

STARPOWER

SEMICONDUCTOR™

IGBT

GD50FFT170C5S

Preliminary

Molding Type Module**1700V/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

- Low $V_{CE(sat)}$ trench IGBT technology
- Low switching losses
- 10 μ 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

Typical Applications

- AC Inverter Drives
- Uninterruptible Power Supply
- Wind Turbines

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

Symbol	Description	GD50FFT170C5S	Units
V_{CES}	Collector-Emitter Voltage	1700	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^\circ\text{C}$	90	A
	@ $T_C=80^\circ\text{C}$	50	
$I_{CM(1)}$	Pulsed Collector Current $t_p=1\text{ms}$	100	A
I_F	Diode Continuous Forward Current @ $T_C=80^\circ\text{C}$	50	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	100	A
P_D	Maximum power Dissipation @ $T_j=175^\circ\text{C}$	375	W
T_j	Maximum Junction Temperature	175	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-40 to +125	$^\circ\text{C}$
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}, t=1\text{min}$	3400	V
Mounting Torque	Mounting Screw: M5	3.0 to 6.0	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
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$T_j=25^\circ\text{C}$	1700			V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$			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	$I_C=2.0\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	5.2	5.8	6.4	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=50\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		2.00	2.45	V
		$I_C=50\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		2.40		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900V, I_C=50A,$ $R_G=8.0\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		371		ns
t_r	Rise Time			40		ns
$t_{d(off)}$	Turn-Off Delay Time			645		ns
t_f	Fall Time			180		ns
E_{on}	Turn-On Switching Loss			11.1		mJ
E_{off}	Turn-Off Switching Loss			10.4		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900V, I_C=50A,$ $R_G=8.0\Omega, V_{GE}=\pm 15V,$ $T_j=175^\circ C$		395		ns
t_r	Rise Time			50		ns
$t_{d(off)}$	Turn-Off Delay Time			801		ns
t_f	Fall Time			295		ns
E_{on}	Turn-On Switching Loss			15.9		mJ
E_{off}	Turn-Off Switching Loss			15.6		mJ
C_{ies}	Input Capacitance	$V_{CE}=25V, f=1MHz,$ $V_{GE}=0V$		4.41		nF
C_{oes}	Output Capacitance			0.18		nF
C_{res}	Reverse Transfer Capacitance			0.15		nF
I_{SC}	SC Data	$T_P \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=1000V,$ $V_{CEM} \leq 1700V$		200		A
L_{CE}	Stray Inductance			19		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			2.5		m Ω

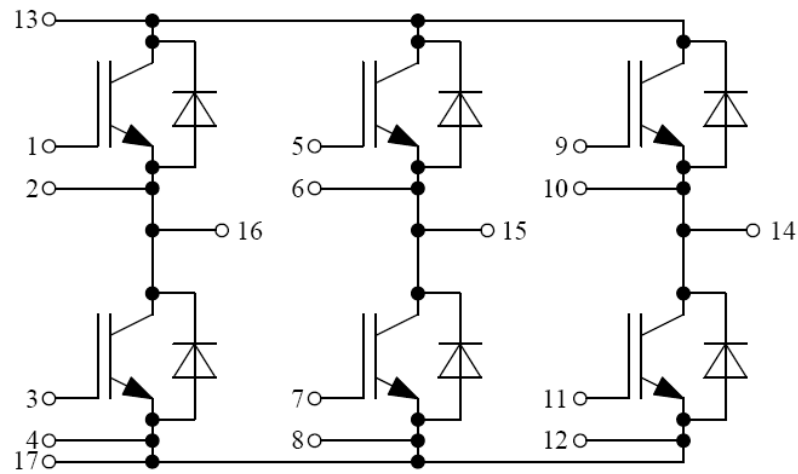
Electrical Characteristics of DIODE $T_C=25^\circ C$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	$I_F=50A$	$T_j=25^\circ C$	1.80	2.20	V
			$T_j=125^\circ C$	1.90		
Q_r	Recovered charge	$I_F=50A,$	$T_j=25^\circ C$	14.3		μC
			$T_j=125^\circ C$	24.6		
I_{RM}	Peak Reverse Recovery Current	$V_R=900V,$ $di/dt=-1200A/\mu s,$	$T_j=25^\circ C$	77		A
			$T_j=125^\circ C$	85		
E_{rec}	Reverse Recovery Energy	$V_{GE}=-15V$	$T_j=25^\circ C$	7.70		mJ
			$T_j=125^\circ C$	13.6		

