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

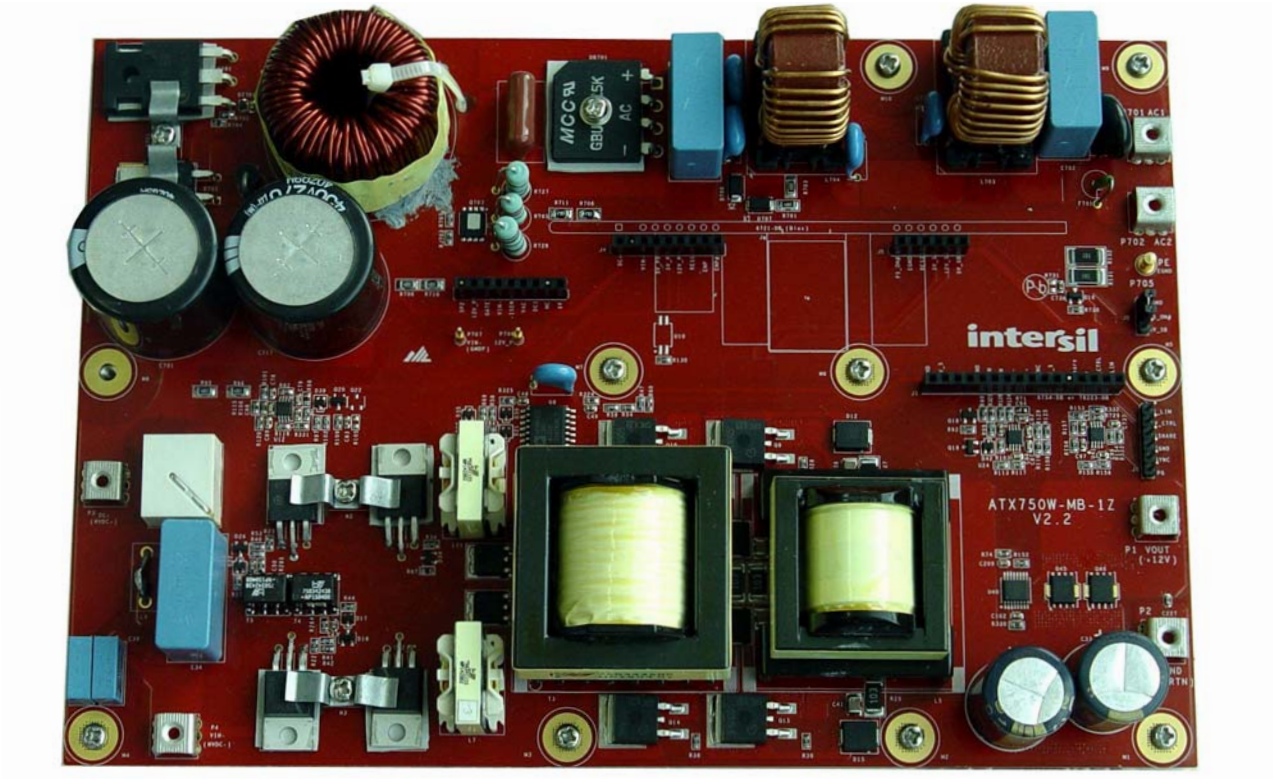

FIGURE 1. MOTHERBOARD ISLACDC750W-MBEV1Z

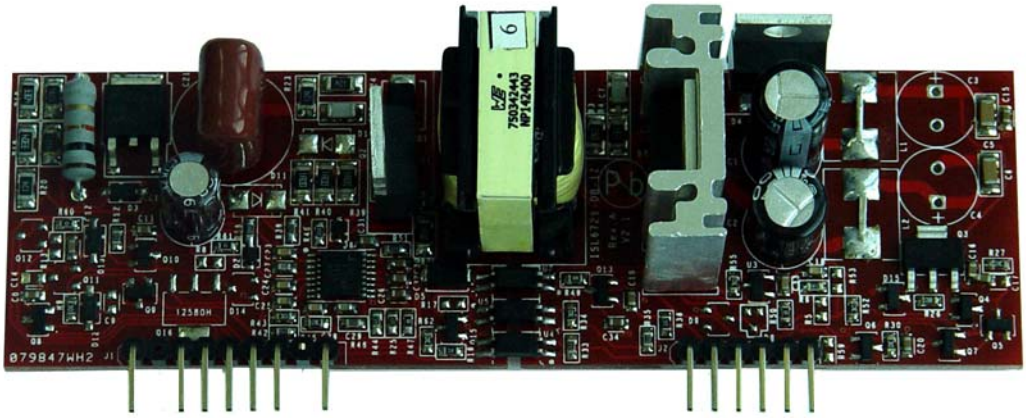

FIGURE 2A. ISL6721-DB-1Z

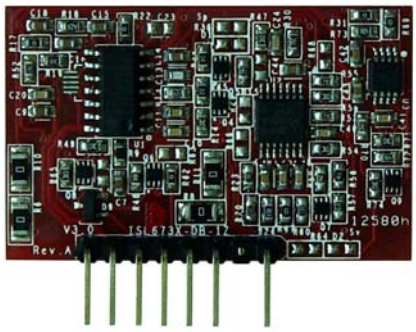

FIGURE 2B. ISL6731x-DB-1Z

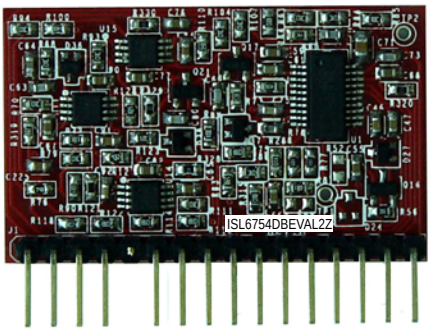

FIGURE 2C. ISL6754DBEVAL2Z

FIGURE 2. DAUGHTER BOARDS

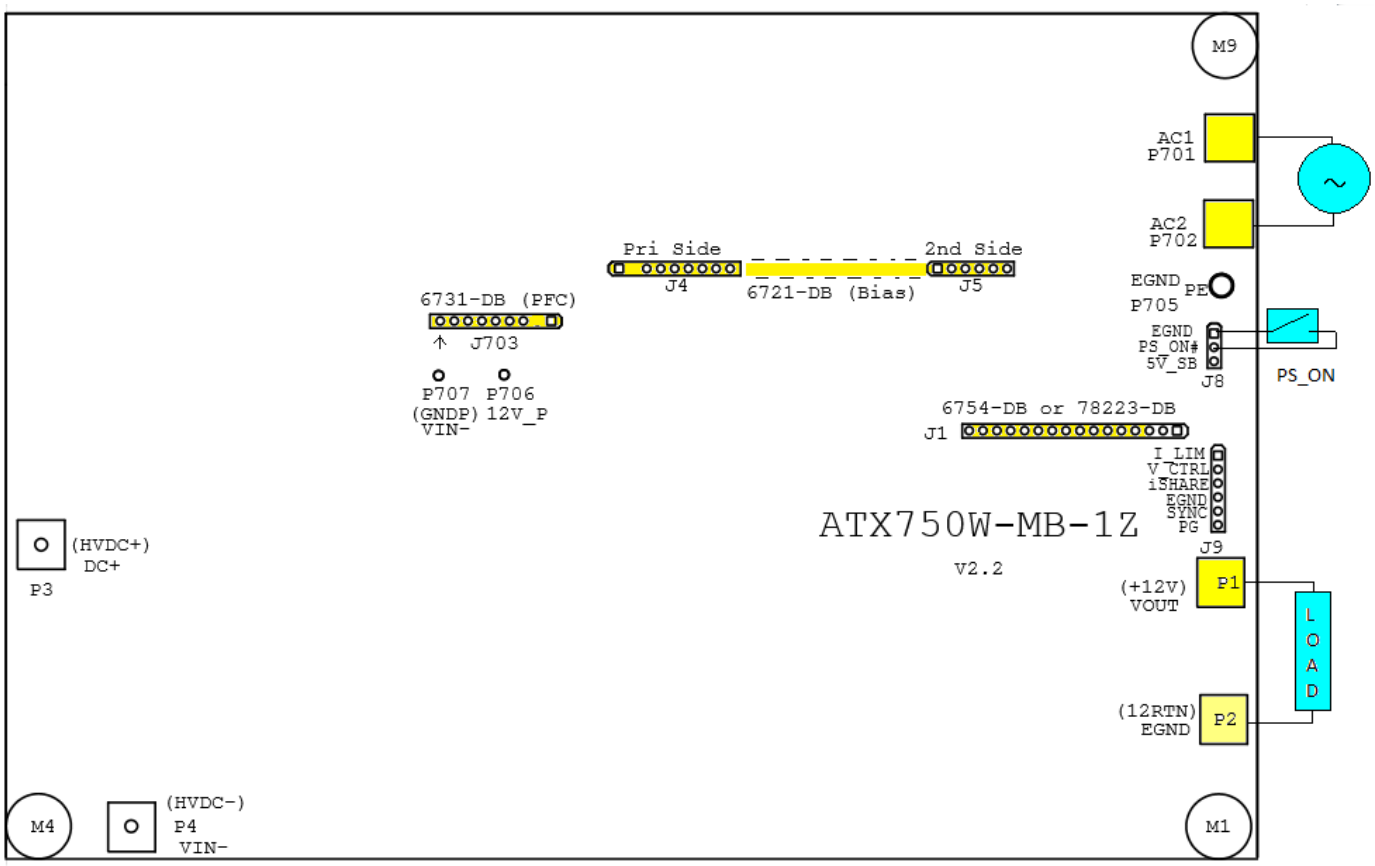

FIGURE 3. ASSEMBLY OF ISLACDC750WEVKIT1Z

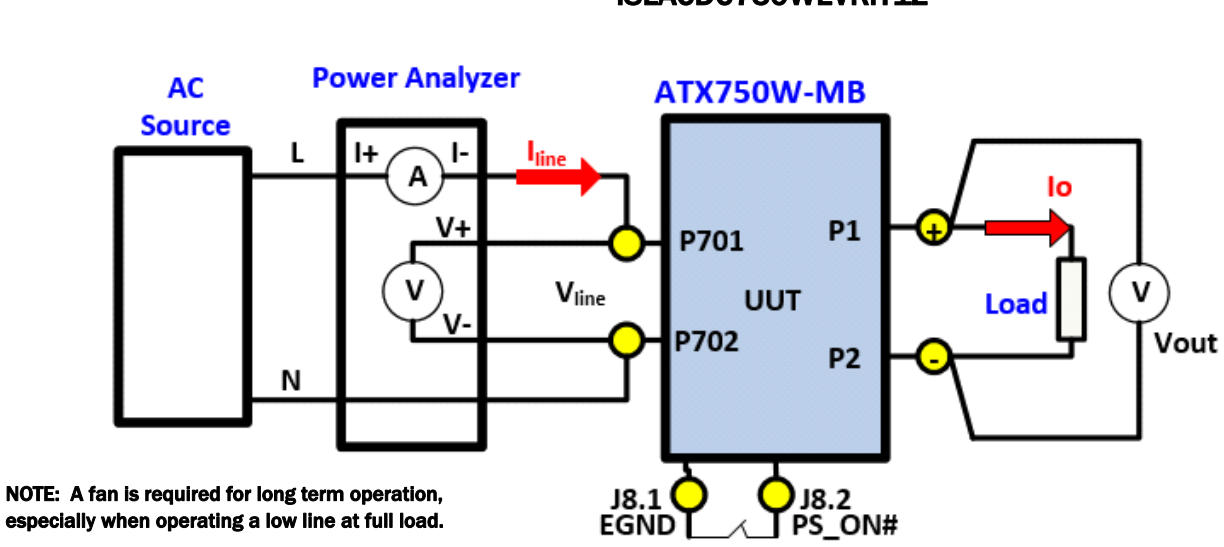

