PI33xx-xx-EVAL1 & PI34xx-xx-EVAL1
ZVS Regulators Buck Evaluation Board

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Introduction

The PI33xx-xx-EVAL1 and PI34xx-xx-EVAL1 evaluation board demonstrates the features and benefits of the ZVS Buck Regulator PI33xx and PI34xx families. The board features the ZVS Buck Regulator SiP, along with inductor, ceramic input and output capacitors.

The evaluation board provides several options for making input power (V_{IN} and GND) and output load (V_{OUT} and GND) connections. The user can solder tab style banana jacks or wire, use threaded binding posts secured by a retaining nut, or to simply use a #6 nut and bolt connection.

All the I/O pins are labeled and routed to the board edge for easy access. Each I/O pin is accompanied with an adjacent 50mil through-hole for adding a test point or to facilitate wiring to external circuitry.

The board has a scope tip jack for measuring output voltage (V_{OUT}), and has locations for two optional jacks for measuring V_{IN} and the switching node of the regulator (See Figure 4). There are two headers installed: an ENABLE jumper which can be used to enable or disable the converter and the remote sense jumper that will connect the buck's remote sense pin to the output at the V_{OUT} terminal.

Connections required for parallel regulator operation are grouped together (labeled Current Sharing) to allow for easy connection between evaluation boards. There is a zero ohm jumper between SYNCI and SGND to ensure that SYNCI is grounded when not used. This resistor must be removed for interleaved operation. Please refer to the product data sheet for more detailed information on paralleling and on interleaving units.

There are two unpopulated resistor footprints (RADJ1 and RADJ2) used in trimming the output voltage and a capacitor footprint (CTRK) to add additional capacitance to the output tracking pin. Please refer to the product datasheet for more detailed information on these topics.

The evaluation board is constructed using 4 layers of 2oz copper and is routed to optimize the regulation path between input and output voltage, which reduces the parasitic losses and yields the best efficiency.

Table 1
Applicable evaluation board, product part numbers, and associated evaluation PCB number

Product Part Number	Evaluation Board Number	PCB Part Number
PI3301-00-LGIZ	PI3301-00-EVAL1	PCB0108
PI3301-01-LGIZ	PI3301-01-EVAL1	PCB0113
PI3302-00-LGIZ	PI3302-00-EVAL1	PCB0108
PI3302-03-LGIZ	PI3302-03-EVAL1	PCB0190
PI3303-00-LGIZ	PI3303-00-EVAL1	PCB0108
PI3305-00-LGIZ	PI3305-00-EVAL1	PCB0108
PI3423-00-LGIZ	PI3423-00-EVAL1	PCB0113
PI3424-00-LGIZ	PI3424-00-EVAL1	PCB0113
End of Life Product Part Number	**End of Life Evaluation Board Number**	**PCB Part Number**
PI3303-20-LGIZ	PI3303-20-EVAL1	PCB0108
PI3311-00-LGIZ	PI3311-00-EVAL1	PCB0113
PI3311-01-LGIZ	PI3311-01-EVAL1	PCB0113
PI3312-00-LGIZ	PI3312-00-EVAL1	PCB0108
PI3312-01-LGIZ	PI3312-01-EVAL1	PCB0113
PI3318-00-LGIZ	PI3318-00-EVAL1	PCB0113
PI3318-01-LGIZ	PI3318-01-EVAL1	PCB0113
PI3420-00-LGIZ	PI3420-00-EVAL1	PCB0113
PI3421-00-LGIZ	PI3421-00-EVAL1	PCB0113
PI3422-00-LGIZ	PI3422-00-EVAL1	PCB0113

Figure 1
Evaluation board (PCB 0108)

Figure 2
Evaluation board (PCB 0113)

