

STARPOWER

SEMICONDUCTOR™

IGBT

GD3600SGT170A4S

Preliminary

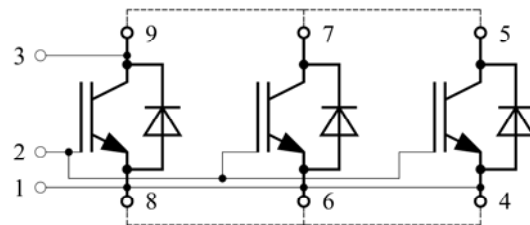
Molding Type Module**1700V/3600A 1 in one-package**

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 high power converters.

Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 10 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- AlSiC baseplate for high power cycling capability
- AlN substrate for low thermal resistance



external connection to be done
Equivalent Circuit Schematic

Typical Applications

- AC Inverter Drives
- Uninterruptible Power Supply
- Wind Turbines

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

Symbol	Description	GD3600SGT170A4S	Units
V_{CES}	Collector-Emitter Voltage	1700	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^\circ\text{C}$ @ $T_C=80^\circ\text{C}$	5200	A
		3600	
$I_{CM(1)}$	Pulsed Collector Current $t_p=1\text{ms}$	7200	A
I_F	Diode Continuous Forward Current	3600	A
I_{FM}	Diode Maximum Forward Current @ $T_C=80^\circ\text{C}$	7200	A
P_D	Maximum power Dissipation @ $T_j=175^\circ\text{C}$	20	kW
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, $f=50\text{Hz}, t=1\text{min}$	4000	V
Mounting Torque	Signal Terminal Screw:M4	1.8 to 2.1	N.m
	Power Terminal Screw:M8	8.0 to 10	
	Mounting Screw:M6	4.25 to 5.75	

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	$T_j=25^\circ\text{C}$	1700			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	$I_C=145\text{mA}, V_{CE}=V_{GE},$ $T_j=25^\circ\text{C}$	5.2	5.8	6.4	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=3600\text{A}, V_{GE}=15\text{V},$ $T_j=25^\circ\text{C}$		2.00	2.45	V
		$I_C=3600\text{A}, V_{GE}=15\text{V},$ $T_j=125^\circ\text{C}$		2.40	2.85	

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Q_G	Gate charge	$V_{GE}=-15\dots+15V$		42.0		μC
R_{Gint}	Internal Gate Resistor	$T_j=25^\circ C$		0.4		Ω
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900V, I_C=3600A,$		730		ns
t_r	Rise Time			205		ns
$t_{d(off)}$	Turn-Off Delay Time	$R_{Gon}=0.4\Omega,$		1510		ns
t_f	Fall Time	$R_{Goff}=0.5\Omega,$		185		ns
E_{on}	Turn-On Switching Loss	$V_{GE}=\pm 15V, T_j=25^\circ C$		498		mJ
E_{off}	Turn-Off Switching Loss			1055		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900V, I_C=3600A,$		785		ns
t_r	Rise Time			225		ns
$t_{d(off)}$	Turn-Off Delay Time	$R_{Gon}=0.4\Omega,$		1800		ns
t_f	Fall Time	$R_{Goff}=0.5\Omega,$		325		ns
E_{on}	Turn-On Switching Loss	$V_{GE}=\pm 15V, T_j=125^\circ C$		746		mJ
E_{off}	Turn-Off Switching Loss			1451		mJ
C_{ies}	Input Capacitance	$V_{CE}=25V, f=1MHz,$ $V_{GE}=0V$		317		nF
C_{oes}	Output Capacitance			13.2		nF
C_{res}	Reverse Transfer Capacitance			10.5		nF
I_{SC}	SC Data	$t_{sc}\leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=1000V,$ $V_{CEM}\leq 1700V$		14000		A
L_{CE}	Stray Inductance			10		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			0.12		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	$I_F=3600A$	$T_j=25^\circ C$		1.80	2.20	V
			$T_j=125^\circ C$		1.90	2.30	
Q_r	Recovered Charge	$I_F=3600A,$	$T_j=25^\circ C$		836		μC
			$T_j=125^\circ C$		1451		
I_{RM}	Reverse Recovery Current	$V_R=900V,$ $R_{Gon}=0.4\Omega,$	$T_j=25^\circ C$		2800		A
			$T_j=125^\circ C$		3300		
E_{rec}	Reverse Recovery Energy	$V_{GE}=-15V$	$T_j=25^\circ C$		590		mJ
			$T_j=125^\circ C$		1051		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		7.5	K/kW
$R_{\theta JC}$	Junction-to-Case (per Diode)		14.9	K/kW
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied, per Module)	4		K/kW
Weight	Weight of Module	1500		g

