

# STARPOWER

SEMICONDUCTOR

# IGBT

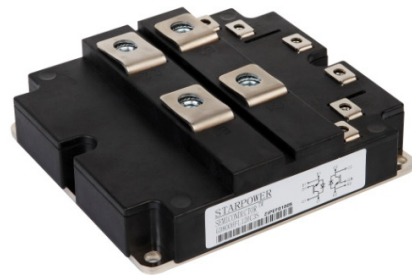
## GD800HFK170A3S

Molding Type Module

1700V/800A 2 in one-package

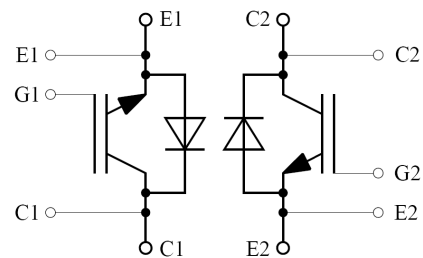
### General Description

STARPOWER IGBT Power Module provides ultra low conduction loss as well as short circuit ruggedness. They are designed for the applications such as high power converters.



### Features

- NPT IGBT technology
- 10 $\mu$ s short circuit capability
- $V_{CE(sat)}$  with positive temperature coefficient
- Maximum junction temperature 150°C
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- AlSiC baseplate for high power cycling capability
- AlN substrate for low thermal resistance



Equivalent Circuit Schematic

### Typical Applications

- High Power Converters
- Motor Drives
- AC Inverter Drives

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

Symbol	Description	GD800HFK170A3S	Unit
$V_{CES}$	Collector-Emitter Voltage	1700	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 20$	V
$I_C$	Collector Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=80^{\circ}\text{C}$	1300 800	A
$I_{CM}$	Pulsed Collector Current $t_p=1\text{ms}$	1600	A
$I_F$	Diode Continuous Forward Current	800	A
$I_{FM}$	Diode Maximum Forward Current $t_p=1\text{ms}$	1600	A
$P_D$	Maximum Power Dissipation @ $T_j=150^{\circ}\text{C}$	5.53	kW
$T_{jmax}$	Maximum Junction Temperature	150	$^{\circ}\text{C}$
$T_{jop}$	Operating Junction Temperature	-40 to +125	$^{\circ}\text{C}$
$T_{STG}$	Storage Temperature Range	-40 to +125	$^{\circ}\text{C}$
$V_{ISO}$	Isolation Voltage RMS, $f=50\text{Hz}, t=1\text{min}$	4000	V
M	Terminal Connection Torque, Screw M4 Terminal Connection Torque, Screw M8 Mounting Torque, Screw M6	1.8 to 2.1 8.0 to 10 4.25 to 5.75	N.m
G	Weight of Module	1050	g

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$T_j=25^{\circ}\text{C}$	1700			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

**On Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=64.0\text{mA}, V_{CE}=V_{GE},$ $T_j=25^{\circ}\text{C}$	5.5	6.1	6.7	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=800\text{A}, V_{GE}=15\text{V},$ $T_j=25^{\circ}\text{C}$ $I_C=800\text{A}, V_{GE}=15\text{V},$ $T_j=125^{\circ}\text{C}$		2.60 3.20	3.05	V

**Switching Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900V, I_C=800A,$ $R_{Gon}=1.2\Omega, R_{Goff}=1.8\Omega,$ $V_{GE}=\pm 15V, T_j=25^\circ C$		420		ns
$t_r$	Rise Time			135		ns
$t_{d(off)}$	Turn-Off Delay Time			1150		ns
$t_f$	Fall Time			125		ns
$E_{on}$	Turn-On Switching Loss			210		mJ
$E_{off}$	Turn-Off Switching Loss			245		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900V, I_C=800A,$ $R_{Gon}=1.2\Omega, R_{Goff}=1.8\Omega,$ $V_{GE}=\pm 15V, T_j=125^\circ C$		500		ns
$t_r$	Rise Time			140		ns
$t_{d(off)}$	Turn-Off Delay Time			1300		ns
$t_f$	Fall Time			135		ns
$E_{on}$	Turn-On Switching Loss			285		mJ
$E_{off}$	Turn-Off Switching Loss			325		mJ
$C_{ies}$	Input Capacitance	$V_{CE}=25V, f=1MHz,$ $V_{GE}=0V$		53.5		nF
$C_{res}$	Reverse Transfer Capacitance			2.82		nF
$I_{SC}$	SC Data	$t_p \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=1000V,$ $V_{CEM} \leq 1700V$		4800		A
$Q_G$	Gate Charge	$V_{GE}=-15 \dots +15V$		9.50		$\mu C$
$L_{CE}$	Stray Inductance			20		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			0.37		m $\Omega$

