STARPOWER

SEMICONDUCTOR **IGBT**

GD3600SGY120C4S

1200V/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 general inverters and UPS.

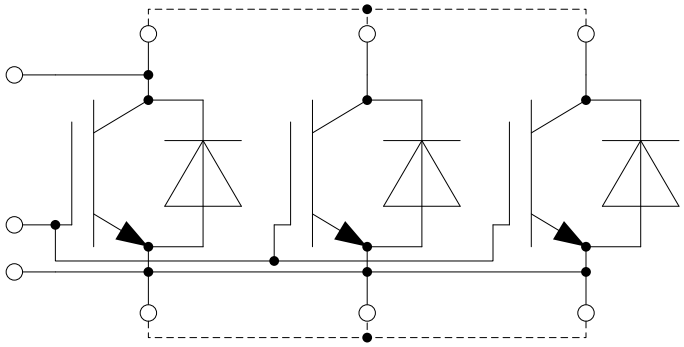
Features

- 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

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterruptible power supply

Equivalent Circuit Schematic



Absolute Maximum Ratings T_C=25°C unless otherwise noted

IGBT

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25°C @ T_C=60°C	4302 3600	A
I_{CM}	Pulsed Collector Current t_p=1ms	7200	A
P_D	Maximum Power Dissipation @ T_j=175°C	11.90	kW

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	3600	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	7200	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=3600A,V_{GE}=15V, T_j=25°C		1.70	2.15	V
		I_C=3600A,V_{GE}=15V, T_j=125°C		1.95		
		I_C=3600A,V_{GE}=15V, T_j=150°C		2.00		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=90.0mA,V_{CE}=V_{GE}, T_j=25°C	5.2	6.0	6.8	V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25°C			1.0	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			0.31		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		252		nF
C_{res}	Reverse Transfer Capacitance			14.4		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		31.2		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=3600A, R_{Gon}=1.3Ω, R_{Goff}=0.22Ω, V_{GE}=±15V,T_j=25°C		471		ns
t_r	Rise Time			460		ns
$t_{d(off)}$	Turn-Off Delay Time			1185		ns
t_f	Fall Time			237		ns
E_{on}	Turn-On Switching Loss			519		mJ
E_{off}	Turn-Off Switching Loss			834		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=3600A, R_{Gon}=1.3Ω, R_{Goff}=0.22Ω, V_{GE}=±15V,T_j=125°C		492		ns
t_r	Rise Time			460		ns
$t_{d(off)}$	Turn-Off Delay Time			1288		ns
t_f	Fall Time			258		ns
E_{on}	Turn-On Switching Loss			637		mJ
E_{off}	Turn-Off Switching Loss			922		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=3600A, R_{Gon}=1.3Ω, R_{Goff}=0.22Ω, V_{GE}=±15V,T_j=150°C		492		ns
t_r	Rise Time			460		ns
$t_{d(off)}$	Turn-Off Delay Time			1339		ns
t_f	Fall Time			258		ns
E_{on}	Turn-On Switching Loss			685		mJ
E_{off}	Turn-Off Switching Loss			953		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=800V, V_{CEM}≤1200V		14.4		kA

Diode Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=3600A,V_{GE}=0V,T_j=25°C		1.65	2.10	V
		I_F=3600A,V_{GE}=0V,T_j=125°C		1.65		
		I_F=3600A,V_{GE}=0V,T_j=150°C		1.65		
Q_r	Recovered Charge	V_{CC}=600V,I_F=3600A, -di/dt=6935A/μs,V_{GE}=±15V, T_j=25°C		266		μC
I_{RM}	Peak Reverse Recovery Current			879		A
E_{rec}	Reverse Recovery Energy			124		mJ
Q_r	Recovered Charge	V_{CC}=600V,I_F=3600A, -di/dt=6935A/μs,V_{GE}=±15V, T_j=125°C		551		μC
I_{RM}	Peak Reverse Recovery Current			1425		A
E_{rec}	Reverse Recovery Energy			247		mJ
Q_r	Recovered Charge	V_{CC}=600V,I_F=3600A, -di/dt=6935A/μs,V_{GE}=±15V, T_j=150°C		618		μC
I_{RM}	Peak Reverse Recovery Current			1473		A
E_{rec}	Reverse Recovery Energy			285		mJ

