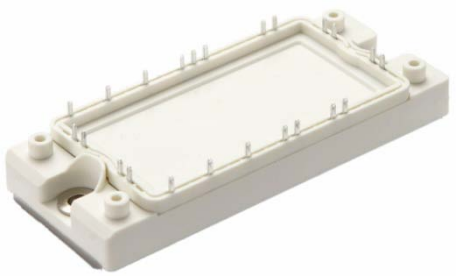
STARPOWER

SEMICONDUCTOR **IGBT**

GD50PIT120C5SN_G8

Molding Type Module

1200V/50A PIM 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
- 10μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175℃
- 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

IGBT-inverter T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD50PIT120C5SN_G8	Units
V_{CES}	Collector-Emitter Voltage @ T_j=25℃	1200	V
V_{GES}	Gate-Emitter Voltage @ T_j=25℃	±30	V
I_C	Collector Current @ T_C=25℃ @ T_C=100℃	100 50	A
I_{CM}	Pulsed Collector Current t_p=1ms	100	A
P_{tot}	Total Power Dissipation @ T_j=175℃	285	W

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	T_j=25℃	1200			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=2.0mA,V_{CE}=V_{GE}, T_j=25℃	5.0		6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=50A,V_{GE}=15V, T_j=25℃		1.70	2.15	V
		I_C=50A,V_{GE}=15V, T_j=175℃		2.10		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=50A, R_G=15Ω,V_{GE}=±15V, T_j=25℃		200		ns
t_r	Rise Time			43		ns
$t_{d(off)}$	Turn-Off Delay Time			266		ns
t_f	Fall Time			295		ns
E_{on}	Turn-On Switching Loss			3.01		mJ
E_{off}	Turn-Off Switching Loss			3.35		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=50A, R_G=15Ω,V_{GE}=±15V, T_j=125℃		200		ns
t_r	Rise Time			47		ns
$t_{d(off)}$	Turn-Off Delay Time			280		ns
t_f	Fall Time			400		ns
E_{on}	Turn-On Switching Loss			3.62		mJ
E_{off}	Turn-Off Switching Loss			5.10		mJ
C_{ies}	Input Capacitance	V_{CE}=30V,f=1Mhz, V_{GE}=0V		4.50		nF
C_{res}	Reverse Transfer Capacitance			0.15		nF
Q_G	Gate Charge	V_{CC}=600V,I_C=50A, V_{GE}=15V		300		nC
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15 V, T_j=125℃,V_{CC}=900V, V_{CEM}≤1200V		TBD		A

Diode-inverter T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD50PIT120C5SN_G8	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	1200	V
I_F	DC Forward Current	50	A
I_{FRM}	Repetitive Peak Forward Current t_p=1ms	100	A

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=50A,V_{GE}=0V	T_j=25℃		1.70	2.10	V
			T_j=125℃		1.65		
Q_r	Recovered Charge	I_F=50A, V_R=600V, R_G=15Ω, V_{GE}=-15V	T_j=25℃		3.0		μC
			T_j=125℃		7.2		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		46		A
			T_j=125℃		56		
E_{rec}	Reverse Recovery Energy		T_j=25℃		2.00		mJ
			T_j=125℃		3.50		

Diode-rectifier T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD50PIT120C5SN_G8	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	1600	V
$I_{F(AV)}$	Average On-state Current @ T_C=80℃	50	A
I_{RMSM}	Maximum RMS Current At Rectifier Output @ T_C=80℃	80	A
I_{FSM}	Surge Forward Current V_R=0V,t_p=10ms,T_j=45℃	600	A
I^2t	I^2t-value,V_R=0V,t_p=10ms,T_j=45℃	1800	A^2s

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=50A	T_j=150℃		1.30		V
I_R	Reverse Current	T_j=150℃,V_R=1600V				3.0	mA

IGBT-brake-chopper T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD50PIT120C5SN_G8	Units
V_{CES}	Collector-Emitter Voltage @ T_j=25℃	1200	V
V_{GES}	Gate-Emitter Voltage @ T_j=25℃	±30	V
I_C	Collector Current @ T_C=25℃ @ T_C=100℃	50 25	A
I_{CM}	Pulsed Collector Current t_p=1ms	50	A
P_{tot}	Total Power Dissipation @ T_j=175℃	192	W

