

STARPOWER

SEMICONDUCTOR™

IGBT

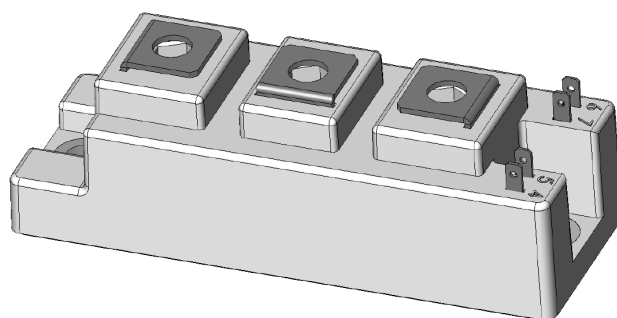
GD50HFU120C1S

Molding Type Module

1200V/50A 2 in one-package

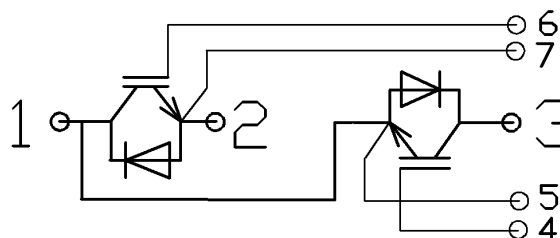
General Description

STARPOWER IGBT Power Module provides ultrafast Switching speed as well as short circuit ruggedness. It's designed for the applications such as electronic welders and Inductive heating.



Features

- High short circuit capability, self limiting to $6 \cdot I_{Cnom}$
- Rugged with ultrafast performance
- Low t_{rr} and I_{rr}
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- 10us short circuit capability
- Isolated copper baseplate using DCB Direct Copper Bonding technology



Typical Applications

- Switching mode power supplies at $f_{sw} > 20\text{kHz}$
- Resonant inverters up to 100kHz
- Inductive heating
- UPS
- Electronic welders at $f_{sw} > 20\text{kHz}$

Equivalent Circuit Schematic

Absolute Maximum Ratings $T_c=25^\circ\text{C}$ unless otherwise noted

Symbol	Description	GD50HFU120C1S	Units
V_{CES}	Collector-Emitter Voltage	1200	V

Symbol	Description	GD50HFU120C1S	Units
V_{GES}	Gate-Emitter Voltage	$\pm 20V$	V
I_C	Collector Current @80°C	50	A
$I_{CM(1)}$	Pulsed Collector Current @80°C	100	A
I_F	Diode Continuous Forward Current	50	A
I_{FM}	Diode Maximum Forward Current	100	A
P_D	Maximum power Dissipation @ $T_c=25^\circ C$	480	W
T_{SC}	Short Circuit Withstand Time @ $T_c=125^\circ C$	10	us
T_J	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
Mounting Torque	Power Terminal Screw:M5	2.5 to 5	N.m
	Mounting Screw:M5	3 to 6	N.m

Notes:

(1) Repetitive rating: Pulse width limited by max. junction temperature

Electrical Characteristics of IGBT $T_c=25^\circ C$ unless otherwise noted**Off Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$B_{V_{CES}}$	Collector-Emitter Breakdown Voltage	$T_J=25^\circ C$	1200			V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0V$			5	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0V$ @ $T_J=25^\circ C$			100	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=2mA, V_{CE}=V_{GE}$	3.5	4.2	5.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=50A, V_{GE}=15V,$ @ $25^\circ C$		3.5	3.7	V
		$I_C=50A, V_{GE}=15V,$ @ $125^\circ C$		3.6		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units	
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=50A, R_G=5.9$ $\Omega, V_{GE} = \pm 15V, Inductive$ Load, $T_C = 25^\circ C$		70		ns	
t_r	Rise Time			30		ns	
$t_{d(off)}$	Turn-Off Delay Time				280		ns
t_f	Fall Time				20		ns
E_{on}	Turn-On Switching				2.5		mJ

