ISL73846MEV2Z

Single Switch Isolated Forward Converter Evaluation Board

Description

The ISL73846MEV2Z evaluation platform evaluates the ISL73846M in a single switch forward converter power supply topology. The circuit uses a power transformer for power transfer to secondary and includes a demagnetizing winding for core reset and an auxiliary winding to provide the power to the VDD pin of the device. The ISL73846M is a radiation tolerant dual output pulse width modulator that can be used in high frequency switching power supplies in either voltage mode or current mode control configurations. The board uses and input of 28V input and converts it to a regulated DC output of 5V at an output current of 10A.

Specifications

- Input Voltage, V_{IN}: 21V to 35V
- Output voltage, V_{OUT}: 5V
- Output Current, I_{OUT}: 0A to 10A
- Switching frequency: 400kHz
- Number of Board Layers: 8
- PCB Thickness: 2oz outer, 1oz PCB thickness

Features

- Programmable soft-start
- Off-line startup
- Programmable UVLO
- Programmable enable
- Synchronous rectification
- Feedback isolation using ISLFBKISOEV2Z
- Tight line/load regulation of less than 1%
- Current Mode control
- Slope Compensation
- Pulse-by-pulse current limiting for overcurrent protection

Board Contents

The following is shipped with the evaluation board.

- Feedback isolator board ISLFBKISOEV2Z

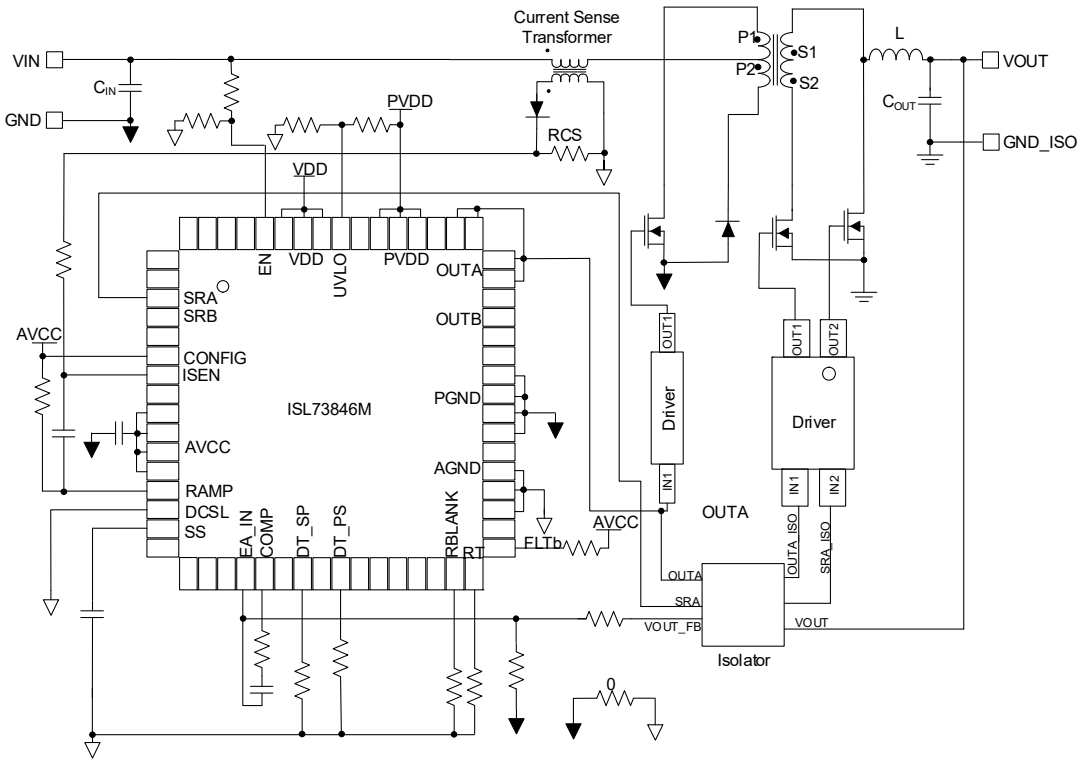


Figure 1. Block Diagram

Contents

1. Functional Description

ISL73846MEV2Z is a one-switch forward converter power supply that takes an input voltage between 21V and 35V and outputs 5V with a maximum load of 10A.

The board is shipped with the ISLFBKISOEV2Z, which provides feedback isolation.

See Figure 3 for the board photo.

1.1 Operational Characteristics

The ISL73846MEV2Z requires only one supply rail for VIN ranging from 21V to 35V to operate properly. The controller analog supply VDD input is provided through off-line start up at first then through the auxiliary winding of the PL300X2-101L transformer. The controller power circuitry supply PVDD input is tied to the internal LDO output AVCC(5V) for driving the GaN FET primary switch.

1.2 Setup and Configuration

Table 1 shows an overview of all the default jumper settings and their different configurations.

1. VDD_SEL is connected to position 2 and 3.
2. UVLO_SEL is connected to 2 and 3.
3. JP1 is connected to position 1 and 2.
4. Place ISLFBKISOEV2Z on J1 and J2 as shown in Figure 2.
5. Apply a 21V to 35V voltage to VIN banana plug connectors as shown in Figure 2.
6. A resistor or electronic load can be connected to the VOUT banana plug connectors as shown in Figure 2.
7. A minimum load of 400mA is required unless the modification to the board is applied as shown in the Board Modification for RCD Snubber section.

Table 1. Default Jumper Settings

Jumper	Function /Description	Default Configuration	Alternate Configuration
VDD_SEL	Select the supply rail for the VDD input	Jumper in 2-3 position connects VDD to the rectified signal coming from the auxiliary winding of the transformer.	Not Available
UVLO_SEL	Select the supply rail for the UVLO input	Jumper in 2-3 position connects UVLO to a VDD voltage divider network that sets the UVLO hysteresis.	Not Available
JP1	Select fault behavior	Jumper in 1-2 position connects the CONFIG pin to AGND using a 113k resistor. Overcurrent protection is set to pulse-by-pulse current limit at OC1 level or 1/1 Hiccup at OC2 level.	Jumper in 2-3 position connects CONFIG pin to AVCC: Overcurrent protection is set to 4/8 Hiccup at OC1 level and 1/1 Hiccup at OC2 level. This Configuration does not work with feedback isolation using ISLFBKISOEV2Z
J1/J2	Feed back Isolator connection	J1 and J2 are connected to ISLFBKISOEV2Z for feedback isolation.	J1 and J2 are not connected to the ISLFBKISOEV2Z (non isolated mode): in this case R-14, R19, and R43 must be populated with 0Ω resistors, R23 must be populated with a 3.47k resistor, R54 must be replaced with 15k resistor, and C51 must be DNP.

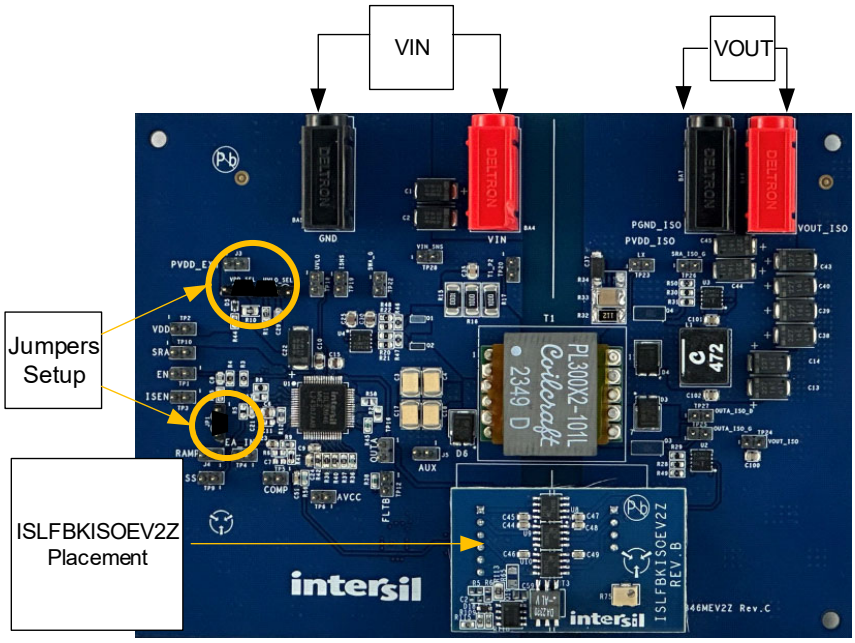


Figure 2. Setup Configuration

2. Board Design

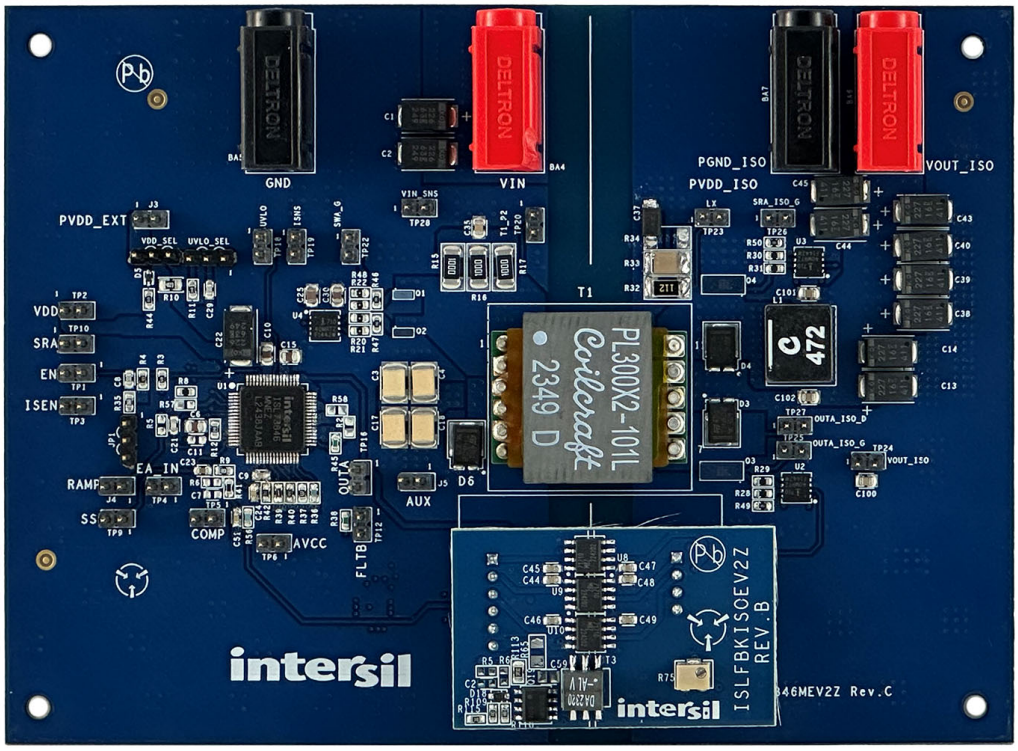


Figure 3. Top Board Photo

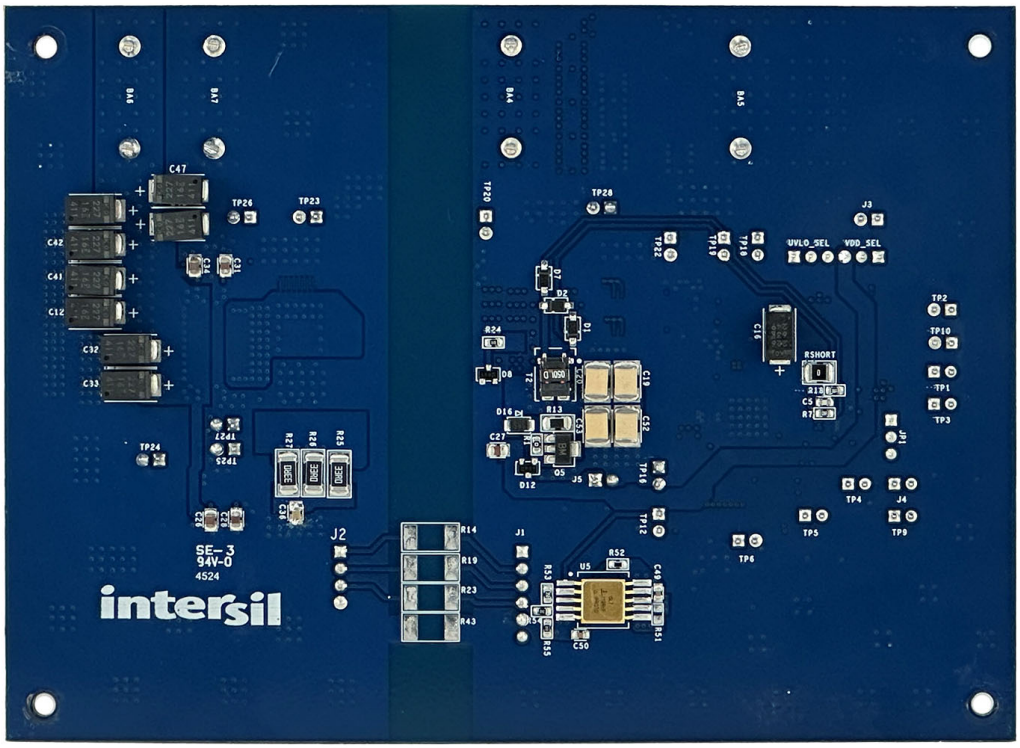


Figure 4. Bottom Board Photo

2.1 Layout Guidelines

For recommended layout guidelines for the forward converter, see the Board Layout details.

