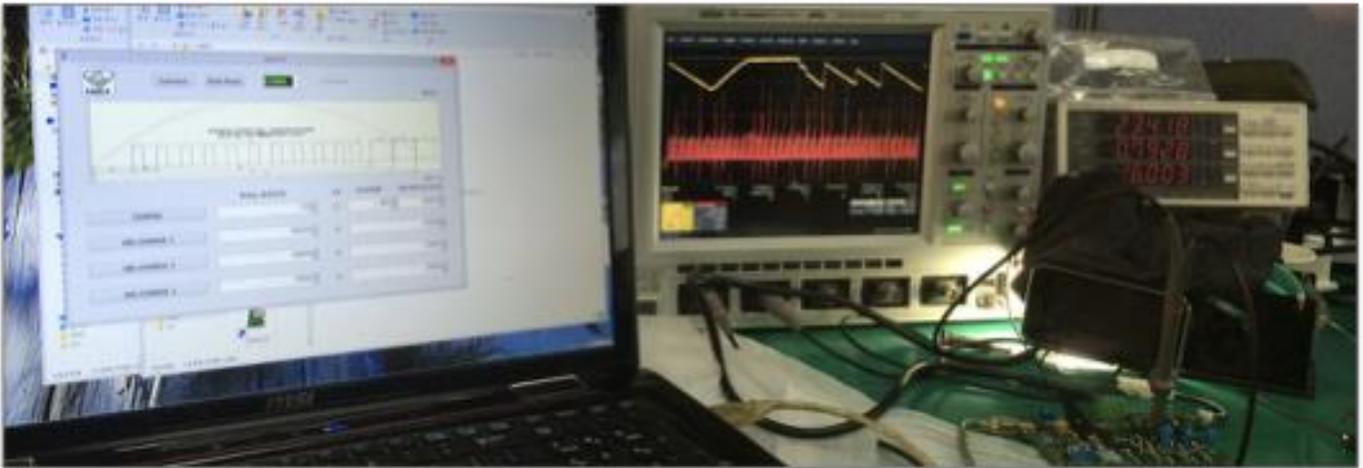


AC-DC Valley-Fill Smooth For Solid Digital Capacitor using the FIDES- P6V-EVM and FIDES-P6C-EVM

User's Guide



Number: FIDES-P6 EVM
April 2016

Contents

Preface	4
1 Description	6
1.1 FIDES-P6V-EVM.....	6
1.2 FIDES-P6CV-EVM.....	8
1.3 Typical Applications.....	9
1.4 Features.....	9
2 Schematic	10
3 EVM Kit Contents	13
4 Test Setup	13
4.1 Test Equipment.....	13
4.2 Recommended Test Setup.....	13
4.3 List of Test Points.....	15
4.4 List of Terminals.....	16
5 Test Procedure	17
5.1 Setup.....	17
5.2 Startup and Operating Procedure.....	17
5.3 Shutdown Procedure.....	17
5.4 Additional Operation Notes.....	17
6 Typical Characteristics	18
7 EVM Assembly Drawing and PCB Layout	20
8 Bill of Materials	21

List of Figures

1	Simplified FIDES-P6X EVM Schematic	7
2	Exposed Copper for Heatsink	8
3	FIDES-P6X-EVM Schematic.....	10
4	Recommended Footprint for FIDES-P6X-EVM	11
5	FIDES-P6X-EVM Schematic.....	12
6	FIDES-P6X-EVM Connected with any SMPS.....	14
7	Recommended Connection Points	15
8	Recommended Probe Connection for Logic Signals	18
9	Recommended Probe Connection for High Voltage Switch Node.....	18
10	Recommended Configuration for Heatsink and Fan	18
11	Switching Waveforms with 480V input, 100kHz, 30% duty cycle, 6A output	18
12	Low to High Transition Waveform with 480V input, 100kHz, 30% duty cycle, 6A output.....	18
13	High to Low Transition Waveform with 480V input, 100kHz, 30% duty cycle, 6A output.....	18
14	FIDES-P6X-EVM Top Layer and Components	20
15	FIDES-P6X-EVM Inner Copper Layer 1	20
16	FIDES-P6X-EVM Inner Copper Layer 2	20
17	FIDES-P6X-EVM Bottom Layer and Components	20
18	FIDES-P6X-EVM Top Layer and Components	20
19	FIDES-P6X-EVM Bottom Layer and Components	20

List of Tables

1	Logic Pin Function Description.....	6
2	Power Pin Function Description	6
3	Test Point Functional Description	16
4	List of Terminals	16
5	FIDES-P6-EVM List of Materials.....	21
6	FIDES-P6X-EVM List of Materials	21

FIDES High Voltage Evaluation User Safety Guidelines



Always follow FIDES's set-up and application instructions, including use of all interface components within their recommended electrical rated voltage and power limits. Always use electrical safety precautions to help ensure your personal safety and the safety of those working around you. Contact FIDES's Product Information Center <http://jeongosc.wixsite.com/standbyzero/contact> for further information.

Save all warnings and instructions for future reference.

Failure to follow warnings and instructions may result in personal injury, property damage, or death due to electrical shock and/or burn hazards.

The term FIDES HV EVM refers to an electronic device typically provided as an open framed, unenclosed printed circuit board assembly. It is intended strictly for use in development laboratory environments, solely for qualified professional users having training, expertise, and knowledge of electrical safety risks in development and application of high-voltage electrical circuits. Any other use and/or application are strictly prohibited by Texas Instruments. If you are not suitably qualified, you should immediately stop from further use of the HV EVM.

- **Work Area Safety:**

- Maintain a clean and orderly work area.
- Qualified observer(s) must be present anytime circuits are energized.
- Effective barriers and signage must be present in the area where the FIDES HV EVM and its interface electronics are energized, indicating operation of accessible high voltages may be present, for the purpose of protecting inadvertent access.
- All interface circuits, power supplies, evaluation modules, instruments, meters, scopes and other related apparatus used in a development environment exceeding 50 V_{RMS}/75 VDC must be electrically located within a protected Emergency Power Off (EPO) protected power strip.
- Use a stable and non-conductive work surface.
- Use adequately insulated clamps and wires to attach measurement probes and instruments. No freehand testing whenever possible.

- **Electrical Safety:**

- As a precautionary measure, it is always a good engineering practice to assume that the entire EVM may have fully accessible and active high voltages.
- De-energize the FIDES HV EVM and all its inputs, outputs, and electrical loads before performing any electrical or other diagnostic measurements. Confirm that FIDES HV EVM power has been safely de-energized.
- With the EVM confirmed de-energized, proceed with required electrical circuit configurations, wiring, measurement equipment hook-ups and other application needs, while still assuming the EVM circuit and measuring instruments are electrically live.
- When EVM readiness is complete, energize the EVM as intended.

WARNING: While the EVM is energized, never touch the EVM or its electrical circuits as they could be at high voltages capable of causing electrical shock hazard.

- **Personal Safety:**
 - Wear personal protective equipment, for example, latex gloves and/or safety glasses with side shields or protect EVM in an adequate lucent plastic box with interlocks from accidental touch.
- **Limitation for Safe Use:**
 - EVMs are not to be used as all or part of a production unit.

Safety and Precautions

The EVM is designed for professionals who have received the appropriate technical training, and is designed to operate from an AC power supply or a high-voltage DC supply. Please read this user guide and the safety-related documents that come with the EVM package before operating this EVM.

