

4855452 INTERNATIONAL RECTIFIER

55C 05195 D

T-25-23

Data Sheet No. PD-4.001C

INTERNATIONAL RECTIFIER **P100, PR100 SERIES****Passivated Assembled Circuit Elements****Major ratings and characteristics**

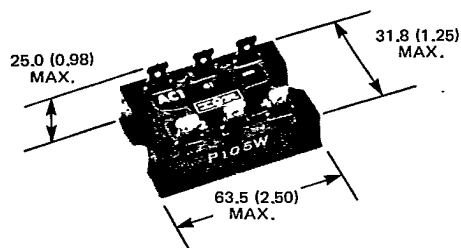
| | | P(R) 100 | Units |
|---------------|------|-------------|---------------------------|
| I_O | | 25 | A |
| I_{TSM} | 50Hz | 357 | A |
| | 60Hz | 375 | A |
| I^2t | 50Hz | 637 | A ² s |
| | 60Hz | 580 | A ² s |
| $I^2\sqrt{t}$ | | 6365 | A ² \sqrt{s} |
| V_{RRM} | | 400 to 1200 | V |
| V_{INS} | | 2500 | V |
| T_J | | -40 to 125 | °C |

Description

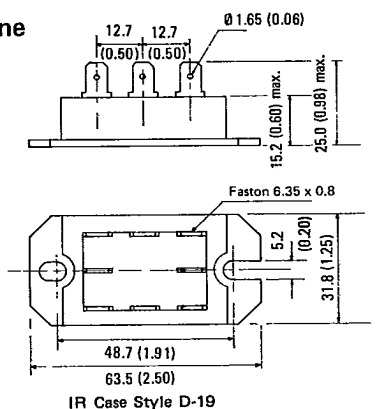
The P100 series of Integrated Power Circuits consists of power thyristors and power diodes configured in a single package. With its isolating base plate mechanical designs are greatly simplified giving advantages of cost reduction and reduced size. Applications include power supplies, control circuits and battery chargers.

Features

- Glass passivated junctions for greater reliability
- Electrically isolated base plate
- Available up to 1200V V_{RRM} , V_{DRM}
- High dynamic Characteristics.
- Available with screw terminals as "PR" series.

D**CASE STYLE AND DIMENSIONS****"P" Outline**

See page D-52
for PR outline



IR Case Style D-19

All dimensions in mm (inches)

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ELECTRICAL SPECIFICATIONS

Voltage ratings

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| Type number | V_{RRM} , maximum repetitive peak reverse voltage $V_g \leq 0$ | V_{RSM} , maximum non-repetitive peak reverse voltage | V_{DRM} , maximum repetitive peak off-state voltage, gate open circuit |
|---|---|---|--|
| | V | V | V |
| P(R)101, P(R)111, P(R)121, P(R)131, P(R)141, P(R)161, P(R)171 | 400 | 500 | 400 |
| P(R)102, P(R)112, P(R)122, P(R)132, P(R)142, P(R)162, P(R)172 | 600 | 700 | 600 |
| P(R)103, P(R)113, P(R)123, P(R)133, P(R)143, P(R)163, P(R)173 | 800 | 900 | 800 |
| P(R)104, P(R)114, P(R)124, P(R)134, P(R)144, P(R)164, P(R)174 | 1000 | 1100 | 1000 |
| P(R)105, P(R)115, P(R)125, P(R)135, P(R)145, P(R)165, P(R)175 | 1200 | 1300 | 1200 |

