STARPOWER

SEMICONDUCTOR **IGBT**

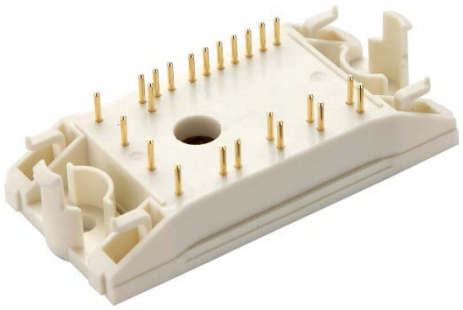
GD50CUT120F1S

Molding Type Module

1200V/50A 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 boost.



Features

- Low $V_{CE(sat)}$ trench IGBT technology
- 10μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175℃
- Fast & soft reverse recovery anti-parallel FWD

Typical Applications

- Solar boost

T1 IGBT T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD50CUT120F1S	Unit
V_{CES}	Collector-Emitter Voltage @ T_j=25℃	1200	V
V_{GES}	Gate-Emitter Voltage @ T_j=25℃	±20	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℃	324	W

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	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℃			1.0	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.	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=1.7mA,V_{CE}=V_{GE}, T_j=25℃	5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=50A,V_{GE}=15V, T_j=25℃		2.05	2.50	V
		I_C=50A,V_{GE}=15V, T_j=125℃		2.50		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=50A, R_G=11.5Ω,V_{GE}=0-15V, T_j=25℃		28		ns
t_r	Rise Time			42		ns
$t_{d(off)}$	Turn-Off Delay Time			278		ns
t_f	Fall Time			18		ns
E_{on}	Turn-On Switching Loss			3.60		mJ
E_{off}	Turn-Off Switching Loss			1.70		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=50A, R_G=11.5Ω,V_{GE}=0-15V, T_j=125℃		28		ns
t_r	Rise Time			43		ns
$t_{d(off)}$	Turn-Off Delay Time			330		ns
t_f	Fall Time			36		ns
E_{on}	Turn-On Switching Loss			4.60		mJ
E_{off}	Turn-Off Switching Loss			2.85		mJ
C_{ies}	Input Capacitance	V_{CE}=25V,f=1Mhz, V_{GE}=0V		2.86		nF
C_{oes}	Output Capacitance			0.23		nF
C_{res}	Reverse Transfer Capacitance			0.15		nF
Q_G	Gate Charge	V_{CC}=960V,I_C=50A, V_{GE}=15V		230		nC
R_{Gint}	Internal Gate Resister			/		Ω
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15 V, T_j=125℃,V_{CC}=600V, V_{CEM}≤1200V		170		A

D1 Diode T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD50CUT120F1S	Unit
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.	Unit
V_F	Diode Forward Voltage	I_F=50A,V_{GE}=0V	T_j=25℃		1.70	2.15	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℃		5.5		μC
			T_j=125℃		8.8		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		54		A
			T_j=125℃		60		
E_{rec}	Reverse Recovery Energy		T_j=25℃		1.70		mJ
			T_j=125℃		3.00		

T2 IGBT T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD50CUT120F1S	Unit
V_{CES}	Collector-Emitter Voltage @ T_j=25℃	1200	V
V_{GES}	Gate-Emitter Voltage @ T_j=25℃	±20	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℃	175	W

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	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℃			1.0	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.	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=0.85mA,V_{CE}=V_{GE}, T_j=25℃	5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=25A,V_{GE}=15V, T_j=25℃		2.05	2.50	V
		I_C=25A,V_{GE}=15V, T_j=125℃		2.50		

