ISL6225EVAL2 Dual Switcher Evaluation Board Setup Procedure

Application Note | May 2003 | AN1058.0

General Description

This document describes the setup procedure for the ISL6225 Evaluation Board dual switcher implementation. The ISL6225 can control two output voltages adjustable from 0.9V to 5.5V. The ISL6225 combines two synchronous PWM voltage regulators into a single IC. PWM1 and PWM2 output voltages are set by a simple feedback voltage divider connected across the outputs to GND. The feedback voltage divider outputs are 0.9VDC, which are connected to the VSEN1 and VSEN2 pins.

Automatic mode selection of constant-frequency synchronous rectification at heavy load, and hysteretic diode-emulation at light load, assure high efficiency over a wide range of conditions. The hysteretic mode of operation can be disabled separately on each PWM converter if constant-frequency continuous-conduction operation is desired for all load levels. Efficiency is further enhanced by using the lower MOSFET $R_{DS(ON)}$ as the current sense element.

Voltage-feed-forward ramp modulation, current mode control, and internal feedback compensation provide fast response to input voltage and output load transients.

In dual power supply applications the ISL6225 monitors the output voltage of both CH1 and CH2. An independent PGOOD (power good) signal is asserted for each channel after its soft-start sequence has completed, and the output voltage is within ±10% of the set point.

Built-in over-voltage protection prevents the output from going above 115% of the set point by holding the lower MOSFET on and the upper MOSFET off. When the output voltage decays below the over-voltage threshold, normal operation automatically resumes. Once the soft-start sequence has completed, under-voltage protection will latch the channel off if the output drops below 75% of its set point value.

Adjustable over-current protection (OCP) monitors the voltage drop across the $R_{DS(ON)}$ of the lower MOSFET. If more precise current-sensing is required, an external current sense resistor may be used.

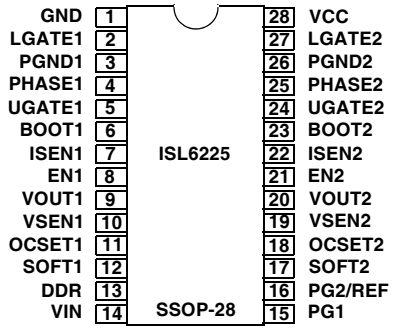
Ordering Information

PART NUMBER	TEMP. (^{o}C)	PACKAGE	PKG. DWG. #
ISL6225CA	-10 to 85	28 Ld SSOP	M28.15
ISL6225CA-T	-10 to 85	28 Ld SSOP Tape and Reel	M28.15

Features

- Provides regulated output voltage in the range of 0.9V–5.5V
  - High efficiency over wide load range
  - Synchronous buck converter with hysteretic operation at light load
  - Inhibit Hysteretic mode on one, or both channels
- No current-sense resistor required
  - Uses MOSFET $R_{DS(ON)}$
  - Optional current-sense resistor for precision Over-Current
- Over-Voltage, Under-Voltage and Over-Current protection on both channels
- Under-voltage lock-out on VCC pin
- Dual input voltage mode operation
  - Operates directly from battery 5V to 24V input
  - Operates from 3.3V or 5V system rail
  - VCC from 5V only
- Excellent dynamic response
  - Combined voltage feed-forward and average current mode control
- Power-good signal for each channel
- 300kHz switching frequency
  - 180° channel to channel phase operation

Pinout



What's Inside

This Evaluation Board Kit contains the following materials:

- ISL6225EVAL2 Evaluation Board
- ISL6225EVAL2 Board Evaluation Document

What is Needed

The following items will be needed to perform a complete evaluation:

- 4 channel oscilloscope with probes
- 2 electronic loads
- 2 laboratory power supplies
- Precision digital multimeters
- Digital pulse generator