	Loss					
E_{off}	Turn-Off Switching Loss			3.3		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=50A, R_G=8\Omega$, $V_{GE} = \pm 15V$, Inductive Load, $T_C = 125^\circ C$		78		ns
t_r	Rise Time			36		ns
$t_{d(off)}$	Turn-Off Delay Time			320		ns
t_f	Fall Time			20		ns
E_{on}	Turn-On Switching Loss			4		mJ
E_{off}	Turn-Off Switching Loss			6.5		mJ
T_{SC}	Short Circuit Withstand Time	$V_{CC}=600V, V_{GE} = 20V$ @ $T_C = 125^\circ C$	10			us
C_{ies}	Input Capacitance	$V_{CE} = 25V, f=1MHz, V_{GE} = 0V$		6.215		nF
C_{oes}	Output Capacitance			0.505		nF
C_{res}	Reverse Transfer Capacitance			0.195		nF

Electrical Characteristics of DIODE $T_C=25^\circ C$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_{FM}	Diode Forward Voltage	$I_F=50A$	$T_C = 25^\circ C$	2.13	2.5	V
			$T_C = 125^\circ C$		2.25	
t_{rr}	Diode Reverse Recovery Time	$I_F=50A,$ $V_R=600V, di$	$T_C = 25^\circ C$	150		ns
			$T_C = 125^\circ C$			
I_{rr}	Diode Peak Reverse Recovery Current	$/dt=-800A/\mu$ s, $V_{GE}=0V$	$T_C = 25^\circ C$	42		A
			$T_C = 125^\circ C$	50		
Q_{rec}	Reverse Recovery Charge		$T_C = 25^\circ C$	3		uC
			$T_C = 125^\circ C$	9.2		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (IGBT Part, per 1/2 Module)		0.35	$^\circ C/W$
$R_{\theta JC}$	Junction-to-Case (DIODE Part, per 1/2 Module)		0.7	$^\circ C/W$
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.05		$^\circ C/W$
Weight	Weight of Module	150		g

