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^2s
	60Hz	580	A^2s
$I^2\sqrt{t}$		6365	$A^2\sqrt{s}$
V_{RRM}		400 to 1200	V
V_{INS}		2500	V
T_J		–40 to 125	°C

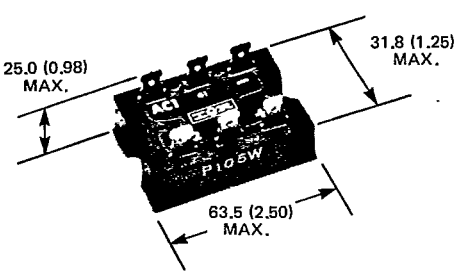
Description

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

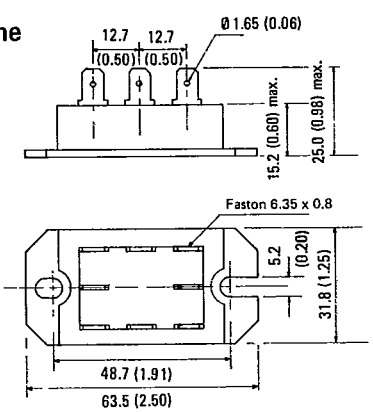
- Glass passivated junctions for greater reliability
- Electrically isolated base plate
- Available up to 1200V V_{RRM}, V_{DRM}
- High dynamic Characteristics.
- Available with screw terminals as "PR" series.

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

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_C = 85°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} reapplied	Sinusoidal half wave, initial $T_J = T_J$ max
		315	A	8.3ms		
		357	A	10ms	No voltage reapplied	
		375	A	8.3ms		
I^2t	Maximum I^2t for fusing	450	A^2s	10ms	100% V_{RRM} reapplied	Initial $T_J = T_J$ max
		410	A^2s	8.3ms		
		637	A^2s	10ms	No voltage reapplied	
		580	A^2s	8.3ms		
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing ①	6365	$A^2\sqrt{s}$	t = 0.1 to 10ms, no voltage reapplied		
$V_{T(TO)}$	Maximum value of threshold voltage	0.82	V	T_J = 125°C		
r_T	Maximum value of on-state slope resistance	12	mΩ	T_J = 125°C		
V_{TM}	Maximum peak on-state or forward voltage	1.35	V	$I_{TM} = \pi \times I_{T(AV)}$	T_J = 25°C, 180° conduction	
V_{FM}		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°C, from 0.67 V_{DRM}, $I_{TM} = \pi \times I_{T(AV)}$, I_g = 500mA, tr < 0.5 μs, t_p > 6 μs		
I_H	Maximum holding current	100	mA	T_J = 25°C, anode supply = 6V, resistive load, gate open circuit		
I_L	Maximum latching current	250	mA	T_J = 25°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°C	Anode supply = 6V resistive load
		2.0	V	T_J = 25°C	
		1.0	V	T_J = 125°C	
I_{GT}	Maximum gate current required to trigger	90	mA	T_J = −40°C	Anode supply = 6V resistive load
		60	mA	T_J = 25°C	
		35	mA	T_J = 125°C	
V_{GD}	Maximum gate voltage that will not trigger	0.2	V	T_J = 125°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°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 2.0	mA	$T_J = T_J$ 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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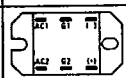
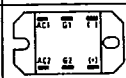
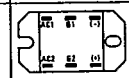
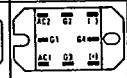
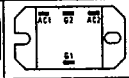
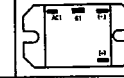
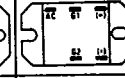
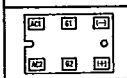
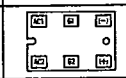
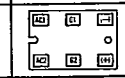
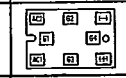
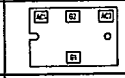
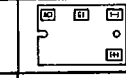
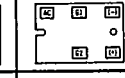
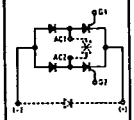
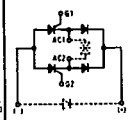
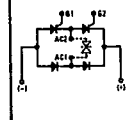
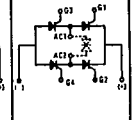
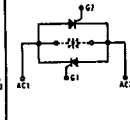
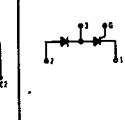
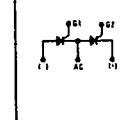
THERMAL AND MECHANICAL SPECIFICATIONS