Forward conduction

| | P(R)100 Series | Units | Conditions |
|---|----------------|-----------------------------|---|
| I_C Maximum DC output current | 25 | A | $T_g = 85^\circ\text{C}$, full bridge circuits 0, 1, 2 and 3 |
| $I_{T(AV)}$ $I_{F(AV)}$ Maximum average on-state and forward current | 12.5 | A | 180° sine wave conduction circuits 0, 1, 2, 3, 4, 6 and 7 |
| I_{RMS} Maximum RMS current | 28 | A | 180° sine wave conduction circuit 4 |
| I_{TSM} OR I_{FSM} Maximum peak, one-cycle non-repetitive on-state or forward current | 300 | A | 10ms 100% V_{RRM} |
| | 315 | A | 8.3ms reapplied |
| | 357 | A | 10ms No voltage |
| | 375 | A | 8.3ms reapplied |
| I^2t Maximum I^2t for fusing | 450 | A^2s | 10ms 100% V_{RRM} |
| | 410 | A^2s | 8.3ms reapplied |
| | 637 | A^2s | 10ms No voltage |
| | 580 | A^2s | 8.3ms reapplied |
| $I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing ① | 6365 | $\text{A}^2\sqrt{\text{s}}$ | $t = 0.1$ to 10ms, no voltage reapplied |
| $V_{T(TO)}$ Maximum value of threshold voltage | 0.82 | V | $T_J = 125^\circ\text{C}$ |
| r_T Maximum value of on-state slope resistance | 12 | m Ω | $T_J = 125^\circ\text{C}$ |
| V_{TM} V_{FM} Maximum peak on-state or forward voltage | 1.35 | V | $I_{TM} = \pi \times I_{T(AV)}$ |
| | 1.35 | V | $I_{FM} = \pi \times I_{F(AV)}$ |
| di/dt Maximum non-repetitive rate of rise of turned on current | 200 | A/ μs | $T_J = 125^\circ\text{C}$, from 0.67 V_{DRM} , $I_{TM} = \pi \times I_{T(AV)}$, $I_g = 500\text{mA}$, $t_r < 0.5 \mu\text{s}$, $t_p > 6 \mu\text{s}$ |
| I_H Maximum holding current | 100 | mA | $T_J = 25^\circ\text{C}$, anode supply = 6V, resistive load, gate open circuit |
| I_L Maximum latching current | 250 | mA | $T_J = 25^\circ\text{C}$, anode supply = 6V, resistive load |

Triggering

| | | | |
|---|-----|----|---|
| P_{GM} Maximum peak gate power | 8.0 | W | |
| $P_{G(AV)}$ Maximum average gate power | 2.0 | W | |
| I_{GM} Maximum peak gate current | 2.0 | A | |
| $-V_{GM}$ Maximum peak negative gate voltage | 10 | V | |
| V_{GT} Maximum gate voltage required to trigger | 3.0 | V | $T_J = -40^\circ\text{C}$ |
| | 2.0 | V | $T_J = 25^\circ\text{C}$ |
| | 1.0 | V | $T_J = 125^\circ\text{C}$ |
| I_{GT} Maximum gate current required to trigger | 90 | mA | $T_J = -40^\circ\text{C}$ |
| | 60 | mA | $T_J = 25^\circ\text{C}$ |
| | 35 | mA | $T_J = 125^\circ\text{C}$ |
| V_{GD} Maximum gate voltage that will not trigger | 0.2 | V | $T_J = 125^\circ\text{C}$, rated V_{DRM} applied |
| I_{GD} Maximum gate current that will not trigger | | mA | |

Blocking

| | | | |
|--|------|------------------|---|
| dv/dt Maximum critical rate of rise of off-state voltage | 200 | V/ μs | $T_J = 125^\circ\text{C}$, exponential to 0.67 V_{DRM} , gate open circuit |
| I_{RM} I_{DM} Maximum peak reverse and off-state leakage current at V_{RRM} , V_{DRM} | 10 | mA | $T_J = T_J \text{ max}$, gate open circuit |
| V_{INS} RMS isolation voltage | 2500 | V | 50Hz, circuit to base, all terminals shorted |

