

STARPOWER

SEMICONDUCTOR™

IGBT

GD50HFT120C1S

Molding Type Module

1200V/50A 2 in one-package

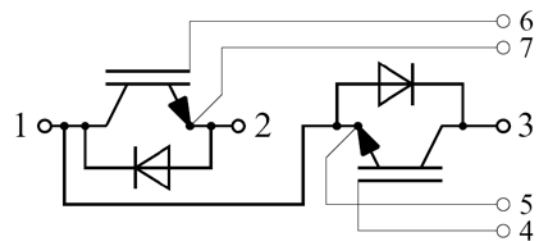
General Description

STARPOWER IGBT Power Module provides ultra low conduction loss as well as short circuit ruggedness. They are designed for the applications such as UPS and SMPS.



Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- Low switching losses
- 10 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175°C
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology



Equivalent Circuit Schematic

Typical Applications

- UPS
- Switching mode power supplies
- Electronic welders

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

Symbol	Description	GD50HFT120C1S	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	100	A
	@ $T_C=80^{\circ}\text{C}$	50	
$I_{CM(1)}$	Pulsed Collector Current $t_p=1\text{ms}$	100	A
I_F	Diode Continuous Forward Current	50	A
I_{FM}	Diode Maximum Forward Current	100	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	405	W
T_j	Maximum Junction Temperature	175	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-40 to +125	$^{\circ}\text{C}$
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}$, $t=1\text{min}$	2500	V
Mounting Torque	Power Terminal Screw:M5	2.5 to 5.0	N.m
	Mounting Screw:M6	3.0 to 5.0	

Notes:

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

Electrical Characteristics of IGBT $T_C=25^{\circ}\text{C}$ unless otherwise noted**Off Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$T_j=25^{\circ}\text{C}$	1200			V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}$, $V_{GE}=0\text{V}$, $T_j=25^{\circ}\text{C}$			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}$, $V_{CE}=0\text{V}$, $T_j=25^{\circ}\text{C}$			400	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=2.4\text{mA}$, $V_{CE}=V_{GE}$, $T_j=25^{\circ}\text{C}$	5.0	5.5	7.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=50\text{A}$, $V_{GE}=15\text{V}$, $T_j=25^{\circ}\text{C}$		1.90	2.35	V
		$I_C=50\text{A}$, $V_{GE}=15\text{V}$, $T_j=175^{\circ}\text{C}$		2.50		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=50A,$ $R_G=15\Omega, V_{GE}=\pm 15V,$ $T_J=25^\circ C$		148		ns
t_r	Rise Time			84		ns
$t_{d(off)}$	Turn-Off Delay Time			245		ns
t_f	Fall Time			251		ns
E_{on}	Turn-On Switching Loss			5.51		mJ
E_{off}	Turn-Off Switching Loss			2.70		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=50A,$ $R_G=15\Omega, V_{GE}=\pm 15V,$ $T_J=125^\circ C$		263		ns
t_r	Rise Time			81		ns
$t_{d(off)}$	Turn-Off Delay Time			256		ns
t_f	Fall Time			292		ns
E_{on}	Turn-On Switching Loss			6.63		mJ
E_{off}	Turn-Off Switching Loss			3.25		mJ
C_{ies}	Input Capacitance	$V_{CE}=30V, f=1MHz,$ $V_{GE}=0V$		6.24		nF
C_{oes}	Output Capacitance			0.23		nF
C_{res}	Reverse Transfer Capacitance			0.15		nF
I_{SC}	SC Data	$t_{SC}\leq 10\mu s, V_{GE}=15V,$ $T_J=125^\circ C, V_{CC}=600V,$ $V_{CEM}\leq 1200V$		450		A
L_{CE}	Stray Inductance				30	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip	$T_C=25^\circ C$		0.75		m Ω

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	$I_F=50A$	$T_J=25^\circ C$	1.85	2.25	V
			$T_J=125^\circ C$	1.95		
Q_r	Recovered Charge	$I_F=50A,$	$T_J=25^\circ C$	3.1		μC
			$T_J=125^\circ C$	6.1		
I_{RM}	Peak Reverse Recovery Current	$V_R=600V,$ $di/dt=-654A/\mu s,$	$T_J=25^\circ C$	24		A
			$T_J=125^\circ C$	31		
E_{rec}	Reverse Recovery Energy	$V_{GE}=-15V$	$T_J=25^\circ C$	0.98		mJ
			$T_J=125^\circ C$	2.06		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		0.37	K/W
$R_{\theta JC}$	Junction-to-Case (per DIODE)		0.49	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.05		K/W
Weight	Weight of Module	150		g

