STARPOWER

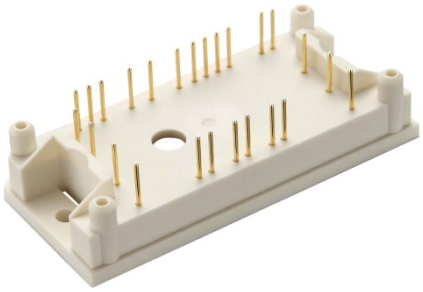
SEMICONDUCTOR **IGBT**

GD25PJT120F5S

1200V/25A 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.



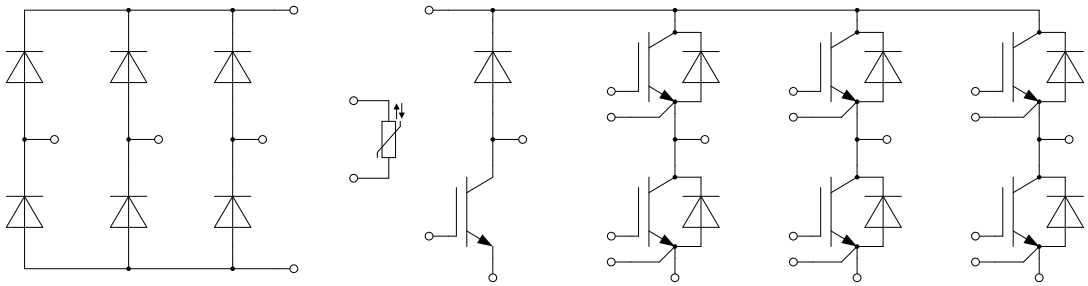
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 10μs 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 heatsink using DBC 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°C unless otherwise noted

IGBT-inverter

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°C @ T_C=100°C	50 25	A
I_{CM}	Pulsed Collector Current t_p=1ms	50	A
P_D	Maximum Power Dissipation @ T_j=175°C	206	W

Diode-inverter

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	25	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	50	A

Diode-rectifier

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1600	V
I_O	Average Output Current 50Hz/60Hz,sine wave	25	A
I_{FSM}	Surge Forward Current V_R=0V,t_p=10ms,T_j=45°C	320	A
I^2t	I^2t-value,V_R=0V,t_p=10ms,T_j=45°C	510	A^2s

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°C @ T_C=100°C	30 15	A
I_{CM}	Pulsed Collector Current t_p=1ms	30	A
P_D	Maximum Power Dissipation @ T_j=175°C	148	W

Diode-brake

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	15	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	30	A

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature	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

IGBT-inverter 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=25A,V_{GE}=15V, T_j=25°C		1.90	2.35	V
		I_C=25A,V_{GE}=15V, T_j=125°C		2.30		
		I_C=25A,V_{GE}=15V, T_j=150°C		2.40		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=1.2mA,V_{CE}=V_{GE}, T_j=25°C	5.0	6.3	7.5	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			400	nA
R_{Gint}	Internal Gate Resistance			/		Ω
C_{ies}	Input Capacitance	V_{CE}=30V,f=1MHz, V_{GE}=0V		3.43		nF
C_{res}	Reverse Transfer Capacitance			0.08		nF
Q_G	Gate Charge	V_{GE}=15V		0.16		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=25A, R_G=33Ω,V_{GE}=±15V, T_j=25°C		233		ns
t_r	Rise Time			66		ns
$t_{d(off)}$	Turn-Off Delay Time			184		ns
t_f	Fall Time			208		ns
E_{on}	Turn-On Switching Loss			3.06		mJ
E_{off}	Turn-Off Switching Loss			1.16		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=25A, R_G=33Ω,V_{GE}=±15V, T_j=125°C		310		ns
t_r	Rise Time			86		ns
$t_{d(off)}$	Turn-Off Delay Time			217		ns
t_f	Fall Time			324		ns
E_{on}	Turn-On Switching Loss			3.50		mJ
E_{off}	Turn-Off Switching Loss			1.78		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=25A, R_G=33Ω,V_{GE}=±15V, T_j=150°C		221		ns
t_r	Rise Time			68		ns
$t_{d(off)}$	Turn-Off Delay Time			225		ns
t_f	Fall Time			347		ns
E_{on}	Turn-On Switching Loss			4.45		mJ
E_{off}	Turn-Off Switching Loss			2.02		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=900V, V_{CEM}≤1200V		225		A