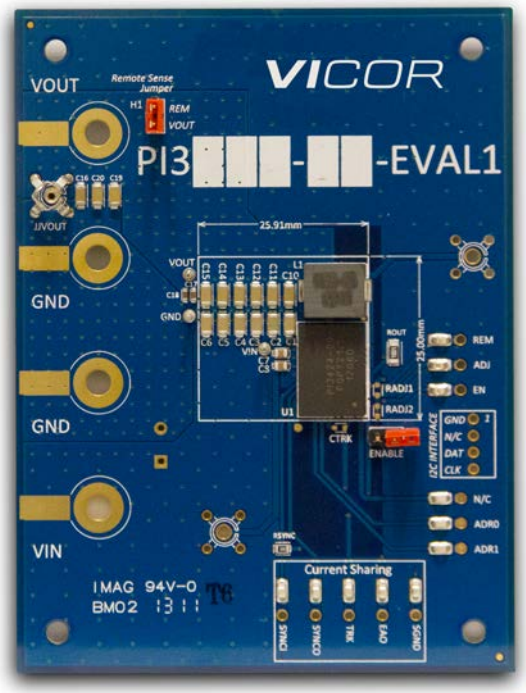
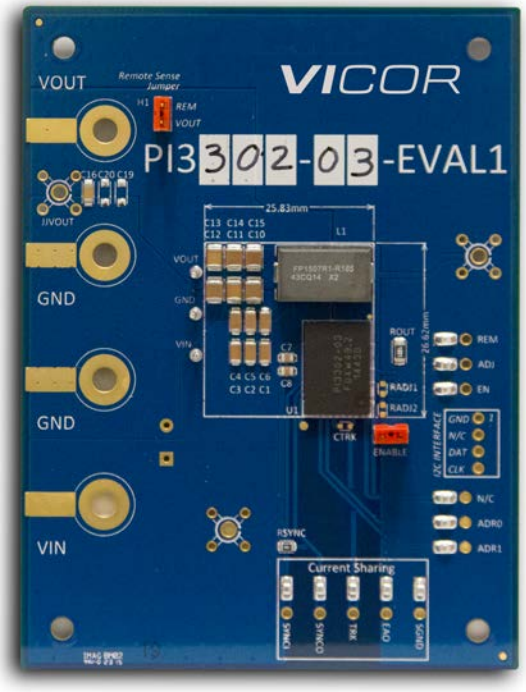


Figure 3
Evaluation board (PCB 0190)



Evaluation Board Supply & Load Connections

Figure 4 displays the recommended connections for input supply and output loading, and the best test points for measuring input and output voltages. All the I/O pins are brought out to the edge to allow for easy measurement and/or connection to the user's external circuitry.

