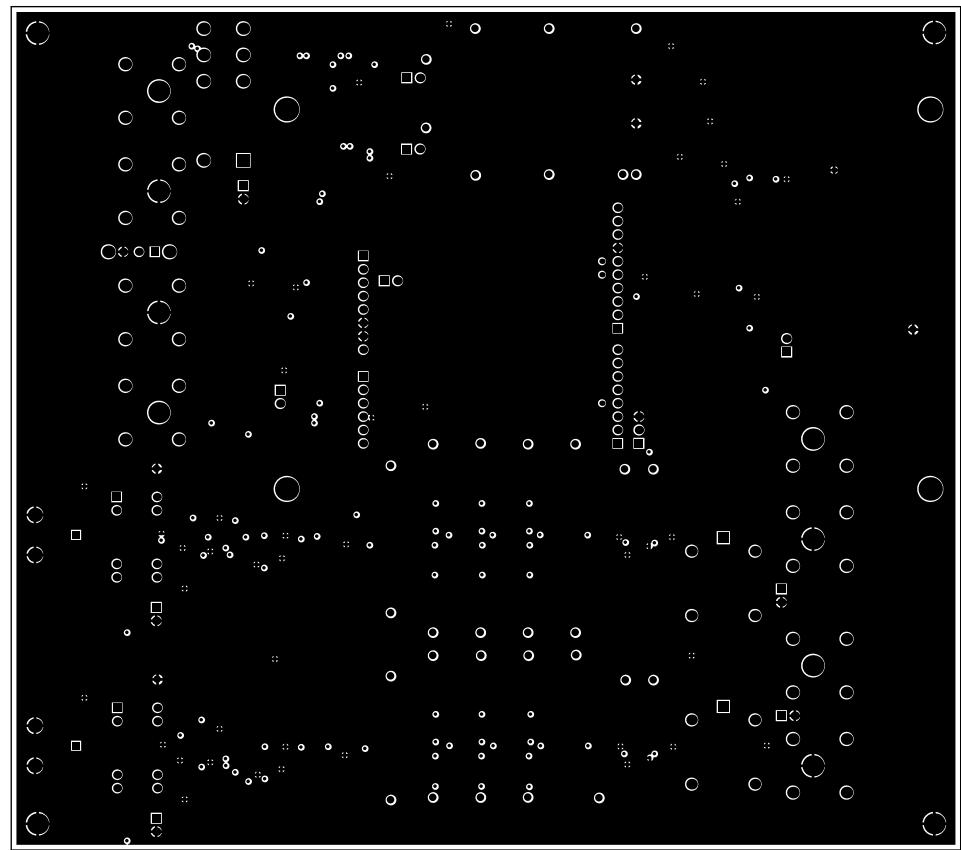
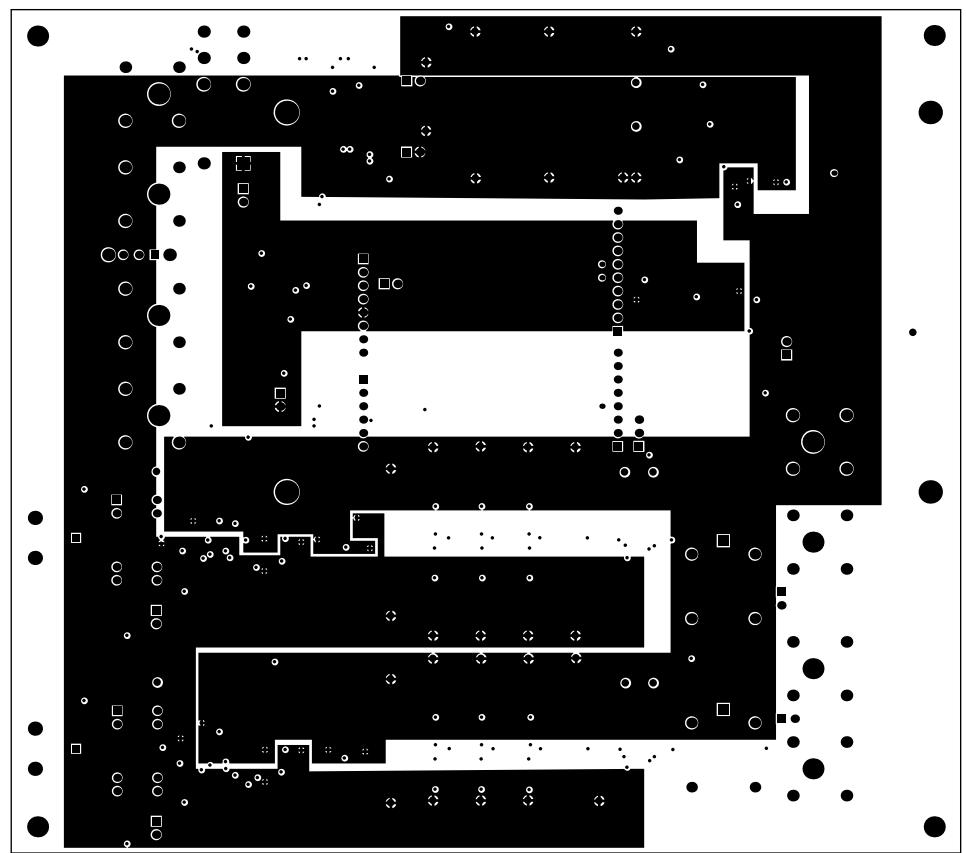


