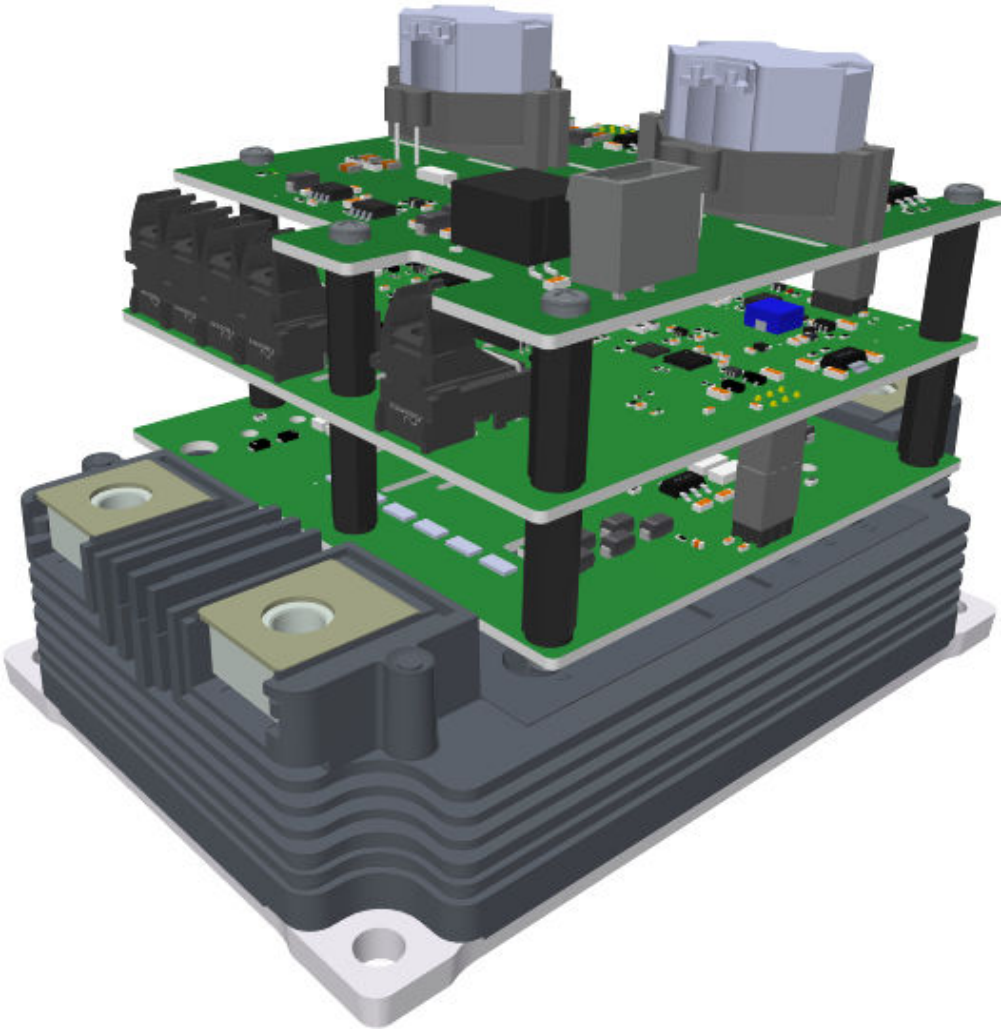
XIFx-Intelligent HV100 Fiber Series

Product Overview

The AgileSwitch® XIFx-intelligent HV100 fiber series driver is designed to drive 3.3 kV SiC modules in High-Voltage (HV) packages such as LinPak, XHP™, or equivalent. It features Augmented Switching™ to monitor the fault report and to improve control of SiC MOSFET-based power systems. The driver includes isolated High (HI) and Low (LO) side DC/DC converters and complies with key rail specifications—EN 50155.

The following figure shows a representative stack-up of the XIFx-intelligent HV100 fiber series driver, which is subject to change without notice.

Figure 1. XIFx-Intelligent HV100 Fiber Series Driver—3D View



The following figure shows the basic topology of the XIFx-intelligent HV100 fiber series driver.