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=25A,V_{GE}=0V,T_j=25°C		2.10	2.55	V
		I_F=25A,V_{GE}=0V,T_j=125°C		2.15		
		I_F=25A,V_{GE}=0V,T_j=150°C		2.15		
Q_r	Recovered Charge	V_R=600V,I_F=25A, -di/dt=900A/μs,V_{GE}=-15V T_j=25°C		1.3		μC
I_{RM}	Peak Reverse Recovery Current			31		A
E_{rec}	Reverse Recovery Energy			0.68		mJ
Q_r	Recovered Charge	V_R=600V,I_F=25A, -di/dt=900A/μs,V_{GE}=-15V T_j=125°C		2.2		μC
I_{RM}	Peak Reverse Recovery Current			38		A
E_{rec}	Reverse Recovery Energy			1.46		mJ
Q_r	Recovered Charge	V_R=600V,I_F=25A, -di/dt=900A/μs,V_{GE}=-15V T_j=150°C		2.4		μC
I_{RM}	Peak Reverse Recovery Current			40		A
E_{rec}	Reverse Recovery Energy			1.91		mJ

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=25A,T_j=150°C		1.02		V
I_R	Reverse Current	T_j=150°C,V_R=1600V			2.0	mA

IGBT-brake 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=15A,V_{GE}=15V, T_j=25°C		1.90	2.35	V
		I_C=15A,V_{GE}=15V, T_j=125°C		2.30		
		I_C=15A,V_{GE}=15V, T_j=150°C		2.40		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=0.72mA,V_{CE}=V_{GE}, T_j=25°C	5.0	6.3	7.5	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			400	nA
R_{Gint}	Internal Gate Resistance			/		Ω
C_{ies}	Input Capacitance	V_{CE}=30V,f=1MHz, V_{GE}=0V		1.95		nF
C_{res}	Reverse Transfer Capacitance			0.05		nF
Q_G	Gate Charge	V_{GE}=15V		0.08		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=15A, R_G=69Ω,V_{GE}=±15V, T_j=25°C		231		ns
t_r	Rise Time			37		ns
$t_{d(off)}$	Turn-Off Delay Time			293		ns
t_f	Fall Time			386		ns
E_{on}	Turn-On Switching Loss			2.36		mJ
E_{off}	Turn-Off Switching Loss			0.98		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=15A, R_G=69Ω,V_{GE}=±15V, T_j=125°C		240		ns
t_r	Rise Time			44		ns
$t_{d(off)}$	Turn-Off Delay Time			318		ns
t_f	Fall Time			467		ns
E_{on}	Turn-On Switching Loss			3.11		mJ
E_{off}	Turn-Off Switching Loss			1.45		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=15A, R_G=69Ω,V_{GE}=±15V, T_j=150°C		245		ns
t_r	Rise Time			45		ns
$t_{d(off)}$	Turn-Off Delay Time			316		ns
t_f	Fall Time			488		ns
E_{on}	Turn-On Switching Loss			3.04		mJ
E_{off}	Turn-Off Switching Loss			1.62		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=900V, V_{CEM}≤1200V		135		A

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=15A,V_{GE}=0V,T_j=25°C		2.05	2.50	V
		I_F=15A,V_{GE}=0V,T_j=125°C		2.20		
		I_F=15A,V_{GE}=0V,T_j=150°C		2.25		
Q_r	Recovered Charge	V_R=600V,I_F=15A, -di/dt=450A/μs,V_{GE}=-15V T_j=25°C		0.5		μC
I_{RM}	Peak Reverse Recovery Current			15		A
E_{rec}	Reverse Recovery Energy			0.29		mJ
Q_r	Recovered Charge	V_R=600V,I_F=15A, -di/dt=450A/μs,V_{GE}=-15V T_j=125°C		1.0		μC
I_{RM}	Peak Reverse Recovery Current			16		A
E_{rec}	Reverse Recovery Energy			0.64		mJ
Q_r	Recovered Charge	V_R=600V,I_F=15A, -di/dt=450A/μs,V_{GE}=-15V T_j=150°C		1.1		μC
I_{RM}	Peak Reverse Recovery Current			17		A
E_{rec}	Reverse Recovery Energy			0.80		mJ

