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# PACSR28018

**28V Output AC/DC Converter, Module Package**


## FEATURES

- Full Load Efficiency up to 93% @220VAC
- Metal Case Box Type Package
- Package Dimension: 110.8x50.8x13.7mm (4.36”x2.0”x0.54”)
- Operating Baseplate Temperature Range - 40°C to +100°C
- Input Brown-Out, Output OCP, OTP, OVP, SHORT protection
- 3000VAC Isolation
- RoHs Compliant
- CE Mark
- EMC compatible: CISPR22 ClassB(with external EMC filter)
- ISO 9001, ISO 14001 certified manufacturing facility
- UL/cUL 60950-1 (US&Canada)
- Prohibit parallel application

The PACSR28018, a wide input voltage range of 85~265VAC, and single isolated output converter, is the latest product offering from a world leader in power systems technology and manufacturing — Delta Electronics, Inc. Such module type ACDC converter can provide 500W, 28V regulated DC output voltage with full load efficiency up to 93% @220Vac; The PACSR28018 offers Brown-out, output OCP, OTP, OVP and Short protections, and allows a wide operating baseplate temperature range of –40°C to +100°C. With creative design technology and optimization of component placement, this converter possess outstanding electrical and thermal performance, as well as high reliability under extrmely harsh operating conditions.

(All specifications valid base on the connection of figure 9, unless otherwise indicated)

## INPUT CHARACTERISTICS

| Item | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Rated input voltage range | | 100 | 110/220 | 240 | VAC |
| Max input voltage range | | 85 | | 265 | VAC |
| Input voltage frequency range | | 45 | 50/60 | 65 | Hz |
| Maximum Input Current | Vin=85VAC, 85% Load | | | 6.3 | A |
| Open load loss | | | 2.5 | | W |
| Input PF value | Vin=220VAC, 100% Load | 0.95 | | | |
| Allowable bus capacitance range（***1**） | Vin=110/220VAC 100% Load | 660 | | 1000 | uF |

## OUTPUT CHARACTERISTICS

| Item | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| PG | Vo=28V | 3.1 | 3.2 | 3.3 | V |
| Output voltage setpoint | Vin=220VAC, Io=0-18A | 27.5 | 28 | 28.5 | Vdc |
| Out put current range | | 0 | | 18 | A |
| Output OCP point | | 19 | 22 | 25 | A |
| Turn-on rise time | | | 20 | | ms |
| Start up time | Vin=110/220VAC | | 2500 | | mS |
| Hold up time | Vin=110/220VAC, Io= 100% Load | | 20 | | mS |
| Output OVP point | | 32 | 33.5 | 35 | V |
| Output trim range | Trim up | | | 10 | % |
| | Trim down | | | 3.5 | % |
| Output Current Transient | Positive voltage step, 75% to 25% load dynamic, 0.1A/us slew rate | | 400 | 600 | mV |
| | Nagetive voltage step, 25% to 75% load dynamic, 0.1A/us slew rate | | 400 | 600 | mV |



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http://www.deltaww.com/dcdc

| | | | | | |
|---|---|---|---|---|---|
| Output Voltage Ripple and Noise | Vin=110/220Vac, Io=18A, peak to peak, 20MHz bandwidth | | 150 | | mV |
| | RMS | | 50 | | mV |
| Output overshoot | | | | 3 | % |
| Efficiency @ 60% Load | Vin=110VAC | | 90 | | % |
| Efficiency @ 60% Load | Vin=220VAC | | 92 | | % |
| Efficiency @ 100% Load | Vin=110VAC | | 91.5 | | % |
| Efficiency @ 100% Load | Vin=220VAC | | 93 | | % |
| Allowable output capacitance range（*2） | Vin=110/220VAC, Io= 100% Load | 1080 | | 5000 | uF |
| **GENERAL CHARACTERISTICS** | | | | | |
| Item | Conditions | Min. | Typ. | Max. | Unit |
| I/O Isolation Voltage | Input to output | | 3000 | | VAC |
| | Input to case | | 1500 | | VAC |
| | Output to case | | 500 | | VAC |
| I/O Isolation Resistance | 500Vdc | 10 | | | MΩ |
| MTBF | Ta=25ºC, 100%load | | 1 | | Mhours |
| Weight | | | 240 | | g |
| **ENVIRONMENTAL SPECIFICATIONS** | | | | | |
| **Parameter** | Conditions | **Min.** | | **Max.** | **Unit** |
| Storage Temperature Range | | -40 | | +125 | ℃ |
| Operating Temperature Range | Case Temperature | -40 | | +100 | ℃ |
| Operating altitude | | | | 3000 | meter |
| **ELECTRICAL CURVE** | | | | | |

