



FEATURES

- Full Load Efficiency up to 93% @220VAC
- Metal Baseplate Type Package
- Package Dimension:
110.8x50.8x13.7mm (4.36"x2.00"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
- UL60950-1 (US&Canada)
- Prohibit parallel application

The PACSR28010, 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 300W, 28V regulated DC output voltage with full load efficiency up to 93% @220Vac; The PACSR28010 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 extremely 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, 100% Load | | | 5 | A |
| Open load loss | | | 2.5 | | W |
| Input PF value | Vin=110VAC, 100% Load | 0.95 | | | |
| Allowable bus capacitance range (*1) | Vin=110/220VAC 100% Load | 440 | | 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=0-10.5A | 27.6 | 28 | 28.4 | Vdc |
| Output current range | | 0 | | 10.5 | A |
| Output OCP point | | 11 | 13.5 | 16 | A |
| Turn-on rise time | | | 20 | | ms |
| Start up time | | | 1000 | | mS |
| Hold up time | Vin=110/220VAC, Io= 100% Load | | 20 | | mS |
| Output trim range | Trim up | | | 10 | % |
| | Trim down | | | 5 | % |
| Output OVP point | | 32 | 33.5 | 35 | V |
| Output Current Transient | Positive voltage step, 75% to 25% load dynamic, 0.1A/us slew rate | | 400 | 600 | mV |
| | Negative voltage step, 25% to 75% load dynamic, 0.1A/us slew rate | | 400 | 600 | mV |



| | | | | | |
|---|---|------|------|------|----|
| Output Voltage Ripple and Noise | Vin=110/220Vac, Io=10.5A, peak to peak, 20MHz bandwidth | | 100 | | mV |
| | RMS | | 50 | | mV |
| Output overshoot | | | | 3 | % |
| Efficiency @ 60% Load | Vin=110VAC | | 90 | | % |
| Efficiency @ 60% Load | Vin=220VAC | | 91 | | % |
| 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 | 220Vac, Ta=25°C, Baseplate =85C, 80%load | | 1.15 | | Mhours |
| Weight | | | 240 | | g |

ENVIRONMENTAL SPECIFICATIONS

| Parameter | Conditions | Min. | Max. | Unit |
|-----------------------------|-----------------------|------|------|-------|
| Storage Temperature Range | | -55 | +125 | °C |
| Operating Temperature Range | Baseplate Temperature | -40 | +100 | °C |
| Operating altitude | | | 3000 | meter |

