

STARPOWER

SEMICONDUCTOR

Rectifier

RD180PBS180C5S

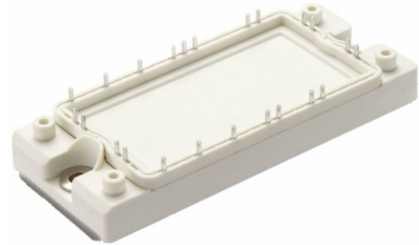
1800V/180A 6 in one-package

General Description

STARPOWER Rectifier Power Module provides ultra low conduction loss. They are designed for the applications such as SMPS.

Features

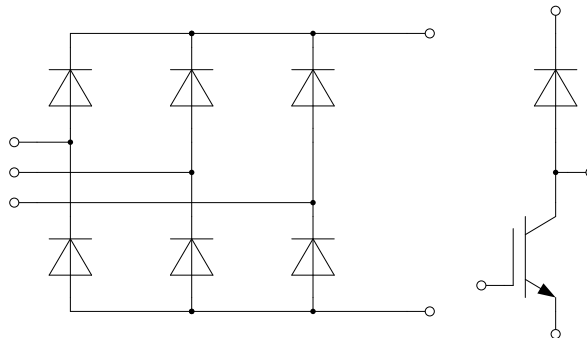
- Low forward voltage drop
- Small temperature coefficient
- High surge capacity
- Low inductance
- Isolated copper baseplate using DBC technology



Typical Applications

- Motor drive
- Auxiliry inverter
- Power supply

Equivalent Circuit Schematic



Absolute Maximum Ratings $T_C=25^{\circ}\text{C}$ unless otherwise noted**Diode-rectifier**

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1800	V
I_O	Average Output Current $T_C=80^{\circ}\text{C}$	180	A
I_{FSM}	Surge Forward Current $V_R=0\text{V}, t_p=10\text{ms}, T_j=25^{\circ}\text{C}$ $V_R=0\text{V}, t_p=10\text{ms}, T_j=150^{\circ}\text{C}$	1800	A
		1560	
I^2t	I^2t -value $V_R=0\text{V}, t_p=10\text{ms}, T_j=25^{\circ}\text{C}$ $V_R=0\text{V}, t_p=10\text{ms}, T_j=150^{\circ}\text{C}$	16200	A^2s
		12168	

IGBT-brake

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 30	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=100^{\circ}\text{C}$	200	A
		100	
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	200	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	519	W

Diode-brake

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	50	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	100	A

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature(rectifier)	150	$^{\circ}\text{C}$
	Maximum Junction Temperature(brake)	175	
T_{jop}	Operating Junction Temperature	-40 to +150	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-40 to +125	$^{\circ}\text{C}$
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}, t=1\text{min}$	4000	V

Rectifier Diode Characteristics $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	$I_F=200\text{A}$	$T_j=25^{\circ}\text{C}$		1.25	V
			$T_j=150^{\circ}\text{C}$		1.20	
$V_{(TO)}$	Threshold Voltage	$T_j=150^{\circ}\text{C}$			0.86	V
r_T	Forward Slope Resistance	$T_j=150^{\circ}\text{C}$			1.7	$\text{m}\Omega$
I_R	Diode Reverse Current	$V_R=V_{RRM}$	$T_j=25^{\circ}\text{C}$		0.1	mA
			$T_j=150^{\circ}\text{C}$		2.0	

IGBT-brake Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=100\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		1.70	2.15	V	
		$I_C=100\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		1.95			
		$I_C=100\text{A}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}$		2.00			
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=4.0\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	5.0	5.5	6.5	V	
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$			5.0	mA	
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0\text{V}, T_j=25^\circ\text{C}$			400	nA	
R_{Gint}	Internal Gate Resistance			2		Ω	
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		9.90		nF	
C_{res}	Reverse Transfer Capacitance			0.30		nF	
Q_G	Gate Charge	$V_{GE}=15\text{V}$		0.60		μC	
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=100\text{A}, R_G=4.7\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$		280		ns	
t_r	Rise Time			54		ns	
$t_{d(off)}$	Turn-Off Delay Time			313		ns	
t_f	Fall Time			232		ns	
E_{on}	Turn-On Switching Loss			3.50		mJ	
E_{off}	Turn-Off Switching Loss			7.35		mJ	
$t_{d(on)}$	Turn-On Delay Time		$V_{CC}=600\text{V}, I_C=100\text{A}, R_G=4.7\Omega, V_{GE}=\pm 15\text{V}, T_j=125^\circ\text{C}$		281		ns
t_r	Rise Time				56		ns
$t_{d(off)}$	Turn-Off Delay Time			330		ns	
t_f	Fall Time			379		ns	
E_{on}	Turn-On Switching Loss			5.15		mJ	
E_{off}	Turn-Off Switching Loss			11.3		mJ	
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=100\text{A}, R_G=4.7\Omega, V_{GE}=\pm 15\text{V}, T_j=150^\circ\text{C}$			285		ns
t_r	Rise Time				56		ns
$t_{d(off)}$	Turn-Off Delay Time			350		ns	
t_f	Fall Time			390		ns	
E_{on}	Turn-On Switching Loss			5.60		mJ	
E_{off}	Turn-Off Switching Loss			13.0		mJ	
I_{SC}	SC Data		$t_p \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}, V_{CC}=900\text{V}, V_{CEM} \leq 1200\text{V}$		400		A

