STARPOWER

SEMICONDUCTOR **IGBT**

GD2400SGX170C4S

1700V/2400A 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.

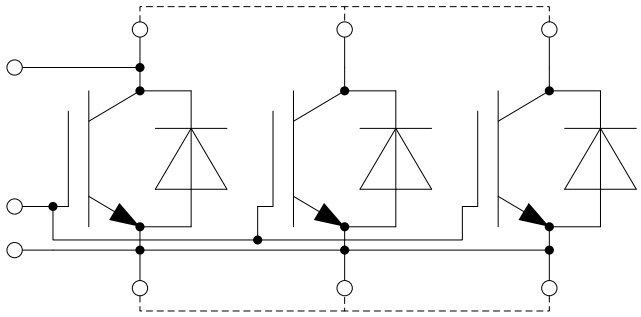
Features

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

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=100°C	2400	A
I_{CM}	Pulsed Collector Current t_p=1ms	4800	A
P_D	Maximum Power Dissipation @ T_j=175°C	15.8	kW

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1700	V
I_F	Diode Continuous Forward Current	2400	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	4800	A
I_{FSM}	Surge Forward Current V_R=0V,t_p=10ms, @T_j=25°C @T_j=150°C	18.65 15.25	kA
I^2t	I^2t-value,V_R=0V,t_p=10ms,T_j=25°C I^2t-value,V_R=0V,t_p=10ms,T_j=150°C	1739 1162	kA^2s

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=2400A,V_{GE}=15V, T_j=25°C		1.85	2.30	V
		I_C=2400A,V_{GE}=15V, T_j=125°C		2.25		
		I_C=2400A,V_{GE}=15V, T_j=150°C		2.35		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=96.0mA,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			0.6		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=100kHz, V_{GE}=0V		285		nF
C_{res}	Reverse Transfer Capacitance			7.13		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		23.5		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=2400A, R_G=0.82Ω,L_S=32nH, V_{GE}=-9V/+15V, T_j=25°C		609		ns
t_r	Rise Time			232		ns
$t_{d(off)}$	Turn-Off Delay Time			1676		ns
t_f	Fall Time			192		ns
E_{on}	Turn-On Switching Loss			784		mJ
E_{off}	Turn-Off Switching Loss			785		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=2400A, R_G=0.82Ω,L_S=32nH, V_{GE}=-9V/+15V, T_j=125°C		732		ns
t_r	Rise Time			280		ns
$t_{d(off)}$	Turn-Off Delay Time			2171		ns
t_f	Fall Time			243		ns
E_{on}	Turn-On Switching Loss			1350		mJ
E_{off}	Turn-Off Switching Loss			1083		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=2400A, R_G=0.82Ω,L_S=32nH, V_{GE}=-9V/+15V, T_j=150°C		772		ns
t_r	Rise Time			298		ns
$t_{d(off)}$	Turn-Off Delay Time			2294		ns
t_f	Fall Time			298		ns
E_{on}	Turn-On Switching Loss			1533		mJ
E_{off}	Turn-Off Switching Loss			1126		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=1000V, V_{CEM}≤1700V		10.5		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=2400A,V_{GE}=0V,T_j=25°C		1.80	2.25	V
		I_F=2400A,V_{GE}=0V,T_j=125°C		1.90		
		I_F=2400A,V_{GE}=0V,T_j=150°C		1.95		
Q_r	Recovered Charge	V_R=900V,I_F=2400A, -di/dt=9570A/μs,V_{GE}=-9V, L_S=32nH,T_j=25°C		243		μC
I_{RM}	Peak Reverse Recovery Current			1656		A
E_{rec}	Reverse Recovery Energy			274		mJ
Q_r	Recovered Charge	V_R=900V,I_F=2400A, -di/dt=7500A/μs,V_{GE}=-9V, L_S=32nH,T_j=125°C		425		μC
I_{RM}	Peak Reverse Recovery Current			1692		A
E_{rec}	Reverse Recovery Energy			438		mJ
Q_r	Recovered Charge	V_R=900V,I_F=2400A, -di/dt=6990A/μs,V_{GE}=-9V, L_S=32nH,T_j=150°C		534		μC
I_{RM}	Peak Reverse Recovery Current			1809		A
E_{rec}	Reverse Recovery Energy			563		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		0.10		mΩ
R_{thJC}	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			9.5 15.8	K/kW
R_{thCH}	Case-to-Heatsink (per IGBT) Case-to-Heatsink (per Diode) Case-to-Heatsink (per Module)		6.4 10.7 4.0		K/kW
d_{Creep}	Terminal-to-Heatsink Terminal-to-Terminal		32.2 32.2		mm
d_{Clear}	Terminal-to-Heatsink Terminal-to-Terminal		19.1 19.1		mm
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		2060		g