ELECTRICAL CURVE

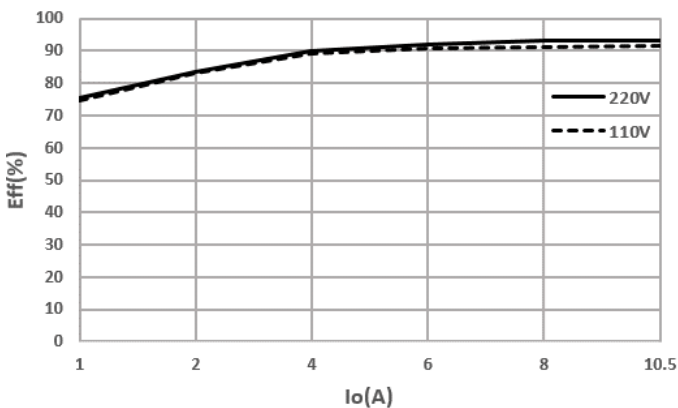


Figure 1: Efficiency vs. Output current @ Vin=110,220VAC

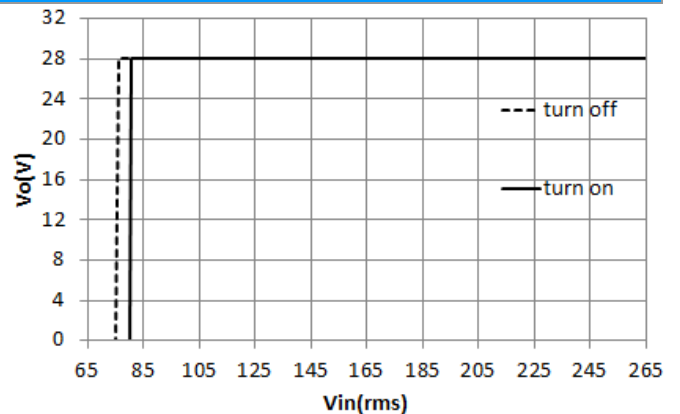


Figure 2: Vout vs. Vin @ Full load

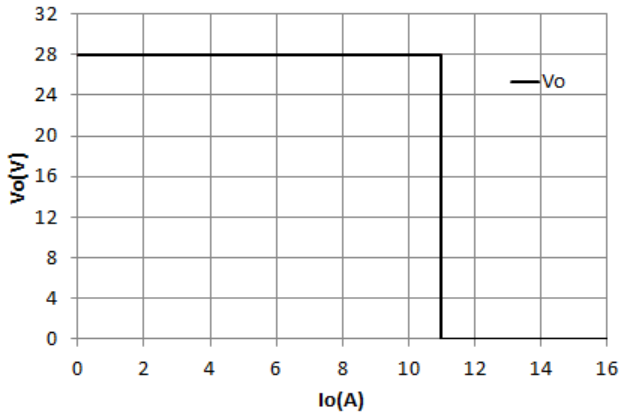


Figure 3: Output voltage vs. Output current @ $V_{in}=110/220VAC$.

ELECTRICAL CURVES (continous)



Figure 4: Dynamic response to load step 25%~75% with $0.1A/\mu S$ slew rate at 220Vac
TOP: VOUT, 200mV/div, BOTTOM: Iout, 5A/div, 200uS/div

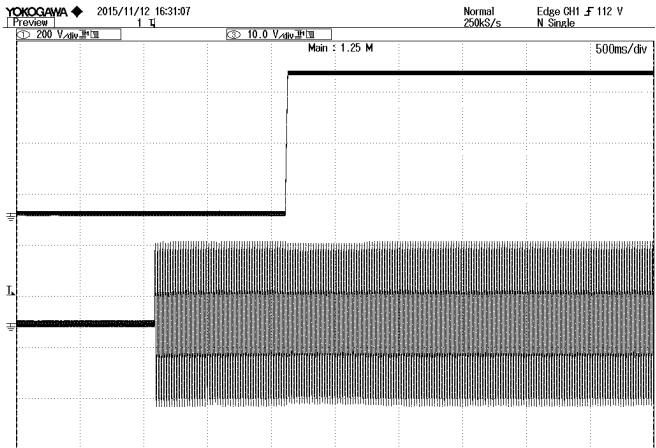
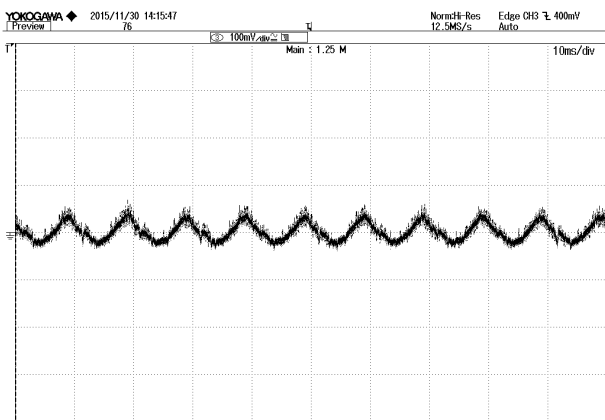


Figure 5: Vout start up at 220Vac, 10.5A Iout,
TOP: VOUT, 10V/div, 500mS/div
BOTTOM: Vin, 200V/div, 500mS/div



P-P(C3) 110.0mV

Figure 6: Output ripple & noise at 220Vac, 10.5A Iout
VOUT: 100mV/div, 10mS/div

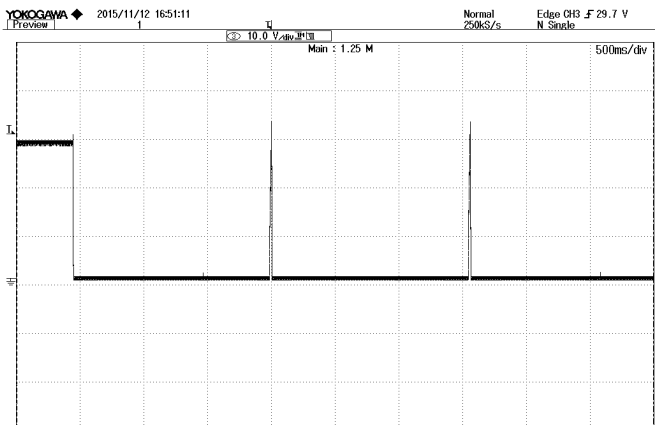


Figure 7: Output over voltage protection at 220Vac, 10.5A Iout. VOUT: 10V/div, 500mS/div