2.2 Schematic Diagrams

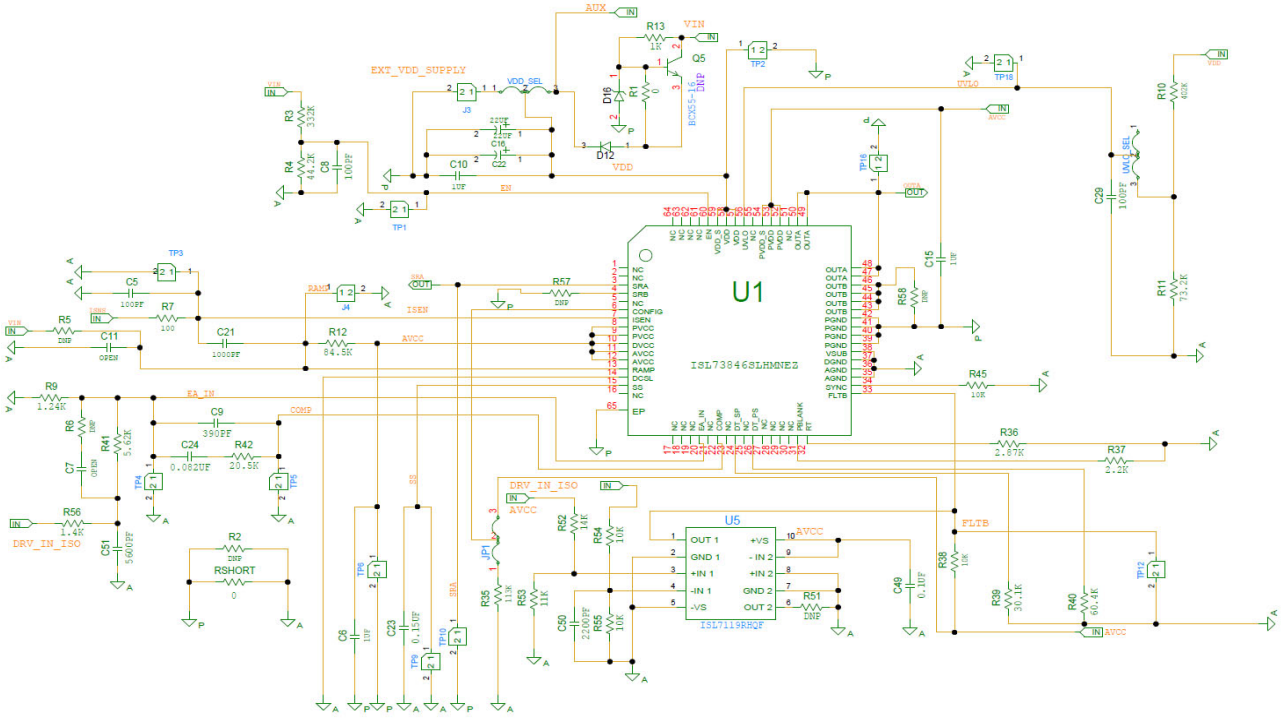


Figure 5. Power Stage Schematics

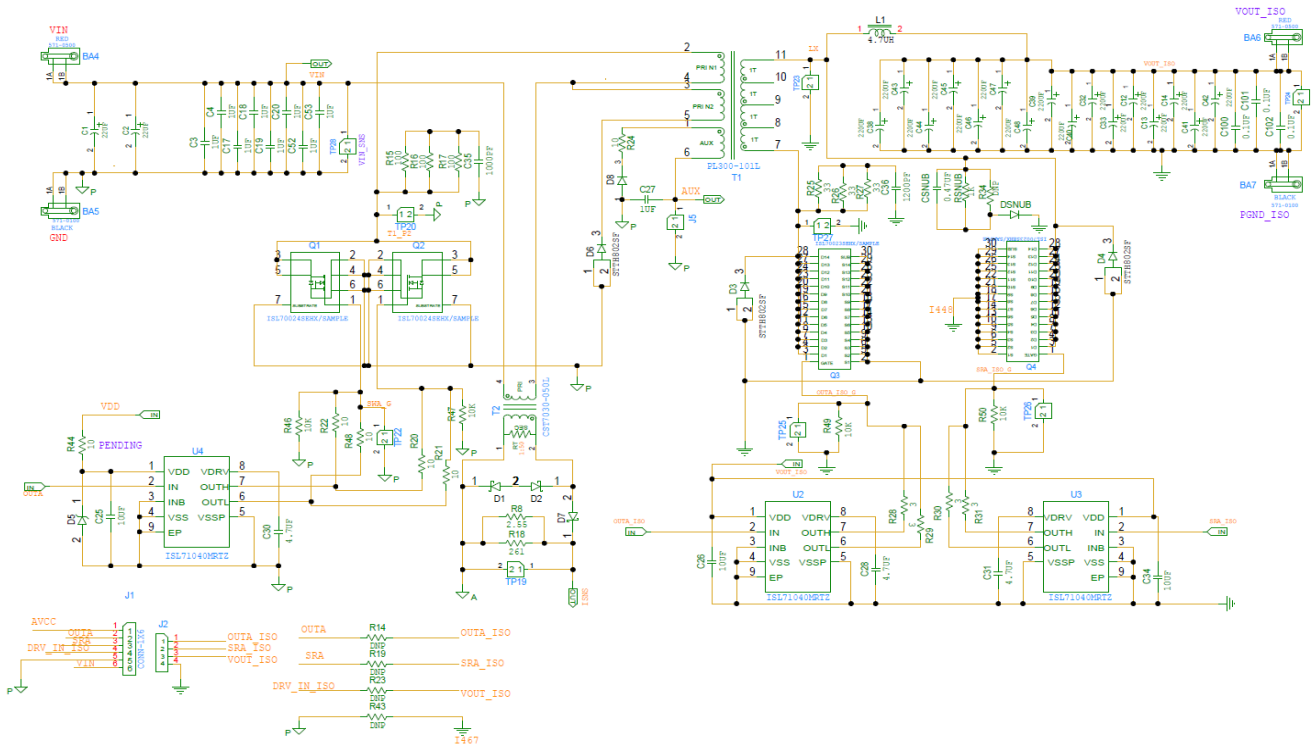


Figure 6. Control Stage Schematics

2.3 Bill of Materials

Qty	Ref Des	Description	Manufacturer	Part Number
2	BA5, BA7	CONN-PLUG, TH, 4mm INSUL.SOCKET, BLK, R/A, RoHS	Deltron	571-0100
2	BA4, BA6	CONN-PLUG, TH, 4mm INSUL.SOCKET, RED, R/A, RoHS	Deltron	571-0500
23	J3, J4, J5, TP1, TP2, TP3, TP4, TP5, TP6, TP9, TP10, TP12, TP16, TP18, TP19, TP20, TP22, TP23, TP24, TP25, TP26, TP27, TP28	CONN-HEADER, TH, 1×2, 2.54mmPITCH, 5.5×3.3mm, RoHS	3M	961102-6404-AR
1	C50	CAP, SMD, 0603, 2200pF, 50V, 10%, X7R, RoHS	Kemet	C0603C222K5RAC7867-T
3	C28, C30, C31	CAP-AEC-Q200, SMD, 0805, 4.7µF, 25V, 10%, X7R, RoHS	Kemet	C0805C475K3RACAUTO-T
2	C8, C29	CAP, SMD, 0603, 100pF, 100V, 10%, C0G/NP0, RoHS	TDK	C1608C0G2A101K080AA-T
1	C6	CAP, SMD, 0805, 1.0µF, 25V, 10%, X7R, RoHS	TDK	C2012X7R1E105K125AB-T
1	C23	CAP-AEC-Q200, SMD, 0603, 0.15µF, 25V, 10%, X7R, RoHS	TDK	CGA3E2X7R1E154K080AA-T
3	C10, C15, C27	CAP, SMD, 0805, 1µF, 50V, 10%, X7R, RoHS	Yageo	CC0805KKX7R9BB105-T
3	C25, C26, C34	CAP, SMD, 0805, 10µF, 25V, 10%, X7R, RoHS	Murata	GRM21BZ71E106KE15L-T
1	C49	CAP, SMD, 0603, 0.1µF, 16V, 10%, X7R, RoHS	YAGEO	CC0603KRX7R7BB104-T
1	C24	CAP, SMD, 0603, 0.082µF, 10V, 5%, RoHS	KEMET	C603C823J8ACAUTO-T
1	C9	CAP, SMD, 0603, 390pF, 50V, 5%, C0G/NP0, RoHS	KEMET	GRM1885C1H391JA01D-T
1	C51	CAP, SMD, 0603, 5600pF, 50V, 10%, X7R, RoHS	KEMET	C0603C562K5RAC7867-T
1	C21	CAP, SMD, 0603, 1000pF, 25V, 10%, C0G/NP0, RoHS	AVX	KGM15ACG1E102KT-T
1	C5	CAP, SMD, 0603, 100pF, 50V, 5%, C0G/NP0, RoHS	AVX	KGM15ACG1H101J-T
0	C7, C11	DO NOT POPULATE OR PURCHASE	-	-
4	C1, C2, C16, C22	CAP-TANT, SMD, 7.3x4.3mm, 22µF, 63V, 20%, RoHS	Kemet	T521X226M063ATE075-T
16	C12, C13, C14, C32, C33, C38, C39, C40, C41, C42, C43, C44, C45, C46, C47, C48	CAP-TANT, SMD, 7.30mm x 4.30mm, 220µF, 16V, 20%, RoHS	Kemet	T521X227M016ATE035-T
1	C35	CAP, SMD, 0805, 1000pF, 200V, 10%, X7R, RoHS	Vishay	VJ0805Y102KXCAC-T
3	C100, C101, C102	CAP, SMD, 0805, 0.1µF, 25V, 10%, X7R, RoHS	Vishay	VJ0805Y104KXXAT-T
0	C37	Do Not Populate or Purchase	-	-
1	C36	CAP, SMD, 0805, 1200pF, 100V, 10%, X7R, RoHS	Vishay	VJ0805Y122KXBMC-T
8	C3, C4, C17, C18, C19, C20, C52, C53	CAP, SMD, 1812, 0.47µF, 100V, 10%, X7R, RoHS	Vishay	VJ1812Y105KBBAT4X-T
1	CSNUB	CAP, SMD, 1812, 0.47µF, 100V, 10%, X7R, RoHS	Vishay	VJ1812Y474KXBAT-T
2	D8, D12	Diode-Switching, SMD, SOT-23-3, 100V, 215mA, RoHS	Nexperia	BAS16-QR-T
3	D1, D2, D7	Diode-Schottky, SMD, SOD-123, 100V, 0.15A, RoHS	Vishay	BAT46W-E3-08-T

