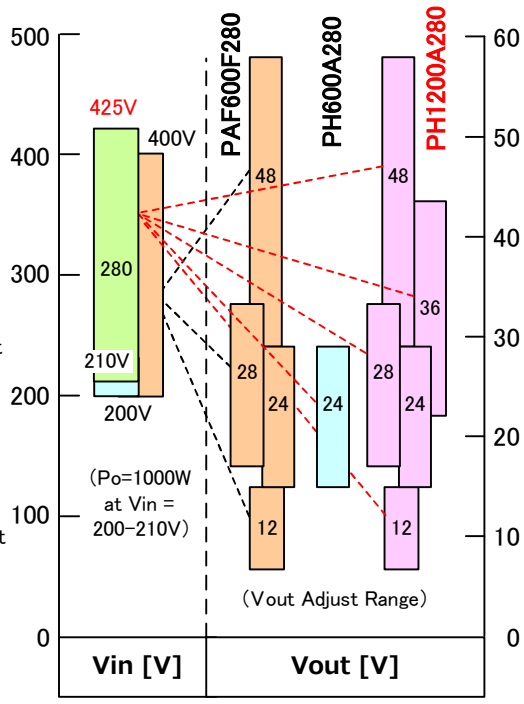
PH1200A280 Series Quick Manual

TDK-Lambda

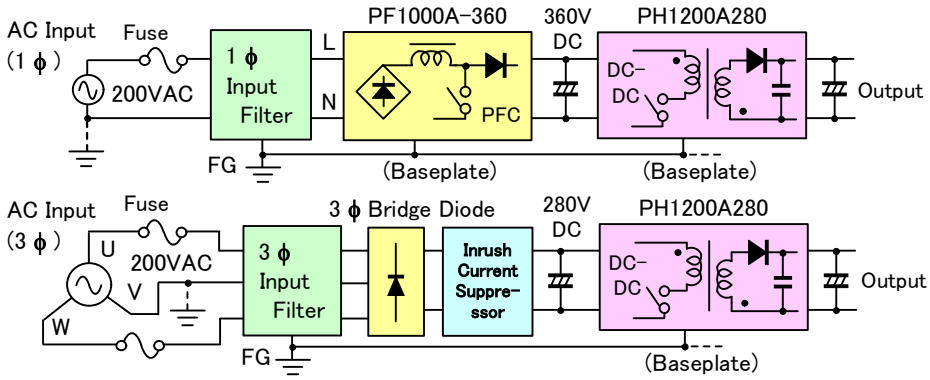
1. Product Abstract & Features

(1) Same size with Current Product PAF600F280, but 1200W Output Available
(2) High Efficiency 94% @ 210 to 425Vin, and Low Pd 77W @ 1.2kW Output
(Common for ALL PH1200A280, same Loss as PAF600F280 of 400Vin)
(3) Various Function : Aux. PS (12V, 20mA), IOG (Output OPR. Monitor),
TRM (Vo Adjustment, +20%/−40% of Nominal Vo), +S/−S (Remote Sensing)
PC (Parallel Control for Current Share), ORing FET inside (N+1 Redundant Operation), CNT/SG (Remote ON/OFF)

2. Products Line-up

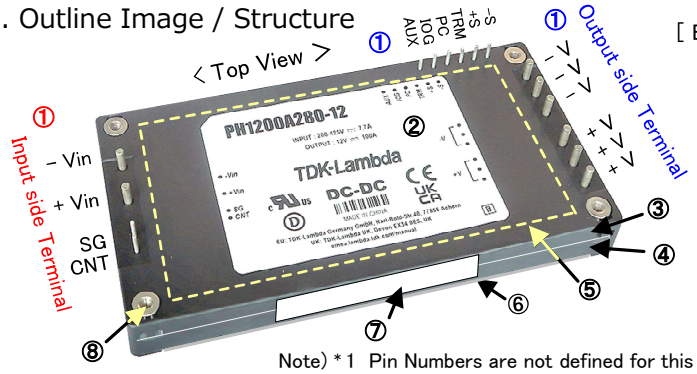


3. Example of Use (Assumption a Large Power System)



Note) The above block diagram is a conceptual one, and the actual internal circuit is different.

