

STARPOWER

SEMICONDUCTOR

IGBT

GD200PIA120C6SNF

1200V/200A PIM in one-package

General Description

STARPOWER IGBT Power Module provides ultra low conduction loss as well as short circuit ruggedness. They are designed for the applications such as general inverters and UPS.

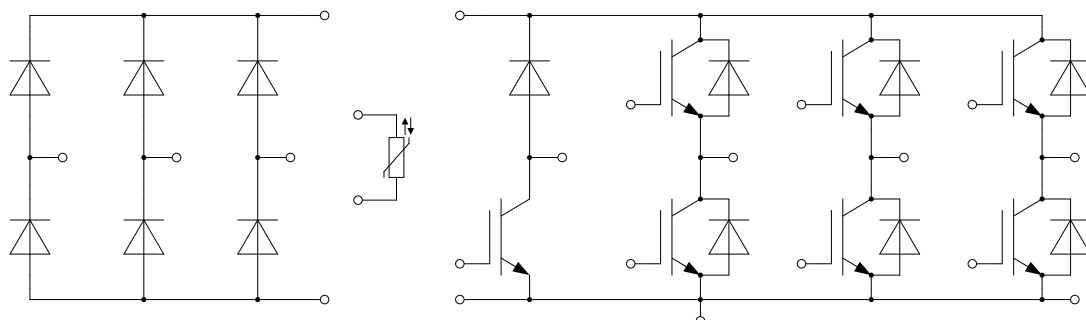
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 8 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175°C
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology
- PressFIT contact technology

Typical Applications

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterruptible power supply

Equivalent Circuit Schematic



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

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=90^{\circ}\text{C}$	200	A
I_{CRM}	Repetitive Peak Collector Current tp limited by T_{vjop}	400	A

Diode-inverter

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	200	A
I_{FRM}	Repetitive Peak Forward Current tp limited by T_{vjop}	400	A

Diode-rectifier

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	2200	V
I_{FRMSM}	Maximum RMS Forward Current per Chip @ $T_C=110^{\circ}\text{C}$	150	A
I_{RMSM}	Maximum RMS Current at Rectifier Output @ $T_C=110^{\circ}\text{C}$	150	A
I_{FSM}	Surge Forward Current $t_p=10\text{ms}$ @ $T_{vj}=25^{\circ}\text{C}$ @ $T_{vj}=150^{\circ}\text{C}$	1970 1584	A
I^2t	I^2t -value, $t_p=10\text{ms}$ @ $T_{vj}=25^{\circ}\text{C}$ @ $T_{vj}=150^{\circ}\text{C}$	19405 12545	A^2s

IGBT-brake

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=100^{\circ}\text{C}$	100	A
I_{CRM}	Repetitive Peak Collector Current tp limited by T_{vjop}	200	A

Diode-brake

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	75	A
I_{FRM}	Repetitive Peak Forward Current tp limited by T_{vjop}	150	A

Module

Symbol	Description	Value	Unit
T_{vjmax}	Maximum Junction Temperature(inverter,brake) Maximum Junction Temperature (rectifier)	175 150	$^{\circ}\text{C}$
T_{vjop}	Operating Junction Temperature(inverter,brake) Operating Junction Temperature(rectifier)	-40 to +175 -40 to +150	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-40 to +125	$^{\circ}\text{C}$
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}$, $t=1\text{min}$	2500	V

Note: $T_{vjop} > 150^{\circ}\text{C}$ is allowed for operation at overload conditions.

