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Development Board EPC9042 Quick Start Guide

300 V Half Bridge with Gate Drive

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DESCRIPTION

The EPC9042 development board are 300 V maximum device voltage, half bridge with onboard gate drives, featuring the EPC2025 enhancement mode (*eGaN*[®]) field effect transistor (FET). The purpose of this development board is to simplify the evaluation process of the EPC2025 *eGaN* FET by including all the critical components on a single board that can be easily connected into any existing converter.

The EPC9042 development board is 2" x 1.5" and contains not only two EPC2025 *eGaN* FET in a half bridge configuration with gate drivers, but also an on board gate drive 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 EPC2025 *eGaN* FETs 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.

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			240	V
V _{OUT}	Switch Node Output Voltage			300	V
I _{OUT}	Switch Node Output Current	Using EPC2025		3*	A
V _{PWM}	PWM Logic Input Voltage Threshold	Input 'High'	3.5	6	V
		Input 'Low'	0	1.5	V
	Minimum 'High' State Input Pulse Width	V _{PWM} rise and fall time < 10ns	200		ns
	Minimum 'Low' State Input Pulse Width	V _{PWM} rise and fall time < 10ns	500#		ns

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

Dependent on time needed to 'refresh' high side bootstrap supply voltage.

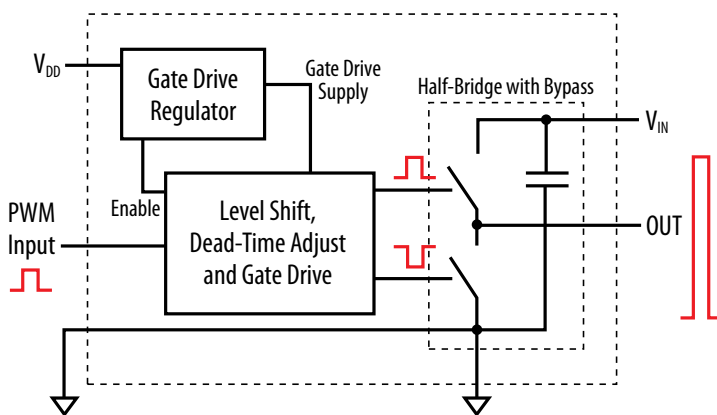


Figure 1: Block Diagram of EPC9042 Development Board

Demonstration Board Notification

EPC9042 boards are intended for product evaluation purposes only and are not intended for commercial use. As evaluation tools, they are 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.

THERMAL CONSIDERATIONS

The EPC9042 development board showcases the EPC2025 eGaN FET. Although the electrical performance surpasses that for traditional Si devices, their relatively smaller size does magnify the thermal management requirements. The EPC9042 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 EPC9042 development boards do not have any current or thermal protection on board.

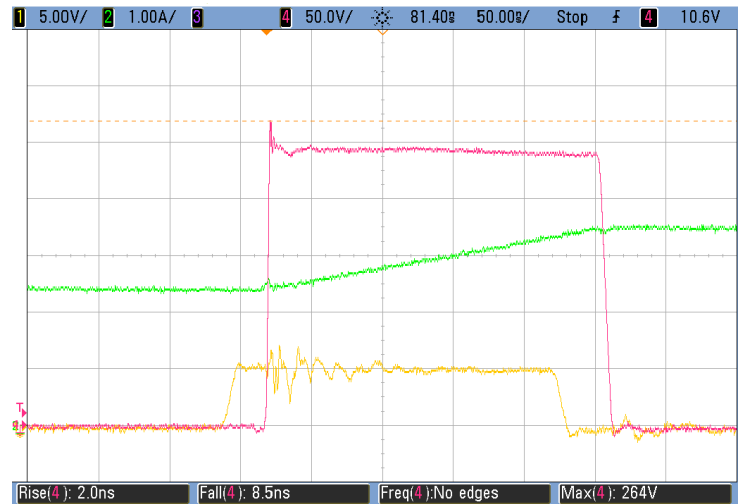
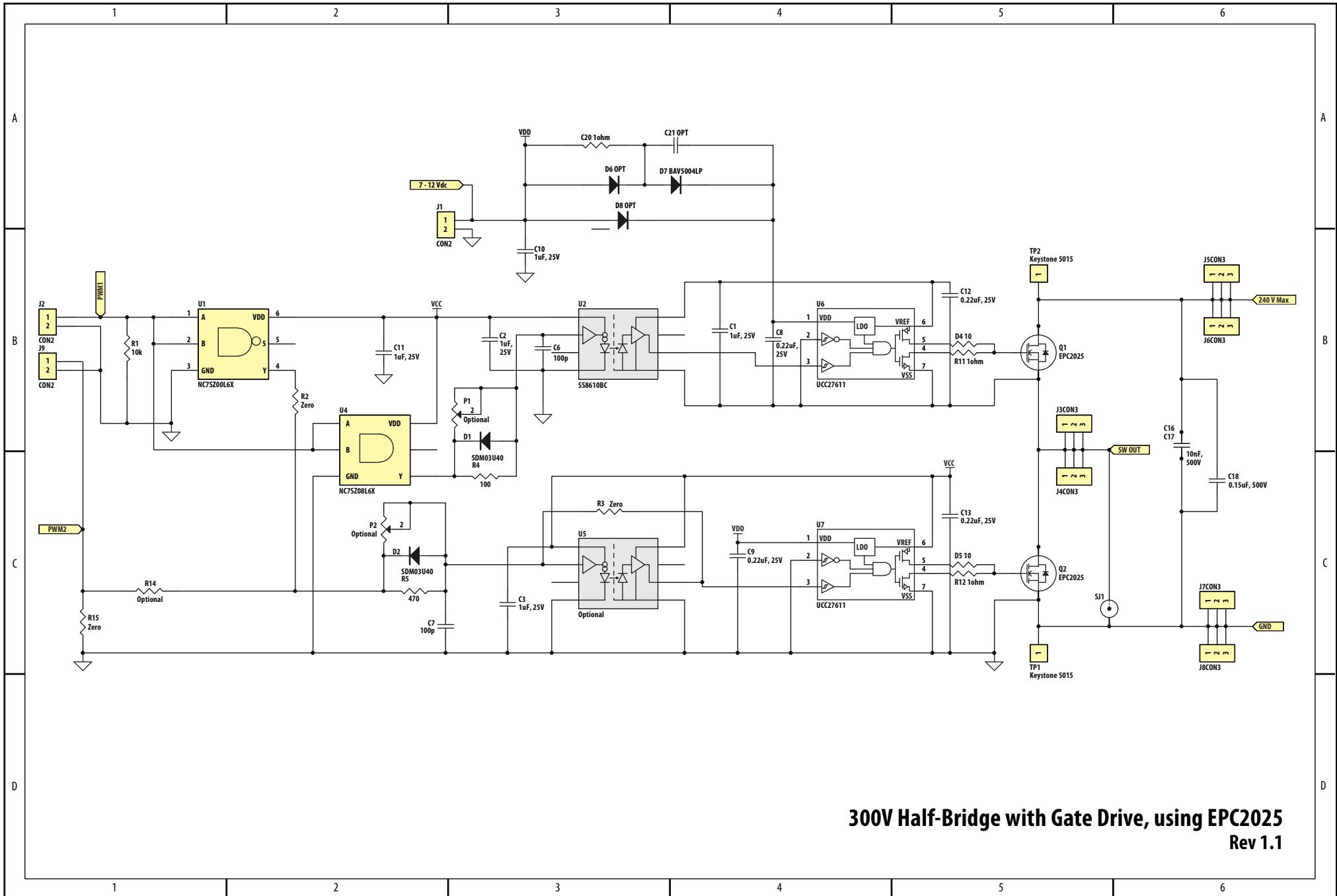


