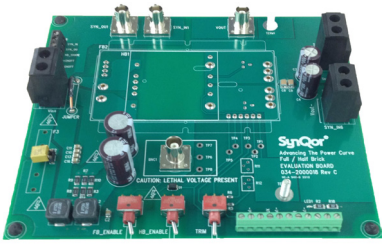


EVAL-1000005

Evaluation Board for High Current High Voltage Isolated Converters, Full and Half Brick

Summary

SynQor has developed EVAL-1000005, an evaluation board to facilitate testing of our high current isolated full and half brick DC-DC converters rated for voltages up to 450 Vdc, 475 V surge

Introduction

This application note is a guide to the features, schematic, component placement, and BOM for this evaluation board. The applicable series of DC-DC converter modules include MCOTS-C-270, MCOTS-C-150 and the InQor (IQ), RailQor (RQ), and half brick BusQor (BQ) that are rated for voltages up to 450 Vdc, 475 V surge.

For assistance with testing the performance of our DC-DC power converters, please refer to our application note “Guidelines for Testing SynQor DC-DC Converters”.

Contents

Shock Warning: There are areas of this evaluation board that have exposed access to high voltage. Exercise caution to avoid contact with those voltages. Also note that the evaluation board may retain high voltage temporarily after input power has been removed. Exercise caution when handling

Application of Input Power: Never apply input power to a converter with a switch closure, such as a knife switch or circuit breaker. That type of action applies input voltage with an uncontrolled very high rate of rise (dV/dt) that could be damaging to the converter and to external components before the converter. Instead, apply input voltage with a controlled rate of rise. Also, ensure input voltage is off before inserting or removing a converter module from the evaluation board

Thermal Considerations: When testing converters on an evaluation board, ensure adequate cooling. Apply cooling air with a fan blowing across the converter or across a heatsink attached to the converter. Monitor the converter temperature to ensure it doesn’t exceed the maximum rated per the datasheet specification

Sockets: This evaluation board uses sockets to provide the option of testing multiple converters. These sockets are not rated for continuous high currents. Short-term testing is fine, but be aware of this limitation for longer-term testing. The spring fingers in the sockets will add resistance in the power path, which will cause voltage drops at higher currents that could contribute significant errors in regulation and efficiency measurements. These spring fingers also do not provide the thermal cooling path from the module pins to PCB routing that is enabled by soldered connections. This may contribute to higher converter temperatures and error when performing thermal evaluations. For longer-term testing, thermal testing, and permanent installations use soldered connections.

Section 1 – Input and Output Connections

Input power is applied through connector Syn_IN9, Vin+ and Vin-.

Output power is applied through connectors Syn_IN3 and Term1 Vout+, and SynIN6 and Term2 Vout-.

Control signals are available through connectors SynIN2, SynIN7, and SynIN8. See Tables 1, 2 and 3 below for descriptions

Table 1: Input Signal Connector (SynIN8)

Terminal # of Connector	Signal Name
1	SYN_IN
2	SYN_OU
3	HB_SHARE
4	+ON/OFF
5	-ON/OFF

Table 2: Output Signal Connector (SynIN7)

Terminal # of Connector	Signal Name
1	Sense-
2	Trim
3	Sense+

Table 3: Monitor and Control Signal Connector (SynIN2)

Terminal # of Connector	Signal Name
1	START_SYNC
2	VO-
3	No Connection
4	VAUX
5	VO-
6	No Connection
7	PAR
8	VO-
9	No Connection
10	No Connection
11	No Connection

Note: *Please refer to the appropriate SynQor converter datasheet for descriptions of these features.*

Section 2 – Switches, Trim Resistors, and BNC Connectors

Description of Switches

FB_Enable Switch

This switch provides manual On/Off control of the full-brick converters. Toggling this switch to the position closest to the output power connectors will connect +ONOFF to –ONOFF and to VO-. Toggling this switch to the position closest to the input connectors will connect +ONOFF to VAUX through diode D1.

HB_Enable Switch

This switch provides manual On/Off control of the half-brick converters. Toggling this switch to the position closest to the output power connectors will disconnect ENABLE and allow it to float. Toggling this switch to the position closest to the input connectors will connect ENABLE to VIN-.

