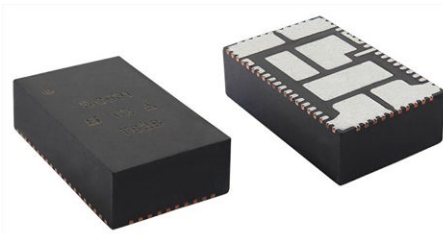


Reference Board User's Manual

High Current microBRICK[®] DC/DC Regulator Module with PMBus



DESCRIPTION

The SiC951 is a complete package with no need for an external inductor and minimal components. It is a PMBus 1.3 compliant non-isolated DC/DC buck regulator module with integrated MOSFETs and inductor in a 10.6 mm x 6.5 mm x 3 mm thermally efficient package. It is capable of supplying 25 A continuous with 30 A peak. Its output voltage is digitally adjustable from 0.3 V to 5.5 V from a 4.5 V to 20 V input with switching frequencies up to 1.5 MHz. The SiC951 can accommodate a variety of applications, including computing, consumer electronics, telecom, and industrial. SiC951 architecture delivers ultrafast transient response with minimum output capacitance and tight regulation over a broad load range. The device has integrated internal compensation and is stable with any type of output capacitor. The device incorporates a power saving scheme that significantly increases light load efficiency.

The SiC951 allows configuration programs to be stored in non volatile memory (NVM). Operation parameters such as V_{OUT} , I_{OUT} over temperature etc. can all be locally stored and used to determine fault behavior. Operation is firmware based and is field upgradable. The SiC951 is available in lead (Pb)-free power enhanced MLP60- A6 package.

APPLICATIONS

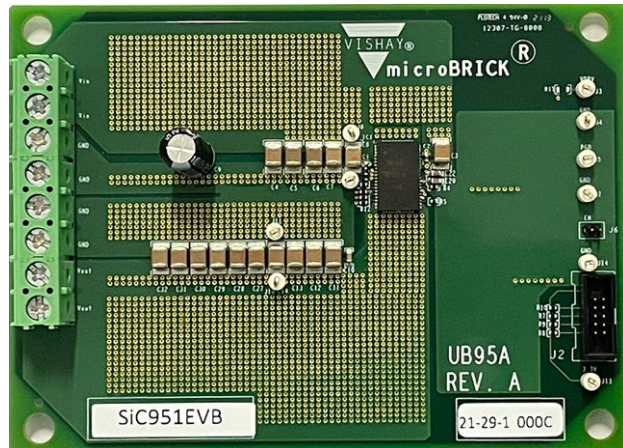
- Servers
- Networking, telecom, storage applications
- Ultrabook, notebook, desktop
- Distributed point of load power architectures
- Storage applications
- DDR memory

FEATURES

- Versatile
 - Single supply operation from 4.5 V to 20 V input voltage
 - Output current: 25 A continuous with 30 A peak
 - Adjustable output voltage from 0.3 V to 5.5 V
 - Built in 5 V regulator for internal circuits and driver supply
 - $\pm 1\%$ output voltage accuracy over temperature
- Highly efficient
 - close to 97 %
- Highly configurable
 - PMBus 1.3 compliant with 1 MHz bus speed
 - Internal NVM
 - V_{OUT} adjustability and reading resolution of 2 mV
 - Supports over 50 PMBus commands
 - Ability to support sequential, tracking and simultaneous operation
 - Supports in phase or 180° out of phase synchronization
 - Output voltage source and sink capability
- Robust and reliable
 - V_{IN} , V_{OUT} , I_{IN} and I_{OUT} and temperature reporting over PMBus
 - Over current protection in pulse-by-pulse mode
 - Output over voltage protection
 - Output under voltage protection
 - Over temperature protection with hysteresis
 - Dedicated enable pin for easy power sequencing
 - Power good open drain output
 - Remote sense amplifier with true differential voltage sensing
 - Ultrafast transient response
 - Optional power saving mode
 - Input power and output power monitoring

SPECIFICATIONS

This reference board allows the end user to evaluate the SiC951 microBRICK® regulator module for its features and all functionalities. It can also be served as a reference design for a user's application.



CONNECTION AND SIGNAL / TEST POINTS

Power Terminal

V_{IN} (J1 - #1, #2), GND (J1 - #3, #4)

Connect a voltage source to this terminal. The input voltage must be between 4.5 V and 20 V. An input of 12 V is a good default voltage.

V_{OUT} (J1 - #7, #8), GND (J1 - #5, #6)

Connect an electronic load to this terminal.

