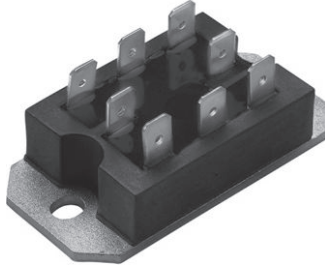


## Power Modules, Passivated Assembled Circuit Elements, 25 A



PACE-PAK (D-19)

### FEATURES

- Glass passivated junctions for greater reliability
- Electrically isolated base plate
- Available up to 1200  $V_{RRM}/V_{DRM}$
- High dynamic characteristics
- Wide choice of circuit configurations
- Simplified mechanical design and assembly
- UL E78996 approved
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



RoHS  
COMPLIANT

### DESCRIPTION

The VS-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.

PRIMARY CHARACTERISTICS	
$I_o$	25 A
Type	Modules - thyristor, standard
Package	PACE-PAK (D-19)

MAJOR RATINGS AND CHARACTERISTICS			
SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_o$	85 °C	25	A
$I_{TSM}$	50 Hz	357	A
	60 Hz	375	
$I^2t$	50 Hz	637	A <sup>2</sup> s
	60 Hz	580	
$I^2\sqrt{t}$		6365	A <sup>2</sup> √s
$V_{DRM}, V_{RRM}$		400 to 1200	V
$V_{ISOL}$		2500	V
$T_J$	Range	-40 to +125	°C
$T_{Stg}$		-40 to +125	°C

### ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS			
TYPE NUMBER	$V_{RRM}/V_{DRM}$ , MAXIMUM REPETITIVE PEAK REVERSE AND PEAK OFF-STATE VOLTAGE V	$V_{RSM}$ , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	$I_{RRM}$ MAXIMUM AT $T_J$ MAXIMUM mA
VS-P101, VS-P121, VS-P131	400	500	10
VS-P102, VS-P122, VS-P132	600	700	
VS-P103, VS-P123, VS-P133	800	900	
VS-P103, VS-P124, VS-P134	1000	1100	
VS-P105, VS-P125, VS-P135	1200	1300	



ON-STATE CONDUCTION					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum DC output current at case temperature	I <sub>O</sub>	Full bridge		25	A
				85	°C
Maximum peak, one-cycle non-repetitive on-state or forward current	I <sub>TSM</sub> , I <sub>FSM</sub>	t = 10 ms	No voltage reapplied	Sinusoidal half wave, initial T <sub>J</sub> = T <sub>J</sub> maximum	A
		t = 8.3 ms			
		t = 10 ms	100 % V <sub>RRM</sub> reapplied		
		t = 8.3 ms			
Maximum I <sup>2</sup> t for fusing	I <sup>2</sup> t	t = 10 ms	No voltage reapplied		A <sup>2</sup> s
		t = 8.3 ms			
		t = 10 ms	100 % V <sub>RRM</sub> reapplied		
		t = 8.3 ms			
Maximum I <sup>2</sup> √t for fusing	I <sup>2</sup> √t	t = 0.1 ms to 10 ms, no voltage reapplied I <sup>2</sup> t for time t <sub>x</sub> = I <sup>2</sup> √t · √t <sub>x</sub>		6365	A <sup>2</sup> √s
Maximum value of threshold voltage	V <sub>T(TO)</sub>	T <sub>J</sub> = 125 °C		0.82	V
Maximum level value of on-state slope resistance	r <sub>t1</sub>	T <sub>J</sub> = 125 °C, average power = V <sub>T(TO)</sub> × I <sub>T(AV)</sub> + r <sub>t</sub> + (I <sub>T(RMS)</sub> ) <sup>2</sup>		12	mΩ
Maximum on-state voltage drop	V <sub>TM</sub>	I <sub>TM</sub> = π × I <sub>T(AV)</sub>	T <sub>J</sub> = 25 °C	1.35	V
Maximum forward voltage drop	V <sub>FM</sub>	I <sub>FM</sub> = π × I <sub>F(AV)</sub>	T <sub>J</sub> = 25 °C	1.35	V
Maximum non-repetitive rate of rise of turned-on current	di/dt	T <sub>J</sub> = 125 °C from 0.67 V <sub>DRM</sub> I <sub>TM</sub> = π × I <sub>T(AV)</sub> , I <sub>g</sub> = 500 mA, t <sub>r</sub> < 0.5 μs, t <sub>p</sub> > 6 μs		200	A/μs
Maximum holding current	I <sub>H</sub>	T <sub>J</sub> = 25 °C anode supply = 6 V, resistive load, gate open		130	mA
Maximum latching current	I <sub>L</sub>	T <sub>J</sub> = 25 °C anode supply = 6 V, resistive load		250	