Figure 4
Evaluation board measurement connection

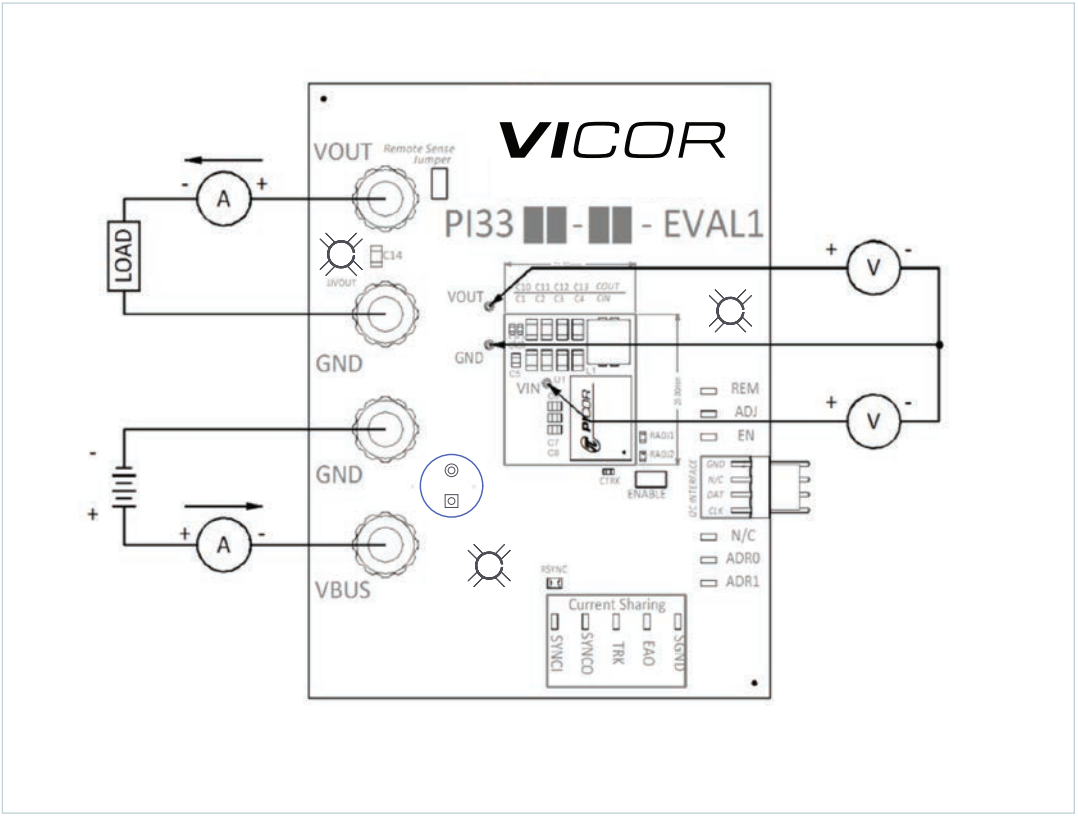


Figure 5
Evaluation board
(PCB 0108) schematic

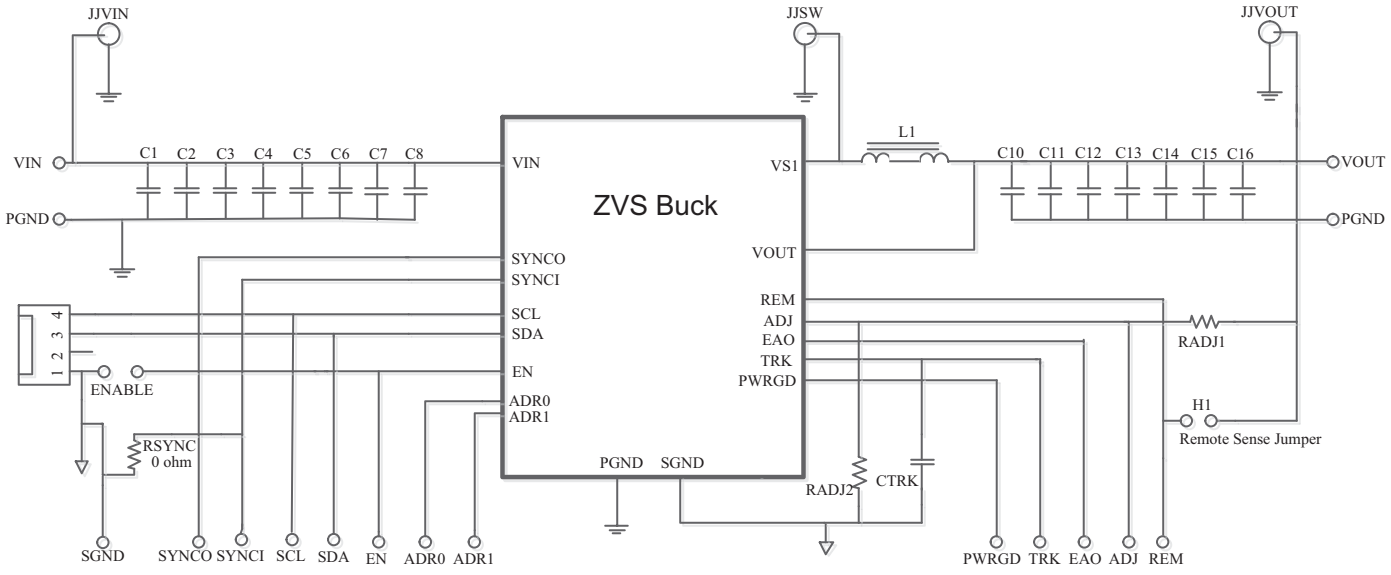


Figure 6
Evaluation board
(PCB0113) schematic

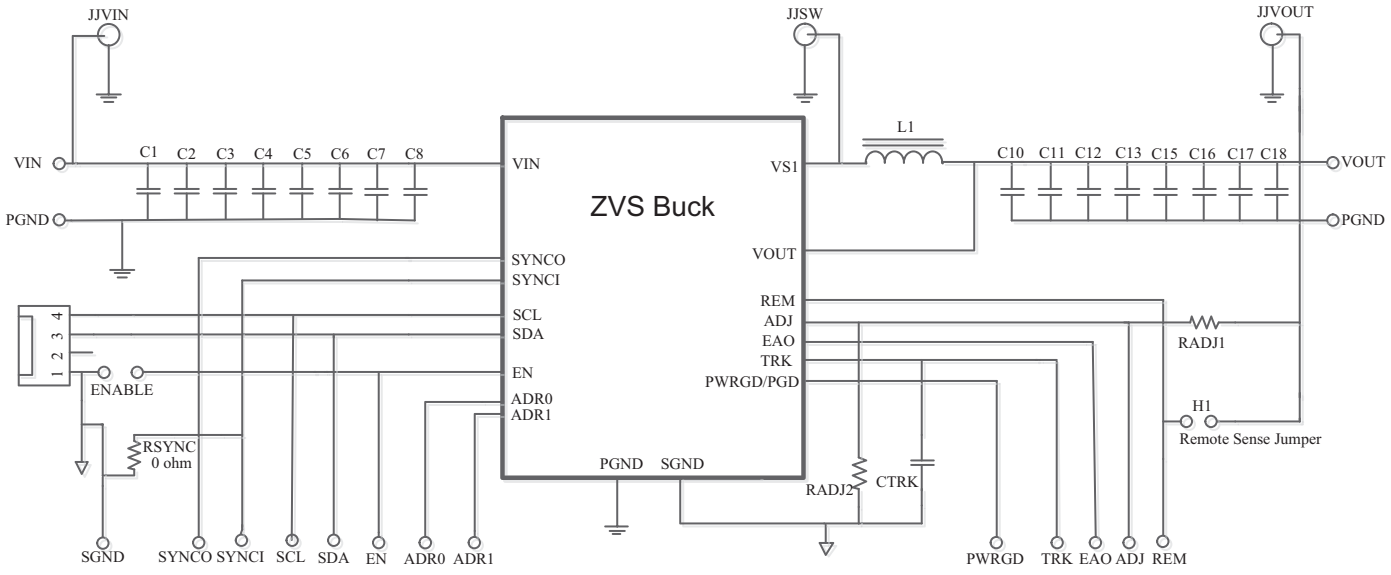
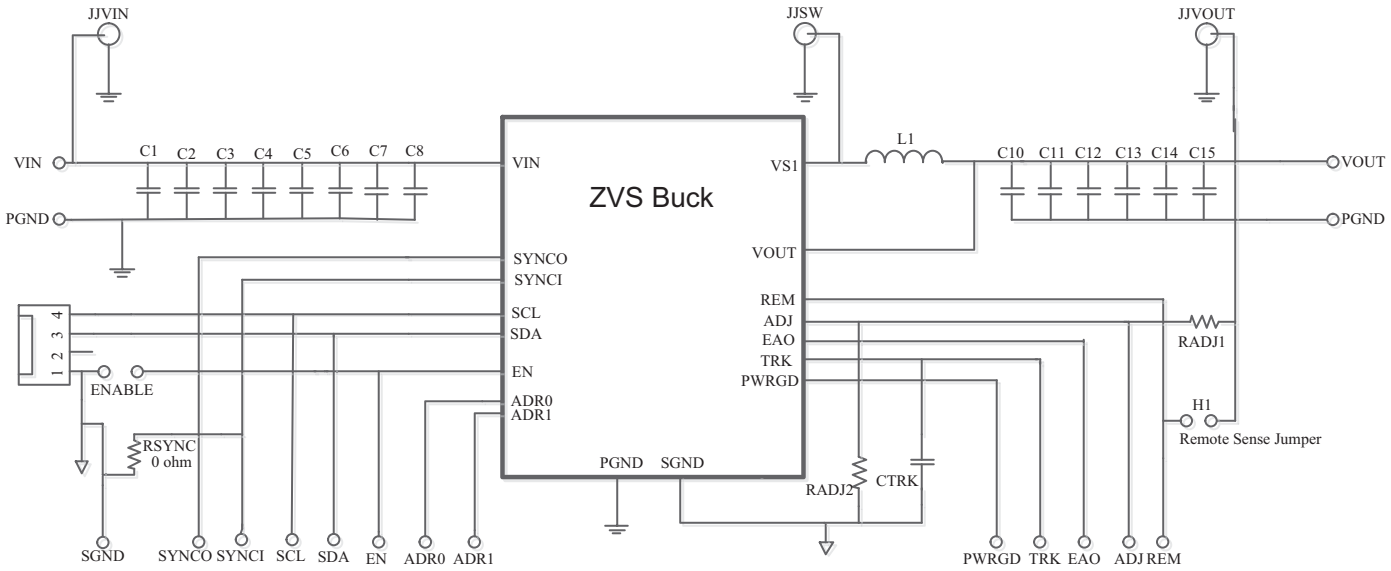


Figure 7
Evaluation board (PCB0190) schematic



Bills of Materials

Locate the PCB number for your product in the following tables and find the BOM for that PCB.

Table 2
Bill of materials Vicor ZVS Buck Regulator evaluation board (PCB 0108)

Device	Qty	Designators	Value	Description	Manufacturer	Part Number
PI3301-00	1	U1	3.3V ZVS Buck Regulator	ZVS Buck Regulator	VICOR	PI3301-00-LGIZ
	4	C10-C13	100µF 6.3V	Ceramic Output Capacitor	Murata	GRM31CR60J107ME39L
	1	L1	200nH	Buck Inductor	Eaton	FPT705-200-R
		I^2C_ INTERFACE	n/a	n/a	n/a	n/a
PI3302-00	1	U1	5V ZVS Buck Regulator	ZVS Buck Regulator	VICOR	PI3302-00-LGIZ