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

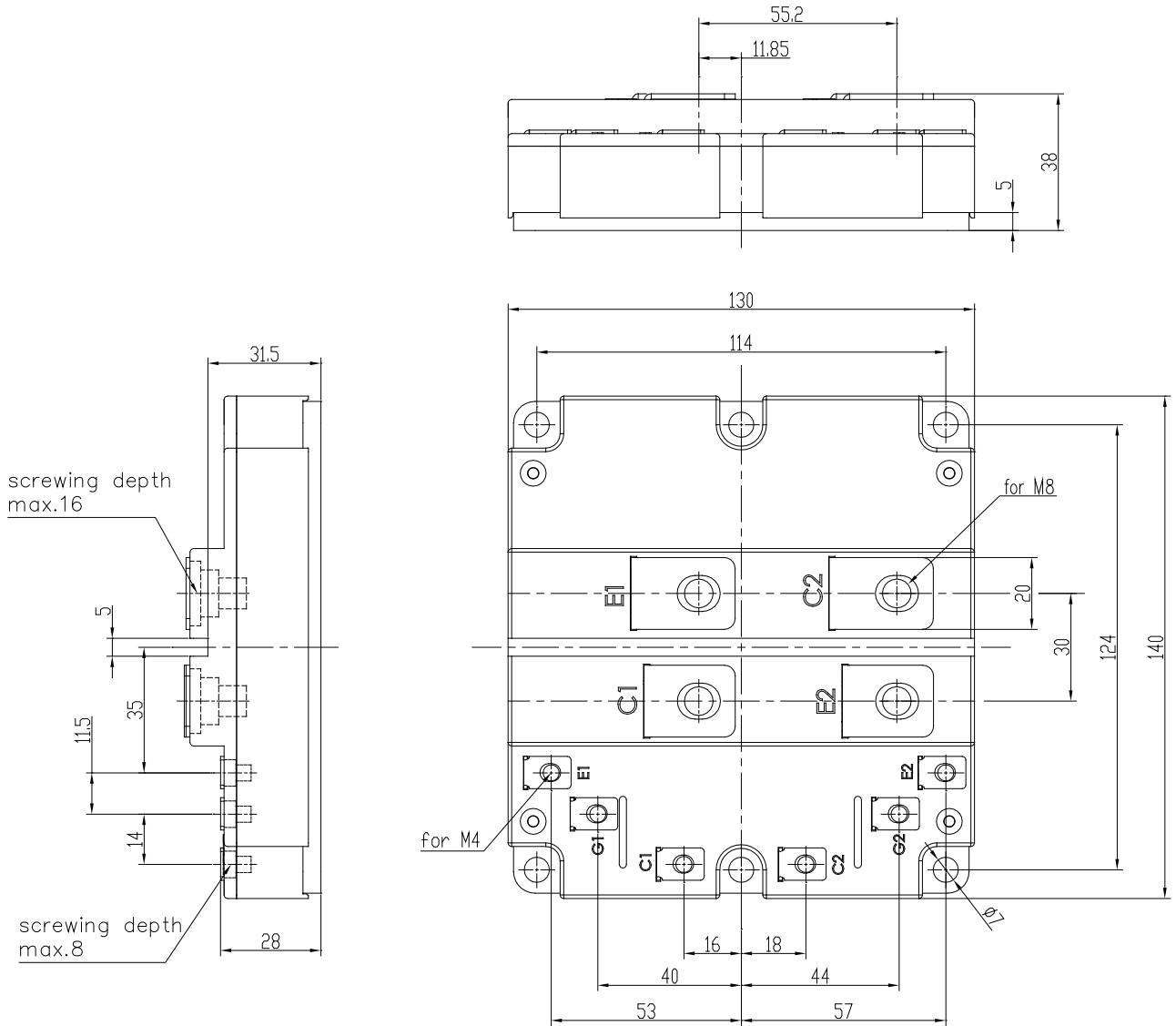
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_F$	Diode Forward Voltage	$I_F=800A, V_{GE}=0V, T_j=25^\circ C$		1.80	2.25	V
		$I_F=800A, V_{GE}=0V, T_j=125^\circ C$		1.95		
$Q_r$	Recovered Charge	$V_{CC}=900V, I_F=800A,$ $-di/dt=6000A/\mu s,$ $V_{GE}=\pm 15V, T_j=25^\circ C$		160		$\mu C$
$I_{RM}$	Peak Reverse Recovery Current			700		A
$E_{rec}$	Reverse Recovery Energy			75.0		mJ
$Q_r$	Recovered Charge	$V_{CC}=900V, I_F=800A,$ $-di/dt=6000A/\mu s,$ $V_{GE}=\pm 15V, T_j=125^\circ C$		300		$\mu C$
$I_{RM}$	Peak Reverse Recovery Current			850		A
$E_{rec}$	Reverse Recovery Energy			160		mJ

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

Symbol	Parameter	Min.	Typ.	Max.	Unit
$R_{thJC}$	Junction-to-Case (per IGBT)			22.6	K/kW
	Junction-to-Case (per Diode)			47.6	
$R_{thCH}$	Case-to-Heatsink (per IGBT)		23.6		K/kW
	Case-to-Heatsink (per Diode)		49.7		
	Case-to-Heatsink (per Module)		8.0		

**Package Dimensions**

Dimensions in Millimeters



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