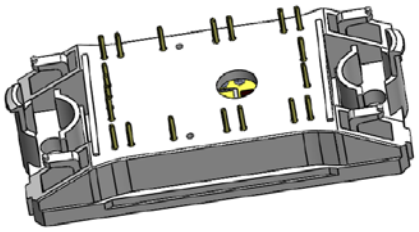
STARPOWER

SEMICONDUCTOR **IGBT**

GD50MLT60F1S

Molding Type Module

600V/50A 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 3-level-application.

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 power
- UPS
- 3-level-application

TI,T2,T3,T4 IGBT T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD50MLT60F1S	Units
V_{CES}	Collector-Emitter Voltage @ T_j=25℃	600	V
V_{GES}	Gate-Emitter Voltage @ T_j=25℃	±20	V
I_C	Collector Current @ T_C=25℃ @ T_C=80℃	70 50	A
I_{CM}	Pulsed Collector Current t_p=1ms	100	A
P_{tot}	Total Power Dissipation @ T_j=175℃	175	W

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	T_j=25℃	600			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.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=1.4mA,V_{CE}=V_{GE}, T_j=25℃	4.0	4.9	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=50A,V_{GE}=15V, T_j=25℃		1.65	2.10	V
		I_C=50A,V_{GE}=15V, T_j=175℃		2.05		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=50A, R_G=3.3Ω,V_{GE}=±15V, T_j=25℃		58		ns
t_r	Rise Time			31		ns
$t_{d(off)}$	Turn-Off Delay Time			80		ns
t_f	Fall Time			100		ns
E_{on}	Turn-On Switching Loss			0.41		mJ
E_{off}	Turn-Off Switching Loss			0.42		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=50A, R_G=3.3Ω,V_{GE}=±15V, T_j=125℃		64		ns
t_r	Rise Time			37		ns
$t_{d(off)}$	Turn-Off Delay Time			90		ns
t_f	Fall Time			117		ns
E_{on}	Turn-On Switching Loss			0.69		mJ
E_{off}	Turn-Off Switching Loss			0.69		mJ
C_{ies}	Input Capacitance	V_{CE}=30V,f=1Mhz, V_{GE}=0V		3.03		nF
C_{oes}	Output Capacitance			0.25		nF
C_{res}	Reverse Transfer Capacitance			0.09		nF
Q_G	Gate Charge	V_{CC}=400V,I_C=50A, V_{GE}=15V		99		nC
R_{Gint}	Internal Gate Resister			/		Ω
I_{SC}	SC Data	t_P≤5μs,V_{GE}=15V, T_j=125℃, V_{CC}=360V, V_{CEM}≤600V		450		A

DI,D2,D3,D4 Diode T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD50MLT60F1S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	600	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℃		1.35	1.75	V
			T_j=125℃		1.37		
Q_r	Recovered Charge	I_F=50A, V_R=300V, R_G=3.3Ω, V_{GE}=-15V	T_j=25℃		2.3		μC
			T_j=125℃		4.3		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		33		A
			T_j=125℃		58		
E_{rec}	Reverse Recovery Energy		T_j=25℃		0.56		mJ
			T_j=125℃		1.11		

D5,D6 Diode T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD50MLT60F1S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	600	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℃		1.35	1.75	V
			T_j=125℃		1.37		
Q_r	Recovered Charge	I_F=50A, V_R=300V, R_G=3.3Ω, V_{GE}=-15V	T_j=25℃		2.3		μC
			T_j=125℃		4.3		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		33		A
			T_j=125℃		58		
E_{rec}	Reverse Recovery Energy		T_j=25℃		0.56		mJ
			T_j=125℃		1.11		