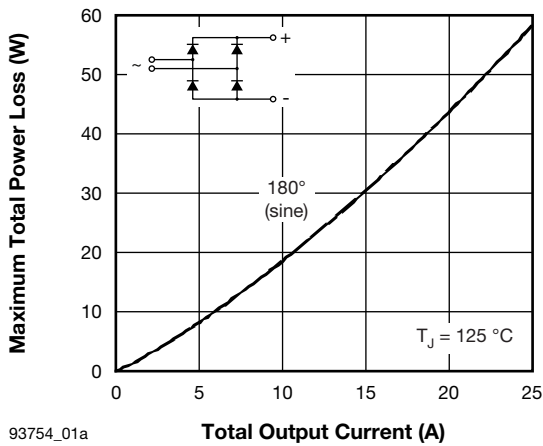
BLOCKING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum critical rate of rise of off-state voltage	dV/dt	T <sub>J</sub> = 125 °C, exponential to 0.67 V <sub>DRM</sub> gate open		200	V/μs
Maximum peak reverse and off-state leakage current at V <sub>RRM</sub> , V <sub>DRM</sub>	I <sub>RRM</sub> , I <sub>DRM</sub>	T <sub>J</sub> = 125 °C, gate open circuit		10	mA
Maximum peak reverse leakage current	I <sub>RRM</sub>	T <sub>J</sub> = 25 °C		100	μA
RMS isolation voltage	V <sub>ISOL</sub>	50 Hz, circuit to base, all terminals shorted, T <sub>J</sub> = 25 °C, t = 1 s		2500	V

TRIGGERING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum peak gate power	P <sub>GM</sub>			8	W
Maximum average gate power	P <sub>G(AV)</sub>			2	
Maximum peak gate current	I <sub>GM</sub>			2	A
Maximum peak negative gate voltage	-V <sub>GM</sub>			10	V
Maximum gate voltage required to trigger	V <sub>GT</sub>	T <sub>J</sub> = -40 °C		3	V
		T <sub>J</sub> = 25 °C		2	
		T <sub>J</sub> = 125 °C		1	
Maximum gate current required to trigger	I <sub>GT</sub>	T <sub>J</sub> = -40 °C		90	mA
		T <sub>J</sub> = 25 °C		60	
		T <sub>J</sub> = 125 °C		35	
Maximum gate voltage that will not trigger	V <sub>GD</sub>	T <sub>J</sub> = 125 °C, rated V <sub>DRM</sub> applied		0.2	V
Maximum gate current that will not trigger	I <sub>GD</sub>			2	mA

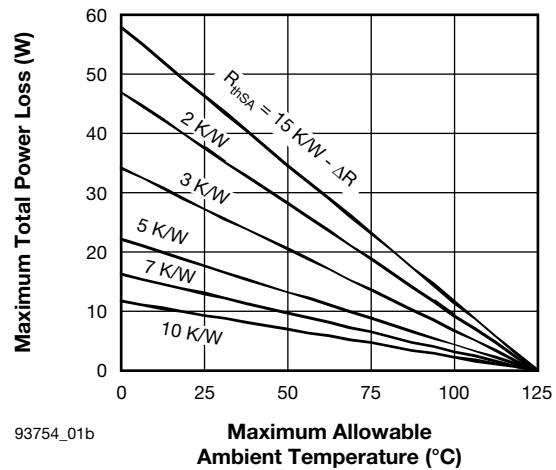
THERMAL AND MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction operating and storage temperature range	$T_J, T_{Stg}$		-40 to +125	°C
Maximum thermal resistance, junction to case per junction	$R_{thJC}$	DC operation	2.24	K/W
Maximum thermal resistance, case to heatsink	$R_{thCS}$	Mounting surface, smooth and greased	0.10	
Mounting torque, base to heatsink <sup>(1)</sup>			4	Nm
Approximate weight			58	g
			2.0	oz.
Case style			PACE-PAK (D-19)	

**Note**

(1) A mounting compound is recommended and the torque should be checked after a period of 3 hours to allow for the spread of the compound

