PI3741-0x-EVAL1
ZVS Regulators Buck-Boost Evaluation Board

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Introduction

The PI3741-0x-EVAL1 evaluation board demonstrates the features and benefits of the Vicor ZVS Buck-Boost regulator; pre-configured for either a 24 or 48V output voltage and rated for up to 150W. Please refer to the corresponding PI3741-0x-LGIZ data sheet for all power specifications. The PI3741-0x-EVAL1 evaluation board is used with the following ZVS buck-boost products: PI3741-00-LGIZ, PI3741-01-LGIZ.

The evaluation board provides several options for applying input power (VIN and GND) and output load (VOUT and GND). The user can solder tab-style banana jacks or wire, use threaded connectors with retaining nuts or solder turret pins for clip-on connections.

The evaluation board comes with all of the PI3741-0x-LGIZ's features accessible to the user. The current-monitor function (IMON) is set up to monitor the PI3741-0x-LGIZ's output current, sensed across a 5mΩ resistor. The general purpose amplifier (VDIFF) comes pre-set with a gain of 2, but can be easily reconfigured for differential measurements by adding extra 0603 resistors.

The I/O pins are brought out to the right edge of the evaluation board to allow for easy monitoring or for adding additional circuitry. The status of the PGD pin is indicated by a dual-colored LED; red indicating a fault and green indicating no faults. The SYNCO (sync out) and SYNCI (sync in) pins are accessible to allow for paralleling or for synchronizing to an external clock. Shorting J5 between IMON and VSP on the board will connect the output of IMON to the positive input of the general purpose amplifier, allowing for user-designed signal scaling and conditioning.

A footprint for an external Soft-Start capacitor (0603) is available to tailor the start-up profile of the converter. The error amplifier's output (EAO) is brought to a pin and in conjunction with the soft-start pin can be used for paralleling converters. The error amplifier's input (EAIN) is not directly connected to a pin, but connects to the pin EXT_VREF via a 10kΩ series resistor. Applying a DC voltage to this pin will allow the user to change the regulated output voltage without changing the feedback network.

The board is designed with an edge connector to facilitate testing at the factory, but this connection can also be used for board evaluation. The PCB is 4-layer FR-4 170Tg material with 2oz copper per layer, ENIG pad finish and a board thickness of 0.062in.

Bill of Materials

| Qty	Reference Designator	Value	Description	Manufacturer	Manufacturer Part Number
14	C1, C2, C3, C4, C5, C7, C8, C9, C10, C11, C12, C13, C14, CIN1	2.2µF	Ceramic Cap, X7S, 100V, 1206	TDK	C3216X7S2A225K160AB
1	CCOMP	4.7nF	Ceramic Cap, X7R, 50V, 0603	Murata	GRM188R71H472KA01D
1	D1	Fault Status	1 x 1mm Dual Color SM LED	Rohm	SML-P24MUWT86
2	FT1, FT2	TEST 1, TEST 2	SM Testpoint	Keystone	5015
2	J5, J6		0.1in Header Jumper	Samtec	TSW-148-07-F-S
1	L1	65nH	FP0404 Series Inductor	Eaton	FP0404R1-R065-R
1	LMAG	0.9µH	HCV1206 Inductor	Eaton	HCV1206-R90-R
1	PCB		PI37xx-xx Edge Connector Eval Board	VICOR	PCB0175rD
1	PI3741	ZVS Buck-Boost	Low Voltage ZVS B-B SIP 10 x 14mm	VICOR	PI3741-0x-LGIZ
1	R5	1.00kΩ	Resistor, 1%, 0.1W, 0603	Rohm	MCR03EZPFX1001
5	RDIFF1, RDIFF2, REA3, RPGD, RSYNCI	10.0kΩ	Resistor, 1%, 0.1W, 0603	Rohm	MCR03EZPFX1002
1	REA1	14.0kΩ for PI3741-00	Resistor, 1%, 0.1W, 0603	Yageo	RC0603FR-0714KL
		29.1kΩ for PI3741-01	Resistor, 1%, 0.1W, 0603	KOA Speer	RN73H1JTTD2912F50
1	REA4	1.07kΩ	Resistor, 1%, 0.1W, 0603	Yageo	RC0603FR-071K07L
1	RGP	49.9Ω	Resistor, 1%, 0.1W, 0603	Rohm	MCR03ERTF49R9
1	RIN	0.51Ω	Resistor, 1%, 0.25W, 1206	Rohm	MCR18EZHFLR510
1	RSENSE	0.005Ω	Resistor, 1%, 1W, 2512	Panasonic	ERJ-M1WSF5M0U
3	RSDA, RSCL, RZ1	0Ω	Resistor, 1%, 0.1W, 0603	Rohm	MCR03EZPJ000
1	U1	NC7WZ14EP6X	Dual Schmidt trigger Inverter	Fairchild	NC7WZ14EP6X
1	CVDR	0.1µF	Capacitor, X7R Ceramic, 0.1µF, 50V, 0603	Rohm	MCH185CN104KK