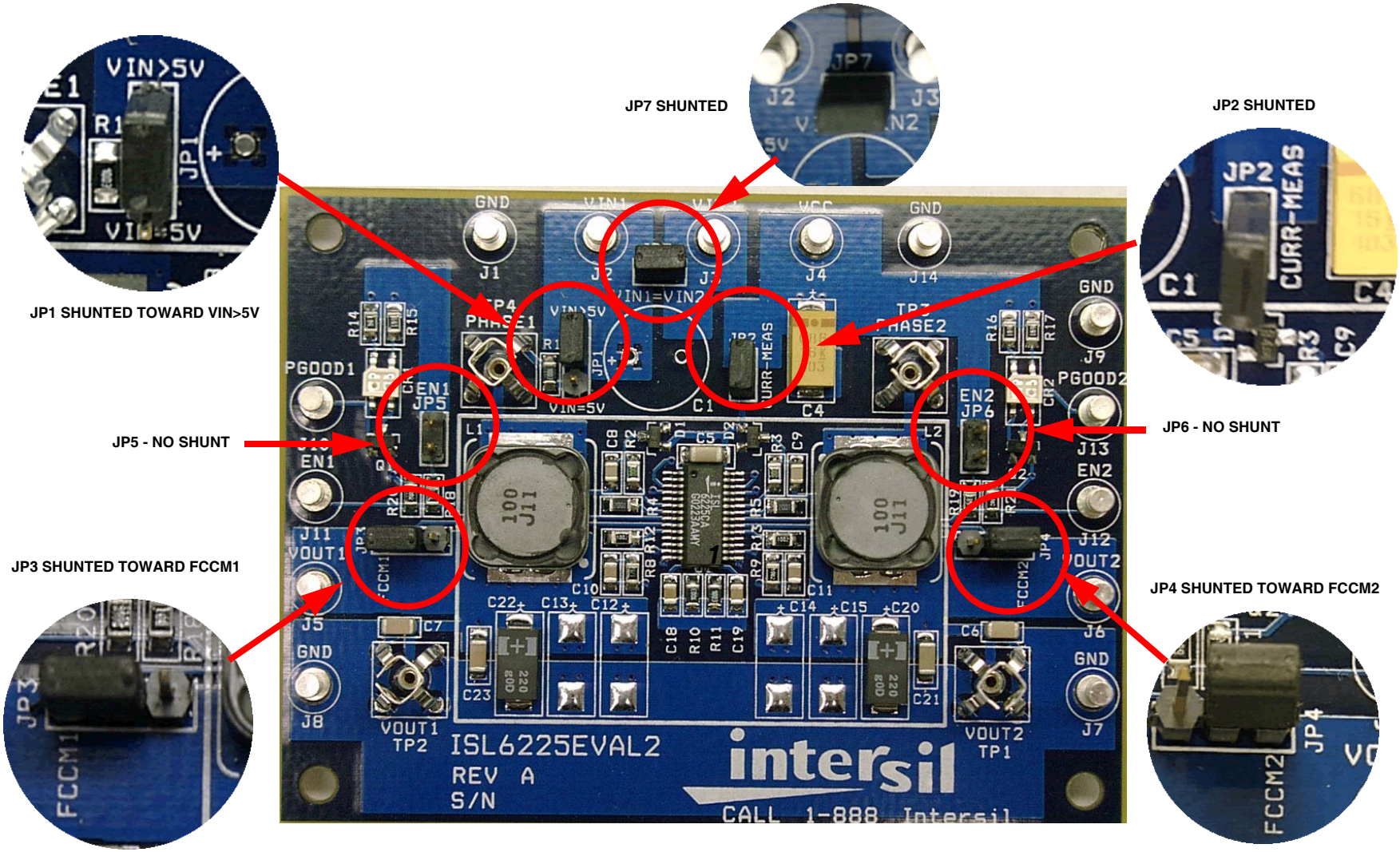


FIGURE 1. INITIAL SHUNT PLACEMENT FOR ISL6225EVAL2

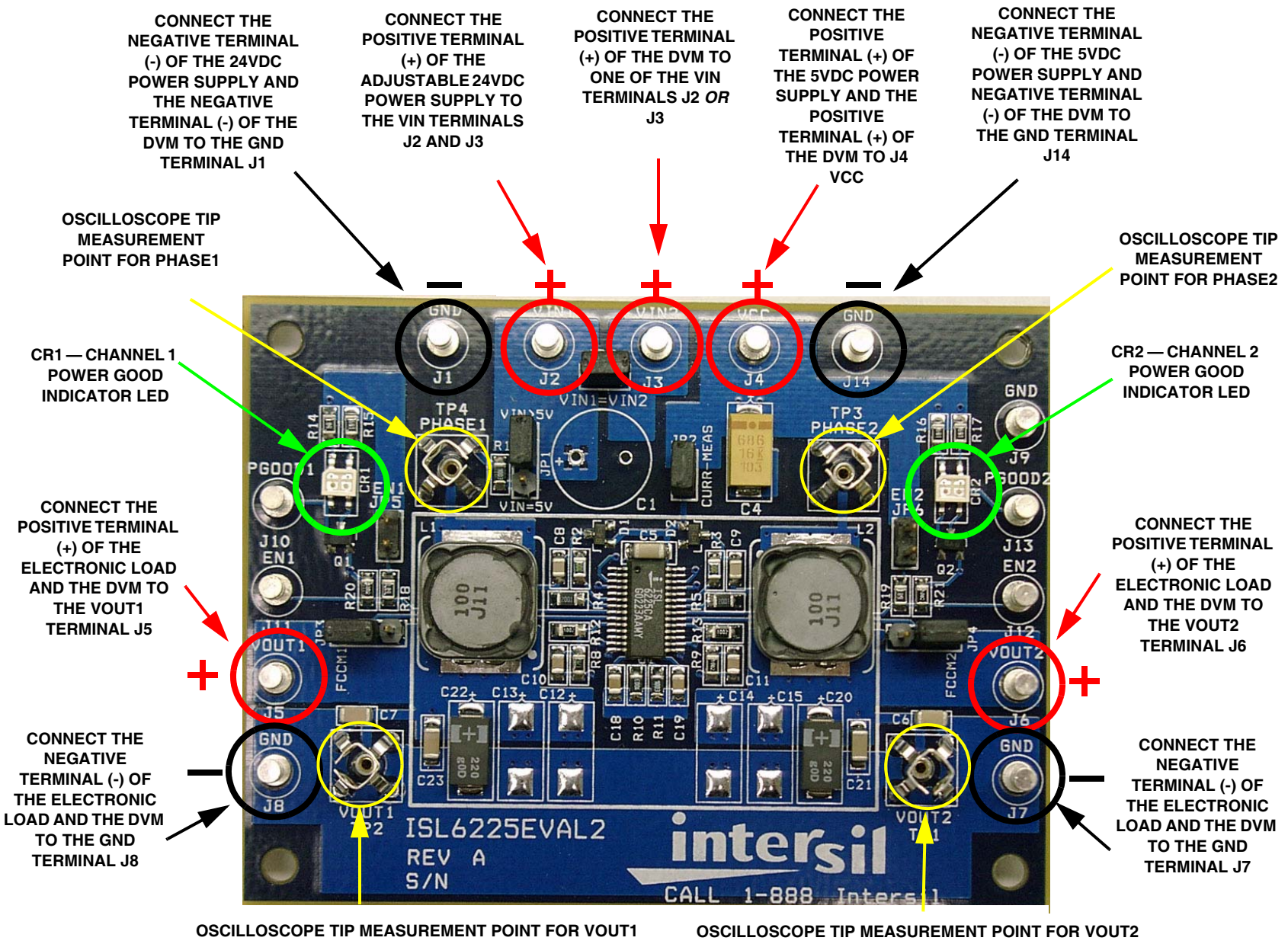


FIGURE 2. WIRING CONNECTIONS FOR ISL6225EVAL2

TABLE 1. DETAILED DESCRIPTION OF THE JUMPER SETTINGS

JUMPER	POSITION	FUNCTION
JP1	*VIN>5V	*Input Voltage greater than 5V
	VIN=5V	Input Voltage 3.3V to 5V operation
JP2	*Shunted	*An AmpMeter may be connected across these pins to measure IC and GATE Drive Current only
JP3	*FCCM1	*PWM1 Fixed Continuous Conduction Mode
	Away from FCCM1	PWM1 Hysteretic Operation enabled
JP4	*FCCM2	*PWM2 Fixed Continuous Conduction Mode
	Away from FCCM2	PWM2 Hysteretic Operation enabled
JP5	Shunted	CH1 enabled
	* Removed	* CH1 disabled
JP6	Shunted	CH2 enabled
	*Removed	* CH2 disabled
JP7	*Shunted	* One VIN supply for both CH1 and CH2
	Removed	Separate VIN supplies for CH1 and CH2

NOTE: * = Initial Setting

TABLE 2. LED CONDITION INDICATORS

LED CONDITION	CONDITION	RESULT
CR1	Green	VOUT1 Within PGOOD Range
	Red	VOUT1 Outside PGOOD Range
CR2	Green	VOUT2 Within PGOOD Range
	Red	VOUT1 Outside PGOOD Range

Quick Setup

- The VIN Power Supply must always be the first supply on and the last supply off.
- The 5V V_{CC} Power Supply must be between 5V ± 5%.
- Make sure the power is off before moving any jumpers, except EN1 and EN2.

Step 1: Set the output voltage of the 5V adjustable power supply to zero volts. Connect the positive terminal (+) of the power supply to the VCC terminal J4. Connect the negative terminal (-) of the 5VDC power supply to the GND terminal J14.

Do not apply power yet

Step 2: Connect the positive terminal (+) of a DVM to the VCC terminal J4. Connect the negative terminal (-) of the DVM to the GND terminal J14.

Step 3: Set the adjustable 24VDC output voltage to zero volts. Connect the positive terminal (+) of the power supply to the VIN terminals J2 and J3. Connect the negative terminal (-) of the 24VDC power supply to the GND terminal J1.