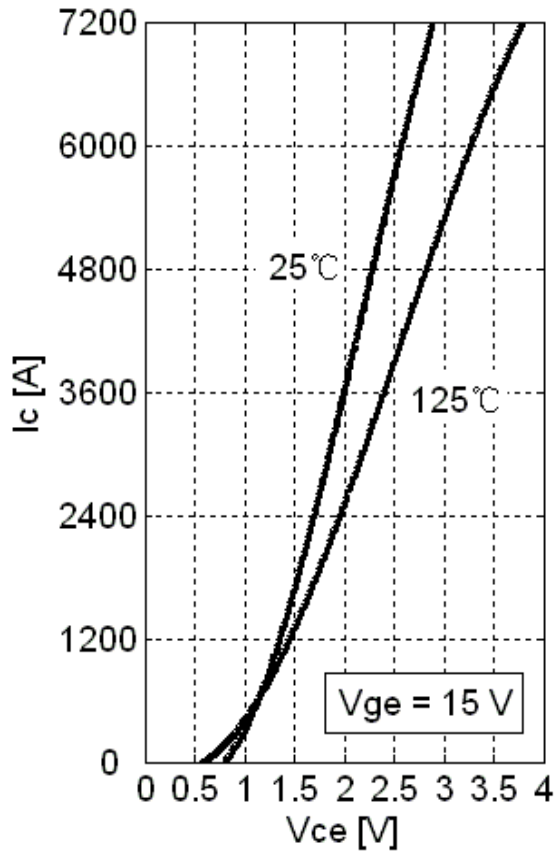


Fig 1. IGBT Output Characteristics

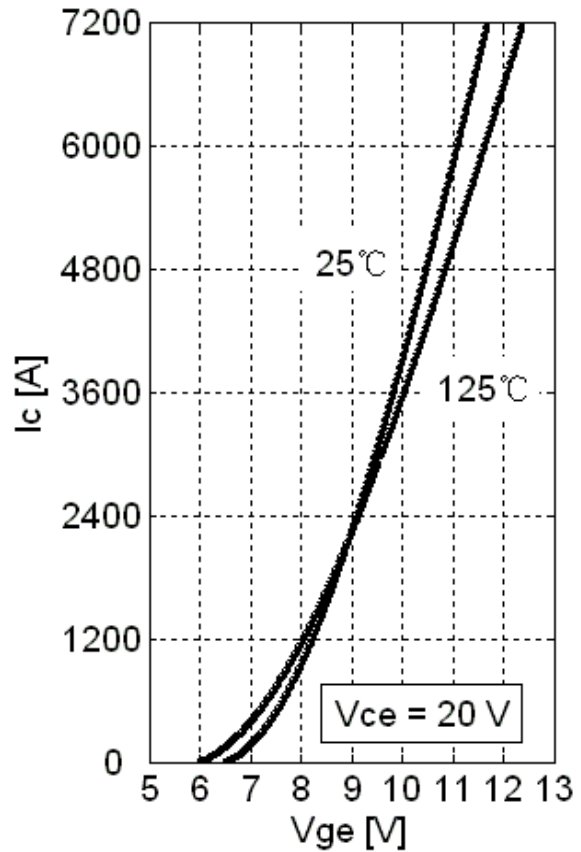


Fig 2. IGBT Transfer Characteristics

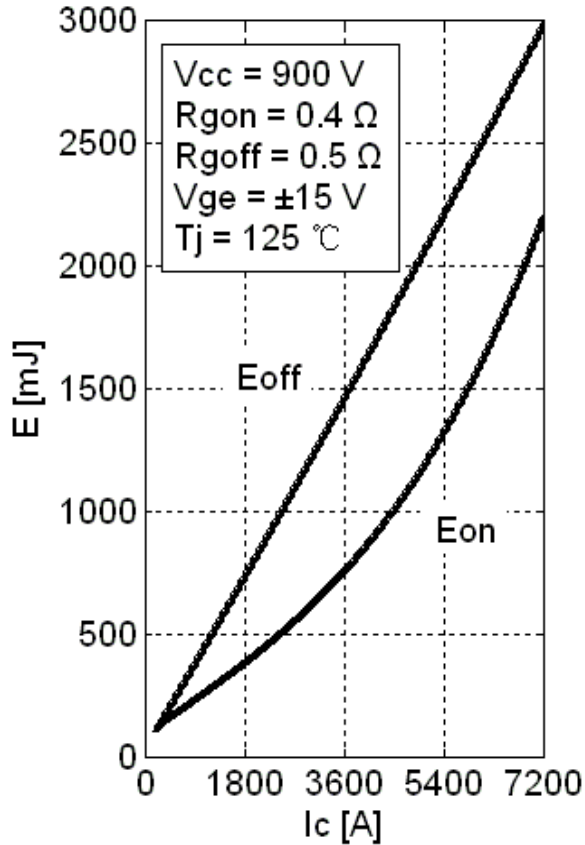