Qty	Ref Des	Description	Manufacturer	Part Number
1	D16	Diode-Zener, SMD, DO-219AB, 20V, 800mW, RoHS	Vishay	BZD27B20P-M3-08-T
1	D5	Diode-Zener, SMD, SOD-523, 13V, 300mW, RoHS	Diodes	BZT52C13T-7-T
3	D3, D4, D6	Diode-Rectifier, SMD, TO-277A, 200V, 8A, RoHS	STMicroelectronics	STTH802SF-T
1	DSNUB	Diode-Rectifier, SMD, DO214_AC, 200V, 1A, RoHS	Fairchild	ES1D
1	J2	CONN-HEADER, 1x4, BRKAWY 1×36, 2.54mm, RoHS	Various	Generic
1	J1	CONN-HEADER, 1x6, BRKAWY 1×36, 2.54mm, RoHS	Various	Generic
1	L1	COIL-PWR Inductor, SMD, 11.3×10mm, 4.7µH, 20%, RoHS	Coilcraft	XAL1010-472MED-T
1	Q5	Transistor, NPN, SMD, SOT-89, 4P, 60V, 1A, RoHS	Diodes Inc	BCX55-16-T
2	Q3, Q4	IC-Sample Die, Rad Hard, 100V GAN FET, RoHS	Renesas	ISL70023SEHX/SAMPLE
2	Q1, Q2	IC-Sample Die, Rad Hard, 200V GAN FET, RoHS	Renesas	ISL70024SEHX/SAMPLE
4	R46, R47, R49, R50	RES-AEC-Q200, SMD, 0603, 10K, 1/10W, 1%, TKF, RoHS	Vishay	CRCW060310K0FKEB-T
1	R18	RES, SMD, 0603, 243Ω, 1/10W, 1%, TKF, RoHS	Vishay	RC0603FR-07243RL-T
4	R28, R29, R30, R31	RES-AEC-Q200, SMD, 0603, 3Ω, 1/10W, 1%, TF, RoHS	Vishay	CRCW06033R00FKEA-T
1	R8	RES-AEC-Q200, SMD, 0603, 2.55Ω, 1/10W, 1%, TKF, RoHS	Vishay	CRCW06032R55FKEA-T
1	R52	RES-AEC-Q200, SMD, 0603, 14K, 1/10W, 0.1%, TNF, RoHS	Panasonic	ERA-3AEB1402V-T
1	R41	RES-AEC-Q200, SMD, 0603, 5.62K, 1/10W, 0.1%, TNF, RoHS	Panasonic	ERA-3AEB5621V-T
1	R39	RES-AEC-Q200, SMD, 0603, 30.1K, 1/5W, 1%, RoHS	Panasonic	ERJ-PB3B3012V-T
1	R40	RES-AEC-Q200, SMD, 0603, 60.4K, 1/10W, 0.1%, TKF, RoHS	Stackpole	RMCF0603FT60K4
0	R2, R5, R6, R51, R57, R58	DO NOT POPULATE OR PURCHASE	-	-
1	R53	RES, SMD, 0603, 11K, 1/10W, 1%, TF, RoHS	Yageo	AC0603FR-0711KL-T
1	R9	RES, SMD, 0603, 1.24K, 1/10W, 1%, TKF, RoHS	Yageo	RC0603FR-071K24L-T
1	R42	RES, SMD, 0603, 20.5K, 1/10W, 1%, TKF, RoHS	Yageo	RC0603FR-0720K5L-T
0	R14, R19, R23, R43	DO NOT POPULATE OR PURCHASE	-	-
4	R20, R21, R22, R48	RES-AEC-Q200, SMD, 0603, 10Ω, 1/10W, 1%, TKF, RoHS	Rohm	KTR03EZPF10R0-T
1	R36	RES-AEC-Q200, SMD, 0603, 2.87K, 1/10W, 1%, RoHS	Rohm	ERJ-3EKF2871V-T
1	R35	RES, SMD, 0603, 113K, 1/10W, 1%, TKF, RoHS	Yageo	RC0603FR-07113KL-T
1	R10	RES, SMD, 0805, 402K, 1/8W, 1%, TKF, RoHS	Yageo	RC0805FR-07402KL-T
1	RSHORT	RES, SMD, 1210, 0Ω, TKF, RoHS	Yageo	RC1210JR-070RL-T
1	R56	RES, SMD, 0603, 1.4K, 1/10W, 1%, TKF, RoHS	KOA Speer	RK73H1JTTD1401F-T
2	R54, R55	RES-AEC-Q200, SMD, 0603, 10K, 1/10W, 1%, TKF, RoHS	Stackpole	RMCF0603FT10K0-T
2	R24, R44	RES-AEC-Q200, SMD, 0603, 10Ω, 1/10W, 1%, TKF, RoHS	Stackpole	RMCF0603FT10R0-T
1	R37	RES-AEC-Q200, SMD, 0603, 2.2K, 1/10W, 1%, TKF, RoHS	Stackpole	RMCF0603FT2K20-T

Qty	Ref Des	Description	Manufacturer	Part Number
1	R3	RES-AEC-Q200, SMD, 0603, 332K, 1/10W, 1%, TKF, RoHS	Stackpole	RMCF0603FT332K-T
1	R4	RES-AEC-Q200, SMD, 0603, 44.2K, 1/10W, 1%, TKF, RoHS	Stackpole	RMCF0603FT44K2-T
1	R11	RES-AEC-Q200, SMD, 0603, 73.2K, 1/10W, 1%, TKF, RoHS	Stackpole	RMCF0603FT73K2-T
1	R12	RES-AEC-Q200, SMD, 0603, 84.5K, 1/10W, 1%, TKF, RoHS	Stackpole	RMCF0603FT84K5
3	R15, R16, R17	RES-AEC-Q200, SMD, 2010, 100Ω, 1W, 1%, TKF, RoHS	Stackpole	RMCP2010FT100R-T
3	R25, R26, R27,	RES-AEC-Q200, SMD, 2010, 33Ω, 1W, 1%, TKF, RoHS	Stackpole	RMCP2010FT33R0-T
0	R33, R34	DO NOT POPULATE OR PURCHASE	-	-
1	R13	RES-AEC-Q200, SMD, 1206, 1K, 1/4W, 0.1%, TNF, RoHS	KOA	RN73R2BTTD1001B25-T
1	R7	RES, SMD, 0603, 100Ω, 1/10W, 1%, TKF, RoHS	Yageo	RC0603FR-07100RL-T
2	R38, R45	RES-AEC-Q200, SMD, 0603, 10K, 1/10W, 0.1%, TNF, RoHS	Vishay	TNPW060310K0BEEA-T
1	R1	RES, SMD, 0603, 0Ω, W, TKF, RoHS	Yageo	RC0603JR-070RL-T
1	RSNUB (R32)	RES, SMD, 2010, 1k, 1W RoHS	Stackpole	RMCP2010FT1K00-T
1	T1	Transformer-Planar, 300W, Custom, AUX Winding 2TURN	Coilcraft	PL300X2-101L
1	T2	Transformer-Current, 1:50 Turns, 0.333mH, 20A, RoHS	Coilcraft	CST7030-050LC
3	U2, U3, U4	IC-GaN FET Driver, 8PTDFN, 4×4, RoHS	Renesas	ISL71040MRTZ
1	U5	IC-RH, Dual Comparator, CFP, 10P, RoHS	Renesas	ISL7119RHF/PROTO
1	U1	IC RT plastic, PWM Controller, 19V, 1.5A, RoHS	Renesas	ISL73846M30NEZ
3	JP1, UVLO_SEL, VDD_SEL	CONN-HEADER, 1×3, BRKAWY 1×36, 2.54mm, RoHS	FCI	68000-236HLF-1X3
1	NA	Feedback Isolator	Renesas	ISLFBKISOEV2Z

