

STARPOWER

SEMICONDUCTOR

IGBT

GD1200SGX170C3S

1700V/1200A 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 general inverters and UPS.

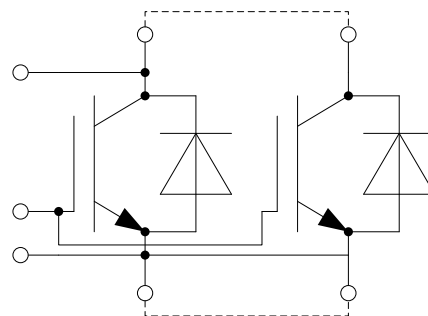
Features

- 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
- Isolated copper baseplate using DBC technology

Typical Applications

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

Equivalent Circuit Schematic



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

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1700	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=95^{\circ}\text{C}$	1849 1200	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	2400	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	6.58	KW

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1700	V
I_F	Diode Continuous Forward Current	1200	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	2400	A

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature	175	$^{\circ}\text{C}$
T_{jop}	Operating Junction Temperature	-40 to +150	$^{\circ}\text{C}$
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

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=1200\text{A}, V_{GE}=15\text{V}, T_j=25^{\circ}\text{C}$		1.85	2.20	V
		$I_C=1200\text{A}, V_{GE}=15\text{V}, T_j=125^{\circ}\text{C}$		2.25		
		$I_C=1200\text{A}, V_{GE}=15\text{V}, T_j=150^{\circ}\text{C}$		2.35		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=48.0\text{mA}, V_{CE}=V_{GE}, T_j=25^{\circ}\text{C}$	5.6	6.2	6.8	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
R_{Gint}	Internal Gate Resistance			1.6		Ω
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		145		nF
C_{res}	Reverse Transfer Capacitance			3.51		nF
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		11.3		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900\text{V}, I_C=1200\text{A}, R_{Gon}=0.68\Omega, R_{Goff}=1.0\Omega, V_{GE}=\pm 15\text{V}, T_j=25^{\circ}\text{C}$		578		ns
t_r	Rise Time			106		ns
$t_{d(off)}$	Turn-Off Delay Time			89		ns
t_f	Fall Time			90		ns
E_{on}	Turn-On Switching Loss			231		mJ
E_{off}	Turn-Off Switching Loss			144		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900\text{V}, I_C=1200\text{A}, R_{Gon}=0.68\Omega, R_{Goff}=1.0\Omega, V_{GE}=\pm 15\text{V}, T_j=125^{\circ}\text{C}$		666		ns
t_r	Rise Time			114		ns
$t_{d(off)}$	Turn-Off Delay Time			778		ns
t_f	Fall Time			214		ns
E_{on}	Turn-On Switching Loss			322		mJ
E_{off}	Turn-Off Switching Loss			293		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900\text{V}, I_C=1200\text{A}, R_{Gon}=0.68\Omega, R_{Goff}=1.0\Omega, V_{GE}=\pm 15\text{V}, T_j=150^{\circ}\text{C}$		689		ns
t_r	Rise Time			116		ns
$t_{d(off)}$	Turn-Off Delay Time			950		ns
t_f	Fall Time			245		ns
E_{on}	Turn-On Switching Loss			345		mJ
E_{off}	Turn-Off Switching Loss			331		mJ
I_{SC}	SC Data	$t_p \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_j=150^{\circ}\text{C}, V_{CC}=1000\text{V}, V_{CEM} \leq 1700\text{V}$		4800		A

