

ISLACDC750WEVKIT1Z

Boost PFC and Asymmetrical Full-Bridge ZVS Converter

UG043
Rev. 1.00
Apr 30, 2018

Description

The ISLACDC750WEVKIT1Z uses an active PFC and asymmetrical full-bridge ZVS converter and targets ATX PC power supply applications. With a 400V DC bus, the converter can output 12V at 62.5A. The efficiency performance can reach upward of 80%. Overall protection functions such as input overvoltage and undervoltage protection, output overvoltage, overcurrent, over-temperature, and short-circuit protection make the circuit very reliable. The PSON pin provides an interface to remotely control the board, and a Power-Good (PG) pin indicates the working condition of the circuit. The circuit can also be adapted to a battery charger.

The ISLACDC750WEVKIT1Z consists of the following components.

TABLE 1. ISLACDC750WEVKIT1Z Components

Component	Type	Name
ISLACDC750W-MBEV1Z	Motherboard	MB
ISL6731x-DB-1Z	Daughter board	PFDB
ISL6721-DB-1Z	Daughter board	BiasDB
ISL6754DBEVAL2Z	Daughter board	ZVSDB

Specifications

The ISLACDC750WEVKIT1Z is designed for high current applications. The current rating is limited by the FETs and the transformer and inductor selected. The electrical ratings are shown in [Table 2](#).

TABLE 2. ELECTRICAL RATINGS

PARAMETER	RATING
Input Range	90 to 264V _{AC}
Output Voltage	12V _{DC}
Power	750W

Key Features

- Current sharing
- ORing: hot swap
- OVP/OTP/UVP
- OCP: constant current
- Stand-by mode turn off PFC and DC/DC

Related Literature

For a full list of related documents, visit our website

- [ISL6754](#), [ISL6731A](#), [ISL6731B](#), [ISL6721](#) product pages

Ordering Information

PART NUMBER	DESCRIPTION
ISLACDC750WEVKIT1Z	Boost PFC and Asymmetrical Full-Bridge ZVS converter

Recommended Test Equipment

The following materials are recommended to perform testing:

- Power analyzer
- AC source: 1kW
- Electronic loads: 12V, 750W minimum
- DVM
- 100MHz quad-trace oscilloscope

Motherboard and Daughter Boards

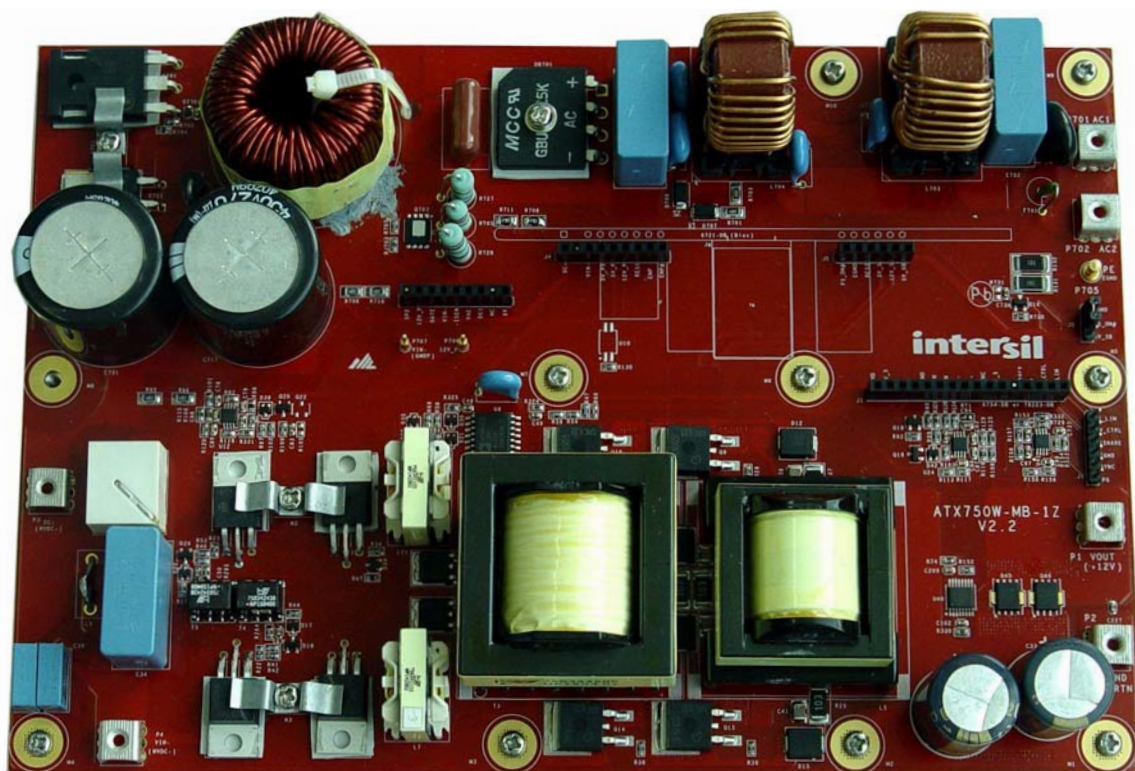


FIGURE 1. MOTHERBOARD ISLACDC750W-MBEV1Z

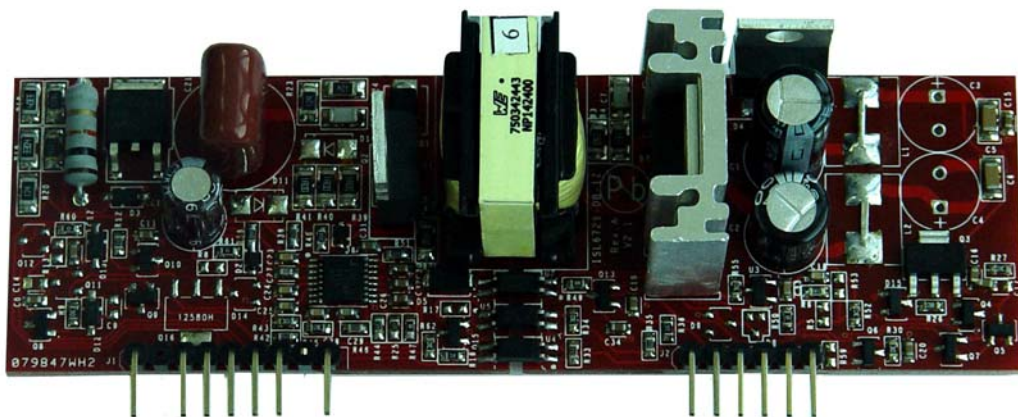


FIGURE 2A. ISL6721-DB-1Z

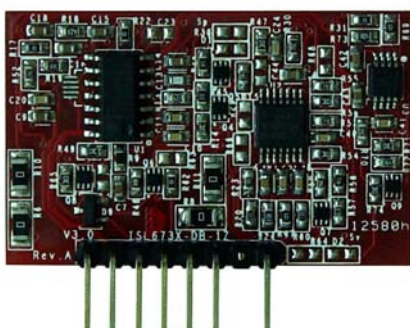


FIGURE 2B. ISL6731x-DB-1Z

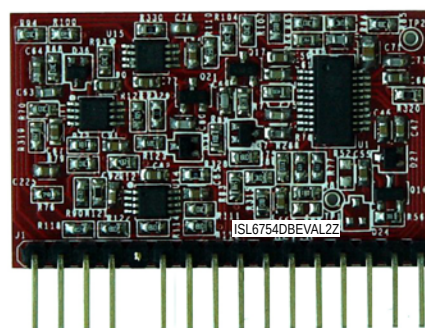


FIGURE 2C. ISL6754DBEVAL2Z

FIGURE 2. DAUGHTER BOARDS

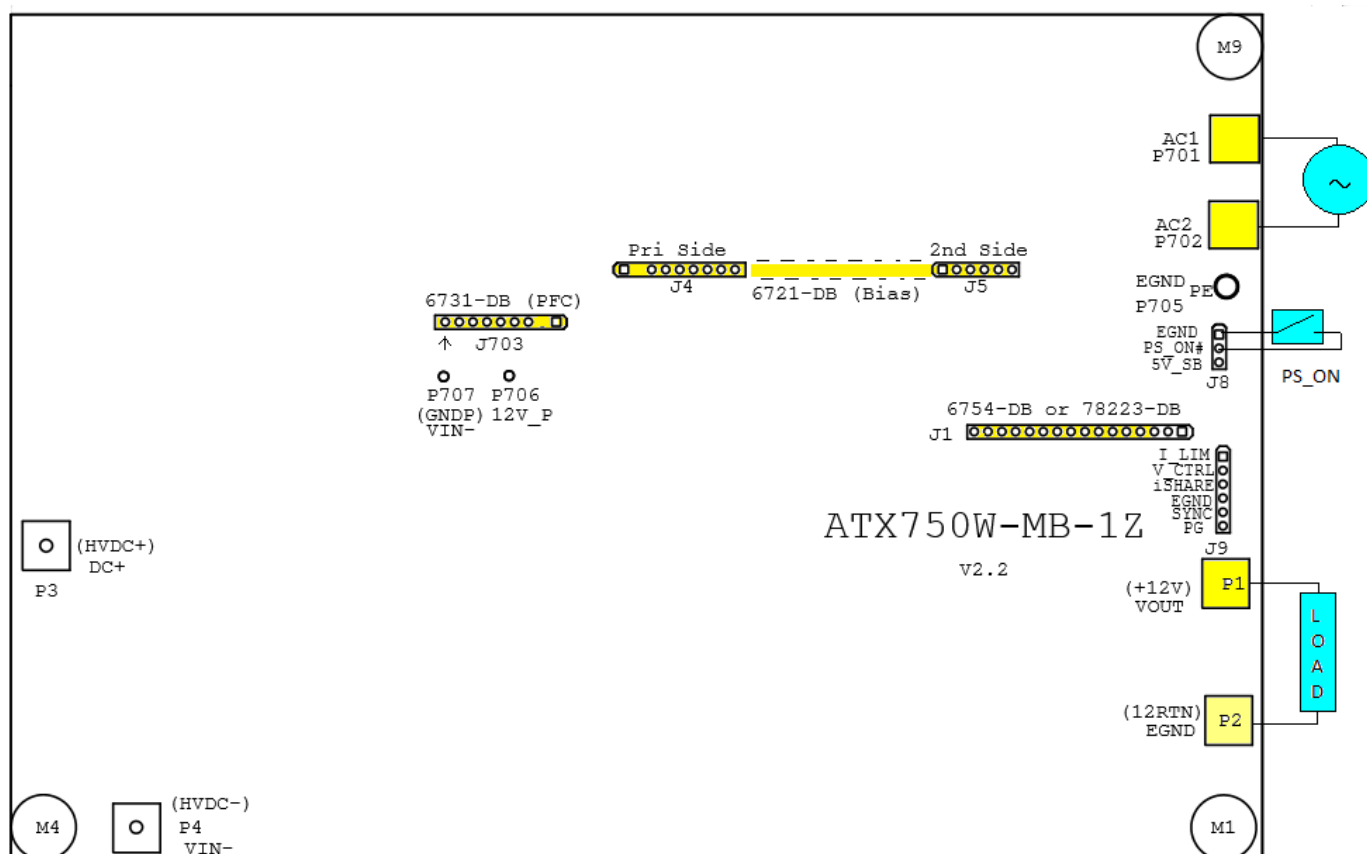
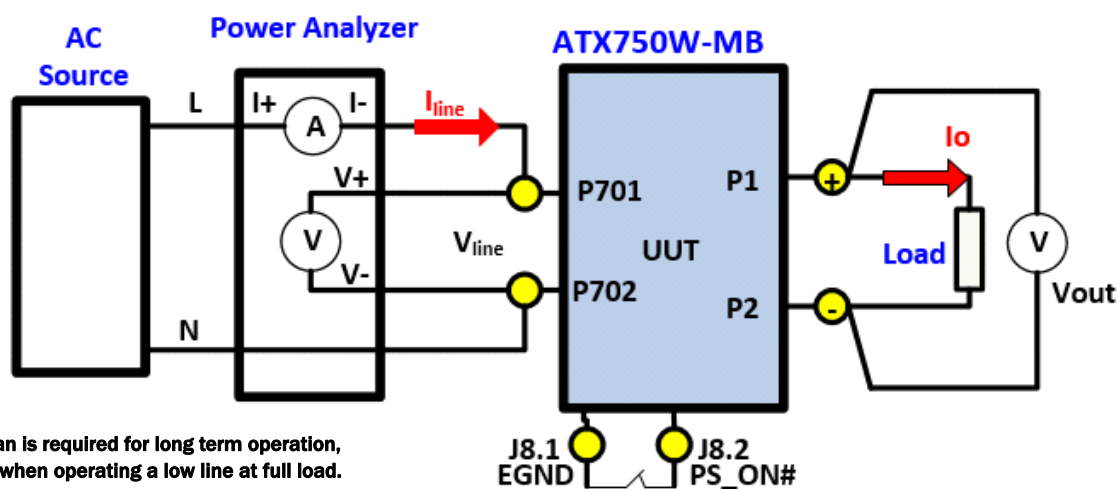


FIGURE 3. ASSEMBLY OF ISLACDC750WEVKIT1Z

ISLACDC750WEVKIT1Z



NOTE: A fan is required for long term operation, especially when operating a low line at full load.

