

# IX4351 Evaluation Board IX4351-EVAL



## Table of Contents

|                                          |   |
|------------------------------------------|---|
| 1. Introduction .....                    | 2 |
| 1.1. Features .....                      | 2 |
| 2. Connections to Evaluation Board ..... | 5 |

## List of Figures

|                                                                |   |
|----------------------------------------------------------------|---|
| Figure 1. Evaluation Board, Top & Bottom .....                 | 3 |
| Figure 2. Evaluation Board, Top Layer & Inner Layer 2 .....    | 3 |
| Figure 3. Evaluation Board, Inner Layer 3 & Bottom Layer ..... | 3 |
| Figure 4. Connections To/From Evaluation Board .....           | 5 |
| Figure 5. Evaluation Board Schematic .....                     | 6 |

## List of Tables

|                                                   |   |
|---------------------------------------------------|---|
| Table 1. Evaluation Board Pin Descriptions .....  | 4 |
| Table 2. Evaluation Board Bill of Materials ..... | 4 |

## 1. Introduction



IXYS Integrated Circuits Division's IX4351 Evaluation Board contains all the necessary circuitry to demonstrate the features of a high power SiC MOSFET gate driver and SiC MOSFET. The board includes an LSIC1MO120E0080 1200V SiC MOSFET from Littelfuse with an  $R_{DS(on)}$  of 80m $\Omega$  typical and an  $I_D$  of 25A. The board has an optically isolated interface for the input drive and FAULT output indication pin.

### 1.1. Features

- 9A source and sink outputs on gate driver
- Output capable of switching 25A
- Gate drive supply range: from 13V to 25V
- 3.3V/5V CMOS/TTL logic compatibility enables seamless interfacing with microcontrollers
- Independent under-voltage lockout (UVLO)
- Input pin includes schmitt trigger for better noise immunity
- Desaturation detection with soft shutdown
- Negative charge pump regulator
- FAULT indication pin