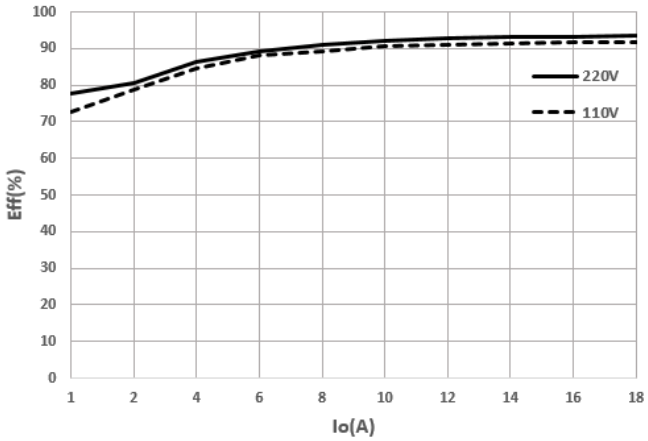



***Figure 1:*** *Efficiency vs. Output current @ Vin=110,220VAC*

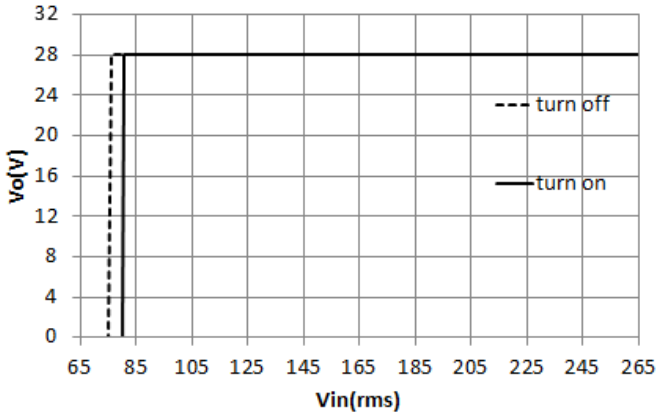
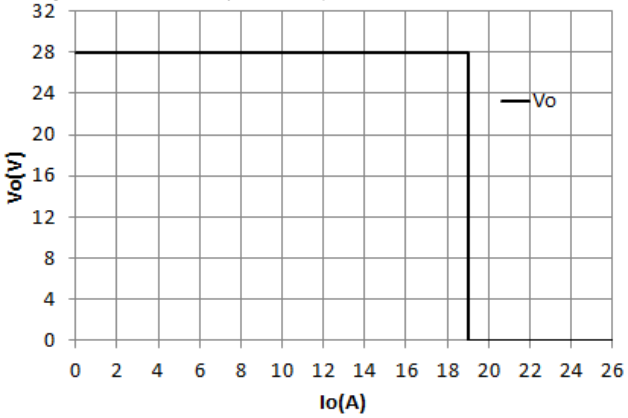