Figure 2. Basic Schematic of the XIFx Gate Driver

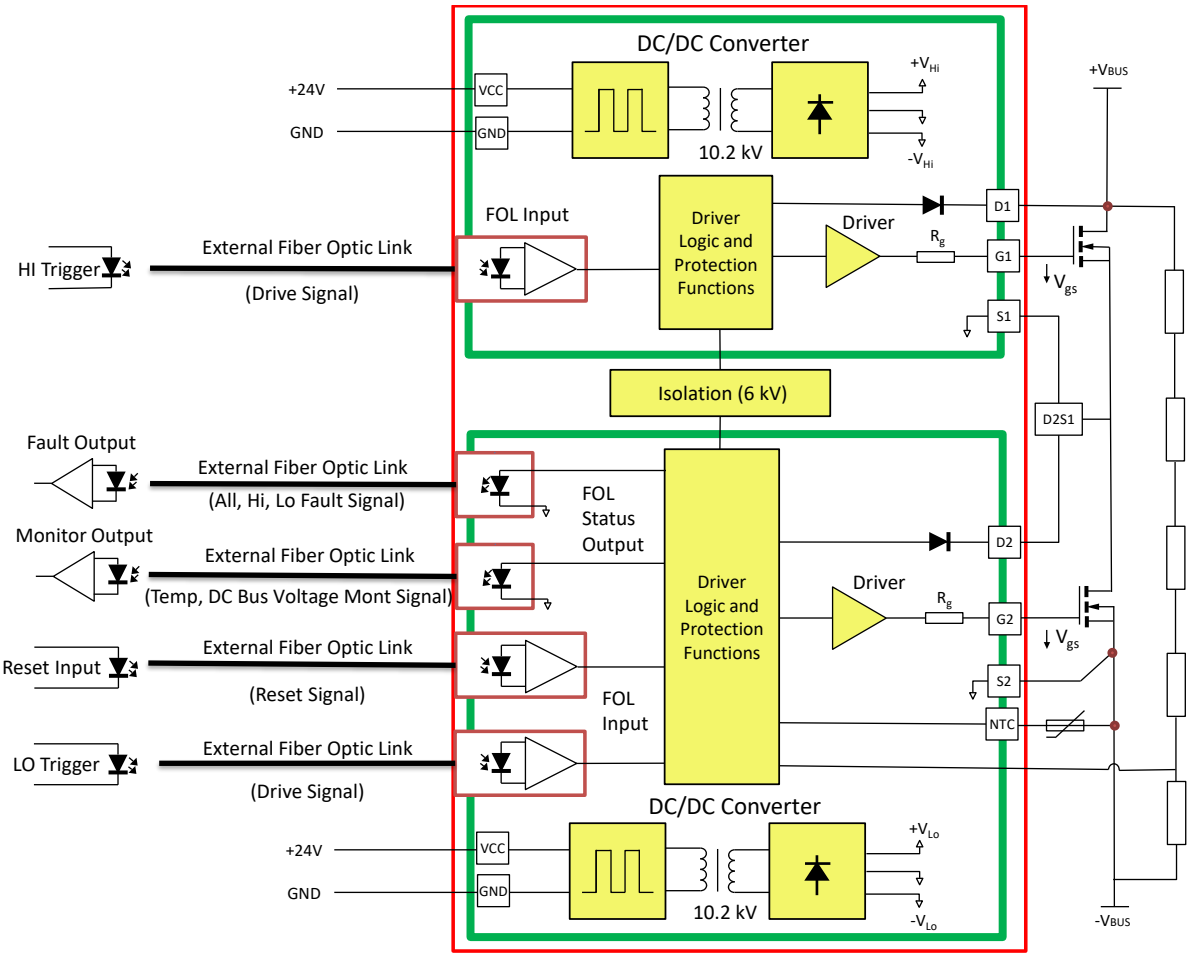


Table 1. Fiber Optic Interface

Interface	Description	Part Number
HI trigger input—J5	Fiber optic receiver	HFBR-2531ETZ/FR05DVCR
LO trigger input—J4	Fiber optic receiver	HFBR-2531ETZ/FR05DVCR
Reset input—J1	Fiber optic receiver	HFBR-2531ETZ/FR05DVCR
All fault output—J3	Fiber optic transmitter	HFBR-1531ETZ/FT05MVNR
HV/Temp. monitor output—J2	Fiber optic transmitter	HFBR-1531ETZ/FT05MVNR

Table 2. Electrical Connector

Interface	Description	Part Number
J1	24V On-board connector	231-132/001-000

Features

The following sections describes the features of the XIFx-intelligent HV100 fiber series driver.