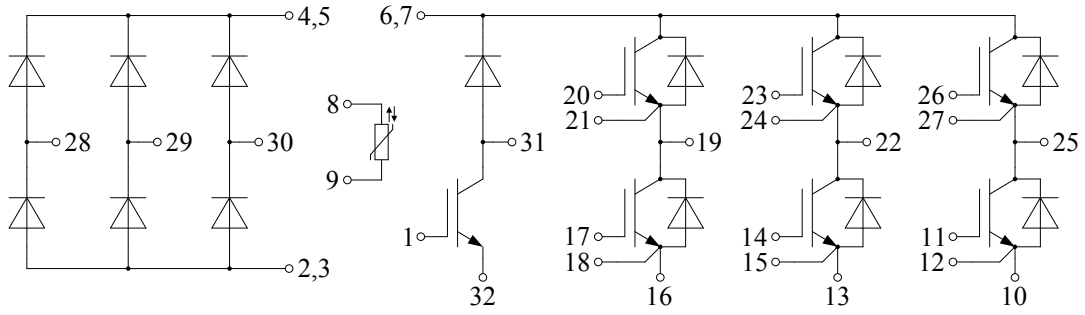
NTC Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
R_{25}	Rated Resistance			22.0		kΩ
ΔR/R	Deviation of R_{100}	T_C=100°C,R_{100}=1486.1Ω	-5		5	%
P_{25}	Power Dissipation				200	mW
$B_{25/50}$	B-value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$		4000		K

Module Characteristics T_C=25°C unless otherwise noted

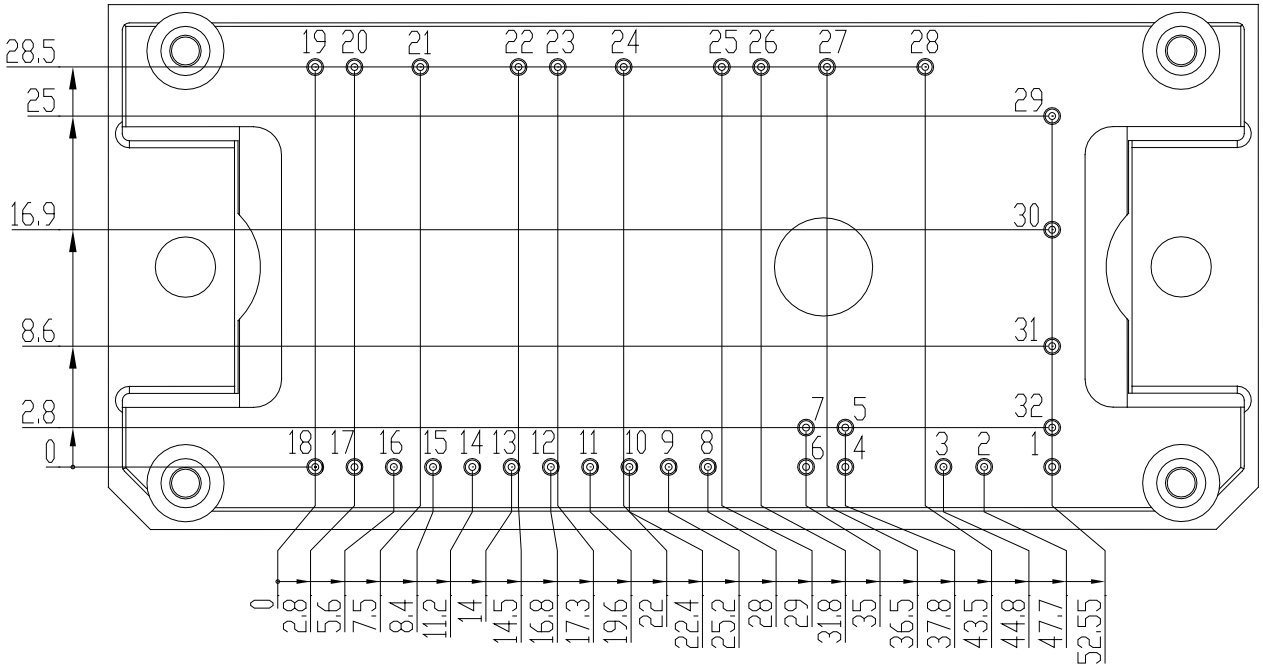
Symbol	Parameter	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case (per IGBT-inverter)		0.662	0.728	K/W
	Junction-to-Case (per Diode-inverter)		1.197	1.317	
	Junction-to-Case (per Diode-rectifier)		1.126	1.239	
	Junction-to-Case (per IGBT-brake)		0.917	1.009	
	Junction-to-Case (per Diode-brake)		1.591	1.750	
R_{thCH}	Case-to-Heatsink (per IGBT-inverter)		0.419		K/W
	Case-to-Heatsink (per Diode-inverter)		0.759		
	Case-to-Heatsink (per Diode-rectifier)		0.714		
	Case-to-Heatsink (per IGBT-brake)		0.581		
	Case-to-Heatsink (per Diode-brake)		1.008		
	Case-to-Heatsink (per Module)		0.030		
M	Mounting Torque, Screw M4	2.0		2.2	N.m
G	Weight of Module		42		g

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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