***Figure 2:*** *Vout vs. Vin @ Full load*




. ***Figure 3:*** *Output voltage vs. Output current @ Vin=110/220VAC*

## ELECTRICAL CURVES (continous)

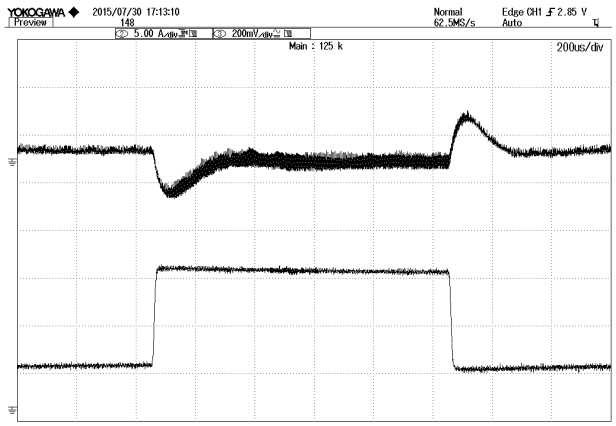



***Figure 4:*** *Dynamic response to load step 25%~75% with 0.1A/uS slew rate at 110/220Vac*
*TOP: Vout, 200mV/div, BOTTOM:Iout,5A/div,200uS/div*

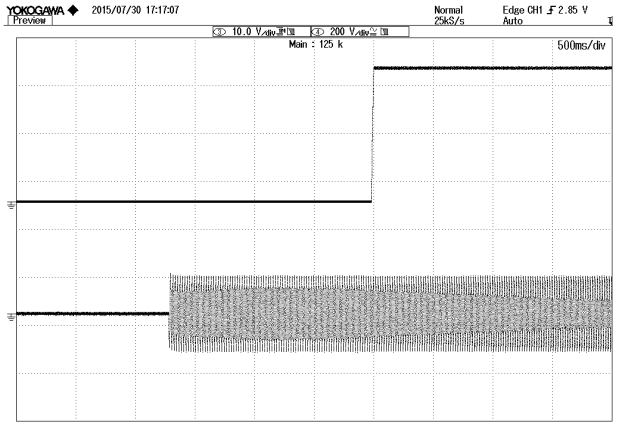



***Figure 5:*** *Vout start up with Enable on at 110Vac,18A Iout, TOP: Vout, 10V/div, 500mS/div*
*BOTTOM: Vin, 200V/div, 500mS/div*