FIGURE 4. TEST SETUP

Typical Performance Curves

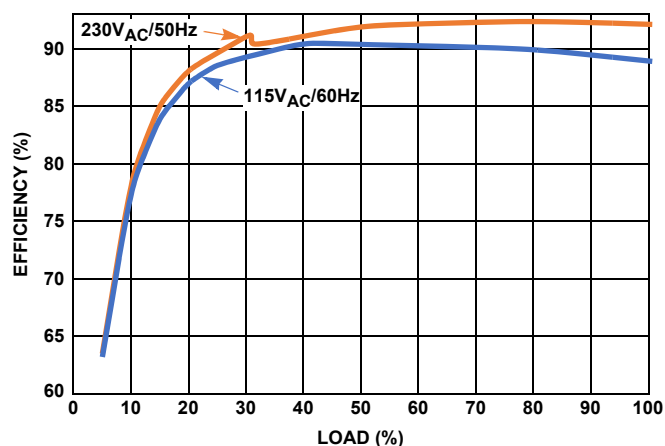


FIGURE 5. EFFICIENCY vs LOAD

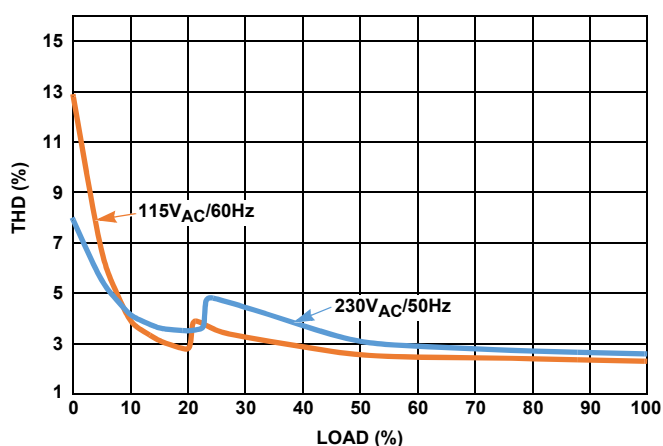


FIGURE 6. THD vs LOAD

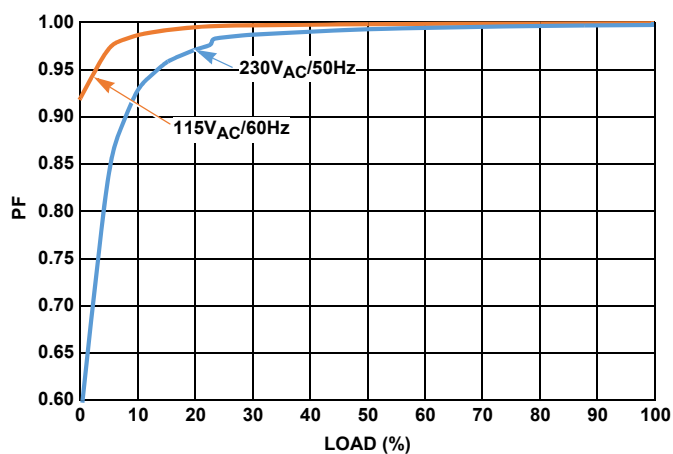
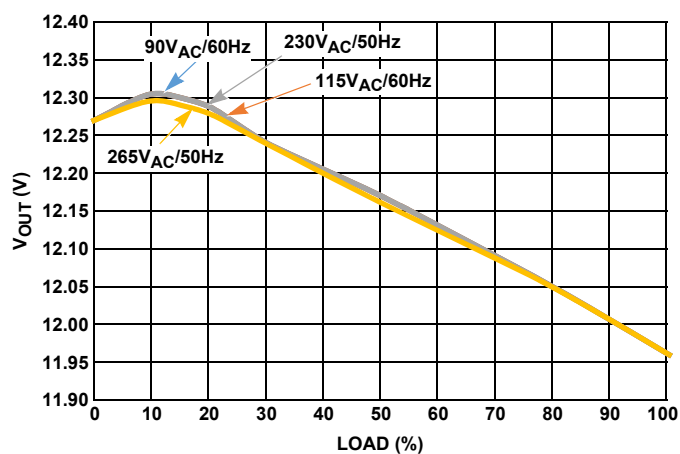


FIGURE 7. PF vs LOAD

FIGURE 8. V_{OUT} vs LOAD, DROP FOR PARALLEL OPERATION

Block Diagrams

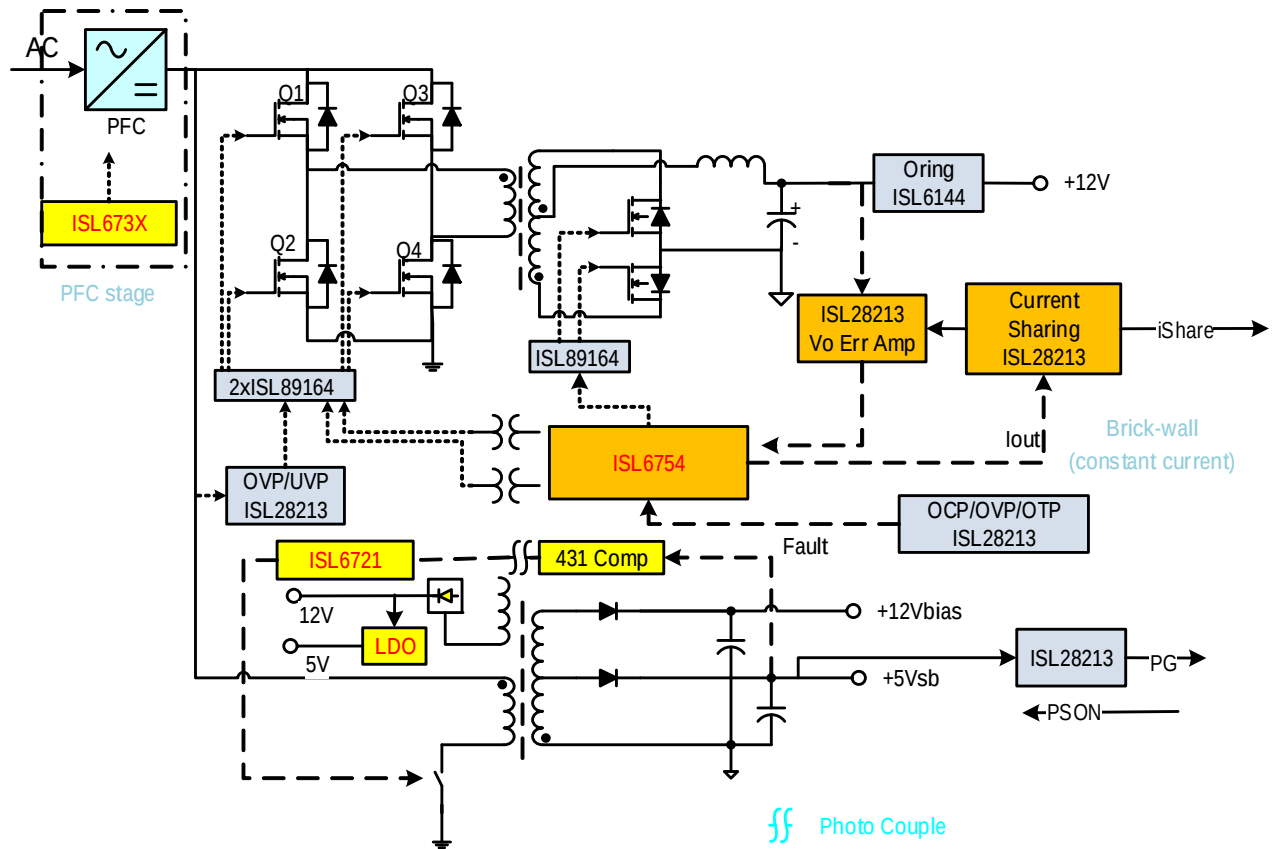


FIGURE 9. BLOCK DIAGRAM OF SYSTEM

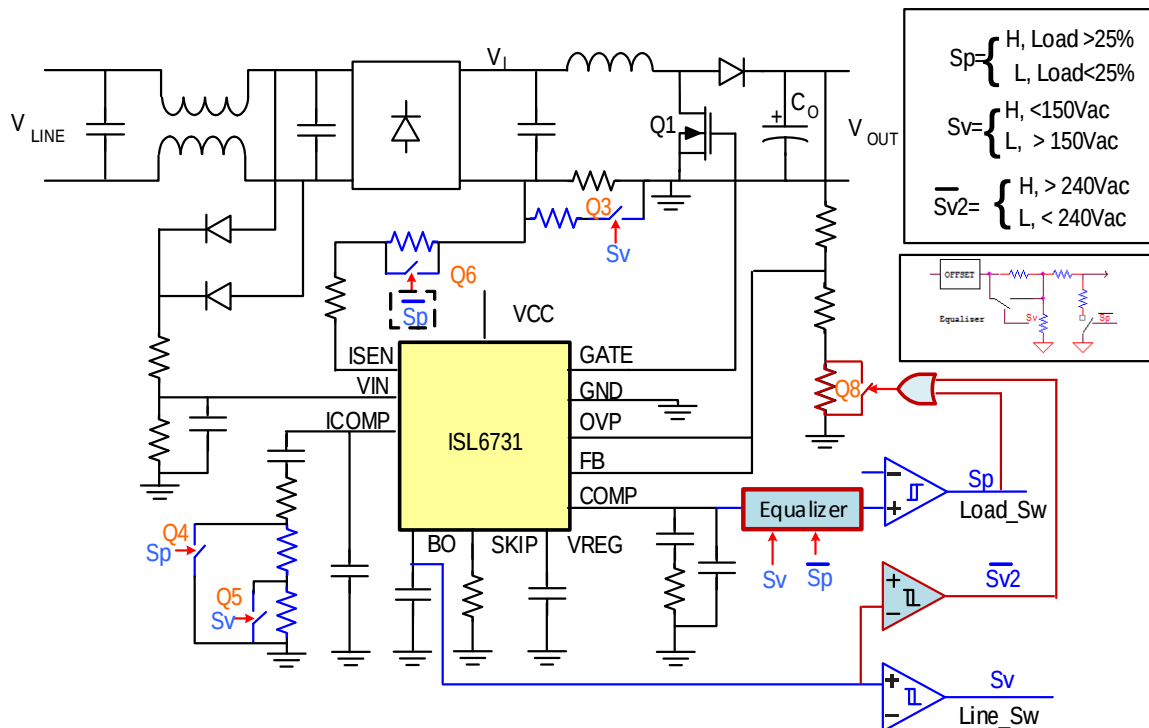


FIGURE 10. BLOCK DIAGRAM OF THE PFC STAGE

Adaptive Control and Bus Voltage Auto-Adjustment

The ISL6730 and ISL6731 families have excellent Power Factor Correction (PFC) capability to achieve low THD and high PF with the optimized circuit shown in [Figure 10, "BLOCK DIAGRAM OF THE PFC STAGE," on page 5](#). To further improve THD at light and high line conditions, Q3, Q4, Q5, Q6, and two comparators are added to dynamically change current loop and current sense gain (refer to [Figure 10](#)). This simple analog implementation can achieve the same level of THD and PF performance as DSP control.

The Sp signal controls Q6 (inverted) and Q4. Sp is controlled by the load power level from the voltage level on the COMP pin. Sp goes high at heavy load and low at light load.

At light-load conditions, the COMP voltage is low and Sp goes low. Q4 turns off to increase $R_{I\text{COMP}}$ resistance to increase current loop gain and Q6 turns on to increase current sense gain. The increase of current loop and sense gain pushes crossover frequency higher to improve THD.

The Sv signal controls Q3 and Q5. Sv is controlled by the line voltage from the voltage level on the BO pin. Sv goes high at low line and low at high line.

At high-line conditions, the BO voltage is low and Sv goes low. Q5 turns off to increase R_{ic} resistance to increase current loop gain and Q3 turns off to increase current sense gain. The increase of current loop and sense gain pushes the crossover frequency higher to improve THD.

At light-load or high-line condition, the boost inductor current is relatively small. The converter runs in Discontinuous Conduction Mode (DCM). In this condition, the CCM frequency domain model cannot be used for analysis. In DCM condition, the current loop will be inherently stable, and thus, can be pushed to run in a higher gain and crossover frequency configuration.

The COMP pin signal represents the power level. Use an "Equalizer" block to unify the scale. It is a variable gain voltage divider, implemented by resistors and FET switches. The gain is controlled by signals Sv2 and Sp, where Sv2 goes high when the RMS line voltage is less than 240V and goes low when greater than 240V. The actual circuit has a hysteresis of about 10V~20V. The bar over the Sv2 means the logic is inverting.

For normal operation, voltage switch Q8 is closed and the bus voltage is 390V. If open, the bus voltage will decrease to 360V and this will improve light load efficiency. An extra signal, Sv2, is added to avoid the bus decreasing at high line ($>250V_{AC}$), otherwise the PF cannot be corrected. Q8 needs to know the P_{OUT} , which can be obtained from the equalized COMP signal.

For a conventional application in which THD requirement is not so critical, the adaptive circuit can be removed.

The ISLACDC750WEVKIT1Z can be adapted to an off-line charger, but the main transformer T3 and inductor L5 may need to be redesigned. I_{LIM} and V_{CTRL} can be interfaced to program the charger current and floating charge voltage from an MCU. For stand-alone operation the current sharing and ORing FET circuit can be removed.

TABLE 3. UNIT CIRCUIT DETAILS

TERMINAL	LABEL	DESCRIPTION
P0, P12	EGND	Signal GND.
P5	iShare	Analog I/O signal and current sharing bus, handled by U14A/B on the ISL6754DBEVAL2Z (related RCs: R_{90} , R_{111} , R_{112} , R_{114} , R_{118} , R_{121} , R_{122} , R_{328} , C_{82} , C_{85} , and C_{92}).
P6	SYNC	Input logic signal, handled by Q21 (D_{38} , C_{80} , and R_{89}).
P7	I_{LIM}	Input analog signal, handled by U15b on the ISL6754DBEVAL2Z. Reserved for the charger to set the current. Not necessary for ATX applications. Move the R_{104} to stack on the R_{88} (that is, change R_{88} to 4.99k and remove R_{104} , R_{107} , R_{110} , and C_{84}).
P8	PG	Output logic signal and power-good signal for ATX. Output of the comparator U41A on the motherboard. Can be removed for chargers.
P9	V_{CTRL}	Input analog signal, handled by U15A on the ISL6754DBEVAL2Z. Reserved for the charger to trim the output voltage V_O . Not necessary for ATX applications. Move the R_{93} in parallel with R_{79} (that is, change R_{79} to 4.99k and remove R_{93} , R_{94} , R_{100} , C_{77} , C_{76} , and R_{330}).
P10	PS-ON#	Input logic signal to power on the ATX. Can be tied to EGND for the charger.
P11	5V_SB	Standby 5V bias supply (sources 1.25A current. For a real ATX, source 2.5A current for the computer motherboard).
	SR_EN	Internal logic signal, reserved for DEM. Set the output of comparator U11B to the low level to disable the SR signals.
	U1.2	Internal analog signal and output of U11A. This is the compensated V_O error signal.
	U24.1	Internal logic signal and output of comparator U24A on MB. Logic low means a V_O OVP is tripped.
	U24.7	Internal logic signal and output of comparator U24B on MB. Logic low means an OTP is tripped.
	U12.1	Internal logic signal and output of comparator U12A on MB. Logic low means a HVDC bus OVP is tripped.
	U12.7	Internal logic signal and output of comparator U12B on MB. Logic low means a HVDC bus UVP is tripped.
	U10, U41	Reserved. Can be removed (related RCs: R_{130} , R_{729} , R_{333} , and R_{332}).
	Q16	R_{131} and R_{132} are bleeding loads for the 5V SB on MB. For start-up only; does not consume power during normal operation.