1.1 Software Programmable Features

The following are the software programmable features of the XIFx-intelligent HV100 fiber series driver:

- Augmented Switching
- Power supply Under-Voltage Lockout (UVLO)
- Desaturation detection settings
- Fault lockout settings
- Automatic Reset settings
- Positive and negative gate voltage biasing
- Negative Temperature Coefficient (NTC) based measurement settings

1.2 Key Switch Driver Features

The following are the key switch driver features of the XIFx-intelligent HV100 fiber series driver:

- Compatible with HV 100 packages of the LinPak, XHP, or equivalent
- 10.2 kV primary-to-secondary isolation voltage
- Isolated temperature and DC link monitoring
- 2 × 10W output power
- 15A peak source/sink current
- Configurable gate output voltages
- Compact three boards stack on-board isolated solution
- Soft shutdown time and voltage level

Applications

The following are the applications of the XIFx-intelligent HV100 fiber series driver:

- High-speed trains, traction, and hybrid trains
- Railway/Transportation
- Grid
- DC/DC

Standards Compliance Targets

The following are the standards compliance targets for the XIFx-intelligent HV100 fiber series driver:

- Railway application compliant to EN50155
- Electromagnetic Compatibility (EMC) compliant to EN 50121-3-2 and EN 61000-6-4
- Shock and vibration to EN 61373
- Fire hazard level—HL2

Table of Contents

1. Electrical Specifications

The following sections describes the electrical specifications of the XIFx-intelligent HV100 fiber series driver.

1.1 Absolute Maximum Ratings

The following table lists the absolute maximum ratings of the XIFx-intelligent HV100 fiber series driver.

Table 1-1. Absolute Maximum Ratings

Parameter	Description	Min.	Max.	Unit
Supply voltage	V_{CC} to GND	0	27	V
Peak gate current	Peak current allowed only for fast charge C_{GS}	−15	15	A
Output power per gate	—	—	10	W
Isolation voltage	Primary-to-secondary VAC RMS 1 min	—	10200	V
	Secondary-to-secondary VAC RMS 1 min	—	6000	
Clearance distance	Primary-to-secondary side	22	—	mm
	Secondary-to-secondary side	12.5	—	
Creepage distance	Primary-to-secondary side	41	—	
	Secondary-to-secondary side	25	—	
Common Mode Transient Immunity (CMTI)	Rate of change from input to output	100	—	kV/µs
Operating temperature	Ambient operating temperature	−40	85	°C
Storage temperature	—	−40	90	
Voltage measurement	Voltage monitoring on drain of the High-Side (HS) switch against source of the Low-Side (LS) switch	0	2500	V
Temperature measurement	NTC thermistor-based monitoring; Note 1	−40	150	°C

Note:

1. Software configurable parameter.

1.2 Electrical Characteristics

The following table lists the electrical characteristics of the XIFx-intelligent HV100 fiber series driver.
Note: Conditions: V_{SUP} = 24V, and MOSFET = SiC module 5SFG 0500Z330100.

Table 1-2. Electrical Characteristics

Parameter	Description	Min.	Typ.	Max.	Unit
Power Supply					
Supply voltage	V_{CC} to GND	22	24	27	V
Supply current	Without load	—	105	—	mA
	With load; Note 1	—	—	340	

.....continued					
Parameter	**Description**	**Min.**	**Typ.**	**Max.**	**Unit**
UVLO level—HI and LO	Primary side low voltage detects fault level	TBD	TBD	—	V
Positive biasing V_{GS} voltage	—	15	—	21	
Negative biasing V_{GS} voltage	—	−10	—	0	
Signal I/O					
Gate output voltage low	Note 2	—	−15	—	V
Gate output voltage high	Note 2	—	15	—	
Fault output (Optical signal output)	Open signal output	—	—	0 (low on fault)	
HV/Temp. monitor output	Open signal output; Note 3	1	—	10	kHz
Temperature range	−30 °C–150 °C; Note 2	1	—	10	kHz
HV range	0–2500V	2.5	—	10	kHz
MOSFET Short Protection					
Desaturation (DSAT) monitor voltage	Between drain and source; Note 2	—	TBD	—	V
Desaturation time (T_{DSAT})	DSAT blanking time; Note 2	—	TBD	—	µs
Response time after fault	—	—	—	TBD	ns

Notes:

1. The preceding SiC MOSFET dependent conditions assume SiC MOSFET Module 5SFG 0500Z330100 with C_{iss} = TBD nF; Q_g = 100 nF operating at 20 kHz.
2. Software configurable parameter.
3. Shared between HV and temperature signals. One of them can be selected.