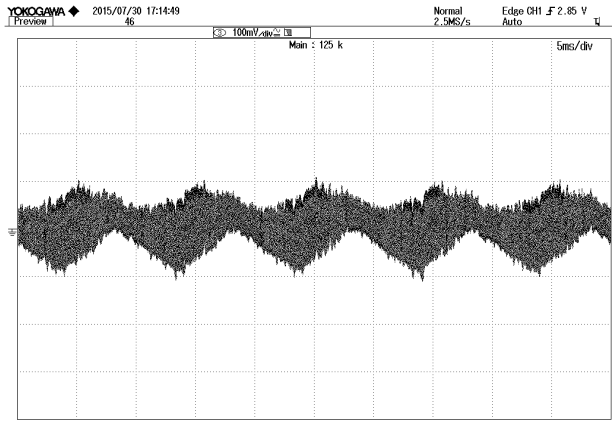



***Figure 6:*** *Output ripple & noise at 110/220Vac, 18A Iout Vout: 100mV/div, 5mS/div*

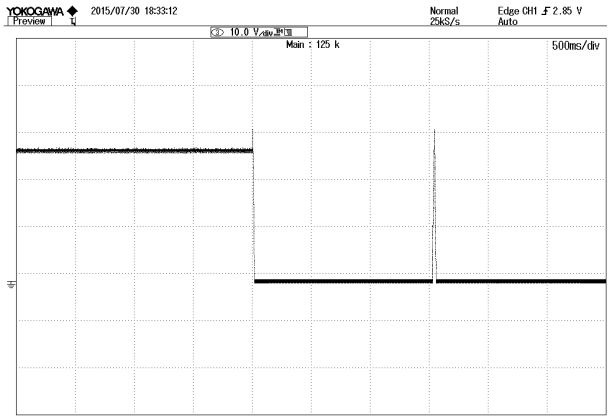



***Figure 7:*** *Output over voltage protection at 110/220Vac, 18A Iout. Vout: 10V/div, 500mS/div*

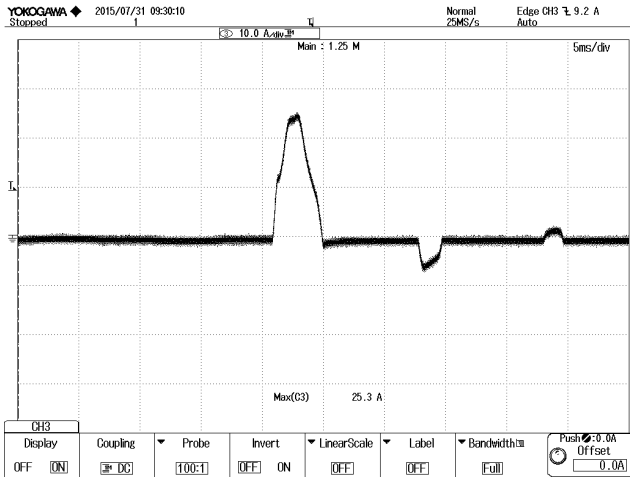



***Figure 8:*** *Inrush current @ Vin=220Vac*
*Iin： 10A/div, 5mS/div; Max current 25.3A*

## SIMPLIFIED APPLICATION CIRCUIT

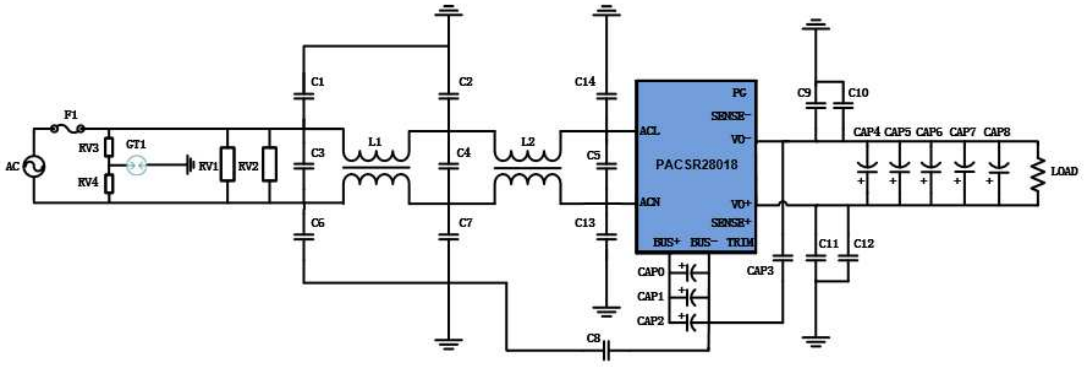



*Figure 9: Application connection*

*TYPICAL value ADVISED*

| No | Location | item | value | Notes |
|---|---|---|---|---|
| 1 | Cap0 | bus cap | 220uF/450V | Capacitor should have good low-temperature characteristics, keep at least 75% capacitance at -40℃ if need -40C application. (*3) |
| 2 | Cap1 | bus cap | 220uF/450V | |
| 3 | Cap2 | bus cap | 220uF/450V | |
| 4 | Cap3 | Cap for pri-sec | 2200pF/250Vac Y1/X1 | |
| 5 | Cap4 | Output cap | 1000uF/35V | ESR≤16mΩ (100kHz), Rated ripple≥ 2920mArms(105℃) (*4) |
| 6 | Cap5 | Output cap | 270uF/35V | ESR≤17mΩ (100kHz), Rated ripple≥ 2200mArms(125℃) (*5) |
| 7 | Cap6 | Output cap | 270uF/35V | |
| 8 | Cap7 | Output cap | 270uF/35V | |
| 9 | Cap8 | Output cap | 270uF/35V | |
| 10 | F1 | Input Fuse | 10A/250Vac | |
| 11 | RV1 | Input VDR | 300VAC | TVR14471KOOOTB9Y/THINKING |
| 12 | RV2 | Input VDR | 300VAC | TVR14471KOOOTB9Y/THINKING |
| 13 | RV3 | Input VDR | 300VAC | TVR14471KOOOTB9Y/THINKING |
| 14 | RV4 | Input VDR | 300VAC | TVR14471KOOOTB9Y/THINKING |
| 15 | GT1 | Input GAS TUBE | 2.5KV/10KA | B88069X8661S102(EF2500X8S) |
| 16 | C1 | Input Y-cap | 100pF/250Vac Y2/X1 | |

