STARPOWER

SEMICONDUCTOR **IGBT**

GD1200HFX170A3S

1700V/1200A 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 high power converters.

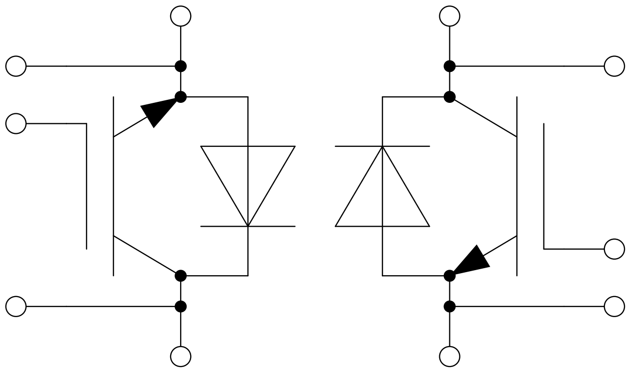
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 10μs 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

Typical Applications

- High Power Converters
- Motor Drives
- Wind Turbines

Equivalent Circuit Schematic



Absolute Maximum Ratings T_C=25°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°C @ T_C=100°C	2044 1200	A
I_{CM}	Pulsed Collector Current t_p=1ms	2400	A
P_D	Maximum Power Dissipation @ T_j=175°C	6.97	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=1ms	2400	A

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature	175	°C
T_{jop}	Operating Junction Temperature	-40 to +150	°C
T_{STG}	Storage Temperature Range	-40 to +125	°C
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	4000	V

IGBT Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=1200A,V_{GE}=15V, T_j=25°C		1.85	2.30	V
		I_C=1200A,V_{GE}=15V, T_j=125°C		2.25		
		I_C=1200A,V_{GE}=15V, T_j=150°C		2.35		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=48.0mA,V_{CE}=V_{GE}, T_j=25°C	5.6	6.2	6.8	V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25°C			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25°C			400	nA
R_{Gint}	Internal Gate Resistance			1.6		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=100kHz, V_{GE}=0V		142		nF
C_{res}	Reverse Transfer Capacitance			3.57		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		11.8		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=1200A, R_G=1.5Ω, V_{GE}=-9/+15V, L_S=65nH,T_j=25°C		647		ns
t_r	Rise Time			225		ns
$t_{d(off)}$	Turn-Off Delay Time			1657		ns
t_f	Fall Time			180		ns
E_{on}	Turn-On Switching Loss			363		mJ
E_{off}	Turn-Off Switching Loss			401		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=1200A, R_G=1.5Ω, V_{GE}=-9/+15V, L_S=65nH,T_j=125°C		815		ns
t_r	Rise Time			294		ns
$t_{d(off)}$	Turn-Off Delay Time			2231		ns
t_f	Fall Time			235		ns
E_{on}	Turn-On Switching Loss			733		mJ
E_{off}	Turn-Off Switching Loss			549		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=1200A, R_G=1.5Ω, V_{GE}=-9/+15V, L_S=65nH,T_j=150°C		860		ns
t_r	Rise Time			312		ns
$t_{d(off)}$	Turn-Off Delay Time			2422		ns
t_f	Fall Time			247		ns
E_{on}	Turn-On Switching Loss			850		mJ
E_{off}	Turn-Off Switching Loss			586		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=1000V, V_{CEM}≤1700V		4800		A

Diode Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=1200A,V_{GE}=0V,T_j=25°C		1.80	2.25	V
		I_F=1200A,V_{GE}=0V,T_j=125°C		1.90		
		I_F=1200A,V_{GE}=0V,T_j=150°C		1.95		
Q_r	Recovered Charge	V_{CC}=900V,I_F=1200A, -di/dt=4950A/μs,V_{GE}=-9V, L_S=65nH,T_j=25°C		249		μC
I_{RM}	Peak Reverse Recovery Current			922		A
E_{rec}	Reverse Recovery Energy			153		mJ
Q_r	Recovered Charge	V_{CC}=900V,I_F=1200A, -di/dt=3780A/μs,V_{GE}=-9V, L_S=65nH,T_j=125°C		418		μC
I_{RM}	Peak Reverse Recovery Current			959		A
E_{rec}	Reverse Recovery Energy			242		mJ
Q_r	Recovered Charge	V_{CC}=900V,I_F=1200A, -di/dt=3520A/μs,V_{GE}=-9V, L_S=65nH,T_j=150°C		563		μC
I_{RM}	Peak Reverse Recovery Current			990		A
E_{rec}	Reverse Recovery Energy			321		mJ

