

STARPOWER

SEMICONDUCTOR

IGBT

GD150HFY120C2S

1200V/150A 2 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 inverter and UPS.

Features

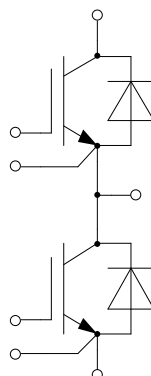
- Low $V_{CE(sat)}$ Trench IGBT technology
- 10 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175°C
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology



Typical Applications

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

Equivalent Circuit Schematic



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

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=100^{\circ}\text{C}$	260 150	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	300	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	904	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	150	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	300	A

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature	175	$^{\circ}\text{C}$
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, $f=50\text{Hz}$, $t=1\text{min}$	4000	V

IGBT 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	$I_C=150\text{A}, V_{GE}=15\text{V}, T_j=25^{\circ}\text{C}$		1.65	2.10	V
		$I_C=150\text{A}, V_{GE}=15\text{V}, T_j=125^{\circ}\text{C}$		1.95		
		$I_C=150\text{A}, V_{GE}=15\text{V}, T_j=150^{\circ}\text{C}$		2.00		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=3.75\text{mA}, V_{CE}=V_{GE}, T_j=25^{\circ}\text{C}$	5.2	6.0	6.8	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			1.0		Ω
C_{ies}	Input Capacitance	$V_{CE}=30\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		14.3		nF
C_{res}	Reverse Transfer Capacitance			0.46		nF
Q_G	Gate Charge	$V_{GE}=15\text{V}$		0.48		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=150\text{A}, R_G=4.7\Omega, V_{GE}=\pm 15\text{V}, T_j=25^{\circ}\text{C}$		250		ns
t_r	Rise Time			67		ns
$t_{d(off)}$	Turn-Off Delay Time			345		ns
t_f	Fall Time			182		ns
E_{on}	Turn-On Switching Loss			6.00		mJ
E_{off}	Turn-Off Switching Loss			9.69		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=150\text{A}, R_G=4.7\Omega, V_{GE}=\pm 15\text{V}, T_j=125^{\circ}\text{C}$		255		ns
t_r	Rise Time			70		ns
$t_{d(off)}$	Turn-Off Delay Time			392		ns
t_f	Fall Time			324		ns
E_{on}	Turn-On Switching Loss			8.23		mJ
E_{off}	Turn-Off Switching Loss			15.3		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=150\text{A}, R_G=4.7\Omega, V_{GE}=\pm 15\text{V}, T_j=150^{\circ}\text{C}$		244		ns
t_r	Rise Time			73		ns
$t_{d(off)}$	Turn-Off Delay Time			432		ns
t_f	Fall Time			343		ns
E_{on}	Turn-On Switching Loss			9.51		mJ
E_{off}	Turn-Off Switching Loss			17.1		mJ
I_{SC}	SC Data	$t_p \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_j=150^{\circ}\text{C}, V_{CC}=900\text{V}, V_{CEM} \leq 1200\text{V}$		600		A

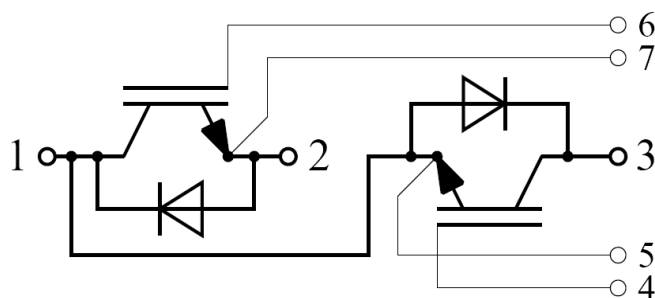
Diode Characteristics $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	$I_F=150\text{A}, V_{GE}=0\text{V}, T_j=25^{\circ}\text{C}$		1.80	2.25	V
		$I_F=150\text{A}, V_{GE}=0\text{V}, T_j=125^{\circ}\text{C}$		1.85		
		$I_F=150\text{A}, V_{GE}=0\text{V}, T_j=150^{\circ}\text{C}$		1.85		
Q_r	Recovered Charge	$V_{CC}=600\text{V}, I_F=150\text{A},$ $-di/dt=2200\text{A}/\mu\text{s}, V_{GE}=-15\text{V},$ $T_j=25^{\circ}\text{C}$		12.5		μC
I_{RM}	Peak Reverse Recovery Current			136		A
E_{rec}	Reverse Recovery Energy			5.54		mJ
Q_r	Recovered Charge	$V_{CC}=600\text{V}, I_F=150\text{A},$ $-di/dt=2200\text{A}/\mu\text{s}, V_{GE}=-15\text{V},$ $T_j=125^{\circ}\text{C}$		20.0		μC
I_{RM}	Peak Reverse Recovery Current			173		A
E_{rec}	Reverse Recovery Energy			11.8		mJ
Q_r	Recovered Charge	$V_{CC}=600\text{V}, I_F=150\text{A},$ $-di/dt=2200\text{A}/\mu\text{s}, V_{GE}=-15\text{V},$ $T_j=150^{\circ}\text{C}$		26.8		μC
I_{RM}	Peak Reverse Recovery Current			190		A
E_{rec}	Reverse Recovery Energy			15.4		mJ

