

STARPOWER

SEMICONDUCTOR™

IGBT

GD400HFK60C2S

Molding Type Module

600V/400A 2 in one-package

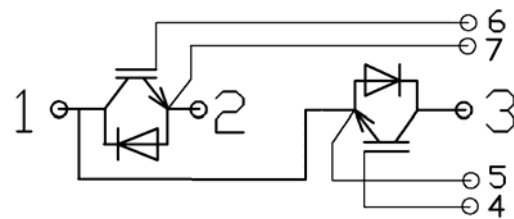
General Description

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



Features

- 10 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Square RBSOA
- Latch-up free
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology



Equivalent Circuit Schematic

Typical Applications

- UPS
- Switching mode power supplies
- Electronic welders

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

Symbol	Description	GD400HFK60C2S	Units
V_{CES}	Collector-Emitter Voltage	600	V

Symbol	Description	GD400HFK60C2S	Units
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^\circ\text{C}$	500	A
	@ $T_C=80^\circ\text{C}$	400	
$I_{CM(1)}$	Pulsed Collector Current $t_p=1\text{ms}$	800	A
I_F	Diode Continuous Forward Current	400	A
I_{FM}	Diode Maximum Forward Current	800	A
P_D	Maximum Power Dissipation @ $T_j=150^\circ\text{C}$	1330	W
T_{SC}	Short Circuit Withstand Time @ $T_j=125^\circ\text{C}$	10	μs
T_j	Maximum Junction Temperature	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	2.5 to 5.0	N.m
	Mounting Screw:M6	3.0 to 5.0	N.m

Notes:

(1) Repetitive rating: Pulse width limited by max. junction temperature

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	$T_j=25^\circ\text{C}$	600			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	$I_C=1.0\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	3.5	4.5	5.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=400\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		1.90	2.30	V
		$I_C=400\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		2.20		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units	
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300\text{V}, I_C=400\text{A}, R_G=3.5\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$		400		ns	
t_r	Rise Time			200		ns	
$t_{d(off)}$	Turn-Off Delay Time				529		ns
t_f	Fall Time				107		ns

E_{on}	Turn-On Switching Loss	$V_{CC}=300V, I_C=400A,$ $R_G=3.5\Omega, V_{GE}=\pm 15V,$ $T_J=25^\circ C$		2.5		mJ
E_{off}	Turn-Off Switching Loss			21.1		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300V, I_C=400A,$ $R_G=3.5\Omega, V_{GE}=\pm 15V,$ $T_J=125^\circ C$		410		ns
t_r	Rise Time			210		ns
$t_{d(off)}$	Turn-Off Delay Time			553		ns
t_f	Fall Time			109		ns
E_{on}	Turn-On Switching Loss			4.7		mJ
E_{off}	Turn-Off Switching Loss			24.0		mJ
C_{ies}	Input Capacitance	$V_{CE}=30V, f=1MHz,$ $V_{GE}=0V$		22.6		nF
C_{oes}	Output Capacitance			1.74		nF
C_{res}	Reverse Transfer Capacitance			0.82		nF
I_{SC}	SC Data	$t_{sc} \leq 10\mu s, V_{GE}=15V,$ $T_J=125^\circ C, V_{CC}=360V,$ $V_{CEM} \leq 600V$		TBD		A
R_{Gint}	Internal Gate Resistance			1.2		Ω
L_{CE}	Stray Inductance				20	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip	$T_C=25^\circ C$		0.35		m Ω