Non-Populated Components

Qty	Reference Designator	Description
3	REA2, RIMON, RZ2	Resistor, 1%, 0.1W, 0603
4	R1, R2, R3, R4	Factory Use Only
14	EAO, EXT_VREF, PGD, IMON, SGND1, SGND2, SS/TRK, SYNCI, SYNCO, VDIFF, VDR, VIN, VSN, VSP	Thru-hole test points, Vector K24C
3	CEAIN1, CEAO, CTRK	Ceramic Cap, 50V, 0603
1	CIN2	Bi-Polar Capacitor, Nichicon UPW2A330MPD or equivalent
2	JVIN, JVOUT	Johnson Jack, Tektronix 131503100
3	ENABLE, FT3, FT4	SM Test point, Keystone 5015
1	JGP	0.1in Header Jumper
1	C6	Capacitor, Ceramic, 1206
1	H1	Factory Test Header

Figure 1

Evaluation board schematic

Figure 1
Evaluation board schematic
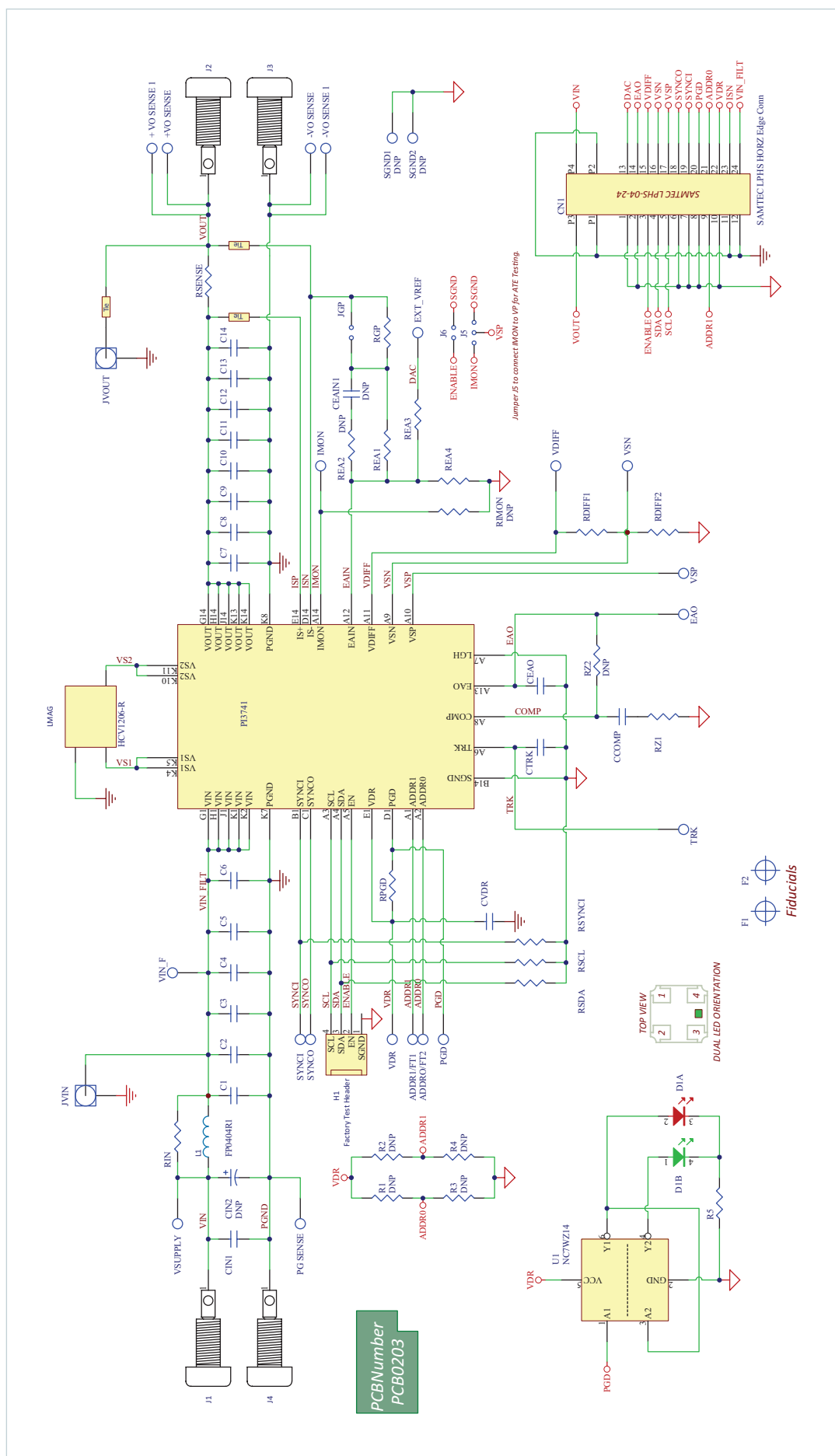
Figure 2

