STARPOWER

SEMICONDUCTOR

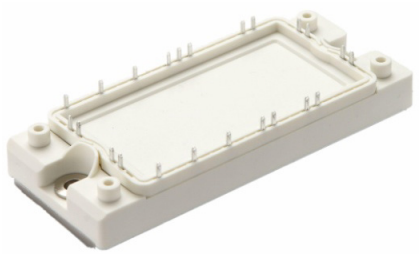
Rectifier

RD200PBS160C5S

1600V/200A in one-package

General Description

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



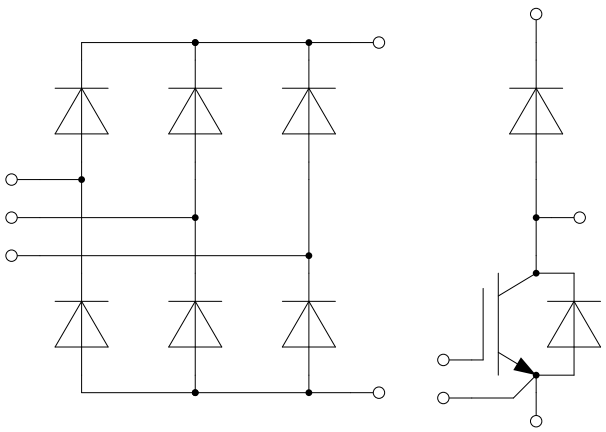
Features

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

Typical Applications

- Input bridge rectifier
- AC/DC motor control
- Power supply

Equivalent Circuit Schematic



Absolute Maximum Ratings T_C=25°C unless otherwise noted

Diode-rectifier

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1600	V
I_O	Average Output Current T_C=80°C	200	A
I_{FSM}	Surge Forward Current V_R=0V,t_p=10ms,T_j=25°C V_R=0V,t_p=10ms,T_j=150°C	1800 1560	A
I^2t	I^2t-value V_R=0V,t_p=10ms,T_j=25°C V_R=0V,t_p=10ms,T_j=150°C	16200 12168	A^2s

Diode-chopper

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=1ms	100	A

IGBT-chopper

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25°C @ T_C=100°C	145 100	A
I_{CM}	Pulsed Collector Current t_p=1ms	200	A
P_D	Maximum Power Dissipation @ T_j=175°C	530	W

Diode-chopper-reverse

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	10	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	20	A

Module

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

Diode-rectifier Characteristics T_C=25°C unless otherwise noted

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

Diode-chopper Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_C=50A,V_{GE}=0V,T_j=25°C		1.70	2.15	V
		I_C=50A,V_{GE}=0V,T_j=125°C		1.65		
		I_C=50A,V_{GE}=0V,T_j=150°C		1.65		
Q_r	Recovered Charge	V_R=600V,I_F=50A, -di/dt=1150A/μs,V_{GE}=-15V T_j=25°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=600V,I_F=50A, -di/dt=1150A/μs,V_{GE}=-15V T_j=125°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=600V,I_F=50A, -di/dt=1150A/μs,V_{GE}=-15V T_j=150°C		8.0		μC
I_{RM}	Peak Reverse Recovery Current			59		A
E_{rec}	Reverse Recovery Energy			3.47		mJ

