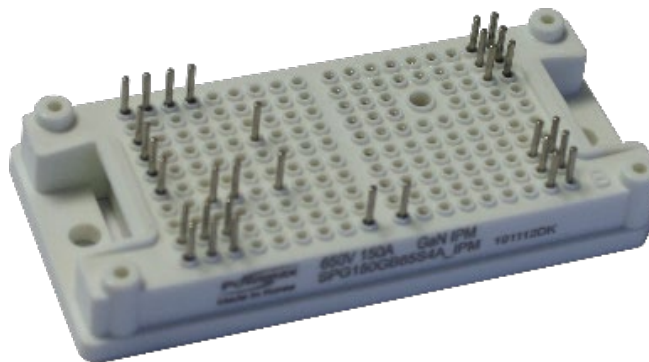


## GS-EVM-HB-650V150A-SP1

### 650V 150A Half-Bridge Intelligent Power Module with Integrated Gate Drive

#### Technical Manual



**SEMIPOWEREX<sup>®</sup>**

Visit [www.gansystems.com](http://www.gansystems.com) for the latest version of this technical manual.



**WARNING:**

PCB surface can become hot. Contact may cause burns. Do not touch!



**CAUTION!**

This product contains parts that are susceptible to damage by electrostatic discharge (ESD). Always follow ESD prevention procedures when handling the product.

## Overview

GS-EVM-HB-650V150A-SP1 is 650V 150A half-bridge Intelligent Power Module with integrated gate drive. This 650V 150A GaN E-mode IPM provides ultra-low  $E_{sw}$  (switching loss), integrated gate drive, ultra-small system form factor, and low  $R_{DS(on)}$ . The module is designed for high-efficiency high switching frequency applications such as PV Inverters, energy storage systems, UPS, and VFD and other general-purpose use. GS-EVM-HB-650V150A-SP1 is created in partnership with SemiPowerEx and intended for testing and evaluation purposes only.

## Features

- Includes 2 GS-065-150-1-D (650V 150A E-mode Die)
- Isolated, integrated gate drive
- Ultra low  $0.2^{\circ}\text{C/W}$   $R_{Q\_JUNC\_PLATE}$
- Low  $R_{DS(on)}$  and low switching losses ( $E_{sw}$ )
- Industry-standard case with Press-Fit Pins

## Applications

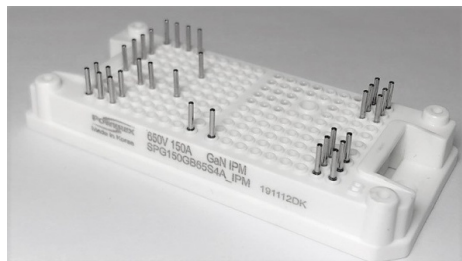
- PV Inverters
- Energy storage systems
- UPS
- VFD
- EV Chargers

## Contents

The GS-EVM-HB-650V150A-SP1 includes the following hardware.

