STARPOWER

SEMICONDUCTOR

IGBT

GD40TLQ120F1S

1200V/40A 3-level 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.

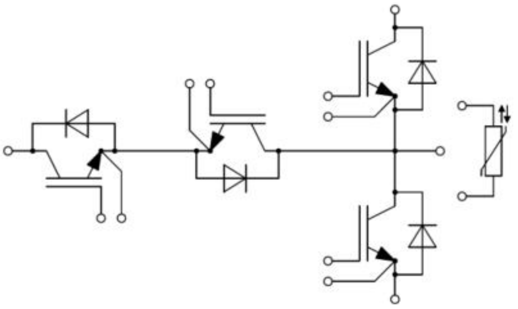
Features

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

Typical Applications

- Solar power
- UPS
- 3-level-application

Equivalent Circuit Schematic



Absolute Maximum Ratings T_C=25°C unless otherwise noted

T1,T2 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°C @ T_C=100°C	66 40	A
I_{CM}	Pulsed Collector Current t_p=1ms	80	A
P_D	Maximum Power Dissipation @ T_j=175°C	244	W

D1,D2 Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	25	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	50	A

T3,T4 IGBT

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	650	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25°C @ T_C=85°C	75 50	A
I_{CM}	Pulsed Collector Current t_p=1ms	100	A
P_D	Maximum Power Dissipation @ T_j=175°C	198	W

D3,D4 Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	650	V
I_F	Diode Continuous Forward Current	30	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	60	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	2500	V

T1,T2 IGBT 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		1.90	2.35	V
		I_C=40A,V_{GE}=15V, T_j=125°C		2.20		
		I_C=40A,V_{GE}=15V, T_j=150°C		2.30		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=1.6mA,V_{CE}=V_{GE}, T_j=25°C	5.6	6.2	6.8	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			TBD		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=100kHz, V_{GE}=0V		TBD		nF
C_{res}	Reverse Transfer Capacitance			TBD		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		TBD		μC
$t_{d(on)}$	Turn-On Delay Time	TBD		TBD		ns
t_r	Rise Time			TBD		ns
$t_{d(off)}$	Turn-Off Delay Time			TBD		ns
t_f	Fall Time			TBD		ns
E_{on}	Turn-On Switching Loss			TBD		mJ
E_{off}	Turn-Off Switching Loss			TBD		mJ
$t_{d(on)}$	Turn-On Delay Time	TBD		TBD		ns
t_r	Rise Time			TBD		ns
$t_{d(off)}$	Turn-Off Delay Time			TBD		ns
t_f	Fall Time			TBD		ns
E_{on}	Turn-On Switching Loss			TBD		mJ
E_{off}	Turn-Off Switching Loss			TBD		mJ
$t_{d(on)}$	Turn-On Delay Time	TBD		TBD		ns
t_r	Rise Time			TBD		ns
$t_{d(off)}$	Turn-Off Delay Time			TBD		ns
t_f	Fall Time			TBD		ns
E_{on}	Turn-On Switching Loss			TBD		mJ
E_{off}	Turn-Off Switching Loss			TBD		mJ
I_{SC}	SC Data	TBD		TBD		A

D1,D2 Diode Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=25A,V_{GE}=0V,T_j=25°C		1.85	2.30	V
		I_F=25A,V_{GE}=0V,T_j=125°C		1.90		
		I_F=25A,V_{GE}=0V,T_j=150°C		1.95		
Q_r	Recovered Charge	TBD		TBD		μC
I_{RM}	Peak Reverse Recovery Current			TBD		A
E_{rec}	Reverse Recovery Energy			TBD		mJ
Q_r	Recovered Charge	TBD		TBD		μC
I_{RM}	Peak Reverse Recovery Current			TBD		A
E_{rec}	Reverse Recovery Energy			TBD		mJ
Q_r	Recovered Charge	TBD		TBD		μC
I_{RM}	Peak Reverse Recovery Current			TBD		A
E_{rec}	Reverse Recovery Energy			TBD		mJ

