ISL85003EVAL2Z, ISL85003AEVAL2Z

Evaluation Board User Guide

AN1930
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Description

The ISL85003 and ISL85003A kits are intended for use for point-of-load applications sourcing from 4.5V to 18V. The kits are used to demonstrate the performance of the ISL85003 and ISL85003A, low quiescent current high efficiency synchronous buck regulators.

The ISL85003 and ISL85003A are offered in a 4x3mm dual flat no lead (DFN) package.

Specifications

The boards are designed to operate at the following operating conditions:

- Input voltage range from 4.5V to 18V
- Resistor programmable output voltage from 0.8V, ±1%
- Up to 3A output current
- Current mode control
  - DCM/CCM
  - Internal or external compensation options
  - 500kHz switching frequency option
  - External synchronization up to 2MHz on ISL85003
- Adjustable soft-start time on the ISL85003A
- Operating junction temperature range: -40°C to +125°C

Quick Setup Guide

1. Ensure that the circuit is correctly connected to the supply and loads prior to applying any power.
2. Connect the bias supply to VIN, the plus terminal to VIN (P4) and the negative return to PGND (P5).
3. Connect the output load to V0, the plus terminal to V0 (P8) and the negative return to PGND (P9).
4. Verify that the position is PWM or PFM for SW2.
5. Verify that the position is ON for SW1.
6. Turn on the power supply.
7. Verify the output voltage is 5V for V0.

Recommended Equipment

The following materials are recommended to perform testing:

- 0V to 25V power supply with at least 10A source current capability
- Electronic loads capable of sinking current up to 7A
- Digital multimeters (DMMs)
- 100MHz quad-trace oscilloscope
- Signal generator

Key Board Features

- Small, compact design
- Switch selectable EN (enabled/disabled)
- Switch selectable MODE (auto-DCM/forced-PWM)
- Connectors and test points for easy probing

References

- ISL85003, ISL85003A datasheet

Ordering Information

PART NUMBER	DESCRIPTION
ISL85003EVAL2Z	Evaluation Board for ISL85003FRZ and ISL85003AFRZ

Evaluating the Other Output Voltage

The ISL85003 and ISL85003A kit outputs are preset to 5V for V_{OUT}; however, the output voltages are programmed using an external resistor divider that scales the feedback relative to the internal reference voltage. The output voltage programming resistor, R_2, will depend on the value chosen for the feedback resistor, R_1, and the desired regulator output voltage, V_{OUT}. The value for the feedback resistor R_1 is typically between 10kΩ and 400kΩ, as shown in Equation 1.

$$R_2 = \frac{R_1 \cdot 0.8V}{V_{OUT} - 0.8V} \quad \text{(EQ. 1)}$$

If the output voltage desired is 0.8V, then R_2 is left unpopulated. R_1 is still required to set the low frequency pole of the modulator compensation.

Switch Control

The ISL85003 and ISL85003A evaluation boards contain SW1 and SW2 for various controls of the ISL85003 and ISL85003A circuitries. Table 1 details this function.

TABLE 1. SWITCH SETTINGS

SW1	ENABLE	FUNCTION
1	OFF	Disable V0
3	ON	Enable V0
SW2	**MODE**	**FUNCTION**
1	DCM	Force DCM
3	PWM	Fixed PWM frequency at light load

Components Selection

V_{OUT}	0.8V	1V	1.2V	1.5V	1.8V	2.5V	3.3V	5V
C_1, C_2	10µF	10µF	10µF	10µF	10µF	10µF	10µF	10µF
C_5	22µF	22µF	22µF	47µF	47µF	47µF	47µF	47µF
C_6	22µF	22µF	22µF	22µF	22µF	22µF	22µF	22µF
C_4	Open	Open	Open	4.7pF	4.7pF	4.7pF	4.7pF	4.7pF
L_1	1.8µH	2.2µH	2.2µH	3.3µH	3.3µH	3.3µH	4.7µH	4.7µH
R_1	301kΩ	301kΩ	301kΩ	301kΩ	301kΩ	301kΩ	301kΩ	301kΩ
R_2	Open	1.2MΩ	604kΩ	344kΩ	241kΩ	142kΩ	96.3kΩ	57.6kΩ