2. Timing Diagrams

TBD

3. Generic Factory Settings

TBD

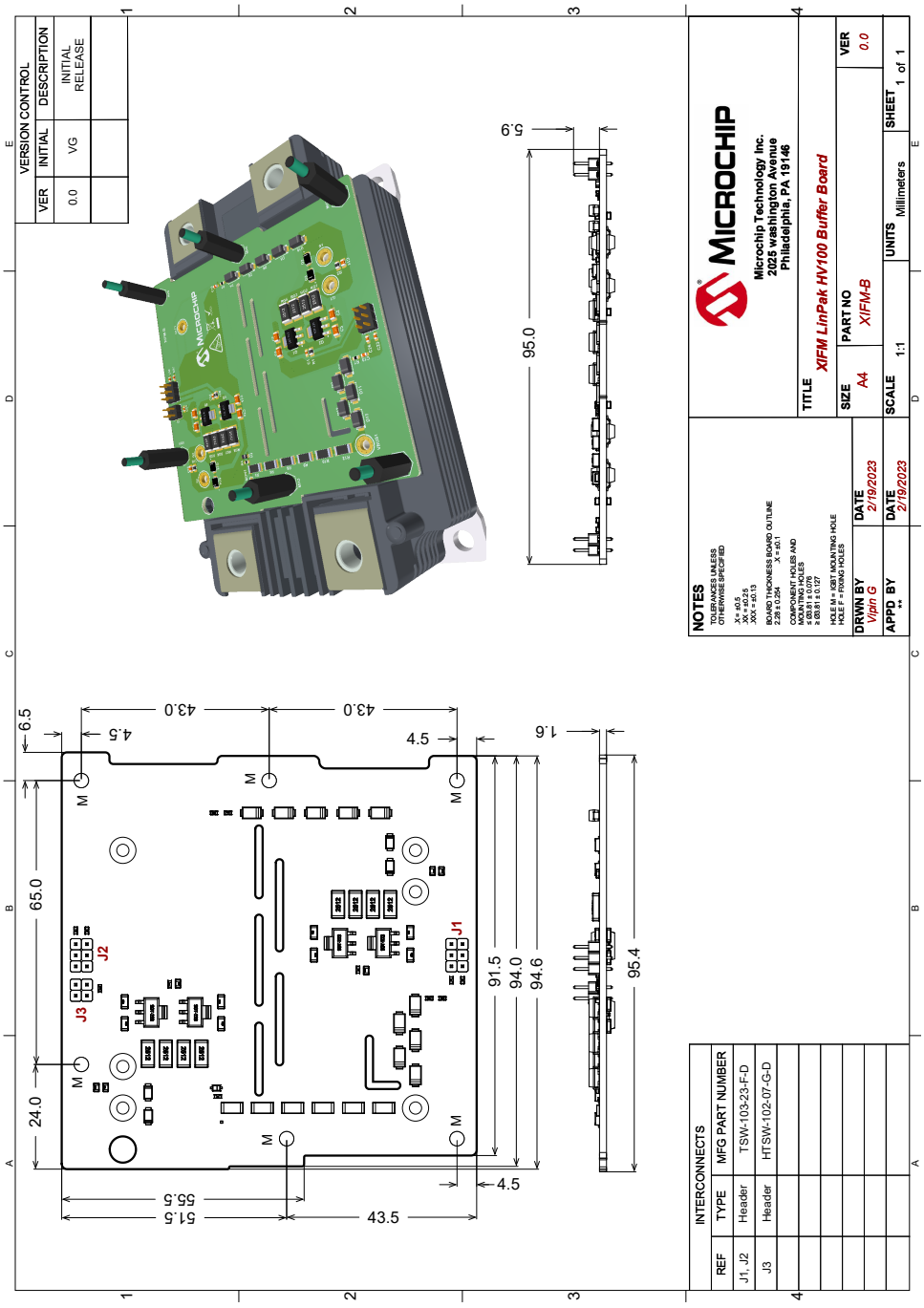
4. Package Specifications

The following section shows the package specification of the XIFx-intelligent HV100 fiber series driver.