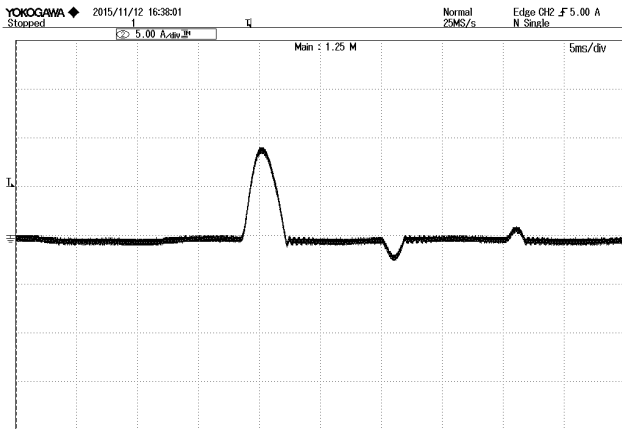


Figure 8: Inrush current @ Vin=220Vac lin: 5A/div, 5mS/div

SIMPLIFIED APPLICATION CIRCUIT

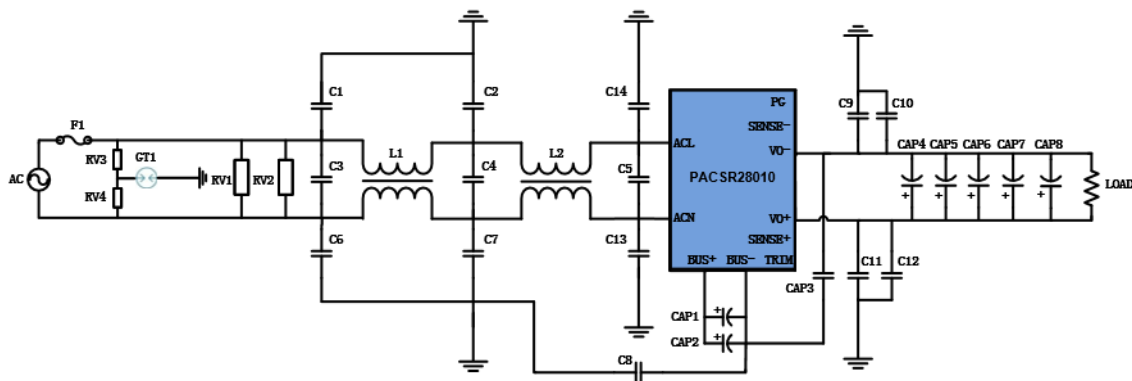


Figure 9: Application connection

TYPICAL value ADVISED

| No | Locati on | item | value | Part No |
|----|-----------|-----------------|---------------------|---|
| 1 | Cap1 | bus cap | 220uF/450V | Capacitor should have good low-temperature characteristics, keep at least 75% capacitance at -40°C if need -40C application. (*3) |
| 2 | Cap2 | bus cap | 220uF/450V | |
| 3 | Cap3 | Cap for pri-sec | 2200pF/250Vac Y1/X1 | |
| 4 | Cap4 | Output cap | 1000uF/35V | ESR ≤ 16m Ω (100kHz), Rated ripple ≥ 2920mArms(105°C) (*4) |
| 5 | Cap5 | Output cap | 270uF/35V | ESR ≤ 17m Ω (100kHz), Rated ripple ≥ 2200mArms(125°C) (*5) |
| 6 | Cap6 | Output cap | 270uF/35V | |
| 7 | Cap7 | Output cap | 270uF/35V | |
| 8 | Cap8 | Output cap | 270uF/35V | |
| 9 | F1 | Input Fuse | 6.3A/250Vac | |
| 10 | RV1 | Input VDR | 300VAC | TVR14471K000TB9Y/THINKING |
| 11 | RV2 | Input VDR | 300VAC | TVR14471K000TB9Y/THINKING |
| 12 | RV3 | Input VDR | 300VAC | TVR14471K000TB9Y/THINKING |
| 13 | RV4 | Input VDR | 300VAC | TVR14471K000TB9Y/THINKING |