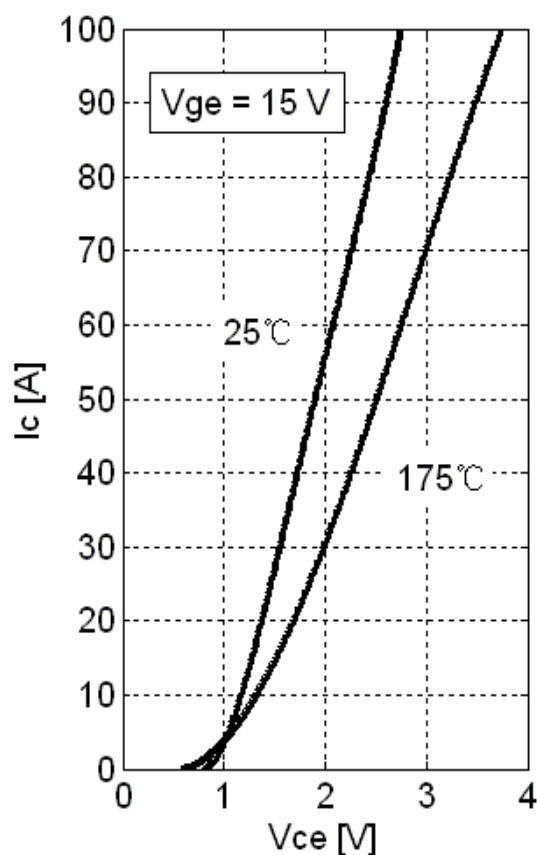


Fig 1. IGBT Typical Output Characteristics

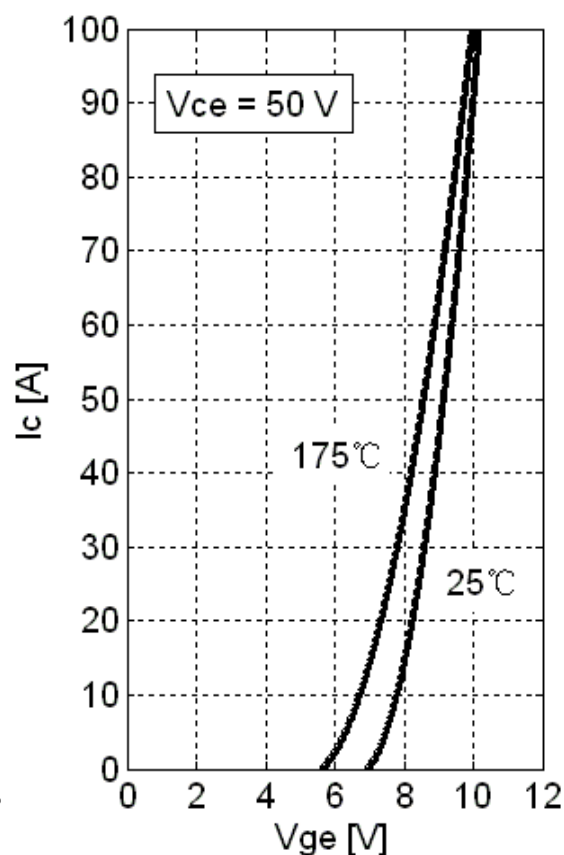
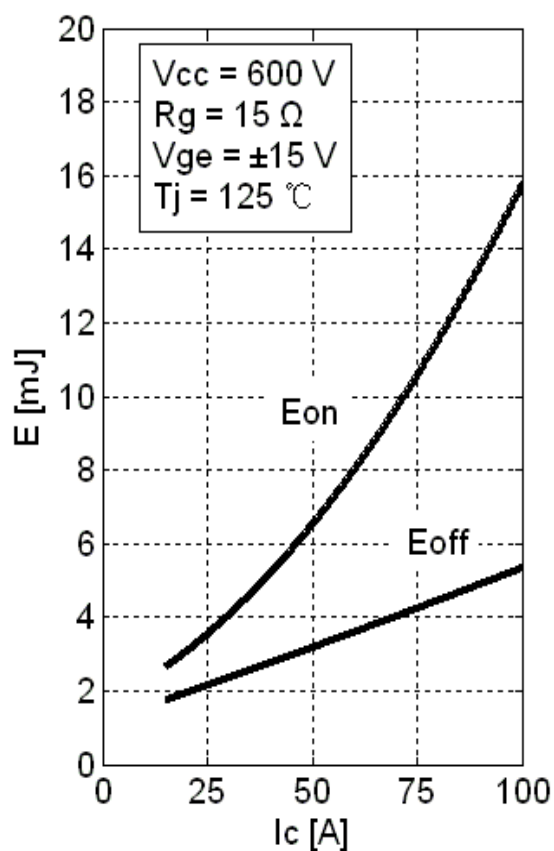
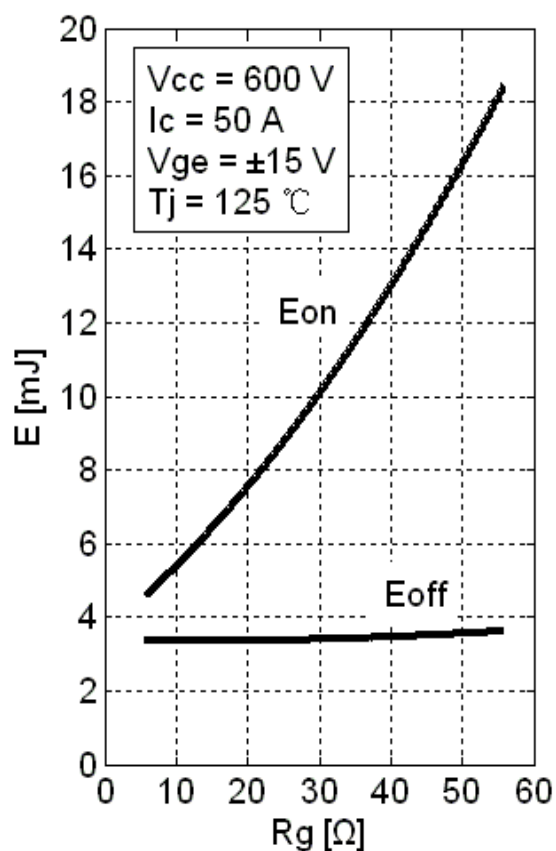