| No | Location | item | value | Notes |
|---|---|---|---|---|
| 17 | C2 | Input Y-cap | 4700pF/250Vac Y2/X1 | |
| 18 | C3 | Input X-cap | 1uF /305VAC X2 | |
| 19 | C4 | Input X-cap | 0.47uF /275VAC X2 | |
| 20 | C5 | Input X-cap | 0.47uF /275VAC X2 | |
| 21 | C6 | Input Y-cap | 100pF/250Vac Y2/X1 | |
| 22 | C7 | Input Y-cap | 4700pF/250Vac Y2/X1 | |
| 23 | C8 | Cap for pri-PE | 1500pF/250Vac Y1/X1 | |
| 24 | C9 | output Y-cap | 4700pF/250Vac Y2/X1 | |
| 25 | C10 | output Y-cap | 4700pF/250Vac Y2/X1 | |
| 26 | C11 | output Y-cap | 4700pF/250Vac Y2/X1 | |
| 27 | C12 | output Y-cap | 4700pF/250Vac Y2/X1 | |
| 28 | C13 | Input Y-cap | 100pF/250Vac Y2/X1 | |
| 29 | C14 | Input Y-cap | 100pF/250Vac Y2/X1 | |
| 30 | L1 | Input chock | 6.5mH ϕ 1mm | PH9455.705NL/Pulse Electronics |
| 31 | L2 | Input chock | 6.5mH ϕ 1mm | |

*read the Application Note for this module carefully before using the power supply unit

=Note=
*1 and *3 . About the bus cap, pls read the Application Note about the hold up time configure.
*2 and *5. About the min output cap, pls use the cap which has more performance than the cap in the table above, or refer the cap about the output cap ability in the Application Note.

*2 and *4. About the max output cap, pls follow the Application Note about the output cap ability.

## INPUT VOLTAGE DERATING CURVE

Input voltage derating curve is shown in Fig.10.