FIGURE 4. TEST SETUP

Typical Performance Curves

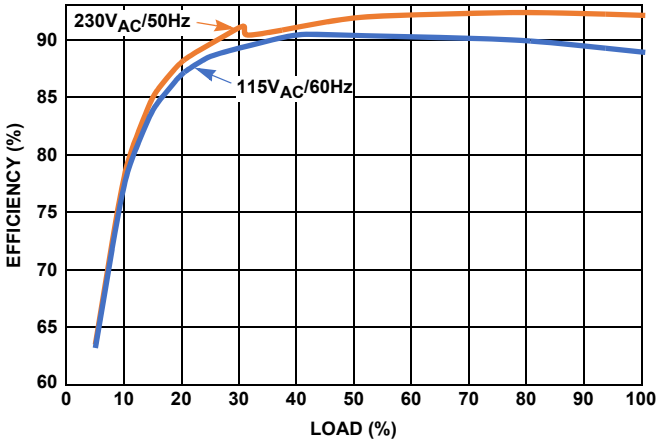

FIGURE 5. EFFICIENCY vs LOAD

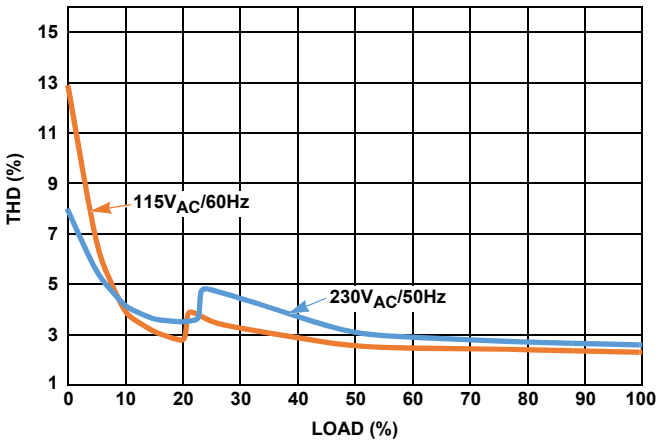

FIGURE 6. THD vs LOAD

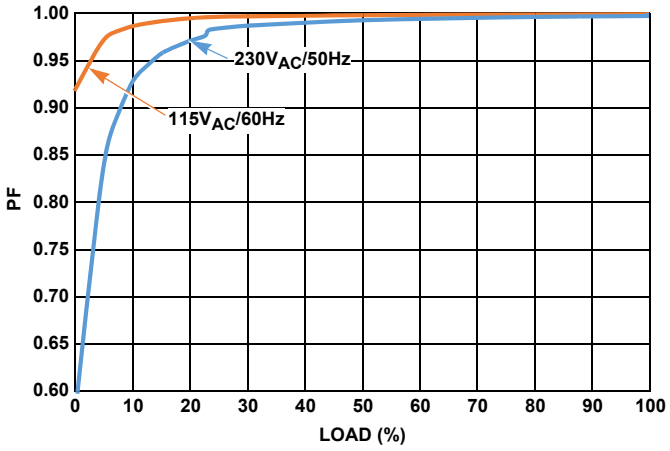

FIGURE 7. PF vs LOAD

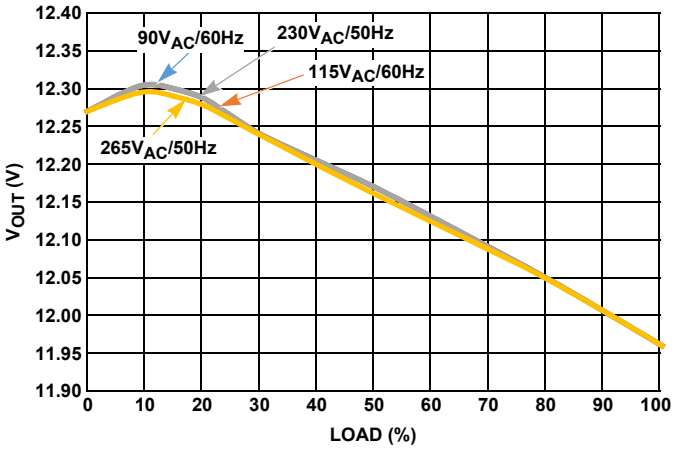

FIGURE 8. V_{OUT} vs LOAD, DROP FOR PARALLEL OPERATION

Block Diagrams

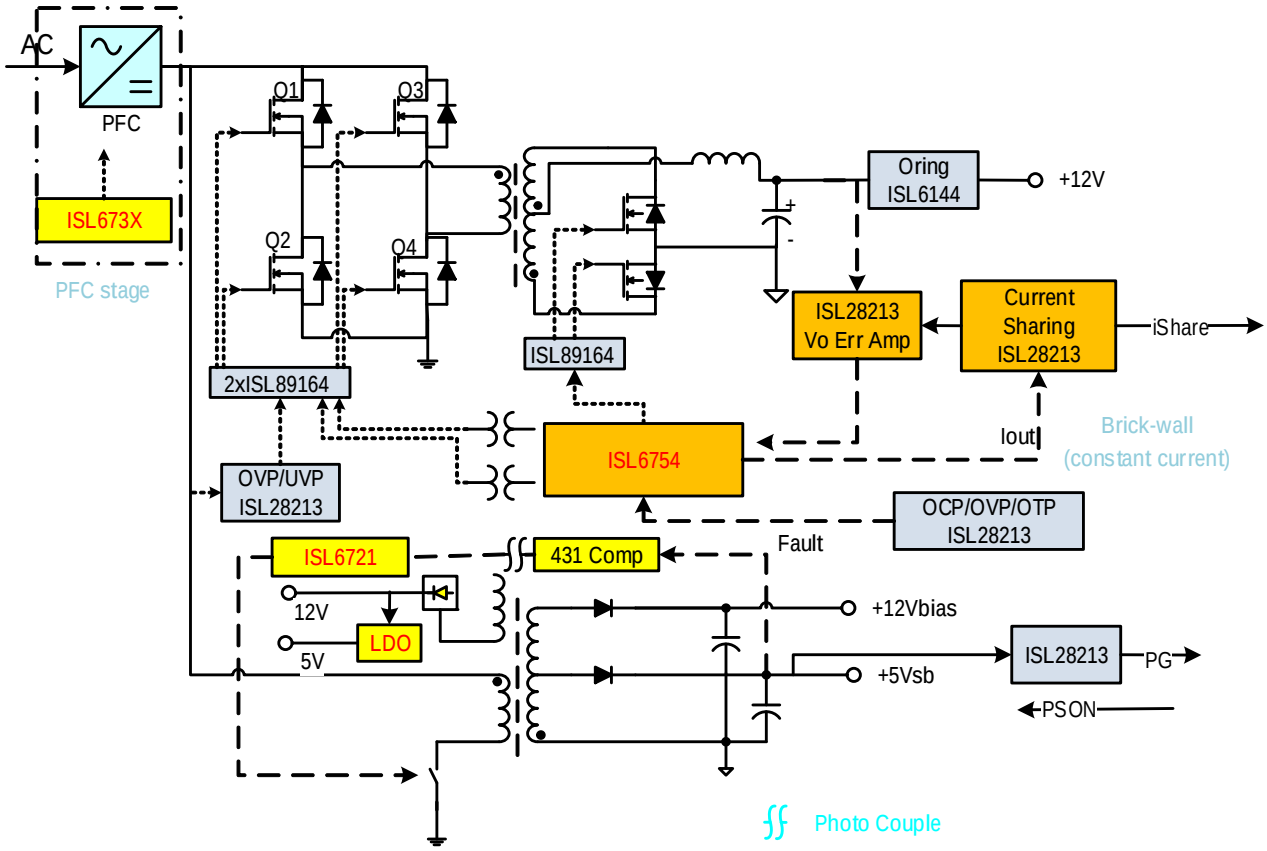

FIGURE 9. BLOCK DIAGRAM OF SYSTEM