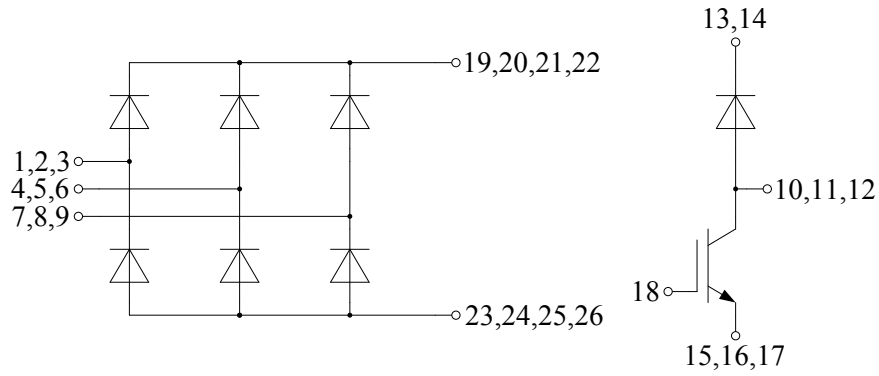
Diode-brake Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	$I_C=50\text{A}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$		1.70	2.15	V
		$I_C=50\text{A}, V_{GE}=0\text{V}, T_j=125^\circ\text{C}$		1.65		
		$I_C=50\text{A}, V_{GE}=0\text{V}, T_j=150^\circ\text{C}$		1.65		
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=50\text{A},$ $-di/dt=1150\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=25^\circ\text{C}$		3.0		μC
I_{RM}	Peak Reverse Recovery Current			46		A
E_{rec}	Reverse Recovery Energy			1.72		mJ
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=50\text{A},$ $-di/dt=1150\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=125^\circ\text{C}$		7.2		μC
I_{RM}	Peak Reverse Recovery Current			56		A
E_{rec}	Reverse Recovery Energy			3.15		mJ
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=50\text{A},$ $-di/dt=1150\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=150^\circ\text{C}$		8.0		μC
I_{RM}	Peak Reverse Recovery Current			59		A
E_{rec}	Reverse Recovery Energy			3.47		mJ

Module Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

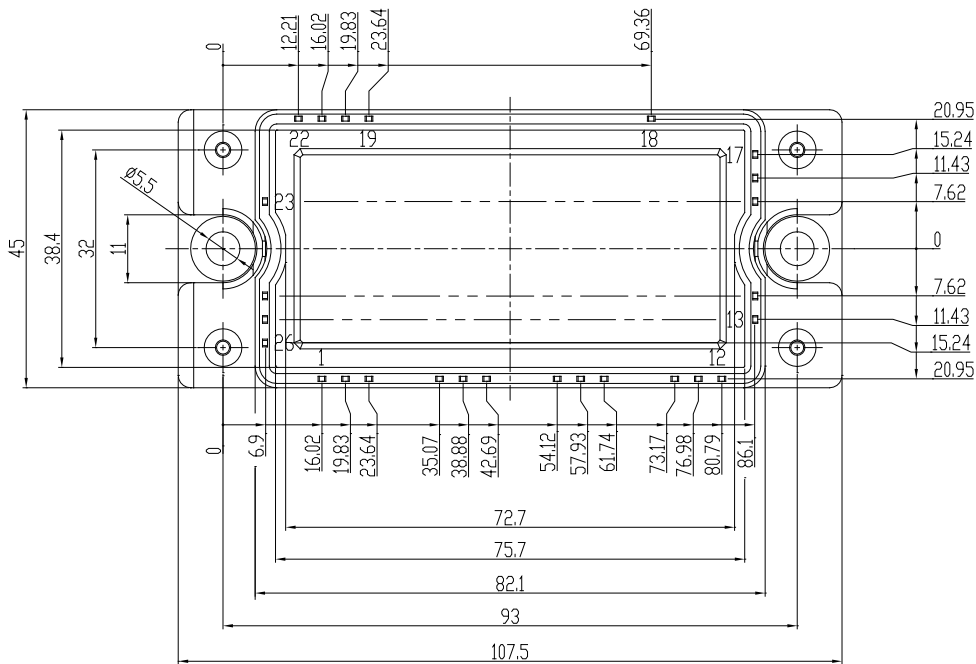
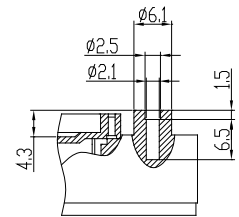
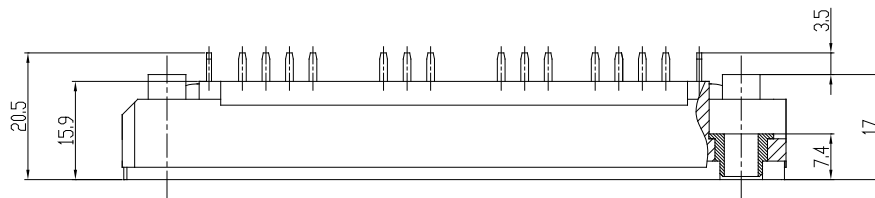
Symbol	Parameter	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case (per Diode-rectifier)			0.206	K/W
	Junction-to-Case (per IGBT-brake)			0.289	
	Junction-to-Case (per Diode-brake)			0.804	
R_{thCH}	Case-to-Heatsink (per Diode-rectifier)		0.139		K/W
	Case-to-Heatsink (per IGBT-brake)		0.196		
	Case-to-Heatsink (per Diode-brake)		0.544		
	Case-to-Heatsink (per Diode-brake)		0.02		
M	Mounting Torque, Screw M5	3.0		6.0	N.m
G	Weight of Module		200		g

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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