| No | Location | item | value | Part No |
|----|----------|----------------|---------------------|--------------------------------|
| 14 | GT1 | Input GAS TUBE | 2.5KV/10KA | B88069X8661S102(EF2500X8S) |
| 15 | C1 | Input Y-cap | 100pF/250Vac Y2/X1 | |
| 16 | C2 | Input Y-cap | 4700pF/250Vac Y2/X1 | |
| 17 | C3 | Input X-cap | 1uF /305VAC X2 | |
| 18 | C4 | Input X-cap | 0.47uF /275VAC X2 | |
| 19 | C5 | Input X-cap | 0.47uF /275VAC X2 | |
| 20 | C6 | Input Y-cap | 100pF/250Vac Y2/X1 | |
| 21 | C7 | Input Y-cap | 4700pF/250Vac Y2/X1 | |
| 22 | C8 | Cap for pri-PE | 1500pF/250Vac Y1/X1 | |
| 23 | C9 | output Y-cap | 4700pF/250Vac Y2/X1 | |
| 24 | C10 | output Y-cap | 4700pF/250Vac Y2/X1 | |
| 25 | C11 | output Y-cap | 4700pF/250Vac Y2/X1 | |
| 26 | C12 | output Y-cap | 4700pF/250Vac Y2/X1 | |
| 27 | C13 | Input Y-cap | 100pF/250Vac Y2/X1 | |
| 28 | C14 | Input Y-cap | 100pF/250Vac Y2/X1 | |
| 29 | L1 | Input chock | 6.5mH ϕ 1mm | PH9455.705NL/Pulse Electronics |
| 30 | 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.

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. Natural convection is usually the dominant mode of heat transfer.

Thermal Testing Setup

The following figure shows the testing setup in which the power module is mounted on a 250x300x5mm test Al plate, under natural convection.

