

STARPOWER

SEMICONDUCTOR

IGBT

GD15PJT120F3S_G8

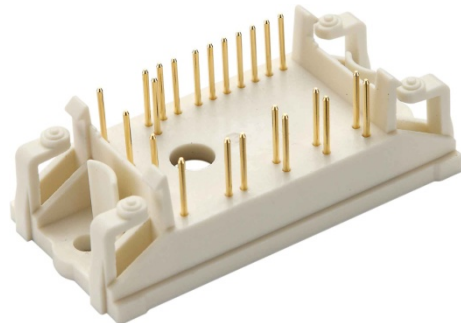
1200V/15A PIM in one-package

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

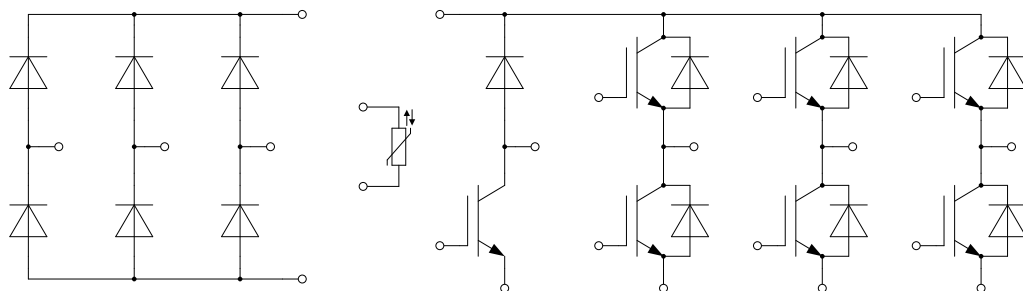
- Low $V_{CE(sat)}$ Trench IGBT technology
- 10 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175°C
- Fast & soft reverse recovery anti-parallel FWD



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	± 30	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	30	A
	@ $T_C=100^{\circ}\text{C}$	15	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	30	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	131	W

Diode-inverter

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 $t_p=1\text{ms}$	30	A

Diode-rectifier

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1600	V
I_O	Average Output Current 50Hz/60Hz,sine wave	15	A
I_{FSM}	Surge Forward Current $V_R=0\text{V}, t_p=10\text{ms}, T_j=45^{\circ}\text{C}$	270	A
I^2t	I^2t -value, $V_R=0\text{V}, t_p=10\text{ms}, T_j=45^{\circ}\text{C}$	360	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 @ $T_C=25^{\circ}\text{C}$	22	A
	@ $T_C=90^{\circ}\text{C}$	15	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	30	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	104	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 $t_p=1\text{ms}$	30	A

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature(inverter,brake)	175	$^{\circ}\text{C}$
	Maximum Junction Temperature (rectifier)	150	$^{\circ}\text{C}$
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, $f=50\text{Hz}, t=1\text{min}$	2500	V