Figure 1. Evaluation Board, Top & Bottom

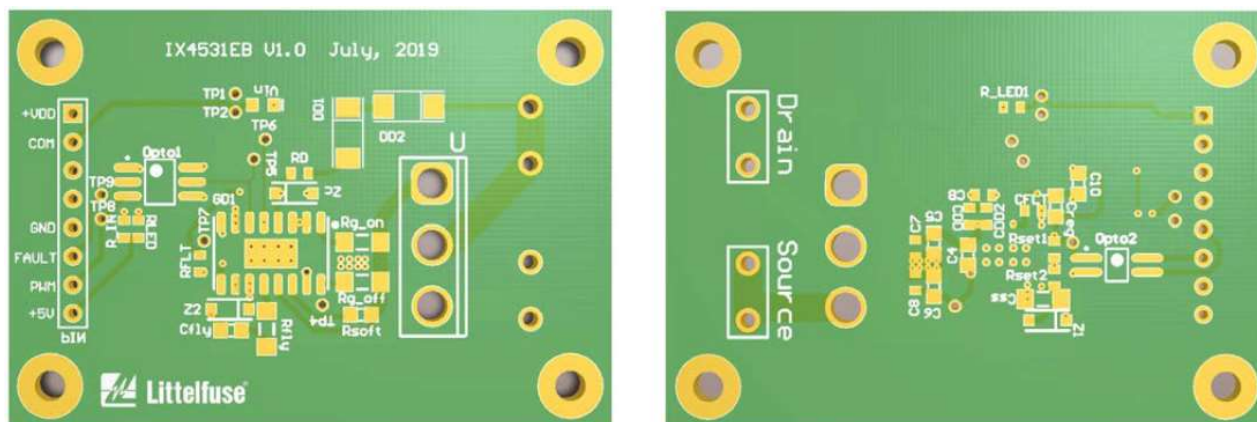


Figure 2. Evaluation Board, Top Layer & Inner Layer 2

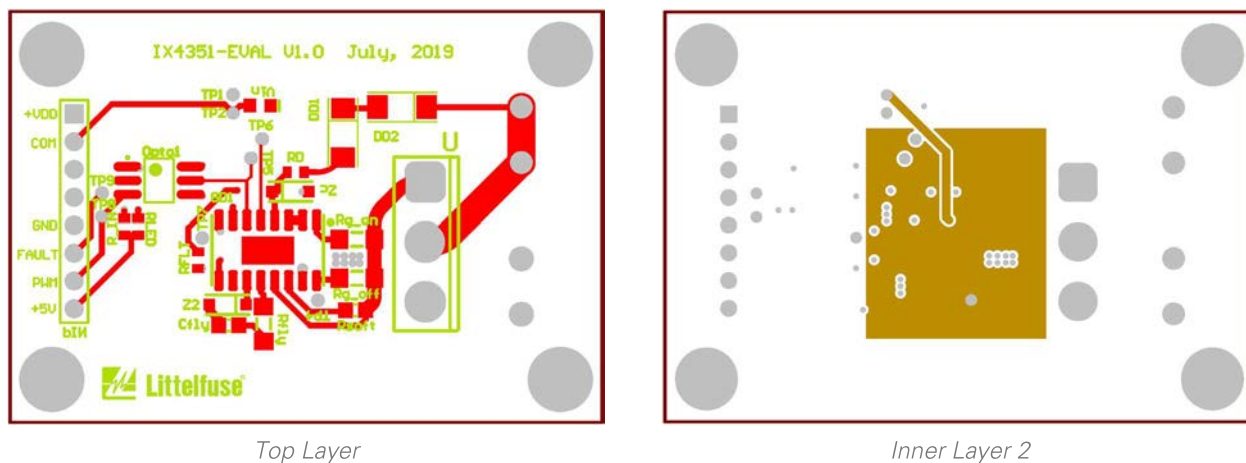
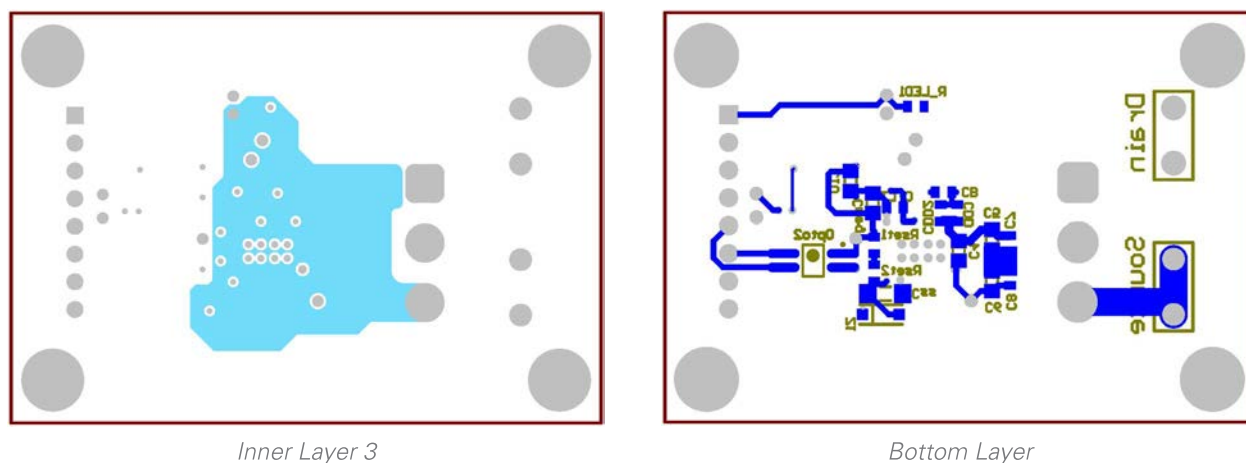


Figure 3. Evaluation Board, Inner Layer 3 & Bottom Layer



**Table 1. Evaluation Board Pin Descriptions**

| Pin Number | Pin Name        | Description                                                                                                                                                     |
|------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1          | V <sub>DD</sub> | Positive supply voltage for gate driver outputs                                                                                                                 |
| 2          | COM             | Return for driver circuitry. Note that COM is isolated electrically from GND pin                                                                                |
| 3          | N/C             | Make no connection                                                                                                                                              |
| 4          | N/C             | Make no connection                                                                                                                                              |
| 5          | GND             | Logic Ground. This ground is isolated from COM pin                                                                                                              |
| 6          | FAULT           | A low signal indicates a FAULT was detected. Phototransistor collector is pulled up to +5V with a 1K $\Omega$ resistor for this isolated output referred to GND |
| 7          | PWM             | Isolated logic input to gate driver referred to GND                                                                                                             |
| 8          | +5V             | Logic supply voltage. The evaluation board can be connected to either a +5V or +3.3V power supply                                                               |