Trim Switch

Toggling this switch connects the converter trim pin to the Sense+ or Sense- pin through the trim resistors, R5 (fixed) / R11 (trim pot) or R6 (fixed) / R12 (trim pot). This allows for trimming the output voltage up or down by adjusting the trim resistors. Leaving the switch in the middle position will disable the output voltage trim function.

Description of Trim Resistors

Voltage Trim

Fixed resistor R5 and potentiometer R11 are connected to SENSE+ and are used to adjust the output voltage set-point of the converter.

Fixed resistor R6 and potentiometer R12 are connected to SENSE- are used to adjust the output voltage set-point of the converter.

The trim pot resistors R11 and R12 are not populated in this evaluation board. This is to allow the user to determine and install the needed trim resistance values based on the range of desired output voltage adjustment of the module being evaluated.

BNC Monitoring Point Descriptions

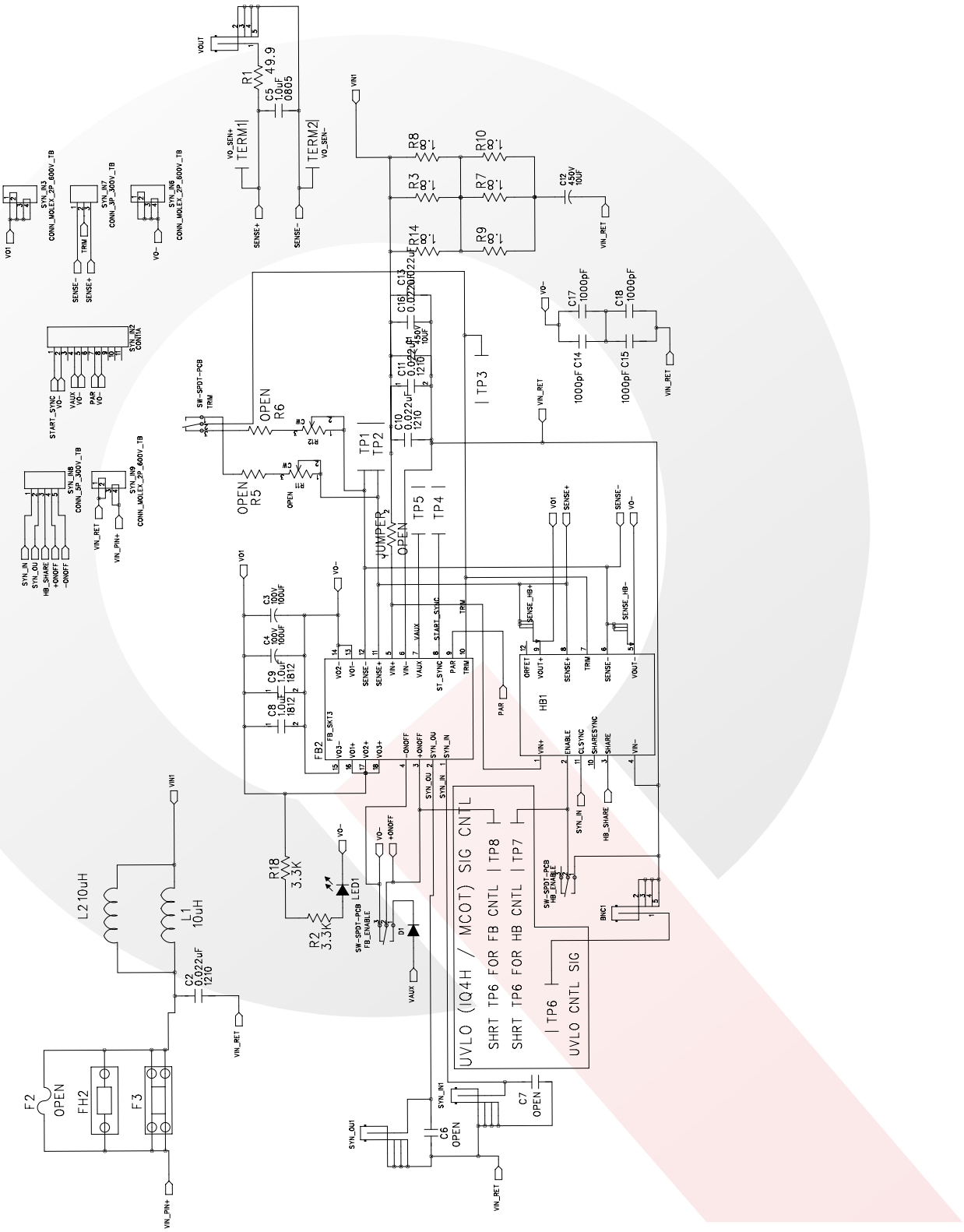
BNC1 – Test Point 6, UVLO Control Signal, full-brick jumper to TP8, half-brick jumper to TP7