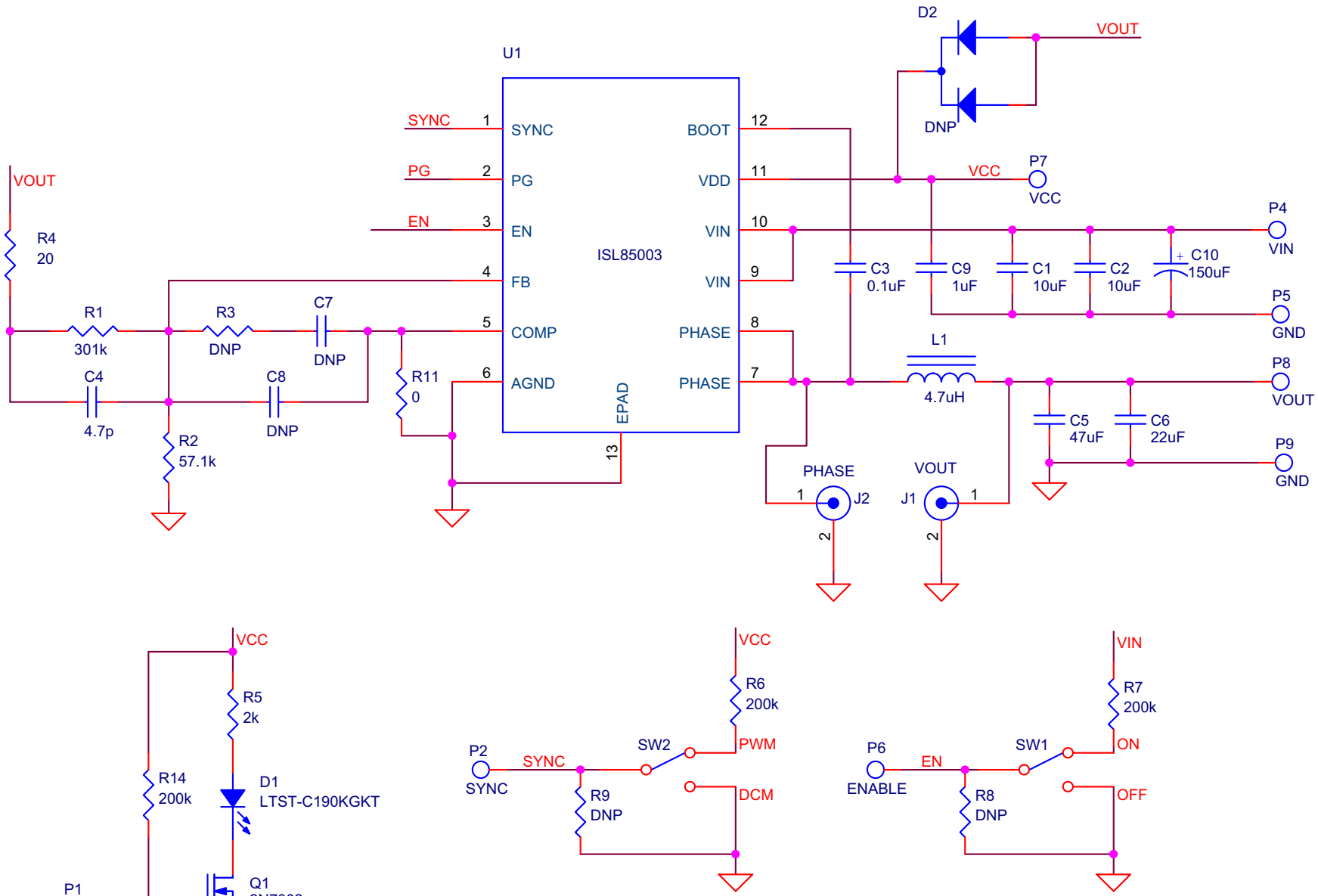
NOTE: V_{IN} = 12V, I_{OUT} = 3A; The components selection table is a suggestion for typical application using internal compensation mode. For applications that require high output capacitance greater than 200µF, R_1 should be adjusted to maintain a loop response bandwidth about 40kHz.