IGBT-inverter 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	$I_C=200\text{A}, V_{GE}=15\text{V}, T_{vj}=25^{\circ}\text{C}$		1.50	1.95	V
		$I_C=200\text{A}, V_{GE}=15\text{V}, T_{vj}=125^{\circ}\text{C}$		1.70		
		$I_C=200\text{A}, V_{GE}=15\text{V}, T_{vj}=150^{\circ}\text{C}$		1.80		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=4.0\text{mA}, V_{CE}=V_{GE}, T_{vj}=25^{\circ}\text{C}$	5.4	6.2	7.0	V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$			50	μA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$			100	nA
R_{Gint}	Internal Gate Resistance			0.75		Ω
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		17.7		nF
C_{res}	Reverse Transfer Capacitance			0.16		nF
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		1.28		μC
$t_{d(on)}$	Turn-On Delay Time	TBD		TBD		ns
t_r	Rise Time			TBD		ns
$t_{d(off)}$	Turn-Off Delay Time			TBD		ns
t_f	Fall Time			TBD		ns
E_{on}	Turn-On Switching Loss			TBD		mJ
E_{off}	Turn-Off Switching Loss			TBD		mJ
$t_{d(on)}$	Turn-On Delay Time	TBD		TBD		ns
t_r	Rise Time			TBD		ns
$t_{d(off)}$	Turn-Off Delay Time			TBD		ns
t_f	Fall Time			TBD		ns
E_{on}	Turn-On Switching Loss			TBD		mJ
E_{off}	Turn-Off Switching Loss			TBD		mJ
$t_{d(on)}$	Turn-On Delay Time	TBD		TBD		ns
t_r	Rise Time			TBD		ns
$t_{d(off)}$	Turn-Off Delay Time			TBD		ns
t_f	Fall Time			TBD		ns
E_{on}	Turn-On Switching Loss			TBD		mJ
E_{off}	Turn-Off Switching Loss			TBD		mJ
I_{SC}	SC Data	TBD		TBD		A

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	$I_F=200\text{A}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$		1.60	2.05	V
		$I_F=200\text{A}, V_{GE}=0\text{V}, T_{vj}=125^{\circ}\text{C}$		1.65		
		$I_F=200\text{A}, V_{GE}=0\text{V}, T_{vj}=150^{\circ}\text{C}$		1.65		
Q_r	Recovered Charge	TBD		TBD		μC
I_{RM}	Peak Reverse Recovery Current			TBD		A
E_{rec}	Reverse Recovery Energy			TBD		mJ
Q_r	Recovered Charge	TBD		TBD		μC
I_{RM}	Peak Reverse Recovery Current			TBD		A
E_{rec}	Reverse Recovery Energy			TBD		mJ
Q_r	Recovered Charge	TBD		TBD		μC
I_{RM}	Peak Reverse Recovery Current			TBD		A
E_{rec}	Reverse Recovery Energy			TBD		mJ

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	$I_F=200\text{A}, V_{GE}=0\text{V}, T_{vj}=150^{\circ}\text{C}$		1.0		V
I_R	Reverse Current	$T_{vj}=150^{\circ}\text{C}, V_R=2200\text{V}$			2.0	mA

