

# STARPOWER

SEMICONDUCTOR™

# IGBT

## GD800HFL120C3S

## Preliminary

**Molding Type Module****1200V/800A 2 in one-package**

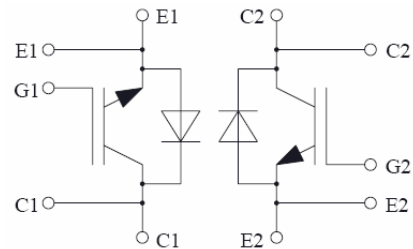
### General Description

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



### Features

- High short circuit capability, self limiting to  $6 \cdot I_C$
- 10 $\mu$ s short circuit capability
- $V_{CE(sat)}$  with positive temperature coefficient
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology

**Equivalent Circuit Schematic**

### Typical Applications

- AC inverter drives
- Switching mode power supplies
- Electronic welders

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

Symbol	Description	GD800HFL120C3S	Units
$V_{CES}$	Collector-Emitter Voltage	1200	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 20$	V
$I_C$	Collector Current @ $T_C=25^{\circ}\text{C}$	1250	A
	@ $T_C=80^{\circ}\text{C}$	800	
$I_{CM(1)}$	Pulsed Collector Current $t_p=1\text{ms}$	1600	A
$I_F$	Diode Continuous Forward Current	800	A
$I_{FM}$	Diode Maximum Forward Current	1600	A
$P_D$	Maximum power Dissipation @ $T_j=150^{\circ}\text{C}$	4310	W
$T_{SC}$	Short Circuit Withstand Time @ $T_j=125^{\circ}\text{C}$	10	$\mu\text{s}$
$T_j$	Operating Junction Temperature	-40 to +150	$^{\circ}\text{C}$
$T_{STG}$	Storage Temperature Range	-40 to +125	$^{\circ}\text{C}$
$I^2t$ -value, Diode	$V_R=0\text{V}$ , $t=10\text{ms}$ , $T_j=125^{\circ}\text{C}$	140	$\text{kA}^2\text{s}$
$V_{ISO}$	Isolation Voltage RMS, $f=50\text{Hz}$ , $t=1\text{min}$	2500	V
Mounting Torque	Power Terminal Screw:M4	1.7 to 2.3	N.m
	Power Terminal Screw:M8	8.0 to 10	
	Mounting Screw:M6	4.25 to 5.75	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
$BV_{CES}$	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	$I_C=32\text{mA}$ , $V_{CE}=V_{GE}$ , $T_j=25^{\circ}\text{C}$	5.0	6.2	7.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=800\text{A}$ , $V_{GE}=15\text{V}$ , $T_j=25^{\circ}\text{C}$		1.8		V
		$I_C=800\text{A}$ , $V_{GE}=15\text{V}$ , $T_j=125^{\circ}\text{C}$		2.0		

## Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$Q_{ge}$	Gate charge	$I_C=800A, V_{CE}=600V,$ $V_{GE}=-15\dots+15V$		11.5		$\mu C$
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=800A,$		600		ns
$t_r$	Rise Time	$R_{Gon}=3.3\Omega,$		230		ns
$t_{d(off)}$	Turn-Off Delay Time	$R_{Goff}=0.39\Omega,$		820		ns
$t_f$	Fall Time	$V_{GE} = \pm 15V, T_j=25^\circ C$		150		ns
$t_{d(on)}$	Turn-On Delay Time			660		ns
$t_r$	Rise Time	$V_{CC}=600V, I_C=800A,$		220		ns
$t_{d(off)}$	Turn-Off Delay Time	$R_{Gon}=3.3\Omega,$		960		ns
$t_f$	Fall Time	$R_{Goff}=0.39\Omega,$		180		ns
$E_{on}$	Turn-On Switching Loss	$V_{GE} = \pm 15V, T_j=125^\circ C$		160		mJ
$E_{off}$	Turn-Off Switching Loss			125		mJ
$C_{ies}$	Input Capacitance			61.8		nF
$C_{oes}$	Output Capacitance	$V_{CE}=25V, f=1MHz,$		4.2		nF
$C_{res}$	Reverse Transfer Capacitance	$V_{GE}=0V$		2.7		nF
$I_{SC}$	SC Data	$t_{sc} \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=900V,$ $V_{CEM} \leq 1200V$		3760		A
$L_{CE}$	Stray Inductance			20		nH
$R_{CC'+EE'}$	Module lead resistance, terminal to chip	$T_C=25^\circ C$		0.18		$m\Omega$