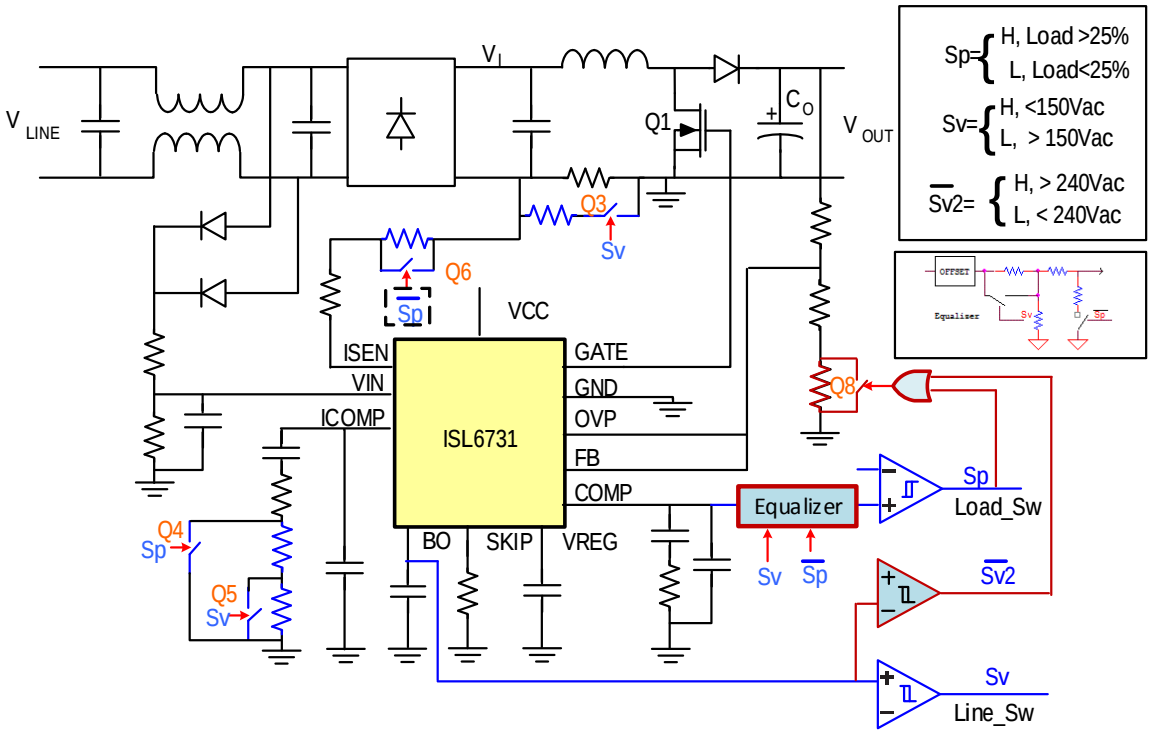

FIGURE 10. BLOCK DIAGRAM OF THE PFC STAGE

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_{ICOMP} 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 Ric 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

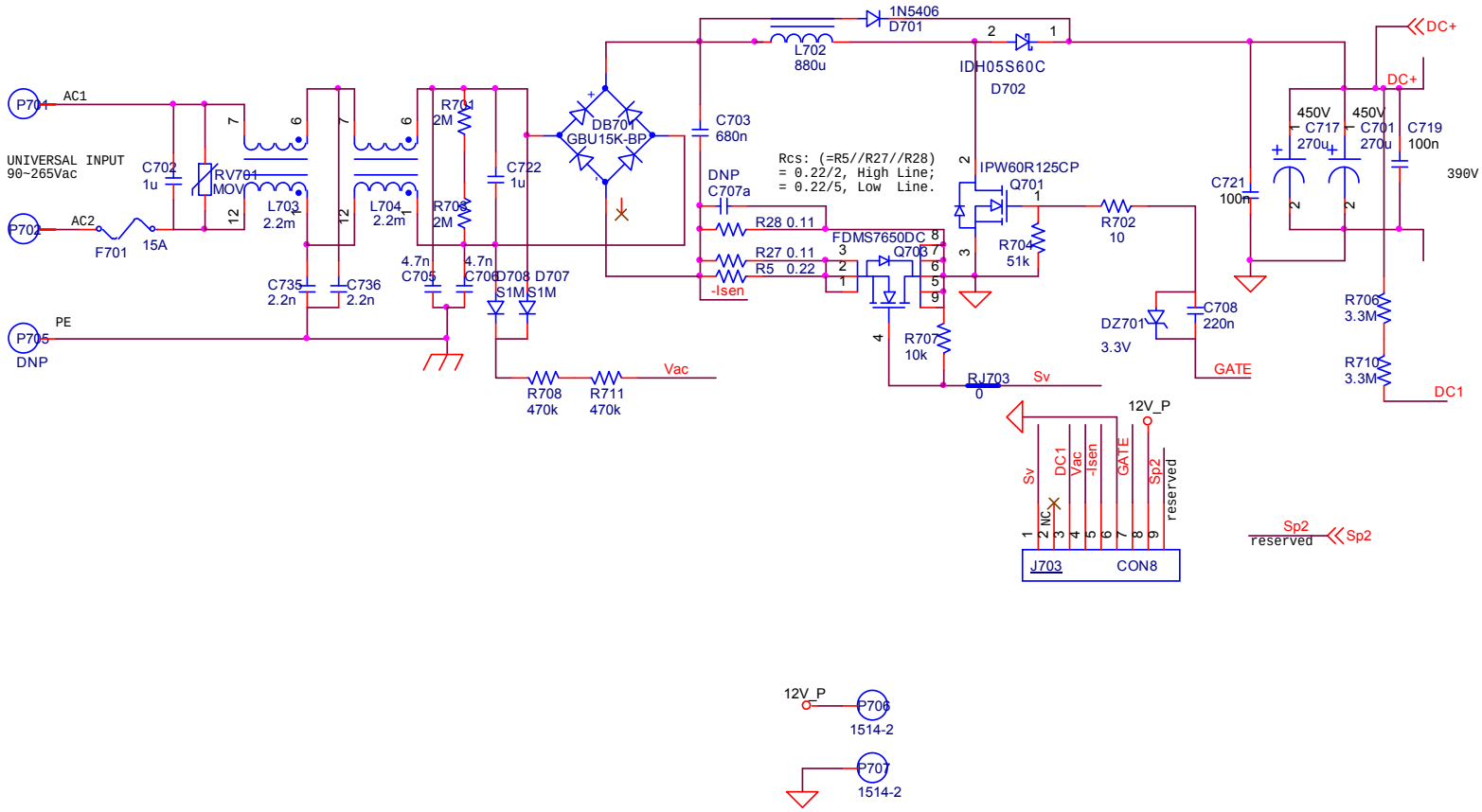

FIGURE 11. ISLACDC750W-MBEV1Z, PFC STAGE SCHEMATIC

Schematics (Continued)

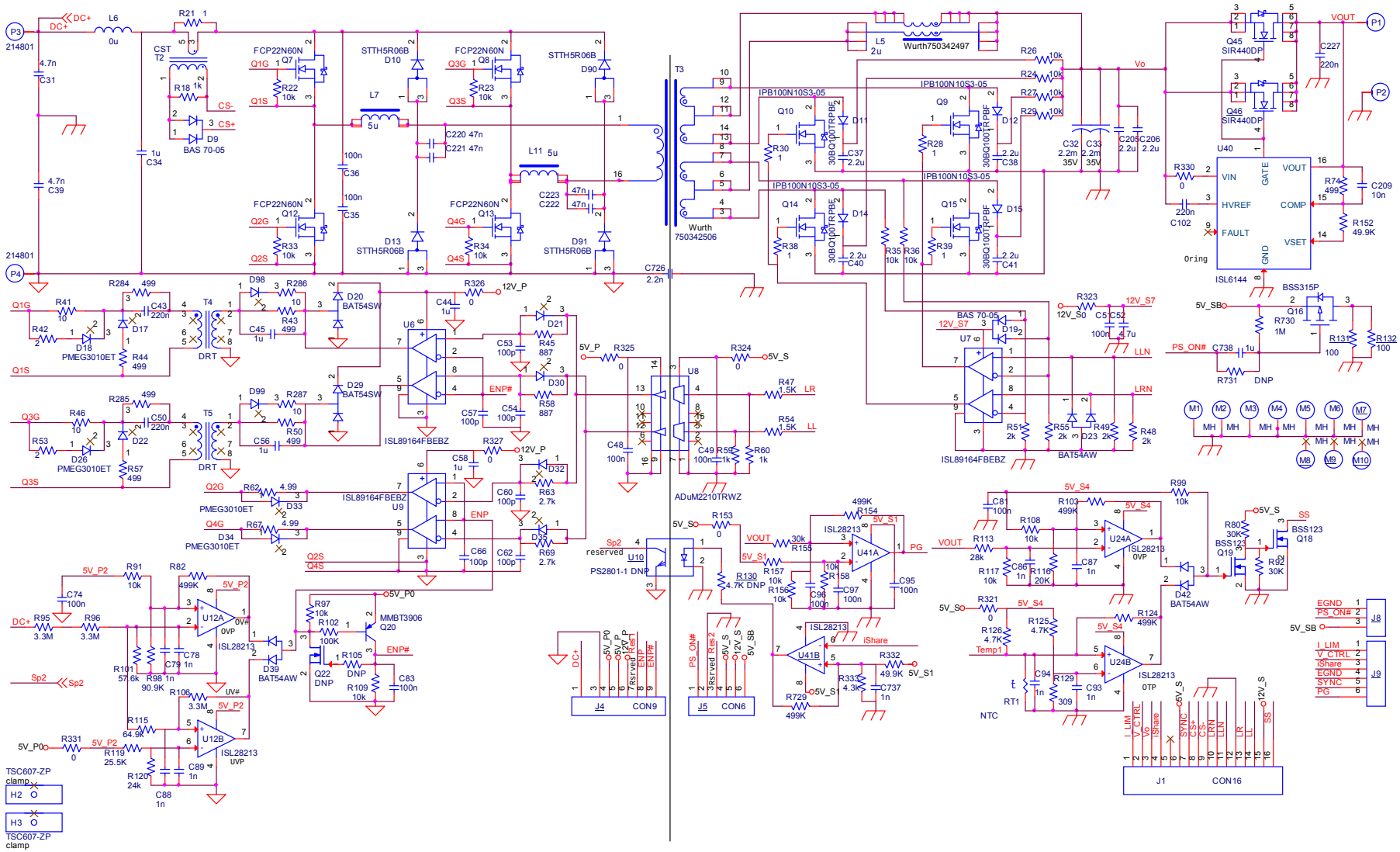

FIGURE 12. ISLACDC750W-MBEV1Z, AFB STAGE SCHEMATIC

Schematics (Continued)