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	$I_C=15\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		1.70	2.15	V	
		$I_C=15\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		1.95			
		$I_C=15\text{A}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}$		2.00			
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=0.60\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	5.0	5.5	6.5	V	
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$			1.0	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			0		Ω	
C_{ies}	Input Capacitance	$V_{CE}=30\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		1.79		nF	
C_{res}	Reverse Transfer Capacitance			0.05		nF	
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		0.10		μC	
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=15\text{A}, R_G=69\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$		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		$V_{CC}=600\text{V}, I_C=15\text{A}, R_G=69\Omega, V_{GE}=\pm 15\text{V}, T_j=125^\circ\text{C}$		212		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	$V_{CC}=600\text{V}, I_C=15\text{A}, R_G=69\Omega, V_{GE}=\pm 15\text{V}, T_j=150^\circ\text{C}$			227		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		$t_p \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}, V_{CC}=900\text{V}, V_{CEM} \leq 1200\text{V}$		60		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	$I_F=15\text{A}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$		2.05	2.50	V
		$I_F=15\text{A}, V_{GE}=0\text{V}, T_j=125^\circ\text{C}$		2.00		
		$I_F=15\text{A}, V_{GE}=0\text{V}, T_j=150^\circ\text{C}$		2.00		
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=15\text{A},$ $-di/dt=450\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=25^\circ\text{C}$		0.5		μC
I_{RM}	Peak Reverse Recovery Current			15		A
E_{rec}	Reverse Recovery Energy			0.29		mJ
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=15\text{A},$ $-di/dt=450\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=125^\circ\text{C}$		1.0		μC
I_{RM}	Peak Reverse Recovery Current			16		A
E_{rec}	Reverse Recovery Energy			0.64		mJ
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=15\text{A},$ $-di/dt=450\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=150^\circ\text{C}$		1.1		μC
I_{RM}	Peak Reverse Recovery Current			17		A
E_{rec}	Reverse Recovery Energy			0.80		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	$I_F=15\text{A}, T_j=150^\circ\text{C}$		0.96		V
I_R	Reverse Current	$T_j=150^\circ\text{C}, V_R=1600\text{V}$			1.0	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	$I_C=15\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		1.70	2.15	V	
		$I_C=15\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		1.95			
		$I_C=15\text{A}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}$		2.00			
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=0.60\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	5.0	5.5	6.5	V	
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$			1.0	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			0		Ω	
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		1.79		nF	
C_{res}	Reverse Transfer Capacitance				0.05		nF
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		0.10		μC	
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=15\text{A}, R_G=69\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$		200		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		$V_{CC}=600\text{V}, I_C=15\text{A}, R_G=69\Omega, V_{GE}=\pm 15\text{V}, T_j=125^\circ\text{C}$		212		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	$V_{CC}=600\text{V}, I_C=15\text{A}, R_G=69\Omega, V_{GE}=\pm 15\text{V}, T_j=150^\circ\text{C}$			227		ns
t_r	Rise Time				45		ns
$t_{d(off)}$	Turn-Off Delay Time			320		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		$t_p \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}, V_{CC}=900\text{V}, V_{CEM} \leq 1200\text{V}$		60		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	$I_F=15\text{A}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$		2.05	2.50	V
		$I_F=15\text{A}, V_{GE}=0\text{V}, T_j=125^\circ\text{C}$		2.00		
		$I_F=15\text{A}, V_{GE}=0\text{V}, T_j=150^\circ\text{C}$		2.00		
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=15\text{A},$ $-di/dt=450\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=25^\circ\text{C}$		0.5		μC
I_{RM}	Peak Reverse Recovery Current			15		A
E_{rec}	Reverse Recovery Energy			0.29		mJ
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=15\text{A},$ $-di/dt=450\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=125^\circ\text{C}$		1.0		μC
I_{RM}	Peak Reverse Recovery Current			16		A
E_{rec}	Reverse Recovery Energy			0.64		mJ
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=15\text{A},$ $-di/dt=450\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=150^\circ\text{C}$		1.1		μC
I_{RM}	Peak Reverse Recovery Current			17		A
E_{rec}	Reverse Recovery Energy			0.80		mJ

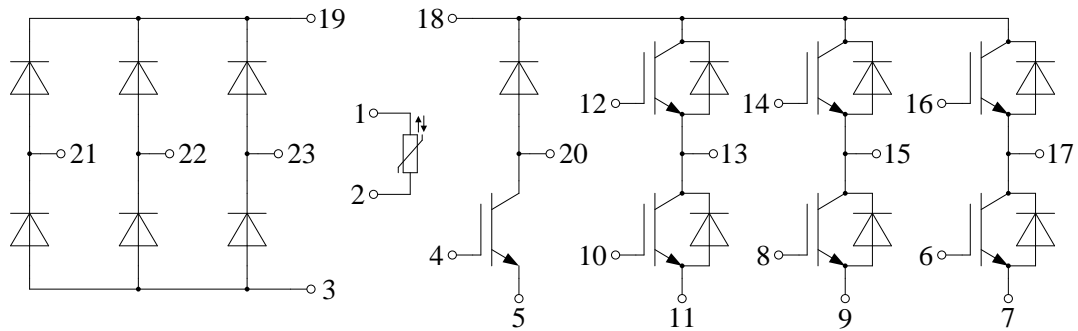
NTC Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