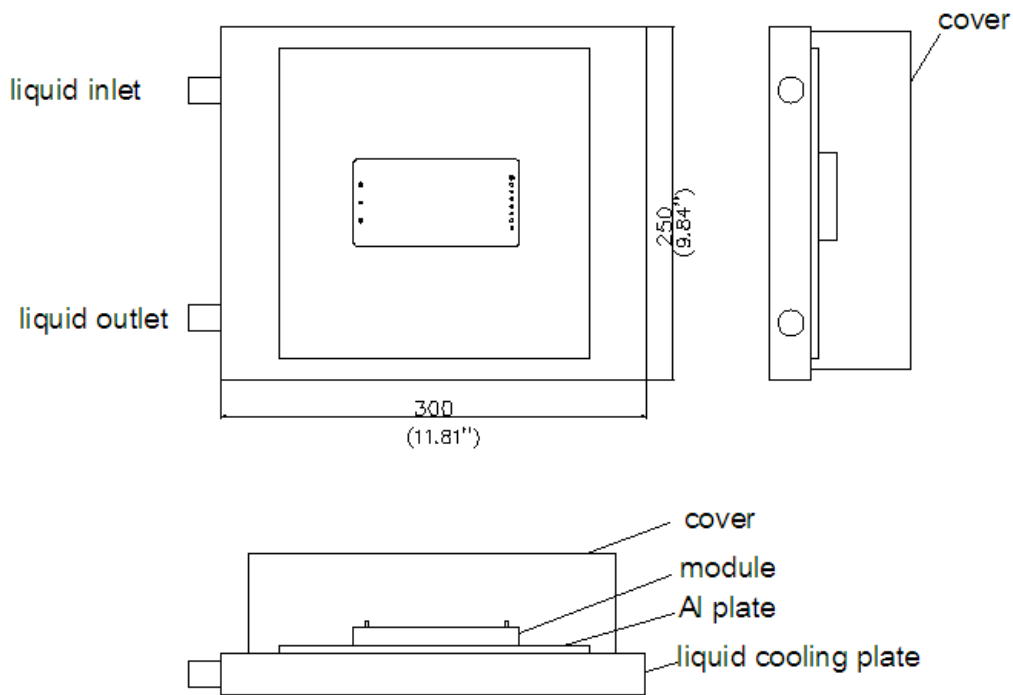


Figure 10: Thermal test setup

THERMAL DERATING CURVE

The following figure shows the location to monitor the temperature of base plate. Before customer decides to use this, a thermal evaluation need to be done to make sure the temperature of base plate is lower than that read from below thermal curves (Figure11 is based on different input voltage).