Evaluation board details
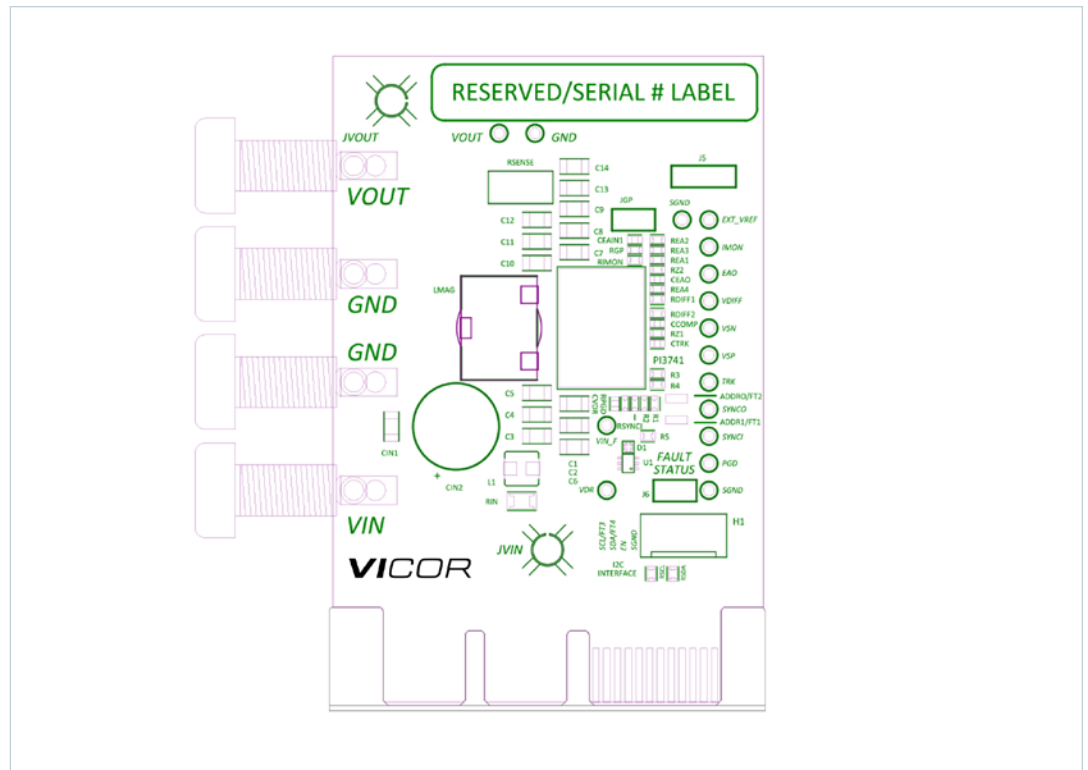
Typical Connections

Figure 4 illustrates the typical input supply and output load connections required to power the PI3741-x0 evaluation board. The test points on the right side of the board provide access to key nodes used to assess the board's performance. The jumper "JGP" provides an access point that allows the user to add a small signal in the feedback loop to make Gain/Phase measurements. The jumper J5 will connect the IMON output signal to the positive input of the general purpose amplifier, allowing this signal to be scaled. The J6 jumper will disable the converter when connected.