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

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

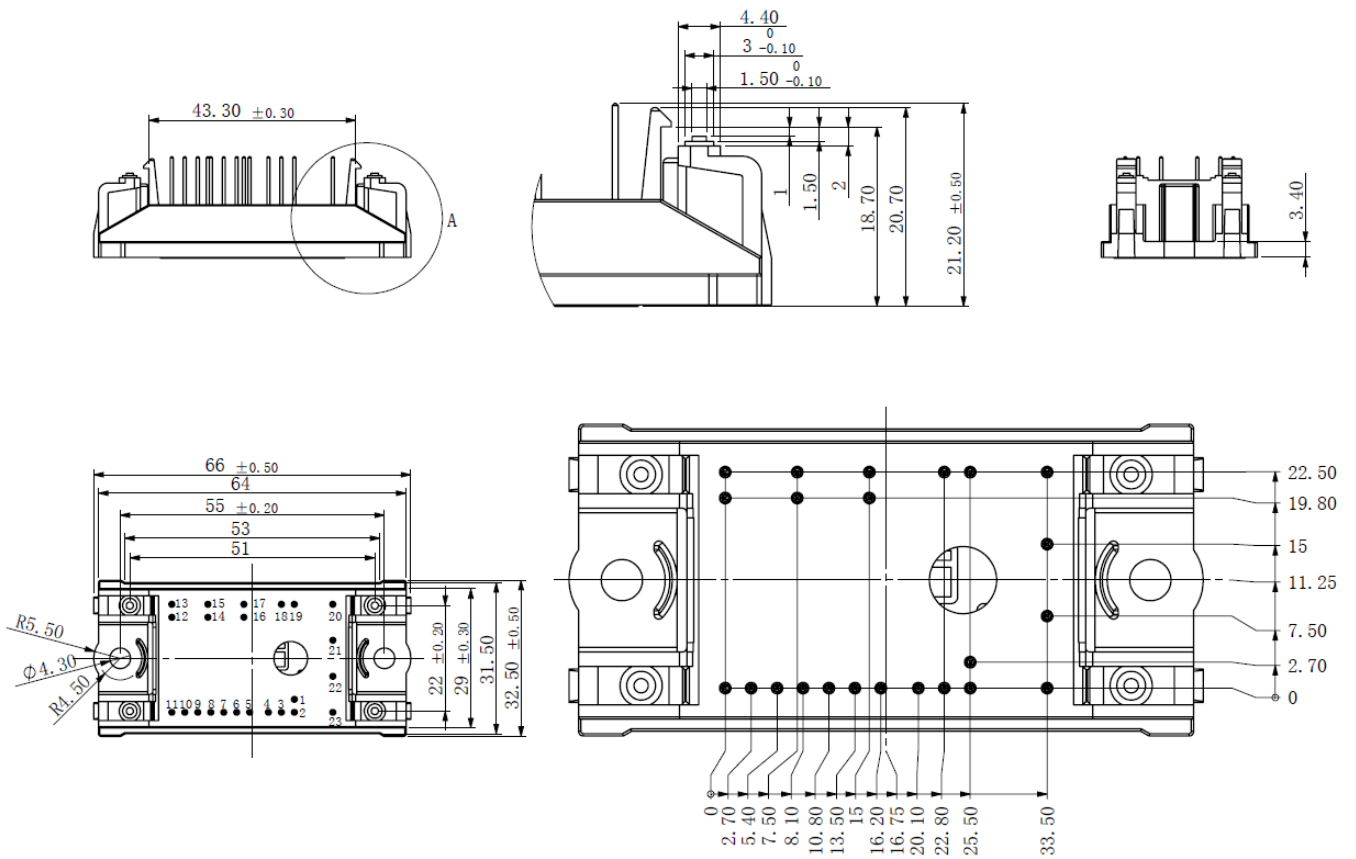
Symbol	Parameter	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case (per IGBT-inverter)		1.035	1.139	K/W
	Junction-to-Case (per Diode-inverter)		1.938	2.132	
	Junction-to-Case (per Diode-rectifier)		1.427	1.570	
	Junction-to-Case (per IGBT-brake)		1.307	1.438	
	Junction-to-Case (per Diode-brake)		2.155	2.371	
R_{thCH}	Case-to-Heatsink (per IGBT-inverter)		0.534		K/W
	Case-to-Heatsink (per Diode-inverter)		0.999		
	Case-to-Heatsink (per Diode-rectifier)		0.736		
	Case-to-Heatsink (per IGBT-brake)		0.674		
	Case-to-Heatsink (per Diode-brake)		1.111		
	Case-to-Heatsink (per Module)		0.036		
M	Mounting Torque, Screw M4	2.0		2.2	N.m
G	Weight of Module		28		g

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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