4.1 Package Outline

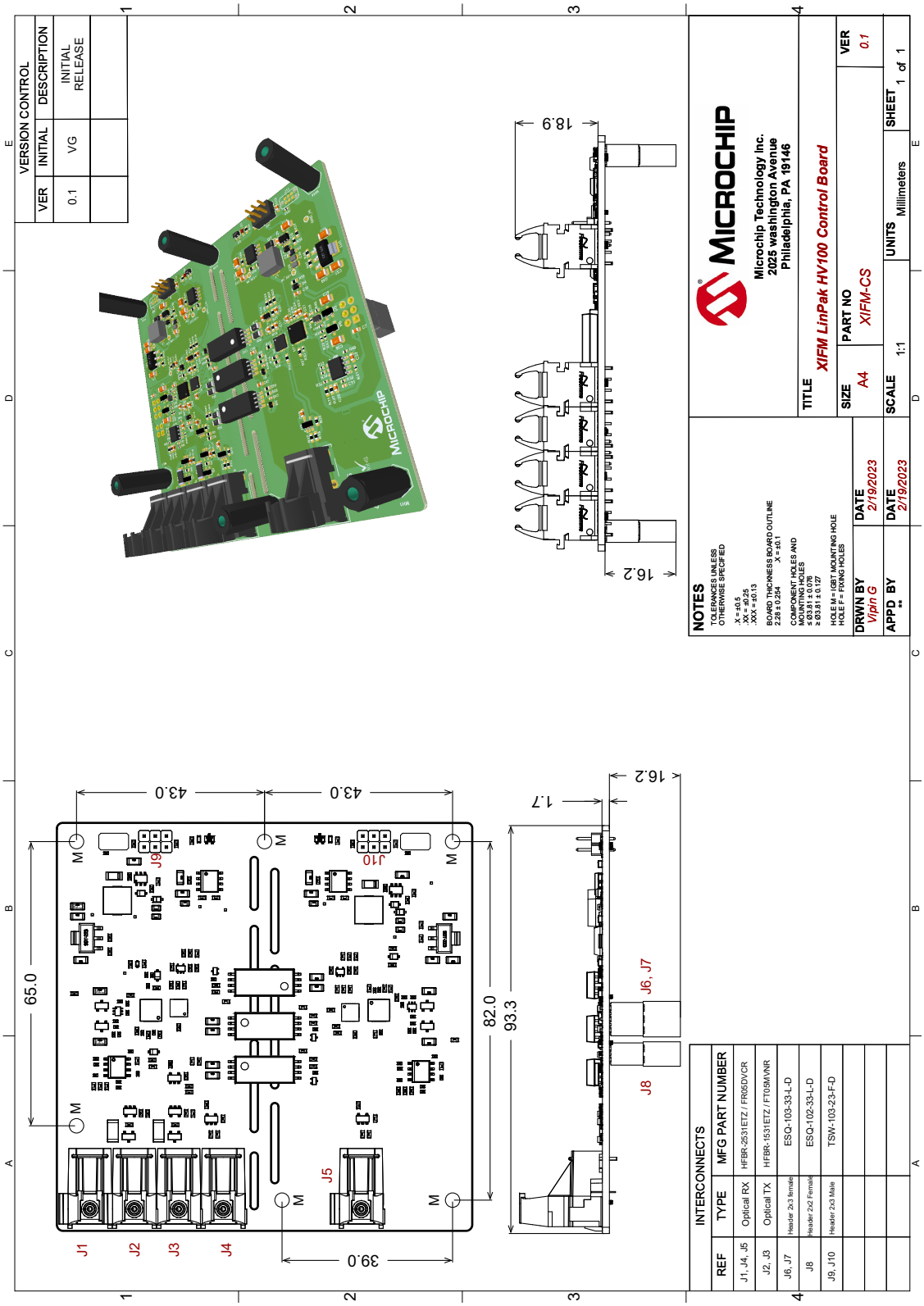
The following figure shows the package outline drawing of the XIFM LinPak HV100 buffer board. The dimensions in the following figure are in millimeters.

