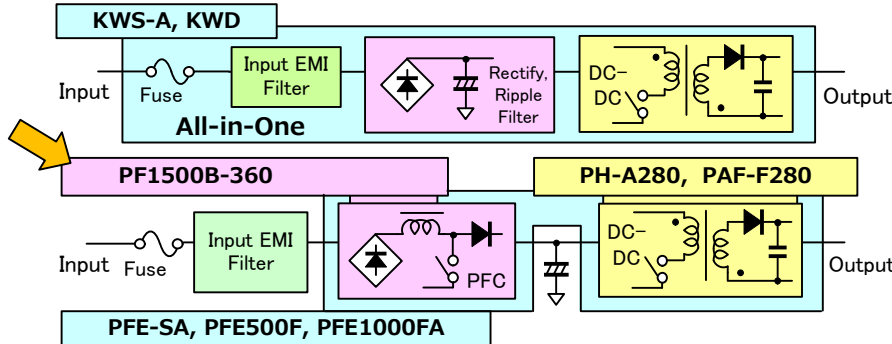


1. Product Abstract & Features

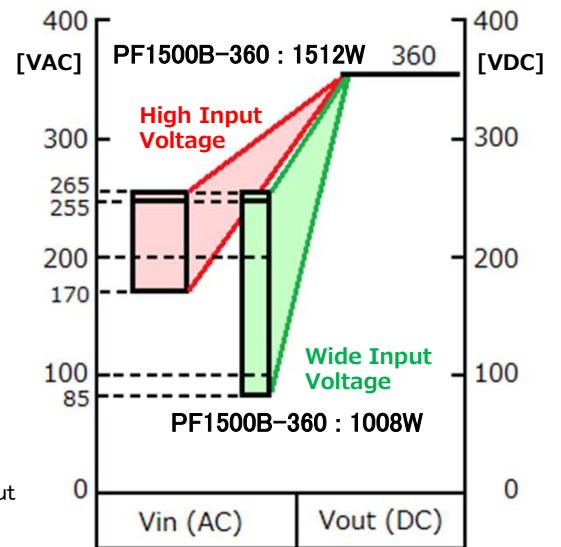
The PF1500B-360 is a power module, which is extracted the PFC part of an AC-DC power supplies. By connecting High-Vin DC-DCs (PH-A280 or PAF-F280) to the output of this product, it is possible to construct a high-performance, flexible multi-output power supply system.

- (1) Integrated PFC section of AC-DC Converter in **Full-Brick size Module**
- (2) Wide Vin : 85~265VAC, High output power 1512W at 170~265VAC Vin
- (3) **High P.F. 0.98** (Harmonic Reg. IEC61000-3-2), **High Efficiency 96%** typ.
- (4) Built-in capacitor is only MLCC (multilayer ceramic) type, High reliability
- (5) Various Functions: AUX (Auxiliary Power Supply), ENA (Back end DC-DC ON/OFF control), IOG (Inverter Operation Good), PC (Parallel Control), R / +BC (In-Rush Input Current Suppressor), **CNT (remote ON/OFF)**

3. Example of Use (Front End of AC-DC with PFC System)



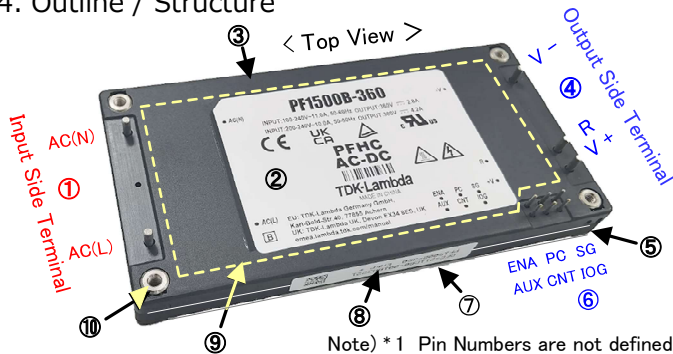
2. Products Line-up



Note) The PF1500B has a non-isolated structure between input and output. Having high output voltage, so, please be careful not to get an electric shock when handling. Vo= 360VDC, fixed and cannot be changed. External parts (prepared and designed by the customer) such as an EMI countermeasure input filter and input fuse are required.