Do not apply power yet

Step 4: Connect the positive terminal (+) of a DVM to one of the VIN terminals J2 or J3. Connect the negative terminal (-) of the DVM to the GND terminal J1.

Step 5: Connect the positive terminal (+) of the electronic load and the DVM to the VOUT1 terminal J5. Connect the negative terminal (-) of the electronic load and the DVM to the GND terminal J8.

Step 6: Connect the positive terminal (+) of the electronic load and the DVM to the VOUT2 terminal J6. Connect the negative terminal (-) of the electronic load and the DVM to the GND terminal J7.

Step 7: Take the adjustable 24VDC power supply that is connected to the VIN terminals J2 and J3 and make sure the output voltage is set to zero VOLTS.

Step 8: Turn on the 24VDC power supply.

Step 9: While reading the DVM, increase the output voltage of the 24VDC power supply to 5.0 VDC.

Step 10: Turn on the 5VDC power supply.

Step 11: While reading the DVM, increase the output voltage of the 5VDC power supply to 5VDC.

Step 12: Install the EN1 shunt jumper JP5.

Step 13: Install the EN2 shunt jumper JP6.

NOTE: Terminals J1 (EN1) and J12 (EN2) may be connected to a Pulse generator for controlled on/off operation and may be observed with an oscilloscope.

Step 14: Read the DVM connected to the VOUT1 terminal J5.

Step 15: Read the DVM connected to the VOUT2 terminal J6.

The 24V VIN Power Supply may be adjusted between 5-24 VDC.

If Hysteretic operation is desired move jumper J3 for PWM1 or JP4 for PWM2, to the position opposite the silk screen “FCCM”.

The Electronic Load can be connected to VOUT1 and VOUT2 for load regulator measurement.

Make sure the power is off before moving the jumpers.

Terminals J1 (EN1) and J12 (EN2) may be connected to a Pulse generator for controlled on/off operation and may be observed with an oscilloscope.

Make sure the enable voltage is less than 5V V_{CC}.