VOUT – Converter Output Voltage

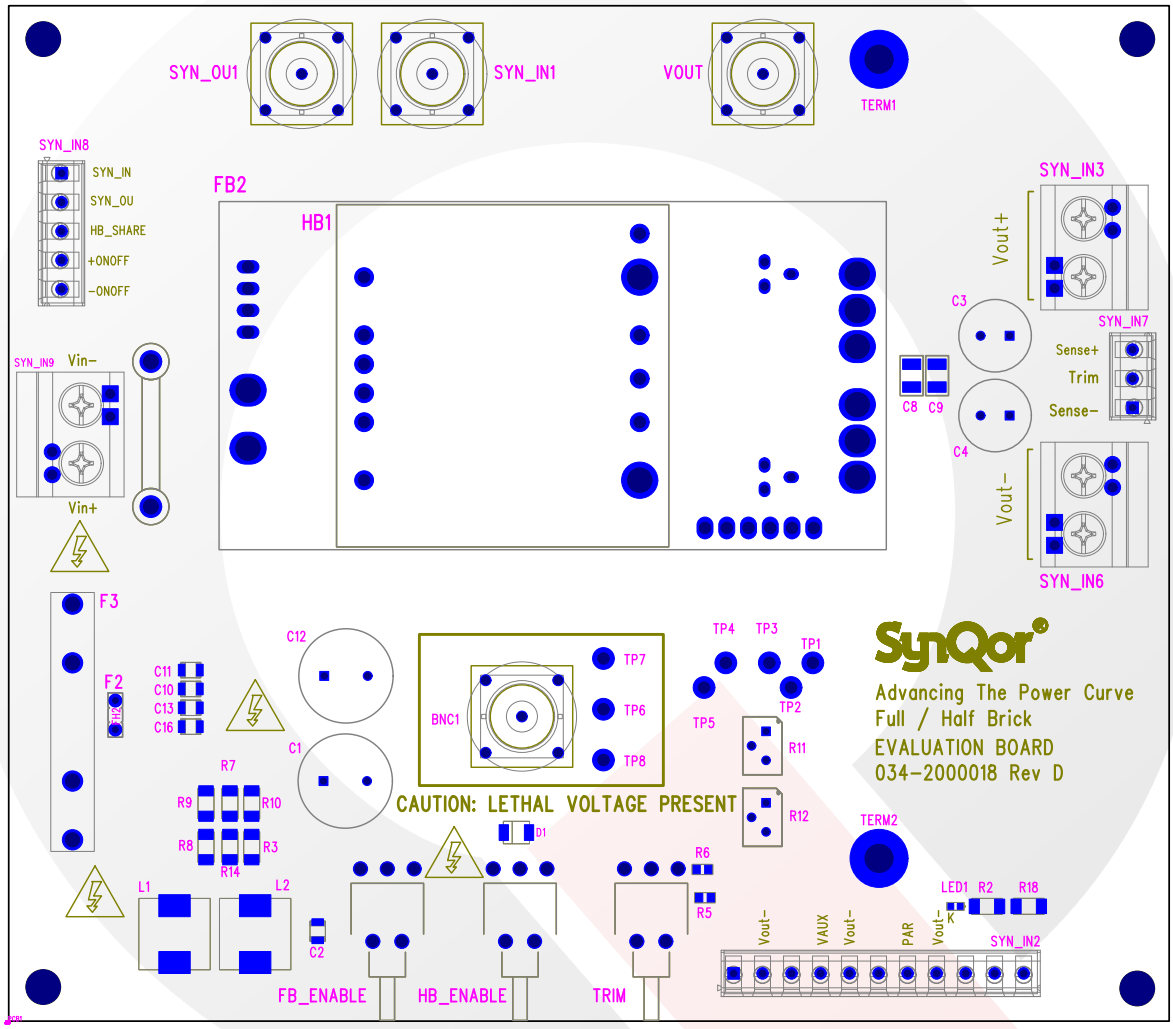
SYN_IN1 – Sync Input SYN_IN

SYN_OU1 – Sync Output SYN_OU

Section 3 – Schematic



Section 4 – Component Placement



Section 5 – Bill of Materials (BOM)

Table 4: EVAL-1000005

Ref Des	Value	Tolerance	Package	Description
C1	10 uF	20 %	16X25MM	Cap, Alum Elec, 450 V
C2	0.022 uF	10 %	1210	Cap, ceramic, X7R, 1000V
C3	100 uF	20 %	12.5X20MM	Cap, Alum Elec, 100 V
C4	100 uF	20 %	12.5X20MM	Cap, Alum Elec, 100 V
C5	1 uF	20 %	0805	Cap, ceramic, X7R, 50 V
C6	Open	10 %	0805	Cap, ceramic, COG, 250 V, 22 pF
C7	Open	10%	0805	Cap, ceramic, COG, 250 V, 22 pF
C8	1 uF	10 %	0812	Cap, ceramic, X7R, 100 V
C9	1 uF	10 %	0812	Cap, ceramic, X7R, 100 V
C10	0.022 uF	10 %	1210	Cap, ceramic, X7R, 1000 V
C11	0.022 uF	10 %	1210	Cap, ceramic, X7R, 1000 V
C12	10 uF	20 %	16X25MM	Cap, Alum Elec, 450 V
C13	0.022 uF	10 %	1210	Cap, ceramic, X7R, 1000 V
C14	1000 pF	10 %	1812	Cap, ceramic, 1000 V, X1/Y2 Safety Cap, 1500 VAC Withstand, 5000 V Impulse