IGBT-chopper Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=100A,V_{GE}=15V, T_j=25°C		1.75	2.20	V
		I_C=100A,V_{GE}=15V, T_j=125°C		2.05		
		I_C=100A,V_{GE}=15V, T_j=150°C		2.10		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=3.8mA,V_{CE}=V_{GE}, T_j=25°C	5.1	5.8	6.4	V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25°C			1.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25°C			100	nA
R_{Gint}	Internal Gate Resistance			7.5		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		6.30		nF
C_{res}	Reverse Transfer Capacitance			0.27		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		0.80		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=100A, R_G=4.7Ω,V_{GE}=±15V, T_j=25°C		279		ns
t_r	Rise Time			64		ns
$t_{d(off)}$	Turn-Off Delay Time			305		ns
t_f	Fall Time			188		ns
E_{on}	Turn-On Switching Loss			5.65		mJ
E_{off}	Turn-Off Switching Loss			6.10		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=100A, R_G=4.7Ω,V_{GE}=±15V, T_j=125°C		286		ns
t_r	Rise Time			68		ns
$t_{d(off)}$	Turn-Off Delay Time			339		ns
t_f	Fall Time			284		ns
E_{on}	Turn-On Switching Loss			7.85		mJ
E_{off}	Turn-Off Switching Loss			10.0		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=100A, R_G=4.7Ω,V_{GE}=±15V, T_j=150°C		292		ns
t_r	Rise Time			69		ns
$t_{d(off)}$	Turn-Off Delay Time			352		ns
t_f	Fall Time			322		ns
E_{on}	Turn-On Switching Loss			8.64		mJ
E_{off}	Turn-Off Switching Loss			11.0		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=900V, V_{CEM}≤1200V		360		A

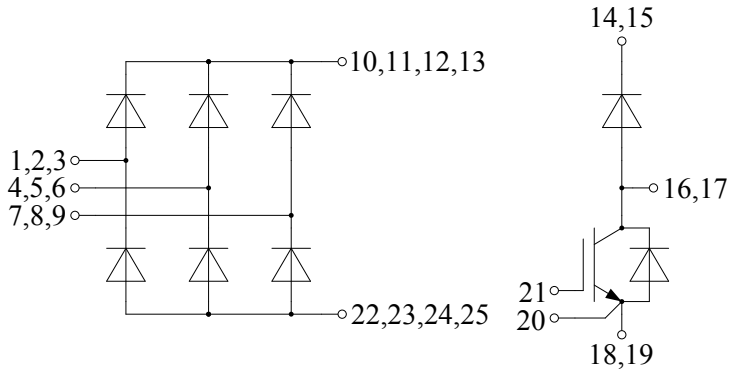
Diode-chopper-reverse Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_C=10A,V_{GE}=0V,T_j=25°C		1.90	2.35	V
		I_C=10A,V_{GE}=0V,T_j=125°C		1.90		
		I_C=10A,V_{GE}=0V,T_j=150°C		1.90		
Q_r	Recovered Charge	V_R=600V,I_F=10A, -di/dt=250A/μs,V_{GE}=-15V T_j=25°C		0.6		μC
I_{RM}	Peak Reverse Recovery Current			9		A
E_{rec}	Reverse Recovery Energy			0.15		mJ
Q_r	Recovered Charge	V_R=600V,I_F=10A, -di/dt=250A/μs,V_{GE}=-15V T_j=125°C		1.3		μC
I_{RM}	Peak Reverse Recovery Current			11		A
E_{rec}	Reverse Recovery Energy			0.35		mJ
Q_r	Recovered Charge	V_R=600V,I_F=10A, -di/dt=250A/μs,V_{GE}=-15V T_j=150°C		1.5		μC
I_{RM}	Peak Reverse Recovery Current			12		A
E_{rec}	Reverse Recovery Energy			0.39		mJ