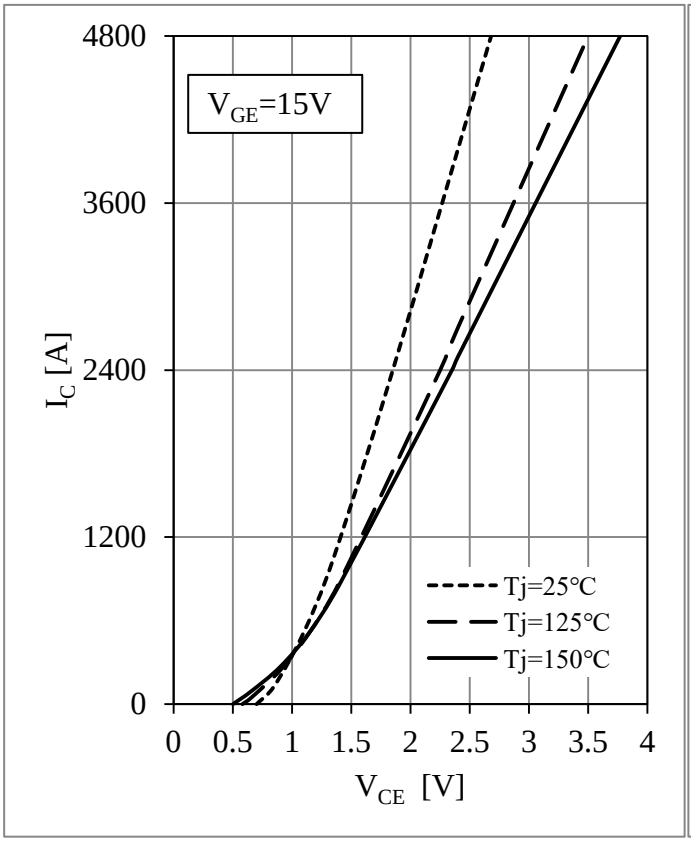


Fig 1. IGBT Output Characteristics

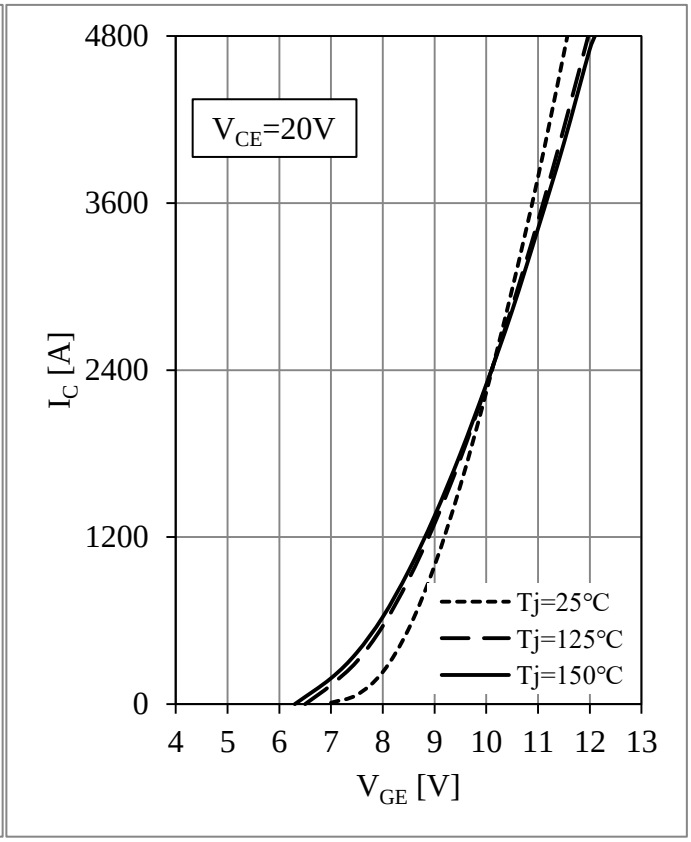


Fig 2. IGBT Transfer Characteristics