Module Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		20		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		0.37		mΩ
R_{thJC}	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			21.5 41.4	K/kW
R_{thCH}	Case-to-Heatsink (per IGBT) Case-to-Heatsink (per Diode) Case-to-Heatsink (per Module)		18.2 35.1 6.0		K/kW
M	Terminal Connection Torque, Screw M4 Terminal Connection Torque, Screw M8 Mounting Torque, Screw M6	1.8 8.0 4.25		2.1 10 5.75	N.m
G	Weight of Module		1500		g

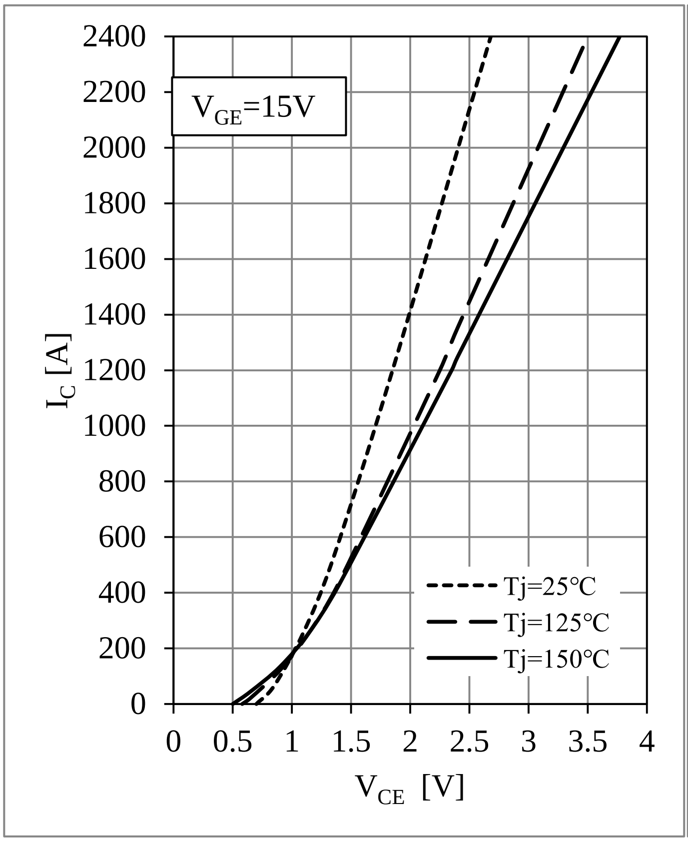


Fig 1. IGBT Output Characteristics

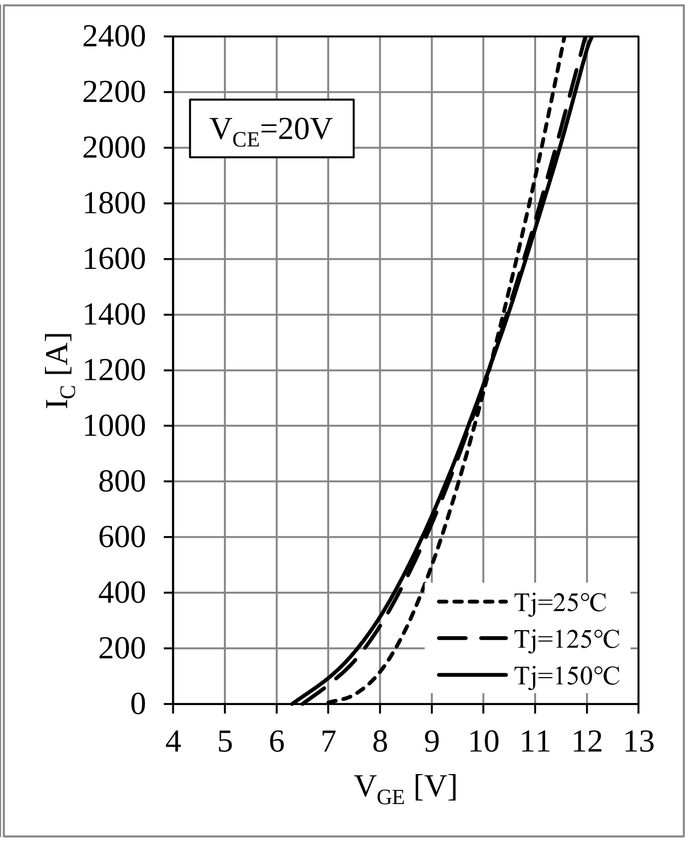


Fig 2. IGBT Transfer Characteristics

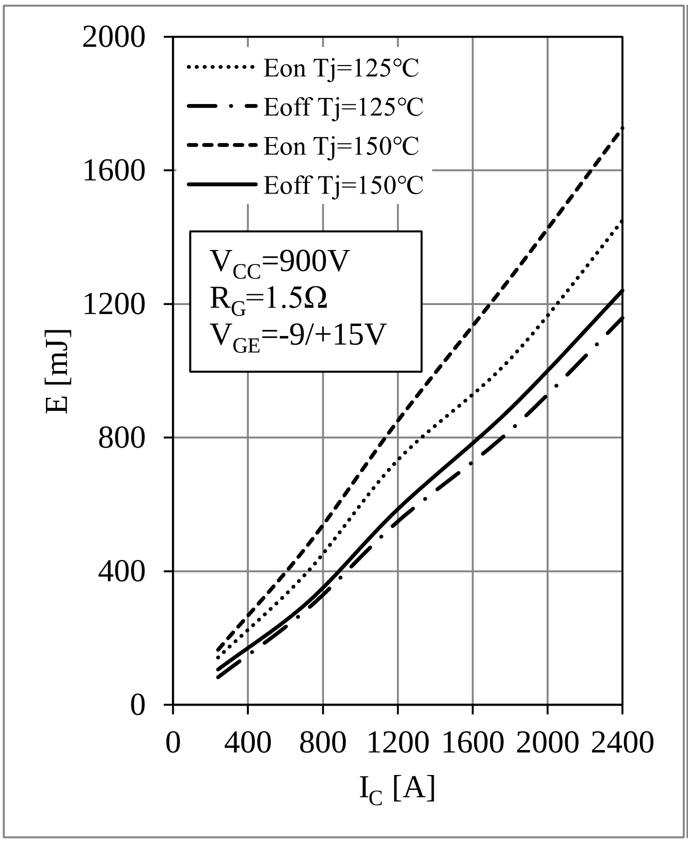


Fig 3. IGBT Switching Loss vs. I_C

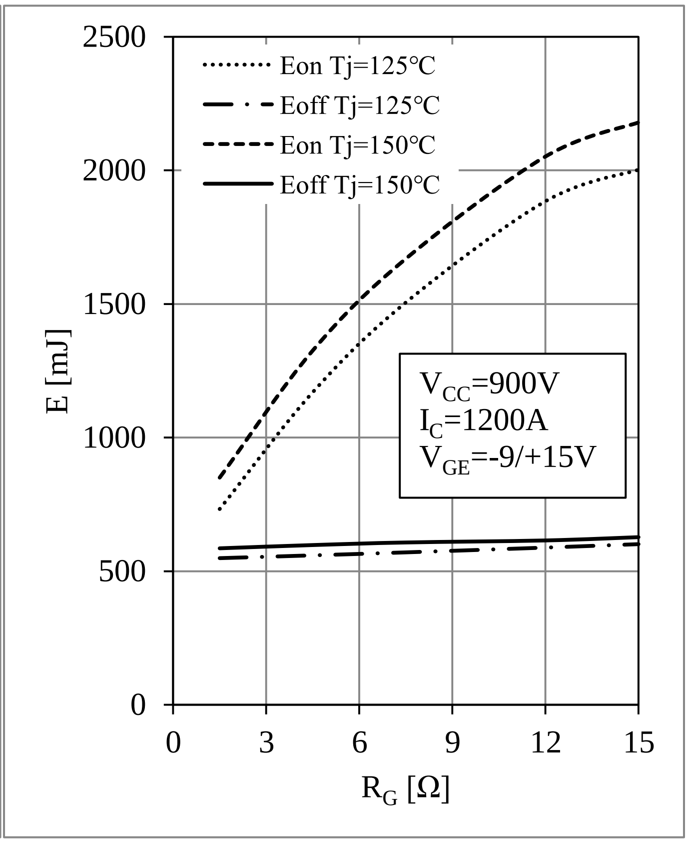