Module Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		6.0		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		0.12		mΩ
R_{thJC}	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			12.7 19.7	K/kW
R_{thCH}	Case-to-Heatsink (per IGBT) Case-to-Heatsink (per Diode) Case-to-Heatsink (per Module)		6.5 10.2 4.0		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		2300		g

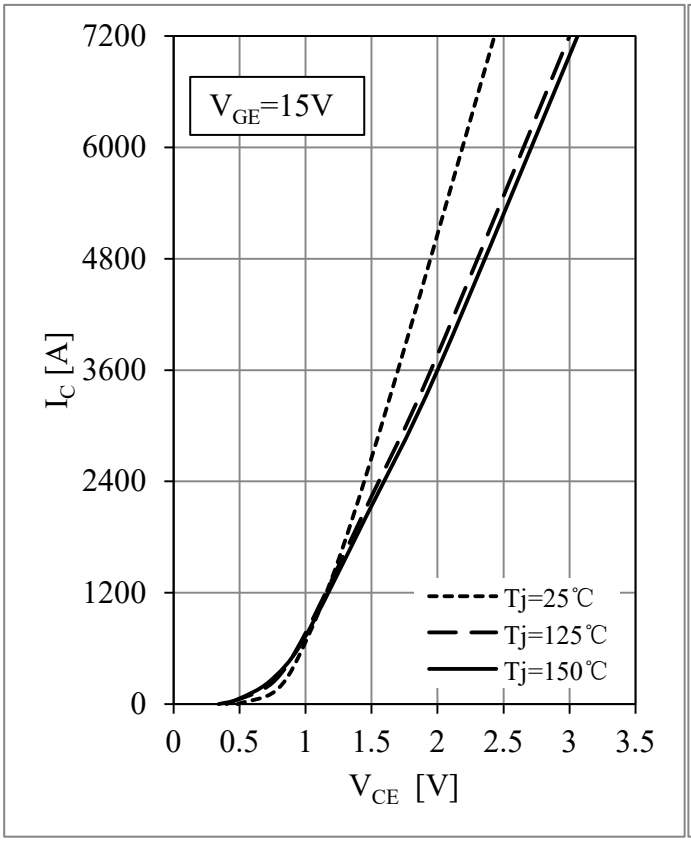


Fig 1. IGBT Output Characteristics