Figure 4-1. Package Outline Drawing—XIFM LinPak HV100 Buffer Board



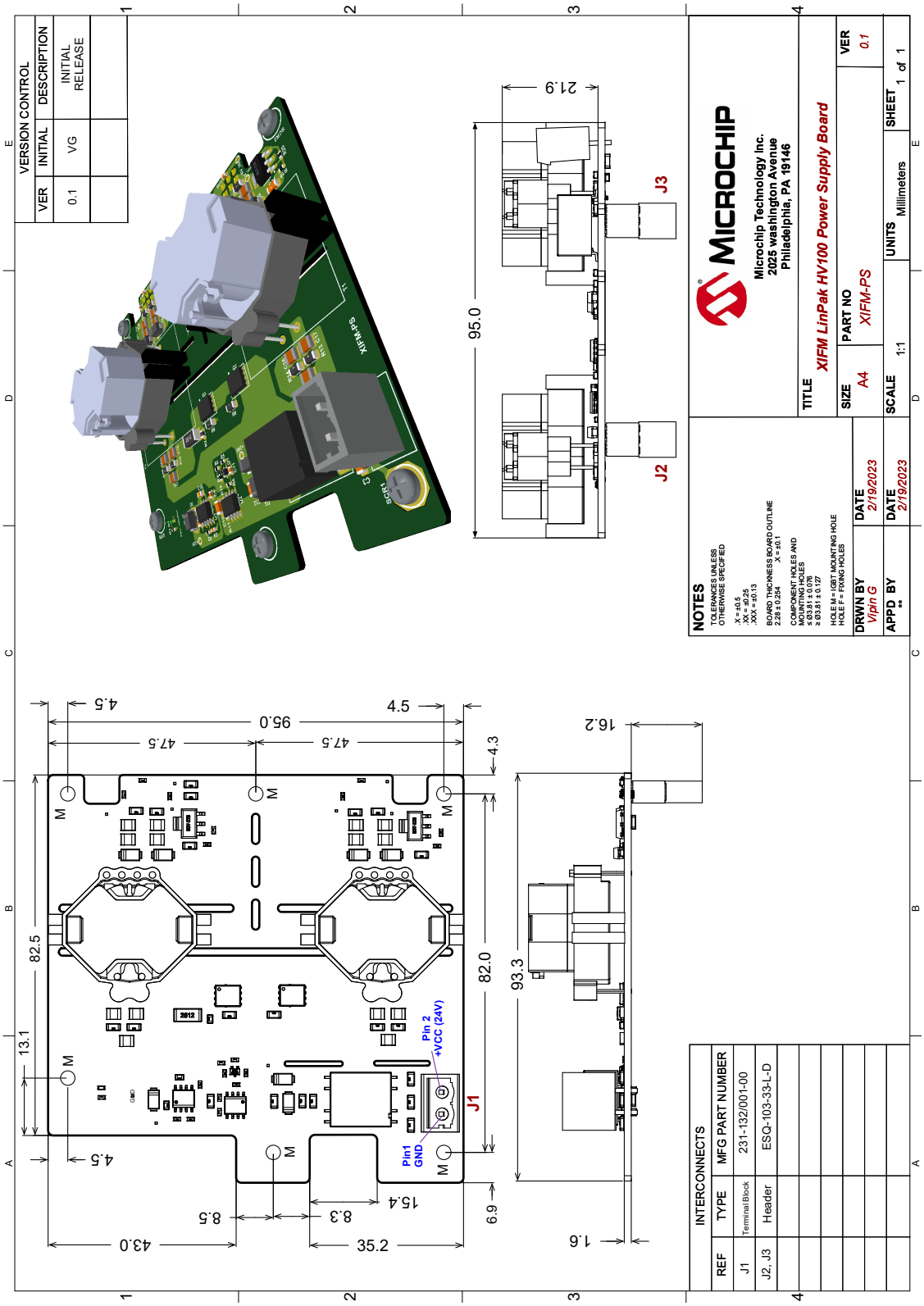
The following figure shows the package outline drawing of the XIFM LinPak HV100 control board. The dimensions in the following figure are in millimeters.

Figure 4-2. Package Outline Drawing—XIFM LinPak HV100 Control Board



The following figure shows the package outline drawing of the XIFM LinPak HV100 power supply board. The dimensions in the following figure are in millimeters.