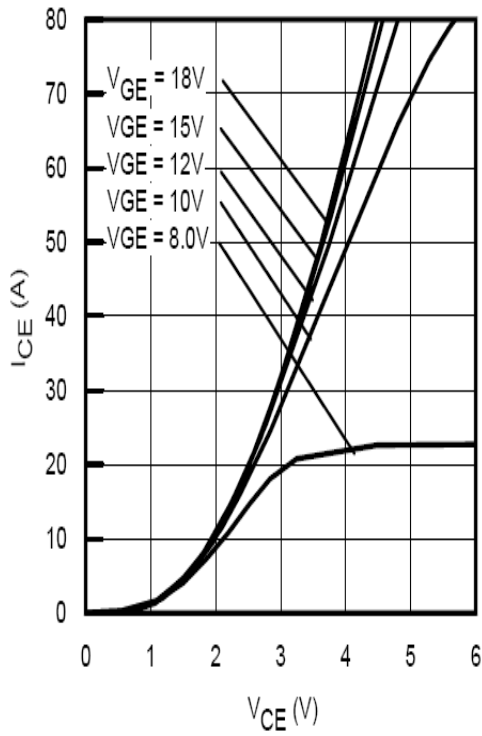


Fig 1. Typical Output Characteristics

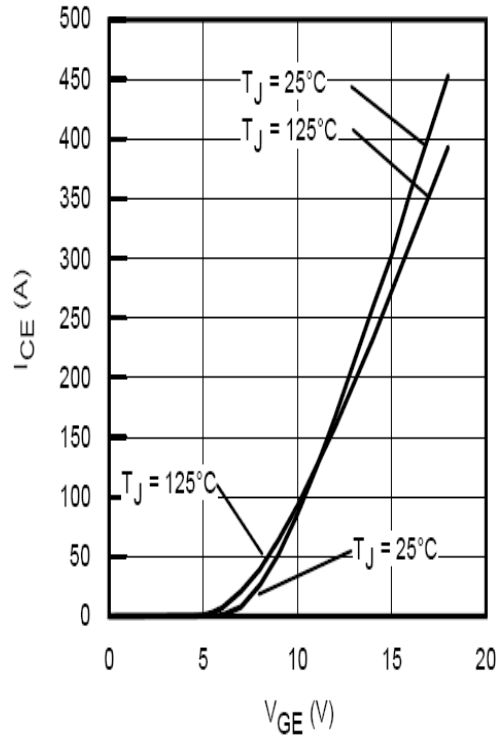


Fig 2. Typical transfer Characteristics

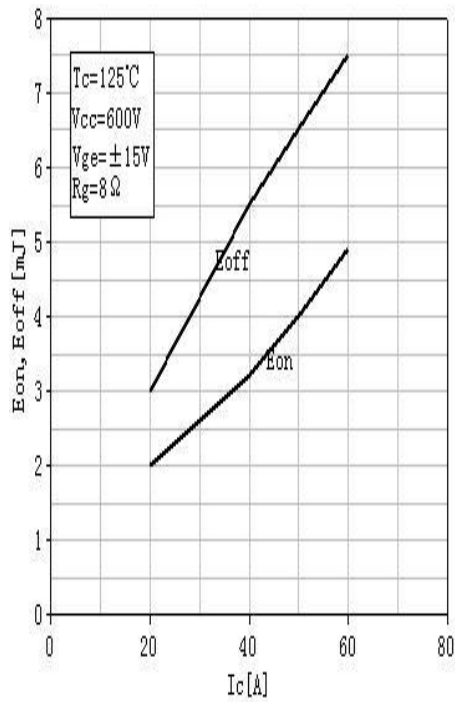


Fig 3. Total Switching Loss vs. Collector Current

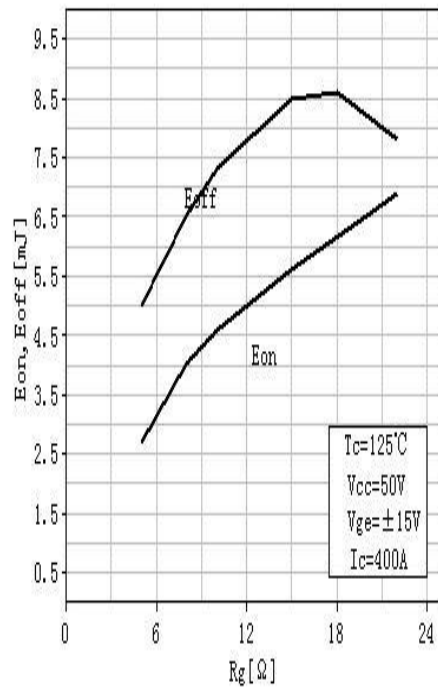


Fig 4. Total Switching Loss vs. Gate Resistance

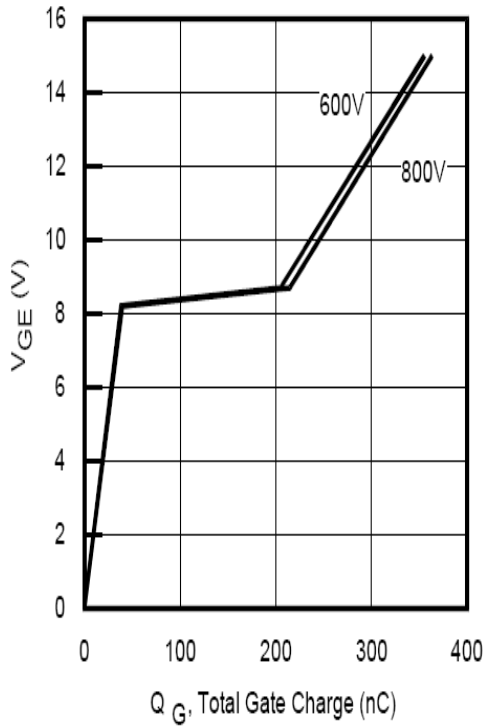


Fig 5. Gate Charge Characteristics.