Diode Characteristics $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	$I_F=1200\text{A}, V_{GE}=0\text{V}, T_j=25^{\circ}\text{C}$		1.80	2.25	V
		$I_F=1200\text{A}, V_{GE}=0\text{V}, T_j=125^{\circ}\text{C}$		1.90		
		$I_F=1200\text{A}, V_{GE}=0\text{V}, T_j=150^{\circ}\text{C}$		1.95		
Q_r	Recovered Charge	$V_{CC}=900\text{V}, I_F=1200\text{A},$ $-di/dt=10300\text{A}/\mu\text{s},$ $V_{GE}=\pm 15\text{V},$ $T_j=25^{\circ}\text{C}$		330		μC
I_{RM}	Peak Reverse Recovery Current			1485		A
E_{rec}	Reverse Recovery Energy			196		mJ
Q_r	Recovered Charge	$V_{CC}=900\text{V}, I_F=1200\text{A},$ $-di/dt=10300\text{A}/\mu\text{s},$ $V_{GE}=\pm 15\text{V},$ $T_j=125^{\circ}\text{C}$		567		μC
I_{RM}	Peak Reverse Recovery Current			1600		A
E_{rec}	Reverse Recovery Energy			382		mJ
Q_r	Recovered Charge	$V_{CC}=900\text{V}, I_F=1200\text{A},$ $-di/dt=10300\text{A}/\mu\text{s},$ $V_{GE}=\pm 15\text{V},$ $T_j=150^{\circ}\text{C}$		638		μC
I_{RM}	Peak Reverse Recovery Current			1650		A
E_{rec}	Reverse Recovery Energy			444		mJ

Module Characteristics $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		12		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		0.19		m Ω
R_{thJC}	Junction-to-Case (per IGBT)			22.8	K/kW
	Junction-to-Case (per Diode)			36.3	
R_{thCH}	Case-to-Heatsink (per IGBT)		9.8		K/kW
	Case-to-Heatsink (per Diode)		15.6		
	Case-to-Heatsink (per Module)		6.0		
M	Power Terminal Screw:M4	1.8		2.1	N.m
	Power Terminal Screw:M8	8.0		10.0	
	Mounting Screw:M6	4.25		5.75	
G	Weight of Module		1500		g

