

STARPOWER

SEMICONDUCTOR

IGBT

GD400CLK120C2S

1200V/400A chopper in one-package

General Description

STARPOWER IGBT Power Module provides ultra low conduction and switching loss as well as short circuit ruggedness. They are designed for the applications such as general inverters and UPS.

Features

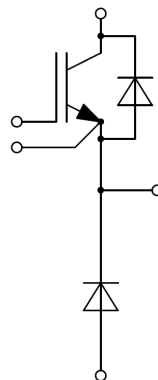
- NPT IGBT technology
- 10 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology



Typical Applications

- 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**

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	615	A
	@ $T_C=80^{\circ}\text{C}$	400	
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	800	A
P_D	Maximum Power Dissipation @ $T_j=150^{\circ}\text{C}$	2358	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	400	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	800	A

Module

Symbol	Description	Value	Unit
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, $f=50\text{Hz}$, $t=1\text{min}$	2500	V

IGBT 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	$I_C=400\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		2.15	2.60	V
		$I_C=400\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		2.65		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=4.0\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	5.2	5.7	6.2	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
R_{Gint}	Internal Gate Resistance			0.5		Ω
C_{ies}	Input Capacitance			26.2		nF
C_{res}	Reverse Transfer Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		1.68		nF
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		4.18		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=400\text{A}, R_G=2.2\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$		392		ns
t_r	Rise Time			129		ns
$t_{d(off)}$	Turn-Off Delay Time			567		ns
t_f	Fall Time			143		ns
E_{on}	Turn-On Switching Loss			8.40		mJ
E_{off}	Turn-Off Switching Loss			37.3		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=400\text{A}, R_G=2.2\Omega, V_{GE}=\pm 15\text{V}, T_j=125^\circ\text{C}$		395		ns
t_r	Rise Time			135		ns
$t_{d(off)}$	Turn-Off Delay Time			604		ns
t_f	Fall Time			154		ns
E_{on}	Turn-On Switching Loss			12.0		mJ
E_{off}	Turn-Off Switching Loss			42.7		mJ
I_{SC}	SC Data	$t_p \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}, V_{CC}=900\text{V}, V_{CEM} \leq 1200\text{V}$		2400		A

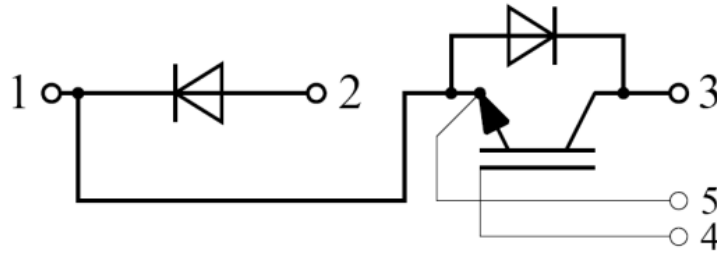
Diode Characteristics $T_c=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	$I_F=400\text{A}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$		1.80	2.25	V
		$I_F=400\text{A}, V_{GE}=0\text{V}, T_j=125^\circ\text{C}$		1.85		
Q_r	Recovered Charge	$V_{CC}=600\text{V}, I_F=400\text{A},$ $-di/dt=2840\text{A}/\mu\text{s}, V_{GE}=\pm 15\text{V},$ $T_j=25^\circ\text{C}$		35.2		μC
I_{RM}	Peak Reverse Recovery Current			246		A
E_{rec}	Reverse Recovery Energy			17.1		mJ
Q_r	Recovered Charge			56.0		μC
I_{RM}	Peak Reverse Recovery Current	$V_{CC}=600\text{V}, I_F=400\text{A},$ $-di/dt=2840\text{A}/\mu\text{s}, V_{GE}=\pm 15\text{V},$ $T_j=125^\circ\text{C}$		312		A
E_{rec}	Reverse Recovery Energy			26.3		mJ

