STARPOWER

SEMICONDUCTOR **IGBT**

GD650HFL170P1S

Molding Type Module

1700V/650A 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 wind and solar power.

Features

- Low $V_{CE(sat)}$ SPT+ IGBT technology
- 10μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- High power and thermal cycling capability

Typical Applications

- Auxiliary Inverters
- High Power Converters
- UPS
- Wind and Solar Power
- Traction Drives

Absolute Maximum Ratings T_C=25℃ unless otherwise noted

Symbol	Description	GD650HFL170P1S	Units
V_{CES}	Collector-Emitter Voltage	1700	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25℃ @ T_C=100℃	890 650	A
I_{CM}	Pulsed Collector Current t_p=1ms	1300	A
I_F	Diode Continuous Forward Current @ T_C=100℃	650	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	1300	A
P_D	Maximum Power Dissipation @ T_j=150℃	3.22	kW
T_{jmax}	Maximum Junction Temperature	150	℃
T_{jop}	Operating Junction Temperature	-40 to +150	℃
T_{STG}	Storage Temperature Range	-40 to +125	℃
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	4000	V
Mounting Torque	Power Terminal Screw:M4 Power Terminal Screw:M8	1.8 to 2.1 8.0 to 10	N.m
	Mounting Screw:M5	3.0 to 6.0	N.m

Electrical Characteristics of IGBT T_C=25℃ unless otherwise noted

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	T_j=25℃	1700			V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25℃			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25℃			400	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=24.0mA,V_{CE}=V_{GE}, T_j=25℃	5.4		7.4	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=650A,V_{GE}=15V, T_j=25℃		1.95	2.40	V
		I_C=650A,V_{GE}=15V, T_j=125℃		2.35		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=650A, R_{Gon}=1.0Ω, R_{Goff}=2.7Ω, V_{GE}=±15V, T_j=25℃		560		ns
t_r	Rise Time			85		ns
$t_{d(off)}$	Turn-Off Delay Time			1100		ns
t_f	Fall Time			280		ns
E_{on}	Turn-On Switching Loss			185		mJ
E_{off}	Turn-Off Switching Loss			125		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=650A, R_{Gon}=1.0Ω, R_{Goff}=2.7Ω, V_{GE}=±15V, T_j=125℃		620		ns
t_r	Rise Time			100		ns
$t_{d(off)}$	Turn-Off Delay Time			1300		ns
t_f	Fall Time			470		ns
E_{on}	Turn-On Switching Loss			265		mJ
E_{off}	Turn-Off Switching Loss			180		mJ
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		40.5		nF
C_{oes}	Output Capacitance			2.04		nF
C_{res}	Reverse Transfer Capacitance			1.44		nF
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=125℃,V_{CC}=1000V, V_{CEM}≤1700V		1860		A
R_{Gint}	Internal Gate Resistance			1.5		Ω
Q_G	Gate Charge	V_{CC}=900V,I_C=650A, V_{GE}=-15…+15V		4.85		μC
L_{CE}	Stray Inductance			18		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			0.30		mΩ

Electrical Characteristics of Diode T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=650A	T_j=25℃		1.80	2.25	V
			T_j=125℃		1.90		
Q_r	Recovered Charge	I_F=650A, V_R=900V, R_G=1.0Ω, V_{GE}=-15V	T_j=25℃		150		μC
			T_j=125℃		250		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		680		A
			T_j=125℃		750		
E_{rec}	Reverse Recovery Energy		T_j=25℃		74.5		mJ
			T_j=125℃		155		

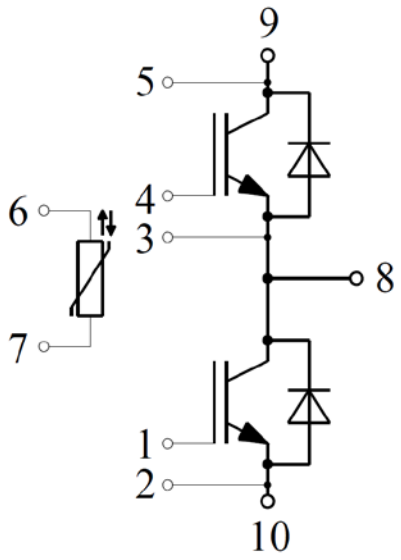
Electrical Characteristics of NTC T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
R_{25}	Rated Resistance			5.0		kΩ
ΔR/R	Deviation of R_{100}	T_C=100℃,R_{100}=493Ω	-5		5	%
P_{25}	Power Dissipation				20.0	mW
$B_{25/50}$	B-value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$		3375		K