2.4 Board Layout

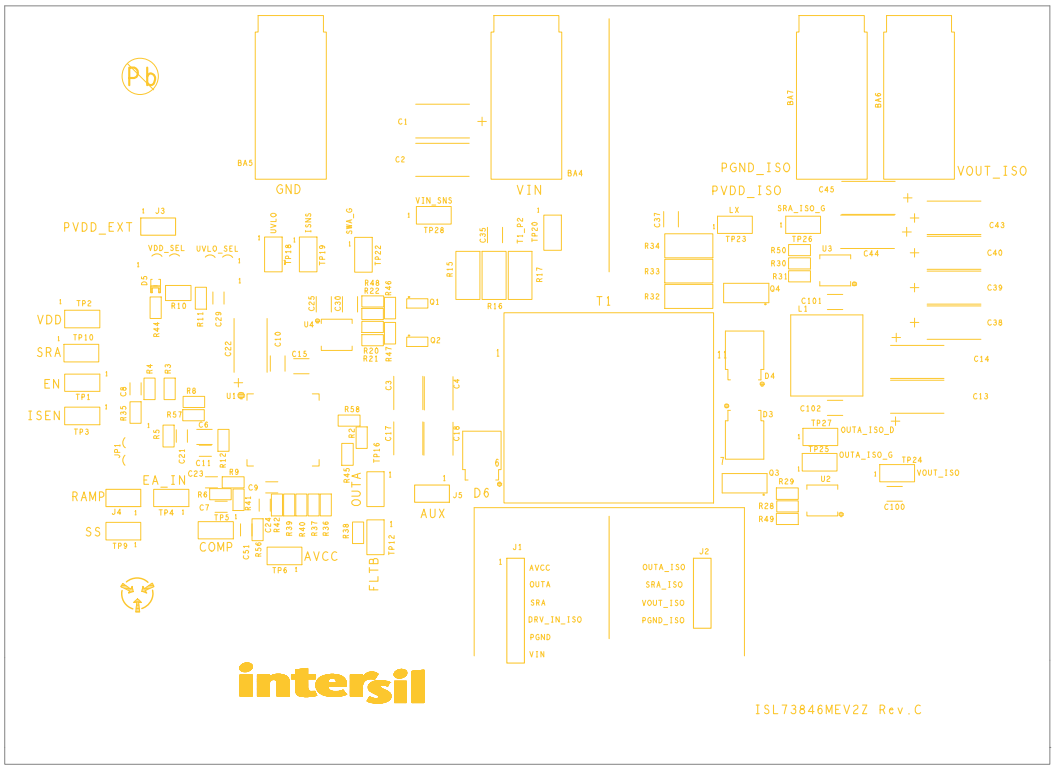


Figure 7. Top Silkscreen

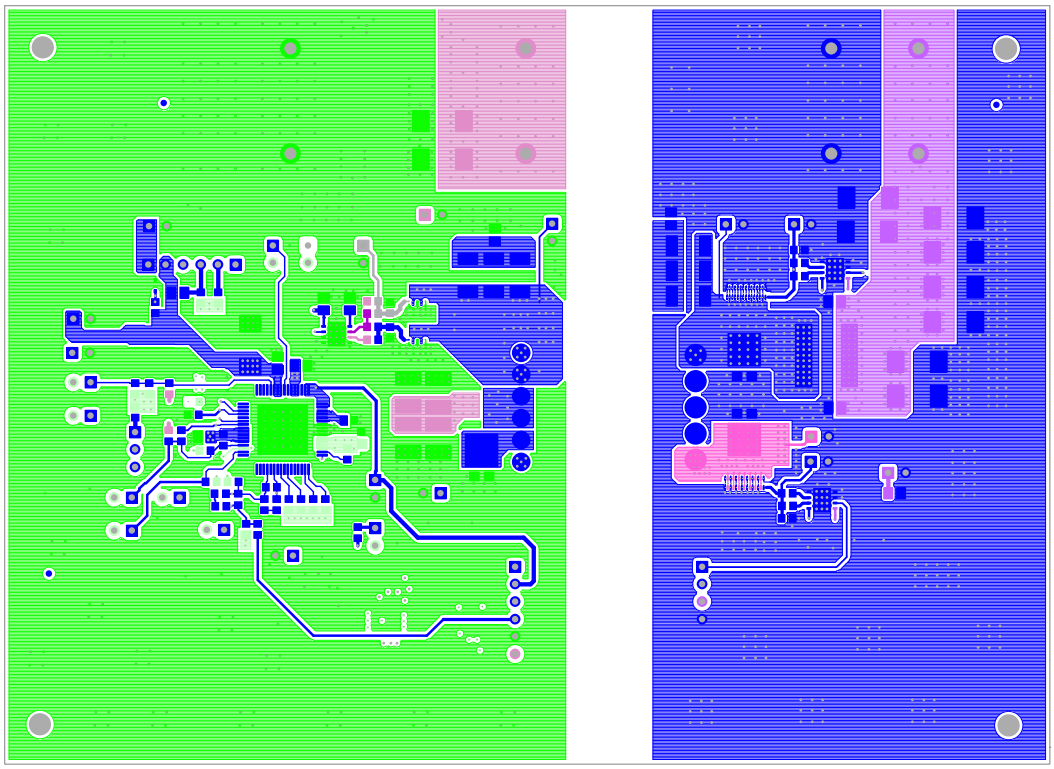


Figure 8. Top Layer

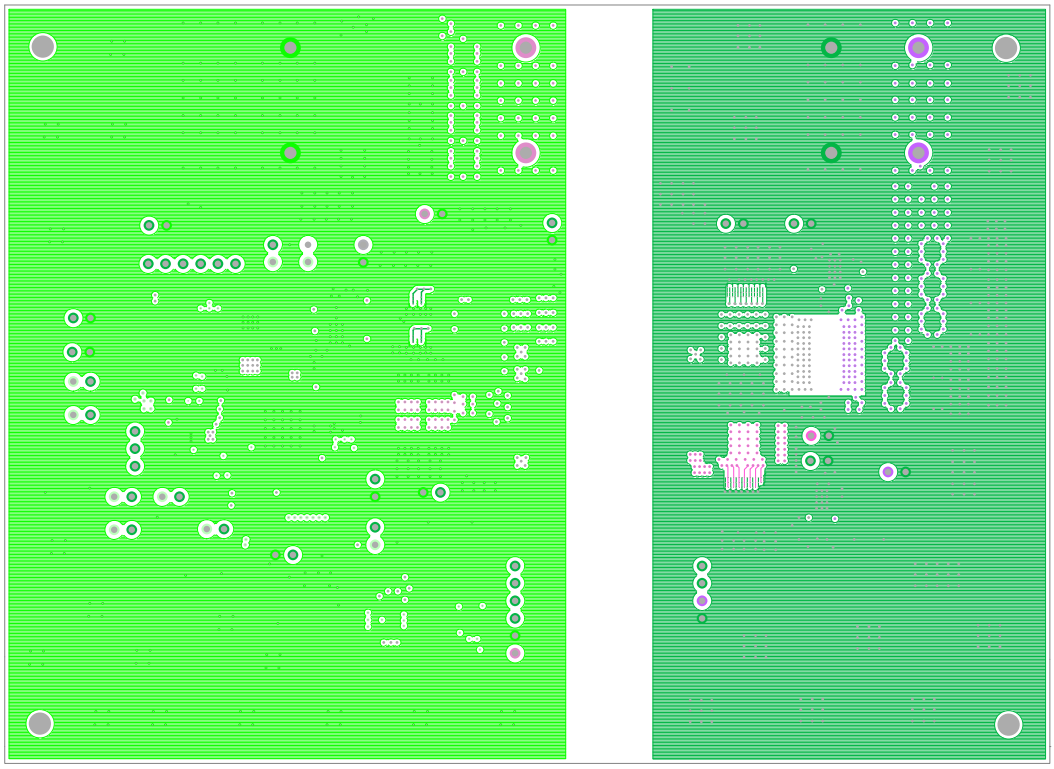


Figure 9. Layer 2

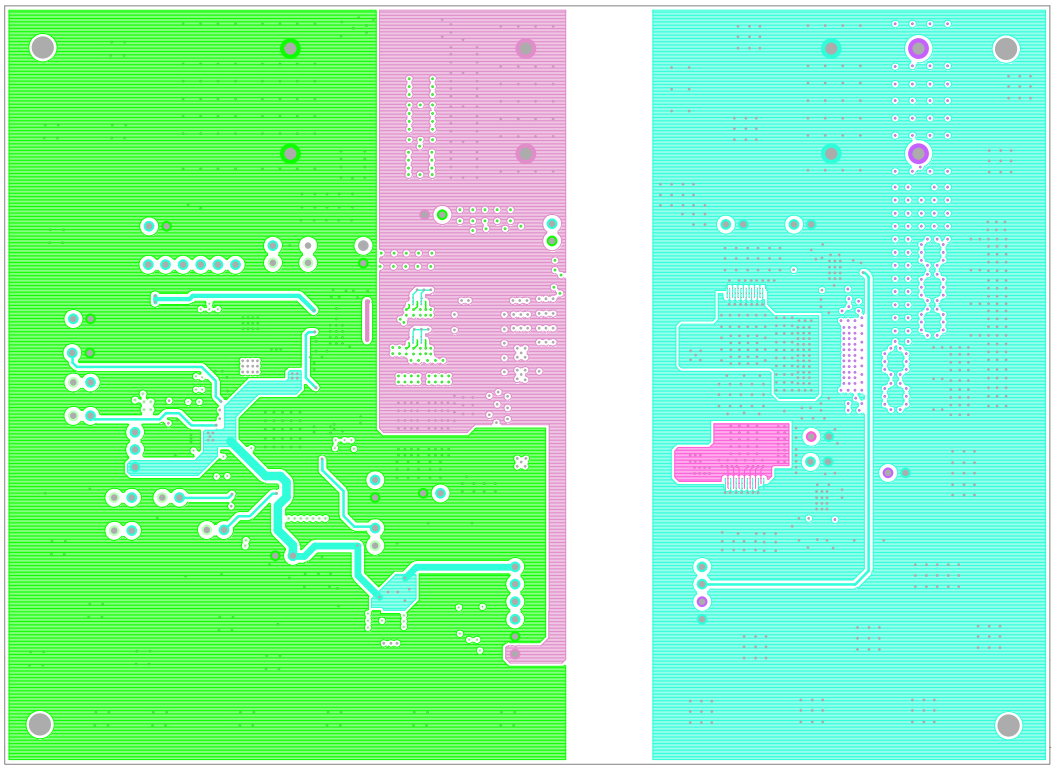


Figure 10. Layer 3

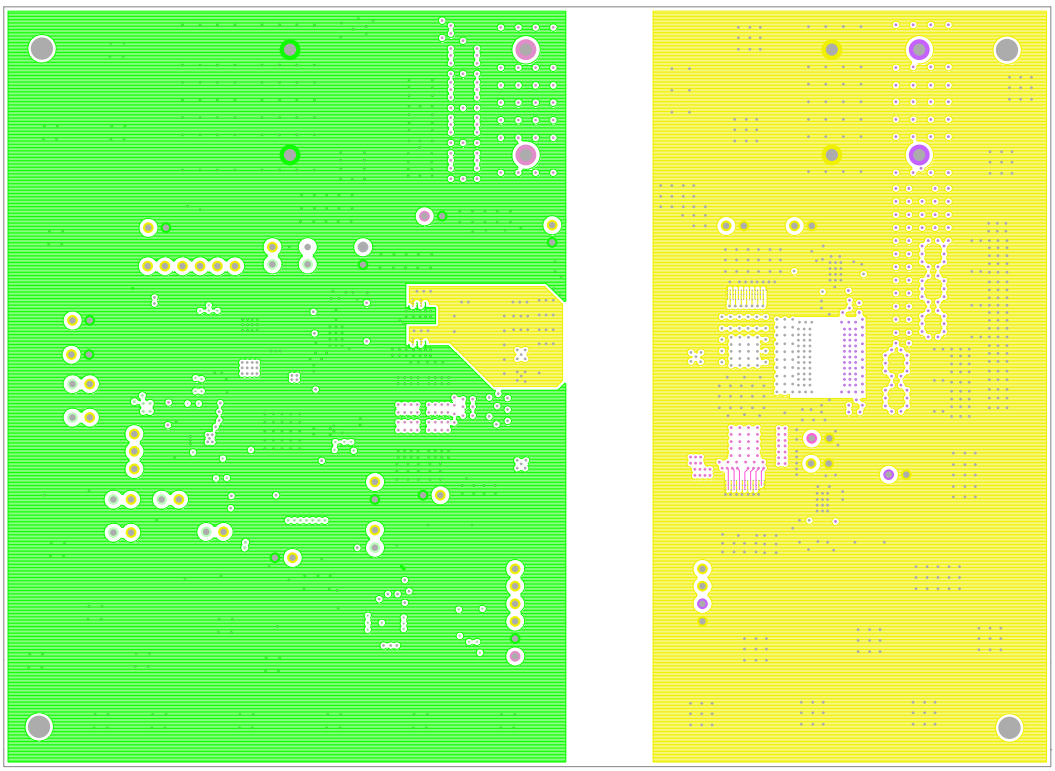
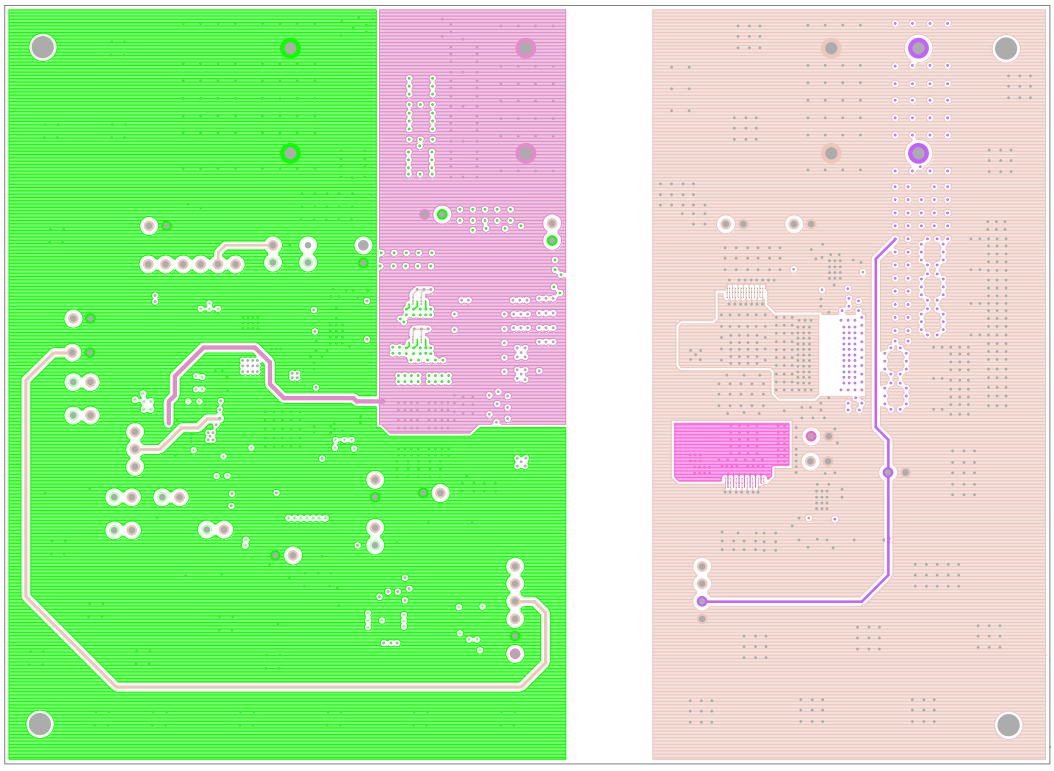