CAUTION



Do not leave the EVM powered when unattended.

WARNING



Hot surface! Contact may cause burns. Do not touch!

WARNING



High Voltage! Electric shock is possible when connecting board to live wire. Board should be handled with care by a professional.

For safety, use of isolated test equipment with overvoltage and overcurrent protection is highly recommended.

*General FIDES High Voltage
Evaluation User Safety
Guidelines*

Using the FIDES-P6-EVM and FIDES-DigiCAP software Breakout Board EVM

The FIDES-P6-EVM features high voltage AC-DC rectify smoothing digital controlled valley fill ripple voltage with integrated ceramic valley capacitor that are configured in input voltage with current sensing with all the required circuit and logic/power level shifting. Essential power factor correction stage and current smooth capacitors are fully enclosed on the module board to minimize parasitic inductances, reducing voltage overshoots and improving performance. The FIDES-P6-EVM is configured to have a pin socket style external connection for easy interface with external power stages to run the any SMPS in various applications.

1 Description

The FIDES-P6-EVM operates as a daughter card as part of a larger custom designed system or with the FIDES-P6-EVM breakout motherboard.

1.1 FIDES-EVM

The FIDES-P6-EVM configures smooth capacitor in a module. All the bias and level shifting components are included, allowing USB control to load of LED valley fill with PFC. Solid capacitors are included on the power stage in an optimized layout to minimize parasitic inductance and reduce voltage overshoot.

There are 3 pins on the module card

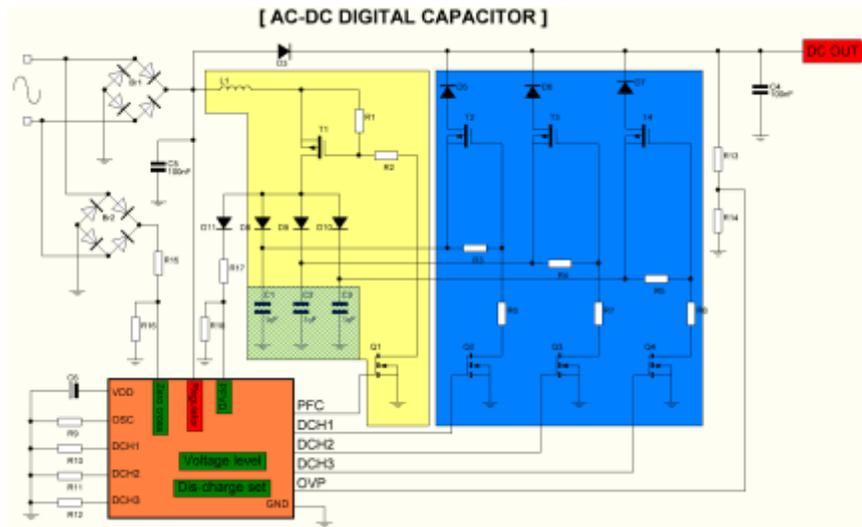
Table 1. Pin Function Description

Pin	Description
AGND	Logic and bias power ground return pin. Functionally isolated from PGND.
12V	Auxiliary power input for when the FIDES-P6-EVM is configured in bootstrap mode. Pin is not used when configured in isolated power mode.
5V	Auxiliary power input for the FIDES-P6-EVM. Used to power logic isolators. Used as input bias power of FIDES-P6X devices when configured in isolated power mode.
ZCD	Zero crossing logic signal out from AC power signal. Pin is either active low or high impedance. A pull up resistor to logic VDD and no capacitor to ground is recommended for proper operation.
Q2 Gate	AGND referenced logic gate signal input for bottom FIDES-P6. Compatible with both 3.3V and 5V logic.
Q1 Gate	AGND referenced logic gate signal input for top FIDES-P6. Compatible with both 3.3V and 5V logic.

There are 3 power pins on the FIDES-P6V FIDES-P6I module.

Table 2. Power Pin Function Description

Pin	Description
VSW	Switch node of the half bridge
VDC	Input DC voltage of the half bridge
IS	Load current feedback (FIDES-6I)
PGND	Power ground of the half bridge. Functionally isolated from AGND.



Copyright © 2016, FIDES Incorporated

Figure 1. Simplified FIDES-P6-EVM Schematic

CAUTION

High-voltage levels are present on the evaluation module whenever it is energized. Proper precautions must be taken when working with the EVM.

1.1.1 Valley fill with PFC

The Valley fill adjust command of FIDES-P6-EVM is active by USB control low when zero cross detection lockout on an auxiliary voltage detect, over temperature or overcurrent even occurs on the FIDES-P6. The PFC signal for both FIDES-P6 devices are input voltage just pass to loads. where they are PFC logic clock not driven. This makes the output PFC pin high impedance during normal operation and active low during a PFC event. It is recommended to PFC control mode setup by PC control software and adjust proper operation.

1.1.2 Power Pins

While there are some power stage valley fill capacitors on the FIDES-P6-EVM from VDC to PGND to minimize voltage overshoot during switching, more bulk capacitance is required to hold up the DC voltage during operation. It is highly recommended to minimize, and ideally prevent, any overlap and current capacity from Load of DUT to VDC, PGND. The two grounds PGND and AGND are functionally isolated from each other on the FIDES-P6-EVM.

1.1.3 PFC Bootstrap Mode

The FIDES-P6-EVM card can be modified to operate in PFC bootstrap mode, where the 12V bias voltage is used to power both FIDES-P6X devices. This can be achieved by removing Q5, Q7 and R2, and placing a 200KΩ resistor on R1, a 0 Ω resistor on R18 and a 600V SOD-123 diode on D1, such as Micro Commercial Components UFM15PL-TP. Do NOT power up the FIDES-P6-EVM when R1, R2, R18, D1, U5 and U7 are all populated.

1.1.4 LED DUT Heatsink

While a LED DUT Heatsink is not provided, it is recommended to install one to help with heat dissipation of the FIDES-P6X. Exposed copper pads that are attached to the die attach pad (DAP) of both the high and low side devices are provided for a low thermal impedance point to a heatsink. The two copper pads have high voltage potential difference between them so an electrically isolative thermal interface material (TIM) is required. Bergquist BP100-0.005-00-1112 double sided adhesive tape TIM and Cool Innovations 3- 101004U heatsink are recommended.

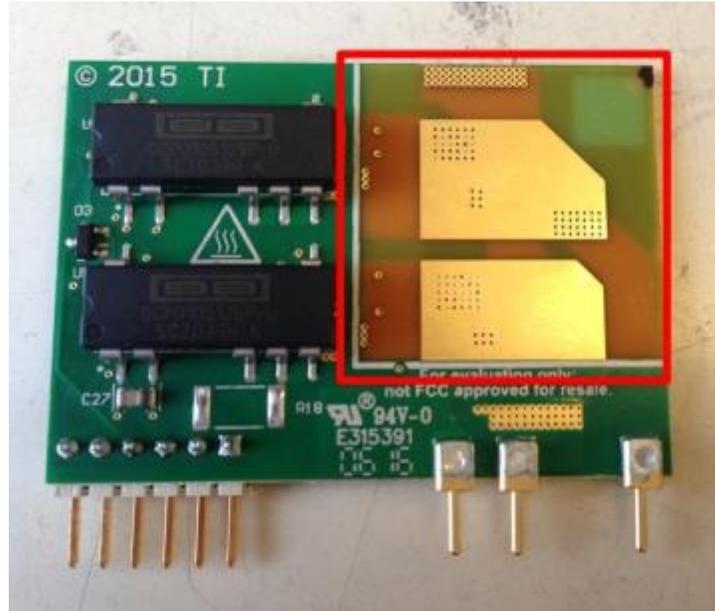


Figure 2. Exposed Copper for Heatsink example

1.2 FIDES-P6-EVM

To allow for quick operation the FIDES-P6-EVM is optionally provided to interface with the FIDES-P6- HB-EVM. This board is designed to operate the FIDES-P6 as a synchronous open loop buck converter. Easy probe locations are provided for measurement of logic and power stage voltages.