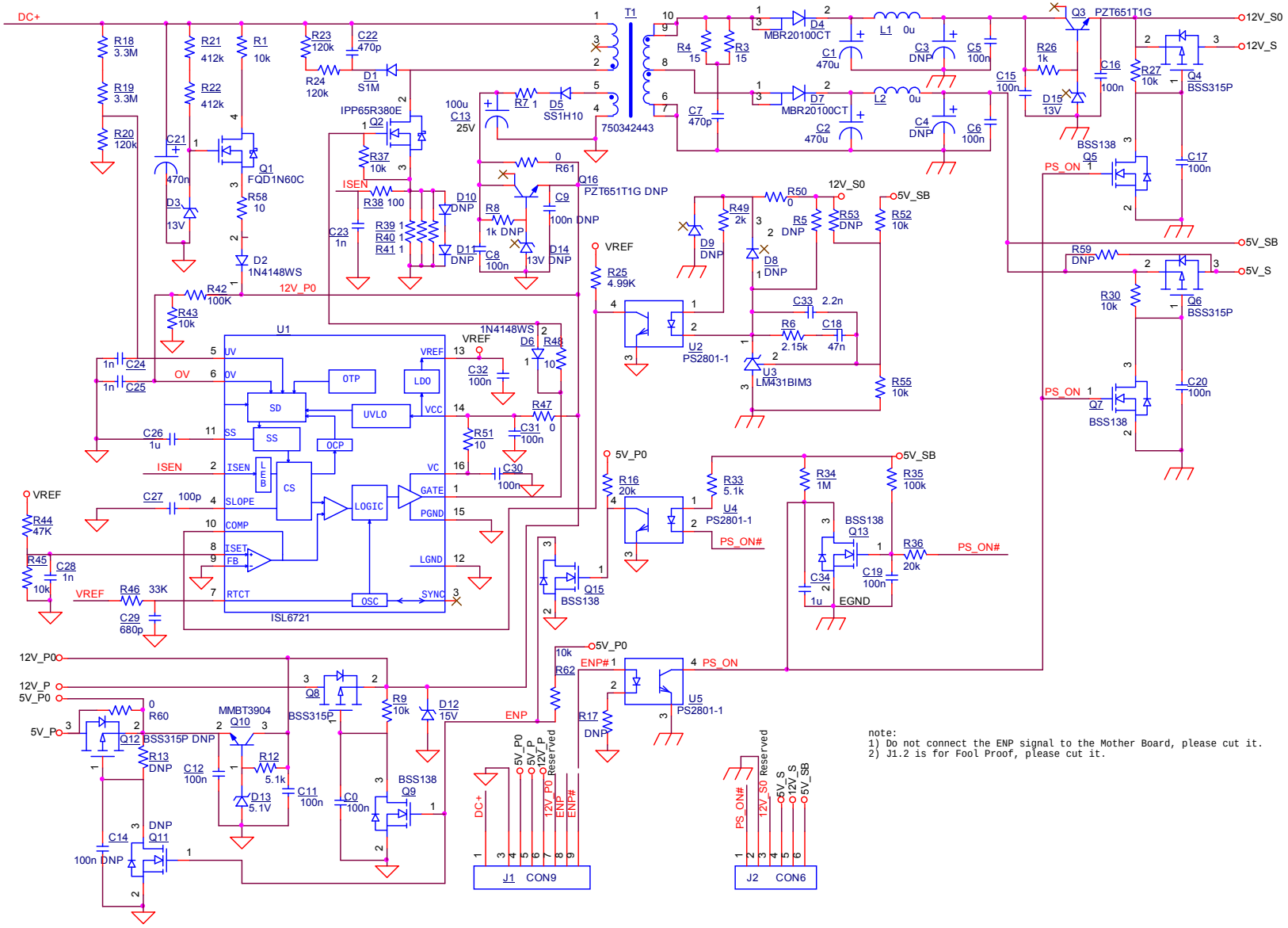

FIGURE 13. ISL6721-DB-1Z SCHEMATIC

Schematics (Continued)

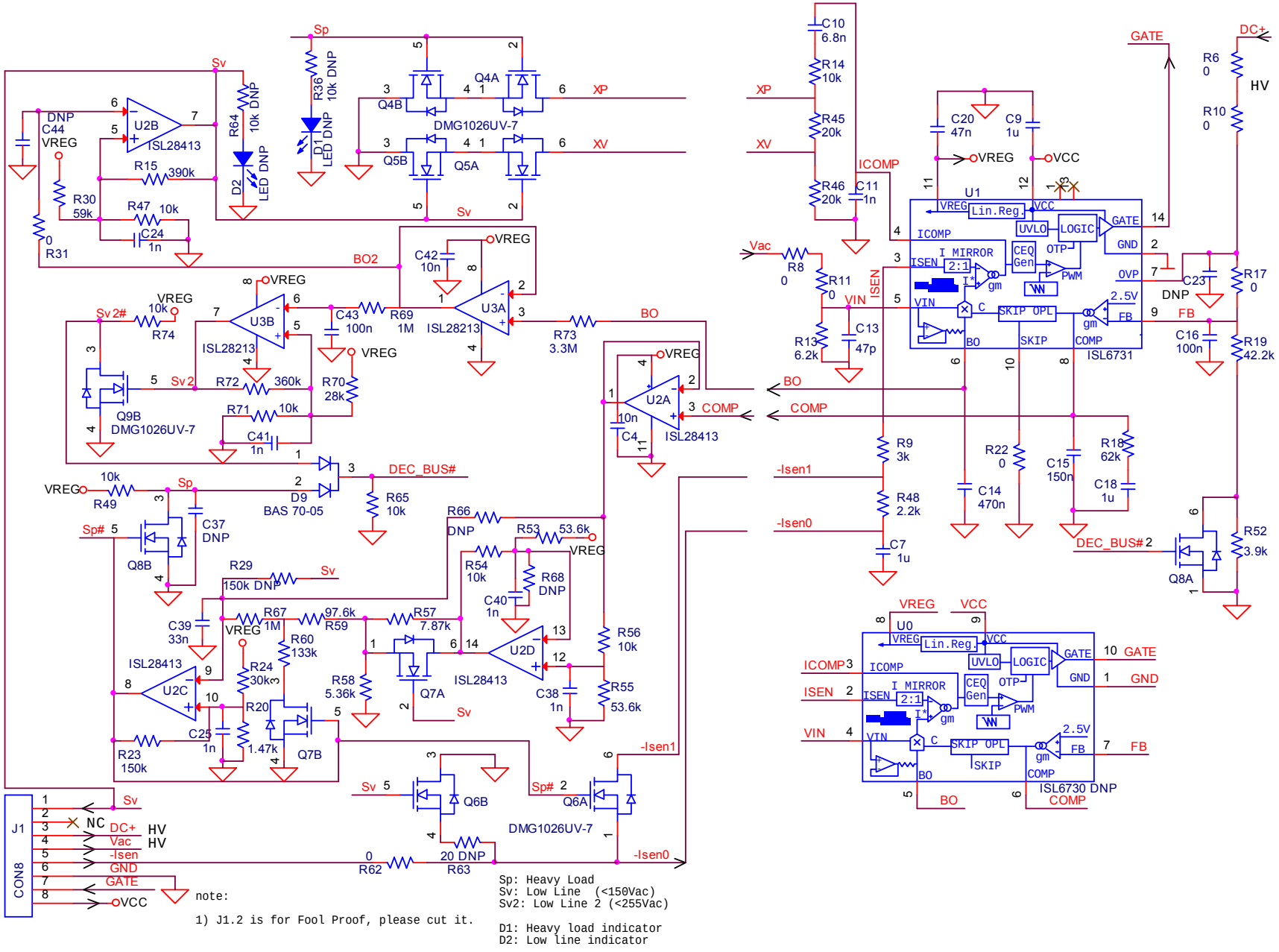

FIGURE 14. ISL6731X-DB-1Z SCHEMATIC

Schematics (Continued)