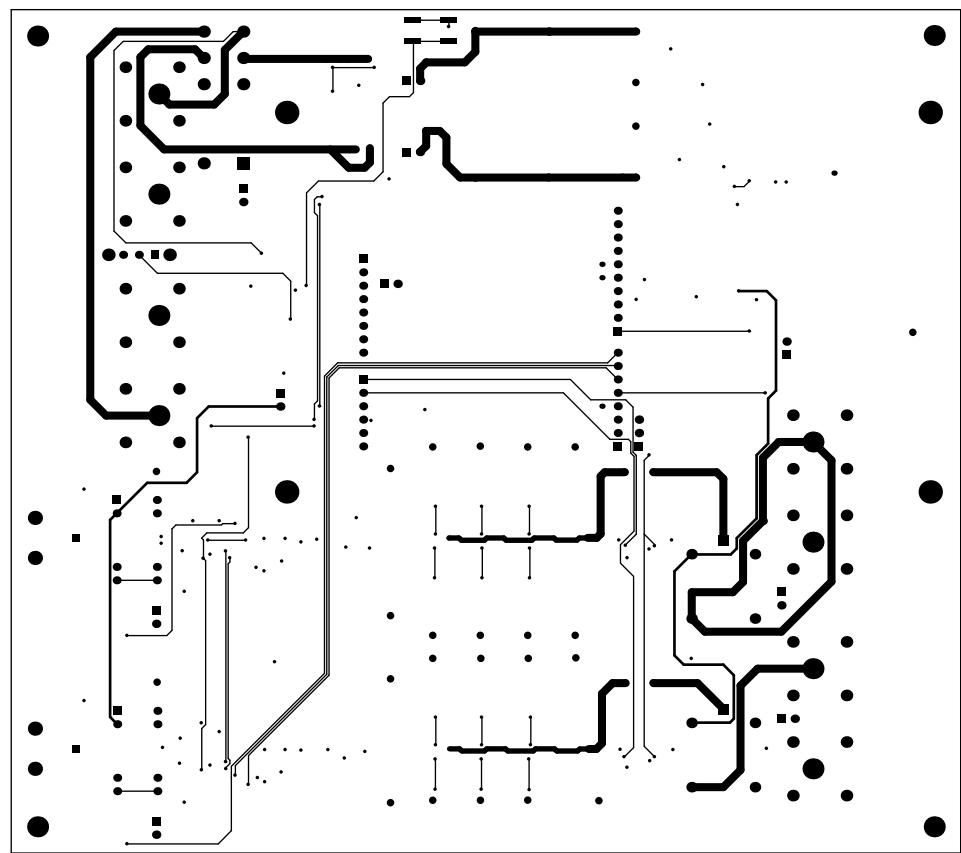
TOP



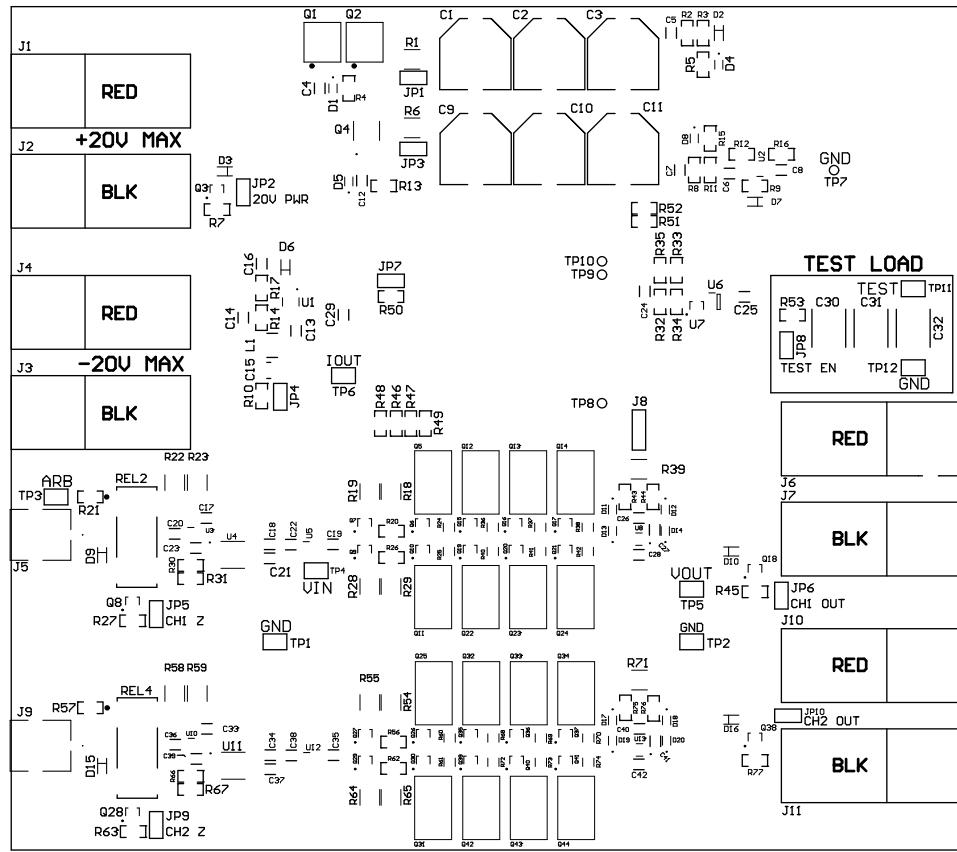
SIGNAL LAYER 1



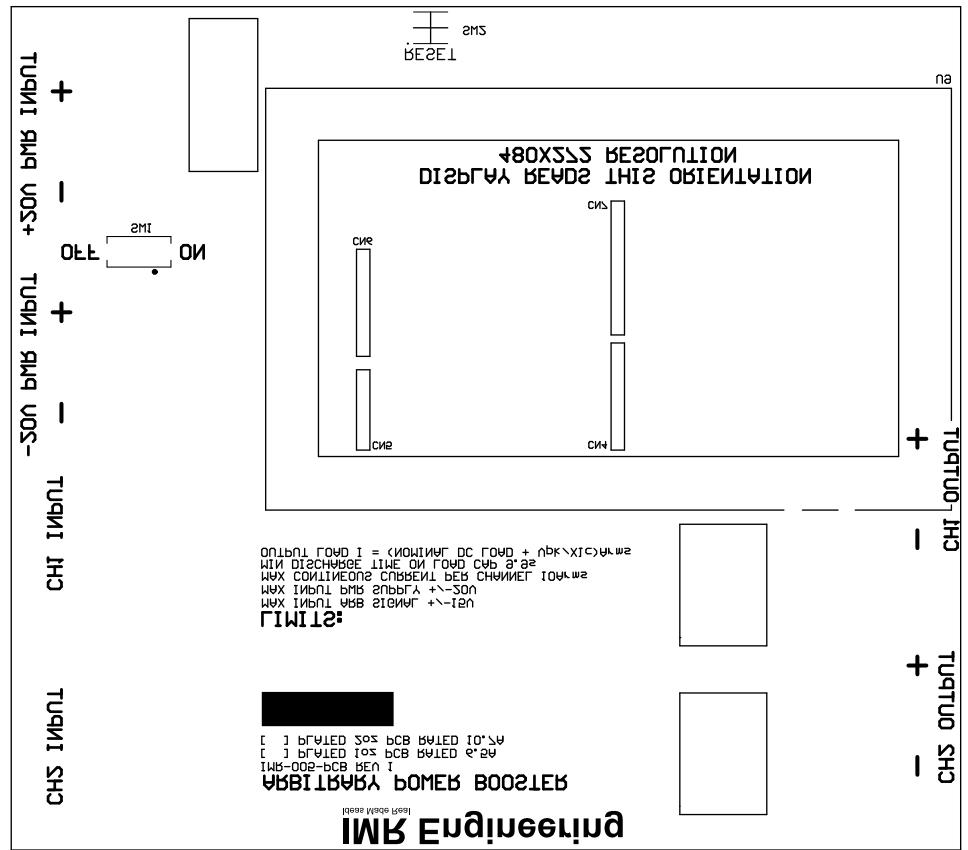
SIGNAL LAYER 2



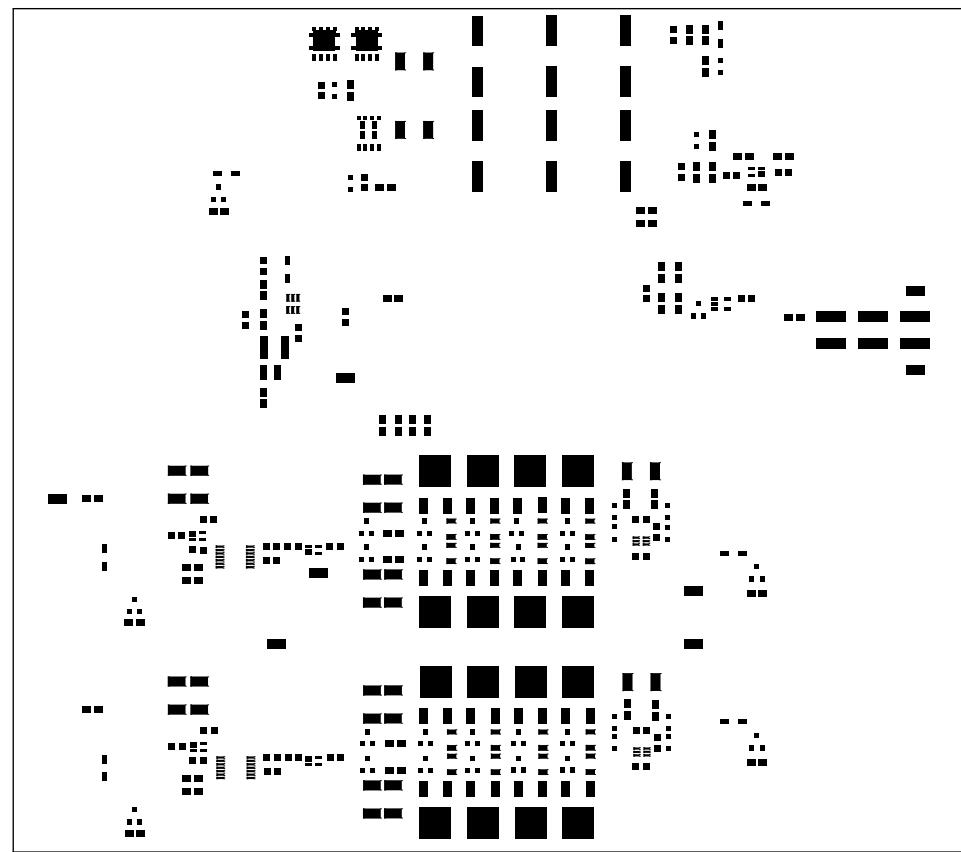
BOTTOM



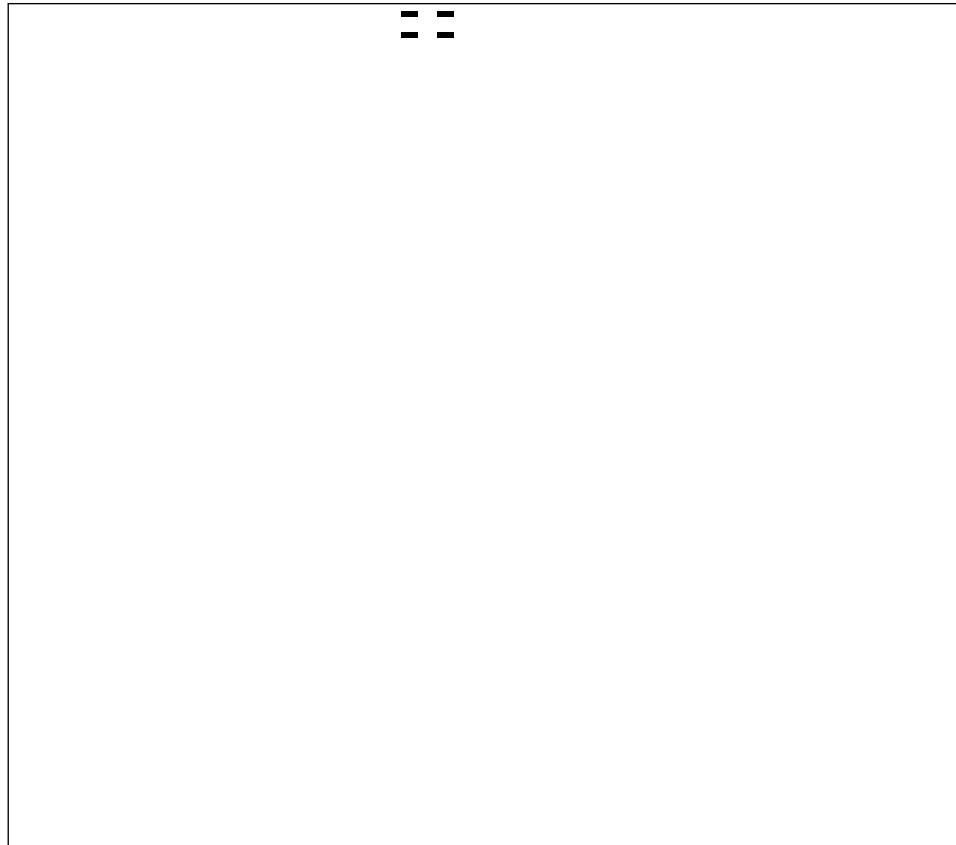
TOP SILK



BOTTOM SILK

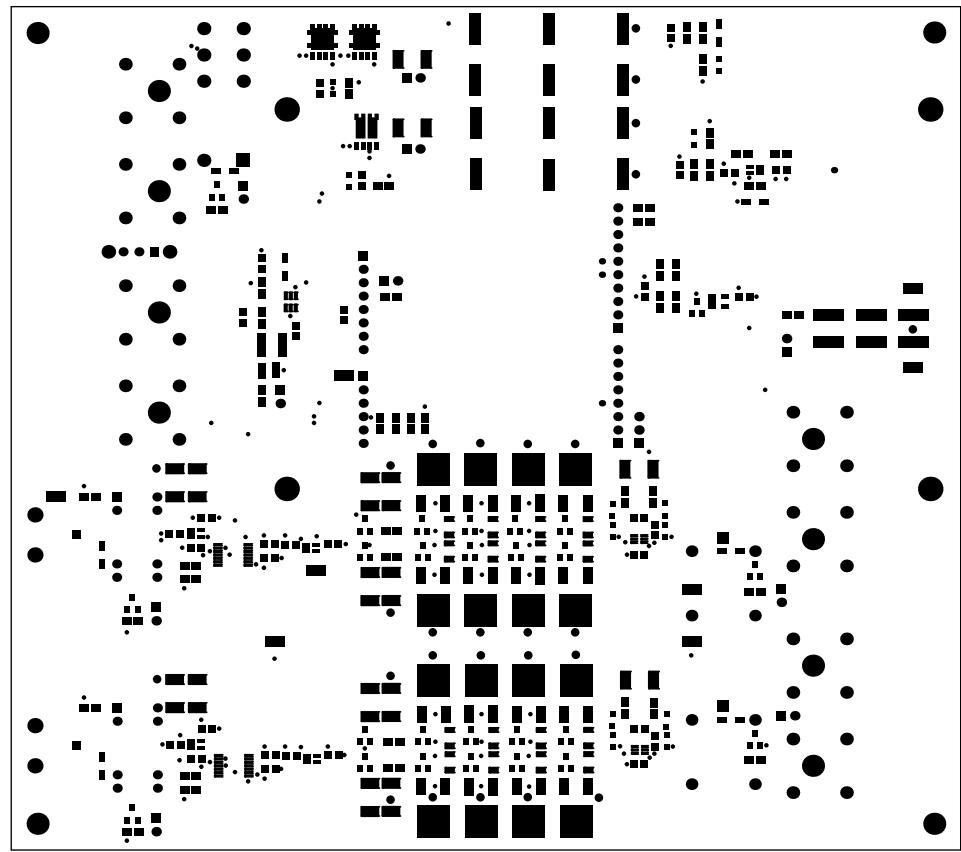


TOP PM

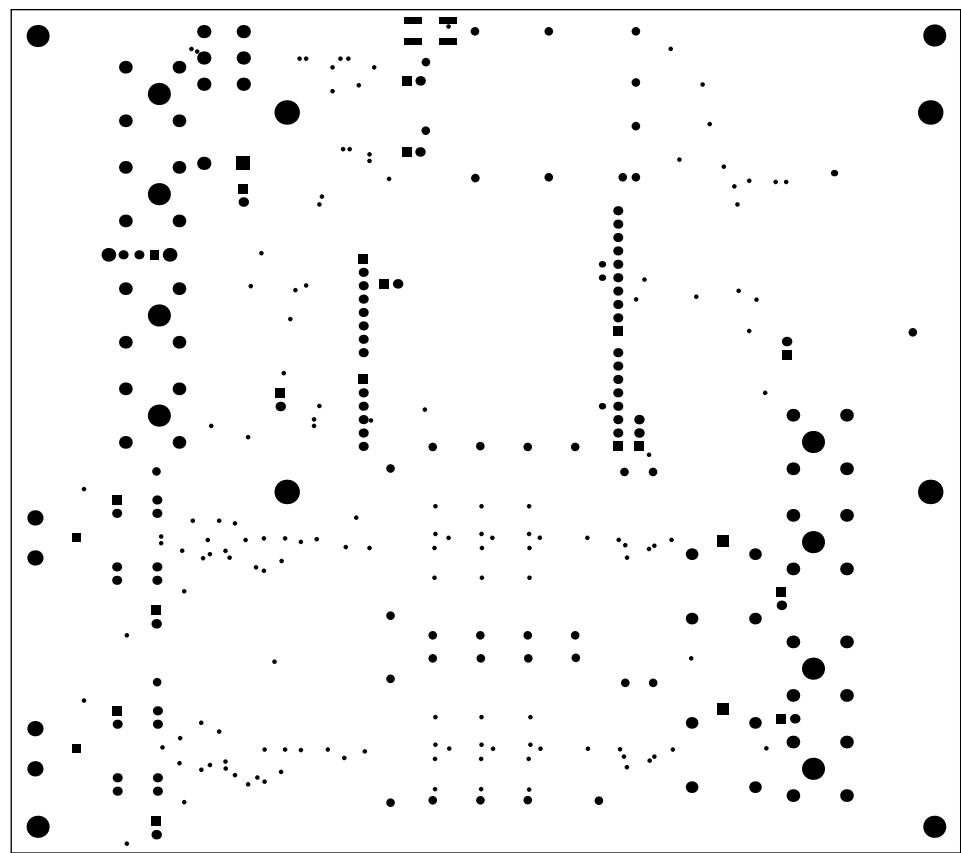


— —

BOTTOM PM



TOP SM

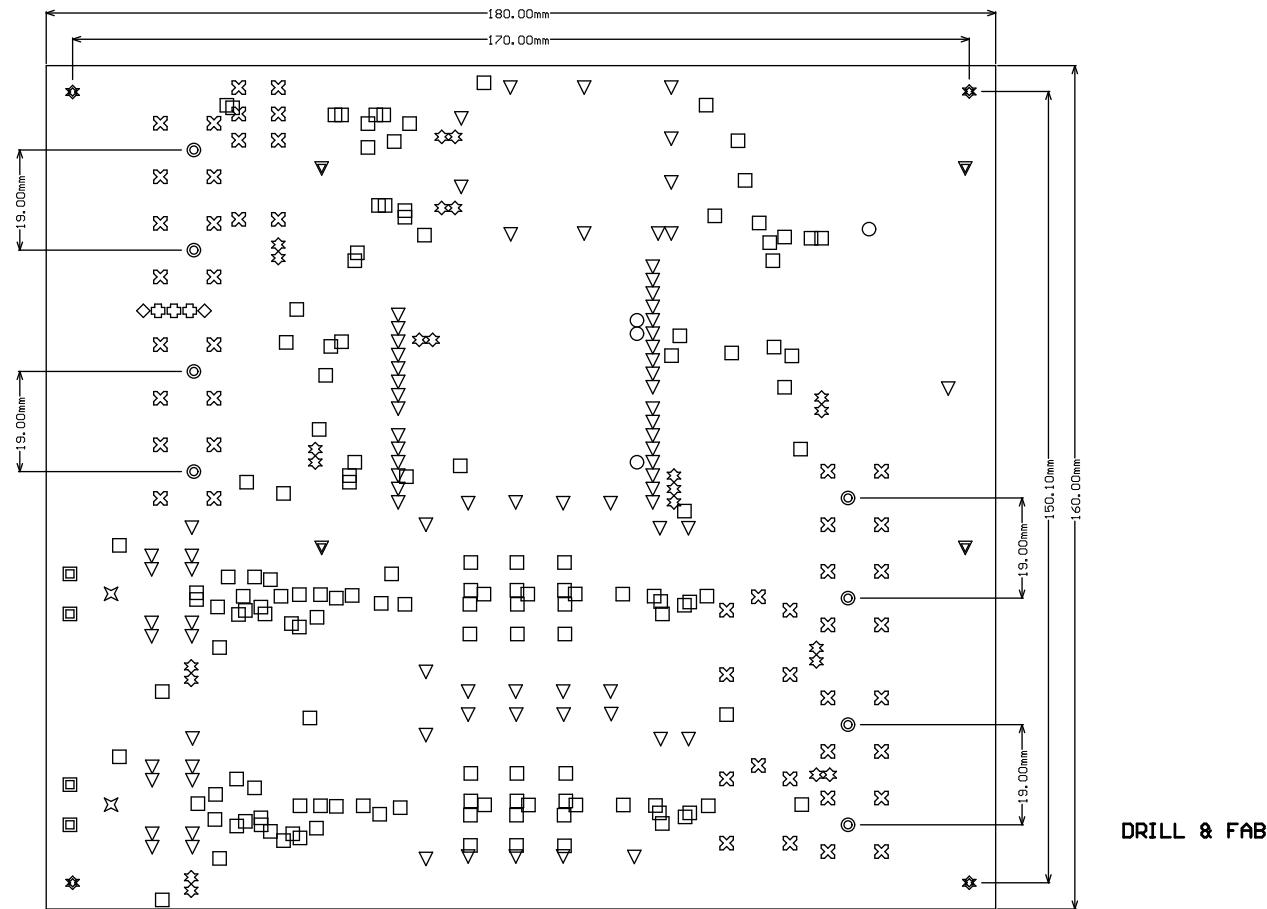


BOTTOM SM

Symbol	Hit Count	Finished Hole Size	Plated	Hole Type
x	2	0.920mm (.36.22mil)	PTH	Round
◊	2	1.590mm (.62.60mil)	PTH	Round
○	3	1.010mm (.39.76mil)	PTH	Round
○	4	0.508mm (.20.00mil)	PTH	Round
□	4	1.800mm (.70.87mil)	PTH	Round
▼	4	3.175mm (.125.00mil)	PTH	Round
*	4	3.300mm (.129.92mil)	PTH	Round
