

8V to 36Vin Cool-Power® ZVS Buck Regulator Evaluation Board User Guide

Description

The PI33XX-XX-EVAL1 evaluation board demonstrates the features and benefits of the Picor Cool-Power® ZVS Buck Regulator PI33XX family. The board features the ZVS Buck Regulator SIP (U1), along with inductor (L1), ceramic input (C1-C8), and output capacitors (C10-C16).

The evaluation board provides several options for making input power (VIN and GND) and output load (VOUT 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 (VOUT), and has locations for two optional jacks for measuring VIN 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 (H1) that will connect the buck's remote sense pin to the output at the VOUT terminal.

There is a location for an optional 4-pin I²C header that allows users to set certain device parameters and to read the fault registers of the regulator (select regulator versions). Each regulator can be assigned an address from 0 to 7 using the two tri-state address pins (ADRO and ADR1).

Connections required for parallel regulator operation are grouped together (labeled Current Sharing) to allow for easy connection between evaluation boards. There is a connection wire from SYNC1 to SGND that ensures SYNC1 is grounded when not used in parallel with another PI33XX regulator. This wire should be removed for parallel operation.

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.



Figure 1 – PI33XX-XX-EVAL1 Board

Evaluation Board Supply and Load Connections

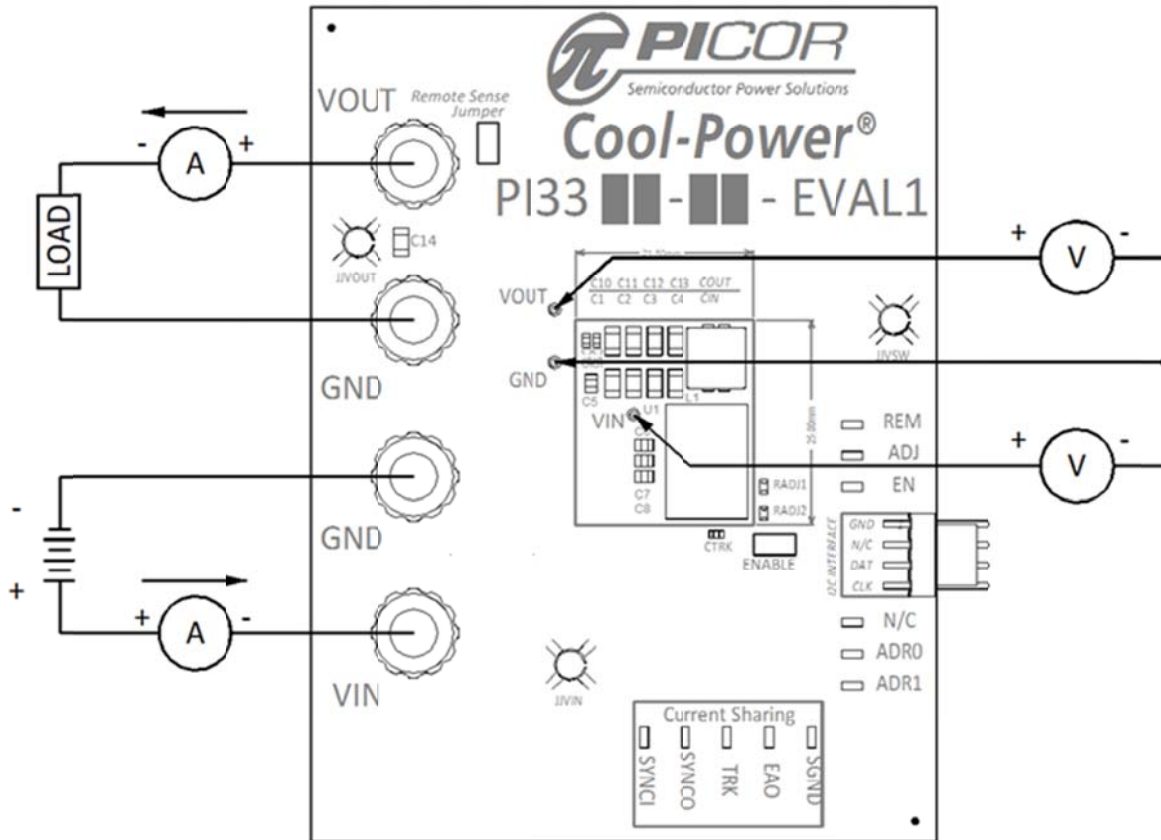


Figure 2 - Evaluation board measurement connection

Figure 2 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.