4. Outline Image / Structure



[Each Part Explanation]

① Terminal Pins (* 1) : Cu (2.0 ϕ) or Brass (1.0 ϕ) with Plating with Ni・Sn
② Front Seal : Product Name, Safety Indication (Poly-Ester with Ink-Printing)
③ Plastic Cover : PBT (Poly-Butylene Terephthalate), Insulator
④ Plastic Frame : PPS (Poly-Phenylene Sulfide), Insulator
⑤ Plastic Printed Circuit Board Inside : FR-4 (UL94V-0) (* 2)
⑥ Base-Plate and Power PCB : Aluminum (A1050P) t=1.5mm
(Electric Power Components are mounted for Heat-Radiation)
⑦ Side Seal (Product Name, Lot & Serial No. Indication) : Poly-Ester
⑧ Fixing Stud (4 points): Ni Plated Free-Cutting Steel, Conductor

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 seal, 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). For the temperature profile, please refer to the instruction manual. Also, on the opposite side of the baseplate, attach a heat sink (radiator) with good 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

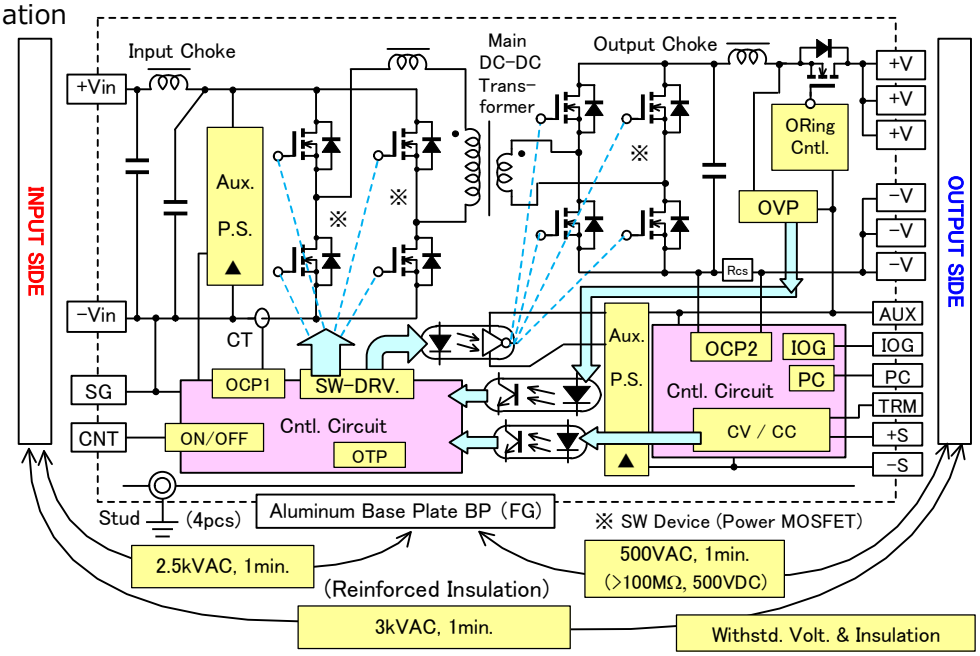
1) Circuit Method
・ Main DC-DC Con. : Phase-Shift Full Bridge, Sec. side Synchronous Rectification. ORing FET inside, First used for P/Ms.
・ Auxiliary PS : Flyback Converter. (Internal power supply & AUX output)

2) Switching Frequency
・ Main DC-DC Part : 200kHz typ.
・ Auxiliary PS Part : 115kHz typ.
(Freq. Dev. : ±20%, including Temp. Shift.)

3) Withstand Voltage (1 min. each)
IN − OUT : 3kVAC, IN − BP (FG) : 2.5kVAC,
OUT − BP (FG) : 500VAC (BP:Baseplate)

4) Insulation Resistance
OUT − BP (FG) : >100MΩ at 500VDC
Note) No Insulation Resistance are defined for IN − OUT and IN − BP (FG)

5) 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).



Note) ▲ For convenience, AUX. P.S. is drawn separately for input and output, but it is actually an integrated flyback power supply.

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6. Representative Pin Functions (Refer th previous page, Block Diagram)

< Input side Pins, Ref. Potential (0V) is "SG" >

① CNT (Remote ON/OFF) : DC-DC Output turns on when shortening to SG terminal. Even remote OFF condition, AUX PS operates, so 1～2W power dissipation exists. If no need to use this, CNT & SG terminal must be shorted each other.