Fig 2. IGBT Typical Transfer Characteristics

Fig 3. IGBT Switching Loss vs. I_c Fig 4. IGBT Switching Loss vs. R_g

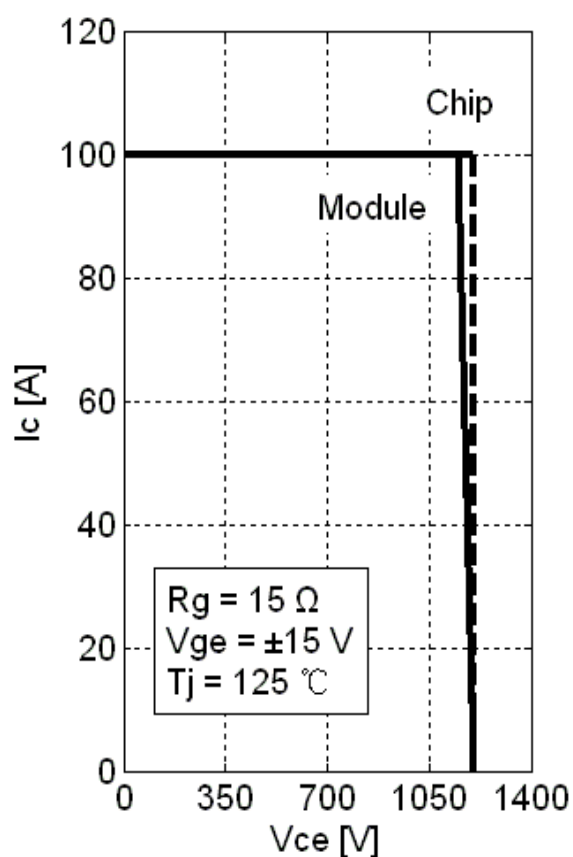


Fig 5. RBSOA