Evaluation Board Schematic

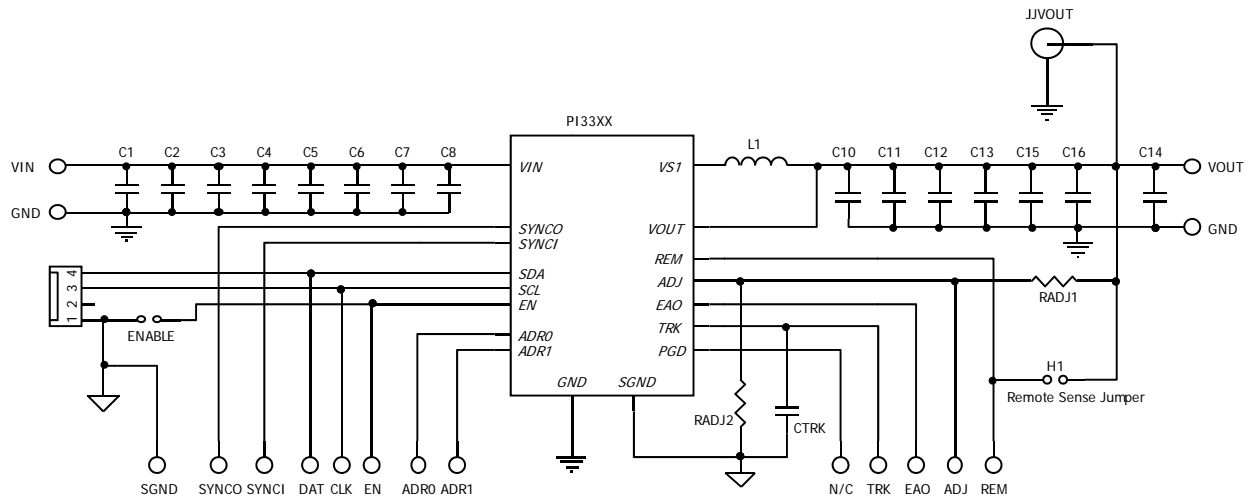


Figure 3 – PI33XX-xx-EVAL1 Schematic

PI33XX-xx-EVAL1 BOM

Device	Qty	Designators	Value	Description	Manufacturer	Part Number
PI3312	1	U1	2.5V ZVS Regulator	ZVS Regulator	PICOR	PI3312-00-LGIZ
	4	C10, C11, C12, C13	100uF, 6V	Ceramic Output Capacitor	Murata	GRM31CR60J107ME39L
	1	L1	200nH	Buck Inductor	Cooper	FPT705-200-R
PI3301	1	U1	3.3V ZVS Regulator	ZVS Regulator	PICOR	PI3301-00-LGIZ
	4	C10, C11, C12, C13	100uF, 6V	Ceramic Output Capacitor	Murata	GRM31CR60J107ME39L
	1	L1	200nH	Buck Inductor	Cooper	FPT705-200-R
PI3302	1	U1	5V ZVS Regulator	ZVS Regulator	PICOR	PI3302-00-LGIZ
	4	C10, C11, C12, C13	47uF, 16V	Ceramic Output Capacitor	Murata	GRM31CR61A476ME15
	1	L1	200nH	Buck Inductor	Cooper	FPT705-200-R
PI3303	1	U1	12V ZVS Regulator	ZVS Regulator	PICOR	PI3303-00-LGIZ
	4	C10, C11, C12, C13	22uF, 25V	Ceramic Output Capacitor	Murata	GRM31CR61E226KE15L
	1	L1	230nH	Buck Inductor	Cooper	FPT705-230-R

Table 1 – PI33XX-xx-EVAL1 Bill of materials (continued on next page)