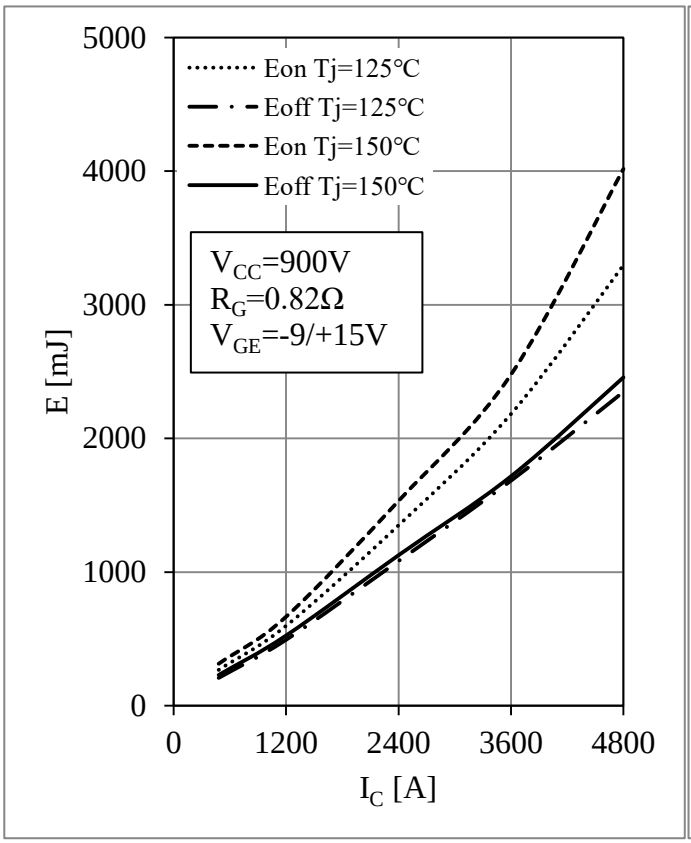


Fig 3. IGBT Switching Loss vs. I_C

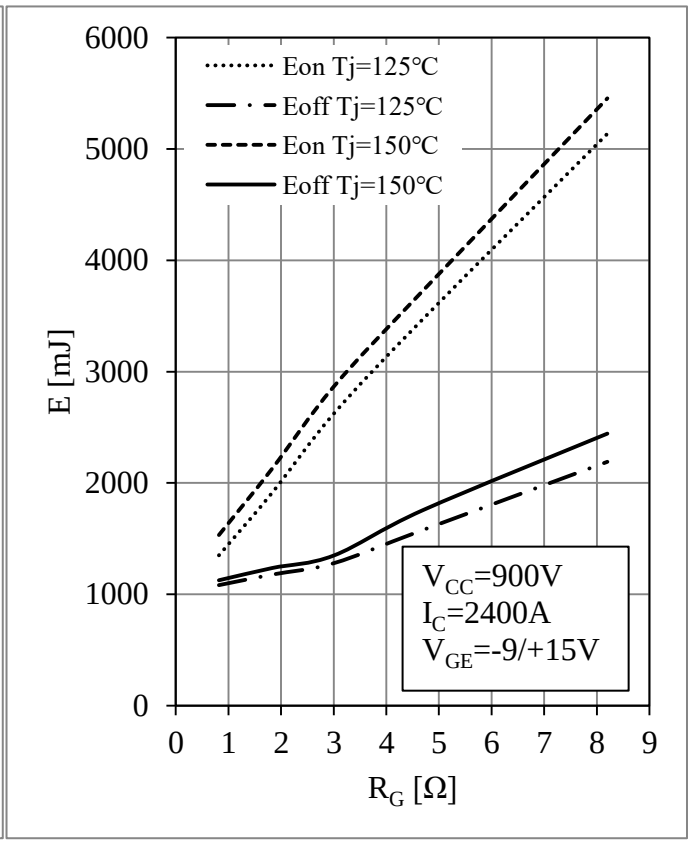


Fig 4. IGBT Switching Loss vs. R_G