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	T_j=25℃	1200			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=1.0mA,V_{CE}=V_{GE}, T_j=25℃	5.0		6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=25A,V_{GE}=15V, T_j=25℃		1.70	2.15	V
		I_C=25A,V_{GE}=15V, T_j=175℃		2.10		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=25A, R_G=18Ω,V_{GE}=±15V, T_j=25℃		147		ns
t_r	Rise Time			26		ns
$t_{d(off)}$	Turn-Off Delay Time			201		ns
t_f	Fall Time			337		ns
E_{on}	Turn-On Switching Loss			1.64		mJ
E_{off}	Turn-Off Switching Loss			1.65		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=25A, R_G=18Ω,V_{GE}=±15V, T_j=125℃		143		ns
t_r	Rise Time			28		ns
$t_{d(off)}$	Turn-Off Delay Time			216		ns
t_f	Fall Time			400		ns
E_{on}	Turn-On Switching Loss			1.93		mJ
E_{off}	Turn-Off Switching Loss			2.38		mJ
C_{ies}	Input Capacitance	V_{CE}=30V,f=1Mhz, V_{GE}=0V		2.40		nF
C_{res}	Reverse Transfer Capacitance			0.08		nF
Q_G	Gate Charge	V_{CC}=600V,I_C=25A, V_{GE}=15V		180		nC
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=125℃,V_{CC}=900V, V_{CEM}≤1200V		TBD		A

Diode-brake-chopper T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD50PIT120C5SN_G8	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	1200	V
I_F	DC Forward Current	25	A
I_{FRM}	Repetitive Peak Forward Current t_p=1ms	50	A

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=25A,V_{GE}=0V	T_j=25℃		2.10	2.50	V
			T_j=125℃		2.15		
Q_r	Recovered Charge	I_F=25A, V_R=600V, R_G=18Ω, V_{GE}=-15V	T_j=25℃		1.3		μC
			T_j=125℃		2.0		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		31		A
			T_j=125℃		38		
E_{rec}	Reverse Recovery Energy		T_j=25℃		0.68		mJ
			T_j=125℃		1.45		

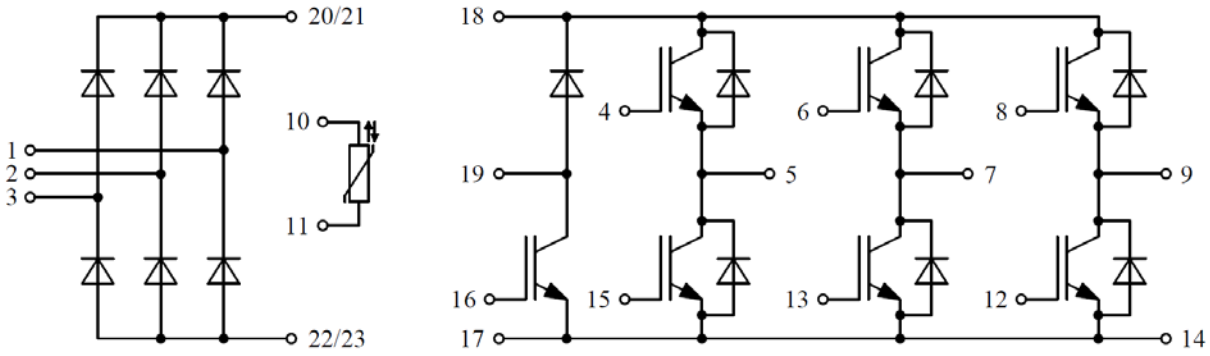
Electrical Characteristics of NTC T_C=25℃ unless otherwise noted

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}=493.3Ω	-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

