

# STARPOWER

SEMICONDUCTOR™

# IGBT

## GD50HFL120C1S

Molding Type Module

1200V/50A 2 in one-package

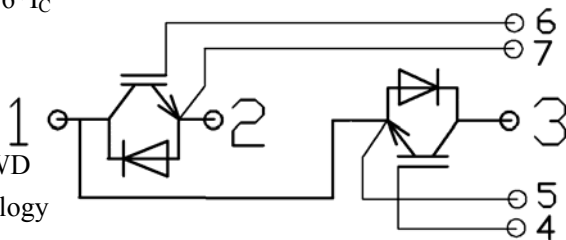
### General Description

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

- High short circuit capability, self limiting to  $6 \cdot I_C$
- 10 $\mu$ s short circuit capability
- $V_{CE(sat)}$  with positive temperature coefficient
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology

**Equivalent Circuit Schematic**

### Typical Applications

- AC inverter drives
- Switching mode power supplies
- Electronic welders

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

Symbol	Description	GD50HFL120C1S	Units
$V_{CES}$	Collector-Emitter Voltage	1200	V

Symbol	Description	GD50HFL120C1S	Units
$V_{GES}$	Gate-Emitter Voltage	$\pm 20V$	V
$I_C$	Collector Current @ $T_C=25^\circ C$	100	A
	@ $T_C=80^\circ C$	50	
$I_{CM(1)}$	Pulsed Collector Current $t_p=1ms$	100	A
$I_F$	Diode Continuous Forward Current	50	A
$I_{FM}$	Diode Maximum Forward Current	100	A
$P_D$	Maximum power Dissipation @ $T_j=150^\circ C$	329	W
$T_{SC}$	Short Circuit Withstand Time @ $T_j=125^\circ C$	10	$\mu s$
$T_j$	Operating Junction Temperature	-40 to +150	$^\circ C$
$T_{STG}$	Storage Temperature Range	-40 to +125	$^\circ C$
$I^2t$ -value, Diode	$V_R=0V, t=10ms, T_j=125^\circ C$	420	$A^2s$
$V_{ISO}$	Isolation Voltage RMS, $f=50Hz, t=1min$	2500	V
Mounting Torque	Power Terminal Screw:M5	2.5 to 5.0	N.m
	Mounting Screw:M6	3.0 to 6.0	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
$BV_{CES}$	Collector-Emitter Breakdown Voltage	$T_j=25^\circ C$	1200			V
$I_{CES}$	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0V,$ $T_j=25^\circ C$			2.0	mA
$I_{GES}$	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0V,$ $T_j=25^\circ C$			400	nA

**On Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=2.0mA, V_{CE}=V_{GE},$ $T_j=25^\circ C$	5.0	6.5	7.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=50A, V_{GE}=15V,$ $T_j=25^\circ C$		1.8		V
		$I_C=50A, V_{GE}=15V,$ $T_j=125^\circ C$		2.0		

**Switching Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=50A,$ $R_G=18\Omega, V_{GE} = \pm 15V,$ $T_j=25^\circ C$		220		ns
$t_r$	Rise Time			60		ns
$t_{d(off)}$	Turn-Off Delay Time			420		ns

$t_f$	Fall Time	$V_{CC}=600V, I_C=50A,$ $R_G=18\Omega, V_{GE} = \pm 15V,$ $T_j=25^\circ C$	60		ns
$E_{on}$	Turn-On Switching Loss		2.1		mJ
$E_{off}$	Turn-Off Switching Loss		2.6		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=50A,$ $R_G=18\Omega, V_{GE} = \pm 15V,$ $T_j=125^\circ C$	270		ns
$t_r$	Rise Time		60		ns
$t_{d(off)}$	Turn-Off Delay Time		500		ns
$t_f$	Fall Time		65		ns
$E_{on}$	Turn-On Switching Loss		4.1		mJ
$E_{off}$	Turn-Off Switching Loss		4.7		mJ
$C_{ies}$	Input Capacitance	$V_{CE} = 25V, f=1MHz,$ $V_{GE} = 0V$	4.29		nF
$C_{oes}$	Output Capacitance		0.30		nF
$C_{res}$	Reverse Transfer Capacitance		0.20		nF
$I_{SC}$	SC Data	$t_{sc} \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=900V,$ $V_{CEM} \leq 1200V$	270		A
$L_{CE}$	Stray inductance			30	nH
$R_{CC'+EE'}$	Module lead resistance, terminal to chip	$T_C=25^\circ C$	0.75		m $\Omega$