	4	C10-C13	47µF 10V	Ceramic Output Capacitor	Murata	GRM31CR61A476ME15L
	1	L1	200nH	Buck Inductor	Eaton	FPT705-200-R
		I^2C_ INTERFACE	n/a	n/a	n/a	n/a
PI3303-00	1	U1	12V ZVS Buck Regulator	ZVS Buck Regulator	VICOR	PI3303-00-LGIZ
	4	C10-C13	22µF 25V	Ceramic Output Capacitor	Murata	GRM31CR61E226KE15L
	1	L1	230nH	Buck Inductor	Eaton	FPT705-200-R
		I^2C_ INTERFACE	n/a	n/a	n/a	n/a
PI3303-20 [a]	1	U1	12V ZVS Buck Regulator	ZVS Buck Regulator	VICOR	PI3303-20-LGIZ
	4	C10-C13	22µF 25V	Ceramic Output Capacitor	Murata	GRM31CR61E226KE15L
	1	L1	230nH	Buck Inductor	Eaton-Coiltronics	FPT705-230-R
	1	I^2C_ INTERFACE		4 Position, I2C Header	Molex	22-23-2041
PI3305-00	1	U1	15V ZVS Buck Regulator	ZVS Buck Regulator	VICOR	PI3305-00-LGIZ
	4	C10-C13	22µF 25V	Ceramic Output Capacitor	Murata	GRM31CR61E226KE15L
	1	L1	230nH	Buck Inductor	Eaton-Coiltronics	FPT705-230-R
		I^2C_ INTERFACE	n/a	n/a	n/a	n/a

[a] End-of-life part number.

