Development Board EPC9001 Quick Start Guide

40 V Half-Bridge with Gate Drive, Using EPC2015

EFFICIENT POWER CONVERSION

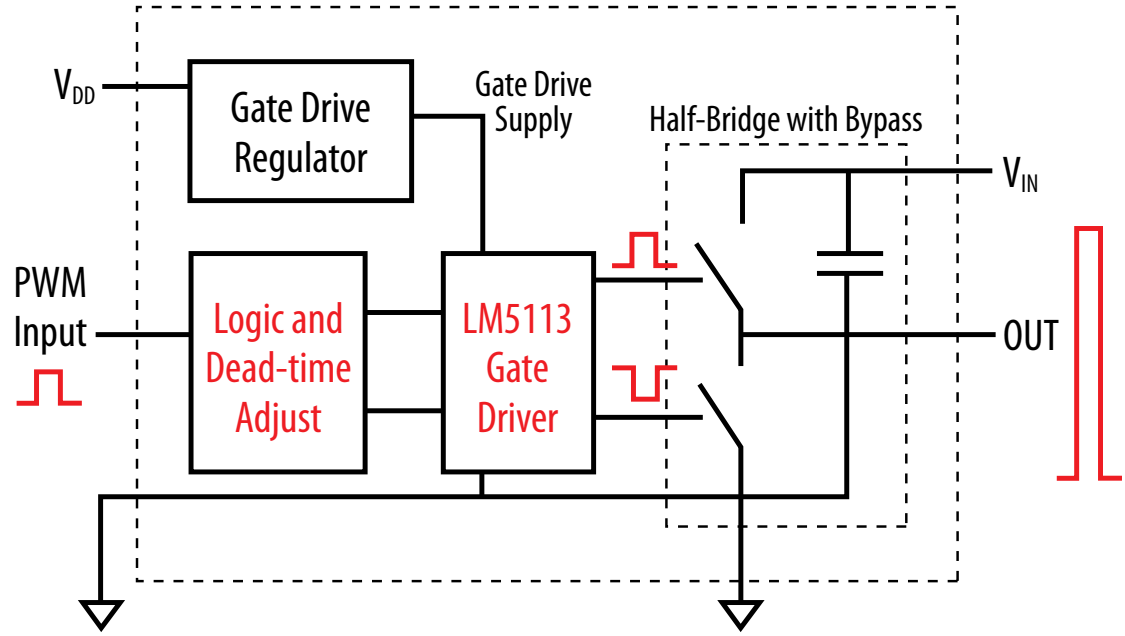


Figure 1: Block Diagram of EPC9001 Development Board

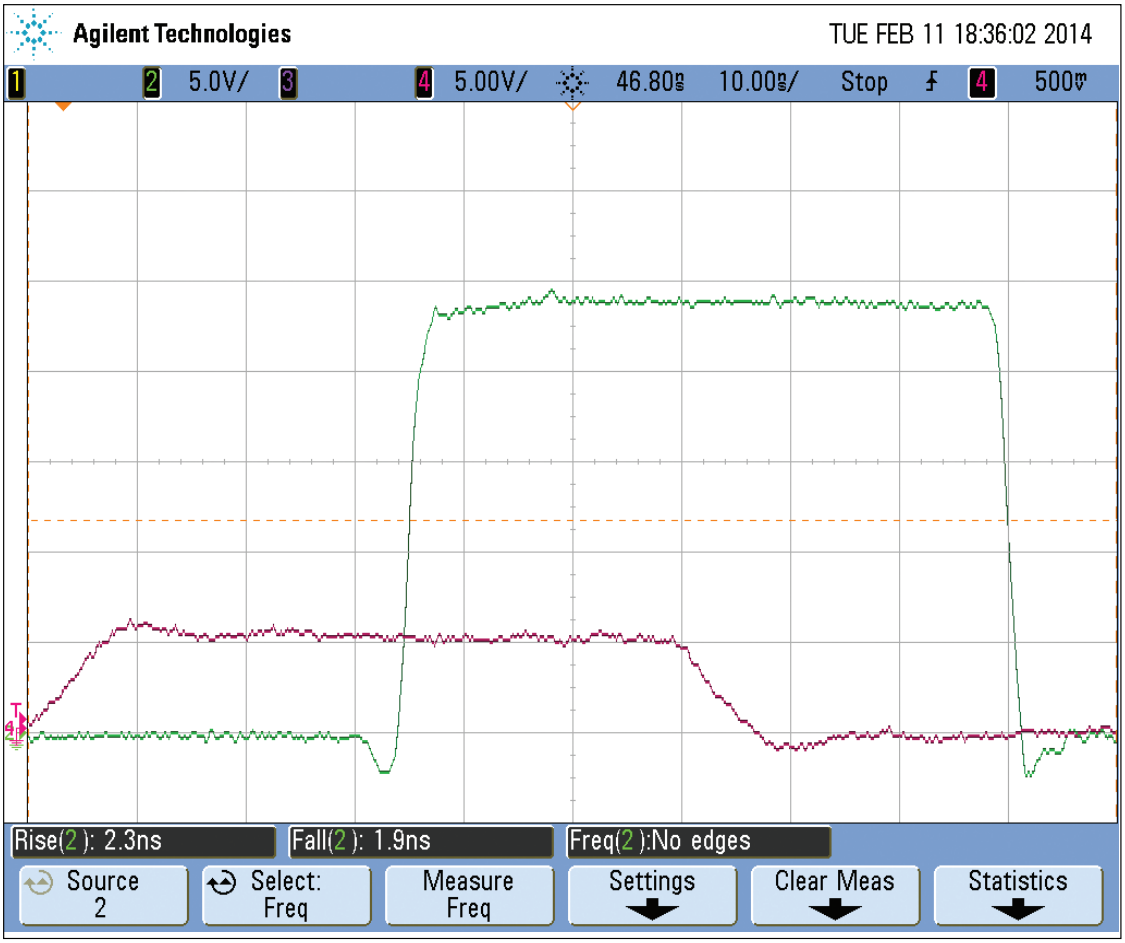


Figure 4: Typical Waveforms for V_{IN} = 24 V to 1.2 V/15 A (500kHz) Buck converter
CH1: V_{PWM} Input voltage – CH3: (I_{OUT}) Switch node current – CH4: (V_{OUT}) Switch node voltage