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_F$	Diode Forward Voltage	$I_F=50A$	$T_j=25^\circ C$	2.0		V
			$T_j=125^\circ C$	2.2		
$t_{rr}$	Diode Reverse Recovery Time	$I_F=50A,$ $V_R=600V,$ $di/dt=-2100A/\mu s,$ $V_{GE}=-15V$	$T_j=25^\circ C$	90		ns
			$T_j=125^\circ C$	130		
$I_{RM}$	Diode Peak Reverse Recovery Current		$T_j=25^\circ C$	52		A
			$T_j=125^\circ C$	60		
$E_{rec}$	Reverse Recovery Energy		$T_j=25^\circ C$	1.9		mJ
			$T_j=125^\circ C$	4.0		

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (IGBT Part, per 1/2 Module)		0.38	K/W
$R_{\theta JC}$	Junction-to-Case (DIODE Part, per 1/2 Module)		0.65	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.05		K/W
Weight	Weight of Module	150		g

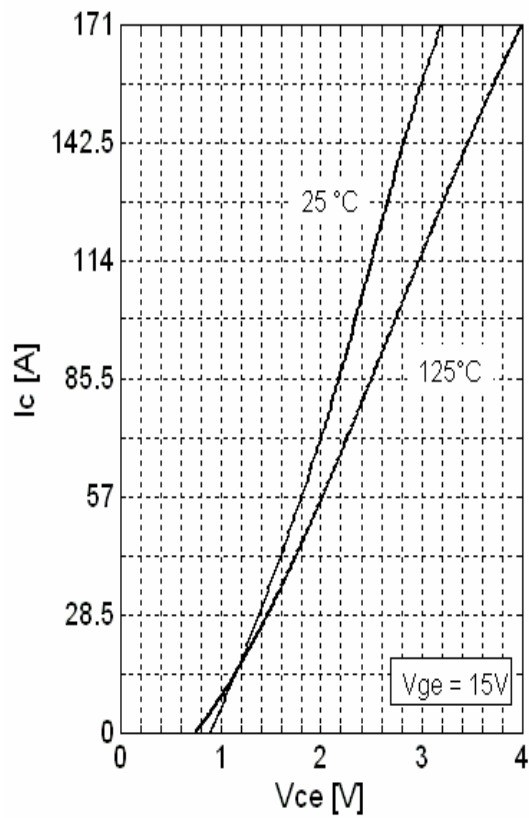


Fig 1. Typical Output Characteristics

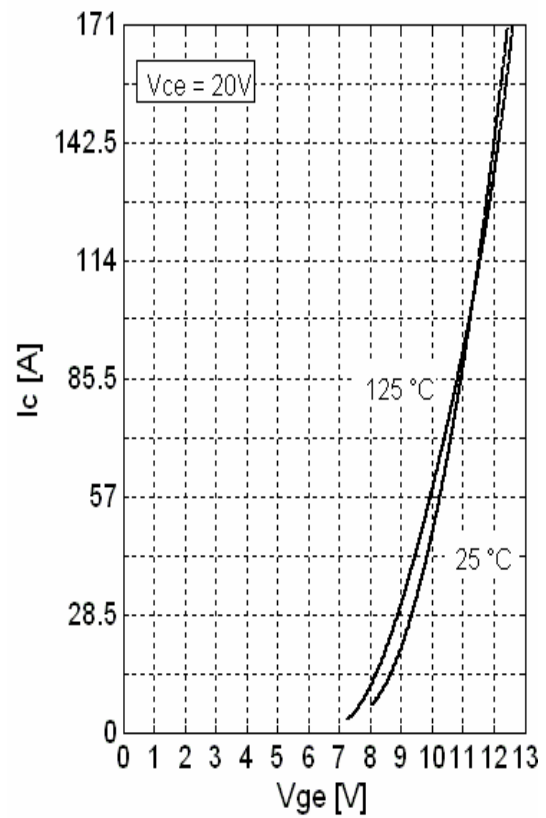


Fig 2. Typical Transfer Characteristics

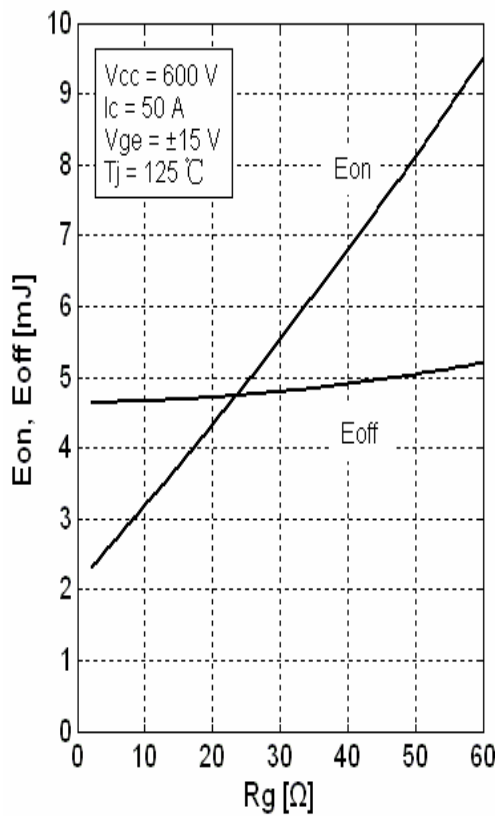


Fig 3. Switching Loss vs. Collector Current

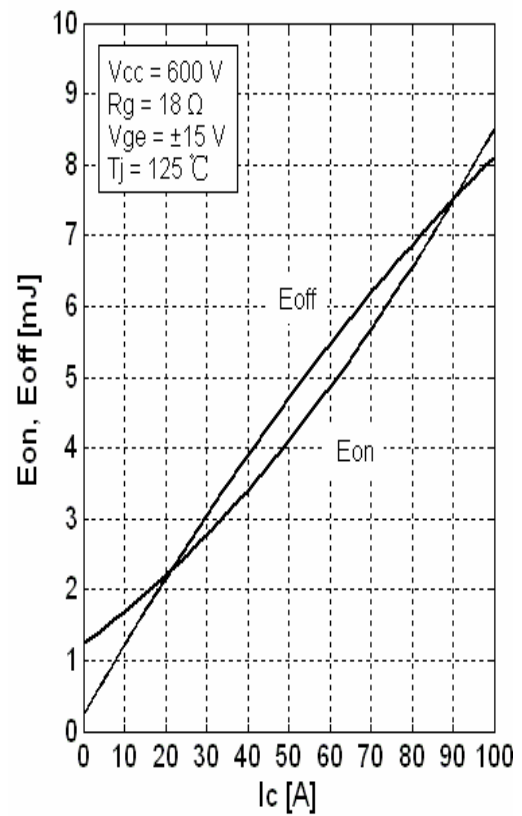


Fig 4. Switching Loss vs. Gate Resistor

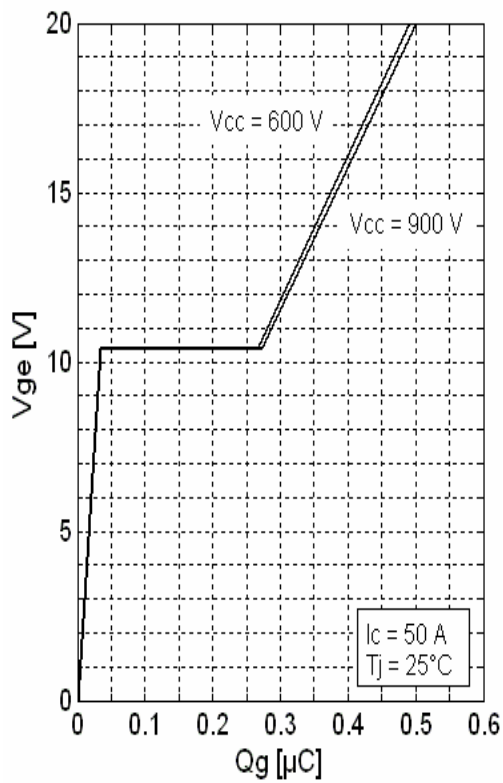


Fig 5. Gate Charge Characteristics.