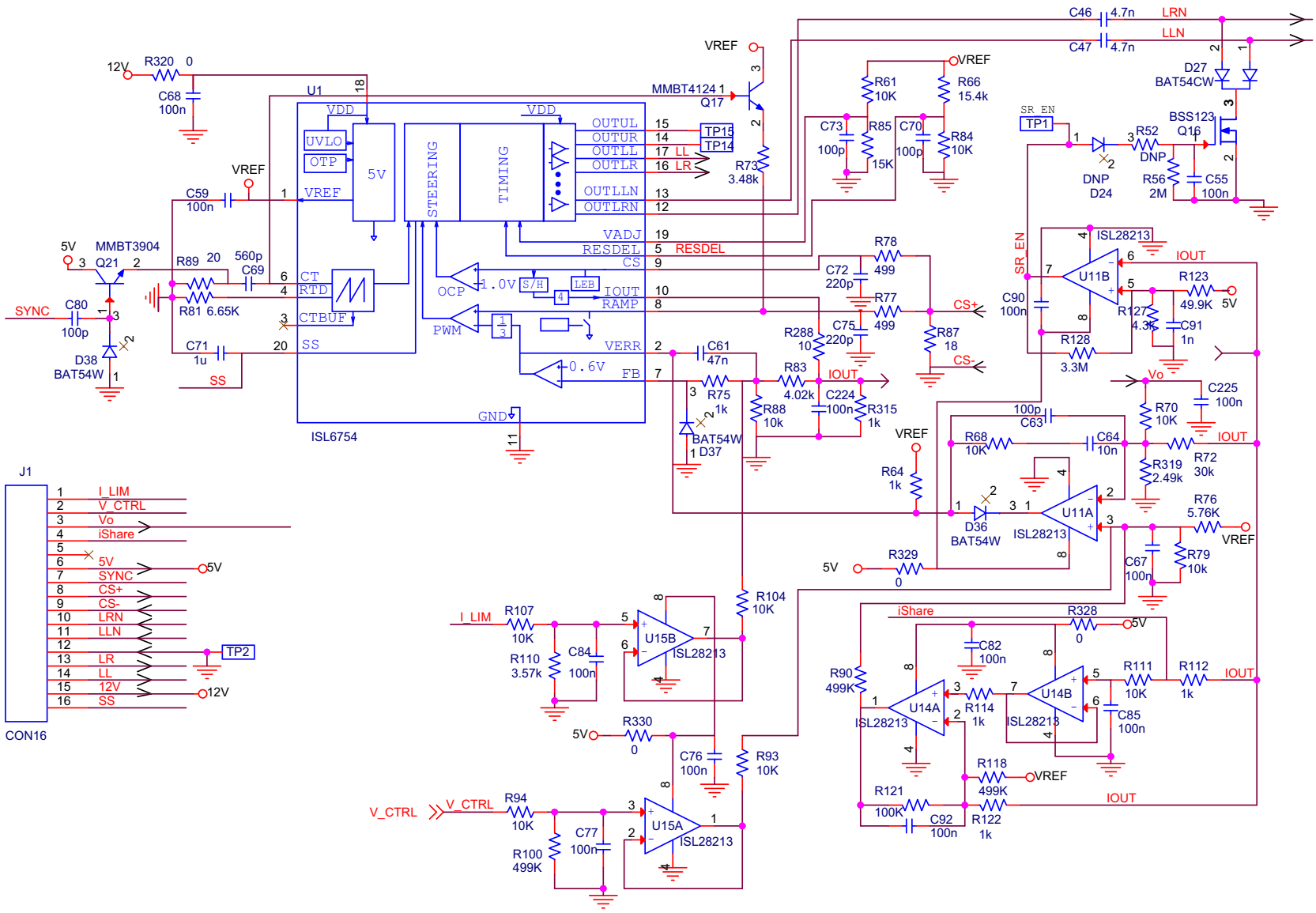

FIGURE 15. ISL6754DBEVAL2Z SCHEMATIC

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	Wurth	-
2	T4, T5	Transformer; SM; -	DRT	; ; Driver Transformer	Wurth	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%; C0G	Generic	
1	C64	Cap; SM; 0603	10n	50V; 10%; X7R	Generic	
1	C69	Cap; SM; 0603	560p	50V; 5%; C0G	Generic	
1	C71	Cap; SM; 0805	1µ	50V; 10%; X7R	Generic	
1	C72	Cap; SM; 0603	220p	50V; 5%; C0G	Generic	
1	C75	Cap; SM; 0603	1n *	50V; 5%; C0G	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	; ;	Wurth	
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			

Assembly Drawings

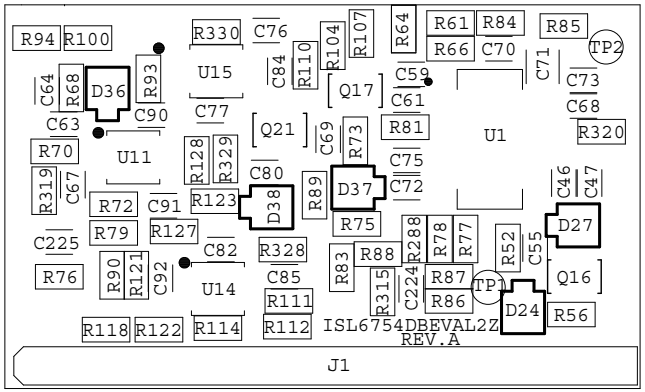

FIGURE 16. ISL6754DBEVAL2Z ASSEMBLY

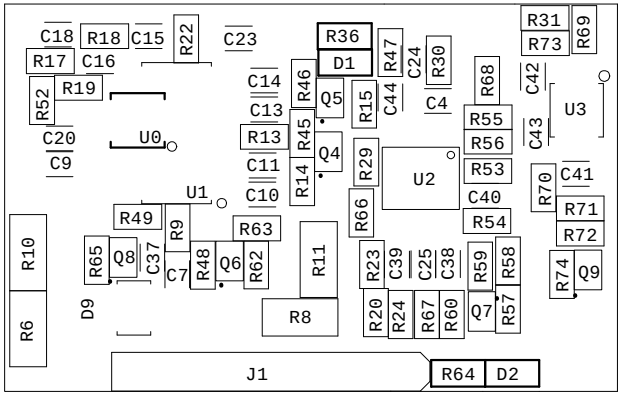

FIGURE 17. ISL6731X-DB-1Z ASSEMBLY

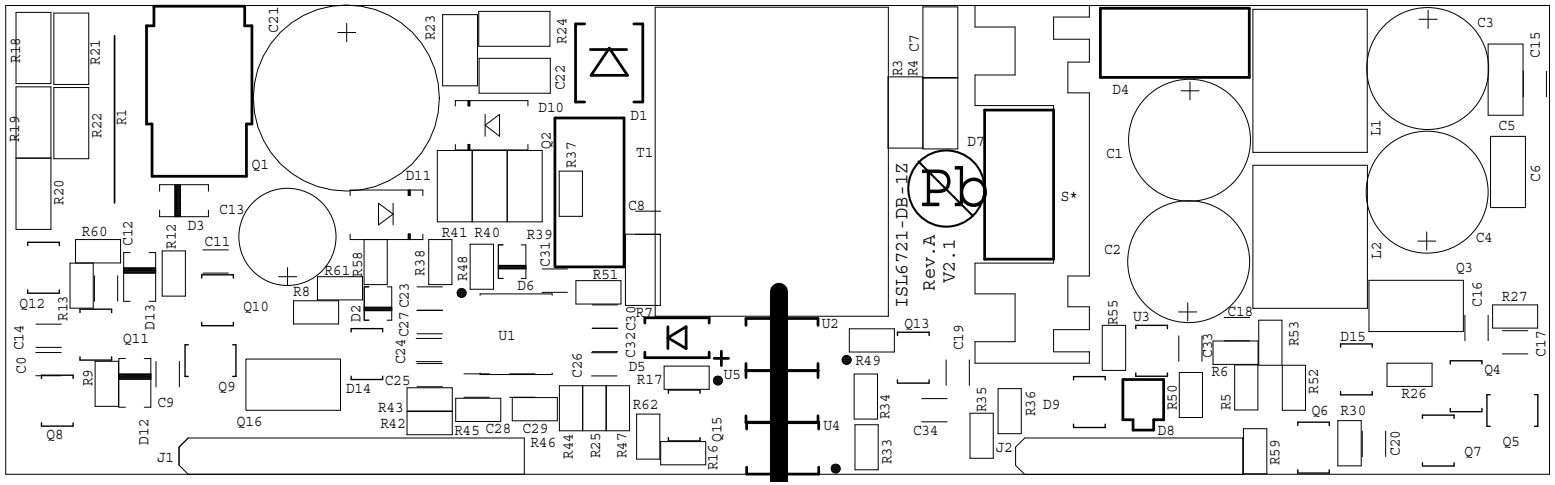

FIGURE 18. ISL6721-DB-1Z ASSEMBLY

Assembly Drawings (Continued)

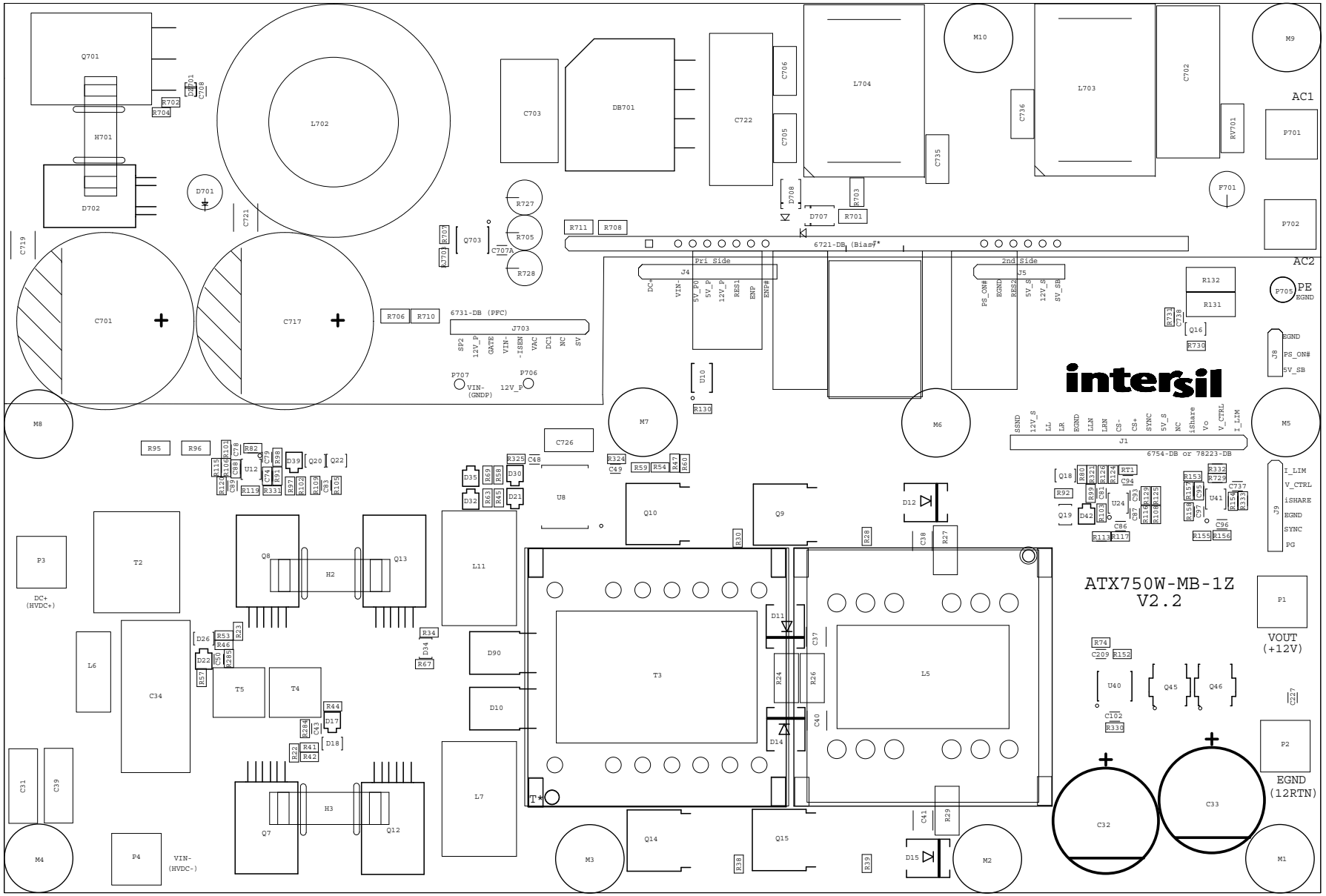

FIGURE 19. ISLACDC750W-MBEV1Z ASSEMBLY TOP

Assembly Drawings (Continued)