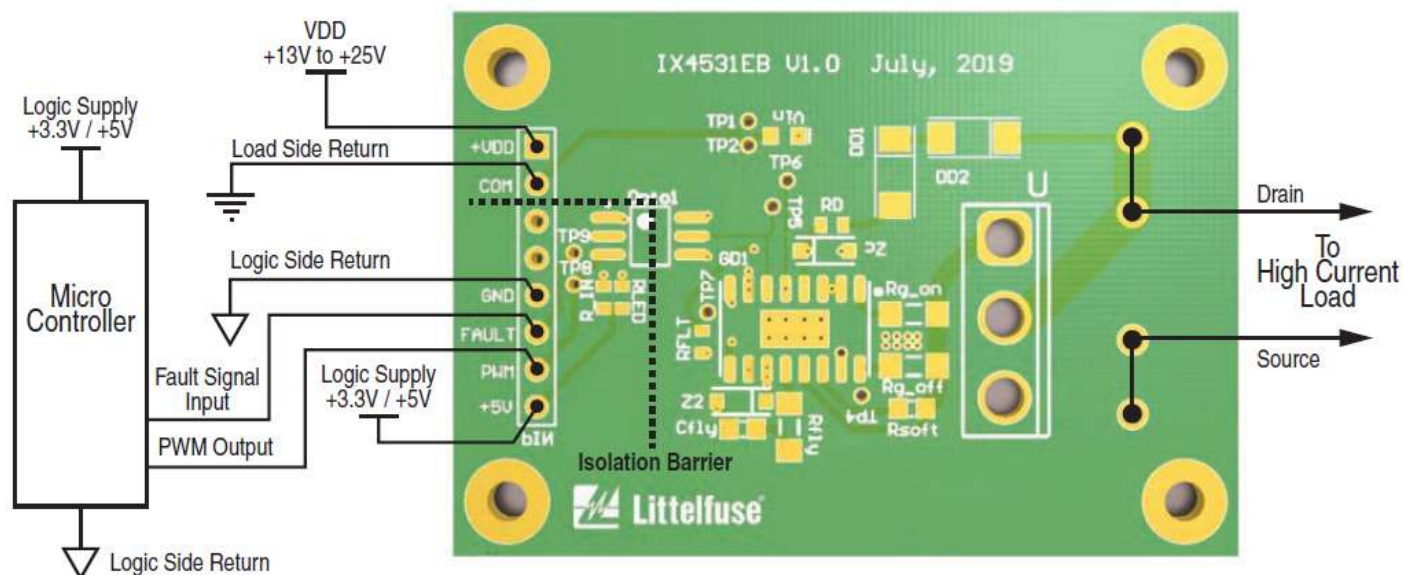
**Table 2. Evaluation Board Bill of Materials**

