advanced
USER_CONFIG                  0x0030 # SYNC Output
MFR_CONFIG                   0x82D5
NLR_CONFIG                   0xE1060C00
INTERLEAVE                   0x0140
TEMPCO_CONFIG                0xA8
TRACK_CONFIG                 0x00

# Advanced 2
MISC_CONFIG                  0x0080
ISHARE_CONFIG                0x0200 # Ishare Group 2, members 1, position 1, CS disabled
DDC_CONFIG                   0x0202 # DDC Rail ID 2, Broadcast Group 2
DDC_GROUP                    0x00000000
STORE_DEFAULT_ALL
RESTORE_DEFAULT_ALL
```

Measured Data

The following data was acquired using a ZL2006EV2 rev 3 evaluation board.

Efficiency

The measured input power includes the quiescent current for all three controllers on the evaluation board and is included in the efficiency measurement for the separate channels. Adaptive diode emulation and adaptive frequency modes are disabled for these efficiency measurements.

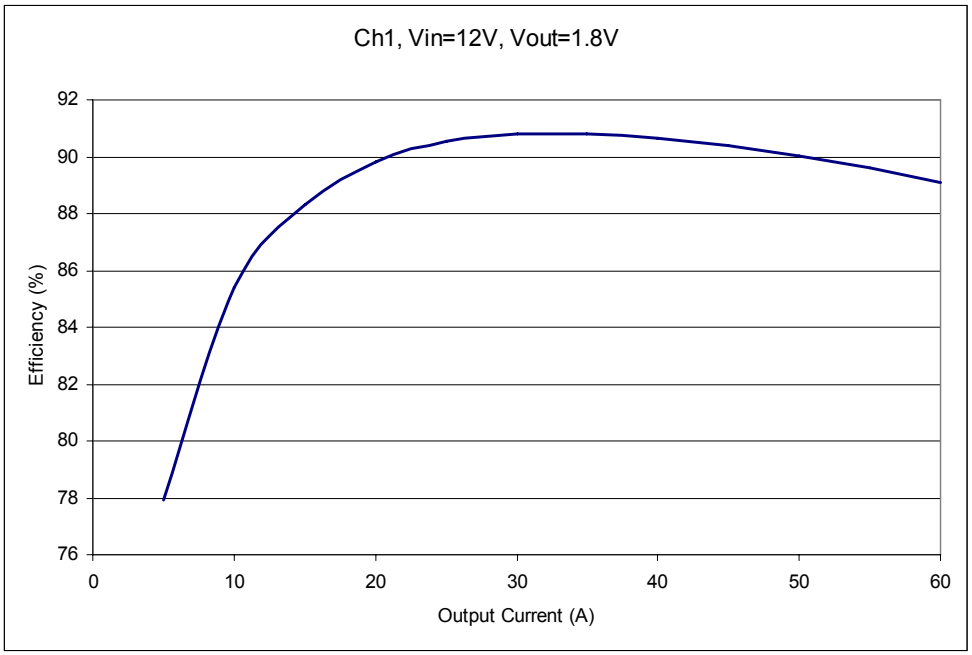

Figure 18. Channel 1 Efficiency

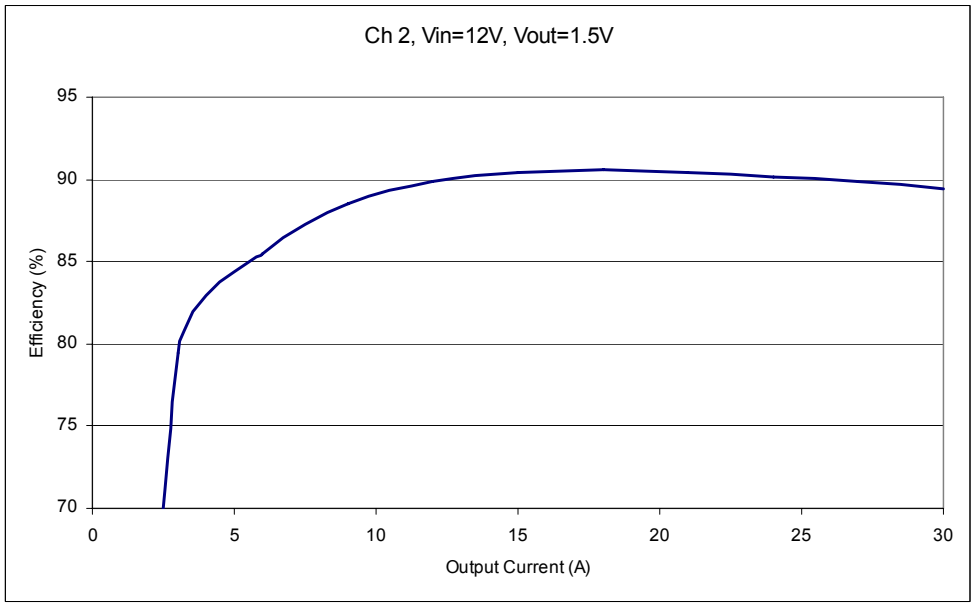

Figure 19. Channel 2 Efficiency

Ramp-up / Ramp-down Characteristics

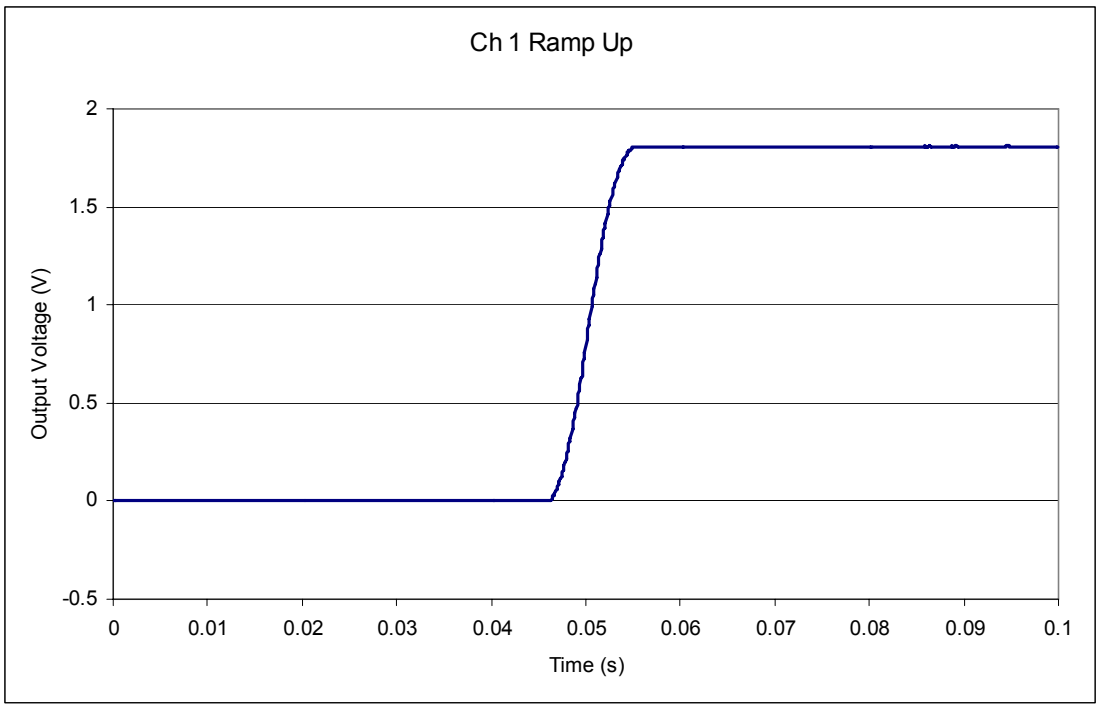

Figure 20. Channel 1 Ramp Up

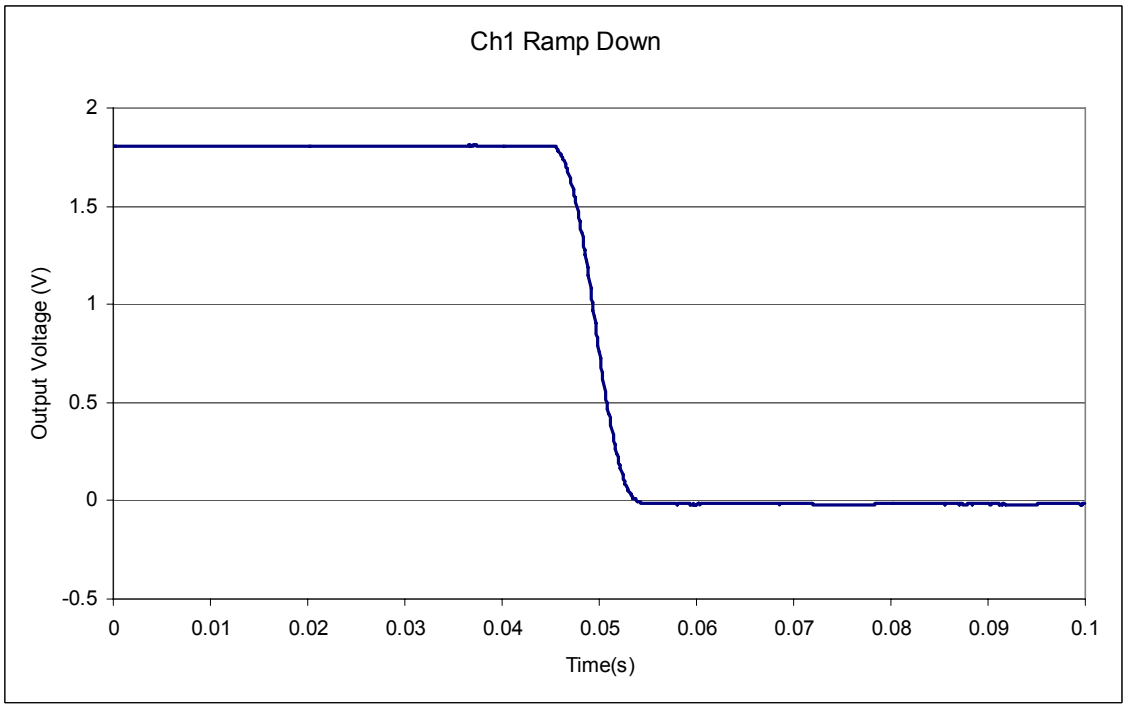

Figure 21. Channel 1 Ramp Down

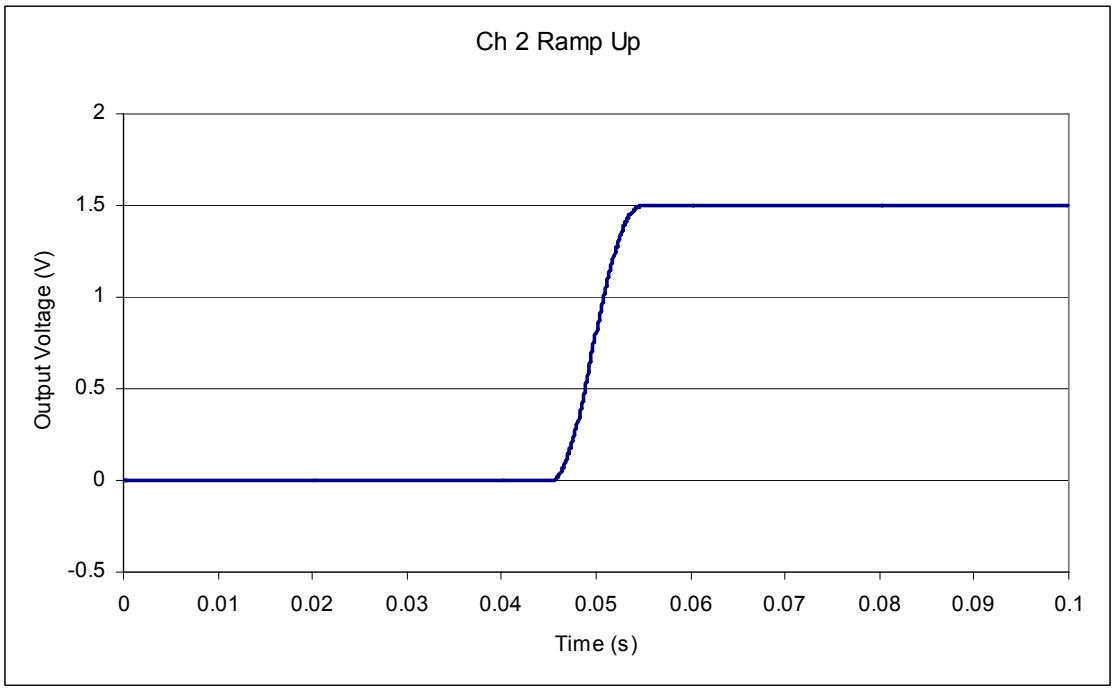

Figure 22. Channel 2 Ramp Up