**Table 1 GS-EVM-HB-650V150A-SP1 Evaluation Kit Contents**

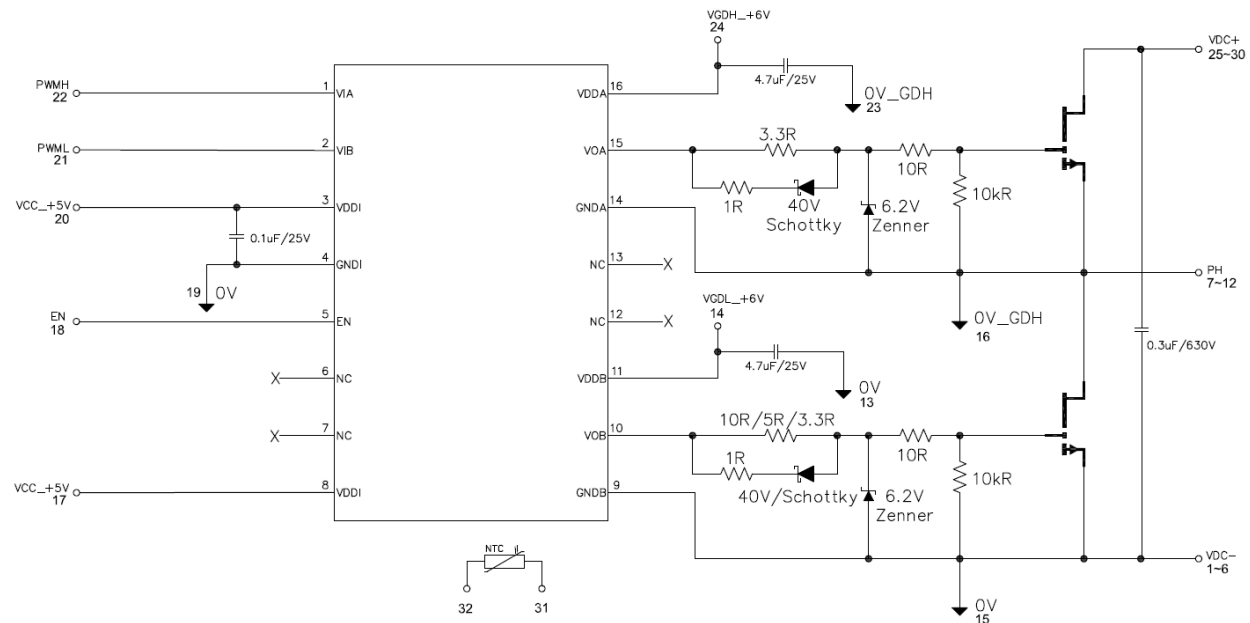
Quantity	Description
1	GS-EVM-HB-650V150A-SP1 150A Half-Bridge Intelligent Power Module with Integrated Gate Drive



**Figure 1 650V 150A GaN IPM**

## Technical Specifications

### Block Diagram



**Figure 2 650V 150A GaN IPM Block Diagram**

## Electrical Characteristics

( $T_J=25^{\circ}\text{C}$ , and  $V_{GS} = 6\text{V}$ , unless otherwise noted)

Symbol	Parameter	Conditions	Values	Units
$V_{DSS}$	Drain-Source Blocking Voltage	$V_{GS}=0\text{V}$ , $I_{DSS}=250\text{mA}$	650	V
$V_{GSS}$	Gate-Source Voltage, continuous		-10 ~ 7	V
$I_{DSS}$	Drain-Source Leakage Current	$V_{GS}=0\text{V}$ , $V_{DS}=650\text{V}$	3 (~100)	$\mu\text{A}$
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=6\text{V}$	0.25 (~1.0)	mA
$I_{DS}^*$	Continuous Drain Current	$T_C=25^{\circ}\text{C}$	188	A
		$T_C=71^{\circ}\text{C}$	150	A
$V_{GS(th)}$	Gate-Source Threshold Voltage	$V_{DS}=V_{GS}$ , $I_D=21\text{mA}$	1.2 (0.8~2.5)	V
$R_{DS(ON)}$	Drain-Source ON Resistance	$V_{GS}=6\text{V}$ , $T_J=25^{\circ}\text{C}$ , $I_{DS}=120\text{A}$	10 (~17)	$\text{m}\Omega$
		$V_{GS}=6\text{V}$ , $T_J=150^{\circ}\text{C}$ , $I_{DS}=120\text{A}$	20	$\text{m}\Omega$
$T_{j(op)}$	Operating Junction Temperature (Chip)		-55 ~ 150	$^{\circ}\text{C}$
$T_{stg}$	Storage Temperature (Module)		-40 ~ 125	$^{\circ}\text{C}$
$V_{ISO}$	Isolation Voltage	RMS, $f=50\text{Hz}$ , $t=1\text{ minutes}$	2,500	V
$R_{th(j-c)}$	Thermal Resistance		0.14	$^{\circ}\text{C/W}$
Weight	Module		35.4	g