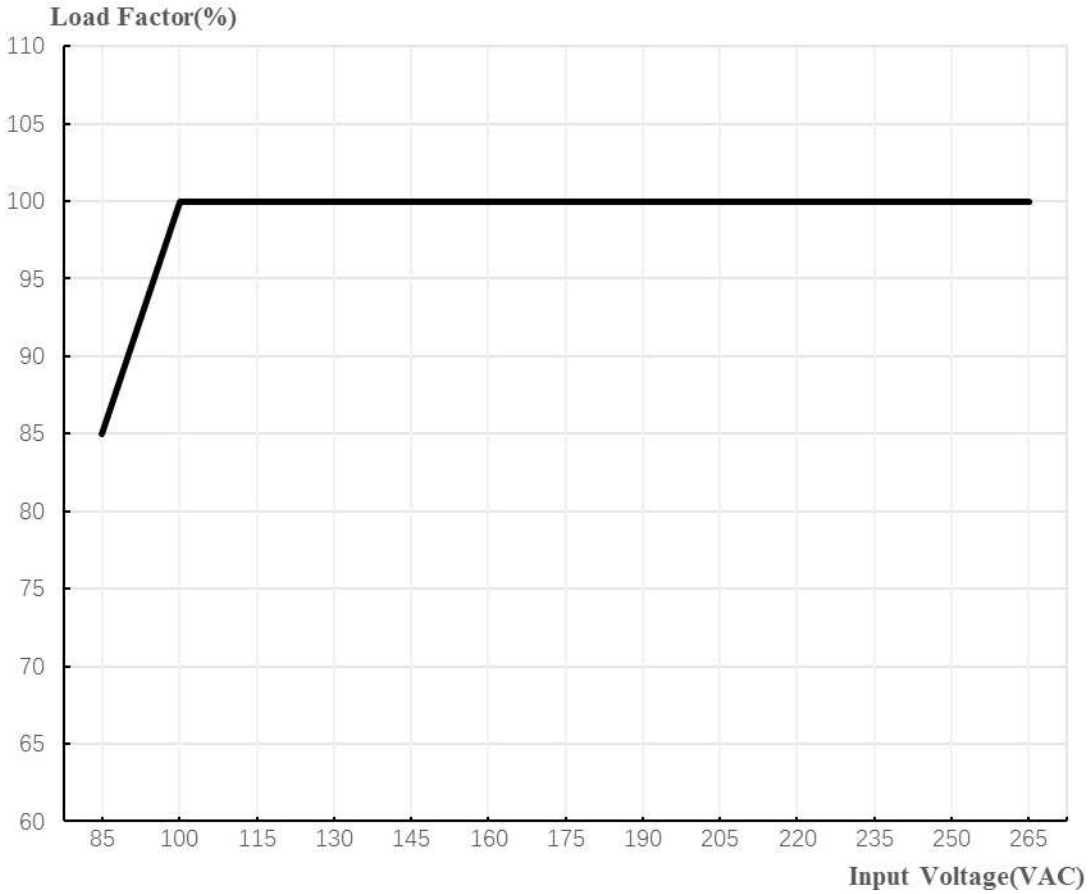



***Figure 10:*** *Input voltage derating curve*

## THERMAL CONSIDERATION

Thermal management is an important part of the system design. To ensure proper, reliable operation, sufficient cooling of the power module is needed over the entire temperature range of the module. Conduction cooling is usually the dominant mode of heat transfer.

**Thermal Testing Setup**

The following figure shows the testing setup in which the power mudule is mounted on an Al plate and was cooled by cooling liquid.