Figure 11. Layer 4



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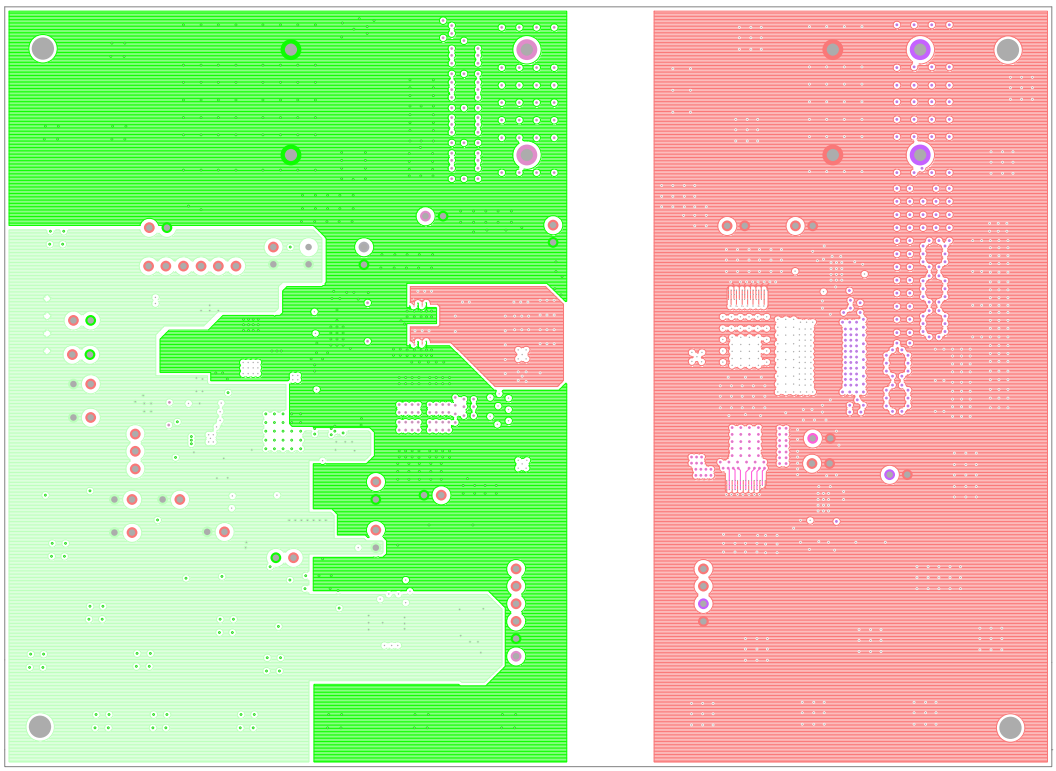

Figure 13. Layer 6

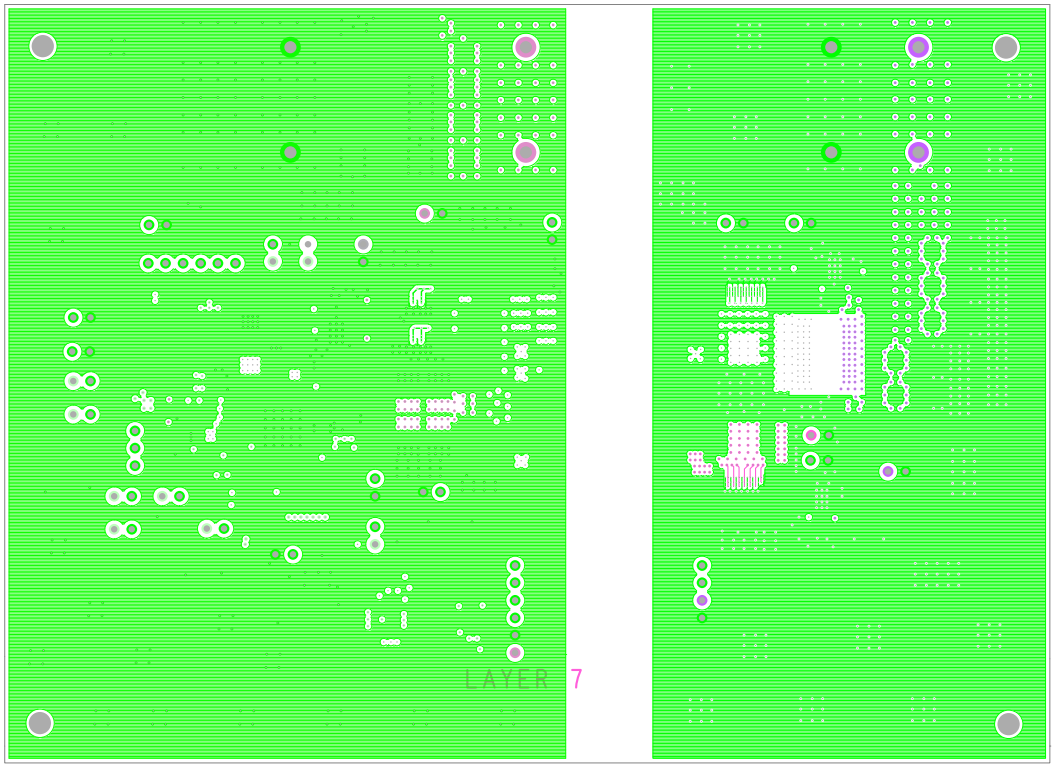

Figure 14. Layer 7

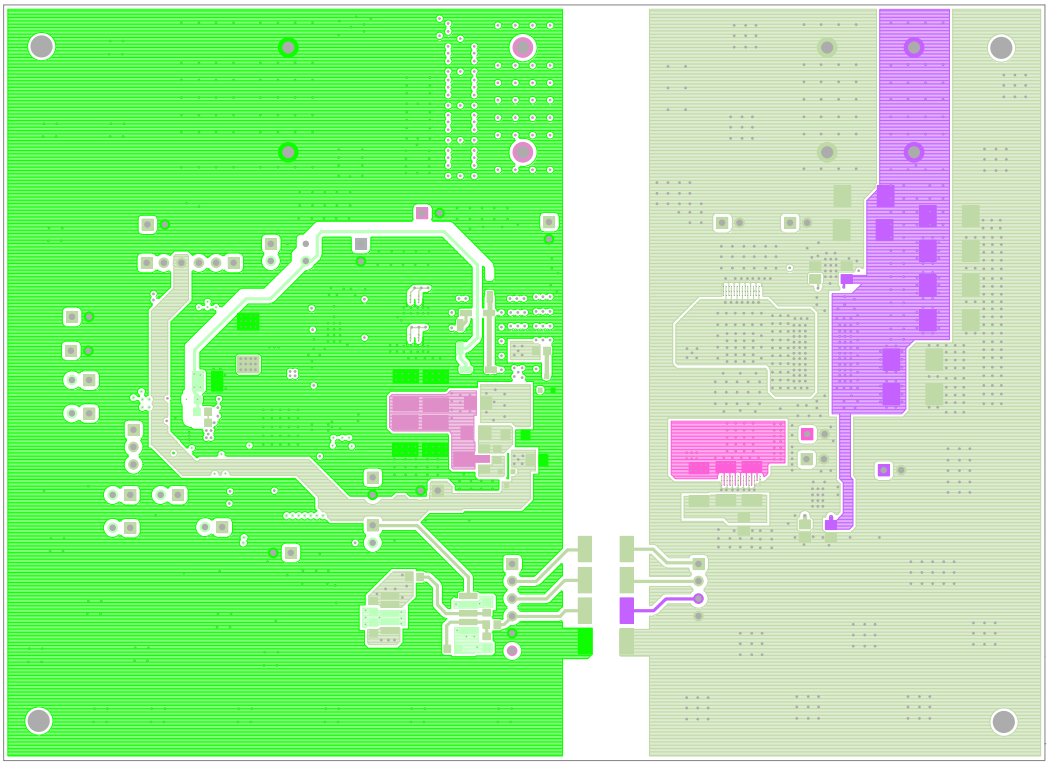

Figure 15. Bottom Layer

Figure 16. Bottom Silkscreen

3. Board Modification for RCD Snubber

The RC snubber for the LX node was modified to an RCD snubber by first removing R32, R33, R34, and C37 then proceeding to do the following steps:

1. Place an ES1D 200V diode between the left pad of R34 and C37 ground pad (diode cathode facing ground) as shown in Figure 17.
2. Place a 0.47µF 100V X7R capacitor across the R33 PCB pads as shown in Figure 17.
3. Place a 1k resistor across the R32 PCB pads as shown in Figure 17.

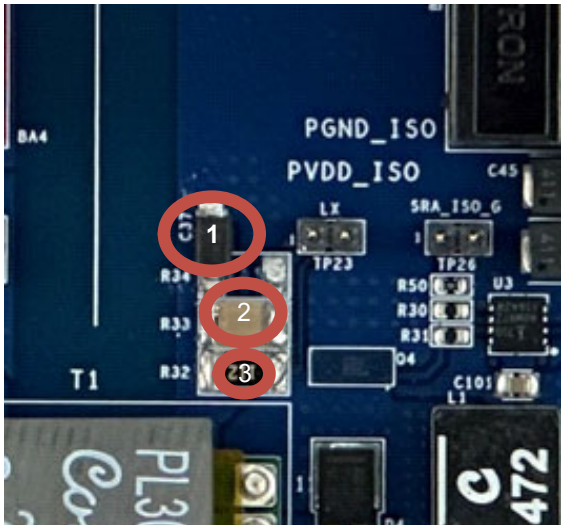

Figure 17. RC Snubber Modified to RCD Snubber

4. ISLFBKISOEV2Z (Isolation Board)

The ISLFBKISOEV2Z Board was developed specifically to provide feedback isolation to the ISL73846MEV2Z and ISL73846SLHEV2Z single-switch forward converters. It also provides isolation to the synchronous rectifiers PWM signals OUTA and SRA.

4.1 Features

- Closed Loop Fly back housekeeping supply.
- Feedback isolation.

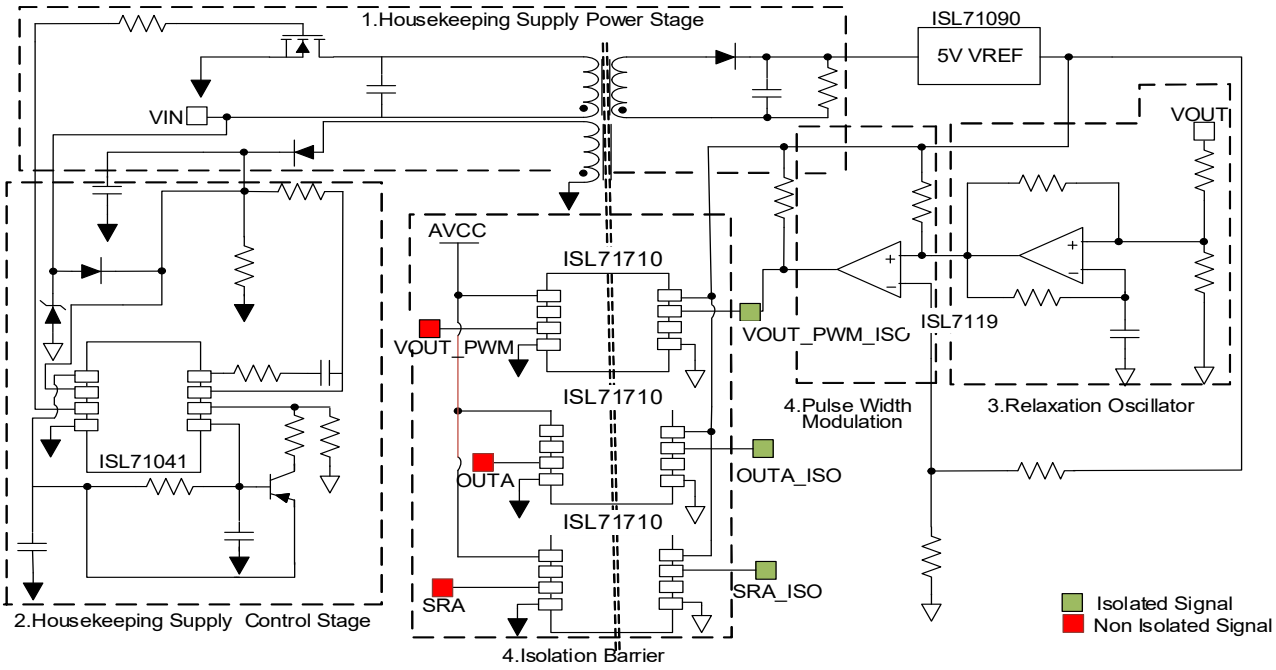

Figure 18. ISLFBKISOEV2Z Block Diagram

4.2 Functional Description

This board was developed specifically for radiation hardened PWM controller ISL73846M. To provide galvanic isolation for the V_{IN} = 28V to V_{OUT} = 5V forward converter evaluation boards, ISL73846MEV2Z and ISL73846SLHEV2Z.