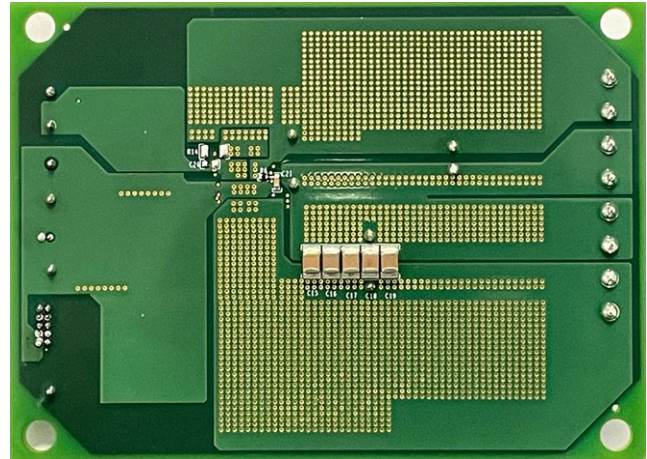


Fig. 1 - SiC951 EVB

SELECTION JUMPERS

Enable of Device

J6: this is the jumper that enables / disables the part. With J6 two pins left open, the device is enabled. With J6 two pins shorted, the device is disabled. The EN pin has an internal pull-up to enable the device. The jumper pulls the EN pin to GND to disable the device.

PMBUS CONNECTION AND CONFIGURATION

R4, shown in the schematic, sets the default V_{OUT} to 1.05 V. Output voltage can be changed with PMBus commands. The V_{OUT} defaults to the minimum of 0.6 V if R4 is missing or shorted.

R5 sets the default frequency to 600 kHz, this can be changed with PMBus commands. The frequency defaults to 600 kHz if the resistor is missing or shorted. The PMBus interface is described in the SiC951 datasheet and can be found on our website.

PMBus SDA (J2 - #2)

PMBus SCL (J2 - #4)

PMBus SALERT (J2 - #6)

Resistors R7, R8, R9 are DNP, these can be populated with 10 k Ω pull-up resistors if the PMBus interface being used does not perform this function already.

SIGNALS AND TEST LEADS

Input Voltage Sense

V_{IN_SENSE} (J8), GND_{IN_SENSE} (J9): this allows the user to measure the voltage directly at the input of the regulator bypassing any losses generated by connections to the board.

Output Voltage Sense

V_{OUT_SENSE} (J10), GND_{OUT_SENSE} (J11): this allows the user to measure the output voltage directly at the sense point of the regulator bypassing any losses generated by connections to the board.

Power Good Indicator

P_{GOOD} (J5): is an open drain output and is pulled up with a 100 k Ω resistor. See SiC951 datasheet for details on fault conditions.

Snubber Circuit

Snubber may be used when the user desires to decrease the peak voltage of switching node (SW) during turn on of the high side switch. There are place holders on the reference board, R14, and C26, for the snubber.