			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 ± 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"
"P" Terminal Positions							
"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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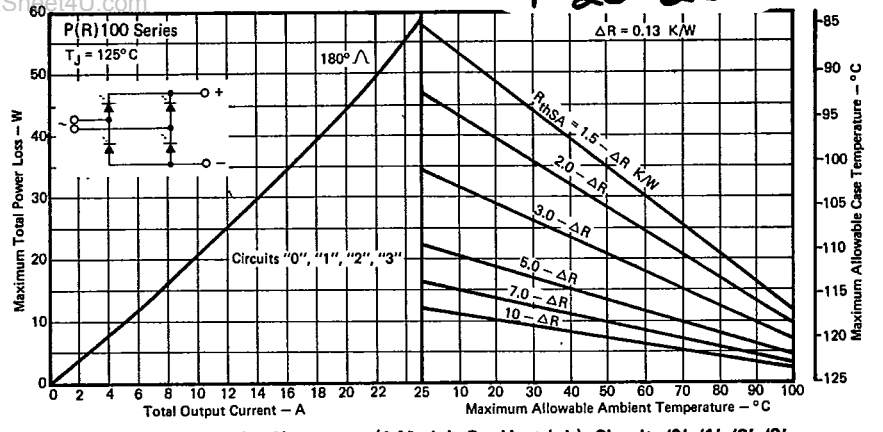


Fig. 1 — Current Rating Nomogram (1 Module Per Heatsink), Circuits '0', '1', '2', '3'

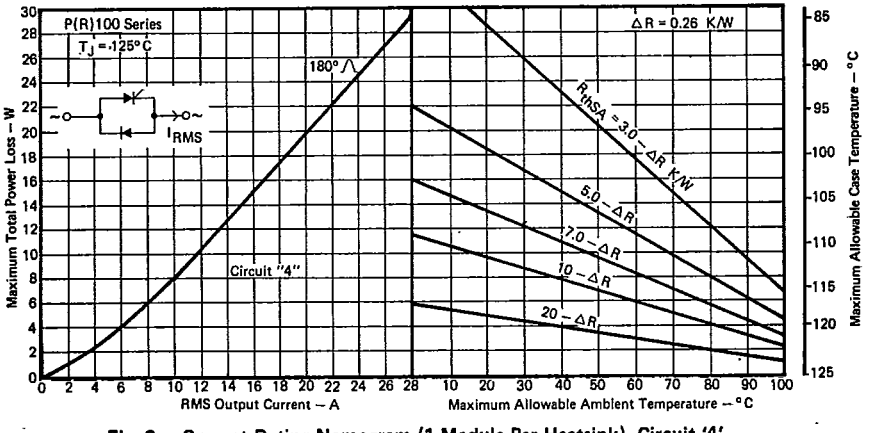
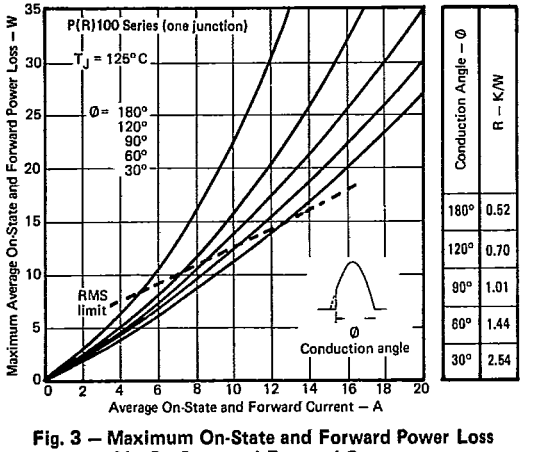
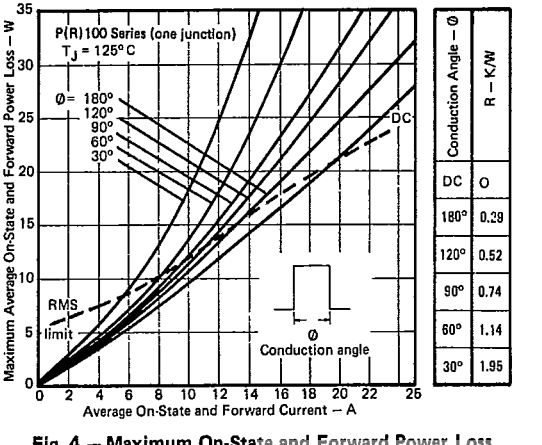