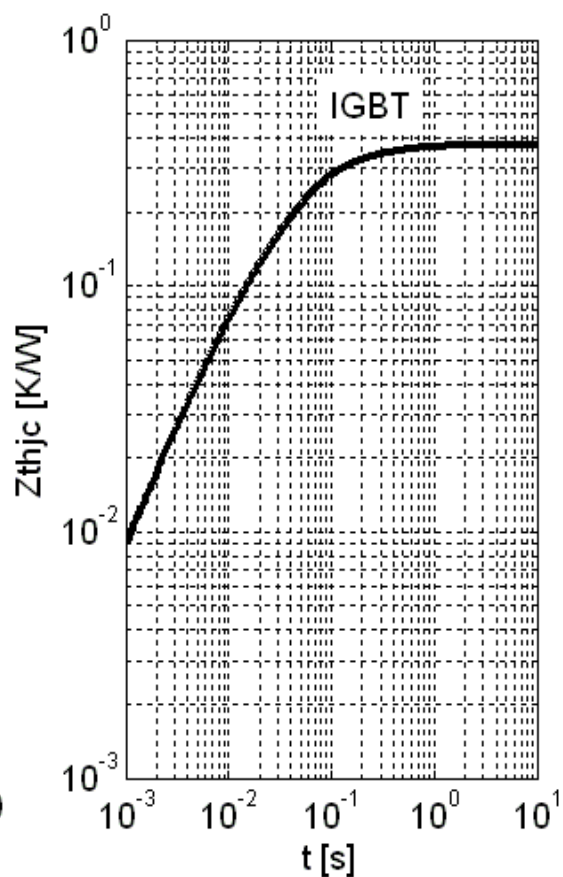


Fig 6. IGBT Transient Thermal Impedance

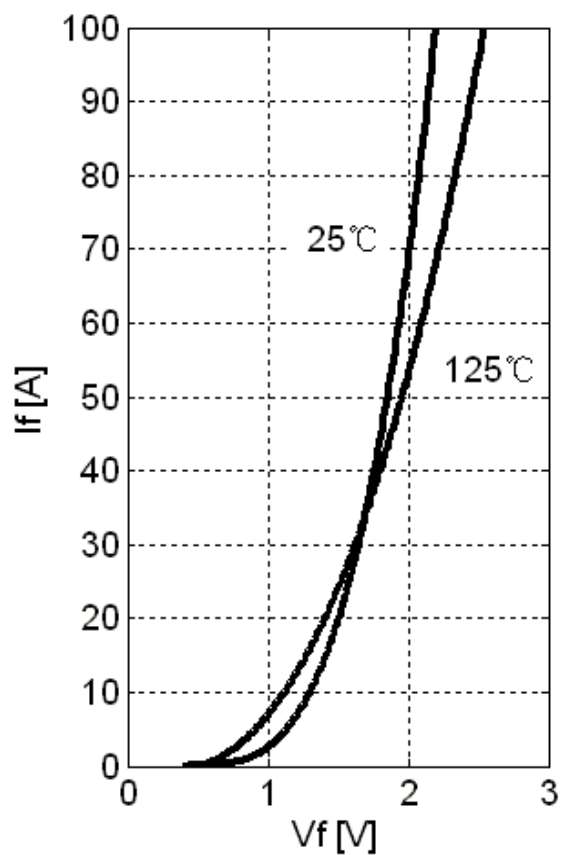
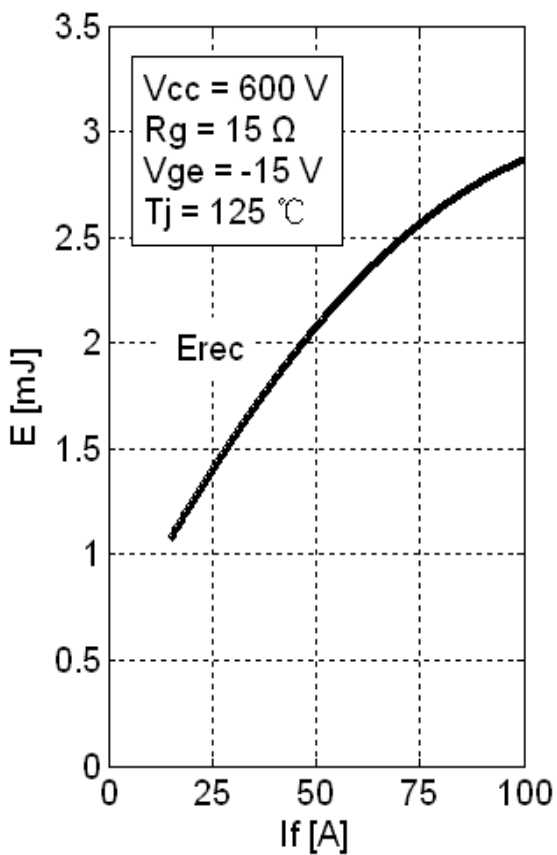


