



Communication Tech. Inc.

Reference Board

INF_HB240A

User Start Guide

*INF_HB240A-30V Half Bridge
Reference Board For
High Current Applications*

DESCRIPTION

The half-bridge reference board features two 650V Infinityrf GaN ICs (D-mode Cascode Gallium Nitride) operating in parallel with a single on-board gate drive to achieve higher output currents. The purpose of this reference board is to simplify the evaluation process of these D- GaN FETs by including all the critical components on a single board that can be easily connected into any existing converter. The half-bridge reference board is 1.74" x 1.16" and contains two D-GaN half bridge ICs in a half bridge configuration using the STMicroelectronics STDRIVEG 600 gate driver. The board also 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 Infinityrf D-GaN IC please refer to the datasheet available from Infinityrf at www.infinityrf.com . The datasheet should be read in conjunction with this user start guide.

QUICK START PROCEDURE

Reference board INF_HB240A is easy to set up to evaluate the performance of two Infinityrf D-GaN half bridge ICs operated in series . 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 (H1) and ground (H3).
2. With power off, connect the switch node of the half bridge OUT (H2) to your circuit as required (half bridge configuration). The INF_HB240A features an optional buck converter configuration, as shown in figure 2, with unpopulated footprints for an output inductor and output capacitors.
3. With power off, connect the gate drive input to +V DD (J1, Pin-2) and return to ground (J1, Pin-1).
4. With power off, connect the input PWM control signal to PWM (J1 , Pin-5 and Pin-6) and return to ground (J1, Pin-1).
5. Turn on the gate drive supply - make sure the supply is between 7 V and 21 V range.
6. Turn on the controller / PWM input source.
7. Turn on the bus voltage to the required value (do not exceed the absolute maximum voltage) and probe switching node to see switching operation.
8. Once operational , adjust the PWM control , bus voltage , and load 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 oscillo - scope 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.

Table 1: Performance Summary (T _A = 25°C)					
Symbol	Parameter	Conditions	Min	Max	Units
V _{IN} / V _{out}	Bus Input/Output Voltage Range			500	V
I _{OUT}	Switch Node Output Current			8	A
V _{PWM}	PWM Logic Input	Input 'High'	3.5	3.5	V
		Input 'Low'	0	1.6	
V _{GG}	Gate Drive Input Supply Range		7	21	V

(1) Maximum input voltage depends on inductive loading, maximum switch node ringing must be kept under 500V for Infinityrf D-GaN half bridge IC.

(2) Maximum current depends on die temperature – actual maximum current will be subject to switching frequency, bus voltage and thermal cooling. Infinityrf D-GaN IC intended for high step - down ratio applications.

(3) Limited by time needed to 'refresh' high side bootstrap supply voltage.