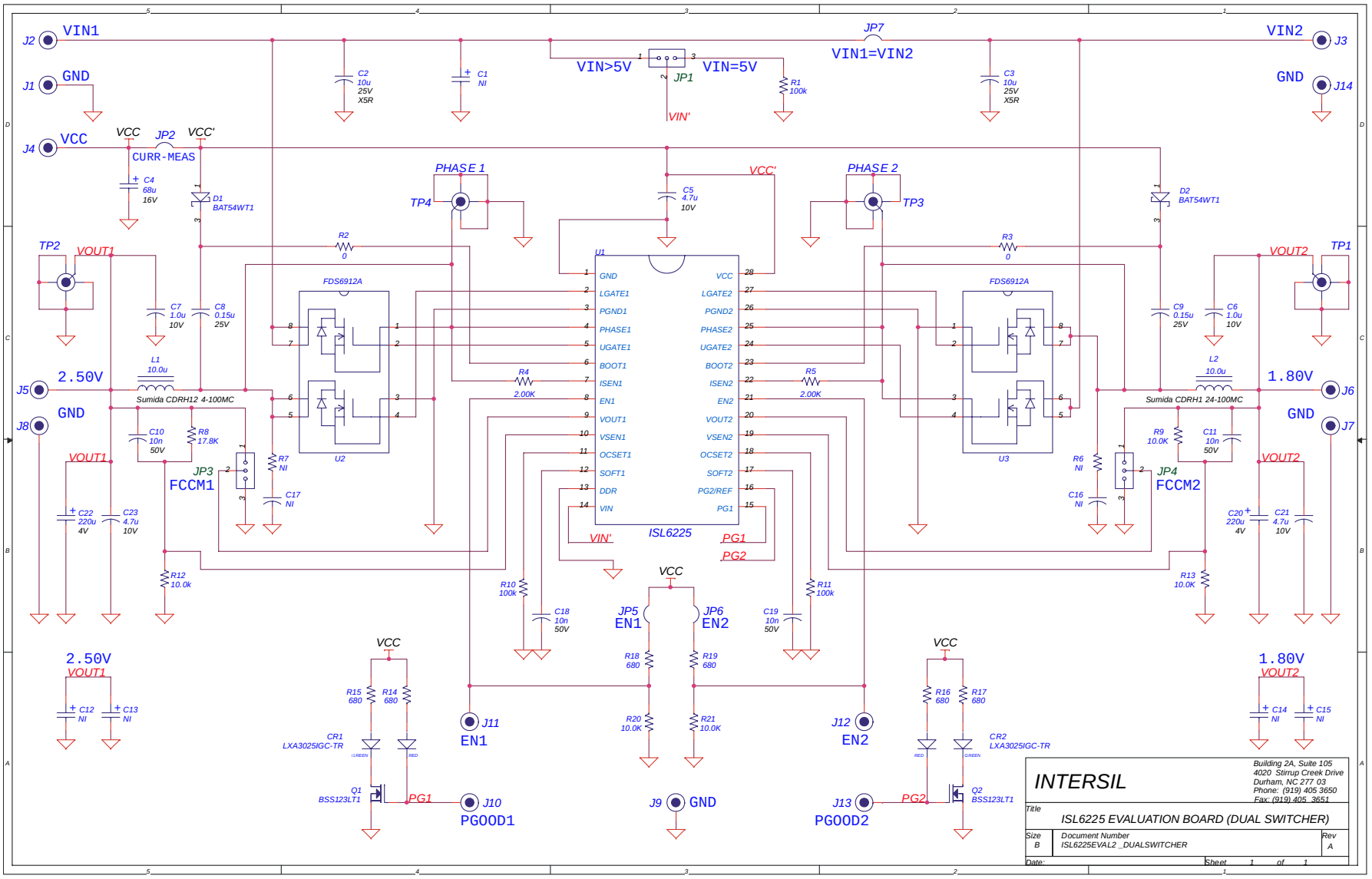
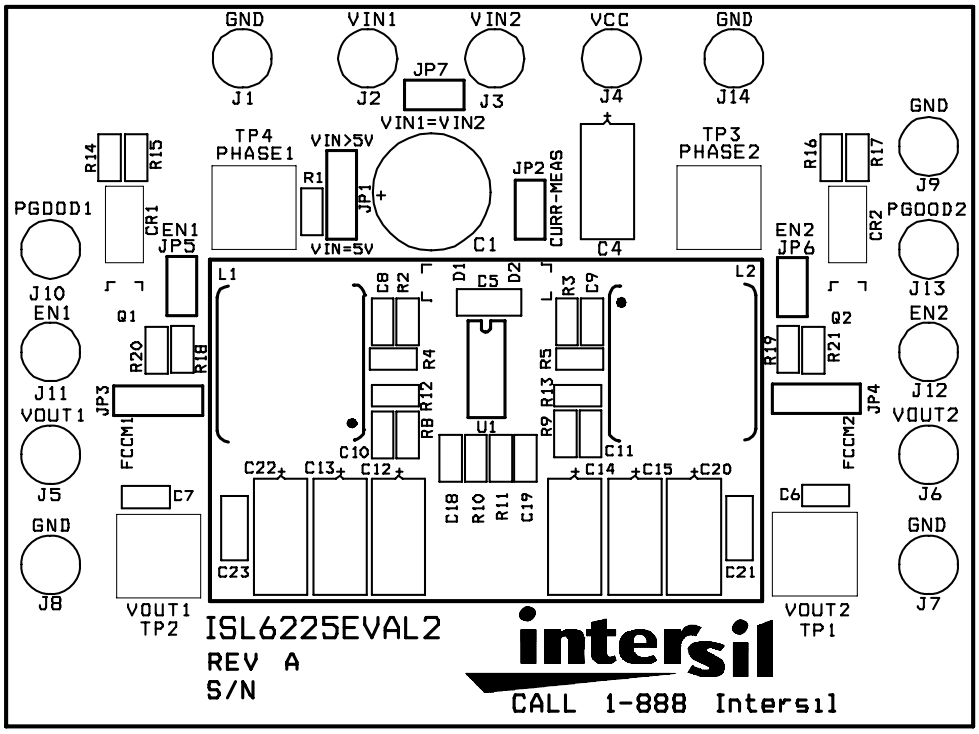