The FB isolation circuit is divided into two main stages illustrated in Figure 19

- Converting the VOUT DC voltage into a Pulse Width Modulated signal (4V at 80% duty cycle).
- Transmitting the PWM Signal across an isolation barrier circuit

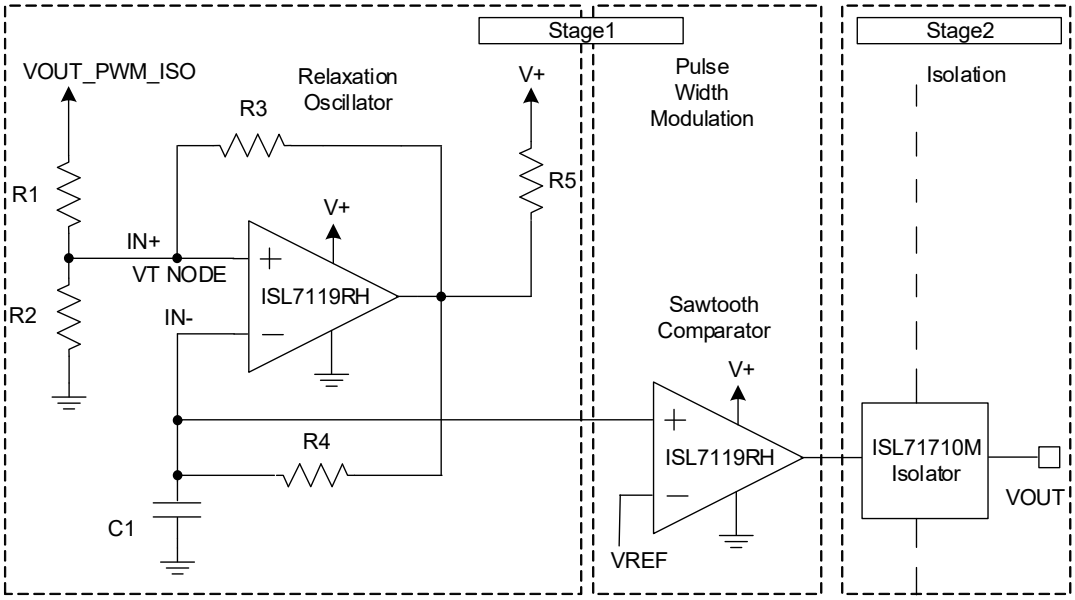

Figure 19. FB Isolation Circuit Main Stages

4.3 Schematic Diagrams

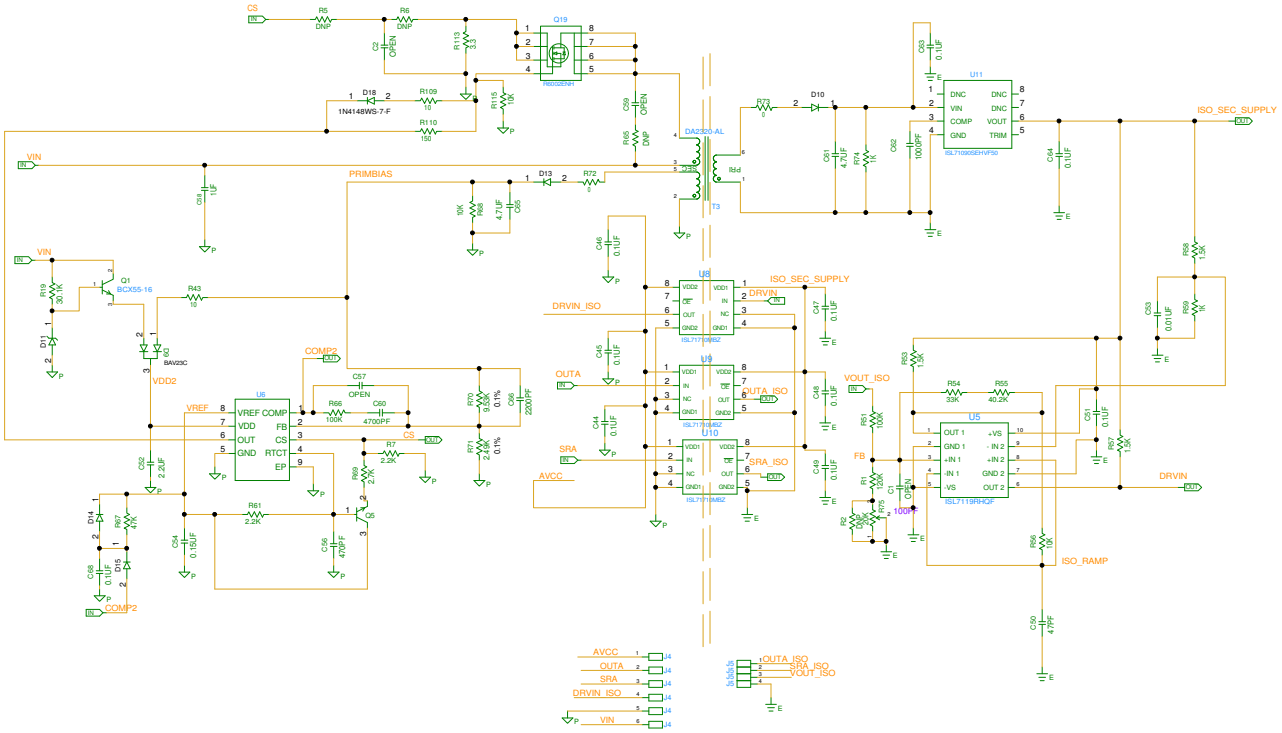

Figure 20. ISLFBKISOEV2Z Schematic

4.4 ISLFBKISOEV2Z Bill of Materials

Qty	Ref Designator	Description	Manufacturer	Part Number
2	D10, D13	Diode -Rectifier, SMD, SOD-323, 2P, 100V, 250mA, ROHS	Diodes	1N4148WS
3	D14, D15, D18	Diode -Rectifier, SMD, SOD-323, 2P, 75V, 150mA, ROHS	Diodes	1N4148WS-7-F
1	D9	Diode-Array, SMD, SOT-23-3, 200V, 200mA, 1 PAIR Common CATH, ROHS	Diodes	BAV23C
1	D11	Diode-Zener, SMD, DO-219AB, 12V, 800mW, ROHS	Vishay	BZD27B12P-M
1	R75	POT-TRIM, TH, 20K, 0.25W, 10%, JLEAD, Sealed, TOP ADJ, ROHS	Bourns	3224W-1-203E-T
1	R19	RES-AEC-Q200, SMD, 0603, 30.1K, 1/10W, 1%, TKF, ROHS	Yageo	AC0603FR-0730K1L-T
2	R72, R73	RES-AEC-Q200, SMD, 0805, 0Ω, 1/2W, TF, ROHS	Vishay	CRCW08050000Z0EAHP-T
1	R56	RES-AEC-Q200, SMD, 0603, 10K, 1/10W, 0.1%, TNF, ROHS	Panasonic	ERA-3AEB103V-T
1	R55	RES-AEC-Q200, SMD, 0603, 40.2K, 1/10W, 0.1%, ROHS	Panasonic	ERA-3AEB4022V-T
1	R70	RES-AEC-Q200, SMD, 0603, 9.53K, 1/10W, 0.1%, TNF, ROHS	Panasonic	ERA-3AEB9531V-T
1	R69	RES-AEC-Q200, SMD, 0603, 2.7K, 1/10W, 1%, ROHS	Panasonic	ERJ3EKF2701V-T
0	R5, R6	DO NOT POPULATE OR PURCHASE	-	-
1	R59	RES-AEC-Q200, SMD, 0603, 1K, 1/10W, 0.1%, TNF, ROHS	Panasonic	ERA-3AEB102V-T

Qty	Ref Designator	Description	Manufacturer	Part Number
1	R1	RES, SMD, 0603, 120KΩ, 0.1%, 1/16W	TE	CPF0603B120KE1-T
2	R51, R66	RES, SMD, 0603, 100K, 1/16W, 0.1%, TF, ROHS	TE	CPF0603B100KE-T
3	R53, R57, R58	RES, SMD, 0603, 1.5K, 1/16W, 0.1%, TF, ROHS	TE	CPF0603B1K5E-T
1	R61	RES, SMD, 0603, 2.2K, 1/16W, 0.1%, ROHS	TE	CPF0603B2K2E1-T
1	R54	RES, SMD, 0603, 33K, 1/16W, 0.1%, ROHS	TE	CPF0603B33KE1-T
1	R67	RES, SMD, 0603, 47K, 1/10W, 1%, TKF, ROHS	Yageo	RC0603FR-0747KL-T
1	R74	RES, SMD, 1206, 1K, 1/4W, 1%, TF, ROHS	Panasonic	ERJ-8ENF1001V-T
0	R65	DO NOT POPULATE OR PURCHASE	-	-
0	R2	DO NOT POPULATE OR PURCHASE	-	-
2	R68, R115	RES-AEC-Q200, SMD, 0603, 10K, 1/10W, 1%, TKF, ROHS	Stackpole	RMCF0603FT10K0-T
1	R110	RES-AEC-Q200, SMD, 0603, 150Ω, 1/10W, 1%, TKF, ROHS	Stackpole	RMCF0603FT150R-T
1	R7	RES-AEC-Q200, SMD, 0603, 2.2K, 1/10W, 1%, TKF, ROHS	Stackpole	RMCF0603FT2K20-T
1	R71	RES, SMD, 0603, 2.49K, 1/10W, 0.1%, TNF, ROHS	Yageo	RT0603BRE072K49L-T
1	R113	RES-AEC-Q200, SMD, 0805, 3.3Ω, 1/2W, 1%, TKF, ROHS	KOA	SG73P2ATTD3R30F-T
2	R43, R109	RES-AEC-Q200, SMD, 0603, 10Ω, 1/10W, 1%, TKF, ROHS	Rohm	KTR03EZPF10R0-T
1	C53	CAP, SMD, 0603, 0.01µF, 25V, 10%, X7R, ROHS	Kemet	C0603C103K3RAC7411-T
1	C66	CAP, SMD, 0603, 2200pF, 25V, 10%, X7R, ROHS	Kemet	C0603C222K3RAC7867-T
1	C54	CAP-AEC-Q200, SMD, 0603, 0.15µF, 25V, 10%, X7R, ROHS	TDK	CGA3E2X7R1E154K080AA-T
7	C44, C45, C46, C47, C48, C49, C51	CAP-AEC-Q200, SMD, 0603, 0.1µF, 50V, 10%, X7R, ROHS	Murata	GCJ188R71H104KA12D-T
1	C52	CAP, SMD, 0603, 2.2µF, 25V, 10%, X7S, ROHS	Murata	GRM188C71E225KE11D-T
2	C61, C65	CAP, SMD, 0603, 4.7µF, 35V, 10%, X5R, ROHS	Murata	GRM188R6YA475KE15D-T
1	C62	CAP, SMD, 0805, 1000pF, 25V, 10%, X7R, ROHS	Kyocera	KGM21NR71E102KT-T
1	C68	CAP, SMD, 0603, 0.1µF, 16V, 10%, X7R, ROHS	Kemet	GCJ188R71H104KA12D-T
2	C63, C64	CAP, SMD, 0603, 0.1µF, 16V, 20%, X7R, ROHS	Kemet	GCJ188R71H104KA12D-T
1	C50	CAP, SMD, 0603, 47pF, 50V, 5%, C0G/NP0, ROHS	Yageo	CC0603JRNP09BN470-T
1	C56	CAP, SMD, 0603, 470pF, 50V, 5%, C0G/NP0, ROHS	Murata	GRM1885C1H471JA01D-T
1	C60	CAP, SMD, 0603, 4700pF, 50V, 5%, C0G/NP0, ROHS	TDK	C1608C0G1H472J080AA-T
0	C1, C2, C57	DO NOT POPULATE OR PURCHASE	-	-
1	C58	CAP, SMD, 1812, 1µF, 100V, 10%, X7R, ROHS	Vishay	VJ1812Y105KBBAT4X-T
1	Q1	Transistor, NPN, SMD, SOT-89, 4P, 60V, 1A, ROHS	Diodes Inc	BCX55-16-T
1	Q5	Transistor, NPN, 3P, SOT23, 30V, 600mA, ROHS	Motorola	MMBT2222LT1G-T
1	Q19	Transistor, SMD, 8SOP, MOSFET, N-CHANNEL, 600V, 1.7A, 2W, ROHS	Rohm	R6002ENHTB1-T
1	U6	IC-Current Mode PWM, 50% DC, 7.0V UVLO, 8P, RoHS	Renesas	ISL71041MRTZ
1	U11	IC-RH, Ultralow Noise, 5.0V, ROHS	Renesas	ISL71090SEHVF50
1	U5	IC-RH High Speed Dual Voltage Comparator, ROHS	Renesas	ISL7119RHQF
3	U8, U9, U10	IC-Digital Active Isolator, SMD, 8P, SOICN, ROHS	Renesas	ISL71710MBZ
1	J5	CONN-Socket, TH, 1×4, Insulated, 2.54mm, ROHS	Sullins	PPTC041LFBN-RC