Fig 3. IGBT Switching Loss vs. I_c

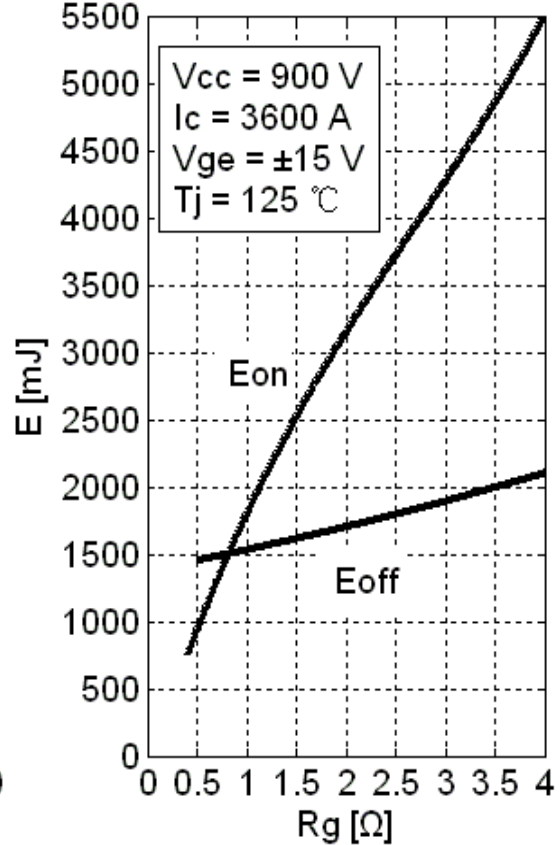


Fig 4. IGBT Switching Loss vs. R_G

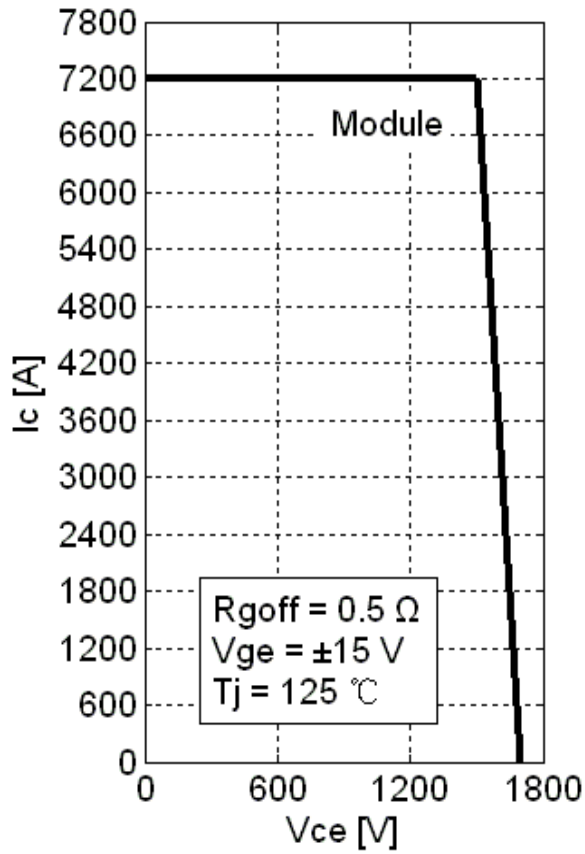


Fig 5. RBSOA

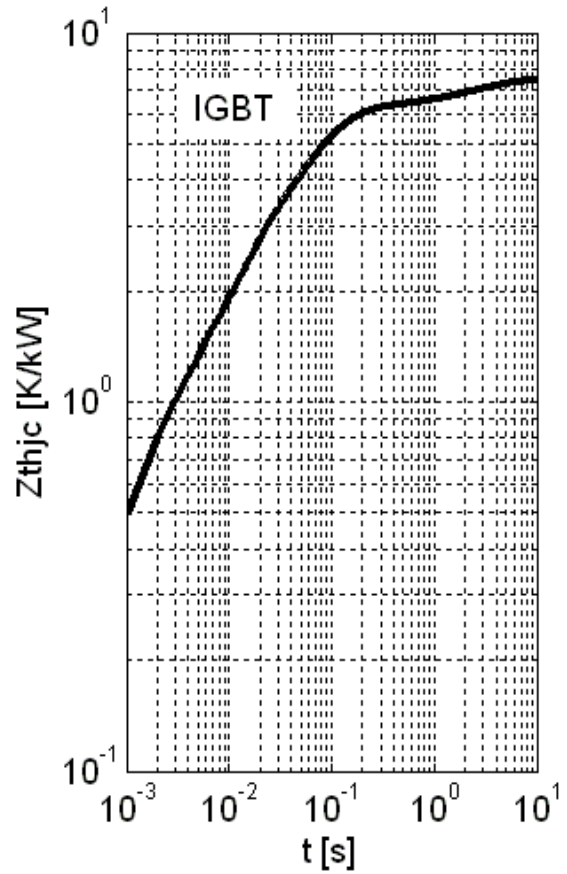