Fig. 2 — Current Rating Nomogram (1 Module Per Heatsink), Circuit '4'



Conduction Angle — Ø	R — K/W
180°	0.52
120°	0.70
90°	1.01
60°	1.44
30°	2.54

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



Conduction Angle — Ø	R — K/W
DC	0
180°	0.29
120°	0.52
90°	0.74
60°	1.14
30°	1.95

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

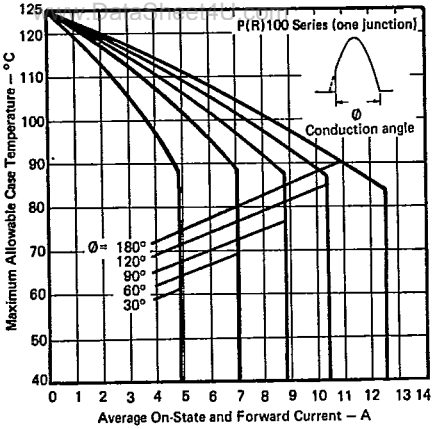


Fig. 5 — Average On-State and Forward Current Vs. Maximum Allowable Case Temperature (Sinusoidal Current Waveform)

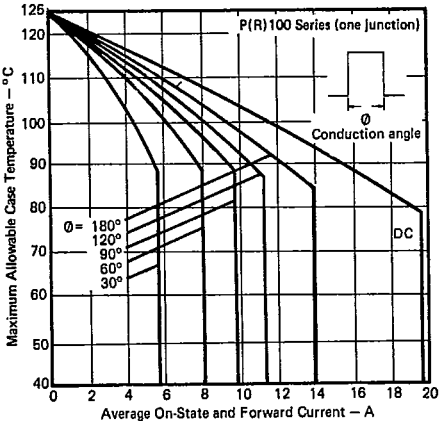


Fig. 6 — Average On-State and Forward Current Vs. Maximum Allowable Case Temperature (Rectangular Current Waveform)