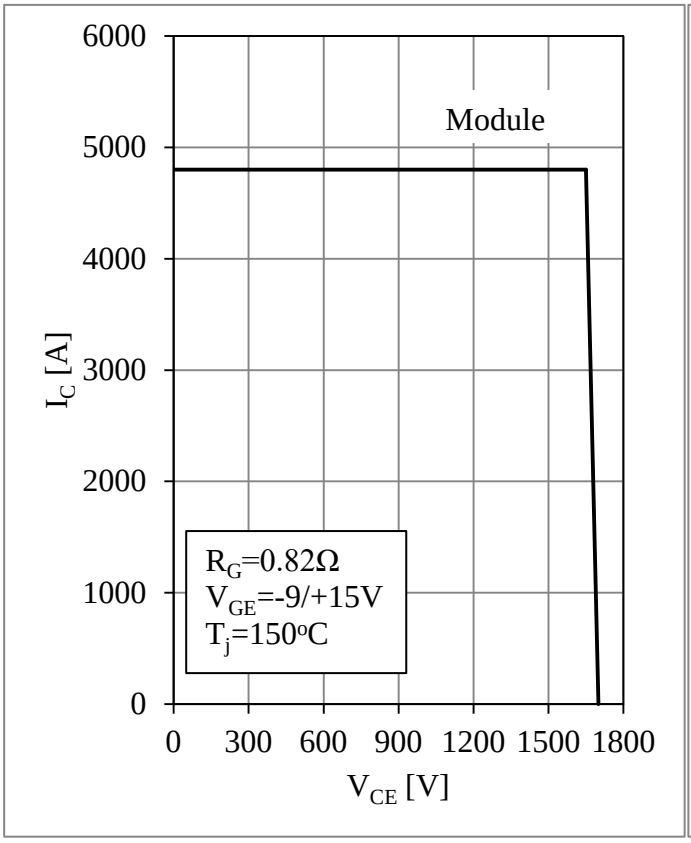


Fig 5. RBSOA

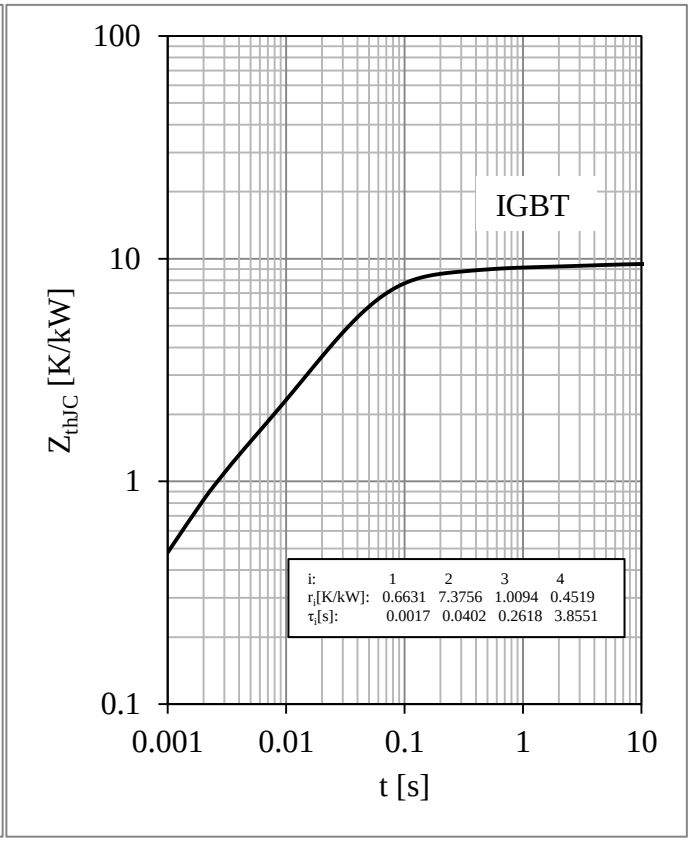


Fig 6. IGBT Transient Thermal Impedance