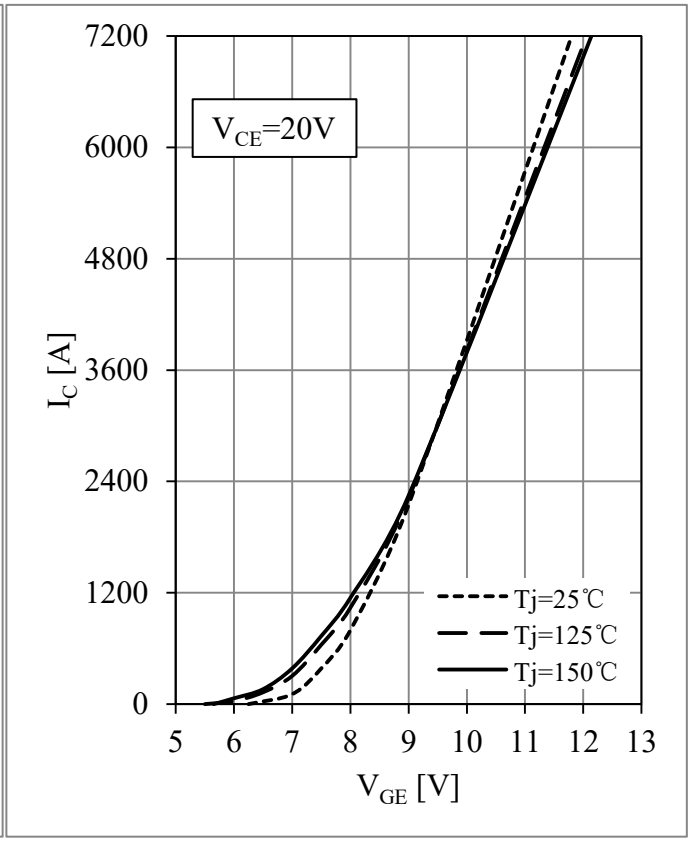


Fig 2. IGBT Transfer Characteristics

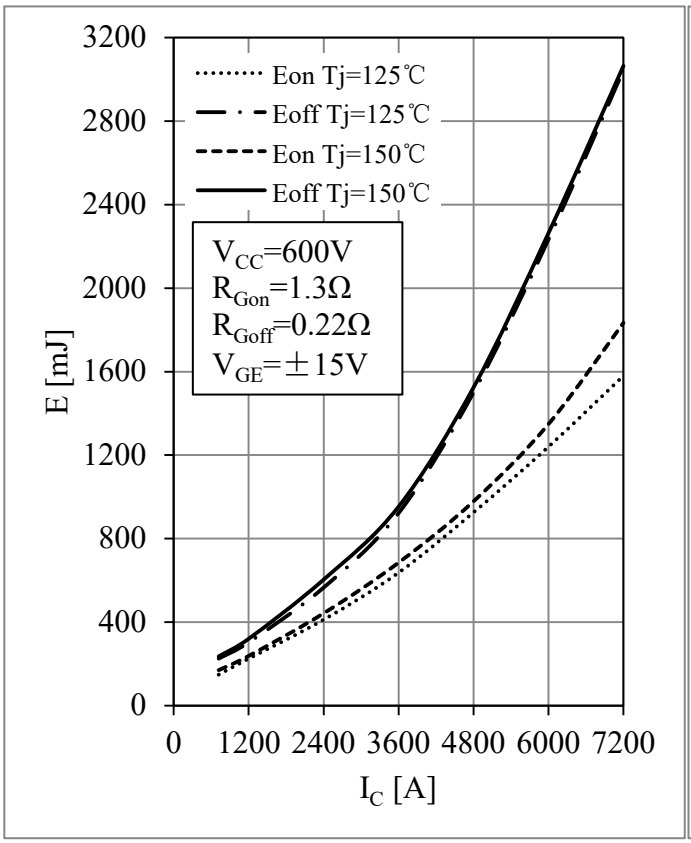


Fig 3. IGBT Switching Loss vs. I_C

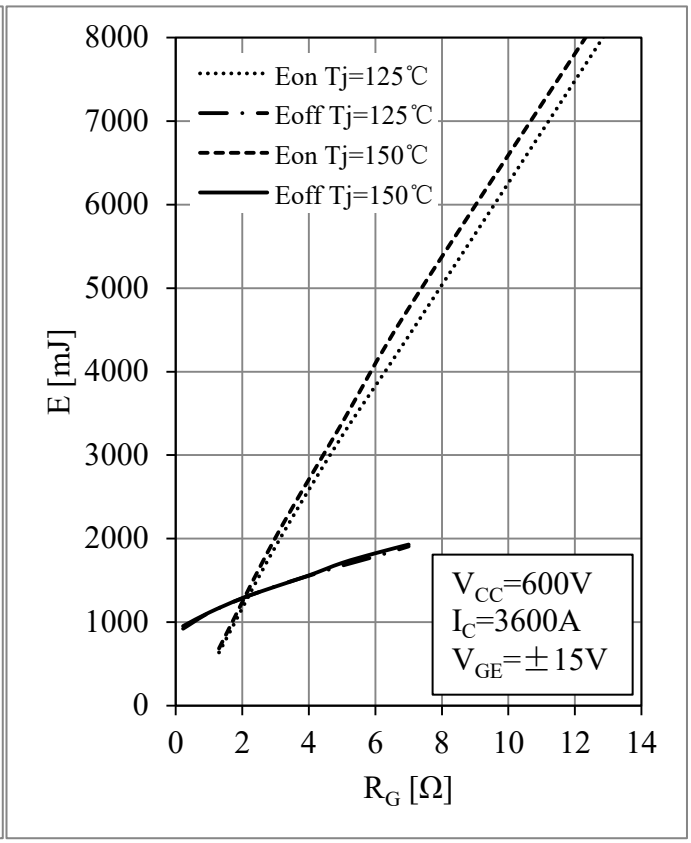


Fig 4. IGBT Switching Loss vs. R_G