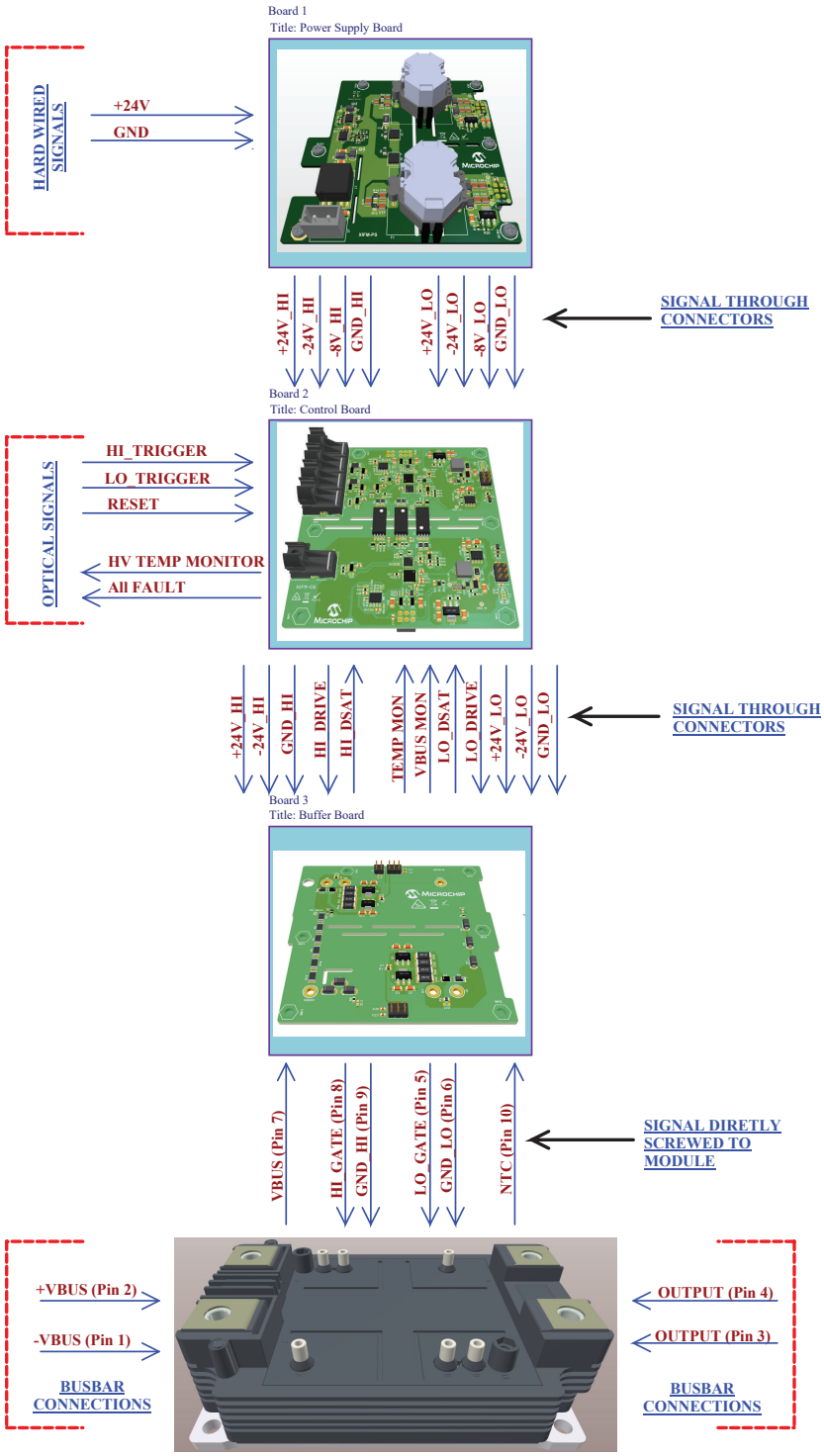
Figure 4-3. Package Outline Drawing—XIFM LinPak HV100 Power Supply Board



4.2 Signal Flow and Mounting Overview

The following figure shows the signal flow and mounting overview of the XIFx-intelligent HV100 fiber series driver.

Figure 4-4. Signal Flow and Mounting Overview



5. Important Precautions

⚠WARNING Handling devices with high voltages involves risk to life. It is imperative to comply with all respective precautions and safety regulations.

Microchip assumes that the gate drive board is mounted on the SiC MOSFET prior to start-up testing. It is recommended that the user check that the SiC MOSFET power modules are operating inside the Specified Operating Area (SOA) as specified by the module manufacturer, including short circuit testing under very low load conditions.

6. Revision History

The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

Revision	Date	Description
C	02/2023	• Updated part numbers in Table 1. • Updated values in Table 1-1 and Table 1-2. • Updated Figure 4-1, Figure 4-2, Figure 4-3, and Figure 4-4.
B	12/2022	Updated Table 1, Table 1-1, and Table 1-2.
A	10/2022	Initial revision.

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