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

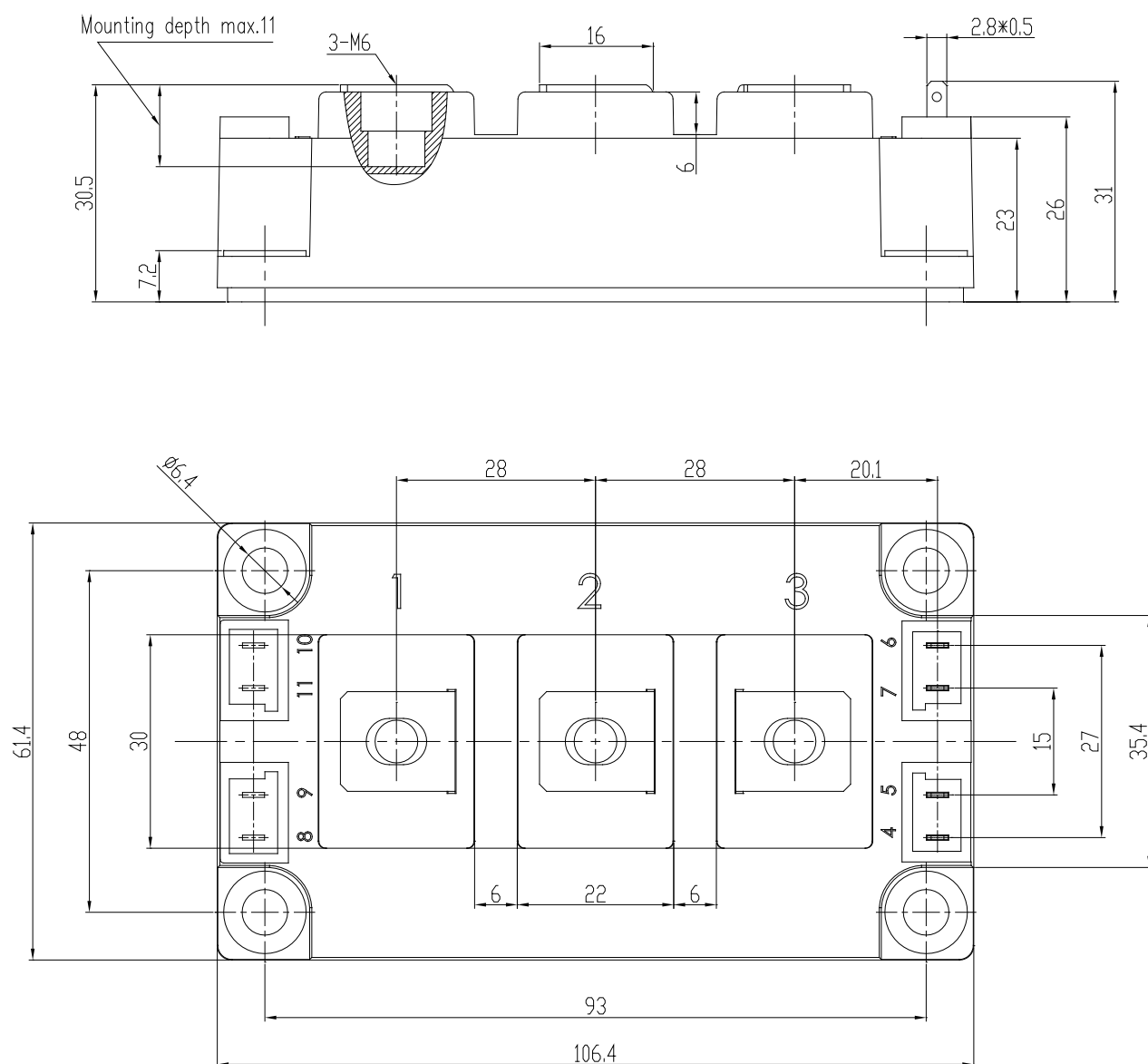
Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance			20	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		0.35		m Ω
R_{thJC}	Junction-to-Case (per IGBT)			0.166	K/W
	Junction-to-Case (per Diode)			0.221	
R_{thCH}	Case-to-Heatsink (per IGBT)		0.123		K/W
	Case-to-Heatsink (per Diode)		0.163		
	Case-to-Heatsink (per Module)		0.035		
M	Terminal Connection Torque, Screw M6	2.5		5.0	N.m
	Mounting Torque, Screw M6	3.0		5.0	
G	Weight of Module		300		g

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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