

# STARPOWER

SEMICONDUCTOR

# IGBT

## GD1200HFL120C3S

Molding Type Module

1200V/1200A 2 in one-package

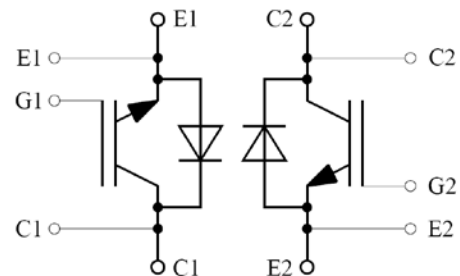
### General Description

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

- Low  $V_{CE(sat)}$  SPT++ IGBT technology
- 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

- High Power Converters
- Motor Drivers
- Wind Turbines

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

Symbol	Description	GD1200HFL120C3S	Units
$V_{CES}$	Collector-Emitter Voltage	1200	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 20$	V
$I_C$	Collector Current @ $T_C=25^\circ\text{C}$	1900	A
	@ $T_C=100^\circ\text{C}$	1200	
$I_{CM}$	Pulsed Collector Current $t_p=1\text{ms}$	2400	A
$I_F$	Diode Continuous Forward Current	1200	A
$I_{FM}$	Diode Maximum Forward Current $t_p=1\text{ms}$	2400	A
$P_D$	Maximum Power Dissipation @ $T_j=175^\circ\text{C}$	6.41	kW
$T_{jmax}$	Maximum Junction Temperature	175	$^\circ\text{C}$
$T_{jop}$	Maximum 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
M	Terminal Connection Torque, Screw M4	1.8 to 2.1	N.m
	Terminal Connection Torque, Screw M8	8.0 to 10	
	Mounting Torque, Screw M6	4.25 to 5.75	
G	Weight of Module	1500	g

**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	$I_C=48.0\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	5.4		7.4	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=1200\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		1.95	2.40	V
		$I_C=1200\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		2.10		

### Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=1200A,$ $R_{Gon}=2.1\Omega, R_{Goff}=4.5\Omega,$ $V_{GE}=\pm 15V, T_j=25^\circ C$		200		ns
$t_r$	Rise Time			135		ns
$t_{d(off)}$	Turn-Off Delay Time			1050		ns
$t_f$	Fall Time			130		ns
$E_{on}$	Turn-On Switching Loss			136		mJ
$E_{off}$	Turn-Off Switching Loss			160		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=1200A,$ $R_{Gon}=2.1\Omega, R_{Goff}=4.5\Omega,$ $V_{GE}=\pm 15V, T_j=125^\circ C$		220		ns
$t_r$	Rise Time			190		ns
$t_{d(off)}$	Turn-Off Delay Time			1150		ns
$t_f$	Fall Time			140		ns
$E_{on}$	Turn-On Switching Loss			184		mJ
$E_{off}$	Turn-Off Switching Loss			208		mJ
$C_{ies}$	Input Capacitance	$V_{CE}=25V, f=1MHz,$ $V_{GE}=0V$		84.8		nF
$C_{res}$	Reverse Transfer Capacitance			3.76		nF
$I_{SC}$	SC Data	$t_p \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=900V,$ $V_{CEM} \leq 1200V$		4500		A
$R_{Gint}$	Internal Gate Resistance			2.7		$\Omega$
$L_{CE}$	Stray Inductance			20		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			0.18		m $\Omega$