## Test Results

### Double Pulse Test (GS-EVM-HB-650V150A-SP1)

- Test Condition:  $V_{DS} = 400V$ ,  $I_D = 150A$ ,  $R_{g-ON} = 13.5\Omega$ ,  $R_{g-OFF} = 11\Omega$

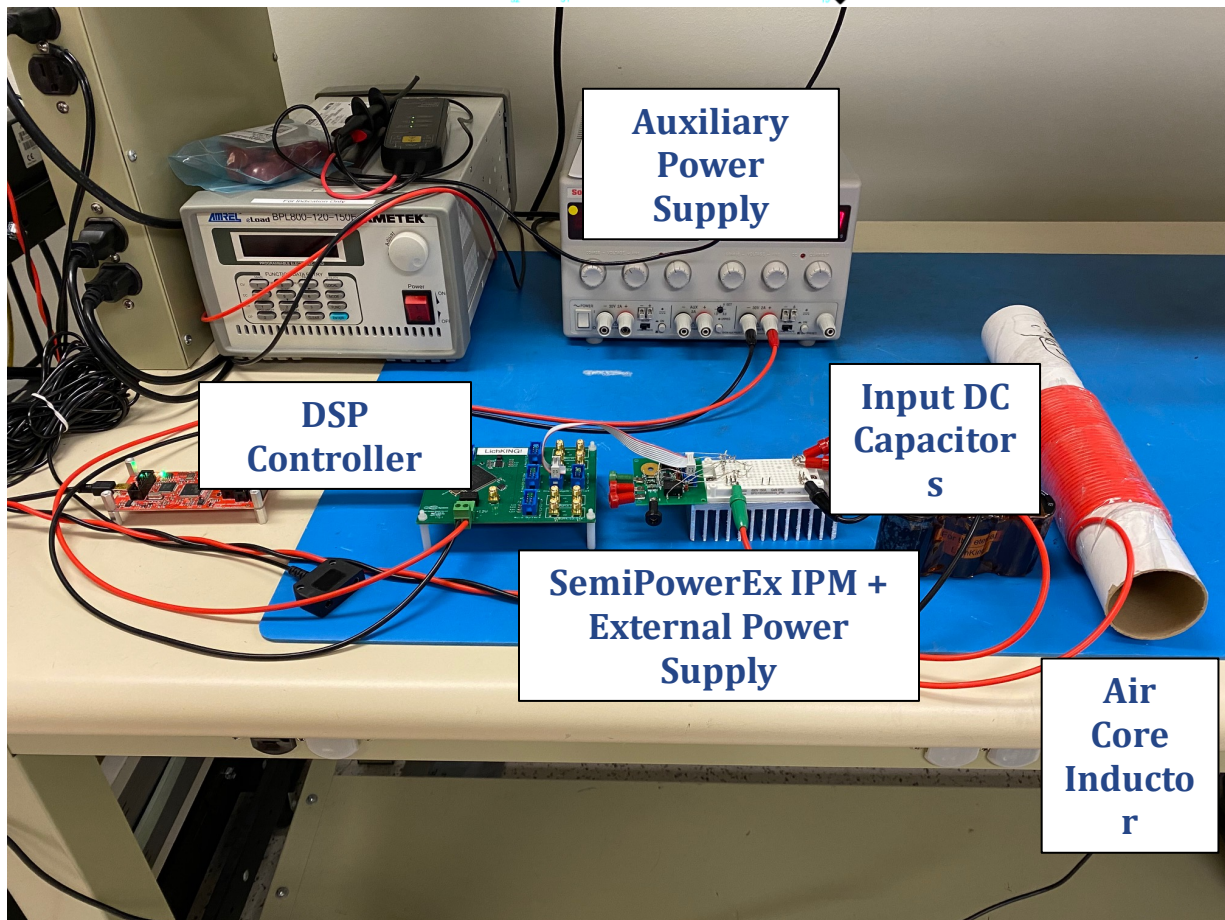
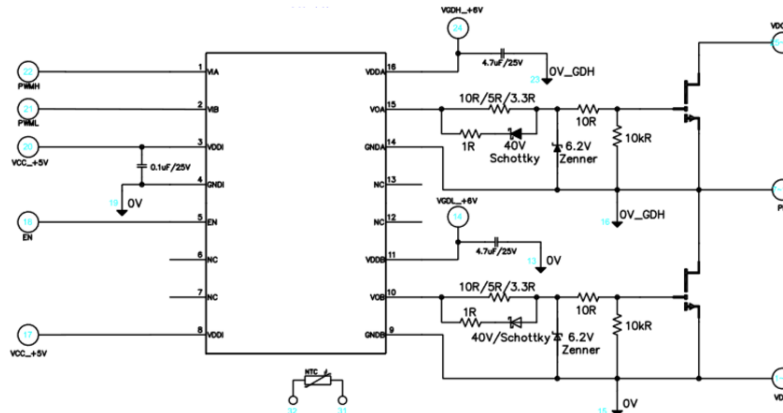