① I^2t for time $t_x = I^2\sqrt{t} \cdot \sqrt{t_x}$

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THERMAL AND MECHANICAL SPECIFICATIONS

| | | P(R)100 Series | Units | Conditions |
|------------|---|----------------|----------|--|
| T_J | Junction operating temperature range | -40 to 125 | °C | |
| T_{stg} | Storage temperature range | -40 to 150 | °C | |
| R_{thJC} | Maximum internal thermal resistance, one junction to case | 2.24 | K/W | DC Operation |
| R_{thCS} | Maximum thermal resistance, base to heatsink | 0.10 | K/W | Mounting surface smooth and greased |
| T | Mounting torque, base to heatsink $\pm 10\%$ | 5 | Nm | A mounting compound is recommended and the torque should be checked after a period of about 3 hrs to allow for the spread of the compound. |
| wt | Approximate weight | P100 | 58 (2.0) | g (oz) |
| | | PR100 | 90 (3.2) | g (oz) |

CIRCUIT TYPES AND CODING*

| | Circuit "0" | Circuit "1" | Circuit "2" | Circuit "3" | Circuit "4" | Circuit "6" | Circuit "7" |
|---|---|---|---|------------------------------|---------------|----------------|-------------|
| Terminal Positions "P" "PR" | | | | | | | |
| Schematic Diagram | | | | | | | |
| | Single Phase, Hybrid Bridge, Common Cathode | Single Phase, Hybrid Bridge, Common Anode | Single Phase, Hybrid Bridge, Doubler Connection | Single Phase, All SCR Bridge | SCR AC Switch | Hybrid Doubler | SCR Doubler |
| Basic series | P(R)10_* | P(R)11_* | P(R)12_* | P(R)13_* | P(R)14_* | P(R)16_* | P(R)17_* |
| With voltage suppression | P(R)10_K | P(R)11_K | P(R)12_K | P(R)13_K | P(R)14_K | — | — |
| With free-wheeling diode | P(R)10_W | P(R)11_W | — | — | — | — | — |
| With both voltage suppression and free-wheeling diode | P(R)10_KW | P(R)11_KW | — | — | — | — | — |

*To complete code refer to voltage ratings table, i.e. for 600V P(R)10_KW complete code is P102KW.

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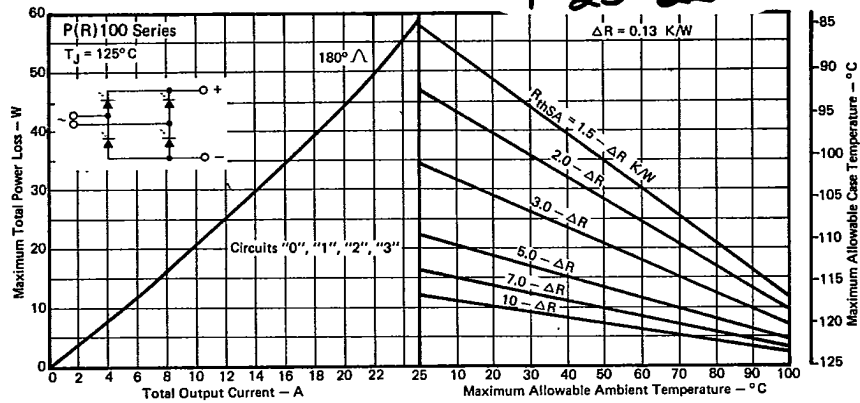


Fig. 1 - Current Rating Nomogram (1 Module Per Heatsink), Circuits '0', '1', '2', '3'