4. Outline / Structure

[Each Part Explanation]



- ①-④ Power Terminal Pins : Cu(2.0mm φ) with Ni and Sn Plating (* 1)
- ② Front Sticker : Product Name, Safety Indication (Poly-Ester with Ink-Printing)
- ③ Plastic Cover : PBT (Poly-Butylene Terephthalate), Insulator
- ⑤ Plastic Frame : PPS (Poly-Phenylene Sulfide), Insulator
- ⑥ Signal Terminal Pins : Brass 1mm SQR with Ni and Sn Plating (* 1)
- ⑦ Base-Plate and Power PCB : Aluminum (A1050P) t=1.5mm
(Electric Power Components are mounted for Heat-Radiation)
- ⑧ Side Sticker (Product Name, Lot & Serial No. Indication) : Poly-Ester
- ⑨ Control PCB inside, FR-4 (UL94V-0) (* 2)
- ⑩ Fixing Stud (4 pcs): Ni Plated Free-Cutting Steel, Conductor to Base-Plate

Note) *1 Pin Numbers are not defined for this product. Please refer the instruction manual for pins function in detail.

*2 Although inflammable class is UL94V-0 except a front and side sticker, the product itself inflammable is not certificated.

[Mounting Method] With the nameplate side of this product facing down, insert the terminal pins into the mounting PCB, and mount the product by flow soldering or hand soldering (reflow is not allowed). Please refer to the instruction manual for the temperature profile. Also, on the opposite side of the baseplate, attach a heat sink (radiator) with improved thermal coupling. Please note that the mounting board should be designed and manufactured by the customer. For details, please refer to the "Power Module Application Note".

5. Simple Internal Circuit and Explanation

1) Circuit Method

- PFC Part : Semi-Bridgeless Boost PFC Conv. (Continuous Current Mode for High power)
- Auxiliary P.S. : 5W Flyback Converter. (for Internal power supply & AUX output)

2) Switching Frequency

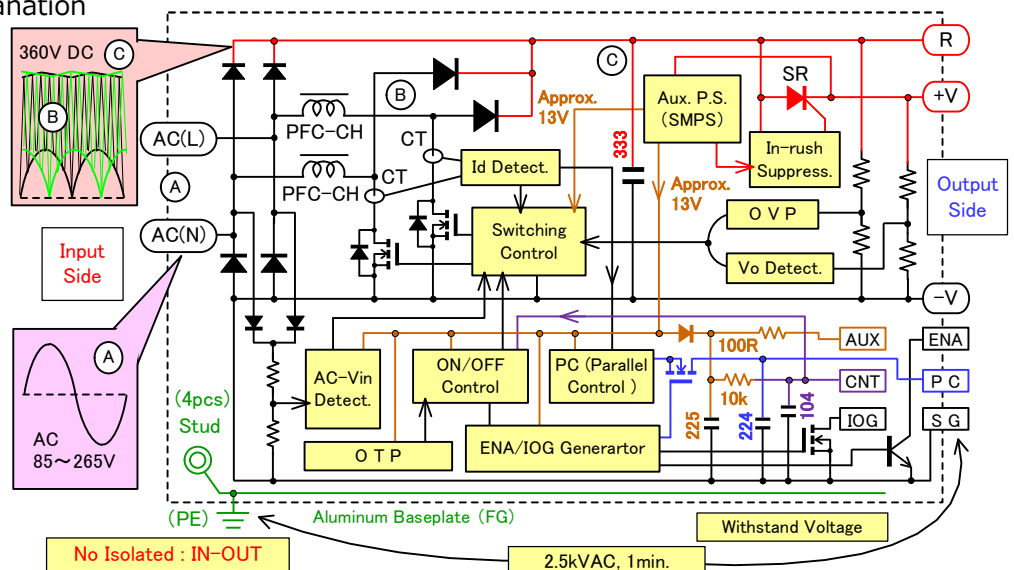
- PFC Section : 130kHz typ.
- Auxiliary PS Part : 60kHz typ. (Freq. Dev. : ±20%, including Temp. Shift.)

3) Withstand Voltage (1 min. each)

- Baseplate - Each terminal : 3kVAC, 1min. (Insulation Distance : 6mm or more)
- Please note that IN - OUT is not isolated.