Fig 4. IGBT Switching Loss vs. R_G

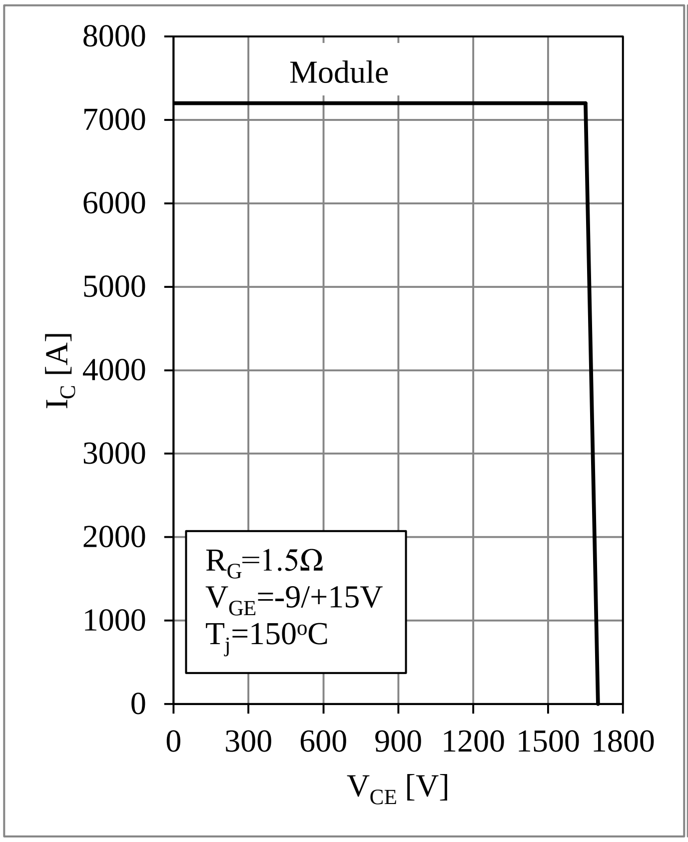


Fig 5. RBSOA

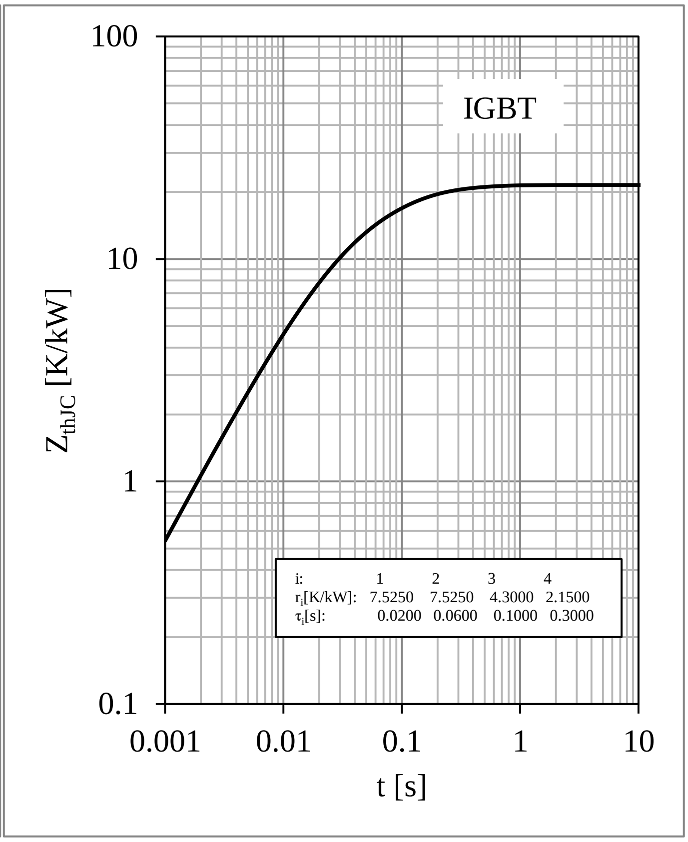


Fig 6. IGBT Transient Thermal Impedance

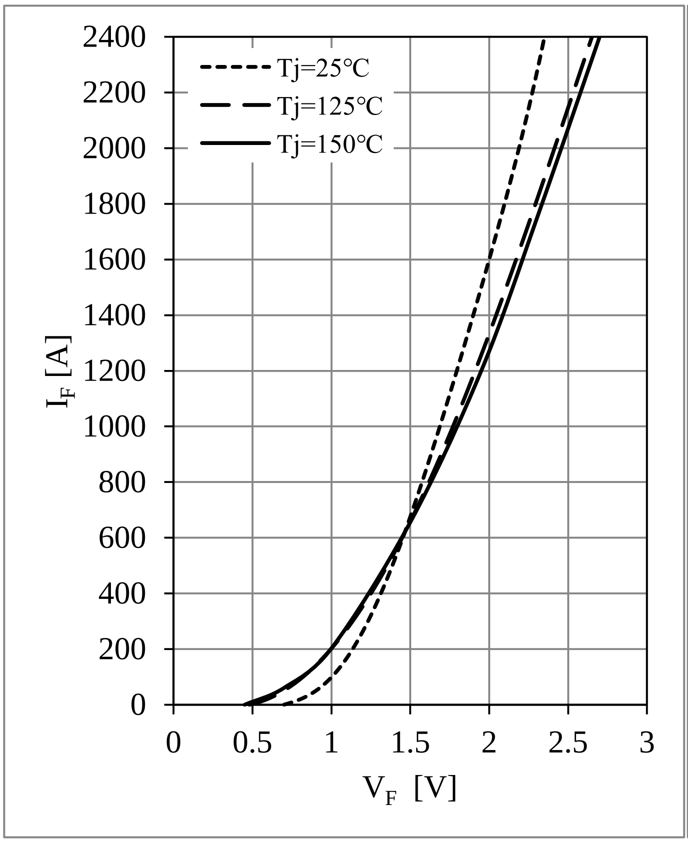


Fig 7. Diode Forward Characteristics