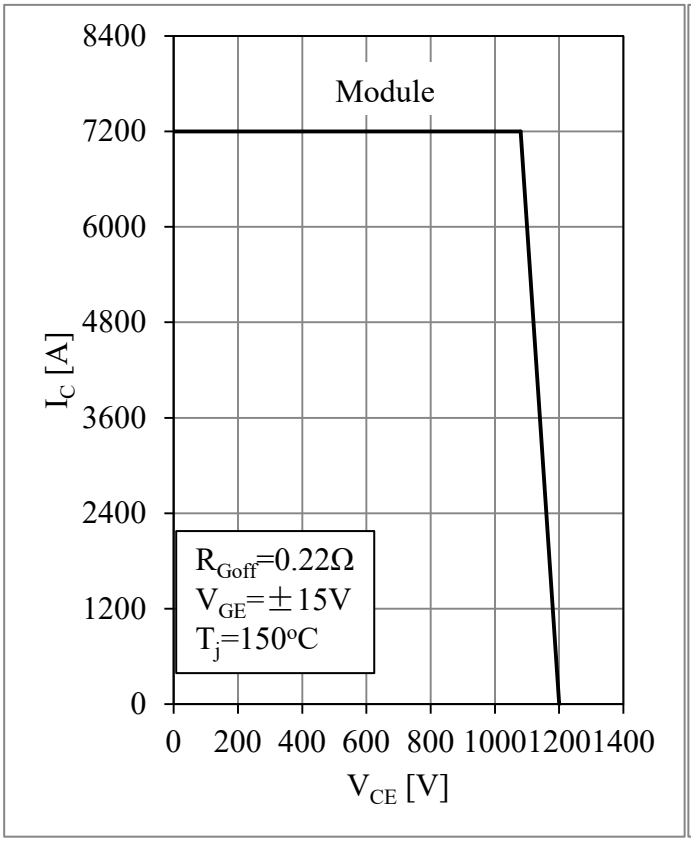


Fig 5. RBSOA

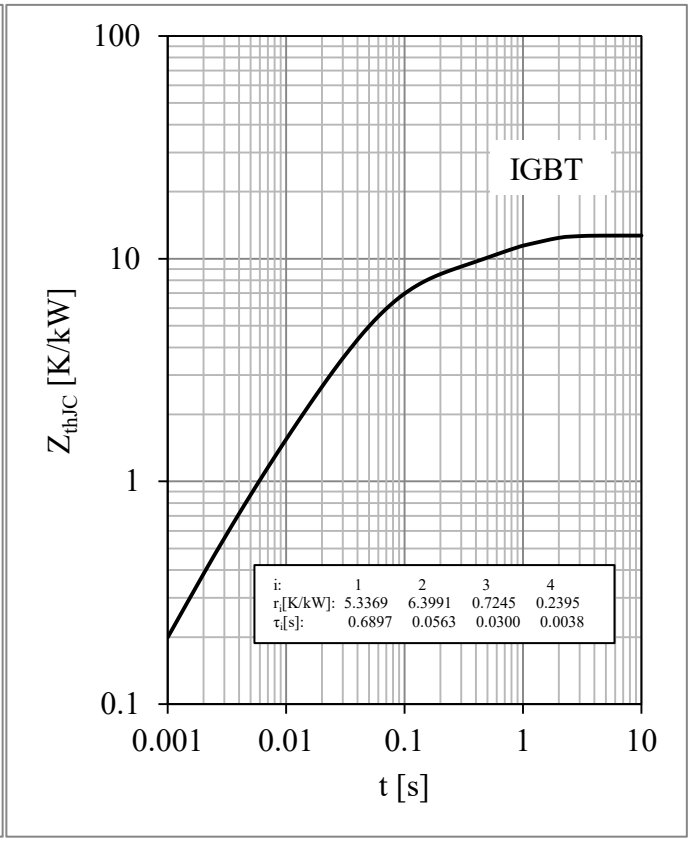


Fig 6. IGBT Transient Thermal Impedance

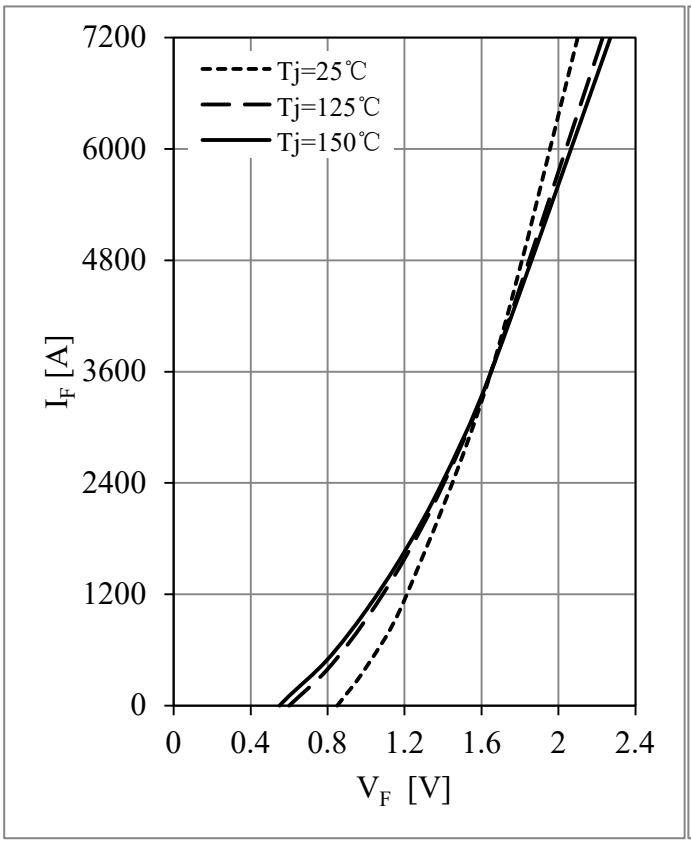


Fig 7. Diode Forward Characteristics