| Ref. Des.        | Qty. | Description                   | Manufacturer     | Mfr. P/N            |
|------------------|------|-------------------------------|------------------|---------------------|
| C4, C5, C6, Creg | 3    | Cap 4.7 $\mu$ F, 50V          | TDK              | C2012X7R1H475K125AE |
| C7, C8           | 2    | Cap 2.2 $\mu$ F, 50V          | Yageo            | CC0603KRX5R9BB225   |
| C10              | 1    | Cap, 1 $\mu$ F, 50V           | Yageo            | CC0805KKX7R9BB105   |
| CB               | 1    | Cap, 33 pF, 50V               | Yageo            | CC0603JRNPO9BN330   |
| CDD              | 1    | Cap, 1 $\mu$ F, 50V           | Yageo            | CC0603KRX7R9BB105   |
| CDD2             | 1    | Cap, 0.01 $\mu$ F, 50V        | Yageo            | CC0603KRX7R9BB103   |
| CFLT             | 1    | Cap, 100pF, 50V               | Yageo            | CC0603KPX7R9BB101   |
| Cfly             | 1    | Cap, 68nF, 50V                | Yageo            | CC0805KRX7R9BB683   |
| Css              | 1    | Cap, 4.7 $\mu$ F, 50V         | AVX              | 12065C475KAT4A      |
| DD1, DD2         | 2    | Rectifier, 1A, 1200V          | STmicro          | STTH112A            |
| Drain, Source    | 2    | Drain and Source Connector    | Keystone         | 1287-ST             |
| U                | 1    | MOSFET in TO247               | Littelfuse       | LSIC1MO120E0080     |
| Opto1            | 1    | High Speed Optocoupler        | Toshiba          | TLP2361E            |
| Opto2            | 1    | Transistor Output Optocoupler | On Semiconductor | FODM217D            |
| PIN              | 1    | Header 1x8                    | TE Connectivity  | 3-644456-8          |
| RD               | 1    | Resistor, 100 $\Omega$        | Vishay / Dale    | CRCW0603100RJNEAC   |
| RFLT             | 1    | Resistor, 1.8K $\Omega$       | Yageo            | RC0603FR-071K8L     |
| Rfly             | 1    | Resistor, 33 $\Omega$         | Yageo            | RC1206FR-7W33RL     |
| Rg_off, Rg_on    | 2    | Resistor, 2 $\Omega$          | Yageo            | RC1206JR-072RL      |
| RLED             | 1    | Resistor, 430 $\Omega$        | KOA Speer        | RK73B1JTTDD431J     |
| Rset1            | 1    | Resistor, 40.2K $\Omega$      | Yageo            | RC0603FR-0740K2L    |
| Rset2            | 1    | Resistor, 44.2K $\Omega$      | Yageo            | RC0603FR-0744K2L    |
| Rsoft            | 1    | Resistor, 510 $\Omega$        | Yageo            | RC0805JR-07510RL    |
| R_IN             | 1    | Resistor, 3.3K $\Omega$       | Yageo            | RC0603JR-073K3L     |
| R_LED1           | 1    | Resistor, 1.5K $\Omega$       | Vishay / Dale    | CRCW06031K50FKEAC   |
| TP1-TP9          | 9    | Test Point – Do not populate  |                  |                     |
| LED1             | 1    | Red LED                       | Dialight         | 599-0010-007F       |
| Zc               | 1    | Zener Diode 7.5V 500mW        | Diodes Inc.      | MMSZ5236B-7-F       |
| Z1, Z2           | 2    | Schottky Diode                | On Semiconductor | MBR0540             |