Figure 3 Double pulse test setup

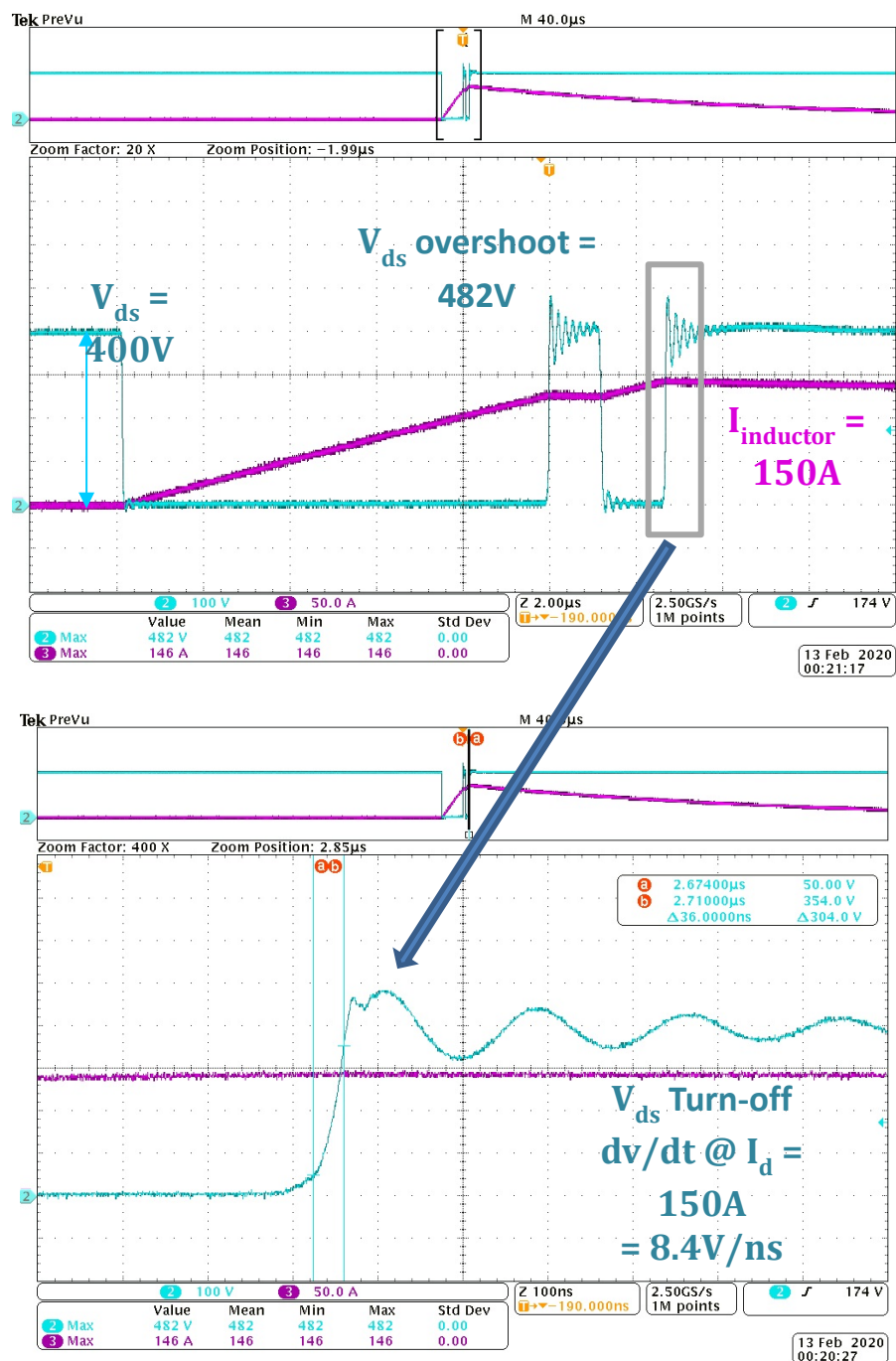