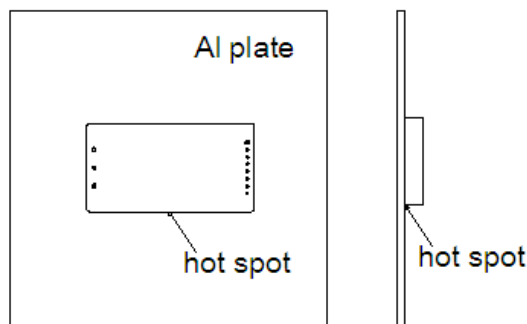


Figure 11: Hot spot's temperature measured point

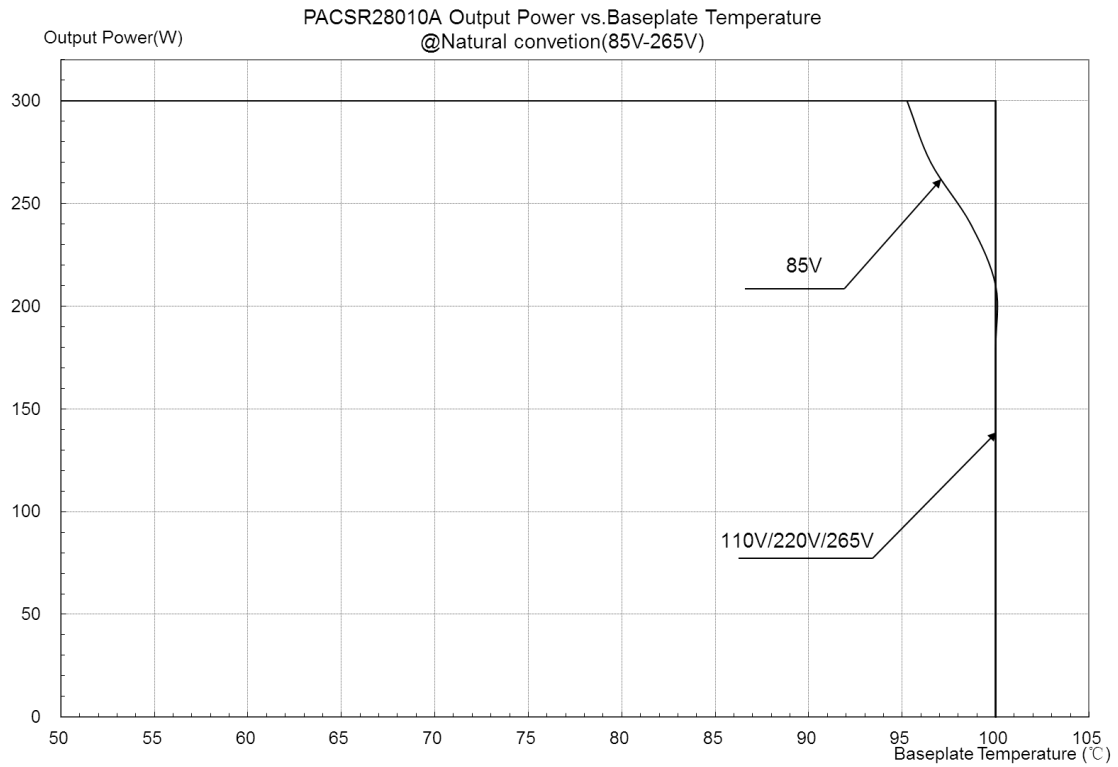
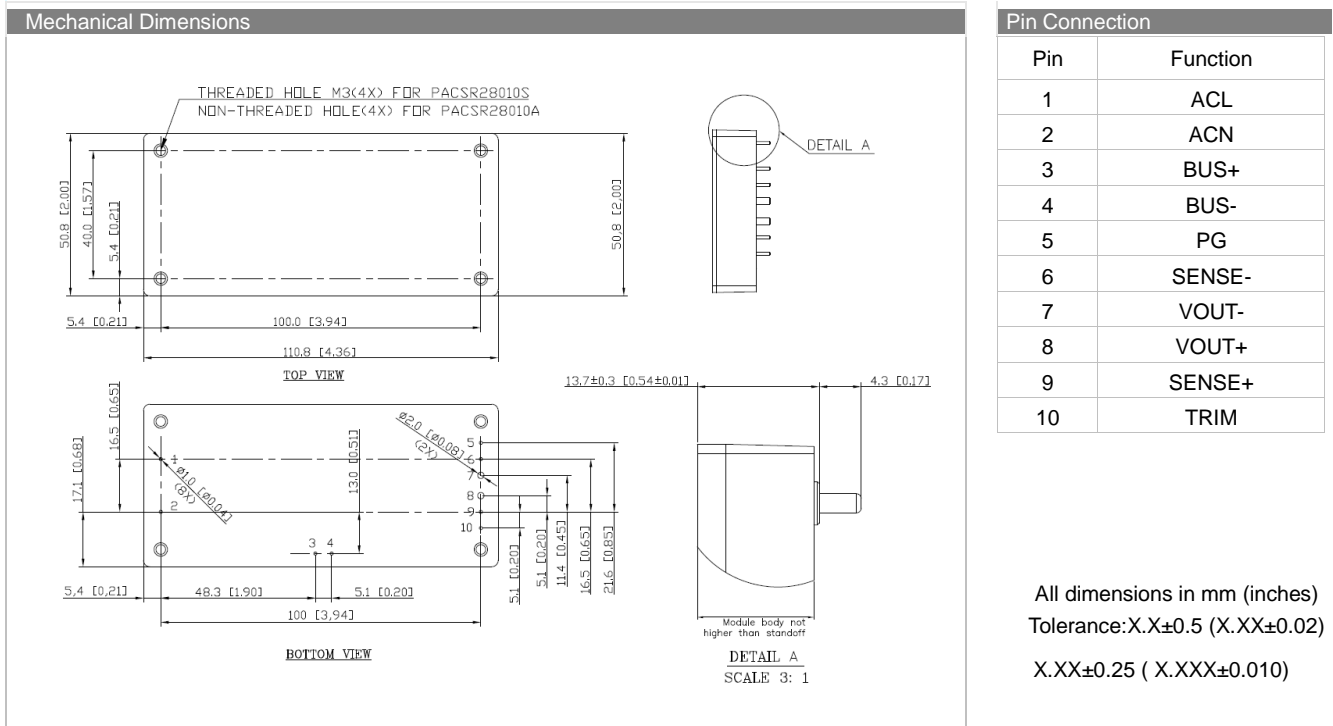


Figure 12: Thermal derating curve

MECHANICAL DRAWING



PHYSICAL OUTLINE

| | |
|---------------|---|
| Case Size | : 110.8x50.8x13.7mm (4.36"x2.00"x0.54") |
| Case Material | : AL plate and Plastic case |
| Weight | : 240±10g |

PART NUMBERING SYSTEM

| P | AC | S | R | 28 | 010 | 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 | 10.5A | A - Through hole S - Screw hole(M3*0.5) |

RECOMMENDED PART NUMBER

| Model Name | Rated Input | Output | EFF @220VAC 100% LOAD |
|-------------|--------------------|-----------|-----------------------|
| PACSR28010A | 100VAC~240VAC 3.8A | 28V 10.5A | 93% |
| PACSR28010S | 100VAC~240VAC 3.8A | 28V 10.5A | 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.

Information furnished by Delta is believed to be accurate and reliable. However, no responsibility is assumed by Delta for its use, nor for any infringements of patents or other rights of third parties, which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Delta. Delta reserves the right to revise these specifications at any time, without notice.