

# STARPOWER

SEMICONDUCTOR

# IGBT

## GD50HFT120C1SU

Molding Type Module

1200V/50A 2 in one-package

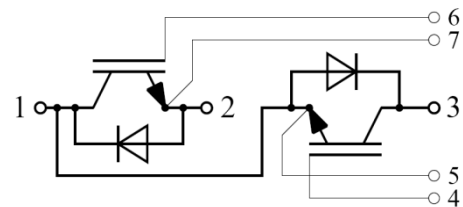
### General Description

STARPOWER IGBT Power Module provides ultra low conduction loss as well as ultrafast switching speed. It's designed for the applications such as welding machine and inductive heating.



### Features

- Low  $V_{CE(sat)}$  Trench IGBT technology
- Low switching losses
- $V_{CE(sat)}$  with positive temperature coefficient
- Maximum junction temperature 175 °C
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology



Equivalent Circuit Schematic

### Typical Applications

- Switching mode power supply
- Inductive heating
- Welding machine

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

Symbol	Description	GD50HFT120C1SU	Units
$V_{CES}$	Collector-Emitter Voltage	1200	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 30$	V
$I_C$	Collector Current @ $T_C=25^\circ\text{C}$	100	A
	@ $T_C=80^\circ\text{C}$	50	
$I_{CM}$	Pulsed Collector Current $t_p=1\text{ms}$	100	A
$I_F$	Diode Continuous Forward Current	50	A
$I_{FM}$	Diode Maximum Forward Current $t_p=1\text{ms}$	100	A
$P_D$	Maximum Power Dissipation @ $T_j=175^\circ\text{C}$	410	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, $f=50\text{Hz}, t=1\text{min}$	4000	V
Mounting Torque	Power Terminal Screw:M5 Mounting Screw:M6	2.5 to 5.0 3.0 to 5.0	N.m
Weight	Weight of Module	150	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	$I_C=2.4\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	3.0	4.6	6.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=50\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		1.78	2.25	V
		$I_C=50\text{A}, V_{GE}=15\text{V}, T_j=175^\circ\text{C}$		2.15		

### Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300V, I_C=50A,$ $R_G=20\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		331		ns
$t_r$	Rise Time			66		ns
$t_{d(off)}$	Turn-Off Delay Time			329		ns
$t_f$	Fall Time			172		ns
$E_{on}$	Turn-On Switching Loss			4.08		mJ
$E_{off}$	Turn-Off Switching Loss			1.90		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300V, I_C=50A,$ $R_G=20\Omega, V_{GE}=\pm 15V,$ $T_j=125^\circ C$		340		ns
$t_r$	Rise Time			68		ns
$t_{d(off)}$	Turn-Off Delay Time			342		ns
$t_f$	Fall Time			265		ns
$E_{on}$	Turn-On Switching Loss			4.87		mJ
$E_{off}$	Turn-Off Switching Loss			2.98		mJ
$C_{ies}$	Input Capacitance	$V_{CE}=30V, f=1MHz,$ $V_{GE}=0V$		6.68		nF
$C_{res}$	Reverse Transfer Capacitance			0.15		nF
$Q_G$	Gate Charge	$V_{CC}=600V, I_C=50A,$ $V_{GE}=15V$		262		nC
$R_{Gint}$	Internal Gate Resistance			2.35		$\Omega$
$L_{CE}$	Stray Inductance				30	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			0.75		m $\Omega$