ISL85003EVAL2Z Evaluation Board

FIGURE 1. TOP VIEW

FIGURE 2. BOTTOM VIEW

ISL85003EVAL2Z Rev B Schematic



Bill of Materials

PART NUMBER	QTY	UNITS	REFERENCE DESIGNATOR	DESCRIPTION	MFR	MFR PART #
ISL85003FRZ	1	ea	U1	IC-3A BUCK REGULATOR, 12P, DFN, 4X3, ROHS	INTERSIL	ISL85003FRZ
ISL85003AFRZ	1	ea	U1	IC-3A BUCK REGULATOR PWM, 12P, DFN, 4X3, ROHS	INTERSIL	ISL85003AFRZ
EEE-FK1H151P-T	1	ea	C10	CAP, SMD, 10.3mm, 150µF, 50V, 20%, ROHS, ALUM.ELEC.	PANASONIC	EEE-FK1H151P
H1044-004R7-50VR25-T	1	ea	C4	CAP, SMD, 0402, 4.7pF, 50V, 0.25pF, NPO, ROHS	MURATA	GRM36COG4R7C050AQ
H1044-DNP	0	ea	C7, C8, CSS	CAP, SMD, 0402, DNP-PLACE HOLDER, ROHS		
H1045-00104-50V10-T	1	ea	C3	CAP, SMD, 0603, 0.1µF, 50V, 10%, X7R, ROHS	AVX	06035C104KAT2A
H1045-00105-16V10-T	1	ea	C9	CAP, SMD, 0603, 1µF, 16V, 10%, X5R, ROHS	MURATA	GRM188R61C105KA12D
H1065-00106-25V10-T	2	ea	C1, C2	CAP, SMD, 1206, 10µF, 25V, 10%, X7R, ROHS	VENKEL	C1206X7R250-106KNE
H1065-00226-25V10-T	2	ea	C5, C6	CAP, SMD, 1206, 22µF, 25V, 10%, X5R, ROHS	MURATA	GRM31CR61E226KE15L
RLF7030T-4R7M3R4	1	ea	L1	COIL-PWR INDUCTOR, SMD, 7.3X6.8mm, 4.7µH, 20%, 3.5A, ROHS	TDK	RLF7030T-4R7M3R4
131-4353-00	2	ea	J1, J2	CONN-SCOPE PROBE TEST PT, COMPACT, PCB MNT, ROHS	TEKTRONIX	131-4353-00
1514-2	4	ea	P4, P5, P8, P9	CONN-TURRET, TERMINAL POST, TH, ROHS	KEYSTONE	1514-2
5002	4	ea	P1, P2, P6, P7	CONN-MINI TEST POINT, VERTICAL, WHITE, ROHS	KEYSTONE	5002
BAT54C-T	1	ea	D2	DIODE-RECTIFIER, SMD, SOT23, 3P, 30V, 200mA, ROHS	FAIRCHILD	BAT54C
LTST-C190KGKT-T	1	ea	D1	LED, SMD, 0603, GREEN CLEAR, 2V, 20mA, 571nm, 35mcd, ROHS	LITEON/VISHAY	LTST-C190KGKT
2N7002LT1G-T	1	ea	Q1	TRANSISTOR-MOS, N-CHANNEL, SMD, SOT23, 60V, 115mA, ROHS	ON SEMICONDUCTOR	2N7002LT1G
H2510-00R00-1/16W-T	1	ea	R11	RES, SMD, 0402, 0Ω, 1/16W, 5%, TF, ROHS	VENKEL	CR0402-16W-00T
H2510-03013-1/16W1-T	1	ea	R1	RES, SMD, 0402, 301k, 1/16W, 1%, TF, ROHS	YAGEO	RC0402FR-07301KL
H2510-05762-1/16W1-T	1	ea	R2	RES, SMD, 0402, 57.6k, 1/16W, 1%, TF, ROHS	PANASONIC	ERJ-2RKF5762X
H2510-DNP	0	ea	R3	RES, SMD, 0402, DNP, DNP, DNP, TF, ROHS		
H2511-00200-1/10W1-T	1	ea	R4	RES, SMD, 0603, 20Ω, 1/10W, 1%, TF, ROHS	PANASONIC	ERJ-3EKF20R0V
H2511-02001-1/10W1-T	1	ea	R5	RES, SMD, 0603, 2k, 1/10W, 1%, TF, ROHS	KOA	RK73H1JTTD2001F
H2511-02003-1/10W1-T	3	ea	R6, R7, R14	RES, SMD, 0603, 200k, 1/10W, 1%, TF, ROHS	VENKEL	CR0603-10W-2003FT
H2511-DNP	0	ea	R8, R9	RES, SMD, 0603, DNP-PLACE HOLDER, ROHS		
GT11MSCBE-T	2	ea	SW1, SW2	SWITCH-TOGGLE, SMD, 6PIN, SPDT, 2POS, ON-ON, ROHS	ITT INDUSTRIES/ C&K DIVISION	GT11MSCBE
SJ-5003-BLACK	4	ea	Bottom four corners	BUMPONS, 0.44inW x 0.20inH, DOMETOP, BLACK	3M	SJ-5003SPBL