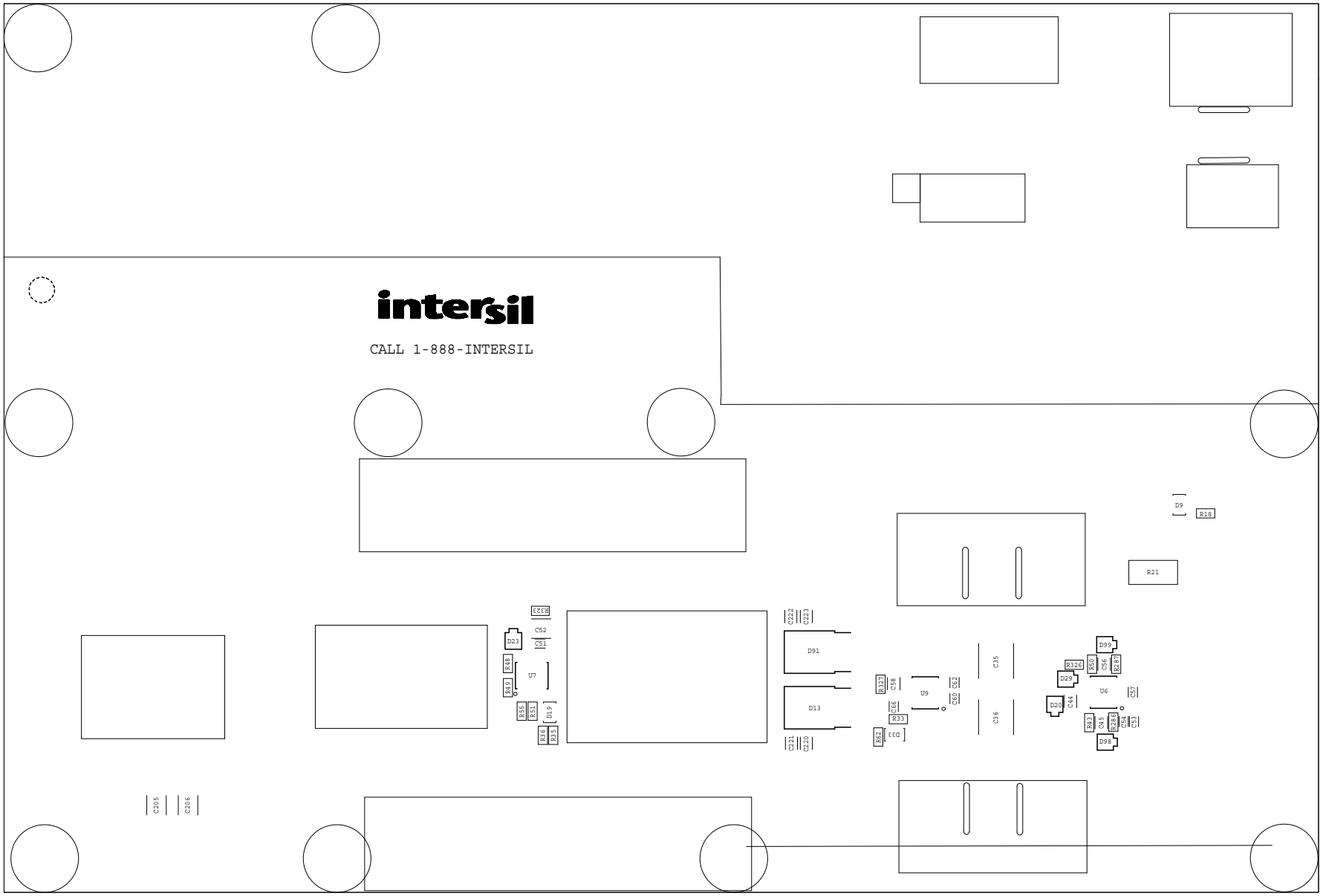

FIGURE 20. ISLACDC750W-MBEV1Z ASSEMBLY BOTTOM

PCB Layout

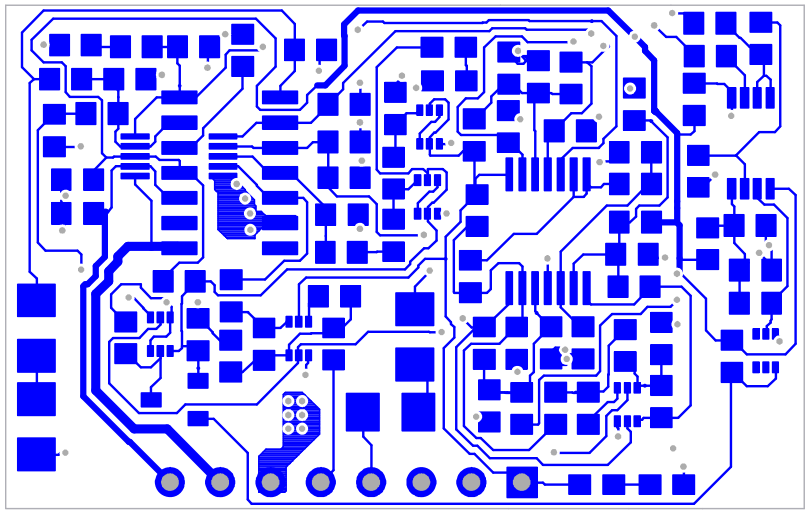

FIGURE 21. ISL6731X-DB-1Z TOP LAYER

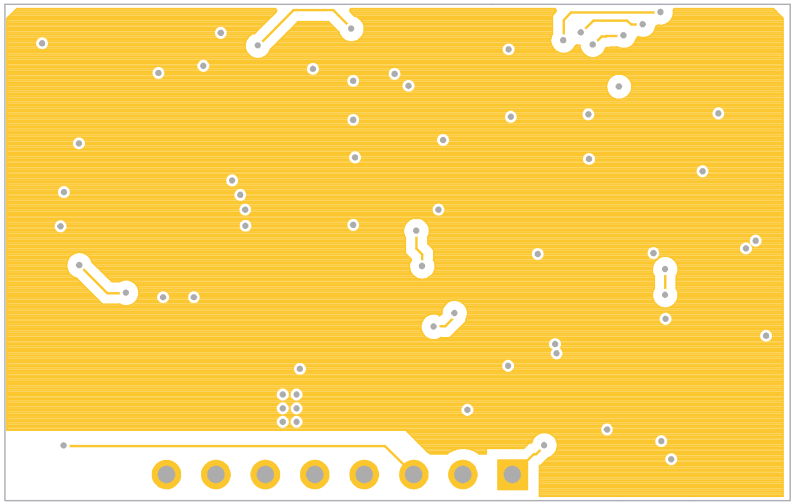

FIGURE 21A. ISL6731X-DB-1Z BOTTOM LAYER

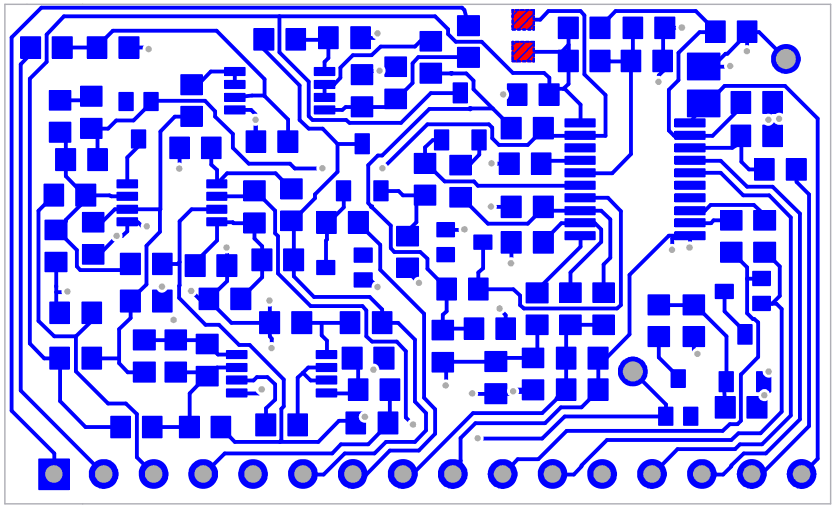

FIGURE 22. ISL6754DBEVAL2Z TOP LAYER

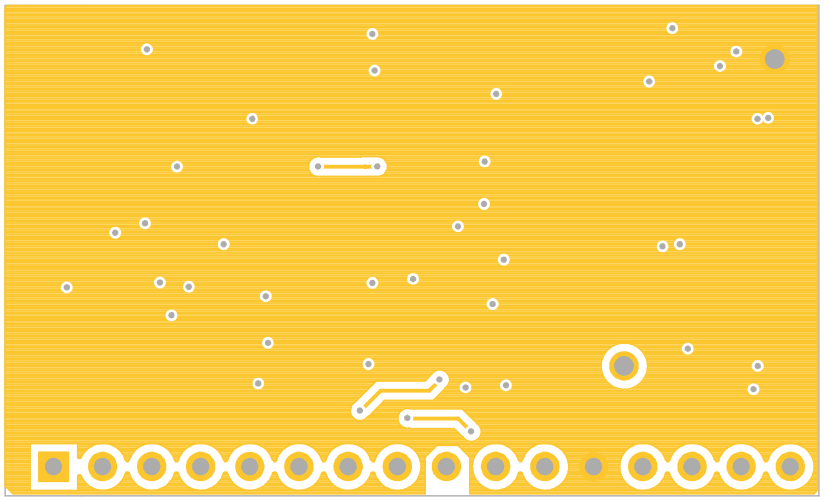

FIGURE 22A. ISL6754DBEVAL2Z BOTTOM LAYER

PCB Layout (Continued)

