



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of "Quality Parts,Customers Priority,Honest Operation,and Considerate Service",our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



Demonstration Board

EPC9022/23/24/25/27/28/29/30

Quick Start Guide

Half Bridge with Gate Drive for EPC8000 Family



DESCRIPTION

www.epc-co.com

The development board is in a half bridge topology with onboard gate drives, featuring the EPC8000 family of high frequency enhancement mode (*eGaN*[®]) field effect transistors (FETs). The purpose of these development boards is to simplify the evaluation process of the EPC8000 family of *eGaN* FETs by including all the critical components on a single board that can be easily connected into any existing converter.

The development board is 2" x 1.5" and contains two *eGaN* FETs in a half bridge configuration using 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 EPC8000 family of *eGaN* FETs, please refer to the datasheets available from EPC at www.epc-co.com. The datasheet should be read in conjunction with this quick start guide.

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

SYMBOL	PARAMETER	CONDITIONS	MIN	MAX	UNITS
V _{DD}	Gate Drive Input Supply Range		7	12	V
V _{IN}	Bus Input Voltage Range	40 V devices; EPC9024, EPC9027, EPC9028		28*	V
		65 V devices; EPC9022, EPC9025, EPC9029		45*	V
		100 V devices; EPC9023, EPC9030		70*	V
V _{OUT}	Switch Node Output Voltage	40 V devices; EPC9024, EPC9027, EPC9028		40	V
		65 V device EPC9022, EPC9025, EPC9029		65	V
		100 V devices; EPC9023, EPC9030		100	V
I _{OUT}	Switch Node Output Current	40 V device EPC9024		4.4*	A
		40 V device EPC9027		3.5*	A
		40 V device EPC9028		2.2*	A
		65 V device EPC9022		1.6*	A
		65 V device EPC9025		2.2*	A
		65 V device EPC9029		3.5*	A
		100 V device EPC9023		2.2*	A
		100 V device EPC9030		3.2*	A
V _{PWM}	PWM Logic Input Voltage Threshold	Input 'High'	3.5	6	V
		Input 'Low'	0	1.5	V
F _{MIN}	Minimum Switching Frequency	Bootstrap Capacitor Limited	500		kHz
	Minimum 'High' State Input Pulse Width	V _{PWM} rise and fall time < 10ns	20		ns
	Minimum 'Low' State Input Pulse Width	V _{PWM} rise and fall time < 10ns	50†		ns

* Assumes inductive load, maximum current depends on die temperature – actual maximum current will be subject to switching frequency, bus voltage and thermal.

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

Quick Start Procedure

The development board is easy to set up to evaluate the performance of the eGAN FET. Refer to Figure 2 for proper connect and measurement setup and follow the procedure below:

1. With power off, connect the input power supply bus to +V_{in} (J5, J6) and ground / return to -VIN (J7, J8).

2. With power off, connect the switch node of the half bridge OVT (J3, J4) to your circuit as required.

3. With power off, connect the gate drive input to +V_{DD} (J1, Pin-1) and ground return to -V_{DD} (J1, Pin-2).

4. With power off, connect the input PWM control signal to PWM (J2, Pin-1) and ground return to any of the remaining J2 pins.

5. Turn on the gate drive supply – make sure the supply is between 7 V and 12 V range.

6. Turn on the bus voltage to the required value (do not exceed the absolute maximum voltage on V_{OUT} as indicated in the table below:

a.	EP C9022, 65 V	d.	EP C9025, 65 V
b.	EP C9023, 100 V	e.	EP C9027, 40 V
c.	EP C9024, 40 V	f.	EP C9028, 40 V
		g.	EP C9029, 65 V
		h.	EP C9030, 100 V

7. Turn on the controller / PWM input source and probe switching node to see switching operation.

8. Once operational, adjust the bus voltage and load PWM control within the operating range and observe the output switching behavior, efficiency and other parameters.

9. For shutdown, please follow steps in reverse.

NOTE. When measuring the high frequency content switch node (OUT), care must be taken to avoid long ground leads. Measure the switch node (OUT) by placing the oscilloscope probe tip through the large via on the switch node (designed for this purpose) and grounding the probe directly across the GND terminals provided. See Figure 3 for proper scope probe technique.

THEMAL CONSIDERATIONS

The development board showcases the EP C8000 family of eGAN FET. Although the electrical performance surpasses that for traditional silicon devices, their relatively smaller size does magnify the thermal management requirements. The development board is intended for bench evaluation with low ambient temperature and convection cooling. The addition of heat-sinking and forced air cooling can significantly increase the current rating of these devices, but care must be taken to not exceed the absolute maximum die temperature of 125°C.

