

PFEVAL-1 Evaluation Board Kit

WARNING! HAZARDOUS VOLTAGES!

In setting up a laboratory station for conducting electrical tests of the PF600-1 using the PFEVAL-1 Evaluation Board, operator safety must be the first and foremost consideration. Because the PFEVAL-1 Evaluation Board was designed to provide users with access to all input, output, status, and control leads on the PF600-1, it was impractical to incorporate all conceivable safeguards to protect the operator against potential shock hazards. For this reason, only fully trained, qualified personnel should attempt to perform any qualification tests of the PF600-1 using the PFEVAL-1 Evaluation Board.

Qualified personnel must have the skills necessary to distinguish exposed live parts from other parts of the assembly, to recognize the precautions for avoiding shock, and to understand the consequential hazards of contact. Exposed live parts are those parts of the circuit which are energized and which the operator may contact during testing. The operator should be trained in the proper techniques for use of tools and equipment used to perform such testing, and in emergency procedures required to release a victim from contact with exposed live parts or circuits. The operator must be able to determine the degree and extent of the hazard and the personal protective equipment and advance planning necessary to perform the testing safely.

The test station cannot be considered safe without the proper training of any individuals involved in or exposed to the testing. In addition, the station needs to be configured to provide the operator with every possible protection against exposure to hazardous voltages.

For guidelines regarding the proper set up of an electrical testing workstation, refer to the European Normative standard EN 50191 *Erection and Operation of Electrical Test Equipment*.

INTRODUCTION

The PFEVAL-1 Evaluation Board was designed to facilitate the testing and verification of functional performance of the PF600-1 AC-DC converter at room temperature.

This evaluation board provides access to the input, output, control, and status leads on the PF600-1 for the express purpose of demonstrating the functionality of the PF600-1 converter when connected to a specific application load and input source and to permit measurement of various associated electrical parameters. The Kit includes:

- PFEVAL-1 Evaluation Board
- PF600-1 Product
- PF600T-1 Heatsink (Transverse)

DESCRIPTION

With reference to the PWB Top Layer Silkscreen Component Layout in Figure 2 and the PFEVAL-1 Evaluation Board Reference Schematic in Figure 3, the PFEVAL-1 Evaluation Board includes the following circuit elements to simulate the support circuits found in a typical application and to accommodate connection:

- Three-position input terminal block, TB1. Terminals TB1-1, TB1-2, and TB1-3 provide accommodation for input Line, Neutral, and Earth Ground connections, respectively. Table 1 below provides additional detail in tabular form.

Table 1: PFEVAL-1 Evaluation Board Input Terminal Block Connections

Eval. Bd. Designation	TB Reference	PF600-1 Pin Name	Function
TB1-1	P1	LINE	AC Input Line
TB1-2	P2	NEU	AC Input Neutral
TB1-3	P3	GND	Input Earth Ground

- Input fusing is provided in both Line and Neutral feeds by fuses F1 and F2, respectively. Additional information on input fusing and inrush current limiting with the PF600-1 can be found in Application Note ACAN-13.
- Surge immunity from line-to-neutral surges to EN61000-4 is provided by MOV RV1, while MOVs RV2 and RV3 in conjunction with gas tube SG1, provide for immunity from line-to-ground and neutral-to-ground surges. These are intended to shunt high-energy transients imposed on the input lines to ground to protect the module. The high AC impedance of the EMI module will also provide additional transient suppression. Additional information on input transient suppression with the PF600-1 can be found in Application Note ACAN-12.

ACAN-24

Application Notes

- Integrated input EMI filter U1 was selected based on simplicity and is not optimum. Optimized discrete conducted EMI filter solutions are the subject of ACAN-14. U1 provides conducted common-mode and differential-mode noise attenuation from 150kHz to 30MHz. As this filter has a maximum input current rating of 6A, it is important to ensure that this level is not exceeded. It is therefore recommended that the input line voltage be kept above 120VAC for characterizations at or near the full output load rating of 600W. Additional information on input EMI filtering with the PF600-1 can be found in Application Note ACAN-14.
- While the integrated EMI filter incorporates two sets of “Y” capacitors and three “X” capacitors, discrete, safety-rated “X” capacitor C1 (1uF) and “Y” capacitors C2 & C3 (0.005uF) were added for visual reference in the event that a discrete EMI filter is intended in the end application.
- Bulk capacitor C4 provides the input holdup during momentary line sags and outages. Application Note ACAN-10 provides additional details for calculating the value of this capacitor for the desired holdup time. At 470uF, a minimum holdup time of 16msec should be demonstrated at full output power.
- Output inhibit switch SW1 is a three-position switch with the center position open. Switching to either of the other two positions will short Pins 10 & 11 of the PF600-1 to disable the main output. The Auxiliary output will