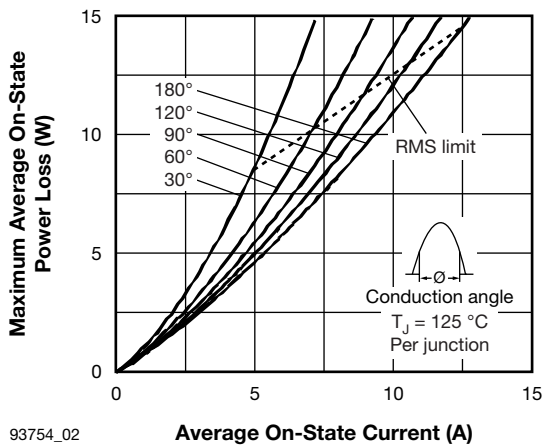


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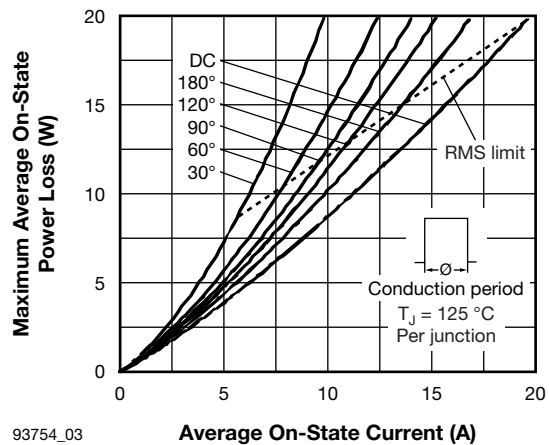
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Fig. 1 - Current Ratings Nomogram (1 Module Per Heatsink)



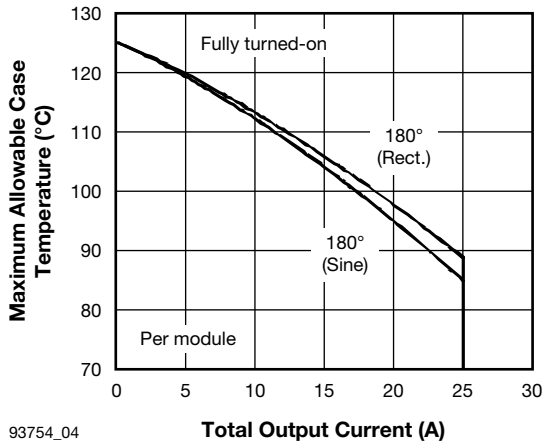
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Fig. 2 - On-State Power Loss Characteristics



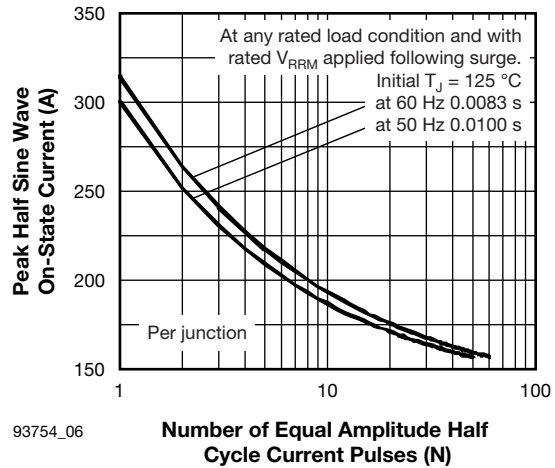
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Fig. 3 - On-State Power Loss Characteristics



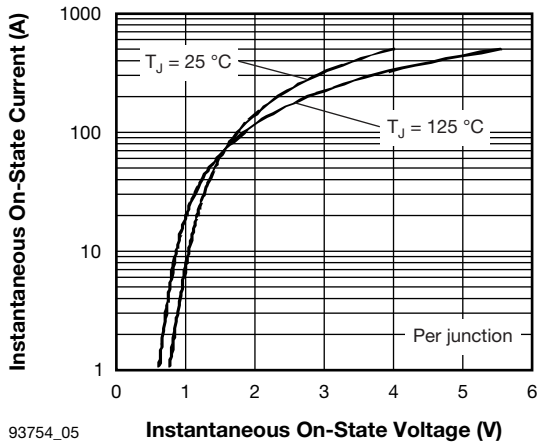
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Fig. 4 - Current Ratings Characteristics