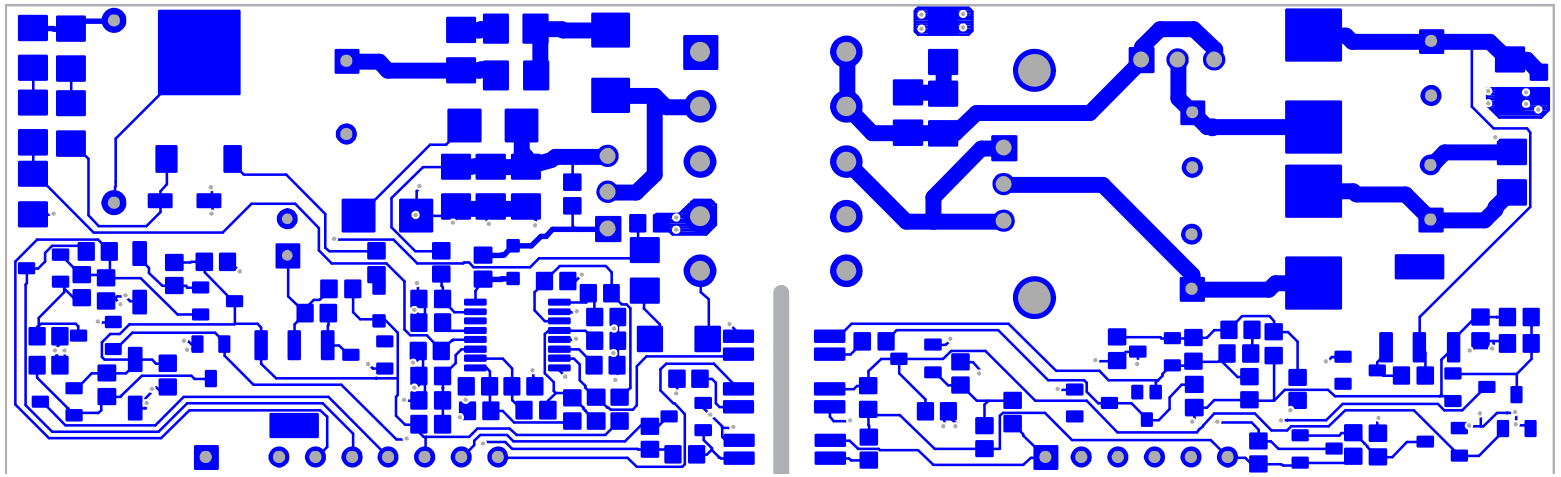

FIGURE 23. ISL6721-DB-1Z TOP LAYER

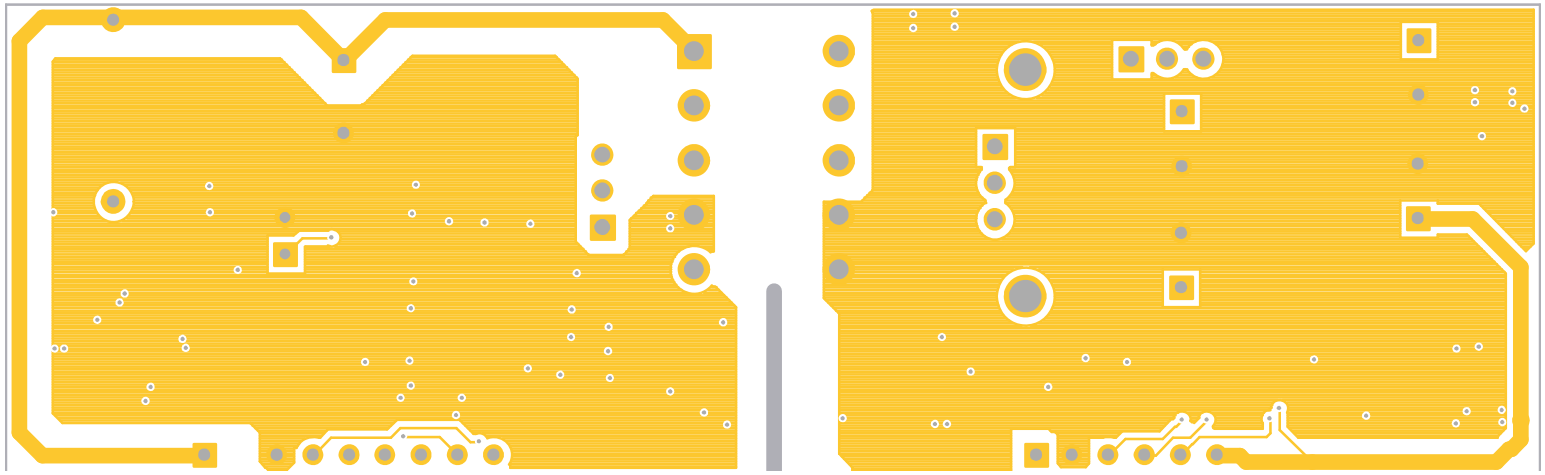

FIGURE 24. ISL6721-DB-1Z BOTTOM LAYER

PCB Layout (Continued)

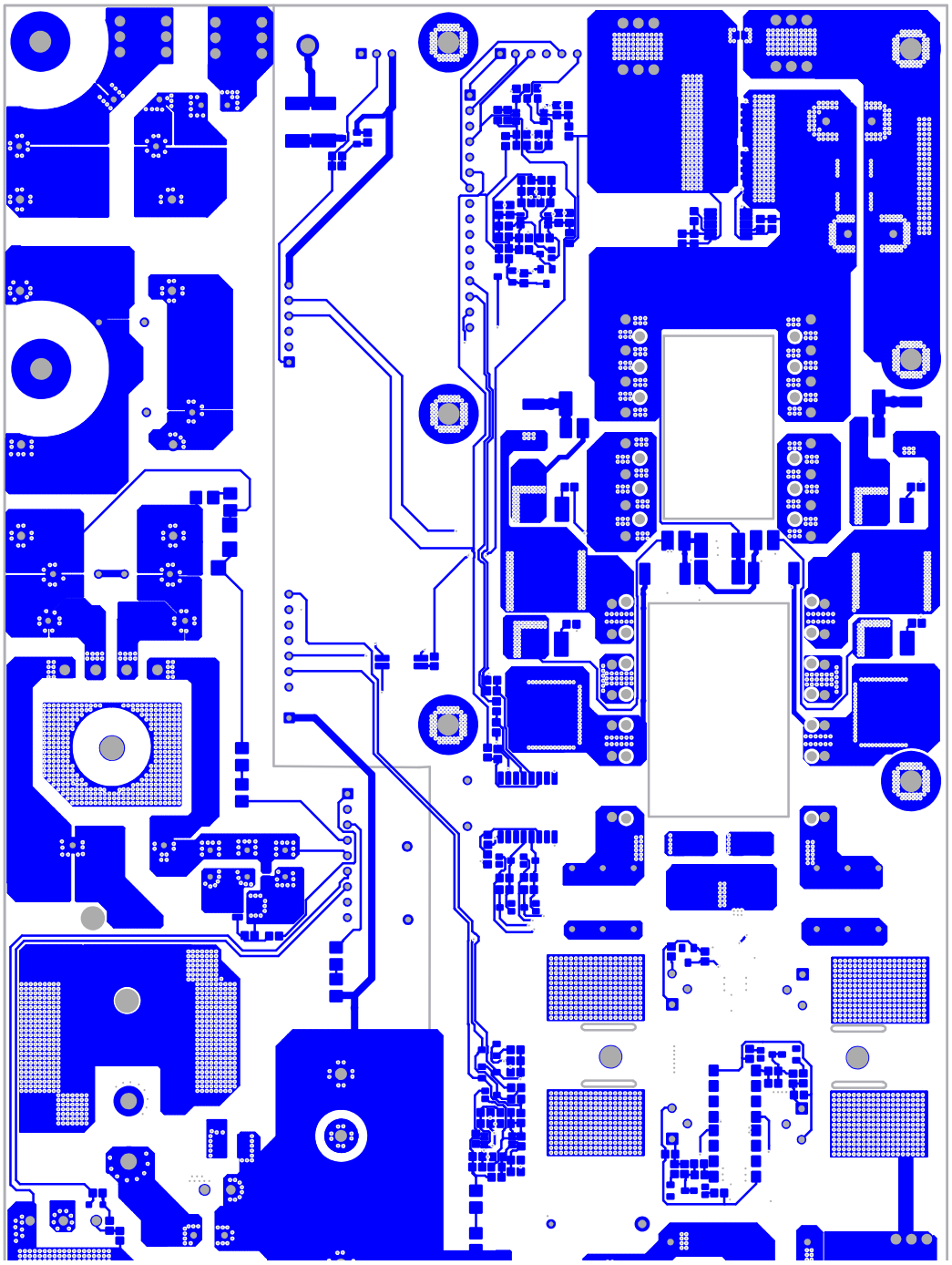

FIGURE 25. ISLACDC750W-MBEV1Z LAYER 1 (TOP)

PCB Layout (Continued)