PCB Layout

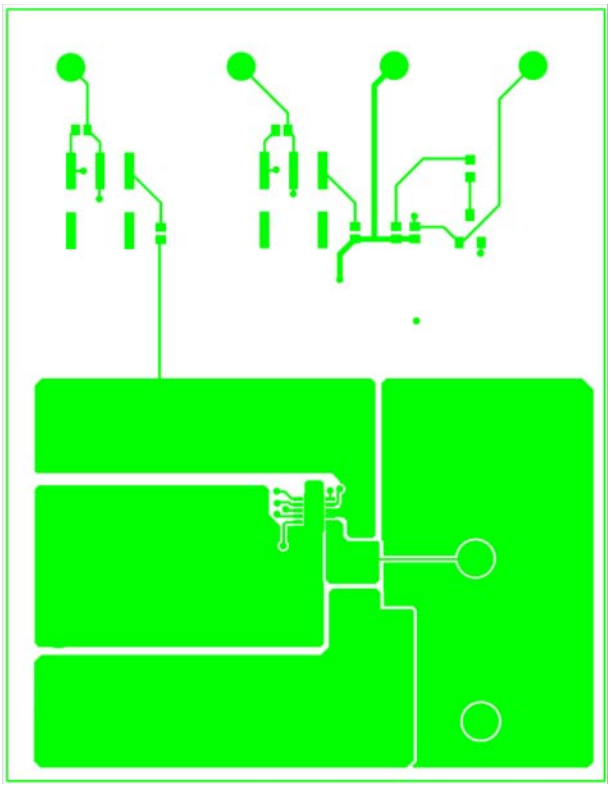


FIGURE 3. TOP LAYER

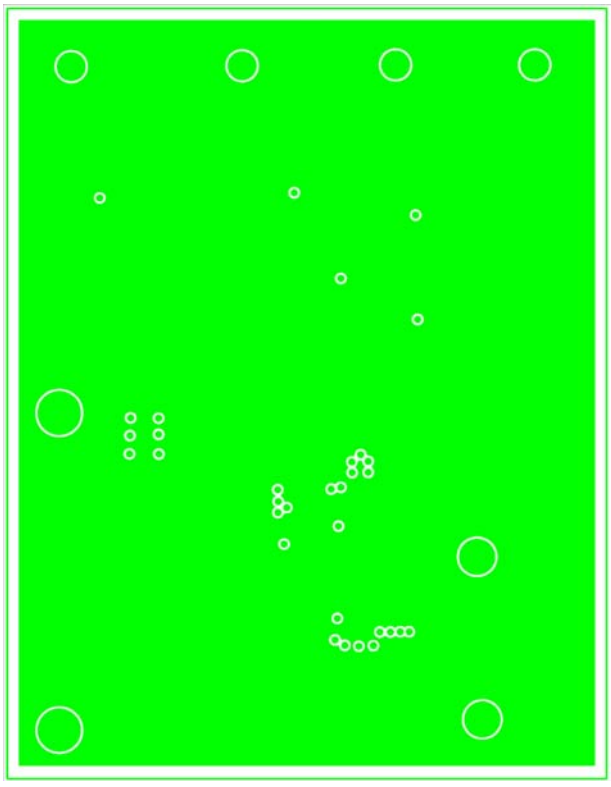


FIGURE 4. INNER LAYER 1