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	$I_C=100\text{A}, V_{GE}=15\text{V}, T_{vj}=25^{\circ}\text{C}$		1.50	1.95	V
		$I_C=100\text{A}, V_{GE}=15\text{V}, T_{vj}=125^{\circ}\text{C}$		1.70		
		$I_C=100\text{A}, V_{GE}=15\text{V}, T_{vj}=150^{\circ}\text{C}$		1.80		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=2.00\text{mA}, V_{CE}=V_{GE}, T_{vj}=25^{\circ}\text{C}$	5.4	6.2	7.0	V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$			50	μA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$			100	nA
R_{Gint}	Internal Gate Resistance			1.5		Ω
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		8.84		nF
C_{res}	Reverse Transfer Capacitance			0.08		nF
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		0.64		μC
$t_{d(on)}$	Turn-On Delay Time	TBD		TBD		ns
t_r	Rise Time			TBD		ns
$t_{d(off)}$	Turn-Off Delay Time			TBD		ns
t_f	Fall Time			TBD		ns
E_{on}	Turn-On Switching Loss			TBD		mJ
E_{off}	Turn-Off Switching Loss			TBD		mJ
$t_{d(on)}$	Turn-On Delay Time	TBD		TBD		ns
t_r	Rise Time			TBD		ns
$t_{d(off)}$	Turn-Off Delay Time			TBD		ns
t_f	Fall Time			TBD		ns
E_{on}	Turn-On Switching Loss			TBD		mJ
E_{off}	Turn-Off Switching Loss			TBD		mJ
$t_{d(on)}$	Turn-On Delay Time	TBD		TBD		ns
t_r	Rise Time			TBD		ns
$t_{d(off)}$	Turn-Off Delay Time			TBD		ns
t_f	Fall Time			TBD		ns
E_{on}	Turn-On Switching Loss			TBD		mJ
E_{off}	Turn-Off Switching Loss			TBD		mJ
I_{SC}	SC Data	TBD		TBD		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	$I_F=75\text{A}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$		1.60	2.05	V
		$I_F=75\text{A}, V_{GE}=0\text{V}, T_{vj}=125^{\circ}\text{C}$		1.65		
		$I_F=75\text{A}, V_{GE}=0\text{V}, T_{vj}=150^{\circ}\text{C}$		1.65		

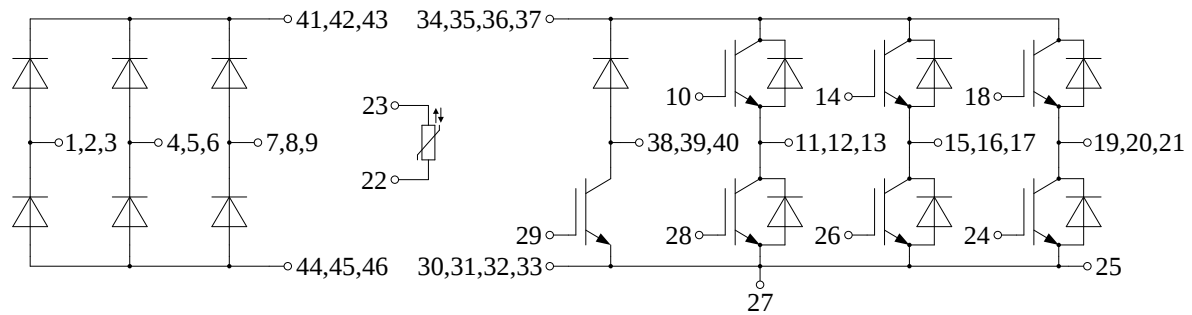
NTC Characteristics $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
R_{25}	Rated Resistance			5.0		k Ω
$\Delta R/R$	Deviation of R_{100}	$T_C=100^{\circ}\text{C}, R_{100}=493.3\Omega$	-5		5	%
P_{25}	Power Dissipation				20.0	mW
$B_{25/50}$	B-value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$		3375		K
$B_{25/80}$	B-value	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15\text{K}))]$		3411		K
$B_{25/100}$	B-value	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15\text{K}))]$		3433		K