1.2.1 Input AC Supply

The motherboard requires 220V AC supply. A internal linear drop off regulator steps the voltage down to a tightly regulated 16V for logic and auxiliary power of the FIDES-P6 when the FIDES-P6-EVM is configured in isolated power mode. When the FIDES-P6-EVM is configured in smooth bootstrap mode the ~300VDC input is used to power the two FIDES-P6 devices.

1.2.2 Logic PWM Input

The FIDES-P6-EVM supports a single PWM, with complimentary signal and corresponding dead time generated on board. A 0 V to 5 V magnitude input square wave is required. The complementary Dis-charge generation circuit creates 50 ns of dead time between both transitions of the valley fill signals.

1.2.3 LED Fault Protection

There is an option to disable PWM input to the FET in the event of a fault signal from the FIDES-P6-EVM. When the FAULT Protect is placed in the current mode Dis-charge is disabled when either FIDES-P6I has an LED active fault. This disable is not latching, so when the fault clears Dis-charge immediately resumes. If LED FAULT Protect mode is not desired it can be disabled by placing the LED DUT in the DIS position.

1.3 Typical Applications

The FIDES-P6-EVM is designed for use in isolated or non-isolated AC/DC SMPS applications

- Totem-Pole PFC converters
- Phase-Shifted Full Bridge or LLC Converter
- Non-isolated Buck converter such as the FIDES-P6-EVM

1.4 Features

The FIDES-P6-EVM has the following features and specifications:

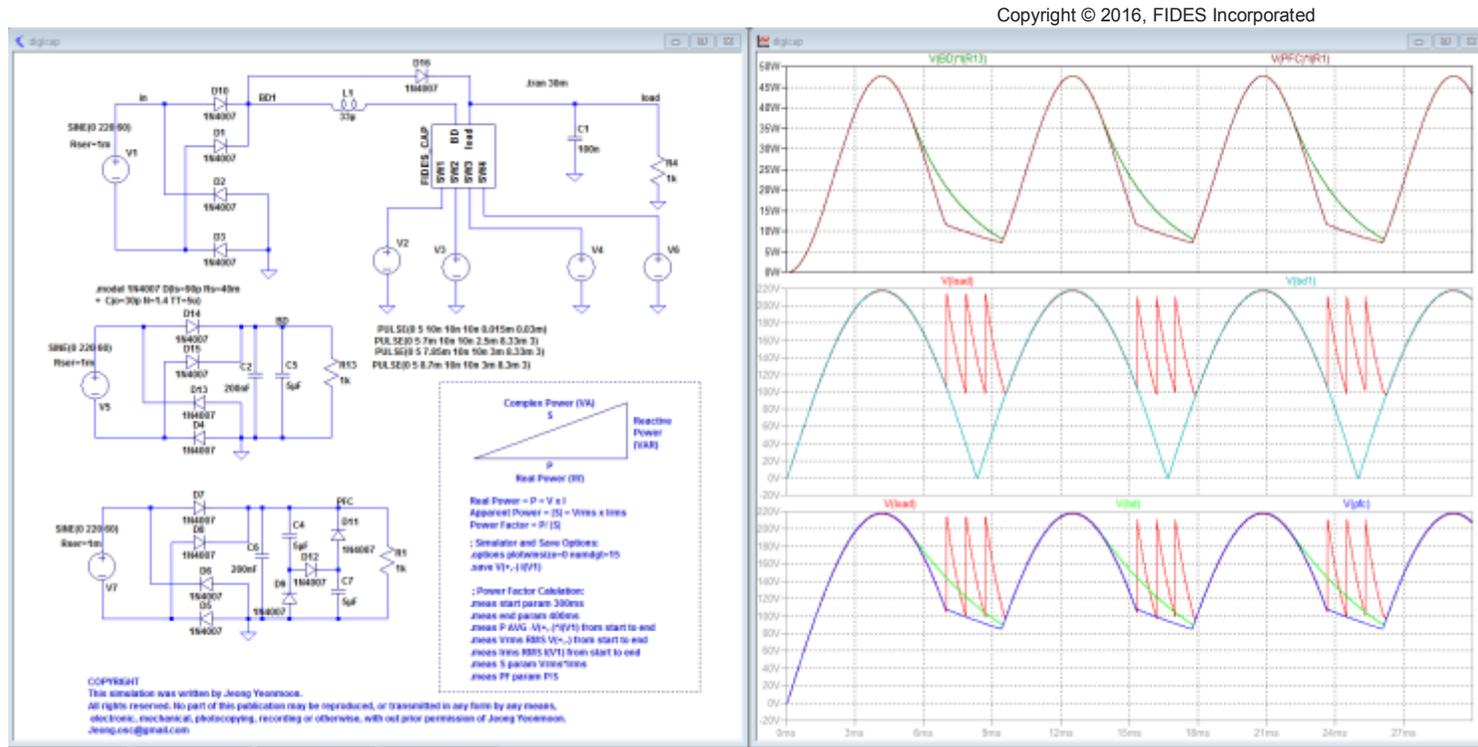
- Two options to bias the FIDES-P6, isolated power or from PC USB.
- Over temperature, overcurrent, and under voltage lockout protection with ZCD indication that is level shifted to an AGND referenced signal
- Current sensing input support of either 0V or 0.5V
- Maximum recommended operating voltage of 300V and absolute maximum voltage of 380V

The FIDES-P6-EVM has the following features and specifications:

- Requires only a under 300V DC supply
- Requires only a current mode single 0V to 0.5V current load feedback input to generate gate drive signal
- Soft PFC disable in the event of a disable from the FIDES-P6-EVM DigiCAP software
- Maximum recommended operating voltage of 300V and absolute maximum voltage of 380V
- Maximum recommended operating capacitor current of 1A

2 Schematic

shows the schematic of the EVM.



