

STARPOWER

SEMICONDUCTOR

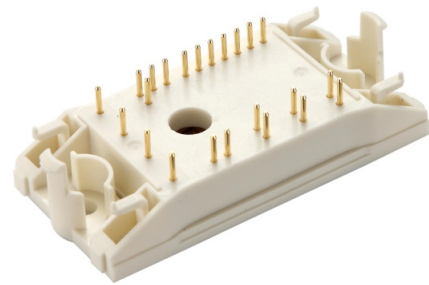
IGBT

GD75FFT60F1S

600V/75A 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.



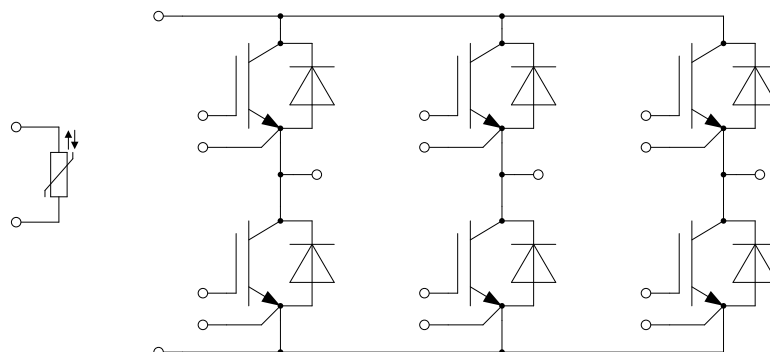
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- Low switching loss
- 5 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175°C
- Fast & soft reverse recovery anti-parallel FWD
- Isolated heatsink using DBC technology

Typical Applications

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

Equivalent Circuit Schematic



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

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	600	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	89	A
	@ $T_C=55^{\circ}\text{C}$	75	
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	150	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	248	W

Diode-inverter

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	600	V
I_F	Diode Continuous Forward Current	75	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	150	A

Module

Symbol	Description	Value	Unit
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

IGBT-inverter Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=75\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		1.70	2.15	V	
		$I_C=75\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		1.95			
		$I_C=75\text{A}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}$		2.00			
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=2.1\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	4.0	4.5	6.5	V	
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$			1.0	mA	
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0\text{V}, T_j=25^\circ\text{C}$			400	nA	
R_{Gint}	Internal Gate Resistance			/		Ω	
C_{ies}	Input Capacitance	$V_{CE}=30\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		4.44		nF	
C_{res}	Reverse Transfer Capacitance			0.13		nF	
Q_G	Gate Charge	$V_{GE}=15\text{V}$		0.15		μC	
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300\text{V}, I_C=75\text{A}, R_G=8.2\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$		105		ns	
t_r	Rise Time			54		ns	
$t_{d(off)}$	Turn-Off Delay Time			104		ns	
t_f	Fall Time			76		ns	
E_{on}	Turn-On Switching Loss			0.65		mJ	
E_{off}	Turn-Off Switching Loss			0.82		mJ	
$t_{d(on)}$	Turn-On Delay Time		$V_{CC}=300\text{V}, I_C=75\text{A}, R_G=8.2\Omega, V_{GE}=\pm 15\text{V}, T_j=125^\circ\text{C}$		105		ns
t_r	Rise Time				54		ns
$t_{d(off)}$	Turn-Off Delay Time			109		ns	
t_f	Fall Time			100		ns	
E_{on}	Turn-On Switching Loss			0.75		mJ	
E_{off}	Turn-Off Switching Loss			1.09		mJ	
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300\text{V}, I_C=75\text{A}, R_G=8.2\Omega, V_{GE}=\pm 15\text{V}, T_j=150^\circ\text{C}$			105		ns
t_r	Rise Time				55		ns
$t_{d(off)}$	Turn-Off Delay Time			112		ns	
t_f	Fall Time			108		ns	
E_{on}	Turn-On Switching Loss			0.83		mJ	
E_{off}	Turn-Off Switching Loss			1.28		mJ	
I_{SC}	SC Data		$t_p \leq 5\mu\text{s}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}, V_{CC}=360\text{V}, V_{CEM} \leq 600\text{V}$		675		A

Diode-inverter Characteristics $T_c=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	$I_F=75\text{A}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$		1.55	2.00	V
		$I_F=75\text{A}, V_{GE}=0\text{V}, T_j=125^\circ\text{C}$		1.50		
		$I_F=75\text{A}, V_{GE}=0\text{V}, T_j=150^\circ\text{C}$		1.50		
Q_r	Recovered Charge	$V_R=300\text{V}, I_F=75\text{A},$ $-di/dt=1600\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=25^\circ\text{C}$		3.4		μC
I_{RM}	Peak Reverse Recovery Current			53		A
E_{rec}	Reverse Recovery Energy			0.76		mJ
Q_r	Recovered Charge	$V_R=300\text{V}, I_F=75\text{A},$ $-di/dt=1600\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=125^\circ\text{C}$		5.7		μC
I_{RM}	Peak Reverse Recovery Current			66		A
E_{rec}	Reverse Recovery Energy			1.47		mJ
Q_r	Recovered Charge	$V_R=300\text{V}, I_F=75\text{A},$ $-di/dt=1600\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=150^\circ\text{C}$		6.0		μC
I_{RM}	Peak Reverse Recovery Current			70		A
E_{rec}	Reverse Recovery Energy			1.54		mJ