○	8	2.200mm (.86.61mil)	PTH	Round
◊	23	0.900mm (.35.43mil)	PTH	Round
☒	50	1.300mm (.51.18mil)	PTH	Round
▼	86	0.762mm (.30.00mil)	PTH	Round
□	144	0.381mm (.15.00mil)	PTH	Round
334 Total				

LAYER STACK:  
 Top Layer  
 Signal Layer 1  
 Signal Layer 2  
 Bottom Layer

+/- 20V TRACE:  
 MAX BOARD CURRENT 1oz PLATING: 6.50A RMS  
 MAX BOARD CURRENT 2oz PLATING: 10.70A RMS



## PCB FABRICATION NOTES:

MATERIAL:  
 FR4 (GF per MIL-P-13949) MIN UL 94V0

Cu WEIGHT:  
 OUTER LAYER: 1oz  
 INNER LAYER: NA

SOLDER MASK:  
 TYPE: LPI (LIQUID PHOTO-IMAGE)  
 COVER: SMOBC (SOLDER MASK OVER BARE CU)  
 COLOR: RED (PROTOTYPE) OR GREEN (PRODUCTION) GLOSS

OVERALL PCB THICKNESS:  
 PCB: 1.6mm (.63MIL)  
 TOLERANCE: 0.178mm (.7MIL)