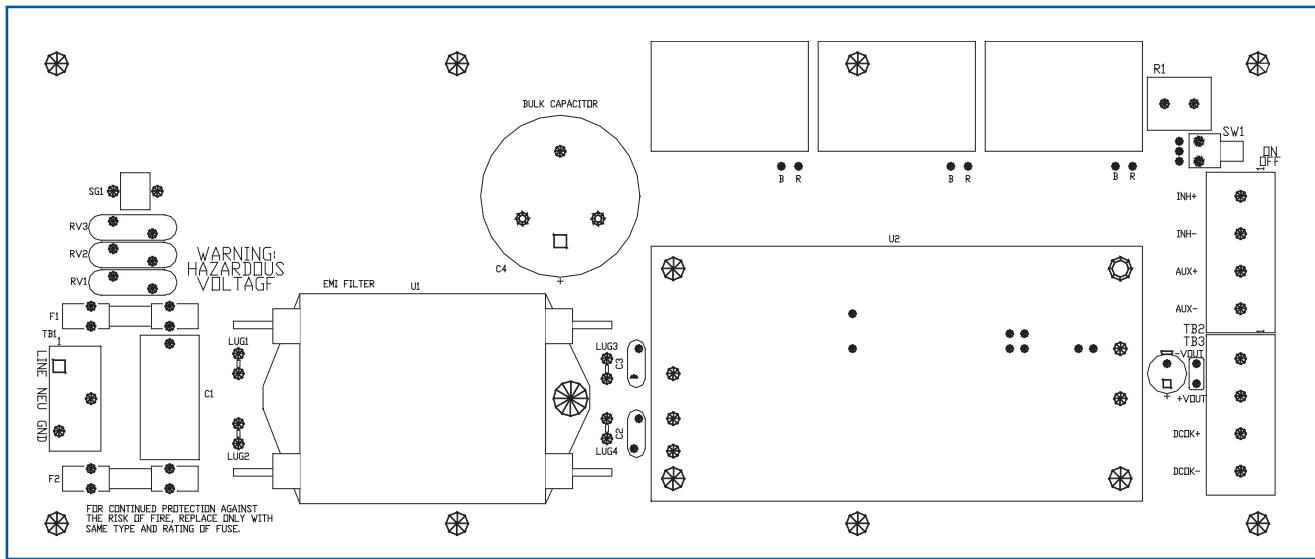


Figure 2: PFEVAL-1 Evaluation Board Layout

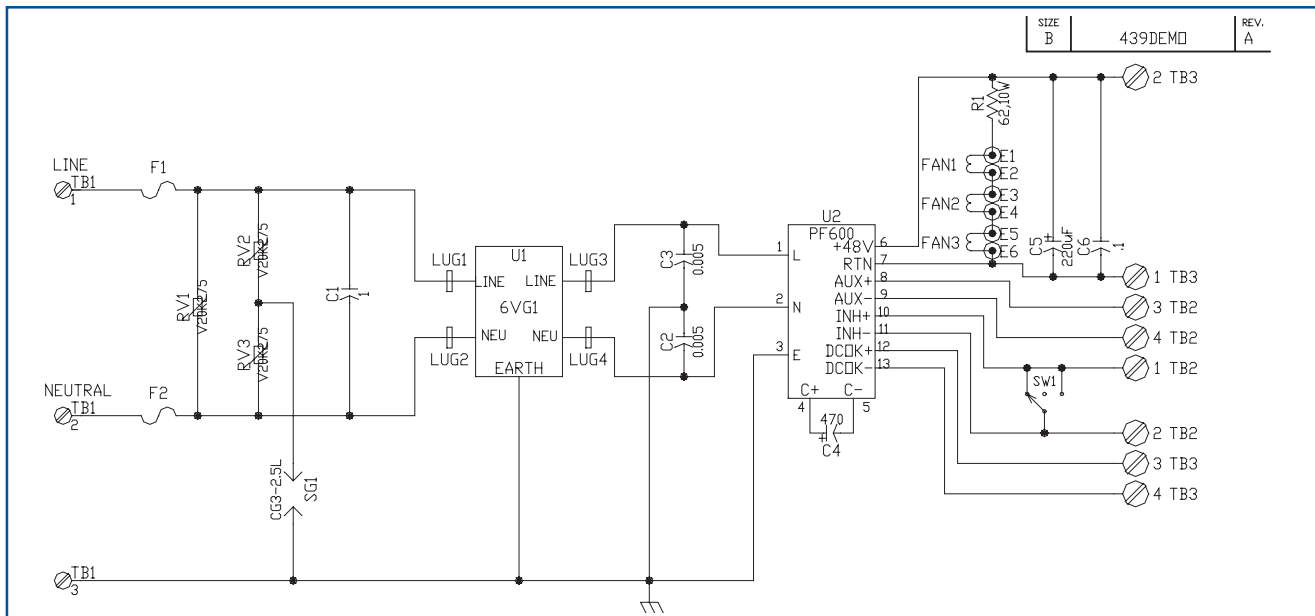


Figure 3: PFEVAL-1 Evaluation Board Reference Schematic

ACAN-24

Application Notes

remain active when the main output is inhibited in this manner.

- Thermal management on the PFEVAL-1 Evaluation Board is accomplished with three fans which force air transversely across the PF600T-1 heatsink. For simplicity, the three 12V fans are connected in series across the main 48V output of the PFEVAL-1 with a series-connected resistor to drop the excess voltage. Because the fans are connected across the main output, some commutation noise from the fans will be present. At least two different fans are presently being used for the PFEVAL-1 Evaluation Board, and the characteristic frequencies may be different. Typically, this noise component falls within the frequency range of 400-1000Hz. In the event that the application load is sensitive to noise in this frequency range, it is recommended that the fans be driven from an isolated source or that additional filtering be added. For additional information on thermal management with the PF600-1, please refer to Application Note ACAN-15.
- Output filter capacitors C5 & C6 provide output filtering of the low frequency and high frequency components, respectively, of the output ripple and noise (PARD). While these capacitors will attenuate the commutation noise of the fans, this filtering is not optimum at this frequency.
- Terminal blocks TB2 & TB3 accommodation provide for connection to various output, status, and control leads on the PF600-1. Table 2 provides detail in tabular form.