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

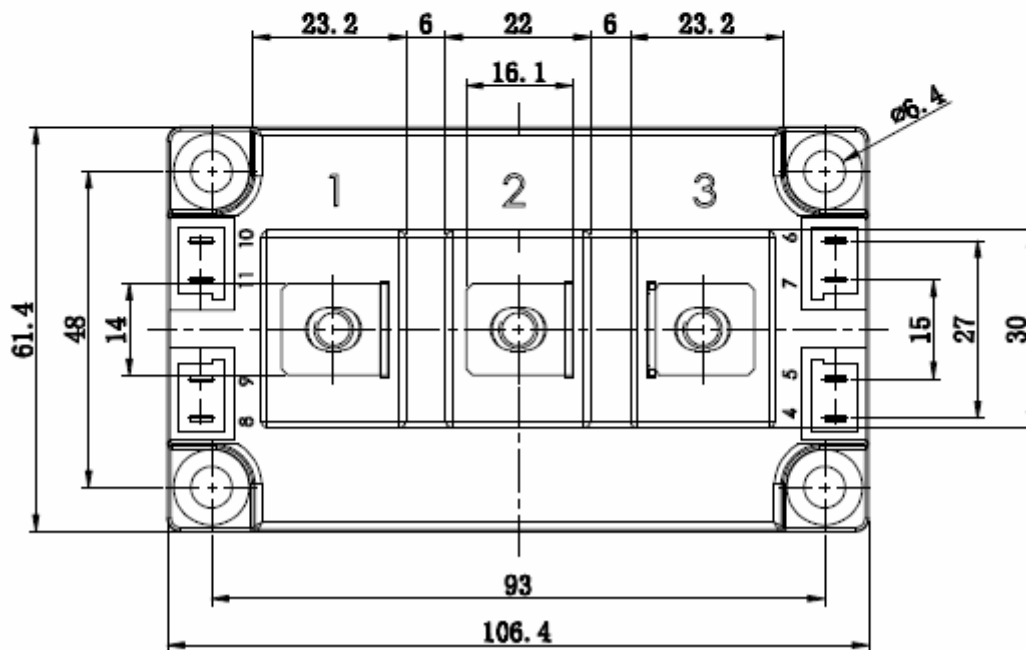
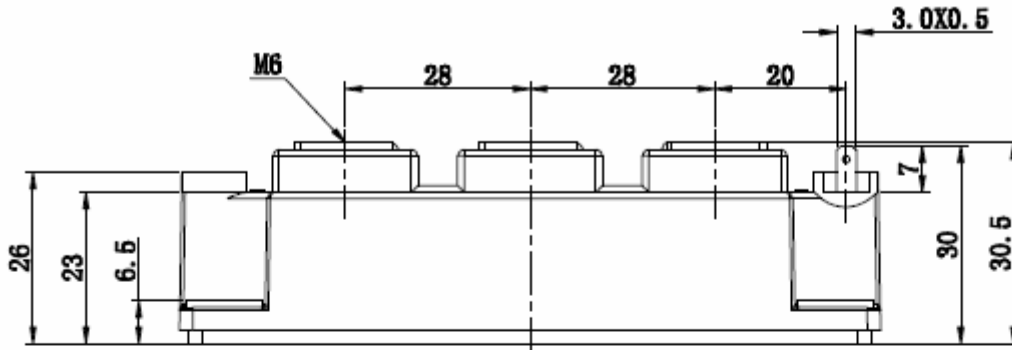
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units	
V_F	Diode Forward Voltage	$I_F=400A$	$T_J=25^\circ C$		1.40	1.80	V
			$T_J=125^\circ C$		1.45		
Q_r	Recovered Charge	$I_F=400A,$	$T_J=25^\circ C$		14.2		μC
			$T_J=125^\circ C$		22.5		
I_{RM}	Peak Reverse Recovery Current	$V_R=300V,$ $di/dt=-1600A/\mu s,$	$T_J=25^\circ C$		158		A
			$T_J=125^\circ C$		183		
E_{rec}	Reverse Recovery Energy	$V_{GE}=-15V$	$T_J=25^\circ C$		4.8		mJ
			$T_J=125^\circ C$		5.9		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		0.094	K/W
$R_{\theta JC}$	Junction-to-Case (per DIODE)		0.170	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.035		K/W
Weight	Weight of Module	300		g

Package Dimension

Dimensions in Millimeters



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