Qty	Ref Designator	Description	Manufacturer	Part Number
1	J4	CONN-Receptacle, Female, TH, 1×6, 2.54mm Pitch, ROHS	Sullins	PPTC061LFBN-RC
1	T3	Transformer, SMD, 6.6mm, 264µH, MAX 95pF, ROHS	Coilcraft	DA2320-AL

4.5 Board Layout

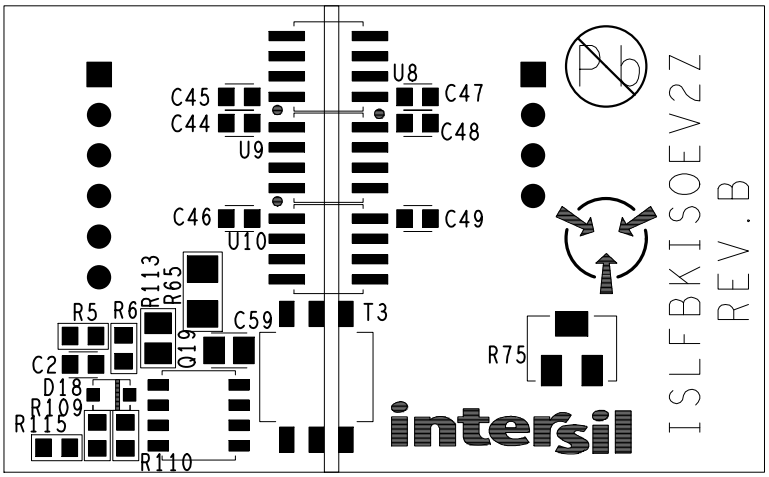

Figure 21. Top Silk Screen

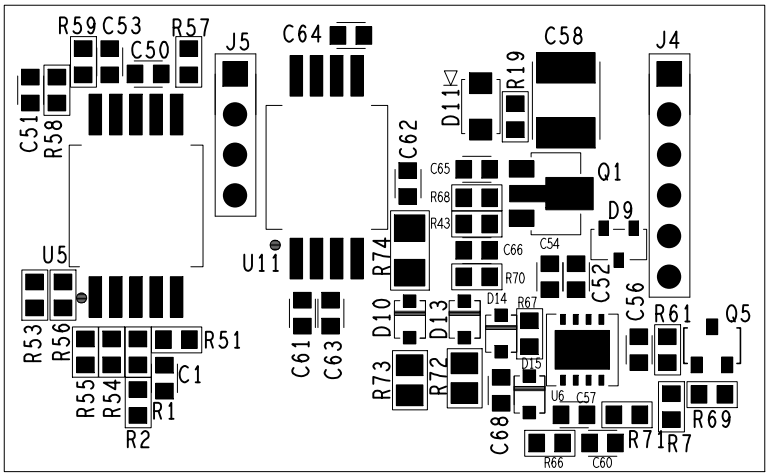

Figure 22. Bottom Silk Screen

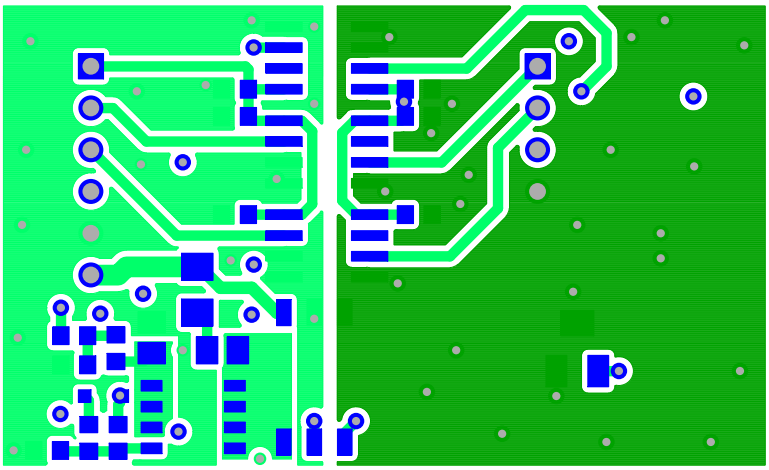

Figure 23. Top Layer

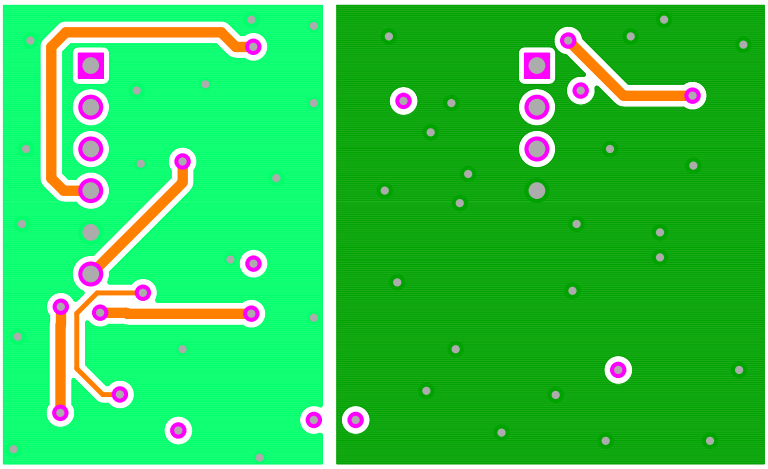

Figure 24. Layer 2

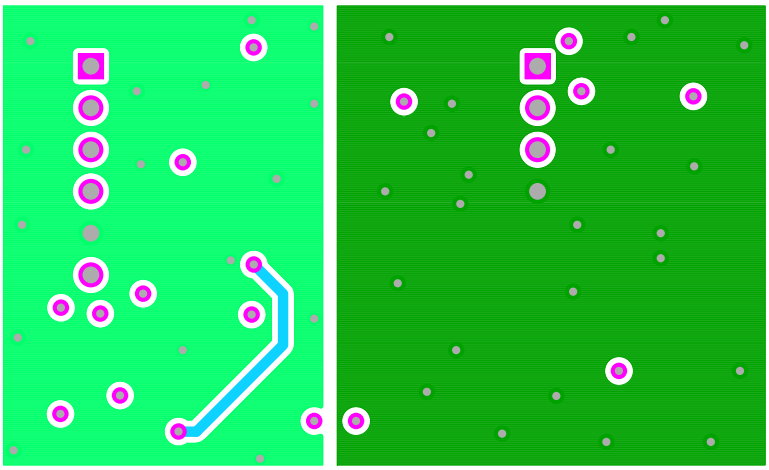

Figure 25. Layer 3

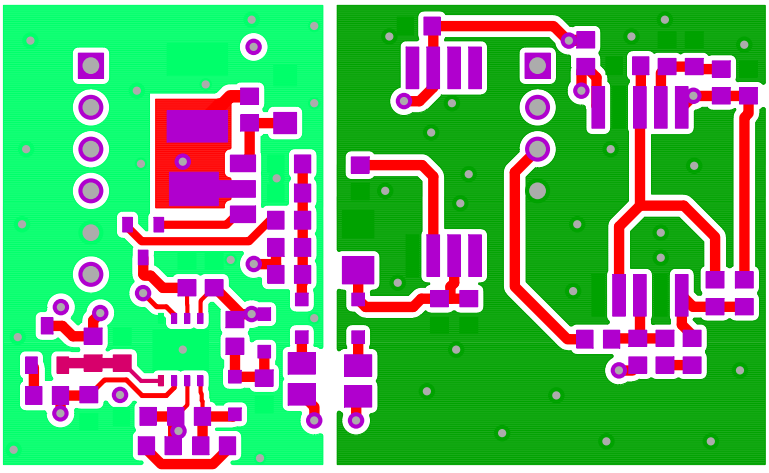

Figure 26. Bottom Layer 3

5. Overvoltage Protection Circuit

To protect the forward converter from a negative overcurrent, a comparator, ISL7119RHQF (U5 in the schematics shown in Figure 6) was added. This comparator pulls the FLTB pin of the ISL73846M low, forcing the converter to restart every time a feedback higher than 4.8V is detected from the isolator output.