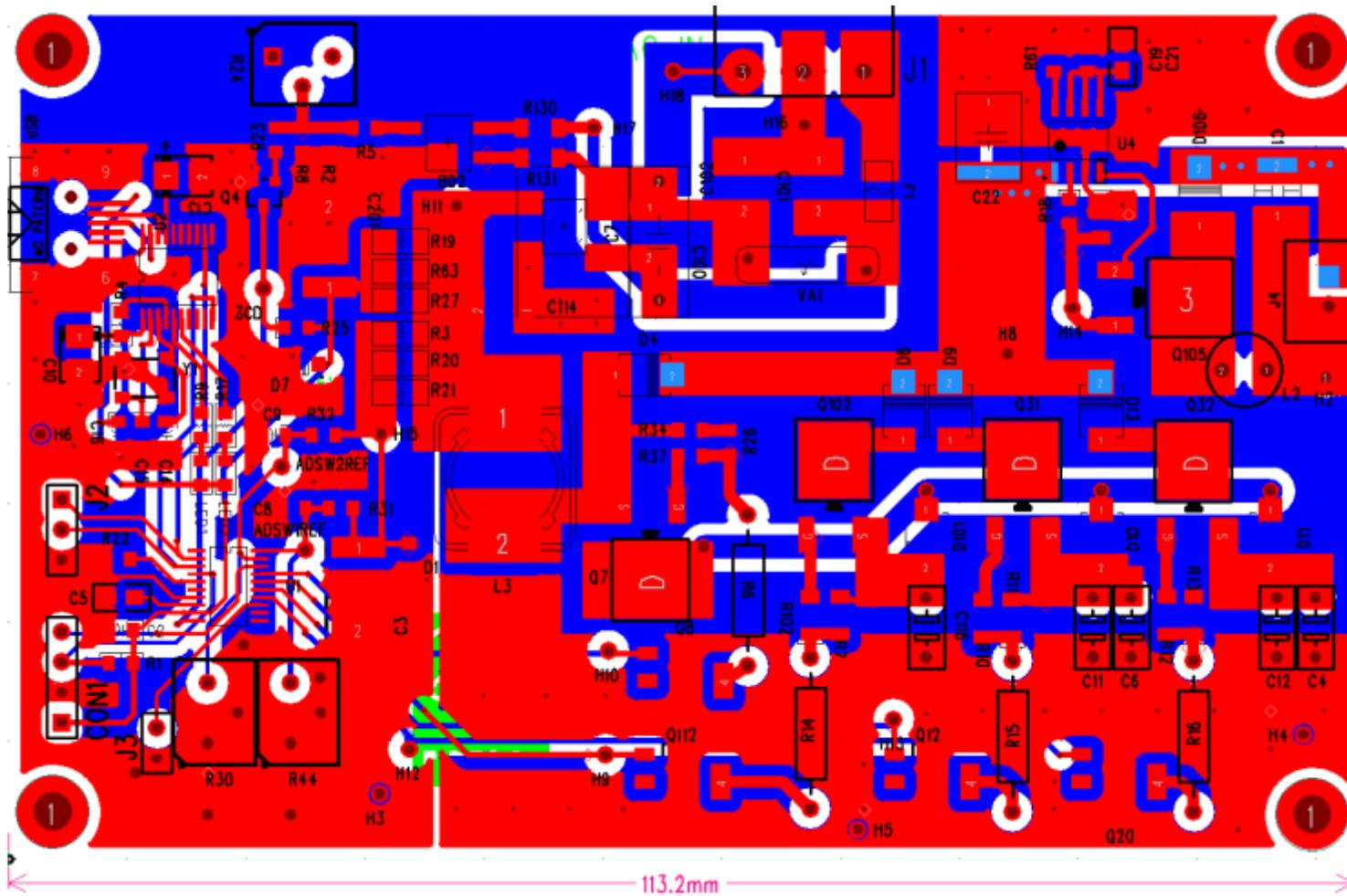
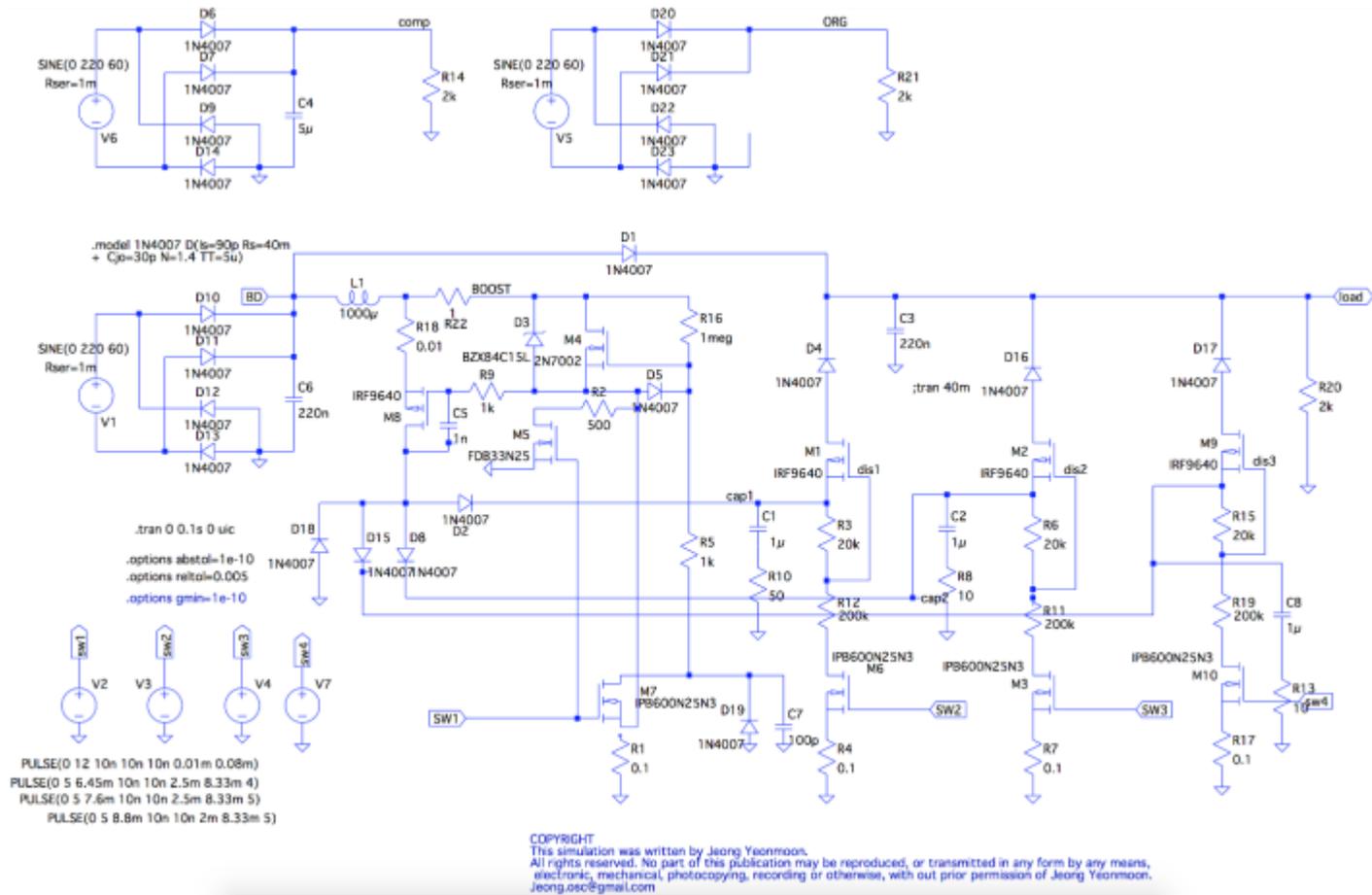


Figure 4. PCB layout of FIDES-P6-EVM

FIDES HV Synchronous Buck Motherboard



P

N

Copyright © 2016, FIDES Incorporated

Figure 5. FIDES-P6-EVM Schematic

3 EVM Kit Contents

The kit contains the following:

- Using the FIDES-P6-EVM Half-Bridge and FIDES-P6X-EVM Breakout Board EVM (this user's guide)
- Safety instructions
- FIDES-P6-EVM PCB
- USB lost FIDES-P6X devices
- FIDES-P6X-EVM PCB (Optional)

4 Test Setup

4.1 Test Equipment

DUT Voltage Source: Capable of supplying the input of the EVM up to 12 V to

180 V DUT Bias Source: Capable of 60 V output at up to 0.35 A

Function Generator: Capable of 0 V to 5 V square wave output with adjustable duty cycle and frequency in desired operating range. It is recommended to operate the FIDES-P6-EVM and FIDES-P6X-EVM with a switching frequency between 50 kHz to 200 kHz.