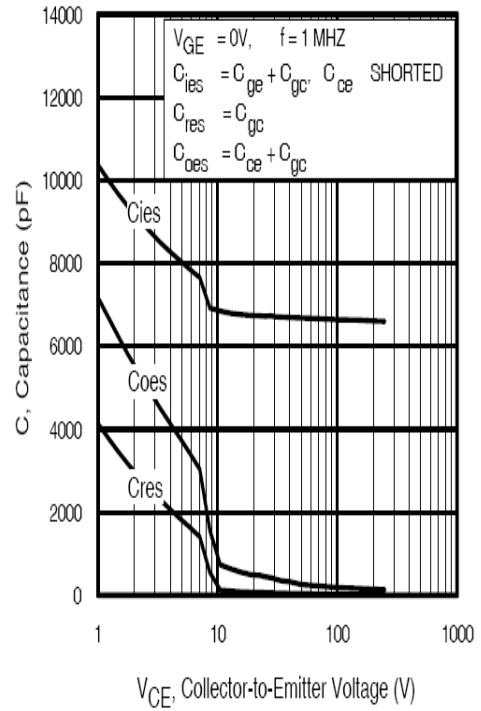


Fig 6. Typical Capacitance vs. Collector-Emitter Current

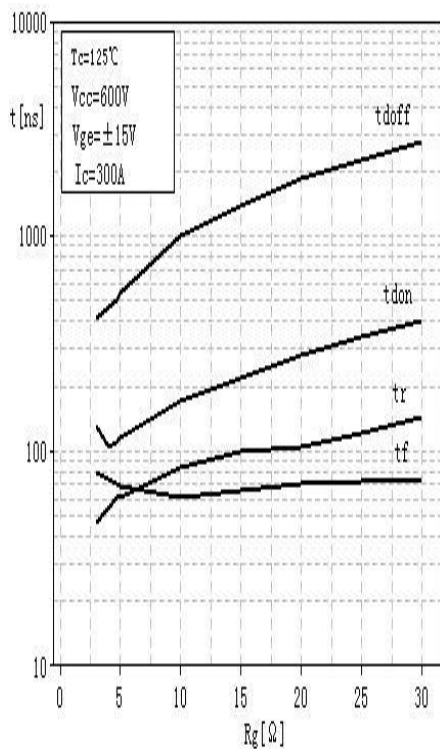


Fig 7. Typical Switching Times vs. I_C

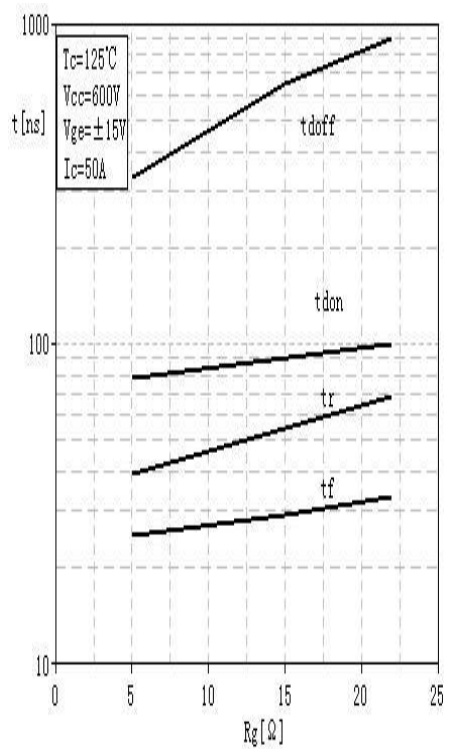


Fig 8. Typical Switching Times vs. Gate Resistance R_G

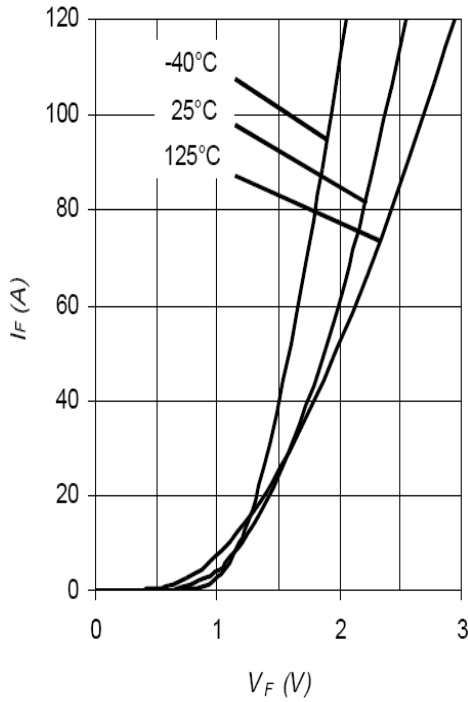


Fig 9. Typical Forward Characteristics(diode)

