

STARPOWER

SEMICONDUCTOR

IGBT

GD800SGX170C3S

1700V/800A 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.

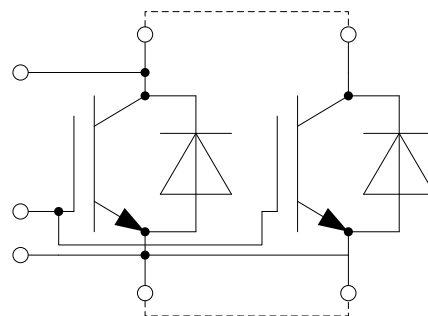
Features

- 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	800	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	1600	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	5.75	kW

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1700	V
I_F	Diode Continuous Forward Current	800	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	1600	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	$I_C=800\text{A}, V_{GE}=15\text{V}, T_j=25^{\circ}\text{C}$		1.85	2.30	V
		$I_C=800\text{A}, V_{GE}=15\text{V}, T_j=125^{\circ}\text{C}$		2.25		
		$I_C=800\text{A}, V_{GE}=15\text{V}, T_j=150^{\circ}\text{C}$		2.35		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=32.0\text{mA}, V_{CE}=V_{GE}, T_j=25^{\circ}\text{C}$	5.6	6.2	6.8	V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_j=25^{\circ}\text{C}$			1.0	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			1.1		Ω
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		96.3		nF
C_{res}	Reverse Transfer Capacitance			2.34		nF
Q_G	Gate Charge	$V_{GE}=-15 \dots +15\text{V}$		7.54		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900\text{V}, I_C=800\text{A}, R_G=2.4\Omega, V_{GE}=-9/+15\text{V}, L_S=65\text{nH}, T_j=25^{\circ}\text{C}$		457		ns
t_r	Rise Time			104		ns
$t_{d(off)}$	Turn-Off Delay Time			1250		ns
t_f	Fall Time			66		ns
E_{on}	Turn-On Switching Loss			265		mJ
E_{off}	Turn-Off Switching Loss			124		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900\text{V}, I_C=800\text{A}, R_G=2.4\Omega, V_{GE}=-9/+15\text{V}, L_S=65\text{nH}, T_j=125^{\circ}\text{C}$		502		ns
t_r	Rise Time			133		ns
$t_{d(off)}$	Turn-Off Delay Time			1404		ns
t_f	Fall Time			113		ns
E_{on}	Turn-On Switching Loss			385		mJ
E_{off}	Turn-Off Switching Loss			157		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900\text{V}, I_C=800\text{A}, R_G=2.4\Omega, V_{GE}=-9/+15\text{V}, L_S=65\text{nH}, T_j=150^{\circ}\text{C}$		515		ns
t_r	Rise Time			141		ns
$t_{d(off)}$	Turn-Off Delay Time			1446		ns
t_f	Fall Time			116		ns
E_{on}	Turn-On Switching Loss			421		mJ
E_{off}	Turn-Off Switching Loss			169		mJ
I_{SC}	SC Data	$t_p \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_j=150^{\circ}\text{C}, V_{CC}=1000\text{V}, V_{CEM} \leq 1700\text{V}$		3200		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	$I_F=800\text{A}, V_{GE}=0\text{V}, T_j=25^{\circ}\text{C}$		1.80	2.25	V
		$I_F=800\text{A}, V_{GE}=0\text{V}, T_j=125^{\circ}\text{C}$		1.90		
		$I_F=800\text{A}, V_{GE}=0\text{V}, T_j=150^{\circ}\text{C}$		1.95		
Q_r	Recovered Charge	$V_{CC}=900\text{V}, I_F=800\text{A},$ $-di/dt=6150\text{A}/\mu\text{s}, V_{GE}=-9\text{V},$ $L_S=65\text{nH}, T_j=25^{\circ}\text{C}$		107		μC
I_{RM}	Peak Reverse Recovery Current			717		A
E_{rec}	Reverse Recovery Energy			189		mJ
Q_r	Recovered Charge	$V_{CC}=900\text{V}, I_F=800\text{A},$ $-di/dt=6150\text{A}/\mu\text{s}, V_{GE}=-9\text{V},$ $L_S=65\text{nH}, T_j=125^{\circ}\text{C}$		225		μC
I_{RM}	Peak Reverse Recovery Current			734		A
E_{rec}	Reverse Recovery Energy			312		mJ
Q_r	Recovered Charge	$V_{CC}=900\text{V}, I_F=800\text{A},$ $-di/dt=6150\text{A}/\mu\text{s}, V_{GE}=-9\text{V},$ $L_S=65\text{nH}, T_j=150^{\circ}\text{C}$		256		μC
I_{RM}	Peak Reverse Recovery Current			737		A
E_{rec}	Reverse Recovery Energy			343		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)			26.1	K/kW
	Junction-to-Case (per Diode)			40.3	
R_{thCH}	Case-to-Heatsink (per IGBT)		9.9		K/kW
	Case-to-Heatsink (per Diode)		15.3		
	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