NOTE. The development board does not have any current or thermal protection on board.

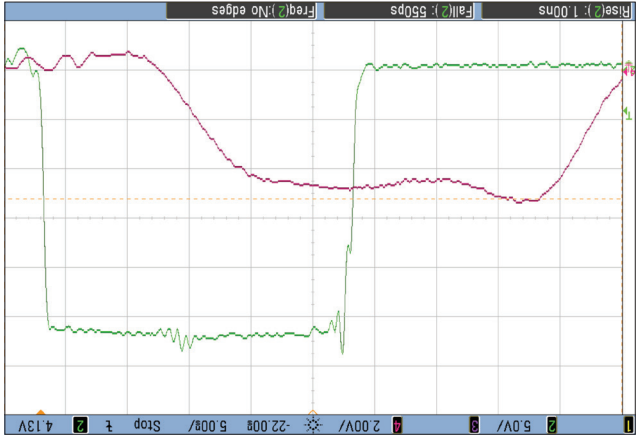


Figure 4: Typical Waveforms for $V_{in} = 28\text{ V}$ to 3.3 V (5 MHz) Buck converter
CH2: (V_{out}) Switch node voltage --- CH4: V_{PWM} Input voltage

Figure 1: Block Diagram of Development Board

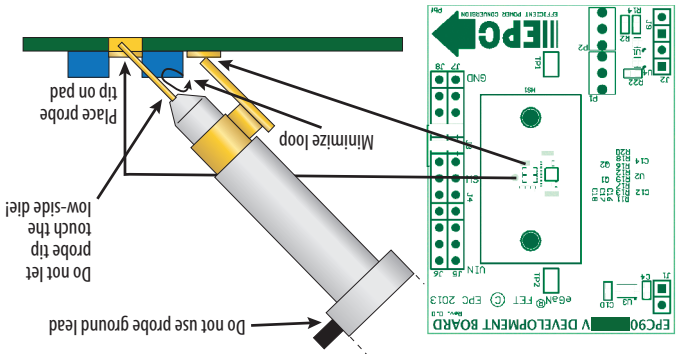
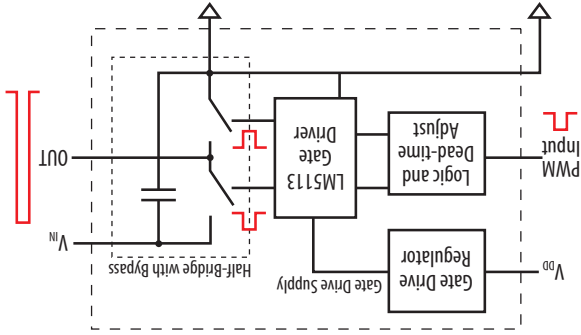