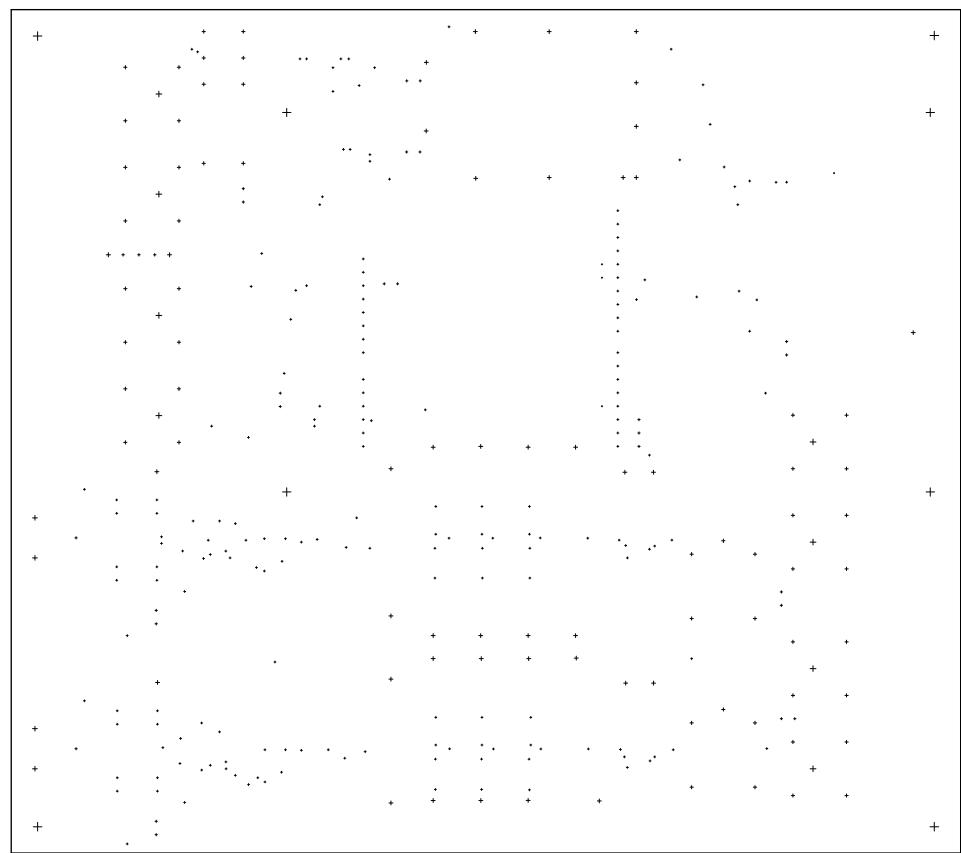
PCB ELECTRICAL TEST  
 TESTED TO GERBER DATA  
 PURCHASE ORDER TO OVERRIDE

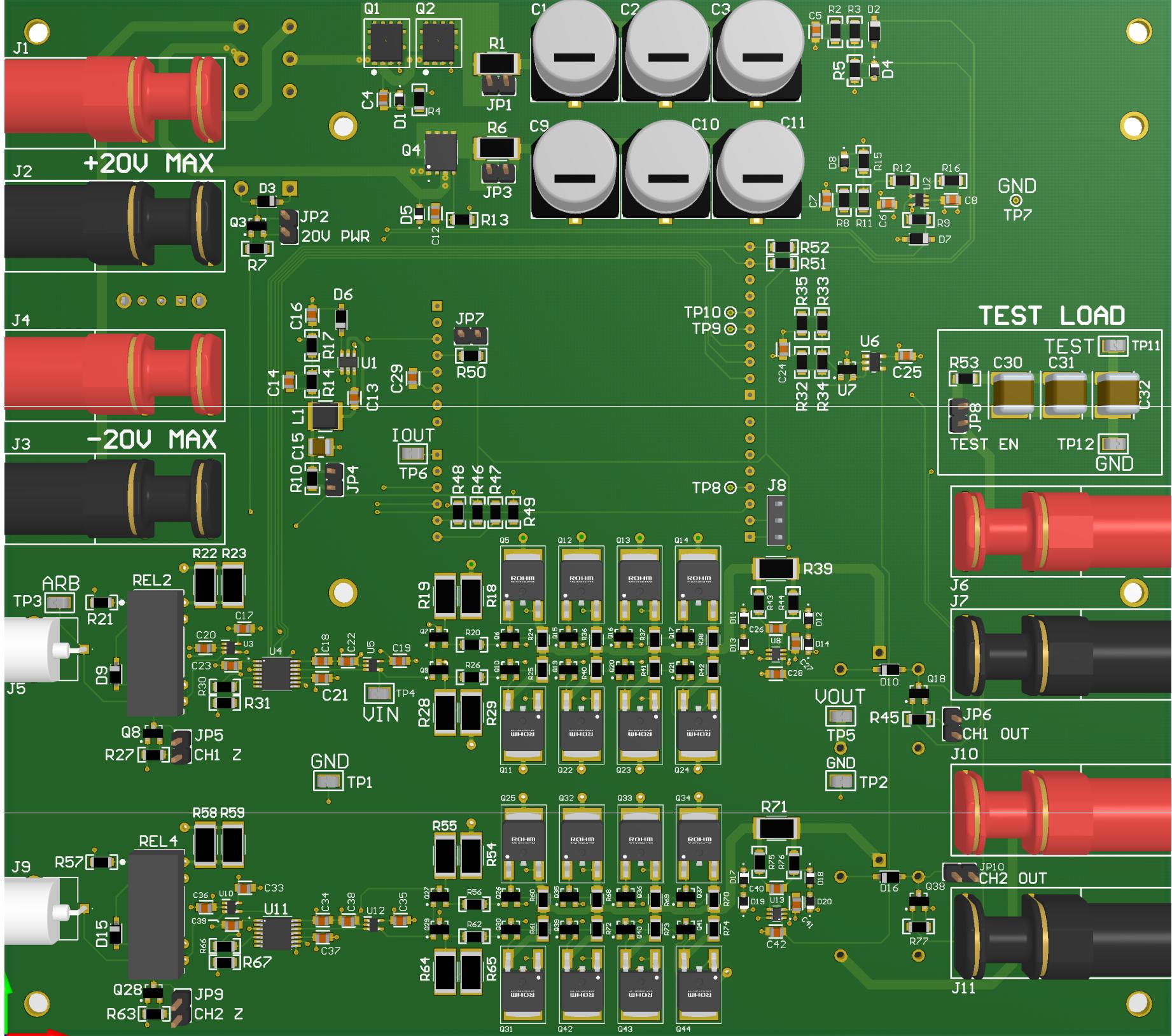
HOLE DIAMETER TOLERANCE:  
 PLATED HOLE TOLERANCE: 0.076mm (.3MIL)  
 NON PLATED HOLE TOLERANCE: 0.076mm (.3MIL)

SILK SCREEN  
 SIDES: TOP  
 COLOR: WHITE  
 TYPE: LPI (PREFERRED)

SURFACE FINISH:  
 PROTOTYPE: HASL OR ENIG  
 PRODUCTION: ENIG (ONLY IF SPEC ON PURCHASE ORDER)

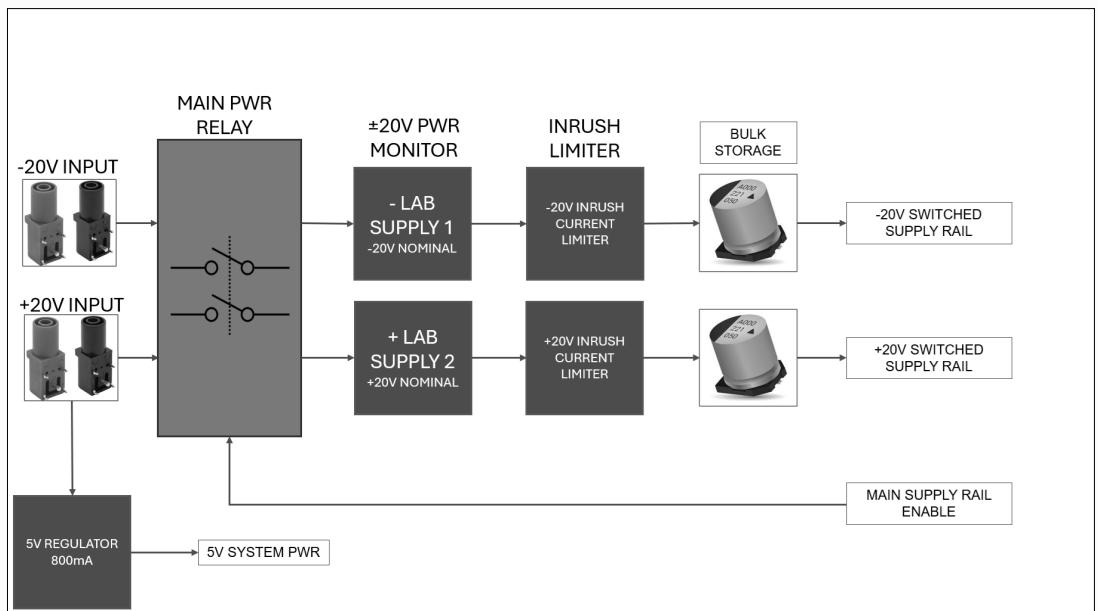
ACCEPTABILITY:  
 STANDARD: IPC-A-600 (LATEST REV)  
 MFG TO ADD: DATE CODE, UL FLAME CODE