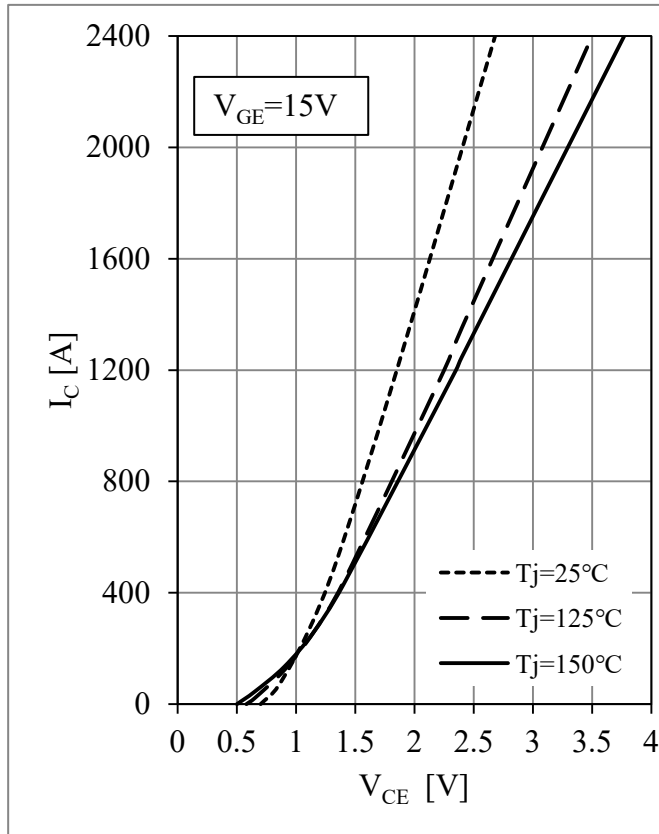


Fig 1. IGBT Output Characteristics

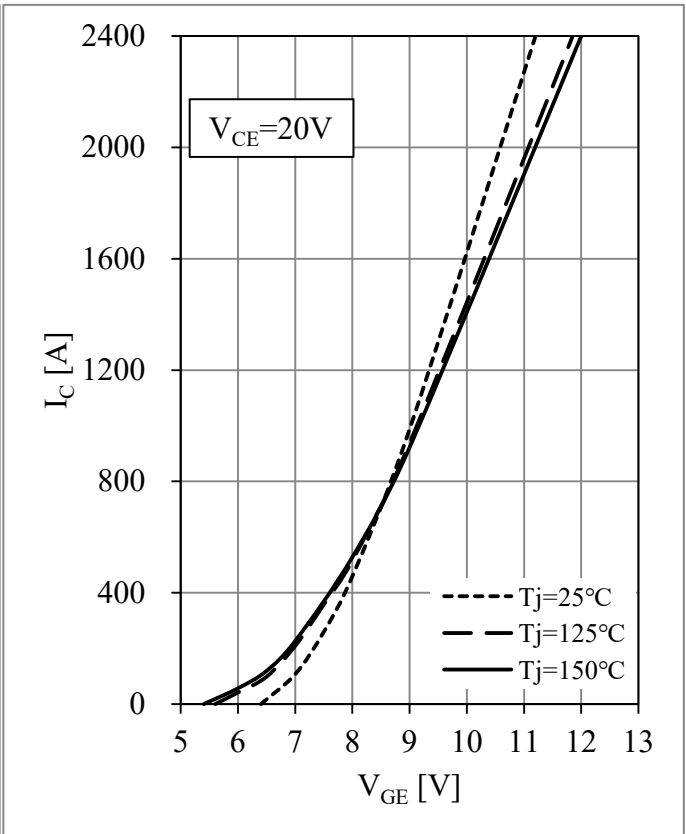