Figure 2: Proper Connection and Measurement Setup

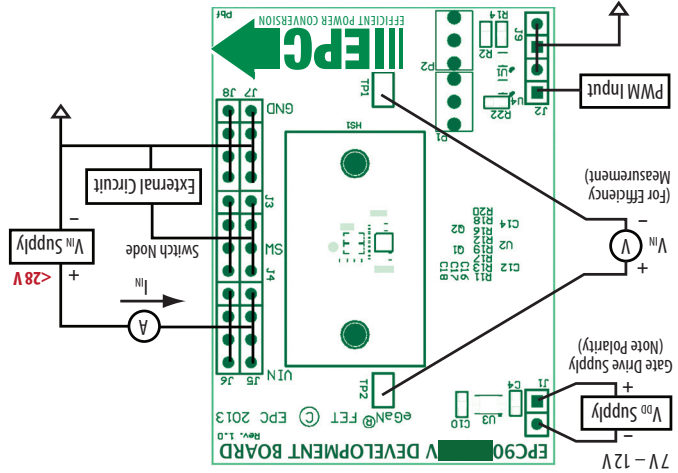


Figure 3: Proper Measurement of Switch Node – OVT

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	C6, C7	Capacitor, 100pF, 5%, 50V, NP0	Kemet, C0402C101K5GACTU
3	1	C12	Capacitor, 22nF, 10%, 25V, X5R	TDK, C1005X5R1E223K050BA
4	1	C14	Capacitor, 0.1uF, 10%, 25V, X5R	TDK, C1005X5R1E104K
5	3	C16, C17, C18	Capacitor, - SEE TABLE 3	SEE TABLE 3
6	1	C13	Capacitor, 1uF, 10%, 25V, X5R	Murata, GRM188R61E105KA12D
7	1	C21	Capacitor, - SEE TABLE 3	SEE TABLE 3
8	2	D1, D2	Schottky Diode, 30V	Diodes Inc., SDM03U40-7
9	3	J1, J2, J9	Connector	2pins of Tyco, 4-103185-0
10	6	J3, J4, J5, J6, J7, J8	Connector	FCI, 68602-224HLF
11	2	Q1, Q2	eGaN® FET - SEE TABLE 3	SEE TABLE 3
12	1	R1	Resistor, 10.0K, 5%, 1/8W	Stackpole, RMCF0603FT10K0
13	2	R2, R15	Resistor, 0 Ohm, 1/8W	Stackpole, RMCF0603ZTOR00
14	2	R4,R5	Resistor, 7.5 Ohm, 5%, 1/16W	Stackpole, RMCF0603JT7R50
15	2	TP1, TP2	Test Point	Keystone Elect, 5015
16	1	U1	I.C., Logic	Fairchild, NC7SZ00L6X
17	1	U2	I.C., Gate driver	Texas Instruments, LM5113
18	1	U3	I.C., Regulator	Microchip, MCP1703T-5002E/MC
19	1	U4	I.C., Logic	Fairchild, NC7SZ08L6X
20	0	HS1	Optional Heatsink	HeatSink15mmX15mm
21	0	R14, R22	Optional Resistor	
22	0	P1,P2	Optional Potentiometer	PV37Y

Table 3: Variable BOM Components

Board Number	Item	Qty	Reference	Part Description	Manufacturer / Part #
EPC9022	5	3	C16, C17, C18	Capacitor, 0.01uF, 20%, 100V, X7R	TDK, C1005X7S2A103M050BB
	7	1	C21	Capacitor, 1uF, 10%, 100V, X7R	TDK, CGA4J3X7S2A105K125A
	11	2	Q1, Q2	eGaN® FET	EPC8002
EPC9023	5	3	C16, C17, C18	Capacitor, 0.01uF, 20%, 100V, X7R	TDK, C1005X7S2A103M050BB
	7	1	C21	Capacitor, 1uF, 10%, 100V, X7R	TDK, CGA4J3X7S2A105K125A
	11	2	Q1, Q2	eGaN® FET	EPC8003
EPC9024	5	3	C16, C17, C18	Capacitor, 0.1uF, 20%, 50V, X5R	TDK, C1005X5R1H104K050BB
	7	1	C21	Capacitor, 4.7uF, 10%, 50V, X5R	TDK, C2012X5R1H475K125AB
	11	2	Q1, Q2	eGaN® FET	EPC8004
EPC9025	5	3	C16, C17, C18	Capacitor, 0.01uF, 20%, 100V, X7R	TDK, C1005X7S2A103M050BB
	7	1	C21	Capacitor, 1uF, 10%, 100V, X7R	TDK, CGA4J3X7S2A105K125A
	11	2	Q1, Q2	eGaN® FET	EPC8005
EPC9027	5	3	C16, C17, C18	Capacitor, 0.1uF, 20%, 50V, X5R	TDK, C1005X5R1H104K050BB
	7	1	C21	Capacitor, 4.7uF, 10%, 50V, X5R	TDK, C2012X5R1H475K125AB
	11	2	Q1, Q2	eGaN® FET	EPC8007
EPC9028	5	3	C16, C17, C18	Capacitor, 0.1uF, 20%, 50V, X5R	TDK, C1005X5R1H104K050BB
	7	1	C21	Capacitor, 4.7uF, 10%, 50V, X5R	TDK, C2012X5R1H475K125AB
	11	2	Q1, Q2	eGaN® FET	EPC8008
EPC9029	5	3	C16, C17, C18	Capacitor, 0.01uF, 20%, 100V, X7R	TDK, C1005X7S2A103M050BB
	7	1	C21	Capacitor, 1uF, 10%, 100V, X7R	TDK, CGA4J3X7S2A105K125A
	11	2	Q1, Q2	eGaN® FET	EPC8009
EPC9030	5	3	C16, C17, C18	Capacitor, 0.01uF, 20%, 100V, X7R	TDK, C1005X7S2A103M050BB
	7	1	C21	Capacitor, 1uF, 10%, 100V, X7R	TDK, CGA4J3X7S2A105K125A
	11	2	Q1, Q2	eGaN® FET	EPC8010