Oscilloscope: Capable of at least 200 MHz operation. A 1 GHz or greater oscilloscope and probes with short ground springs are recommended for accurate measurements.

DC Multimeter(s): Capable of 600 V measurement, suitable for determining operation and efficiency (if desired).

DC Load: Capable of 12V to 180 V operation at up to 1A in current-mode operation. Fan: 200 LFM minimum airflow is recommended

4.2 Recommended Test Setup

The FIDES-P6-EVM connects to the DigiCAP software as [Figure 6](#) shows.

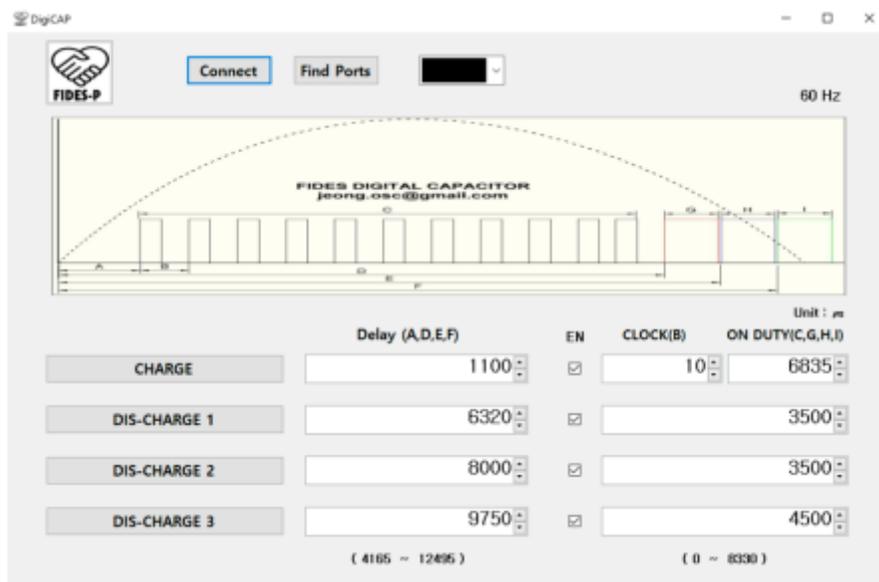
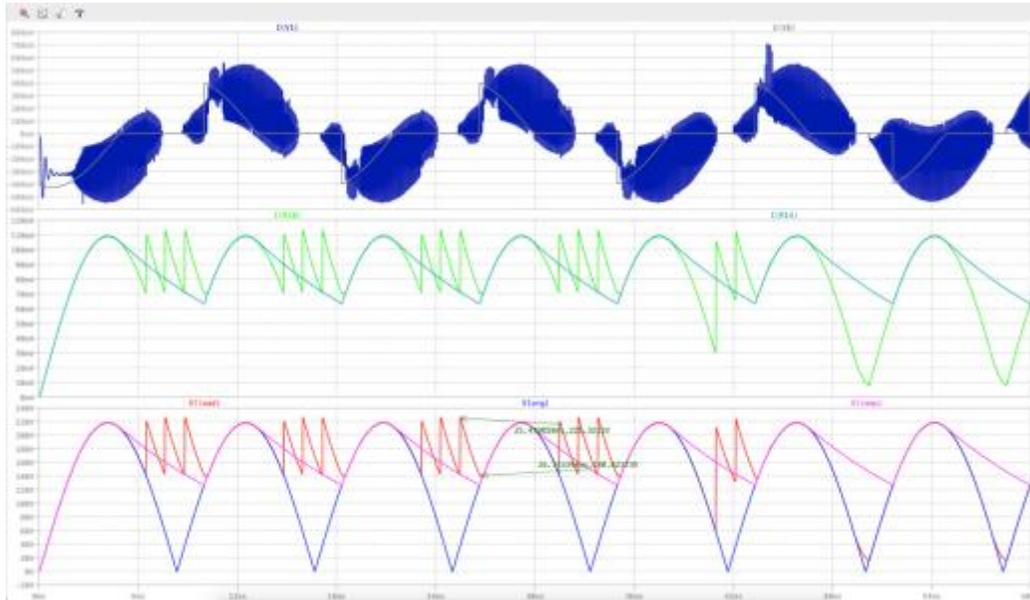


Figure 6. FIDES-P6-EVM Connected with DigiCAP software



The FIDES-P6-EVM power and probe are shown in [Figure 7](#).

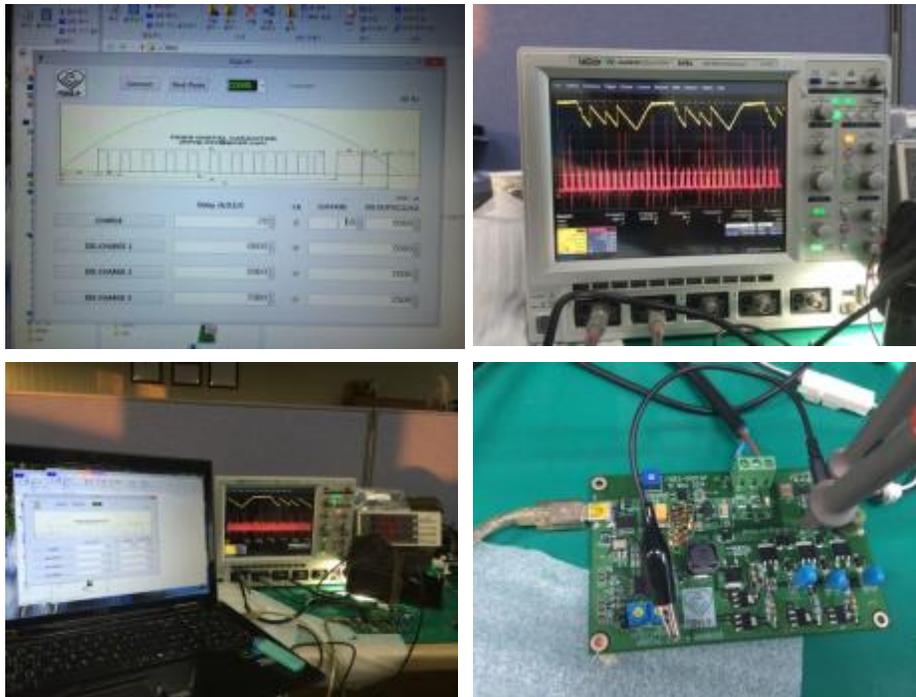


Figure 7. Recommended Connection Points of FIDES-P6-EVM

PCB Notes:

- FIDES-P6-EVM GND must be isolation with oscilloscope and computer
- USB C type input, check the recognize control driver to FIDES-P6-EVM
- LED DUT connector for output
- AC supply to input connector
- Zero cross detect header
- PFC stage Enable or Disable set input
- Probe point for power stage switch node
- Power stage valley fill voltage output check by oscilloscope

WARNING

There are very high voltages present on the EVM. Some components reach temperatures above 50°C. Precautions must be taken when handling the board.