Figure 4 Double pulse test Switching OFF waveforms



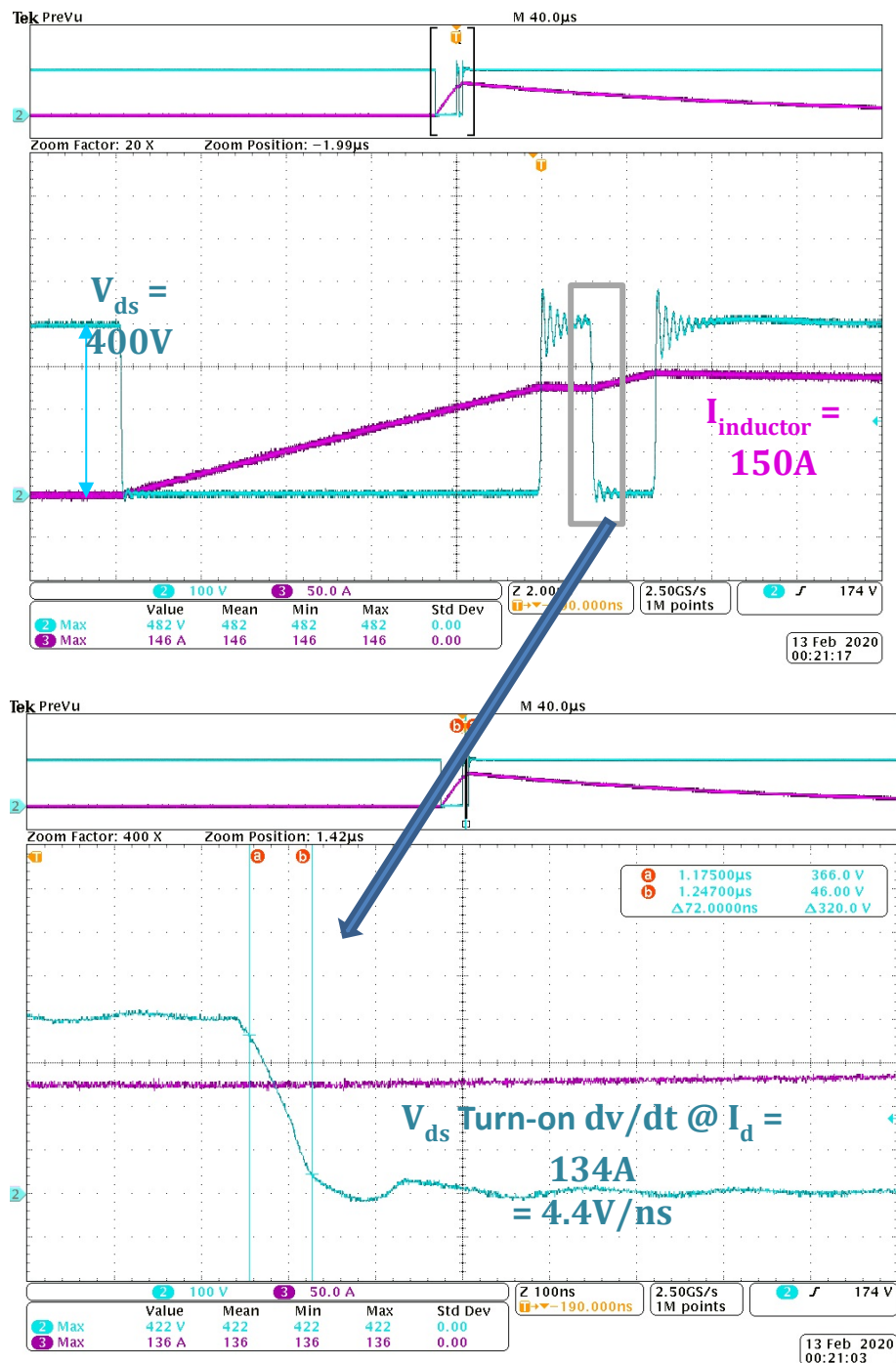
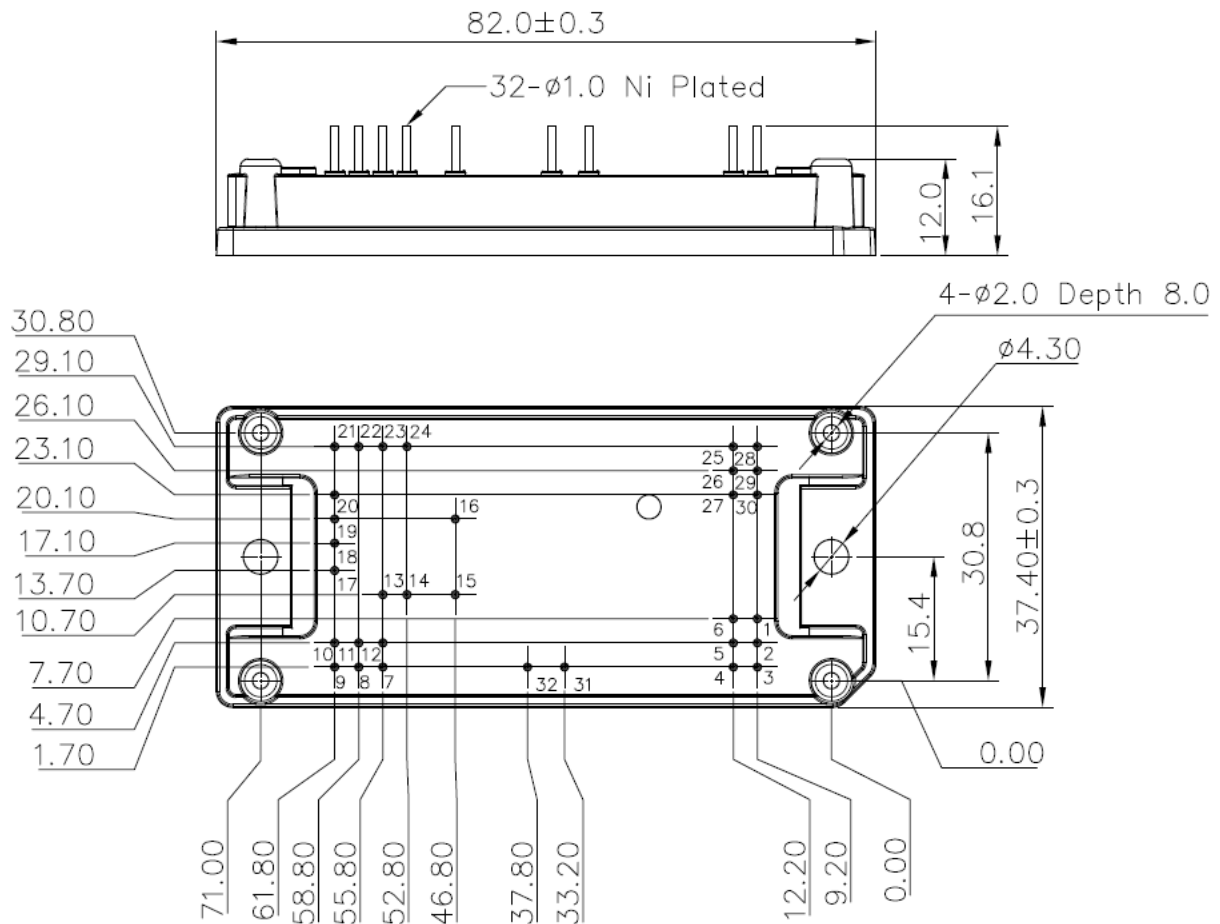