Schematics

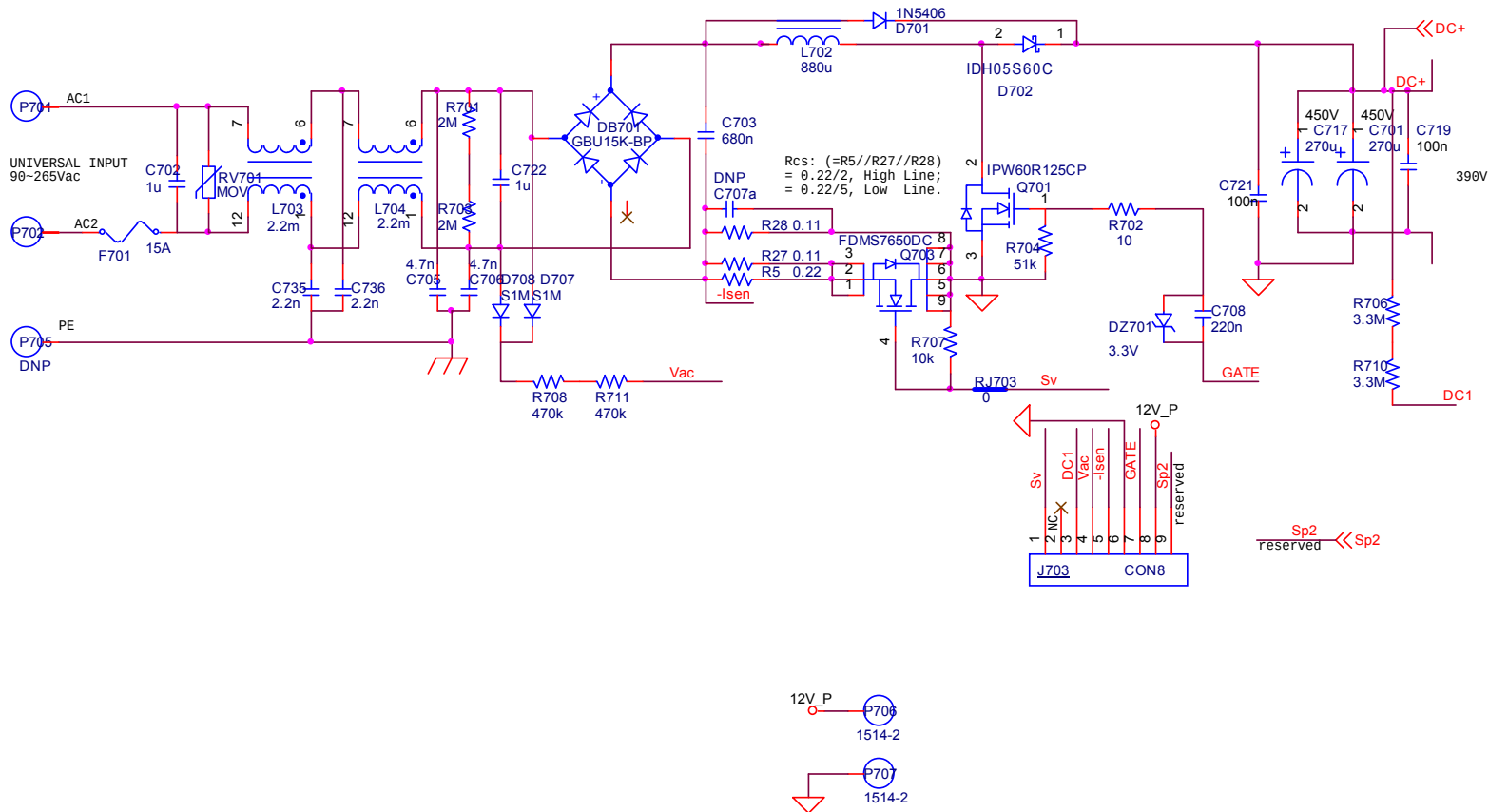


FIGURE 11. ISLACDC750W-MBEV1Z, PFC STAGE SCHEMATIC

Schematics (Continued)

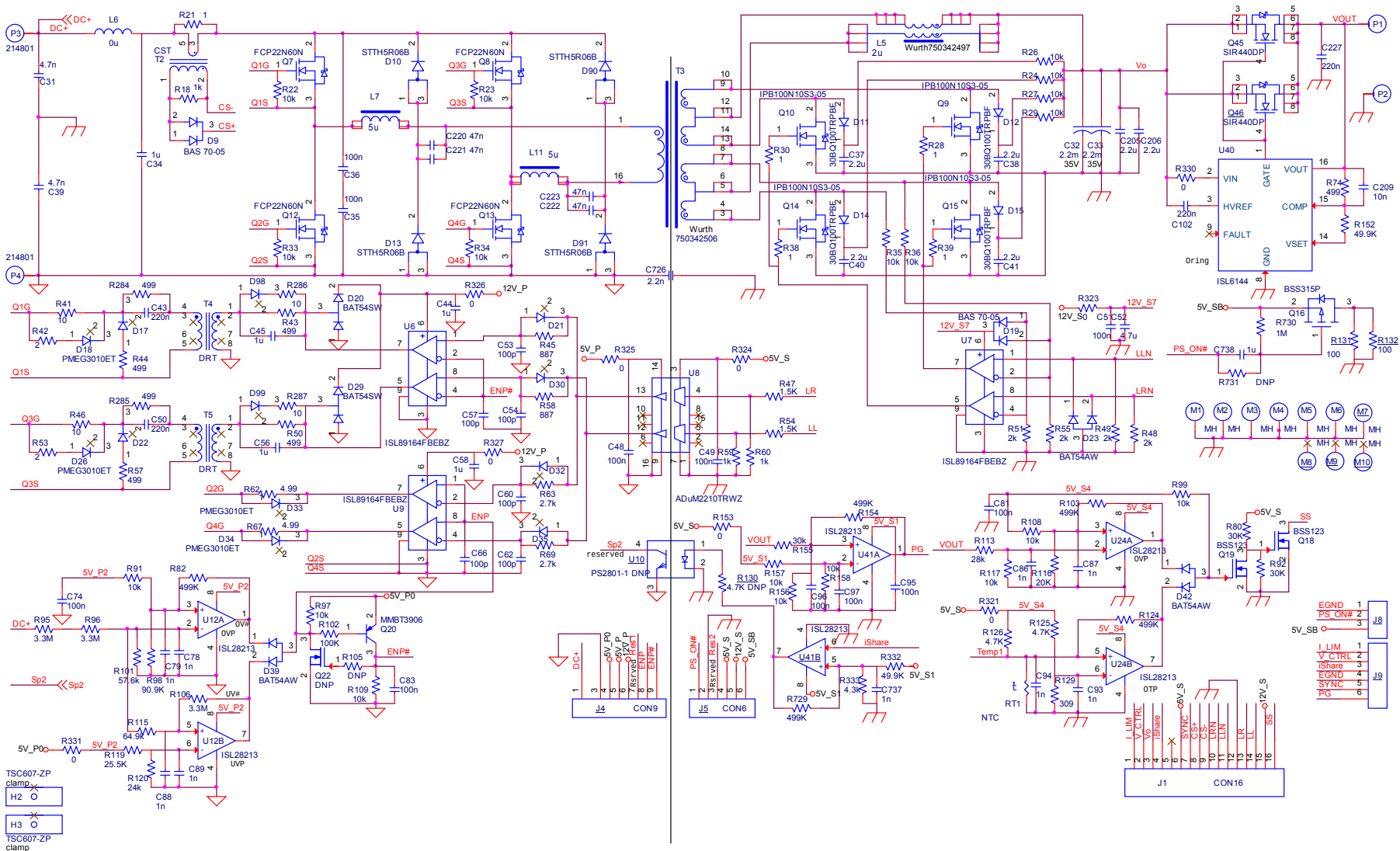


FIGURE 12. ISLACDC750W-MBEV1Z, AFB STAGE SCHEMATIC

Schematics (Continued)

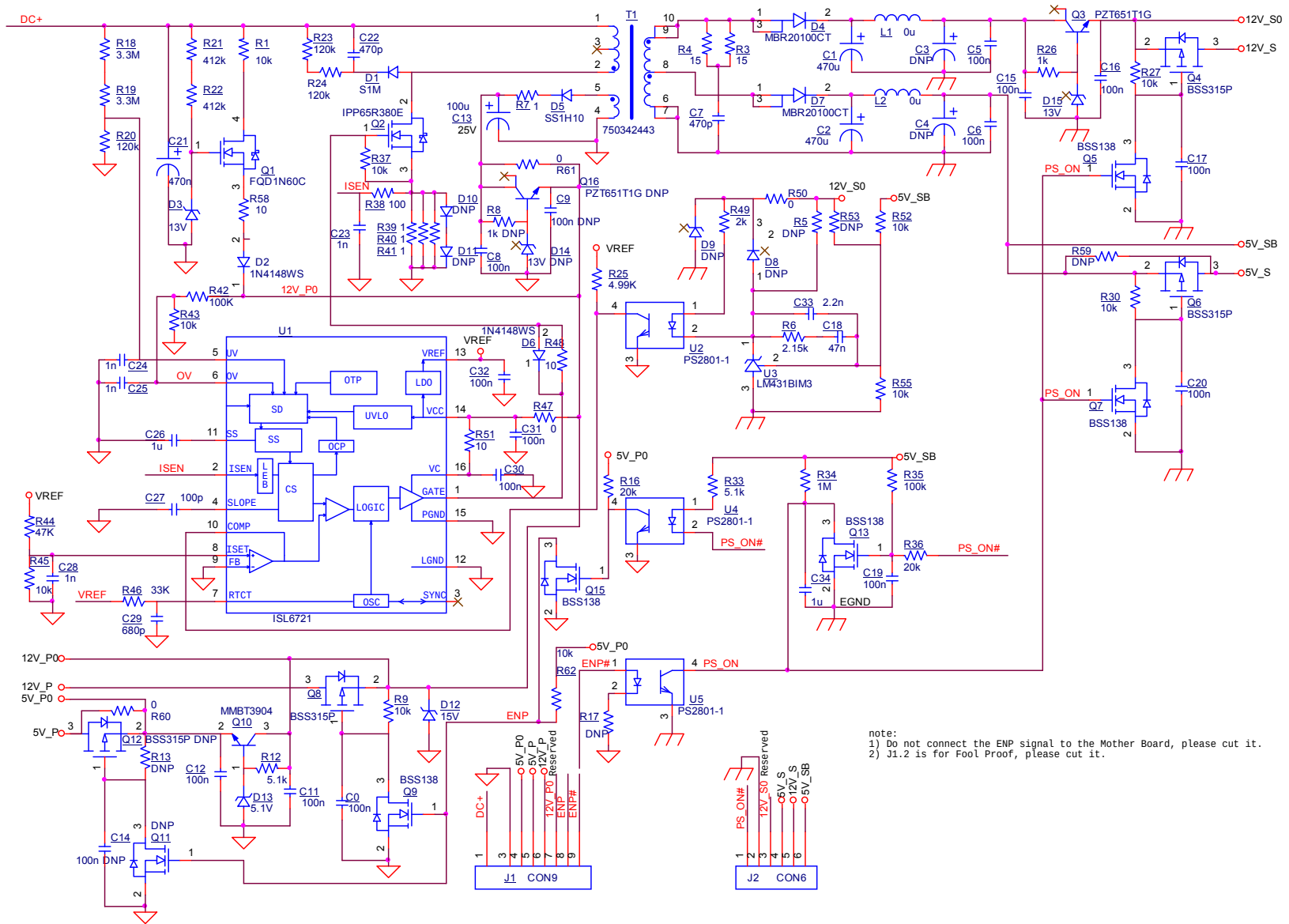


FIGURE 13. ISL6721-DB-1Z SCHEMATIC

Schematics (Continued)

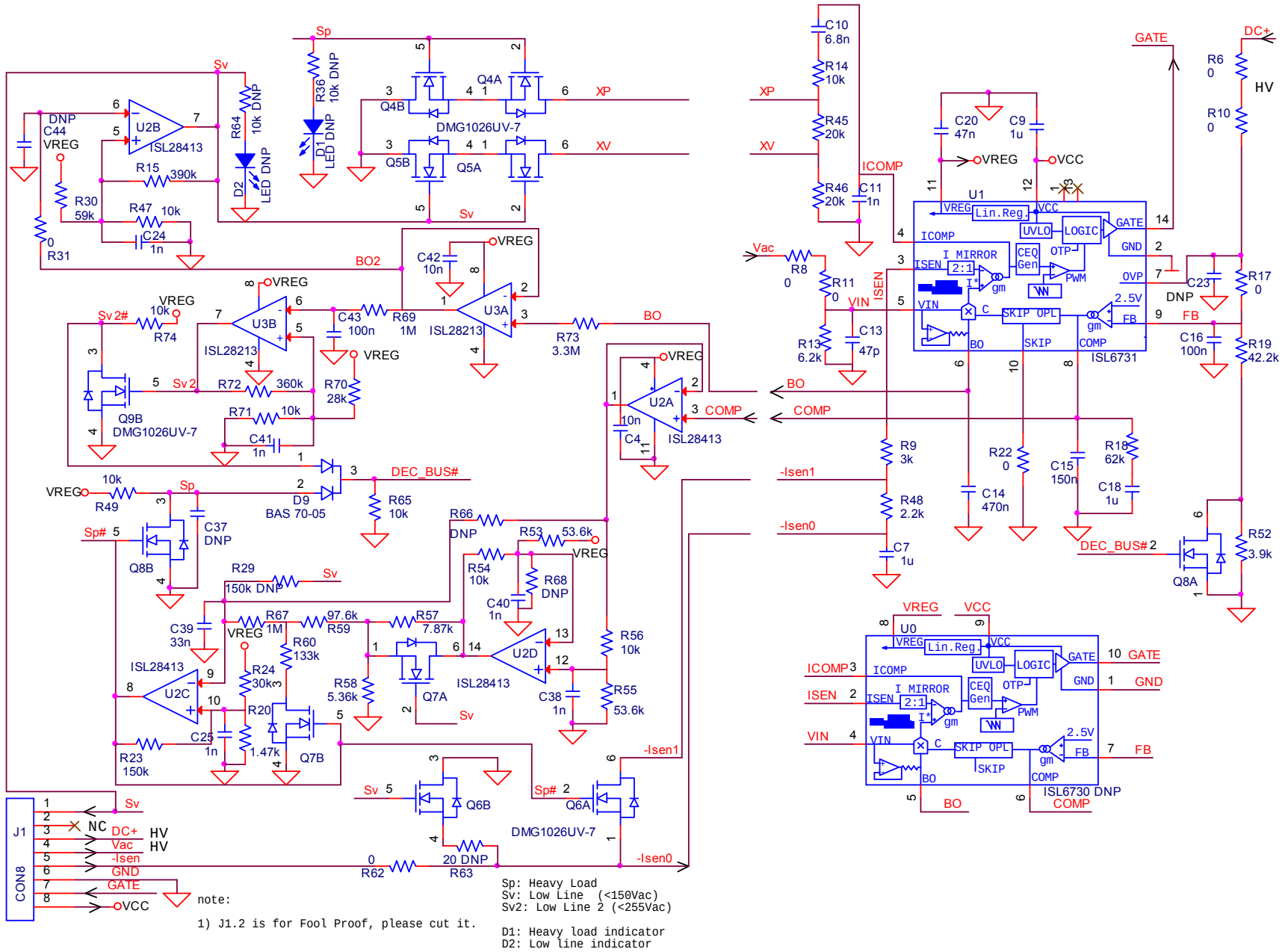


FIGURE 14. ISL6731X-DB-1Z SCHEMATIC

Schematics (Continued)