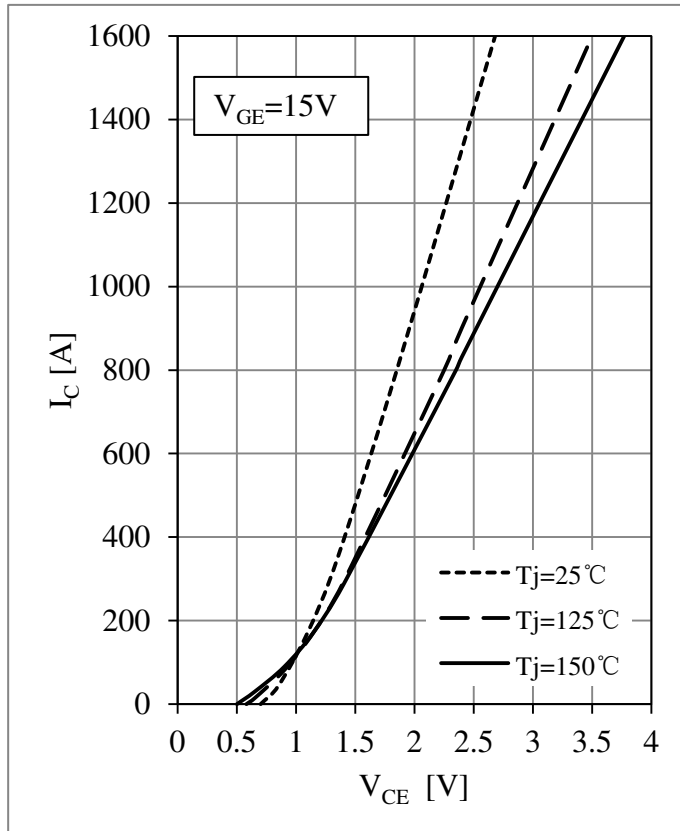


Fig 1. IGBT Output Characteristics

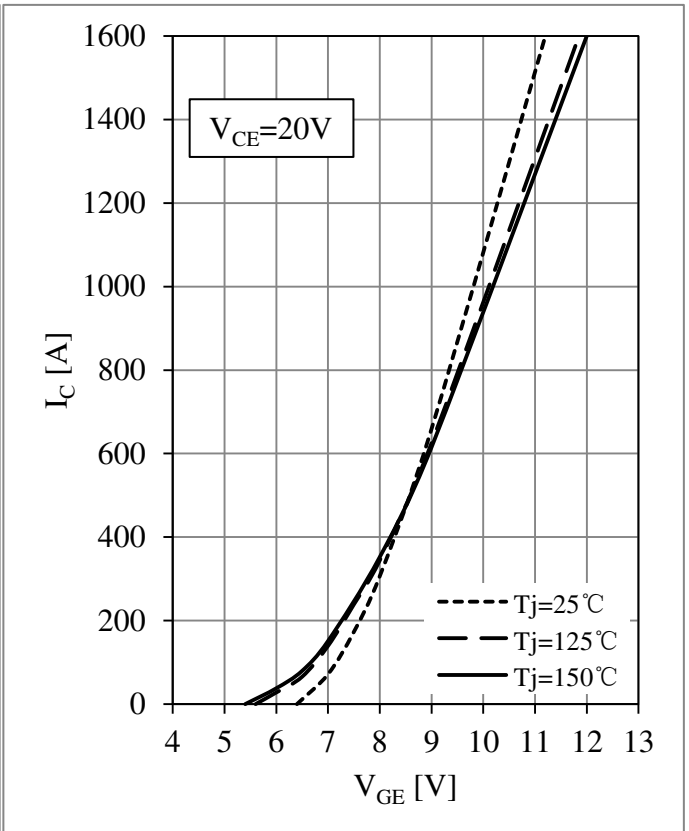