< Output side Pins, Ref. Potential (0V) is "-S" >

② +S,-S (Remote Sensing) : Compensate a voltage drop of PCB pattern by load current. Output stability is achieved by connecting electrolytic Cap. at the sensing points.

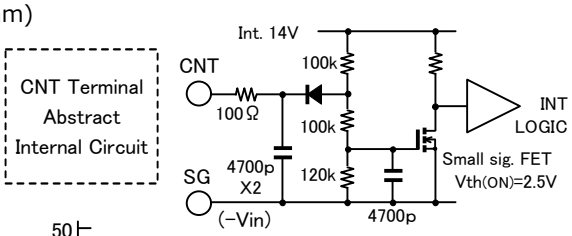
③ TRM (Vo-Adjustment) : Output voltage can be adjusted by external TRM Resistor.

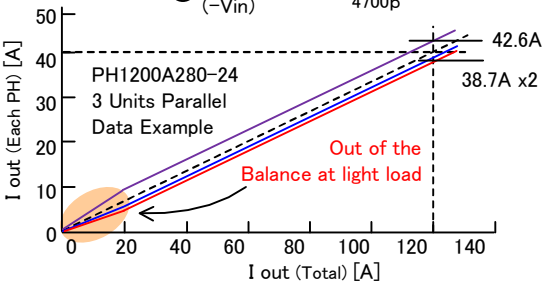
④ AUX (Auxiliary P.S.) : AUX. Output exists all the time if Vin is applied with rating as 12V (typ), 20mA(max), Recommended Ext. Co=47uF (max), (Approximately 15μF inside)

⑤ IOG (DC-DC OPR Monitor) Shorted by about 40 ohms with -S when DC-DC OPRs.

⑥ PC (Parallel Cntl.) : When plural PH1200A280s (+V,-V,+S,-S, and PC) are connected, the output current are evenly shared. Output current balance is not completely equal because of the Current-Balance Characteristics. Refer the right side graph image.

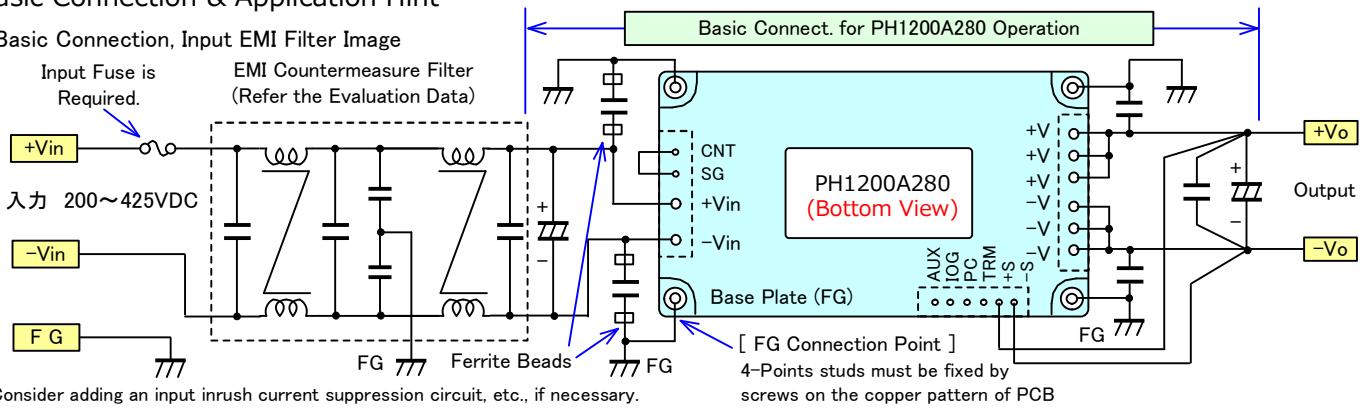
◎ Others : TRM, AUX, IOG, PC terminals must be opened when not using them. Output pins (+V, -V) current rating is 50A. Please use in parallel for each.





7. Basic Connection & Application Hint

(1) Basic Connection, Input EMI Filter Image



※ Consider adding an input inrush current suppression circuit, etc., if necessary.

Including an input filter for EMI countermeasures requires an external circuit of the size shown in the figure above. For details, refer to the instruction manual and model data.