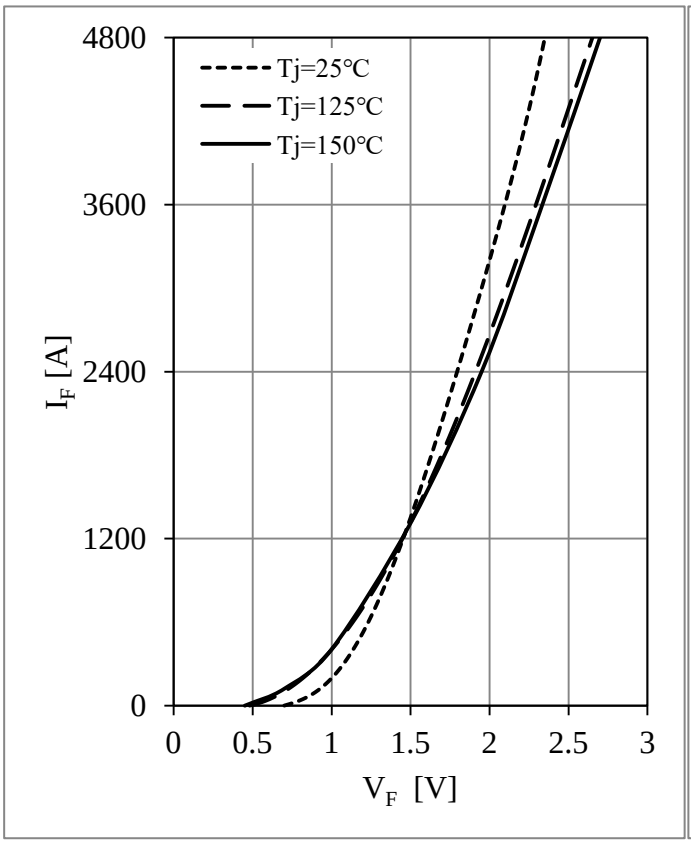


Fig 7. Diode Forward Characteristics

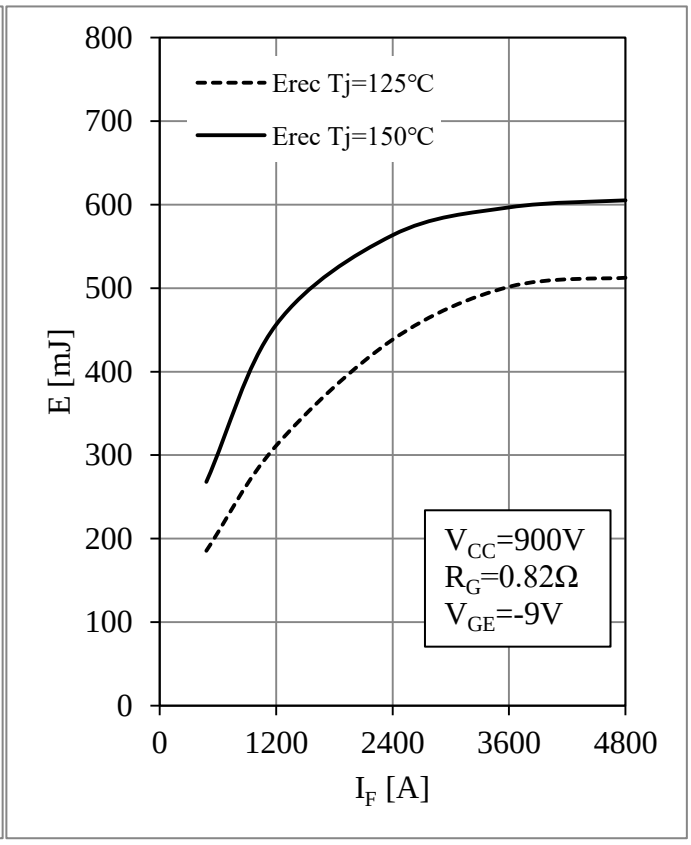


Fig 8. Diode Switching Loss vs. I_F