JVIN is an unpopulated "Johnson Jack" location that may be used to measure input ripple voltage.

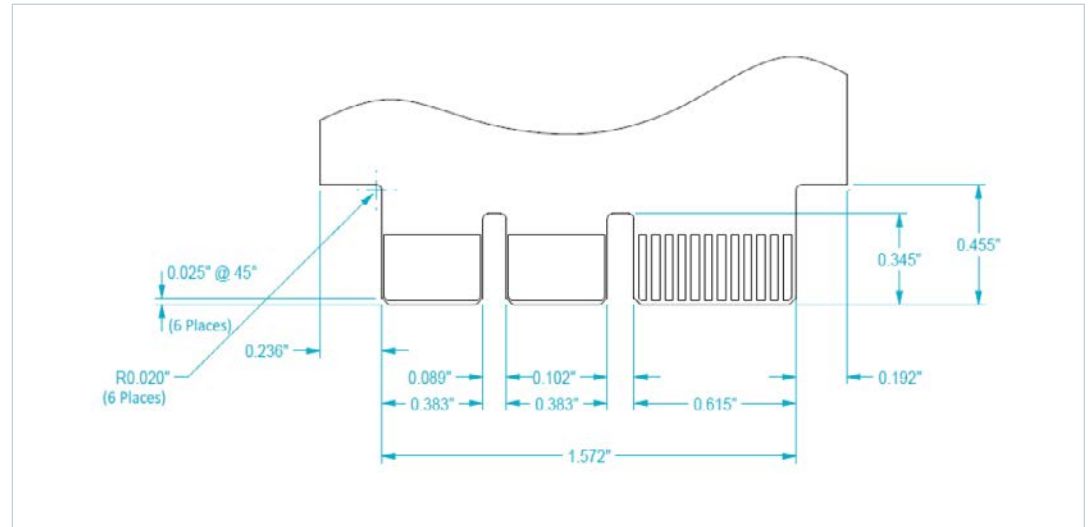*Figure 3*

Typical input and output connections
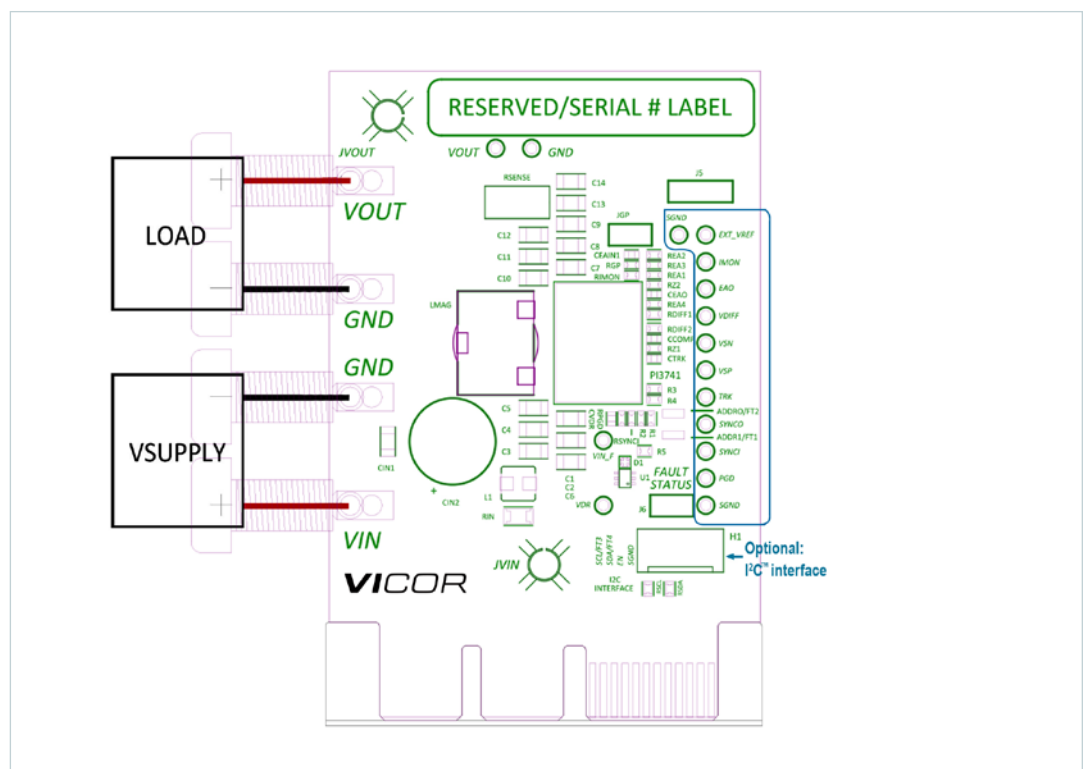
Vicor PCB Edge Connector Description