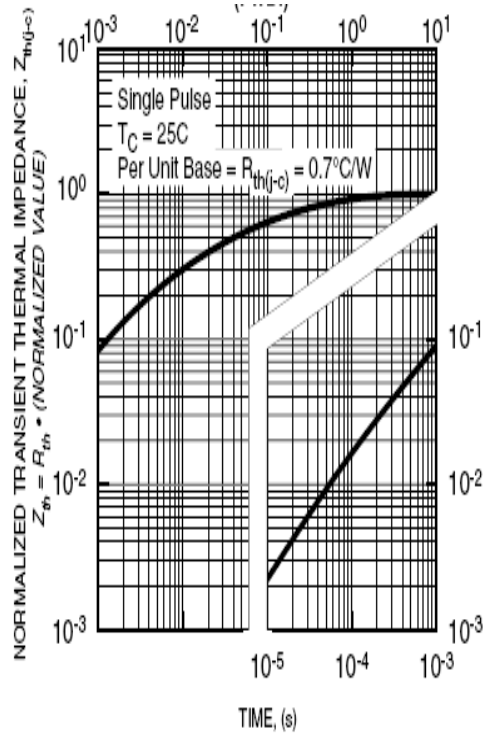


Fig 10. transient thermal impedance diode

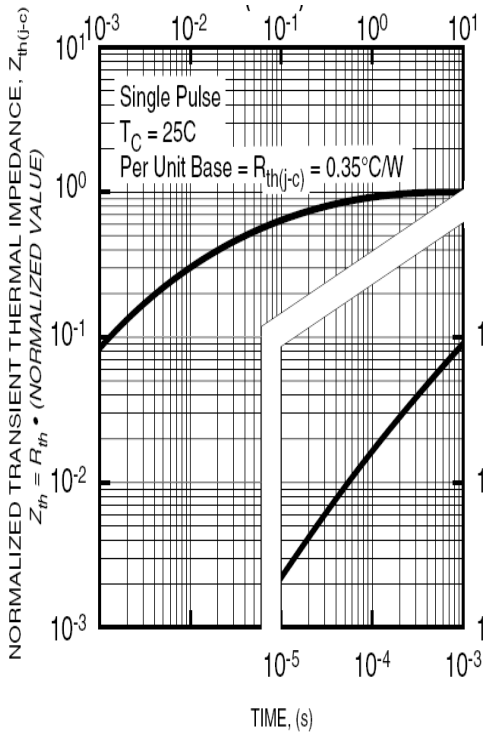


Fig 11. Transient thermal impedance IGBT

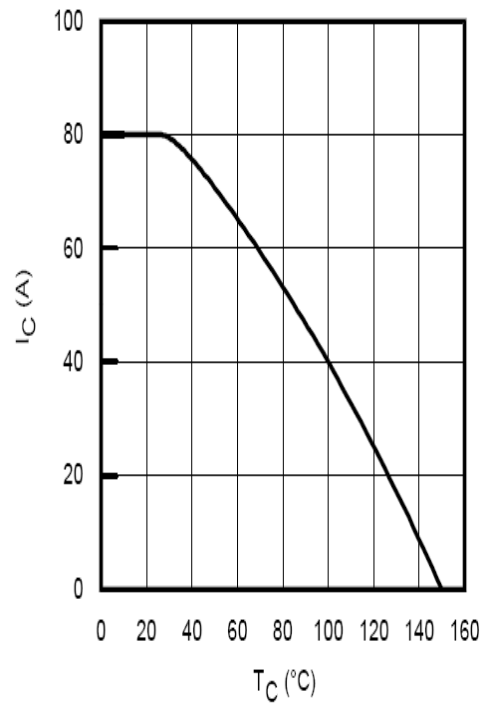