4.3 List of Test Points

Key test points on this EVM have been designed for use with oscilloscope probes with short ground springs. Using the short ground spring instead of the alligator ground lead will minimize measurement error and produce a cleaner signal with PFC power meter used on this EVM. The data shown in this user guide has been obtained using such a measurement method.

Table 3. Test Point Functional Description

NAME	DESCRIPTION
HVDD	220 V main DC input connection before smooth filter
AGND	Ground for digital circuit bias input
5V	5 V bias for USB
AGND1	Analog ground for USB
PFCV	Boost voltage supply to valley fill capacitor
SW0	PFC side PWM signal
SW1	Dis-charge of 1 st valley fill capacitor switch logic signal
SW2	Dis-charge of 2 nd valley fill capacitor switch logic signal
SW3	Dis-charge of 3 rd valley fill capacitor switch logic signal
HIGH	Dis-charge of 1 st valley fill capacitor switch logic signal
ZCD	Zero crossing detect for logic
15V	15 V reference bias for input AC voltage compare
AGND	Power ground
HVOUT+	Regulated DC output voltage for LED DUT Anode
HVOUT-	Power ground for LED DUT cathode
IS	DUT current sensing output voltage
PGND1	AC Power ground
MODE	Switch mode to Voltage or Current drive

4.4 List of Terminals

Table 4. List of Terminals

TERMINAL	NAME	DESCRIPTION
J1	VIN	Input DC voltage input
J2	GND	Power ground
J3	IS	Load sense feedback voltage input
J4	VOUT	Output valley fill voltage

5 Test Procedure

5.1 Setup

The following procedure is recommended to set up the DigiCAP USB software with the FIDES-P6-EVM:

- Connect FIDES-P6-EVM to LED DUT
- Connect oscilloscope or multi meter probes to desired test points as shown in A or G
- Connect the AC 220V supply, load to the output, and input supply to the input
- Connect the resistor load to either the DUT connector.
- Set up USB to Enable a drive control software and setting attached to the DUT condition

5.2 Startup and Operating Procedure

The following procedure is recommended to enable the FIDES-P6-EVM with the DigiCAP:

1. Power up the AC 220V supply. Ensure the top right green “Power Enable” LED is illuminated.
2. Enable USB com port on the DigiCAP.
3. Power up high voltage input supply. Ensure the red “HV Enable” LED is illuminated when the input supply is above AC 170V.

WARNING

Do NOT turn on device at absolute maximum voltage. It is recommended to start at voltages at or below 300 V, and then increase the input voltage slowly while monitoring V_{sw} to insure the peak voltage does not exceed the absolute maximum rating of 380 V.

5.3 Shutdown Procedure

1. Dis connect USB connector supply
2. Turn off input AC supply then FIDES-P6. Wait until red “HV Enable” LED turns off.

5.4 Additional Operation Notes

- LED DUT Fault protection on the FIDES-P6-EVM is not latching, so if a fault clears and the FIDES-P6- EVM is still operational FIDES-P6 will resume.