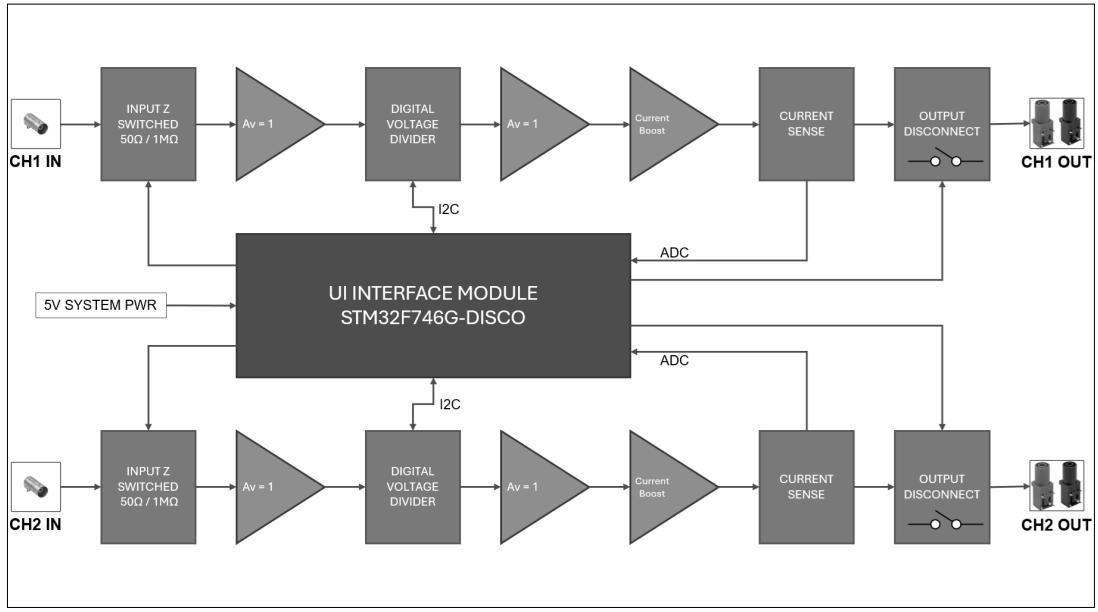




1 2 3 4 5 6

**REVISION HISTORY:**

REV	ECO	CHANGE DESCRIPTION
1	NA	Initial design



Title: <b>Arbitrary Power Booster</b>	IMR Engineering 3621 Gin Way Sneville GA, 30039
Size: B	Number: IMR-005-SCH
Date: 02/25/25	Revision: 1
File: ArbPwrBoost_P1.SchDoc	Time: 08:00 Sheet 1 of 7 Engineer: Hab S Collector

1 2 3 4 5 6

## MAIN SWITCH

**MAX INPUT +20V**

J1 +POS 73099-2 1000V 24A  
J2 -NEG 73099-0 1000V 24A GND

**MAX INPUT -20V**

J3 -NEG 73099-0 1000V 24A J4 +POS 73099-2 1000V 24A GND

MAIN PWR EN

R7 10K 1% 25W

Q3 2N7002-7-F 60V 115mA

D3 1N4148W-7-F 300mA 100V

AZ733-2AE-5DE 5V 12A

REL1 5V 1 2 3 4 5 6

C5 .1uF 50V 50V

C6 .1uF 50V 50V

C7 .1uF 50V 50V

C8 .1uF 50V 50V

-20VSW

## BYPASS CAPS

+20V

D6 1N5819HW-7-F 1A 40V

C16 10uF 50V 50V

SW1 SLV1-2689-4A-NJD

TPS54202DDCR 4.5V-28V

VIN

EN

SW

FB

SRN4018TA-6R8M

L1 6.8uH 1.7A

C13 .1uF 50V

100K 1% 25W

C14 68pF 50V

C15 47uF 16V

TP1 S1751-46R S1751-46R

R10 1% 25W

13.7K 1% 125W

R17 1% 125W

5V

Q1 DMP6050SPS-13 60V 5.7A

Q2 DMP6050SPS-13 60V 5.7A

D1 MMSZ5239BS-7-F 200mW 9.1V

C4 10uF 50V

3V3

R1 1% 1W

R2 1% 1W

C1 330uF 50V

C2 330uF 50V

C3 330uF 50V

R3 1% 125W

R4 1.24K 1% 125W

D2 1N4148W-7-F 300mA 100V

R5 1% 125W

R6 1% 50V 330uF

C9 50V 330uF

C10 50V 330uF

C11 50V 330uF

R7 1% 125W

R8 1% 125W

-20VSW

+20V MON

## +I INRUSH LIMITER

## -I INRUSH LIMITER

Title Arbitrary Power Booster

IMR Engineering  
3621 Gin Way  
Snellville GA, 30039

IMR Engineering

Size: B Number: IMR-005-SCH Revision: 1

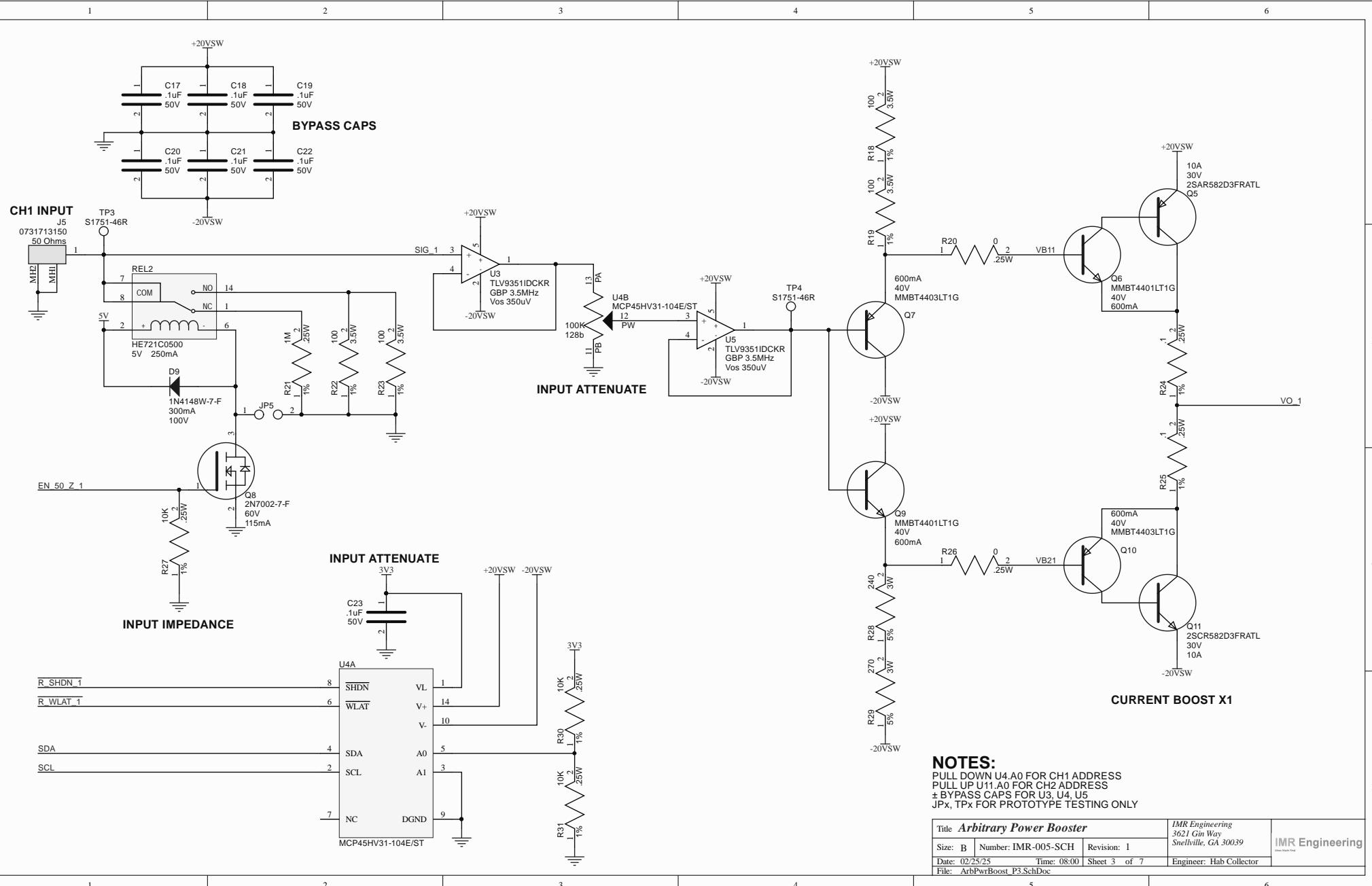
Date: 02/25/25 Time: 08:00 Sheet 2 of 7

Engineer: Hab S Collector

File: ArbPwrBoost\_P2.SchDoc

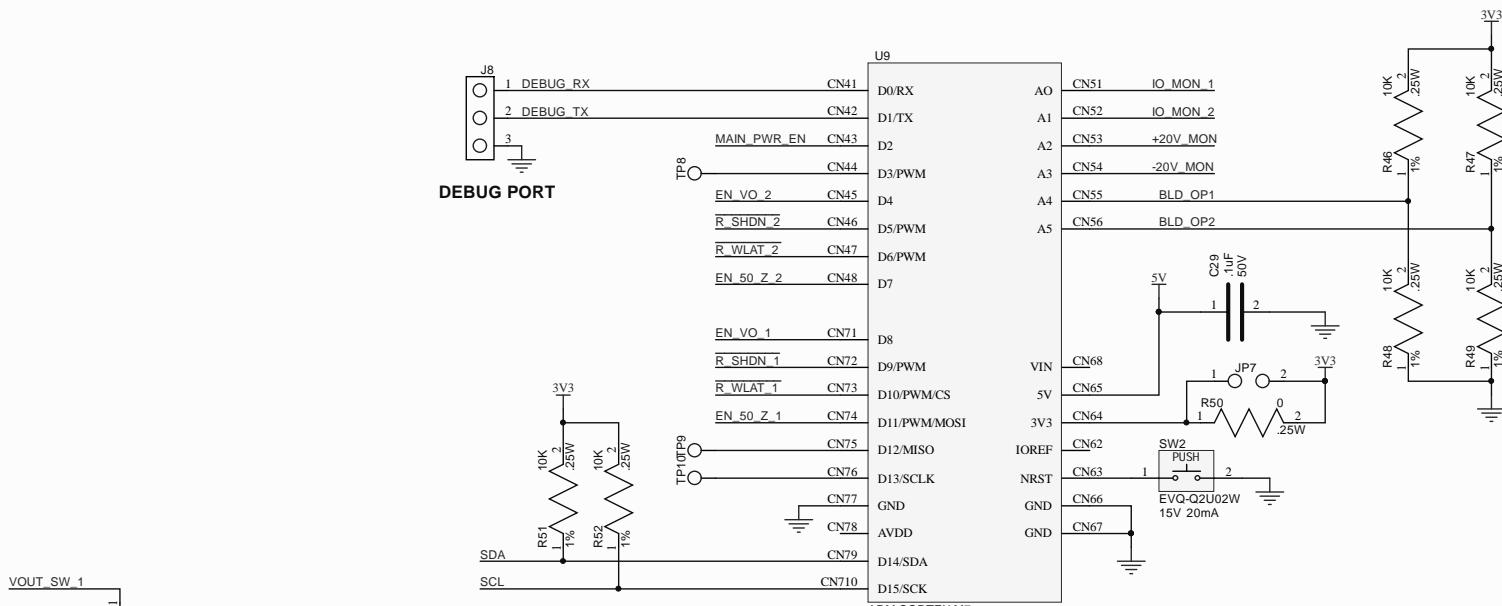
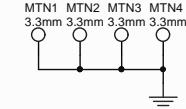
## NOTES:

SW1 SHOWS 5V PWR IN THE OFF POSITION  
JPX, JPX FOR PROTOTYPE TESTING ONLY  
MAX INPUT ON JA, JB CONNECTOR PAIRS IS ±20V  
INPUTS ON JA AND JB MUST BE FROM ISOLATED POWER SUPPLY  
INPUT RATIO OF ±20V\_MON IS 0.110V/V, MAX INPUT OF 30V



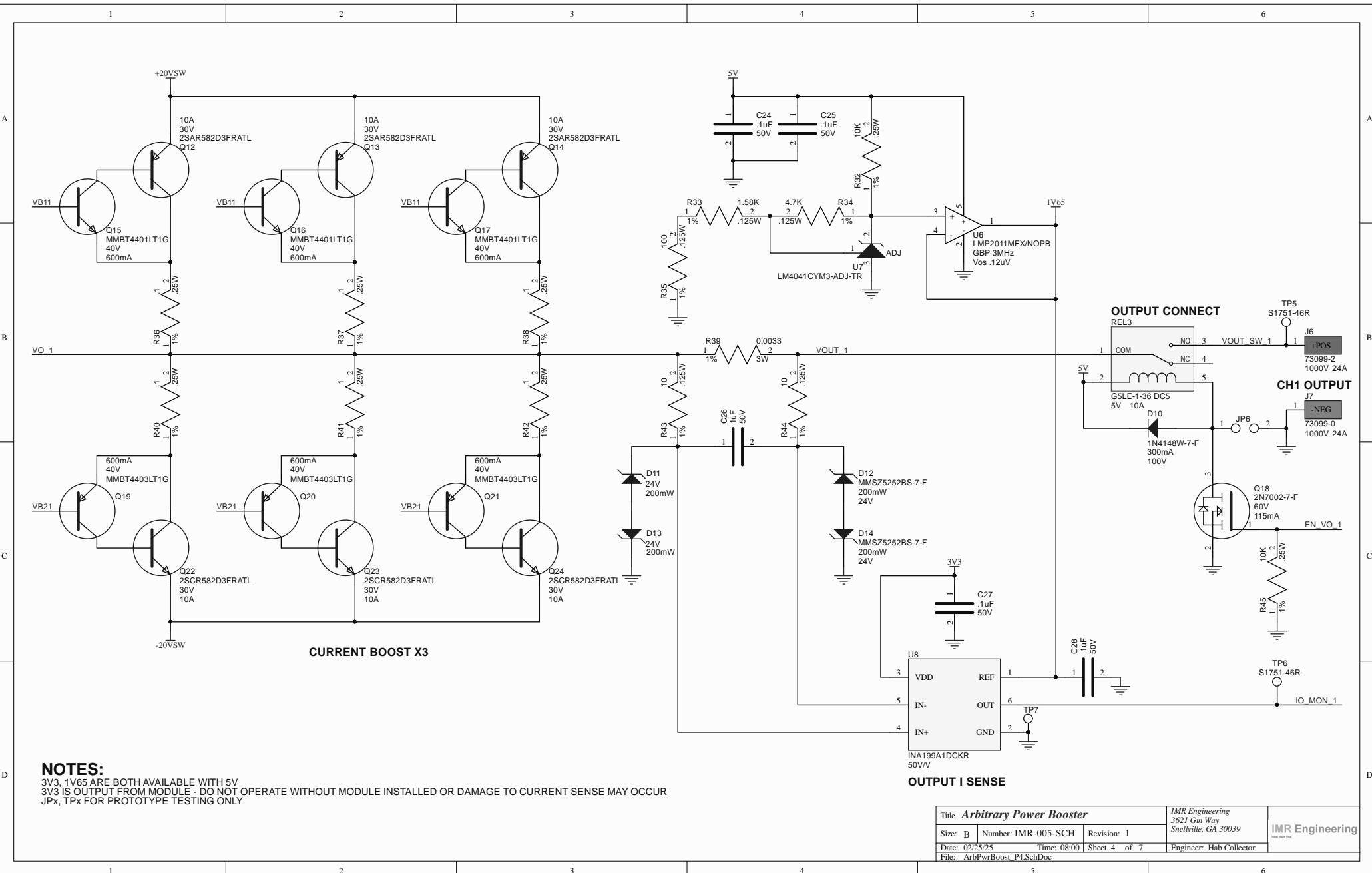
Title: Arbitrary Power Booster	IMR Engineering 3621 Gin Way Sneadville, GA 30039
Size: B	Number: IMR-005-SCH
Date: 02/25/25	Revision: 1
File: ArbPwrBoost_P3.SchDoc	Engineer: Hab Collector

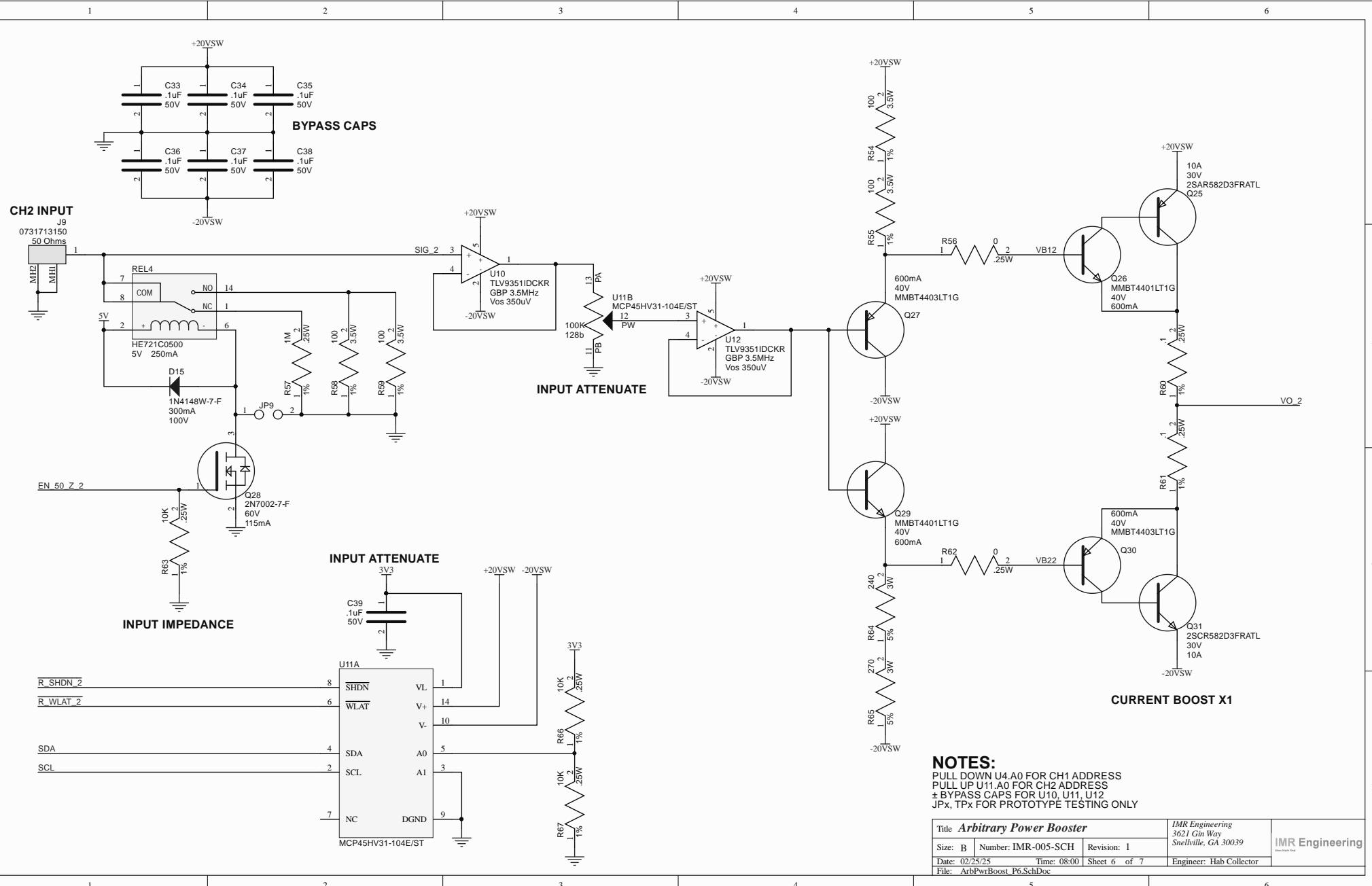
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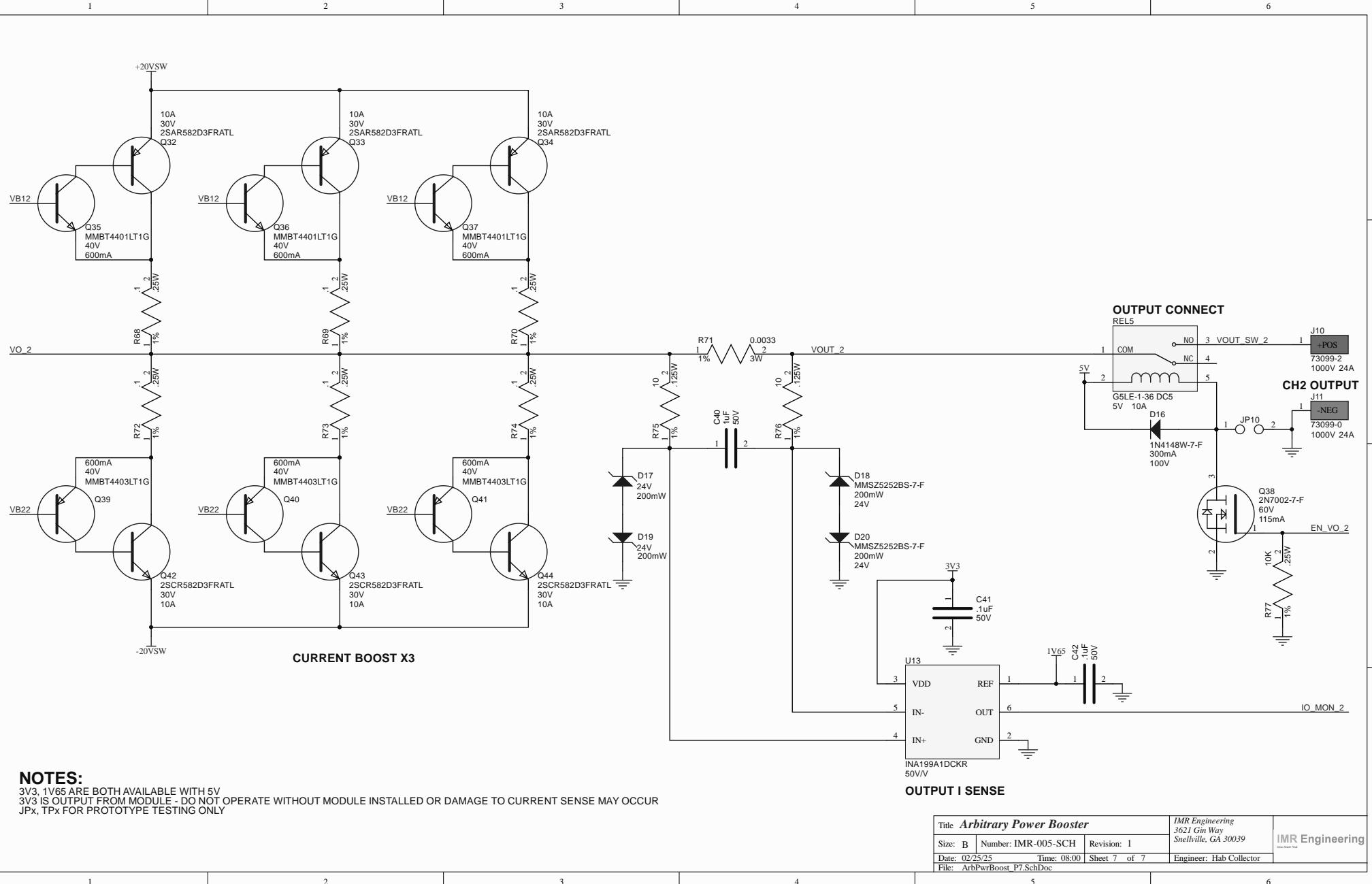
**MOUNTING HOLES****NOTES:**