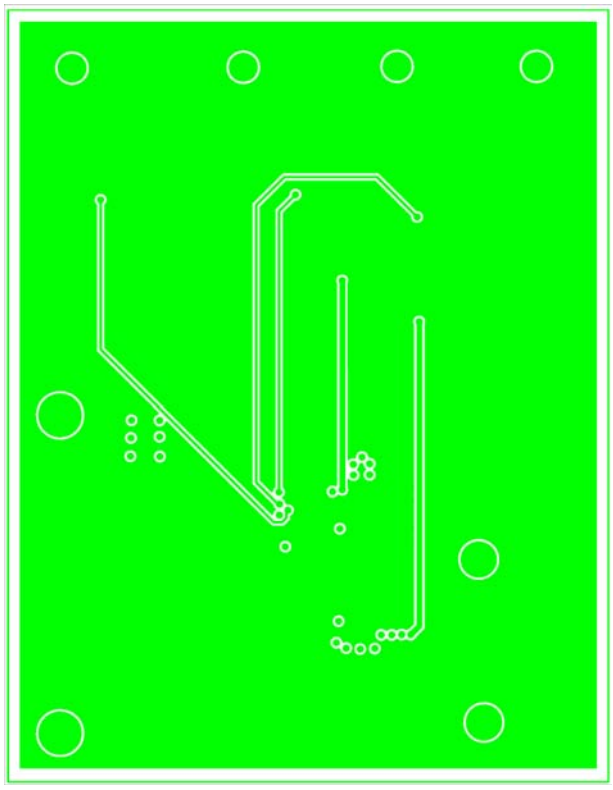


FIGURE 5. INNER LAYER 2

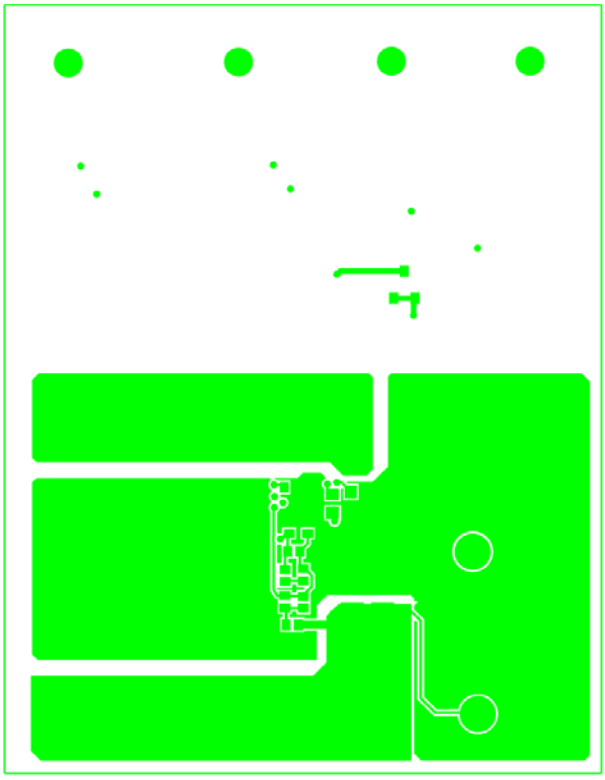


FIGURE 6. BOTTOM LAYER