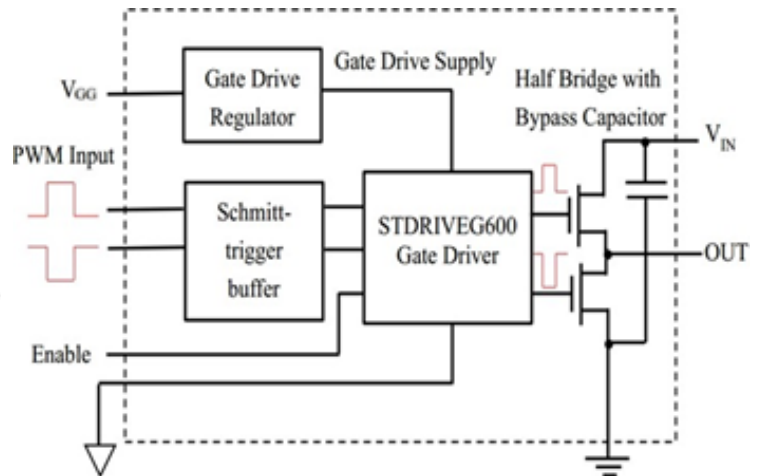


Figure 1: Block Diagram of INF_HB240A Reference Board

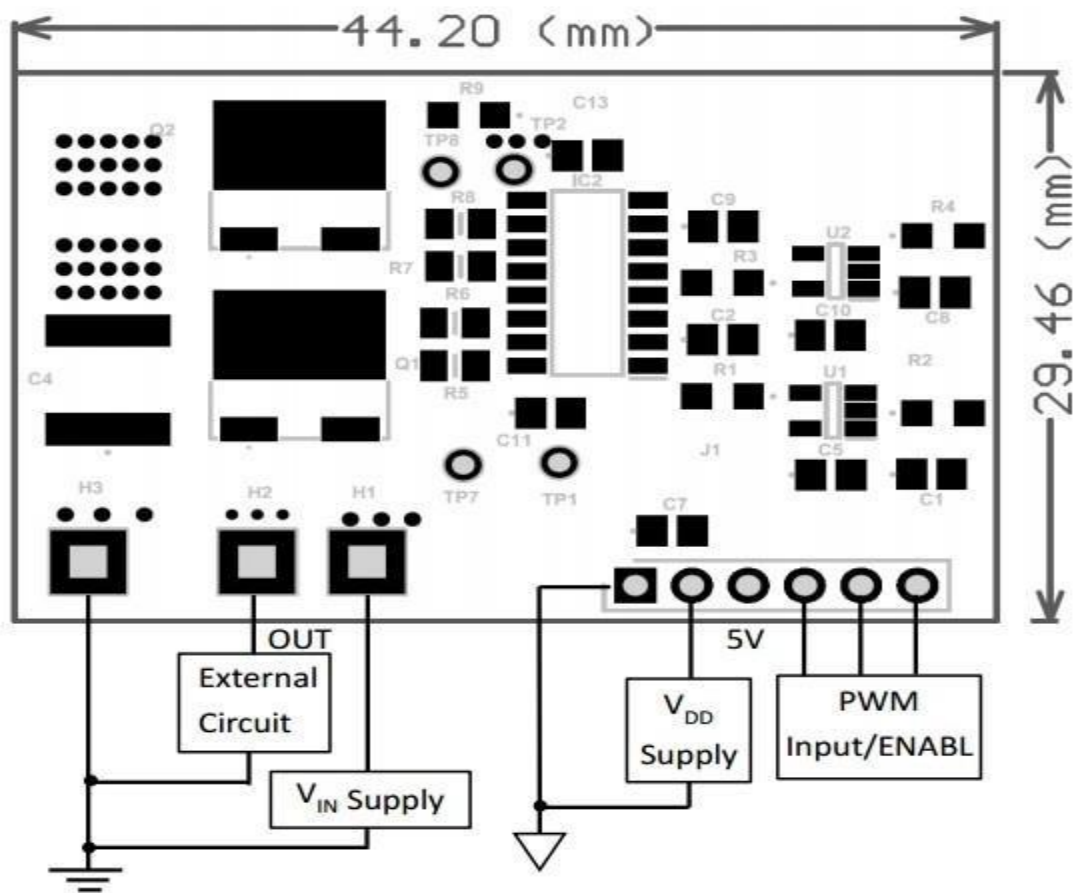


Figure 2. Reference board INF_HB240A_top view

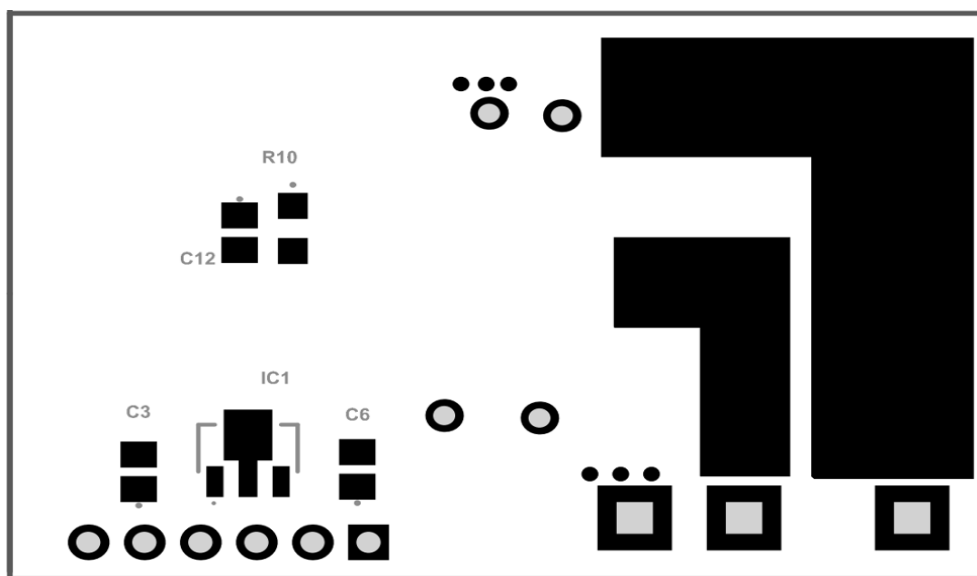
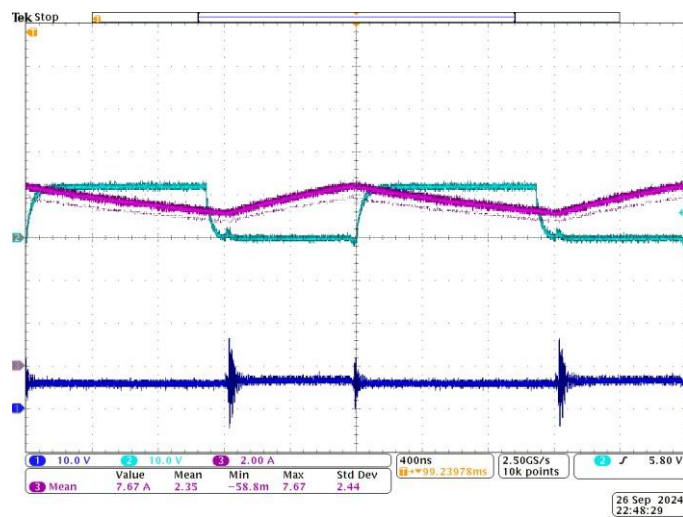