I2C PULL UP ON MODULE - ADDED HERE JUST IN CASE - DNP  
5V IS POWER INPUT TO MODULE  
3V3 IS REGULATED POWER OUTPUT FROM MODULE  
JPx, TPx FOR PROTOTYPE TESTING ONLY  
CHANNEL 1 AND CHANNEL 2 OPERATE INDEPENDENTLY OF EACH OTHER  
CHANNEL 1 IS MANDATORY, CHANNEL 2 IS A BUILD OPTION  
BLD\_OP1, 2 ARE HARDWARE FIRMWARE BUILD / CONFIG OPTIONS TBD

Title: Arbitrary Power Booster	IMR Engineering 3621 Gin Way Snellville, GA 30039	IMR Engineering
Size: B	Number: IMR-005-SCH	Revision: 1
Date: 02/25/25	Time: 08:00	Sheet 4 of 7
File: ArbPwrBoost_P5.SchDoc		Engineer: Hab Collector







## PROTOTYPE BOM

## Arbitrary Power Booster

Source Data From: Arb\_Power\_Booster.PnjPcb  
 Project: Arb\_Power\_Booster.PnjPcb  
 Variant: None

Company Part Number: IMR-005-SCH  
 PCB Revision: 1  
 Engineer: Hab S Collector

**IMR Engineering**  
 Ideas Made Real

Report Date: 2/24/2025 11:26:08 AM  
 Print Date: 24-Feb-25 11:26:33 AM

#	Quantity	LibRef	Description	Designator	MFG	MFG PN	Supplier 1	Supplier Part Number 1	Unit Price	TOTAL
1	6	CAP_330UF_50V_ALE	CAP ALE 330uF 20% 50V SMD	C1, C2, C3, C9, C10, C11	EEV-FK1b31Q	Panasonic Electronic	DigiKey	PCB3475CT-ND	1.41	\$8.46
2	3	CAP_SMD_10uF_50V_0805	CAP CER 10uF 50V X5R 0805	C4, C12, C16	Murata Electronics	GRM21BR1H106KE43L	DigiKey	490-18663-1-ND	.28	\$0.84
3	26	CAP_SMD_0.1uF_50V_0805	CAP CER 0.1uF 50V X7R 0805	C5, C6, C7, C8, C13, C17, C18, C19, C20, C21, C22, C23, C24, C25, C27, C28, C29, C33, C34, C35, C36, C37, C38, C39, C41, C42	KYOCERA AVX	KGM21NR71H104KT	DigiKey	478-KGM21NR71H104KTCT-ND	.1	\$2.60
4	1	CAP_SMD_68PF_50V_0805	CAP CER 68PF 50V X7R 0805	C14	KEMET	C0805C680K5RA0CAUTO	DigiKey	399-C0805C680K5RA0CAUTO-ND	.24	\$0.24
5	1	CAP_SMD_47uF_16V_1210	CAP CER 47uF 16V X5R 1210	C15	Murata Electronics	GRM21ER604J76ME20L	DigiKey	490-1887-1-ND	.28	\$0.28
6	2	CAP_SMD_1uF_50V_0805	CAP CER 1uF 50V X7R 0805	C26, C40	KYOCERA AVX	08055C105K4T2A	DigiKey	478-KAM21KR71H105KUCT-ND	.27	\$0.54
7	3	CAP_SMD_100uF_25V_SMD	CAP CER 100uF 25V X7S SMD	C30, C31, C32	Murata Electronics	KCM55WC71E107MH13L	DigiKey	490-KCM55WC71E107MH13LCT-ND	5.68	\$17.04
8	2	DIODE_ZENER_MWSZ5239BS-7-F	DIODE ZENER 3.1V 200MW SOD323	D1, D5	Diodes Inc	MWSZ5239BS-7-F	DigiKey	MWSZ5239BS-FDICT-ND	.18	\$0.36
9	7	DIODE_1N4148W-7-F	RELAY REED SPDT 250MA 5V	D2, D3, D7, D9, D10, D15, D16	Diodes Inc	1N4148W-F	DigiKey	1N4148W-FDICT-ND	.16	\$1.12
10	1	DIODE_ZENER_MWSZ5226BS-7-F	DIODE ZENER 3.3V 200MW SOD323	D4	Diodes Inc	MWSZ5226BS-7-F	DigiKey	MWSZ5226BS-FDICT-ND	.15	\$0.15
11	1	DIODE_SCHOTTKY_1N5819HW-7-F	DIODE SCHOTTKY 40V 1A SOD123	D6	Diodes Inc	1N5819HW-F	DigiKey	1N5819HW-FDICT-ND	.25	\$0.25
12	1	DIODE_ZENER_BZT52C2V0S-7-F	DIODE ZENER 2V 200MW SOD323	D8	Diodes Inc	BZT52C2V0S-7-F	DigiKey	BZT52C2V0S-7FDICT-ND	.15	\$0.15
13	8	DIODE_ZENER_MWSZ5252BS-7-F	DIODE ZENER 24V 200MW SOD323	D11, D12, D13, D14, D17, D18, D19, D20	Diodes Inc	MWSZ5252BS-7-F	DigiKey	MWSZ5252BS-FDICT-ND	.12	\$0.96
14	4	CONN_PANDA_73099-2	CONN 4mm Banana Socket Right Angle PCB RED	J1, J4, J6, J10	Pomona	73099-2	DigiKey	501-73099-2-ND	10.39	\$41.56
15	4	CONN_PANDA_73099-0	CONN 4mm Banana Socket Right Angle PCB BLK	J2, J3, J7, J11	Pomona	73099-0	DigiKey	501-73099-0-ND	10.39	\$41.56
16	2	CONN_MOLEX_0731713150	CONN BNC RP/PT R/A 50 OHM PCB	J5, J9	Molex	0731713150	DigiKey	WM20430-ND	1.40	\$2.80
17	1	CONN_HEADER_3P_100ML_VERT	CONN HEADER 3P 2.54MM	J8	Sullins Connector Solutions	PRE003SFAN-RC	Digi-Key	S1212EC-03-ND	.07	\$0.07
18	10	CONN_JUMPER_2P_100ML_VERT	CONN HEADER VERT 2P 2.54MM	JP1, JP2, JP3, JP4, JP5, JP6, JP7, JP8, JP9, JP10	Sullins Connector Solutions	PRE002SFAN-RC	Digi-Key	S1212EC-02-ND	.07	\$0.70
19	1	INDUCTOR_SRN4018TA-6R8M	FIXED IND 6.8uH 1.7A 95 MOHM SMD	L1	Bourns Inc.	SRN4018TA-6R8M	DigiKey	SRN4018TA-6R8MCT-ND	.48	\$0.48
20	2	MOSFET_PCH_DMPB050SPS-13	MOSFET P-CH 60V 5.7A PWRD50B-08	O1, O2	Diodes Inc	DMPB050SPS-13	DigiKey	DMPB050SPS-13DICT-ND	1.07	\$2.14
21	5	MOSFET_NCH_CN72002-7-F	MOSFET N-CH 60V 115mA SOT23-3	Q3, Q8, Q18, Q28, Q38	Diodes Inc	2N7002-7-F	DigiKey	2N7002-FDICT-ND	.20	\$1.00
22	1	MOSFET_NCH_DMNH6042SPQD-13	MOSFET NCH 60V 5.7A POWERDI	Q4	Diodes Inc	DMNH6042SPQD-13	DigiKey	DMNH6042SPQD-13DICT-ND	1.36	\$1.36
23	8	BUT_PNP_CSA582D3FRATL	TRANS PNP 30V 5.7A TO-252	Q5, Q12, Q13, Q14, Q25, Q32, Q33, Q34	Rohm Semiconductor	2SAR582D3FRATL	DigiKey	846-2SA582D3FRATLCT-ND	1.59	\$12.72
24	10	BUT_NPN_MMBT4401LT1G	TRANS NPN 40V 0.6A SOT23-3	Q6, Q9, Q15, Q16, Q17, Q26, Q29, Q35, Q36, Q37	On Semiconductor	MBBT4401LT1G	DigiKey	MBBT4401LT1GOSCT-ND	.13	\$1.30
25	10	BUT_PNP_MMBT4403LT1G	TRANS PNP 40V 0.6A SOT23-3	Q7, Q10, Q19, Q20, Q21, Q27, Q30, Q39, Q40, Q41	On Semiconductor	MBBT4403LT1G	DigiKey	MBBT4403LT1GOSCT-ND	.13	\$1.30