Device	Qty	Designators	Value	Description	Manufacturer	Part Number
PI3305	1	U1	15V ZVS Regulator	ZVS Regulator	PICOR	PI3305-00-LGIZ
	4	C10, C11, C12, C13	22uF, 25V	Ceramic Output Capacitor	Murata	GRM31CR61E226KE15L
	1	L1	230nH	Buck Inductor	Cooper	FPT705-230-R
Common	10	ADJ, ADRO, ADR1, EAO, EN, REM, SGND, SYNCI, SYNCO, TRK		SM Testpoint	Keystone	5015
	4	C1, C2, C3, C4	4.7uF, 50V	Ceramic Capacitor, 50V, X7R	Murata	GRM31CR71H475KA12L
	4	C5, C6, C7, C8	0.1uF, 50V	Ceramic Capacitor	TDK	C2012X7R1H104K
	1	C14	0.1uF, 50V	Ceramic Capacitor	Murata	GRM319R71H104KA01D
	2	C15, C16	1uF, 50V	Ceramic Capacitor	Murata	GRM188R71C105KA12J
	1	CTRK	47nF	Ceramic Capacitor	Murata	GRM188F51H473ZA01D
	2	ENABLE, H1		Header Jumper	Samtec	TSW-148-07-F-S
	3	GND, VIN, VOUT		TH Testpoint	Vector	K24
	1	JJVOUT		Johnson Jack	Tektronix	131503100
	1	PCB		PI33XX-xx-EVAL1 PCB	PICOR	PCB0108
User Optional	2	RADJ1, RADJ2	User defined	0603 Trim resistors	TBD	TBD
	2	JJVIN, JJVSW	Optional	Scope Tip Jack	Tektronix	131503100

Table 1 - PI33XX-XX-EVAL1 Bill of materials (continued on from previous page)

Evaluation Board Notes

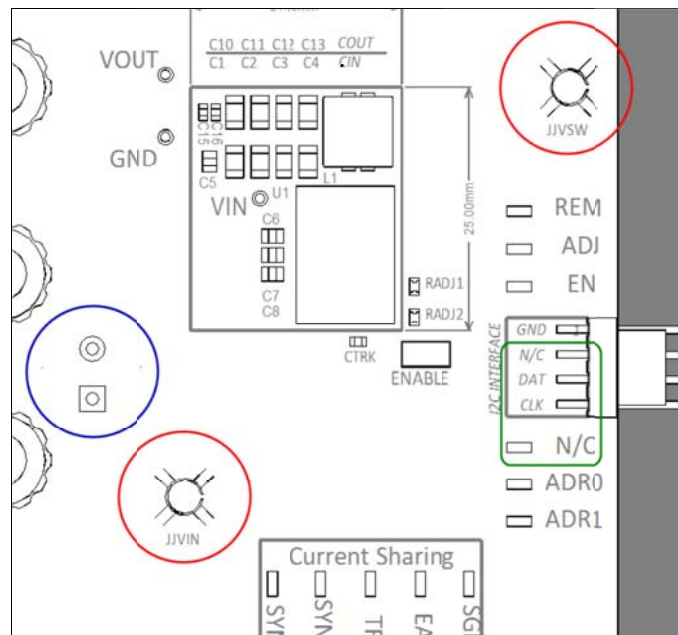
The evaluation board has solder mask openings on the bottom side of the board to allow for the option of additional output capacitance (4 x 1206 or 2 x 1812).

There are two additional, unmarked, scope tip test points (circled in red in figure 4) that allow the user to measure VIN and the switching node (VS1). These are labeled as JJVIN and JJVSW in Figure 4.

There are two thru-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 100 μ F, 50V Electrolytic is recommended with an ESR between 20 and 50m Ω .

The two pins labeled as “N/C” (highlighted in green box in figure 4) are not electrically connected to each other.

There is an internal connection within the PI33XX 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.