Bills of Materials (Cont.)

Table 2 (Cont.)
Bill of materials Vicor ZVS Buck Regulator evaluation board (PCB 0108)

Device	Qty	Designators	Value	Description	Manufacturer	Part Number
PI3312-00 [a]	1	U1	2.5V ZVS Buck Regulator	ZVS Buck Regulator	VICOR	PI3312-00-LGIZ
	4	C10-C13	100µF 6.3V	Ceramic Output Capacitor	Murata	GRM31CR60J107ME39L
	1	L1	200nH	Buck Inductor	Eaton-Coiltronics	FPT705-200-R
		I^2C_ INTERFACE	n/a	n/a	n/a	n/a
Common	10	ADJ, ADR0, ADR1, EAO, EN, REM, SGND, SYNCI, SYNCO, TRK		SM Test Point	Keystone	5015
	4	C1-C4	4.7µF 50V	Ceramic Capacitor	Murata	GRM31CR71H475KA12L
	4	C5-C8	0.1µF 50V	Ceramic Capacitor	TDK	C2012X7R1H104K085AA
	1	C14	0.1µF 50V	Ceramic Capacitor	Murata	GRM319R71H104KA01D
	2	C15-C16	1µF 16V	Ceramic Capacitor	Murata	GRM188R71C105KA12J
	2	ENABLE, H1		Header Jumper	Samtec	TSW-148-07-F-S
	3	GND, VIN, VOUT		TH Testpoint	Vector	K24
	1	JJVOUT		Compact 3.5mm Jack	Tektronix	131503100
		JJVIN, JJVSW	n/a	n/a	n/a	n/a
	1	PCB		PI33xx-xx-EVAL1 PCB	VICOR	PCB0108
	1	RSYNC	0Ω	0805 Resistor	Rohm	MCR10EZPJ000

[a] End-of-life part number.

Bills of Materials (Cont.)

Table 3
Bill of materials Vicor ZVS Buck Regulator evaluation board (PCB 0113)

Device	Qty	Designators	Value	Description	Manufacturer	Part Number
PI3301-01	1	U1	3.3V ZVS Buck Regulator	ZVS Buck Regulator	VICOR	PI3301-01-LGIZ
	8	C10-C15 C19-C20	100µF 6.3V	Ceramic Output Capacitor	Murata	GRM31CR60J107ME39L
	1	L1	150nH	Buck Inductor	Datatronics	38950-05
	6	C1-C6	4.7µF 50V	Ceramic Capacitor	Murata	GRM31CR71H475KA12L
PI3311-00 [a]	1	U1	1V ZVS Buck Regulator	ZVS Buck Regulator	VICOR	PI3311-00-LGIZ
	8	C10-C15 C19-C20	100µF 6.3V	Ceramic Output Capacitor	Murata	GRM31CR60J107ME39L
	1	L1	125nH	Buck Inductor	Datatronics	38950-04
	6	C1-C6	4.7µF 50V	Ceramic Capacitor	Murata	GRM31CR71H475KA12L
PI3311-01 [a]	1	U1	1V ZVS Buck Regulator	ZVS Buck Regulator	VICOR	PI3311-01-LGIZ
	8	C10-C15 C19-C20	100µF 6.3V	Ceramic Output Capacitor	Murata	GRM31CR60J107ME39L
	1	L1	80nH	Buck Inductor	Datatronics	38950-02
	6	C1-C6	4.7µF 50V	Ceramic Capacitor	Murata	GRM31CR71H475KA12L
PI3312-01 [a]	1	U1	2.5V ZVS Buck Regulator	ZVS Buck Regulator	VICOR	PI3312-01-LGIZ
	8	C10-C15 C19-C20	100µF 6.3V	Ceramic Output Capacitor	Murata	GRM31CR60J107ME39L
	1	L1	125nH	Buck Inductor	Datatronics	38950-04
	6	C1-C6	4.7µF 50V	Ceramic Capacitor	Murata	GRM31CR71H475KA12L
PI3318-00 [a]	1	U1	1.8V ZVS Buck Regulator	ZVS Buck Regulator	VICOR	PI3318-00-LGIZ
	8	C10-C15 C19-C20	100µF 6.3V	Ceramic Output Capacitor	Murata	GRM31CR60J107ME39L
	1	L1	150nH	Buck Inductor	Datatronics	38950-05
	6	C1-C6	4.7µF 50V	Ceramic Capacitor	Murata	GRM31CR71H475KA12L

[a] End-of-life part number.

