STARPOWER

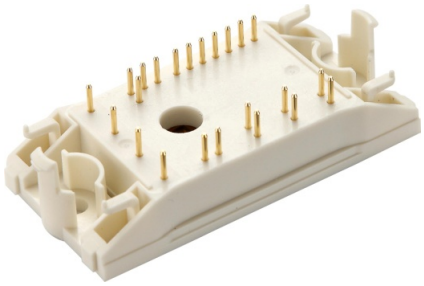
SEMICONDUCTOR **IGBT**

GD40HCT120F1S

1200V/40A 4 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 solar power.



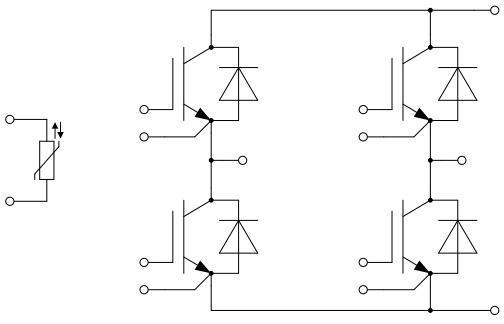
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 10μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175°C
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated heatsink using DBC technology

Typical Applications

- Switching mode power supply
- Solar power
- Battery charge

Equivalent Circuit Schematic



Absolute Maximum Ratings T_C=25°C unless otherwise noted

IGBT-inverter

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25°C @ T_C=100°C	60 40	A
I_{CM}	Pulsed Collector Current t_p=1ms	80	A
P_D	Maximum Power Dissipation @ T_j=175°C	262	W

Diode-inverter

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	40	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	80	A

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature	175	°C
T_{jop}	Operating Junction Temperature	-40 to +150	°C
T_{STG}	Storage Temperature Range	-40 to +125	°C
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	4000	V

IGBT-inverter Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=40A,V_{GE}=15V, T_j=25°C		2.05	2.50	V
		I_C=40A,V_{GE}=15V, T_j=125°C		2.50		
		I_C=40A,V_{GE}=15V, T_j=150°C		2.60		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=1.5mA,V_{CE}=V_{GE}, T_j=25°C	5.3	5.8	6.3	V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25°C			1.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25°C			400	nA
R_{Gint}	Internal Gate Resistance			0		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		2.33		nF
C_{res}	Reverse Transfer Capacitance			0.13		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		0.19		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=40A, R_G=12Ω,V_{GE}=±15V, T_j=25°C		35		ns
t_r	Rise Time			20		ns
$t_{d(off)}$	Turn-Off Delay Time			230		ns
t_f	Fall Time			20		ns
E_{on}	Turn-On Switching Loss			2.00		mJ
E_{off}	Turn-Off Switching Loss			1.50		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=40A, R_G=12Ω,V_{GE}=±15V, T_j=125°C		36		ns
t_r	Rise Time			25		ns
$t_{d(off)}$	Turn-Off Delay Time			290		ns
t_f	Fall Time			40		ns
E_{on}	Turn-On Switching Loss			3.10		mJ
E_{off}	Turn-Off Switching Loss			2.40		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=40A, R_G=12Ω,V_{GE}=±15V, T_j=150°C		37		ns
t_r	Rise Time			26		ns
$t_{d(off)}$	Turn-Off Delay Time			310		ns
t_f	Fall Time			50		ns
E_{on}	Turn-On Switching Loss			3.50		mJ
E_{off}	Turn-Off Switching Loss			2.70		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=800V, V_{CEM}≤1200V		130		A

Diode-inverter Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=40A,V_{GE}=0V,T_j=25°C		2.10	2.55	V
		I_F=40A,V_{GE}=0V,T_j=125°C		2.00		
		I_F=40A,V_{GE}=0V,T_j=150°C		1.97		
Q_r	Recovered Charge	V_R=600V,I_F=40A, -di/dt=470A/μs,V_{GE}=-15V T_j=25°C		2.5		μC
I_{RM}	Peak Reverse Recovery Current			4.8		A
E_{rec}	Reverse Recovery Energy			5.0		mJ
Q_r	Recovered Charge	V_R=600V,I_F=40A, -di/dt=470A/μs,V_{GE}=-15V T_j=125°C		22		μC
I_{RM}	Peak Reverse Recovery Current			26		A
E_{rec}	Reverse Recovery Energy			28		mJ
Q_r	Recovered Charge	V_R=600V,I_F=40A, -di/dt=470A/μs,V_{GE}=-15V T_j=150°C		1.28		μC
I_{RM}	Peak Reverse Recovery Current			2.40		A
E_{rec}	Reverse Recovery Energy			2.50		mJ