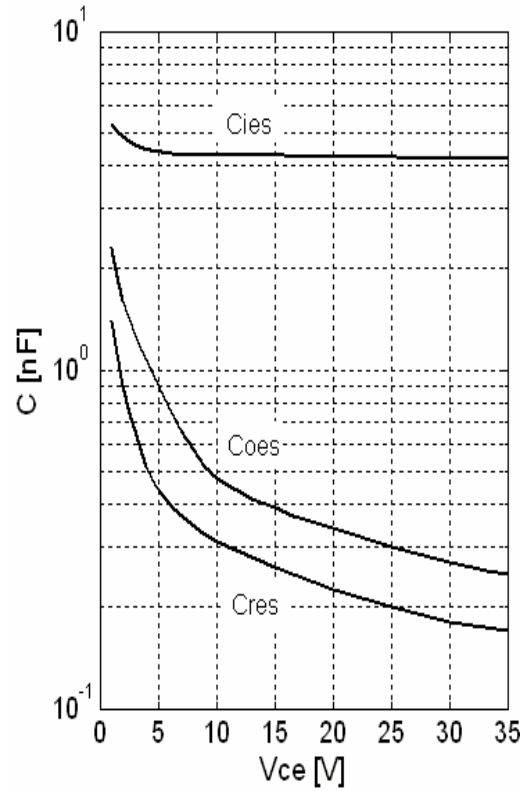


Fig 6. Typical Capacitance vs. Collector-Emitter Voltage

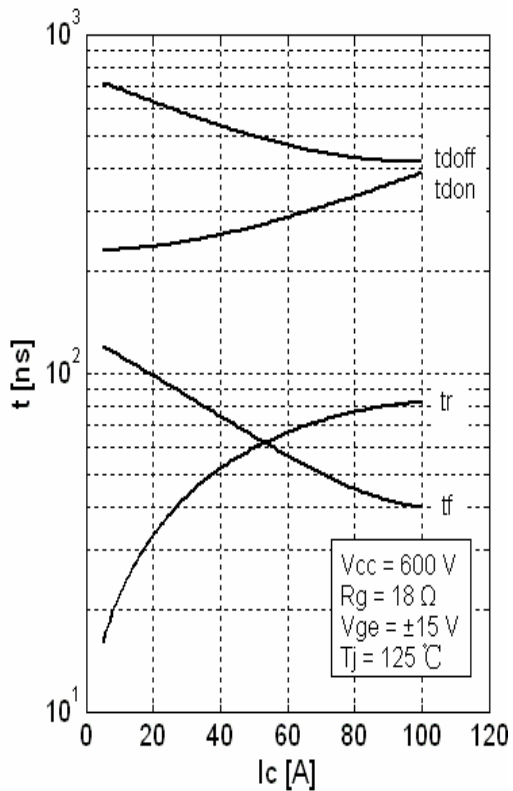


Fig 7. Typical Switching Times vs.  $I_c$

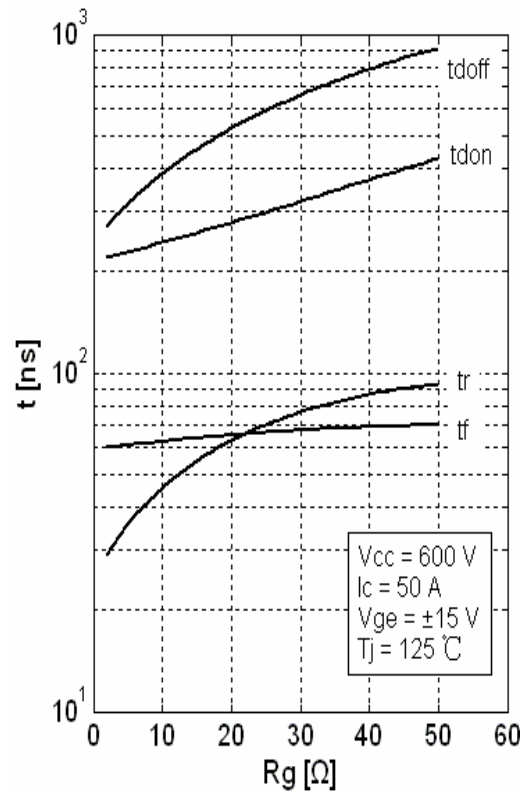