Bills of Materials (Cont.)

Table 3 (Cont.)
Bill of materials Vicor ZVS Buck Regulator evaluation board (PCB 0113)

Device	Qty	Designators	Value	Description	Manufacturer	Part Number
PI3318-01 [a]	1	U1	1.8V ZVS Buck Regulator	ZVS Buck Regulator	VICOR	PI3318-01-LGIZ
	8	C10-C15 C19-C20	100µF 6.3V	Ceramic Output Capacitor	Murata	GRM31CR60J107ME39L
	1	L1	125nH	Buck Inductor	Datatronics	38950-04
	6	C1-C6	4.7µF 50V	Ceramic Capacitor	Murata	GRM31CR71H475KA12L
PI3420-00 [a]	1	U1	1.8V ZVS Buck Regulator	ZVS Buck Regulator	VICOR	PI3420-00-LGIZ
	8	C10-C15 C19-C20	100µF 6.3V	Ceramic Output Capacitor	Murata	GRM31CR60J107ME39L
	1	L1	80nH	Inductor	Datatronics	38950-02
	6	C1-C6	22µF 25V	Ceramic Capacitor	Murata	GRM31CR61E226KE15L
PI3421-00 [a]	1	U1	1.8V ZVS Buck Regulator	ZVS Buck Regulator	VICOR	PI3421-00-LGIZ
	8	C10-C15 C19-C20	100µF 6.3V	Ceramic Output Capacitor	Murata	GRM31CR60J107ME39L
	1	L1	125nH	Inductor	Datatronics	38950-04
	6	C1-C6	22µF 25V	Ceramic Capacitor	Murata	GRM31CR61E226KE15L
PI3422-00 [a]	1	U1	2.5V ZVS Buck Regulator	ZVS Buck Regulator	VICOR	PI3422-00-LGIZ
	8	C10-C15 C19-C20	100µF 6.3V	Ceramic Output Capacitor	Murata	GRM31CR60J107ME39L
	1	L1	125nH	Inductor	Datatronics	38950-04
	6	C1-C6	22µF 25V	Ceramic Capacitor	Murata	GRM31CR61E226KE15L
PI3423-00	1	U1	3.3V ZVS Buck Regulator	ZVS Buck Regulator	VICOR	PI3423-00-LGIZ
	8	C10-C15 C19-C20	100µF 6.3V	Ceramic Output Capacitor	Murata	GRM31CR60J107ME39L
	1	L1	150nH	Inductor	Datatronics	38950-05
	6	C1-C6	22µF 25V	Ceramic Capacitor	Murata	GRM31CR61E226KE15L

[a] End-of-life part number.

Bills of Materials (Cont.)

Table 3 (Cont.)
Bill of materials Vicor ZVS Buck Regulator evaluation board (PCB 0113)

Device	Qty	Designators	Value	Description	Manufacturer	Part Number
PI3424-00	1	U1	5V ZVS Buck Regulator	ZVS Buck Regulator	VICOR	PI3424-00-LGIZ
	8	C10-C15 C19-C20	47µF 10V	Ceramic Output Capacitor	Murata	GRM31CR61A476ME15L
	1	L1	150nH	Inductor	Datatronics	38950-05
	6	C1-C6	22µF 25V	Ceramic Capacitor	Murata	GRM31CR61E226KE15L
Common	11	ADJ, ADR0, ADR1, EAO, EN, NC, REM, SGND, SYNCI, SYNCO, TRK		SM Testpoint	Keynote	5015
	2	C7-C8	0.1µF 50V	Ceramic Capacitor	TDK	C2012X7R1H104K085AA
	1	C16	0.1µF 50V	Ceramic Capacitor	Murata	GRM319R71H104KA01D
	2	C17-C18	1µF 16V	Ceramic Capacitor	Murata	GRM188R71C105KA12J
	2	ENABLE, H1		Header Jumper	Samtec	TSW-148-07-F-S
	3	GND, VIN, VOUT		TH Testpoint	Vector Technologies	K24C/M
	1	JJVOUT		Compact 3.5mm Jack	Tektronix	131503100
		JJVIN, JJVSW	n/a	n/a	n/a	n/a
	1	PCB		PI3xxx-xx-EVAL1-pcb	VICOR	PCB0113
	1	ROUT	1kΩ	Resistor	Rohm	MCR18EZHF1001
	1	RSYNC	0Ω	Resistor	Rohm	MCR10EZPJ000
		I^2C_ INTERFACE	n/a	n/a	n/a	n/a

Bills of Materials (Cont.)