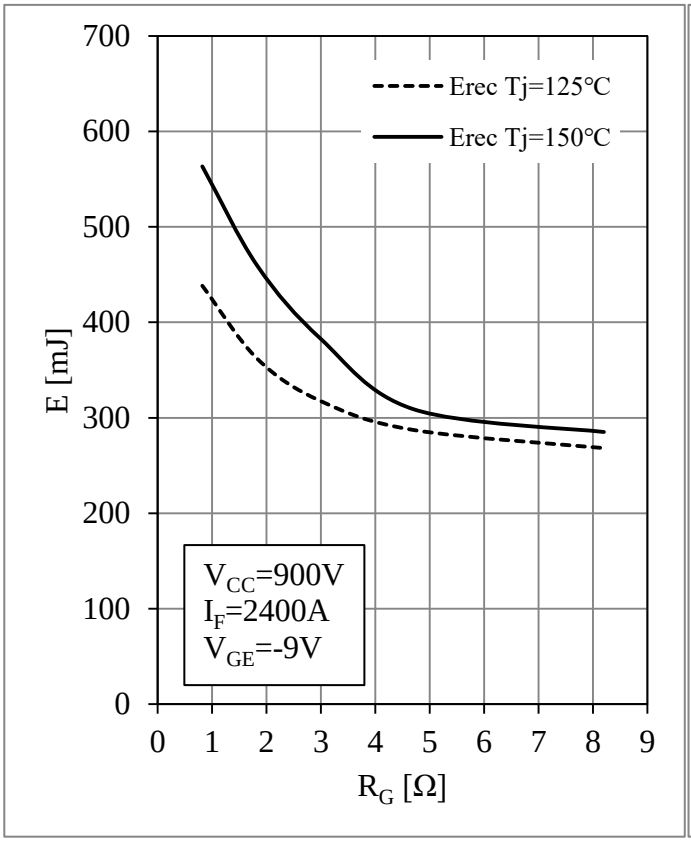


Fig 9. Diode Switching Loss vs. R_G

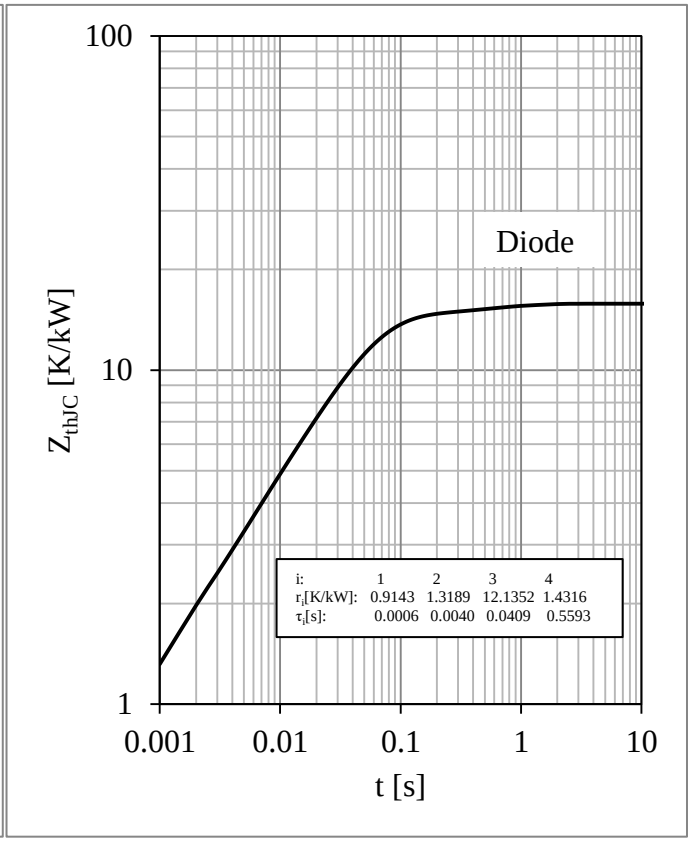
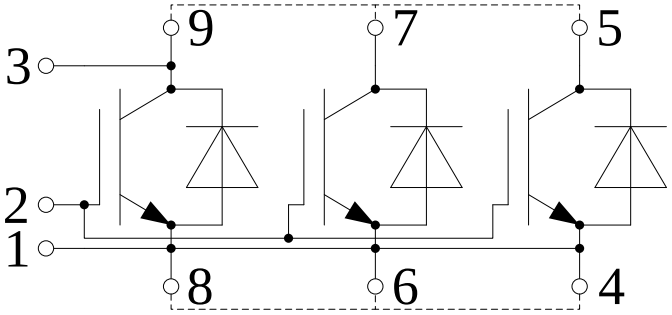


