Introduction

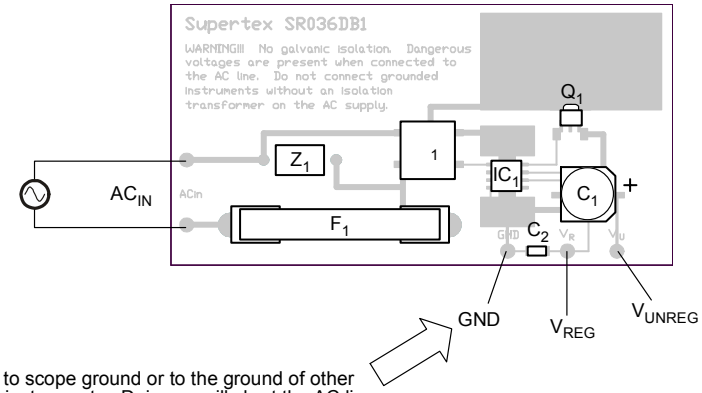
The Supertex SR036 is an inductorless, dual output off-line regulator intended for 120/240VAC line operation. The operating principle is to activate a pass element between line and load only when the input voltage is lower than a certain value. Thus conduction only occurs with a low voltage drop across the pass element, resulting in more efficient operation compared to a standard linear regulator.

The SR036DB1 demo board contains all the circuitry needed to supply a low-current (<40mA) load. Included are input protection circuitry, a full wave bridge rectifier, a pass element, and output capacitors.

Specifications

AC Input	24VAC to 264VAC 40Hz to 100Hz
Output Voltages	
V_{UNREG}	18V±20%
V_{REG}	3.3V ±10%
Output Current $I_{UNREG} + I_{REG}$	40mA @ 120VAC 30mA @ 240VAC
Efficiency AC_{IN}=120VAC 60Hz, I_U=40mA, I_R=0mA	40% typ

Board Layout and Connections



WARNING!!!
Do not connect to scope ground or to the ground of other earth-grounded instruments. Doing so will short the AC line, resulting in damage to the circuit and/or instrument. Either use an isolation transformer on the AC line, use a differential probe, or use a floating, battery-powered instrument to make measurements.

WARNING!!!
No galvanic isolation. Dangerous voltages are present when connected to the AC mains.

AC_{IN}

Connect to the AC line. Neutral to top, hot to bottom.

GND

Circuit common.

Note that since galvanic isolation is not provided, connecting this point to an earth-grounded instrument (such as an oscilloscope) will short the AC line, resulting in circuit and/or instrument damage.

Also note that GND may be at a higher potential with respect to earth ground, even if the AC is switched off. Use caution!

Do not connect to earth-ground.

V_{UNREG}

The unregulated output. Nominal output voltage is 18 volts. This output will have a certain amount of 120Hz ripple, depending on load.

Do not connect to earth-grounded loads.

V_{REG}

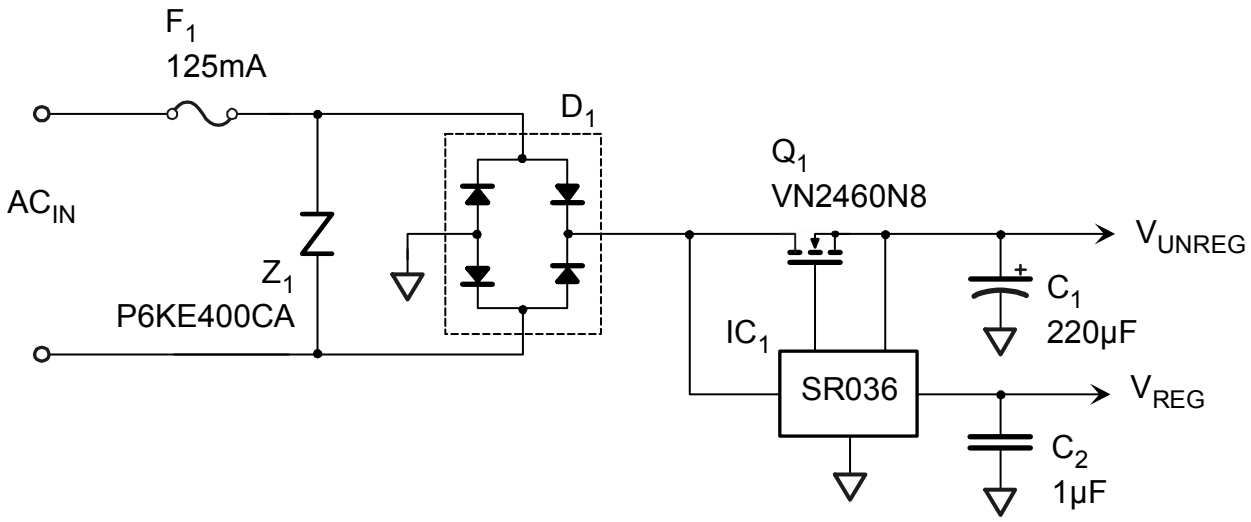
The regulated output. 5V nominal output voltage.

Do not connect to earth-grounded loads.

Fuse

The AC input is fused to protect against overloads. It should be replaced with a 125mA, 250V standard 3AG fuse.

SR036 Circuit



Parts List

Desig	Description	Part Number
F_1	Fuse, 3AG, 125mA, 250V	
Z_1	Transient voltage suppressor, 400V	P6KE400CA
D_1	Diode bridge, 1A, 600V	
IC_1	HV Supply Controller	Supertex SR036SG
Q_1	MOSFET, 600V N-channel	Supertex VN2460N8
C_1	Capacitor, alum, 220µF, 35V	
C_2	Capacitor, cer, 1µF, 16V	

Modifications

The SR036DB1 may be modified to provide higher output current. Remove Q1 and replace with a D-Pak N-channel MOSFET with a voltage rating appropriate for the input voltage. The on resistance of the replacement FET is not as important as the gate threshold voltage – the lower the threshold voltage, the more efficient the converter.

To reduce ripple at the higher output current, C1 may be replaced with a higher value capacitor.