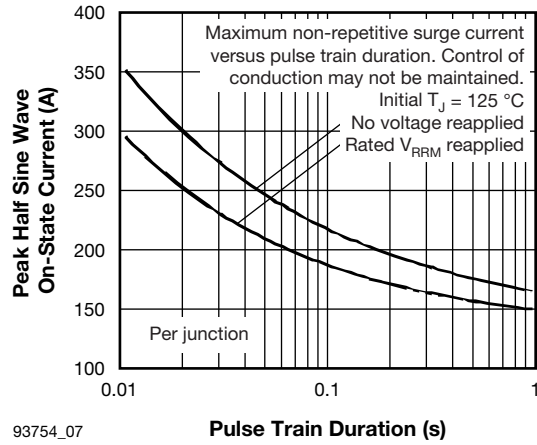
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Fig. 6 - Maximum Non-Repetitive Surge Current



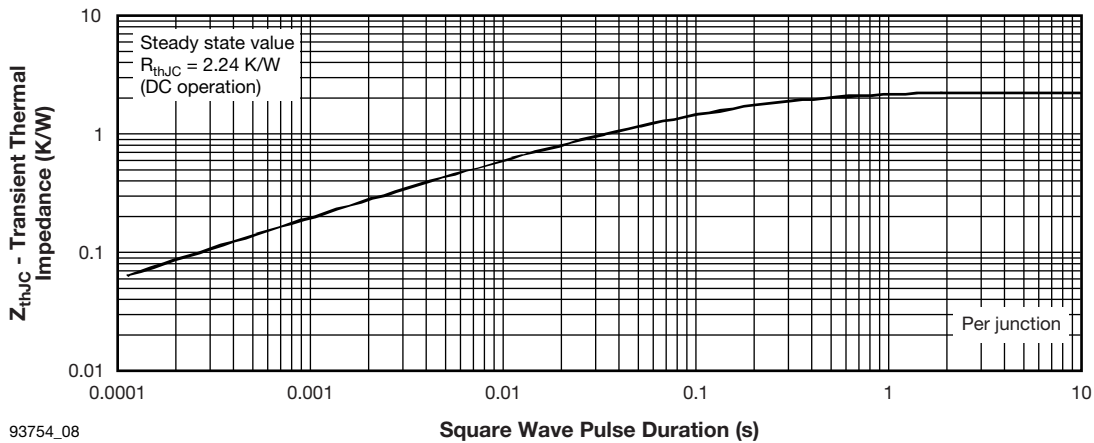
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Fig. 5 - On-State Voltage Drop Characteristics



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Fig. 7 - Maximum Non-Repetitive Surge Current



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Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristics

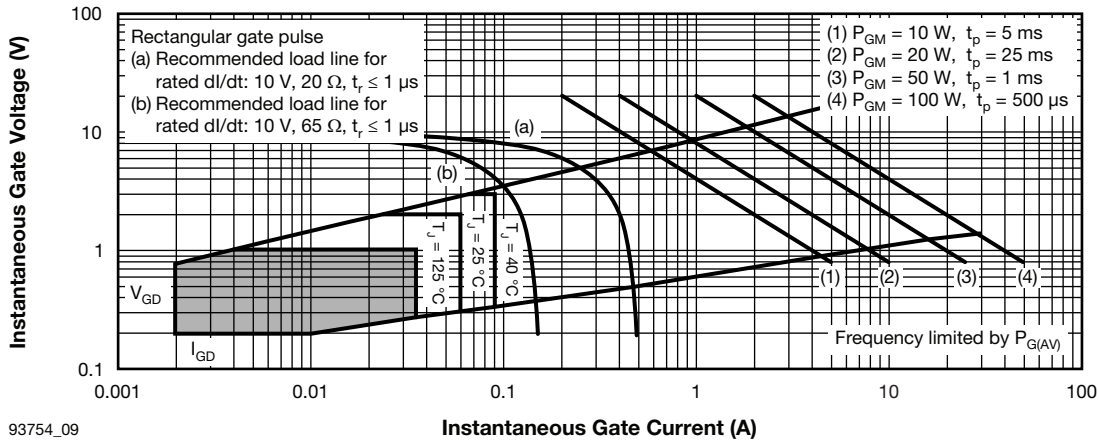


Fig. 9 - Gate Characteristics

**ORDERING INFORMATION TABLE**

Device code	<b>VS-</b>	<b>P</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>K</b>	<b>W</b>
	(1)	(2)	(3)	(4)	(5)	(6)	(7)

