

# STARPOWER

SEMICONDUCTOR

# IGBT

## GD50FFK120C5SN

Molding Type Module

1200V/50A 6 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

- NPT IGBT technology
- 10 $\mu$ s short circuit capability
- $V_{CE(sat)}$  with positive temperature coefficient
- Rugged with ultrafast performance
- Square RBSOA
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology

### Typical Applications

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterruptible power supply

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

Symbol	Description	GD50FFK120C5SN	Units
$V_{CES}$	Collector-Emitter Voltage	1200	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 20$	V
$I_C$	Collector Current @ $T_C=25^\circ\text{C}$	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 @ $T_j=150^\circ\text{C}$	417	W
$T_{jmax}$	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
Mounting Torque	Mounting Screw:M5	3.0 to 6.0	N.m
Weight	Weight of Module	200	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	$I_C=0.5\text{mA}$ , $V_{CE}=V_{GE}$ , $T_j=25^\circ\text{C}$	4.4	5.2	6.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=50\text{A}$ , $V_{GE}=15\text{V}$ , $T_j=25^\circ\text{C}$		2.15	2.60	V
		$I_C=50\text{A}$ , $V_{GE}=15\text{V}$ , $T_j=125^\circ\text{C}$		2.45		

**Switching Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=50A,$ $R_G=22\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		381		ns
$t_r$	Rise Time			163		ns
$t_{d(off)}$	Turn-Off Delay Time			393		ns
$t_f$	Fall Time			76		ns
$E_{on}$	Turn-On Switching Loss			5.70		mJ
$E_{off}$	Turn-Off Switching Loss			3.45		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=50A,$ $R_G=22\Omega, V_{GE}=\pm 15V,$ $T_j=125^\circ C$		395		ns
$t_r$	Rise Time			76		ns
$t_{d(off)}$	Turn-Off Delay Time			399		ns
$t_f$	Fall Time			265		ns
$E_{on}$	Turn-On Switching Loss			6.82		mJ
$E_{off}$	Turn-Off Switching Loss			4.86		mJ
$C_{ies}$	Input Capacitance	$V_{CE}=30V, f=1MHz,$ $V_{GE}=0V$		4.30		nF
$C_{oes}$	Output Capacitance			0.40		nF
$C_{res}$	Reverse Transfer Capacitance			0.16		nF
$I_{SC}$	SC Data	$t_p \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=900V,$ $V_{CEM} \leq 1200V$		400		A
$L_{CE}$	Stray Inductance			60		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			8.0		m $\Omega$

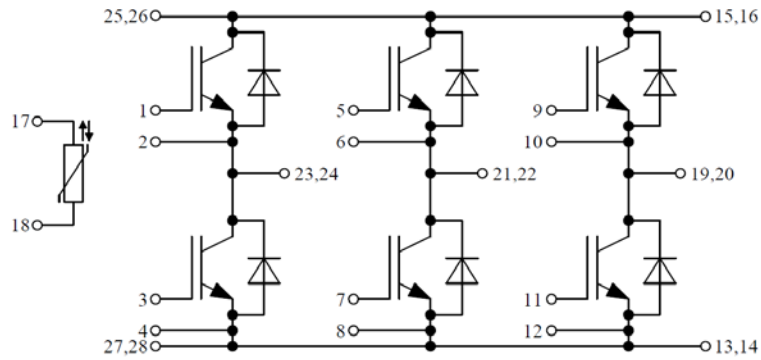
**Electrical Characteristics of Diode**  $T_C=25^\circ C$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_F$	Diode Forward Voltage	$I_F=50A, V_{GE}=0V$	$T_j=25^\circ C$	1.82	2.25	V
			$T_j=125^\circ C$	1.95		
$Q_r$	Recovered Charge	$I_F=50A,$ $V_R=600V,$ $R_G=22\Omega,$ $V_{GE}=-15V$	$T_j=25^\circ C$	3.4		$\mu C$
			$T_j=125^\circ C$	6.4		
$I_{RM}$	Peak Reverse Recovery Current	$V_{GE}=-15V$	$T_j=25^\circ C$	35		A
			$T_j=125^\circ C$	44		
$E_{rec}$	Reverse Recovery Energy	$V_{GE}=-15V$	$T_j=25^\circ C$	1.07		mJ
			$T_j=125^\circ C$	2.26		