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=23Ω,V_{GE}=0-15V, T_j=25℃		28		ns
t_r	Rise Time			42		ns
$t_{d(off)}$	Turn-Off Delay Time			278		ns
t_f	Fall Time			18		ns
E_{on}	Turn-On Switching Loss			1.80		mJ
E_{off}	Turn-Off Switching Loss			0.85		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=25A, R_G=23Ω,V_{GE}=0-15V, T_j=125℃		28		ns
t_r	Rise Time			43		ns
$t_{d(off)}$	Turn-Off Delay Time			330		ns
t_f	Fall Time			36		ns
E_{on}	Turn-On Switching Loss			2.30		mJ
E_{off}	Turn-Off Switching Loss			1.42		mJ
C_{ies}	Input Capacitance	V_{CE}=25V,f=1Mhz, V_{GE}=0V		1.43		nF
C_{oes}	Output Capacitance			0.12		nF
C_{res}	Reverse Transfer Capacitance			0.08		nF
Q_G	Gate Charge	V_{CC}=960V,I_C=25A, V_{GE}=15V		115		nC
R_{Gint}	Internal Gate Resister			/		Ω
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=125℃,V_{CC}=600V, V_{CEM}≤1200V		85		A

D2 Diode T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD50CUT120F1S	Unit
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	1200	V
I_F	DC Forward Current	20	A
I_{FRM}	Repetitive Peak Forward Current t_p=1ms	40	A

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=20A,V_{GE}=0V	T_j=25℃		1.85	2.30	V
			T_j=125℃		2.05		
Q_r	Recovered Charge	I_F=20A, V_R=600V, R_G=41Ω, V_{GE}=-15V	T_j=25℃		1.0		μC
			T_j=125℃		1.4		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		26		A
			T_j=125℃		28		
E_{rec}	Reverse Recovery Energy		T_j=25℃		0.56		mJ
			T_j=125℃		0.96		

D3,D4 Diode T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD50CUT120F1S	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℃		2.20	2.75	V
			T_j=125℃		2.30		
Q_r	Recovered Charge	I_F=25A, V_R=600V, R_G=15Ω, V_{GE}=-15V	T_j=25℃		1.7		μC
			T_j=125℃		2.7		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		25		A
			T_j=125℃		33		
E_{rec}	Reverse Recovery Energy		T_j=25℃		1.00		mJ
			T_j=125℃		1.78		

D5 Diode T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD50CUT120F1S	Unit
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	1200	V
I_F	DC Forward Current	150	A
I_{FRM}	Repetitive Peak Forward Current t_p=1ms	300	A

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=150A, V_{GE}=0V	T_j=25℃		1.70	2.15	V
			T_j=125℃		1.65		
Q_r	Recovered Charge	I_F=150A, V_R=600V, R_G=0.55Ω, V_{GE}=-15V	T_j=25℃		14.6		μC
			T_j=125℃		26.0		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		176		A
			T_j=125℃		178		
E_{rec}	Reverse Recovery Energy		T_j=25℃		5.30		mJ
			T_j=125℃		9.20		

D6 Diode T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD50CUT120F1S	Unit
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	1600	V
I_O	Average Output Current 50Hz/60Hz,sine wave	50	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.	Unit
V_F	Diode Forward Voltage	I_F=50A	T_j=150℃			1.15	V
I_R	Reverse Current	T_j=150℃,V_R=1600V				3.0	mA