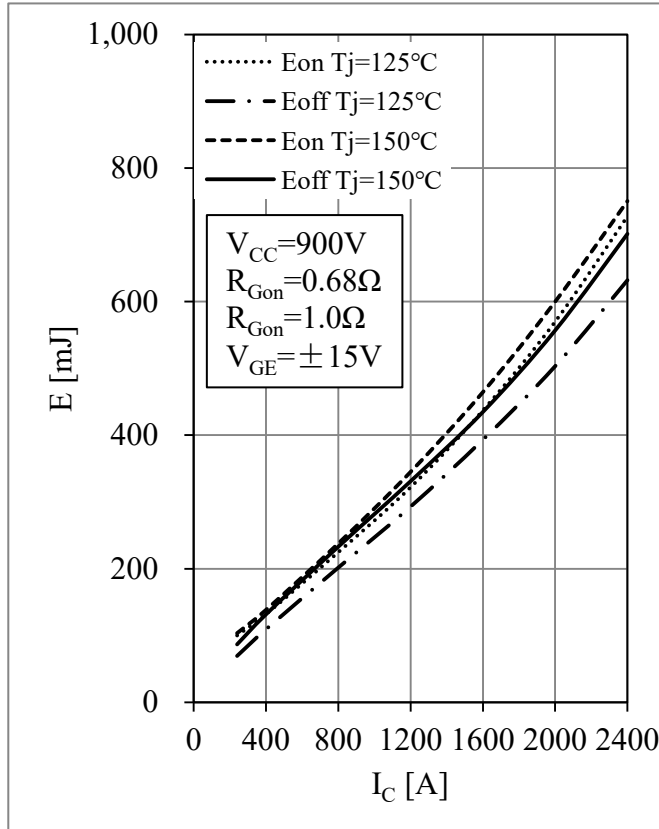
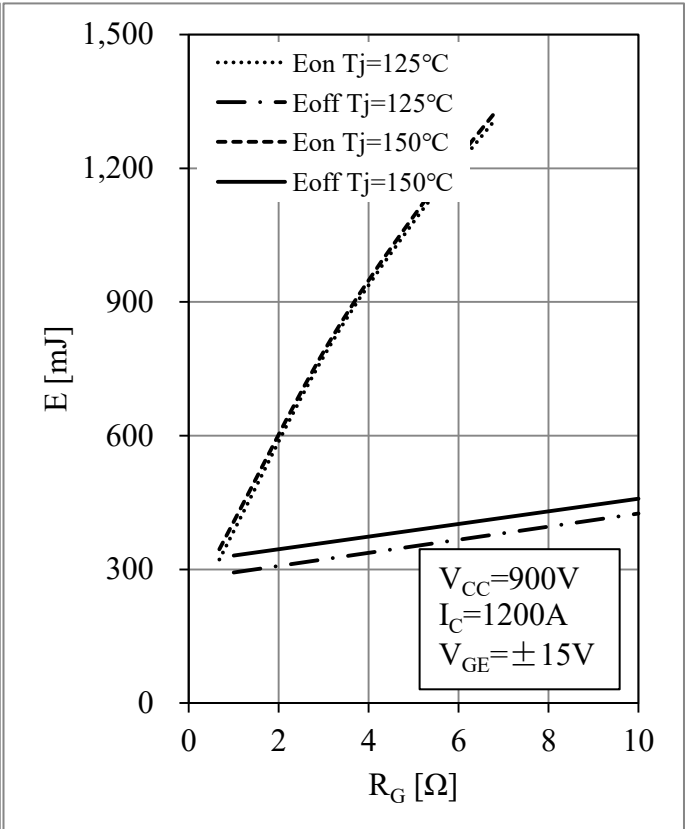