Table 4
Bill of materials Vicor ZVS Buck Regulator evaluation board (PCB 0190)

Device	Qty	Designators	Value	Description	Manufacturer	Part Number
PI3302-03	1	U1	5V ZVS Buck Regulator	ZVS Buck Regulator	VICOR	PI3302-03-LGIZ
	6	C10-C15	47µF 10V	Ceramic Capacitor	Murata	GRM32ER71A476KE15L
	1	L1	185nH	Buck inductor	Eaton-Coiltronics	FP1507R1-R185-R
	11	ADJ, ADR0, ADR1, EAO, EN, N/C, REM, SGND, SYNCI, SYNCO, TRK		SM Testpoint	Keystone	5015
	1	C16	0.1µF 50V	Ceramic Capacitor	Murata	GRM319R71H104KA01D
	2	C17-C18	1µF 16V	Ceramic Capacitor	Murata	GRM188R71C105KA12J
	6	C1-C6	10µF 50V	Ceramic Capacitor	TDK	C3216X5R1H106K160AB
	2	C7-C8	0.1µF 50V	Ceramic Capacitor	TDK	C2012X7R1H104K085AA
	2	ENABLE, H1		Header Jumper	Samtec	TSW-148-07-F-S
		JJVIN, JJVSW, JJVOUT	n/a	n/a	n/a	n/a
	3	GND, VIN VOUT		TH Testpoint	Vector	K24
	1	ROUT	1kΩ	1206 Resistor	Rohm	MCR18EZHF1001
	1	RSYNC	0Ω	0805 Resistor	Rohm	MCR10EZPJ000
		I^2C_ INTERFACE	n/a	n/a	n/a	n/a

Evaluation Board Notes

The evaluation board has solder mask openings on the bottom side of the board to allow for the option of additional output capacitance (4 x 1206 or 2 x 1812).

There are two additional, unmarked, scope tip test points (circled in red in Figures 8 – 10) that allow the user to measure V_{IN} and the switching node (VS1). These are labeled as JJVIN and JJVSW in Figures 8 – 10.

There are two through-hole pads (blue circle) for the addition of an electrolytic bulk storage capacitor. This capacitor is required when the evaluation board is connected to the input voltage source through long leads. A 100µF, 50V Electrolytic is recommended with an ESR between 20 and 50mΩ.

The two pins labeled as "N/C" (highlighted in green box in Figures 8 – 10) are not electrically connected to each other.

There are internal connections within the PI33xx and PI34xx between grounds SGND and PGND. It is not required to tie these two grounds together externally and these two grounds are not connected together on the evaluation board.

Figure 8
Optional Test Points & Component Locations (PCB 0108)

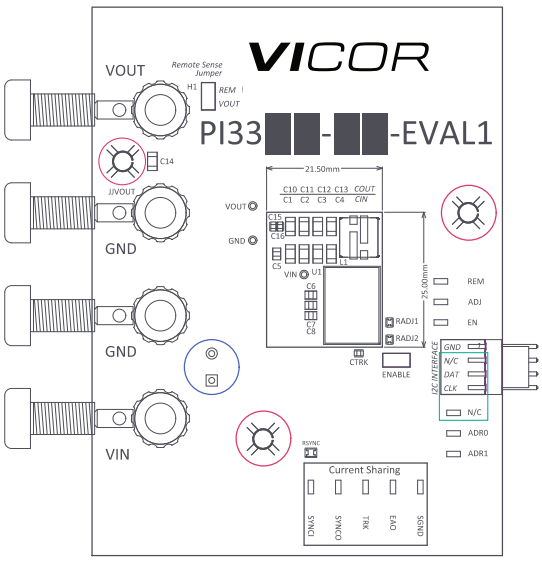


Figure 9
Optional Test Points & Component Locations (PCB0113)

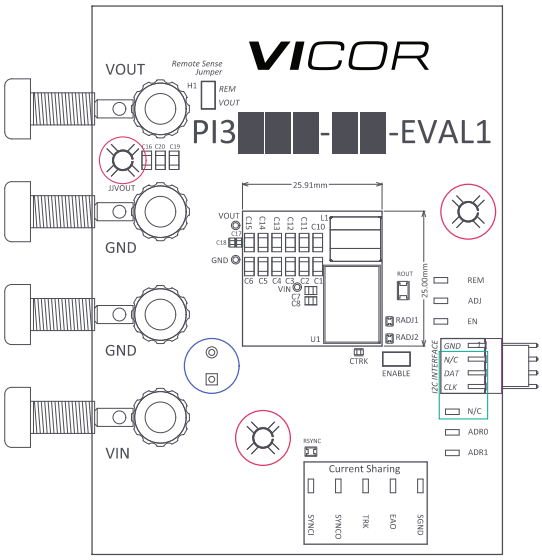


Figure 10
Optional Test Points & Component Locations (PCB0190)