Figure 4: Waveforms for EPC9042, $V_{in} = 240\text{ V to }5\text{ V} / 3\text{ A}$ (100 kHz) Buck converter
CH1: PWM Input – CH2: Inductor current – CH4: (V_{out}) Switch node voltage

Table 2 : Bill of Material

Item	Qty	Reference	Part Description	Manufacturer / Part #
1	5	C1, C2, C3, C10, C11	Capacitor, 1uF, 10%, 25V, X5R	Murata, GRM188R61E105KA12D
2	2	C6, C7	Capacitor, 100pF, 5%, 50V, NP0	TDK, C1608C0G1H101J
3	4	C8, C9, C12, C13	Capacitor, 0.22uF, 10%, 16V, X7R	TDK, C1005X7R1C224K
4	2	C16, C17	Capacitor, 10nF, 10%, 500V, X7R	Kemet, C2012X7T2E104K125AA
5	1	C18	Capacitor, 0.15uF, 10%, 500V, X7T	Kemet, C1210V154KCRCTU
6	2	D1, D2	Schottky Diode, 30V	Diodes Inc., SDM03U40-7
7	2	D4, D5	Resistor, 10 Ohm, 1%, 1/16W	Stackpole, RMCF0402FT10R0
8	1	D7	Diode, 350V	Diodes Inc.,BAV5004LP-7B
9	3	J1, J2, J9	Connector	2pins of Tyco, 4-103185-0
10	3	J3, J4, J5, J6, J7, J8	Connector	FCI, 68602-206HLF
11	2	Q1, Q2	eGaN® FET	EPC, EPC2025
12	1	R1	Resistor, 10.0K, 5%, 1/8W	Stackpole, RMCF0603FT10K0
13	3	R2, R3, R15	Resistor, 0 Ohm, 1/8W	Stackpole, RMCF0603FT00R0
14	1	R4	Resistor, 100 Ohm, 1%, 1/8W	Stackpole, RMCF0603FT100R
15	1	R5	Resistor, 470 Ohm, 1%, 1/8W	Stackpole, RMCF0603FT470R
16	3	R11, R12, C20	Resistor, 1 Ohm, 1/16W	Stackpole, RMCF0402FT1R00
17	2	TP1, TP2	Test Point	Keystone Elect, 5015
18	1	U1	I.C., Logic	Fairchild, NC7SZ00L6X
19	1	U2	I.C., Opto-coupler	Silicon Labs, Si8610BC
20	1	U4	I.C., Logic	Fairchild, NC7SZ08L6X
21	2	U6, U7	I.C., Gate driver	Texas Instruments, UCC27611
22	0	C21	Optional Capacitor	
23	0	D6, D8	Optional diodes	
24	0	P1, P2	Optional potentiometer	
25	0	R14	Optional resistor	
26	0	U5	Optional I.C.	
27	0	SJ1	BNC measurement probe jack	



300V Half-Bridge with Gate Drive, using EPC2025
Rev 1.1