## 2. Connections to Evaluation Board

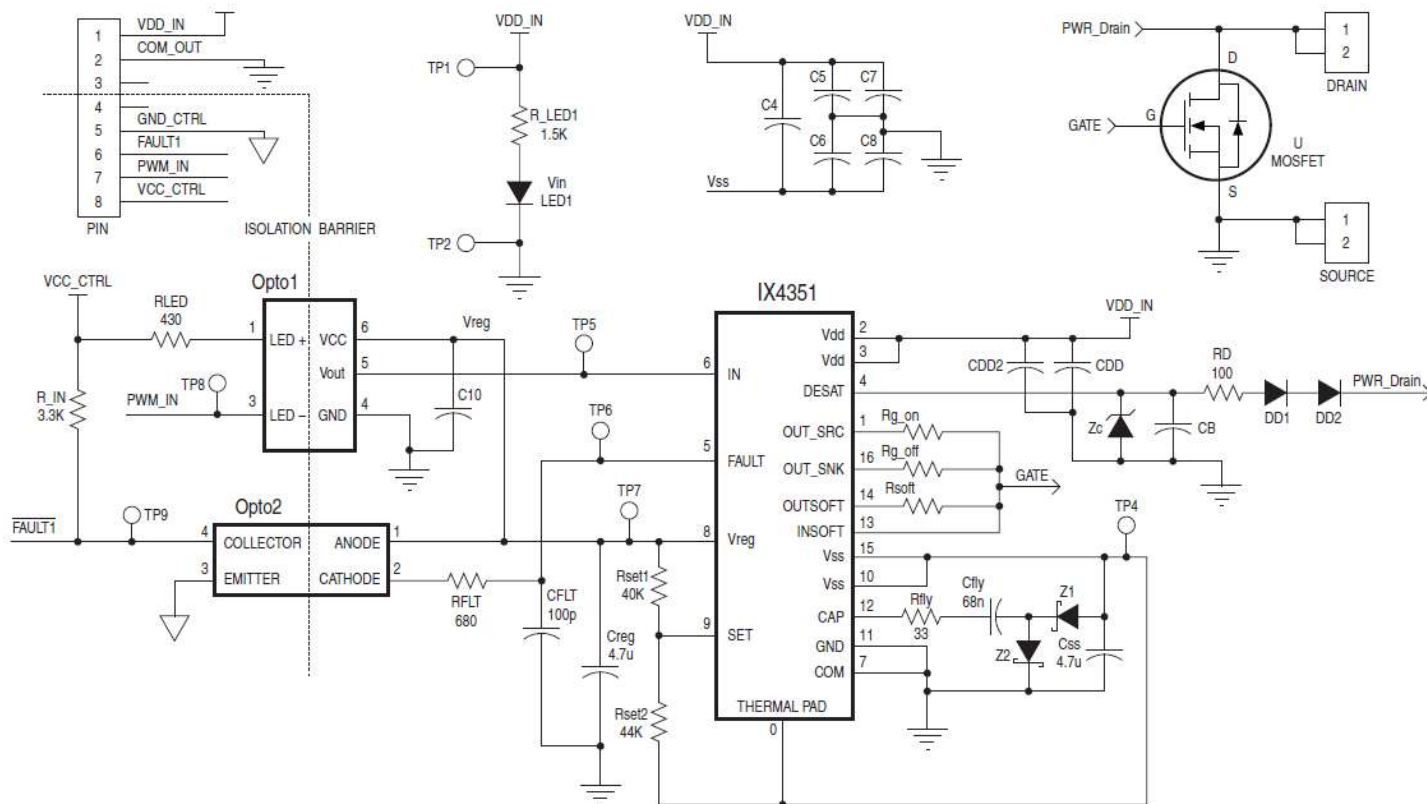
To start the Evaluation Board, provide necessary voltages to  $+V_{DD}$  and  $+5V/+3.3V$  logic supply as shown in Figure 4. Note that the PWM pin is active low and sinks approximately 5mA (see Note 1). Connect the PWM pin to the output of the microcontroller and the FAULT signal to an input, if this option is desired. For more details on the gate driver, please refer to the IX4351NE data sheet. The IX4351 Evaluation Board provides galvanic isolation between the logic side and load side of the circuit. Referring to Figure 4, the barrier is denoted by a dashed black line.

**Figure 4. Connections To/From Evaluation Board**



**Note 1:** Current depends on Optocoupler LED  $V_F$ ,  $V_{OL}$  of the Microcontroller, and power supply voltage. For 5V supply assuming 0V  $V_{OL}$ ,  $V_F = 1.35V$ , LED current can be as high as 8.4mA. User can modify RLED as necessary provided optocoupler drive requirements are met.



**Figure 5. Evaluation Board Schematic**


For additional information please visit [www.ixysic.com](http://www.ixysic.com)

**Disclaimer Notice** - This document is provided by Littelfuse, Inc. ("Littelfuse") for informational and guideline purposes only. Littelfuse assumes no liability for errors or omissions in this document or for any of the information contained herein. Information is provided on an "as is" and "with all faults" basis for evaluation purposes only. Applications described are for illustrative purposes only and Littelfuse makes no representation that such applications will be suitable for the customer's specific use without further testing or modification. Littelfuse expressly disclaims all warranties, whether express, implied or statutory, including but not limited to the implied warranties of merchantability and fitness for a particular purpose, and non-infringement. It is the customer's sole responsibility to determine suitability for a particular system or use based on their own performance criteria, conditions, specific application, compatibility with other components, and environmental conditions. Customers must independently provide appropriate design and operating safeguards to minimize any risks associated with their applications and products.

Littelfuse products are not designed for, and shall not be used for, any purpose (including, without limitation, automotive, military, aerospace, medical, life-saving, life-sustaining or nuclear facility applications, devices intended for surgical implant into the body, or any other application in which the failure or lack of desired operation of the product may result in personal injury, death, or property damage) other than those expressly forth in applicable Littelfuse product documentation. Littelfuse shall not be liable for any claims or damages arising out of products used in applications not expressly intended by Littelfuse as set forth in applicable Littelfuse documentation.

Read complete Disclaimer Notice at [www.littelfuse.com/disclaimer-electronics](http://www.littelfuse.com/disclaimer-electronics)