- 1** - Vishay Semiconductors product
- 2** - Module type
- 3** - Current rating  
 1 = 25 A DC (P100 series)  
 4 = 40 A DC (P400 series)
- 4** - Circuit configuration  
 0 = single phase, hybrid bridge common cathode  
 2 = single phase, hybrid bridge doubler connection  
 3 = single phase, all SCR Bridge
- 5** - Voltage code  
 1 = 400 V  
 2 = 600 V  
 3 = 800 V  
 4 = 1000 V  
 5 = 1200 V
- 6** - K = optional voltage suppression
- 7** - W = optional freewheeling diode

CIRCUIT CONFIGURATION			
CIRCUIT DESCRIPTION	CIRCUIT CONFIGURATION CODE	SCHEMATIC DIAGRAM	TERMINAL POSITIONS
Single phase, hybrid bridge common cathode	0		
Single phase, hybrid bridge doubler connection	2		
Single phase, all SCR bridge	3		

CODING (1)					
CIRCUIT DESCRIPTION	CIRCUIT CONFIGURATION CODE	BASIC SERIES	WITH VOLTAGE SUPPRESSION	WITH FREEWHEELING DIODE	WITH BOTH VOLTAGE SUPPRESSION AND FREEWHEELING DIODE
Single phase, hybrid bridge common cathode	0	P10.	P10.K	P10.W	P10.KW
Single phase, hybrid bridge doubler connection	2	P12.	P12.K	-	-
Single phase, all SCR bridge	3	P13.	P13.K	-	-

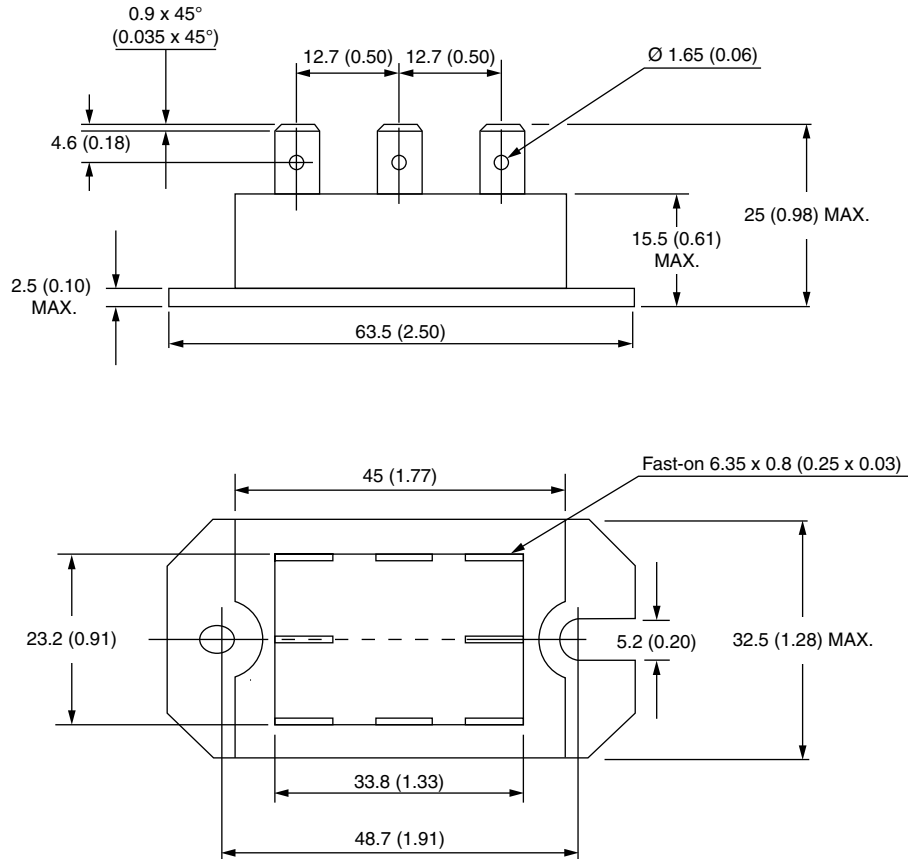
**Note**

(1) To complete code refer to Voltage Ratings table, i.e.: for 600 V P10.W complete code is P102W

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95335">www.vishay.com/doc?95335</a>

## D-19 PACE-PAK

**DIMENSIONS** in millimeters (inches)





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