Figure 3. Reference board INF_HB240A_bottom view



$V_{IN} = 30\text{ V}$, $V_{OUT} = 5\text{ V}$, $I_{OUT} = 7.6\text{ A}$, $f_{SW} = 500\text{ kHz}$, $L = 47\mu\text{H}$

Figure 4: Typical Waveform for $V_{IN} = 30\text{ V}$ to 5 V_{OUT} , 7.6 A (500kHz), Buck Converter

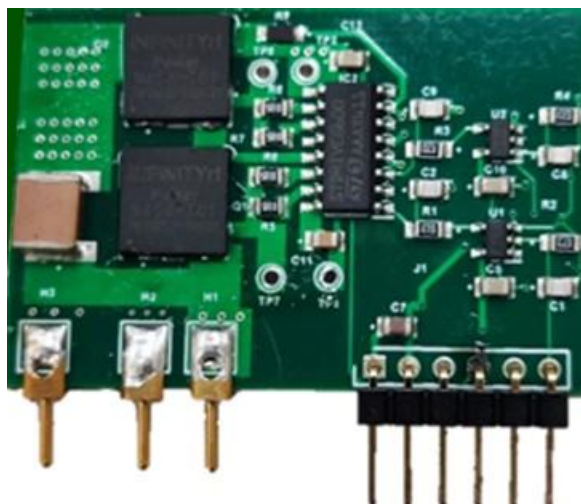


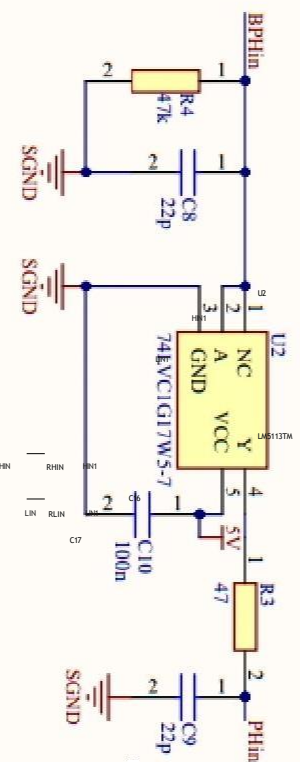
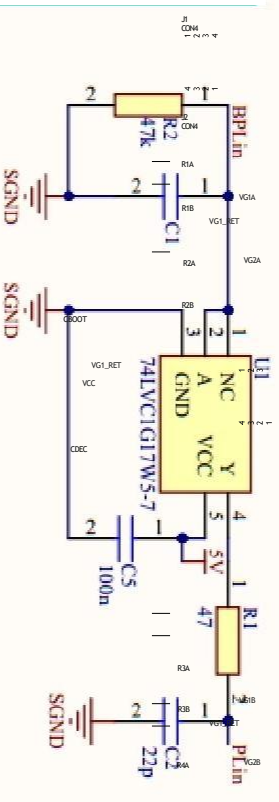
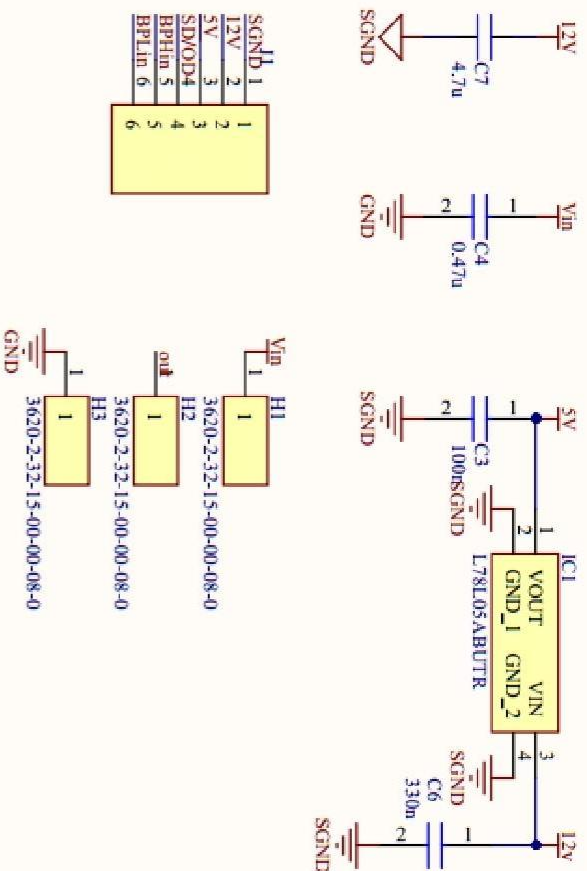
Figure 5. Reference board INF_HB240A