FIGURE 3. ISL6225EVAL2 SCHEMATIC

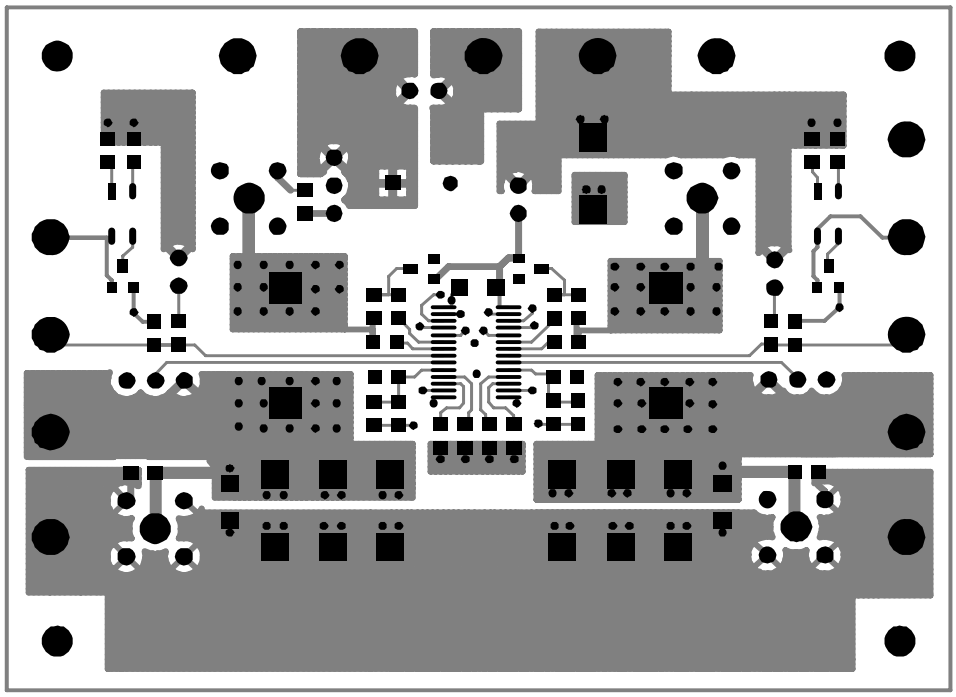
TABLE 3. BILL OF MATERIALS (BOM)

QTY	REFERENCE	DESCRIPTION	VENDOR	PART NO.
4	C10, C11, C18, C19	Capacitor, SMD, 0805, .01µF,50V, 10%,X7R	Kemet	C0805C103K5RAC
2	C2, C3	Capacitor, SMD,1812, 10µF, 25V,20%, X5R	Taiyo Yuden	TMK432BJ106MM-T
2	C20, C22	Pos Cap, Low ESR, SMD, D3, 220µF, 4V, 20%	Sanyo	4TPB220M
1	C4	Capacitor, TANT, Low ESR, SMD, D, 68µF, 16V, 10%	Kemet	T494D686K016AS
3	C5, C21, C23	Capacitor, SMD,1206, 4.7µF, 10V, 10%, X7R	Venkel	C1206X7R100475KNE
2	C6, C7	Capacitor, SMD, 1206, 1µF, 10V, 10%, X7R	Kemet	C1206C105K8RAC
2	C8, C9	Capacitor, SMD, 0805, 0.15µF, 25V, 10%, X7R	Panasonic	ECJ-2YB1E154K
2	CR1, CR2	Led, SMD, 4P, Polarized, Red/Grn	Lumex	SSL-LXA3025IGC
2	D1, D2	Diode, Schottky, SMD, SOT323, 3P, 30V, 0.2A	ON-Semiconductor	BAT54WT1-T
14	J1-J14	Terminal Post, TH, 0.09	Keystone	1502-2
3	JP1, JP3, JP4	Header, 1x3, Breakaway, 1X36, 2.54mm, ST	Berg/FCI	68000-236-1X3
7	JP1-JP7	Jumper, 2PIN, Shunt	Sullens	SPC02SYAN
4	JP2, JP5-JP7	Header, 1x2, Retentive, 2.54mm, ST	Berg/FCI	69190-202
2	L1, L2	Inductor, SMD, 5.7mm, 4.6µH	Panasonic	ETQ-P6F4R6HFA
2	Q1, Q2	MOSFET, N-Channel, 3P, SOT23, 100V, 0.17A	ON-Semiconductor	BSS123LT1-T
3	R1, R10, R11	Resistor, SMD, 0805, 100K, 1/10W, 1%, TF	Panasonic	ERJ-6ENF1003V
6	R14-R19	Resistor, SMD, 0805, 680Ω, 1/10W, 5%, TF	Panasonic	ERJ-6GEYJ681V
2	R2, R3	Resistor, SMD, 0805, 0Ω, 1/10W, TF	Panasonic	ERJ-6GEY0R00V
2	R4, R5	Resistor, SMD, 0805, 2K, 1/10W, 1%, TF	Panasonic	ERJ-6ENF2001V
1	R8	Resistor, SMD, 0805, 17.8K, 1/10W, 1%, TF	Panasonic	ERJ-6ENF1782V
5	R9, R12, R13, R20, R21	Resistor, SMD, 0805, 10K, 1/10W, 1%, TF	Panasonic	ERJ-6ENF1002V
4	TP1-TP4	Test Point, Scope Probe, 0.135" DIA	Tektronix	131-5031-00
1	U1	IC, Dual Switcher, 24V, 28Pin, SSOP	Intersil	ISL6225CA
2	U2, U3	MOSFET, Dual, N-Channel, Logic, 8P, SOIC, 30V, 6A	Fairchild	FDS6912A