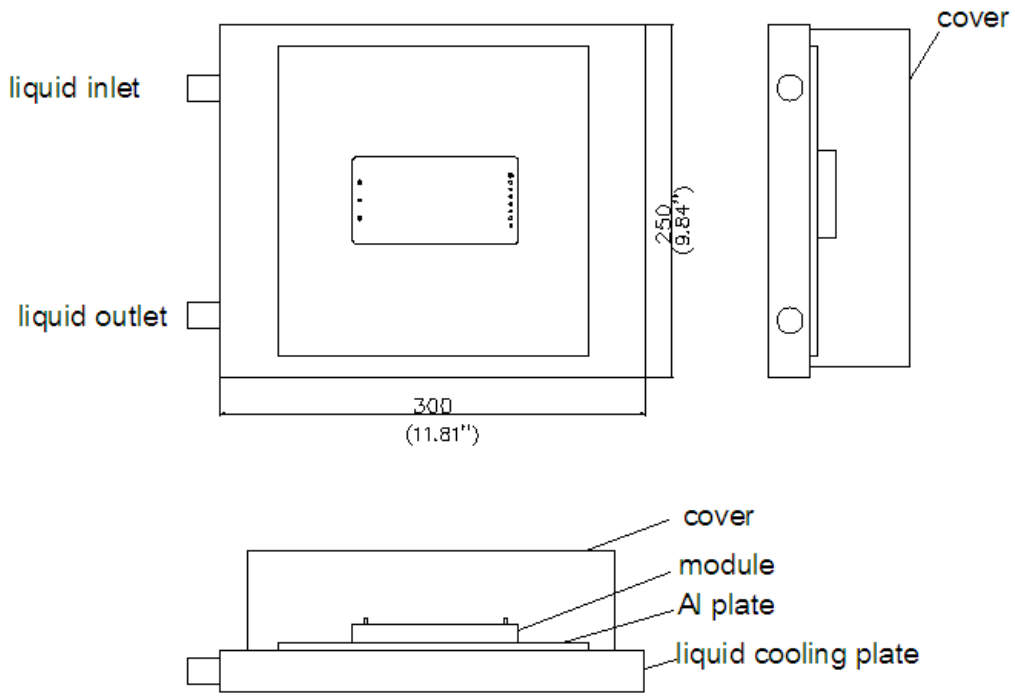



***Figure 11:*** *Thermal test setup*

## THERMAL DERATING CURVE

The following figure shows the location to monitor the temperature of the module's baseplate. The baseplate temperature in thermal curve is a reference for customer to make thermal evaluation and make sure the module is operated under allowable temperature. (Thermal curves shown in Figure13 are based on different input voltage).

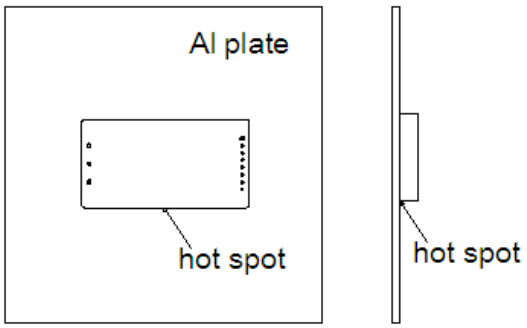



***Figure 12:*** *Baseplate's temperature measured point*

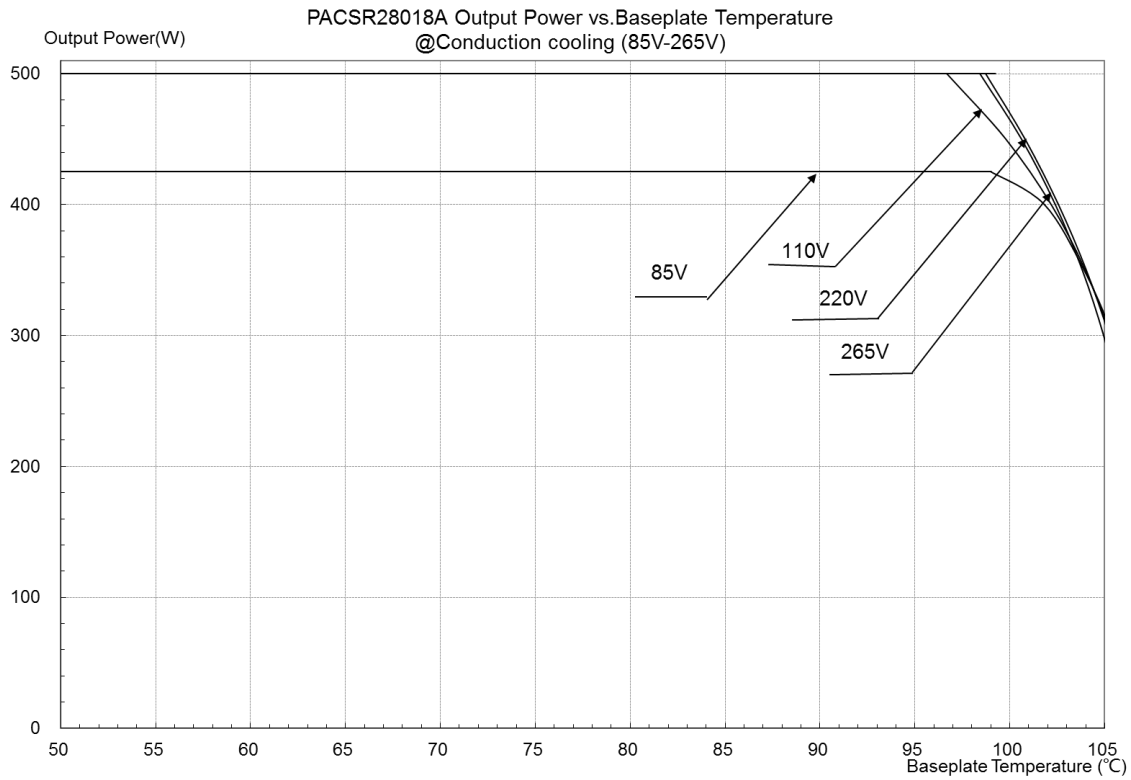
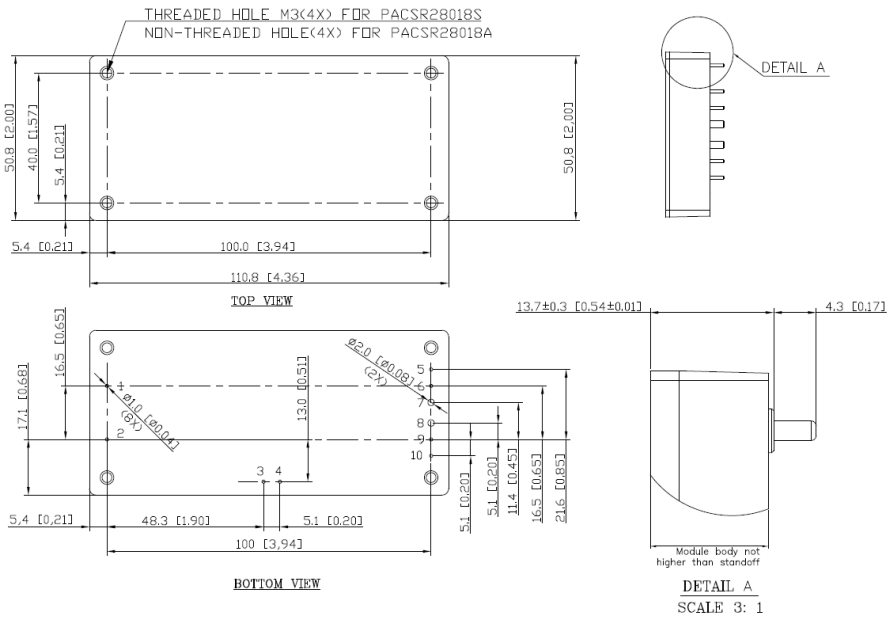