ations

PCB Mechanicals

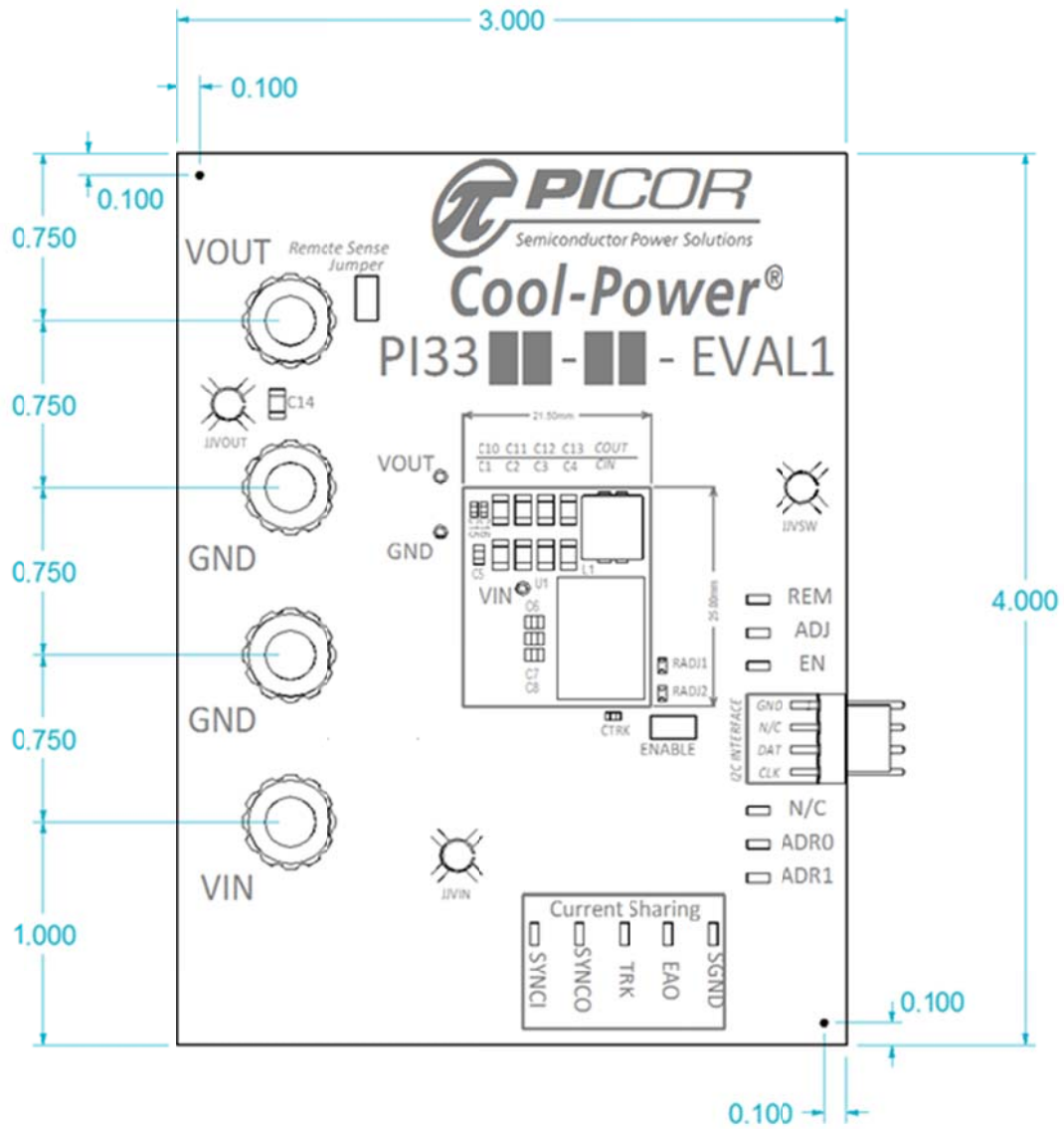
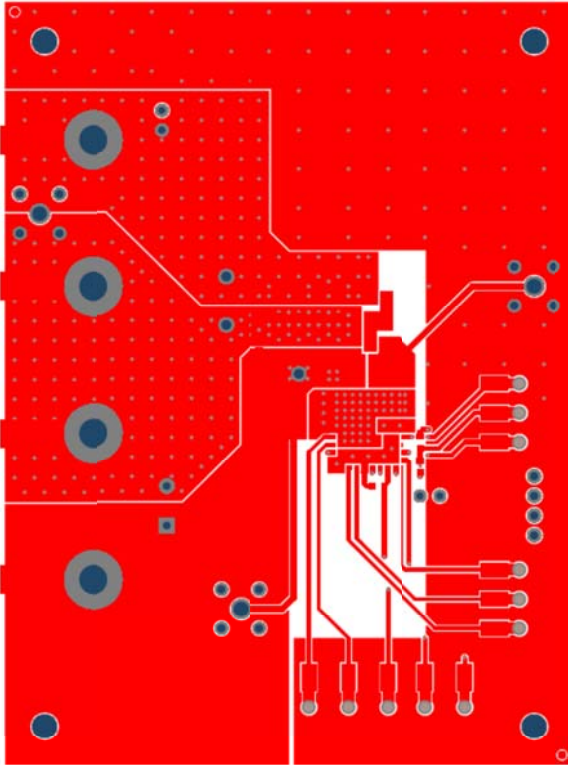
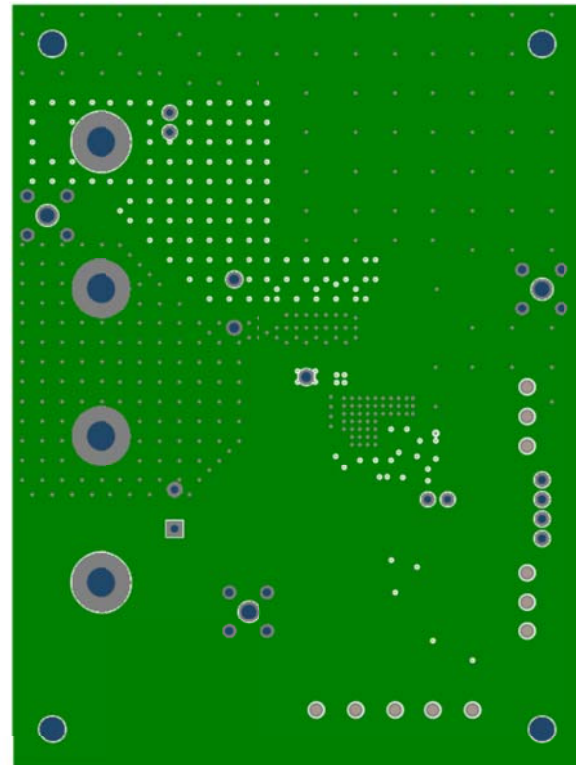