Fig 2. IGBT Transfer Characteristics

Fig 3. IGBT Switching Loss vs. I_C Fig 4. IGBT Switching Loss vs. R_G

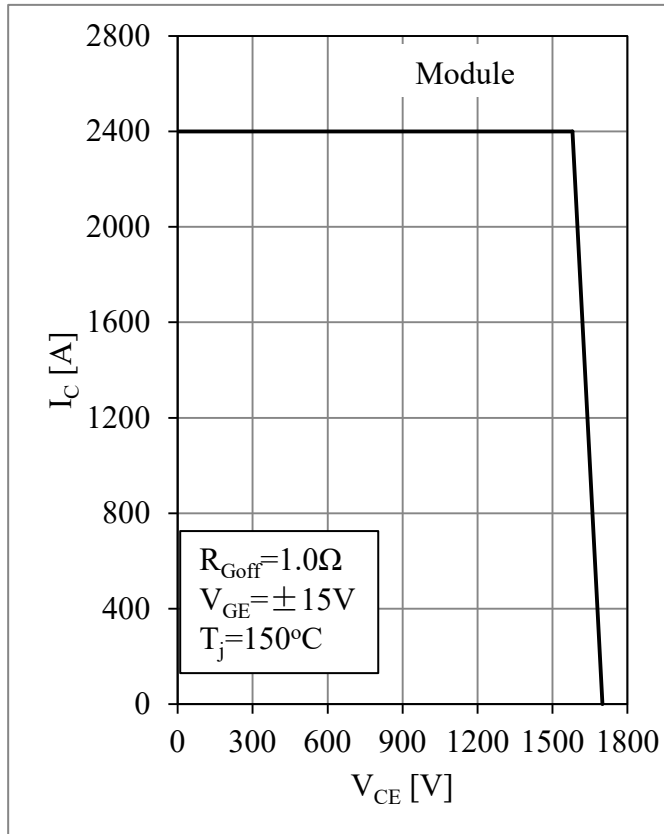


Fig 5. RBSOA

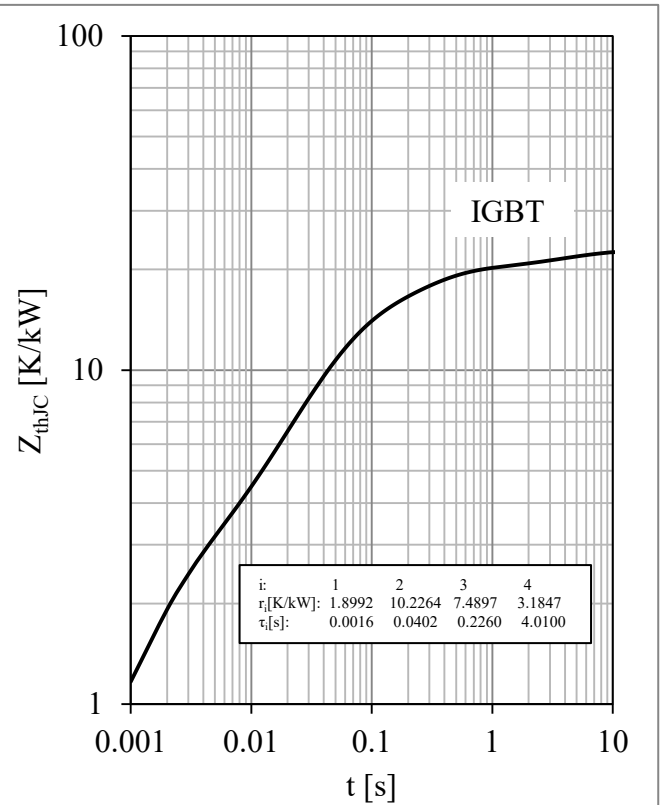


Fig 6. IGBT Transient Thermal Impedance

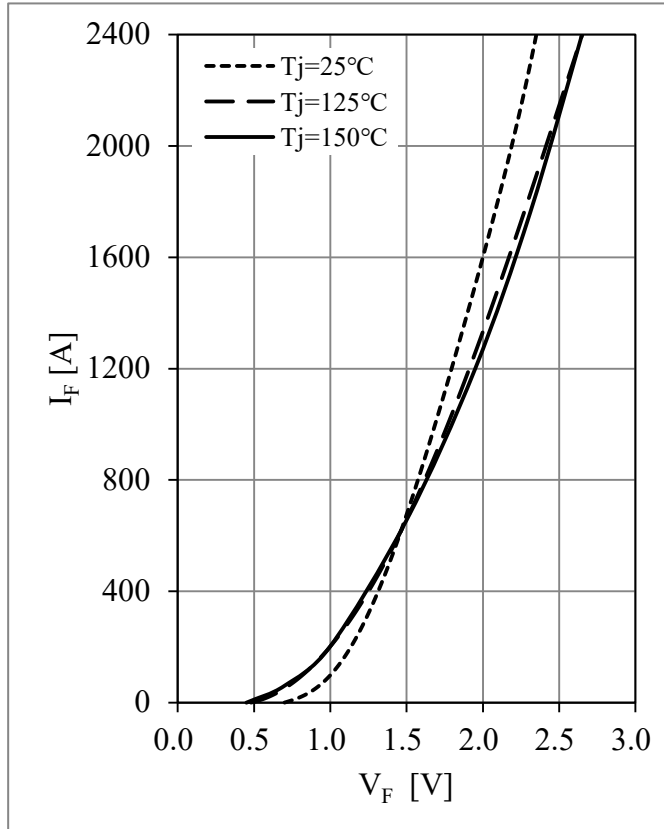
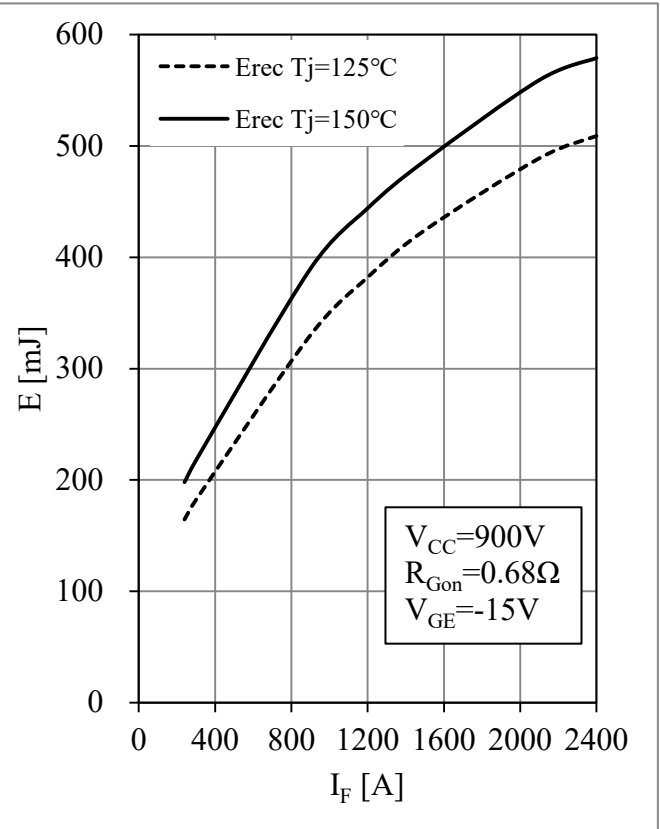