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

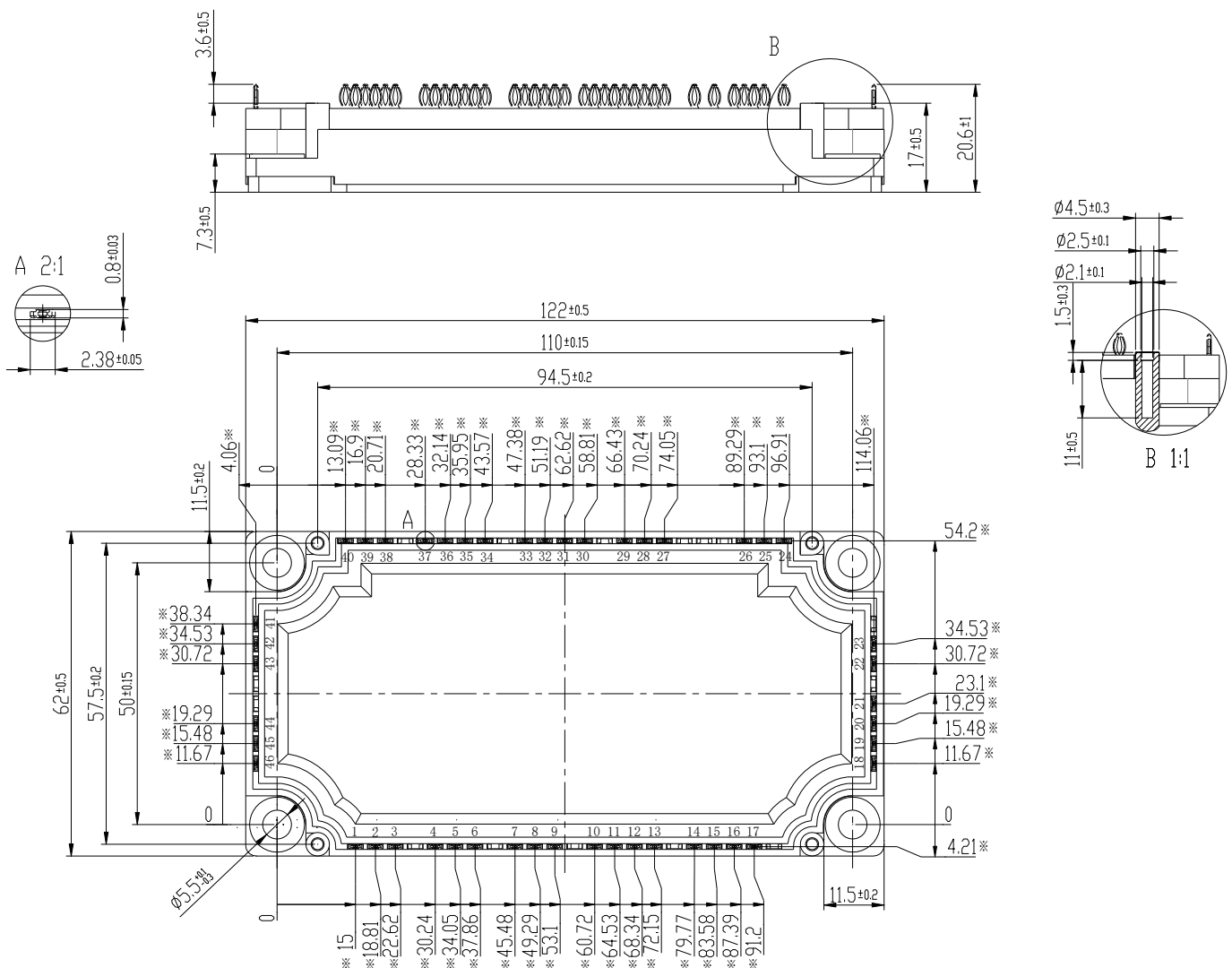
Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		40		nH
$R_{CC'+EE'}$ $R_{AA'+CC'}$	Module Lead Resistance, Terminal to Chip		4.00 3.00		m Ω
R_{thJC}	Junction-to-Case (per IGBT-inverter) Junction-to-Case (per Diode-inverter) Junction-to-Case (per Diode-rectifier) Junction-to-Case (per IGBT-brake) Junction-to-Case (per Diode-brake)			0.180 0.303 0.227 0.285 0.627	K/W
R_{thCH}	Case-to-Sink (per IGBT-inverter) Case-to-Sink (per Diode-inverter) Case-to-Sink (per Diode-rectifier) Case-to-Sink (per IGBT-brake) Case-to-Sink (per Diode-brake)		0.135 0.145 0.145 0.148 0.171		K/W
M	Mounting Torque, Screw:M5	3.0		6.0	N.m
G	Weight of Module		300		g

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



*all dimensions with a tolerance of ± 0.4

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