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

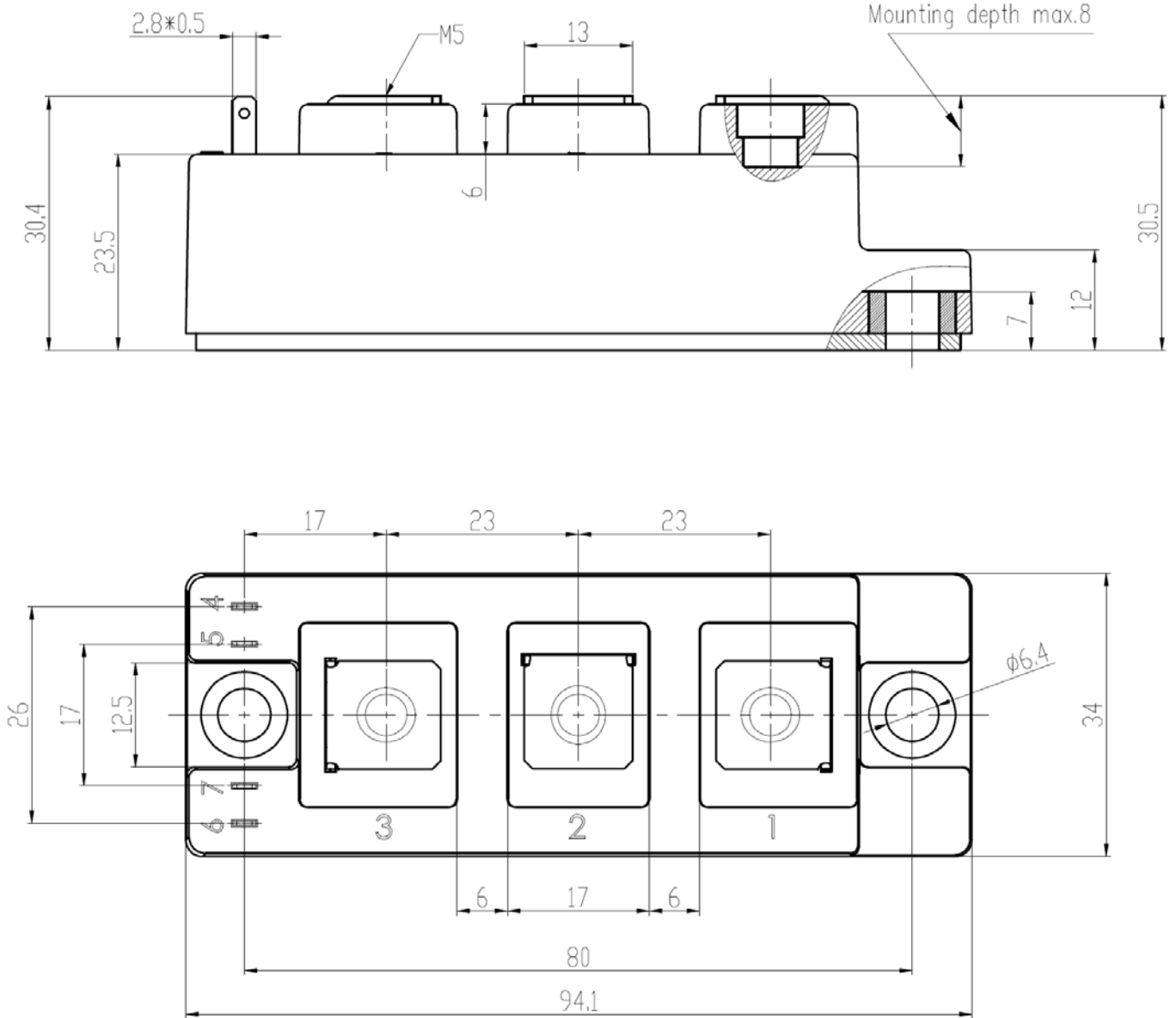
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_F$	Diode Forward Voltage	$I_F=50A$	$T_j=25^\circ C$	2.23	2.63	V
			$T_j=125^\circ C$	2.17		
$Q_r$	Recovered Charge	$I_F=50A,$ $V_R=300V,$ $R_G=20\Omega,$ $V_{GE}=-15V$	$T_j=25^\circ C$	2.8		$\mu C$
			$T_j=125^\circ C$	5.0		
$I_{RM}$	Peak Reverse Recovery Current	$V_{GE}=-15V$	$T_j=25^\circ C$	33		A
			$T_j=125^\circ C$	38		
$E_{rec}$	Reverse Recovery Energy	$V_{GE}=-15V$	$T_j=25^\circ C$	1.75		mJ
			$T_j=125^\circ C$	3.02		

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		0.366	K/W
$R_{\theta JC}$	Junction-to-Case (per Diode)		0.914	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.05		K/W

**Package Dimensions**

Dimensions in Millimeters



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