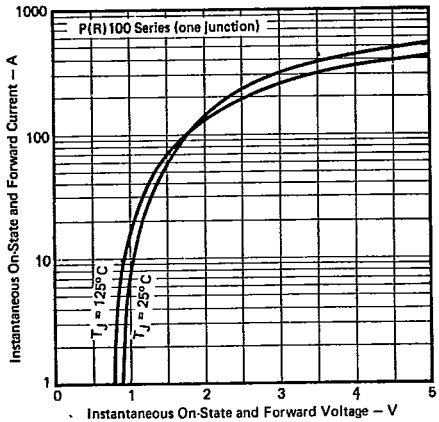


Fig. 7 — Maximum On-State and Forward Voltage Vs. On-State and Forward Current

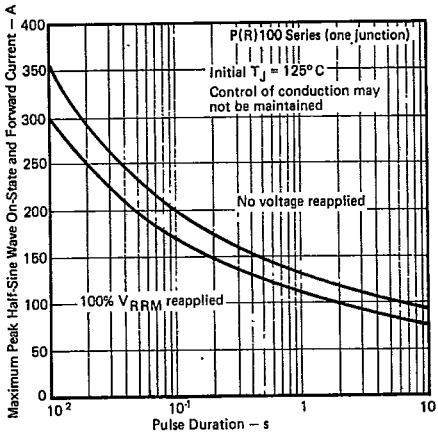


Fig. 8 — Maximum Non-Repetitive Surge Current Vs. Pulse Duration

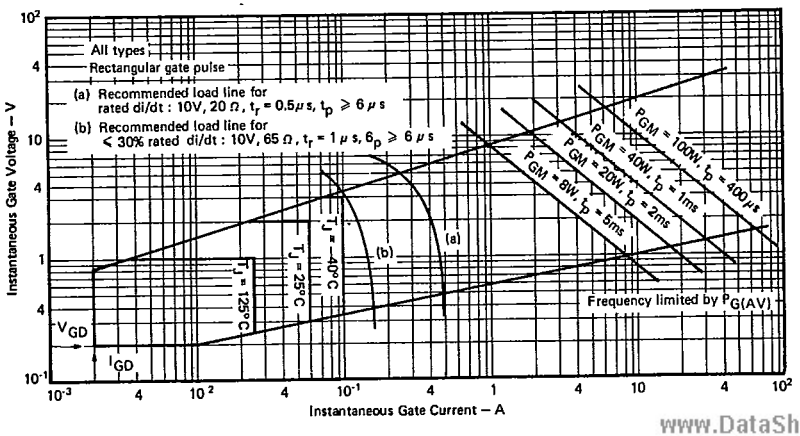


Fig. 9 — Gate Characteristics / Fig. 10 — Area of All Possible Triggering Points

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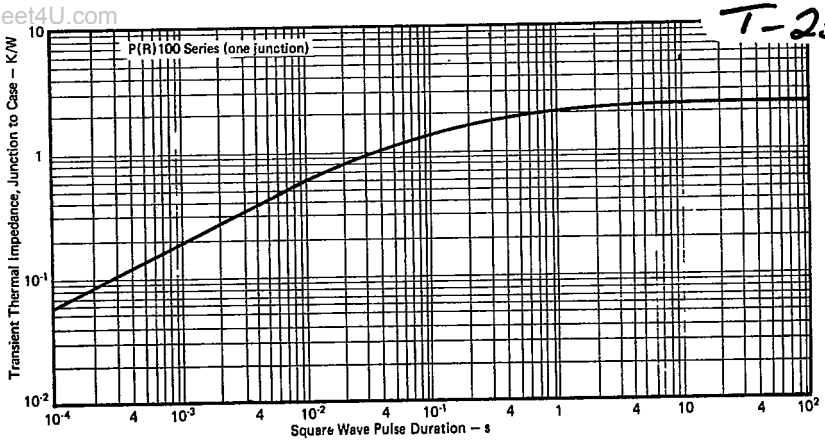
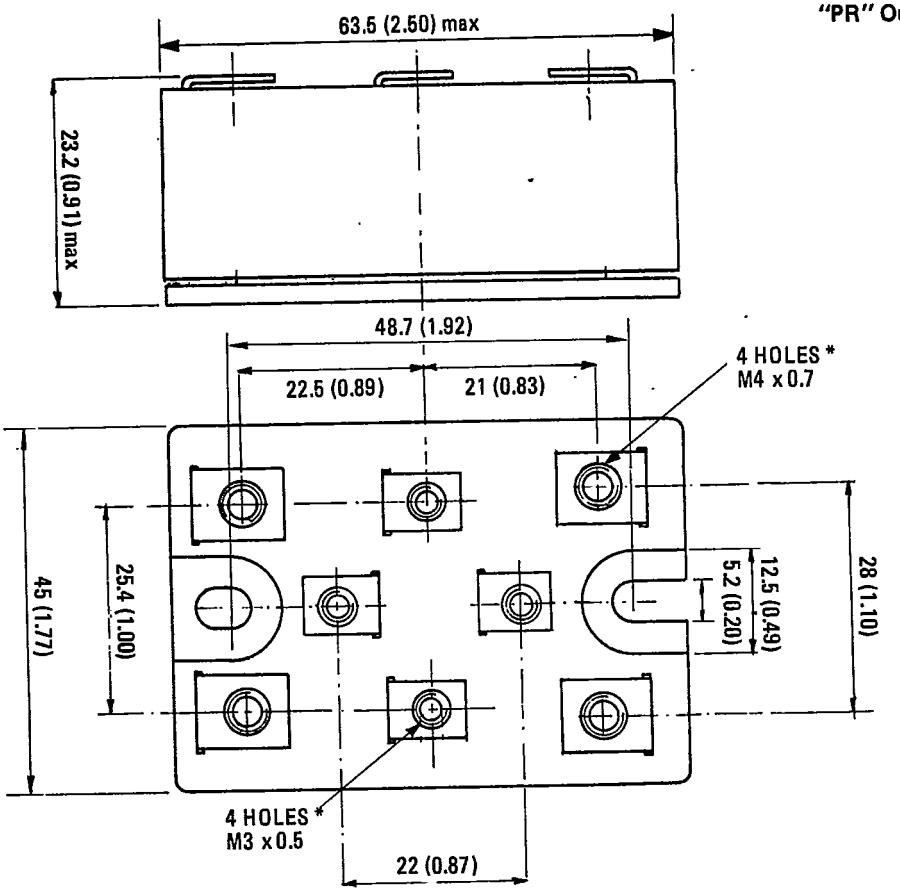


Fig. 11 – Maximum Transient Thermal Impedance, One-Junction-to-Case Vs. Pulse Duration

"PR" Outline



* number will vary with circuit configuration.

All dimensions in millimetres (inches)