SAMTEC Reference Mechanical Drawings: based on EXTreme LPHPower™ Socket Assembly series, available from Samtec's website PCB Dimensions:
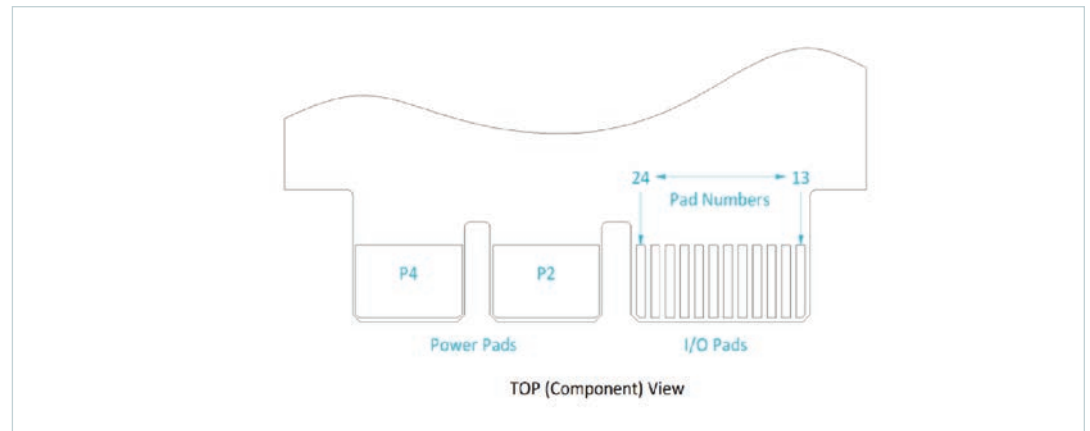
- Recommended PCB layout for LPHS-XX-XX-X-VXX-XX PCB Layout.pdf
- Right-angle Socket: LPHS-XX-XX-X-RTX-XX-MKT.pdf
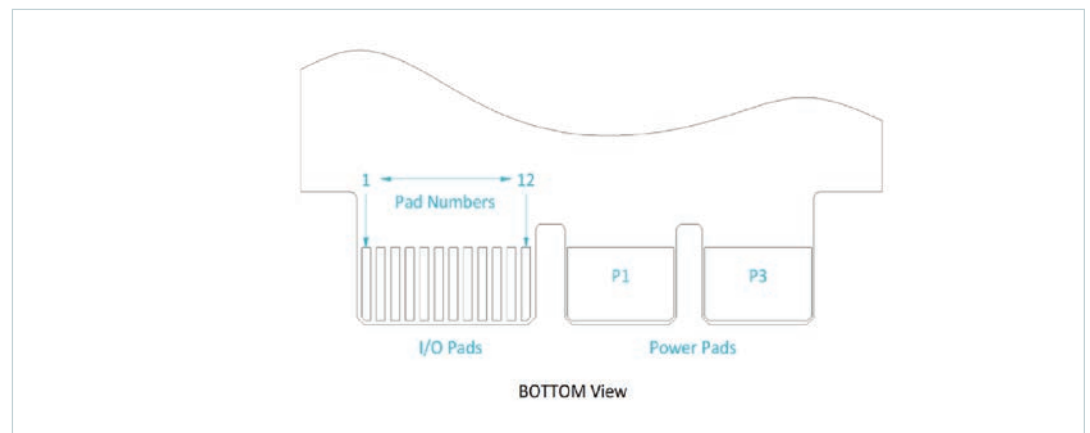- Vertical Socket: LPHS-XX-XX-X-VXX-XX-MKT.pdf