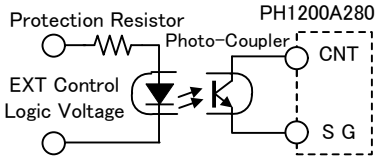
(2) Application Hint

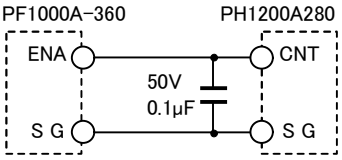
① External Input EMC Filter (Refer above circuit and page 1)

The filter in the dot line above is for Class A EMI when using PH1200A alone, it needs the ferrite beads. When countermeasure EMI on using PF1000A-360 of 1ϕ input, please apply the input filter suitable for PF1000A-360s. This circuit is shown in the Evaluation Data of PF1000A-360. But when using 3ϕ input with direct rectifier and ripple filter, it is better to arrange 1ϕ filter to 3ϕ's circuit and insert it.

② How to use CNT (Remote ON/OFF) : When using this across the common mode coil input filter, please use a photocoupler as shown in the upper right figure. And if the front stage is PF1000A-360, use the ENA terminal to control ON/OFF of the CNT terminal of PH1200A280.

Note) Please avoid starting PF1000SA-360 operation with CNT-ON of PH1200A280, because of being danger of large inrush input current causes damage on PF1000A-360. And if applying directly remote ON/OFF, please study adding by-pass capacitor between CNT-SG as the right side schematics.



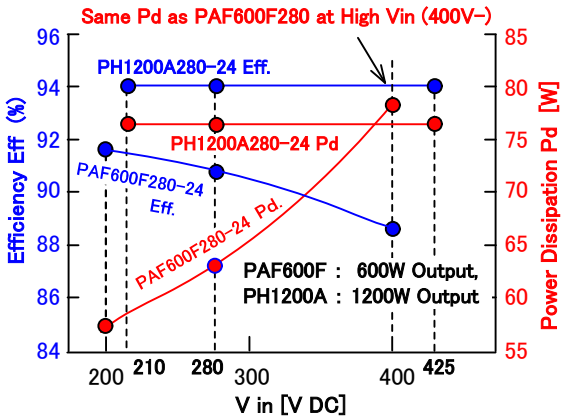


8. Various Protection Explanation

	Protection	Y/N	Notice
IN-PUT	OVP	No	Need to avoid large Vin on +Vin/-Vin by user themselves
	LVP	Yes	Main DC-DC : Start Vin=190V, Stop Vin=175V AUX PS Output : Start Vin=40V, Stop Vin=35V
OUT-PUT	OVP	Yes	Latch stop at VoX135%, Manual Res. (No OVP for AUX)
	OCP	Yes	Constanl I o droop 125%, (AUX-OCP approx. 30mA)
	LVP	Yes	Shutdown at OCP droop at 50% Vout or less, Manual Reset
Whole	OTP	Yes	Shutdown at Tp=108℃, Manual Reset after cooling 80℃

Note) Each protection speed is quick, 100μs approximately. Table values are typical ones. No damages even if 110% (460V) input over Vin applied, but out of quality guarantees. Please avoid shorting AUX and -S or other terminals, to avoid product damages.

9. High Eff. & Low Pd PR (Comparison with PAF600F280)



10. Heat Radiation Example (Required attachment Heat-Sink when using)

The optional standard heat sink HAF-15T assumes forced air cooling. Here is an example of heat dissipation calculation when using PH1200A280-24 with 1kW output. Reading the efficiency from the model data as 94% and calculating the power loss, Pd=1kWx(1/0.94-1)=64W. Use at an ambient temperature of 50°C and set the base plate temperature to set to 90°C (max), the allowable temperature rise is 90-50=40° C, so the required thermal resistance is θ=40° C/64W=0.625 [°C/W]. where "power module from the cooling characteristic curve of the HAF-15T heatsink described in "Application Note", the wind speed is 1 m/s (this is a rough estimate ignoring the contact thermal resistance with the heatsink). If you want to use the product in natural convection, or if you need a heatsink with a different shape, please design the heatsink yourself and request production from the heatsink manufacturer.

For details on heat dissipation design, please refer to the section "Heat dissipation design" in the attached "Power Module Application Note".