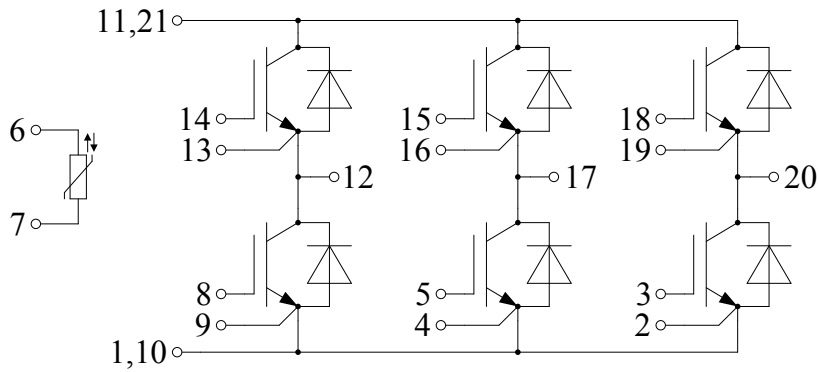
NTC Characteristics $T_c=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
R_{25}	Rated Resistance			22.0		$\text{k}\Omega$
$\Delta R/R$	Deviation of R_{100}	$T_c=100^\circ\text{C}, R_{100}=1486.1\Omega$	-5		5	%
P_{25}	Power Dissipation				200	mW
$B_{25/50}$	B-value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$		4000		K

Module Characteristics $T_c=25^\circ\text{C}$ unless otherwise noted

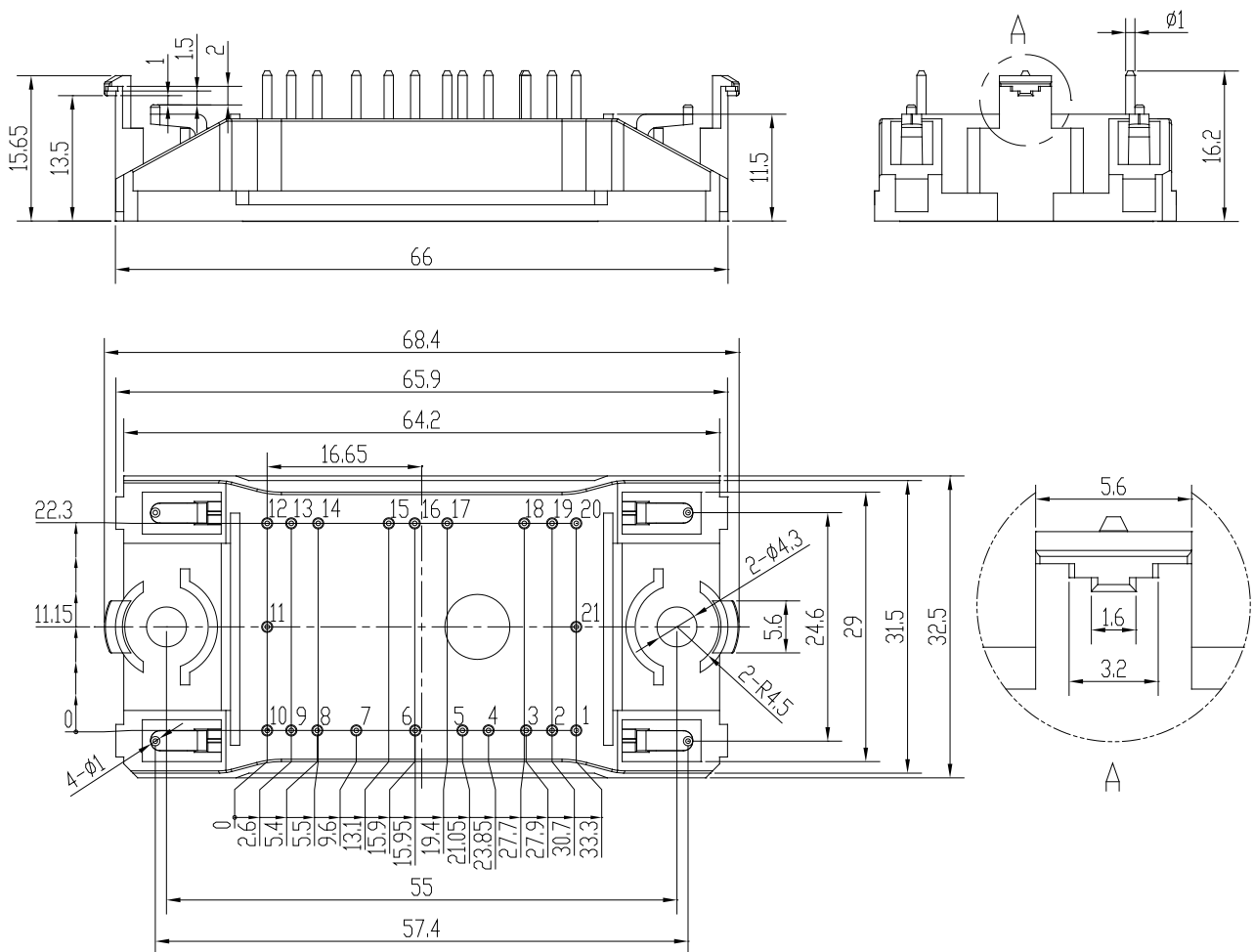
Symbol	Parameter	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case (per IGBT-inverter)		0.549	0.604	K/W
	Junction-to-Case (per Diode-inverter)		0.610	0.671	
R_{thCH}	Case-to-Heatsink (per IGBT-inverter)		0.399		K/W
	Case-to-Heatsink (per Diode-inverter)		0.443		
	Case-to-Heatsink (per Module)		0.035		
M	Mounting Torque, Screw M4	2.0		2.2	N.m
G	Weight of Module		26		g

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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