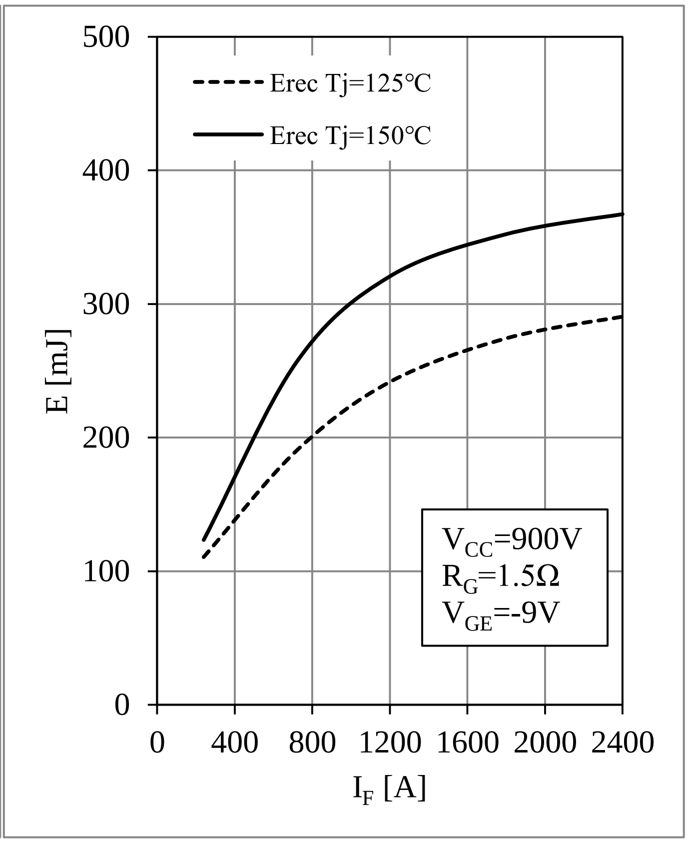


Fig 8. Diode Switching Loss vs. I_F

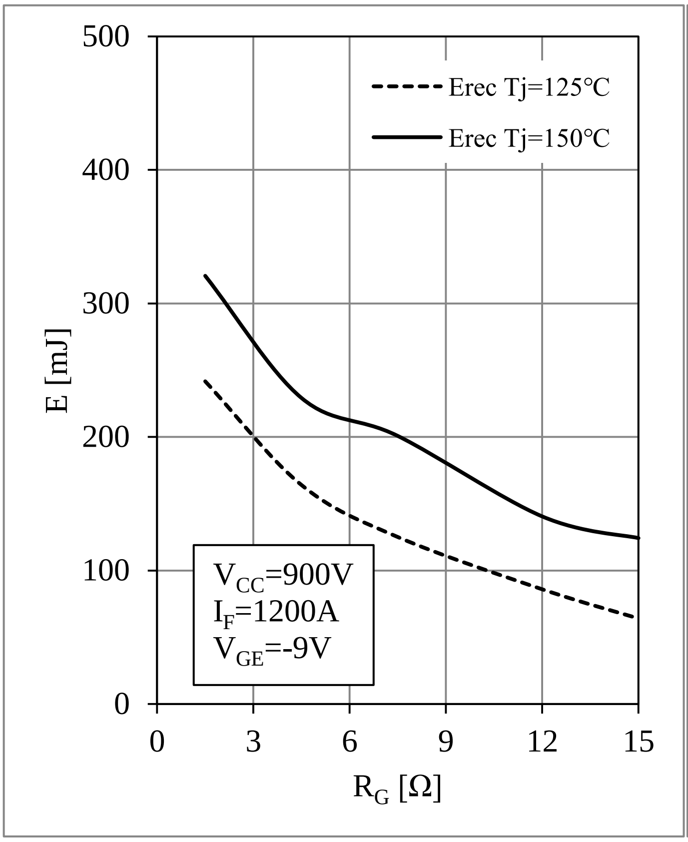


Fig 9. Diode Switching Loss vs. R_G

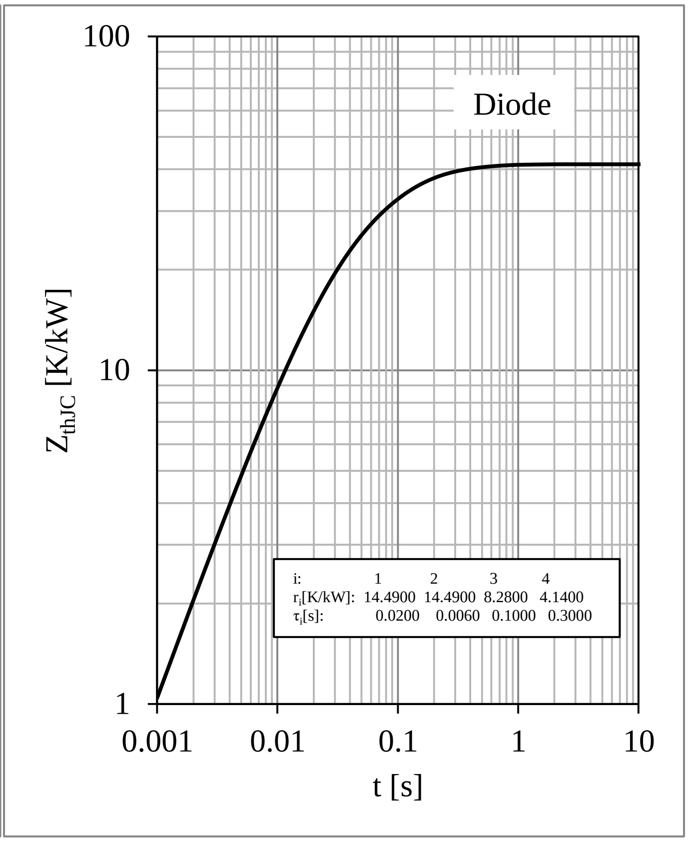
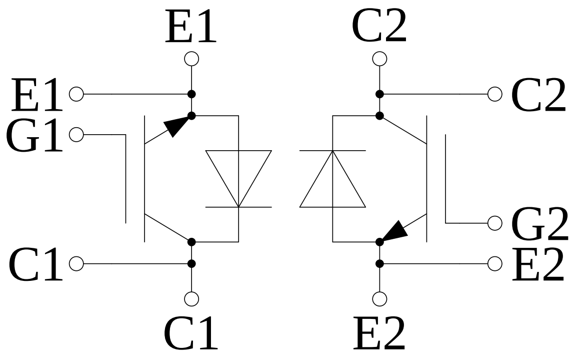