Figure 5 – PI33XX-XX-EVAL1 Board Dimensions

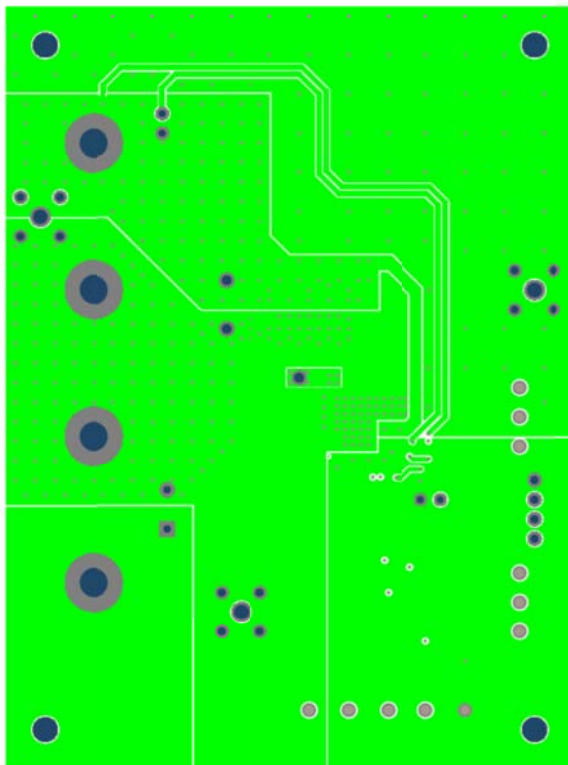
PCB Metal Layers



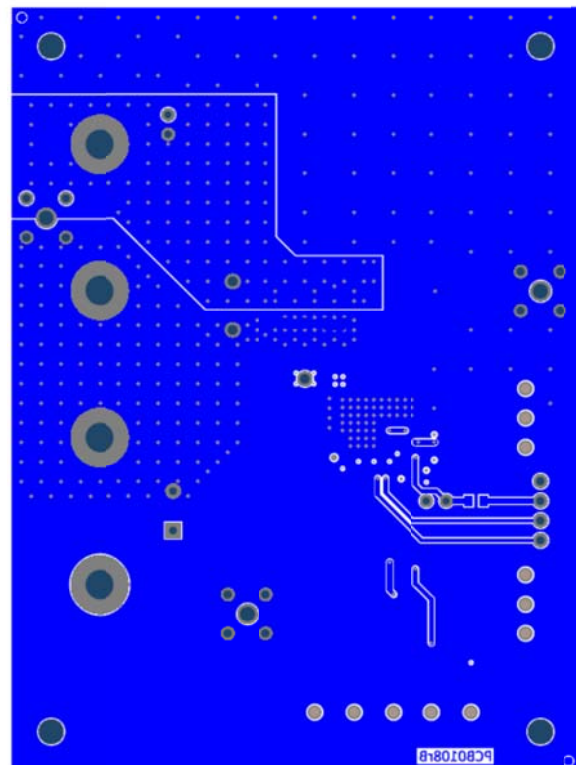
Top Metal



Mid Layer 1



Mid Layer 2



Bottom Metal

Information furnished by Vicor is believed to be accurate and reliable. However, no responsibility is assumed by Vicor for its use. Vicor makes no representations or warranties with respect to the accuracy or completeness of the contents of this publication. Vicor reserves the right to make changes to any products, specifications, and product descriptions at any time without notice. Information published by Vicor has been checked and is believed to be accurate at the time it was printed; however, Vicor assumes no responsibility for inaccuracies. Testing and other quality controls are used to the extent Vicor deems necessary to support Vicor's product warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed. **Specifications are subject to change without notice.**

Vicor's Standard Terms and Conditions

All sales are subject to Vicor's Standard Terms and Conditions of Sale, which are available on Vicor's webpage or upon request.

Product Warranty

In Vicor's standard terms and conditions of sale, Vicor warrants that its products are free from non-conformity to its Standard Specifications (the "Express Limited Warranty"). This warranty is extended only to the original Buyer for the period expiring two (2) years after the date of shipment and is not transferable.

UNLESS OTHERWISE EXPRESSLY STATED IN A WRITTEN SALES AGREEMENT SIGNED BY A DULY AUTHORIZED VICOR SIGNATORY, VICOR DISCLAIMS ALL REPRESENTATIONS, LIABILITIES, AND WARRANTIES OF ANY KIND (WHETHER ARISING BY IMPLICATION OR BY OPERATION OF LAW) WITH RESPECT TO THE PRODUCTS, INCLUDING, WITHOUT LIMITATION, ANY WARRANTIES OR REPRESENTATIONS AS TO MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE, INFRINGEMENT OF ANY PATENT, COPYRIGHT, OR OTHER INTELLECTUAL PROPERTY RIGHT, OR ANY OTHER MATTER.

This warranty does not extend to products subjected to misuse, accident, or improper application, maintenance, or storage. Vicor shall not be liable for collateral or consequential damage. Vicor disclaims any and all liability arising out of the application or use of any product or circuit and assumes no liability for applications assistance or buyer product design. Buyers are responsible for their products and applications using Vicor products and components. Prior to using or distributing any products that include Vicor components, buyers should provide adequate design, testing and operating safeguards.