Fig 10. Diode Transient Thermal Impedance

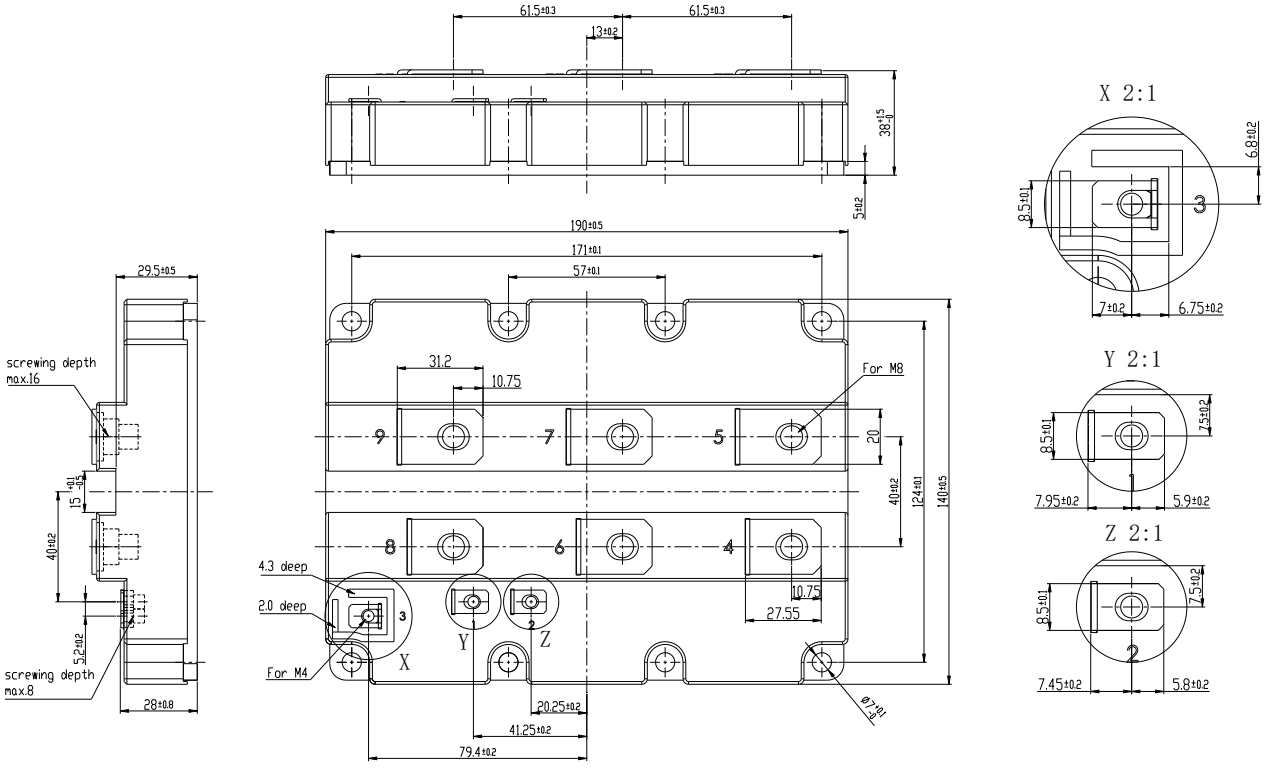
Circuit Schematic



external connection (to be done)

Package Dimensions

Dimensions in Millimeters



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