THERMAL CONSIDERATIONS

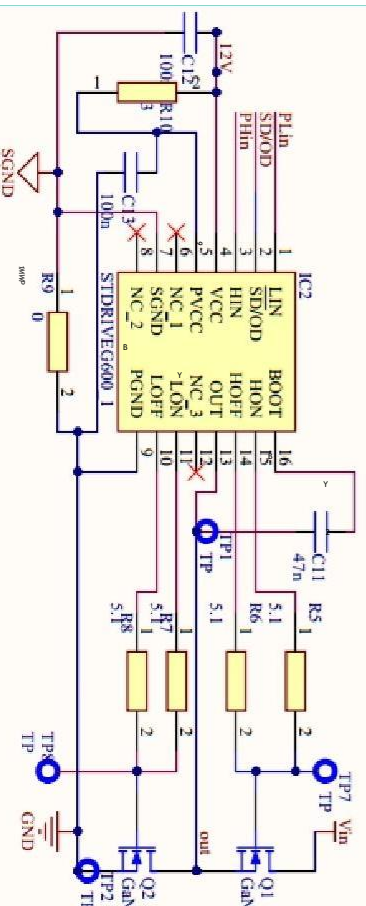
The INF_HB240A reference board showcases the INFINITY D-GaN IC. The INF_HB240A is intended for bench evaluation with low ambient temperature and convection cooling. The addition of heat-sinking and forced air cooling can significantly increase the current rating of these devices, but care must be taken to not exceed the absolute maximum die temperature of 150° C.

Item	Quantity	Designator	Description	Manufacturer,Part Number
1	3	H1, H2, H3	Hardware	Mill-Max,3620-2-32-15-00-00-08-0
2	1	C6	CAP CER 330n 25V X7R 0805	KEMET,C0805C104K5RAC7411
3	1	C7	CAP CER 4.7u 25V X7R 0805	KEMT,C0805X475K3RACAU0
4	1	C11	CAP CER 47n 25V X7R 0805	KEMET,C0805F473K3RACTU
5	4	C1, C2, C8, C9	CAP CER 22p 25V X7R 0805	KEMET,C0805C104K5RAC7411
6	5	C3, C5, C10, C12, C13	CAP CER 100n 25V X7R 0805	KEMET, C0805C104K5RAC7411
7	1	C4	CAP CER 0.47u 500V X7R 2220	KEMET,C2220C474KCRACTU
8	1	R9	0 ohm 0805	Bourns,CR0805AJ/-000EAS
9	1	R10	3 Ohms 0805	Bourns,CR0805AJ/-000EAS
10	2	R1, R3	47ohms 0805	Panasonic,ERA-6AHD150V
11	2	R2, R4	47Kohm 0805	Panasonic,ERA-6AHD150V
12	1	J1	Connector	Wurth Elektronik,61300611121
13	1	IC1	LDO	STMicroelectronics,L78L05ABUTR
14	4	R5, R6, R7, R8	5.1ohms 0805	Bourns,CRF0805-FZ-R001ELF
15	1	IC2	GateDriver	STMicroelectronics,STDRIVEG600
16	2	U1, U2	Undefined or Miscellaneous	Diodes Inc.,74LVC1G17W5-7
17	2	Q1, Q2	650V, 150mohm	Infinity M4S4 cascode GaN

NOTE. The INF_HB240A reference board does not have any current or thermal protection on board.



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Reference Board Notification

The INF_HB240A reference 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. INFINITY COMMUNICATION TECH. INC. 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. INFINITY assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or any other intellectual property rights of any kind.

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