Vicor will repair or replace defective products in accordance with its own best judgment. For service under this warranty, the buyer must contact Vicor to obtain a Return Material Authorization (RMA) number and shipping instructions. Products returned without prior authorization will be returned to the buyer. The buyer will pay all charges incurred in returning the product to the factory. Vicor will pay all reshipment charges if the product was defective within the terms of this warranty.

Life Support Policy

VICOR'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS PRIOR WRITTEN APPROVAL OF THE CHIEF EXECUTIVE OFFICER AND GENERAL COUNSEL OF VICOR CORPORATION. As used herein, life support devices or systems are devices which (a) are intended for surgical implant into the body, or (b) support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in a significant injury to the user. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system or to affect its safety or effectiveness. Per Vicor Terms and Conditions of Sale, the user of Vicor products and components in life support applications assumes all risks of such use and indemnifies Vicor against all liability and damages.

Intellectual Property Notice

Vicor and its subsidiaries own Intellectual Property (including issued U.S. and Foreign Patents and pending patent applications) relating to the products described in this data sheet. No license, whether express, implied, or arising by estoppel or otherwise, to any intellectual property rights is granted by this document. Interested parties should contact Vicor's Intellectual Property Department.

Vicor Corporation
25 Frontage Road
Andover, MA 01810

Picor Corporation
51 Industrial Drive
North Smithfield, RI 02896

Customer Service: custserv@vicorpower.com

Technical Support: apps@vicorpower.com

Tel: 800-735-6200

Ihr Vertriebspartner:
HY-LINE[®]
POWER COMPONENTS

Inselkammerstraße 10
D-82008 Unterhaching
Tel: +49 (0)89 614 503 10
Fax +49 (0)89 614 503 20
E-Mail: power@hy-line.de
URL: www.hy-line.de

Gründenstrasse 82
CH-8247 Flurlingen
Tel: +41 (0)52 647 42 00
Fax +41 (0)52 647 42 01
E-Mail: power@hy-line.ch
URL: www.hy-line.ch