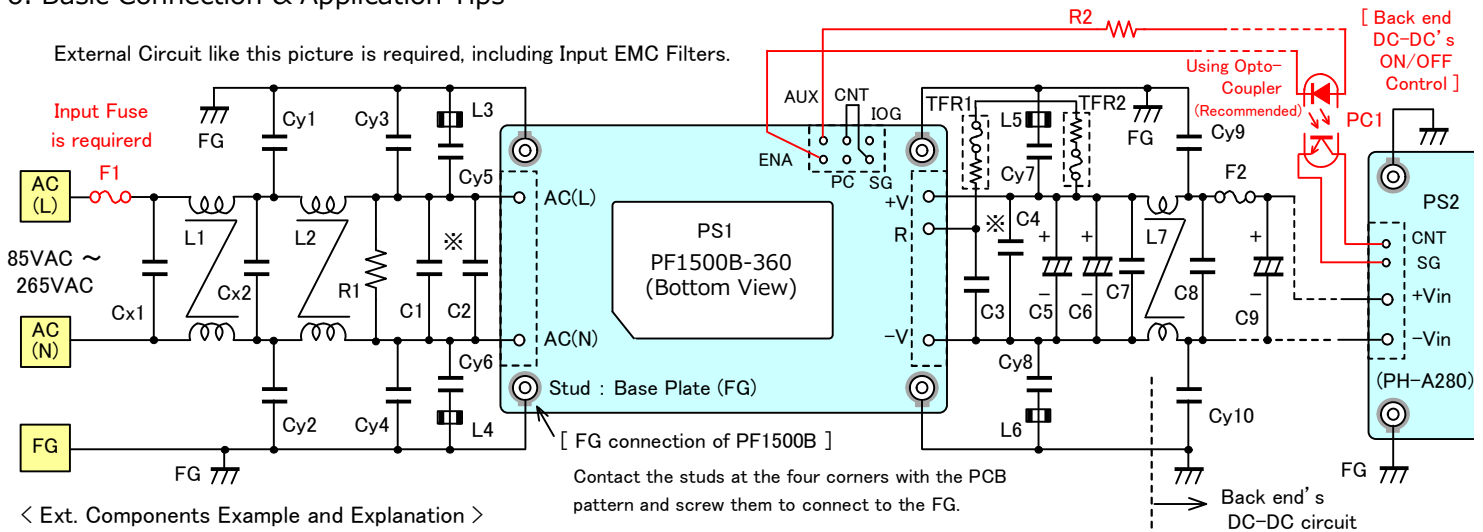
4) Input Fuse, Input (EMC) Filter

- Be sure to attach the fuse externally for safety. If no fuse, Safety Standard cannot be obtained. For EMI countermeasures, an External Input Filter addition is also required (see next page).



[Important Notice] The PF1500B-360 application assumes that TDK-Lambda DC-DCs (PH-A280, PAF-F280) are connected to the output. When connecting DC-DCs, be sure to control the CNT terminal by the ENA terminal. If not controlled, the product may be damaged. If the customers use 360VDC output for other purposes directly, such as an Inverter, they should fully evaluate the actual system.

6. Basic Connection & Application Tips



< Ext. Components Example and Explanation >

(1) Fuses (Fast-Blow Type)

F1 : 250VAC, 20A : Input Fuse [Indispensable] Without the fuse (F1), the safety approval cannot be obtained.

F2 : 600VDC, 6A : PF1500B-360 Output short and back end DC-DC input Protection (Dual use). If multiple PH-A280 DC-DCs are connected in the back end, please insert a fuse for each unit. And please use properly rated current fuse for each DC-DC product.

(2) EMI / EMC Countermeasure (Input) Filter ※

An example circuit composed of common mode filters, X or Y capacitors, ferrite beads, connected to the input and output of the PF1500B-360.

< Inductive components >

* Common Mode Chokes: L1 : 4.5mH, 20A, L2 : 1.5mH, 20A, L3 : 202uH, 5A. Select them with high frequency attenuation characteristics.

* Ferrite Beads: L3, L4, L5, L6 By attaching it to the legs of some Y capacitors, it reduces high frequency switching noise.

< Capacitors or Resistors >

* X Capacitors : Cx1, Cx2, C1, C2 : 275VAC, 1uF, C3, C4 : 500VDC, 2.2uF Cx7, Cx8 : 500VDC, 0.22uF They are Film Capacitors.