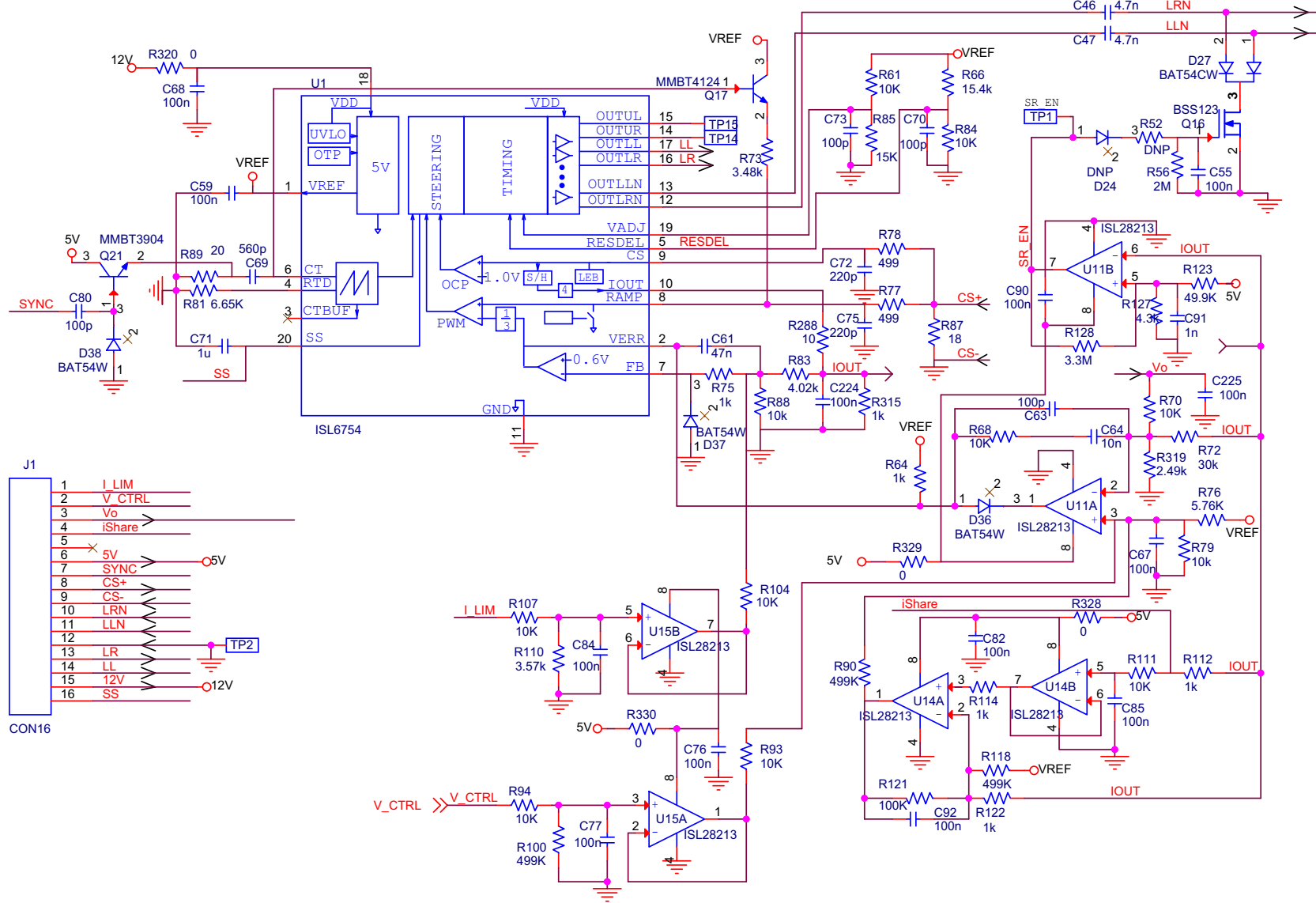


FIGURE 15. ISL6754DBEVAL2Z SCHEMATIC

ISLACDC750W-MBEV1Z Bill of Materials

QTY	REFERENCE DESIGNATOR	TYPE/PACKAGE	VALUE	VOL/TOL/MAT	MANUFACTURER	MANUFACTURER PART NUMBER
2	C31, C39	Cap; TH; -	4.7n	300VAC; 10%; EMI SUPPRES	EPCOS	B32021A3472M
2	C32, C33	Cap; TH; -	2200μ	35V; 10%;	Panasonic	EEU-FC1V222
3	C34, C702, C722	Cap; TH; Radial	1μ	; 20%; EMI, X2-class	EPCOS	B32923C3105M
1	C35	Cap; SM; 2220	100n	630V; 10%; X7R	Murata	GCJ55DR72J104KXJ1L
1	C36	Cap; SM; 2220	100n	630V; 10%; X7R	Murata	GCJ55DR72J104KXJ1L
6	C37, C38, C40, C41, C205, C206	Cap; SM; 1210	2.2μ	100V; 10%; X7R	Murata	GCM32DR72A225KA64L
4	C43, C50, C739, C740	Cap; SM; 0603	220n	25V; 20%; X7R	Murata	GCM188R71H224KA64D
4	C44, C45, C56, C58	Cap; SM; 0805	1μ	50V; 10%; X7R	Murata	CGA4J3X7R1H105K
9	C48, C49, C51, C74, C81, C83, C95, C96, C97	Cap; SM; 0603	100n	50V; 10%; X7R	Murata	GCM188R71H104KA57D
~	C52	Cap; SM; 1210	4.7μ	50V; 10%; X7R	Murata	GCM32ER71H475KA55L
4	C53, C54, C60, C62	Cap; SM; 0603	100p	50V; 5%; C0G	Murata	GCM1885C1H101JA16D
2	C57, C66	Cap; SM; 0603	100p	25V; 20%; X7R	Murata	GCM1885C1H101JA16D
9	C78, C79, C86, C87, C88, C89, C93, C94, C737	Cap; SM; 0603	1n	50V; 10%; X7R	Murata	GCM188R71H102KA37D
2	C102, C227	Cap; SM; 0603	220n	50V; 10%; X7R	Murata	GCM188R71H224KA64D
1	C209	Cap; SM; 0603	10n	25V; 10%; X7R		
4	C220, C221, C222, C223	Cap; SM; 0805	47n	100V; 10%; X7R	Murata	GCM21BR72A473KA37L
2	C701, C717	Cap; TH; Radial	270μ	450V; 20%; ELECT, Aluminum	Panasonic	EETUQ2W271DA
1	C703	Cap; TH; Radial	680n	450V; 20%; Metallized Polyester Film	Panasonic	ECW-F2W684J
2	C705, C706	Cap; TH; Radial	4.7n	Y1; 20%; EMI, Y2-class	TDK	CS11-E2GA4722MYNS
1	C707a	Cap; SM; 0603	DNP	50V; 20%; X7R	TDK	
1	C708	Cap; SM; 0603	220n	25V; 20%; X7R	TDK	
2	C719, C721	Cap; SM; 1812	100n	630V; 10%; X7R	Murata	GRM43DR72J104KW01L
3	C726, C735, C736	Cap; TH; Radial	2.2n	Y1; 20%; EMI, Y2-class	TDK	CS11-E2GA222MYNS
1	C738	Cap; SM; 0603	1μ	10V; 10%; X7R		
1	DB701	Diode; TH; 4-SIP	GBU15K-BP	800V; 15A; Bridge Rectifier	Diodes	
1	DZ701	Zener; SM; SOD323	3.3V	; ; Zener	NXP	BZX384-B3V3
2	D9, D19	Diode; SM; SOT23	BAS 70-05	70V; 70mA; Schottky Dual	Infineon	BAS 70-05 E6327
4	D10, D13, D90, D91	Diode; SM; DPAK	STTH5R06B	600V; 5A; ULT FAST	ST	STTH5R06B-TR
4	D11, D12, D14, D15	Diode; SM; SMC	30BQ100TRPBF	100V; 3A; Schottky	Vishay	VS-30BQ100TRPBF
6	D17, D21, D22, D30, D32, D35	Diode; SM; SOT323	BAS70W	70V; 70mA; Schottky	NXP	
4	D18, D26, D33, D34	Diode; SM; SOT23	PMEG3010ET	30V; 1A; Schottky	NXP	
2	D20, D29	Diode; SM; SOT323	BAT54SW	30V; 200mA; Schottky	Diodes	BAT54SW-7-F
3	D23, D39, D42	Diode; SM; SOT323	BAT54AW	30V; 200mA; Schottky	Diodes	BAT54AW-7-F
2	D98, D99	Diode; SM; SOT323	BAT54W	30V; 200mA; Schottky	Diodes	BAT54W-7-F

ISLACDC750W-MBEV1Z Bill of Materials (Continued)

QTY	REFERENCE DESIGNATOR	TYPE/PACKAGE	VALUE	VOL/TOL/MAT	MANUFACTURER	MANUFACTURER PART NUMBER
1	D701	Diode; TH; DO-201AD	1N5406	800V; 3A; Standard Recovery	MCC	1N5406-TP
1	D702	Diode; SM; TO-220	IDH05S60C	600V; 5A; Schottky	Infineon	
2	D707, D708	Diode; SM; SMA	S1M	1kV; 1A; Standard Recovery	Diodes	S1M-13-F
1	F701	Fuse; TH; 5 x 20 mm	15A	250V; Fast Acting; Ceramic	Bel Fuse	5HF8-R
3	H2, H3, H701	Clamp; -; -	TSC607-ZP	; ; Transistor Clips	LAIRD TECH	
1	J1	Conn; TH; SIP16	CON16	; ; 2.54mm Socket	Wurth	61301611821
2	J4, J703	Conn; TH; SIP9	CON9	; ; 2.54mm Socket	Wurth	61300911821
1	J5	Conn; TH; SIP6	CON6	; ; 2.54mm Socket	Wurth	61300611821
1	J8	Conn; TH; SIP3	CON3	; ; 2.54mm THT Pin	Wurth	TBD
1	J9	Conn; TH; SIP6	CON6	; ; 2.54mm THT Pin	Wurth	61300611821
1	L5	Ind; TH; ETD39	2μ	; ; INDUCTOR POWER	Wurth	750342497
1	L6	Ind; TH; -	0μ	; ; Wire	-	-
2	L7, L11	Ind; TH; e16-6pin	5μ	; 6A; Inductor Power	Wurth	750341155
1	L702	Ind; TH; -	880μ	Core: Magmetics 0077071-A7 HT22; ; AWG16, 85T.	-	Renesas Engineering
2	L703, L704	CMC; TH; -	2.2m	; ; Common Mode Choke	Wurth	7448258022
10	M1, M2, M3, M4, M5, M6, M7, M8, M9, M10	Screw; -; -	MH	; ; M3*8	KeyStone	
6	P1, P2, P3, P4, P701, P702	TP; TH; -	214801	; ; -	ERNI	
1	P705	TP; TH; -	DNP	; ; -	KeyStone	1514-2
2	P706, P707	TP; TH; -	1514-2	; ; -	KeyStone	
4	Q7, Q8, Q12, Q13	Transistor; TH; to-220F	FCP22N60N	600V; 22A; N-Chan	Fairchild	
4	Q9, Q10, Q14, Q15	Transistor; SM; D2PAK	IPB100N10S3-05	100V; 100A; N-Chan	Infineon	
1	Q16	Transistor; SM; SOT23	BSS315P	30V; 1.5A; P-Chan	Infineon	BSS315P H6327
2	Q18, Q19	Transistor; SM; SOT23	BSS123	100V; 170mA; N-Chan	Fairchild	
1	Q20	Transistor; SM; SOT23	MMBT3906	40V; 200mA; PNP	Fairchild	
1	Q22	Transistor; SM; SOT23	DNP	100V; 170mA; N-Chan	Fairchild	
2	Q45, Q46	Transistor; SM; SO-8	SIR440DP	20V; 60A; N-Chan	Vishay	SIR440DP-T1-GE3
1	Q701	Transistor; SM; TO-247	IPW60R125CP	600V; 25A; N-Chan	Infineon	
1	Q703	Transistor; TH; SO-8-EP	FDMS7650DC	650V; ; N-Chan	Fairchild	-
1	RJ703	Res; SM; 0603	0	; ;		
1	RT1	NTC; SM; 0603	NTC	; 1%; Thermistor NTC	Vishay	NTCS0603E3103FMT
1	RV701	Rv; TH; Radial	MOV	; ; Varistors	Panasonic-ECG	ERZV14D391
1	R5	Res; TH; Axial	0.22	1W; 1%; WW	Yageo	KNP100JR-73-0R22
3	R18, R59, R60	Res; SM; 0603	1k	; 1%;		
1	R21	Res; SM; 2512	1	; 1%;		
14	R22, R23, R33, R34, R35, R36, R91, R97, R99, R108, R109, R117, R156, R158	Res; SM; 0603	10k	; 1%;		