Figure 4
Edge connector details
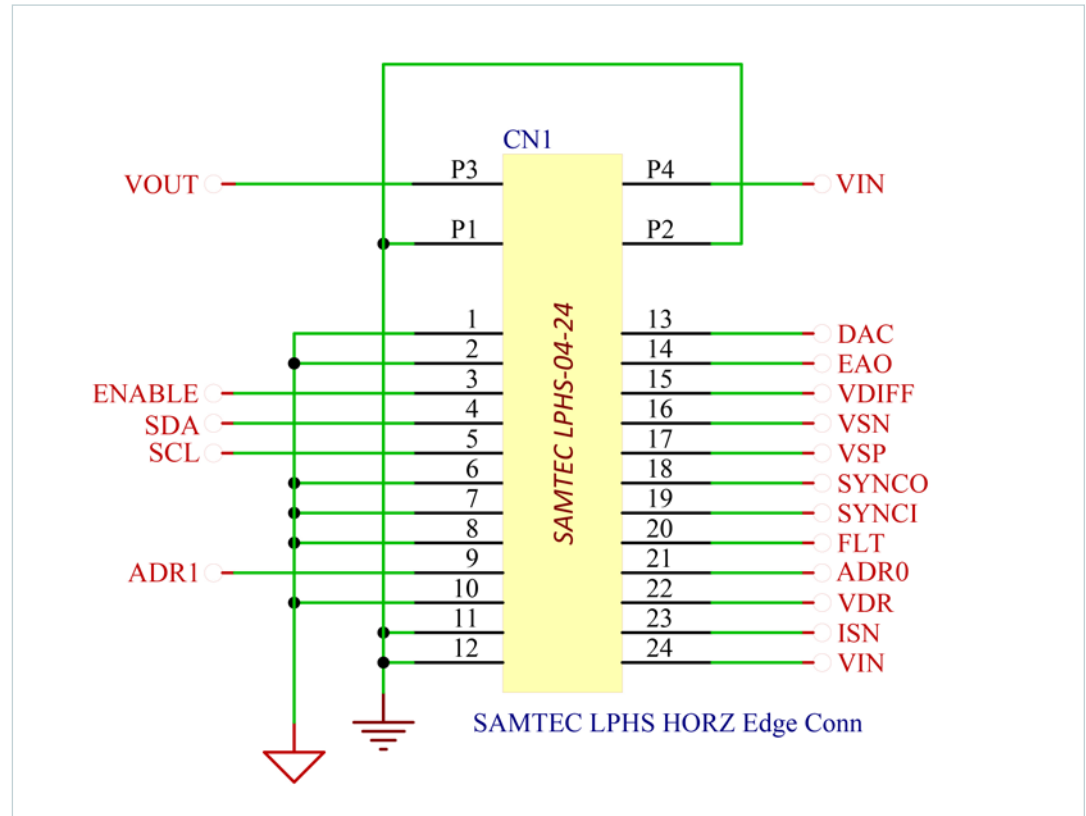

PAD Numbering

Figure 5
Top (component) view

Figure 6
Bottom view

Schematic Symbol

PAD Definitions

PAD	Name	Description
P1,P2	PGND	Power ground connection for the input supply and output load
P3	VOUT	Output voltage connection
P4	VIN	Input voltage connection
1, 2, 6, 7, 8, 10	SGND	Signal ground used as reference for I/O measurements
11, 12	PGND	Power ground used as reference for input and output voltage measurements
3	ENABLE	Enable
4	SDA	Factory use only
5	SCL	Factory use only
9	ADR1	Factory use only
13	DAC	External voltage node to adjust regulated output voltage (EXT_VREF)
14	EAO	Error amplifier output
15	VDIFF	Differential amplifier output
16	VSN	Differential amplifier inverting input
17	VPN	Differential amplifier non-inverting input
18	SYNCO	Sync output pin
19	SYNCI	Sync input pin
20	PGD	Power good status pin
21	ADR0	Factory use only
22	VDR	Internal generated 5.1V supply for gate drivers and internal logic
23	ISN	Remote-sensed output voltage, after the IMON resistor
24	VIN	Input supply voltage measured at SiP's input

PCB Design Files

ODB++ evaluation board design files are available for download on the Vicor website.

Product	Deisgn File Format	Link to Download
PI3741-0x-EVAL1	ODB++	PI3741-0x Eval ODB++.zip

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