Fig 2. IGBT Transfer Characteristics

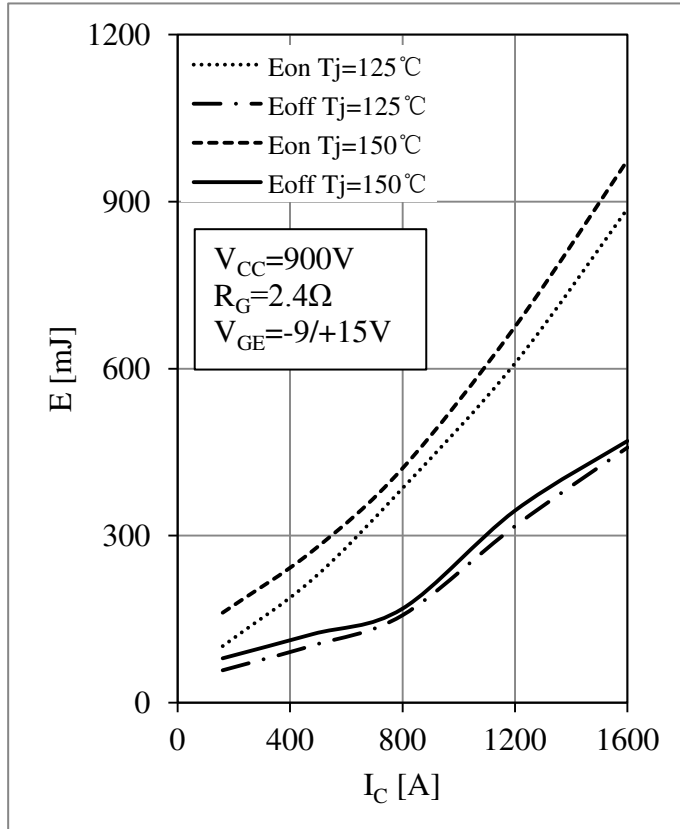


Fig 3. IGBT Switching Loss vs. Ic

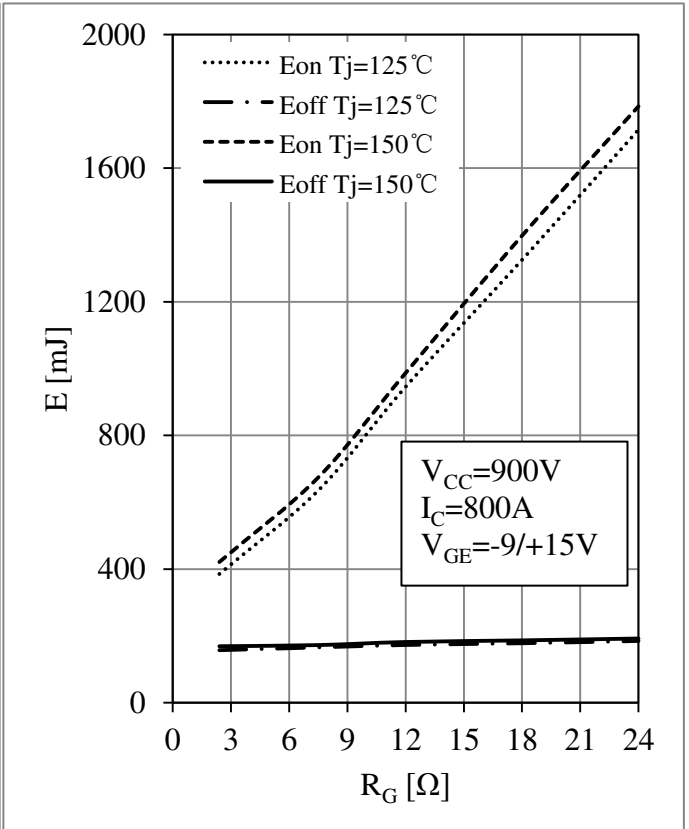