ISLACDC750W-MBEV1Z Bill of Materials (Continued)

QTY	REFERENCE DESIGNATOR	TYPE/PACKAGE	VALUE	VOL/TOL/MAT	MANUFACTURER	MANUFACTURER PART NUMBER
4	R24, R26, R27, R29	Res; SM; 2512	10k	; 1%;		
2	R27, R28	Res; TH; Axial	0.11	2W; 1%; WW	Yageo	FKN200JR-73-0R1
4	R28, R30, R38, R39	Res; SM; 0603	1	; 1%;		
4	R41, R46, R286, R287	Res; SM; 0603	10	; 1%;		
2	R42, R53	Res; SM; 0603	2	; 1%;		
7	R43, R44, R50, R57, R74, R284, R285	Res; SM; 0603	499	; 1%;		
2	R45, R58	Res; SM; 0603	887	; 1%;		
2	R47, R54	Res; SM; 0603	1.5k	; 1%;		
4	R48, R49, R51, R55	Res; SM; 0603	2k	; 1%;		
2	R62, R67	Res; SM; 0603	4.99	; 1%;		
2	R63, R69	Res; SM; 0603	2.7k	; 1%;		
2	R80, R92	Res; SM; 0603	30k	; 1%;		
5	R82, R103, R124, R154, R729	Res; SM; 0603	499k	; 1%;		
2	R95, R96	Res; SM; 1206	3.3M	; 1%;		
1	R98	Res; SM; 0603	90.9k	; 1%;		
1	R101	Res; SM; 0603	57.6k	; 1%;		
1	R102	Res; SM; 0603	100k	; 1%;		
2	R105, R731	Res; SM; 0603	DNP	; 1%;		
1	R106	Res; SM; 0603	3.3M	; 1%;		
1	R113	Res; SM; 0603	28k	; 1%;		
1	R115	Res; SM; 0603	64.9k	; 1%;		
1	R116	Res; SM; 0603	20k	; 1%;		
1	R119	Res; SM; 0603	25.5k	; 1%;		
1	R120	Res; SM; 0603	24k	; 1%;		
2	R125, R126	Res; SM; 0603	4.7k	; 1%;		
1	R129	Res; SM; 0603	309	; 1%;		
1	R130	Res; SM; 0603	4.7k DNP	; 1%;		
2	R131, R132	Res; SM; 2512	100	; 1%;		
2	R152, R332	Res; SM; 0603	49.9k	; 1%;		
1	R153	Res; SM; 0603	0	; ;		
1	R155	Res; SM; 0603	30k	; 1%;		
1	R157	Res; SM; 0603	10k	; 1%;		
3	R321, R330, R331	Res; SM; 0603	0	; ;		
5	R323, R324, R325, R326, R327	Res; SM; 0603	0	; ;		
1	R333	Res; SM; 0603	4.3k	; 1%;		
2	R701, R703	Res; SM; 1206	2M	; 5%;		
1	R702	Res; SM; 0603	10	; 1%;		

ISLACDC750W-MBEV1Z Bill of Materials (Continued)

QTY	REFERENCE DESIGNATOR	TYPE/PACKAGE	VALUE	VOL/TOL/MAT	MANUFACTURER	MANUFACTURER PART NUMBER
1	R704	Res; SM; 0603	51k	; 1%;		
2	R706, R710	Res; SM; 1206	3.3M	; 1%;		
1	R707	Res; SM; 0603	10k	; 1%;		
2	R708, R711	Res; SM; 1206	470k	; 1%;		
1	R730	Res; SM; 0603	1M	; 1%;		
1	T2	Transformer; SM; -	CST	; ; Current Sense	Pulse	FIS115NL
1	T3	Transformer; TH; ER42	750342506	; ; Transformer-ER42	Würth	-
2	T4, T5	Transformer; SM; -	DRT	; ; Driver Transformer	Würth	750342438
	(Second source)				Pulse	PA2007NL
3	U6, U7, U9	IC; SM; SO-8-EP	ISL89164FBEBZ	; ; Driver	Renesas	ISL89164FBEBZ
1	U8	IC; SM; SO-16	ADuM2210TRWZ	; ; ISOLAT DGTl 5KVRMS 2CH 16SOIC-W	Analog Devices Inc	
1	U10	IC; SM; SSOP4	PS2801-1 DNP	2.5KV; ; Optoisolator	CEL	
3	U12, U24, U41	IC; SM; MSOP8	ISL28213	; ; OpAmp	Renesas	ISL28213FUZ
1	U40	IC; SM; TSSOP16	ISL6144	; ; ORing Controller	Renesas	ISL6144IVZA
1	_PCB	PCB; -; Rev. B2	ISL6731AEVAL2Z	; 1.6mm; FR-4		

ISL6721-DB-1Z Bill of Materials

QTY	REFERENCE DESIGNATOR	TYPE/PACKAGE	VALUE	VOL/TOL/MAT	MANUFACTURER	MANUFACTURER PART NUMBER
9	C8, C11, C12, C15, C16, C17, C19, C20, C0	Cap; SM; 0603	100n	25V; 20%; X7R		
1	C1	Cap; TH; -	470μ	35V; 20%;	Panasonic -ECG	EEU-FR1V471L
1	C2	Cap; TH; -	470μ	10V; 20%;	Panasonic -ECG	EEU-EB1A471BJ
1	C5	Cap; SM; 1206	100n	50V; 10%; X7R		
1	C6	Cap; SM; 1206	100n	16V; 10%; X7R		
1	C7	Cap; SM; 1206	470p	100V; 10%; X7R		
1	C13	Cap; TH; -	100μ	25V; 20%;	United Chemi-con	EKZE250ELL101MF11D
1	C18	Cap; SM; 0603	47n	16V; 10%; X7R		
1	C21	Cap; TH; -	470n	450V; ;	Panasonic -ECG	ECQ-E2W474KH
1	C22	Cap; SM; 1206	470p	630; 20%; X7R	TDK	C3216C0G2J471J
4	C23, C24, C25, C28	Cap; SM; 0603	1n	25V; 20%; X7R		
2	C26, C34	Cap; SM; 0603	1μ	25V; 10%; X7R		
1	C27	Cap; SM; 0603	100p	25V; 20%; X7R		
1	C29	Cap; SM; 0603	680p	25V; 10%; C0G		
3	C30, C31, C32	Cap; SM; 0603	100n	25V; 10%; X7R		
1	C33	Cap; SM; 0603	2.2n	25V; 20%; X7R		
1	D1	Diode; SM; SMA	S1M	; ;	Diodes	S1M-13-F
2	D2, D6	Diode; SM; SOD-323	1N4148WS	; ; Switch	FairChild	

ISL6721-DB-1Z Bill of Materials (Continued)

QTY	REFERENCE DESIGNATOR	TYPE/PACKAGE	VALUE	VOL/TOL/MAT	MANUFACTURER	MANUFACTURER PART NUMBER
1	D3	Diode; SM; SOD-123	13V	-, 500mW; Zener	Diodes	BZT52C13-7-F
2	D4, D7	Diode; TH; TO-220AB	MBR20100CT	100V; 20A; Schottky	ON-Semi	
1	D5	Diode; SM; SMA	SS1H10	100V; 1A;	Vishay	SS1H10-E3/61T
1	D12	Diode; SM; SOD-123	15V	; ; Zener	Diodes	
1	D13	Diode; SM; SOD-123	5.1V	; 500mW; Zener	Diodes	BZT52C5V1-7-F
1	D15	Diode; SM; SOT-23	13V	13V; 0.35W; Zener	Diodes	BZX84C13-7-F
1	J1	Conn; TH; SIP9	CON9	; ;		
1	J2	Conn; TH; SIP6	CON6	; ;		
2	L1, L2	Wire; SM; -	0μ	; ;		
1	Q1	Transistor; SM; DPAK	FQD1N60C	600V; 1A; N-Chan	Fairchild	-
1	Q2	Transistor; TH; TO-220AB	IPP65R380E	650V; 10.6A; N-Chan	Infineon	
1	Q3	Transistor; SM; SOT-223	PZT651T1G	60V; 2A; NPN	ON Semi	
3	Q4, Q6, Q8	Transistor; SM; SOT-23	BSS315P	30V; 1.5A; P-Chan	Infineon	
5	Q5, Q7, Q9, Q13, Q15	Transistor; SM; SOT-23	BSS138	100V; 170mA; N-Chan	Fairchild	
1	Q10	Transistor; SM; SOT-23	MMBT3904	40V; 200mA; NPN	Fairchild	
1	R1	Res; TH; Axial 0.5	10k	; 5%; 1W		
2	R3, R4	Res; SM; 1206	15	; 5%;		
1	R6	Res; SM; 0603	2.15k	; 1%;		
9	R9, R27, R30, R37, R43, R45, R52, R55, R62	Res; SM; 0603	10k	; 1%;		
1	R12	Res; SM; 0603	5.1k	; 5%;		
2	R16, R36	Res; SM; 0603	20k	; 1%;		
2	R18, R19	Res; SM; 1206	3.3M	; 1%;		
1	R20	Res; SM; 1206	120k	; 1%;		
2	R21, R22	Res; SM; 1206	412k	; 5%;		
2	R23, R24	Res; SM; 1206	120k	; 5%;		
1	R25	Res; SM; 0603	4.99k	; 1%;		
1	R26	Res; SM; 0603	1k	; ;		
1	R33	Res; SM; 0603	5.1k	; 1%;		
1	R34	Res; SM; 0603	1M	; 1%;		
2	R35, R42	Res; SM; 0603	100k	; 1%;		
1	R38	Res; SM; 0603	100	; 5%;		
4	R7, R39, R40, R41	Res; SM; 1206	1	; 1%;		
1	R44	Res; SM; 0603	47k	; 1%;		
1	R46	Res; SM; 0603	33k	; 1%;		
4	R47, R50, R60, R61	Res; SM; 0603	0			
3	R48, R51, R58	Res; SM; 0603	10	; 5%;		
1	R49	Res; SM; 0603	2k	; 1%;		
1	T1	Transformer; TH; EE20	750342443	; ; EE20	Wurth	-

ISL6721-DB-1Z Bill of Materials (Continued)

QTY	REFERENCE DESIGNATOR	TYPE/PACKAGE	VALUE	VOL/TOL/MAT	MANUFACTURER	MANUFACTURER PART NUMBER
1	U1	Chip; SM; TSSOP16	ISL6721	; ; PWM Control	Renesas	ISL6721AV
3	U2, U4, U5	Chip; SM; SSOP4	PS2801-1	2.5KV; ; Optoisolator	CEL	
1	U3	Res; SM; SOT-23	LM431BIM3	; ; Shunt Regulator	National	LM431BIM3X
0	C3, C4, C9, C14; D8, D9, D10, D11, D14; R5, R8, R13, R17, R59, R53; Q11, Q12, Q16		DNP			

ISL6731x-DB-1Z Bill of Materials

QTY	REFERENCE DESIGNATOR	TYPE/PACKAGE	VALUE	VOL/TOL/MAT	MANUFACTURER	MANUFACTURER PART NUMBER
2	C4, C42	Cap; SM; 0603	10n	16V; ;	TDK	
2	C7, C18	Cap; SM; 0603	1μ	10V; ;	TDK	
1	C9	Cap; SM; 0603	1μ	25V; ;	TDK	
1	C10	Cap; SM; 0603	6.8n	10V; ;	TDK	
1	C13	Cap; SM; 0603	47p	16V; ;	TDK	
1	C14	Cap; SM; 0603	470n	16V; ;	TDK	
1	C15	Cap; SM; 0603	150n	10V; ;	TDK	
1	C16	Cap; SM; 0603	100n	10V; ;	TDK	
1	C20	Cap; SM; 0603	47n	10V; ;	TDK	
6	C11, C24, C25, C38, C40, C41	Cap; SM; 0603	1n	16V; ;	TDK	
1	C39	Cap; SM; 0603	33n	16V; ;	TDK	
1	C43	Cap; SM; 0603	100n	16V; ;	TDK	
1	D9	Diode; SM; SOT23	BAS 70-05	70V; 70mA; Schottky Dual	Infineon	BAS 70-05 E6327
1	J1	; TH; SIP8	CON8	; ;		
6	Q4, Q5, Q6, Q7, Q8, Q9	MOS; SM; SOT563	DMG1026UV-7	60V; 400mA; N-Chan, Dual	Diodes	
4	R6, R8, R10, R11	Res; SM; 1206	0	; 1%;		
1	R9	Res; SM; 0603	3k	; 1%;		
1	R13	Res; SM; 0603	6.2k	; 1%;		
8	R14, R47, R49, R54, R56, R65, R71, R74	Res; SM; 0603	10k	; 1%;		
1	R15	Res; SM; 0603	390k	; 1%;		
4	R17, R22, R31, R62	Res; SM; 0603	0	; 1%;		
1	R18	Res; SM; 0603	62k	; 1%;		
1	R19	Res; SM; 0603	42.2k	; 1%;		
1	R20	Res; SM; 0603	1.47k	; 1%;		
1	R23	Res; SM; 0603	150k	; 1%;		
1	R24	Res; SM; 0603	30k	; 1%;		
1	R30	Res; SM; 0603	59k	; 1%;		
2	R45, R46	Res; SM; 0603	20k	; 1%;		
1	R48	Res; SM; 0603	2.2k	; 1%;		

ISL6731x-DB-1Z Bill of Materials (Continued)

QTY	REFERENCE DESIGNATOR	TYPE/PACKAGE	VALUE	VOL/TOL/MAT	MANUFACTURER	MANUFACTURER PART NUMBER
1	R52	Res; SM; 0603	3.9k	; 1%;		
2	R53, R55	Res; SM; 0603	53.6k	; 1%;		
1	R57	Res; SM; 0603	7.87k	; 1%;		
1	R58	Res; SM; 0603	5.36k	; 1%;		
1	R59	Res; SM; 0603	97.6k	; 1%;		
1	R60	Res; SM; 0603	133k	; 1%;		
2	R67, R69	Res; SM; 0603	1M	; 1%;		
1	R70	Res; SM; 0603	28k	; 1%;		
1	R72	Res; SM; 0603	360k	; 1%;		
1	R73	Res; SM; 0603	3.3M	; 1%;		
1	U1	IC; SM; SOIC14	ISL6731	; ; CCM PFC	Renesas	ISL6731AFBZ or ISL6731BFBZ
1	U2	IC; SM; MSOP14	ISL28413	Quad; ; 2M RRIO OpAmp	Renesas	ISL28413FVZ
1	U3	IC; SM; MSOP8	ISL28213	; ; OpAmp	Renesas	ISL28213FUZ
0	R29, R36, R63, R64, R66, R68; C23, C37, C44; D1, D2		DNP			