***Figure 13:*** *Thermal derating curve*

## MECHANICAL DRAWING

### Mechanical Dimensions




### Pin Connection

| Pin | Function |
|---|---|
| 1 | ACL |
| 2 | ACN |
| 3 | BUS+ |
| 4 | BUS- |
| 5 | PG |
| 6 | SENSE- |
| 7 | VOUT- |
| 8 | VOUT+ |
| 9 | SENSE+ |
| 10 | TRIM |

All dimensions in mm (inches)
Tolerance:X.X±0.5 (X.XX±0.02)

X.XX±0.25 ( X.XXX±0.010)

## PHYSICAL OUTLINE

| | | |
|---|---|---|
| Case Size | : | 110.8x50.8x13.7mm (4.36”x2.0”x0.54”) |
| Case Material | : | AL6061+Plastic case |
| Weight | : | 240g±10g |

## PART NUMBERING SYSTEM

| P | AC | S | R | 28 | 018 | A |
|---|---|---|---|---|---|---|
| Form Factor | Rated Input Voltage | Number of Outputs | Product Series | Output Voltage | Output Current | Option Code |
| P - Module | AC - 100VAC~240VAC | S - Single | R - Regular | 28V | 18A | A - Through Hole<br>S - Screw hole(M3*0.5) |

## RECOMMENDED PART NUMBER

| Model Name | Rated Input | | Output | | EFF @220VAC 100% LOAD |
|---|---|---|---|---|---|
| PACSR28018A | 100VAC~240VAC | 5.8A | 28V | 18A | 93% |
| PACSR28018S | 100VAC~240VAC | 5.8A | 28V | 18A | 93% |

### WARRANTY

Delta offers a three (3) years limited warranty. Complete warranty information is listed on our web site or is available upon request from Delta.

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