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

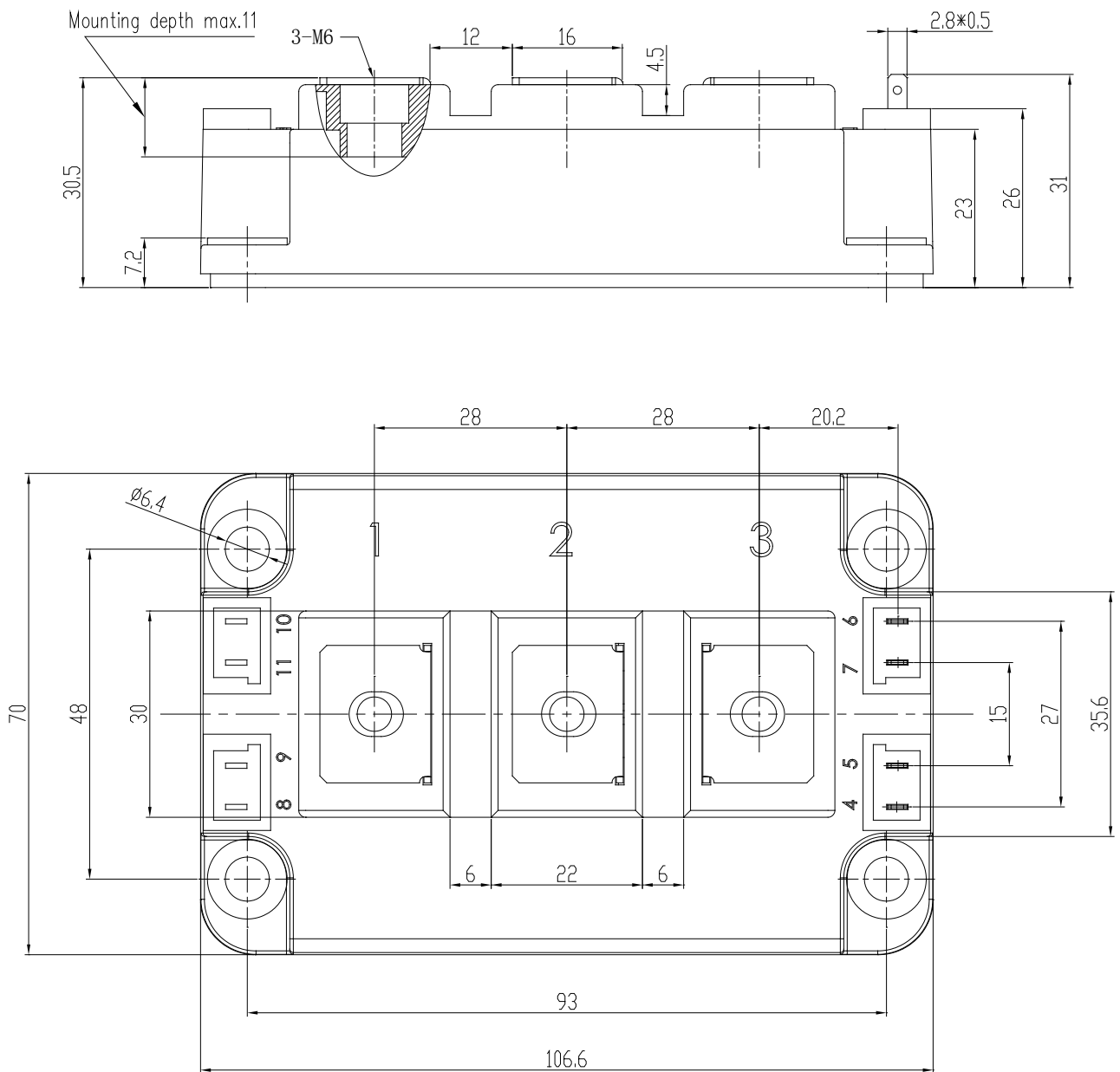
Symbol	Parameter	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case (per IGBT)			0.053	K/W
	Junction-to-Case (per Diode)			0.103	
R_{thCH}	Case-to-Heatsink (per IGBT)		0.048		K/W
	Case-to-Heatsink (per Diode)		0.094		
	Case-to-Heatsink (per Module)		0.032		
M	Terminal Connection Torque, Screw M6	2.5		5.0	N.m
	Mounting Torque, Screw M6	3.0		5.0	
G	Weight of Module		350		g

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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