PCB LAYOUT

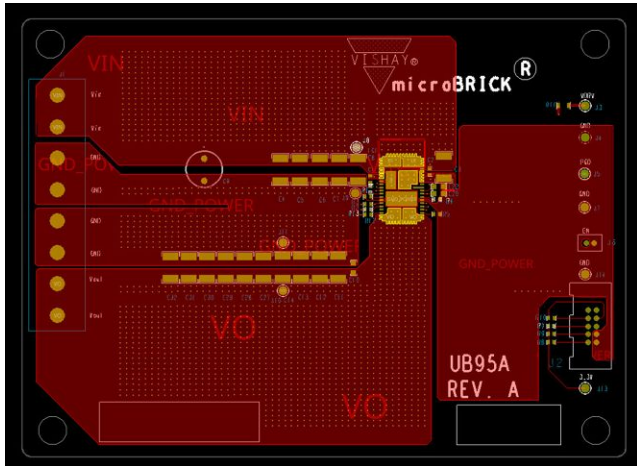


Fig. 2 - Top Layer

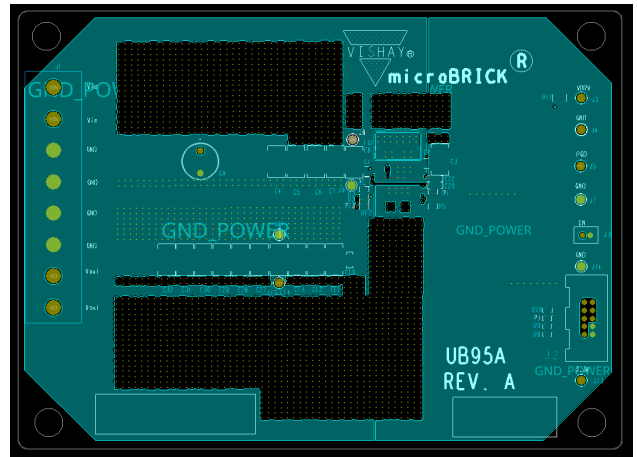


Fig. 5 - Inner Layer 2

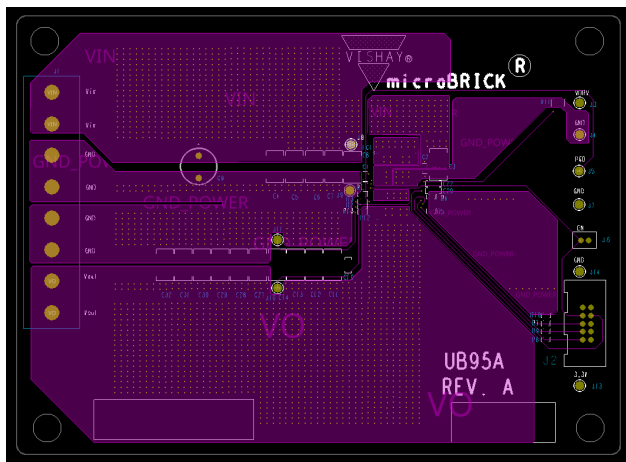


Fig. 3 - Inner Layer 3

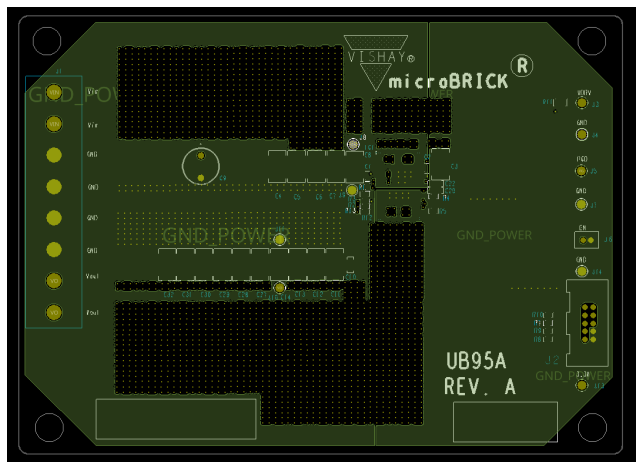


Fig. 6 - Inner Layer 4