C1 to C4 are for absorbing ripple current generated by switching, so select a type with a large rating ripple current (3A).

Please note that the withstand voltage are different for AC and DC. (If necessary, use products certified by safety standards.▲)

* Y Capacitors : Cy1, Cy2, Cy5 to Cy10 : 250VAC, 2200pF, Cy3, Cy4 : 250VAC, 47pF Ceramic capacitors (Same as ▲ mark above.)

* Bleeder resistor for input line discharge R1 : 1/2W, 470k Ohms, the R1 is usually connected inside the input filter.

Note) ※ This is an example based on EMI evaluation results of TDK-Lambda. Due to the PF1500B-360 is a power module, therefore various arrangements are possible according to the customer's application system.

(3) External Parts for PFC or others

* Output electrolytic capacitor C5, C6: 450VDC, 220uFx3 (parallel) : Smoothing capacitor for PFC, they affect output ripple voltage (smoothness) and affects the "output holding time" of the back end DC-DC power supply during an input brown out. Please refer to the instruction manual carefully to determine the components value.

* In-Rush Current Suppressor TFR1, TFR2 : 6.8ohms, 139°C x 2 (in series) The inrush current suppressor of the C5, C6 capacitors when AC input is turned on. The purpose of a TFR is for event product is damaged, the temperature of rises and blows the fuse to ensure safety.

* Input electrolytic capacitor C9 for DC-DC power supply in the back end. Please select according to the connected DC-DC converter.

< Interface with back end (load) circuit > [IMPORTANT]

The PH-A280s are assumed connecting to the back end of PF1500B-360 as shown in No.6 circuit. Please use the ENA signal for ON/OFF control. If this is not applied, the product may be damaged, and be out of the warranty. Also, when using the CNT function of the PF1500B-360, please link it with the ENA. When the CNT terminal is open, it turns OFF, but DC output voltage appears which is approximately 1.4 times of the input AC voltage level. (Example: For 200VAC input, approximately 280VDC output appears during CNT-OFF state.)

7. Various Protection Explanation

	Protection	Y/N	Notice
IN-PUT	O V P	No	Please avoid applying higher Vin
	L V P	Yes	Turn ON Vin=80VAC, OFF Vin=70VAC (Approx.)
OUT-PUT	O V P	Yes	Operation stops at Vo=400V, with ENA/IOG-OFF
	O C P	No	Easy current limiter only to avoid damage
Whole	O T P	Yes	Shutdown at 110 °C baseplate, Manual reset

* The protection above operate almost instantaneously (~ 100 μs).

The PF1500B-360 will not be damage if it an input voltage exceeds 10% of the maximum value, but it is not covered by the warranty.

8. Heat Radiation Example

(Be sure to attach a heat sink before use.)

PF1500B-360 with option heatsink HAF-15T (0.45°C/W at 2m/s) is described. (Please note this is only calculation by a desk study.)

< Example > Assuming PF1500B-360 worst efficiency 94% @ 1008W (85VAC), when HAF-15T is attached to this and forced air cooling is performed, the ambient temperature can be used at Ta=60°C. [PF1500B Worst power loss: 1,008Wx(1/0.94-1)=65W, ΔTp=65Wx0.45°C/W=30°C, therefore Tp=30+60=90°C at an ambient temperature of 60°C] (Apply thermal grease to the PF1500B-360 base plate and screw the HAF-15T.)

If natural air cooling is required or a heatsink with a different shape is used, please arrange the heatsink outline and ask the heatsink manufacturer how to design it. Please refer to the "Heat dissipation design" section of the separate "Power module application note".

< FAQ >

- (1) In-rush current ==> 2 types when starting up
 - * Output Electrolytic Cap. Charge when input voltage is applied
 - * Secondary rush current due to PFC Boost starts to operate (The latter one cannot be adjusted from the outside)
- (2) Input voltage type ==> AC 47-63Hz only. DC Input may cause damage. AC 400-800Hz, square wave, pseudo sine wave, PFC may deteriorate & abnormal noise occurs.
- (3) When using the load except PH-A280 or PAF-F280 on the output ==> Please fully evaluate it by customer themselves.