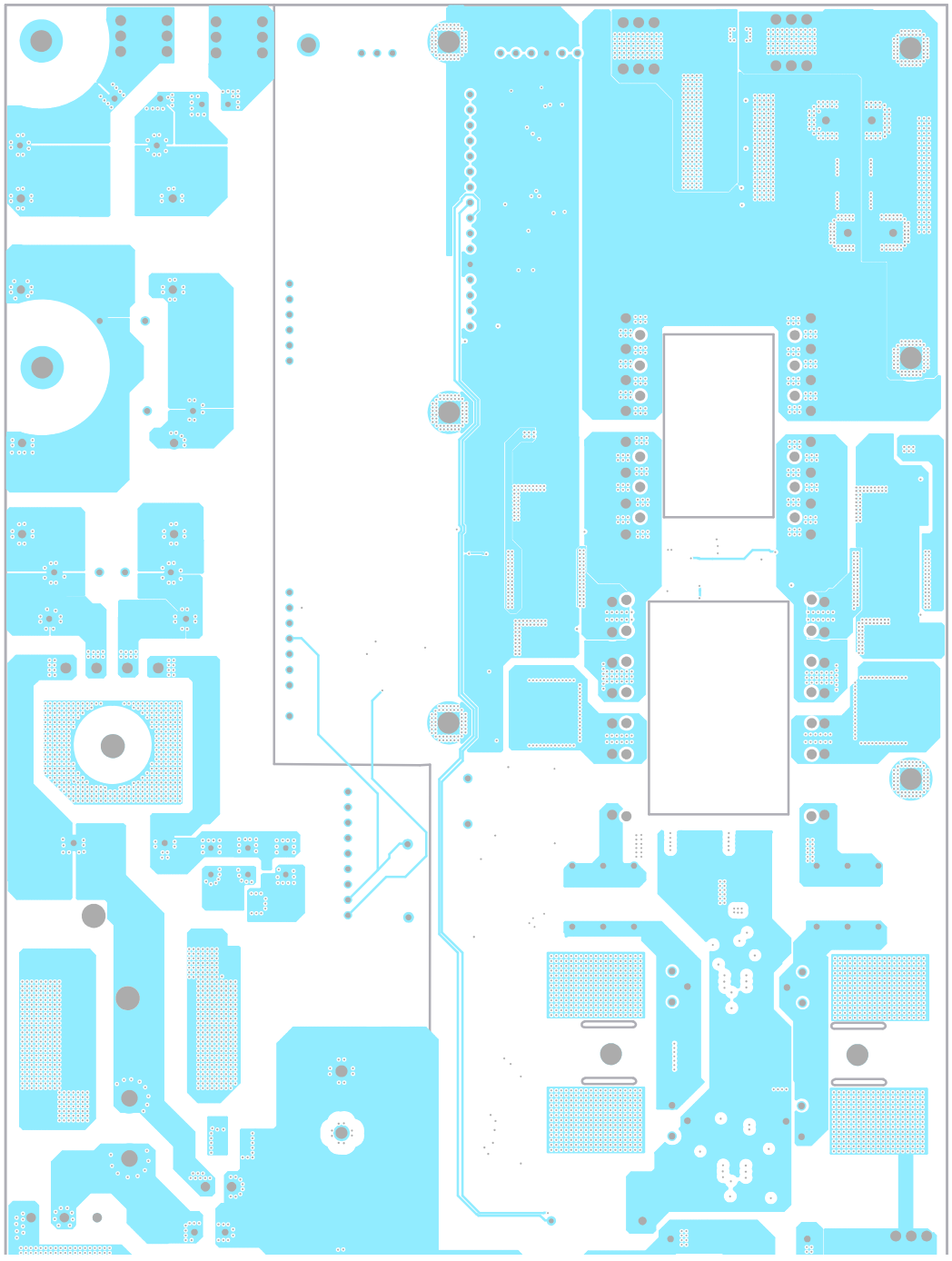

FIGURE 26. ISLACDC750W-MBEV1Z LAYER 2

PCB Layout (Continued)

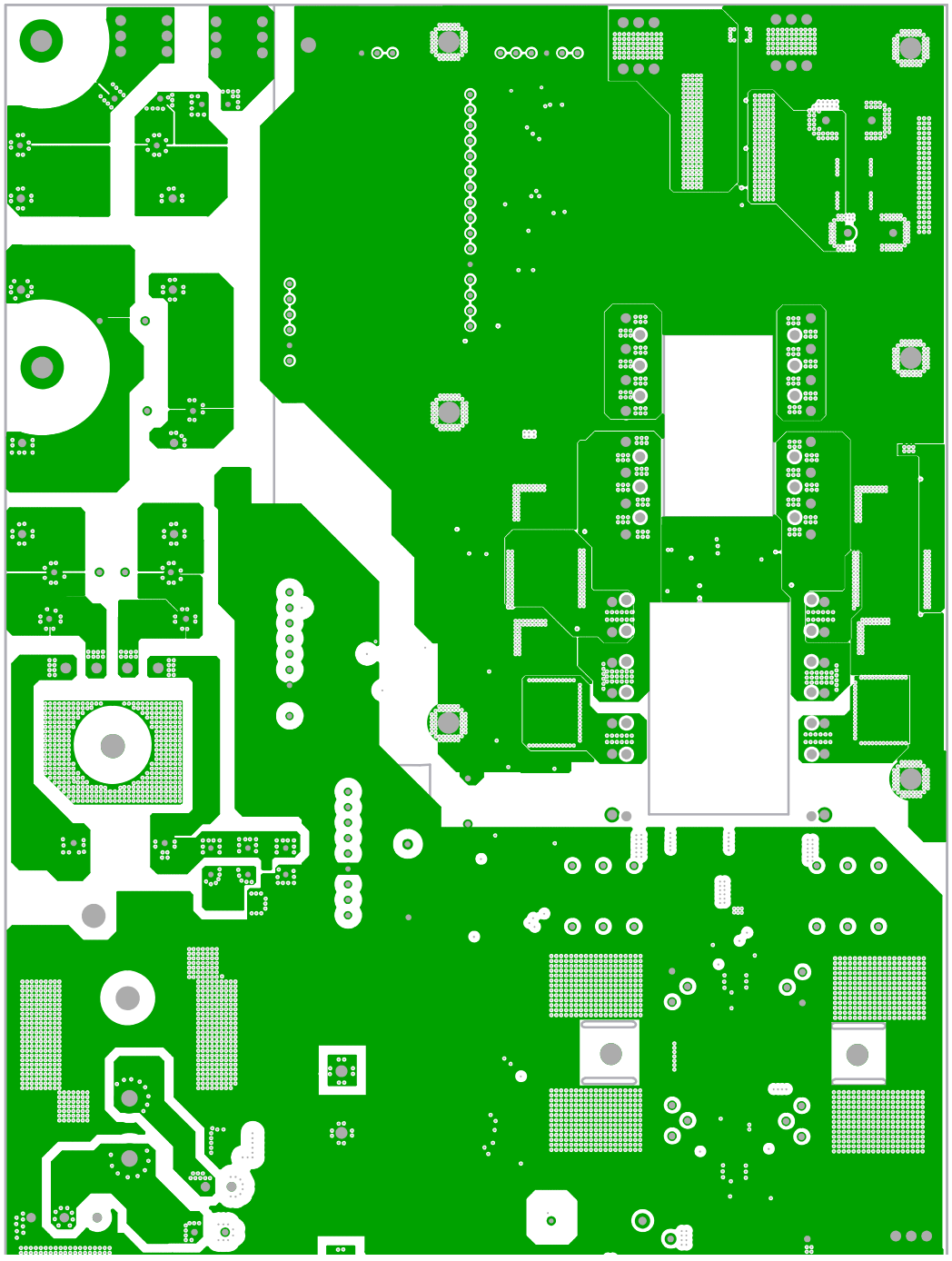

FIGURE 27. ISLACDC750W-MBEV1Z LAYER 3

PCB Layout (Continued)

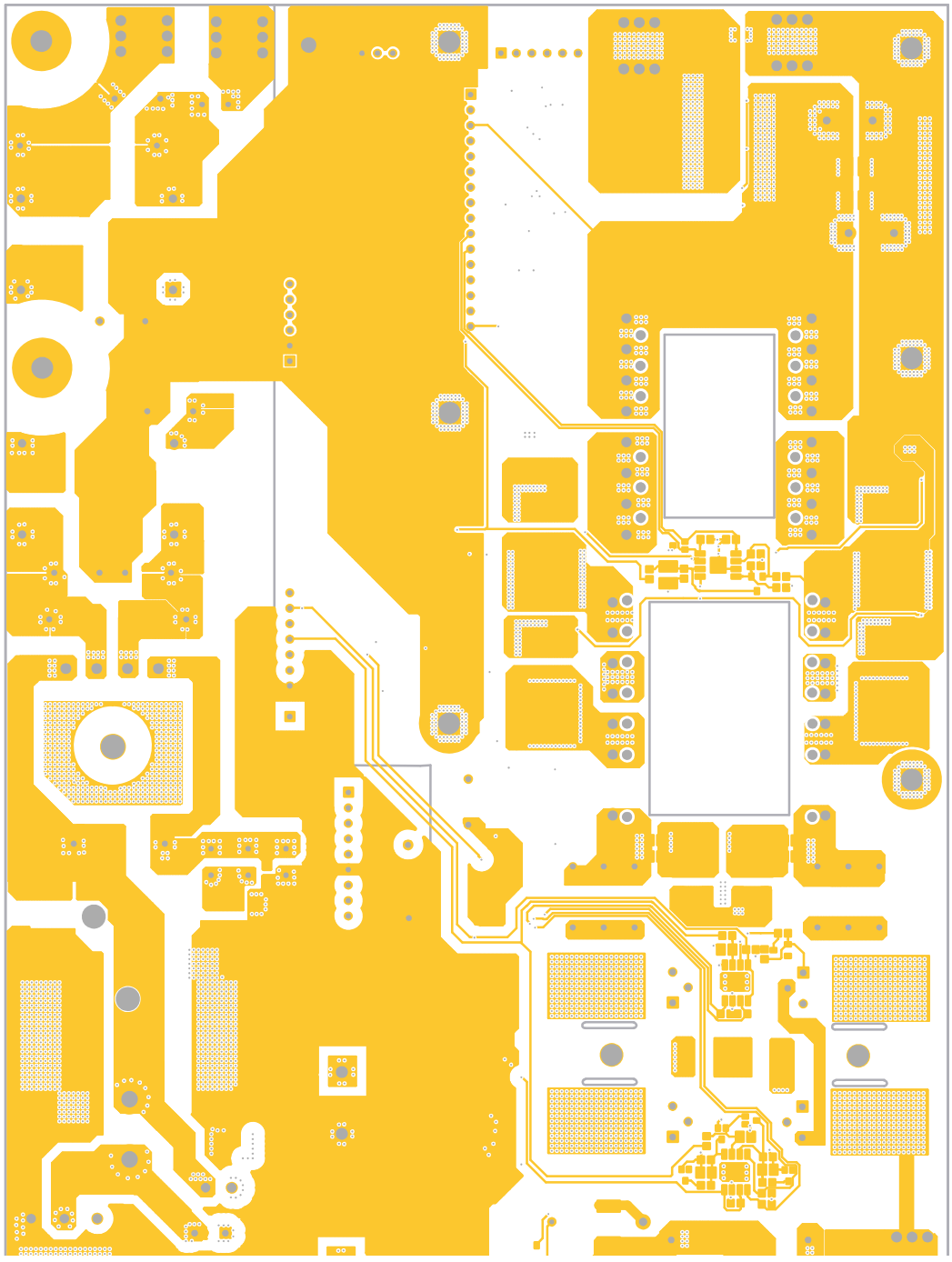

FIGURE 28. ISLACDC750W-MBEV1Z LAYER 4 (BOTTOM)

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.

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