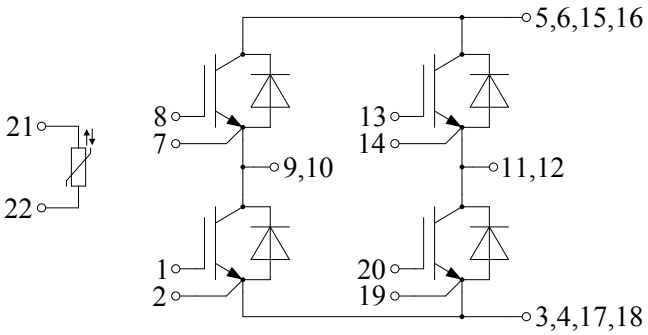
NTC Characteristics T_C=25°C unless otherwise noted

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

Module Characteristics T_C=25°C unless otherwise noted

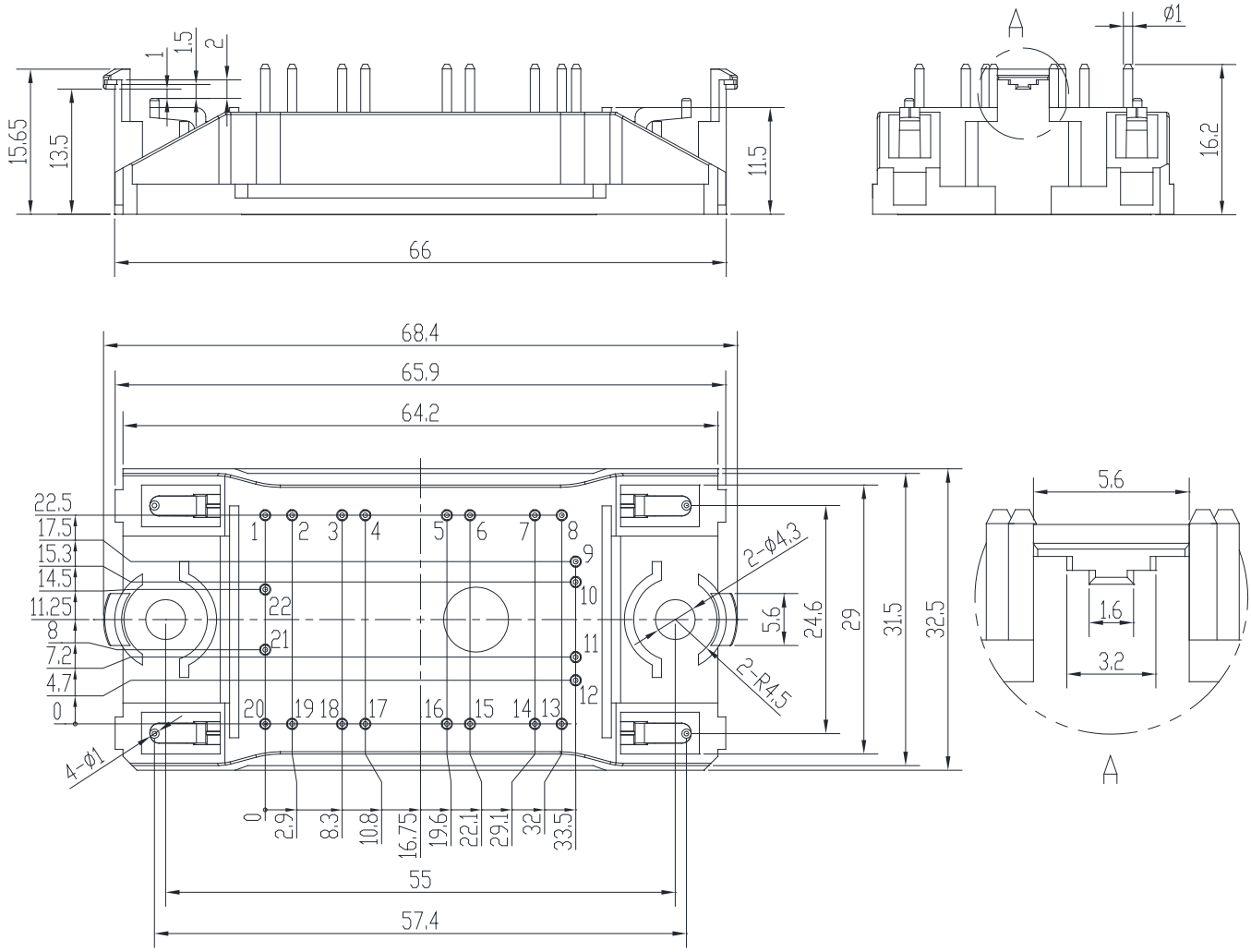
Symbol	Parameter	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case (per IGBT-inverter) Junction-to-Case (per Diode-inverter)		0.519 0.887	0.571 0.976	K/W
R_{thCH}	Case-to-Heatsink (per IGBT-inverter) Case-to-Heatsink (per Diode-inverter) Case-to-Heatsink (per Module)		0.222 0.379 0.035		K/W
M	Mounting Torque, 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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