Fig 7. Diode Typical Forward Characteristics

Fig 8. Diode Switching Loss vs. I_f

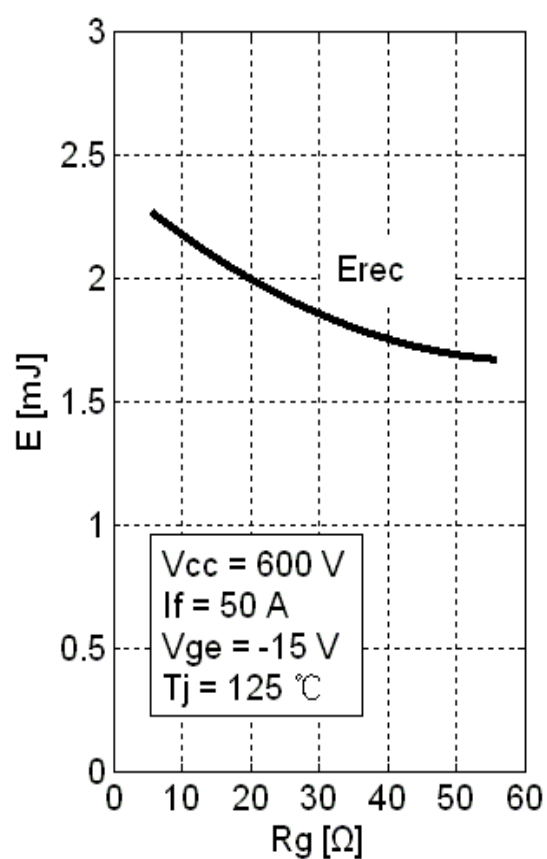
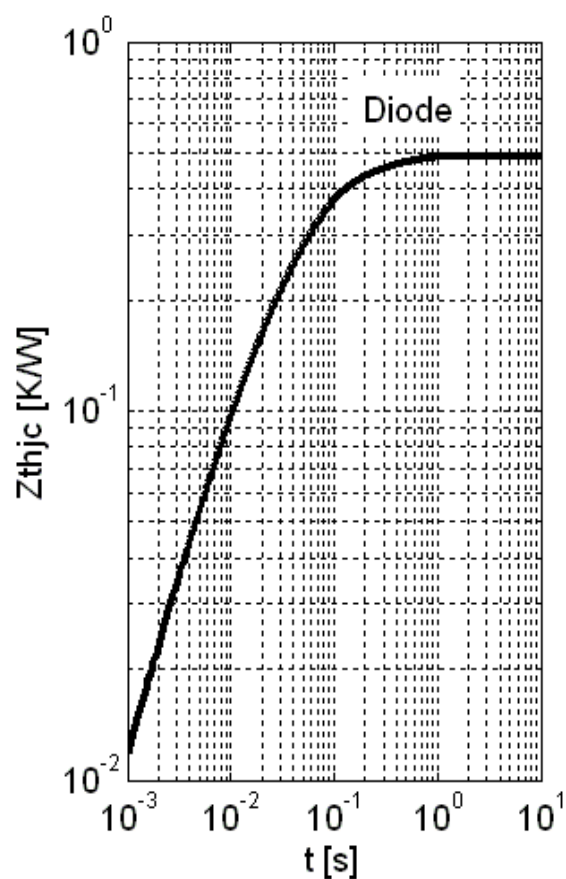
Fig 9. Diode Switching Loss vs. R_G 

Fig 10. Diode Transient Thermal Impedance

Package Dimension

Dimensions in Millimeters