Fig 4. IGBT Switching Loss vs. Rg

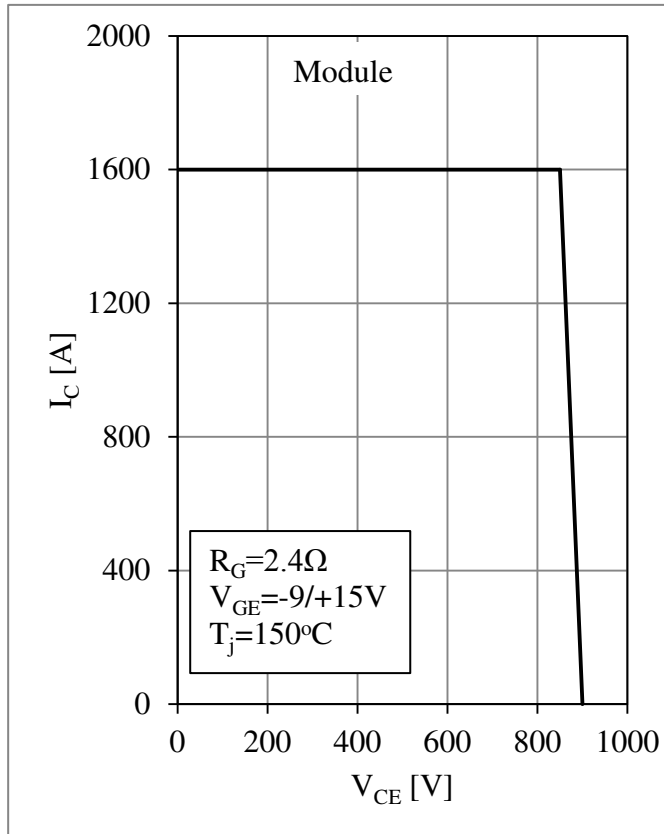


Fig 5. RBSOA

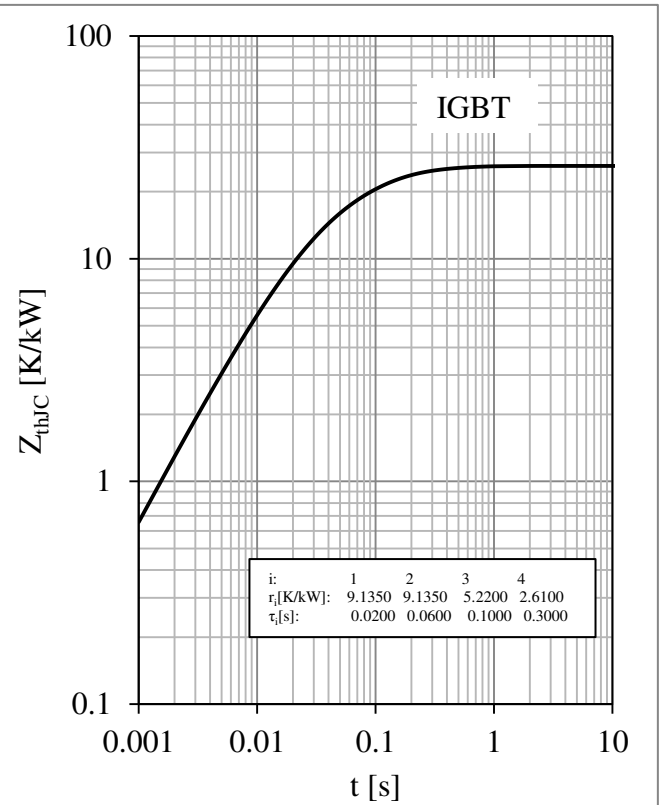