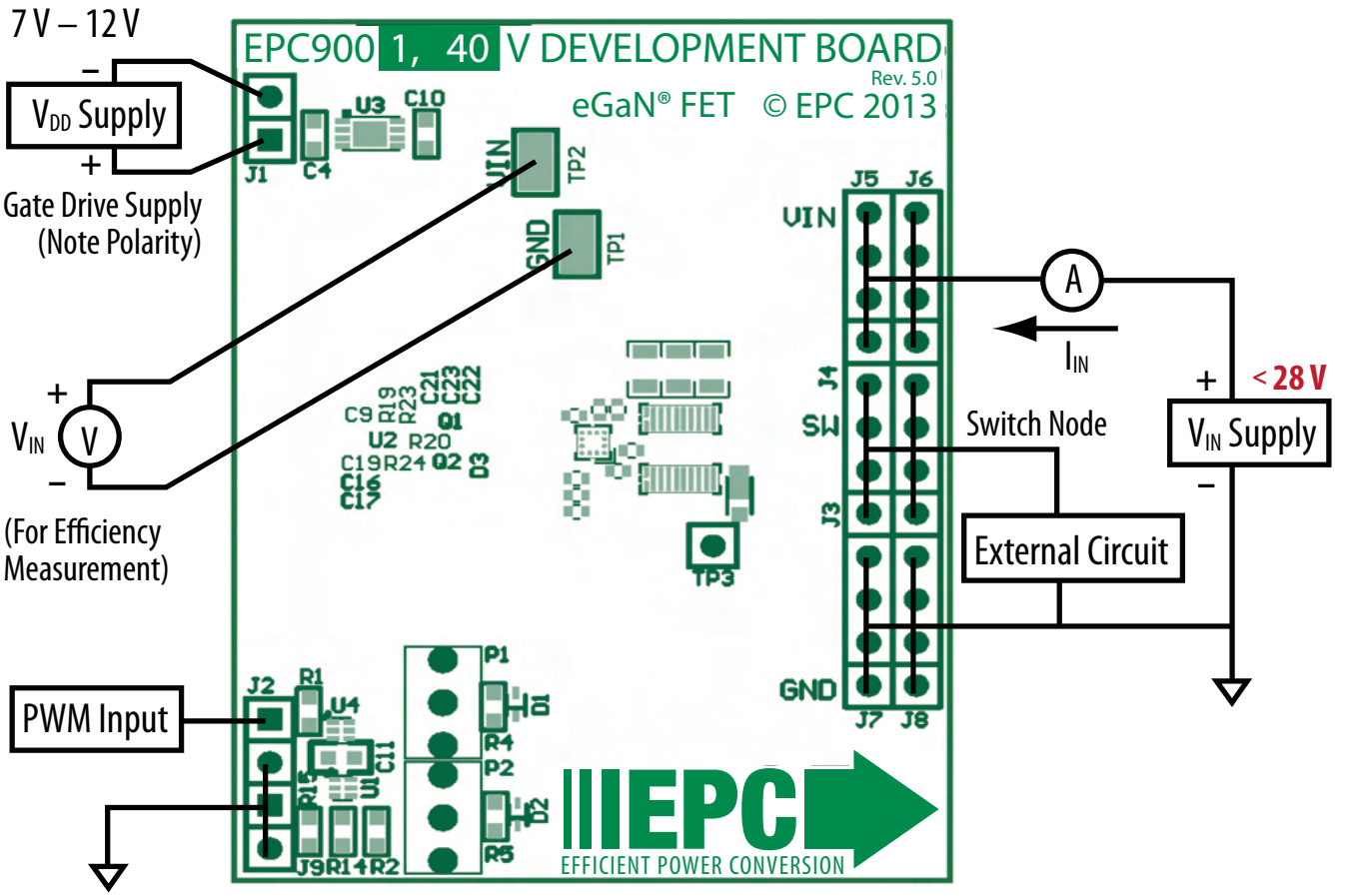


Figure 2: Proper Connection and Measurement Setup

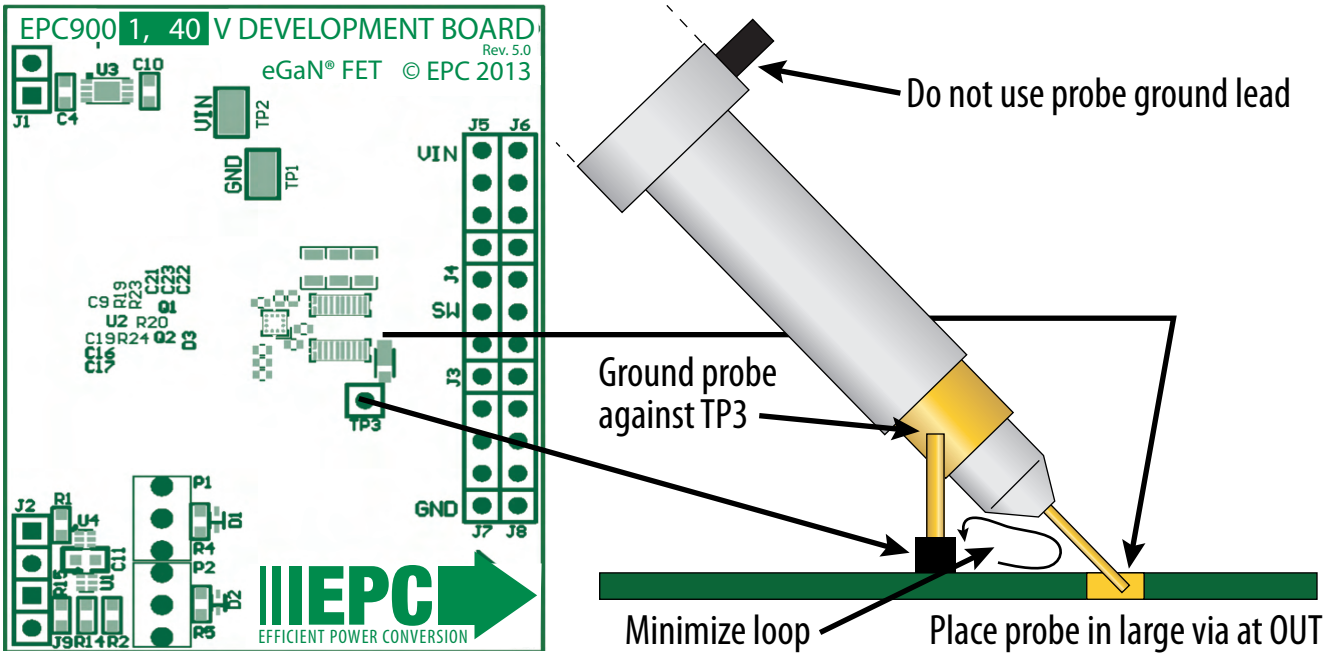


Figure 3: Proper Measurement of Switch Node – OUT

Quick Start Procedure

Development board EPC9001 is easy to set up to evaluate the perform and measurement setup and follow the procedure below:

1. With power off, connect the input power supply bus to $+V_{IN}$ (J5, J6)
2. With power off, connect the switch node of the half bridge OUT (J3
3. With power off, connect the gate drive input to $+V_{DD}$ (J1, Pin-1) and
4. With power off, connect the input PWM control signal to PWM (J2,
5. Turn on the gate drive supply – make sure the supply is between 7
6. Turn on the bus voltage to the required value (do not exceed the a
7. Turn on the controller / PWM input source and probe switching no
8. Once operational, adjust the bus voltage and load PWM control wi efficiency and other parameters.

NOTE. When measuring the high frequency content switch node (OUT), care must be oscilloscope probe tip through the large via on the switch node (designed for this pu Figure 3 for proper scope probe technique.

THERMAL CONSIDERATIONS