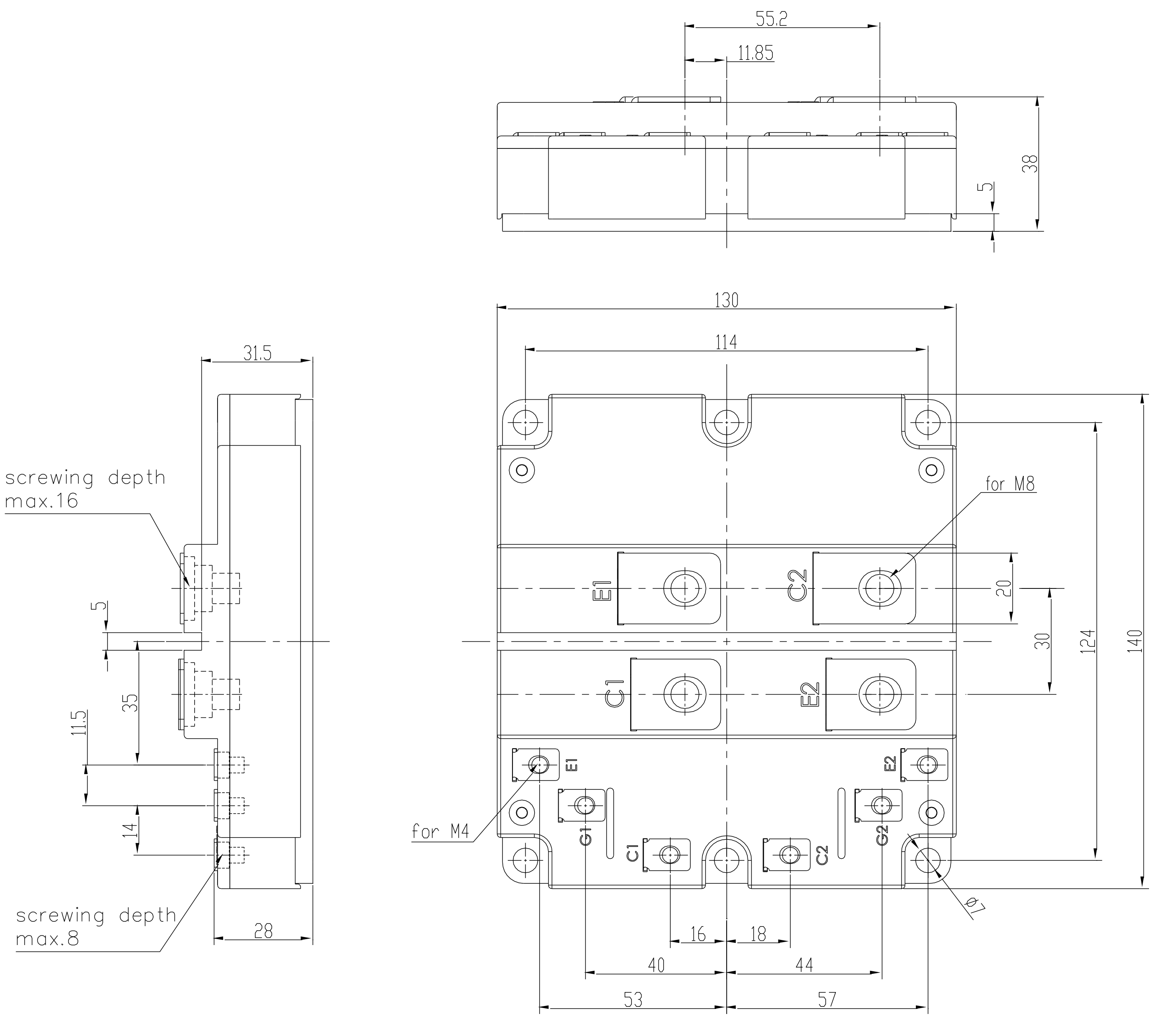
Fig 10. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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