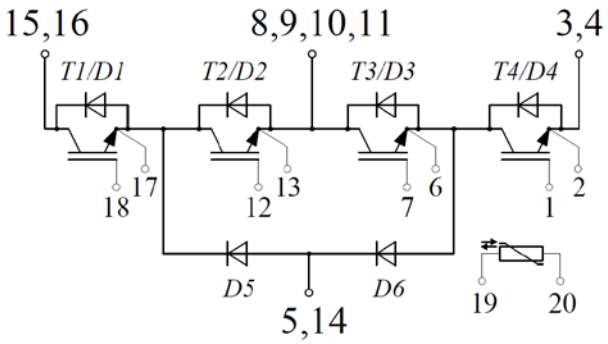
NTC T_C=25℃ unless otherwise noted

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

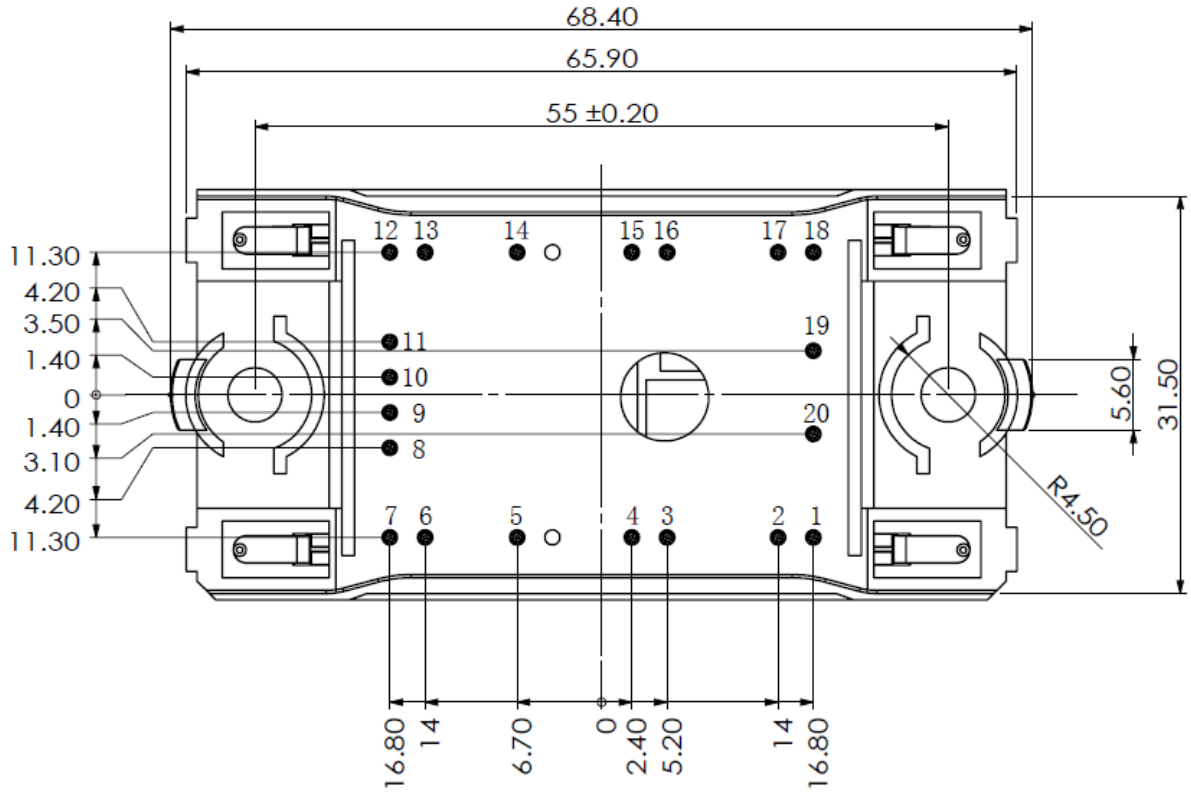
Symbol	Parameter	Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=2s	4000			V
$R_{\theta JC}$	Junction-to-Case (per T1,T2,T3,T4 IGBT) Junction-to-Case (per D1,D2,D3,D4 Diode) Junction-to-Case (per D5,D6 Diode)			0.856 1.120 1.162	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)		0.035		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



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