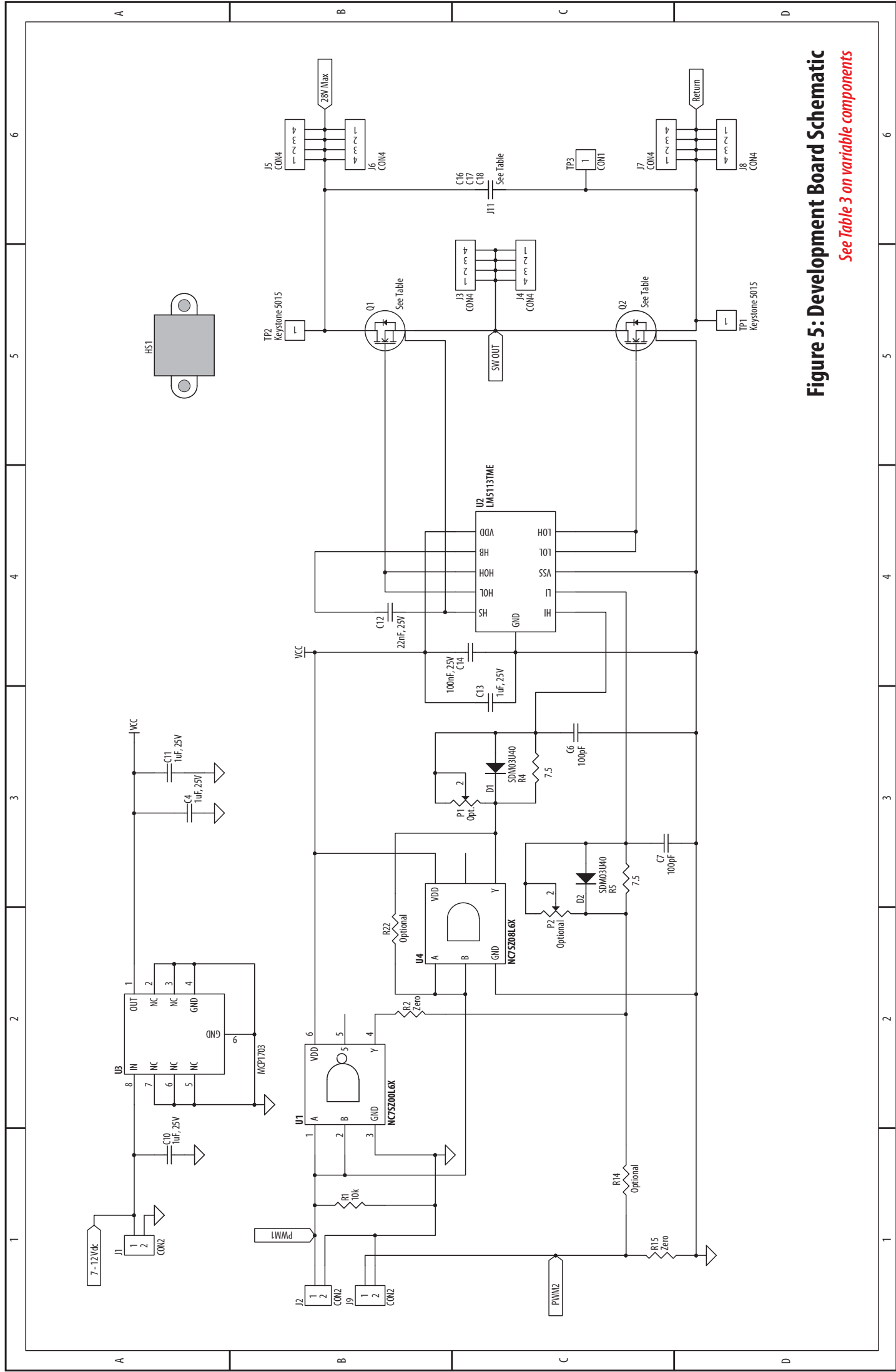


Figure 5: Development Board Schematic
 See Table 3 on variable components

Contact us:

www.epc-co.com

Renee Yawger

WW Marketing

Office: +1.908.475.5702

Mobile: +1.908.619.9678

renee.yawger@epc-co.com

Stephen Tsang

Sales, Asia

Mobile: +852.9408.8351

stephen.tsang@epc-co.com

Bhasy Nair

Global FAE Support

Office: +1.972.805.8585

Mobile: +1.469.879.2424

bhasy.nair@epc-co.com

Peter Cheng

FAE Support, Asia

Mobile: +886.938.009.706

peter.cheng@epc-co.com



EPC Products are distributed exclusively through Digi-Key.

www.digikey.com

Demonstration Board Notification

The EPC boards are 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.