ISL6754DBEVAL21Z Bill of Materials

QTY	REFERENCE DESIGNATOR	TYPE/PACKAGE	VALUE	VOL/TOL/MAT	MANUFACTURER	MANUFACTURER PART NUMBER
2	C46, C47	Cap; SM; 0603	4.7n	50V; 10%; X7R	Generic	
13	C55, C59, C67, C68, C76, C77, C82, C84, C85, C90, C92, C224, C225	Cap; SM; 0603	100n	50V; 10%; X7R	Generic	
1	C61	Cap; SM; 0603	47n	50V; 10%; X7R	Generic	
4	C63, C70, C73, C80	Cap; SM; 0603	100p	50V; 5%; COG	Generic	
1	C64	Cap; SM; 0603	10n	50V; 10%; X7R	Generic	
1	C69	Cap; SM; 0603	560p	50V; 5%; COG	Generic	
1	C71	Cap; SM; 0805	1μ	50V; 10%; X7R	Generic	
1	C72	Cap; SM; 0603	220p	50V; 5%; COG	Generic	
1	C75	Cap; SM; 0603	1n *	50V; 5%; COG	Generic	
1	C91	Cap; SM; 0603	1n	50V; 10%; X7R	Generic	
1	D27	Diode; SM; SOT323	BAT54CW	30V; 200mA; Schottky	Diode	BAT54CW-7-F
3	D36, D37, D38	Diode; SM; SOT323	BAT54W	30V; 200mA; Schottky	Diode	BAT54W-7-F
1	J1	Conn; TH; SIP16	CON16	; ;	Würth	
1	Q16	MOS; SM; SOT23	BSS123	100V; 150mA; MOSFET N-CH	NXP	
1	Q17	Transistor; SM; SOT23	MMBT4124	25V; 300mA; TRANS NPN	Diodes Inc	MMBT4124-7-F
1	Q21	Transistor; SM; SOT23	MMBT3904	45V; 200mA; TRANS NPN	Diodes Inc	MMBT3904-7-F

ISL6754DBEVAL21Z Bill of Materials (Continued)

QTY	REFERENCE DESIGNATOR	TYPE/PACKAGE	VALUE	VOL/TOL/MAT	MANUFACTURER	MANUFACTURER PART NUMBER
7	R52, R64, R75, R112, R114, R122, R315	Res; SM; 0603	1k	; 1%;	Generic	
1	R56	Res; SM; 0603	2M	; 1%;	Generic	
11	R61, R68, R70, R79, R84, R88, R93, R94, R104, R107, R111	Res; SM; 0603	10k	; 1%;	Generic	
1	R66	Res; SM; 0603	15.4k	; 1%;	Generic	
1	R72	Res; SM; 0603	30k	; 1%;	Generic	
1	R73	Res; SM; 0603	3.48k	; 1%;	Generic	
1	R76	Res; SM; 0603	5.76k	; 1%;	Generic	
2	R77, R78	Res; SM; 0603	499	; 1%;	Generic	
1	R81	Res; SM; 0603	6.65k	; 1%;	Generic	
1	R83	Res; SM; 0603	4.02k	; 1%;	Generic	
1	R85	Res; SM; 0603	15k	; 1%;	Generic	
1	R87	Res; SM; 0603	18	; 1%;	Generic	
1	R89	Res; SM; 0603	20	; 1%;	Generic	
3	R90, R100, R118	Res; SM; 0603	499k	; 1%;	Generic	
1	R110	Res; SM; 0603	3.57k	; 1%;	Generic	
1	R121	Res; SM; 0603	100k	; 1%;	Generic	
1	R123	Res; SM; 0603	49.9k	; 1%;	Generic	
1	R127	Res; SM; 0603	4.3k	; 1%;	Generic	
1	R128	Res; SM; 0603	3.3M	; 1%;	Generic	
1	R288	Res; SM; 0603	10	; 1%;	Generic	
1	R319	Res; SM; 0603	2.49k	; 1%;	Generic	
4	R320, R328, R329, R330	Res; SM; 0603	0	; 1%;	Generic	
1	U1	Chip; SM; SSOP20	ISL6754	; ; PWM control	Renesas	ISL6754AAZA
3	U11, U14, U15	Chip; SM; MSOP8	ISL28213	; ; Amplifier	Renesas	ISL28213FUZ
0	D24; TP1, TP2; R86		DNP			

FIGURE 18. ISL6721-DB-1Z ASSEMBLY

Assembly Drawings (Continued)

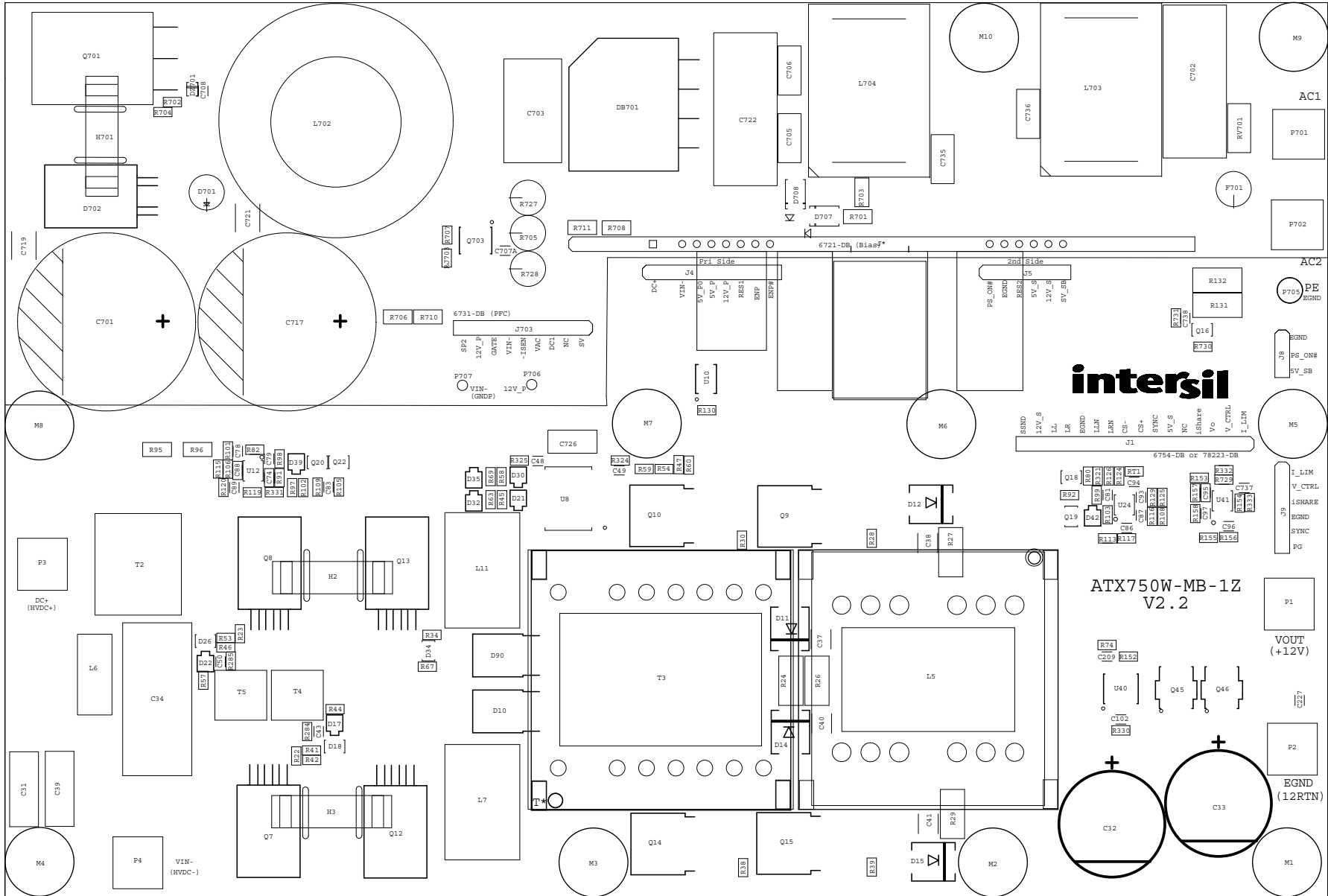


FIGURE 19. ISLACDC750W-MBEV1Z ASSEMBLY TOP

Assembly Drawings (Continued)