Fig 7. Diode Forward Characteristics

Fig 8. Diode Switching Loss vs. I_F

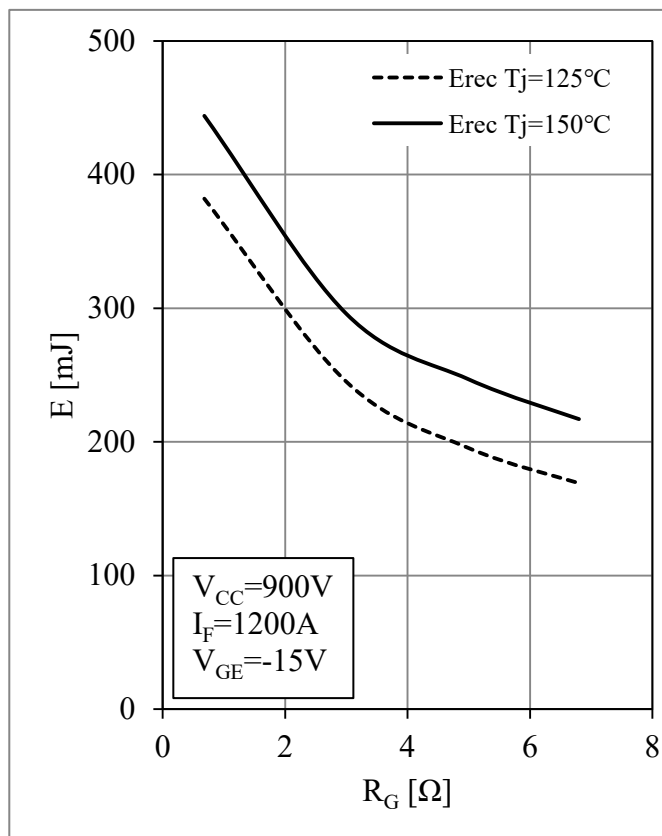
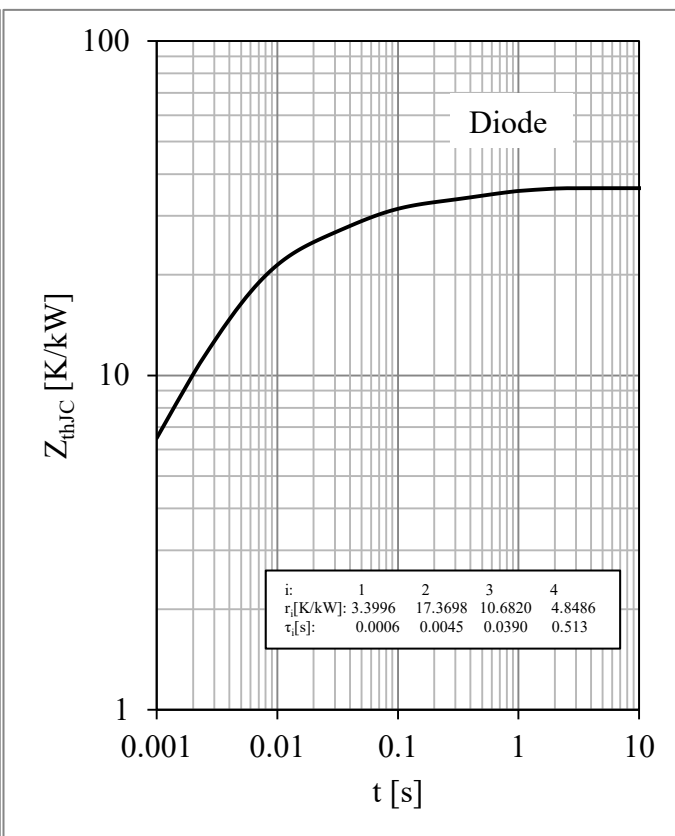
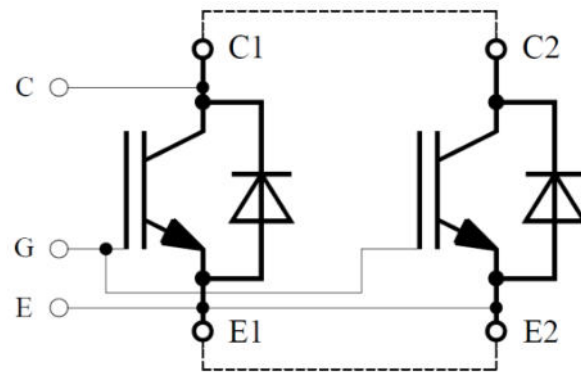
Fig 9. Diode Switching Loss vs. R_G 