C15	1000 pF	10 %	1812	Cap, ceramic, 1000 V, X1/Y2 Safety Cap, 1500 VAC Withstand, 5000 V Impulse
C16	0.022 uF	10 %	1210	Cap, ceramic, X7R, 1000V
C17	1000 pF	10 %	1812	Cap, ceramic, 1000 V, X1/Y2 Safety Cap, 1500 VAC Withstand, 5000 V Impulse
C18	1000 pF	10 %	1812	Cap, ceramic, 1000 V, X1/Y2 Safety Cap, 1500 VAC Withstand, 5000 V Impulse
D1	600 V		SMB	Diode, STTH2L06U
F2	5 A			Fuse, through-hole, radial, subminiture
F3	Open			Fuse, Littelfuse, Maxi Blade, 80V
L1	10 uH			Inductor, Coiltronics, DR127-100-R
L2	10 uH			Inductor, Coiltronics, DR127-100-R
LED1	Orange			LED, LED0603
R1	49.9	1 %	0805	Resistor
R2	3.3K	5 %	2010	Resistor
R3	1.8	10 %	2010	Resistor, surge
R5	Open	1 %	0805	Resistor, 300 V, 200K
R6	Open	1 %	0805	Resistor
R7	1.8	10 %	2010	Resistor, surge
R8	1.8	10 %	2010	Resistor, surge
R9	1.8	10 %	2010	Resistor, surge
R10	1.8	10 %	2010	Resistor, surge
R11	Open			Resistor, Trim Potentiometer, 3299Y-1-xxx LF (xxx = value)
R12	Open			Resistor, Trim Potentiometer, 3299Y-1-xxx LF (xxx = value)
R14	1.8	10 %	2010	Resistor, surge
R18	3.3K	5 %	2010	Resistor