Fig 6. IGBT Transient Thermal Impedance

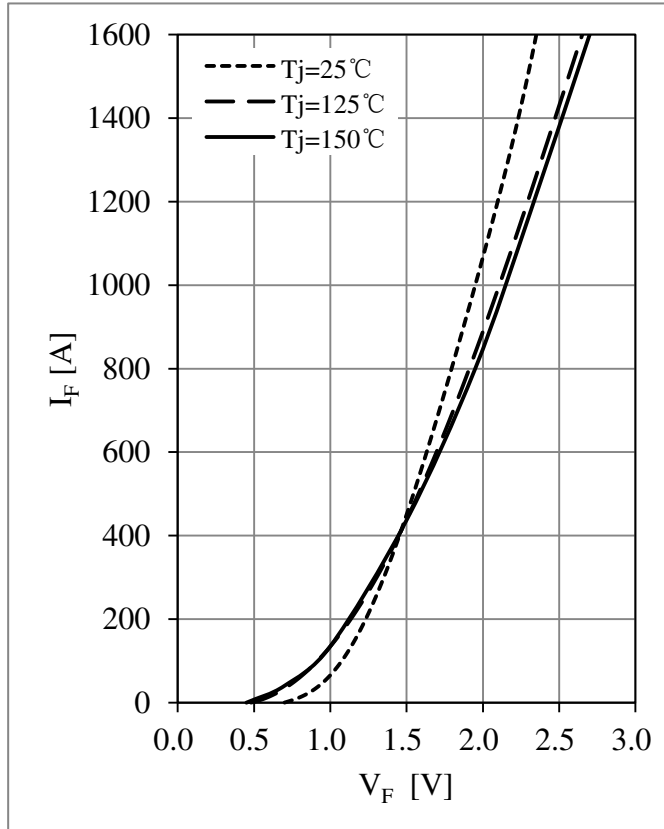
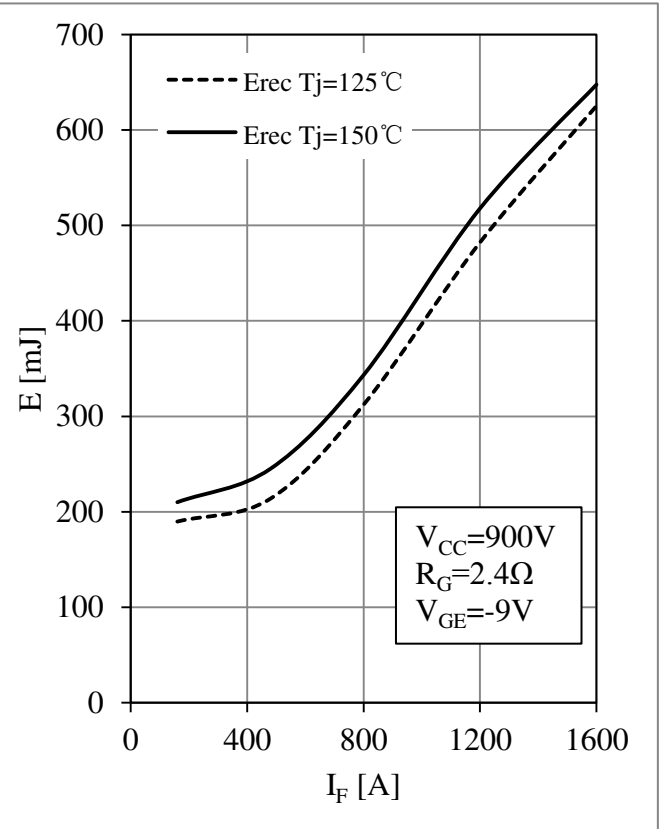