6 Typical Characteristics

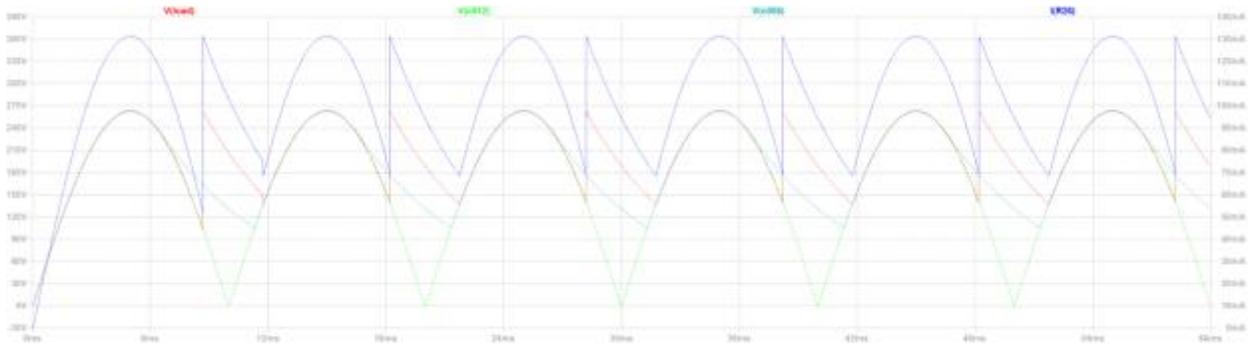


Figure 8. Voltage mode valley fill FIDES-P6V-M

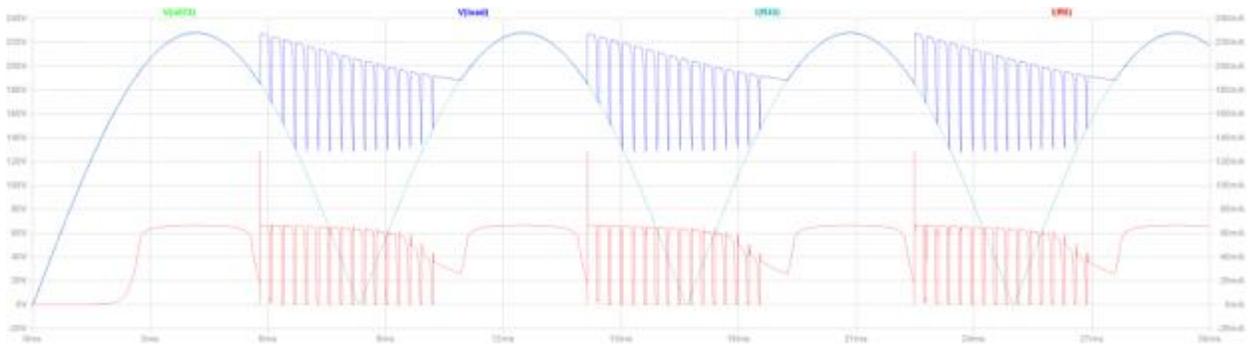


Figure 9. Current mode valley fill FIDES-P6I-M

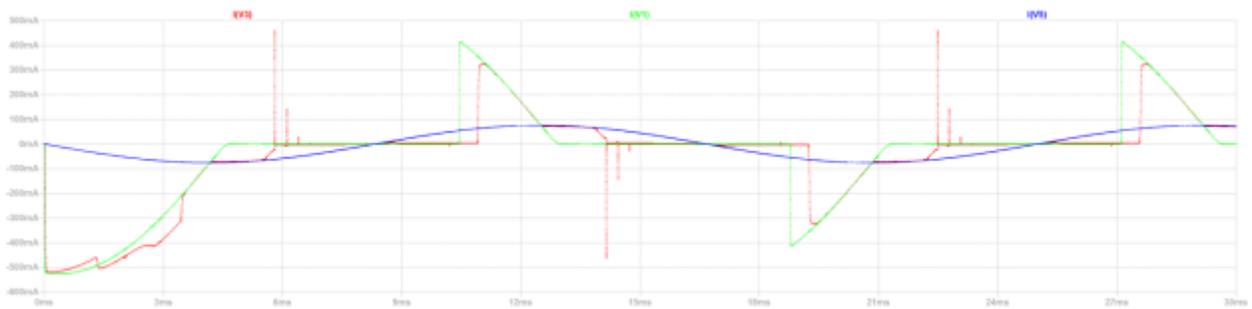


Figure 10. AC Current compare ordinary valley fill with FIDES-P6I-M

7 EVM Assembly Drawing and PCB Layout

FIDES-P6 – April 2016

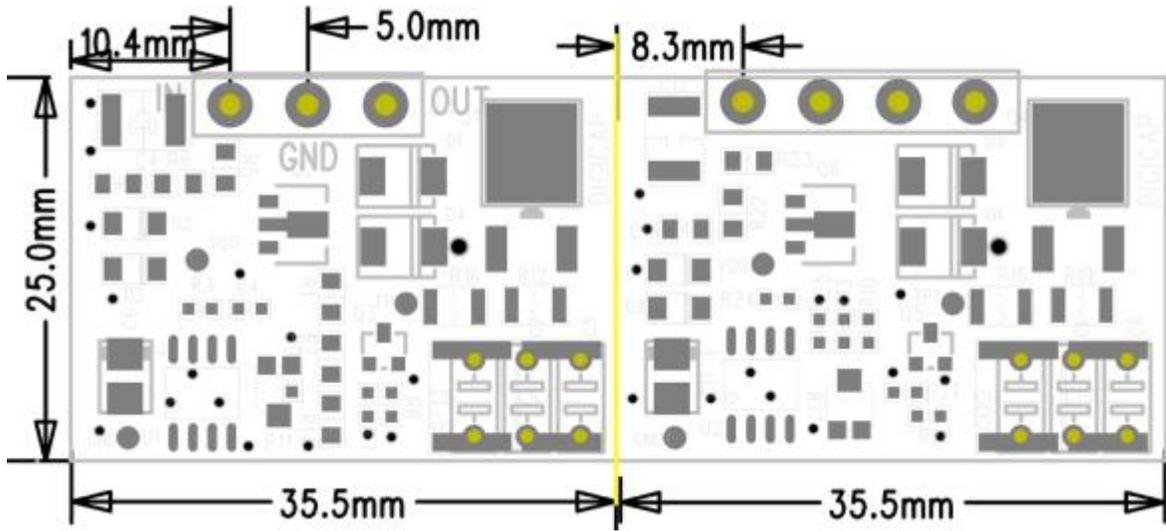


Figure 14. FIDES-P6V-M FIDES-P6I-M Top Layer and Components

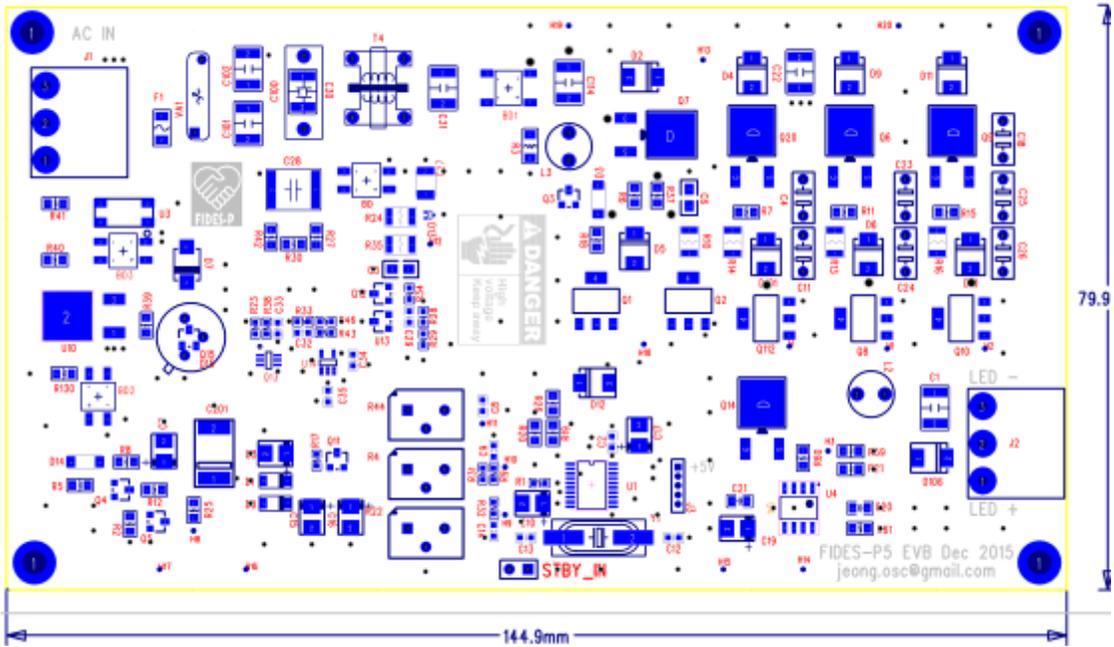


Figure 14. FIDES-P6V-EVM DES-P6V-EVM Top Layer and Components

Components

STANDARD TERMS AND CONDITIONS FOR EVALUATION MODULES

1. *Delivery:* FIDES delivers FIDES evaluation boards, kits, or modules, including any accompanying demonstration software, components, or documentation (collectively, an "EVM" or "EVMs") to the User ("User") in accordance with the terms and conditions set forth herein. Acceptance of the EVM is expressly subject to the following terms and conditions.

1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of FIDES semiconductor products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM ("Software") shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms and conditions that accompany such Software

1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.

2 *Limited Warranty and Related Remedies/Disclaimers:*

2.1 These terms and conditions do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.

2.2 FIDES warrants that the FIDES EVM will conform to FIDES's published specifications for ninety (90) days after the date FIDES delivers such EVM to User. Notwithstanding the foregoing, FIDES shall not be liable for any defects that are caused by neglect, misuse or mistreatment by an entity other than FIDES, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than FIDES. Moreover, FIDES shall not be liable for any defects that result from User's design, specifications or instructions for such EVMs. Testing and other quality control techniques are used to the extent FIDES deems necessary or as mandated by government requirements. FIDES does not test all parameters of each EVM.

2.3 If any EVM fails to conform to the warranty set forth above, FIDES's sole liability shall be at its option to repair or replace such EVM, or credit User's account for such EVM. FIDES's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by FIDES and that are determined by FIDES not to conform to such warranty. If FIDES elects to repair or replace such EVM, FIDES shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

3 *Regulatory Notices:*

3.1 *United States*

3.1.1 *Notice applicable to EVMs not FCC-Approved:*

This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

3.1.2 *For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:*

CAUTION

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

3.2 Canada

3.2.1 For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concernant les EVMs avec appareils radio :

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur

3.3 Japan

3.3.1 *Notice for EVMs delivered in Japan:* Please see [NSSMICON](http://www.nssemicon.com/pdf/ac_dc.pdf) 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。
http://www.nssemicon.com/pdf/ac_dc.pdf

3.3.2 *Notice for Users of EVMs Considered "Radio Frequency Products" in Japan:* EVMs entering Japan may not be certified by FIDES as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required by Radio Law of Japan to follow the instructions below with respect to EVMs:

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

【無線電波を送信する製品の開発キットをお使いになる際の注意事項】開発キットの中には技術基準適合証明を受けていないものFIDESあります。技術適合証明を受けていないもののご使用に際しては、電波法遵守のため、以下のいずれもFIDESの措置を取っていただく必要FIDESありますのでご注意ください。

1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。
2. 実験局の免許を取得後ご使用いただく。
3. 技術基準適合証明を取得後ご使用いただく。

なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。上記を遵守頂けない場合は、電波法の罰則FIDES適用される可能性はFIDESあることをご留意ください。

東京都品川区南品川2-2-1 0 南品川Nビル2F

日本NSSEMICON株式会社 <http://www.nssemicon.com>

3.3.3 Notice for EVMs for AC DC Power : Please see [Digital Cap](#)

AC待機電力や絶縁通信についての開発キットをお使いになる際の注意事項については、次のところをご覧ください。 [STANDBY ZERO](#)

4 EVM Use Restrictions and Warnings:

4.1 EVMS ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.

4.2 User must read and apply the user guide and other available documentation provided by FIDES regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

4.3 Safety-Related Warnings and Restrictions:

4.3.1 User shall operate the EVM within FIDES's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by FIDES, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should contact a FIDES field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a FIDES field representative. During normal operation, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.