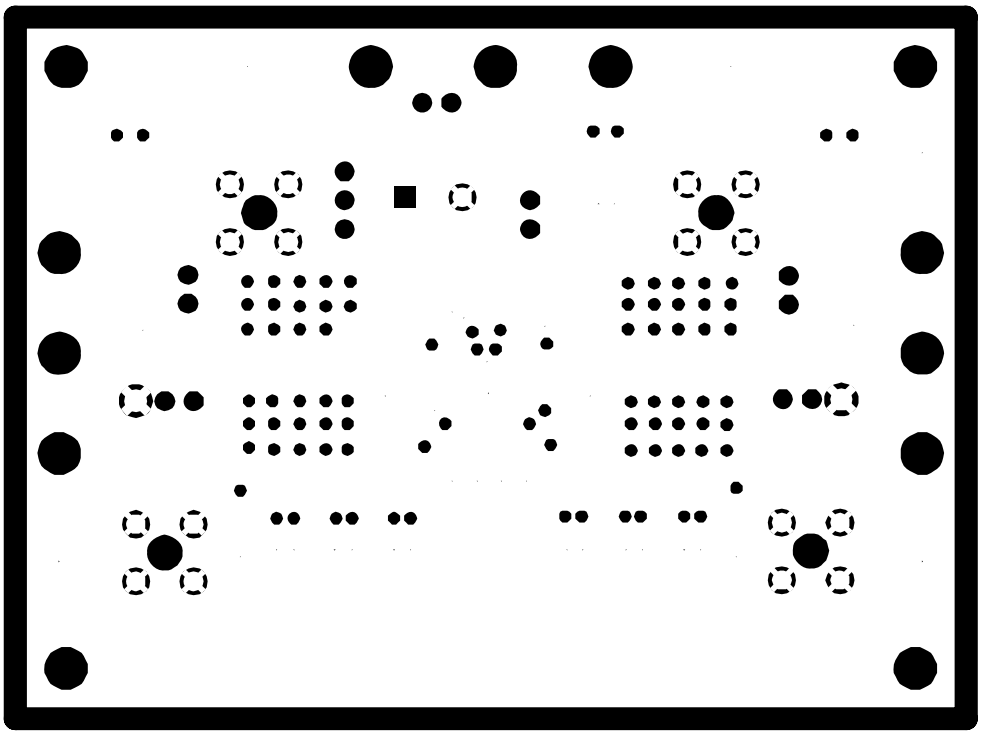
SILK SCREEN TOP



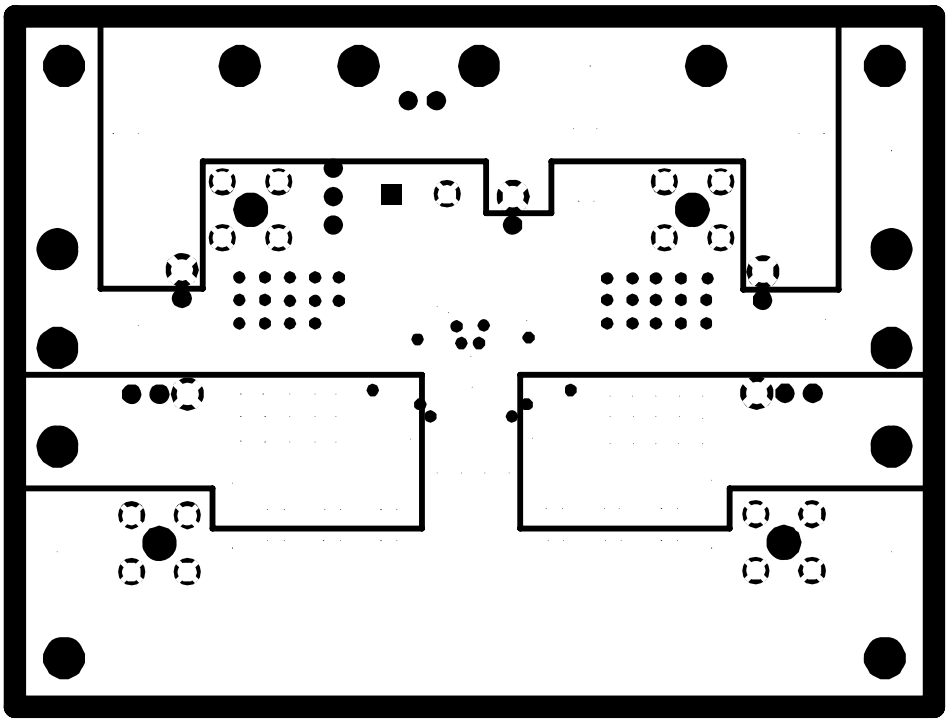
TOP LAYER



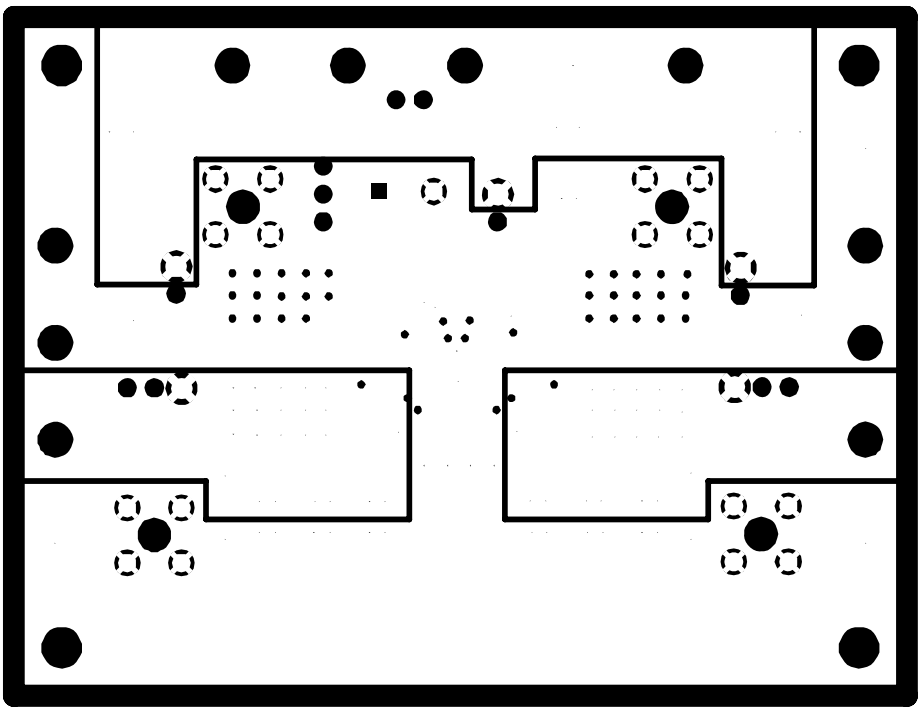