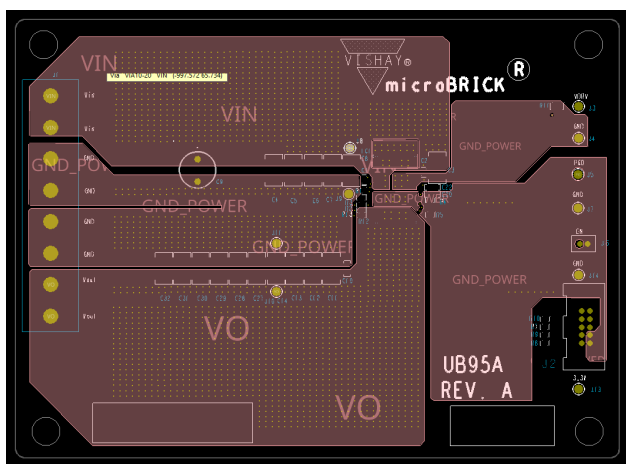


Fig. 4 - Inner Layer 5

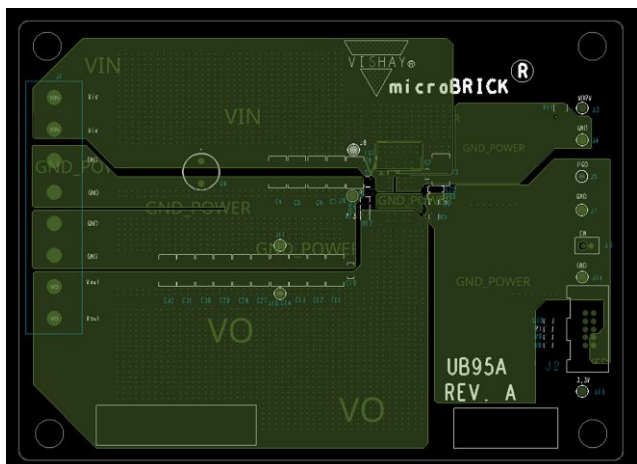


Fig. 7 - Inner Layer 6

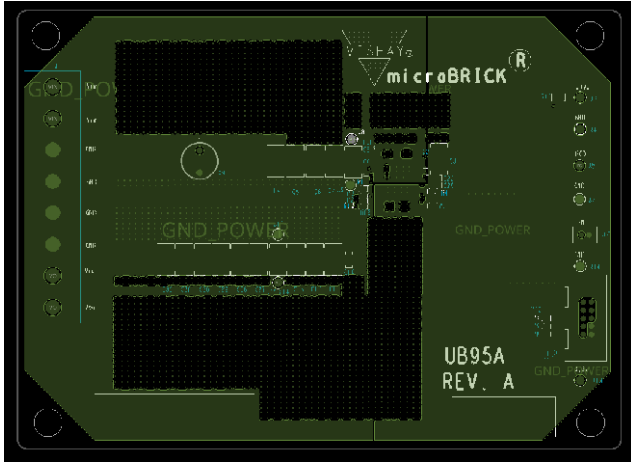


Fig. 8 - Inner Layer 7

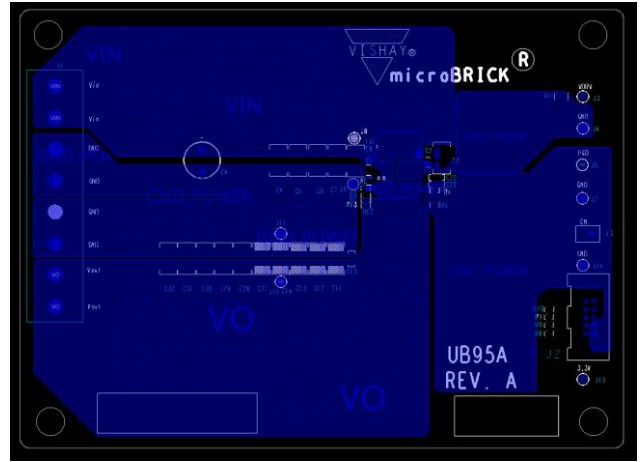
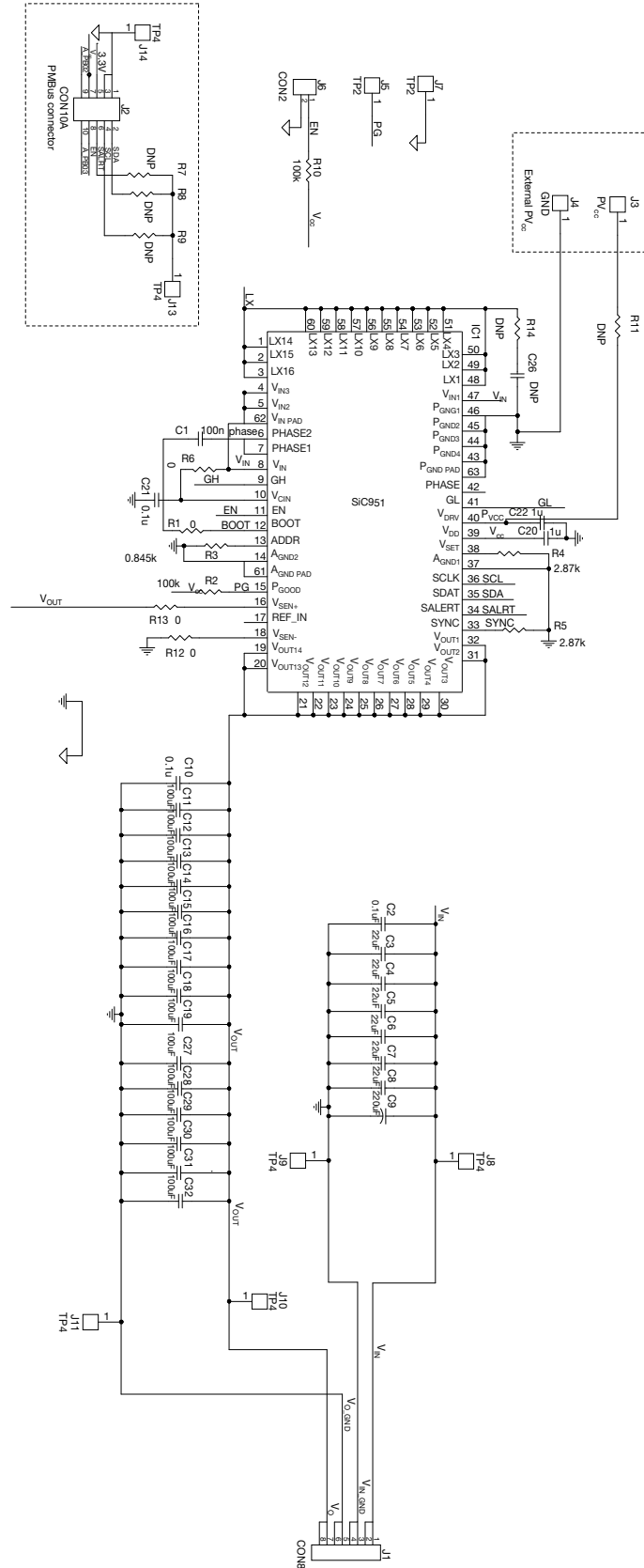