IGBT Module

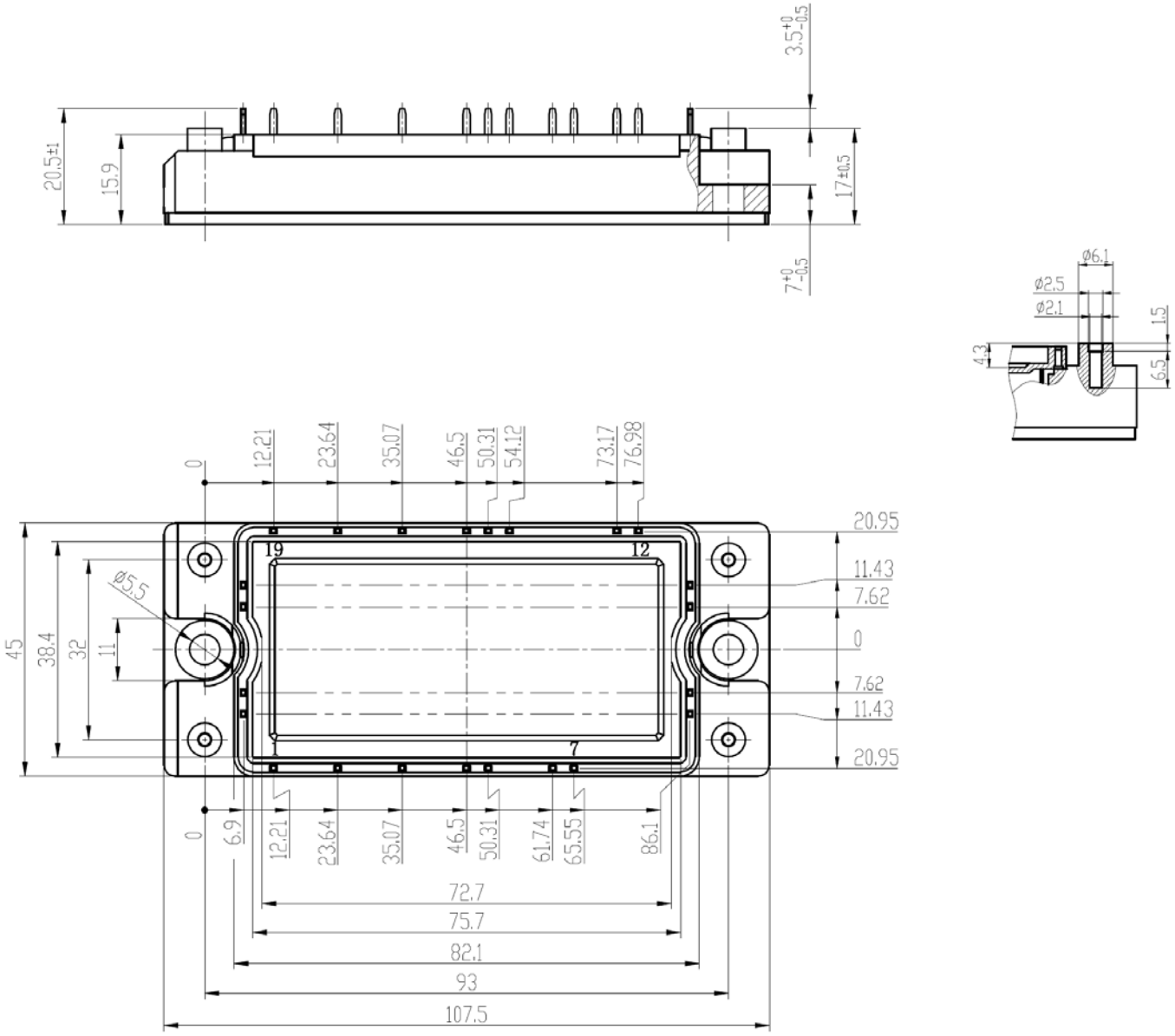
Symbol	Parameter	Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	4000			V
L_{CE}	Stray Inductance		60		nH
$R_{CC'+EE'}$ $R_{AA'+CC'}$	Module Lead Resistance,Terminal to Chip @ T_C=25℃		4.00 2.00		mΩ
$R_{\theta JC}$	Junction-to-Case (per IGBT-inverter) Junction-to-Case (per Diode-inverter) Junction-to-Case (per Diode-rectifier) Junction-to-Case (per IGBT-brake-chopper) Junction-to-Case (per Diode-brake-chopper)			0.527 0.862 0.908 0.780 1.326	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)		0.02		K/W
T_{jmax}	Maximum Junction Temperature (inverter, brake) Maximum Junction Temperature(rectifier)			 175 150	℃
T_{jop}	Operating Junction Temperature (inverter, brake) Operating Junction Temperature(rectifier)	 -40 -40		 150 125	℃
T_{STG}	Storage Temperature Range	-40		125	℃
M	Mounting Torque, Screw:M5	3.0		6.0	N.m
G	Weight of Module		180		g

Equivalent Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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