Fig 6. IGBT Transient Thermal Impedance

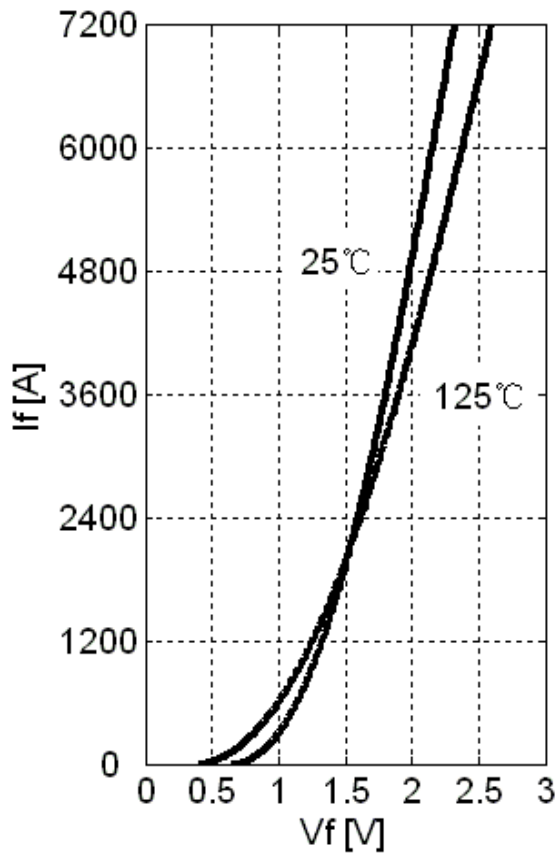


Fig 7. Diode Forward Characteristics

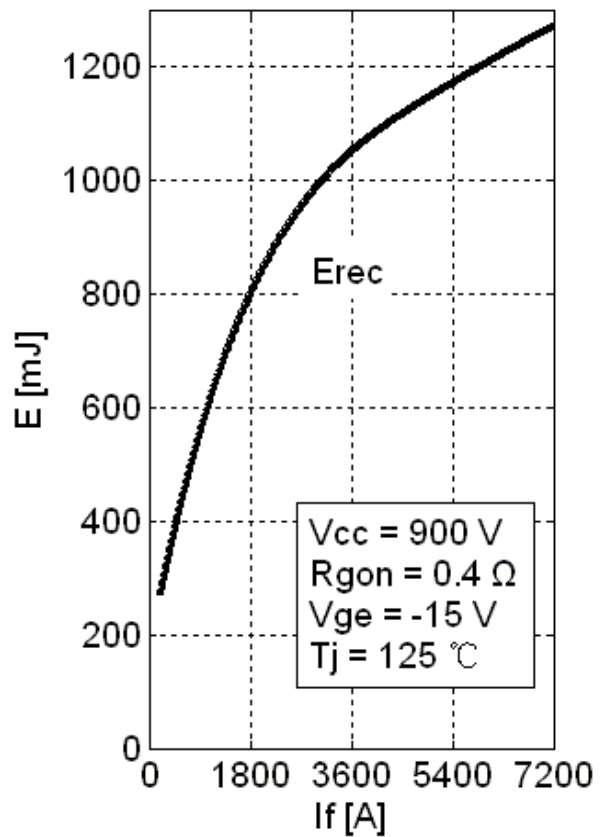


Fig 8. Diode Switching Loss vs. I_f