Thermal Characteristics

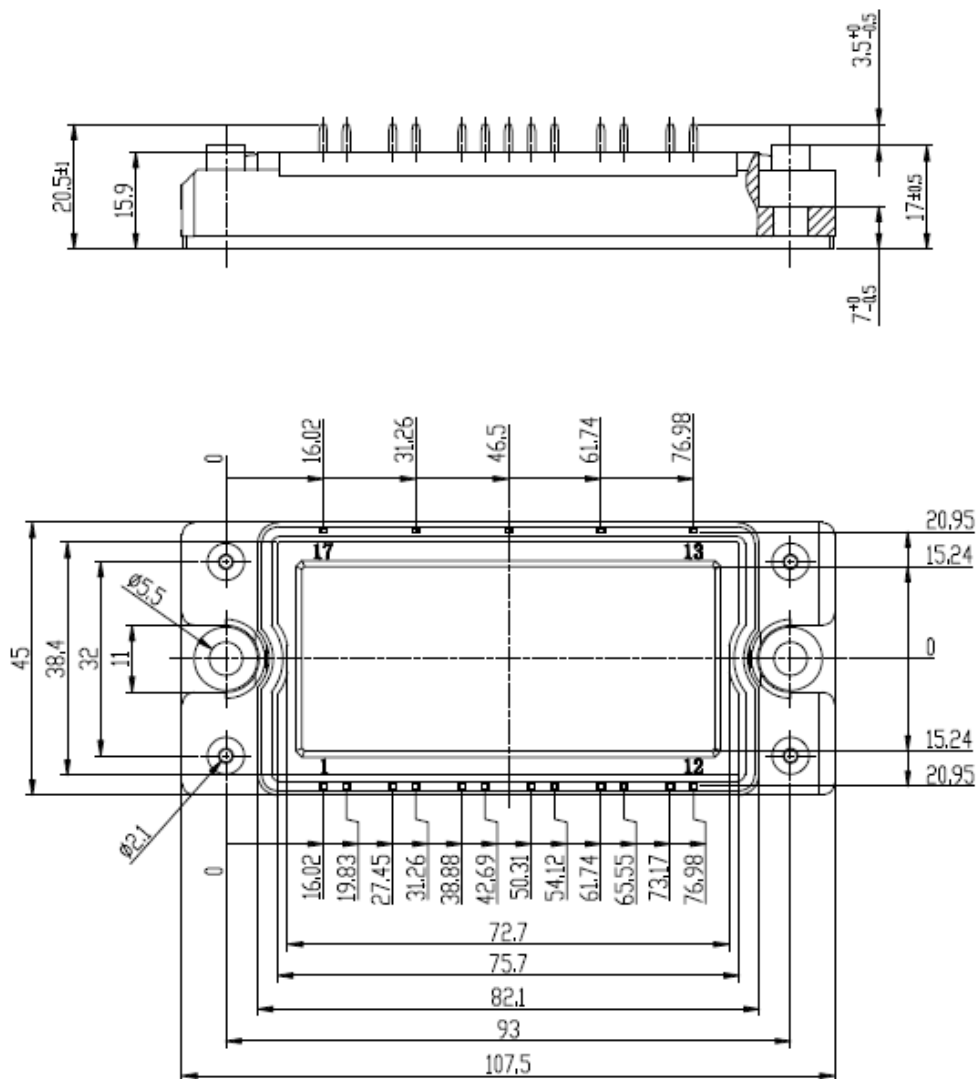
Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		0.40	K/W
$R_{\theta JC}$	Junction-to-Case (per DIODE)		0.69	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.02		K/W
Weight	Weight of Module	200		g

Equivalent Circuit Schematic



Package Dimension

Dimensions in Millimeters



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