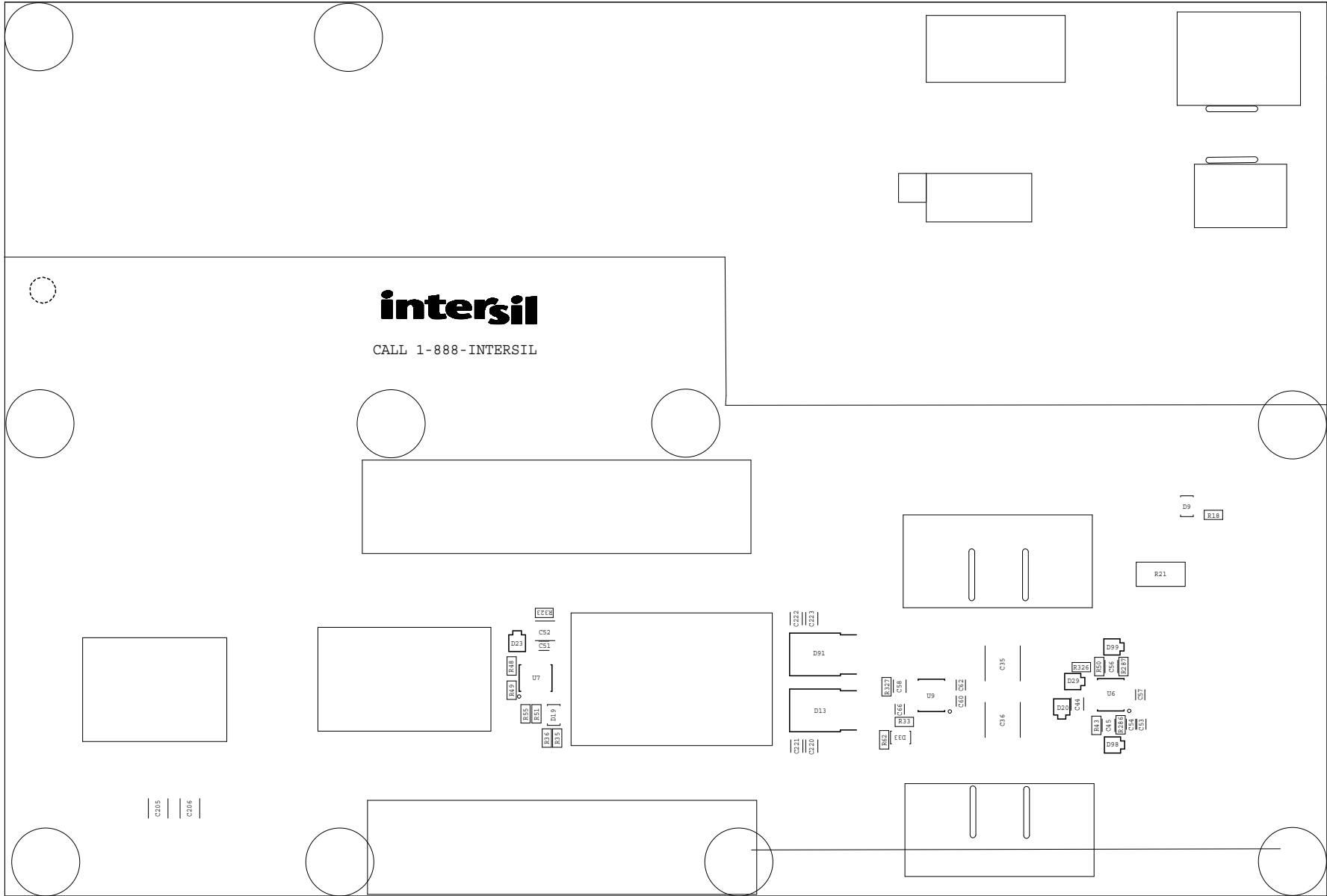


FIGURE 20. ISLACDC750W-MBEV1Z ASSEMBLY BOTTOM

PCB Layout

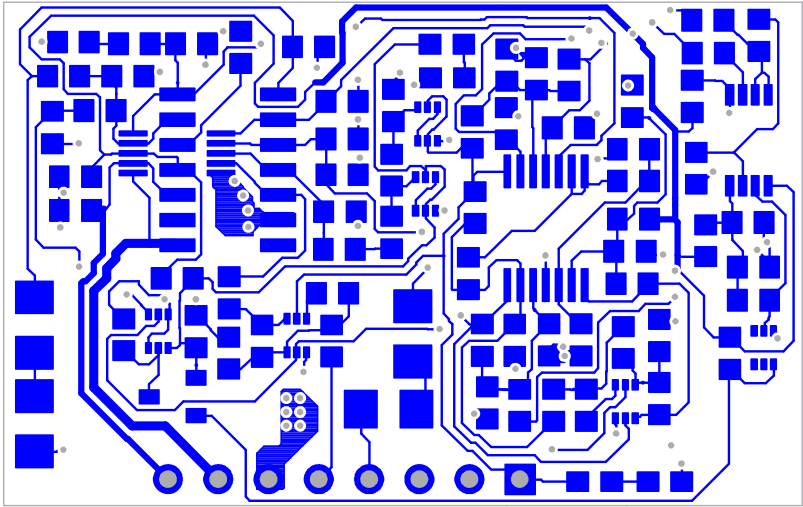


FIGURE 21. ISL6731X-DB-1Z TOP LAYER

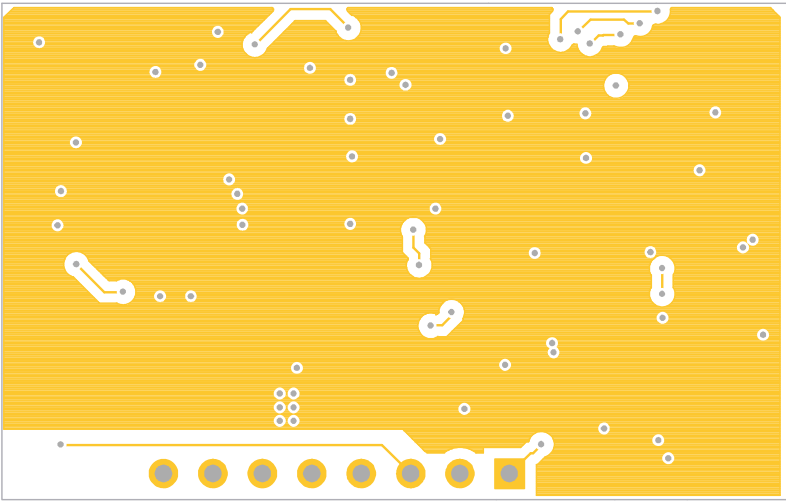


FIGURE 21A. ISL6731X-DB-1Z BOTTOM LAYER

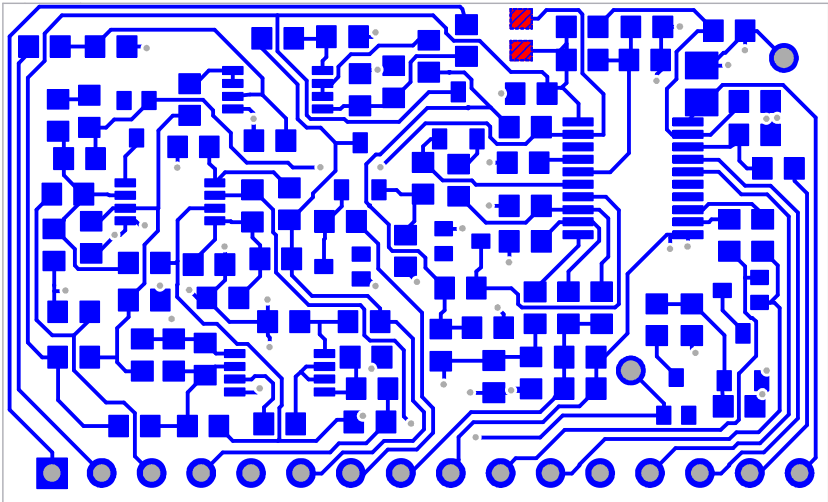


FIGURE 22. ISL6754DBEVAL2Z TOP LAYER

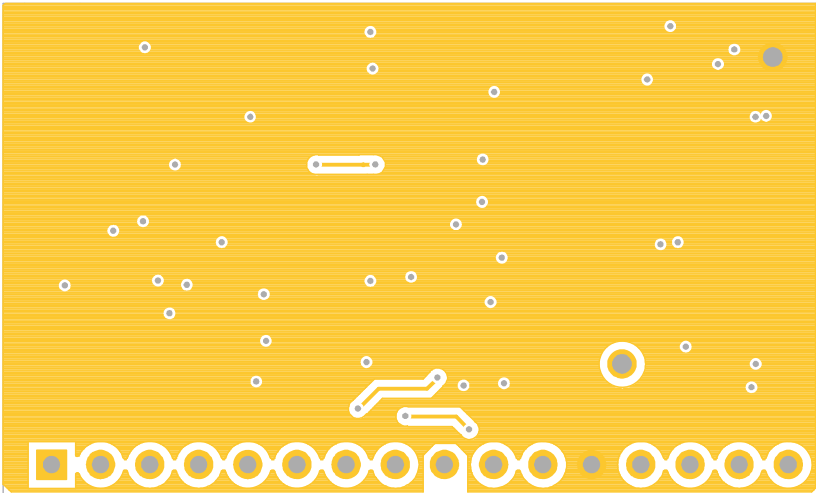


FIGURE 22A. ISL6754DBEVAL2Z BOTTOM LAYER

PCB Layout (Continued)

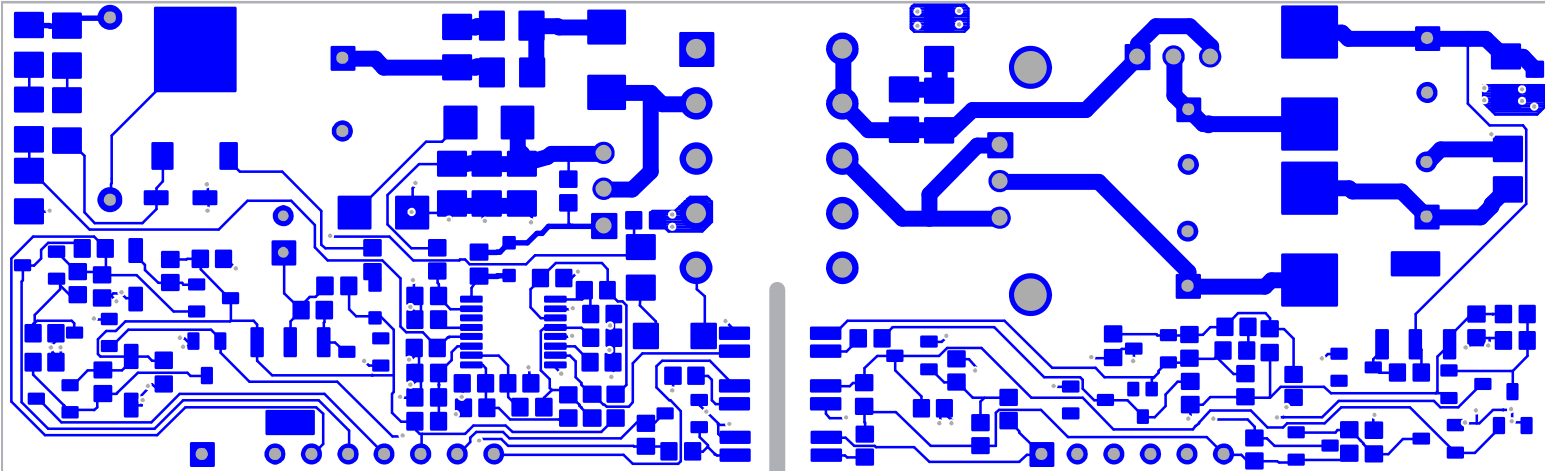


FIGURE 23. ISL6721-DB-1Z TOP LAYER

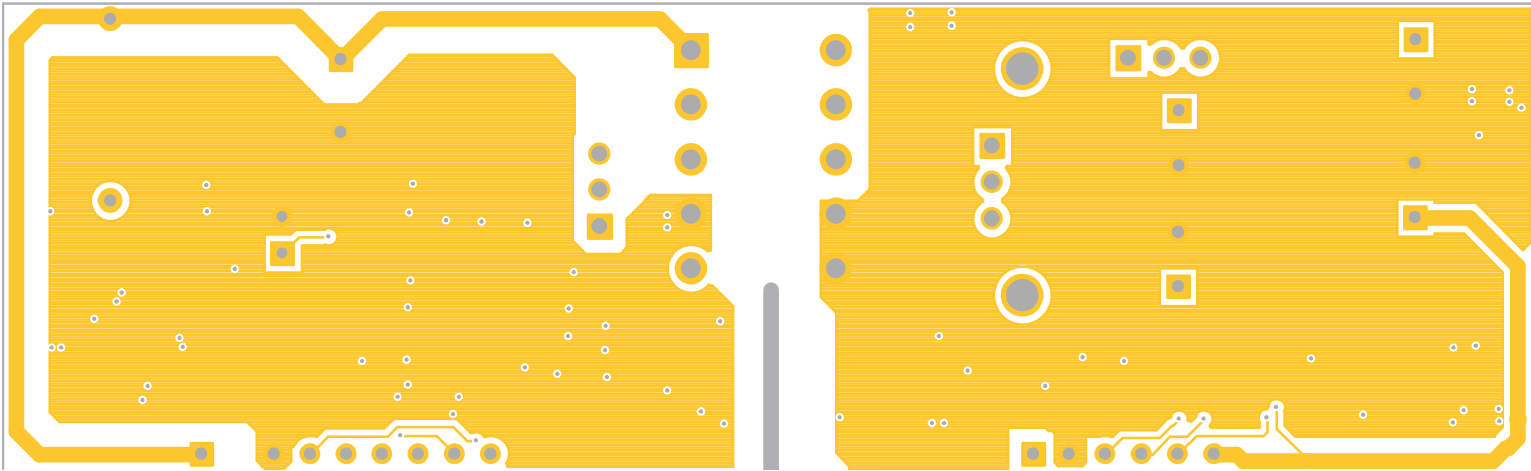


FIGURE 24. ISL6721-DB-1Z BOTTOM LAYER

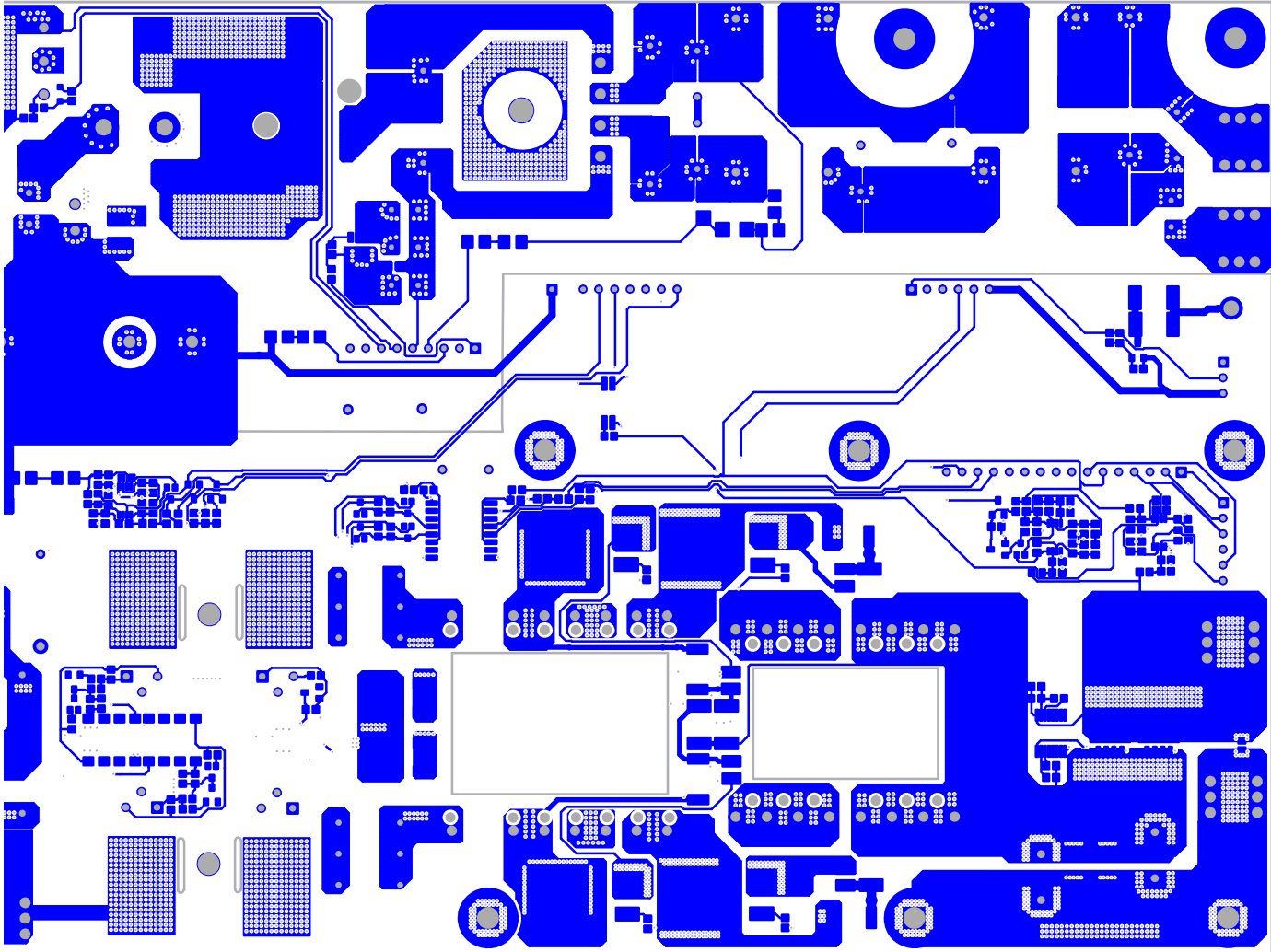
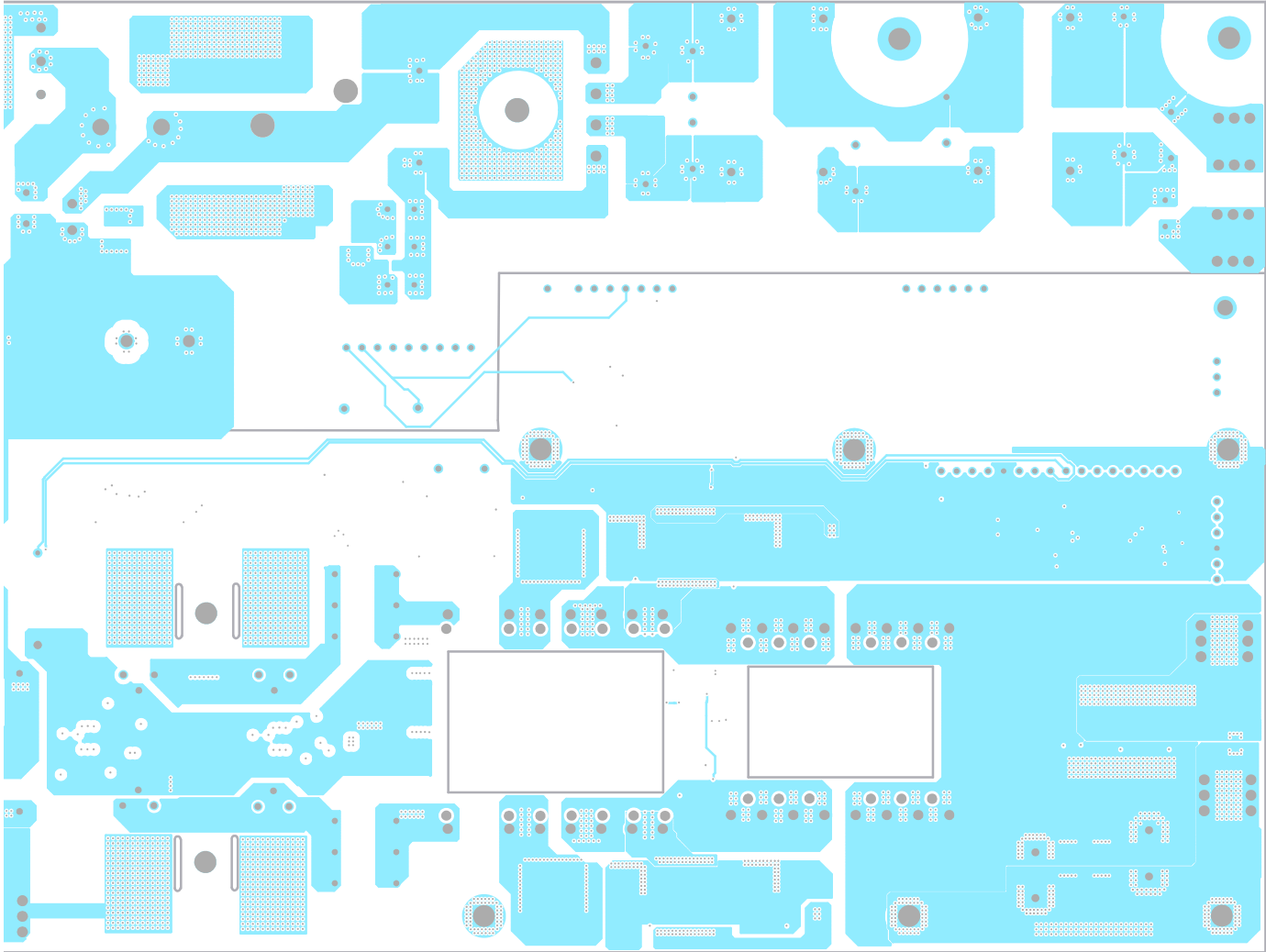
PCB Layout (Continued)