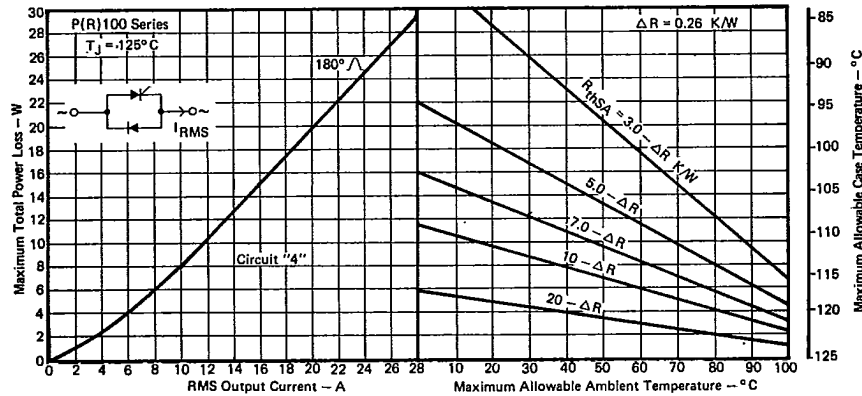


Fig. 2 - Current Rating Nomogram (1 Module Per Heatsink), Circuit '4'

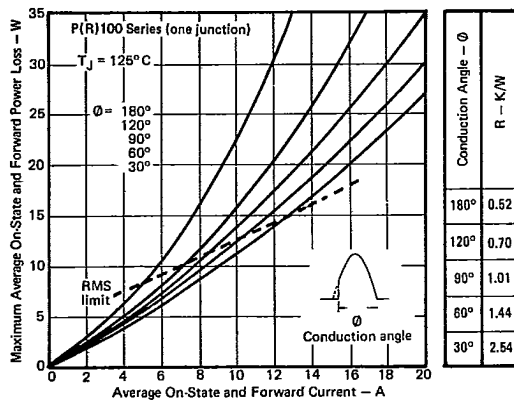


Fig. 3 - Maximum On-State and Forward Power Loss Vs. On-State and Forward Current (Sinusoidal Current Waveform)

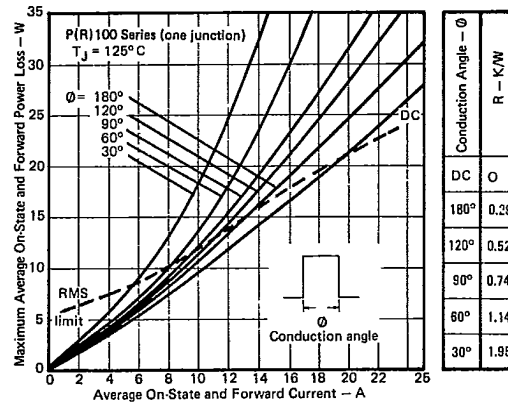


Fig. 4 - Maximum On-State and Forward Power Loss Vs. On-State and Forward Current (Rectangular Current Waveform)

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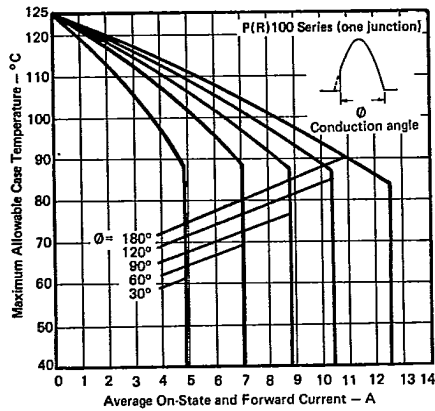


Fig. 5 - Average On-State and Forward Current Vs. Maximum Allowable Case Temperature (Sinusoidal Current Waveform)

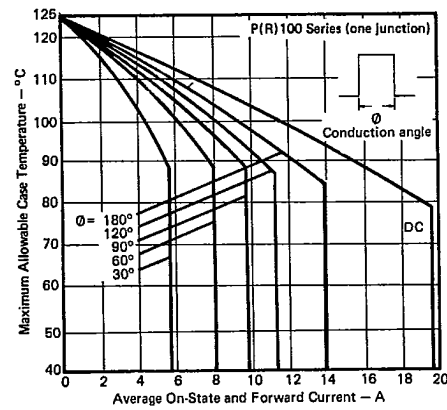


Fig. 6 - Average On-State and Forward Current Vs. Maximum Allowable Case Temperature (Rectangular Current Waveform)