Fig. 9 - Bottom Layer

SCHEMATIC



**SCHEMATIC, DESIGN, BILL OF MATERIALS, AND GERBER FILES FOR PCB FABRICATION**

These files are as follows and available for download at www.vishay.com/power-ics/integrated-microbrick/list/product-71554/tab/documents/

- “*.DSN” for schematic design file
- “*.DBK” for data backup file for Orcad
- “.opj” Orcad project file. Any schematic work should always be opened with the opj file. Use of a DSN file for this purpose is not advised
- “*.xlsx” is the bill of materials (BOM) derived from the schematic
- “*.PDF” is the PDF version of the schematic from the “*.DSN” file

BILL OF MATERIAL REPORT					
SYM_NAME	COMP_DEVICE_TYPE	COMP VALUE	SPEC FOR ORDER	QTY	REFDES
C0402-TDK1	CAPACITOR NON-POL	0.1 μ F	Cap. cer 0.1 μ F, 50 V, X7R, 0402	1	C1, C2
C1210-TDK	CAPACITOR NON-POL	22 μ F	Cap. cer 22 μ F, 25 V, X7R, 1210	6	C3, C4, C5, C6, C7, C8
cap_rad	CAP	220 μ F	Cap. alu 220 μ F, 20 %, 35 V, radial	1	C9
C0603-TDK1	CAPACITOR NON-POL	0.1 μ F		2	C10, C21
C1210-TDK	CAPACITOR NON-POL	100 μ F		15	C11, C12, C13, C14, C15, C16, C17, C18, C19, C27, C28, C29, C30, C31, C32
C0603-TDK1	CAPACITOR NON-POL	1 μ F	Cap. cer 1 μ F, 25 V, X7R, 0603	2	C20, C22
C0603-TDK1	CAPACITOR NON-POL	DNP / Snubber C		0	C26
SiC951	SiC951	SiC951		1	IC1
PHC8	CON8	CON8		1	J1
SHF-105-01-X-D-T H	CON10A	CON10A		1	J2
TP30	CON1	PVCC	PC test point, red	1	J3
TP30	CON1	GND	PC test point, black	1	J4
TP30	CON1	TP2	PC test point, red	2	J5, J7
MINIJUMPER2	CON2_MINIJUMPER2_CON2	CON2		1	J6
TP30	CON1	TP4	PC test point	6	J8, J9, J10, J11, J13, J14
R0402-VISHAY1	R	0 Ω	Res. SMD 0 k Ω , 1 %, 1/16 W, 402	4	R1, R6, R12, R13
R0402-VISHAY1	R	100 k Ω	Res. SMD 100 k Ω , 1 %, 1/16 W, 402	1	R2
R0402-VISHAY1	R	0.845 k Ω	Res. SMD 845 Ω , 1 %, 1/16 W, 402	1	R3
R0402-VISHAY1	R	2.87 k Ω	Res. SMD 2.87 k Ω , 1 %, 1/16 W, 402	2	R4, R5
R0402-VISHAY1	R	DNP / 10 k Ω	Res. SMD 10 k Ω , 1 %, 1/16 W, 402	0	R7, R8, R9
R0402-VISHAY1	R	100 k Ω	Res. SMD 100 k Ω , 1 %, 1/16 W, 402	1	R10
R0603-VISHAY1	R	DNP / < 10 Ω		0	R11
R1206-VISHAY	R	DNP / Snubber R		0	R14