The EPC9001 development board showcases the EPC2015 *eGaN* FET. Altho vices, their relatively smaller size does magnify the thermal management r bient temperature and convection cooling. The addition of heat-sinking an devices, but care must be taken to not exceed the absolute maximum die t

NOTE. The EPC9001 development board does not have any current or therm

nance of the EPC2015 *eGaN* FET. Refer to Figure 2 for proper connect

) and ground / return to $-V_{IN}$ (J7, J8).
3, J4) to your circuit as required.
d ground return to $-V_{DD}$ (J1, Pin-2).
Pin-1) and ground return to any of the remaining J2 pins.
V and 12 V range.
absolute maximum voltage of 40 V on V_{OUT}).
ode to see switching operation.
ithin the operating range and observe the output switching behavior,

e taken to avoid long ground leads. Measure the switch node (OUT) by placing the urpose) and grounding the probe directly across the GND terminals provided. See

ugh the electrical performance surpasses that for traditional silicon de-equirements. The EPC9001 is intended for bench evaluation with low am-d forced air cooling can significantly increase the current rating of these emperature of 125°C.

mal protection on board.

DESCRIPTION

The EPC9001 development board is a 40 V maximum device voltage, 15 A maximum output current, half bridge with onboard gate drives, featuring the EPC2015 enhancement mode (*eGaN*®) field effect transistor (FET). The purpose of this development board is to simplify the evaluation process of the EPC2015 *eGaN* FET by including all the critical components on a single board that can be easily connected into any existing converter.

The EPC9001 development board is 2" x 1.5" and contains not only two EPC2015 *eGaN* FET in a half bridge configuration using

Table 1: Performance Summary (TA = 25°C)

SYMBOL	PARAMETER	CONDITIONS
V_{DD}	Gate Drive Input Supply Range	
V_{IN}	Bus Input Voltage Range	
V_{OUT}	Switch Node Output Voltage	
I_{OUT}	Switch Node Output Current	
V_{PWM}	PWM Logic Input Voltage Threshold	Input 'High'
		Input 'Low'
	Minimum 'High' State Input Pulse Width	V_{PWM} rise and fall tim
	Minimum 'Low' State Input Pulse Width	V_{PWM} rise and fall tim

* Assumes inductive load, maximum current depends on die temperature – actual maximum curr

\# Limited by time needed to 'refresh' high side bootstrap supply voltage.

the Texas Instruments LM5113 gate driver, supply and bypass capacitors. The board contains all critical components and layout for optimal switching performance. There are also various probe points to facilitate simple waveform measurement and efficiency calculation. A complete block diagram of the circuit is given in Figure 1.