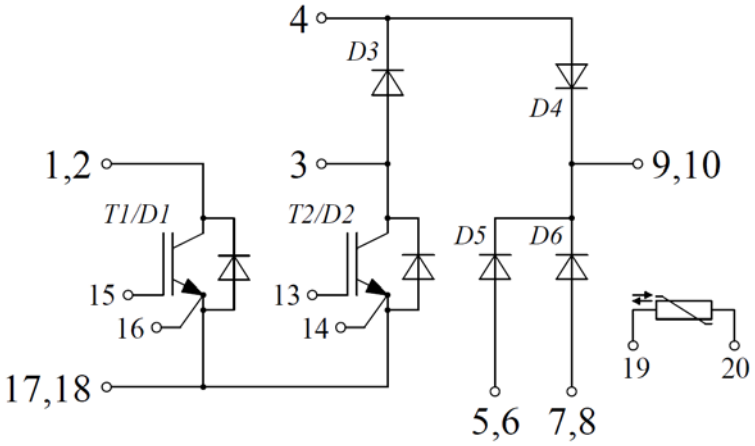
NTC T_C=25℃ unless otherwise noted

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

IGBT Module

Symbol	Parameter	Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=2s	4000			V
$R_{\theta JC}$	Junction-to-Case (per T1 IGBT) Junction-to-Case (per D1 Diode) Junction-to-Case (per T2 IGBT) Junction-to-Case (per D2 Diode) Junction-to-Case (per D3,D4 Diode) Junction-to-Case (per D5 Diode) Junction-to-Case (per D6 Diode)			0.463 0.840 0.858 1.047 1.506 0.338 0.894	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)		0.075		K/W
T_{jmax}	Maximum Junction Temperature			175	℃
T_{jop}	Operating Junction Temperature	-40		150	℃
T_{stg}	Storage Temperature Range	-40		125	℃

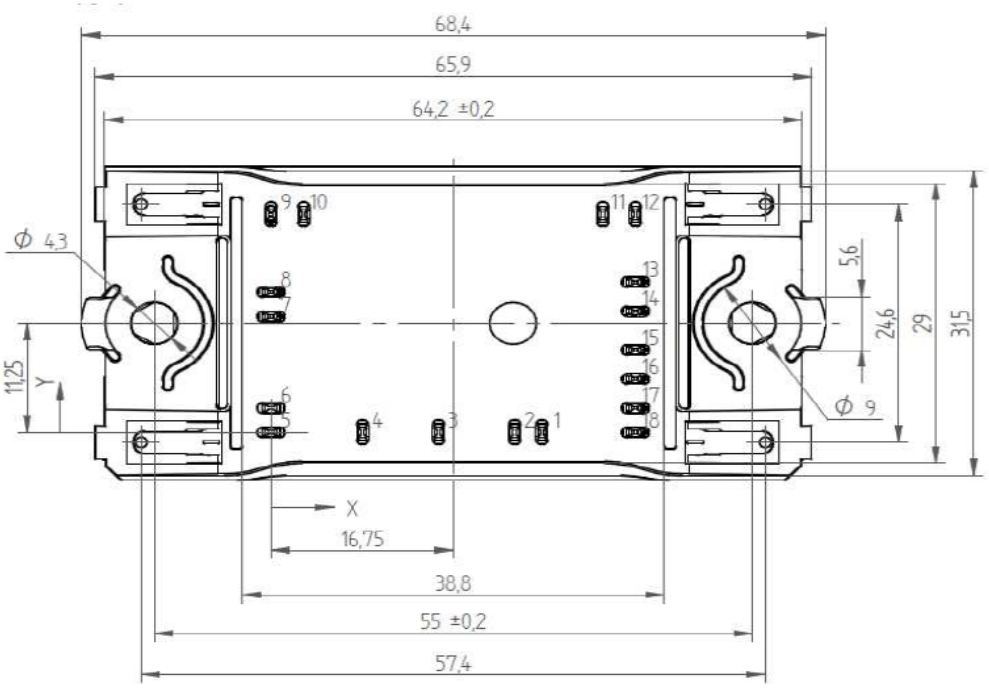
Equivalent Circuit Schematic



Package Dimensions

Dimensions in Millimeters

Pin table		
Pin	X	Y
1	24,9	0
2	22,4	0
3	15,4	0
4	8,4	0
5	0	0
6	0	2,5
7	0	11,95
8	0	14,5
9	0	22,5
10	3	22,5
11	30,5	22,5
12	33,5	22,5
13	33,5	15,5
14	33,5	12,5
15	33,5	8,5
16	33,5	5,5
17	33,5	2,5
18	33,5	0



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