

STARPOWER

SEMICONDUCTOR

IGBT

GD450HFL120C2S

Molding Type Module

1200V/450A 2 in one-package

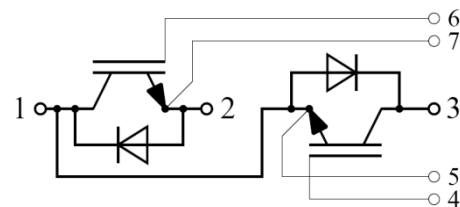
General Description

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



Features

- Low $V_{CE(sat)}$ SPT+ IGBT technology
- Low switching loss
- 10 μ s short circuit capability
- Low inductance case
- $V_{CE(sat)}$ with positive temperature coefficient
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology



Equivalent Circuit Schematic

Typical Applications

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

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

Symbol	Description	GD450HFL120C2S	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^\circ\text{C}$	715	A
	@ $T_C=100^\circ\text{C}$	450	
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	900	A
I_F	Diode Continuous Forward Current	450	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	900	A
P_D	Maximum Power Dissipation @ $T_j=175^\circ\text{C}$	2679	W
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, $f=50\text{Hz}$, $t=1\text{min}$	2500	V
Mounting Torque	Power Terminal Screw:M6 Mounting Screw:M6	2.5 to 5.0 3.0 to 5.0	N.m

Electrical Characteristics of IGBT $T_C=25^\circ\text{C}$ unless otherwise noted**Off Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$T_j=25^\circ\text{C}$	1200			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

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=18.0\text{mA}$, $V_{CE}=V_{GE}$, $T_j=25^\circ\text{C}$	5.0	5.8	7.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=450\text{A}$, $V_{GE}=15\text{V}$, $T_j=25^\circ\text{C}$		2.00	2.45	V
		$I_C=450\text{A}$, $V_{GE}=15\text{V}$, $T_j=125^\circ\text{C}$		2.20		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=450A,$ $R_G=2.2\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		220		ns
t_r	Rise Time			68		ns
$t_{d(off)}$	Turn-Off Delay Time			475		ns
t_f	Fall Time			55		ns
E_{on}	Turn-On Switching Loss			48.0		mJ
E_{off}	Turn-Off Switching Loss			28.2		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=450A,$ $R_G=2.2\Omega, V_{GE}=\pm 15V,$ $T_j=125^\circ C$		250		ns
t_r	Rise Time			72		ns
$t_{d(off)}$	Turn-Off Delay Time			530		ns
t_f	Fall Time			80		ns
E_{on}	Turn-On Switching Loss			66.0		mJ
E_{off}	Turn-Off Switching Loss			45.0		mJ
C_{ies}	Input Capacitance	$V_{CE}=25V, f=1Mhz,$ $V_{GE}=0V$		31.8		nF
C_{oes}	Output Capacitance			2.13		nF
C_{res}	Reverse Transfer Capacitance			1.41		nF
I_{SC}	SC Data	$t_p \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=900V,$ $V_{CEM} \leq 1200V$		1950		A
Q_G	Gate Charge	$V_{CC}=600V, I_C=450A,$ $V_{GE}=-15 \dots +15V$		4.59		μC
R_{Gint}	Internal Gate Resistance			0.7		Ω
L_{CE}	Stray Inductance				20	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			0.35		m Ω

Electrical Characteristics of Diode $T_C=25^\circ C$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Vd tage	$I_F=450A$ $V_{GE}=0V$	$T_j=25^\circ C$	1.72	2.12	V
			$T_j=125^\circ C$	1.73		
Q_r	Recovered Charge	$I_F=450A,$ $V_R=600V,$ $R_G=2.2\Omega,$ $V_{GE}=-15V$	$T_j=25^\circ C$	36.2		μC
			$T_j=125^\circ C$	78.1		
I_{RM}	Peak Reverse Recovery Current	$V_R=600V,$ $R_G=2.2\Omega,$ $V_{GE}=-15V$	$T_j=25^\circ C$	234		A
			$T_j=125^\circ C$	314		
E_{rec}	Reverse Recovery Energy	$V_R=600V,$ $R_G=2.2\Omega,$ $V_{GE}=-15V$	$T_j=25^\circ C$	19.1		mJ
			$T_j=125^\circ C$	36.3		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		0.056	K/W
$R_{\theta JC}$	Junction-to-Case (per Diode)		0.107	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.035		K/W
Weight	Weight of Module	300		g

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