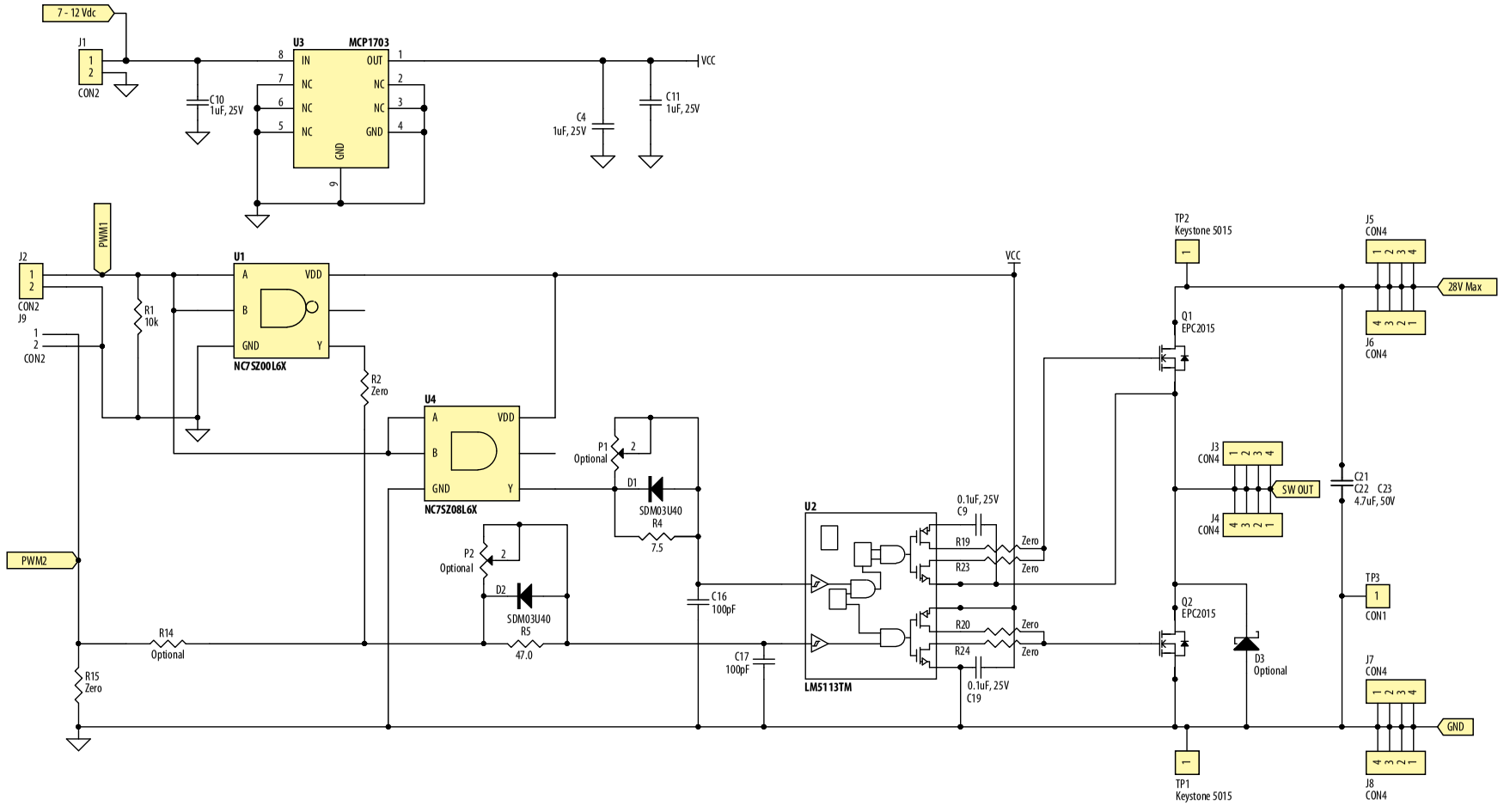
For more information on the EPC2015s *eGaN* FET please refer to the datasheet available from EPC at www.epc-co.com. The datasheet should be read in conjunction with this quick start guide.