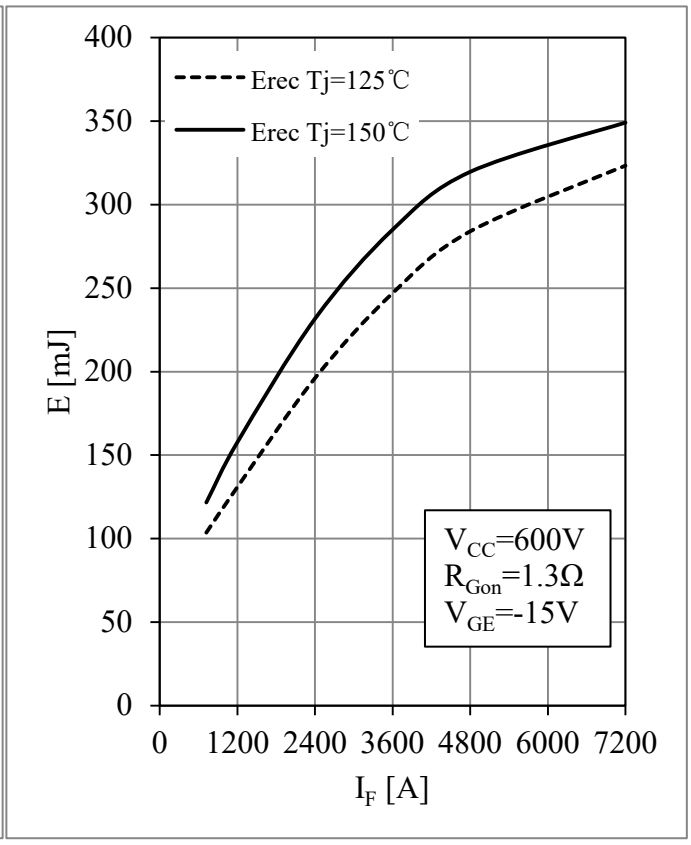


Fig 8. Diode Switching Loss vs. I_F

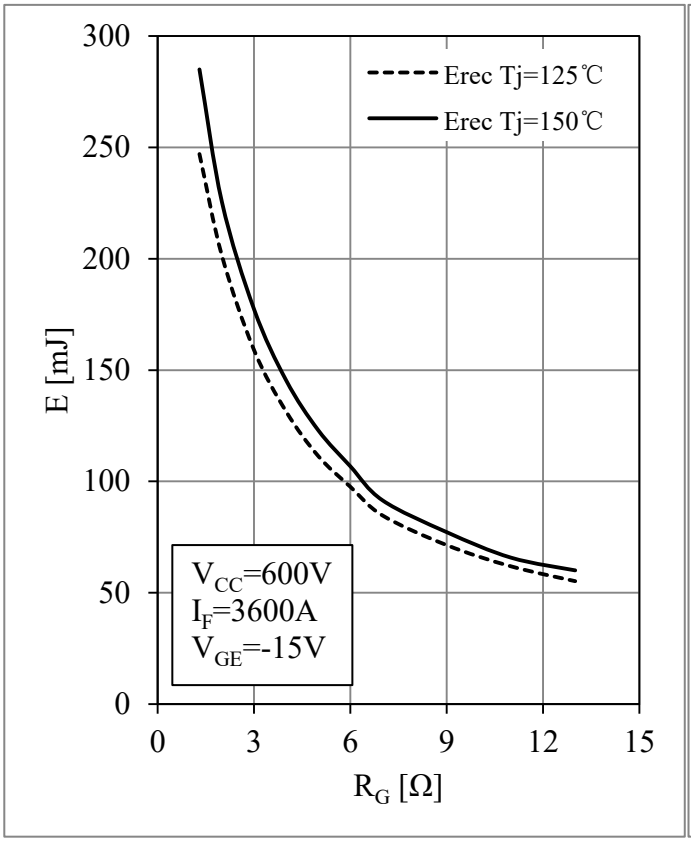


Fig 9. Diode Switching Loss vs. R_G

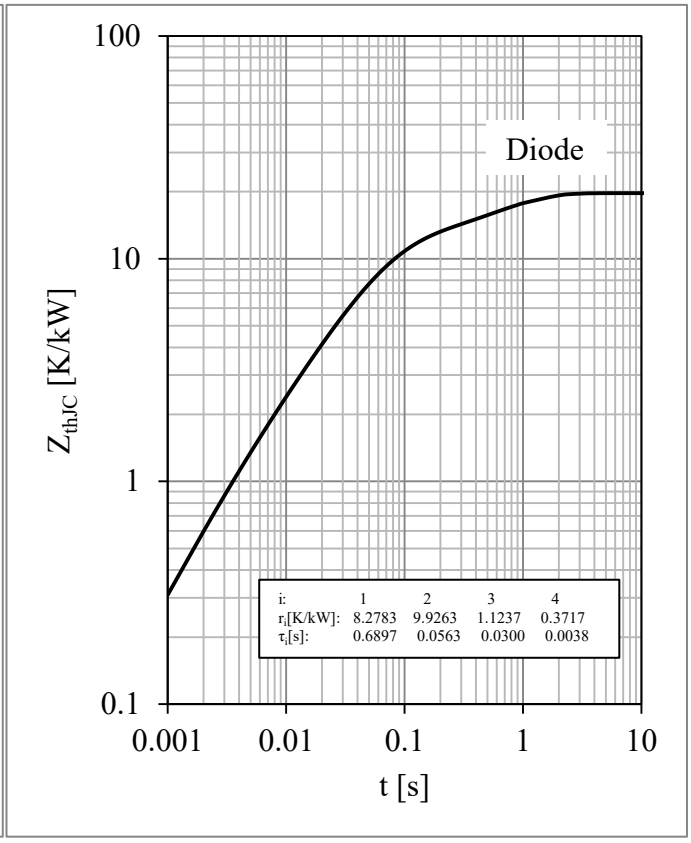
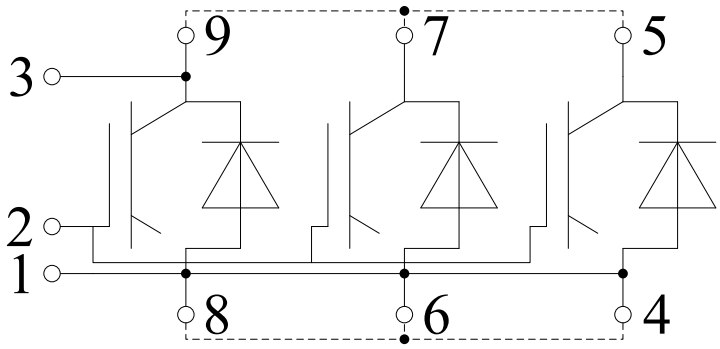