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

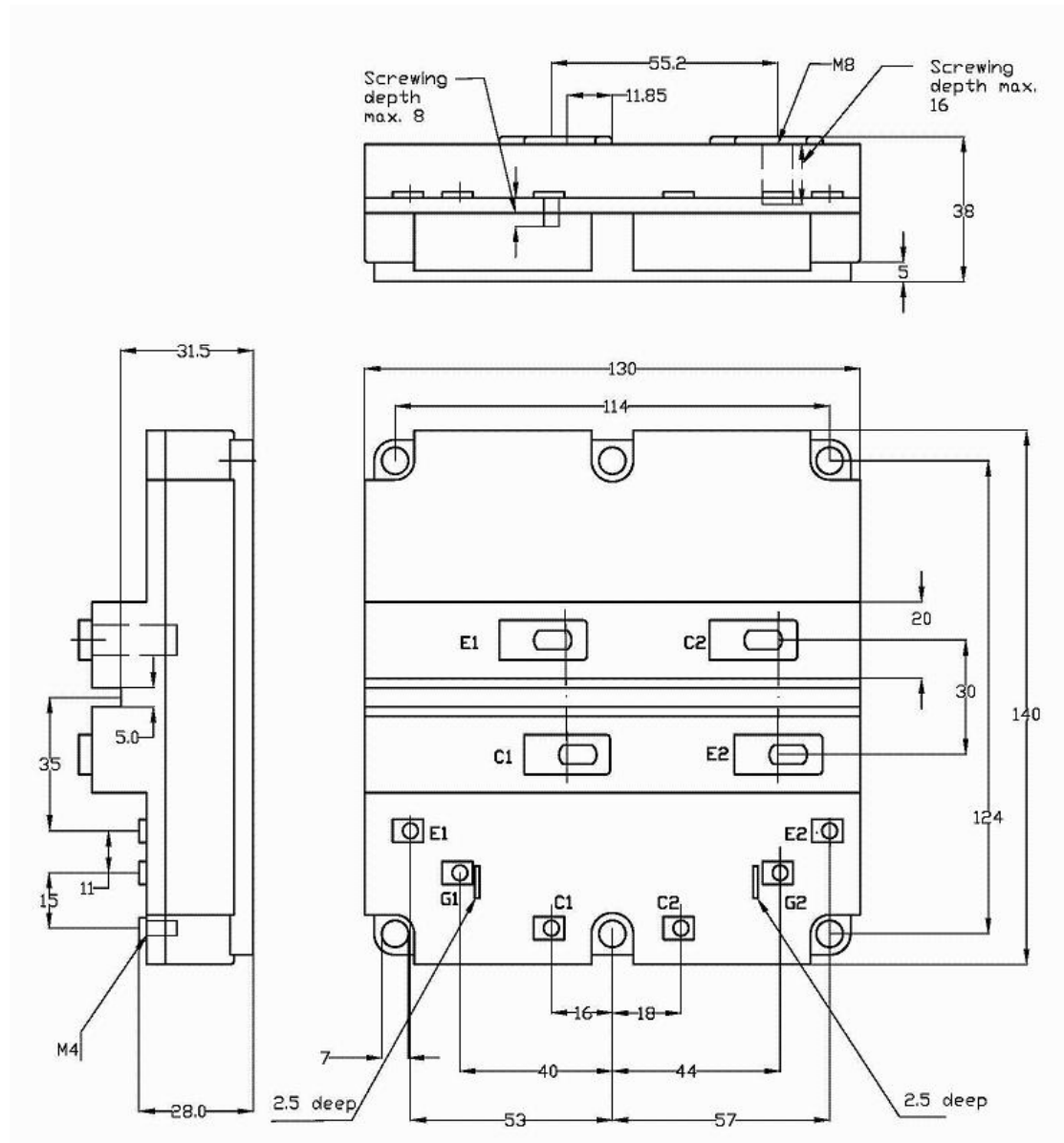
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_F$	Diode Forward Voltage	$I_F=800A$	$T_j=25^\circ C$		2.4	V
			$T_j=125^\circ C$		2.2	
$Q_r$	Diode Reverse Recovery Charge	$I_F=800A,$	$T_j=25^\circ C$		37	$\mu C$
			$T_j=125^\circ C$		90	
$I_{RM}$	Diode Peak Reverse Recovery Current	$V_R=600V,$ $di/dt=-3600A/\mu s,$ $V_{GE}=-15V$	$T_j=25^\circ C$		260	A
			$T_j=125^\circ C$		400	
$E_{rec}$	Reverse Recovery Energy		$T_j=25^\circ C$		9	mJ
			$T_j=125^\circ C$		24	

**Thermal Characteristics**

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (IGBT Part, per 1/2 Module)		0.029	K/W
$R_{\theta JC}$	Junction-to-Case (Diode Part, per 1/2 Module)		0.052	K/W
$R_{\theta CS}$	Case-to-Sink (conductive grease applied, per Module)	0.006		K/W
Weight	Weight of Module	1500		g

**Package Dimension**

Dimensions in Millimeters



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