	MIN	MAX	UNITS
	7	12	V
		28*	V
		40	V
		15*	A
	3.5	6	V
	0	1.5	V
e < 10ns	60		ns
e < 10ns	200#		ns

rent with be subject to switching frequency, bus voltage and thermals.

Table 2 : Bill of Material

Item	Qty	Reference	Part Description	Manufacturer / Part #
1	3	C4, C10, C11,	Capacitor, 1uF, 10%, 25V, X5R	Murata, GRM188R61E105KA12D
2	2	C16, C17	Capacitor, 100pF, 5%, 50V, NP0	Kemet, C0402C101K5GACTU
3	2	C9, C19	Capacitor, 0.1uF, 10%, 25V, X5R	TDK, C1005X5R1E104K
4	3	C21, C22, C23	Capacitor, 4.7uF, 10%, 50V, X5R	TDK, C2012X5R1H475K125AB
5	2	D1, D2	Schottky Diode, 30V	Diodes Inc., SDM03U40-7
6	3	J1, J2, J9	Connector	2pins of Tyco, 4-103185-0
7	1	J3, J4, J5, J6, J7, J8	Connector	FCI, 68602-224HLF
8	2	Q1, Q2	eGaN® FET	EPC, EPC2015
9	1	R1	Resistor, 10.0K, 5%, 1/8W	Stackpole, RMCF0603FT10K0
10	2	R2, R15	Resistor, 0 Ohm, 1/8W	Stackpole, RMCF0603ZT0R00
11	1	R4	Resistor, 7.5 Ohm, 1%, 1/8W	Stackpole, RMCF0603FT7R50
12	1	R5	Resistor, 47 Ohm, 1%, 1/8W	Stackpole, RMCF0603FT47R0
13	4	R19, R20, R23, R24	Resistor, 0 Ohm, 1/16W	Stackpole, RMCF0402ZT0R00
14	2	TP1, TP2	Test Point	Keystone Elect, 5015
15	1	TP3	Connector	1/40th of Tyco, 4-103185-0
16	1	U1	I.C., Logic	Fairchild, NC7SZ00L6X
17	1	U2	I.C., Gate driver	Texas Instruments, LM5113TME
18	1	U3	I.C., Regulator	Microchip, MCP1703T-5002E/MC
19	1	U4	I.C., Logic	Fairchild, NC7SZ08L6X
20	0	R14	Optional Resistor	
21	0	D3	Optional Diode	
22	0	P1, P2	Optional Potentiometer	



40V Half-Bridge with Gate Drive, using EPC2015

Rev 5.0

For More Information:

Please contact info@epc-co.com
or your local sales representative

Visit our website:
www.epc-co.com

Sign-up to receive
EPC updates at
bit.ly/EPCupdates
or text "EPC" to 22828

EFFICIENT POWER CONVERSION

EPC Products are distributed through Digi-Key.
www.digikey.com

Development Board / Demonstration Board Notification

The EPC9001 board is intended for product evaluation purposes only and is not intended for commercial use. As an evaluation tool, it is not designed for compliance with the European Union directive on electromagnetic compatibility or any other such directives or regulations.

As board builds are at times subject to product availability, it is possible that boards may contain components or assembly materials that are not RoHS compliant. Efficient Power Conversion Corporation (EPC) makes no guarantee that the purchased board is 100% RoHS compliant.

No Licenses are implied or granted under any patent right or other intellectual property whatsoever. EPC assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or any other intellectual property rights of any kind.

EPC reserves the right at any time, without notice, to change said circuitry and specifications.