Module Characteristics T_C=25°C unless otherwise noted

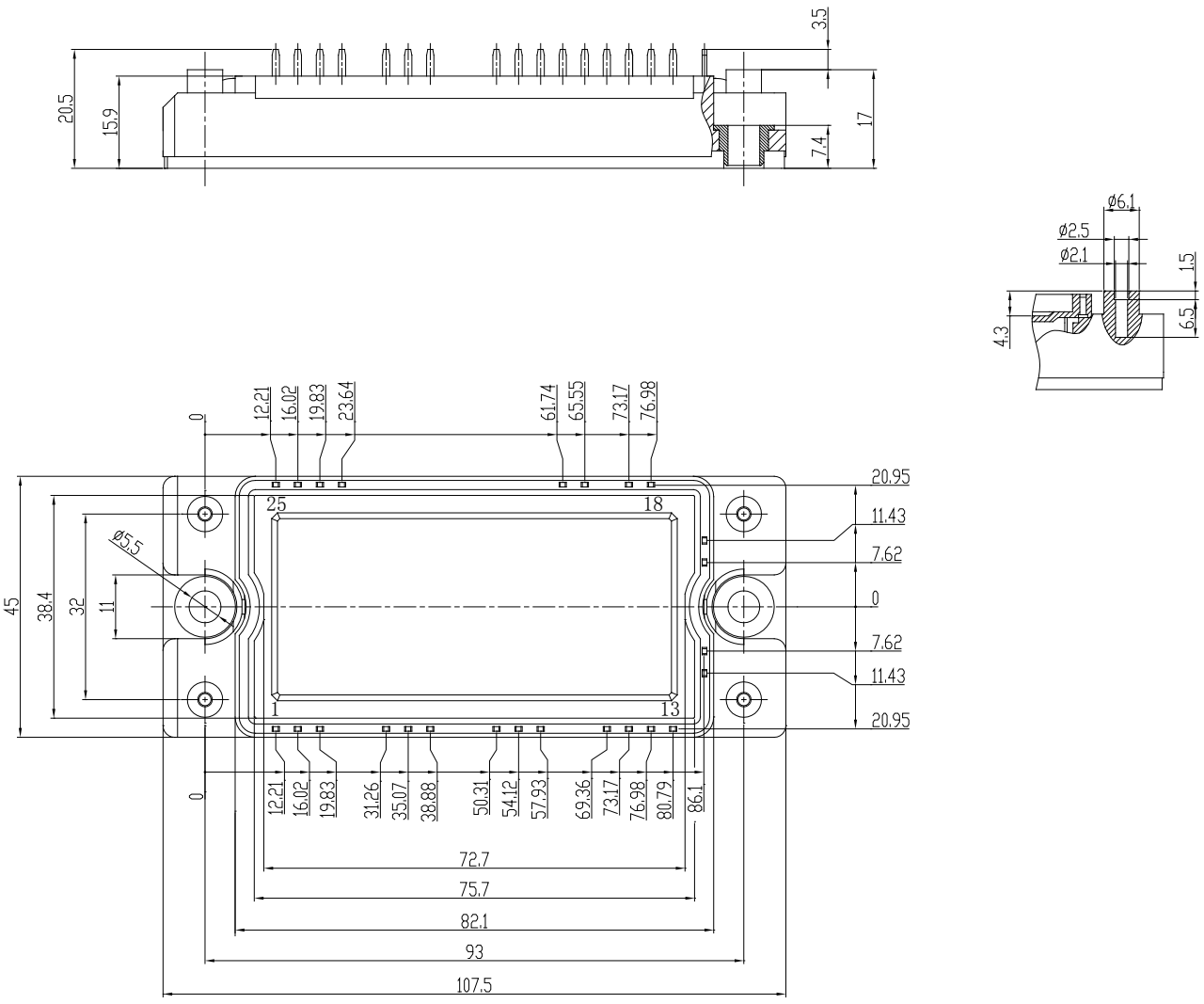
Symbol	Parameter	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case (per Diode-rectifier)			0.382	K/W
	Junction-to-Case (per Diode-chopper)			0.736	
	Junction-to-Case (per IGBT-chopper)			0.283	
	Junction-to-Case (per Diode-chopper-reverse)			1.946	
R_{thCH}	Case-to-Heatsink (per Diode-rectifier)		0.161		K/W
	Case-to-Heatsink (per Diode-chopper)		0.311		
	Case-to-Heatsink (per IGBT-brake)		0.119		
	Case-to-Heatsink (per Diode-chopper-reverse)		0.822		
	Case-to-Heatsink (per Module)		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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