Fig 7. Diode Forward Characteristics

Fig 8. Diode Switching Loss vs. I_F

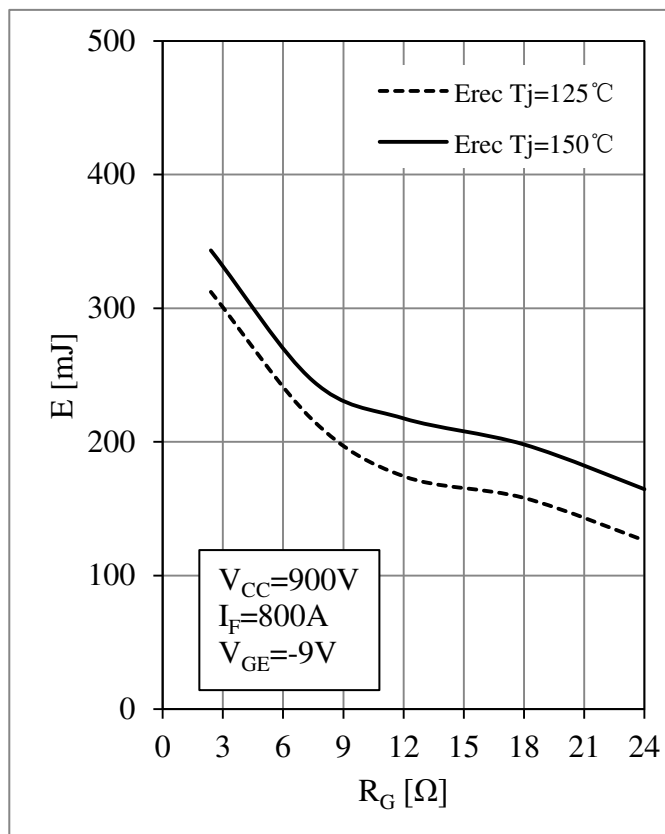
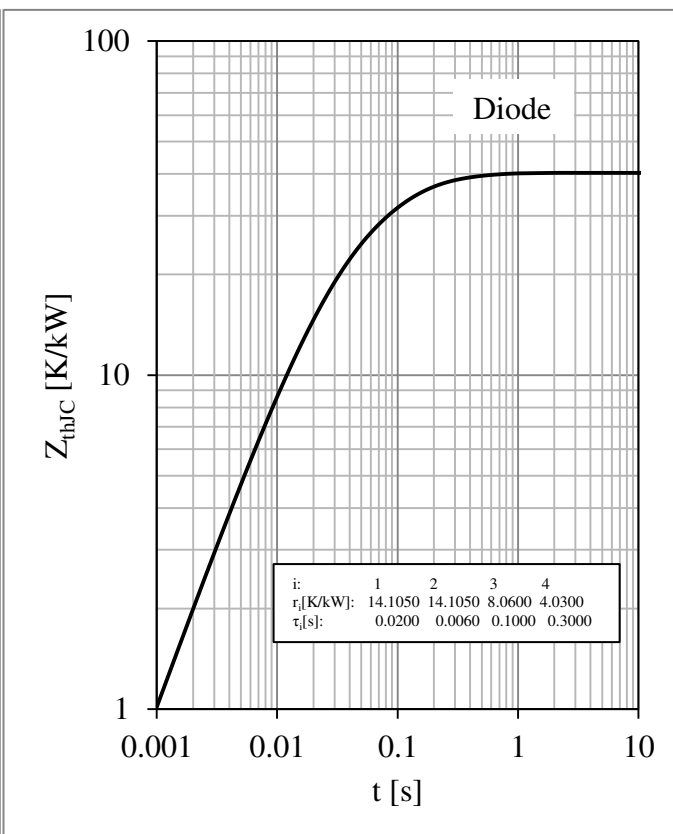
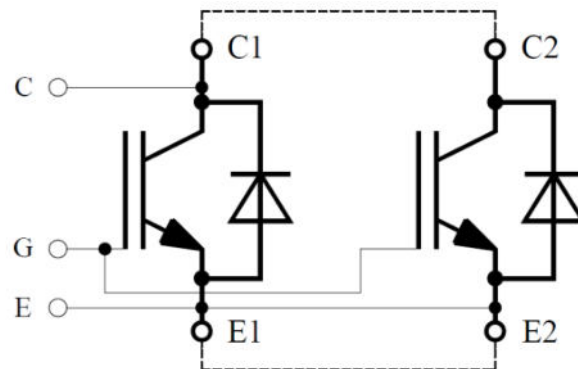
Fig 9. Diode Switching Loss vs. R_G 