6. Typical Performance Graphs

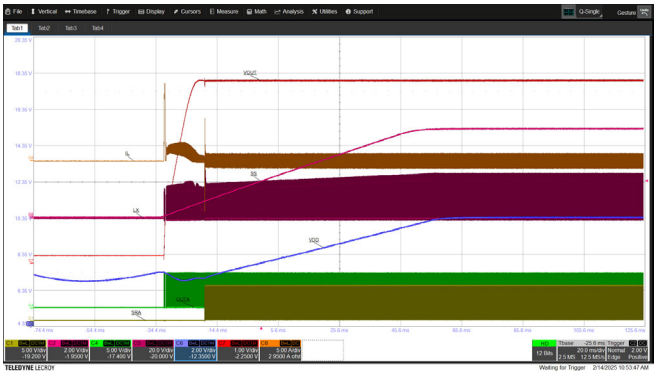

Figure 27. Startup with VIN 28V and No Load

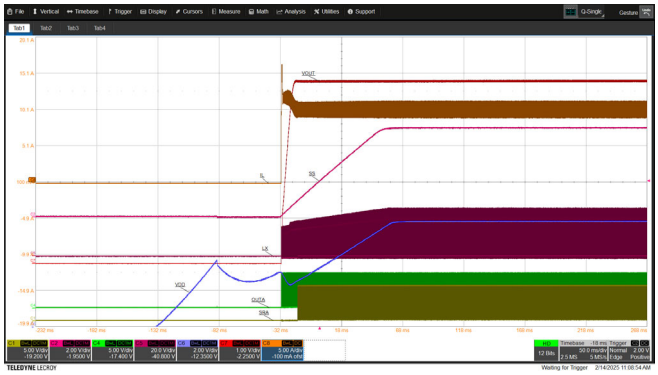

Figure 28. Startup with VIN 28V and 10A Load

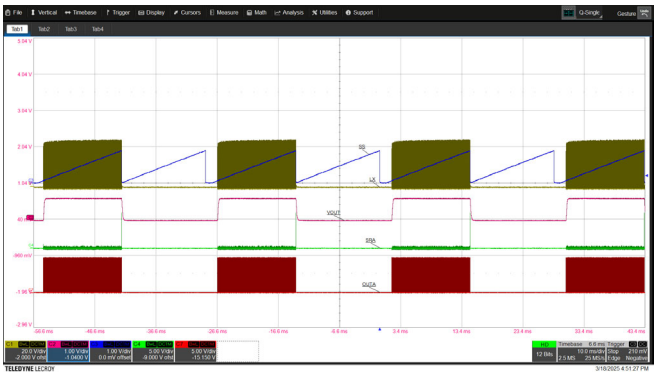

Figure 29. Startup with Output Short OCP Response, V_{IN} = 28V

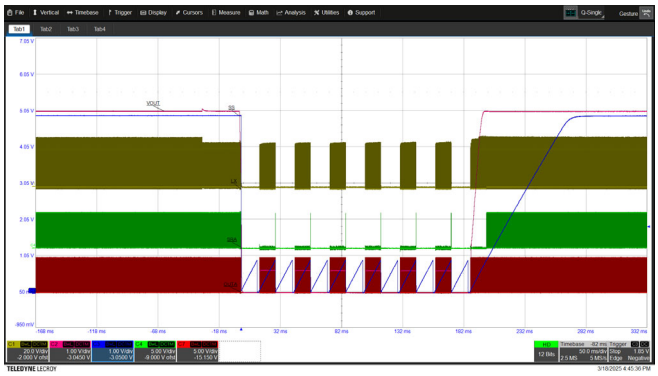

Figure 30. OCP Response Short at Steady State, V_{IN} = 28V

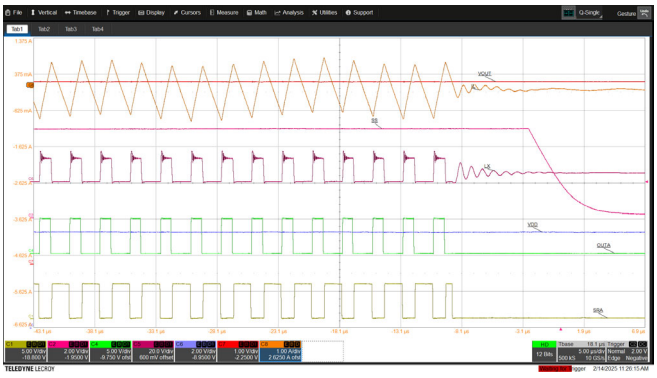

Figure 31. Shutdown with VIN 28V and No Load

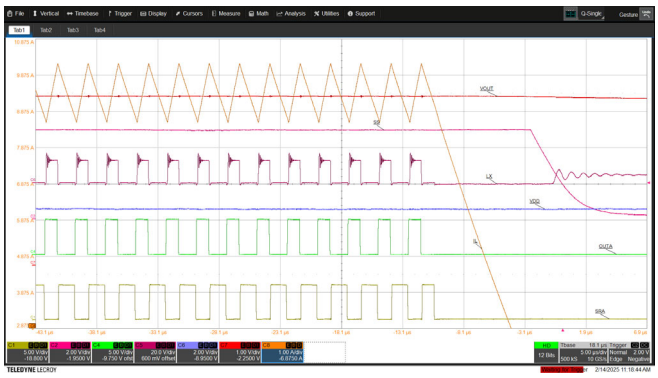

Figure 32. Shutdown VIN 28V and 10A Load

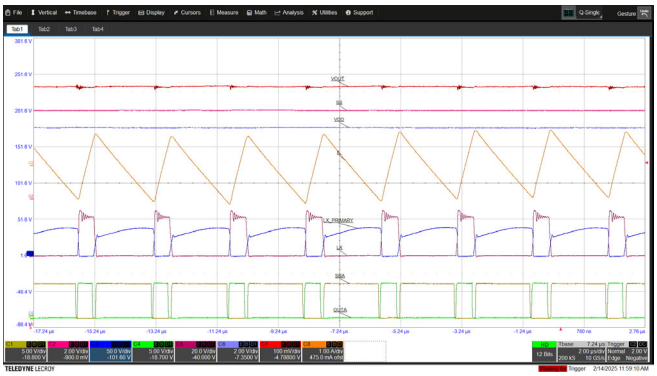

Figure 33. Waveforms with VIN 28V and No Load

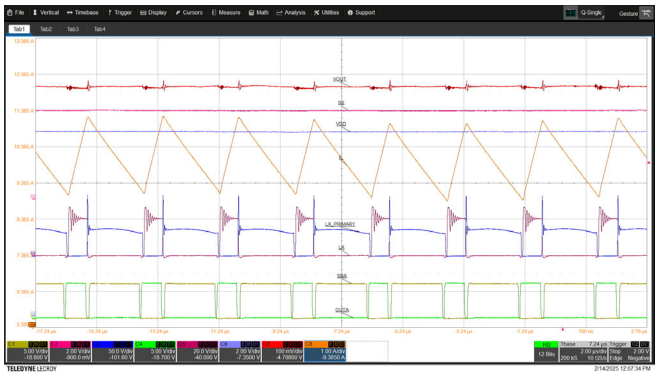

Figure 34. Waveforms with VIN 28V and 10A Load

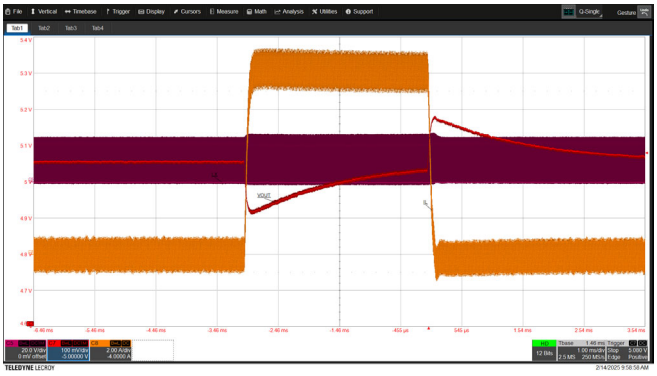

Figure 35. Load Transient with VIN 28V and Step Load from 0 to 10A at Room Temperature

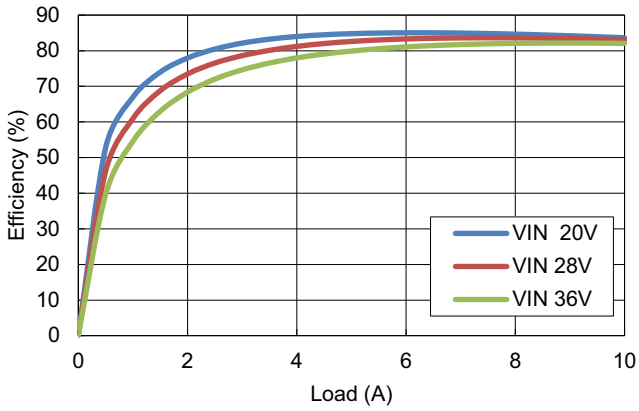

Figure 36. Efficiency with Various VIN at Room Temperature

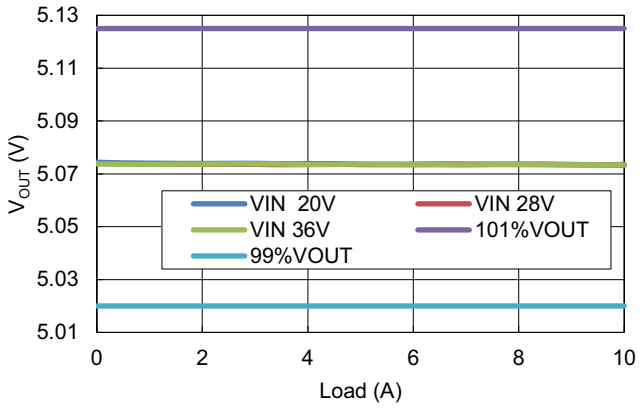

Figure 37. Load Regulation with 50mA Load at Room Temperature

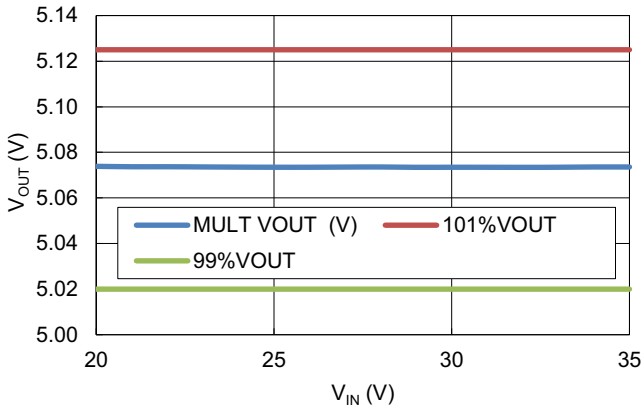

Figure 38. Line Regulation with Various VIN at Room Temperature

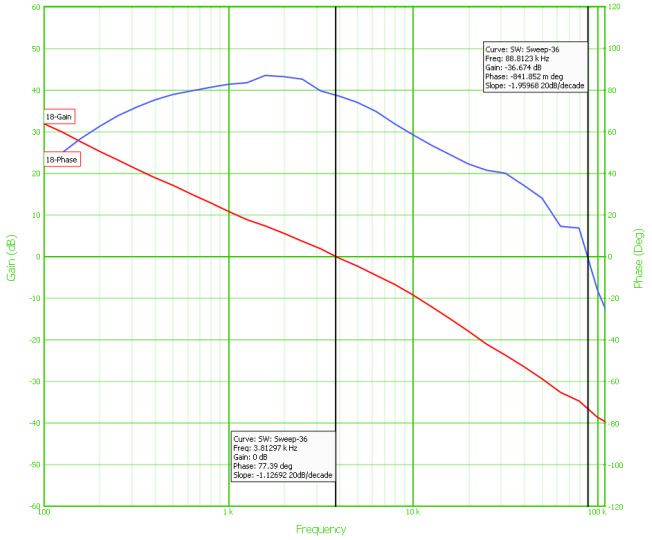

Figure 39. Gain and Phase vs Frequency (V_{IN} = 28V, Load = 1A)

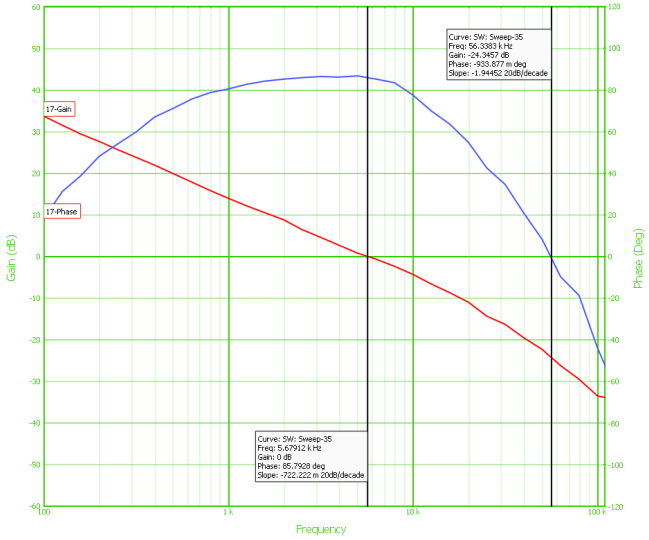

Figure 40. Gain and Phase vs Frequency (V_{IN} = 28V, Load = 5A)

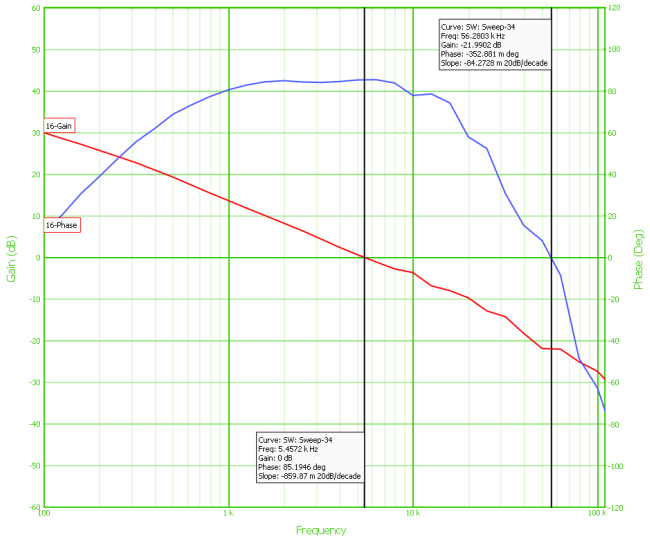

Figure 41. Gain and Phase vs Frequency (V_{IN} = 28V, Load = 10A)

7. Ordering Information

Part Number	Description
ISL73846MEV2Z	ISL73846M Single Switch Isolated Forward Converter Evaluation Board

8. Revision History

Revision	Date	Description
1.02	Jul 18, 2025	Updated BOMs.
1.01	May 28, 2025	Corrected typo in the BOM and Figure 20 title.
1.00	Apr 15, 2025	Initial release

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