GND - INTERNAL 1



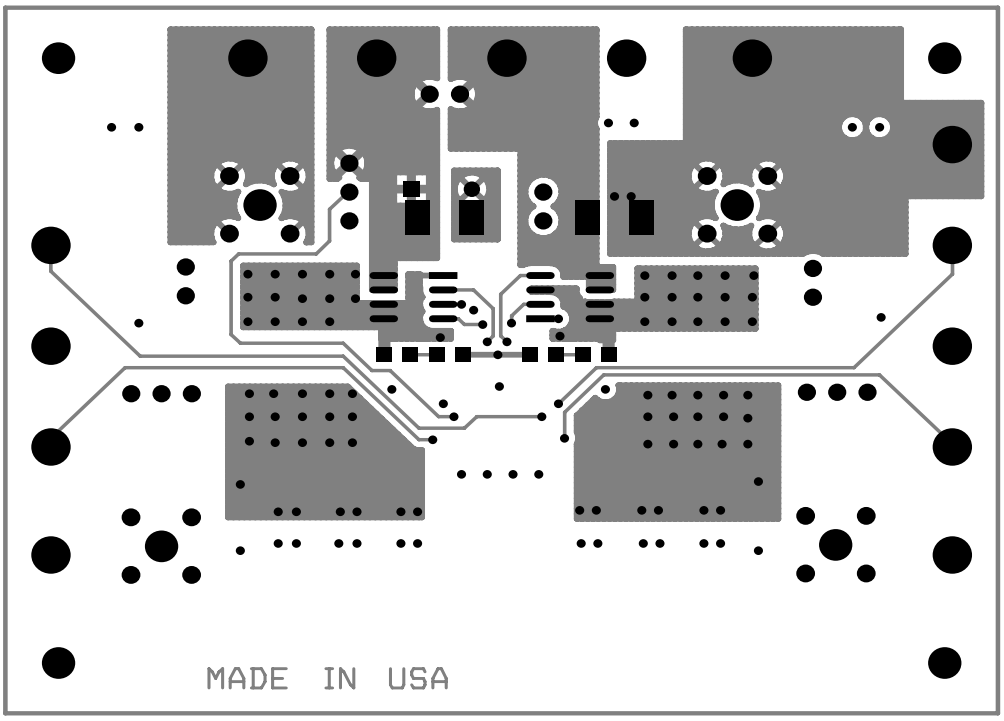
POWER - INTERNAL 2



POWER - INTERNAL3



BOTTOM LAYER



SILK SCREEN BOTTOM