Figure 5 Double pulse test Switching ON waveforms

## Mechanical Drawing



**Figure 6 650V 150A GaN IPM Package Outline**



### Evaluation Board/kit Important Notice

GaN Systems Inc. (GaN Systems) provides the enclosed product(s) under the following **AS IS** conditions:

This evaluation board/kit being sold or provided by GaN Systems is intended for use for **ENGINEERING DEVELOPMENT, DEMONSTRATION, and OR EVALUATION PURPOSES ONLY** and is not considered by GaN Systems to be a finished end-product fit for general consumer use. As such, the goods being sold or provided are not intended to be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including but not limited to product safety and environmental measures typically found in end products that incorporate such semiconductor components or circuit boards. This evaluation board/kit does not fall within the scope of the European Union directives regarding electromagnetic compatibility, restricted substances (RoHS), recycling (WEEE), FCC, CE or UL, and therefore may not meet the technical requirements of these directives, or other related regulations.

If this evaluation board/kit does not meet the specifications indicated in the Technical Manual, the board/kit may be returned within 30 days from the date of delivery for a full refund. **THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY THE SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THIS INDEMNITY, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.**

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies GaN Systems from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge.

No License is granted under any patent right or other intellectual property right of GaN Systems whatsoever. **GaN Systems assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or any other intellectual property rights of any kind.**

GaN Systems currently services a variety of customers for products around the world, and therefore this transaction is **not exclusive**.

**Please read the Technical Manual and, specifically, the Warnings and Restrictions notice in the Technical Manual prior to handling the product.** Persons handling the product(s) must have electronics training and observe good engineering practice standards.

This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a GaN Systems' application engineer.

In Canada:

GaN Systems Inc.  
1145 Innovation Drive Suite 101  
Ottawa, Ontario, Canada K2K 3G8  
T +1 613-686-1996

In Europe:

GaN Systems Ltd., German Branch  
Terminalstrasse Mitte 18,  
85356 München, Germany  
T +49 (0) 8165 9822 7260

In the United States:

GaN Systems Corp.  
2723 South State Street, Suite 150,  
Ann Arbor, MI. USA 48104  
T +1 248-609-7643

[www.gansystems.com](http://www.gansystems.com)

Important Notice – Unless expressly approved in writing by an authorized representative of GaN Systems, GaN Systems components are not designed, authorized or warranted for use in lifesaving, life sustaining, military, aircraft, or space applications, nor in products or systems where failure or malfunction may result in personal injury, death, or property or environmental damage. The information given in this document shall not in any event be regarded as a guarantee of performance. GaN Systems hereby disclaims any or all warranties and liabilities of any kind, including but not limited to warranties of non-infringement of intellectual property rights. All other brand and product names are trademarks or registered trademarks of their respective owners. Information provided herein is intended as a guide only and is subject to change without notice. The information contained herein or any use of such information does not grant, explicitly, or implicitly, to any party any patent rights, licenses, or any other intellectual property rights. General Sales and Terms Conditions apply.

© 2009-2020 GaN Systems Inc. All rights reserved.