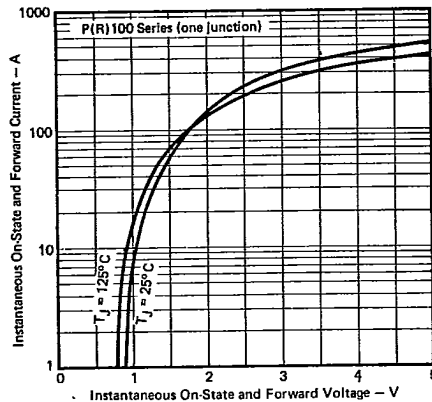


Fig. 7 - Maximum On-State and Forward Voltage Vs. On-State and Forward Current

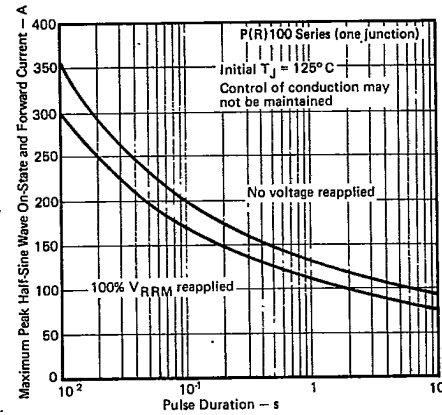


Fig. 8 - Maximum Non-Repetitive Surge Current Vs. Pulse Duration

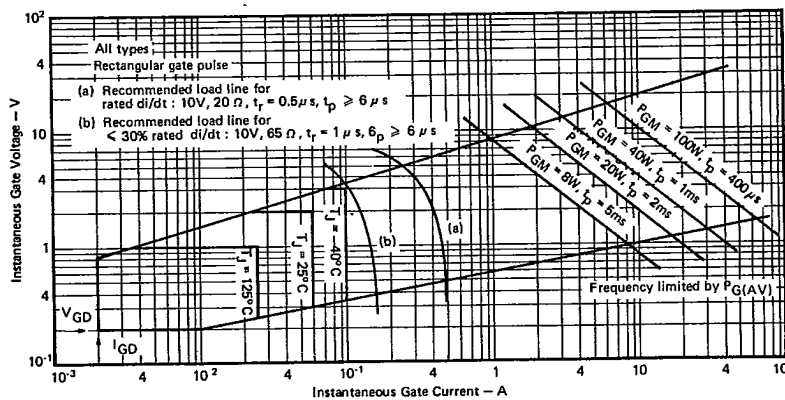


Fig. 9 - Gate Characteristics / Fig. 10 - Area of All Possible Triggering Points

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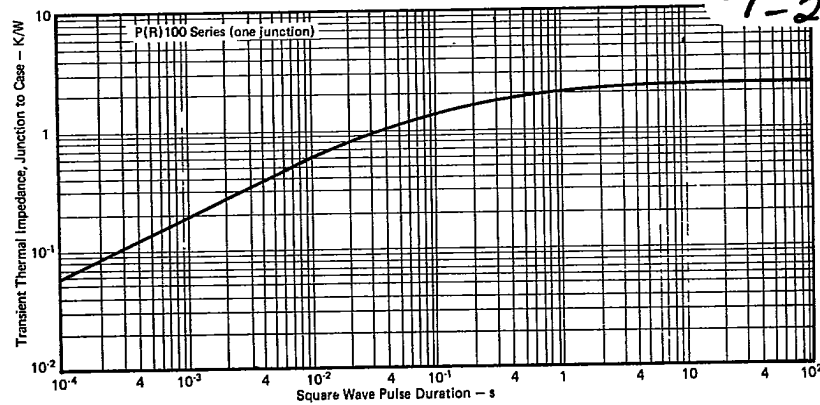
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Fig. 11 - Maximum Transient Thermal Impedance,
One-Junction-to-Case Vs. Pulse Duration