Thermal Characteristics

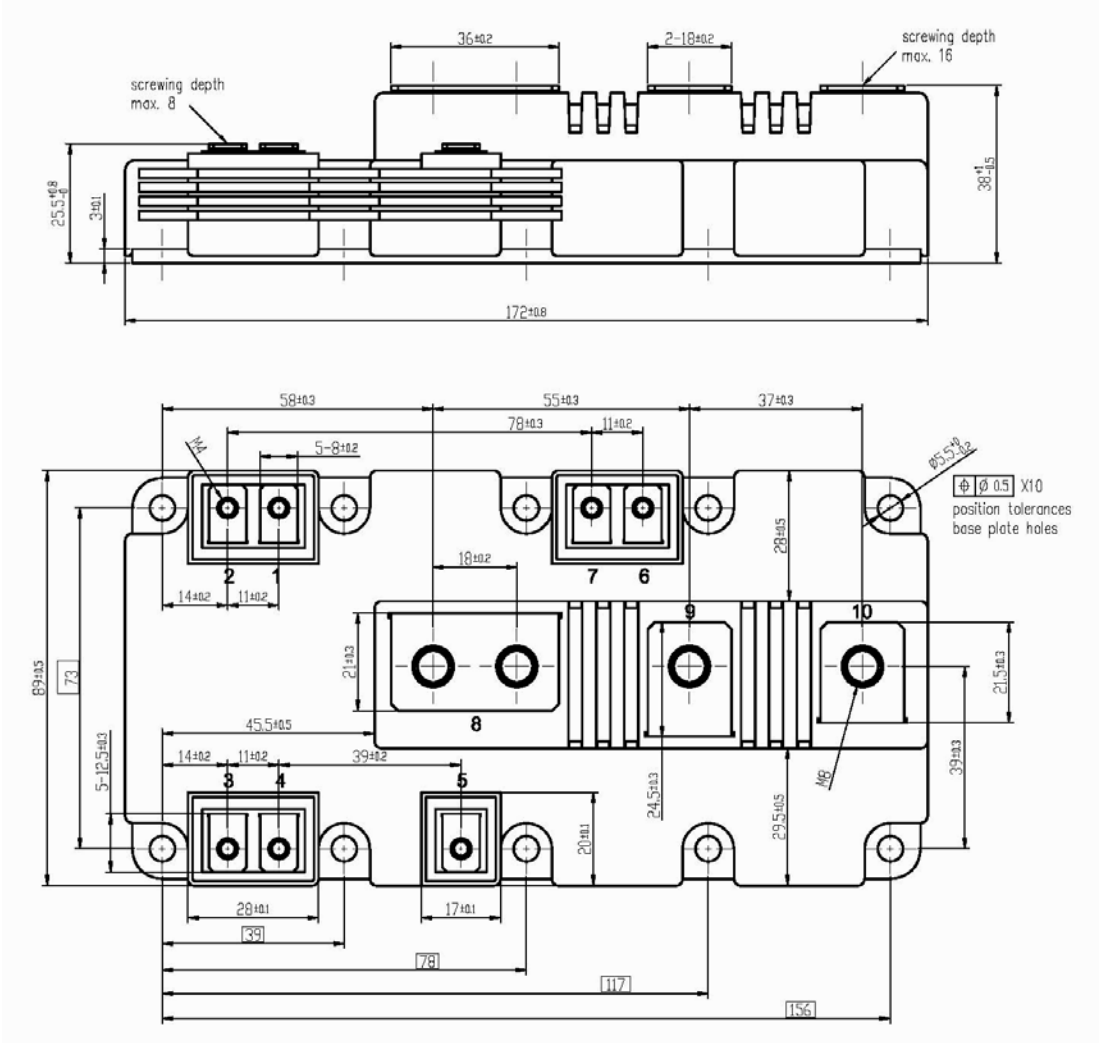
Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		38.8	K/kW
$R_{\theta JC}$	Junction-to-Case (per Diode)		56.0	K/kW
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	4.5		K/kW
Weight	Weight of Module	825		g

Equivalent Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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