T3,T4 IGBT 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=50A,V_{GE}=15V, T_j=25°C		1.45	1.90	V
		I_C=50A,V_{GE}=15V, T_j=125°C		1.60		
		I_C=50A,V_{GE}=15V, T_j=150°C		1.70		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=0.80mA,V_{CE}=V_{GE}, T_j=25°C	5.1	5.8	6.4	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			TBD		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=100kHz, V_{GE}=0V		TBD		nF
C_{res}	Reverse Transfer Capacitance			TBD		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		TBD		μC
$t_{d(on)}$	Turn-On Delay Time	TBD		TBD		ns
t_r	Rise Time			TBD		ns
$t_{d(off)}$	Turn-Off Delay Time			TBD		ns
t_f	Fall Time			TBD		ns
E_{on}	Turn-On Switching Loss			TBD		mJ
E_{off}	Turn-Off Switching Loss			TBD		mJ
$t_{d(on)}$	Turn-On Delay Time	TBD		TBD		ns
t_r	Rise Time			TBD		ns
$t_{d(off)}$	Turn-Off Delay Time			TBD		ns
t_f	Fall Time			TBD		ns
E_{on}	Turn-On Switching Loss			TBD		mJ
E_{off}	Turn-Off Switching Loss			TBD		mJ
$t_{d(on)}$	Turn-On Delay Time	TBD		TBD		ns
t_r	Rise Time			TBD		ns
$t_{d(off)}$	Turn-Off Delay Time			TBD		ns
t_f	Fall Time			TBD		ns
E_{on}	Turn-On Switching Loss			TBD		mJ
E_{off}	Turn-Off Switching Loss			TBD		mJ
I_{SC}	SC Data	TBD		TBD		A

D3,D4 Diode Characteristics $T_C=25^oC$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	$I_F=30A,V_{GE}=0V,T_j=25^oC$		1.60	2.05	V
		$I_F=30A,V_{GE}=0V,T_j=125^oC$		1.55		
		$I_F=30A,V_{GE}=0V,T_j=150^oC$		1.50		
Q_r	Recovered Charge	TBD		TBD		μC
I_{RM}	Peak Reverse Recovery Current			TBD		A
E_{rec}	Reverse Recovery Energy			TBD		mJ
Q_r	Recovered Charge	TBD		TBD		μC
I_{RM}	Peak Reverse Recovery Current			TBD		A
E_{rec}	Reverse Recovery Energy			TBD		mJ
Q_r	Recovered Charge	TBD		TBD		μC
I_{RM}	Peak Reverse Recovery Current			TBD		A
E_{rec}	Reverse Recovery Energy			TBD		mJ

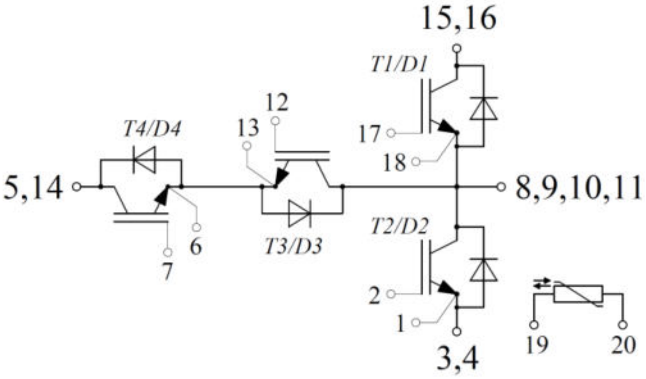
NTC Characteristics $T_C=25^oC$ unless otherwise noted