FIGURE 25. ISLACDC750W-MBEV1Z LAYER 1 (TOP)

PCB Layout (Continued)**FIGURE 26. ISLACDC750W-MBEV1Z LAYER 2**

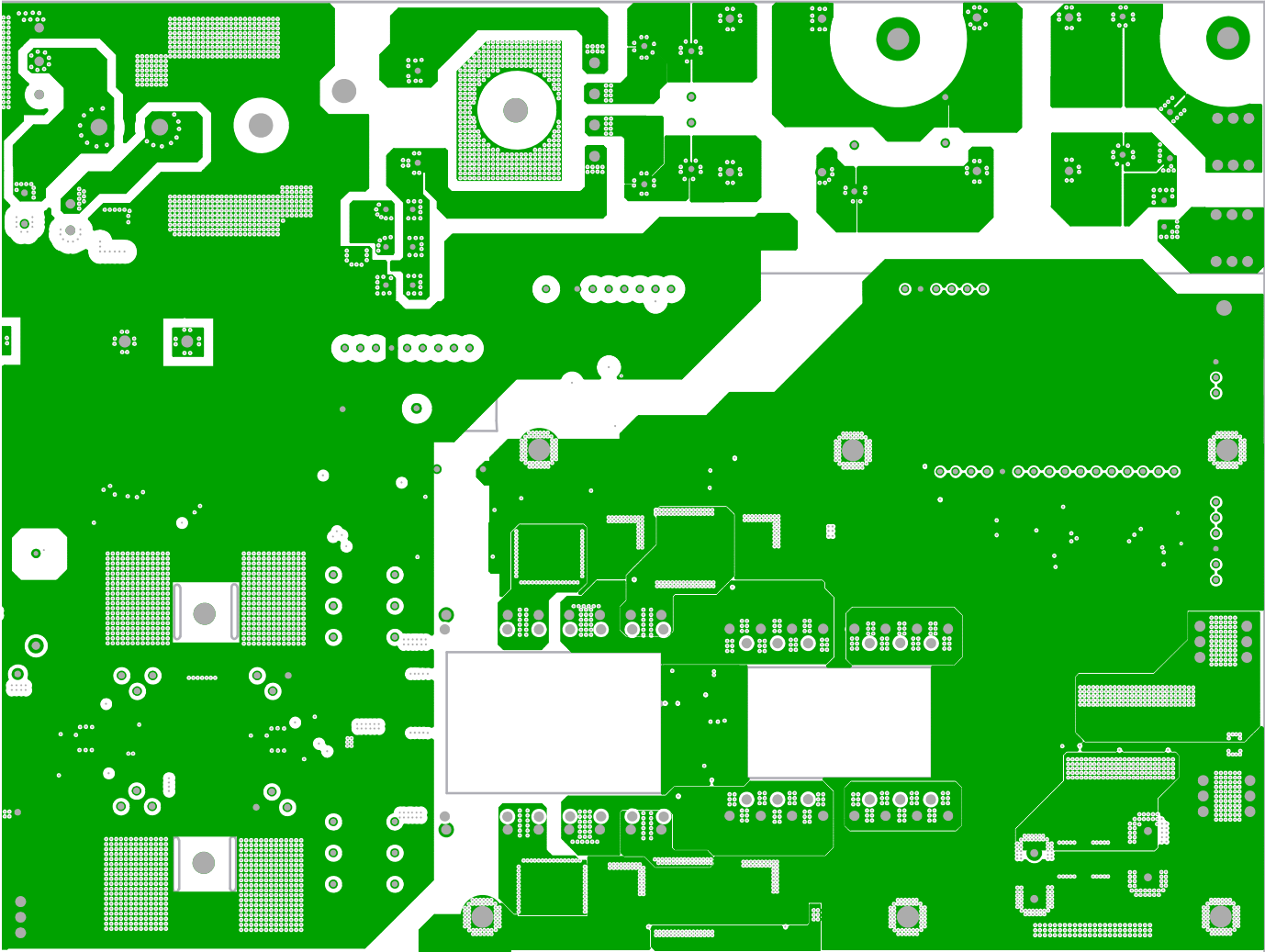
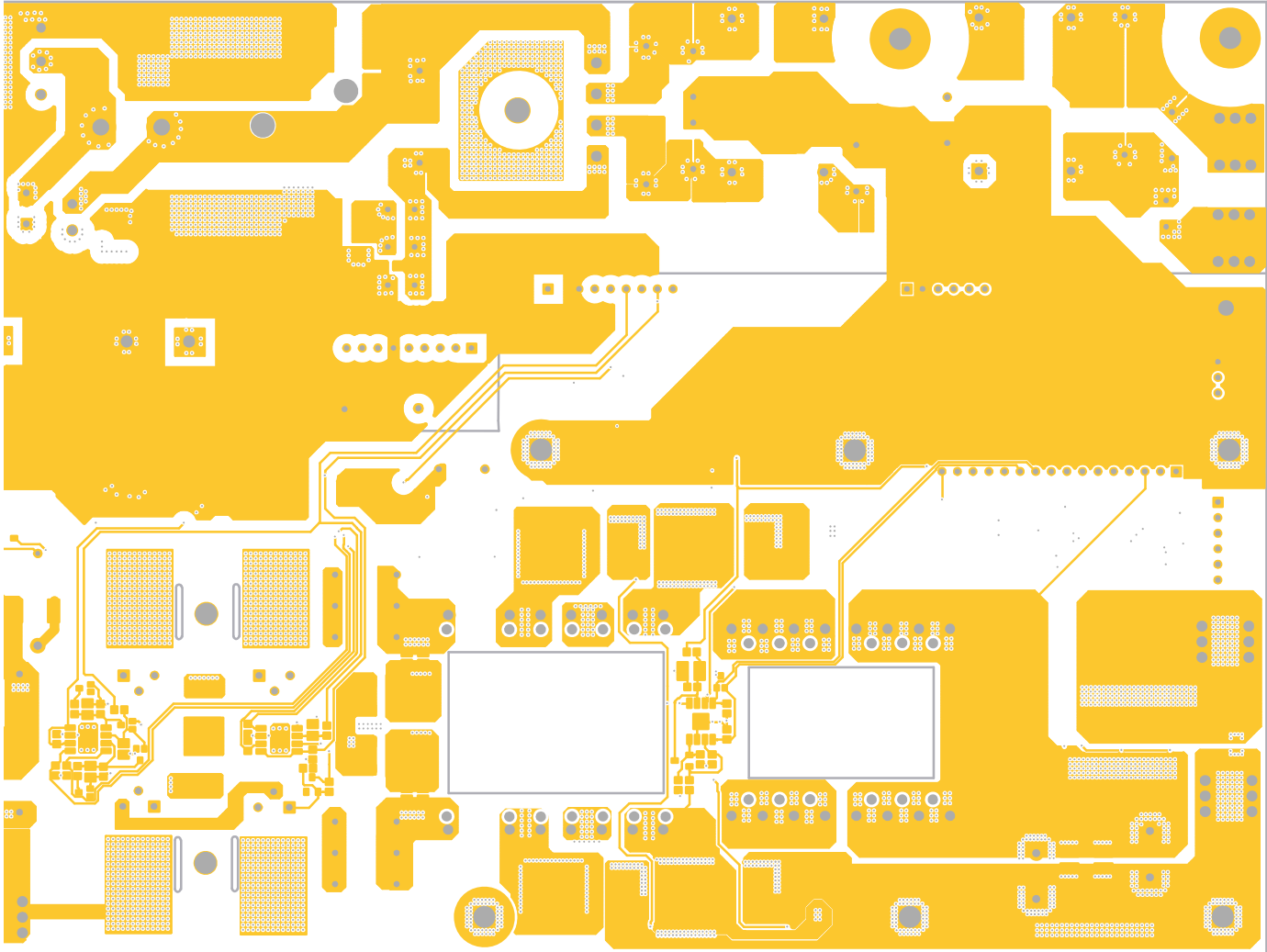
PCB Layout (Continued)

FIGURE 27. ISLACDC750W-MBEV1Z LAYER 3

PCB Layout (Continued)**FIGURE 28. ISLACDC750W-MBEV1Z LAYER 4 (BOTTOM)**

Revision History

The revision history provided is for informational purposes only and is believed to be accurate, but not warranted. Please visit our website to make sure you have the latest revision.

DATE	REVISION	CHANGE
Apr 30, 2018	UG043.1	-Changed document subtitle from "Demonstration Board 3-Phase Module with HIP2103/4 Drivers" to "Boost PFC and Asymmetrical Full-Bridge ZVS Converter" on page 1. -Added Renesas disclaimer.

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.
 2. Renesas Electronics hereby expressly disclaims any warranties against liability for infringement or any other claims involving patents, copyrights, or other intellectual property rights of third parties, by or arising from the use of Renesas Electronics products or technical information described in this document, including but not limited to, the product data, drawings, charts, programs, algorithms, and application examples.
 3. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
 4. You shall not alter, modify, copy, or reverse engineer any Renesas Electronics product, whether in whole or in part. Renesas Electronics disclaims any and all liability for any losses or damages incurred by you or third parties arising from such alteration, modification, copying or reverse engineering.
 5. Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The intended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below.

"Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; industrial robots; etc.

"High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control (traffic lights); large-scale communication equipment; key financial terminal systems; safety control equipment; etc.

Unless expressly designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not intended or authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems; surgical implantations; etc.), or may cause serious property damage (space system; undersea repeaters; nuclear power control systems; aircraft control systems; key plant systems; military equipment; etc.). Renesas Electronics disclaims any and all liability for any damages or losses incurred by you or any third parties arising from the use of any Renesas Electronics product that is inconsistent with any Renesas Electronics data sheet, user's manual or other Renesas Electronics document.
 6. When using Renesas Electronics products, refer to the latest product information (data sheets, user's manuals, application notes, "General Notes for Handling and Using Semiconductor Devices" in the reliability handbook, etc.), and ensure that usage conditions are within the ranges specified by Renesas Electronics with respect to maximum ratings, operating power supply voltage range, heat dissipation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions, failure or accident arising out of the use of Renesas Electronics products outside of such specified ranges.
 7. Although Renesas Electronics endeavors to improve the quality and reliability of Renesas Electronics products, semiconductor products have specific characteristics, such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Unless designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not subject to radiation resistance design. You are responsible for implementing safety measures to guard against the possibility of bodily injury, injury or damage caused by fire, and/or danger to the public in the event of a failure or malfunction of Renesas Electronics products, such as safety design for hardware and software, including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult and impractical, you are responsible for evaluating the safety of the final products or systems manufactured by you.
 8. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. You are responsible for carefully and sufficiently investigating applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive, and using Renesas Electronics products in compliance with all these applicable laws and regulations. Renesas Electronics disclaims any and all liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
 9. Renesas Electronics products and technologies shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You shall comply with any applicable export control laws and regulations promulgated and administered by the governments of any countries asserting jurisdiction over the parties or transactions.
 10. It is the responsibility of the buyer or distributor of Renesas Electronics products, or any other party who distributes, disposes of, or otherwise sells or transfers the product to a third party, to notify such third party in advance of the contents and conditions set forth in this document.
 11. This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
 12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products.
- (Note 1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.
- (Note 2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

(Rev.4.0-1 November 2017)



SALES OFFICES

Renesas Electronics Corporation

<http://www.renesas.com>

Refer to "<http://www.renesas.com/>" for the latest and detailed information.

Renesas Electronics America Inc.

1001 Murphy Ranch Road, Milpitas, CA 95035, U.S.A.
Tel: +1-408-432-8888, Fax: +1-408-434-5351

Renesas Electronics Canada Limited

9251 Yonge Street, Suite 8309 Richmond Hill, Ontario Canada L4C 9T3
Tel: +1-905-237-2004

Renesas Electronics Europe Limited

Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
Tel: +44-1628-651-700, Fax: +44-1628-651-804

Renesas Electronics Europe GmbH

Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.

Room 1709 Quantum Plaza, No.27 ZhichunLu, Haidian District, Beijing, 100191 P. R. China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.

Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, 200333 P. R. China
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited

Unit 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852 2886-9022

Renesas Electronics Taiwan Co., Ltd.

13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.

80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre, Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.

Unit 1207, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics India Pvt. Ltd.

No.777C, 100 Feet Road, HAL 2nd Stage, Indiranagar, Bangalore 560 038, India
Tel: +91-80-67208700, Fax: +91-80-67208777

Renesas Electronics Korea Co., Ltd.

17F, KAMCO Yangjae Tower, 262, Gangnam-daero, Gangnam-gu, Seoul, 06265 Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5338