26	8	BUT_NPN_2SCR582D3FRATL	TRANS NPN 30V 10A TO-252	Q11, Q22, Q23, Q24, Q31, Q42, Q43, Q44	Rohm Semiconductor	2SCR582D3FRATL	DigiKey	846-2SCR582D3FRATLCT-ND	1.76	\$14.08
27	2	RES_SMD_0_2512_1W_1%	RES SMD 0 OHM 1% 1W 2512	R1, R6	Yageo	RC2512JK-070RL	DigiKey	YAG1232CT-ND	.2	\$0.40
28	21	RES_SMD_10K_0805_1W4W_1%	RES SMD 10K OHM 1% 1W4W 0805	R2, R3, R7, R8, R11, R16, R27, R30, R31, R32, R45, R46, R47, R48, R49, R51, R52, R63, R66, R67, R77	Yageo	RC0805FR-7W10KL	DigiKey	13-RC0805FR-7W10KLCT-ND	.10	\$2.10
29	2	RES_SMD_47K_0805_1W8W_1%	RES SMD 47K OHM 1% 1W8W 0805	R4, R13	Yageo	RC0805FR-1347KL	DigiKey	13-RC0805FR-1347KLCT-ND	.1	\$0.20
30	2	RES_SMD_1.24K_0805_1W8W_1%	RES SMD 1.24K OHM 1% 1W8W 0805	R5, R15	Yageo	RC0805FR-071K24L	DigiKey	311-1.24KCRCT-ND	.1	\$0.20
31	1	RES_SMD_2.1K_0805_1W8W_1%	RES SMD 2.1K OHM 1% 1W8W 0805	R9	Yageo	RC0805FR-072KL	DigiKey	311-2.10KCRCT-ND	.1	\$0.10
32	7	RES_SMD_0_0805_1W8W_1%	RES SMD 0 OHM 1% 1W8W 0805	R10, R20, R26, R50, R53, R56, R62	Yageo	RC0805JR-070RL	DigiKey	311-0.0ARCT-ND	.1	\$0.70
33	1	RES_SMD_10K_0805_1W8W_1%	RES SMD 1.0K OHM 1% 1W8W 0805	R12	Yageo	RC0805FR-071KL	DigiKey	311-1.00KCRCT-ND	.1	\$0.10
34	1	RES_SMD_100K_0805_1W4W_1%	RES SMD 100K OHM 1% 1W4W 0805	R14	Yageo	RC0805FR-07100KL	DigiKey	311-100KCRCT-ND	.13	\$0.13
35	1	RES_SMD_13.7K_0805_1W8W_1%	RES SMD 13.7K OHM 1% 1W8W 0805	R17	Yageo	RC0805FR-0713K7L	DigiKey	311-13.7KCRCT-ND	.10	\$0.10
36	8	RES_SMD_100_0805_3.5W_2512	RES SMD 100 OHM 1% 3.5W 2512	R18, R19, R22, R23, R54, R55, R58, R59	Ohmite	ALN2512F100RE-1	DigiKey	273-ALN2512F100RE-1CT-ND	1.50	\$12.00
37	2	RES_SMD_1M_0805_1W4W_1%	RES SMD 1M OHM 1% 1W4W 0805	R21, R57	Yageo	RC0805FR-7W1M1L	DigiKey	13-RC0805FR-7W1M1LCT-ND	.10	\$0.20
38	16	RES_SMD_0_1_1206_1W4W_1%	RES SMD 0 OHM 1% 1W4W 1206	R24, R25, R36, R37, R38, R40, R41, R42, R60, R61, R68, R69, R70, R72, R73, R74	Yageo	311-0.1LWCT-ND	DigiKey	311-0.1LWCRCT-ND	.45	\$7.20
39	2	RES_SMD_240_2512_3W_5%	RES 240 OHM 5% 3W 2512	R28, R64	Yageo	RC2512JK-07240RL	DigiKey	13-RC2512JK-07240RLCT-ND	.28	\$0.56
40	2	RES_SMD_270_2512_3W_5%	RES 270 OHM 5% 3W 2512	R29, R65	Yageo	RC2512JK-07270RL	DigiKey	13-RC2512JK-07270RLCT-ND	.21	\$0.42
41	1	RES_SMD_1.58K_0805_1W8W_1%	RES SMD 1.58K OHM 1% 1W8W 0805	R33	Yageo	RC0805FR-071K58L	DigiKey	311-1.58KCRCT-ND	.1	\$0.10
42	1	RES_SMD_4.7K_0805_1W8W_1%	RES SMD 4.7K OHM 1% 1W8W 0805	R34	Yageo	RC0805FR-134KL7	DigiKey	13-RC0805FR-134KL7LCT-ND	.1	\$0.10
43	1	RES_SMD_100_0805_1W8W_1%	RES SMD 100 OHM 1% 1W8W 0805	R35	Yageo	RC0805FR-07100RL	DigiKey	311-100CRCT-ND	.1	\$0.10
44	2	RES_SMD_0.0033_2512_3W_1%	RES SMD 0.0033 OHM 1% 3W 2512	R39, R71	Vishay Dale	WSP12512L300FEA	DigiKey	541-10151-1-ND	.123	\$2.46
45	4	RES_SMD_10_0805_1W8W_1%	RES SMD 10 OHM 1% 1W8W 0805	R43, R44, R75, R76	Yageo	RC0805FR-1310RL	DigiKey	13-RC0805FR-1310RLCT-ND	.1	\$0.40
46	1	RELAY_AZ733-2AE-5DE	RELAY REED SPDT 250MA 5V	REL1	American Zettler	AZ733-2AE-5DE	DigiKey	3385-AZ733-2AE-5DE-nd	2.18	\$2.18
47	2	RELAY_REL21C0500	RELAY REED SPDT 250MA 5V	REL2, REL4	Liteuse	HE712C0500	DigiKey	HE112-ND	3.77	\$7.54
48	2	RELAY_G5LE-1-36_DC5	RELAY GEN PURPOSE SPDT 10A 5V	REL3, REL5	Omron	G5LE-1-36DC5-ND	DigiKey	G5LE-1-36DC5-ND	1.24	\$2.48
49	1	SWITCH_SWL-12689-4A-N-D	SWITCH SLIDE SPDT 300MA 50V	SW1	Same Sky	SLW-12689-4A-N-D	DigiKey	2223-SWL-12689-4A-N-D-ND	.48	\$0.48
50	1	SWITCH_EVQ-Q2002W	SWITCH TACTILE SPST-NO 0.02A 15V	SW2	American Zettler	EVQ-Q2002W	DigiKey	P12954SCT-ND	.25	\$0.25
51	8	CONN_TEST_POINT_S1751-46R	PCB TEST POINT CONNECT	TP1, TP2, TP3, TP4, TP5, TP6, TP11, TP12	HarwIn Inc	S1751-46R	DigiKey	952-1478-1-ND	.28	\$2.24
52	1	IC_TPS54202DDCR	IC REG BUCK ADJ 2A SOT23	U1	Texas Instruments	TPS54202DDCR	Digi-Key	296-TPS54202DDCRCT-ND	.97	\$0.97
53	5	OPAMP_TLV9351DCR	IC OPAMP GP 3.5MHz 350uV C70-5	U2, U3, U5, U10, U12	Texas Instruments	TLV9351DCR	DigiKey	296-TLV9351DCRCT-ND	.49	\$2.45
54	2	IC_MCP45H3/31-104EST	IC DGT POT 100KOHM 1.28TP 147SSOP	U4, U11	Microchip	MCP45H3/31-104EST	DigiKey	MCP45H3/31-104EST-ND	1.82	\$3.64
55	1	OPAMP_LMP2011MFN/NOB	IC OPAMP GP 3MHz -12uV CIRCUIT SOT23-5	U6	Texas Instruments	LMP2011MFN/NOB	DigiKey	LMP2011MFN/NOBCT-ND	2.33	\$2.33
56	1	IC_LM401CY3-ADJ-TR	IC VREF SHUNT ADJ 0.5% SOT23-3	U7	Microchip	LM401CY3-ADJ-TR	DigiKey	576-1049-1-ND	.39	\$0.39
57	2	ICINA199A1DCR	IC CURRENT SENSE 1.5% 50V/V SC70-6	U8, U13	Texas Instruments	INA199A1DCR	DigiKey	296-27329-1-ND	.45	\$0.90
58	1	MODULE_STM32F746G-DISCO	DISCOVERY STM32F7 EVAL BRD	U9	ST Microelectronics	STM32F746G-DISCO	DigiKey	497-15680-5-ND	.57.50	\$57.50

Approved

Notes

Bill of Cost (Unit Buy): \$264.98