With these accommodations and typical laboratory test equipment, the PFEVAL-1 Evaluation Board can be used to verify the following features and functions of the

PF600-1:

- Input voltage operating range
- Input power factor
- Inrush current
- Input current harmonics
- Efficiency
- Output voltage regulation
- Output holdup
- Output ripple and noise (PARD)
- Overload protection and recovery
- Start-up delay
- Auxiliary output
- Remote On/Off
- DC OK signal
- Conducted EMI

Caution should be exercised when using ground-referenced test equipment, such as an oscilloscope, to the primary-side circuits of the PF600-1 on the PFEVAL-1 Evaluation Board. Such connections cannot be made without isolation of either the PFEVAL-1 Evaluation Board or the test equipment to preclude the flow of current from the AC source to ground through the test equipment. Such exposure will damage the test equipment. An input isolation transformer of appropriate rating may be used for this purpose.

The PFEVAL-1 Evaluation Board Kit is neither intended nor suitable for any use other than room-temperature evaluation of the PF600-1 features and functions.

Table 2: PFEVAL-1 Evaluation Board Terminal Block Connections

Eval. Bd. TB Designation	PF600-1 Pin Reference	Pin Name	Function
TB2-1	P10	INH+	Output Inhibit/Temperature Monitor
TB2-2	P11	INH-	Return for Output Inhibit/Temperature Monitor
TB2-3	P8	AUX+	Auxiliary output positive
TB2-4	P9	AUX-	Auxiliary output negative
TB3-1	P7	V _o -	48V Negative Output
TB3-2	P6	V _o +	48V Positive Output
TB3-3	P12	DC OK+	Output Good signal
TB3-4	P13	DC OK-	Return for Output Good signal