**Thermal Characteristics**

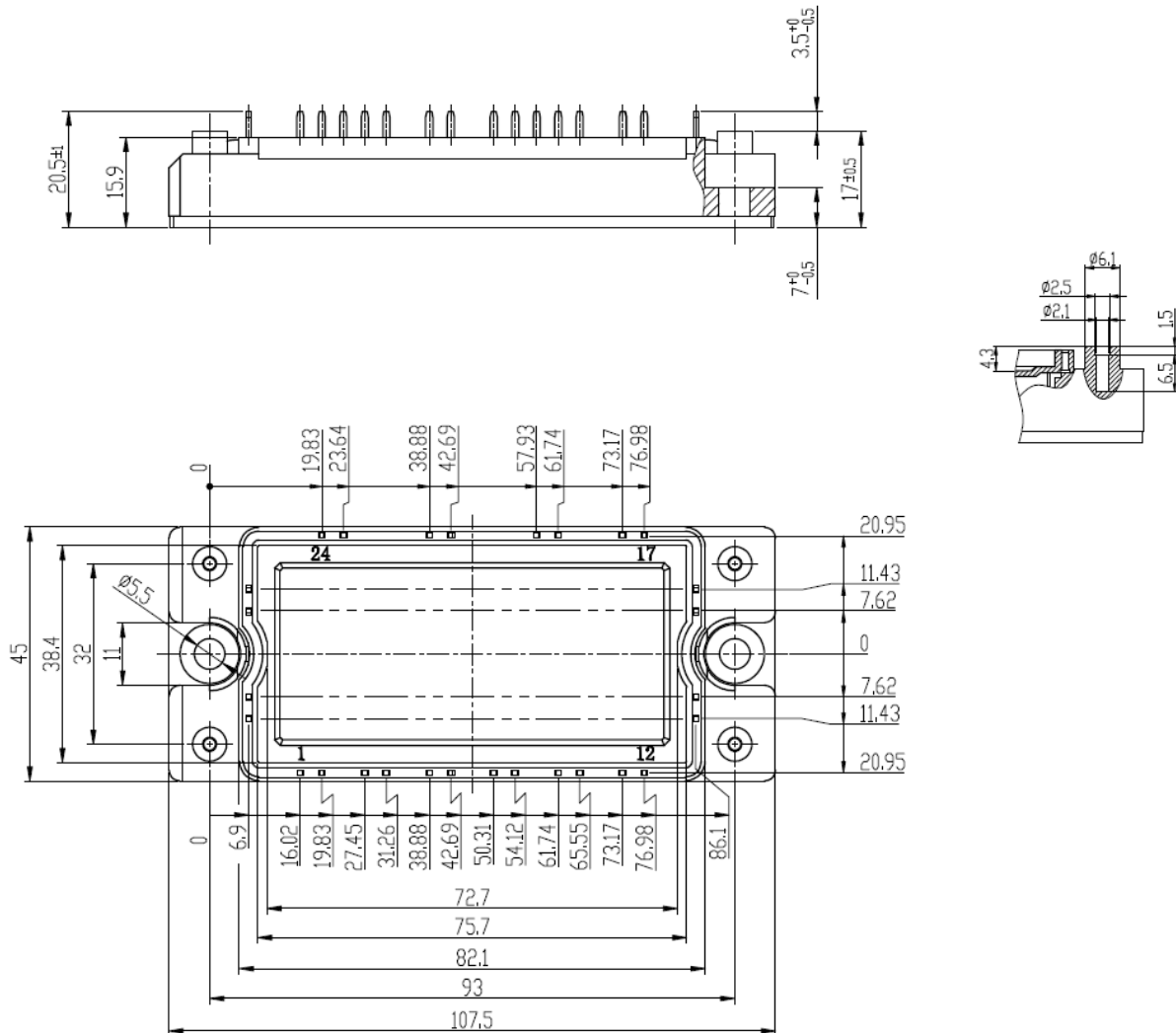
Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		0.302	K/W
$R_{\theta JC}$	Junction-to-Case (per Diode)		0.490	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.02		K/W

### Equivalent Circuit Schematic



### Package Dimensions

Dimensions in Millimeters



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