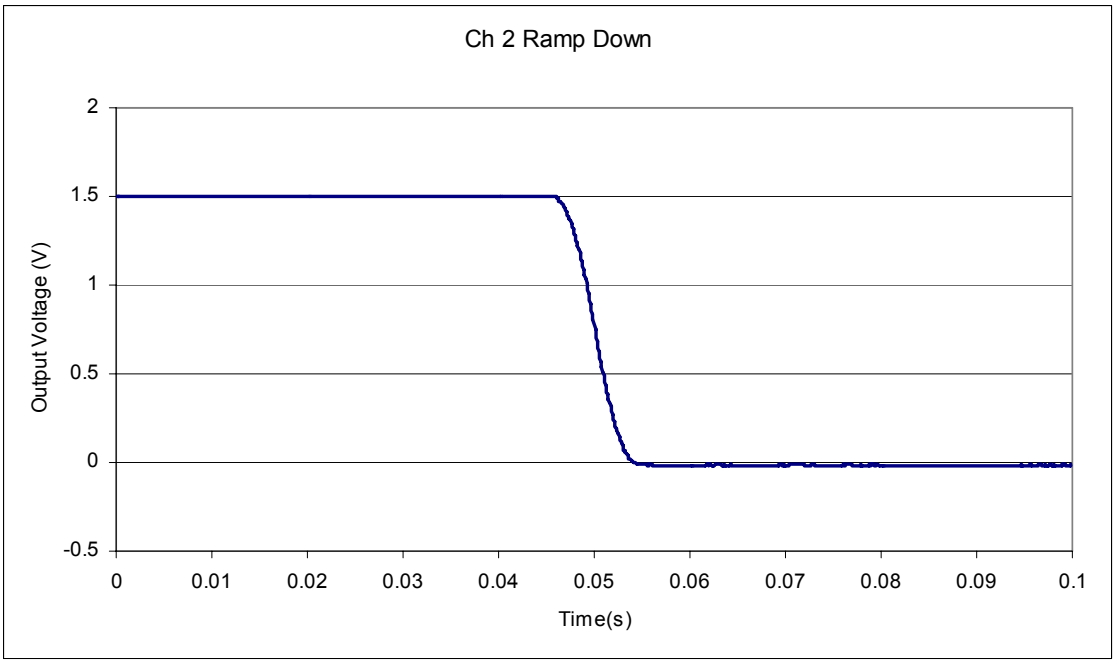

Figure 23. Channel 2 Ramp Down

Dynamic Load Response

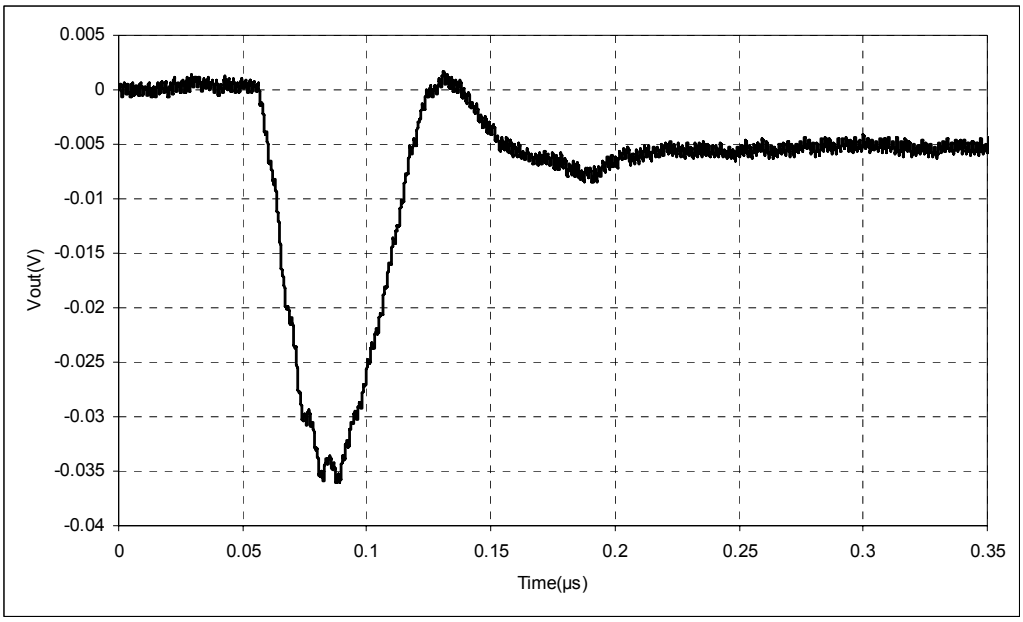

Figure 24. Channel 1 Dynamic Response, 30A to 42A Load Step

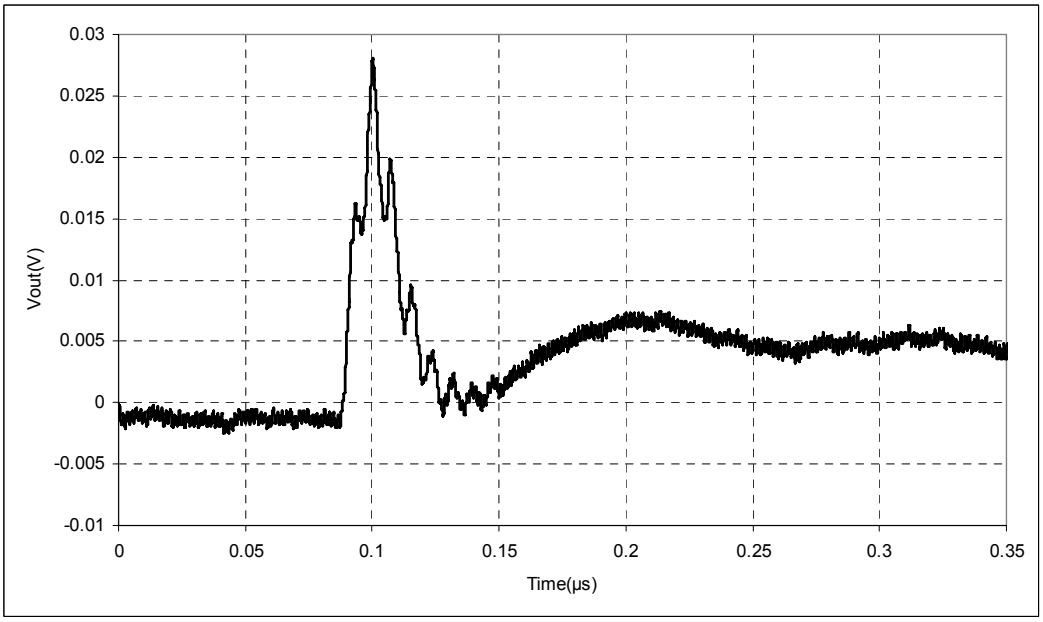

Figure 25. Channel 1 Dynamic Response, 42A to 30A Load Step

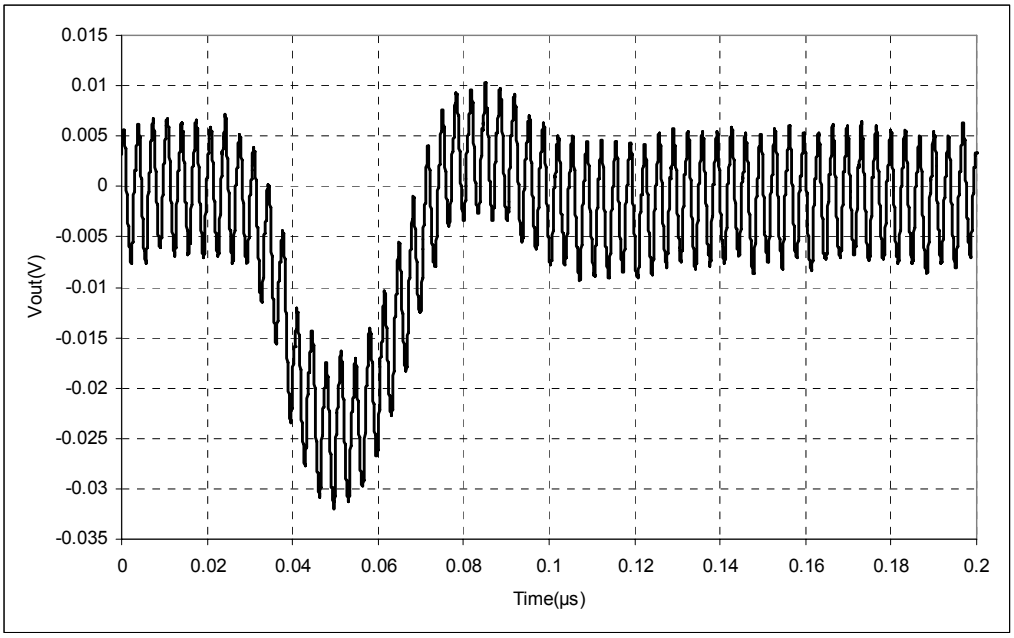

Figure 26. Channel 2 Dynamic Response, 21A to 15A Load Step

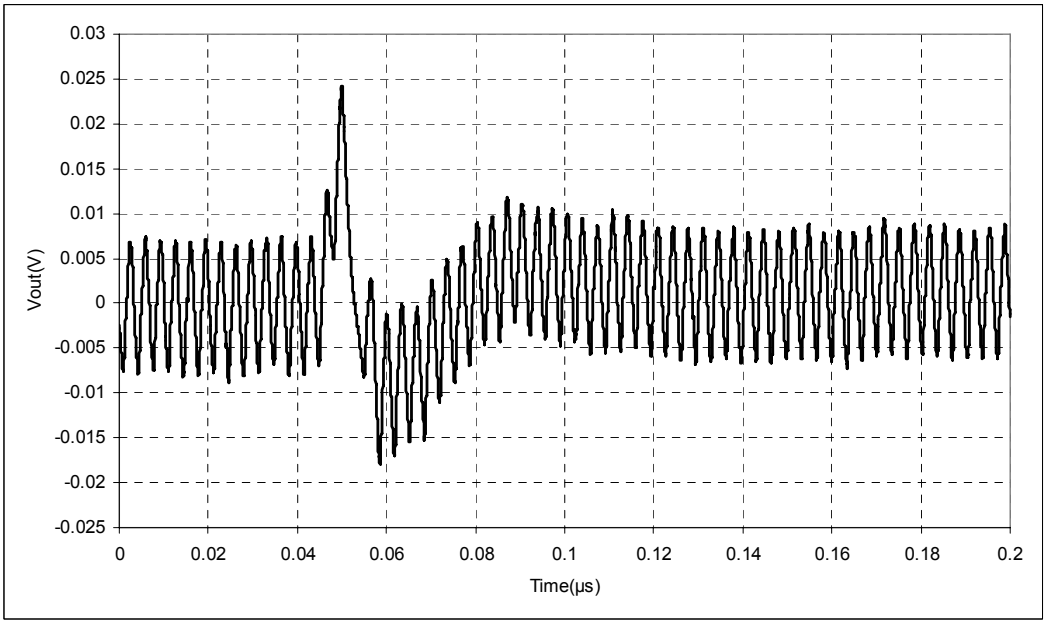

Figure 27. Channel 2 Dynamic Response, 15A to 21A Load Step

References

[1] *ZL2006 Data Sheet*, Zilker Labs, Inc., 2008.

[2] AN33 – *PMBus™ Command Set*, Zilker Labs, Inc., 2008.

Ordering Information

Orderable Part Number	Description
ZL2006EVK2	ZL2006 Two Channel Evaluation Kit (EVB, USB Adapter, Cable, Software)
ZL2006EV2	ZL2006 Two Channel Evaluation board only

Revision History

Date	Rev. #	Description
4-14-08	1.0	Initial release
June 2008	1.1	Added text to clarify that the USB-to-SMBus Adapter must be connected to a PC for proper board operation on Page 2 and Page 3.
July 2008	1.2	Corrected Figure 5 to show Interface Logic
September 2008	1.3	Updated Default Configuration text for all 3 devices
October 2008	1.4	Updated Default Configuration text for all 3 devices
February 2009	3.0	Updated schematics, layout, and BOM for board revision 3

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