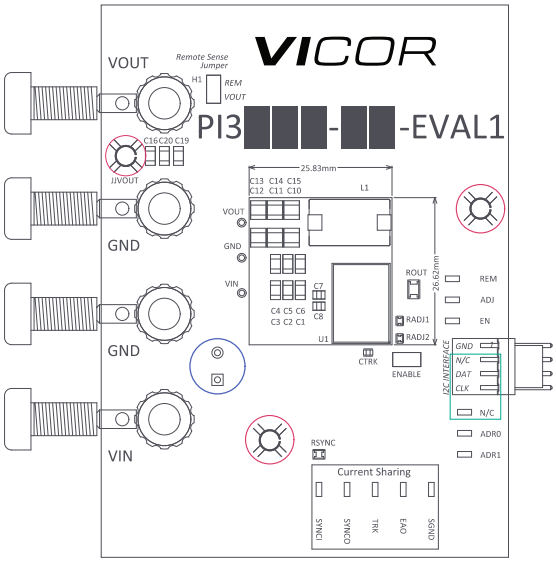
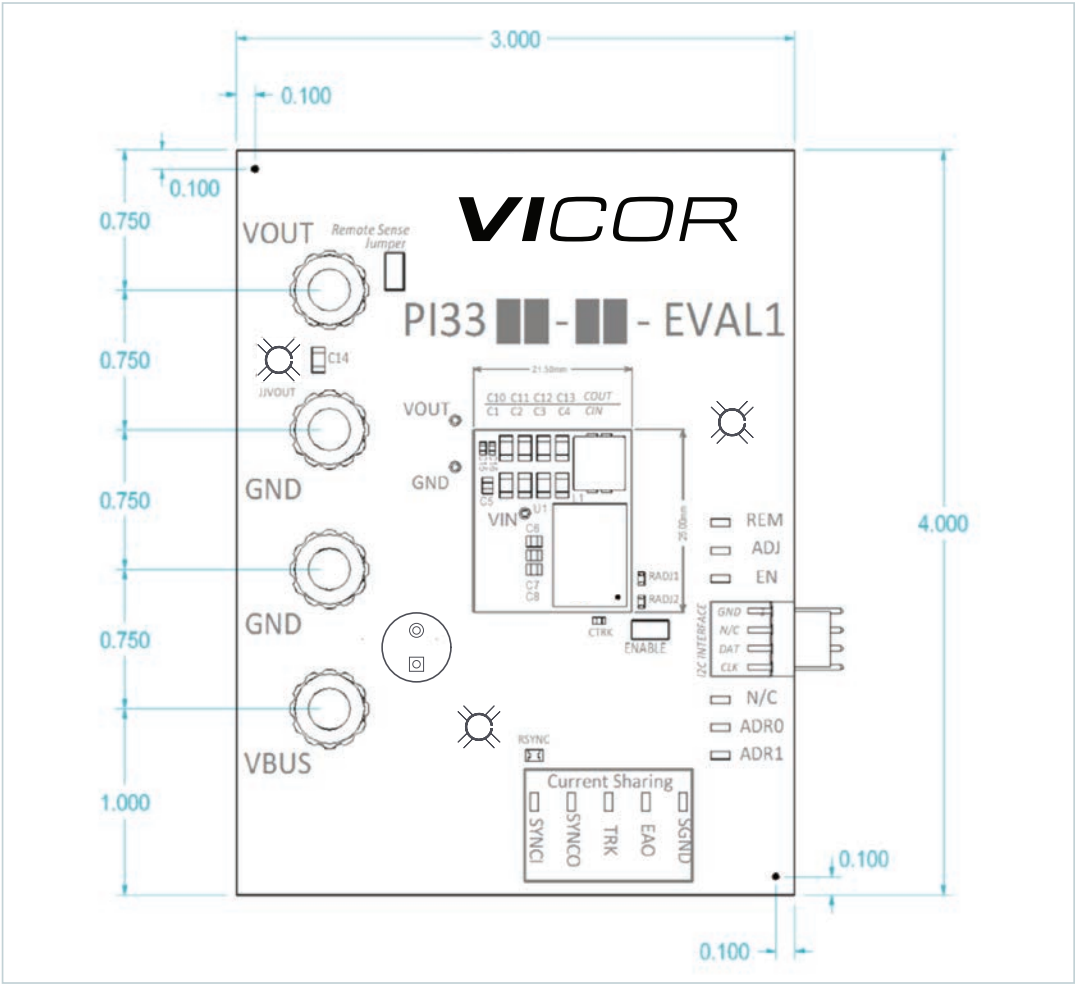


Figure 11
Board Dimensions Common to all Three PCBNumbers



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