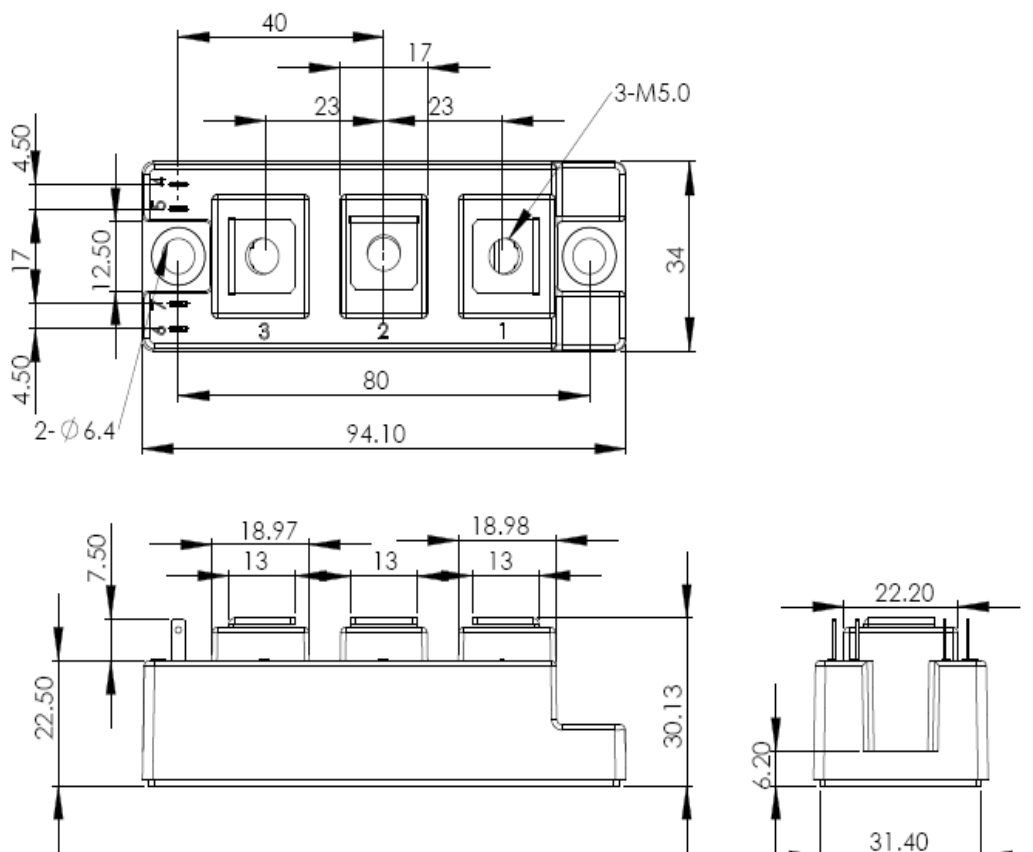


Fig12. Maximum DC Collector Current vs. Case Temperature

Package Dimension

Dimensions in Millimeters



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