4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.

4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User's handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

5. *Accuracy of Information:* To the extent FIDES provides information on the availability and function of EVMs, FIDES attempts to be as accurate as possible. However, FIDES does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.

6. *Disclaimers:*

6.1 EXCEPT AS SET FORTH ABOVE, EVMS AND ANY WRITTEN DESIGN MATERIALS PROVIDED WITH THE EVM (AND THE DESIGN OF THE EVM ITSELF) ARE PROVIDED "AS IS" AND "WITH ALL FAULTS." FIDES DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, REGARDING SUCH ITEMS, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF ANY THIRDPARTY PATENTS, COPYRIGHTS, TRADE SECRETS OR OTHER INTELLECTUAL PROPERTY RIGHTS.

6.2 EXCEPT FOR THE LIMITED RIGHT TO USE THE EVM SET FORTH HEREIN, NOTHING IN THESE TERMS AND CONDITIONS SHALL BE CONSTRUED AS GRANTING OR CONFERRING ANY RIGHTS BY LICENSE, PATENT, OR ANY OTHER INDUSTRIAL OR INTELLECTUAL PROPERTY RIGHT OF FIDES, ITS SUPPLIERS/LICENSORS OR ANY OTHER THIRD PARTY, TO USE THE EVM IN ANY FINISHED END-USER OR READY-TO-USE FINAL PRODUCT, OR FOR ANY INVENTION, DISCOVERY OR IMPROVEMENT MADE, CONCEIVED OR ACQUIRED PRIOR TO OR AFTER DELIVERY OF THE EVM.

7. *USER'S INDEMNITY OBLIGATIONS AND REPRESENTATIONS.* USER WILL DEFEND, INDEMNIFY AND HOLD FIDES, ITS LICENSORS AND THEIR REPRESENTATIVES HARMLESS FROM AND AGAINST ANY AND ALL CLAIMS, DAMAGES, LOSSES, EXPENSES, COSTS AND LIABILITIES (COLLECTIVELY, "CLAIMS") ARISING OUT OF OR IN CONNECTION WITH ANY HANDLING OR USE OF THE EVM THAT IS NOT IN ACCORDANCE WITH THESE TERMS AND CONDITIONS. THIS OBLIGATION SHALL APPLY WHETHER CLAIMS ARISE UNDER STATUTE, REGULATION, OR THE LAW OF TORT, CONTRACT OR ANY OTHER LEGAL THEORY, AND EVEN IF THE EVM FAILS TO PERFORM AS DESCRIBED OR EXPECTED.

8. *Limitations on Damages and Liability:*

8.1 *General Limitations.* IN NO EVENT SHALL FIDES BE LIABLE FOR ANY SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF THESE TERMS AND CONDITIONS OR THE USE OF THE EVMS PROVIDED HEREUNDER, REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. EXCLUDED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, COST OF REMOVAL OR REINSTALLATION, ANCILLARY COSTS TO THE PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, RETESTING, OUTSIDE COMPUTER TIME, LABOR COSTS, LOSS OF GOODWILL, LOSS OF PROFITS, LOSS OF SAVINGS, LOSS OF USE, LOSS OF DATA, OR BUSINESS INTERRUPTION. NO CLAIM, SUIT OR ACTION SHALL BE BROUGHT AGAINST FIDES MORE THAN ONE YEAR AFTER THE RELATED CAUSE OF ACTION HAS OCCURRED.

8.2 *Specific Limitations.* IN NO EVENT SHALL FIDES'S AGGREGATE LIABILITY FROM ANY WARRANTY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS AND CONDITIONS, OR ANY USE OF ANY FIDES EVM PROVIDED HEREUNDER, EXCEED THE TOTAL AMOUNT PAID TO FIDES FOR THE PARTICULAR UNITS SOLD UNDER THESE TERMS AND CONDITIONS WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED. THE EXISTENCE OF MORE THAN ONE CLAIM AGAINST THE PARTICULAR UNITS SOLD TO USER UNDER THESE TERMS AND CONDITIONS SHALL NOT ENLARGE OR EXTEND THIS LIMIT.

9. *Return Policy.* Except as otherwise provided, FIDES does not offer any refunds, returns, or exchanges. Furthermore, no return of EVM(s) will be accepted if the package has been opened and no return of the EVM(s) will be accepted if they are damaged or otherwise not in a resalable condition. If User feels it has been incorrectly charged for the EVM(s) it ordered or that delivery violates the applicable order, User should contact FIDES. All refunds will be made in full within thirty (30) working days from the return of the components(s), excluding any postage or packaging costs.

10. *Governing Law:* These terms and conditions shall be governed by and interpreted in accordance with the laws of the Seoul Korea, without reference to conflict-of-laws principles. User agrees that non-exclusive jurisdiction for any dispute arising out of or relating to these terms and conditions lies within courts located in the Seoul Korea and consents to venue in Seoul County, Korea. Notwithstanding the foregoing, any judgment may be enforced in any United States or foreign court, and FIDES may seek injunctive relief in any United States or foreign court.

Mailing Address: 303 Songdo smartvalley 30, Sandomirae-ro Yeonsu Incheon Korea

IMPORTANT NOTICE

FIDES Incorporated and its subsidiaries reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to FIDES's terms and conditions of sale supplied at the time of order acknowledgment.

FIDES warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in FIDES's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent FIDES deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

FIDES assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using FIDES components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

FIDES does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which FIDES components or services are used. Information published by FIDES regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from FIDES under the patents or other intellectual property of FIDES.

Reproduction of significant portions of FIDES information in FIDES data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. FIDES is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of FIDES components or services with statements different from or beyond the parameters stated by FIDES for that component or service voids all express and any implied warranties for the associated FIDES component or service and is an unfair and deceptive business practice. FIDES is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of FIDES components in its applications, notwithstanding any applications-related information or support that may be provided by FIDES. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify FIDES and its representatives against any damages arising out of the use of any FIDES components in safety-critical applications.

In some cases, FIDES components may be promoted specifically to facilitate safety-related applications. With such components, FIDES's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No FIDES components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those FIDES components which FIDES has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of FIDES components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

FIDES has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, FIDES will not be responsible for any failure to meet ISO/TS16949.

Products

Power Mgmt

<http://jeongosc.wixsite.com/standbyzero>

Energy and Lighting

<http://jeongosc.wixsite.com/standbyzero/energy>

Clocks and Timers

<http://jeongosc.wixsite.com/standbyzero/clocks>

Wireless Connectivity

<http://jeongosc.wixsite.com/standbyzero/wirelessconnectivity>

Applications

Automotive and Transportation

<http://jeongosc.wixsite.com/standbyzero/automotive>

Industrial

<http://jeongosc.wixsite.com/standbyzero/industrial>