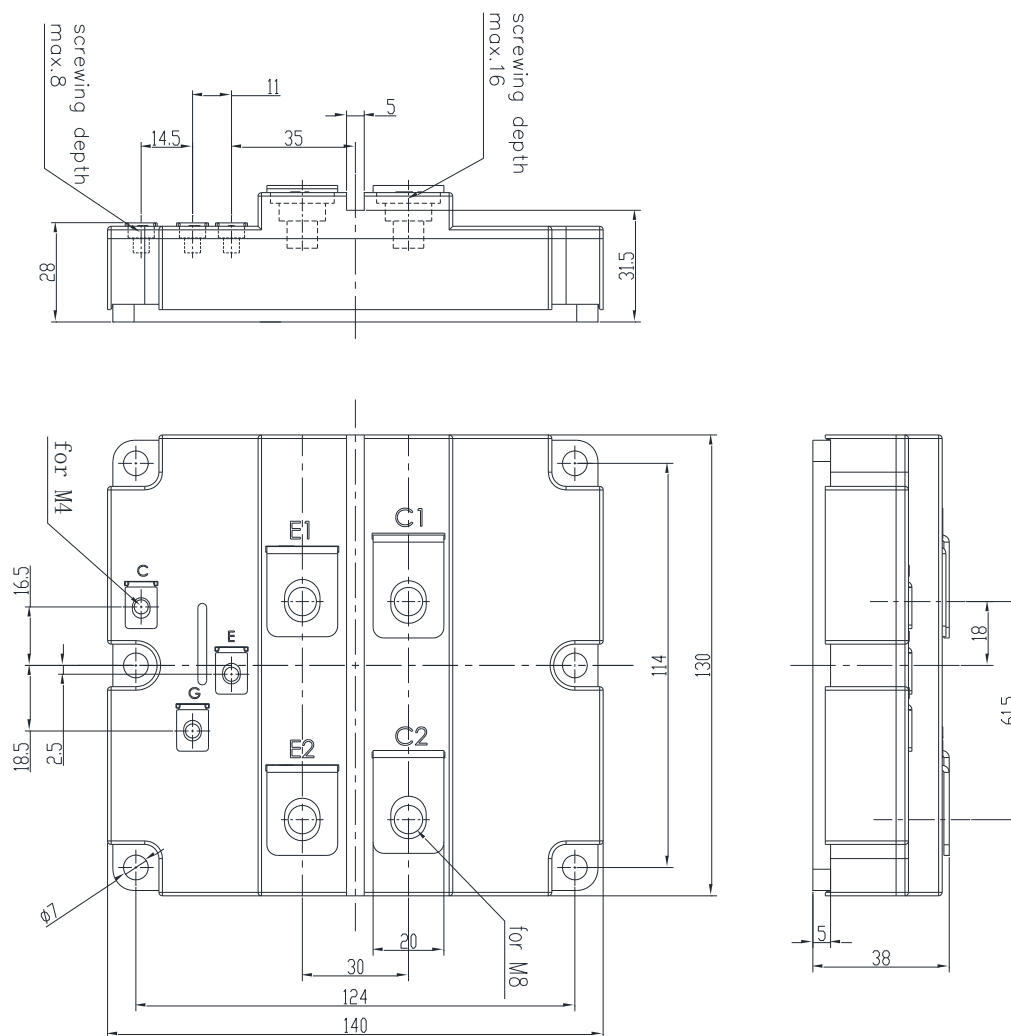
Fig 10. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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