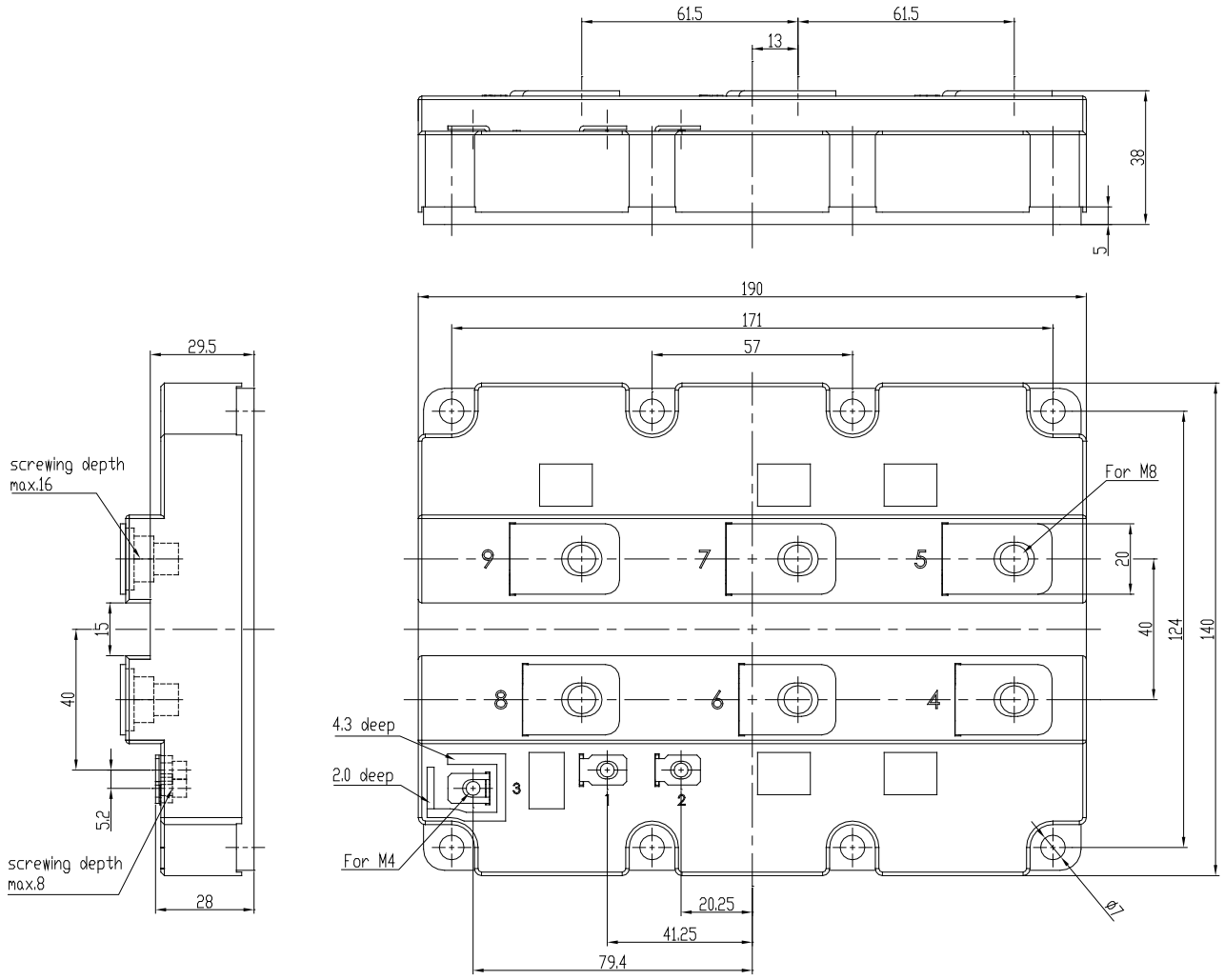
Fig 10. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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