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

Module Characteristics $T_C=25^oC$ unless otherwise noted

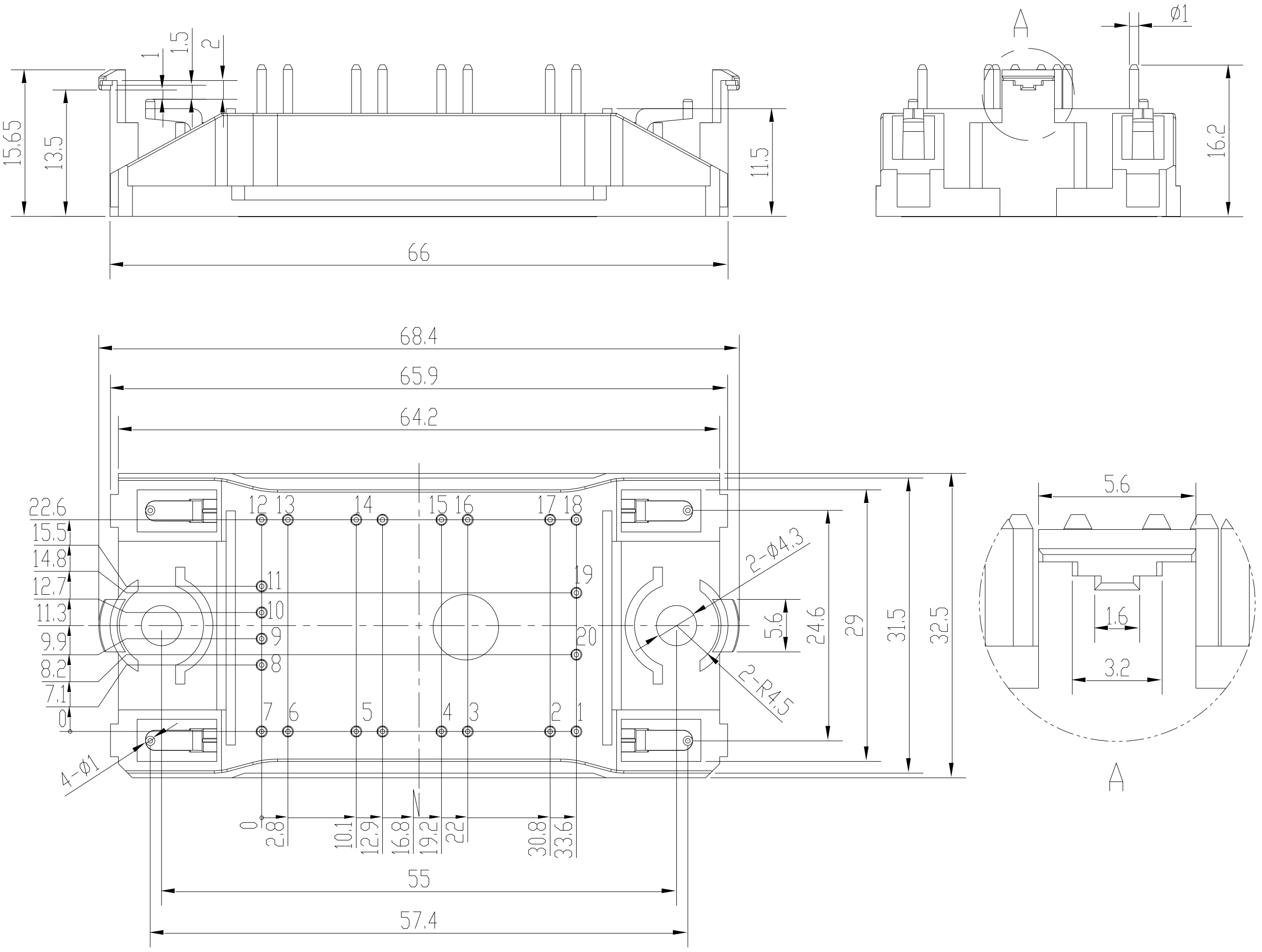
Symbol	Parameter	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case (per T1,T2 IGBT)		0.558	0.614	K/W
	Junction-to-Case (per D1,D2 Diode)		1.095	1.204	
	Junction-to-Case (per T3,T4 IGBT)		0.685	0.754	
	Junction-to-Case (per D3,D4 Diode)		1.655	1.821	
R_{thCH}	Case-to-Heatsink (per T1,T2 IGBT)		0.186		K/W
	Case-to-Heatsink (per D1,D2 Diode)		0.365		
	Case-to-Heatsink (per T3,T4 IGBT)		0.229		
	Case-to-Heatsink (per D3,D4 Diode)		0.553		
	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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