Fig 8. Typical Switching Times vs. Gate Resistance  $R_g$

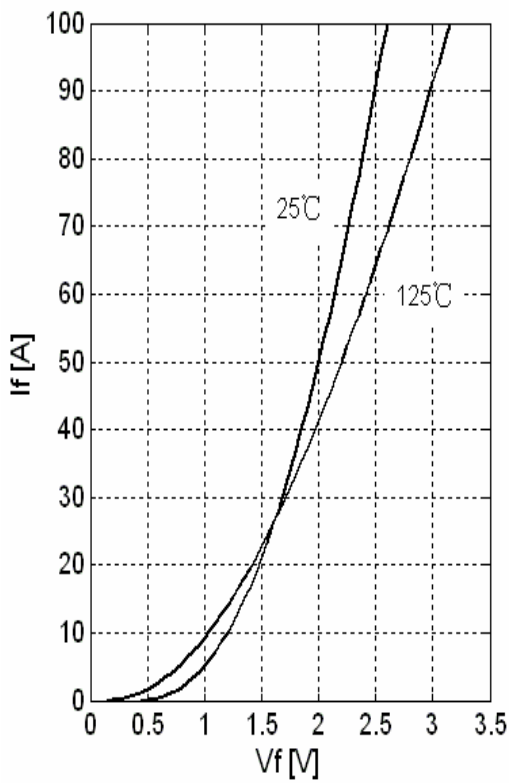


Fig 9. Typical Forward Characteristics (diode)

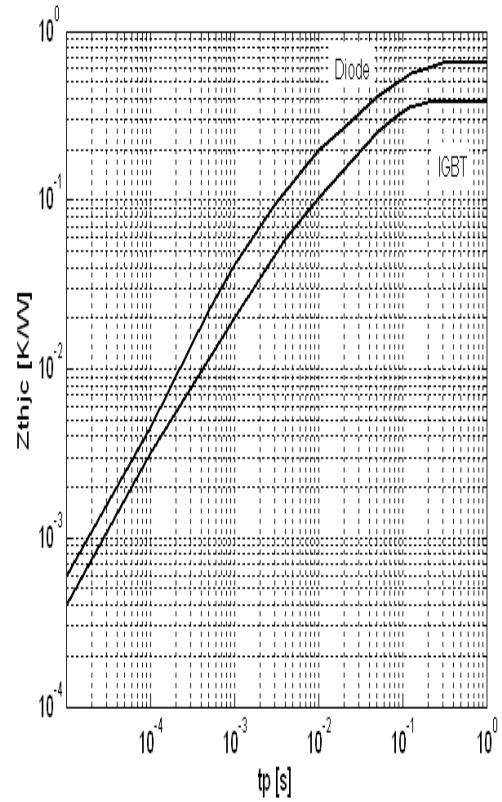


Fig 10. Transient thermal impedance

Package Dimension

Dimensions in Millimeters