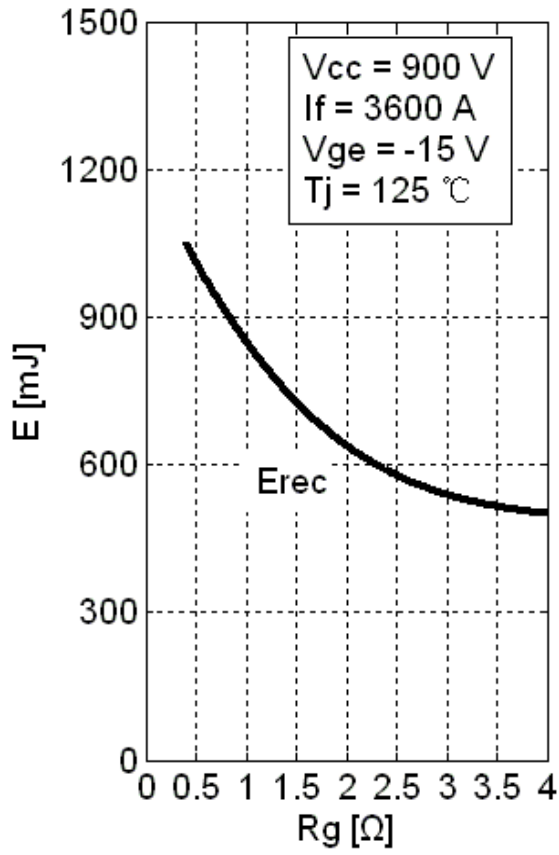


Fig 9. Diode Switching Loss vs. R_G

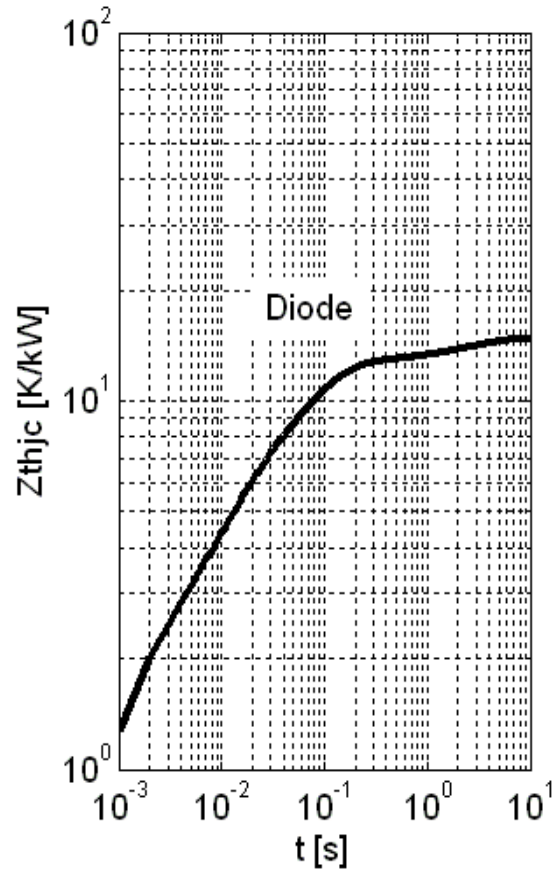


Fig 10. Diode Transient Thermal Impedance

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