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

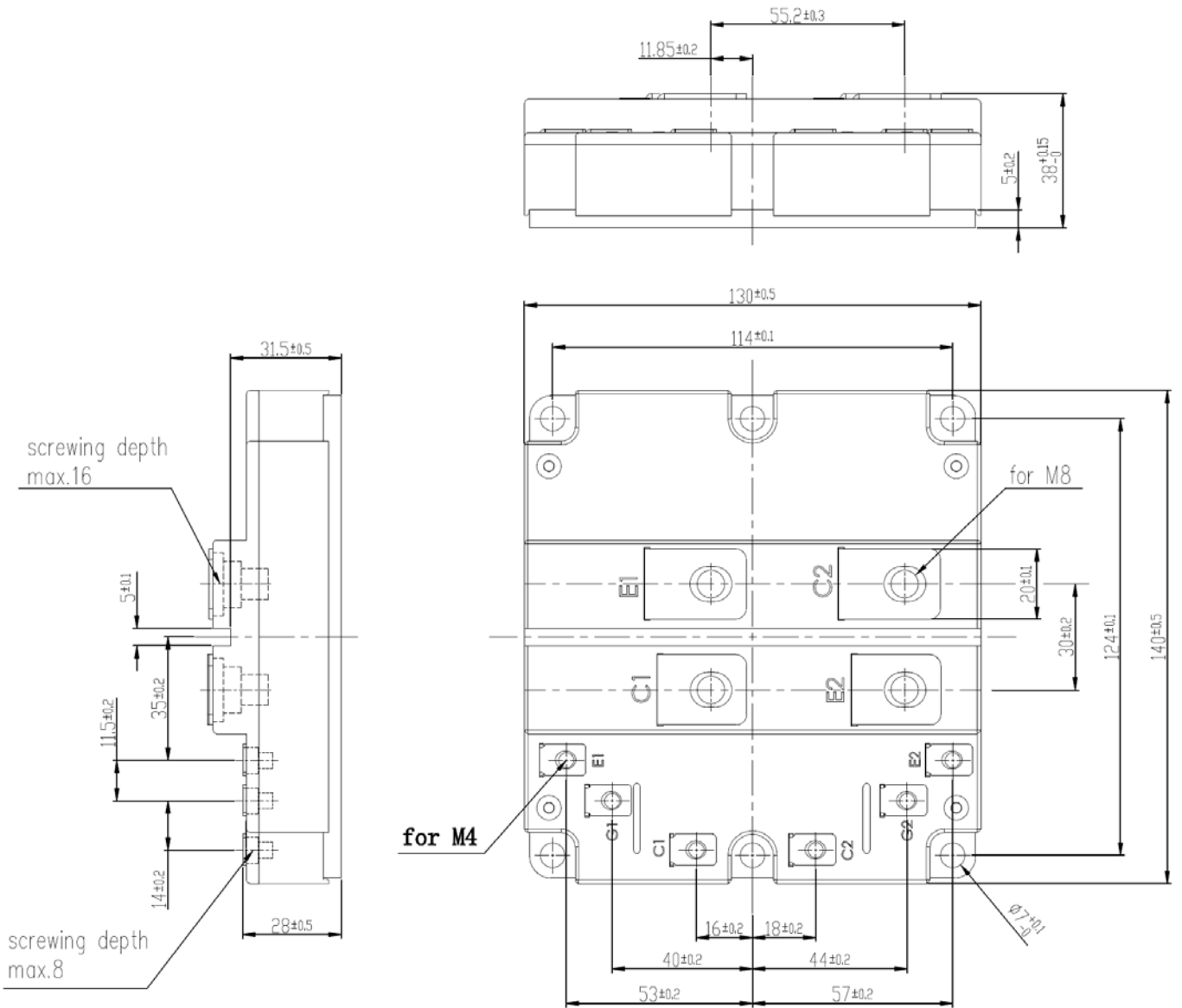
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_F$	Diode Forward Voltage	$I_F=1200A$	$T_j=25^\circ C$	1.65	2.20	V
			$T_j=125^\circ C$	1.75		
$Q_r$	Recovered Charge	$I_F=1200A,$	$T_j=25^\circ C$	400		$\mu C$
			$T_j=125^\circ C$	680		
$I_{RM}$	Peak Reverse Recovery Current	$V_R=600V,$ $R_{Gon}=2.1\Omega,$	$T_j=25^\circ C$	1400		A
			$T_j=125^\circ C$	1840		
$E_{rec}$	Reverse Recovery Energy	$V_{GE}=-15V$	$T_j=25^\circ C$	160		mJ
			$T_j=125^\circ C$	296		

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		23.4	K/kW
$R_{\theta JC}$	Junction-to-Case (per Diode)		46.1	K/kW
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	6		K/kW

**Package Dimensions**

Dimensions in Millimeters



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