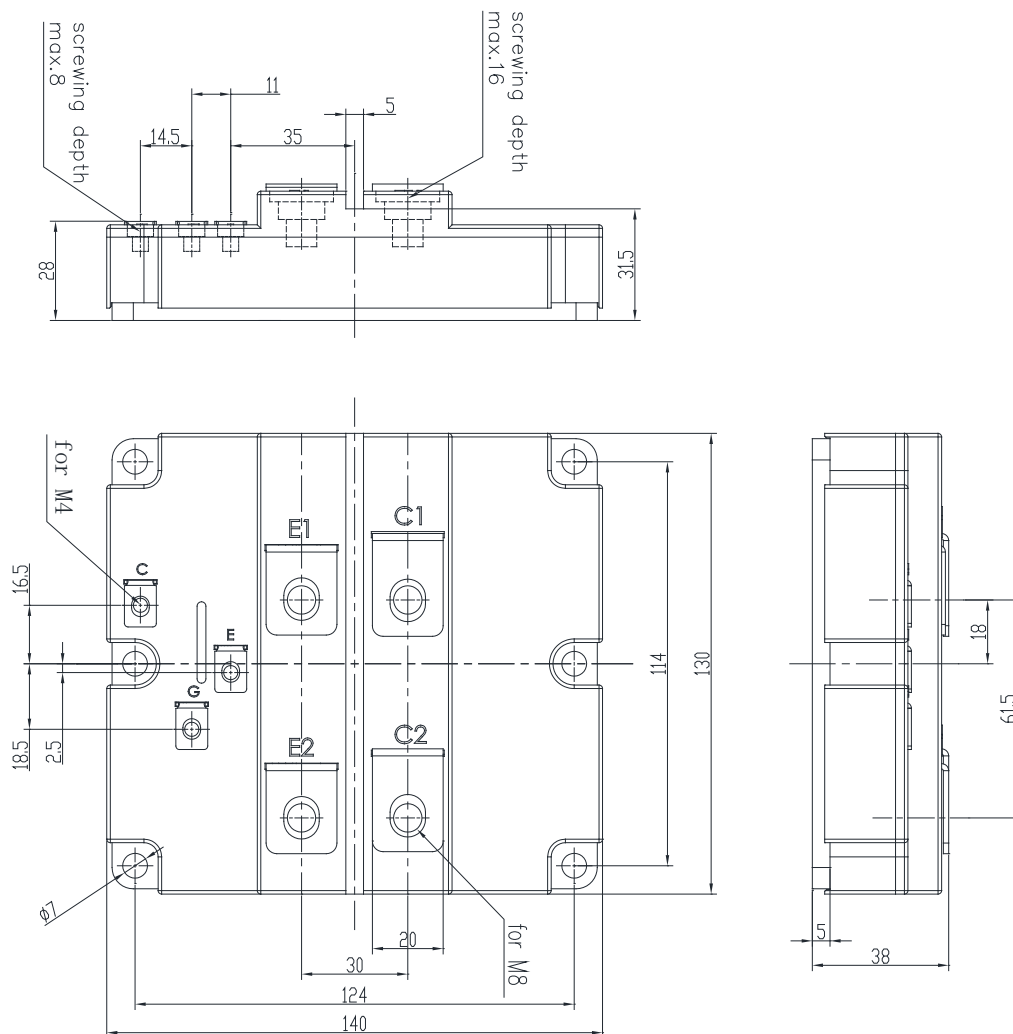
Fig 10. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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